TM 10-4320-374-13&P

TECHNICAL MANUAL

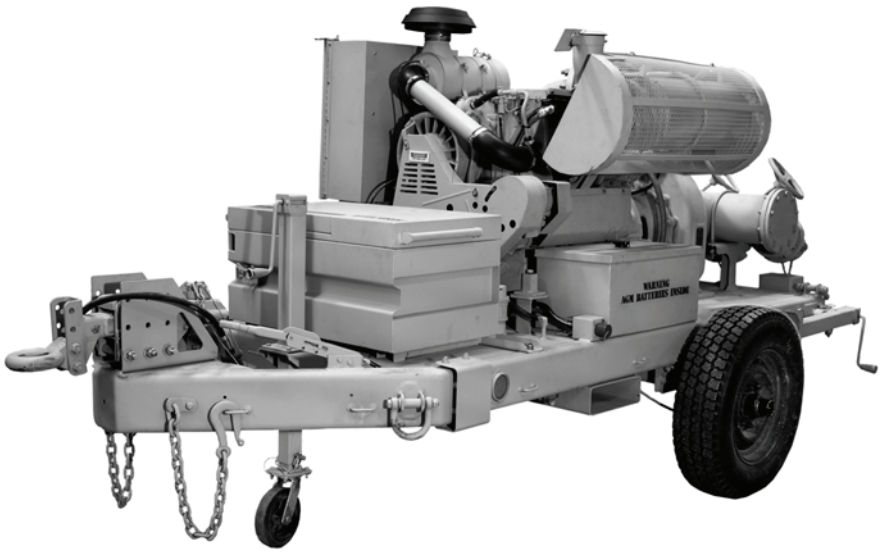
OPERATION AND FIELD MAINTENANCE MANUAL
INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

FOR

PUMP ASSEMBLY: DIESEL-ENGINE-DRIVEN (DED), 600 GPM

FUEL PUMP ASSEMBLY
NSN 4320-01-546-6128

WATER PUMP ASSEMBLY
NSN 4320-01-546-6140



HEADQUARTERS, DEPARTMENT OF THE ARMY

MAY 2008

WARNING SUMMARY

This warning summary contains general safety warnings and hazardous materials warnings that must be understood and applied during operation and maintenance of this equipment. Failure to observe these precautions could result in serious injury or death to personnel. Also included are explanations of safety and hazardous materials icons used within the technical manual.

BIOLOGICAL - abstract symbol bug shows that a material may contain bacteria or viruses that present a danger to life or health.

CHEMICAL - drop of liquid on hand shows that the material will cause burns or irritation to human skin or tissue.

EAR PROTECTION - headphones over ears show that noise level will harm ears.

ELECTRICAL - electrical wire to arm with electricity symbol running through human body shows that shock hazard is present.

EYE PROTECTION - person with goggles shows that the material will injure the eyes.

FIRE - flame shows that a material may ignite and cause burns.

FLYING PARTICLES - arrows bouncing off face with face shield show that particles flying through the air will harm face.

HEAVY OBJECT - human figure stooping over heavy object shows physical injury potential from improper lifting techniques.

HEAVY PARTS - hand with heavy object on top shows that heavy parts can crush and harm.

HEAVY PARTS - heavy object on human figure shows that heavy parts present a danger to life or limb.

HIGH PRESSURE FUEL - high pressure fuel spraying human hand shows that fuel escaping under great pressure can cause injury or death.

HOT AREA - hand over object radiating heat shows that part is hot and can burn.

PINCH POINT - Object crushing human figure shows that areas between vehicles or parts present a danger to life or limb.

RADIOACTIVE - identifies a material that emits radioactive energy and can injure human tissue or organs.

SLICK FLOOR - wavy line on floor with legs prone shows that slick floor presents a danger from falling.

VAPOR - human figure in a cloud shows that material vapors present a danger to life or health.

FOR INFORMATION ON FIRST AID, REFER TO FM 4-25.11.

WARNING

CARBON MONOXIDE (EXHAUST GASES) CAN KILL!

- Carbon monoxide is a colorless, odorless, deadly poison which, when breathed, deprives the body of oxygen and causes suffocation. Exposure to air containing carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, apparent drowsiness, and coma. Permanent brain damage or death can result from severe exposure.
- Carbon monoxide occurs in exhaust fumes of internal combustion engines. Carbon monoxide can become dangerously concentrated under conditions of inadequate ventilation. The following precautions must be observed to ensure safety of personnel when engine of pump assembly is operated.

1. DO NOT operate engine in enclosed areas.
2. DO NOT idle engine without adequate ventilation.
3. BE ALERT for exhaust poisoning symptoms. They are:
   - Headache
   - Dizziness
   - Sleepiness
   - Loss of muscular control
4. If you see another person with exhaust poisoning symptoms:
   - Remove person from area.
   - Expose to fresh air.
   - Keep person warm.
   - DO NOT permit physical exercise.
   - Administer Cardiopulmonary Resuscitation (CPR), if necessary.
   - Notify a medic.
5. BE AWARE. The field protective mask for Nuclear, Biological, and Chemical (NBC) protection will not protect you from carbon monoxide poisoning.
6. CALIFORNIA PROPOSITION 65 WARNING: Engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

The Best Defense Against Carbon Monoxide Poisoning Is Good Ventilation!

WARNING

BATTERIES

- To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. DO NOT smoke, use open flame, make sparks, or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury to personnel. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating or electric shock, damage to equipment, and injury to personnel.
- Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes, or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these procedures may result in death or serious injury to personnel.

a. Eyes. Flush with cold water for no less than 15 minutes and seek medical attention immediately.

b. Skin. Flush with large amounts of cold water until all acid is removed. Seek medical attention as required.

c. Internal. If corrosion or electrolyte is ingested, drink large amounts of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Seek medical attention immediately.

d. Clothing/Equipment. Wash area with large amounts of cold water. Neutralize acid with baking soda or household ammonia.

- CALIFORNIA PROPOSITION 65 WARNING: Battery posts, terminals, and related accessories contain lead and lead components. These chemicals are known to the State of California to cause cancer and reproductive harm. Wash hands after handling.
- Arcing or sparks may occur if battery cables contact any metal surfaces of equipment during removal. Ensure cables do not contact metal surfaces. Failure to do so may cause injury to personnel or damage to equipment.

WARNING

BRAKE FLUID

Wear gloves and eye protection when handling brake fluid. Work in a well-ventilated area. Exposure to brake fluid may cause irritation to eyes, skin, and lungs. If ingested, it can irritate mouth, esophagus, and stomach. Failure to exercise caution may result in injury to personnel.

WARNING

CLEANING

Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. To prevent this, refer to TM 9-247, *Materials Used for Cleaning, Preserving, Abrading and Cementing Ordnance Materiel and Related Materials Including Chemicals* for further instructions.

WARNING

COMPRESSED AIR

Particles blown by compressed air are hazardous. DO NOT exceed 15 psi (103 kPa) nozzle pressure when drying parts with compressed air. Use a maximum of 30 psi (207 kPa) when cleaning components. DO NOT direct compressed air against human skin. Failure to follow this warning may result in injury to personnel. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield.

WARNING

COUPLING/UNCOUPLING TRAILER

Use caution and ground guide assistance when coupling or uncoupling pump assembly trailer to towing vehicle. Do not stand between trailer and towing vehicle while towing vehicle is moving. Failure to follow this warning may cause injury or death to personnel or damage to equipment.

WARNING

EYE PROTECTION

Eye protection must be worn when performing maintenance where components or particles could fly out during procedure. Failure to take precautions could cause injury to personnel.

WARNING

FUEL HANDLING

- DO NOT smoke or permit any open flame in area of pump assembly while you are servicing engine fuel system. Be sure hose nozzle is grounded against filler tube during refueling to prevent static electricity. Failure to follow this warning may result in injury or death to personnel or damage to equipment.
- DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing damage to equipment and injury or death to personnel.
- Wear fuel-resistant gloves and eye protection when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing.
- ALWAYS ensure engine is shut down prior to refueling.

WARNING

FUEL/WATER PUMP OPERATION

- FUEL PUMP ASSEMBLY: When handling fuel, personnel must take appropriate measures to minimize the risk of fire, explosion, injury, illness, and contamination of the environment. To attain this goal, personnel must have a thorough knowledge of the hazards involved. They must strictly observe fire and safety precautions. They must follow spill control and containment measures. Failure to do so may result in injury or death to personnel or damage to equipment.
- For further information, read and become familiar with safety information in *General Safety Instructions* (WP 0004).
- A water pump assembly may be converted to fuel service. However, once a pump has been used to pump fuel, it must NEVER again be used to pump water. Failure to follow this warning may result in injury or death to personnel.
- With pump assembly started, operators using a co-located GPS may find GPS performance to be degraded. Failure to realize this limitation may result in death or injury of personnel.
- With pump assembly started, operators that are within a distance of 23 m may find UHF communications to be compromised. Failure to realize this limitation may result in death or injury of personnel.
- Ensure system pressure has been removed from system discharge and suction hose(s) connected to pump before removing hose(s). Failure to follow this warning may result in injury or death to personnel.

WARNING

HAZARDOUS WASTE DISPOSAL

- When servicing this equipment, performing maintenance, or disposing of materials such as lubricating oil, fuel, brake fluid, battery acids, batteries, and CARC paint, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.
- Lubricating oils and brake fluid used in the performance of maintenance can be very slippery. Immediately wipe up any spills. Failure to follow this warning may result in injury to personnel.

WARNING

HEARING PROTECTION

Hearing protection is required when operating pump assembly, or when within 50 ft (15.2 m) of pump assembly while it is operating. Failure to wear hearing protection may result in hearing loss.

WARNING

HOT COMPONENTS

Components with metal parts can cause severe burns at operating temperature. Allow components to cool before performing maintenance on them. Wear insulated gloves, long sleeves, and eye protection when working with heated parts.

WARNING

LIFTING/HOISTING HEAVY PARTS

- Use extreme caution when lifting/hoisting pump assembly or other heavy parts. Provide adequate support and use assistance during procedure. Ensure that lifting equipment used is on solid footing, is in good condition, and is of suitable lift capacity. Keep clear of heavy parts supported only by lifting equipment. Failure to follow this warning may result in death or injury to personnel or damage to equipment.
- Death or injury could occur if unauthorized personnel are in the hoisting area. Permit only personnel engaged in hoisting operation to be near pump assembly and lifting equipment.
- Hoist pump assembly slowly and smoothly. Do not swing load from side to side, as this places extra strain on lifting components. Watch boom angle and overhead clearance when hoisting. Failure to follow this warning may result in injury or death to personnel or damage to equipment.

WARNING

LUBRICATING OIL

Contact with engine oil can damage skin. Wear gloves when handling engine oil. If oil contacts skin, wash it off immediately. Failure to follow this warning may cause injury to personnel.

WARNING

NBC EXPOSURE

If NBC exposure is suspected, personnel wearing protective equipment must handle all air cleaner media. Contaminated filters must be handled using adequate precautions and must be disposed of by trained personnel. Consult your NBC Officer or NBC NCO for appropriate handling or disposal procedures. Failure to follow this warning may cause injury or death to personnel.

To order this NBC decal use:

National Stock Number (NSN) - 7690-01-114-3702
Part Number (PN) - 12296626
Commercial and Government Entity Code (CAGEC) - 19207

WARNING

RTV SILICONE COMPOUND

Wear gloves and eye protection when handling RTV silicone compound. Work in a well-ventilated area. Exposure to RTV silicone compound may cause irritation to eyes, skin, and lungs. If ingested, do NOT induce vomiting. Seek medical attention.

WARNING

SERVICE BRAKE SYSTEM

- When performing inspection or maintenance of service brakes or wheel and tire assembly, ensure wheel and tire assembly on side not being worked on is securely chocked with hand brake applied. Failure to follow this warning may cause trailer to roll, resulting in injury or death to personnel or damage to equipment.
- If one brakeshoe is being replaced, replace all brakeshoes. Combination of old and new will cause uneven braking. Accidents causing injury or death to personnel may occur.
- DO NOT allow grease to contact brakeshoe linings. Remove any grease from brakeshoe linings to prevent them from becoming grease-soaked. Brakeshoe linings that absorb grease become glazed, resulting in poor braking action. Failure to keep brakeshoes free of grease may cause brakes to malfunction, resulting in injury or death to personnel or damage to equipment.

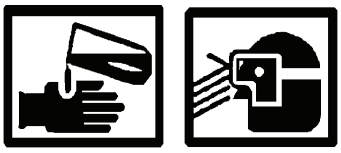
WARNING

SLAVE STARTING ENGINE

When slave starting engine of pump assembly:

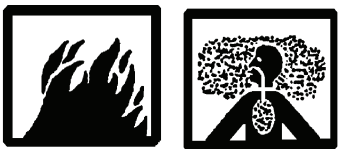
- Use NATO slave cable that does NOT have loose or missing insulation.
- DO NOT proceed if suitable cable is not available.
- DO NOT use civilian-type jumper cables.
- DO NOT allow disabled pump assembly and booster vehicle to come in contact with each other at any time during slave starting.

Failure to follow these warnings may result in injury or death to personnel.



WARNING

SOLVENT CLEANING COMPOUND



Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low-toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to do so may result in injury or death to personnel.

WARNING

TIRES

- Towing pump assembly with underinflated or defective tires may lead to tire failure and loss of traction or control. Failure to follow this warning may cause damage to equipment or injury to personnel.
- Use a self-inflating chuck and stand at a distance behind tire when inflating tire. Failure to follow this warning may cause injury or death to personnel.

WARNING

TOWING PUMP ASSEMBLY

ALWAYS check brake fluid level in master cylinder before towing pump assembly. If brake fluid level is below specification, trailer brakes will not function properly. Damage to equipment or injury or death to personnel could result.

LIST OF EFFECTIVE PAGES/WORK PACKAGES

NOTE: Zero in the "Change No." column indicates and original page or work package.

Date of issue for the original manual is:

Original . . . . . 30 May 2008

Total number of pages for front and rear matter is 42 and total number of work packages is 129, consisting of the following:

Page/WP No.	Change No.	Page/WP No.	Change No.
Front cover (2 pgs)	0	WP 0028 (2 pgs)	0
Warning Summary (10 pgs)	0	WP 0029 (4 pgs)	0
TOC (10 pgs)	0	WP 0030 (8 pgs)	0
Chapter 1 title page		WP 0031 (6 pgs)	0
WP 0001 (4 pgs)	0	WP 0032 (2 pgs)	0
WP 0002 (10 pgs)	0	WP 0033 (8 pgs)	0
WP 0003 (20 pgs)	0	WP 0034 (4 pgs)	0
WP 0004 (4 pgs)	0	WP 0035 (4 pgs)	0
Chapter 2 title page		WP 0036 (6 pgs)	0
WP 0005 (16 pgs)	0	WP 0037 (8 pgs)	0
WP 0006 (22 pgs)	0	WP 0038 (8 pgs)	0
WP 0007 (6 pgs)	0	WP 0039 (4 pgs)	0
WP 0008 (10 pgs)	0	WP 0040 (4 pgs)	0
Chapter 3 title page		WP 0041 (4 pgs)	0
WP 0009 (2 pgs)	0	WP 0042 (4 pgs)	0
WP 0010 (2 pgs)	0	WP 0043 (4 pgs)	0
WP 0011 (12 pgs)	0	WP 0044 (2 pgs)	0
Chapter 4 title page		WP 0045 (2 pgs)	0
WP 0012 (8 pgs)	0	WP 0046 (2 pgs)	0
WP 0013 (42 pgs)	0	WP 0047 (4 pgs)	0
WP 0014 (2 pgs)	0	WP 0048 (6 pgs)	0
WP 0015 (4 pgs)	0	WP 0049 (4 pgs)	0
WP 0016 (4 pgs)	0	WP 0050 (4 pgs)	0
Chapter 5 title page		WP 0051 (10 pgs)	0
WP 0017 (4 pgs)	0	WP 0052 (4 pgs)	0
WP 0018 (2 pgs)	0	WP 0053 (12 pgs)	0
WP 0019 (18 pgs)	0	WP 0054 (4 pgs)	0
Chapter 6 title page		WP 0055 (6 pgs)	0
WP 0020 (2 pgs)	0	WP 0056 (8 pgs)	0
WP 0021 (12 pgs)	0	WP 0057 (10 pgs)	0
WP 0022 (8 pgs)	0	WP 0058 (2 pgs)	0
WP 0023 (6 pgs)	0	WP 0059 (8 pgs)	0
WP 0024 (6 pgs)	0	WP 0060 (4 pgs)	0
WP 0025 (2 pgs)	0	WP 0061 (2 pgs)	0
WP 0026 (6 pgs)	0	WP 0062 (4 pgs)	0
WP 0027 (6 pgs)	0	WP 0063 (2 pgs)	0

Page/WP No.	Change No.
WP 0064 (2 pgs)	0
WP 0065 (2 pgs)	0
WP 0066 (6 pgs)	0
WP 0067 (4 pgs)	0
WP 0068 (4 pgs)	0
WP 0069 (4 pgs)	0
WP 0070 (2 pgs)	0
WP 0071 (2 pgs)	0
WP 0072 (6 pgs)	0
WP 0073 (16 pgs)	0
WP 0074 (4 pgs)	0
WP 0075 (4 pgs)	0
WP 0076 (12 pgs)	0
WP 0077 (4 pgs)	0
WP 0078 (10 pgs)	0
WP 0079 (4 pgs)	0
WP 0080 (4 pgs)	0
WP 0081 (4 pgs)	0
WP 0082 (4 pgs)	0
WP 0083 (6 pgs)	0
WP 0084 (6 pgs)	0
WP 0085 (2 pgs)	0
WP 0086 (6 pgs)	0
WP 0087 (8 pgs)	0
WP 0088 (6 pgs)	0
WP 0089 (2 pgs)	0
WP 0090 (4 pgs)	0
WP 0091 (10 pgs)	0
WP 0092 (8 pgs)	0
WP 0093 (6 pgs)	0
WP 0094 (28 pgs)	0
WP 0095 (6 pgs)	0
WP 0096 (6 pgs)	0
WP 0097 (8 pg)	0
WP 0098 (8 pgs)	0

Page/WP No.	Change No.
WP 0099 (14 pgs)	0
WP 0100 (4 pgs)	0
WP 0101 (6 pgs)	0
WP 0102 (4 pgs)	0
WP 0103 (6 pgs)	0
WP 0104 (6 pgs)	0
WP 0105 (4 pgs)	0
WP 0106 (2 pgs)	0
WP 0107 (12 pgs)	0
WP 0108 (10 pgs)	0
WP 0109 (4 pgs)	0
WP 0110 (8 pgs)	0
WP 0111 (34 pgs)	0
WP 0112 (12 pgs)	0
WP 0113 (24 pgs)	0
WP 0114 (14 pgs)	0
WP 0115 (4 pgs)	0
WP 0116 (16 pgs)	0
WP 0117 (4 pgs)	0
WP 0118 (4 pgs)	0
WP 0119 (2 pgs)	0
Chapter 7 title page	
WP 0120 (6 pgs)	0
WP 0121 (148 pgs)	0
WP 0122 (4 pgs)	0
WP 0123 (30 pgs)	0
Chapter 8 title page	
WP 0124 (2 pgs)	0
WP 0125 (4 pgs)	0
WP 0126 (8 pgs)	0
WP 0127 (4 pgs)	0
WP 0128 (2 pgs)	0
WP 0129 (6 pgs)	0
Index (8 pgs)	0
Foldouts (6 pgs)	0
Back cover (2 pgs)	0

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 30 May 2008

TECHNICAL MANUAL

OPERATION AND FIELD MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

FOR

PUMP ASSEMBLY: DIESEL-ENGINE-DRIVEN (DED), 600 GPM

FUEL PUMP ASSEMBLY
NSN 4320-01-546-6128

WATER PUMP ASSEMBLY
NSN 4320-01-546-6140

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Submit your DA Form 2028 (Recommended Changes to Equipment Technical Publications), through the Internet, on the Army Electronic Product Support (AEPS) website. The Internet address is: https://aeps.ria.army.mil. The DA Form 2028 is located under the Public Applications section in the AEPS Public Home Page. Fill out the form and click on SUBMIT. Using this form on the AEPS will enable us to respond quicker to your comments and better manage the DA Form 2028 program. You may also mail, fax or E-mail your letter or DA Form 2028 direct to: U. S. Army TACOM Life Cycle Management Command, ATTN: AMSTA-LC-LMPP/TECH PUBS, 1 Rock Island Arsenal, Rock Island, IL 61299-7630. The E-mail address is ROCK-TACOM-TECH-PUBS@conus.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726.

TABLE OF CONTENTS

WP Sequence No.

How To Use This Manual ix

Chapter 1 - INTRODUCTORY INFORMATION, EQUIPMENT DESCRIPTION, AND THEORY OF OPERATION

General Information . . . . . WP 0001
Equipment Description and Data . . . . . WP 0002
Theory of Operation . . . . . WP 0003
General Safety Instructions . . . . . WP 0004

Chapter 2 - OPERATOR INSTRUCTIONS

Description and Use of Operator Controls and Indicators . . . . . WP 0005
Operation Under Usual Conditions . . . . . WP 0006
Operation Under Unusual Conditions . . . . . WP 0007
Stowage and Decal, Data Plate, and Stencil Guide . . . . . WP 0008

Chapter 3 - OPERATOR TROUBLESHOOTING PROCEDURES

Operator Troubleshooting Introduction . . . . . WP 0009
Operator Troubleshooting Symptom Index . . . . . WP 0010

TABLE OF CONTENTS

WP Sequence No.

Operator Troubleshooting Procedures . . . . . WP 0011

Chapter 4 - OPERATOR MAINTENANCE INSTRUCTIONS

Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions Introduction . . . . . WP 0012

Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions . . . . . WP 0013

Storage of Pump Assembly . . . . . WP 0014

Air Cleaner Service . . . . . WP 0015

Hand Brake Inspection and Adjustment . . . . . WP 0016

Chapter 5 - FIELD MAINTENANCE TROUBLESHOOTING PROCEDURES

Field Maintenance Troubleshooting Introduction . . . . . WP 0017

Field Maintenance Troubleshooting Symptom Index . . . . . WP 0018

Field Maintenance Troubleshooting Procedures . . . . . WP 0019

Chapter 6 - FIELD MAINTENANCE INSTRUCTIONS

Miscellaneous and General Maintenance

Service Upon Receipt . . . . . WP 0020

Field Maintenance Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions Introduction . . . . . WP 0021

Field Maintenance Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions . . . . . WP 0022

General Maintenance Instructions . . . . . WP 0023

Electrical General Maintenance Instructions . . . . . WP 0024

Cleaning Engine . . . . . WP 0025

Fuel System

Fuel Injector Replacement . . . . . WP 0026

Cooling System

Cooling Fan Assembly Maintenance . . . . . WP 0027

Cooling Fan and Alternator V-Belts Inspection and Tension Check . . . . . WP 0028

Cooling Fan and Alternator V-Belts Replacement . . . . . WP 0029

Electrical System

Alternator Maintenance . . . . . WP 0030

Taillight Maintenance . . . . . WP 0031

Battery Testing and Charging . . . . . WP 0032

Battery Cables and Batteries Replacement . . . . . WP 0033

Battery Box Maintenance . . . . . WP 0034

NATO Electrical Receptacle and Cables Replacement . . . . . WP 0035

Intervehicular Electrical Cable Replacement . . . . . WP 0036

Trailer Wiring Harness Replacement . . . . . WP 0037

Engine/Control Panel Wiring Harness Replacement . . . . . WP 0038

TABLE OF CONTENTS - CONTINUED

WP Sequence No.

24V Trailer Electrical Receptacle Replacement . . . . . WP 0039
Flame Glow Plug Maintenance . . . . . WP 0040
Checking Oil Pressure Sender . . . . . WP 0041
Oil Pressure Sender Replacement . . . . . WP 0042
Checking Oil Temperature Sender . . . . . WP 0043
Oil Temperature Sender Replacement . . . . . WP 0044
Checking Cooling Fan V-Belt Shutdown Switch . . . . . WP 0045
Cooling Fan V-Belt Shutdown Switch Replacement . . . . . WP 0046

Front Axle

Axle Replacement . . . . . WP 0047

Brakes

Hand Brake Maintenance . . . . . WP 0048
Service Brake Adjustment . . . . . WP 0049
Service Brake Inspection . . . . . WP 0050
Service Brake Maintenance . . . . . WP 0051
Wheel Cylinder Replacement . . . . . WP 0052
Hydraulic Brake Actuator Assembly Maintenance . . . . . WP 0053
Brake Actuator Breakaway Lever and Leaf Spring Replacement . . . . . WP 0054
Master Cylinder Replacement . . . . . WP 0055
Hydraulic Brake Lines Replacement . . . . . WP 0056
Bleeding Hydraulic Brake System . . . . . WP 0057

Wheels and Tracks

Lunette Ring Replacement . . . . . WP 0058
Wheel Hub/Drum and Wheel Bearings Maintenance . . . . . WP 0059
Wheel and Tire Assembly Replacement . . . . . WP 0060
Wheel and Tire Assembly Maintenance . . . . . WP 0061

Frame, Towing Attachments, and Drawbar

Frame Repair . . . . . WP 0062
Lifting/Tiedown Ring Replacement . . . . . WP 0063
Pintle Hook Assembly Maintenance . . . . . WP 0064
Safety Chains Replacement . . . . . WP 0065
Front Leveling Jack Assembly Replacement . . . . . WP 0066
Rear Leveling Jack Assembly Replacement . . . . . WP 0067

Body, Cab, Hood, and Hull

Access Plates Replacement . . . . . WP 0068
Storage Box Maintenance . . . . . WP 0069

TABLE OF CONTENTS - CONTINUED

WP Sequence No.

Body, Chassis or Hull, and Accessory Items

Ground Terminal Stud Replacement . . . . . WP 0070
Reflector Replacement . . . . . WP 0071

Auxiliary Generator, Engine, and Controls (Special Purpose)

Engine Mounts Replacement . . . . . WP 0072
Engine Replacement . . . . . WP 0073
Setting Engine At Top Dead Center (TDC) . . . . . WP 0074
Checking Engine Compression . . . . . WP 0075
Cylinder Head Assembly Replacement . . . . . WP 0076
Piston Crown Clearance Measurement . . . . . WP 0077
Rear Main Seal and Rear Cover Replacement . . . . . WP 0078
Rocker Arm and Rocker Arm Bracket Replacement . . . . . WP 0079
Engine Valve Clearance Check and Adjustment . . . . . WP 0080
V-Belt Guard Replacement . . . . . WP 0081
Crankcase Breather and Lines Replacement . . . . . WP 0082
Oil Cooler Maintenance . . . . . WP 0083
Changing Engine Oil and Replacing Oil Filter . . . . . WP 0084
Oil Filter Head Assembly Replacement . . . . . WP 0085
Oil Pan Replacement . . . . . WP 0086
Oil Pump Replacement . . . . . WP 0087
Intake Manifold Replacement . . . . . WP 0088
Exhaust Manifold Replacement . . . . . WP 0089
Front Main Seal Replacement . . . . . WP 0090
Engine Front Cover Replacement . . . . . WP 0091
Cooling Fan V-Belt Tensioner Pulley Assembly Maintenance . . . . . WP 0092
Crankshaft V-Belt Pulley and Vibration Damper Replacement . . . . . WP 0093
Fuel Injection Pump Replacement . . . . . WP 0094
Fuel Injection Pump Solenoid and Electromagnet Replacement . . . . . WP 0095
Fuel Pump Maintenance . . . . . WP 0096
Air Cleaner Housing Assembly Maintenance . . . . . WP 0097
Turbocharger Replacement . . . . . WP 0098
Fuel Tank Maintenance . . . . . WP 0099
Stage III Fuel Filter Maintenance . . . . . WP 0100
Fuel Filter/Water Separator Maintenance . . . . . WP 0101
Low Pressure Fuel Lines Replacement. . . . . WP 0102
Fuel Injector Lines Replacement. . . . . WP 0103
Fuel Selector Valve Replacement. . . . . WP 0104
Flame Glow Plug Fuel Lines and Preheat Fuel Solenoid Replacement . . . . . WP 0105
Bleeding Fuel System . . . . . WP 0106

TABLE OF CONTENTS - CONTINUED

WP Sequence No.

Exhaust System Replacement . . . . . WP 0107
Cooling Air Duct Panels Replacement . . . . . WP 0108
Starter and Starter Solenoid Replacement . . . . . WP 0109
Control Panel Box Replacement . . . . . WP 0110
Control Panel Repair . . . . . WP 0111

Pumps

Pump Replacement . . . . . WP 0112
Pump Impeller, Impeller Shaft, Seal Assembly, and Bearing Replacement . . . . . WP 0113
Pump Discharge Manifold Assembly Maintenance . . . . . WP 0114
Cleaning Suction Manifold Strainer . . . . . WP 0115
Pump Suction Manifold Assembly Maintenance . . . . . WP 0116
Preparation for Shipment . . . . . WP 0117
Torque Limits . . . . . WP 0118
Illustrated List of Manufactured Items . . . . . WP 0119

Chapter 7

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

Page No.

Repair Parts and Special Tools List (RPSTL) Introduction . . . . . WP 0120
Repair Parts List . . . . . WP 0121
GROUP 03 FUEL SYSTEM 0121-3
0301 CARBURETOR, FUEL INJECTOR 0121-3
FUEL INJECTOR 0121-3
GROUP 05 COOLING SYSTEM 0121-5
0505 FAN ASSEMBLY 0121-5
COOLING FAN 0121-5
GROUP 06 ELECTRICAL SYSTEM 0121-7
0601 GENERATOR, ALTERNATOR 0121-7
ALTERNATOR AND RELATED PARTS 0121-7
0609 LIGHTS 0121-9
TRAILER LIGHTS 0121-9
0612 BATTERIES, STORAGE 0121-9
BATTERIES 0121-11
BATTERY BOX 0121-13
0613 HULL OR CHASSIS WIRING HARNESS 0121-17
WIRING HARNESS AND SENSORS 0121-17
GROUP 10 FRONT AXLE 0121-19
1000 FRONT AXLE ASSEMBLY 0121-19
AXLE ASSEMBLY 0121-19

TABLE OF CONTENTS - CONTINUED

WP Sequence No.

	Page No.
GROUP 12 BRAKES	0121-21
1201 HAND BRAKES	0121-21
HAND BRAKES	0121-21
1202 SERVICE BRAKES	0121-23
SERVICE BRAKES	0121-23
1204 HYDRAULIC BRAKE SYSTEM	0121-27
BRAKE ACTUATOR ASSEMBLY	0121-27
GROUP 13 WHEELS AND TRACKS	0121-31
1311 WHEEL ASSEMBLY	0121-31
BRAKE DRUM	0121-31
WHEEL ASSEMBLY	0121-33
1313 TIRES, TUBES, TIRE CHAINS	0121-35
TIRE	0121-35
GROUP 15 FRAME, TOWING ATTACHMENTS, DRAWBARS, AND ARTICULATION SYSTEMS	0121-37
1501 FRAME ASSEMBLY	0121-37
TRAILER FRAME AND HARDWARE	0121-37
1503 PINTLES AND TOWING ATTACHMENTS	0121-39
PINTLE HOOK	0121-39
SAFETY CHAINS	0121-41
1507 LANDING GEAR, LEVELING JACKS	0121-43
LANDING GEAR AND LEVELING JACKS	0121-43
GROUP 18 BODY, CAB, HOOD, AND HULL	0121-45
1801 BODY, CAB, HOOD, AND HULL ASSEMBLIES	0121-45
ENGINE COVERS	0121-45
1808 STOWAGE RACKS, BOXES, STRAPS, CARRYING CASES, CABLE REELS, HOSE REELS, ETC.	0121-47
STORAGE BOX	0121-47
GROUP 22 BODY, CHASSIS, HULL, AND ACCESSORY ITEMS	0121-49
2202 ACCESSORY ITEMS	0121-49
ACCESSORY ITEMS	0121-49
2210 DATA PLATES AND INSTRUCTION HOLDERS	0121-51
DECALS AND DATA PLATES	0121-51
GROUP 29 AUXILIARY GENERATOR, ENGINE, AND CONTROLS	0121-53
2910 ENGINE ASSEMBLY	0121-53
ENGINE AND MOUNTING HARDWARE	0121-53
2911 CRANKCASE, CYLINDER SLEEVE, CYLINDER HEAD, AND BLOCK	0121-55
CYLINDER AND CYLINDER ASSEMBLY	0121-55

TABLE OF CONTENTS - CONTINUED

WP Sequence No.

Page No.

CYLINDER BLOCK AND RELATED PARTS. 0121-57
2912 CRANKSHAFT 0121-59
CRANKSHAFT. 0121-59
DYNAMIC BALANCER 0121-61
2913 FLYWHEEL ASSEMBLY. 0121-63
FLYWHEEL AND FLYWHEEL HOUSING 0121-63
2914 PISTONS AND CONNECTING RODS 0121-65
PISTON ASSEMBLY 0121-65
2915 VALVES, CAMSHAFTS, AND TIMING SYSTEM 0121-67
CAMSHAFT 0121-67
ROCKER ARM ASSEMBLY 0121-69
VALVE COVER 0121-71
V-BELT GUARD. 0121-73
2916 ENGINE LUBRICATION SYSTEM 0121-75
CRANKCASE BREATHER 0121-75
OIL COOLER 0121-77
OIL FILTER 0121-79
OIL PAN AND ATTACHING HARDWARE. 0121-81
OIL PUMP AND LINES 0121-85
2918 MANIFOLDS 0121-87
MANIFOLDS 0121-87
2919 DRIVING MECHANISMS 0121-89
FRONT ENGINE COVER 0121-89
IDLER GEAR 0121-91
TENSIONER PULLEY 0121-93
2932 ENGINE FUEL PUMP 0121-97
FUEL INJECTION PUMP. 0121-97
2933 ENGINE AIR CLEANER 0121-101
AIR CLEANER 0121-101
2934 ENGINE SUPERCHARGER OR BLOWER 0121-103
TURBOCHARGER AND RELATED PARTS 0121-103
2935 ENGINE FUEL TANK 0121-105
FUEL TANK AND RELATED PARTS 0121-105
2937 ENGINE FUEL FILTER 0121-107
FUEL FILTER AND RELATED PARTS 0121-107
WATER SEPARATOR/FUEL FILTER 0121-109
2938 ENGINE PRIMING STEM, LINES, AND PUMPS 0121-113
FUEL LINES AND FITTINGS. 0121-113

TABLE OF CONTENTS - CONTINUED

WP Sequence No.

Page No.

2941 ENGINE MUFFLER, EXHAUST, AND TAIL PIPES 0121-117
MUFFLER 0121-117
2952 ENGINE COWLING DEFLECTORS, AIR DUCTS, AND SHROUDS 0121-121
AIR COWLING, DUCT WALLS, AND EMI SHIELD. 0121-121
2963 STARTER, SOLENOIDS, CIRCUIT BREAKERS, WIRING, AND SWITCHES 0121-125
STARTER 0121-125
2967 INSTRUMENT PANEL 0121-127
CONTROL PANEL 0121-127
2968 SWITCHES, CIRCUIT BREAKERS, AND FUSES 0121-131
CONTROL PANEL WIRING 0121-131
GROUP 55 PUMPS 0121-135
5500 PUMP ASSEMBLY 0121-135
PUMP ASSEMBLY 0121-135
5513 FLUID LINES. 0121-139
PUMP LINES AND FITTINGS 0121-139
5518 MANIFOLD ASSEMBLY 0121-143
DISCHARGE MANIFOLD 0121-143
SUCTION MANIFOLD 0121-145
GROUP 95 GENERAL USE STANDARDIZED PARTS 0121-147
9501 BULK MATERIEL 0121-147
BULK MATERIEL. 0121-147
Special Tools List . . . . . WP 0122
Cross Reference Indexes . . . . . WP 0123

Chapter 8

SUPPORTING INFORMATION

References . . . . . WP 0124
Maintenance Allocation Chart (MAC) Introduction . . . . . WP 0125
Maintenance Allocation Chart (MAC) . . . . . WP 0126
Basic Issue Items (BII) List . . . . . WP 0127
Additional Authorization List (AAL) . . . . . WP 0128
Expendable and Durable Items List . . . . . WP 0129
Index INDEX-1

Foldout Figures

FO: 1. Diagrams and Wiring Schematics FP-1

HOW TO USE THIS MANUAL

NOTE

If at any time you are unsure how to use this manual or you cannot locate the information you need, notify your supervisor.

INTRODUCTION

1. This manual contains operating instructions, maintenance procedures, and an illustrated Repair Parts and Special Tools List (RPSTL) for the 600 GPM Fuel and Water Pump Assemblies. It is divided into eight chapters.
2. This manual is written in work package format:
   a. Chapters divide the manual into major categories of information: *Introductory Information, Equipment Description, and Theory of Operation; Operator Instructions; Operator Troubleshooting Procedures; Operator Maintenance Instructions; Field Maintenance Troubleshooting Procedures; Field Maintenance Instructions; Repair Parts and Special Tools List (RPSTL)*; and *Supporting Information*.
   b. Each chapter is divided into work packages, which are identified by a 4-digit number (e.g., 0001, 0002) located on the upper right-hand corner of each page. The work package page number (e.g., 0001-1, 0001-2) is located centered at the bottom of each page.
3. Read through this manual to become familiar with its organization and contents before attempting to operate or maintain the equipment.

CONTENTS OF THIS MANUAL

1. A *Warning Summary* is located at the beginning of this manual. Become familiar with these warnings before operating or maintaining the equipment.
2. A *Table of Contents*, located in the front of the manual, lists all chapters and work packages in the publication. If you cannot find what you are looking for in the Table of Contents, refer to the alphabetical *Index* at the back of the manual.
3. Chapter 1, *Introductory Information, Equipment Description, and Theory of Operation* provides general information about the equipment, identifies the major components and systems, and describes how the components and systems work. It also contains a discussion of *General Safety Instructions*.
4. Chapter 2, *Operator Instructions*, identifies operating controls and indicators and explains how to use them. This chapter covers all equipment operating procedures. It also contains a *Stowage and Decal, Data Plate, and Stencil Guide*.
5. Chapter 3, *Operator Troubleshooting Procedures*, describes operator troubleshooting procedures to locate and correct malfunctions of the equipment. Included in this chapter is an *Operator Troubleshooting Symptom Index*. If the equipment malfunctions, this index should always be consulted to locate the appropriate troubleshooting procedure.
6. Chapter 4, *Operator Maintenance Instructions*, includes preventive maintenance and lubrication as well as operator maintenance procedures for the equipment.
7. Chapter 5, *Field Maintenance Troubleshooting Procedures*, describes Field Maintenance troubleshooting procedures to locate and correct malfunctions of the equipment. Included in this chapter is a *Field Maintenance Troubleshooting Symptom Index*. If the equipment malfunctions, this index should always be consulted to locate the appropriate troubleshooting procedure.
8. Chapter 6, *Field Maintenance Instructions*, explains how to maintain and repair the equipment at the Field Maintenance level. Major areas covered are *Field Maintenance PMCS, Including Lubrication Instructions* and miscellaneous maintenance tasks.
9. Chapter 7, *Repair Parts and Special Tools List (RPSTL)*, includes an illustrated repair parts list for the pumps. It also includes a *Special Tools List* as well as cross-reference indices.
10. Chapter 8, *Supporting Information* contains following: *References*; *Maintenance Allocation Chart (MAC) Introduction*; *Maintenance Allocation Chart (MAC); Basic Issue Items (BII) List; Additional Authorization List (AAL);* and *Expendable and Durable Items List*.
11. An alphabetical *Index* is located at the back of this manual, followed by foldouts of *Wiring Diagrams and Schematics*.

FEATURES OF THIS MANUAL

1. This manual contains information on operating and maintaining BOTH Fuel and Water Pump Assemblies.
   a. If a procedural step, description, or illustration pertains to BOTH Fuel and Water Pump Assemblies, no differentiation is made.
   b. If a procedural step or description pertains to a specific model Pump Assembly (Fuel or Water), the designation "FUEL PUMP ASSEMBLY" or "WATER PUMP ASSEMBLY" precedes the procedural step, description, or illustration.
2. WARNINGs, CAUTIONs, NOTEs, subject headings, and other important information are highlighted as a visual aid.

WARNING

A WARNING indicates a hazard which may result in injury or death to personnel.

CAUTION

A CAUTION is a reminder of safety practices or directs attention to usage practices that may result in damage to equipment.

NOTE

A NOTE is a statement containing information that will make the procedures easier to perform.

3. Statements and words of particular interest may be printed in CAPITAL LETTERS to create emphasis.
4. Within a procedural step, reference may be made to another chapter or work package in this manual or to another manual. These references indicate where you should look for more complete information. If you are told: "Service engine air cleaner (WP 0015)", go to WP 0015 in this manual for instructions on air cleaner servicing.
5. Illustrations are placed after, and as close to, the procedural steps to which they apply. Callouts placed on the art are text or numbers.
6. Numbers located at lower right corner of art (e.g., 600PumpA-0001; 600PumpA-0002) are art control numbers and are used for tracking purposes only. Disregard these numbers.
7. Dashed leader lines used in the Lubrication Chart and in the PMCS Table (WP 0012, WP 0013, WP 0021, and WP 0022) indicate that called out lubrication points are located on both sides of the equipment.
8. Technical instructions include standard units as well as metric units. For your reference, a *Metric Conversion Chart* is located on the inside back cover of the manual.
9. Location Terms. The terms left, right, front, or rear are used to describe areas of the equipment. These terms indicate location as seen when facing toward front of trailer.
10. Torque Values. Whenever a component is "installed" or "tightened," refer to *Torque Limits* (WP 0118) for the correct torque specification.

CHAPTER 1

INTRODUCTORY INFORMATION, EQUIPMENT DESCRIPTION, AND THEORY OF OPERATION

INTRODUCTORY INFORMATION, EQUIPMENT DESCRIPTION, AND THEORY OF OPERATION

GENERAL INFORMATION

SCOPE

1. **Type of Manual.**
   a. This manual provides instructions on how to operate the 600 GPM Fuel and Water Pump Assemblies.
   b. Also included are Field Maintenance instructions, including removal/disassembly, adjustments, troubleshooting, and periodic inspections and lubrication services to keep the pump assemblies serviceable.
   c. An illustrated Repair Parts and Special Tools List (RPSTL) (WP 0121) for all components of the pump assemblies is included in this manual.
2. **Equipment Name and Model Number.**
   a. Fuel Pump Assembly: Diesel-Engine Driven (DED), 600 GPM, NSN 4320-01-546-6128
   b. Water Pump Assembly: Diesel-Engine Driven (DED), 600 GPM, NSN 4320-01-546-6140
3. **Purpose of Equipment.**
   a. The fuel pump assemblies are used to pump bulk fuel to and from distribution and storage points.
   b. The water pump assemblies are used in bulk transfer of potable water, at either lead or boost pumping stations.

MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by PAM 750-8, *The Army Maintenance Management System (TAMMS) User's Manual*.

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRS)

If your pump needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you do not like about your equipment. Let us know why you do not like the design or performance. If you have Internet access, the easiest and fastest way to report problems or suggestions is to go to https://aeps.ria.army.mil/aepspublic.cfm (scroll down and choose the "Submit Quality Deficiency Report" bar). The Internet form lets you choose to submit an EIR, a Product Quality Deficiency Report (PQDR), or a Warranty Claim Action (WCA). You may also submit your information using an SF Form 368 (*Product Quality Deficiency Report*). You can send your SF Form 368 via e-mail, regular mail, or facsimile using the addresses/facsimile numbers specified in PAM 750-8, *TAMMS User's Manual*. We will send you a reply.

CORROSION PREVENTION AND CONTROL (CPC)

1. CPC of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.
2. Corrosion specifically occurs with metals. It is an electrochemical process that causes the degradation of metals. It is commonly caused by exposure to moisture, acids, bases, or salts. An example is the rusting of iron. Corrosion damage in metals can be seen, depending on the metal, as tarnishing, pitting, fogging, surface residue, and/or cracking.
3. Plastic, composites, and rubber can also degrade. Degradation is caused by thermal (heat), oxidation (oxygen), solvation (solvents), or photolytic (light, typically UV) processes. The most common exposures are excessive heat or light. Damage from these processes will appear as cracking, softening, swelling, and/or breaking.
4. SF Form 368*, Product Quality Deficiency Report* should be submitted to the address specified in PAM 750-8, *TAMMS User's Manual*.

DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

For destruction of Army materiel to prevent enemy use, refer to TM 750-244-3 *Procedures for Destruction of Equipment to Prevent Enemy Use (Mobility Equipment Command)*.

PREPARATION FOR STORAGE OR SHIPMENT

1. Refer to WP 0014 for *Storage of Pump Assembly.*
2. Refer to WP 0117 for *Preparation for Shipment*.

LIST OF ABBREVIATIONS

NOTE

- For standard abbreviations, refer to ASME Y14.38-1999, *Abbreviations and Acronyms*.
- Only non-standard abbreviations are listed here.

ABBREVIATION/ACRONYM	DEFINITION
AGM	Absorbed Glass Matt (Batteries)
AAL	Additional Authorization List
BII	Basic Issue Items
BTDC	Breakdown Top Dead Center
CAGEC	Commercial and Government Entity Code
CARC	Chemical Agent Resistant Coating
CCA	Cold Cranking Amps
COEI	Components of End Item
CPC	Corrosion Prevention and Control
CPR	Cardiopulmonary Resuscitation
EIR	Equipment Improvement Recommendation
FSSP	Fuel System Supply Point
GPM	Gallons per Minute
GPS	Global Positioning System
HMMWV	High Mobility Multipurpose Wheeled Vehicle
IAW	In Accordance With
ISO	International Organization for Standardization
KPH	Kilometers per Hour
MPH	Miles per Hour
MSDS	Material Safety Data Sheets
NATO	North Atlantic Treaty Organization
NBC	Nuclear, Biological, and Chemical
NIIN	National Item Identification Number
Nm	Newton Meter
NSN	National Stock Number
OCV	Open Circuit Voltage
OSHA	Occupational Safety and Health Administration
PCB	Printed Circuit Board
PMCS	Preventive Maintenance Checks and Services
PPE	Personnel Protective Equipment
RPSTL	Repair Parts and Special Tools List

LIST OF ABBREVIATIONS - CONTINUED

ABBREVIATION/ACRONYM	DEFINITION
SAE	Society of Automotive Engineers
SMR (Code)	Source, Maintenance, and Recoverability (Code)
SOP	Standard Operating Procedure
TAMCN	Table of Allowance Materiel Control Number
TB	Terminal Board
TDC	Top Dead Center
TMDE	Test, Measurement, and Diagnostic Equipment
TOE/MTOE	Table of Organization and Equipment/Modified Table of Organization and Equipment
WP	Work Package

QUALITY OF MATERIAL

Material used for replacement, repair, or modification must meet the requirements of this manual. If quality of material requirements are not stated in this manual, the material must meet the requirements of the drawings, standards, specifications, or approved engineering change proposals applicable to the subject equipment.

END OF WORK PACKAGE

INTRODUCTORY INFORMATION, EQUIPMENT DESCRIPTION, AND THEORY OF OPERATION

EQUIPMENT DESCRIPTION AND DATA

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

NOTE

For a more complete description of components of the fuel and water pump assemblies, refer to WP 0003, *Theory of Operation*.

1. The 600 GPM Pump Assemblies consist of a 4-cylinder diesel engine, a centrifugal pump, and an electrical control system, all contained on a mobile trailer. The suction and discharge manifolds are used to connect to various bulk fuel/water systems and are equipped with gate valves to control flow and pressure.
2. FUEL PUMP ASSEMBLY.
   a. The fuel pump assembly is used to pump bulk fuel to and from distribution and storage points.
   b. The fuel pump assembly is capable of pumping all types and grades of automotive and aviation gasoline, aviation jet fuels, and diesel fuel within a specific gravity range of 0.75 to 0.85, at an ambient temperature range of -25°F (-31.6°C) to +130°F (+54.4°C).
3. WATER PUMP ASSEMBLY.
   a. The water pump assembly is used in bulk transfer of potable water, at either lead or boost pumping stations.
   b. The water pump assembly is capable of pumping water at an ambient temperature range of +32°F (0°C) to +130°F (+54.4°C).
4. Power to turn the pump assemblies is supplied by a 4-cylinder Deutz 914 turbocharged diesel engine, mounted at the front of the trailer chassis.This engine has been modified to a 24V engine with an operating speed range of 650 to 2,500 RPM.
5. A 604-F “O” Series Gorman-Rupp pump is mounted directly behind the engine. The pump shaft that turns the pump impeller is connected to the engine flywheel, i.e., engine and pump are a closed-coupled unit.
6. The designated towing vehicle for the pump assemblies is all models of the High Mobility Multipurpose Wheeled Vehicle (HMMWV).
7. The pump assemblies are capable of fording to a depth of 30 in. (76.2 cm).
8. The following are features of the Deutz engine:
   a. Model BF4L 914.
   b. Turbocharged, air cooled.
   c. Direct injection fuel system capable of operating with diesel fuel, JP-5, or JP-8.
   d. Flame glow plug starting aid for cold weather starting.
   e. Spark arrester exhaust system.
9. The following are features of the Gorman-Rupp pump:
   a. 6-in., single stage, self-priming, centrifugal type with manual air eliminator.
   b. Permanent lubricated shaft support sealed bearing.
   c. Suction ports and manifold assembly, with strainer, mounted at the rear.
   d. Discharge ports, with check valve, and manifold assembly mounted on the right-hand (curb) side.

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES - CONTINUED

10. The following are features of the trailer assembly:
    a. Welded and bolted steel chassis frame with forklift slots and lift/tiedown provisions.
    b. Two-wheel axle assembly with torsion bar suspension and a rated capacity of 6,000 lb (2,721.6 kg).
    c. Stabilizing “swing-away” rear leveling jack assemblies for supporting and leveling trailer.
    d. Hydraulic surge (inertia) brakes on chassis drawbar.
    e. Manual hand brake lever for each wheel.
    f. Adjustable towing extension (tongue) with two safety chains and intervehicular electrical cable.
    g. Grounding rod assembly stowed on chassis frame, with permanent ground terminal stud on frame.
11. The following are military-specific features of the pump assemblies:
    a. CARC paint.
    b. NATO electrical receptacle.
    c. Military taillight assemblies with blackout lighting.
    d. Lift and tiedown provisions conforming to MIL-STD-209K.

DIFFERENCES BETWEEN MODELS

1. Fuel and water pump assemblies differ in the configuration of the discharge manifold and fuel tank.
2. The fuel pump assembly is equipped with a fuel jumper hose and a quick disconnect fitting at discharge manifold and fuel tank. This feature permits use of fuel being pumped to fill fuel tank and run engine. The water pump assembly does not have this feature.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

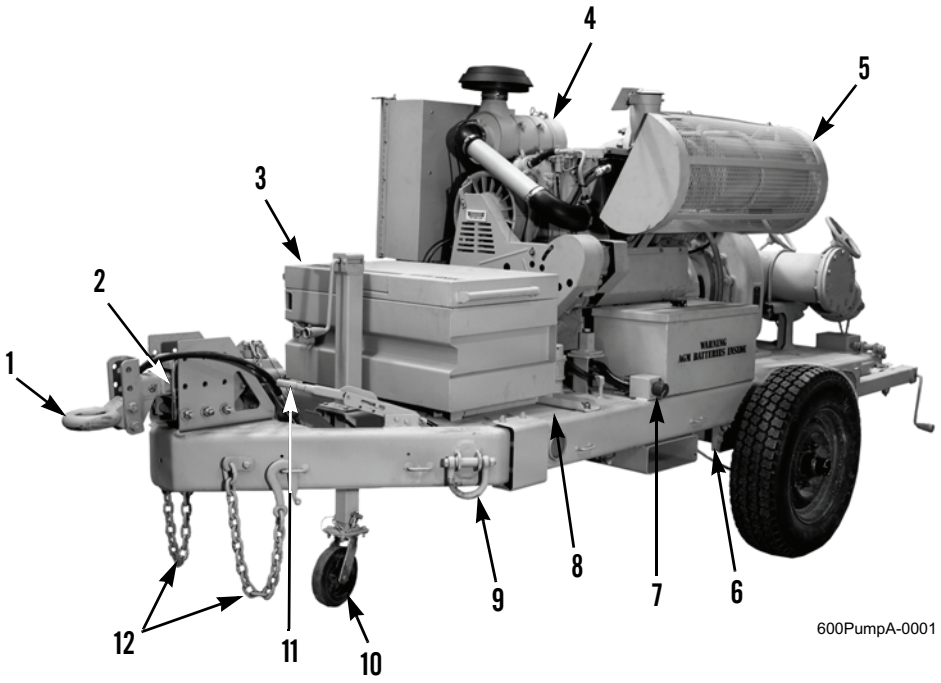


Figure 1. 3/4 Left-Front View.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - CONTINUED

KEY	COMPONENT	DESCRIPTION
1	Lunette Ring	Provides means to couple trailer to towing vehicle pintle hook. Height can be adjusted as required.
2	Hydraulic Brake Actuator	Inertia-actuated assembly provides service brake capability. Height can be adjusted as required.
3	Storage Box	Stores tools, fabric cover, service replacement parts, and other miscellaneous items (WP 0008).
4	Air Cleaner	Filters incoming air to engine.
5	Muffler	Includes spark arrester feature for safe operation around fuels and fuel vapors.
6	Axle Assembly	Two-wheel torsion bar axle provides sufficient suspension capacity for pump assembly.
7	NATO Electrical Receptacle	Allows trailer to be connected to an external power source.
8	Fuel Tank	Stores fuel for engine operation. Fuel tank has one suction port, two return ports, a vent, and a 6-in. (15.24-cm) filler cap which incorporates a float-type fuel level gauge. FUEL PUMP ASSEMBLY: Fuel tank also has a quick disconnect fitting for connection of fuel jumper hose, if filling fuel tank with fuel being pumped.
9	Lifting/Tiedown Rings	Ring on each side at front of trailer provides both lift and tiedown provision.
10	Front Leveling Jack Assembly (Shown with Wheel Assembly Installed)	Supports weight of drawbar when trailer is not coupled to towing vehicle. Either a wheel assembly or sand pad may be installed, as required by terrain. Jack height may be adjusted to assist in leveling trailer. Jack may also be used to raise trailer for maintenance purposes.
11	Hand Brake Levers	Cable-operated levers, on each side at front of trailer, provide a mechanical parking brake to secure trailer wheels from movement.
12	Safety Chains	Two chains must be attached to towing vehicle when trailer is towed, to prevent trailer from breaking free from towing vehicle if coupling fails.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - CONTINUED

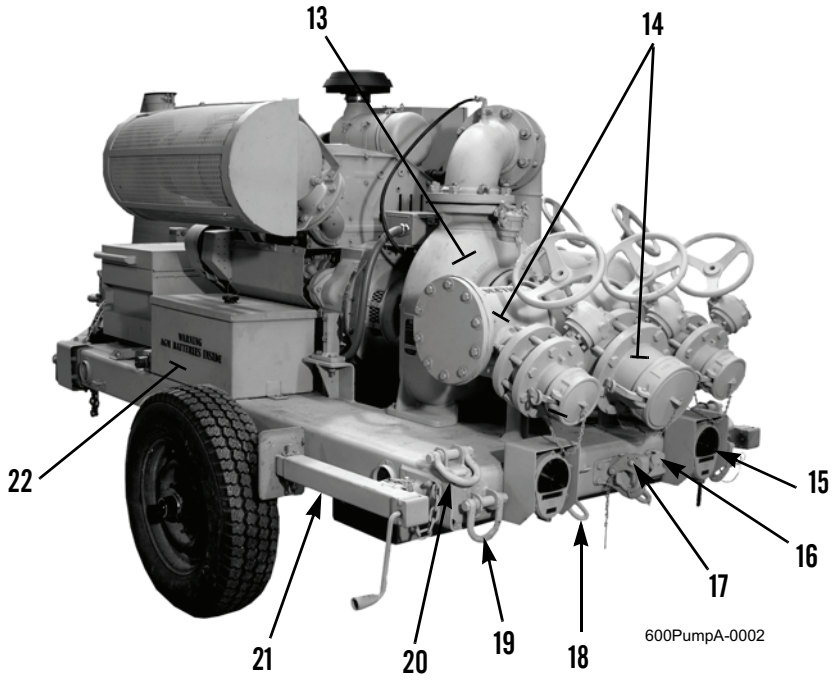


Figure 2. 3/4 Left-Rear View.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - CONTINUED

KEY	COMPONENT	DESCRIPTION
13	Pump	Provides 600 GPM @ 150 PSI (1,034 kPa).
14	Suction Manifold Assembly	Provides suction inlet for 4-in. (10.16-cm) and 6-in. (15.24-cm) hose connections. Includes two 4-in. couplings and gate valves, one 6-in. coupling and gate valve, and a manifold with strainer. All hose connection couplings are camlock-type.
15	Military Taillight Assemblies	Located at each rear corner of trailer. Each assembly includes tail, stop, turn signals, and military blackout lights.
16	24V Trailer Electrical Receptacle	12-pin 24V receptacle connector is used when towing another trailer behind pump assembly.
17	Pintle Hook	Coupling device for trailer towed behind pump assembly.
18	Safety Chain Rings	Two welded rings on either side of pintle hook are used to attach safety chains of a trailer being towed behind pump assembly.
19	Tiedown Rings	Located at each rear corner of trailer frame. Provide tiedown provision.
20	Lifting Rings	Located at each rear corner of trailer frame. Provide lift provision.
21	Rear Leveling Jack Assemblies (Stowed Position)	Located at each rear corner of trailer frame. Jack is swung down to support and level pump assembly when pumping fluid. Height may be adjusted to assist in leveling trailer. Jack may also be used to raise trailer for maintenance purposes.
22	Battery Box	Vented box holds two AGM (Absorbed Glass Matt) 12V batteries. Box is equipped with bottom drain holes.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - CONTINUED

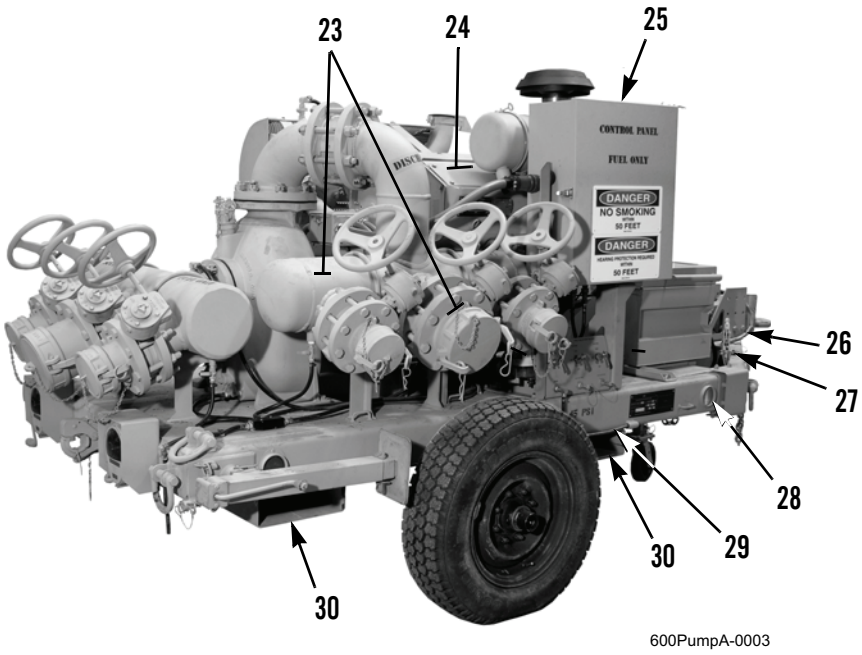


Figure 3. 3/4 Right-Rear View.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - CONTINUED

KEY	COMPONENT	DESCRIPTION
23	Discharge Manifold Assembly (Fuel Pump Assembly Shown)	Distributes discharge from pump. Includes gate valves and couplings for two 4-in. (10.16-cm) and one 6-in. (15.24-cm) hose connections. Also includes a manual air eliminator, check valve, and flow monitor sensor. All hose connection couplings are camlock-type.
24	Engine	Provides power to turn pump impeller.
25	Control Panel Box	Enclosure for control panel, which is used to operate and control pump assembly. Contains gauges and indicator or warning lights to monitor engine and pump operation. Also includes two drain valves for pump suction and pressure gauges, a throttle control, and engine start switch.
26	Intervehicular Electrical Cable	12-pin connector provides 24V to operate trailer's lights.
27	Ground Terminal Stud	Provides grounding point for ground rod and cable.
28	Reflectors	Two amber reflectors at front and two red reflectors at rear mark outline of trailer.
29	Ground Rod (Stowed Position)	Rod must be used when pumping, to prevent buildup of static electricity.
30	Forklift Slots	4 x 12 in. (10.2 x 30.5 cm) slots are spaced 48 in. (121.9 cm) apart. Permit a balanced lift of trailer by forklift.

EQUIPMENT DATA

600 GPM Pump Assembly

Manufacturer . . . . . Bowhead Manufacturing Company
Model Number
Fuel Pump Assembly 600GPMFPTA
Water Pump Assembly 600GPMWPTA
Fuel Pump Service . . . . . Flammable liquids
Specific Gravity Range (Fuel Pump Assembly) . . . . . 0.75 to 0.85
Water Pump Service . . . . . Potable water
Overall Length . . . . . 151 in. (383.54 cm)
Overall Width . . . . . 70.4 in. (178.8 cm)
Overall Height . . . . . 71.8 in. (182.4 cm)
Gross Weight . . . . . 3,965 lb (1,798 kg)
Shipping Volume . . . . . 442 ft^3 (12.52 m^3)
Pump Manufacturer . . . . . Gorman-Rupp
Pump Mounting . . . . . Direct mounting to chassis mounting brackets
Type . . . . . Centrifugal, self-priming
Pumping Rate . . . . . 600 GPM (2,271 L/min) @ 150 PSI (1,034 kPa)
Operating Speed Range (Engine) . . . . . 650 to 2,500 RPM
Operating Ambient Temperature Range
Fuel Pump Assembly . . . . . -25°F to +130°F (-31.6°C to +54.4°C)
Water Pump Assembly . . . . . +32°F to +130°F (0°C to +54.4°C)
Priming Method . . . . . Self-priming after initial fill
Head . . . . . 350 ft (106.7 m)
Priming Port . . . . . 1-1/2-in. (3.8-cm) adapter fitting with dust cap
Suction Ports (Intake) . . . . . One 6-in. (15.24-cm) inlet; two 4-in. (10.16-cm) inlets; one 6-in. (15.24-cm) outlet
Discharge Ports . . . . . One 6-in. (15.24-cm) inlet; two 4-in. (10.16-cm) outlets; one 6-in. (15.24-cm) outlet
Orientation of Manifold Ports . . . . . 23 degree angle downward
Manifold Mounting . . . . . Direct mounting to chassis mounting brackets
Drain Port . . . . . Draincock
Rotation . . . . . Counterclockwise (to the left) (facing pump inlet)

ENGINE

Manufacturer . . . . . Deutz
Model BF4L 914
Type . . . . . 4-stroke turbocharged diesel
Cooling System . . . . . Air-cooled
Engine Mounting . . . . . Direct mounting to chassis mounting brackets
Number of Cylinders 4
Bore and Stroke . . . . . 4.016 x 5.197 in. (102 x 132 mm)
Displacement . . . . . 262 $in.^3$ (4.3 L)

EQUIPMENT DATA - CONTINUED

Output @ 2,500 RPM . . . . . 96 hp (71.7 kW)
Compression Ratio (Nominal) 18:1
Combustion System. . . . . Direct injection
Direction of Rotation. . . . . Counterclockwise (when facing flywheel)
Firing Order. . . . . 1-3-4-2 (Cylinder No. 1 is rearmost on engine)
Inlet/Exhaust Valve Tip Clearance (Cold). . . . . 0.0059 + 0.0020 in. (0.15 + 0.05 mm)
Injector Opening Pressure . . . . . 2,900.8 + 145.0 PSI (200 + 10 bar)
Fuel . . . . . Diesel fuel ASTM D975-88, 1-D and 2-D; JP-5; JP-8
Lubrication . . . . . Pressure lubrication
SAE Oil . . . . . 15W40 and OEA-30
Oil Temperature in Oil Pan . . . . . 275°F (135°C)
Minimum Oil Pressure When Warm, 248°F (120°C), and at Low Idle . . . . . 7.25 PSI (0.5 bar)
Oil Capacity (Without Filter) . . . . . 12.68 qt (12 L)
Oil Capacity (With Filter) . . . . . 13.74 qt (13 L)
Engine Dimensions (Approximate)
  Length . . . . . 36 in. (91.4 cm)
  Width . . . . . 27 in. (68.6 cm)
  Height. . . . . 34 in. (86.4 cm)
V-Belt Deflection
  Alternator . . . . . 0.12 to 0.28 in. (3 to 7 mm)
  Fan . . . . . 0.39 to 0.59 in. (10 to 15 mm)
Alternator Amperage. . . . . 55 amp
Voltage. 24V
Air Cleaner Type . . . . . Dry
Fuel Tank Capacity . . . . . 23 gal. (87.1 L)
Automatic Safety Shutdowns . . . . . High temperature; low oil pressure; cooling fan V-belt malfunction

TRAILER ASSEMBLY

Chassis Frame . . . . . 4-in. (10.2 cm) channel, angle, and tube steel, 100% welded
Axle Suspension . . . . . Torsion bar
Rated Capacity . . . . . 6,000 lb (2,721.6 kg)
Maximum Side Slope Capability 20%
Maximum Ramp Grade Capability 40%
Fording Depth . . . . . 30 in. (76.2 cm)
Maximum Braking Distance . . . . . 30 ft (9.4 m) at 20 MPH (32.2 KPH)
Towing Provisions
  Front . . . . . Lunette ring
  Rear . . . . . Pintle hook

EQUIPMENT DATA - CONTINUED

Towing Speeds
- Hard Surface Roads . . . . . 45 to 50 MPH (72.4 to 80 KPH)
- Gravel/Dirt Roads . . . . . 25 to 30 MPH (40.2 to 48.3 KPH)
- Level Cross Country . . . . . 15 to 20 MPH (24.1 to 32.2 KPH)
- Hilly Cross Country . . . . . 10 to 15 MPH (16 to 24.1 KPH)

Forklift Slots . . . . . 4 x 12 in. (10.2 x 30.5 cm) slots; spaced 48 in. (121.9 cm) apart
Service Brakes . . . . . Surge (inertia) hydraulic with breakaway feature
Brake Drum Maximum Inside Diameter . . . . . 12.09 in. (30.7 cm)
Hand Brakes . . . . . One manual lever each wheel, snap-over-center
Wheel Rims . . . . . 16 in. (40.6 cm) x 6 in. (15.2 cm) aluminum, 8 lugs each wheel
Tires . . . . . LT225/75R16, tubeless, 16 in. (40.6 cm)
Tire Inflation . . . . . 45 PSI (310 kPa)
Batteries
- Type . . . . . AGM
- Quantity . . . . . Two, 12V each, connected in series
- CCA 1,225

Alternator . . . . . 24V, 35 Amps

END OF WORK PACKAGE

INTRODUCTORY INFORMATION, EQUIPMENT DESCRIPTION, AND THEORY OF OPERATION

THEORY OF OPERATION

PUMP ASSEMBLY

WARNING

A water pump assembly may be converted to fuel service. However, once a pump has been used to pump fuel, it must NEVER again be used to pump water. Failure to follow this warning may result in injury or death to personnel.

NOTE

Refer to WP 0002 for pump assembly equipment data.

1. **General.**

NOTE

- Both fuel and water pump assemblies have three suction inlet ports and three discharge outlet ports. All ports have camlock-type fittings.
- Pump operation is most efficient when at least a single 6-in. (15.24-cm) or two 4-in. (10.16-cm) suction and discharge hoses are connected.

a. The 600 GPM Pump Assemblies are connected to a source of fluid supply by suction hose(s) connected to inlet port(s) at the suction manifold.

b. When the engine is started, the engine's turning force operates the pump to draw fluid from the suction port(s), through the pump, to the discharge port(s) of the discharge manifold.

c. Discharge hose(s) are connected to the discharge manifold to transfer fluid to its destination.

2. **Electrical and Electronic Theory of Operation.**

a. **Electromagnetic Interference (EMI) Protection.** The pump assembly's electrical system is designed to provide EMI protection. EMI protection has also been achieved by enclosing all wiring in protective conduits and covering electrical components with protective plates.

b. **Control Panel.**

(1) This panel contains the gauges required to operate the pump and engine. The control panel electrical system is not connected to the trailer electrical system.

(2) For a description of all control panel gauges and indicators, refer to WP 0005.

c. **Engine Electrical System.**

(1) Components of the engine electrical system are the batteries, starter motor, alternator, and wiring harness.

(2) Two 12V AGM (Absorbed Glass Matt) military batteries provide 24V power to run the starter motor and start the engine.

(3) The alternator recharges the batteries after the engine is started and provides power to all electrical components through the wiring harness.

(4) Battery cables are connected to a NATO electrical receptacle to provide outside power to start the engine should the pump assemblies' batteries be discharged.

PUMP ASSEMBLY - CONTINUED

d. **Automatic Shutdown Systems.** Three safety control systems protect the engine and pump.

(1) The oil pressure sender shuts down the engine if oil pressure drops below 24 PSI (165 kPa). The oil pressure warning light on the control panel also comes on.

(2) The oil temperature sender shuts down the engine if engine oil temperature exceeds 240°F (115.6°C). The oil temperature warning light on the control panel also comes on.

(3) The cooling fan V-belt shutdown switch shuts down the engine if the V-belt that turns the engine cooling fan breaks or becomes worn or too loose. The cooling fan V-belt warning light on the control panel also comes on.

e. **Trailer Electrical System.**

(1) The trailer lights receive 24V from the towing vehicle through a 12-pin waterproof intervehicular cable.

(2) A 24V 12-pin electrical connector at the rear of the trailer supplies power to any trailer towed behind the pump assembly.

3. **Mechanical Theory of Operation.**

NOTE

An illustration of the fuel pump assembly is used to demonstrate flow theory. The water pump assembly operates the same way.

a. **Flow Theory.** The following illustration shows the flow of fluid from the suction inlet(s), through the pump body, to the discharge outlet(s). After the pump is primed and pumping, fluid is sent through the following pump components:

(1) Male Camlock Plugs. These must be removed to allow connection of suction hoses. Plugs cover camlock flanges to protect suction gate valves when not in use. To prevent loss, plugs are tethered to flanges by a chain.

(2) Suction Gate Valves. Fluid in the supply hoses enters the gear-operated valves. If the valves are open, fluid flows into the suction manifold where it enters the suction strainer.

(3) Suction Strainer. As fluid passes through the 1/4-in. (6.35-mm) stainless steel mesh screen strainer, large particles of debris are filtered out.

(4) Pump Body. From the strainer, fluid enters the pump body's suction port. Impeller rotation at high speed forces fluid out the pump body through the discharge port. This creates suction pressure at the suction port which, in turn, draws additional fluid from the suction inlets into the pump body.

(5) Discharge Manifold Manual Air Eliminator Valve. Fluid is forced out the pump body into the discharge elbow, past the manual air eliminator valve, and through the check valve assembly. This valve is normally left closed. Valve is opened during priming, to vent air from the fluid out the discharge elbow.

(6) Discharge Manifold Check Valve. This valve permits fluid flow in one direction only, from pump body to the discharge manifold.

(7) Discharge Manifold Assembly. Fluid enters this manifold and flows out through any open discharge gate valves (also gear operated) into the discharge hoses.

(8) Female Camlock Covers. Covers are installed on camlock flanges to protect discharge gate valves when not in use. Covers must be removed to allow connection of discharge hoses. To prevent loss, covers are tethered to flanges by a chain.

PUMP ASSEMBLY - CONTINUED

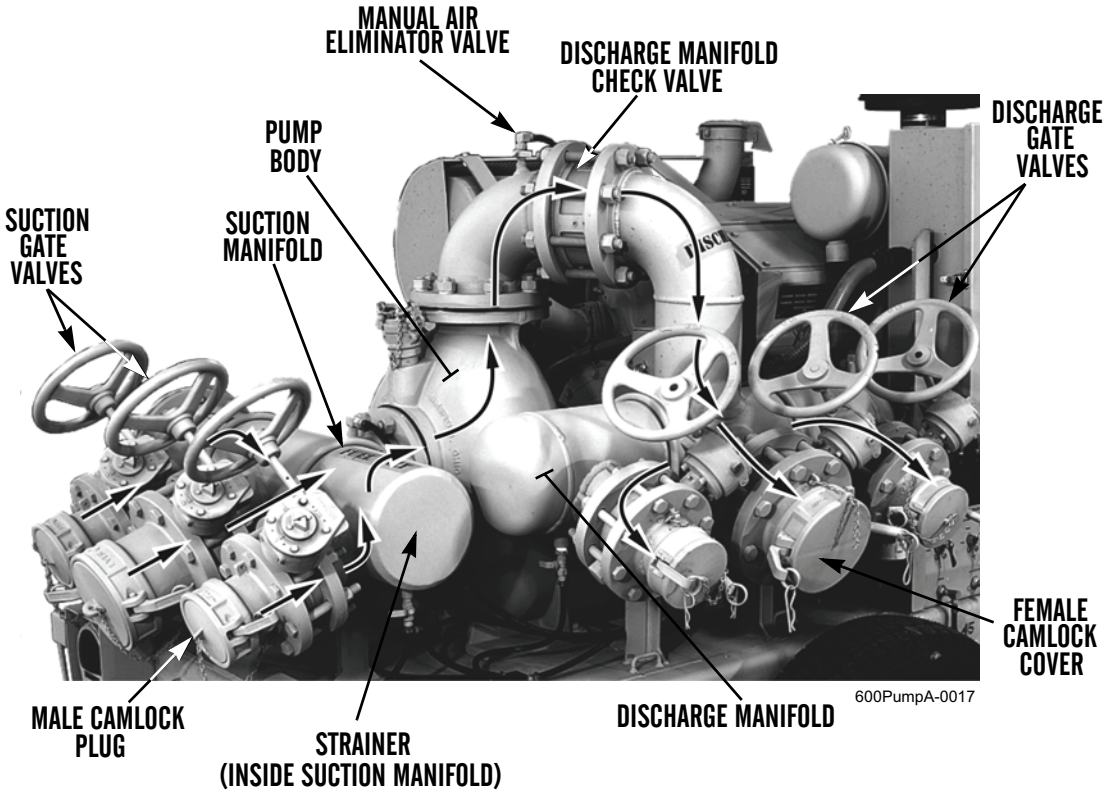


Figure 1. Flow Theory of Operation.

(9) The quantity of fluid pumped is dependent on many factors, some of which include:

(a) pumping conditions (distance and lift of incoming fluid),

(b) diameter of suction hose,

(c) RPM of engine, and

(d) extent to which discharge gate valves are opened while pumping.

(10) Fully opened discharge gate valves will result in higher GPM but lower pressure. Higher pressure is obtained by partially closing discharge gate valves; however, flow will be reduced.

PUMP ASSEMBLY - CONTINUED

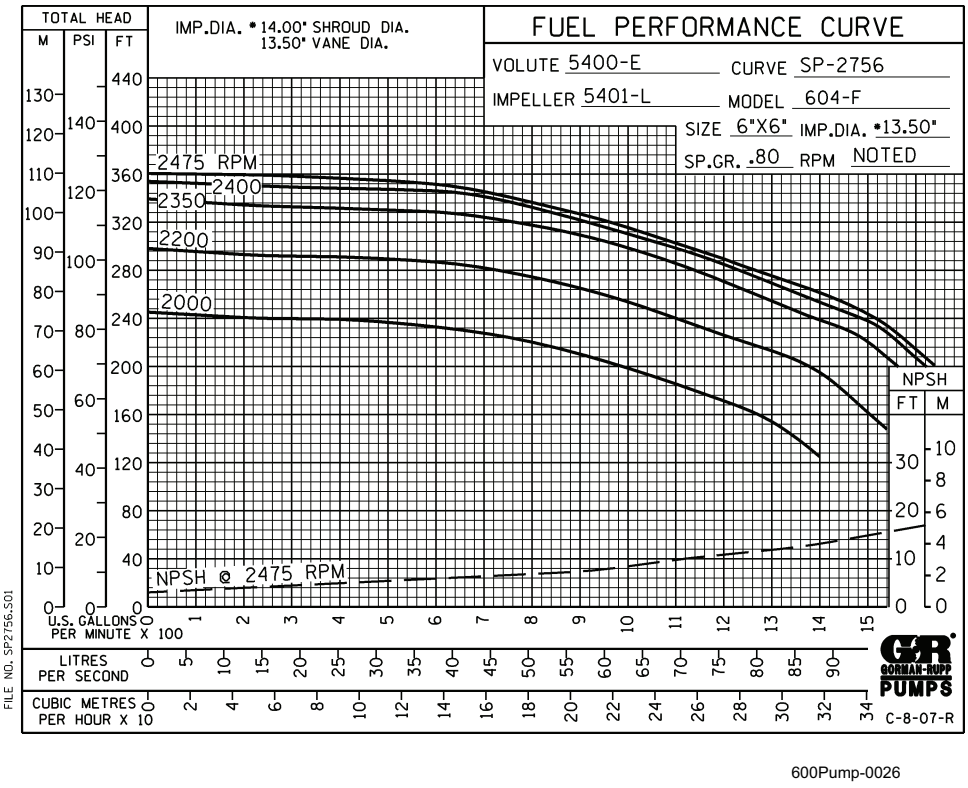
(11) The following Fuel and Water Performance Curve data plates are located on the inside door of the control panel box. They indicate what pressure and GPM will be achieved at various engine RPM. When operated within these limitations, pump and engine will provide satisfactory life and performance.

(a) Engine horsepower required to drive the pump varies with the weight of the liquid being pumped and the capacity or rate of pumping.

(b) To avoid overloading, adjust the throttle control to maintain the desired flow rate determined from the pump performance curve.

(c) Pump capacities are shown in gallons per minute (GPM). Discharge pressures are shown in PSI and feet of head.

(d) Engine speed is presented at the following RPM: 2,000; 2,200; 2,350; 2,400; and 2,475.



600Pump-0026

Figure 2. Fuel Performance Curve.

PUMP ASSEMBLY - CONTINUED

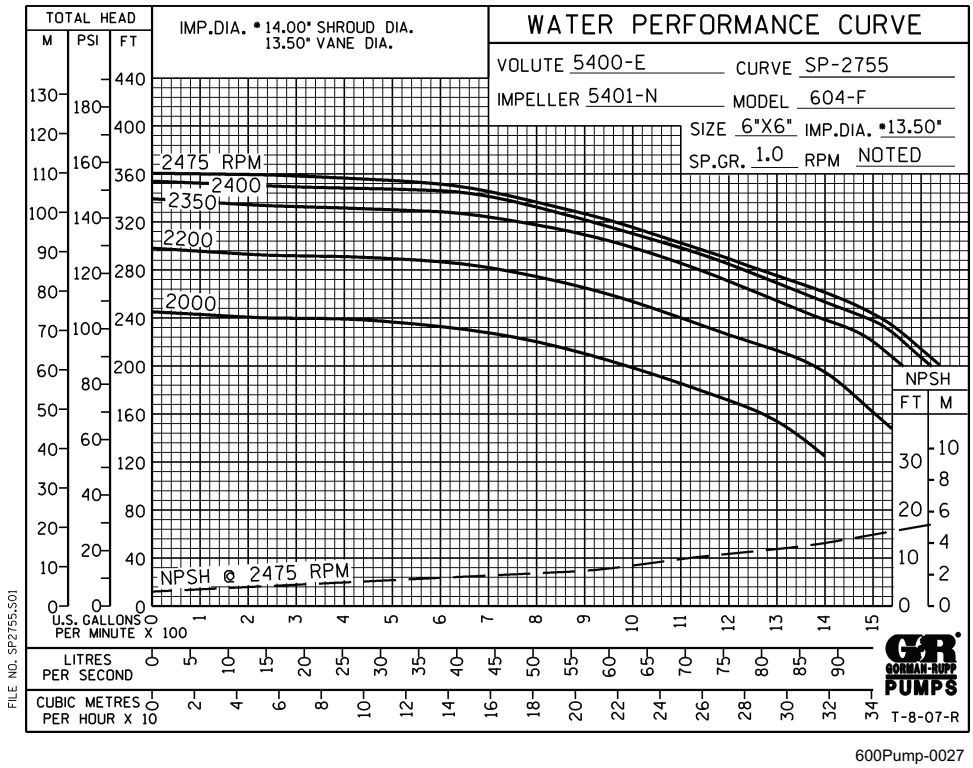


Figure 3. Water Performance Curve.

b. **Pumping Balance.**

(1) The discharge gate valves can be used to limit and/or balance the amount of fluid pumping into or out of the system.

(2) The discharge gate valves can also be used to keep fluid in or out of the system when pumping stops. Valves may be closed, when replacing a hose section, to prevent the pump from losing its prime.

PUMP ASSEMBLY - CONTINUED

c. **Pump Drive Operation.**

(a) The pump body is connected to the engine by a drive shaft, which is enclosed in a sealed bearing housing also known as the “intermediate” housing. No lubrication is required.

(b) The drive shaft is coupled directly to the engine flywheel assembly. The pump impeller is installed at the other end of the shaft.

(c) The impeller rotates at engine speed. When engine speed is increased, the impeller rotates faster, resulting in increased suction and discharge pressures, and increased pumping rate and discharge head.

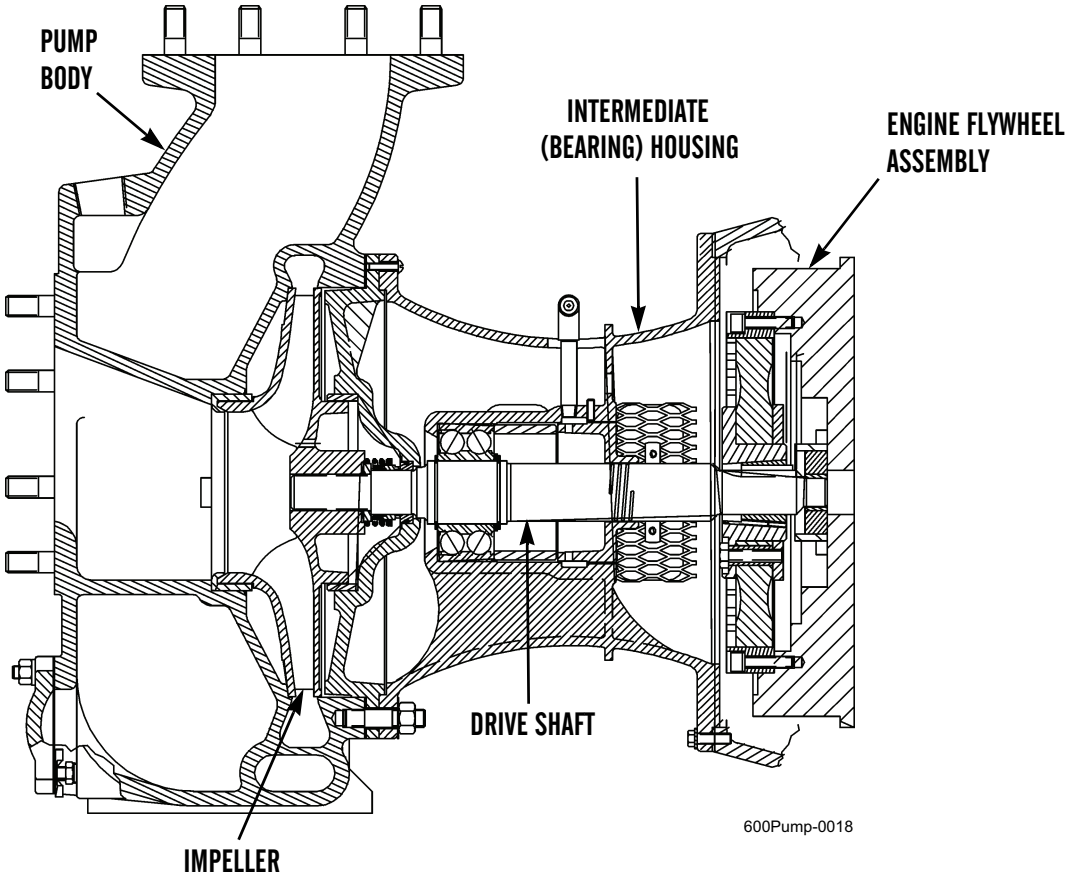


Figure 4. Pump Drive Operation.

PUMP ASSEMBLY - CONTINUED

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

(d) This equipment has no clutch to disengage the pump from the engine. Whenever the engine is running, the pump is turning. Since the pump's mechanical seal is lubricated by the fluid flowing through the pump, the engine must not be operated without the pump volute being at least 2/3 full.

(e) To run the engine for checking and adjustment, fill the pump (body) volute 2/3 full with appropriate fluid before starting the engine.

d. **Suction and Discharge Components.**

(1) Suction and discharge manifolds are constructed of marine grade aluminum to reduce weight.

(2) The manifold design incorporates long radius components and internal straightening vanes, to assist flow characteristics and reduce friction loss.

(3) For both suction and discharge, two 4-in. (10.16-cm) and one 6-in. (15.24-cm) ports incorporate two 4-in. (10.16-cm) and one 6-in. (15.24-cm) gate valves. Valves are capped when not in use.

(4) Suction and discharge couplers are slanted downward at a 23 degree angle, to facilitate connection of suction and discharge hoses.

ENGINE

NOTE

Refer to WP 0002 for engine equipment data.

1. **General.**

a. The pump is driven by a Deutz BF4L 914 turbocharged, 4-cylinder diesel engine capable of operating on JP-5 and JP-8.

b. The engine has been modified to a 24V engine with an operating speed range of 650 to 2,500 RPM.

c. The engine flywheel and bell housing is compatible with the pump (bearing) intermediate housing. The engine is mounted forward of the pump and provides a closed-coupled unit assembly.

2. **General Features.**

a. Air-cooled system with axial blower (cooling fan).

b. Cast-iron crankcase and modular cast-iron crankshaft with integrated counterweights.

c. Aluminum single-cylinder heads.

d. Overhead cylinder head valves, activated via tappets, pushrods, and rocker arms.

e. Pistons with two compression rings and one oil scraper ring.

f. Piston cooling by oil spray nozzle.

g. Connecting rods are diagonally split, drop-forged steel rods.

h. Steel camshaft seated in a bi-metal bearing on the blower side.

i. System lubrication force fed with rotary pump.

j. Integrated aluminum oil cooler.

k. Replaceable paper-type, micro-filter oil filter cartridge.

l. In-line injection pump with mechanical, centrifugal governor.

m. Five-hole injection nozzle.

n. Replaceable cartridge fuel filters.

ENGINE - CONTINUED

3. **Major Systems.**

a. **Air Intake System.**

(1) Air inlet components supply filtered air to the inlet of the engine through the turbocharger.

(2) Components include a dry-type air cleaner with primary and secondary filter elements and an air inlet tube between the air cleaner and the turbocharger.

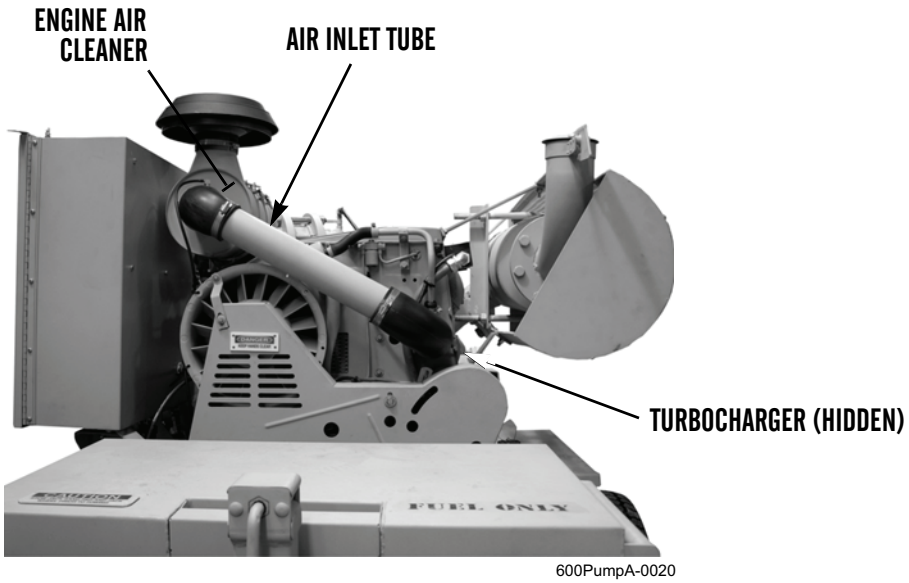


Figure 5. Air Intake System.

b. **Turbocharger.**

(1) The turbocharger boosts engine output by increasing the amount of air delivered to the engine combustion chambers.

(2) Turbocharger turbine and compressor wheels are mounted on opposite ends of a shaft.

(3) The turbine wheel is driven by engine exhaust gas.

(4) The compressor wheel takes in fresh air from the outside, through the air cleaner, and delivers it under pressure to the engine cylinders.

c. **Exhaust System.**

(1) Exhaust system components vent engine exhaust from the exhaust side of the turbocharger.

(2) Components include a spark-arrester type muffler and exhaust pipes between the muffler and the turbocharger.

ENGINE - CONTINUED

d. **Lubrication System.**

(1) The engine lubrication system is comprised of the oil pump which circulates oil through the engine. It also sends oil through the oil cooler, to maintain proper oil temperature.

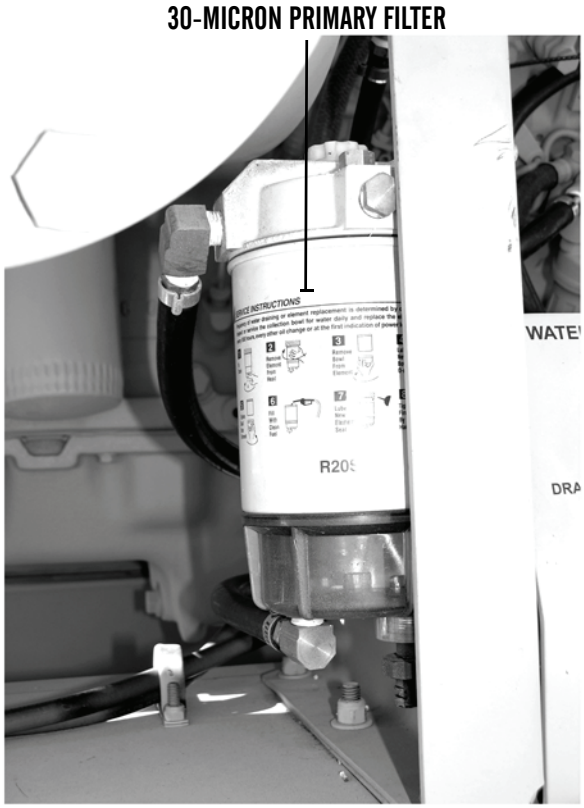
(2) The oil filter removes impurities from the oil.

(3) An oil bypass switch is located at the control panel and assists in cold weather starting.

e. **Cooling System.** The engine is air cooled and has a belt-driven blower (cooling) fan that draws air over the oil cooler.

f. **Fuel System.**

(1) Major components of the fuel system are the fuel lift pump, fuel injection pump, fuel tank, fuel filter/water separator with 30-micron primary filter, secondary stage II screen filter, stage III fuel filter, and low and high pressure fuel lines.



600Pump-0009

Figure 6. Fuel Filter/Water Separator.

ENGINE - CONTINUED

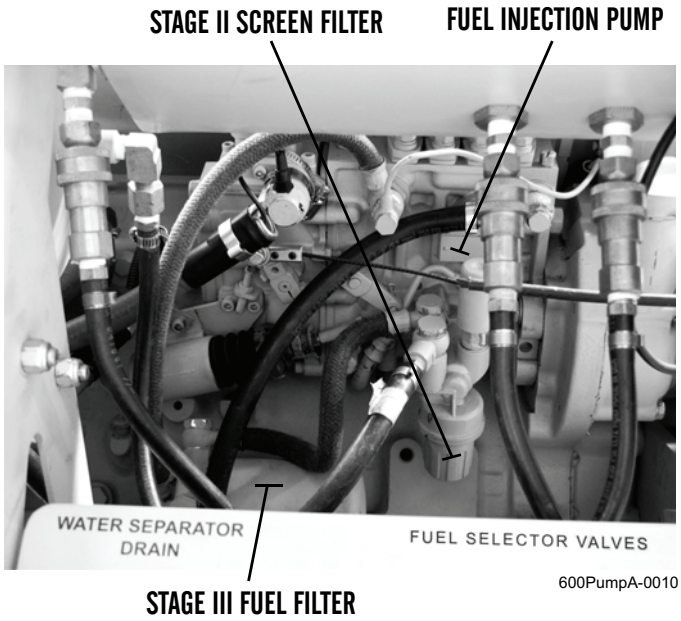


Figure 7. Stage II and III Fuel Filters.

(2) The fuel lift pump draws fuel from the fuel tank, through primary and secondary filters, to the fuel injection pump.

(3) The fuel injection pump injects fuel into the engine cylinders.

(4) Fuel lines connect all fuel system components.

(5) To assist in cold weather starting, a single flame glow plug preheats air for combustion.

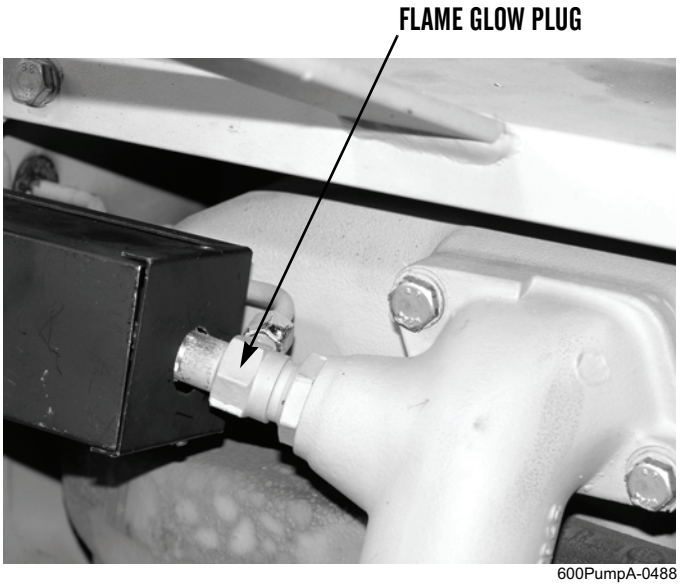


Figure 8. Flame Glow Plug.

PUMP

NOTE

Refer to WP 0002 for pump equipment data.

1. **General.**
   a. The pump is manufactured by Gorman-Rupp. It is a volute centrifugal pump designed to pump fluid up to 600 GPM at 350 ft total head.
   b. The pump is self-priming after initial filling. It will deliver rated flow within 2 minutes after initial filling of pump casing.
   c. Fluid enters the pump at high speed near the center of the rotating impeller and is thrown against the tight-fitting volute casing by the impeller vanes. Centrifugal pressure forces the fluid through an opening in the casing. This outlet widens increasingly in a spiral fashion, which reduces the speed of the flow, thereby increasing pressure.

PUMP - CONTINUED

2. **Major Components.** The following are major components of the pump:
   a. 6-in. (15.24-cm) suction inlet and discharge outlet.
   b. All-aluminum casing with volute-shaped outlet.
   c. Copper alloy impeller.
   d. Replaceable copper alloy wear rings.
   e. SAE 3/10 intermediate (bearing) housing with permanently lubricated shaft support ball bearing.
   f. Self-lubricated mechanical seal.

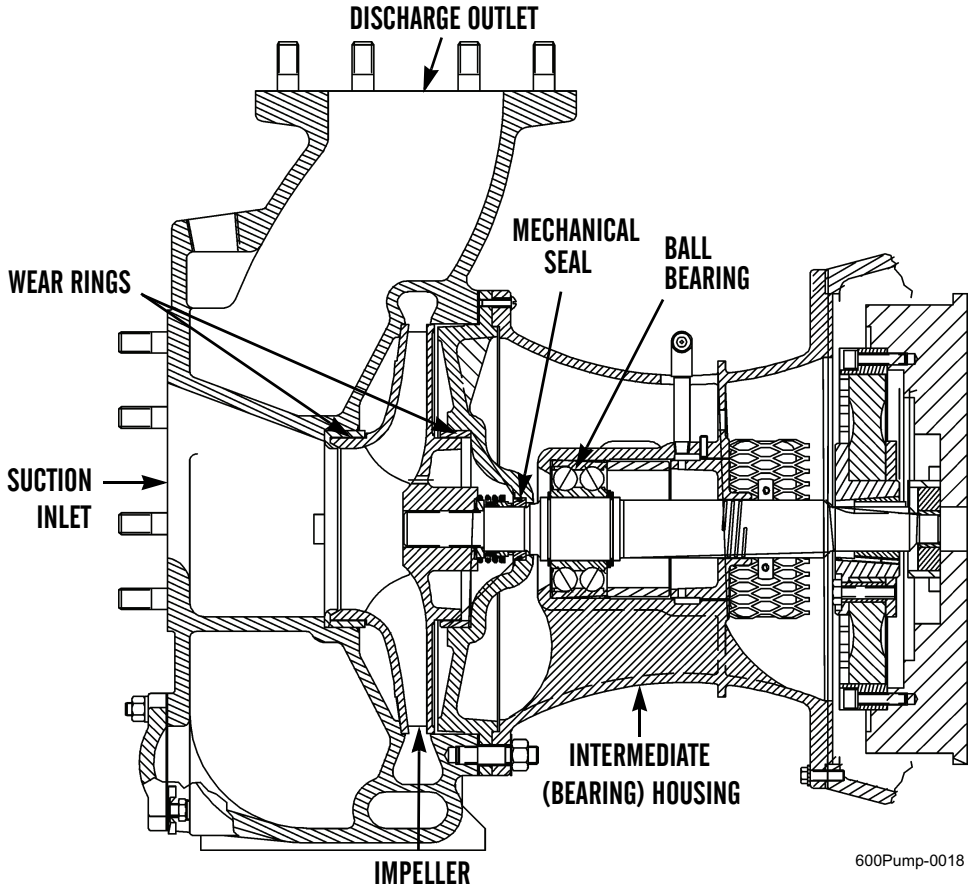


Figure 9. Major Components of Pump.

PUMP - CONTINUED

g. 1-1/2-in. (3.8-cm) priming port with female locking camlock cover with lanyard.

h. Case draincock.

i. Stro-Mag type flywheel mounted drive coupling.

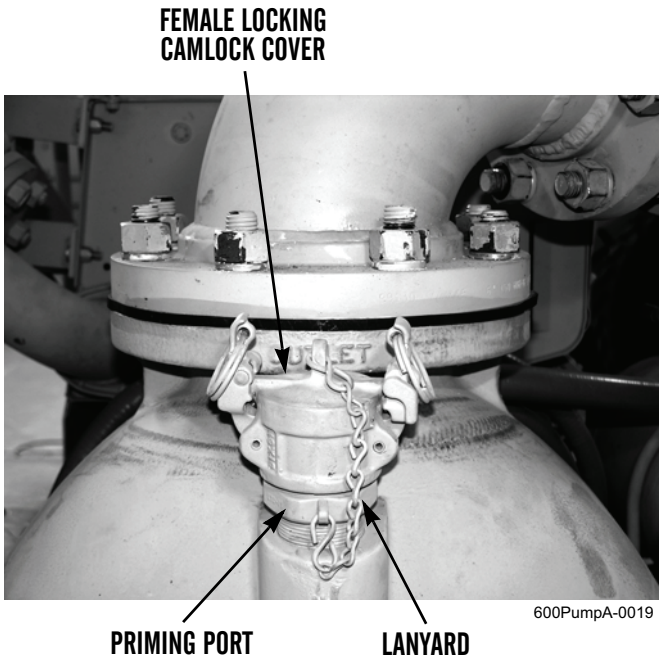


Figure 10. Pump Priming Port.

PUMP - CONTINUED

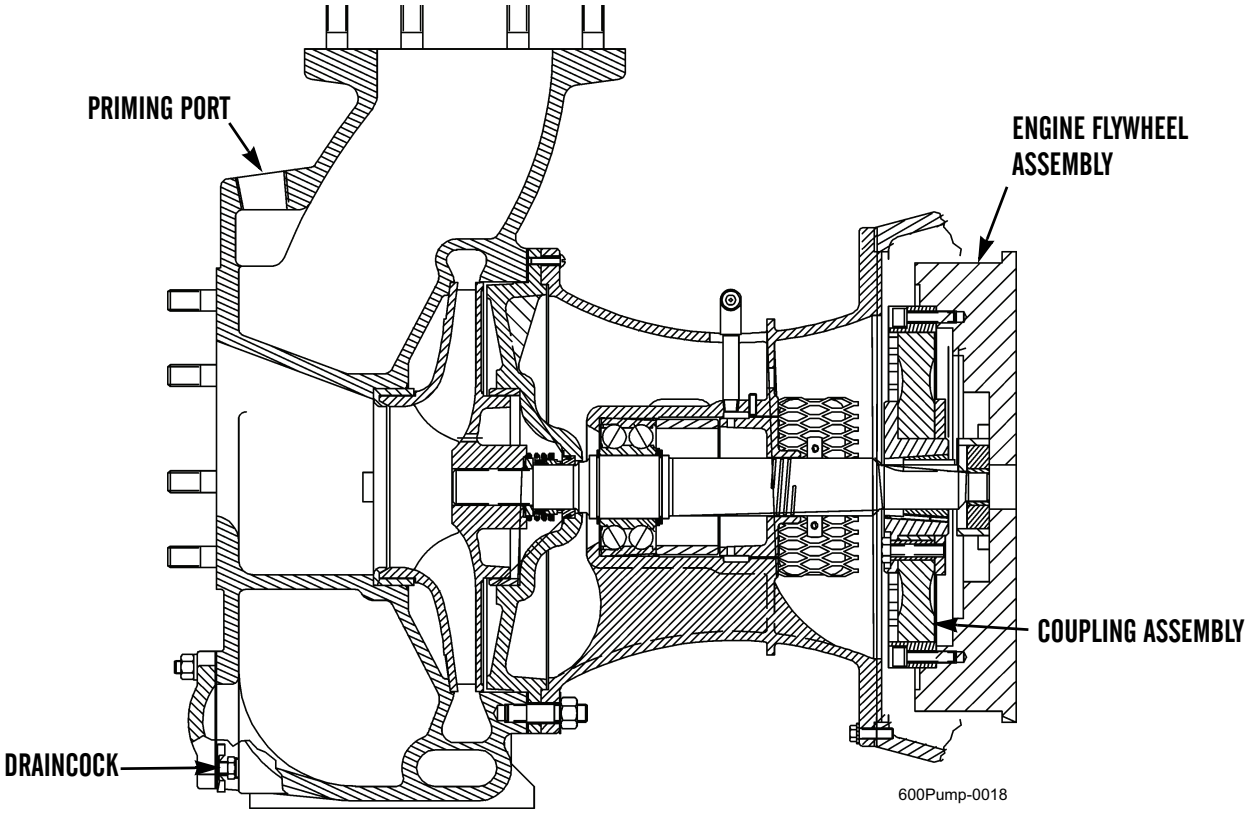


Figure 11. Major Components of Pump.

TRAILER

NOTE

Refer to WP 0002 for trailer equipment data.

1. **General Features.**
   a. Welded and bolted steel chassis frame with forklift slots and lifting/tiedown provisions.
   b. Corrosion prevention by means of an “E-coat”.
   c. CARC painted.
   d. 2-wheel axle assembly with torsion bar suspension.
   e. Front jack assembly equipped with wheel assembly or sand pad.
   f. Stabilizing “swing-away” rear jack assemblies for supporting and leveling trailer.
   g. Hydraulic surge (inertia) brakes on chassis tongue.
   h. Service brakeshoes at each wheel.
   i. Manual hand brake levers to apply parking brake at each wheel.
   j. Up to 10 in. (25.4 cm) adjustable towing extension (tongue) with two safety chains and intervehicular electrical cable.
   k. Military taillight assemblies and reflectors (red and amber).
   l. Grounding rod assembly stowed on chassis frame, with permanent ground terminal stud on frame.
   m. Strap rings used for attaching fabric cover.

TRAILER - CONTINUED

2. **Torsion Bar Suspension System.**
   a. The trailer's torsion bar suspension is rated at 6,000 lb (2,721.6 kg) capacity. It provides a smoother ride than traditional leaf spring suspension systems.
   b. The inner axle tube contains packed rubber cords that provide cushioning when the trailer is on rough terrain. The axle is directly mounted to the trailer frame.
   c. Each wheel and tire assembly is mounted to the spindle that is attached to the Torflex torsion bar.
   d. This independent suspension allows each wheel and tire assembly to adjust to the terrain, without directly affecting the other wheel and tire assembly.

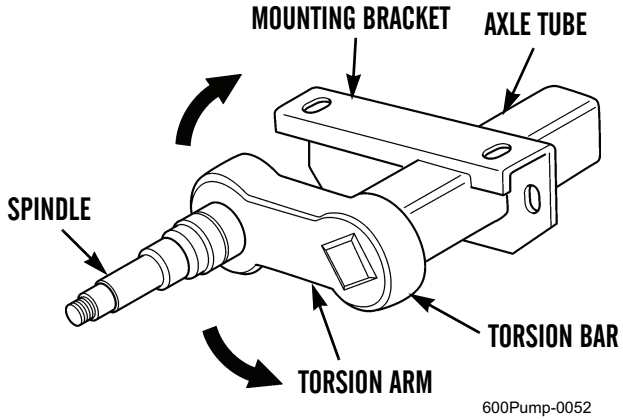


Figure 12. Torsion Bar Suspension System.

TRAILER - CONTINUED

3. **Trailer Brake System.**
   a. The trailer is equipped with hydraulic surge (inertia) brakes.
   b. The hydraulic brakes are rated for a 6,000 lb (2,721.6 kg) trailer and a 600 lb (272.2 kg) tongue load capacity.
   c. The hydraulic brake system consists of a hydraulic brake actuator assembly, hydraulic brake tubes and hoses, and wheel cylinders to activate the service brakes. The master cylinder is part of the hydraulic brake actuator and is filled with brake fluid.
   d. Hydraulic surge brakes are self-contained. They require no electrical, hydraulic, or other connection of brake sensing components to the towing vehicle.
   e. The hydraulic brake actuator changes the mechanical motion of the lunette ring into hydraulic pressure. The actuator has a built-in shock absorber to prevent jerky lunette ring movement.
   f. When towing vehicle brakes, the lunette ring “surges” or pushes against the towing vehicle. This causes the actuator to telescope together and apply force to the master cylinder.
   g. Hydraulic pressure is transmitted from the master cylinder, through brake tubes and hoses, to the wheel cylinder at each wheel. The wheel cylinder converts hydraulic pressure into mechanical force, which applies the service brakes.
   h. When the towing vehicle moves forward, the lunette ring is pulled forward, hydraulic brake pressure drops, and the service brakes are released.
   i. The breakaway cable is attached to the breakaway lever, which is part of the hydraulic brake actuator. The cable is attached to the towing vehicle when the trailer is being towed. If the towing connection fails, the cable will pull the breakaway lever forward. This causes hydraulic pressure to apply the service brakes.

CAUTION

Ensure breakaway cable is attached to towing vehicle with sufficient slack in cable. Insufficient slack may result in partial or full brake activation while trailer is being towed. Severe damage to brakes, hubs, wheel bearings, axle, and tires may result.

   j. The breakaway cable must be properly attached to the towing vehicle to ensure correct operation. If it is attached without sufficient slack, partial or full brake activation may occur while the trailer is moving.

TRAILER - CONTINUED

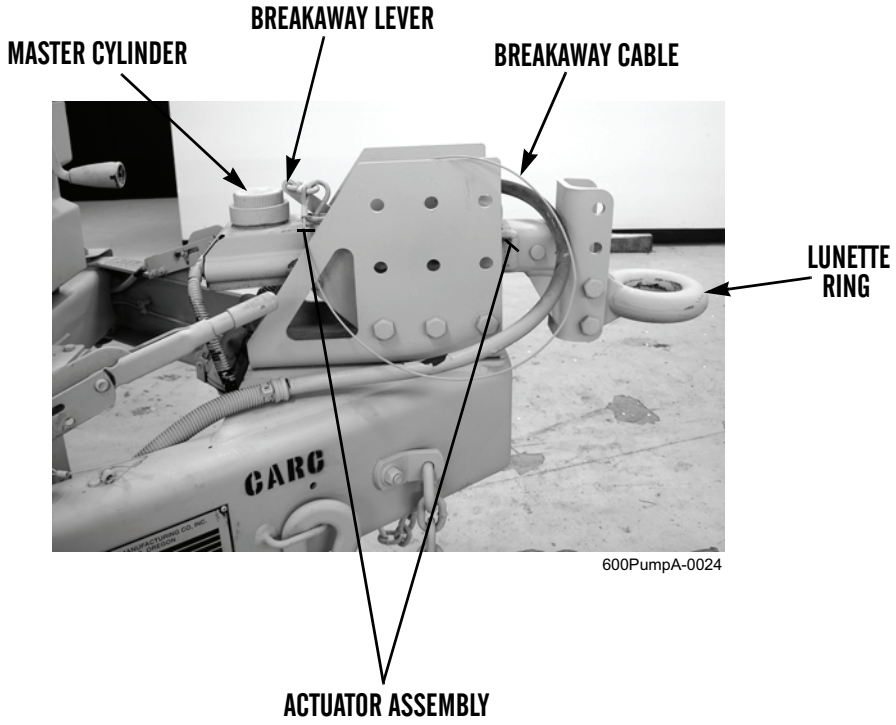


Figure 13. Hydraulic Brake Actuator Assembly.

TRAILER - CONTINUED

4. **Hub/Drum Assembly.**

   a. Two mechanisms to apply the trailer brakes are located at the hub/drum assembly: hydraulic brake system components and cable hand brake components.

   b. At each hub/drum assembly, hydraulic pressure, through the wheel cylinder mounted on the backing plate, actuates the service brakeshoes to expand against the interior of the drum.

   c. The hand brake cable passes through the backing plate and provides a mechanical means to expand the brakeshoes, thereby applying the brakes.

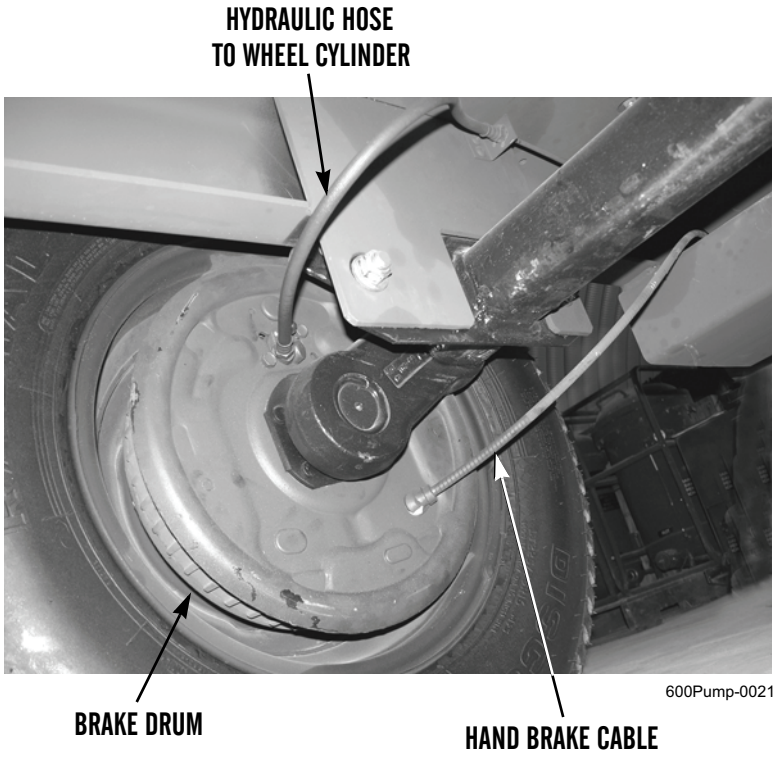


Figure 14. Brake Components at Wheel Hub/Drum Assembly.

TRAILER - CONTINUED

d. Grease is used to lubricate the hub wheel bearings.

(1) A Bearing Buddy® cap attachment includes a grease fitting mounted on a spring-loaded piston. An automatic pressure relief feature prevents over-filling and over-pressurization of the hub.

(2) Grease is added to the hub through the grease fitting, until the grease forces the piston outward about 1/8 in. (3.2 mm). When hub is full of grease, the piston can be rocked/moved by hand.

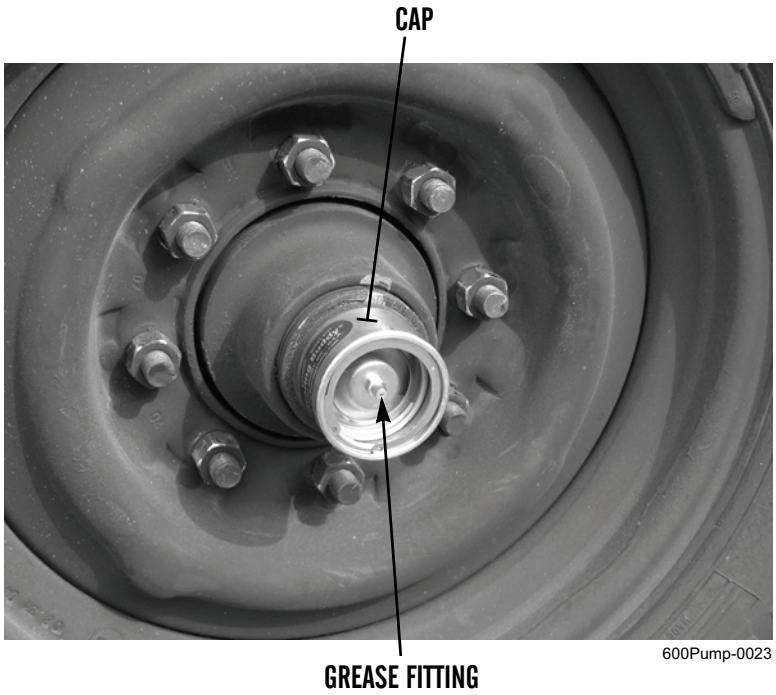


Figure 15. Bearing Buddy® at Wheel End.

END OF WORK PACKAGE

INTRODUCTORY INFORMATION, EQUIPMENT DESCRIPTION, AND THEORY OF OPERATION

GENERAL SAFETY INSTRUCTIONS

NOTE

- This work package is divided into a discussion of two categories of safety instructions: general safety instructions for both fuel and water pump assemblies, and fuel pump-related safety instructions.
- Refer to the *Warning Summary* at the front of this manual for a listing of specific warnings found in this manual.

GENERAL SAFETY (FUEL AND WATER PUMP ASSEMBLIES)

WARNING

The following general safety precautions relate to safe operation and maintenance of both 600 GPM Pump Assemblies. Read these precautions and follow them to the letter. Failure to do so may result in injury or death to personnel or damage to equipment.

1. To prevent carbon monoxide poisoning, operate engine in a well-ventilated area. If area is enclosed, exhaust fumes must be vented to the outside. Exposure to exhaust fumes produces symptoms of headache, dizziness, loss of muscular control, drowsiness, or coma. Brain damage can result from severe exposure. If someone is overcome, expose to fresh air, keep warm and still, and give cardio-pulmonary resuscitation (CPR), if needed. Seek medical attention. Administer oxygen, if available. GOOD VENTILATION IS THE BEST DEFENSE AGAINST EXHAUST POISONING.
2. Noise hazard exists within 50 ft (15.2 m) of an operating pump assembly. Wear approved hearing protective equipment.
3. Do not carry or wear exposed metal objects (jewelry, knives, keys, ID tags, etc.) that could cause sparks if struck or dropped.
4. Before starting engine, ensure all personnel are clear of engine and pump systems.
5. When engine and pump are running, there is a risk of injury through turning components, hot components, coming in contact with electrical voltage systems, and breathing exhaust. Maintain safety precautions whenever engine and pump are running.
   a. To prevent injury, do not operate engine and pump with safety guards removed.
   b. Never remove air inlet and exhaust elbows while engine is running. Touching a moving impeller can cause serious injury.
   c. Severe burns can result from touching turbocharger or exhaust system components heated during operation of the engine. If engine has been running, allow turbocharger and exhaust system components time to cool before touching them.
   d. Use extreme caution when handling hot oil.
6. Serious burns, illness, or death could occur if fuels are not handled carefully.
   a. Use in a well-ventilated area away from open flame, arcing equipment, ignition sources, heaters, or excessive heat.
   b. Ensure fuel lines and connections are secure.
   c. Do not inhale vapors.
   d. Shut down engine and allow it to cool down before refueling.
   e. Do not overfill fuel tank.
   f. Use proper refueling procedures and equipment to avoid spillage. Clean up any spill immediately.
   g. Do not run engines near open fuel containers.
   h. Wear fuel-resistant gloves and eye protection when handling fuels.

GENERAL SAFETY (FUEL AND WATER PUMP ASSEMBLIES) - CONTINUED

7. Serious injury or death can occur if compressed air is directed against the skin. Do not use compressed air for cleaning or drying purposes unless pressure is reduced to 30 PSI (207 kPa). When working with compressed air, always use chip guards, eye protection, and other personnel protective equipment.
8. Handle solvent cleaning compound carefully to avoid injury. Avoid prolonged and repeated breathing of vapors. Avoid contact with skin. Do not use near open flame, arcing equipment, or other ignition sources. Always wear eye protection and protective clothing. The flash point of P-D-680 solvent cleaning compound is 100 to 138°F (38 to 59°C).
9. Before application of heat, such as open flame, torch, or arc welding, ensure all traces of solvent cleaning compound, or flammable fluids or vapors, are absent from the repair area.
10. Never clean a filter cartridge with fuels or hot fluids.
11. Use caution when handling batteries or battery electrolyte (acid).
    a. If acid is splashed on the skin, wash affected area immediately with plenty of clean water.
    b. If acid is splashed in the eyes, wash affected area immediately with plenty of clean water and seek medical attention.
    c. Charge battery in a well-ventilated area.
    d. Do not smoke or use open flame or spark-producing equipment in the vicinity of charging battery.
12. Use caution when handling brake fluid. Wear gloves and eye protection and work in a well-ventilated area.
13. Dispose of used engine oil and brake fluid IAW local policy and ordinances.
14. Dispose of oily waste or rags immediately after use by placing in a self-closing metal container.
15. Report leaks to the proper authorities. Do not operate leaky equipment.
16. Do not throw or drag hoses and nozzles. Avoid kinking hoses.
17. Only authorized and trained personnel should be in the area when pump assembly is being hoisted. Ensure all lifting equipment is in good condition and of suitable lift capacity. Handle load slowly and carefully.
18. Use extreme caution when moving or lifting heavy equipment. Ensure there is adequate personnel to do the job. Use proper lifting procedures or use suitable lifting equipment. Ensure lifting equipment is in good condition. Wear safety shoes, gloves, and other suitable protective equipment.
19. Injury or death could occur if trailer frame is not adequately supported during related maintenance. After jacking up trailer frame, position suitable blocking under all four corners of the frame, to ensure it will not drop or move.
20. Injury to personnel or damage to equipment could occur if brakes fail the braking test. Do not perform test at speeds greater than a quick walk. Brake test must be performed on a level surface or with the trailer coupled to a towing vehicle.
21. Serious injury to hands, face, or eyes could occur if high-pressure fuel injection spray is not handled carefully. The injection pressure will cause fuel to penetrate the skin or eyes. Wear protective goggles during spray test. Seek medical attention immediately if penetration to skin or eyes occurs.
22. If welding on pump assembly, operate acetylene torches properly and be alert for leaks on any part of the equipment. Inhalation of acetylene produces headache, dizziness, nausea, and possible loss of consciousness. If acetylene is inhaled, seek fresh air immediately.
23. Live steam used for cleaning shall not exceed 100 PSI (689 kPa). The washer should be provided with hat or cap, a face shield, a heavy rubber apron, oilskin or rubber trousers, knee-length rubber boots drawn under trouser legs, a heavy rubber coat, and rubber gloves covering canvas gloves. If the air temperature is excessive, causing the worker to suffer from the heat, equipment may be limited to trousers, knee boots worn under the trousers, an oiled (or plastic) apron, gloves, and face shield. During steam cleaning operations, adequate ventilation, natural or forced, must be provided. Do not direct live steam against skin.

FUEL PUMP-RELATED SAFETY

WARNING

The following safety precautions relate to safe operation and maintenance of the 600 GPM Fuel Pump Assembly. Read these precautions and follow them to the letter. Failure to do so may result in injury or death to personnel or damage to equipment.

NOTE

Refer to FM 10-67-1, *Concepts and Equipment of Petroleum Operations* (WP 0124), for a comprehensive discussion of fuel handling hazards and risk.

1. **Introduction.**
   a. When handling fuel, personnel must take appropriate measures to minimize the risk of fire, explosion, injury, illness, and contamination of the environment.
   b. To attain this goal, personnel must have a thorough knowledge of the hazards involved. They must strictly observe fire and safety precautions. They must follow spill control and containment measures.
   c. Although the hazard is high, fuel handling operations can be safely performed if procedures and precautions are carefully observed.
2. **Safety Instructions.**
   a. DO NOT SMOKE within 50 ft (15.2 m) of fuel pump assembly. Prohibit smoking except in designated areas. DO NOT allow matches or lighters in hazardous areas.
   b. Fire extinguishing equipment must always be at hand during refueling/de-fueling operations.
   c. Bonding and grounding connections must be made before fuel flow begins, and must not be broken until after fuel flow stops.
   d. Bonding and grounding connections should be tested frequently to ensure conductivity. Repair or replace defective parts.
   e. Water alone should not be used on fuel fires since it tends to spread the fire.
   f. Wear non static-producing clothing, with shirt sleeves rolled down and buttoned, and shirttails tucked in. Do not carry or wear loose items of clothing. Keep all pockets empty.
   g. Always wear leather gloves and all-leather, rubber-soled boots for splash protection. Do not wear boots with exposed nails, metal plates, or hobnails.
   h. Avoid getting fuel on skin. Wash fuel from skin as soon as possible with soap and water. If fuel gets into eyes or mouth, flush thoroughly with water. Do not swallow. Get medical attention immediately.
   i. If fuel gets on clothing, remove clothing promptly but carefully. Wash skin with soap and water and put on clean clothing.
   j. Avoid spilling fuel. Clean up all spills immediately. Wipe up small spills or cover with dirt. Follow local emergency procedures for large spills. Treat the area as dangerous until all vapors have dissipated.
   k. Keep all fuel containers, full or empty, tightly closed except when in use.
   l. Open drums slowly, especially if they have been shaken or exposed to heat, to prevent a fuel-air mixture from spewing out.
   m. Beware of empty (or apparently empty) cans, drums, tanks, and hoses that formerly held fuel. Vapors can remain long after the container has been emptied; the fuel-air mixture is more dangerous than fuel alone.

FUEL PUMP-RELATED SAFETY - CONTINUED

n. Fuel vapors are heavier than air and will collect in low places such as pits or sumps. Be especially careful in such areas.

o. Use only flashlights, drop lights, or lanterns approved for use in hazardous areas.

p. Use only explosion-proof electrical equipment and fixtures in hazardous areas. Inspect them often and correct any conditions that could cause sparking, arcing, or overheating.

q. To ensure fire safety requirements, do not conduct fueling operations in confined areas: Do not conduct fueling operations within 300 ft (91.4 m) of active ground radar. Allow at least 150 ft (45.7 m) between bulk tank outlets and fuel dispensing points.

r. Stop all fuel handling operations during electrical storms.

s. Do not filter fuel through anything other than properly grounded filter-separators and monitors.

t. Do not pump fuel at a rate which will cause severe turbulence.

u. After filling large tanks, allow several minutes of relaxation time to allow the static charge on the fuel surface to equalize with the tank, before inserting gauges or any other objects into the fuel.

v. If top loading a tank truck or tank car is necessary, do not splash fuel. Start fill at a slow rate with fill hose near the tank bottom. When the hose end is submerged, loading can proceed at a full flow rate.

w. Build protective earthworks (berms) around collapsible tanks to ensure the least possible exposed fuel surface in case of tank rupture. A small area generates the least vapor and provides the smallest burning surface in case of fire.

x. Keep clear of rotor blades, propeller blades, and their paths, when refueling aircraft.

y. Open switches and pull fuses before doing essential work on electrical equipment.

z. Equipment requiring welding or cutting operations must be clean and vapor-free. Heaters, welding torches, or blow-torches must not be used within 50 ft (15.2 m) of fuel handling operations.

aa. Never use fuel to wash hands.

ab. Never use liquid fuels and cleaning fluids for cleaning floors, equipment, clothing, etc.

END OF WORK PACKAGE

CHAPTER 2

OPERATOR INSTRUCTIONS

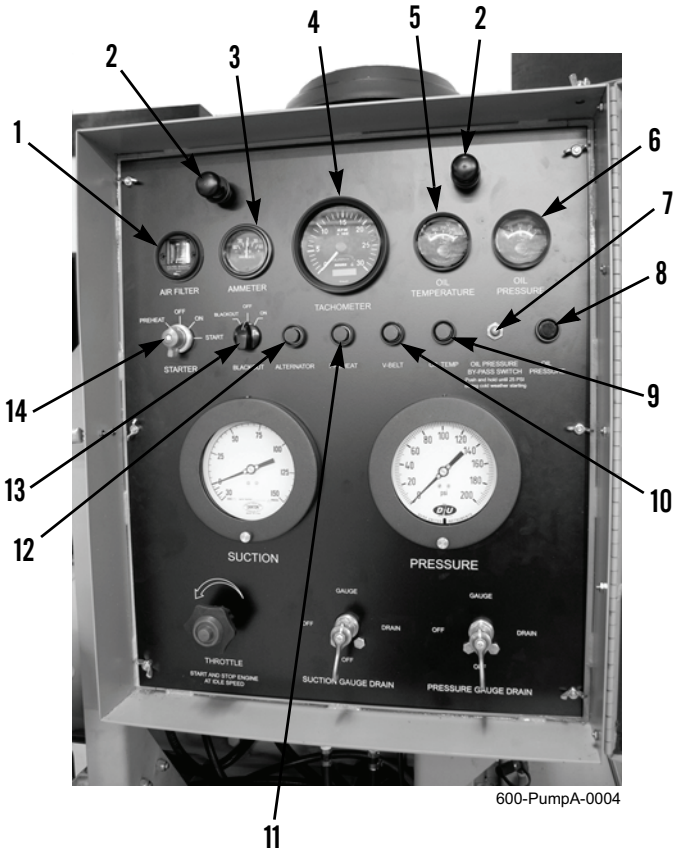
OPERATOR INSTRUCTIONS

DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS

SCOPE

1. This work package describes the location and function of all operator controls and indicators of the 600 GPM Pump Assemblies.
2. Do not attempt to operate equipment until becoming familiar with these controls and indicators.

CONTROL PANEL

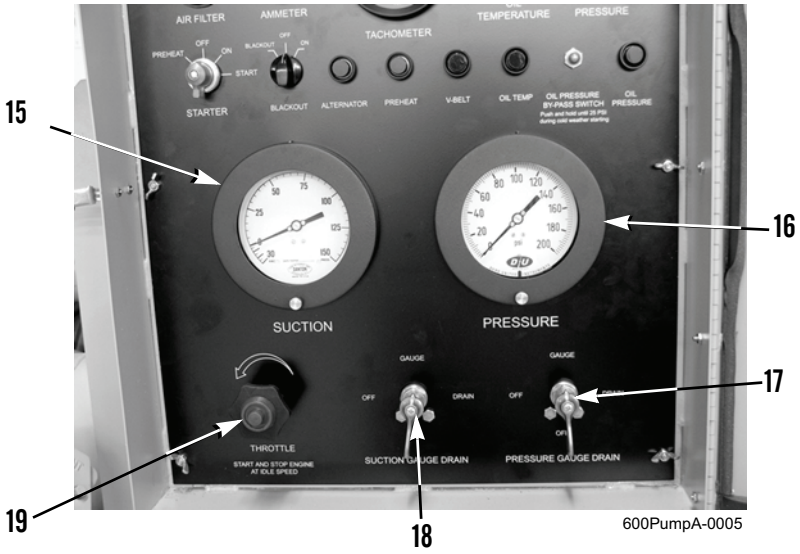


KEY	CONTROL OR INDICATOR	FUNCTION
1	Air Filter Restriction Indicator	Measures and indicates restriction of air through air cleaner filters. Air cleaner service is required when yellow band on gauge rises to red zone. A reset button is located at bottom of gauge.
2	Panel Lights	Illuminate control panel when blackout light switch (13) is in ON position.
3	Ammeter	Indicates amount of current flow to and from batteries. When the needle reads negative, battery charge is being depleted. When the needle reads positive, battery charge is being increased. When the needle reads zero, either the circuit is not operating or the battery has all the charge it can hold, which raises its voltage to match the alternator, preventing more current from being pushed into batteries.
4	Tachometer	Displays engine speed in RPM. An hourmeter is also included on gauge.

CONTROL PANEL - CONTINUED

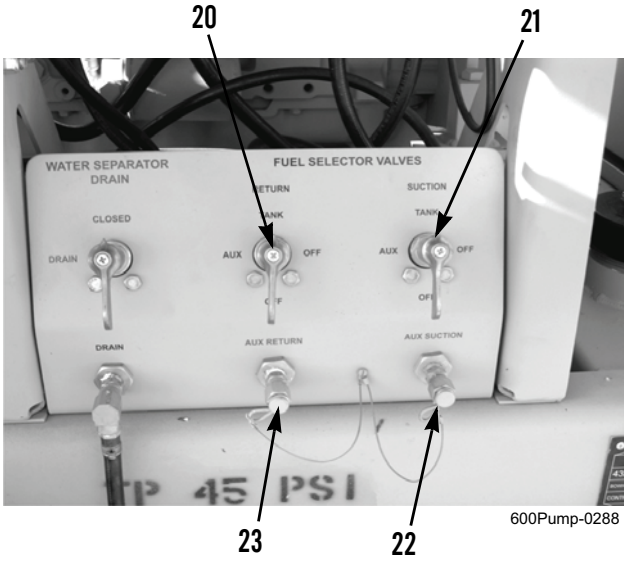
KEY	CONTROL OR INDICATOR	FUNCTION
5	Oil Temperature Gauge	Indicates temperature of engine oil. Normal oil temperature while pumping should be 180 to 200°F (82.2 to 93.3°C). Gauge shuts down engine if oil temperature exceeds 240°F (115.6°C).
6	Oil Pressure Gauge	Indicates pressure of oil in engine. Oil pressure will be as high as 100 PSI (689 kPa) when oil is cold, but has an acceptable range of 50 to 85 PSI (345 to 586 kPa) during normal pumping when engine is warm. Gauge shuts down engine if oil pressure is less than 25 PSI (172 kPa).
7	Oil Pressure Bypass Switch	Switch is used during cold weather starting. Engine safety shutdown system will shut off the fuel solenoid in 30 seconds if less than 25 PSI (172 kPa) is indicated on oil pressure gauge. Depress bypass switch and hold to override shutdown sequence and allow engine to continue cranking even if it takes longer than 30 seconds to start engine.
8	Oil Pressure Warning Light	Comes on when oil pressure gauge reads oil pressure less than 25 PSI (172 kPa) and shuts engine down.
9	Oil Temperature Warning Light	Comes on when oil temperature gauge reads an engine oil temperature exceeding 240°F (115.6°C) and shuts engine down.
10	Cooling Fan V-Belt Warning Light	Comes on when cooling fan V-belt tension is disrupted at tension ring roller and shuts down engine to prevent damage from overheating.
11	Preheat Light	Comes on when engine start key is turned to PREHEAT position (or START position), to activate glow plug and heat intake air to engine during cold weather starting.
12	Alternator Light	Comes on to indicate there is less charge going to batteries than is being produced by the alternator. This condition will drain batteries over time.
13	Blackout Light Switch	Circuit board on back side of switch regulates voltage to all lights on control panel (panel and warning lights, ammeter, tachometer, and oil pressure and oil temperature gauges). Switch positions are: BLACKOUT (to the left) - panel lights off and gauge and warning lights in blackout (dimmed) mode; OFF (middle position) - no lights on control panel; and ON (to the right) - panel lights on and gauge and warning lights in normal (bright) mode.
14	Engine Start Switch	Four-position switch controls glow plug preheating and engine starter. Turn counterclockwise (to the left) to PREHEAT. Remaining switch positions are OFF, ON, and START.

CONTROL PANEL - CONTINUED



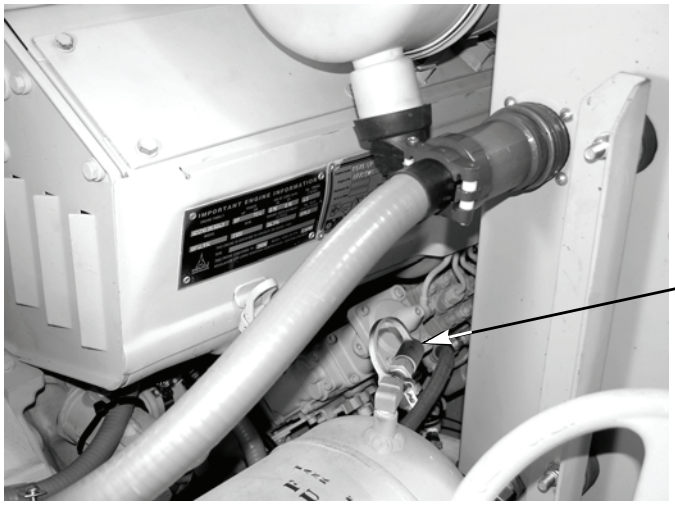
KEY	CONTROL OR INDICATOR	FUNCTION
15	Suction Gauge	Indicates pump suction pressure. Dial is graduated from -30 to +150 PSI.
16	Pressure Gauge	Indicates pump discharge pressure on a dial graduated from 0 to 200 PSI.
17	Pressure Gauge Drain	Drains pressure gauge to remove any accumulated moisture that could affect accuracy of gauge. Drain is used during long-term storage of pump assembly or during extreme cold weather conditions. Turn to DRAIN position to drain. Turn to GAUGE position during normal operation. To prevent damage to gauge when fluid pumped is very dirty, turn to either OFF position to segregate gauge from fluid flow.
18	Suction Gauge Drain	Drains suction gauge to remove any accumulated moisture that could affect accuracy of gauge. Drain is used during long-term storage of pump assembly or during extreme cold weather conditions. Turn to DRAIN position to drain. Turn to GAUGE position during normal operation. To prevent damage to gauge when fluid pumped is very dirty, turn to either OFF position to segregate gauge from fluid flow.
19	Throttle Control	Controls engine RPM. Control is cable operated. Turn control counterclockwise (to the left) and pull out to increase engine speed. Turn clockwise (to the right) and push in to decrease engine speed. Turn jamnut on cable clockwise to lock throttle at desired setting, as indicated on tachometer.

ENGINE FUEL SYSTEM



KEY	CONTROL OR INDICATOR	FUNCTION
		NOTE Fuel selector valves allow operator to run engine using either fuel from fuel tank on trailer or an external auxiliary fuel supply.
20	Fuel Return Selector Valve	TANK valve position directs return fuel to fuel tank. AUX valve position returns fuel to external auxiliary fuel tank. When placed in either OFF position, valve acts as a fuel shut-off. Place in OFF position to perform fuel system maintenance.
21	Fuel Suction Selector Valve	TANK valve position draws fuel from fuel tank. AUX valve position draws fuel from external auxiliary fuel tank. When placed in either OFF position, valve acts as a fuel shut-off. Place in OFF position to perform fuel system maintenance.
22	Auxiliary (AUX) Suction Inlet	Connection point for suction fuel line from external auxiliary fuel tank. When not in use, ensure cap with lanyard is installed.
23	Auxiliary (AUX) Return Outlet	Connection point for return fuel line to external auxiliary fuel tank. When not in use, ensure cap with lanyard is installed.

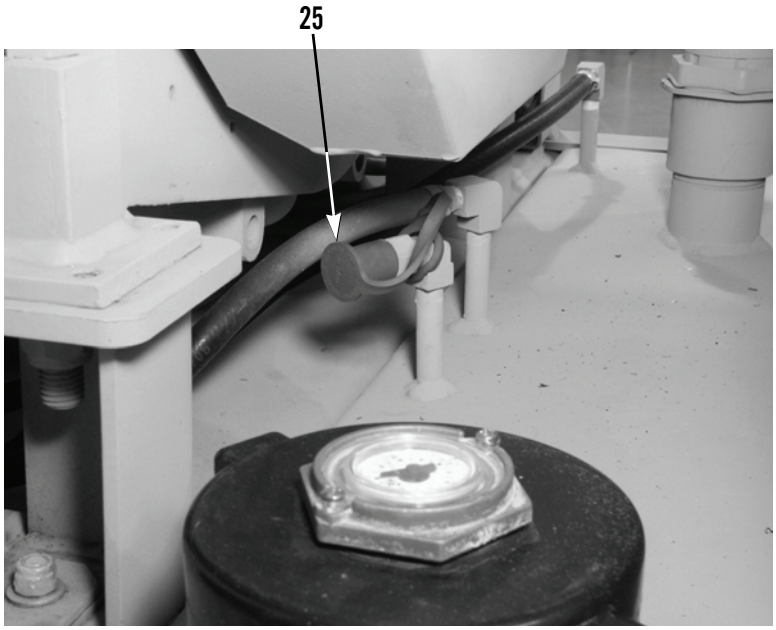
ENGINE FUEL SYSTEM - CONTINUED



600PumpA-0008

KEY	CONTROL OR INDICATOR	FUNCTION
	NOTE FUEL PUMP ASSEMBLY ONLY. Fuel may be diverted from the discharge manifold to fill the fuel tanks, using a fuel jumper hose assembly (stowed in storage box).	
24	Fuel Quick Disconnect Coupler (at Discharge Manifold) (FUEL PUMP ASSEMBLY ONLY)	Connection point at discharge manifold for fuel jumper hose assembly, when running engine with fuel diverted from discharge manifold.

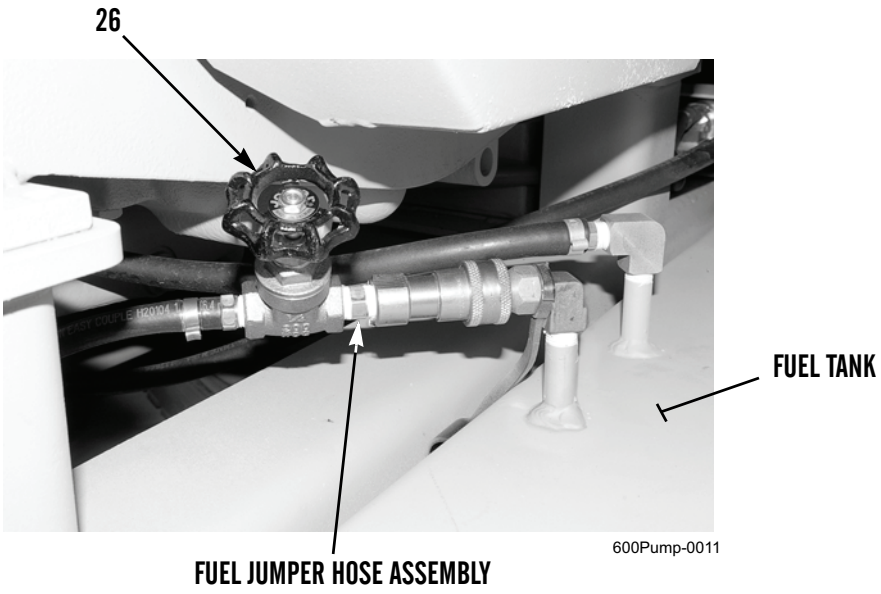
ENGINE FUEL SYSTEM - CONTINUED



600Pump-0007

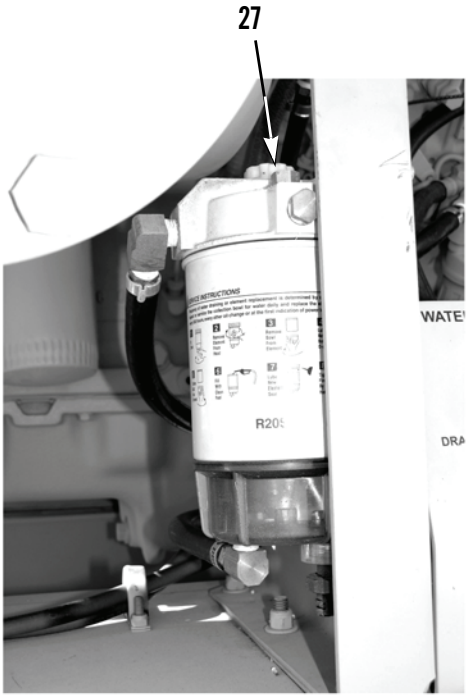
KEY	CONTROL OR INDICATOR	FUNCTION
	NOTE FUEL PUMP ASSEMBLY ONLY. Fuel may be diverted from the discharge manifold to fill the fuel tank using a fuel jumper hose assembly (stowed in storage box).	
25	Fuel Quick Disconnect Coupler (at Fuel Tank) (FUEL PUMP ASSEMBLY ONLY)	Connection point at fuel tank for fuel jumper hose assembly, when running engine with fuel diverted from discharge manifold.

ENGINE FUEL SYSTEM - CONTINUED

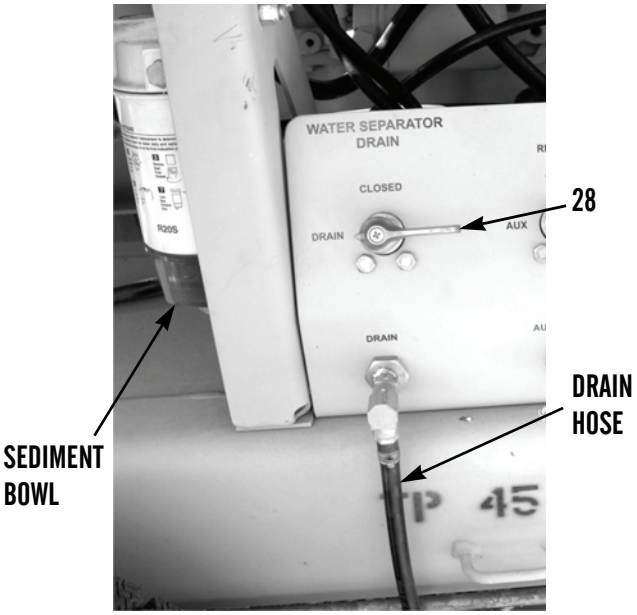


KEY	CONTROL OR INDICATOR	FUNCTION
26	Fuel Tank Fill Valve (FUEL PUMP ASSEMBLY ONLY)	Fill valve is component of fuel jumper hose assembly. When jumper hose is connected between discharge manifold and fuel tank, turn valve knob counterclockwise (to the left) to open valve and allow fuel to flow from discharge manifold into fuel tank. Turn valve knob clockwise (to the right) to shut off fuel flow.

ENGINE FUEL SYSTEM - CONTINUED



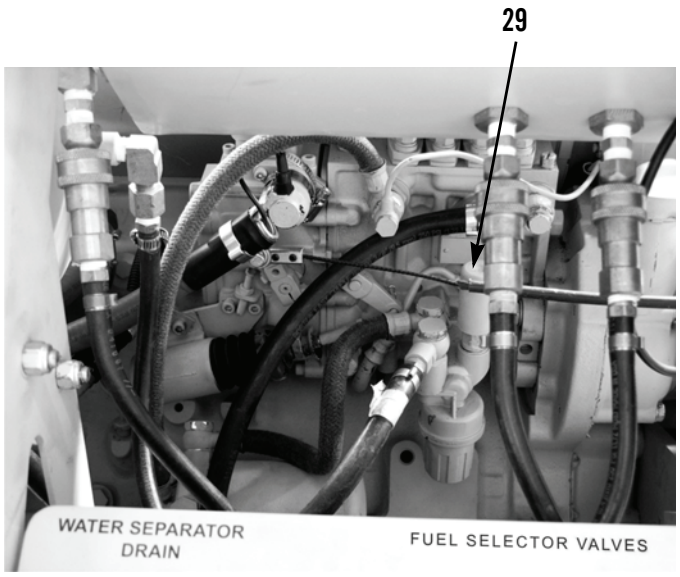
600Pump-0009



600Pump-0320

KEY	CONTROL OR INDICATOR	FUNCTION
27	Fuel Filter/Water Separator Priming Knob	To prime fuel filter/water separator, turn knob counterclockwise (to the left) to loosen knob, then pump up and down until pump has filled filter and resistance is felt against priming knob. After priming, turn knob clockwise (to the right) to tighten.
28	Fuel Filter/Water Separator Drain Valve	Turn valve handle to DRAIN to drain water and sediment from sediment bowl through drain hose. After draining, turn valve handle to CLOSED.

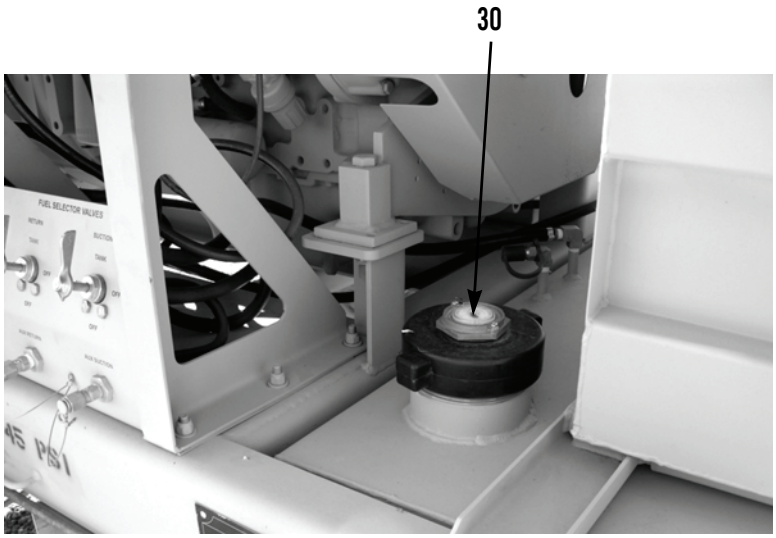
ENGINE FUEL SYSTEM - CONTINUED



600PumpA-0010

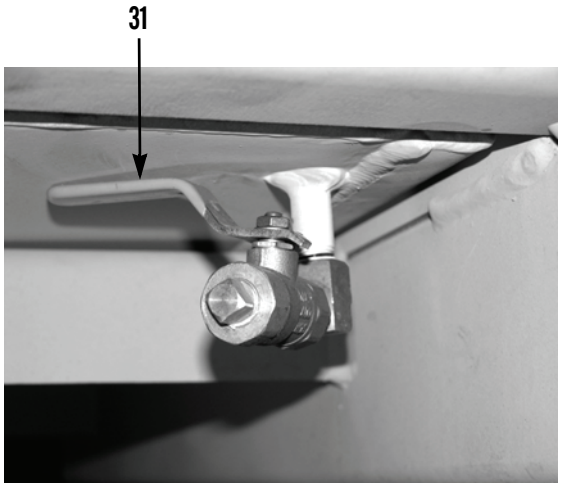
KEY	CONTROL OR INDICATOR	FUNCTION
29	Fuel Pump Primer	To prime fuel pump, pump up and down on primer until there is pressure against primer and it is difficult to push primer down.

ENGINE FUEL SYSTEM - CONTINUED



600Pump-0014

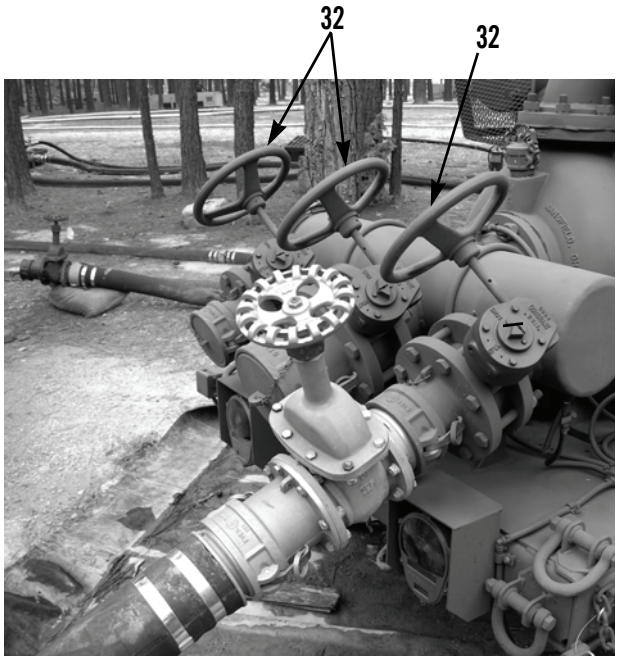
KEY	CONTROL OR INDICATOR	FUNCTION
30	Fuel Tank Gauge	Float-type gauge indicates level of fuel in fuel tank. Indicator readings are: E (Empty), 1/4, 1/2, 3/4, and F (Full).



600Pump-0054

KEY	CONTROL OR INDICATOR	FUNCTION
31	Fuel Tank Drain	To drain fuel tank, remove plug and turn valve handle 1/4 turn counterclockwise (to the left) until valve handle is in line with drain flow. After draining fuel tank, close valve by turning handle 1/4 turn clockwise (to the right). Install plug.

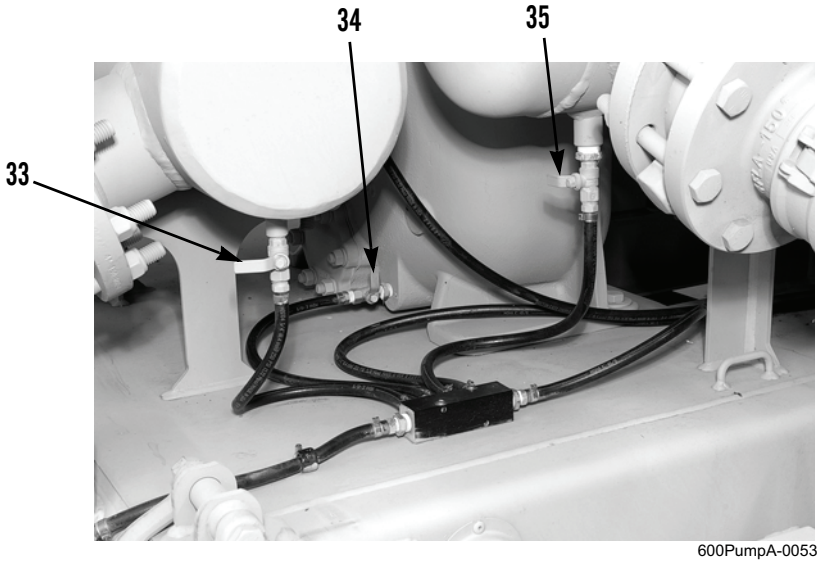
PUMPING SYSTEM



600Pump-0012

KEY	CONTROL OR INDICATOR	FUNCTION
	NOTE Illustration above shows suction manifold gate valves.	
32	Suction and Discharge Manifold Gate Valves	Two 4-in. (10.16-cm) and one 6-in. (15.24-cm) gate valves control fluid flow into suction manifold and out of discharge manifold. To open each valve, turn handwheel counterclockwise (to the left), in direction of OPEN arrow stamped on valve. Turn handwheel clockwise (to the right), in direction of SHUT arrow, to close each valve.

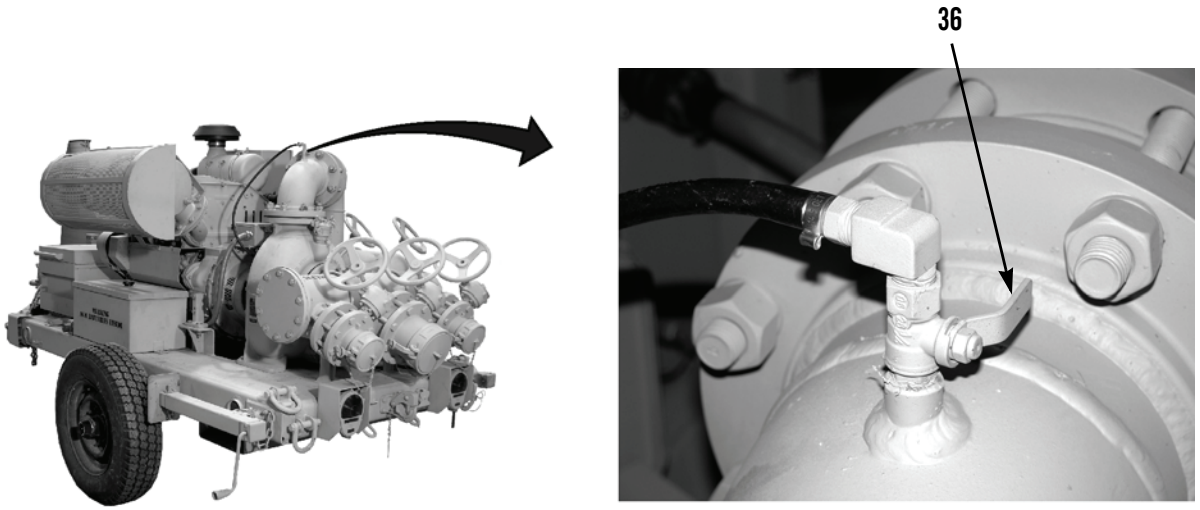
PUMPING SYSTEM - CONTINUED



600PumpA-0053

KEY	CONTROL OR INDICATOR	FUNCTION
33	Suction Manifold Drain Valve	To drain suction manifold, open drain valve by turning valve handle 1/4 turn counterclockwise (to the left), until in line with fluid drain flow. To close drain valve, turn valve handle 1/4 turn clockwise (to the right).
34	Pump Housing Drain Valve	To drain pump housing, open drain valve by turning valve handle 1/4 turn counterclockwise (to the left), until in line with fluid drain flow. To close drain valve, turn valve handle 1/4 turn clockwise (to the right).
35	Discharge Manifold Drain Valve	To drain discharge manifold, open drain valve by turning valve handle 1/4 turn counterclockwise (to the left), until in line with fluid drain flow. To close drain valve, turn valve handle 1/4 turn clockwise (to the right).

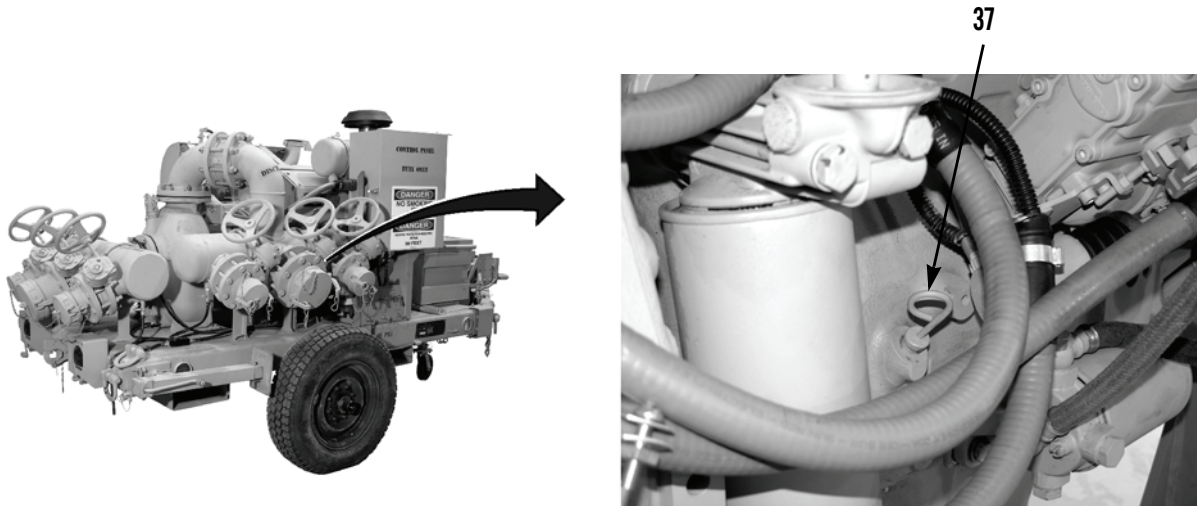
PUMPING SYSTEM - CONTINUED



600PumpA-0443

KEY	CONTROL OR INDICATOR	FUNCTION
36	Discharge Manifold Manual Air Eliminator Valve	Valve should be in CLOSED position, unless pump is being primed. To prime pump, open valve by turning valve handle 1/4 turn counter-clockwise (to the left). When a steady steam of fluid flows from drain hose at right-rear of trailer, close valve by turning valve handle 1/4 turn clockwise (to the right).

MISCELLANEOUS CONTROLS AND INDICATORS

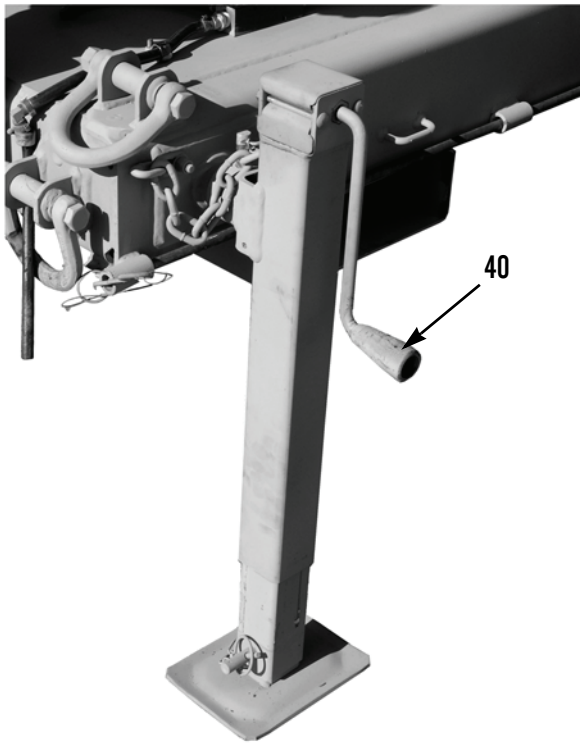


600PumpA-0445

KEY	CONTROL OR INDICATOR	FUNCTION
37	Engine Oil Level Dipstick	Located on right side of engine. Indicates oil level in engine crankcase. Level should be between lines on dipstick.

MISCELLANEOUS CONTROLS AND INDICATORS - CONTINUED

600Pump-0015



600Pump-0016

KEY	CONTROL OR INDICATOR	FUNCTION
38	Front Leveling Jack Crank Handle	Turn handle clockwise (to the right) to extend leg and raise trailer. Turn handle counterclockwise (to the left) to retract leg and lower trailer.
39	Hand Brake Lever	Applied position is horizontal. Move lever to vertical position to release. With lever in released position, turn adjusting knob clockwise (to the right) to tighten brake adjustment, counterclockwise (to the left) to loosen adjustment.
40	Rear Leveling Jack Crank Handle	Turn handle clockwise (to the right) to extend leg and raise trailer. Turn handle counterclockwise (to the left) to retract leg and lower trailer.

END OF WORK PACKAGE

OPERATOR INSTRUCTIONS

OPERATION UNDER USUAL CONDITIONS

- FUEL PUMP ASSEMBLY: When handling fuel, personnel must take appropriate measures to minimize the risk of fire, explosion, injury, illness, and contamination of the environment. To attain this goal, personnel must have a thorough knowledge of the hazards involved. They must strictly observe fire and safety precautions. They must follow spill control and containment measures. Failure to follow this warning may result in injury or death to personnel or damage to equipment.
- For further information, read and become familiar with safety information in *General Safety Instructions* (WP 0004) and in the *Warning Summary* at the front of this manual.
- A water pump assembly may be converted to fuel service. However, once a pump has been used to pump fuel, it must NEVER again be used to pump water. Failure to follow this warning may result in injury or death to personnel.
- With the 600 GPM pump started, operators using a co-located GPS may find GPS performance to be degraded. Failure to realize this limitation may result in death or injury of personnel.
- With the 600 GPM pump started, operators that are within a distance of 23 m may find UHF communications to be compromised. Failure to realize this limitation may result in death or injury of personnel.

CAUTION

WATER PUMP ASSEMBLY: Water pump assembly is capable of pumping water at an ambient temperature range of +32°F (0°C) to +130°F (+54.4°C). Operation at temperatures below freezing may result in freeze damage to pump. If operating water pump assembly in cold weather (below freezing), ensure equipment is drained after usage and before storage.

INTRODUCTION

1. This work package contains instructions on how to operate both fuel and water pump assemblies under usual conditions.
2. Fuel and water pump assembly operation is almost identical, except for safety procedures which are crucial to pumping fuel. Differences in configuration and/or operating procedures will be pointed out as they occur.
3. Before operating pump assembly, read and become familiar with *General Safety Instructions* (WP 0004). Also read the warnings located in the *Warning Summary* at the front of this manual.
4. Refer to the following, as needed, to assist in locating components related to operation:
   a. *Location and Description of Major Components* (WP 0002).
   b. *Description and Use of Operator Controls and Indicators* (WP 0005).
5. Fuel Performance Curve and Water Performance Curve charts are located on the inside door of the control panel. These charts are used to determine correct engine speed when pumping. Refer to *Theory of Operation* (WP 0003) for an explanation on how to use these charts.
6. *Operation Under Unusual Conditions* is covered in WP 0007.

PREPARATION FOR USE

1. If pump assembly has been in long-term storage, ensure Field Maintenance has performed appropriate deprocessing steps to return pump to service (WP 0014).
2. Perform *Before* operation *Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions* (WP 0012 and WP 0013).
3. Couple pump assembly to towing vehicle. Refer to *Coupling Pump Assembly to Towing Vehicle* in this work package.
4. Tow pump assembly to site of operation. Refer to *Towing Instructions* in this work package.

PUMP ASSEMBLY PREPARATION BEFORE STARTING

1. Position pump assembly over spill-containment berm.
2. Place pump assembly as close as possible to fluid being pumped, with suction (inlet) side toward source. Keep length of suction hose(s) and height of suction lift to a minimum. Allow adequate space to permit support of suction and discharge hoses where they connect to manifold assemblies.
3. If terrain is sandy or marshy, place planks, logs, or any available dunnage under wheels to improve stability.
4. Refer to *Uncoupling Pump Assembly from Towing Vehicle* in this work package to uncouple pump assembly.
5. Remove pin and swing rear jack assemblies to vertical position. Reinstall pin. Turn crank handle to adjust height of rear jack assemblies until trailer chassis is level.
6. Chock wheels in both directions.
7. Remove pin from welded loop. Remove ground rod from stowage along right side of trailer frame. Reinstall pin in welded loop.

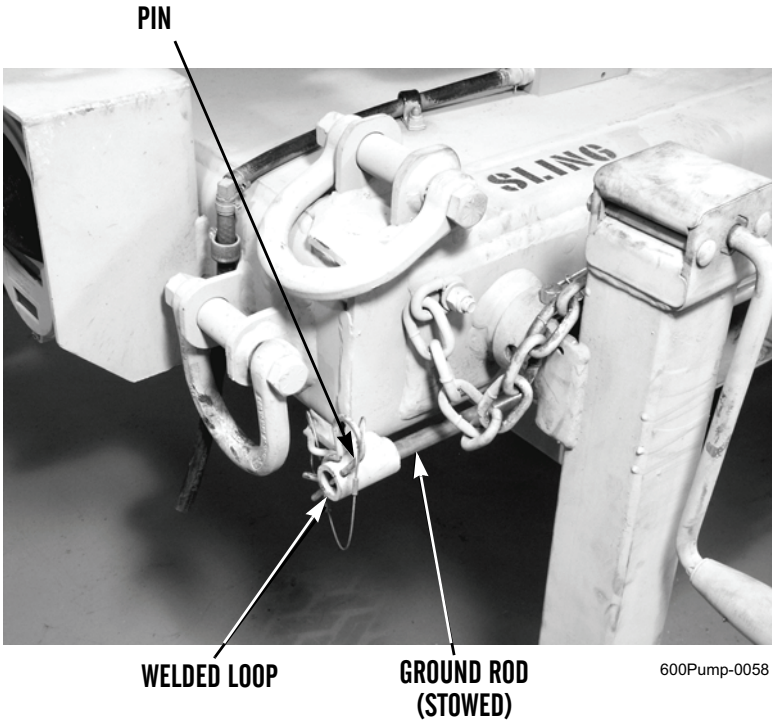


Figure 1. Ground Rod - Stowed Position.

PUMP ASSEMBLY PREPARATION BEFORE STARTING - CONTINUED

8. Drive ground rod at least 3 ft (91.4 cm) into the ground, using non-sparking mallet in storage box (FM 10-67-1).

Table 1. Required Depths for Ground Rods.

TYPE OF SOIL	DEPTH OF GROUND ROD
Coarse ground, cohesionless sands, and gravels	6 ft (182.9 cm)
Inorganic clay, claying gravels, grave-sand-clay, claying sands, sandy clay, gravelly clay, and silty clay	4 ft (121.2 cm)
Silty gravel, gravel-sand-silt, silty sand, sand, silt, peat, muck, and swamp	3 ft (91.4 cm)

9. If earth around ground rod is dry or sandy, pour water around ground rod to improve electrical connection.
10. Install ground cable on chassis grounding stud on trailer frame and fully tighten clamp. Install other end of cable securely on ground rod in same manner.

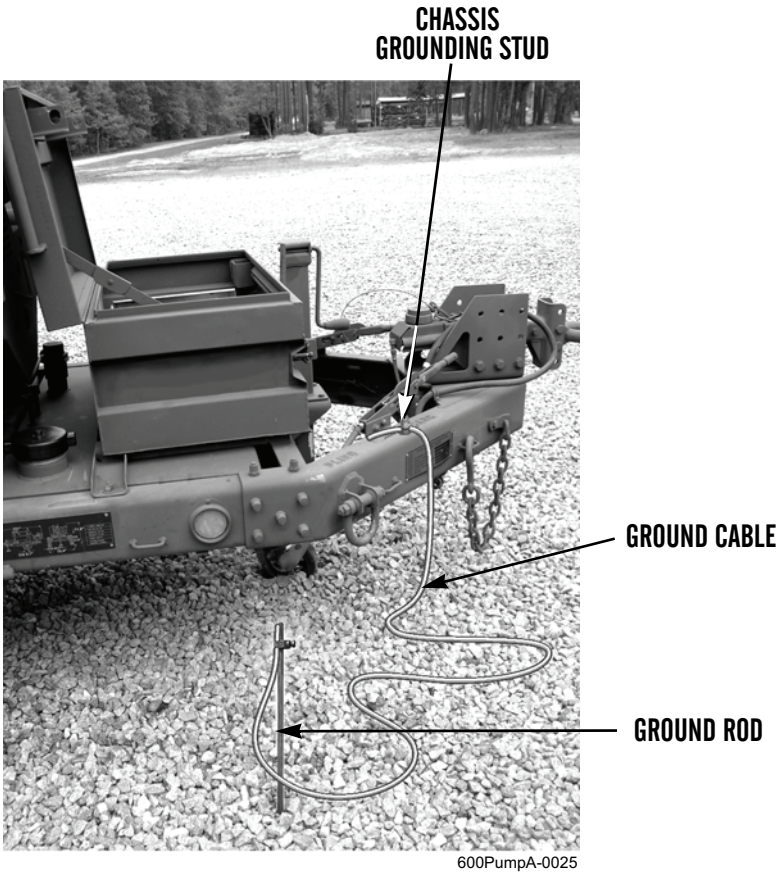


Figure 2. Ground Rod - Deployed Position.

11. Close suction and discharge gate valves.

PUMP ASSEMBLY PREPARATION BEFORE STARTING - CONTINUED

12. Connect suction hose(s):
    a. Remove male camlock plug from camlock flange at suction manifold.
    b. Align suction hose with camlock flange, ensuring that hose is not twisted, pinched, or kinked.
    c. Fully engage suction hose with camlock flange. When fully engaged, use two cam arms on suction hose to lock connection.
    d. Check suction hose to ensure it is adequately supported, to avoid strain and vibration during pumping. Ensure connection is tight, to ensure optimal pump priming, head, and capacity.

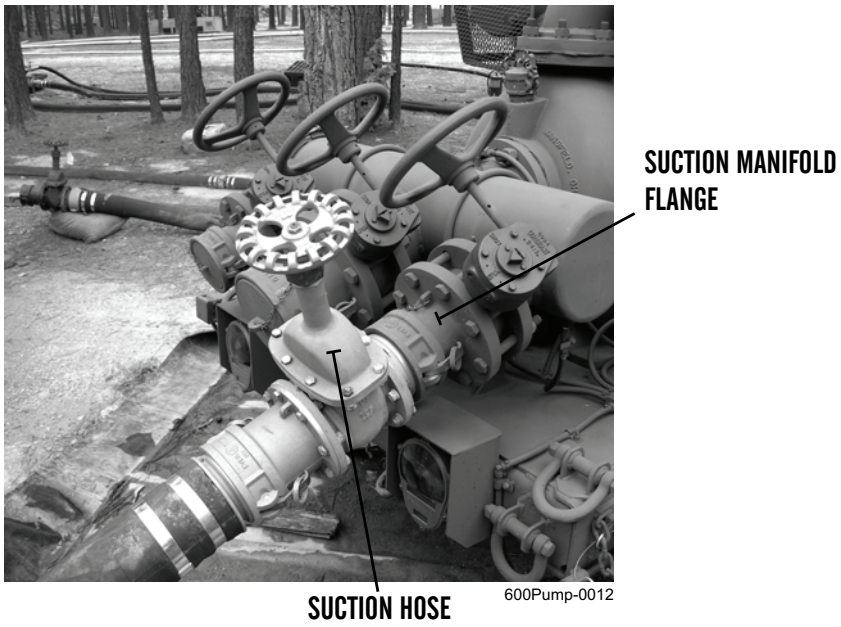


Figure 3. Connection of Suction Hose(s).

NOTE

Pump operation is most efficient when at least a single 6-in. (15.24-cm) or two 4-in. (10.16-cm) suction and discharge hoses are connected.

    e. Connect other suction hose(s) in the same manner, as required.
    f. Ensure all suction manifold gate valves are closed.

PUMP ASSEMBLY PREPARATION BEFORE STARTING - CONTINUED

13. Connect discharge hose(s):
    a. Remove female camlock cover from camlock flange at discharge manifold.
    b. Align discharge hose with camlock flange, ensuring that hose is not twisted, pinched, or kinked.
    c. Fully engage discharge hose with camlock flange. When fully engaged, use two cam arms on discharge hose to lock connection.
    d. Check discharge hose to ensure it is adequately supported, to avoid strain and vibration during pumping. Ensure connection is tight.

NOTE

Pump operation is most efficient when at least a single 6-in. (15.24-cm) or two 4-in. (10.16-cm) suction and discharge hoses are connected.

    e. Connect other discharge hose(s) in the same manner, as required.
    f. Ensure all discharge manifold gate valves are closed.
14. Verify suction gauge drain and pressure gauge drain at control panel are turned to GAUGE position.
15. Verify suction manifold, discharge manifold, and pump housing drain valves are closed.
16. Verify manual air eliminator valve is closed.

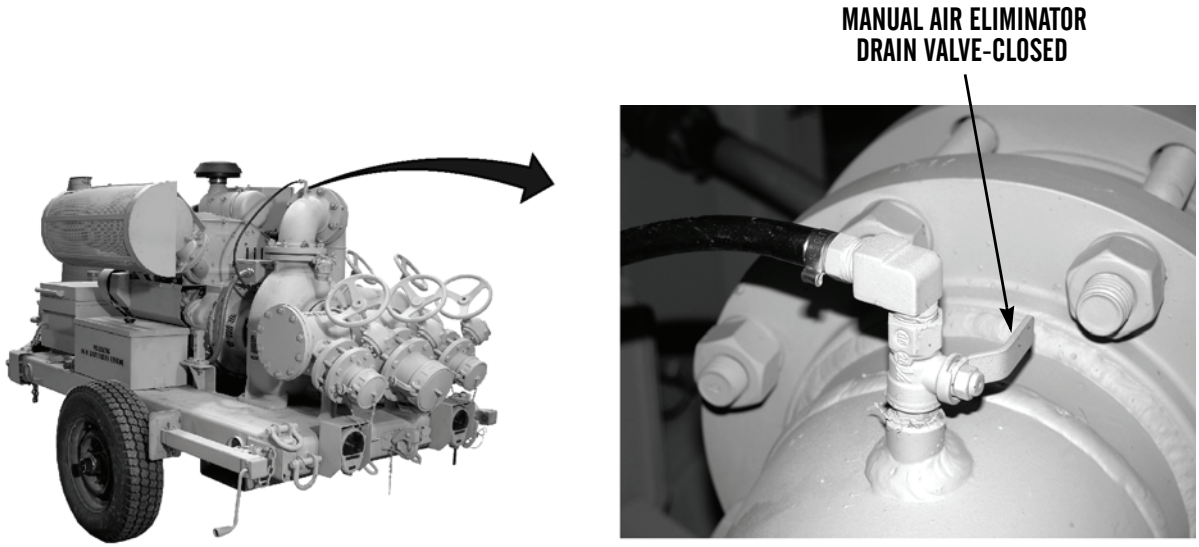


Figure 4. Manual Air Eliminator Valve.

PUMP ASSEMBLY PREPARATION BEFORE STARTING - CONTINUED

17. Make a final check to ensure all suction and discharge hoses are free of sharp bends or kinks and that connections are tight.

WARNING

Manual air eliminator drain valve should remain open. Pressure may build up causing priming port to pop up when camlocks are removed. Failure to follow this warning may result in injury or death to personnel.

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled at least 2/3 or full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

18. Place drip pan under drain hose and open discharge manifold manual air eliminator valve.
19. Lift up on two locking tabs and remove camlock locking cover from pump priming port. Check level of fluid in pump. As required, fill pump volute 2/3 full with same fluid that will be pumped.
20. Replace camlock locking cover on priming port and secure two locking tabs.
21. Close discharge manifold manual air eliminator valve.

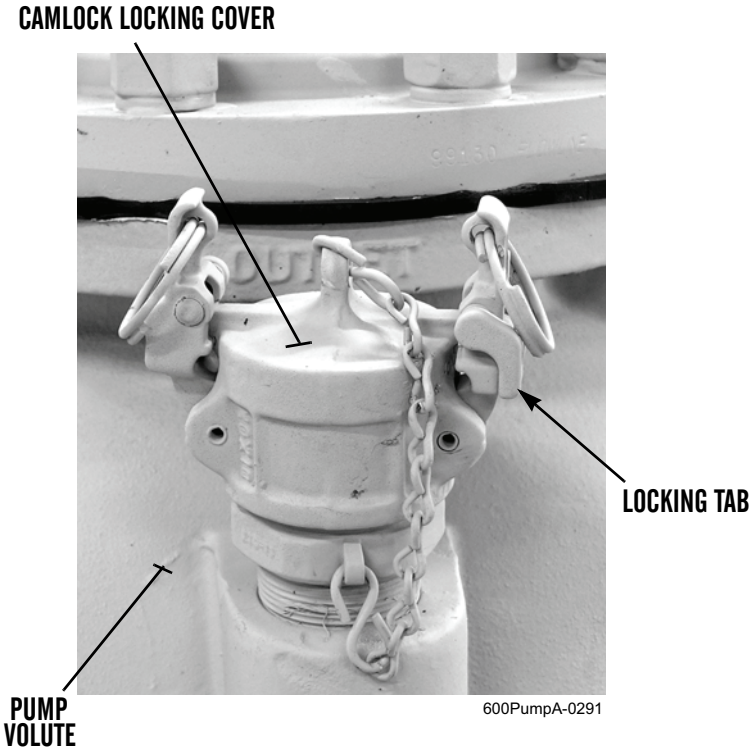
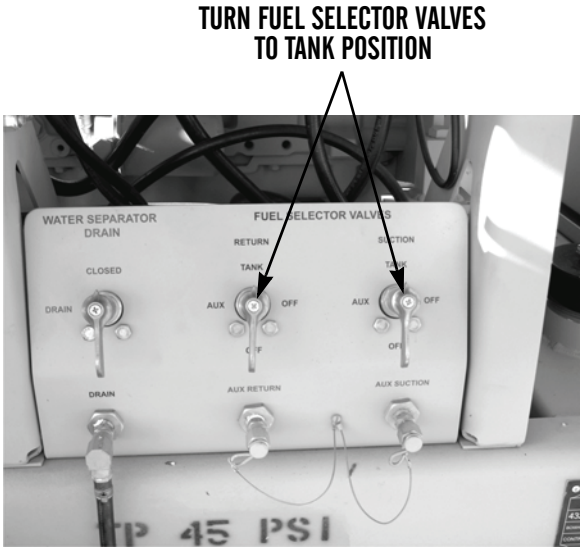


Figure 5. Pump Priming Port.

ENGINE PREPARATION BEFORE STARTING

1. **Introduction.**

   a. When operating pump assembly from on board fuel tank, turn fuel selector valves to TANK position.



600Pump-0288

Figure 6. Fuel Selector Valves Panel.

   b. Fuel can also be supplied by an external auxiliary fuel tank.

   c. FUEL PUMP ASSEMBLY ONLY. When fuel supply from first two options is low, a third option is available. Fuel being pumped may be diverted from discharge manifold to supply fuel to fuel tank.

ENGINE PREPARATION BEFORE STARTING - CONTINUED

2. **Obtaining Fuel Supply from External Auxiliary Tank.**

   a. Clean auxiliary suction and return fuel fittings with a clean rag to remove any dirt or contamination.

CAUTION

FUEL PUMP ASSEMBLY. Provide a suitable container under drain hose of manifold drain block to catch draining fuel. Dispose of fuel IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.

   b. Remove caps from auxiliary suction and return fuel fittings.

   c. Connect fuel supply hose from auxiliary fuel tank to AUX SUCTION fitting. Connect fuel return hose from AUX RETURN fitting to auxiliary fuel tank.

   d. Move both suction and return fuel selector valves to AUX position.

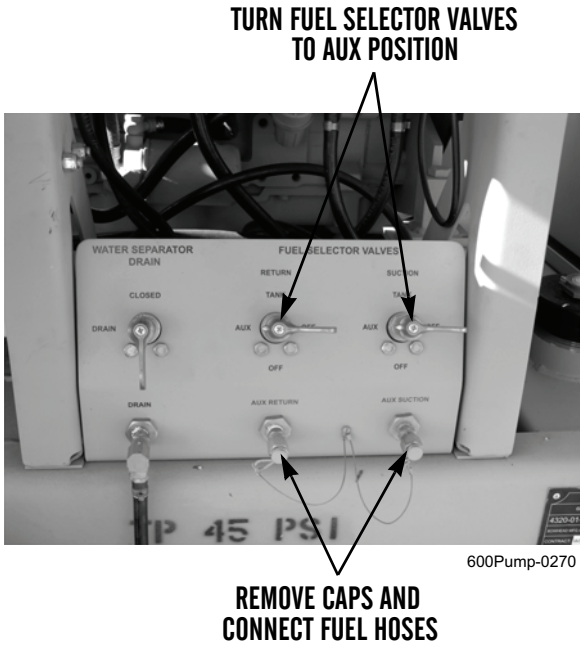


Figure 7. Fuel Selector Valves Panel.

ENGINE PREPARATION BEFORE STARTING - CONTINUED

3. **FUEL PUMP ASSEMBLY ONLY. Obtaining Fuel Supply from Fuel Being Pumped.**

WARNING

- Ensure throttle control is pushed in and rotated fully clockwise before installing fuel hose jumper assembly. Failure to follow this warning may result in injury or death to personnel.
- Fuel hose jumper assembly valve must be closed before connecting line to pump assembly. Failure to follow this warning may result in injury or death to personnel.

a. Set both fuel selector valves to TANK.

b. Wipe clean, then remove dust cap from quick-disconnect coupler at discharge manifold and at fuel tank.

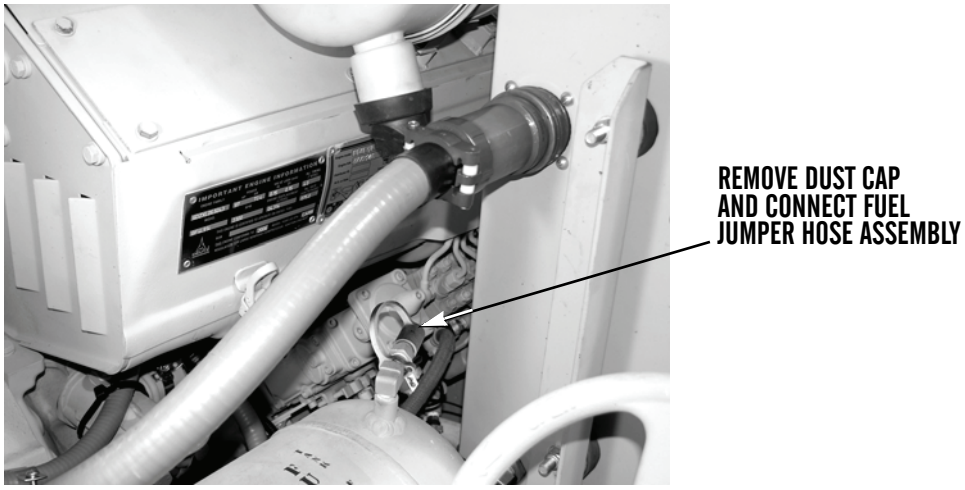


Figure 8. Quick-Disconnect Coupler at Discharge Manifold.

c. Connect fuel jumper hose assembly (Item 12, WP 0127) between quick-disconnect couplers.

Figure 9. Quick-Disconnect Coupler at Fuel Tank.

ENGINE PREPARATION BEFORE STARTING - CONTINUED

d. Open fuel tank fill valve by turning knob fully counterclockwise (left).

e. As soon as fuel pump assembly is pumping fuel, monitor fuel tank gauge. Close fuel tank fill valve when gauge reads F (Full).

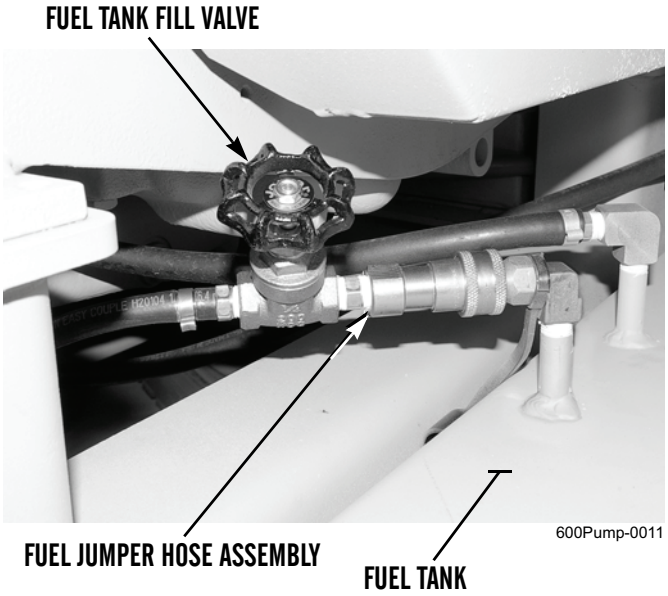


Figure 10. Fuel Jumper Hose Assembly.

STARTING ENGINE

WARNING

- DO NOT operate engine in enclosed areas due to the dangers of carbon monoxide poisoning from exhaust fumes. Always start and operate engine in a well-ventilated area and, if in an enclosed area, vent exhaust to the outside. Failure to follow this warning may result in injury or death to personnel.
- Hearing protection is required when operating pump assembly, or when within 50 ft (15.2 m) of pump assembly while it is operating. Failure to wear hearing protection may cause hearing loss.
- With the 600 GPM pump started, operators using a co-located GPS may find GPS performance to be degraded. Failure to realize this limitation may result in death or injury of personnel.
- With the 600 GPM pump started, operators that are within a distance of 23 m may find UHF communications to be compromised. Failure to realize this limitation may result in death or injury of personnel.

CAUTION

DO NOT use ether to start engine. This engine is equipped with a flame glow plug. Engine damage can occur if ether is used for cold weather starting.

1. Verify pump assembly and engine have been prepared for use. Refer to *Pump Assembly Preparation Before Starting* and *Engine Preparation Before Starting* in this work package.
2. Open control panel door and secure in open position with latch.
3. Verify throttle control is pushed fully in and turned fully clockwise (right) to idle position.
4. If pump assembly has not been operated recently (or if operating with fuel from an auxiliary tank or with fuel from fuel jumper hose), prime fuel pump by pushing primer up and down until there is pressure against primer and it is difficult to push primer down. If primer remains springy, it may be necessary to use a Screwdriver, Flat Tip (Item 9, WP 0127) to loosen setscrew on injection pump to allow air to escape.

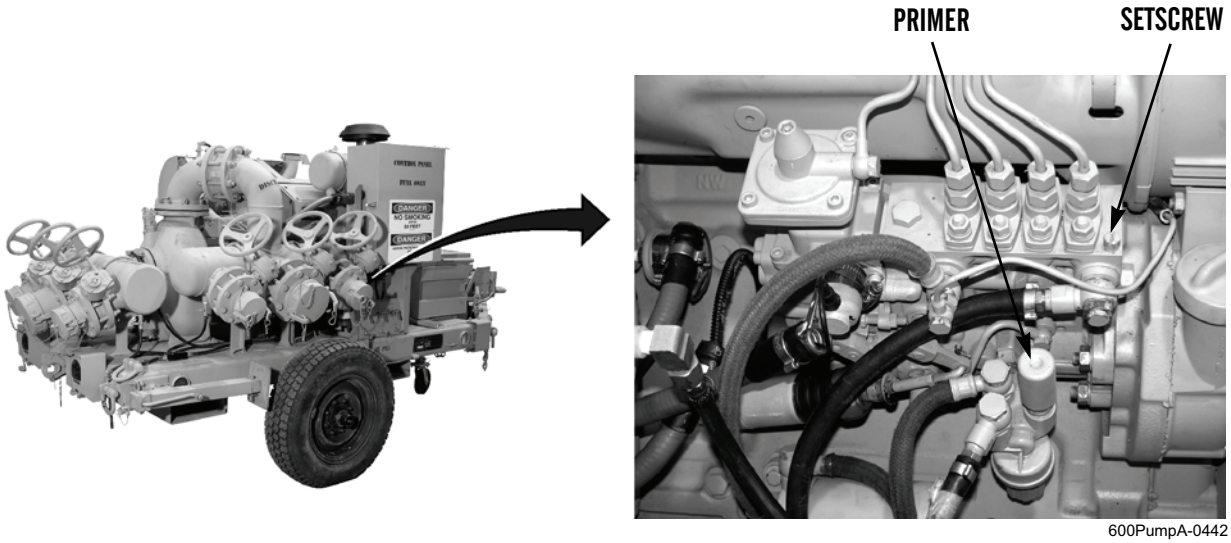


Figure 11. Fuel Pump Primer.

STARTING ENGINE - CONTINUED

5. As required, prime fuel filter/water separator by loosening priming knob and pumping up and down until pump has filled filter and there is resistance against priming knob. After priming, tighten knob.

600Pump-0009

Figure 12. Fuel/Water Separator Priming Knob.

STARTING ENGINE - CONTINUED

6. If ambient temperature is below 32°F (0°C), turn engine start switch counterclockwise (left) to PREHEAT position. Wait for preheat light to go out in 20 seconds.

CAUTION

- To prevent starter from overheating, do not crank engine for more than 60 seconds at a time. If engine fails to start within 60 seconds, release engine start switch, wait three minutes, then try again. Failure to follow this procedure may result in damage to starter.
- Battery life will be extended if 60 seconds is allowed to elapse between starting attempts. Under any condition, if engine does not start on first attempt, allow engine rotation to stop completely before engaging starter again.
- Once engine has started, do not press oil pressure bypass switch for more than 10 seconds. If oil pressure is insufficient, shut down engine and investigate problem. Failure to follow this procedure may damage engine.

NOTE

If oil pressure fails to build, engine will automatically shut down unless oil pressure bypass switch is pressed.

7. Turn engine start switch fully clockwise (right) to START position and engage starter to crank engine.
   a. During cold weather starting, it may also be necessary to press and hold oil pressure bypass switch during engine startup, until engine oil pressure indicates at least 25 PSI (172 kPa).

NOTE

In cold weather conditions, engine can be cranked up to one minute without causing any damage.

   b. If engine does not start within 60 seconds of cranking, turn engine start switch to OFF position and wait three minutes.
8. As required, repeat preheat and cranking steps 6 and 7. When engine starts, release engine start switch to ON position.
9. Verify engine oil pressure builds to normal range.
   a. Once started, a cold engine will produce up to 100 PSI (689 kPa) oil pressure.
   b. Oil pressure will stabilize at 50 to 85 PSI (345 to 586 kPa) as engine heats up.
   c. If oil pressure fails to build to these ranges, shut down engine and perform troubleshooting.

PUMPING (FUEL AND WATER)

WARNING

- FUEL PUMP ASSEMBLY: When handling fuel, personnel must take appropriate measures to minimize the risk of fire, explosion, injury, illness, and contamination of the environment. To attain this goal, personnel must have a thorough knowledge of the hazards involved. They must strictly observe fire and safety precautions. They must follow spill control and containment measures. Failure to do so may result in injury or death to personnel or damage to equipment.
- For further information, read and become familiar with safety information in *General Safety Instructions* (WP 0004) and in the *Warning Summary* at the front of this manual.
- A water pump assembly may be converted to fuel service. However, once a pump has been used to pump fuel, it must NEVER again be used to pump water. Failure to follow this warning may result in injury or death to personnel.

CAUTION

- WATER PUMP ASSEMBLY: Water pump assembly is capable of pumping water at an ambient temperature range of +32°F (0°C) to +130°F (+54.4°C). Operation at temperatures below freezing may result in freeze damage to pump. If operating water pump assembly in cold weather (below freezing), ensure equipment is drained after usage and before storage.
- Provide a suitable container under drain tube of manifold drain block to catch draining fluid. Dispose of fluid IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.

NOTE

Fuel and water pumping instructions are the same.

1. Open suction gate valve(s).
2. Open manual air eliminator valve.
3. Use throttle control to raise engine speed to 1,200 RPM.
4. Observe pump suction gauge for indication that suction has been created. Suction gauge should read a vacuum.

PUMPING (FUEL AND WATER) - CONTINUED

5. During this time, pump is evacuating air from pump and manifolds through manual air eliminator valve. A mixture of air and fluid will be flowing out manifold drain block and into drain hose at right-rear of pump assembly. Monitor flow of air and fluid from drain hose.
6. When flow of fluid from drain hose is a steady steam without air, close manual air eliminator valve.

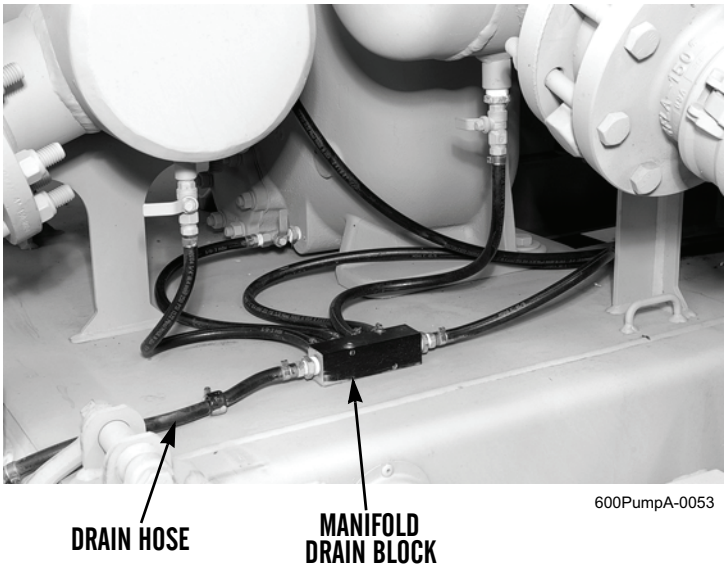


Figure 13. Manifold Drain Block and Drain Hose.

7. As pump begins priming, engine will begin to push fluid. Watch for increased strain on engine, by sound and by a slight drop in RPM.

CAUTION

- Do not raise engine RPM to maximum speeds prior to complete filling of discharge manifold and hose(s). Failure to follow this caution may cause damage to engine and pump.
- Do not open discharge gate valve(s) too quickly or damage to components down the line may result.

8. Slowly open discharge gate valve(s) to start charging discharge manifold and hose(s).
9. Once discharge gate valve(s) is open to desired amount, slowly raise throttle to 1,800 RPM. OPERATE AT 1,800 RPM FOR FIVE MINUTES, OR UNTIL SYSTEM IS FULLY CHARGED WITH FLUID.

PUMPING (FUEL AND WATER) - CONTINUED

CAUTION

- Damage to engine or pump may result from improper adjustment of engine idle or maximum speed settings. Do not attempt to change these settings.
- Operating RPM will vary in accordance with physical layout of system and output demand. Regardless, pumping capacity has been reached when there is no gain in suction (vacuum) as indicated on suction gauge.
- Impeller inlet cavitation occurs when engine speed is increased beyond the point of maximum suction (vacuum). Cavitation is harmful to pump assembly and should be avoided at all times. Cavitation can be detected by an excessively loud cracking noise in pump body. Pump should not be run in this condition any longer than necessary to isolate trouble.

10. Slowly increase engine RPM until pumping at desired speed. Refer to Fuel or Water Performance Curve data plate, as applicable, on inside of control panel door, to determine what pressure and RPM will be achieved at various engine RPM.
11. Engine can now pump at all RPM levels for extended periods of time.
12. While pumping, perform these During operation checks:

CAUTION

Damage to pump can result if suction pressure falls below 10 PSI (69 kPa) or discharge pressure rises above 150 PSI (1,034 kPa).

a. Maintain proper GPM flow and pressure by controlling engine RPM and discharge gate valve(s) position. DO NOT allow suction pressure to fall below 10 PSI (69 kPa). DO NOT allow discharge pressure to rise above 150 PSI (1,034 kPa).
b. Be alert for fluid leaks. If leaks are evident, shut down pump, clean up spills, and repair leaks.
c. Monitor engine temperature and oil pressure to ensure engine is operating within recommended range:
   (1) Engine oil temperature should be 180 to 220°F (82 to 93°C). A reading of approximately 186°F (86°C) is to be expected during normal operations.
   (2) Engine oil pressure should be 50 to 85 PSI (345 to 586 kPa).
   (3) Monitor air filter restriction indicator, especially if operating in dusty conditions. A clogged air filter will reduce engine output and pumping capacity.

SHUTTING DOWN PUMP

1. Reduce engine RPM to idle speed by turning throttle control fully clockwise (to the right) and pushing in.

CAUTION

- Stopping engine immediately after it has been operating under a load can result in overheating and accelerated wear of engine components.
- Damage to turbocharger can result if engine is shut down without adequate idling time.
- Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled at least 2/3 full or full with appropriate fluid (fuel or water) while running engine. Running pump dry will damage seal.

2. Allow engine to idle for 3 to 5 minutes, to cool engine down while under reduced pumping strain. Discharge valve(s) may be closed at this time, if desired, as long as pump volute is at least 2/3 full.

SHUTTING DOWN PUMP - CONTINUED

NOTE

If a primed condition is maintained, suction manifold, pump housing, and discharge manifold will remain full of fluid.

3. To maintain prime, close off all suction and discharge valves just prior to engine shutdown.
4. Turn engine start switch to OFF position.
5. Perform *After* operation *Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions* (WP 0012 and WP 0013).
6. Close and secure control panel door.

DRAINING SYSTEM

1. **Introduction.**
   a. If pump assembly is to be idle for more than two hours, system should be drained.
   b. If pump assembly is to be relocated, it must also be drained.

CAUTION

Water must be drained from pump volute, suction and discharge manifolds, and control panel suction and discharge gauges immediately after shutdown in cold weather, below 32°F (0°C). Damage may occur if residual water is allowed to freeze inside pump volute, suction and discharge manifolds, and control panel suction and discharge gauges.

   c. WATER PUMP ASSEMBLY. If pump assembly is idle in freezing weather conditions, system must be drained.
   d. These components must be drained:
      (1) Pump.
      (2) Suction and discharge manifolds.
      (3) Suction and pressure gauges.
2. **Draining Pump.**

WARNING

Manual air eliminator drain valve should remain open. Pressure may build up causing priming port to pop up when camlocks are removed. Failure to follow this warning may result in injury or death to personnel.

CAUTION

FUEL PUMP ASSEMBLY. Provide a suitable container under drain hose of manifold drain block to catch draining fuel. Dispose of fuel IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.

   a. Remove camlock locking cover from priming port.
   b. Open pump housing drain valve.
   c. When pump housing is empty, close drain valve.
   d. Replace camlock locking cover on priming port.

DRAINING SYSTEM - CONTINUED

3. **Draining Suction and Discharge Manifolds.**

WARNING

- Ensure system pressure has been removed from system discharge and suction hose(s) connected to pump before removing hose(s). Failure to follow this warning may result in injury or death to personnel.
- Manual air eliminator drain valve should remain open. Pressure may build up causing priming port to pop up when camlocks are removed. Failure to follow this warning may result in injury or death to personnel.

CAUTION

- Manual air eliminator drain valve should remain open. Pressure may build up causing priming port to pop up when camlocks are removed. Failure to follow this warning may result in injury or death to personnel.
- FUEL PUMP ASSEMBLY. Provide a suitable container under drain hose of manifold drain block to catch draining fuel. Dispose of fuel IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.
- FUEL PUMP ASSEMBLY. Also, provide suitable containers under suction and discharge manifold ports to catch draining fuel. Dispose of fuel IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.

a. If connected, remove discharge hose(s) from discharge manifold and drain fluid from hose(s).
b. If connected, remove suction hose(s) from suction manifold and drain fluid from hose(s).
c. Open suction manifold drain valve.
d. Open discharge manifold drain valve.
e. If installed, remove camlock/victaulic plugs and covers.
f. Open suction and discharge gate valves.
g. When draining is complete, close gate valves and replace camlock/victaulic plugs and covers.
h. Close discharge manifold drain valve.
i. Close suction manifold drain valve.

4. **Draining Suction and Pressure Gauges.**

WARNING

Manual air eliminator drain valve should remain open. Pressure may build up causing priming port to pop up when camlocks are removed. Failure to follow this warning may result in injury or death to personnel.

CAUTION

- FUEL PUMP ASSEMBLY. Provide a suitable container under drain hose of manifold drain block to catch draining fuel. Dispose of fuel IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.
- Manual air eliminator drain valve should remain open. Pressure may build up causing priming port to pop up when camlocks are removed. Failure to follow this warning may result in injury or death to personnel.
- Fluid from gauges will drain out manifold drain block.

DRAINING SYSTEM - CONTINUED

a. Open control panel door and secure in open position with latch.

b. Move suction gauge drain to DRAIN position.

c. Move pressure gauge drain to DRAIN position.

d. When gauges are fully drained, turn gauge handles to CLOSED position.

e. Close and secure control panel door.

PREPARATION FOR RELOCATION OF PUMP ASSEMBLY

1. Refer to *Draining System* in this work package to drain pump assembly.
2. Remove ground cable from ground rod and chassis grounding stud. Stow ground cable in storage box. Return ground rod to stowage location on right side of trailer frame. Install pin in welded loop to secure ground rod.

CAUTION

Provide a suitable container to catch draining fuel. Dispose of fuel IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.

3. If engine was run from an external auxiliary fuel tank, perform these steps to return fuel selection to normal mode (i.e., fuel supplied by on-board fuel tank):
   a. Move both suction and return fuel selector valves to TANK position.
   b. Wipe clean, then disconnect fuel return hose from AUX RETURN fitting.
   c. Wipe clean, then disconnect fuel supply hose from AUX SUCTION fitting.
   d. Wipe clean, then replace caps on auxiliary suction and return fuel fittings.

CAUTION

Provide a suitable container to catch draining fuel. Dispose of fuel IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.

4. FUEL PUMP ASSEMBLY ONLY. If engine was run on fuel being pumped, perform these steps:
   a. If open, close fuel tank fill valve by turning knob fully clockwise (right).
   b. Wipe clean, then disconnect fuel jumper hose assembly from quick-disconnect couplers at fuel tank and discharge manifold.
   c. Wipe clean, then install dust caps on quick-disconnect couplers at discharge manifold and at fuel tank.
5. Ensure all Basic Issue Items (BII) are accounted for and properly stowed in storage box (WP 0008).
6. Pump assembly is ready to be towed to a different location.

COUPLING PUMP ASSEMBLY TO TOWING VEHICLE

WARNING

Use caution and ground guide assistance when coupling pump assembly trailer to towing vehicle. Do not stand between trailer and towing vehicle while towing vehicle is backing up. Failure to follow this warning may cause injury or death to personnel or damage to equipment.

1. Ensure both hand brakes are applied and wheels are chocked.

CAUTION

Rear leveling jack assemblies must be secured in horizontal stowed position before pump assembly can be moved. Failure to do so may damage rear leveling jack assemblies.

2. Operate crank handle to fully retract each rear leveling jack assembly. Remove pin and swing each rear leveling jack assembly into horizontal stowed position. Reinstall pin.

NOTE

Trailer towing height may be adjusted, if necessary. Notify Field Maintenance to adjust towing height.

3. Begin to back towing vehicle up, ensuring pintle hook is aligned with lunette ring on trailer.
4. Use front leveling jack assembly to raise front of trailer until lunette ring is higher than towing vehicle pintle hook.
5. Remove safety pin, lift up on locking latch, and open pintle hook.
6. Continue to back up towing vehicle until lunette ring is positioned inside pintle hook, using front leveling jack assembly, as needed, to adjust height.
7. Close and latch pintle hook. Ensure locking latch is locked by pulling up on pintle hook. Install safety pin in pintle hook.
8. Remove safety chains from stowage on trailer tongue. Cross chains under tongue, then hook to eyebolts at rear of towing vehicle.

CAUTION

Front leveling jack assembly must be secured in fully raised position, with wheel assembly or sand pad removed, before pump assembly can be moved. Failure to do so may damage front jack assembly.

9. Use crank handle to fully raise front leveling jack assembly. Remove pin and remove wheel assembly or sand pad from front jack. Stow wheel assembly or sand pad in storage box.
10. Remove breakaway cable from stowage on trailer tongue. Connect breakaway cable to towing vehicle. Ensure there is adequate slack in cable so trailer can make full turns without brakes being applied.
11. Remove intervehicular electrical cable from stowage on trailer tongue. Connect cable to towing vehicle electrical receptacle.
12. Release both hand brakes.
13. Ensure storage box is closed and latched.
14. Remove wheel chocks from both wheels and stow in storage box.
15. Pull forward slowly with towing vehicle and test trailer brakes.
16. Check trailer lights for proper operation.

TOWING INSTRUCTIONS

WARNING

ALWAYS check brake fluid level in master cylinder before towing pump assembly. If brake fluid is NOT okay, trailer brakes will not function properly. Damage to equipment or injury or death to personnel could result.

1. **Driving.**
   a. Always start and stop slowly and gradually.
   b. Due to hydraulic surge (inertia) brakes on trailer, sudden and fast deceleration will cause trailer hydraulic brakes to be applied.
   c. NEVER exceed maximum speed limits.
      (1) Hard surface roads: 45 to 50 MPH (72.4 to 80 KPH).
      (2) Ground/dirt roads: 25 to 30 MPH (40.2 to 48.3 KPH).
      (3) Level cross country: 15 to 20 MPH (24.1 to 32.2 KPH).
      (4) Hilly cross country: 10 to 15 MPH (16 to 24.1 KPH).
   d. When driving with towing vehicle and trailer, overall length of unit must be kept in mind when turning or passing other vehicles.
   e. Because unit is hinged at middle, turning and backing are also affected.
2. **Turning.**
   a. When turning corners, allow for trailer wheels turning inside turning radius of towing vehicle.
   b. To make a right turn at an intersection, drive towing vehicle partway into intersection, then cut sharply right. This will allow for turning radius of trailer to keep its wheels off curb.
3. **Backing.**
   a. Back towing vehicle and trailer unit slowly and carefully.
   b. Always use an assistant driver or another person to act as a ground guide.
   c. Adjust all towing vehicle rearview mirrors before backing.
   d. When backing, rear of trailer will move in opposite direction in which towing vehicle is turned.
      (1) When towing vehicle is turned right, rear of trailer will go left.
      (2) When towing vehicle is turned and backing in a straight line is desired, turn towing vehicle in direction trailer is moving. This will slowly bring towing vehicle and trailer into a straight line.
4. **Stopping.** Stop towing vehicle and trailer by applying brakes gradually and smoothly.
5. **Parking.**
   a. When towing vehicle and trailer are to be left unattended, set towing vehicle brakes and shut down towing vehicle engine.
   b. Apply both trailer hand brakes.
   c. Chock both trailer wheels.

UNCOUPLING PUMP ASSEMBLY FROM TOWING VEHICLE

WARNING

Use caution and ground guide assistance when uncoupling pump assembly trailer from towing vehicle. Do not stand between trailer and towing vehicle while towing vehicle is moving. Failure to follow this warning may cause injury or death to personnel or damage to equipment.

1. Apply both hand brakes and chock both wheels.

UNCOUPLING PUMP ASSEMBLY FROM TOWING VEHICLE - CONTINUED

NOTE

- If terrain is sandy or marshy, sand pad should be installed.
- Sand pad also provides the most stability when operating pump assembly.

2. Remove wheel assembly or sand pad from storage box. Install wheel assembly or sand pad to front leveling jack assembly and secure with pin. Use crank handle to lower front leveling jack assembly to ground.
3. Disconnect intervehicular electrical cable from towing vehicle and stow on trailer tongue.
4. Remove safety chains from towing vehicle and stow on trailer tongue.
5. Remove breakaway cable from towing vehicle and stow on trailer tongue.
6. Remove safety pin, lift up on locking latch, and open towing vehicle pintle hook.
7. Raise front of trailer until lunette ring is clear of pintle hook.
8. Slowly drive towing vehicle away.
9. Close and latch pintle hook. Install safety pin in pintle hook.

END OF WORK PACKAGE

OPERATOR INSTRUCTIONS

OPERATION UNDER UNUSUAL CONDITIONS

INTRODUCTION

CAUTION

- Special precautions are required to keep pump assembly in good working order under extreme operating conditions. Many factors such as wear, fuel type, and weather conditions can affect engine's ability to start. Operator must use good judgement when starting engine under extreme conditions.
- Operation of pump assembly outside the performance descriptions in this work package will result in damage to the equipment.

1. This work package contains instructions on how to operate both fuel and water pump assemblies under unusual conditions.
2. Operation of pump assembly that is outside the performance descriptions in this work package should be avoided, unless the immediate need outweighs the risk that the pump will not be available for the next service requirement.

OPERATION IN EXTREME COLD

CAUTION

Water must be drained from pump volute, suction and discharge manifolds, and control panel suction and pressure gauges immediately after shutdown in cold weather, below 32°F (0°C). Damage may occur if residual water is allowed to freeze inside pump volute, suction and discharge manifolds, and control panel suction and pressure gauges.

1. WATER PUMP ASSEMBLY. Immediately after shutdown in temperatures below 32°F (0°C), drain pump volute, suction and discharge manifolds, and control panel suction and pressure gauges (WP 0006).
2. Refer to *Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions Introduction* (WP 0012) for proper lubricants to use in extreme cold weather.
3. Ensure preheat flame glow plug is operational and used when starting engine. Refer to *Starting Engine* in WP 0006. After 20-second preheat cycle, glow plug should be hot.
4. Depending on type and grade of fuel, it may be necessary to use winter grade fuel for operation below 14°F (-10°C).
5. Before refueling, clear any snow, ice, or moisture from area around fuel tank filler cap. Also clear coupling area at engine flywheel.
6. If possible, keep fuel tank full to prevent an excess of water condensation in fuel lines.
7. Keep fuel tank filler cap tight to prevent foreign matter from entering fuel tank.
8. Extreme cold can cause wires and cables to become stiff and brittle. When performing maintenance, avoid excess bending of intervehicular electrical cable and wiring harness when coupling or uncoupling from towing vehicle.
9. Ensure tires are properly inflated to 45 PSI (310 kPa). Tires may freeze to the ground or have flat spots if underinflated.
10. Brake pads may freeze to the brake drum and require preheating to prevent damage.
11. Refer to FM 9-207, *Operation and Maintenance of Ordnance Materiel in Cold Weather* (WP 0124) and FM 21-305, *Manual for the Wheeled Vehicle Driver* (WP 0124) for special instructions on driving hazards that may be encountered during cold weather conditions.
12. In extreme cold below -4°F (-20°C), Field Maintenance may need, after removing starter if necessary, to coat ring gear on flywheel, via the pinion bore, with GAA grease (Item 14, WP 0129).

OPERATION IN EXTREME HEAT

1. Fill fuel tank at the end of each day of operation, to prevent an accumulation of vapor in tank.
2. Do not overfill fuel tank. To allow for fuel expansion, fill tank only 3/4 full.
3. Check air cooling system, engine air cleaner, air filter restriction indicator, engine oil level, and blower (cooling) fan frequently. Perform necessary services and notify Field Maintenance of any unusual readings or problems.
4. Ensure V-belts are in good condition and properly tensioned.
5. Reduce engine RPM and allow engine to cool down, if there is evidence of overheating.
6. If engine overheats, stop and perform troubleshooting procedures.
7. Park pump assembly in the shade, if possible. When not in use, cover with fabric cover.
8. Ensure all tires are inflated to 45 PSI (310 kPa).
9. Check frequently for rust. Clean and lubricate pump assembly to help prevent deterioration.

OPERATION IN SANDY OR DUSTY CONDITIONS

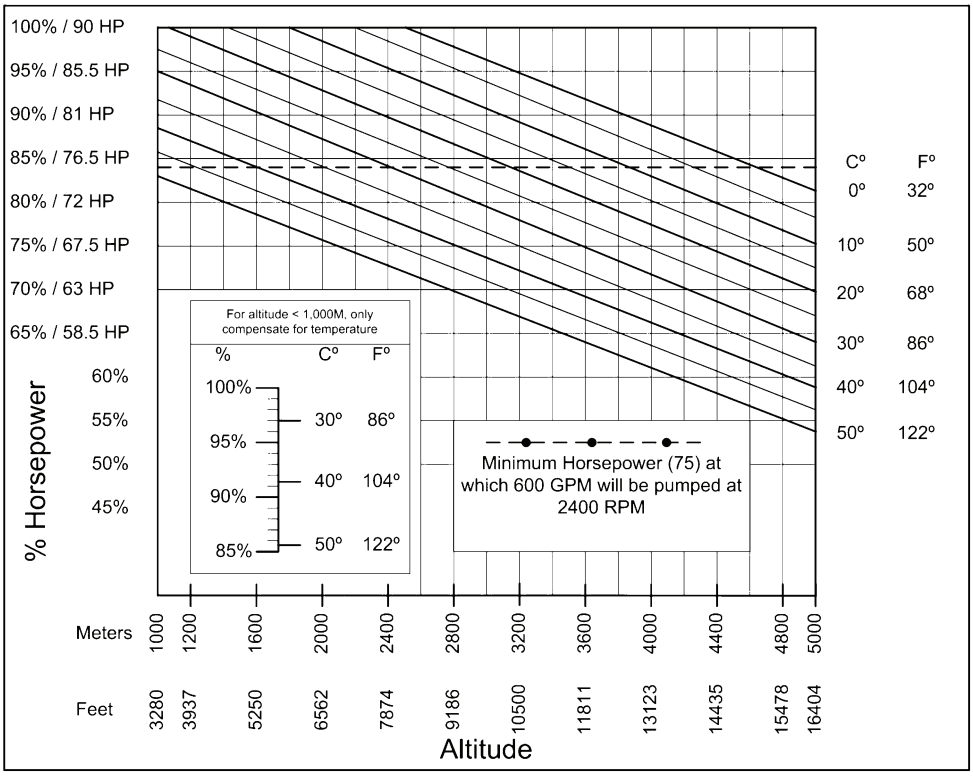
1. Protect pump assembly from sand and dust as much as possible. When not in use, cover with fabric cover.
2. Service engine air cleaner, breather, and oil filter more frequently than normally required.
3. Check engine oil level more frequently than normally required. Ensure dipstick tube and dipstick are cleaned before dipstick is removed to check oil level. Clean accumulations of sand and dirt from around oil filler location before adding oil.
4. Ensure V-belts are in good condition and properly tensioned.
5. Use caution to prevent sand and dust from entering fuel tank when refueling. Clean spouts of fuel containers and area around filler cap on fuel tank before adding fuel. Under extremely sandy or dusty conditions, filter fuel when filling tank.
6. Ensure each tire has a valve cap.
7. Keep stores of fuel, oil, and grease tightly sealed to prevent entrance of foreign matter into components.
8. If engine overheats, stop and perform troubleshooting procedures.

OPERATION IN SALTWATER AREAS

1. Use fresh water to clean off any saltwater that comes in contact with equipment.
2. Remove any rust or corrosion and cover exposed surfaces with paint.

OPERATION AT HIGH AMBIENT TEMPERATURES AND ALTITUDES

1. Air density decreases as ambient temperature or altitude increases. As a result, engine's maximum output, quality of exhaust gas, temperature and, in extreme cases, starting behavior may be impeded.
2. Under transient cases, engine can be operated at altitudes up to 3,281 ft (1,000 m) and at temperatures up to 86°F (20°C).
3. The following de-rating chart shows the loss of horsepower due to temperature or altitude. For altitudes less than 3,281 ft (1,000 m), only temperature is noted to compensate for horsepower loss.



600Pump-0030

Figure 1. De-Rating Chart.

4. The Deutz B4L 914 engine output is rated at 96 hp (71.7 kW) @ 2,500 RPM.
5. The Gorman-Rupp pump requires 75 hp (56 kW) to pump 600 GPM at 350 ft of head.
6. For example: at 104°F (40°C) and an altitude of 5,250 ft (1,600 m), the engine will produce the necessary 75 hp (56 kW) to pump 600 GPM.

SLAVE STARTING

WARNING

When slave starting engine of pump assembly:

- Use NATO slave cable that does NOT have loose or missing insulation.
- DO NOT proceed if suitable cable is not available.
- DO NOT use civilian-type jumper cables.
- DO NOT allow disabled pump assembly and booster vehicle to come in contact with each other at any time during slave starting.

Failure to follow these warnings may result in injury or death to personnel.

CAUTION

Pump is coupled directly to engine. Ensure pump volute is filled 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

NOTE

Ensure both disabled pump assembly and booster vehicle are equipped with serviceable NATO electrical receptacles.

1. Connect NATO slave cable to booster vehicle's NATO electrical receptacle.
2. Connect other end of slave cable to NATO electrical receptacle on left side of disabled pump assembly.

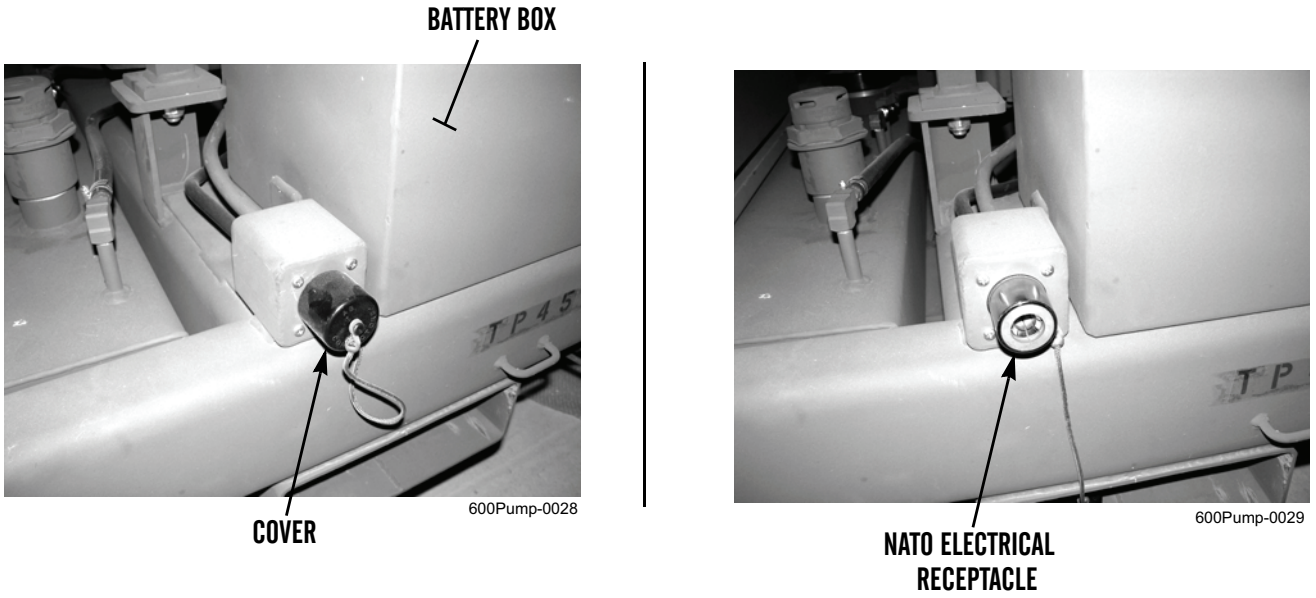


Figure 2. NATO Electrical Receptacle.

SLAVE STARTING - CONTINUED

3. Turn engine start switch on disabled pump assembly to ON position.
4. Start booster vehicle and run at a speed just above idle.
5. Wait approximately five minutes, then start engine of disabled pump assembly. If engine fails to start, notify Field Maintenance.
6. After starting disabled pump assembly, return booster vehicle to idle.
7. Remove NATO slave cable from disabled pump assembly, then from booster vehicle.

END OF WORK PACKAGE

OPERATOR INSTRUCTIONS

STOWAGE AND DECAL, DATA PLATE, AND STENCIL GUIDE

Stowage Guide; Decal, Data Plate, and Stencil Guide Introduction; Decal, Data Plate, and Stencil Guide

STOWAGE GUIDE

1. Refer to Table 1, *Stowage Guide*, for the stowage location of all tools and accessories for the 600 GPM Pump Assemblies.
2. Refer to the *Basic Issue Items (BII) List* (WP 0127) for P/N and NSN information to order replacements.

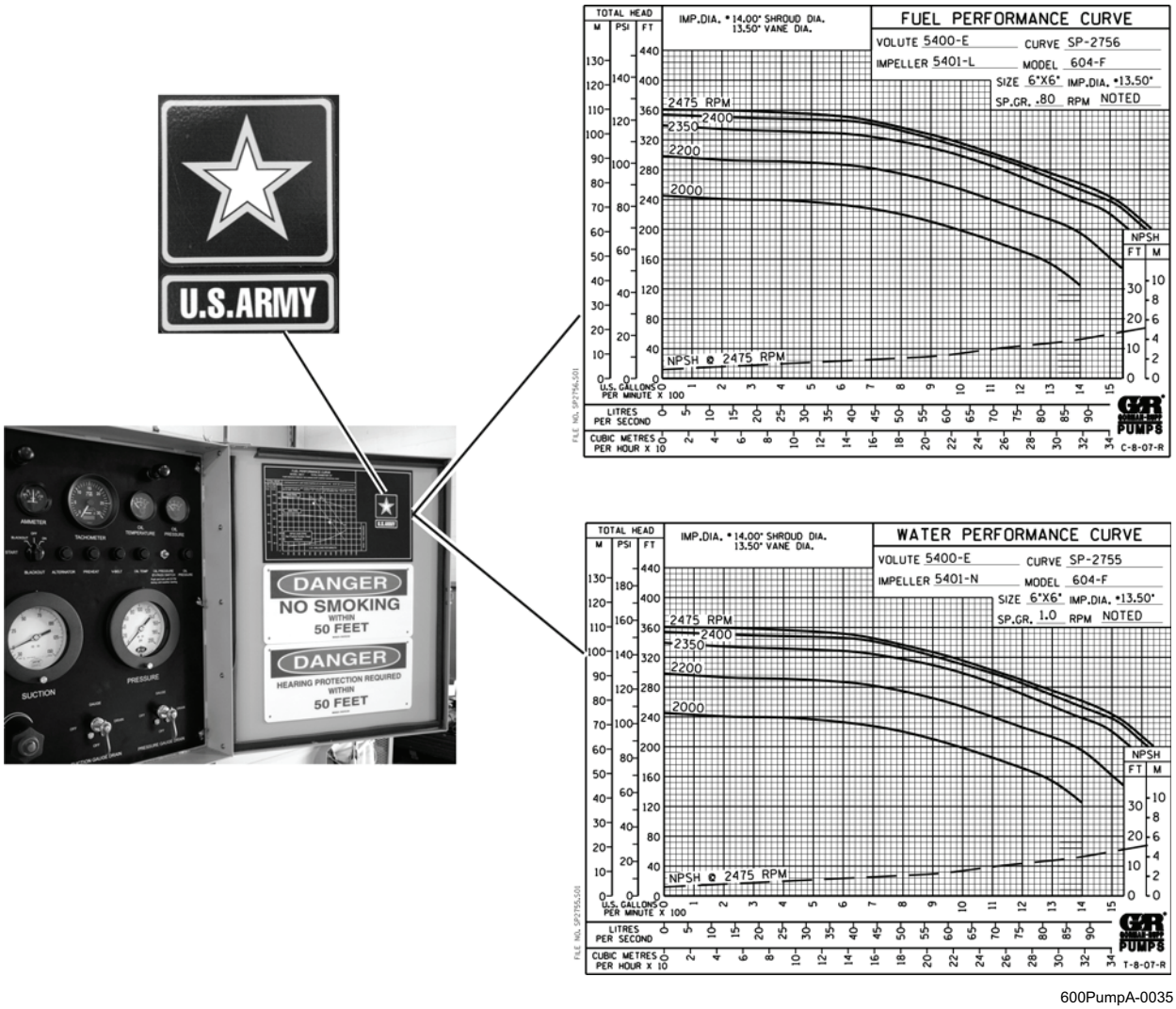
Table 1. Stowage Guide.

ITEM NO.	DESCRIPTION	STOWAGE LOCATION	QTY
1	Cable, Ground Rod	In Storage Box	1
2	Chock, Wheel-Track	In Storage Box	1
3	Clamp, Ground Rod	In Storage Box	1
4	Clamp, Hose	In Storage Box	10
5	Funnel, Engine Oil Service	In Storage Box	2
6	Funnel, Plastic (Pump Priming)		
7	Hose Assembly, Fuel, Jumper (Fuel Pump Assembly ONLY)	In Storage Box	1
8	Mallet, Bronze	In Storage Box	1
9	Screwdriver, Flat Tip	In Storage Box	1
10	Tire Pressure Gage	In Storage Box	1
11	TM 10-4320-374-13&P Operation and Field Maintenance Manual Including RPSTL for 600 GPM Pump Assembly	In Storage Box	1
12	Wrench, Adjustable: 12-1/2 in. long	In Storage Box	1

DECAL, DATA PLATE, AND STENCIL GUIDE INTRODUCTION

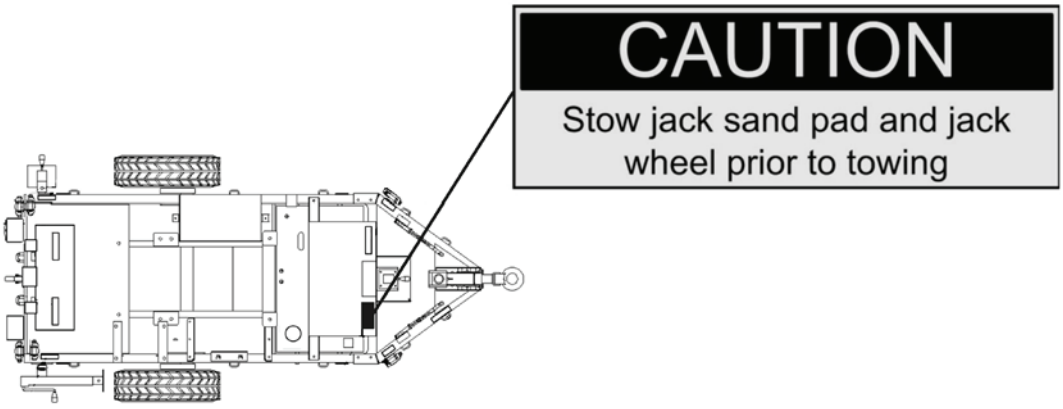
1. It is important that all decals, data plates, and stencils on the pump assemblies be maintained so they are in good condition and legible to the user.
2. If any decal or data plate is not serviceable, replace. If a stencil is no longer visible, redo stencil.

DECAL, DATA PLATE, AND STENCIL GUIDE

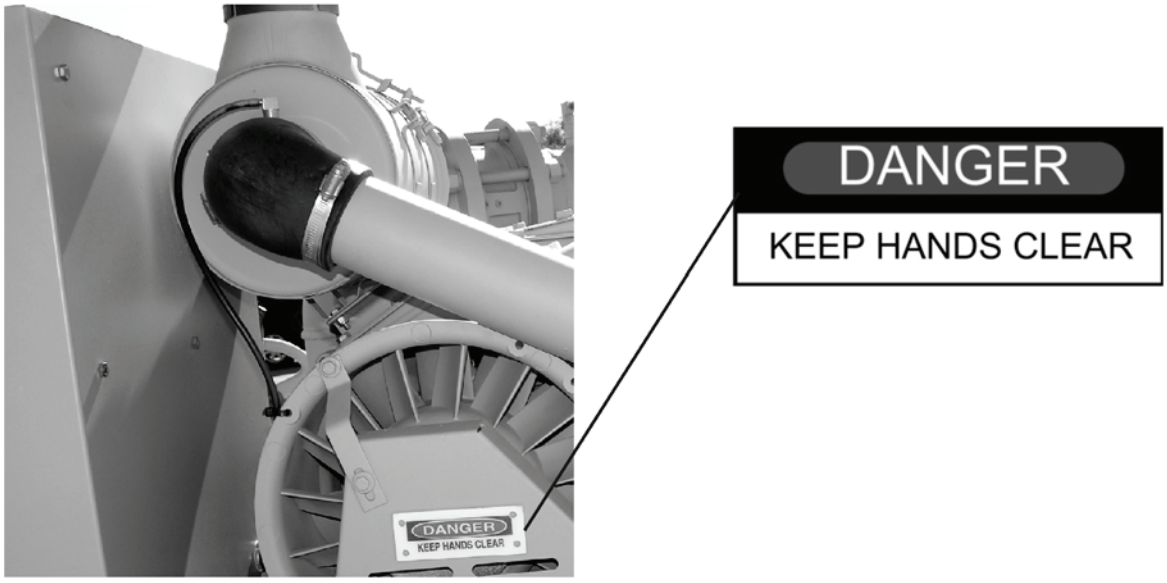


600PumpA-0035

DECAL, DATA PLATE, AND STENCIL GUIDE - CONTINUED

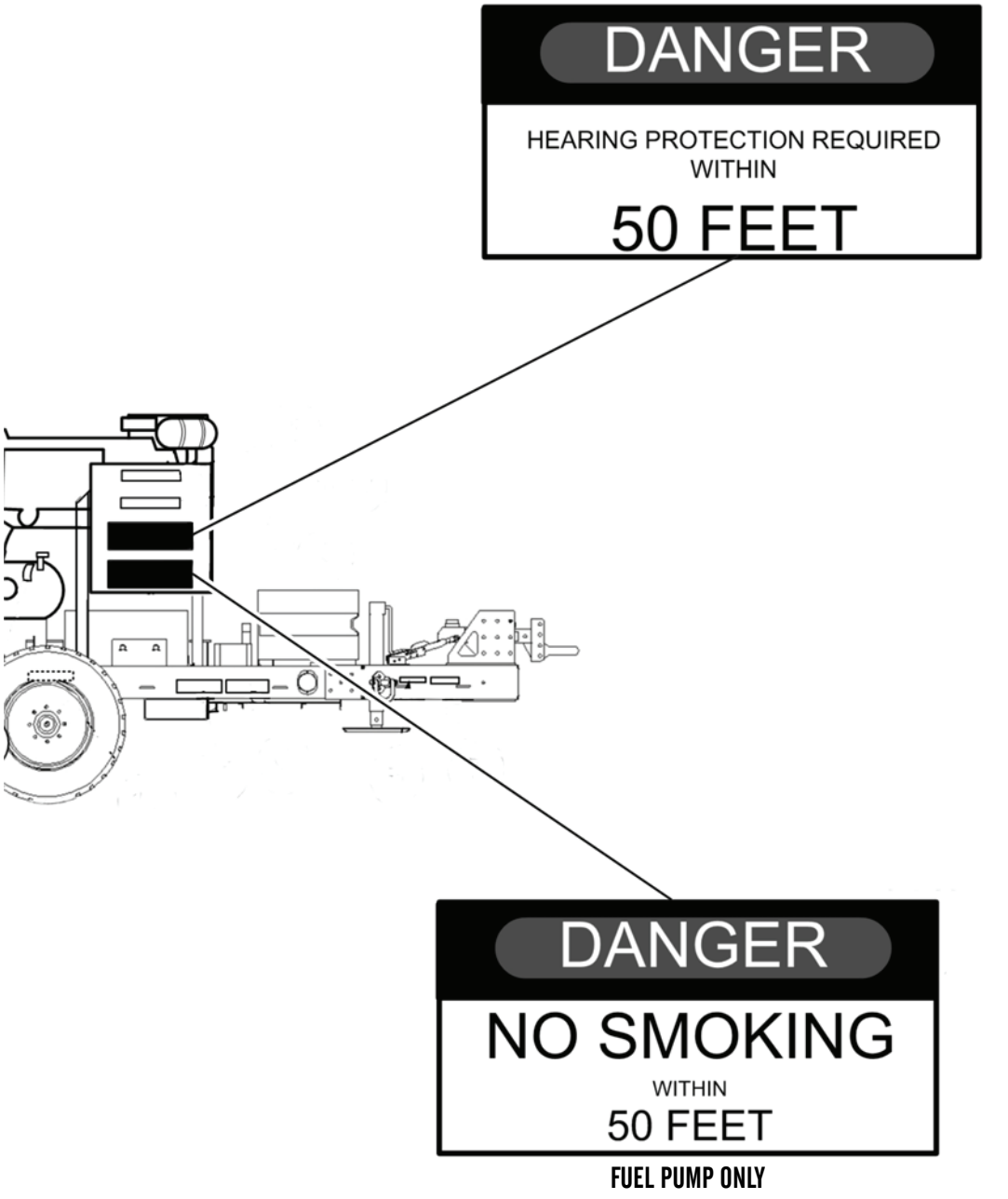


600Pump-0039

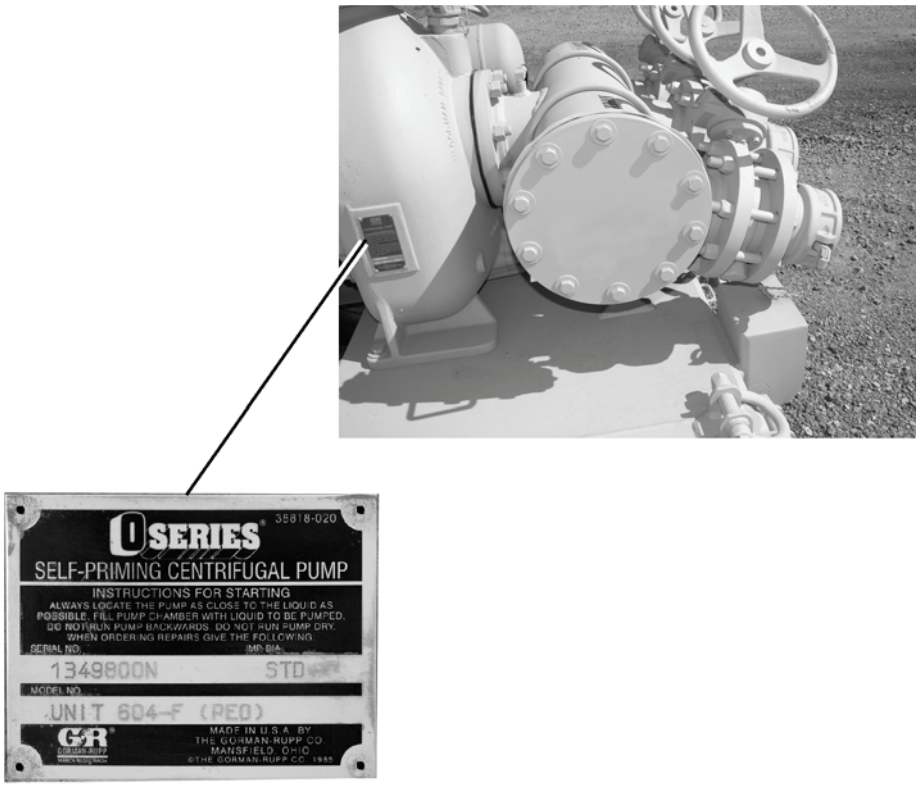


600Pump-0271

DECAL, DATA PLATE, AND STENCIL GUIDE - CONTINUED

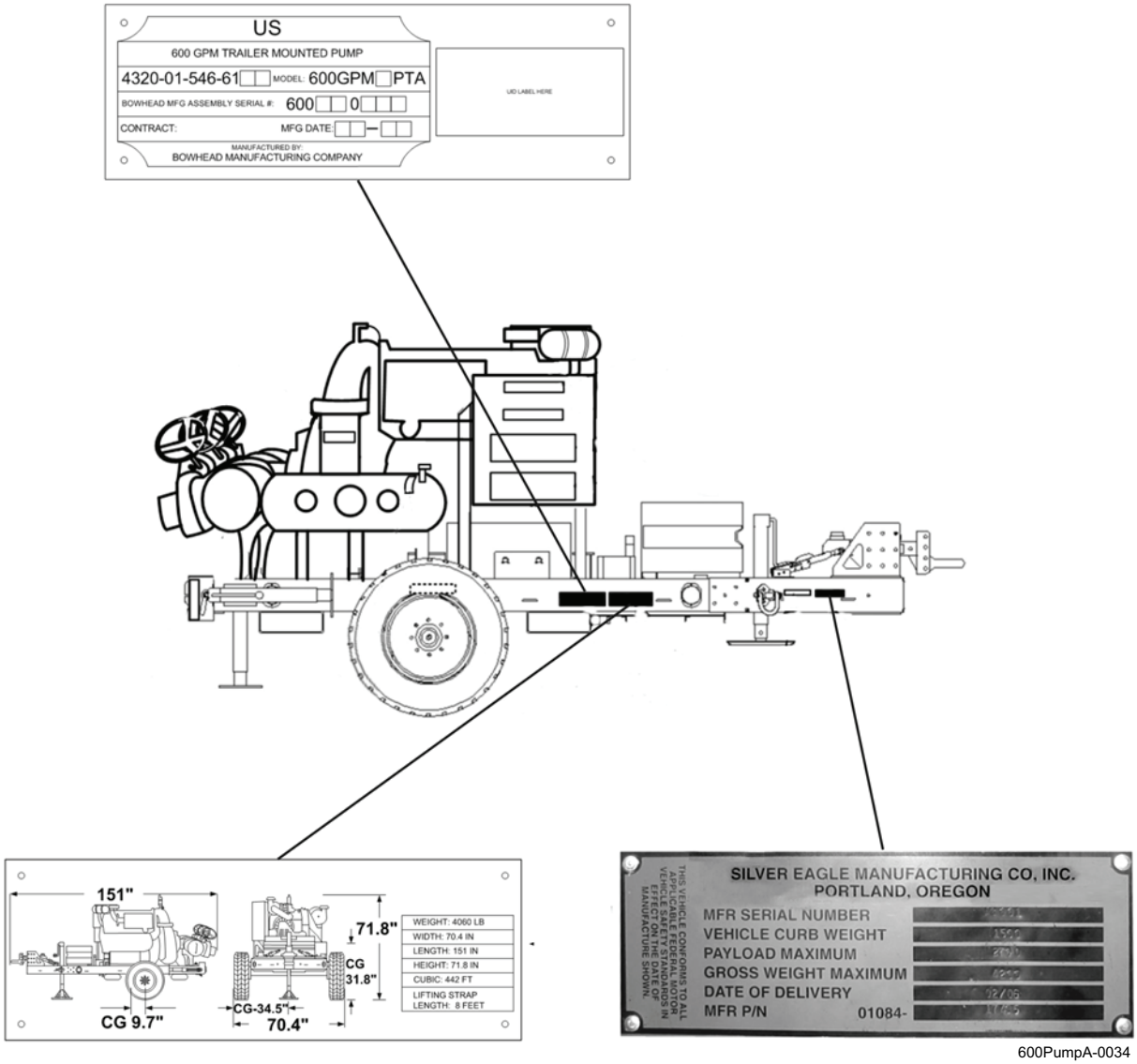


DECAL, DATA PLATE, AND STENCIL GUIDE - CONTINUED



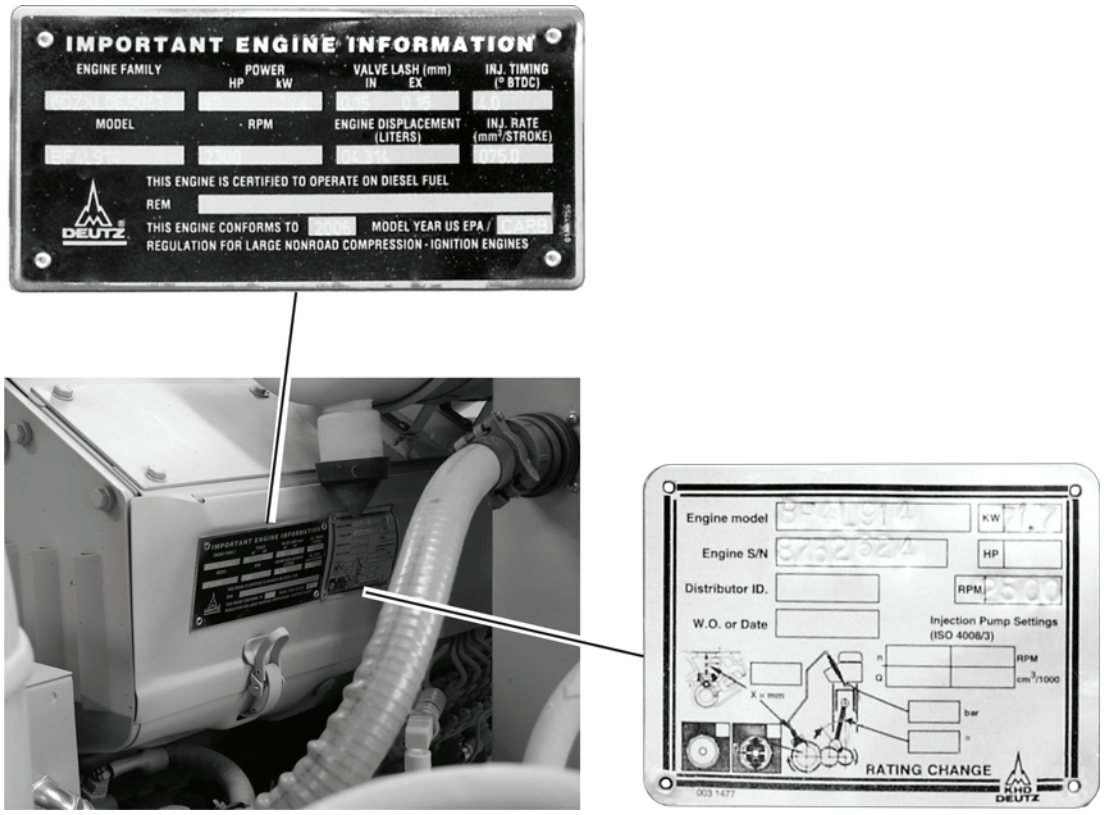
600Pump-0032

DECAL, DATA PLATE, AND STENCIL GUIDE - CONTINUED



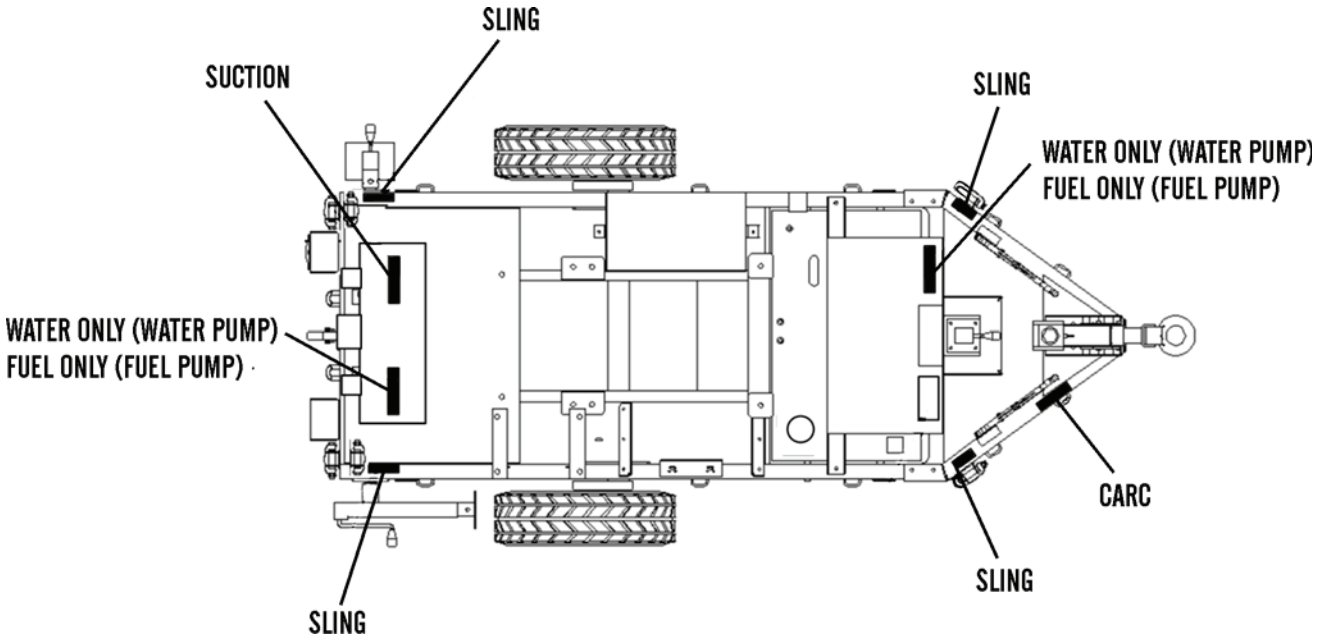
600PumpA-0034

DECAL, DATA PLATE, AND STENCIL GUIDE - CONTINUED

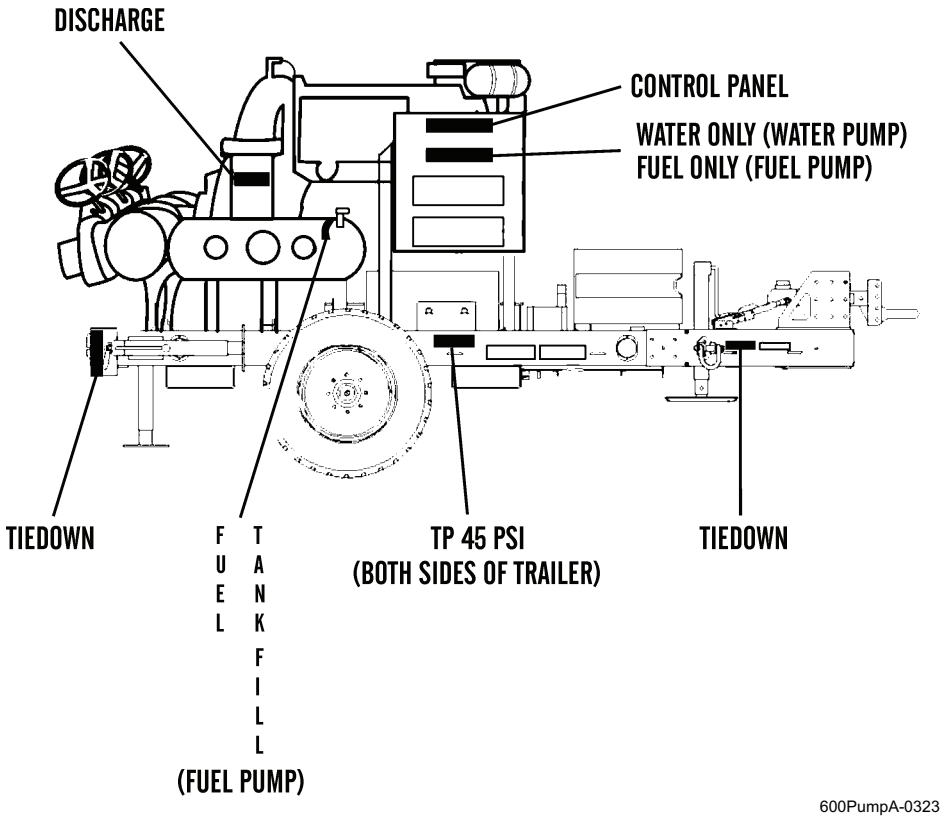


600PumpA-0031

DECAL, DATA PLATE, AND STENCIL GUIDE - CONTINUED

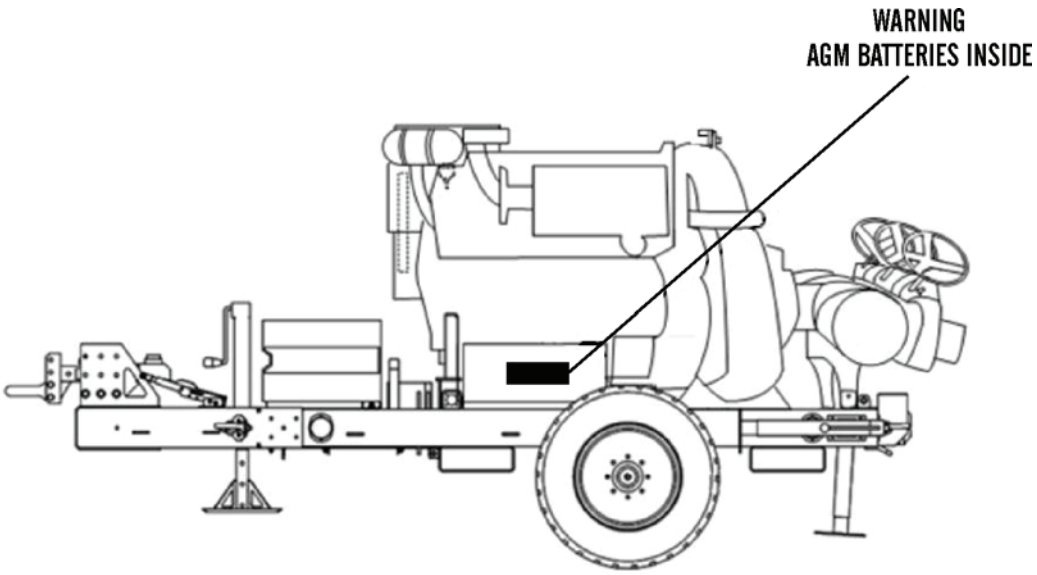


600Pump-0038



600PumpA-0323

DECAL, DATA PLATE, AND STENCIL GUIDE - CONTINUED



600Pump-0324

END OF WORK PACKAGE

CHAPTER 3

OPERATOR TROUBLESHOOTING PROCEDURES

OPERATOR TROUBLESHOOTING PROCEDURES

OPERATOR TROUBLESHOOTING INTRODUCTION

INTRODUCTION

1. This chapter provides information for identifying and correcting malfunctions which may develop while operating the 600 GPM Pump Assemblies.
2. Unless otherwise indicated, troubleshooting procedures for Fuel or Water Pump Assemblies are not separated. If either pump assembly has a malfunction that is particular to its service, the troubleshooting malfunction and procedures will be clearly differentiated.
3. The *Operator Troubleshooting Symptom Index* (WP 0010) lists common malfunctions which may occur and refers you to the proper page in WP 0011 for a troubleshooting procedure.
4. If you are unsure of the location or operation of an item mentioned in troubleshooting, refer to *Location and Description of Major Components* located in WP 0002 or *Description and Use of Operator's Controls and Indicators* (WP 0005).
5. Before performing troubleshooting, read and follow all safety instructions found in *General Safety Instructions* (WP 0004) and in the *Warning Summary* at the front of this manual.
6. The *Operator Troubleshooting Symptom Index* (WP 0010) cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed, or is not corrected by the listed corrective actions, notify your supervisor.
7. When troubleshooting a malfunction:
   a. Locate the symptom or symptoms in WP 0010 that best describe the malfunction.
   b. Turn to the page in WP 0011 where the troubleshooting procedures for the malfunction in question are described. Headings at the top of each page show how each troubleshooting procedure is organized: MALFUNCTION, TEST OR INSPECTION (in step number order), and CORRECTIVE ACTION.
   c. Perform each step in the order listed until the malfunction is corrected. DO NOT perform any maintenance task unless the troubleshooting procedure tells you to do so.

EXPLANATION OF COLUMNS

The columns in the troubleshooting table in WP 0011 are defined as follows:

1. **MALFUNCTION.** A visual or operational indication that something is wrong with the equipment.
2. **TEST OR INSPECTION.** A procedure to isolate the problem in a system or component.
3. **CORRECTIVE ACTION.** A procedure to correct the problem.

END OF WORK PACKAGE

OPERATOR TROUBLESHOOTING PROCEDURES

OPERATOR TROUBLESHOOTING SYMPTOM INDEX

Malfunction/Symptom **Troubleshooting Procedure Page**

ENGINE

1. Engine Will Not Crank. 0011-1
2. Engine Cranks but Fails to Start (Operating Temperature Above 32°F (0°C)). 0011-1
3. Engine Cranks but Fails to Start (Operating Temperature Below 32°F (0°C)).. 0011-2
4. Engine Does Not Develop Full Power. 0011-3
5. Engine Does Not Idle Properly or Runs Rough. 0011-3
6. Engine Overheats. 0011-4
7. Low or No Engine Oil Pressure. 0011-4
8. Excessive Engine Oil Consumption. 0011-4
9. Excessive Blue Exhaust Smoke. 0011-5
10. Excessive White Exhaust Smoke. 0011-5
11. Excessive Black Exhaust Smoke. 0011-5

ELECTRICAL SYSTEM

1. Taillights Fail to Operate.. 0011-6
2. One or More Service, Brake, or Blackout Lights are Not Working. 0011-6
3. Panel Lights Do Not Come on When Engine Start Switch is Turned to ON. 0011-7
4. Alternator, Preheat, and Oil Pressure Warning Lights Do Not Come on When Engine Start Switch is Turned to ON.. 0011-8
5. Ammeter on Control Panel Indicates Over or Under Charge. 0011-8
6. Alternator Light on Control Panel Remains on After Engine Startup. 0011-8
7. V-belt Warning Light on Control Panel is Illuminated. 0011-8
8. Engine Oil Temperature Warning Light on Control Panel is Illuminated.. 0011-8
9. Engine Oil Pressure Warning Light on Control Panel is Illuminated. 0011-9

BRAKE SYSTEM

1. Service Brakes Do Not Apply or Slow Pump Assembly. 0011-10
2. Hand (Parking) Brakes Do Not Apply and/or Hold Pump Assembly.. 0011-10

PUMP

1. Pump Fails to Prime. 0011-11
2. Pump Stops or Fails to Deliver Rated Flow or Pressure. 0011-11
3. Pump Requires Too Much Power. 0011-11
4. Pump Clogs Frequently. 0011-12
5. Excessive Noise From Pump Assembly. 0011-12

END OF WORK PACKAGE

OPERATOR TROUBLESHOOTING PROCEDURES

OPERATOR TROUBLESHOOTING PROCEDURES

Engine, Electrical System, Brake System, Pump

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE

1. ENGINE WILL NOT CRANK.

Remove battery box cover and check battery cable connections for looseness or corrosion. Refer to *Monthly* service in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

a. Clean battery cable connections and tighten as required, using 1/2 in. Wrench, Adjustable, 12-1/2 in. long (Item 12, WP 0127).

b. Attempt to jump start engine using NATO electrical receptacle (WP 0007).

c. If starting problem still exists, notify Field Maintenance.

2. ENGINE CRANKS BUT FAILS TO START (OPERATING TEMPERATURE ABOVE 32°F (0°C)).

Step 1. Ensure cooling fan V-belt warning light on control panel is not illuminated (WP 0005).

If warning light is illuminated, notify Field Maintenance.

Step 2. Check fuel level gauge at fuel tank filler cap (WP 0005).

If indication is empty, add fuel. Refer to *Before* service in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

Step 3. Check position of fuel selector valves (Return and Suction) (WP 0005).

Position both fuel selector valves (Return and Suction) to TANK position (or AUX position if operating engine from an auxiliary fuel tank) (WP 0005).

Step 4. Check position of engine throttle control (WP 0005).

Verify throttle control is pushed fully in and turned fully clockwise (right) to idle position (WP 0005).

Step 5. Check for correct engine oil level. Low engine oil level or pressure will prevent starting.

If engine oil is below operating level, service oil level (WP 0012 and WP 0013).

Step 6. Check air cleaner restriction indicator for showing of RED band (WP 0005).

If RED band is visible, service air cleaner assembly (WP 0015).

Step 7. If engine has not been operated recently, fuel system may need priming. Prime fuel pump and fuel/water separator (WP 0006).

If starting problem still exists, notify Field Maintenance.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE - CONTINUED

3. ENGINE CRANKS BUT FAILS TO START (OPERATING TEMPERATURE BELOW 32°F (0°C)).

Step 1. Ensure cooling fan V-belt warning light on control panel is not illuminated (WP 0005).

If warning light is illuminated, notify Field Maintenance.

Step 2. Check fuel level gauge at fuel tank filler cap (WP 0005).

If indication is empty, add fuel. Refer to *Before* service in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

Step 3. Check position of fuel selector valves (Return and Suction) (WP 0005).

Position both fuel selector valves (Return and Suction) to TANK position (or AUX position if operating engine from an auxiliary fuel tank) (WP 0005).

Step 4. Check position of engine throttle control (WP 0005).

Verify throttle control is pushed fully in and turned fully clockwise (right) to idle position (WP 0005).

Step 5. Check for correct engine oil level.

If engine oil is below operating level, service oil level (WP 0012 and WP 0013).

Step 6. Check air cleaner restriction indicator for showing of RED band (WP 0005).

If RED band is visible, service air cleaner assembly (WP 0015).

Step 7. If engine has not been operated recently, fuel system may need priming.

Prime fuel pump and fuel/water separator (WP 0006).

Step 8. Check engine preheat operation. Refer to *Starting Engine* in WP 0006.

Turn engine start switch counterclockwise (to the left) to PREHEAT position and wait until preheat light goes out. Light should go out within 20 seconds. Attempt to start engine (WP 0006).

Step 9. Check engine oil pressure bypass switch operation. Refer to *Starting Engine* in WP 0006.

a. Depress oil bypass switch during starting attempts until oil pressure gauge shows 25 PSI (172 kPa).

b. If starting problem still exists, notify Field Maintenance.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE - CONTINUED

4. ENGINE DOES NOT DEVELOP FULL POWER.

Step 1. Check air cleaner restriction indicator for showing of RED band (WP 0005).

If RED band is visible, service air cleaner assembly (WP 0015).

Step 2. Check for correct engine oil level.

If engine oil is not within operating range, service oil level (WP 0012 and WP 0013).

Step 3. Check for liquid or sediment in fuel/water separator sediment bowl.

If liquid or sediment is visible, drain sediment bowl. Refer to *After* service in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

Step 4. Check fuel system components, lines, and hoses for signs of leakage or damage.

a. Tighten any items found to be loose and/or leaking.

b. Notify Field Maintenance of any damaged items.

Step 5. Check engine cooling fan and oil cooler fins for clogging.

a. Remove debris from cooling fan. Refer to *Before* service in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

b. Remove oil cooler access plate and clean engine oil cooler fins. Refer to *Weekly* service in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

c. If engine low power problem still exists, notify Field Maintenance.

5. ENGINE DOES NOT IDLE PROPERLY OR RUNS ROUGH.

Step 1. Check air cleaner restriction indicator for showing of RED band (WP 0005).

If RED band is visible, service air cleaner assembly (WP 0015).

Step 2. Check throttle control is set and tightly locked in place (WP 0005).

If found loose, tighten.

Step 3. Check for liquid or sediment in fuel/water separator sediment bowl.

If liquid or sediment is visible, drain sediment bowl. Refer to *After* service in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

Step 4. Check fuel system components, lines, and hoses for signs of leakage or damage.

a. Tighten any items found to be loose and/or leaking.

b. Notify Field Maintenance of any damaged items found, or if problem still exists.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE - CONTINUED

6. ENGINE OVERHEATS.

Step 1. Check for correct engine oil level.

If engine oil is not within operating range, service oil level (WP 0012 and WP 0013).

Step 2. Check air cleaner restriction indicator for showing of RED band (WP 0005).

If RED band is visible, service air cleaner assembly (WP 0015).

Step 3. Check engine cooling fan and oil cooler fins for clogging.

a. Remove debris from cooling fan. Refer to *Before* service in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

b. Remove oil cooler access plate and clean engine oil cooler fins. Refer to *Weekly* service in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

c. If engine overheating problem still exists, notify Field Maintenance.

7. LOW OR NO ENGINE OIL PRESSURE.

Step 1. Check for correct engine oil level and SAE weight.

a. If engine oil is not within operating range, service oil level (WP 0012 and WP 0013).

b. Notify Field Maintenance to replace engine oil with correct SAE weight and to replace oil filter.

Step 2. Check engine oil cooler fins for clogging.

a. Remove oil cooler access plate and clean engine oil cooler fins. Refer to *Weekly* service in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

b. If engine oil pressure problem still exists, notify Field Maintenance.

8. EXCESSIVE ENGINE OIL CONSUMPTION.

Step 1. Check for correct engine oil level and SAE weight.

a. If engine oil is not within operating range, service oil level (WP 0012 and WP 0013).

b. Notify Field Maintenance to replace engine oil with correct SAE weight and to replace oil filter.

Step 2. Check engine oil cooler fins for clogging.

a. Remove oil cooler access plate and clean engine oil cooler fins. Refer to *Weekly* service in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

b. If excessive engine oil consumption problem still exists, notify Field Maintenance.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE - CONTINUED

9. EXCESSIVE BLUE EXHAUST SMOKE.

Step 1. Check air cleaner restriction indicator for showing of RED band (WP 0005).

If RED band is visible, service air cleaner assembly (WP 0015).

Step 2. Check for correct engine oil level to ensure level is not too high (over full).

a. If engine oil level is too high, notify Field Maintenance to service oil level.

b. If blue engine exhaust problem still exists, notify Field Maintenance.

10. EXCESSIVE WHITE EXHAUST SMOKE.

Allow engine to warm to operating temperature (WP 0006).

If white engine exhaust problem still exists, notify Field Maintenance.

11. EXCESSIVE BLACK EXHAUST SMOKE.

Step 1. Check air cleaner restriction indicator for showing of RED band (WP 0005).

If RED band is showing, service air cleaner assembly (WP 0015).

Step 2. Check engine cooling fan and oil cooler fins for clogging.

a. Remove debris from cooling fan. Refer to *Before* service in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

b. Remove oil cooler access plate and clean engine oil cooler fins. Refer to *Weekly* service in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

c. If black engine exhaust problem still exists, notify Field Maintenance.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ELECTRICAL SYSTEM

1. TAILLIGHTS FAIL TO OPERATE.

Step 1. Ensure towing vehicle light switch is in correct position. Refer to towing vehicle's Operator Manual.

Place towing vehicle light switch in correct operational position.

Step 2. Check operation of towing vehicle lights. Refer to towing vehicle's Operator Manual.

If towing vehicle lights are not working, troubleshoot IAW towing vehicle's Operator Manual.

Step 3. Check for proper connection of intervehicular electrical cable to towing vehicle. Check for dirty or corroded connectors.

a. Disconnect intervehicular electrical cable from towing vehicle and remove any dirt or corrosion found.

b. Reconnect intervehicular electrical cable and check operation of lights.

NOTE

Junction of intervehicular electrical cable to trailer wiring harness is located under right side of trailer, directly in front of wheel and tire assembly.

Step 4. Check for proper connection of intervehicular electrical cable to trailer wiring harness. Check for dirty or corroded connectors.

a. Disconnect intervehicular electrical cable from trailer wiring harness and remove any dirt or corrosion found.

b. Reconnect intervehicular electrical cable to trailer wiring harness and check operation of lights.

c. If problem still exists, notify Field Maintenance.

2. ONE OR MORE SERVICE, BRAKE, OR BLACKOUT LIGHTS ARE NOT WORKING.

Step 1. Check for proper connection of intervehicular electrical cable to towing vehicle.

Remove and reconnect intervehicular electrical cable.

NOTE

Junction of intervehicular electrical cable to trailer wiring harness is located under right side of trailer, directly in front of wheel and tire assembly.

Step 2. Check for proper connection of intervehicular electrical cable to trailer wiring harness.

a. Disconnect intervehicular electrical cable from trailer wiring harness.

b. Reconnect intervehicular electrical cable to trailer wiring harness.

c. If problem still exists, notify Field Maintenance.

Step 3. Notify Field Maintenance to remove light assembly cover(s) and check for burned out bulb(s)/LED(s).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ELECTRICAL SYSTEM - CONTINUED

2. ONE OR MORE SERVICE, BRAKE, OR BLACKOUT LIGHTS ARE NOT WORKING - CONTINUED.

Step 4. Check trailer wiring harnesses for damage.

a. If damage is found, notify Field Maintenance.

b. If problem still exists, notify Field Maintenance.

3. PANEL LIGHTS DO NOT COME ON WHEN ENGINE START SWITCH IS TURNED TO ON.

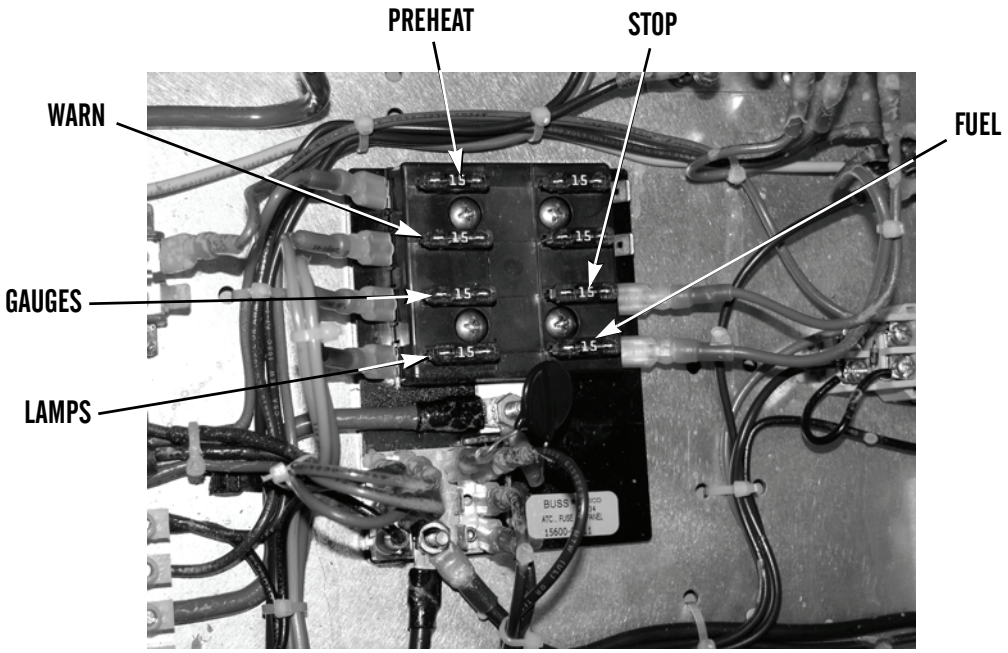
Step 1. Check position of blackout light switch (WP 0005).

Turn blackout light switch to ON position (WP 0005).

Step 2. Check for a burned-out panel light bulb(s).

Replace any bulb found to be damaged.

Step 3. Remove six wingnuts and move panel away from control panel box to access components behind panel. Check for blown fuse. Replace any blown fuse.



600PumpA-0451

Step 4. Check control panel wiring for damage or loose connections.

If damage or loose connections are found, notify Field Maintenance.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ELECTRICAL SYSTEM - CONTINUED

4. ALTERNATOR, PREHEAT, AND OIL PRESSURE WARNING LIGHTS DO NOT COME ON WHEN ENGINE START SWITCH IS TURNED TO ON.

NOTE

Cooling fan V-belt and oil temperature warning lights do not come on unless there is a malfunction.

Step 1. Check position of blackout light switch (WP 0005).

Turn blackout light switch to ON or BLACKOUT position (WP 0005).

Step 2. Remove battery box cover and check battery cable connections for looseness or corrosion. Refer to *Monthly* service in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

Clean and tighten battery cable connections as required.

Step 3. Remove six wing nuts and move panel away from control panel box, to access warning lights behind panel. Disconnect connector from rear of warning light and check for a burned out bulb.

Replace any bulb found to be damaged.

Step 4. Check control panel wiring for damage or loose connections.

If damage or loose connections are found, notify Field Maintenance.

5. AMMETER ON CONTROL PANEL INDICATES OVER OR UNDER CHARGE.

Remove battery box cover and check battery cable connections for looseness or corrosion. Refer to *Monthly* service in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

a. Clean and tighten battery cable connections as required.

b. If problem still exists, notify Field Maintenance.

6. ALTERNATOR LIGHT ON CONTROL PANEL REMAINS ON AFTER ENGINE STARTUP.

Notify Field Maintenance.

7. V-BELT WARNING LIGHT ON CONTROL PANEL IS ILLUMINATED.

Notify Field Maintenance.

8. ENGINE OIL TEMPERATURE WARNING LIGHT ON CONTROL PANEL IS ILLUMINATED.

Step 1. Check for correct engine oil level.

If engine oil is not within operating range, service oil level (WP 0012 and WP 0013).

Step 2. Check engine cooling fan and oil cooler fins for clogging.

a. Remove debris from cooling fan. Refer to *Before* service in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

b. Remove oil cooler access plate and clean engine oil cooler fins. Refer to *Weekly* service in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

Step 3. If engine oil temperature problem still exists, notify Field Maintenance.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ELECTRICAL SYSTEM - CONTINUED

9. ENGINE OIL PRESSURE WARNING LIGHT ON CONTROL PANEL IS ILLUMINATED.

Check for correct engine oil level.

a. If engine oil is not within operating range, service oil level (WP 0012 and WP 0013).

b. If engine oil pressure problem still exists, notify Field Maintenance.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

BRAKE SYSTEM

1. SERVICE BRAKES DO NOT APPLY OR SLOW PUMP ASSEMBLY.

Step 1. Check brake fluid level in master cylinder. Refer to *Monthly* service in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

Service brake fluid level. Refer to *Monthly* service in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

Step 2. Check for damaged or leaking brake lines.

If damaged or leaking lines are found, notify Field Maintenance.

2. HAND (PARKING) BRAKES DO NOT APPLY AND/OR HOLD PUMP ASSEMBLY.

Step 1. Check adjustment of both hand brake levers (WP 0016).

Adjust hand brake levers (WP 0016).

Step 2. Check for damaged or binding hand brake control cables.

If damaged or binding cables are found, notify Field Maintenance.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

PUMP

1. PUMP FAILS TO PRIME.

Step 1. Check for correct fluid level in pump volute. Refer to *Pump Assembly Preparation Before Starting* (WP 0006).

Fill pump volute 2/3 full with the same fluid that will be pumped. Refer to *Pump Assembly Preparation Before Starting* (WP 0006).

Step 2. Check for possible air leak or damaged suction hose. Refer to *Pump Assembly Preparation Before Starting* (WP 0006).

Tighten suction hose connections, if possible. Refer to *Pump Assembly Preparation Before Starting* (WP 0006).

Step 3. Notify Field Maintenance to remove endplate and check for clogged suction manifold strainer.

2. PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE.

Step 1. Check engine RPM. Engine speed may be too low. Refer to *Pumping (Fuel and Water)* (WP 0006).

Adjust engine RPM as required. Refer to *Pumping (Fuel and Water)* (WP 0006).

Step 2. Check position of suction intake. It may not be submerged at proper level. Refer to *Pump Assembly Preparation Before Starting* (WP 0006).

Reposition suction intake as required. Refer to *Pump Assembly Preparation Before Starting* (WP 0006).

Step 3. Check for possible air leak or damaged suction hose. Refer to *Pump Assembly Preparation Before Starting* (WP 0006).

Tighten suction hose connections, if possible. Refer to *Pump Assembly Preparation Before Starting* (WP 0006).

Step 4. Notify Field Maintenance to remove endplate and check for clogged suction manifold strainer.

3. PUMP REQUIRES TOO MUCH POWER.

Step 1. Check engine RPM. Engine speed may be too high. Refer to *Pumping (Fuel and Water)* (WP 0006).

Adjust engine RPM as required. Refer to *Pumping (Fuel and Water)* (WP 0006).

Step 2. Pump assembly may have internal bearing damage.

Notify Field Maintenance.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

PUMP - CONTINUED

4. PUMP CLOGS FREQUENTLY.

Step 1. Check for too slow discharge flow rate.

a. Open discharge valve fully to increase flow rate. Refer to *Pumping (Fuel and Water)* (WP 0006).

b. Adjust engine RPM as required to increase flow rate. Refer to *Pumping (Fuel and Water)* (WP 0006).

Step 2. Check discharge hose(s) positioning. Refer to *Pump Assembly Preparation Before Starting* (WP 0006).

Straighten or reposition hoses to prevent kinking. Refer to *Pump Assembly Preparation Before Starting* (WP 0006).

5. EXCESSIVE NOISE FROM PUMP ASSEMBLY.

Step 1. Check for cavitation in pump. Refer to *Pumping (Fuel and Water)* (WP 0006).

Step 2. Check for secure pump and intermediate housing mounting hardware.

a. If loose or missing mounting hardware is found, notify Field Maintenance.

b. If noise problem still exists, notify Field Maintenance.

END OF WORK PACKAGE

CHAPTER 4

OPERATOR MAINTENANCE INSTRUCTIONS

OPERATOR MAINTENANCE INSTRUCTIONS

OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS), INCLUDING LUBRICATION INSTRUCTIONS INTRODUCTION

GENERAL

1. To ensure 600 GPM Fuel or Water Pump Assembly is ready for operation at all times, it must be inspected on a regular basis so defects may be found and corrected before they result in injury, damage, or equipment failure.
2. Table 1 in WP 0013, *Operator PMCS, Including Lubrication Instructions*, contains systematic instructions on inspections, lubrications, services, tests, and corrections to be performed to keep your equipment in good operating condition and ready for its primary mission.
3. Also included in Table 1 are maintenance service directives to be performed on a new or overhauled engine after a break-in period of 50 to 150 hours.
4. For information on Corrosion Prevention and Control (CPC), refer to WP 0001.

EXPLANATION OF TABLE ENTRIES

1. **Item No. Column.** Numbers in this column are for reference. When completing DA Form 2404 or DA Form 5988-E *(Equipment Inspection and Maintenance Worksheet)*, include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must perform checks and services for the interval listed.
2. **Interval Column.** This column tells you when you must perform the procedure in the procedure column.

NOTE

- If both calendar and hours intervals are indicated, perform procedure at whichever interval comes first.
- If you are operating the pump assembly for the first time, perform your *Weekly* and *Monthly* PMCS the first time you do your *Before* PMCS.

   a. *Before* procedures must be done immediately before you operate the pump assembly.

   b. *During* procedures must be done while you are operating the pump assembly.

   c. *After* procedures must be done immediately after you have operated the pump assembly.

   d. *Weekly* procedures must be done once each week. If the pump assembly has not been operated in a week, also perform *Before* PMCS at the same time.

   e. *Monthly* procedures must be done once each month.

   f. *Hourly* procedures must be done at hour interval indicated.

3. **Location, Item to Check/Service Column.** This column provides the location and item to be checked or serviced.

NOTE

The WARNINGs and CAUTIONs appearing in your PMCS table should always be observed. WARNINGs and CAUTIONs appear before applicable procedures. You must observe these WARNINGs to prevent serious injury to yourself and others, and CAUTIONs to prevent your equipment from being damaged.

4. **Procedure Column.** This column gives the procedure you must perform to check or service the item listed in the Item to Check/Service column, to know if the equipment is ready or available for its intended mission. You must perform the procedure at the time stated in the interval column.
5. **Not Fully Mission Capable If: Column.** Information in this column tells you what faults will prevent your equipment from being capable of performing its primary mission. If you perform check/service procedures that show faults listed in this column, the equipment is not mission-capable. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

GENERAL PMCS PROCEDURES

1. Always perform PMCS in the same order so it gets to be a habit. Once you have had some practice, you will spot anything wrong in a hurry. If the pump assembly does not perform as required, refer to *Operator Troubleshooting Symptom Index* (WP 0010) for an appropriate troubleshooting procedure.
2. If anything looks wrong and you can't fix it, write it on your DA Form 2404 or DA Form 5988-E. If you find something seriously wrong, IMMEDIATELY report it to your supervisor.
3. Before performing preventive maintenance, read all the checks required for the applicable interval and prepare all that is needed to make all the checks. You will always need a Rag, wiping (Item 22, WP 0129) or two.

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low-toxicity material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to do so may result in injury or death to personnel.

a. **Keep It Clean.** Dirt, grease, oil, and debris get in the way and may cover up a serious problem. Clean as you work and as needed. Use Cleaning compound, solvent, Type III (Item 6, WP 0129) on all metal surfaces. Use Detergent, general purpose, liquid (Item 9, WP 0129) and water when you clean rubber, plastic, and painted surfaces.

WARNING

When servicing this equipment, performing maintenance, or disposing of materials such as lubricating oil, fuel, brake fluid, battery acids, batteries, and CARC paint, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

b. **Hazardous Waste Disposal.** Ensure all spills are cleaned up IAW spill containment plan and disposed of IAW using unit's SOP.

c. **Rust and Corrosion.** Check metal parts for rust and corrosion. If any bare metal or corrosion exists, clean and apply a light coat of Oil, lubricating, OE/HDO-10 (Item 19, WP 0129).

d. **Bolts, Nuts, and Screws.** Check bolts, nuts, and screws for obvious looseness, missing, bent, or broken condition. You can't try them all with a tool, but look for chipped paint, bare metal, or rust around bolt heads. If you find one is loose, tighten it.

e. **Welds.** Look for loose or chipped paint, rust, or gaps where parts are welded together. If you find a bad weld, report it to your supervisor.

f. **Electrical Wires, Harnesses, and Connectors.** Look for cracked or broken insulation, bare wires, and loose or broken connectors. Tighten loose connectors. Ensure wires are in good condition. Notify Field Maintenance if wires are disconnected.

g. **Hydraulic Brake Lines, Hoses, and Fittings.** Look for wear, damage, and signs of leaks. Check for loose clamps and fittings. Wet spots indicate leaks, but a stain around a fitting or connector can also mean a leak. If a leak comes from a loose fitting or connector, tighten it. If something is broken or worn out, correct problem.

GENERAL PMCS PROCEDURES - CONTINUED

h. **Fluid Leakage.** It is necessary for you to know how fluid leakage affects the status of your equipment. The following are definitions of the types/classes of leakage you need to know to be able to determine the status of your equipment. Learn and be familiar with them, and remember: when in doubt, notify your supervisor.

CAUTION

- Equipment operation is allowable with minor leakage (Class I or II), except for fuel and brake fluid where no leaks are allowable. Of course, consideration must be given to the fluid capacity of the item or system being checked. When in doubt, ask your supervisor.
- When operating with Class I or II leaks, continue to check fluid levels as required in your PMCS.
- Class III leaks should be reported immediately to your supervisor.

Leakage Definitions for Operator PMCS

Class I	Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
Class II	Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked.
Class III	Leakage of fluid great enough to form drops that fall from the item being checked.

GENERAL LUBRICATION PROCEDURES

NOTE

- Lubrication instructions contained in Operator PMCS are MANDATORY.
- Overall views of lubrication points are located at the end of this work package.
- Localized lubrication views are located in the PMCS table in WP 0013.

1. Recommended intervals are based on normal conditions of operation, temperature, and humidity. When operating under extreme conditions, such as high or low temperatures or exposure to sand or dust, lubricants should always be changed more frequently. Lubricants that have become contaminated will be changed regardless of interval. When in doubt, notify your supervisor.

WARNING

When servicing this equipment, performing maintenance, or disposing of materials such as lubricating oil, fuel, brake fluid, battery acids, batteries, and CARC paint, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

2. Ensure all fluids drained as a result of lubrication or maintenance are collected in a suitable container and disposed of IAW using unit's SOP. Clean up any spills immediately IAW spill containment plan.
3. Keep all lubricants in a closed container and store in a clean, dry place away from extreme heat. Keep container covers clean and do not allow dust, dirt, or other foreign material to mix with lubricants. Keep all lubrication equipment clean and ready for use.
4. Maintain a good record of all lubrication performed and report any problem noted during lubrication. Refer to DA Form 2404 or DA Form 5988-E *Equipment Inspection and Maintenance Worksheet* (WP 0124) to record and report any findings.

GENERAL LUBRICATION PROCEDURES - CONTINUED

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low-toxicity material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to do so may result in injury or death to personnel.

5. Keep all external parts of equipment not requiring lubrication free of lubricants. Before lubrication, wipe lubrication fittings with a Rag, wiping (Item 22, WP 0129) and Cleaning compound, solvent, Type III (Item 6, WP 0129). After lubrication, wipe off excess oil or grease to prevent accumulation of foreign matter.
6. Refer to FM 9-207, *Operation and Maintenance of Ordnance Materiel in Cold Weather* for lubrication instructions in cold weather.

NOTE

The 600 GPM Pump Assemblies are not enrolled in the Army Oil Analysis Program. HARDTIME INTERVALS apply.

7. For equipment under manufacturer's warranty, hardtime oil service intervals shall be followed. Intervals shall be shortened if lubricants are known to be contaminated or if operation is under adverse conditions (i.e., longer-than-usual operating hours, extended idling periods, or extreme dust).
8. Engine oil and fuel system filters should be changed when:
   a. they are known to be contaminated or clogged, or
   b. at prescribed hardtime intervals.

GENERAL LUBRICATION PROCEDURES - CONTINUED

- KEY-

LUBRICANT/ COMPONENT	REFILL CAPACITY	EXPECTED TEMPERATURES*			INTERVALS
		+40°F to -22°F (+4°C to -30°C)	+40°F to +5°F (+4°C to -15°C)		
OE/HDO: Lubricating Oil, ICE, Tactical Service (MIL-PRF-2104)					D - Daily W - Weekly M - Monthly H - Hours
OEA-30: Lubricating Oil, ICE, Tactical Service (MIL-PRF-46167)					
Engine Crankcase		OEA-30	OE/HDO-15/40		
Without Filter	12.68 qt (12 L)				
With Filter	13.74 qt (13 L)				
BFS: Brake Fluid, Silicone, Automotive (MIL-B-46176)					
Master Cylinder	As Required	All Temperatures			
GAA: Grease, Automotive and Artillery (MIL-PRF-10924)					
Wheel Bearings	As Required	All Temperatures			
NLG12: Grease, Multipurpose, High Temperature					
Suction/Discharge Manifold Gate Valves	As Required	All Temperatures			

* For arctic operation, refer to FM 9-207.

GENERAL LUBRICATION PROCEDURES - CONTINUED

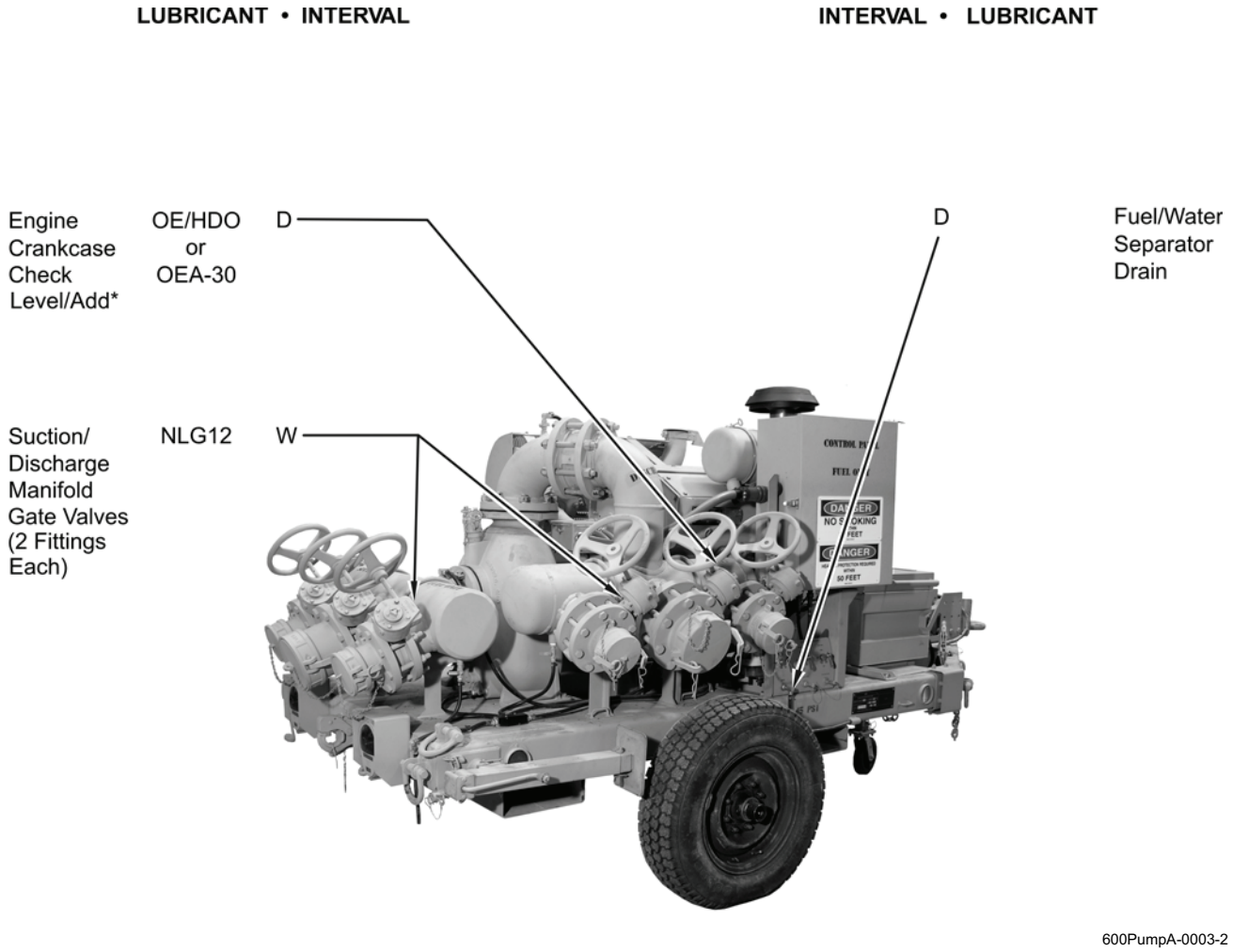


Figure 1. Operator PMCS - Daily and Weekly Lubrication Services.

*Check engine oil level twice each day during initial 50 to 150 hours of operation of a new or overhauled engine.

GENERAL LUBRICATION PROCEDURES - CONTINUED

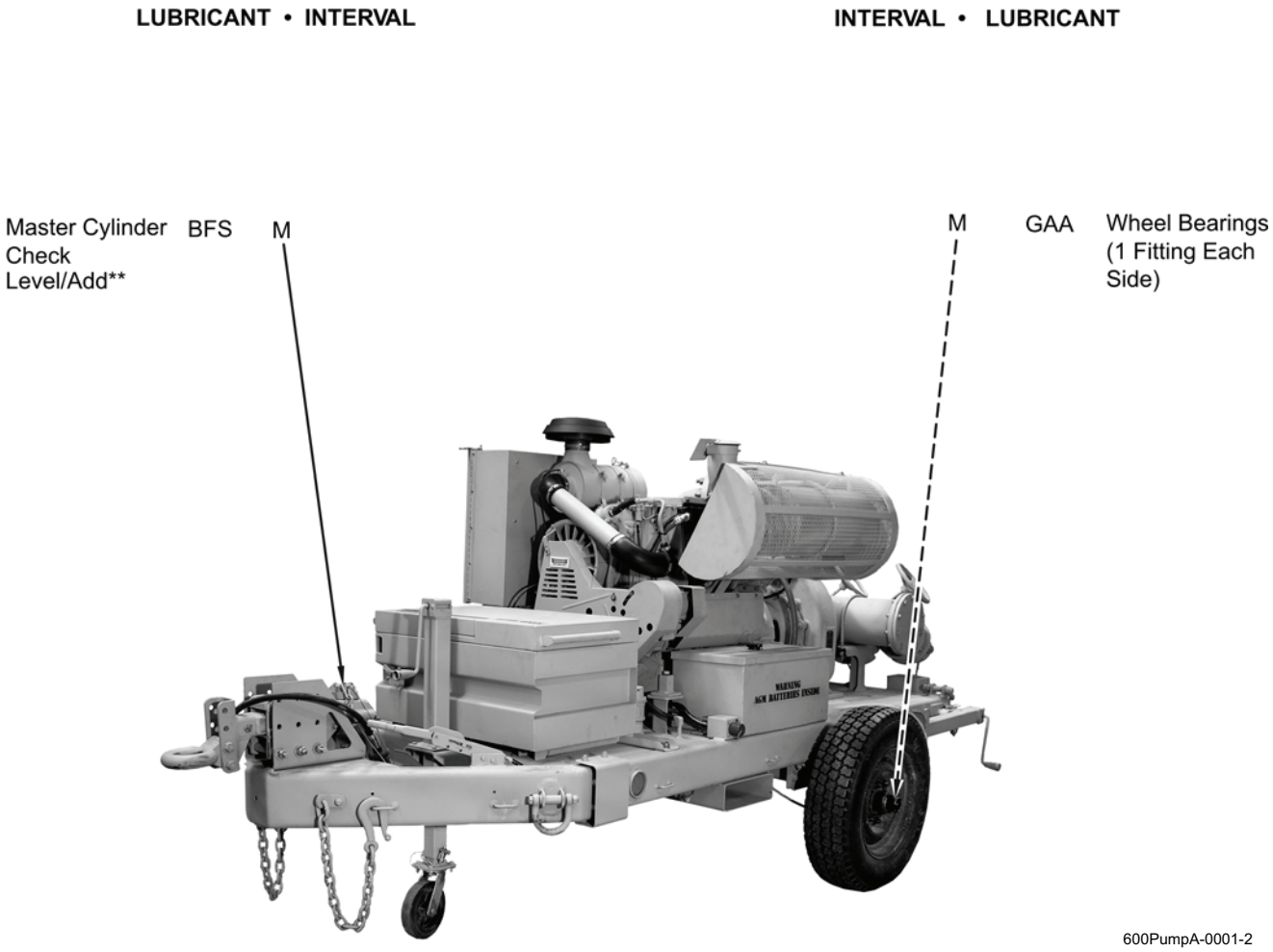


Figure 2. Operator PMCS - Monthly Lubrication Services.

**ALWAYS check brake fluid level before towing pump assembly.

END OF WORK PACKAGE

OPERATOR MAINTENANCE INSTRUCTIONS

OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS), INCLUDING LUBRICATION INSTRUCTIONS

INITIAL SETUP

Tools and Special Tools

Wrench, Adjustable, 12-1/2 in. long (Item 12, WP 0127)

Materials/Parts

Brake fluid, automotive, silicone (Item 4, WP 0129)

Cleaning compound, solvent, Type III (Item 6, WP 0129)

Detergent, general purpose, liquid (Item 9, WP 0129)

Diesel fuel, DF-1 (Item 10, WP 0129)

Diesel fuel, DF-2 (Item 11, WP 0129)

Grease, automotive and artillery, GAA (Item 14, WP 0129)

Materials/Parts - Continued

Grease, multipurpose, NLG12 (Item 15, WP 0129)

Oil, lubricating, OEA-30 (Item 18, WP 0129)

Oil, lubricating, OE/HDO-15/40 (Item 20, WP 0129)

Rag, wiping (Item 22, WP 0129)

Turbine fuel, aviation, JP-5 (Item 31, WP 0129)

Turbine fuel, aviation, JP-8 (Item 32, WP 0129)

Personnel Required

92F/W (1)

References

WP 0006

WP 0008

WP 0015

WP 0016

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
			NOTE • Review all WARNINGs, CAUTIONs, and NOTEs before performing PMCS on the 600 GPM Pump Assemblies. • If you are operating pump assembly for the first time, perform your *Weekly* and *Monthly* PMCS the first time you do your *Before* PMCS. • If performing *Weekly* PMCS and pump assembly has not been operated in a week, perform *Before* PMCS at the same time. • If performing *Monthly* PMCS and pump assembly has not been operated in a month, perform *After* PMCS at the same time. • Unless otherwise indicated, perform preventive maintenance and lubrication with pump assembly uncoupled from towing vehicle, parked on level ground, engine shut down, hand brakes applied, and wheels chocked. • Begin walkaround inspection at front left side of pump assembly and proceed in a counterclockwise direction.	
		FRONT AND LEFT SIDE		
1	Before	Overall View	a. Check for fluids/oil/fuel under pump assembly. If fluids/oils/fuel are found, identify source of leak.	Any fuel or brake fluid leaks are evident. Any other Class III leaks are evident.
			b. Check for signs of tampering, damage, and missing parts.	
2	Before	Drawbar Area	a. Ensure safety chains are present and in good condition.	Safety chains are missing or damaged.
			b. Ensure intervehicular electrical cable is present and in good condition.	Intervehicular electrical cable is damaged or missing.
			c. Ensure lunette ring is securely bolted to mounting bracket and shows no evidence of cracks or breaks.	Lunette ring is loose, cracked, or broken.
			d. Check for security of mounting of hydraulic brake actuator. Be alert for evidence of brake fluid leaks.	Mounting bolts and nuts are missing or loose. Any brake fluid leaks are evident.
			e. Inspect breakaway cable and lever for damage and missing parts. Ensure breakaway lever is in down position.	Cable or lever is damaged or missing.
3	Before	Front Leveling Jack Assembly	Check front leveling jack assembly for damage and missing parts. Ensure jack can be cranked up and down.	
4	Before	Hand Brake Lever	Ensure hand brake lever is securely mounted to frame and is in good condition. Ensure it can be applied and released. Adjust as needed (WP 0016) and apply hand brake lever.	

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
5	Before	Left-Side Electrical Components	a. Ensure battery box and cover are securely mounted and in good condition. b. Ensure NATO electrical receptacle and cables are in good condition and securely mounted.	
6	Before	Left-Side Wheel and Tire Assembly	a. Ensure wheel lug nuts are present, in good condition, and tight.	Two or more lug nuts are missing.
			NOTE Correct tire inflation is 45 PSI (310 kPa).	
			b. Inspect tire for cuts, gouges, cracks, bulges, and underinflation. Remove any penetrating object from tire tread.	Tire is damaged, missing, or unserviceable.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
7	Before	Pump Assembly	a. Ensure pump priming port locking camlock cover is installed with no evidence of leaks. b. Ensure manual air eliminator valve on discharge elbow of pump is closed.	FUEL PUMP ASSEMBLY. Any fuel leaks are evident. WATER PUMP ASSEMBLY. Class III water leaks are evident. Cover is missing or damaged so it will not close.

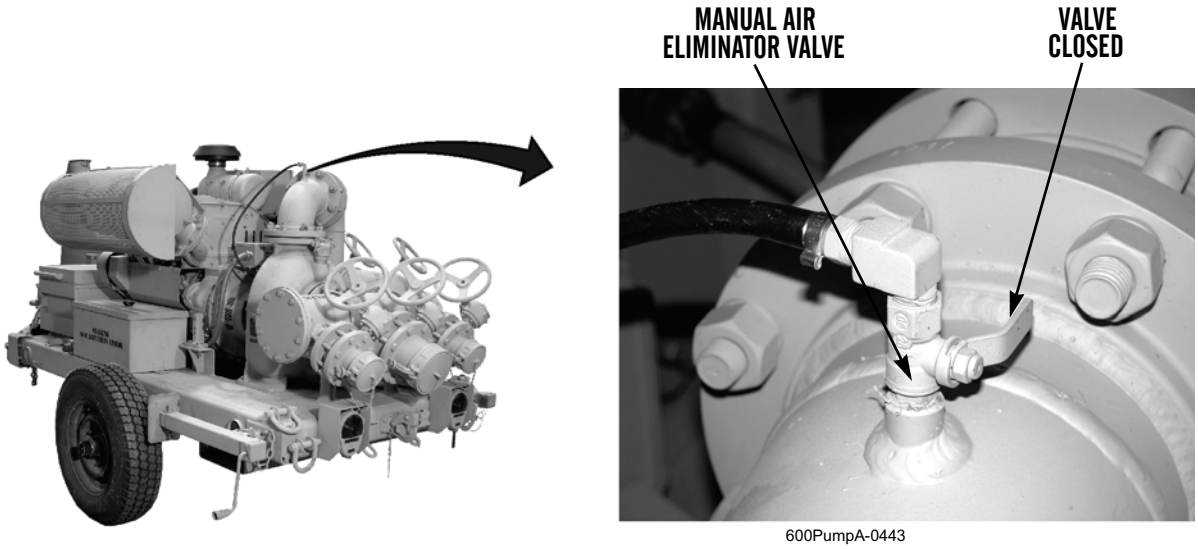


Figure 1. Manual Air Eliminator Valve.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
7 (Con't)	Before	Pump Assembly	c. Ensure suction manifold strainer endplate is present, in good condition, and securely installed. Be alert for evidence of leaks.	FUEL PUMP ASSEMBLY. Any fuel leaks are evident. WATER PUMP ASSEMBLY. Class III water leaks are evident. Endplate is missing, damaged, or mounting bolts are missing or damaged.

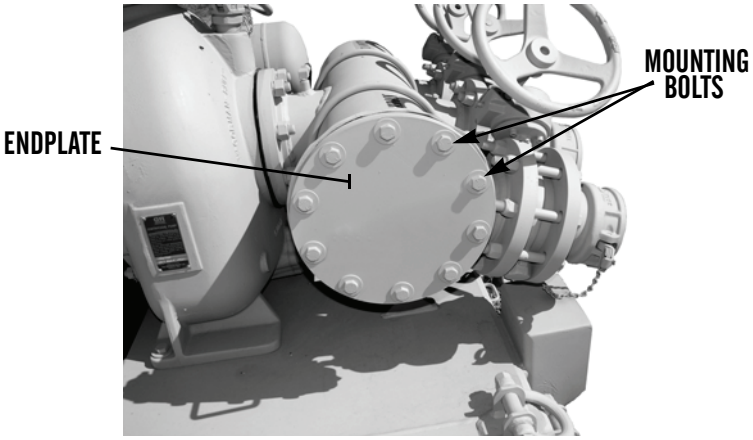


Figure 2. Suction Manifold Endplate.

		REAR AND RIGHT SIDE		
8	Before	Overall View	a. Check for fluids/oil/fuel under pump assembly. If fluids/oils/fuel are found, identify source of leak. b. Check for signs of tampering, damage, and missing parts.	Any fuel or brake fluid leaks are evident. Any other Class III leaks are evident.
9	Before	Suction Manifold Assembly	a. Ensure suction manifold assembly is securely mounted with no evidence of leaks. b. Ensure camlock plugs are installed on camlock flanges. Ensure tethered chains are present. c. Ensure gate valve(s) are in good condition with no missing parts. Ensure valve(s) are closed.	FUEL PUMP ASSEMBLY. Any fuel leaks are evident. WATER PUMP ASSEMBLY. Class III water leaks are evident. Valve(s) are damaged and will not open or close.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
			NOTE Operation of trailer lights must be checked before towing.	
10	Before	Trailer Lights	Ensure rear trailer lights are securely mounted and in good condition.	
11	Before	Rear Leveling Jack Assemblies	Check each rear leveling jack assembly for damage and missing parts. If in lowered position, ensure jack can be cranked up and down.	Damage that would impair operation is evident.
12	Before	Pump Assembly Drain Valves and Hoses	a. Ensure pump, suction manifold, and discharge manifold drain valves are in good condition with no evidence of leaks. Ensure drain valves are closed.	FUEL PUMP ASSEMBLY. Any fuel leaks are evident. WATER PUMP ASSEMBLY. Class III water leaks are evident. Drain valves do not function.
			b. Ensure manifold drain block is securely mounted and in good condition with no evidence of leaks.	FUEL PUMP ASSEMBLY. Any fuel leaks are evident. WATER PUMP ASSEMBLY. Class III water leaks are evident.
			c. Ensure drain hose is securely mounted to trailer chassis and is in good condition.	Drain hose is damaged or missing.

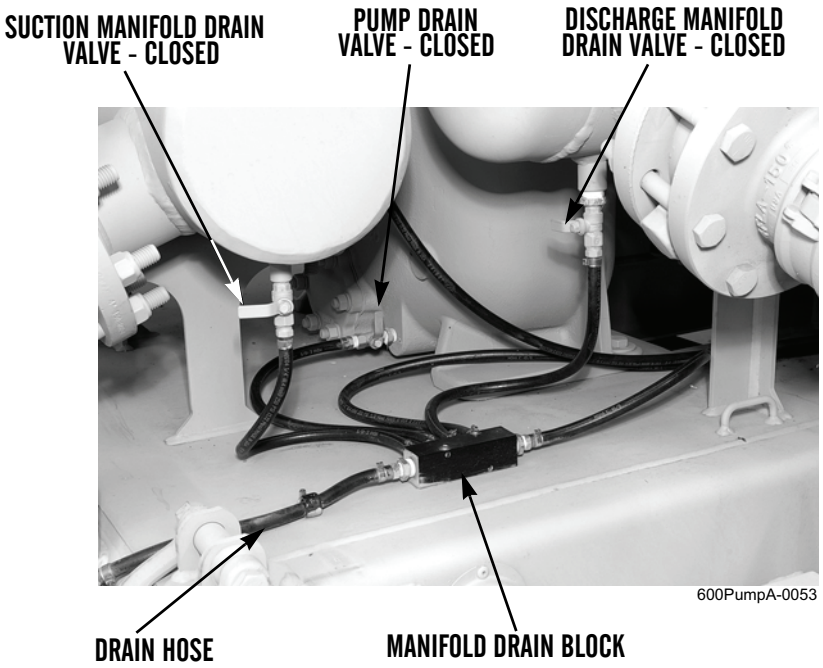


Figure 3. Drain Valves and Hoses.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
13	Before	Ground Rod	Ensure ground rod is present, in good condition, and securely stowed inside welded loops on right side of trailer frame.	Ground rod is damaged or missing.
14	Before	Discharge Manifold Assembly	a. Ensure discharge manifold assembly is securely mounted with no evidence of leaks.	FUEL PUMP ASSEMBLY. Any fuel leaks are evident. WATER PUMP ASSEMBLY. Class III water leaks are evident.
			b. Ensure gate valve(s) are in good condition with no missing parts. Ensure valve(s) are closed.	Valve(s) are damaged and will not open or close.
			c. FUEL PUMP ASSEMBLY. Ensure quick-disconnect coupler on discharge manifold body is in good condition and dust cap is installed on fitting.	

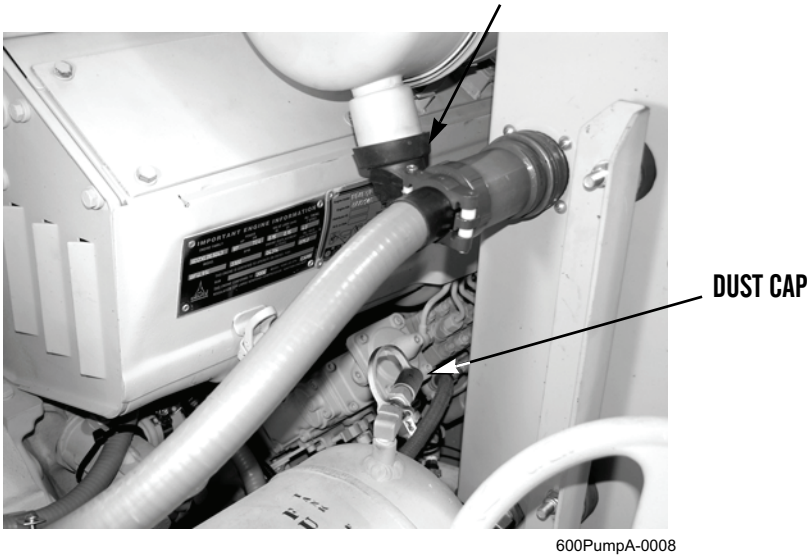


Figure 4. Quick-Disconnect Coupler at Discharge Manifold.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
15	Before	Right-Side Wheel and Tire Assembly	a. Ensure wheel lug nuts are present, in good condition, and tight.	Two or more lug nuts are missing.
			NOTE Correct tire inflation is 45 PSI (310 kPa).	
			b. Inspect tire for cuts, gouges, cracks, bulges, and underinflation. Remove any penetrating object from tire tread.	Tire is damaged, missing, or unserviceable.
16	Before	Engine Assembly	**CAUTION** Engine air cooling covers must be installed when engine is running to ensure engine is kept sufficiently cool during operation. Failure to follow this caution may cause engine overheating and damage to engine.	
			a. Ensure engine air cooling covers and air cleaner are securely mounted to engine.	Components are loose, damaged, or missing.
			b. Squeeze dust evacuator valve to evacuate any dirt or dust from air cleaner. If dust is expelled from valve, service engine air cleaner (WP 0015).	

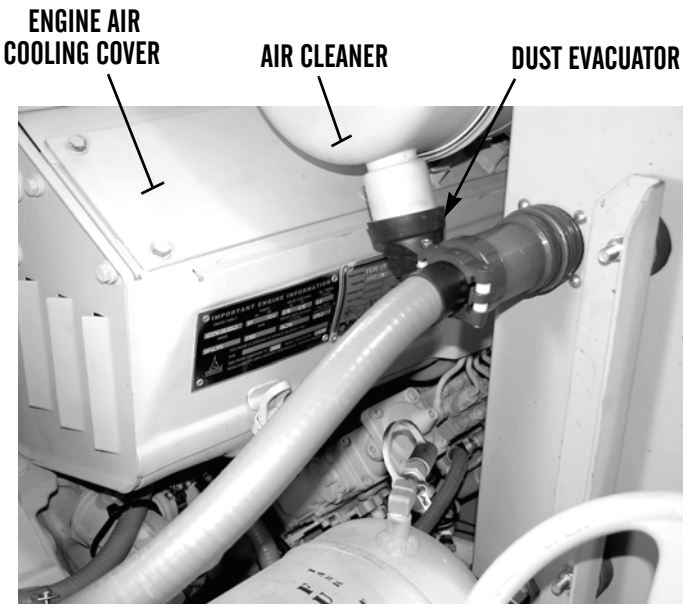


Figure 5. Dust Evacuator Valve.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
16 (Con't)	Before	Engine Assembly	**CAUTION** Cooling fan must not be obstructed by debris, to ensure adequate air flow to oil cooler. Failure to keep cooling fan free of debris may cause engine to overheat. c. Check for debris collecting in area of cooling fan. Remove debris to ensure cooling fan's air supply is not restricted.	

600Pump-0057

Figure 6. Cooling Fan.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
17	Before	Fuel Selector Valves Panel	a. Ensure return and suction valves are securely mounted with no evidence of leaks. Ensure AUX RETURN and AUX SUCTION fittings are capped and in good condition. b. Place return and suction valves in correct position for fuel source to be used when operating (WP 0006). c. Ensure fuel filter/water separator drain valve is closed.	Any fuel leaks are evident.

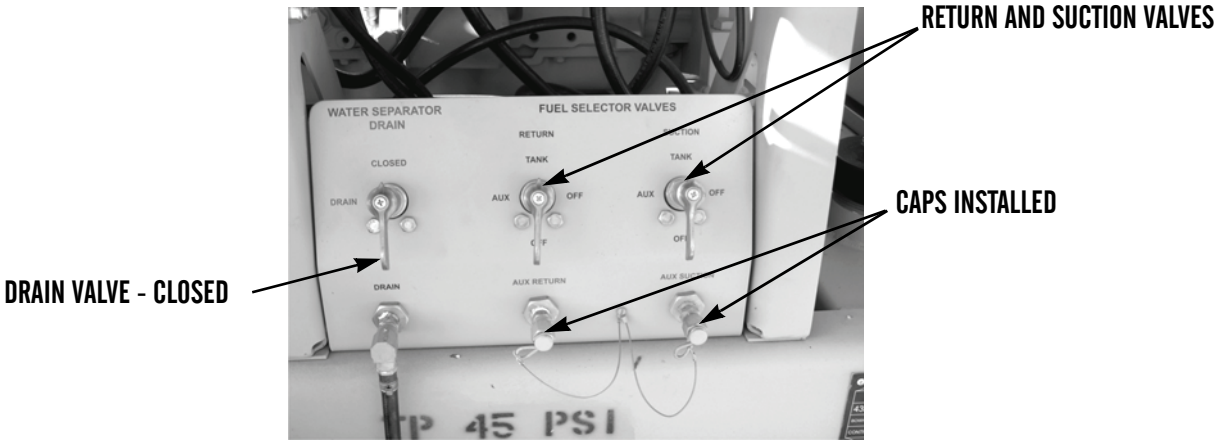


Figure 7. Fuel Selector Valves Panel.

18	Before	Fuel Tank	a. Inspect fuel tank and fittings for damage or leaks.	Any fuel leaks are evident.
			b. Ensure fuel tank filler cap is securely installed on fuel tank with no evidence of leaks.	Any fuel leaks are evident.
			c. Check gauge reading on filler cap to ensure there is adequate fuel for mission.	

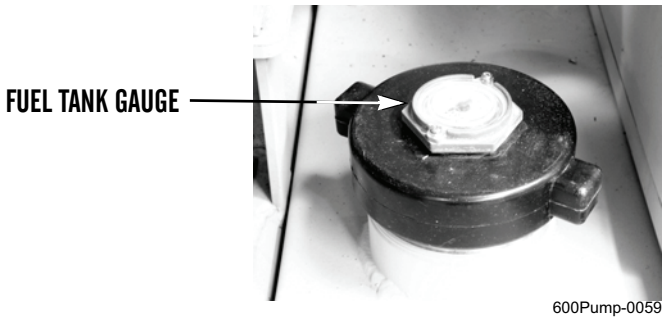


Figure 8. Fuel Tank Filler Cap.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
18 (Con't)	Before	Fuel Tank	 **WARNING** • DO NOT smoke or permit any open flame in area of pump assembly while you are servicing engine fuel system. Be sure hose nozzle is grounded against filler tube during refueling to prevent static electricity. Failure to follow this warning may result in injury or death to personnel, or damage to equipment. • Wear fuel-resistant gloves and eye protection when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. • ALWAYS ensure engine is shut down prior to refueling. **CAUTION** Ensure only clean fuel is used in engine fuel system. As required, use a strainer to prevent dirt, sand, or other contaminants from entering fuel system and causing damage. **NOTE** DO NOT let fuel tank run empty or air can enter fuel system. If this occurs, fuel system will need bleeding. Refer to *Starting Engine* (WP 0006). d. If fuel supply is low, remove filler cap and add fuel (Item 10, 11, 31, or 32, WP 0129) until gauge reads F (Full). DO NOT overfill.	

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

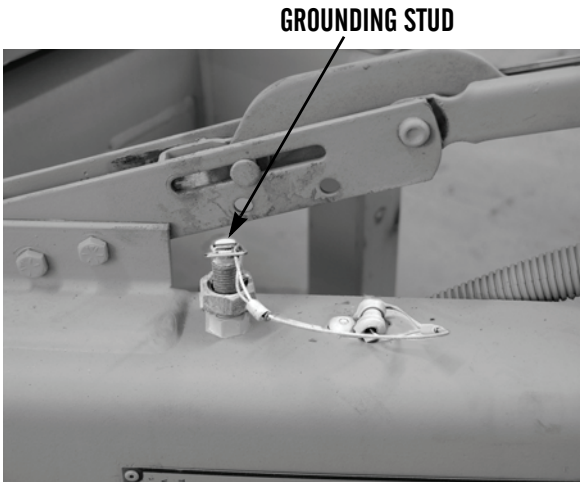
ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
19	Before	Chassis Grounding Stud	Ensure chassis grounding stud is present and securely installed on trailer frame. Ensure it is clean and free of paint.	
			 600PumpA-0060	
			Figure 9. Grounding Stud.	
20	Before	Storage Box	a. Inspect storage box for damage and security of mounting.	
			b. Open storage box and ensure all Basic Issue Items (BII) are present and in good condition (WP 0008). Close storage box.	Any BII required for mission are damaged or missing.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
21	Before	Engine Oil Level Check	**WARNING** • Contact with engine oil can damage skin. Wear gloves when handling engine oil. If oil contacts skin, wash it off immediately. Failure to follow this warning may cause injury to personnel. • Keep engine clean and free of accumulated dirt, grease, and trash. Failure to do so may cause a fire. **CAUTION** During break-in of a new pump assembly, for approximately 200 operating hours, engine oil level should be checked twice each day. Failure to do so could result in engine damage, if oil level should drop too low for optimum lubrication. a. Clean area around dipstick with a clean Rag, wiping (Item 22, WP 0129).	

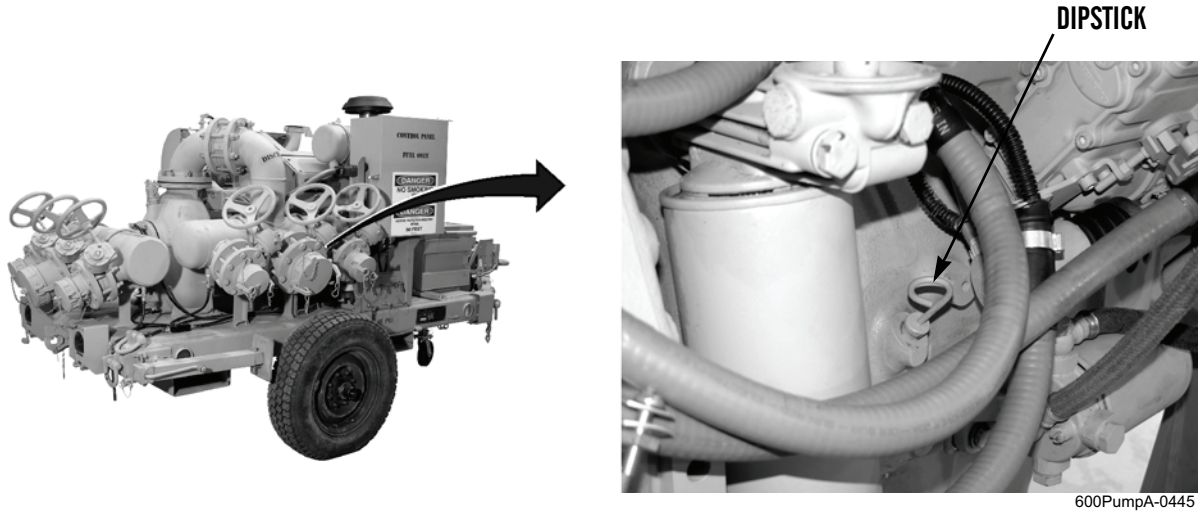


Figure 10. Engine Oil Level Dipstick.

			b. Remove dipstick from crankcase, wipe clean, and reinstall. c. Remove dipstick again. Check oil level on dipstick. d. Oil level should be visible between top (MAX) and bottom (MIN) lines at lower end of dipstick.	

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
21 (Con't)	Before	Engine Oil Level Check	e. If oil level is low, clean area around oil filler cap, located behind control panel at right-front of engine. Remove oil filler cap and add Oil, lubricating, OEA-30 (Item 18, WP 0129) or Oil, lubricating, OE/HDO-15/40 (Item 20, WP 0129) or to engine crankcase.	

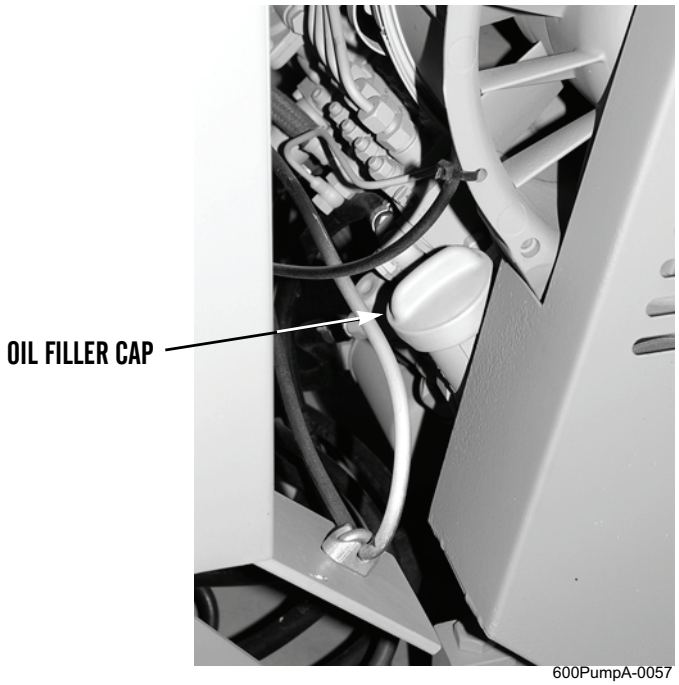


Figure 11. Engine Oil Filler Cap.

NOTE

It takes approximately five minutes for oil to drain down into oil pan.

f. If oil was added, wait five minutes, then recheck oil level on dipstick.

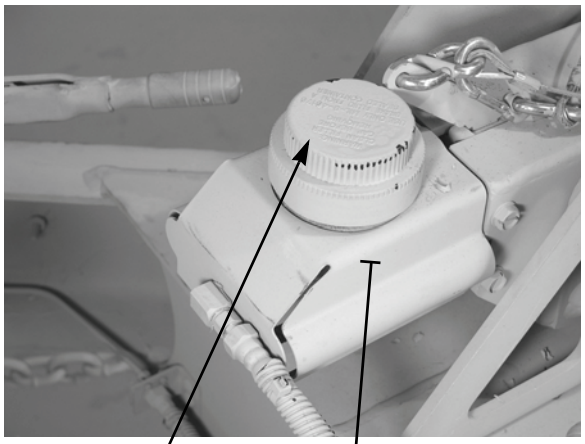
g. Reinstall oil filler cap when oil level is okay.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
22	Before	Brake Actuator Master Cylinder	  **WARNING**  • Wear gloves and eye protection when handling brake fluid. Work in a well-ventilated area. Exposure to brake fluid may cause irritation to eyes, skin, and lungs. If ingested, it can irritate mouth, esophagus, and stomach. Failure to exercise caution may result in injury to personnel. • When servicing this equipment, performing maintenance, or disposing of materials such as brake fluid, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance. **NOTE** Perform this service before operation only if pump assembly is to be towed.	
			a. Inspect master cylinder for damaged or missing cap and leaks.	Cap is damaged or missing. Any brake fluid leaks are evident.
			CAUTION Use caution to ensure dirt or debris does not enter master cylinder and contaminate hydraulic brake system.	

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
22 (Con't)	Before	Brake Actuator Master Cylinder	b. Use a clean Rag, wiping (Item 22, WP 0129) to clean master cylinder cap. c. Remove cap and check level of brake fluid in reservoir. Level should be 1/8 in. (0.32 cm) below top edge of reservoir. d. If level is low, add Brake fluid, automotive, silicone (Item 4, WP 0129) until level in reservoir is correct. e. Reinstall cap and tighten.	



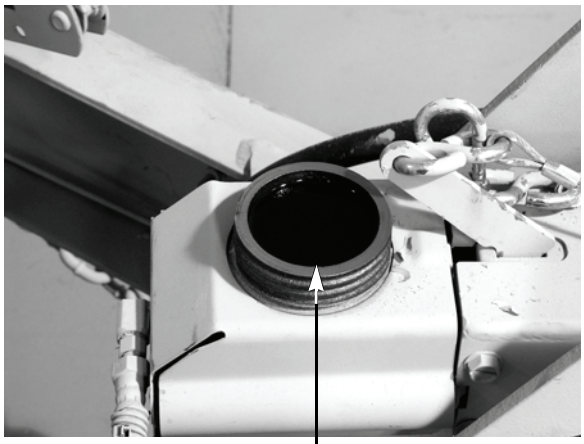
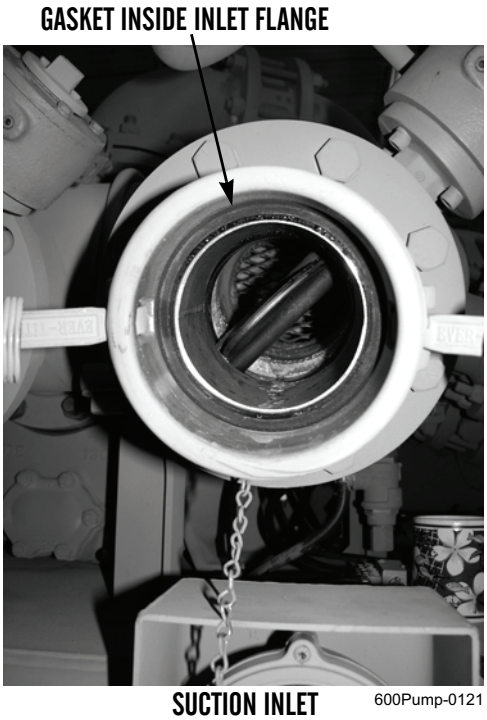


Figure 12. Master Cylinder.

23	Before	Control Panel	a. Open control panel door and secure in open position with latch. Inspect gauges for damage and cracked or broken glass. b. Ensure suction and pressure gauge drains are in GAUGE position. c. Ensure throttle control is fully pushed in and turned fully clockwise (right) to low idle position. d. Check air filter restriction indicator reading to ensure yellow band is in green zone on indicator. If indicator reads in RED zone, service air cleaner (WP 0015).	Any damage that would impair operation is evident.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
24	During	Pumping Operations	a. Monitor oil temperature gauge for evidence of engine overheating. Normal oil temperature while pumping should be 180 to 200°F (82.2 to 93.3°C).	
			b. Monitor oil pressure gauge. It should read 50 to 85 PSI (345 to 586 kPa) during normal pumping when engine is warm.	
			c. Monitor air filter restriction indicator (WP 0005). Ensure yellow band is in green zone on indicator. If yellow band rises to RED zone, shut down engine immediately and service air cleaner (WP 0015).	
			d. Monitor engine performance and be alert for engine fuel system leaks.	Any fuel leaks are evident.
			e. Monitor suction and discharge gate valves, fittings, and hose connections for proper operation and evidence of leaks. If leaks are evident, check for damage to gaskets at suction inlets and/or discharge outlets.	FUEL PUMP ASSEMBLY. Any fuel leaks are evident. WATER PUMP ASSEMBLY. Class III water leaks are evident. Valves do not open or close.



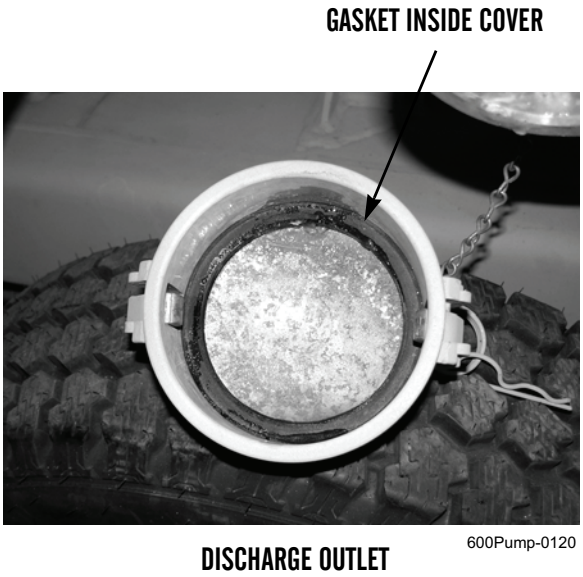


Figure 13. Suction Inlet/Discharge Outlet Gaskets.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
24 (Con't)	During	Pumping Operations	**CAUTION** Damage to pump can occur if suction pressure falls below 10 PSI (69 kPa) or discharge pressure rises above 150 PSI (1,034 kPa). **NOTE** Refer to Fuel or Water Performance Curve charts on inside of control panel door for guidance in making adjustments in engine RPM to affect flow of fluid.	
			f. Monitor suction and discharge gate valve positions, suction and pressure gauges, and engine RPM during pumping and make adjustments as needed (WP 0006).	
			g. Monitor engine fuel supply. Be alert for fuel leaks.	Any fuel leaks are evident.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
		FRONT AND LEFT SIDE		
			NOTE Begin walkaround inspection at front of pump assembly and proceed in a counterclockwise direction.	
25	After	Cleaning	Before performing walkaround inspection, thoroughly clean vehicle.	
26	After	Overall View	a. Check for fluids/oil/fuel under pump assembly. If fluids/oils/fuel are found, identify source of leak.	Any fuel or brake fluid leaks are evident. Any other Class III leaks are evident.
			b. Check for signs of tampering, damage, and missing parts.	
27	After	Drawbar Area	a. Ensure safety chains are present and in good condition.	Safety chains are missing or damaged.
			b. Ensure intervehicular electrical cable is present and in good condition.	Intervehicular electrical cable is damaged or missing.
			c. Ensure lunette ring is securely bolted to mounting bracket and shows no evidence of cracks or breaks.	Lunette ring is loose, cracked, or broken.
			d. Check for security of mounting of hydraulic brake actuator. Be alert for evidence of brake fluid leaks.	Mounting bolts and nuts are missing or loose. Any brake fluid leaks are evident.
			e. Inspect breakaway cable and lever for damage and missing parts. Ensure breakaway lever is in down position.	Cable or lever is damaged or missing.
28	After	Front Leveling Jack Assembly	Check front leveling jack assembly for damage and missing parts. Ensure jack can be cranked up and down.	
29	After	Hand Brake Lever	Ensure hand brake lever is securely mounted to frame and is in good condition. Ensure it can be applied and released. Adjust as needed (WP 0016) and apply hand brake lever.	
30	After	Fuel Tank	Inspect fuel tank and fittings for damage or leaks.	Any fuel leaks are evident.
31	After	Left-Side Trailer Frame	a. Ensure lifting/tiedown ring near front of trailer is securely mounted and in good condition.	
			b. Ensure lifting ring and tiedown ring at left-rear corner of trailer frame are securely mounted and in good condition.	

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
31 (Con't)	After	Left-Side Trailer Frame	c. Ensure amber reflector near front and red reflector near rear corner of frame are present and in good condition. Wipe reflectors clean, as required. d. Inspect front and rear forklift pockets for cracks, bends, broken welds, or other damage.	
32	After	Left-Side Electrical Components	a. Ensure battery box and battery box lid are securely mounted and in good condition. b. Ensure NATO electrical receptacle and cables are in good condition and securely mounted. c. Inspect lower access plate and engine/control panel wiring harness to ensure there is no looseness or damage.	

Figure 14. Left-Side Electrical Components.

33	After	Left-Side Wheel and Tire Assembly	a. Ensure wheel lug nuts are present, in good condition, and tight.	Two or more lug nuts are missing.
			NOTE Correct tire inflation is 45 PSI (310 kPa).	
			b. Ensure tire is not underinflated or leaking. Inspect tire for cuts, gouges, cracks, and bulges. Remove any penetrating object from tire tread.	Tire is damaged, missing, or unserviceable.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
34	After	Engine and Pump Assembly	a. Ensure engine covers, air intake tube, muffler, turbocharger, and other components are securely mounted to engine.	Components are loose, damaged, or missing.
			b. Ensure engine and pump are securely mounted to trailer.	Engine and pump assembly mounting is loose.
			c. Ensure pump priming port locking camlock cover is installed with no evidence of leaks.	FUEL PUMP ASSEMBLY. Any fuel leaks are evident. WATER PUMP ASSEMBLY. Class III water leaks are evident. Cover is missing or damaged so it will not close.
			d. Ensure manual air eliminator valve on discharge elbow of pump is closed.	
			e. Ensure suction manifold strainer endplate is present, in good condition, and securely installed. Be alert for evidence of leaks.	FUEL PUMP ASSEMBLY. Any fuel leaks are evident. WATER PUMP ASSEMBLY. Class III water leaks are evident. Endplate is missing, damaged, or mounting bolts are missing or damaged.
		REAR AND RIGHT SIDE		
35	After	Overall View	a. Check for fluids/oil/fuel under pump assembly. If fluids/oils/fuel are found, identify source of leak.	Any fuel or brake fluid leaks are evident. Any other Class III leaks are evident.
			b. Check for signs of tampering, damage, and missing parts.	
36	After	Suction Manifold Assembly	a. Ensure suction manifold assembly is securely mounted with no evidence of leaks.	FUEL PUMP ASSEMBLY. Any fuel leaks are evident. WATER PUMP ASSEMBLY. Class III water leaks are evident.
			b. Ensure camlock plugs are installed on camlock flanges. Ensure tethered chains are present.	
			c. Ensure gate valve(s) are in good condition with no missing parts. Ensure valve(s) are closed.	Valve(s) are damaged and will not open or close.
37	After	Trailer Taillights	Ensure trailer taillights are securely mounted and in good condition.	

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
38	After	Rear Leveling Jack Assemblies	Check each rear leveling jack assembly for damage and missing parts. If in lowered position, ensure jack can be cranked up and down.	
39	After	Pump Assembly Drain Valves and Hoses	a. Ensure pump, suction manifold, and discharge manifold drain valves are in good condition with no evidence of leaks. Ensure valves are closed.	FUEL PUMP ASSEMBLY. Any fuel leaks are evident. WATER PUMP ASSEMBLY. Class III water leaks are evident. Drain valves do not function.
			b. Ensure manifold drain block is securely mounted and in good condition with no evidence of leaks.	FUEL PUMP ASSEMBLY. Any fuel leaks are evident. WATER PUMP ASSEMBLY. Class III water leaks are evident.
			c. Ensure drain hose is securely mounted to trailer chassis and is in good condition.	Drain hose is damaged or missing.
40	After	Ground Rod	Ensure ground rod is present, in good condition, and securely stowed inside welded loops on right side of trailer frame.	Ground rod is damaged or missing.
41	After	Discharge Manifold Assembly	a. Ensure discharge manifold assembly is securely mounted with no evidence of leaks.	FUEL PUMP ASSEMBLY. Any fuel leaks are evident. WATER PUMP ASSEMBLY. Class III water leaks are evident.
			b. Ensure camlock caps are installed on camlock flanges. Ensure tethered chains are present.	
			c. Ensure gate valve(s) are in good condition with no missing parts. Ensure valve(s) are closed.	Valve(s) are damaged and will not open or close.
			d. FUEL PUMP ASSEMBLY ONLY. Ensure quick-disconnect fitting on discharge manifold body is in good condition and dust cap is installed on fitting.	
42	After	Right-Side Wheel and Tire Assembly	a. Ensure wheel lug nuts are present, in good condition, and tight.	Two or more lug nuts are missing.
			NOTE Correct tire inflation is 45 PSI (310 kPa).	
			b. Ensure tire is not under inflated or leaking. Inspect tire for cuts, gouges, cracks, and bulges. Remove any penetrating object from tire tread.	Tire is damaged, missing, or unserviceable.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
43	After	Engine Assembly	**CAUTION** Engine air cooling covers must be installed when engine is running, to ensure engine is kept sufficiently cool during operation. Failure to follow this caution may cause engine overheating and damage to engine.	
			a. Ensure engine air cooling covers and air cleaner are securely mounted to engine.	Components are loose, damaged, or missing.
			b. Inspect mounting of engine/control panel wiring harness to bracket at pump intermediate housing. Ensure conduits that provide electromagnetic interference (EMI) protection to wiring harness are not cracked, loose, or damaged.	

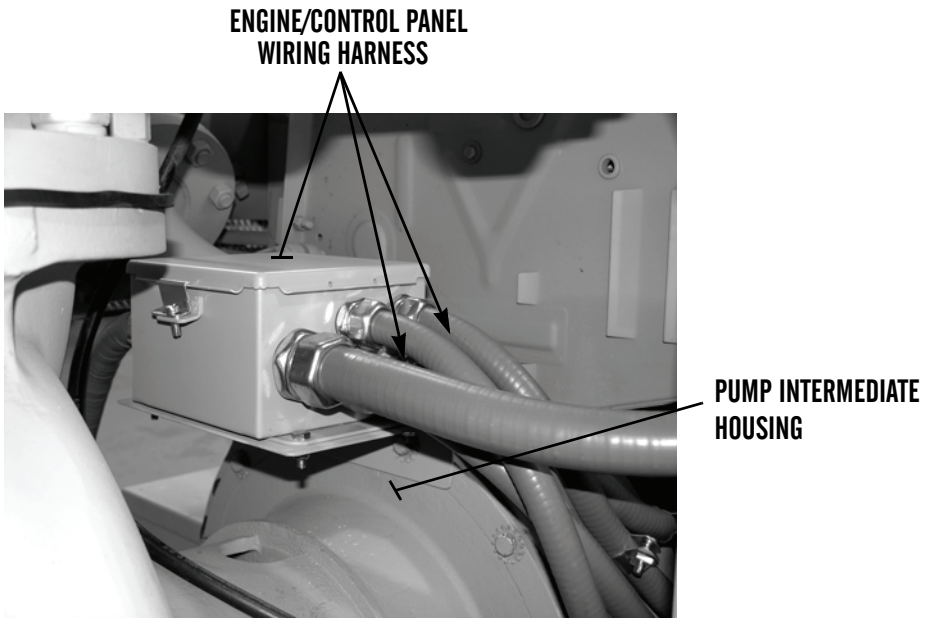
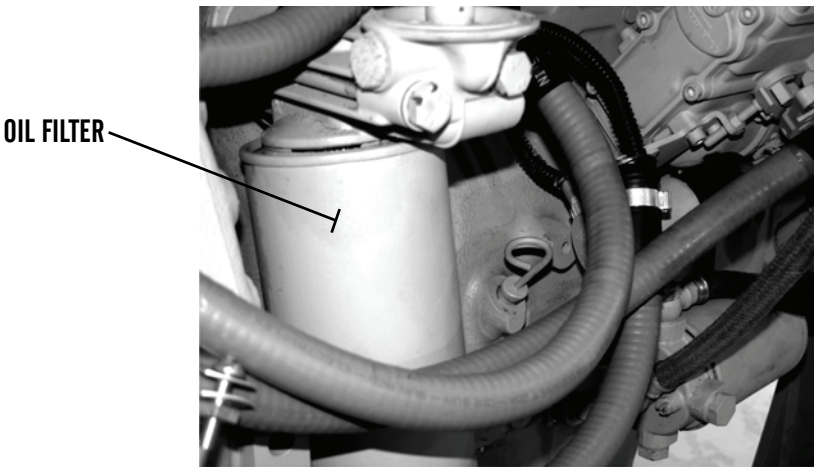


Figure 15. Engine/Control Panel Wiring Harness.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
43 (Con't)	After	Engine Assembly	c. Squeeze dust evacuator valve to evacuate any dirt or dust from air cleaner. If dust is expelled from valve, service engine air cleaner (WP 0015).	
			CAUTION Cooling fan must not be obstructed by debris, to ensure adequate air flow to oil cooler. Failure to keep cooling fan free of debris may cause engine to overheat.	
			d. Check for debris collecting in area of cooling fan. Remove debris to ensure cooling fan's air supply is not restricted.	
			e. Inspect area around oil filter to ensure there are no leaks.	Class III oil leaks are evident.



600PumpA-0013

Figure 16. Engine Oil Filter.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
44	After	Fuel Filters	**WARNING** • DO NOT perform fuel system checks, inspections or maintenance while smoking or near fire, flames or sparks. Fuel may ignite, causing damage to equipment and injury or death to personnel. • Wear fuel-resistant gloves and eye protection when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. Failure to follow this warning may result in injury to personnel. • When servicing this equipment, performing maintenance, or disposing of materials such as fuel, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.	
			a. Inspect stage II and III fuel filters for evidence of damage or leaks.	Any fuel leaks are evident.

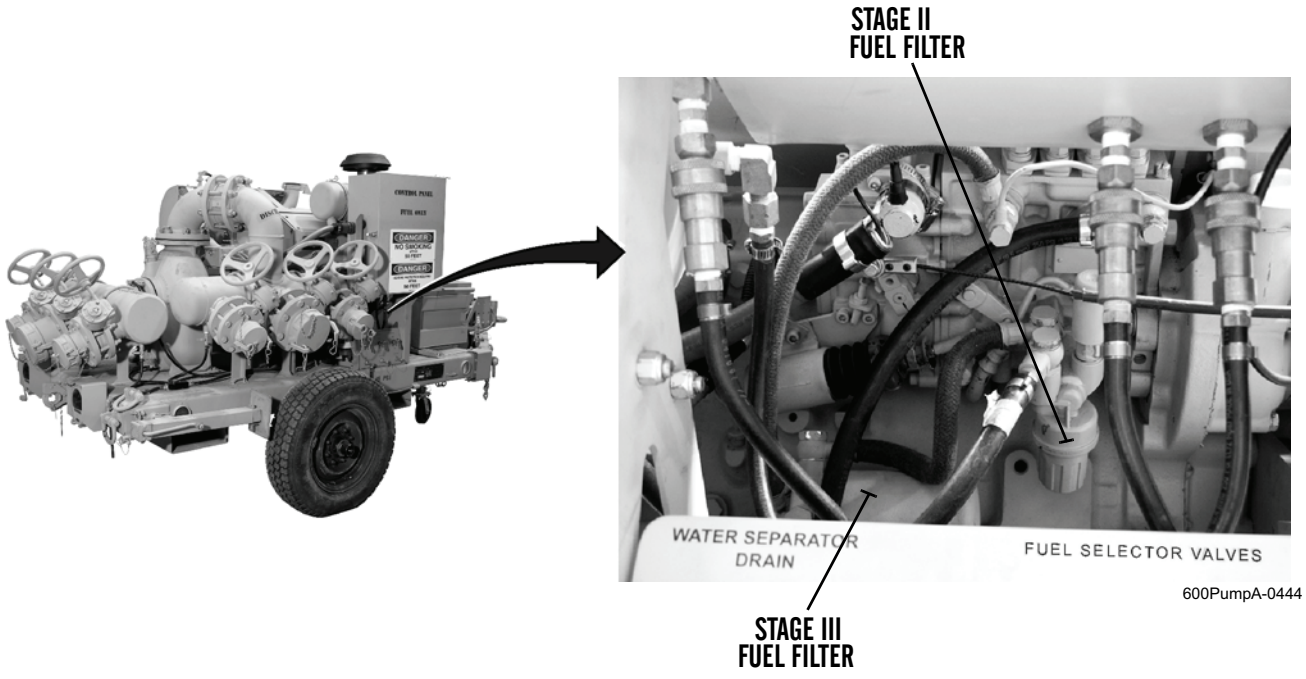


Figure 17. Stage II and III Fuel Filters.

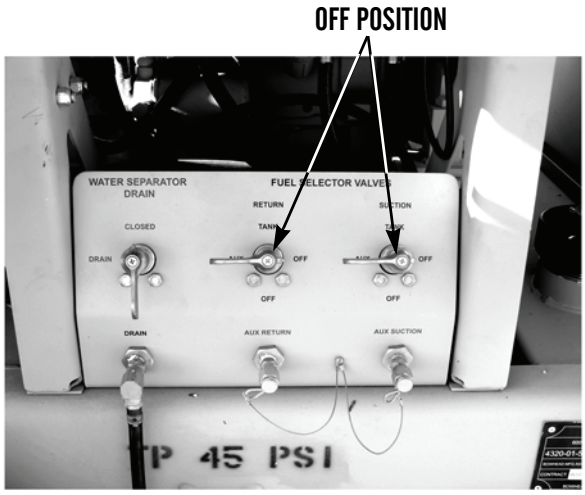
Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
44 (Con't)	After	Fuel Filters	b. If liquid or sediment is visible in sediment bowl, drain fuel/water separator:	

NOTE

- A suitable container should be placed under drain hose to capture draining liquid and sediment. Dispose of liquid and sediment IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.
- Perform the following steps if liquid or sediment are visible in sediment bowl:

1. Turn fuel selector valves to OFF position.



600Pump-0006

Figure 18. Fuel Selector Valves - OFF Position.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
44 (Con't)	After	Fuel Filters	2. Place a suitable container under drain hose. 3. Move fuel/water separator drain valve to DRAIN position and allow liquid and sediment bowl to drain. 4. Move fuel/water separator drain valve to CLOSED position. 5. Dispose of collected liquid and sediment IAW using unit's SOP. 6. Return fuel selector valves to original position.	

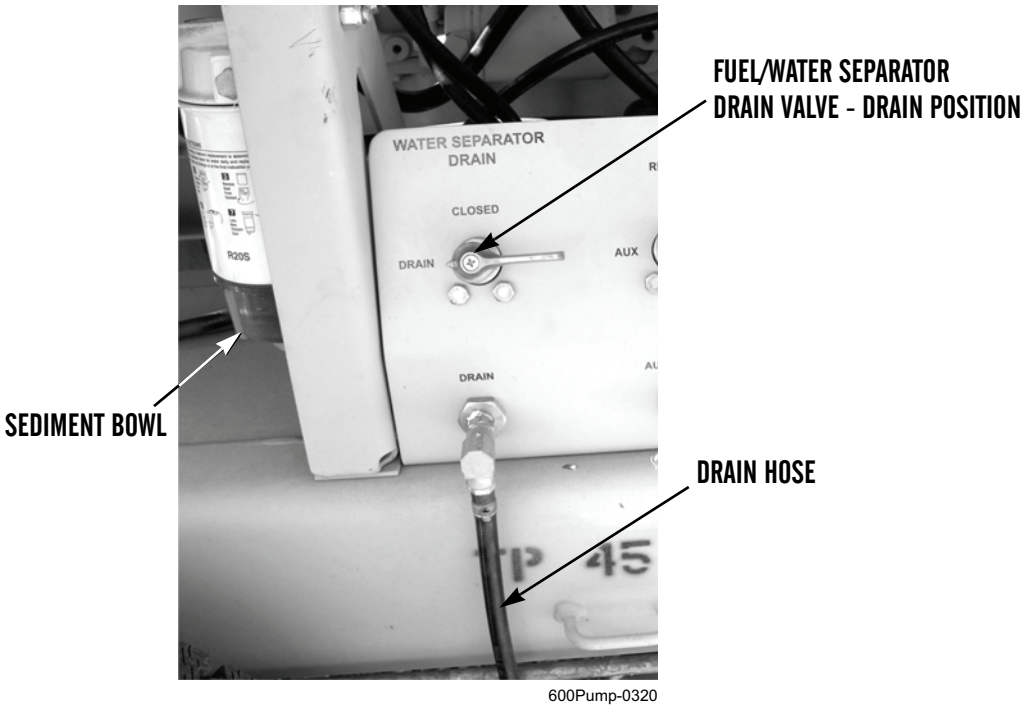


Figure 19. Fuel/Water Separator Drain.

45	After	Fuel Selector Valves Panel	a. Ensure return and suction valves are securely mounted with no evidence of leaks. Ensure AUX RETURN and AUX SUCTION fittings are capped and in good condition.	Any fuel leaks are evident.
			b. Inspect fuel lines for damage or leaks.	Any fuel leaks are evident.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
46	After	Fuel Tank	a. Inspect fuel tank and fittings for damage or leaks.	Any fuel leaks are evident.
			b. Ensure fuel tank filler cap is securely installed on fuel tank with no evidence of leaks.	Any fuel leaks are evident.
			c. Check gauge reading on filler cap to ensure there is adequate fuel for next mission.	
			  **WARNING**  • DO NOT smoke or permit any open flame in area of pump assembly while you are servicing fuel system. Be sure hose nozzle is grounded against filler tube during refueling to prevent static electricity. Failure to follow this warning may result in injury or death to personnel, or damage to equipment. • Wear fuel-resistant gloves and eye protection when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. • ALWAYS stop engine prior to refueling.	
			CAUTION Ensure only clean fuel is used in engine fuel system. As required, use a strainer to prevent dirt, sand, or other contaminants from entering fuel system and causing damage.	
			NOTE DO NOT let fuel tank run empty or air can enter fuel system. If this occurs, fuel system will need bleeding. Refer to *Starting Engine* in WP 0006.	
			d. If fuel supply is low, remove filler cap and add fuel (Item 10, 11, 31, or 32 (WP 0132) until gauge reads F (Full). DO NOT overfill.	

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
47	After	Right-Side Trailer Frame	a. Ensure lifting/tiedown ring near front of trailer is securely mounted and in good condition. b. Ensure lifting ring and tiedown ring at right-rear corner of trailer frame are securely mounted and in good condition. c. Ensure amber reflector near front and red reflector near rear corner of frame are present and in good condition. Wipe reflectors clean, as required. d. Inspect front and rear forklift pockets for cracks, bends, broken welds, or other damage. e. Ensure chassis grounding stud is present and securely installed on trailer frame. Ensure it is clean and free of paint.	
48	After	Storage Box	a. Inspect storage box for damage and security of mounting. b. Open storage box and check that all Basic Issue Items (BII) are present and in good condition (WP 0008). Close storage box.	Any BII required for mission are damaged or missing.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
49	After	Engine Oil Level Check	**WARNING** • Contact with engine oil can damage skin. Wear gloves when handling engine oil. If oil contacts skin, wash it off immediately. Failure to follow this warning may cause injury to personnel. • Keep engine clean and free of accumulated dirt, grease, and trash. Failure to do so may cause a fire. a. Clean area around dipstick with a clean Rag, wiping (Item 22, WP 0129).	

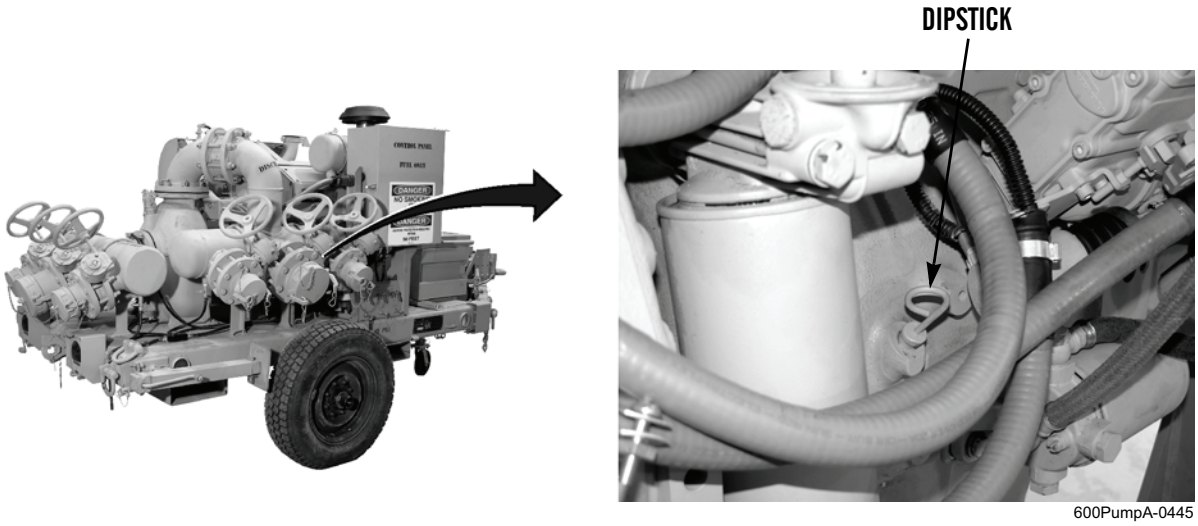


Figure 20. Engine Oil Level Dipstick.

			b. Remove dipstick from crankcase, wipe clean, and reinstall. c. Remove dipstick again. Check oil level on dipstick. d. Oil level should be visible between top (MAX) and bottom (MIN) lines at lower end of dipstick.	

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
49 (Con't)	After	Engine Oil Level Check	e. If oil level is low, clean area around oil filler cap. Remove oil filler cap and add Oil, lubricating, OEA-30 (Item 18, WP 0129) or Oil, lubricating, OE/HDO-15/40 (Item 20, WP 0129) to engine crankcase.	

Figure 21. Engine Oil Filler Cap.

NOTE

It takes approximately five minutes for oil to drain down into oil pan.

f. If oil was added, wait five minutes, then recheck oil level on dipstick.

g. Reinstall oil filler cap when oil level is okay.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

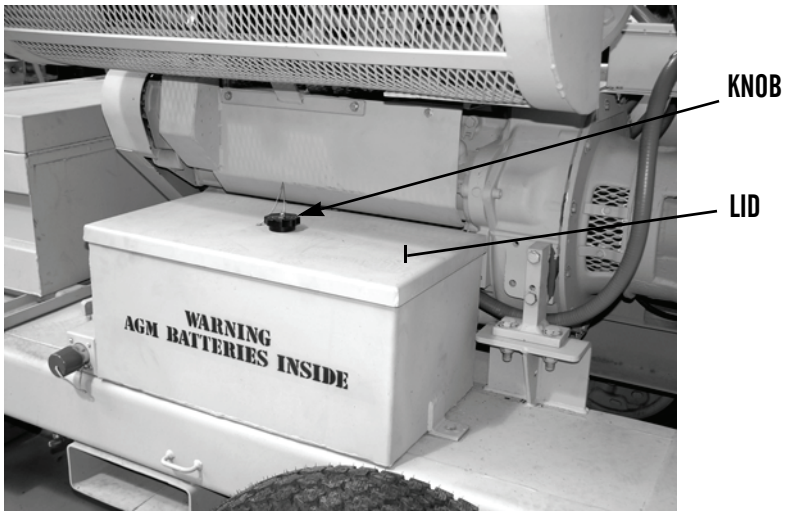
ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
50	After	Control Panel	a. Open control panel door and secure in open position with latch. Inspect gauges for damage or cracked or broken glass.	Any damage that would impair operation is evident.
			b. Check wiring harness, engine throttle cable, air filter restriction indicator hose, and fuel hose connections to control panel for looseness or damage. Tighten any that are loose. Be alert for fuel leaks.	Damage that would impair operation is evident. Any fuel leaks are evident.
			c. Ensure throttle control is fully pushed in and turned fully clockwise (right) to low idle position.	
			d. Check air filter restriction indicator reading to ensure yellow band is in green zone on indicator. If indicator reads in RED zone, service air cleaner (WP 0015).	
51	After	Water Pump Assembly	Drain pump system (WP 0006).	

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
		ENGINE BREAK-IN MAINTEN-ANCE		
52	Initial 50 to 150 Hours	Engine Assembly	**NOTE** The following break-in maintenance should be performed on any new or overhauled engine.	
			a. Have Field Maintenance perform these tasks: 1. Change engine oil and replace oil filter. 2. Replace stage III (secondary) fuel filter. 3. Check tension of V-belts. 4. Check and adjust valve clearance. 5. Inspect engine and pump mounts and tighten as required.	
			CAUTION Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.	
			b. Start engine (WP 0006). Check for proper operation and leaks.	Class III oil leaks or any fuel leaks are evident.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
53	Weekly	Batteries	 • To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. DO NOT smoke, use open flame, make sparks, or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury to personnel. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating or electrical shock, damage to equipment, and injury to personnel. • Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes, or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these procedures may result in injury or death to personnel. • CALIFORNIA PROPOSITION 65 WARNING: Battery posts, terminals, and related accessories contain lead and lead components. These chemicals are known to the state of California to cause cancer and reproductive harm. Wash hands after handling. a. Turn knob counterclockwise (left) and remove knob and battery box lid.	



600PumpA-0047

Figure 22. Battery Box.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
53 (Con't)	Weekly	Batteries	b. Inspect batteries, battery cables, and holddown. Ensure holddown and cable connections are tight and batteries are clean and dry. If cable connections are loose, tighten with Wrench, Adjustable, 12-1/2 in. long (Item 12, WP 0127).	

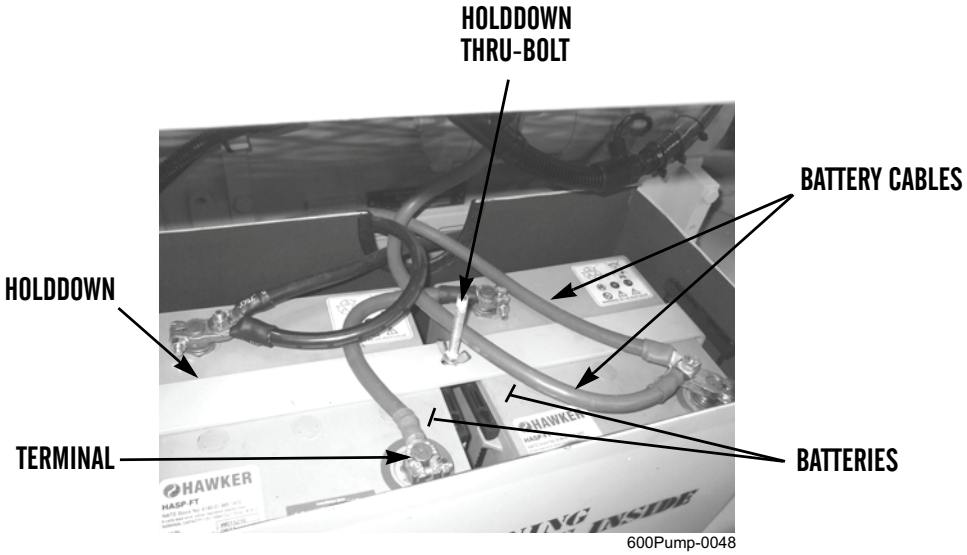


Figure 23. Batteries and Battery Cables.

			c. Position lid over holddown thru-bolt. Install knob and turn clockwise (right) to secure lid tightly.	

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
54	Weekly	Pump Priming Port and Suction/Discharge Camlock Plugs and Covers	Remove camlock covers and plugs. Inspect for cleanliness, chips, cracks, defective cam arms, and defective gaskets. Clean as required or replace cover, plug, or gasket if defective.	

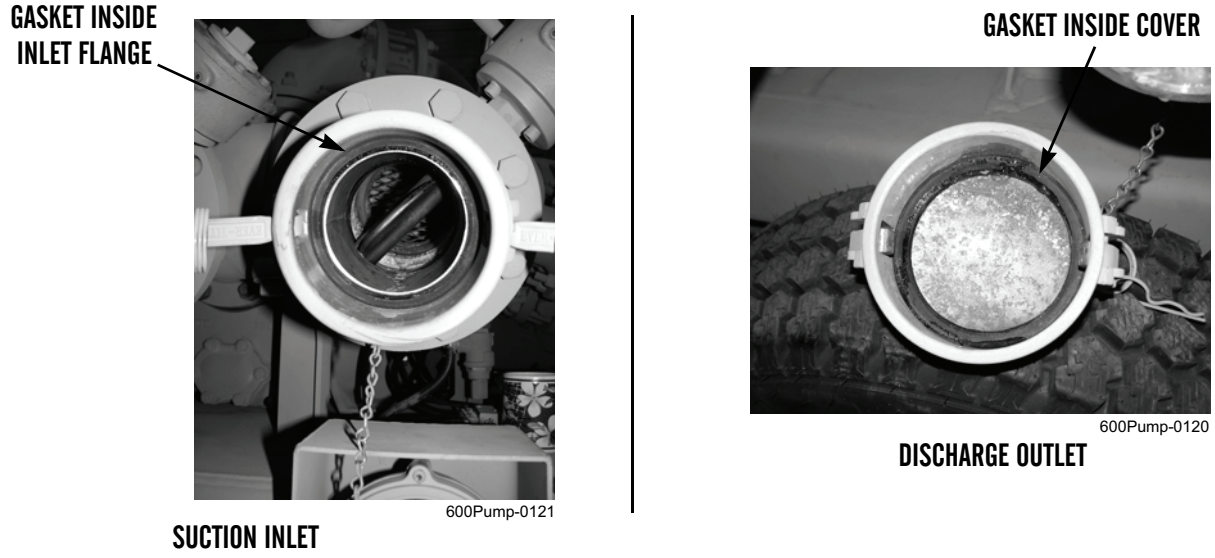


Figure 24. Suction Inlet/Discharge Outlet Gaskets.

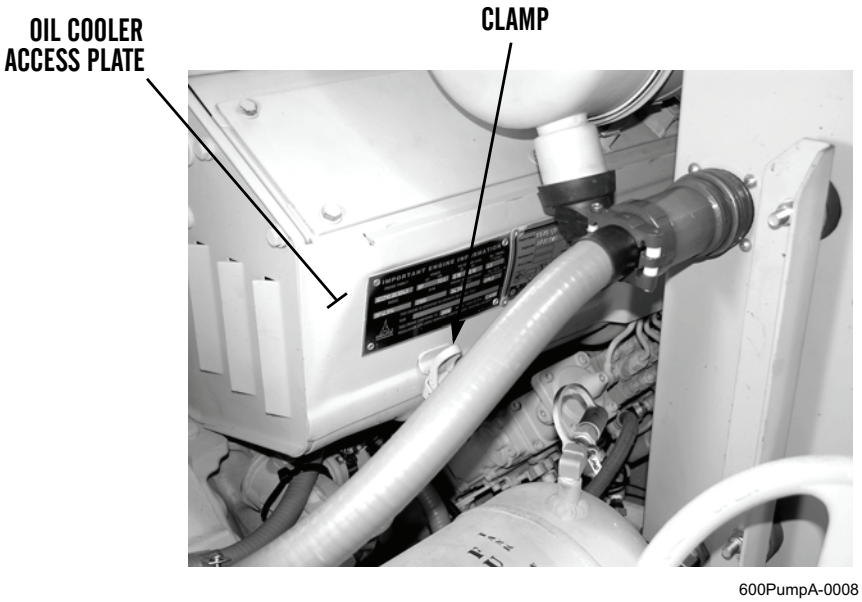
55	Weekly	Trailer Frame	a. Inspect frame for cracks, breaks, or bends. Inspect welds for cracks or breaks.	Damage that would impair operation is evident.
			b. Inspect frame for missing or broken huck bolts, rivets, bracket mounting bolts, and other mounting hardware.	Damage that would impair operation is evident.
56	Weekly	Axle Assembly	Inspect axle for cracks, breaks, bends, or loose, damaged, or missing mounting bolts.	Damage that would impair operation is evident.
57	Weekly	Wheel and Tire Assembly	a. Check lug nuts to ensure they are not missing, damaged, or loose. If any are loose, tighten. Notify Field Maintenance to apply correct torque: 125 lb-ft (169 Nm).	Two or more lug nuts are missing.
			NOTE Correct tire inflation is 45 PSI (310 kPa).	
			b. Check tire inflation pressure and adjust as required.	
			c. Inspect tire for cuts, gouges, cracks, and bulges. Remove any penetrating object from tire tread.	Tire is damaged, missing, or unserviceable.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
58	Weekly	Taillights, Reflectors, and Wiring	a. Inspect taillights for missing or broken parts and loose or damaged wires or connectors. Tighten loose connections.	
			b. Where accessible, inspect trailer wiring harness for exposed, frayed, or damaged wiring or missing mounting hardware.	Damage that would impair operation is evident.
			c. Inspect intervehicular electrical cable for exposed, frayed, or damaged wiring or damaged connector plugs.	Damage that would impair operation is evident.
59	Weekly	Hydraulic Brake Actuator Assembly	Inspect brake lines and hoses for missing clamps, cracks, leaks, loose connections, or broken lines.	Any brake fluid leaks are evident.
60	Weekly	Engine Air Cleaner	 **WARNING**  If NBC exposure is suspected, personnel wearing protective equipment must handle all air cleaner media. Contaminated filters must be handled using adequate precautions and must be disposed of by trained personnel. Consult your NBC Officer or NBC NCO for appropriate handling or disposal procedures. Failure to follow this warning may cause injury or death to personnel.	
			Service engine air cleaner (WP 0015).	

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
61	Weekly	Engine Oil Cooler Housing	a. Release two clamps and remove oil cooler access plate.	



600PumpA-0008

Figure 25. Oil Cooler Access Plate.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
61 (Con't)	Weekly	Engine Oil Cooler Housing	b. Clean out any debris and wipe out any dust or sediment.	

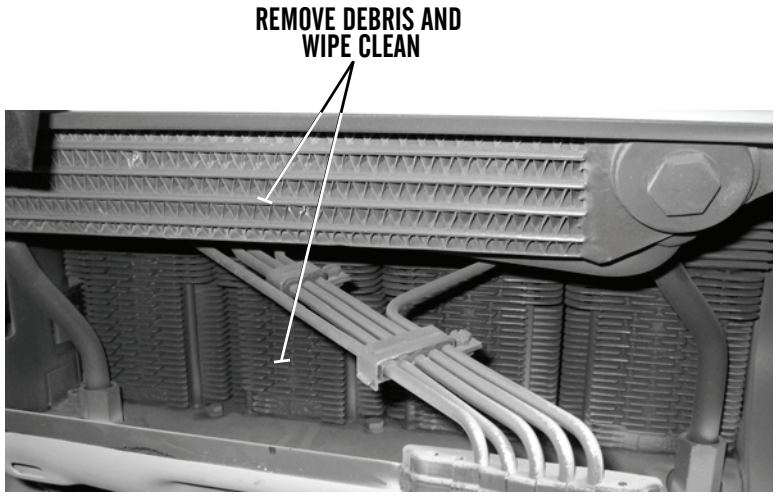


Figure 26. Engine Oil Cooler Housing.

			c. Reinstall access plate and secure with two clamps.	
62	Weekly	Suction and Discharge Gate Valves	Apply Grease, multipurpose, NLG12 (Item 15, WP 0129) to two grease fittings on each valve. There are a total of 12 grease fittings.	

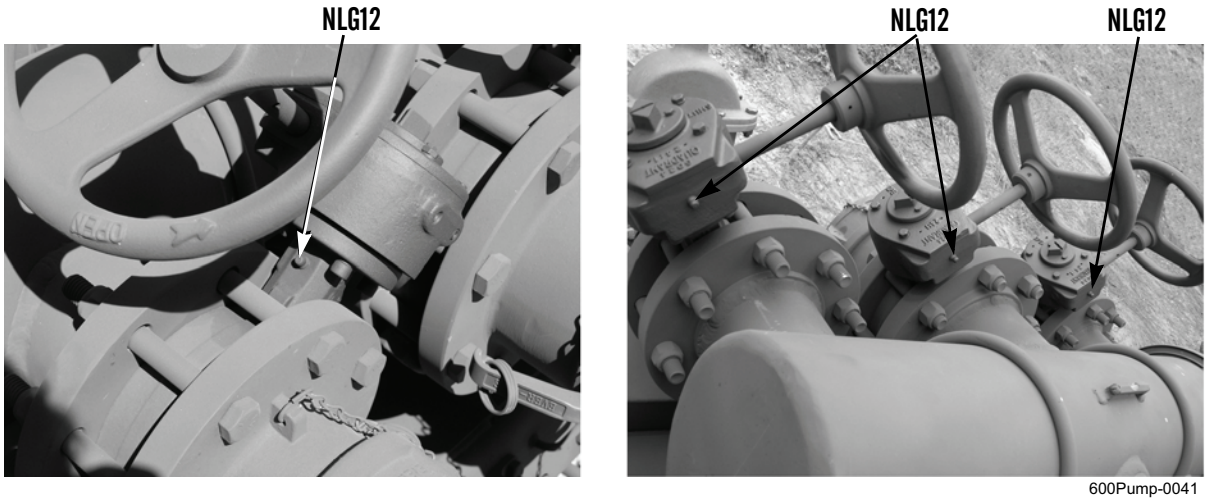


Figure 27. Gate Valve Grease Fittings.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
63	Monthly	Engine and Pump	a. Check pump and engine mounting to ensure it is secure. Tighten any loose mounting hardware.	
			b. Inspect pump for cracks, dents, or other damage. Be alert for evidence of leaks.	FUEL PUMP ASSEMBLY. Any fuel leaks are evident. WATER PUMP ASSEMBLY. Class III water leaks are evident.
64	Monthly	Hand Brake Levers	a. Inspect hand brake levers and adjust as required (WP 0016).	
			b. Position cover over holddown thru-bolt. Install knob and turn clockwise (right) to secure cover tightly.	
65	Monthly	Wheel Bearings	**NOTE** Bearing Buddy® piston has an automatic pressure relief feature that prevents over-filling and over-pressurization of hub with grease.	
			a. Check position of grease fitting in Bearing Buddy® piston. When hub is correctly filled with grease, piston is extended approximately 1/8 in. (3.2 mm) and can be rocked or moved.	
			b. As required, apply Grease, automotive and artillery, GAA (Item 14, WP 0129) to grease fitting at each wheel hub.	

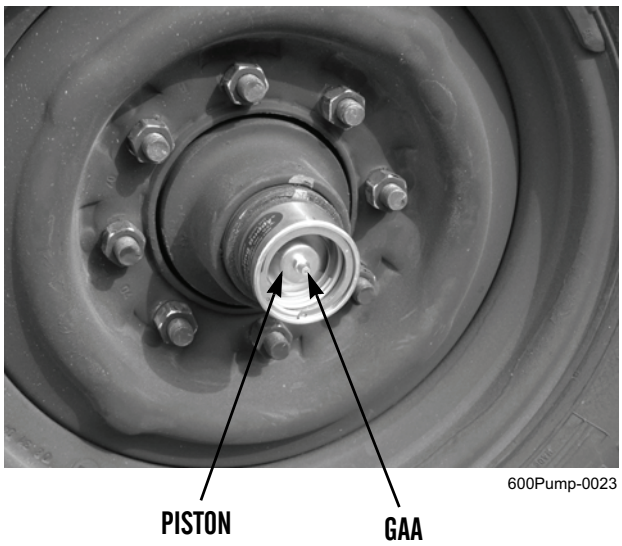


Figure 28. Wheel Bearing Lubrication.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
66	Monthly	Brake Actuator Master Cylinder	**WARNING** • Wear gloves and eye protection when handling brake fluid. Work in a well-ventilated area. Exposure to brake fluid may cause irritation to eyes, skin, and lungs. If ingested, it can irritate mouth, esophagus, and stomach. Failure to exercise caution may result in injury to personnel. • When servicing this equipment, performing maintenance, or disposing of materials such as brake fluid, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.	
			a. Inspect master cylinder for damaged or missing cap and leaks.	Cap is damaged or missing. Any brake fluid leaks are evident.
			CAUTION Use caution to ensure dirt or debris does not enter master cylinder and contaminate hydraulic brake system.	
			b. Use a clean Rag, wiping (Item 22, WP 0129) to clean master cylinder cap.	

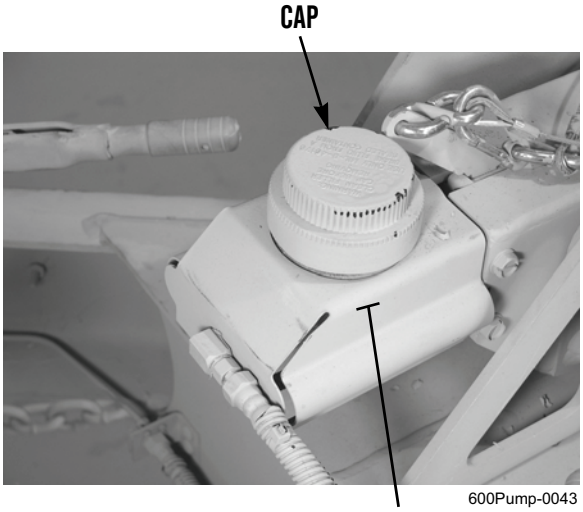


Figure 29. Master Cylinder.

Table 1. Operator Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
66 (Con't)	Monthly	Brake Actuator Master Cylinder	c. Remove cap and check level of brake fluid in reservoir. Level should be 1/8 in. (0.32 cm) below top edge of reservoir.	

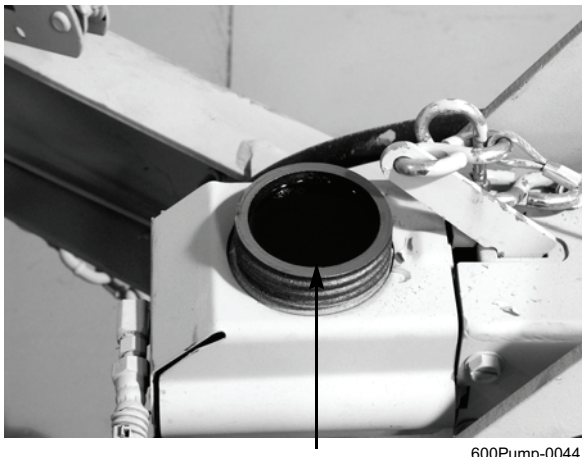


Figure 30. Correct Brake Fluid Level.

			d. If level is low, add Brake fluid, automotive, silicone (Item 4, WP 0129) until level in reservoir is correct. e. Reinstall cap and tighten.	

END OF WORK PACKAGE

OPERATOR MAINTENANCE INSTRUCTIONS

STORAGE OF PUMP ASSEMBLY

SHORT-TERM STORAGE

NOTE

- Pump assembly is placed in short-term storage in a mission-ready condition. It can be returned to service without delay.
- Assistance from Field Maintenance is required to prepare pump assembly for short-term storage.

1. **Placing Pump Assembly in Short-Term Storage.**
   a. Perform *Preparation for Relocation of Pump Assembly* (WP 0006).
   b. Ensure fuel tank is full. If pump assembly is to be stored outdoors in cold weather, ensure correct grade of fuel has been used.
   c. Perform Operator PMCS (WP 0012 and WP 0013).
   d. Have Field Maintenance perform the following tasks:
      (1) Change engine oil and replace oil filter (WP 0084).
      (2) Remove and clean batteries (WP 0033).
      (3) Charge batteries as required (WP 0032).
      (4) Reinstall batteries (WP 0033).
   e. Cover engine intake and exhaust ports.
   f. FUEL PUMP ASSEMBLY. Leave pump volute 2/3 full of fuel.

CAUTION

Do not allow water to remain undrained in water pump while pump is in storage. Failure to comply with this caution could result in equipment damage from water freezing or sludging (deposits forming).

   g. WATER PUMP ASSEMBLY. Fully drain pump volute, suction and discharge manifolds, and control panel suction and pressure gauges (WP 0006).
   h. Place pump assembly in storage location. Support pump assembly trailer by lowering front leveling jack.

2. **Removing Pump Assembly from Short-Term Storage.**
   a. Remove covers from engine intake and exhaust ports.

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled at least 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

   b. Ensure pump volute is filled at least 2/3 full with appropriate fluid, then start engine and allow it to warm up (WP 0006).
   c. Monitor ammeter and V-belt warning light on control panel to ensure V-belts are functioning properly (WP 0005).
   d. Shut down engine (WP 0006).
   e. Check engine oil level and add as required (WP 0012 and WP 0013). Be alert for any evidence of leaks.

LONG-TERM STORAGE

NOTE

- Pump assembly is placed in long-term storage in a preserved condition. Preservatives must be removed before pump assembly can be returned to service.
- Preservative measures described will protect engine for up to six months.
- Assistance from Field Maintenance is required to prepare pump assembly for long-term storage.

1. **Introduction.**
   a. If pump assembly is to remain idle for extended periods of time, measures must be taken to preserve engine.
   b. Anti-corrosion oils used should conform to MIL-L-21260B, *Military Specification for Lubricating Oil, Preservative, Type I, Grade 10, 30, 50* (WP 0124).
2. **Placing Pump Assembly in Long-Term Storage.**
   a. Have Field Maintenance perform the following tasks:
      (1) Clean engine (WP 0025).
      (2) Remove batteries (WP 0033).
      (3) Drain engine oil and fill with anti-corrosion oil (WP 0084).
      (4) Drain fuel tank (WP 0099).
      (5) Remove V-belts (WP 0029). Wipe V-belts dry. Store wrapped, laid flat, and not crimped.
   b. Cover all engine intake and exhaust ports.
   c. Drain pump volute, suction and discharge manifolds, and control panel suction and discharge gauges (WP 0006).
   d. Place pump assembly in storage location. Support pump assembly trailer by lowering front and rear leveling jacks.
3. **Removing Pump Assembly from Long-Term Storage.**
   a. Remove covers from engine intake and exhaust ports.
   b. Fill fuel tank (WP 0013).
   c. Check air cleaner and service as needed (WP 0015).
   d. Have Field Maintenance perform the following tasks:
      (1) Install batteries (WP 0033).
      (2) Install V-belts (WP 0029). DO NOT install V-belt guard at this time.
      (3) Drain and replace engine oil (WP 0084).

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled at least 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

NOTE

During long-term storage, fuel will drain out of fuel injectors. When engine is first started after long-term storage, engine will run rough until it has operated for 3 to 5 minutes. This is normal.

   e. Fill pump volute at least 2/3 full with appropriate fluid, then start engine and idle for 10 minutes (WP 0006).
   f. Shut down engine (WP 0006).
   g. Check engine oil level and add oil as required (WP 0012 and WP 0013). Be alert for any evidence of leaks.
   h. Have Field Maintenance check V-belts for correct tension (WP 0029) and install V-belt guard (WP 0081).

END OF WORK PACKAGE

OPERATOR MAINTENANCE INSTRUCTIONS

AIR CLEANER SERVICE

Service

INITIAL SETUP

Tools and Special Tools

Supply of shop air

Materials/Parts

Detergent, general purpose, liquid (Item 9, WP 0129)

Rag, wiping (Item 22, WP 0129)

Personnel Required

92F/W (1)

Equipment Condition

Pump assembly parked on level ground (WP 0006)

Engine off (WP 0006)

Hand brakes applied (WP 0005)

Wheels chocked

WARNING

If NBC exposure is suspected, personnel wearing protective equipment must handle all air cleaner media. Contaminated filters must be handled using adequate precautions and must be disposed of by trained personnel. Consult your NBC Officer or NBC NCO for appropriate handling or disposal procedures. Failure to follow this warning may cause injury or death to personnel.

NOTE

- Air cleaner primary element may be cleaned several times, as long as it is not damaged. However, it should be replaced at least once each year.
- Air cleaner safety element should never be cleaned. It should be replaced after five air cleaner services or at least after two years.

SERVICE

1. Empty dust evacuator valve (Figure 1, Item 4) by squeezing discharge slot and expelling dust from air cleaner.
2. Clean discharge slot as needed. Remove any caked dirt by pressing together upper section of valve.
3. Loosen thumbscrew (Figure 1, Item 1) and clamp (Figure 1, Item 2) and remove cover (Figure 1, Item 3) from air cleaner housing (Figure 1, Item 5).

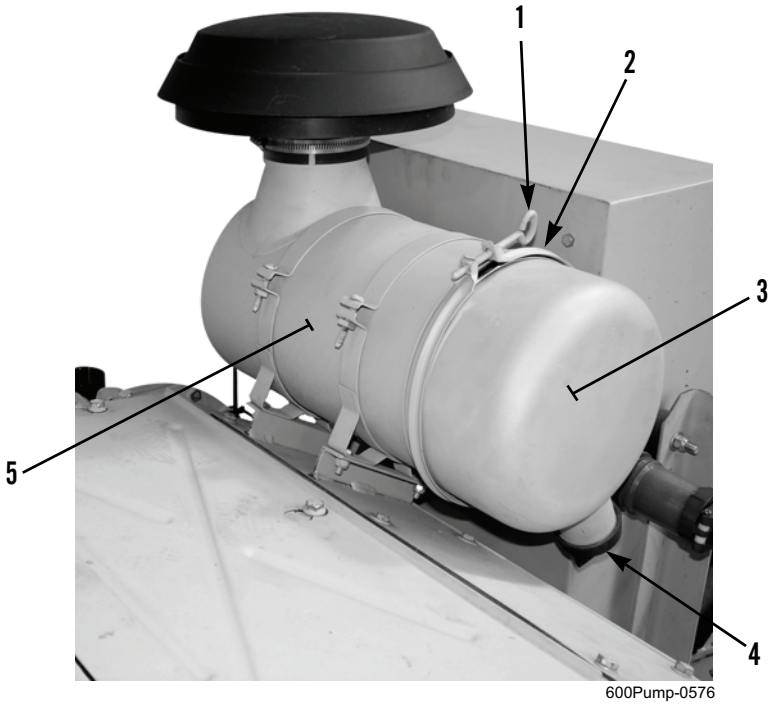


Figure 1. Air Cleaner Housing Cover.

4. Remove air cleaner primary element (Figure 2, Item 6) from air cleaner housing (Figure 2, Item 5).

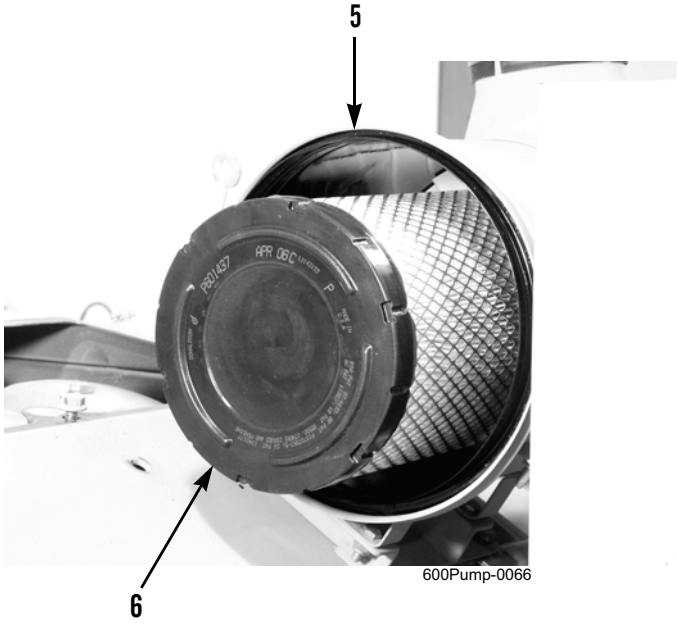


Figure 2. Primary Element.

SERVICE - CONTINUED

5. Use a rag to clean inside of air cleaner housing (Figure 2, Item 5).

WARNING

Particles blown by compressed air are hazardous. Use a maximum of 30 PSI (207 kPa) when cleaning components. DO NOT direct compressed air against human skin. Failure to follow this warning may result in injury or death to personnel. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield.

CAUTION

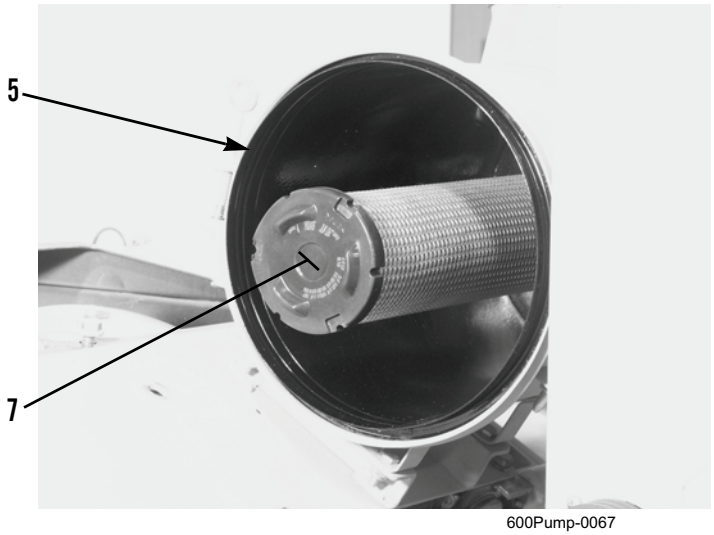
Rough handling of air cleaner primary element will damage element.

6. Direct compressed air, from inside out, into primary element (Figure 2, Item 6), while turning element. If dust and dirt does not come out easily, tap primary element gently to dislodge solid material.

NOTE

Manufacturer of primary element may not recommend cleaning by washing. Read any instructions that may be found on primary element.

7. If primary element (Figure 2, Item 6) is covered with carbon or oil, soak element in detergent for 15 minutes. Wash element several times in water, rinse with clean water, and dry naturally.
8. After primary element (Figure 2, Item 6) is dry, perform these inspections:
   a. Check inside of element with a light to verify there is no damage. Light should not shine through if element is in good condition.
   b. Check primary element sealing gaskets for damage.
9. Obtain replacement primary element (Figure 2, Item 6), if worn or damaged.
10. To replace safety element (Figure 3, Item 7), perform these steps:
    a. Remove safety element from air cleaner housing (Figure 3, Item 5) and discard.
    b. Position new safety element squarely in air cleaner housing. Ensure it is firmly seated.



600Pump-0067

Figure 3. Safety Element.

SERVICE - CONTINUED

11. Install primary element (Figure 4, Item 6) squarely in air cleaner housing (Figure 4, Item 5) until firmly seated.

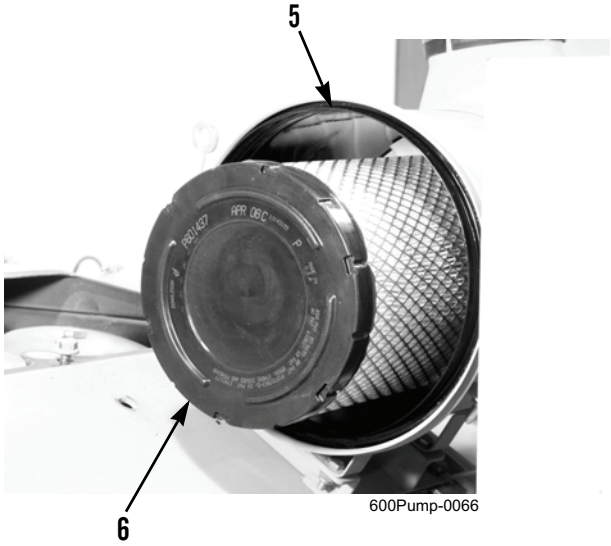


Figure 4. Primary Element.

CAUTION

Ensure dust evacuator valve on cover is not in contact with engine. Failure to follow this caution may result in damage to equipment.

12. Install cover (Figure 5, Item 3) on air cleaner housing (Figure 5, Item 5). Tighten thumbscrew (Figure 5, Item 1) to secure clamp (Figure 5, Item 2).

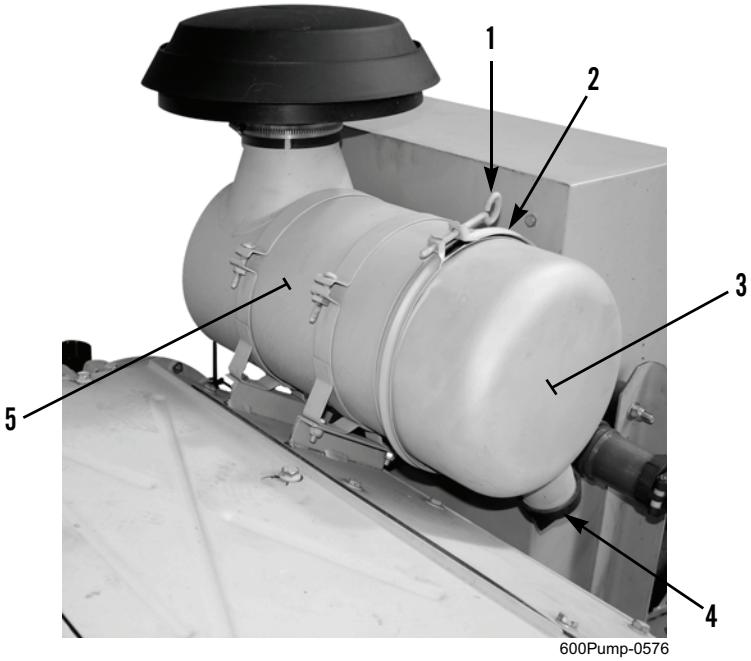


Figure 5. Air Cleaner Housing Cover.

13. Reset air filter restriction indicator at control panel by pressing yellow reset button at bottom of indicator (WP 0005).

END OF WORK PACKAGE

OPERATOR MAINTENANCE INSTRUCTIONS

HAND BRAKE INSPECTION AND ADJUSTMENT

Inspection, Adjustment

INITIAL SETUP

Materials/Parts

Cleaning compound, solvent, Type III (Item 6, WP 0129)

Rag, wiping (Item 22, WP 0129)

Personnel Required

92F/W (1)

Equipment Condition

Pump assembly parked on level ground (WP 0006)

Engine off (WP 0006)

Hand brakes applied (WP 0005)

Wheels chocked

NOTE

Perform *Inspection* and *Adjustment* at each hand brake lever.

INSPECTION

1. Wipe hand brake lever (Figure 1, Item 1) and cable (Figure 1, Item 2) clean, as needed.

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low-toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to do so may result in injury or death to personnel.

2. Remove stubborn grime with solvent cleaning compound. Dry with a clean rag.
3. Inspect hand brake lever mounting to welded angle bracket (Figure 1, Item 3) to ensure it is secure.
4. Inspect cable end at hand brake lever (Figure 1, Item 1) for excessive wear or damage.
5. Inspect clevis pin (Figure 1, Item 4) for excessive wear or damage.
6. Inspect cable (Figure 1, Item 2) for frays, cracks, or distortion.
7. Apply and release hand brake and ensure cable (Figure 1, Item 2) moves freely in sheath.

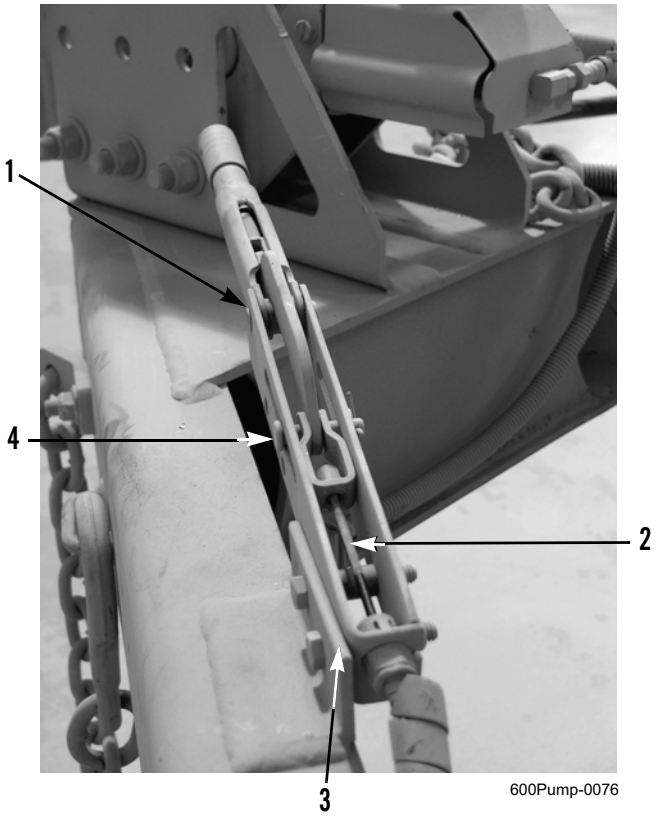


Figure 1. Hand Brake Lever and Cable.

INSPECTION - CONTINUED

8. Ensure sheath (Figure 2, Item 5) with cable is securely installed on backing plate of wheel assembly.

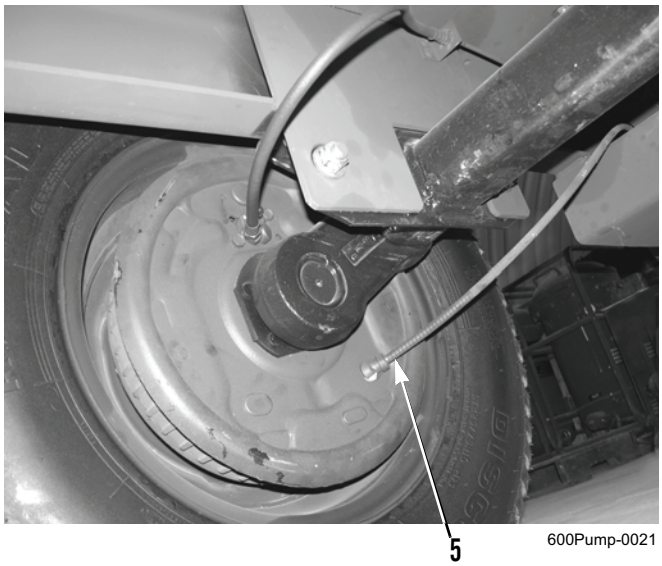


Figure 2. Hand Brake Cable at Backing Plate.

9. Report any damage to Field Maintenance so damaged parts can be replaced.

ADJUSTMENT

1. Release hand brake (WP 0005).
2. Turn adjustment knob (Figure 3, Item 6) clockwise (right) as far as possible by hand.
3. Apply hand brake (WP 0005).
4. If hand brake cannot be applied, turn adjustment knob (Figure 3, Item 6) counterclockwise (left) until hand brake can be applied.

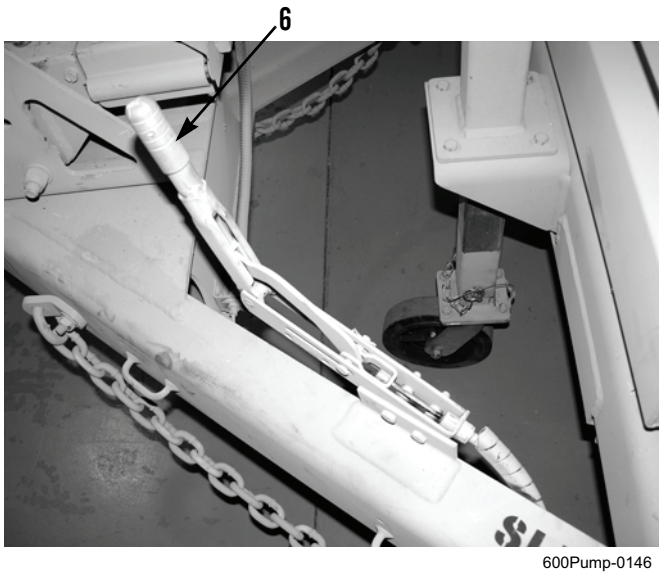


Figure 3. Adjustment Knob.

END OF WORK PACKAGE

CHAPTER 5

FIELD MAINTENANCE TROUBLESHOOTING PROCEDURES

FIELD MAINTENANCE TROUBLESHOOTING PROCEDURES

FIELD MAINTENANCE TROUBLESHOOTING INTRODUCTION

INTRODUCTION

1. This chapter provides *Field Maintenance Troubleshooting Procedures* for identifying and correcting malfunctions which may develop while operating the 600 GPM Pump Assemblies.
2. Before performing troubleshooting at the Field Maintenance level, ensure all applicable *Operator Troubleshooting Procedures* have been performed (WP 0010).
3. The *Field Maintenance Troubleshooting Symptom Index* (WP 0018) lists common malfunctions which may occur and refers you to the proper page in WP 0019 for a troubleshooting procedure.
4. If you are unsure of the location or operation of an item mentioned in troubleshooting, refer to *Location and Description of Major Components* (WP 0002) or *Description and Use of Operator's Controls and Indicators* (WP 0005).
5. Before performing troubleshooting, read and follow all safety instructions found in *General Safety Instructions* (WP 0004) and in the *Warning Summary* at the front of this manual.
6. The *Field Maintenance Troubleshooting Symptom Index* (WP 0018) cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed, or is not corrected by the listed corrective actions, notify your supervisor.
7. When troubleshooting a malfunction:
   a. Locate the symptom or symptoms in WP 0018 that best describe the malfunction.
   b. Turn to the page in WP 0019 where the troubleshooting procedures for the malfunction in question are described. Headings at the top of each page show how each troubleshooting procedure is organized: MALFUNCTION, TEST OR INSPECTION (in step number order), and CORRECTIVE ACTION.
   c. Perform each step in the order listed until the malfunction is corrected. DO NOT perform any maintenance task unless the troubleshooting procedure tells you to do so.

EXPLANATION OF COLUMNS

The columns in the troubleshooting table in WP 0019 are defined as follows:

1. **MALFUNCTION.** A visual or operational indication that something is wrong with the equipment.
2. **TEST OR INSPECTION.** A procedure to isolate the problem in a system or component.
3. **CORRECTIVE ACTION.** A procedure to correct the problem.

LOCATOR VIEWS OF ELECTRICAL COMPONENTS

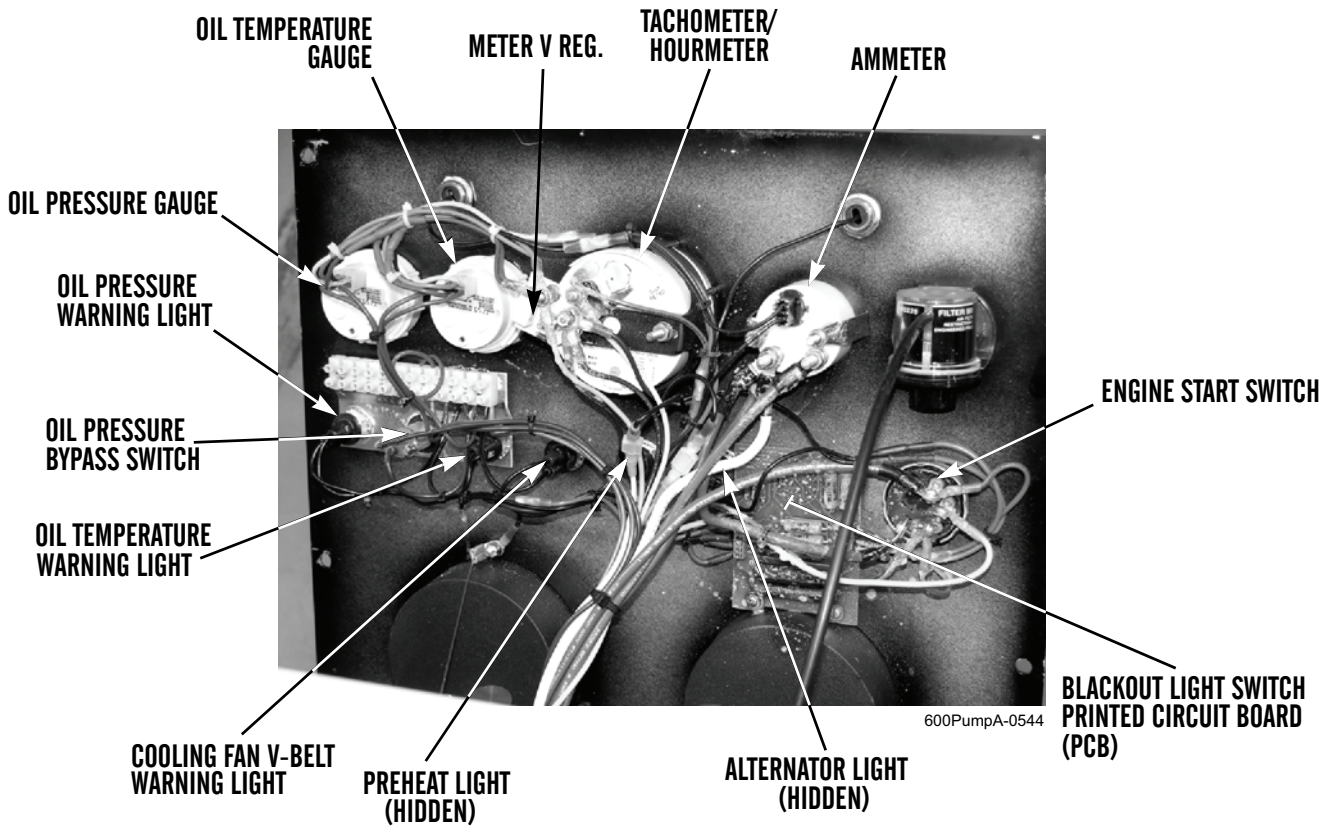


Figure 1. Rear of Control Panel.

LOCATOR VIEWS OF ELECTRICAL COMPONENTS - CONTINUED

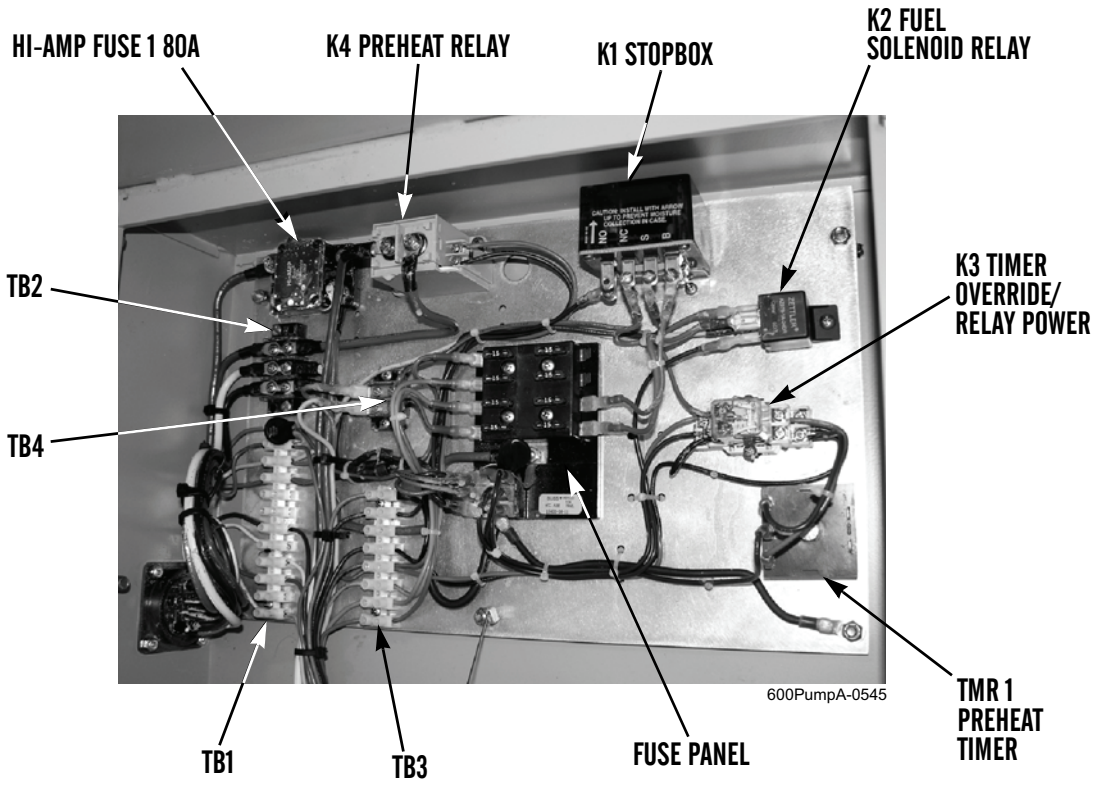


Figure 2. Rear of Control Panel Box.

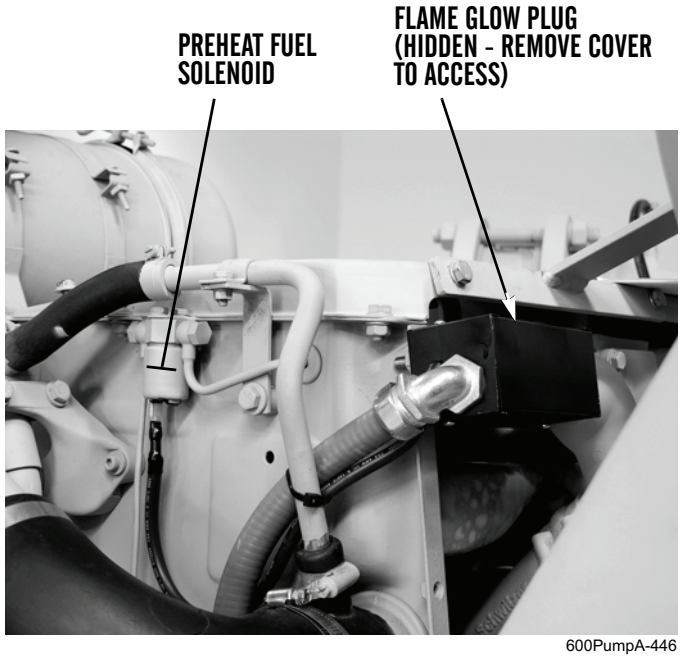


Figure 3. Front of Engine.

LOCATOR VIEWS OF ELECTRICAL COMPONENTS - CONTINUED

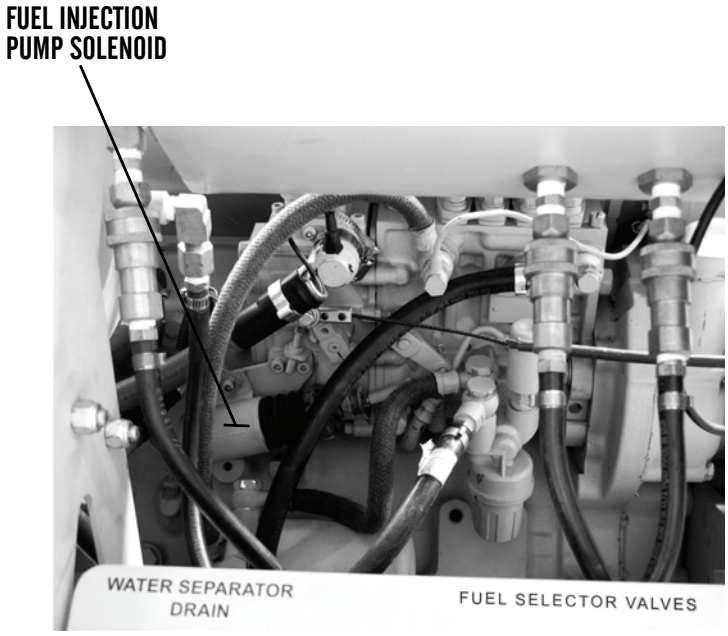


Figure 4. Right Side of Engine.

END OF WORK PACKAGE

FIELD MAINTENANCE TROUBLESHOOTING PROCEDURES

FIELD MAINTENANCE TROUBLESHOOTING SYMPTOM INDEX

Malfunction/Symptom **Troubleshooting Procedure Page**

ENGINE

1. Engine Will Not Crank. 0019-1
2. Engine Cranks but Fails to Start (K2 Fuel Solenoid Relay Check). 0019-2
3. Engine Cranks but Fails to Start (Engine Fuel Injection Pump Solenoid Check). 0019-3
4. Engine Cranks but Fails to Start (K1 Stopbox Check). 0019-3
5. Engine Cranks but Fails to Start (Oil Pressure Bypass Switch Held in). 0019-4
6. Engine Cranks but Fails to Start (Operating Temperature Above 30°F (0°C)). 0019-4
7. Engine Cranks but Fails to Start (Operating Temperature Below 32°F (0°C)). 0019-4
8. Engine Does Not Develop Full Power. 0019-5
9. Engine Does Not Idle Properly or Runs Rough. 0019-5
10. Engine Overheats. 0019-6
11. Low or No Engine Oil Pressure. 0019-7
12. Excessive Engine Oil Consumption. 0019-7
13. Excessive Blue Exhaust Smoke. 0019-7
14. Excessive White Exhaust Smoke. 0019-8
15. Excessive Black Exhaust Smoke. 0019-8

ELECTRICAL SYSTEM

1. Control Panel Displays No Power When Engine Start Switch is Turned to ON Position. 0019-9
2. Preheat Will Not Turn On. 0019-10
3. Cooling Fan V-Belt Warning Light is Illuminated. 0019-11
4. Engine Oil Temperature Warning Light on Control Panel is Illuminated. 0019-11
5. Ammeter, Tachometer, and Panel Lights Not Illuminating. 0019-12
6. Control Panel Warning Lights (Oil Pressure) Not Illuminating. 0019-12
7. Engine Oil Pressure Warning Light on Control Panel is Illuminated. 0019-13
8. Panel Gauge Lights Not Illuminated. 0019-14
9. Ammeter on Control Panel Indicates Over or Under Charge. 0019-14
10. Alternator Light on Control Panel Remains ON. 0019-15
11. Taillights Fail to Operate. 0019-15
12. One or All Service, Brake, or Blackout Lights are Not Working. 0019-15
13. Engine Oil Pressure Warning Light on Control Panel is Illuminated. 0019-15

BRAKE SYSTEM

1. Service Brakes Do Not Apply or Slow Pump Assembly. 0019-16
2. Hand (Parking) Brakes Do Not Apply and/or Hold Pump Assembly. 0019-16

PUMP

1. Pump Fails to Prime. 0019-17
2. Pump Stops or Fails to Deliver Rated Flow or Pressure. 0019-17
3. Pump Requires too Much Power. 0019-17
4. Pump Clogs Frequently. 0019-17
5. Excessive Noise from Pump Assembly. 0019-17

END OF WORK PACKAGE

FIELD MAINTENANCE TROUBLESHOOTING PROCEDURES

FIELD MAINTENANCE TROUBLESHOOTING PROCEDURES

Engine, Electrical System, Brake System, Pump

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE

NOTE

For the following work package, refer to electrical schematics of control panel and engine/control panel wiring harness when making voltage and resistance checks. Refer to *Wiring Diagrams and Schematics* (FP-1).

1. ENGINE WILL NOT CRANK.

For the following work package, refer to electrical schematics of control panel and engine/control panel wiring harness when making voltage and resistance checks. Refer to foldouts at the back of this manual.

Step 1. Inspect insulation on battery cables.

If insulation is worn and wire exposed, replace battery cable (WP 0033).

Step 2. Check main ground cable (power OFF).

Using ohmmeter, ensure (-) battery cable is grounded from battery to engine block.

Step 3. Check condition of battery. Refer to *After* Inspection in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

If battery is damaged or leaking, replace battery (WP 0033).

Step 4. Perform battery test (WP 0032).

If battery fails test, charge battery and retest. If battery fails test, replace battery (WP 0033).

NOTE

V-belt, oil temp, and pressure lights are built-in safety features for the system. If any of the lights are illuminated during a startup attempt, engine will not start. It is normal to see the V-Belt or oil temp lights not illuminated unless a fault is present. The oil pressure light should be on until engine oil pressure reaches 25 PSI (172 kPa).

Step 5. Check engine start switch for 24 VDC.

a. With 24 VDC present at BATT terminal on engine start switch, turn engine start switch to ON position. Check for 24 VDC at ACC and IGN terminals on engine start switch. If 24 VDC is not present at both terminals, replace engine start switch (WP 0111).

b. If battery was charged, replaced in step 3, and engine is now running, recheck voltage.

c. If voltage reading of less than 24 VDC is indicated, original fault may have been caused by faulty alternator. Replace alternator (WP 0030).

Step 6. Check for loose or damaged wire, cable connections on batteries, starter and starter relay, and check all ground connections. As required, tighten cable and wire connections (WP 0024).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE - CONTINUED

1. ENGINE WILL NOT CRANK - CONTINUED.

Step 7. If engine still does not crank, hold start switch to start position and check for 24 VDC at starter power input terminal F.

a. If 24 VDC is not present, check batteries again (WP 0032).

b. If 24 VDC is present, replace starter solenoid (WP 0109).

Step 8. If engine still does not crank after starter solenoid was replaced, replace starter (WP 0109).

2. ENGINE CRANKS BUT FAILS TO START (K2 FUEL SOLENOID RELAY CHECK).

Step 1. Inspect insulation on battery cables.

If insulation is worn and wire exposed, replace battery cable (WP 0033).

Step 2. Check condition of battery. Refer to *After* Inspection in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

If battery is damaged or leaking, replace battery (WP 0033).

Step 3. Perform battery test (WP 0032).

If battery fails test, charge battery and retest. If battery fails test, replace battery (WP 0033).

Step 4. Check fuse F2 on fuse panel.

a. If fuse F2 is blown or defective, replace fuse (WP 0111).

b. If fuse F2 is not blown or defective, proceed to step 5.

NOTE

The K1 stopbox provides a signal to close the contacts within K2 fuel solenoid relay. This signal will prevent the K2 fuel solenoid relay from functioning properly. If V-belt, oil temp, and oil pressure warning lights are active, F2 fuse on fuse panel or the fuse located within the K1 stopbox is blown or defective.

Step 5. Check K2 fuel solenoid relay (with power OFF).

a. If continuity is present between terminal #4 and #1 on K2 fuel solenoid relay, replace K2 fuel solenoid (WP 0111).

b. If continuity is not present, proceed to step 6.

Step 6. Check K2 fuel solenoid relay voltage (with power ON).

a. Check for 24 VDC at terminal #4 or terminal #1 on K2 fuel solenoid relay. If 24 VDC is present at both terminals, relay is functioning correctly.

b. If 24 VDC is not present at terminal #4 or terminal #1 on K2 fuel solenoid relay, check F2 fuse on fuse panel. Replace fuse if defective (WP 0111).

c. If 24 VDC is present at terminal #4 and not at terminal #1, check fuse within K1 stopbox. Replace if defective (WP 0111).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE - CONTINUED

3. ENGINE CRANKS BUT FAILS TO START (ENGINE FUEL INJECTION PUMP SOLENOID CHECK).

Visually ensure fuel injection pump solenoid moves when engine start switch is placed in ON position.

a. If fuel injection pump solenoid does not move, check for 24 VDC at fuel injection pump solenoid. If 24 VDC is present, replace fuel injection pump solenoid (WP 0095).

b. If 24 VDC is not present, check K2 fuel solenoid relay terminal #1 inside of control panel for 24 VDC. If 24 VDC is present at K2 fuel solenoid relay terminal #1, repair or replace defective wire, PIN J-Yellow #14 (WP 0024).

4. ENGINE CRANKS BUT FAILS TO START (K1 STOPBOX CHECK).

Step 1. Inspect insulation on battery cables.

If insulation is worn and wire exposed, replace battery cable (WP 0033).

Step 2. Check condition of battery. Refer to *After* Inspection in *Operator PMCS, Including Lubrication Instructions*.

If battery is damaged or leaking, replace battery (WP 0033).

Step 3. Perform battery test (WP 0032).

If battery fails test, charge battery and retest. If battery fails test, replace battery (WP 0033).

Step 4. Check fuse F4 on fuse panel.

a. If fuse F4 is blown or defective, replace fuse (WP 0111).

b. If fuse F4 is not blown or defective, proceed to step 5.

Step 5. Check K1 stopbox (with power ON for first 30 seconds).

NOTE

The K1 stopbox has a built-in 30 second time delay that provides voltage on terminal B to close the contacts within The K2 fuel solenoid relay for the first 30 seconds that IGN/Starter switch is turned to the ON position. After 30 seconds has passed, the time delay within the K1 stopbox will be tripped and the S terminal will become active for the V-belt and oil temp warning lights. The bypass pushbutton (when pushed) will allow voltage to proceed out of NC terminal to K2 fuel solenoid relay, unless a fuse is blown.

a. Within 30 seconds, check terminal B on K1 stopbox for 24 VDC. If 24 VDC is not present at terminal B, check fuse F2 at fuse panel. Replace if defective (WP 0111).

b. Check terminal NC on K1 stopbox for 24 VDC. If 24 VDC is not present at terminal NC, check fuse within K1 stopbox. Replace if blown or defective. If fuse is good, replace K1 stopbox (WP 0111).

Step 6. Check K1 stopbox (with power ON after 30 seconds).

a. If 24 VDC is not present at terminal S on K1 stopbox, check fuse F5 on fuse panel; replace if blown or defective (WP 0111).

b. If 24 VDC is present at terminal S on K1 stopbox, press and hold bypass pushbutton and check terminal NC for 24 VDC. If 24 VDC is not present, replace K1 stopbox (WP 0111).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE - CONTINUED

5. ENGINE CRANKS BUT FAILS TO START (OIL PRESSURE BYPASS SWITCH HELD IN).

Check oil pressure bypass switch (with power OFF).

a. With oil pressure bypass switch held in, check for continuity between terminals on oil pressure bypass switch. If continuity is present, replace oil pressure bypass switch (WP 0111).

b. If continuity is not present, proceed to MALFUNCTION 6 in this work package.

6. ENGINE CRANKS BUT FAILS TO START (OPERATING TEMPERATURE ABOVE 30°F (0°C)).

Step 1. Perform cooling fan V-belt shutdown switch check (WP 0045).

If switch fails, replace cooling fan V-belt tension shutdown switch (WP 0046).

Step 2. Check fuel for contamination.

If fuel is contaminated, remove and flush fuel tank (WP 0099), replace filters (WP 0103 and WP 0101), and flush lines (WP 0103 and WP 0102). Clean and refill with correct type fuel.

Step 3. Check fuel injection pump timing (WP 0094).

Adjust fuel injection pump timing to specification (WP 0094).

Step 4. Check engine timing (WP 0074).

Adjust engine timing to specification (WP 0074).

Step 5. Check engine compression (WP 0075). Specification is 290 to 435 PSI (20 to 30 kPa). If compression is below specification:

a. Remove cylinder head and replace worn or damaged parts (WP 0076).

b. If cylinder head parts are not worn or damaged, replace engine (WP 0073).

7. ENGINE CRANKS BUT FAILS TO START (OPERATING TEMPERATURE BELOW 32°F (0°C)).

Step 1. Perform flame glow plug function test (WP 0040).

If plug fails function test, replace flame glow plug (WP 0040).

Step 2. Perform cooling fan V-belt shutdown switch check (WP 0045).

If sensor fails, replace cooling fan V-belt tension shutdown switch (WP 0046).

Step 3. Check fuel for contamination.

If fuel is contaminated, remove and flush fuel tank (WP 0099), replace filters (WP 0103 and WP 0101), and flush lines (WP 0103 and WP 0102). Clean and refill with correct type fuel.

Step 4. Check fuel injection pump timing (WP 0094).

Adjust fuel injection pump timing to specification (WP 0094).

Step 5. Check engine timing (WP 0074).

Adjust engine timing to specification (WP 0074).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE - CONTINUED

7. ENGINE CRANKS BUT FAILS TO START (OPERATING TEMPERATURE BELOW 32°F (0°C)) - CONTINUED.

Step 6. Check engine compression (WP 0075). Specification is 290 to 435 PSI (20 to 30 kPa). If compression is below specification:

a. Remove cylinder head and replace worn or damaged parts (WP 0076).

b. If cylinder head parts are not worn or damaged, replace engine (WP 0073).

8. ENGINE DOES NOT DEVELOP FULL POWER.

Step 1. Check for air in fuel system.

Bleed fuel injection lines (WP 0106).

Step 2. Check fuel for contamination.

If fuel is contaminated, remove and flush fuel tank (WP 0099), replace filters (WP 0103 and WP 0101), and flush lines (WP 0103 and WP 0102). Clean and refill with correct type fuel.

Step 3. Remove turbocharger air inlet hose and check turbocharger impeller movement (WP 0098).

If impeller does not spin, replace turbocharger (WP 0098).

Step 4. Remove fuel injectors and bench test for pressure and pattern. Fuel injector opening pressure specification is 2,901 + 145 PSI (200 + 10 bar) (WP 0026).

If low pressure or incorrect spray pattern, replace fuel injector (WP 0026).

Step 5. Check fuel injection pump timing (WP 0094).

Adjust fuel injection pump timing to specification (WP 0094).

Step 6. Check engine timing (WP 0074).

Adjust engine timing to specification (WP 0074).

Step 7. Check engine compression (WP 0075). Specification is 290 to 435 PSI (20 to 30 kPa). If compression is below specification:

a. Remove cylinder head and replace worn or damaged parts (WP 0077).

b. If cylinder head parts are not worn or damaged, replace engine (WP 0074).

9. ENGINE DOES NOT IDLE PROPERLY OR RUNS ROUGH.

Step 1. Check for air in fuel system.

Bleed fuel injection lines (WP 0106).

Step 2. Check exhaust system for restrictions.

If restricted, replace muffler or pipes (WP 0107).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE - CONTINUED

9. ENGINE DOES NOT IDLE PROPERLY OR RUNS ROUGH - CONTINUED.

Step 3. Remove fuel injectors and bench test for pressure and pattern. Fuel injector opening pressure specification is 2,901 + 145 PSI (200 + 10 bar) (WP 0026).

If low pressure or incorrect spray pattern, replace fuel injector (WP 0026).

Step 4. Check fuel injection pump timing (WP 0094).

Adjust fuel injection pump timing to specification (WP 0094).

Step 5. Check engine timing (WP 0074).

Adjust engine timing to specification (WP 0074).

Step 6. Check engine compression (WP 0075). Specification is 290 to 435 PSI (20 to 30 kPa). If compression is below specification:

a. Remove cylinder head and replace worn or damaged parts (WP 0076).

b. If cylinder head parts are not worn or damaged, replace engine (WP 0073).

10. ENGINE OVERHEATS.

Step 1. Remove V-belt guard and cooling fan V-belt (WP 0029). Check cooling fan movement.

If fan does not rotate freely, replace cooling fan assembly (WP 0028).

Step 2. Check exhaust system for restrictions.

If restricted, replace muffler or pipes (WP 0107).

Step 3. Replace engine oil filter (WP 0084).

Step 4. Check engine timing (WP 0074).

Adjust engine timing to specification (WP 0074).

Step 5. Check engine valve clearance (WP 0080).

Adjust engine valve clearance to specification (WP 0080).

Step 6. Replace oil cooler thermostat (WP 0083).

NOTE

Oil pressure with engine idling at 650 RPM, and oil temperature at approximately 248°F (120°C) using SAE 15W/40 oil should be 25 PSI (1.72 bar).

Step 7. Check engine oil pressure gauge. Specification at 650 RPM is 25 PSI (1.72 bar).

If pressure is below specification, replace oil pump (WP 0087).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE - CONTINUED

11. LOW OR NO ENGINE OIL PRESSURE.

Step 1. Check oil pressure sender (WP 0041). Opening pressure specification is 80 to 94 PSI (5.5 to 6.5 bar).

If pressure is below specification, replace oil pressure sender (WP 0042).

NOTE

Oil pressure with engine idling at 650 RPM and oil temperature at approximately 248°F (120°C) using SAE 15W/40 oil should be 25 PSI (1.72 bar).

Step 2. Check engine oil pressure gauge. Specification at 650 RPM is 25 PSI (1.72 bar).

If pressure is below specification, replace oil pump (WP 0087).

12. EXCESSIVE ENGINE OIL CONSUMPTION.

Step 1. Replace engine oil filter (WP 0084).

NOTE

- During engine oil break in period of 200 hours, engine may consume more oil than normal.
- Oil pressure with engine idling at 650 RPM and oil temperature at approx 248°F (120°C) using SAE 15W/40 oil should be 25 PSI (1.72 bar).

Step 2. Check engine compression (WP 0075). Specification is 290 to 435 PSI (20 to 30 kPa). If compression is below specification:

a. Remove cylinder head and replace worn or damaged parts (WP 0076).

b. If cylinder head parts are not worn or damaged, replace engine (WP 0073).

Step 3. Remove turbocharger air inlet hose and check turbocharger impeller movement (WP 0098).

If impeller does not spin, replace turbocharger (WP 0098).

Step 4. Check turbocharger for oil leaks.

If leaking oil, replace turbocharger (WP 0098).

13. EXCESSIVE BLUE EXHAUST SMOKE.

Step 1. Remove turbocharger air inlet hose and check turbocharger impeller movement (WP 0098).

If impeller does not spin, replace turbocharger (WP 0098).

Step 2. Check turbocharger for oil leaks.

If leaking oil, replace turbocharger (WP 0098).

Step 3. Check engine compression (WP 0075). Specification is 290 to 435 PSI (20 to 30 kPa). If compression is below specification:

a. Remove cylinder head and replace worn or damaged parts (WP 0076).

b. If cylinder head parts are not worn or damaged, replace engine (WP 0073).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ENGINE - CONTINUED

14. EXCESSIVE WHITE EXHAUST SMOKE.

Step 1. Perform flame glow plug function test (WP 0040).

If plug fails function test, replace flame glow plug (WP 0040).

Step 2. Remove fuel injectors and bench test for pressure and pattern. Fuel injector opening pressure specification is 2,901 + 145 PSI (200 + 10 bar).

If low pressure or incorrect spray pattern, replace fuel injector (WP 0026).

Step 3. Check engine compression (WP 0075). Specification is 290 to 435 PSI (20 to 30 kPa). If compression is below specification:

a. Remove cylinder head and replace worn or damaged parts (WP 0076).

b. If cylinder head parts are not worn or damaged, replace engine (WP 0073).

Step 4. Check engine valve clearance (WP 0080).

Adjust engine valve clearance to specification (WP 0080).

15. EXCESSIVE BLACK EXHAUST SMOKE.

Step 1. Check exhaust system for restrictions.

If restricted, replace muffler or pipes (WP 0107).

Step 2. Remove fuel injectors and bench test for pressure and pattern. Fuel injector opening pressure specification is 2,901 + 145 PSI (200 + 10 bar) (WP 0026).

If low pressure or incorrect spray pattern, replace fuel injector (WP 0026).

Step 3. Remove turbocharger air inlet hose and check turbocharger impeller movement (WP 0098).

If impeller does not spin, replace turbocharger (WP 0098).

Step 4. Check engine compression (WP 0075). Specification is 290 to 435 PSI (20 to 30 kPa). If compression is below specification:

a. Remove cylinder head and replace worn or damaged parts (WP 0076).

b. If cylinder head parts are not worn or damaged, replace engine (WP 0073).

Step 5. Check engine valve clearance (WP 0080).

Adjust engine valve clearance to specification (WP 0080).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ELECTRICAL SYSTEM

NOTE

For assistance in performing electrical troubleshooting, refer to foldouts of *Wiring Diagrams and Schematics* at the back of this technical manual.

1. CONTROL PANEL DISPLAYS NO POWER WHEN ENGINE START SWITCH IS TURNED TO ON POSITION.

Step 1. Inspect insulation on battery cables.

If insulation is worn and wire exposed, replace battery cable (WP 0033).

Step 2. Check condition of battery. Refer to *After* Inspection in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

If battery is damaged or leaking, replace battery (WP 0033).

Step 3. Perform battery test (WP 0032).

If battery fails test, charge battery and retest. If battery fails test, replace battery (WP 0033).

Step 4. Remove engine/control panel wiring harness electrical connector on left side of control panel and check female pin A for 24 VDC (WP 0038).

a. If 24 VDC is not present, repair or replace engine control panel wiring harness (WP 0024 or WP 0038).

b. If 24 VDC is present, reconnect electrical connector to left side of control panel (WP 0038).

Step 5. Check wire for 24 VDC at input terminal on Hi-amp Fuse 1 (HAF1).

a. If 24 VDC is not present, replace HAF1 red #8 input wire and male pin A on electrical connector on left side of control panel (WP 0024).

b. If 24 VDC is present, check output terminal on HAF1 for 24 VDC if voltage is not present, replace HAF1 (WP 0111).

Step 6. Check wire between HAF1 output terminal and (-) terminal at ammeter.

If 24 VDC is present at output terminal on HAF1, check (-) terminal at ammeter for 24 VDC. If voltage is not present, replace red #8 wire between HAF1 and ammeter (WP 0024).

Step 7. Check wire between ammeter and engine start switch.

If 24 VDC is present at (+) terminal or ammeter, check for 24 VDC at BATT terminal on engine start switch. If voltage is not present, replace red #8 wire between ammeter and engine start switch (WP 0024).

Step 8. Check engine start switch.

If 24 VDC is present at BATT terminal on engine start switch, turn engine start switch to ON position and check for 24 VDC at ACC and IGN terminals on engine start switch. If 24 VDC is not present at both terminals, replace engine start switch (WP 0111).

Step 9. Check ignition power circuit.

If 24 VDC is not present at fuse panel, repair or replace red #8 wire between engine start switch and fuse panel (WP 0024).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ELECTRICAL SYSTEM - CONTINUED

2. PREHEAT WILL NOT TURN ON.

NOTE

The preheat has a 20 second timer built into the circuit and will automatically shut off after 20 seconds has passed.

Step 1. Inspect insulation on battery cables.

If insulation is worn and wire exposed, replace battery cable (WP 0033).

Step 2. Check condition of battery. Refer to *After* Inspection in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

If battery is damaged or leaking, replace battery (WP 0033).

Step 3. Perform battery test (WP 0032).

If battery fails test, charge battery and retest. If battery fails test, replace battery (WP 0033).

Step 4. Turn on preheat (WP 0006). On engine, check flame glow plug connection for 24 VDC (WP 0040).

WARNING

Use caution to avoid injury when checking for a hot flame glow plug.

a. If 24 VDC is present and flame glow plug is hot, replace preheat light bulb (WP 0111).
b. If 24 VDC is present and flame glow plug is not hot, replace flame glow plug (WP 0040).
c. If 24 VDC is not present, check fuse F7 on fuse panel. If fuse is blown or defective, replace fuse (WP 0111).

Step 5. Check preheat fuel solenoid.

NOTE

The preheat fuel solenoid should make a single click noise when preheat is turned ON.

a. On engine, check preheat fuel solenoid connection for 24 VDC. If 24 VDC is not present, proceed to step 6.
b. If 24 VDC is present and no clicking noise was heard, replace preheat fuel solenoid (WP 0105).
c. If 24 VDC is present and click was heard, clean or replace preheat fuel solenoid fuel lines (WP 0105).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ELECTRICAL SYSTEM - CONTINUED

2. PREHEAT WILL NOT TURN ON - CONTINUED.

Step 6. Check engine start switch.

a. With 24 VDC present at BATT terminal on engine start switch, turn engine start switch to PRE-HEAT position and check for 24 VDC at ACC terminal on engine start switch. If 24 VDC is not present at terminal, replace engine start switch (WP 0111).

b. If 24 VDC is present, proceed to step 7.

NOTE

- The preheat has a 20 second timer built into the circuit and will automatically shut off after 20 seconds.
- The K4 preheat relay should make a single click when preheat is turned ON.

Step 7. Check K4 preheat relay (power ON).

Within 20 seconds, check for 24 VDC at terminal #1 and red #16 wire on K4 preheat relay. If 24 VDC is present and no clicking noise was heard, replace K4 preheat relay (WP 0111).

3. COOLING FAN V-BELT WARNING LIGHT IS ILLUMINATED.

Step 1. Inspect cooling fan V-belt and check V-belt tension (WP 0028).

If defective or missing, replace cooling fan V-belt (WP 0029).

Step 2. Check cooling fan V-belt shutdown switch (WP 0045).

If switch test fails, replace cooling fan V-belt shutdown switch (WP 0046).

4. ENGINE OIL TEMPERATURE WARNING LIGHT ON CONTROL PANEL IS ILLUMINATED.

Step 1. Inspect wiring. If found defective, replace as required (WP 0024).

Step 2. Check oil temperature sender (WP 0043).

a. If engine shuts down during test, oil temperature sender is working properly.

b. If engine does not shut down during test, replace oil temperature sender (WP 0044).

Step 3. Remove cooling fan V-belt (WP 0029). Check cooling fan movement.

If fan does not rotate freely, replace cooling fan assembly (WP 0027).

NOTE

Oil pressure with engine idling at 650 RPM and oil temperature at approximately 248°F (120°C) using SAE 15W/40 oil should be 25 PSI (1.72 bar).

Step 4. Check engine oil pressure gauge. Specification at 650 RPM is 25 PSI (1.72 bar).

If pressure is below specification, replace oil pump (WP 0087).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ELECTRICAL SYSTEM - CONTINUED

5. AMMETER, TACHOMETER, AND PANEL LIGHTS NOT ILLUMINATING.

Step 1. Inspect insulation on battery cables.

If insulation is worn and wire exposed, replace battery cable (WP 0033).

Step 2. Check condition of battery. Refer to *After* Inspection in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

If battery is damaged or leaking, replace battery (WP 0033).

Step 3. Perform battery test (WP 0032).

If battery fails test, charge battery and retest. If battery fails test, replace battery (WP 0033).

Step 4. Check fuse F1 on fuse panel.

a. If fuse F1 is blown or defective, replace fuse (WP 0111).

b. If fuse F1 is not blown or defective, proceed to step 5.

Step 5. Check blackout switch Printed Circuit Board (PCB) (power ON).

a. Check for 24 VDC at terminal (RED) HDR2-2 on PCB. If 24 VDC is present, PCB has a voltage supply. Proceed to step 6.

b. If 24 VDC is not present, PCB has no voltage supply. Check wiring between fuse panel fuse F1 and terminal (RED) HDR2-2 on PCB; replace as required (WP 0024).

Step 6. Set blackout light switch to ON position (WP 0005).

a. Check for 24 VDC at terminals (METERS) HDR2-7 and (PANL) HDR2-8 on PCB. If 24 VDC is present, check wiring between PCB and panel lamps. Replace wiring as required (WP 0024).

b. If 24 VDC is not present, replace blackout light switch (WP 0111).

6. CONTROL PANEL WARNING LIGHTS (OIL PRESSURE) NOT ILLUMINATING.

NOTE

V-belt, oil temp, and oil pressure lights are on the same circuit on the PCB. It is normal to see the V-belt and the oil temp lights not illuminated unless a fault is present. The oil pressure should be ON until engine oil pressure reaches 25 PSI (1.72 bar). For the following checks, use the oil pressure circuit to ensure PCB is functioning correctly.

Step 1. Inspect insulation on battery cables.

If insulation is worn and wire exposed, replace battery cable (WP 0033).

Step 2. Check condition of battery. Refer to *After* Inspection in *Operator PMCS, Including Lubrication Instructions* (WP 0013).

If battery is damaged or leaking, replace battery (WP 0033).

Step 3. Perform battery test (WP 0032).

If battery fails test, charge battery and retest. If battery fails test, replace battery (WP 0033).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ELECTRICAL SYSTEM - CONTINUED

6. CONTROL PANEL WARNING LIGHTS (OIL PRESSURE) NOT ILLUMINATING - CONTINUED.

Step 4. Check oil pressure shutdown sender operation (WP 0041).

If sensor fails, replace oil pressure shutdown sender (WP 0042).

Step 5. Check fuse F5 on fuse panel.

a. If fuse F5 is blown or defective, replace fuse (WP 0111).

b. If fuse F5 is not blown or defective, proceed to step 6.

NOTE

V-belt, oil temp, and oil pressure lights are on the same circuit on the PCB. It is normal to see the V-belt and the oil temp lights not illuminated unless a fault is present. The oil pressure should be ON until engine oil pressure reaches 25 PSI (1.72 bar). For the following checks, use the oil pressure circuit to ensure PCB is functioning correctly.

Step 6. Set engine start switch to ON position (WP 0005).

a. Check for 24 VDC at terminals (PINK) HDR2-1 on PCB. If 24 VDC is present, PCB has a voltage supply. Proceed to step 7.

b. If 24 VDC is not present, PCB has no voltage supply. Check wiring between fuse panel fuse F1 and terminal (PINK) HDR2-1 on PCB. Replace wiring as required (WP 0024).

Step 7. Set engine start switch to ON position (WP 0005).

a. Check for 24 VDC at terminals (OIL TEMP) HDR2-3 on PCB. If 24 VDC is not present, replace PCB (WP 0111).

b. Check for 24 VDC at terminals (OIL TEMP) HDR2-3 on PCB. If 24 VDC is present at PCB, check wiring between (OIL TEMP) HDR2-3 on PCB and warning lamp. Replace wiring as required (WP 0024).

7. ENGINE OIL PRESSURE WARNING LIGHT ON CONTROL PANEL IS ILLUMINATED.

Step 1. Check oil pressure shutdown sender operation (WP 0041).

If sensor fails, replace oil pressure shutdown sender (WP 0042).

NOTE

Oil pressure with engine idling at 650 RPM and oil temperature at approximately 248°F (120°C) using SAE 15W/40 oil should be 25 PSI (1.72 bar).

Step 2. Check engine oil pressure gauge. Specification at 650 RPM is 25 PSI (1.72 bar).

If pressure is below specification, replace oil pump (WP 0087).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ELECTRICAL SYSTEM - CONTINUED

8. PANEL GAUGE LIGHTS NOT ILLUMINATED.

NOTE

All gauge lights are on the same circuit on the PCB. The ammeter gauge and tach/hour meter gauge have replaceable light bulbs; the oil pressure and oil temperature gauges do not. For the following checks, use the ammeter circuit to ensure PCB is working correctly.

Step 1. Inspect insulation on battery cables.

If insulation is worn and wire exposed, replace battery cable (WP 0033).

Step 2. Check condition of battery. Refer to *After* Inspection in *Operation PMCS, Including Lubrication Instructions* (WP 0013).

If battery is damaged or leaking, replace battery (WP 0033).

Step 3. Perform battery test (WP 0032).

If battery fails test, charge battery and retest. If battery fails test, replace battery (WP 0033).

Step 4. Check fuse F1 on fuse panel.

a. If fuse F1 is blown or defective, replace fuse (WP 0111).

b. If fuse F1 is not blown or defective, proceed to step 5.

Step 5. Set engine start switch to ON position (WP 0005).

a. Check for 24 VDC at terminal (PINK) HDR2-1 on PCB. If 24 VDC is present, PCB has a voltage supply. Proceed to step 6.

b. If 24 VDC is not present, PCB has no voltage supply. Check wiring between fuse panel fuse F1 and terminal (PINK) HDR2-1 on PCB. Replace wiring as required (WP 0024).

Step 6. Set engine start switch to ON position (WP 0005).

a. Check for 24 VDC at terminals (OIL TEMP) HDR2-3 on PCB. If 24 VDC is not present, replace PCB (WP 0111).

b. If 24 VDC is present, check wiring between (OIL TEMP) HDR2-3 on PCB and warning lamp. Replace wiring as required (WP 0024).

9. AMMETER ON CONTROL PANEL INDICATES OVER OR UNDER CHARGE.

Step 1. Check alternator amperage and voltage output. Specification is 35 amps, 24V.

a. If output is not to specification, replace alternator regulator (WP 0030).

b. If problem persists, replace alternator (WP 0030).

Step 2. With engine start switch in ON position, check for 24 VDC at ammeter.

If 24 VDC is present at (-) and (+) terminals of ammeter and ammeter shows no change when engine start switch is in ON position, replace ammeter (WP 0111).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

ELECTRICAL SYSTEM - CONTINUED

10. ALTERNATOR LIGHT ON CONTROL PANEL REMAINS ON.

Check alternator amperage and voltage output. Specification is 35 amps, 24V.

a. Inspect alternator V-belt (WP 0028).

b. If output is not to specification, replace alternator regulator (WP 0030).

c. If problem persists, replace alternator (WP 0030).

11. TAILLIGHTS FAIL TO OPERATE.

Step 1. Check for burned out bulb(s)/LED(s).

Replace any burned out bulb/LED (WP 0031).

Step 2. Check for voltage at taillight, trailer wiring harness, and intervehicular electrical cable connections.

a. Inspect alternator V-belts (WP 0028).

b. If no voltage is present, repair or replace trailer wiring harness (WP 0037) or intervehicular electrical cable (WP 0036), as required (WP 0024).

c. If voltage is at specification, check ground circuit (WP 0024).

12. ONE OR ALL SERVICE, BRAKE, OR BLACKOUT LIGHTS ARE NOT WORKING.

Step 1. Check for burned out bulb(s)/LED(s).

Replace any burned out bulb/LED (WP 0031).

Step 2. Check for voltage at taillight, trailer wiring harness, and intervehicular electrical cable connections.

a. If no voltage is present, repair or replace trailer wiring harness (WP 0037) or intervehicular electrical cable (WP 0036), as required (WP 0024).

b. If voltage is at specification, check ground circuit (WP 0024).

13. ENGINE OIL PRESSURE WARNING LIGHT ON CONTROL PANEL IS ILLUMINATED.

Step 1. Check oil pressure sender operation (WP 0041).

If sensor fails, replace oil pressure sender (WP 0042).

NOTE

Oil pressure with engine idling at 650 RPM and oil temperature at approximately 248°F (120°C) using SAE 15W/40 oil should be 25 PSI (1.72 bar).

Step 2. Check engine oil pressure gauge. Specification at 650 RPM is 25 PSI (1.72 bar).

If pressure is below specification, replace oil pump (WP 0087).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

BRAKE SYSTEM

1. SERVICE BRAKES DO NOT APPLY OR SLOW PUMP ASSEMBLY.

Step 1. Check service brake adjustment (WP 0049).

Step 2. Check master cylinder for leaks.

Replace leaking master cylinder (WP 0055).

Step 3. Remove wheel hub/drum (WP 0059). Check wheel cylinders for leaks (WP 0050).

Replace leaking wheel cylinders (WP 0052).

Step 4. Check brake lines for leaks.

Replace leaking or damaged brake lines (WP 0056).

Step 5. Remove wheel hub/drum (WP 0059). Inspect brakeshoe linings for wear or damage (WP 0050).

Replace worn or damaged brakeshoe linings (WP 0051).

2. HAND (PARKING) BRAKES DO NOT APPLY AND/OR HOLD PUMP ASSEMBLY.

Step 1. Check service brake adjustment (WP 0049).

Step 2. Remove wheel hub/drum (WP 0059). Inspect brakeshoe linings for wear and damage (WP 0050).

Replace worn or damaged brakeshoe linings (WP 0051).

Step 3. Check for damaged or binding hand brake cables (WP 0048).

Replace damaged hand brake cable (WP 0048).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

PUMP

1. PUMP FAILS TO PRIME.

Step 1. Check suction hose for collapsed lining.

If collapsed, replace suction hose.

Step 2. Check pump vacuum. At operating speed, specification is 20 in. (508 mm) of mercury.

Replace worn or leaking seal and gaskets. Replace worn or damaged parts (WP 0113).

2. PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE.

Step 1. Check suction hose for collapsed lining.

If collapsed, replace suction hose.

Step 2. Check pump vacuum. At operating speed, specification is 20 in. (508 mm) of mercury.

Replace worn or leaking seal gaskets. Replace worn or damaged parts (WP 0113).

Step 3. Check impeller for debris, wear, or damage.

Clean debris out of impeller. Replace worn or damaged parts (WP 0113).

3. PUMP REQUIRES TOO MUCH POWER.

Check pump vacuum. At operating speed, specification is 20 in. (508 mm) of mercury.

Replace worn or leaking seal and gaskets. Replace worn or damaged parts (WP 0113).

4. PUMP CLOGS FREQUENTLY.

Check suction and discharge gate valves for debris or wear.

Clean or replace worn discharge and suction gate valves (WP 0115 and WP 0116).

5. EXCESSIVE NOISE FROM PUMP ASSEMBLY.

Step 1. Check if pump mounting hardware is loose.

Tighten loose mounting hardware on pump to engine and/or pump to trailer.

Step 2. Check pump vacuum. At operating speed, specification is 20 in. (508 mm) of mercury.

Replace worn or leaking seal and gaskets. Replace worn or damaged parts (WP 0113).

Step 3. Check impeller for debris, wear, or damage.

Clean debris out of impeller. Replace worn or damaged parts (WP 0113).

END OF WORK PACKAGE

CHAPTER 6

FIELD MAINTENANCE INSTRUCTIONS

FIELD MAINTENANCE INSTRUCTIONS

SERVICE UPON RECEIPT

General, Inspection Instructions, Servicing Instructions

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Materials/Parts

Cleaning compound, solvent, Type III (Item 6, WP 0129)

Rag, wiping (Item 22, WP 0129)

Personnel Required

63J (1)

92F (1)

References

DD Form 314

DD Form 361

PAM 750-8

WP 0008

WP 0012

WP 0013

WP 0021

WP 0022

WP 0127

GENERAL

When a new, used, or reconditioned 600 GPM Pump Assembly is first received, determine whether it has been properly prepared for service and is in condition to perform its mission. Follow inspection and servicing instructions specified in this work package.

INSPECTION INSTRUCTIONS

1. Remove all packaging material from equipment.

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low-toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to do so may result in injury or death to personnel.

2. Remove any rust-preventive compound from equipment using solvent cleaning compound and rags.
3. Inspect pump for damage incurred during shipment. If equipment has been damaged, report damage on DD Form 361, *Transportation Discrepancy Report (TDR)*.
4. Check equipment against packing slip to ensure shipment is complete. Report any discrepancies IAW instructions in PAM 750-8.
5. Verify if equipment has been modified.
6. Inventory Basic Issue Items (BII) (WP 0127).
7. Stow BII in storage box (WP 0008).

SERVICING INSTRUCTIONS

1. Perform all Operator and Field Maintenance Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions (WP 0012, WP 0013, WP 0021, and WP 0022).
2. Schedule the next PMCS on DD Form 314, *Preventive Maintenance Schedule and Record*.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

FIELD MAINTENANCE PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS), INCLUDING LUBRICATION INSTRUCTIONS INTRODUCTION

GENERAL

1. To ensure 600 GPM Fuel or Water Pump Assembly is ready for operation at all times, it must be inspected on a regular basis so defects may be found and corrected before they result in injury, damage, or equipment failure.
2. Table 1 in WP 0022, *Field Maintenance PMCS, Including Lubrication Instructions*, contains systematic instructions on inspections, lubrications, services, tests, and corrections to be performed by Field Maintenance to keep your equipment in good operating condition and ready for its primary mission.
3. Table 2 in WP 0022 lists mandatory replacement parts, by interval, for the pump assemblies.
4. For information on Corrosion Prevention and Control (CPC), refer to WP 0001.

EXPLANATION OF TABLE ENTRIES

1. **Item Number (Item No.) Column.** Numbers in this column are for reference. When completing DA Form 2404 or DA Form 5988-E, *Equipment Inspection and Maintenance Worksheet*, include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must perform checks and services for the interval listed.
2. **Interval Column.** This column tells you when you must perform the procedure in the Procedure column.

NOTE

If both calender and hours intervals are indicated, perform procedure at whichever interval comes first.

   a. *Semiannual* procedures must be done once every six months.
   b. *Annual* procedures must be done once each year.
   c. *Biennial* procedures must be performed once every two years.
   d. *Hourly* procedures must be done at hour interval indicated.

3. **Location, Item to Check/Service Column.** This column provides the location and item to be checked or serviced.

NOTE

The WARNINGs and CAUTIONs appearing in your PMCS table should always be observed. WARNINGs and CAUTIONs appear before applicable procedures. You must observe these WARNINGs to prevent serious injury to yourself and others, and CAUTIONs to prevent your equipment from being damaged.

4. **Procedure Column.** This column gives the procedure you must perform to check or service the item listed in the Item to Check/Service column, to know if the equipment is ready or available for its intended mission. You must perform the procedure at the time stated in the Interval column.

GENERAL PMCS PROCEDURES

1. Always perform PMCS in the same order so it gets to be a habit. Once you have had some practice, you will spot anything wrong in a hurry. If the pump assembly does not perform as required, refer to the appropriate troubleshooting procedure in WP 0018.
2. If anything looks wrong and you cannot fix it, write it on your DA Form 2404 or DA Form 5988-E. If you find something seriously wrong, IMMEDIATELY report it to your supervisor.
3. Before performing preventive maintenance, read all the checks required for the applicable interval and prepare all that is needed to make all the checks. You will always need a Rag, wiping (Item 22, WP 0129) or two.

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low-toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to do so may result in injury or death to personnel.

a. **Keep It Clean.** Dirt, grease, oil, and debris get in the way and may cover up a serious problem. Clean as you work and as needed. Use Cleaning compound, solvent, Type III (Item 6, WP 0129) on all metal surfaces. Use Detergent, general purpose, liquid (Item 9, WP 0129) and water when you clean rubber, plastic, and painted surfaces.

WARNING

When servicing this equipment, performing maintenance, or disposing of materials such as lubricating oil, fuel, brake fluid, battery acids, batteries, and CARC paint, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

b. **Hazardous Waste Disposal.** Ensure all spills are cleaned up and disposed of IAW spill containment plan.

c. **Rust and Corrosion.** Check metal parts for rust and corrosion. If any bare metal or corrosion exists, clean and apply a light coat of Oil, lubricating, OE/HDO-10 (Item 19, WP 0129).

d. **Bolts, Nuts, and Screws.** Check bolts, nuts, and screws for obvious looseness, missing, bent, or broken condition. You can't try them all with a tool, but look for chipped paint, bare metal, or rust around bolt heads. If you find one is loose, tighten it.

e. **Welds.** Look for loose or chipped paint, rust, or gaps where parts are welded together. If you find a bad weld, report it to your supervisor.

f. **Electrical Wires, Harnesses, and Connectors.** Look for cracked or broken insulation, bare wires, and loose or broken connectors. Tighten loose connectors. Ensure that wires are in good condition.

g. **Hydraulic Brake Lines, Hoses, and Fittings.** Look for wear, damage, and signs of leaks. Check for loose clamps and fittings. Wet spots indicate leaks, but a stain around a fitting or connector can also mean a leak. If a leak comes from a loose fitting or connector, tighten it. If something is broken or worn out, correct problem.

GENERAL PMCS PROCEDURES - CONTINUED

h. **Fluid Leakage.** It is necessary for you to know how fluid leakage affects the status of your equipment. The following are definitions of the types/classes of leakage you need to know to be able to determine the status of your equipment. Learn and be familiar with them, and remember: when in doubt, notify your supervisor.

CAUTION

- Equipment operation is allowable with minor leakage (Class I or II), except for fuel and brake fluid where no leaks are allowable. Of course, consideration must be given to the fluid capacity of the item or system being checked. When in doubt, ask your supervisor.
- When operating with Class I or II leaks, continue to check fluid levels as required in your PMCS.
- Class III leaks should be reported for corrective action by Field Maintenance.

Leakage Definitions for Field Maintenance PMCS

Class I	Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
Class II	Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked.
Class III	Leakage of fluid great enough to form drops that fall from the item being checked.

GENERAL LUBRICATION PROCEDURES

NOTE

- Lubrication instructions contained in Field Maintenance PMCS are MANDATORY.
- Lubrication points are illustrated at the end of this work package.
- A dashed leader line in an illustration indicates that lubrication is required on both sides of the equipment.

1. Recommended intervals are based on normal conditions of operation, temperature, and humidity. When operating under extreme conditions, such as high or low temperatures or exposure to sand or dust, lubricants should always be changed more frequently. Lubricants that have become contaminated will be changed regardless of interval. When in doubt, notify your supervisor.

WARNING

When servicing this equipment, performing maintenance, or disposing of materials such as lubricating oil, fuel, brake fluid, battery acids, batteries, and CARC paint, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

2. Ensure all fluids drained as a result of lubrication or maintenance are collected in a suitable container and disposed of IAW using unit's SOP. Clean up any spills immediately, IAW spill containment plan.
3. Keep all lubricants in a closed container and store in a clean, dry place away from extreme heat. Keep container covers clean and do not allow dust, dirt, or other foreign material to mix with lubricants. Keep all lubrication equipment clean and ready for use.

GENERAL LUBRICATION PROCEDURES - CONTINUED

4. Maintain a good record of all lubrication performed and report any problem noted during lubrication. Refer to DA Form 2404 or DA Form 5988-E, *Equipment Inspection and Maintenance Worksheet*, to record and report any findings.

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low-toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to do so may result in injury or death to personnel.

5. Keep all external parts of equipment not requiring lubrication free of lubricants. Before lubrication, wipe lubrication fittings with a clean Rag, wiping (Item 22, WP 0129) and Cleaning compound, solvent, Type III (Item 6, WP 0129). After lubrication, wipe off excess oil or grease to prevent accumulation of foreign matter.
6. Refer to FM 9-207, *Operation and Maintenance of Ordnance Materiel in Cold Weather,* for lubrication instructions in cold weather.

NOTE

The 600 GPM Pump Assemblies are not enrolled in the Army Oil Analysis Program. HARDTIME INTERVALS apply.

7. For equipment under manufacturer's warranty, hardtime oil service intervals shall be followed. Intervals shall be shortened if lubricants are known to be contaminated or if operation is under adverse conditions (i.e., longer-than-usual operating hours, extended idling periods, or extreme dust).
8. Engine oil and fuel system filters should be changed when:
   a. they are known to be contaminated or clogged, or
   b. at prescribed hardtime intervals.

GENERAL LUBRICATION PROCEDURES - CONTINUED

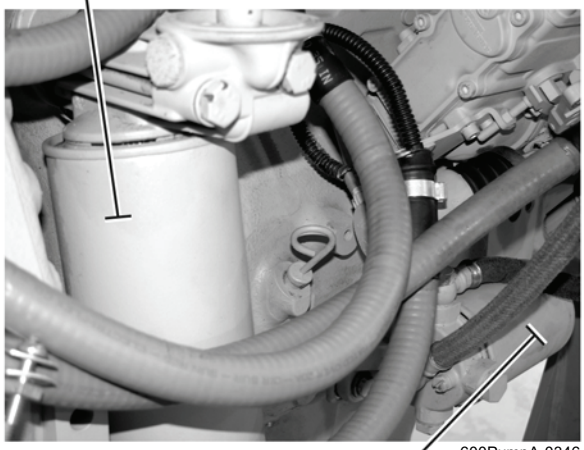
- KEY-

LUBRICANT/ COMPONENT	REFILL CAPACITY	EXPECTED TEMPERATURES*			INTERVALS
		+40°F to -22°F (+4°C to -30°C)	+40°F to +5°F (+4°C to -15°C)		
OE/HDO: Lubricating Oil, ICE, Tactical Service (MIL-PRF-2104)					S - Semiannual A - Annual B - Biennial H - Hours
OEA-30: Lubricating Oil, ICE, Tactical Service (MIL-PRF-46167)					
Engine Crankcase		OEA-30	OE/HDO-15/40		
Without Filter	12.68 qt (12 L)				
With Filter	13.74 qt (13 L)				
GAA: Grease, Automotive and Artillery (MIL-PRF-10924)					
Wheel Bearings	As Required	All Temperatures			

* For arctic operation, refer to FM 9-207.

GENERAL LUBRICATION PROCEDURES - CONTINUED

	LUBRICANT	INTERVAL
Engine Crankcase Change Engine Oil/Replace Oil Filter	OE/HDO or OEA-30	Initial 50 to 150 Hours
Stage III (Secondary) Fuel Filter Replace	–	Initial 50 to 150 Hours

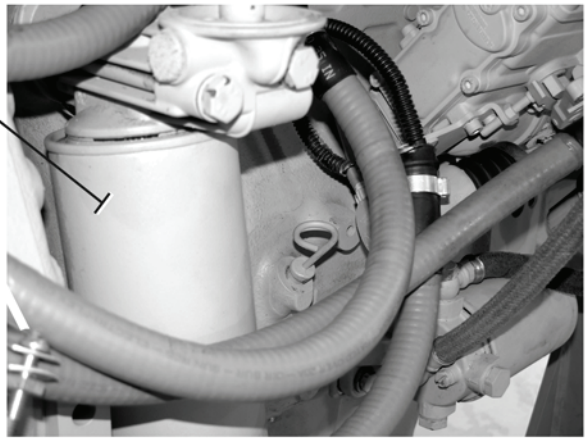


600PumpA-0346

Figure 1. Field Maintenance PMCS - Initial 50 to 150 Hours Lubrication Service.

GENERAL LUBRICATION PROCEDURES - CONTINUED

	LUBRICANT	INTERVAL
Engine Crankcase Change Engine Oil/Replace Oil Filter	OE/HDO or OEA-30	250 Hours



600PumpA-0347

Figure 2. Field Maintenance PMCS - 250 Hours Lubrication Service.

GENERAL LUBRICATION PROCEDURES - CONTINUED

	INTERVAL	• LUBRICANT	
	S	GAA	Wheel Bearings Remove, Clean, Inspect, Install

600PumpA-0284

Figure 3. Field Maintenance PMCS - Semiannual Lubrication Service.

GENERAL LUBRICATION PROCEDURES - CONTINUED

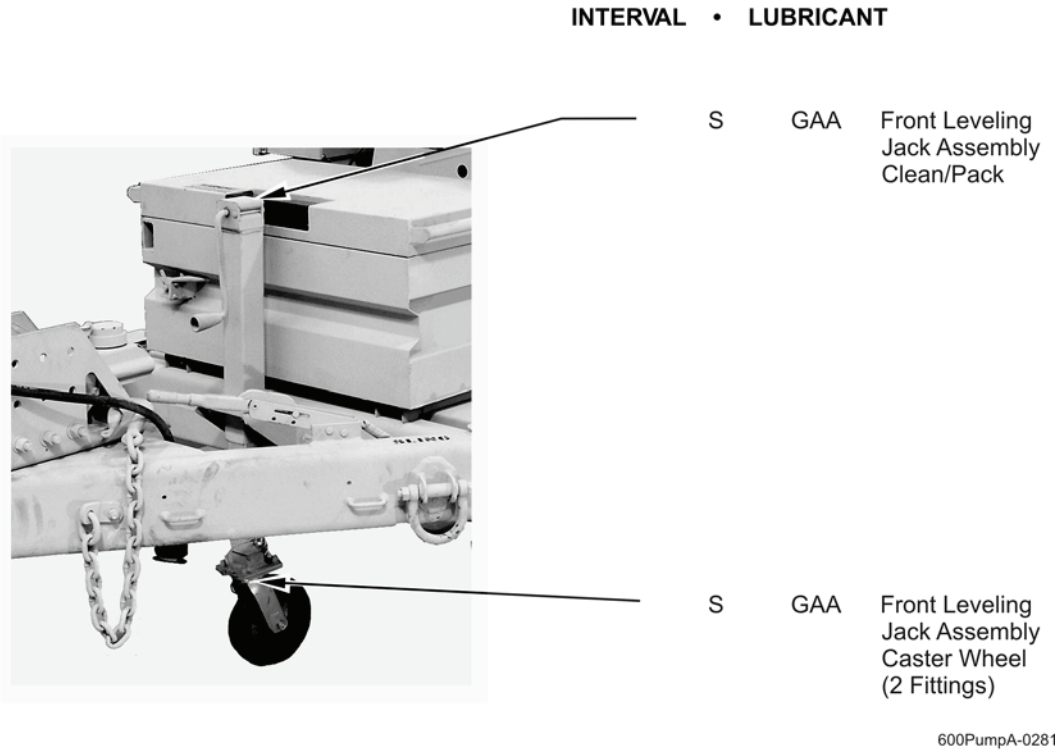
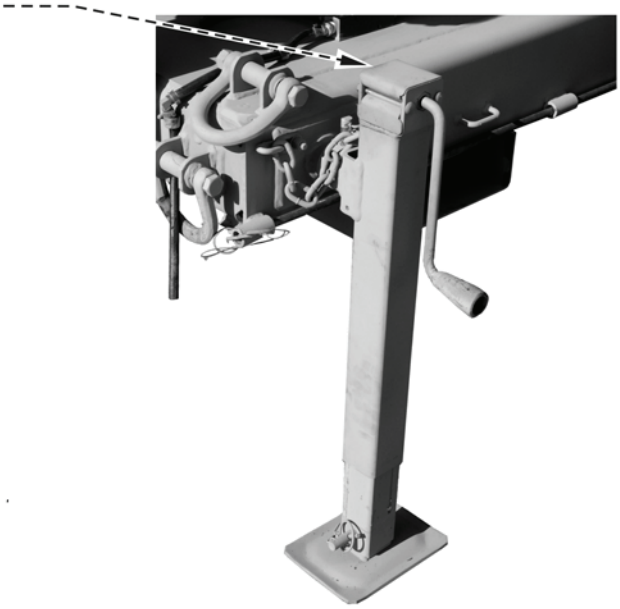


Figure 4. Field Maintenance PMCS - Semiannual Lubrication Service.

GENERAL LUBRICATION PROCEDURES - CONTINUED

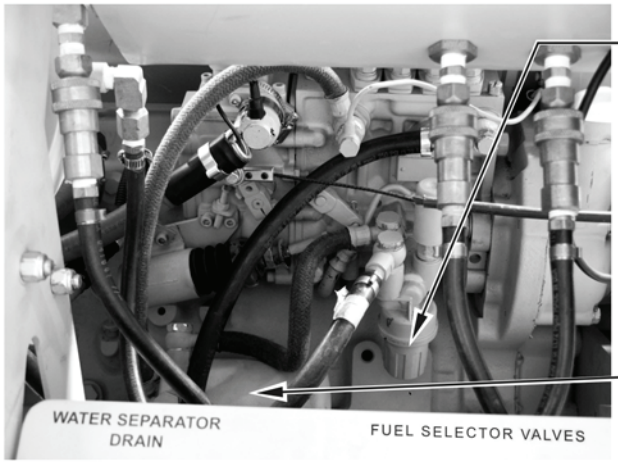
	LUBRICANT	INTERVAL
Rear Leveling Jack Assembly Clean/Pack	GAA	S



600PumpA-0282

Figure 5. Field Maintenance PMCS - Semiannual Lubrication Service.

GENERAL LUBRICATION PROCEDURES - CONTINUED



INTERVAL	•	LUBRICANT
1000 Hours/A	-	Stage II Fuel Pump Strainer Clean
1000 Hours/A	-	Stage III (Secondary) Fuel Filter Replace

600PumpA-0280

Figure 6. Field Maintenance PMCS - 1,000 Hours/Annual Lubrication Service.

GENERAL LUBRICATION PROCEDURES - CONTINUED

	LUBRICANT •	INTERVAL
Stage I (Primary) Fuel Filter Replace	-	1000 Hours/A

600Pump-0283

Figure 7. Field Maintenance PMCS - 1,000 Hours/Annual Lubrication Service.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

FIELD MAINTENANCE PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS), INCLUDING LUBRICATION INSTRUCTIONS

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Brake fluid, automotive, silicone (Item 4, WP 0129)
Cap set, protective, dust and moisture (Item 5, WP 0129)
Cleaning compound, solvent, Type III (Item 6, WP 0129)
Detergent, general purpose, liquid (Item 9, WP 0129)
Grease, automotive and artillery, GAA (Item 14, WP 0129)
Oil, lubricating, OEA-30 (Item 18, WP 0129)
Oil, lubricating, OE/HDO-15/40 (Item 20, WP 0129)
Rag, wiping (Item 22, WP 0129)

Personnel Required

63J (1)

References

WP 0028

References - Continued

WP 0029
WP 0040
WP 0045
WP 0046
WP 0047
WP 0049
WP 0050
WP 0051
WP 0052
WP 0053
WP 0058
WP 0059
WP 0061
WP 0066
WP 0067
WP 0080
WP 0084
WP 0096
WP 0100
WP 0101
WP 0118

Table 1. Field Maintenance Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies.

ITEM NO.	INTERVAL	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
			 **WARNING** If pump assembly is parked indoors during performance of PMCS, DO NOT run engine unless exhaust fumes are vented to the outside. Failure to follow this warning may cause injury or death to personnel due to carbon monoxide poisoning. **NOTE** • Review all WARNINGs, CAUTIONs, and NOTEs before performing PMCS on the 600 GPM Pump Assembly. • Perform Operator PMCS prior to or in conjunction with Field Maintenance PMCS if: a. There is a delay between daily operation of the pump assembly and Field Maintenance PMCS. b. The regular operator is not assisting. • At 12,000 hours of operation, engine should be overhauled.	
1	Initial 50 to 150 Hours	Engine Assembly	**NOTE** The following break-in maintenance should be performed on any new or overhauled engine. a. Change engine oil and replace oil filter (WP 0084). b. Replace stage III (secondary) fuel filter (WP 0100). c. Visually inspect V-belts for frays, cuts, wear, or other damage. Check V-belt tension (WP 0028). d. Check engine valve clearance and adjust as required (WP 0080). e. Inspect engine and pump mounts and tighten as required.	
2	125 Hours	Cooling Fan and Alternator V-Belts	a. Visually inspect V-belts for frays, cuts, wear, or other damage. Check V-belt tension (WP 0028). Re-tension or replace V-belts as required (WP 0029).	

Table 1. Field Maintenance Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
2 (Con't)			b. Check function of cooling fan V-belt shutdown switch (WP 0045). Replace switch if it does not function (WP 0046).	
3	250 Hours	Engine Oil and Oil Filter	**NOTE** Engine oil filter must be replaced annually if engine is operated less than 250 hours a year.	
			Change engine oil and replace oil filter (WP 0084).	
4	500 Hours	Engine Valve Clearance	Check valve clearance and adjust as required (WP 0080).	
5	500 Hours	Flame Glow Plug	Check function of flame glow plug. If defective, replace (WP 0040).	
6	Semiannual	Walkaround Inspection	a. Before performing walkaround inspection, thoroughly clean pump assembly.	
			b. Perform a walkaround inspection of pump assembly, to include removing battery box cover and opening control panel door and storage box cover. Include an inspection of trailer frame and undercarriage. Check for:	
			1. Oil, fuel, brake fluid, and grease leaks.	Any fuel or brake fluid leaks are evident. Class III oil leaks are evident.
			2. Loose, cracked, bent, damaged, or missing parts.	Any damage is noted that would impair operation.
			3. Cracked or broken welds and huck bolts.	
			4. Missing rivets.	
			5. Loose, missing, or damaged axle mounting hardware: correct torque should be IAW WP 0047.	
			6. Loose, missing, or damaged engine mounting hardware: correct torque should be IAW WP 0118.	

Table 1. Field Maintenance Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
6 (Con't)	Semiannual	Walkaround Inspection	7. Loose, missing, or damaged pump mounting hardware: correct torque should be IAW WP 0118. 8. Corrosion. 9. Loose, missing, or damaged reflectors and taillights. 10. Frayed, chafed, worn, or cut hoses and tubes. 11. Loose or missing hose/tube mounting clamps. 12. Frayed, chafed, cut, or burned electrical wires and EMI (electromagnetic interference) conduits. 13. Disconnected, loose, or damaged electrical connections. c. Replace or repair any loose or damaged component.	
7	Semiannual	Engine Assembly Fasteners	Check torque of fasteners for the following engine components: 1. Cylinder head valve covers: 10 lb-ft (13 Nm). 2. Air intake manifold: 186 ± 18 lb-in. (21 ± 2 Nm). 3. Exhaust manifold: 30 ± 3 lb-ft (40 ± 4 Nm).	
8	Semiannual	Lunette Ring	Measure thickness of lunette ring. If less than 5/8 in. (16 mm), replace lunette ring (WP 0058).	Lunette ring thickness is less than 5/8 in. (16 mm).
9	Semiannual	Hydraulic Brake Actuator Assembly	Remove and disassemble hydraulic brake actuator assembly. Perform inspection to ensure wear of components is within acceptable limits (WP 0053). Replace any component that is damaged or worn beyond wear limits.	Wear limits are exceeded.
10	Semiannual	Tires	a. Gauge tires for correct inflation: 45 PSI (310 kPa).	

Table 1. Field Maintenance Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
10 (Con't)	Semiannual	Tires	b. Inspect tires for damage and wear IAW WP 0061.	Any tire is missing or unserviceable. Tire has leaks, cuts, gouges, cracks, or bulges that would result in tire failure during operation. Tire tread is worn beyond level of wear bar.
11	Semiannual	Wheel Assemblies	a. Check wheel lug nuts to ensure none are loose or missing. Replace any that are missing. Tighten lug nuts to 125 lb-ft (169 Nm). b. Remove, disassemble, clean, and inspect wheel/hub drum and wheel bearings (WP 0059). Replace any damaged component. c. Inspect service brakes and condition of wheel cylinder (WP 0050). Replace and damaged component (WP 0051 and WP 0052). d. Assemble and install wheel/hub drum and wheel bearings. Adjust wheel bearings (WP 0059). e. Adjust service brakes (WP 0049).	
12	Semiannual	Front and Rear Leveling Jack Assemblies	a. Fully extend leveling jack leg and clean as required. b. Remove housing cover from front and rear leveling jack assemblies (WP 0066 and WP 0067). Fill cavity under housing cover with Grease, automotive and artillery, GAA (Item 14, WP 0129). Reinstall cover.	
13	Semiannual	Front Leveling Jack Assembly Caster Wheel	Apply Grease, automotive and artillery, GAA (Item 14, WP 0129) to two grease fittings.	
14	1,000 Hours or Annual	Stage I (Primary) Fuel Filter	Replace Stage I primary fuel filter (WP 0101).	
15	1,000 Hours or Annual	Stage II Fuel Pump Strainer	Clean Stage II fuel pump strainer (WP 0096).	

Table 1. Field Maintenance Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions for the 600 GPM Pump Assemblies - Continued.

ITEM NO.	INTERVAL	LOCATION ITEM TO CHECK/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
16	1,000 Hours or Annual	Stage III (Secondary) Fuel Filter	Replace Stage III secondary fuel filter (WP 0100).	
17	Biennial	Cooling Fan and Alternator V-Belts	Replace V-belts (WP 0029).	
18	Biennial	Flame Glow Plug	Replace flame glow plug (WP 0040).	

Table 2. Field Maintenance PMCS Mandatory Replacement Parts List.

ITEM NO.	PART NUMBER (CAGEC)	NSN	NOMENCLATURE	QTY
		INITIAL 50 TO 150 HOURS		
1	0118 1917 (62445)		Filter, Fuel, Stage III (Secondary)	1
2	0118 1749 (62445)		Filter, Element, Oil Spin-On	1
3	111 8737 (62445)	5365-01-280-7191	Ring, Sealing	1
		250 HOURS		
1	0118 1749 (62445)		Filter, Element Oil Spin-On	1
2	111 8737 (62445)	5365-01-280-7191	Ring, Sealing	1
		SEMIANNUAL		
1	M45913/1-10CG5C (81349)	5310-00-269-4040	Nut, Self-locking	3
2	AN380-4-5 (80059)	5315-00-012-0123	Pin, Cotter	2
3	91901 (0Z890)	5315-01-417-1051	Pin, Cotter	2
4	S630NA84CAG12354BNB3A (05047)		Bolt, Machine	4
5	22532 (80201)	5330-01-412-4447	Seal, Plain, Encased	2
		1,000 HOURS OR ANNUAL		
1	R20P (55752)	2910-01-524-3009	Filter, Element, Fluid	1
2	0118 1917 (62445)		Filter, Fuel, Stage III (Secondary)	1
3	RK22244 (55752)	5331-01-360-0944	O-Ring	1
4	0423 3880 (62445)		O-Ring	1
		BIENNIAL		
1	01178703 (62445)		Glow Plug, Flame	1
2	15465 (1VZM7)	3030-01-157-9621	V-belt, Alternator	1
3	01180830 (62445)		V-belt, Cooling Fan	1

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

GENERAL MAINTENANCE INSTRUCTIONS

General, Work Safety, Cleaning Instructions, Preservation of Parts, Painting, Inspection Instructions, Disassembly and Assembly Instructions, Repair Instructions, Lubrication Instructions, Application of Adhesives and Sealing Compounds, Standard Tool Requirements, Tagging Wires and Lines, Lines and Ports, Fluid Disposal

GENERAL

1. These general maintenance instructions contain general shop practices and specific methods which you must be familiar with to properly maintain the 600 GPM Pump Assemblies. You should read and understand these practices and methods before performing any Field Maintenance procedures.
2. Before beginning a task, find out how much repair, modification or replacement is needed to fix the equipment. Sometimes the reason for equipment failure can be seen right away and complete teardown is not necessary. Disassemble equipment only as far as necessary to repair or replace damaged parts.
3. In some cases, a part may be damaged during removal. If the part appears to be good, and other parts behind it are not defective, leave it in place and continue with the procedure. Here are a few simple rules:
   a. DO NOT remove dowel pins or studs unless loose, bent, broken, or otherwise damaged.
   b. DO NOT remove bearings or bushings unless damaged. If you need to remove them to access parts behind, carefully pull out bearings and bushings.
   c. Replace all gaskets, lockwashers, locknuts, seals, sealing washers, sealing rings, cotter pins, and O-rings.
4. All tags and forms attached to the equipment must be checked to learn the reason for removal of equipment from service.

WORK SAFETY

1. Before beginning a procedure, think about the safety risks and hazards to yourself and to others. Wear protective gear such as safety goggles or lenses, safety shoes, rubber apron, or gloves.
2. Before beginning a procedure, ensure the following conditions have been observed, unless otherwise specified:
   a. Pump assembly must be uncoupled from towing vehicle and parked on level ground with hand brakes applied and wheels chocked.
   b. Engine must be off.
   c. Components must be at operating temperature to be tested.
   d. Components which are hot at operating temperatures (i.e., lubricating oil, turbocharger and exhaust systems, and pumping systems) must cool down before they are removed.
3. Immediately clean up spilled fluids, IAW spill containment plan, to avoid slipping.
4. When lifting heavy parts, have someone help you. Ensure lifting equipment or jack is working properly, meets weight requirement of part being lifted, and is securely fastened to part.
5. Always use power tools carefully.
6. Observe all WARNINGS and CAUTIONS.

CLEANING INSTRUCTIONS

WARNING

Improper cleaning methods and use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. To prevent this, refer to TM 9-247, *Materials Used for Cleaning, Preserving, Abrading and Cementing Ordnance Materiel and Related Materials, Including Chemicals,* for further instructions.

1. **General.** Cleaning instructions will be the same for the majority of parts and components which make up the pump assembly. The following applies to all cleaning operations:
   a. Clean all parts before inspection, after repair, and before assembly.
   b. Keep hands free of grease which can collect dust, dirt, and grit.
   c. After cleaning, all parts should be covered or wrapped to protect them from dust and dirt. Parts that are subject to rust should be lightly oiled after cleaning.
2. **Castings, Forgings, and Metal Parts.**
   a. Clean inner and outer surfaces with detergent (Item 9, WP 0129) and dry with a clean rag (Item 22, WP 0129).
   b. Remove grease and accumulated deposits with a scrub brush.

WARNING

Particles blown by compressed air are hazardous. DO NOT exceed 15 psi (103 kPa) nozzle pressure when drying parts with compressed air. Use a maximum of 30 psi (207 kPa) when cleaning components. DO NOT direct compressed air against human skin. Failure to follow this warning may result in injury or death to personnel. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield.

   c. Clear all threaded holes with compressed air to remove dirt and cleaning fluids.

CAUTION

DO NOT wash oil seals, electrical cables, and flexible hoses with dry cleaning solvent or mineral spirits. Serious damage or destruction of material will result.

3. **Oil Seals, Electrical Cables, and Flexible Hoses.** Wash oil seals, electrical cables, and flexible hoses with a solution of detergent (Item 9, WP 0132) and water, and wipe dry with a clean rag (Item 22, WP 0129).

PRESERVATION OF PARTS

Unpainted metal parts that will not be installed immediately after cleaning may be covered with a thin coat of light oil (Item 19, WP 0129).

PAINTING

On painted areas where paint has been removed, paint in accordance with procedures outlined in MIL-T-704*, Treatment and Painting of Materiel*.

INSPECTION INSTRUCTIONS

NOTE

All damaged areas should be marked for repair or replacement.

1. All components and parts must be carefully checked to determine if they are serviceable for use, can be repaired, or must be scrapped.
2. Inspect drilled and tapped (threaded) holes for the following:
   a. Wear, distortion, cracks, and any other damage in or around holes.
   b. Threaded areas for wear, distortion (stretching), and evidence of cross-threading.
3. Inspect metal lines, flexible lines or hoses, and metal fittings and connectors for the following:
   a. Metal lines for sharp kinks, cracks, bad bends, and dents.
   b. Flexible lines or hoses for fraying, evidence of leakage, and loose metal fittings or connectors.
   c. Metal fittings and connectors for thread damage and worn or rounded hex heads.
4. Inspect castings, forgings, and vehicle metal parts for the following:
   a. Vehicle surfaces for nicks, burrs, raised metal wear, and other damage.
   b. Inner and outer surfaces for breaks and cracks.

DISASSEMBLY AND ASSEMBLY INSTRUCTIONS

1. Keep major components together whenever possible and practical.
2. Tag hoses, tubes, electrical wires, cables, and harnesses to identify them and aid during installation.
3. Keep related parts together for identification purposes.
4. Temporarily install attaching hardware such as screws, bolts, washers, and nuts to prevent loss.
5. Only disassemble to the point of the problem.
6. Ensure parts are clean and lubricated before assembly.

REPAIR INSTRUCTIONS

1. Repair castings, forgings, and parts using the following instructions:
   a. Repair minor cracked castings or forgings IAW TC 9-237, *Operator's Circular Welding Theory and Application*.
   b. Repair minor damage to surfaces with an abrasive cloth (Item 7, WP 0129) dipped in detergent (Item 9, WP 0129).
   c. Replace any deeply nicked surface that could affect the assembly operation.
   d. Repair minor damage to threaded capscrew holes with thread tap of same size to prevent cutting oversize.
2. After repair, thoroughly clean all parts to prevent dirt, metal chips, or other foreign material from entering any working parts.

LUBRICATION INSTRUCTIONS

1. Refer to *Operator PMCS, Including Lubrication Instructions Introduction* (WP 0012) and to *Field Maintenance PMCS, Including Lubrication Instructions Introduction* (WP 0021) for detailed, illustrated instructions on proper lubrication.
2. Some general practices to remember:
   a. Use the correct lubricant.
   b. Keep lubricants clean.
   c. Clean all fittings prior to lubrication.
   d. Lubricate clean disassembled and new parts to prevent rust.

APPLICATION OF ADHESIVES AND SEALING COMPOUNDS

1. **General.** Adhesives are recommended in some tasks to ensure and strengthen seals. Sealing compounds are used to seal parts against moisture. The following information describes their correct use and application.
2. **Adhesive.** Adhesive provides a seal against leakage and a resistance to loosening when used in the assembly of threaded, slip-fitted, or press-fitting parts. Always use the grade of adhesive specified and never use adhesive when other retaining means are provided, such as lockwires, lockwashers, lockplates, and fasteners.
3. **Sealing Compound.**
   a. Anytime a seal is broken, the part must be thoroughly cleaned to remove any remaining sealing compound and dirt.
   b. Thoroughly clean surface before applying sealing compound.
   c. When applying sealing compound, ensure the area is completely covered. Press sealing compound into and around parts as necessary.
   d. Refer to manufacturer's instructions for time needed to set sealing compound.

STANDARD TOOL REQUIREMENTS

1. The following are general practices regarding the use of tools:
   a. Always use the proper tool kit and tools for the procedure being performed.
   b. Ensure tools are clean and lubricated to reduce wear and prevent rust.
   c. Keep track of tools. DO NOT be careless with them.
   d. Return tools to toolbox when finished with repair or maintenance.
   e. Return toolboxes and tools to tool storage when not in use.
   f. Inventory tools before and after each use.
2. Some maintenance tasks may require special or fabricated tools. The "Initial Setup" of the procedure will specify any special or fabricated tools needed to perform that procedure. Use these special tools only for the maintenance procedures for which they are designed or called out. If you are unfamiliar with a required tool, see your supervisor.

TAGGING WIRES AND LINES

1. Use marker tags (Item 27, WP 0129) to identify all electrical wires and fuel, oil, or brake fluid lines, and any other parts which may be hard to identify or replace later. Fasten tags to parts during removal by wrapping wire fasteners around or through parts and twisting ends together. Position tags to be out of the way during cleaning, inspection, and repair. Mark tags with a pencil, pen, or marker.
2. Whenever possible, identify electrical wires with the number of the terminal or wire to which it connects. If no markings can be found, tag both wires or wire and terminal, and use the same identifying mark for both. If you cannot tag a wire because it must fit through a small hole or you cannot reach it, write down the description of the wire and the point to which it connects or draw a simple diagram on paper. Be sure to write down enough information so you will be able to properly connect the wires during assembly. If you need to identify a loose wire, look for an identifying number near the end of the wire, stamped on a permanent metal tag. Compare the number to wire numbers on the appropriate electrical schematic.
3. Identify fuel, oil, and brake fluid lines when you are taking off more than one line at the same time. Mark tags with points to which lines and hoses must be connected. If it is not obvious which end of a line goes where, tag each end of the line.
4. Identify and tag other parts as required by name and installed location.

LINES AND PORTS

To keep dirt from contaminating fluid systems when removing and installing fuel, oil, and brake fluid lines, perform the following steps:

a. Clean fittings and surrounding area before disconnecting lines.

b. Cover lines with protective caps or plugs (Item 5, WP 0129) or tape lines and ports after disconnecting lines. When these are not available, use plastic bags and rubber bands, a clean rag (Item 22, WP 0129), duct tape (Item 29, WP 0129) or other similar materials to prevent dirt from entering system.

c. Ensure new and used parts are clean before installing.

d. Wait to remove cover, cap, plug, or tape from lines and ports until just before installing lines.

FLUID DISPOSAL

Dispose of contaminated drained fluids IAW the Standard Operating Procedures (SOP) of your unit.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

ELECTRICAL GENERAL MAINTENANCE INSTRUCTIONS

Soldering, Splicing Wires, Heat-Shrinkable Tubing (Electrical Insulating Sleeving), Ring Terminal Repair, Military Connector Repair, Receptacle Connector Repair, Electrical Ground Points, Multimeter Usage, Relay Inspection and Testing, Circuit Breaker Inspection and Testing

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Cloth, abrasive (Item 7, WP 0129)

Detergent, general purpose, liquid (Item 9, WP 0129)

Flux, soldering (Item 12, WP 0129)

Insulating sleeving, electrical (Item 16, WP 0129)

Solder, tin alloy (Item 24, WP 0129)

Strap, tiedown, electrical components (Item 26, WP 0129)

Materials/Parts - Continued

Tag, marker (Item 27, WP 0129)

Personnel Required

63J (1)

References

TB SIG 222

WP 0039

Equipment Condition

Battery cables disconnected, as required (WP 0033)

Intervehicular electrical cable disconnected, as required (WP 0006)

SOLDERING

NOTE

Refer to TB SIG 222, *Solder and Soldering*, for more information.

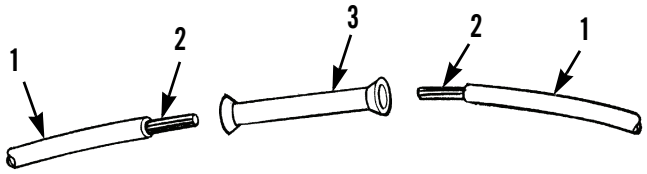
1. Solder connection must be bright and clean before soldering. Remove dirt and grease with a wire brush or pocket knife. Use lead alloy solder with soldering flux. All wires, parts, and soldering gun must be tinned for good connection and maximum transfer of heat.
2. To prevent overheating damage to electrical parts when soldering and de-soldering connections, hold bare wire, lead, or terminal lug close to soldering point with long round nose pliers. Pliers act as a heat sink and absorb excess heat.

SPLICING WIRES

NOTE

The use of high quality splice connectors is essential to ensure optimum electrical integrity. Use the type and size connector best suited to the application.

1. Inspect each end of wire (Figure 1, Item 1). Trim insulation and metal strands (Figure 1, Item 2) of wire back, as necessary, to ensure integrity of wire.
2. Using wire stripping tool, strip each end of wire (Figure 1, Item 1) to expose length of metal strands (Figure 1, Item 2) suitable for size of splice connector (Figure 1, Item 3).
3. Insert metal strands (Figure 1, Item 2) of each wire (Figure 1, Item 1) fully into splice connector (Figure 1, Item 3).
4. Securely crimp splice connector (Figure 1, Item 3) to metal strands (Figure 1, Item 2) and to insulation of wire (Figure 1, Item 1).



600Pump-0097

Figure 1. Splicing Wires.

HEAT-SHRINKABLE TUBING (ELECTRICAL INSULATING SLEEVING)

Use heat-shrinkable tubing to insulate soldered and crimped electrical connections.

a. Cut length of new heat-shrinkable tubing twice as long as connection to be covered.

b. Slide heat-shrinkable tubing onto wire and out of the way before making electrical connection.

c. After making electrical connection, slide heat-shrinkable tubing into place over electrical connection.

WARNING

Do not touch heat-shrinkable tubing for at least 30 seconds after heating. Heat-shrinkable tubing is hot and will cause burns.

d. Hold air blow gun away from heat-shrinkable tubing and apply heat for approximately 30 seconds, until tubing forms to shape of electrical connection.

RING TERMINAL REPAIR

1. Remove ring terminal (Figure 2, Item 6) from wire (Figure 2, Item 2) by cutting through wire just behind heat-shrinkable tubing (Figure 2, Item 1).
2. Cut heat-shrinkable tubing (Figure 2, Item 1) to length sufficient to cover tabs (Figure 2, Items 4 and 5) of ring terminal (Figure 2, Item 6) and 1/4 in. (6-mm) of wire (Figure 2, Item 2).
3. Slide heat-shrinkable tubing (Figure 2, Item 1) back on wire (Figure 2, Item 2).
4. Using wire stripping tool, strip insulation from wire (Figure 2, Item 2) to expose proper length of metal strands (Figure 2, Item 3).
5. Using crimping tool, securely crimp tabs (Figure 2, Item 5) of ring terminal (Figure 2, Item 6) over metal strands (Figure 2, Item 3).
6. Using crimping tool, crimp tabs (Figure 2, Item 4) of ring terminal (Figure 2, Item 6) over insulation of wire (Figure 2, Item 2).
7. Slide heat-shrinkable tubing (Figure 2, Item 1) over tabs (Figure 2, Items 4 and 5) of ring terminal (Figure 2, Item 6).
8. Use a heat gun to apply heat to heat-shrinkable tubing (Figure 2, Item 1) until tubing snugly conforms to ring terminal (Figure 2, Item 6) and insulation of wire (Figure 2, Item 2).

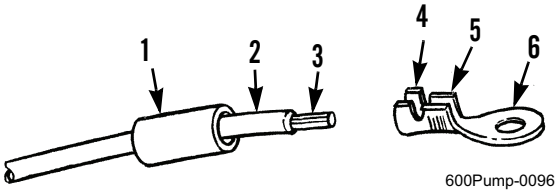


Figure 2. Ring Terminal Repair.

MILITARY CONNECTOR REPAIR

1. Slide shell (Figure 3, Item 1) back on wire (Figure 3, Item 2) to expose sleeve (Figure 3, Item 5).
2. Remove sleeve (Figure 3, Item 5) from terminal (Figure 3, Item 4) by pulling sleeve forward.
3. If defective, remove terminal (Figure 3, Item 4) from wire (Figure 3, Item 2) by cutting through wire just behind terminal.

NOTE

Perform steps 4 through 6 only if terminal was removed.

4. Using wire stripping tool, strip insulation from wire (Figure 3, Item 2) to expose length of metal strands (Figure 3, Item 3) equal to depth of terminal (Figure 3, Item 4).
5. Using crimping tool, securely crimp terminal (Figure 3, Item 4) to metal strands (Figure 3, Item 3) of wire (Figure 3, Item 2).
6. Install sleeve (Figure 3, Item 5) on terminal (Figure 3, Item 4) by pushing sleeve over front of terminal until fully seated.
7. Slide shell (Figure 3, Item 1) up wire (Figure 3, Item 2) and over sleeve (Figure 3, Item 5).

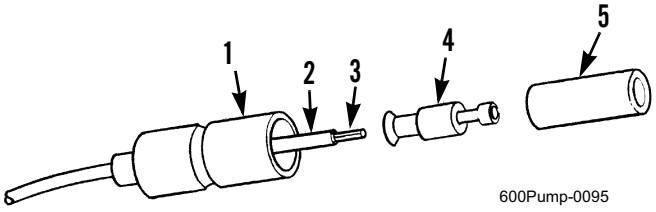


Figure 3. Military Connector Repair.

RECEPTACLE CONNECTOR REPAIR

1. Remove receptacle connector (WP 0039).

NOTE

Tag wires to ensure correct installation.

2. Use soldering gun to heat soldered wire connections on electrical receptacle.
3. Disconnect wires from pin locations of receptacle connector.
4. Position new wires at appropriate pin locations of receptacle connector. Refer to wiring diagrams located as foldouts at the back of this technical manual.
5. Solder wire connections IAW instructions in *Soldering* in this work package.
6. Install receptacle connector (WP 0039).

ELECTRICAL GROUND POINTS

CAUTION

Good electrical ground points are essential for the proper functioning of the electrical system. Ground points on electrical components and trailer frame must be maintained in a clean and secure condition to minimize electrical problems.

1. Remove nut, locknut, lockwasher, screw, etc. connecting ground wire or ground cable to ground point on electrical component or threaded stud on trailer frame.
2. If necessary, clean dirt from ring terminal, surface of electrical component, ground point, and all mounting hardware with detergent, water, and a scrub brush.
3. Remove any corrosion or rust with a wire brush and abrasive cloth.
4. Replace defective mounting hardware. Replace defective ring terminal IAW *Ring Terminal Repair* in this work package.
5. Install ground wire or ground cable on ground point with mounting hardware and tighten securely.

MULTIMETER USAGE

1. **General.** A multimeter is used to troubleshoot the electrical system of the pump assembly. The multimeter Ohms scale is used to test for continuity, shorts, and resistance. The multimeter voltmeter scale is used to test voltage levels at any point in the electrical system.
2. **Continuity Tests.** Continuity tests are performed to check for breaks in a circuit (such as a fuse, switch, light bulb connector, or electrical wiring).

NOTE

If readout will not zero properly, replace batteries and repeat zeroing procedure. If readout will not zero after batteries have been replaced, notify your supervisor.

a. **Zero Multimeter.**
   (1) Set multimeter to ON.
   (2) Select OHMS.
   (3) Select LOWEST VOLTAGE/OHMS scale.
   (4) Touch black and red probes together and check for a zero indication on digital readout.

b. **Testing for Continuity.**
   (1) Zero multimeter.
   (2) Connect black and red probes to both terminals of circuit being tested.
   (3) Observe readout and interpret results as follows:
      (a) If readout indicates 0 (zero), circuit is open.

MULTIMETER USAGE - CONTINUED

(b) If readout indicates resistance, circuit has continuity.

c. **Testing for Shorts.** A short (or short circuit) occurs when two circuits that should not be connected have metal-to-metal contact with each other. A short also occurs when a circuit that should not touch ground has metal-to-metal contact with ground.

(1) Zero multimeter.

(2) Connect black probe to one pin and red probe to either ground or another pin.

(3) Observe readout and interpret results as follows:

(a) If readout indicates 0 (zero), circuits are not shorted.

(b) If readout indicates resistance, circuits are shorted or circuit is grounded, if testing to ground.

(c) If readout jumps or flickers, circuits are shorted or grounded intermittently.

d. **Testing for Resistance.** Allowable resistance readings depend on circuit being tested. Refer to the particular section dealing with that circuit or component for allowable readings.

(1) Zero multimeter.

(2) Select OHMS.

(3) Select LOWEST VOLTAGE/OHMS range. If test specifies Ohms range, select required range.

(4) Connect black and red probes across circuit to be tested.

(5) Observe readout and interpret results as circuit resistance.

3. **Measuring DC Voltage.**

a. Set multimeter to ON.

b. Select VOLTS.

c. Select Volts DC.

d. Select LOWEST VOLTAGE/OHMS range for voltage range that is higher than Volts to be measured.

e. Connect red probe to positive (+) pin and black probe to negative (-) pin.

f. Observe readout and interpret results as DC voltage in circuit being tested.

RELAY INSPECTION AND TESTING

1. **Inspecting Relays.**

a. Check for bent or damaged pins.

b. Check for burned or damaged relay case.

2. **Testing Relays.**

NOTE

When testing relays, always refer to the circuit diagram printed or stamped on relay case.

a. Using a multimeter, check for continuity across relay coil.

b. Using a multimeter, check open or closed contacts within relay.

CIRCUIT BREAKER INSPECTION AND TESTING

NOTE

Circuit breakers may be inspected and tested while installed in pump assembly.

1. Inspect circuit breaker for damaged or corroded terminals.
2. Inspect circuit breaker for burned or damaged housing or reset button.
3. If any of these conditions are evident, replace circuit breaker. If none of these conditions are evident, test circuit breaker (refer to step 4).
4. With reset button in the fully outward position, depress reset button to “reset” circuit breaker. Reset button should remain depressed. If not, circuit breaker is defective or an electrical problem exists in another part of the electrical circuit.
5. Isolate circuit breaker by disconnecting one wire from rear of circuit breaker. Again depress reset button. If reset button does not remain depressed, replace circuit breaker.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

CLEANING ENGINE

General Information, Cleaning Using Compressed Air, Cleaning Using High-Pressure Device

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Pressurized water supply

Shop air supply

Steam cleaner

Materials/Parts

Rag, wiping (Item 22, WP 0129)

Personnel Required

63J (1)

References

WP 0068

Equipment Condition

Pump assembly parked on level ground (WP 0006)

Engine off (WP 0006)

Hand brakes applied (WP 0005)

Wheels chocked

GENERAL INFORMATION

CAUTION

Engine cleaning should only be done when engine is off and cool. Ensure electrical system is switched off. When cleaning with fluids, all electrical components must be protected by impermeable covers. Failure to follow this caution may cause damage.

1. This work package describes two methods of cleaning engine.
2. Wear personnel protective equipment that is appropriate for cleaning method selected.
3. In all cases, it is important that electrical and electronic components and connections be covered during the cleaning process (e.g., alternator, starter motor, governor, solenoid).
4. While cleaning, engine should be off.

CAUTION

If turbocharger is cleaned without completely disassembling it, small deposits of carbon or dirt buildup will remain on impeller blades. This will unbalance impeller and damage turbocharger.

5. Do not attempt to remove carbon or dirt buildup from compressor or turbine impellers, unless by complete disassembly of turbocharger.

CAUTION

Use of caustic cleaning solutions will damage certain engine parts.

6. Do not use caustic cleaning solutions when cleaning.

CLEANING USING COMPRESSED AIR

WARNING

Particles blown by compressed air are hazardous. DO NOT exceed 15 psi (103 kPa) nozzle pressure when drying parts with compressed air. Use a maximum of 30 psi (207 kPa) when cleaning components. DO NOT direct compressed air against human skin. Failure to follow this warning may result in injury or death to personnel. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield.

1. Remove engine upper access plate, lower access plate, and oil cooler access plate (WP 0068).
2. Cover all electrical and electronic components and connections.
3. Direct air through engine, using caution not to damage oil cooler and cooling fins. Begin by directing air from exhaust side.
4. Remove dirt that has blown into interior space.
5. Uncover electrical and electronic components and connections.
6. Install engine upper access plate, lower access plate, and oil cooler access plate (WP 0068).

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

7. Ensure pump body is filled with appropriate fluid, then start engine and ensure engine operates correctly (WP 0006).

CLEANING USING HIGH-PRESSURE DEVICE

1. Remove engine upper access plate, lower access plate, and oil cooler access plate (WP 0068).
2. Cover all electrical and electronic components and connections.
3. Clean engine with a jet stream, with a maximum pressure of 850 PSI (5,861 kPa) and a maximum temperature of 194°F (90°C).
4. Uncover electrical and electronic components and connections.
5. Install engine upper access plate, lower access plate, and oil cooler access plate (WP 0068).

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

6. Ensure pump volute is filled 2/3 full with appropriate fluid, then start engine and ensure engine operates correctly (WP 0006).
7. Run engine warm to help remaining water evaporate.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

FUEL INJECTOR REPLACEMENT

Removal, Cleaning and Inspection, Testing, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)
Holder (Item 9, WP 0126)
Puller fixture (Item 13, WP 0126)
Removal tool, seal ring (Item 15, WP 0126)
Tester, diesel fuel injector nozzle (Item 22, WP 0126)

Materials/Parts

Diesel fuel, DF-1 (Item 10, WP 0129)
Diesel fuel, DF-2 (Item 11, WP 0129)

Materials/Parts - Continued

Rag, wiping (Item 22, WP 0129)
Turbine fuel, aviation, JP-5 (Item 31, WP 0129)
Turbine fuel, aviation, JP-8 (Item 32, WP 0129)
Seal

Personnel Required

63J (1)

References

WP 0023
WP 0106

Equipment Condition

Fuel injector line removed (WP 0103)


WARNING

- DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing damage to equipment and injury or death to personnel.
- Wear fuel-resistant gloves and eye protection when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. Failure to follow this warning may result in injury to personnel.
- When servicing this equipment, performing maintenance, or disposing of materials such as fuel, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

NOTE

Replacement of a single fuel injector is described in this work package. Remaining three fuel injectors are replaced the same way.

REMOVAL

1. Remove nut (Figure 1, Item 3) and clamp (Figure 1, Item 4) from cylinder head (Figure 1, Item 5).
2. Remove fuel injector (Figure 1, Item 1) from cylinder head (Figure 1, Item 5).
3. Remove seal (Figure 1, Item 2) from fuel injector (Figure 1, Item 1). Discard seal.

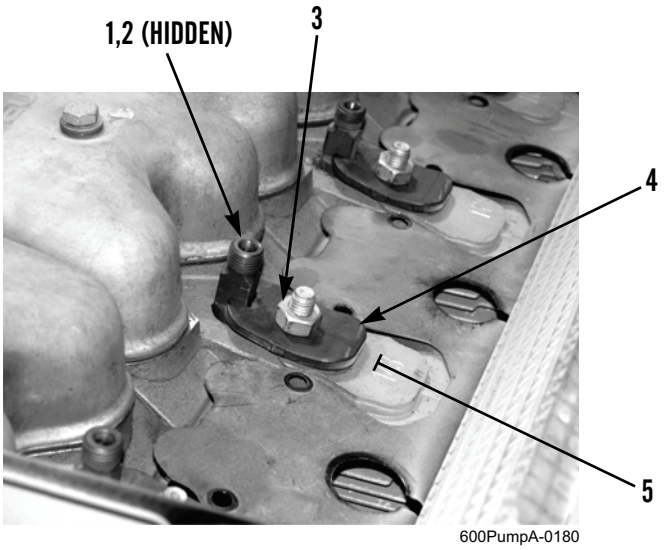


Figure 1. Fuel Injector - Installed.

CLEANING AND INSPECTION

1. Clean and inspect all parts IAW WP 0023.
2. Inspect tip of fuel injector for damage and corrosion. If damaged or corroded, replace fuel injector.

TESTING

WARNING

- Keep hands clear when testing fuel injector. Fuel under high pressure can penetrate the skin, causing blood poisoning. Injury or death to personnel could result.
- Eye protection must be worn when testing fuel injector. Failure to follow this warning may result in injury to personnel.

NOTE

Utmost cleanliness is required when working on injection equipment. Only use pure testing oil or clean fuel for testing injectors.

1. Place holder (Figure 2, Item 7) in vise and insert fuel injector (Figure 2, Item 1) into holder. Release nozzle tensioning nut (Figure 2, Item 6) approximately 180 degrees to release pressure. Retighten nozzle tensioning nut.

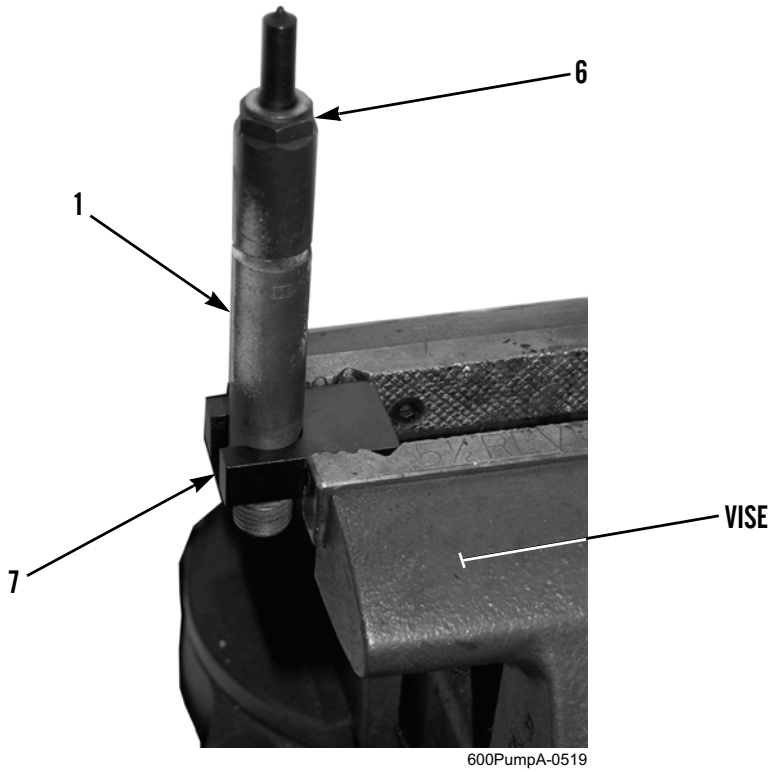


Figure 2. Releasing Pressure From Fuel Injector.

TESTING - CONTINUED

2. Install fuel injector (Figure 3, Item 1) in collector cup (Figure 3, Item 8) of nozzle tester.

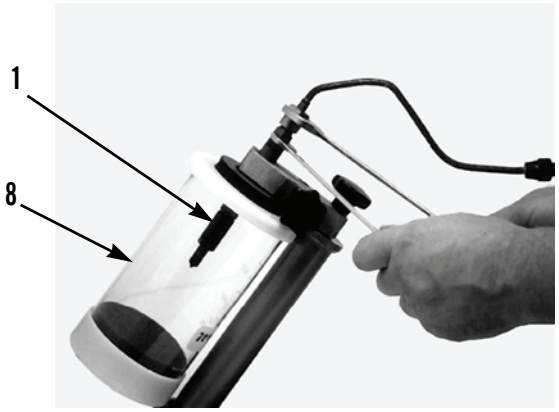


Figure 3. Collector Cup of Nozzle Tester.

3. Fill reservoir (Figure 4, Item 11) of nozzle tester with clean fuel.
4. Install lever (Figure 4, Item 13) on nozzle tester.
5. Operate lever (Figure 4, Item 13) until clear fuel (without air bubbles) flows from supply port (Figure 4, Item 10).
6. Install supply tube (Figure 4, Item 9) between supply port (Figure 4, Item 10) and fuel injector (Figure 4, Item 1).
7. Loosen supply tube fitting at fuel injector (Figure 4, Item 1) and operate lever (Figure 4, Item 13) to purge air from supply tube (Figure 4, Item 9). Tighten supply tube fitting.

NOTE

Opening pressure should be 200 + 10 bar (2,901 + 145 PSI).

8. Turn on pressure gauge (Figure 4, Item 12) and operate lever (Figure 4, Item 13) of nozzle tester. Pressure at which pressure gauge pointer stops, or suddenly drops, is the opening pressure. Note opening pressure.

NOTE

After actuating lever of nozzle tester 3-4 times, pressure builds up again in spring chamber. Nozzle tensioning nut must be released and retightened before repeating test.

9. Repeat step 1 to release pressure, then repeat step 8 two more times and note opening pressure.
   a. If values measured in three tests are the same, values can be regarded as valid.
   b. If opening pressure is not 200 + 10 bar (2,901 + 145 PSI), fuel injector (Figure 4, Item 1) must be replaced.

TESTING - CONTINUED

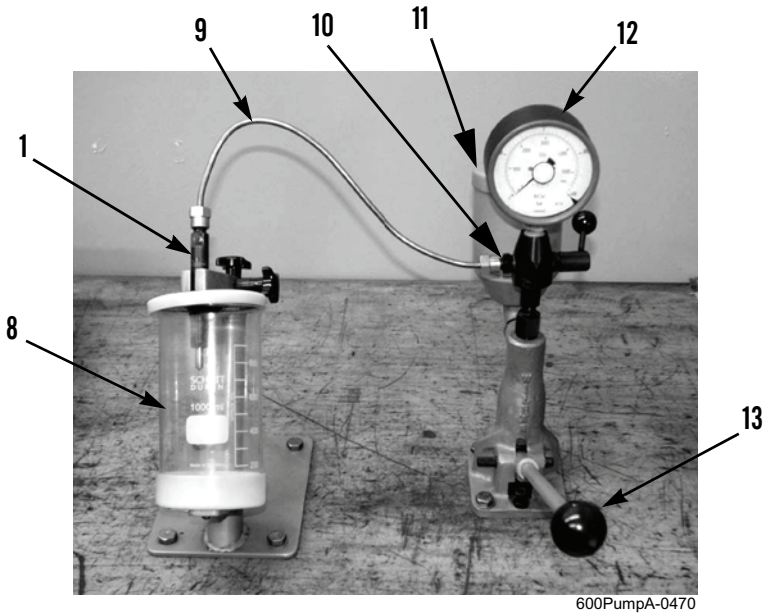


Figure 4. Nozzle Tester and Gauge.

10. Operate lever (Figure 4, Item 13) on nozzle tester slowly up to about 20 bar below opening pressure previously observed in step 8.

NOTE

Injection nozzle is tight if there is no dripping within a 10 second period.

11. If a drip falls from fuel injector (Figure 3, Item 1), fuel injector must be replaced.
12. Remove fuel injector (Figure 3, Item 1) from collector cup (Figure 3, Item 8) nozzle tester.
13. Repeat step 1 to release pressure.
14. Perform buzzing and spray pattern test:
    a. Install fuel injector (Figure 4, Item 1) in collector cup (Figure 4, Item 8) and connect supply tube (Figure 4, Item 9).
    b. Turn off pressure gauge (Figure 4, Item 12).
    c. Operate lever (Figure 4, Item 13) rapidly and listen for buzzing sound emitted by fuel injector (Figure 4, Item 1). Note spray pattern to ensure it is well atomized.
    d. If no buzzing sound is heard or spray pattern is not well atomized, fuel injector (Figure 4, Item 1) must be replaced.

INSTALLATION

NOTE

Lightly coat new seal with clean fuel before installing into cylinder head.

1. Install new seal (Figure 5, Item 2) on fuel injector (Figure 5, Item 1).
2. Install fuel injector (Figure 5, Item 1) into cylinder head (Figure 5, Item 5).
3. Secure fuel injector (Figure 5, Item 1) to cylinder head (Figure 5, Item 5) with clamp (Figure 5, Item 4) and nut (Figure 5, Item 3). Tighten nut to 18 to 26 lb-ft (25 to 35 Nm).

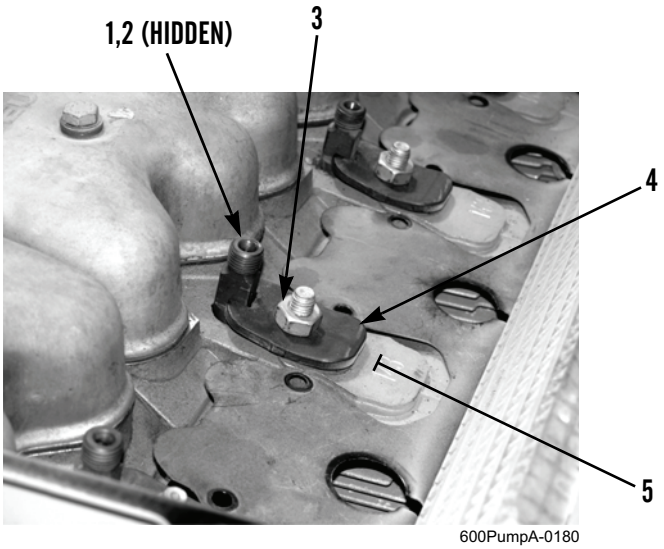


Figure 5. Fuel Injector.

FOLLOW-ON TASKS

1. Install fuel injector line (WP 0103).
2. Bleed fuel system (WP 0106).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

COOLING FAN ASSEMBLY MAINTENANCE

Removal, Disassembly, Cleaning and Inspection, Assembly, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Tool set, SATS base (Item 24, WP 0126)

Press, arbor, hand operated (Item 12, WP 0126)

Materials/Parts

Grease, automotive and artillery, GAA (Item 14, WP 0129)

Rag, wiping (Item 22, WP 0129)

Strap, tiedown, electrical components (Item 26, WP 0129)

Materials/Parts - Continued

Circlip

Personnel Required

63J (1)

References

WP 0006

WP 0023

Equipment Condition

V-belt guard removed (WP 0081)

REMOVAL

1. Push inward and upward on tensioner pulley assembly (Figure 1, Item 5) to release tension on cooling fan V-belt (Figure 1, Item 2) and remove V-belt.
2. Remove two tiedown straps (Figure 1, Item 10) and air line (Figure 1, Item 11) from cooling fan assembly (Figure 1, Item 1). Discard tiedown straps.
3. Remove nut (Figure 1, Item 6), two washers (Figure 1, Item 7), and bolt (Figure 1, Item 8) from cooling fan assembly (Figure 1, Item 1) and engine front cover (Figure 1, Item 9).
4. Remove three bolts (Figure 1, Item 4), washers (Figure 1, Item 3), and cooling fan assembly (Figure 1, Item 1) from engine front cover (Figure 1, Item 9).

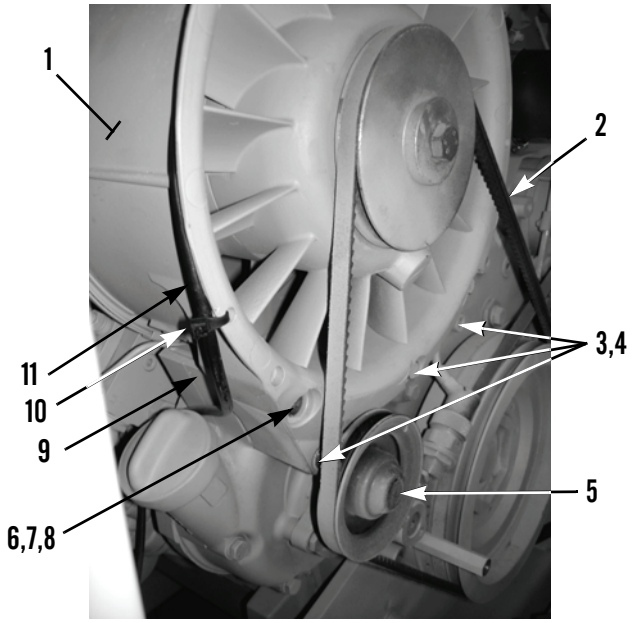


Figure 1. Cooling Fan.

DISASSEMBLY

1. Remove nut (Figure 2, Item 12) and bolt (Figure 2, Item 20) from cooling fan assembly (Figure 2, Item 1).
2. Remove impeller (Figure 2, Item 13) from shaft (Figure 2, Item 16) and cooling fan assembly (Figure 2, Item 1).

NOTE

Shaft is pressed on pulley. Shaft and pulley will pull out of cooling fan as an assembly.

3. Pull pulley (Figure 2, Item 19) and shaft (Figure 2, Item 16) out of cooling fan assembly (Figure 2, Item 1).
4. Remove pulley (Figure 2, Item 19) from shaft (Figure 2, Item 16).

WARNING

Wear eye protection when removing circlip. Failure to follow this warning may result in injury to personnel.

5. Remove circlip (Figure 2, Item 18), bearing (Figure 2, Item 17), bushing (Figure 2, Item 15), and bearing (Figure 2, Item 14) from cooling fan assembly (Figure 2, Item 1). Discard circlip.

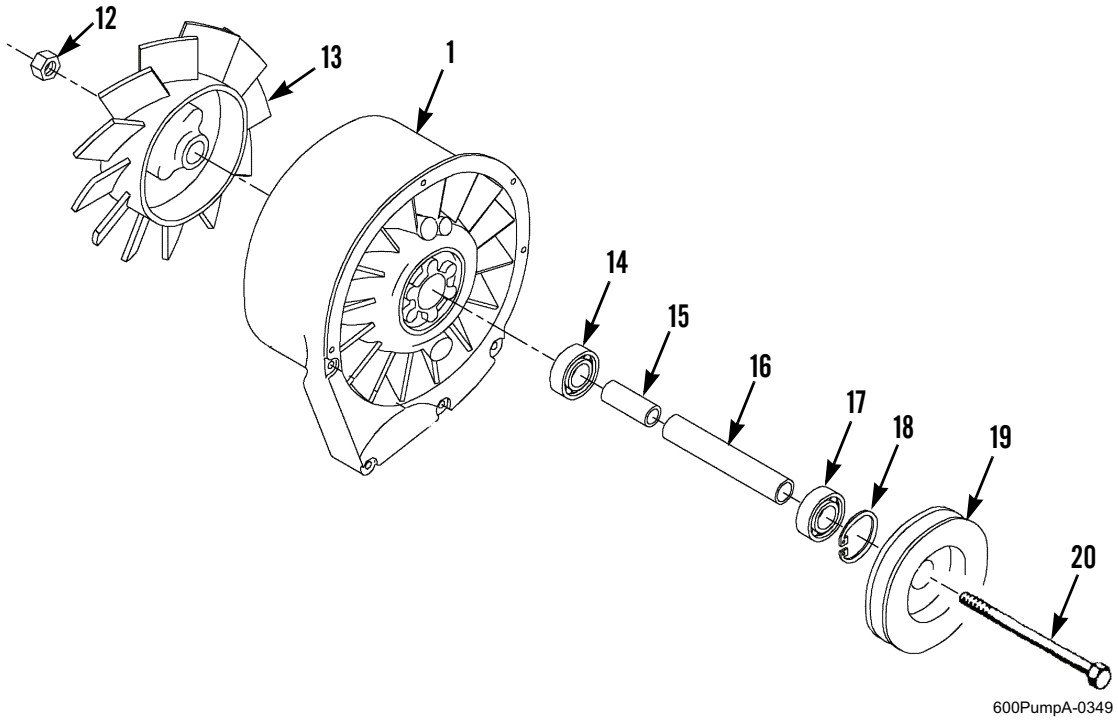


Figure 2. Cooling Fan - Exploded View.

CLEANING AND INSPECTION

Clean and inspect components IAW WP 0023.

ASSEMBLY

1. Pack bearing (Figure 3, Item 14) and bearing (Figure 3, Item 17) with GAA grease.

WARNING

Wear eye protection when installing circlip. Failure to follow this warning may result in injury to personnel.

NOTE

Use an arbor press to install bearings in cooling fan and shaft on pulley.

2. Install bearing (Figure 3, Item 14), bushing (Figure 3, Item 15), bearing (Figure 3, Item 17), and new circlip (Figure 3, Item 18) in cooling fan assembly (Figure 3, Item 1).
3. Install pulley (Figure 3, Item 19) on shaft (Figure 3, Item 16).
4. Install shaft (Figure 3, Item 16) with pulley (Figure 3, Item 19) on cooling fan assembly (Figure 3, Item 1).
5. Install impeller (Figure 3, Item 13) on shaft (Figure 3, Item 16) and cooling fan assembly (Figure 3, Item 1).
6. Install bolt (Figure 3, Item 20) and nut (Figure 3, Item 12) on cooling fan assembly (Figure 3, Item 1). Tighten nut to 22 lb-ft (30 Nm), then tighten nut an additional 1/4 turn.

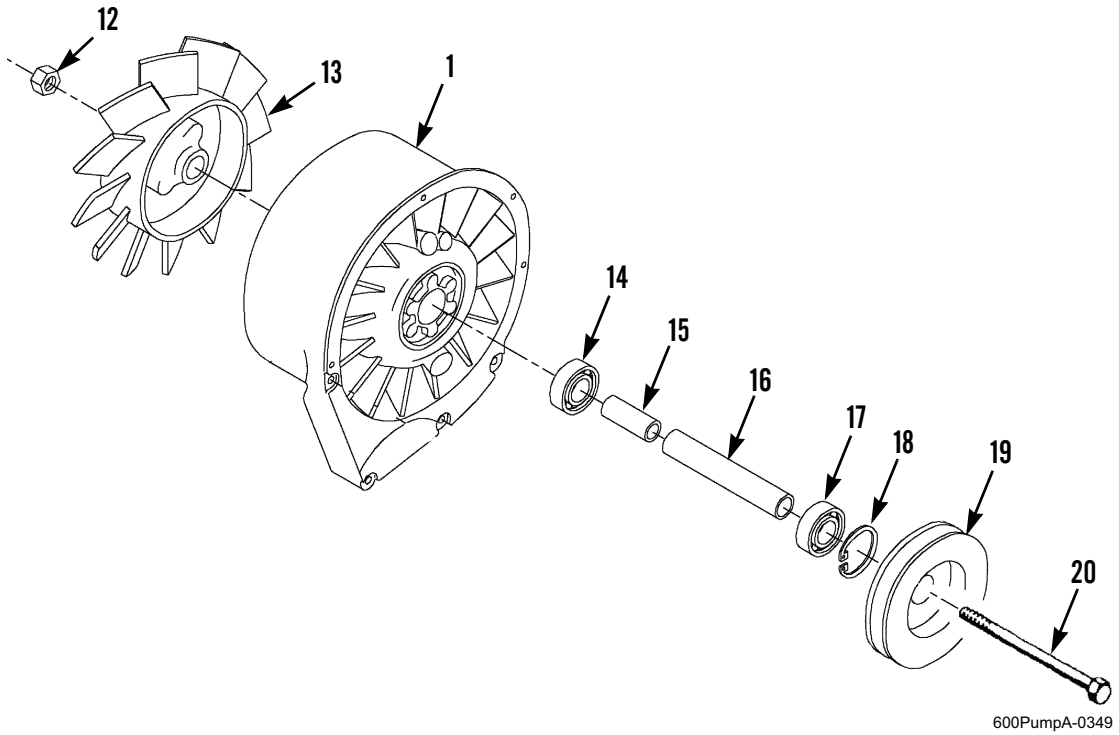


Figure 3. Cooling Fan - Exploded View.

INSTALLATION

1. Install cooling fan assembly (Figure 4, Item 1) on engine front cover (Figure 4, Item 9) with three washers (Figure 4, Item 3) and bolts (Figure 4, Item 4).
2. Install two washers (Figure 4, Item 7), bolt (Figure 4, Item 8), and nut (Figure 4, Item 6) on cooling fan assembly (Figure 4, Item 1) and engine front cover (Figure 4, Item 9).
3. Secure air line (Figure 4, Item 11) to cooling fan assembly (Figure 4, Item 1) with two new tiedown straps (Figure 4, Item 10).
4. Push inward and upward on tensioner pulley assembly (Figure 4, Item 5) and install cooling fan V-belt (Figure 4, Item 2).

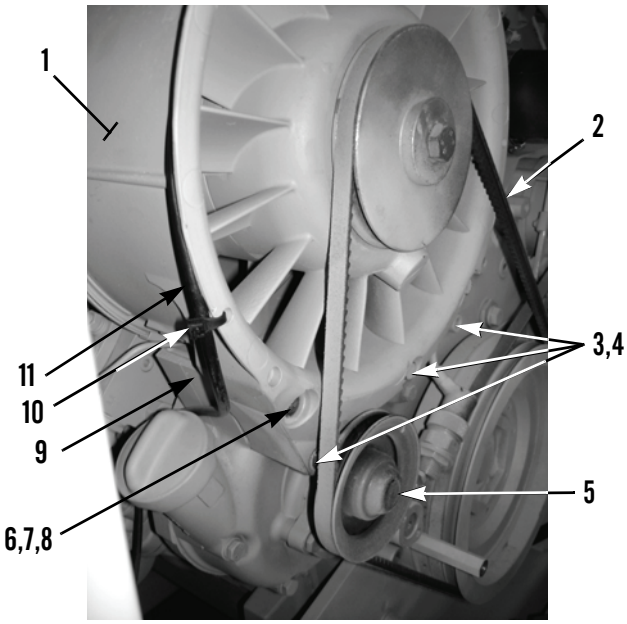


Figure 4. Cooling Fan.

FOLLOW-ON TASKS

1. Install V-belt guard (WP 0081).

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

2. Fill pump volute with appropriate fluid (fuel or water), then start engine and check operation of cooling fan assembly (WP 0006).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

COOLING FAN AND ALTERNATOR V-BELTS INSPECTION AND TENSION CHECK

Cooling Fan V-Belt Inspection and Tension Check, Follow-On Tasks
Alternator V-Belt Inspection and Tension Check, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Gauge unit (Item 8, WP 0126)

References

WP 0029
WP 0092

Personnel Required

63J (1)

Equipment Condition

V-belt guard removed (WP 0081)

COOLING FAN V-BELT INSPECTION AND TENSION CHECK

1. Visually inspect cooling fan V-belt (Figure 1, Item 3) for cuts, frays, breaks, or other damage.

NOTE

If checking tension of a new cooling fan V-belt, run engine for 15 minutes before checking belt tension.

2. Check belt deflection midway between cooling fan pulley (Figure 1, Item 1) and tensioner pulley assembly (Figure 1, Item 2) with gauge unit. Deflection should be 10 to 15 mm (0.39 to 0.59 in).
3. If tension is not correct, either cooling fan V-belt (Figure 1, Item 3) is worn or tensioner pulley assembly (Figure 1, Item 2) is damaged. Replace cooling fan V-belt (WP 0029) or tensioner pulley assembly (WP 0092).

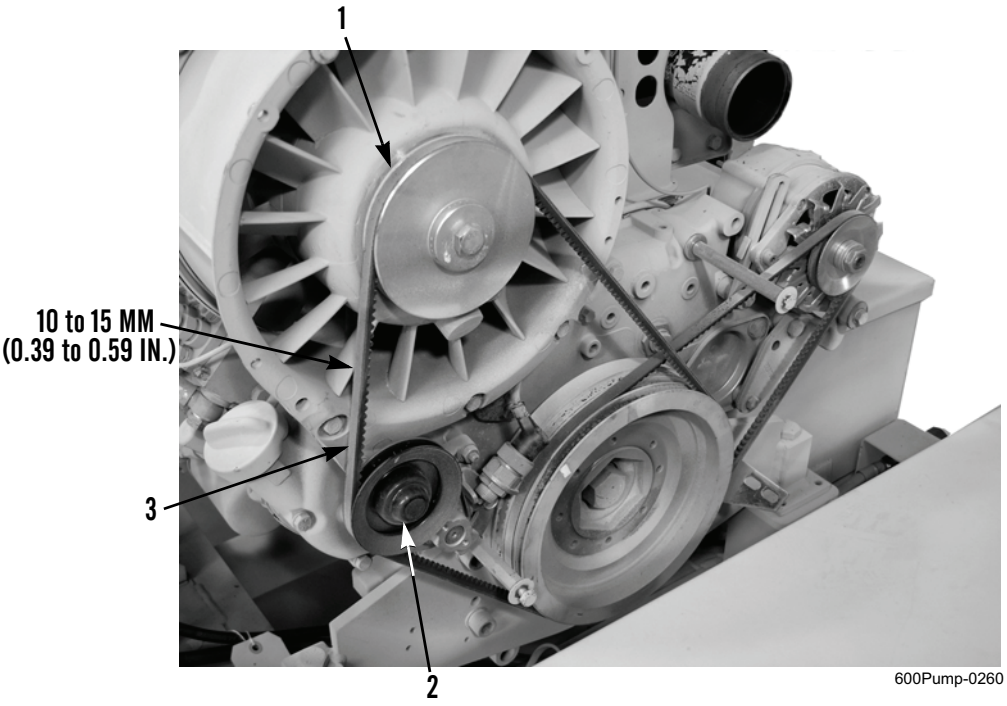


Figure 1. Cooling Fan V-Belt.

FOLLOW-ON TASKS

Install V-belt guard (WP 0081).

ALTERNATOR V-BELT INSPECTION AND TENSION CHECK

1. Visually inspect alternator V-belt (Figure 2, Item 5) for cuts, frays, breaks, or other damage.

NOTE

If checking tension of a new alternator V-belt, run engine for 15 minutes before checking belt tension.

2. Check belt deflection midway between alternator pulley (Figure 2, Item 4) and crankshaft pulley (Figure 2, Item 6) with gauge unit. Deflection should be 3 to7 mm (0.12 to 0.28 in.).
3. If tension is not correct, adjust tension or replace alternator V-belt (Figure 2, Item 5) (WP 0029).

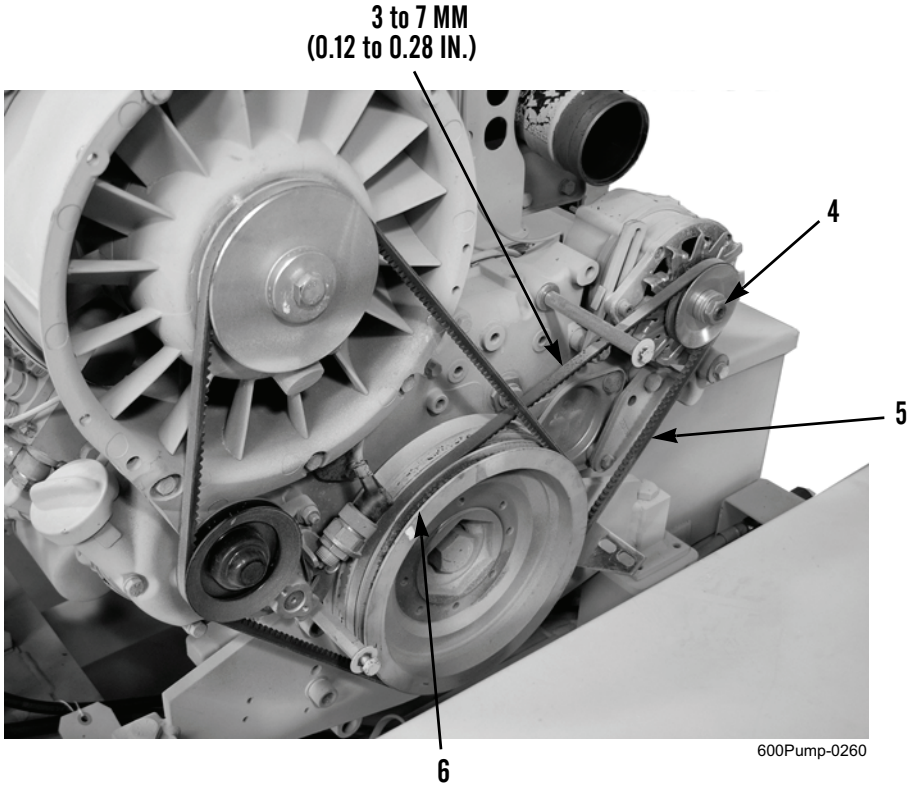


Figure 2. Alternator V-Belt.

FOLLOW-ON TASKS

Install V-belt guard (WP 0081).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

COOLING FAN AND ALTERNATOR V-BELTS REPLACEMENT

Cooling Fan V-Belt Replacement, Follow-On Tasks
Alternator V-Belt Replacement, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Gauge unit (Item 8, WP 0126)

References

WP 0006
WP 0028

Personnel Required

63J (1)

Equipment Condition

V-belt guard removed (WP 0081)

COOLING FAN V-BELT REPLACEMENT

1. Push inward and upward on tensioner pulley assembly (Figure 1, Item 3) to release tension on cooling fan V-belt (Figure 1, Item 4).
2. Remove cooling fan V-belt (Figure 1, Item 4).
3. While pushing inward and upward on tensioner pulley assembly (Figure 1, Item 3), install new cooling fan V-belt (Figure 1, Item 4) between cooling fan pulley (Figure 1, Item 1) and crankshaft pulley (Figure 1, Item 2).
4. Release tensioner pulley assembly (Figure 1, Item 3), restoring tension to cooling fan V-belt (Figure 1, Item 4).

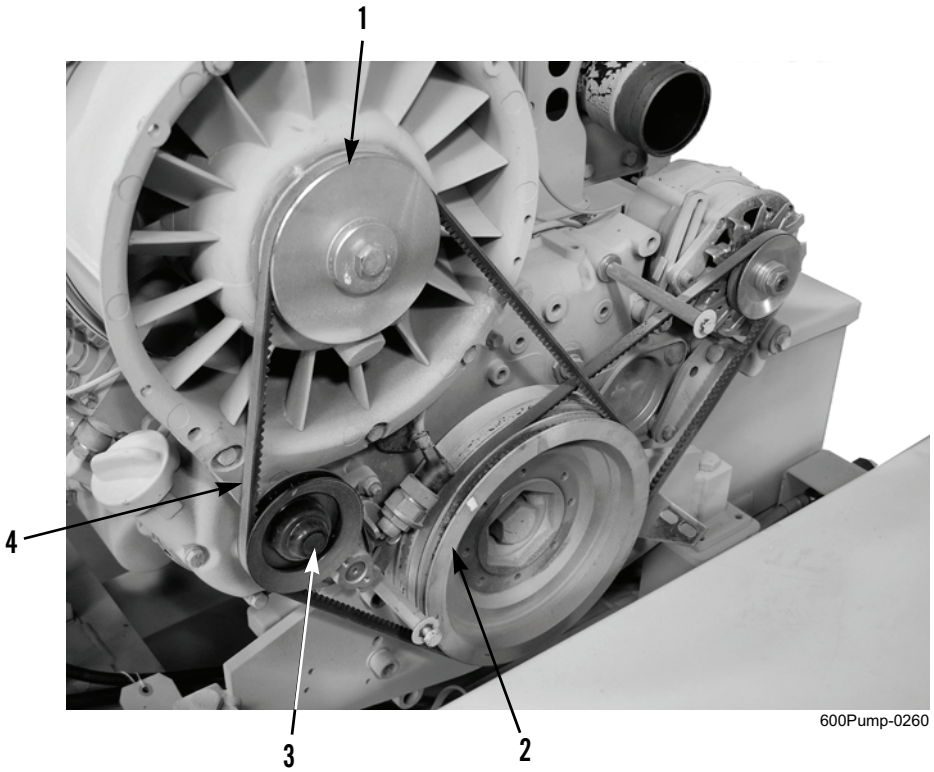


Figure 1. Cooling Fan V-Belt.

COOLING FAN V-BELT REPLACEMENT - CONTINUED

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

5. Ensure pump volute is filled 2/3 full with appropriate fluid, then start engine (WP 0006) and run engine for 15 minutes. Shut down engine.
6. Recheck cooling fan V-belt tension (WP 0028).

FOLLOW-ON TASKS

Install V-belt guard (WP 0081).

ALTERNATOR V-BELT REPLACEMENT

1. Remove cooling fan V-belt. Refer to *Cooling Fan V-Belt Replacement* in this work package.
2. Loosen bolts (Figure 2, Items 5, 6, and 8).
3. Press inward on alternator (Figure 2, Item 7) in direction of arrow (A) and remove alternator V-belt (Figure 2, Item 9).

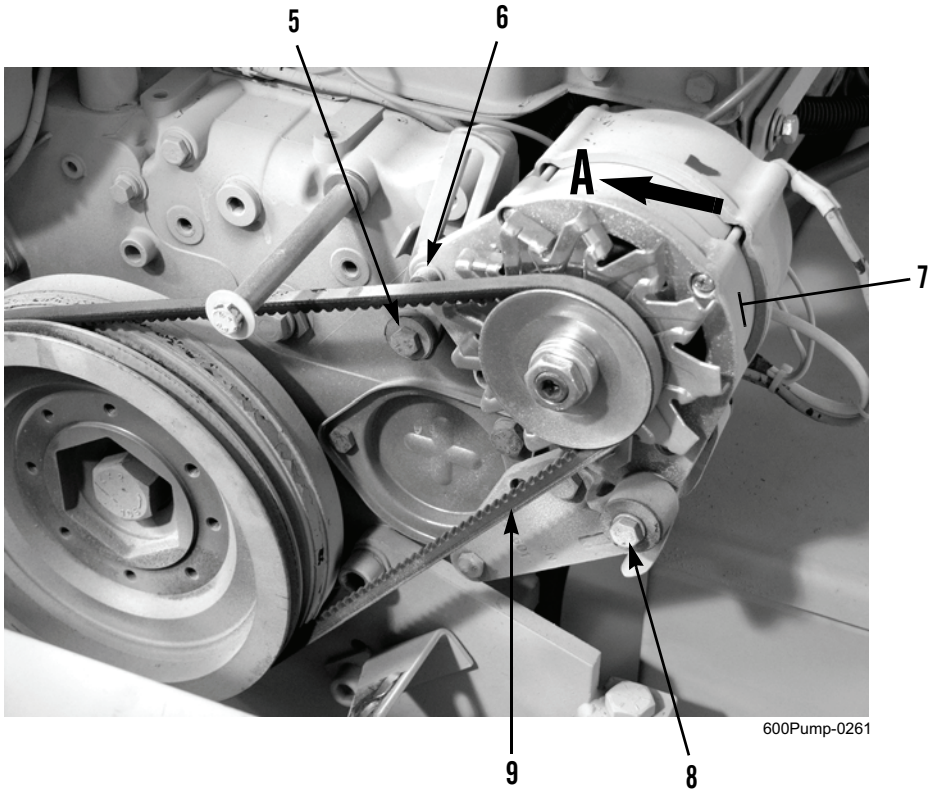


Figure 2. Alternator V-Belt Removal.

ALTERNATOR V-BELT REPLACEMENT - CONTINUED

4. Position new alternator V-belt (Figure 3, Item 9) between alternator pulley (Figure 3, Item 10) and crankshaft pulley (Figure 3, Item 2). Press outward on alternator (Figure 3, Item 7) in direction of arrow (B) until correct V-belt deflection is obtained: 3 to 7 mm (0.12 to 0.28 in.) as determined by gauge unit.
5. Tighten bolts (Figure 3, Items 5, 6, and 8).

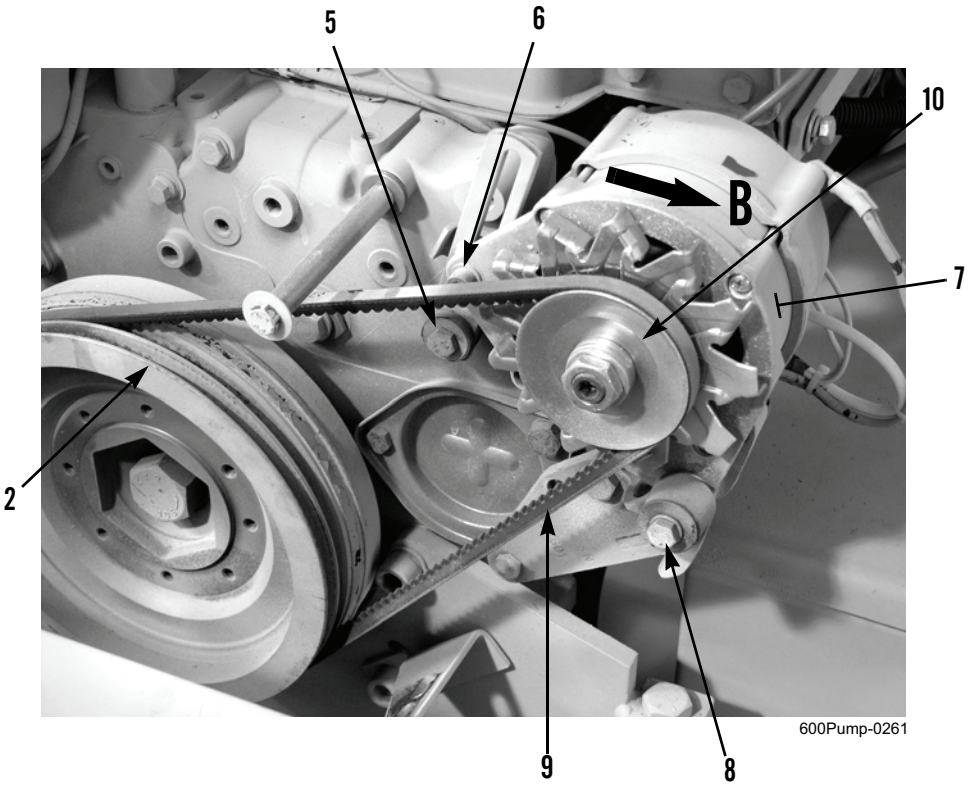


Figure 3. Alternator V-Belt Installation.

6. Install cooling fan V-belt. Refer to *Cooling Fan V-Belt Replacement* in this work package.

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

7. Ensure pump volute is filled 2/3 full with appropriate fluid, then start engine (WP 0006) and run for 15 minutes. Shut down engine.
8. Ensure alternator V-belt deflection is within specification: 3 to 7 mm (0.12 to 0.28 in.).

FOLLOW-ON TASKS

Install V-belt guard (WP 0081).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

ALTERNATOR MAINTENANCE

Removal, Disassembly, Cleaning and Inspection, Assembly, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Rag, wiping (Item 22, WP 0129)
Tag, marker (Item 27, WP 0129)
Locknut (2)
Lockwasher

Personnel Required

63J (1)

References

WP 0023
WP 0029

Equipment Condition

Battery cables disconnected (WP 0033)
Lower access plate removed (WP 0068)
V-belt guard removed (WP 0081)

REMOVAL

WARNING

Ensure battery cables are disconnected before replacing alternator. Failure to follow this warning could result in personal injury or damage to equipment.

1. Remove capscrew (Figure 1, Item 1), washer (Figure 1, Item 2), and weldnut (Figure 1, Item 3) from alternator (Figure 1, Item 5) and adjustment bracket (Figure 1, Item 4).
2. Remove V-belt (Figure 1, Item 12) from pulley (Figure 1, Item 11).

NOTE

It is not necessary to remove damping bushing unless damaged.

3. Remove bolt (Figure 1, Item 8), washer (Figure 1, Item 9), damping bushing (Figure 1, Item 10), and nut (Figure 1, Item 6) from alternator (Figure 1, Item 5) and bracket (Figure 1, Item 7).

CAUTION

During alternator removal, only move alternator enough to gain access for removing attached wires. Allowing alternator to hang on wires or to fall may damage equipment.

4. Remove alternator (Figure 1, Item 5) from bracket (Figure 1, Item 7).

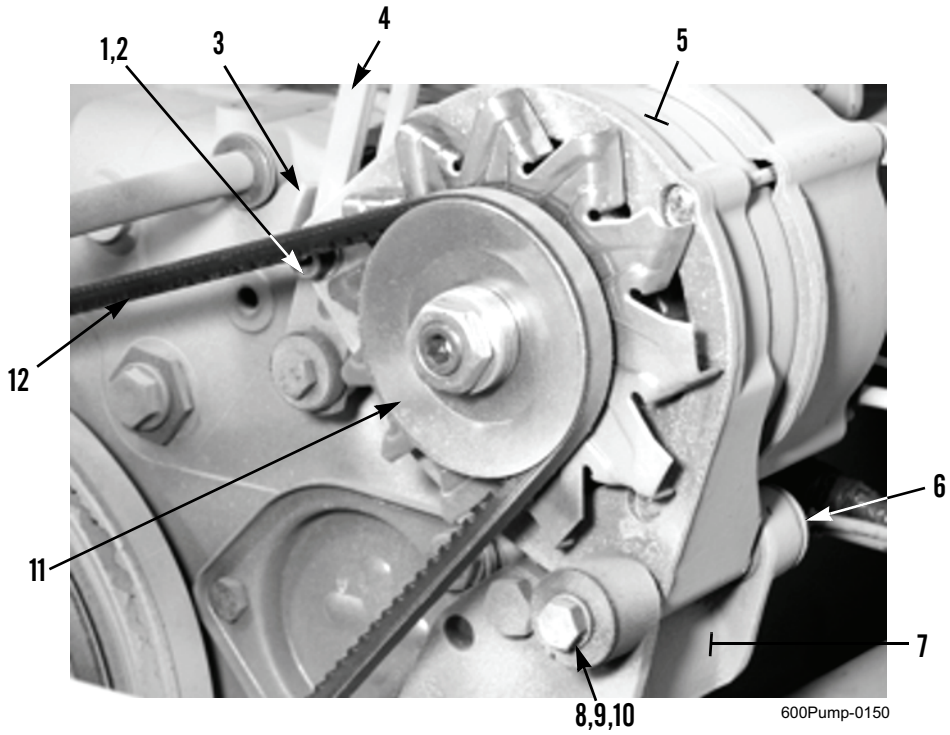


Figure 1. Alternator.

REMOVAL - CONTINUED

NOTE

Tag wires before removal to ensure correct installation.

5. Remove locknut (Figure 2, Item 19) and wire (Figure 2, Item 18) from alternator (Figure 2, Item 5). Discard locknut.
6. Remove locknut (Figure 2, Item 21) and wire (Figure 2, Item 20) from alternator (Figure 2, Item 5). Discard locknut.
7. Disconnect wire (Figure 2, Item 17) from alternator (Figure 2, Item 5).
8. Remove nut (Figure 2, Item 13), lockwasher (Figure 2, Item 14), and wires (Figure 2, Items 15 and 16) from alternator (Figure 2, Item 5). Discard lockwasher.

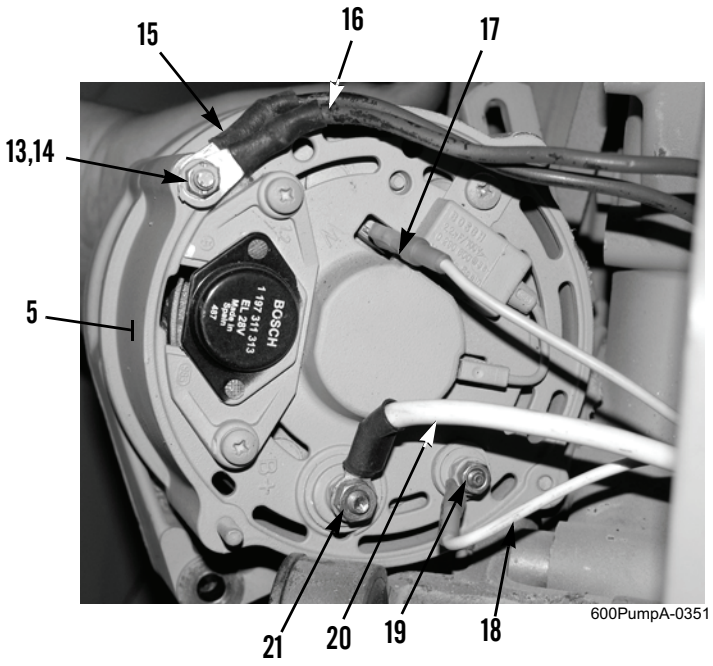


Figure 2. Alternator Wires.

DISASSEMBLY

NOTE

If only replacing voltage regulator, it is not necessary to remove any alternator electrical wires.

1. Remove two screws with captive washers (Figure 3, Item 22) and voltage regulator (Figure 3, Item 23) from alternator (Figure 3, Item 5).

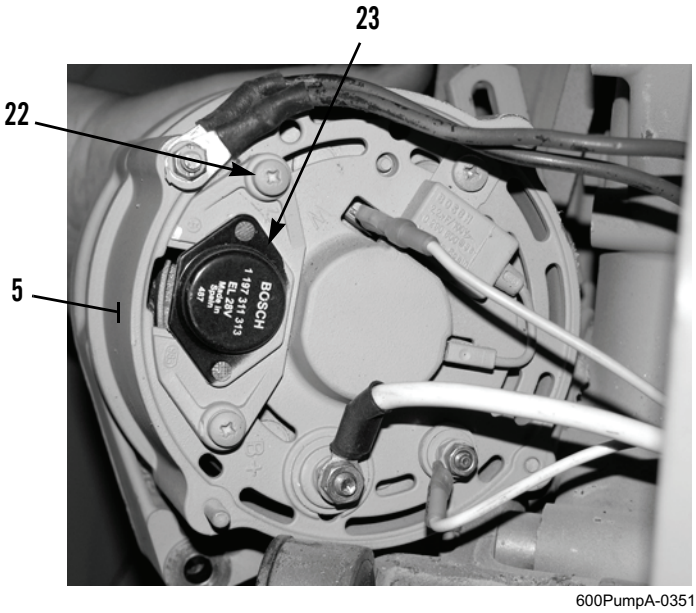


Figure 3. Voltage Regulator.

2. Remove nut (Figure 4, Item 30), washer (Figure 4, Item 29), spacer (Figure 4, Item 28), pulley (Figure 4, Item 11), washer (Figure 4, Item 27), supporting ring (Figure 4, Item 26), and fan (Figure 4, Item 25) from shaft (Figure 4, Item 24) on alternator (Figure 4, Item 5).

NOTE

If alternator bracket is damaged or cracked, replace as needed.

3. Remove bolt (Figure 4, Item 31), nut (Figure 4, Item 36), wires (Figure 4, Items 37 and 38), washer (Figure 4, Item 35), and spacer (Figure 4, Item 34) from bracket (Figure 4, Item 7).
4. Remove bolt (Figure 4, Item 32), spacer (Figure 4, Item 33), and bracket (Figure 4, Item 7) from engine.

DISASSEMBLY - CONTINUED

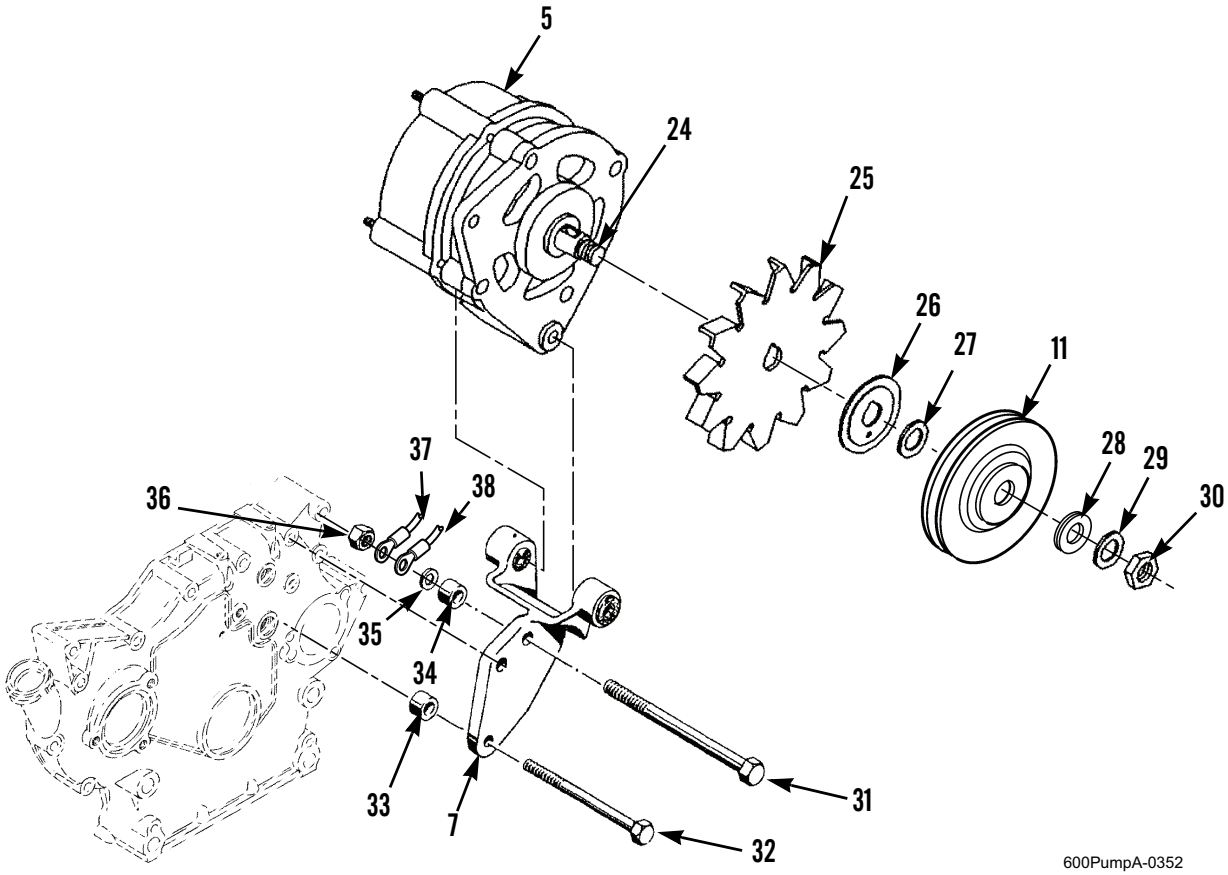


Figure 4. Alternator - Exploded Parts.

CLEANING AND INSPECTION

1. Clean and inspect all parts IAW WP 0023.
2. Replace any damaged parts.

ASSEMBLY

1. Install spacer (Figure 5, Items 33), bracket (Figure 5, Item 7), and bolt (Figure 5, Item 32) on engine.
2. Install bolt (Figure 5, Item 31), spacer (Figure 5, Item 34), washer (Figure 5, Item 35), wires (Figure 5, Items 37 and 38), and nut (Figure 5, Item 36) on bracket (Figure 5, Item 7).
3. Install fan (Figure 5, Item 25), supporting ring (Figure 5, Item 26), washer (Figure 5, Item 27), pulley (Figure 5, Item 11), spacer (Figure 5, Item 28), washer (Figure 5, Item 29), and nut (Figure 5, Item 30) on shaft (Figure 5, Item 24) on alternator (Figure 5, Item 5). Tighten nut to 30 lb-ft (40 Nm).
4. Install voltage regulator (Figure 6, Item 23) and two screws with captive washers (Figure 6, Item 22) on alternator (Figure 5, Item 5).

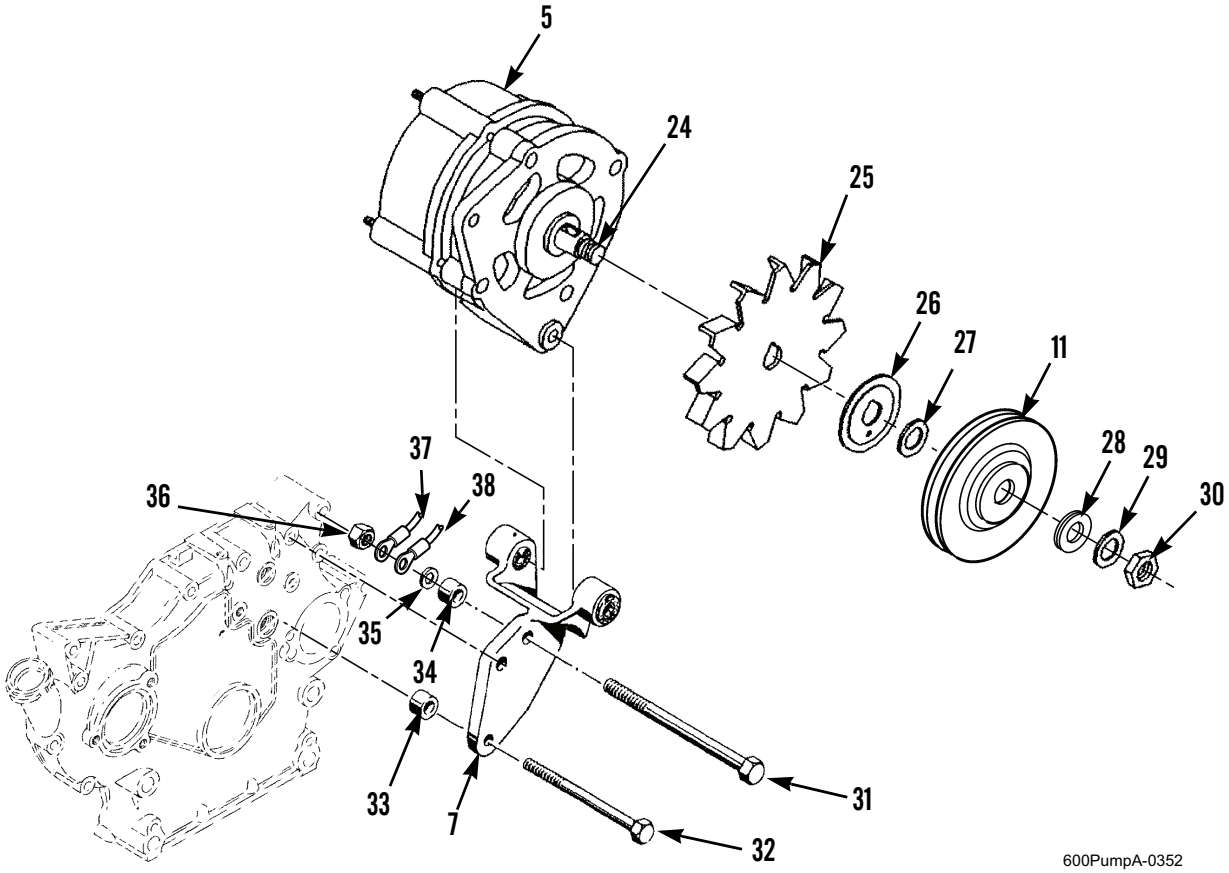


Figure 5. Alternator - Exploded Parts.

INSTALLATION

CAUTION

During installation, support alternator in position while installing wires. Allowing alternator to hang on wires or to fall may damage equipment.

1. Install wires (Figure 6, Items 15 and 16), new lockwasher (Figure 6, Item 14), and nut (Figure 6, Item 13) on alternator (Figure 6, Item 5).
2. Connect wire (Figure 6, Item 17) to alternator (Figure 6, Item 5).
3. Install wire (Figure 6, Item 20) and new locknut (Figure 6, Item 21) on alternator (Figure 6, Item 5).
4. Install wire (Figure 6, Item 18) and new locknut (Figure 6, Item 19) on alternator (Figure 6, Item 5).

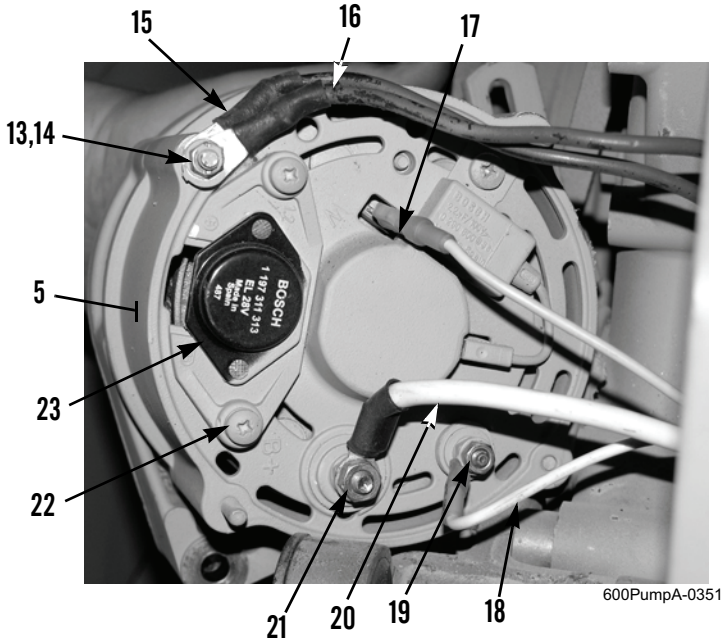


Figure 6. Alternator Wires.

INSTALLATION - CONTINUED

5. Install alternator (Figure 7, Item 5) on bracket (Figure 7, Item 7).
6. Install damping bushing (Figure 7, Item 10), washer (Figure 7, Item 9), bolt (Figure 7, Item 8), and nut (Figure 7, Item 6) on alternator (Figure 7, Item 5) and bracket (Figure 7, Item 7).
7. Install V-belt (Figure 7, Item 12) on pulley (Figure 7, Item 11).
8. Install weldnut (Figure 7, Item 3), washer (Figure 7, Item 2), and capscrew (Figure 7, Item 1) on alternator (Figure 7, Item 5) and adjustment bracket (Figure 7, Item 4).

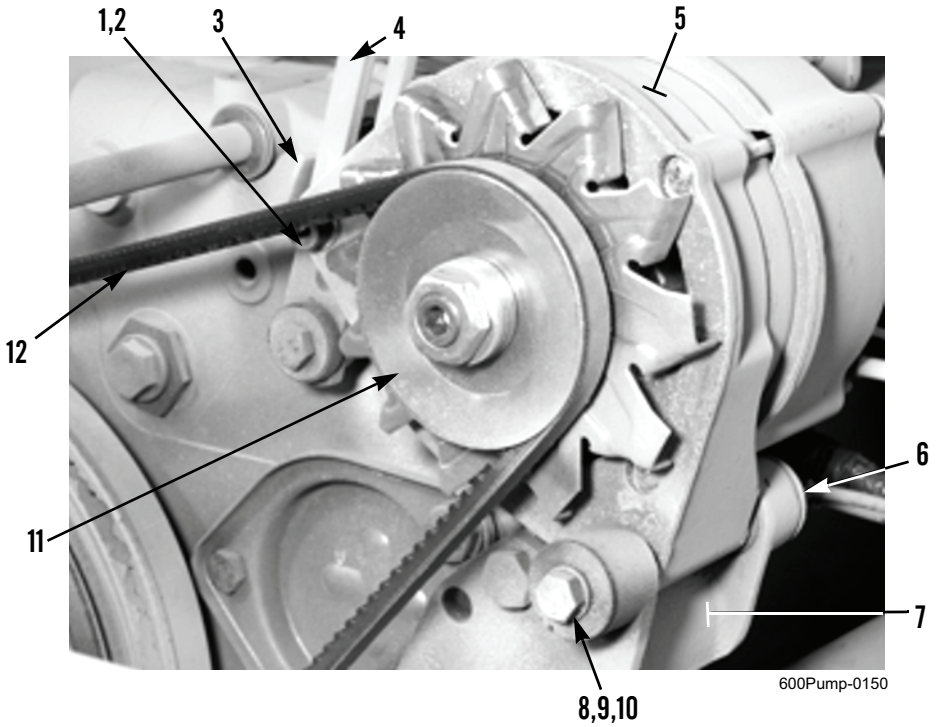


Figure 7. Alternator.

FOLLOW-ON TASKS

1. Adjust alternator V-belt tension (WP 0029).
2. Install V-belt guard (WP 0081).
3. Install lower access plate (WP 0068).
4. Connect battery cables (WP 0033).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

TAILLIGHT MAINTENANCE

**Lamp/LED Replacement, Follow-On Tasks,
Taillight Removal, Taillight Installation, Follow-On Tasks**

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Personnel Required

63J (1)

Materials/Parts

Rag, wiping (Item 22, WP 0129)
Strap, tiedown, electrical components (Item 26, WP 0129)
Tag, marker (Item 27, WP 0129)
Lamp (as required)
LED (as required)
Lockwasher (2)

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked
Intervehicular electrical cable disconnected from towing vehicle (WP 0006)

LAMP/LED REPLACEMENT

1. Loosen six captive screws (Figure 1, Item 1) and remove taillight lens (Figure 1, Item 2) from taillight body (Figure 1, Item 3).

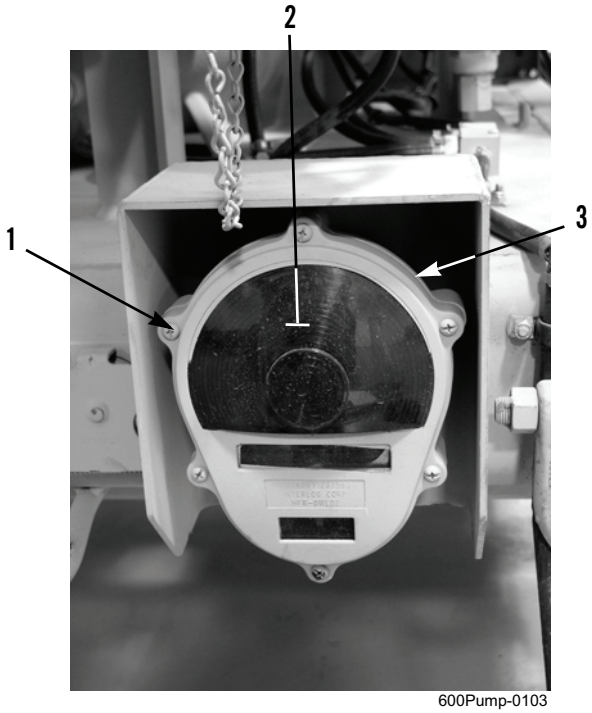


Figure 1. Taillight Lens.

LAMP/LED REPLACEMENT - CONTINUED

2. Inspect O-ring (Figure 2, Item 4) in groove of taillight lens (Figure 2, Item 2). If damaged, remove and discard O-ring.

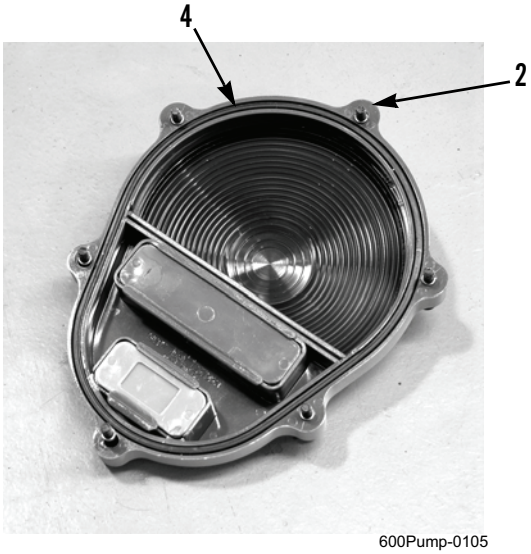


Figure 2. Taillight Lens O-Ring.

3. Remove defective lamp (Figure 3, Item 5) by pushing in and turning counterclockwise (left).
4. Install new lamp (Figure 3, Item 5) by pushing in and turning clockwise (right).
5. Remove defective LED (Figure 3, Item 6):
   a. Pull forward on printed circuit board.
   b. At socket, push in and turn counterclockwise (left).
6. Install new LED (Figure 3, Item 6):
   a. At socket, push in and turn clockwise (right).
   b. Push printed circuit board onto socket.

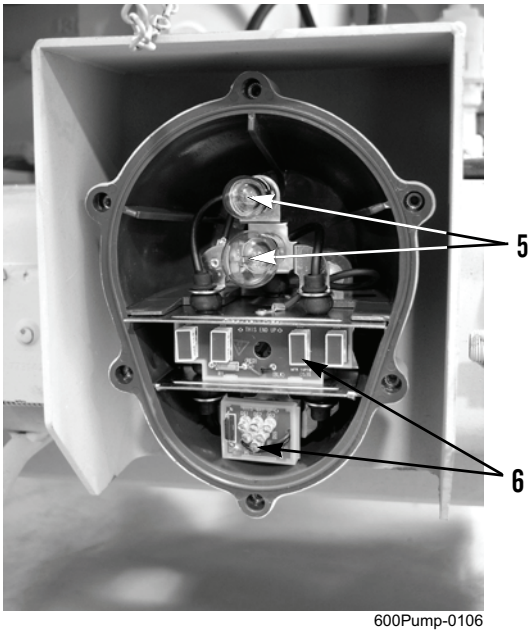


Figure 3. Lamps and LEDs.

LAMP/LED REPLACEMENT - CONTINUED

7. If replaced, install new O-ring (Figure 2, Item 4) in groove of taillight lens (Figure 2, Item 2).
8. Install taillight lens (Figure 4, Item 2) on taillight body (Figure 4, Item 3) and tighten six captive screws (Figure 4, Item 1).

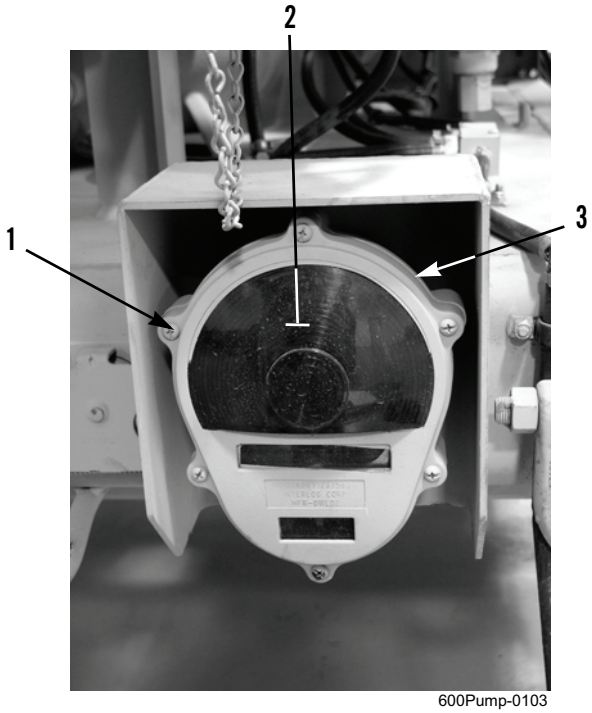


Figure 4. Taillight Lens.

FOLLOW-ON TASKS

Connect intervehicular electrical cable to towing vehicle and check operation of taillight (WP 0006).

TAILLIGHT REMOVAL

NOTE

Tag wires before removal to ensure correct installation.

1. Cut tiedown strap (Figure 5, Item 7) from taillight connectors (Figure 5, Item 13) and trailer wiring harness connectors (Figure 5, Item 14). Discard tiedown strap.
2. Disconnect four trailer wiring harness connectors (Figure 5, Item 14) from taillight connectors (Figure 5, Item 13).
3. Remove two screws (Figure 5, Item 11), taillight ground wire (Figure 5, Item 12), two lockwashers (Figure 5, Item 10), and washers (Figure 5, Item 9) from rear of trailer. Discard lockwashers.
4. If required, remove grommet (Figure 5, Item 8) and remove taillight (Figure 6, Item 15) from rear of trailer.

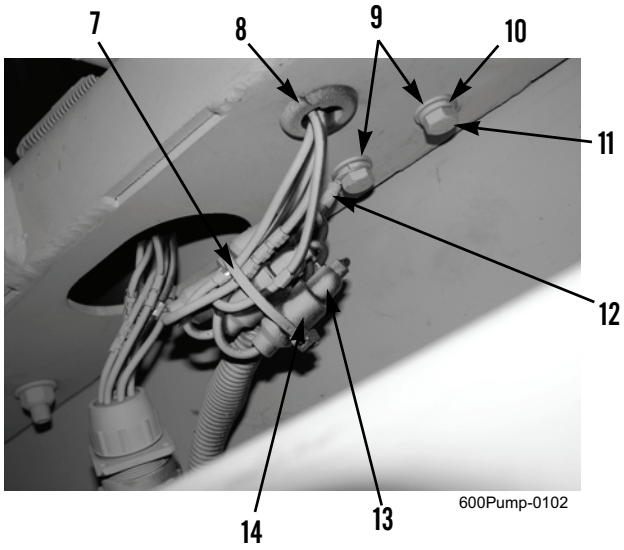


Figure 5. Taillight Connectors.

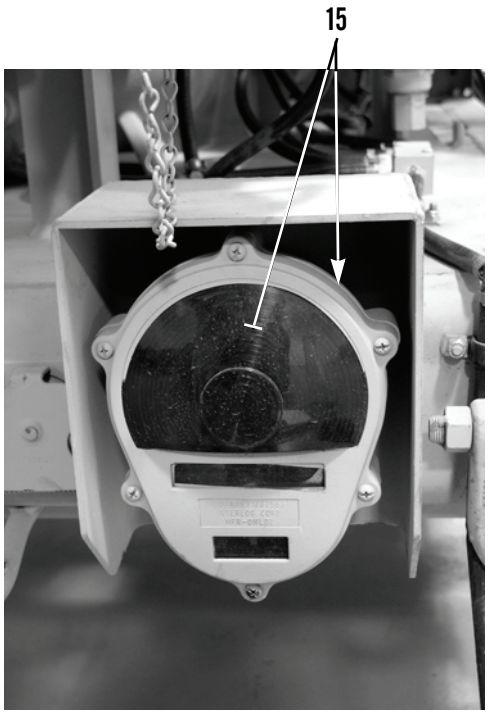
TAILLIGHT INSTALLATION

1. Position taillight (Figure 6, Item 15) at rear of trailer, with taillight ground wire (Figure 5, Item 12) and taillight connectors (Figure 5, Item 13) fed through opening at rear of trailer. If removed, install grommet (Figure 5, Item 8).

CAUTION

Taillight body is made of plastic material. To prevent damaging body, do not overtighten bolts.

2. Secure taillight (Figure 6, Item 15) and taillight ground wire (Figure 5, Item 12) to rear of trailer with two washers (Figure 5, Item 9), new lockwashers (Figure 5, Item 10), and screws (Figure 5, Item 11).



600Pump-0103

Figure 6. Taillight.

3. Connect four trailer wiring harness connectors (Figure 5, Item 14) to taillight connectors (Figure 5, Item 13).
4. Install new tiedown strap (Figure 5, Item 7) around four taillight connectors (Figure 5, Item 13) and trailer wiring harness connectors (Figure 5, Item 14).

FOLLOW-ON TASKS

Connect intervehicular electrical cable to towing vehicle and check operation of taillight (WP 0006).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

BATTERY TESTING AND CHARGING

Testing, Charging, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Personnel Required

63J (1)

Equipment Conditions

Batteries removed (WP 0033)

WARNING

- To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. DO NOT smoke, use open flame, make sparks, or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury to personnel. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating or electrical shock, damage to equipment, and injury to personnel.
- Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes, or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these procedures may result in injury or death to personnel.
- CALIFORNIA PROPOSITION 65 WARNING: Battery posts, terminals, and related accessories contain lead and lead components. These chemicals are known to the state of California to cause cancer and reproductive harm. Wash hands after handling.

TESTING

NOTE

- To prevent inaccurate Open Circuit Voltage (OCV) measurements, wait at least four hours after charging with engine alternator or 8 hours after using a battery charger.
- Do not crank engine to test batteries. Measure OCV instead.
- Most engine alternators require a minimum of 20 minutes engine run time to replace energy used by batteries to start engine.

1. Use a multimeter to measure OCV. A fully charged battery should read 12.8 to 13.0V. A discharged battery will read 10.5V.
2. If OCV is less than 12.75V, charge battery.

CHARGING

NOTE

This procedure is for Absorbed Glass Matt (AGM) batteries only.

1. Use a Constant Voltage battery charger that regulates voltage between 14.25 and 14.75VDC. When charger indicates charge cycle is complete, let batteries rest for a minimum of eight hours. If charger does not have an "end of charge indicator," follow procedure a or b below as required:
   a. Leave charger running for at least two hours after charge current falls below one amp.
   b. Estimate recharge time, based on charger rated output (estimated time is for a battery discharged to an OCV of 10.5V):
      (1) If using a 10-amp charger, charge battery for a minimum of 24 hours.
      (2) If using a 20-amp charger, charge battery for a minimum of 16 hours.
      (3) If a battery is severely discharged, below 10V, run battery through two complete charge cycles.
2. After rest period, recheck OCV.
   a. If OCV is greater than 12.75V, return battery to service.
   b. If OCV is less than 12.75V, repeat recharge/rest cycle above.
   c. If after two complete recharge/rest cycles OCV is not above 12.75V, replace battery (WP 0033).

FOLLOW-ON TASKS

Install batteries (WP 0033).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

BATTERY CABLES AND BATTERIES REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Materials/Parts

Petrolatum, technical (Item 21, WP 0129)
Rag, wiping (Item 22, WP 0129)
Sodium bicarbonate, technical (Item 23, WP 0129)
Tag, marker (Item 27, WP 0129)

Personnel Required

63J (2) (if replacing batteries)

References

WP 0032
WP 0034
WP 0035
WP 0109

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked
Heat shield removed (WP 0107) (if replacing batteries)

WARNING

- To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. DO NOT smoke, use open flame, make sparks, or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury to personnel. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating or electrical shock, damage to equipment, and injury to personnel.
- Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes, or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these procedures may result in injury or death to personnel.
- CALIFORNIA PROPOSITION 65 WARNING: Battery posts, terminals, and related accessories contain lead and lead components. These chemicals are known to the state of California to cause cancer and reproductive harm. Wash hands after handling.
- Arcing or sparks may occur if battery cables contact any metal surfaces of equipment during removal. Ensure cables do not contact metal surfaces. Failure to do so may cause injury to personnel or damage to equipment.

REMOVAL

1. Access batteries by turning knob (Figure 1, Item 1) counterclockwise (left) and removing knob and battery box lid (Figure 1, Item 2).

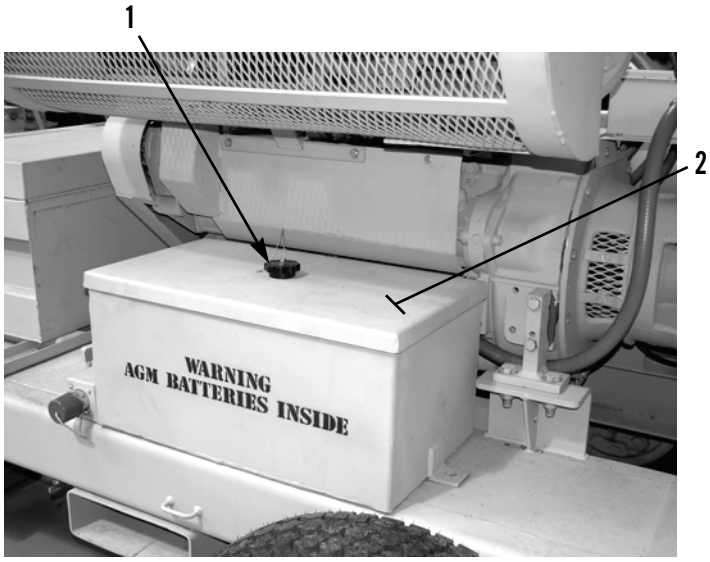


Figure 1. Battery Box.

WARNING

Be careful not to touch tool used to disconnect battery cable clamps to any part of equipment. Sparks may occur, resulting in injury to personnel or damage to equipment.

NOTE

Tag battery cables before removal to ensure correct installation.

2. Remove battery cables:
   a. Remove nut (Figure 2, Item 5) and disconnect negative battery cables (Figure 2, Items 6 and 19) from negative terminal of battery (Figure 2, Item 18).
   b. Remove nut (Figure 2, Item 9) and disconnect positive battery cables (Figure 2, Items 7 and 8) from positive terminal of battery (Figure 2, Item 13).
   c. Loosen nut (Figure 2, Item 14) and bolt (Figure 2, Item 15) and disconnect jumper cable (Figure 2, Item 17) and terminal lug (Figure 2, Item 16) from positive terminal of battery (Figure 2, Item 18).
   d. Repeat step c to remove jumper cable (Figure 2, Item 17) from negative terminal of battery (Figure 2, Item 13).

REMOVAL - CONTINUED

e. If damaged, remove nut (Figure 2, Item 3), bolt (Figure 2, Item 4), and terminal lug (Figure 2, Item 20) from battery (Figure 2, Item 18).

f. If damaged, remove nut (Figure 2, Item 11), bolt (Figure 2, Item 12), and terminal lug (Figure 2, Item 10) from battery (Figure 2, Item 13).

g. Disconnect negative battery cable (Figure 2, Item 6) and positive battery cable (Figure 2, Item 8) from NATO electrical receptacle (WP 0035).

h. Disconnect negative battery cable (Figure 2, Item 19) from chassis ground (WP 0109).

i. Disconnect positive battery cable (Figure 2, Item 7) from starter solenoid (WP 0109).

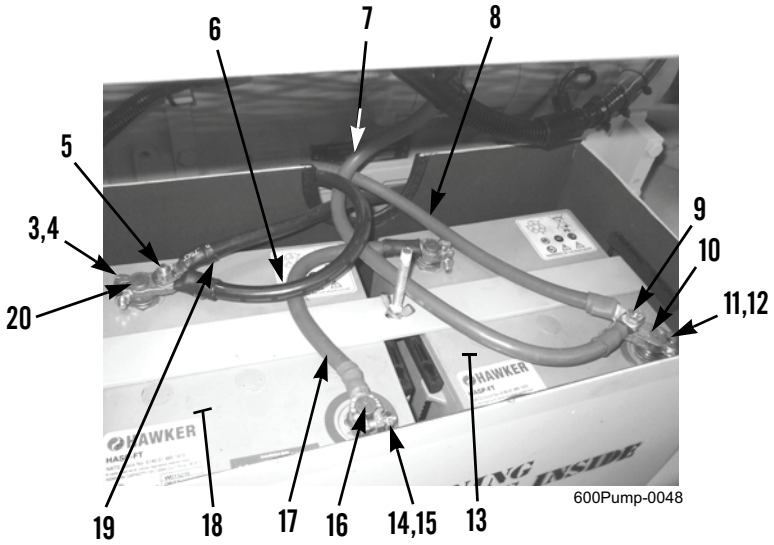


Figure 2. Battery Cables.

REMOVAL - CONTINUED

3. Remove batteries:
   a. Remove wingnut (Figure 3, Item 23) from threaded retaining bolt (Figure 3, Item 22).
   b. Remove battery holddown (Figure 3, Item 21) from top of batteries (Figure 3, Items 13 and 18).

WARNING

Use caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may cause injury to personnel.

NOTE

Each battery weighs approximately 88 lb (40 kg).

   c. With assistance, lift batteries (Figure 3, Items 13 and 18) from battery box (Figure 3, Item 24), using handles provided on each side of battery.

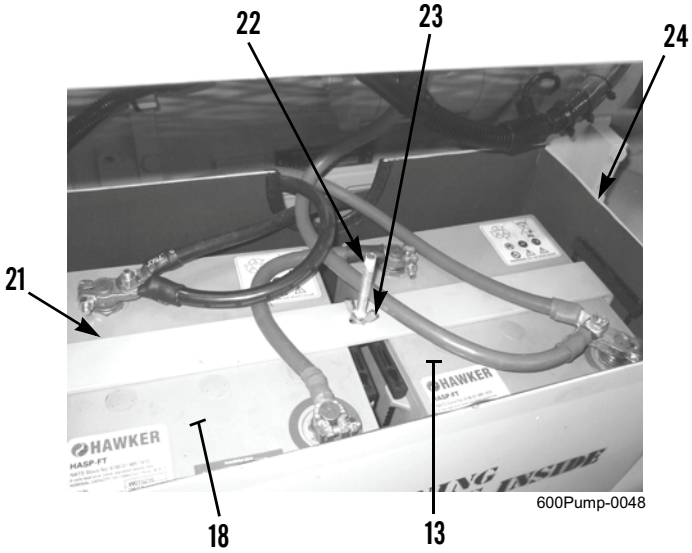


Figure 3. Batteries.

CLEANING AND INSPECTION

1. Clean and inspect battery box IAW WP 0034.
2. Inspect battery cables for damage. Replace if damaged.
3. Use a rag to clean terminal posts and terminal lugs.

CLEANING AND INSPECTION - CONTINUED

4. If corrosion is noted, perform the following steps:
   a. Use a battery brush to clean terminal posts and terminal lugs.

WARNING

When servicing this equipment, performing maintenance, or disposing of materials such as battery media, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

   b. Prepare a baking soda/water mixture and clean terminal posts and terminal lugs. Rinse with fresh water and dry. Dispose of contaminated rags IAW using unit's SOP.
   c. Lightly grease terminal posts and terminal lugs with petrolatum.

INSTALLATION

1. Install batteries:
   a. Check battery voltage before installing new batteries. If open circuit voltage (OCV) is below 12.7 VDC, charge batteries (WP 0032).

WARNING

Use caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may cause injury to personnel.

NOTE

- Each battery weighs approximately 88 lb (40 kg).
- Batteries should be positioned in battery box with positive (+) terminals located furthest from engine and toward rear of trailer.

   b. With assistance, lift batteries (Figure 3, Items 13 and 18) and place in battery box (Figure 3, Item 24), using handles provided on each side of each battery.
   c. Install battery holddown (Figure 3, Item 21) over batteries (Figure 4, Items 13 and 18). Install wingnut (Figure 3, Item 23) on threaded retaining bolt (Figure 3, Item 22) hand tight. Wrench-tighten wingnut another full turn (360 degrees).

INSTALLATION - CONTINUED

WARNING

Be careful not to touch tool used to connect battery cable clamps to any part of equipment. Sparks may occur, resulting in injury to personnel or damage to equipment.

2. Install battery cables:
   a. Connect positive battery cable (Figure 4, Item 7) to starter solenoid (WP 0109).
   b. Connect negative battery cable (Figure 4, Item 19) to chassis ground (WP 0109).
   c. Connect negative battery cable (Figure 4, Item 6) and positive battery cable (Figure 4, Item 8) to NATO electrical receptacle (WP 0035).
   d. If removed, install terminal lug (Figure 4, Item 10) on battery (Figure 4, Item 13) with bolt (Figure 4, Item 12) and nut (Figure 4, Item 11).
   e. If removed, install terminal lug (Figure 4, Item 20) on battery (Figure 4, Item 18) with bolt (Figure 4, Item 4) and nut (Figure 4, Item 3).
   f. Install terminal lug (Figure 4, Item 16) and jumper cable (Figure 4, Item 17) on negative terminal of battery (Figure 4, Item 13) with bolt (Figure 4, Item 15) and nut (Figure 4, Item 14).
   g. Repeat step f to install jumper cable (Figure 4, Item 17) on positive terminal of battery (Figure 4, Item 18) with bolt (Figure 4, Item 15) and nut (Figure 4, Item 14).
   h. Connect positive battery cables (Figure 4, Items 7 and 8) to positive terminal of battery (Figure 4, Item 13). Install and tighten nut (Figure 4, Item 9).
   i. Connect negative battery cables (Figure 4, Items 6 and 19) to negative terminal of battery (Figure 4, Item 18). Install and tighten nut (Figure 4, Item 5).

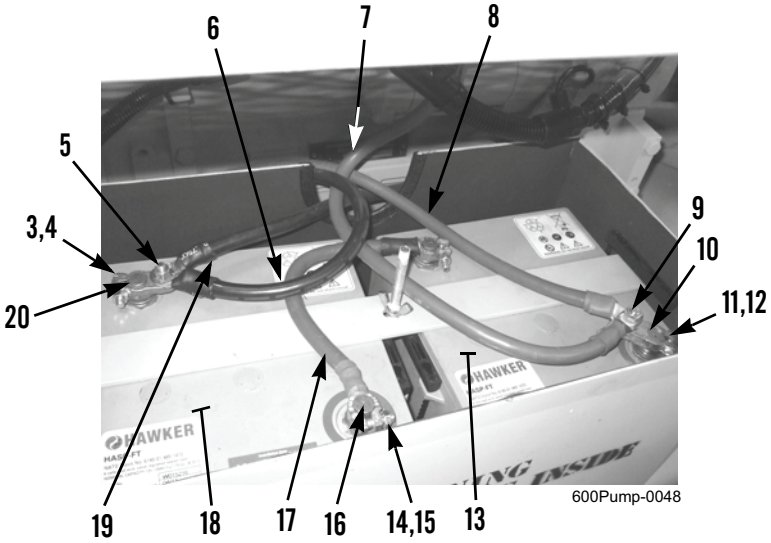


Figure 4. Battery Cables.

INSTALLATION - CONTINUED

j. Lightly grease terminal posts and cable clamps with petrolatum.

3. Close battery box by positioning lid (Figure 5, Item 2) over holddown retaining bolt and turning knob (Figure 5, Item 1) clockwise (right) to secure lid tightly.

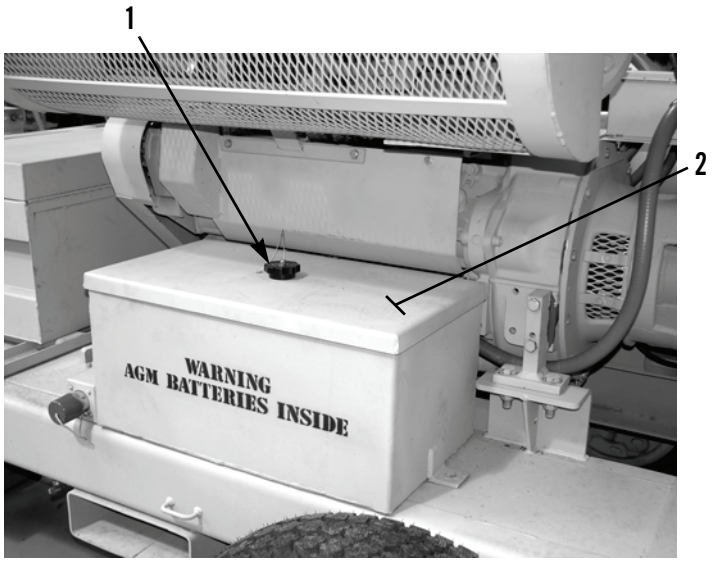


Figure 5. Battery Box.

FOLLOW-ON TASKS

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled at least 2/3 full or full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

1. Ensure pump volute is filled at least 2/3 full with appropriate fluid, then start engine to ensure correct operation of electrical system (WP 0006).
2. If removed, install heat shield (WP 0107).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

BATTERY BOX MAINTENANCE

Removal, Cleaning and Inspection, Disassembly, Assembly, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Materials/Parts

Adhesive (Item 2, WP 0129)
Rag, wiping (Item 22, WP 0129)
Spray coating, battery box (Item 25, WP 0129)
Locknut (5)

Personnel Required

63J (2)

References

WP 0023

Equipment Condition

Batteries removed (WP 0033)

REMOVAL

Remove two capscrews (Figure 1, Item 1), locknuts (Figure 1, Item 2), and battery box (Figure 1, Item 3) from trailer (Figure 1, Item 4). Discard locknuts.

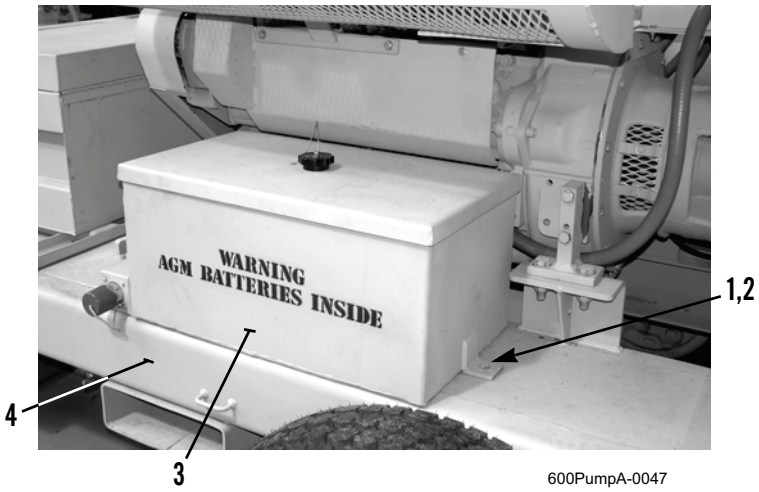


Figure 1. Battery Box.

CLEANING AND INSPECTION

1. Clean and inspect all parts IAW WP 0023.
2. Inspect threaded retaining bolt for damaged threads, corrosion, or rust.
3. Inspect battery box for dents, rust, or corrosion. If damage is major or acid has corroded box, replace battery box.
4. Inspect spray coating on battery box inner surfaces. If coating is worn off, apply a new layer of protective coating.
5. Inspect rubber lining on battery box lid. If damaged, replace. Use adhesive to secure new rubber lining to lid.

DISASSEMBLY

1. Remove locknut (Figure 2, Item 8), screw (Figure 2, Item 9), and cable (Figure 2, Item 11) from battery box lid (Figure 2, Item 10). Discard locknut.
2. Remove locknut (Figure 2, Item 6), washer (Figure 2, Item 7), and cable (Figure 2, Item 11) from knob (Figure 2, Item 5). Discard locknut.

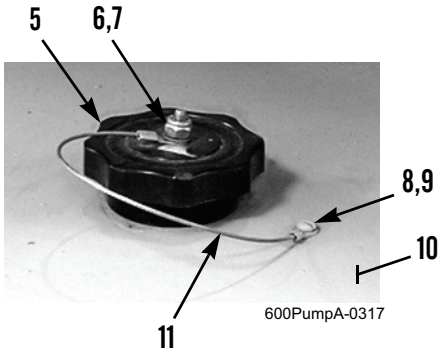


Figure 2. Knob Lanyard.

3. Remove locknut (Figure 3, Item 12), nut (Figure 3, Item 13), and threaded retaining bolt (Figure 3, Item 14) from battery box (Figure 3, Item 3). Discard locknut.

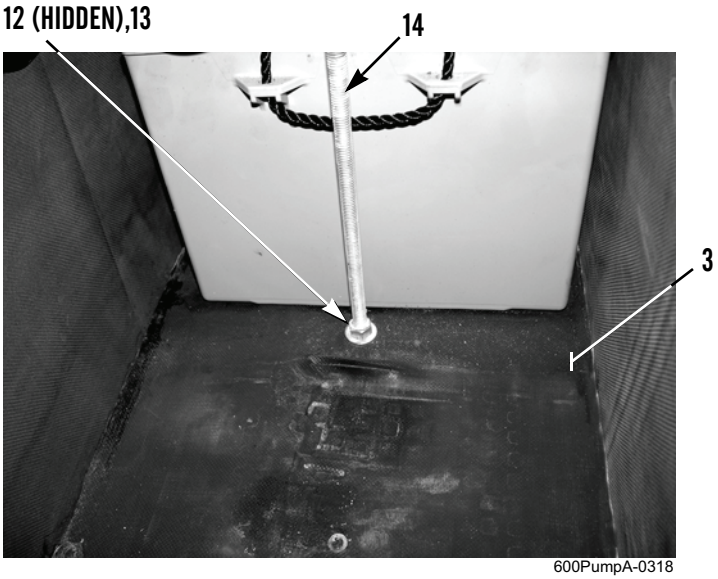


Figure 3. Battery Box Interior.

ASSEMBLY

1. Install threaded retaining bolt (Figure 3, Item 14) in battery box (Figure 3, Item 3) with nut (Figure 3, Item 13) and new locknut (Figure 3, Item 12).
2. Install cable (Figure 2, Item 11) on knob (Figure 2, Item 5) with washer (Figure 2, Item 7) and new locknut (Figure 2, Item 6).
3. Install cable (Figure 2, Item 11) on battery box lid (Figure 2, Item 10) with screw (Figure 2, Item 9) and new locknut (Figure 2, Item 8).

INSTALLATION

Install battery box (Figure 4, Item 3) on trailer (Figure 4, Item 4) with two capscrews (Figure 4, Item 1) and new locknuts (Figure 4, Item 2).

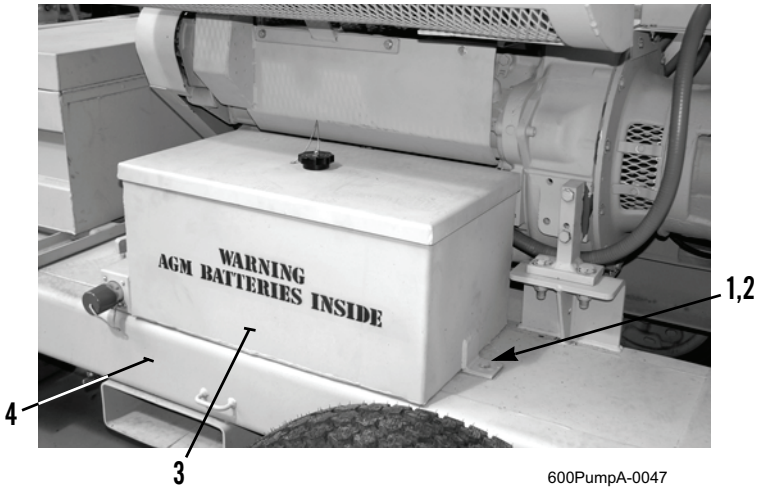


Figure 4. Battery Box.

FOLLOW-ON TASKS

Install batteries (WP 0033).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

NATO ELECTRICAL RECEPTACLE AND CABLES REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Materials/Parts

Rag, wiping (Item 22, WP 0129)
Locknut (4)
Lockwasher (2)

Personnel Required

63J (1)

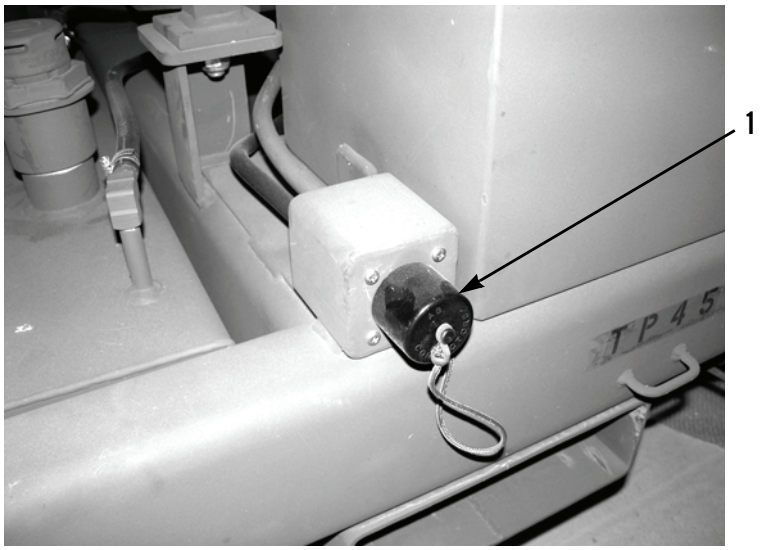
References

WP 0023

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked
Battery cables disconnected (WP 0033)

1. Remove NATO electrical receptacle cover (Figure 1, Item 1).



600Pump-0028

Figure 1. NATO Electrical Receptacle Cover.

REMOVAL - CONTINUED

2. Remove four locknuts (Figure 2, Item 6), screws (Figure 2, Item 5), cover lanyard (Figure 2, Item 4), and NATO electrical receptacle (Figure 2, Item 3) from bracket (Figure 2, Item 2). Discard locknuts.

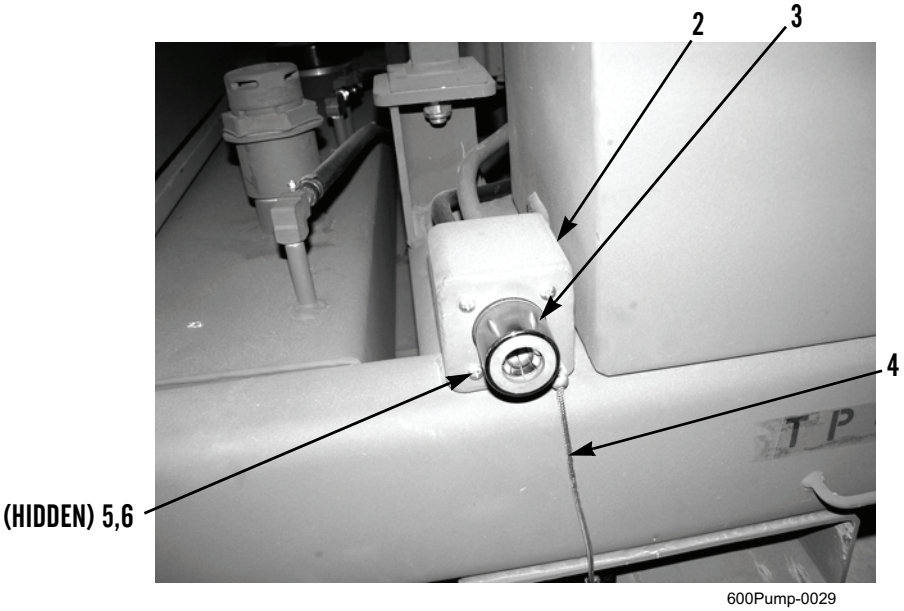


Figure 2. NATO Electrical Receptacle.

3. Remove bolt (Figure 3, Item 10), lockwasher (Figure 3, Item 11), and negative battery cable (Figure 3, Item 12) from NATO electrical receptacle (Figure 3, Item 3). Discard lockwasher.
4. Remove bolt (Figure 3, Item 8), lockwasher (Figure 3, Item 9), and positive battery cable (Figure 3, Item 7) from NATO electrical receptacle (Figure 3, Item 3). Discard lockwasher.

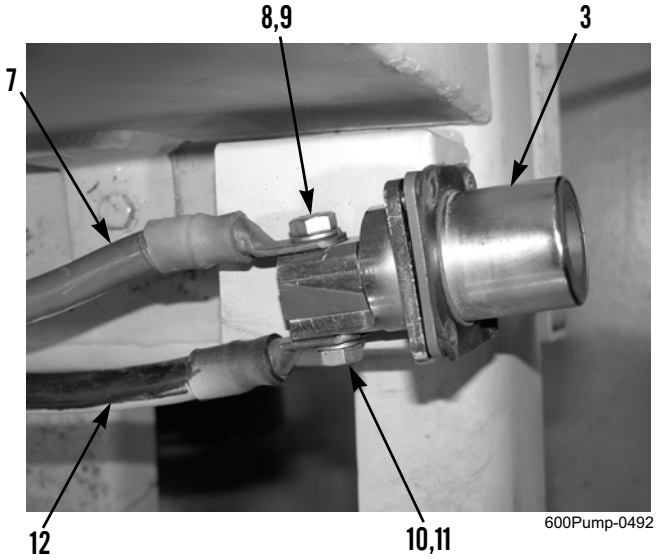


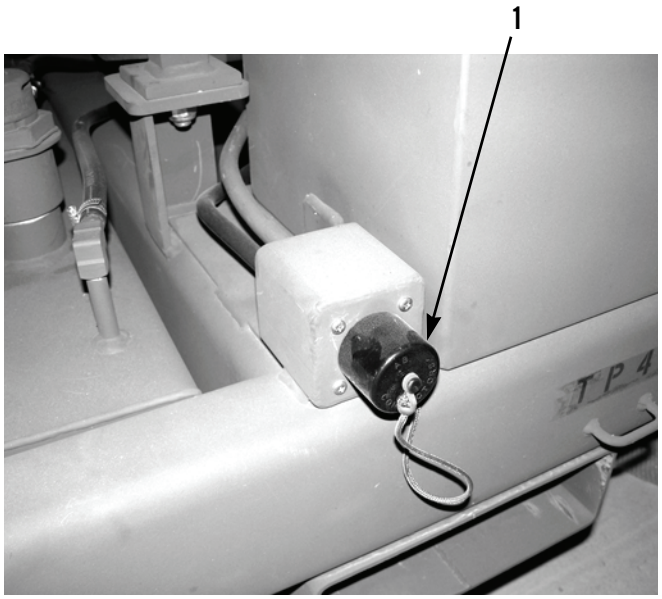
Figure 3. Battery Cables at NATO Electrical Receptacle.

CLEANING AND INSPECTION

Clean and inspect terminals of NATO electrical receptacle IAW WP 0023. If receptacle or terminals are damaged, replace NATO electrical receptacle.

INSTALLATION

1. Install positive battery cable (Figure 3, Item 7), new lockwasher (Figure 3, Item 9), and bolt (Figure 3, Item 8) on positive terminal on NATO electrical receptacle (Figure 3, Item 3).
2. Install negative battery cable (Figure 3, Item 12), new lockwasher (Figure 3, Item 11), and bolt (Figure 3, Item 10) on negative terminal on NATO electrical receptacle (Figure 3, Item 3).
3. Install NATO electrical receptacle (Figure 2, Item 3) and cover lanyard (Figure 2, Item 4) on bracket (Figure 2, Item 2) with four screws (Figure 2, Item 5) and new locknuts (Figure 3, Item 6).
4. Install NATO electrical receptacle cover (Figure 4, Item 1).



600Pump-0028

Figure 4. NATO Electrical Receptacle Cover.

FOLLOW-ON TASKS

Connect battery cables (WP 0033).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

INTERVEHICULAR ELECTRICAL CABLE REPLACEMENT

Removal, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Rag, wiping (Item 22, WP 0129)

Strap, tiedown, electrical components (Item 26, WP 0129)

Tag, marker (Item 27, WP 0129)

Tape, antiseizing (Item 28, WP 0129)

Personnel Required

63J (2)

References

WP 0099

Equipment Condition

Storage box and storage box frame weldment removed (WP 0069)

Intervehicular electrical cable disconnected from towing vehicle (WP 0006)

WARNING

- DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing damage to equipment and injury or death to personnel.
- Wear fuel-resistant gloves and eye protection when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. Failure to follow this warning may result in injury to personnel.
- When servicing this equipment, performing maintenance, or disposing of materials such as fuel, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

REMOVAL

NOTE

A suitable container should be placed under fuel tank drain valve to capture draining fuel. Dispose of fuel IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.

1. Drain fuel tank (Figure 1, Item 2), as required:
   a. Locate drain valve (Figure 1, Item 3) under left side of fuel tank (Figure 1, Item 2).
   b. Remove plug (Figure 1, Item 4) and turn drain valve handle (Figure 1, Item 1) 1/4 turn counterclockwise (left) until valve handle is on line with drain flow.
   c. After draining fuel tank (Figure 1, Item 2), close drain valve (Figure 1, Item 3) by turning valve handle (Figure 1, Item 1) 1/4 clockwise (right). Wipe plug (Figure 1, Item 4), clean with a rag, apply antiseizing tape to male threads, and install plug in drain valve.
   d. Dispose of drained fuel IAW using unit's SOP.

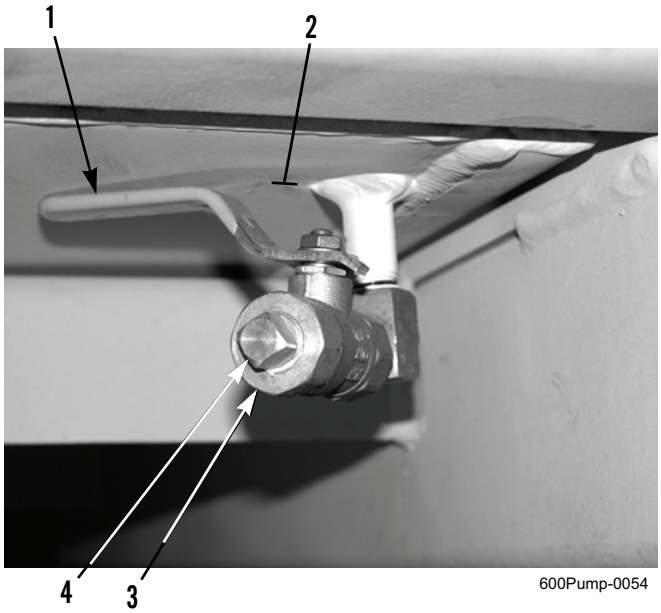


Figure 1. Fuel Tank Drain.

REMOVAL - CONTINUED

WARNING

Fuel tank is heavy and awkward to handle. Provide adequate support and use assistance when raising. Failure to follow this warning may result in injury to personnel or damage to equipment.

NOTE

Fuel tank weighs approximately 89 lb (40 kg).

2. Raise fuel tank (Figure 1, Item 2) above level of trailer frame to access intervehicular electrical cable (Figure 2, Item 5). Provide suitable support for fuel tank.
3. Remove all clamps (Figure 2, Item 6) from intervehicular electrical cable (Figure 2, Item 5) along right side of trailer frame.

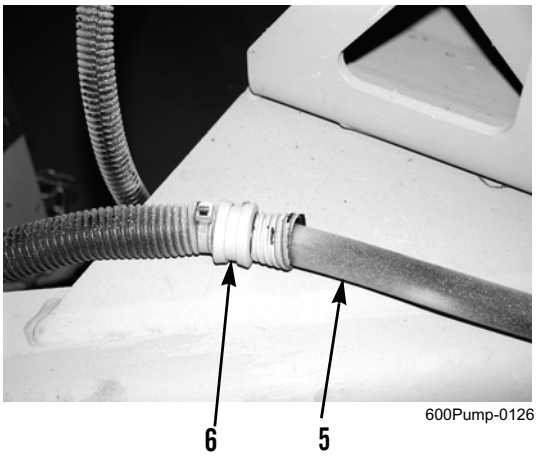


Figure 2. Intervehicular Electrical Cable Clamp.

REMOVAL - CONTINUED

4. Remove intervehicular electrical cable connectors (Figure 3, Item 9) and trailer wiring harness connectors (Figure 3, Item 8) from wiring harness junction (Figure 3, Item 7).

NOTE

Tag connectors before disconnecting to ensure proper connection.

5. Disconnect intervehicular electrical cable connectors (Figure 3, Item 9) from trailer wiring harness connectors (Figure 3, Item 8).
6. Remove nut (Figure 3, Item 12), intervehicular electrical cable ground wire (Figure 3, Item 11), and trailer wiring harness ground wire (Figure 3, Item 13).
7. Remove intervehicular electrical cable (Figure 3, Item 5) from right side of trailer frame.
8. As required, cut tiedown straps and remove protective conduit (Figure 3, Item 10) from around intervehicular electrical cable (Figure 3, Item 5). Discard tiedown straps.

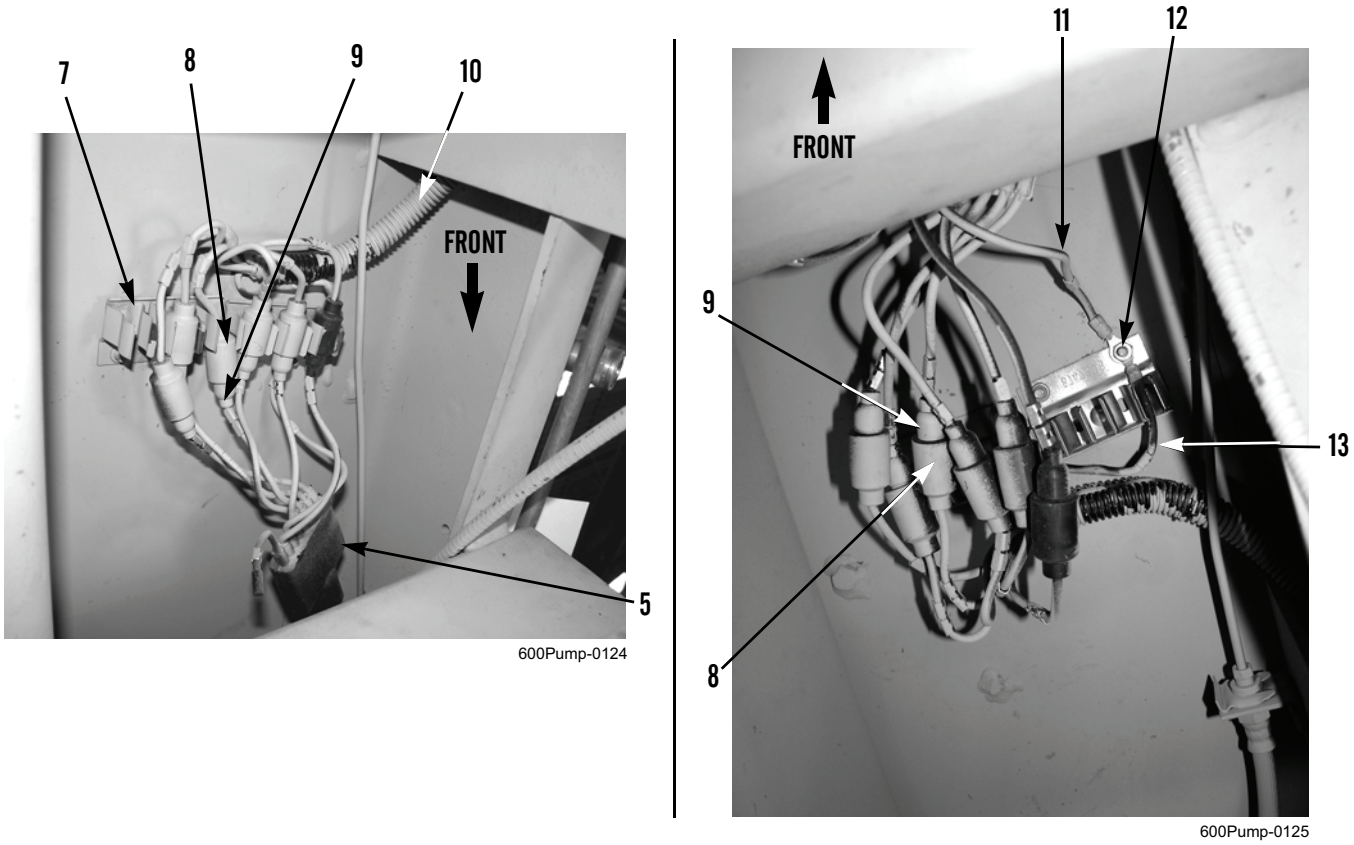


Figure 3. Wiring Harness Junction.

INSTALLATION

1. As required, wrap protective conduit (Figure 3, Item 10) around intervehicular electrical cable (Figure 3, Item 5) and secure with new tiedown straps.
2. Route intervehicular electrical cable (Figure 3, Item 5) along right side of trailer frame. Ensure intervehicular electrical cable connectors (Figure 3, Item 9) reach wiring harness junction (Figure 3, Item 7).
3. Secure intervehicular electrical cable ground wire (Figure 3, Item 11) and trailer wiring harness ground wire (Figure 3, Item 13) with nut (Figure 3, Item 12).
4. Connect intervehicular electrical cable connectors (Figure 3, Item 9) to trailer wiring harness connectors (Figure 3, Item 8).
5. Install intervehicular electrical cable connectors (Figure 3, Item 9) and trailer wiring harness connectors (Figure 3, Item 8) in wiring harness junction (Figure 3, Item 7).
6. Secure intervehicular electrical cable (Figure 4, Item 5) to right side of trailer frame with clamps (Figure 4, Item 6).

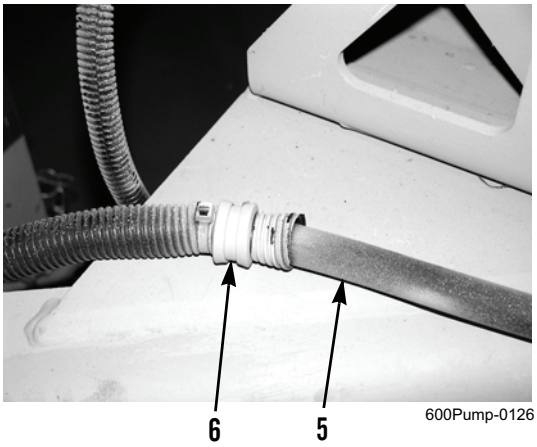


Figure 4. Intervehicular Electrical Cable Clamp.

INSTALLATION - CONTINUED

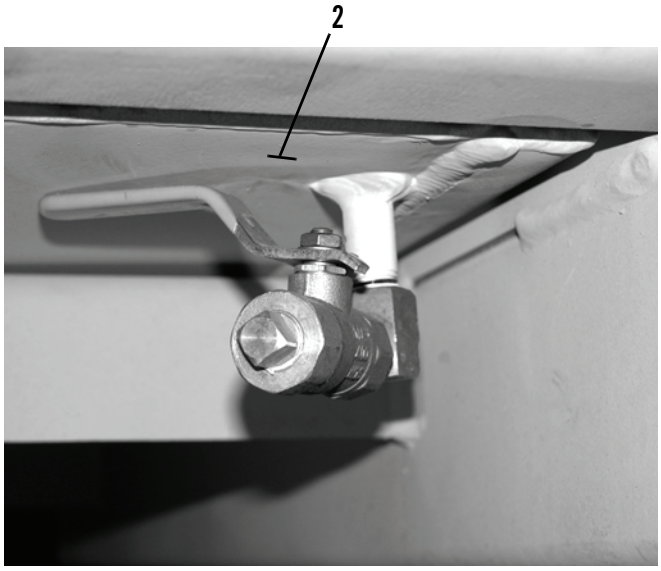
WARNING

Fuel tank is heavy and awkward to handle. Provide adequate support and use assistance when lowering. Failure to follow this warning may result in injury to personnel or damage to equipment.

NOTE

Fuel tank weighs approximately 89 lb (40 kg).

7. Lower fuel tank (Figure 5, Item 2) back into position.



600Pump-0054

Figure 5. Fuel Tank Drain.

8. Fill fuel tank (WP 0099).

FOLLOW-ON TASKS

1. Install storage box and storage box frame weldment (WP 0069).
2. Connect intervehicular electrical cable to towing vehicle (WP 0006).
3. Check operation of taillights.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

TRAILER WIRING HARNESS REPLACEMENT

Removal, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Materials/Parts

Strap, tiedown, electrical components (Item 26, WP 0129)

Tag, marker (Item 27, WP 0129)

Clamp (5)

Lockwasher (2)

Personnel Required

63J (1)

Equipment Condition

Pump assembly parked on level ground (WP 0006)

Engine off (WP 0006)

Hand brakes applied (WP 0005)

Wheels chocked

Intervehicular electrical cable disconnected from towing vehicle (WP 0006)

REMOVAL

NOTE

Note routing of trailer wiring harness before removal to ensure correct installation.

1. Remove intervehicular electrical cable connectors (Figure 1, Item 3) and trailer wiring harness connectors (Figure 1, Item 2) from wiring harness junction (Figure 1, Item 1).

NOTE

Tag connectors before disconnecting ensure proper connection.

2. Disconnect intervehicular electrical cable connectors (Figure 1, Item 3) from trailer wiring harness connectors (Figure 1, Item 2).
3. Remove nut (Figure 1, Item 5), intervehicular electrical cable ground wire (Figure 1, Item 4), and trailer wiring harness ground wire (Figure 1, Item 6).

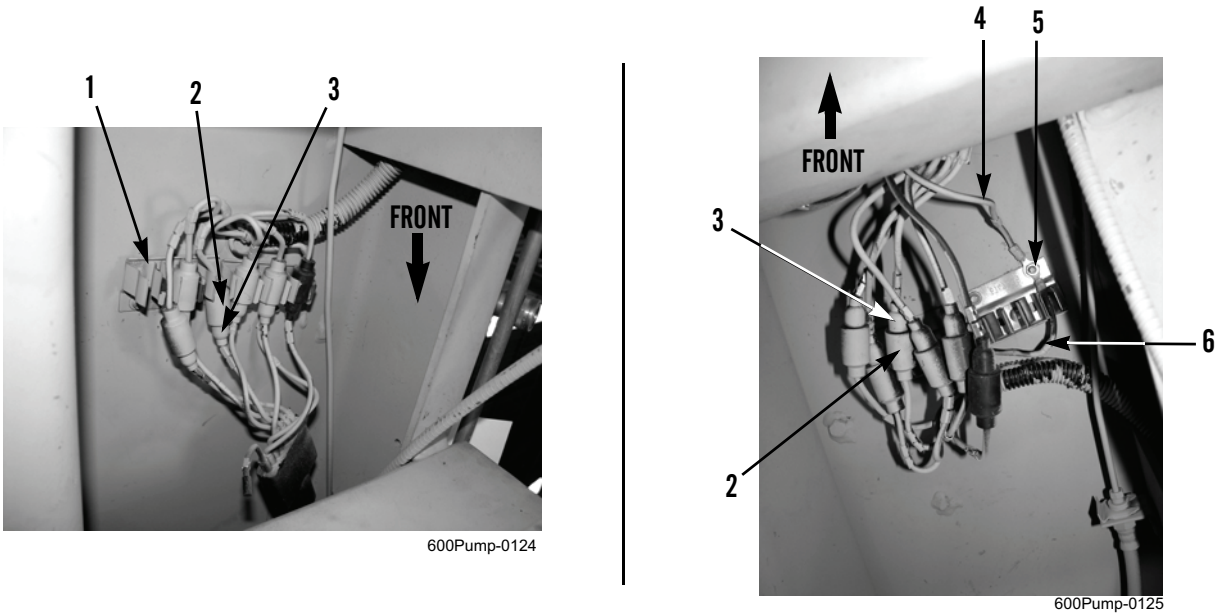


Figure 1. Wiring Harness Junction.

REMOVAL - CONTINUED

4. At right rear of trailer, loosen nut (Figure 2, Item 8) and disconnect trailer wiring harness connector (Figure 2, Item 7) from connector (Figure 2, Item 9) of 24V electrical receptacle.

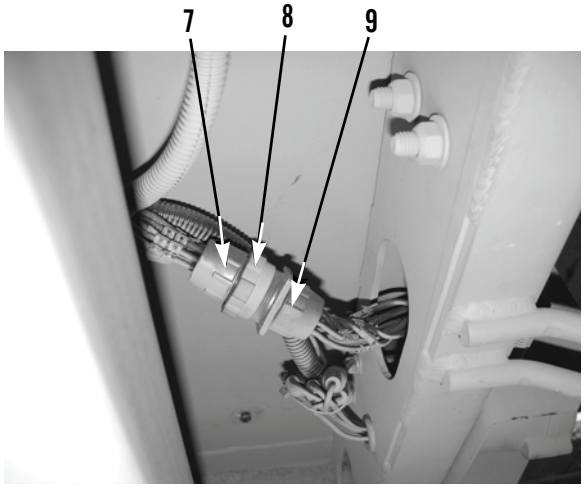


Figure 2. Wiring Harness Connection at 24V Electrical Receptacle.

5. Cut tiedown strap (Figure 3, Item 10) from four taillight connectors (Figure 3, Item 15) and trailer wiring harness connectors (Figure 3, Item 16). Discard tiedown strap.
6. Disconnect four trailer wiring harness connectors (Figure 3, Item 16) from taillight connectors (Figure 3, Item 15).
7. Remove screw (Figure 3, Item 13), trailer wiring harness ground wire (Figure 3, Item 14), lockwasher (Figure 3, Item 12), and washer (Figure 3, Item 11) from right rear of trailer. Discard lockwasher.

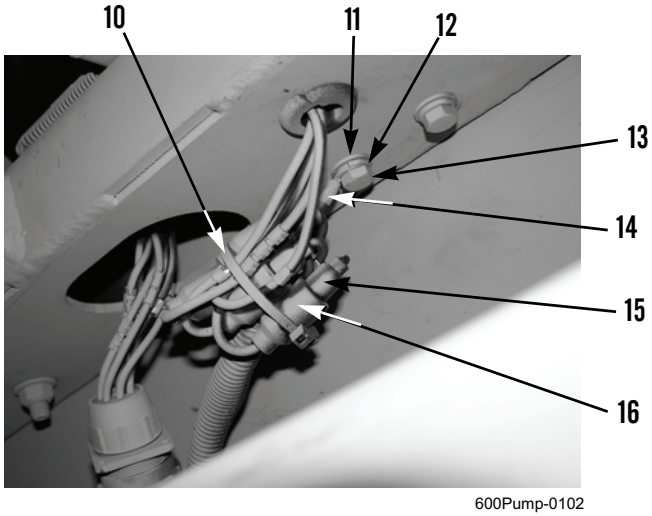


Figure 3. Wiring Harness Connections at Taillight.

REMOVAL - CONTINUED

8. Repeat steps 5 through 7 for left-rear taillight.
9. Remove five clamps (Figure 4, Item 18) and release trailer wiring harness (Figure 4, Item 17) from trailer. Discard clamps.

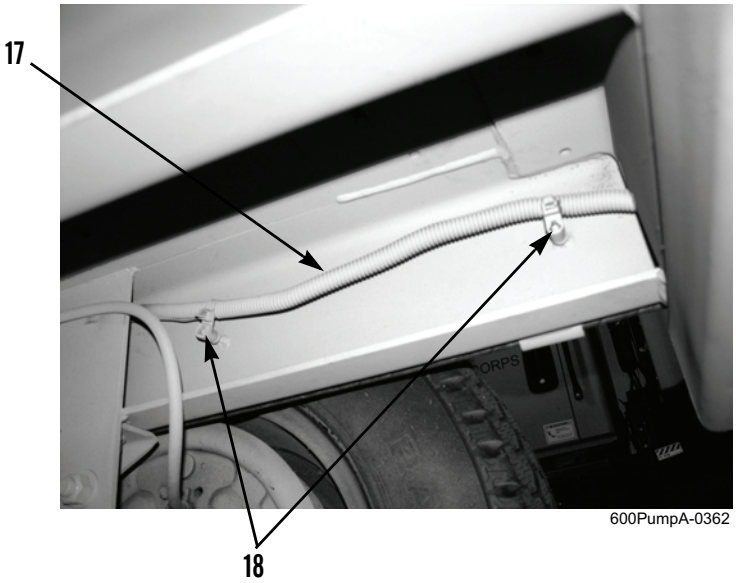


Figure 4. Wiring Harness Clamps.

INSTALLATION

1. Position trailer wiring harness (Figure 5, Item 17) between points of connection.

CAUTION

Taillight body is made of plastic material. To prevent damaging body, do not overtighten screw.

2. At right rear of trailer, secure trailer wiring harness ground wire (Figure 5, Item 14) to rear of trailer with washer (Figure 5, Item 11), new lockwasher (Figure 5, Item 12), and screw (Figure 5, Item 13).
3. Connect four trailer wiring harness connectors (Figure 5, Item 16) to taillight connectors (Figure 5, Item 15).
4. Install new tiedown strap (Figure 5, Item 10) around four taillight connectors (Figure 5, Item 15) and trailer wiring harness connectors (Figure 5, Item 16).

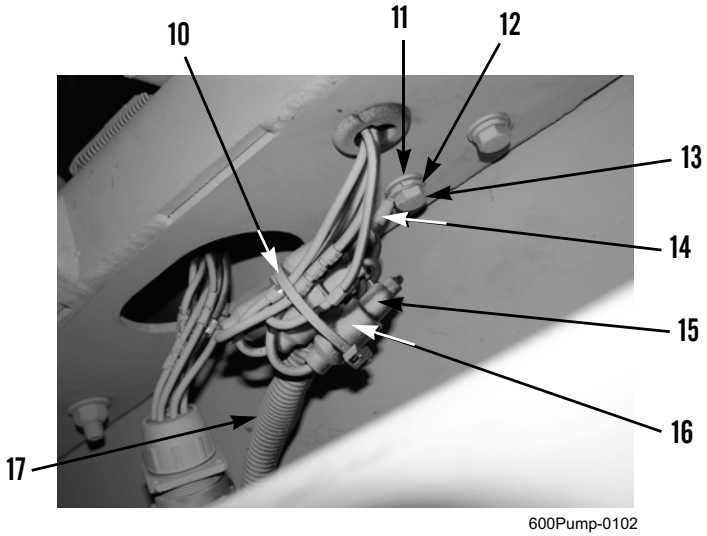
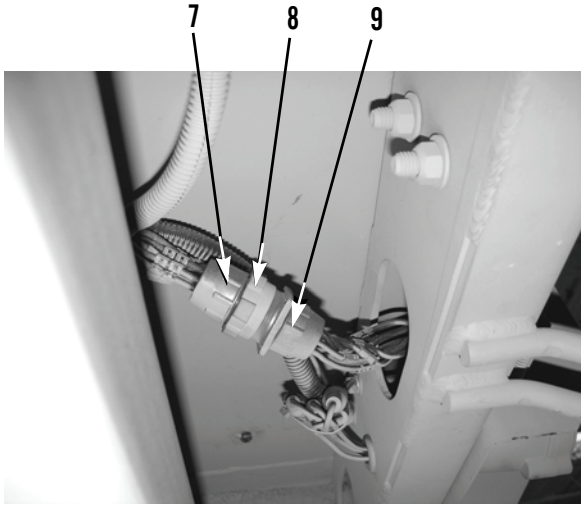


Figure 5. Wiring Harness Connections at Taillight.

INSTALLATION - CONTINUED

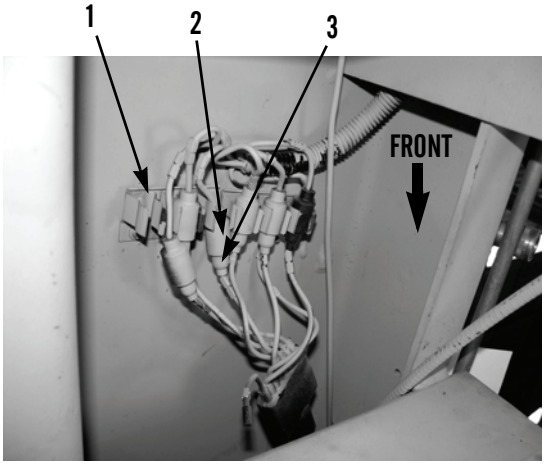
5. Connect trailer wiring harness connector (Figure 6, Item 7) to connector (Figure 6, Item 9) of 24V electrical receptacle and tighten nut (Figure 6, Item 8).



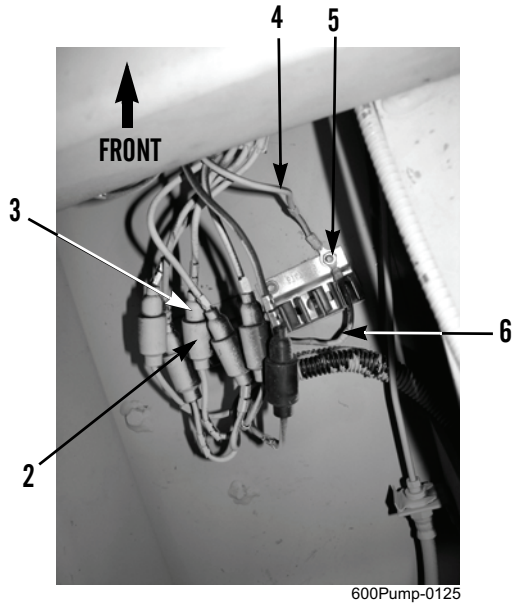
600Pump-0098

Figure 6. Harness Connection at 24V Electrical Receptacle.

6. Repeat steps 2 through 4 at left-rear taillight.
7. Secure intervehicular electrical cable ground wire (Figure 7, Item 4) and trailer wiring harness ground wire (Figure 7, Item 6) with nut (Figure 7, Item 5).
8. Connect intervehicular electrical cable connectors (Figure 7, Item 3) to trailer wiring harness connectors (Figure 7, Item 2).
9. Install intervehicular electrical cable connectors (Figure 7, Item 3) and trailer wiring harness connectors (Figure 7, Item 2) in wiring harness junction (Figure 7, Item 1).



600Pump-0124



600Pump-0125

Figure 7. Wiring Harness Junction.

INSTALLATION - CONTINUED

10. Secure trailer wiring harness (Figure 8, Item 17) to trailer frame with five new clamps (Figure 8, Item 18).

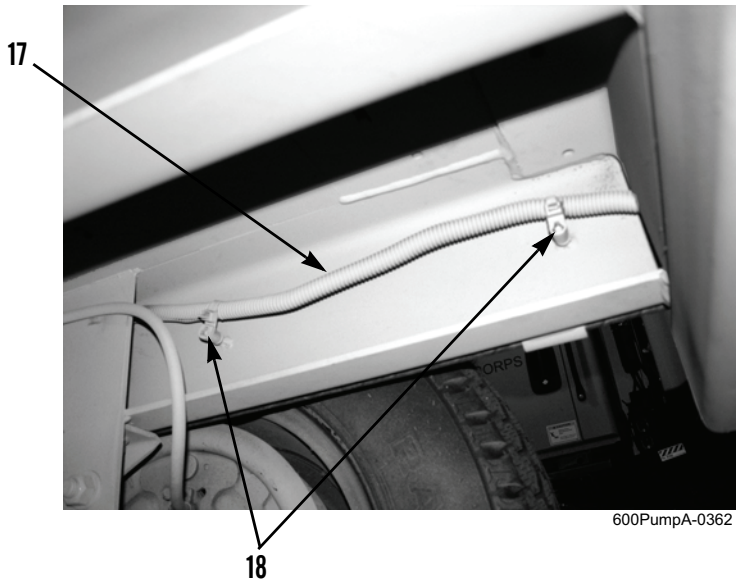


Figure 8. Wiring Harness Clamps.

FOLLOW-ON TASKS

1. Connect intervehicular electrical cable to towing vehicle (WP 0006).
2. Check operation of taillights.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

ENGINE/CONTROL PANEL WIRING HARNESS REPLACEMENT

Removal, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Materials/Parts

Strap, tiedown, electrical components (Item 26, WP 0129)

Tag, marker (Item 27, WP 0129)

Locknut (5)

Personnel Required

63J (1)

References

WP 0005

References - Continued

WP 0006

WP 0030

WP 0042

WP 0044

WP 0095

WP 0109

Equipment Condition

Battery cables disconnected (WP 0033)

Lower access plate removed (WP 0068)

Heat shield removed (WP 0107)

Battery box removed (WP 0034)

REMOVAL

NOTE

- Tag wires and connectors before disconnecting them to ensure proper connection.
- Cut tiedown straps and remove clamps from wiring harness as required. Discard tiedown straps.

1. Disconnect engine/control panel wiring harness leads from alternator (WP 0030).
2. Disconnect engine/control panel wiring harness leads from starter (WP 0109).
3. Disconnect engine/control panel wiring harness cable connector (Figure 1, Item 1) from control panel box (Figure 1, Item 2).

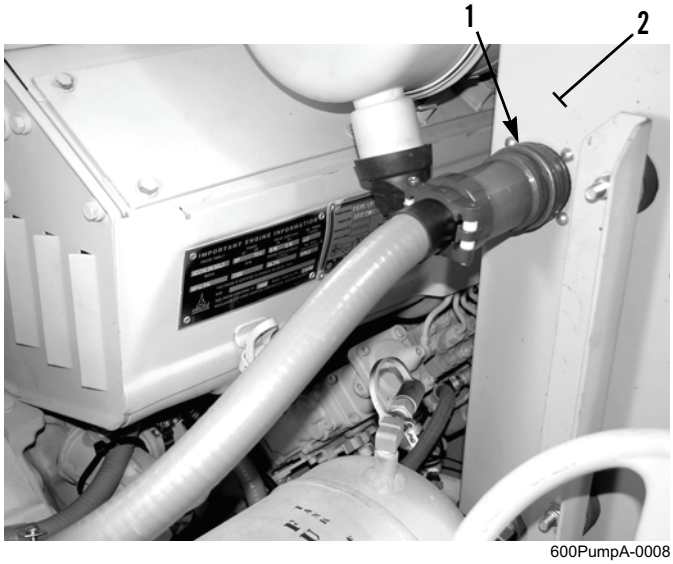


Figure 1. Wiring Harness Cable Connector at Control Panel Box.

REMOVAL - CONTINUED

4. Loosen screw (Figure 2, Item 4) and open cover (Figure 2, Item 9) of wiring harness junction box (Figure 2, Item 3).
5. Remove five locknuts (Figure 2, Item 5), bolts (Figure 2, Item 6), and ground wire (Figure 2, Item 8) from wiring harness junction box (Figure 2, Item 3) and remove wiring harness junction box from mounting bracket (Figure 2, Item 7). Discard locknuts.
6. Close cover (Figure 2, Item 9) of wiring harness junction box (Figure 2, Item 3) and tighten screw (Figure 2, Item 4).

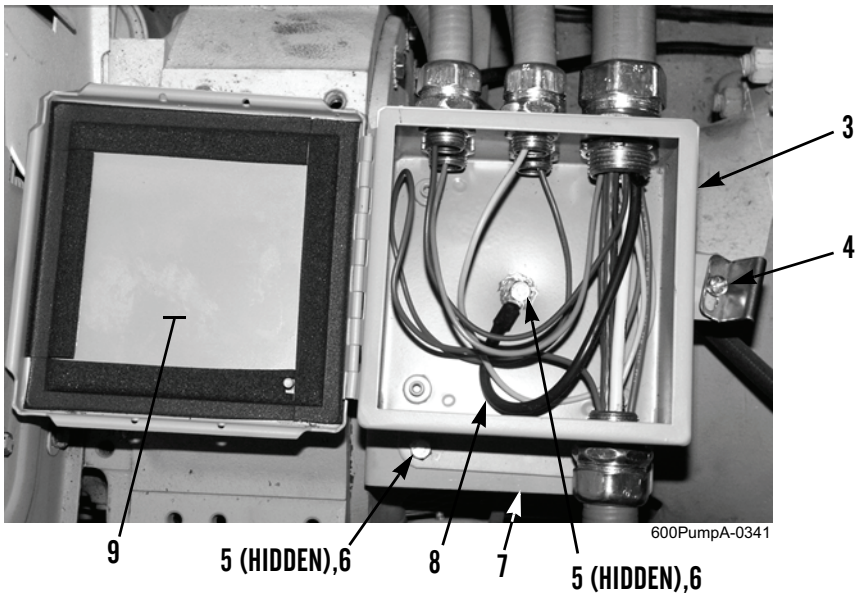


Figure 2. Wiring Harness Junction Box.

7. Disconnect engine/control panel wiring harness from oil temperature sender (Figure 3, Item 10) (WP 0044).
8. Disconnect engine/control panel wiring harness from oil pressure sender (Figure 3, Item 11) (WP 0042).

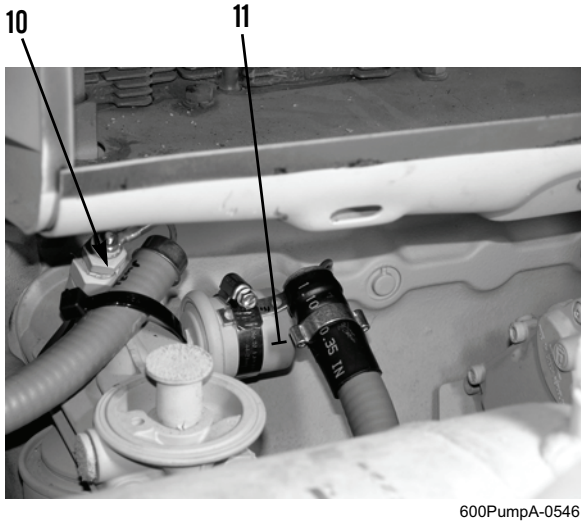


Figure 3. Oil Temperature and Oil Pressure Senders.

REMOVAL - CONTINUED

9. Disconnect engine/control wiring harness from fuel injection pump solenoid (Figure 4, Item 12) (WP 0095).
10. Disconnect engine/control wiring harness from fuel injection pump electromagnet (Figure 4, Item 13) (WP 0095).

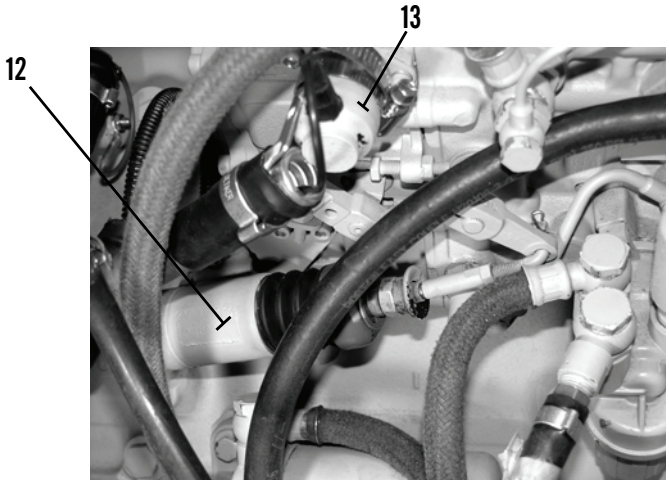


Figure 4. Fuel Injection Pump.

11. Disconnect engine/control panel wiring harness connector (Figure 5, Item 15) from cooling fan V-belt shutdown switch connector (Figure 5, Item 14).

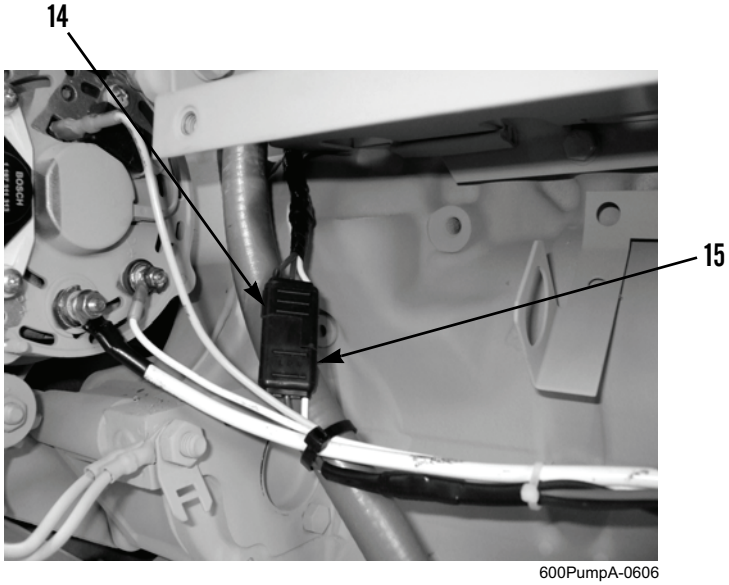


Figure 5. Cooling Fan V-Belt Shutdown Switch Connector.

REMOVAL - CONTINUED

12. Remove cover of tee fitting (Figure 6, Item 16), bolt (Figure 6, Item 18), ground wire (Figure 6, Item 17), and three spacers (Figure 6, Item 19) from engine block (Figure 6, Item 20).

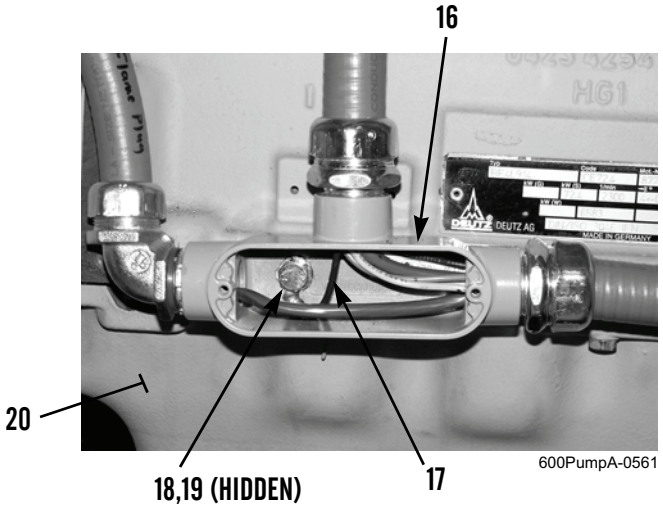


Figure 6. Wiring Harness Tee Fitting.

13. Remove engine/control panel wiring harness with wiring harness junction box (Figure 7, Item 3) from pump assembly.

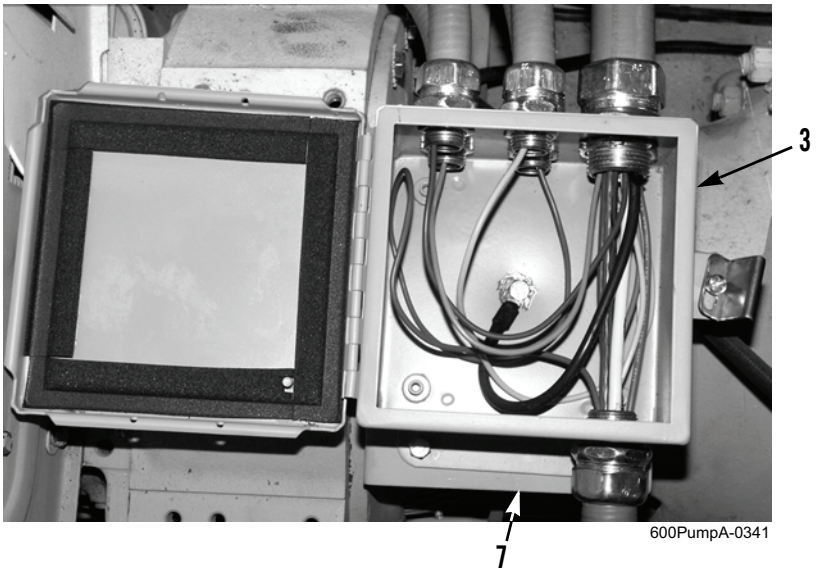


Figure 7. Wiring Harness Junction Box.

INSTALLATION

1. Position engine/control panel wiring harness with wiring harness junction box (Figure 7, Item 3) on pump assembly. Place junction box on mounting bracket (Figure 7, Item 7) at pump intermediate housing and route wiring harness leads to points of connection.
2. Position three spacers (Figure 6, Item 19) and tee fitting (Figure 6, Item 16) at engine block (Figure 6, Item 20) and install ground wire (Figure 6, Item 17) and bolt (Figure 6, Item 18). Install cover on tee fitting.

INSTALLATION - CONTINUED

3. Connect engine/control panel wiring harness connector (Figure 8, Item 15) to shutdown switch connector (Figure 8, Item 14).

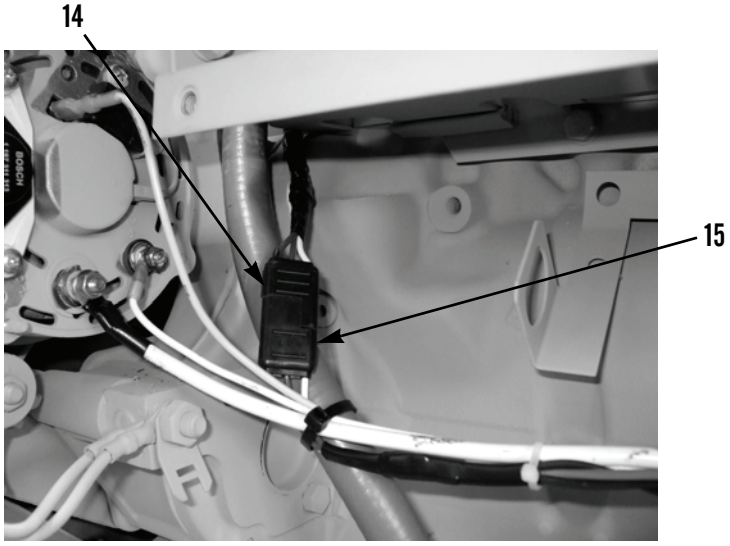


Figure 8. Cooling Fan V-Belt Shutdown Switch Connector.

4. Connect engine/control panel wiring harness to fuel injection pump solenoid (Figure 9, Item 12).
5. Connect engine/control panel wiring harness to fuel injection pump electromagnet (Figure 9, Item 13).

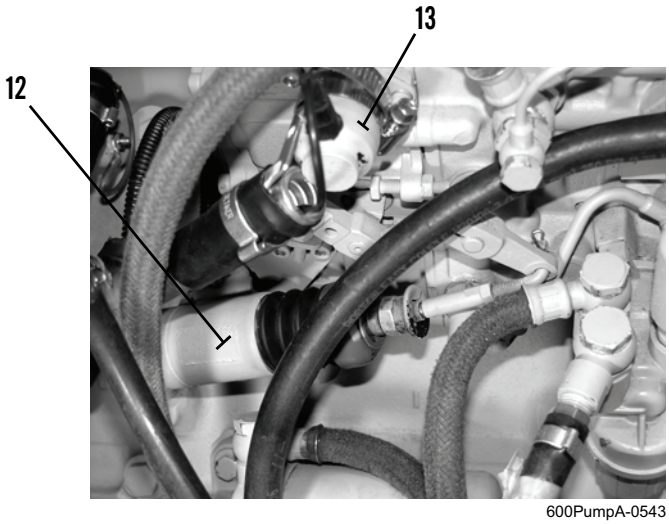


Figure 9. Fuel Injection Pump.

INSTALLATION - CONTINUED

6. Connect engine/control panel wiring harness to oil pressure sender (Figure 10, Item 11) (WP 0042).
7. Connect engine/control panel wiring harness to oil temperature sender (Figure 10, Item 10) (WP 0044).

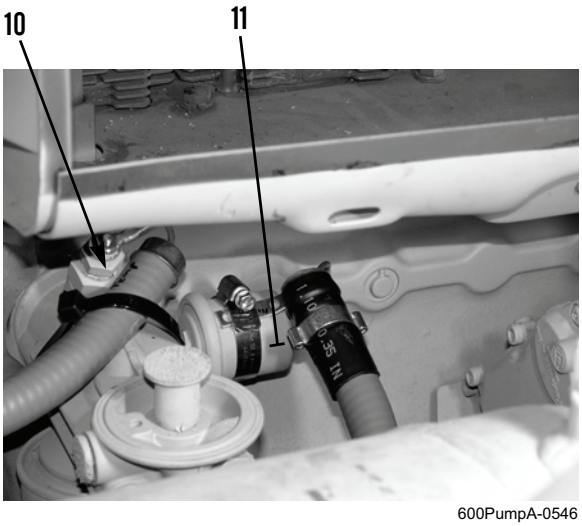


Figure 10. Oil Temperature and Oil Pressure Senders.

8. Position and open wiring harness junction box (Figure 11, Item 3) on mounting bracket (Figure 11, Item 7) at pump intermediate housing and install ground wire (Figure 11, Item 8), five bolts (Figure 11, Item 6), and new locknuts (Figure 11, Item 5).
9. Close cover (Figure 11, Item 9) on wiring harness junction box (Figure 11, Item 3) and tighten screw (Figure 11, Item 4).

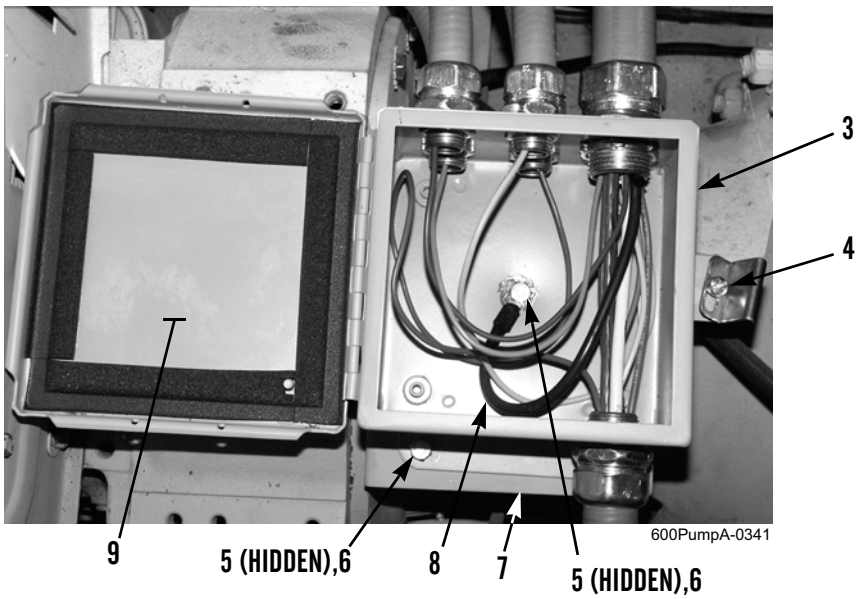


Figure 11. Wiring Harness Junction Box.

INSTALLATION - CONTINUED

10. Connect engine/control panel wiring harness cable connector (Figure 12, Item 1) to control panel box (Figure 12, Item 2).

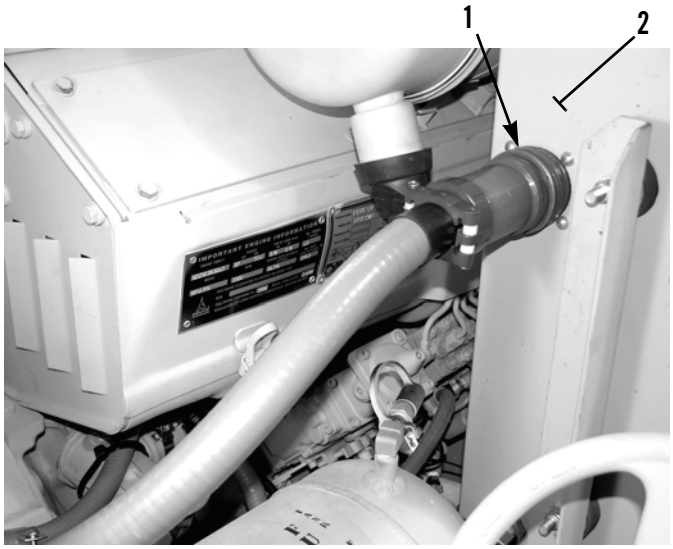


Figure 12. Wiring Harness Cable Connector at Control Panel Box.

11. Connect engine/control panel wiring harness leads to starter (WP 0109).
12. Connect engine/control panel wiring harness leads to alternator (WP 0030).
13. Install clamps and new tiedown straps.

FOLLOW-ON TASKS

1. Install lower access plate (WP 0068).
2. Install battery box and batteries (WP 0034).
3. Connect battery cables (WP 0033).
4. Install heat shield (WP 0107).

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

5. Ensure pump volute is filled 2/3 full with appropriate fluid, then start engine (WP 0006).
6. Check operation of control panel gauges, warning lights, and indicators (WP 0005).
7. Shut down engine (WP 0006).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

24V TRAILER ELECTRICAL RECEPTACLE REPLACEMENT

Removal, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Materials/Parts

Locknut (4)

Personnel Required

63J (1)

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked
Intervehicular electrical cable disconnected from towing vehicle (WP 0006)

REMOVAL

1. Loosen nut (Figure 1, Item 2) and disconnect trailer wiring harness connector (Figure 1, Item 1) from connector (Figure 1, Item 3) of 24V electrical receptacle (Figure 2, Item 7).

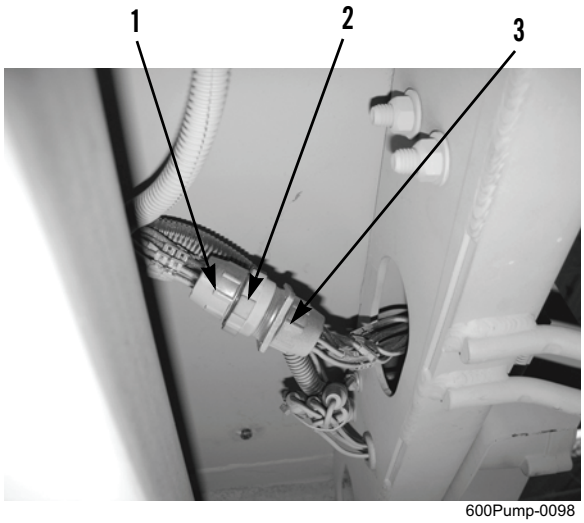


Figure 1. Wiring Harness Connection at 24V Electrical Receptacle.

2. Remove four locknuts (Figure 2, Item 4), washers (Figure 2, Item 5), bolts (Figure 2, Item 6), cover (Figure 2, Item 8), and 24V electrical receptacle (Figure 2, Item 7) from rear of trailer. Discard locknuts.

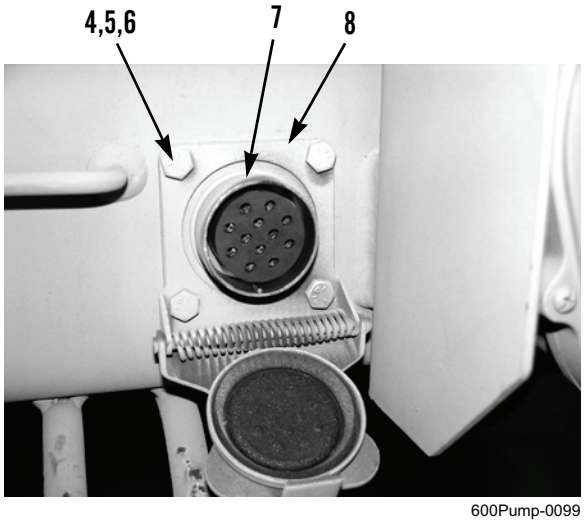


Figure 2. 24V Electrical Receptacle.

INSTALLATION

1. Install 24V electrical receptacle (Figure 2, Item 7) in opening at rear of trailer.
2. Install cover (Figure 2, Item 8) and 24V electrical receptacle (Figure 2, Item 7) on rear of trailer with four bolts (Figure 2, Item 6), washers (Figure 2, Item 5), and new locknuts (Figure 2, Item 4).
3. Connect trailer wiring harness connector (Figure 1, Item 1) to connector (Figure 1, Item 3) of 24V electrical receptacle (Figure 2, Item 7) and tighten nut (Figure 1, Item 2).

FOLLOW-ON TASKS

1. Connect intervehicular electrical cable to towing vehicle (WP 0006).
2. Check operation of taillights.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

FLAME GLOW PLUG MAINTENANCE

Function Test, Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Materials/Parts

Cap set, protective, dust and moisture (Item 5, WP 0129)

Rag, wiping (Item 22, WP 0129)

Locknut

Personnel Required

63J (1)

References

WP 0018

WP 0023

WP 0024

WP 0106

Equipment Condition

Heat shield removed (WP 0107)

WARNING

- Allow engine to cool off before performing maintenance on flame glow plug. Hot metal parts can cause severe burns. Wear eye, glove, and skin protection when working with heated parts. Failure to follow this warning may cause injury to personnel.
- DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing injury or death to personnel or damage to equipment.
- Wear fuel-resistant gloves and eye protection when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. Failure to follow this warning may result in injury to personnel.
- When servicing this equipment, performing maintenance, or disposing of materials such as fuel, consult your unit/local hazardous waste disposed center or safety office for local regulatory guidance.

CAUTION

Wipe area clean around all connections to be opened during removal. Cap lines and plug openings after removing lines. Contamination of fuel system could result in premature failure.

NOTE

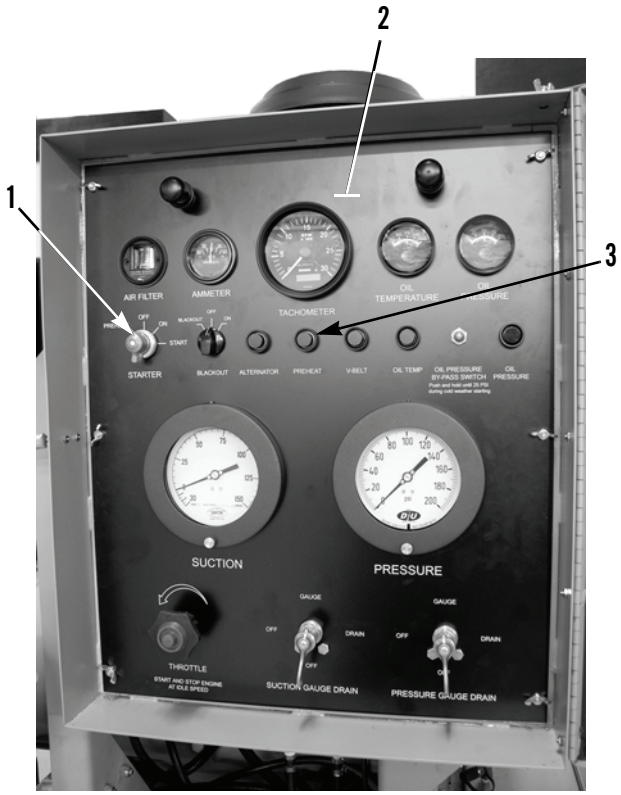
Use container to capture draining fuel. Dispose of fuel IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.

FUNCTION TEST

NOTE

- Engine must be cold to preform this test.
- For more information, refer to *Electrical General Maintenance Instructions* (WP 0024) and *Wiring Diagrams and Schematics* at the end of this manual.
- The preheat has a 20 second timer built into the circuit and will automatically shut off after 20 seconds.

1. Turn engine start switch (Figure 1, Item 1) on control panel (Figure 1, Item 2) to PREHEAT position.
2. Check that preheat light (Figure 1, Item 3) has turned ON. If preheat light does not come on, refer to troubleshooting (WP 0018).

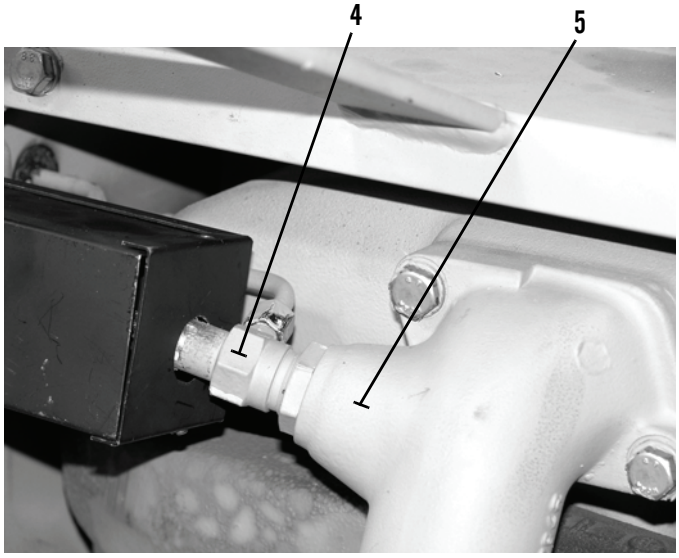


600pumpA-0004

Figure 1. Engine Start Switch.

FUNCTION TEST - CONTINUED

3. With preheat on, place hand on manifold pipe (Figure 2, Item 5) and check that flame glow plug (Figure 2, Item 4) is heating up manifold pipe.
   a. If manifold pipe is heating up, flame glow plug is functioning properly.
   b. If manifold pipe is not heating up, refer to troubleshooting (WP 0018).

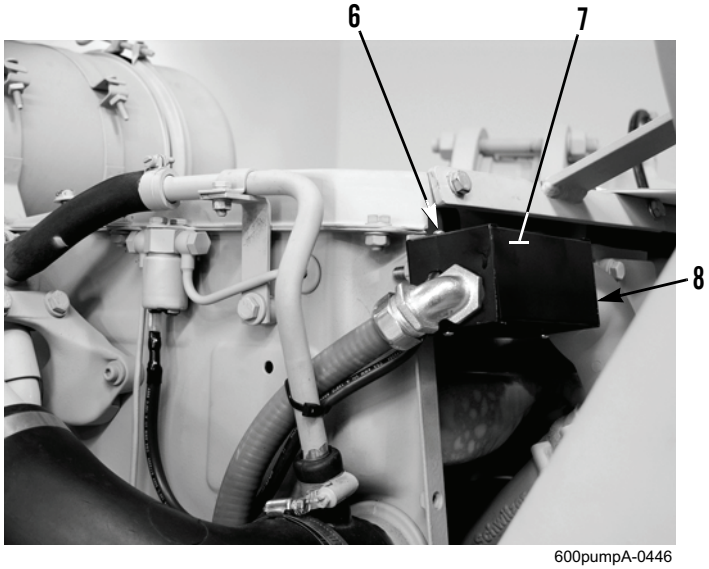


600pumpA-0488

Figure 2. Flame Glow Plug at Manifold Pipe.

REMOVAL

1. Remove four screws (Figure 3, Item 6) and cover (Figure 3, Item 7) from electromagnetic interference (EMI) enclosure (Figure 3, Item 8).



600pumpA-0446

Figure 3. EMI Enclosure at Flame Glow Plug.

REMOVAL - CONTINUED

2. Remove nut (Figure 4, Item 13) and two wires (Figure 4, Items 11 and 14) from flame glow plug (Figure 4, Item 4).
3. Remove bolt (Figure 4, Item 9), ground wire (Figure 4, Item 10), and pull EMI enclosure (Figure 4, Item 8) away from front air duct wall (Figure 4, Item 15).
4. Disconnect fuel line (Figure 4, Item 12) from flame glow plug (Figure 4, Item 4).
5. Remove flame glow plug (Figure 4, Item 4) from manifold pipe (Figure 4, Item 5).

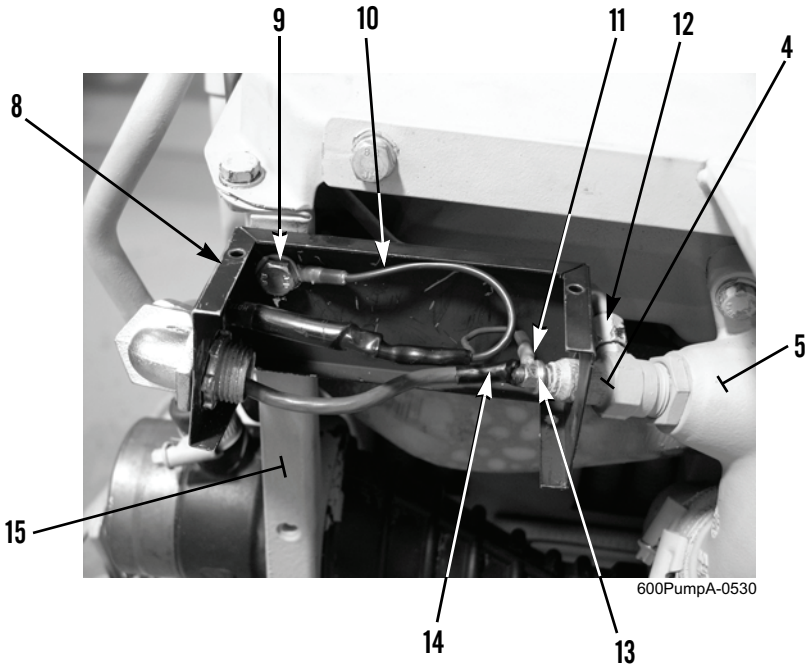


Figure 4. Flame Glow Plug.

CLEANING AND INSPECTION

Clean and inspect all parts IAW WP 0023.

INSTALLATION

1. Install flame glow plug (Figure 4, Item 4) in manifold pipe (Figure 4, Item 5).
2. Connect fuel line (Figure 4, Item 12) to flame glow plug (Figure 4, Item 4).
3. Position EMI enclosure (Figure 4, Item 8) at front air duct wall (Figure 4, Item 15) and flame glow plug (Figure 4, Item 4) and install ground wire (Figure 4, Item 10) and bolt (Figure 4, Item 9).
4. Install two wires (Figure 4, Items 11 and 14) and nut (Figure 4, Item 13) on flame glow plug (Figure 4, Item 4).
5. Install cover (Figure 3, Item 7) on EMI enclosure (Figure 3, Item 8) with four screws (Figure 3, Item 6).

FOLLOW-ON TASKS

1. Bleed fuel system (WP 0106).
2. Install heat shield (WP 0107).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

CHECKING OIL PRESSURE SENDER

General Information, Checking Oil Pressure Sender

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Personnel Required

63J (2)

References

WP 0018

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked

GENERAL INFORMATION

1. The oil pressure sender (Figure 1, Item 1) is located on the cast housing that holds the oil filter.

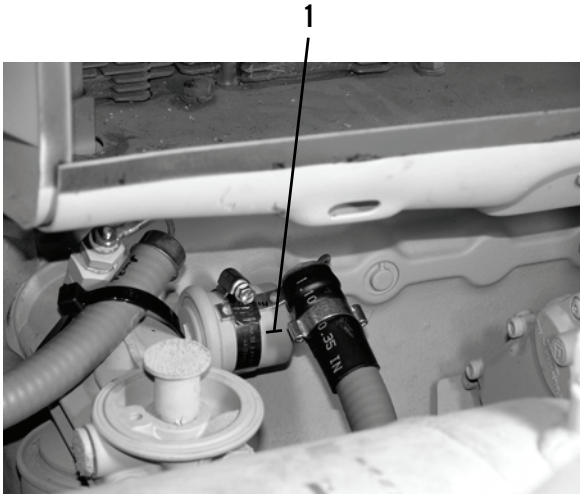


Figure 1. Oil Pressure Sender.

GENERAL INFORMATION - CONTINUED

2. This sender sends a reading to the oil pressure gauge (Figure 2, Item 2) on the control panel. This gauge is set to shut down the engine should oil pressure drop below 24 PSI (165 kPa).

CAUTION

If engine at idle does not exert at least 20 PSI (138 kPa), engine may be malfunctioning. Troubleshooting should be performed (WP 0018).

3. The following check can be performed at any engine temperature, as long as oil pressure is GREATER than 24 PSI (165 kPa).

CHECKING OIL PRESSURE SENDER

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

1. Ensure pump volute is filled 2/3 full with appropriate fluid, then start engine (WP 0006).
2. Run engine at idle, maintaining a MINIMUM of 25 PSI (172 kPa).
3. Remove six wingnuts (Figure 2, Item 3) and slide out control panel to access back side of oil pressure gauge (Figure 2, Item 2).

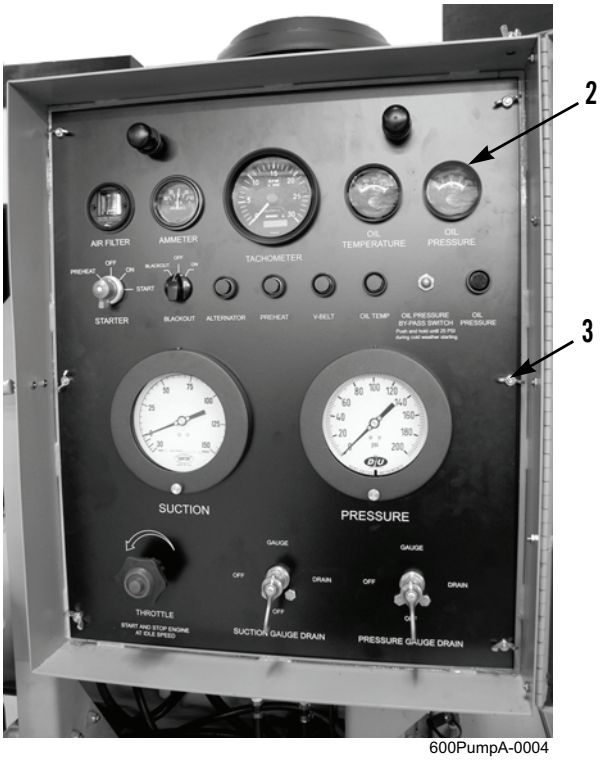
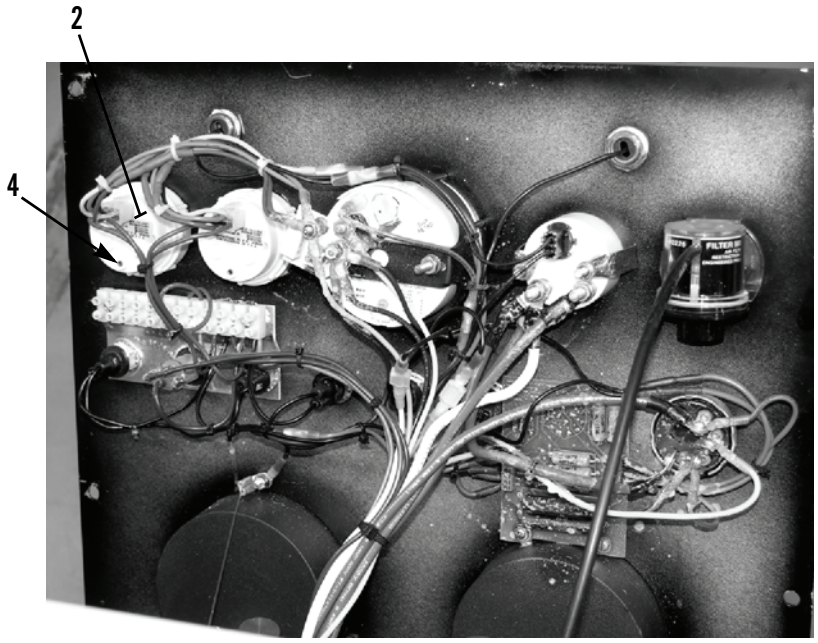


Figure 2. Oil Pressure Gauge at Control Panel.

CHECKING OIL PRESSURE SENDER - CONTINUED

4. Use a 1/16 in. allen wrench to turn setscrew (Figure 3, Item 4) on back of oil pressure gauge (Figure 3, Item 2), moving switch-gauge arm from 24 PSI (165 kPa) setting to a pressure setting greater than current oil pressure: 100 PSI (689 kPa) (Figure 4). Within 30 seconds, engine should shut down and oil pressure warning light should come on.



600PumpA-0544

Figure 3. Back Side of Oil Pressure Gauge.

600Pump-0073

Figure 4. Oil Pressure Gauge.

5. When engine shuts down, turn engine start switch to OFF.
6. Reset switch-gauge arm to 24 PSI (165 kPa) setting.
7. Place control panel back into position and secure with six wingnuts (Figure 2, Item 3).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

OIL PRESSURE SENDER REPLACEMENT

Removal, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Personnel Required

63J (1)

Materials/Parts

Adhesive (Item 1, WP 0129)

Rag, wiping (Item 22, WP 0129)

Equipment Condition

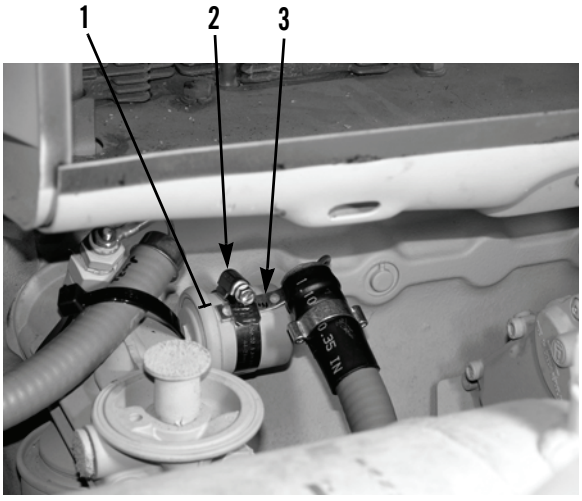
Battery cables disconnected (WP 0033)

WARNING

Ensure battery cables are disconnected before replacing oil pressure sender. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

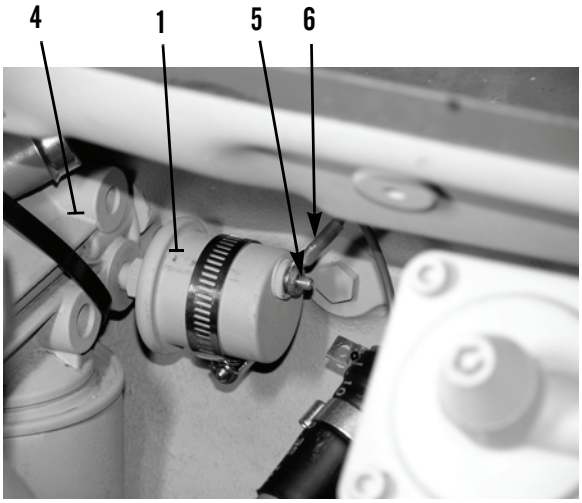
1. Loosen screw on clamp (Figure 2, Item 2) attached to oil pressure sender (Figure 2, Item 1) and remove L-bracket (Figure 2, Item 3) of conduit.



600PumpA-0546

Figure 1. Conduit L-Bracket.

2. Remove nut (Figure 2, Item 5) and wire (Figure 2, Item 6) from oil pressure sender (Figure 2, Item 1).
3. Remove oil pressure sender (Figure 2, Item 1) from oil filter head assembly (Figure 2, Item 4).



600PumpA-0547

Figure 2. Oil Pressure Sender.

INSTALLATION

NOTE

Apply adhesive to male threads of oil pressure sender.

1. Install oil pressure sender (Figure 2, Item 1) on oil filter head assembly (Figure 2, Item 4).
2. Install wire (Figure 2, Item 6) and nut (Figure 2, Item 5) on oil pressure sender (Figure 2, Item 1).
3. Secure L-bracket (Figure 1, Item 3) of conduit with clamp (Figure 1, Item 2) around oil pressure sender (Figure 1, Item 1). Tighten clamp screw.

FOLLOW-ON TASKS

Connect battery cables (WP 0033).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

CHECKING OIL TEMPERATURE SENDER

General Information, Checking Oil Temperature Sender

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Personnel Required

63J (2)

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked

GENERAL INFORMATION

1. The oil temperature sender (Figure 1, Item 1) is located on the cast housing that holds the oil filter.

600PumpA-0546

Figure 1. Oil Temperature Sender.

GENERAL INFORMATION - CONTINUED

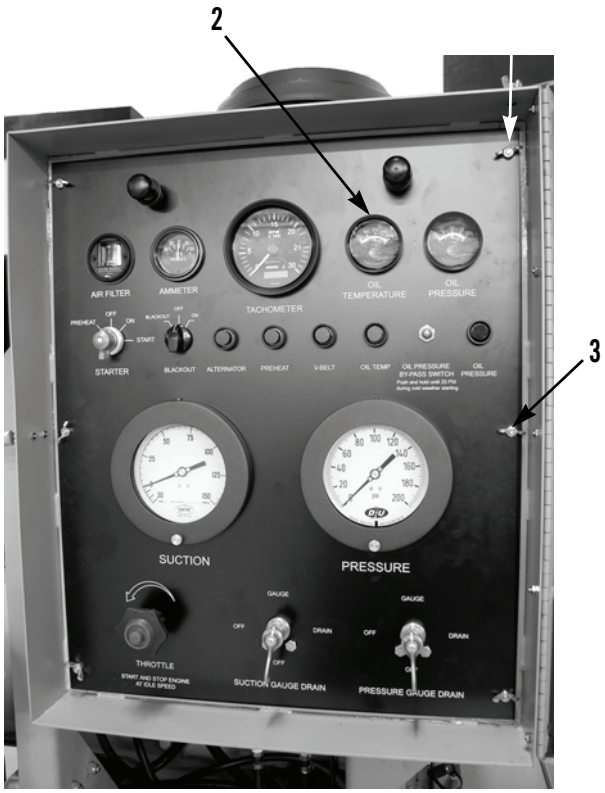
2. This sender sends a reading to the oil temperature gauge (Figure 2, Item 2) on the control panel. This gauge is set to shut down the engine should the oil temperature exceed 240°F (115.6°C).

CHECKING OIL TEMPERATURE SENDER

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

1. Ensure pump volute is filled 2/3 full with appropriate fluid, then start engine (WP 0006).
2. Run engine until oil temperature gauge (Figure 2, Item 2) maintains a minimum of 150°F (66°C).
3. Remove six wingnuts (Figure 2, Item 3) and slide out control panel to access back side of oil temperature gauge (Figure 2, Item 2).

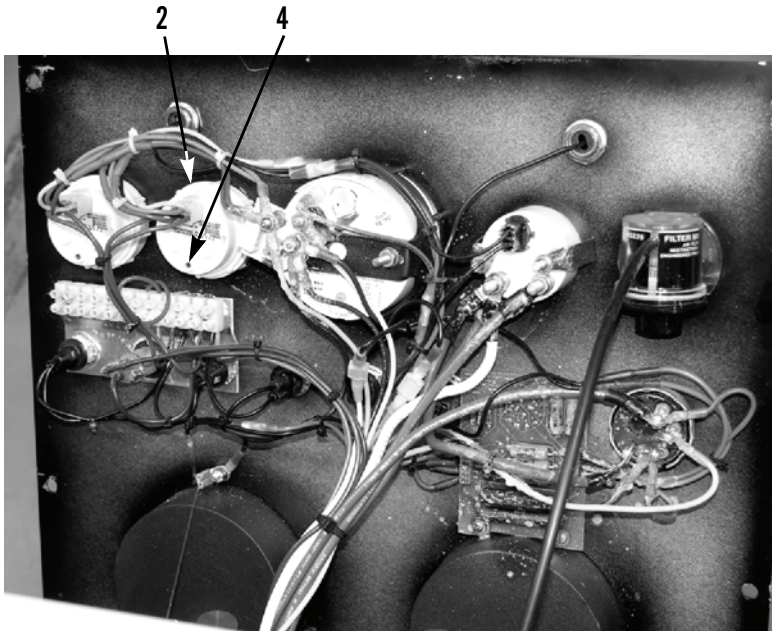


600PumpA-0004

Figure 2. Oil Temperature Gauge at Control Panel.

CHECKING OIL TEMPERATURE SENDER - CONTINUED

4. Use a 1/16 in. allen wrench to turn setscrew (Figure 3, Item 4) on back of oil temperature gauge (Figure 3, Item 2), moving switch-gauge arm from 240°F (115.6°C) setting to 140°F (60°C) (Figure 4). Within 30 seconds, engine should shut down and oil temperature warning light should come on.



600PumpA-0544

Figure 3. Back Side of Oil Temperature Gauge.

600Pump-0071

Figure 4. Oil Temperature Gauge.

5. When engine shuts down, turn engine start switch to OFF.
6. Reset switch-gauge arm to 240°F (115.6°C) setting.
7. Place control panel back into position and secure with six wingnuts (Figure 2, Item 3).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

OIL TEMPERATURE SENDER REPLACEMENT

Removal, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Personnel Required

63J (1)

Materials/Parts

Adhesive (Item 1, WP 0129)
Rag, wiping (Item 22, WP 0129)
Sealing washer (2)

Equipment Condition

Battery cables disconnected (WP 0033)

WARNING

Ensure battery cables are disconnected before replacing oil temperature sender. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

1. Remove nut (Figure 1, Item 5), washer (Figure 1, Item 6), wire (Figure 1, Item 7), and washer (Figure 1, Item 8) from oil temperature sender (Figure 1, Item 3).
2. Remove oil temperature sender (Figure 1, Item 3), sealing washer (Figure 1, Item 4), adapter (Figure 1, Item 1), and sealing washer (Figure 1, Item 2) from oil filter head assembly (Figure 1, Item 9). Discard sealing washers.

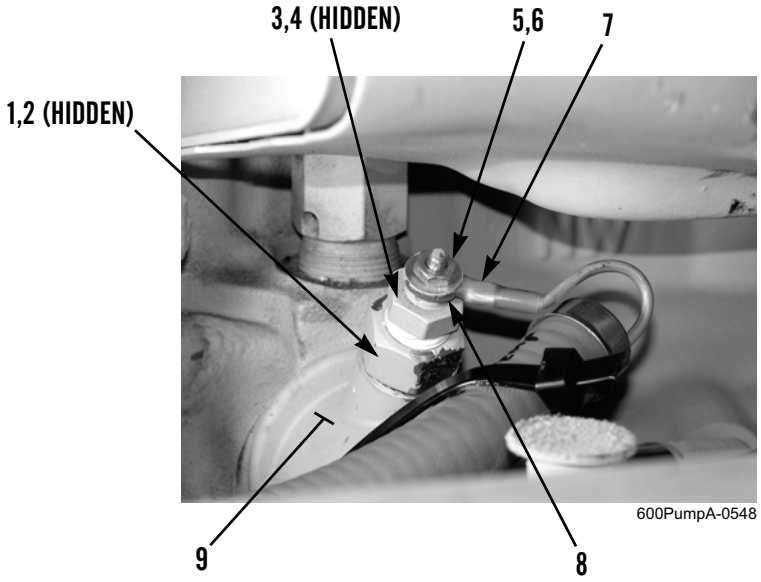


Figure 1. Oil Temperature Sender.

INSTALLATION

NOTE

Apply adhesive to male threads of oil temperature sender and adapter.

1. Install new sealing washer (Figure 1, Item 2), adapter (Figure 1, Item 1), new sealing washer (Figure 1, Item 4), and oil temperature sender (Figure 1, Item 3) on oil filter head assembly (Figure 1, Item 9).
2. Install washer (Figure 1, Item 8), wire (Figure 1, Item 7), washer (Figure 1, Item 6), and nut (Figure 1, Item 5) on oil temperature sender (Figure 1, Item 3).

FOLLOW-ON TASKS

Connect battery cables (WP 0033).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

CHECKING COOLING FAN V-BELT SHUTDOWN SWITCH

General Information, Checking Cooling Fan V-Belt Shutdown Switch, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Jumper wire

Personnel Required

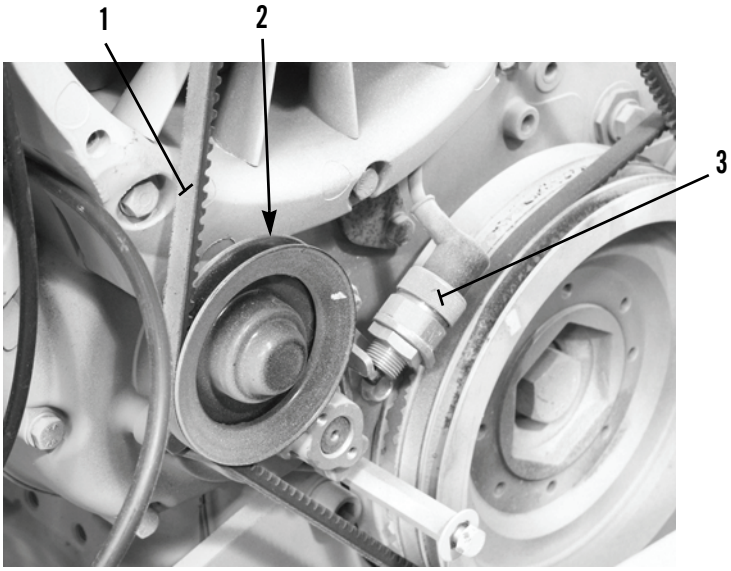
63J (1)

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked
Lower access plate removed (WP 0068)

GENERAL INFORMATION

1. The cooling fan V-belt shutdown switch (Figure 1, Item 3) is located on the engine, close to the tensioner pulley assembly (Figure 1, Item 2).
2. The tensioner pulley assembly (Figure 1, Item 2) rests against the cooling fan V-belt (Figure 1, Item 1). When the V-belt is properly installed and functioning, the cooling fan V-belt shutdown switch (Figure 1, Item 3) is not activated.
3. If the cooling fan V-belt (Figure 1, Item 1) should break, come off, become worn, or loosen enough to result in no tension against the tensioner pulley assembly (Figure 1, Item 2), the cooling fan V-belt shutdown switch (Figure 1, Item 3) will activate, the engine will shut down, and the cooling fan V-belt warning light on the control panel will come on (WP 0005).



SHOWN WITH V-BELT GUARD REMOVED

Figure 1. Cooling Fan V-Belt Shutdown Switch.

CHECKING COOLING FAN V-BELT SHUTDOWN SWITCH

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

1. Ensure pump volute is filled 2/3 full with appropriate fluid, then start engine and allow it to idle (WP 0006).
2. Verify oil pressure warning light on control panel goes out (WP 0005) and wait at least 30 seconds before continuing with test.

NOTE

Connection plug of V-belt shutdown switch wiring harness and engine/control panel wiring harness is located on left side of engine between alternator and starter.

3. Disconnect engine/control panel wiring harness connector (Figure 2, Item 5) from V-belt shutdown switch connector (Figure 2, Item 4).

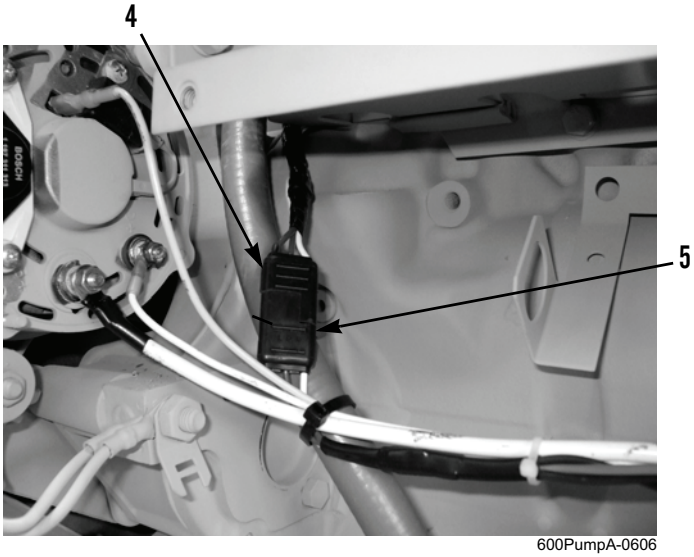


Figure 2. Shutdown Switch and Wiring Harness Connectors - Left Side of Engine.

4. Use a wire or tool to jump connection between two spade connectors of engine/control panel wiring harness connector (Figure 2, Item 5) and hold. Engine should shut down and cooling fan V-belt warning light on control panel should come on (WP 0005).
5. When engine shuts down, turn engine start switch to OFF.
6. Connect engine/control panel wiring harness connector (Figure 2, Item 5) to V-belt shutdown switch connector (Figure 2, Item 4).

FOLLOW-ON TASKS

Install lower access plate (WP 0068).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

COOLING FAN V-BELT SHUTDOWN SWITCH REPLACEMENT

Removal, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Personnel Required

63J (1)

Materials/Parts

Rag, wiping (Item 22, WP 0129)

Equipment Condition

Battery cables disconnected (WP 0033)
V-belt guard removed (WP 0081)

WARNING

Ensure cables are disconnected before replacing cooling fan V-belt shutdown switch. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

1. Push inward and upward on tensioner pulley assembly (Figure 1, Item 2) and remove cooling fan V-belt (Figure 1, Item 1).
2. Remove cable end connector (Figure 1, Item 3) from switch (Figure 1, Item 4).
3. Remove nut (Figure 1, Item 6) and switch (Figure 1, Item 4) from bracket (Figure 1, Item 5).
4. If necessary, remove bolt (Figure 1, Item 7), hex bolt (Figure 1, Item 8), and bracket (Figure 1, Item 5) from tensioner (Figure 1, Item 9).

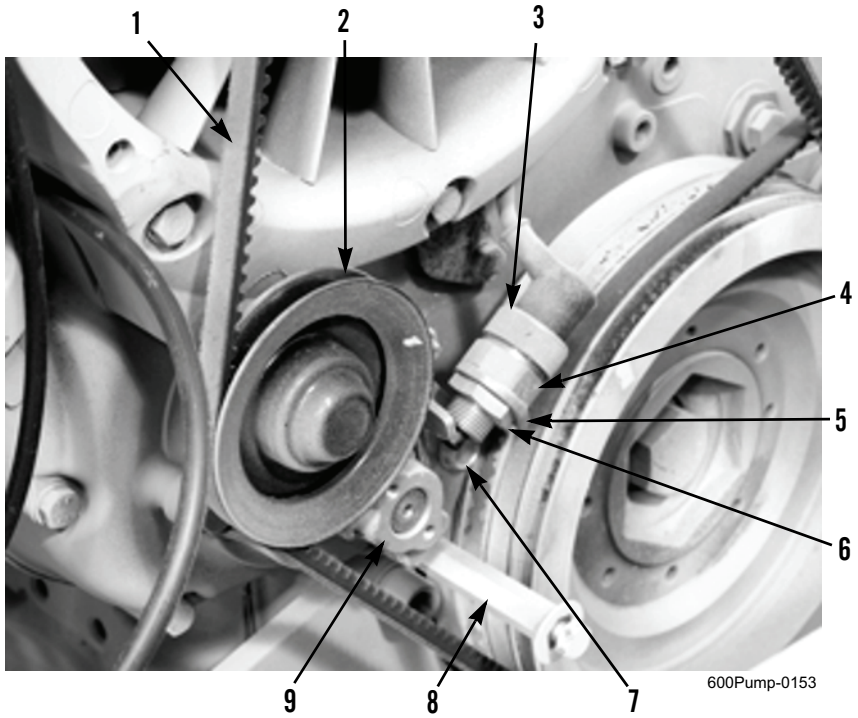


Figure 1. Cooling Fan V-Belt Shutdown Switch.

INSTALLATION

1. If removed, install bracket (Figure 1, Item 5) on tensioner (Figure 1, Item 9) with bolt (Figure 1, Item 7) and hex bolt (Figure 1, Item 8).
2. Install cable end connector (Figure 1, Item 3) on switch (Figure 1, Item 4).

NOTE

With cooling fan V-belt removed, tensioner pulley assembly arm should depress plunger on switch.

3. Install switch (Figure 1, Item 4) on bracket (Figure 1, Item 5) with nut (Figure 1, Item 6).
4. Push inward and upward on tensioner pulley assembly (Figure 1, Item 2) and install cooling fan V-belt (Figure 1, Item 1).

FOLLOW-ON TASKS

1. Install V-belt guard (WP 0081).
2. Connect battery cables (WP 0033).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

AXLE REPLACEMENT

Removal, Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Locknut (8)

Personnel Required

63J (2)

References

WP 0023
WP 0048
WP 0049

References - Continued

WP 0051
WP 0057
WP 0059
WP 0060

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked
Pump assembly drained (WP 0006)

WARNING

Use extreme caution when lifting heavy parts. Provide adequate support and use assistance during procedure. Ensure that lifting equipment used is on solid footing, is in good condition, and is of suitable lift capacity. Keep clear of heavy parts supported only by lifting equipment. Failure to follow this warning may result in death or injury to personnel or damage to equipment.

NOTE

Axle weighs approximately 123 lb (56 kg).

REMOVAL

1. Raise trailer and support on jack stands at all four corners.
2. Remove wheel and tire assemblies (WP 0060).
3. Remove wheel hub/drum assemblies (WP 0059).
4. Remove brakeshoes, hand brake cable, hydraulic brake line, and backing plate from each end of axle (Figure 1, Item 7) (WP 0051).
5. Position a floor jack under rear of trailer and position jack saddle under midpoint of axle (Figure 1, Item 7).
6. At each end of axle (Figure 1, Item 7), remove two locknuts (Figure 1, Item 4), four washers (Figure 1, Item 5), and two bolts (Figure 1, Item 6) from axle and top axle mounts. Discard locknuts.
7. At each end of axle (Figure 1, Item 7), remove two locknuts (Figure 1, Item 1), four washers (Figure 1, Item 2), and two bolts (Figure 1, Item 3) from axle and side axle mounts. Discard locknuts.
8. Carefully lower axle (Figure 1, Item 7) and remove axle from trailer.

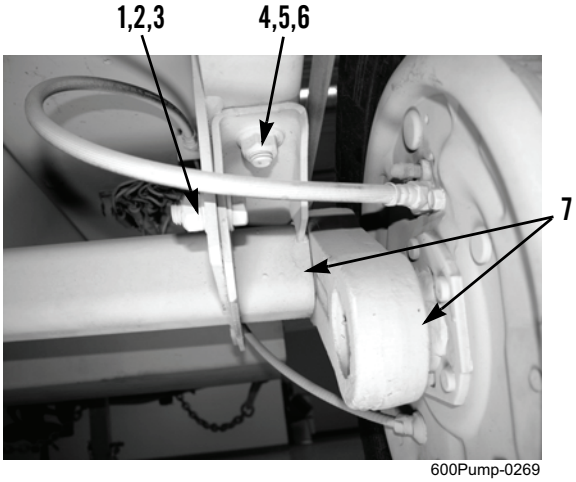


Figure 1. Axle Mounting Hardware.

INSPECTION

1. Inspect axle/frame mounting holes for damage IAW WP 0023.
2. Report any damage found.

INSTALLATION

1. Place axle (Figure 1, Item 7) on a floor jack with jack saddle under midpoint of axle. Roll axle into position under trailer.
2. Carefully raise axle to frame and align eight axle mounting holes.
3. Install two bolts (Figure 1, Item 6), four washers (Figure 1, Item 5), and two new locknuts (Figure 1, Item 4) on each end of axle (Figure 1, Item 7) and top axle mounts. DO NOT fully tighten locknuts.
4. Install two bolts (Figure 1, Item 3), four washers (Figure 1, Item 2), and two new locknuts (Figure 1, Item 1) on each end of axle (Figure 1, Item 7) and side axle mounts. DO NOT fully tighten locknuts.
5. Tighten locknuts (Figure 1, Item 4) at top axle mounts to 130 ± 13 lb-ft (176 ± 18 Nm).
6. Tighten locknuts (Figure 1, Item 1) at side axle mounts to 142 ± 14 lb-ft (193 ± 19 Nm).
7. Install backing plate, hydraulic brake line, hand brake cable, and brakeshoes at each end of axle (Figure 1, Item 7) (WP 0051).
8. Install wheel hub/drum assemblies (WP 0059).
9. Install wheel and tire assemblies (WP 0060).
10. Remove jack stands from four corners of trailer and lower trailer to ground.

FOLLOW-ON TASKS

1. Bleed hydraulic brake system (WP 0057).
2. Adjust service brakes (WP 0049).
3. Adjust hand brakes (WP 0048).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

HAND BRAKE MAINTENANCE

Hand Brake Lever Removal, Hand Brake Lever Installation and Adjustment, Hand Brake Cable and Sheath Removal, Hand Brake Cable and Sheath Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Materials/Parts

Clamp (4)
Cotter pin (2)
Locknut (4)

Personnel Required

63J (1)

References

WP 0051
WP 0099

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brake applied on unaffected side (WP 0005)
Wheels chocked

WARNING

When performing maintenance on hand brake system, ensure wheel and tire assemblies are securely blocked with hand brake applied on side not being worked on. Failure to follow this warning may cause trailer to roll, resulting in injury or death to personnel or damage to equipment.

NOTE

Perform the following procedure for each hand brake lever and cable.

HAND BRAKE LEVER REMOVAL

1. Place hand brake lever (Figure 1, Item 2) in released (vertical) position. Turn adjustment knob (Figure 1, Item 1) counterclockwise (left) to provide slack in hand brake cable (Figure 1, Item 3).

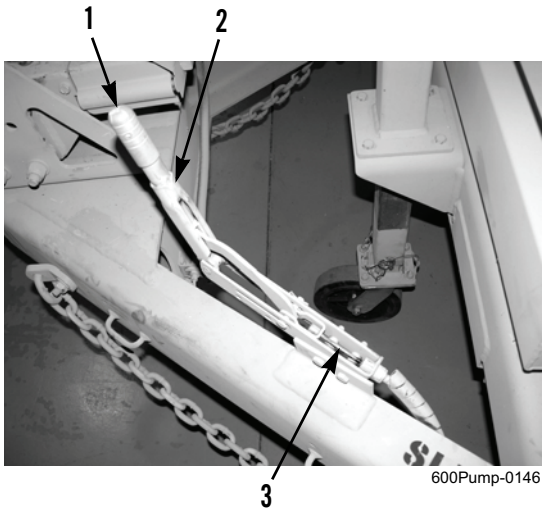


Figure 1. Hand Brake Lever.

HAND BRAKE LEVER REMOVAL - CONTINUED

2. Remove cotter pin (Figure 2, Item 4), washer (Figure 2, Item 5), and clevis pin (Figure 2, Item 12), and release hand brake cable clevis (Figure 2, Item 13) from hand brake lever (Figure 2, Item 2). Discard cotter pin.
3. Remove two locknuts (Figure 2, Item 9), washers (Figure 2, Item 10), spacers (Figure 2, Item 6), bolts (Figure 2, Item 11), and hand brake lever (Figure 2, Item 2) from welded angle bracket (Figure 2, Item 8) on trailer frame. Discard locknuts.
4. Release hand brake cable (Figure 2, Item 3) and cable sheath (Figure 2, Item 7) from notch in hand brake lever (Figure 2, Item 2).

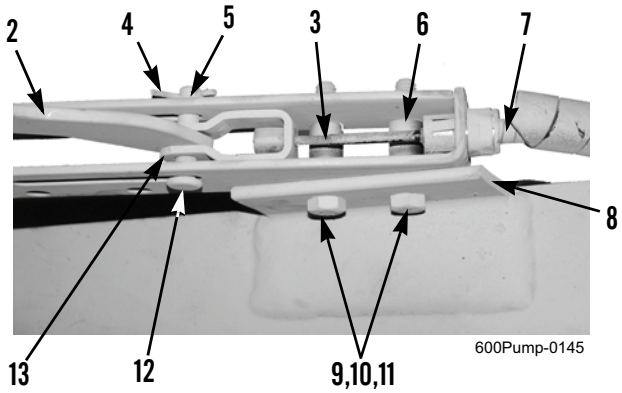


Figure 2. Hand Brake Lever Mounting.

HAND BRAKE LEVER INSTALLATION AND ADJUSTMENT

1. Position hand brake cable (Figure 2, Item 3) and cable sheath (Figure 2, Item 7) in notch in hand brake lever (Figure 2, Item 2).
2. Install hand brake lever (Figure 2, Item 2) on welded angle bracket (Figure 2, Item 8) on trailer frame with two spacers (Figure 2, Item 6), bolts (Figure 2, Item 11), washers (Figure 2, Item 10), and new locknuts (Figure 2, Item 9).
3. Secure hand brake cable clevis (Figure 2, Item 13) to hand brake lever (Figure 2, Item 2) with clevis pin (Figure 2, Item 12), washer (Figure 2, Item 5), and new cotter pin (Figure 2, Item 4).
4. With hand brake lever (Figure 1, Item 2) in released (vertical) position, turn adjustment knob (Figure 1, Item 1) clockwise (right) to take up slack in hand brake cable (Figure 1, Item 3). Lever is adjusted correctly when cable has slack during one-third of its travel from released to applied position.

HAND BRAKE CABLE AND SHEATH REMOVAL

1. Remove fuel tank from trailer chassis (WP 0099).
2. Remove hand brake cable (Figure 2, Item 3) and cable sheath (Figure 2, Item 7) from hand brake lever (Figure 2, Item 2). Refer to *Hand Brake Lever Removal* in this work package.
3. Remove brakeshoes on affected side (WP 0051).
4. Squeeze tabs (Figure 3, Item 15) on hand brake cable (Figure 3, Item 3) and push outward to remove hand brake cable from backing plate (Figure 3, Item 14).

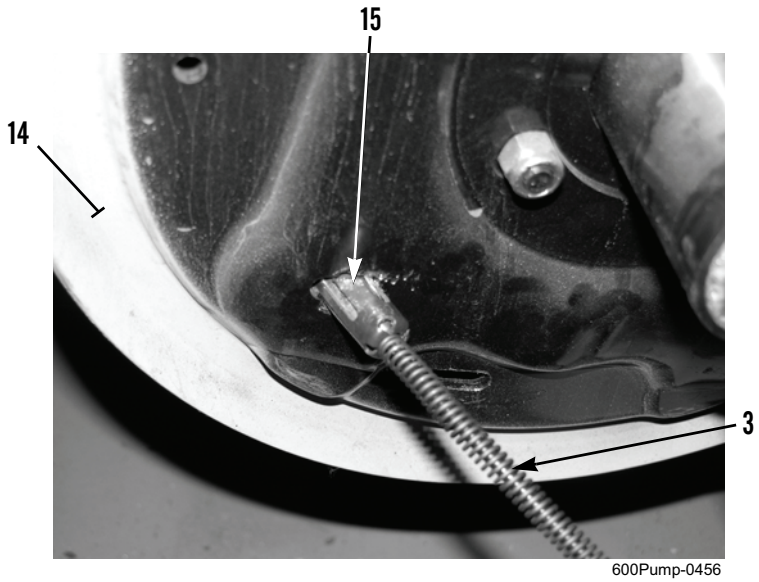


Figure 3. Tabs on Hand Brake Cable.

5. Disconnect hand brake cable sheath (Figure 4, Item 7) from backing plate (Figure 4, Item 14).

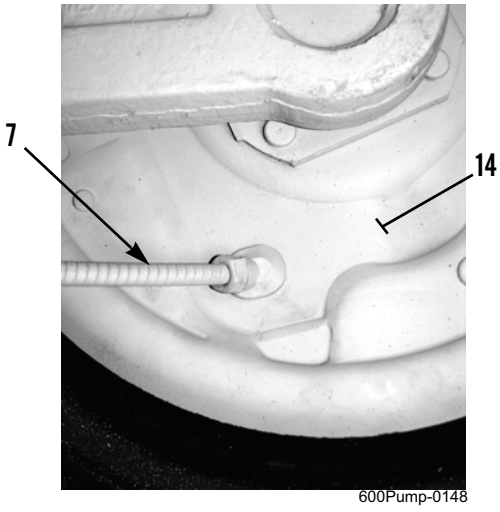


Figure 4. Hand Brake Cable at Backing Plate.

HAND BRAKE CABLE AND SHEATH REMOVAL - CONTINUED

6. Remove two clamps (Figure 5, Item 16) to release hand brake cable and cable sheath (Figure 5, Item 7) from trailer frame. Discard clamps.

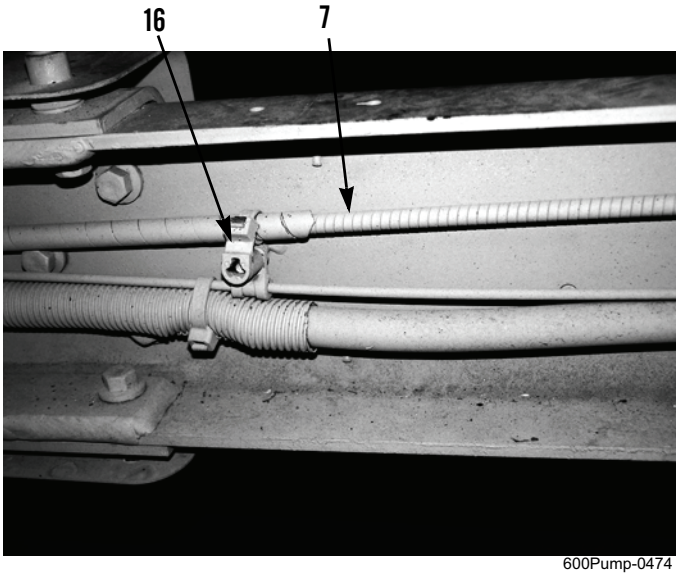


Figure 5. Hand Brake Cable Sheath Along Trailer Frame.

HAND BRAKE CABLE AND SHEATH INSTALLATION

CAUTION

Ensure hand brake cable and cable sheath are not twisted or kinked as they are positioned along frame. If twisted or kinked, hand brake will become damaged and will not function correctly.

1. Position hand brake cable sheath (Figure 5, Item 7) along trailer frame, between backing plate (Figure 6, Item 14) and hand brake lever mounting location.
2. At backing plate (Figure 6, Item 14), feed hand brake cable (Figure 6, Item 3) through backing plate.

Figure 6. Hand Brake Cable.

HAND BRAKE CABLE AND SHEATH INSTALLATION - CONTINUED

3. Connect hand brake cable sheath (Figure 7, Item 7) to backing plate (Figure 7, Item 14).

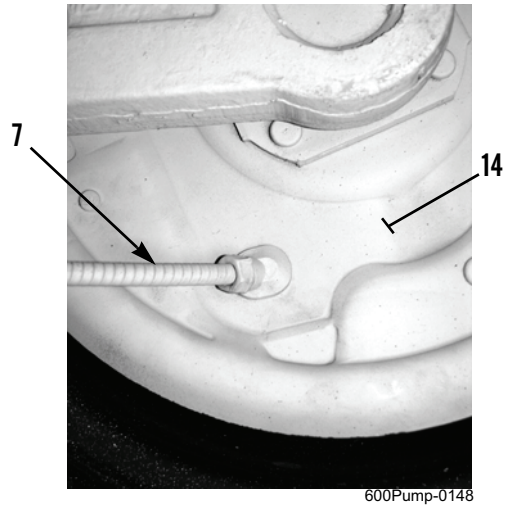


Figure 7. Hand Brake Cable at Backing Plate.

4. Secure hand brake cable sheath (Figure 5, Item 7) to trailer frame with two new clamps (Figure 5, Item 16).
5. Install hand brake cable (Figure 8, Item 3) and cable sheath (Figure 8, Item 7) on hand brake lever (Figure 8, Item 2). Adjust hand brake. Refer to *Hand Brake Lever Installation and Adjustment* in this work package.

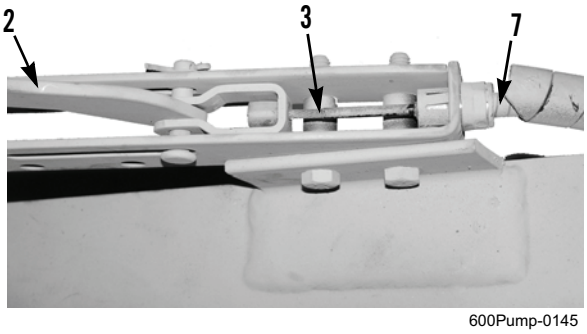


Figure 8. Hand Brake Lever Mounting.

FOLLOW-ON TASKS

1. Install brakeshoes on affected side (WP 0051).
2. Install fuel tank (WP 0099).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

SERVICE BRAKE ADJUSTMENT

Adjustment, Adjustment Check

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Personnel Required

63J (1)

References

WP 0005

References - Continued

WP 0018

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)

WARNING

When performing adjustment of service brakes, ensure wheel and tire assembly on side not being adjusted is securely blocked with hand brake applied. Failure to follow this warning may cause trailer to roll, resulting in injury or death to personnel or damage to equipment.

NOTE

- Service brakes at each wheel and tire assembly are adjusted the same way.
- Left-side service brakes are illustrated.

ADJUSTMENT

1. Block wheel and tire assembly on side not being adjusted.
2. Apply both hand brakes (WP 0005).

NOTE

- Rear leveling jack assemblies are rated above weight of trailer. They can be safely used to support trailer weight.
- If terrain is uneven or will not support rear leveling jack assembly, blocking may be placed under rear jack.
- A jack stand may also be used.

3. Remove pin and swing rear leveling jack assembly to vertical position. Use crank handle to raise trailer until wheel and tire assembly is approximately 1 in. (2.54 cm) off ground (WP 0005).
4. Release hand brake on side being adjusted (WP 0005).

ADJUSTMENT - CONTINUED

5. Remove protective plug (Figure 1, Item 1) from adjustment slot in backing plate.

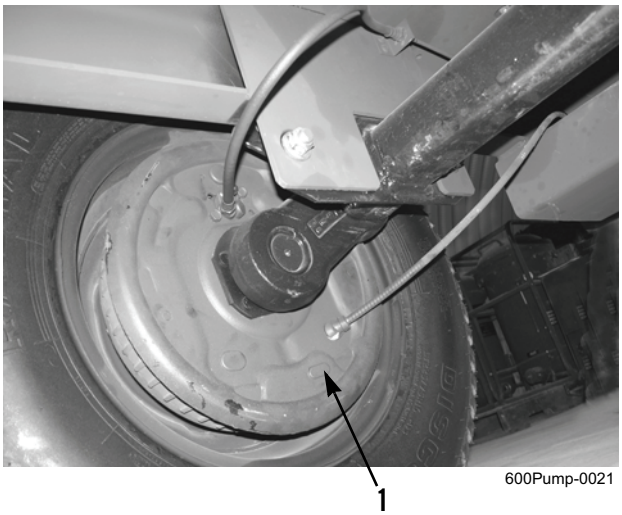


Figure 1. Adjustment Slot at Backing Plate.

6. Rotate starwheel (Figure 2, Item 2) downward until brakes drag.

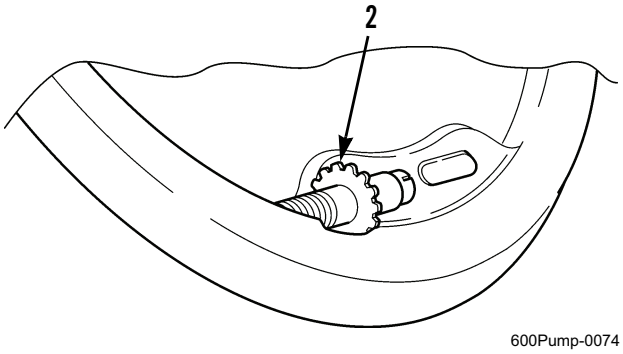


Figure 2. Starwheel.

NOTE

- Brake adjustment is performed by rotating wheel and using a torque wrench to measure force required to rotate wheel. To ensure correct adjustment, wheel must be rotated in FORWARD direction only.
- If wheel rotates in reverse or backwards direction, brakeshoes must be aligned by starting procedure again at step 7.

7. Roll wheel in forward direction three or four revolutions. Stop wheel when two opposite lug nuts are at 12 o'clock and 6 o'clock positions.

ADJUSTMENT - CONTINUED

NOTE

Torque wrench must be properly aligned on wheel to ensure accurate measurement of force. Proper torque wrench placement is with handle pointing away from center of wheel and in a straight line with center of Bearing Buddy®.

8. Set torque wrench to 170 ± 17 lb-in. (19.2 ± 1.9 Nm). Place torque wrench on top lug nut and use torque wrench to roll wheel forward 90 degrees (1/4 turn), checking whether torque wrench exceeded setting.
9. Move torque wrench back to top, checking every other lug nut by repeating step 8. Continue checking until all four lug nuts have been checked, i.e., one full rotation of wheel.

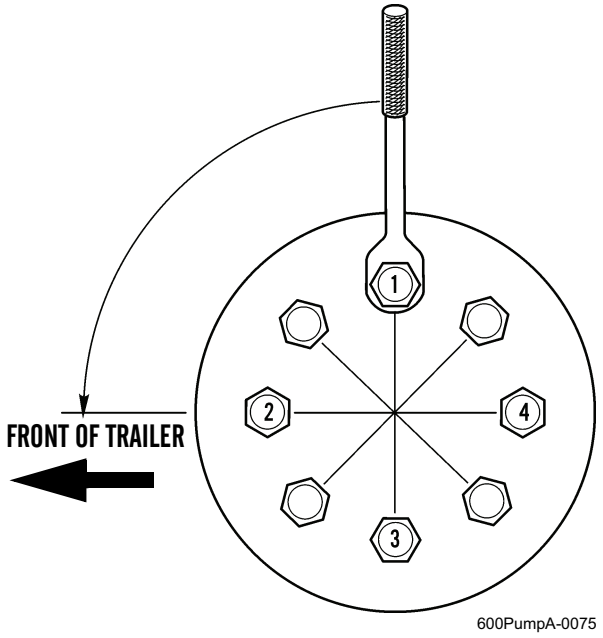


Figure 3. Checking Lug Nut Torque.

10. Set torque wrench to 220 ± 22 lb-in. (24.9 ± 2.5 Nm). Repeat steps 8 and 9 with new setting.
11. If torque measurement at two or more lug nuts is less than 170 ±17 lb-in. (19.2 ± 1.9 Nm), tighten brakes and repeat steps 8 through 10.
12. If torque measurement at two or more lug nuts is greater than 220 ± 22 lb-in. (24.9 ± 2.5 Nm), loosen brakes and repeat steps 8 through 10.
13. Torque measurement at four lug nuts must meet one of the conditions listed in Table 1.

Table 1. Torque Measurements.

Condition	Number of Lug Nuts Less Than 170 lb-in. (19.2 Nm)	Number of Lug Nuts Greater Than 170 lb-in. (19.2 Nm) and Less Than 220 lb-in. (24.9 Nm)	Number of Lug Nuts Greater Than 170 lb-in. (19.2 Nm)
1	1	3	0
2	0	3	1
3	1	2	1

ADJUSTMENT - CONTINUED

14. Install protective plug (Figure 4, Item 1) over adjustment slot in backing plate.

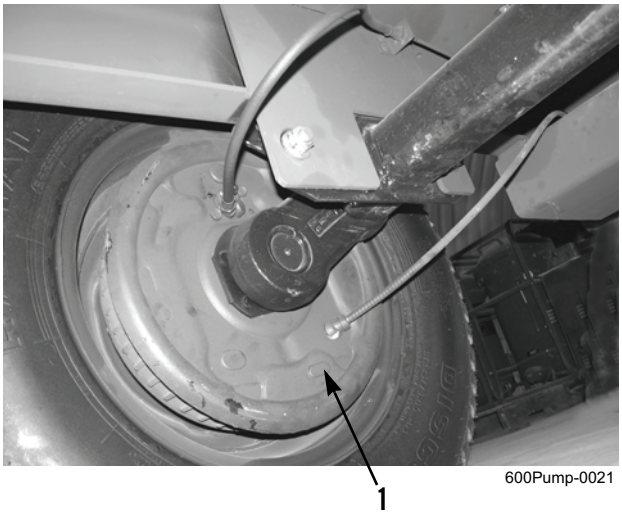


Figure 4. Adjustment Slot at Backing Plate.

15. Use rear leveling jack assembly to lower wheel and tire assembly to ground (WP 0005).
16. Fully retract rear leveling jack assembly. Swing into horizontal (stowed) position and secure with pin (WP 0005).
17. Apply hand brake on adjusted side (WP 0005).
18. Repeat steps 1 through 16 to adjust other side.

ADJUSTMENT CHECK

1. Couple trailer to towing vehicle (WP 0006).
2. Release both hand brakes (WP 0005).
3. Pull forward sharply on breakaway cable to move breakaway lever forward to apply trailer brakes.
4. Place towing vehicle in drive, with transfer case in high range and engine at idle.
5. Attempt to move trailer with towing vehicle. Services brakes should hold trailer. Perform brake system troubleshooting if service brakes do not hold (WP 0018).
6. Disengage breakaway lever.
7. Uncouple trailer from towing vehicle (WP 0006).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

SERVICE BRAKE INSPECTION

Inspection, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Materials/Parts

Rag, wiping (Item 22, WP 0129)

Personnel Required

63J (1)

References

WP 0005

Equipment Condition

Wheel hub/drum removed (WP 0059)

WARNING

When performing inspection of service brakes, ensure wheel and tire assembly on side not being inspected is securely blocked with hand brake applied. Failure to follow this warning may cause trailer to roll, resulting in injury or death to personnel or damage to equipment.

INSPECTION

1. Ensure wheel and tire assembly is blocked on side not being inspected.
2. Ensure hand brake is applied on side not being inspected (WP 0005).
3. Release hand brake on side being inspected (WP 0005).

INSPECTION - CONTINUED

4. Inspect wheel cylinder (Figure 2, Item 2) for leakage and corrosion.
5. Inspect brakeshoe linings (Figure 2, Item 1) for cracks or signs of grease or brake fluid on linings.
6. Measure thickness of brakeshoe linings (Figure 2, Item 1). Thickness should be 1/8 in. (3.18 mm) minimum.
7. Inspect brake adjuster starwheel (Figure 2, Item 3) for corrosion and freedom of movement.

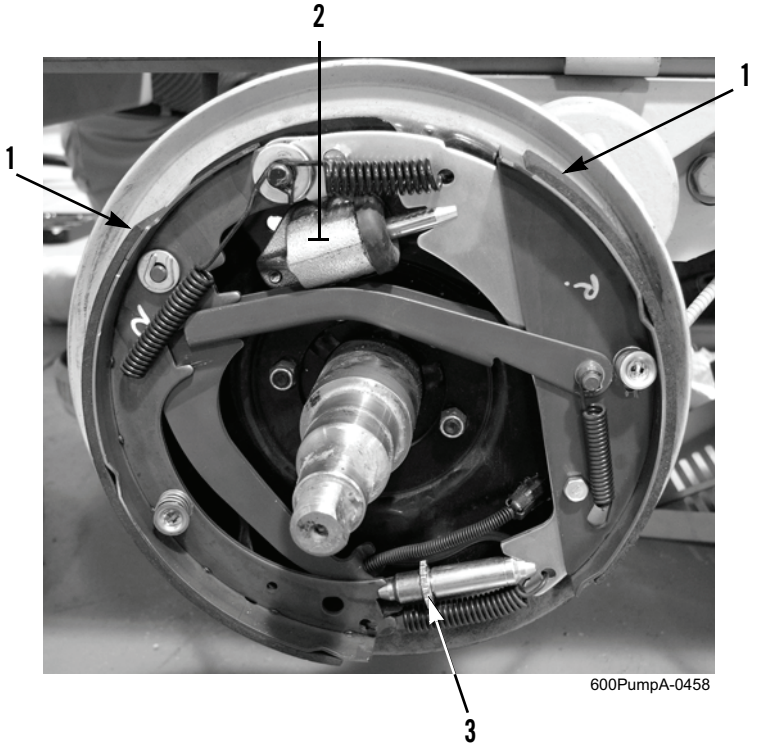
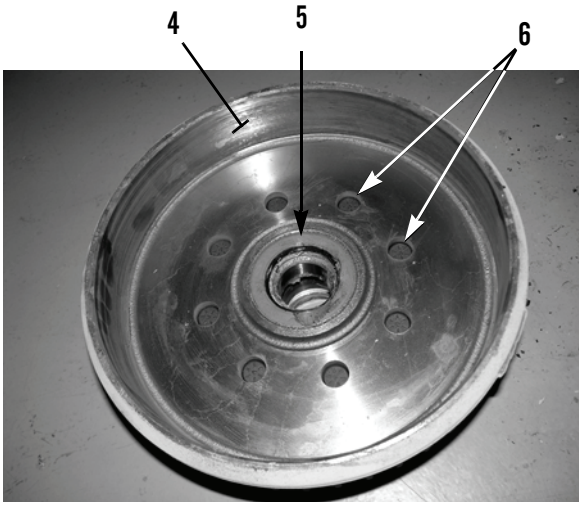


Figure 1. Service Brakes.

8. Inspect grease seal (Figure 2, Item 5) for signs of leakage.
9. Inspect interior of brake drum (Figure 2, Item 4) for scoring.

INSPECTION - CONTINUED

10. Inspect wheel studs (Figure 2, Item 6) for looseness or damage.
11. Replace any damaged component.



600PumpA-0549

Figure 2. Brake Drum - Rotated 180°.

FOLLOW-ON TASKS

Install wheel hub/drum (WP 0059).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

SERVICE BRAKE MAINTENANCE

Disassembly, Cleaning and Inspection, Assembly, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Cap set, protective, dust and moisture (Item 5, WP 0129)
Cleaning compound, solvent, Type III (Item 6, WP 0129)
Grease, automotive and artillery, GAA (Item 14, WP 0129)
Rag, wiping (Item 22, WP 0129)
Capscrew (with integral lockwasher) (2)
Locknut (2)

Materials/Parts - Continued

Retaining ring
Spring tension clip
Spring tension washer

Personnel Required

63J (2)

References

WP 0005
WP 0049
WP 0057

Equipment Condition

Wheel hub/drum removed (WP 0059)

WARNING

- When performing maintenance on service brakes, ensure wheel and tire assembly on unaffected side is securely blocked with hand brake applied. Failure to follow this warning may cause trailer to roll, resulting in injury or death to personnel or damage to equipment.
- If one brakeshoe is being replaced, replace all brakeshoes. Combination of old and new will cause uneven braking. Accidents causing injury or death to personnel may occur.

DISASSEMBLY

NOTE

- Disassembly of right-side service brakes is illustrated. Left side is disassembled the same way.
- Note position of components as they are disassembled to ensure correct assembly.

1. Ensure hand brake is released on affected side (WP 0005).

WARNING

Wear eye protection when removing springs. Failure to follow this warning may result in injury to personnel.

2. Remove front shoe spring (Figure 1, Item 6) from backing shoe lever (Figure 1, Item 7) and anchor pin (Figure 1, Item 5).
3. Remove rear shoe spring (Figure 1, Item 1) from rear brakeshoe (Figure 1, Item 2) and anchor pin (Figure 1, Item 5).
4. Remove washer (Figure 1, Item 3) from anchor pin (Figure 1, Item 5).
5. Remove retainer (Figure 1, Item 12), spring (Figure 1, Item 11), retainer (Figure 1, Item 10), and pin (Figure 1, Item 13) securing front brakeshoe (Figure 1, Item 9) to backing plate (Figure 1, Item 8).
6. Remove retainer (Figure 1, Item 19), spring (Figure 1, Item 20), retainer (Figure 1, Item 21), and pin (Figure 1, Item 18) securing rear brakeshoe (Figure 1, Item 2) to backing plate (Figure 1, Item 8).
7. Remove spring (Figure 1, Item 14) and brake adjuster (Figure 1, Item 15) from rear brakeshoe (Figure 1, Item 2) and backing shoe lever (Figure 1, Item 7).
8. Remove hand brake cable (Figure 1, Item 16) from parking brake link (Figure 1, Item 17).
9. Remove rear brakeshoe (Figure 1, Item 2) from backing plate (Figure 1, Item 8).
10. Remove link (Figure 1, Item 4) from anchor pin (Figure 1, Item 5) and remove front brakshoe (Figure 1, Item 9) from backing plate (Figure 1, Item 8).

DISASSEMBLY - CONTINUED

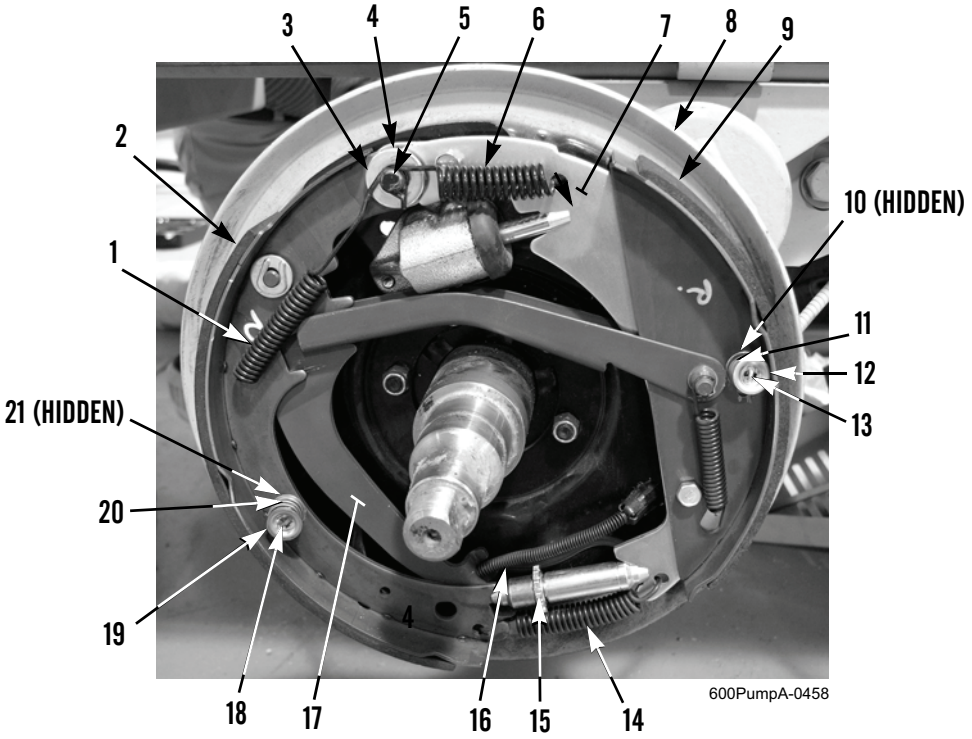


Figure 1. Right-Side Service Brakes.

DISASSEMBLY - CONTINUED

11. Remove spring tension clip (Figure 2, Item 25), washer (Figure 2, Item 22), spring tension washer (Figure 2, Item 23), transporter washer (Figure 2, Item 24), and parking brake link (Figure 2, Item 17) from rear brakeshoe (Figure 2, Item 2). Discard spring tension clip and spring tension washer.
12. Remove locknut (Figure 2, Item 26), bolt (Figure 2, Item 27), and link (Figure 2, Item 4) from backing shoe lever (Figure 2, Item 7). Discard locknut.
13. Remove spring (Figure 2, Item 32) from pin (Figure 2, Item 28) and backing shoe lever (Figure 2, Item 7).
14. Remove locknut (Figure 2, Item 30) and capscrew (Figure 2, Item 31) from backing shoe lever (Figure 2, Item 7) and front brakeshoe (Figure 2, Item 9). Discard locknut.
15. Remove retaining ring (Figure 2, Item 29), pin (Figure 2, Item 28), backing shoe lever (Figure 2, Item 7), and parking shoe lever (Figure 2, Item 33) from front brakeshoe (Figure 2, Item 9). Discard retaining ring.

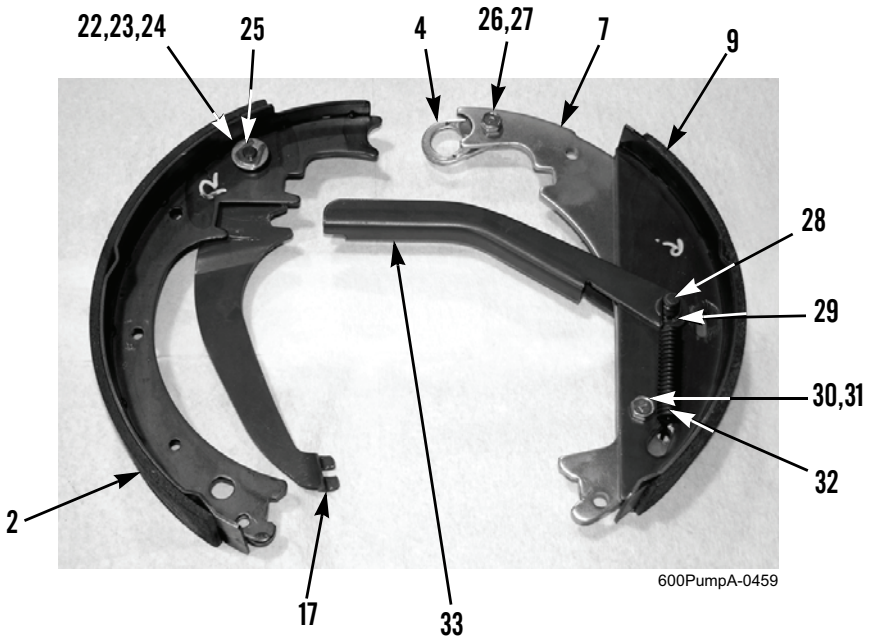


Figure 2. Right-Side Service Brakes.

CLEANING AND INSPECTION

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low-toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to do so may result in injury or death to personnel.

1. Clean all removed components in solvent cleaning compound and allow components to dry.
2. Replace any damaged components.
3. Inspect backing plate (Figure 3, Item 8) for cracks, breaks, corrosion, or other damage. If damaged, replace backing plate:
   a. Squeeze tabs (Figure 3, Item 34) on hand brake cable (Figure 3, Item 16) and push hand brake cable out from backing plate (Figure 3, Item 8).

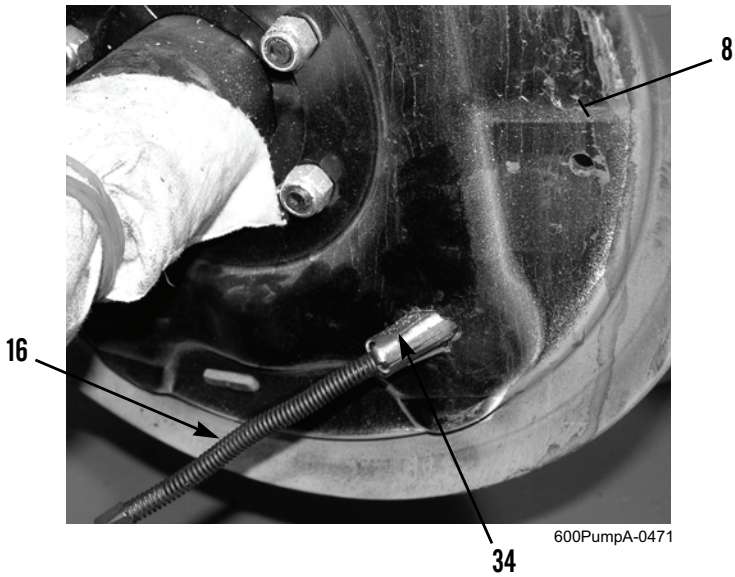


Figure 3. Hand Brake Cable at Backing Plate.

CLEANING AND INSPECTION - CONTINUED

b. Remove hand brake cable sheath (Figure 4, Item 38) from backing plate (Figure 4, Item 8).

WARNING

Wear gloves and eye protection when handling brake fluid. Work in a well-ventilated area. Exposure to brake fluid may cause irritation to eyes, skin, and lungs. If ingested, it can irritate mouth, esophagus, and stomach. Failure to exercise caution may result in injury to personnel.

CAUTION

Plug flex brake line after disconnection to prevent fluid loss and contamination of hydraulic brake system.

c. Remove two capscrews (Figure 4, Item 35) with integral lockwashers securing wheel cylinder (Figure 4, Item 41) to backing plate (Figure 4, Item 8). Pull wheel cylinder loose from backing plate and disconnect flex brake line (Figure 4, Item 37) from wheel cylinder. Install temporary plug in flex brake line. Remove wheel cylinder. Discard capscrews with integral lockwashers.

d. Remove five nuts (Figure 4, Item 36) from mounting studs (Figure 4, Item 39) and remove backing plate (Figure 4, Item 8) from axle spindle (Figure 4, Item 40).

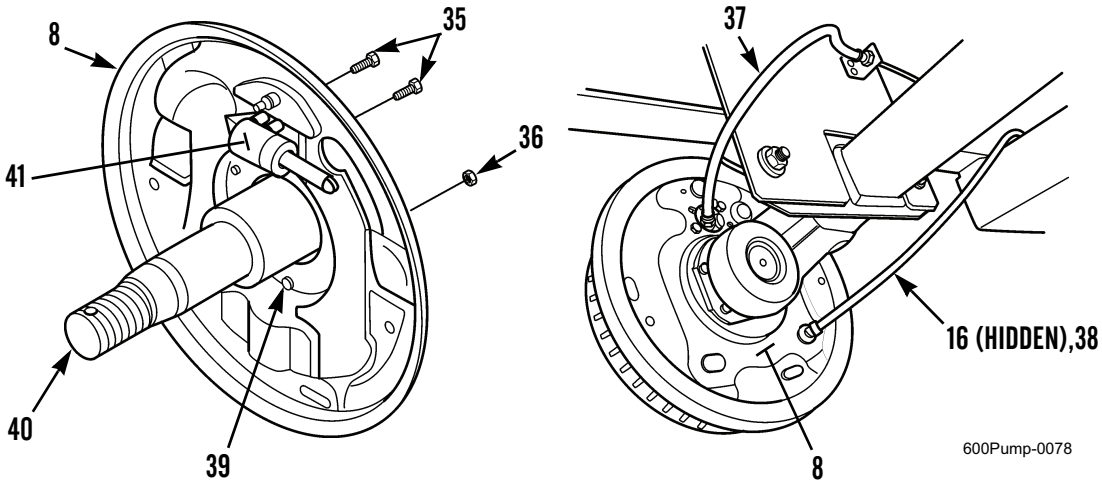


Figure 4. Wheel Cylinder and Backing Plate.

4. Disassemble brake adjuster (Figure 5, Item 15) and clean with solvent cleaning compound. Ensure brake adjuster is not damaged.

CLEANING AND INSPECTION - CONTINUED

5. Lightly coat inside of cap and threads of brake adjuster (Figure 5, Item 15) with GAA grease and assemble. Back brake adjuster off 1/2 turn.

Figure 5. Brake Adjuster.

ASSEMBLY

1. If removed, install backing plate:
   a. Install backing plate (Figure 6, Item 8) on five mounting studs (Figure 6, Item 39) at axle spindle (Figure 6, Item 40) with five nuts (Figure 6, Item 36). Tighten nuts evenly to 50 ± 5 lb-ft (68 ± 7 Nm).
   b. Remove plug from flex brake line (Figure 6, Item 37) and connect flex brake line to wheel cylinder (Figure 6, Item 41).
   c. Install wheel cylinder (Figure 6, Item 41) on backing plate (Figure 6, Item 8) with two new capscrews (Figure 6, Item 35) with integral lockwashers. Tighten capscrews with integral lockwashers to 168 ± 17 lb-in. (19 ± 1.9 Nm).
   d. Feed hand brake cable (Figure 6, Item 16) through backing plate (Figure 6, Item 8), then connect hand brake cable sheath (Figure 6, Item 38) to backing plate.

WARNING

DO NOT allow grease to contact brakeshoe linings. Remove any grease from brakeshoe linings to prevent them from becoming grease-soaked. Brakeshoe linings that absorb grease become glazed, resulting in poor braking action. Failure to keep brakeshoes free of grease may cause brakes to malfunction, resulting in injury or death to personnel or damage to equipment.

   e. Wipe clean any grease from hand brake cable (Figure 6, Item 16) or hand brake cable sheath (Figure 6, Item 38) to ensure grease does not come in contact with brakeshoe linings.

ASSEMBLY - CONTINUED

2. Install parking shoe lever (Figure 6, Item 33) on front brakeshoe (Figure 6, Item 9) and backing shoe lever (Figure 6, Item 7) with pin (Figure 6, Item 28) and new retaining ring (Figure 6, Item 29).
3. Secure backing shoe lever (Figure 6, Item 7) to front brakeshoe (Figure 6, Item 9) with capscrew (Figure 6, Item 31) and new locknut (Figure 6, Item 30). Tighten locknut as needed to ensure a 0.30-in. (0.76-mm) clearance between backing shoe lever and front brakeshoe.
4. Install spring (Figure 6, Item 32) on backing shoe lever (Figure 6, Item 7) and pin (Figure 6, Item 28).
5. Install link (Figure 6, Item 4) on backing shoe lever (Figure 6, Item 7) with bolt (Figure 6, Item 27) and new locknut (Figure 6, Item 26). Measure clearance between backing shoe lever and link. Tighten locknut as needed to ensure a 0.30-in. (0.76-mm) clearance.
6. Install transporter washer (Figure 6, Item 24), new spring tension washer (Figure 6, Item 23), washer (Figure 6, Item 22), and new spring tension clip (Figure 6, Item 25) securing parking brake link (Figure 6, Item 17) to rear brakeshoe (Figure 6, Item 2).

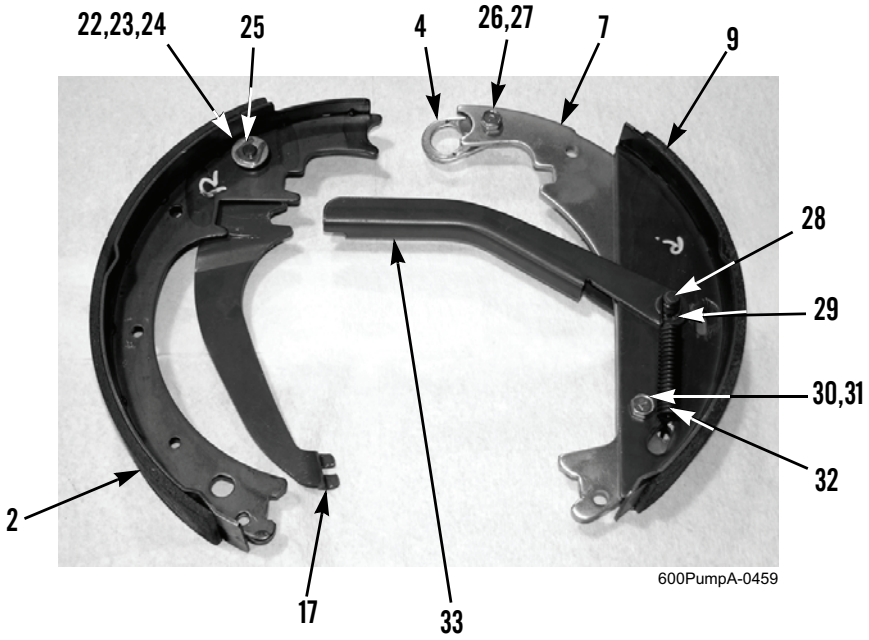


Figure 6. Right-Side Service Brakes.

ASSEMBLY - CONTINUED

7. Ensure wheel cylinder pushrod is installed in backing shoe lever (Figure 6, Item 7), position front brakeshoe (Figure 6, Item 9) at backing plate (Figure 6, Item 8), and install link (Figure 6, Item 4) on anchor pin (Figure 6, Item 5).
8. Install pin (Figure 6, Item 13), retainer (Figure 6, Item 10), spring (Figure 6, Item 11), and retainer (Figure 6, Item 12) to secure front brakeshoe (Figure 6, Item 9) to backing plate (Figure 6, Item 8).
9. Install hand brake cable (Figure 6, Item 16) on parking brake link (Figure 6, Item 17).
10. Install spring (Figure 6, Item 14) and brake adjuster (Figure 6, Item 15) between backing shoe lever (Figure 6, Item 7) and rear brakeshoe (Figure 6, Item 2) and position rear brakeshoe.
11. Install pin (Figure 6, Item 18), retainer (Figure 6, Item 21), spring (Figure 6, Item 20), and retainer (Figure 6, Item 19) to secure rear brakeshoe (Figure 6, Item 2) to backing plate (Figure 6, Item 8).
12. Position parking shoe lever (Figure 6, Item 33) into parking brake link (Figure 6, Item 17).
13. Install washer (Figure 6, Item 3) on anchor pin (Figure 6, Item 5) at backing plate (Figure 6, Item 8).

WARNING

Wear eye protection when installing springs. Failure to follow this warning may result in injury to personnel.

14. Ensure slot at top of rear brakeshoe (Figure 7, Item 2) is engaged in anchor pin (Figure 7, Item 5), then install rear shoe spring (Figure 7, Item 1) on rear brakeshoe and anchor pin.
15. Install front shoe spring (Figure 7, Item 6) on backing shoe lever (Figure 7, Item 7) and anchor pin (Figure 7, Item 5).

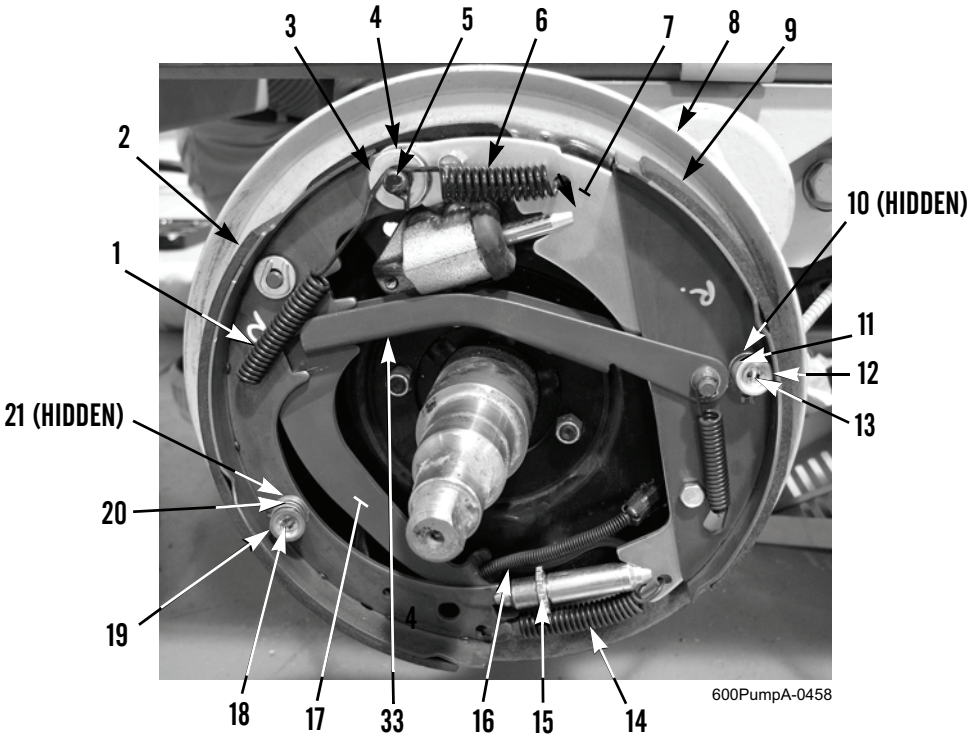


Figure 7. Right-Side Service Brakes.

FOLLOW-ON TASKS

1. Install wheel hub/drum (WP 0059).
2. Bleed hydraulic brake system (WP 0057).
3. Adjust service brakes (WP 0049).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

WHEEL CYLINDER REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Cap set, protective, dust and moisture (Item 5, WP 0129)
Cleaning compound, solvent, Type III (Item 6, WP 0129)
Rag, wiping (Item 22, WP 0129)

Materials/Parts - Continued

Capscrew with integral lockwasher (2)

Personnel Required

63J (1)

References

WP 0057

Equipment Condition

Wheel hub/drum removed (WP 0059)

WARNING

When performing maintenance on brake system, ensure wheel and tire assembly on unaffected side is securely blocked with hand brake applied. Failure to follow this warning may cause trailer to roll, resulting in injury or death to personnel or damage to equipment.

REMOVAL

1. Remove front shoe spring (Figure 1, Item 9) from front brakeshoe (Figure 1, Item 8) and anchor pin (Figure 1, Item 3).
2. Remove rear shoe spring (Figure 1, Item 10) from rear brakeshoe (Figure 1, Item 2) and anchor pin (Figure 1, Item 3).
3. Remove washer (Figure 1, Item 1) from anchor pin (Figure 1, Item 3).
4. Remove two capscrews (Figure 1, Item 4) with integral lockwashers securing wheel cylinder (Figure 1, Item 5) to backing plate (Figure 1, Item 7). Discard capscrews with integral lockwashers.
5. Pull wheel cylinder (Figure 1, Item 5) loose from backing plate (Figure 1, Item 7) while compressing wheel cylinder push rod (Figure 1, Item 6). Remove push rod from front brakeshoe (Figure 1, Item 8).

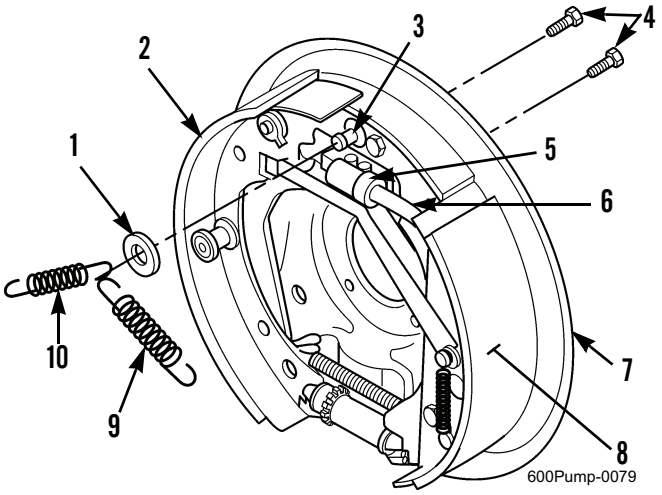


Figure 1. Wheel Cylinder.

REMOVAL - CONTINUED

WARNING

Wear gloves and eye protection when handling brake fluid. Work in a well-ventilated area. Exposure to brake fluid may cause irritation to eyes, skin, and lungs. If ingested, it can irritate mouth, esophagus, and stomach. Failure to exercise caution may result in injury to personnel.

CAUTION

- Dirt, water, or grease will contaminate brake fluid, causing brake system damage. Ensure wheel cylinder is kept clean.
- Plug flex brake line after disconnection to prevent fluid loss and contamination of hydraulic brake system.

NOTE

A suitable container should be placed under flex brake line to capture draining brake fluid. Dispose of brake fluid IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.

6. Disconnect flex brake line (Figure 2, Item 11) from wheel cylinder (Figure 3, Item 5). Install temporary plug in flex brake line. Remove wheel cylinder.

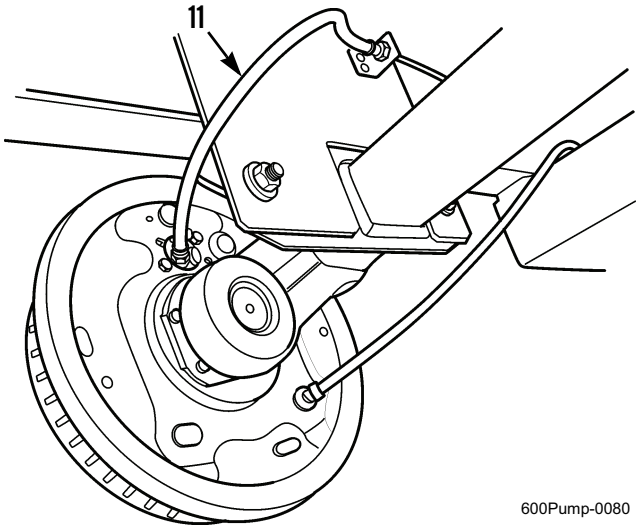


Figure 2. Flex Brake Line at Backing Plate.

CLEANING AND INSPECTION

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low-toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to do so may result in injury or death to personnel.

1. Clean all removed components, except wheel cylinder, in solvent cleaning compound and allow components to dry.
2. Inspect components for cracks, breaks, corrosion, or damaged threads. Replace any damaged component.

INSTALLATION

1. Remove plug from flex brake line (Figure 2, Item 11) and connect flex brake line to wheel cylinder (Figure 3, Item 5).

NOTE

For ease of installation, install rear capscrew first.

2. Position wheel cylinder (Figure 3, Item 5) on backing plate (Figure 3, Item 7) with wheel cylinder push rod (Figure 3, Item 6) engaged in front brakeshoe (Figure 3, Item 8). Install two new capscrews (Figure 3, Item 4) with integral lockwashers and tighten to 168 +/- 17 lb-in. (19 +/- 1.9 Nm).
3. Install washer (Figure 3, Item 1) on anchor pin (Figure 3, Item 3).
4. Install front shoe spring (Figure 3, Item 9) on front brakeshoe (Figure 3, Item 8) and anchor pin (Figure 3, Item 3).
5. Install rear shoe spring (Figure 3, Item 10) on rear brakeshoe (Figure 3, Item 2) and anchor pin (Figure 3, Item 3).

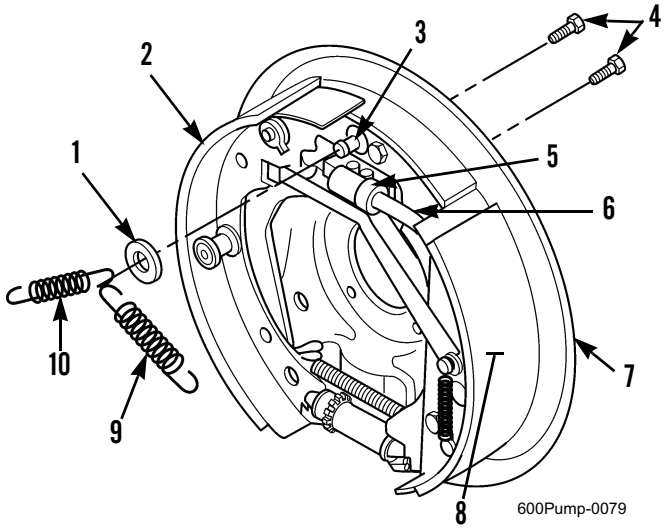


Figure 3. Wheel Cylinder.

FOLLOW-ON TASKS

1. Install wheel hub/drum (WP 0059).
2. Bleed hydraulic brake system (WP 0057).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

HYDRAULIC BRAKE ACTUATOR ASSEMBLY MAINTENANCE

Removal, Disassembly, Cleaning and Inspection, Assembly, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Brake fluid, automotive, silicone (Item 4, WP 0129)
Cap set, protective, dust and moisture (Item 5, WP 0129)
Cleaning compound, solvent, Type III (Item 6, WP 0129)
Rag, wiping (Item 22, WP 0129)
Tape, antiseizing (Item 28, WP 0129)
Bolt (4)
Cotter pin (2)

Materials/Parts - Continued

Locknut (4)

Personnel Required

63J (1)

References

WP 0057

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked


WARNING

- When performing maintenance on brake system, ensure wheel and tire assemblies are securely blocked with hand brakes applied. Failure to follow this warning may cause trailer to roll, resulting in injury or death to personnel or damage to equipment.
- Wear gloves and eye protection when handling brake fluid. Work in a well-ventilated area. Exposure to brake fluid may cause irritation to eyes, skin, and lungs. If ingested, it can irritate mouth, esophagus, and stomach. Failure to exercise caution may result in injury to personnel.

REMOVAL

CAUTION

Dirt, water, or grease will contaminate brake fluid, causing brake system damage. Ensure master cylinder and fittings are clean before disconnecting flex brake line or removing master cylinder cap. Cap or plug all openings to prevent contamination from entering the system.

NOTE

Ensure all brake fluid spills are cleaned up IAW spill containment plan.

1. Place a suitable container under flex brake line (Figure 1, Item 5) and master cylinder (Figure 1, Item 9).
2. Loosen nut (Figure 1, Item 7), remove frame bracket clip (Figure 1, Item 6), and disconnect flex brake line (Figure 1, Item 5) from front solid brake line (Figure 1, Item 8). Install temporary plug in flex brake line.
3. Disconnect flex brake line (Figure 1, Item 5) from straight adapter (Figure 1, Item 4).
4. Remove straight adapter (Figure 1, Item 4) and elbow (Figure 1, Item 3) from orifice of master cylinder (Figure 1, Item 9). Plug orifice of master cylinder.
5. Remove cap (Figure 1, Item 1) from master cylinder (Figure 1, Item 9).
6. Remove access cover (Figure 1, Item 2) from actuator housing (Figure 1, Item 10). Reinstall cap (Figure 1, Item 1) on master cylinder (Figure 1, Item 9).

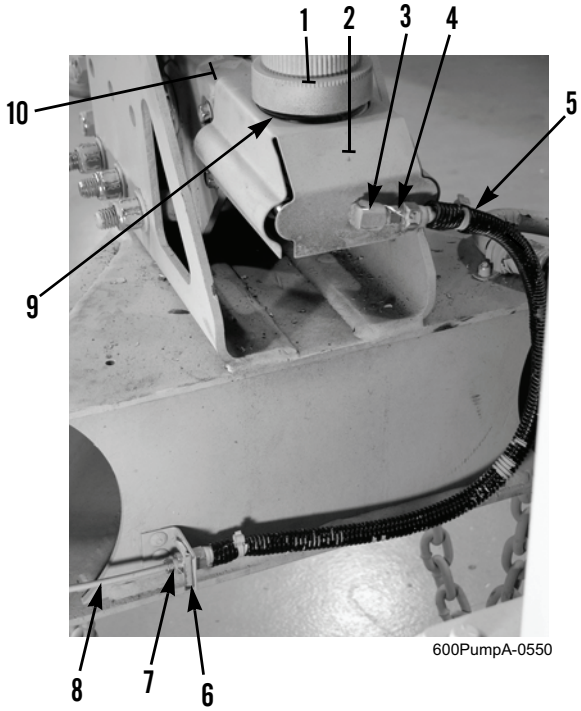


Figure 1. Master Cylinder and Flex Brake Line.

REMOVAL - CONTINUED

WARNING

Use caution when removing actuator housing and actuator bracket to avoid injury to personnel.

NOTE

Towing height of trailer may be adjusted by changing mounting location of actuator housing at welded actuator bracket. Note position of actuator housing to ensure installation at same height.

7. Remove three locknuts (Figure 2, Item 14), washers (Figure 2, Item 13), capscrews (Figure 2, Item 15), actuator housing (Figure 2, Item 10), and actuator bracket (Figure 2, Item 11) from welded actuator bracket (Figure 2, Item 12). Discard locknuts.

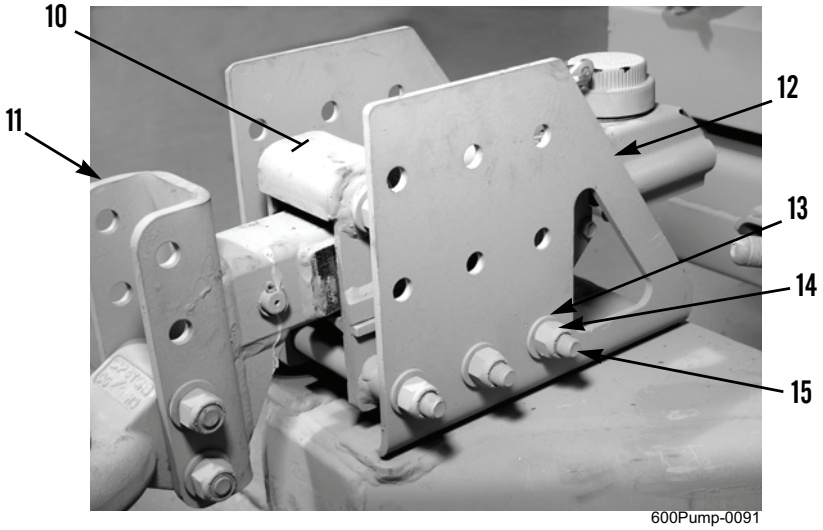


Figure 2. Hydraulic Brake Actuator Assembly.

DISASSEMBLY

1. Remove cotter pin (Figure 3, Item 17) from master pin (Figure 3, Item 16). Remove washer (Figure 3, Item 18) and master pin from actuator housing (Figure 3, Item 10) and actuator bracket (Figure 3, Item 11). Discard cotter pin.
2. Remove actuator bracket (Figure 3, Item 11) with damper (Figure 3, Item 22) attached from actuator housing (Figure 3, Item 10). Remove two master pin rollers (Figure 3, Item 21).
3. Remove cotter pin (Figure 3, Item 20) from damper pin (Figure 3, Item 19). Remove damper pin and damper (Figure 3, Item 22) from actuator bracket (Figure 3, Item 11). Discard cotter pin.

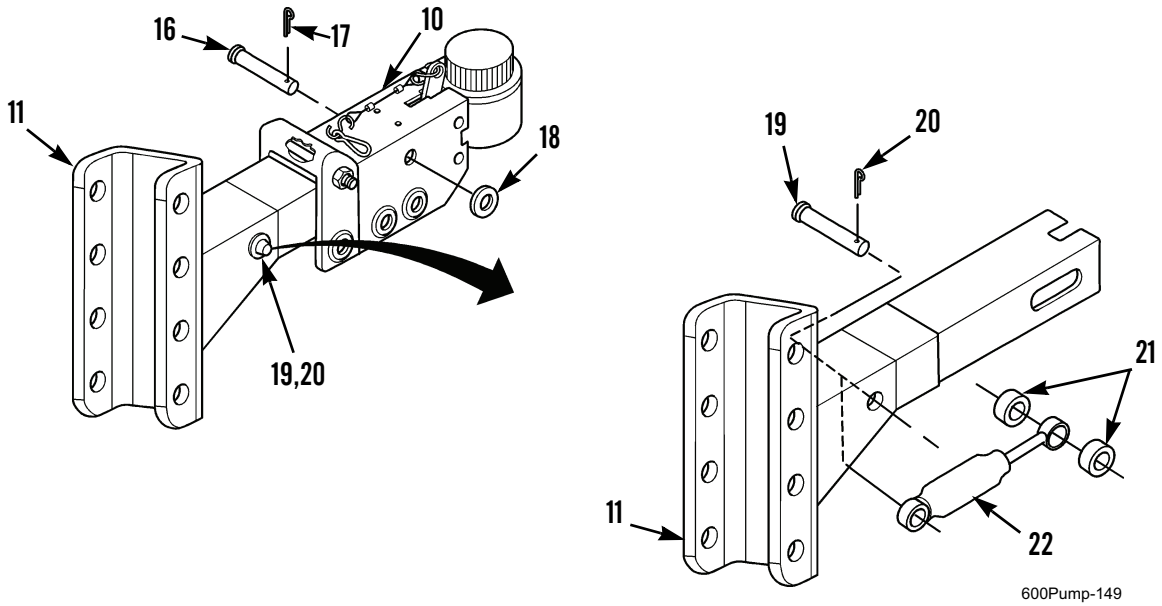


Figure 3. Actuator Bracket and Damper Inside Actuator Housing.

4. Remove four bolts (Figure 4, Item 32) securing master cylinder mounting plate (Figure 4, Item 30) to actuator housing (Figure 4, Item 10). Remove master cylinder (Figure 4, Item 9) with attached mounting plate from actuator housing. Discard bolts.

NOTE

Note position of breakaway lever leaf spring to ensure correct assembly.

5. Remove breakaway lever (Figure 4, Item 24) with attached cable (Figure 4, Item 23) from actuator housing (Figure 4, Item 10). Remove breakaway lever leaf spring (Figure 4, Item 25).
6. Remove two nuts (Figure 4, Item 26), washers (Figure 4, Item 27), springs (Figure 4, Item 28), and capscrews (Figure 4, Item 29) securing master cylinder (Figure 4, Item 9) to master cylinder mounting plate (Figure 4, Item 30).

DISASSEMBLY - CONTINUED

7. Carefully remove master cylinder (Figure 4, Item 9) from master cylinder mounting plate (Figure 4, Item 30) and pushrod assembly (Figure 4, Item 31).

WARNING

When servicing this equipment, performing maintenance, or disposing of materials such as brake fluid, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

8. Remove cap (Figure 4, Item 1) and drain brake fluid from master cylinder (Figure 4, Item 9). Dispose of brake fluid IAW using unit's SOP.
9. Remove locknut (Figure 4, Item 33), washer (Figure 4, Item 34), upper bolt (Figure 4, Item 35), and roller (Figure 4, Item 36) from actuator housing (Figure 4, Item 10). Discard locknut.

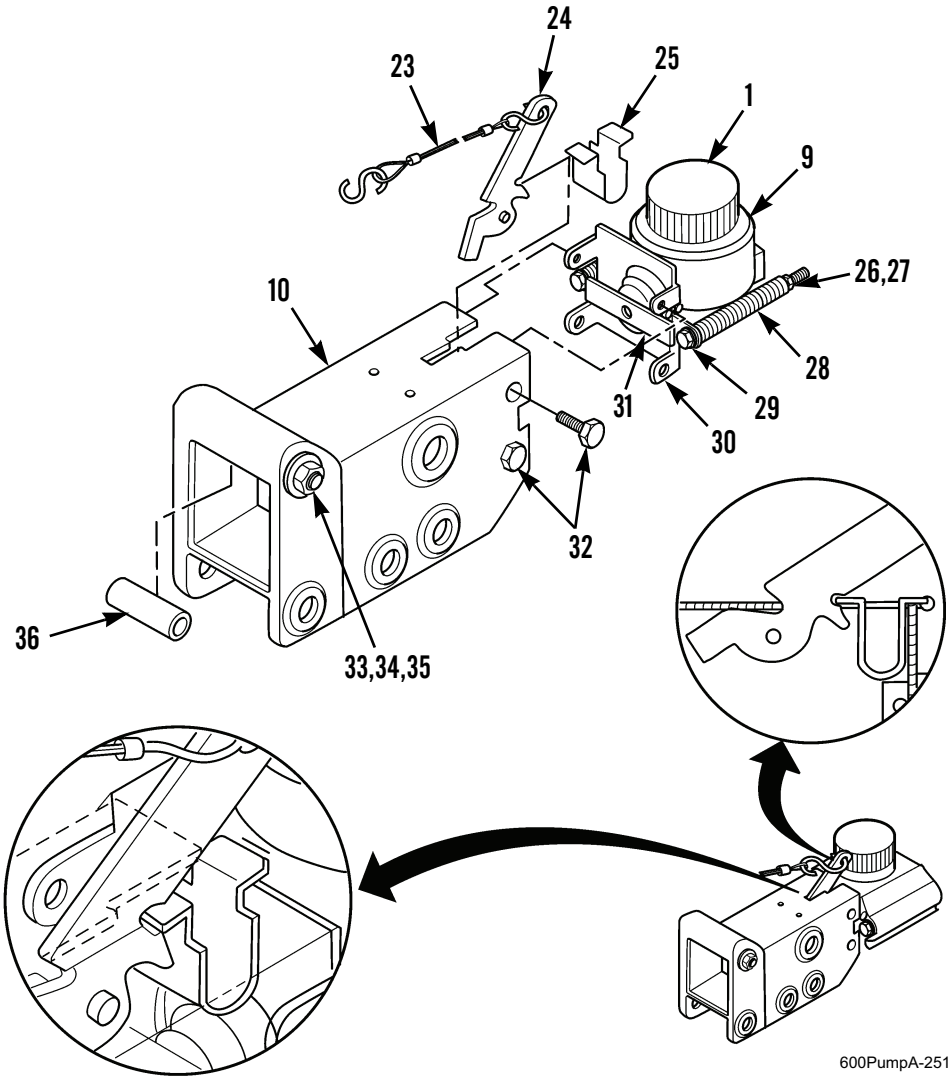


Figure 4. Separation of Actuator Housing and Master Cylinder.

CLEANING AND INSPECTION

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low-toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to do so may result in injury or death to personnel.

1. Clean all removed components, except master cylinder, in solvent cleaning compound and allow to dry.
2. Inspect components for wear, cracks, breaks, corrosion, or other damage.
3. Inspect master cylinder and damper for leakage. Replace if defective.
4. Inspect master pin hole (Figure 5, Item 38) for wear. If hole diameter exceeds 1.06 in. (26.92 mm), replace actuator housing (Figure 5, Item 10).
5. Inspect front roller bolt hole (Figure 5, Item 37) for wear. If hole diameter exceeds 0.75 in. (19.05 mm), replace actuator housing (Figure 5, Item 10).
6. Measure inside diameter of capscrew holes (Figure 5, Item 39). Replace hydraulic brake actuator assembly if any bolt hole is more than 1/8 in. (3.18 mm) oversize.

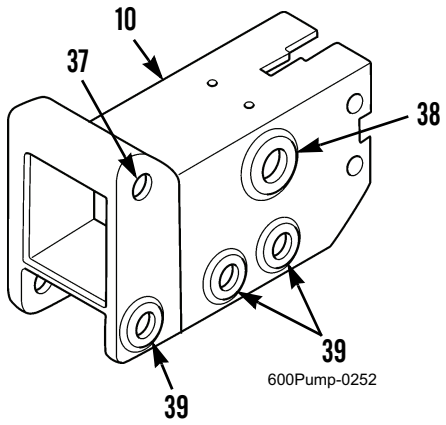


Figure 5. Actuator Housing Inspection.

7. Inspect master pin for grooves. Replace master pin if depth of any groove exceeds 3/32 in. (2.38 mm).
8. Inspect upper bolt for grooves. Replace upper bolt if depth of any groove exceeds 3/32 in. (2.38 mm).
9. Measure outside and inside diameter of upper roller.
   a. Replace upper roller if outside diameter is less than 0.9 in. or 29/32 in. (22.86 mm).
   b. Replace upper roller if inside diameter is greater than 0.718 in. or 23/32 in. (18.24 mm).
10. Measure outside and inside diameter of master pin rollers.
    a. Replace master pin rollers if outside diameter is less than 1.78 in. or 1-25/32 in. (45.20 mm).
    b. Replace master pin rollers if inside diameter is greater than 15/16 in. (23.81 mm).
11. Inspect master pin rollers for dings and dents. Replace master pin roller if dings or dents are longer or wider than 1/2 in. (12.7 mm).

CLEANING AND INSPECTION - CONTINUED

12. Measure inner side slots (Figure 6, Item 40) at height of lip. Replace hydraulic brake actuator assembly if distortion of slots exceeds specification.
    a. Maximum length allowable is 2.25 in. (57.15 mm).
    b. Maximum height allowable is 1.125 in. or 1-1/8 in. (28.58 mm).

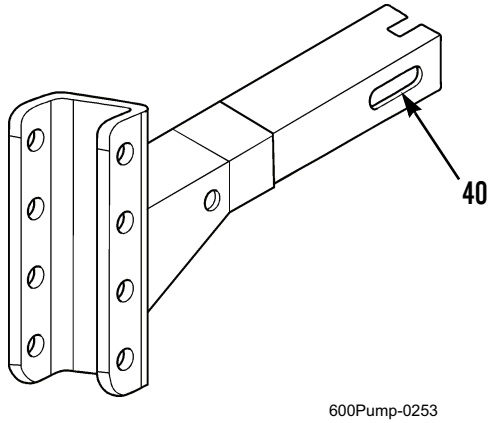


Figure 6. Actuator Bracket Inspection.

13. Inspect for grooves. If present, measure depth of grooves on top inner slide surface of actuator housing (Figure 7, Item 10). If groove depth is greater than 1/8 in. (3.18 mm), replace actuator housing. Check upper roller for proper operation.

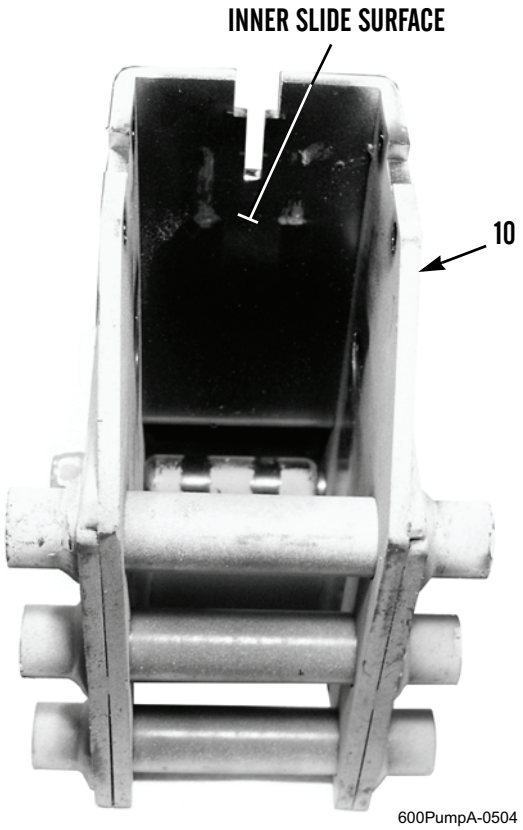


Figure 7. Inspection of Actuator Housing.

CLEANING AND INSPECTION - CONTINUED

14. Inspect for grooves. If present, measure depth of grooves on bottom three mounting capscrews (Figure 8, Item 15). Replace capscrews if grooves exceed 1/16 in. (1.59 mm) or if thread distortion is greater than 1/32 in. (0.79 mm).

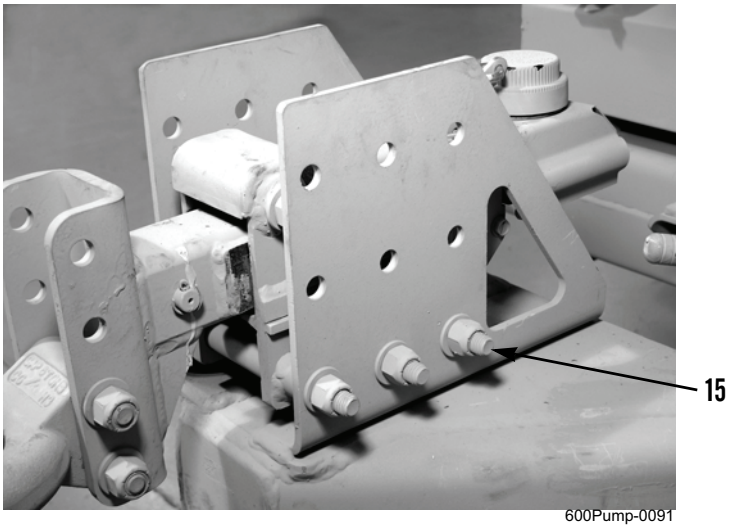


Figure 8. Hydraulic Brake Actuator Assembly.

ASSEMBLY

1. Install upper bolt (Figure 9, Item 35), roller (Figure 9, Item 36), and washer (Figure 9, Item 34) in actuator housing (Figure 9, Item 10) and secure with new locknut (Figure 9, Item 33).
2. Position master cylinder mounting plate (Figure 9, Item 30) on master cylinder (Figure 9, Item 9). Install two capscrews (Figure 9, Item 29), springs (Figure 9, Item 28), washers (Figure 9, Item 27), and nuts (Figure 9, Item 26) to secure master cylinder mounting plate to master cylinder.
3. Tighten two nuts (Figure 9, Item 26) until snug to shoulder. Tighten two capscrews (Figure 9, Item 29) and nuts until springs (Figure 9, Item 28) are compressed to a dimension of 3-1/4 in. ± 1/16 in. (82.55 ± 1.59 mm).

WARNING

When installing breakaway lever leaf spring onto breakaway lever and actuator housing, leaf spring must be held in place until master cylinder is installed. If leaf spring is not held in place, it can fall out of actuator housing, resulting in no surge brake protection for the trailer. Equipment damage or injury or death to personnel could result.

4. Install breakaway lever leaf spring (Figure 9, Item 25) and breakaway lever (Figure 9, Item 24) with attached cable (Figure 9, Item 23) in actuator housing (Figure 9, Item 10).
5. Install pushrod assembly (Figure 9, Item 31) in master cylinder (Figure 9, Item 9).
6. Hold breakaway lever leaf spring (Figure 9, Item 25) and install pushrod assembly (Figure 9, Item 31) and master cylinder (Figure 9, Item 9) with attached mounting bracket (Figure 9, Item 30) in actuator housing (Figure 9, Item 10). Secure mounting bracket with four new bolts (Figure 9, Item 32). Tighten bolts to 30 ± 3 lb-ft (41 ± 4 Nm).

ASSEMBLY - CONTINUED

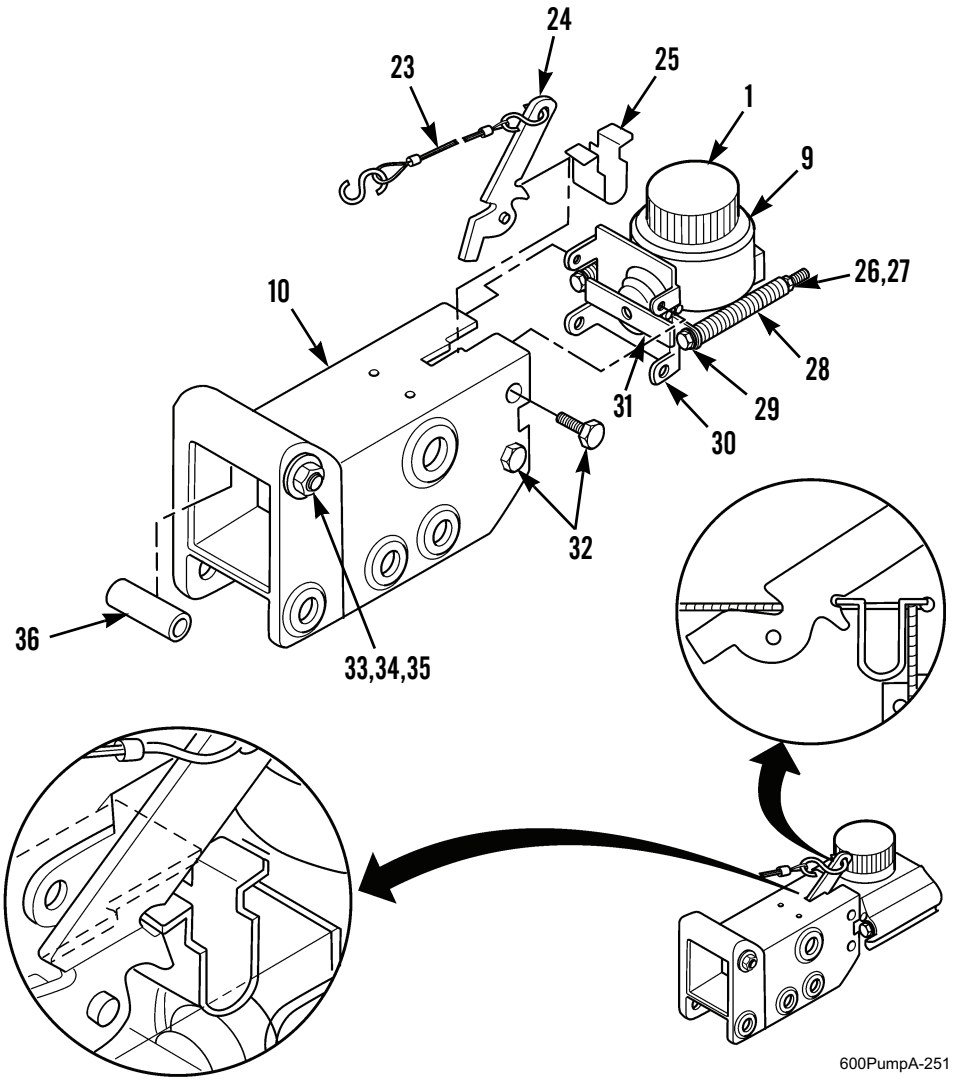


Figure 9. Separation of Actuator Housing and Master Cylinder.

ASSEMBLY - CONTINUED

7. Install damper (Figure 10, Item 22) on actuator bracket (Figure 10, Item 11) with damper pin (Figure 10, Item 19) and new cotter pin (Figure 10, Item 20).
8. Position two master pin rollers (Figure 10, Item 21), with beveled sides facing out, on either side of damper (Figure 10, Item 22) inside actuator bracket (Figure 10, Item 11). Use a 5/8 in. deep well socket to hold damper and rollers in place.

NOTE

Deep well socket will be pushed out as master pin is installed.

9. Install actuator bracket (Figure 10, Item 11) on actuator housing (Figure 10, Item 10) with master pin (Figure 10, Item 16), washer (Figure 10, Item 18), and new cotter pin (Figure 10, Item 17).

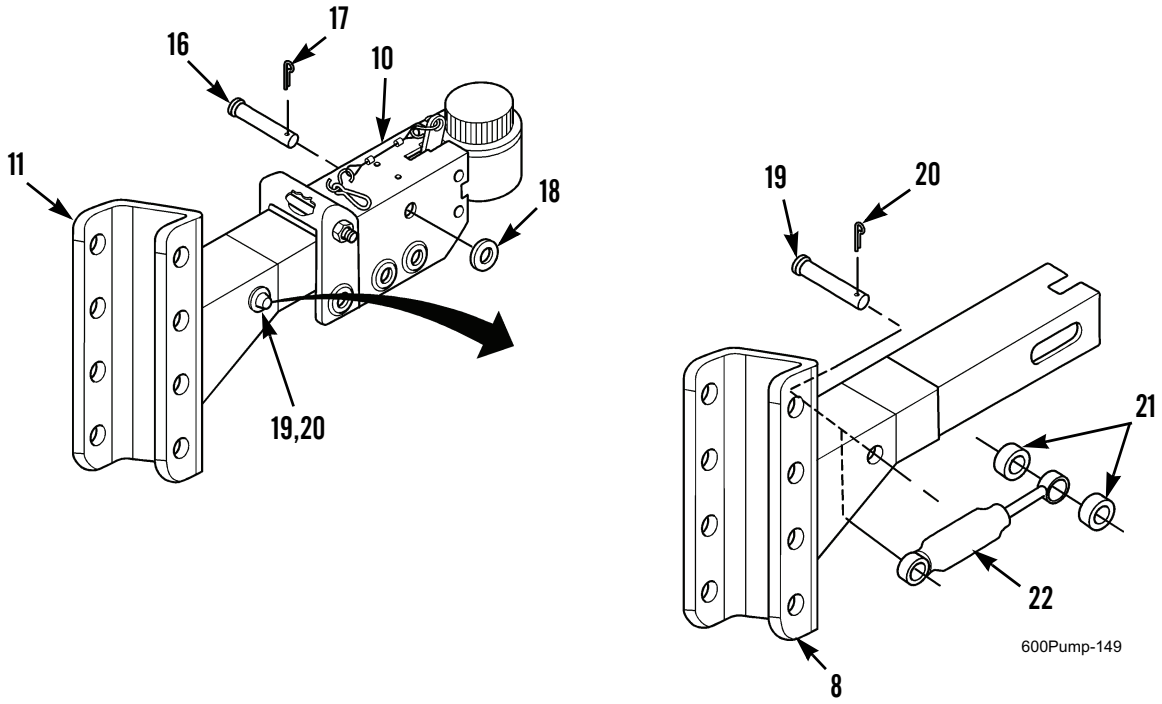


Figure 10. Actuator Bracket and Damper Inside Actuator Housing.

INSTALLATION

WARNING

Use caution when installing actuator housing and actuator bracket to avoid injury to personnel.

NOTE

Towing height of trailer may be adjusted by changing mounting location of actuator housing at welded actuator bracket.

1. Position actuator bracket (Figure 11, Item 11) and actuator housing (Figure 11, Item 10) as an assembly at welded actuator bracket (Figure 11, Item 12).
2. Secure assembly to welded actuator bracket (Figure 11, Item 12) with three capscrews (Figure 11, Item 15), washers (Figure 11, Item 13), and new locknuts (Figure 11, Item 14). Tighten locknuts to 105 lb-ft (142 Nm).

INSTALLATION - CONTINUED

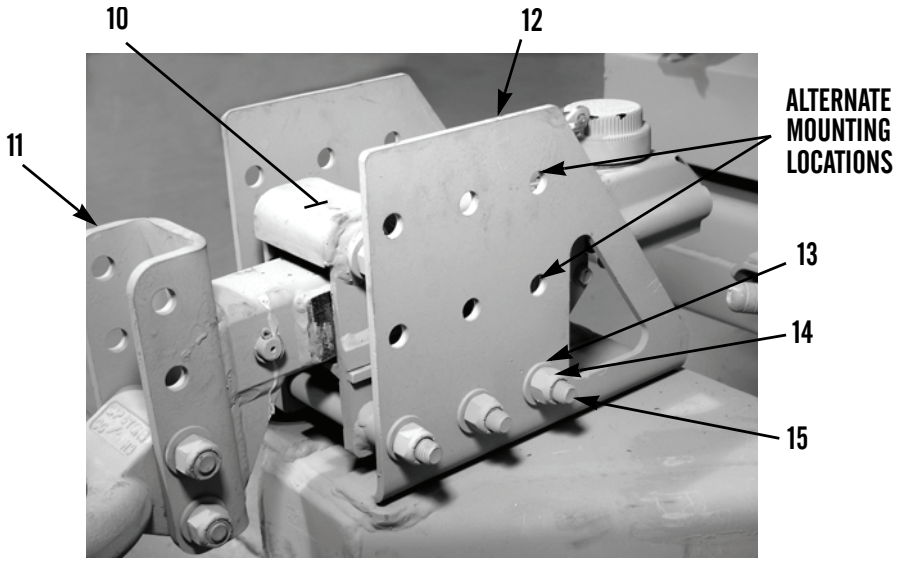


Figure 11. Hydraulic Brake Actuator Assembly.

INSTALLATION - CONTINUED

3. Install access cover (Figure 12, Item 2) on actuator housing (Figure 12, Item 10). Reinstall cap (Figure 12, Item 1) on master cylinder (Figure 12, Item 9).

NOTE

Apply antiseizing tape to male threads of fittings prior to installation.

4. Remove plug from orifice of master cylinder (Figure 12, Item 9). Install elbow (Figure 12, Item 3) and straight adapter (Figure 12, Item 4) on master cylinder.
5. Connect flex brake line (Figure 12, Item 5) to straight adapter (Figure 12, Item 4).
6. Connect flex brake line (Figure 12, Item 5) to front solid brake line (Figure 12, Item 8) and tighten nut (Figure 12, Item 7). Install frame bracket clip (Figure 12, Item 6).
7. Remove cap (Figure 12, Item 1) and add brake fluid to master cylinder (Figure 12, Item 9), until brake fluid level is within 1/8 in. (0.32 cm) of top of master cylinder reservoir.

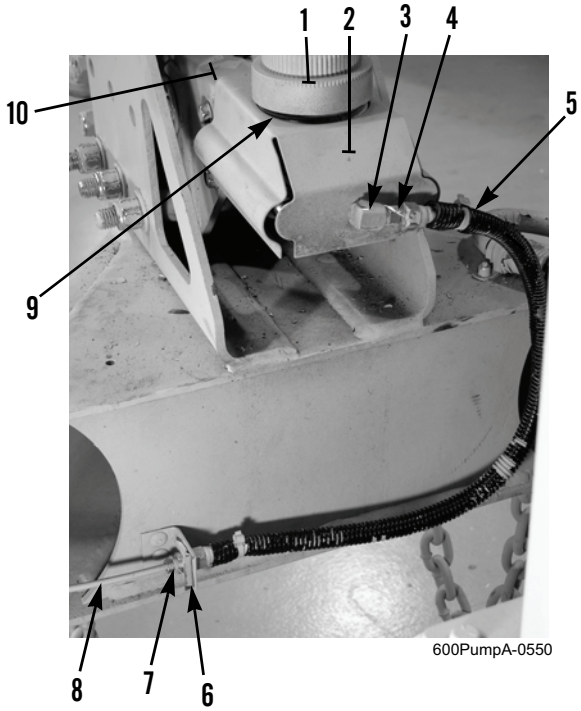


Figure 12. Master Cylinder and Flex Brake Line.

FOLLOW-ON TASKS

Bleed hydraulic brake system (WP 0057).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

BRAKE ACTUATOR BREAKAWAY LEVER AND LEAF SPRING REPLACEMENT

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Bolt (4)

Personnel Required

63J (1)

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked

WARNING

When performing maintenance on brake system, ensure wheel and tire assemblies are securely blocked with hand brakes applied. Failure to follow this warning may cause trailer to roll, resulting in injury or death to personnel or damage to equipment.

REMOVAL

1. Remove four bolts (Figure 1, Item 5) from actuator housing (Figure 1, Item 1) and master cylinder assembly (Figure 1, Item 4). Discard bolts.
2. Pry master cylinder assembly (Figure 1, Item 4) 1/2 in. (12.7 mm) away from actuator housing (Figure 1, Item 1) to allow access to breakaway lever (Figure 1, Item 2) and leaf spring (Figure 1, Item 3).

NOTE

Note position of leaf spring to ensure correct installation.

3. Remove breakaway lever (Figure 1, Item 2) and leaf spring (Figure 1, Item 3) from actuator housing (Figure 1, Item 1).

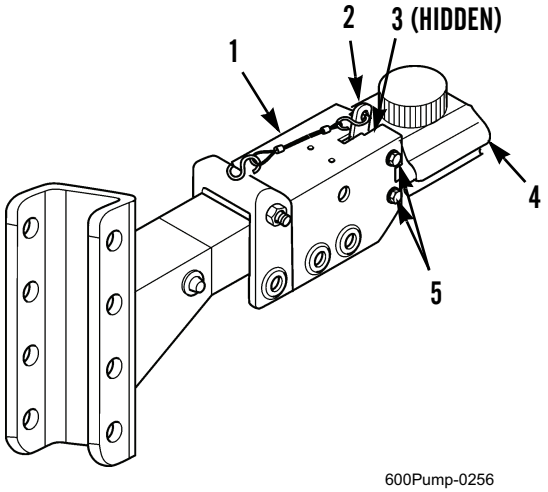


Figure 1. Breakaway Lever and Leaf Spring - Installed.

INSTALLATION

1. Install breakaway lever (Figure 2, Item 2) and leaf spring (Figure 2, Item 3) in actuator housing (Figure 2, Item 1).

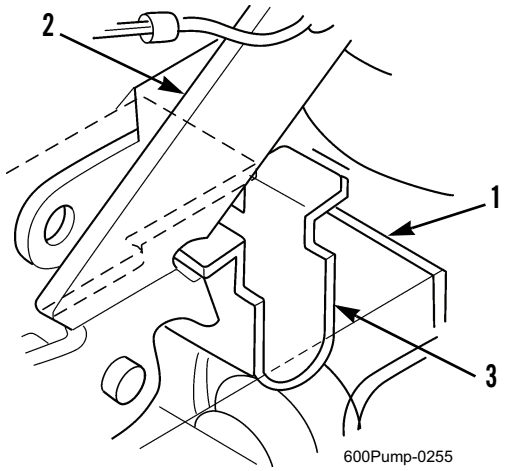


Figure 2. Correct Leaf Spring Position.

WARNING

When installing leaf spring onto breakaway lever and actuator housing, leaf spring must be held in place until master cylinder is installed. If leaf spring is not held in place, it can fall out of actuator housing, resulting in no surge brake protection for the trailer. Equipment damage or injury or death to personnel could result.

2. Hold leaf spring (Figure 1, Item 3) and reposition master cylinder assembly (Figure 1, Item 4). Secure master cylinder assembly to actuator housing (Figure 1, Item 1) with four new bolts (Figure 1, Item 5). Tighten bolts to 30 ± 3 lb-ft (41 ± 4 Nm).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

MASTER CYLINDER REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Brake fluid, automotive, silicone (Item 4, WP 0129)
Cap set, protective, dust and moisture (Item 5, WP 0129)
Rag, wiping (Item 22, WP 0129)
Tape, antiseizing (Item 28, WP 0129)

Personnel Required

63J (1)

References

WP 0023
WP 0057

Equipment Conditions

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked


WARNING

- When performing maintenance on brake system, ensure wheel and tire assemblies are securely blocked with hand brakes applied. Failure to follow this warning may cause trailer to roll, resulting in injury or death to personnel or damage to equipment.
- Wear gloves and eye protection when handling brake fluid. Work in a well-ventilated area. Exposure to brake fluid may cause irritation to eyes, skin, and lungs. If ingested, it can irritate mouth, esophagus, and stomach. Failure to exercise caution may result in injury to personnel.

REMOVAL

CAUTION

Dirt, water, or grease will contaminate brake fluid, causing brake system damage. Ensure master cylinder and fittings are clean before disconnecting flex brake line or removing master cylinder cap. Cap or plug all openings to prevent contamination from entering the system.

NOTE

Ensure all brake fluid spills are cleaned up IAW spill container plan.

1. Place a suitable container under flex brake line (Figure 1, Item 5) and master cylinder (Figure 1, Item 9).
2. Loosen nut (Figure 1, Item 7), remove frame bracket clip (Figure 1, Item 6), and disconnect flex brake line (Figure 1, Item 5) from front solid brake line (Figure 1, Item 8).
3. Disconnect flex brake line (Figure 1, Item 5) from straight adapter (Figure 1, Item 4).
4. Remove straight adapter (Figure 1, Item 4) and elbow (Figure 1, Item 3) from orifice of master cylinder (Figure 1, Item 9). Plug orifice of master cylinder.
5. Remove cap (Figure 1, Item 1) from master cylinder (Figure 1, Item 9).
6. Remove access cover (Figure 1, Item 2) from actuator housing (Figure 1, Item 10). Reinstall cap (Figure 1, Item 1) on master cylinder (Figure 1, Item 9).

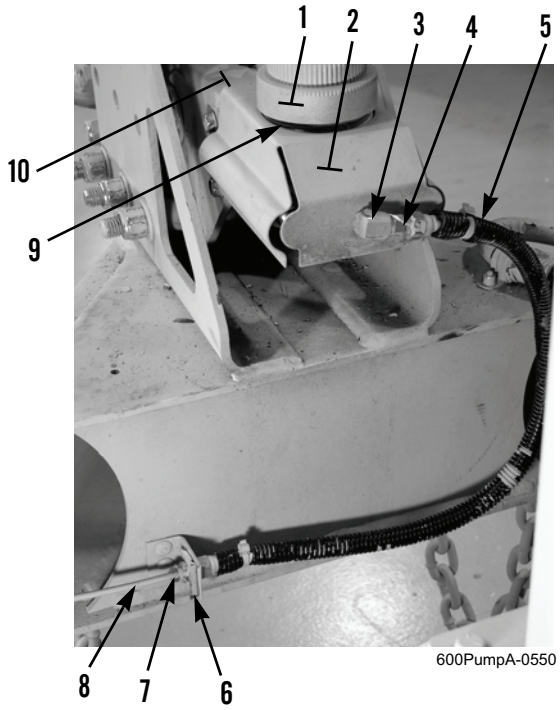


Figure 1. Master Cylinder and Flex Brake Line.

REMOVAL - CONTINUED

7. Remove two nuts (Figure 2, Item 12), washers (Figure 2, Item 13), springs (Figure 2, Item 14), and capscrews (Figure 2, Item 15) securing master cylinder (Figure 2, Item 9) to master cylinder mounting plate (Figure 2, Item 11).

WARNING

When servicing this equipment, performing maintenance, or disposing of materials such as brake fluid, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

8. Carefully remove master cylinder (Figure 2, Item 9) from master cylinder mounting plate (Figure 2, Item 11) and pushrod assembly (Figure 2, Item 16). Remove cap (Figure 2, Item 1) and drain brake fluid from master cylinder. Dispose of brake fluid IAW using unit's SOP.

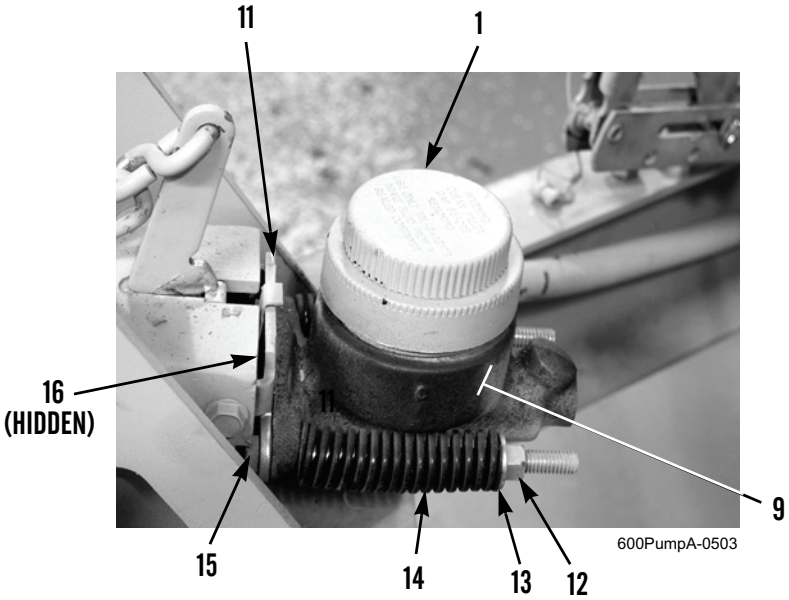


Figure 2. Master Cylinder and Mounting Plate.

CLEANING AND INSPECTION

1. Clean and inspect all components IAW WP 0023.
2. Replace any damaged component.

INSTALLATION

1. Carefully install master cylinder (Figure 3, Item 9) on pushrod assembly (Figure 3, Item 16) and master cylinder mounting plate (Figure 2, Item 11).
2. Install two capscrews (Figure 3, Item 15), springs (Figure 3, Item 14), washers (Figure 3, Item 13), and nuts (Figure 3, Item 12) on master cylinder (Figure 2, Item 9) and master cylinder mounting plate (Figure 3, Item 11).
3. Tighten nuts (Figure 3, Item 12) until snug to shoulder. Tighten capscrews and nuts until springs (Figure 2, Item 14) are compressed to a dimension of 3-1/4 in. ±1/16 in. (82.55 ± 1.59 mm).
4. Remove cap (Figure 3, Item 1) from master cylinder (Figure 3, Item 9).
5. Install access cover (Figure 3, Item 2) on actuator housing (Figure 3, Item 10). Reinstall cap (Figure 3, Item 1) on master cylinder (Figure 3, Item 9).

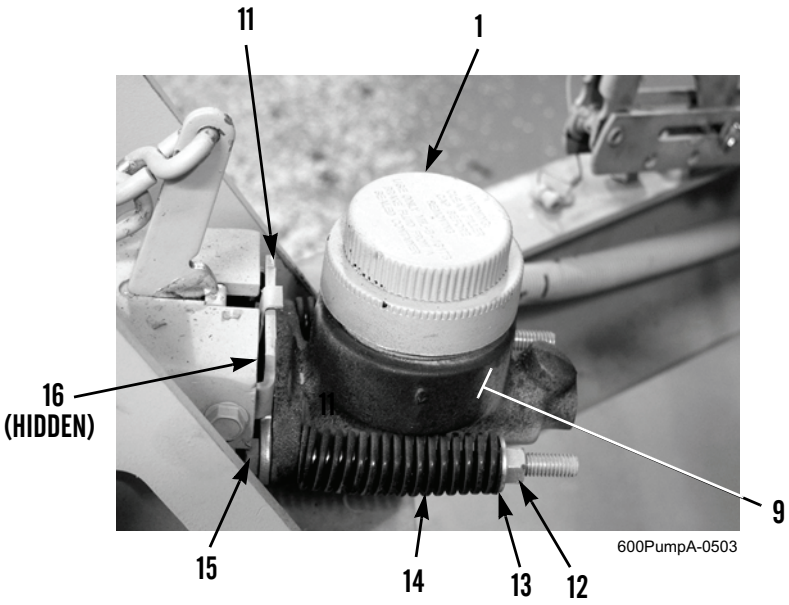


Figure 3. Master Cylinder and Mounting Plate.

INSTALLATION - CONTINUED

NOTE

Apply antiseizing tape to male threads of fittings prior to installation.

6. Remove plug from master cylinder (Figure 4, Item 9). Install elbow (Figure 4, Item 3) and straight adapter (Figure 4, Item 4) on master cylinder.
7. Connect flex brake line (Figure 4, Item 5) to straight adapter (Figure 4, Item 4).
8. Connect flex brake line (Figure 4, Item 5) to front solid brake line (Figure 4, Item 8) and tighten nut (Figure 4, Item 7). Install frame bracket clip (Figure 4, Item 6).
9. Remove cap (Figure 4, Item 1) and add brake fluid to master cylinder (Figure 4, Item 9) until brake fluid level is within 1/8 in. (0.32 cm) of top of master cylinder reservoir.

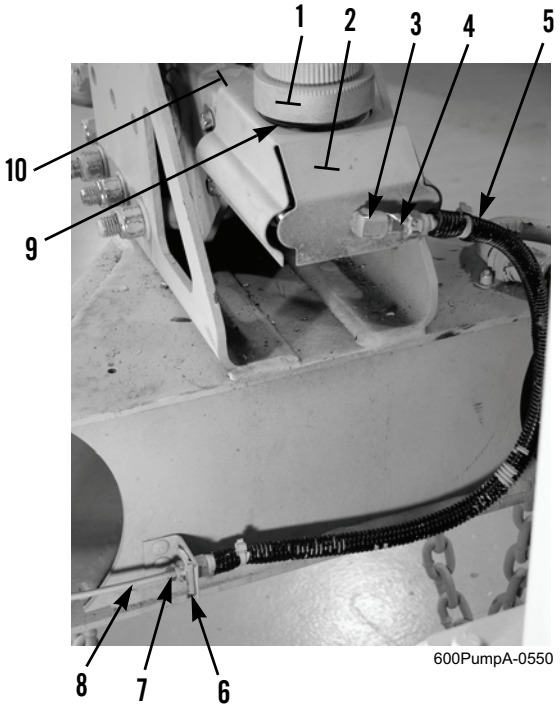


Figure 4. Master Cylinder and Flex Brake Line.

FOLLOW-ON TASKS

Bleed hydraulic brake system (WP 0057).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

HYDRAULIC BRAKE LINES REPLACEMENT

Introduction, Front Flex Brake Line Removal, Front Flex Brake Line Installation, Follow-On Tasks, Front Solid Brake Line Removal, Front Solid Brake Line Installation, Follow-On Tasks, Right-Side Rear Solid Brake Line Removal, Right-Side Rear Solid Brake Line Installation, Follow-On Tasks, Left-Side Rear Solid Brake Line Removal, Left-Side Rear Solid Brake Line Installation, Follow-On Tasks, Right-Side/ Left-Side Rear Flex Brake Line Removal, Right-Side/Left-Side Rear Flex Brake Line Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Brake fluid, automotive, silicone (Item 4, WP 0129)

Cap set, protective, dust and moisture (Item 5, WP 0129)

Rag, wiping (Item 22, WP 0129)

Tape, antiseizing (Item 28, WP 0129)

Personnel Required

63J (1)

References

WP 0057

WP 0099

Equipment Condition

Pump assembly parked on level ground (WP 0006)

Engine off (WP 0006)

Hand brakes applied (WP 0005)

Wheels chocked

WARNING

- When performing maintenance on brake system, ensure wheel and tire assemblies are securely blocked with hand brakes applied. Failure to follow this warning may cause trailer to roll, resulting in injury or death to personnel or damage to equipment.
- Wear gloves and eye protection when handling brake fluid. Work in a well-ventilated area. Exposure to brake fluid may cause irritation to eyes, skin, and lungs. If ingested, it can irritate mouth, esophagus, and stomach. Failure to exercise caution may result in injury to personnel.
- When servicing this equipment, performing maintenance, or disposing of materials such as brake fluid, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

CAUTION

- Dirt, water, or grease will contaminate brake fluid, causing brake system damage. Ensure fittings are clean before disconnecting hydraulic brake lines.
- Cap or plug all brake line ends after disconnections are made to prevent contamination from entering hydraulic brake system. On installation, remove caps/plugs before lines are connected.

NOTE

Ensure all brake fluid spills are cleaned up IAW spill containment plan.

INTRODUCTION

Figure 1 shows an overall view of the trailer's hydraulic brake lines. Table 1 identifies them by item nomenclature and by location on the equipment.

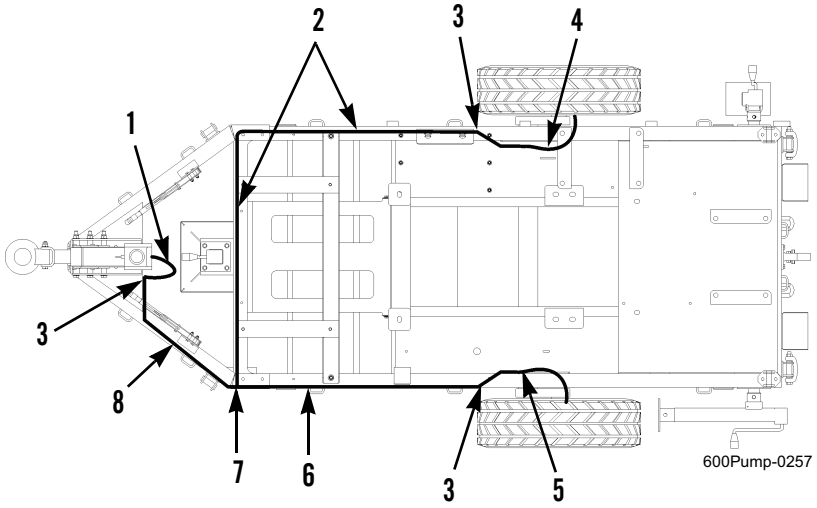


Figure 1. Overview of Hydraulic Brake Lines.

Table 1. Hydraulic Brake Lines.

ITEM NO.	ITEM NOMENCLATURE
1	Front Flex Brake Line
2	Right-Side Rear Solid Brake Line
3	Angle Bracket with Clip (Junction of Solid Brake Line and Flex Brake Line)
4	Right-Side Rear Flex Brake Line
5	Left-Side Rear Flex Brake Line
6	Left-Side Rear Solid Brake Line
7	Tee Fitting (Junction of Solid Brake Lines)
8	Front Solid Brake Line

FRONT FLEX BRAKE LINE REMOVAL

1. Place a suitable container under front flex brake line (Figure 2, Item 1) and master cylinder (Figure 2, Item 12).
2. Loosen nut (Figure 2, Item 11), remove frame bracket clip (Figure 2, Item 10), and disconnect front flex brake line (Figure 2, Item 1) from front solid brake line (Figure 2, Item 8).
3. Disconnect front flex brake line (Figure 2, Item 1) from straight adapter (Figure 2, Item 9).

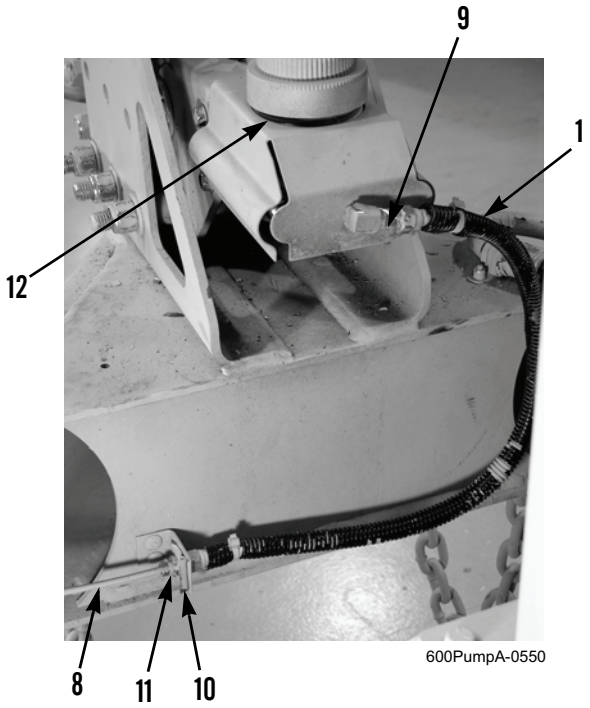


Figure 2. Front Flex Brake Line.

FRONT FLEX BRAKE LINE INSTALLATION

CAUTION

Ensure flex brake line is installed without kinks or sharp bends. Failure to follow this caution may damage flex brake line.

NOTE

Apply antiseizing tape to male threads of fittings prior to installation.

1. Connect front flex brake line (Figure 2, Item 1) to straight adapter (Figure 2, Item 9) at master cylinder (Figure 2, Item 12).
2. Connect front flex brake line (Figure 2, Item 1) to front solid brake line (Figure 2, Item 8) and tighten nut (Figure 2, Item 11). Install frame bracket clip (Figure 2, Item 10).

FOLLOW-ON TASKS

Bleed hydraulic brake system (WP 0057).

FRONT SOLID BRAKE LINE REMOVAL

1. Remove fuel tank to access tee fitting (Figure 3, Item 7) on left side of trailer frame (WP 0099).
2. Place a suitable container under front flex brake line (Figure 3, Item 1) and front solid brake line (Figure 3, Item 8).
3. Loosen nut (Figure 3, Item 11), remove frame bracket clip (Figure 3, Item 10), and disconnect front flex brake line (Figure 3, Item 1) from front solid brake line (Figure 3, Item 8). Allow brake fluid to drain.
4. Disconnect front solid brake line (Figure 3, Item 8) from tee fitting (Figure 3, Item 7) and allow brake fluid to drain.
5. Remove clamps and release front solid brake line (Figure 3, Item 8) from trailer frame.
6. Dispose of brake fluid IAW using unit's SOP.

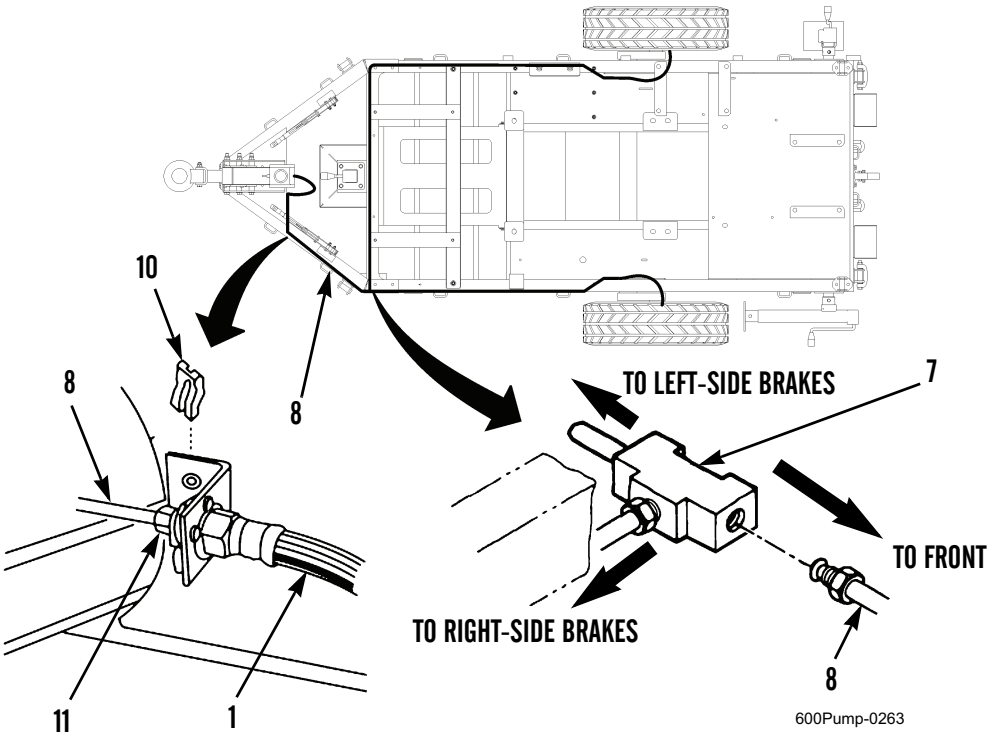


Figure 3. Front Solid Brake Line.

FRONT SOLID BRAKE LINE INSTALLATION

1. Connect front solid brake line (Figure 3, Item 8) to tee fitting (Figure 3, Item 7) and tighten flare fitting.
2. Connect front flex brake line (Figure 3, Item 1) to front solid brake line (Figure 3, Item 8) and tighten nut (Figure 3, Item 11). Install frame bracket clip (Figure 3, Item 10).
3. Secure front solid brake line (Figure 3, Item 8) to trailer frame with clamps.

FOLLOW-ON TASKS

1. Bleed hydraulic brake system (WP 0057).
2. Install fuel tank (WP 0099).

RIGHT-SIDE REAR SOLID BRAKE LINE REMOVAL

1. Remove fuel tank to access tee fitting (Figure 4, Item 7) on right side of trailer frame (WP 0099).
2. Place a suitable container under tee fitting (Figure 4, Item 7) and disconnect right-side rear solid brake line (Figure 4, Item 2) from tee fitting. Allow brake fluid to drain.

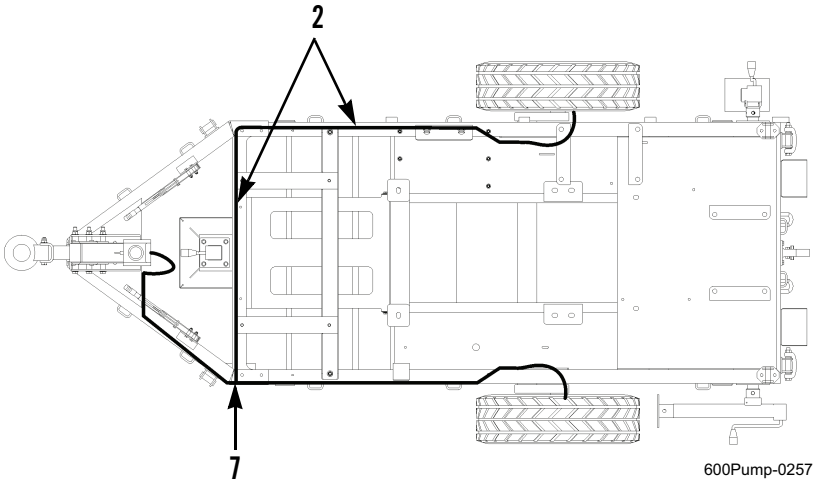


Figure 4. Right-Side Rear Solid Brake Line.

3. Loosen nut (Figure 5, Item 13), remove frame bracket clip (Figure 5, Item 14), and disconnect right-side rear solid brake line (Figure 5, Item 2) from right-side rear flex brake line (Figure 5, Item 4). Allow brake fluid to drain.
4. Remove clamps and release right-side rear solid brake line (Figure 5, Item 2) from trailer frame.
5. Dispose of brake fluid IAW using unit's SOP.

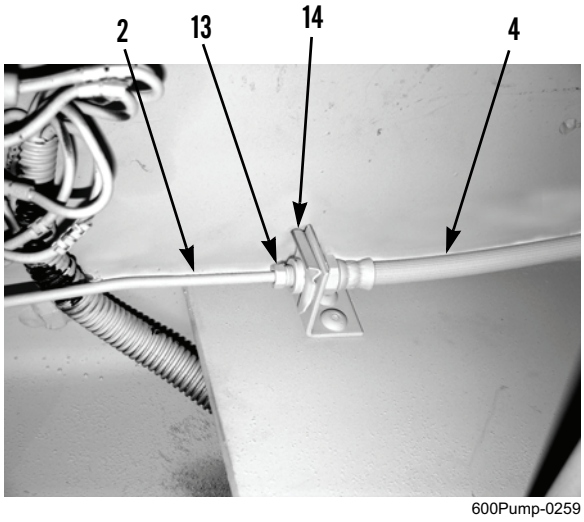


Figure 5. Right-Side Rear Solid Brake Line - Frame Bracket Clip.

RIGHT-SIDE REAR SOLID BRAKE LINE INSTALLATION

1. Connect right-side rear solid brake line (Figure 5, Item 2) to right-side rear flex brake line (Figure 5, Item 4) and tighten nut (Figure 5, Item 13). Install frame bracket clip (Figure 5, Item 14).
2. Connect right-side rear solid brake line (Figure 5, Item 2) to tee fitting (Figure 5, Item 7) and tighten nut.
3. Secure right-side rear solid brake line (Figure 5, Item 2) to trailer frame with clamps.

FOLLOW-ON TASKS

1. Bleed hydraulic brake system (WP 0057).
2. Install fuel tank (WP 0099).

LEFT-SIDE REAR SOLID BRAKE LINE REMOVAL

1. Remove fuel tank to access tee fitting (Figure 6, Item 7) on left side of trailer frame (WP 0099).
2. Place a suitable container under tee fitting (Figure 6, Item 7) and disconnect left-side rear solid brake line (Figure 6, Item 6) from tee fitting. Allow brake fluid to drain.

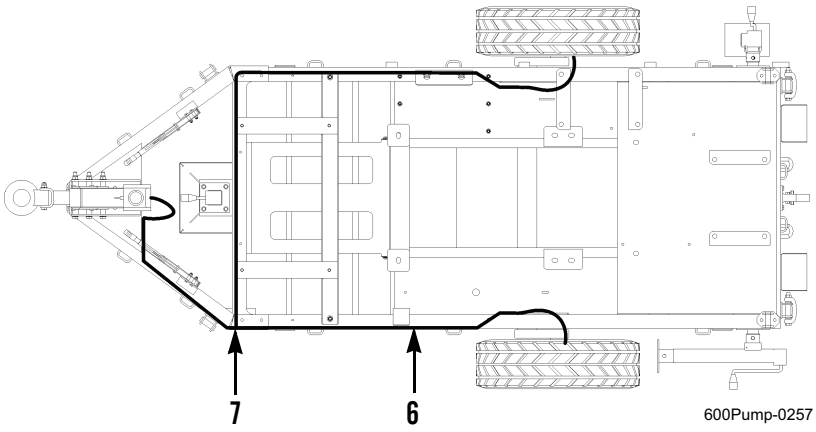


Figure 6. Left-Side Rear Solid Brake Line.

LEFT-SIDE REAR SOLID BRAKE LINE REMOVAL - CONTINUED

3. Loosen nut (Figure 7, Item 16), remove frame bracket clip (Figure 7, Item 15), and disconnect left-side rear solid brake line (Figure 7, Item 6) from left-side rear flex brake line (Figure 7, Item 5). Allow brake fluid to drain.
4. Remove clamps and release left-side rear solid brake line (Figure 7, Item 6) from trailer frame.

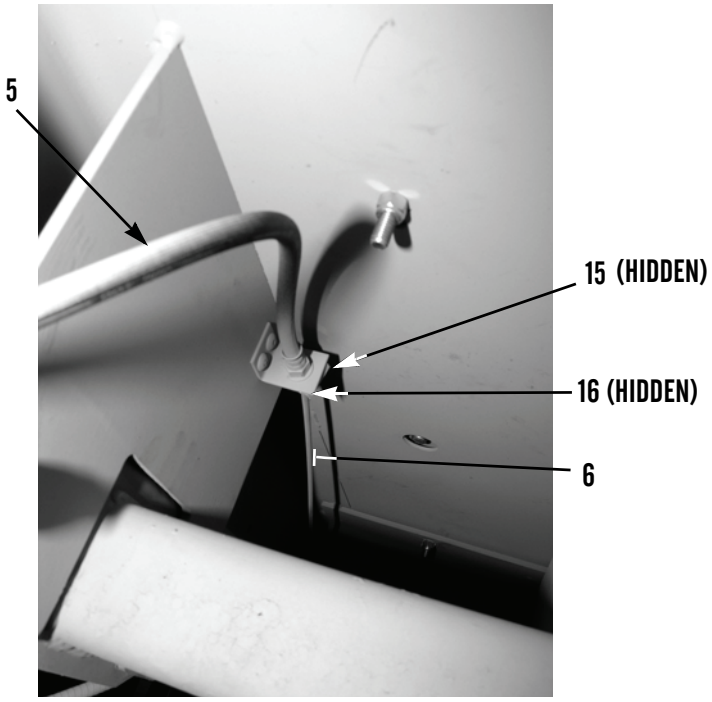


Figure 7. Left-Side Rear Solid Brake Line - Frame Bracket Clip.

5. Dispose of brake fluid IAW using unit's SOP.

LEFT-SIDE REAR SOLID BRAKE LINE INSTALLATION

1. Connect left-side rear solid brake line (Figure 7, Item 6) to left-side rear flex brake line (Figure 7, Item 5) and tighten nut (Figure 7, Item 16). Install frame bracket clip (Figure 7, Item 15).
2. Connect left-side rear solid brake line (Figure 6, Item 6) to tee fitting (Figure 6, Item 7) and tighten flare fitting.
3. Secure left-side rear solid brake line (Figure 6, Item 6) to trailer frame with clamps.

FOLLOW-ON TASKS

1. Bleed hydraulic brake system (WP 0057).
2. Install fuel tank (WP 0099).

RIGHT-SIDE/LEFT-SIDE REAR FLEX BRAKE LINE REMOVAL

NOTE

- Right-side and left-side rear flex brake lines are removed the same way.
- Left-side rear flex brake line is shown.

1. Loosen nut (Figure 8, Item 16), remove frame bracket clip (Figure 8, Item 15), and disconnect left-side rear solid brake line (Figure 8, Item 6) from left-side rear flex brake line (Figure 8, Item 5). Allow brake fluid to drain.
2. Disconnect left-side rear flex brake line (Figure 8, Item 5) from wheel cylinder (Figure 8, Item 17) and remove brake line. Allow brake fluid to drain.

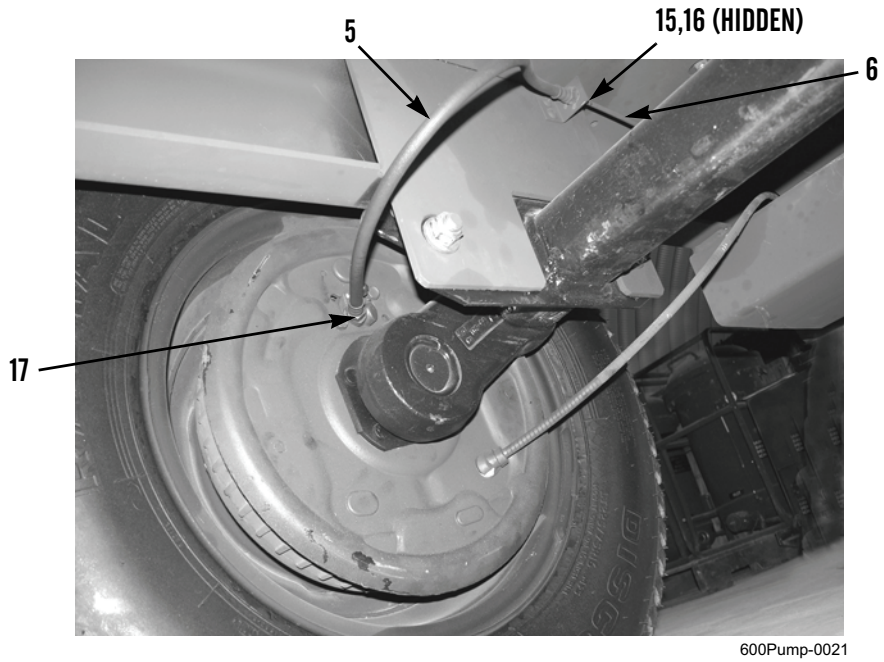


Figure 8. Left-Side Rear Flex Brake Line.

3. Dispose of brake fluid IAW using unit's SOP.

RIGHT-SIDE/LEFT-SIDE REAR FLEX BRAKE LINE INSTALLATION

CAUTION

Ensure flex brake line is installed without kinks or sharp bends. Failure to follow this caution may damage flex brake line.

NOTE

- Right-side and left-side rear flex brake lines are installed the same way.
- Left-side rear flex brake line is shown.

1. Connect left-side rear flex brake line (Figure 8, Item 5) to wheel cylinder (Figure 8, Item 17) and tighten flare fitting.
2. Connect left-side rear solid brake line (Figure 8, Item 6) to left-side rear flex brake line (Figure 8, Item 5) and tighten nut (Figure 8, Item 16). Install frame bracket clip (Figure 8, Item 15).

FOLLOW-ON TASKS

Bleed hydraulic brake system (WP 0057).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

BLEEDING HYDRAULIC BRAKE SYSTEM

Pressure Bleeding, Manual Bleeding

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Brake fluid, automotive, silicone (Item 4, WP 0129)
Rag, wiping (Item 22, WP 0129)

Personnel Required

63J (2)

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked

WARNING

- When performing maintenance on brake system, ensure wheel and tire assemblies are securely blocked with hand brakes applied. Failure to follow this warning may cause trailer to roll, resulting in injury or death to personnel or damage to equipment.
- Wear gloves and eye protection when handling brake fluid. Work in a well-ventilated area. Exposure to brake fluid may cause irritation to eyes, skin, and lungs. If ingested, it can irritate mouth, esophagus, and stomach. Failure to exercise caution may result in injury to personnel.

CAUTION

Dirt, water, or grease will contaminate brake fluid, causing brake system damage. Ensure wheel cylinder bleeder fitting, master cylinder, and master cylinder cap are kept clean.

NOTE

Ensure all spills are cleaned up IAW spill containment plan.

PRESSURE BLEEDING

1. Remove dust cap from wheel cylinder bleeder fitting (Figure 1, Item 1) and connect one end of clear bleeder hose to fitting.

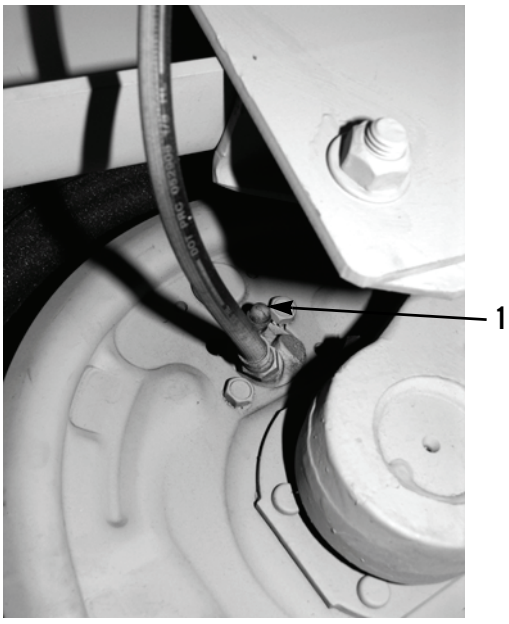
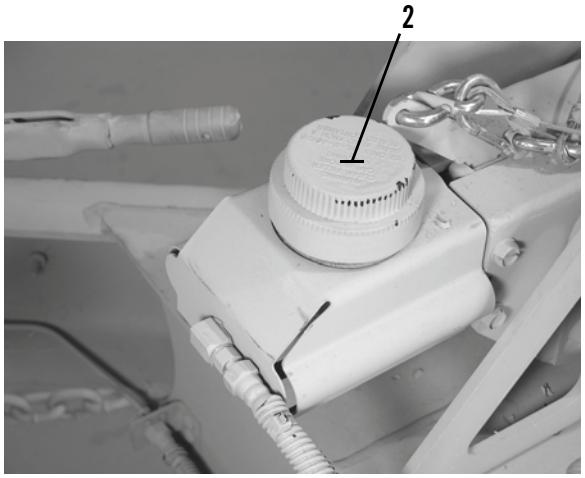


Figure 1. Wheel Cylinder Bleeder Fitting.

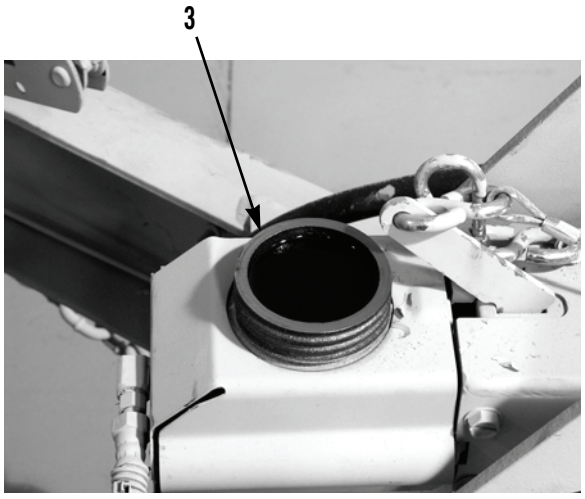
PRESSURE BLEEDING - CONTINUED

2. Place other end of bleeder hose in a clean container 3/4 full of brake fluid.
3. Remove cap (Figure 2, Item 2) from master cylinder (Figure 3, Item 3). Ensure brake fluid level is within 1/8 in. (0.32 cm) of top of reservoir. Add brake fluid, as required.



600Pump-0043

Figure 2. Master Cylinder Cap.



600Pump-0044

Figure 3. Master Cylinder.

PRESSURE BLEEDING - CONTINUED

NOTE

Configuration of your hydraulic system filler and bleeder may differ from equipment illustrated in this task. If different, operating principles will be the same. Refer to manufacturer's instructions for more information.

4. Position brake bleeder adapter (Figure 4, Item 7) at opening of master cylinder (Figure 4, Item 3). Secure adapter as follows so seal between adapter and master cylinder is air tight.
   a. Connect chain (Figure 4, Item 10) to slot A. Pass other end of chain under drawbar and connect to slot B.
   b. Tighten handle (Figure 4, Item 8).
5. Ensure valve (Figure 4, Item 13) on brake bleeder quick disconnect (Figure 4, Item 12) is closed, then connect quick disconnect to fitting (Figure 4, Item 9) on brake bleeder adapter (Figure 4, Item 7).
6. If pressure gauge (Figure 4, Item 6) on canister (Figure 4, Item 4) reads positive pressure, bleed pressure from canister through air passage valve (Figure 4, Item 11).
7. Remove top (Figure 4, Item 5) from canister (Figure 4, Item 4) and add 1 gal. (3.8 L) of brake fluid to canister. Install top and tighten by hand.
8. Insert 18 ± 2 PSI (124 ± 14 kPa) of air into canister (Figure 4, Item 4) through air passage valve (Figure 4, Item 11) until pressure gauge (Figure 4, Item 6) reads 18 ± 2 PSI (124 ± 14 kPa).

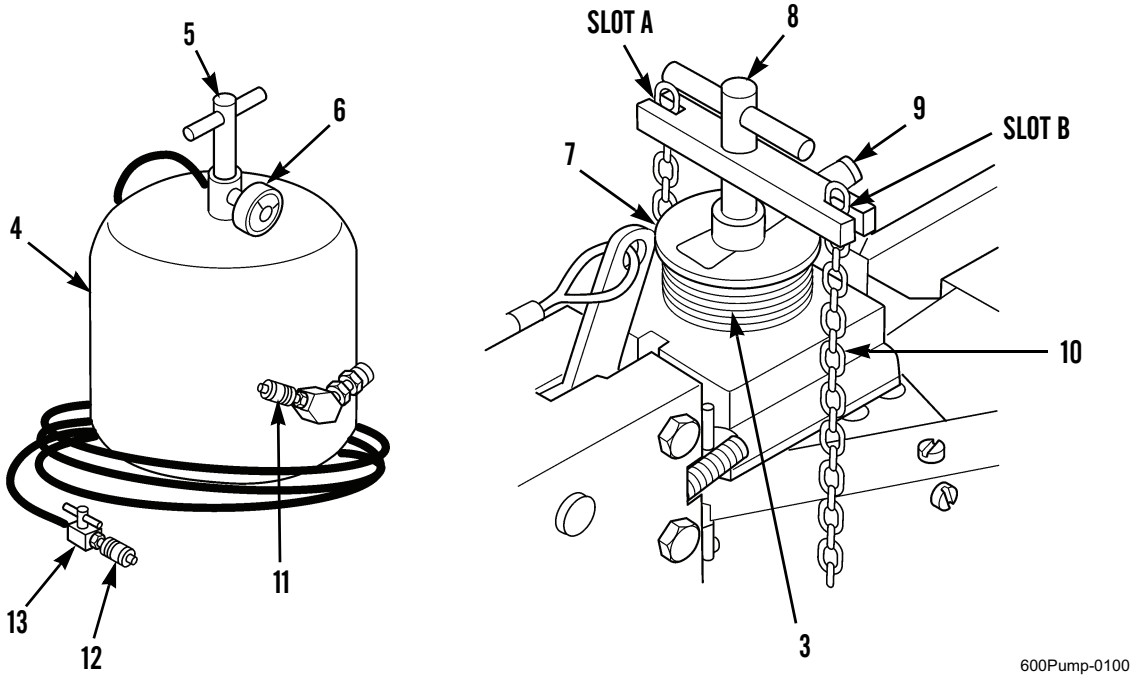


Figure 4. Hydraulic System Filler and Bleeder.

PRESSURE BLEEDING - CONTINUED

9. Pull breakaway cable (Figure 5, Item 16) at hydraulic brake actuator until breakaway lever (Figure 5, Item 15) is in locked position secured by leaf spring (Figure 5, Item 14).

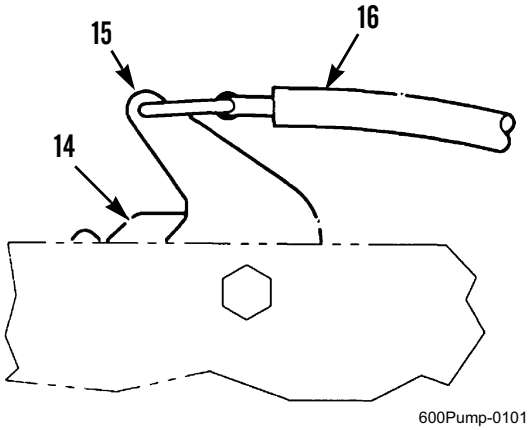


Figure 5. Breakaway Cable and Lever.

10. Open valve (Figure 4, Item 13) on brake bleeder quick disconnect (Figure 4, Item 12) two turns.
11. Carefully open wheel cylinder bleeder fitting (Figure 6, Item 1) 1/2 to 3/4 turn and drain brake fluid into container until brake fluid is free of air bubbles.
12. Close wheel cylinder bleeder fitting (Figure 6, Item 1).

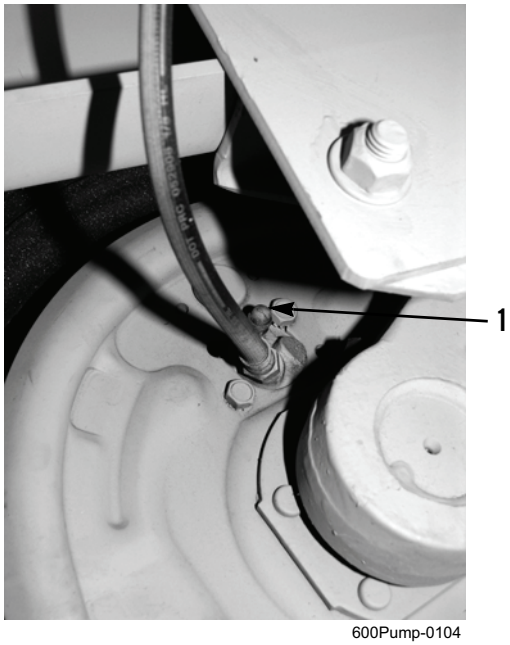


Figure 6. Wheel Cylinder Bleeder Fitting.

PRESSURE BLEEDING - CONTINUED

13. Fully close valve (Figure 7, Item 13) on brake bleeder quick disconnect (Figure 7, Item 12).
14. Disconnect bleeder hose from wheel cylinder bleeder fitting (Figure 6, Item 1).
15. Connect bleeder hose to wheel cylinder at other wheel.
16. Repeat steps 10 through 14 to bleed other side.
17. When bleeding is finished, disconnect brake bleeder quick disconnect (Figure 7, Item 12) from fitting (Figure 7, Item 9) on brake bleeder adapter (Figure 7, Item 7).
18. Bleed air from canister (Figure 7, Item 4) through air passage valve (Figure 7, Item 11).
19. Loosen handle (Figure 7, Item 8) and remove chain (Figure 7, Item 10).
20. Remove brake bleeder adapter (Figure 7, Item 7) from master cylinder (Figure 7, Item 3).

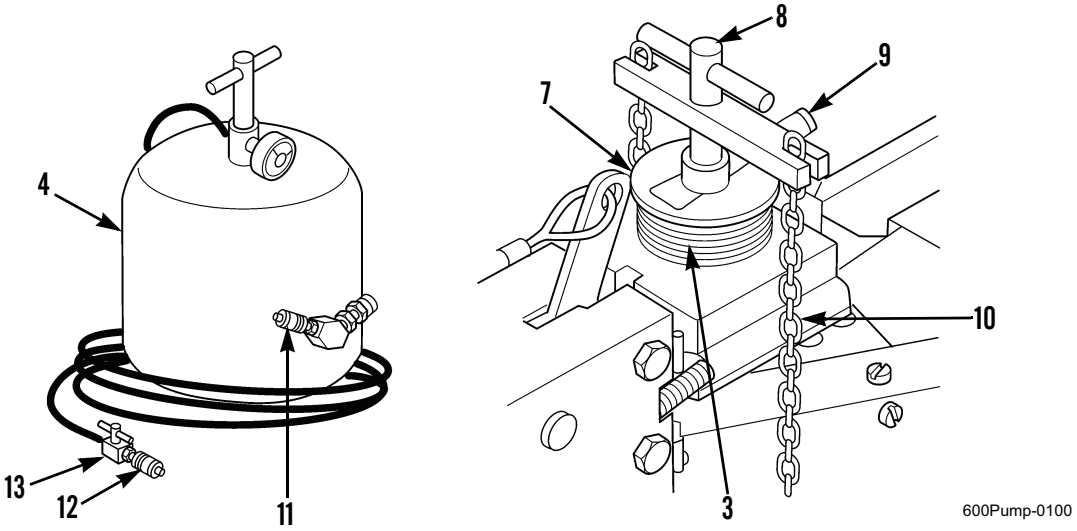
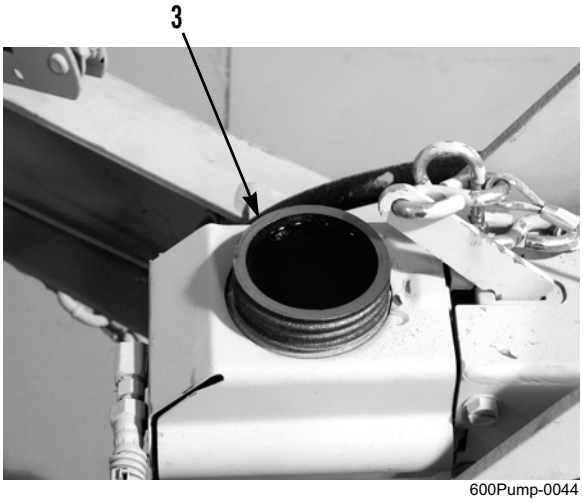


Figure 7. Hydraulic System Filler and Bleeder.

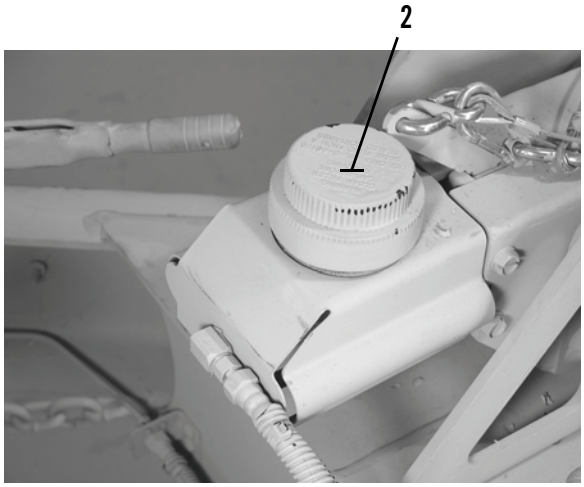
PRESSURE BLEEDING - CONTINUED

21. Ensure brake fluid level is within 1/8 in. (0.32 cm) of top of master cylinder reservoir. Add brake fluid, as required.
22. Install cap (Figure 9, Item 2) on master cylinder (Figure 8, Item 3).



600Pump-0044

Figure 8. Master Cylinder.



600Pump-0043

Figure 9. Master Cylinder Cap.

PRESSURE BLEEDING - CONTINUED

23. Disengage breakaway lever (Figure 10, Item 15) from leaf spring (Figure 10, Item 14) at hydraulic brake actuator.

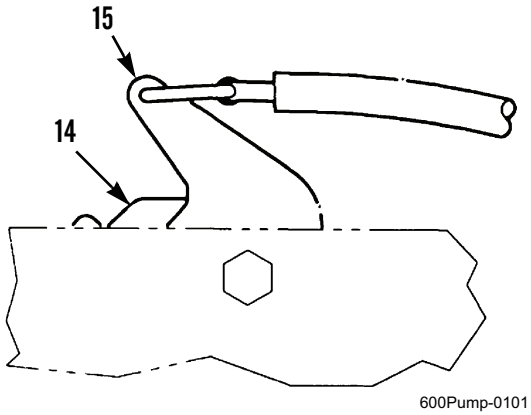


Figure 10. Breakaway Lever and Leaf Spring.

WARNING

When servicing this equipment, performing maintenance, or disposing of materials such as brake fluid, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

24. Dispose of brake fluid IAW using unit's SOP.

MANUAL BLEEDING

1. Remove cap (Figure 11, Item 2) from master cylinder (Figure 11, Item 3). Ensure brake fluid level is within 1/8 in. (0.32 cm) of top of reservoir. Add brake fluid, as required.

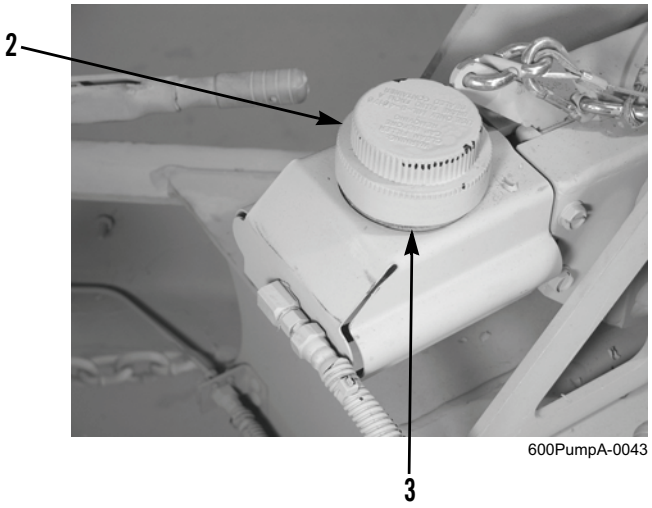


Figure 11. Master Cylinder and Cap.

MANUAL BLEEDING - CONTINUED

2. Remove dust cap from wheel cylinder bleeder fitting (Figure 12, Item 1) and connect one end of clear bleeder hose to fitting.

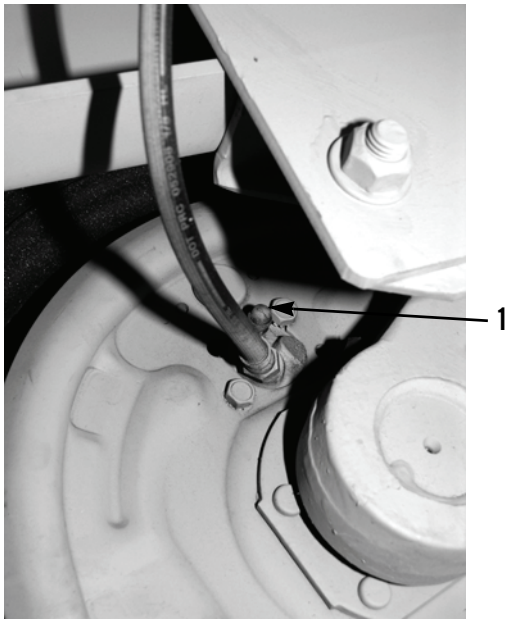


Figure 12. Wheel Cylinder Bleeder Fitting.

3. Use prybar (Figure 13, Item 17) to pull on lunette ring (Figure 13, Item 18) until brake actuator assembly is fully extended.

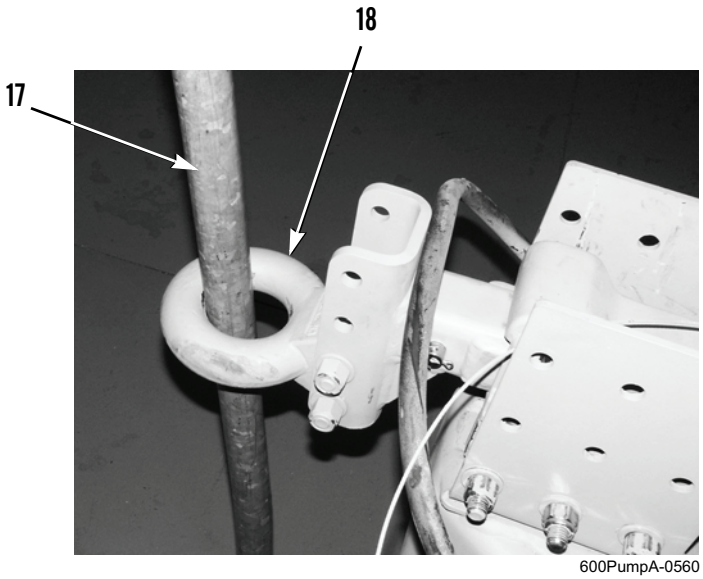


Figure 13. Brake Actuator Extension and Retraction.

MANUAL BLEEDING - CONTINUED

4. Open wheel cylinder bleeder fitting (Figure 12, Item 1).
5. Use prybar (Figure 13, Item 17) to push on lunette ring (Figure 13, Item 18) until brake actuator assembly is fully retracted.
6. Close wheel cylinder bleeder fitting (Figure 12, Item 1).
7. Repeat steps 3 through 6 until no air bubbles are present in hose.
8. Remove hose from wheel cylinder bleeder fitting (Figure 12, Item 1).
9. Install dust cap on wheel cylinder bleeder fitting (Figure 12, Item 1).
10. Repeat steps 1 through 9 for other side.
11. Remove cap (Figure 14, Item 2) from master cylinder (Figure 14, Item 3). Ensure brake fluid level is within 1/8 in. (0.32 cm) of top of reservoir. Add brake fluid, as required. Reinstall cap on master cylinder.

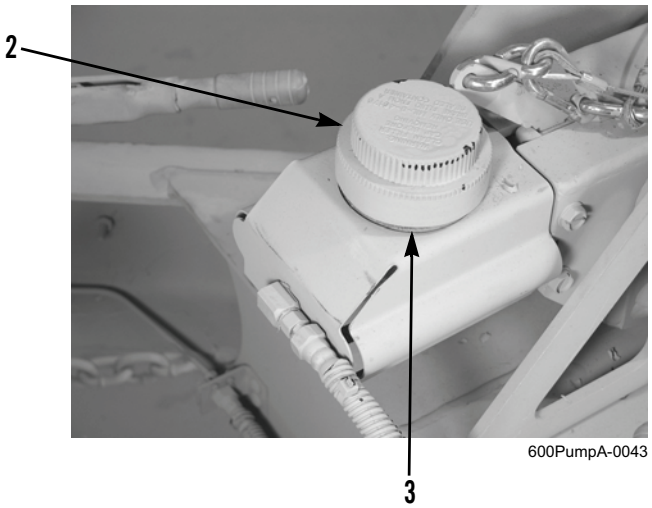


Figure 14. Master Cylinder and Cap.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

LUNETTE RING REPLACEMENT

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Materials/Parts

Locknut (2)

Personnel Required

63J (1)

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked

REMOVAL

NOTE

Towing height of trailer may be adjusted by changing mounting location of lunette ring at actuator bracket. Note position of lunette ring to ensure installation at same height.

Remove two locknuts (Figure 1, Item 2), washers (Figure 1, Item 3), hex head screws (Figure 1, Item 5), and lunette ring (Figure 1, Item 4) from actuator bracket (Figure 1, Item 1). Discard locknuts.

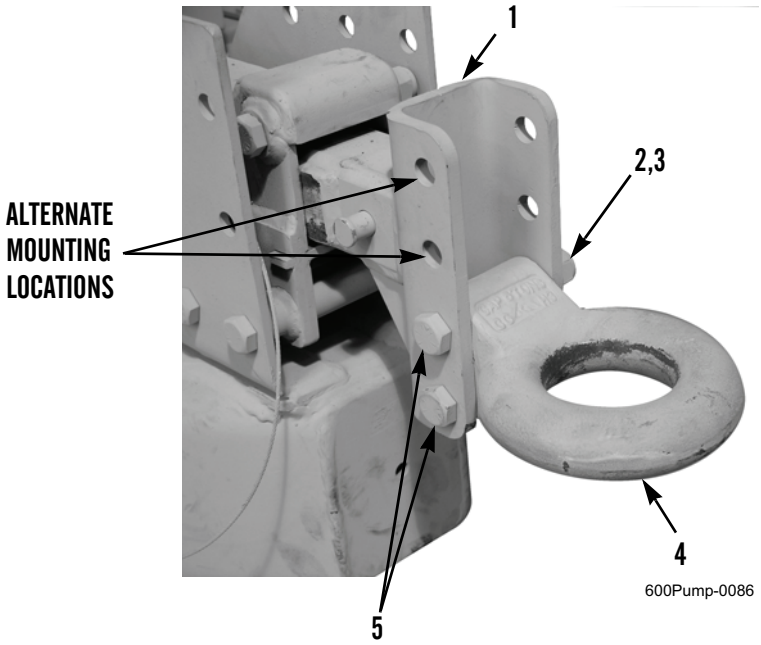


Figure 1. Lunette Ring.

INSTALLATION

NOTE

Towing height of trailer may be adjusted by changing mounting location of lunette ring at actuator bracket.

1. Position lunette ring (Figure 2, Item 4) at desired height.
2. Secure lunette ring (Figure 2, Item 4) to actuator bracket (Figure 2, Item 1) with two hex head screws (Figure 2, Item 5), washers (Figure 2, Item 3), and new locknuts (Figure 2, Item 2).

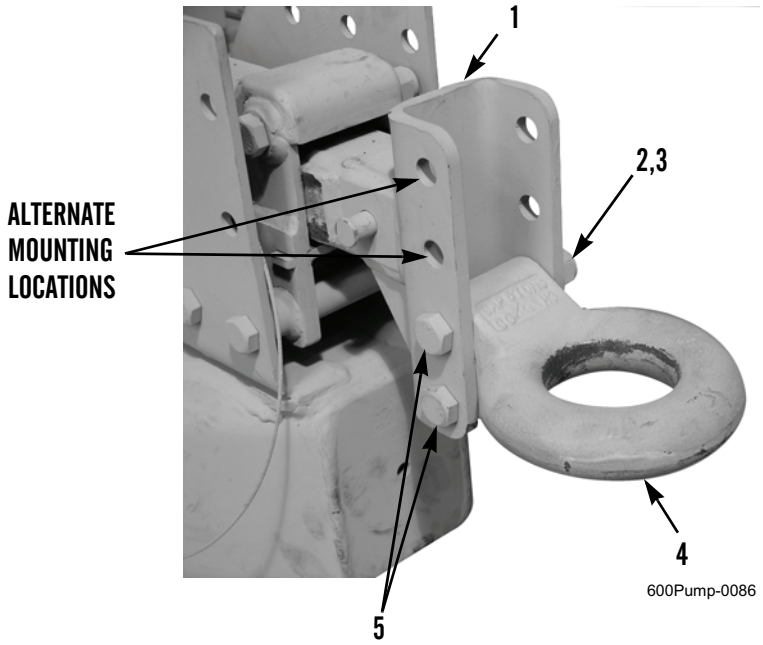


Figure 2. Lunette Ring.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

WHEEL HUB/DRUM AND WHEEL BEARINGS MAINTENANCE

Removal, Disassembly, Cleaning and Inspection, Assembly, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Cleaning compound, solvent, Type III (Item 6, WP 0129)

Grease, automotive and artillery, GAA (Item 14, WP 0129)

Rag, wiping (Item 22, WP 0129)

Cotter pin

Materials/Parts - Continued

Seal

Personnel Required

63J (1)

References

WP 0005

Equipment Condition

Service brakes adjusted (WP 0049)

Wheel and tire assembly removed (WP 0060)

WARNING

When performing maintenance on wheel hub/drum and wheel bearings, ensure wheel and tire assembly on unaffected side is securely blocked with hand brakes applied. Failure to follow this warning may cause trailer to roll, resulting in injury or death to personnel or damage to equipment.

REMOVAL

NOTE

Bearing Buddy® cap is made up of two parts and is a press fit into hub/drum. When removed, it may separate into two pieces.

1. Use a pipe wrench to remove Bearing Buddy® cap (Figure 1, Item 1) from hub/drum (Figure 1, Item 4).
2. Remove cotter pin (Figure 1, Item 2) from spindle nut (Figure 1, Item 3). Discard cotter pin.
3. Remove spindle nut (Figure 1, Item 3) and washer (Figure 1, Item 5).

WARNING

Hub/drum is heavy and awkward to handle. Use caution when removing hub/drum to avoid injury to personnel.

NOTE

- Hub/drum weighs approximately 90 lb (41 kg).
- Outer wheel bearing may come loose when hub/drum is removed.

4. Remove hub/drum (Figure 1, Item 4), with wheel bearings and seal installed, from axle spindle.

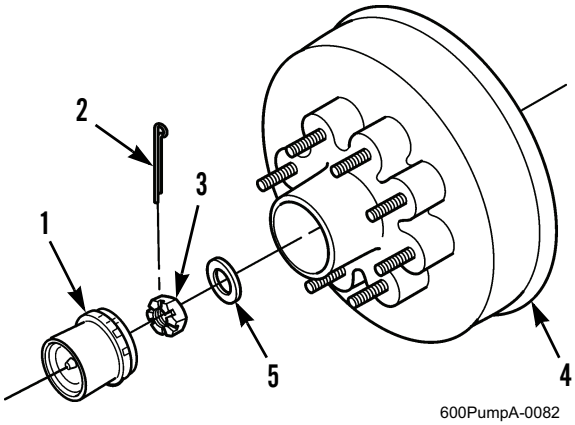


Figure 1. Remove Hub/Drum from Axle Spindle.

DISASSEMBLY

1. Remove seal (Figure 2, Item 10) from hub/drum (Figure 2, Item 4). Discard seal.
2. Remove inner bearing (Figure 2, Item 9) from hub/drum (Figure 2, Item 4).
3. Remove outer bearing (Figure 2, Item 6) from hub/drum (Figure 2, Item 4).

NOTE

After cleaning and inspection, bearing races must be replaced if they are damaged or if either bearing needs to be replaced.

4. Do not remove bearing races (Figure 2, Items 7 and 8) at this time.

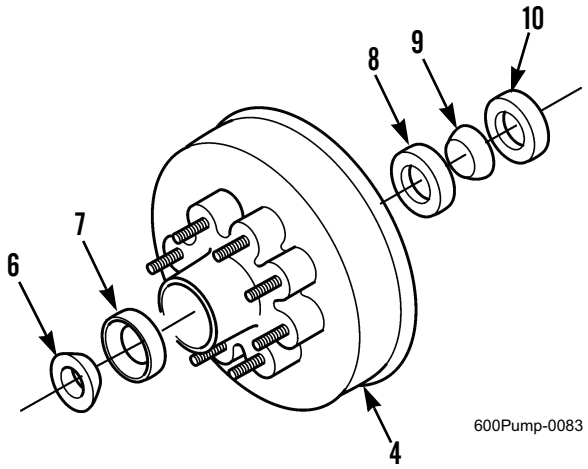


Figure 2. Hub/Drum Seal, Bearings, and Bearing Races.

CLEANING AND INSPECTION

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low-toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to do so may result in injury or death to personnel.

1. Clean and inspect bearings and bearing races.
2. Clean all other removed components with solvent cleaning compound and allow to dry.
3. Remove any corrosion with a wire brush.
4. If damaged, or if replacing bearings, remove bearing races (Figure 2, Items 7 and 8) from hub/drum and discard.

CLEANING AND INSPECTION - CONTINUED

5. Inspect hub/drum for cracks, breaks, and excessive wear and scoring. Measure inside diameter (braking surface) (Figure 3, Item 12) of drum. If inside diameter exceeds 12.09 in. (30.7 cm), replace hub/drum.

WARNING

Removing metal parts can be hazardous to personnel. Injury may result if metal chips contact eyes. Always wear eye protection when replacing wheel stud.

6. Inspect studs (Figure 3, Item 11) for cracks, breaks, wear, or other damage. If any stud is damaged, drive stud out of hub/drum (Figure 3, Item 4). Discard stud.
7. Align splines on new stud (Figure 3, Item 11) with splines in hub/drum (Figure 3, Item 4), then press stud into hub/drum until stud shoulder rests against hub/drum.

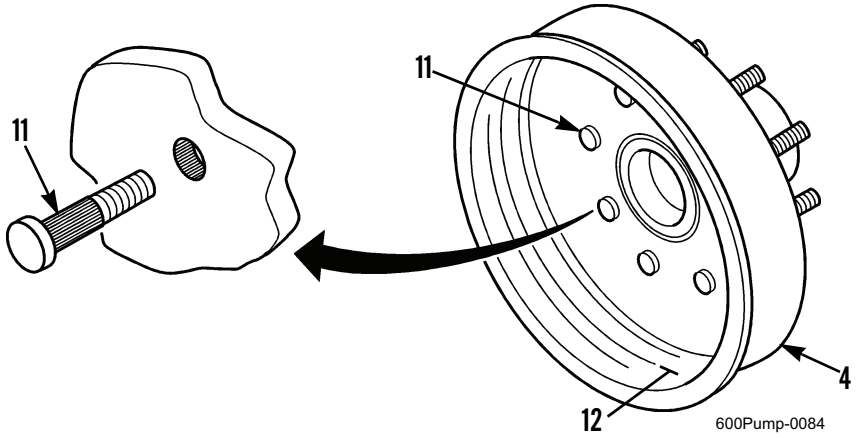


Figure 3. Wheel Studs and Hub/Drum Inspection.

ASSEMBLY

1. If removed, install new bearing races (Figure 4, Items 7 and 8) in hub/drum (Figure 4, Item 4). Lightly coat outer surfaces of bearing races with GAA grease.
2. Pack inner and outer bearings (Figure 4, Items 9 and 6) with GAA grease by pressing fresh grease into bearing roller area.
3. Install inner bearing (Figure 4, Item 9) in hub/drum (Figure 4, Item 4).
4. Lightly coat outer edge of new seal (Figure 4, Item 10) with GAA grease and install new seal in hub/drum (Figure 4, Item 4). Wipe excess grease from outer surface of seal.

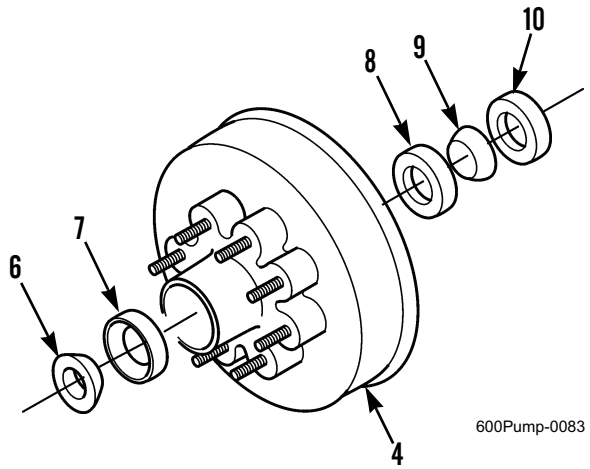


Figure 4. Hub/Drum Seal, Bearings, and Races.

INSTALLATION

WARNING

Hub/drum is heavy and awkward to handle. Use caution when installing hub/drum to avoid injury to personnel.

CAUTION

Use caution not to damage seal when installing hub/drum on axle spindle.

NOTE

Hub/drum weighs approximately 90 lb (41 kg).

1. Position assembled hub/drum (Figure 5, Item 4) on axle spindle (Figure 5, Item 13) until fully seated.
2. Install outer bearing (Figure 5, Item 6) in hub/drum (Figure 5, Item 4).
3. Install washer (Figure 5, Item 5) and spindle nut (Figure 5, Item 3) on axle spindle (Figure 5, Item 13).
4. If applied, release hand brake on affected side (WP 0005).
5. Ensure spindle nut (Figure 5, Item 3) turns freely on axle spindle (Figure 5, Item 13) and brakes are not dragging.
6. While turning hub/drum (Figure 5, Item 4) slowly, tighten spindle nut (Figure 5, Item 3) to seat bearings.
7. Back off spindle nut (Figure 5, Item 3) as required to align cotter pin hole.
8. Install new cotter pin (Figure 5, Item 2) on spindle nut (Figure 5, Item 3) and axle spindle (Figure 5, Item 13). Bend back ends of cotter pin to secure spindle nut.

NOTE

Bearing Buddy® cap is a press fit into hub/drum.

9. Drive Bearing Buddy® cap (Figure 5, Item 1) squarely into hub/drum (Figure 5, Item 4).

NOTE

Bearing Buddy® piston has an automatic pressure relief feature that prevents over-filling and over-pressurization of hub with grease.

10. Check position of piston in Bearing Buddy® cap (Figure 5, Item 1). When hub is correctly filled with grease, piston is extended approximately 1/8 in. (3.2 mm) and can be rocked or moved.

INSTALLATION - CONTINUED

11. As required, add GAA grease to grease fitting (Figure 5, Item 14) on Bearing Buddy® cap (Figure 5, Item 1).

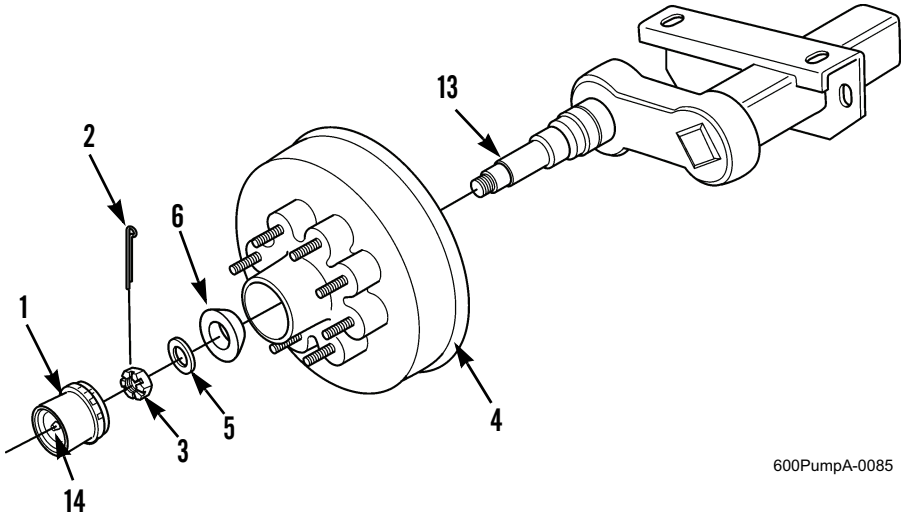


Figure 5. Installing Hub/Drum On Axle Spindle.

FOLLOW-ON TASKS

Install wheel and tire assembly (WP 0060).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

WHEEL AND TIRE ASSEMBLY REPLACEMENT

Removal, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Personnel Required

63J (1)

Equipment Condition

Pump assembly parked on level ground (WP 0006)

Equipment Condition - Continued

Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheel chocked on unaffected side

REMOVAL

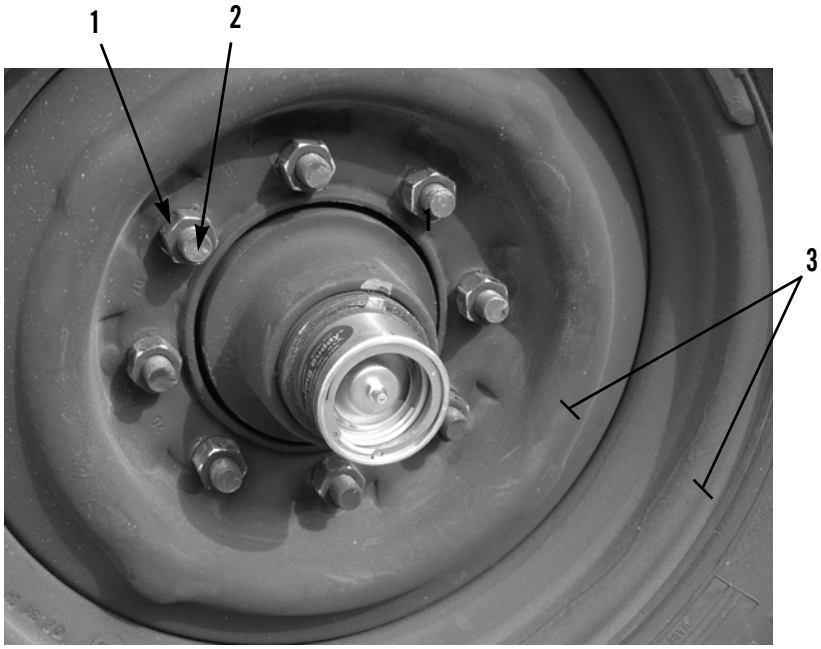
WARNING

When replacing wheel and tire assembly, ensure wheel and tire assembly on unaffected side is securely blocked with hand brakes applied. Failure to follow this warning may cause trailer to roll, resulting in injury or death to personnel or damage to equipment.

NOTE

- Rear leveling jack assemblies are rated above weight of trailer. They can be safely used to support trailer weight.
- If terrain is uneven or will not support rear leveling jack assembly, blocking may be placed under rear jack.

1. Loosen eight lug nuts (Figure 1, Item 1).
2. Remove pin and swing rear leveling jack assembly to vertical position. Reinstall pin. Use crank handle (WP 0005) to raise trailer until wheel and tire assembly (Figure 1, Item 3) is approximately 1 in. (2.54 cm) off ground.
3. Remove eight lug nuts (Figure 1, Item 1) from wheel studs (Figure 1, Item 2) and remove wheel and tire assembly (Figure 1, Item 3) from hub/drum.



600Pump-0023

Figure 1. Wheel and Tire Assembly.

INSTALLATION

1. Position wheel and tire assembly (Figure 1, Item 3) on hub/drum.
2. Install eight lug nuts (Figure 1, Item 1) on wheel studs (Figure 1, Item 2) and wrench tighten.
3. Use rear leveling jack assembly to lower wheel and tire assembly (Figure 1, Item 3) to ground (WP 0005).
4. Tighten eight lug nuts (Figure 1, Item 1) to 85 lb-ft (115 Nm) in sequence shown (Figure 2).
5. Tighten eight lug nuts (Figure 1, Item 1) to 125 lb-ft (169 Nm) in sequence shown (Figure 2).
6. Fully retract rear leveling jack assembly. Swing into horizontal (stowed) position and secure with pin (WP 0005).

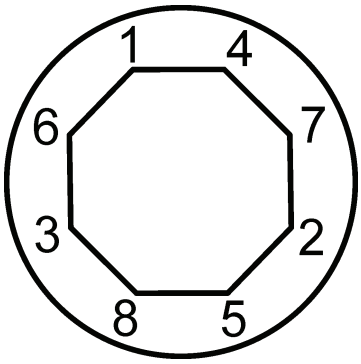


Figure 2. Tightening Sequence.

FOLLOW-ON TASKS

Ensure tire is inflated to 45 PSI (310 kPa).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

WHEEL AND TIRE ASSEMBLY MAINTENANCE

Inspection, Disassembly, Assembly, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)
Safety cage

Personnel Required

63J (1)

References

TM 9-2610-200-14

Equipment Condition

Wheel and tire assembly removed (WP 0060)

INSPECTION

1. Remove nails, glass, or other objects that may be embedded in tire.
2. Inspect tire for evidence of cracks, deep sidewall cuts, damage to tire bead, or separated tire threads. Replace worn or damaged tire. Refer to *Disassembly* in this work package.

NOTE

Wear bars are molded across tread pattern and are only noticeable in valley between center rib and lugs.

3. Check depth of tread on tire. Treads should not be worn beyond level of wear bars. Replace tire if worn beyond level of wear bars. Refer to *Disassembly* in this work package.
4. Inspect wheel for bends, cracks, or other damage. Replace wheel if damaged. Refer to *Disassembly* in this work package.
5. Inspect valve stem in wheel for damage. Replace valve stem if damaged. Refer to *Disassembly* in this work package.

DISASSEMBLY

Completely deflate, then dismount tire from wheel IAW TM 9-2610-200-14, *Operator's, Unit, Direct Support and General Support Maintenance Manual for Care, Maintenance, Repair, and Inspection of Pneumatic Tires and Inner Tubes*.

ASSEMBLY

1. Mount tire on wheel IAW TM 9-2610-200-14, *Operator's, Unit, Direct Support and General Support Maintenance Manual for Care, Maintenance, Repair, and Inspection of Pneumatic Tires and Inner Tubes*.
2. Using a safety cage and a tire inflator gage and hose assembly, inflate tire to 45 PSI (310 kPa).

FOLLOW-ON TASKS

Install wheel and tire assembly (WP 0060).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

FRAME REPAIR

Removal, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Shop equipment, welding (Item 19, WP 0126)
Lifting equipment, 500-lb capacity

Materials/Parts

Bolt (9)
Locknut (9)
Washer (18)

Personnel Required

63J (2)

References

WP 0023

Equipment Condition

Fuel tank removed (WP 0099)

WARNING

Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may cause injury or death to personnel.

NOTE

Fasteners used to hold drawbar to trailer frame are huckbolts. They can not be unscrewed and must be cut off using an anvil and air chisel or a huck collar cutter. Replacement of the drawbar requires that all huckbolts be removed and grade 8 bolts and locknuts be installed.

REMOVAL

1. Remove two cover plates (Figure 1, Item 2) from trailer frame (Figure 1, Item 1).
2. Install lifting equipment on drawbar (Figure 1, Item 5).
3. Remove nine huckbolts (Figure 1, Item 3), collars (Figure 1, Item 4), and drawbar (Figure 1, Item 5) from trailer frame (Figure 1, Item 1) and place on flat surface. Discard huckbolts.
4. Remove lifting equipment from drawbar (Figure 1, Item 5).

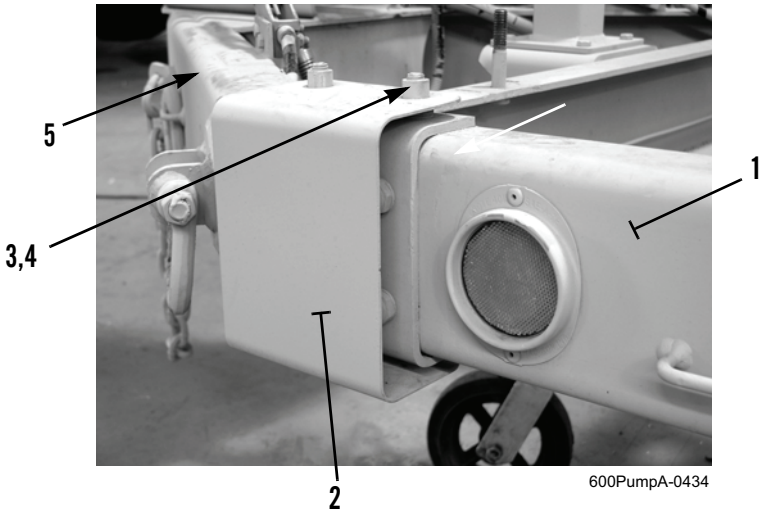


Figure 1. Drawbar Huckbolts.

CLEANING AND INSPECTION

Clean and inspect all parts IAW WP 0023.

INSTALLATION

1. Install lifting equipment on drawbar (Figure 2, Item 5).
2. Install drawbar (Figure 2, Item 5) on trailer frame (Figure 2, Item 1) with nine new washers (Figure 2, Item 6), new bolts (Figure 2, Item 7), new washers (Figure 2, Item 8), and new locknuts (Figure 2, Item 9).
3. Remove lifting equipment from drawbar (Figure 2, Item 5).
4. Install two cover plates (Figure 2, Item 2) on trailer frame (Figure 2, Item 1).

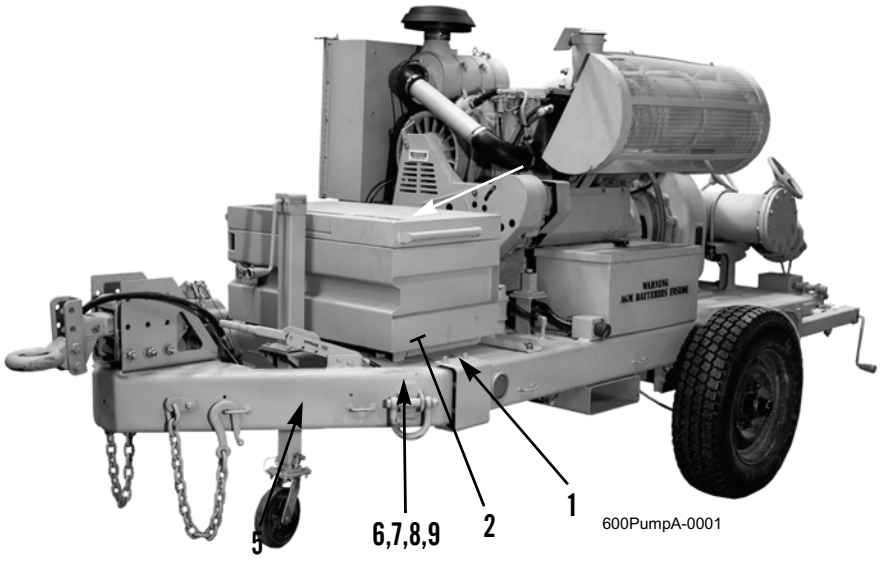


Figure 2. Drawbar.

FOLLOW-ON TASKS

Install fuel tank (WP 0099).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

LIFTING/TIEDOWN RING REPLACEMENT

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Shop equipment, welding (Item 19, WP 0126)

Materials/Parts

Capscrew
Nut

Personnel Required

63J (1)

References

TC 9-237

Equipment Condition

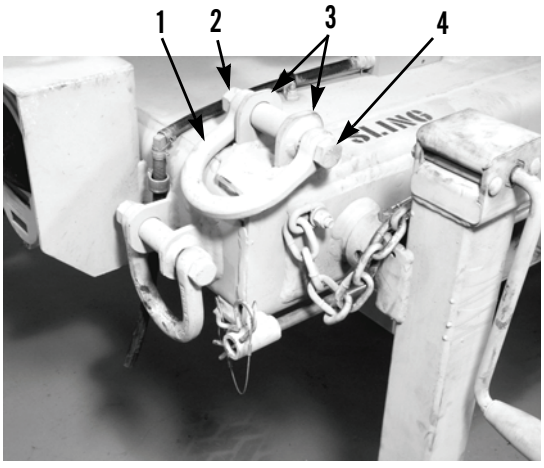
Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked

NOTE

- Lifting rings, tiedown rings, and lifting/tiedown rings are replaced the same way.
- Lifting ring at rear of trailer is shown.

REMOVAL

1. Use a cold chisel or torch to cut off head of capscrew (Figure 1, Item 4) or tack-welded nut (Figure 1, Item 2).
2. Remove nut (Figure 1, Item 2) and capscrew (Figure 1, Item 4) from ring (Figure 1, Item 1) and welded bracket (Figure 1, Item 3). Discard nut and capscrew.
3. Remove ring (Figure 1, Item 1) from welded bracket (Figure 1, Item 3).



600Pump-0058

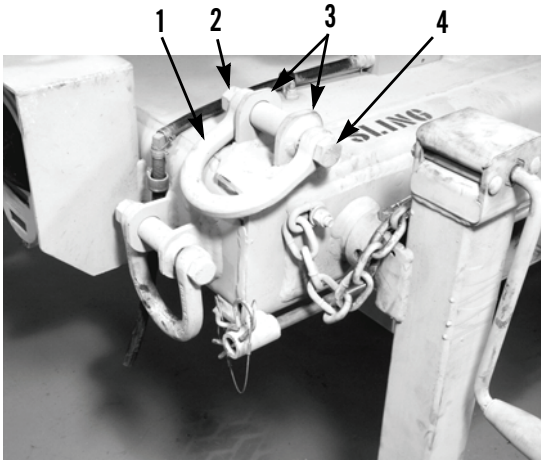
Figure 1. Lifting Ring.

INSTALLATION

NOTE

Ring must have sufficient free movement to allow lifting and/or tiedown.

1. Install ring (Figure 2, Item 1) on welded bracket (Figure 2, Item 3) with new capscrew (Figure 2, Item 4) and new nut (Figure 2, Item 2). Tighten nut only enough to provide slight tension on ring.
2. Tack weld nut (Figure 2, Item 2), IAW TC 9-237, to shaft of capscrew (Figure 2, Item 4) to prevent nut from backing off capscrew.



600Pump-0058

Figure 2. Lifting Ring.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

PINTLE HOOK ASSEMBLY MAINTENANCE

Replacement, Repair

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Personnel Required

63J (1)

Materials/Parts

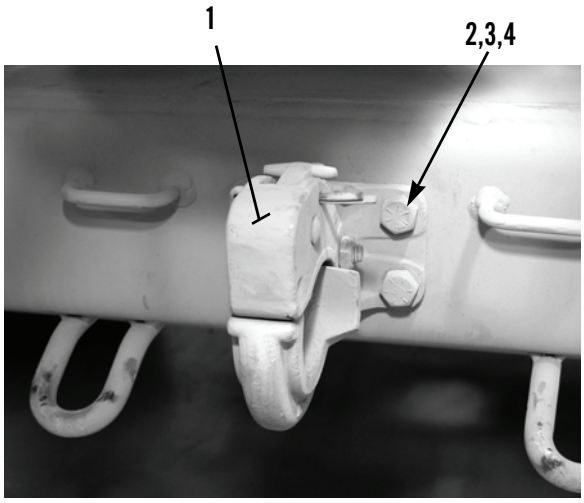
Cotter pin
Locknut (4)

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked

REPLACEMENT

1. Remove four locknuts (Figure 1, Item 2), washers (Figure 1, Item 3), capscrews (Figure 1, Item 4), and pintle hook assembly (Figure 1, Item 1) from rear of trailer. Discard locknuts.
2. Install pintle hook assembly (Figure 1, Item 1) on rear of trailer with four capscrews (Figure 1, Item 4), washers (Figure 1, Item 3), and new locknuts (Figure 1, Item 2).



600Pump-0088

Figure 1. Pintle Hook Assembly.

REPAIR

NOTE

Pintle hook need not be removed from trailer to replace latch and chain assembly.

1. Remove nut (Figure 2, Item 9), bolt (Figure 2, Item 5), chain assembly (Figure 2, Item 6), and latch (Figure 2, Item 8) from pintle hook (Figure 2, Item 10).
2. Separate cotter pin (Figure 2, Item 7) from chain assembly (Figure 2, Item 6). Discard cotter pin.

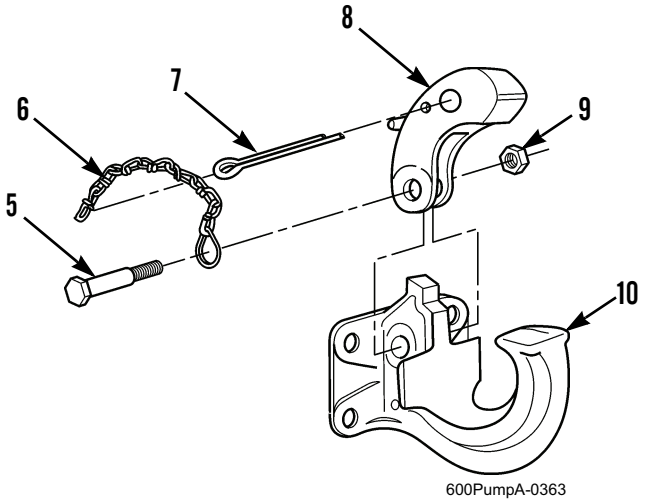


Figure 2. Pintle Hook Assembly - Exploded View.

3. Install new cotter pin (Figure 2, Item 7) on chain assembly (Figure 2, Item 6).
4. Install latch (Figure 2, Item 8) and chain assembly (Figure 2, Item 6) on pintle hook (Figure 2, Item 10) with bolt (Figure 2, Item 5) and nut (Figure 2, Item 9).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

SAFETY CHAINS REPLACEMENT

Replacement

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Personnel Required

63J (1)

Materials/Parts

Locknut

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked

NOTE

Each safety chain is replaced the same way.

REPLACEMENT

1. Remove locknut (Figure 1, Item 2), washer (Figure 1, Item 1), bolt (Figure 1, Item 4), and safety chain (Figure 1, Item 3) from trailer frame. Discard locknut.
2. Install safety chain (Figure 1, Item 3) on trailer frame with bolt (Figure 1, Item 4), washer (Figure 1, Item 1), and new locknut (Figure 1, Item 2).

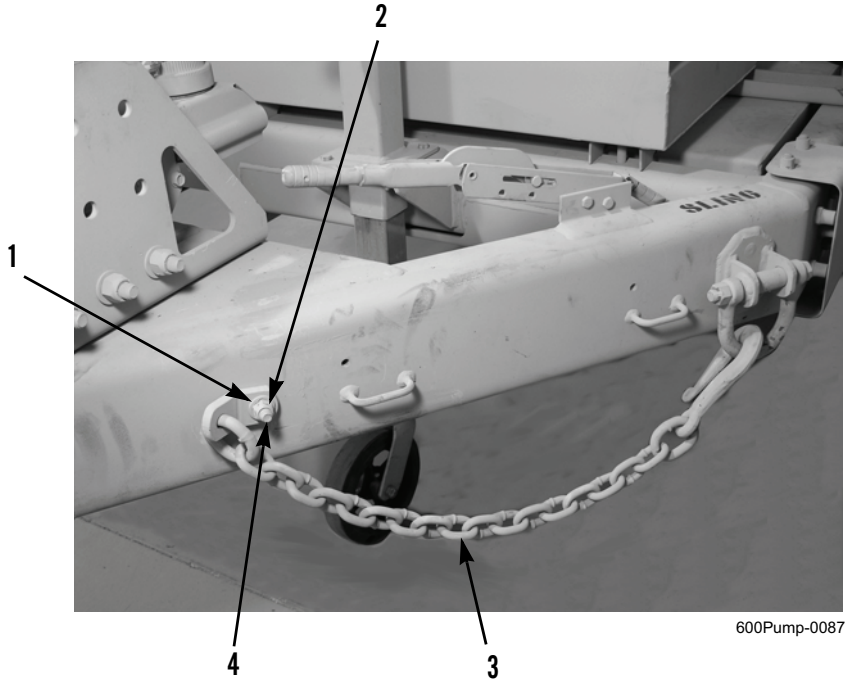


Figure 1. Safety Chain.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

FRONT LEVELING JACK ASSEMBLY REPLACEMENT

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Grease, automotive and artillery, GAA (Item 14, WP 0129)
Rag, wiping (Item 22, WP 0129)

Materials/Parts - Continued

Locknut (4)

Personnel Required

63J (1)

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked

NOTE

- Sand pad and caster wheel of front jack assembly can be replaced individually, but there is no replacement of individual parts of front jack assembly. Failure of any individual part will require replacement of entire front jack assembly.
- Front jack assembly with caster wheel installed is shown.

REMOVAL

1. Raise front of trailer by placing a floor jack under trailer frame close to front leveling jack assembly.
2. Place two jack stands, one under each front corner of frame, in line with front leveling jack assembly.
3. Lower floor jack and support front of trailer on jack stands.
4. Use crank handle to fully raise front leveling jack assembly (WP 0005).
5. Remove pin (Figure 1, Item 1) and caster wheel (Figure 1, Item 3) from base of front leveling jack assembly (Figure 1, Item 2).

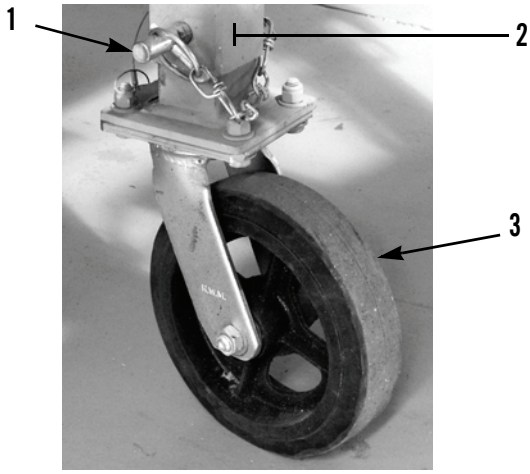


Figure 1. Caster Wheel.

REMOVAL - CONTINUED

WARNING

Front leveling jack assembly is heavy and awkward to handle. Use caution when removing front leveling jack assembly to avoid injury to personnel.

NOTE

Front leveling jack assembly weighs approximately 43 lb (20 kg).

6. Remove four locknuts (Figure 2, Item 4), washers (Figure 2, Item 5), bolts (Figure 2, Item 6), and front leveling jack assembly (Figure 2, Item 2) from mounting bracket (Figure 2, Item 7). Discard locknuts.

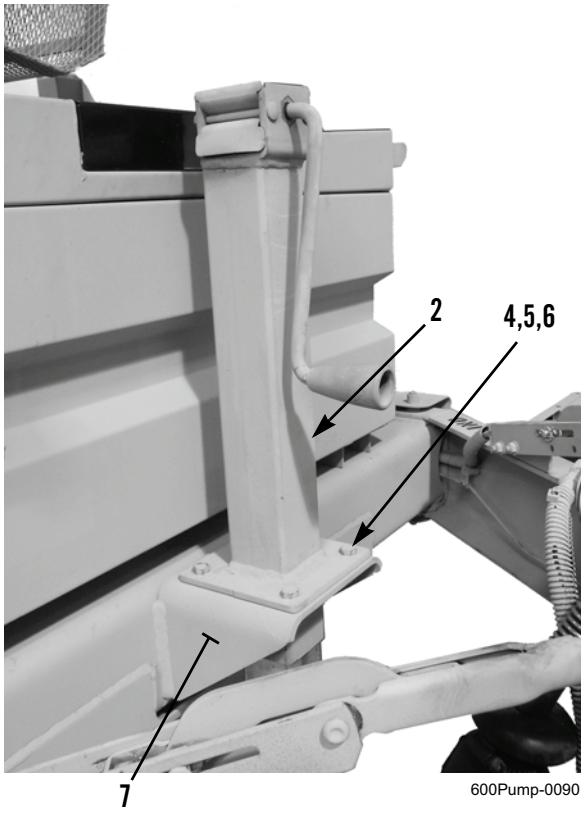


Figure 2. Front Leveling Jack Assembly.

INSTALLATION

WARNING

Front leveling jack assembly is heavy and awkward to handle. Use caution when installing front leveling jack assembly to avoid injury to personnel.

NOTE

Front leveling jack assembly weighs approximately 43 lb (20 kg).

1. Install front leveling jack assembly (Figure 2, Item 2) on mounting bracket (Figure 2, Item 7) with four bolts (Figure 2, Item 6), washers (Figure 2, Item 5), and new locknuts (Figure 2, Item 4).
2. Install caster wheel (Figure 3, Item 3) on base of front leveling jack assembly (Figure 3, Item 2) with pin (Figure 3, Item 1).

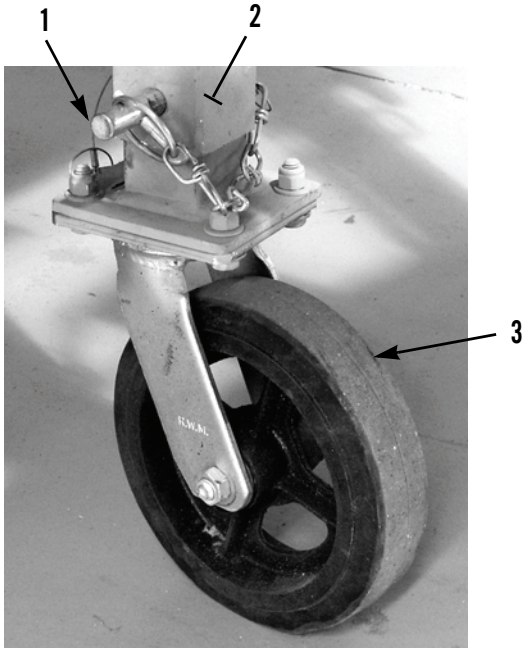
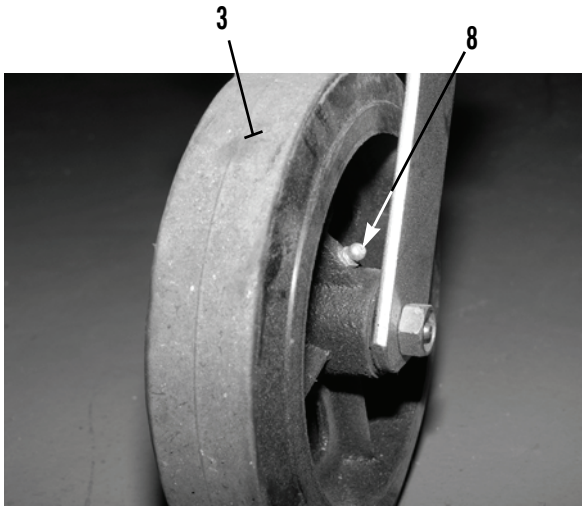


Figure 3. Caster Wheel.

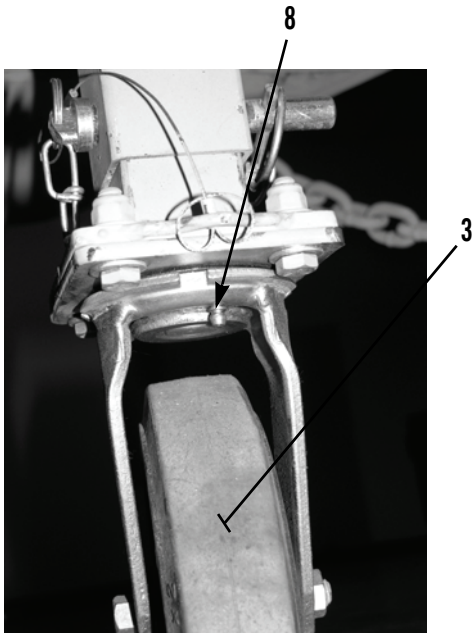
INSTALLATION - CONTINUED

3. As required, apply GAA grease to two grease fittings (Figures 4 and 5, Item 8) on caster wheel (Figures 4 and 5, Item 3).



600Pump-0132

Figure 4. Caster Wheel Grease Fitting.



600Pump-0133

Figure 5. Caster Wheel Grease Fitting.

INSTALLATION - CONTINUED

4. Extend and retract front leveling jack assembly (Figure 6, Item 2) to check for adequate lubrication.
5. If lubrication is required, remove two nuts (Figure 6, Item 10), bolts (Figure 6, Item 11), and housing cover (Figure 6, Item 9) from front leveling jack assembly (Figure 6, Item 2).
6. Fill cavity and pack gear under housing cover (Figure 6, Item 9) with GAA grease. Reinstall cover with two bolts (Figure 6, Item 11) and nuts (Figure 6, Item 10).

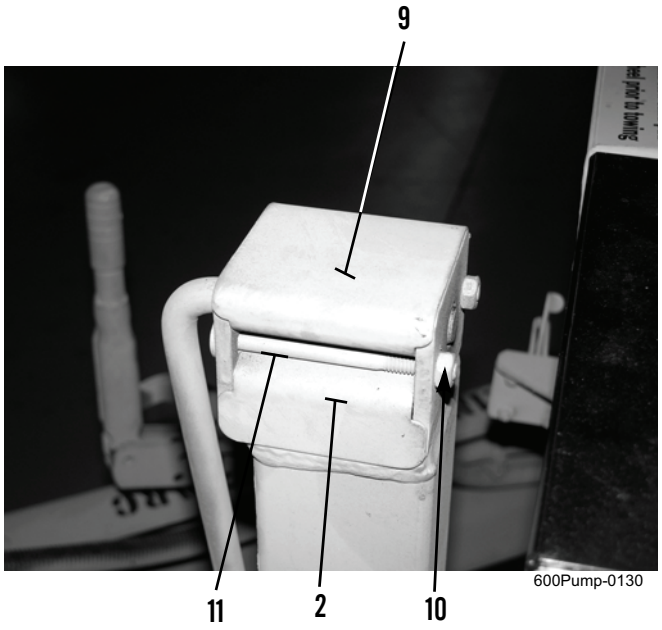


Figure 6. Housing Cover.

7. Raise trailer frame with floor jack sufficiently to remove jack stands. Extend front leveling jack assembly and lower trailer frame with floor jack until front of trailer is level and supported by front leveling jack assembly.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

REAR LEVELING JACK ASSEMBLY REPLACEMENT

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Personnel Required

63J (1)

Materials/Parts

Grease, automotive and artillery, GAA (Item 14, WP 0129)

Rag, wiping (Item 22, WP 0129)

Locknut

Equipment Condition

Pump assembly parked on level ground (WP 0006)

Engine off (WP 0006)

Hand brakes applied (WP 0005)

Wheels chocked

NOTE

Rear leveling jack assembly is a single assembly with no replacement of individual components. Failure of any individual part will require replacement of entire rear leveling jack assembly.

REMOVAL

1. If stowed in horizontal (travel) position, remove pin (Figure 1, Item 6) and swing rear leveling jack assembly (Figure 1, Item 8) to vertical position. Reinstall pin.
2. Use crank handle (Figure 1, Item 7) to raise rear leveling jack assembly (Figure 1, Item 8) until sand pad is off the ground.
3. Remove locknut (Figure 1, Item 2) and washer (Figure 1, Item 3) from threaded stud (Figure 1, Item 4) and release security chain (Figure 1, Item 1) from trailer frame. Discard locknut.
4. Remove pin (Figure 1, Item 6) from rear leveling jack assembly (Figure 1, Item 8) and swivel joint (Figure 1, Item 5).

WARNING

Rear leveling jack assembly is heavy and awkward to handle. Use caution when removing rear leveling jack assembly to avoid injury to personnel.

NOTE

Rear leveling jack assembly weighs approximately 27 lb (12 kg).

5. Remove rear leveling jack assembly (Figure 1, Item 8) from swivel joint (Figure 1, Item 5).

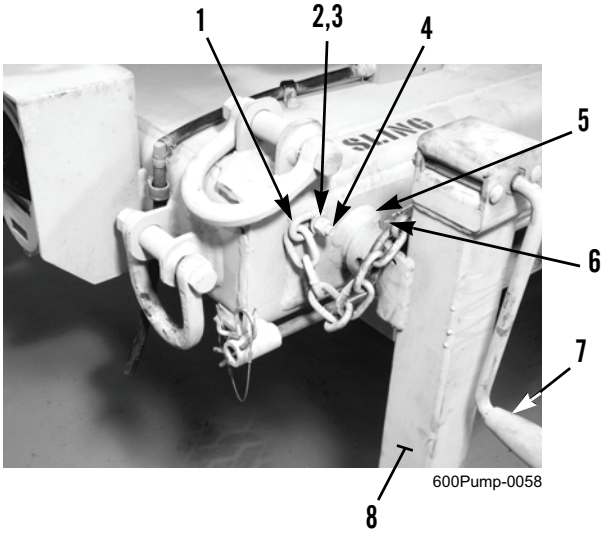


Figure 1. Rear Leveling Jack Assembly.

INSTALLATION

WARNING

Rear leveling jack assembly is heavy and awkward to handle. Use caution when installing rear leveling jack assembly to avoid injury to personnel.

NOTE

Rear leveling jack assembly weighs approximately 27 lb (12 kg).

1. Position rear leveling jack assembly (Figure 1, Item 8) at swivel joint (Figure 1, Item 5), with rear leveling jack assembly in vertical position.
2. Install pin (Figure 1, Item 6) on rear leveling jack assembly (Figure 1, Item 8) and swivel joint (Figure 1, Item 5).
3. Install security chain (Figure 1, Item 1) on threaded stud (Figure 1, Item 4) at trailer frame with washer (Figure 1, Item 3) and new locknut (Figure 1, Item 2).
4. Use crank handle (Figure 1, Item 7) to extend and retract rear leveling jack assembly (Figure 1, Item 8) and check for adequate lubrication.
5. If lubrication is required, remove two nuts (Figure 2, Item 11), bolts (Figure 2, Item 10), and housing cover (Figure 2, Item 9) from rear leveling jack assembly (Figure 2, Item 8).
6. Fill cavity and pack gear under housing cover (Figure 2, Item 9) with GAA grease. Reinstall housing cover with two bolts (Figure 2, Item 10) and nuts (Figure 2, Item 11).

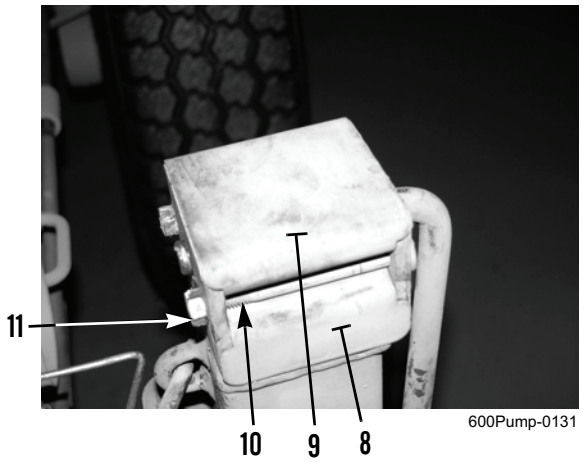


Figure 2. Housing Cover.

7. To stow in horizontal (travel) position, remove pin (Figure 1, Item 6) and swing rear leveling jack assembly (Figure 1, Item 8) to horizontal position. Reinstall pin.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

ACCESS PLATES REPLACEMENT

Upper Access Plate Removal, Upper Access Plate Installation, Oil Cooler Access Plate Replacement, Lower Access Plate Removal, Lower Access Plate Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Materials/Parts

Strap, tiedown, electrical components (Item 26, WP 0129)
Tag, marker (Item 27, WP 0129)
Locknut
Lockwasher (2)

Personnel Required

63J (1)

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked

UPPER ACCESS PLATE REMOVAL

1. Remove four bolts (Figure 1, Item 1) and upper access plate (Figure 1, Item 2).

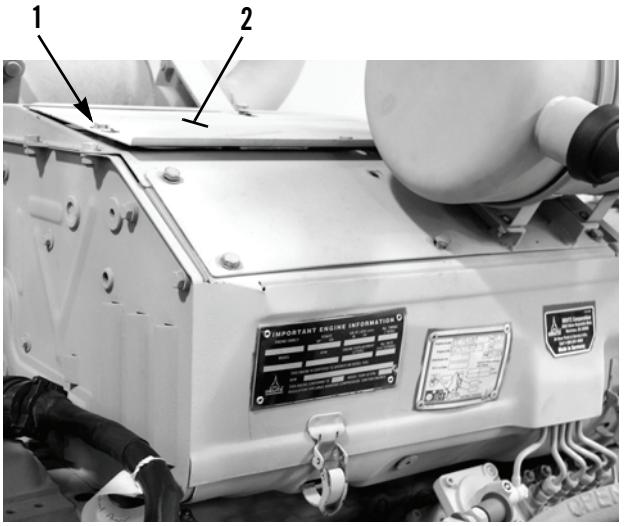


Figure 1. Upper Access Plate.

UPPER ACCESS PLATE INSTALLATION

Install upper access plate (Figure 1, Item 2) with four bolts (Figure 1, Item 1).

OIL COOLER ACCESS PLATE REPLACEMENT

1. Release two clamps (Figure 2, Item 4) and remove oil cooler access plate (Figure 2, Item 3).
2. Install oil cooler access plate (Figure 2, Item 3) and latch two clamps (Figure 2, Item 4).

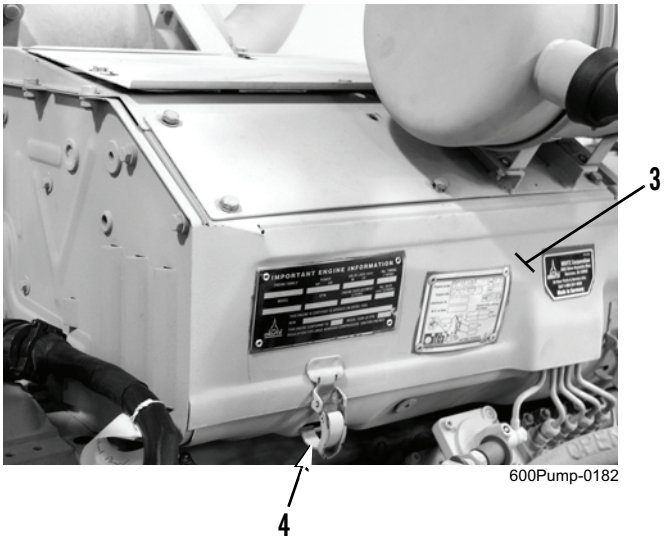


Figure 2. Oil Cooler Access Plate.

LOWER ACCESS PLATE REMOVAL

1. Remove bolt (Figure 3, Item 6) and locknut (Figure 3, Item 7) from lower bracket (Figure 3, Item 5) and heat shield (Figure 3, Item 10). Discard locknut.
2. Remove three bolts (Figure 3, Item 8), two lockwashers (Figure 3, Item 9), lower bracket (Figure 3, Item 5), and lower access plate (Figure 3, Item 11) from left side of engine. Discard lockwashers.

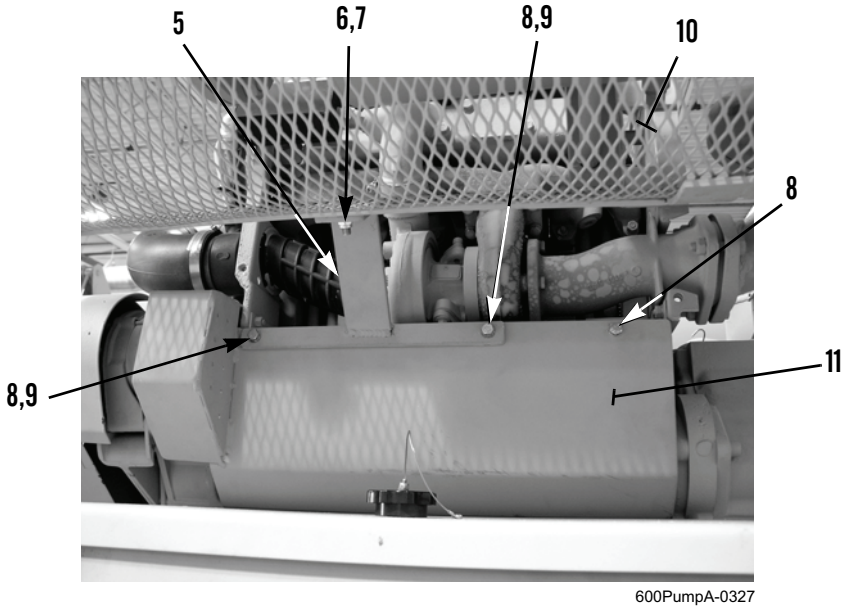


Figure 3. Lower Access Plate.

LOWER ACCESS PLATE INSTALLATION

1. Install lower bracket (Figure 3, Item 5) and lower access plate (Figure 3, Item 11) to left side of engine with two new lockwashers (Figure 3, Item 9) and three bolts (Figure 3, Item 8).
2. Install bolt (Figure 3, Item 6) and new locknut (Figure 3, Item 7) on lower bracket (Figure 3, Item 5) and heat shield (Figure 3, Item 10).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

STORAGE BOX MAINTENANCE

Removal, Disassembly, Cleaning and Inspection, Assembly, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's: automotive (Item 23, WP 0126)

Materials/Parts

Cleaning compound, solvent, Type III (Item 6, WP 0129)

Rag, wiping (Item 22, WP 0129)

Locknut (4)

Personnel Required

63J (2)

References

MIL-T-704

WP 0008

Equipment Condition

Pump assembly parked on level ground (WP 0006)

Engine off (WP 0006)

Hand brakes applied (WP 0005)

Wheels chocked

WARNING

Storage box is heavy and awkward to handle. Provide adequate support and use assistance during procedure. Failure to follow this warning may result in injury to personnel or damage to equipment.

NOTE

Storage box weighs approximately 73 lb (33 kg).

REMOVAL

1. Open storage box cover. Remove contents of storage box (Figure 1, Item 1) and set aside.

NOTE

Studs are tack-welded to underside of storage box frame weldment.

2. Remove four nuts (Figure 1, Item 2) and washers (Figure 1, Item 3) from studs (Figure 1, Item 5) protruding through bottom of storage box (Figure 1, Item 1).
3. Remove divider (Figure 1, Item 4) from storage box (Figure 1, Item 1).
4. With assistance, lift storage box (Figure 2, Item 1) clear of storage box mount (Figure 2, Item 7).
5. To remove storage box mount (Figure 2, Item 7), remove two nuts (Figure 2, Item 9), washers (Figure 2, Item 8), and storage box mount from studs (Figure 2, Item 6) at trailer frame.

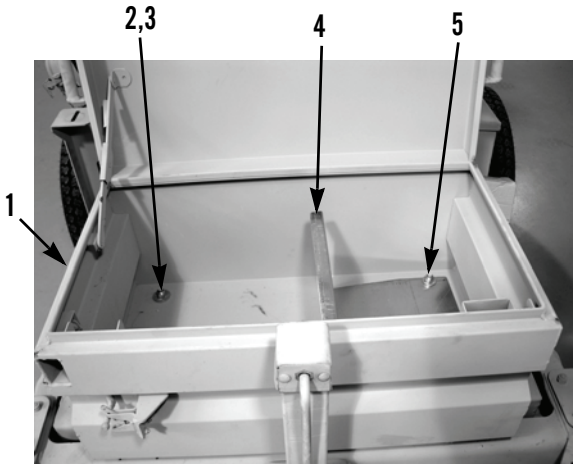


Figure 1. Storage Box.

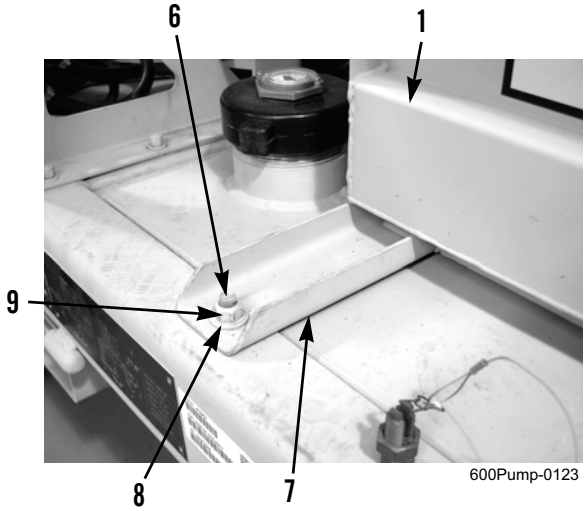


Figure 2. Storage Box Mount.

DISASSEMBLY

1. Remove four locknuts (Figure 3, Item 13) and bolts (Figure 3, Item 14) from latch (Figure 3, Item 10) and latch mounting bracket (Figure 3, Item 12). Discard locknuts.
2. Remove latch (Figure 3, Item 10) from lock rod (Figure 3, Item 11) and latch mounting bracket (Figure 3, Item 12).

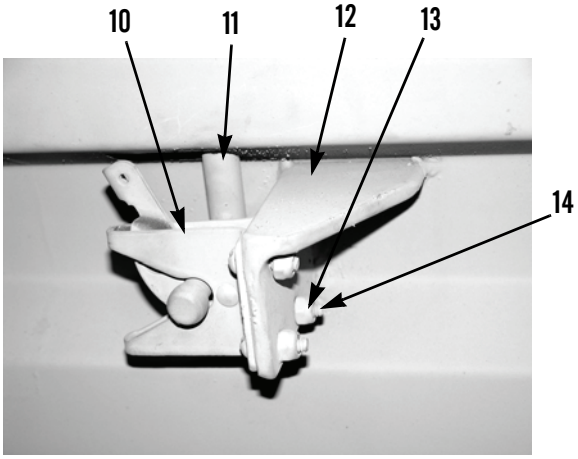


Figure 3. Latch.

CLEANING AND INSPECTION

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low-toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to do so may result in injury or death to personnel.

1. Clean storage box in solvent cleaning compound and wipe dry.
2. Inspect storage box for cracks, corrosion, or other damage.
3. As required, repair rust or corrosion IAW MIL-T-704, *Treatment and Painting of Materiel*.

ASSEMBLY

1. Position latch (Figure 3, Item 10) on latch mounting bracket (Figure 3, Item 12) with lock rod (Figure 3, Item 11) engaged in latch.
2. Install four bolts (Figure 3, Item 14) and new locknuts (Figure 3, Item 13) to secure latch (Figure 3, Item 10) to latch mounting bracket (Figure 3, Item 12).

INSTALLATION

1. To install storage box mount (Figure 4, Item 7), install two washers (Figure 4, Item 8), nuts (Figure 4, Item 9), and storage box mount on studs (Figure 4, Item 6) at trailer frame.
2. With assistance, lift storage box (Figure 4, Item 1) and position on storage box mount (Figure 4, Item 7), with tack-welded studs (Figure 5, Item 5) protruding through holes in bottom of storage box.
3. Position divider (Figure 5, Item 4) inside storage box (Figure 5, Item 1).
4. Install four washers (Figure 5, Item 3) and nuts (Figure 5, Item 2) on studs (Figure 5, Item 5) to secure storage box (Figure 5, Item 1).
5. Place contents of storage box into box IAW *Stowage Guide* in WP 0008. Close storage box cover and latch.

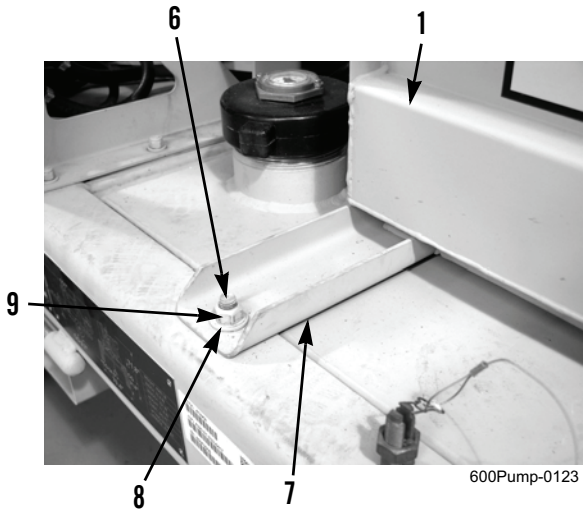


Figure 4. Storage Box Mount.

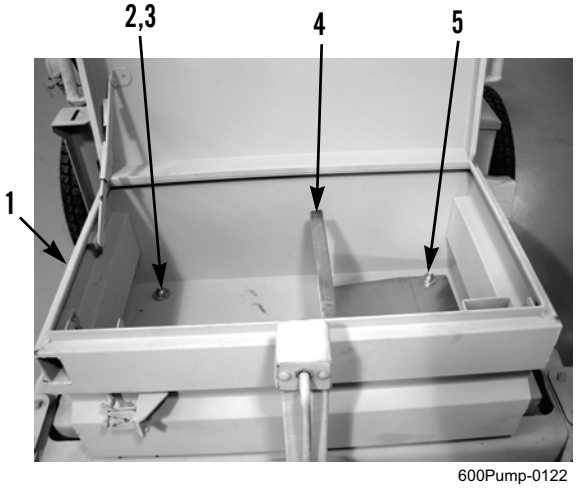


Figure 5. Storage Box.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

GROUND TERMINAL STUD REPLACEMENT

Removal, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Rivet

Personnel Required

63J (1)

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked

REMOVAL

1. Remove nut (Figure 1, Item 5) and ground terminal stud (Figure 1, Item 1) from trailer frame.

WARNING

Eye protection must be worn when drilling out rivet. Failure to take precautions could cause injury to personnel.

2. Drill out rivet (Figure 1, Item 3) and remove clamp (Figure 1, Item 4) with attached lanyard (Figure 1, Item 2) from trailer frame. Discard rivet.

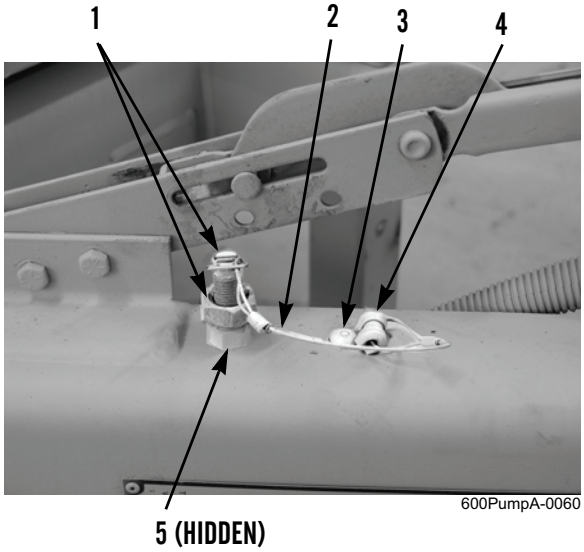


Figure 1. Ground Terminal Stud.

INSTALLATION

1. Secure lanyard (Figure 2, Item 2) to trailer frame with clamp (Figure 2, Item 4) and new rivet (Figure 2, Item 3).

NOTE

To ensure adequate grounding, ensure mounting location for ground terminal stud is clean and free of paint.

2. Install ground terminal stud (Figure 2, Item 1) on trailer frame with nut (Figure 2, Item 5).

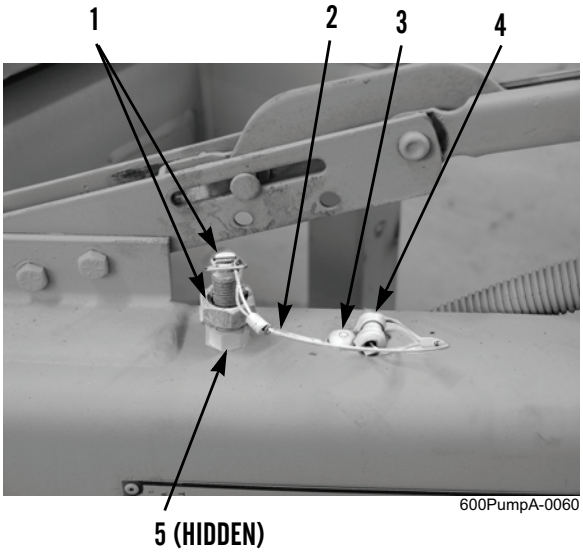


Figure 2. Ground Terminal Stud.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

REFLECTOR REPLACEMENT

Replacement

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Rivet (2)

Personnel Required

63J (1)

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked

NOTE

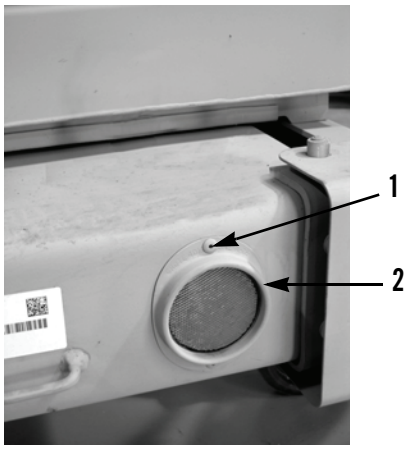
Yellow reflectors at front of trailer and red reflectors at rear of trailer are replaced the same way.

REPLACEMENT

WARNING

Eye protection must be worn when drilling out rivet. Failure to take precautions could cause injury to personnel.

1. Drill out two rivets (Figure 1, Item 1) securing reflector (Figure 1, Item 2) to trailer frame. Remove reflector. Discard rivets.
2. Position reflector (Figure 1, Item 2) on trailer frame and install two new rivets (Figure 1, Item 1).



600PumpA-0092

Figure 1. Reflector.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

ENGINE MOUNTS REPLACEMENT

Front Engine Mount Removal, Front Engine Mount Installation, Follow-On Tasks
Rear Engine Mount Removal, Rear Engine Mount Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)
Bolt, eye, engine lifting (Item 3, WP 0126)
Lifting equipment, 1,000-lb capacity

Materials/Parts

Locknut (4)
Lockwasher (7)

Personnel Required

63J (2)

Equipment Condition

V-belt guard removed, if replacing front engine mount (WP 0081)
Front U-bolt removed from discharge manifold, if replacing right-rear engine mount (WP 0114)

FRONT ENGINE MOUNT REMOVAL

WARNING

Use extreme caution when supporting engine. Provide adequate support and use assistance during procedure. Ensure that lifting equipment used is on solid footing, is in good condition, and is of suitable lift capacity. Keep clear of heavy parts supported only by lifting equipment. Failure to follow this warning may result in death or injury to personnel or damage to equipment.

NOTE

Engine weighs approximately 772 lb (350 kg).

1. Install lifting eyebolt (Figure 1, Item 1) to front of engine. Connect lifting chains to lifting eyebolt and lift until all slack is removed from lifting chains and front of engine is supported.

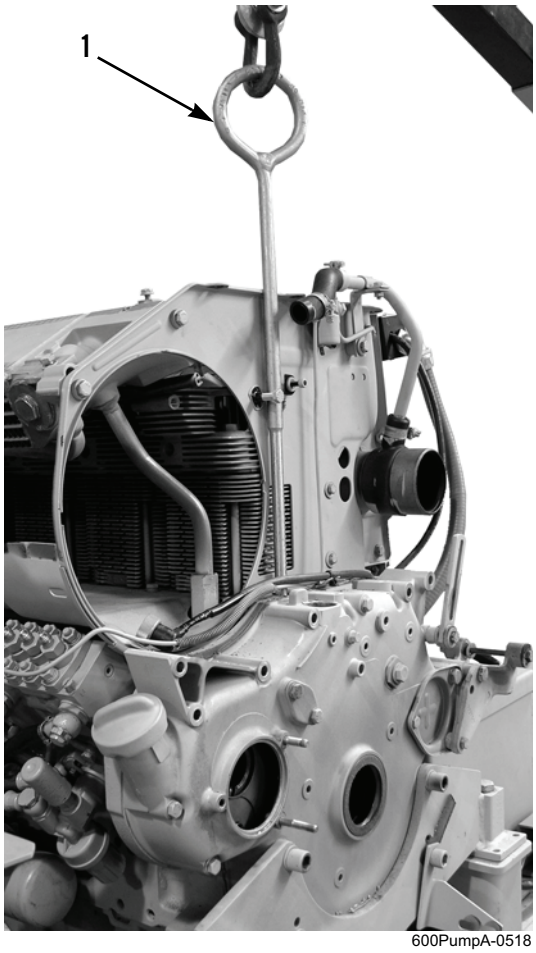


Figure 1. Supporting Front of Engine.

FRONT ENGINE MOUNT REMOVAL - CONTINUED

2. Remove locknut (Figure 2, Item 2), lockwasher (Figure 2, Item 3), washer (Figure 2, Item 4), and bolt (Figure 2, Item 5) from each side of engine crossbeam (Figure 2, Item 6) and frame (Figure 2, Item 7). Discard lockwashers and locknuts.

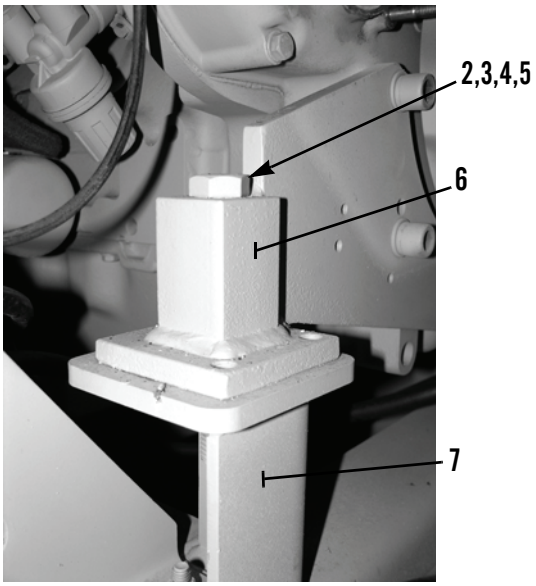


Figure 2. Right Side of Front Engine Mount.

FRONT ENGINE MOUNT REMOVAL - CONTINUED

3. Remove bolt (Figure 3, Item 8) and bracket (Figure 3, Item 12) from engine crossbeam (Figure 3, Item 6) and front engine cover (Figure 3, Item 11).
4. Remove three bolts (Figure 3, Item 8), lockwashers (Figure 3, Item 9), washers (Figure 3, Item 10), and engine crossbeam (Figure 3, Item 6) from front engine cover (Figure 3, Item 11). Discard lockwashers.

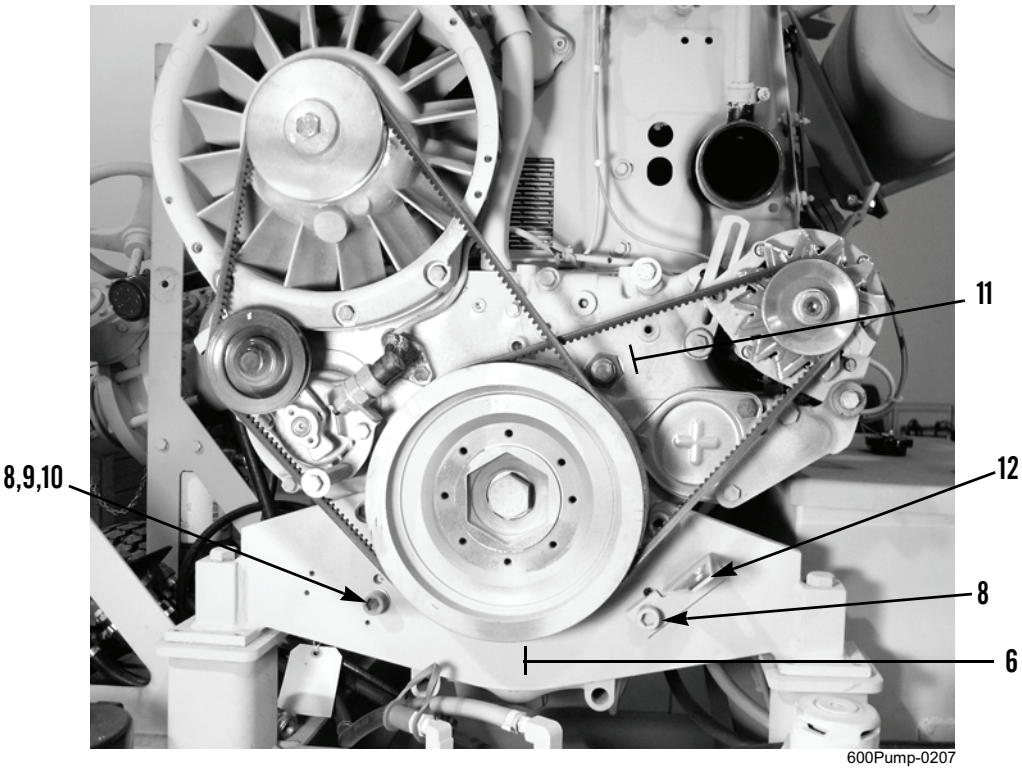


Figure 3. Front Engine Mount.

FRONT ENGINE MOUNT INSTALLATION

1. Install engine crossbeam (Figure 3, Item 6) on front engine cover (Figure 3, Item 11) with three washers (Figure 3, Item 10), new lockwashers (Figure 3, Item 9), and bolts (Figure 3, Item 8).
2. Install bracket (Figure 3, Item 12) on engine crossbeam (Figure 3, Item 6) and front engine cover (Figure 3, Item 11) with bolt (Figure 3, Item 8).
3. Secure each side of engine crossbeam (Figure 2, Item 6) to frame (Figure 2, Item 7) with bolt (Figure 2, Item 5), washer (Figure 2, Item 4), new lockwasher (Figure 2, Item 3), and locknut (Figure 2, Item 2).
4. Lower lifting device and remove lifting chains from lifting eyebolt (Figure 1, Item 1). Remove eyebolt from front of engine.

FOLLOW-ON TASKS

Install V-belt guard (WP 0081).

REAR ENGINE MOUNT REMOVAL

WARNING

Use extreme caution when supporting engine. Provide adequate support and use assistance during procedure. Ensure that lifting equipment used is on solid footing, is in good condition, and is of suitable lift capacity. Keep clear of heavy parts supported only by lifting equipment. Failure to follow this warning may result in death or injury to personnel or damage to equipment.

NOTE

- Engine weighs approximately 772 lb (350 kg).
- Left-rear and right-rear engine mount replacement steps are similar. This procedure replaces left-rear engine mount.

1. Install lifting eyebolt (Figure 4, Item 1) to rear of engine. Connect lifting chains to lifting eyebolt and lift until all slack is removed from lifting chains and rear of engine is supported.

Figure 4. Supporting Rear of Engine.

REAR ENGINE MOUNT REMOVAL - CONTINUED

2. Remove two bolts (Figure 5, Item 13) from engine mount (Figure 5, Item 15) and engine flywheel housing (Figure 5, Item 14).
3. Remove two locknuts (Figure 5, Item 17), lockwashers (Figure 5, Item 18), washers (Figure 5, Item 19), bolts (Figure 5, Item 20), and engine mount (Figure 5, Item 15) from frame (Figure 5, Item 16). Discard lockwashers and locknuts.

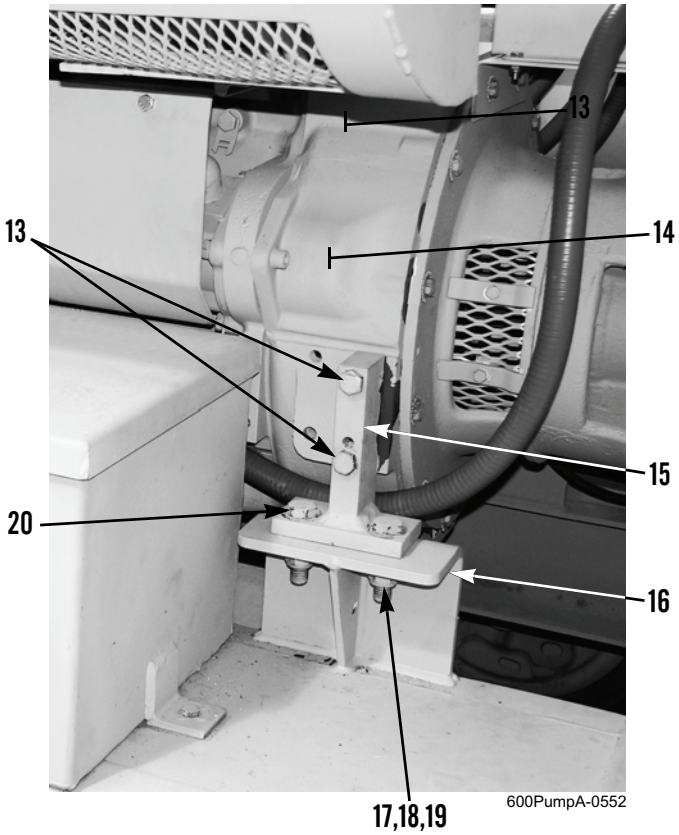


Figure 5. Left-Rear Engine Mount.

REAR ENGINE MOUNT INSTALLATION

1. Install engine mount (Figure 5, Item 15) on frame (Figure 5, Item 16) with two bolts (Figure 5, Item 20), washers (Figure 5, Item 19), new lockwashers (Figure 5, Item 18), and new locknuts (Figure 5, Item 17).
2. Install engine mount (Figure 5, Item 15) on engine flywheel housing (Figure 5, Item 14) with two bolts (Figure 5, Item 13).
3. Lower lifting device and remove lifting chains from lifting eyebolt (Figure 4, Item 1). Remove eyebolt from rear of engine.

FOLLOW-ON TASKS

If right-rear engine mount was replaced, install front U-bolt on discharge manifold (WP 0114).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

ENGINE REPLACEMENT

Engine Removal, Coupling Assembly Removal, Cleaning and Inspection, Coupling Assembly Installation, Engine Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)
Bolt, eye, engine lifting (Item 3, WP 0126)
Lifting equipment, 1,000-lb capacity

Materials/Parts

Adhesive (Item 1, WP 0129)
Antiseize compound (Item 3, WP 0129)
Cap set, protective, dust and moisture (Item 5, WP 0129)
Glycerin, USP (Item 13, WP 0129)
Grease, automotive and artillery, GAA (Item 14, WP 0129)
Rag, wiping (Item 22, WP 0129)
Strap, tiedown, electrical components (Item 26, WP 0129)
Tag, marker (Item 27, WP 0129)
Locknut (6)

Materials/Parts - Continued

Lockwasher (14)
Sealing washer (4)
T-type lockwasher (12)

Personnel Required

63J (3)

References

WP 0006
WP 0023
WP 0084
WP 0106

Equipment Condition

Front and rear leveling jack assemblies extended (WP 0005)
Storage box removed (WP 0069)
Fuel tank removed (WP 0099)

WARNING

Allow engine to cool off before performing engine replacement. Hot metal parts can cause severe burns. Wear eye, glove and skin protection when working with heated parts. Failure to follow this warning may cause injury or death to personnel.

ENGINE REMOVAL

1. Remove two tiedown straps (Figure 1, Item 3) and air line (Figure 1, Item 1) from cooling fan assembly (Figure 1, Item 4). Discard tiedown straps.
2. Remove air line (Figure 1, Item 1) from air cleaner fitting (Figure 1, Item 2).

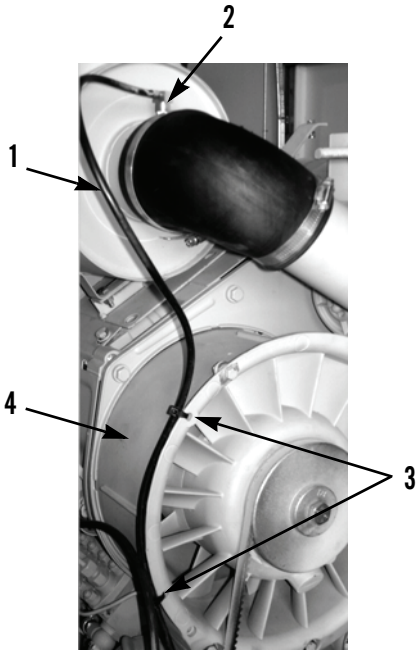


Figure 1. Tiedown Straps and Air Line.

3. Remove bolt (Figure 2, Item 5) and rod (Figure 2, Item 6) from throttle arm (Figure 2, Item 7) at fuel injection pump (Figure 2, Item 8).

WARNING

- DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing damage to equipment and injury or death to personnel.
- Wear fuel-resistant gloves and eye protection when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. Failure to follow this warning may result in injury to personnel.
- When servicing this equipment, performing maintenance, or disposing of materials such as fuel, consult your unit/local hazardous waste disposal center or safety office for regulatory guidance.

CAUTION

Wipe area clean around all connections to be opened during removal. Cap lines and plug openings after removing lines. Contamination of fuel system could result in premature failure.

ENGINE REMOVAL - CONTINUED

4. Bleed pressure from fuel system by loosening ventilation valve setscrew (WP 0106).

NOTE

Tag fuel lines to ensure correct installation.

5. Remove fluid passage bolt (Figure 2, Item 10), sealing washer (Figure 2, Item 11), fuel line (Figure 2, Item 9), and sealing washer (Figure 2, Item 12) from fuel injection pump (Figure 2, Item 8). Discard sealing washers.
6. Remove fluid passage bolt (Figure 2, Item 13), sealing washer (Figure 2, Item 14), fuel line (Figure 2, Item 16), and sealing washer (Figure 2, Item 15) from fuel injection pump (Figure 2, Item 8). Discard sealing washers.

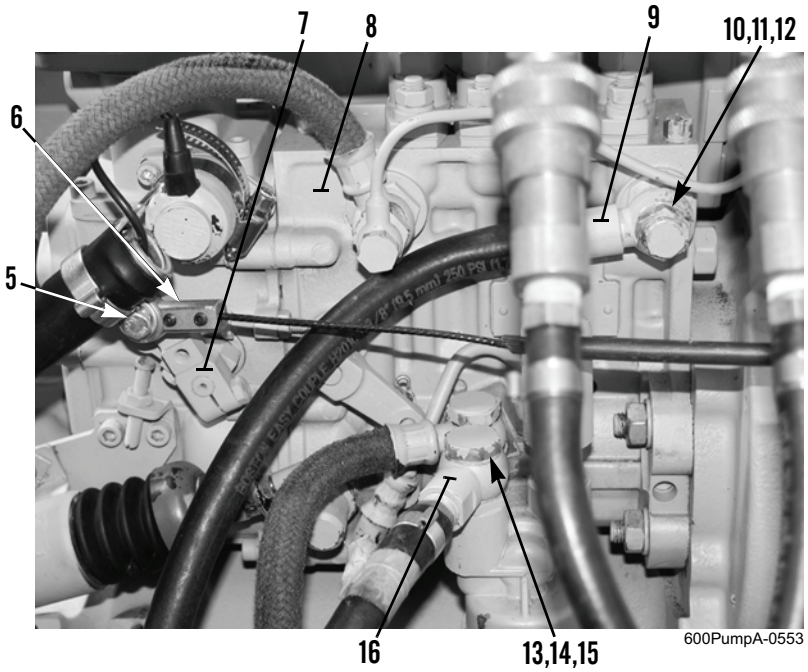


Figure 2. Throttle and Fuel Line Connections.

ENGINE REMOVAL - CONTINUED

WARNING

- Use extreme caution when lifting engine. Provide adequate support and use assistance during procedure. Ensure that lifting equipment used is on solid footing, is in good condition, and is of suitable lift capacity. Keep clear of heavy parts supported only by lifting equipment. Failure to follow this warning may result in death or injury to personnel or damage to equipment.
- Lift engine slowly and smoothly. Do not swing load from side to side, as this places extra strain on lifting components. Watch boom angle and overhead clearance when lifting. Failure to follow this warning may result in injury or death to personnel or damage to equipment.

NOTE

Engine weighs approximately 772 lb (350 kg).

7. Install two lifting eyebolts (Figure 3, Item 17) to front and rear of engine (Figure 3, Item 19).
8. Connect lifting device with spreader bar (Figure 3, Item 18) to lifting eyebolts (Figure 3, Item 17), support engine (Figure 3, Item 19) with lifting device, and raise lifting device until all slack is removed from chains.

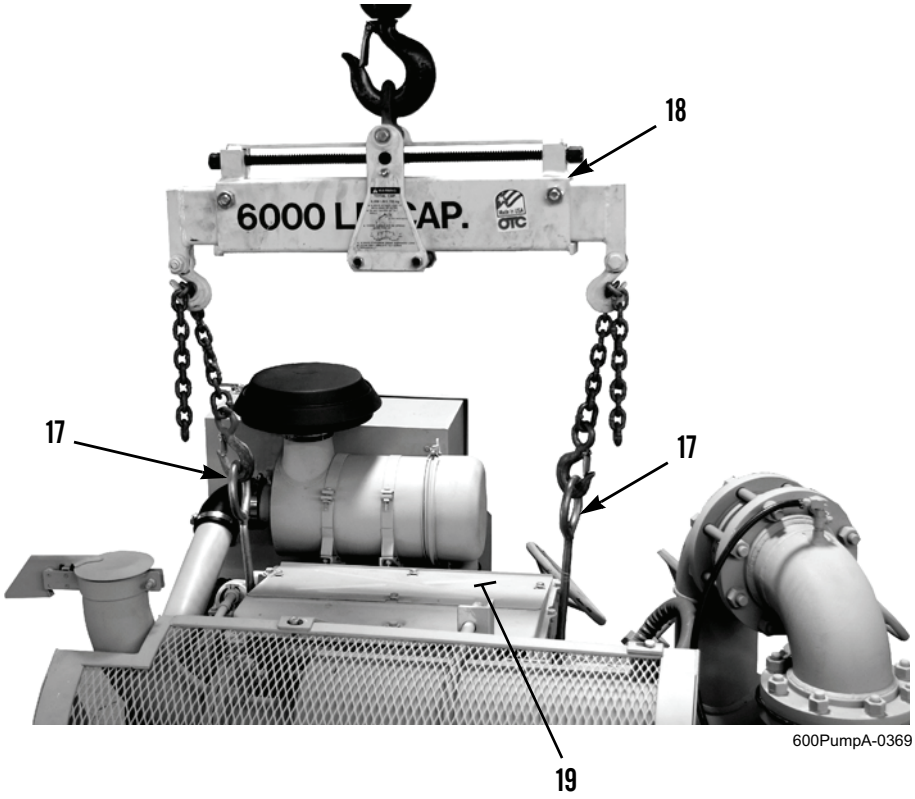


Figure 3. Lifting Eyebolts.

ENGINE REMOVAL - CONTINUED

9. Remove 12 capscrews (Figure 4, Item 21) and T-type lockwashers (Figure 4, Item 22) from intermediate housing (Figure 4, Item 25), engine flywheel housing (Figure 4, Item 20), and junction box mounting bracket (Figure 4, Item 24). Discard T-type lockwashers.
10. Place junction box (Figure 4, Item 23) and mounting bracket (Figure 4, Item 24) out of the way on engine flywheel housing (Figure 4, Item 20) and secure with a tiedown strap.

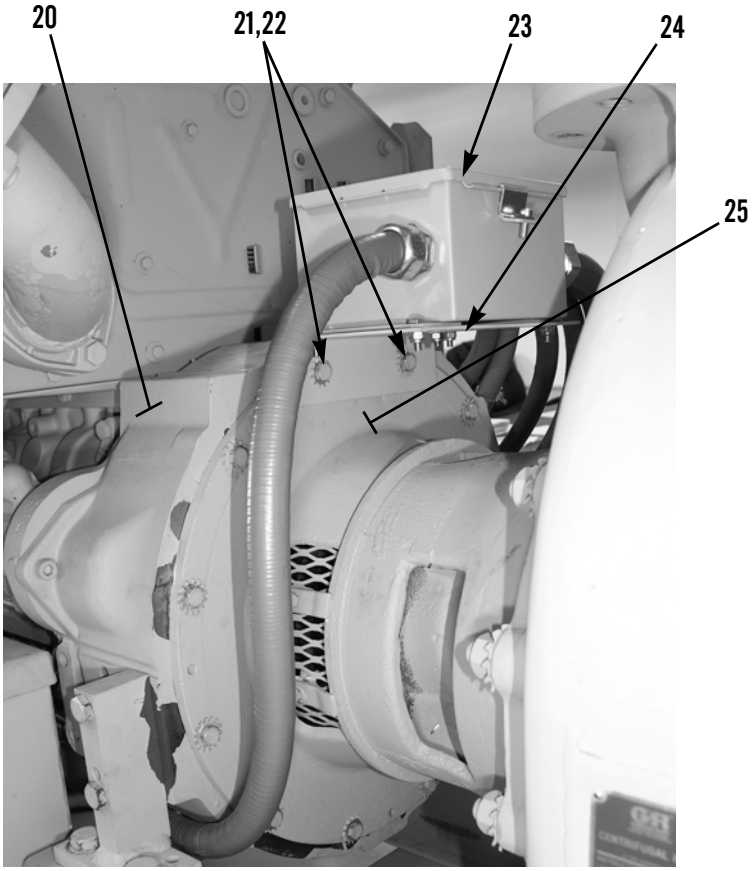


Figure 4. Engine and Intermediate Housing.

ENGINE REMOVAL - CONTINUED

11. Remove two nuts (Figure 5, Item 29), four washers (Figure 5, Item 27), two shock mounts (Figure 5, Item 28), and discharge manifold front U-bolt (Figure 5, Item 30) from bracket (Figure 5, Item 26).

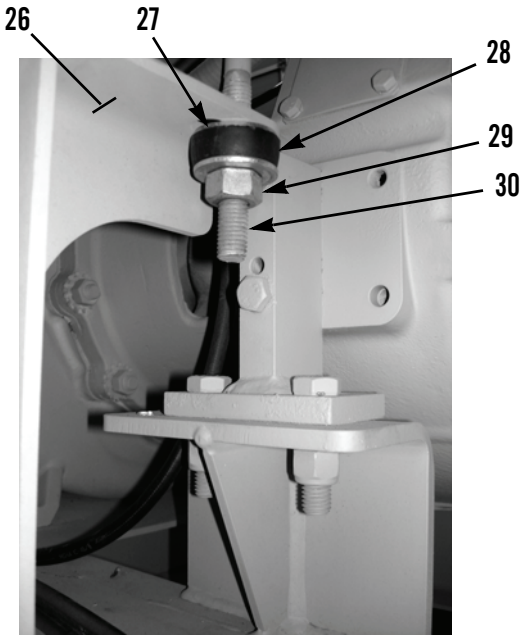


Figure 5. Discharge Manifold Front U-bolt.

12. Remove two locknuts (Figure 6, Item 34), lockwashers (Figure 6, Item 33), and bolts (Figure 6, Item 32) from front engine crossbeam (Figure 6, Item 31). Discard locknuts and lockwashers.

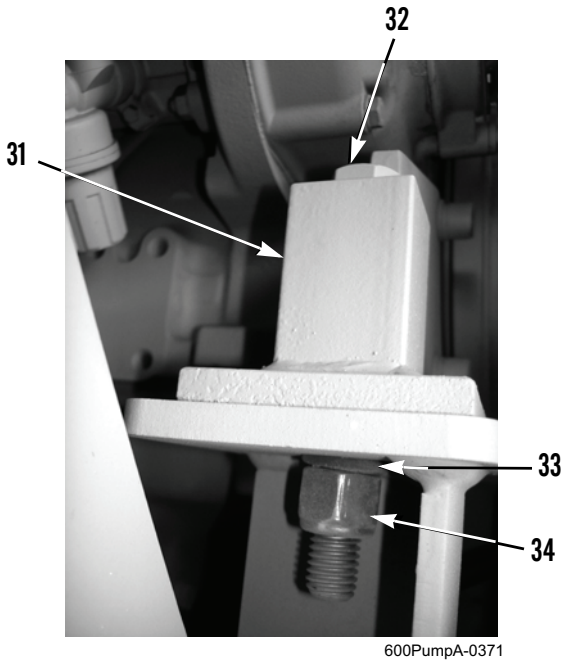


Figure 6. Front Engine Mount.

ENGINE REMOVAL - CONTINUED

13. Remove two locknuts (Figure 7, Item 38), lockwashers (Figure 7, Item 37), and bolts (Figure 7, Item 36) from right-rear engine mount (Figure 7, Item 35). Discard locknuts and lockwashers.

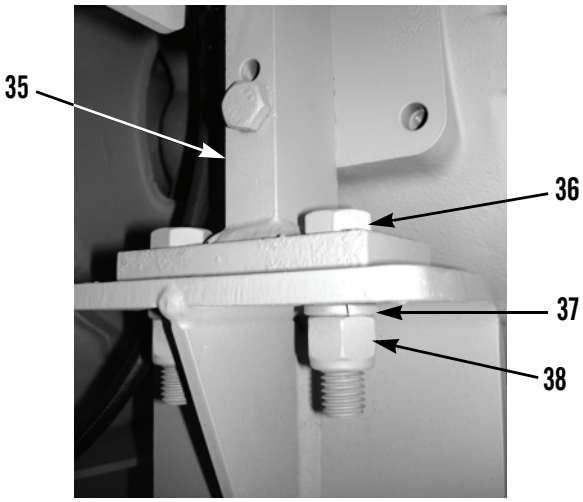


Figure 7. Right-Rear Engine Mount.

ENGINE REMOVAL - CONTINUED

NOTE

Left-rear engine mount is removed from engine flywheel housing and trailer frame to allow room to remove engine.

14. Remove two bolts (Figure 8, Item 39) from left-rear engine mount (Figure 8, Item 40) and engine flywheel housing (Figure 8, Item 20).
15. Remove two locknuts (Figure 8, Item 43), lockwashers (Figure 8, Item 44), washers (Figure 8, Item 45), bolts (Figure 8, Item 41), and left-rear engine mount (Figure 8, Item 40) from trailer frame (Figure 8, Item 42). Discard locknuts and lockwashers.

NOTE

As assemblies separate, flexible coupling will remain on impeller shaft.

16. Using lifting device, separate engine (Figure 8, Item 19) from intermediate housing (Figure 8, Item 25) by pulling engine forward and straight away from intermediate housing.
17. Place engine (Figure 8, Item 19) on suitable cribbing in a clean work area.

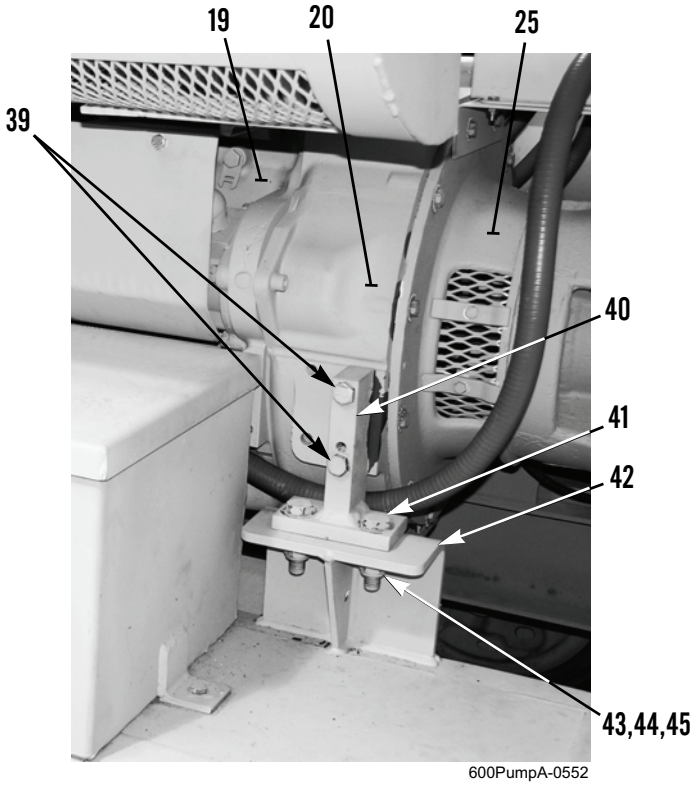


Figure 8. Left Rear of Engine.

COUPLING ASSEMBLY REMOVAL

1. To remove outer ring (Figure 9, Item 46) of coupling assembly from engine flywheel (Figure 9, Item 47), remove eight socket head capscrews (Figure 9, Item 48) and lockwashers (Figure 9, Item 49). Discard lockwashers.
2. Inspect pilot bushing assembly (Figure 9, Item 50) inside engine flywheel (Figure 9, Item 47) for excessive wear. As required, remove pilot bushing assembly, using a slide hammer puller.

COUPLING ASSEMBLY REMOVAL - CONTINUED

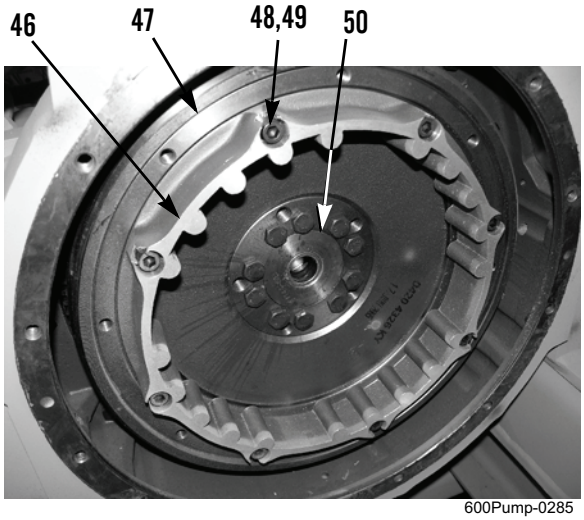


Figure 9. Outer Ring and Pilot Bushing Assembly.

CLEANING AND INSPECTION

1. Clean and inspect all parts IAW WP 0023.
2. Replace any damaged part.
3. Remove any parts or components from engine that are not supplied or provided with new replacement engine. Transfer parts or components and install on new engine.

COUPLING ASSEMBLY INSTALLATION

NOTE

If engine was replaced, new engine will not come with pilot bushing assembly and outer ring of coupling assembly installed. Perform steps 1-3 to install pilot bushing assembly and outer ring.

1. If removed, install pilot bushing assembly (Figure 9, Item 50) in bore of engine flywheel (Figure 9, Item 47), with beveled side of outer hub facing in. Ensure pilot bushing assembly is installed flush with flywheel.
2. Apply antiseize compound to inside diameter of pilot bushing assembly (Figure 9, Item 50).
3. If removed, install outer ring (Figure 9, Item 46) of coupling assembly on engine flywheel (Figure 9, Item 47):
   a. Apply Loctite adhesive to eight socket head capscrews (Figure 9, Item 48).
   b. Install eight new lockwashers (Figure 9, Item 49) and socket head capscrews (Figure 9, Item 48) to secure outer ring (Figure 9, Item 46) of coupling assembly to engine flywheel (Figure 9, Item 47). Tighten capscrews alternately and evenly to 45 lb-ft (61 Nm).

ENGINE INSTALLATION

WARNING

- Use extreme caution when lifting engine. Provide adequate support and use assistance during procedure. Ensure that lifting equipment used is on solid footing, is in good condition, and is of suitable lift capacity. Keep clear of heavy parts supported only by lifting equipment. Failure to follow this warning may result in death or injury to personnel or damage to equipment.
- Lift engine slowly and smoothly. Do not swing load from side to side, as this places extra strain on lifting components. Watch boom angle and overhead clearance when lifting. Failure to follow this warning may result in injury or death to personnel or damage to equipment.

NOTE

Engine weighs approximately 772 lb (350 kg).

1. Install two lifting eyebolts (Figure 10, Item 17) to front and rear of engine (Figure 10, Item 19).
2. Connect lifting device with spreader bar (Figure 10, Item 18) to lifting eyebolts (Figure 10, Item 17), support engine (Figure 10, Item 19) with lifting device, and raise lifting device until all slack is removed from chains.

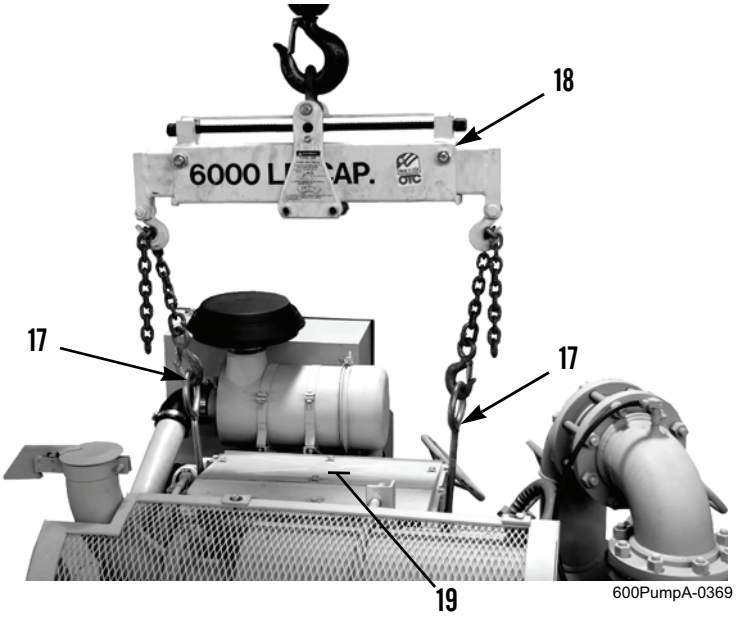


Figure 10. Lifting Eyebolts.

ENGINE INSTALLATION - CONTINUED

CAUTION

DO NOT use petroleum-based lubricants, or any other substance which may soften or otherwise damage rubber (flexible) portion of coupling assembly.

3. To assist in installation, lightly lubricate rubber (flexible) coupling on pump with glycerin.

CAUTION

Use caution not to damage engine/control panel wiring harness when positioning engine at intermediate housing.

4. Lift engine (Figure 11, Item 19), position on trailer chassis, and align flywheel housing (Figure 11, Item 20) with intermediate housing (Figure 11, Item 25). Align coupling assembly and move engine rearward until flush with intermediate housing.
5. Cut tiedown strap and reposition junction box mounting bracket (Figure 11, Item 24) with junction box (Figure 11, Item 23) at intermediate housing (Figure 11, Item 25).
6. Loosely install 12 new T-type lockwashers (Figure 11, Item 22) and capscrews (Figure 11, Item 21) on intermediate housing (Figure 11, Item 25), junction box mounting bracket (Figure 11, Item 24), and engine flywheel housing (Figure 11, Item 20). DO NOT fully tighten capscrews.

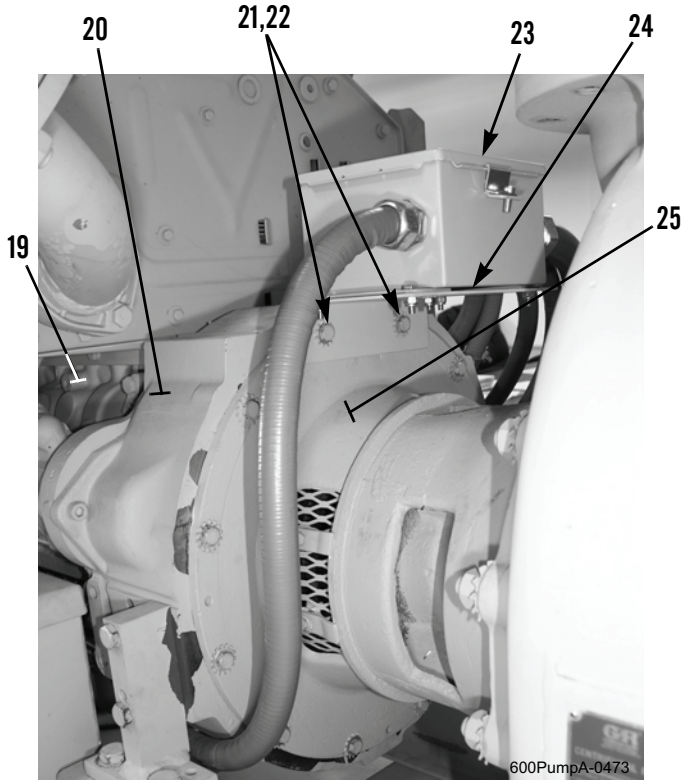


Figure 11. Engine and Intermediate Housing.

ENGINE INSTALLATION - CONTINUED

7. Install left-rear engine mount (Figure 12, Item 40) to trailer frame (Figure 12, Item 42) with two bolts (Figure 12, Item 41), washers (Figure 12, Item 45), new lockwashers (Figure 12, Item 44), and new locknuts (Figure 12, Item 43).
8. Apply three drops of adhesive to two bolts (Figure 12, Item 39) and install bolts on left-rear engine mount (Figure 12, Item 40) and engine flywheel housing (Figure 12, Item 20).

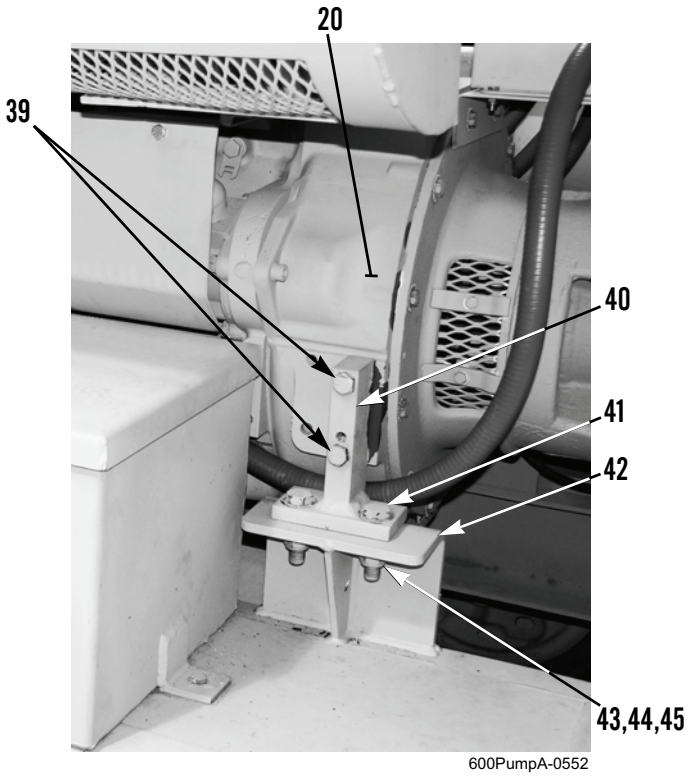


Figure 12. Left Rear of Engine.

ENGINE INSTALLATION - CONTINUED

9. Install two bolts (Figure 13, Item 36), new lockwashers (Figure 13, Item 37), and new locknuts (Figure 13, Item 38) on right-rear engine mount (Figure 13, Item 35).

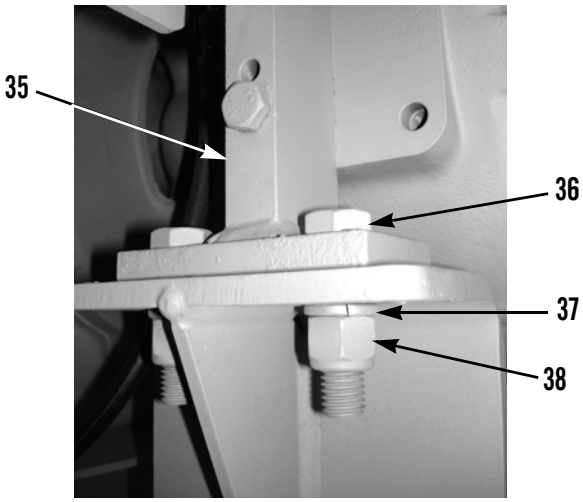


Figure 13. Right-Rear Engine Mount.

10. Install two bolts (Figure 14, Item 32), new lockwashers (Figure 14, Item 33), and new locknuts (Figure 14, Item 34) on front engine crossbeam (Figure 14, Item 31).

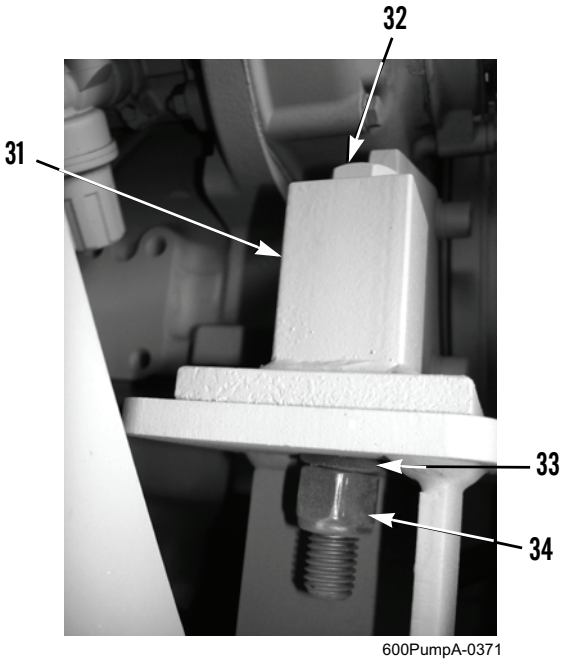


Figure 14. Front Engine Mount.

ENGINE INSTALLATION - CONTINUED

11. Alternately and evenly, apply final torque of 30 lb-ft (41 Nm) to 12 capscrews (Figure 15, Item 21).

Figure 15. Intermediate Housing Capscrews.

12. Install discharge manifold front U-bolt (Figure 16, Item 30) on bracket (Figure 16, Item 26) with four washers (Figure 16, Item 27), two shock mounts (Figure 16, Item 28), and nuts (Figure 16, Item 29).

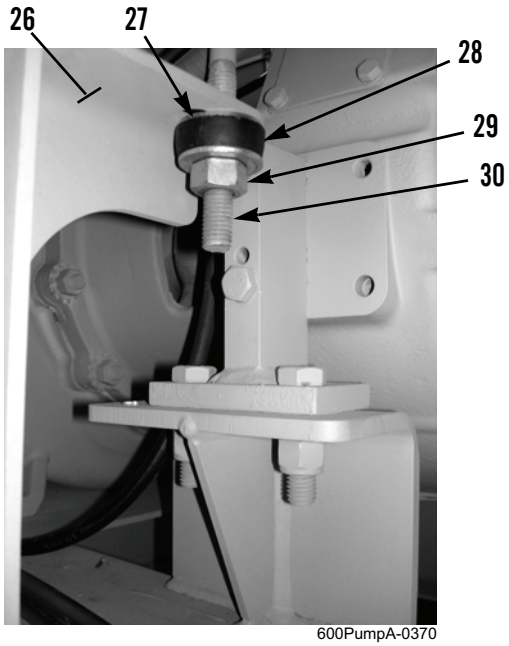


Figure 16. Discharge Manifold Front U-Bolt.

ENGINE INSTALLATION - CONTINUED

13. Remove lifting eyebolts (Figure 17, Item 17) and lifting equipment from engine.

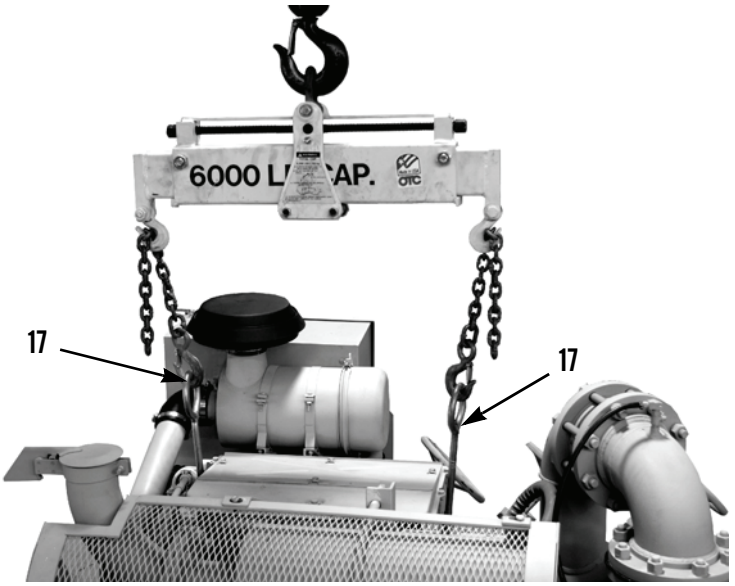


Figure 17. Lifting Eyebolts.

14. Install new sealing washer (Figure 18, Item 15), fuel line (Figure 18, Item 16), new sealing washer (Figure 18, Item 14), and fluid passage bolt (Figure 18, Item 13) on fuel injection pump (Figure 18, Item 8).
15. Install new sealing washer (Figure 18, Item 12), fuel line (Figure 18, Item 9), new sealing washer (Figure 18, Item 11), and fluid passage bolt (Figure 18, Item 10) on fuel injection pump (Figure 18, Item 8).
16. Install rod (Figure 18, Item 6) and bolt (Figure 18, Item 5) on throttle arm (Figure 18, Item 7) at fuel injection pump (Figure 18, Item 8).

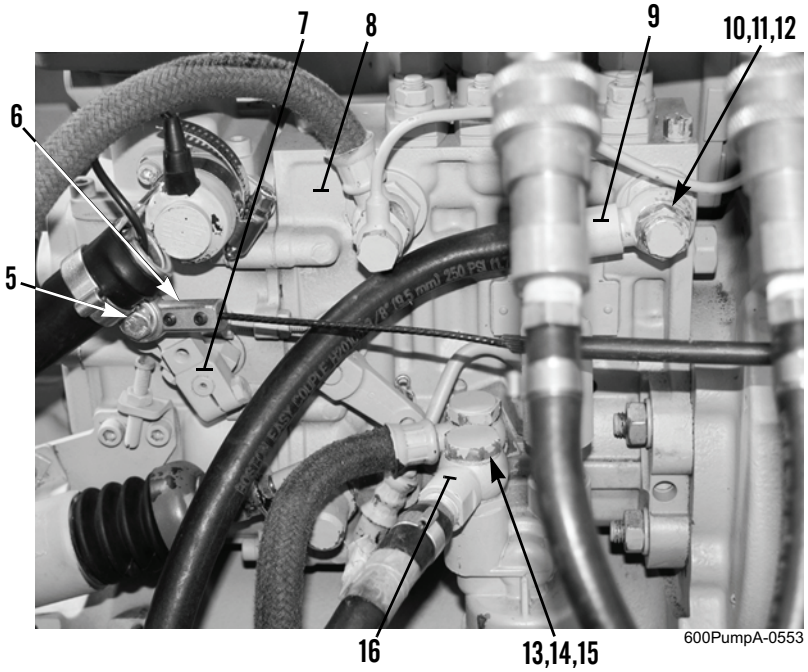


Figure 18. Throttle and Fuel Line Connections.

ENGINE INSTALLATION - CONTINUED

17. Install air line (Figure 19, Item 1) and two new tiedown straps (Figure 19, Item 3) on cooling fan assembly (Figure 19, Item 4).
18. Install air line (Figure 19, Item 1) on air cleaner fitting (Figure 19, Item 2).

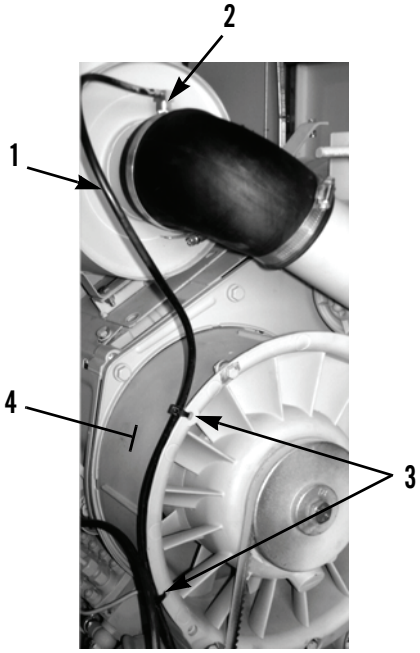


Figure 19. Tiedown Straps and Air Line.

FOLLOW-ON TASKS

1. Install fuel tank (WP 0099).
2. Install storage box (WP 0069).
3. Bleed fuel system (WP 0106).

CAUTION

Ensure engine is filled with correct type and amount of engine oil before starting engine. Running engine without oil will cause major engine damage.

4. Ensure engine is filled with appropriate oil (WP 0084).

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

5. Fill pump volute 2/3 full with appropriate fluid, then start engine (WP 0006).
6. Check engine and pump operation. Be alert for leaks.
7. Shut down engine (WP 0006).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

SETTING ENGINE AT TOP DEAD CENTER (TDC)

Setting TDC, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)
Pointer tool (Item 11, WP 0126)

Materials/Parts

Rag, wiping (Item 22, WP 0129)

Personnel Required

63J (2)

Equipment Condition

V-belt guard removed (WP 0081)
Valve cover removed from cylinder No. 1 (WP 0080)

SETTING TDC

NOTE

- Cylinder No. 1 is rearmost cylinder on engine.
- Valves are overlapped when exhaust valve is not yet closed and inlet valve is about to open. In this position, two pushrods cannot be turned.

1. Slowly turn engine clockwise (as viewed from the front) until both valves of cylinder No. 1 overlap.
2. Mark top of vibration damper (Figure 1, Item 2) after overlap position has been achieved.
3. Attach pointer tool to engine front cover (Figure 1, Item 1), placed above and aligned with center of vibration damper (Figure 1, Item 2).

NOTE

When facing vibration damper, engine rotation direction is clockwise (right).

4. Use a socket and breaker bar to rotate crankshaft approximately 180 degrees in direction of engine rotation (Figure 1).

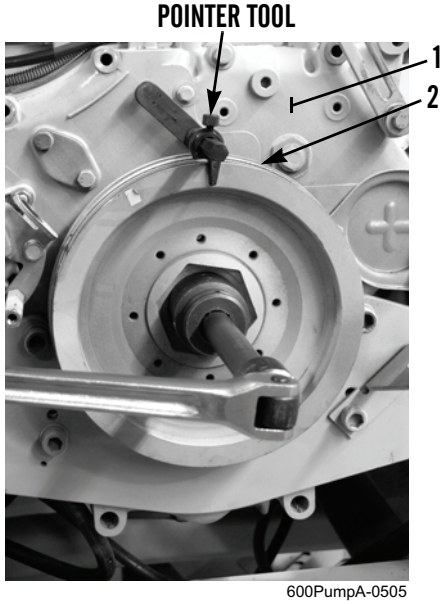


Figure 1. Attaching Pointer Tool and Rotating Crankshaft.

SETTING TDC - CONTINUED

5. Depress intake valve (Figure 2, Item 4) and insert a 5 mm key stock between intake valve and rocker arm (Figure 2, Item 3).

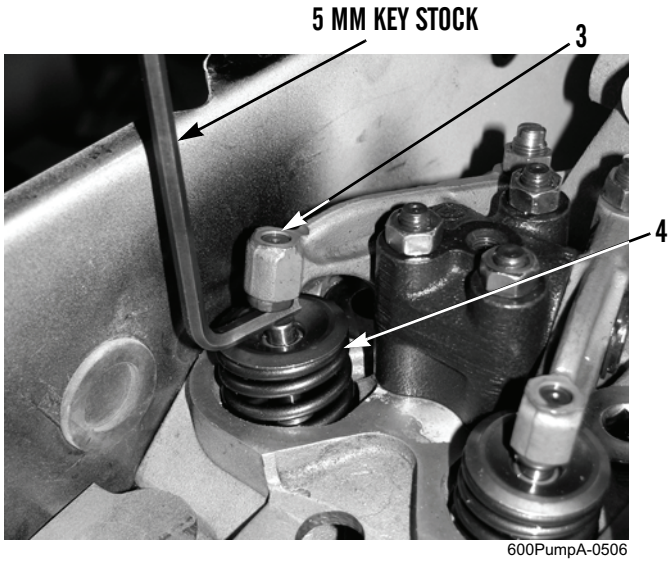


Figure 2. 5 mm Key Stock.

CAUTION

Do NOT continue to turn crankshaft after increased resistance is felt. Failure to follow this caution may bend intake valve.

6. Slowly turn crankshaft clockwise (right) until a significant increase in resistance to turning is felt. This indicates piston has made light contact with intake valve (Figure 2, Item 4). If mark on vibration damper (made in step 2) is again at top, crankshaft has been turned too far.
7. Mark V-belt pulley (Figure 3, Item 5) where indicated by pointer tool. This is the first mark.

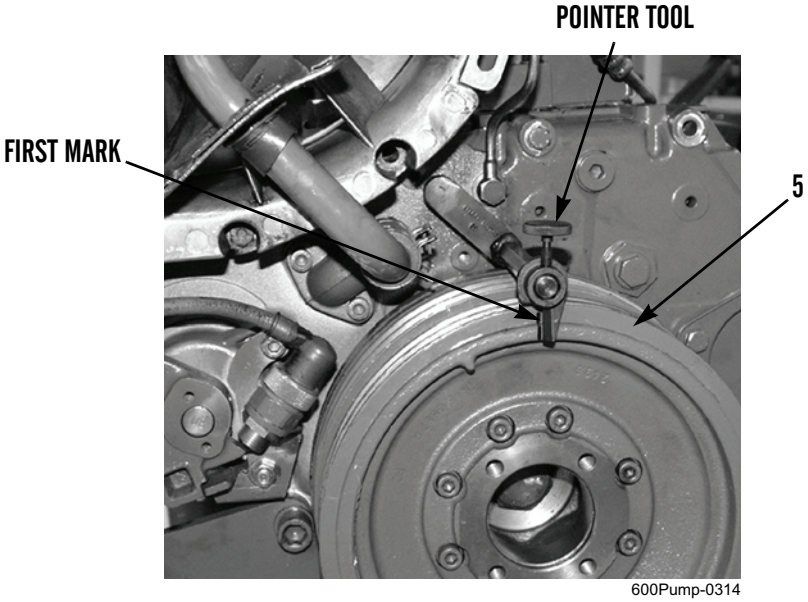


Figure 3. Placing First Mark.

SETTING TDC - CONTINUED

8. Rotate crankshaft 90 degrees in opposite direction of engine rotation (counterclockwise) (left).
9. Remove 5 mm key stock from between rocker arm (Figure 2, Item 3) and intake valve (Figure 2, Item 4).
10. Rotate crankshaft clockwise (right) 90 degrees past first mark.
11. Reinsert 5 mm key stock between intake valve (Figure 2, Item 4) and rocker arm (Figure 2, Item 3).

CAUTION

Do NOT continue to turn crankshaft after increased resistance is felt. Failure to follow this caution may bend intake valve.

12. Slowly turn crankshaft in direction opposite engine rotation (counterclockwise) (left) until a significant increase in resistance to turning is felt.
13. Mark V-belt pulley (Figure 3, Item 5) where indicated by pointer tool. This is second mark.
14. Rotate crankshaft clockwise (right) 90 degrees.
15. Remove 5 mm key stock from between rocker arm (Figure 2, Item 3) and intake valve (Figure 2, Item 4).
16. Measure midpoint between first mark and second mark on V-belt pulley (Figure 4, Item 5). This is top dead center (TDC). Mark V-belt pulley to indicate TDC.

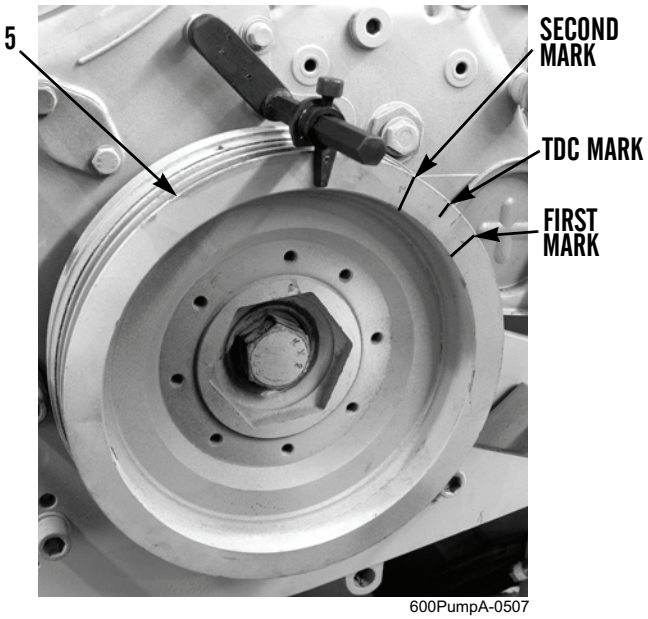


Figure 4. Determining TDC Mark on V-belt Pulley.

FOLLOW-ON TASKS

1. Install valve cover on cylinder No. 1 (WP 0080).
2. Install V-belt guard (WP 0081).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

CHECKING ENGINE COMPRESSION

Checking Engine Compression, Follow-On Tasks, Interpreting Results

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)
Connector (Item 5, WP 0126)
Tester, cylinder com (Item 21, WP 0126)
Suitable drain hose

Materials/Parts

Rag, wiping (Item 22, WP 0129)
Seal (4)

Equipment Condition

Fuel injectors removed (WP 0026)
Valve clearance checked and adjusted (WP 0080)

CHECKING ENGINE COMPRESSION

NOTE

Repeat the following procedure for each cylinder.

1. Install a suitable drain hose (Figure 1, Item 4) on end of fuel injector line (Figure 1, Item 3) and place other end of drain hose into a container, to capture fuel when engine is cranked.
2. Install adapter (Figure 1, Item 2) from cylinder compression tester to end of connector tool (Figure 1, Item 1).
3. Position new seal (Figure 1, Item 6) and connector tool (Figure 1, Item 1) in cylinder head (Figure 1, Item 5).

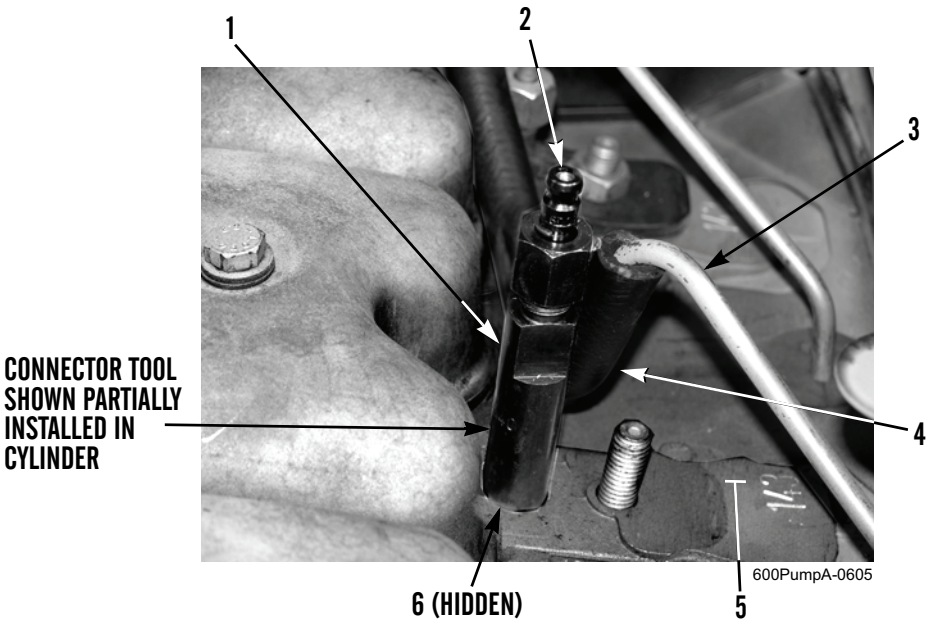


Figure 1. Connector Tool, Compression Tester Adapter, and Drain Hose.

4. Install clamping pad (Figure 2, Item 8) and nut (Figure 2, Item 7) to secure connector tool (Figure 1, Item 1) to cylinder head (Figure 2, Item 5). Tighten nut to 18 to 26 lb-ft (25 to 35 Nm).

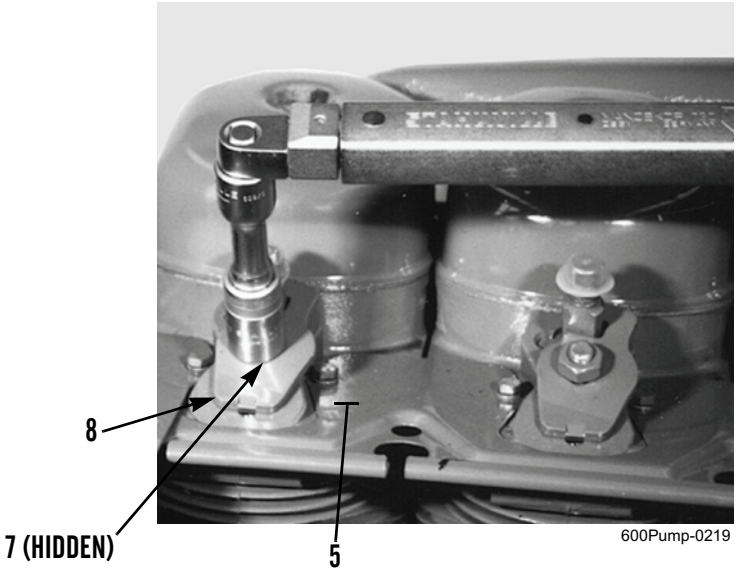


Figure 2. Securing Connector Tool.

CHECKING ENGINE COMPRESSION - CONTINUED

5. Attach compression tester (Figure 3, Item 9) to adapter (Figure 3, Item 2).
6. Crank engine (WP 0006) and record measurement from compression tester (Figure 3, Item 9).
7. Remove compression tester (Figure 3, Item 9) from adapter (Figure 3, Item 2).
8. Remove nut (Figure 3, Item 7), clamping pad (Figure 3, Item 8), and connector tool (Figure 3, Item 1) from cylinder head (Figure 3, Item 5).
9. Remove adapter (Figure 3, Item 2) from connector tool (Figure 3, Item 1).

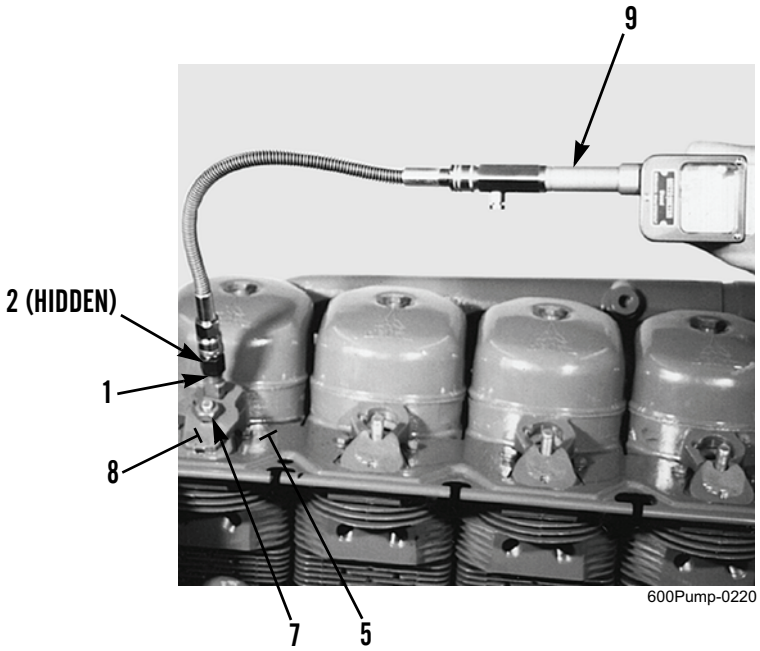


Figure 3. Measuring Engine Compression.

FOLLOW-ON TASKS

Install fuel injectors (WP 0026).

INTERPRETING RESULTS

1. Under normal conditions, engine compression can be affected by ambient temperature and altitude; both affect cranking speed and therefore compression readings.
2. Engine damage and wear can also affect engine compression readings.
3. To interpret compression readings, recorded pressure from each cylinder should be compared to other cylinders.
   a. On average, a reading of 290 to 435 PSI (20 to 30 kPa, or 20 to 30 bar) indicates a correct pressure reading.
   b. A difference in excess of 15 percent, recorded from one cylinder, indicates a problem in that cylinder.
   c. For example, three cylinders have readings of 291 PSI, one cylinder has a reading of 247 PSI. The cylinder with the reading of 247 PSI (17 kPa, or 17 bar) is 15 percent below other cylinder readings and requires repair.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

CYLINDER HEAD ASSEMBLY REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)
Spring compressor (Item 20, WP 0126)

Materials/Parts

Rag, wiping (Item 22, WP 0129)
Lockwasher (7)

Personnel Required

63J (2)

References

WP 0023
WP 0077

Equipment Condition

Intake manifold removed (WP 0088)
Exhaust manifold removed (WP 0089)
Lower left cooling air guide plate removed (WP 0108)
Fuel injectors removed (WP 0026)
Air baffle removed (WP 0103)
Rocker arm and rocker arm bracket removed (WP 0079)

REMOVAL

NOTE

- Perform the following procedure for each cylinder.
- Note orientation of all components removed from each cylinder to aid in installation.

1. Remove two pushrods (Figure 1, Item 1) from cylinder head (Figure 1, Item 2).

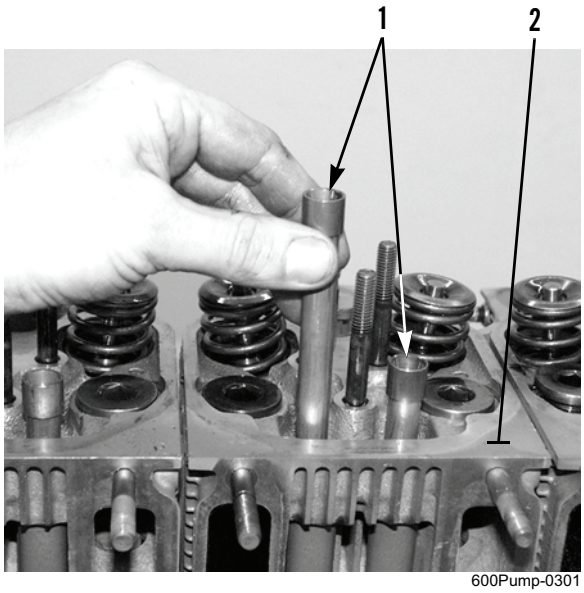


Figure 1. Pushrods.

REMOVAL - CONTINUED

2. Remove two screw plugs (Figure 2, Item 3) from cylinder head (Figure 2, Item 2).

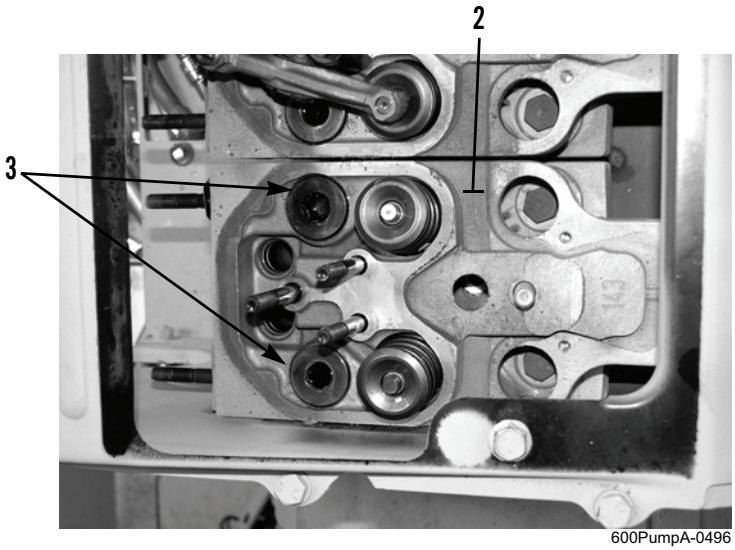


Figure 2. Screw Plugs.

3. Fully loosen bolts (Figure 3, Item 4) from cylinder head (Figure 3, Item 2).

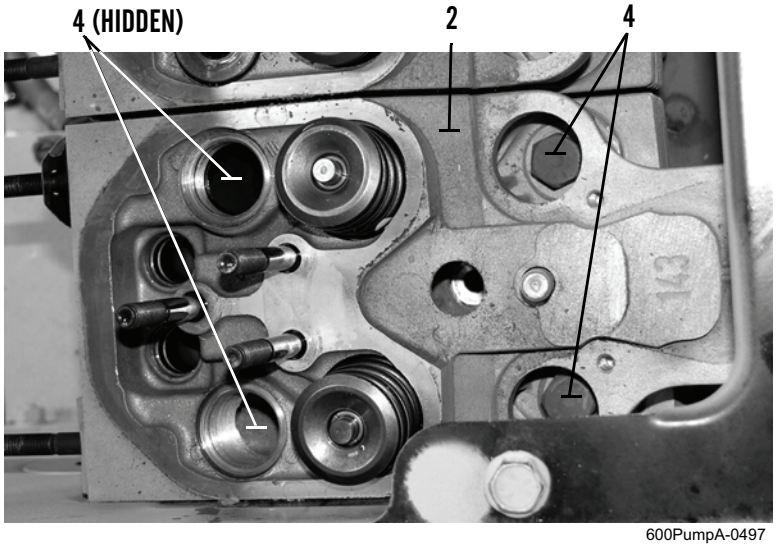
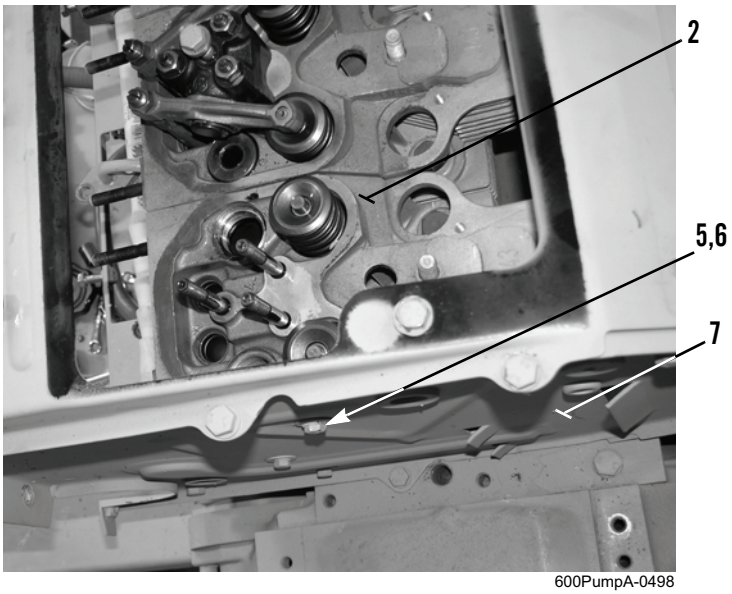


Figure 3. Cylinder Head Bolts.

REMOVAL - CONTINUED

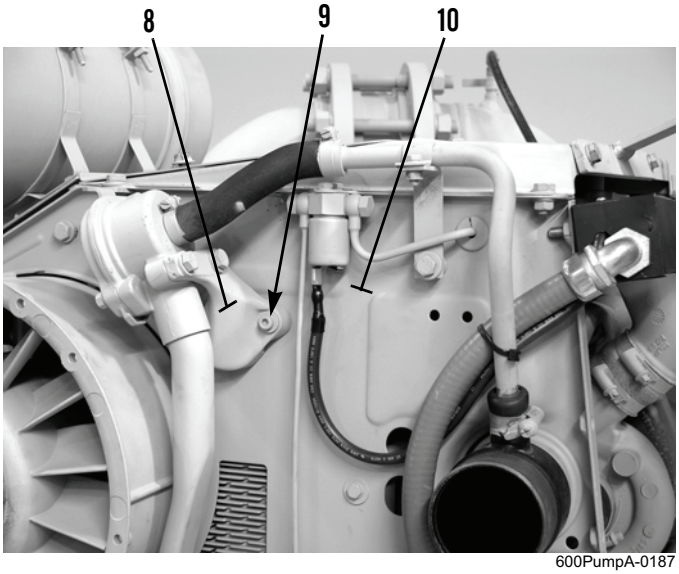
4. If removing rearmost cylinder head (Figure 4, Item 2), remove bolt (Figure 4, Item 5) and washer (Figure 4, Item 6) from rear air duct wall (Figure 4, Item 7) and cylinder head.



600PumpA-0498

Figure 4. Cylinder Head and Rear Air Duct Wall.

5. If removing frontmost cylinder head (Figure 4, Item 2), remove torx head screw (Figure 5, Item 9) from crankcase breather bracket (Figure 5, Item 8), front air duct wall (Figure 5, Item 10), and cylinder lead.



600PumpA-0187

Figure 5. Cylinder Head and Front Air Duct Wall.

REMOVAL - CONTINUED

6. Remove two bolts (Figure 6, Item 11), lockwashers (Figure 6, Item 12), and washers (Figure 6, Item 13) from rear air duct wall (Figure 6, Item 7) and cover plate (Figure 6, Item 17). Discard lockwashers.
7. Repeat step 6 to remove same parts at front air duct wall (Figure 5, Item 10).

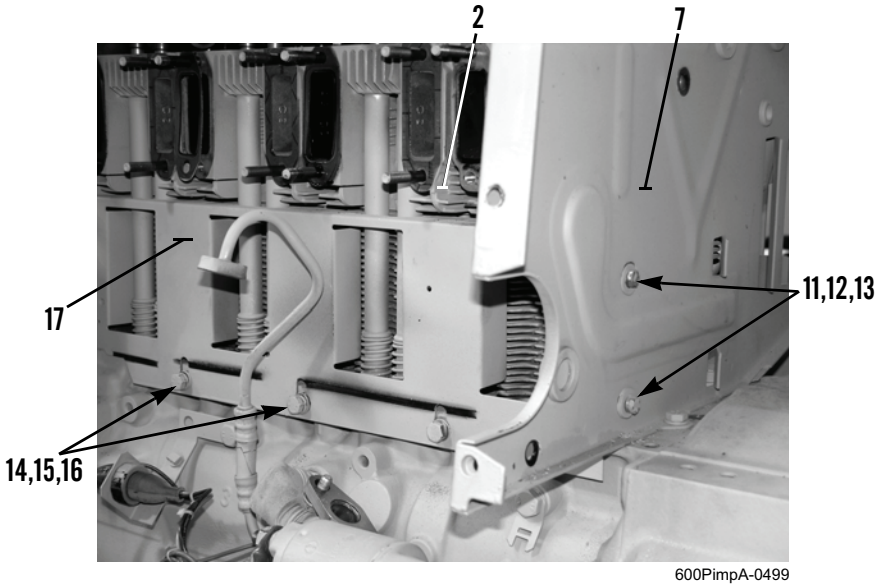


Figure 6. Cover Plate.

8. Remove three bolts (Figure 6, Item 14), lockwashers (Figure 6, Item 15), washers (Figure 6, Item 16), and remove cover plate (Figure 6, Item 17) from front air duct wall (Figure 7, Item 10) and rear air duct wall (Figure 6, Item 7). Discard lockwashers.

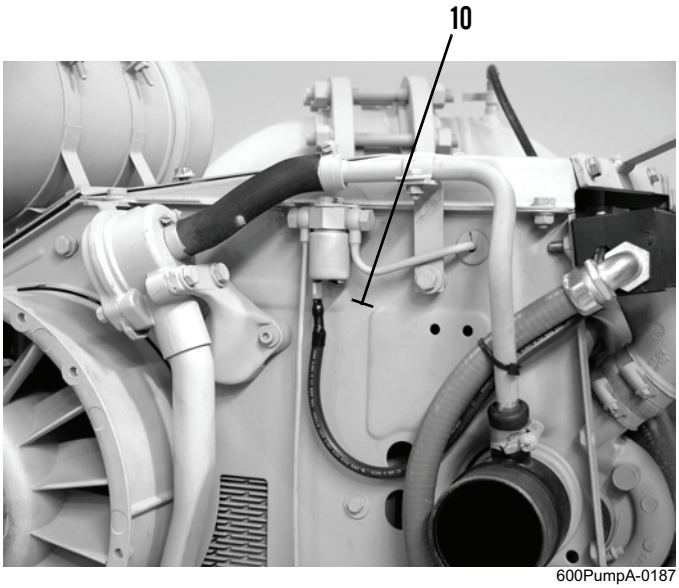


Figure 7. Cylinder Head and Front Air Duct Wall.

REMOVAL - CONTINUED

NOTE

Two cylinder head bolts with washers are installed on injector side of cylinder head. Two bolts without washers are on exhaust side of cylinder head.

9. Remove four bolts (Figure 8, Item 4) and two washers (Figure 8, Item 18) from cylinder head (Figure 8, Item 2).

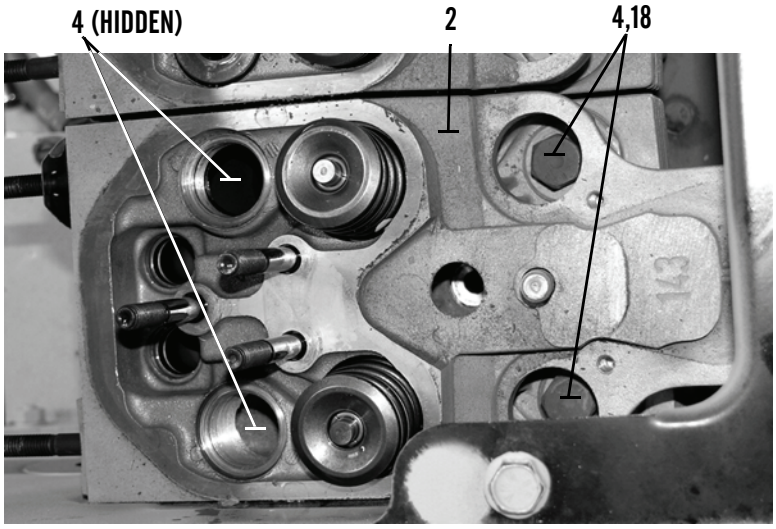


Figure 8. Cylinder Head Bolt and Washers.

REMOVAL - CONTINUED

10. Raise cylinder head (Figure 9, Item 2) slightly and remove two cover tubes (Figure 9, Item 20), compression springs (Figure 9, Item 21), retainers (Figure 9, Item 22), and four washers (Figure 9, Item 19).

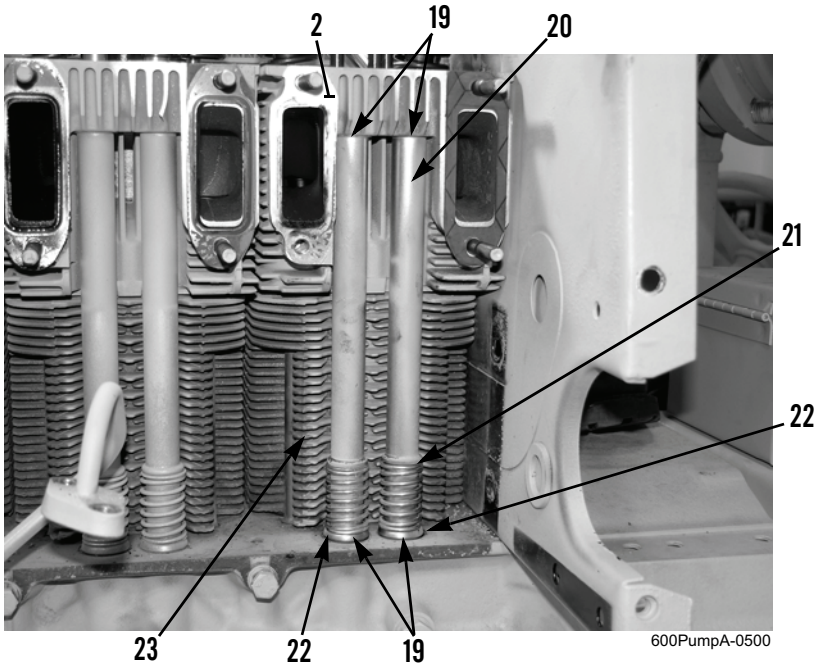


Figure 9. Cover Tubes.

11. Remove cylinder head (Figure 10, Item 2) and cylinder head gasket (Figure 10, Item 24) from cylinder (Figure 9, Item 23) and engine block.

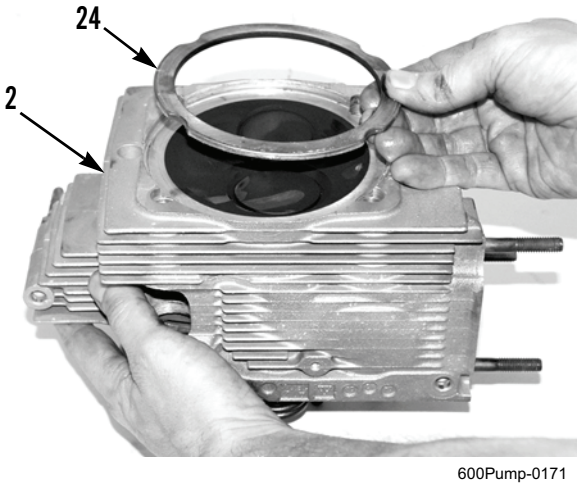


Figure 10. Cylinder Head Gasket.

CLEANING AND INSPECTION

1. Clean and inspect all parts IAW WP 0023.
2. Replace any damaged parts.

INSTALLATION

NOTE

Perform the following procedure for each cylinder.

1. Measure piston crown clearance (WP 0077).
2. Measure cylinder head bolts (Figure 11, Item 4). If bolt length exceeds 8.6 in. (218.5 mm), discard bolts.

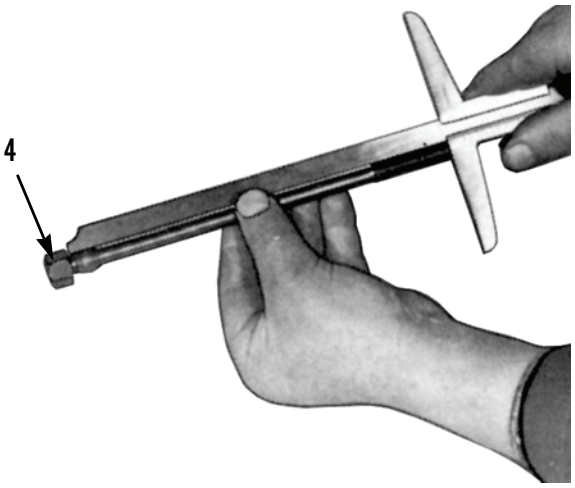


Figure 11. Measuring Cylinder Head Bolts.

NOTE

- Two cylinder head bolts with washers are installed on injector side of cylinder head.
- At this time, cylinder head bolts must be installed loosely to allow approximately 1/4 in. (6.4 mm) vertical play in cylinder head. This will allow installation of cover tubes and compression springs.

3. Install cylinder head (Figure 12, Item 2), cylinder head gasket (Figure 10, Item 24), two washers (Figure 12, Item 18), and four bolts (Figure 12, Item 4) on cylinder (Figure 9, Item 23) and engine block. Do not tighten bolts.

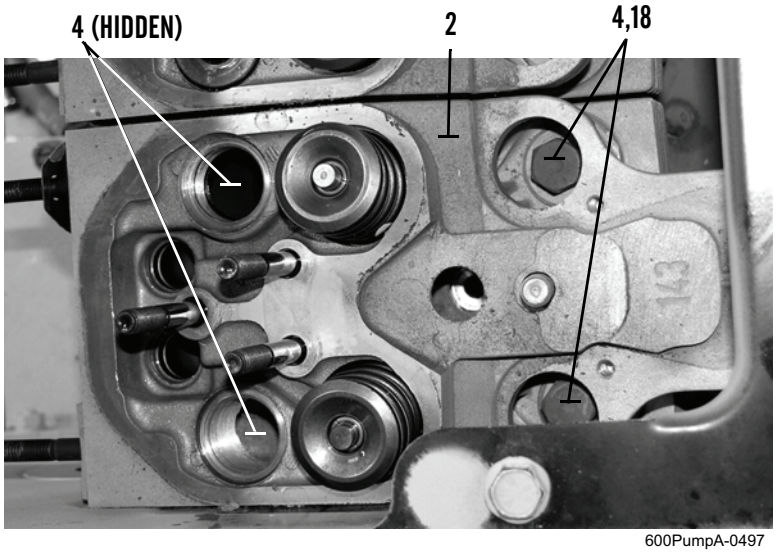


Figure 12. Cylinder Head Bolts and Washers.

INSTALLATION - CONTINUED

NOTE

- Perform steps 4-8 to install both cover tubes.
- Washer should be installed with rounded side oriented upwards.

4. Install washer (Figure 13, Item 19) on non-spring end of cover tube (Figure 13, Item 20).

WARNING

Use caution and wear eye protection when compressing spring. Failure to follow this warning may result in injury to personnel.

5. Slide compression spring (Figure 13, Item 21) on cover tube (Figure 13, Item 20) and apply tension with spring compressor.
6. Install retainer (Figure 13, Item 22) and other washer (Figure 13, Item 19) on spring end of cover tube (Figure 13, Item 20).

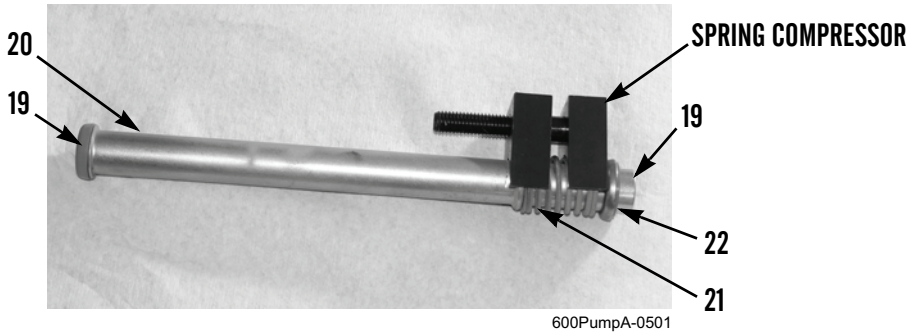


Figure 13. Assembling Cover Tube.

7. Slide cover tube (Figure 14, Item 20) in engine block (Figure 14, Item 25), then in cylinder head (Figure 14, Item 2). Remove spring compressor.
8. Repeat steps 4-7 to install other cover tube (Figure 14, Item 20).

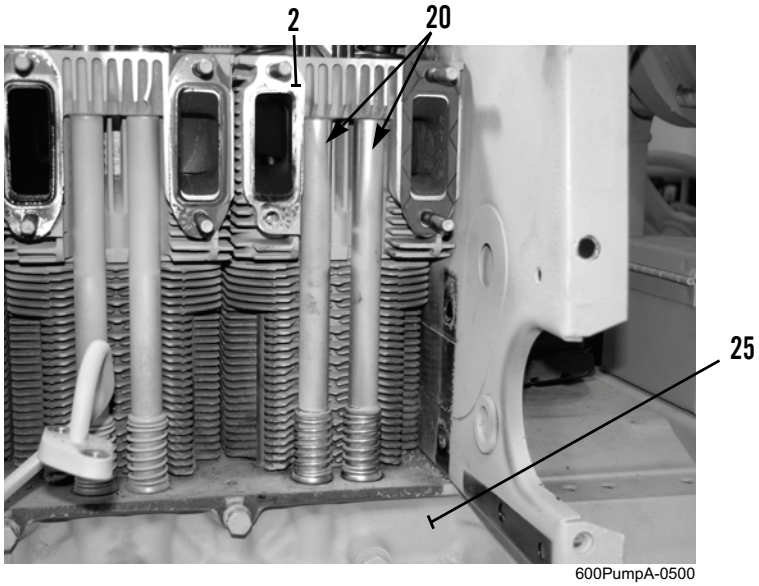


Figure 14. Cover Tubes.

INSTALLATION - CONTINUED

9. Tighten all bolts (Figure 15, Item 4) in cylinder head (Figure 15, Item 2) in a crosswise pattern to 22 to 33 lb-ft (30 to 45 Nm). Then tighten an additional 45 degrees, three separate times in same crosswise pattern. Tighten all bolts another 30 degrees.

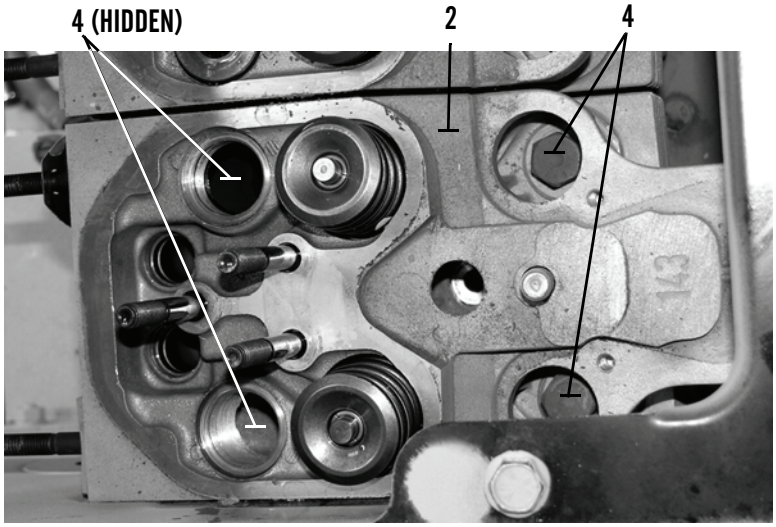


Figure 15. Cylinder Head Bolts.

10. Install two screw plugs (Figure 16, Item 3) on cylinder head (Figure 16, Item 2). Tighten screw plugs to 55 to 70 lb-ft (75 to 95 Nm).

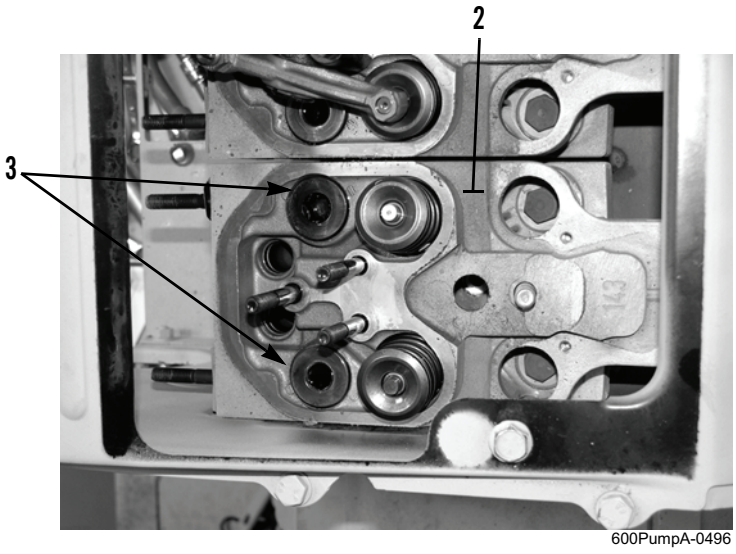


Figure 16. Removing Screw Plugs.

INSTALLATION - CONTINUED

11. Position cover plate (Figure 17, Item 17) between front air duct wall (Figure 18, Item 10) and rear air duct wall (Figure 17, Item 7) and install three washers (Figure 17, Item 16), new lockwashers (Figure 17, Item 15), and bolts (Figure 17, Item 14).
12. Install two washers (Figure 17, Item 13), new lockwashers (Figure 17, Item 12), and bolts (Figure 17, Item 11) to rear air duct wall (Figure 17, Item 7) and cover plate (Figure 17, Item 17).
13. Repeat step 12 to install same parts at front air duct wall (Figure 18, Item 10).

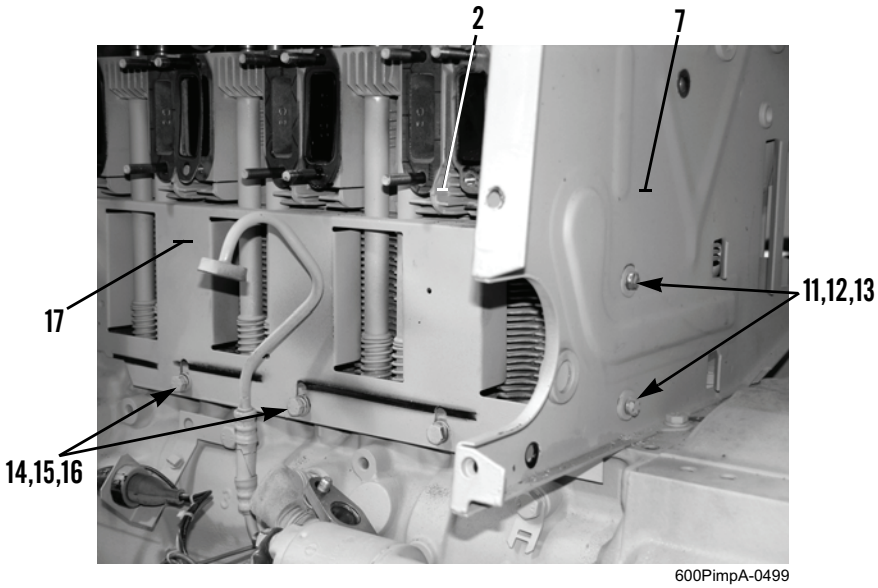


Figure 17. Cover Plate.

14. If installing frontmost cylinder head (Figure 19, Item 2), install torx head screw (Figure 18, Item 9) to crankcase breather bracket (Figure 18, Item 8), front air duct wall (Figure 18, Item 10), and cylinder head.

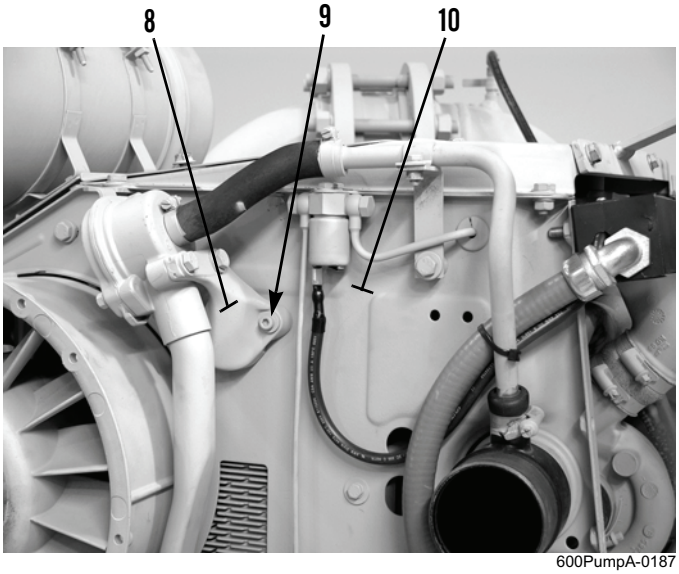


Figure 18. Cylinder Head and Front Air Duct Wall.

INSTALLATION - CONTINUED

15. If installing rearmost cylinder head (Figure 19, Item 2), install washer (Figure 19, Item 6) and bolt (Figure 19, Item 5) to rear air duct wall (Figure 19, Item 7) and cylinder head.

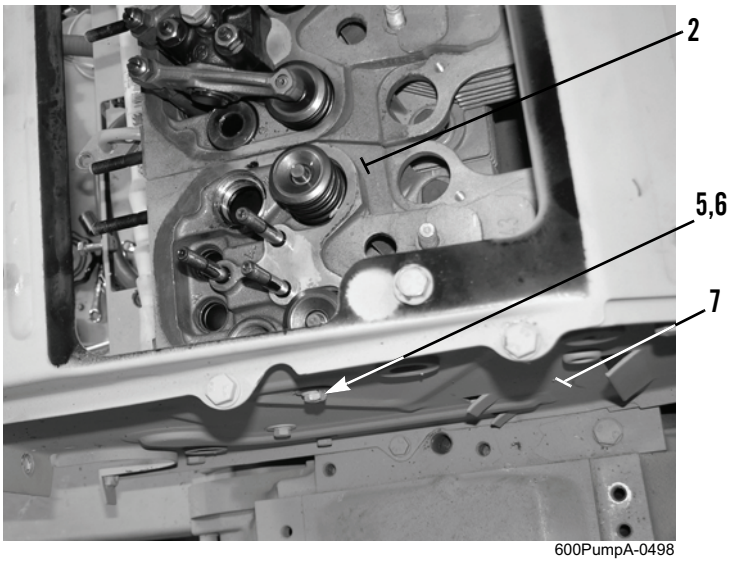


Figure 19. Cylinder Head and Rear Air Duct Wall.

16. Install two pushrods (Figure 20, Item 1) in cylinder head (Figure 20, Item 2).

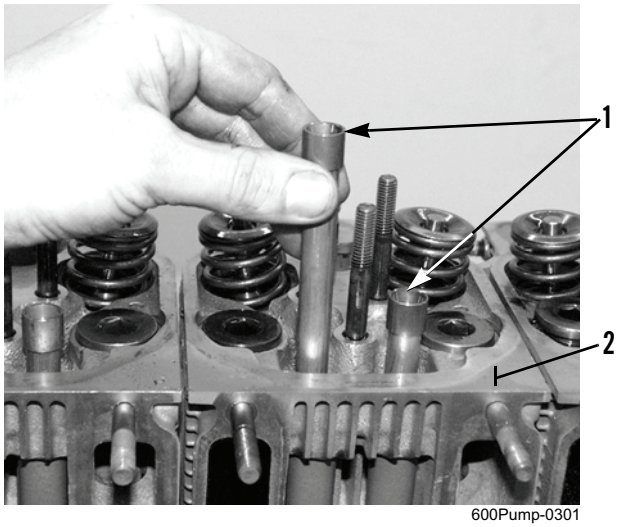


Figure 20. Pushrods.

FOLLOW-ON TASKS

1. Install rocker arm and rocker arm bracket (WP 0079).
2. Install air baffle (WP 0103).
3. Install fuel injectors (WP 0026).
4. Install lower left cooling air guide plate (WP 0108).
5. Install exhaust manifold (WP 0089).
6. Install intake manifold (WP 0088).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

PISTON CROWN CLEARANCE MEASUREMENT

Measurement, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Oil, lubricating, OEA-30 (Item 18, WP 0129)
Oil, lubricating, OE/HDO-15/40 (Item 20, WP 0129)

Materials/Parts - Continued

Lead wire, 0.08 in. (2 mm) thick

Personnel Required

63J (1)

Equipment Condition

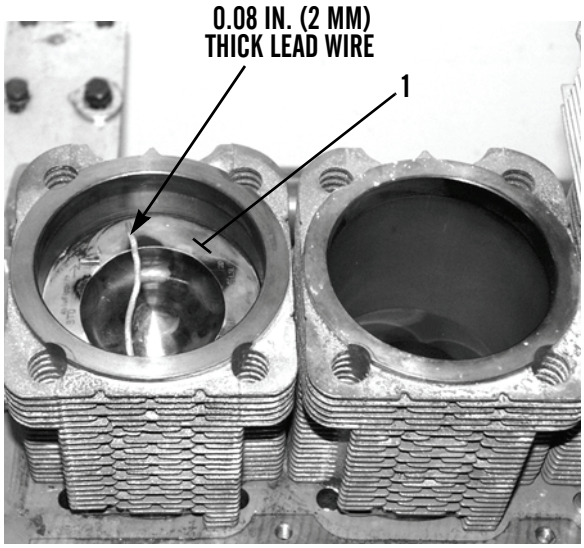
Cylinder head removed (WP 0076)

MEASUREMENT

NOTE

- Repeat this procedure for each cylinder head removed.
- Before installing 0.08 in. (2 mm) thick lead wire in cylinder, piston must be below Top Dead Center (TDC).

1. Place lead wire across piston (Figure 1, Item 1) in a transverse direction to engine axis.



600Pump-0170

Figure 1. Placing Lead Wire Across Piston.

MEASUREMENT - CONTINUED

2. Install cylinder head gasket (Figure 2, Item 2) on cylinder head (Figure 2, Item 3).

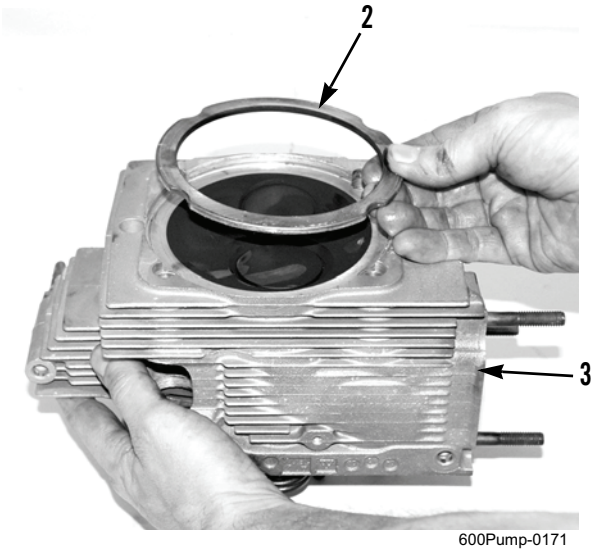


Figure 2. Cylinder Head Gasket.

NOTE

- Two cylinder head bolts with washers are provided on injector side of cylinder head.
- Apply a light coat of oil to cylinder head bolts.

3. Install cylinder head (Figure 3, Item 3), four cylinder head bolts (Figure 3, Item 4), and two washers (Figure 3, Item 5) on cylinder (Figure 4, Item 6). Tighten bolts in a crosswise pattern to 30 lb-ft (40 Nm). Then tighten an additional 45 degrees (1/8 turn).

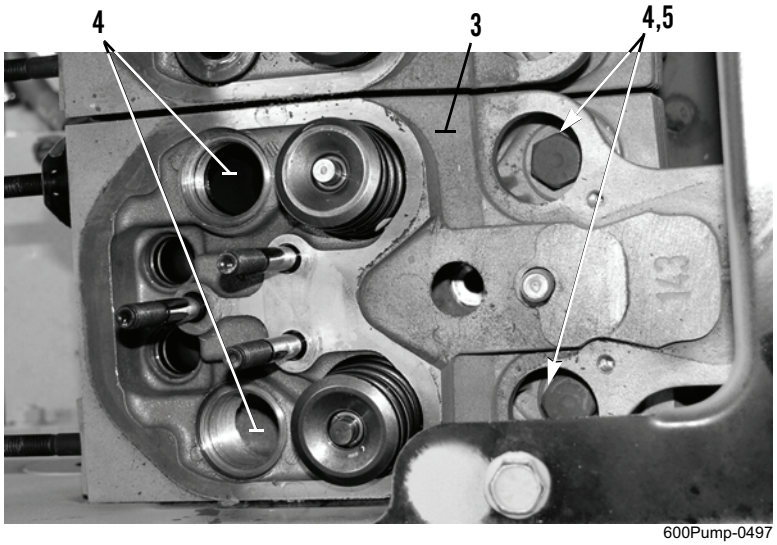


Figure 3. Installing Cylinder Head Bolts and Washers.

MEASUREMENT - CONTINUED

4. Rotate crankshaft 360 degrees.
5. Remove four bolts (Figure 3, Item 4), two washers (Figure 3, Item 5), cylinder head (Figure 3, Item 3), lead wire, and cylinder head gasket (Figure 4, Item 2) from cylinder (Figure 4, Item 6).

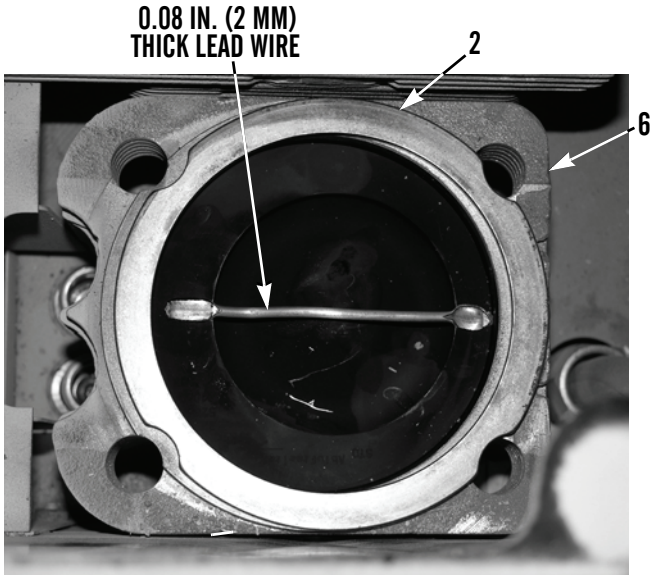


Figure 4. Removing Cylinder Head Gasket and Lead Wire.

NOTE

Piston crown clearance specification is 0.035 to 0.039 in. (0.9 to 1.0 mm).

6. Use a micrometer to measure lead wire at thinnest point on both ends (Figure 5). Record measurements. Add measurements, then divide by 2 to obtain mean value which is piston crown clearance.
7. If piston crown clearance is not IAW specification, notify Sustainment Maintenance to replace spacer (shim) between cylinder (Figure 4, Item 6) and engine block.

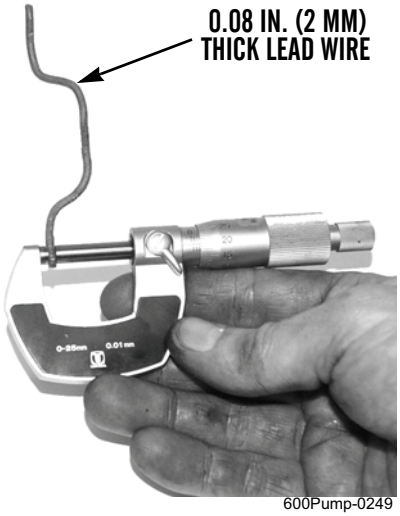


Figure 5. Measuring Lead Wire.

FOLLOW-ON TASKS

Install cylinder head (WP 0076).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

REAR MAIN SEAL AND REAR COVER REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)
Assembly device (Item 2, WP 0126)
Centering device (Item 4, WP 0126)
Retainer (Item 17, WP 0126)
Locating tool (WP 0119)

Materials/Parts

Compound, silicone, RTV (Item 8, WP 0129)
Oil, lubricating, OEA-30 (Item 18, WP 0129)
Oil, lubricating, OE/HDO-15/40 (Item 20, WP 0129)

Materials/Parts - Continued

Rag, wiping (Item 22, WP 0129)
Bolt (10)
Seal

Personnel Required

63J (2)

References

WP 0023

Equipment Condition

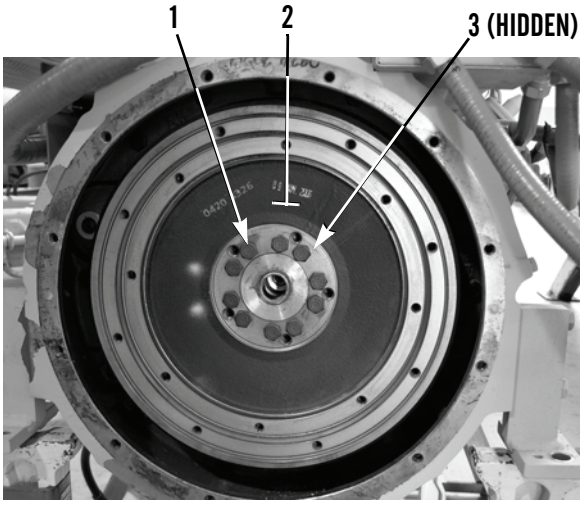
Engine removed (WP 0073)
Outer ring of coupling assembly removed from engine flywheel (WP 0073)
Oil pan removed (WP 0086)

REMOVAL

1. Install retainer tool on crankshaft (Figure 1, Item 3) at vibration damper end to hold crankshaft while removing bolts (Figure 1, Item 1) from flywheel (Figure 1, Item 2).
2. Remove ten bolts (Figure 1, Item 1) from flywheel (Figure 1, Item 2) and crankshaft (Figure 1, Item 3). Discard bolts.

WARNING

Flywheel is heavy and awkward to handle. Use assistance and caution when removing flywheel to avoid injury to personnel.



600PumpA-0236

Figure 1. Removing Flywheel.

NOTE

It may be necessary to use a wooden block and hammer to tap on flywheel, in order to dislodge flywheel.

3. With assistance, remove flywheel (Figure 1, Item 2) from crankshaft (Figure 1, Item 3).

REMOVAL - CONTINUED

4. Remove eight bolts (Figure 2, Item 4), washers (Figure 2, Item 5), and rear cover (Figure 2, Item 6) from engine block (Figure 2, Item 7).

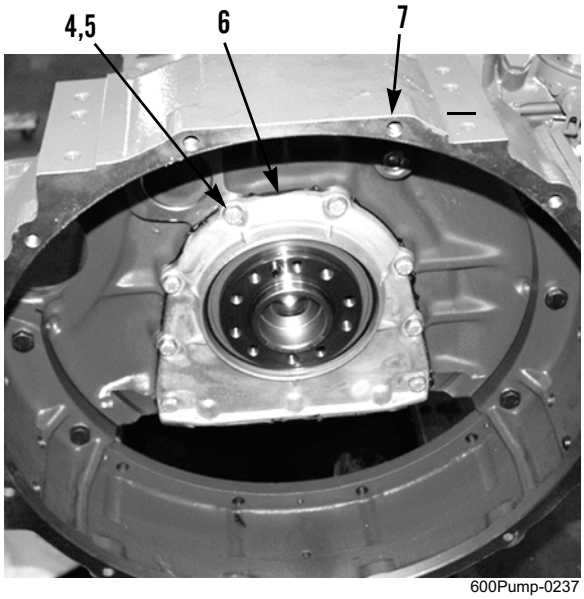


Figure 2. Removing Rear Cover.

5. Remove rear main seal (Figure 3, Item 8) from rear cover (Figure 3, Item 6). Discard rear main seal.

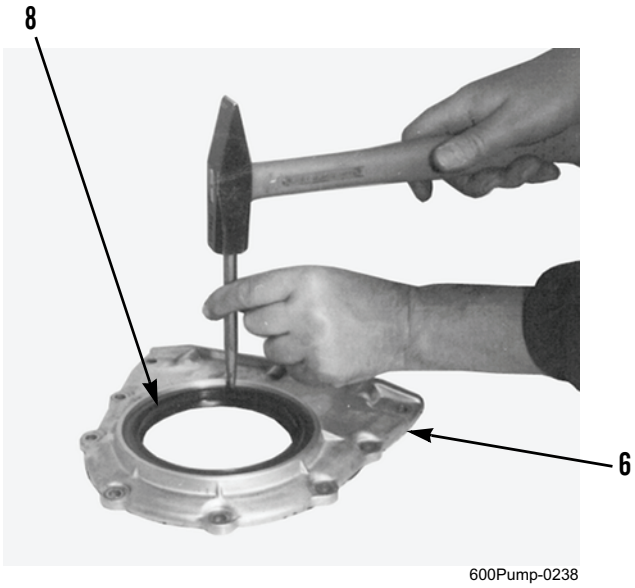
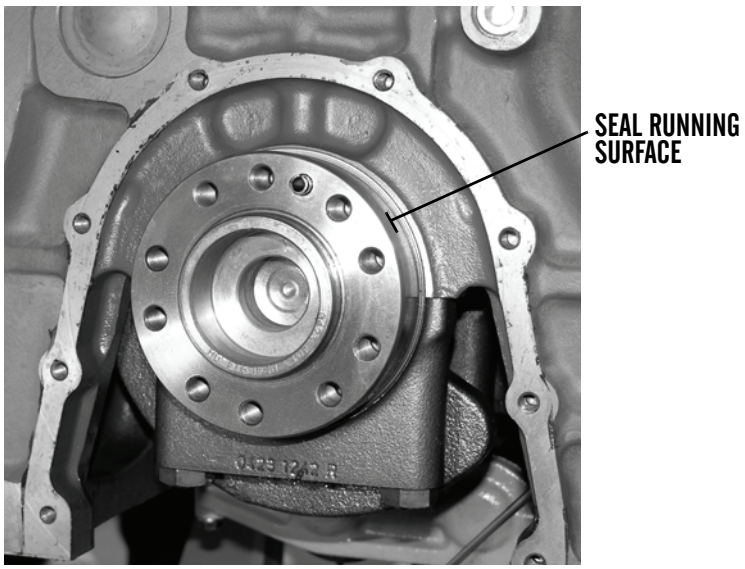


Figure 3. Removing Rear Main Seal.

CLEANING AND INSPECTION

1. Clean and inspect all parts IAW WP 0024.
2. Ensure silicone RTV compound is removed from all mating surfaces.
3. Inspect seal running surface on crankshaft flange for wear (Figure 4). If a run-in groove is noted, new rear main seal must not be installed at same depth as old seal. Refer to *Installation* in this work package for instructions.



600Pump-0520

Figure 4. Inspecting Seal Running Surface on Crankshaft Flange.

INSTALLATION

NOTE

Hole in centering device must be aligned with roll pin in crankshaft.

1. Install centering device (Figure 5) on crankshaft and secure with two bolts (Figure 5, Item 9) and washers (Figure 5, Item 10).

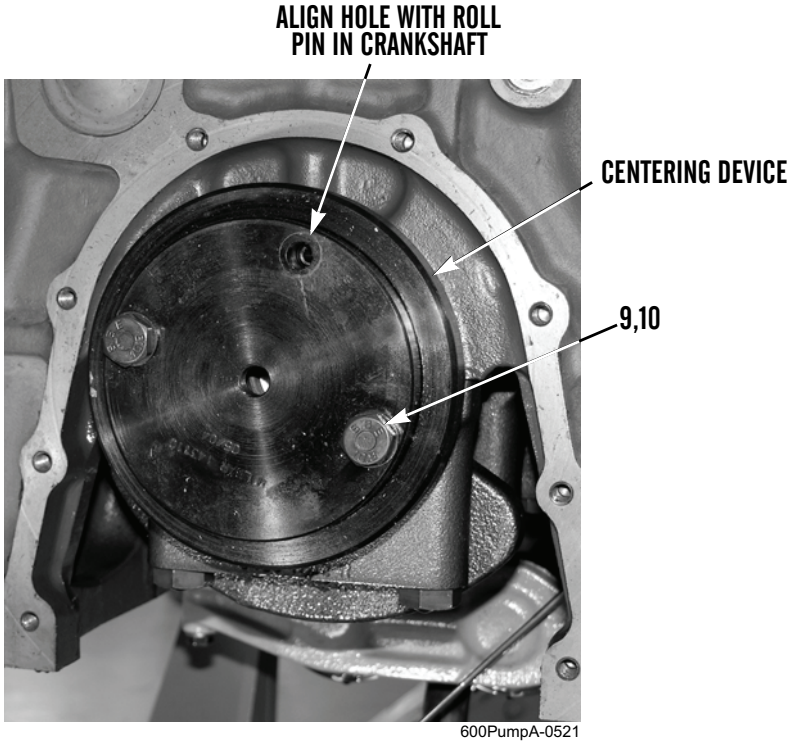


Figure 5. Centering Device.

INSTALLATION - CONTINUED

WARNING

Wear gloves and eye protection when handling RTV silicone compound. Work in a well-ventilated area. Exposure to RTV silicone compound may cause irritation to eyes, skin, and lungs. If ingested, do NOT induce vomiting. Seek medical attention.

2. Apply RTV silicone compound to rear cover (Figure 6, Item 6). Install rear cover, eight washers (Figure 6, Item 5), and bolts (Figure 6, Item 4) on engine block (Figure 6, Item 7). Align rear cover with engine block, ensuring bottom edge of rear cover is flush with engine block.

NOTE

To ensure a good seal will be maintained between rear cover and oil pan, bottom corner rear cover bolts should be tightened first, while checking that bottom edge of rear cover is flush with engine block.

3. Tighten bolts (Figure 6, Item 4) to 15 to 18 lb-ft (20 to 24 Nm). Remove centering device.

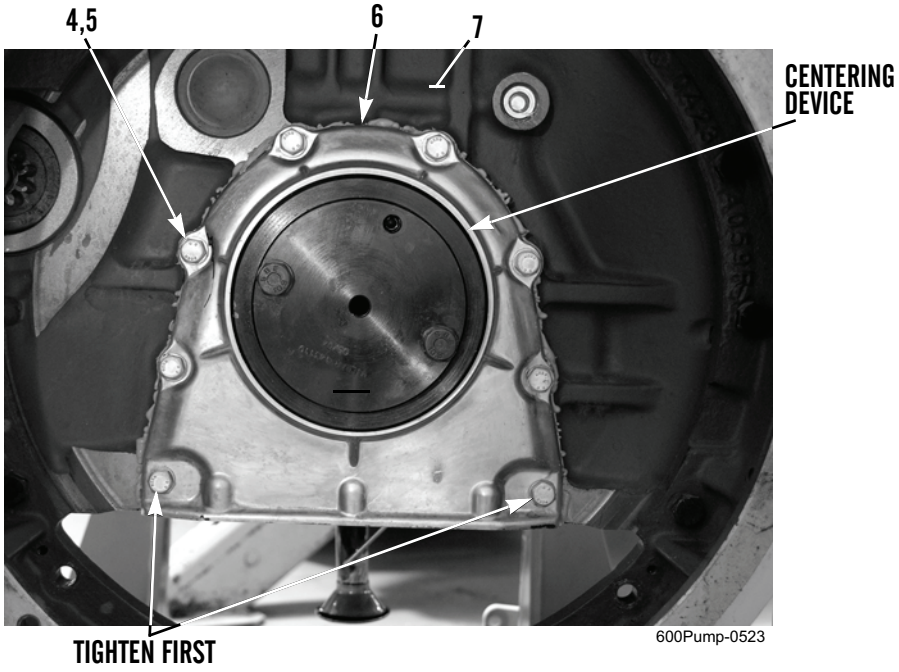


Figure 6. Installing Rear Cover.

INSTALLATION - CONTINUED

NOTE

Hole in assembly device must be aligned with roll pin in crankshaft.

4. Install assembly device on crankshaft (Figure 7, Item 3) with two bolts (Figure 7, Item 11) and washers (Figure 7, Item 12).

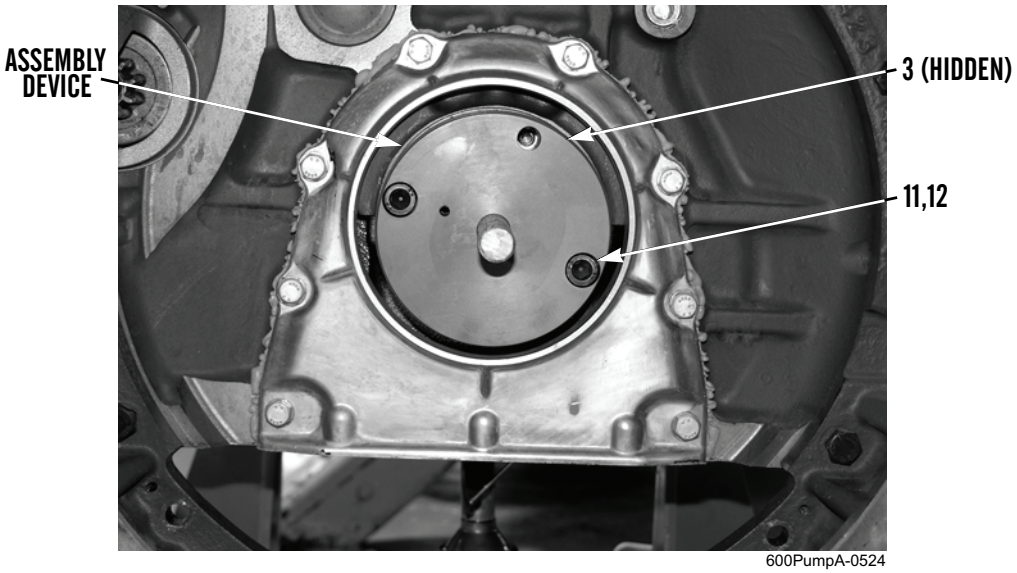


Figure 7. Installing Assembly Device.

NOTE

Apply a light coat of oil to lip of new rear main seal.

5. With sealing lip facing crankshaft (Figure 7, Item 3), install new rear main seal (Figure 8, Item 8) on assembly device.

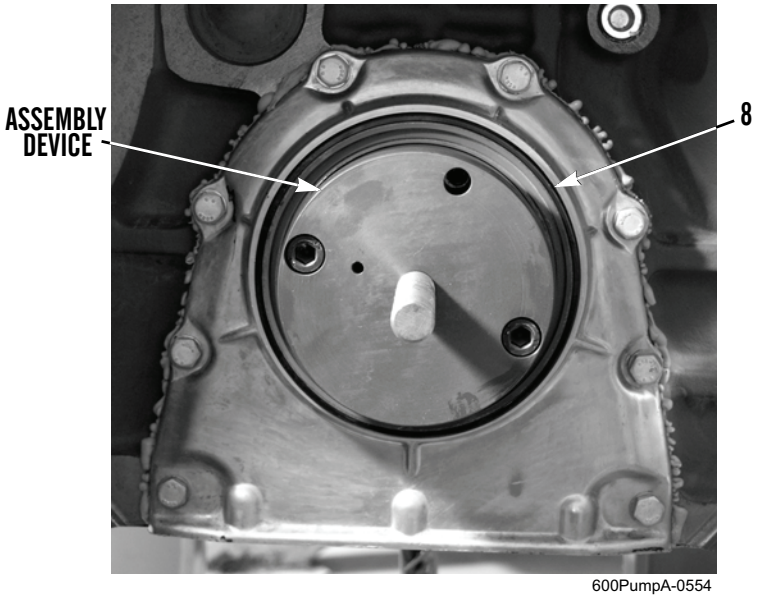


Figure 8. Installing Rear Main Seal on Assembly Device.

INSTALLATION - CONTINUED

NOTE

Correct depth of seating of rear main seal in rear cover must be determined prior to installing rear main seal.

- No shims: Standard installation with perfect crankshaft flange seal running surface.
- 1 or 2 shims: Offset installation with run-in groove noted on crankshaft flange seal running surface.

6. Determine number of shims required (if any).
7. As required, install shim(s) in cap of assembly device (Figure 9).
8. Install cap of assembly device with washer (Figure 9, Item 13) and nut (Figure 9, Item 14).
9. Turn nut (Figure 9, Item 14) until it bottoms to seat rear main seal (Figure 8, Item 8) to correct depth in rear cover (Figure 9, Item 6).

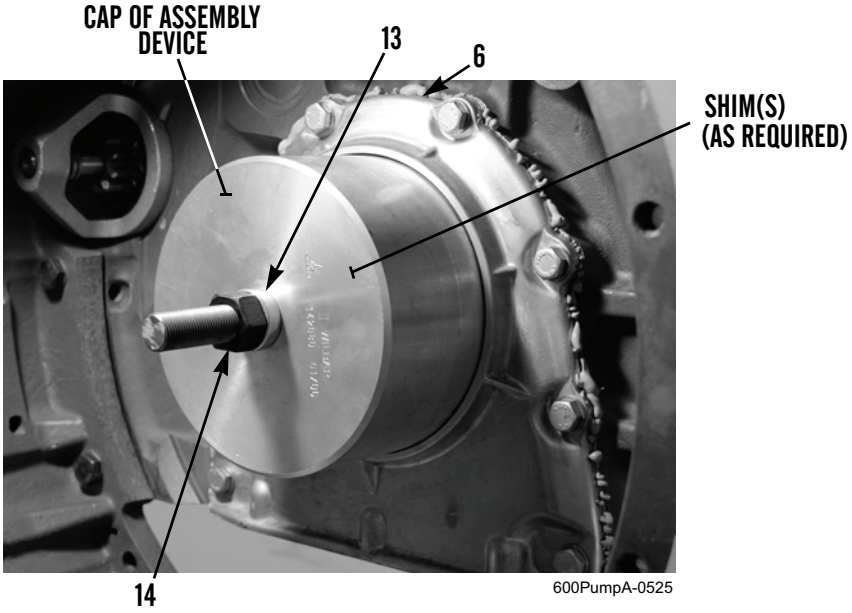


Figure 9. Installing Rear Main Seal.

INSTALLATION - CONTINUED

10. Remove both parts of assembly device and shims (if used) from crankshaft.
11. Install locating tool on crankshaft (Figure 10, Item 3).

NOTE

Ensure alignment hole in back side of flywheel is aligned with roll pin on crankshaft.

12. Install flywheel (Figure 10, Item 2) and ten new bolts (Figure 10, Item 1) on crankshaft (Figure 10, Item 3). Tighten bolts to 22 lb-ft (30 Nm). Tighten bolts again to 40 to 44 lb-ft (55 to 60 Nm). Tighten bolts to 55 to 59 lb-ft (75 to 80 Nm).
13. Remove locating tool from crankshaft (Figure 10, Item 3).

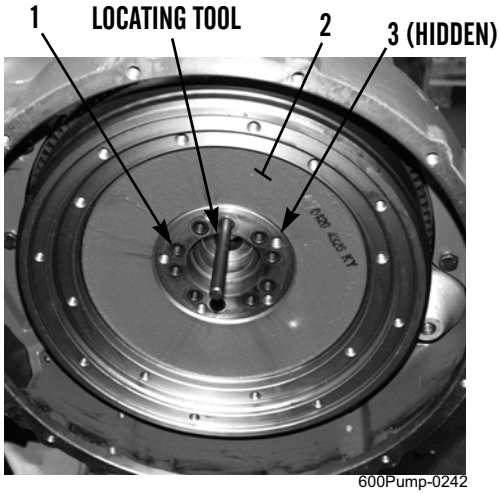


Figure 10. Installing Flywheel.

14. Remove retainer tool from vibration damper.

FOLLOW-ON TASKS

1. Install oil pan (WP 0086).
2. Install outer ring of coupling assembly to engine flywheel (WP 0073).
3. Install engine (WP 0073).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

ROCKER ARM AND ROCKER ARM BRACKET REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Compound, silicone, RTV (Item 8, WP 0129)
Rag, wiping (Item 22, WP 0129)
Gasket (4)
Sealing ring (4)

Personnel Required

63J (1)

References

WP 0023
WP 0080

Equipment Condition

Engine cool
Upper access plate removed (WP 0068)

REMOVAL

NOTE

Repeat the following procedure for each cylinder.

1. Remove bolt (Figure 1, Item 1), washer (Figure 1, Item 2), sealing ring (Figure 1, Item 3), and valve cover (Figure 1, Item 4) from cylinder head (Figure 1, Item 5). Discard sealing ring.
2. Remove gasket (Figure 1, Item 6) from valve cover (Figure 1, Item 4) or from cylinder head (Figure 1, Item 5). Discard gasket.

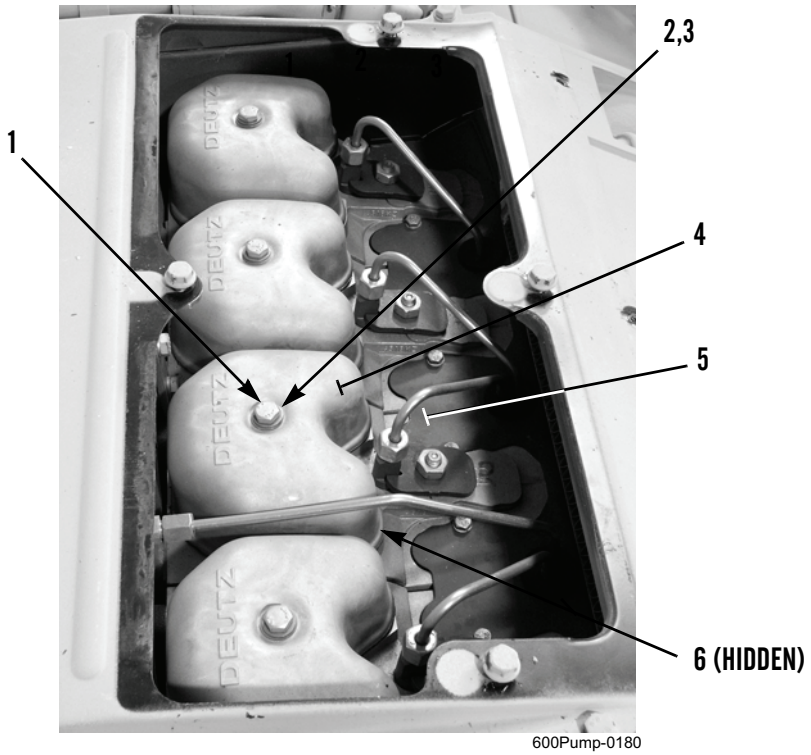


Figure 1. Valve Cover.

REMOVAL - CONTINUED

3. Remove three nuts (Figure 2, Item 7) and rocker arm bracket (Figure 2, Item 8) from cylinder head (Figure 2, Item 5).

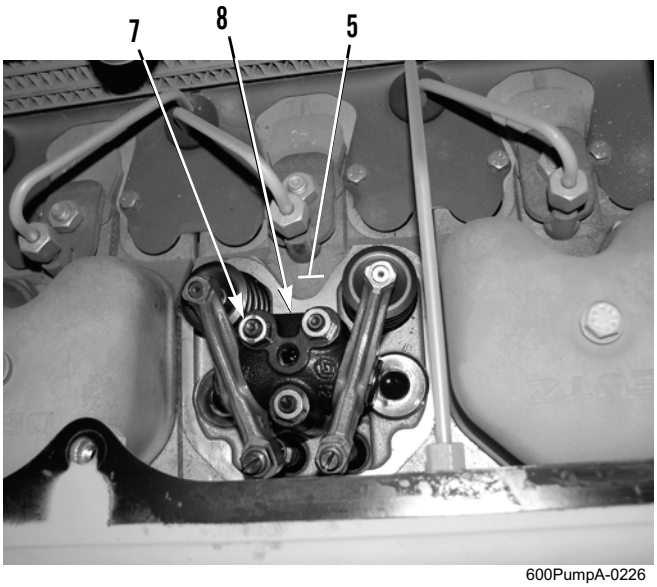


Figure 2. Rocker Arm Bracket and Rocker Arms.

WARNING

Wear eye protection when installing circlips. Failure to follow this warning may result in injury to personnel.

4. Remove two circlips (Figure 3, Item 10) and rocker arms (Figure 3, Item 9) from rocker arm bracket (Figure 3, Item 8).

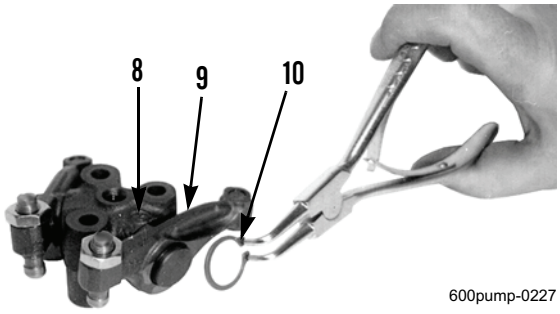


Figure 3. Disassembly of Rocker Arms and Rocker Arm Bracket.

CLEANING AND INSPECTION

1. Clean and inspect all parts IAW WP 0023.
2. Ensure all oil passages are clean.
3. Ensure gasket sealing material is removed from all mating surfaces.
4. Check bearing journals, adjusting screws, rocker arm contact surfaces, and bores for wear (Figure 4). Replace rocker arms, rocker arm components, or rocker arm bracket if necessary.

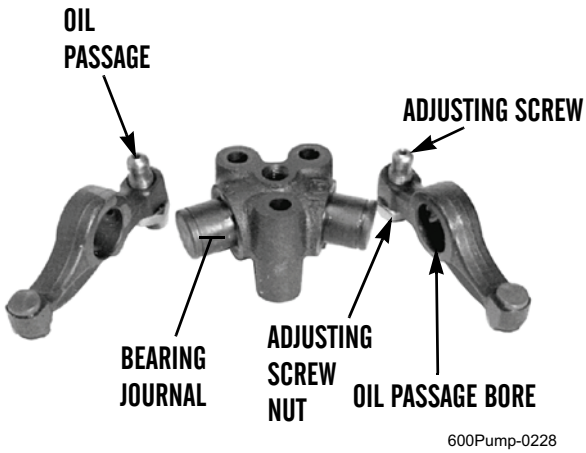


Figure 4. Inspection of Components.

INSTALLATION

WARNING

Wear eye protection when installing circlips. Failure to follow this warning may result in injury to personnel.

NOTE

Repeat the following procedure for each cylinder.

1. Install rocker arms (Figure 3, Item 9) and two circlips (Figure 3, Item 10) on rocker arm bracket (Figure 3, Item 8).
2. Install rocker arm bracket (Figure 2, Item 8) on cylinder head (Figure 2, Item 5) with three nuts (Figure 2, Item 7). Tighten nuts to 23 lb-ft (31 Nm).
3. Adjust valve clearance (WP 0080).

INSTALLATION - CONTINUED

WARNING

Wear gloves and eye protection when handling RTV silicone compound. Work in a well-ventilated area. Exposure to silicone RTV compound may cause irritation to eyes, skin, and lungs. If ingested, do NOT induce vomiting. Seek medical attention.

4. Apply silicone RTV compound to valve cover (Figure 5, Item 4). Install new gasket (Figure 5, Item 6) on valve cover.
5. Install valve cover (Figure 5, Item 4) on cylinder head (Figure 5, Item 5) with new sealing ring (Figure 5, Item 3), washer (Figure 5, Item 2), and bolt (Figure 5, Item 1). Tighten bolt to 10 lb-ft (13 Nm).

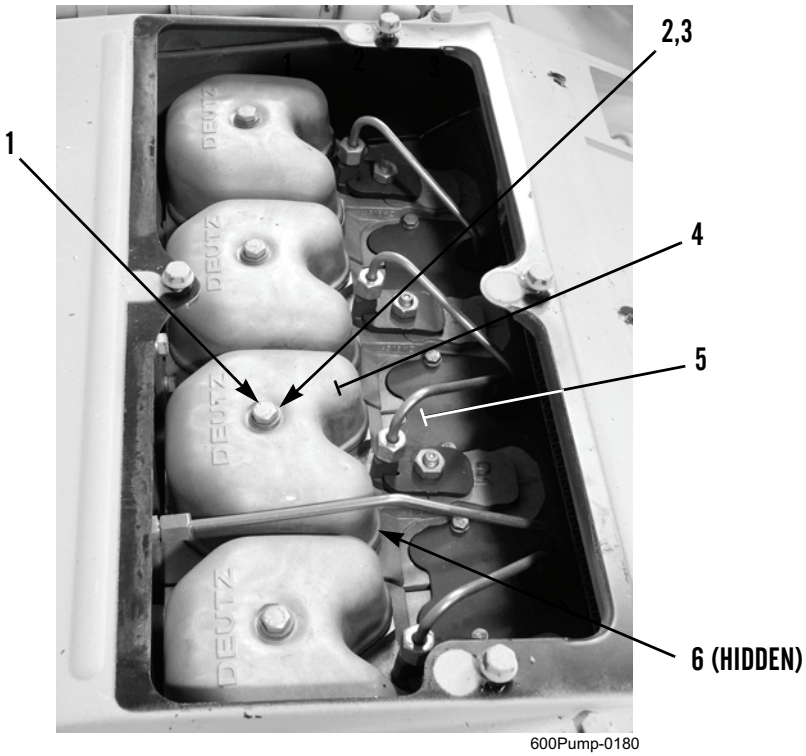


Figure 5. Valve Cover.

FOLLOW-ON TASKS

Install upper access plate (WP 0068).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

ENGINE VALVE CLEARANCE CHECK AND ADJUSTMENT

Valve Cover Removal, Checking and Adjusting Valve Clearance, Valve Cover Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Compound, silicone, RTV (Item 8, WP 0129)
Rag, wiping (Item 22, WP 0129)
Gasket (4)

Materials/Parts - Continued

Sealing ring (4)

Personnel Required

63J (2)

Equipment Condition

Engine cool
Upper access plate removed (WP 0068)

NOTE

Perform the following procedure for each cylinder.

VALVE COVER REMOVAL

1. Remove bolt (Figure 1, Item 1), washer (Figure 1, Item 2), sealing ring (Figure 1, Item 3), and valve cover (Figure 1, Item 4) from cylinder head (Figure 1, Item 5). Discard sealing ring.
2. Remove gasket (Figure 1, Item 6) from valve cover (Figure 1, Item 4). Discard gasket.

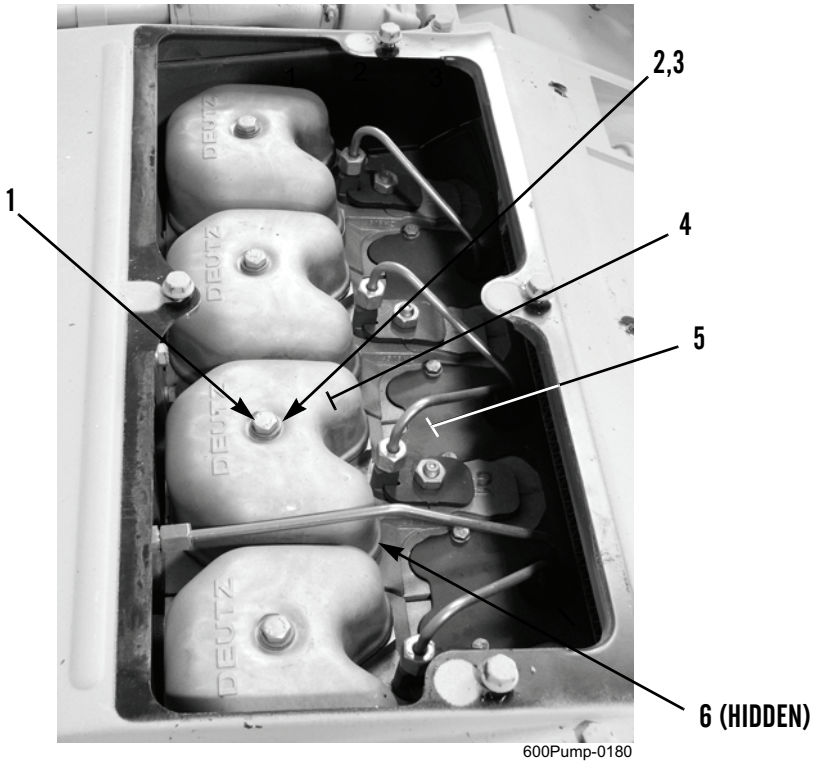


Figure 1. Valve Cover.

CHECKING AND ADJUSTING VALVE CLEARANCE

NOTE

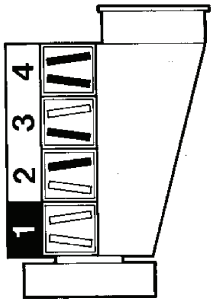
- Cylinder No. 1 is rearmost cylinder or engine.
- Valve clearance should be adjusted when engine is at ambient temperature.
- Valves are overlapped when exhaust valve is not yet closed and inlet valve is about to open. In this position, the two pushrods cannot be turned.

1. Slowly crank engine until both valves of cylinder No. 1 overlap. Adjust valve clearance IAW steps 3 through 6, in sequence shown in black, as shown in Figure 2 for Crankshaft Position 1.

NOTE

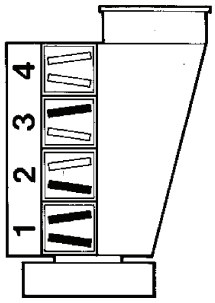
When facing vibration damper, engine rotation direction is clockwise (right).

2. Rotate crankshaft 360 degrees (one revolution) in direction of engine rotation. Adjust valve clearance IAW steps 3-6, in sequence shown in black, as shown in Figure 2 for Crankshaft Position 2.



CRANKSHAFT POSITION 1

VALVES DESIGNATED IN BLACK ARE READY FOR ADJUSTMENT



CRANKSHAFT POSITION 2

600Pump-0225

Figure 2. Crankshaft Positions 1 and 2.

CHECKING AND ADJUSTING VALVE CLEARANCE - CONTINUED

3. Insert feeler gauge between bottom of rocker arm (Figure 3, Item 7) and top of valve stem (Figure 3, Item 8) and record measurement. Valve stem clearance specification is 0.006 in. (0.15 mm).

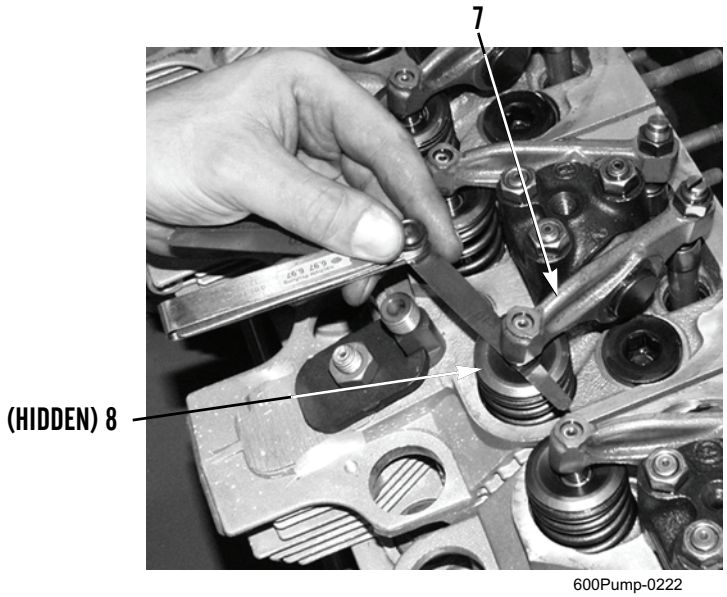


Figure 3. Measuring with Feeler Gauge.

4. If necessary, loosen nut (Figure 4, Item 10) and turn adjusting screw (Figure 4, Item 9) at each rocker arm (Figure 4, Item 7) to adjust valve clearance.
5. Turn adjusting screw (Figure 4, Item 9) until valve clearance is at specification. Tighten nut (Figure 4, Item 10) to 16 to 18 lb-ft (22 to 24 Nm).
6. Repeat step 3 to recheck measurement.

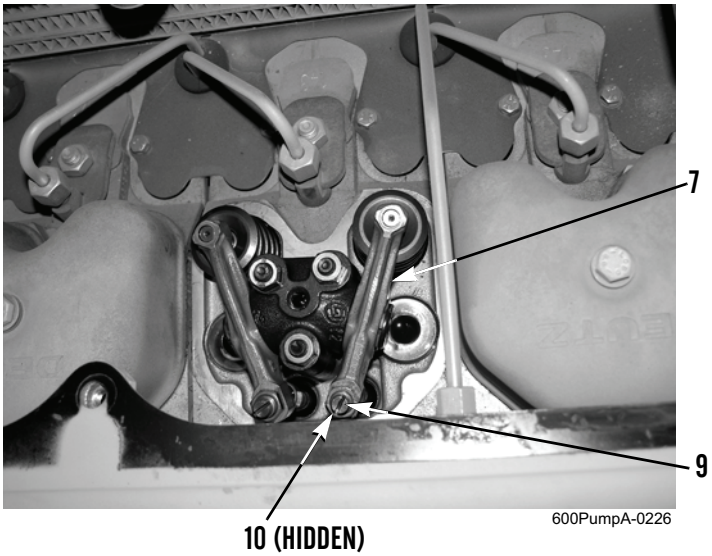


Figure 4. Adjusting Valve Clearance.

VALVE COVER INSTALLATION

WARNING

Wear gloves and eye protection when handling RTV silicone compound. Work in a well-ventilated area. Exposure to silicone RTV compound may cause irritation to eyes, skin, and lungs. If ingested, do NOT induce vomiting. Seek medical attention.

1. Apply silicone RTV compound to valve cover (Figure 5, Item 4). Install new gasket (Figure 5, Item 6) on valve cover.
2. Install valve cover (Figure 5, Item 4) on cylinder head (Figure 5, Item 5) with new sealing ring (Figure 5, Item 3), washer (Figure 5, Item 2), and bolt (Figure 5, Item 1). Tighten bolt to 10 lb-ft (13 Nm).

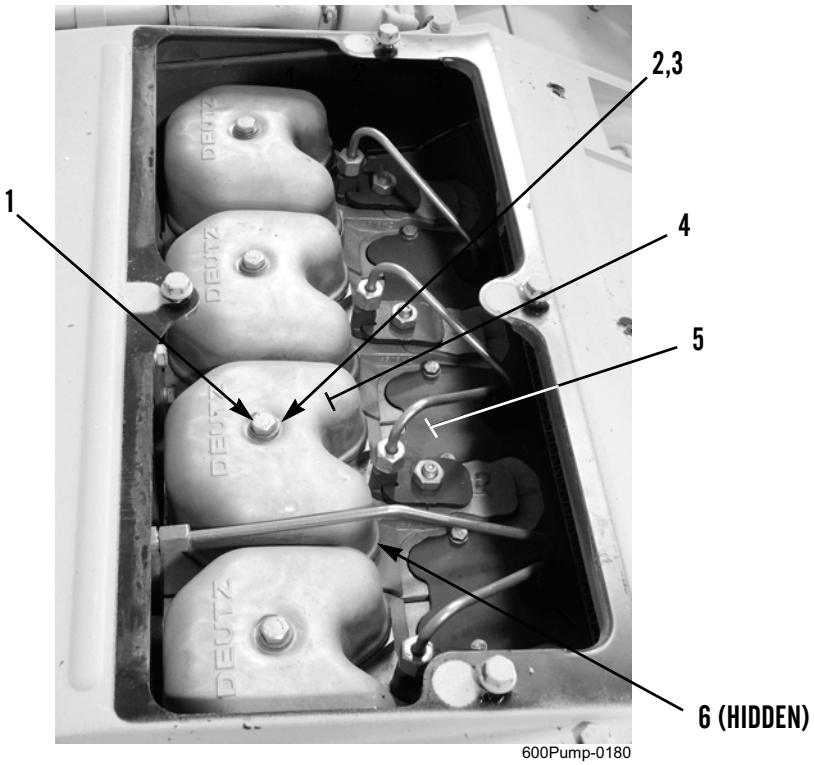


Figure 5. Valve Cover.

FOLLOW-ON TASKS

Install upper access plate (WP 0068).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

V-BELT GUARD REPLACEMENT

Removal, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Materials/Parts

Rag, wiping (Item 22, WP 0129)

Personnel Required

63J (1)

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked
Battery cables disconnected (WP 0033)

REMOVAL

1. Remove nut (Figure 1, Item 1), bolt (Figure 1, Item 4), and two washers (Figure 1, Item 2) from bracket (Figure 1, Item 3) and cooling fan housing.
2. Remove bolt (Figure 1, Item 13) and two washers (Figure 1, Item 14) securing V-belt guard (Figure 1, Item 7) to engine front cover.
3. Remove bolt (Figure 1, Item 8), four washers (Figure 1, Item 5), and spacer tube (Figure 1, Item 6) securing V-belt guard (Figure 1, Item 7) to engine front cover.
4. Remove two bolts (Figure 1, Item 9), washers (Figure 1, Item 10), and V-belt guard (Figure 1, Item 7) from engine crossbeam.
5. If necessary, remove nut (Figure 1, Item 17), bolt (Figure 1, Item 15), two washers (Figure 1, Item 16), and bracket (Figure 1, Item 3) from V-belt guard (Figure 1, Item 7).
6. If necessary, remove bolt (Figure 1, Item 11) and bracket (Figure 1, Item 12) from engine crossbeam.

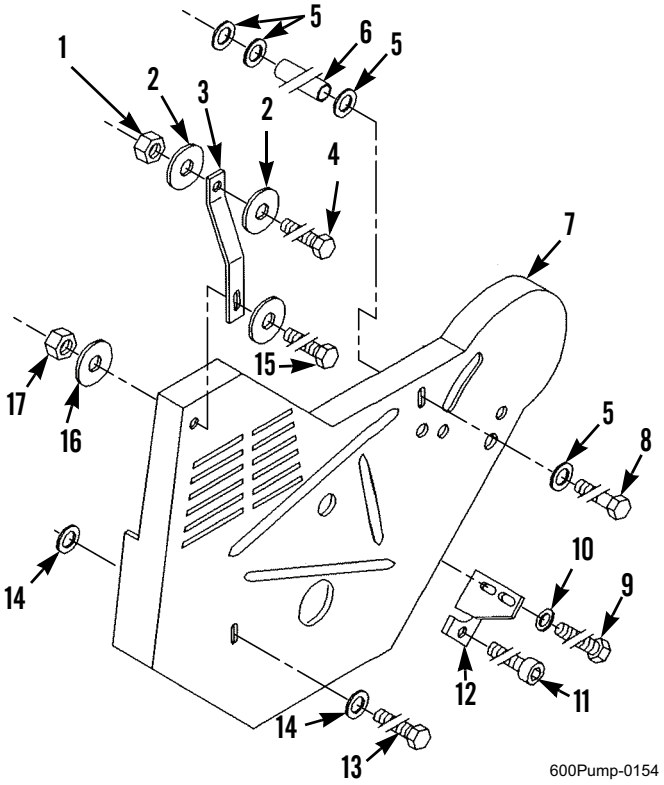


Figure 1. V-Belt Guard.

INSTALLATION

1. If removed, install bracket (Figure 1, Item 12) on engine crossbeam with bolt (Figure 1, Item 11).

NOTE

V-belt guard must be aligned/positioned to prevent contact with V-belts, pulleys, or other moving parts. Do not fully tighten bolts until guard is properly aligned.

2. If removed, install bracket (Figure 1, Item 3) on V-belt guard (Figure 1, Item 7) with bolt (Figure 1, Item 15), two washers (Figure 1, Item 16), and nut (Figure 1, Item 17).
3. Install V-belt guard (Figure 1, Item 7) on engine crossbeam with two washers (Figure 1, Item 10) and bolts (Figure 1, Item 9).
4. Install four washers (Figure 1, Item 5), spacer tube (Figure 1, Item 6), and bolt (Figure 1, Item 8) on V-belt guard (Figure 1, Item 7) and engine front cover.
5. Install two washers (Figure 1, Item 14) and bolt (Figure 1, Item 13) on V-belt guard (Figure 1, Item 7) and engine front cover.
6. Install bracket (Figure 1, Item 3) on cooling fan housing with two washers (Figure 1, Item 2), bolt (Figure 1, Item 4), and nut (Figure 1, Item 1).
7. When V-belt guard (Figure 1, Item 7) is properly aligned, tighten all bolts.

FOLLOW-ON TASKS

Connect battery cables (WP 0033).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

CRANKCASE BREATHER AND LINES REPLACEMENT

Removal, Cleaning and Inspection, Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Materials/Parts

Rag, wiping (Item 22, WP 0129)
Seal (2)

Personnel Required

63J (1)

References

WP 0023

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked

REMOVAL

1. Loosen clamp (Figure 1, Item 8) and remove tube (Figure 1, Item 10) from breather valve (Figure 1, Item 7).
2. Remove nut (Figure 1, Item 4), two washers (Figure 1, Item 5), bolt (Figure 1, Item 6), and bracket (Figure 1, Item 3) from upper cooling air guide plate (Figure 1, Item 9).
3. Remove two capscrews (Figure 1, Item 11) and washers (Figure 1, Item 12) and release breather valve (Figure 1, Item 7) from bracket (Figure 1, Item 13).
4. Remove nut (Figure 1, Item 1), washer (Figure 1, Item 2), and bracket (Figure 1, Item 3) from breather valve (Figure 1, Item 7).
5. Remove breather pipe (Figure 2, Item 15) from engine front cover (Figure 2, Item 17).
6. Remove breather valve (Figure 1, Item 7) from breather pipe (Figure 1, Item 15).
7. Remove two seals (Figures 1 and 2, Item 16) from breather pipe (Figures 1 and 2, Item 15). Discard seals.
8. Cut tiedown strap (Figure 1, Item 14) and discard.

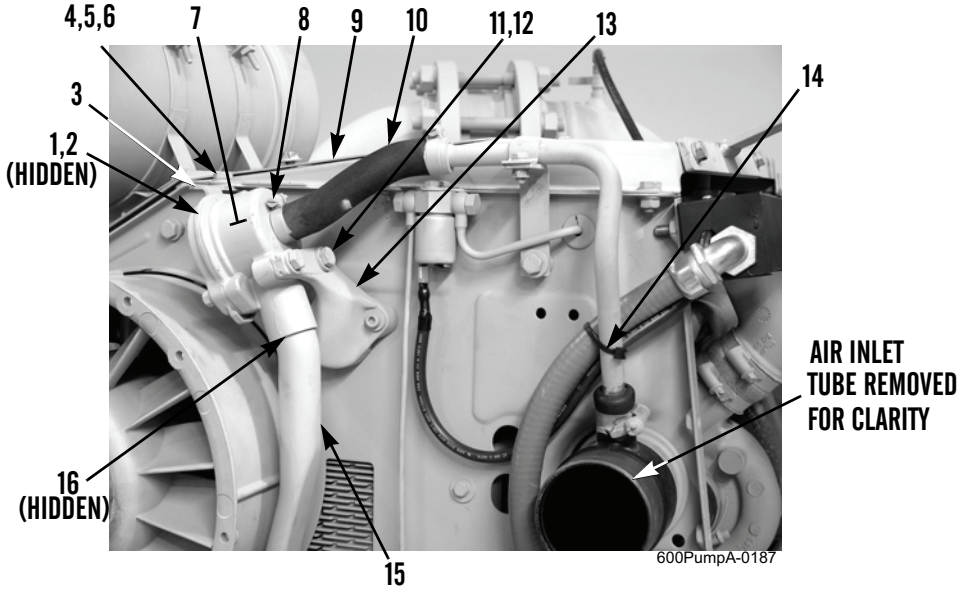


Figure 1. Crankcase Breather and Lines.

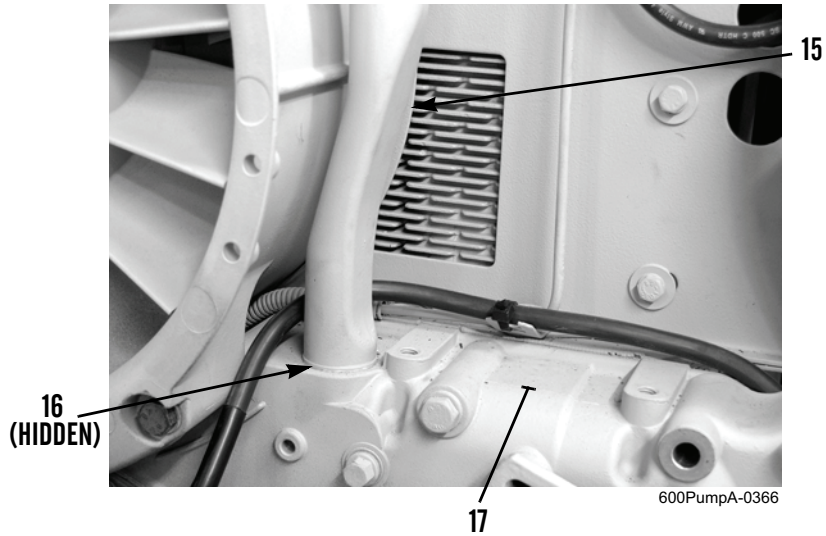


Figure 2. Breather Pipe at Engine Front Cover.

REMOVAL - CONTINUED

9. Remove nut (Figure 3, Item 20), capscrew (Figure 3, Item 21), two washers (Figure 3, Item 22), and clamp (Figure 3, Item 19) and release breather line (Figure 3, Item 24) from bracket (Figure 3, Item 23).
10. Loosen clamp (Figure 3, Item 25) and remove breather line (Figure 3, Item 24) from turbocharger air inlet (Figure 3, Item 26).
11. Loosen clamp (Figure 3, Item 18) and separate tube (Figure 3, Item 10) from breather line (Figure 3, Item 24).
12. If damaged, remove torx head capscrew (Figure 3, Item 28), capscrew (Figure 3, Item 30), two washers (Figure 3, Item 29), and bracket (Figure 3, Item 13) from front air duct wall (Figure 3, Item 27).

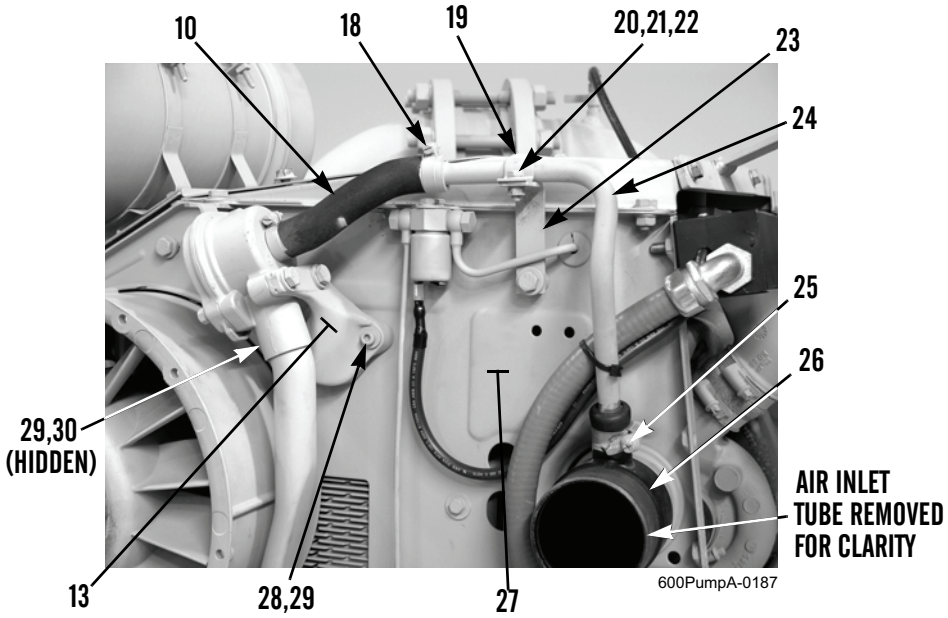


Figure 3. Crankcase Breather and Lines.

CLEANING AND INSPECTION

Clean and inspect all parts IAW WP 0023.

INSTALLATION

1. If removed, install bracket (Figure 3, Item 13) on front air duct wall (Figure 3, Item 27) with two washers (Figure 3, Item 29), capscrew (Figure 3, Item 30), and torx head capscrew (Figure 3, Item 28).
2. Assemble tube (Figure 3, Item 10), clamp (Figure 3, Item 18), and breather line (Figure 3, Item 24). Do NOT fully tighten clamp.
3. Install breather line (Figure 3, Item 24) on turbocharger air inlet (Figure 3, Item 26) and partially tighten clamp (Figure 3, Item 25).
4. Secure breather line (Figure 3, Item 24) to bracket (Figure 3, Item 23) with clamp (Figure 3, Item 19), two washers (Figure 3, Item 22), capscrew (Figure 3, Item 21), and nut (Figure 3, Item 20). Do NOT fully tighten nut.

INSTALLATION - CONTINUED

5. Assemble two new seals (Figures 4 and 5, Item 16), breather pipe (Figures 4 and 5, Item 15), and breather valve (Figure 4, Item 7) and install breather pipe in engine front cover (Figure 4, Item 17).

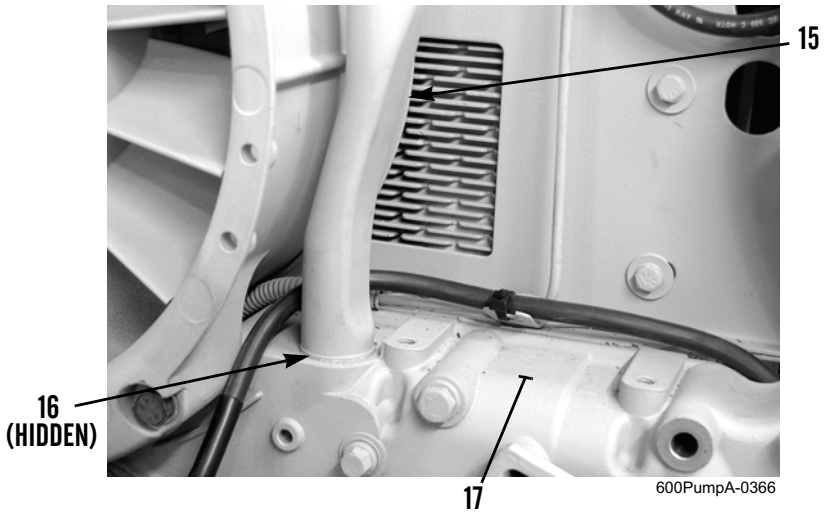


Figure 4. Breather Pipe at Engine Front Cover.

6. Install bracket (Figure 5, Item 3) on breather valve (Figure 5, Item 7) with washer (Figure 5, Item 2) and nut (Figure 5, Item 1).
7. Install breather valve (Figure 5, Item 7) on bracket (Figure 5, Item 13) with two washers (Figure 5, Item 12) and capscrews (Figure 5, Item 11).
8. Install bracket (Figure 5, Item 3) to upper cooling air guide plate (Figure 5, Item 9) with bolt (Figure 5, Item 6), two washers (Figure 5, Item 5), and nut (Figure 5, Item 4).
9. Install tube (Figure 5, Item 10) on breather valve (Figure 5, Item 7) and fully tighten clamp (Figure 5, Item 8).
10. Tighten all clamps and mounting hardware.

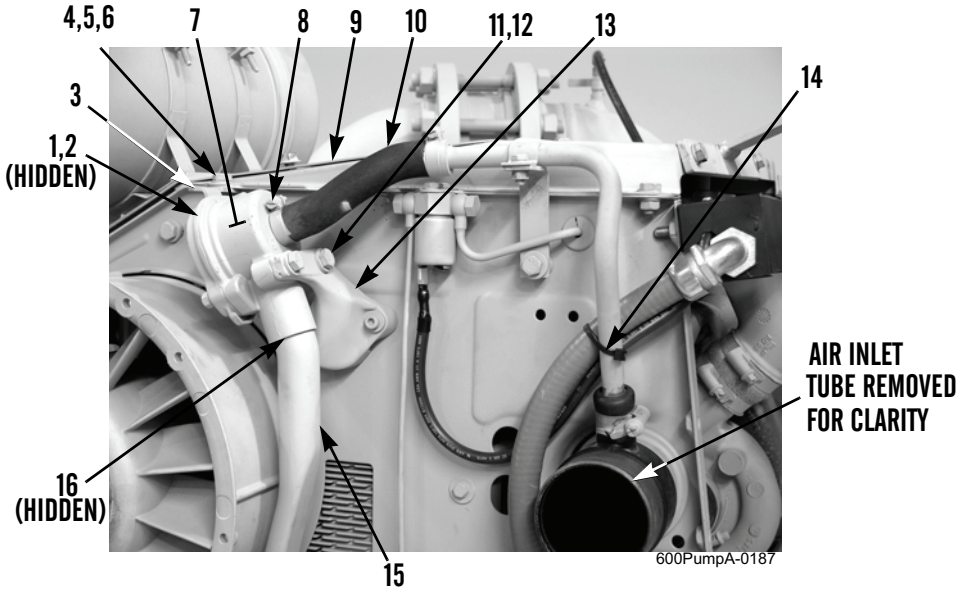


Figure 5. Crankcase Breather and Lines.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

OIL COOLER MAINTENANCE

Oil Cooler Thermostat Element Removal, Oil Cooler Thermostat Element Installation, Follow-On Tasks, Oil Cooler Removal, Cleaning and Inspection, Oil Cooler Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Adhesive (Item 1, WP 0129)

Oil, lubricating, OEA-30 (Item 18, WP 0129)

Oil, lubricating, OE/HDO-15/40 (Item 20, WP 0129)

Rag, wiping (Item 22, WP 0129)

Sealing ring (2) (oil cooler thermostat element replacement)

Personnel Required

63J (1)

References

WP 0023

WP 0084

Equipment Condition

Oil cooler access plate removed (WP 0068)

Air cleaner housing assembly and cover plate removed (WP 0097) (if removing oil cooler)

Upper access plate removed (WP 0068) (if removing oil cooler)

Upper cooling air guide plate removed (WP 0108) (if removing oil cooler)

WARNING

- Contact with engine oil can damage skin. Wear gloves when handling engine oil. If oil contacts skin, wash it off immediately. Failure to follow this warning may cause injury to personnel.
- When servicing this equipment, performing maintenance, or disposing of materials such as lubricating oil, consult your unit/local hazardous waster disposal center or safety officer for local regulatory guidance.

OIL COOLER THERMOSTAT ELEMENT REMOVAL

NOTE

A suitable container should be placed under oil cooler to capture any draining oil. Dispose of oil IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.

Remove plug (Figure 1, Item 1), washer (Figure 1, Item 2), sealing ring (Figure 1, Item 3), spring (Figure 1, Item 4), washer (Figure 1, Item 5), thermostat element (Figure 1, Item 8), and sealing ring (Figure 1, Item 7) from oil cooler (Figure 1, Item 6). Discard sealing rings.

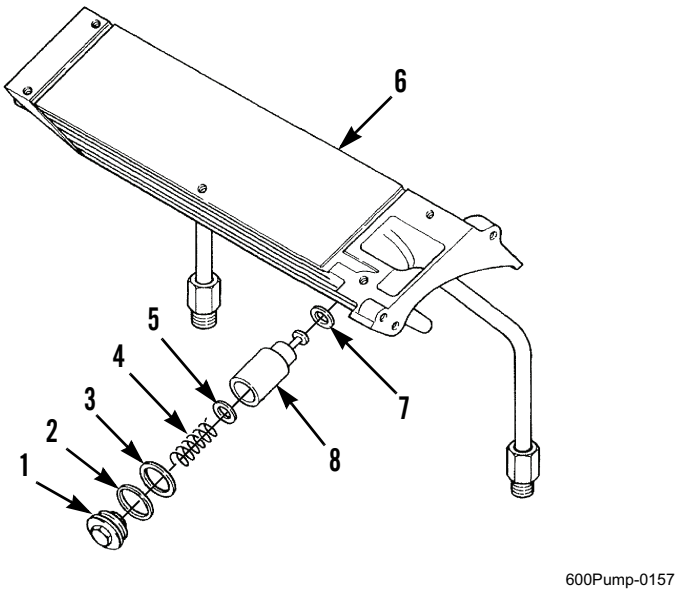


Figure 1. Oil Cooler Element.

OIL COOLER THERMOSTAT ELEMENT INSTALLATION

Install new sealing ring (Figure 1, Item 7), thermostat element (Figure 1, Item 8), washer (Figure 1, Item 5), spring (Figure 1, Item 4), new sealing ring (Figure 1, Item 3), washer (Figure 1, Item 2), and plug (Figure 1, Item 1) in oil cooler (Figure 1, Item 6).

FOLLOW-ON TASKS

1. Check and adjust engine oil to correct level (WP 0084).
2. Install oil cooler access plate (WP 0068).

OIL COOLER REMOVAL

NOTE

A suitable container should be placed under oil cooler to capture any draining oil. Dispose of oil IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.

1. Disconnect two union screws (Figure 2, Item 10) on oil cooler tubes (Figure 2, Item 9) from engine block.

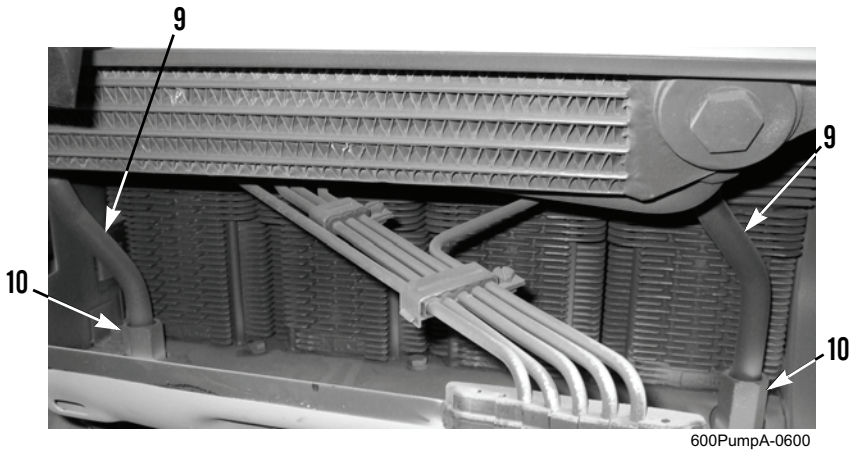


Figure 2. Oil Cooler and Union Screws.

2. Remove two bolts (Figure 3, Item 11) and washers (Figure 3, Item 12) from oil cooler (Figure 3, Item 6) and rear air duct wall (Figure 3, Item 13).
3. Repeat step 2 at front air duct wall.
4. Remove oil cooler (Figure 3, Item 6) from rear air duct wall (Figure 3, Item 13) and front air duct wall.

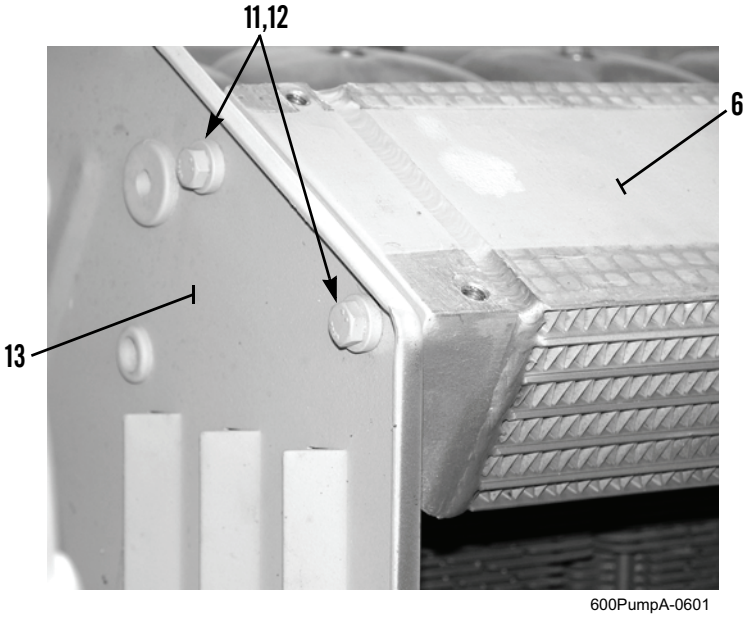
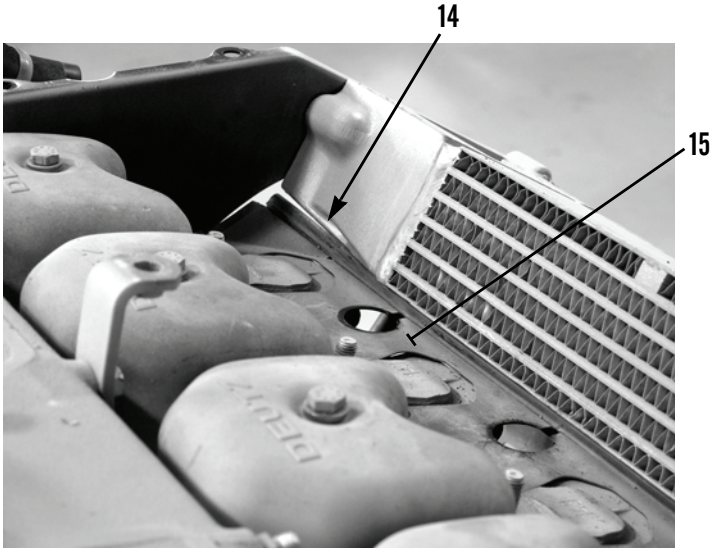


Figure 3. Oil Cooler.

OIL COOLER REMOVAL - CONTINUED

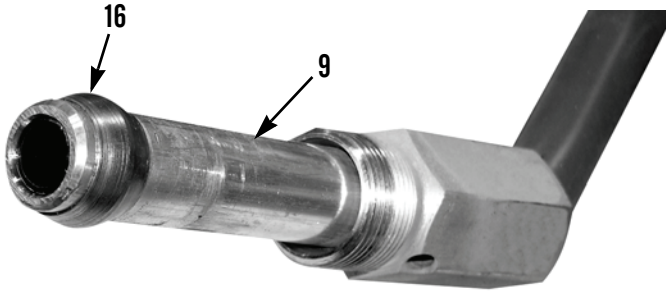
5. If damaged, remove sealing strip (Figure 4, Item 14) from air baffle (Figure 4, Item 15) and discard.



600PumpA-0602

Figure 4. Oil Cooler Sealing Strip.

6. Inspect compression sleeve (Figure 5, Item 16) on each oil cooler tube (Figure 5, Item 9). If damaged, remove compression sleeve and discard.



600PumpA-0603

Figure 5. Compression Sleeve.

CLEANING AND INSPECTION

Clean and inspect all parts IAW WP 0023.

OIL COOLER INSTALLATION

1. If removed, install new compression sleeve (Figure 5, Item 16) on each oil cooler tube (Figure 5, Item 9). Lightly coat each compression sleeve with clean oil.
2. If removed, position new sealing strip (Figure 4, Item 14) on edge of air baffle (Figure 4, Item 15).

NOTE

Apply loctite adhesive to threads of union screws before installation.

3. Position oil cooler (Figure 6, Item 6) on engine block and tighten two union screws (Figure 6, Item 10).

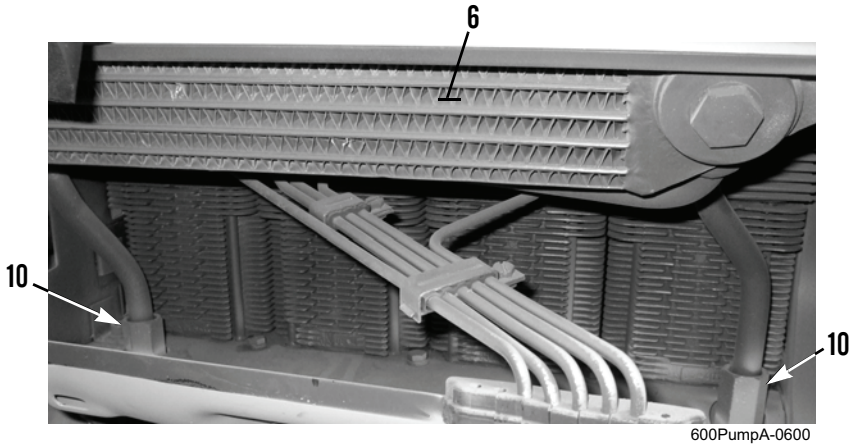


Figure 6. Oil Cooler and Union Screws.

4. Secure oil cooler (Figure 7, Item 6) to rear air duct wall (Figure 7, Item 13) with two washers (Figure 7, Item 12) and bolts (Figure 7, Item 11).

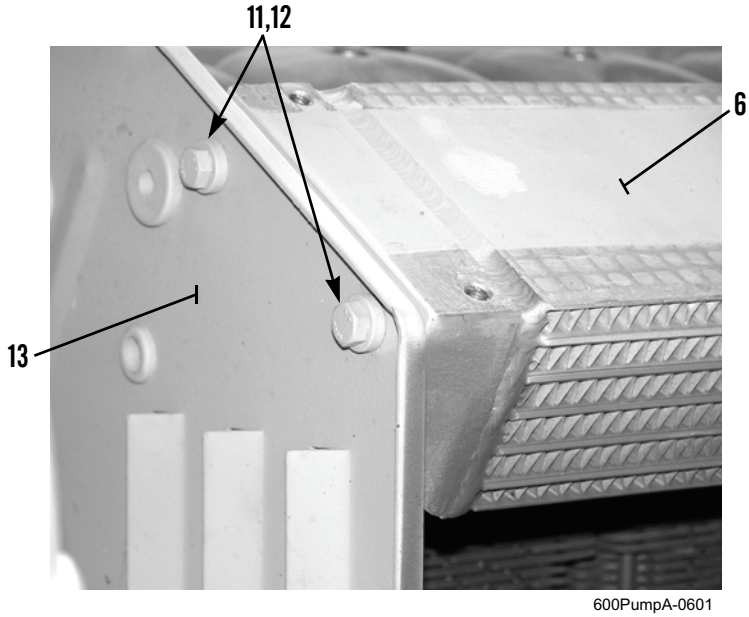


Figure 7. Oil Cooler.

5. Repeat step 4 at front air duct wall.

FOLLOW-ON TASKS

1. Check and adjust engine oil to correct level (WP 0084).
2. Install upper cooling air guide plate (WP 0108).
3. Install upper access plate (WP 0068).
4. Install air cleaner housing assembly and cover plate (WP 0097).
5. Install oil cooler access plate (WP 0068).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

CHANGING ENGINE OIL AND REPLACING OIL FILTER

Changing Engine Oil, Replacing Oil Filter, Refilling Engine Oil

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Oil, lubricating, OEA-30 (Item 18, WP 0129)
Oil, lubricating, OE/HDO-15/40 (Item 20, WP 0129)
Rag, wiping (Item 22, WP 0129)
Oil filter
Sealing ring

Personnel Required

63J (1)

References

WP 0012

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked

WARNING

- Engine oil should be warm to ensure it drains completely from crankcase. Use caution to protect against burns, when draining oil.
- Contact with engine oil can damage skin. Wear gloves when handling engine oil. If oil contacts skin, wash it off immediately. Failure to follow this warning may cause injury to personnel.
- When servicing this equipment, performing maintenance, or disposing of materials such as lubricating oil, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

CHANGING ENGINE OIL

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

1. Ensure pump volute is filled 2/3 full with appropriate fluid, then start engine and allow it to warm up (WP 0006). Oil temperature, as shown on gauge at control panel, should be approximately 176°F (80°C).
2. Shut down engine (WP 0006).

NOTE

- A suitable container should be placed under oil pan drain plug to capture draining oil. Dispose of oil IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.
- With a filter change, oil capacity is 13.74 qt (13 L). Oil capacity without a filter change is 12.68 qt (12 L).

3. Place a suitable container under engine oil pan (Figure 1, Item 1).
4. Remove drain plug (Figure 1, Item 2) and sealing ring (Figure 1, Item 3) from front or rear of oil pan (Figure 1, Item 1) and drain oil. Discard sealing ring. Dispose of oil IAW using unit's SOP.
5. Wipe drain plug (Figure 1, Item 2) clean. Install new sealing ring (Figure 1, Item 3) and drain plug in oil pan.

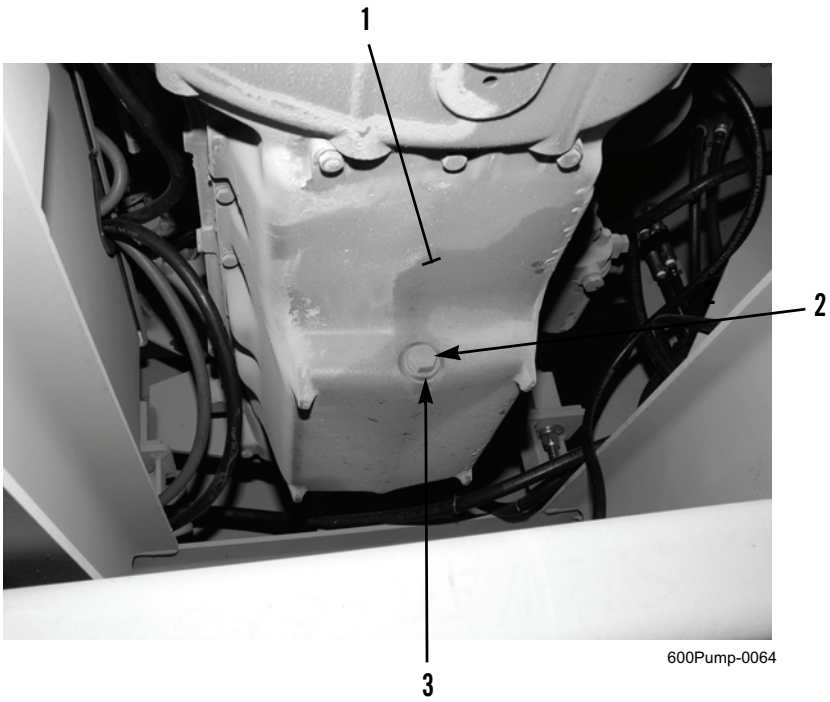


Figure 1. Oil Pan.

REPLACING OIL FILTER

NOTE

A suitable container should be placed under oil filter to capture draining oil. Dispose of oil IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.

1. Place a suitable container under oil filter (Figure 2, Item 4) to capture any draining oil.
2. Use a filter wrench to turn oil filter (Figure 2, Item 4) counterclockwise (left) and remove filter. Dispose of oil filter and oil IAW using unit's SOP.
3. Clean any dirt from sealing surface of filter head (Figure 2, Item 5).
4. Lightly coat gasket of new oil filter (Figure 2, Item 4) with clean oil.
5. Turn oil filter (Figure 2, Item 4) clockwise (right) by hand until filter gasket is flush with filter head (Figure 2, Item 5). Tighten oil filter another 1/2 turn.

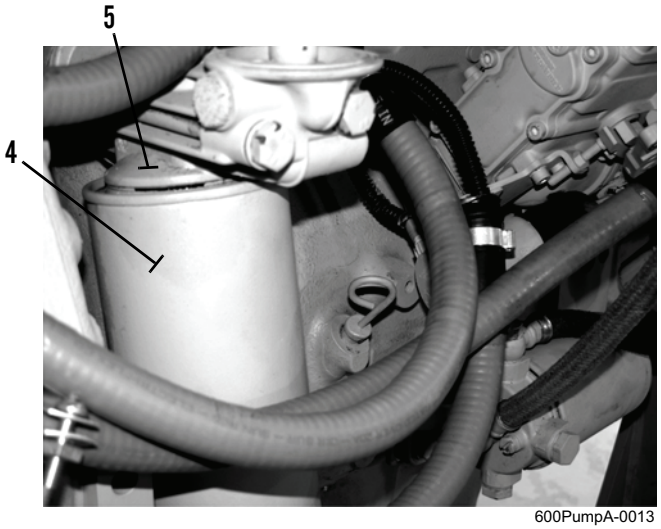


Figure 2. Oil Filter.

REFILLING ENGINE OIL

NOTE

With a filter change, oil capacity is 13.74 qt (13 L). Oil capacity without a filter change is 12.68 qt (12 L).

1. Clean area around oil filler cap (Figure 3, Item 6) with a clean rag. Remove oil filler cap and add 13.74 qt (13 L) of lubricating oil through filler opening. Ensure correct grade of oil is added IAW expected ambient temperature range of operation. Refer to KEY in WP 0012 for correct grade of oil.

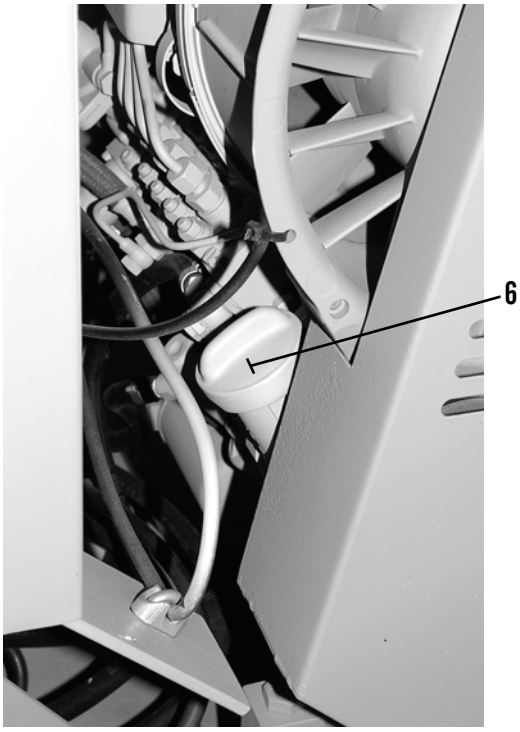


Figure 3. Oil Filler Cap.

REFILLING ENGINE OIL - CONTINUED

2. Clean area around dipstick (Figure 4, Item 7) with a clean rag. Check oil level on dipstick. Oil should be visible between top (MAX) and bottom (MIN) lines at lower end of dipstick. Add oil through oil filler opening as needed until dipstick reading is correct.

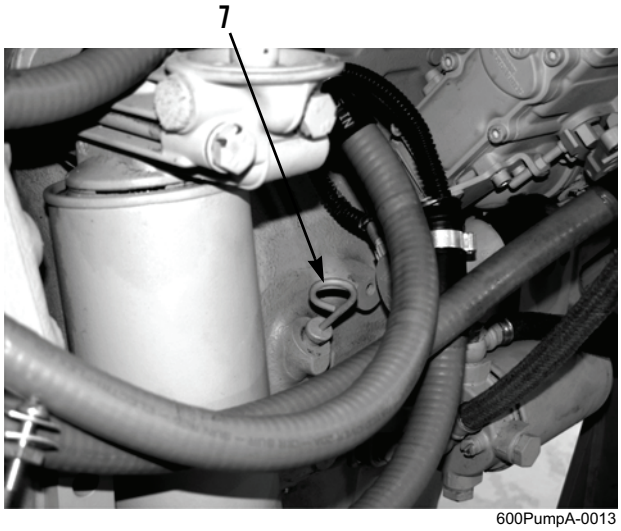


Figure 4. Engine Oil Dipstick.

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

3. Ensure pump volute is filled 2/3 full with appropriate fluid, then start engine and run at idle (WP 0006).
4. Check oil pressure gauge to ensure adequate oil pressure is reached.
5. Check for leaks.
6. Shut down engine (WP 0006) and let it sit for five minutes.
7. Recheck oil level and add oil as needed.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

OIL FILTER HEAD ASSEMBLY REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Rag, wiping (Item 22, WP 0129)
Tag, marker (Item 27, WP 0129)
Gasket

Personnel Required

63J (1)

References

WP 0006
WP 0023

Equipment Condition

Battery cables disconnected (WP 0033)
Oil filter removed from oil filter head assembly (WP 0084)
Oil temperature sender removed oil filter head assembly (WP 0044)
Oil pressure sender removed from oil filter head assembly (WP 0042)


WARNING

- Ensure battery cables are disconnected before replacing oil filter head assembly. Failure to follow this warning could result in personal injury or damage to equipment.
- Contact with engine oil can damage skin. Wear gloves when handling engine oil. If oil contacts skin, wash it off immediately. Failure to follow this warning may cause injury to personnel.
- When servicing this equipment, performing maintenance, or disposing of materials such as lubricating oil and oil filter, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

REMOVAL

NOTE

A suitable container should be placed under oil filter head assembly to capture draining oil. Dispose of oil IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.

Remove two bolts (Figure 1, Item 1), washers (Figure 1, Item 2), oil filter head assembly (Figure 1, Item 3), and gasket (Figure 1, Item 5) from engine block (Figure 1, Item 4). Discard gasket.

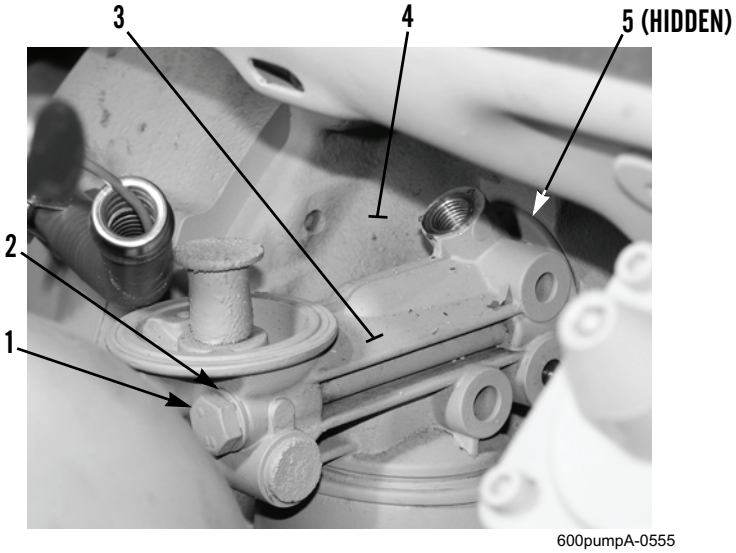


Figure 1. Oil Filter Head Assembly.

CLEANING AND INSPECTION

1. Clean and inspect all parts IAW WP 0023.
2. Ensure gasket material is removed from all surfaces.

INSTALLATION

Install new gasket (Figure 1, Item 5) and oil filter head assembly (Figure 1, Item 3) on engine block (Figure 1, Item 3) with two washers (Figure 1, Item 2) and bolts (Figure 1, Item 1). Tighten bolts to 41 lb-ft (55 Nm).

FOLLOW-ON TASKS

1. Install oil pressure sender to oil filter head assembly (WP 0042).
2. Install oil temperature sender to oil filter head assembly (WP 0044).
3. Install oil filter to oil filter head assembly (WP 0084).
4. Connect battery cables (WP 0033).

CAUTION

Pump is coupled directly to engine. When pump must be run, ensure pump volute is filled 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

5. Ensure pump volute is filled 2/3 full with appropriate fluid, then start engine (WP 0006). Check for leaks. Shut down engine (WP 0006).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

OIL PAN REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Compound, silicone, RTV (Item 8, WP 0129)
Rag, wiping (Item 22, WP 0129)
Lockwasher (4)
Sealing ring

Personnel Required

63J (2)

References

WP 0023
WP 0084

Equipment Condition

Engine removed (WP 0073)
Outer ring of coupling assembly removed from engine (WP 0073)
Flywheel removed (WP 0078)

WARNING

- Contact with engine oil can damage skin. Wear gloves when handling engine oil. If oil contacts skin, wash it off immediately. Failure to follow this warning may cause injury to personnel.
- When servicing this equipment, performing maintenance or disposing of materials such as lubricating oil, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

REMOVAL

NOTE

- A suitable container should be placed under oil pan to capture draining oil. Ensure all spills are cleaned up IAW spill containment plan.
- Oil capacity without a filter change is 12.68 qt (12 L). With a filter change, oil capacity is 13.74 qt (13 L).

1. Remove drain plug (Figure 1, Item 3) and sealing ring (Figure 1, Item 2) from front or rear of oil pan (Figure 1, Item 1) and drain engine oil. Discard sealing ring.

WARNING

Oil pan is heavy and awkward to handle. Use caution and assistance when removing oil pan. Failure to follow this warning may result in injury to personnel.

NOTE

Note bolt length and location to ensure correct installation.

2. Remove two bolts (Figure 1, Item 4), three bolts (Figure 1, Item 7), 16 bolts (Figure 1, Item 6), 21 washers (Figure 1, Item 5), and four bolts (Figure 1, Item 8) from oil pan (Figure 1, Item 1) and engine block.

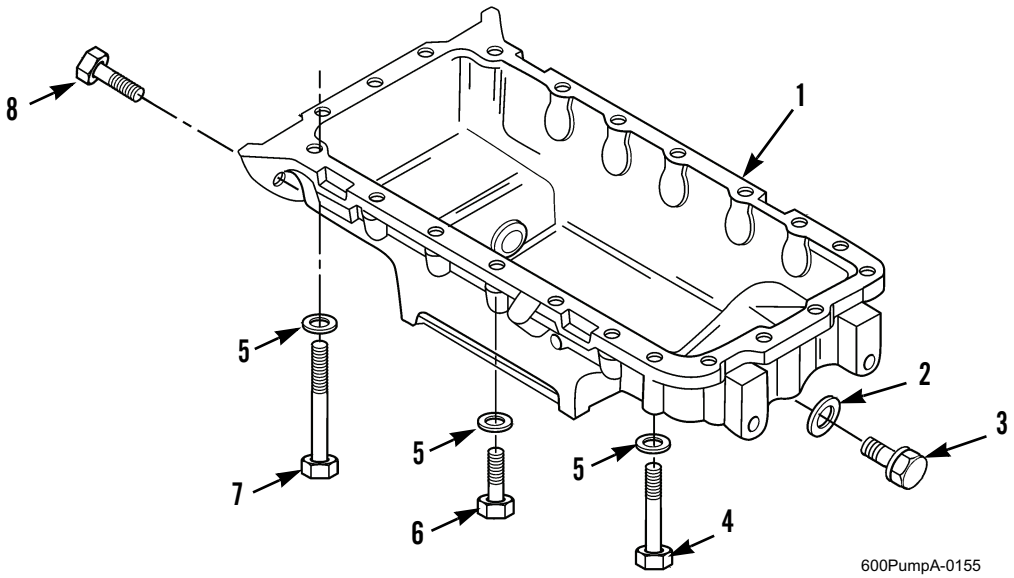


Figure 1. Engine Oil Pan.

REMOVAL - CONTINUED

3. Remove four bolts (Figure 2, Item 9), lockwashers (Figure 2, Item 10), and washers (Figure 2, Item 11) from engine crossbeam (Figure 2, Item 13) and engine front cover (Figure 2, Item 12). Discard lockwashers.

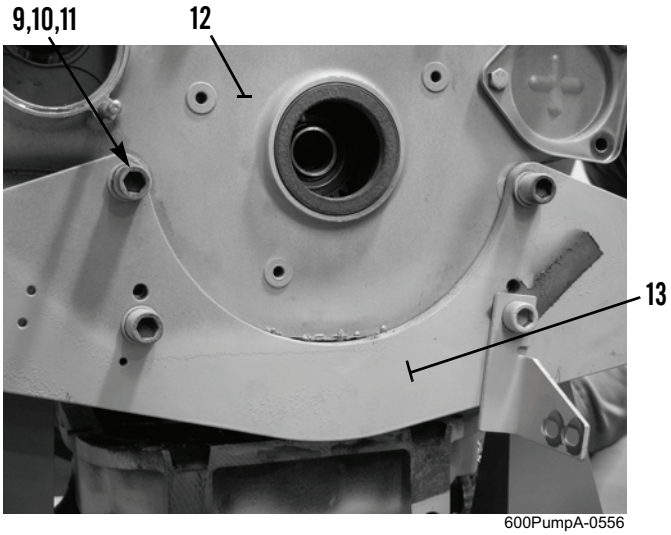


Figure 2. Engine Crossbeam.

4. Partially reinstall two bolts (Figure 1, Item 4) at middle of oil pan (Figure 1, Item 1) to support oil pan.
5. Tap on oil pan (Figure 1, Item 1) to break silicone RTV compound seal and remove two bolts (Figure 1, Item 4) and oil pan from engine block.

CLEANING AND INSPECTION

1. Clean and inspect all parts IAW WP 0023.
2. Ensure silicone RTV compound is removed from all mating surfaces.

INSTALLATION

WARNING

Wear gloves and eye protection when handling silicone RTV compound. Work in a well-ventilated area. Exposure to silicone RTV compound may cause irritation to eyes, skin, and lungs. If ingested, do NOT induce vomiting. Seek medical attention.

1. Apply silicone RTV compound to oil pan (Figure 3, Item 1).

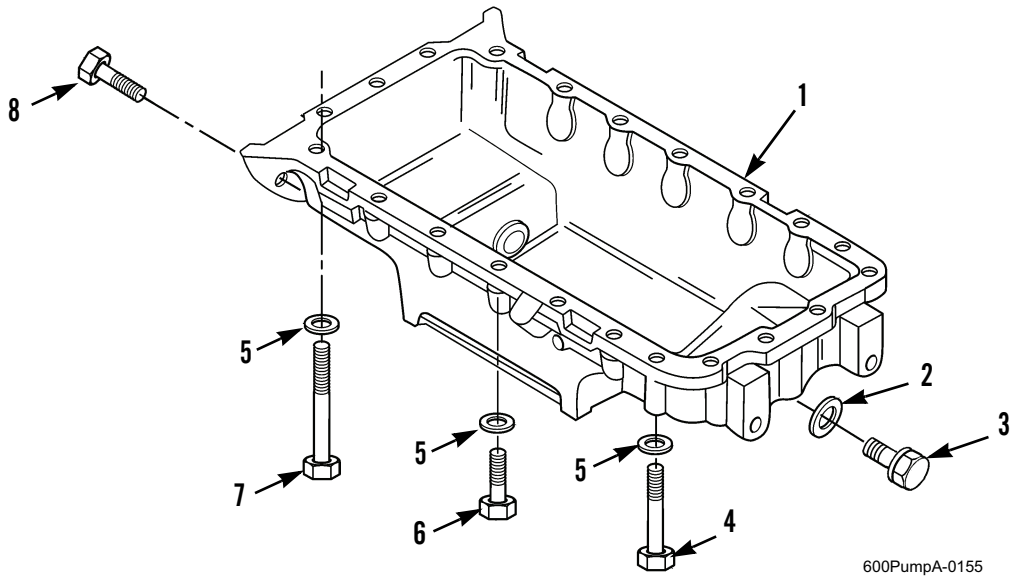


Figure 3. Engine Oil Pan.

WARNING

Oil pan is heavy and awkward to handle. Use caution and assistance when installing oil pan. Failure to follow this warning may result in injury to personnel.

NOTE

Bolts should be tightened from center of oil pan out toward each end.

2. Install oil pan (Figure 3, Item 1) on engine block with four bolts (Figure 3, Item 8), 21 washers (Figure 3, Item 5), two bolts (Figure 3, Item 4), three bolts (Figure 3, Item 7), and 16 bolts (Figure 3, Item 6). Tighten bolts to 16 to 21 lb-ft (22 to 28 Nm).

INSTALLATION - CONTINUED

3. Install four washers (Figure 4, Item 11), new lockwashers (Figure 4, Item 10), and bolts (Figure 4, Item 9) to engine crossbeam (Figure 4, Item 13) and engine front cover (Figure 4, Item 12).

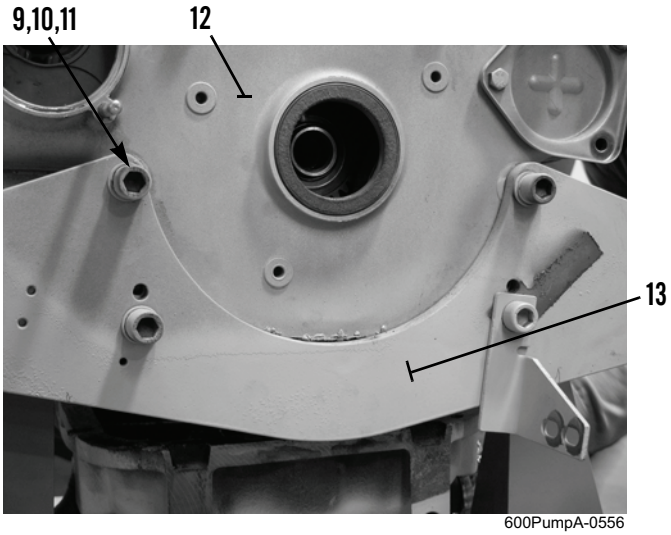


Figure 4. Engine Crossbeam.

4. Install new sealing ring (Figure 3, Item 2) and drain plug (Figure 3, Item 3) to front or rear of oil pan (Figure 3, Item 1).

FOLLOW-ON TASKS

1. Install flywheel (WP 0078).
2. Install outer ring of coupling assembly on flywheel (WP 0073).
3. Install engine (WP 0073).
4. Fill engine with correct amount of clean oil (WP 0084).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

OIL PUMP REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Oil, lubricating, OEA-30 (Item 18, WP 0129)
Oil, lubricating, OE/HDO-15/40 (Item 20, WP 0129)
Rag, wiping (Item 22, WP 0129)
Lockwasher (3)
O-ring (2)
Spring tension washer (2)

Personnel Required

63J (1)

References

WP 0023
WP 0084

Equipment Condition

Engine set at Top Dead Center (TDC) (WP 0074)
Engine front cover removed (WP 0091)
Oil pan removed (WP 0086)

REMOVAL

1. Disconnect oil suction line (Figure 1, Item 2) from oil pump (Figure 1, Item 1).

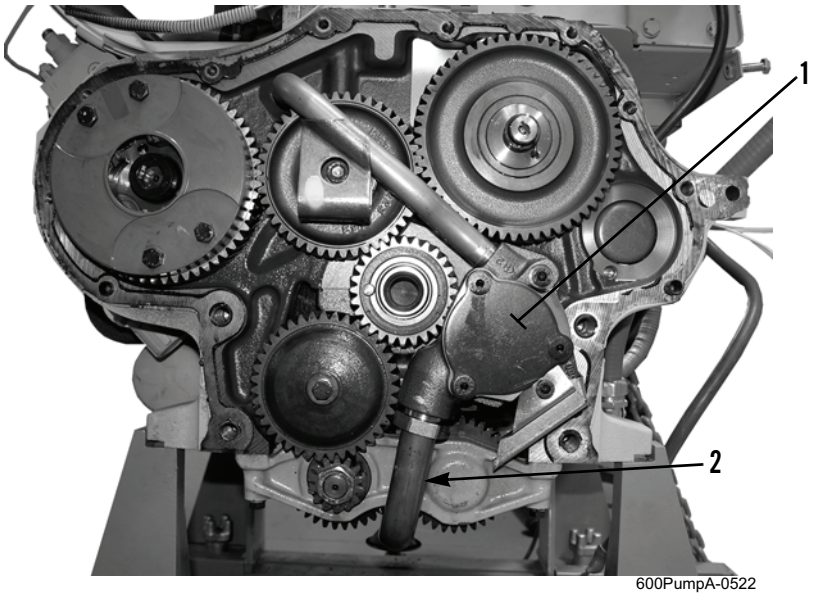


Figure 1. Oil Suction Line.

2. Remove two nuts (Figure 2, Item 7), lockwashers (Figure 2, Item 8), and capscrews (Figure 2, Item 9) from clamp (Figure 2, Item 3) at oil pan end of oil suction line (Figure 2, Item 2). Discard lockwashers.
3. Remove capscrew (Figure 2, Item 4) and lockwasher (Figure 2, Item 5) from clamp (Figure 2, Item 3) and engine block (Figure 2, Item 6) and release oil suction line (Figure 1, Item 2). Remove oil suction line. Discard lockwasher.

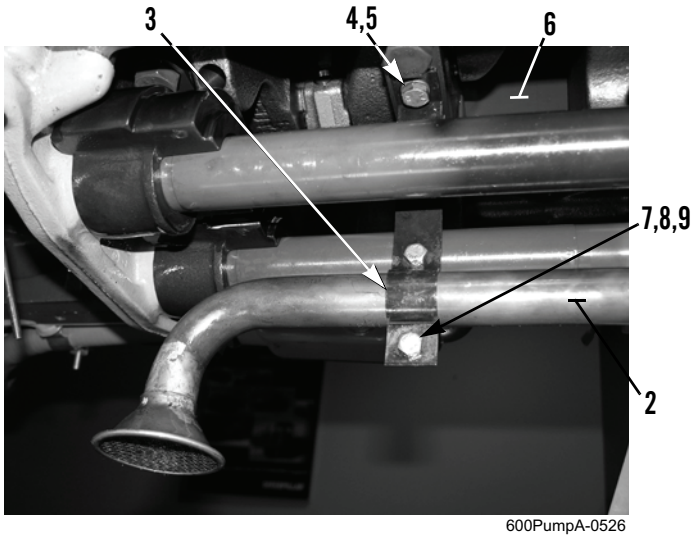


Figure 2. Oil Suction Line.

REMOVAL - CONTINUED

4. Remove torx head screw (Figure 3, Item 10), thrust washer (Figure 3, Item 11), and yoke spring (Figure 3, Item 13) from idler gear (Figure 3, Item 12) and oil pressure line (Figure 3, Item 14).

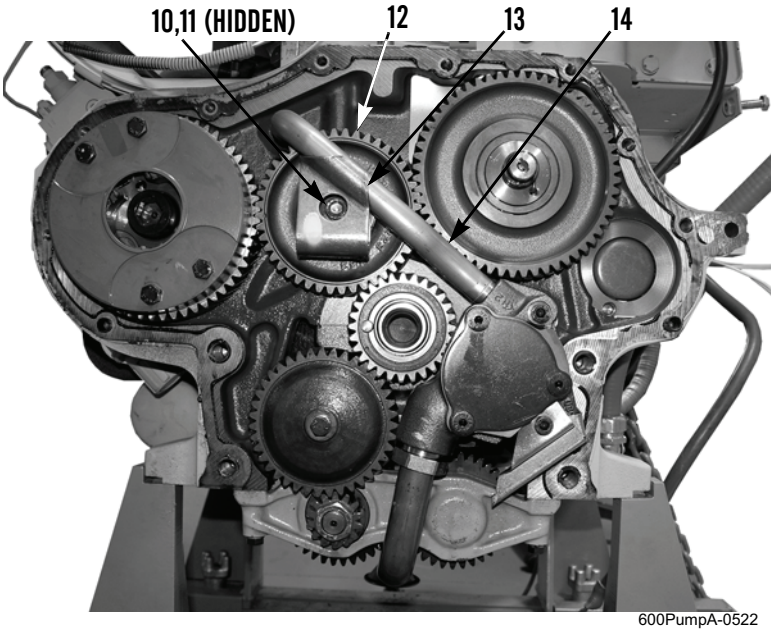


Figure 3. Oil Pump.

NOTE

Perform step 5 to ensure oil pump is installed with correct backlash.

5. Check backlash between oil pump gear (Figure 4, Item 16) and crankshaft gear (Figure 4, Item 15). Note amount of backlash.

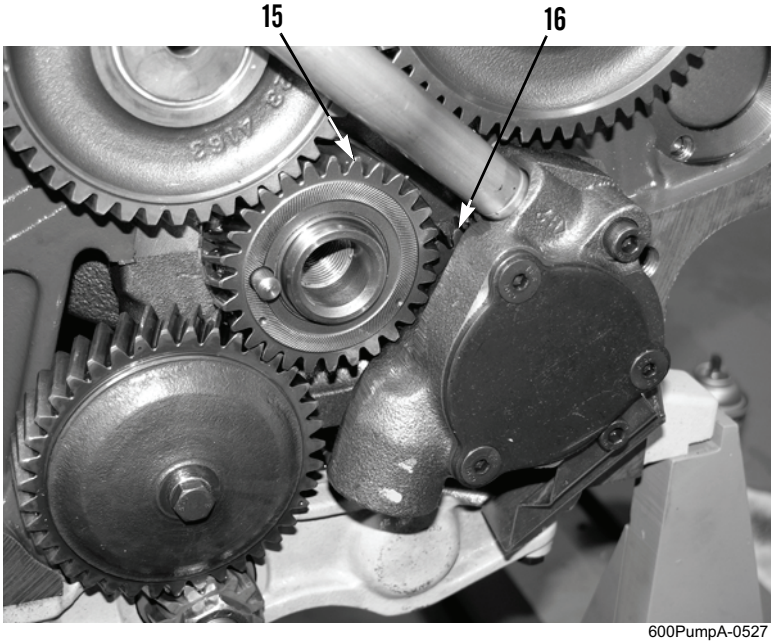


Figure 4. Checking Backlash.

REMOVAL - CONTINUED

6. Remove two torx head screws (Figure 5, Item 17), spring tension washers (Figure 5, Item 18), deflection plate (Figure 5, Item 20), spacer washer (Figure 5, Item 19), oil pump (Figure 5, Item 1), and oil pressure line (Figure 5, Item 14) from engine block (Figure 5, Item 6). Discard spring tension washers.
7. Remove oil pressure line (Figure 5, Item 14) from oil pump (Figure 5, Item 1).

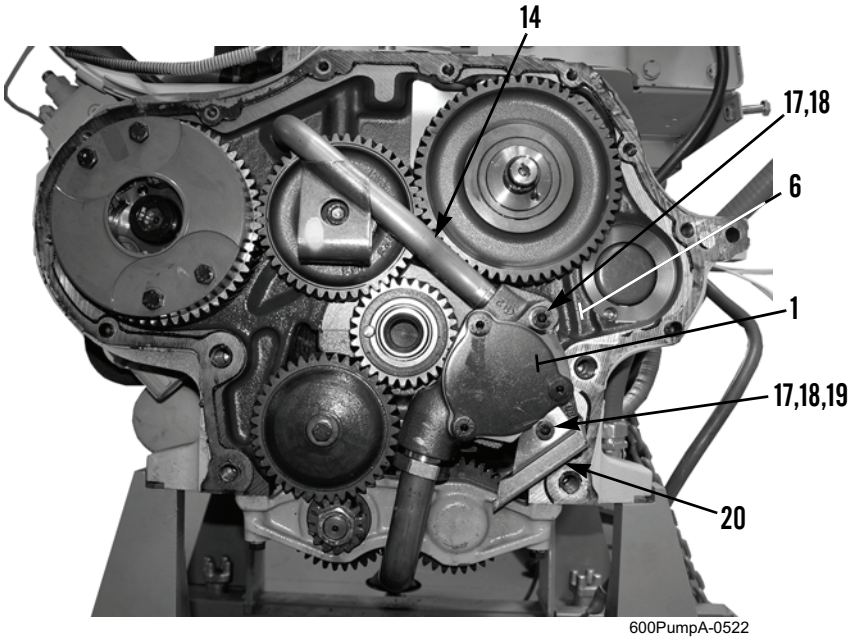


Figure 5. Oil Pump.

8. Remove two O-rings (Figure 6, Item 21) from oil pressure line (Figure 6, Item 14). Discard O-rings.

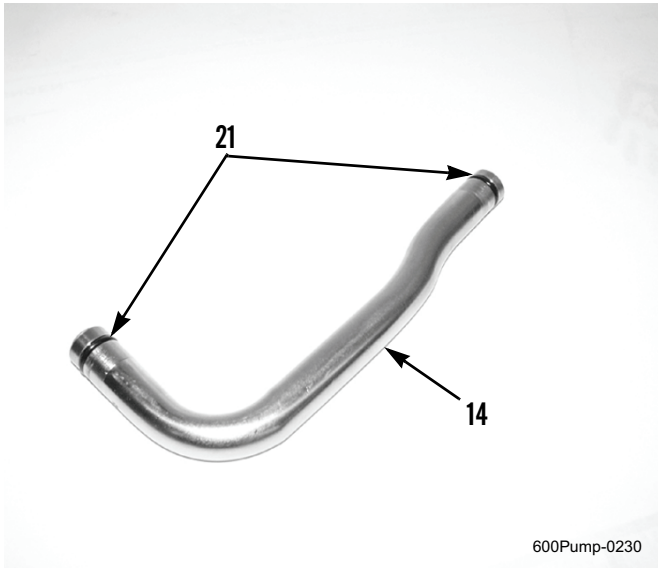


Figure 6. Oil Pressure Line

CLEANING AND INSPECTION

Clean and inspect all parts IAW WP 0023.

INSTALLATION

NOTE

Lightly coat new O-rings with clean oil prior to installation.

1. Install two new O-rings (Figure 6, Item 21) on oil pressure line (Figure 6, Item 14).
2. Install oil pressure line (Figure 5, Item 14) on oil pump (Figure 5, Item 1).
3. Install oil pressure line (Figure 5, Item 14) on engine block (Figure 5, Item 6).
4. Install oil pump (Figure 5, Item 1), deflection plate (Figure 5, Item 20), and spacer washer (Figure 5, Item 19) on engine block (Figure 5, Item 6) with two new spring tension washers (Figure 5, Item 18) and torx head screws (Figure 5, Item 17). Do not fully tighten torx head screws.
5. Check backlash between oil pump gear (Figure 7, Item 16) and crankshaft gear (Figure 7, Item 15). Backlash should be the same as noted in *Removal*, step 5 in this work package.
   a. If backlash is OK, tighten two torx head screws (Figure 7, Item 17) to 23 to 28 lb-ft (31 to 38 Nm).
   b. If backlash is not OK, adjust position of oil pump (Figure 7, Item 1) until backlash is OK, then tighten two torx head screws (Figure 7, Item 17) to 23 to 28 lb-ft (31 to 38 Nm).

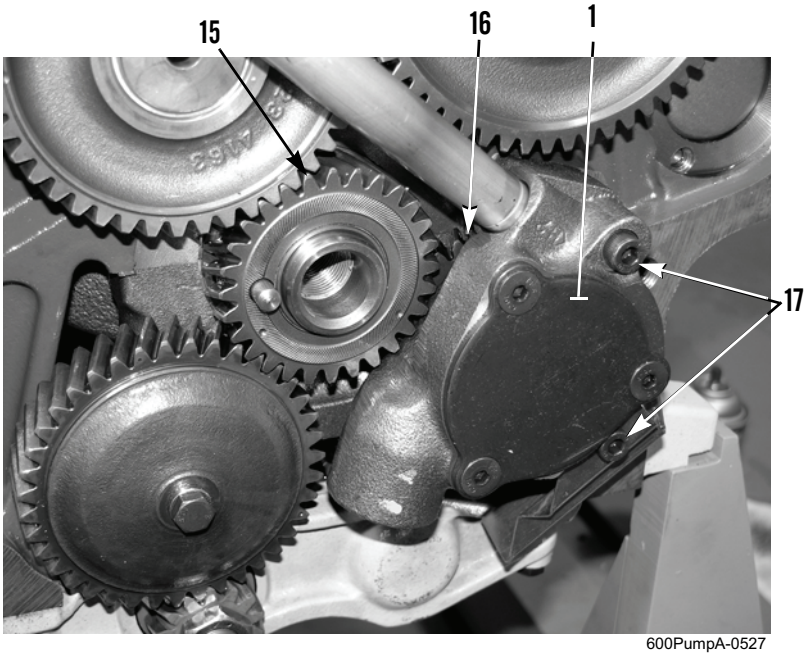


Figure 7. Adjusting Backlash.

INSTALLATION - CONTINUED

6. Install thrust washer (Figure 8, Item 11), yoke spring (Figure 8, Item 13), and torx head screw (Figure 8, Item 10) on idler gear (Figure 8, Item 12) and oil pressure line (Figure 8, Item 14). Tighten torx head screw to 20 to 24 lb-ft (27 to 33 Nm), then tighten another 30 degrees.
7. If installing a new oil suction line (Figure 8, Item 2), install new ferule (Figure 8, Item 22) and nut (Figure 8, Item 23) on oil suction line.
8. Connect oil suction line (Figure 8, Item 2) to oil pump (Figure 8, Item 1).

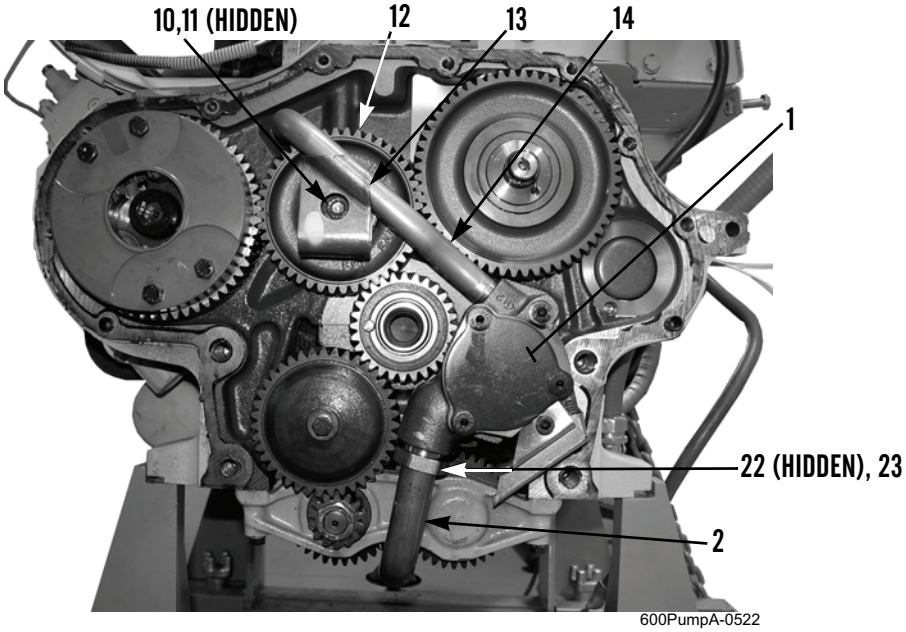


Figure 8. Oil Pump.

INSTALLATION - CONTINUED

9. Secure oil suction line (Figure 9, Item 2) inside clamp (Figure 9, Item 3) and loosely install two capscrews (Figure 9, Item 9), new lockwashers (Figure 9, Item 8), and nuts (Figure 9, Item 7).
10. Secure clamp (Figure 9, Item 3) to engine block (Figure 9, Item 6) with new lockwasher (Figure 9, Item 5) and capscrew (Figure 9, Item 4).
11. Tighten two nuts (Figure 9, Item 7).

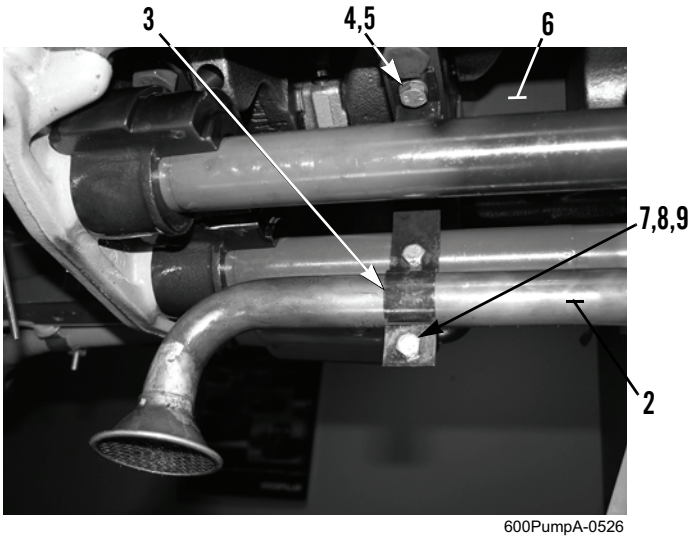


Figure 9. Oil Suction Line.

FOLLOW-ON TASKS

1. Install oil pan (WP 0086).
2. Install engine front cover (WP 0091).
3. Check engine oil level and adjust to correct level (WP 0084).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

INTAKE MANIFOLD REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Rag, wiping (Item 22, WP 0129)
Gasket (4)

Personnel Required

63J (1)

References

WP 0023
WP 0079

Equipment Condition

Battery cables disconnected (WP 0033)
Muffler and muffler support bracket removed (WP 0107)
Exhaust manifold removed (WP 0089)
Upper access plate removed (WP 0068)

WARNING

- Ensure battery cables are disconnected before replacing intake manifold. Failure to follow this warning could result in personal injury or damage to equipment.
- Allow engine to cool off before performing maintenance on intake manifold. Hot metal parts can cause severe burns. Wear eye, glove and skin protection when working with heated parts. Failure to follow this warning may cause injury to personnel.

REMOVAL

1. Remove bolt (Figure 1, Item 3), washer (Figure 1, Item 4), and spacer (Figure 1, Item 2) from rear air duct wall (Figure 1, Item 5) and intake manifold (Figure 1, Item 1).

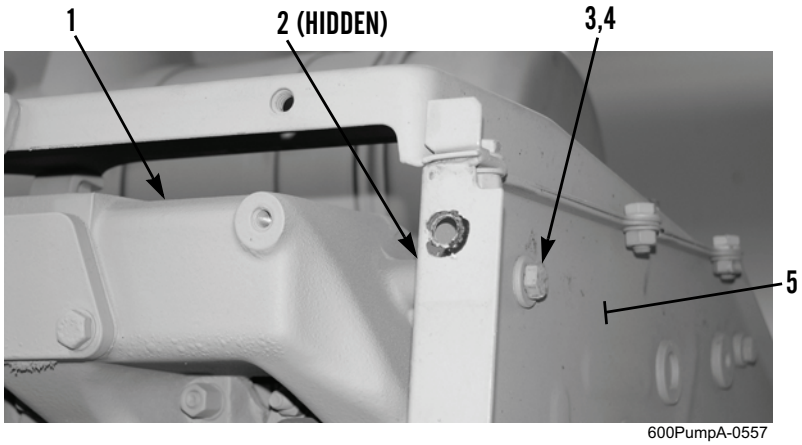


Figure 1. Rear Air Duct Wall.

2. Remove bolt (Figure 2, Item 7), washer (Figure 2, Item 8), spacers (Figure 2, Items 10 and 11), and bracket (Figure 2, Item 6) from front air duct wall (Figure 2, Item 9) and intake manifold (Figure 1, Item 1).

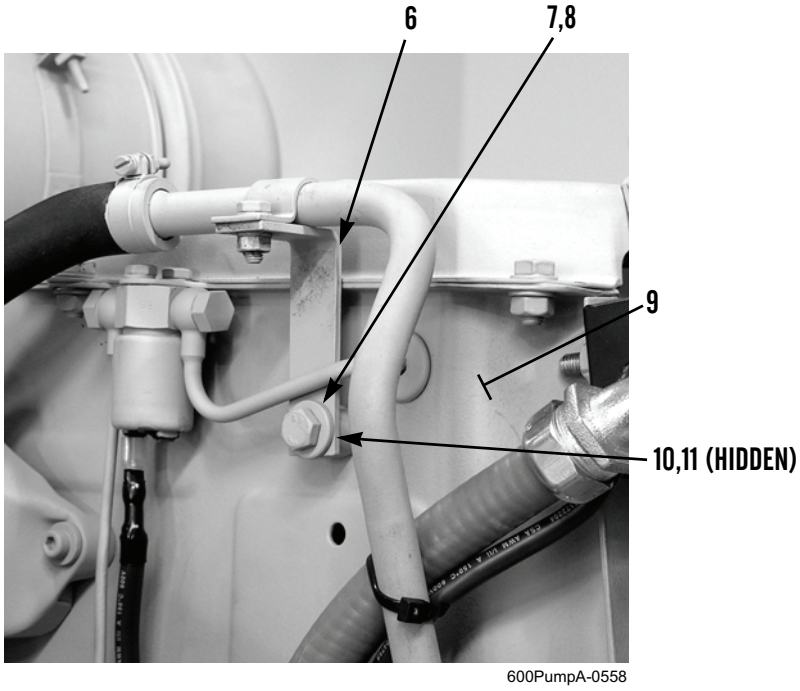


Figure 2. Front Air Duct Wall.

REMOVAL - CONTINUED

3. Disconnect injector line (Figure 3, Item 12) from fitting (Figure 3, Item 13) on intake manifold (Figure 1, Item 1).

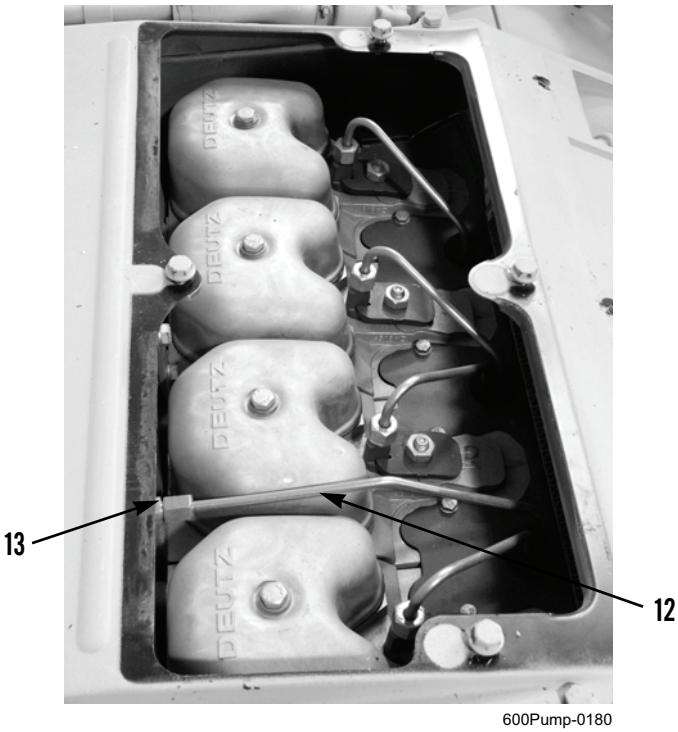


Figure 3. Fuel Injector Line.

4. Remove valve cover (Figure 4, Item 21) from 2nd cylinder head back from front of engine (WP 0079).
5. Remove two bolts (Figure 4, Item 18), washers (Figure 4, Item 19), and angle bracket (Figure 4, Item 20) from intake manifold (Figure 4, Item 1).
6. Remove bolt (Figure 4, Item 15), washer (Figure 4, Item 16), and spacer (Figure 4, Item 17) from upper cooling air duct panel (Figure 4, Item 14) and intake manifold (Figure 4, Item 1).

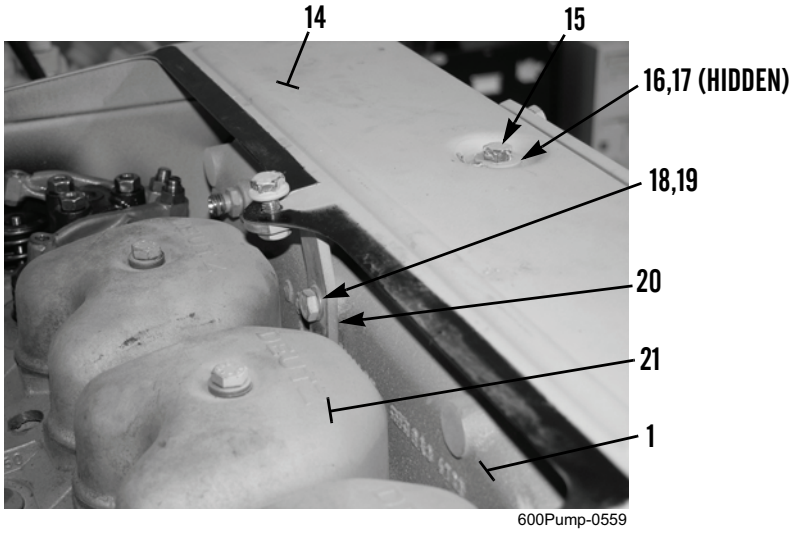


Figure 4. Upper Cooling Air Duct Panel and Intake Manifold.

REMOVAL - CONTINUED

7. Remove eight nuts (Figure 5, Item 22), washers (Figure 5, Item 23), intake manifold (Figure 5, Item 1), and four gaskets (Figure 5, Item 25) from cylinder head studs (Figure 5, Item 24). Discard gaskets.

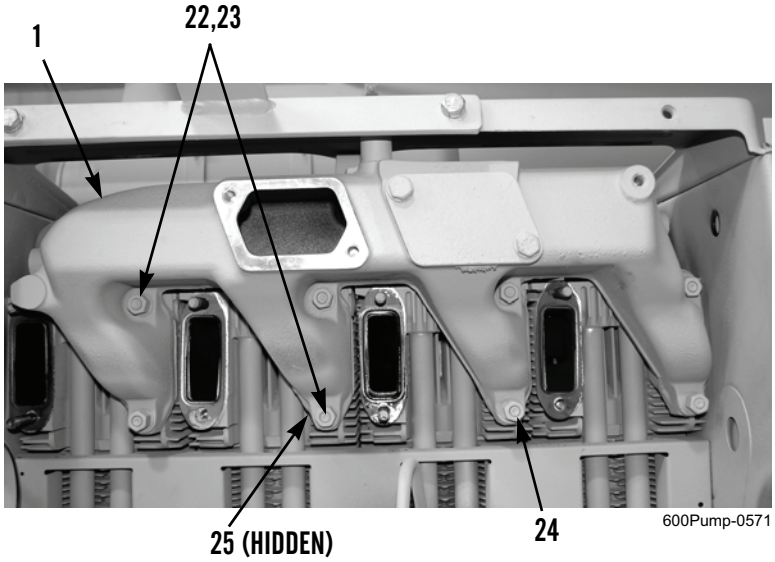


Figure 5. Intake Manifold.

CLEANING AND INSPECTION

Clean and inspect all parts IAW WP 0023.

INSTALLATION

1. Install four new gaskets (Figure 5, Item 25), intake manifold (Figure 5, Item 1), eight washers (Figure 5, Item 23), and nuts (Figure 5, Item 22) to cylinder head studs (Figure 5, Item 25). Tighten nuts to 186 ± 18 lb-in. (21 ± 2 Nm).
2. Install spacer (Figure 6, Item 17), washer (Figure 6, Item 16), and bolt (Figure 6, Item 16) to upper cooling air duct panel (Figure 6, Item 14) and intake manifold (Figure 5, Item 1).
3. Install angle bracket (Figure 6, Item 20) to intake manifold (Figure 6, Item 1) with two washers (Figure 6, Item 19) and bolts (Figure 6, Item 18).
4. Install valve cover (Figure 6, Item 21) to 2nd cylinder head back from front of engine (WP 0079).

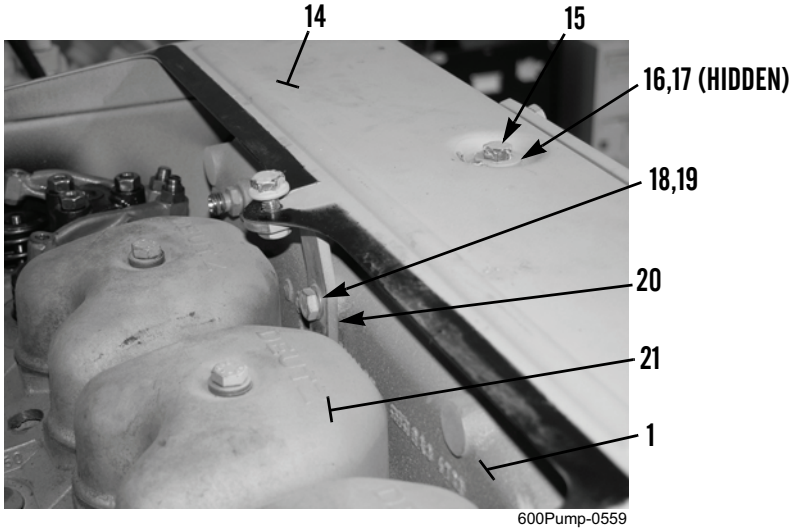


Figure 6. Upper Cooling Air Duct Panel and Intake Manifold.

5. Connect injector line (Figure 7, Item 12) to fitting (Figure 7, Item 13) on intake manifold (Figure 6, Item 1).

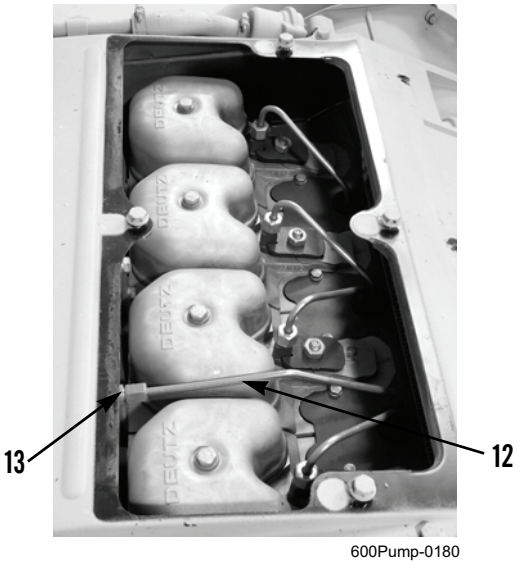


Figure 7. Fuel Injector Line.

INSTALLATION - CONTINUED

6. Install spacers (Figure 8, Items 10 and 11), bracket (Figure 8, Item 6), washer (Figure 8, Item 8), and bolt (Figure 8, Item 7) to front air duct wall (Figure 8, Item 9) and intake manifold (Figure 9, Item 1).

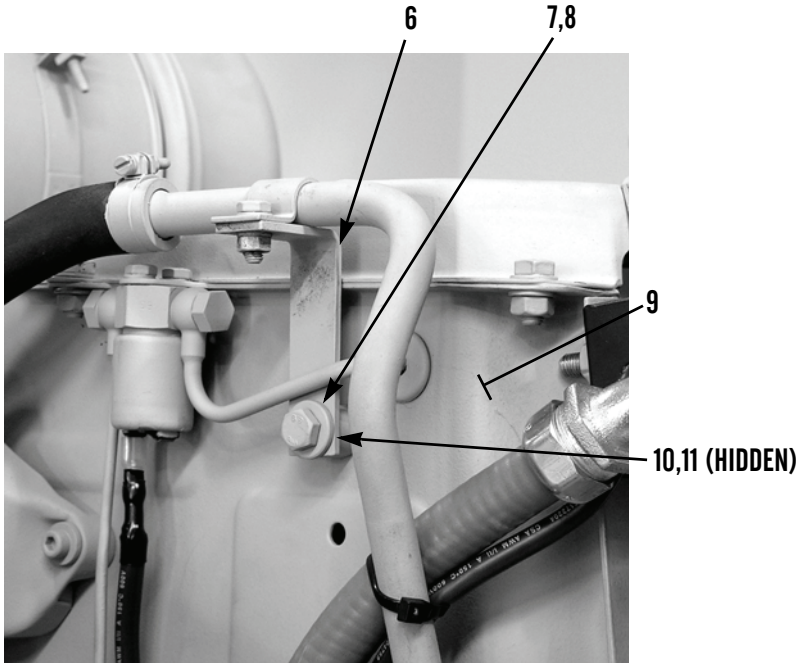


Figure 8. Front Air Duct Wall.

7. Install spacer (Figure 9, Item 2), washer (Figure 9, Item 4), and bolt (Figure 9, Item 3) to rear air duct wall (Figure 9, Item 5) and intake manifold (Figure 9, Item 1).

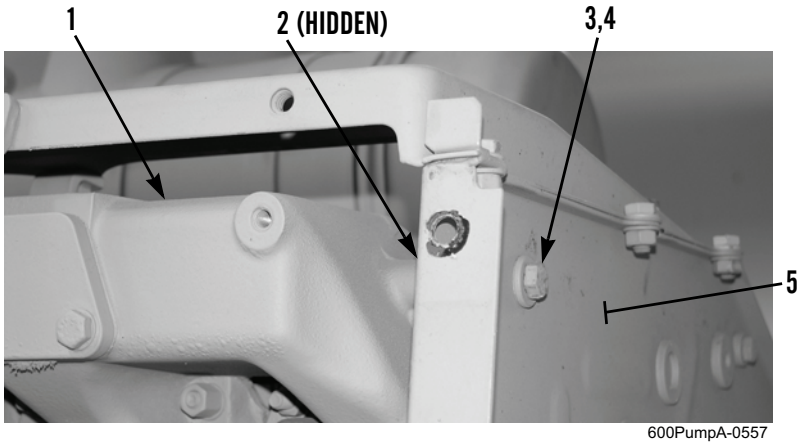


Figure 9. Rear Air Duct Wall.

FOLLOW-ON TASKS

1. Install upper access plate (WP 0068).
2. Install exhaust manifold (WP 0089).
3. Install muffler and muffler support bracket (WP 0107).
4. Connect battery cables (WP 0033).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

EXHAUST MANIFOLD REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Gasket (4)

Personnel Required

63J (1)

References

WP 0023

Equipment Condition

Battery cables disconnected (WP 0033)
Flame glow plug fuel line removed (WP 0105)
Turbocharger removed (WP 0098)

WARNING

- Ensure battery cables are disconnected before replacing exhaust manifold. Failure to follow this warning could result in personal injury or damage to equipment.
- Allow engine to cool off before performing maintenance on exhaust pipe, exhaust manifold, or turbocharger. Hot metal parts can cause severe burns. Wear eye, glove, and skin protection when working with heated parts. Failure to follow this warning may cause injury to personnel.

REMOVAL

Remove eight nuts (Figure 1, Item 4), washers (Figure 1, Item 5), four gaskets (Figure 1, Item 2), and exhaust manifold (Figure 1, Item 1) from cylinder head studs (Figure 1, Item 3). Discard gaskets.

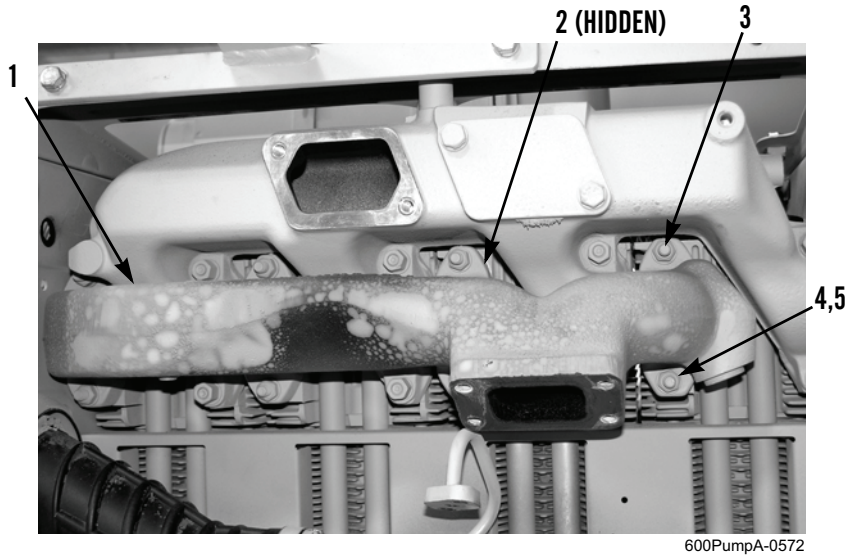


Figure 1. Exhaust Manifold.

CLEANING AND INSPECTION

Clean and inspect all parts IAW WP 0023.

INSTALLATION

Install four new gaskets (Figure 1, Item 2), exhaust manifold (Figure 1, Item 1), eight washers (Figure 1, Item 5), and nuts (Figure 1, Item 4) on cylinder head studs (Figure 1, Item 3). Tighten nuts to 30 ± 3 lb-ft (40 ± 4 Nm) beginning with inside nuts and working outward.

FOLLOW-ON TASKS

1. Install turbocharger (WP 0098).
2. Install flame glow plug fuel line (WP 0105).
3. Connect battery cables (WP 0033).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

FRONT MAIN SEAL REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)
Assembly device (Item 1, WP 0126)
Remover, preformed (extracting device) (Item 16, WP 0126)

Materials/Parts

Oil, lubricating, OEA-30 (Item 18, WP 0129)
Oil, lubricating, OE/HDO-15/40 (Item 20, WP 0129)
Rag, wiping (Item 22, WP 0129)

Materials/Parts - Continued

Seal

Personnel Required

63J (1)

References

WP 0023

Equipment Condition

Crankshaft V-belt pulley and vibration damper removed (WP 0093)

REMOVAL

NOTE

Bolt in step 1 has left-hand threads.

1. Partially install V-belt pulley and vibration damper bolt (Figure 1, Item 3) on crankshaft (Figure 1, Item 4).
2. Hook remover tool behind front main seal (Figure 1, Item 1) and use bolt (Figure 1, Item 3) as leverage to remove front main seal from engine front cover (Figure 1, Item 2). Discard seal.

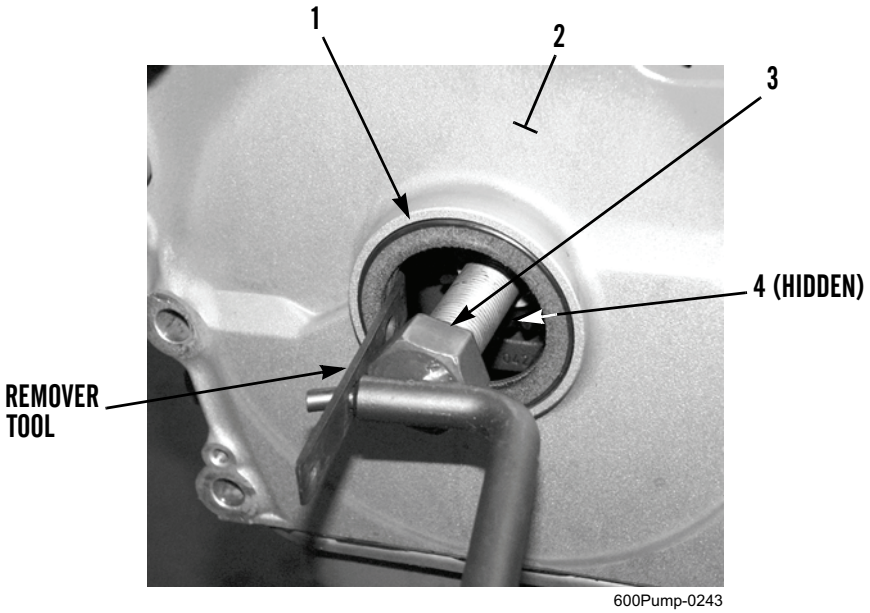


Figure 1. Removing Front Main Seal.

CLEANING AND INSPECTION

1. Clean and inspect all parts IAW WP 0023.
2. Inspect seal running surface on vibration damper shaft (Figure 4, Item 5) for score damage or wear. If a run-in groove is noted, new front main must not be installed at same depth as old seal. Refer to *Installation* for instructions.

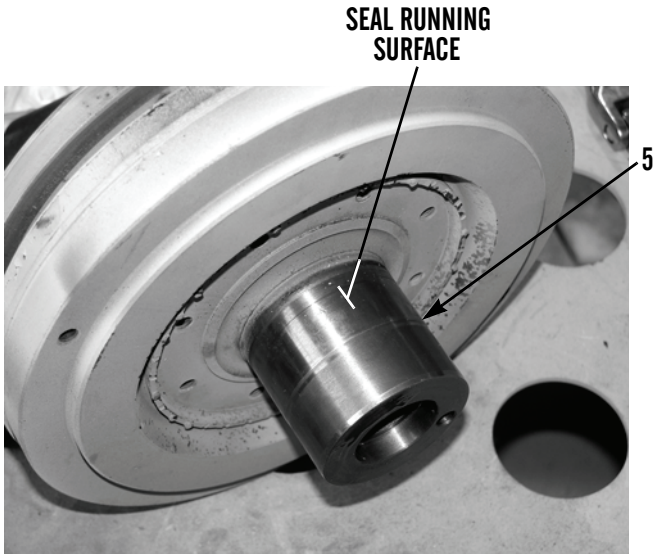


Figure 2. Inspecting Seal Running Surface on Vibration Damper Shaft.

INSTALLATION

1. Install assembly device (without cap) to crankshaft (Figure 3).

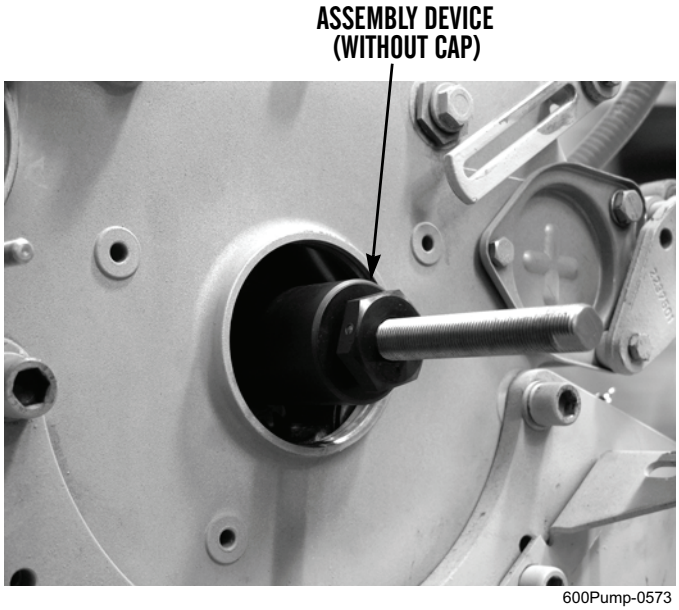


Figure 3. Installing Assembly Device (Without Cap).

INSTALLATION - CONTINUED

NOTE

Correct depth of seating of new front main seal in engine front cover must be determined prior to installing front main seal.

No shims: Standard dimension with perfect vibration damper running surface.

1 or 2 shims: Offset installation with run-in groove noted on vibration damper seal running surface.

2. Determine number of shims required (if any).
3. Install shim(s), as required, in cap of assembly device (Figure 4).
4. Apply a light coat of oil to sealing lip of new front main seal (Figure 4, Item 1) and install seal in cap, with sealing lip facing crankshaft.

Figure 4. Installing Shim(s) (As Required) and New Front Main Seal on Cap.

INSTALLATION - CONTINUED

5. Install cap of assembly device with washer (Figure 5, Item 6) and nut (Figure 5, Item 7).
6. Turn nut (Figure 5, Item 7) to fully seat front main seal (Figure 5, Item 1) to correct depth in engine front cover (Figure 5, Item 2).
7. Remove both parts of assembly device and shim(s) (if used) from crankshaft (Figure 5).

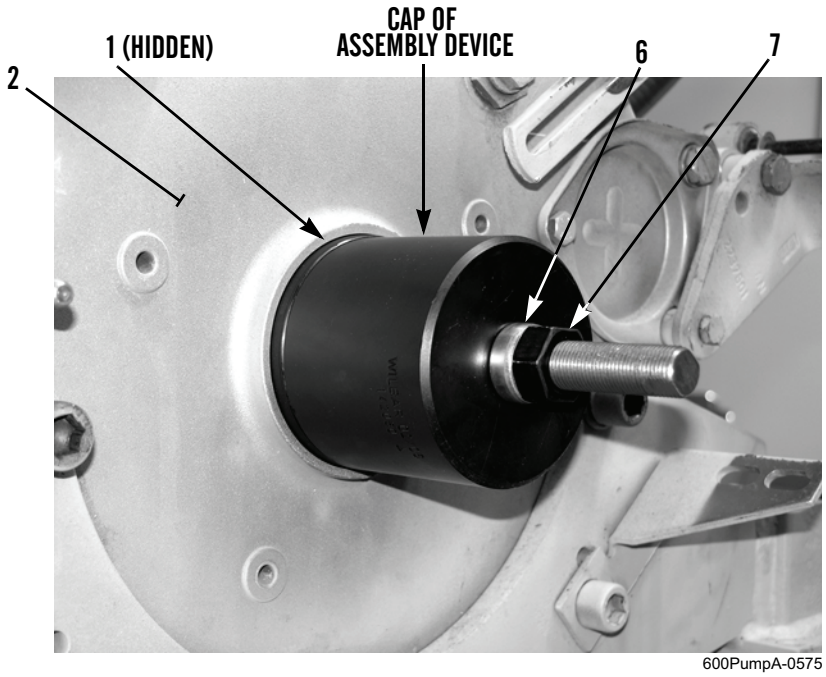


Figure 5. Installing Front Main Seal.

FOLLOW-ON TASKS

Install crankshaft V-belt pulley and vibration damper (WP 0093).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

ENGINE FRONT COVER REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)
Assembly device (Item 1, WP 0126)

Materials/Parts

Compound, silicone, RTV (Item 8, WP 0129)
Oil, lubricating, OEA-30 (Item 18, WP 0129)
Oil, lubricating, OE/HDO-15/40 (Item 20, WP 0129)
Rag, wiping (Item 22, WP 0129)

Personnel Required

63J (1)

References

WP 0023

Equipment Condition

Storage box removed (WP 0069)
Alternator removed (WP 0030)
Cooling fan assembly removed (WP 0027)
Cooling fan V-belt shutdown switch removed (WP 0046)
Cooling fan V-belt tensioner pulley assembly removed (WP 0092)
Crankcase breather removed (WP 0082)
Crankshaft V-belt pulley and vibration damper removed (WP 0093)
Front engine crossbeam removed (WP 0072)

REMOVAL

NOTE

Note location of front cover mounting bolts to ensure connect installation.

1. Remove bolt (Figure 1, Item 2) and washer (Figure 1, Item 3) from front cover (Figure 1, Item 1) and engine block (Figure 1, Item 16).
2. Remove bolt (Figure 1, Item 4), washer (Figure 1, Item 5), spacer (Figure 1, Item 6), two grommets (Figure 1, Item 7), and alternator adjustment bracket (Figure 1, Item 8) from front cover (Figure 1, Item 1).
3. Remove two bolts (Figure 1, Item 11), spacers (Figure 1, Item 12), nut (Figure 1, Item 13), and alternator support bracket (Figure 1, Item 14) from front cover (Figure 1, Item 1).
4. Remove bolt (Figure 1, Item 9) and washer (Figure 1, Item 10) from cover plate (Figure 1, Item 15).
5. Remove two bolts (Figure 1, Item 17) and washers (Figure 1, Item 18) from front cover (Figure 1, Item 1).

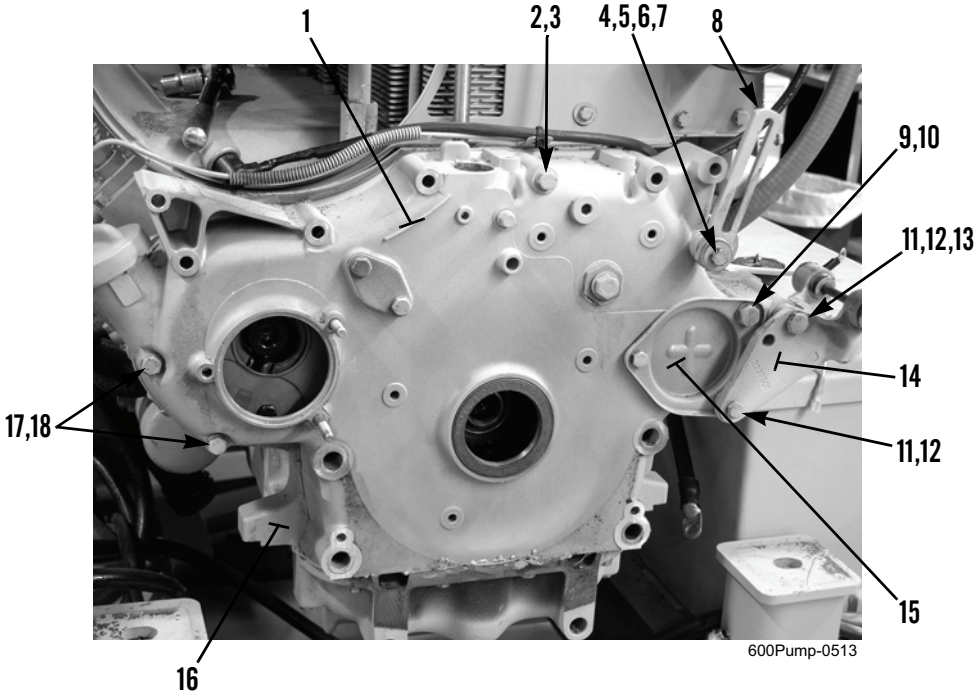


Figure 1. Engine Front Cover.

REMOVAL - CONTINUED

6. Remove four bolts (Figure 2, Item 20) and washers (Figure 2, Item 19) from oil pan (Figure 2, Item 21) and front cover (Figure 2, Item 1).

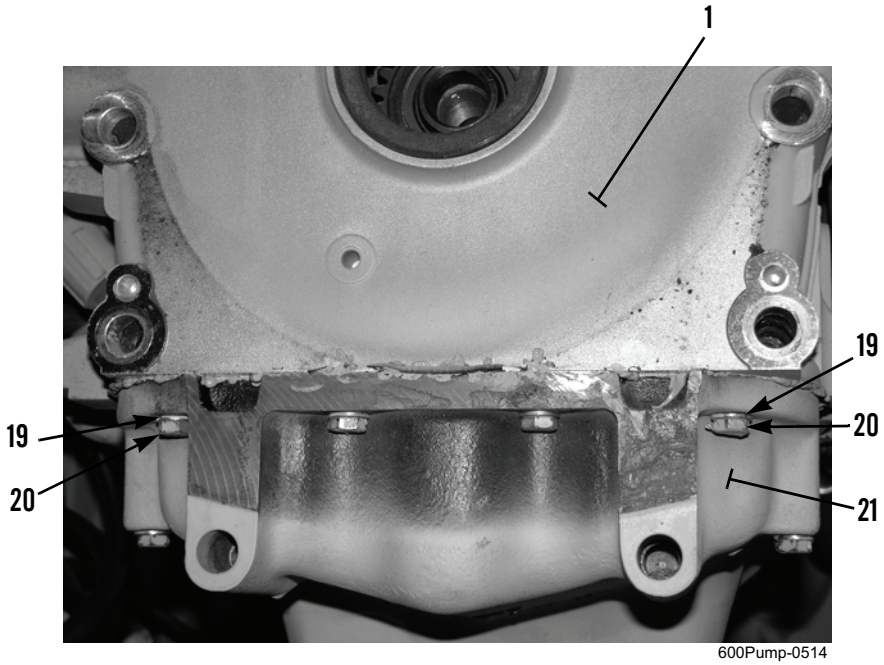


Figure 2. Oil Pan Bolts.

REMOVAL - CONTINUED

7. Tap on front cover (Figure 3, Item 1) to loosen it from engine block (Figure 3, Item 16) and remove front cover.

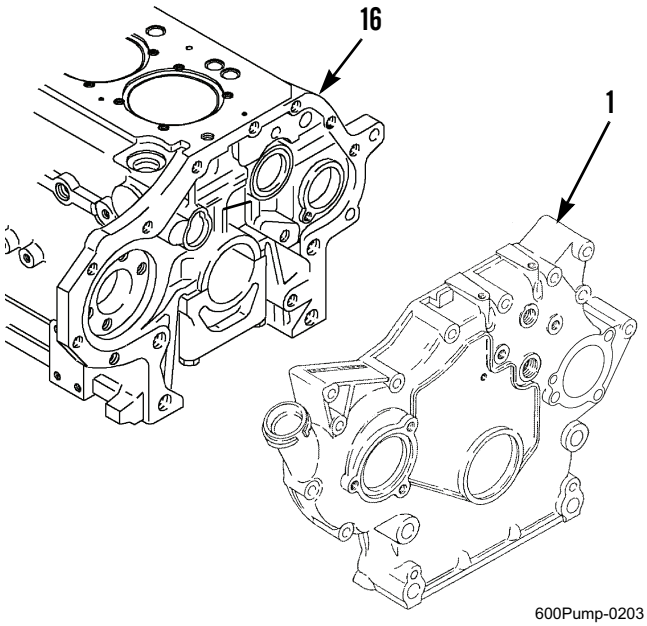


Figure 3. Front Cover.

NOTE

When removing engine front cover, compression spring and cap are loose. Retrieve these parts for installation.

8. Retrieve cap (Figure 4, Item 22) from front cover (Figure 4, Item 1).

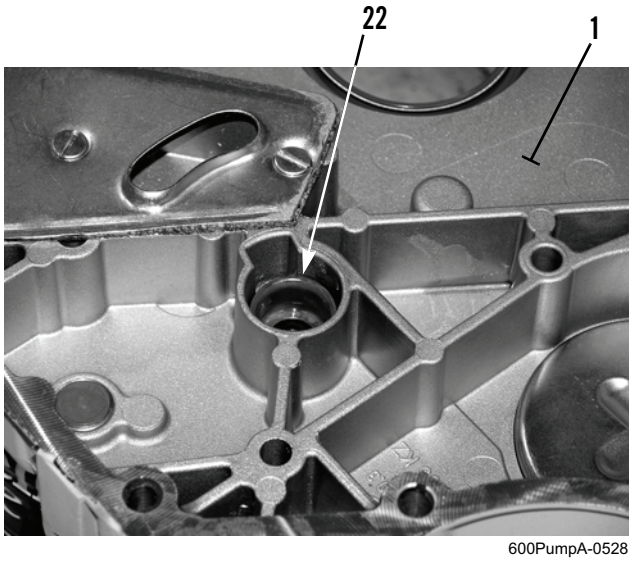


Figure 4. Cap in Front Cover.

REMOVAL - CONTINUED

9. Retrieve compression spring (Figure 5, Item 23) from camshaft gear (Figure 5, Item 24) and camshaft (Figure 5, Item 25).

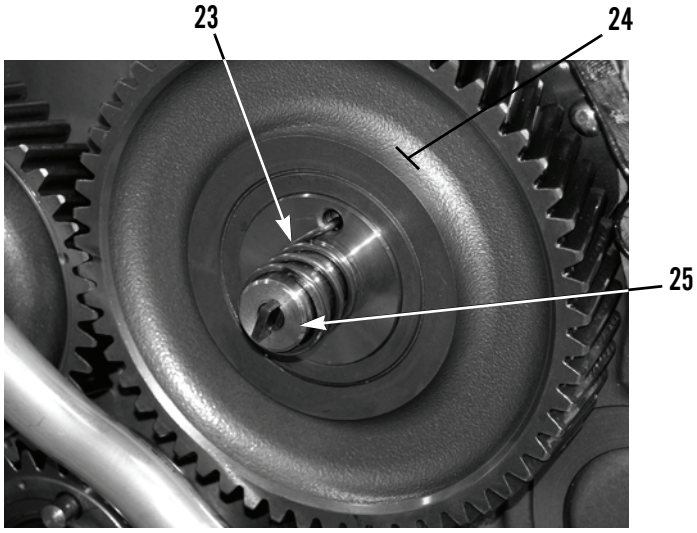


Figure 5. Spring on Camshaft Gear and Camshaft.

CLEANING AND INSPECTION

1. Clean and inspect all parts IAW WP 0023.
2. Remove all silicone RTV compound from front cover and engine block.
3. Inspect vibration damper shaft for score damage or wear.
4. Inspect front main seal. If damaged or leaking, replace as follows:
   a. From inside front cover (Figure 6, Item 1), force front main seal (Figure 6, Item 26) outward to remove it. Discard front main seal.

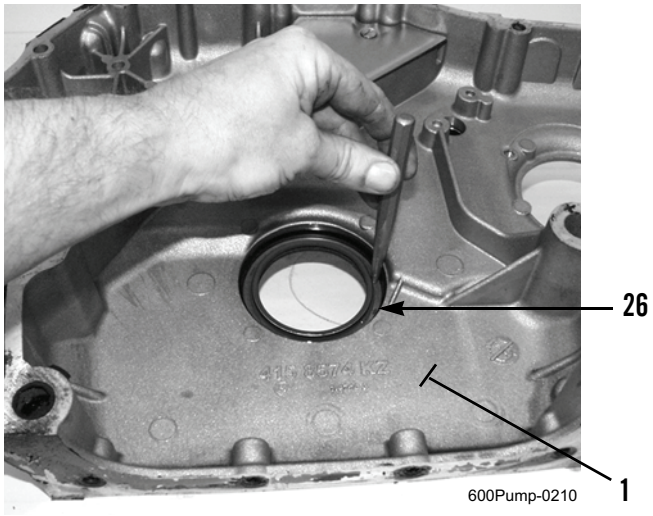


Figure 6. Front Main Seal.

CLEANING AND INSPECTION - CONTINUED

NOTE

- Apply a light coat of oil to sealing lip of front main seal.
- Sealing lip faces crankshaft.

b. From outside front cover (Figure 7, Item 1), use assembly device to install new front main seal (Figure 7, Item 26).

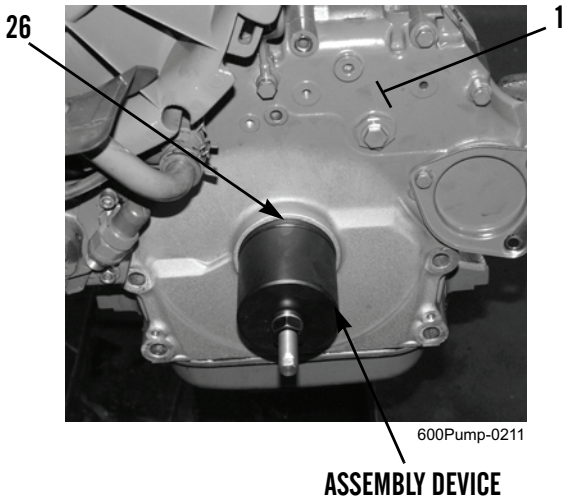


Figure 7. Installing Front Main Seal.

c. Remove assembly device.

INSTALLATION

1. Install angled end of compression spring (Figure 8, Item 23) in hole of camshaft gear (Figure 8, Item 24) and on camshaft (Figure 8, Item 25).

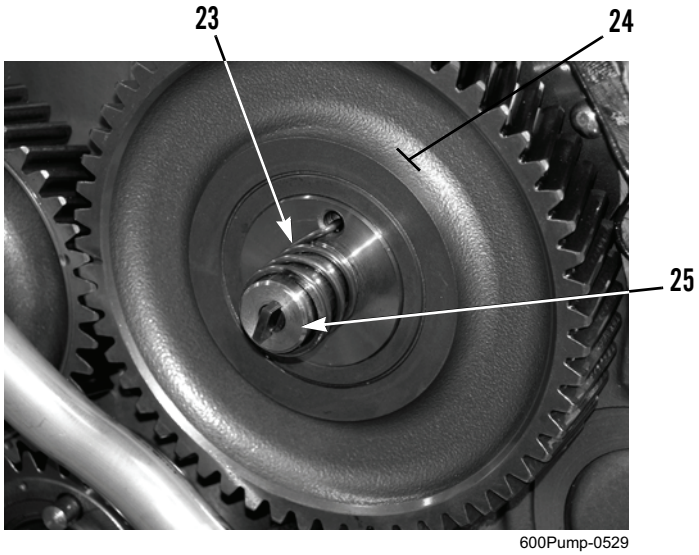


Figure 8. Spring on Camshaft Gear and Camshaft

INSTALLATION - CONTINUED

2. Install cap (Figure 9, Item 22) in front cover (Figure 9, Item 1).

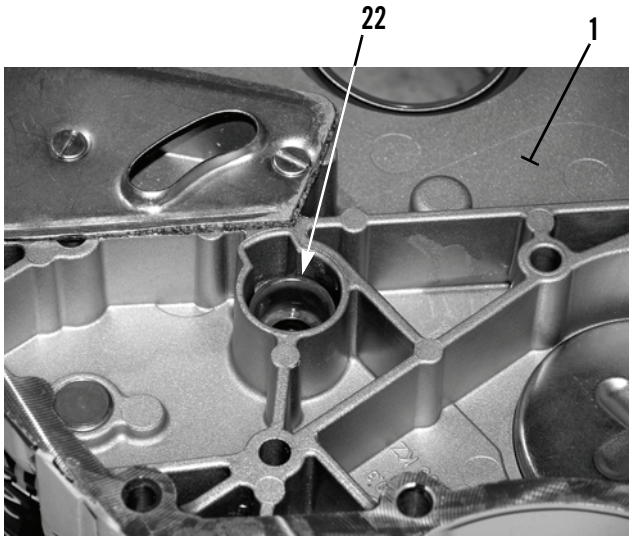


Figure 9. Cap in Front Cover.

INSTALLATION - CONTINUED

WARNING

Wear gloves and eye protection when handling silicone RTV compound. Work in a well-ventilated area. Exposure to silicone RTV compound may cause irritation to eyes, skin, and lungs. If ingested, do NOT induce vomiting. Seek medical attention.

3. Apply silicone RTV compound to front cover (Figure 10, Item 1). Install front cover, two washers (Figure 10, Item 18), and bolts (Figure 10, Item 17) on engine block (Figure 10, Item 16). Tighten bolts to 15 to 18 lb-ft (20 to 24 Nm).
4. Install washer (Figure 10, Item 10) and bolt (Figure 10, Item 9) on cover plate (Figure 10, Item 15).
5. Install alternator support bracket (Figure 10, Item 14), two spacers (Figure 10, Item 12), bolts (Figure 10, Item 11), and nut (Figure 10, Item 13) to front cover (Figure 10, Item 1).
6. Install alternator adjustment bracket (Figure 10, Item 8), spacer (Figure 10, Item 6), two grommets (Figure 10, Item 7), washer (Figure 10, Item 5), and bolt (Figure 10, Item 4) on front cover (Figure 10, Item 1).
7. Install washer (Figure 10, Item 3) and bolt (Figure 10, Item 2) on front cover (Figure 10, Item 1).

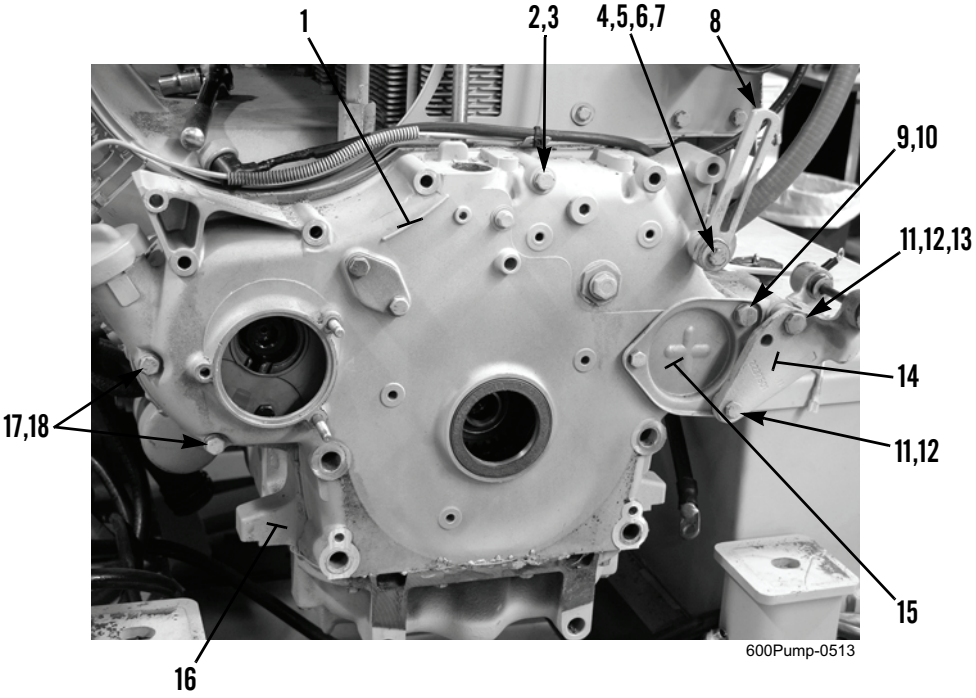


Figure 10. Engine Front Cover.

INSTALLATION - CONTINUED

8. Install four washers (Figure 11, Item 19) and bolts (Figure 11, Item 20) to oil pan (Figure 11, Item 21) and front cover (Figure 11, Item 1). Tighten bolts to 16 to 21 lb-ft (22 to 28 Nm).

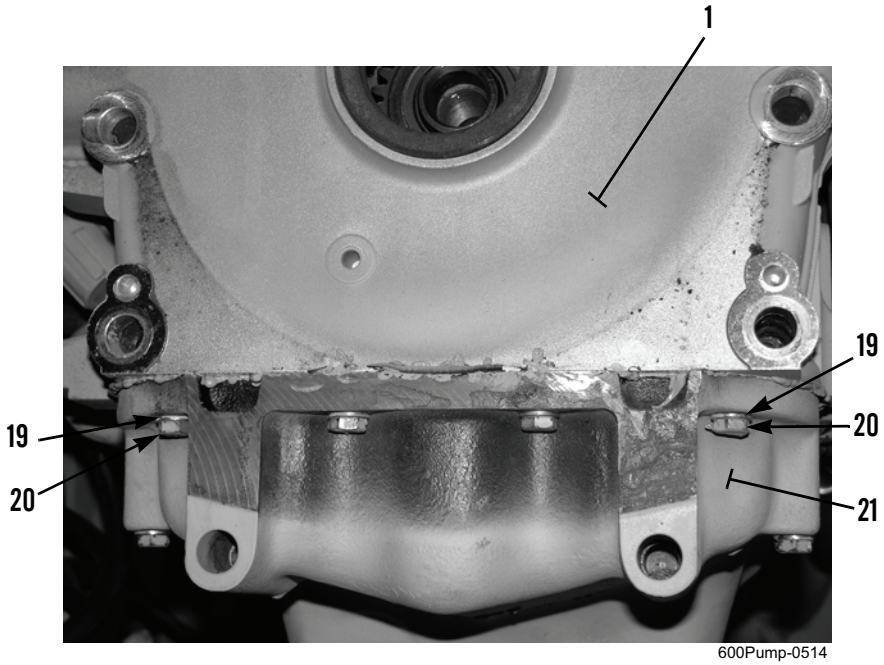


Figure 11. Oil Pan Bolts.

FOLLOW-ON TASKS

1. Install front engine crossbeam (WP 0072).
2. Install crankshaft V-belt pulley and vibration damper (WP 0093).
3. Install crankcase breather (WP 0082).
4. Install cooling fan V-belt tensioner pulley assembly (WP 0092).
5. Install cooling fan V-belt shutdown switch (WP 0046).
6. Install cooling fan assembly (WP 0027).
7. Install alternator (WP 0030).
8. Install storage box (WP 0069).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

COOLING FAN V-BELT TENSIONER PULLEY ASSEMBLY MAINTENANCE

Removal, Disassembly, Cleaning and Inspection, Assembly, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)
Press, arbor, hand operated (Item 12, WP 0126)

Materials/Parts

Adhesive (Item 1, WP 0129)
Oil, lubricating, OEA-30 (Item 18, WP 0129)
Oil, lubricating, OE/HDO-15/40 (Item 20, WP 0129)
Rag, wiping (Item 22, WP 0129)
Bearing bushing (2)
Bushing
O-ring

Materials/Parts - Continued

Pin, straight
Seal
Spring

Personnel Required

63J (1)

References

WP 0023

Equipment Condition

V-belt guard removed (WP 0081)
Connector plug disconnected from cooling fan V-belt shutdown switch (WP 0046)

REMOVAL

WARNING

During V-belt removal, pulley is under tension and must be released slowly to tension switch stop bracket. Failure to comply may result in hand injury or damage to equipment.

1. Push inward and upward on pulley (Figure 1, Item 2) to release tension on cooling fan V-belt (Figure 1, Item 10) and remove cooling fan V-belt.
2. With plunger (Figure 1, Item 6) depressed, slowly lower pulley (Figure 1, Item 2) to stop bracket (Figure 1, Item 8).

NOTE

Pulley is still under light tension and may need to be held away from stop bracket during removal.

3. Remove bolt (Figure 1, Item 7) from stop bracket (Figure 1, Item 8).
4. Remove nut (Figure 1, Item 3) and washer (Figure 1, Item 4) from stud (Figure 1, Item 5).
5. Remove screwed bush (Figure 1, Item 9) and stop bracket (Figure 1, Item 8) from V-belt tensioner pulley assembly (Figure 1, Item 11).
6. Remove bolt (Figure 1, Item 12), washer (Figure 1, Item 13), and V-belt tensioner pulley assembly (Figure 1, Item 11) from engine front cover (Figure 1, Item 1).

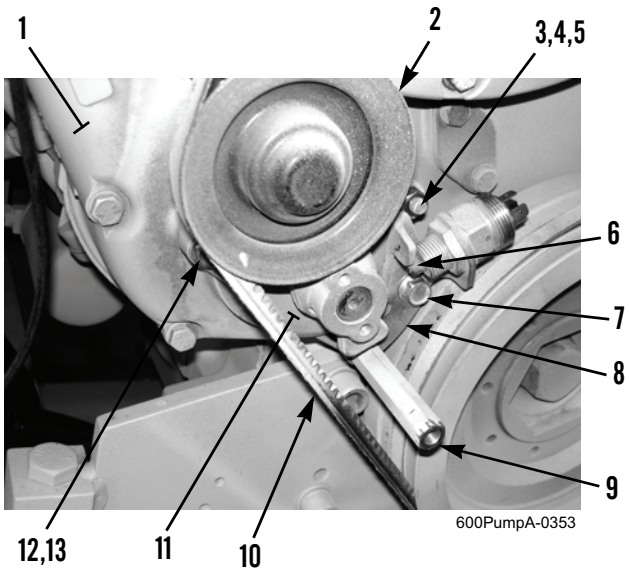


Figure 1. Tensioner Pulley Assembly - Installed View.

REMOVAL - CONTINUED

NOTE

O-ring may have been removed with V-belt tensioner pulley assembly.

7. Remove O-ring (Figure 2, Item 15) from engine front cover (Figure 2, Item 1). Discard O-ring.

NOTE

Stud (Figure 2, Item 14) may have been removed when screwed bush (Figure 1, Item 9) was removed.

8. If necessary, remove studs (Figure 2, Items 5 and 14) from engine front cover (Figure 2, Item 1).

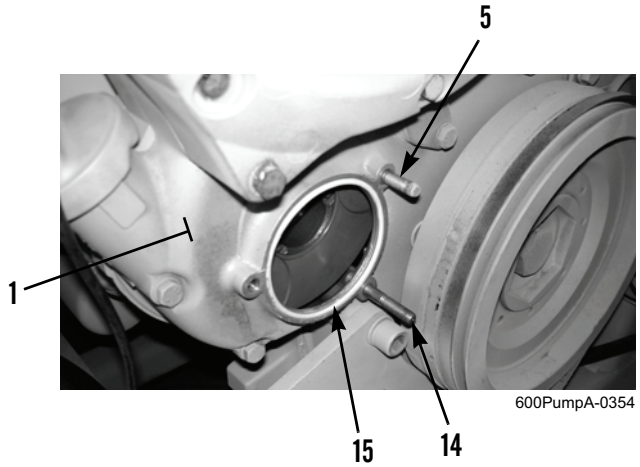


Figure 2. Studs and O-ring at Front Cover.

DISASSEMBLY

1. Remove nut (Figure 3, Item 16), washer (Figure 3, Item 17), washers (Figure 3, Items 19 and 20), and pulley (Figure 3, Item 2) from pulley bracket (Figure 3, Item 18).
2. Remove pin (Figure 3, Item 30), pulley bracket (Figure 3, Item 18), and washers (Figure 3, Items 21 and 22) from shaft (Figure 3, Item 28). Discard pin.
3. Remove shaft (Figure 3, Item 28), spring (Figure 3, Item 29), and washer (Figure 3, Item 27) from tensioner housing (Figure 3, Item 25).
4. Remove spring (Figure 3, Item 29) and washer (Figure 3, Item 27) from shaft (Figure 3, Item 28). Discard spring.

NOTE

Use an arbor press to remove bearing bushings, bushing, and seal. During disassembly, press hardware from the inside outward.

5. Remove two bearing bushings (Figure 3, Item 24), bushing (Figure 3, Item 26), and seal (Figure 3, Item 23) from tensioner housing (Figure 3, Item 25). Discard seal, bearing bushings, and bushing.

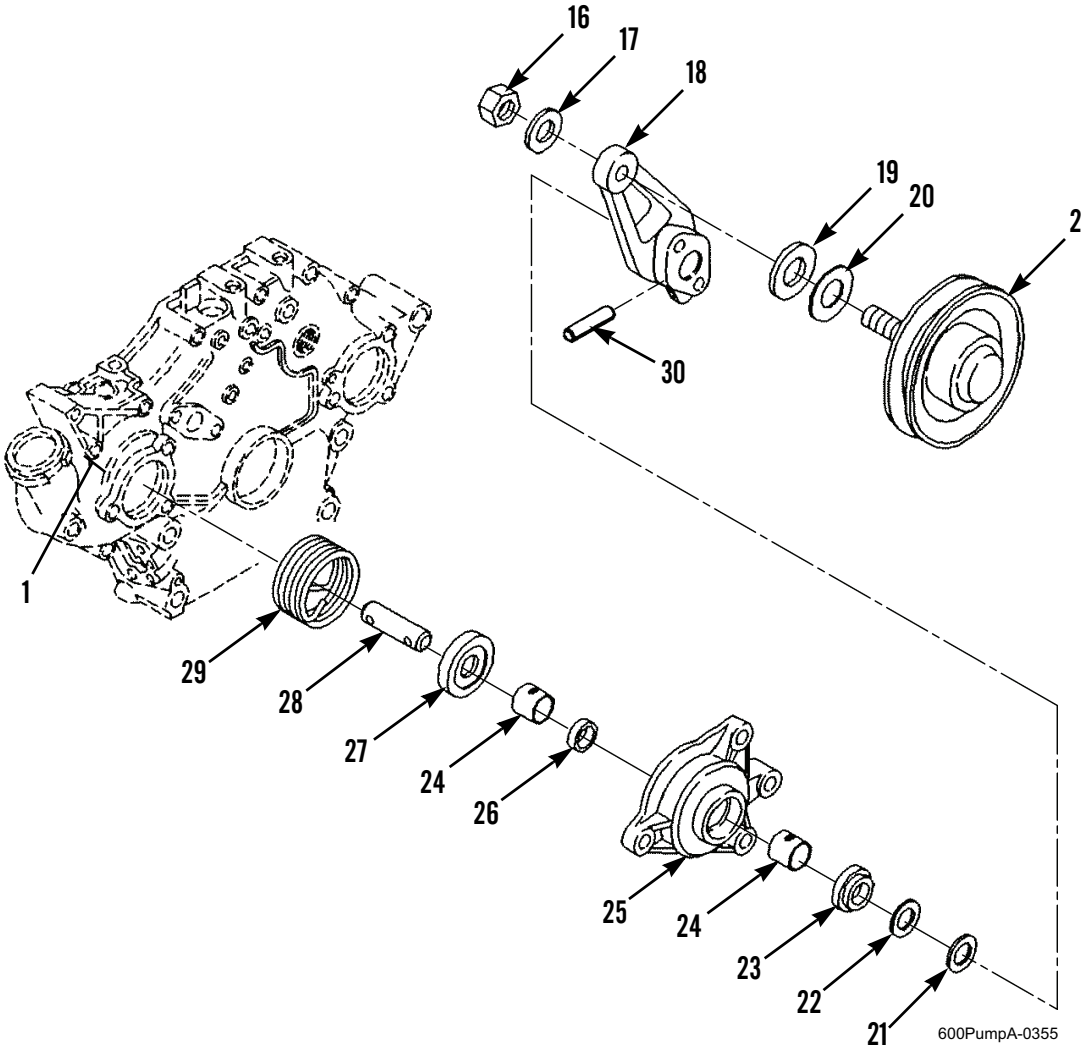


Figure 3. Tensioner Pulley Assembly - Exploded View.

CLEANING AND INSPECTION

Clean and inspect components IAW WP 0023.

ASSEMBLY

CAUTION

- Both bearing bushings have oil duct holes and must be aligned properly with tensioner housing. Failure to comply may result in damage to equipment.
- Oil bores “A” in tensioner housing must be in line with oil duct holes “B” in bearing bushings. Inside bearing bushings must be installed flush. There must be no axial end float between bushing and bearing bushings (Figure 4).

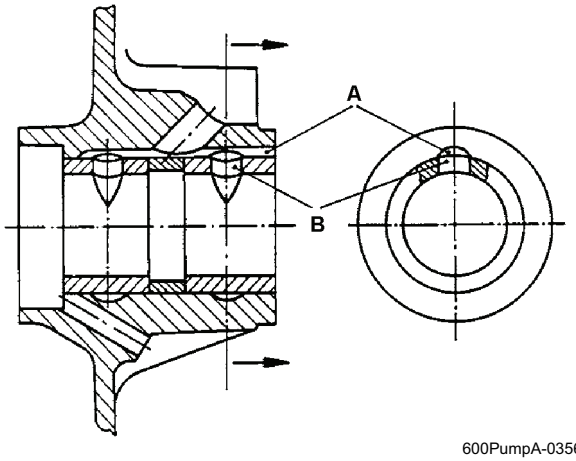


Figure 4. Alignment of Bearing Bushings and Bushing.

NOTE

Use an arbor press to install bearing bushings, bushing, and seal. During assembly, press hardware from the outside inward.

1. Align bushing holes and install two new bearing bushings (Figure 3, Item 24), new bushing (Figure 3, Item 26), and new seal (Figure 3, Item 23) on tensioner housing (Figure 3, Item 25).
2. Install washer (Figure 3, Item 27) and new spring (Figure 3, Item 29) on shaft (Figure 3, Item 28).
3. Install shaft (Figure 3, Item 28), spring (Figure 3, Item 29), and washer (Figure 3, Item 27) on tensioner housing (Figure 3, Item 25).

NOTE

Coated side of washer (Figure 3, Item 22) must point towards steel washer (Figure 3, Item 21).

4. Install washers (Figure 3, Items 21 and 22), pulley bracket (Figure 3, Item 18), and new pin (Figure 3, Item 30) on shaft (Figure 3, Item 28).
5. Install washers (Figure 3, Items 19 and 20), pulley (Figure 3, Item 2), washer (Figure 3, Item 17), and nut (Figure 3, Item 16) on pulley bracket (Figure 3, Item 18).

INSTALLATION

NOTE

Lightly coat new O-ring with clean oil before installation.

1. Install new O-ring (Figure 5, Item 15) on engine front cover (Figure 5, Item 1).
2. If removed, install studs (Figure 5, Items 5 and 14) on engine front cover (Figure 5, Item 1).

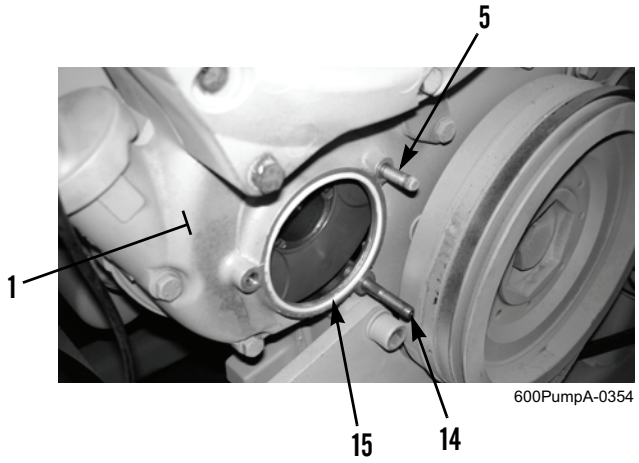


Figure 5. Studs and O-ring at Front Cover.

3. Apply two drops of adhesive to bolt (Figure 6, Item 12).
4. Install V-belt tensioner pulley assembly (Figure 6, Item 11), washer (Figure 6, Item 13), and bolt (Figure 6, Item 12) on engine front cover (Figure 6, Item 1).
5. Install washer (Figure 6, Item 4) and nut (Figure 6, Item 3) on stud (Figure 6, Item 5).
6. Tighten nut (Figure 6, Item 3) and bolt (Figure 6, Item 12) to 16 lb-ft (21 Nm).
7. Install stop bracket (Figure 6, Item 8) and screwed bush (Figure 6, Item 9) on V-belt tensioner pulley assembly (Figure 6, Item 11).

INSTALLATION - CONTINUED

NOTE

- With V-belt removed, idler pulley arm should depress plunger on shutdown switch.
- Pulley may need to be held away from stop bracket during installation.

8. Install bolt (Figure 6, Item 7) on stop bracket (Figure 6, Item 8).
9. Push inward and upward on tensioner pulley assembly (Figure 6, Item 2), install cooling fan V-belt (Figure 6, Item 10), and release tensioner pulley assembly to restore tension to cooling fan V-belt. Ensure plunger (Figure 6, Item 6) is no longer depressed.

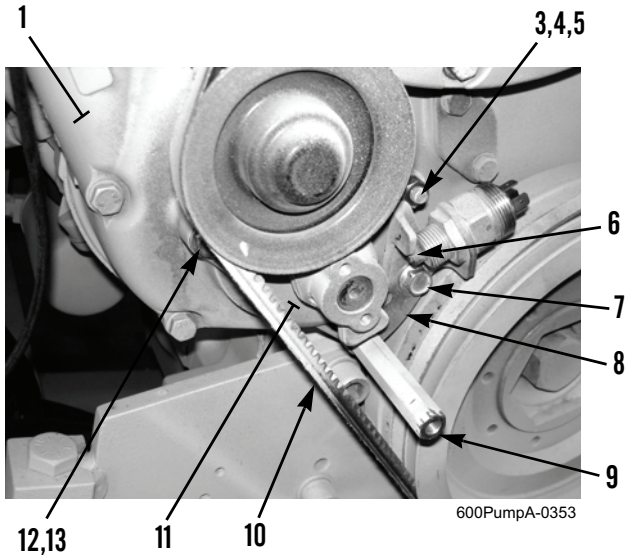


Figure 6. Tensioner Pulley Assembly - Installed View.

FOLLOW-ON TASKS

1. Install connector plug on cooling fan V-belt shutdown switch (WP 0046).
2. Install V-belt guard (WP 0081).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

CRANKSHAFT V-BELT PULLEY AND VIBRATION DAMPER REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)
Retainer (Item 17, WP 0126)

Materials/Parts

Adhesive (Item 1, WP 0129)
Oil, lubricating, OEA-30 (Item 18, WP 0129)
Oil, lubricating, OE/HDO-15/40 (Item 20, WP 0129)
Rag, wiping (Item 22, WP 0129)

Personnel Required

63J (2)

References

WP 0023
WP 0090

Equipment Condition

Cooling fan and alternator V-belts removed (WP 0029)

NOTE

Do not rotate crankshaft after removing V-belt pulley and vibration damper.

REMOVAL

NOTE

Bolt in step 1 has left-hand threads.

1. Use retainer tool on pulley (Figure 2, Item 1) to hold pulley while turning bolt (Figure 2, Item 3) clockwise (right) to remove torque on bolt.

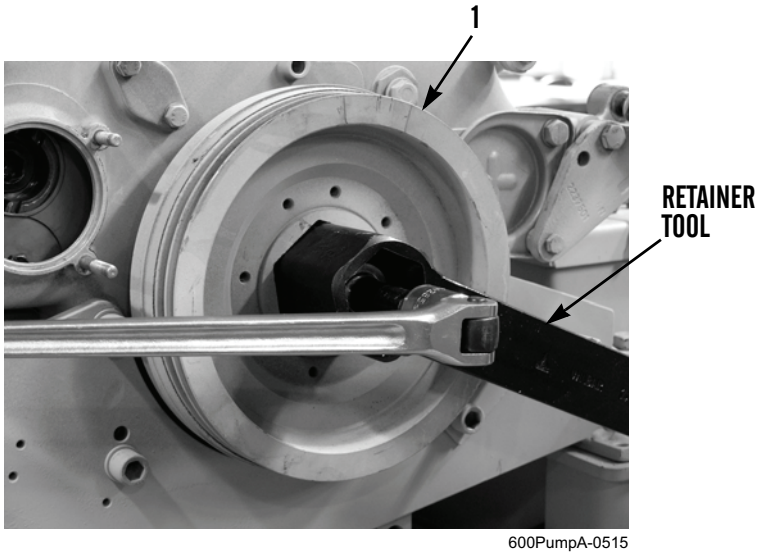


Figure 1. Retainer Tool.

CAUTION

Do not damage front main seal when removing V-belt pulley and vibration damper. Damage to seal may cause oil to leak from engine.

2. Remove bolt (Figure 2, Item 3), washer (Figure 2, Item 4), and pulley (Figure 2, Item 1) and vibration damper (Figure 2, Item 2) as an assembly from crankshaft (Figure 2, Item 5).

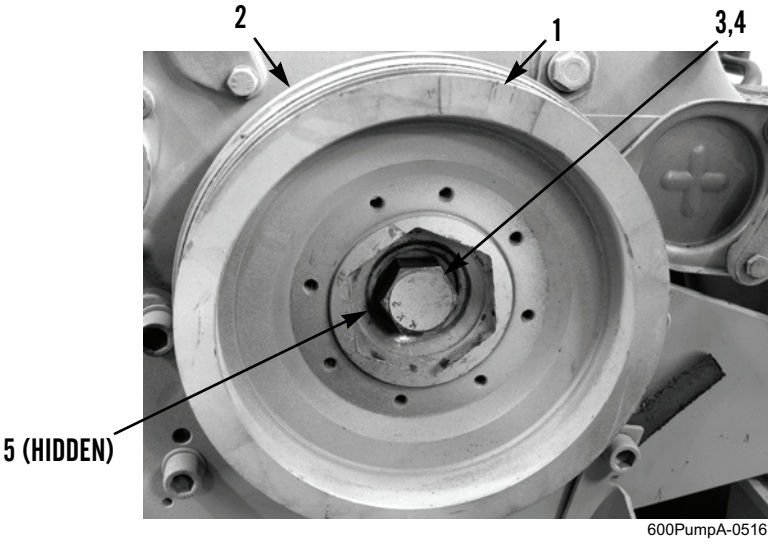


Figure 2. V-Belt Pulley and Vibration Damper.

CLEANING AND INSPECTION

1. Clean and inspect all parts IAW WP 0023.
2. Inspect seal running surface on vibration damper shaft (Figure 3, Item 6) for score damage or wear.

Figure 3. Inspecting Seal Running Surface on Vibration Damper Shaft.

3. Inspect face of V-belt pulley for score damage or wear.
4. If front main seal is damaged, refer to WP 0090 for replacement.

INSTALLATION

1. Apply a light coat of oil to front main seal (Figure 4, Item 9).
2. Align hole (Figure 3, Item 7) in vibration damper shaft (Figure 3, Item 6) with pin (Figure 4, Item 8) on crankshaft (Figure 4, Item 5).

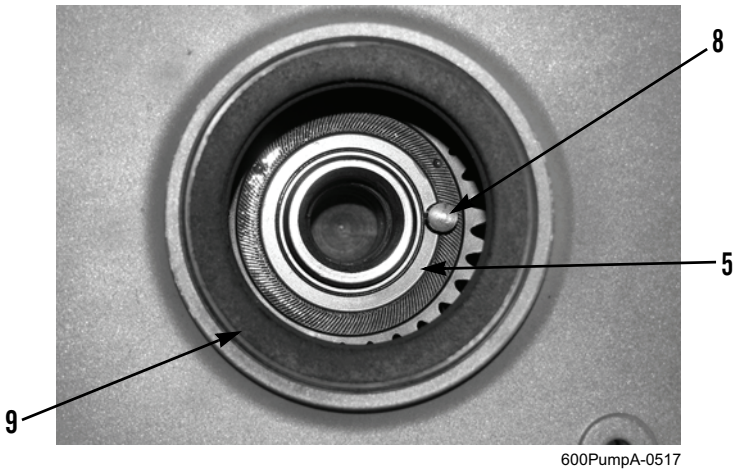


Figure 4. Crankshaft.

INSTALLATION - CONTINUED

CAUTION

Do not damage front main seal when installing V-belt pulley and vibration damper. Damage to seal may cause oil to leak from engine.

NOTE

- Apply Loctite adhesive to bolt thread before installation.
- Bolt has left-hand threads.

3. Install pulley (Figure 5, Item 1) and vibration damper (Figure 5, Item 2) as an assembly, washer (Figure 5, Item 4), and bolt (Figure 5, Item 3) on crankshaft (Figure 5, Item 5).

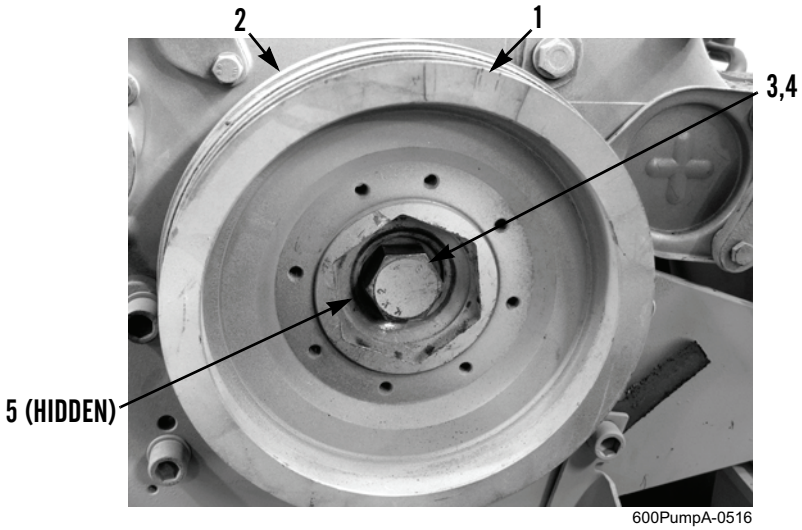


Figure 5. V-Belt Pulley and Vibration Damper.

4. Hold pulley (Figure 6, Item 1) with retainer tool and tighten bolt (Figure 5, Item 3) to 37 lb-ft (50 Nm). Tighten an additional 210 degrees.

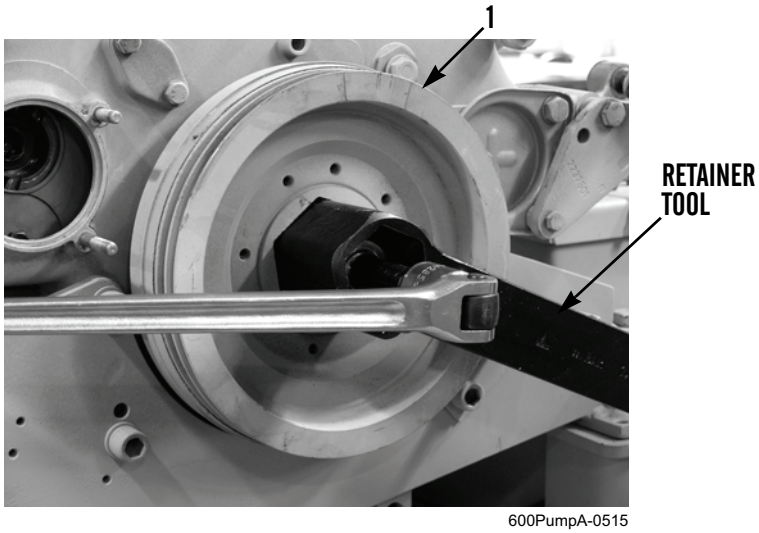


Figure 6. Retainer Tool.

FOLLOW-ON TASKS

Install cooling fan and alternator V-belts (WP 0029).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

FUEL INJECTION PUMP REPLACEMENT

Removal, Cleaning and Inspection, Fuel Injection Pump Timing - Positioning Pin Method, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)
Extra sleeve (Item 7, WP 0126)
Injection pump, time (graduated disc, magnetic) (Item 10, WP 0126)
Removal tool, fuel injection pump (Item 14, WP 0126)
Pointer tool (Item 11, WP 0126)
Retainer (Item 17, WP 0126)

Materials/Parts

Cap set, protective, dust and moisture (Item 5, WP 0129)
Diesel fuel, DF-1 (Item 10, WP 0129)
Diesel fuel, DF-2 (Item 11, WP 0129)
Oil, lubricating, OEA-30 (Item 18, WP 0129)
Oil, lubricating, OE/HDO-15/40 (Item 20, WP 0129)
Rag, wiping (Item 22, WP 0129)
Tag, marker (Item 27, WP 0129)
Turbine fuel, aviation, JP-5 (Item 31, WP 0129)
Turbine fuel, aviation, JP-8 (Item 32, WP 0129)

Materials/Parts - Continued

O-ring
Sealing ring
Sealing washer (14)

Personnel Required

63J (2)

References

WP 0008
WP 0023
WP 0074
WP 0084
WP 0095
WP 0096
WP 0106

Equipment Condition

Control panel box removed (WP 0110)
Cooling fan V-belt tensioner pulley assembly removed (WP 0092)

- DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing damage to equipment and injury or death to personnel.
- Allow engine to cool off before performing maintenance on fuel injection pump. Hot metal parts can cause severe burns. Wear eye, glove, and skin protection when working with heated parts. Failure to follow this warning may cause injury to personnel.
- Wear fuel-resistant gloves and eye protection when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. Failure to follow this warning may result in injury to personnel.
- When servicing this equipment, performing maintenance, or disposing of materials such as fuel or lubricating oil, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

CAUTION

- Wipe area clean around all connections to be opened during removal and disassembly. Cap line and plug openings after removing lines. Contamination of fuel system could result in premature failure.
- Use two line wrenches to loosen fuel lines and oil line. Failure to do so may result in damage to lines.

NOTE

- A suitable container should be placed under fuel lines and oil line to capture draining fuel and oil. Dispose of fuel and oil IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.
- Tag lines prior to removal to ensure correct installation.

REMOVAL

1. Set Top Dead Center (TDC) and place TDC mark on V-belt pulley (WP 0074).
2. Align 0 degree mark on graduated disc with TDC mark on V-belt pulley and attach graduated disc.
3. Attach pointer tool to engine front cover, with pointer tool above and aligned with center of vibration damper (Figure 1).

NOTE

Use a long socket wrench handle attached to socket to rotate vibration damper and crankshaft.

4. Rotate crankshaft counterclockwise (left) until TDC mark on V-belt pulley aligns with pointer tool (Figure 1).

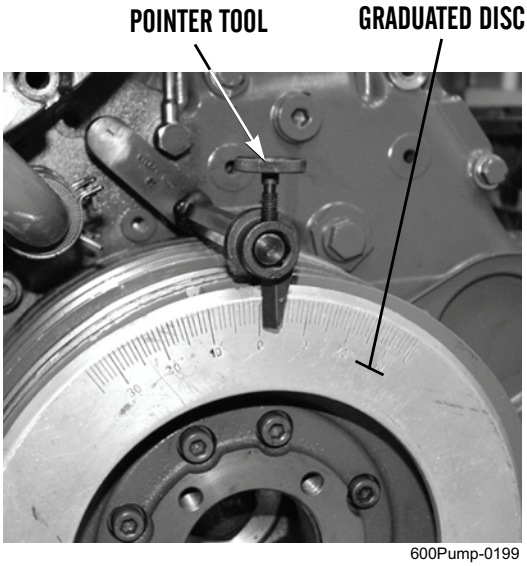
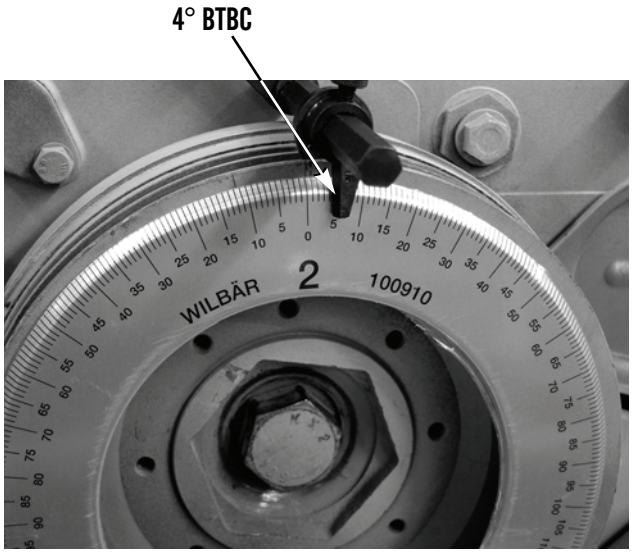


Figure 1. Aligning TDC Mark with Pointer Tool.

5. Refer to IMPORTANT ENGINE INFORMATION data plate (WP 0008), located on oil cooler access plate, for injection timing specification. Note injection timing specification: °BTDC 4.0 (Figure 2).
6. Rotate crankshaft about 90 degrees counterclockwise (left), then rotate crankshaft clockwise (right) until 4 degree mark (before zero on disc) is aligned with pointer tool.

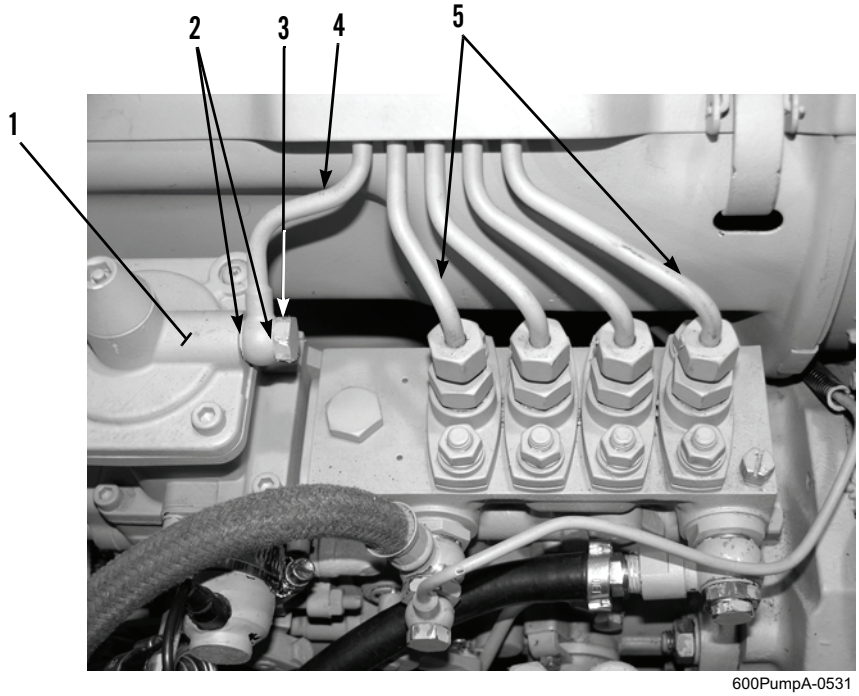
REMOVAL - CONTINUED



600PumpA-0508

Figure 2. Setting Timing Specification.

7. Disconnect engine/control panel wiring harness connector and remove conduit from electromagnet (WP 0095).
8. Disconnect engine/control panel wiring harness connector and remove conduit from solenoid (WP 0095).
9. Bleed pressure from fuel system by loosening ventilation valve setscrew (WP 0106).
10. Remove fluid passage bolt (Figure 3, Item 3), sealing washer (Figure 3, Item 2), injector line (Figure 3, Item 4), and sealing washer (Figure 3, Item 2) from fuel injection pump (Figure 3, Item 1). Discard sealing washers.
11. Disconnect four injector lines (Figure 3, Item 5) from fuel injection pump (Figure 3, Item 1).



600PumpA-0531

Figure 3. Fuel Injection Pump.

REMOVAL - CONTINUED

12. Remove plug (Figure 4, Item 12), sealing washer (Figure 4, Item 13), fluid passage bolt (Figure 4, Item 11), sealing washer (Figure 4, Item 9), overflow line (Figure 4, Item 10), and sealing washer (Figure 4, Item 9) from fuel injection pump (Figure 4, Item 1). Discard sealing washers.
13. Remove fluid passage bolt (Figure 4, Item 14), sealing washer (Figure 4, Item 15), fuel line (Figure 4, Item 8), sealing washer (Figure 4, Item 7), fluid passage bolt (Figure 4, Item 16), hose assembly (Figure 4, Item 6), and sealing washer (Figure 4, Item 7) from fuel injection pump (Figure 4, Item 1). Discard sealing washers.

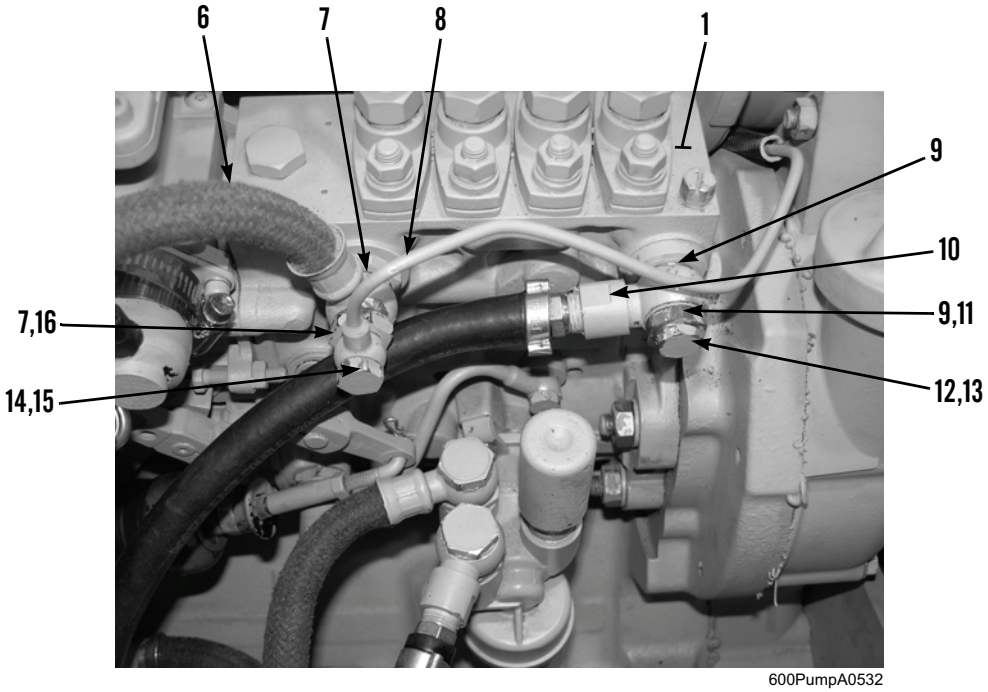


Figure 4. Fuel Lines.

14. Remove fluid passage bolt (Figure 5, Item 23), sealing washer (Figure 5, Item 24), hose assembly (Figure 5, Item 22), and sealing washer (Figure 5, Item 24) from fuel injection pump (Figure 5, Item 1). Discard sealing washers.
15. Remove fluid passage bolt (Figure 5, Item 20), sealing washer (Figure 5, Item 21), hose assembly (Figure 5, Item 25), and sealing washer (Figure 5, Item 21) from fuel injection pump (Figure 5, Item 1). Discard sealing washers.
16. Remove fluid passage bolt (Figure 5, Item 18), sealing washer (Figure 5, Item 19), oil line (Figure 5, Item 17), and sealing washer (Figure 5, Item 19) from fuel injection pump (Figure 5, Item 1). Discard sealing washers.

REMOVAL - CONTINUED

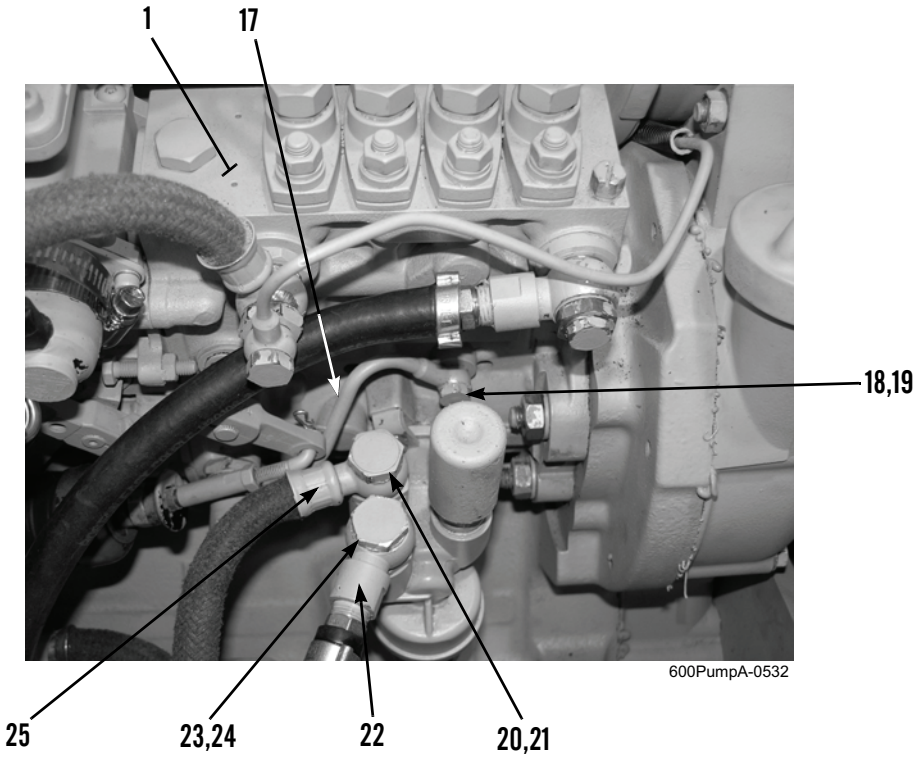


Figure 5. Fuel Lines and Oil Line.

17. Hold crankshaft with retainer tool to prevent it from turning and use a 1/2 in. drive, 17 mm screwdriver attachment hex to remove tensioning nut (Figure 6, Item 28) securing fuel injection pump timing gear (Figure 6, Item 26) to fuel injection pump shaft (Figure 6, Item 27).
18. Verify timing specification has not moved (Figure 6).

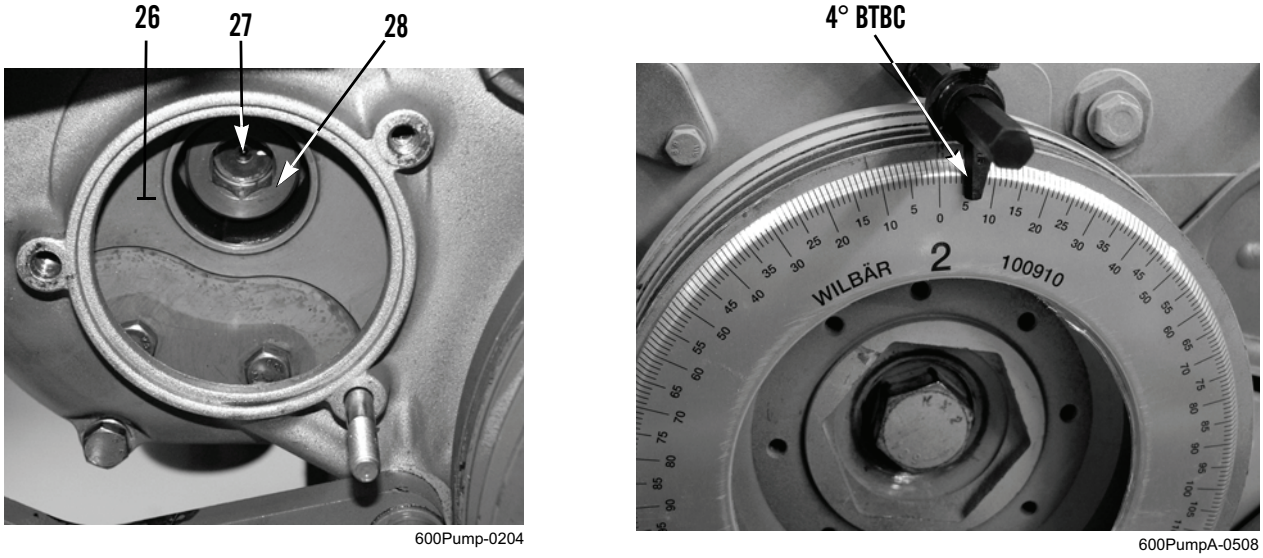


Figure 6. Removing Tensioning Nut.

REMOVAL - CONTINUED

19. Install extra sleeve hand tight into fuel injection pump timing gear (Figure 7, Item 26).

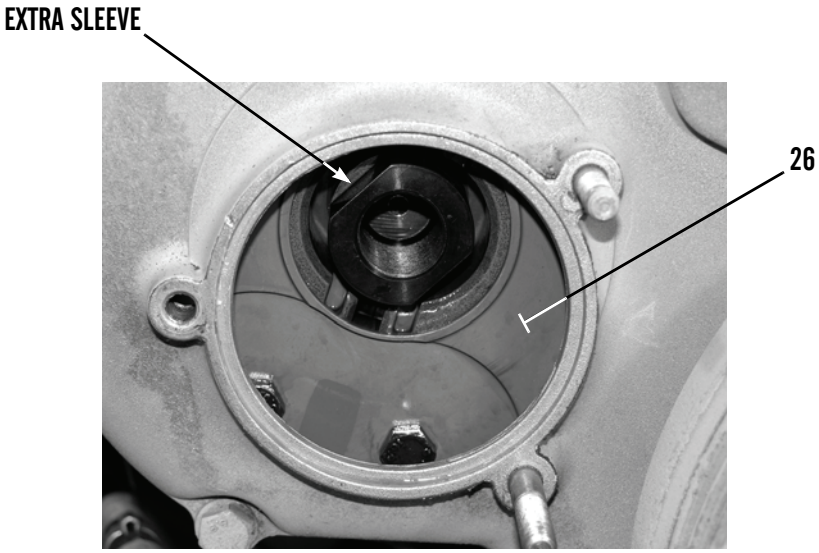


Figure 7. Extra Sleeve.

20. Remove sleeve that comes installed on fuel injection pump removal tool. Install removal tool in extra sleeve.

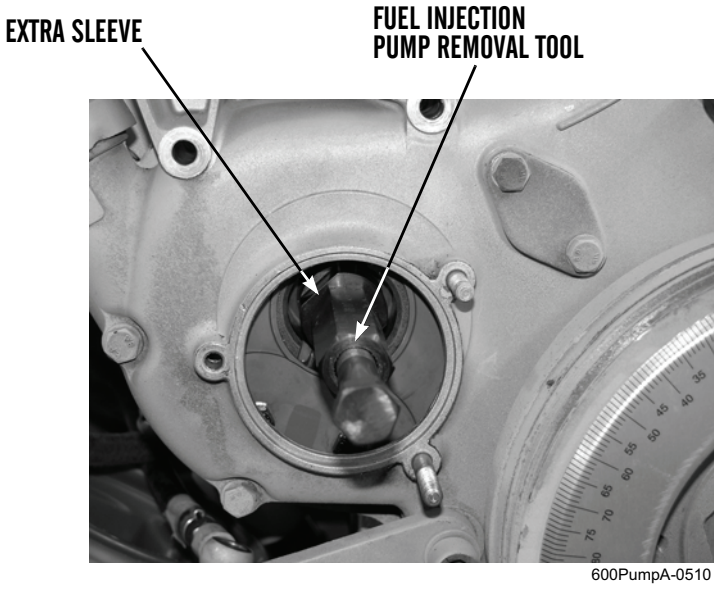


Figure 8. Fuel Injection Pump Removal Tool.

REMOVAL - CONTINUED

21. Remove engine oil level dipstick (Figure 9, Item 29).

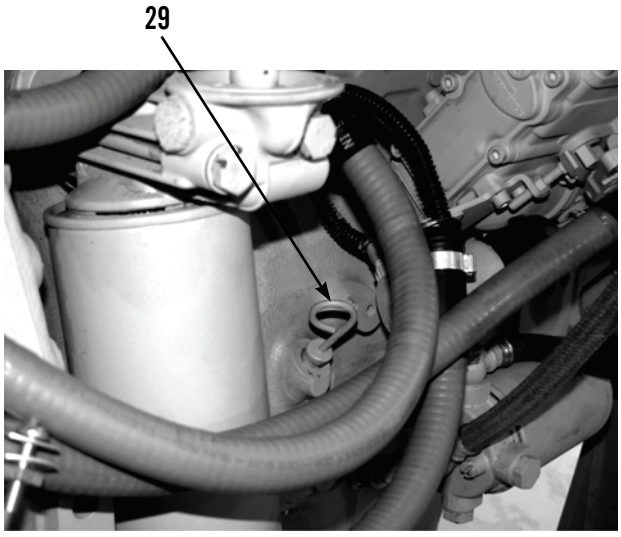


Figure 9. Engine Oil Level Dipstick.

22. Remove four nuts (Figure 10, Item 31) and washers (Figure 10, Item 32) from studs (Figure 10, Item 33) at engine block (Figure 10, Item 30).

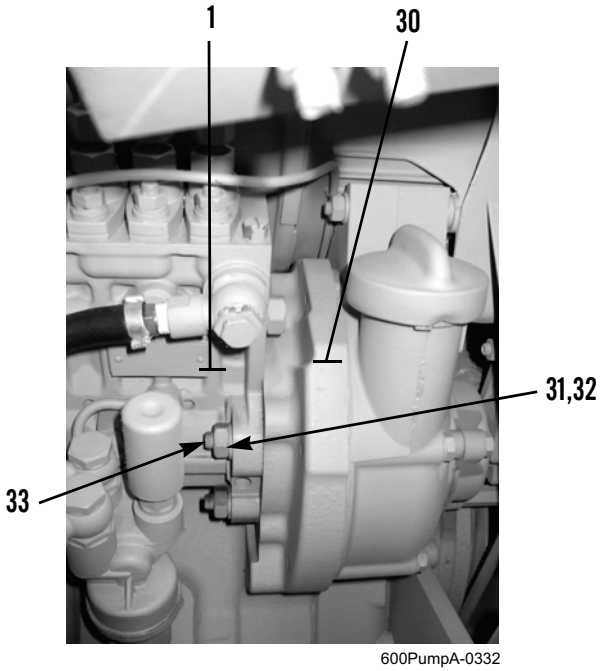


Figure 10. Removing Fuel Injection Pump.

REMOVAL - CONTINUED

CAUTION

- Do not rotate crankshaft after removing fuel injection pump. Engine and fuel injection pump timing will be out of synchronization. Failure to follow this caution may cause engine to not start, run incorrectly, or cause internal engine damage.
- After removing fuel injection pump, do not rotate fuel injection pump shaft. Fuel injection pump timing will be out of synchronization. Failure to follow this caution may cause engine to not start, run incorrectly, or cause internal engine damage.

23. Use fuel injection pump removal tool and extra sleeve (Figure 12) to remove fuel injection pump (Figure 11, Item 1) from fuel injection pump timing gear (Figure 12, Item 26).

600PumpA-0332

Figure 11. Removing Fuel Injection Pump.

REMOVAL - CONTINUED

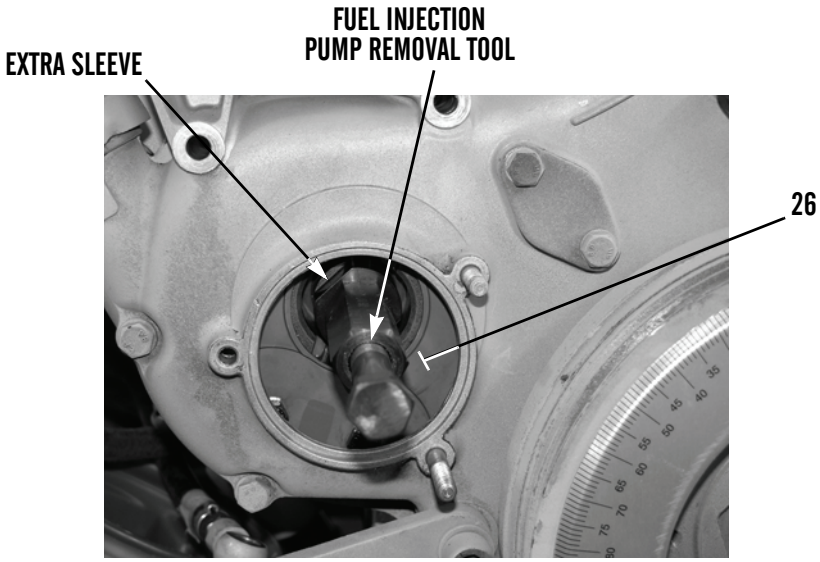


Figure 12. Removing Fuel Injection Pump.

24. Remove O-ring (Figure 13, Item 34) from fuel injection pump (Figure 13, Item 1). Discard O-ring.
25. Remove Woodruff key (Figure 13, Item 35) from fuel injection pump shaft (Figure 13, Item 27). Retain Woodruff key for installation.

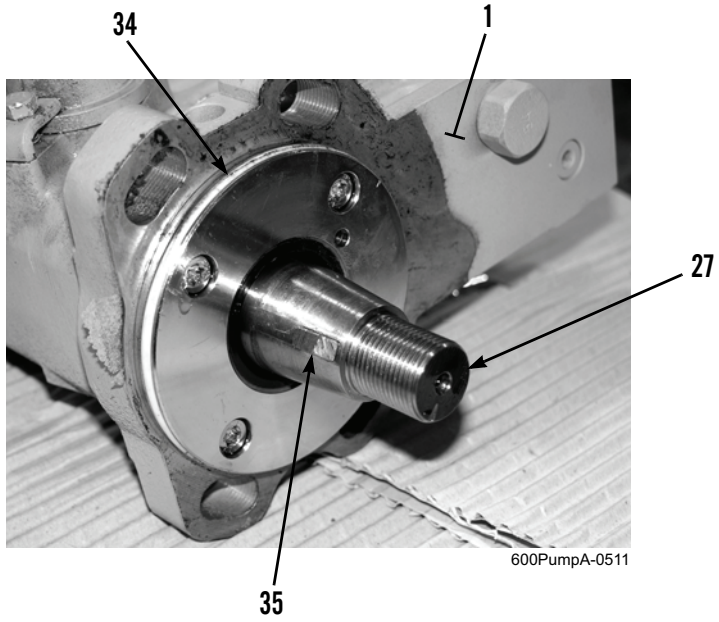


Figure 13. Fuel Injection Pump O-Ring and Woodruff Key.

CLEANING AND INSPECTION

1. Clean and inspect all parts IAW WP 0023.
2. Remove and retain parts as necessary to install on new fuel injection pump.

FUEL INJECTION PUMP TIMING - POSITIONING PIN METHOD

1. Lightly coat new O-ring (Figure 14, Item 34) with clean fuel and install in groove of fuel injection pump (Figure 14, Item 1).
2. Install Woodruff key (Figure 14, Item 35) in fuel injection pump shaft (Figure 14, Item 27).

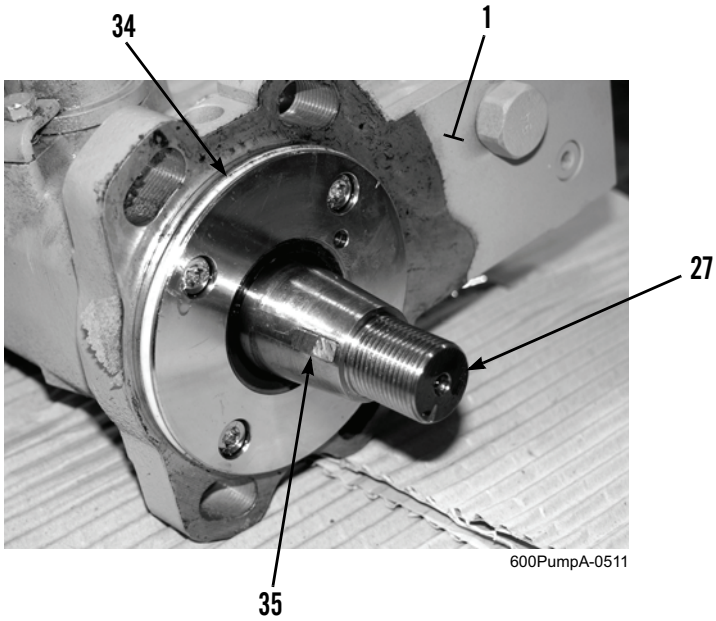


Figure 14. Fuel Injection Pump O-Ring and Woodruff Key.

CAUTION

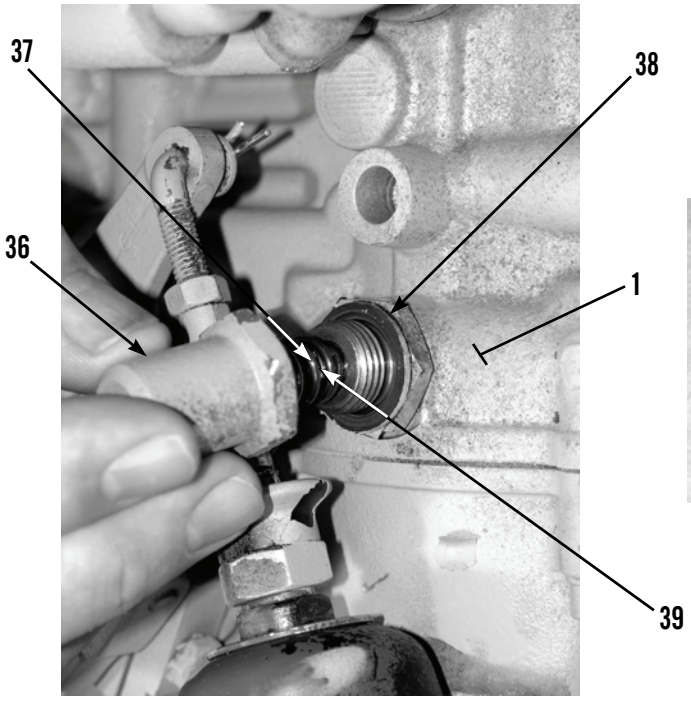
After removing fuel injection pump, fuel injection pump timing must be set. Failure to set fuel injection pump timing may cause engine to not start, run incorrectly, or cause engine damage.

NOTE

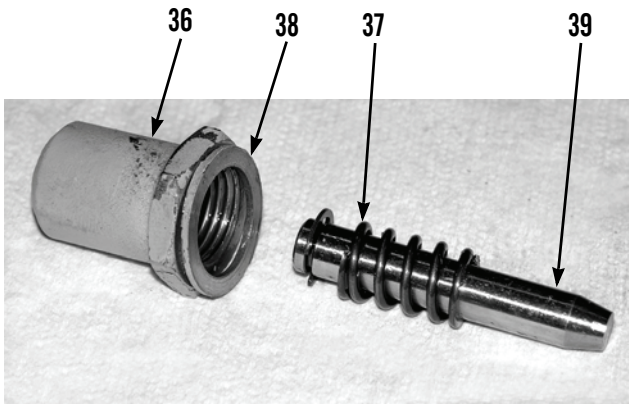
- If engine Top Dead Center (TDC) mark is already set, proceed to step 3.
- If engine TDC mark is not set, set engine TDC mark (WP 0074).

3. Remove bolt sleeve (Figure 15, Item 36), copper sealing ring (Figure 15, Item 38), positioning pin (Figure 15, Item 39), and compression spring (Figure 15, Item 37) from fuel injection pump (Figure 15, Item 1).
4. Remove compression spring (Figure 15, Item 37) from positioning pin (Figure 15, Item 39).

FUEL INJECTION PUMP TIMING - POSITIONING PIN METHOD - CONTINUED



600PumpA-0384



600PumpA-0385

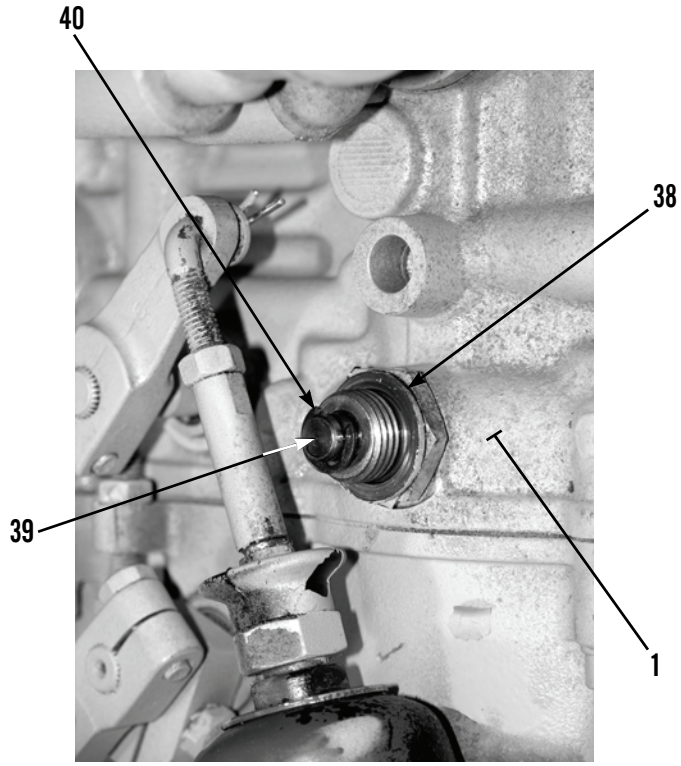
Figure 15. Setting Timing Specification.

FUEL INJECTION PUMP TIMING - POSITIONING PIN METHOD - CONTINUED

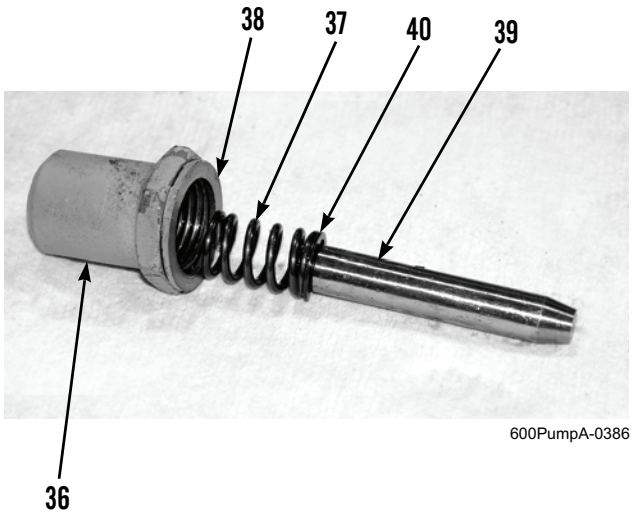
NOTE

- Spring location is very important. Placing spring with positioning pin going through the middle of the spring allows for pump rotation.
- Spring location is very important. Placing spring on top of the positioning pin, with positioning pin fully seated in fuel injector pump, will let you know three things:
  (a) Fuel injection pump timing is set correctly.
  (b) Fuel injection pump shaft is in locked position.
  (c) Fuel injection pump is now ready to be installed back on engine.

5. Install copper sealing ring (Figure 16, Item 38), insert positioning pin (Figure 16, Item 39) in fuel injection pump (Figure 16, Item 1), position compression spring (Figure 16, Item 37) on top of positioning pin circlip (Figure 16, Item 40), and secure with bolt sleeve (Figure 16, Item 36). Positioning pin must be fully seated into recess of fuel injection pump shaft (Figure 17, Item 27). This sets delivery of fuel to cylinder No. 1. If positioning pin fully seats into recess of fuel injection pump shaft, proceed to *Installation* in this work package.



600PumpA-0387



600PumpA-0386

Figure 16. Setting Fuel Delivery to Cylinder No. 1.

CAUTION

If positioning pin does not fully seat in recess of fuel injection pump shaft, fuel injection pump timing is not set correctly. Fuel injection pump shaft must be slowly rotated to allow positioning pin to fully seat. Failure to do so may damage positioning pin and score fuel injection pump shaft.

6. Install tensioning nut (Figure 17, Item 28) on fuel injection pump shaft (Figure 17, Item 27). With light hand pressure on positioning pin (Figure 16, Item 39), very slowly rotate fuel injection pump shaft until positioning pin is fully seated into recess of fuel injection pump (Figure 16, Item 1).

FUEL INJECTION PUMP TIMING - POSITIONING PIN METHOD - CONTINUED

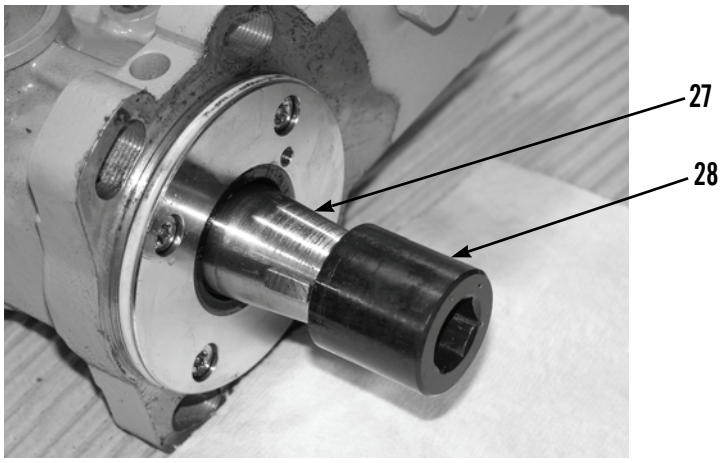
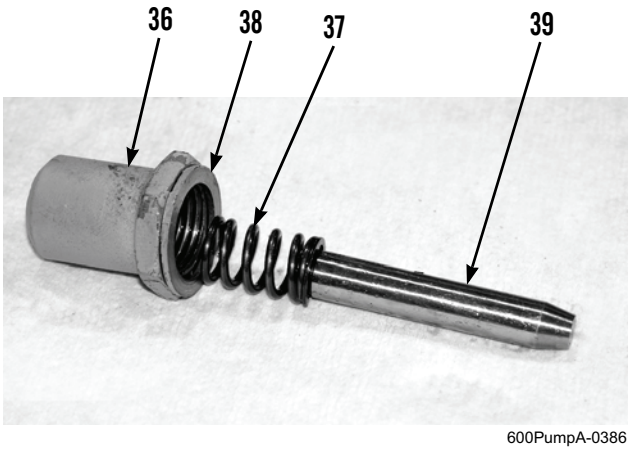


Figure 17. Tensioning Nut and Fuel Injection Pump Shaft.

7. Install copper sealing ring (Figure 18, Item 38), position compression spring (Figure 18, Item 37) on top of positioning pin (Figure 18, Item 39) and secure with bolt sleeve (Figure 18, Item 36). This holds positioning pin into fuel injection pump camshaft and allows fuel injection pump timing to be set correctly.



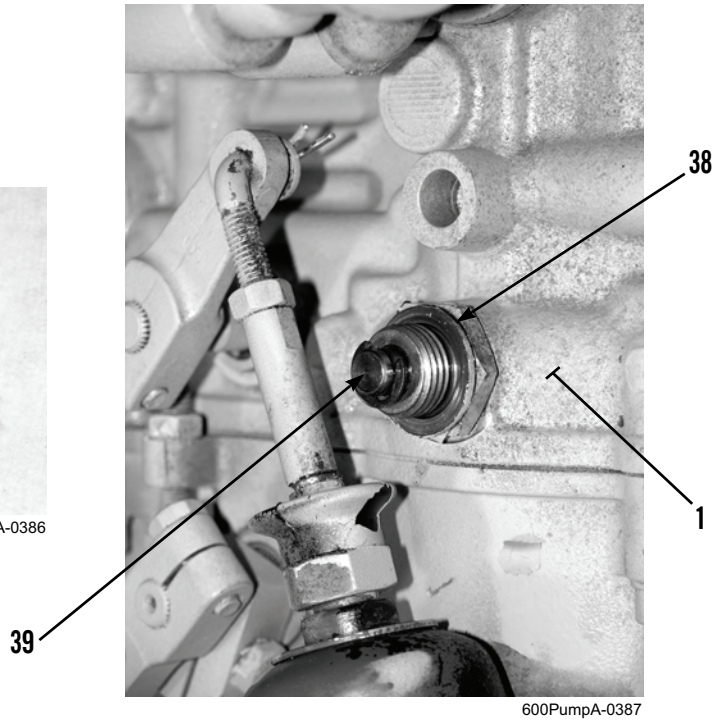


Figure 18. Installing Positioning Pin (Locked Position).

FUEL INJECTION PUMP TIMING - POSITIONING PIN METHOD - CONTINUED

NOTE

If a new fuel injection pump will not mount back on engine because of keyway misalignment, proceed to step 9.

8. Proceed to *Installation* of fuel injection pump in this work package.

CAUTION

Do not rotate engine crankshaft or fuel injection pump shaft with positioning pin installed in the lock position. Failure to follow this caution may damage positioning pin and score fuel injection pump shaft.

NOTE

The following steps must be performed if fuel injection pump cannot be mounted on engine.

9. Remove bolt sleeve (Figure 19, Item 36), copper sealing ring (Figure 19, Item 38), compression spring (Figure 19, Item 37), and positioning pin (Figure 19, Item 39) from fuel injection pump (Figure 19, Item 1).

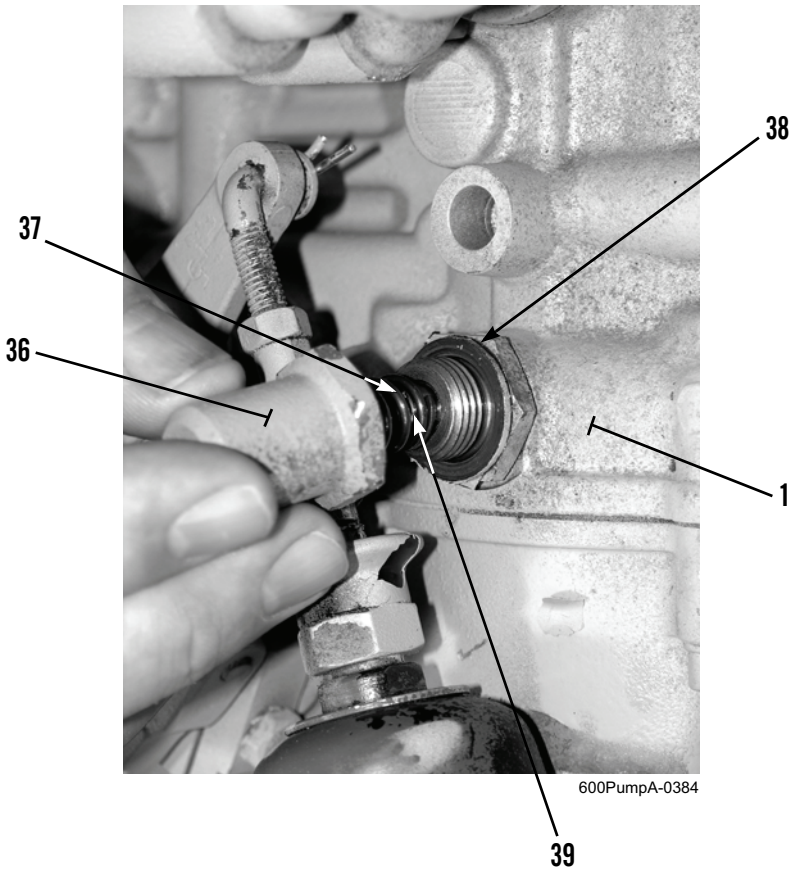


Figure 19. Removing Positioning Pin.

FUEL INJECTION PUMP TIMING - POSITIONING PIN METHOD - CONTINUED

10. Install tensioning nut (Figure 20, Item 28) on fuel injection pump shaft (Figure 20, Item 27) and rotate fuel injection pump shaft until fuel injection pump Woodruff key (Figure 20, Item 35) aligns with engine timing gear slot (Figure 20, Item 41)
11. Remove tensioning nut (Figure 20, Item 28) from fuel injection pump shaft (Figure 20, Item 27).

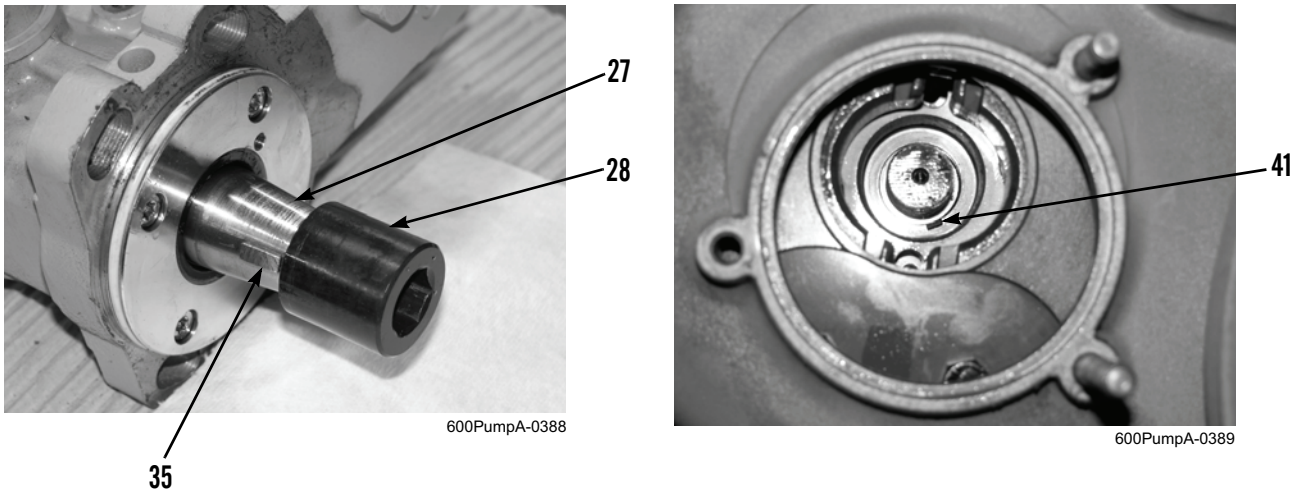


Figure 20. Woodruff Key Alignment.

12. Install fuel injection pump (Figure 21, Item 1) on studs (Figure 21, Item 33) at engine block (Figure 21, Item 30) with four washers (Figure 21, Item 32) and nuts (Figure 21, Item 31). Proceed to step 13.

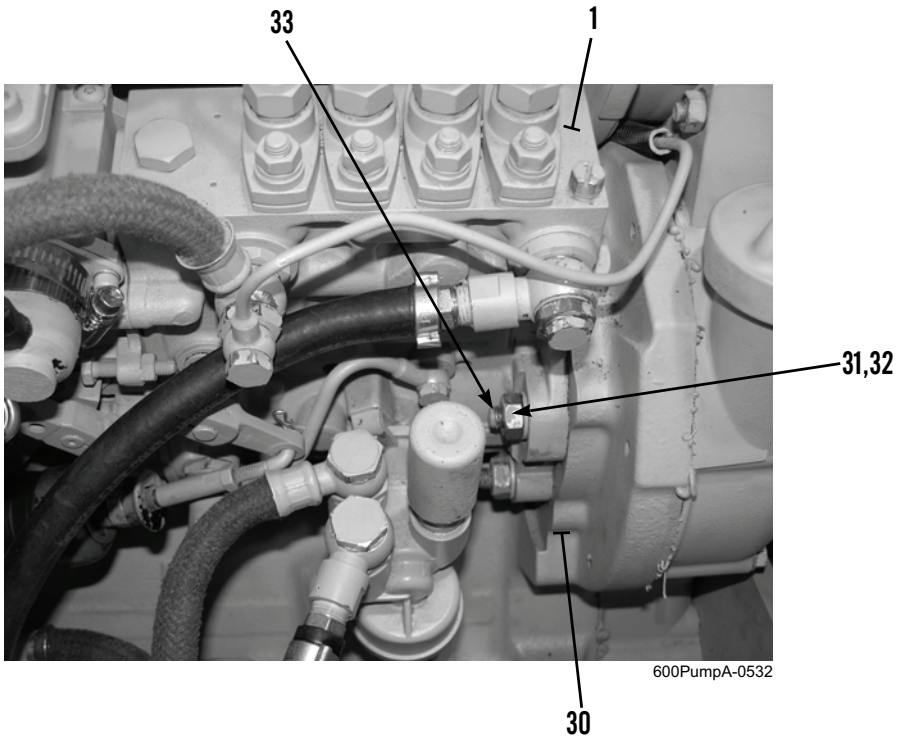


Figure 21. Fuel Injection Pump Mounting.

FUEL INJECTION PUMP TIMING - POSITIONING PIN METHOD - CONTINUED

13. Hold crankshaft with retainer tool and install tensioning nut (Figure 22, Item 28) on fuel injection pump shaft (Figure 22, Item 27). Tighten tensioning nut to 130 lb-ft (176 Nm).

NOTE

- The following steps must be performed in the correct sequence to ensure engine stays on the proper stroke for timing of the fuel injection pump.
- It will be necessary to rotate crankshaft to gain access to timing device bolts.

14. Rotate engine crankshaft 360 degrees clockwise (right) and loosen two upper timing device bolts (Figure 22, Item 42).
15. Rotate engine crankshaft another 360 degrees clockwise (right), stopping at 4° BTDC and loosen two lower timing device bolts (Figure 22, Item 42).

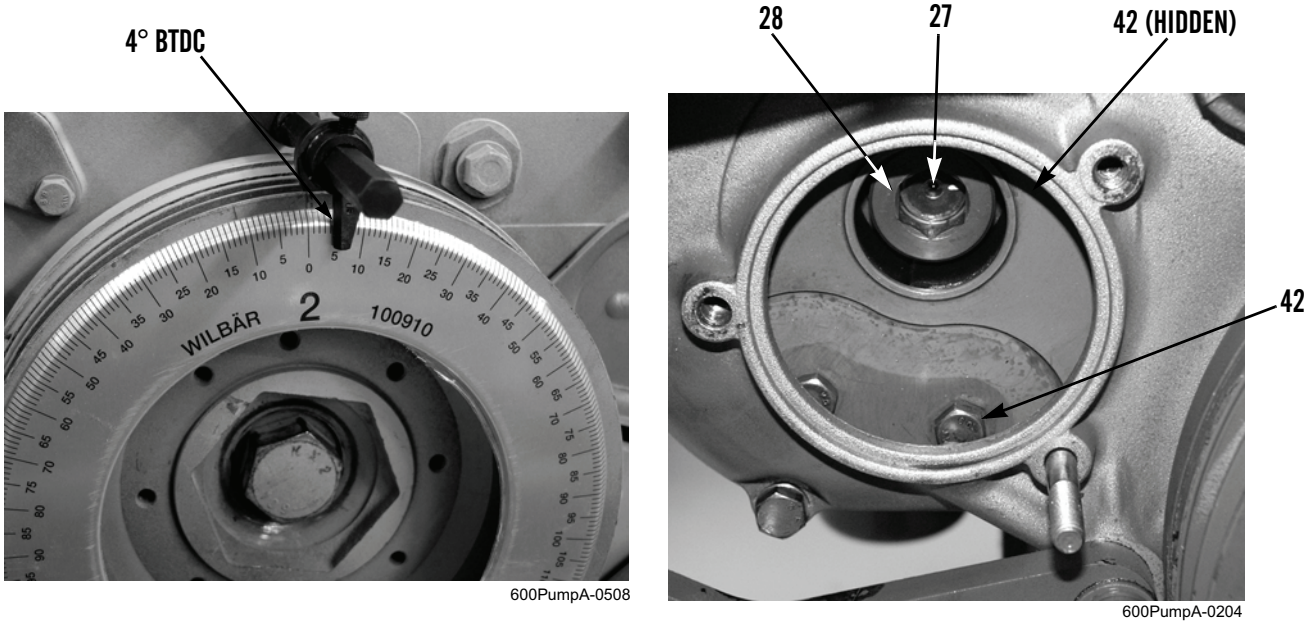


Figure 22. Tensioning Nut and Timing Device Bolts.

CAUTION

If positioning pin does not fully seat into recess of fuel injection pump shaft, fuel injection pump timing is not set correctly. Fuel injection pump shaft must be slowly rotated to allow positioning pin to fully seat. Failure to do so may damage positioning pin and score fuel injection pump shaft.

NOTE

Now that the all four timing device bolts are loose, the fuel injection pump shaft can be turned without off-setting engine timing, because the shaft is no longer locked in the engine timing gear. The fuel injection pump shaft should turn independently from the engine timing gear.

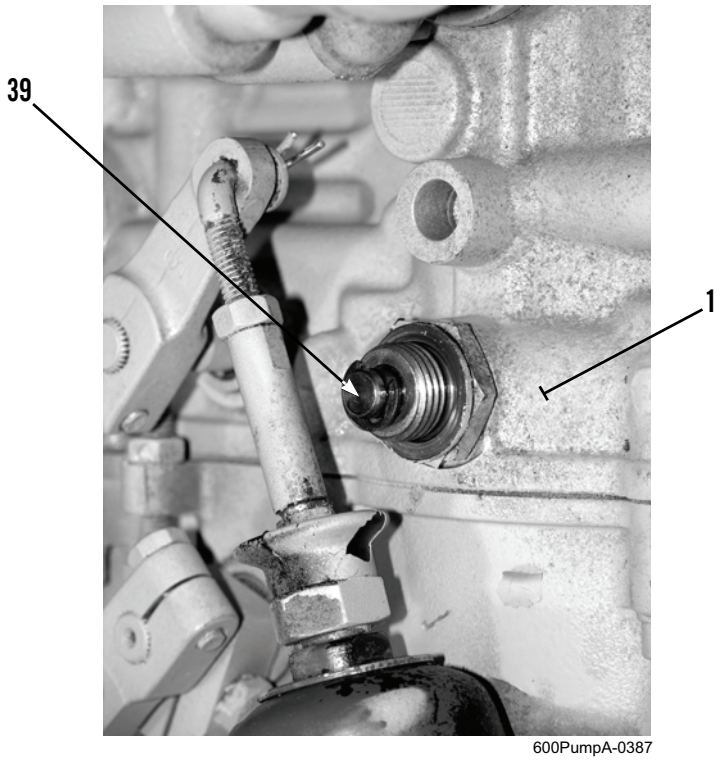
16. Using tensioning nut (Figure 22, Item 28), very slowly rotate fuel injection pump shaft (Figure 22, Item 27), with light hand pressure install positioning pin (Figure 23, Item 39) in fuel injection pump (Figure 23, Item 1) and ensure positioning pin fully seats in recess of fuel injection pump.
17. With positioning pin (Figure 23, Item 39) fully seated in fuel injection pump (Figure 23, Item 1), tighten two lower timing device bolts (Figure 22, Item 42).

FUEL INJECTION PUMP TIMING - POSITIONING PIN METHOD - CONTINUED

CAUTION

Do not rotate engine crankshaft or fuel injection pump shaft with positioning pin installed in the lock position. Failure to follow this caution may damage positioning pin and score fuel injection pump shaft.

18. Remove positioning pin (Figure 23, Item 39) from fuel injection pump (Figure 23, Item 1).



600PumpA-0387

Figure 23. Positioning Pin.

FUEL INJECTION PUMP TIMING - POSITIONING PIN METHOD - CONTINUED

19. Rotate engine crankshaft approximately 90 degrees counterclockwise (left).
20. Slowly rotate engine crankshaft clockwise (right), with light hand pressure install positioning pin (Figure 24, Item 39) in fuel injection pump (Figure 24, Item 1) and ensure positioning pin fully seats in recess of fuel injection pump.
21. With positioning pin (Figure 24, Item 39) fully seated in recess of fuel injection pump (Figure 24, Item 1), check that engine pointer is at 4° BTDC (Figure 25).
    a. If engine pointer is not at 4° BTDC, remove positioning pin (Figure 24, Item 39), while rotating engine clockwise (right), ensure engine is on proper stroke and stop rotating at 4° BTDC. Repeat steps 14 through 21a.

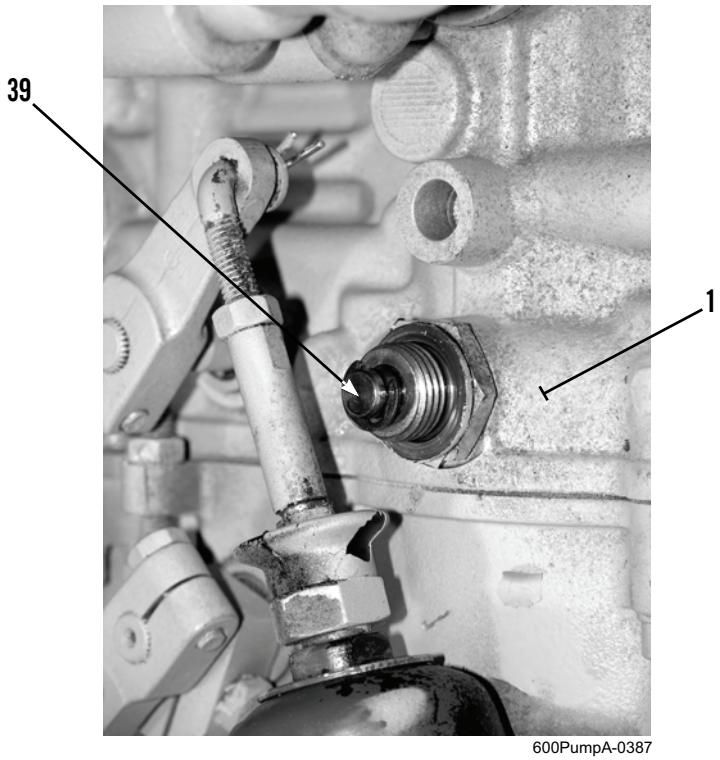


Figure 24. Positioning Pin.

    b. If engine is at 4° BTDC, fuel injection pump (Figure 24, Item 1) is properly timed. Remove positioning pin (Figure 24, Item 39), rotate engine crankshaft 360 degrees clockwise (right) and tighten two upper timing device bolts (Figure 25, Item 42).

FUEL INJECTION PUMP TIMING - POSITIONING PIN METHOD - CONTINUED

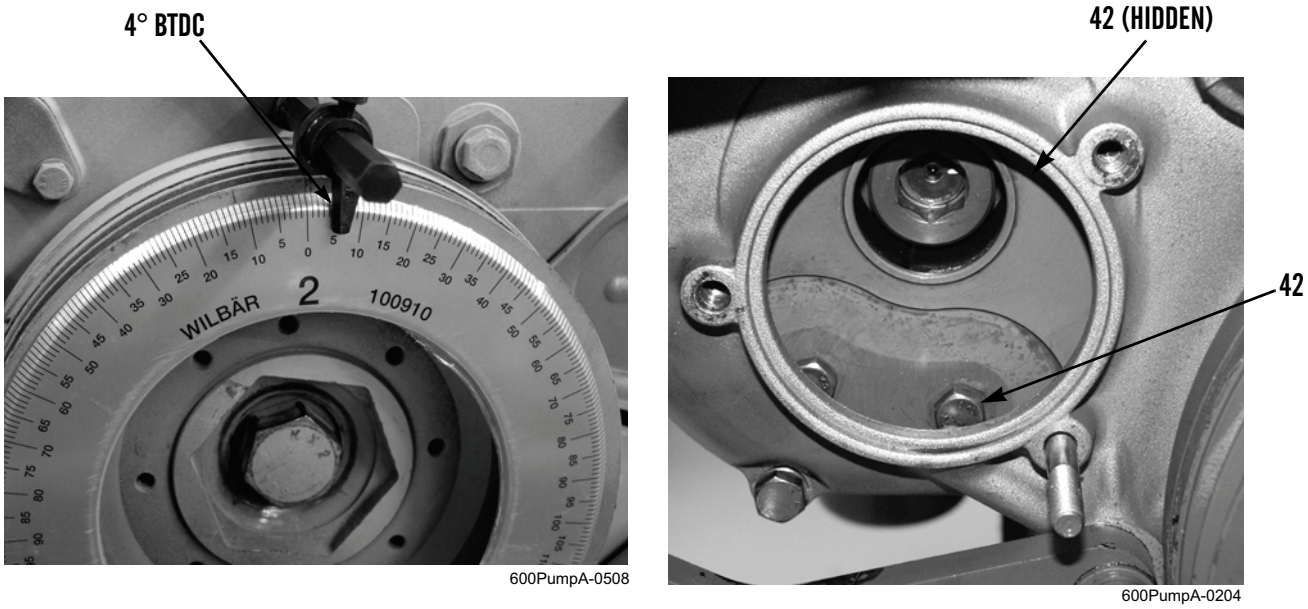


Figure 25. Tensioning Nut and Timing Device Bolts.

22. Install positioning pin (Figure 26, Item 39) through compression spring (Figure 26, Item 37).
23. Install new copper sealing ring (Figure 26, Item 38), positioning pin (Figure 26, Item 39) with compression spring (Figure 26, Item 37), and secure on fuel injection pump (Figure 26, Item 1) with bolt sleeve (Figure 26, Item 36).

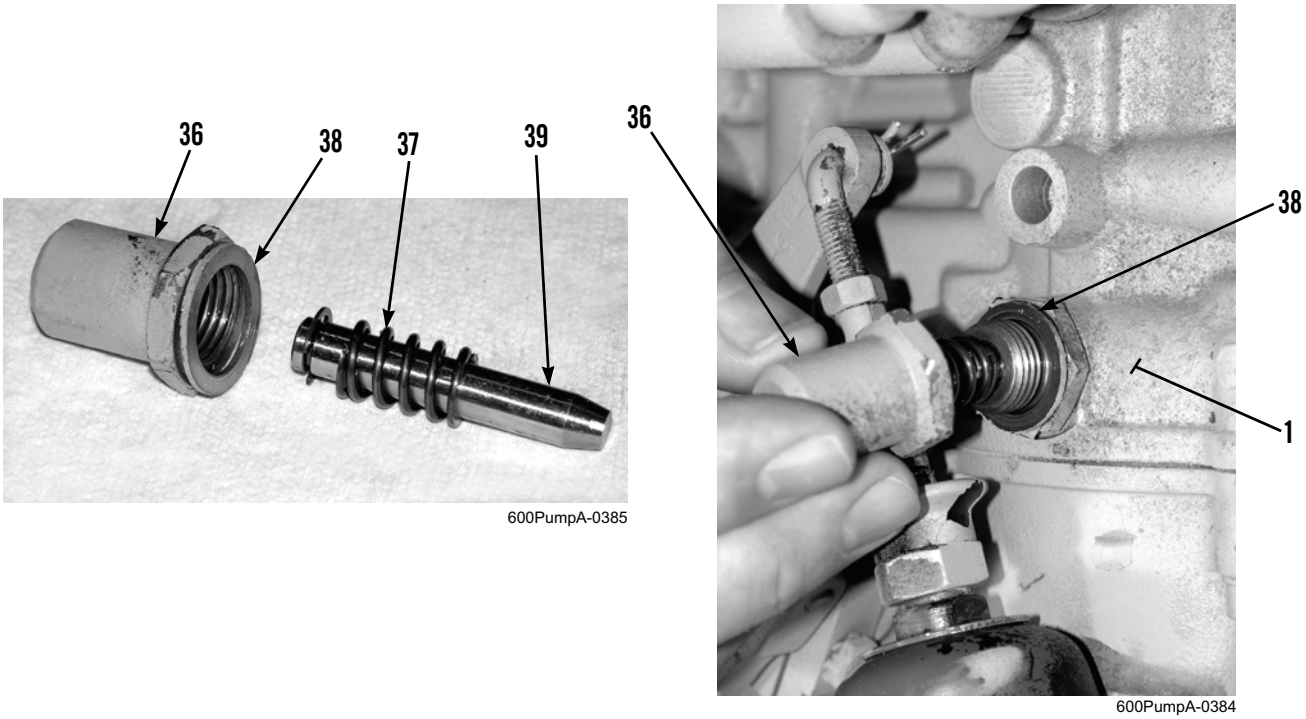


Figure 26. Positioning Pin Installed (Unlocked Position).

INSTALLATION

NOTE

Lightly coat all new sealing washers with clean fuel or oil (if oil line) prior to installation.

1. Install fuel injection pump (Figure 27, Item 1) on studs (Figure 27, Item 33) at engine block (Figure 27, Item 30) with four washers (Figure 27, Item 32) and nuts (Figure 27, Item 31). Do not fully tighten nuts.

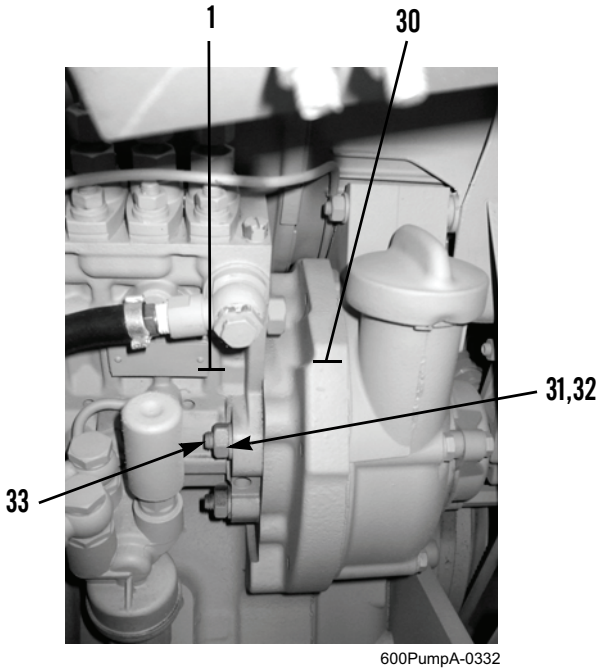


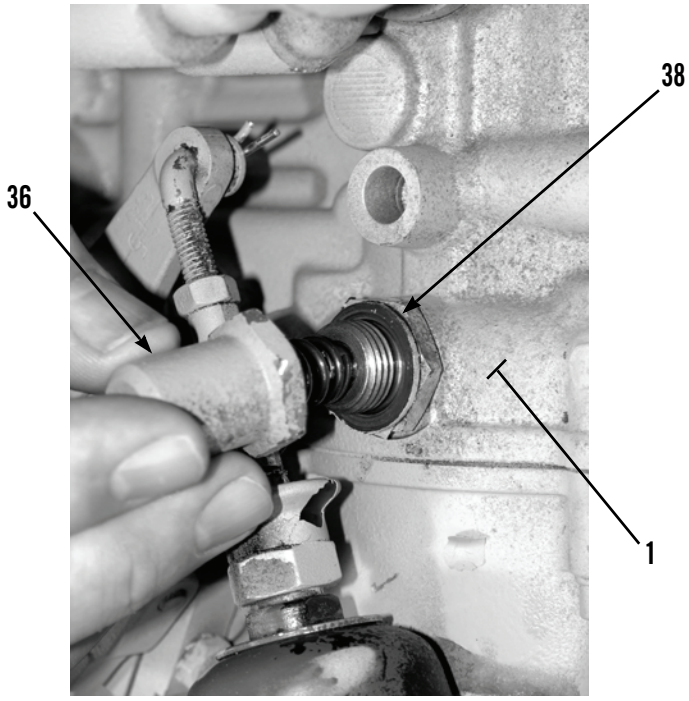
Figure 27. Fuel Injection Pump Mounting.

INSTALLATION - CONTINUED

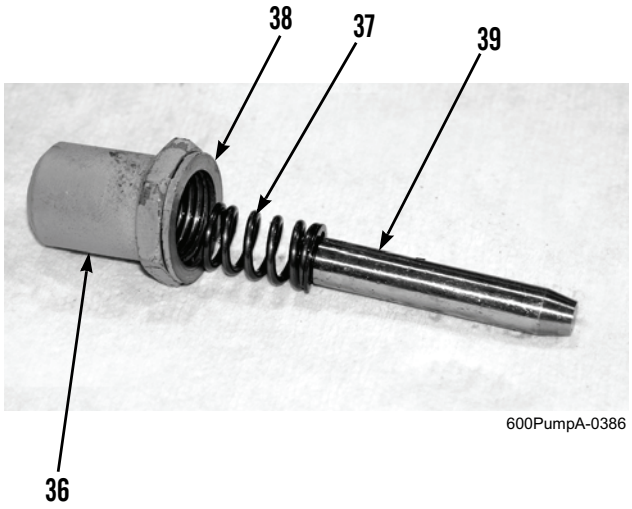
CAUTION

Do not rotate engine crankshaft or fuel injection pump shaft with positioning pin installed in the lock position. Failure to follow this caution may damage positioning pin and score fuel injection pump shaft.

2. Remove bolt sleeve (Figure 28, Item 36), copper sealing ring (Figure 28, Item 38), compression spring (Figure 28, Item 37), and positioning pin (Figure 28, Item 39) from fuel injection pump (Figure 28, Item 1).



600PumpA-0384



600PumpA-0386

Figure 28. Removing Positioning Pin.

INSTALLATION - CONTINUED

3. Install positioning pin (Figure 29, Item 39) through compression spring (Figure 29, Item 37).
4. Install new copper sealing ring (Figure 29, Item 38), positioning pin (Figure 29, Item 39) with compression spring (Figure 29, Item 37), and secure on fuel injection pump (Figure 29, Item 1) with bolt sleeve (Figure 29, Item 36).

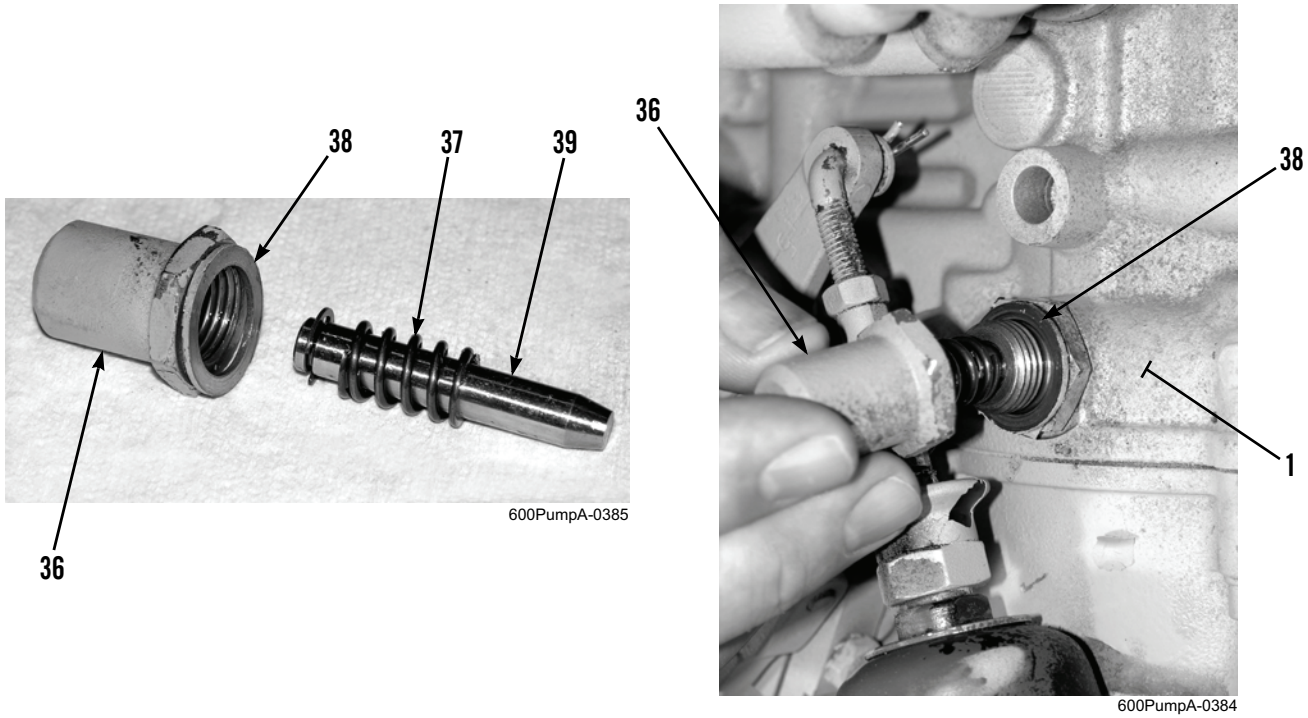


Figure 29. Installing Positioning Pin (Unlocked Position).

5. Install tensioning nut (Figure 30, Item 28) on fuel injection pump shaft (Figure 30, Item 27). Hold crankshaft with retainer tool and tighten tensioning nut to 130 lb-ft (176 Nm).

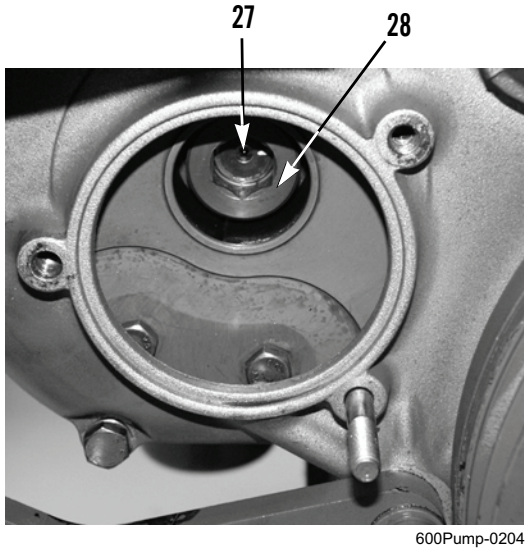


Figure 30. Tightening Tensioning Nut.

INSTALLATION - CONTINUED

NOTE

The following fluid passage bolts should be tightened to 25 to 30 lb-ft (30 to 40 Nm).

6. Install new sealing washer (Figure 31, Item 19), oil line (Figure 31, Item 17), new sealing washer (Figure 31, Item 19), and fluid passage bolt (Figure 31, Item 18) on fuel injection pump (Figure 31, Item 1).
7. Install new sealing washer (Figure 31, Item 21), hose assembly (Figure 31, Item 25), new sealing washer (Figure 31, Item 21), and fluid passage bolt (Figure 31, Item 20) on fuel injection pump (Figure 31, Item 1).
8. Install new sealing washer (Figure 31, Item 24), hose assembly (Figure 31, Item 22), new sealing washer (Figure 31, Item 24), and fluid passage bolt (Figure 31, Item 23) on fuel injection pump (Figure 31, Item 1).

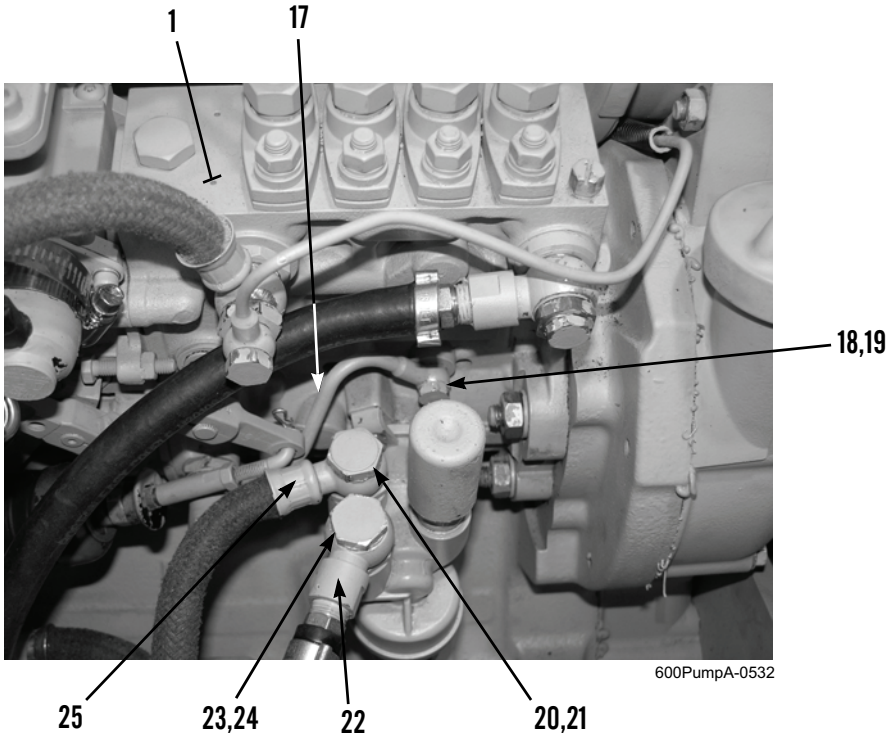


Figure 31. Fuel Lines and Oil Line.

INSTALLATION - CONTINUED

9. Install new sealing washer (Figure 32, Item 7), hose assembly (Figure 32, Item 6), fluid passage bolt (Figure 32, Item 16), new sealing washer (Figure 32, Item 7), fuel line (Figure 32, Item 8), new sealing washer (Figure 32, Item 15), and fluid passage bolt (Figure 32, Item 14) on fuel injection pump (Figure 32, Item 1).
10. Install new sealing washer (Figure 32, Item 9), overflow line (Figure 32, Item 10), new sealing washer (Figure 32, Item 9), fluid passage bolt (Figure 32, Item 11), new sealing washer (Figure 32, Item 13), and plug (Figure 32, Item 12) on fuel injection pump (Figure 32, Item 1).

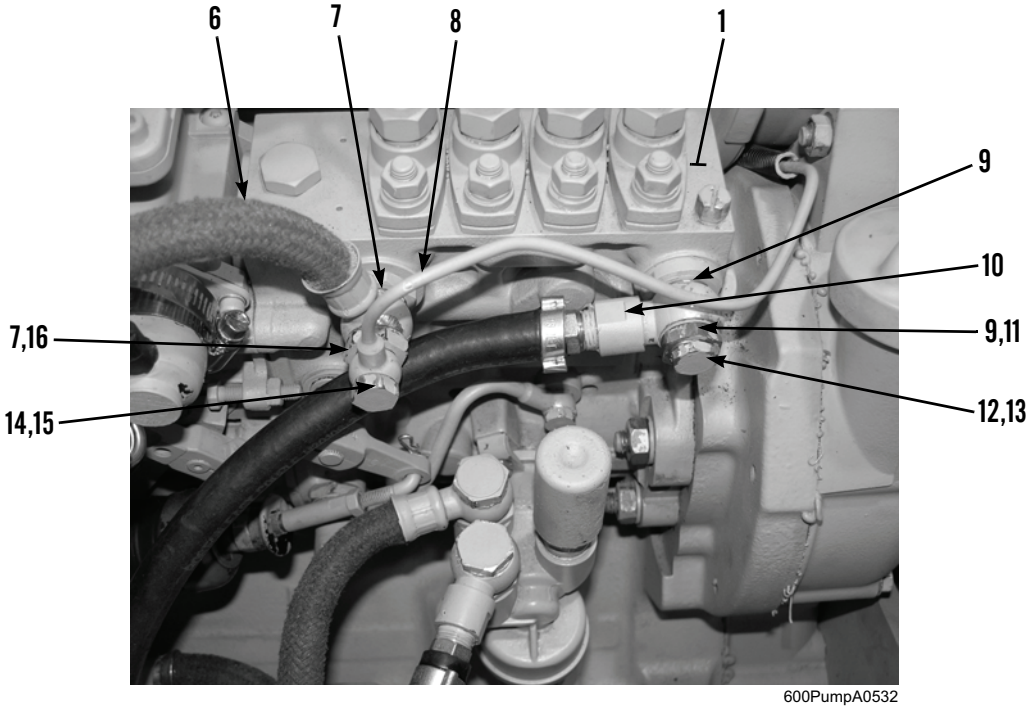


Figure 32. Fuel Lines.

INSTALLATION - CONTINUED

CAUTION

Do not bend or kink fuel lines or damage to fuel lines may result.

11. Connect four injector lines (Figure 33, Item 5) to fuel injection pump (Figure 33, Item 1). Tighten lines to 16 to 21 lb-ft (22 to 28 Nm).
12. Install new sealing washer (Figure 33, Item 2), injector line (Figure 33, Item 4), new sealing washer (Figure 33, Item 2), and fluid passage bolt (Figure 33, Item 3) to fuel injection pump (Figure 33, Item 1).

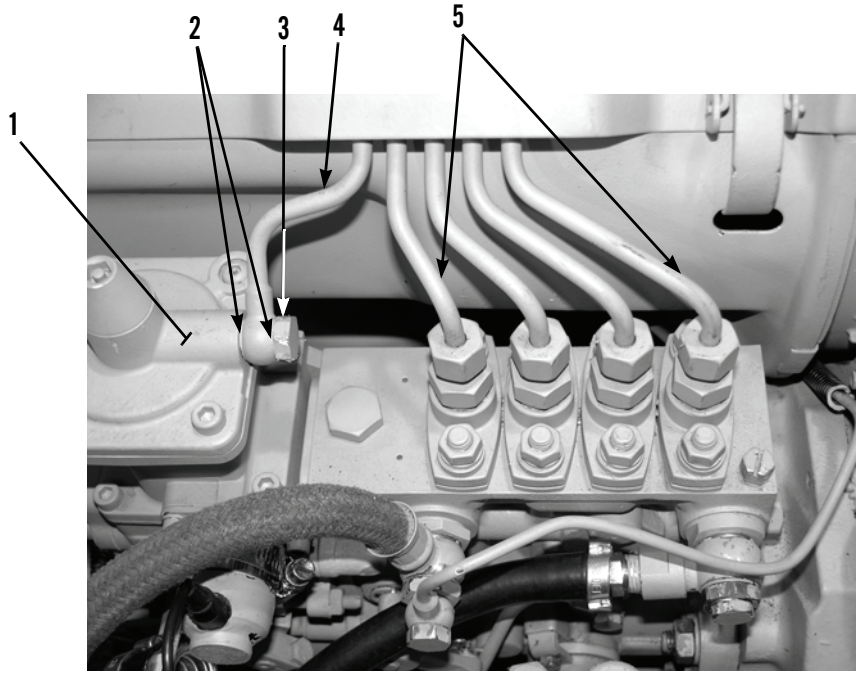


Figure 33. Fuel Injector Lines.

13. Reposition conduit and connect engine/control panel wiring harness connector to solenoid (WP 0095).
14. Reposition conduit and connect engine/control panel wiring harness connector to electromagnet (WP 0095).
15. Remove fuel pump (WP 0096), to allow tool clearance to apply torque in step 16.

INSTALLATION - CONTINUED

16. Tighten four nuts (Figure 34, Item 31) at studs (Figure 34, Item 33) to 30 to 35 lb-ft (40 to 48 Nm).

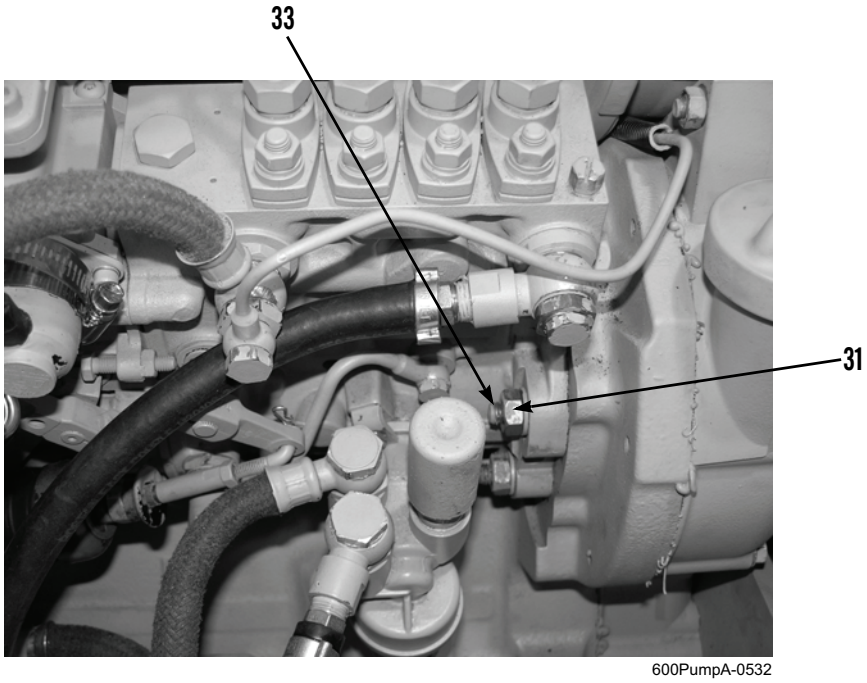


Figure 34. Fuel Injection Pump Mounting.

17. Reinstall fuel pump (WP 0096).
18. Install engine oil level dipstick (Figure 35, Item 29).

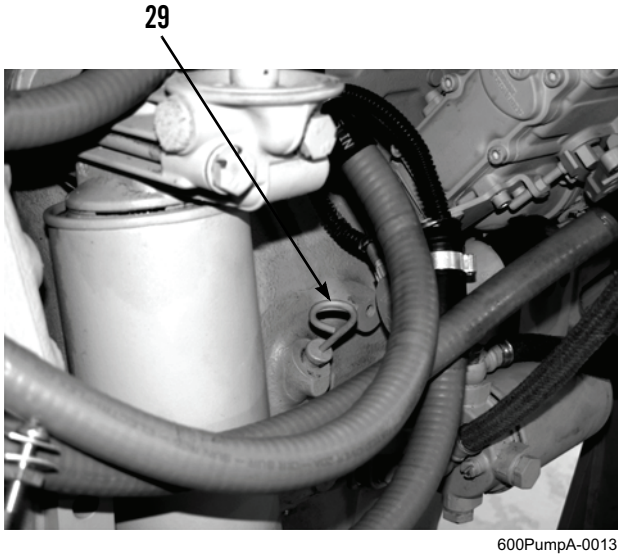


Figure 35. Engine Oil Level Dipstick.

INSTALLATION - CONTINUED

19. Remove pointer tool from engine front cover (Figure 36).
20. Remove graduated disc from V-belt pulley (Figure 36).

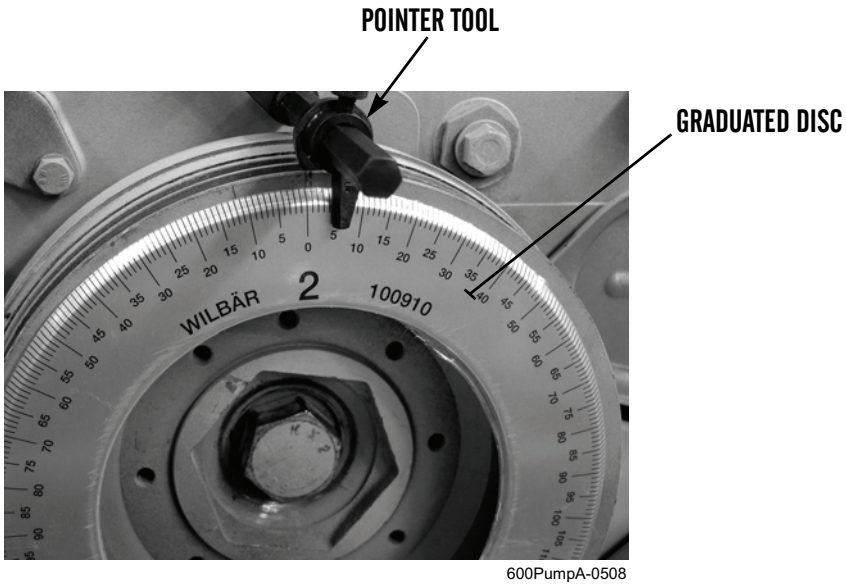


Figure 36. Removing Tools.

FOLLOW-ON TASKS

1. Check engine oil level and add oil as needed (WP 0084).
2. Bleed fuel system (WP 0106).
3. Install cooling fan V-belt tensioner pulley assembly (WP 0092).
4. Install control panel box (WP 0110).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

FUEL INJECTION PUMP SOLENOID AND ELECTROMAGNET REPLACEMENT

Solenoid Removal, Solenoid Installation, Follow-On Tasks
Electromagnet Removal, Electromagnet Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Diesel fuel, DF-1 (Item 10, WP 0129)
Diesel fuel, DF-2 (Item 11, WP 0129)
Rag, wiping (Item 22, WP 0129)
Turbine fuel, aviation, JP-5 (Item 31, WP 0129)
Turbine fuel, aviation, JP-8 (Item 32, WP 0129)
Circlip
Lockwasher (2)
O-ring
Pin

Materials/Parts - Continued

Spring tension washer (2)

Personnel Required

63J (1)

References

WP 0106

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked
Battery cables disconnected (WP 0033)

SOLENOID REMOVAL

1. Remove pin (Figure 1, Item 2), washer (Figure 1, Item 3), and rod (Figure 1, Item 4) from fuel injection pump arm (Figure 1, Item 1). Discard pin.

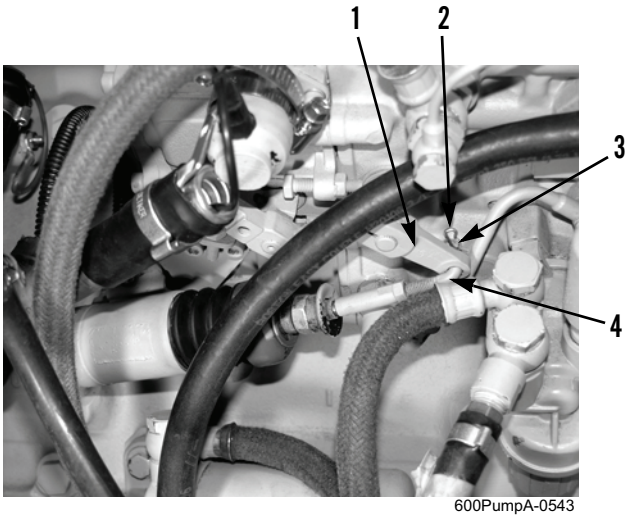


Figure 1. Solenoid Linkage.

2. Pull solenoid wire (Figure 2, Item 5) out of conduit (Figure 2, Item 11) and disconnect solenoid connector (Figure 2, Item 13) from engine/control panel wiring harness connector (Figure 2, Item 12).
3. Remove two capscrews (Figure 2, Item 7), spring tension washers (Figure 2, Item 8), conduit L-bracket (Figure 2, Item 6), and solenoid (Figure 2, Item 10) with assembled linkage from fuel solenoid bracket (Figure 2, Item 9). Discard spring tension washers.

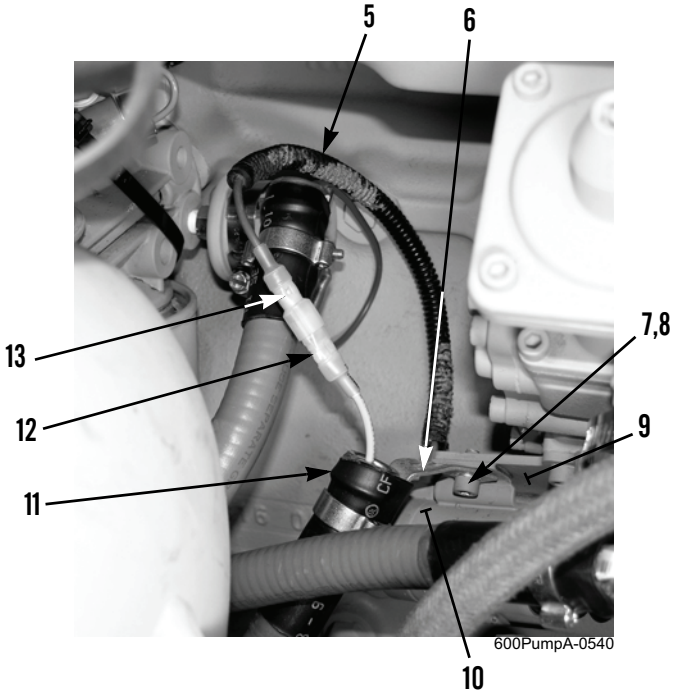


Figure 2. Solenoid and Conduit.

SOLENOID REMOVAL - CONTINUED

NOTE

- Measure length of linkage prior to removal to ensure correct installation.
- It is not necessary to disassemble rod, nut, and threaded linkage unless they are damaged.

4. Loosen nut (Figure 3, Item 16) on rod (Figure 3, Item 4) and remove rod and nut from threaded linkage (Figure 3, Item 15).
5. Remove threaded linkage (Figure 3, Item 15) from linkage nut (Figure 3, Item 14).

WARNING

Solenoid has spring pressure. Ensure solenoid is not compressed when removing circlip. Use caution and wear eye protection to prevent injury to personnel.

6. Remove circlip (Figure 3, Item 17) and linkage nut (Figure 3, Item 14) from solenoid (Figure 3, Item 10). Discard circlip.

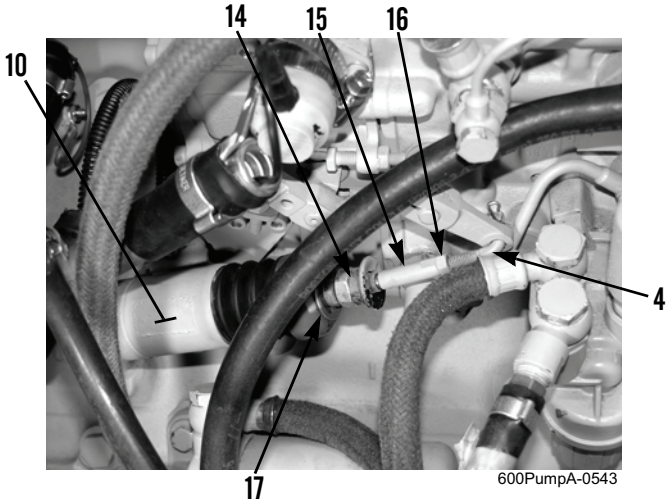


Figure 3. Solenoid Linkage.

SOLENOID INSTALLATION

1. Install linkage nut (Figure 3, Item 14) and new circlip (Figure 3, Item 17) on solenoid (Figure 3, Item 10).
2. Install threaded linkage (Figure 3, Item 15) on linkage nut (Figure 3, Item 14).

NOTE

Use length measurement as noted during removal.

3. Install rod (Figure 3, Item 4) with nut (Figure 3, Item 16) on threaded linkage (Figure 3, Item 15) and adjust to measurement noted during removal. Tighten nut.
4. Install solenoid (Figure 2, Item 10) with assembled linkage and conduit L-bracket (Figure 2, Item 6) on fuel solenoid bracket (Figure 2, Item 9) with two new spring tension washers (Figure 2, Item 8) and capscrews (Figure 2, Item 7).
5. Connect solenoid connector (Figure 2, Item 13) to engine/control panel wiring harness connector (Figure 2, Item 12). Push wire (Figure 2, Item 5) back inside conduit (Figure 2, Item 11).
6. Install rod (Figure 1, Item 4) on fuel injection pump arm (Figure 1, Item 1) with washer (Figure 1, Item 3) and new pin (Figure 1, Item 2).

FOLLOW-ON TASKS

Connect battery cables (WP 0033).

ELECTROMAGNET REMOVAL

1. Bleed pressure from fuel system by loosening ventilation valve setscrew (WP 0106).
2. Pull black wire (Figure 4, Item 25) of electromagnet (Figure 4, Item 22) out of conduit (Figure 4, Item 18).
3. Disconnect connector (Figure 4, Item 26) of electromagnet (Figure 4, Item 22) from engine/control panel wiring harness connector (Figure 4, Item 27).
4. Remove clamp (Figure 4, Item 21) securing conduit L-bracket (Figure 4, Item 19) to electromagnet (Figure 4, Item 22).
5. Remove two capscrews (Figure 4, Item 23), lockwashers (Figure 4, Item 24), and electromagnet (Figure 4, Item 22) from fuel injection pump (Figure 4, Item 20). Discard lockwashers.

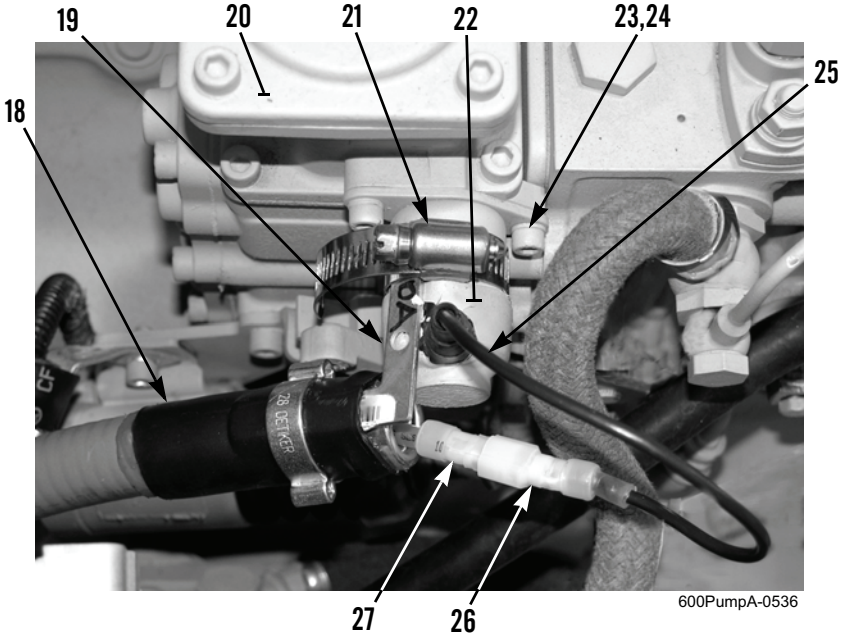


Figure 4. Electromagnet.

6. Remove O-ring (Figure 5, Item 28) from electromagnet (Figure 5, Item 22). Discard O-ring.

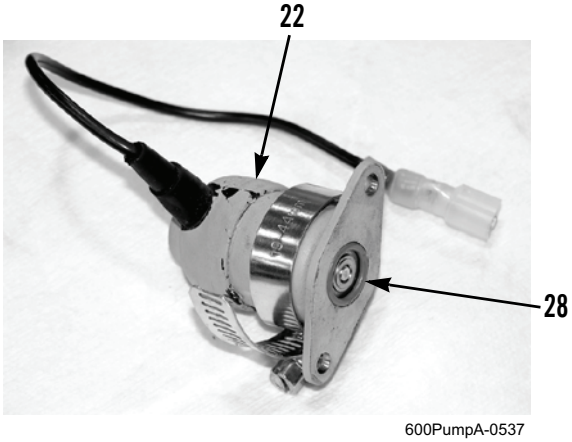


Figure 5. Electromagnet O-ring.

ELECTROMAGNET INSTALLATION

NOTE

Lightly coat new O-ring with clean fuel before installation.

1. Install new O-ring (Figure 5, Item 28) to electromagnet (Figure 5, Item 22).
2. Install electromagnet (Figure 4, Item 22) on fuel injection pump (Figure 4, Item 20) with two new lockwashers (Figure 4, Item 24) and capscrews (Figure 4, Item 23).
3. Reposition conduit L-bracket (Figure 4, Item 19) and secure to electromagnet (Figure 4, Item 22) and tighten clamp (Figure 5, Item 21).
4. Connect connector (Figure 4, Item 26) of electromagnet (Figure 4, Item 22) to engine/control panel wiring harness connector (Figure 4, Item 27).
5. Push wire (Figure 4, Item 25) back inside conduit (Figure 4, Item 18).
6. Tighten ventilation valve setscrew (WP 0106).

FOLLOW-ON TASKS

Connect battery cables (WP 0033).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

FUEL PUMP MAINTENANCE

Removal, Disassembly, Cleaning and Inspection, Assembly, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Cap set, protective, dust and moisture (Item 5, WP 0129)
Diesel fuel, DF-1 (Item 10, WP 0129)
Diesel fuel, DF-2 (Item 11, WP 0129)
Rag, wiping (Item 22, WP 0129)
Tag, marker (Item 27, WP 0129)
Turbine fuel, aviation, JP-5 (Item 31, WP 0129)
Turbine fuel, aviation, JP-8 (Item 32, WP 0129)

Materials/Parts - Continued

O-ring (2)
Sealing ring
Sealing washer (4)

Personnel Required

63J (2)

References

WP 0023
WP 0106

Equipment Condition

Battery cables disconnected (WP 0033)
Engine cool

- DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing damage to equipment and injury or death to personnel.
- Allow engine to cool off before performing maintenance on fuel pump. Hot metal parts can cause severe burns. Wear eye, glove, and skin protection when working with heated parts. Failure to follow this warning may cause injury to personnel.
- Wear fuel-resistant gloves and eye protection when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. Failure to follow this warning may result in injury to personnel.
- When servicing this equipment, performing maintenance, or disposing of materials such as fuel, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

CAUTION

Wipe area clean around all connections to be opened during removal and disassembly. Cap line and plug openings after removing lines. Contamination of fuel system could result in premature failure.

NOTE

- A suitable container should be placed under fuel lines to capture draining fuel. Dispose of fuel IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.
- Tag hoses prior to removal to ensure correct installation.

REMOVAL

1. Bleed pressure from fuel system by loosening ventilation valve setscrew (WP 0106).
2. Remove fluid passage bolt (Figure 1, Item 2), sealing washer (Figure 1, Item 3), hose (Figure 1, Item 1), and sealing washer (Figure 1, Item 4) from fuel pump (Figure 1, Item 7). Discard sealing washers.
3. Remove fluid passage bolt (Figure 1, Item 8), sealing washer (Figure 1, Item 9), hose (Figure 1, Item 11), and sealing washer (Figure 1, Item 10) from fuel pump (Figure 1, Item 7). Discard sealing washers.
4. Remove two bolts (Figure 1, Item 6), clamps (Figure 1, Item 5), and fuel pump (Figure 1, Item 7) from fuel injection pump (Figure 1, Item 12).

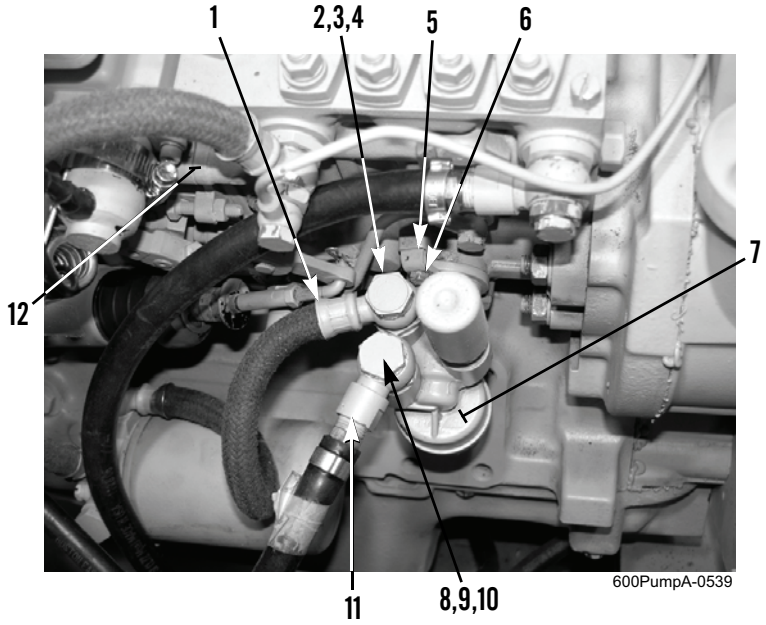


Figure 1. Fuel Pump.

DISASSEMBLY

1. Remove hand pump (Figure 2, Item 14) and sealing ring (Figure 2, Item 13) from fuel pump (Figure 2, Item 7). Discard sealing ring.
2. Remove bowl (Figure 2, Item 24), O-ring (Figure 2, Item 21), spring (Figure 2, Item 23), and strainer (Figure 2, Item 22) from fuel pump (Figure 2, Item 7). Discard O-ring.
3. Remove insert (Figure 2, Item 18), plunger (Figure 2, Item 20), washer (Figure 2, Item 17), spring (Figure 2, Item 16), and washer (Figure 2, Item 15) from fuel pump (Figure 2, Item 7).
4. Remove O-ring (Figure 2, Item 19) from insert (Figure 2, Item 18). Discard O-ring.

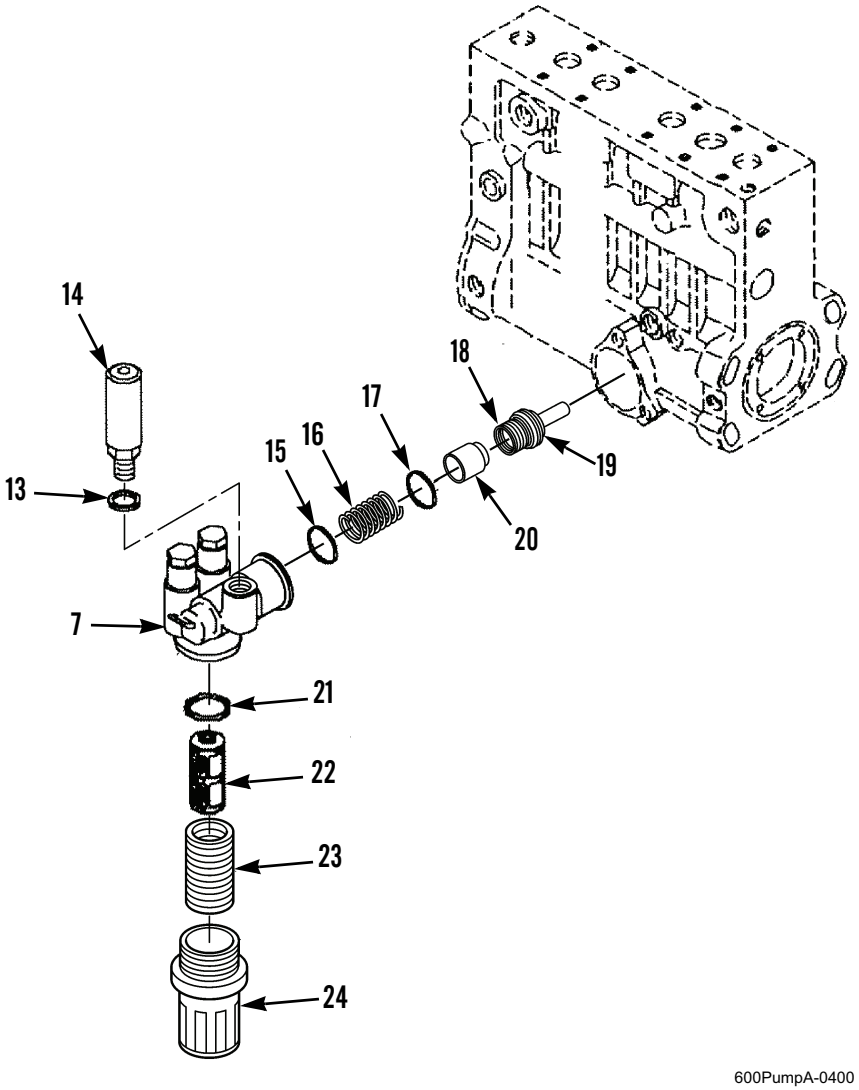


Figure 2. Fuel Pump-Exploded View.

CLEANING AND INSPECTION

1. Clean and inspect all parts IAW WP 0023.
2. Replace parts as necessary.

ASSEMBLY

NOTE

- Lightly coat all new O-rings and sealing ring with clean fuel prior to installation.
- The following fluid passage bolts should be tightened to 25 to 30 lb-ft (34 to 40 Nm).

1. Install new O-ring (Figure 3, Item 19) on insert (Figure 3, Item 18).
2. Assemble washer (Figure 3, Item 15), spring (Figure 3, Item 16), washer (Figure 3, Item 17), plunger (Figure 3, Item 20), and insert (Figure 3, Item 18) in fuel pump (Figure 3, Item 7). Tighten to 30 to 37 lb-ft (40 to 50 Nm).
3. Install strainer (Figure 3, Item 22), spring (Figure 3, Item 23), new O-ring (Figure 3, Item 21), and bowl (Figure 3, Item 24) on fuel pump (Figure 3, Item 7).
4. Install new sealing ring (Figure 3, Item 13) and hand pump (Figure 3, Item 14) on fuel pump (Figure 3, Item 7).

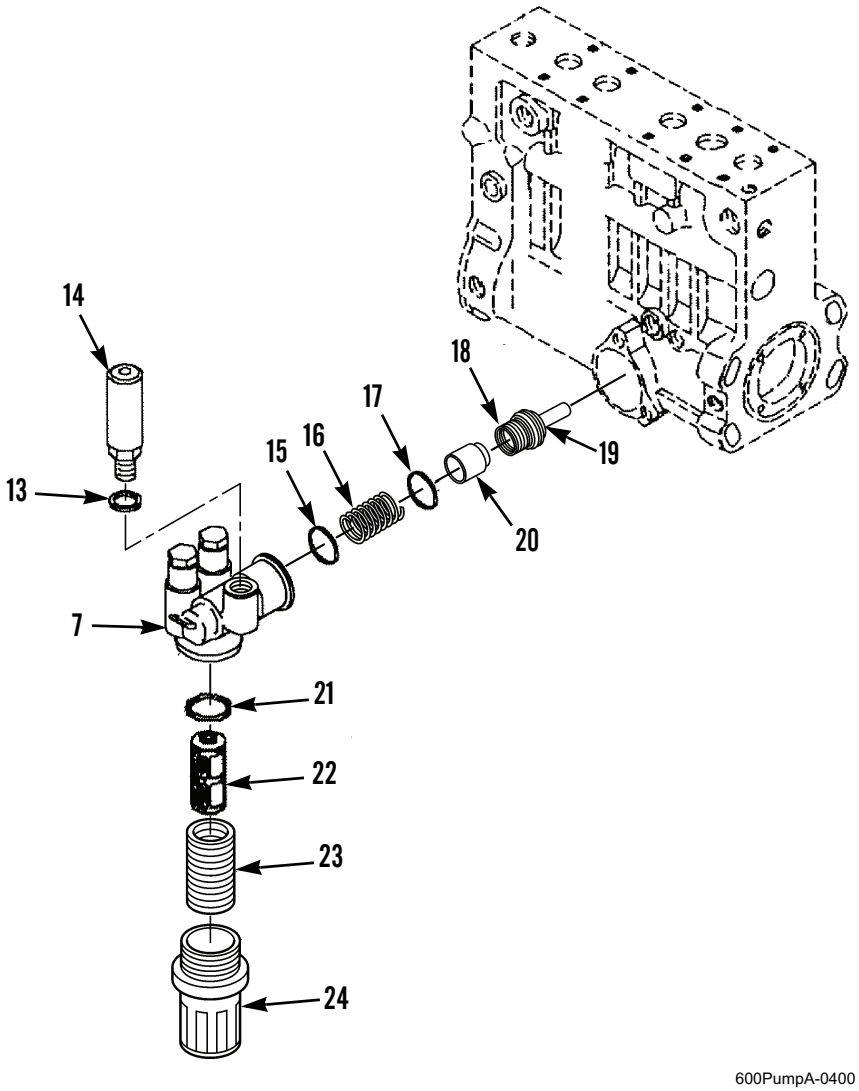


Figure 3. Fuel Pump-Exploded View.

INSTALLATION

1. Install fuel pump (Figure 4, Item 7) on fuel injection pump (Figure 4, Item 12) with two clamps (Figure 4, Item 5) and bolts (Figure 4, Item 6).
2. Install new sealing washer (Figure 4, Item 10), hose (Figure 4, Item 11), new sealing washer (Figure 4, Item 9), and fluid passage bolt (Figure 4, Item 8) on fuel pump (Figure 4, Item 7).
3. Install new sealing washer (Figure 4, Item 4), hose (Figure 4, Item 1), new sealing washer (Figure 4, Item 3), and fluid passage bolt (Figure 4, Item 2) on fuel pump (Figure 4, Item 7).

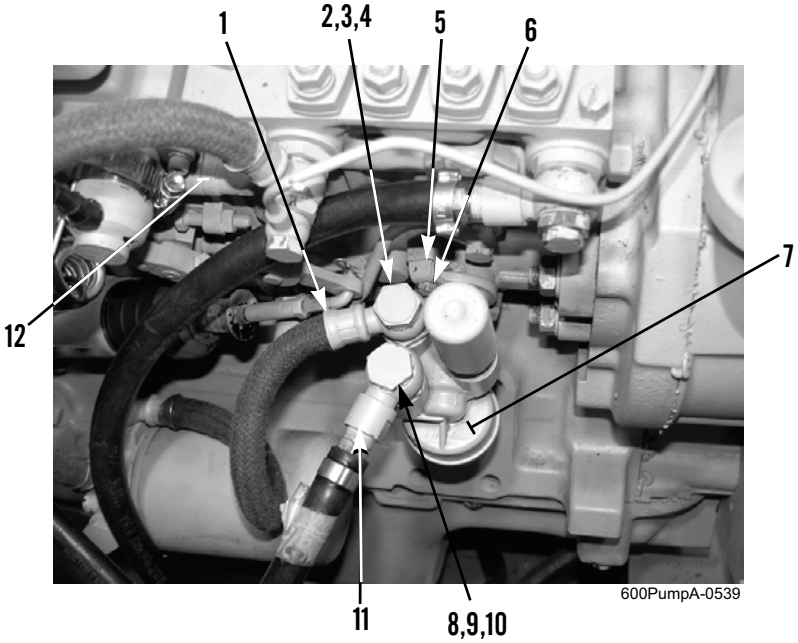


Figure 4. Fuel Pump.

FOLLOW-ON TASKS

Bleed fuel system (WP 0106).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

AIR CLEANER HOUSING ASSEMBLY MAINTENANCE

Service, Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Materials/Parts

Rag, wiping (Item 22, WP 0129)
Tape, antiseizing (Item 28, WP 0129)
Locknut (4)

Personnel Required

63J (1)

References

WP 0023

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked
Batteries cables disconnected (WP 0033)

WARNING

If NBC exposure is suspected, personnel wearing protective equipment must handle all air cleaner media. Contaminated filters must be handled using adequate precautions and must be disposed of by trained personnel. Consult your NBC Officer or NBC NCO for appropriate handling or disposal procedures. Failure to follow this warning may cause injury or death to personnel.

NOTE

- Air cleaner primary element may be cleaned several times, as long as it is not damaged. However, it should be replaced at least once each year.
- Air cleaner safety element should never be cleaned. It should be replaced after five air cleaner services or at least after two years.

SERVICE

1. Empty dust evacuator valve (Figure 1, Item 4) by squeezing discharge slot and expelling dust from air cleaner.
2. Clean discharge slot as needed. Remove any caked dirt by pressing together upper section of valve.
3. Loosen thumbscrew (Figure 1, Item 1) and clamp (Figure 1, Item 2) and remove cover (Figure 1, Item 3) from air cleaner housing (Figure 1, Item 5).

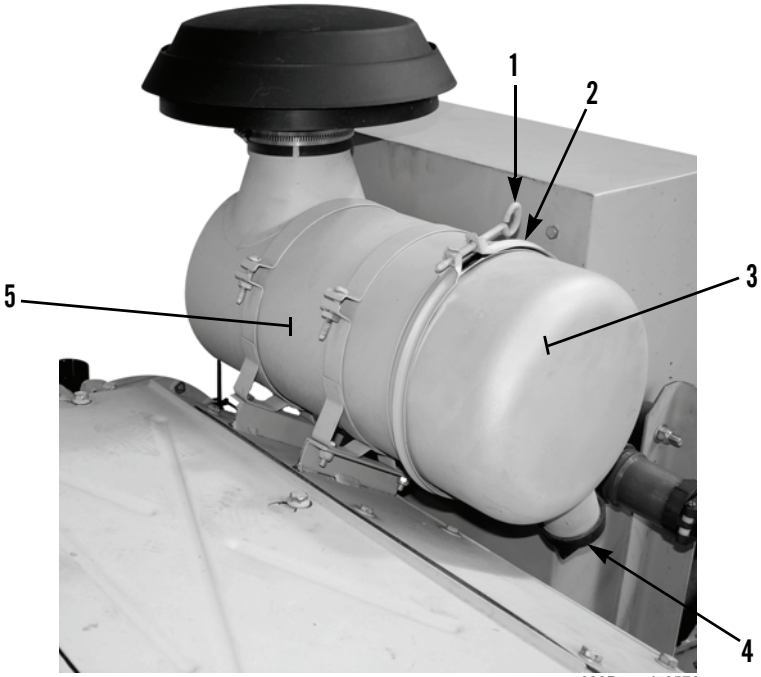


Figure 1. Air Cleaner Housing Assembly.

4. Remove primary air cleaner element (Figure 2, Item 6) from air cleaner housing (Figure 2, Item 5).

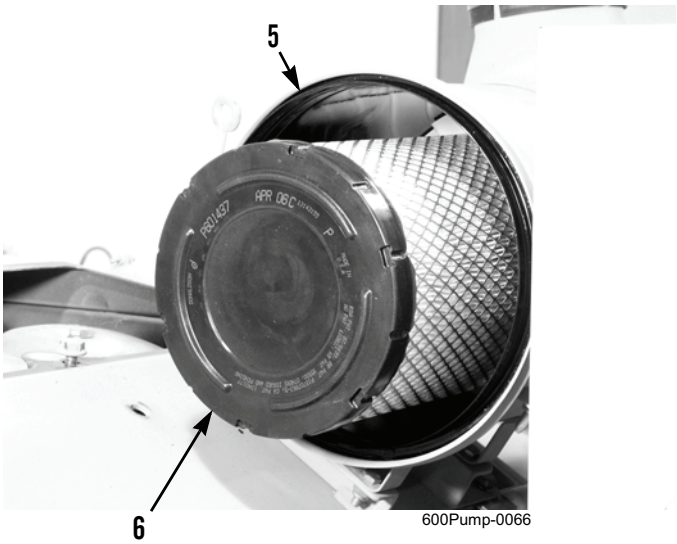


Figure 2. Primary Air Cleaner Element.

SERVICE - CONTINUED

5. Use a rag to clean inside of air cleaner housing (Figure 2, Item 5).

WARNING

Particles blown by compressed air are hazardous. Use a maximum of 30 PSI (207 kPa) when cleaning components. DO NOT direct compressed air against human skin. Failure to follow this warning may result in injury or death to personnel. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield.

CAUTION

Rough handling of primary air cleaner element will damage it.

6. Direct compressed air, from inside out, into primary air cleaner element (Figure 2, Item 6) while turning element. If dust and dirt does not come out easily, tap element gently to dislodge solid material.

NOTE

Manufacturer of primary air cleaner element may not recommend cleaning by washing. Read any instructions that may be found on primary element.

7. If primary air cleaner element (Figure 2, Item 6) is covered with carbon or oil, soak element in detergent for 15 minutes. Wash element several times in water, rinse with clean water, and dry naturally.
8. After primary air cleaner element (Figure 2, Item 6) is dry, perform these inspections:
   a. Check inside of element with a light to verify there is no damage. Light should not shine through if element is in good condition.
   b. Check primary air cleaner element sealing gaskets for damage.
9. To replace safety element (Figure 3, Item 7), remove safety element from air cleaner housing (Figure 3, Item 5) and discard.
10. Position new safety element (Figure 3, Item 7) squarely inside air cleaner housing (Figure 3, Item 5). Ensure it is firmly seated.
11. Position primary air cleaner element (Figure 3, Item 7) squarely inside air cleaner housing (Figure 3, Item 5) until firmly seated.

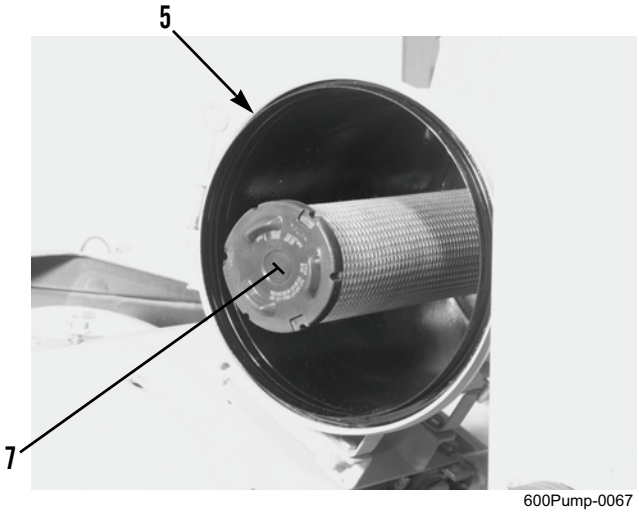


Figure 3. Safety Element.

SERVICE - CONTINUED

12. Install cover (Figure 4, Item 3) on air cleaner housing (Figure 4, Item 5). Tighten thumbscrew (Figure 4, Item 1) to secure clamp (Figure 4, Item 2).

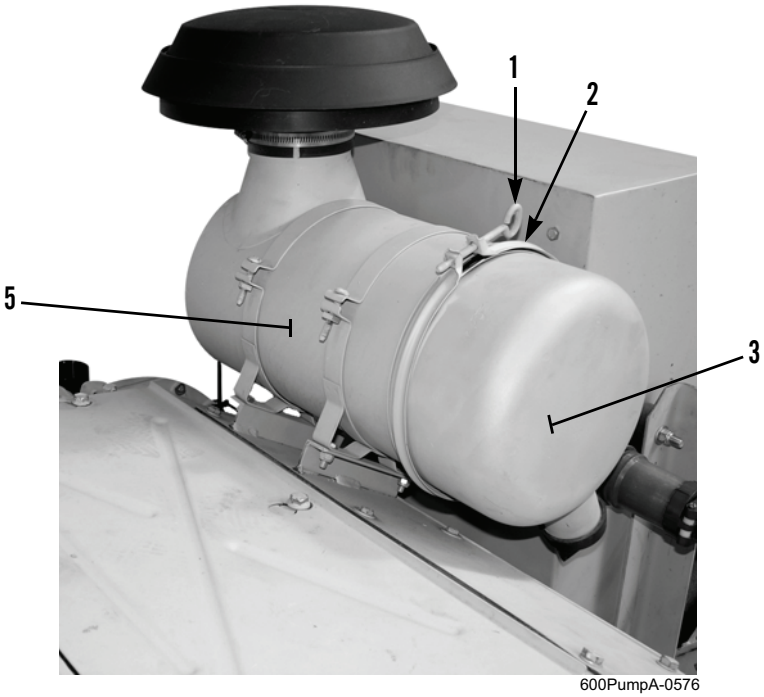


Figure 4. Air Cleaner Housing Assembly.

13. Reset air filter restriction indicator at control panel by pressing yellow reset button at bottom of indicator (WP 0005).

REMOVAL

1. Disconnect air hose (Figure 5, Item 8) from fitting (Figure 5, Item 9) on air cleaner housing (Figure 5, Item 5).
2. Remove two clamps (Figure 5, Item 10) and disconnect rubber elbow (Figure 5, Item 14) from air cleaner housing (Figure 5, Item 5) and tube (Figure 5, Item 11).
3. Remove two clamps (Figure 5, Item 10) and disconnect rubber elbow (Figure 5, Item 12) from tube (Figure 5, Item 11) and turbocharger intake (Figure 5, Item 13).
4. If necessary, remove fitting (Figure 5, Item 9) from air cleaner housing (Figure 5, Item 5).

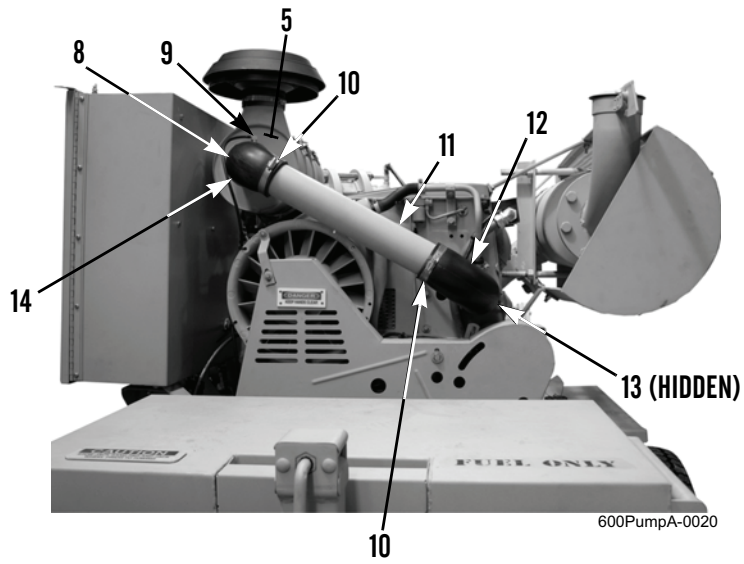


Figure 5. Air Cleaner Housing Assembly - Front of Engine.

REMOVAL - CONTINUED

5. Remove clamp (Figure 6, Item 24) and hood assembly (Figure 6, Item 15) from air cleaner housing (Figure 6, Item 5).
6. Remove two bolts (Figure 6, Item 17) from support clamps (Figure 6, Item 16) and remove air cleaner housing (Figure 6, Item 5).
7. Remove four locknuts (Figure 6, Item 22), bolts (Figure 6, Item 23), and two support clamps (Figure 6, Item 16) from cover plate (Figure 6, Item 21). Discard locknuts.
8. Remove six bolts (Figure 6, Item 19), washers (Figure 6, Item 20), cover plate (Figure 6, Item 21), and metal strip (Figure 6, Item 18) from top of oil cooler.

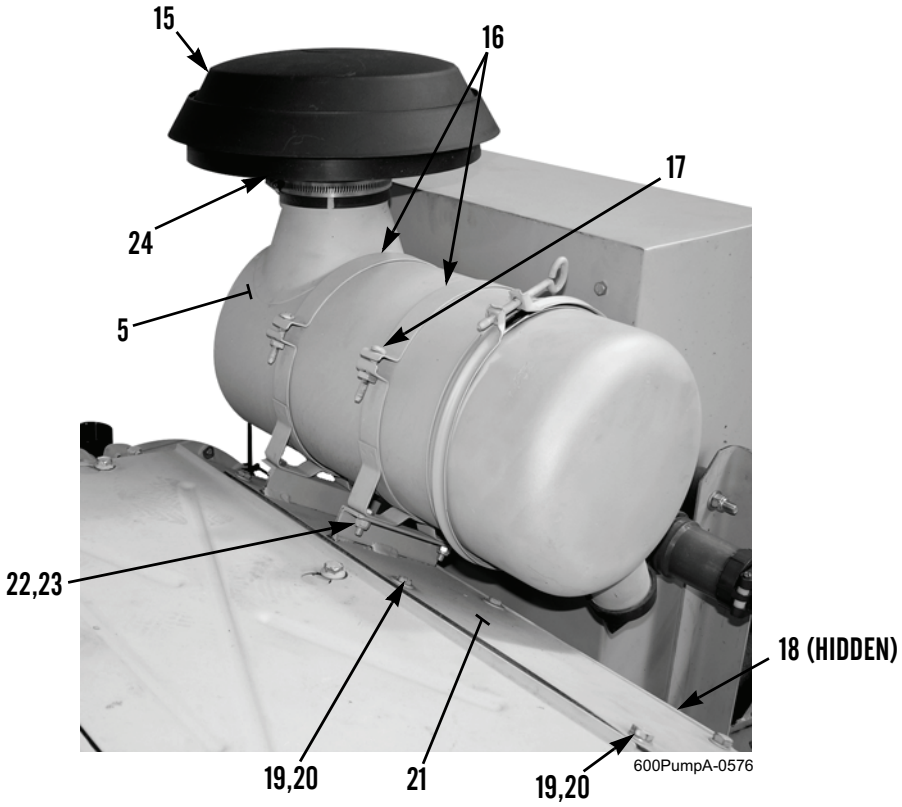


Figure 6. Air Cleaner Housing Assembly.

CLEANING AND INSPECTION

Clean and inspect all parts IAW WP 0023.

INSTALLATION

NOTE

Two shorter bolts are installed in two middle holes in cover plate.

1. Install metal strip (Figure 6, Item 18) and cover plate (Figure 6, Item 21) to top of oil cooler with six washers (Figure 6, Item 20) and bolts (Figure 6, Item 19).
2. Install two support clamps (Figure 6, Item 16) to cover plate (Figure 6, Item 21) with four bolts (Figure 6, Item 23) and new locknuts (Figure 6, Item 22).
3. Install air cleaner housing (Figure 6, Item 5) in two support clamps (Figure 6, Item 16) and install two bolts (Figure 6, Item 17).
4. Install hood assembly (Figure 6, Item 15) and clamp (Figure 6, Item 24) on air cleaner housing (Figure 6, Item 5).

INSTALLATION - CONTINUED

NOTE

- Apply antiseizing tape to fitting before installation.
- Align elbows with turbocharger inlet and air cleaner housing before tightening clamps.

5. If removed, install fitting (Figure 7, Item 9) on air cleaner housing (Figure 7, Item 5).
6. Install rubber elbow (Figure 7, Item 12) and two clamps (Figure 7, Item 10) on tube (Figure 7, Item 11) and turbocharger intake (Figure 7, Item 13).
7. Install rubber elbow (Figure 7, Item 14) and two clamps (Figure 7, Item 10) on tube (Figure 7, Item 11) and air cleaner housing (Figure 7, Item 5).
8. Connect air hose (Figure 7, Item 8) to fitting (Figure 7, Item 9) on air cleaner housing (Figure 7, Item 5).

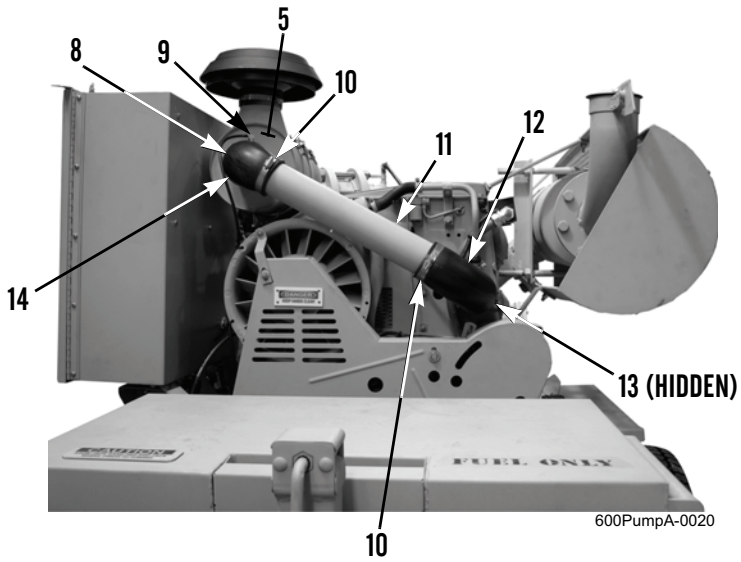


Figure 7. Air Cleaner Housing Assembly - Front of Engine.

FOLLOW-ON TASKS

Connect battery cables (WP 0033).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

TURBOCHARGER REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Cap set, protective, dust and moisture (Item 5, WP 0129)
Rag, wiping (Item 22, WP 0129)
Gasket (5)
Lockwasher (6)

Personnel Required

63J (2)

References

WP 0023

Equipment Condition

Muffler removed (WP 0107)
Lower access plate removed (WP 0068)
Flame glow plug removed (WP 0040)

WARNING

Allow engine to cool off before performing maintenance on muffler, exhaust pipe, exhaust manifold, or turbocharger. Hot metal parts can cause severe burns. Wear eye, glove, and skin protection when working with heated parts. Failure to follow this warning may cause injury to personnel.

REMOVAL

1. Loosen clamp (Figure 1, Item 2) and remove intake elbow (Figure 1, Item 1) from turbocharger (Figure 1, Item 8).
2. Remove two nuts (Figure 1, Item 3), bolts (Figure 1, Item 4), four washers (Figure 1, Item 5), and cap (Figure 1, Item 7) from lower cover (Figure 1, Item 6).

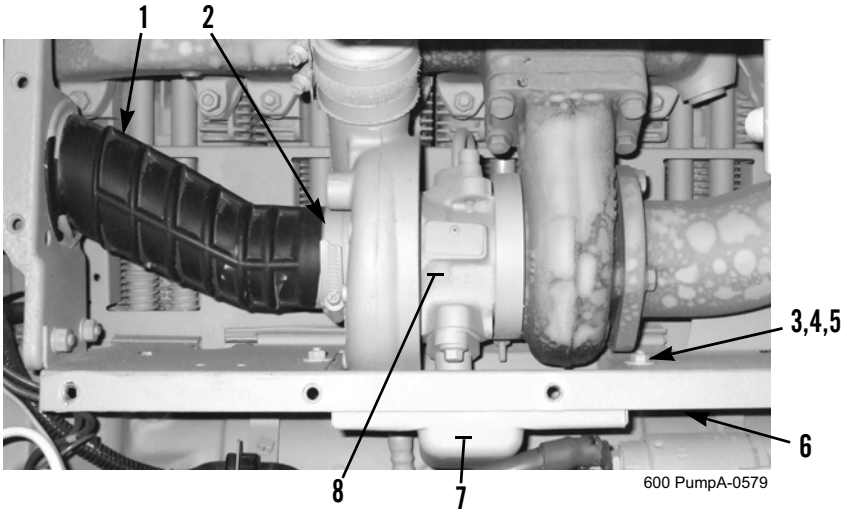


Figure 1. Turbocharger.

3. Loosen bottom clamp (Figure 2, Item 14) on sleeve (Figure 2, Item 13).
4. Remove two bolts (Figure 2, Item 10), washers (Figure 2, Item 11), gasket (Figure 2, Item 9), manifold pipe (Figure 2, Item 12), and sleeve (Figure 2, Item 13) from intake manifold (Figure 2, Item 15) and turbocharger (Figure 2, Item 8). Discard gasket.

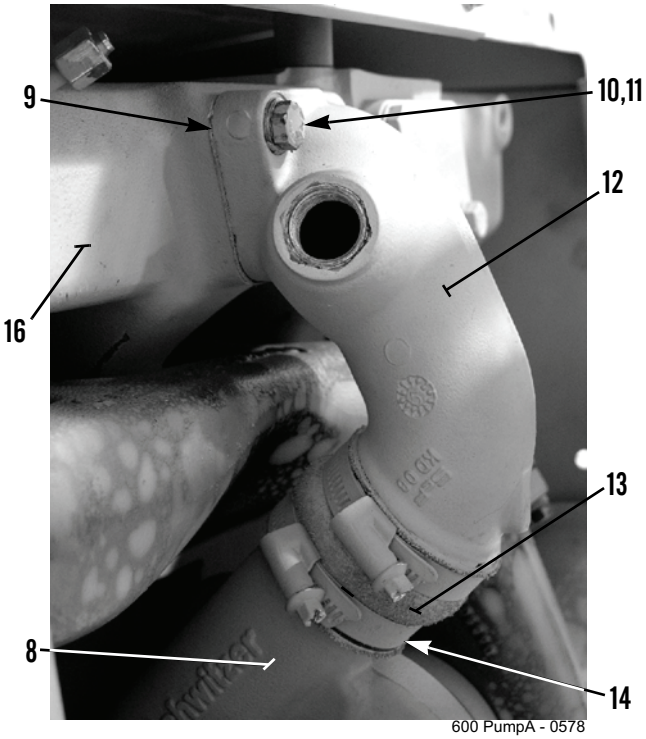


Figure 2. Manifold Pipe.

REMOVAL - CONTINUED

NOTE

Use a suitable container to catch oil.

5. Remove two bolts (Figure 3, Item 17), lockwashers (Figure 3, Item 18), lube oil line (Figure 3, Item 16), and gasket (Figure 3, Item 19) from turbocharger (Figure 3, Item 8). Discard gasket and lockwashers.
6. Remove two bolts (Figure 3, Item 22), oil return line (Figure 3, Item 21), and gasket (Figure 3, Item 20) from turbocharger (Figure 3, Item 8). Discard gasket.

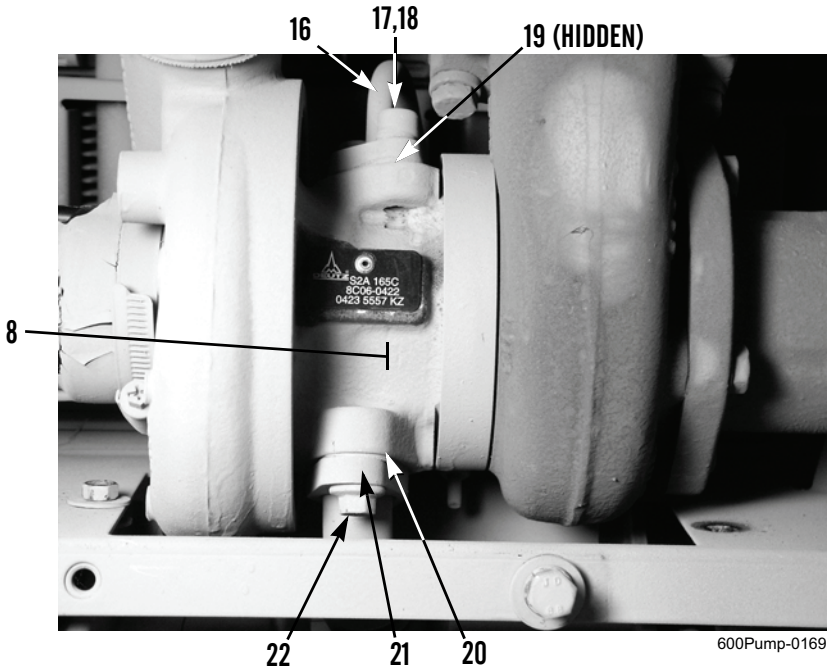


Figure 3. Turbocharger Oil Lines.

REMOVAL - CONTINUED

WARNING

Turbocharger with exhaust pipe is heavy and awkward to handle. Provide adequate support and use assistance during removal. Failure to follow this warning may result in injury to personnel.

7. Remove four bolts (Figure 4, Item 23), washers (Figure 4, Item 24), gasket (Figure 4, Item 26), and turbocharger (Figure 4, Item 8) with exhaust pipe (Figure 4, Item 27) from exhaust manifold (Figure 4, Item 25). Discard gasket.
8. Remove four bolts (Figure 4, Item 28), lockwashers (Figure 4, Item 29), and gasket (Figure 4, Item 30) and separate turbocharger (Figure 4, Item 8) from exhaust pipe (Figure 4, Item 27). Discard gasket and lockwashers.

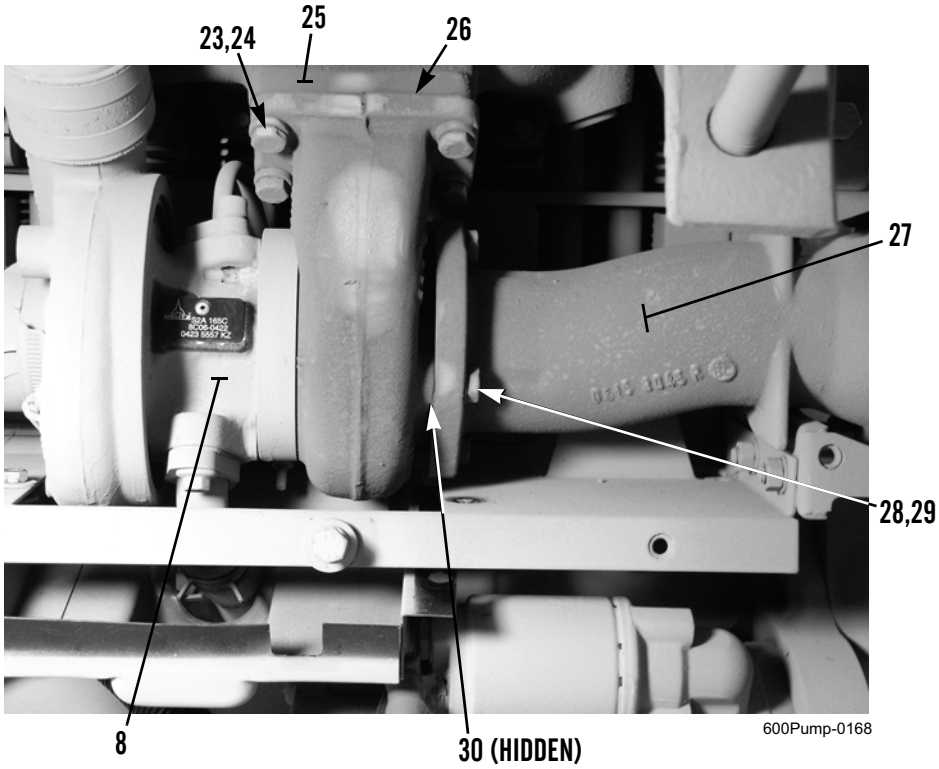


Figure 4. Turbocharger Exhaust Pipe.

CLEANING AND INSPECTION

Clean and inspect all parts IAW WP 0023.

INSTALLATION

1. Install new gasket (Figure 4, Item 30), four new lockwashers (Figure 4, Item 29), and bolts (Figure 4, Item 28) on turbocharger (Figure 4, Item 8) and exhaust pipe (Figure 4, Item 27).

WARNING

Turbocharger with exhaust pipe is heavy and awkward to handle. Provide adequate support and use assistance during installation. Failure to follow this warning may result in injury to personnel.

2. Install new gasket (Figure 4, Item 26), turbocharger (Figure 4, Item 8) with exhaust pipe (Figure 4, Item 27), four washers (Figure 4, Item 24), and bolts (Figure 4, Item 23) on exhaust manifold (Figure 4, Item 25).
3. Install new gasket (Figure 5, Item 20), oil return line (Figure 5, Item 21), and two bolts (Figure 5, Item 22) on turbocharger (Figure 5, Item 8).
4. Install new gasket (Figure 5, Item 19), lube oil line (Figure 5, Item 16), two new lockwashers (Figure 5, Item 18), and bolts (Figure 5, Item 17) on turbocharger (Figure 5, Item 8).

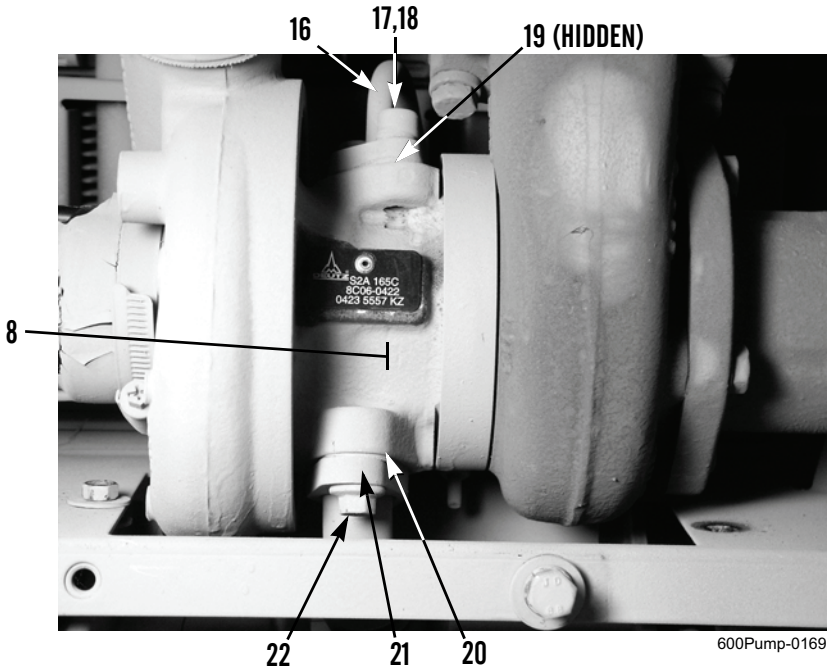


Figure 5. Turbocharger Oil Lines.

INSTALLATION - CONTINUED

5. Position new gasket (Figure 6, Item 9) and manifold pipe (Figure 6, Item 12) at intake manifold (Figure 6, Item 15) with sleeve (Figure 6, Item 13) installed on turbocharger (Figure 6, Item 8).
6. Install two washers (Figure 6, Item 11) and bolts (Figure 6, Item 10) to manifold pipe (Figure 6, Item 12) and intake manifold (Figure 6, Item 15).
7. Tighten bottom clamp (Figure 6, Item 14) on sleeve (Figure 6, Item 13) and turbocharger (Figure 6, Item 8).

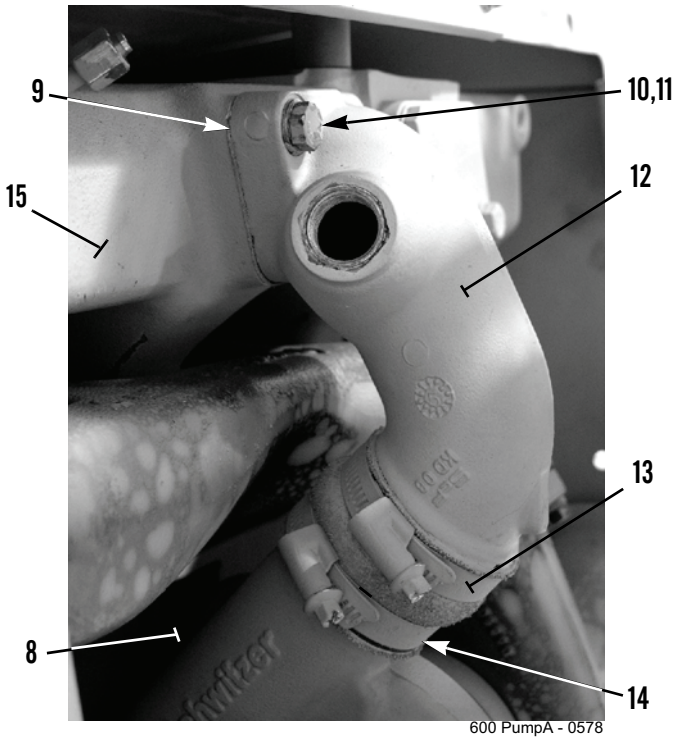


Figure 6. Manifold Pipe.

INSTALLATION - CONTINUED

8. Install intake elbow (Figure 7, Item 1) and clamp (Figure 7, Item 2) on turbocharger (Figure 7, Item 8).
9. Install cap (Figure 7, Item 7), four washers (Figure 7, Item 5), two bolts (Figure 7, Item 4), and nuts (Figure 7, Item 3) on lower cover (Figure 7, Item 6).

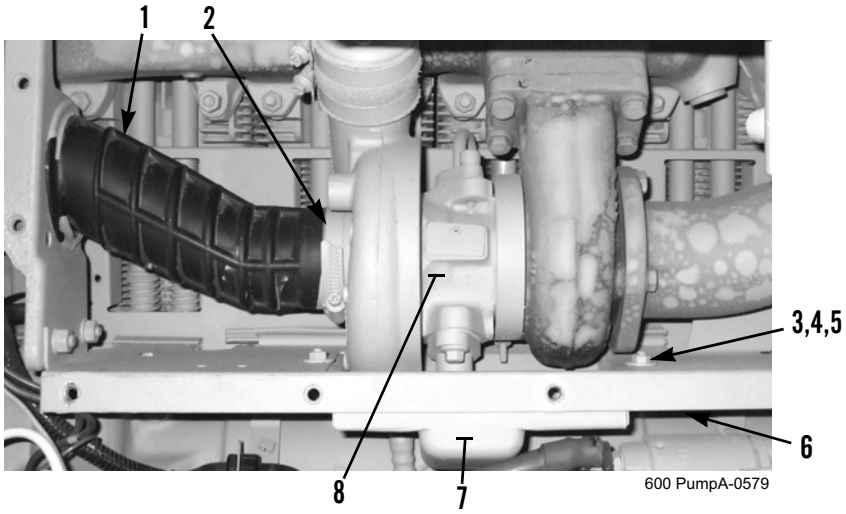


Figure 7. Turbocharger.

FOLLOW-ON TASKS

1. Install muffler (WP 0107).
2. Install lower access plate (WP 0068).
3. Install flame glow plug (WP 0040).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

FUEL TANK MAINTENANCE

Draining, Removal, Disassembly, Cleaning and Inspection, Assembly, Installation, Filling, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Cap set, protective, dust and moisture (Item 5, WP 0129)
Cleaning compound, solvent, Type III (Item 6, WP 0129)
Diesel fuel, DF-1 (Item 10, WP 0129)
Diesel fuel, DF-2 (Item 11, WP 0129)
Rag, wiping (Item 22, WP 0129)
Tag, marker (Item 27, WP 0129)
Tape, antiseizing (Item 28, WP 0129)
Turbine fuel, aviation, JP-5 (Item 31, WP 0129)
Turbine fuel, aviation, JP-8 (Item 32, WP 0129)

Materials/Parts

Hose clamp (2)

Personnel Required

63J (2)

References

WP 0008
WP 0069

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked
Battery cables disconnected (WP 0033)

WARNING

- DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing damage to equipment and injury or death to personnel.
- Wear fuel-resistant gloves and eye protection when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. Failure to follow this warning may result in injury or death to personnel.
- When servicing this equipment, performing maintenance, or disposing of materials such as fuel, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

NOTE

Fuel tank need not be removed from trailer chassis to replace fuel tank fittings. For instructions, refer to *Disassembly*, *Cleaning and Inspection*, and *Assembly* in this work package.

DRAINING

1. Turn fuel selector valves to OFF position to prevent loss of prime in low pressure fuel system (WP 0005).

NOTE

- A suitable container should be placed under fuel tank drain valve to capture draining fuel. Dispose of fuel IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.
- Fuel tank capacity is 23 gal. (87.1 L).

2. Place an approved fuel safety can or other suitable container under drain valve (Figure 1, Item 2) on underside of fuel tank (Figure 1, Item 1), on left side of trailer.
3. Remove plug (Figure 1, Item 3) and turn valve handle 1/4 turn counterclockwise (left) until valve handle is in line with drain flow. Allow fuel tank (Figure 1, Item 1) to drain.
4. After draining fuel tank (Figure 1, Item 1), close drain valve (Figure 1, Item 2) by turning valve handle 1/4 turn clockwise (right). Retain plug (Figure 1, Item 3) for installation when fuel tank is filled.
5. Dispose of fuel IAW using unit's SOP.

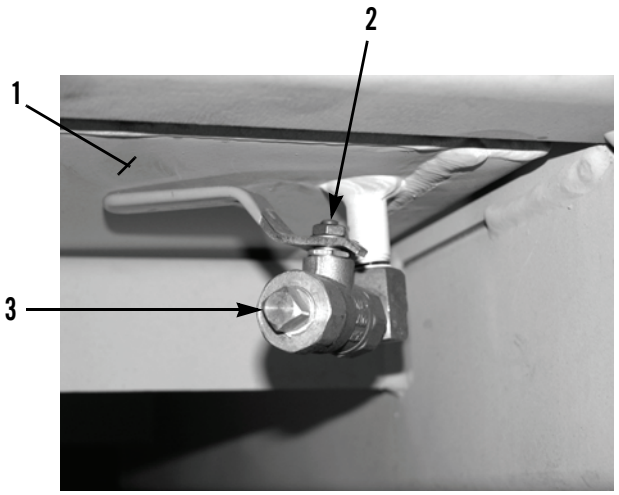


Figure 1. Drain Valve.

REMOVAL

1. Drain fuel tank IAW *Draining* in this work package.
2. Remove storage box and storage box frame weldment from trailer chassis (WP 0069).

CAUTION

Cap or plug fuel hoses to prevent contamination of fuel system.

NOTE

- Tag fuel hoses to ensure correct installation.
- All original equipment hose clamps should be replaced, on installation, with new worm drive type hose clamps. A supply of extra hose clamps is stored in storage box (WP 0008).

3. Cut hose clamp (Figure 2, Item 5), hold fuel hose (Figure 2, Item 4), and remove barb fitting (Figure 2, Item 6) and fuel hose from elbow fitting (Figure 2, Item 7) at fuel tank (Figure 2, Item 1). Discard hose clamp.
4. Repeat step 3 to remove fuel hose (Figure 2, Item 8) and barb fitting (Figure 2, Item 9) from elbow fitting (Figure 2, Item 10).

WARNING

Fuel tank is heavy and awkward to handle. Provide adequate support and use assistance during removal. Failure to follow this warning may result in injury to personnel or damage to equipment.

NOTE

Fuel tank weighs approximately 89 lb (40 kg).

5. With assistance, remove fuel tank (Figure 2, Item 1) from trailer chassis framework.

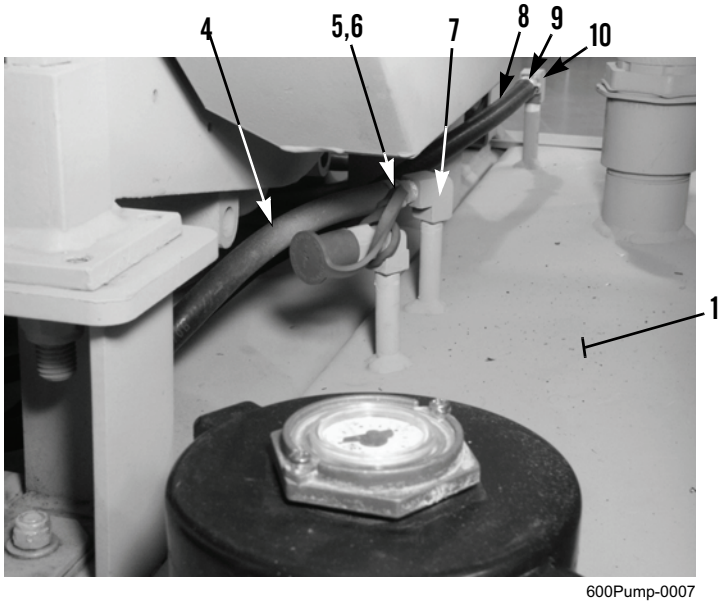


Figure 2. Fuel Tank Hoses.

DISASSEMBLY

NOTE

Perform steps 1 and 2 ONLY if fuel tank is installed.

1. Turn fuel selector valves to OFF position to prevent loss of prime in low pressure fuel system (WP 0005).
2. Drain fuel tank as required. Refer to *Draining* in this work package.
3. Remove elbow fitting (Figure 3, Item 7) from fuel tank nipple (Figure 3, Item 11).
4. Remove quick disconnect fitting (Figure 3, Item 14) and elbow fitting (Figure 3, Item 12) from fuel tank nipple (Figure 3, Item 13).

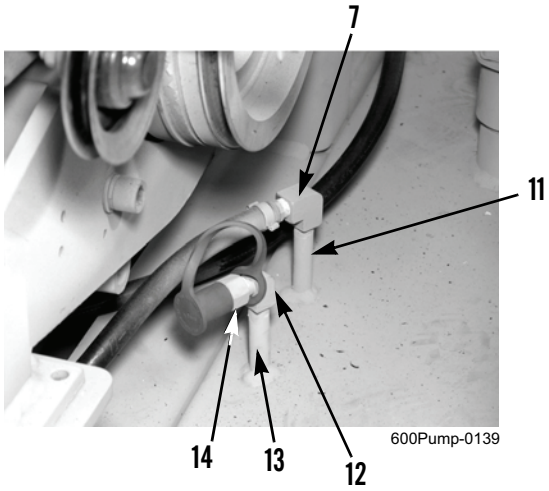


Figure 3. Fuel Tank Fittings.

5. Remove elbow fitting (Figure 4, Item 10) from fuel tank nipple (Figure 4, Item 16).
6. Remove cap (Figure 4, Item 15) from vent assembly (Figure 4, Item 17).

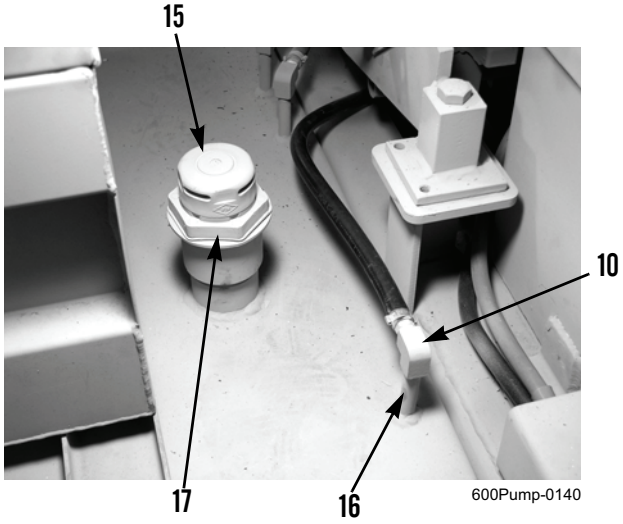


Figure 4. Vent Assembly.

DISASSEMBLY - CONTINUED

7. Remove spring (Figure 5, Item 18) and vent insert (Figure 5, Item 19) from vent assembly (Figure 5, Item 17).

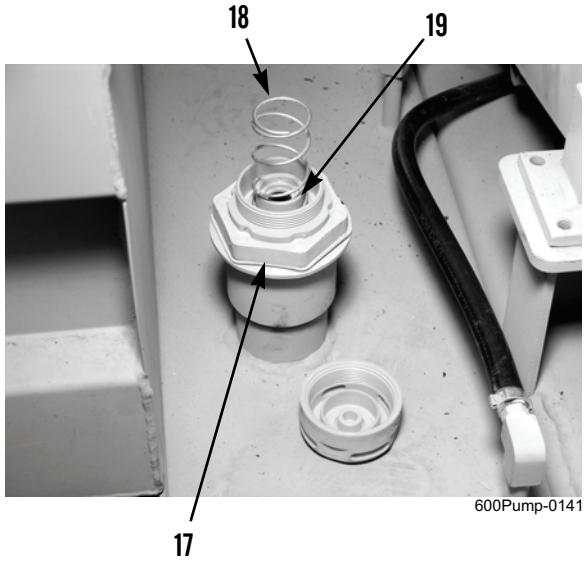


Figure 5. Vent Assembly - Disassembled.

8. Remove fuel tank cap/gauge (Figure 6, Item 20) from fuel tank (Figure 6, Item 1).

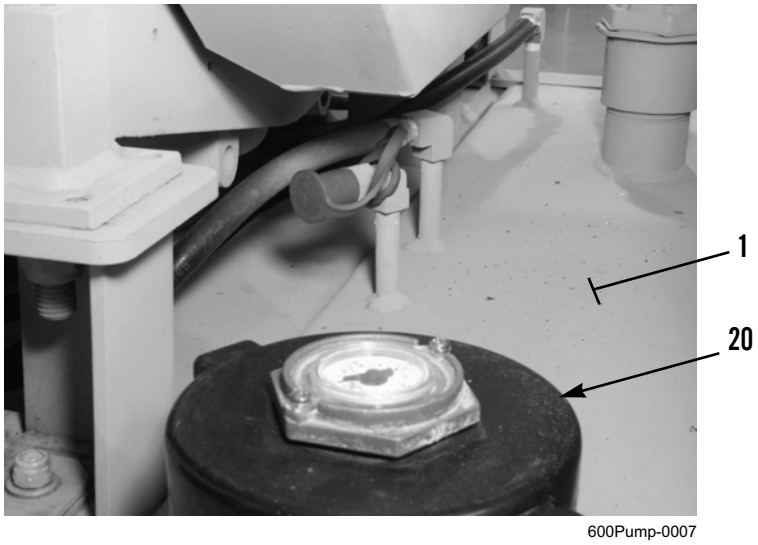


Figure 6. Fuel Tank Gauge.

DISASSEMBLY - CONTINUED

9. Remove drain valve (Figure 7, Item 2) and elbow fitting (Figure 7, Item 22) from fuel tank nipple (Figure 7, Item 21).

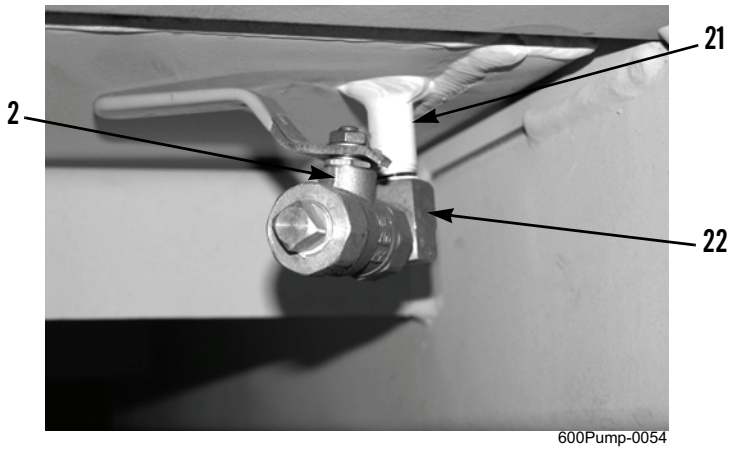


Figure 7. Drain Valve.

CLEANING AND INSPECTION

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low-toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to do so may result in injury or death to personnel.

CAUTION

Vent assembly is made of non-metallic material. Avoid contact with solvent cleaning compound.

1. Clean interior and exterior of fuel tank with solvent cleaning compound. Dry thoroughly and flush with clean fuel.
2. Inspect all tank fittings for cracks, breaks, or damaged threads. Replace if damaged.
3. Inspect gasket (Figure 8, Item 23) in fuel tank cap/gauge (Figure 8, Item 20) for deterioration or other damage. If damaged, obtain replacement fuel tank cap/gauge.

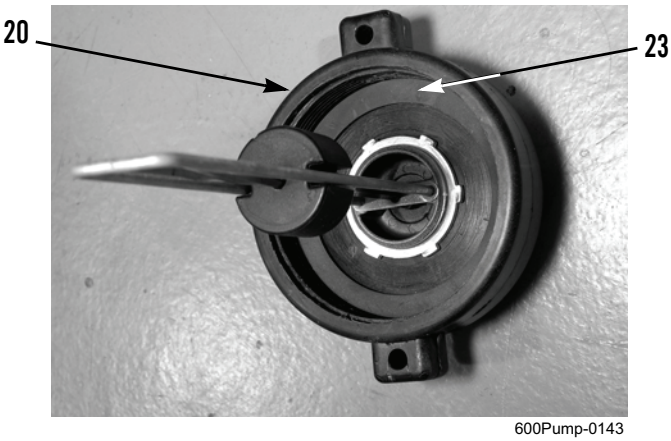


Figure 8. Fuel Tank Cap/Gauge.

CLEANING AND INSPECTION - CONTINUED

4. Inspect fuel gauge (Figure 9, Item 24) for cracks or other damage. As required, replace.
   a. Remove two screws (Figure 9, Item 25) and fuel gauge (Figure 9, Item 24) from fuel tank cap/gauge (Figure 9, Item 20).
   b. Install fuel gauge (Figure 9, Item 24) with two screws (Figure 9, Item 25).

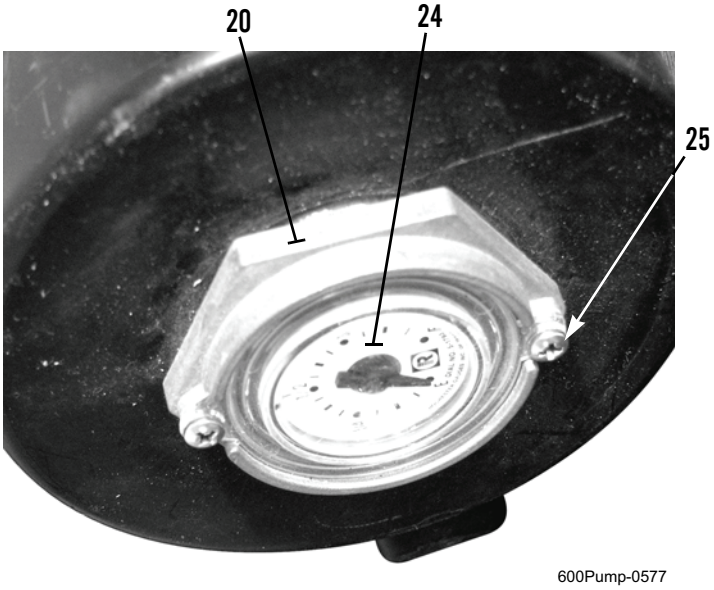


Figure 9. Fuel Gauge.

5. Inspect vent insert (Figure 10, Item 19) to ensure it is free of obstructions and not damaged. If damaged, vent assembly must be replaced.

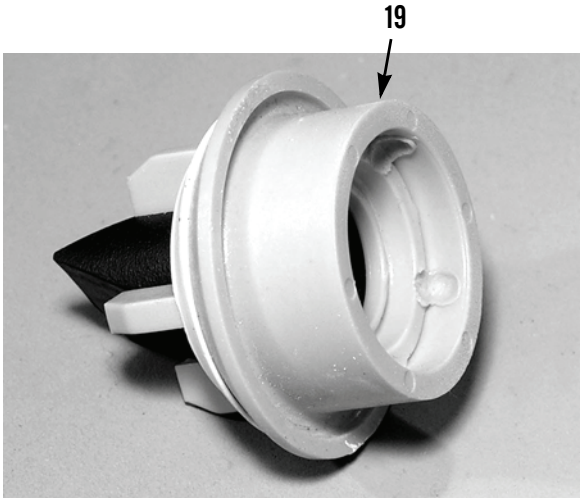


Figure 10. Vent Insert.

ASSEMBLY

NOTE

Apply antiseizing tape to male threads of fittings prior to assembly.

1. Install elbow fitting (Figure 11, Item 22) and drain valve (Figure 11, Item 2) on fuel tank nipple (Figure 11, Item 21).

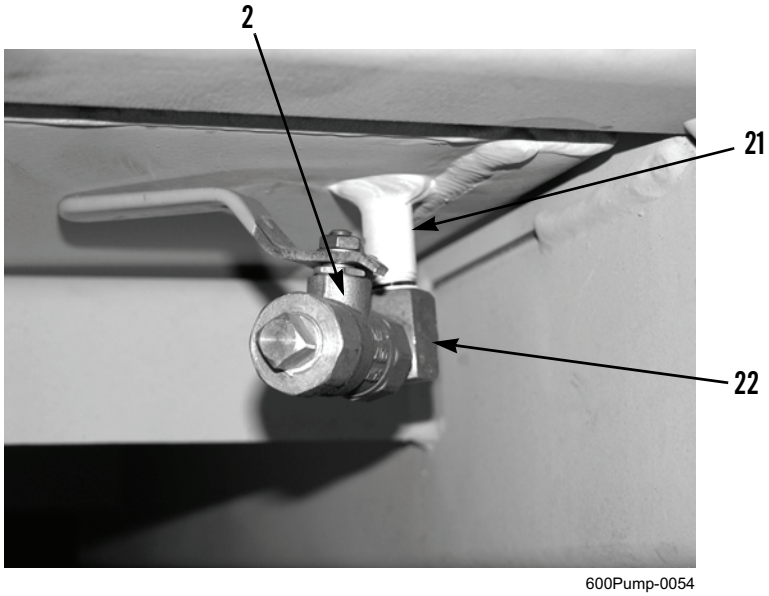


Figure 11. Drain Valve.

2. Install fuel tank cap/gauge (Figure 12, Item 20) on fuel tank (Figure 12, Item 1).

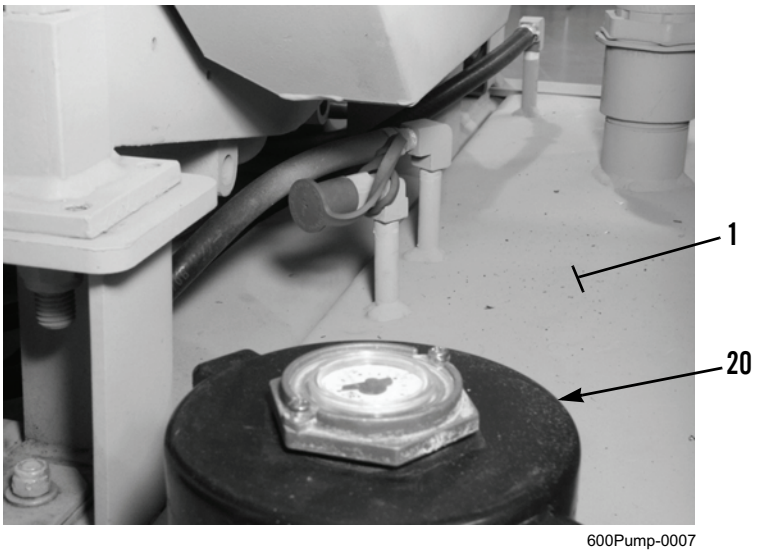


Figure 12. Fuel Tank Cap/Gauge.

ASSEMBLY - CONTINUED

3. Install vent insert (Figure 13, Item 19) and spring (Figure 13, Item 18) in vent assembly (Figure 13, Item 17).

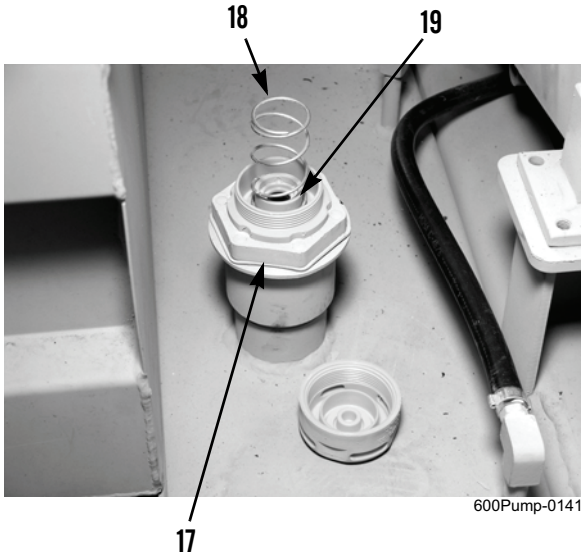


Figure 13. Vent Assembly.

4. Install cap (Figure 14, Item 15) on vent assembly (Figure 14, Item 17).
5. Install elbow fitting (Figure 14, Item 10) on fuel tank nipple (Figure 14, Item 16).

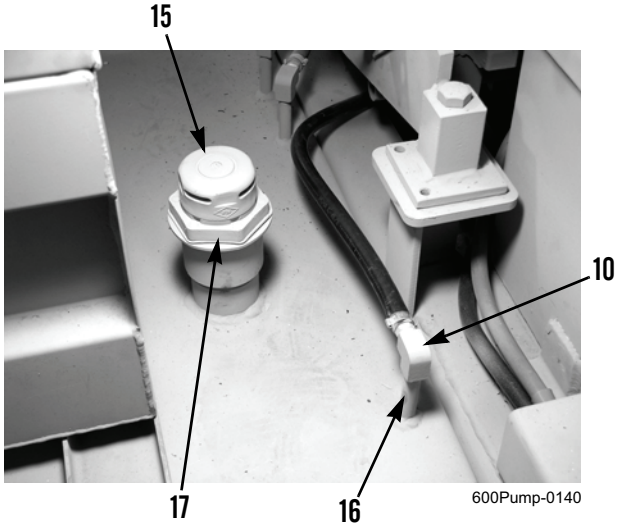


Figure 14. Vent Assembly.

ASSEMBLY - CONTINUED

6. Install elbow fitting (Figure 15, Item 12) and quick disconnect fitting (Figure 15, Item 14) on fuel tank nipple (Figure 15, Item 13).
7. Install elbow fitting (Figure 15, Item 7) on fuel tank nipple (Figure 15, Item 11).

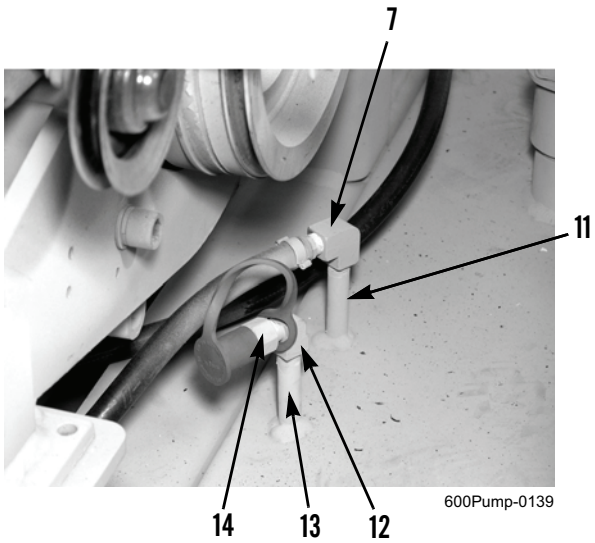


Figure 15. Fuel Tank Fittings.

NOTE

Perform steps 8 and 9 ONLY if fuel tank is installed.

8. Fill fuel tank as required. Refer to *Filling* in this work package.
9. Return fuel selector valves to original position (WP 0005).

INSTALLATION

WARNING

Fuel tank is heavy and awkward to handle. Provide adequate support and use assistance during installation. Failure to follow this warning may result in injury to personnel or damage to equipment.

NOTE

Fuel tank weighs approximately 89 lb (40 kg).

1. With assistance, lift fuel tank (Figure 16, Item 1) and position in trailer chassis framework.
2. Position new hose clamp (Figure 16, Item 5) on fuel hose (Figure 16, Item 4). Hold fuel hose and install barb fitting (Figure 16, Item 6) on elbow fitting (Figure 16, Item 7). Tighten hose clamp.
3. Repeat step 2 to install fuel hose (Figure 16, Item 8) and barb fitting (Figure 16, Item 9) on elbow fitting (Figure 16, Item 10).

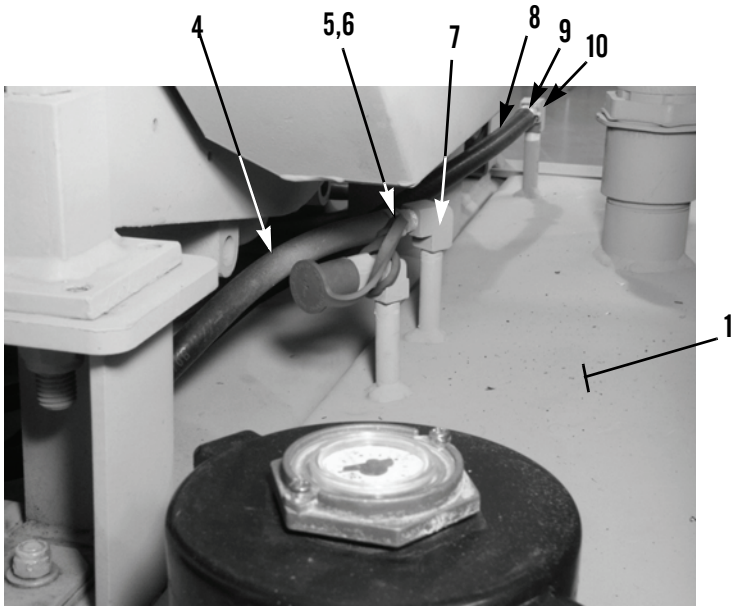


Figure 16. Fuel Tank Hoses.

4. Install storage box frame weldment and storage box on trailer chassis (WP 0069).

FILLING

NOTE

Apply antiseizing tape to male threads of plug.

1. Install plug (Figure 17, Item 3) in drain valve (Figure 17, Item 2).

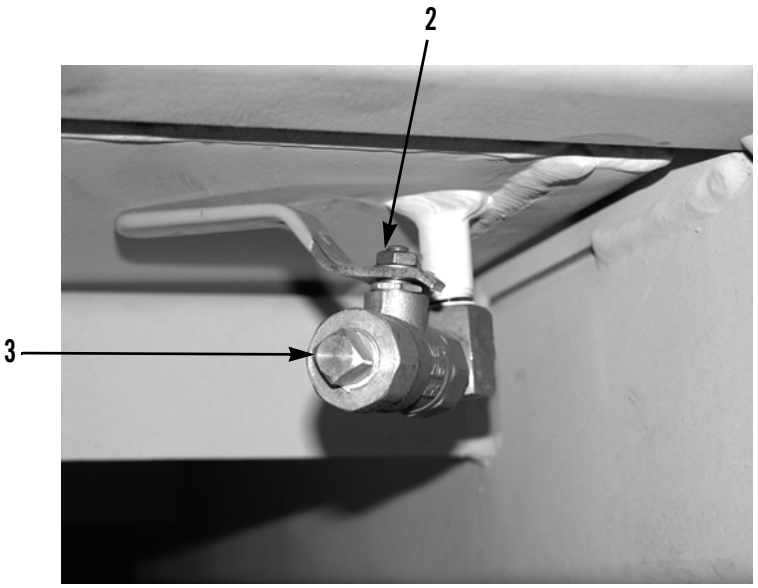


Figure 17. Drain Valve.

2. Remove fuel tank cap/gauge (Figure 18, Item 20) from fuel tank (Figure 18, Item 1).
3. Add fuel until level on fuel tank cap/gauge (Figure 18, Item 20) indicates tank is full.

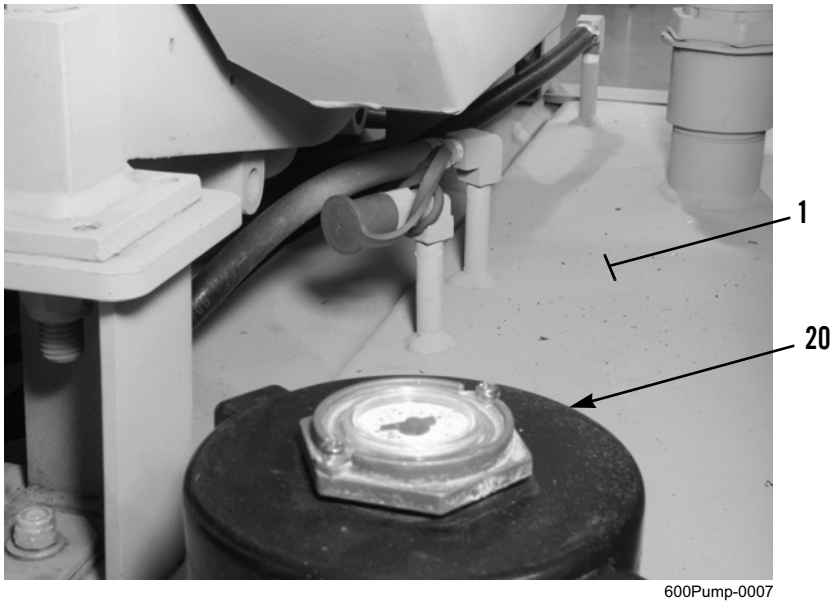


Figure 18. Fuel Tank Cap/Gauge.

FILLING - CONTINUED

4. Return fuel selector valves to original position (WP 0005).

FOLLOW-ON TASKS

1. Connect battery cables (WP 0033).

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

2. Ensure pump volute is filled 2/3 full with appropriate fluid, then start engine (WP 0006). Check for leaks at fuel tank and fittings.
3. Shut down engine (WP 0006).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

STAGE III FUEL FILTER MAINTENANCE

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Diesel fuel, DF-1 (Item 10, WP 0129)
Diesel fuel, DF-2 (Item 11, WP 0129)
Rag, wiping (Item 22, WP 0129)
Tag, marker (Item 27, WP 0129)
Turbine fuel, aviation, JP-5 (Item 31, WP 0129)
Turbine fuel, aviation, JP-8 (Item 32, WP 0129)
Lockwasher (2)
O-ring (3)

Materials/Parts - Continued

Sealing washer (4)

Personnel Required

63J (1)

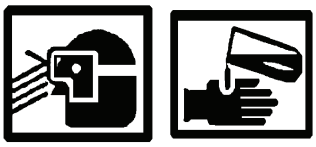
References

WP 0023
WP 0106

Equipment Condition

Battery cables disconnected (WP 0033)
Engine cool

WARNING



- DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing damage to equipment and injury or death to personnel.
- Allow engine to cool off before performing maintenance on fuel filter. Hot metal parts can cause severe burns. Wear eye, glove, and skin protection when working with heated parts. Failure to follow this warning may cause injury to personnel.
- Wear fuel resistant gloves and eye protection when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. Failure to follow this wearing may result in injury or death to personnel.
- When servicing this equipment, performing maintenance, or disposing of materials such as fuel, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

CAUTION

Wipe area clean around all connections to be opened during removal and disassembly. Cap line and plug openings after removing lines. Contamination of fuel system could result in premature failure.

NOTE

- A suitable container should be placed under fuel lines to capture draining fuel. Dispose of fuel IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.
- Tag hoses prior to removal to ensure correct installation.

REMOVAL

1. Bleed pressure from fuel system by loosening ventilation valve setscrew (WP 0106).
2. Remove fluid passage bolt (Figure 1, Item 2), sealing washer (Figure 1, Item 3), hose (Figure 1, Item 4), and sealing washer (Figure 1, Item 5) from head (Figure 1, Item 1). Discard sealing washers.
3. Remove fluid passage bolt (Figure 1, Item 11), sealing washer (Figure 1, Item 12), hose (Figure 1, Item 10), and sealing ring (Figure 1, Item 9) from head (Figure 1, Item 1). Discard sealing washers.
4. Remove filter (Figure 1, Item 6) from head (Figure 1, Item 1).

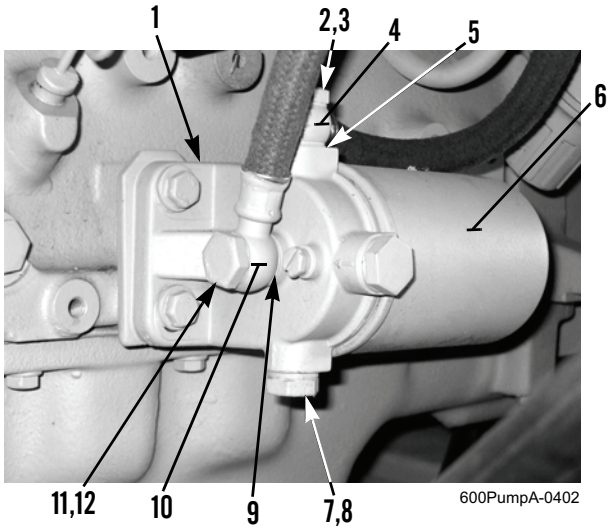


Figure 1. Stage III Fuel Filter.

5. Remove two bolts (Figure 2, Item 17), lockwashers (Figure 2, Item 18), and head (Figure 2, Item 1) with retaining plate (Figure 2, Item 16) from engine (Figure 2, Item 23). Discard lockwashers.
6. If damaged, remove nut (Figure 2, Item 15), bolt (Figure 2, Item 13), washer (Figure 2, Item 14), and retaining plate (Figure 2, Item 16) from head (Figure 2, Item 1).
7. If damaged, remove plug (Figure 2, Item 19), O-ring (Figure 2, Item 20), plug (Figure 2, Item 7), O-ring (Figure 1, Item 8), screw (Figure 2, Item 21), and O-ring (Figure 2, Item 22) from head (Figures 1 and 2, Item 1). Discard O-rings.

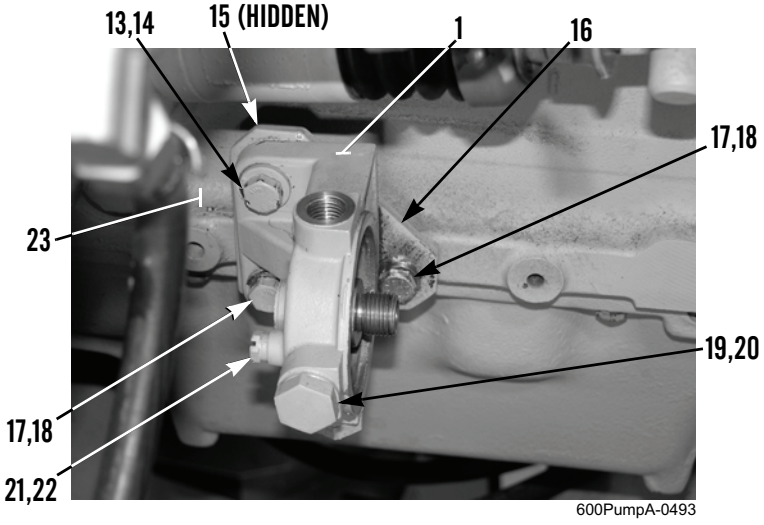


Figure 2. Filter Head and Retaining Plate.

CLEANING AND INSPECTION

1. Clean and inspect all parts IAW WP 0023.
2. Replace parts as necessary.

INSTALLATION

NOTE

Lightly coat new sealing washers with clean fuel before installation.

1. If removed, install new O-ring (Figure 1, Item 8), plug (Figure 1, Item 7), new O-ring (Figure 2, Item 20), plug (Figure 2, Item 19), new O-ring (Figure 2, Item 22), and screw (Figure 2, Item 21) on head (Figure 2, Item 1).
2. If removed, install retaining plate (Figure 2, Item 16) to head (Figure 2, Item 1) with bolt (Figure 2, Item 13), washer (Figure 2, Item 14), and nut (Figure 2, Item 15).
3. Install retaining plate (Figure 2, Item 16) and head (Figure 2, Item 1) on engine (Figure 2, Item 23) with two new lockwashers (Figure 2, Item 18) and bolts (Figure 2, Item 17).
4. Install filter (Figure 1, Item 6) on head (Figure 1, Item 1) hand tight.
5. Install new sealing washer (Figure 1, Item 9), hose (Figure 1, Item 10), new sealing washer (Figure 1, Item 12), and fluid passage bolt (Figure 1, Item 11) on head (Figure 1, Item 1).
6. Install new sealing washer (Figure 1, Item 5), hose (Figure 1, Item 4), new sealing washer (Figure 1, Item 3), and fluid passage bolt (Figure 1, Item 2) on head (Figure 1, Item 1).

FOLLOW-ON TASKS

1. Bleed fuel system (WP 0106).
2. Connect battery cables (WP 0033).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

FUEL FILTER/WATER SEPARATOR MAINTENANCE

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Diesel fuel, DF-1 (Item 10, WP 0129)
Diesel fuel, DF-2 (Item 11, WP 0129)
Rag, wiping (Item 22, WP 0129)
Tag, marker (Item 27, WP 0129)
Tape, antiseizing (Item 28, WP 0129)
Turbine fuel, aviation, JP-5 (Item 31, WP 0129)
Turbine fuel, aviation, JP-8 (Item 32, WP 0129)
Hose clamp (2)
Locknut (2)

Materials/Parts - Continued

O-ring (2)

Personnel Required

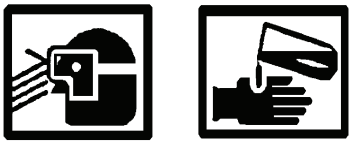
63J (1)

References

WP 0005
WP 0008
WP 0023
WP 0106

Equipment Condition

Battery cables disconnected (WP 0033)
Engine cool

WARNING

- DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing damage to equipment and injury or death to personnel.
- Allow engine to cool off before performing maintenance on fuel/filter water separator. Hot metal parts can cause severe burns. Wear eye, glove, and skin protection when working with heated parts. Failure to follow this warning may cause injury to personnel.
- Wear fuel resistant gloves and eye protection when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. Failure to follow this warning may result in injury or death to personnel.
- When servicing this equipment, performing maintenance, or disposing of materials such as fuel, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

CAUTION

Wipe area clean around all connections to be opened during removal and disassembly. Cap line and plug openings after removing lines. Contamination of fuel system could result in premature failure.

NOTE

- A suitable container should be placed under fuel filter/water separator drain valve and fuel lines to capture draining fuel. Dispose of fuel IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.
- Tag hoses prior to removal to ensure correct installation.
- All original equipment hose clamps should be replaced, on installation, with new worm drive type hose clamps. A supply of extra hose clamps is stored in storage box (WP 0008).

REMOVAL

1. Bleed pressure from fuel system by loosening ventilation valve setscrew (WP 0106).
2. Drain sediment bowl (Figure 1, Item 8) by turning fuel filter/water separator drain valve handle to DRAIN (WP 0005).
3. Cut hose clamp (Figure 1, Item 3), hold hose (Figure 1, Item 2), and remove hose and barb fitting (Figure 1, Item 4) from head (Figure 1, Item 7). Discard hose clamp.
4. Cut hose clamp (Figure 1, Item 5), hold hose (Figure 1, Item 1), and remove hose and barb fitting (Figure 1, Item 6) from head (Figure 1, Item 7). Discard hose clamp.
5. Remove hose clamp (Figure 1, Item 11), hose (Figure 1, Item 12), fitting (Figure 1, Item 10), and elbow (Figure 1, Item 9) from sediment bowl (Figure 1, Item 8).

Figure 1. Fuel Filter/Water Separator.

REMOVAL - CONTINUED

6. Remove filter (Figure 2, Item 16) from head (Figure 2, Item 7).
7. Remove drain cock (Figure 2, Item 18), sediment bowl (Figure 2, Item 8), and O-ring (Figure 2, Item 17) from filter (Figure 2, Item 16). Discard O-ring.
8. Remove two locknuts (Figure 2, Item 14), bolts (Figure 2, Item 13), and head (Figure 2, Item 7) from control panel rear support bracket (Figure 2, Item 15). Discard locknuts.

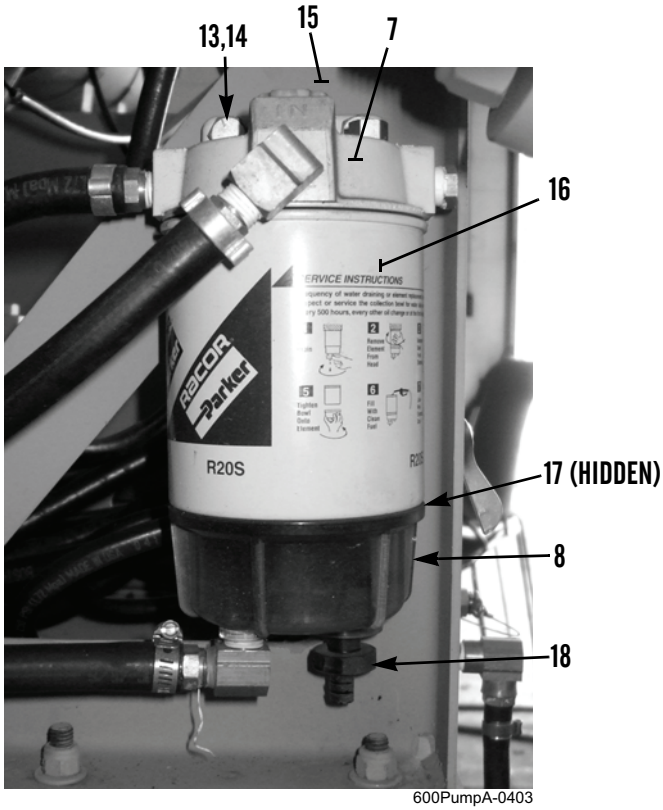


Figure 2. Fuel Filter/Water Separator.

REMOVAL - CONTINUED

9. Remove elbow (Figure 3, Item 25) from head (Figure 3, Item 7).
10. If damaged, remove plug (Figure 3, Item 19), O-ring (Figure 3, Item 20), and check ball (Figure 3, Item 21) from head (Figure 3, Item 7). Discard parts.
11. Separate plunger (Figure 3, Item 22) from plunger adapter (Figure 4, Item 26).
12. Remove plug (Figure 3, Item 24) and screw (Figure 3, Item 23) from head (Figure 3, Item 7).

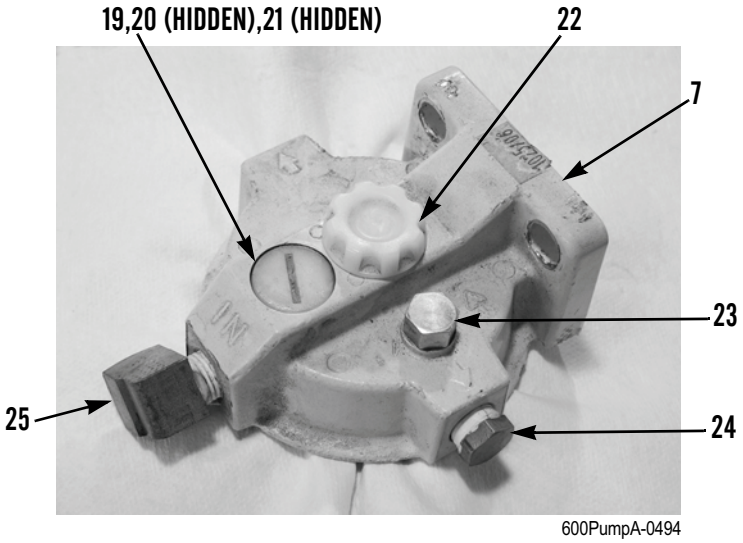


Figure 3. Filter Head.

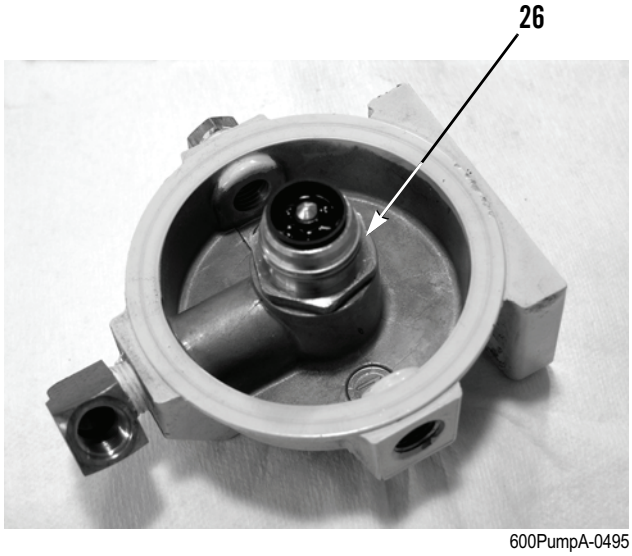


Figure 4. Plunger Adapter.

CLEANING AND INSPECTION

1. Clean and inspect all parts IAW WP 0023.
2. Replace parts as necessary.

INSTALLATION

NOTE

- Lightly coat new O-rings with clean fuel before installation.
- Apply antiseizing tape to male threads of fittings prior to installation.

1. Install screw (Figure 3, Item 23) and plug (Figure 3, Item 24) to head (Figure 3, Item 7).
2. Install plunger (Figure 3, Item 22) to plunger adapter (Figure 4, Item 26).
3. If removed, install check ball (Figure 3, Item 21), new O-ring (Figure 3, Item 20), and plug (Figure 3, Item 19) to head (Figure 3, Item 7).
4. Install head (Figure 5, Item 7) on control panel rear support bracket (Figure 5, Item 15) with two bolts (Figure 5, Item 13) and new locknuts (Figure 5, Item 14).
5. Install filter (Figure 5, Item 16) to head (Figure 5, Item 7) and hand tight.
6. Install new O-ring (Figure 5, Item 17), sediment bowl (Figure 5, Item 8), and drain cock (Figure 5, Item 18).

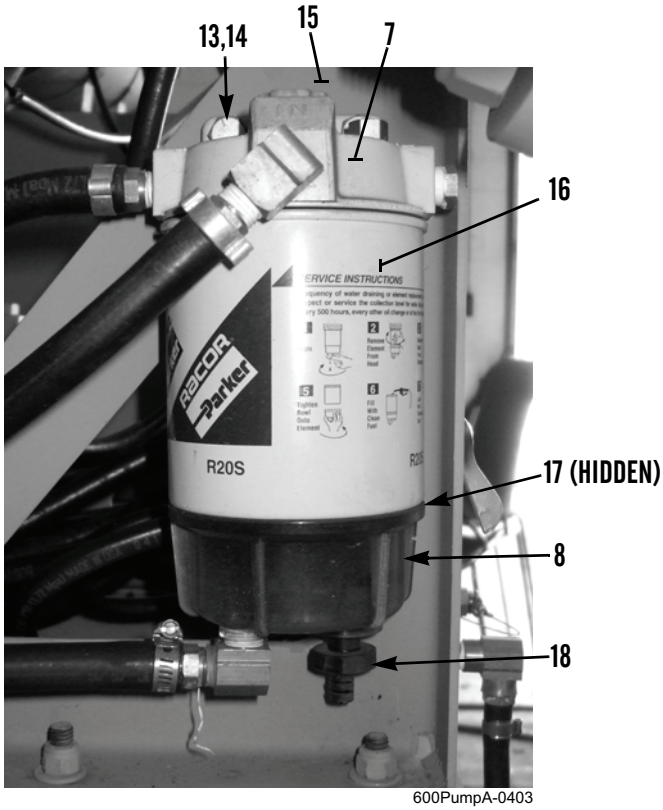


Figure 5. Fuel Filter/Water Separator.

INSTALLATION - CONTINUED

7. Install elbow (Figure 6, Item 9), fitting (Figure 6, Item 10), hose (Figure 6, Item 12), and clamp (Figure 6, Item 11) on sediment bowl (Figure 6, Item 8).
8. Install barb fitting (Figure 6, Item 6), hose (Figure 6, Item 1), and new hose clamp (Figure 6, Item 5) on head (Figure 6, Item 7).
9. Install barb fitting (Figure 6, Item 4), hose (Figure 6, Item 2), and new hose clamp (Figure 6, Item 3) on head (Figure 6, Item 7).

Figure 6. Fuel Filter/Water Separator.

FOLLOW-ON TASKS

1. Bleed fuel system (WP 0106).
2. Connect battery cables (WP 0033).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

LOW PRESSURE FUEL LINES REPLACEMENT

Removal, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Cap set, protective, dust and moisture (Item 5, WP 0129)
Diesel fuel, DF-1 (Item 10, WP 0129)
Diesel fuel, DF-2 (Item 11, WP 0129)
Rag, wiping (Item 22, WP 0129)
Tag, marker (Item 27, WP 0129)
Tape, antiseizing (Item 28, WP 0129)
Turbine fuel, aviation, JP-5 (Item 31, WP 0129)
Turbine fuel, aviation, JP-8 (Item 32, WP 0129)

Materials/Parts - Continued

Hose clamp
Sealing washer (2)

Personnel Required

63J (1)

References

WP 0008
WP 0106

Equipment Condition

Battery cables disconnected (WP 0033)
Engine cool

WARNING

- DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing damage to equipment and injury or death to personnel.
- Allow engine to cool off before performing maintenance on fuel lines. Hot metal parts can cause severe burns. Wear eye, glove, and skin protection when working with heated parts. Failure to follow this warning may cause injury to personnel.
- Wear fuel resistant gloves and eye protection when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. Failure to follow this warning may result in injury or death to personnel.
- When servicing this equipment, performing maintenance, or disposing of materials such as fuel, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

CAUTION

- Wipe area clean around all connections to be opened during removal. Cap line and plug openings after removing lines. Contamination of fuel system could result in premature failure.
- Do not bend or kink fuel lines or damage to fuel lines may result.

NOTE

- This procedure addresses one typical low pressure fuel line.
- If replacing more than one fuel line, tag lines prior to removal to ensure correct installation.
- Use container to capture draining fuel. Dispose of fuel IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.
- Mark location of mounting hardware and clamps prior to removal to aid in installation.
- Note components and their sequence prior to removal to aid in installation.
- If necessary, measure length of removed fuel line to aid in replacement and installation.

REMOVAL

1. Bleed pressure from fuel system by loosening ventilation valve setscrew (WP 0106).
2. Remove fluid passage bolt (Figure 1, Item 5), sealing washer (Figure 1, Item 4), overflow hose (Figure 1, Item 2), and sealing washer (Figure 1, Item 3) from fuel injection pump (Figure 1, Item 1). Discard sealing washers.

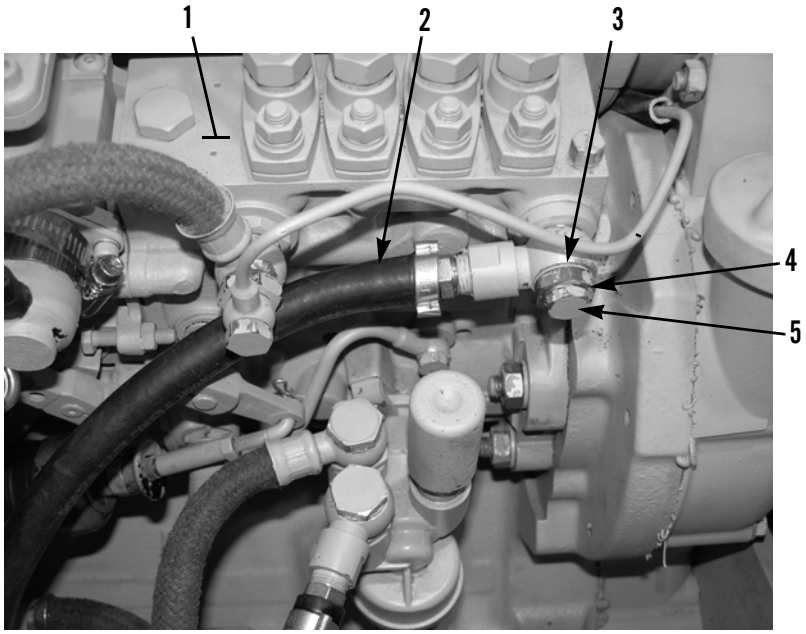


Figure 1. Overflow Hose at Fuel Injection Pump.

REMOVAL - CONTINUED

NOTE

Original equipment hose clamp should be replaced, on installation, with a new worm drive type hose clamp. A supply of extra hose clamps is stored in storage box (WP 0008).

3. Cut hose clamp (Figure 2, Item 8), hold overflow hose (Figure 2, Item 2), and remove barb fitting (Figure 2, Item 7) and overflow hose from fuel return selector valve (Figure 2, Item 6). Discard hose clamp.

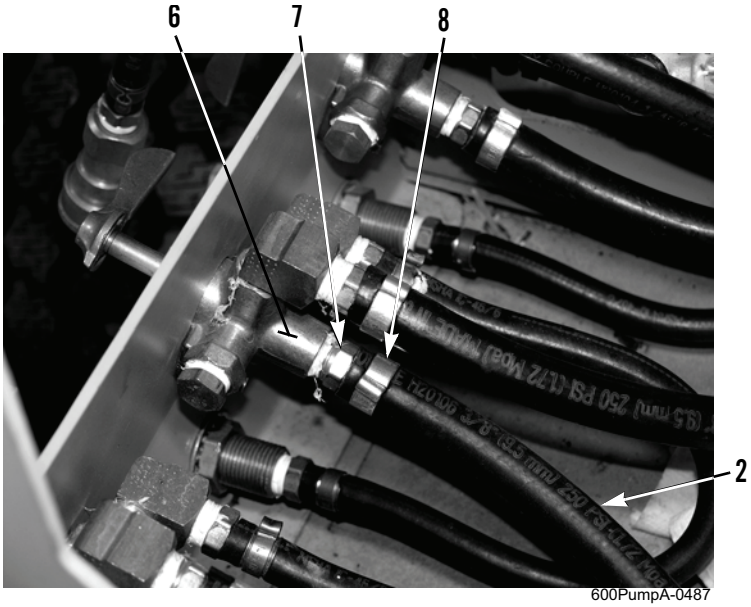


Figure 2. Overflow Hose at Fuel Return Selector Valve.

INSTALLATION

NOTE

Apply antiseizing tape to male threads of barb fitting prior to installation.

1. Position new hose clamp (Figure 2, Item 8) on overflow hose (Figure 2, Item 2).
2. Hold overflow hose (Figure 2, Item 2) and install barb fitting (Figure 2, Item 7) and overflow hose on fuel return selector valve (Figure 2, Item 6). Tighten hose clamp (Figure 2, Item 8).

INSTALLATION - CONTINUED

NOTE

Lightly coat new sealing washers with clean fuel prior to installation.

3. Install new sealing washer (Figure 3, Item 3), overflow hose (Figure 3, Item 2), new sealing washer (Figure 3, Item 4), and fluid passage bolt (Figure 3, Item 5) on fuel injection pump (Figure 3, Item 1).Tighten fluid passage bolt to 25 to 30 lb-ft (34 to Nm).

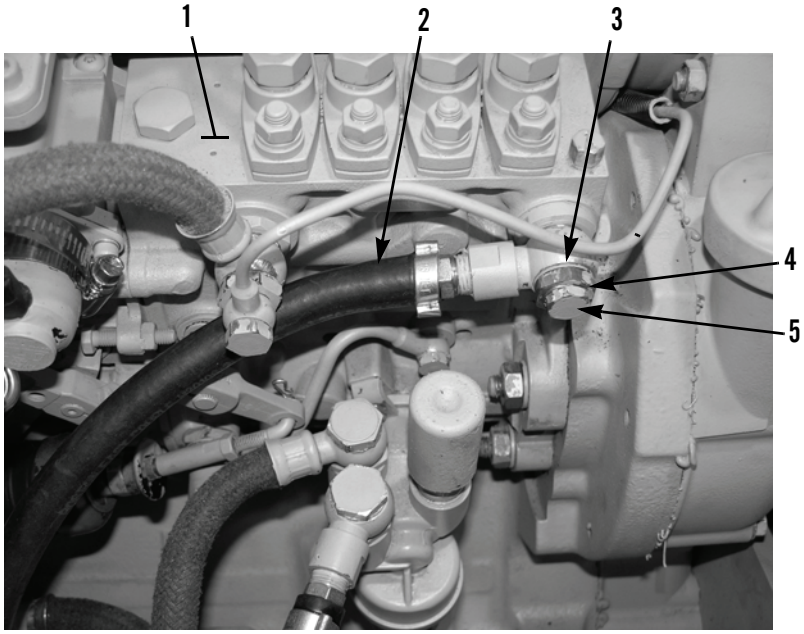


Figure 3. Overflow Hose at Fuel Injection Pump.

FOLLOW-ON TASKS

1. Connect battery cables (WP 0033).
2. Bleed fuel system (WP 0106).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

FUEL INJECTOR LINES REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Cap set, protective, dust and moisture (Item 5, WP 0129)
Diesel fuel, DF-1 (Item 10, WP 0129)
Diesel fuel, DF-2 (Item 11, WP 0129)
Rag, wiping (Item 22, WP 0129)
Tag, marker (Item 27, WP 0129)
Turbine fuel, aviation, JP-5 (Item 31, WP 0129)
Turbine fuel, aviation, JP-8 (Item 32, WP 0129)
Sealing washer (2)

Personnel Required

63J (1)

References

WP 0023
WP 0106

Equipment Condition

Oil cooler access plate removed (WP 0068)
Upper access plate removed (WP 0068)
Control panel box removed (WP 0110)
Engine cool

WARNING

- DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing damage to equipment and injury or death to personnel.
- Allow engine to cool off before performing maintenance on fuel injector lines. Hot metal parts can cause severe burns. Wear eye, glove, and skin protection when working with heated parts. Failure to follow this warning may cause injury to personnel.
- Wear fuel resistant gloves and eye protection when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. Failure to follow this warning may result in injury or death to personnel.
- When servicing this equipment, performing maintenance, or disposing of materials such as fuel, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

CAUTION

- Wipe area clean around all connections to be opened during removal. Cap line and plug openings after disconnecting lines. Contamination of fuel system could result in premature failure.
- Use two line wrenches to loosen/tighten fuel lines. Failure to do so may result in damage to lines.
- Fuel injector nozzles can be permanently damaged by twisting if only one wrench is used to loosen fuel line nuts. Use one wrench to hold nozzle and another to loosen nut.

NOTE

- Tag lines prior to removal to ensure correct installation.
- Use container to capture draining fuel. Dispose of fuel IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.
- Mark location of mounting hardware and clamps prior to removal to aid in installation.

REMOVAL

1. Bleed pressure from fuel system by loosening ventilation valve setscrew (WP 0106).
2. Remove pipe clamps (Figure 1, Items 5 and 7) from injector lines (Figure 1, Items 1, 2, 3, 4, and 6).
3. Remove rubber (Figure 1, Item 8) from cover (Figure 1, Item 9).

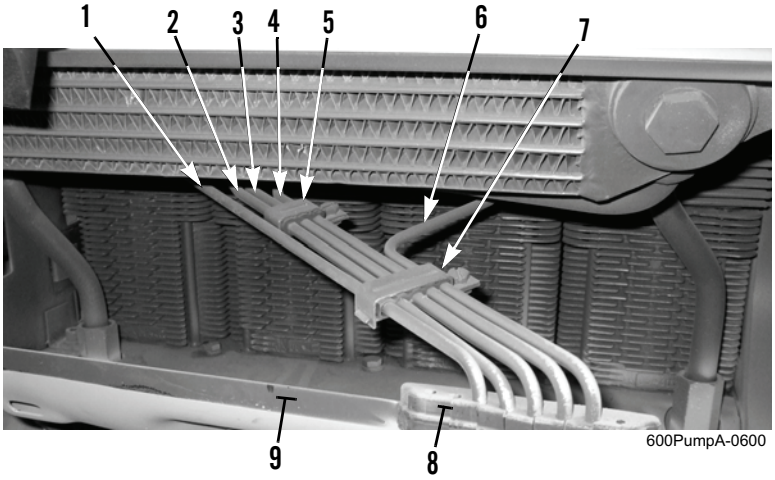


Figure 1. Pipe Clamps and Injector Lines.

REMOVAL - CONTINUED

NOTE

Tag injectors lines prior to removal to ensure correct installation.

4. Disconnect injector lines (Figure 2, Items 2, 3, 4, and 6) from fuel injectors (Figure 2, Items 19, 18, 12, and 13).
5. Disconnect injector line (Figure 2, Item 1) from fitting (Figure 2, Item 10) at intake manifold (Figure 2, Item 11).
6. If damaged, remove eight bolts (Figure 2, Item 14), lockwashers (Figure 2, Item 15), and air baffle (Figure 2, Item 16) from cylinder heads. Discard lockwashers.
7. Remove three grommets (Figure 2, Item 17) from air baffle (Figure 2, Item 16).

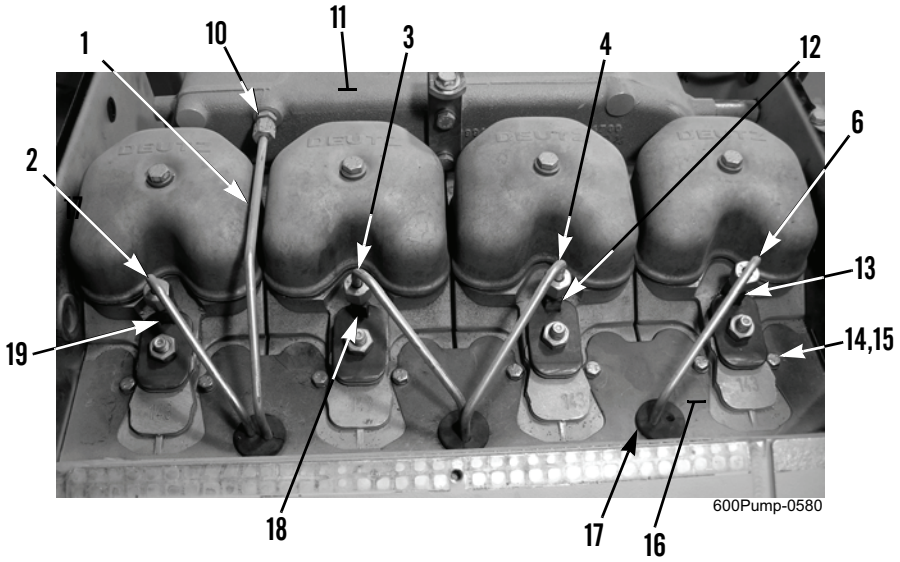


Figure 2. Injector Lines, Fuel Injectors, and Cylinder Heads.

REMOVAL - CONTINUED

8. Remove fluid passage bolt (Figure 3, Item 21), sealing washer (Figure 3, Item 22), injector line (Figure 3, Item 1), and sealing washer (Figure 3, Item 20) from fuel injection pump (Figure 3, Item 23). Discard sealing washers.
9. Remove injector lines (Figure 3, Items 2, 3, 4, and 6) from fuel injection pump (Figure 3, Item 23).

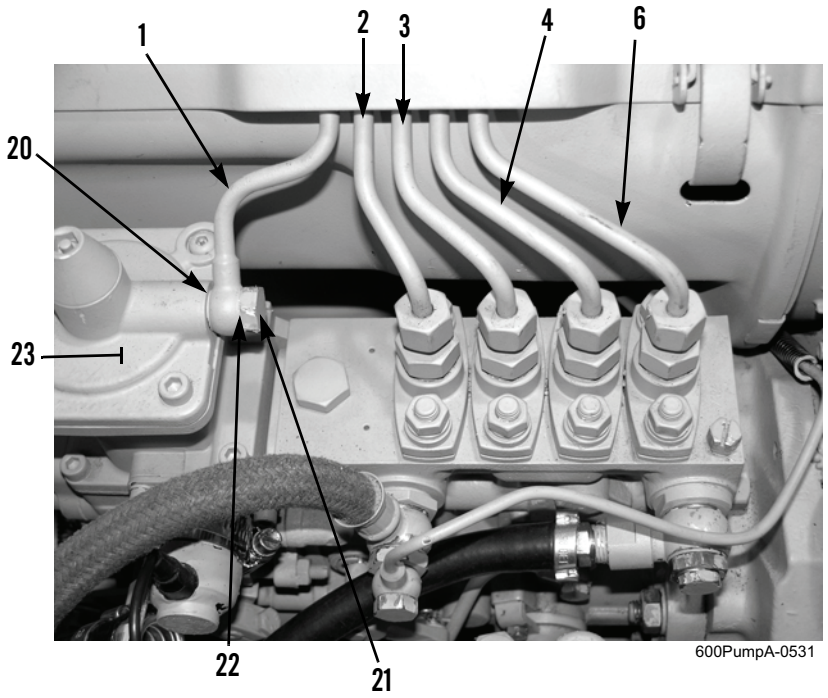


Figure 3. Injector Lines at Fuel Injection Pump.

CLEANING AND INSPECTION

1. Clean and inspect all parts IAW WP 0023.
2. Replace any damaged parts.

INSTALLATION

CAUTION

Do not bend or kink fuel injector lines or damage to lines may result.

1. Position and align injector lines (Figure 3, Items 2, 3, 4, and 6) to fuel injection pump (Figure 3, Item 23). Carefully start tightening all lines.

NOTE

Lightly coat new sealing washers with clean fuel before installation.

2. Install new sealing washer (Figure 3, Item 20), injector line (Figure 3, Item 1), sealing washer (Figure 3, Item 22), and fluid passage bolt (Figure 3, Item 21) on fuel injection pump (Figure 3, Item 23).
3. If removed, install air baffle (Figure 4, Item 16) on cylinder heads with eight new lockwashers (Figure 4, Item 15) and bolts (Figure 4, Item 14).
4. Install three grommets (Figure 4, Item 17) on air baffle (Figure 4, Item 16).
5. Connect injector line (Figure 4, Item 1) to fitting (Figure 4, Item 10) at intake manifold (Figure 4, Item 11).
6. Connect injector lines (Figure 4, Items 2, 3, 4, and 6) to fuel injectors (Figure 4, Items 19, 18, 12, and 13). Tighten lines to 16 to 21 lb-ft (22 to 28 Nm).

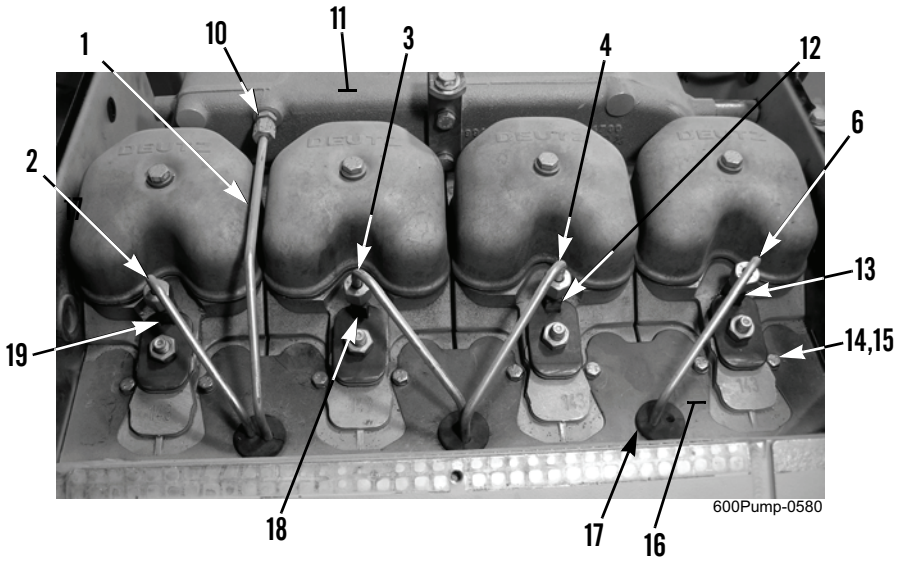


Figure 4. Injector Lines, Fuel Injectors, and Cylinder Heads.

INSTALLATION - CONTINUED

7. Install rubber (Figure 5, Item 8) to secure injector lines (Figure 5, Items 1, 2, 3, 4, and 6) to cover (Figure 5, Item 9).
8. Install pipe clamps (Figure 5, Items 5 and 7) on injector lines (Figure 5, Items 1, 2, 3, 4, and 6).

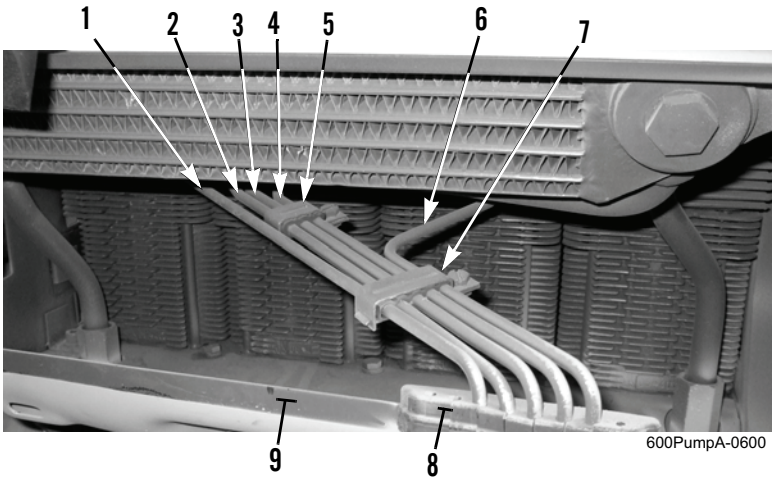


Figure 5. Pipe Clamps and Injector Lines.

FOLLOW-ON TASKS

1. Install control panel box (WP 0110).
2. Bleed fuel system (WP 0106).
3. Install upper access plate (WP 0068).
4. Install oil cooler access plate (WP 0068).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

FUEL SELECTOR VALVE REPLACEMENT

Removal, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Cap set, protective, dust and moisture (Item 5, WP 0129)
Rag, wiping (Item 22, WP 0129)
Tag, marker (Item 27, WP 0129)
Tape, antiseizing (Item 28, WP 0129)
Hose clamp (4)
Locknut (4)

Materials/Parts - Continued

Lockwasher

Personnel Required

63J (1)

References

WP 0008
WP 0106

Equipment Condition

Battery cables disconnected (WP 0033)
Engine cool

WARNING

- DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing damage to equipment and injury or death to personnel.
- Allow engine to cool off before performing maintenance on fuel selector valve. Hot metal parts can cause severe burns. Wear eye, glove, and skin protection when working with heated parts. Failure to follow this warning may cause injury to personnel.
- Wear fuel resistant gloves and eye protection when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. Failure to follow this warning may result in injury or death to personnel.
- When servicing this equipment, performing maintenance, or disposing of materials such as fuel, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

CAUTION

- Wipe area clean around all connections to be opened during removal. Cap lines and plug openings after removing lines. Contamination of fuel system could result in premature failure.
- Do not bend or kink fuel lines or damage to lines may result.

NOTE

- Fuel suction selector valve and AUX suction inlet are replaced in this work package. Fuel return selector valve and AUX return outlet are replaced the same way.
- Tag lines prior to removal to ensure correct installation.
- Use container to capture draining fuel. Dispose of fuel IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.

REMOVAL

1. Remove two locknuts (Figure 1, Item 1) and fuel selector panel (Figure 1, Item 2) from trailer (Figure 1, Item 3). Discard locknuts.

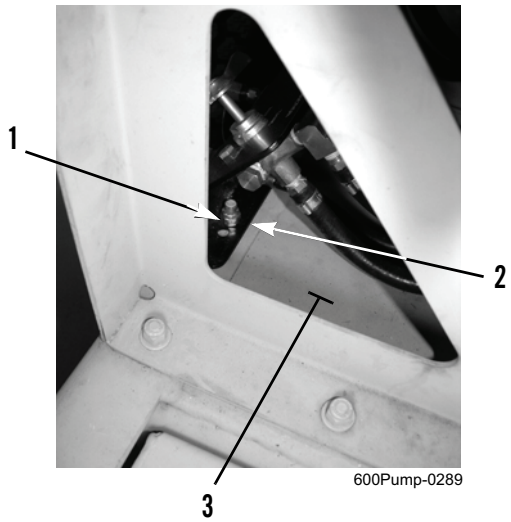


Figure 1. Fuel Selector Panel.

2. Remove screw (Figure 2, Item 5) and handle (Figure 2, Item 6) from fuel suction selector valve (Figure 2, Item 4).
3. Remove two bolts (Figure 2, Item 11) and locknuts (Figure 2, Item 12) from fuel suction selector valve (Figure 2, Item 4) and fuel selector panel (Figure 2, Item 2). Discard locknuts.
4. Remove cap (Figure 2, Item 8) from AUX suction inlet fitting (Figure 2, Item 7).
5. Remove S-hook (Figure 2, Item 9) and lanyard cable (Figure 2, Item 10) from cap (Figure 2, Item 8).
6. If necessary, remove screw (Figure 2, Item 13) and lanyard cable (Figure 2, Item 10) from fuel selector panel (Figure 2, Item 2).

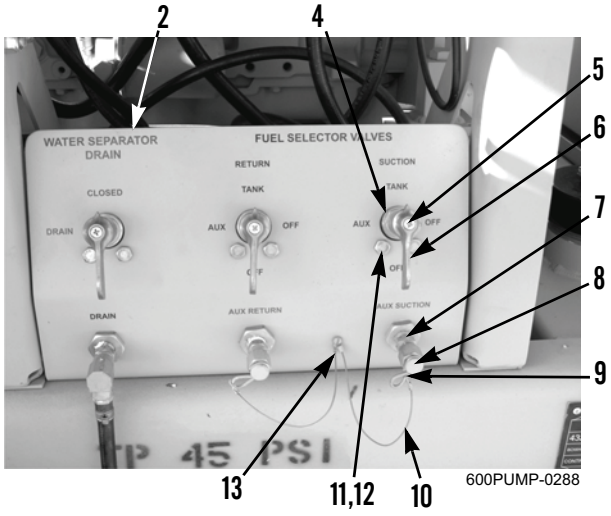


Figure 2. Fuel Selector Panel and Fuel Selector Valve.

REMOVAL - CONTINUED

NOTE

All original equipment hose clamps should be replaced, on installation, with new worm drive type hose clamps. A supply of extra hose clamps is stored in storage box (WP 0008).

7. Cut three hose clamps (Figure 3, Item 16) from hoses (Figure 3, Item 17) at fuel suction selector valve (Figure 3, Item 4). Discard hose clamps.
8. Hold three hoses (Figure 3, Item 17) at fuel suction selector valve (Figure 3, Item 4) and remove fittings (Figure 3, Item 15) and hoses from elbows (Figure 3, Item 14).
9. Remove two elbows (Figure 3, Item 14) from fuel suction selector valve (Figure 3, Item 4).

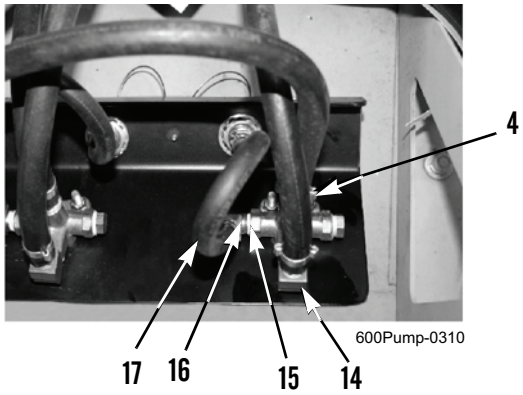


Figure 3. Fuel Suction Selector Valve.

10. Cut hose clamp (Figure 4, Item 20) from hose (Figure 4, Item 17) at AUX suction inlet fitting (Figure 4, Item 7). Discard hose clamp.
11. Hold hose (Figure 4, Item 17) and remove fitting (Figure 4, Item 21) and hose from AUX suction inlet fitting (Figure 4, Item 7).
12. Remove nut (Figure 4, Item 18), lockwasher (Figure 4, Item 19), and AUX suction inlet fitting (Figure 4, Item 7) from fuel selector panel (Figure 4, Item 2). Discard lockwasher.

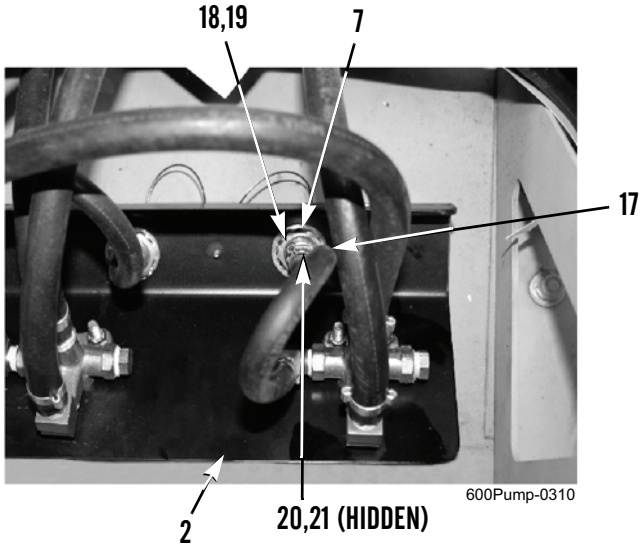


Figure 4. AUX Suction Inlet Fitting and Fuel Selector Panel.

INSTALLATION

NOTE

Apply antiseizing tape to male threads of fittings prior to installation.

1. Install AUX suction inlet fitting (Figure 5, Item 7) on fuel selector panel (Figure 5, Item 2) with new lockwasher (Figure 5, Item 19) and nut (Figure 5, Item 18).
2. Position new hose clamp (Figure 5, Item 20) on hose (Figure 5, Item 17) at AUX suction inlet fitting (Figure 5, Item 7).
3. Hold hose (Figure 5, Item 17) and install fitting (Figure 5, Item 21) and hose on AUX suction inlet fitting (Figure 5, Item 7). Tighten hose clamp (Figure 5, Item 20).

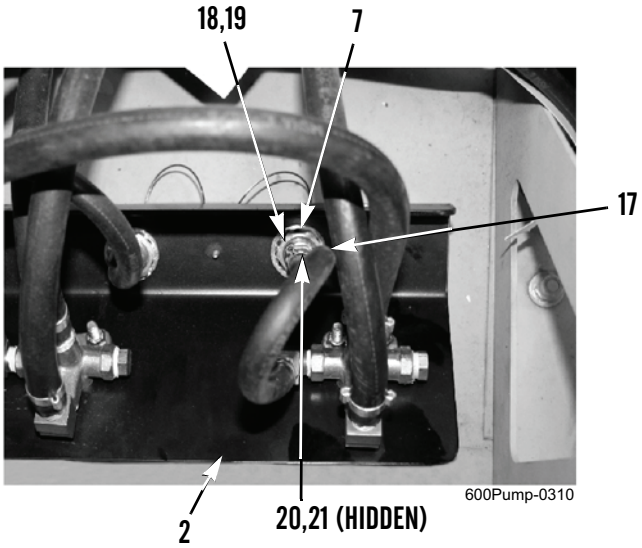


Figure 5. AUX Suction Inlet Fitting and Fuel Selector Panel.

4. Install two elbows (Figure 6, Item 14) on fuel suction selector valve (Figure 6, Item 4).
5. Position three new hose clamps (Figure 6, Item 16) on hoses (Figure 6, Item 17) at fuel suction selector valve (Figure 6, Item 4).
6. Hold hoses (Figure 6, Item 17) and install fittings (Figure 6, Item 15) and hoses on fuel suction selector valve (Figure 6, Item 4). Tighten hose clamps (Figure 6, Item 16).

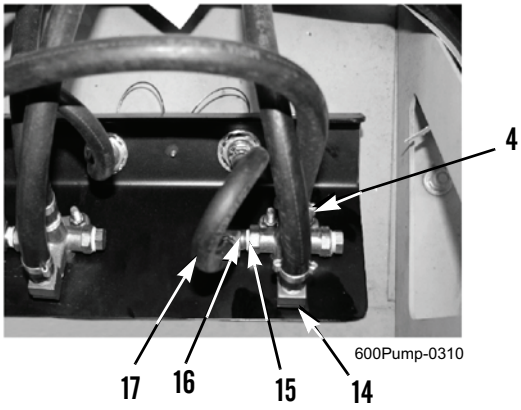


Figure 6. Fuel Suction Selector Valve.

INSTALLATION - CONTINUED

7. If removed, install lanyard cable (Figure 7, Item 10) on fuel selector panel (Figure 7, Item 2) with screw (Figure 7, Item 13).
8. Install cap (Figure 7, Item 8) on AUX suction inlet fitting (Figure 7, Item 7).
9. Install lanyard cable (Figure 7, Item 10) on cap (Figure 7, Item 8) with S-hook (Figure 7, Item 9).
10. Install fuel suction selector valve (Figure 7, Item 4) on fuel selector panel (Figure 7, Item 2) with two bolts (Figure 7, Item 11) and new locknuts (Figure 7, Item 12).
11. Install handle (Figure 7, Item 6) and screw (Figure 7, Item 5) on fuel suction selector valve (Figure 7, Item 4).

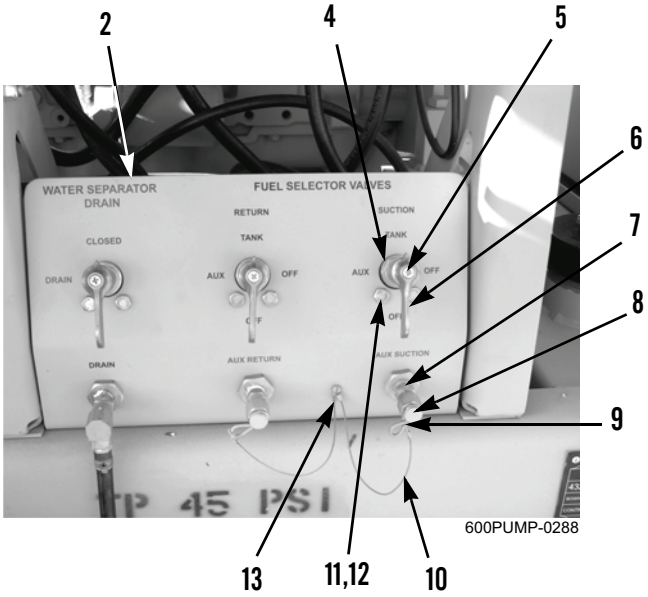


Figure 7. Fuel Selector Panel, AUX Suction Inlet Fitting, and Fuel Suction Selector Valve.

INSTALLATION - CONTINUED

12. Install fuel selector panel (Figure 8, Item 2) on trailer (Figure 8, Item 3) with two new locknuts (Figure 8, Item 1).

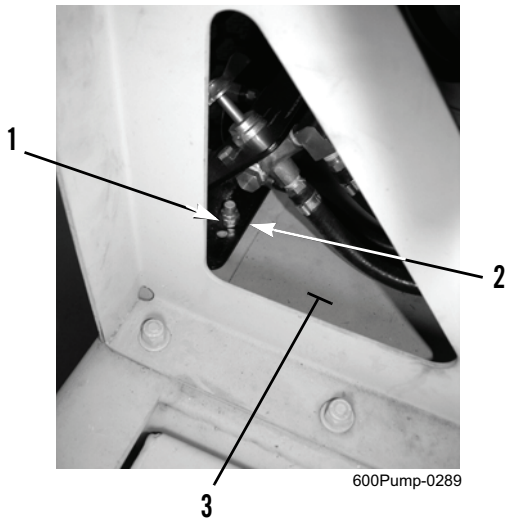


Figure 8. Fuel Selector Panel.

FOLLOW-ON TASKS

1. Connect battery cables (WP 0033).
2. Bleed fuel system (WP 0106).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

FLAME GLOW PLUG FUEL LINES AND PREHEAT FUEL SOLENOID REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Cap set, protective, dust and moisture (Item 5, WP 0129)
Diesel fuel, DF-1 (Item 10, WP 0129)
Diesel fuel, DF-2 (Item 11, WP 0129)
Rag, wiping (Item 22, WP 0129)
Tag, marker (Item 27, WP 0129)
Turbine fuel, aviation, JP-5 (Item 31, WP 0129)
Turbine fuel, aviation, JP-8 (Item 32, WP 0129)

Materials/Parts - Continued

Lockwasher (2)
Sealing washer (4)

Personnel Required

63J (1)

References

WP 0023
WP 0106

Equipment Condition

Cooling fan assembly removed (WP 0027)
Heat shield removed (WP 0107)

WARNING

- DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing damage to equipment and injury or death to personnel.
- Allow engine to cool off before performing maintenance on flame glow plug fuel lines and preheat fuel solenoid. Hot metal parts can cause severe burns. Wear eye, glove, and skin protection when working with heated parts. Failure to follow this warning may cause injury to personnel.
- Wear fuel resistant gloves and eye protection when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. Failure to follow this warning may result in injury or death to personnel.
- When servicing this equipment, performing maintenance, or disposing of materials such as fuel, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

CAUTION

- Wipe area clean around all connections to be opened during removal. Cap lines and plug openings after removing lines. Contamination of fuel system could result in premature failure.
- Use two line wrenches to loosen/tighten fuel lines. Failure to do so may result in damage to lines.

NOTE

- Tag lines prior to removal to ensure correct installation.
- Use container to capture draining fuel. Dispose of fuel IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.
- Mark location of mounting hardware and clamps prior to removal to aid in installation.

REMOVAL

1. Release pressure in fuel system by loosening ventilation valve setscrew (WP 0106).
2. Disconnect wire (Figure 1, Item 13) from solenoid valve (Figure 1, Item 11).
3. Remove fluid passage bolt (Figure 1, Item 1), sealing washer (Figure 1, Item 2), fuel line (Figure 1, Item 14), and sealing washer (Figure 1, Item 3) from solenoid valve (Figure 1, Item 11). Discard sealing washers.
4. Remove fluid passage bolt (Figure 1, Item 7), sealing washer (Figure 1, Item 8), fuel line (Figure 1, Item 9), and sealing washer (Figure 1, Item 6) from solenoid valve (Figure 1, Item 11). Discard sealing washers.
5. Remove two bolts (Figure 1, Item 4), lockwashers (Figure 1, Item 5), and solenoid valve (Figure 1, Item 11) from front air duct wall (Figure 1, Item 12). Discard lockwashers.

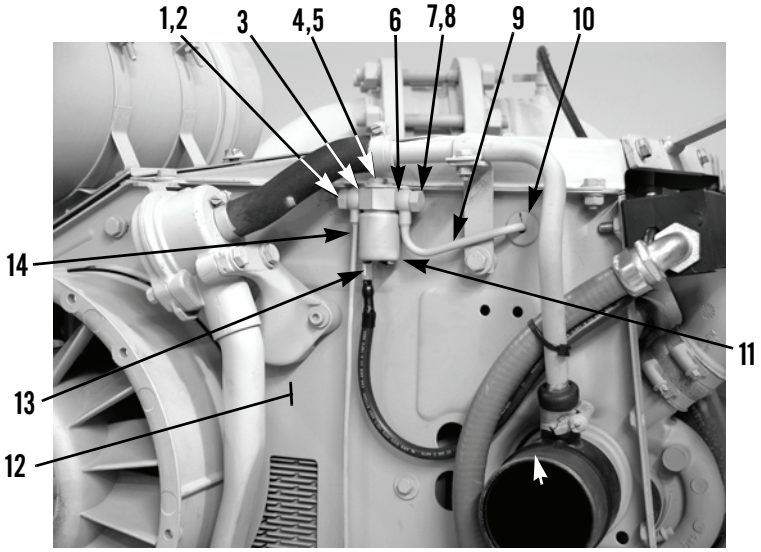


Figure 1. Solenoid Valve.

6. Disconnect fuel line (Figure 2, Item 9) from flame glow plug (Figure 2, Item 15) and remove fuel line and grommet (Figure 1, Item 10) from front air duct wall (Figure 1, Item 12).

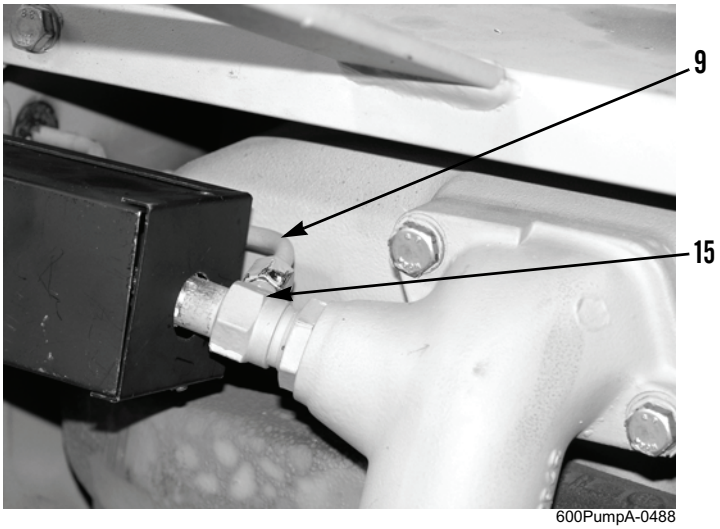


Figure 2. Fuel Line at Flame Glow Plug.

REMOVAL - CONTINUED

7. Remove fluid passage bolt (Figure 3, Item 16), sealing washer (Figure 3, Item 17), fuel line (Figure 3, Item 14), and sealing washer (Figure 3, Item 19) from fuel injection pump (Figure 3, Item 18). Discard sealing washers.

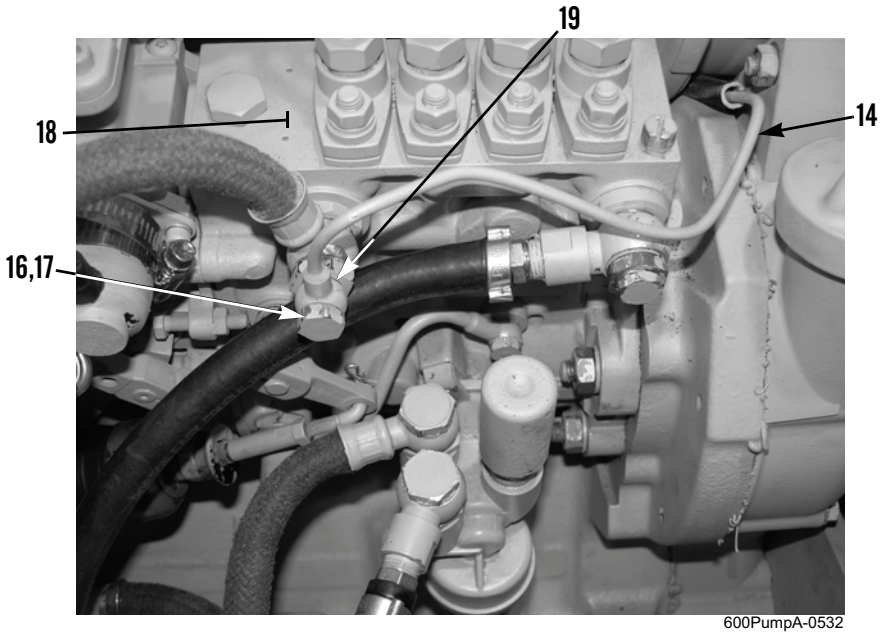


Figure 3. Fuel Line at Fuel Injection Pump.

CLEANING AND INSPECTION

Clean and inspect all parts IAW WP 0023.

INSTALLATION

CAUTION

Do not bend or kink fuel lines or damage to lines may result.

NOTE

Lightly coat new sealing washers with clean fuel prior to installation.

1. Install new sealing washer (Figure 3, Item 19), fuel line (Figure 3, Item 14), new sealing washer (Figure 3, Item 17), and fluid passage bolt (Figure 3, Item 16) to fuel injection pump (Figure 3, Item 18).
2. Position fuel line (Figure 2, Item 9) through front air duct wall (Figure 1, Item 12) and connect fuel line to flame glow plug (Figure 2, Item 15). Seat grommet (Figure 1, Item 10) in front air duct wall.

INSTALLATION - CONTINUED

3. Install solenoid valve (Figure 4, Item 11) on front air duct wall (Figure 4, Item 12) with two new lockwashers (Figure 4, Item 5) and bolts (Figure 4, Item 4).
4. Install new sealing washer (Figure 4, Item 6), fuel line (Figure 4, Item 9), new sealing washer (Figure 4, Item 8), and fluid passage bolt (Figure 4, Item 7) to solenoid valve (Figure 4, Item 11).
5. Install new sealing washer (Figure 4, Item 3), fuel line (Figure 4, Item 14), new sealing washer (Figure 4, Item 2), and fluid passage bolt (Figure 4, Item 1) on solenoid valve (Figure 4, Item 11).
6. Connect wire (Figure 4, Item 13) to solenoid valve (Figure 4, Item 11).

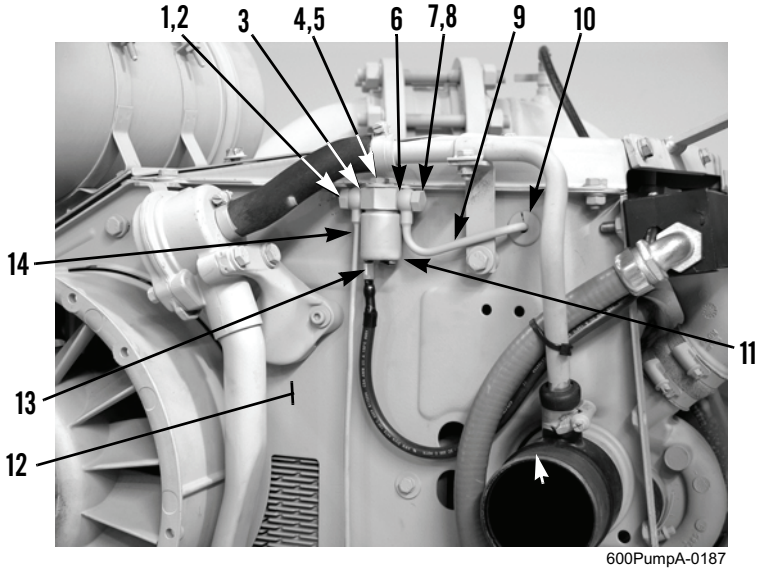


Figure 4. Solenoid Valve.

FOLLOW-ON TASKS

1. Install heat shield (WP 0107).
2. Install cooling fan assembly (WP 0027).
3. Bleed fuel system (WP 0106).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

BLEEDING FUEL SYSTEM

Bleeding

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Rag, wiping (Item 22, WP 0129)

Personnel Required

63J (1)

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked
Fuel selector valves in TANK or AUX position (WP 0005)

WARNING

- DO NOT perform fuel system checks, inspections or maintenance while smoking or near fire, flames or sparks. Fuel may ignite, causing damage to equipment and injury or death to personnel.
- Wear fuel-resistant gloves and eye protection when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. Failure to follow this warning may result in injury to personnel.
- When servicing this equipment, performing maintenance, or disposing of materials such as fuel, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

CAUTION

Air trapped in fuel system will damage engine. Air must be bled from system each time fuel pump input and output tubes are disconnected.

BLEEDING

NOTE

A suitable container should be placed under fuel pump to capture draining fuel. Dispose of fuel IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.

1. Place a suitable container under fuel pump (Figure 1, Item 3).
2. Loosen ventilation valve setscrew (Figure 1, Item 2).
3. Move hand pump (Figure 1, Item 1) up and down until bubble-free fuel escapes from ventilation valve.
4. Tighten ventilation valve setscrew (Figure 1, Item 2), while still pumping.

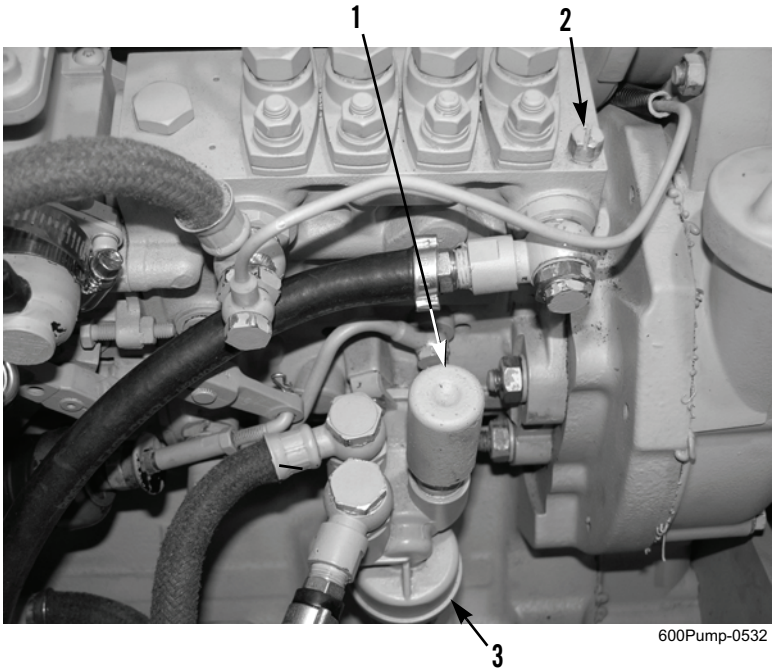


Figure 1. Fuel Pump.

5. Dispose of collected fuel IAW using unit's SOP.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

EXHAUST SYSTEM REPLACEMENT

Heat Shield Removal, Heat Shield Installation, Follow-On Tasks, Muffler Removal, Muffler Installation Extension Pipe Removal, Extension Pipe Installation, Exhaust Pipe Removal, Extension Pipe Installation, Tail Pipe Removal, Tail Pipe Installation, Upper Bracket Replacement, Lower Bracket Replacement, Muffler Support Bracket Replacement, Rear Bracket Replacement

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Rag, wiping (Item 22, WP 0129)
Gasket (4)
Locknut (5)
Lockwasher (8)

Personnel Required

63J (2)

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked
Engine cool
Battery cables disconnected (WP 0033)

WARNING

Allow engine to cool off before performing maintenance on muffler, exhaust pipe, exhaust manifold, or turbocharger. Hot metal parts can cause severe burns. Wear eye, glove, and skin protection when working with heated parts. Failure to follow this warning may cause injury to personnel.

HEAT SHIELD REMOVAL

1. Remove three bolts (Figure 1, Item 1) and locknuts (Figure 1, Item 2) from heat shield (Figure 1, Item 4), rear bracket (Figure 1, Item 5), upper bracket (Figure 1, Item 3), and lower bracket (Figure 1, Item 6). Discard locknuts

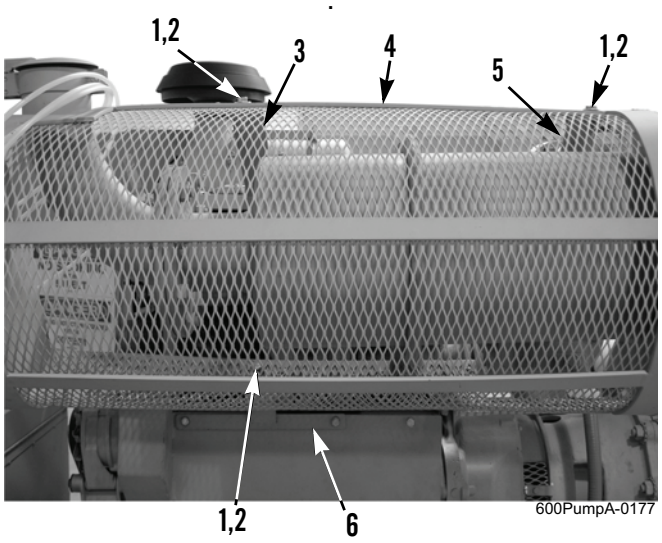


Figure 1. Heat Shield.

2. Remove nut (Figure 2, Item 7) and bolt (Figure 2, Item 8) from heat shield (Figure 2, Item 4), flange of muffler (Figure 2, Item 9), and flange of extension pipe (Figure 2, Item 10). Remove heat shield.

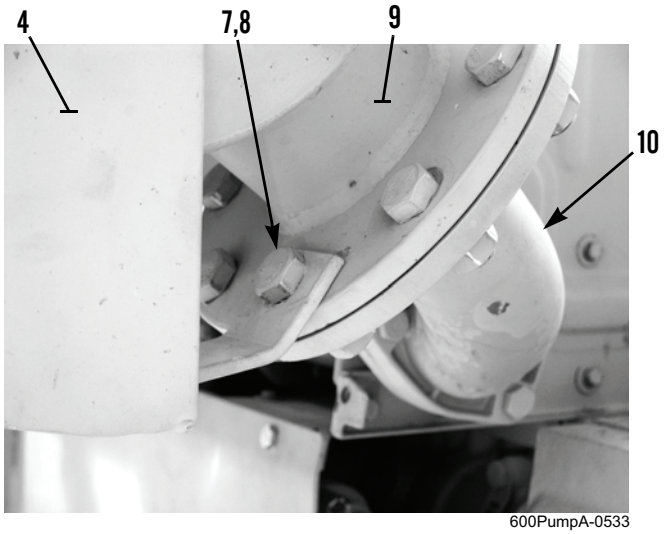


Figure 2. Heat Shield at Muffler and Extension Pipe.

HEAT SHIELD INSTALLATION

1. Position heat shield (Figure 1, Item 4) on rear bracket (Figure 1, Item 5), upper bracket (Figure 1, Item 3), and lower bracket (Figure 1, Item 6) and install three bolts (Figure 1, Item 1) and new locknuts (Figure 1, Item 2).
2. Install bolt (Figure 2, Item 8) and nut (Figure 2, Item 7) to heat shield (Figure 2, Item 4), flange of muffler (Figure 2, Item 9), and flange of extension pipe (Figure 2, Item 10).

FOLLOW-ON TASKS

Connect battery cables (WP 0033).

MUFFLER REMOVAL

1. Remove heat shield. Refer to *Heat Shield Removal* in this work package.
2. Remove two nuts (Figure 3, Item 11) and clamp (Figure 3, Item 12) securing muffler (Figure 3, Item 9) to muffler support bracket (Figure 3, Item 13).

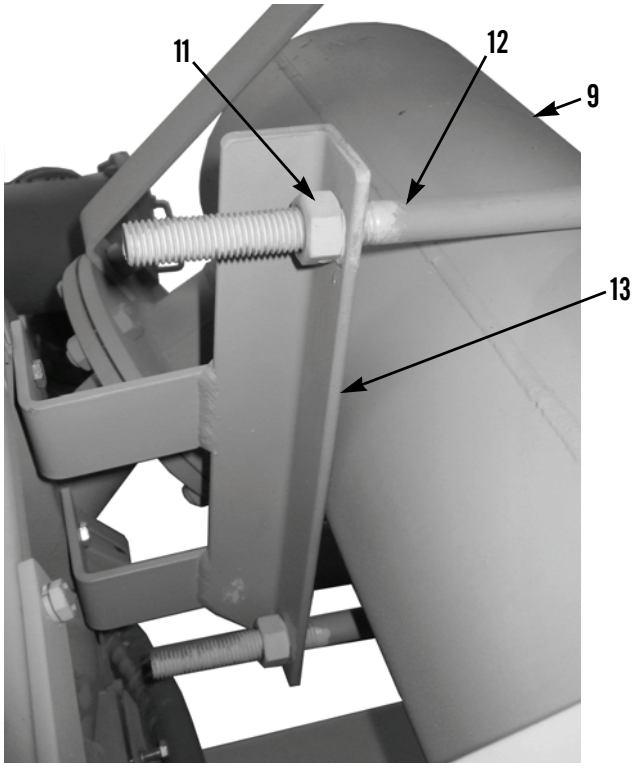


Figure 3. Muffler Support Bracket.

MUFFLER REMOVAL - CONTINUED

3. Remove eight bolts (Figure 4, Item 18), nuts (Figure 4, Item 19), gasket (Figure 4, Item 20), and tail pipe (Figure 4, Item 14) from muffler (Figure 4, Item 9). Discard gasket.

WARNING

To prevent equipment damage and/or personal injury, support muffler prior to removing nuts and bolts from muffler and extension pipe.

NOTE

Muffler weighs approximately 45 lb (20 kg).

4. Remove seven bolts (Figure 4, Item 15), nuts (Figure 4, Item 16), gasket (Figure 4, Item 17), and muffler (Figure 4, Item 9) from extension pipe (Figure 4, Item 10). Discard gasket.

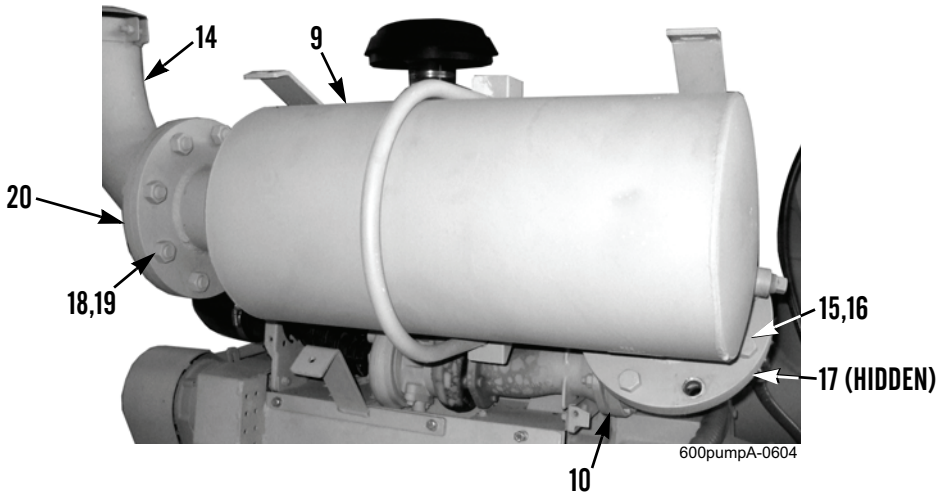


Figure 4. Tail Pipe, Muffler, and Extension Pipe.

MUFFLER INSTALLATION

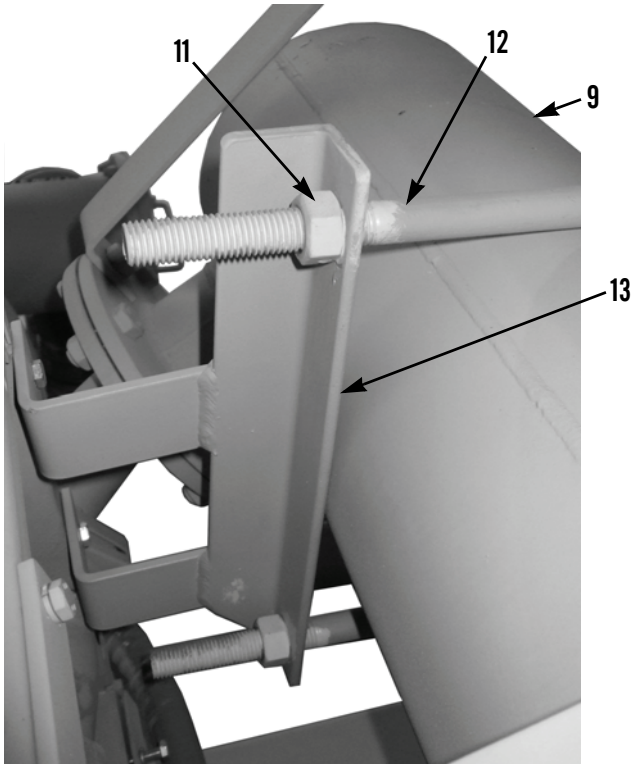
WARNING

To prevent equipment damage and/or personal injury, support muffler prior to installing clamp and nuts.

NOTE

Muffler weighs approximately 45 lb (20 kg).

1. Position muffler (Figure 5, Item 9), clamp (Figure 5, Item 12), and two nuts (Figure 5, Item 11) on muffler support bracket (Figure 5, Item 13). Do not tighten nuts.



600PumpA-0335

Figure 5. Muffler Support Bracket.

2. Install new gasket (Figure 4, Item 20), tail pipe (Figure 4, Item 14), eight bolts (Figure 4, Item 18), and nuts (Figure 4, Item 19) on muffler (Figure 4, Item 9).
3. Install new gasket (Figure 4, Item 17), muffler (Figure 4, Item 9), seven bolts (Figure 4, Item 15), and nuts (Figure 4, Item 16) on extension pipe (Figure 4, Item 10).
4. Tighten two nuts (Figure 5, Item 11) on clamp (Figure 5, Item 12).
5. Install heat shield. Refer to *Heat Shield Installation* in this work package.

EXTENSION PIPE REMOVAL

1. Remove heat shield. Refer to *Heat Shield Removal* in this work package.
2. Remove bolt (Figure 6, Item 15), nut (Figure 6, Item 16), and rear bracket (Figure 6, Item 5) from muffler (Figure 6, Item 9).
3. Remove six remaining bolts (Figure 6, Item 15), nuts (Figure 6, Item 16), and gasket (Figure 6, Item 17) from extension pipe (Figure 6, Item 10) and muffler (Figure 6, Item 9). Discard gasket.
4. Remove three bolts (Figure 6, Item 21), nuts (Figure 6, Item 22), gasket (Figure 6, Item 23), and extension pipe (Figure 6, Item 10) from exhaust pipe (Figure 6, Item 24). Discard gasket.

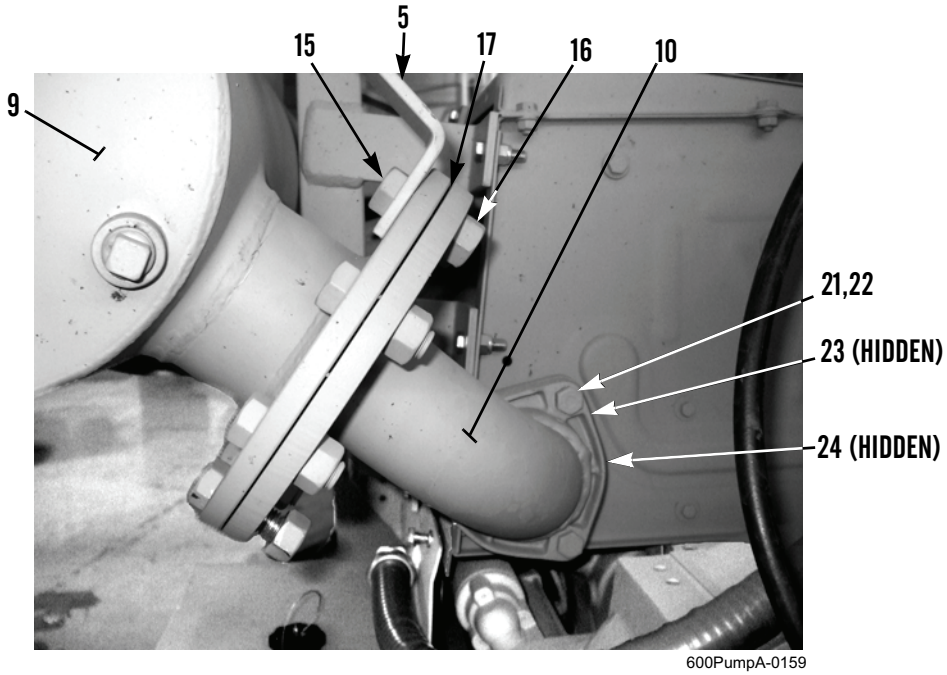


Figure 6. Muffler, Extension Pipe, and Exhaust Pipe.

EXTENSION PIPE INSTALLATION

1. Install new gasket (Figure 6, Item 23), extension pipe (Figure 6, Item 10), three bolts (Figure 6, Item 21), and nuts (Figure 6, Item 22) on exhaust pipe (Figure 6, Item 24).
2. Install new gasket (Figure 6, Item 17), six bolts (Figure 6, Item 15), and nuts (Figure 6, Item 16) on extension pipe (Figure 6, Item 10) and muffler (Figure 6, Item 9).
3. Install rear bracket (Figure 6, Item 5) on muffler (Figure 6, Item 9) with bolt (Figure 6, Item 15) and nut (Figure 6, Item 16).
4. Install heat shield. Refer to *Heat Shield Installation* in this work package.

EXHAUST PIPE REMOVAL

1. Remove heat shield. Refer to *Heat Shield Removal* in this work package.
2. Remove four bolts (Figure 7, Item 27), lockwashers (Figure 7, Item 28), and gasket (Figure 7, Item 26) from exhaust pipe (Figure 7, Item 24) and turbocharger (Figure 7, Item 25). Discard lockwashers and gasket.
3. Remove three bolts (Figure 7, Item 21), nuts (Figure 7, Item 22), gasket (Figure 7, Item 23), and exhaust pipe (Figure 7, Item 24) from extension pipe (Figure 7, Item 10). Discard gasket.

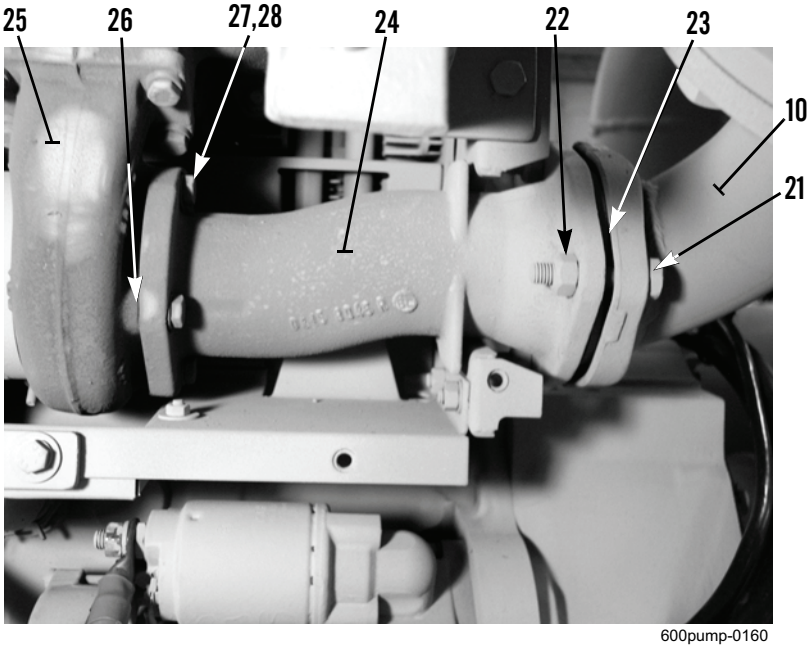


Figure 7. Exhaust Pipe, Turbocharger, and Extension Pipe.

EXHAUST PIPE INSTALLATION

1. Install new gasket (Figure 7, Item 23), exhaust pipe (Figure 7, Item 24), three bolts (Figure 7, Item 21), and nuts (Figure 7, Item 22) on extension pipe (Figure 7, Item 10).
2. Install new gasket (Figure 7, Item 26), four new lockwashers (Figure 7, Item 28), and bolts (Figure 7, Item 27) on exhaust pipe (Figure 7, Item 24) and turbocharger (Figure 7, Item 25).
3. Install heat shield. Refer to *Heat Shield Installation* in this work package.

TAIL PIPE REMOVAL

1. Remove heat shield. Refer to *Heat Shield Removal* in this work package.
2. Remove eight bolts (Figure 8, Item 18), nuts (Figure 8, Item 19), gasket (Figure 8, Item 20), and tail pipe (Figure 8, Item 14) from muffler (Figure 8, Item 9). Discard gasket.
3. Remove bolt (Figure 8, Item 30), nut (Figure 8, Item 31), and flapper valve (Figure 8, Item 29) from tail pipe (Figure 8, Item 14).

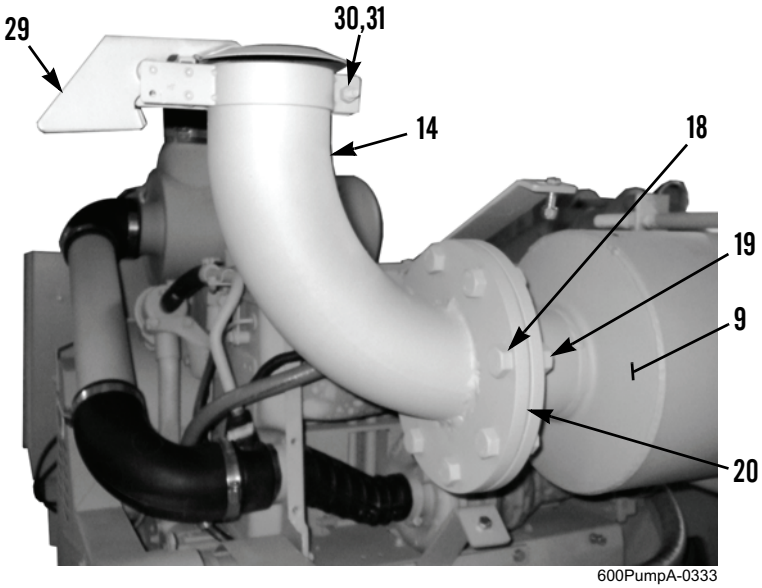


Figure 8. Tail Pipe, Flapper Valve, and Muffler.

TAIL PIPE INSTALLATION

1. Install flapper valve (Figure 8, Item 29), bolt (Figure 8, Item 30), and nut (Figure 8, Item 31) on tail pipe (Figure 8, Item 14).
2. Install new gasket (Figure 8, Item 20), tail pipe (Figure 8, Item 14), eight bolts (Figure 8, Item 18), and nuts (Figure 8, Item 19) on muffler (Figure 8, Item 9).
3. Install heat shield. Refer to *Heat Shield Installation* in this work package.

UPPER BRACKET REPLACEMENT

1. Remove heat shield. Refer to *Heat Shield Removal* in this work package.
2. Remove two bolts (Figure 9, Item 33), lockwashers (Figure 9, Item 34), and upper bracket (Figure 9, Item 3) from upper cover (Figure 9, Item 32). Discard lockwashers.
3. Install upper bracket (Figure 9, Item 3), two new lockwashers (Figure 9, Item 34), and bolts (Figure 9, Item 33) on upper cover (Figure 9, Item 32).
4. Install heat shield. Refer to *Heat Shield Installation* in this work package.

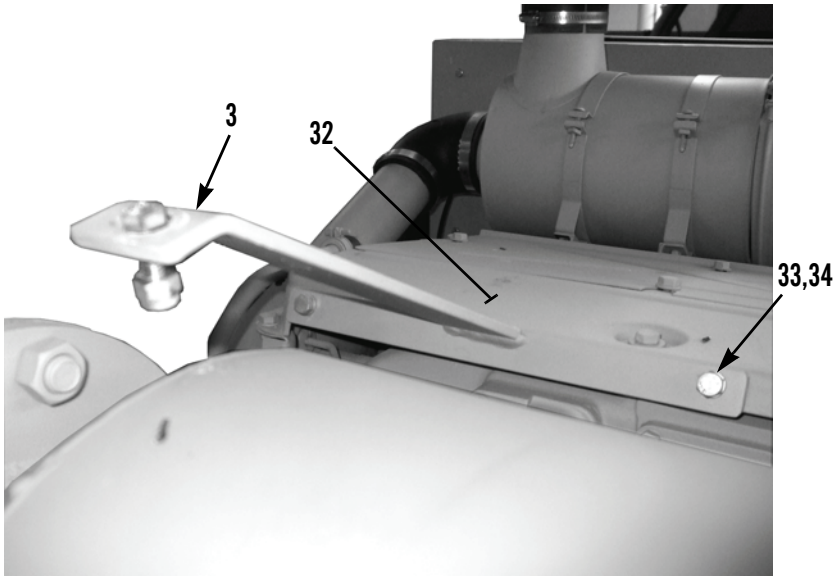


Figure 9. Upper Bracket and Upper Cover.

LOWER BRACKET REPLACEMENT

1. Remove heat shield. Refer to *Heat Shield Removal* in this work package.
2. Remove two bolts (Figure 10, Item 36), lockwashers (Figure 10, Item 37), and lower bracket (Figure 10, Item 6) from lower access plate (Figure 10, Item 35). Discard lockwashers.
3. Install lower bracket (Figure 10, Item 6), two new lockwashers (Figure 10, Item 37), and bolts (Figure 10, Item 36) on lower access plate (Figure 10, Item 35).
4. Install heat shield. Refer to *Heat Shield Installation* in this work package.

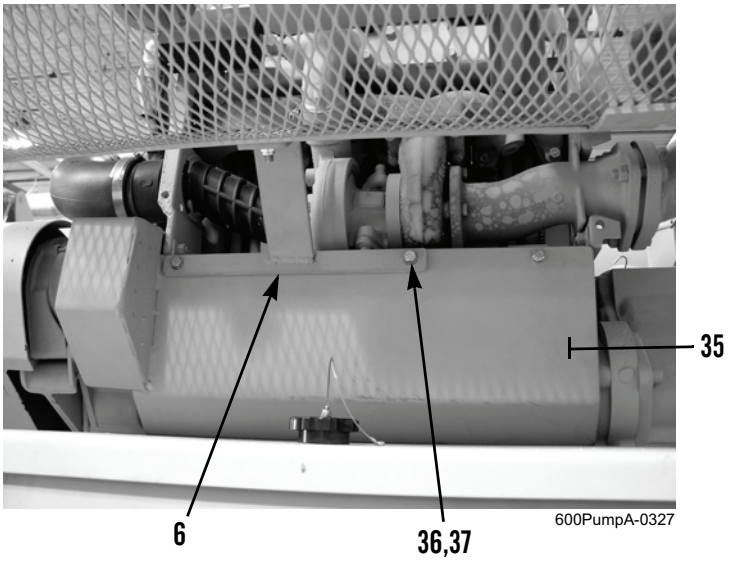


Figure 10. Lower Bracket at Lower Access Plate.

MUFFLER SUPPORT BRACKET REPLACEMENT

1. Remove heat shield. Refer to *Heat Shield Removal* in this work package.
2. Remove two nuts (Figure 11, Item 11) and clamp (Figure 11, Item 12) securing muffler (Figure 11, Item 9) to muffler support bracket (Figure 11, Item 13).
3. Remove two bolts (Figure 11, Item 38), locknuts (Figure 11, Item 39), and muffler support bracket (Figure 11, Item 13) from rear air duct wall (Figure 11, Item 40). Discard locknuts.
4. Install muffler support bracket (Figure 11, Item 13), two bolts (Figure 11, Item 38), and new locknuts (Figure 11, Item 39) on rear air duct wall (Figure 11, Item 40).
5. Install clamp (Figure 11, Item 12) and two nuts (Figure 11, Item 11) on muffler (Figure 11, Item 9) and muffler support bracket (Figure 11, Item 13).
6. Install heat shield. Refer to *Heat Shield Installation* in this work package.

MUFFLER SUPPORT BRACKET REPLACEMENT - CONTINUED

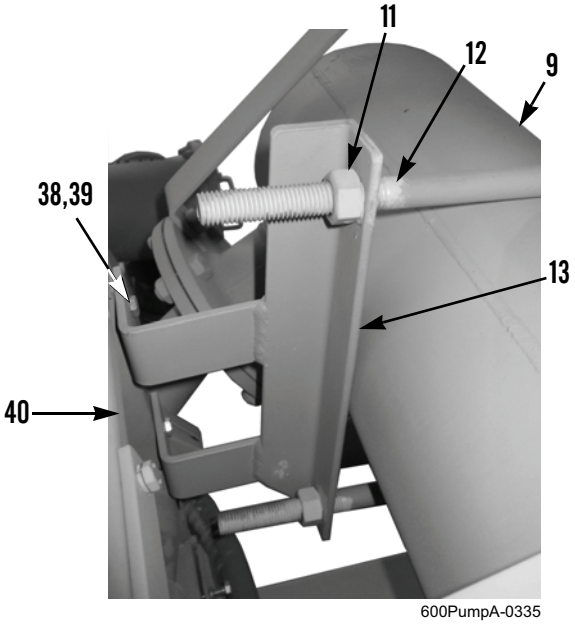


Figure 11. Muffler Support Bracket.

REAR BRACKET REPLACEMENT

1. Remove heat shield. Refer to *Heat Shield Removal* in this work package.
2. Remove nut (Figure 12, Item 16), bolt (Figure 12, Item 15), and rear bracket (Figure 12, Item 5) from flange of muffler (Figure 12, Item 9).
3. Install rear bracket (Figure 12, Item 5), bolt (Figure 12, Item 15), and nut (Figure 12, Item 16) on flange of muffler (Figure 12, Item 9).
4. Install heat shield. Refer to *Heat Shield Installation* in this work package.

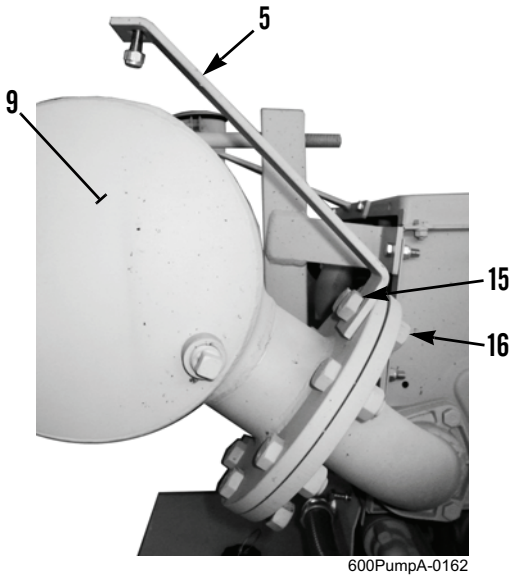


Figure 12. Rear Bracket.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

COOLING AIR DUCT PANELS REPLACEMENT

Upper Cooling Air Guide Plate Removal, Upper Cooling Air Guide Plate Installation, Lower Right Cooling Air Guide Plate Removal, Lower Right Cooling Air Guide Plate Installation, Lower Left Cooling Air Guide Plate Removal, Lower Left Cooling Air Guide Plate Installation, Front Air Duct Wall Removal, Front Air Duct Wall Installation, Rear Air Duct Wall Removal, Rear Air Duct Wall Installation

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Rag, wiping (Item 22, WP 0129)
Lockwasher (12)

Personnel Required

63J (1)

References

WP 0027
WP 0082

References - Continued

WP 0083
WP 0097
WP 0098
WP 0103
WP 0105
WP 0107

Equipment Condition

Upper access plate removed (WP 0068)
Oil cooler access plate removed (WP 0068)
Lower access plate removed (WP 0068)
Battery cables disconnected (WP 0033)

UPPER COOLING AIR GUIDE PLATE REMOVAL

1. Remove air cleaner housing assembly (WP 0097).
2. Remove upper bracket (WP 0107).
3. Remove six bolts (Figure 1, Item 5), nuts (Figure 1, Item 6), and 12 washers (Figure 1, Item 7) from upper cooling air guide plate (Figure 1, Item 3) and front and rear air duct walls (Figure 1, Items 4 and 8).
4. Remove bolt (Figure 1, Item 1) and washer (Figure 1, Item 2) from upper cooling air guide plate (Figure 1, Item 3).

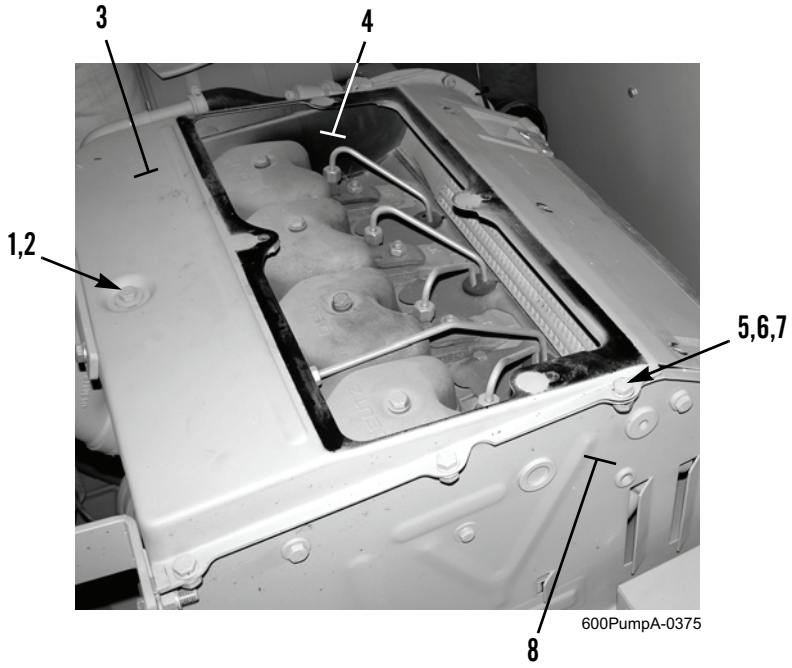


Figure 1. Upper Cooling Air Guide Plate.

UPPER COOLING AIR GUIDE PLATE REMOVAL - CONTINUED

NOTE

Spacer is between upper cooling air guide plate and intake manifold.

5. Remove upper cooling air guide plate (Figure 2, Item 3) from spacer (Figure 2, Item 9).
6. Remove spacer (Figure 2, Item 9) from intake manifold (Figure 2, Item 10).

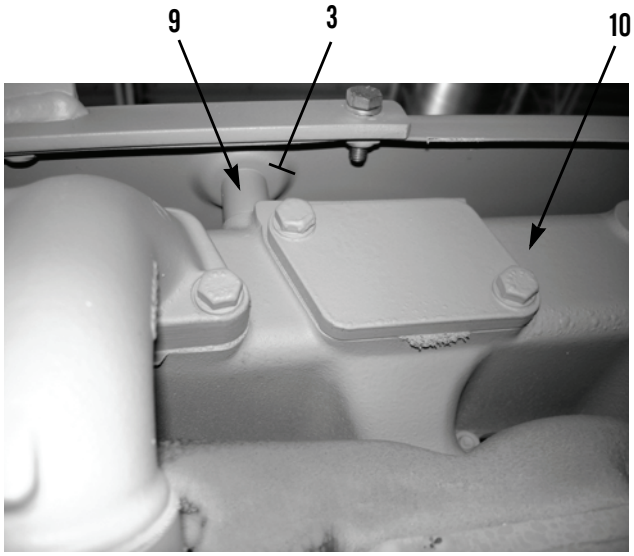


Figure 2. Spacer.

UPPER COOLING AIR GUIDE PLATE INSTALLATION

1. Install spacer (Figure 2, Item 9) on intake manifold (Figure 2, Item 10).
2. Install upper cooling air guide plate (Figure 2, Item 3) on spacer (Figure 2, Item 9).
3. Install washer (Figure 1, Item 2) and bolt (Figure 1, Item 1) on upper cooling air guide plate (Figure 1, Item 3).
4. Install 12 washers (Figure 1, Item 7), six bolts (Figure 1, Item 5), and nuts (Figure 1, Item 6) on upper cooling air guide plate (Figure 1, Item 3) and front and rear air duct walls (Figure 1, Items 4 and 8).
5. Install upper bracket (WP 0107).
6. Install air cleaner housing assembly (WP 0097).

LOWER RIGHT COOLING AIR GUIDE PLATE REMOVAL

1. Remove oil cooler (WP 0083).
2. Remove fuel injector lines (WP 0103).
3. Remove capscrew (Figure 3, Item 12), lockwasher (Figure 3, Item 13), and washer (Figure 3, Item 14) from lower right cooling air guide plate (Figure 3, Item 11). Discard lockwasher.
4. Remove three bolts (Figure 3, Item 17), lockwashers (Figure 3, Item 16), washers (Figure 3, Item 15), and lower right cooling air guide plate (Figure 3, Item 11) from engine block (Figure 3, Item 18). Discard lockwashers.

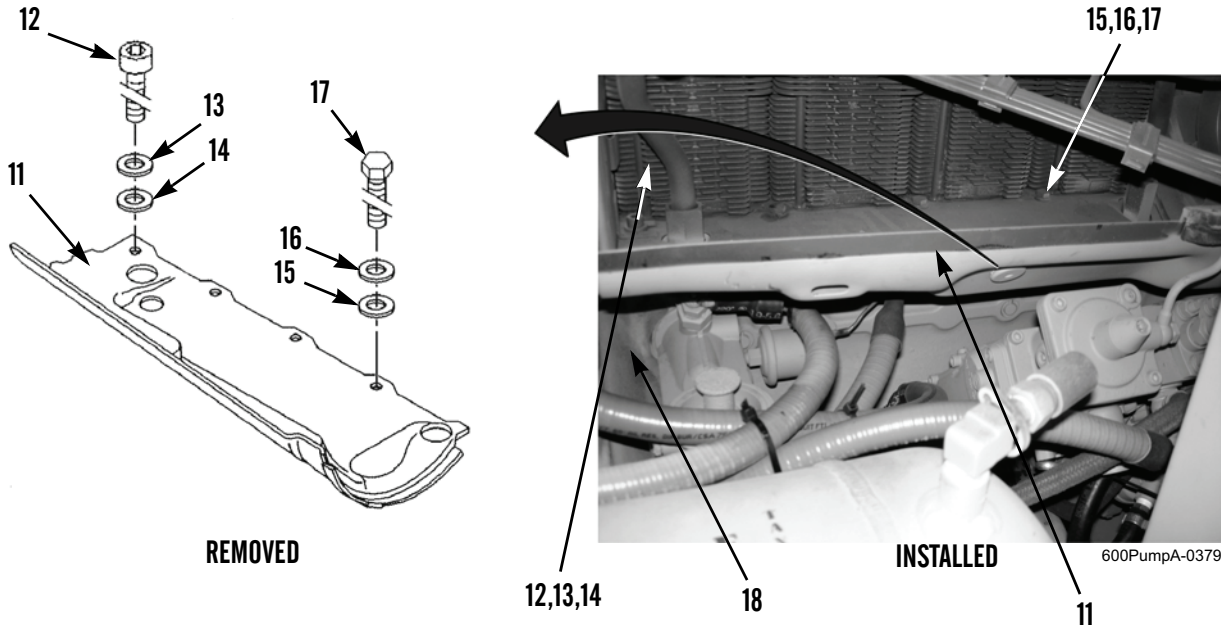


Figure 3. Lower Right Cooling Air Guide Plate.

LOWER RIGHT COOLING AIR GUIDE PLATE INSTALLATION

1. Install lower right cooling air guide plate (Figure 3, Item 11), three washers (Figure 3, Item 15), new lockwashers (Figure 3, Item 16), and bolts (Figure 3, Item 17) on engine block (Figure 3, Item 18).
2. Install washer (Figure 3, Item 14), new lockwasher (Figure 3, Item 13), and capscrew (Figure 3, Item 12) on lower right cooling air guide plate (Figure 3, Item 11) and engine block (Figure 3, Item 18).
3. Install fuel injector lines (WP 0103).
4. Install oil cooler (WP 0083).

LOWER LEFT COOLING AIR GUIDE PLATE REMOVAL

1. Remove turbocharger oil return line (WP 0098).
2. Remove two nuts (Figure 4, Item 19), bolts (Figure 4, Item 20), four washers (Figure 4, Item 21), and cap (Figure 4, Item 26) from lower left cooling air guide plate (Figure 4, Item 22).
3. Remove four bolts (Figure 4, Item 23), nuts (Figure 4, Item 24), eight washers (Figure 4, Item 25), and lower left cooling air guide plate (Figure 4, Item 22) from front and rear air duct walls (Figure 4, Items 4 and 8).

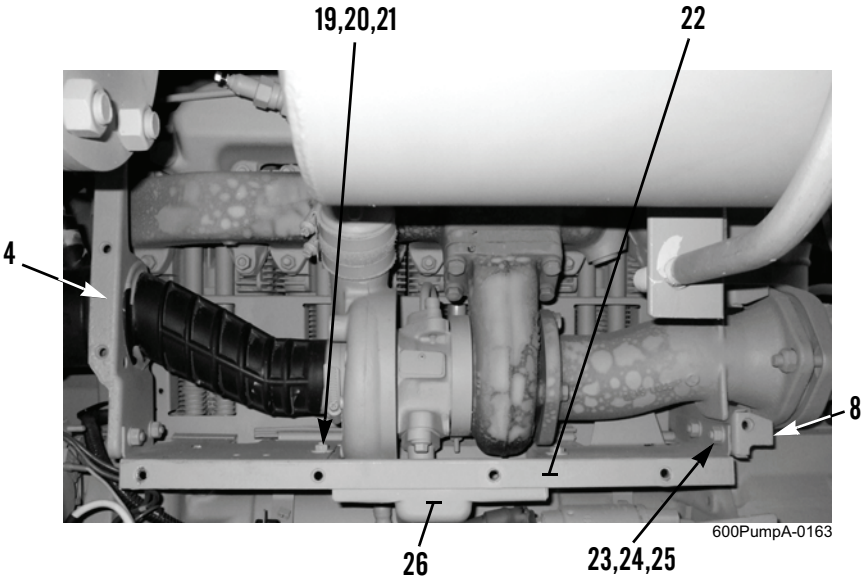


Figure 4. Lower Left Cooling Air Guide Plate.

LOWER LEFT COOLING AIR GUIDE PLATE INSTALLATION

1. Install lower left cooling air guide plate (Figure 4, Item 22) on front and rear air duct walls (Figure 4, Items 4 and 8) with eight washers (Figure 4, Item 25), four bolts (Figure 4, Item 23), and nuts (Figure 4, Item 24).
2. Install cap (Figure 4, Item 26) on lower left cooling air guide plate (Figure 4, Item 22) with four washers (Figure 4, Item 21), two bolts (Figure 4, Item 20), and nuts (Figure 4, Item 19).
3. Install turbocharger oil return line (WP 0098).

FRONT AIR DUCT WALL REMOVAL

1. Remove cooling fan (WP 0027).
2. Remove flame glow plug fuel lines and preheat fuel solenoid (WP 0105).
3. Remove crankcase breather (WP 0082).
4. Remove turbocharger air inlet elbow (WP 0098).
5. Remove two bolts (Figure 5, Item 27) and washers (Figure 5, Item 28) from front air duct wall (Figure 5, Item 4) and oil cooler.
6. Remove two bolts (Figure 5, Item 23), nuts (Figure 5, Item 24), and four washers (Figure 5, Item 25) from front air duct wall (Figure 5, Item 4) and lower left cooling air guide plate (Figure 5, Item 22).
7. Remove two bolts (Figure 5, Item 29), nuts (Figure 5, Item 30), and four washers (Figure 5, Item 31) from front air duct wall (Figure 5, Item 4) and upper cooling air guide plate (Figure 5, Item 3).
8. Remove two bolts (Figure 5, Item 33), lockwashers (Figure 5, Item 34), and washers (Figure 5, Item 35) from left cooling air baffle. Discard lockwashers.
9. Remove bolt (Figure 5, Item 39), lockwasher (Figure 5, Item 40), and washer (Figure 5, Item 41) from left cooling air baffle. Discard lockwasher.
10. Remove two bolts (Figure 5, Item 36), lockwashers (Figure 5, Item 37), washers (Figure 5, Item 38), and front air duct wall (Figure 5, Item 4) from engine. Discard lockwashers.
11. If necessary, remove grommet (Figure 5, Item 32) from front air duct wall (Figure 5, Item 4).

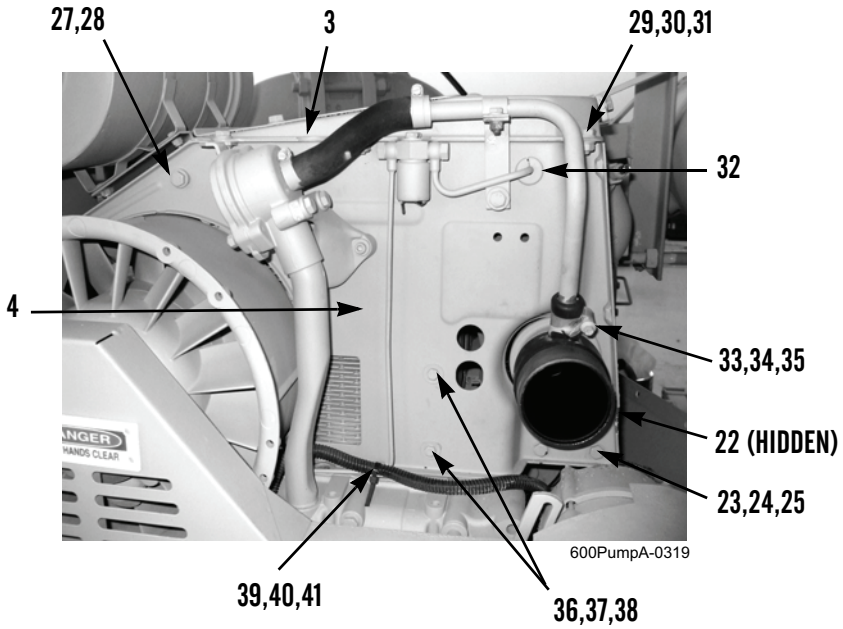


Figure 5. Front Air Duct Wall.

FRONT AIR DUCT WALL INSTALLATION

1. If removed, install grommet (Figure 5, Item 32) in front air duct wall (Figure 5, Item 4).
2. Install front air duct wall (Figure 5, Item 4), two washers (Figure 5, Item 38), new lockwashers (Figure 5, Item 37), and bolts (Figure 5, Item 36) on engine.
3. Install washer (Figure 5, Item 41), new lockwasher (Figure 5, Item 40), and bolt (Figure 5, Item 39) on left cooling air baffle.
4. Install two washers (Figure 5, Item 35), new lockwashers (Figure 5, Item 34), and bolts (Figure 5, Item 33) on left cooling air baffle.
5. Install four washers (Figure 5, Item 31), two bolts (Figure 5, Item 29), and nuts (Figure 5, Item 30) on front air duct wall (Figure 5, Item 4) and upper cooling air guide plate (Figure 5, Item 3).
6. Install four washers (Figure 5, Item 25), two bolts (Figure 5, Item 23), and nuts (Figure 5, Item 24) on front air duct wall (Figure 5, Item 4) and lower left cooling air guide plate (Figure 5, Item 22).
7. Install two washers (Figure 5, Item 28) and bolts (Figure 5, Item 27) on front air duct wall (Figure 5, Item 4) and oil cooler.
8. Install turbocharger air inlet elbow (WP 0098).
9. Install crankcase breather (WP 0082).
10. Install flame glow plug fuel lines and preheat fuel solenoid (WP 0105).
11. Install cooling fan (WP 0027).

REAR AIR DUCT WALL REMOVAL

1. Remove muffler support bracket (WP 0107).
2. Remove oil cooler access plate (WP 0068).
3. Remove three bolts (Figure 6, Item 42), nuts (Figure 6, Item 43), and six washers (Figure 6, Item 44) from rear air duct wall (Figure 6, Item 8) and upper cooling air guide plate (Figure 6, Item 3).
4. Remove two bolts (Figure 6, Item 46) and washers (Figure 6, Item 47) from rear air duct wall (Figure 6, Item 8) and oil cooler.

NOTE

Spacer is located on rear air duct wall, between rear air duct wall and intake manifold.

5. Remove bolt (Figure 6, Item 53), washer (Figure 6, Item 54), and spacer (Figure 6, Item 55) from rear air duct wall (Figure 6, Item 8) and intake manifold.
6. Remove two bolts (Figure 6, Item 23), nuts (Figure 6, Item 24), and four washers (Figure 6, Item 25) from rear air duct wall (Figure 6, Item 8) and lower left cooling air guide plate (Figure 6, Item 22).
7. Remove three bolts (Figure 6, Item 50), lockwashers (Figure 6, Item 51), and washers (Figure 6, Item 52) from rear air duct wall (Figure 6, Item 8). Discard lockwashers.
8. Remove bolt (Figure 6, Item 48), washer (Figure 6, Item 49), and rear air duct wall (Figure 6, Item 8) from engine.
9. If necessary, remove four grommets (Figure 6, Item 45) from rear air duct wall (Figure 6, Item 8).

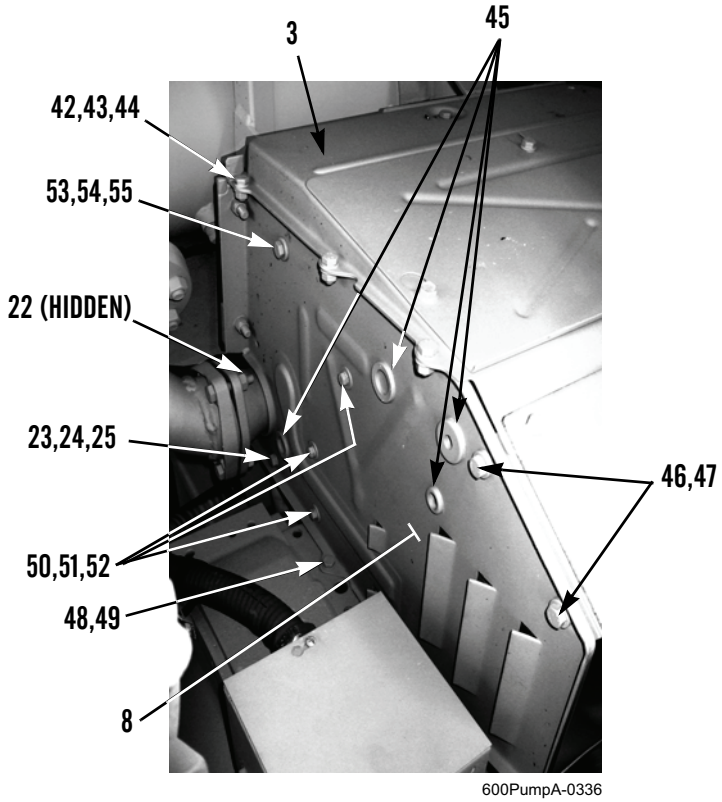


Figure 6. Rear Air Duct Wall.

REAR AIR DUCT WALL INSTALLATION

1. If removed, install four grommets (Figure 6, Item 45) in rear air duct wall (Figure 6, Item 8).
2. Install rear air duct wall (Figure 6, Item 8), washer (Figure 6, Item 49), and bolt (Figure 6, Item 48) on engine.
3. Install three washers (Figure 6, Item 52), new lockwashers (Figure 6, Item 51), and bolts (Figure 6, Item 50) on rear air duct wall (Figure 6, Item 8).
4. Install four washers (Figure 6, Item 25), two bolts (Figure 6, Item 23), and nuts (Figure 6, Item 24) on rear air duct wall (Figure 6, Item 8) and lower left cooling air guide plate (Figure 6, Item 22).
5. Install spacer (Figure 6, Item 55), washer (Figure 6, Item 54), and bolt (Figure 6, Item 53) on rear air duct wall (Figure 6, Item 8) and intake manifold.
6. Install two washers (Figure 6, Item 47) and bolts (Figure 6, Item 46) on rear air duct wall (Figure 6, Item 8) and oil cooler.
7. Install six washers (Figure 6, Item 44), three bolts (Figure 6, Item 42), and nuts (Figure 6, Item 43) on rear air duct wall (Figure 6, Item 8) and upper cooling air guide plate (Figure 6, Item 3).
8. Install oil cooler access plate (WP 0068).
9. Install muffler support bracket (WP 0107).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

STARTER AND STARTER SOLENOID REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Rag, wiping (Item 22, WP 0129)
Tag, marker (Item 27, WP 0129)

Personnel Required

63J (1)

References

WP 0006
WP 0023

Equipment Condition

Battery cables disconnected from batteries (WP 0033)
Lower access plate removed (WP 0068)

WARNING

Ensure battery cables are disconnected before replacing starter. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

NOTE

Tag wires before removal to ensure correct installation.

1. Remove nut (Figure 1, Item 2), positive battery cable (Figure 1, Item 3), and wire (Figure 1, Item 1) from upper stud of starter solenoid (Figure 1, Item 4).
2. Remove screw (Figure 1, Item 5), terminal lug (Figure 1, Item 6), and wire (Figure 1, Item 7) from starter solenoid (Figure 1, Item 4).

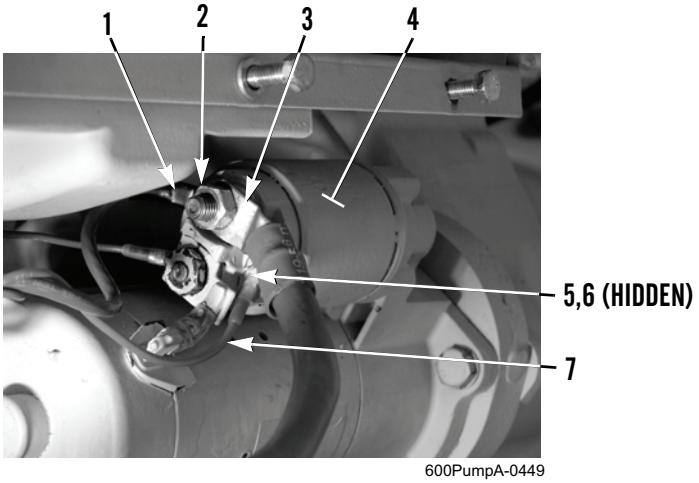


Figure 1. Starter Solenoid and Wires.

REMOVAL - CONTINUED

3. Remove three bolts (Figure 2, Item 9), washers (Figure 2, Item 10), and negative cable (Figure 2, Item 12) from starter (Figure 2, Item 8).
4. Remove starter (Figure 2, Item 8) from engine flywheel housing (Figure 2, Item 11).

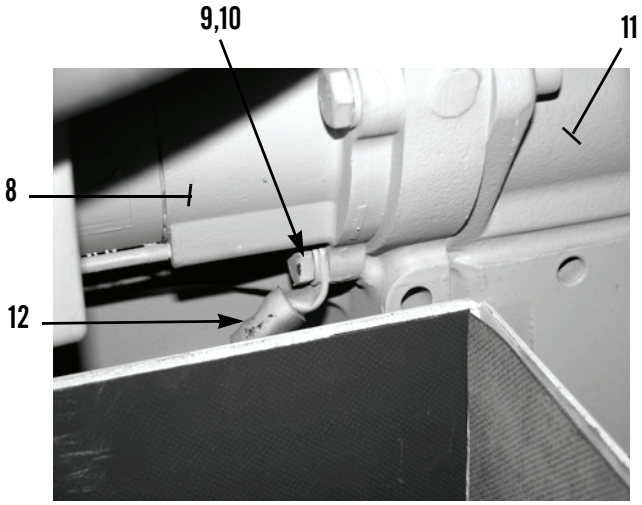


Figure 2. Starter.

5. Remove nut (Figure 3, Item 14) and wire (Figure 3, Item 13) from starter solenoid (Figure 3, Item 4).

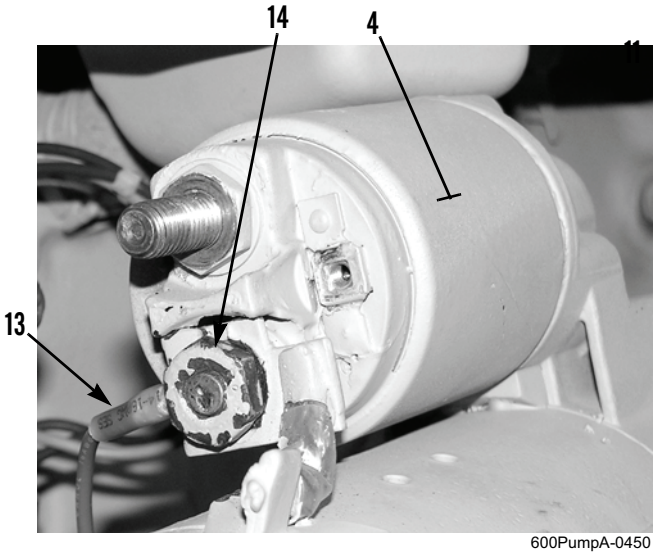


Figure 3. Starter Solenoid and Wire.

REMOVAL - CONTINUED

6. Remove cable (Figure 4, Item 15) from lower stud of starter solenoid (Figure 4, Item 4).

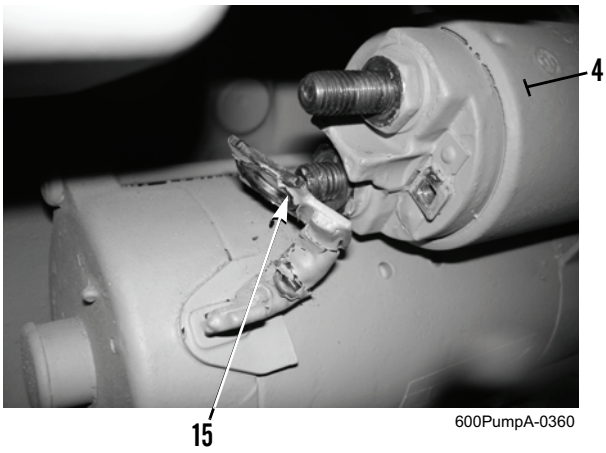


Figure 4. Starter Solenoid and Cable.

7. Remove three screws (Figure 5, Item 16) and starter solenoid (Figure 5, Item 4) from starter (Figure 5, Item 8).

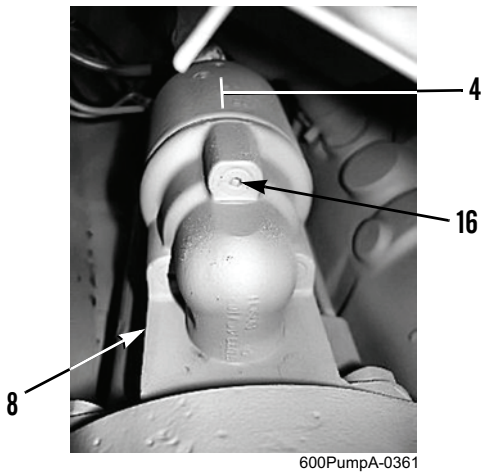


Figure 5. Starter Solenoid.

CLEANING AND INSPECTION

Clean and inspect all parts IAW WP 0023.

INSTALLATION

1. Install starter solenoid (Figure 5, Item 4) to starter (Figure 5, Item 8) with three screws (Figure 5, Item 16).
2. Install cable (Figure 4, Item 15) to lower stud of starter solenoid (Figure 4, Item 4).
3. Install wire (Figure 3, Item 13) and nut (Figure 3, Item 14) to starter solenoid (Figure 3, Item 4).
4. Position starter (Figure 2, Item 8) on engine flywheel housing (Figure 2, Item 11).
5. Install negative cable (Figure 2, Item 12), three washers (Figure 2, Item 10), and bolts (Figure 2, Item 9) to starter (Figure 2, Item 8).

INSTALLATION

6. Install wire (Figure 6, Item 7), terminal lug (Figure 6, Item 6), and screw (Figure 6, Item 5) to starter solenoid (Figure 6, Item 4).
7. Install wire (Figure 6, Item 1), positive battery cable (Figure 6, Item 3), and nut (Figure 6, Item 2) to upper stud of starter solenoid (Figure 6, Item 4).

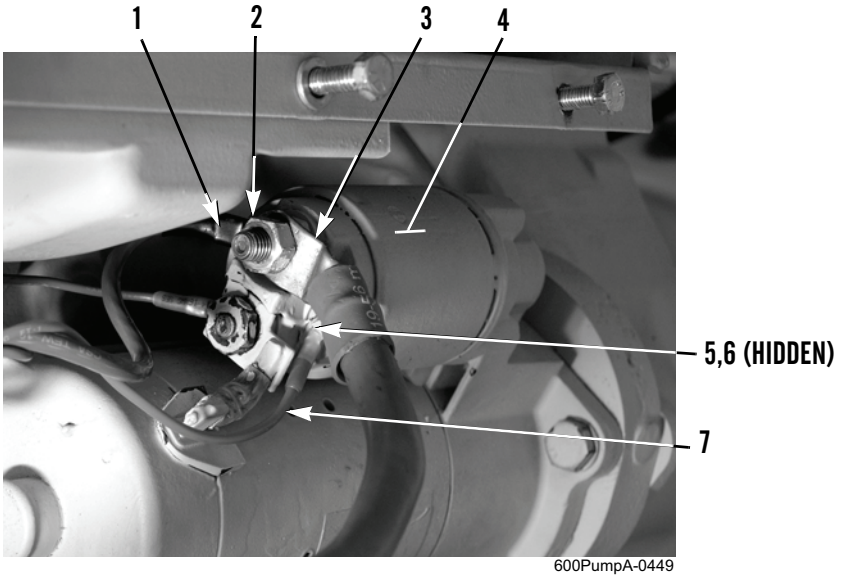


Figure 6. Starter Solenoid and Wires.

FOLLOW-ON TASKS

1. Install lower access plate (WP 0068).
2. Connect battery cables to batteries (WP 0033).

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

3. Ensure pump volute is filled 2/3 full with appropriate fluid, then start engine to ensure it starts correctly (WP 0006).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

CONTROL PANEL BOX REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Materials/Parts

Rag, wiping (Item 22, WP 0129)
Tag, marker (Item 27, WP 0129)
Locknut (11)

Personnel Required

63J (2)

References

WP 0023

Equipment Condition

Battery cables disconnected (WP 0033)
Suction and pressure gauges drained (WP 0006)

WARNING

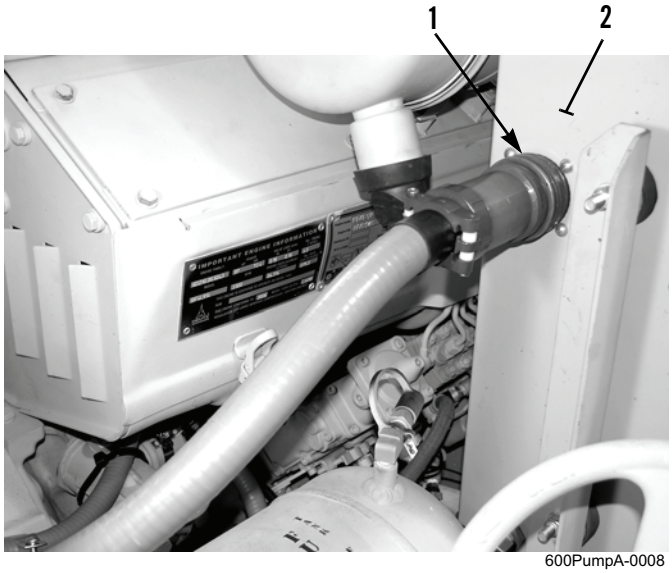
Ensure battery cables are disconnected before removing control panel box. Failure to follow this warning could result in personal injury or damage to equipment.

REMOVAL

NOTE

Tag cables, wires, hoses, lines, and connectors before removal to ensure correct installation.

1. Disconnect wiring harness cable connector (Figure 1, Item 1) from control panel box (Figure 1, Item 2).



600PumpA-0008

Figure 1. Control Panel Box and Wiring Harness Cable Connector.

REMOVAL - CONTINUED

2. Disconnect air filter restriction indicator vacuum hose (Figure 2, Item 3) from fitting (Figure 2, Item 4) on air cleaner housing.

600Pump-0367

Figure 2. Vacuum Hose.

REMOVAL - CONTINUED

3. Disconnect hose coupler (Figure 3, Item 5) from fitting on side of control panel box (Figure 3, Item 2).
4. Disconnect hose coupler (Figure 3, Item 8) from fitting on bottom of control panel box (Figure 3, Item 2).
5. Disconnect hose coupler (Figure 3, Item 9) from fitting on bottom of control panel box (Figure 3, Item 2).
6. Remove bolt (Figure 3, Item 6) and disconnect throttle linkage cable (Figure 3, Item 7) from fuel injector pump linkage (Figure 3, Item 10).

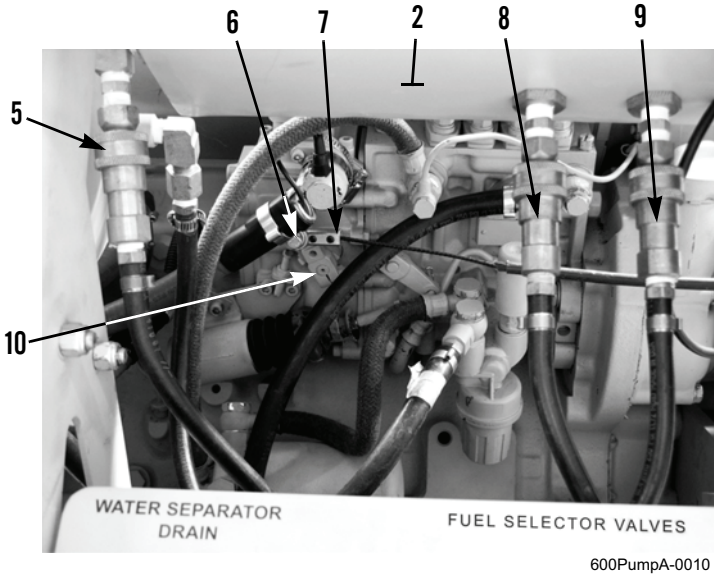


Figure 3. Hose Couplers and Throttle Linkage.

REMOVAL - CONTINUED

WARNING

Use caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may cause injury to personnel.

NOTE

Control panel box weighs approximately 57 lb (26 kg).

7. Remove three locknuts (Figure 4, Item 11), washers (Figure 4, Item 12), and control panel box (Figure 4, Item 2) from front and rear support brackets (Figure 4, Items 14 and 13). Discard locknuts.

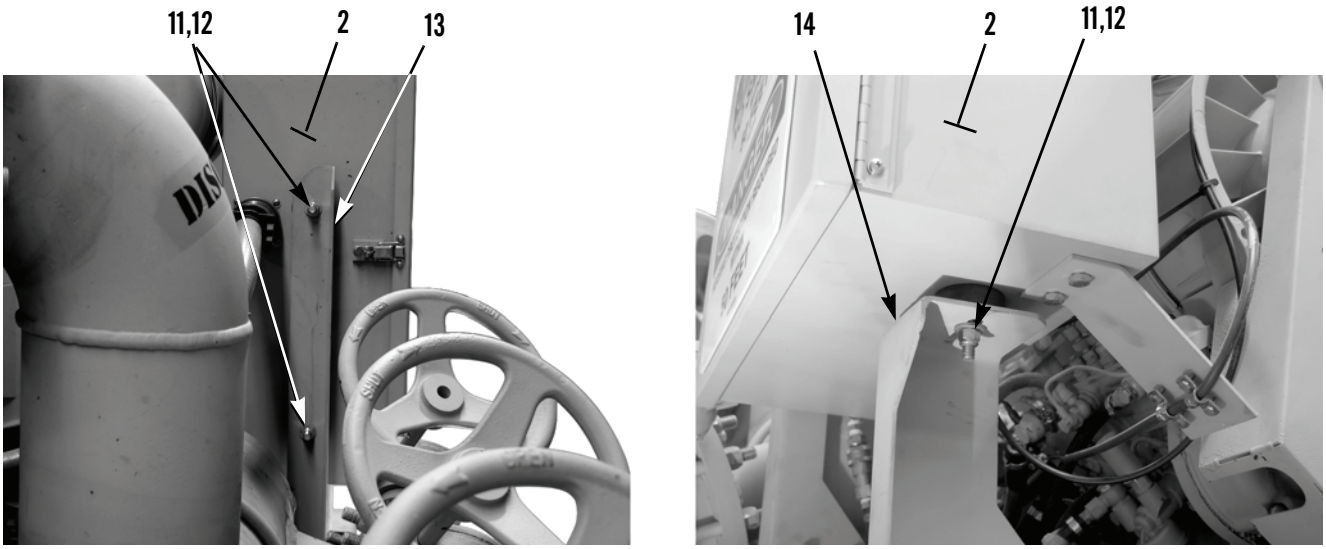


Figure 4. Control Panel Box Mounting.

REMOVAL - CONTINUED

8. If necessary, remove two bolts (Figure 5, Item 15), locknuts (Figure 5, Item 16), and fuel filter/water separator (Figure 5, Item 17) from rear support bracket (Figure 5, Item 13). Discard locknuts.
9. If necessary, remove three locknuts (Figure 5, Item 18), washers (Figure 5, Item 19), and front support bracket (Figure 5, Item 14) from trailer. Discard locknuts.
10. If necessary, remove three locknuts (Figure 5, Item 18), washers (Figure 5, Item 19), and rear support bracket (Figure 5, Item 13) from trailer. Discard locknuts.

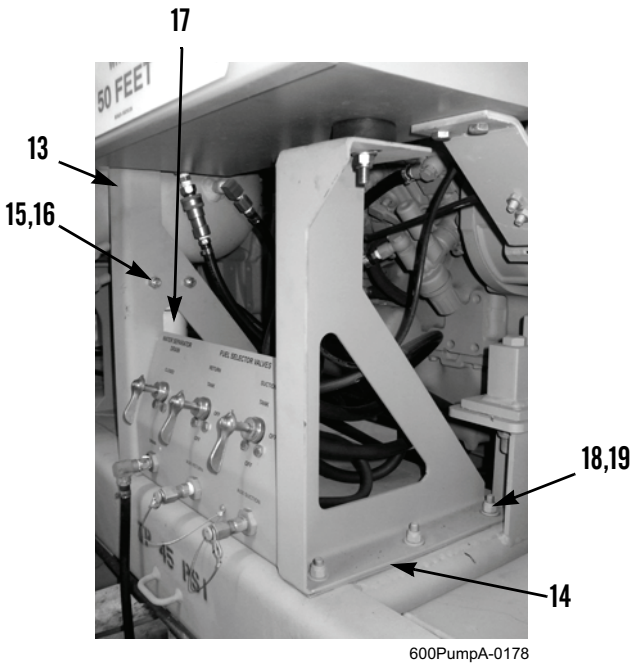


Figure 5. Fuel Filter/Water Separator and Support Brackets.

CLEANING AND INSPECTION

Clean and inspect all parts IAW WP 0023.

INSTALLATION

1. If removed, install front support bracket (Figure 5, Item 14), three washers (Figure 5, Item 19), and new locknuts (Figure 5, Item 18) on trailer.
2. If removed, install rear support bracket (Figure 5, Item 13), three washers (Figure 5, Item 19), and new locknuts (Figure 5, Item 18) on trailer.
3. If removed, install fuel filter/water separator (Figure 5, Item 17), two bolts (Figure 5, Item 15), and new locknuts (Figure 5, Item 16) to rear support bracket (Figure 5, Item 13).

INSTALLATION - CONTINUED

WARNING

Use caution when handling heavy parts. Provide adequate support and use assistance during procedure. Failure to follow this warning may cause injury to personnel.

NOTE

- Control panel box weighs approximately 57 lb (26 kg).
- Install cables, wires, hoses, lines, and connectors as tagged during removal.

4. Install control panel box (Figure 6, Item 2) on front and rear support brackets (Figure 6, Items 14 and 13) with three washer (Figure 6, Item 12) and new locknuts (Figure 6, Item 11).

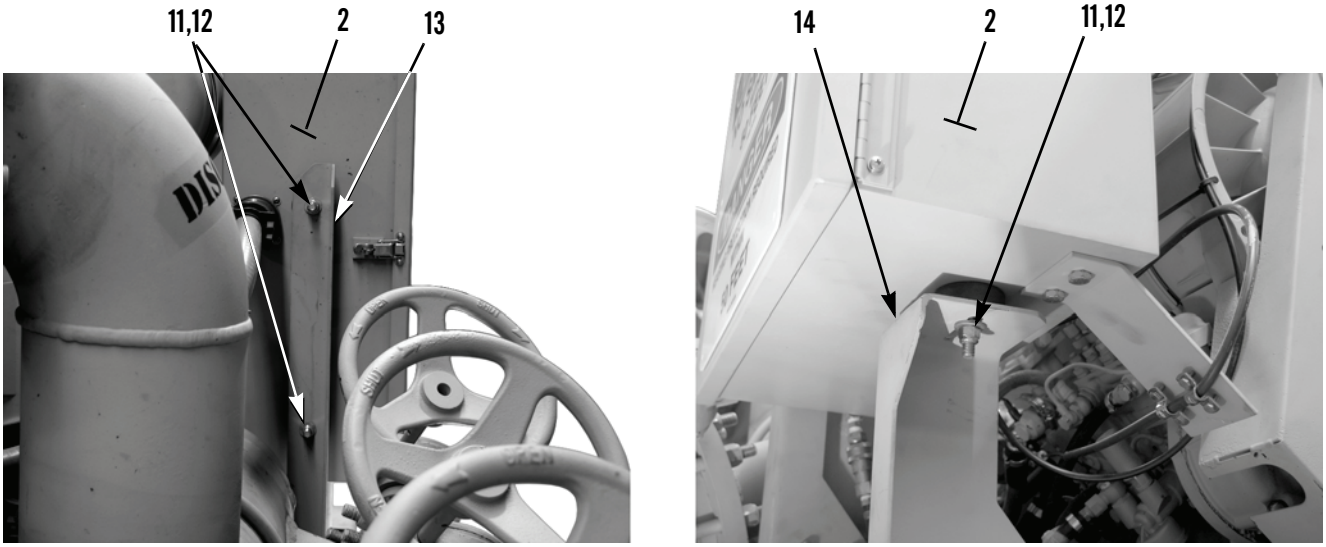


Figure 6. Control Panel Box Mounting.

INSTALLATION - CONTINUED

5. Install throttle linkage cable (Figure 7, Item 7) on fuel injector pump linkage (Figure 7, Item 10) with bolt (Figure 7, Item 6).
6. Connect hose coupler (Figure 7, Item 9) to fitting on bottom of control panel box (Figure 7, Item 2).
7. Connect hose coupler (Figure 7, Item 8) to fitting on bottom of control panel box (Figure 7, Item 2).
8. Connect hose coupler (Figure 7, Item 5) to fitting on side of control panel box (Figure 7, Item 2).

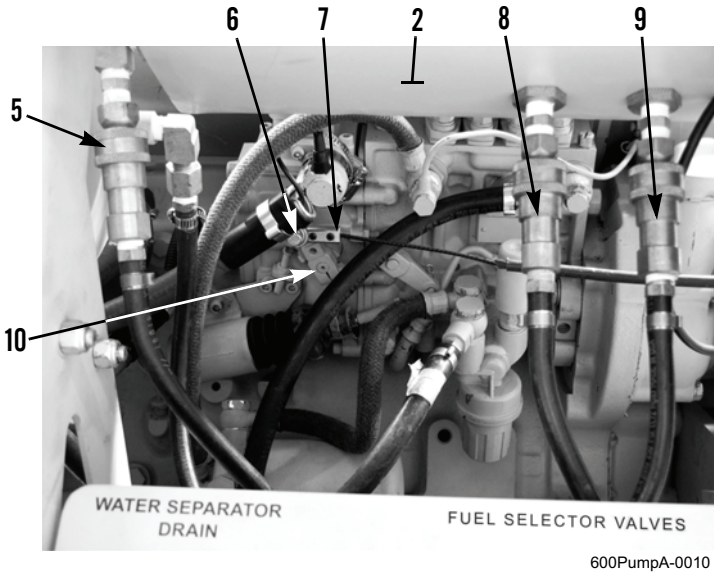


Figure 7. Hose Couplers and Throttle Linkage.

INSTALLATION - CONTINUED

9. Connect air filter restriction indicator vacuum hose (Figure 8, Item 3) to fitting (Figure 8, Item 4) on air cleaner housing.

Figure 8. Vacuum Hose.

10. Connect wiring harness cable connector (Figure 9, Item 1) to control panel box (Figure 9, Item 2).

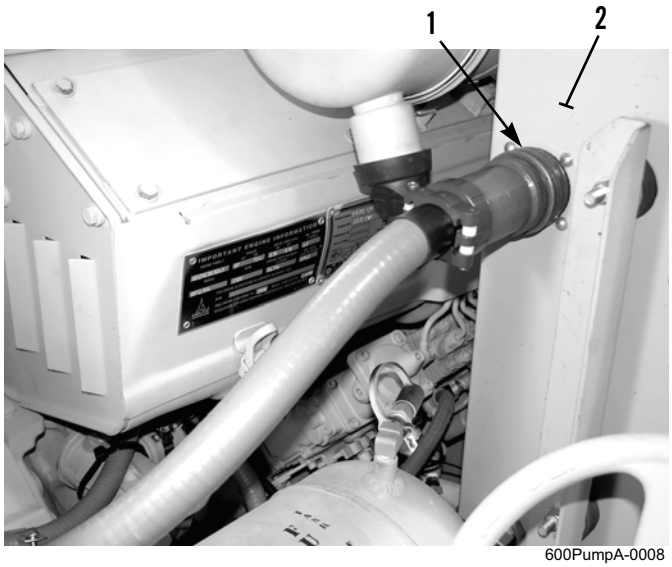


Figure 9. Control Panel Box and Wiring Harness Cable Connector.

FOLLOW-ON TASKS

Connect battery cables (WP 0033).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

CONTROL PANEL REPAIR

Panel Removal; Fuses Replacement; Panel Lights: Removal, Installation; Air Filter Restriction Indicator: Removal, Installation; Ammeter: Removal, Installation; Tachometer: Removal, Installation; Oil Temperature Gauge/Oil Pressure Gauge: Removal, Installation; Engine Start Switch: Removal, Installation; Blackout Light Switch: Removal, Installation; Alternator Light/Preheat Light/V-Belt Warning Light/Oil Temperature Warning Light/Oil Pressure Warning Light: Removal, Installation; Oil Pressure Bypass Switch: Removal, Installation; Suction Gauge/Pressure Gauge: Removal, Installation; Throttle Control Assembly: Removal, Installation; Suction Gauge Drain/Pressure Gauge Drain: Removal, Installation; Hi-Amp Fuse: Removal, Installation; K4 Preheat Relay: Removal, Installation; K1 Stopbox: Removal, Installation; TB2 Three-Gang Terminal Block: Removal, Installation; TB4 Two-Gang Terminal Block: Removal, Installation; Fuse Block: Removal, Installation; K2 Fuel Solenoid Relay: Removal, Installation; K3 Timer Override Power Relay: Removal, Installation; TB1 Terminal Block: Removal, Installation; TB3 Terminal Block: Removal, Installation; TMRI Preheat Timer: Removal, Installation; Connector Assembly: Removal, Installation; Inside Circuit Board Panel: Removal, Installation; Panel Installation; Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Insulating sleeving, electrical (Item 16, WP 0129)
Insulating varnish, electrical (Item 17, WP 0129)
Rag, wiping (Item 22, WP 0129)
Strap, tiedown, electrical components (Item 26, WP 0129)
Tag, marker (Item 27, WP 0129)
Tape, antiseizing (Item 28, WP 0129)
Hose clamp (8)
Locknut (18)

Materials/Parts - Continued

Lockwasher (7)
Screw/captured lockwasher (2)

Personnel Required

63J (1)

References

FP-1
WP 0008
WP 0024

Equipment Condition

Battery cables disconnected (WP 0033)
Control panel box removed, as required (WP 0110)

WARNING

Ensure battery cables are disconnected before repairing control panel, if control panel box is not removed. Failure to follow this warning could result in injury to personnel or damage to equipment.

NOTE

- Tag cables, wires, hoses, lines, and connectors before removal to ensure correct installation.
- As required, cut tiedown straps to assist in removal of components. Install new tiedown straps on installation.
- As required, refer to *Wiring Diagrams and Schematics* (FP-1) to assist in removal of components.
- After any part is replaced within control panel, ensure the *follow-on tasks* at the end of this work package are followed.

PANEL REMOVAL

Remove six wingnuts (Figure 1, Item 1) and panel (Figure 1, Item 2) from control panel box (Figure 1, Item 3).

600PumpA-0004

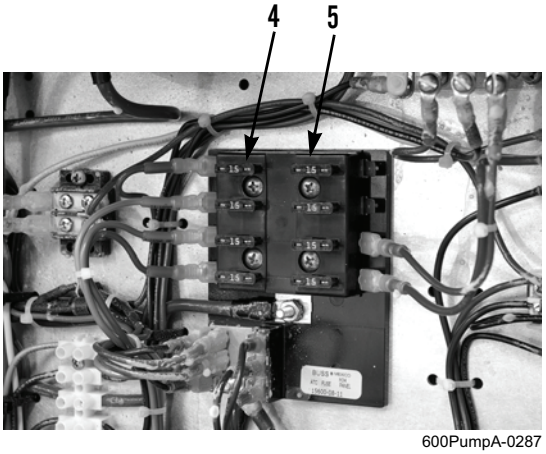
Figure 1. Control Panel Box.

FUSES REPLACEMENT

NOTE

There are eight fuses. They are replaced the same way. This task replaces one fuse.

1. Remove fuse (Figure 2, Item 4) from fuse block (Figure 2, Item 5).
2. Install fuse (Figure 2, Item 4) in fuse block (Figure 2, Item 5).



600PumpA-0287

Figure 2. Fuse Block.

PANEL LIGHTS REMOVAL

NOTE

There are two panel lights. They are replaced the same way. This task replaces one panel light.

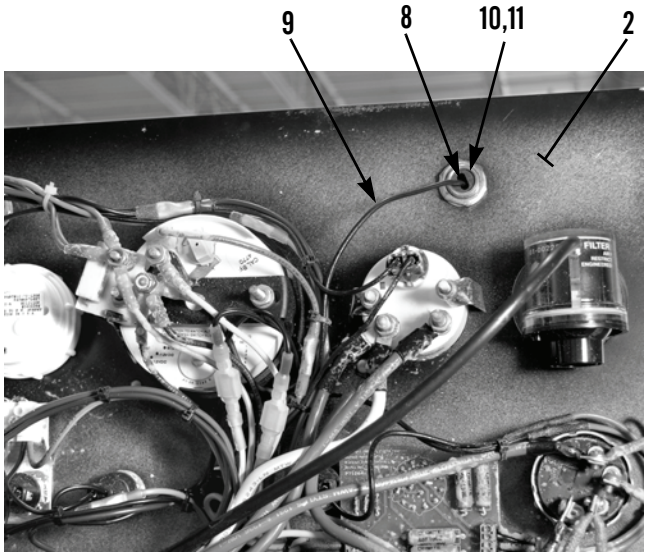
1. Remove cover (Figure 3, Item 6) and bulb (Figure 3, Item 7) from panel light (Figure 3, Item 8).

600PumpA-0004

Figure 3. Panel Light.

PANEL LIGHTS REMOVAL - CONTINUED

2. Cut panel light wire (Figure 4, Item 9).
3. Remove nut (Figure 4, Item 10), lockwasher (Figure 4, Item 11), and panel light (Figure 4, Item 8) from panel (Figure 4, Item 2). Discard lockwasher.



600PumpA-0337

Figure 4. Panel Light.

PANEL LIGHTS INSTALLATION

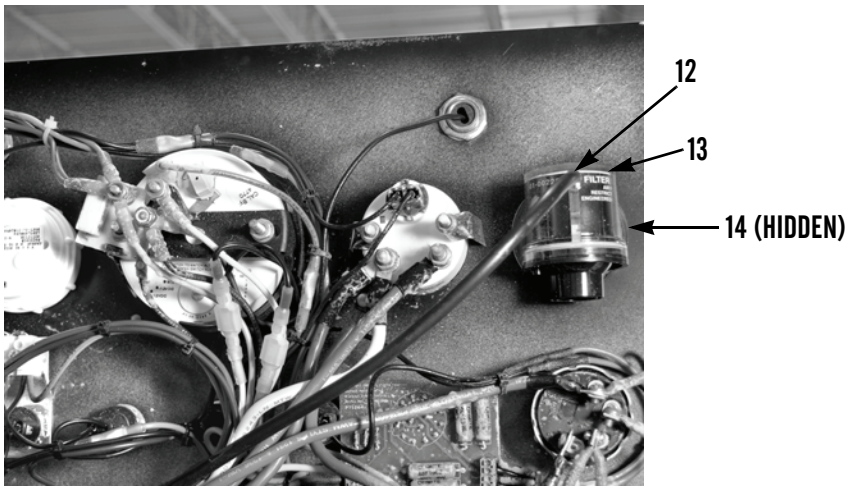
1. Install panel light (Figure 4, Item 8), new lockwasher (Figure 4, Item 11), and nut (Figure 4, Item 10) on panel (Figure 4, Item 2).
2. Splice panel light wire (Figure 4, Item 9) to wire leading to blackout light switch (WP 0024).
3. Install bulb (Figure 5, Item 7) and cover (Figure 5, Item 6) on panel light (Figure 5, Item 8).

600PumpA-0004

Figure 5. Panel Light.

AIR FILTER RESTRICTION INDICATOR REMOVAL

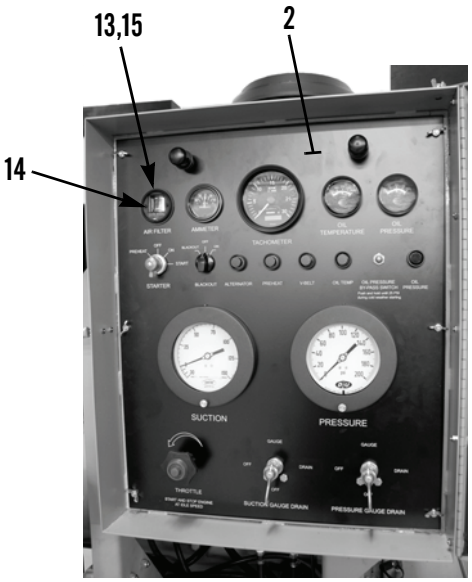
1. Disconnect hose (Figure 6, Item 12) from air filter restriction indicator (Figure 6, Item 13).



600PumpA-0337

Figure 6. Air Filter Restriction Indicator.

2. Remove two screws (Figure 7, Item 14) and cover (Figure 7, Item 15) and air filter restriction indicator (Figure 7, Item 13).



600PumpA-0004

Figure 7. Air Filter Restriction Indicator.

AIR FILTER RESTRICTION INDICATOR INSTALLATION

1. Install air filter restriction indicator (Figure 7, Item 13) on panel (Figure 7, Item 2).
2. Connect hose (Figure 6, Item 12) to air filter restriction indicator (Figure 6, Item 13).
3. Install cover (Figure 7, Item 15) and two screws (Figure 7, Item 14) on air filter restriction indicator (Figure 7, Item 13).

AMMETER REMOVAL

1. Disconnect light plug (Figure 8, Item 7) from ammeter (Figure 8, Item 19). If required, remove bulb (Figure 8, Item 18) from light plug.
2. Remove two nuts (Figure 8, Item 20) and lockwashers (Figure 8, Item 21) from ammeter (Figure 8, Item 19). Discard lockwashers.
3. Disconnect four wires (Figure 8, Item 22) from ammeter (Figure 8, Item 19).

NOTE

Do not discard rubber mounting seal.

4. Remove two nuts (Figure 8, Item 16) and ammeter (Figure 8, Item 19) from panel (Figure 8, Item 2).

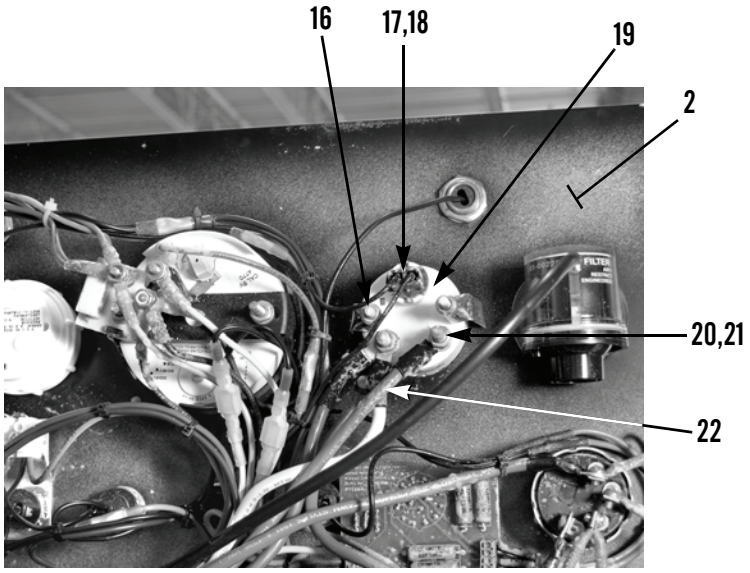


Figure 8. Ammeter.

AMMETER INSTALLATION

1. Install ammeter and rubber seal mounting (Figure 8, Item 19) and two nuts (Figure 8, Item 16) on panel (Figure 8, Item 2).
2. Connect four wires (Figure 8, Item 22) to ammeter (Figure 8, Item 19).
3. Install two new lockwashers (Figure 8, Item 21) and nuts (Figure 8, Item 20) on ammeter (Figure 8, Item 19).
4. If removed, install bulb (Figure 8, Item 18) in light plug (Figure 8, Item 17) and install light plug to ammeter (Figure 8, Item 19).

TACHOMETER REMOVAL

NOTE

Note location of components as they are removed to ensure correct installation.

1. Disconnect terminal of wire (Figure 9, Item 23) from tachometer (Figure 9, Item 24).
2. Remove nut (Figure 9, Item 26) and five wires (Figure 9, Item 25) from terminal of meter voltage regulator (Figure 9, Item 27).

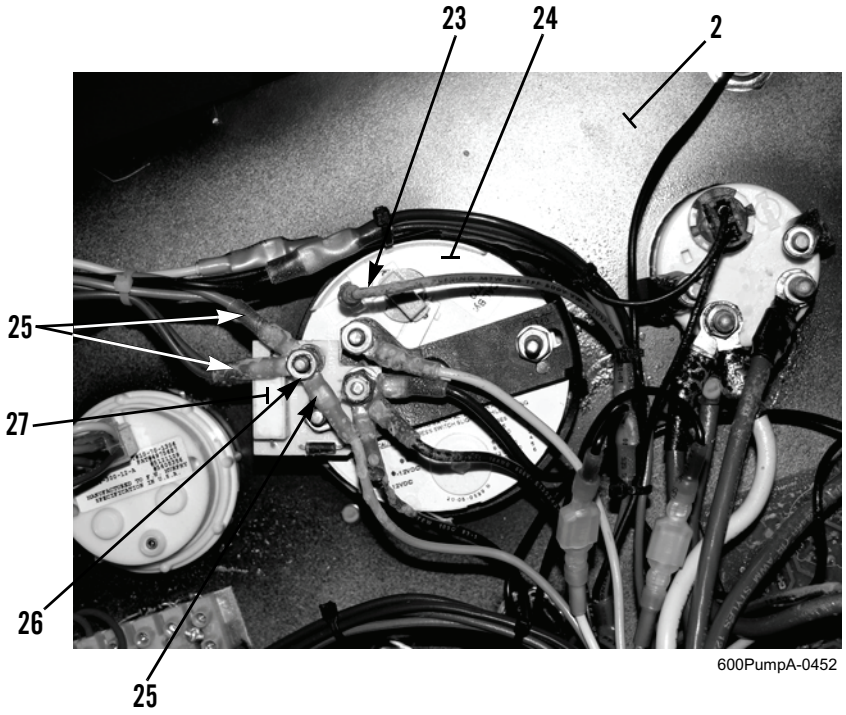


Figure 9. Tachometer Wires.

TACHOMETER REMOVAL - CONTINUED

3. Remove nut (Figure 10, Item 28) and wire (Figure 10, Item 29) from tachometer (Figure 10, Item 24).
4. Remove locknut (Figure 10, Item 31) and three wires (Figure 10, Item 30) from tachometer (Figure 10, Item 24). Discard locknut.

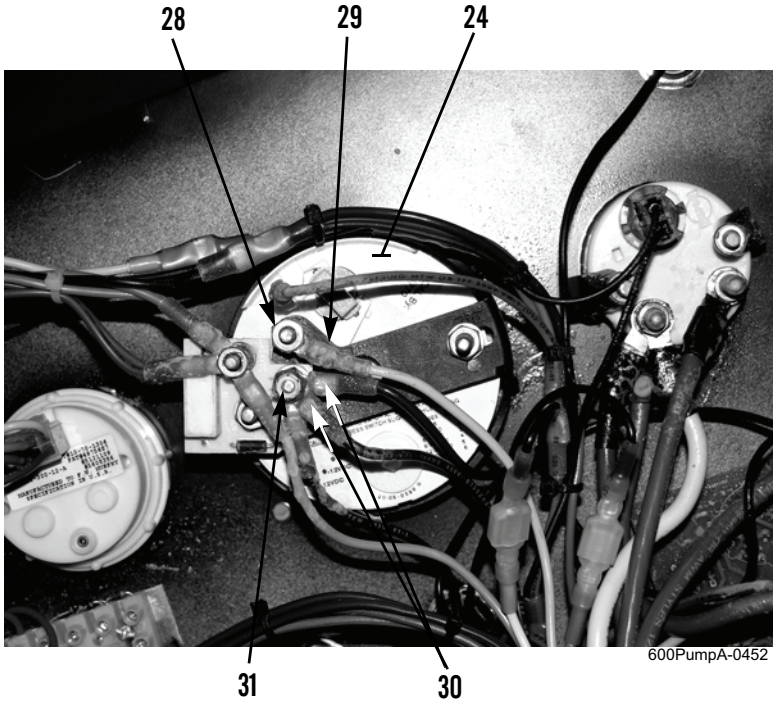


Figure 10. Tachometer Wires.

5. Remove three nuts (Figure 11, Item 32), lockwashers (Figure 11, Item 33), and washers (Figure 11, Item 34) from meter voltage regulator (Figure 11, Item 27) and tachometer bracket (Figure 11, Item 35). Remove meter voltage regulator. Discard lockwashers.

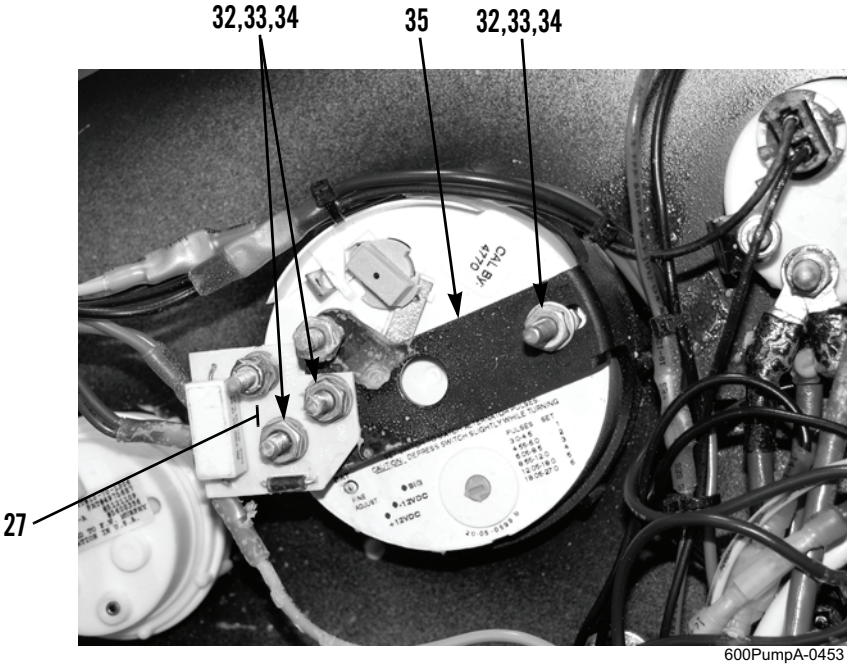


Figure 11. Tachometer Mounting.

TACHOMETER REMOVAL - CONTINUED

6. Remove two nuts (Figure 12, Item 36) and nut (Figure 12, Item 37).
7. Remove nut (Figure 12, Item 38), lockwasher (Figure 12, Item 39), washer (Figure 12, Item 40), tachometer bracket (Figure 12, Item 35), and tachometer (Figure 12, Item 24) from panel (Figure 12, Item 2). Discard lockwashers.

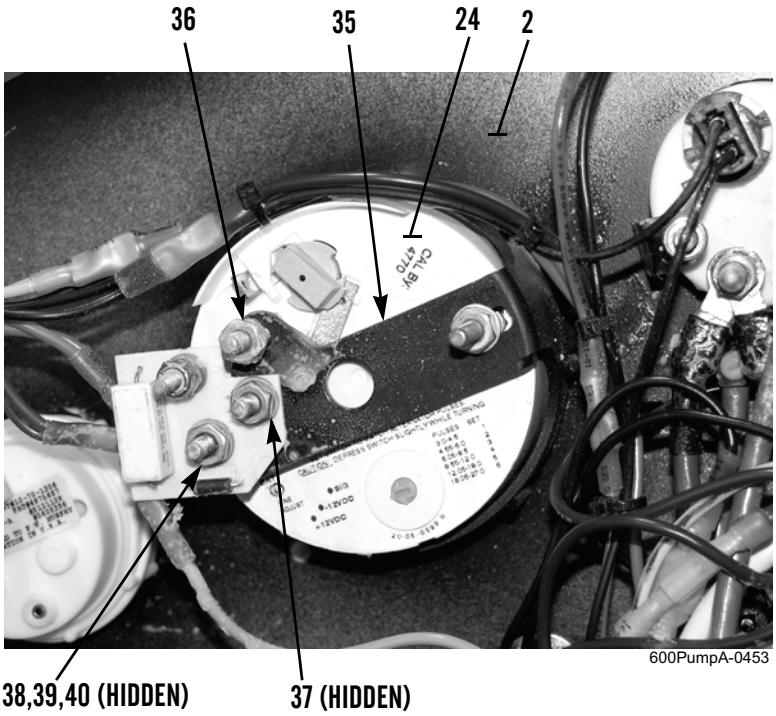


Figure 12. Tachometer Mounting.

TACHOMETER INSTALLATION

1. Install tachometer (Figure 12, Item 24) and tachometer bracket (Figure 12, Item 35) on panel (Figure 12, Item 2) and secure with washer (Figure 12, Item 40), new lockwasher (Figure 12, Item 39), and nut (Figure 12, Item 38).
2. Install nut (Figure 12, Item 37) and two nuts (Figure 12, Item 36).
3. Position meter voltage regulator (Figure 11, Item 27) on tachometer bracket (Figure 11, Item 35) and install three washers (Figure 12, Item 34), new lockwashers (Figure 11, Item 33), and nuts (Figure 11, Item 32).
4. Install three wires (Figure 11, Item 30) on tachometer (Figure 12, Item 24) with new locknut (Figure 12, Item 31).
5. Install wire (Figure 10, Item 29) on tachometer (Figure 12, Item 24) with nut (Figure 10, Item 28).

TACHOMETER INSTALLATION - CONTINUED

6. Install five wires (Figure 13, Item 25) on terminal of meter voltage regulator (Figure 13, Item 27) with nut (Figure 13, Item 26).
7. Connect terminal of wire (Figure 13, Item 23) to tachometer (Figure 13, Item 24).

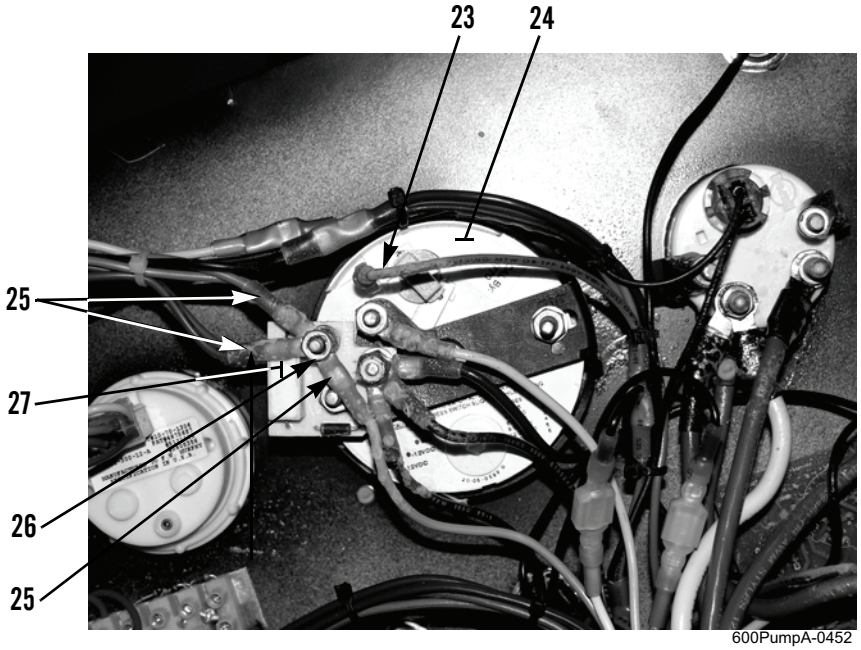


Figure 13. Tachometer Wires.

OIL TEMPERATURE GAUGE/OIL PRESSURE GAUGE REMOVAL

NOTE

Oil temperature gauge and oil pressure gauge are replaced the same way. This task replaces oil temperature gauge.

1. Disconnect connector (Figure 14, Item 43) from oil temperature gauge (Figure 14, Item 41).
2. Remove retaining nut (Figure 14, Item 42) and oil temperature gauge (Figure 14, Item 41) from panel (Figure 14, Item 2).

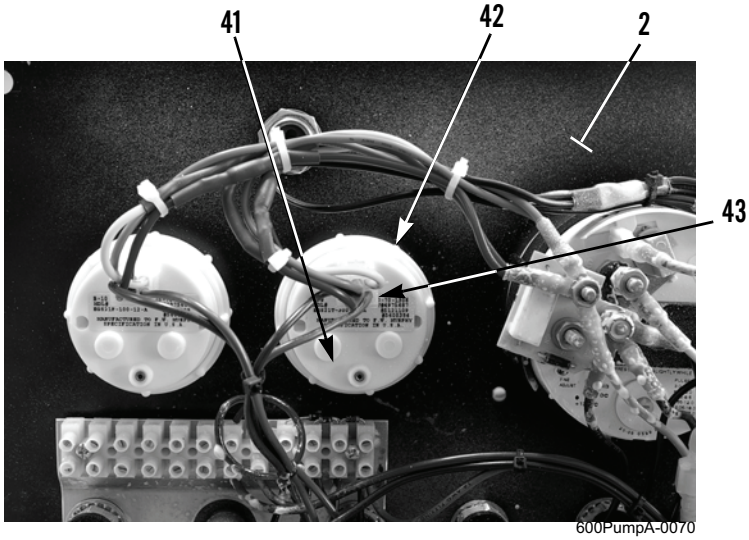


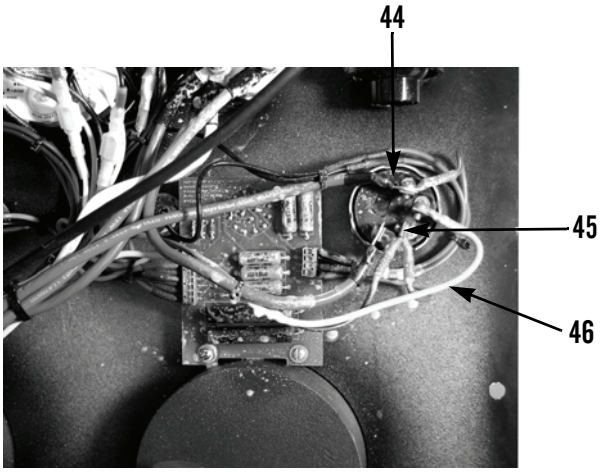
Figure 14. Oil Temperature Gauge.

OIL TEMPERATURE GAUGE/OIL PRESSURE GAUGE INSTALLATION

1. Install oil temperature gauge (Figure 14, Item 41) and retaining nut (Figure 14, Item 42) on panel (Figure 14, Item 2).
2. Connect connector (Figure 14, Item 43) to oil temperature gauge (Figure 14, Item 41).

ENGINE START SWITCH REMOVAL

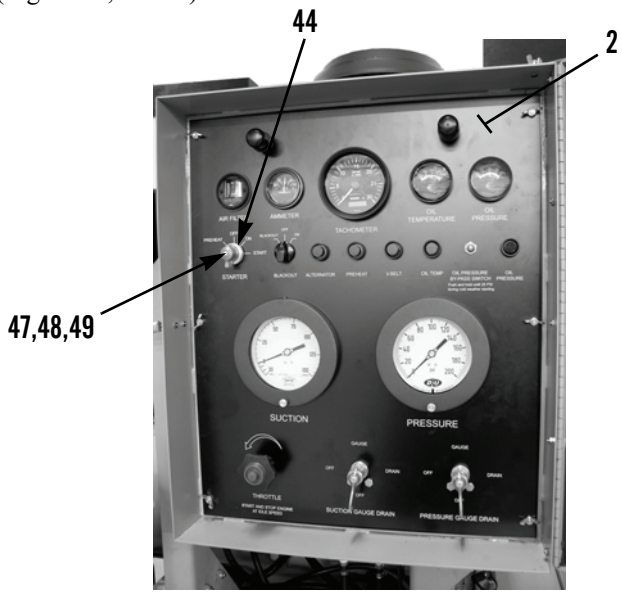
1. Remove four screws (Figure 15, Item 45) and disconnect six wires (Figure 15, Item 46) from engine start switch (Figure 15, Item 44).



600PumpA-0338

Figure 15. Engine Start Switch (Back of Panel).

2. Remove screw (Figure 16, Item 48), knob (Figure 16, Item 47), nut (Figure 16, Item 49), and engine start switch (Figure 15, Item 44) from panel (Figure 16, Item 2).



600PumpA-0004

Figure 16. Engine Start Switch (Front of Panel).

ENGINE START SWITCH INSTALLATION

1. Install engine start switch (Figure 16, Item 44), nut (Figure 16, Item 49), knob (Figure 16, Item 47), and screw (Figure 16, Item 48) on panel (Figure 16, Item 2).
2. Connect six wires (Figure 15, Item 46) and install four screws (Figure 15, Item 45) on engine start switch (Figure 15, Item 44).

BLACKOUT LIGHT SWITCH REMOVAL

1. Loosen setscrew (Figure 17, Item 51) in knob (Figure 17, Item 52).
2. Remove knob (Figure 17, Item 52) and nut (Figure 17, Item 53) from blackout light switch (Figure 17, Item 50).

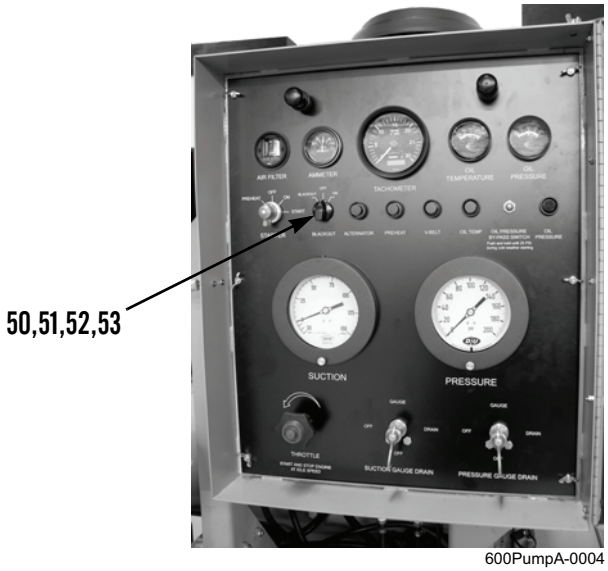


Figure 17. Blackout Light Switch.

3. Loosen screws (Figure 18, Item 54) and disconnect wires (Figure 18, Item 55) from blackout light switch (Figure 18, Item 50).
4. Remove two screws (Figure 18, Item 57), washers (Figure 18, Item 58), and spacers (Figure 18, Item 56) from blackout light switch (Figure 18, Item 50).
5. Remove blackout light switch (Figure 18, Item 50) from panel (Figure 18, Item 2).

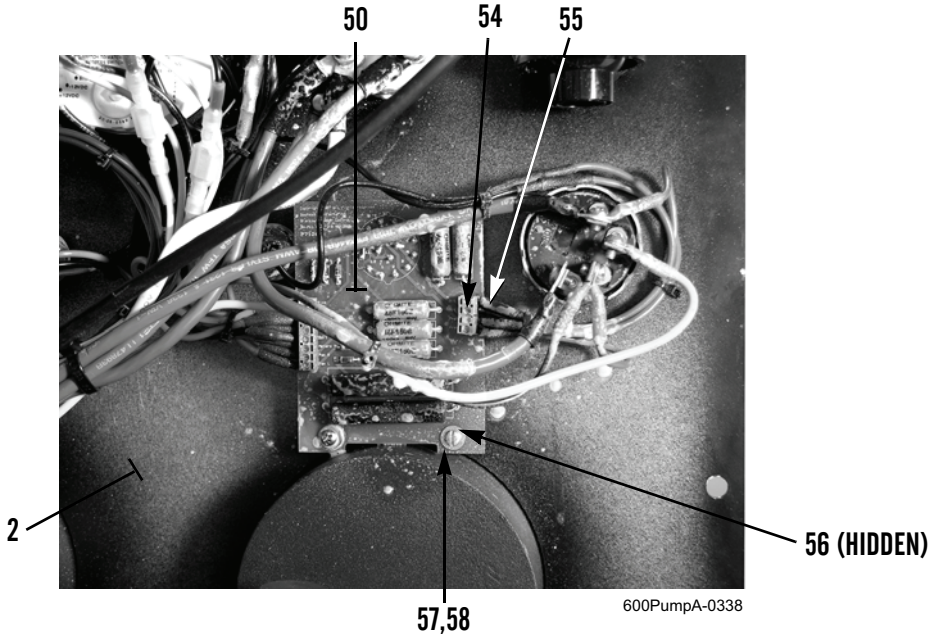


Figure 18. Blackout Light Switch.

BLACKOUT LIGHT SWITCH INSTALLATION

1. Install blackout light switch (Figure 18, Item 50) on panel (Figure 18, Item 2).
2. Install two spacers (Figure 18, Item 56), washers (Figure 18, Item 58), and screws (Figure 18, Item 57) on panel (Figure 18, Item 2).
3. Connect wires (Figure 18, Item 55) to blackout light switch (Figure 18, Item 50) and tighten screws (Figure 18, Item 54).
4. Install nut (Figure 17, Item 53) and knob (Figure 17, Item 52) on blackout light switch (Figure 17, Item 50).
5. Tighten setscrew (Figure 17, Item 51) in knob (Figure 17, Item 52).

ALTERNATOR LIGHT/PREHEAT LIGHT/V-BELT WARNING LIGHT/OIL TEMPERATURE WARNING LIGHT/OIL PRESSURE WARNING LIGHT REMOVAL

NOTE

Alternator light, preheat light, V-belt warning light, oil temperature warning light, and oil pressure warning light are replaced the same way. This task replaces alternator light.

1. Disconnect connector (Figure 19, Item 59) and remove bulb (Figure 19, Item 60) from alternator light (Figure 19, Item 61).
2. Remove nut (Figure 19, Item 62), lockwasher (Figure 19, Item 63), and alternator light (Figure 19, Item 61) from panel (Figure 19, Item 2). Discard lockwasher.

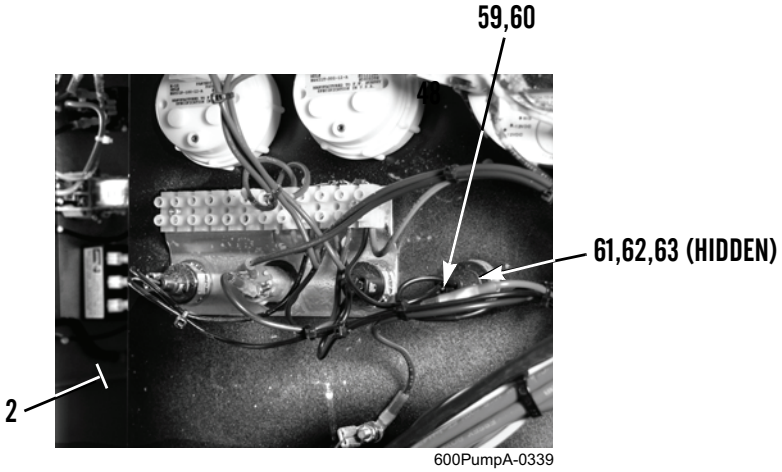


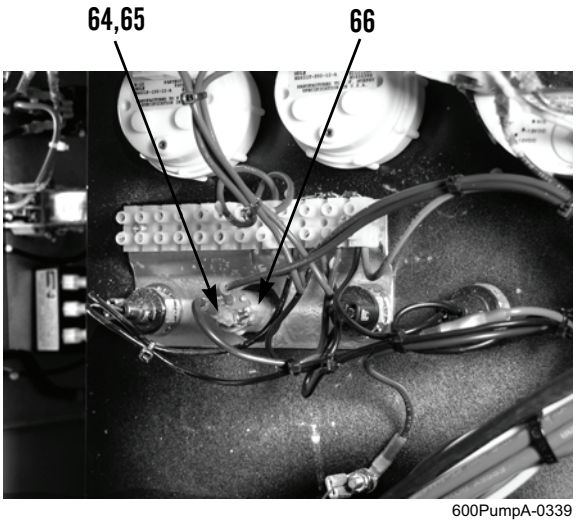
Figure 19. Alternator Light.

ALTERNATOR LIGHT/PREHEAT LIGHT/V-BELT WARNING LIGHT/OIL TEMPERATURE WARNING LIGHT/ OIL PRESSURE WARNING LIGHT INSTALLATION

1. Install alternator light (Figure 19, Item 61), new lockwasher (Figure 19, Item 63), and nut (Figure 19, Item 62) on panel (Figure 19, Item 2).
2. Install bulb (Figure 19, Item 60) and connect connector (Figure 19, Item 59) to alternator light (Figure 19, Item 61).

OIL PRESSURE BYPASS SWITCH REMOVAL

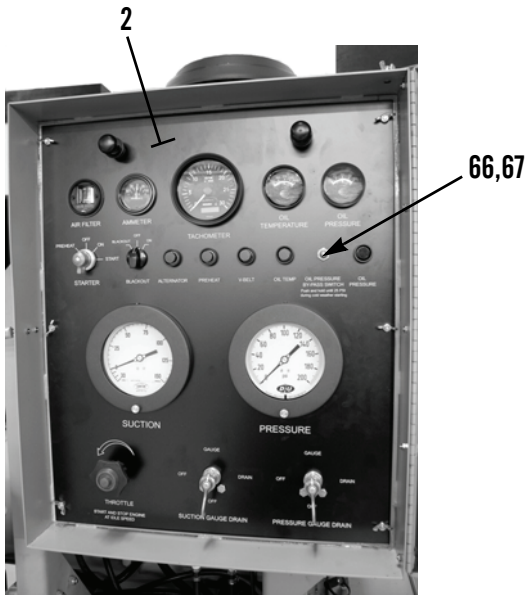
1. Remove two screws (Figure 20, Item 64) and disconnect two wires (Figure 20, Item 65) from oil pressure bypass switch (Figure 20, Item 66).



600PumpA-0339

Figure 20. Oil Pressure Bypass Switch (Back of Panel).

2. Remove nut (Figure 21, Item 67) and oil pressure bypass switch (Figure 21, Item 66) from panel (Figure 21, Item 2).



600PumpA-0004

Figure 21. Oil Pressure Bypass Switch (Front of Panel).

OIL PRESSURE BYPASS SWITCH INSTALLATION

1. Install oil pressure bypass switch (Figure 21, Item 66) and nut (Figure 21, Item 67) on panel (Figure 21, Item 2).
2. Connect two wires (Figure 20, Item 65) and install two screws (Figure 20, Item 64) on oil pressure bypass switch (Figure 20, Item 66).

SUCTION GAUGE/PRESSURE GAUGE REMOVAL

NOTE

Suction gauge and pressure gauge are replaced the same way. This task replaces the suction gauge.

1. Loosen thumbscrew (Figure 22, Item 68), setscrew (Figure 22, Item 71), and remove cover (Figure 22, Item 70) from suction gauge (Figure 22, Item 69).

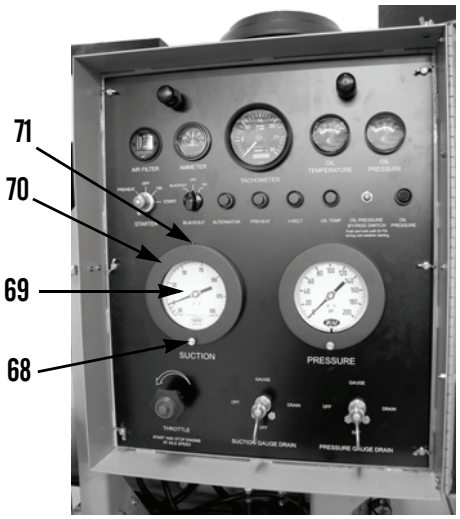


Figure 22. Suction Gauge Cover.

SUCTION GAUGE/PRESSURE GAUGE REMOVAL - CONTINUED

NOTE

All original equipment hose clamps should be replaced, with new worm drive type hose clamps. A supply of extra hose clamps is stored in storage box (WP 0008).

2. Cut hose clamp (Figure 23, Item 76), hold hose (Figure 23, Item 77), and remove barb fitting (Figure 23, Item 75) from snubber valve (Figure 23, Item 78). Discard hose clamp.
3. Remove elbow assembly (Figure 23, Item 74) from suction gauge (Figure 23, Item 69).

NOTE

The blackout light switch must be removed only for the suction gauge.

4. Remove blackout light switch (Figure 23, Item 50). See *Blackout Light Switch Removal* in this work package.

NOTE

On pressure gauge, support cable and ground wire are present and are removed when mounting nut is removed.

5. Remove three locknuts (Figure 23, Item 72), screws (Figure 23, Item 73), and suction gauge (Figure 23, Item 69) from panel (Figure 23, Item 2). Discard locknuts.

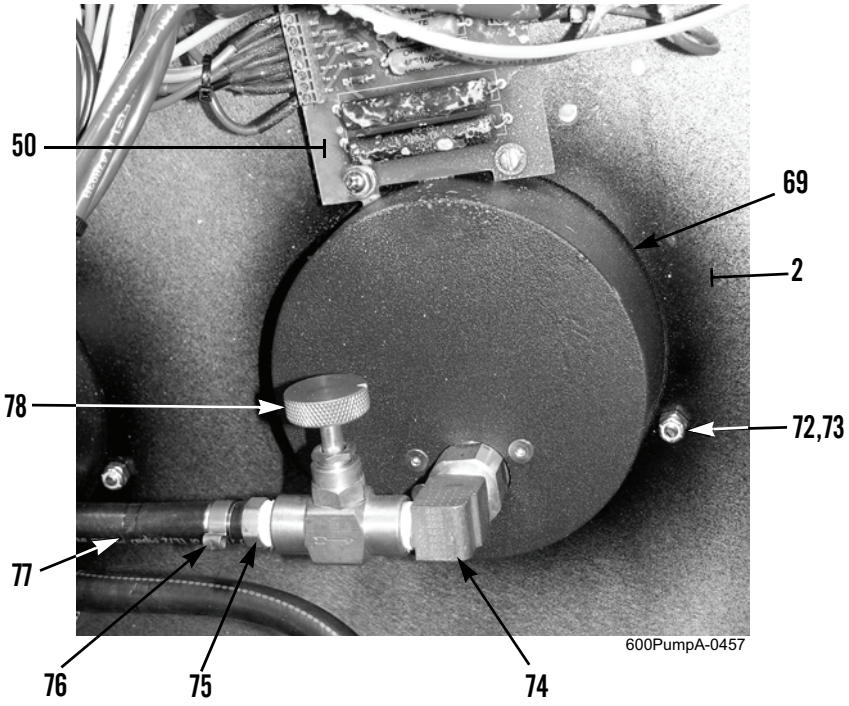


Figure 23. Blackout Light Switch and Suction Gauge.

SUCTION GAUGE/PRESSURE GAUGE INSTALLATION

1. Install suction gauge (Figure 23, Item 69) on panel (Figure 23, Item 2) with three screws (Figure 23, Item 73) and new locknuts (Figure 23, Item 72).

NOTE

- Apply antiseizing tape to threads of suction gauge nipple and barb fitting.
- The blackout light switch must be installed only for the suction gauge.

2. Install blackout light switch (Figure 23, Item 50). See *Blackout Light Switch Installation* in this work package.
3. Install elbow assembly (Figure 23, Item 74) on suction gauge (Figure 23, Item 69).
4. Install snubber valve (Figure 23, Item 78) on elbow (Figure 23, Item 74).
5. Position new hose clamp (Figure 23, Item 76) on hose (Figure 23, Item 77). Hold hose and install barb fitting (Figure 23, Item 75) on snubber valve (Figure 23, Item 78). Tighten hose clamp.

NOTE

Snubber valve functions to modulate suction gauge pressure, to prevent gauge needle from fluctuating.

6. Ensure snubber valve (Figure 23, Item 78) is open one full turn.
7. Install cover (Figure 24, Item 70) and setscrew (Figure 24, Item 71) on suction gauge (Figure 24, Item 69) and tighten thumbscrew (Figure 24, Item 68).

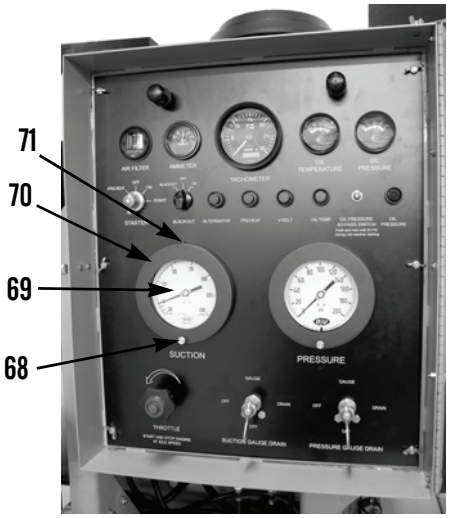


Figure 24. Suction Gauge Cover.

THROTTLE CONTROL ASSEMBLY REMOVAL

1. Remove four locknuts (Figure 25, Item 79), bolts (Figure 25, Item 80) and two C-clamps (Figure 25, Item 81) from throttle control cable (Figure 25, Item 82) and bracket (Figure 25, Item 83). Discard locknuts.

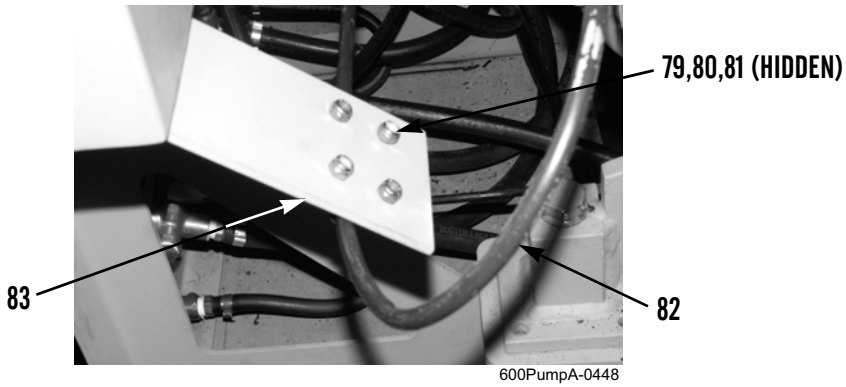


Figure 25. Throttle Control Cable Bracket.

NOTE

Throttle control must be fully threaded in.

2. While holding throttle control (Figure 26, Item 84) with a wrench, loosen nut (Figure 26, Item 85) and disconnect throttle control cable (Figure 26, Item 82) from throttle control.
3. Pull throttle control cable (Figure 26, Item 82) from control panel box (Figure 26, Item 3).
4. Remove nut (Figure 26, Item 87), lockwasher (Figure 26, Item 88), and throttle control (Figure 26, Item 84) from panel (Figure 26, Item 2). Discard lockwasher.
5. If damaged, remove grommet (Figure 26, Item 86) from control panel box (Figure 26, Item 3).

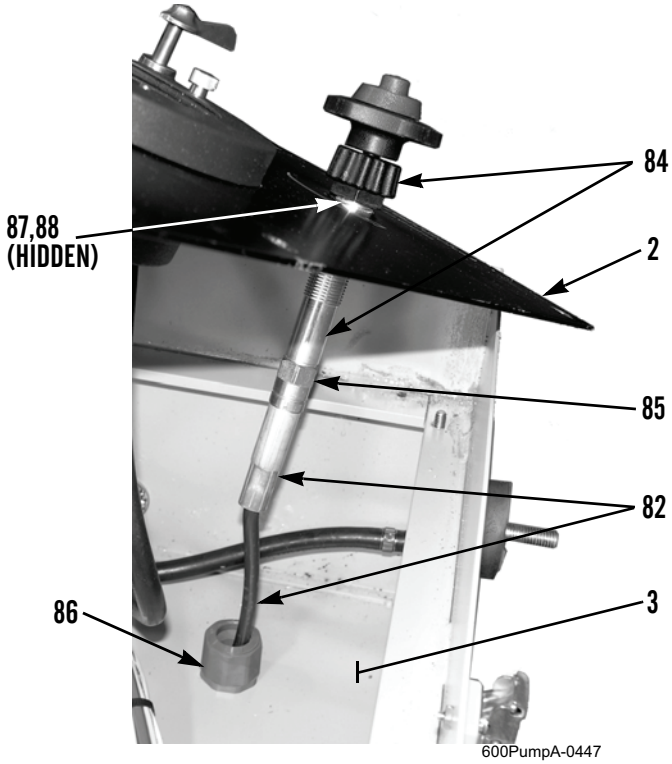


Figure 26. Throttle Control Assembly.

THROTTLE CONTROL ASSEMBLY INSTALLATION

1. If removed, install grommet (Figure 26, Item 86) on control panel box (Figure 26, Item 3).
2. Install throttle control (Figure 26, Item 84) on panel (Figure 26, Item 2) with new lockwasher (Figure 26, Item 88) and nut (Figure 26, Item 87).
3. Feed throttle control cable (Figure 26, Item 82) through grommet (Figure 26, Item 86) and control panel box (Figure 26, Item 3).
4. Connect throttle control cable (Figure 26, Item 82) to throttle control (Figure 26, Item 84). While holding throttle control, tighten nut (Figure 26, Item 85).
5. Position throttle control cable (Figure 27, Item 82) to bracket (Figure 27, Item 83) and install C-clamp (Figure 27, Item 81) with four new locknuts (Figure 27, Item 79) and bolts (Figure 27, Item 80).

SUCTION GAUGE DRAIN/PRESSURE GAUGE DRAIN REMOVAL

NOTE

Suction gauge drain and pressure gauge drain are replaced the same way. This task replaces suction gauge drain.

1. Remove screw (Figure 27, Item 89) and handle (Figure 27, Item 90) from suction gauge drain (Figure 27, Item 91).

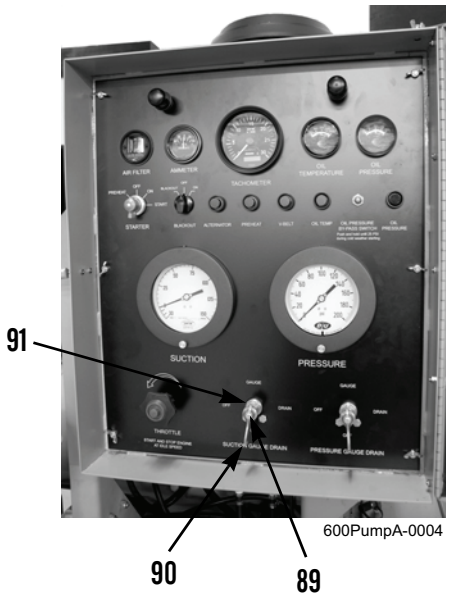


Figure 27. Suction Gauge Drain.

2. Cut three hose clamps (Figure 28, Item 97), hold three hoses (Figure 28, Item 92), and remove barb fittings (Figure 28, Item 93) from three elbows (Figure 28, Item 94). Discard hose clamps.
3. Remove three elbows (Figure 28, Item 94) from suction gauge drain (Figure 28, Item 91).
4. Remove two locknuts (Figure 28, Item 95), bolts (Figure 28, Item 96), and suction gauge drain (Figure 28, Item 91) from panel (Figure 28, Item 2). Discard locknuts.

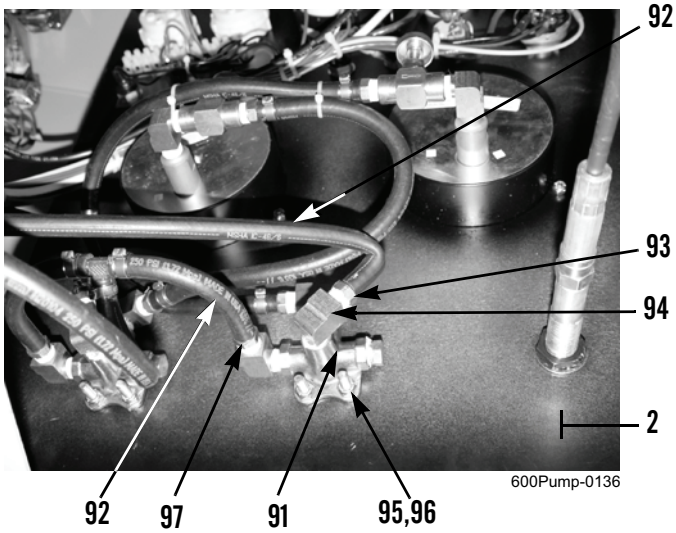


Figure 28. Suction Gauge Drain.

SUCTION GAUGE DRAIN/PRESSURE GAUGE DRAIN INSTALLATION

1. Install suction gauge drain (Figure 28, Item 91), two bolts (Figure 28, Item 96), and new locknuts (Figure 28, Item 95) on panel (Figure 28, Item 2).

NOTE

Apply antiseizing tape to threads of elbows and hose barb fittings.

2. Install three elbows (Figure 28, Item 94) on suction gauge drain (Figure 28, Item 91).
3. Position three new hose clamps (Figure 28, Item 97) on hoses (Figure 28, Item 92). Hold hoses and install three barb fittings (Figure 28, Item 93) on elbows (Figure 28, Item 94). Tighten hose clamps.
4. Install handle (Figure 27, Item 90) and screw (Figure 27, Item 89) on suction gauge drain (Figure 27, Item 91).

HI-AMP FUSE REMOVAL

1. Remove two caps (Figure 29, Item 99), nuts (Figure 29, Item 100), and wires (Figure 29, Item 98) from hi-amp fuse (Figure 29, Item 101).
2. Remove two bolts (Figure 29, Item 102) and hi-amp fuse (Figure 29, Item 101) from inside circuit board panel (Figure 29, Item 103).

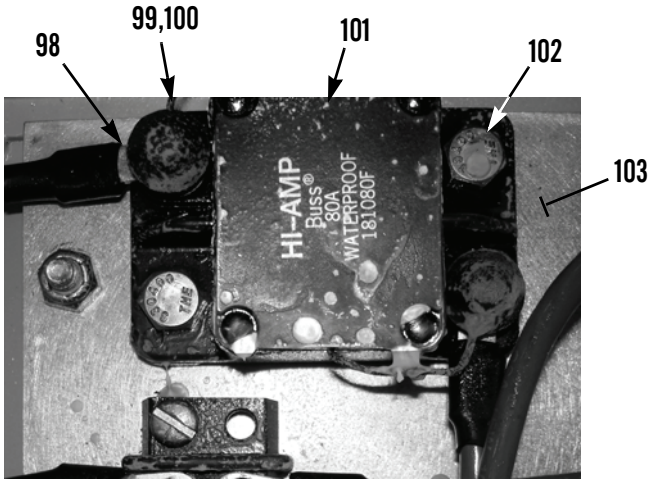


Figure 29. Hi-Amp Fuse.

HI-AMP FUSE INSTALLATION

1. Install hi-amp fuse (Figure 29, Item 101) on inside circuit board panel (Figure 29, Item 103) with two bolts (Figure 29, Item 103).
2. Install two wires (Figure 29, Item 98), nuts (Figure 29, Item 100), and caps (Figure 29, Item 99) on hi-amp fuse (Figure 29, Item 101).

K4 PREHEAT RELAY REMOVAL

1. Remove two screw and washer assemblies (Figure 30, Item 105) and wires (Figure 30, Item 104) from preheat relay (Figure 30, Item 106).
2. Loosen two screws (Figure 30, Item 107), wires (Figure 30, Item 109), and diode (Figure 30, Item 110) from preheat relay (Figure 30, Item 106).
3. Remove two screws (Figure 30, Item 108) and preheat relay (Figure 30, Item 106) from inside circuit board panel (Figure 30, Item 103).

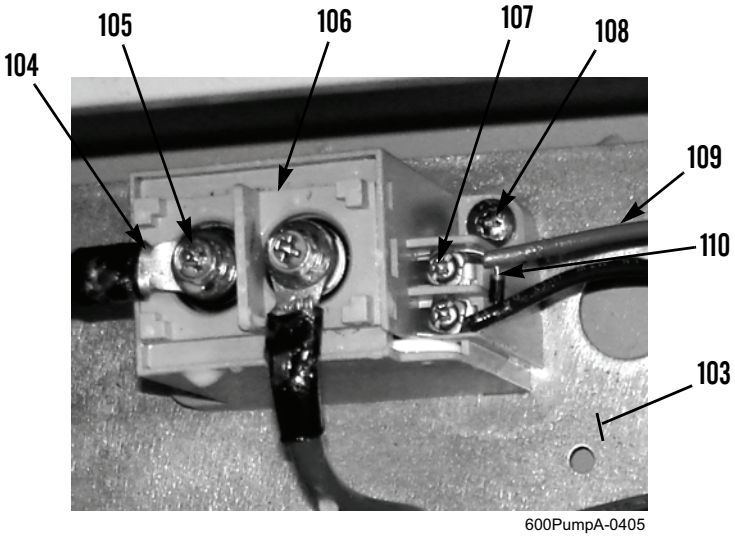


Figure 30. Preheat Relay.

K4 PREHEAT RELAY INSTALLATION

1. Install preheat relay (Figure 30, Item 106) on inside circuit board panel (Figure 30, Item 103) with two screws (Figure 30, Item 108).
2. Install diode (Figure 30, Item 110) and two wires (Figure 30, Item 109) and tighten screws (Figure 30, Item 107) on preheat relay (Figure 30, Item 106).
3. Install two wires (Figure 30, Item 104) and new screw and washer assemblies (Figure 30, Item 105) on preheat relay (Figure 30, Item 106).

K1 STOPBOX REMOVAL

1. Remove four screws (Figure 31, Item 115) and wires (Figure 31, Item 116) from stopbox (Figure 31, Item 111).
2. Remove two screws (Figure 31, Item 114) and stopbox (Figure 31, Item 111) from inside circuit board panel (Figure 31, Item 103).
3. Remove two screws (Figure 31, Item 112) and bracket (Figure 31, Item 113) from stopbox (Figure 31, Item 111).

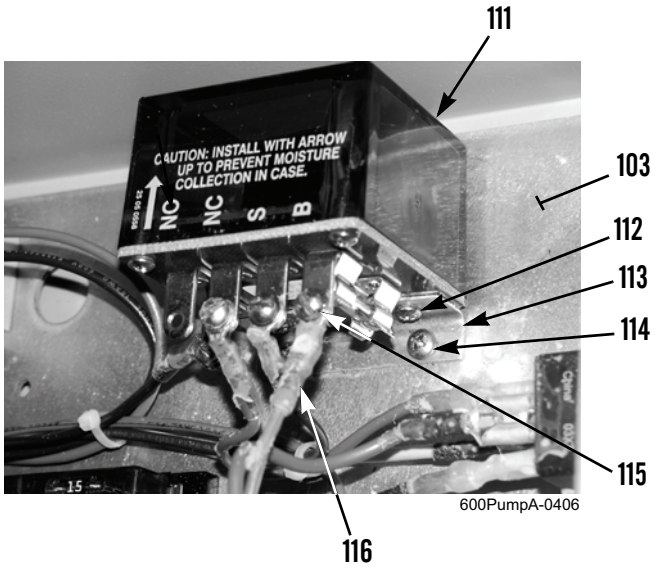


Figure 31. Stopbox.

K1 STOPBOX INSTALLATION

1. Install bracket (Figure 31, Item 113) on stopbox (Figure 31, Item 111) with two screws (Figure 31, Item 112).
2. Install stopbox (Figure 31, Item 111) on inside circuit board panel (Figure 31, Item 103) with two screws (Figure 31, Item 114).
3. Install four wires (Figure 31, Item 116) and screws (Figure 31, Item 115) on stopbox (Figure 31, Item 111).

TB2 THREE-GANG TERMINAL BLOCK REMOVAL

1. Remove six screws (Figure 32, Item 118) and wires (Figure 32, Item 117) from three-gang terminal block (Figure 32, Item 120).
2. Remove two screws (Figure 32, Item 119) and three-gang terminal block (Figure 32, Item 120) from inside circuit board panel (Figure 32, Item 103).

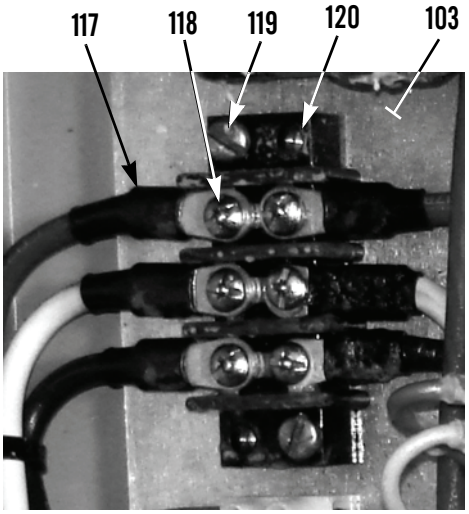


Figure 32. Three-Gang Terminal Block.

TB2 THREE-GANG TERMINAL BLOCK INSTALLATION

1. Install three-gang terminal block (Figure 32, Item 120) on inside circuit board panel (Figure 32, Item 103) with two screws (Figure 32, Item 119).
2. Install six wires (Figure 32, Item 117) and screws (Figure 32, Item 118) on three-gang terminal block (Figure 32, Item 120).

TB4 TWO-GANG TERMINAL BLOCK REMOVAL

1. Disconnect three wires (Figure 33, Item 121) from two-gang terminal block (Figure 33, Item 123).
2. Remove two screws (Figure 33, Item 122) and two-gang terminal block (Figure 33, Item 123) from inside circuit board panel (Figure 33, Item 103).

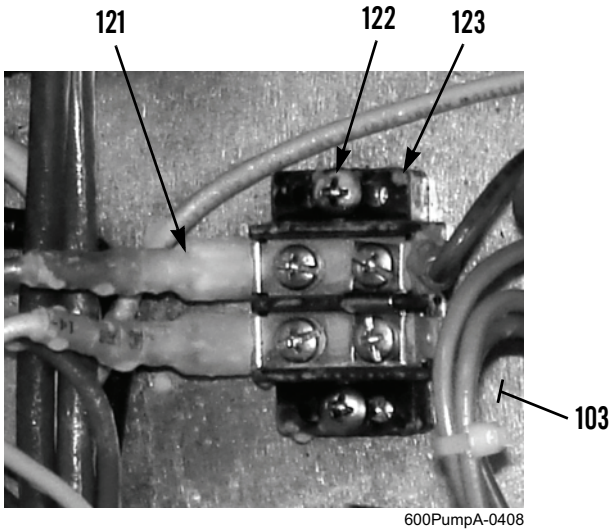


Figure 33. Two-Gang Terminal Block.

TB4 TWO-GANG TERMINAL BLOCK INSTALLATION

1. Install two-gang terminal block (Figure 33, Item 123) on inside circuit board panel (Figure 33, Item 103) with two screws (Figure 33, Item 122).
2. Install three wires (Figure 33, Item 121) on two-gang terminal block (Figure 33, Item 123).

FUSE BLOCK REMOVAL

1. Remove six wires (Figure 34, Item 124) and eight wires (Figure 34, Item 128) from fuse block (Figure 34, Item 126).
2. Remove nut and star washer assembly (Figure 34, Item 129), ring terminal of resistor (Figure 34, Item 127), and wire (Figure 34, Item 130) from fuse block (Figure 34, Item 126).
3. Disconnect resistor lead and remove resistor (Figure 34, Item 127) from fuse panel (Figure 34, Item 126).
4. Remove nut and star washer assembly (Figure 34, Item 132) and two wires (Figure 34, Item 131) from fuse block (Figure 34, Item 126).
5. Remove four screws (Figure 34, Item 125) and fuse block (Figure 34, Item 126) from inside circuit board panel (Figure 34, Item 103).

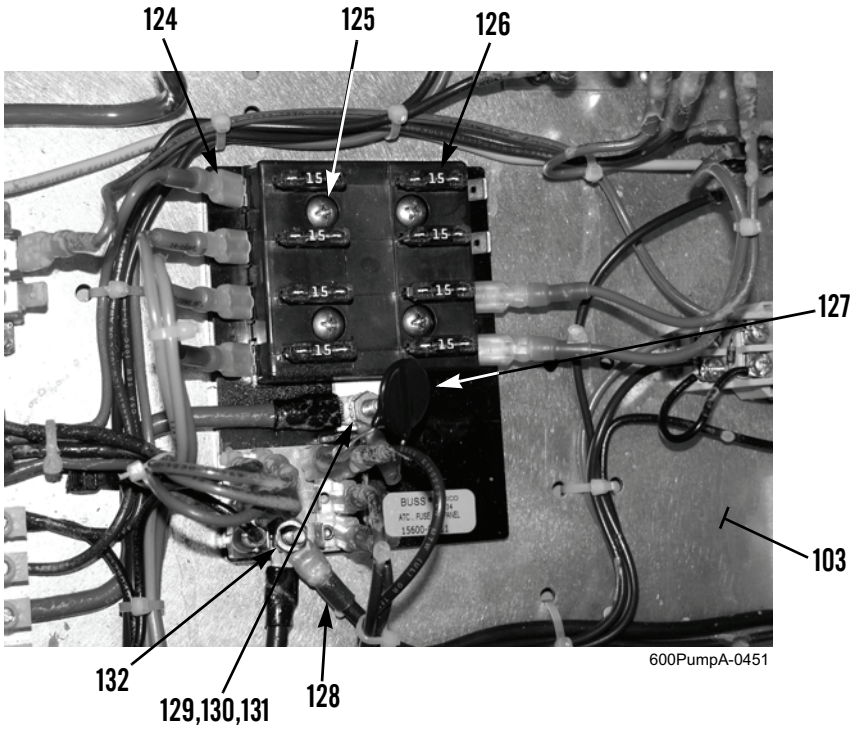


Figure 34. Fuse Block.

FUSE BLOCK INSTALLATION

1. Install fuse block (Figure 34, Item 126) on inside circuit board panel (Figure 34, Item 103) with four screws (Figure 34, Item 125).
2. Install two wires (Figure 34, Item 131), ring terminal of resistor (Figure 34, Item 127), and nut and star washer assembly (Figure 34, Item 132) on fuse block (Figure 34, Item 126).
3. Connect terminal of resistor (Figure 34, Item 127) to fuse panel (Figure 34, Item 126).
4. Install wire (Figure 34, Item 130), ring terminal of resistor (Figure 34, Item 127), and nut and star washer assembly (Figure 34, Item 129) on fuse block (Figure 34, Item 126).
5. Install six wires (Figure 34, Item 124) and eight wires (Figure 34, Item 128) on fuse block (Figure 34, Item 126).

K2 FUEL SOLENOID RELAY REMOVAL

1. Remove four wires (Figure 35, Item 133) from relay (Figure 35, Item 134).
2. Remove screw (Figure 35, Item 135) and relay (Figure 35, Item 134) from inside circuit board panel (Figure 35, Item 103).

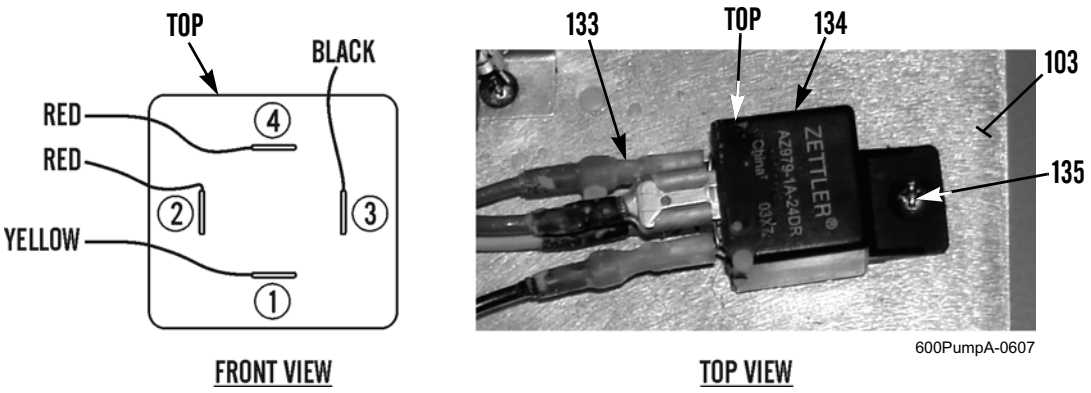


Figure 35. K2 Fuel Solenoid Relay.

K2 FUEL SOLENOID RELAY INSTALLATION

1. Install relay (Figure 35, Item 134) on inside circuit board panel (Figure 35, Item 103) with screw (Figure 35, Item 135).
2. Install four wires (Figure 35, Item 133) on relay (Figure 35, Item 134).

K3 TIMER OVERRIDE POWER RELAY REMOVAL

1. Loosen six screws (Figure 36, Item 137) and remove six wires (Figure 36, Item 136), jumper wire (Figure 36, Item 139), and diode (Figure 36, Item 141) from power relay (Figure 36, Item 140).
2. Remove two screws (Figure 36, Item 138) and power relay (Figure 36, Item 140) from inside circuit board panel (Figure 36, Item 103).

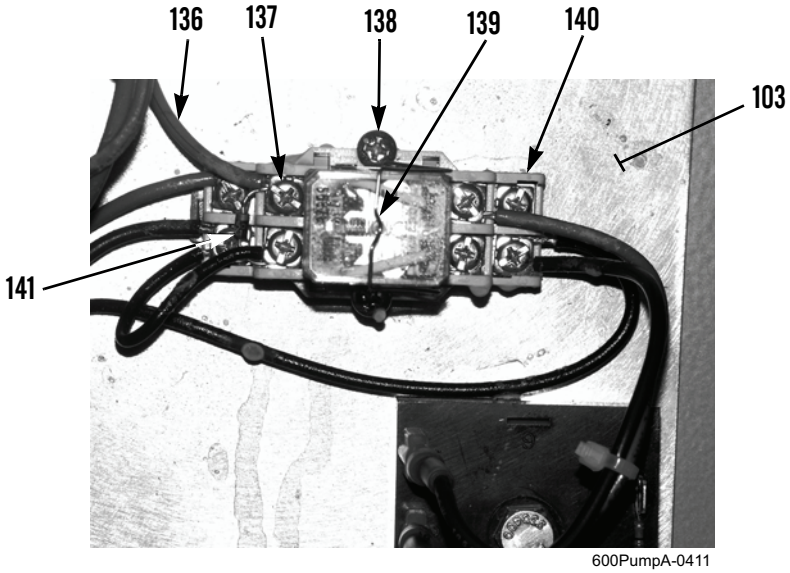


Figure 36. Power Relay.

K3 TIMER OVERRIDE POWER RELAY INSTALLATION

1. Install power relay (Figure 36, Item 140) on inside circuit board panel (Figure 36, Item 103) with two screws (Figure 36, Item 138).
2. Install diode (Figure 36, Item 141), jumper wire (Figure 36, Item 139), and six wires (Figure 36, Item 136) on power relay (Figure 36, Item 140) and tighten six screws (Figure 36, Item 137).

TB1 TERMINAL BLOCK REMOVAL

1. Loosen 18 screws (Figure 37, Item 143) and remove 18 wires (Figure 37, Item 142), resistor (Figure 37, Item 145), and diode (Figure 37, Item 146) from large-connection terminal block (Figure 37, Item 147).
2. Remove two screws (Figure 37, Item 144) and large-connection terminal block (Figure 37, Item 147) from inside circuit board panel (Figure 37, Item 103).

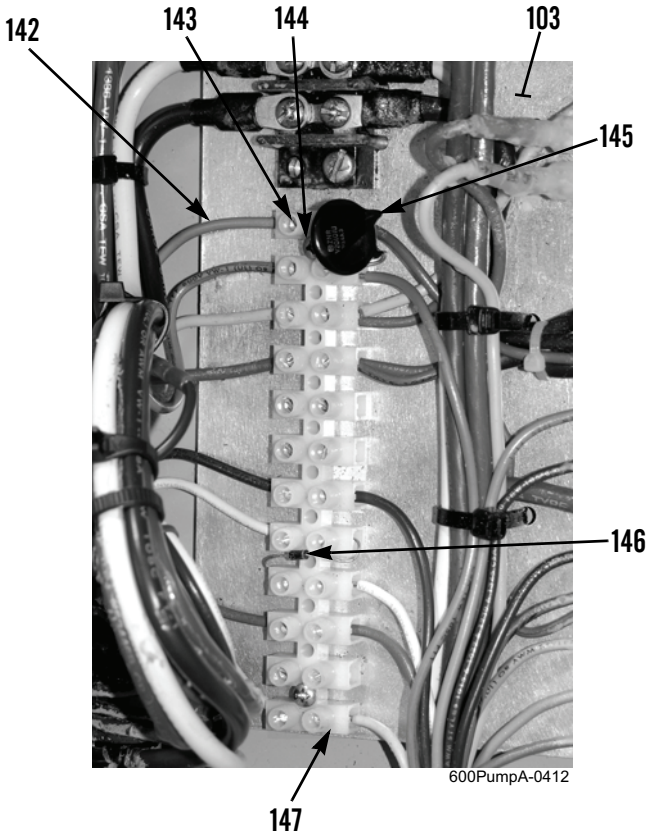


Figure 37. Large-Connection Terminal Block.

TB1 TERMINAL BLOCK INSTALLATION

1. Install large-connection terminal block (Figure 37, Item 147) on inside circuit board panel (Figure 37, Item 103) with two screws (Figure 37, Item 144).
2. Install 18 wires (Figure 37, Item 142), resistor (Figure 37, Item 145), and diode (Figure 37, Item 146) on large-connection terminal block (Figure 37, Item 147) and tighten 18 screws (Figure 37, Item 143).

TB3 TERMINAL BLOCK REMOVAL

1. Loosen 16 screws (Figure 38, Item 149) and remove 19 wires (Figure 38, Item 148) from small-connection terminal block (Figure 38, Item 151).
2. Remove two screws (Figure 38, Item 150) and small-connection terminal block (Figure 38, Item 151) from inside circuit board panel (Figure 38, Item 103).

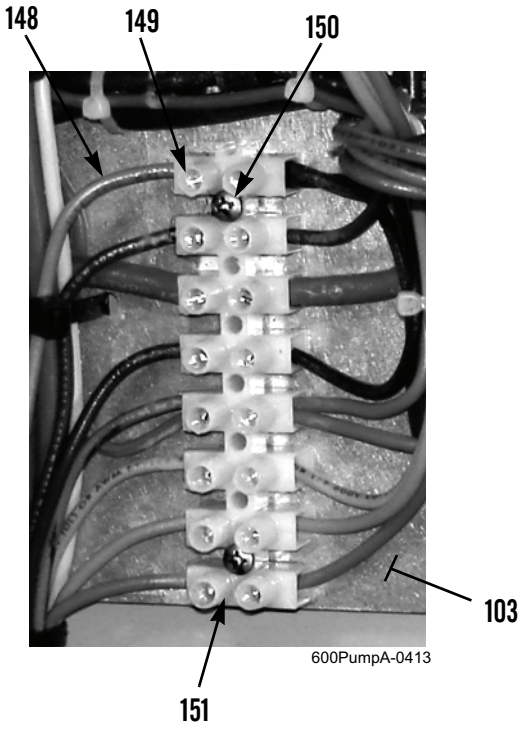


Figure 38. Small-Connection Terminal Block.

TB3 TERMINAL BLOCK INSTALLATION

1. Install small-connection terminal block (Figure 38, Item 151) on inside circuit board panel (Figure 38, Item 103) with two screws (Figure 38, Item 150).
2. Install 19 wires (Figure 38, Item 148) on small-connection terminal block (Figure 38, Item 151) and tighten 16 screws (Figure 38, Item 149).

TMR1 PREHEAT TIMER REMOVAL

1. Remove three wires (Figure 39, Item 152) from preheat timer (Figure 39, Item 155).
2. Remove diode (Figure 39, Item 154) from terminals 4 and 5.
3. Remove bolt (Figure 39, Item 153) and preheat timer (Figure 39, Item 155) from inside circuit board panel (Figure 39, Item 103).

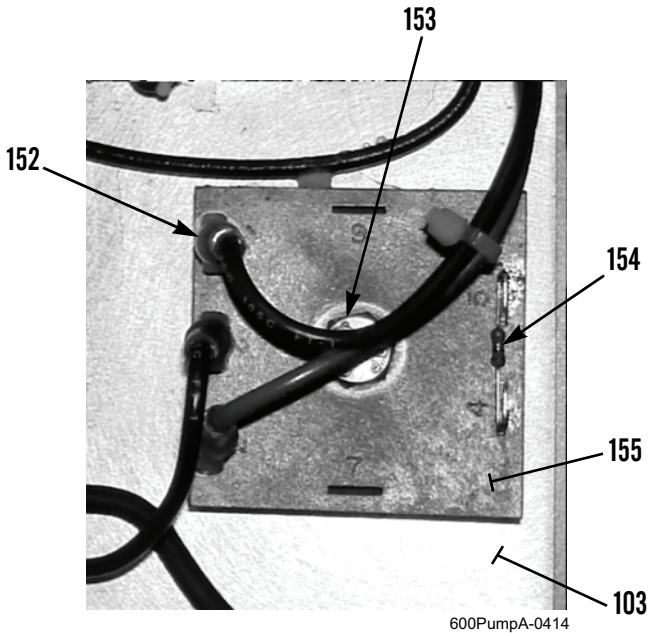


Figure 39. Preheat Timer.

TMR1 PREHEAT TIMER INSTALLATION

1. Install preheat timer (Figure 39, Item 155) on inside circuit board panel (Figure 39, Item 103) with bolt (Figure 39, Item 153).
2. Install diode (Figure 39, Item 154) on terminals 4 and 5.
3. Install three wires (Figure 39, Item 152) on preheat timer (Figure 39, Item 155).

CONNECTOR ASSEMBLY REMOVAL

1. Disconnect each wire of connector wiring harness (Figure 40, Item 156) from components on inside circuit board panel (Figure 40, Item 103).
2. Remove four locknuts (Figure 40, Item 158), screws (Figure 40, Item 159), washers (Figure 40, Item 160), and connector (Figure 40, Item 157) from control panel box (Figure 40, Item 3). Discard locknuts.

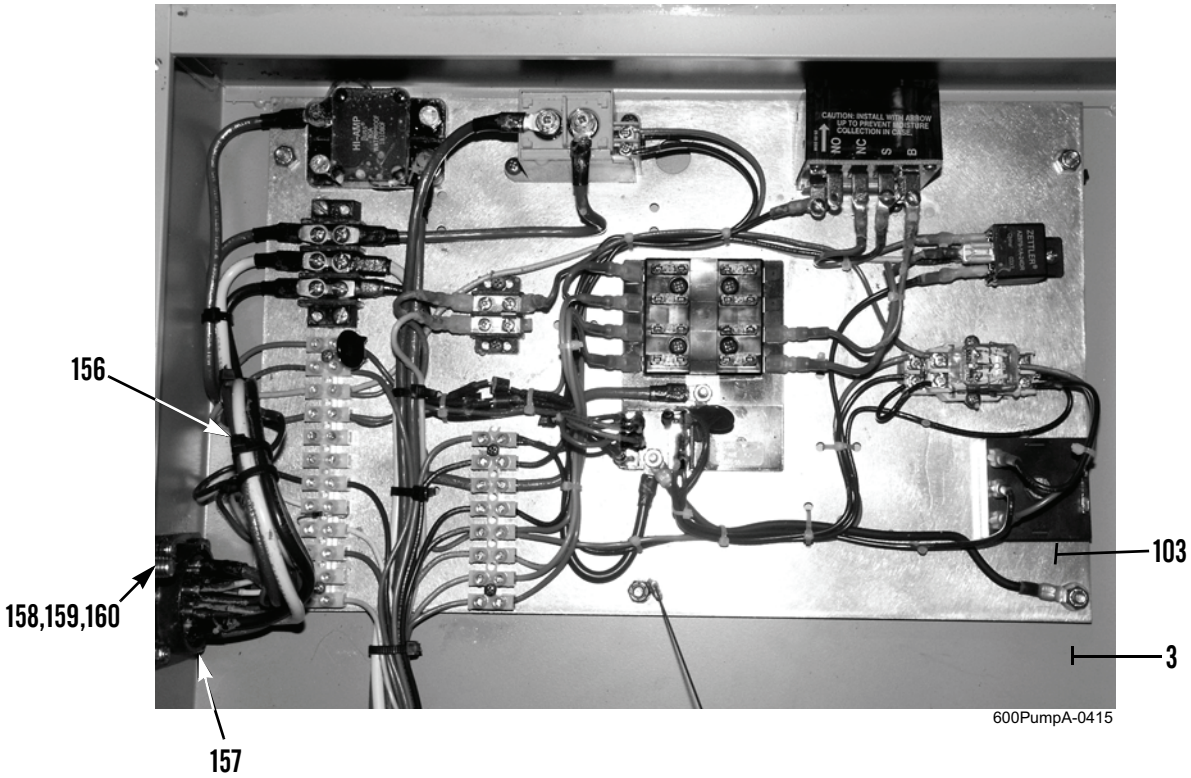


Figure 40. Connector Assembly.

CONNECTOR ASSEMBLY INSTALLATION

1. Install connector (Figure 40, Item 157) on control panel box (Figure 40, Item 3) with four washers (Figure 40, Item 160), screws (Figure 40, Item 159), and new locknuts (Figure 40, Item 158).
2. Connect each wire of connector wiring harness (Figure 40, Item 156) to components on inside circuit board panel (Figure 40, Item 103).

INSIDE CIRCUIT BOARD PANEL REMOVAL

1. Remove all components mounted to inside circuit board panel (Figure 41, Item 103) referenced in this work package.
2. Remove four locknuts (Figure 41, Item 161), ground wire (Figure 41, Item 162), support cable (Figure 41, Item 163), and inside circuit board panel (Figure 41, Item 103) from control panel box (Figure 41, Item 3). Discard locknuts.

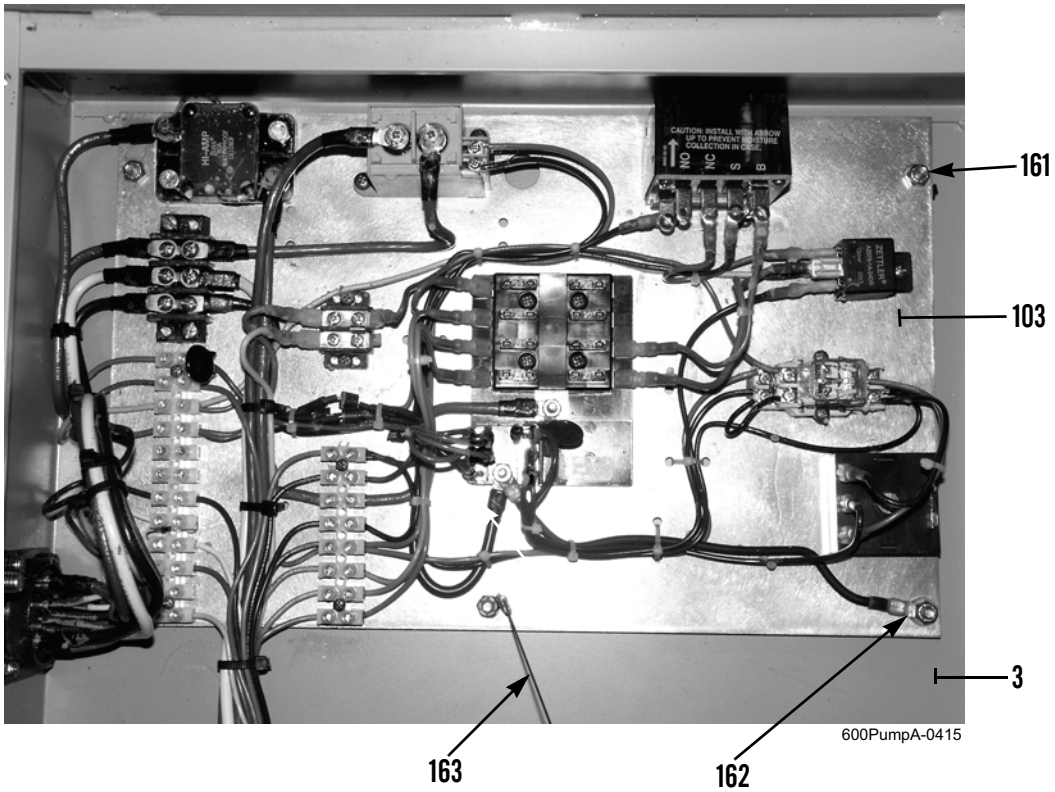


Figure 41. Inside Circuit Board Panel.

INSIDE CIRCUIT BOARD PANEL INSTALLATION

1. Install inside circuit board panel (Figure 41, Item 103) on control panel box (Figure 41, Item 3).
2. Install support cable (Figure 41, Item 163), ground wire (Figure 41, Item 162), and four new locknuts (Figure 41, Item 161) on inside circuit board panel (Figure 41, Item 103).
3. Install all components mounted to inside circuit board panel (Figure 41, Item 103) referenced in this work package.

PANEL INSTALLATION

Install panel (Figure 42, Item 2) and six wingnuts (Figure 42, Item 1) on control panel box (Figure 42, Item 3).

600PumpA-0004

Figure 42. Panel.

FOLLOW-ON TASKS

1. If removed, install control panel box (WP 0110).
2. Connect battery cables (WP 0033).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

PUMP REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)
Suitable lifting equipment

Materials/Parts

Adhesive (Item 1, WP 0129)
Glycerin, USP (Item 13, WP 0129)
Grease, automotive and artillery, GAA (Item 14, WP 0129)
Rag, wiping (Item 22, WP 0129)
Strap, tiedown, electrical components (Item 26, WP 0129)
Tape, antiseizing (Item 28, WP 0129)
Hose clamp

Materials/Parts - Continued

Locknut (2)
Lockwasher (10)
T-type lockwasher (12)

Personnel Required

63J (3)

References

WP 0006
WP 0008
WP 0023
WP 0073

Equipment Condition

Battery cables disconnected (WP 0033)
Suction manifold assembly removed (WP 0116)
Discharge manifold assembly removed (WP 0114)

WARNING

- Use extreme caution when lifting pump. Provide adequate support and use assistance during procedure. Ensure that lifting equipment used is on solid footing, is in good condition, and is of suitable lift capacity. Keep clear of heavy parts supported only by lifting equipment. Failure to follow this warning may result in death or injury to personnel or damage to equipment.
- Lift pump slowly and smoothly. Do not swing load from side to side, as this places extra strain on lifting components. Watch boom angle and overhead clearance when lifting. Failure to follow this warning may result in injury or death to personnel or damage to equipment.

NOTE

Pump casing and intermediate housing weigh approximately 314 lb (142 kg).

REMOVAL

NOTE

All original equipment hose clamps should be replaced, on installation, with new worm drive type hose clamps. A supply of extra hose clamps is stored in storage box (WP 0008).

1. Cut hose clamp (Figure 1, Item 2), hold pump drain hose (Figure 1, Item 1), and remove barb fitting (Figure 1, Item 3) and pump drain hose from drain valve (Figure 1, Item 4). Discard hose clamp.
2. As required, remove drain valve (Figure 1, Item 4) from pump (Figure 1, Item 5).

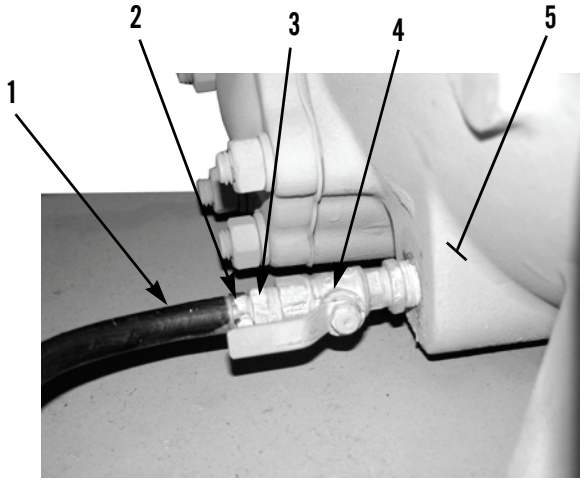


Figure 1. Pump Drain Hose.

3. Remove two locknuts (Figure 2, Item 6), lockwashers (Figure 2, Item 7), four washers (Figure 2, Item 8), and two bolts (Figure 2, Item 9) from base of pump (Figure 2, Item 5) and trailer chassis. Discard locknuts and lockwashers.
4. Support intermediate housing (Figure 2, Item 10) and casing of pump (Figure 2, Item 5) with suitable lifting equipment.

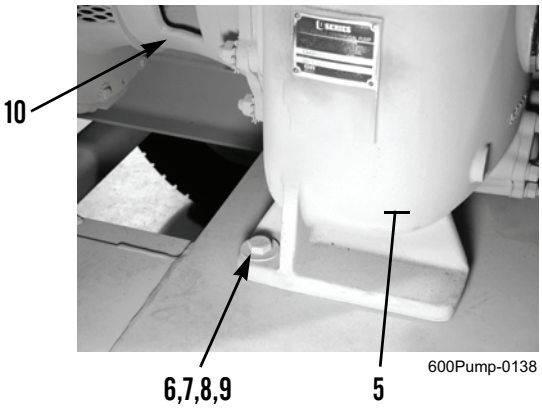


Figure 2. Pump Mounting to Trailer Chassis.

REMOVAL - CONTINUED

5. Remove 12 capscrews (Figure 3, Item 12) and T-type lockwashers (Figure 3, Item 13) from intermediate housing (Figure 3, Item 10), engine flywheel housing (Figure 3, Item 11), and junction box mounting bracket (Figure 3, Item 15). Discard lockwashers.
6. Place junction box (Figure 3, Item 14) and mounting bracket (Figure 3, Item 15) out of the way on top of engine flywheel housing (Figure 3, Item 11) and secure with a tiedown strap.

CAUTION

Use caution not to damage engine/control panel wiring harness when separating intermediate housing from engine flywheel housing.

NOTE

As assemblies separate, flexible coupling will remain on impeller shaft.

7. Separate intermediate housing (Figure 3, Item 10) with attached pump (Figure 3, Item 5) from engine flywheel housing (Figure 3, Item 11) by pulling intermediate housing straight away from engine.

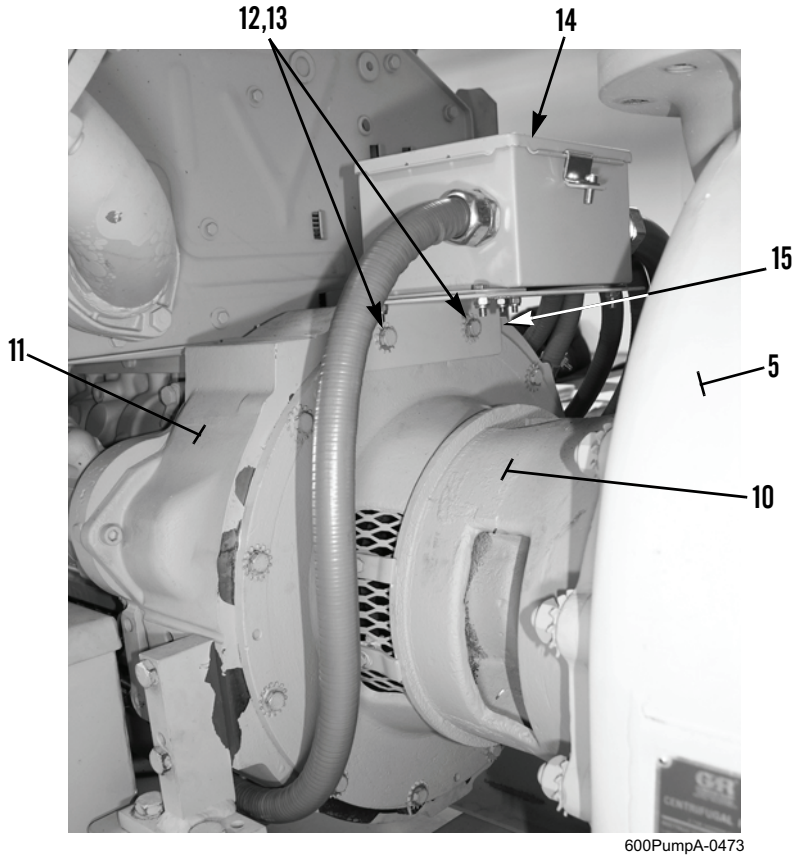


Figure 3. Intermediate Housing at Engine Flywheel Housing.

REMOVAL - CONTINUED

8. Place intermediate housing (Figure 3, Item 10) with attached pump (Figure 3, Item 5) on suitable cribbing in a clean work area with flexible coupling (Figure 4, Item 16) facing up.
9. To remove flexible coupling (Figure 4, Item 16) from impeller shaft (Figure 4, Item 18):
   a. Remove two allen head setscrews (Figure 4, Item 17) from bushing (Figure 4, Item 19).
   b. Install one removed setscrew (Figure 4, Item 17) in setscrew hole in bushing (Figure 4, Item 19) that is opposite split in bushing.
   c. Tighten setscrew (Figure 4, Item 17) while tapping on metal part of flexible coupling (Figure 4, Item 16).
   d. Remove bushing (Figure 4, Item 19) and slide flexible coupling (Figure 4, Item 16) from impeller shaft (Figure 4, Item 18).
   e. Remove impeller shaft key (Figure 4, Item 20).

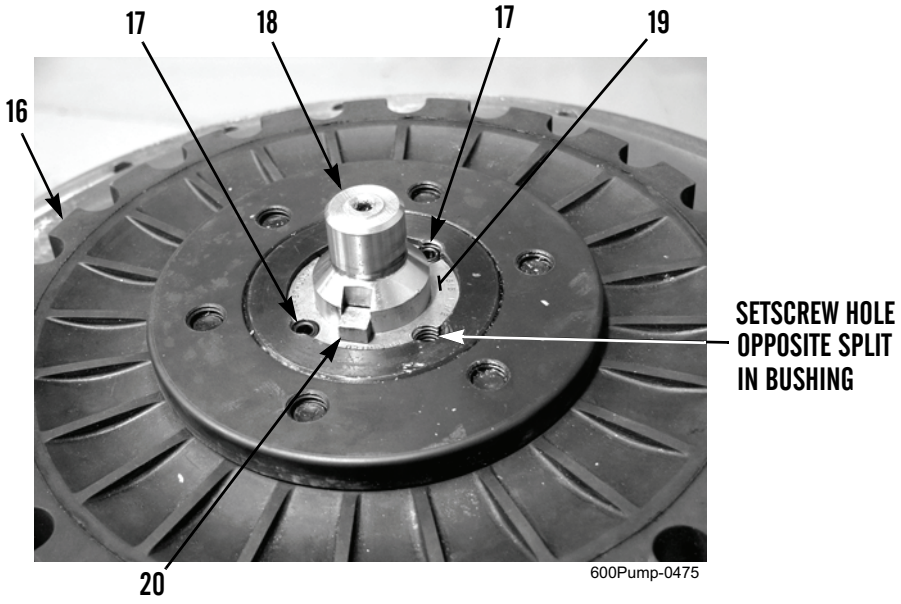


Figure 4. Flexible Coupling on Impeller Shaft.

REMOVAL - CONTINUED

NOTE

Outer ring of coupling need not be removed from engine flywheel unless coupling assembly needs to be replaced.

10. Inspect outer ring (Figure 5, Item 21) of coupling on engine flywheel. If damaged, remove IAW WP 0073.
11. Inspect pilot bushing assembly (Figure 5, Item 22) inside engine crankshaft for excessive wear. If damaged, remove IAW WP 0073.

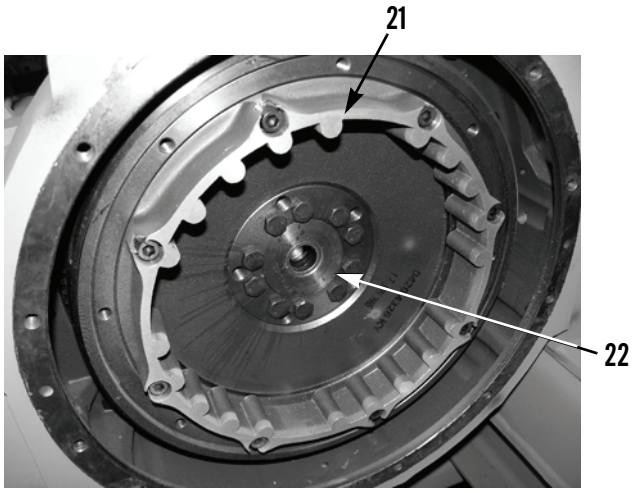


Figure 5. Outer Ring of Coupling and Pilot Bushing Assembly at Engine Flywheel Bore.

CLEANING AND INSPECTION

1. Clean and inspect all parts IAW WP 0023.
2. Replace any damaged part.

INSTALLATION

1. If removed, install pilot bushing assembly (Figure 6, Item 22) in bore of engine flywheel IAW WP 0073.
2. If removed, install outer ring (Figure 6, Item 21) on engine flywheel IAW WP 0073.

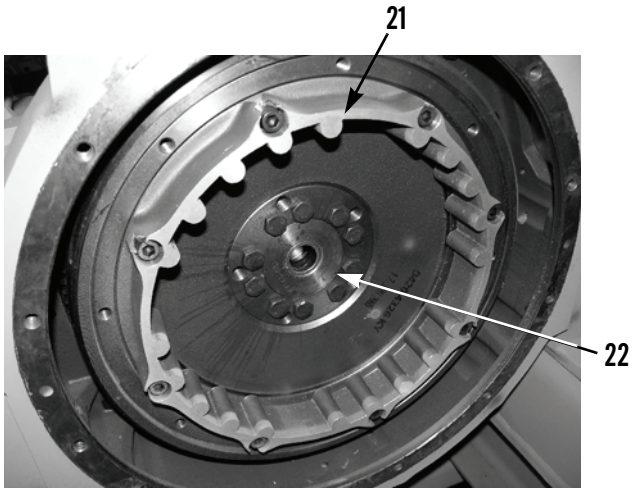


Figure 6. Outer Ring of Coupling and Pilot Bushing Assembly at Engine Flywheel Bore.

3. To install flexible coupling (Figure 7, Item 16) of on impeller shaft (Figure 7, Item 18):
   a. Install impeller shaft key (Figure 7, Item 20) in slot of impeller shaft (Figure 7, Item 18).
   b. Assemble bushing (Figure 7, Item 19) inside flexible coupling (Figure 7, Item 16) and loosely install two setscrews (Figure 7, Item 17).
   c. Align keyway in bushing (Figure 7, Item 19) with impeller shaft key (Figure 7, Item 20) and position flexible coupling (Figure 7, Item 16) on impeller shaft (Figure 7, Item 18). Ensure capscrew heads in metal part of flexible coupling are positioned toward pump end of shaft.

INSTALLATION - CONTINUED

CAUTION

Flexible coupling, impeller shaft key, and bushing must be properly positioned on impeller shaft. This will ensure two portions of coupling assembly (flexible portion and fixed outer ring) will fully engage when intermediate housing is installed on engine flywheel housing, without pre-loading pump bearing or pilot bearing in engine flywheel. Failure to properly install components will result in damage to pump.

d. Tap assembly onto impeller shaft (Figure 7, Item 18) until it is positioned approximately 3/8 in. (9.5 mm) from end of chamfer on shaft.

e. Tighten two setscrews (Figure 7, Item 17) in an alternating sequence until bushing (Figure 7, Item 19) and coupling are fully secured. Apply final torque of 175 lb-in. (19.8 Nm).

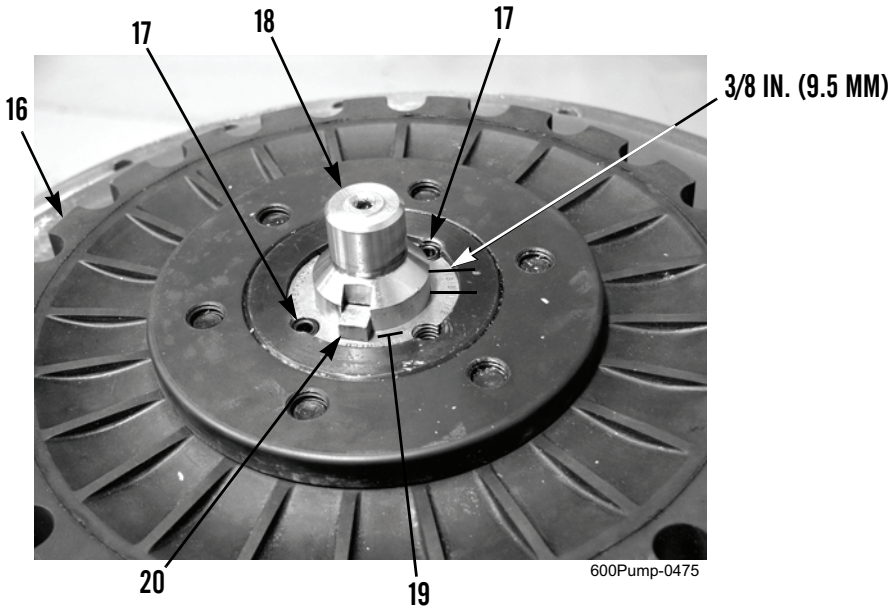


Figure 7. Installing Flexible Coupling on Impeller Shaft.

INSTALLATION - CONTINUED

4. Support intermediate housing (Figure 8, Item 10) and casing of pump (Figure 8, Item 5) with suitable lifting equipment.

CAUTION

DO NOT use petroleum-based lubricants, or any other substance which may soften or otherwise damage flexible coupling.

5. To assist in installation, lightly lubricate flexible coupling (Figure 7, Item 16) with glycerin.

CAUTION

Use caution not to damage engine/control panel wiring harness when assembling intermediate housing on engine flywheel housing.

6. Lift intermediate housing (Figure 9, Item 10) and casing of pump (Figure 9, Item 5) and place on chassis of trailer. Align assembly with engine flywheel housing (Figure 8, Item 11) so that flexible coupling (Figure 7, Item 16) seats inside outer ring (Figure 8, Item 21) at engine flywheel. Rotate impeller shaft as needed to assist in mating parts together.

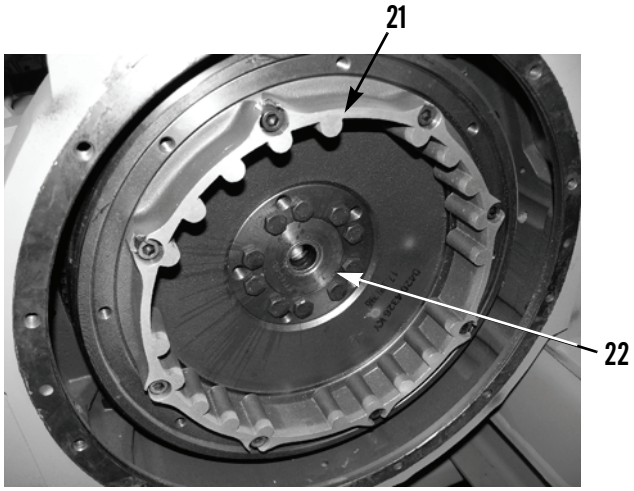


Figure 8. Outer Ring of Coupling and Pilot Bushing Assembly at Engine Flywheel Bore.

INSTALLATION - CONTINUED

7. Cut tiedown strap and reposition junction box mounting bracket (Figure 9, Item 15) with junction box (Figure 9, Item 14) at intermediate housing (Figure 9, Item 10).
8. Loosely install 12 new T-type lockwashers (Figure 9, Item 13) and capscrews (Figure 9, Item 12) on intermediate housing (Figure 9, Item 10) and engine flywheel housing (Figure 9, Item 11). DO NOT fully tighten capscrews.

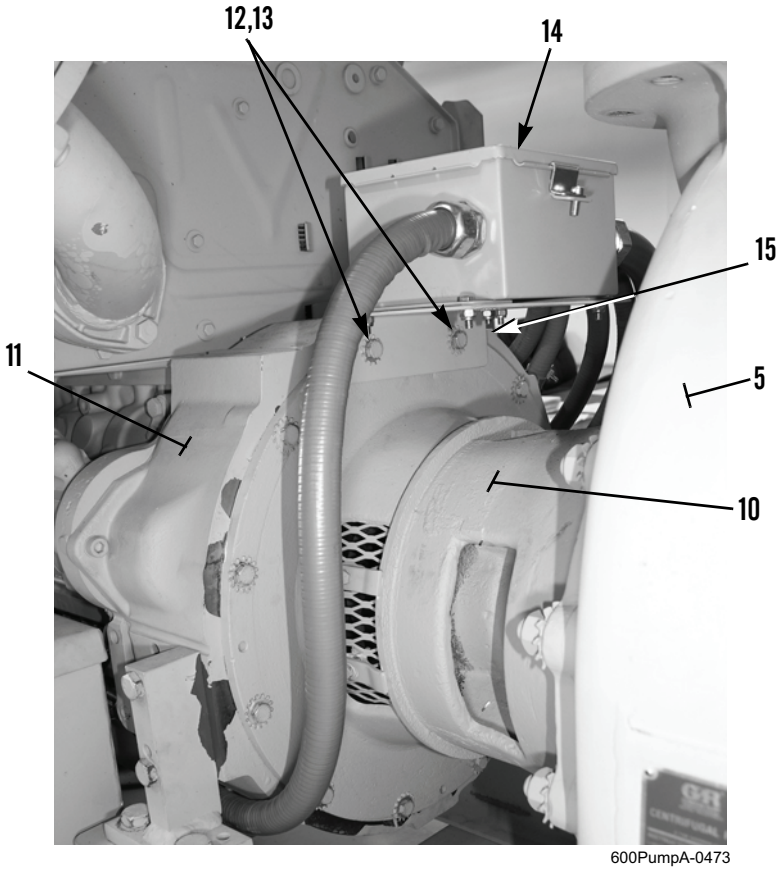


Figure 9. Intermediate Housing at Engine Flywheel Housing.

INSTALLATION - CONTINUED

9. Loosely install base of pump (Figure 10, Item 5) to trailer chassis with two new lockwashers (Figure 10, Item 7), four washers (Figure 10, Item 8), two bolts (Figure 10, Item 9), and new locknuts (Figure 10, Item 6).

CAUTION

DO NOT overtighten capscrews in step 10 or damage may occur.

10. Alternately and evenly, tighten 12 capscrews (Figure 9, Item 12) to 30 lb-ft (41 Nm). Fully tighten two locknuts (Figure 10, Item 6).

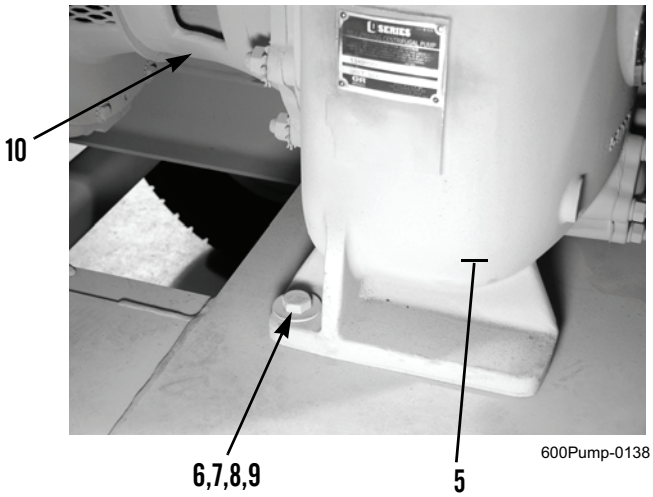


Figure 10. Pump Mounting to Trailer Chassis.

INSTALLATION - CONTINUED

NOTE

Apply antiseizing tape to male threads of fittings as they are installed.

11. If removed, install drain valve (Figure 11, Item 4) on pump (Figure 11, Item 5).
12. Position new hose clamp (Figure 11, Item 2) on pump drain hose (Figure 11, Item 1). Hold hose and install barb fitting (Figure 11, Item 3) on drain valve (Figure 11, Item 4). Tighten hose clamp.
13. Close drain valve (Figure 11, Item 4) by moving valve handle to vertical position.

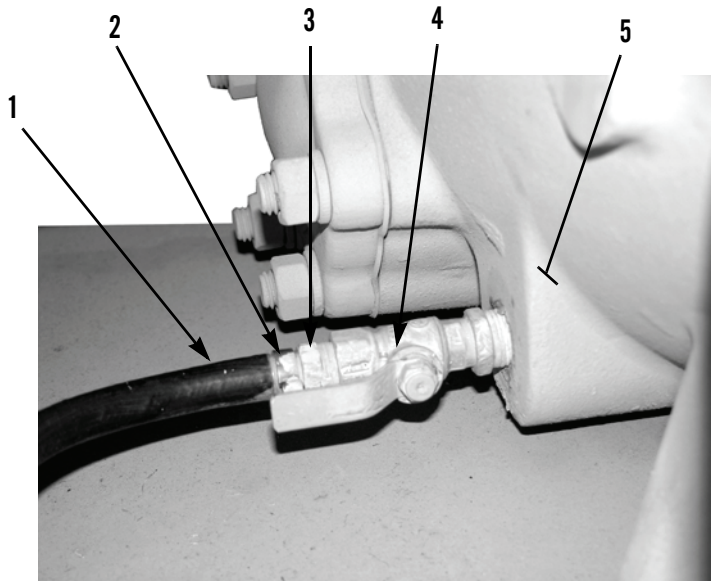


Figure 11. Pump Drain Hose.

FOLLOW-ON TASKS

1. Install discharge manifold assembly (WP 0114).
2. Install suction manifold assembly (WP 0116).
3. Connect battery cables (WP 0033).

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

4. Fill pump volute 2/3 with appropriate fluid, then start engine (WP 0006). Check pump operation. Be alert for leaks at pump.
5. Shut down engine (WP 0006).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

PUMP IMPELLER, IMPELLER SHAFT, SEAL ASSEMBLY, AND BEARING REPLACEMENT

Removal, Cleaning and Inspection, Installation, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)
Dog, lathe: 1-1//2 in. (Item 6, WP 0126)
Press, arbor, hand operated (Item 12, WP 0126)
Rod, brass, impeller holding: 1/2 in. x 18 in. long (Item 18, WP 0126)
Suitable lifting equipment
Wood block

Materials/Parts

Antiseize compound (Item 3, WP 0129)
Cleaning compound, solvent, Type III (Item 6, WP 0129)
Oil, lubricating, OE/HDO-15/40 (Item 20, WP 0129)
Rag, wiping (Item 22, WP 0129)
Bearing
Gasket

Materials/Parts - Continued

Lockwasher (14)
Retaining ring (2)
Seal assembly
Wear ring (2)

Personnel Required

63J (2)

References

WP 0006
WP 0023

Equipment Condition

Pump removed from engine flywheel housing (WP 0112)
Flexible coupling removed from impeller shaft (WP 0112)

REMOVAL

WARNING

Use extreme caution when lifting heavy parts. Provide adequate support and use assistance during procedure. Ensure that lifting equipment used is on solid footing, is in good condition, and is of suitable lift capacity. Keep clear of heavy parts supported only by lifting equipment. Failure to follow this warning may result in injury or death to personnel or damage to equipment.

NOTE

- Intermediate housing weighs approximately 199 lb (90 kg).
- Mark top of intermediate housing before removal to ensure correct installation.

1. Remove 12 nuts (Figure 1, Item 5) and lockwashers (Figure 1, Item 6) from studs (Figure 1, Item 7). Discard lockwashers.
2. Use suitable lifting equipment to separate intermediate housing (Figure 1, Item 2) with seal plate (Figure 1, Item 3) from pump casing (Figure 1, Item 1).
3. Remove gasket (Figure 1, Item 4) from pump casing (Figure 1, Item 1) and discard.

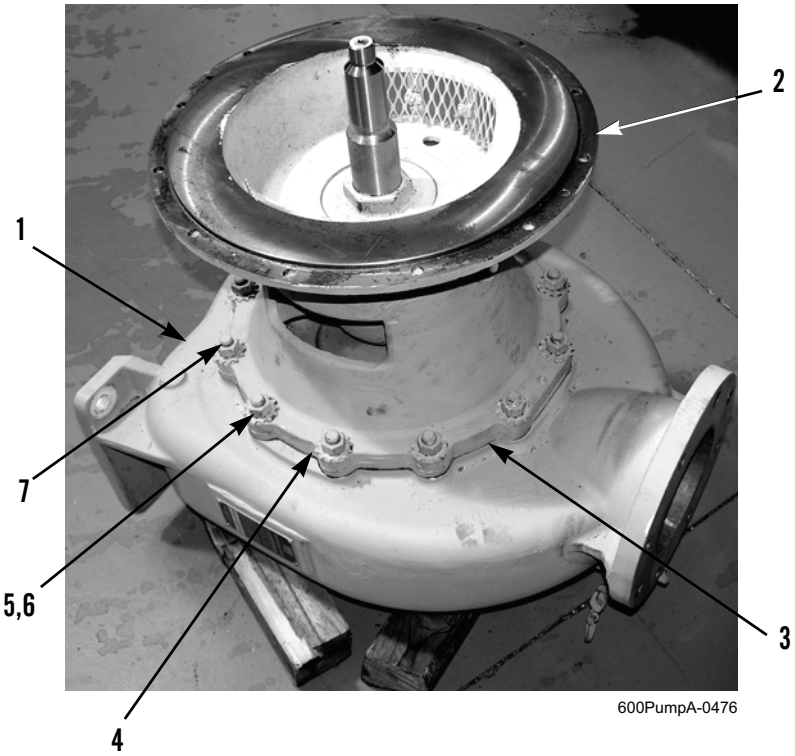


Figure 1. Separating Intermediate Housing and Seal Plate from Pump Casing.

REMOVAL - CONTINUED

4. Inspect wear ring (Figure 2, Item 8) in bore of pump casing (Figure 2, Item 1) for excessive wear or scoring.

CAUTION

Use caution not to damage bore of pump casing when removing wear ring.

NOTE

Wear ring is secured in bore of pump casing by a press fit.

a. If replacement is required, attempt to knock wear ring (Figure 2, Item 8) out of bore in pump casing (Figure 2, Item 1).

b. If required, use a small bit to drill two holes horizontally through wear ring (Figure 2, Item 8), 180 degrees apart.

c. Use a saw or chisel to complete cuts through wear ring (Figure 2, Item 8). Remove wear ring from bore of pump casing (Figure 2, Item 1). Discard wear ring.

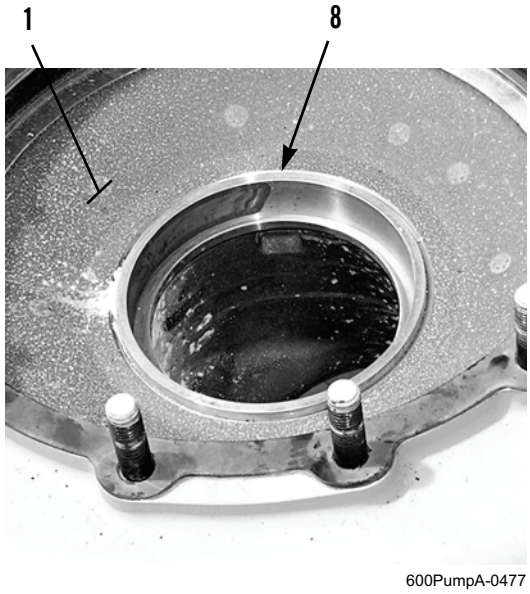


Figure 2. Pump Casing Wear Ring.

REMOVAL - CONTINUED

5. Place intermediate housing (Figure 3, Item 2) on its side and remove two guards (Figure 3, Item 9).

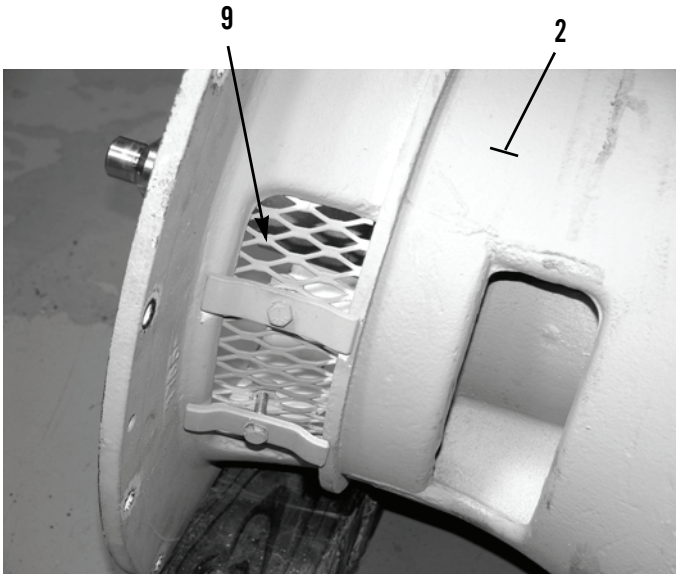


Figure 3. Intermediate Housing Guard.

6. Remove impeller (Figure 4, Item 12) from impeller shaft (Figure 4, Item 10).
   a. Install impeller shaft key (Figure 4, Item 11) on edge, as shown, in keyway on drive end of impeller shaft (Figure 4, Item 10).
   b. Install dog lathe tool on impeller shaft (Figure 4, Item 10) and tighten setscrew on tool.
   c. Insert a brass rod through impeller (Figure 4, Item 12) to prevent impeller from rotating.
   d. While blocking impeller (Figure 4, Item 12), use dog lathe tool to turn impeller shaft (Figure 4, Item 10) in a counter-clockwise direction (left when facing drive end of impeller shaft).
   e. When impeller (Figure 4, Item 12) breaks loose, remove dog lathe tool, impeller shaft key (Figure 4, Item 11), and brass rod.
   f. Remove impeller (Figure 4, Item 12) from impeller shaft (Figure 4, Item 10).

REMOVAL - CONTINUED

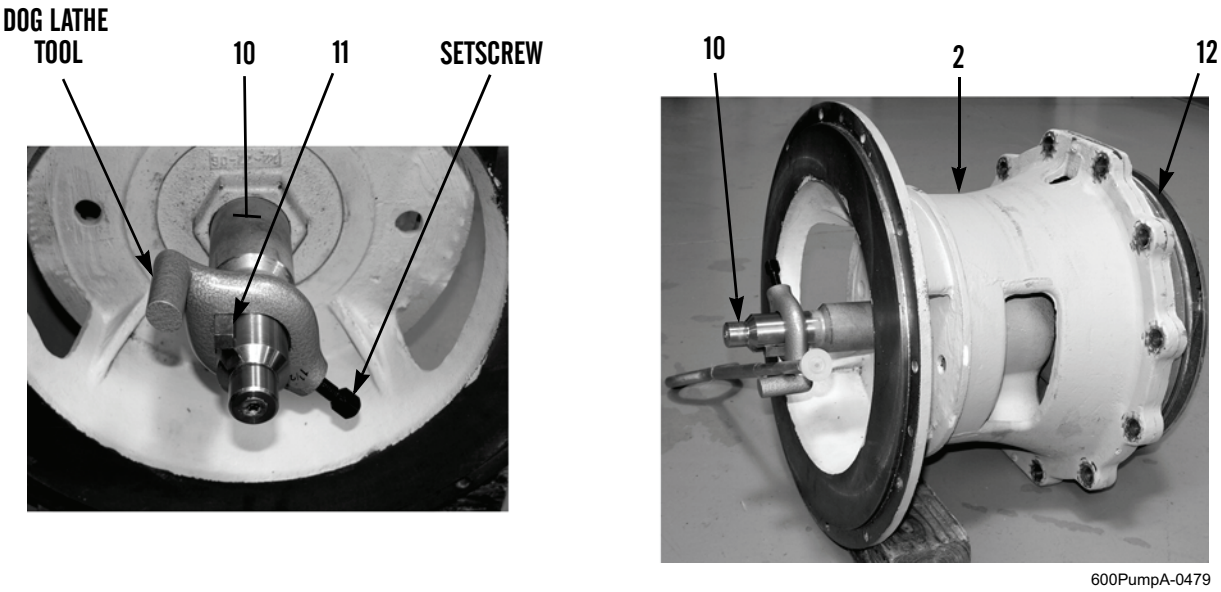


Figure 4. Removing Impeller.

7. Place intermediate housing (Figure 3, Item 2) in upright position with impeller (Figure 4, Item 12) end up.
8. Remove seal spring (Figure 5, Item 13) from impeller shaft (Figure 5, Item 10). Discard seal spring.

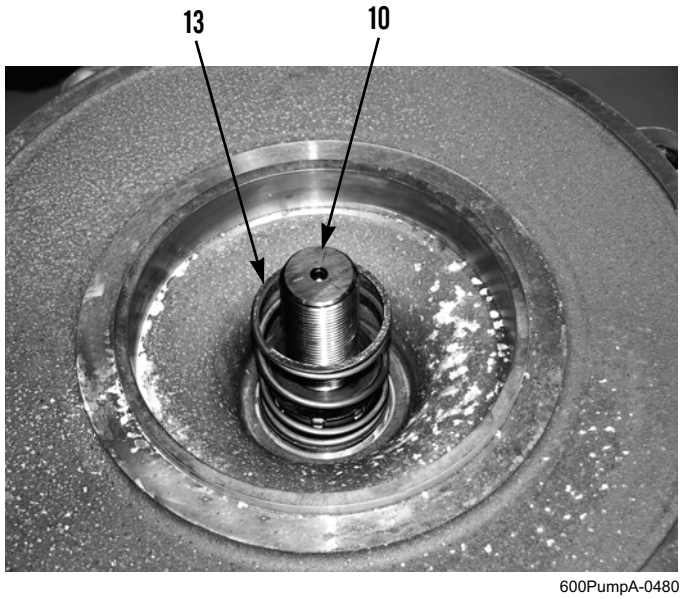


Figure 5. Seal Spring.

REMOVAL - CONTINUED

9. Remove shim(s) (Figure 6, Item 14) and seal washer (Figure 6, Item 15) from impeller shaft (Figure 6, Item 10). Retain shim(s) for installation.
10. Apply oil to impeller shaft (Figure 6, Item 10) and work oil up under rubber bellows of rotating (Figure 6, Item 16) portion of seal. Slide rotating portion of seal off impeller shaft as a unit. Discard rotating portion of seal.

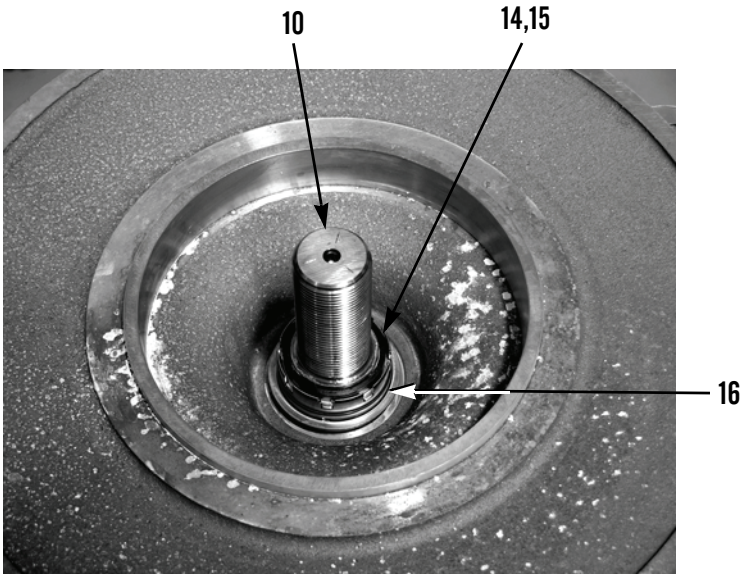


Figure 6. Shim(s), Seal Washer, and Rotating Portion of Seal.

REMOVAL - CONTINUED

11. Remove two screws (Figure 7, Item 20) and lockwashers (Figure 7, Item 21) from intermediate housing (Figure 7, Item 2) and seal plate (Figure 7, Item 3). Discard lockwashers.
12. Remove seal plate (Figure 7, Item 3) and stationary portion (Figure 7, Item 16) of seal from impeller shaft (Figure 7, Item 10) as a unit.
13. Position seal plate (Figure 7, Item 3) on a flat surface, impeller side down. Use a suitable dowel to press stationary portion (Figure 7, Item 18) of seal and O-ring (Figure 7, Item 19) out of seal plate from the back side. Discard stationary portion of seal and O-ring.
14. Inspect wear ring (Figure 7, Item 17) in bore of seal plate (Figure 7, Item 3) for excessive wear and scoring.

CAUTION

Use caution not to damage bore of seal plate when removing wear ring.

NOTE

Wear ring is secured in bore of seal plate by a press fit.

a. If replacement is required, attempt to knock wear ring (Figure 7, Item 17) out of bore in seal plate (Figure 7, Item 3).
b. If required, use a small bit to drill two holes horizontally through wear ring (Figure 7, Item 17), 180 degrees apart.
c. Use a saw or chisel to complete cuts through wear ring (Figure 7, Item 17). Remove wear ring from seal plate (Figure 7, Item 3). Discard wear ring.

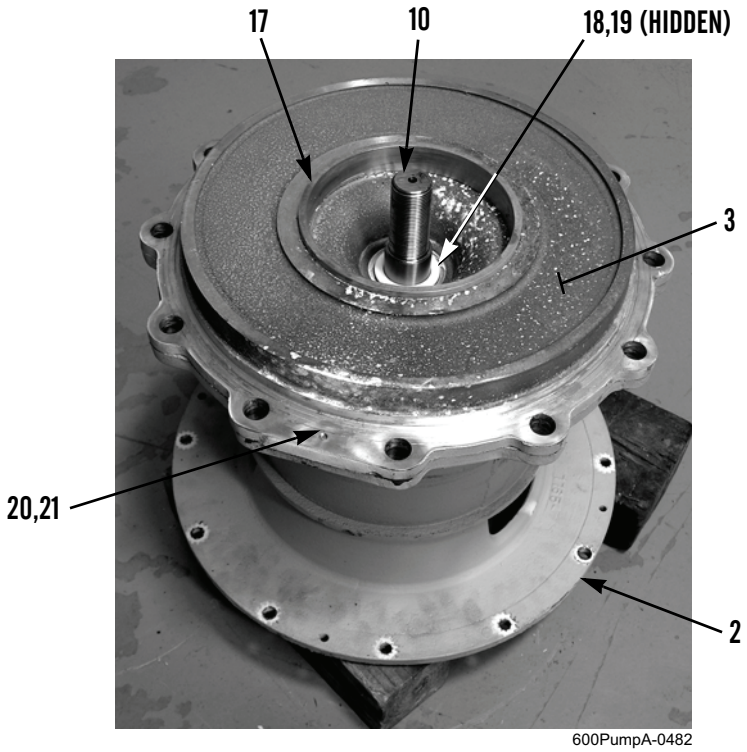
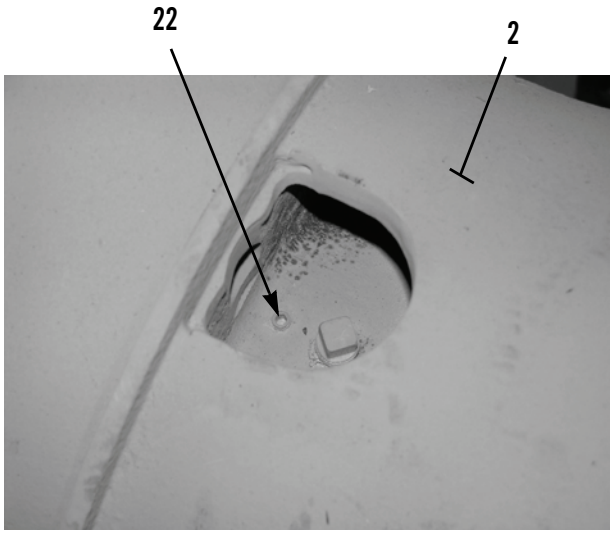


Figure 7. Seal Plate and Stationary Portion of Seal.

REMOVAL - CONTINUED

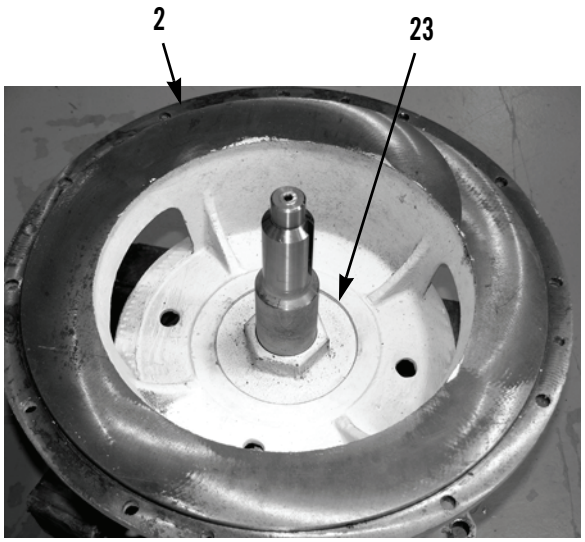
15. Loosen setscrew (Figure 8, Item 22) located at top of intermediate housing (Figure 8, Item 2).



600Pump-0292

Figure 8. Setscrew.

16. Remove bearing retaining nut (Figure 9, Item 23) from intermediate housing (Figure 9, Item 2).



600PumpA-0483

Figure 9. Bearing Retaining Nut.

REMOVAL - CONTINUED

17. Place a block of wood against impeller end of impeller shaft (Figure 10, Item 10) and tap impeller shaft, spacer (Figure 10, Item 24), and bearing (Figure 10, Item 25) from bearing bore in intermediate housing (Figure 10, Item 2).

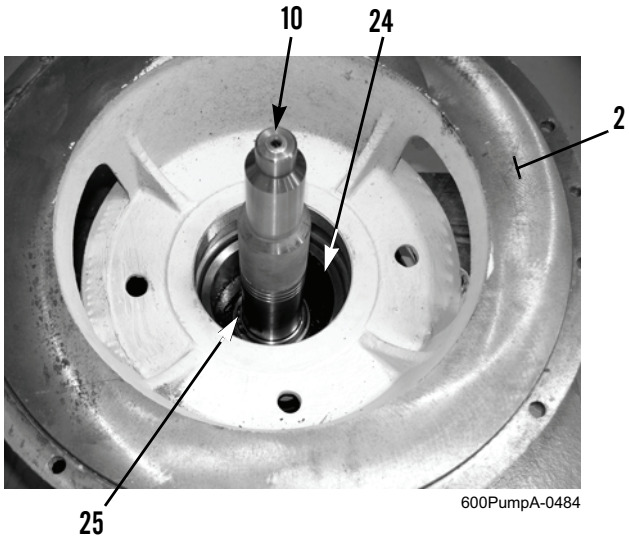


Figure 10. Impeller Shaft, Bearing, and Spacer.

18. Remove spacer (Figure 11, Item 24), retaining rings (Figure 11, Items 26 and 28), and spacer (Figure 11, Item 27) from impeller shaft (Figure 11, Item 10). Discard retaining rings.
19. Use an arbor press and a suitable sleeve to remove bearing (Figure 11, Item 25) from impeller shaft (Figure 11, Item 10). Discard bearing.

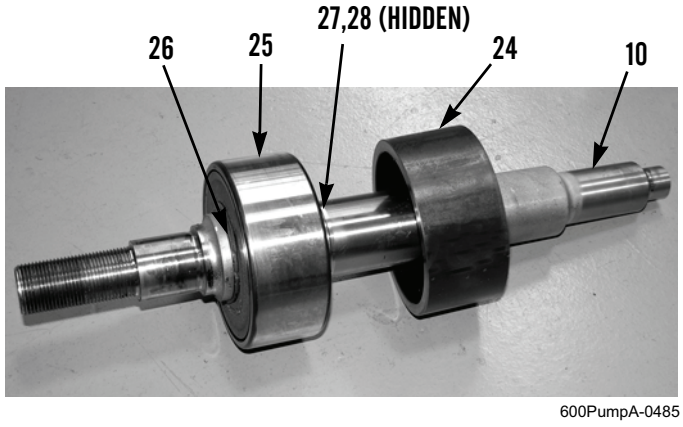


Figure 11. Bearing on Impeller Shaft.

CLEANING AND INSPECTION

1. Clean and inspect pump casing, seal plate, intermediate housing, and all other removed parts IAW WP 0023.
2. Replace any damaged part.

INSTALLATION

1. Install spacer (Figure 12, Item 27) and new retaining ring (Figure 12, Item 28) on impeller shaft (Figure 12, Item 10).

CAUTION

- NEVER press or hit against outer race, balls, or ball cage when pressing bearing on impeller shaft. Press ONLY on inner race. Failure to follow this caution may damage bearing.
- DO NOT heat a sealed bearing to assist in installation of bearing. Heating a sealed bearing will damage bearing.

NOTE

Bearing is sealed and requires no lubrication.

2. Use an arbor press and a suitable sleeve to press new bearing (Figure 12, Item 25) on impeller shaft (Figure 12, Item 10).
3. Secure bearing (Figure 12, Item 25) to impeller shaft (Figure 12, Item 3) with new retaining ring (Figure 12, Item 26).

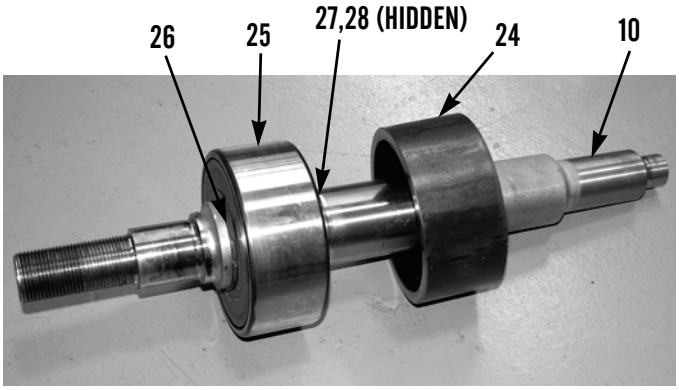


Figure 12. Bearing on Impeller Shaft.

4. Place intermediate housing (Figure 13, Item 2) on wooden blocks with drive end up.

INSTALLATION - CONTINUED

NOTE

Ensure intermediate housing bore is clean.

5. Install impeller shaft (Figure 13, Item 10), spacer (Figure 13, Item 24), and assembled bearing (Figure 13, Item 25) into bore of intermediate housing (Figure 13, Item 2) until bearing seats squarely against bore shoulder. Tap on impeller shaft to assist installation.

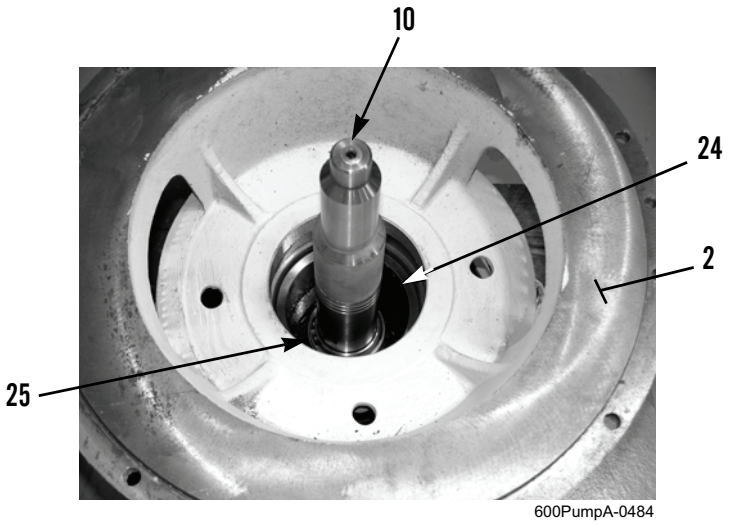


Figure 13. Impeller Shaft, Bearing, and Spacer.

INSTALLATION - CONTINUED

6. Apply antiseize compound to threads, then fully install bearing retaining nut (Figure 14, Item 23) in intermediate housing (Figure 14, Item 2).

CAUTION

Too much end play could result in damage to pump.

NOTE

Correct end play should be no more than 0.002 to 0.010 in. (0.05 to 0.25 mm).

a. Check for movement in impeller shaft (Figure 14, Item 10).

b. If impeller shaft (Figure 14, Item 10) moves, remove bearing retaining nut (Figure 14, Item 23), tap impeller shaft further into intermediate housing (Figure 14, Item 2), and retighten bearing retaining nut.

c. Recheck impeller shaft (Figure 14, Item 10) for movement.

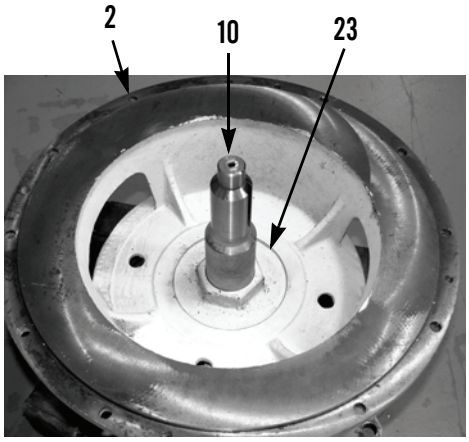


Figure 14. Bearing Retaining Nut.

7. Tighten setscrew (Figure 15, Item 22) to secure bearing retaining nut (Figure 14, Item 23).

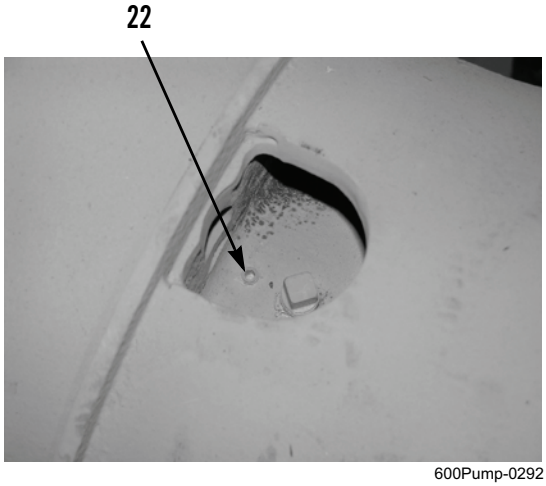


Figure 15. Setscrew.

INSTALLATION - CONTINUED

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low-toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to follow this warning may result in injury or death to personnel.

8. Clean seal cavity in seal plate (Figure 16, Item 3) with a rag soaked in solvent cleaning compound.
9. Position seal plate (Figure 16, Item 3) on a flat surface, impeller side up.

CAUTION

Wear ring must seat squarely in seal plate bore or binding and/or excessive wear will result.

10. If removed, press new wear ring (Figure 16, Item 17) in bore of seal plate (Figure 16, Item 3) until it seats squarely against bore shoulder.

CAUTION

Handle parts of seal assembly with extreme care to prevent damage. Be careful not to contaminate precision finished faces; even fingerprints on faces can shorten seal life. If necessary, clean faces with a non-oil based solvent and a clean, lint-free tissue. Wipe lightly in a concentric pattern to avoid scratching seal faces. Failure to follow this caution may result in damage to equipment.

11. Inspect finished faces of new seal assembly to ensure they are free of any foreign matter. Remove any foreign matter, as required.
12. Lightly lubricate O-ring (Figure 16, Item 19) on stationary portion (Figure 16, Item 18) of seal with oil. Apply a drop of oil to finished faces.
13. Assemble seal assembly and seal plate (Figure 16, Item 3).

NOTE

Ensure notch in stationary portion of seal is facing down.

a. Use even pressure to press new O-ring (Figure 16, Item 19) and stationary portion (Figure 16, Item 18) of seal into seal plate (Figure 16, Item 3), until squarely seated against shoulder bore. Use a lint-free cloth to remove any oil from stationary portion of seal.

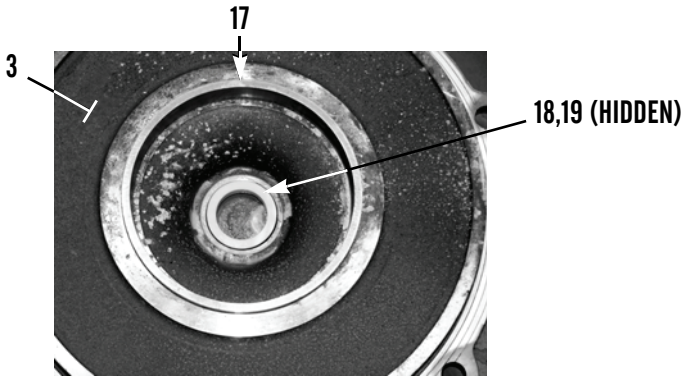


Figure 16. Seal Plate.

INSTALLATION - CONTINUED

b. Carefully slide assembled seal plate (Figure 17, Item 3) and stationary portion (Figure 17, Item 18) of seal onto impeller shaft (Figure 17, Item 10).

c. Secure seal plate (Figure 17, Item 3) to intermediate housing (Figure 17, Item 2) with two new lockwashers (Figure 17, Item 21) and screws (Figure 17, Item 20).

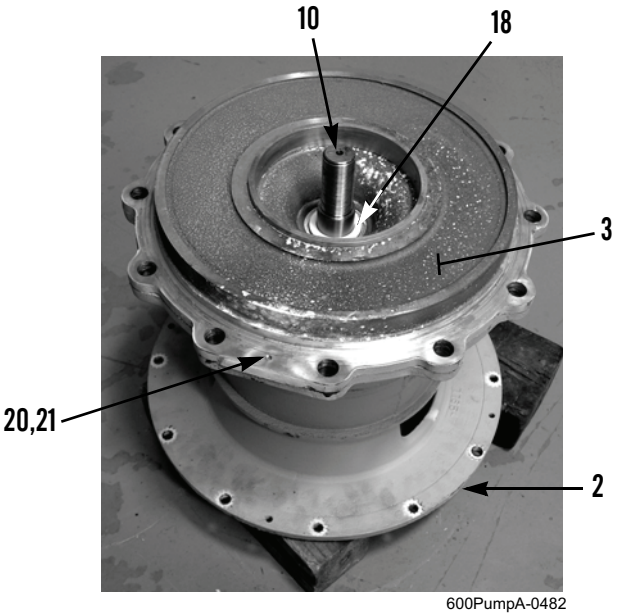


Figure 17. Seal Plate and Intermediate Housing.

NOTE

A suitably tapered sleeve may be placed over end of impeller shaft to ease installation of rotating seal components.

d. Place intermediate housing (Figure 17, Item 2) so that impeller shaft (Figure 17, Item 10) is horizontal.

e. Lubricate wiper (rubber) of rotating portion (Figure 18, Item 16) of seal with oil.

f. Wipe oil from mating face of rotating portion (Figure 18, Item 16) of seal.

g. Lightly lubricate impeller shaft (Figure 18, Item 10) with oil. DO NOT allow oil to contact stationary portion (Figure 17, Item 18) of seal that is already installed.

CAUTION

Use caution not to dislodge black carbon rotating element.

h. Work rotating portion (Figure 18, Item 16) of seal into position over impeller shaft (Figure 18, Item 10). Press evenly around circumference to seat rotating portion of seal.

i. Return intermediate housing (Figure 17, Item 2) to vertical position.

INSTALLATION - CONTINUED

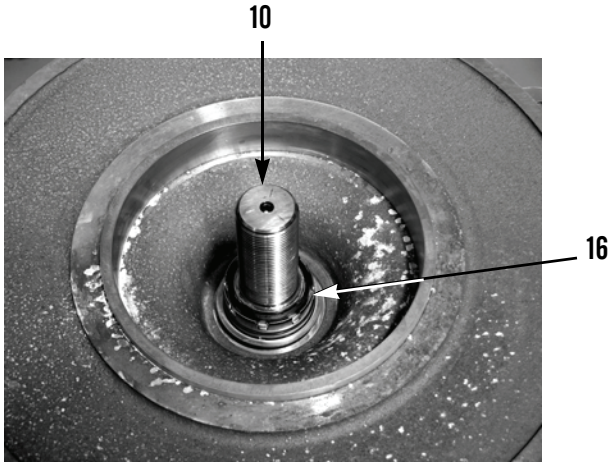


Figure 18. Rotating Portion of Seal.

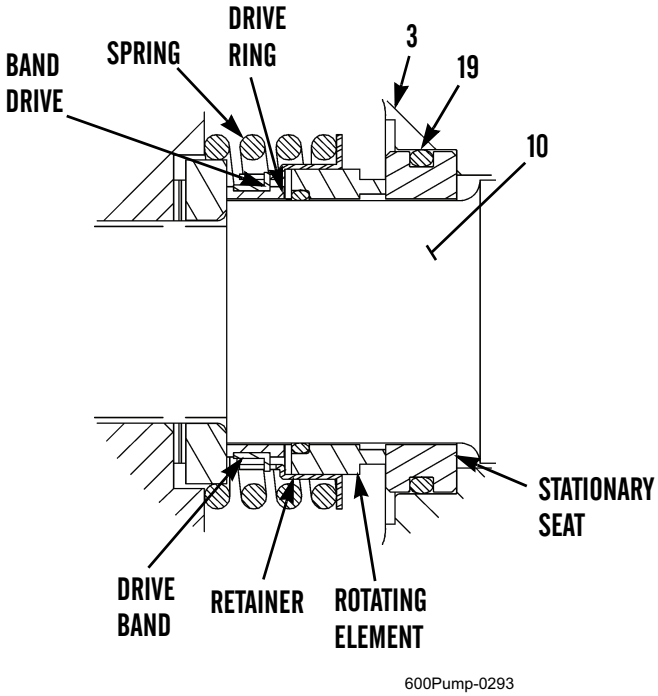
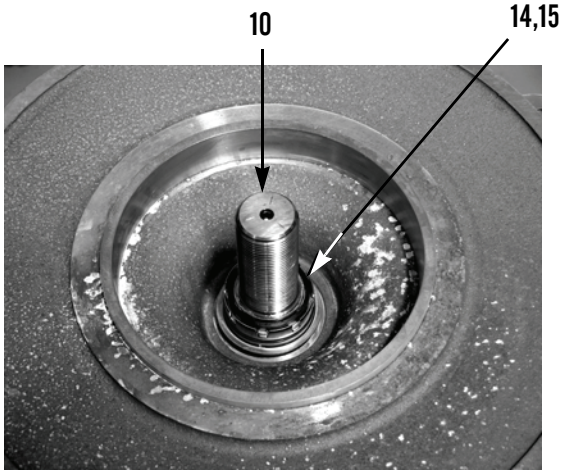


Figure 19. Seal Assembly Components.

INSTALLATION - CONTINUED

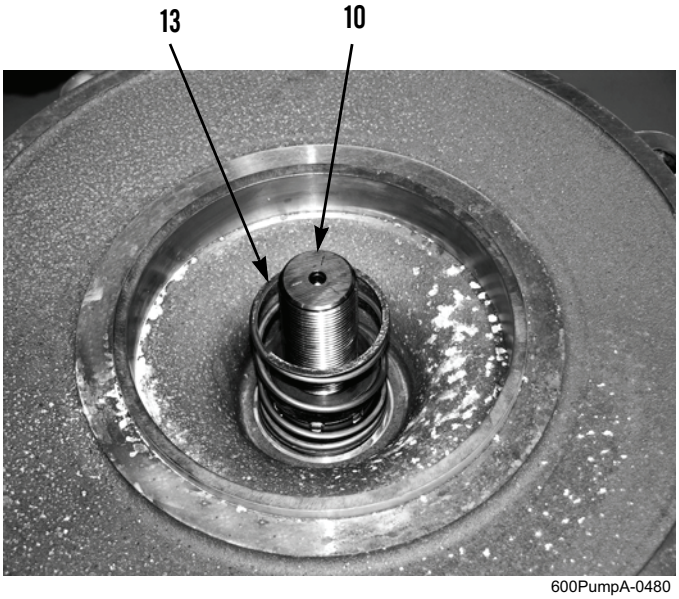
14. Install seal washer (Figure 20, Item 15), with chamfered side toward seal assembly, and shim(s) (Figure 20, Item 14) (same quantity as removed) on impeller shaft (Figure 20, Item 10).



600PumpA-0481

Figure 20. Seal Washer and Shim(s).

15. Install new seal spring (Figure 21, Item 13) on impeller shaft (Figure 21, Item 10).



600PumpA-0480

Figure 21. Seal Spring.

INSTALLATION - CONTINUED

16. Apply antiseize compound on threads of impeller shaft (Figure 22, Item 10). Install impeller (Figure 22, Item 12) by hand on impeller shaft.
17. Tighten impeller (Figure 22, Item 12) on impeller shaft (Figure 22, Item 10).
    a. Turn intermediate housing (Figure 22, Item 2) to horizontal position.
    b. Install impeller shaft key (Figure 22, Item 11) on edge, as shown, in keyway on impeller shaft (Figure 22, Item 10).
    c. Install dog lathe tool on drive end of impeller shaft (Figure 22, Item 10) and hand tighten setscrew on tool.
    d. Hold impeller shaft (Figure 23, Item 10) using dog lathe tool and spin impeller (Figure 23, Item 12) to tighten it.

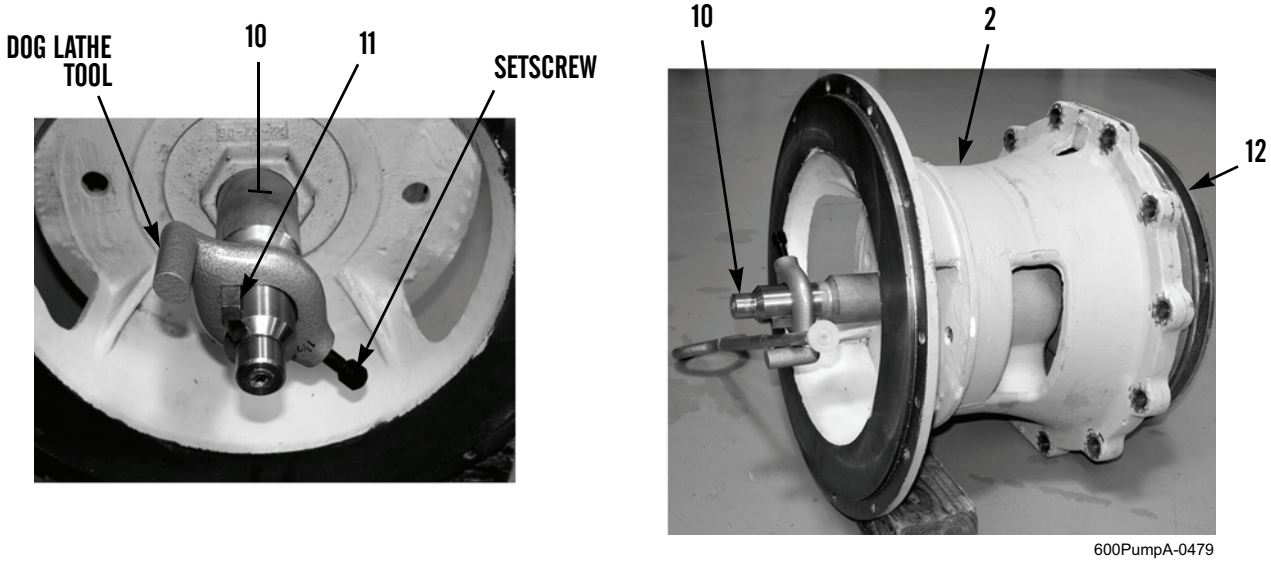


Figure 22. Installing Impeller.

18. Install two guards (Figure 23, Item 9) on intermediate housing (Figure 23, Item 2).

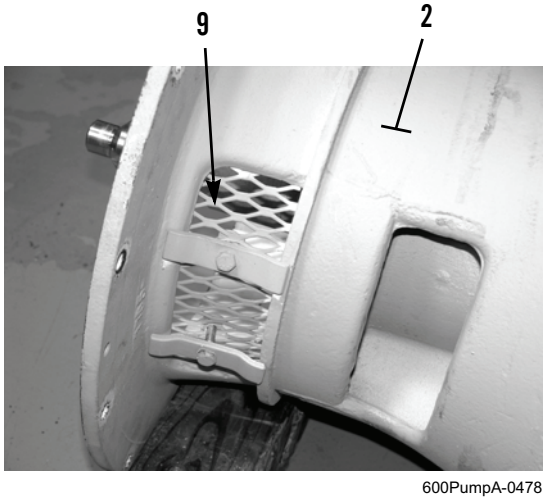
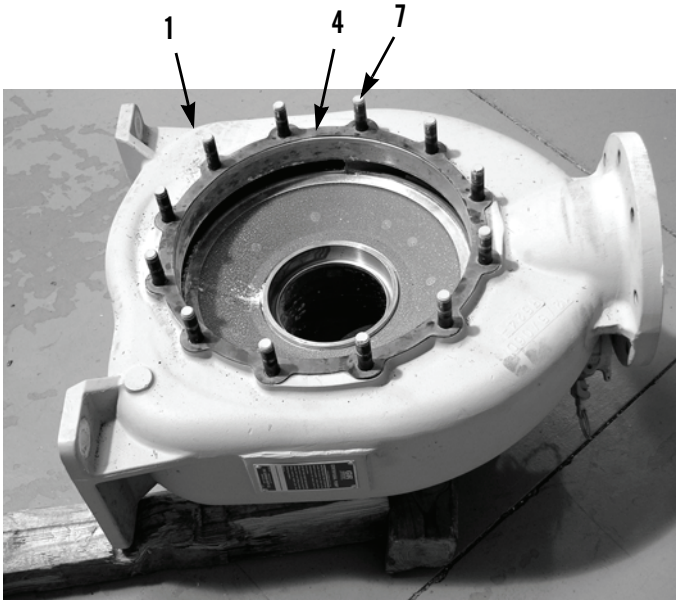


Figure 23. Intermediate Housing Guard.

INSTALLATION - CONTINUED

19. Place pump casing (Figure 24, Item 1) in horizontal position. Install new gasket (Figure 24, Item 4) over studs (Figure 24, Item 7) at pump casing.



600PumpA-0489

Figure 24. Pump Casing Gasket.

CAUTION

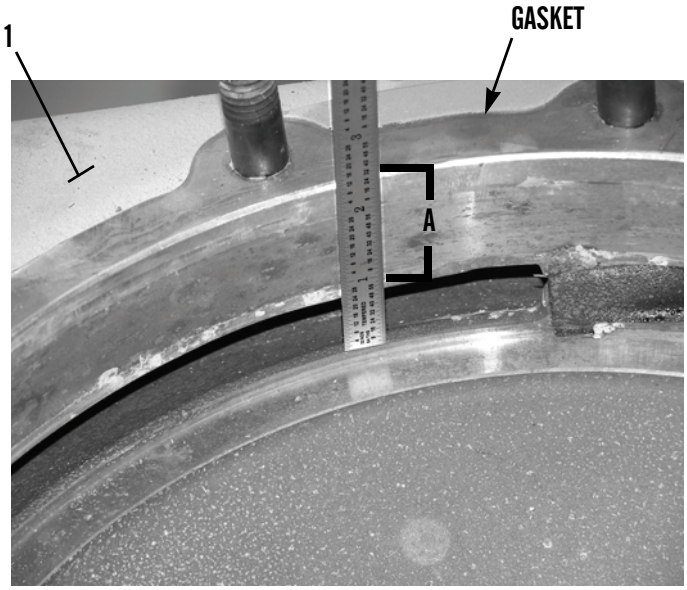
If impeller is not correctly positioned in volute scroll of pump casing, there may be interference, resulting in damage to pump.

NOTE

For maximum pump efficiency, impeller should be centered within volute scroll of pump casing.

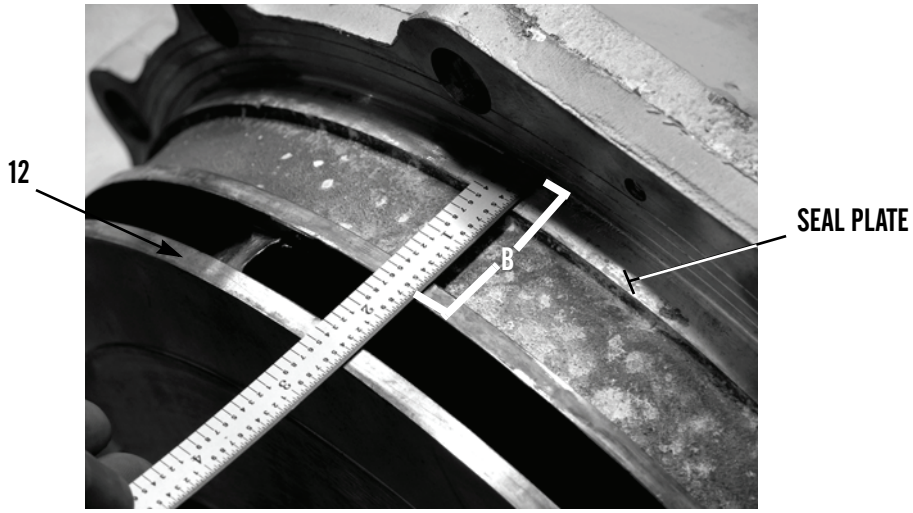
20. Determine correct positioning of impeller (Figure 26, Item 12).
    a. Measure dimension “A” (top of gasket to edge of gap) at pump casing (Figure 25, Item 1).
    b. Measure dimension “B” (edge of seal plate to edge of gap) at impeller (Figure 26, Item 12).

INSTALLATION - CONTINUED



600PumpA-0490

Figure 25. Dimension “A”.



600PumpA-0491

Figure 26. Dimension “B”.

INSTALLATION - CONTINUED

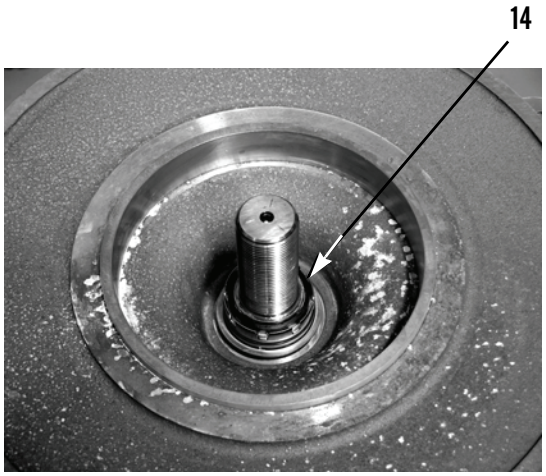
c. If dimensions “A” and “B” are equal, impeller positioning is OK.

NOTE

- Refer to *Removal* step 6 in this work package for procedure to loosen and remove impeller from impeller shaft in order to access shim(s) to add/remove shim(s).
- Shim(s) come in the following thicknesses: 0.005 in., 0.010 in., and 0.030 in.

d. If dimension “B” is greater than dimension “A”, add shim(s) (Figure 27, Item 14) as needed until “A” and “B” are equal.

e. If dimension “B” is less than dimension “A”, remove shim(s) (Figure 27, Item 14) as needed until “A” and “B” are equal.



600PumpA-0481

Figure 27. Seal Washer and Shim(s).

INSTALLATION - CONTINUED

CAUTION

Wear ring must seat squarely in pump casing bore or binding and/or excessive wear will result.

21. If removed, press new wear ring (Figure 28, Item 8) in bore of pump casing (Figure 28, Item 1) until it seats squarely against bore shoulder.

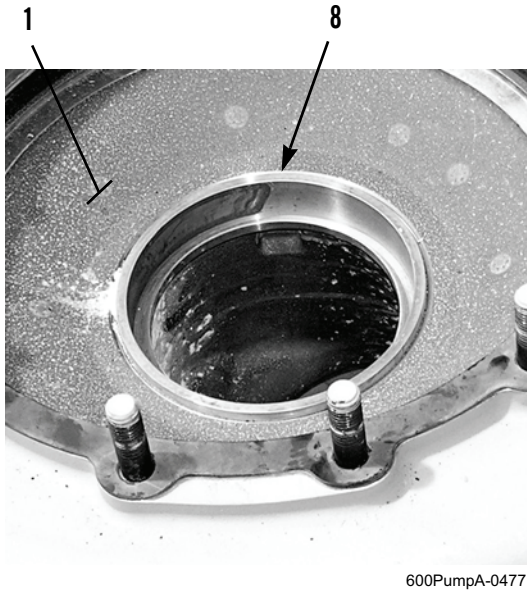


Figure 28. Pump Casing Wear Ring.

INSTALLATION - CONTINUED

WARNING

Use extreme caution when lifting heavy parts. Provide adequate support and use assistance during procedure. Ensure that lifting equipment used is an solid footing, is in good condition, and is of suitable lift capacity. Keep clear of parts supported only by lifting equipment. Failure to follow this warning may result in injury or death to personnel or damage to equipment.

NOTE

- Ensure intermediate housing is installed as marked during removal.
- Intermediate housing weighs approximately 199 lb (90 kg).

22. Use suitable lifting equipment to position intermediate housing (Figure 29, Item 2) and seal plate (Figure 29, Item 3) as an assembly against gasket (Figure 29, Item 4) and pump casing (Figure 29, Item 1).
23. Ensure impeller shaft (Figure 29, Item 10) turns freely.

CAUTION

DO NOT overtighten nuts or stud threads may become pulled/stripped or aluminum pump casing may become cracked.

24. Install 12 new lockwashers (Figure 29, Item 6) and nuts (Figure 29, Item 5) on studs (Figure 29, Item 7). Tighten nuts securely and evenly to 44 lb-ft (60 Nm).

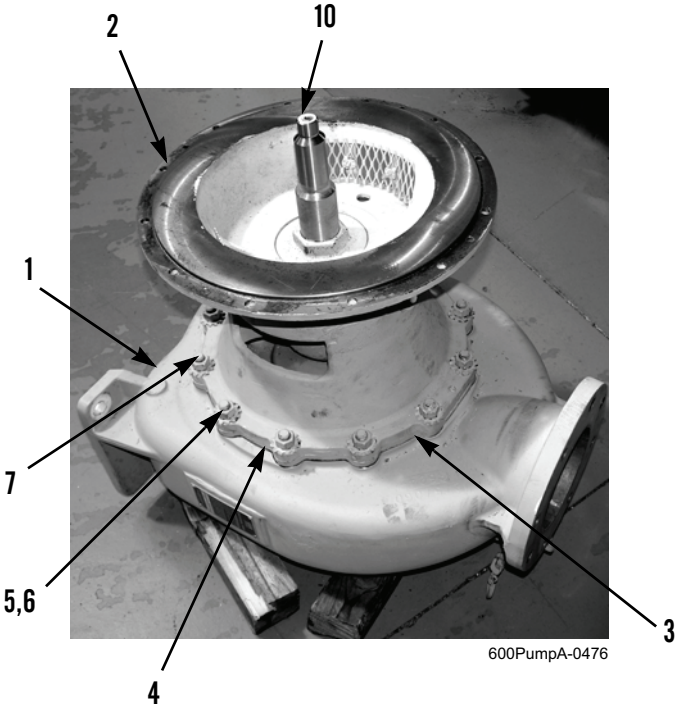


Figure 29. Installing Intermediate Housing and Seal Plate on Pump Casing.

FOLLOW-ON TASKS

1. Install flexible coupling on impeller shaft (WP 0112).
2. Install pump on engine flywheel housing (WP 0112).

CAUTION

Pump is coupled directly to engine. When engine must be run, ensure pump volute is filled 2/3 full with appropriate fluid (fuel or water) before starting engine. Running pump dry will damage seal.

3. Fill pump volute 2/3 full with appropriate fluid, then start engine (WP 0006). Check pump operation. Be alert for leaks at pump.
4. Shut down engine (WP 0006).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

PUMP DISCHARGE MANIFOLD ASSEMBLY MAINTENANCE

Disassembly, Cleaning and Inspection, Assembly, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)
Suitable lifting equipment

Materials/Parts

Adhesive (Item 2, WP 0129)
Cleaning compound, solvent, Type III (Item 6, WP 0129)
Cloth, abrasive (Item 7, WP 0129)
Grease, multipurpose, NLG12 (Item 15, WP 0129)
Rag, wiping (Item 22, WP 0129)
Tape, antiseizing (Item 28, WP 0129)
Gasket (3)
Hose clamp (3)

Materials/Parts - Continued

Locknut (24)
Lockwasher (24)

Personnel Required

63J (2)

References

MIL-T-704
WP 0004
WP 0008

Equipment Condition

Pump system drained (WP 0006)
Battery cables disconnected (WP 0033)

WARNING

- Allow pump assembly to cool off before performing maintenance on discharge manifold assembly. Hot metal parts can cause severe burns. Wear eye, glove, and skin protection when working with parts that may be hot. Failure to follow this warning may cause injury to personnel.
- FUEL PUMP ASSEMBLY. DO NOT perform fuel system checks, inspections or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing damage to equipment and injury or death to personnel.
- FUEL PUMP ASSEMBLY. Wear fuel-resistant gloves and eye protection when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. Failure to follow this warning may result in injury to personnel.
- FUEL PUMP ASSEMBLY. When servicing this equipment, performing maintenance, or disposing of materials such as fuel, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.
- Use extreme caution when lifting discharge manifold assembly. Provide adequate support and use assistance during procedure. Ensure that lifting equipment used is on solid footing, is in good condition, and is of suitable lift capacity. Keep clear of heavy parts supported only by lifting equipment. Failure to follow this warning may result in death or injury to personnel or damage to equipment.

NOTE

Discharge manifold assembly weighs approximately 192 lb (87 kg).

DISASSEMBLY

1. FUEL PUMP ASSEMBLY. Observe all fuel-related safety precautions when disassembling discharge manifold assembly (WP 0004).

NOTE

All original equipment hose clamps should be replaced, on assembly, with new worm drive type hose clamps. A supply of extra hose clamps is stored in storage box (WP 0008).

2. Cut hose clamp (Figure 1, Item 5), hold discharge manifold drain hose (Figure 1, Item 6), and remove barb fitting (Figure 1, Item 4) and discharge manifold drain hose from discharge manifold drain valve (Figure 1, Item 1). Discard hose clamp.
3. Remove reducer fitting (Figure 1, Item 3) and drain valve (Figure 1, Item 1) from discharge manifold (Figure 1, Item 2).

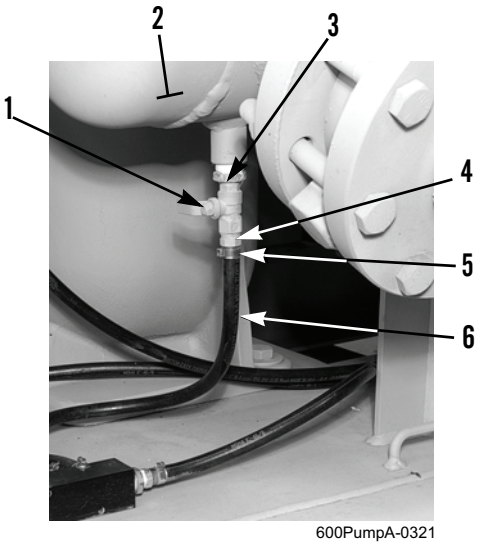


Figure 1. Discharge Manifold Drain Valve and Hose.

4. FUEL PUMP ASSEMBLY. Remove quick disconnect fitting (Figure 2, Item 8) and elbow (Figure 2, Item 7) from discharge manifold (Figure 2, Item 2).

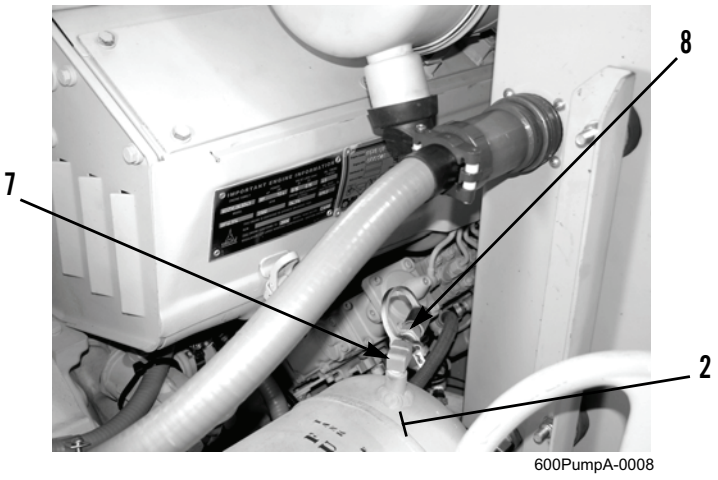


Figure 2. Fuel Jumper Hose Quick Disconnect Fitting.

DISASSEMBLY - CONTINUED

5. Under control panel box (Figure 3, Item 9), disconnect quick disconnect fitting (Figure 3, Item 11) from quick disconnect fitting (Figure 3, Item 10) to disconnect pressure gauge hose (Figure 3, Item 12).

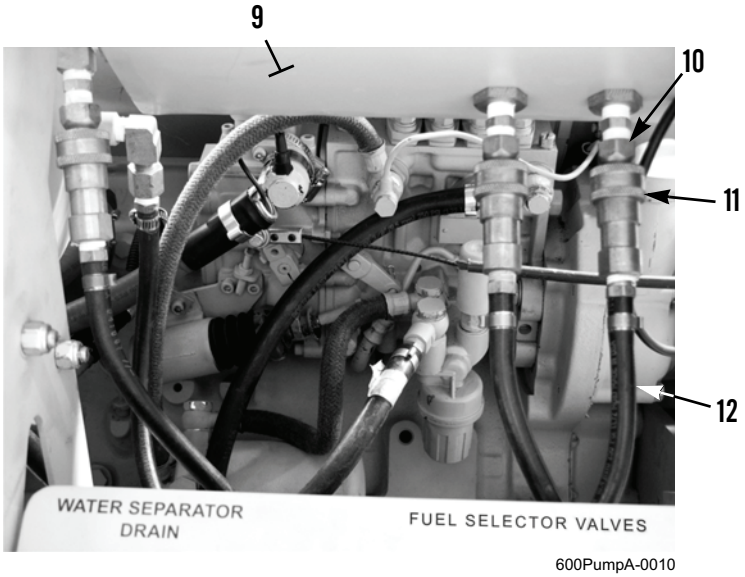


Figure 3. Quick Disconnect for Pressure Gauge Hose.

6. Cut hose clamp (Figure 4, Item 16), hold pressure gauge hose (Figure 4, Item 12), and remove barb fitting (Figure 4, Item 15) and pressure gauge hose from inline filter (Figure 4, Item 14). Discard hose clamp.
7. Remove inline filter (Figure 4, Item 14) from elbow fitting (Figure 4, Item 13).
8. Remove elbow fitting (Figure 4, Item 13) from discharge manifold (Figure 4, Item 2).

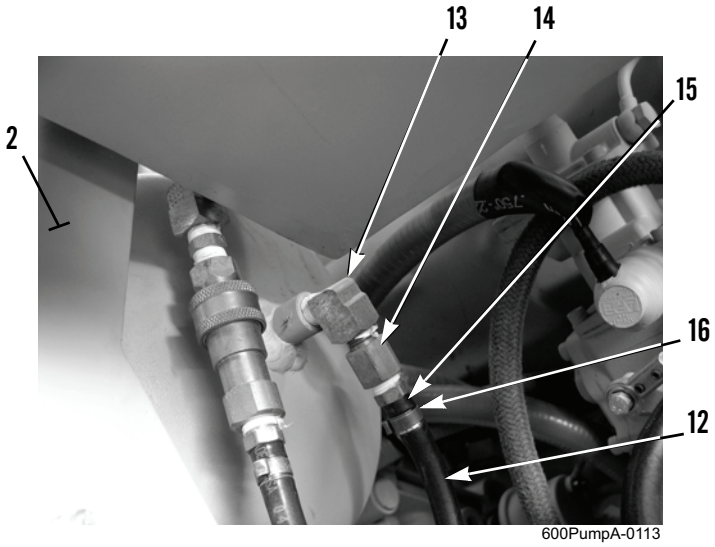


Figure 4. Pressure Gauge Hose and Inline Filter at Discharge Manifold.

DISASSEMBLY - CONTINUED

9. Remove cover (Figure 5, Item 17) from one discharge outlet flange (Figure 6, Item 22).
10. Inspect gasket (Figure 5, Item 18) inside cover (Figure 5, Item 17) for damage. Obtain replacement gasket, if damaged.

Figure 5. Gasket Inside Camlock Cover.

NOTE

Mark position of gate valve in relation to outlet flange of discharge manifold, to ensure correct assembly.

11. With assistance, remove eight locknuts (Figure 6, Item 20) and bolts (Figure 6, Item 21) and remove discharge outlet flange (Figure 6, Item 22) and gate valve (Figure 6, Item 19) from outlet flange of discharge manifold (Figure 6, Item 2). Discard locknuts.
12. Repeat steps 9 through 11 to remove fittings from two remaining outlet flanges of discharge manifold (Figure 6, Item 2).
13. Remove two nuts (Figure 6, Item 25), four washers (Figure 6, Item 23), and two shock mounts (Figure 6, Item 26) from each of two U-bolts (Figure 6, Item 24) and welded mounting brackets (Figure 6, Item 27).

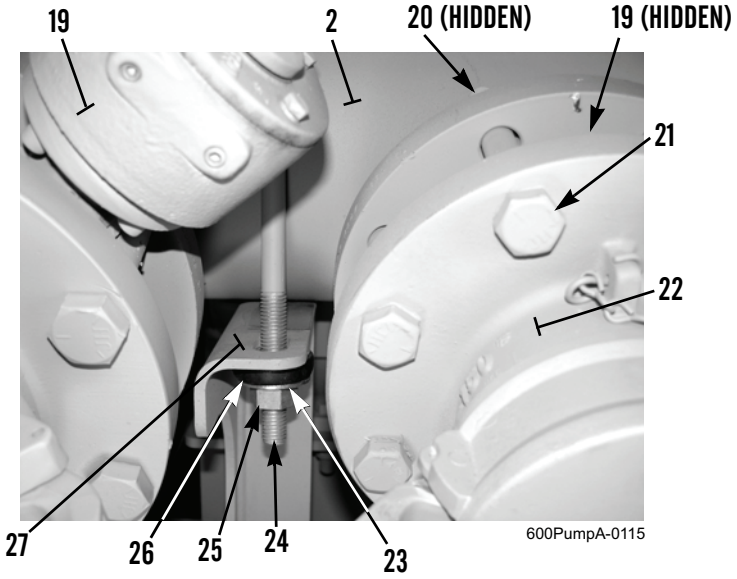


Figure 6. Discharge Manifold Mounting.

DISASSEMBLY - CONTINUED

14. Attach suitable lifting equipment to discharge manifold (Figure 7, Item 2) and support discharge manifold.

NOTE

- Note orientation of discharge manifold flange, check valve, and 90-degree discharge elbow, to ensure correct assembly.
- DO NOT remove threaded studs at this time.

15. Remove nut (Figure 7, Item 29) and lockwasher (Figure 7, Item 30) from each end of eight threaded studs (Figure 7, Item 33) that secure flange (Figure 7, Item 32) of discharge manifold (Figure 7, Item 2) and check valve (Figure 7, Item 31) to 90-degree discharge elbow (Figure 7, Item 28). Discard lockwashers.

NOTE

Two threaded studs that are left installed will help prevent check valve from falling. They cannot be removed until discharge manifold is moved away from 90-degree discharge elbow.

16. While supporting discharge manifold (Figure 7, Item 2), remove all threaded studs (Figure 7, Item 33) EXCEPT for those located at 5 o'clock and 7 o'clock positions.
17. Remove two gaskets (Figure 7, Item 34) and check valve (Figure 7, Item 31). Discard gaskets.
18. Remove discharge manifold (Figure 7, Item 2) away from 90-degree discharge elbow (Figure 7, Item 28) and remove two remaining threaded studs (Figure 7, Item 33).
19. Lift discharge manifold (Figure 7, Item 2) and remove from trailer.
20. If damaged, remove two rubber strips from welded mounting brackets (Figure 6, Item 27).

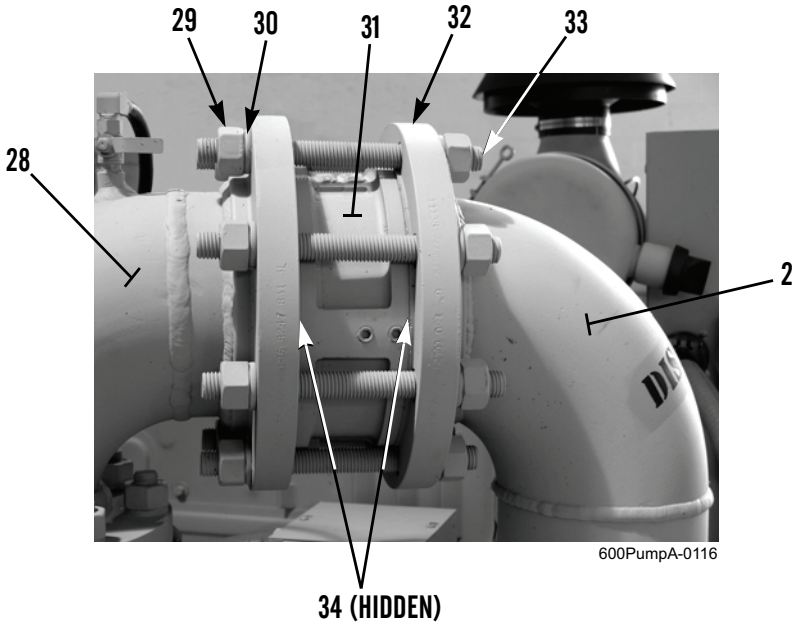


Figure 7. Discharge Elbow, Check Valve, and Discharge Manifold.

DISASSEMBLY - CONTINUED

21. Cut hose clamp (Figure 8, Item 36), hold manual air eliminator valve drain hose (Figure 8, Item 35), and remove barb fitting (Figure 8, Item 37) and hose from elbow fitting (Figure 8, Item 38). Discard hose clamp.
22. Remove elbow fitting (Figure 8, Item 38) from manual air eliminator valve (Figure 8, Item 39).
23. Remove manual air eliminator valve (Figure 8, Item 39) from 90-degree discharge elbow (Figure 8, Item 28).

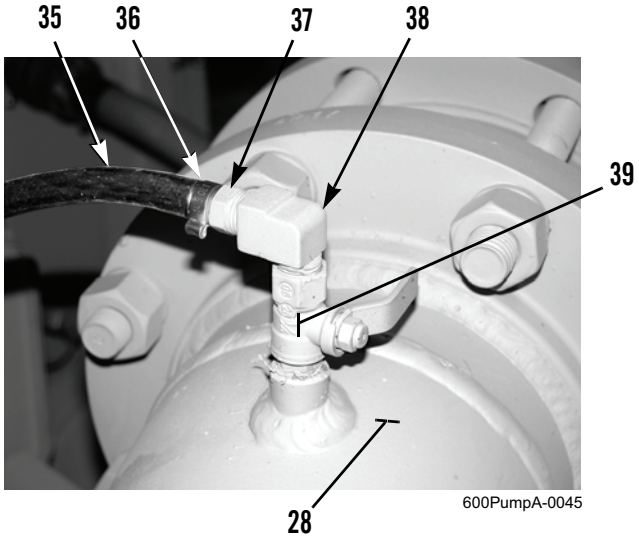


Figure 8. Manual Air Eliminator Valve and Drain Hose.

DISASSEMBLY - CONTINUED

NOTE

Mark orientation of 90-degree discharge elbow and pump casing, to ensure correct assembly.

24. Remove eight nuts (Figure 9, Item 41) and lockwashers (Figure 9, Item 42) from studs (Figure 9, Item 40). Discard lockwashers.
25. Remove 90-degree discharge elbow (Figure 9, Item 28) and gasket (Figure 9, Item 43) from pump casing (Figure 9, Item 44). Discard gasket.

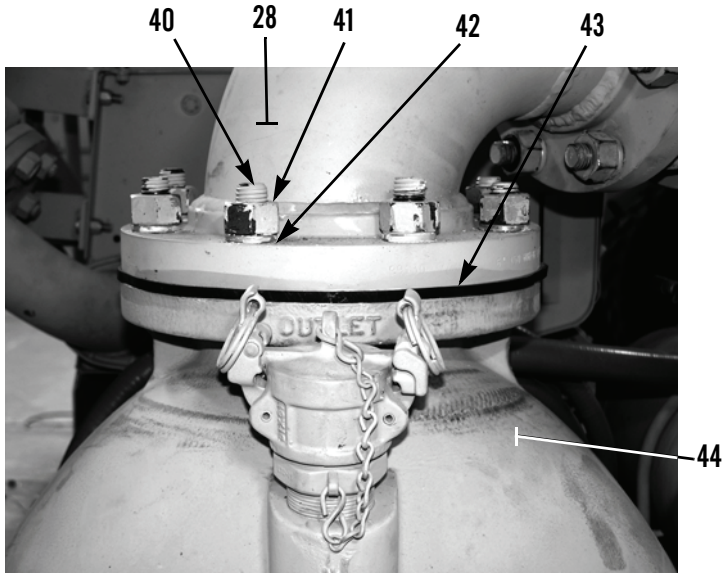


Figure 9. Pump Casing and Discharge Elbow.

CLEANING AND INSPECTION

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low-toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to do so may result in injury or death to personnel.

1. Clean all removed metal components in solvent cleaning compound and allow components to dry.
2. Ensure inlet filter is clean and free of debris.
3. Inspect flanges, valves, shock mounts, and 90-degree discharge elbow for cracks, corrosion, damage to mounting surfaces, stripped threads, or other damage.
4. Ensure all mounting surfaces are smooth and flat with no nicks or burrs. Repair minor nicks or burrs with abrasive cloth or a fine mill file.
5. As required, repair rust or corrosion IAW MIL-T-704, *Treatment and Painting of Material*.
6. Replace any damaged components.

ASSEMBLY

1. Install new gasket (Figure 9, Item 43) on pump casing (Figure 9, Item 44).
2. Position 90-degree discharge elbow (Figure 9, Item 28) on pump casing (Figure 9, Item 44), with alignment mark on discharge elbow in line with alignment mark on pump casing.

CAUTION

- Discharge manifold assembly mounting to pump casing must be fully tightened before discharge manifold U-bolts are installed and tightened to welded mounting brackets on trailer. Failure to follow this tightening sequence may cause stress on discharge manifold. Damage to discharge manifold could result.
- DO NOT overtighten nuts or stud threads may become pulled/stripped or aluminum pump casing may become cracked.

3. Install eight new lockwashers (Figure 9, Item 42) and nuts (Figure 9, Item 41) on studs (Figure 9, Item 40) at 90-degree discharge elbow (Figure 9, Item 28) and pump casing (Figure 9, Item 44). Tighten nuts alternately and evenly to 75 lb-ft (102 Nm).
4. If removed, install two rubber strips to two welded mounting brackets (Figure 10, Item 27), using adhesive.
5. Attach suitable lifting equipment to discharge manifold (Figure 10, Item 2) and support discharge manifold.
6. Lift discharge manifold (Figure 11, Item 2) and position on two welded mounting brackets (Figure 10, Item 27). Position flange (Figure 11, Item 32) of discharge manifold close to 90-degree discharge elbow (Figure 11, Item 28), while leaving room for placement of check valve (Figure 11, Item 31) and two new gaskets (Figure 11, Item 34).

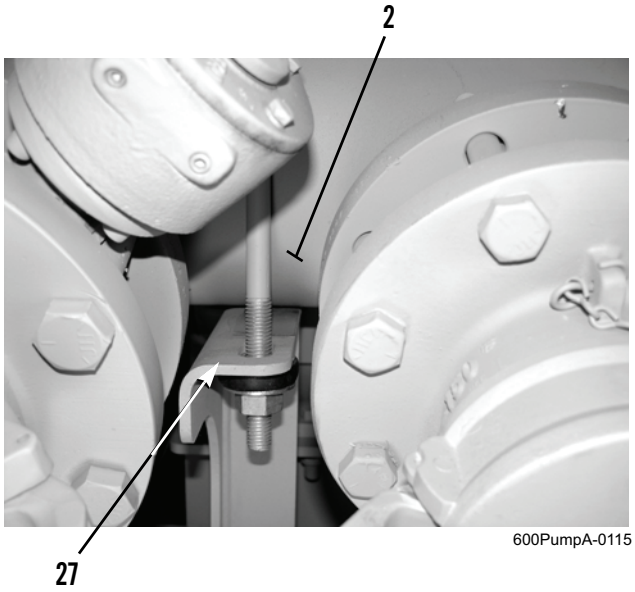


Figure 10. Discharge Manifold on Mounting Brackets.

ASSEMBLY- CONTINUED

7. Loosely install threaded studs (Figure 11, Item 33) in 5 o'clock and 7 o'clock positions, through flange (Figure 11, Item 32) of discharge manifold (Figure 11, Item 2) and flange of 90-degree discharge elbow (Figure 11, Item 28). Install new lockwasher (Figure 11, Item 30) and nut (Figure 11, Item 29) on end of threaded stud closest to 90-degree discharge elbow.

NOTE

Check valve must be installed with directional arrow stamped on valve facing in direction of discharge flow.

8. Position check valve (Figure 11, Item 31) and two new gaskets (Figure 11, Item 34) between flange (Figure 11, Item 32) of discharge manifold (Figure 11, Item 2) and flange of 90-degree discharge elbow (Figure 11, Item 28).
9. Remove lifting equipment from discharge manifold (Figure 11, Item 2).
10. Install new lockwasher (Figure 11, Item 30) and nut (Figure 11, Item 29) on other end of two threaded studs (Figure 11, Item 33). Tighten only enough to hold components in place.
11. Install six remaining threaded studs (Figure 11, Item 33). Install new lockwasher (Figure 11, Item 30) and nut (Figure 11, Item 29) on each end of six studs. Tighten all 16 nuts to 60 lb-ft (81 Nm).

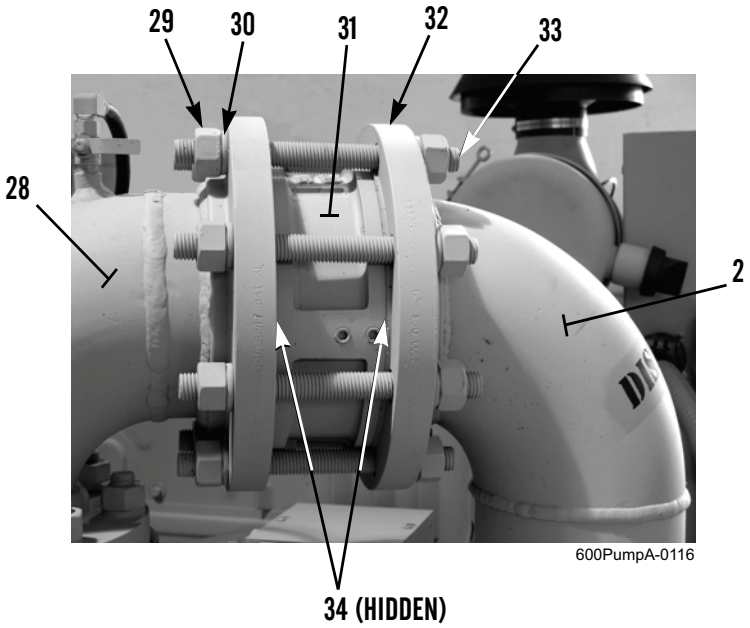


Figure 11. Discharge Elbow, Check Valve, and Discharge Manifold.

ASSEMBLY - CONTINUED

12. Install two U-bolts (Figure 12, Item 24) over discharge manifold (Figure 12, Item 2) and through two welded mounting brackets (Figure 12, Item 27).
13. Install two shock mounts (Figure 12, Item 26), four washers (Figure 12, Item 23), and two nuts (Figure 12, Item 25) on each U-bolt (Figure 12, Item 24). Tighten nuts to 60 lb-ft (81 Nm).

NOTE

Ensure gate valve is positioned as marked during disassembly.

14. With assistance, position gate valve (Figure 12, Item 19) and discharge outlet flange (Figure 12, Item 22) at outlet flange of discharge manifold (Figure 12, Item 2). Install eight bolts (Figure 12, Item 21) and new locknuts (Figure 12, Item 20). Tighten locknuts to 60 lb-ft (81 Nm).
15. Ensure gasket (Figure 12, Item 18) is fully seated in groove of cover (Figure 12, Item 17). Install cover on discharge outlet flange (Figure 12, Item 22).
16. Repeat steps 14 and 15 to install fittings on two remaining outlet flanges (Figure 12, Item 22).

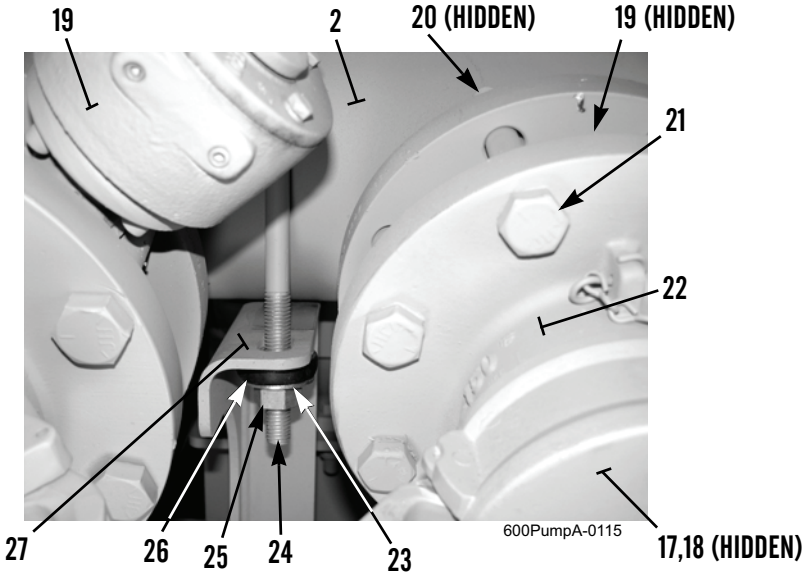


Figure 12. Discharge Manifold Mounting.

ASSEMBLY - CONTINUED

NOTE

Apply antiseizing tape to male threads of fittings as they are assembled.

17. Install manual air eliminator valve (Figure 13, Item 39) on 90-degree discharge elbow (Figure 13, Item 28).
18. Install elbow fitting (Figure 13, Item 38) on manual air eliminator valve (Figure 13, Item 39).
19. Position new hose clamp (Figure 13, Item 36) on manual air eliminator valve drain hose (Figure 13, Item 35). Hold hose and install barb fitting (Figure 13, Item 37) on elbow fitting (Figure 13, Item 38). Tighten hose clamp.

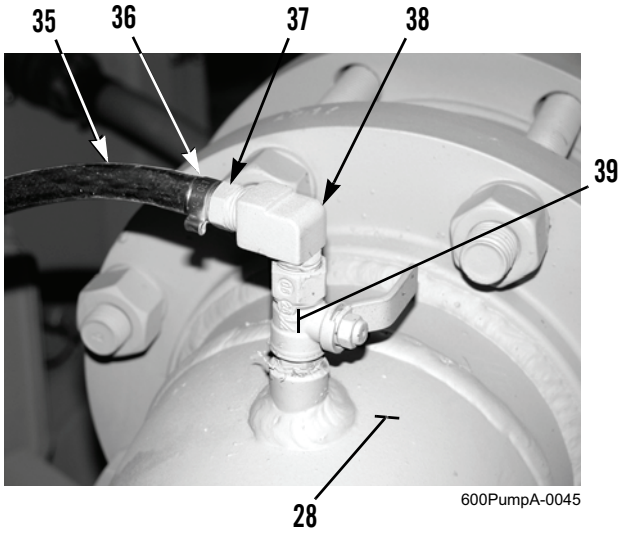


Figure 13. Manual Air Eliminator Valve and Drain Hose.

ASSEMBLY - CONTINUED

20. Install elbow fitting (Figure 14, Item 13) on discharge manifold (Figure 14, Item 2).
21. Install inline filter (Figure 14, Item 14) on elbow fitting (Figure 14, Item 13).
22. Position new hose clamp (Figure 14, Item 16) on pressure gauge hose (Figure 14, Item 12). Hold hose and install barb fitting (Figure 14, Item 15) on inline filter (Figure 14, Item 14). Tighten hose clamp.

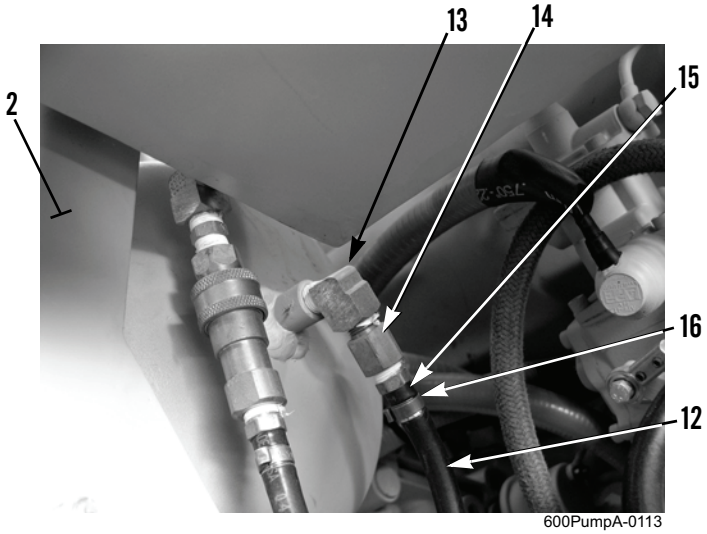


Figure 14. Pressure Gauge Hose and Inline Filter at Discharge Manifold.

23. Under control panel box (Figure 15, Item 9), connect quick disconnect fitting (Figure 15, Item 11) to quick disconnect fitting (Figure 15, Item 10) on pressure gauge hose (Figure 15, Item 12).

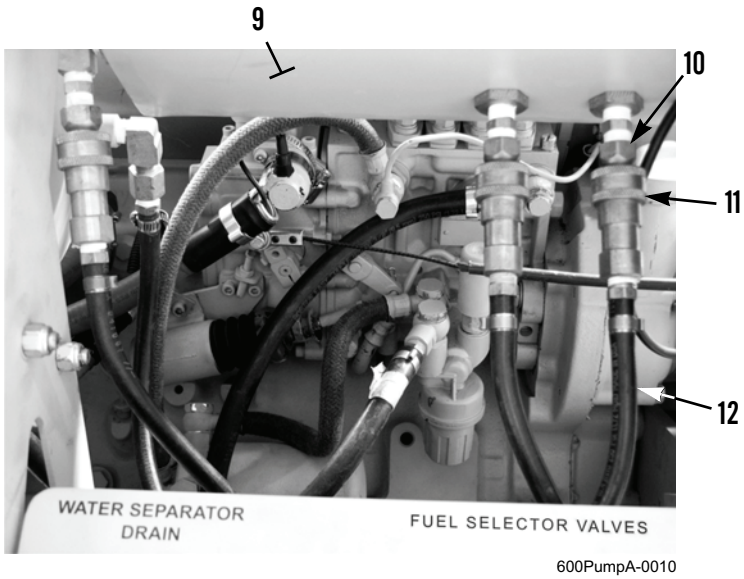


Figure 15. Quick Disconnect for Pressure Gauge Hose.

ASSEMBLY - CONTINUED

24. FUEL PUMP ASSEMBLY. Install elbow (Figure 16, Item 7) and quick disconnect fitting (Figure 16, Item 8) on discharge manifold (Figure 16, Item 2).

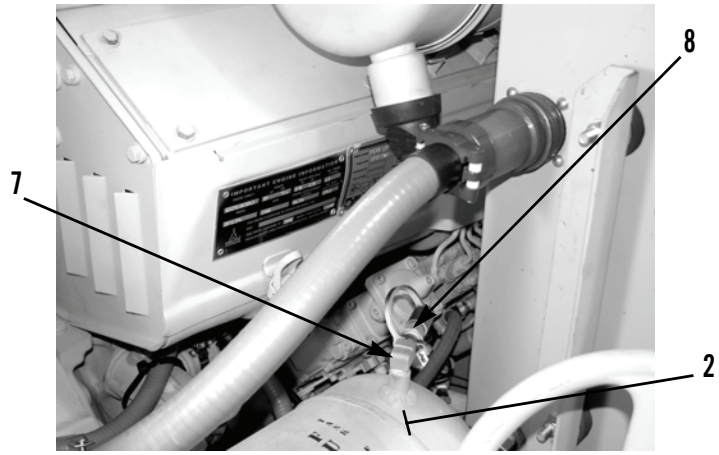


Figure 16. Fuel Jumper Hose Quick Disconnect Fitting.

25. Install reducer fitting (Figure 17, Item 3) and discharge manifold drain valve (Figure 17, Item 1) on discharge manifold (Figure 17, Item 2).
26. Position new hose clamp (Figure 17, Item 5) on discharge manifold drain hose (Figure 17, Item 6). Hold hose and install barb fitting (Figure 17, Item 4) on discharge manifold drain valve (Figure 17, Item 1). Tighten hose clamp.
27. Ensure discharge manifold drain valve (Figure 17, Item 1) is closed.

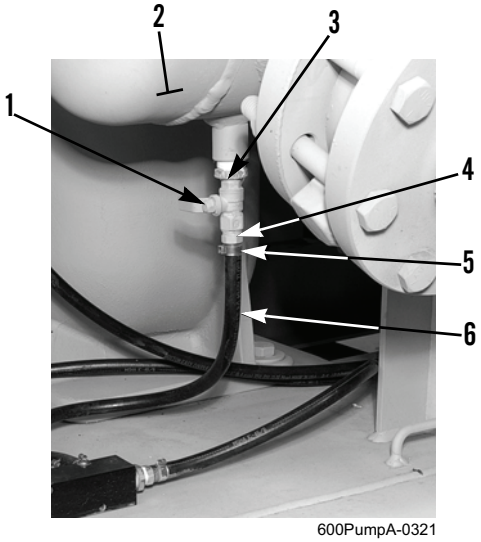


Figure 17. Discharge Manifold Drain Valve and Hose.

FOLLOW-ON TASKS

1. As required, apply NLG12 grease to two grease fittings at each discharge manifold gate valve. There are a total of six grease fittings.
2. Connect battery cables (WP 0033).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

CLEANING SUCTION MANIFOLD STRAINER

Cleaning

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Rag, wiping (Item 22, WP 0129)

Personnel Required

63J (1)

References

WP 0004

Equipment Condition

Pump assembly parked on level ground (WP 0006)
Engine off (WP 0006)
Hand brakes applied (WP 0005)
Wheels chocked

CLEANING

WARNING

- DO NOT perform fuel system checks, inspections or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing damage to equipment and injury or death to personnel.
- Operating personnel must wear fuel-resistant gloves when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. Failure to follow this warning may result in injury to personnel.
- When servicing this equipment, performing maintenance, or disposing of materials such as fuel, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.

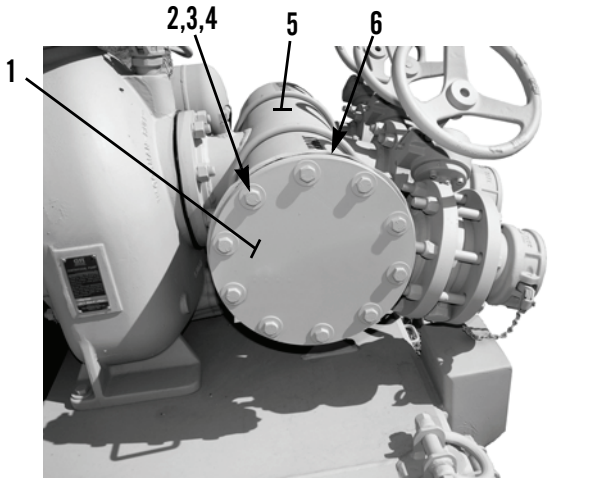
1. FUEL PUMP ASSEMBLY. Observe all fuel-related safety precautions when cleaning strainer (WP 0004).

CLEANING - CONTINUED

NOTE

A suitable container should be placed under end plate of suction manifold to capture any draining fluid. Dispose of fluid IAW using unit's SOP. Ensure all spills are cleaned up IAW spill containment plan.

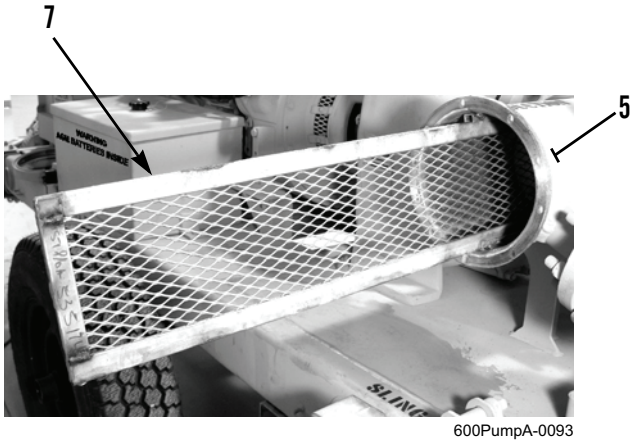
2. Drain suction manifold (WP 0006).
3. Remove 10 nuts (Figure 1, Item 2), bolts (Figure 1, Item 3), and washers (Figure 1, Item 4) from suction manifold endplate (Figure 1, Item 1) and end flange of suction manifold (Figure 1, Item 5).
4. Remove endplate (Figure 1, Item 1) and gasket (Figure 1, Item 6). Set gasket aside.



600PumpA-0049

Figure 1. Endplate.

5. Slide out strainer (Figure 2, Item 7) and remove from suction manifold (Figure 2, Item 5).
6. Clean debris from strainer (Figure 2, Item 7) and from interior of suction manifold (Figure 2, Item 5).



600PumpA-0093

Figure 2. Strainer.

CLEANING - CONTINUED

7. Slide strainer (Figure 3, Item 7) in suction manifold (Figure 3, Item 5).
8. Inspect gasket (Figure 1, Item 6) for damage. Replace if damaged.

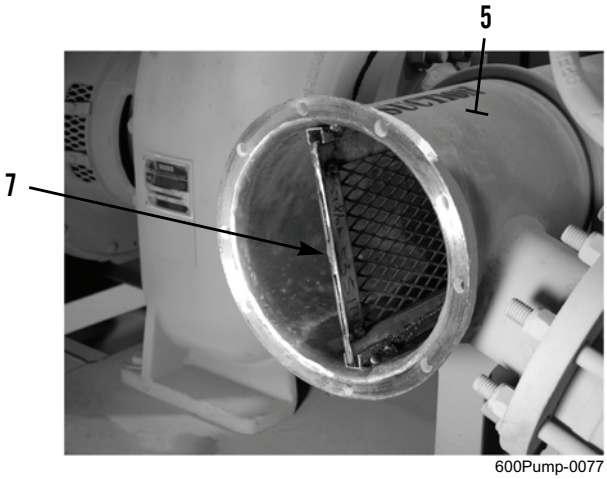


Figure 3. Strainer - Installed.

9. Position gasket (Figure 1, Item 6) and end plate (Figure 1, Item 1) at end flange of suction manifold (Figure 1, Item 5) with gasket, endplate, and end flange aligned.

CAUTION

DO NOT overtighten nuts or damage to suction manifold could occur.

10. Install 10 bolts (Figure 1, Item 3), washers (Figure 1, Item 4), and nuts (Figure 1, Item 2) on endplate (Figure 1, Item 1) and end flange of suction manifold (Figure 1, Item 5).
11. Tighten bolts (Figure 1, Item 3) IAW tightening sequence shown (Figure 4) to 50 lb-ft (68 Nm).

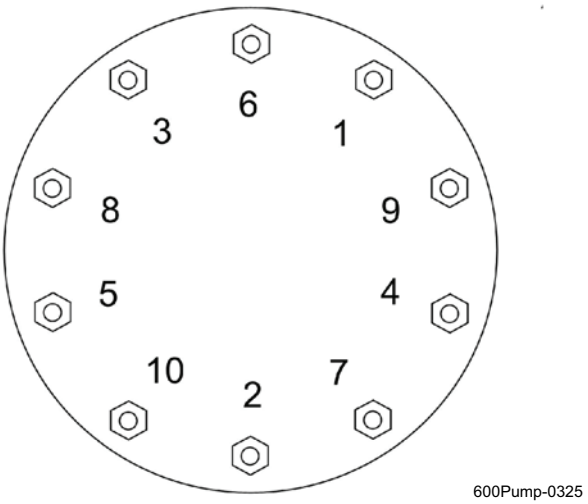


Figure 4. Tightening Sequence.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

PUMP SUCTION MANIFOLD ASSEMBLY MAINTENANCE

Disassembly, Cleaning and Inspection, Assembly, Follow-On Tasks

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)
Tool set, SATS base (Item 24, WP 0126)
Suitable lifting equipment

Materials/Parts

Adhesive (Item 2, WP 0129)
Cleaning compound, solvent, Type III (Item 6, WP 0129)
Cloth, abrasive (Item 7, WP 0129)
Grease, multipurpose, NLG12 (Item 15, WP 0129)
Rag, wiping (Item 22, WP 0129)
Tape, antiseizing (Item 28, WP 0129)
Gasket
Hose clamp (2)
Locknut (24)

Materials/Parts - Continued

Lockwasher (8)

Personnel Required

63J (2)

References

MIL-T-704
WP 0004
WP 0008
WP 0124

Equipment Condition

Pump system drained (WP 0006)
Battery cables disconnected (WP 0033)

WARNING

- Allow pump assembly to cool off before performing maintenance on suction manifold assembly. Hot metal parts can cause severe burns. Wear eye, glove, and skin protection when working with parts that may be hot. Failure to follow this warning may cause injury to personnel.
- FUEL PUMP ASSEMBLY. DO NOT perform fuel system checks, inspections or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing damage to equipment and injury or death to personnel.
- FUEL PUMP ASSEMBLY. Wear fuel-resistant gloves and eye protection when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. Failure to follow this warning may result in injury to personnel.
- FUEL PUMP ASSEMBLY. When servicing this equipment, performing maintenance, or disposing of materials such as fuel, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance.
- Use extreme caution when lifting suction manifold assembly. Provide adequate support and use assistance during procedure. Ensure that lifting equipment used is on solid footing, is in good condition, and is of suitable lift capacity. Keep clear of heavy parts supported only by lifting equipment. Failure to follow this warning may result in injury to personnel or damage to equipment.

NOTE

Suction manifold assembly weighs approximately 209 lb (95 kg).

DISASSEMBLY

1. FUEL PUMP ASSEMBLY. Observe all fuel-related safety precautions when disassembling suction manifold assembly (WP 0004).

NOTE

All original equipment hose clamps should be replaced, on assembly, with new worm drive type hose clamps. A supply of extra hose clamps is stored inside storage box (WP 0008).

2. Cut hose clamp (Figure 1, Item 4), hold suction manifold drain hose (Figure 1, Item 3), and remove barb fitting (Figure 1, Item 5) and suction manifold drain hose from suction manifold drain valve (Figure 1, Item 1). Discard hose clamp.
3. Remove suction manifold drain valve (Figure 1, Item 1) from suction manifold (Figure 1, Item 2).

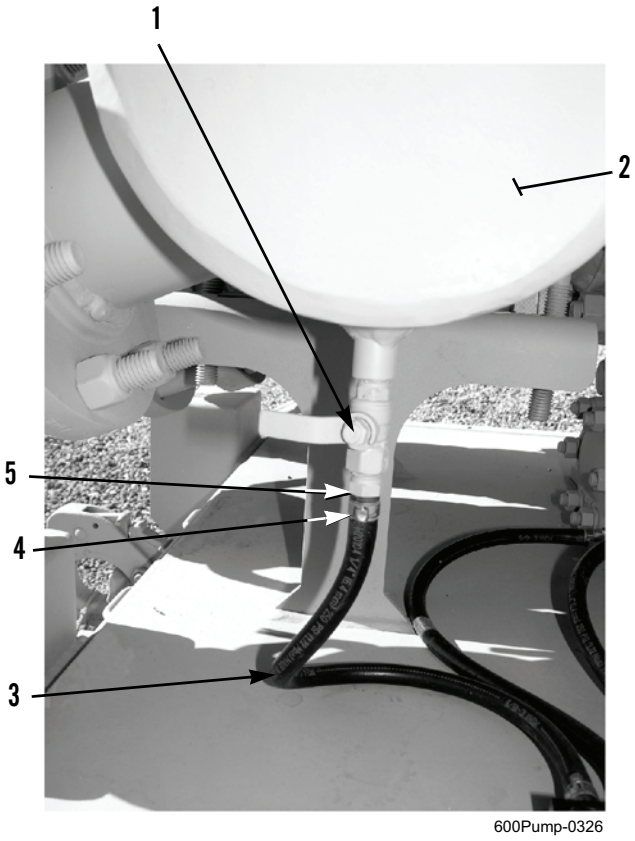


Figure 1. Suction Manifold Drain Valve and Hose.

DISASSEMBLY - CONTINUED

4. Loosen swivel hose barb fitting (Figure 2, Item 8) and disconnect suction gauge hose (Figure 2, Item 9) from inline filter (Figure 2, Item 7).
5. Remove inline filter (Figure 2, Item 7) from elbow fitting (Figure 2, Item 6).
6. Remove elbow fitting (Figure 2, Item 6) from suction manifold (Figure 2, Item 2).

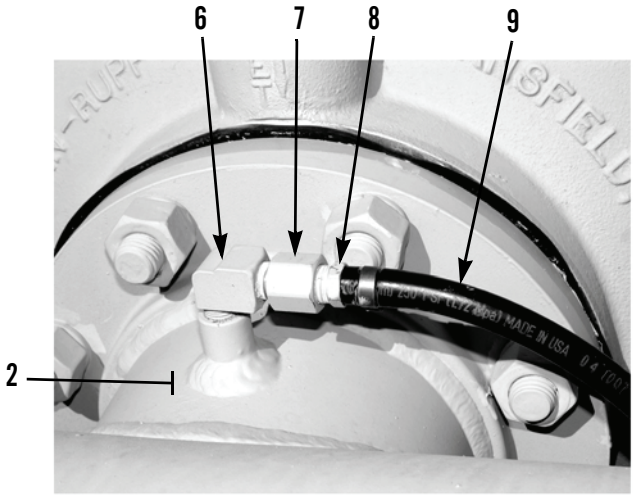


Figure 2. Suction Gauge Hose and Inline Filter.

7. Remove ten nuts (Figure 3, Item 11), bolts (Figure 3, Item 12), and washers (Figure 3, Item 13) from endplate (Figure 3, Item 10) and end flange of suction manifold (Figure 3, Item 2).
8. Remove endplate (Figure 3, Item 10) and gasket (Figure 3, Item 14) from end flange of suction manifold (Figure 3, Item 2). If not damaged, retain gasket for assembly.

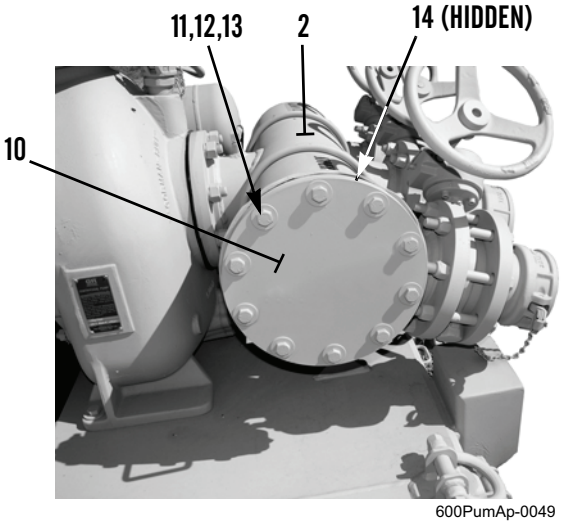


Figure 3. Suction Manifold Endplate.

DISASSEMBLY - CONTINUED

9. Slide out strainer (Figure 4, Item 15) and remove from suction manifold (Figure 4, Item 2).
10. Clean debris from strainer (Figure 4, Item 15) and from interior of suction manifold (Figure 4, Item 2).

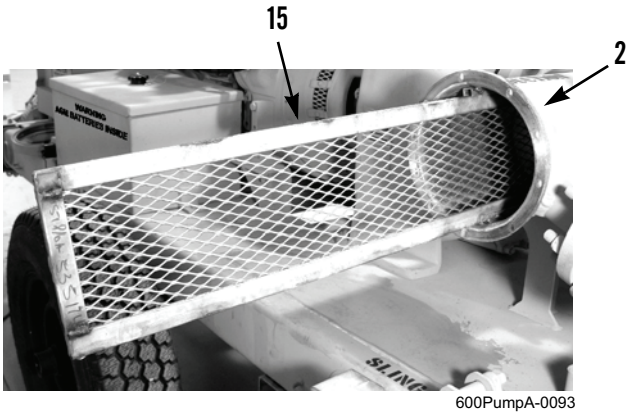


Figure 4. Strainer.

11. Remove plug (Figure 5, Item 17) from one suction inlet flange (Figure 5, Item 16).

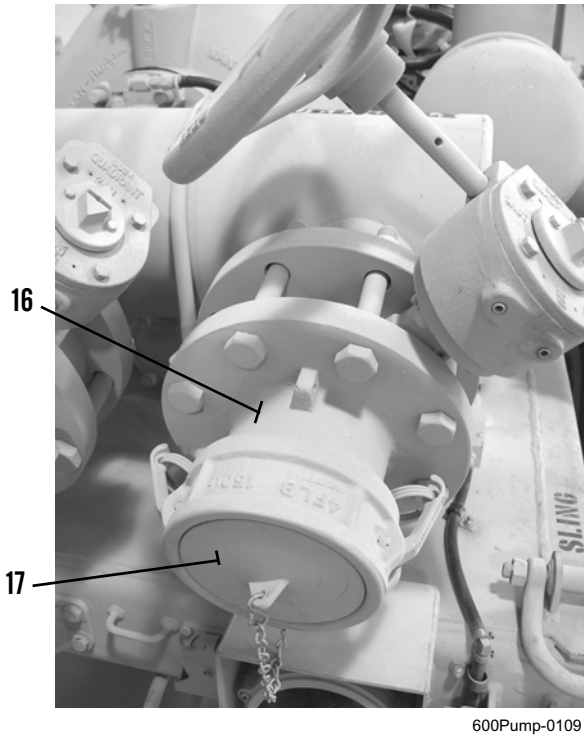


Figure 5. Plug.

DISASSEMBLY - CONTINUED

12. Inspect gasket (Figure 6, Item 18) inside suction inlet flange (Figure 6, Item 16). Obtain replacement gasket, if damaged.

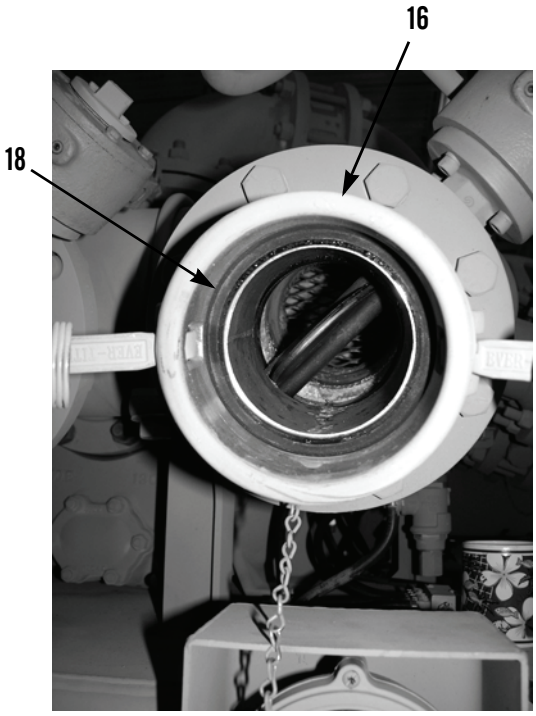


Figure 6. Gasket Inside Suction Inlet Flange.

DISASSEMBLY - CONTINUED

NOTE

Note position of gate valve in relation to inlet flange of suction manifold, to ensure correct assembly.

13. With assistance, remove eight locknuts (Figure 7, Item 19) and bolts (Figure 7, Item 21) and remove suction inlet flange (Figure 7, Item 16) and gate valve (Figure 7, Item 20) from inlet flange of suction manifold (Figure 7, Item 2). Discard locknuts.
14. Repeat steps 11 through 13 to remove fittings from two remaining inlet flanges of suction manifold (Figure 7, Item 2).

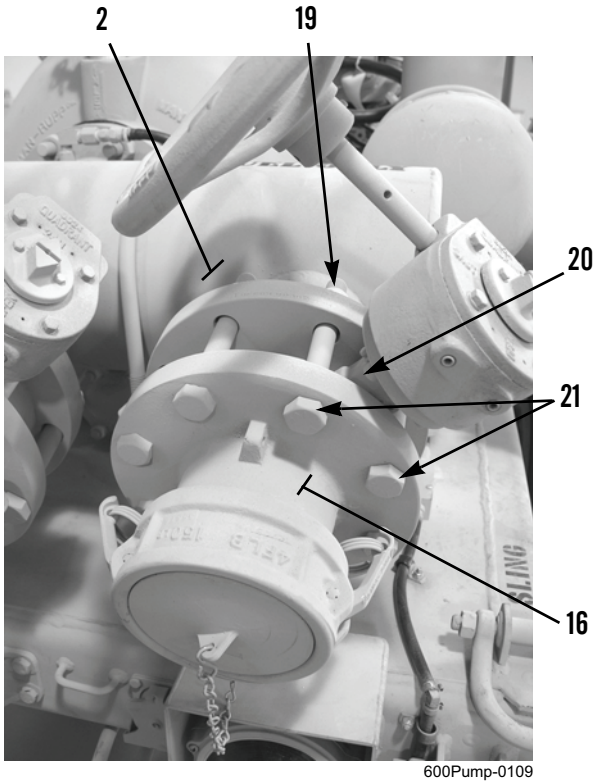


Figure 7. Suction Manifold Mounting.

DISASSEMBLY - CONTINUED

15. Attach suitable lifting equipment to suction manifold (Figure 8, Item 2) and support suction manifold.
16. Remove eight nuts (Figure 8, Item 22) and lockwashers (Figure 8, Item 23) from studs (Figure 8, Item 24) at outlet flange of suction manifold (Figure 8, Item 2) and pump casing (Figure 8, Item 25). Discard lockwashers.

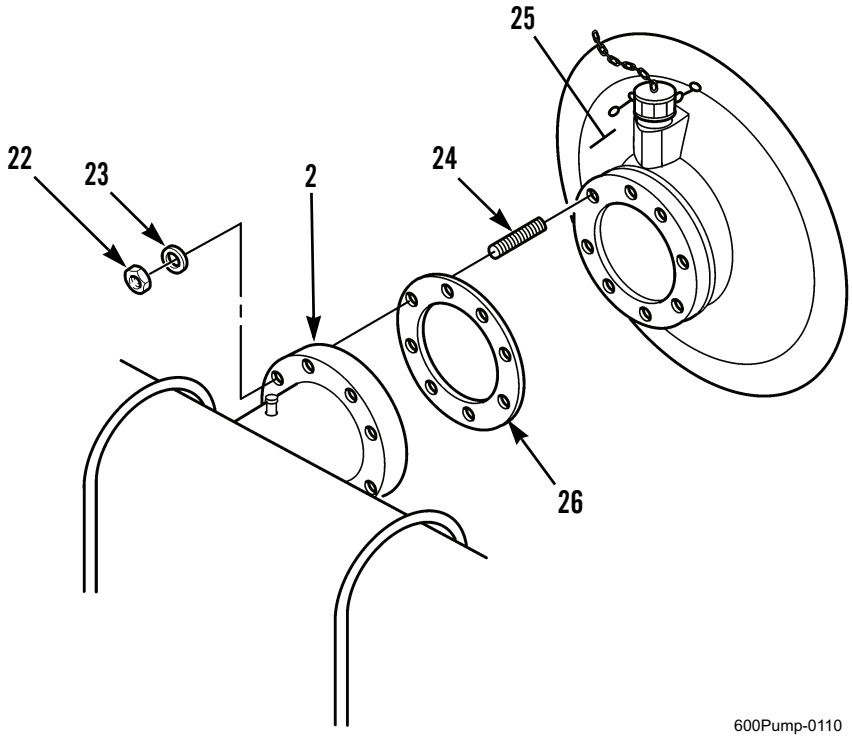


Figure 8. Suction Manifold and Pump Casing.

DISASSEMBLY - CONTINUED

17. Remove two nuts (Figure 9, Item 31), four washers (Figure 9, Item 29), and two shock mounts (Figure 9, Item 30) from each of two U-bolts (Figure 9, Item 27) and welded mounting brackets (Figure 9, Item 28).
18. Lift suction manifold (Figure 9, Item 2) from welded mounting brackets (Figure 9, Item 28) and pump casing (Figure 8, Item 25).
19. If damaged, remove two rubber strips from welded mounting brackets (Figure 9, Item 28).

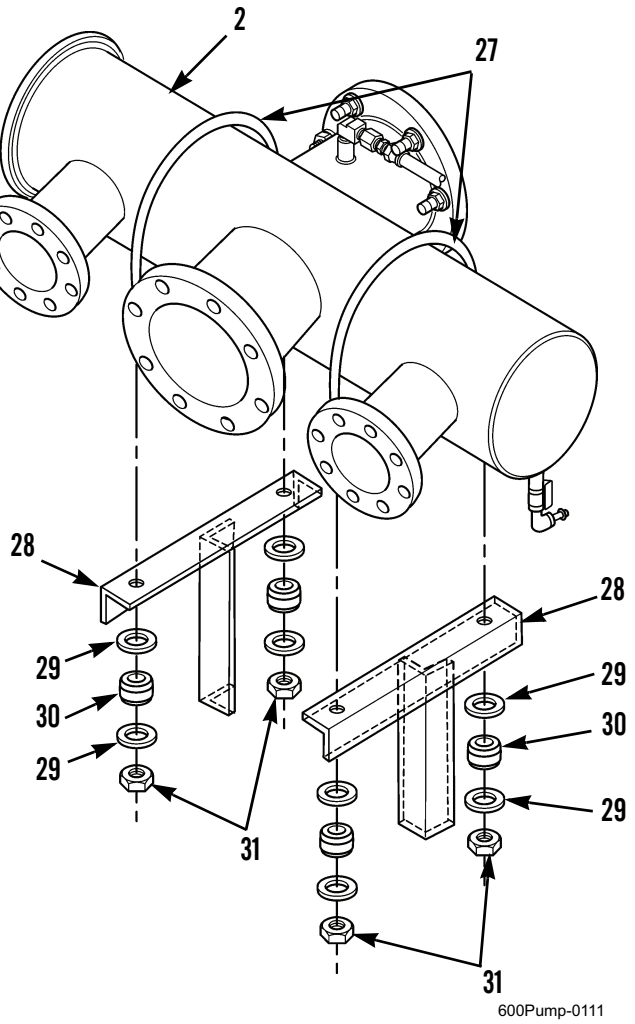


Figure 9. Suction Manifold Mounting.

20. Remove gasket (Figure 8, Item 26) from pump casing (Figure 8, Item 25). Discard gasket.

CLEANING AND INSPECTION

WARNING

Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low-toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to do so may result in injury or death to personnel.

1. Clean all removed metal components in solvent cleaning compound and allow components to dry.
2. Ensure inlet filter is clean and free of debris.
3. Inspect flanges, valves, shock mounts, suction manifold strainer endplate, and endplate rubber gasket for cracks, corrosion, damage to mounting surfaces, stripped threads, or other damage.
4. Ensure strainer slider bars inside suction manifold are free of debris and not damaged.
5. Ensure all mounting surfaces are smooth and flat with no nicks or burrs. Repair minor nicks or burrs with abrasive cloth or a fine mill file.
6. As required, repair rust or corrosion IAW MIL-T-704, *Treatment and Painting of Materiel* (WP 0124).
7. Replace any damaged components.

ASSEMBLY

1. If removed, install two rubber strips to two welded mounting brackets (Figure 11, Item 28), using adhesive.
2. Install new gasket (Figure 10, Item 26) on pump casing (Figure 10, Item 25).
3. Attach suitable lifting equipment to suction manifold (Figure 10, Item 2) and support suction manifold.
4. Lift suction manifold (Figure 11, Item 2) and place on two welded mounting brackets (Figure 11, Item 28), with single suction manifold outlet flange aligned with inlet flange of pump casing (Figure 10, Item 25).

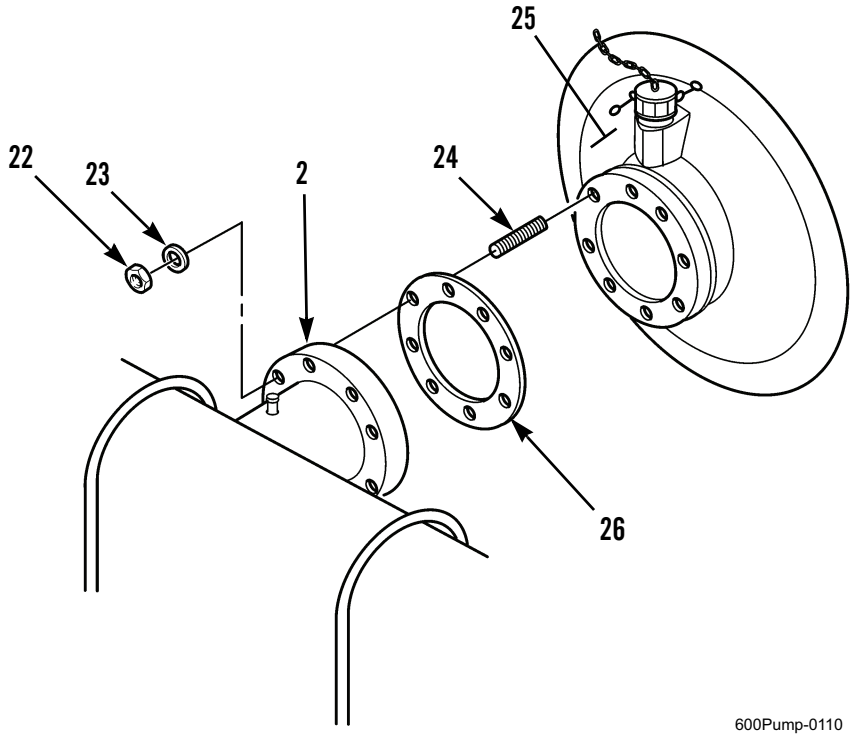


Figure 10. Suction Manifold and Pump Casing.

ASSEMBLY - CONTINUED

CAUTION

- Suction manifold mounting to pump casing must be fully tightened before U-bolts are installed and tightened to welded mounting brackets on trailer. Failure to follow this tightening sequence may cause stress on suction manifold. Damage to suction manifold could result.
- DO NOT overtighten nuts or stud threads may become pulled/stripped, or aluminum pump casing may become cracked.

5. Install eight new lockwashers (Figure 10, Item 23) and nuts (Figure 10, Item 22) on studs (Figure 10, Item 24) at outlet flange of suction manifold (Figure 10, Item 2) and pump casing (Figure 10, Item 25). Securely tighten nuts alternately and evenly to 75 lb-ft (102 Nm).
6. Install two U-bolts (Figure 11, Item 27) over suction manifold (Figure 11, Item 2) and through welded mounting brackets (Figure 11, Item 28). Install two shock mounts (Figure 11, Item 30), four washers (Figure 11, Item 29), and two nuts (Figure 11, Item 31) on each U-bolt. Tighten nuts to 60 lb-ft (81 Nm).

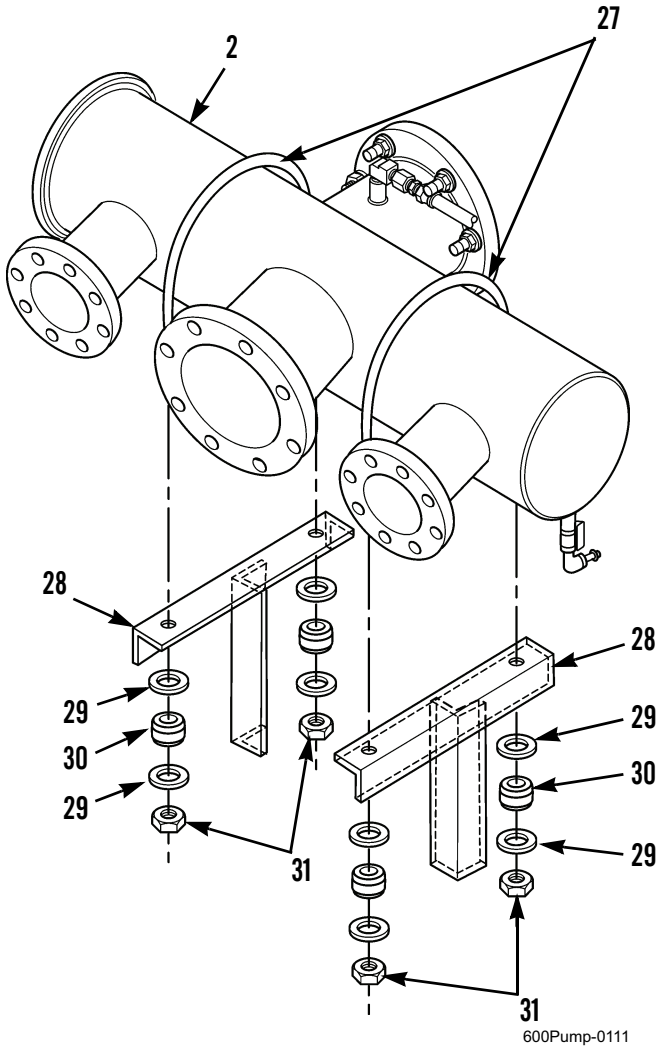


Figure 11. Suction Manifold Mounting.

ASSEMBLY - CONTINUED

NOTE

Ensure gate valve is positioned as noted during disassembly.

7. With assistance, position gate valve (Figure 12, Item 20) and suction inlet flange (Figure 12, Item 16) at inlet flange of suction manifold (Figure 12, Item 2). Install eight bolts (Figure 12, Item 21) and new locknuts (Figure 12, Item 19). Tighten locknuts to 60 lb-ft (81 Nm).

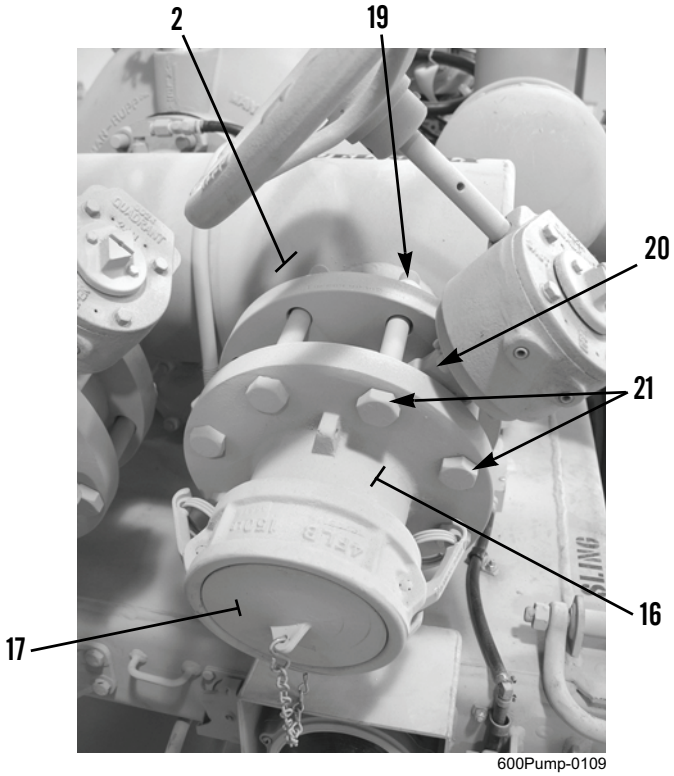


Figure 12. Suction Manifold Mounting.

ASSEMBLY - CONTINUED

8. Ensure gasket (Figure 13, Item 18) is fully seated in groove in suction inlet flange (Figure 13, Item 16). Install plug (Figure 12, Item 17) to suction inlet flange.
9. Repeat steps 7 and 8 to install fittings on two remaining inlet flanges of suction manifold (Figure 12, Item 2).

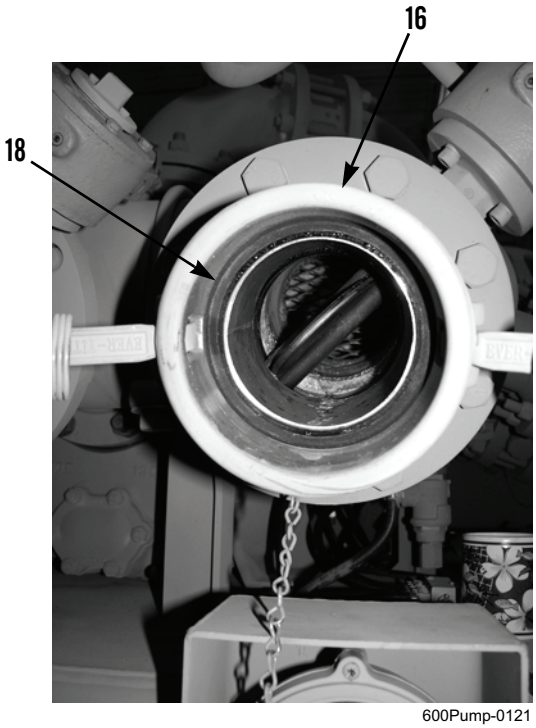


Figure 13. Gasket Inside Suction Inlet Flange.

10. Slide strainer (Figure 14, Item 15) into suction manifold (Figure 14, Item 2).

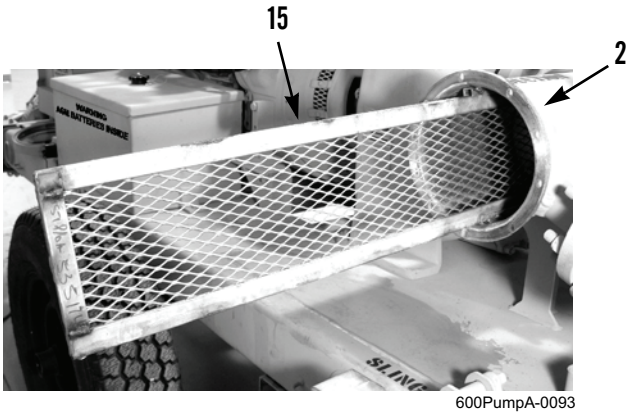


Figure 14. Strainer.

ASSEMBLY - CONTINUED

11. Position gasket (Figure 15, Item 14) and endplate (Figure 15, Item 10) at end flange of suction manifold (Figure 15, Item 2), with gasket, endplate, and end flange of suction manifold aligned. Install ten bolts (Figure 15, Item 12), washers (Figure 15, Item 13), and nuts (Figure 15, Item 11) on endplate and end flange.

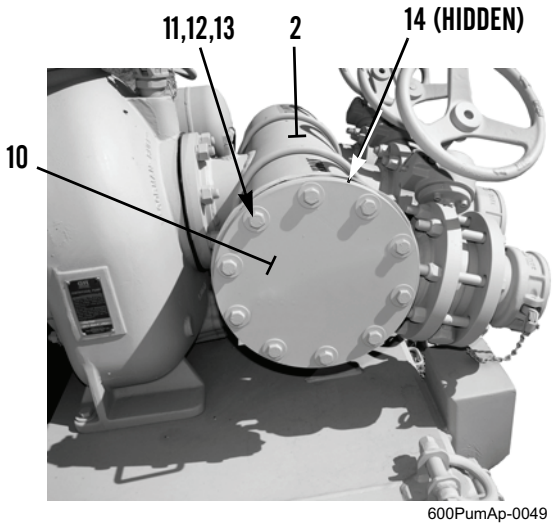


Figure 15. Suction Manifold Endplate.

12. Tighten ten bolts (Figure 15, Item 12) evenly to 40 lb-ft (68 Nm) IAW tightening sequence shown (Figure 16).

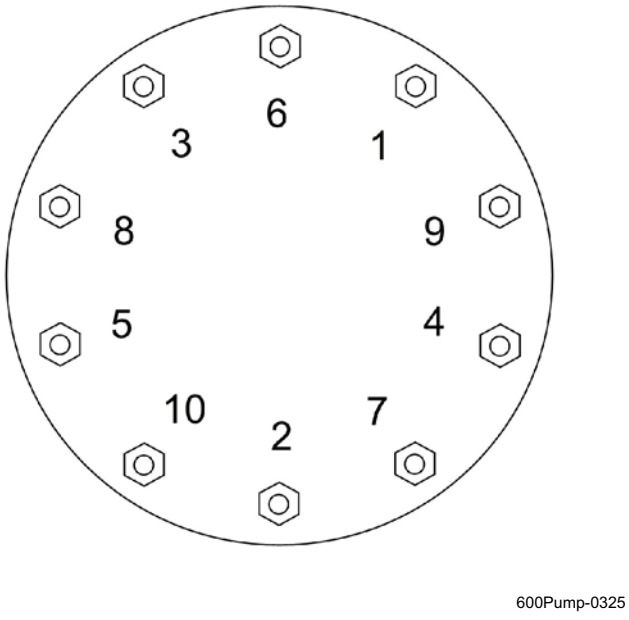


Figure 16. Tightening Sequence.

ASSEMBLY - CONTINUED

NOTE

Apply antiseizing tape to male threads of fittings.

13. Install elbow fitting (Figure 17, Item 6) on suction manifold (Figure 17, Item 2).
14. Install inline filter (Figure 17, Item 7) on elbow fitting (Figure 17, Item 6).
15. Install suction gauge hose (Figure 17, Item 9) on inline filter (Figure 17, Item 7) and tighten swivel hose barb fitting (Figure 17, Item 8).

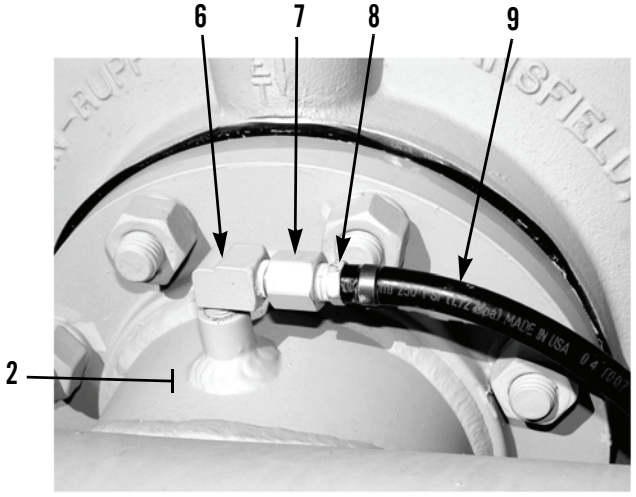


Figure 17. Suction Gauge Hose and Inline Filter.

ASSEMBLY - CONTINUED

16. Install suction manifold drain valve (Figure 18, Item 1) on suction manifold (Figure 18, Item 2).
17. Position new hose clamp (Figure 18, Item 4) on suction manifold drain hose (Figure 18, Item 3).
18. Hold suction manifold drain hose (Figure 18, Item 3) and install barb fitting (Figure 18, Item 5) on suction manifold drain valve (Figure 18, Item 1). Tighten hose clamp (Figure 18, Item 4).
19. Ensure suction manifold drain valve (Figure 18, Item 1) is closed.

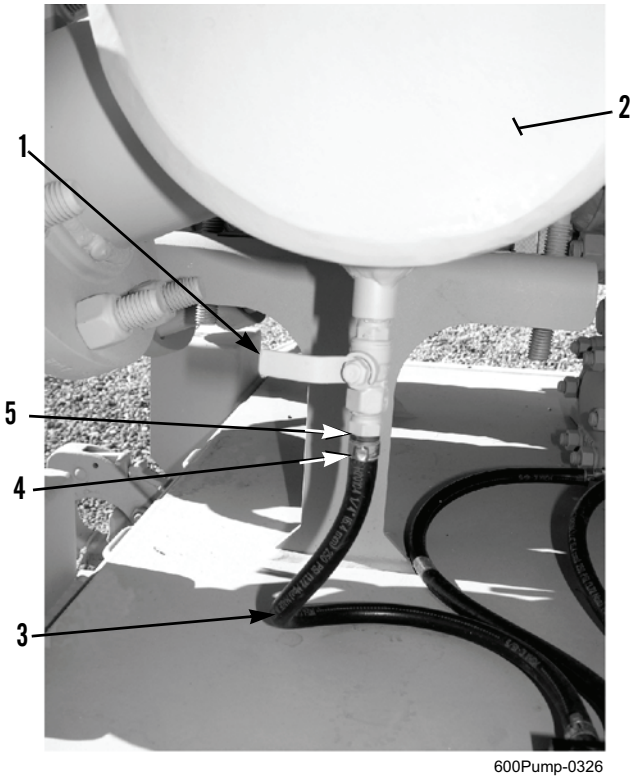


Figure 18. Suction Manifold Drain Valve and Hose.

FOLLOW-ON TASKS

1. As required, apply NLG12 grease to two grease fittings at each suction manifold gate valve. There are a total of six grease fittings.
2. Connect battery cables (WP 0033).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

PREPARATION FOR SHIPMENT

Highway or Rail Transport, External Air Transport by Helicopter

INITIAL SETUP

Tools and Special Tools

Tool kit, general mechanic's (Item 23, WP 0126)

Personnel Required

63J (3)

References

FM 4-20.197

WP 0002

WP 0008

Equipment Condition

Pump system drained (WP 0006)

Fuel tank drained (WP 0099)

Fuel selector valves in OFF position (WP 0005)

Fuel/water separator drain valve in OFF position (WP 0005)

Battery cables disconnected (WP 0033)

NOTE

If pump assembly is being used as part of a fuel/water system, refer to applicable system shipping and storage instructions for transport procedures.

HIGHWAY OR RAIL TRANSPORT

WARNING

- Death or injury could occur if unauthorized personnel are in the hoisting area. Permit only personnel engaged in hoisting operation to be near pump assembly and lifting equipment.
- Use extreme caution when hoisting pump assembly. Provide adequate support and use assistance during procedure. Ensure that lifting equipment used is on solid footing, is in good condition, and is of suitable lift capacity. Keep clear of heavy parts supported only by lifting equipment. Failure to follow this warning may result in death or injury to personnel or damage to equipment.
- Hoist pump assembly slowly and smoothly. Do not swing load from side to side, as this places extra strain on lifting components. Watch boom angle and overhead clearance when hoisting. Failure to follow this warning may result in injury or death to personnel or damage to equipment.

NOTE

- Three personnel are required to perform this procedure.
- Refer to lifting plate, on right side of trailer frame, for weight, center of gravity, and lifting information (WP 0008).
- Refer to *Location and Description of Major Components* in WP 0002 for the location of tiedown rings.

1. Use a crane or forklift, or any other suitable cargo-lifting equipment to load pump assembly. If loading with a crane, it may be necessary to use spreader bars, to prevent lifting cables from damaging pump assembly.
2. Connect lifting cables to lifting rings stenciled SLING at front and rear of trailer. DO NOT use rear tiedown rings as lift points.
3. Lift pump assembly and place on bed of highway or rail transporter.

HIGHWAY OR RAIL TRANSPORT - CONTINUED

4. Lower front and rear leveling jack legs to provide support at front and rear of trailer.
5. Chock trailer wheels to prevent movement.
6. Secure trailer to bed of transporter at front and rear tiedown rings.

EXTERNAL AIR TRANSPORT BY HELICOPTER

WARNING

In order to safely conduct sling load operations, all personnel must be aware of the safety hazards involved, such as static electricity, rotor wash, and other operations involving close proximity to the aircraft such as flying debris. Appropriate personnel protective equipment (PPE) must be worn. Failure to wear PPE and to follow sling procedures and regulations may result in injury or death to personnel or damage to equipment.

NOTE

- Refer to FM 4-20.197, *Multiservice Helicopter Sling Load: Basic Operations and Equipment*, for guidance on sling loading the pump assembly, and for a complete list of equipment and materials required.
- A minimum of three personnel are required to perform this procedure. Four personnel are preferred.
- Refer to lifting plate, on right side of trailer frame, for weight, center of gravity, and lifting information (WP 0008).
- Refer to *Location and Description of Major Components* in WP 0002 for the location of lifting rings.

1. The 600 GPM pump assembly is capable of external transport by helicopter, using a single-point lift with any of the following capacity sling sets:
   a. 10,000 lb (10K)
   b. 15,000 lb (15K)
   c. 25,000 lb (25K)
2. Nominal flight attitude of load (relative to horizontal) is 3-5 degrees front down. The rear end of the pump assembly faces the direction of flight.
3. Maximum recommended air speed of aircraft during external transport of pump assembly is 110 knots.
4. Prepare load (pump assembly).
   a. Fully extend front leveling jack assembly (WP 0005).
   b. Apply hand brakes (WP 0005).
   c. Ensure master cylinder cap on trailer drawbar is tightly installed.
   d. Cover taillights, reflectors, and level indicators with tape.
   e. Secure all loose chains, lanyards, and intervehicular cable with tape or Type III nylon cord.
   f. Ensure control panel box and storage box are securely latched closed.
   g. Ensure battery box lid is securely closed.

EXTERNAL AIR TRANSPORT BY HELICOPTER - CONTINUED

5. Rig load.
   a. Position rigging to one side of load: forward sling legs 1 and 2 to the front; aft sling legs 3 and 4 to the rear.
   b. Loop chain end of sling leg 1 through left-front lifting/tiedown ring (stenciled SLING) on trailer drawbar. Insert link number 5 in grabhook. Draw sling leg taut against storage box and tie chain to forward edge of storage box handle with 80-pound cotton webbing.
   c. Repeat step b with sling leg 2 through right-front lifting/tiedown ring.
   d. Loop chain end of sling leg 3 through left-rear lifting ring (stenciled SLING) on trailer deck. Insert link number 3 in grabhook.
   e. Repeat step d with sling leg 4 through right-rear lifting ring.
   f. Secure excess chain of all sling legs with 2-in. tape or 80-pound cotton webbing.
   g. Cluster and tape or tie (breakaway technique) all slings legs to the side of the load, to prevent entanglement during hookup.
6. Hook up load.
   a. Have helicopter support team kneel beside load as signalman guides aircraft to the load and assumes guidance.
   b. Static discharge wand handler discharges aircraft static electricity to ground.
   c. Apex fitting handler attaches web ring to aircraft center cargo hook.
   d. Helicopter support team stands by load and guides sling legs, to prevent fouling, as aircarft maneuvers to remove slack from rigging.
   e. When satisfactory hookup is assured, signalman indicates affirmative signal to aircraft crew. Helicopter support team exits vicinity of aircraft to designated rendezvous point.

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

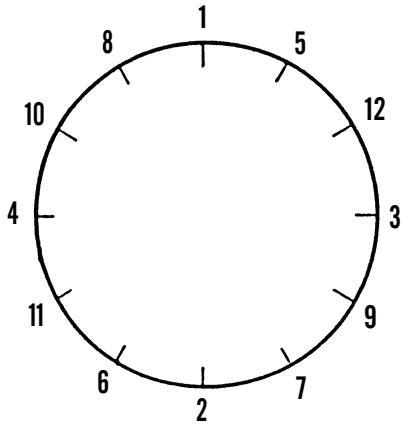
TORQUE LIMITS

SCOPE

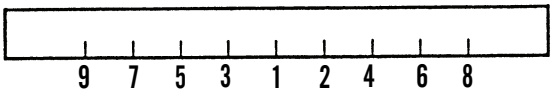
This work package lists standard torque values and provides general information for applying torque. Special torque values and tightening sequences are indicated in the maintenance procedures for applicable components.

GENERAL

1. Always use torque values listed in Tables 1 and 2 when a maintenance procedure does not give a specific torque value.
   a. Table 1 provides torque limits for SAE standard fasteners.
   b. Table 2 provides torque limits for metric fasteners.
2. Unless otherwise indicated, standard torque tolerance shall be ± 10%.
3. Torque values listed are based on clean, dry threads. Reduce torque by 10% when engine oil is used as a lubricant. Reduce torque by 20% if new plated capscrews are used.
4. If the maintenance procedures do not specify a tightening order, use the following guides:
   a. Unless otherwise specified, lubricate threads of fasteners with OE/HDO-10 lubricating oil (Item 19, WP 0129).
   b. When tightening fasteners above 30 lb-ft (41 Nm), use the torque pattern but only tighten to 70% of final value (multiply final value by 0.7). Repeat pattern until final value is reached.
   c. Tighten circular patterns using circular torque pattern and tighten straight patterns using straight torque pattern.



CIRCULAR TORQUE PATTERN



STRAIGHT TORQUE PATTERN

CAUTION

If replacement capscrews are of higher grade than originally supplied, use torque specifications for the original. This will prevent equipment damage due to overtorquing.

Table 1. Torque Limits - SAE Standard Fasteners.

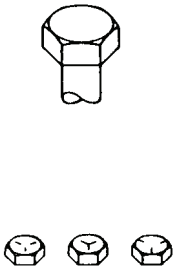
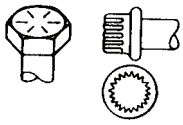
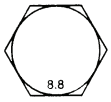
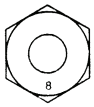
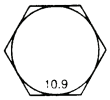
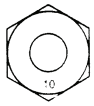
Current Usage	Much Used	Much Used	Used at Times	Used at Times
QUALITY OF MATERIAL	**INDETERMINATE**	**MINIMUM COMMERCIAL**	**MEDIUM COMMERCIAL**	**BEST COMMERCIAL**
SAE Grade Number	1 or 2	5	6 or 7	8
Capscrew Head Markings Manufacturer's marks may vary These are all SAE Grade 5 (3 line)				
CAPSCREW BODY SIZE IN. - THREAD	**TORQUE LB-FT (NM)**	**TORQUE LB-FT (NM)**	**TORQUE LB-FT (NM)**	**TORQUE LB-FT (NM)**
1/4 20	5 (7)	8 (11)	10 (14)	12 (16)
28	6 (8)	10 (14)		14 (19)
5/16 18	11 (15)	17 (23)	19 (26)	24 (33)
24	13 (18)	19 (26)		27 (37)
3/8 16	18 (24)	31 (42)	34 (46)	44 (60)
24	20 (27)	35 (47)		49 (66)
7/16 14	28 (38)	49 (66)	55 (75)	70 (95)
20	30 (41)	55 (75)		78 (106)
1/2 13	39 (53)	75 (102)	85 (115)	105 (142)
20	41 (56)	85 (115)		120 (163)
9/16 12	51 (69)	110 (149)	120 (163)	155 (210)
18	55 (75)	120 (163)		170 (231)
5/8 11	83 (113)	150 (203)	167 (226)	210 (285)
18	95 (129)	170 (231)		240 (325)
3/4 10	105 (142)	270 (366)	280 (380)	375 (508)
16	115 (156)	295 (400)		420 (569)
7/8 9	160 (217)	395 (536)	440 (597)	605 (820)
14	175 (237)	435 (590)		675 (915)
1 8	235 (319)	590 (800)	660 (895)	910 (1,234)
14	250 (339)	660 (895)		990 (1,342)

Table 2. Torque Limits - Metric Fasteners.

Torque values for metric thread fasteners with lubricated* or plated threads†				
THREAD DIAMETER-PITCH	 **Class 8.8 Bolt**	 **Class 8 Nut**	 **Class 10.9 Bolt**	 **Class 10 Nut**
	TORQUE LB-FT (NM)		**TORQUE LB-FT (NM)**	
M6	5	(7)	7	(9)
M8	12	(16)	17	(23)
M8 x 1	13	(18)	18	(24)
M10	24	(33)	34	(46)
M10 x 1.25	27	(37)	38	(52)
M12	42	(57)	60	(81)
M12 x 1.5	43	(58)	62	(84)
M14	66	(89)	95	(129)
M14 x 1.5	72	(98)	103	(140)
M16	103	(140)	148	(201)
M16 x 1.5	110	(149)	157	(213)
M18	147	(199)	203	(275)
M18 x 1.5	165	(224)	229	(310)
M20	208	(282)	288	(390)
M20 x 1.5	213	(313)	320	(434)
M22	283	(384)	392	(531)
M22 x 1.5	315	(427)	431	(584)
M24	360	(488)	498	(675)
M24 x 2	392	(531)	542	(735)
M27	527	(715)	729	(988)
M27 x 2	569	(771)	788	(1,068)
M30	715	(969)	990	(1,342)
M30 x 2	792	(1,074)	1,096	(1,486)

* All plated and unplated fasteners should be coated with oil before installation.

† Use these torque values if either the bolt or nut is lubricated or plated (zinc-phosphate conversion-coated, cadmium-plated, or waxed).

END OF WORK PACKAGE

FIELD MAINTENANCE INSTRUCTIONS

ILLUSTRATED LIST OF MANUFACTURED ITEMS

Manufacturing Instructions

INITIAL SETUP

Tools and Special Tools

Tool set, SATS base (Item 24, WP 0126)

Materials/Parts

Stud or bolt, 120 to 150 mm (4.7 to 5.9 in.) long, Grade 10.9, M10 x 1, thread pitch 1.5 mm

MANUFACTURING INSTRUCTIONS

Locating Tool.

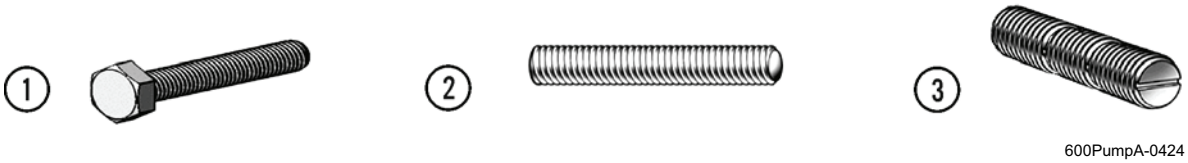


Figure 1. Locating Tool.

NOTE

1. Obtain a 120 to 150 mm (4.7 to 5.9 in.) long stud or bolt, Grade 10.9, M10 x 1, with at least 50 mm (2 in.) of threads.
2. If using a bolt, cut head off bolt and de-burr.
3. Cut slot for screwdriver in end of stud or bolt.

END OF WORK PACKAGE

CHAPTER 7

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL) INTRODUCTION

SCOPE

The RPSTL (WP 0121) lists and authorizes spares and repair parts for performance of Field Maintenance on the 600 GPM Pump Assemblies. It authorizes the requisitioning, issue, and disposition of spares and repair parts as indicated by the source, maintenance, and recoverability (SMR) codes.

GENERAL

In addition to this work package, the RPSTL is divided into the following work packages:

a. **Repair Parts List Work Package (WP 0121).** Work package containing lists of spares and repair parts authorized by the RPSTL for use in the performance of maintenance. This work package also includes parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in ascending alphanumeric sequence, with the parts in each group listed in ascending figure and item number sequence. Repair parts kits are listed separately in their own functional group. Items listed are shown on the associated illustrations.

b. **Special Tools List Work Package (WP 0122).** Work package containing list of special tools, special Test Management, and Diagnostic Equipment (TMDE), and special support equipment authorized by the RPSTL, as indicated by Basis of Issue (BOI) information in the DESCRIPTION AND USABLE ON CODE (UOC) column. Tools that are components of common tool sets and/or Class VII are not listed.

c. **Cross-Reference Indexes Work Package (WP 0123).** There are two cross-reference indexes in the RPSTL: National Stock Number (NSN) Index and Part Number (P/N) Index.The NSN Index refers you to the figure and item number. The P/N Index refers you to the figure and item number.

EXPLANATION OF COLUMNS IN THE REPAIR PARTS LISTS

a. **Item No. (Column 1).** Indicates the number used to identify items called out in the illustration.

b. **SMR Code (Column 2).** The SMR code containing supply/requisitioning information, maintenance level authorization criteria, and disposition instruction, as shown in the following breakout:

SOURCE CODE	MAINTENANCE CODE		RECOVERABILITY CODE
XXxxx	xxXXx		xxxxX
1st two positions	3rd position	4th position	5th position
How you get an item.	Who can install, replace, or use the item.	Who can do complete repair* on the item.	Who determines disposition action on an unserviceable item.

* *Complete Repair:* Maintenance capacity, capability, and authority to perform all corrective maintenance tasks of the “Repair” function in a use/user environment in order to restore serviceability to a failed item.

EXPLANATION OF COLUMNS IN THE REPAIR PARTS LISTS - CONTINUED

(1) **Source Code.** The source code tells you how to get an item needed for maintenance, repair, or overhaul of an end item/equipment. Explanations of source codes follow:

Code	Application/Explanation
PA PB PC PD PE PF PG	Stocked items; use the applicable NSN to request/requisition items with these source codes. They are authorized to the maintenance category indicated by the code entered in the third position of the SMR code. *Items coded PC are subject to deterioration.* . . . . .
KD KF KB	Items with these codes are not to be requested/requisitioned individually. They are part of a kit which is authorized to the maintenance level indicated in the third position of the SMR code. The complete kit must be requisitioned and applied. . . . . .
MO - Made at Unit/ AVUM level MF - Made at DS/AVIM Level MH - Made at GS Level ML - Made at SRA MD - Made at Depot	Items with these codes are not to be requested/requisitioned individually. They must be made from bulk materiel which is identified by the part number in the DESCRIPTION AND USABLE ON CODE (UOC) column and listed in the bulk materiel group work package of the RPSTL. If the item is authorized to you by the third position of the SMR code, but the source code indicates it is made at a higher level, order the item from the higher level of maintenance. . . . . .
AO - Assembled by Unit/ AVUM level AF - Assembled by DS/ AVIM level AH - Assembled by GS level AL - Assembled by SRA AD - Assembled by Depot	Items with these codes are not to be requested/requisitioned individually. The parts that make up the assembled item must be requisitioned or fabricated and assembled at the level of maintenance indicated by the source code. If the third position of the SMR code authorizes you to replace the item, but the source code indicates the item is assembled at a higher level, order the item from the higher level of maintenance.
XA	Do not requisition an XA-coded item. Order the next higher assembly (refer to NOTE below).
XB	If an item is not available from salvage, order it using the CAGEC and P/N.
XC	Installation drawings, diagrams, instruction sheets, field service drawings; identified by manufacturer's P/N.
XD	Item is not stocked. Order an XD-coded item through normal supply channels using the CAGEC and P/N given, if no NSN is available.

NOTE

Cannibalization of controlled exchange, when authorized, may be used as a source of supply for items with the above source codes, except for those source coded "XA" or those aircraft support items restricted by requirements of AR 750-1.

EXPLANATION OF COLUMNS IN THE REPAIR PARTS LISTS - CONTINUED

(2) **Maintenance Code.** Maintenance codes tell you the level(s) of maintenance authorized to use and repair support items. The maintenance codes are entered in the third and fourth positions of the SMR code as follows:

(a) Third Position. The maintenance code entered in the third position tells you the lowest maintenance level authorized to remove, replace, and use an item. The maintenance code entered in the third position will indicate authorization to one of the following levels of maintenance:

Code	Application/Explanation
C	Crew or Operator maintenance done within Field/AVUM maintenance.
O	Unit Level/AVUM maintenance can remove, replace, and use the item.
F	Direct Support/AVIM maintenance can remove, replace, and use the item.
H	General Support maintenance can remove, replace, and use the item.
L	Specialized Repair Activity (SRA) can remove, replace, and use the item.
D	Depot Maintenance can remove, replace, and use the item.

(b) Fourth Position. The maintenance code entered in the fourth position tells you whether or not the item is to be repaired and identifies the lowest maintenance level with the capability to do complete repair (perform all authorized repair functions).

NOTE

Some limited repair may be done on the item at a lower level of maintenance, if authorized by the Maintenance Allocation Chart (MAC) (WP 0129) and SMR codes.

Code	Application/Explanation
O	Unit/AVUM is the lowest level that can do complete repair of the item.
F	Direct Support/AVIM is the lowest level that can do complete repair of the item.
H	General Support is the lowest level that can do complete repair of the item.
L	Specialized Repair Activity (SRA) is the lowest level that can do complete repair of the item.
D	Depot is the lowest level that can do complete repair of the item.
Z	Nonrepairable. No repair is authorized.
B	No repair is authorized. No parts or special tools are authorized for the maintenance of a B-coded item. However, the item may be reconditioned by adjusting, lubricating, etc., at the user level.

EXPLANATION OF COLUMNS IN THE REPAIR PARTS LISTS - CONTINUED

(3) **Recoverability Code.** Recoverability codes are assigned to items to indicate the disposition action on unserviceable items. The recoverability code is entered in the fifth position of the SMR code as follows:

Code	Application/Explanation
Z	Nonrepairable item. When unserviceable, condemn and dispose of the item at the level of maintenance shown in the third position of the SMR code.
O	Reparable item. When uneconomically reparable, condemn and dispose of the item at the Unit level of maintenance.
F	Reparable item. When uneconomically reparable, condemn and dispose of the item at Direct Support level.
H	Reparable item. When uneconomically reparable, condemn and dispose of the item at General Support level.
D	Reparable item. When beyond lower level repair capability, return to depot. Condemnation and disposal of item are not authorized below Depot level.
L	Reparable item. Condemnation and disposal of item not authorized below Specialized Repair Activity (SRA).
A	Item requires special handling or condemnation procedures because of specific reasons (e.g., precious metal content, high dollar value, critical material, or hazardous material). Refer to appropriate manuals/directives for specific instructions.

c. **NSN - (Column 3).** The NSN for the item is listed in this column.

d. **CAGEC (Column 4).** The Commercial and Government Entity Code (CAGEC) is a five-digit code which is used to identify the manufacturer, distributor, or Government agency/activity that supplies the item.

e. **PART NUMBER (Column 5).** Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity) which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

NOTE

When you use an NSN to requisition an item, the item you receive may have a different part number from the part ordered.

f. **DESCRIPTION AND USABLE ON CODE (UOC) (Column 6).** This column includes the following information:

(1) The Federal item name and, when required, a minimum description to identify the item.

(2) P/Ns of bulk materials are referenced in this column in the line entry to be manufactured or fabricated.

(3) Hardness Critical Item (HCI). A support item that provides the equipment with special protection from electromagnetic pulse (EMP) damage during a nuclear attack.

(4) The statement END OF FIGURE appears just below the last item description in column (6) for a given figure in both the repair parts list and special tools list work packages.

g. **QTY (Column 7).** The QTY (quantity per figure) column indicates the quantity of the item used in the breakout shown on the illustration/figure, which is prepared for a functional group, subfunctional group, group or assembly. A "V" appearing in this column in lieu of a quantity indicates that the quantity is variable and the quantity may vary from application to application.

EXPLANATION OF CROSS-REFERENCE INDEXES WORK PACKAGE FORMAT AND COLUMNS

a. **National Stock Number (NSN) Index (WP 0123).** NSNs in this index are listed in National Item Identification Number (NIIN) sequence.

(1) **STOCK NUMBER Column.** This column lists the NSN in NIIN sequence. The NIIN consists of the last nine digits of the NSN (i.e., NSN 5305-01-674-1467). When using this column to locate an item, ignore the first four digits of the NSN. However, the complete NSN should be used when ordering items by stock number.

(2) **FIG. Column.** This column lists the number of the figure where the item is identified/located. The figures are in numerical order in WP 0121.

(3) **ITEM Column.** The item number identifies the item associated with the figure listed in the adjacent FIG. column. This item is also identified by the NSN listed on the same line.

b. **Part Number (P/N) Index (WP 0123).** Part numbers in this index are listed in ascending alphanumeric sequence (i.e., vertical arrangement of letter and number combination which places the first letter or digit of each group in order A through Z, followed by the numbers 0 through 9 and each following letter or digit in like order).

(1) **PART NUMBER Column.** Indicates the P/N assigned to the item.

(2) **FIG. Column.** This column lists the number of the figure where the item is identified/located in the repair parts list and special tools list work packages.

(3) **ITEM Column.** The item number is the number assigned to the item as it appears in the figure referenced in the adjacent FIG. column.

SPECIAL INFORMATION

a. **Usable On Code (UOC).** The UOC appears in the lower left corner of the DESCRIPTION column heading. Usable on codes are shown as "UOC:" in the Description Column (justified left) on the first line under the applicable item/nomenclature. Uncoded items are applicable to all models. Identification of the UOC's used in the RPSTL are:

Code	*Used On*
BFL	Fuel Pump Assembly
BWT	Water Pump Assembly

b. **Associated Publications.** The publication listed below pertains to the 600 GPM Pump Assemblies and their components:

Publication	Short Title
TM 10-4320-374-13&P	Operation and Field Maintenance Manual Including RPSTL

HOW TO LOCATE REPAIR PARTS

a. **When National Stock Number is Known.**

(1) **First.** If you have the NSN, look in the STOCK NUMBER column of the NSN index (WP 0123). The NSN is arranged in NIIN sequence. Note the figure and item number next to the NSN.

(2) **Second.** Turn to the figure and locate the item number. Verify that the item is the one you are looking for.

b. **When Part Number is Known.**

(1) **First.** If you have the P/N and not the NSN, look in the PART NUMBER column of the P/N index (WP 0123). Identify the figure and item number.

(2) **Second.** Look up the item on the figure in the applicable repair parts list (WP 0121).

ABBREVIATIONS

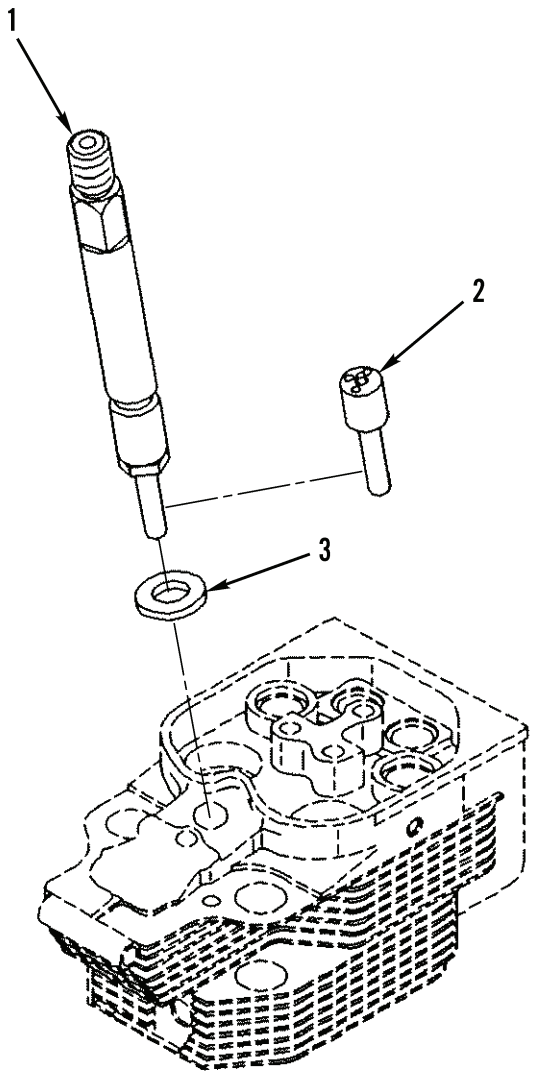
For standard abbreviations see ASME Y14.38-1999, *Abbreviations and Acronyms*.

Abbreviation	Explanation
NIIN	National Item Identification Number (consists of the last 9 digits of the NSN)
RPSTL	Repair Parts and Special Tools List
SMR	Source, Maintenance, and Recoverability Code
TMDE	Test, Measurement, and Diagnostic Equipment

END OF WORK PACKAGE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

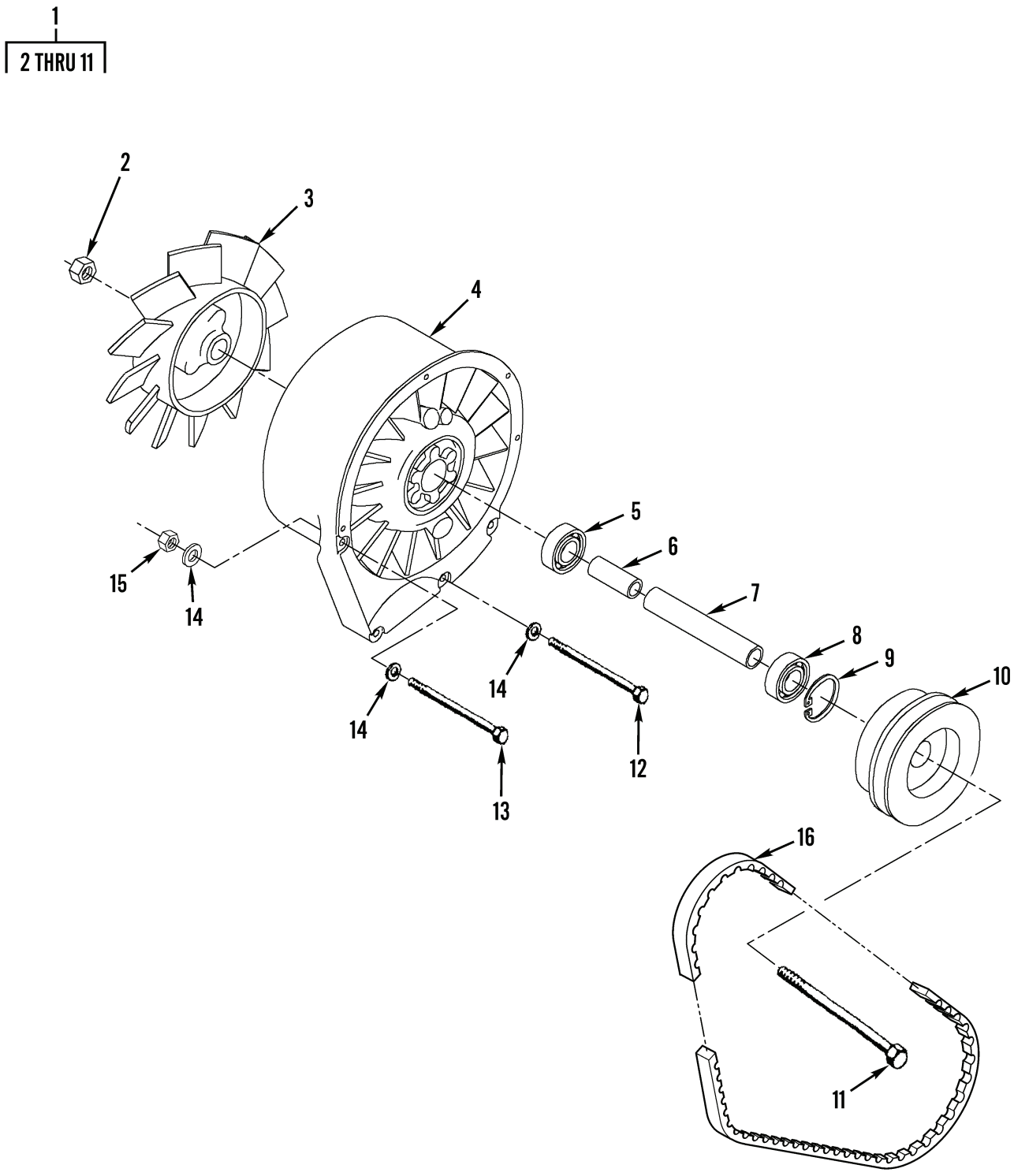
REPAIR PARTS LIST



461-5001

Figure 1. Fuel Injector

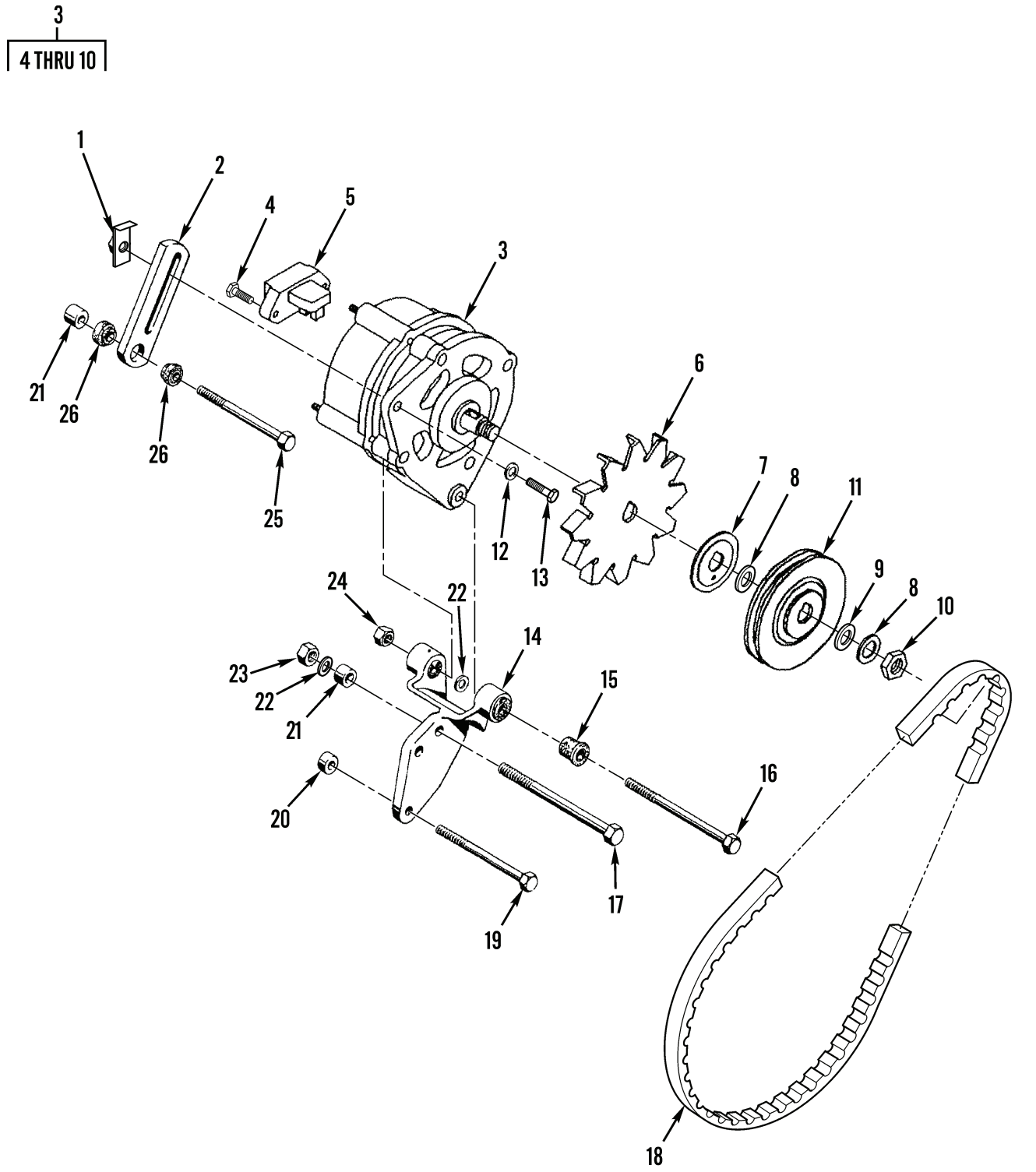
(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP GROUP 03 FUEL SYSTEM	
					GROUP 0301 CARBURETOR, FUEL INJECTOR	
					FIG. 1 FUEL INJECTOR	
1	PAFZZ		62445	0423 4349	FUEL INJECTOR.....	4
2	PAFZZ		62445	0423 4350	NOZZLE.....	4
3	PAFZZ	5330013986652	62445	04175610	SEAL,PLAIN.....	4
					END OF FIGURE	



461-5002

Figure 2. Cooling Fan

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP GROUP 05 COOLING SYSTEM	
					GROUP 0505 FAN ASSEMBLY	
					FIG. 2 COOLING FAN	
1	PAFZZ		62445	0223 5459	COOLING FAN.....	1
2	PAFZZ	5310121564982	D8286	DIN934-M12-B-A2P	.NUT,PLAIN,HEXAGON M12.....	1
3	PAFZZ		62445	0223 3443	.IMPELLER.....	1
4	PAFZZ		62445	0223 5466	.BLOWER JACKET.....	1
5	PAFZZ	3110002939163	1ML14	160606	.BEARING,BALL,ANNULA.....	1
6	PAFZZ		62445	0223 5467	.BUSHING.....	1
7	PAFZZ		62445	0423 0382	.SHAFT,HOLLOW.....	1
8	PAFZZ	3110012159553	62445	1123665	.BEARING,BALL,ANNULA.....	1
9	PAFZZ	5325013178119	62445	110-7844	.RING,RETAINING.....	1
10	PAFZZ		62445	0223 5470	.PULLEY,V-GROOVED.....	1
11	PAFZZ	5305013183287	36719	111 1602	.SCREW,CAP,HEXAGON H M12 X 180-8.8.	1
12	PAFZZ	5305013173243	62445	111 1218	SCREW,CAP,HEXAGON H M8 X 120-8.8...	3
13	PAFZZ	5305012737556	62445	110 3735	SCREW,CAP,HEXAGON H M8 X 115-8.8...	1
14	PAFZZ	5310121494353	D2689	0110 7101	WASHER,FLAT A8.....	5
15	PAFZZ	5310014347272	62445	0111 2824	NUT,PLAIN,HEXAGON M8-8-A4C.....	1
16	PAFZZ		62445	01180830	V-BELT.....	1
					END OF FIGURE	



461-5003

Figure 3. Alternator and Related Parts

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP GROUP 06 ELECTRICAL SYSTEM	
					GROUP 0601 GENERATOR, ALTERNATOR	
					FIG. 3 ALTERNATOR AND RELATED PARTS	
2	PAFZZ		62445	0224 7670	BRACKET.....	1
3	PAFZZ		62445	274541	24V ALTERNATOR 35AMP.....	1
4	PAFZZ		62445	131 8549	SCREW,MACHINE WITH CAPTIVE WASHER..	1
5	PAFZZ		62445	0118 2199	.VOLTAGE REGULATOR.....	1
6	PAFZZ		62445	0118 1859	.FAN.....	1
7	PAFZZ		62445	0118 2010	.SUPPORTING RING.....	1
8	PAFZZ		62445	0118 2271	.WAVE SPRING WASHER.....	2
9	PAFZZ		62445	01177351	.WASHER,FLAT.....	1
10	PAFZZ		62445	0113 1115	.NUT,PLAIN,HEXAGON M16 X 1,5-05....	1
11	PAFZZ		62445	0118 2190	V-GROOVED PULLEY.....	1
12	PAFZZ	5310121494353	D8286	DIN125-A8,4-140H V-A3P	WASHER,FLAT A8.....	2
13	XBFZZ		62445	TBD-0164	BOLT.....	1
14	PAFZZ		62445	0223 7670	BRACKET.....	1
15	PAFZZ	3120012530355	62445	126 0659	BUSH,DAMPING.....	2
16	PAFZZ	5305013173243	62445	111 1218	SCREW,CAP,HEXAGON H M8 X 120-8.8...	1
17	PAFZZ	5306012443716	62445	112-4803	BOLT,MACHINE M10 X 130-8.8.....	1
18	PAFZZ	3030011579621	1VZM7	15465	BELT,V.....	1
19	PAFZZ	5306012531591	62445	1126979	BOLT,MACHINE M8 X 105-8.8.....	1
20	PAFZZ		62445	336 3993	BUSHING,SLEEVE.....	1
21	PAFZZ		D2689	0224 3287	SPACER,SLEEVE.....	2
22	PAFZZ		D2689	0121 5749	WASHER,FLAT.....	1
23	PAFZZ	5310014412807	62445	01102659	NUT,PLAIN,HEXAGON M10.....	1
24	PAFZZ	5310014347272	62445	0111 2824	NUT,PLAIN,HEXAGON M8-8-A4C.....	1
25	PAFZZ		62445	0111 1207	BOLT,HEXAGON M8 X 100-8.8.....	1
26	PAFZZ	3120012530354	62445	224 2433	PAD,RUBBER.....	2
					END OF FIGURE	

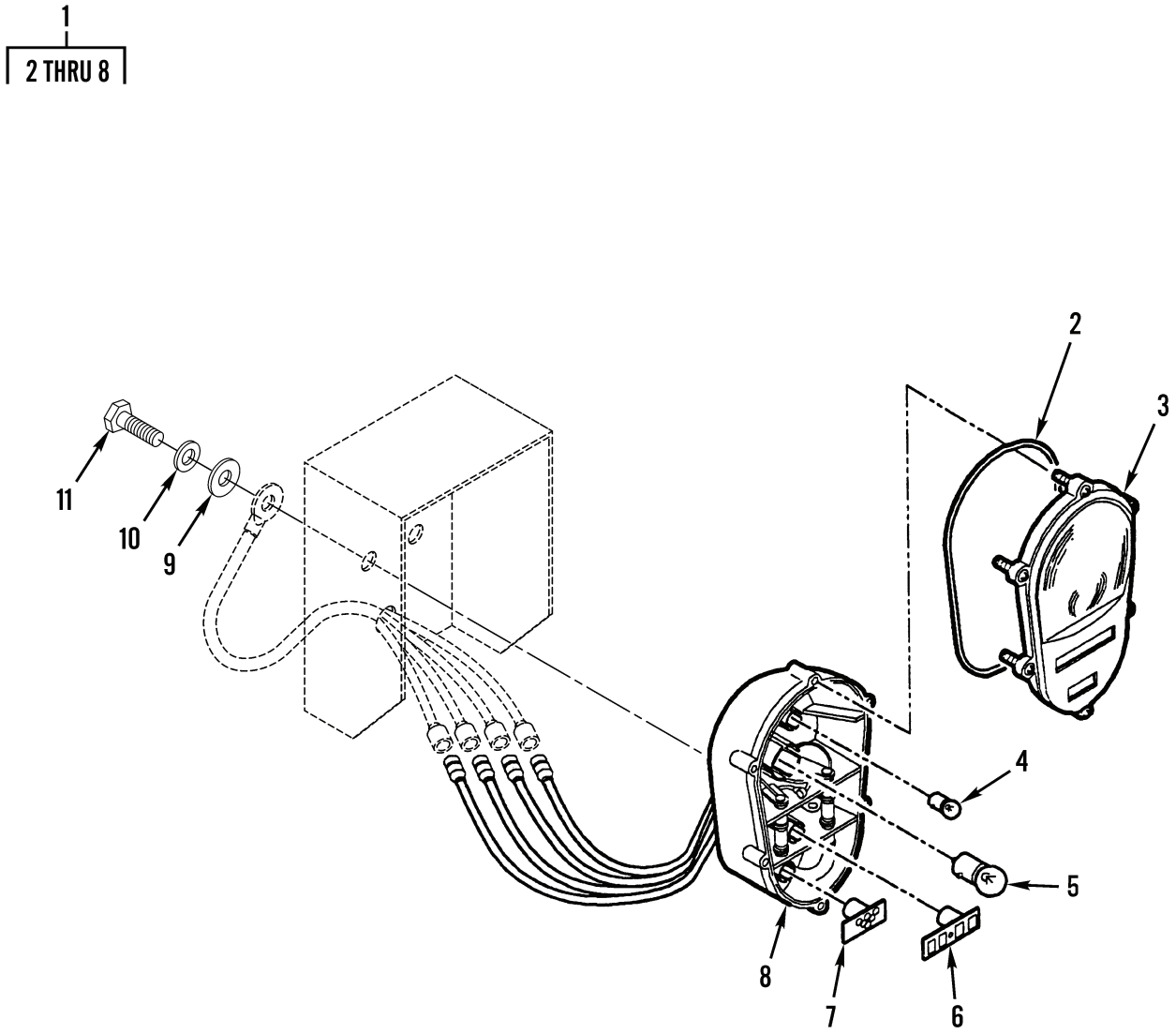


Figure 4. Trailer Lights

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 0609 LIGHTS	
					FIG. 4 TRAILER LIGHTS	
1	PAFFF	6220013723883	19207	12375837	TAILLIGHT,VEHICULAR.....	2
2	PAFZZ	5331004620907	19207	11639519-2	.O-RING.....	1
3	PAFZZ	6220013592870	19207	12375841	.LENS,LIGHT.....	1
4	PAFZZ		08806	A6324	.LAMP,INCADESCENT.....	1
5	PAFZZ	6240000446914	08108	1683	.LAMP,INCANDESCENT.....	1
6	PAFZZ	6220012842709	19207	12360850-1	.LIGHT,MARKER,CLEARA.....	1
7	PAFZZ	6220013874250	19207	12360850-2	.LIGHT,MARKER,CLEARA.....	1
8	PAFZZ		34623	12375838	.ASSEMBLY,BODY.....	1
9	PAFZZ		39428	90130A031	WASHER,FLAT 3/8".....	4
10	PAFZZ	5310006379541	59556	019-00004-42	WASHER,LOCK 3/8".....	4
11	PAFZZ		39428	91781A638	SCREW,MACHINE 3/8" X 3 1/2".....	4
					END OF FIGURE	

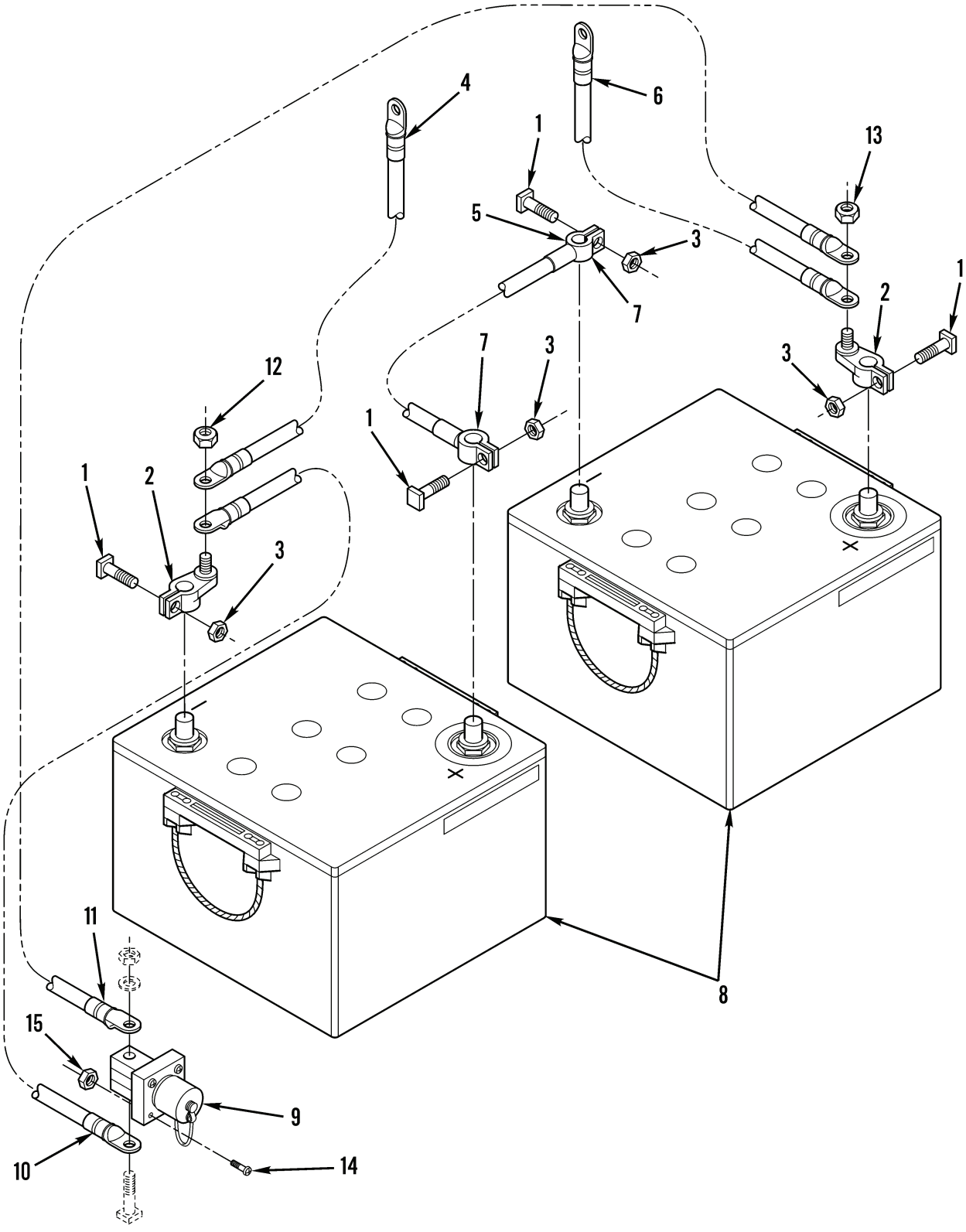
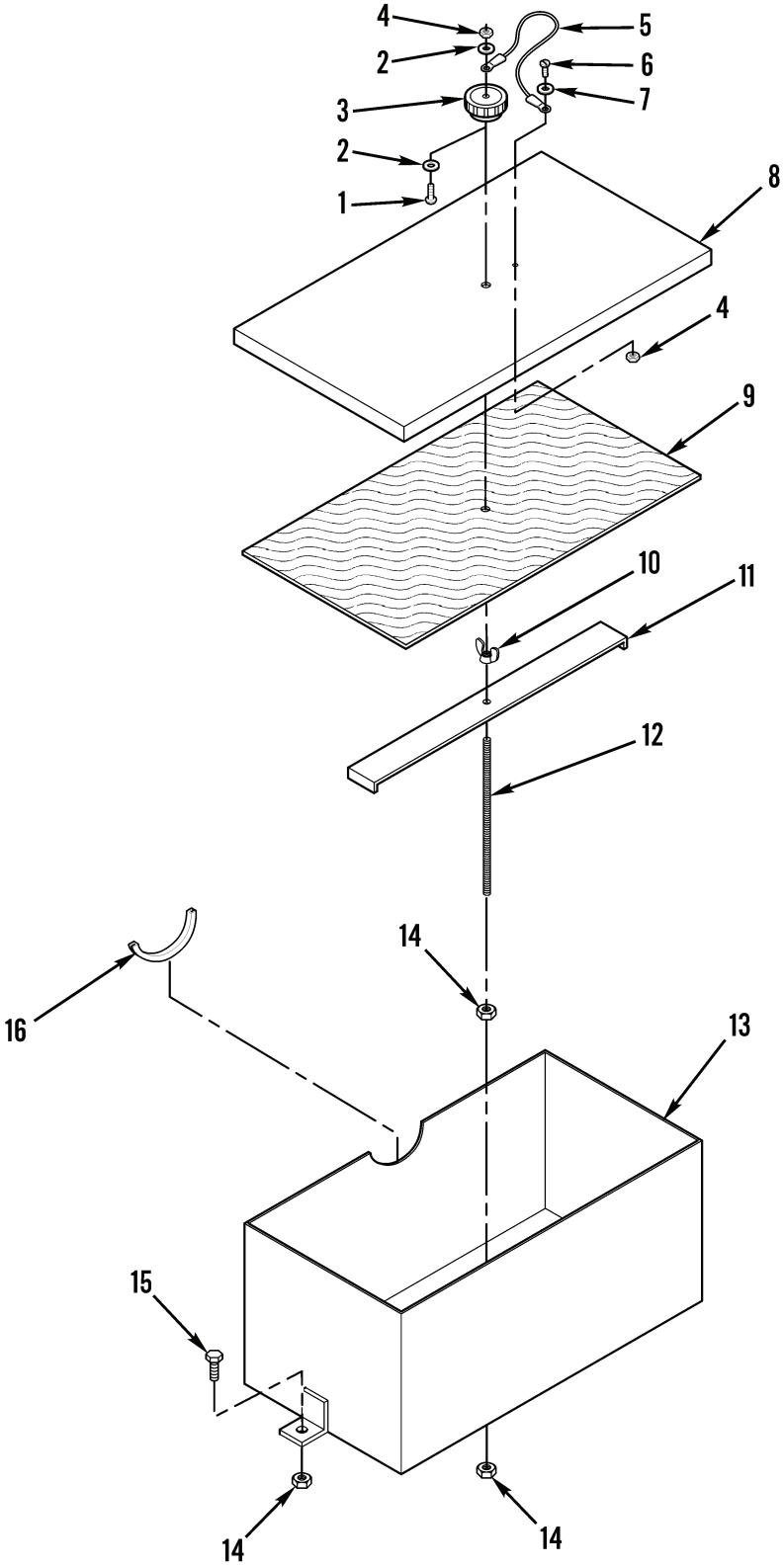


Figure 5. Batteries

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 0612 BATTERIES, STORAGE	
					FIG. 5 BATTERIES	
1	PAFZZ		39428	91772A247	BOLT,MACHINE 10-24 X 1" SS.....	4
2	PAFZZ	5940014581940	39428	69645K59	TERMINAL,LUG.....	1
3	PAFZZ	5310015049412	3A054	90101A011	NUT,PLAIN,HEXAGON 10-24 LOCKING FIBER NUT.....	4
4	PAFZZ		1WB54	90-019-247	CABLE,BATTERY NEGATIVE A(-) TO TRAILER GROUND.....	1
5	PAFZZ		1WB54	90-019-245	CABLE,BATTERY JUMPER A(+) TO BATTERY B(-).....	1
6	PAFZZ		1WB54	90-019-244	CABLE,BATTERY POSITIVE B(+) TO STARTER.....	1
7	PAFZZ	5940014581939	39428	69645K58	TERMINAL,LUG.....	1
8	PAFZA	6140014851472	0WY95	9750N7025	BATTERY,STORAGE.....	2
9	PAFZZ		0CJB0	ABORD954	CONNECTOR,SLAVE NATO INTERVEHICULAR	1
10	PAFZZ		1WB54	90-019-248	CABLE,BATTERY NEGATIVE A(-) TO NATO (-).....	1
11	PAFZZ		1WB54	90-019-246	CABLE,BATTERY POSITIVE B(+) TO NATO(+).....	1
12	PAFZZ		39428	95462A031	NUT,PLAIN,HEXAGON.....	1
13	PAFZZ	5310015247436	39428	95462A030	NUT,PLAIN,HEXAGON.....	1
14	PAFZZ		39428	91772A247	BOLT,MACHINE 10-24 X 1" SS.....	4
15	PAFZZ	5310015049412	3A054	90101A011	NUT,PLAIN,HEXAGON 10-24 LOCKING FIBER NUT.....	4
					END OF FIGURE	



461-5006

Figure 6. Battery Box

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 0612 BATTERIES, STORAGE	
					FIG. 6 BATTERY BOX	
1	PAFZZ		39428	91792A197	SCREW,MACHINE 8/32-3/4.....	1
2	PAFZZ	5310015462651	39428	98017A625	WASHER,FLAT 8/32.....	2
3	PAFZZ		1WB54	501-06	KNOB.....	1
4	PAFZZ	5310013592589	39428	91831A009	NUT,SELF-LOCKING,HE 8/32.....	2
5	PAFZZ		1WB54	90-019-237	LANDARD.....	1
6	PAFZZ		39428	91792A197	SCREW,MACHINE 8/32-3/4.....	1
7	PAFZZ	5310015462651	39428	98017A625	WASHER,FLAT 8/32.....	1
8	PAFZZ		1WB54	501-02	LID.....	1
9	PAFZZ		41HK8	50103-01	LID LINER.....	1
10	PAFZZ	5310014911474	39428	92001A339	NUT,PLAIN,WING 3/8".....	1
11	PAFZZ		1WB54	501-05	RETAINING BAR.....	1
12	PAFZZ		1WB54	501-04	RETAINING BOLT.....	1
13	PAFZZ		1WB54	501-01	BATTERY BOX.....	1
14	PAFZZ	5310015263438	39428	91831A140	NUT,SELF-LOCKING,HE 3/8.....	4
15	PAFZZ	5305015344818	39428	92865A217	SCREW,CAP,HEXAGON H.....	2
16	PAFZZ		41HK8	50103-03	EDGE PROTECTION STR.....	1
					END OF FIGURE	

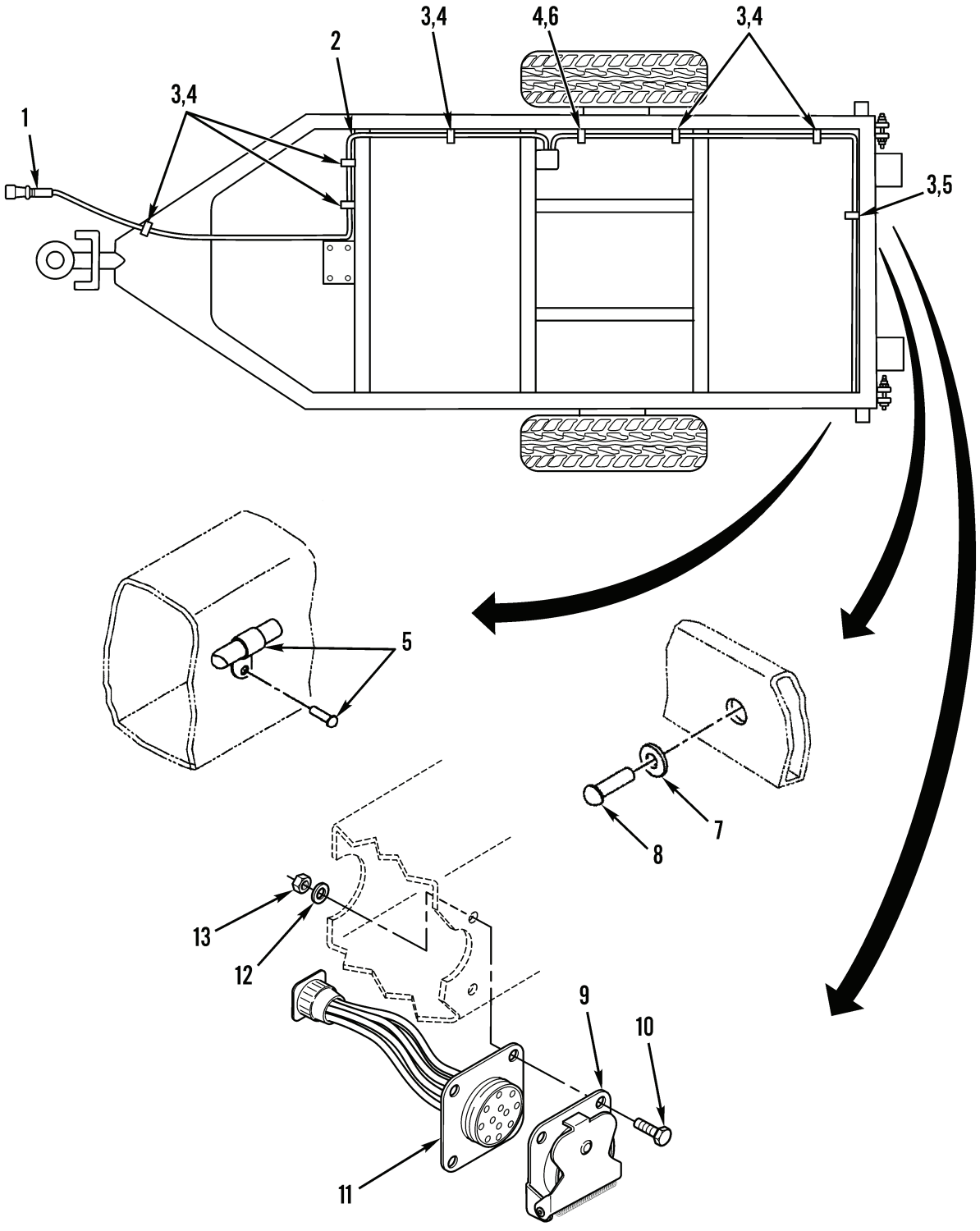


Figure 7. Wiring Harness and Sensors (Sheet 1 of 3)

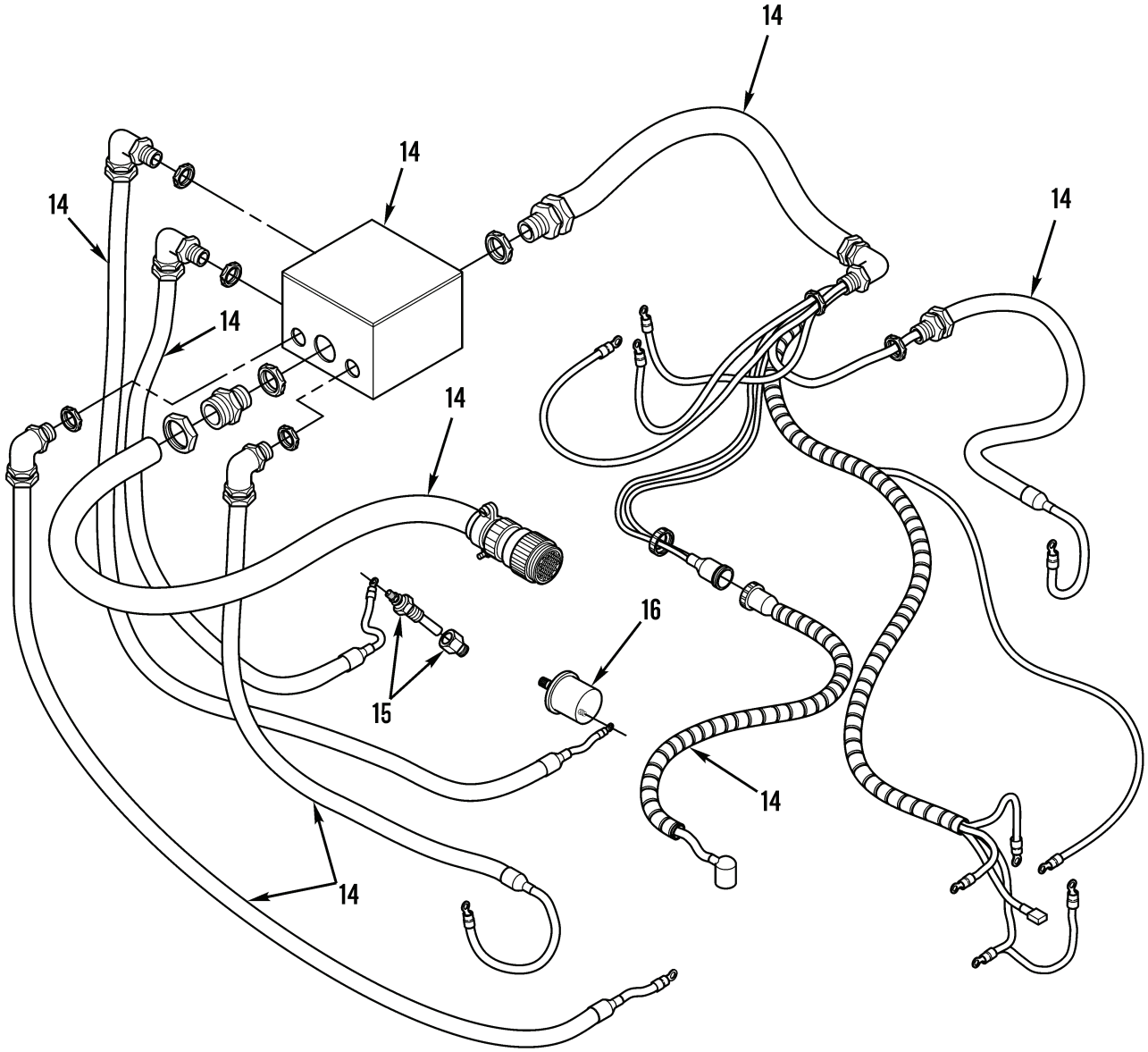
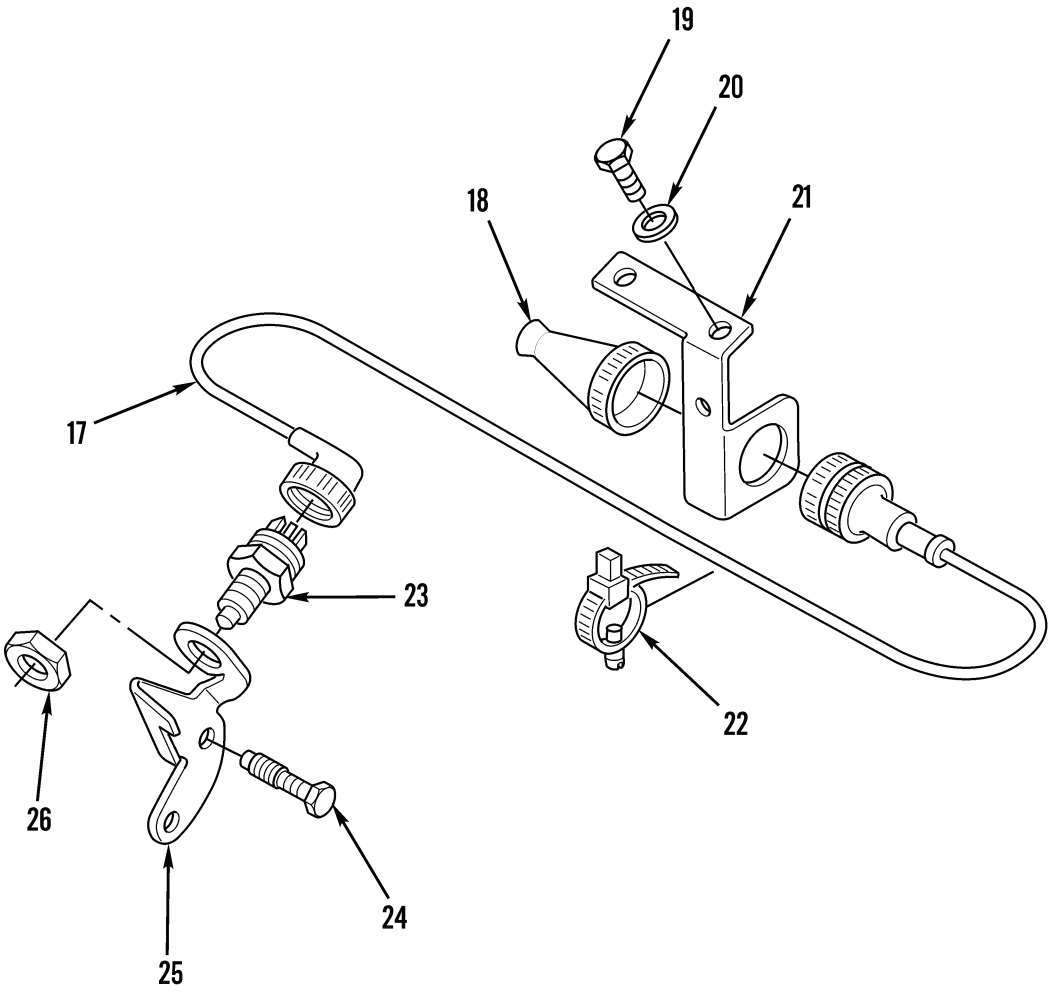


Figure 7. Wiring Harness and Sensors (Sheet 2 of 3)

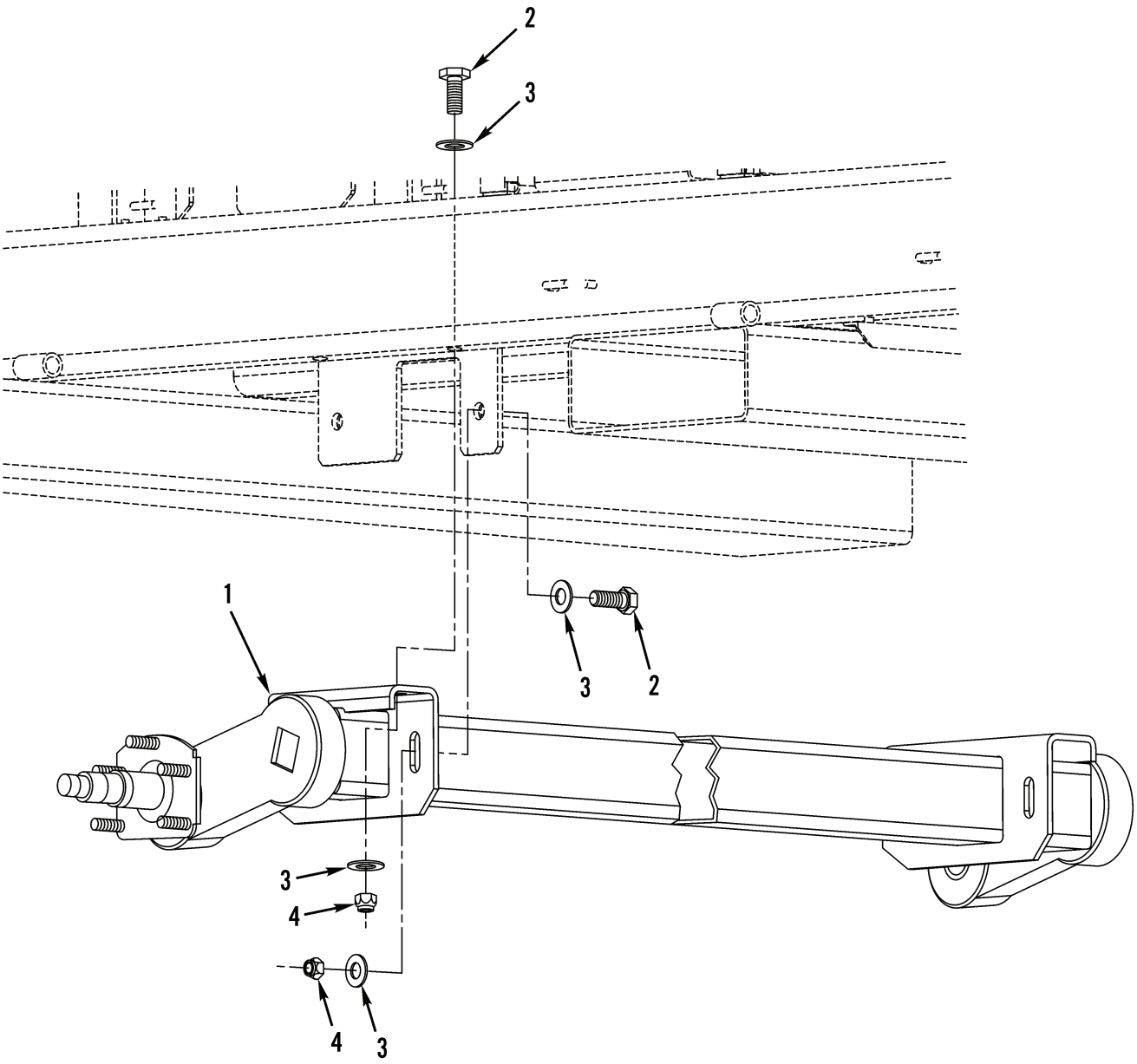


461-5007

Figure 7. Wiring Harness and Sensors (Sheet 3 of 3)

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 0613 HULL OR CHASSIS WIRING HARNESS	
					FIG. 7 WIRING HARNESS AND SENSORS	
1	PAFZZ	6150011676522	19207	10891263-1	CABLE ASSEMBLY,SPEC.....	1
2	PAFZZ	6150014851459	19207	12449997	WIRING HARNESS,BRAN.....	1
3	PAFZZ	5320014141459	19207	12449500-3	RIVET,BLIND .250 DIA X .308-.387 GRIP.....	19
4	PAFZZ		18076	S325DG3	CLAMP,LOOP 3/4 DIA.....	22
5	PAFZZ	5340014141453	19207	12449366-2	CLAMP,LOOP 1/2 DIA.....	9
6	PAFZZ	5320014128088	17446	B0M-R8-9	RIVET,BLIND .250 DIA X .532-.594 GRIP.....	12
7	PAFZZ	5325002766056	94135	MS35489-106	GROMMET,NONMETALLIC.....	1
8	PAFZZ	5320011401479	9K475	BOM-R8-10	RIVET,BLIND .250 DIA X .595-.656 GRIP.....	1
9	PAFZZ		19027	7731428.00	COVER,ELECTRICAL CO.....	1
10	PAFZZ	5305002253843	80204	B1821BH025C100N	SCREW,CAP,HEXAGON H 1/4-20 X 1"....	4
11	PAFZZ		01084	17536	WIRING HARNESS,BRAN.....	1
12	PAFZZ	5310008238804	96906	MS27183-9	WASHER,FLAT 1/4".....	4
13	PAFZZ	5310007616882	96906	MS51967-2	NUT,PLAIN,HEXAGON 1/4-20.....	4
14	PAFZZ		1WB54	503-04	HARNESS,BRANCHED.....	1
15	PAFZZ		1WB54	40-014-25	RESISTOR,THERMAL OIL TEMP.....	1
16	PAFZZ		1WB54	40-014-31	RESISTOR,THERMAL OIL PRESSURE.....	1
17	PAFZZ	6150013960274	62445	0224 8490	CABLE ASSEMBLY,SPEC.....	1
18	PAFZZ	5935013270956	62445	224-5054	CONNECTOR,PLUG,ELEC.....	1
19	PAFZZ	5305121580033	I9008	ISO4017-M10X16-8 .8-A3P	SCREW,CAP,HEXAGON H M10 X 16, 8.8..	1
20	PAFZZ		62445	1107105	WASHER,FLAT A10.....	1
21	PAFZZ		62445	02248935	BRACKET,DOUBLE ANGL.....	1
22	PAFZZ		058D1	1A868	STRAP,TIEDOWN,ELEC 7.5 IN.....	1
23	PAFZZ	5930013656928	62445	4191001	SWITCH,SENSITIVE.....	1
24	PAFZZ	5305012737553	62445	1171763	SCREW,CAP,HEXAGON H M8 X 20.....	1
25	PAFZZ	5930011980916	62445	2245062	RETAINER,ELECTRICAL.....	1
26	PAFZZ		D8286	DIN80705-M18X1,5 -14H-A2P	NUT,PLAIN,HEXAGON M18.....	1

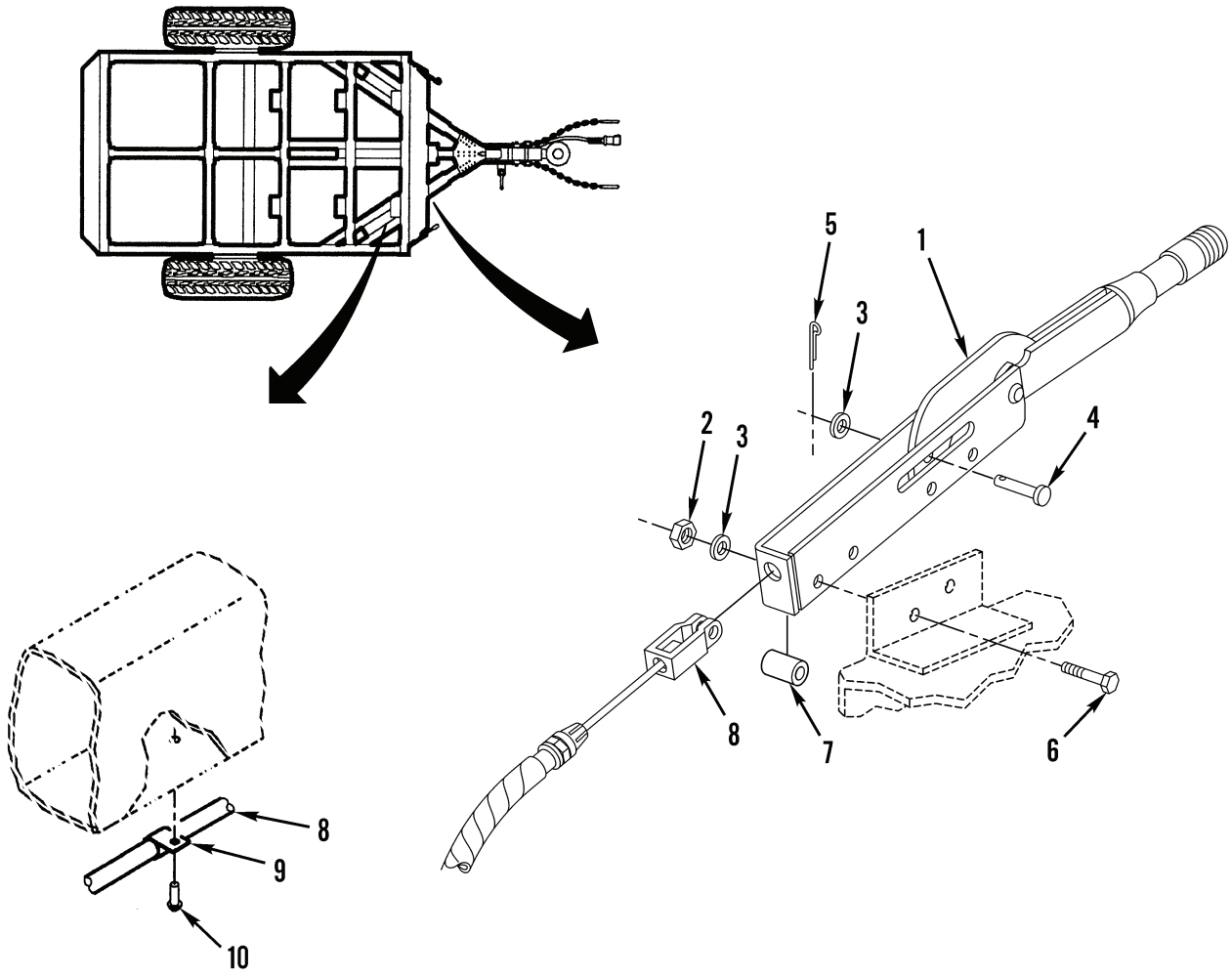
END OF FIGURE



461-5008

Figure 8. Axle Assembly

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 10 FRONT AXLE	
					GROUP 1000 FRONT AXLE ASSEMBLY	
					FIG. 8 AXLE ASSEMBLY	
1	PAFZZ		01084	17477	AXLE,VEHICULAR,NOND.....	1
2	PAFZZ	5305015086879	39428	92620A798	SCREW,CAP,HEXAGON H.....	8
3	PAFZZ		39428	95601A365	WASHER,FLAT.....	16
4	PAFZZ	5310015085907	39428	97135A275	NUT,SELF-LOCKING,HE.....	8
					END OF FIGURE	

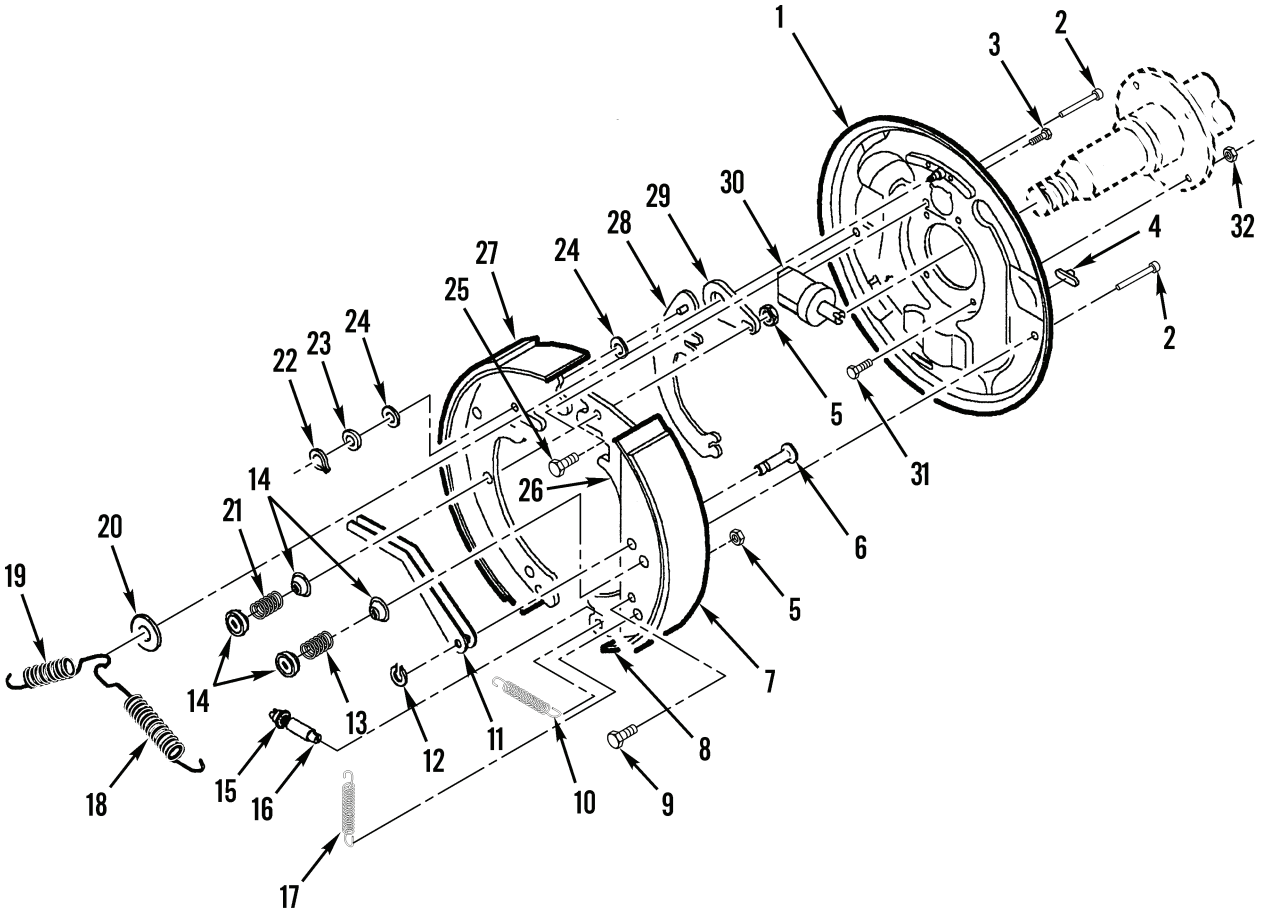


461-5009

Figure 9. Hand Brakes

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 12 BRAKES	
					GROUP 1201 HAND BRAKES	
					FIG. 9 HAND BRAKES	
1	PAFZZ	2510014152636	92867	01191510	LEVER,ACCELERATOR.....	2
2	PAFZZ	5310014121774	19207	12449377-9	NUT,SELF-LOCKING,HE.....	4
3	PAFZZ	5310000814219	96906	MS27183-12	WASHER,FLAT 5/16.....	8
4	PAFZZ	5315005849053	92867	81000129	PIN,STRAIGHT,HEADED.....	2
5	PAFZA	5315013728923	92867	84000139	PIN,COTTER.....	2
6	PAFZZ	5306002264832	80204	B1821BH031C175N	BOLT,MACHINE.....	4
7	XAFZZ		92867	TBD-1395	SPACER.....	2
8	PAFZZ		01084	15300	CABLE,PARK BRAKE 81" LONG.....	2
9	PAFZZ	5340014142173	18076	12449366-1	CLAMP,LOOP 1/4" DIA.....	4
10	PAFZZ	5320014141459	19207	12449500-3	RIVET,BLIND 0.250 DIA X .308-.387 GRIP.....	4
					END OF FIGURE	

1
2 THRU 32



461-5010

Figure 10. Service Brakes

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 1202 SERVICE BRAKES	
					FIG. 10 SERVICE BRAKES	
1	PAFZZ	2530014149317	01084	3484	BRAKE,SHOE TYPE RH.....	1
1	PAFZZ	2530014149314	01084	3382	BRAKE,SHOE TYPE LH.....	1
2	PAFZZ	5315012878770	1TUY2	18508	.PIN,TOGGLE,HEADED.....	4
3	PAFZZ	5305013213522	1TUY2	23457	.SCREW ASSEMBLY,PANE.....	4
4	PAFZZ	5340007143113	29510	131033R1	.COVER,ACCESS.....	2
5	PAFZZ	5310013201980	1TUY2	17406	.NUT,SELF-LOCKING,HE.....	4
6	PAFZZ	5315013199194	94189	9796	.PIN,STRAIGHT,HEADLE.....	2
7	PAFZZ	2530015305068	1CSL0	2026023	.BRAKE SHOE SET.....	2
8	PAFZZ	5340014121285	94189	18502	.LEVER,MANUAL CONTRO.....	2
9	PAFZZ	5305014126287	1TUY2	12972	.SCREW,CAP,HEXAGON H.....	2
10	PAFZZ	5360013205815	1TUY2	9784	.SPRING,HELICAL,COMP.....	2
11	PAFZZ	2530014125210	1TUY2	44863	.LINK,ACTUATING BRAK USED ON P/N 3484 RH ONLY.....	1
11	PAFZZ	2530014125211	1TUY2	44864	.LINK,ACTUATING BRAK USED ON P/N 3382 LH ONLY.....	1
12	PAFZZ	5325014125998	1TUY2	0777801184	.RING,RETAINING.....	2
13	PAFZZ	5360013205819	94189	9790	.SPRING,HELICAL,EXTE.....	2
14	PAFZZ	2530012637061	1TUY2	9789	.CUP,HYDRAULIC BRAKE.....	8
15	PAFZZ	2530012879409	1TUY2	18836	.SOCKET,BRAKE ADJUST.....	2
16	PAFZZ	2530012883979	1TUY2	23323	.ADJUSTING SCREW ASS.....	2
17	PAFZZ	5360013205820	1TUY2	6814	.SPRING,HELICAL,EXTE.....	2
18	PAFZZ	5360013205818	1TUY2	9785	.SPRING,HELICAL,EXTE.....	2
19	PAFZZ	5360012885870	1TUY2	0978600	.SPRING,HELICAL,EXTE.....	2
20	PAFZZ	5310014120861	1TUY2	18950	.WASHER,FLAT.....	2
21	PAFZZ	5360012877297	1TUY2	9791	.SPRING,HELICAL,COMP.....	2
22	PAFZZ	5340012770300	1TUY2	9795	.CLIP,SPRING TENSION.....	2
23	PAFZZ	5310013201987	94189	9794	.WASHER,LOCK.....	2
24	PAFZZ	5330012697265	94189	7820	.WASHER,TRANSPORTER.....	4
25	PAFZZ	5306011005113	1TUY2	7949	.BOLT.....	2
26	XAFZZ		1GSL0	TBD-1455	.LEVER,BRAKESHOE INCLUDED WITH ITEM 7.....	1
27	PAFZZ	2530012874451	01084	12758	.BRAKE,SHOE TYPE RH.....	2
27	PAFZZ	2530015305068	1CSL0	2026023	.BRAKE SHOE SET LH.....	2
28	PAFZZ	2530013201686	1TUY2	4486500	.LINK,PARKING BRAKE USED ON 3484 RH ONLY.....	1
28	PAFZZ	2530013201687	1TUY2	0953700	.LINK,PARKING BRAKE USED ON 3382 LH ONLY.....	1
29	PAFZZ	2530014125209	1TUY2	17917	.LINK,ACTUATING BRAK.....	2
30	PAFZZ	2530001617575	1TUY2	9776	.CYLINDER ASSEMBLY,H USED ON PN 3484 RH ONLY.....	1
30	PAFZZ	2530001617576	1TUY2	9777	.CYLINDER ASSEMBLY,H USED ON PN 3382 LH ONLY.....	1
31	PAFZZ		33875	12449392	.STUD,CONTINUOUS THR.....	10
32	PAFZZ	5310014840489	19207	12449377-5	.NUT,SELF-LOCKING,HE.....	10
					END OF FIGURE	

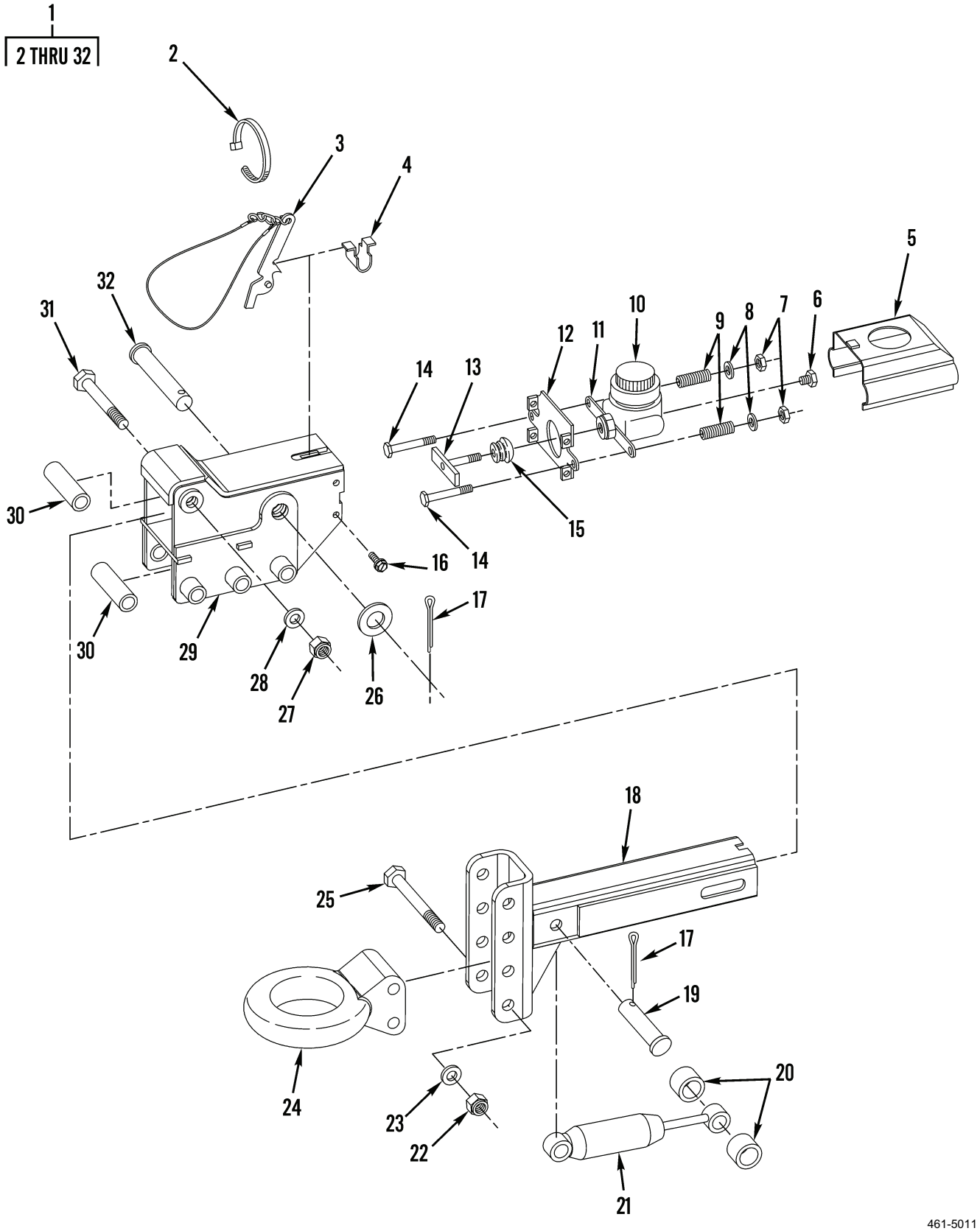
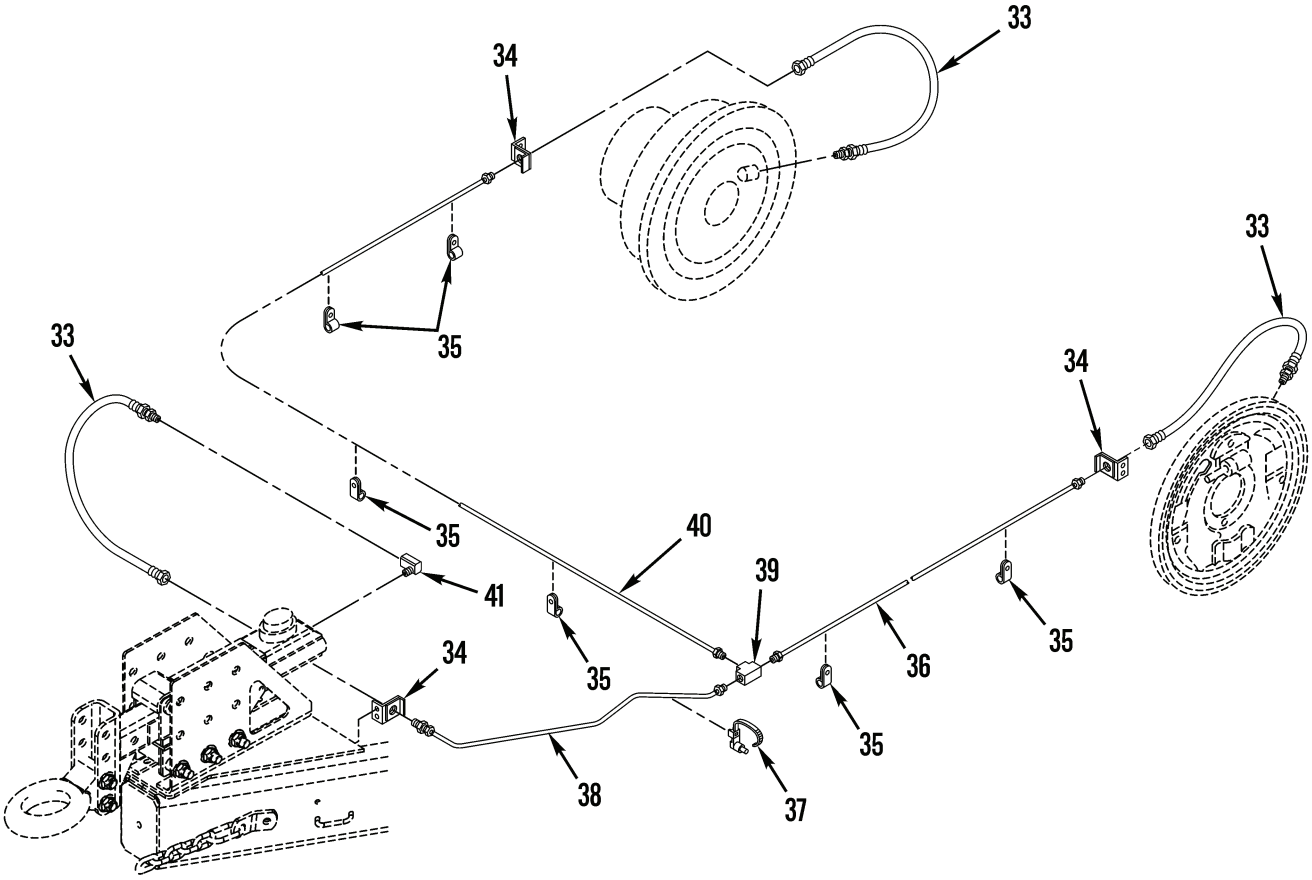


Figure 11. Brake Actuator Assembly (Sheet 1 of 2)



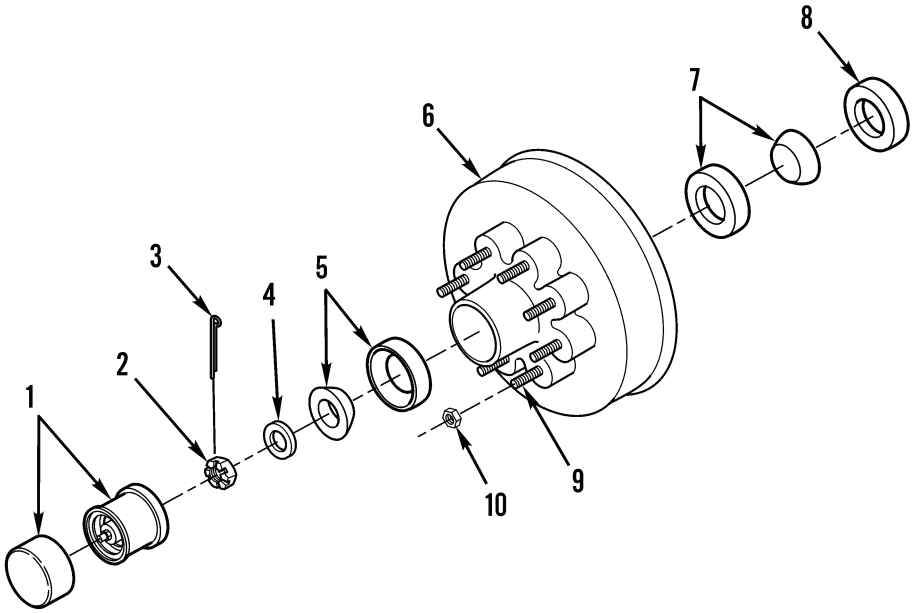
461-5011

Figure 11. Brake Actuator Assembly (Sheet 2 of 2)

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 1204 HYDRAULIC BRAKE SYSTEM	
					FIG. 11 BRAKE ACUTATOR ASSEMBLY	
1	PAFZZ		01084	17508	MASTER CYLINDER POW SURGE BRAKE ASSEMBLY.....	1
2	PAFZZ	5975000742072	06383	PLT2S	.STRAP,TIEDOWN,ELECT.....	1
3	PAFZZ	5340014121278	94189	43593	.LEVER,LOCK-RELEASE.....	1
4	PAFZZ	5360012697266	81996	17803	.SPRING,BREAKAWAY TR.....	1
5	PAFZZ	5340014121284	1TUY2	1806600317	.COVER,ACCESS.....	1
6	PAFZZ	4730014126769	5P512	12098	.RESTRICTOR,FLUID FL.....	1
7	PAFZZ	5310011005112	0VSH3	7976	.NUT.....	2
8	PAFZA	5330012697265	94189	7820	.WASHER,TRANSPORTER.....	2
9	PAFZZ	5360012697264	8X093	10274	.SPRING,TRANSPORTER.....	2
10	PAFZZ		20076	17556	.MASTER CYLINDER POW.....	1
11	PAFZZ	2530011210786	20076	10271	.CYLINDER ASSEMBLY,H.....	1
12	PAFZZ	5340014121281	1TUY2	17762	.PLATE,MOUNTING.....	1
13	PAFZZ	2530014123863	1TUY2	4390500	.PUSH ROD,HYDRAULIC.....	1
14	PAFZZ	5306012580830	94189	10273	.BOLT,MACHINE.....	2
15	XAFZZ		01084	TBD-1501	.BOOT,DUST AND MOSIT.....	1
16	PAFZZ		80204	S630NA84CAG12354 BNBA3	.BOLT,MACHINE,ASEMBL.....	4
17	PAFZZ	5315000120123	80059	AN380-4-5	.PIN,COTTER.....	2
18	PAFZZ		01084	17521	.BRACKET,MOUNTING SURGE BRAKE BRACKET,ADJUSTABLE EYE.....	1
19	PAFZZ	1740012697270	19207	12479779	.PIN,DAMPER TRANSPOR.....	1
20	PAFZZ	3120014949220	19207	12479776	.ROLLER,LINEAR-ROTAR.....	2
21	PAFZZ	3040013496927	1TUY2	12426	.DAMPER,INERTIA.....	1
22	PAFZZ	5310007680318	96906	MS51967-14	.NUT,PLAIN,HEXAGON 1/2-13.....	2
23	PAFZZ	5310008095997	96906	MS27183-17	.WASHER,FLAT 1/2".....	2
24	PAFZZ		01084	14966	.LUNETTE EYE ADJ 3".....	1
25	PAFZZ	5305000712079	80204	B1821BH050C400N	.SCREW,CAP,HEXAGON H 1/2-13 X 4"...	2
26	PAFZZ		80204	W221NAAW087NN039 NNBA1	.WASHER,FLAT 7/8" ID.....	1
27	PAFZZ	5310002694040	81349	M45913/1-10CG5C	.NUT,SELF-LOCKING,HE 5/8-13UNC.....	1
28	PAFZZ		80204	W221NAAW062NN039 NNBA1	.WASHER,FLAT 5/8" ID, USE ON TOP BOLT ONLY.....	1
29	PAFZZ		01084	17509	.HOUSING,MECHANICAL HOUSING, SURGE BRAKE.....	1
30	PAFZZ	3120014949225	19207	12479775	.ROLLER,LINEAR-ROTAR.....	1
31	PAFZZ	5305014842488	80204	B210NA00CAP39354 BNBA1	.SCREW,CAP,HEXAGON H 5/8-13 X 5.25", GR 8.....	1
32	PAFZZ	5315014948535	19207	12479777	.PIN,STRAIGHT,HEADED.....	1
33	PAFZZ	4720014165916	5H671	253-50128-13000	HOSE ASSEMBLY,NONME.....	3
34	PAFZZ		01084	7507	BRACKET,DOUBLE ANGL.....	3
35	PAFZZ		01084	7749	CLAMP,LOOP.....	6
36	PAFZZ		01084	17549	TUBE AND FITTINGS,M LH SIDE.....	1
37	PAFZZ		01084	7749	CLAMP,LOOP.....	7
38	PAFZZ		01084	17547	TUBE AND FITTINGS,M FRONT.....	1

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
39	PAFZZ		01084	3527	TEE,UNION,3/16" O.....	1
40	PAFZZ		01084	17550	TUBE AND FITTINGS,M RH SIDE.....	1
41	PAFZZ		01084	17546	ELBOW,90 DEGREE 1/8 NPT.....	1

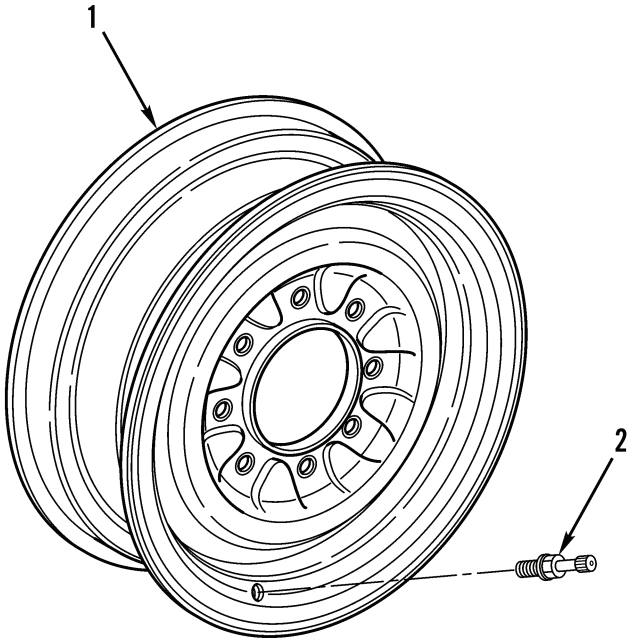
END OF FIGURE



461-5012

Figure 12. Brake Drum

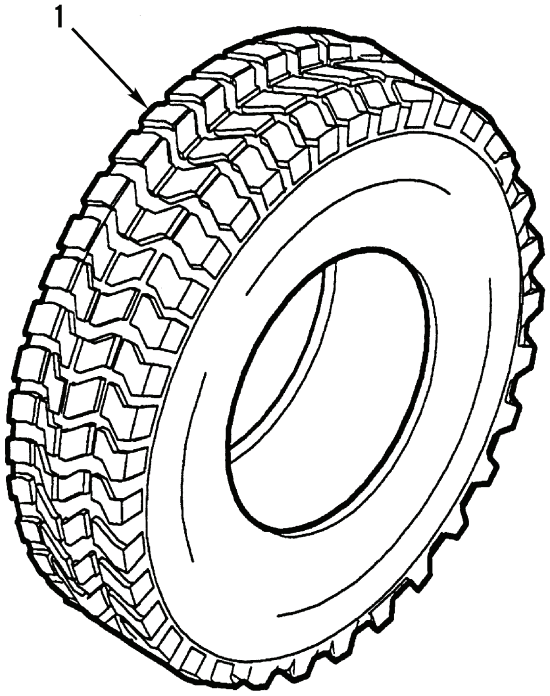
(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP GROUP 13 WHEELS AND TRACKS	
					GROUP 1311 WHEEL ASSEMBLY	
					FIG. 12 BRAKE DRUM	
1	PAFZZ		01084	18201	CAP,GREASE,BEARING.....	2
2	PAFZZ	5310001768117	80205	AN320-16	NUT,PLAIN,SLOTTED,H.....	2
3	PAFZZ	5315014171051	0Z890	91901	PIN,COTTER.....	2
4	PAFZZ	5310014172927	0Z890	363259	WASHER,FLAT.....	2
5	PAFZZ	3110001424355	60038	14125A	CONE AND ROLLERS,TA.....	2
6	PAFZZ		01084	8654	BRAKE DRUM.....	2
7	PAFZZ	3110001003541	60038	25580	CONE AND ROLLERS,TA.....	2
8	PAFZZ	5330014124447	80201	22532	SEAL,PLAIN ENCASED.....	2
9	PAFZZ	5306014189086	0Z890	9251100	BOLT,SHOULDER.....	16
10	PAFZZ	5310014146476	0Z890	90640	NUT,PLAIN,CAP.....	16
					END OF FIGURE	



461-5013

Figure 13. Wheel Assembly

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 1311 WHEEL ASSEMBLY	
					FIG. 13 WHEEL ASSEMBLY	
1	PAFZZ		01084	17475	WHEEL,PNEUMATIC TIR 16 X 6 STEEL, 8 ON 6.5" PCD, 0 OFFSET.....	2
2	PAFZZ		01084	17798	STEM,VALVE.....	2
					END OF FIGURE	



461-5014

Figure 14. Tire

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 1313 TIRES, TUBES, TIRE CHAINS	
					FIG. 14 TIRE	
1	PAFZZ		01084	17476	TIRE A/T 225/75R16, 10 PLY.....	2
					END OF FIGURE	

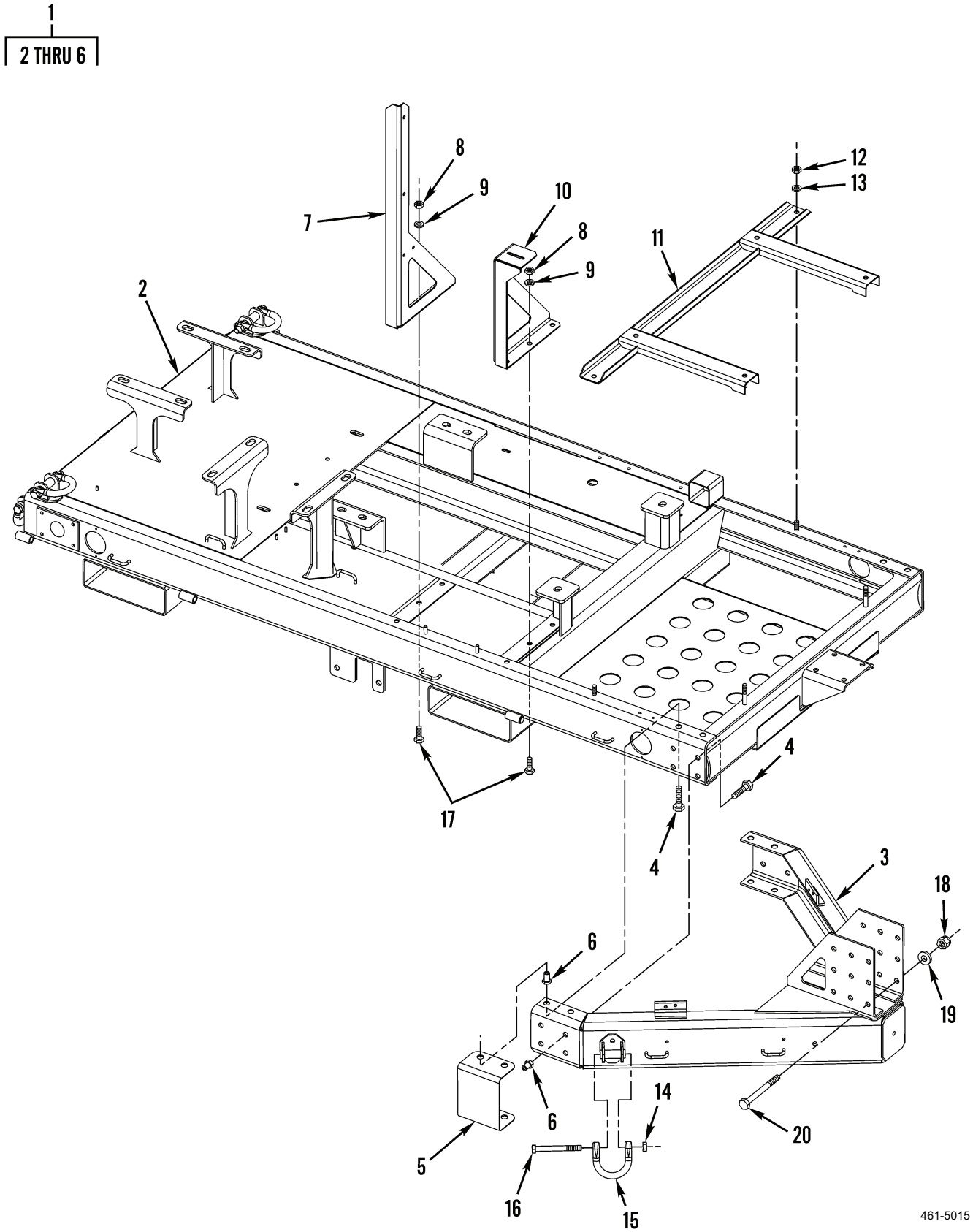


Figure 15. Trailer Frame and Hardware

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 15 FRAME, TOWING ATTACHMENTS, DRAWBARS, AND ARTICULATION SYSTEMS	
					GROUP 1501 FRAME ASSEMBLY	
					FIG. 15 TRAILER FRAME AND HARDWARE	
1	PAFZZ		01084	17537	FRAME ASSEMBLY,HUCK.....	1
2	PAFZZ		01084	17421	.FRAME ASSEMBLY.....	1
3	PAFZZ		01084	17428	.DRAWBAR.....	1
4	PAFZZ		01084	10231	.PIN,HUCKBOLT 12MM.....	18
5	PAFZZ		01084	18022	.COVER PLATE.....	2
6	PAFZZ		01084	10232	.COLLAR,12MM.....	18
7	PAFZZ		01084	17422	BRACKET,MOUNTING CTRL PNL MTG BRACKET, LFT.....	1
8	PAFZZ	5310000874652	81349	M45913/1-6CG5C	NUT,SELF-LOCKING,HE 3/8 UNC.....	6
9	PAFZZ	5310000806004	96906	MS27183-14	WASHER,FLAT 3/8 FLAT WASHER.....	6
10	PAFZZ		01084	17423	BRACKET,MOUNTING CTRL PNL MTG BRACKET, RGHT.....	1
11	PAFZZ		01084	17427	BRACKET,MOUNTING TOOL BOX MOUNT....	1
12	PAFZZ	5310002256993	81349	M45913/1-8CG5C	NUT,SELF-LOCKING,HE 1/2 UNC.....	2
13	PAFZZ	5310008095997	96906	MS27183-17	WASHER,FLAT 1/2".....	4
14	PAFZZ	5310007638905	96906	MS51968-20	NUT,PLAIN,HEXAGON 5/8-18, GR 5.....	6
15	PAFZZ	4030013161551	19207	12342354	SHACKLE.....	6
16	PAFZZ	5305007262568	96906	MS90727-177	SCREW,CAP,HEXAGON H 5/8-18 X 5 1/2"	6
17	PAFZZ	5305000680511	80204	B1821BH038C125N	SCREW,CAP,HEXAGON H 3/8 UNC X 1-1/4	6
18	PAFZZ	5310002694040	81349	M45913/1-10CG5C	NUT,SELF-LOCKING,HE 5/8-13UNC.....	3
19	PAFZZ		96906	MS27183-21	WASHER,FLAT 5/8".....	3
20	PAFZZ		39428	91257A822	SCREW,CAP,HEXAGON H 5/8-16 UNC X 8"	3

END OF FIGURE

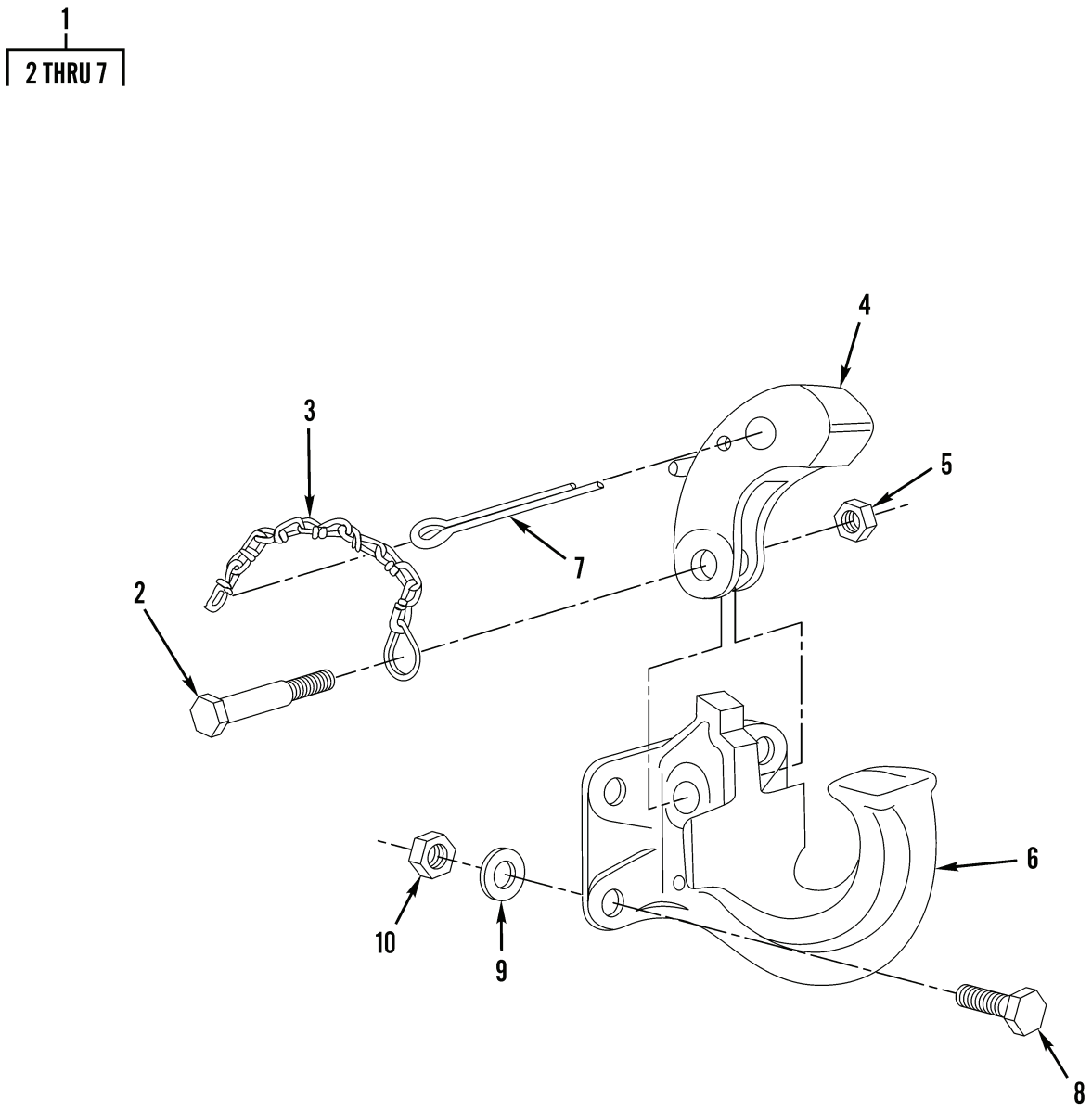
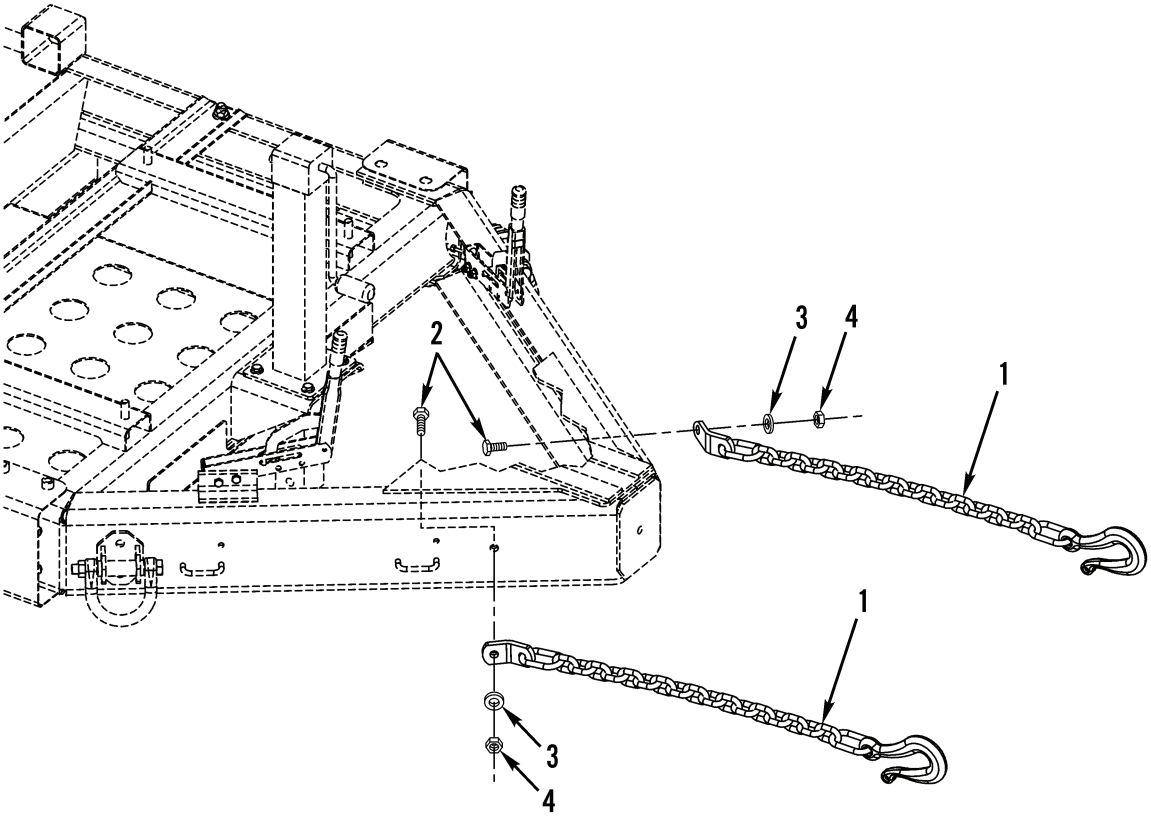


Figure 16. Pintle Hook

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 1503 PINTLES AND TOWING ATTACHMENTS	
					FIG. 16 PINTLE HOOK	
1	PAFZZ		74410	PH-T-60-AL	PINTLE ASSEMBLY,TO.....	1
2	PAFZZ		74410	XB-T-64-S	.BOLT,HEXAGON.....	1
3	PAFZZ	4010012249207	74410	XA-199-4	.CHAIN ASSEMBLY,SING.....	1
4	PAFZZ		74410	XA-T-62-XA-1	.LATCH.....	1
5	PAFZZ		74410	XB-647	.NUT,HEXAGON.....	1
6	PAFZZ		74410	XA-T-60-A	.PINTLE HORN.....	1
7	PAFZZ	5315008460126	80205	MS24665-628	.PIN,COTTER.....	1
8	PAFZZ	5305000712079	80204	B1821BH050C400N	SCREW,CAP,HEXAGON H 1/2-13 X 4"....	4
9	PAFZZ	5310008095997	96906	MS27183-17	WASHER,FLAT 1/2".....	4
10	PAFZZ	5310002256993	81349	M45913/1-8CG5C	NUT,SELF-LOCKING,HE 1/2 UNC.....	4
					END OF FIGURE	



461-5017

Figure 17. Safety Chains

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 1503 PINTLES AND TOWING ATTACHMENTS	
					FIG. 17 SAFETY CHAINS	
1	PAFZZ	4010014121282	33875	12449501	CHAIN ASSEMBLY,SING.....	2
2	PAFZZ	5305000712067	80204	B1821BH050C125N	SCREW,CAP,HEXAGON H 1/2 UNC X 1-1/4	2
3	PAFZZ	5310008095997	96906	MS27183-17	WASHER,FLAT 1/2".....	2
4	PAFZZ	5310002256993	81349	M45913/1-8CG5C	NUT,SELF-LOCKING,HE 1/2 UNC.....	2
					END OF FIGURE	

6
7

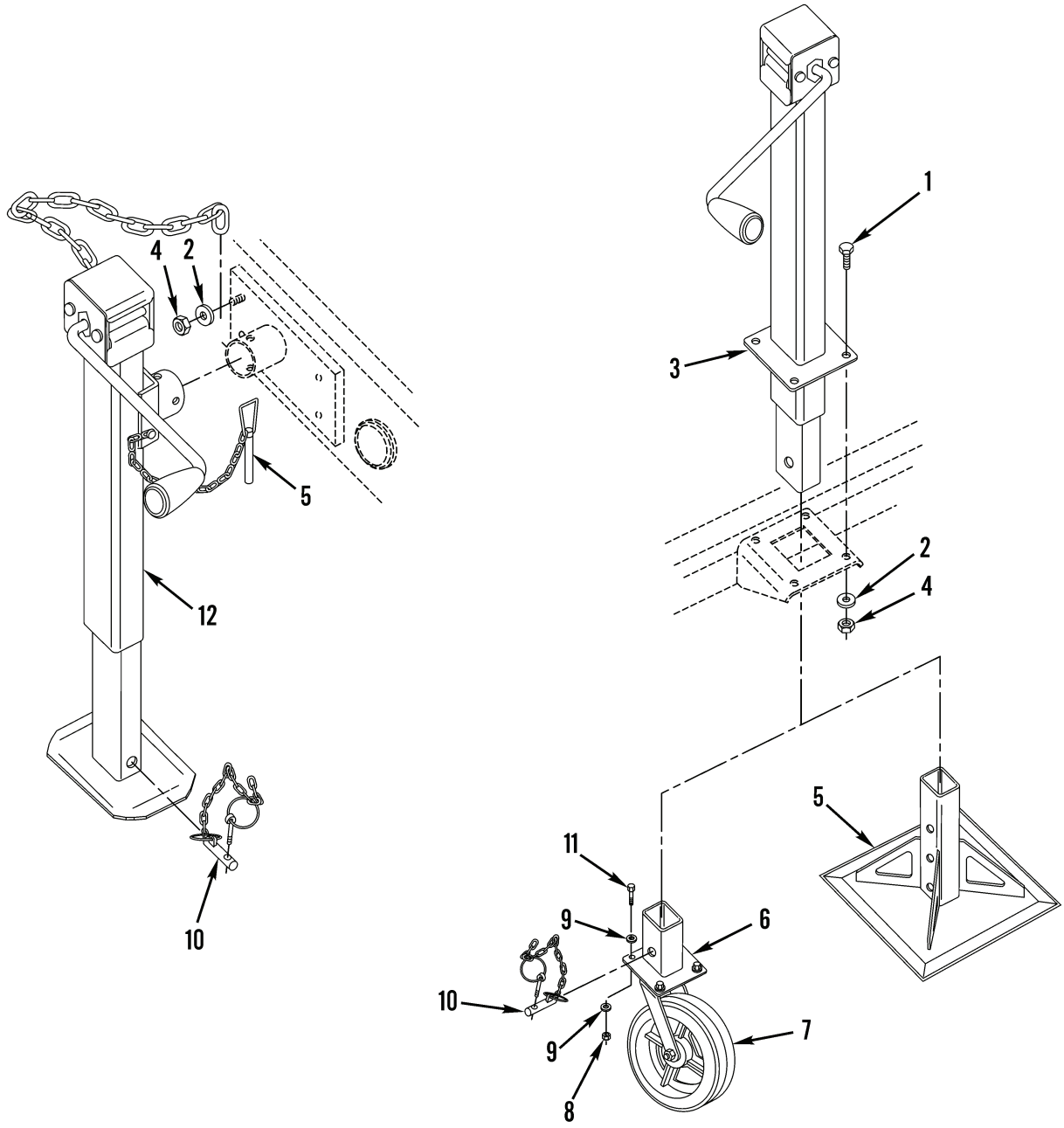


Figure 18. Landing Gear and Leveling Jacks

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 1507 LANDING GEAR, LEVELING JACKS	
					FIG. 18 LANDING GEAR AND LEVELING JACKS	
1	PAFZZ	5305000680511	80204	B1821BH038C125N	SCREW,CAP,HEXAGON H 3/8 UNC X 1-1/4	4
2	PAFZZ		96906	MS27183-21	WASHER,FLAT 5/8".....	12
3	PAFZZ		01084	17424	FRONT JACK.....	1
4	PAFZZ	5310000874652	81349	M45913/1-6CG5C	NUT,SELF-LOCKING,HE 3/8 UNC.....	12
5	PAFZZ		01084	17467	SAND FOOT REMOVABLE.....	1
6	PAFZZ		01084	17469	JACK ADAPTER,CASTER REMOVABLE.....	1
7	PAFZZ		01084	17470	.CASTER WHEEL.....	1
8	PAFZZ	5310007616882	96906	MS51967-2	NUT,PLAIN,HEXAGON 1/4-20.....	4
9	PAFZZ	5310008238804	96906	MS27183-9	WASHER,FLAT 1/4".....	8
10	PAFZZ		01084	17574	RETAINING PIN.....	5
11	PAFZZ	5305002253843	80204	B1821BH025C100N	SCREW,CAP,HEXAGON H 1/4-20 X 1"....	4
12	PAFZZ		01084	17425	REAR JACK.....	2
					END OF FIGURE	

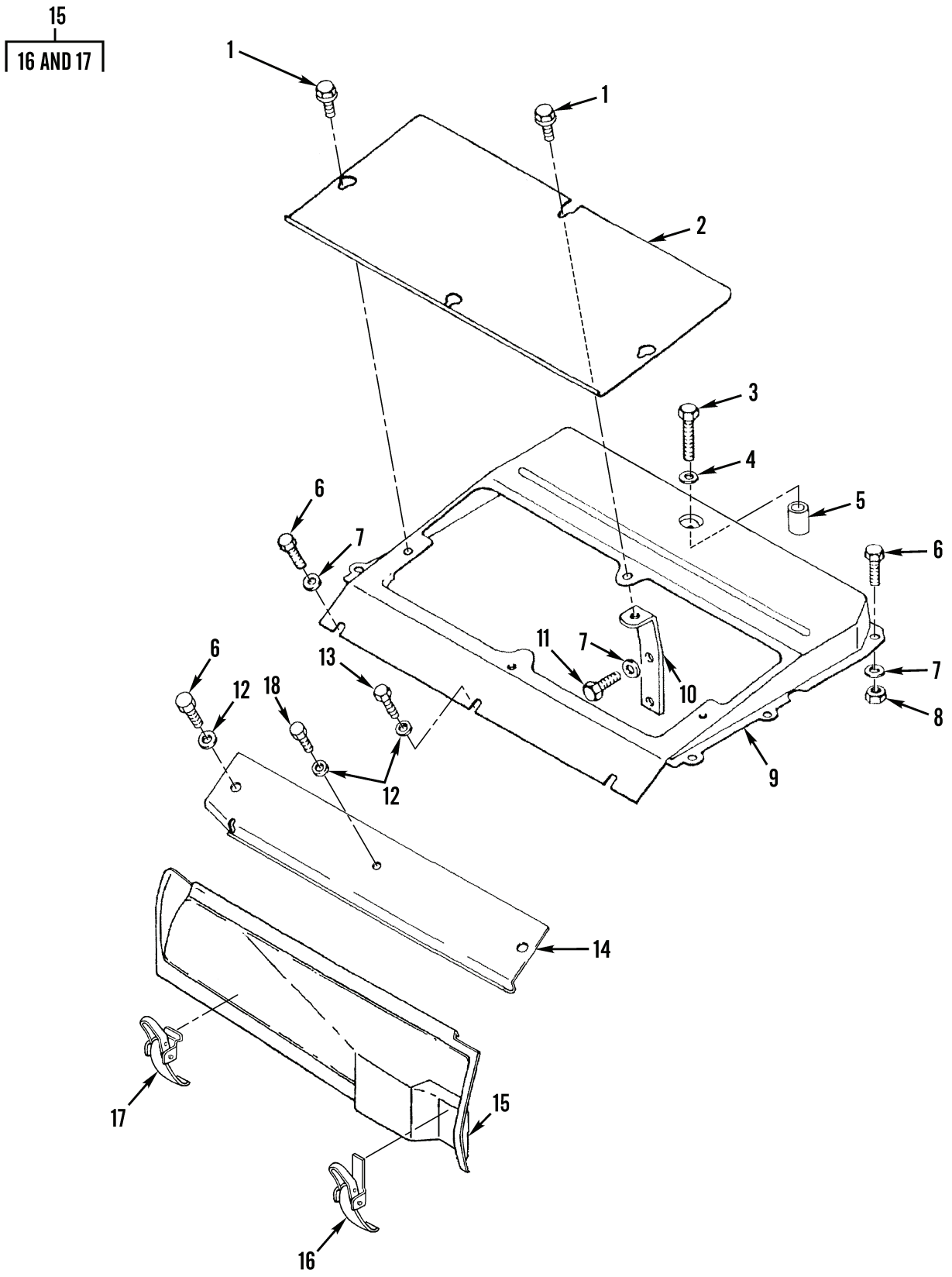
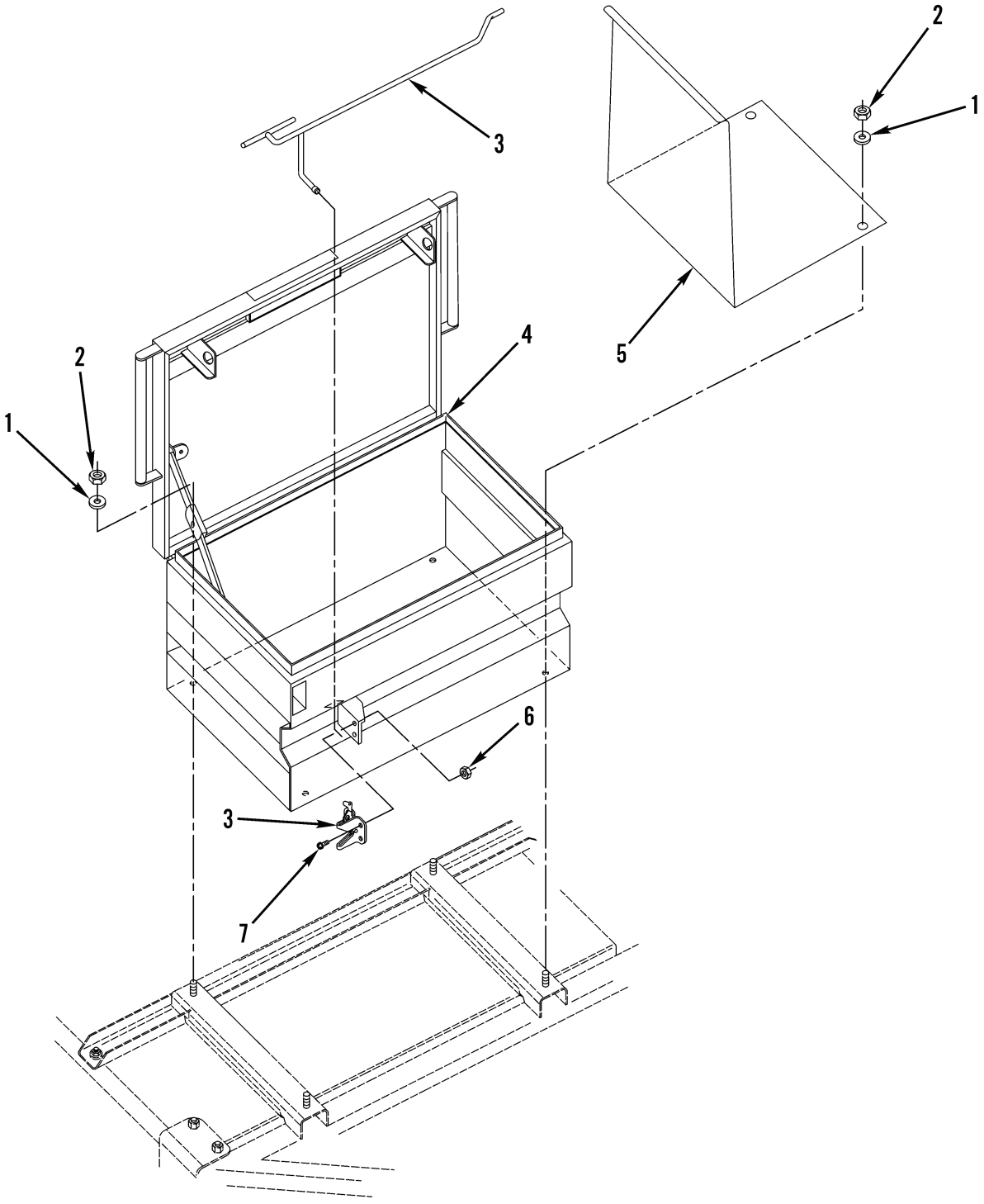


Figure 19. Engine Covers

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 18 BODY, CAB, HOOD, AND HULL	
					GROUP 1801 BODY, CAB, HOOD, AND HULL ASSEMBLIES	
					FIG. 19 ENGINE COVERS	
1	PAFZZ		62445	0113 9565	BOLT,HEXAGON M8 X 16-8.8.....	4
2	PAFZZ		62445	0415 2845	COVER,ACCESS.....	1
3	PAFZZ	5306014394308	62445	0112 4457	BOLT,MACHINE M8 X 45-8.8.....	1
4	PAFZZ	5310012503735	36719	223-4263	WASHER,FLAT.....	1
5	PAFZZ		62445	0223 8160	SPACER,SLEEVE.....	1
6	PAFZZ		D8286	DIN933-M8X16-8.8 -A4C	SCREW,CAP,HEXAGON H M8 X 16-8.8....	10
7	PAFZZ	5310121494353	D8286	DIN125-A8,4-140H V-A3P	WASHER,FLAT A8.....	18
8	PAFZZ	5310014347272	62445	0111 2824	NUT,PLAIN,HEXAGON M8-8-A4C.....	6
9	PAFZZ		62445	0415 2843	HOOD,COVER.....	1
10	PAFZZ		62445	0415 3000	BRACKET,ANGLE.....	1
11	PAFZZ	5306013736085	62445	0111 2322	BOLT,MACHINE M8 X 20-8.8.....	2
12	PAFZZ	5310121848509	D8286	DIN125-A6,4-140H V-A3P	WASHER,FLAT A6.....	2
13	PAFZZ	5305121419839	D8286	DIN933-M6X10-8.8 -A2P	SCREW,CAP,HEXAGON H M6 X 10-8.8....	1
14	PAFZZ		62445	0415 9629	COVER PLATE.....	1
15	PAFZZ		62445	0415 1399	AIR GUIDE.....	1
16	PAFZZ	5340013956279	62445	0121 2482	.CATCH,CLAMPING.....	1
17	PAFZZ	5340013956281	62445	0121 2483	.CATCH,CLAMPING.....	1
18	PAFZZ		D8286	DIN933-M6X12-8.8 -A4C	SCREW,CAP,HEXAGON H M6 X 12-8.8....	2

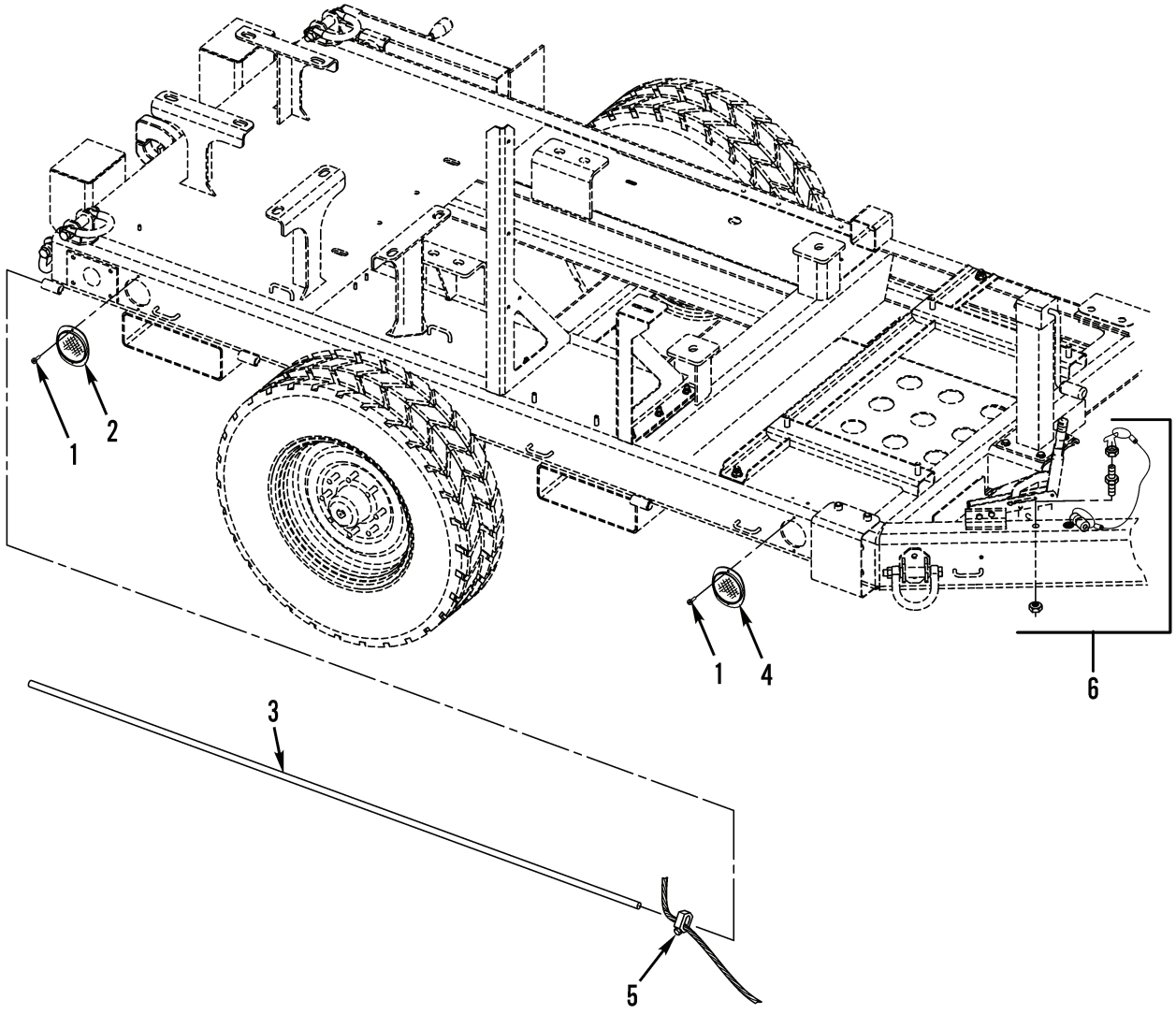
END OF FIGURE



461-5020

Figure 20. Storage Box

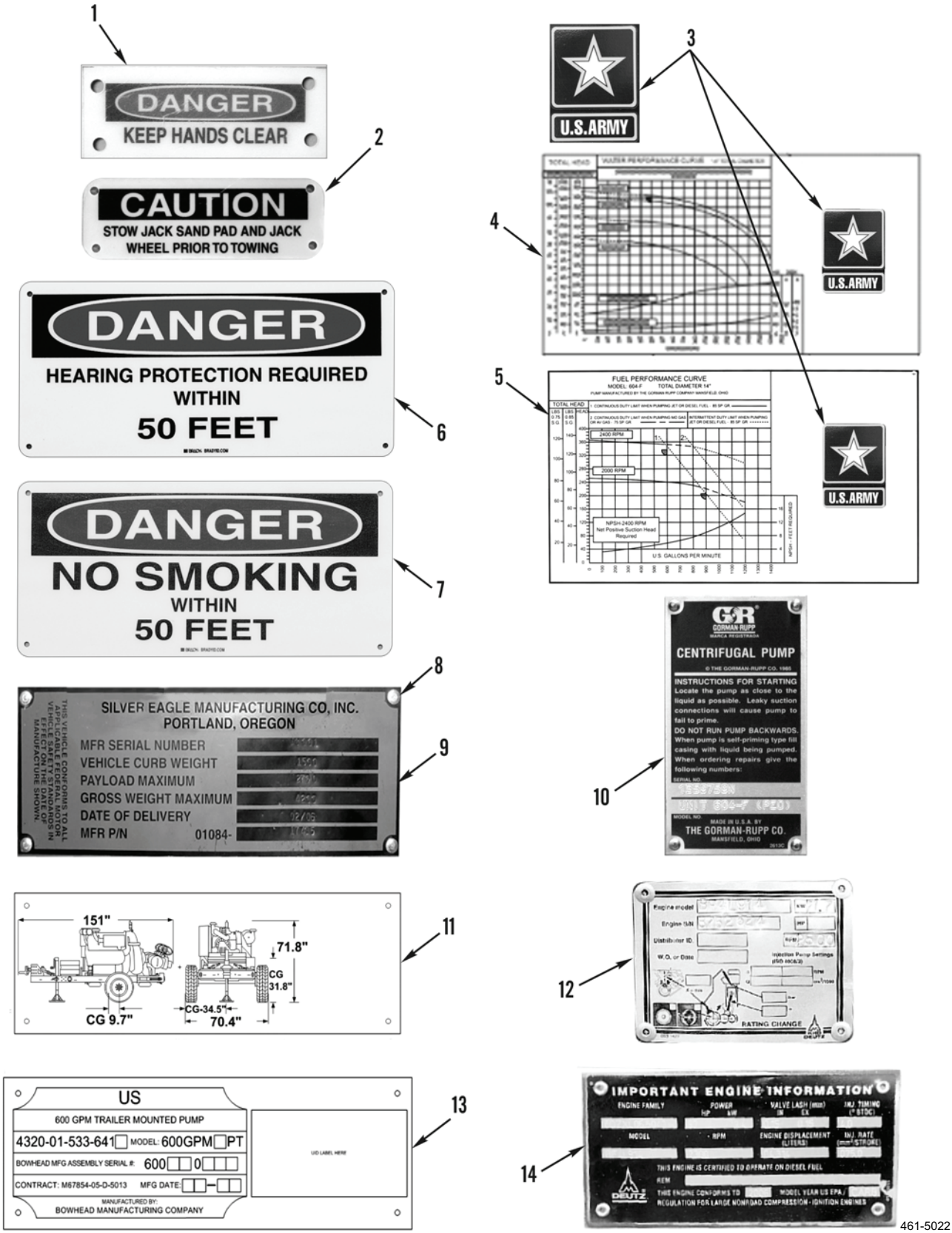
(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 1808 STOWAGE RACKS, BOXES, STRAPS, CARRYING CASES, CABLE REELS, HOSE REELS, ETC.	
					FIG. 20 STORAGE BOX	
1	PAFZZ	5310013517793	10988	496-21053	WASHER,FLAT 1/2" ID.....	4
2	PAFZZ	5310015336193	39428	95462A033	NUT,PLAIN,HEXAGON 1/2" ID.....	4
3	PAFZZ		1WB54	30-21-WH	LEVER LATCH.....	1
4	PAFZZ		01084	90-019-01	STORAGE BOX.....	1
5	PAFZZ		01084	50201-01	DIVIDER,BOX.....	1
6	PAFZZ	5310015049412	3A054	90101A011	NUT,PLAIN,HEXAGON 10-24 LOCKING FIBER NUT.....	4
7	PAFZZ		39428	90272A245	BOLT,HEXAGON 10-24 X .75" S/S BOLT.	4
					END OF FIGURE	



461-5021

Figure 21. Accessory Items

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 22 BODY,CHASSIS, HULL, AND ACCESSORY ITEMS	
					GROUP 2202 ACCESORY ITEMS	
					FIG. 21 ACCESSORY ITEMS	
1	PAFZZ	5320014142171	11815	BAPK-69	RIVET,BLIND .198 DIA X .562-.575 GRIP.....	8
2	PAFZZ	9905002052795	19207	6161059A	REFLECTOR,INDICATIN.....	2
3	PAFZZ		81346	611265	GROUNDING ROD.....	1
4	PAFZZ	9905002023639	19207	7410482	REFLECTOR,INDICATIN.....	2
6	PAFZZ		66195	135273-1	CLAMP,CABLE.....	1
					END OF FIGURE	



461-5022

Figure 22. Decals and Data Plates

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2210 DATA PLATES AND INSTRUCTION HOLDERS	
					FIG. 22 DECALS AND DATA PLATES	
1	PAFZZ		1GE78	90-019-407	DECAL KEEP HANDS CLEAR.....	1
2	PAFZZ		1GE78	90-019-408	DECAL REMOVE AND STOW SAND PAD.....	1
3	PAFZZ		1WB54	90-019-436	DECAL USMC LOGO.....	1
4	PAFZZ		1WB54	90-019-417	DECAL WATER PUMP CURVE AND LUBE CHART - WATER PUMP ONLY..... UOC:BWT	1
5	PAFZZ		1WB54	90-019-416	DECAL FUEL PUMP CURVE AND LUBE CHART - FUEL PUMP ONLY..... UOC:BFL	1
6	PAFZZ		1GE78	90-019-406	DECAL HEARING PROTECTION.....	2
7	PAFZZ		1GE78	90-019-405	DECAL NO SMOKING.....	1
8	PAFZZ		3A054	97525A435	RIVET,BLIND 1/8" X .313"-.375" HOLE SIZE.....	12
9	PAFZZ		01084	8903	DATA PLATE TRAILER SERIAL NUMBER(GREEN).....	1
9	PAFZZ		01084	8974	DATA PLATE TRAILER SERIAL NUMBER(TAN).....	1
10	PAFZZ	5340015333344	1CC55	38818-020	PLATE,MOUNTING PUMP INFORMATION....	1
11	PAFZZ		1WB54	90-019-241	DATA PLATE LIFTING PLATE.....	1
12	PAFZZ		62445	003 1477	DATA PLATE ENGINE INFORMATION.....	1
13	PAFZZ		1WB54	90-019-242	DATA PLATE SERIAL NUMBER PLATE.....	1
14	PAFZZ		62445	0122 3255	DATA PLATE IMPORTANT ENGINE IMFORMATION.....	1

END OF FIGURE

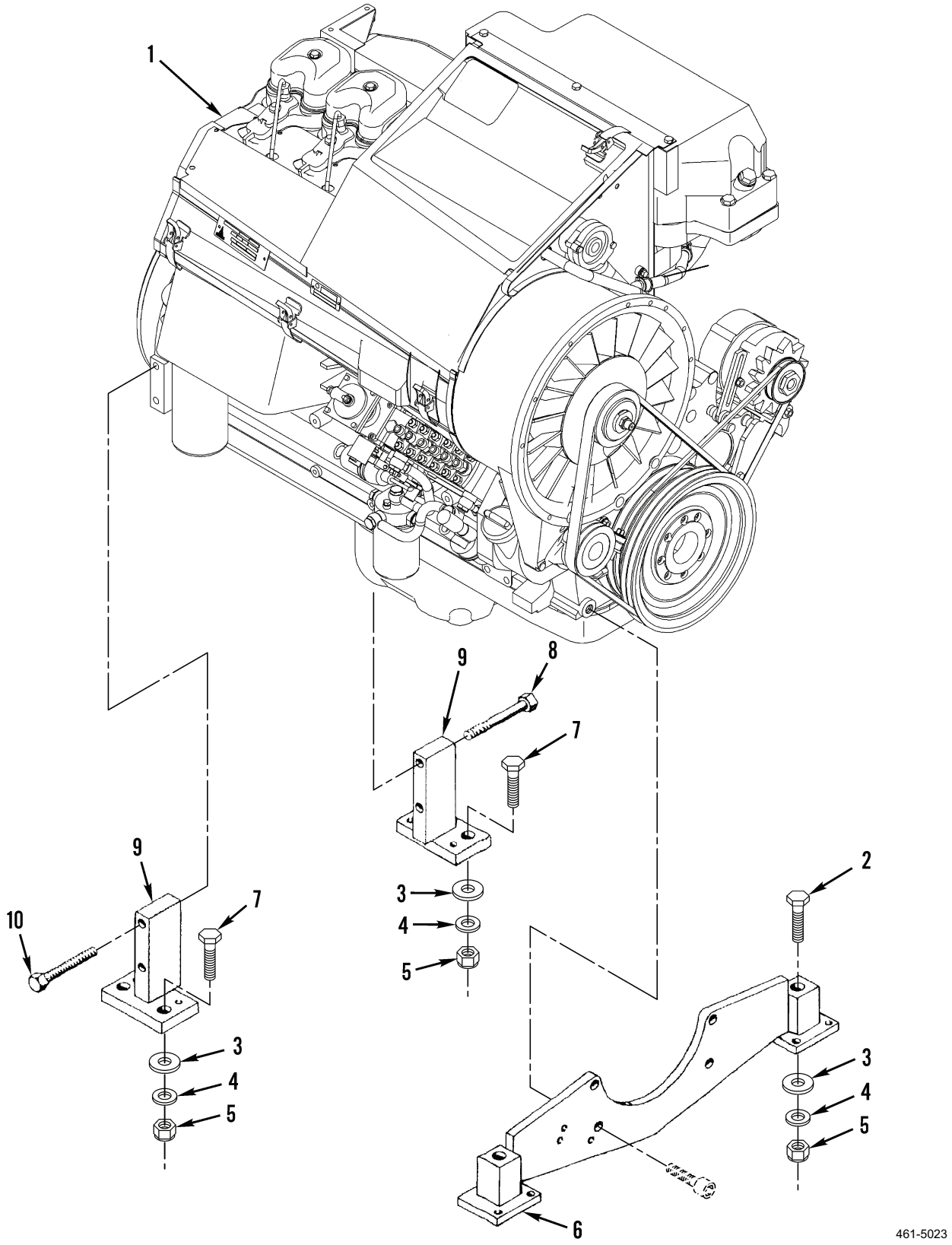


Figure 23. Engine and Mounting Hardware

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 29 AUXILIARY GENERATOR, ENGINE, AND CONTROLS	
					GROUP 2910 ENGINE ASSEMBLY	
					FIG. 23 ENGINE AND MOUNTING HARDWARE	
1	PAFHH		1WB54	BF4L914	ENGINE,DESEL.....	1
2	PAFZZ		3A054	91257A814	BOLT,HEXAGON 5/8" X 5", FRONT ENGINE MOUNTS.....	2
3	PAFZZ		3A054	90-019-5	WASHER,FLAT 5/8".....	6
4	PAFZZ	5310013965295	39428	91104A035	WASHER,LOCK 5/8".....	6
5	PAFZZ		39428	97135A270	NYLON INSERT NUT 5/8".....	6
6	PAFZZ		62445	0216 3215	CROSS BEAM.....	1
7	PAFZZ	5305007247224	80204	B1821BH063C250N	SCREW,CAP,HEXAGON H 5/8-16 X 2.5", REAR ENGINE MOUNTS.....	4
8	PAFZZ		62445	0111 1514	BOLT,HEXAGON DIN931-M12X65-8.8-A4C.	2
9	PAFZZ		62445	0336 4025	ANGLE PLATE.....	2
10	PAFZZ		62445	111 1540	BOLT,MACHINE DIN931-M12X85-8.8-A4C.	2

END OF FIGURE

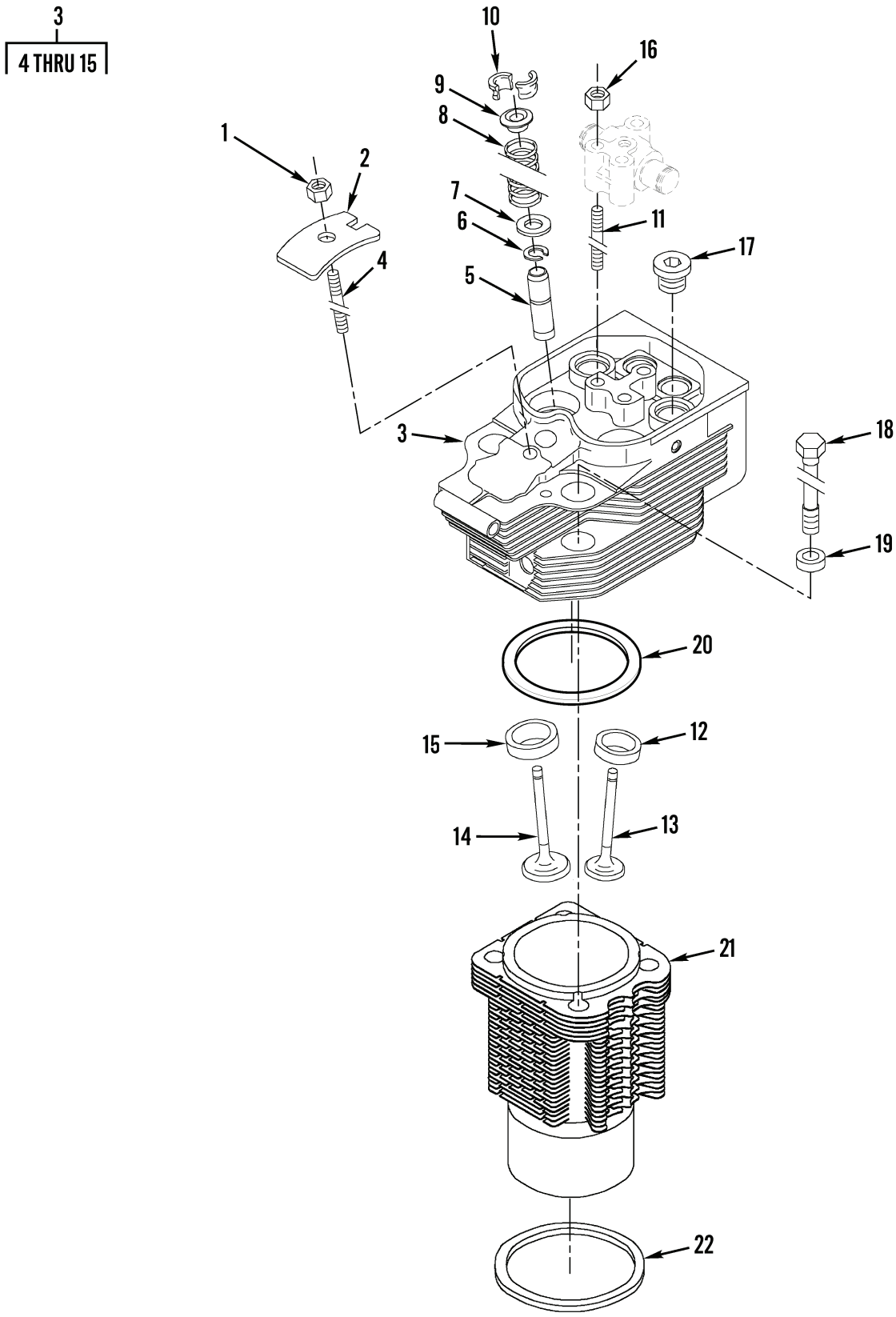
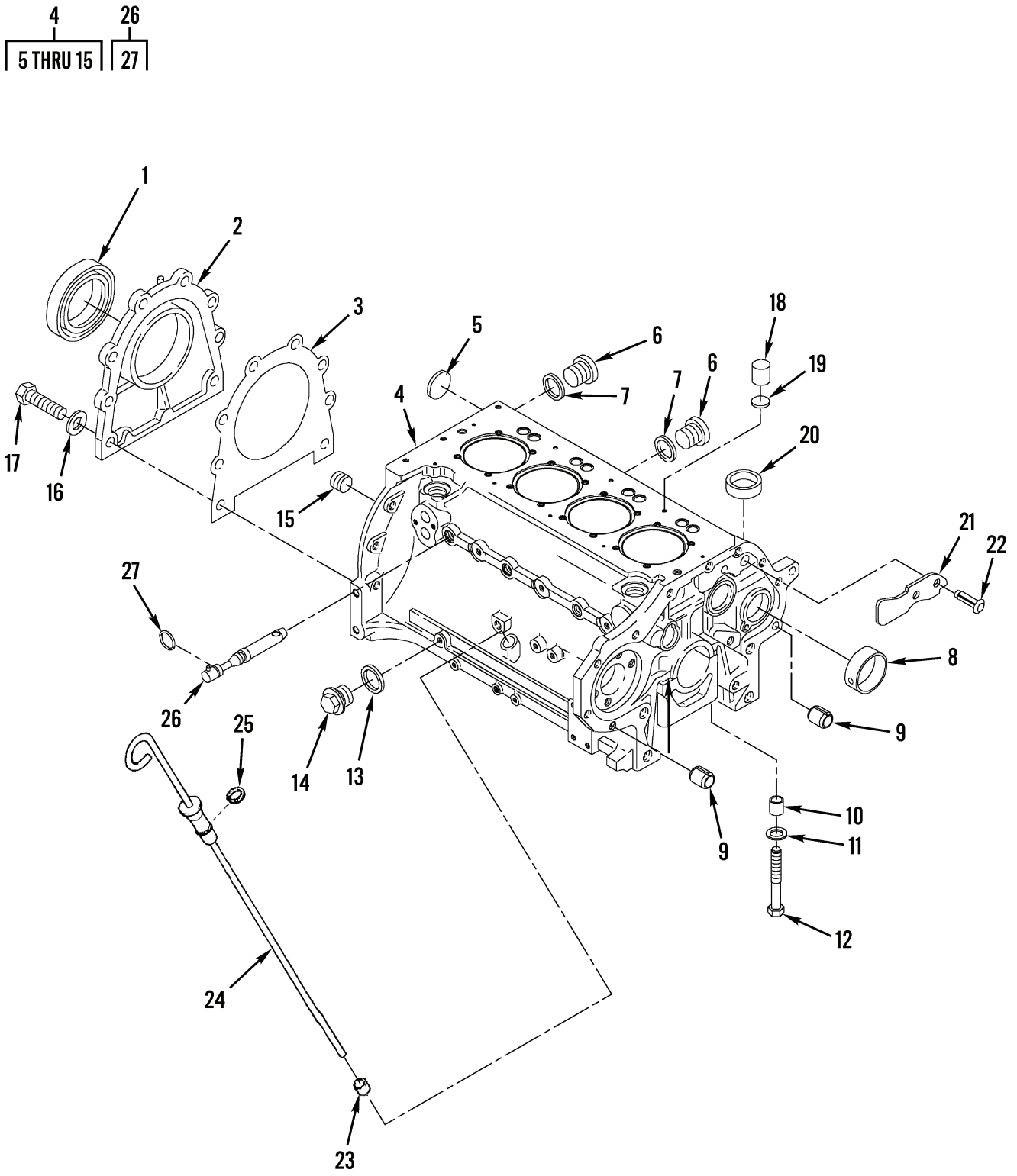


Figure 24. Cylinder and Cylinder Assembly

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2911 CRANKCASE, CYLINDER SLEEVE, CYLINDER HEAD, AND BLOCK	
					FIG. 24 CYLINDER AND CYLINDER ASSEMBLY	
1	PAFZZ		62445	0114 8419	NUT,HEXAGON M10.....	4
2	PAFZZ		62445	0423 3861	CLAW.....	4
3	PAFHH		62445	0423 5409	CYLINDER HEAD.....	4
4	PAHZZ		62445	0114 8425	.STUD.....	1
5	PAHZZ		62445	0423 1976	.VALVE GUIDE.....	2
6	PAHZZ	5325010493976	36719	1215500	.RING,RETAINING.....	2
7	PAHZZ		62445	0423 2070	.WASHER,FLAT.....	2
8	PAHZZ		62445	336-9305	.SPRING,HELICAL,COMP.....	2
9	PAHZZ	5342010291194	62445	3371748	.SPRING RETAINER.....	2
10	PAHZZ		62445	0210 8102	.FASTENER,SNAPSLIDE.....	4
11	PAHZZ	5307012070170	62445	1144534	.STUD,PLAIN.....	3
12	PAHZZ	2815010219093	62445	213-7306	.INSERT,ENGINE VALVE.....	1
13	PAHZZ		62445	4231804	.VALVE,POPPET,ENGINE.....	1
14	PAHZZ		62445	0423 4953	.INLET VALVE.....	1
15	PAHZZ		62445	04234958	.VALVE SEAT INSERT.....	1
16	PAFZZ	5310014347272	62445	0111 2824	NUT,PLAIN,HEXAGON M8-8-A4C.....	3
17	PAFZZ		62445	0114 8136	SCREW,PLUG M26 X 1,5-ST.....	2
18	PAFZZ		62445	0223 8632	BOLT,HEXAGON.....	4
19	PAFZZ		62445	0223 8626	WASHER,FLAT.....	2
20	PAHZZ		62445	0415 8323	SHIM.....	1
21	PAHZZ		62445	0423 1519	CYLINDER.....	4
22	PAHZZ	5365011881089	62445	4231432	SPACER,RING.....	4

END OF FIGURE



461-5025

Figure 25. Cylinder Block and Related Parts

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2911 CRANKCASE, CYLINDER SLEEVE, CYLINDER HEAD AND BLOCK	
					FIG. 25 CYLINDER BLOCK AND RELATED PARTS	
1	PAFZZ		62445	0423 2267	ROT. SHAFT LIP SEAL.....	1
2	PAFZZ		62445	0223 4870	REAR END COVER.....	1
3	PAFZZ	5330012104983	62445	3362337	GASKET.....	1
4	PAHZZ		62445	0423 4395	CRANKCASE.....	1
5	PAFZZ	5340011971502	36719	121-6240	.PLUG,EXPANSION.....	1
6	PAFZZ		D0116	5011145	.PLUG,MACHINE THREAD.....	5
7	PAFZZ	5330121564852	D0210	40-70056-00	.GASKET.....	5
8	PAFZZ		62445	0415 6548	.BEARING BUSH.....	1
9	PAFZZ		62445	1167266	.BUSHING,SLEEVE.....	2
10	PAFZZ	5365013954737	62445	0416 0764	.BUSHING,TAPERED.....	10
11	PAFZZ		62445	0121 8426	.WASHER,FLAT.....	10
12	PAFZZ	5305013957700	62445	0415 6058	.SCREW,CAP,HEXAGON H.....	10
13	PAFZZ		62445	0111 8659	.GASKET.....	1
14	PAFZZ	5365121241048	D8286	DIN7604-A-M10X1-ST-ZNPHRF	.PLUG,MACHINE THREAD.....	1
15	PAFZZ	5310013962857	62445	0117 9155	.WASHER,SEAL.....	2
16	PAFZZ		62445	0113 2562	WASHER,FLAT A8.....	8
17	PAFZZ		62445	0114 8233	BOLT,MACHINE.....	8
18	PAFZZ	5340012366391	62445	1170580	PLUG,EXPANSION.....	3
19	PAFZZ	5310012086603	62445	1167010	WASHER -7,5 X 1-ST.....	3
20	PAFZZ	5340013956282	62445	0117 6197	PLUG,LEAKPROOF SEAL.....	1
21	PAFZZ	5340013957693	62445	0415 6862	PLATE,MOUNTING.....	1
22	PAFZZ	5315011971478	62445	111-5333	PIN,NOTCHED.....	2
23	PAFZZ	3120012391374	62445	1167269	BUSHING,SLEEVE.....	1
25	PAFZZ	5331011880850	62445	1174311	O-RING.....	1
26	PAFZZ		62445	0423 5316	NOZZLE.....	1
27	PAHZZ	5331011880851	62445	1173838	.O-RING.....	1
					END OF FIGURE	

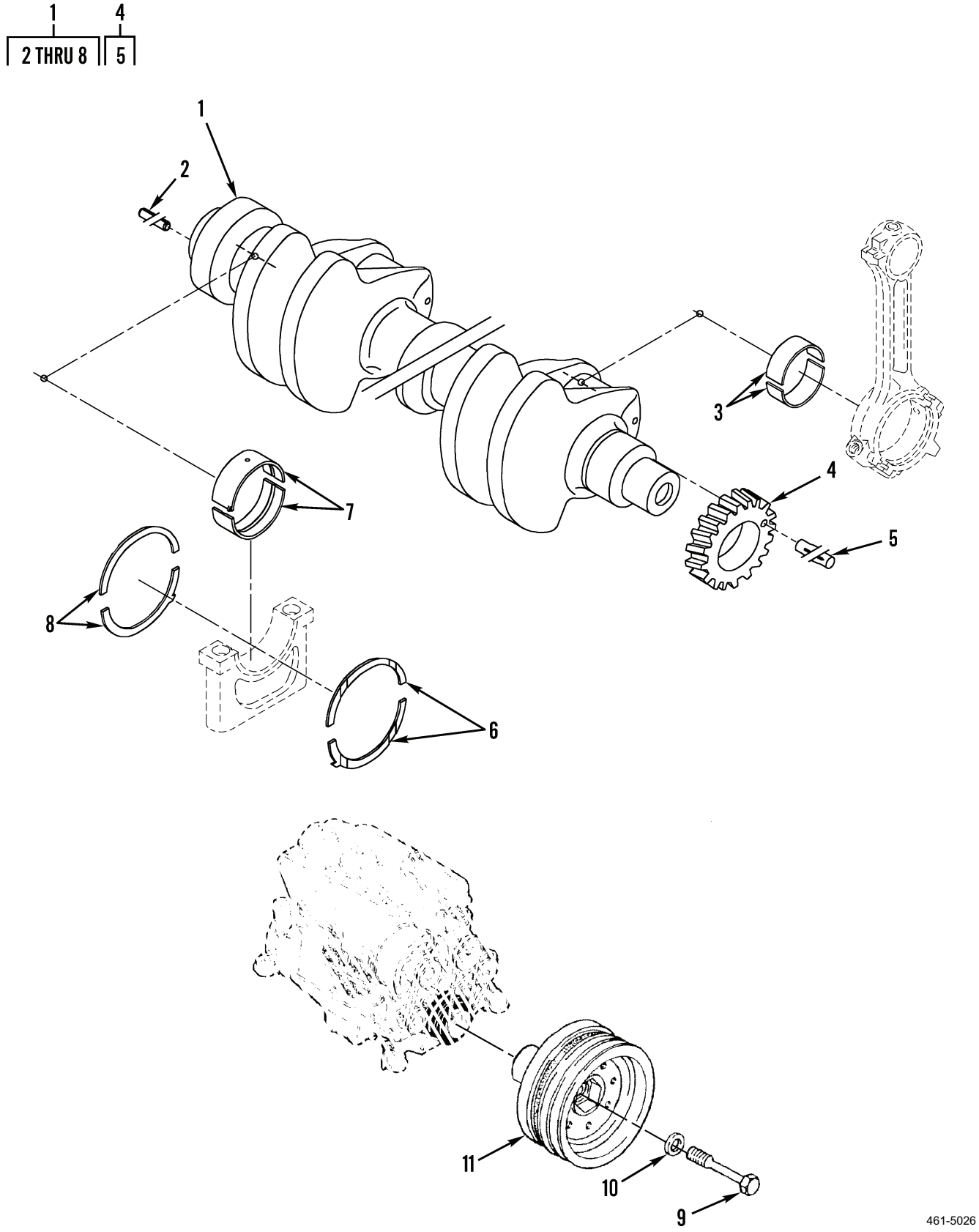


Figure 26. Crankshaft

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2912 CRANKSHAFT	
					FIG. 26 CRANKSHAFT	
1	PAHHH		62445	0293 1492	CRANKSHAFT.....	1
2	PAHZZ		62445	0111 5464	.PIN,STRAIGHT,HEADLE.....	1
3	PAHZZ		62445	0423 2679	.BEARING HALF,SLEEVE BIG END.....	4
4	PAFZZ		62445	0223 7255	.GEAR,TOOTHED.....	1
5	PAHZZ	5315013962214	62445	0113 7239	..PIN,GROOVED,HEADLES.....	1
6	PAHZZ		62445	0423 2791	.WASHER,THRUST.....	1
7	PAHZZ		62445	0423 1079	.BEARING HALF,SLEEVE MAIN.....	5
8	PAHZZ		62445	0423 2790	.WASHER,THRUST.....	1
9	PAHZZ		62445	01178931	BOLT,HEXAGON.....	1
10	PAHZZ	5310012101673	62445	1216128	WASHER,FLAT.....	1
11	PAHZZ		62445	04153683	V-GROOVED PULLEY.....	1
					END OF FIGURE	

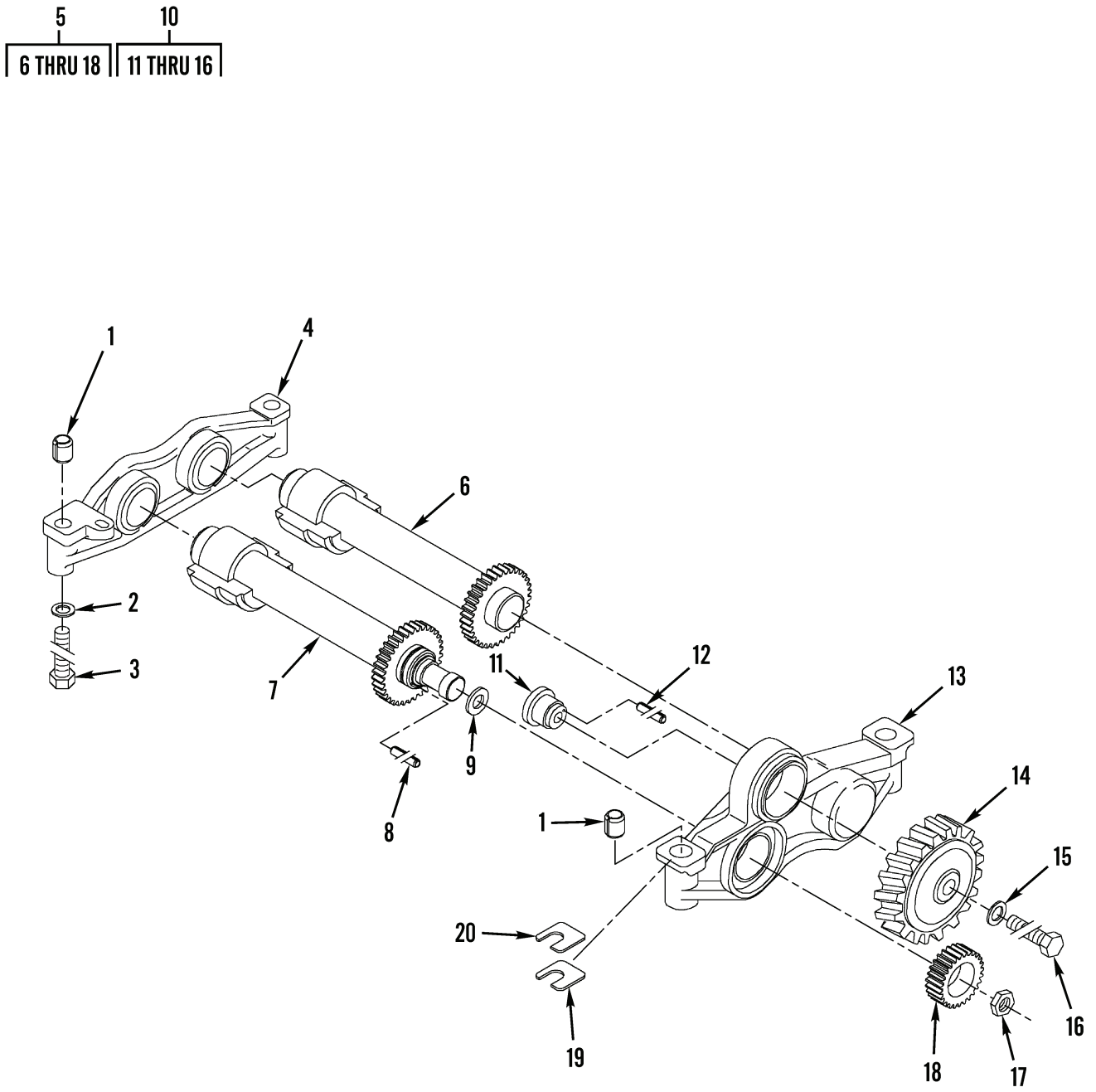


Figure 27. Dynamic Balancer

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2912 CRANKSHAFT	
					FIG. 27 DYNAMIC BALANCER	
1	PAHZZ		62445	0117 4580	CLAMPING BUSH.....	4
2	PAHZZ		62445	0117 8272	WASHER,FLAT 8,4X15X3.....	4
3	PAHZZ		62445	0114 4115	BOLT,HEXAGON M8 X 60-12.9.....	4
4	PAHZZ		62445	0423 0431	BRIDGE.....	1
5	PAHZZ		62445	0423 4075	DYNAMIC BALANCER.....	1
6	PAHZZ		62445	0423 0658	.SHAFT ASSEMBLY,SHOU.....	1
7	PAHZZ		62445	0423 0659	.SHAFT ASSEMBLY,SHOU.....	1
8	PAHZZ	5315012395263	62445	111-5406	.PIN,STRAIGHT,HEADLE.....	1
9	PAHZZ		62445	0223 2166	.WASHER,THRUST.....	1
10	PAHZZ		62445	0423 4074	.BRIDGE.....	1
11	PAHZZ		62445	0223 6507	..PIN,CLEVIS.....	1
12	PAHZZ	5315012876522	62445	1115403	..PIN,STRAIGHT,HEADLE.....	1
13	PAHZZ		62445	0223 6999	..BRIDGE.....	1
14	PAHZZ		62445	0423 3934	..GEAR,IDLER.....	1
15	PAHZZ		62445	0117 8272	..WASHER,FLAT 8,4X15X3.....	1
16	PAHZZ		62445	0113 9357	..BOLT,HEXAGON M8 X 40-10.9.....	1
17	PAHZZ		62445	0113 1116	.NUT,HEXAGON M18 X 1,5-05.....	1
18	PAHZZ		62445	0223 6479	.GEAR,PINION.....	1
19	PAHZZ		62445	0223 6511	PLATE,SPACER.....	2
20	PAHZZ		62445	0213 5196	PLATE,SPACER.....	4
					END OF FIGURE	

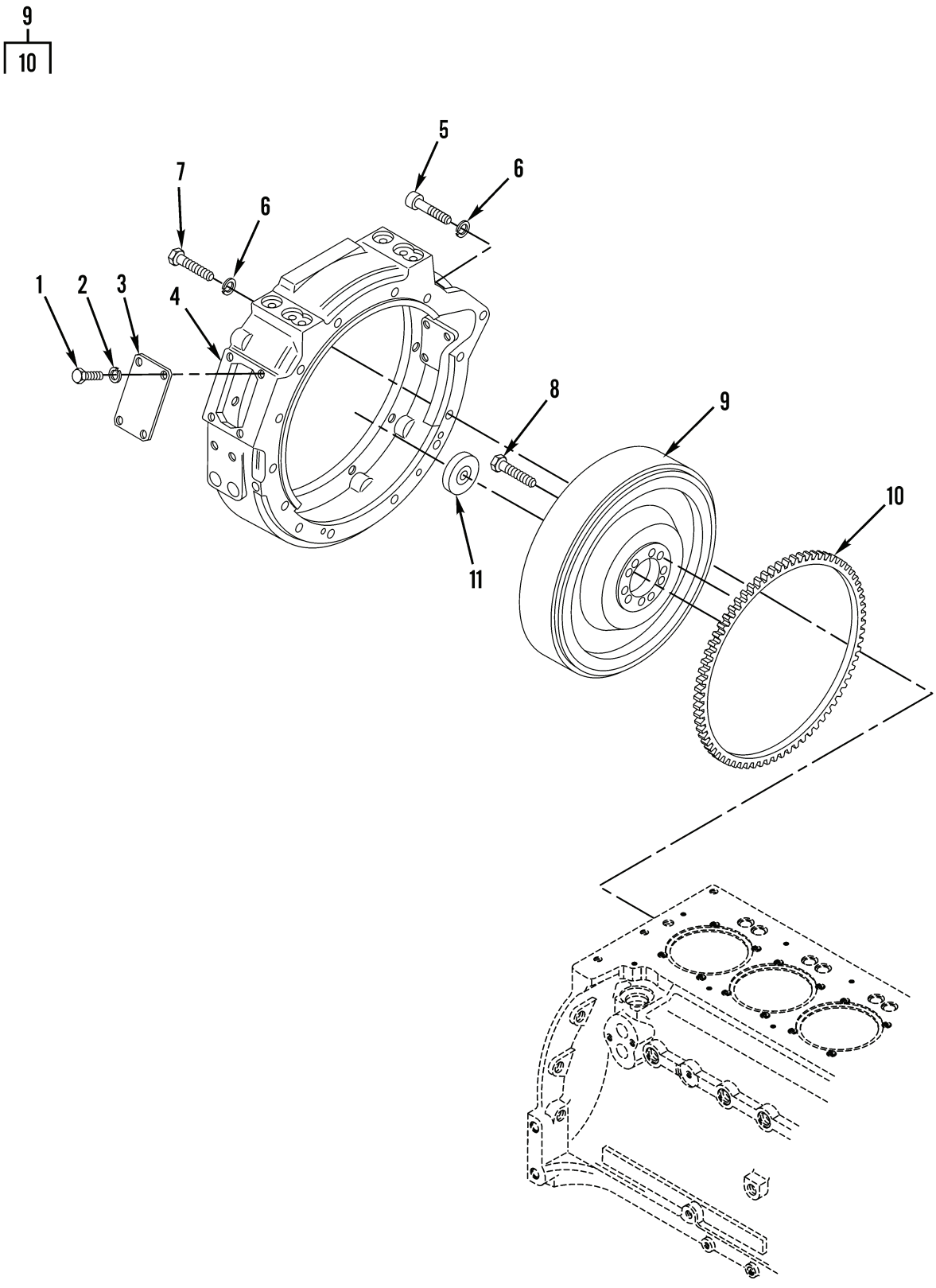


Figure 28. Flywheel and Flywheel Housing

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2913 FLYWHEEL ASSEMBLY	
					FIG. 28 FLYWHEEL AND FLYWHEEL HOUSING	
1	PAFZZ	5305012464430	62445	111-2295	SCREW,CAP,HEXAGON H M8 X 10-8.8....	4
2	PAFZZ	5310014401417	62445	01102799	WASHER,LOCK A8-FST-A4C.....	4
3	PAFZZ	5340013956288	62445	0210 2313	COVER,ACCESS.....	1
4	PAFZZ		62445	2242050	HOUSING,ADAPTER.....	1
5	PAFZZ		D3273	6020990155	SCREW,CAP,SOCKET HE.....	1
6	PAFZZ	5310014390043	62445	0110 2800	WASHER,LOCK A10.....	10
7	PAFZZ	5305121818173	D8286	DIN933-M10X30-8. 8-A4C	SCREW,CAP,HEXAGON H M10 X 30-8.8...	13
8	PAFZZ	5306011967899	62445	1104847	BOLT,MACHINE M10 X 1 X 50-10.9.....	10
9	PAFFZ	2815011929756	62445	420-4326	FLYWHEEL,ENGINE.....	1
10	PAFZZ	3020010223663	62445	2131081	.GEAR SECTOR,BEVEL.....	1
11	PAFZZ		62445	44144-003	BUSHING ASSEMBLY.....	1
					END OF FIGURE	

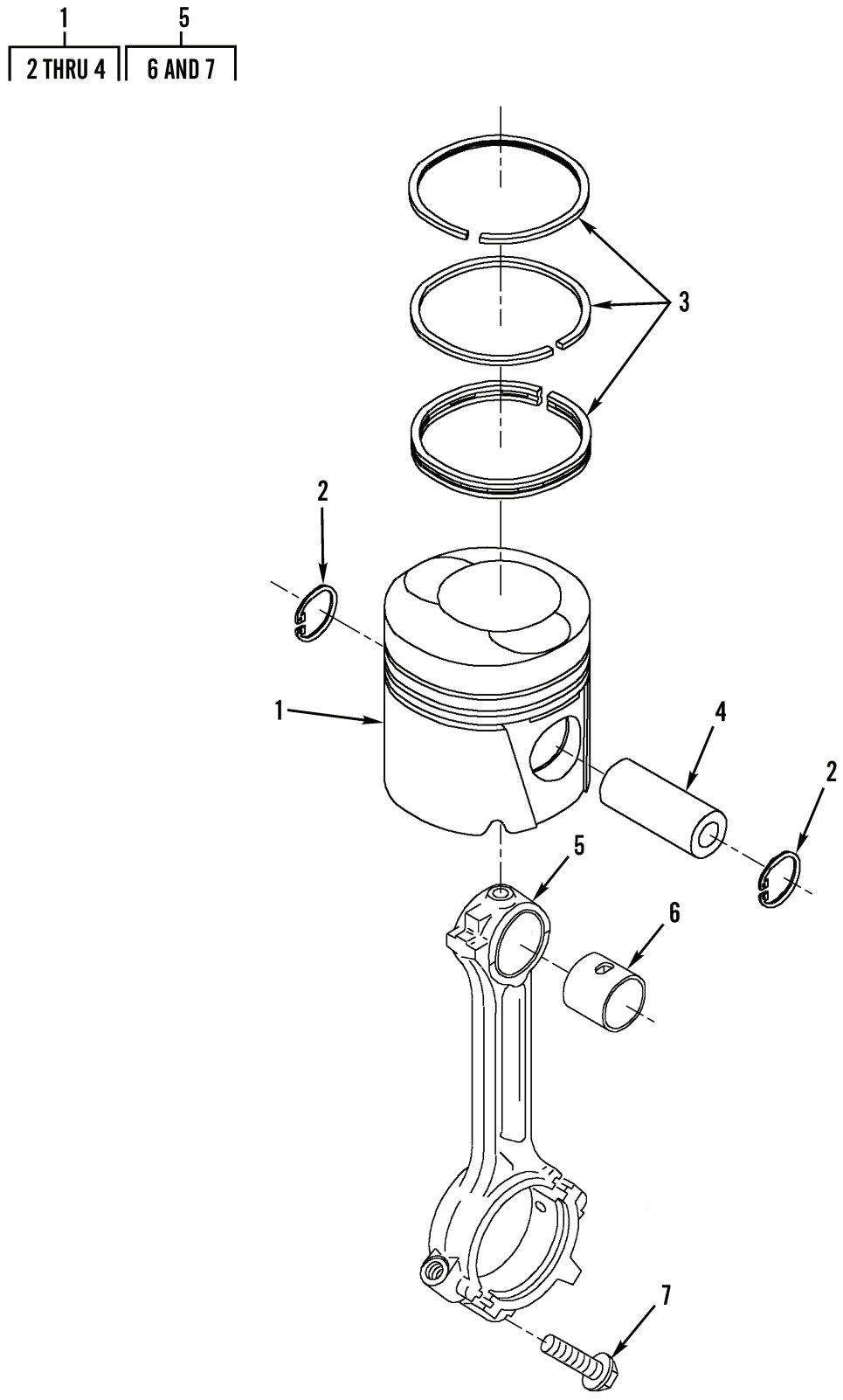
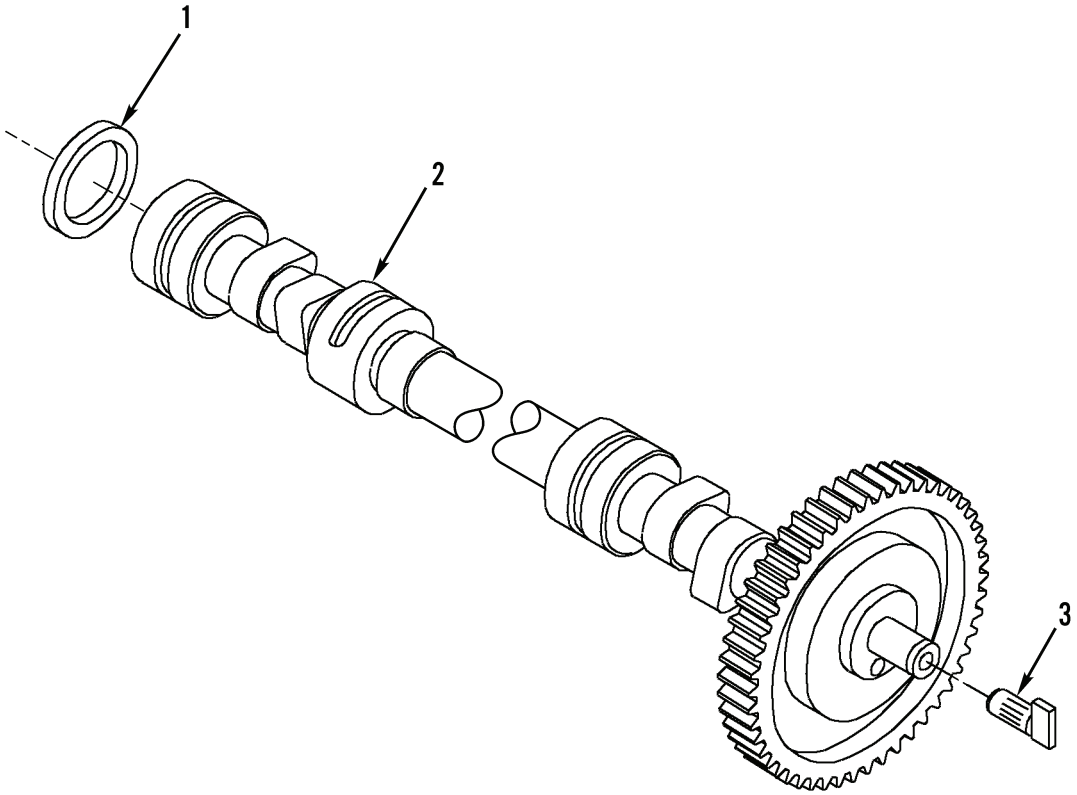


Figure 29. Piston Assembly

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2914 PISTONS AND CONNECTING RODS	
					FIG. 29 PISTON ASSEMBLY	
1	PAHHH		62445	0423 5280	PISTON.....	4
2	PAHZZ	5365121564725	D8090	J35	.RING,RETAINING.....	2
3	PAHZZ		62445	0423 1303	.PISTON RINGS,SET.....	1
4	PAHZZ		36719	3371660	.PIN,PISTON.....	1
5	PAHHH		62445	0423 4181	CONNECTING ROD.....	4
6	PAHZZ	3120011976657	62445	3371612	.BUSHING,SLEEVE.....	1
7	PAHZZ		62445	0423 4117	.BOLT,HEXAGON.....	2
					END OF FIGURE	

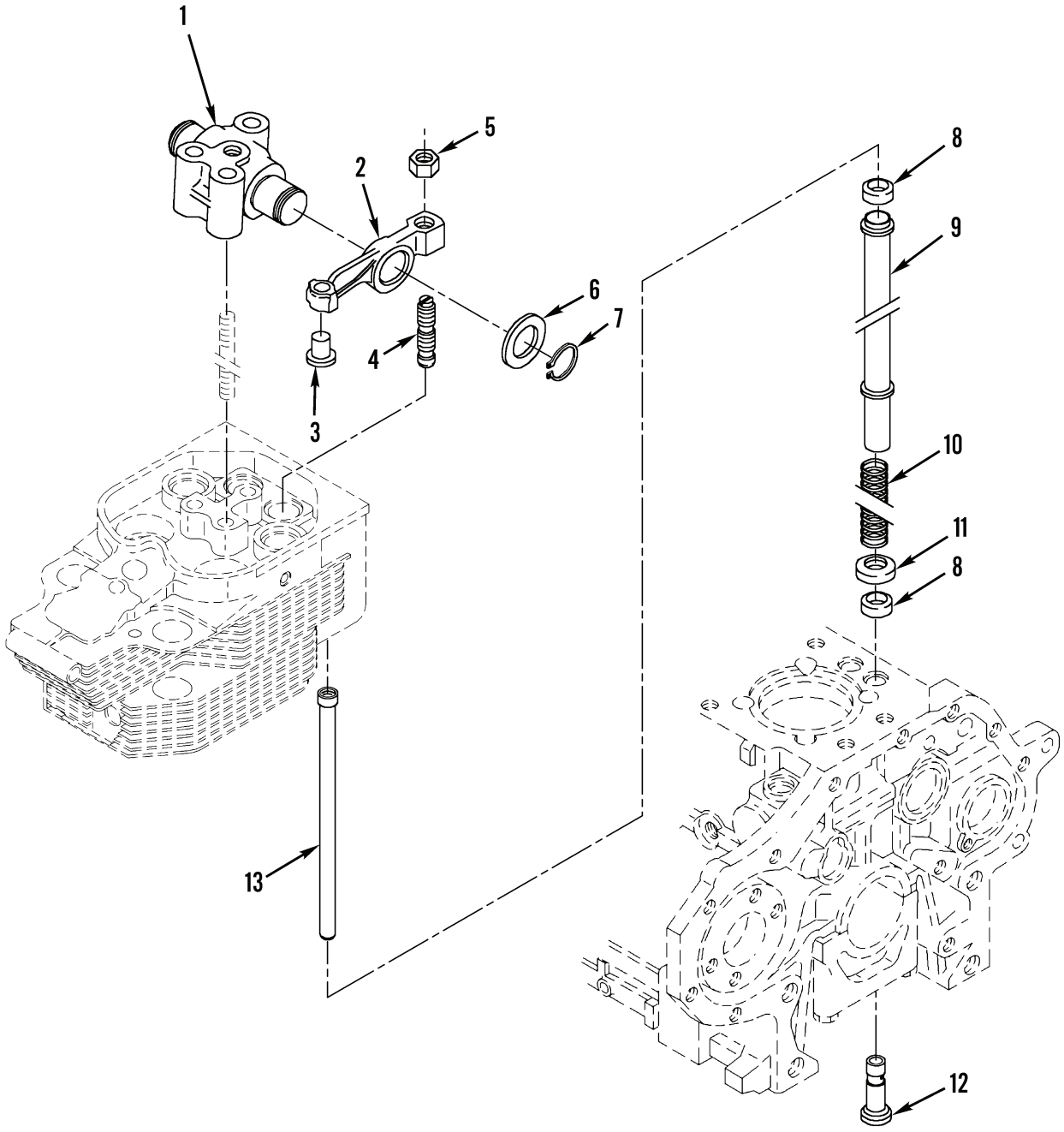


461-5030

Figure 30. Camshaft

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2915 VALVES, CAMSHAFTS, AND TIMING SYSTEM	
					FIG. 30 CAMSHAFT	
1	PAHZZ	3120011946285	62445	3367789	BEARING,WASHER,THRU.....	1
2	PAHZZ		62445	0423 1543	CAMSHAFT.....	1
3	PAHZZ	5315012111139	62445	2137015	PIN.....	1
					END OF FIGURE	

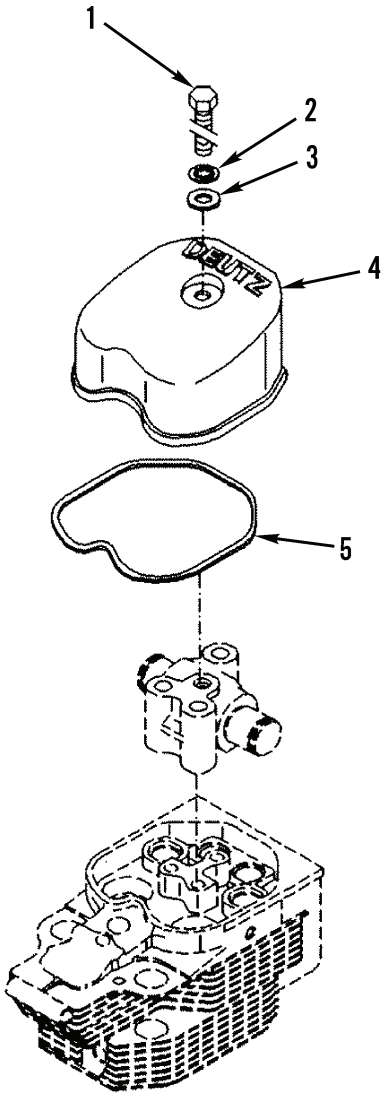
2
3 THRU 5



461-5031

Figure 31. Rocker Arm Assembly

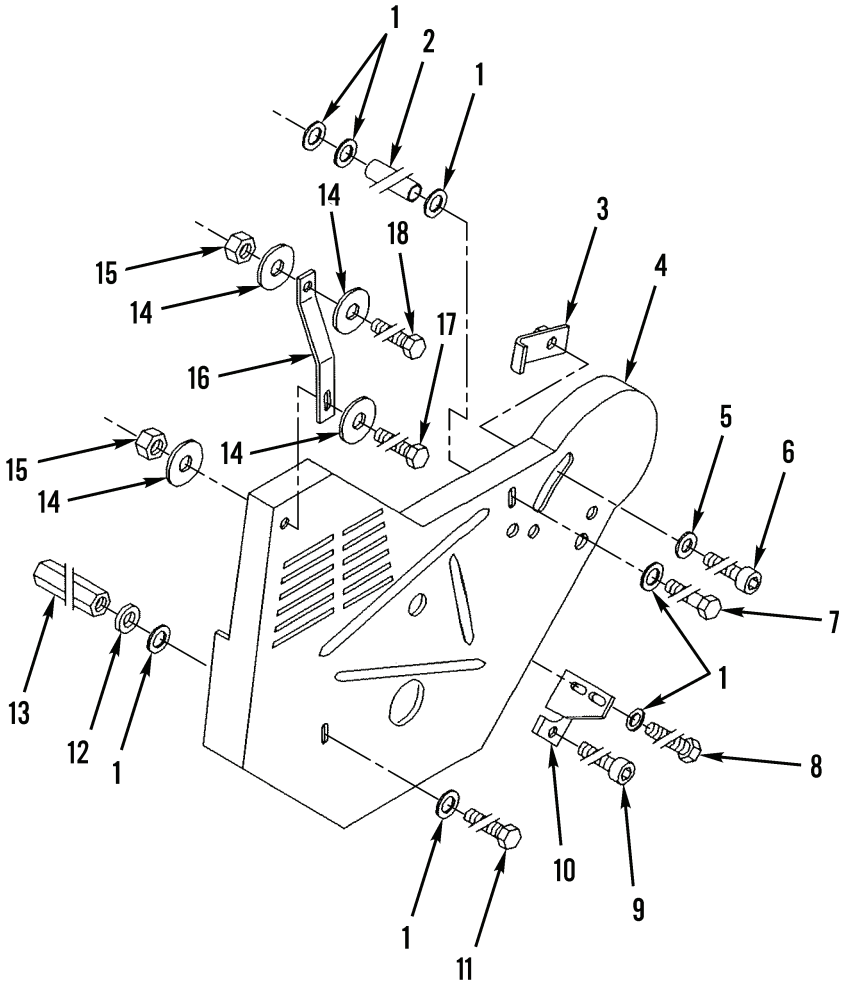
(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2915 VALVES, CAMSHAFTS, AND TIMING SYSTEM	
					FIG. 31 ROCKER ARM ASSEMBLY	
1	PAFZZ		62445	0415 2750	ROCKER ARM BRACKET.....	4
2	PAFFF		D2689	0415 2752	ROCKER ARM,ENGINE P.....	8
3	PAFZZ	5310013962859	62445	0223 6578	.WASHER,FLAT.....	1
4	PAFZZ	2815121230936	D2689	0336 5861	.SCREWS,SPECIAL.....	1
5	PAFZZ	5310123344063	D2689	0210 9637	.NUT,PLAIN,HEXAGON.....	1
6	PAFZZ	5310014348646	62445	0121 6105	WASHER,FLAT -21 X 35 X 1,5.....	8
7	PAFZZ	5325121263410	D8090	A21	RING,RETAINING.....	8
8	PAFZZ	5310011907468	62445	2232840	WASHER,FLAT.....	16
9	PAFZZ		62445	0423 3808	PROTECTING TUBE.....	8
10	PAFZZ	5360013428510	62445	0337 1876	SPRING,HELICAL,COMP.....	8
11	PAFZZ	2815010220094	36719	3371887	RETAINER,HELICAL CO.....	8
12	PAFZZ	2815011929801	62445	3371885	TAPPET,ENGINE POPPE.....	8
13	PAFZZ	2815013243705	62445	4152877	PUSH ROD,ENGINE POP.....	8
					END OF FIGURE	



461-5032

Figure 32. Valve Cover

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2915 VALVES, CAMSHAFTS, AND TIMING SYSTEM	
					FIG. 32 VALVE COVER	
1	PAFZZ		62445	0114 8239	BOLT,MACHINE M8 X 30-8.8.....	4
2	PAFZZ	5310011493703	62445	1216307	WASHER,SPRING TENSI.....	4
3	PAFZZ		62445	0113 2562	WASHER,FLAT A8.....	4
4	PAFZZ		62445	0423 5422	VALVE COVER.....	4
5	PAFZZ		62445	0423 4001	GASKET.....	4
					END OF FIGURE	

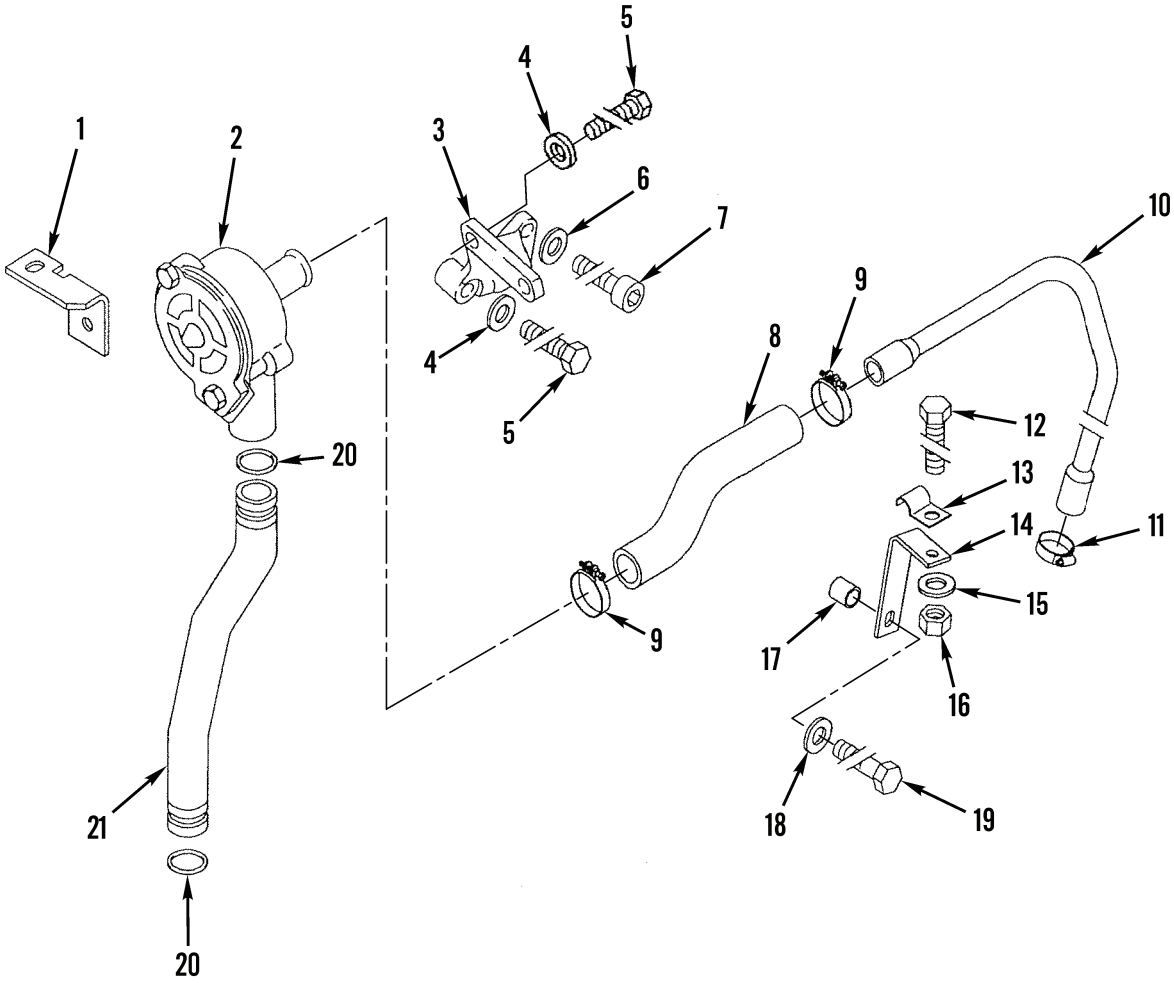


4617-5033

Figure 33. V-Belt Guard

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2915 VALVES, CAMSHAFTS, AND TIMING SYSTEM	
					FIG. 33 V-BELT GUARD	
1	PAFZZ		62445	0336 7024	WASHER,FLAT.....	8
2	PAFZZ		62445	0223 9178	SPACER,SLEEVE.....	1
3	PAFZZ	5310012737433	36719	216-4969	NUT,PLAIN,PLATE.....	1
4	PAFZZ		62445	0423 3073	V-BELT GUARD.....	1
5	PAFZZ		62445	0113 2562	WASHER,FLAT A8.....	1
6	PAFZZ		62445	0111 0582	SCREW,TORX HEAD.....	1
7	PAFZZ		62445	0114 4573	BOLT,HEXAGON M8 X 190-8.8.....	1
8	PAFZZ		D8286	DIN933-M8X16-8.8 -A4C	SCREW,CAP,HEXAGON H M8 X 16-8.8....	2
9	PAFZZ		62445	0114 4544	SCREW,TORX HEAD.....	1
10	PAFZZ		62445	0223 9180	BRACKET,MOUNTING.....	1
11	PAFZZ	5305121250321	D8286	DIN933-M8X20-8.8	SCREW,CAP,HEXAGON H M8 X 20-8.8....	1
12	PAFZZ	5310012737518	62445	336 3948	WASHER,FLAT.....	1
13	PAFZZ		25900	12411431	SPACER,SLEEVE.....	1
14	PAFZZ		62445	0081 0311	WASHER,FLAT 6,4-ST-A4C.....	4
15	PAFZZ		62445	0114 8122	NUT,PLAIN,HEXAGON M6-8-A4C.....	2
16	PAFZZ		62445	0223 9181	BRACKET,ANGLE.....	1
17	PAFZZ		D2689	01103316ES8920-0 7	SCREW,CAP,HEXAGON H M6 X 16-8.8....	1
18	PAFZZ	5305012461404	36719	111 2264	SCREW,CAP,HEXAGON H M6 X 20-8.8....	1

END OF FIGURE



461-5034

Figure 34. Crankcase Breather

(3) ITEM NO	(4) SMR CODE	(5) NSN	CAGEC	(6) PART NUMBER	(7) DESCRIPTION AND USABLE ON CODES(UOC)	(1) (2) QTY
					GROUP 2916 ENGINE LUBRICATION SYSTEM	
					FIG. 34 CRANKCASE BREATHER	
1	PAFZZ		62445	0423 1132	BRACKET,ANGLE.....	1
2	PAFZZ	4820013967742	62445	4231246	VALVE,CHECK.....	1
3	PAFZZ		D2689	0415 2424	HALTER,VENTIL.....	1
4	PAFZZ	5310121656886	D2689	0240 4201	WASHER,FLAT.....	3
5	PAFZZ	5305012685796	15526	DIN933-M8-1.25X30-8.8-A4C	SCREW,CAP,HEXAGON H M8 X 30-8.8....	3
6	PAFZZ	5310012372050	62445	331-2840	WASHER,FLAT.....	1
7	PAFZZ		62445	0111 0523	SCREW,TORX HEAD M6 X 30-10.9.....	1
8	PAFZZ		62445	0415 1993	BLEEDING TUBE.....	1
9	PAFZZ		62445	0116 6366	HOSE CLIP.....	2
10	PAFZZ		62445	0423 1475	BREATHER LINE.....	1
11	PAFZZ	4730121614632	D8773	SGT20-32/13C8-W2	CLAMP,HOSE.....	1
12	PAFZZ		D2689	01103316ES8920-07	SCREW,CAP,HEXAGON H M6 X 16-8.8....	1
13	PAFZZ		62445	0116 8145	PIPE CLAMP.....	1
14	PAFZZ		62445	0415 3618	BRACKET,ANGLE.....	1
15	PAFZZ		62445	0110 7092	WASHER,FLAT A6.....	1
16	PAFZZ		62445	0114 8122	NUT,PLAIN,HEXAGON M6-8-A4C.....	1
17	PAFZZ		62445	0333 1884	SPACER,SLEEVE.....	1
18	PAFZZ		62445	0113 2562	WASHER,FLAT A8.....	3
19	PAFZZ		D8286	M8X70DIN931-8.8-A4C	SCREW,CAP,HEXAGON H M8 X 70-8.8....	1
20	PAFZZ	5330013960443	62445	0116 0480	SEAL,NONMETALLIC RO.....	2
21	PAFZZ		D2689	0415 0820	TUBE,BENT,METALLIC.....	1
					END OF FIGURE	

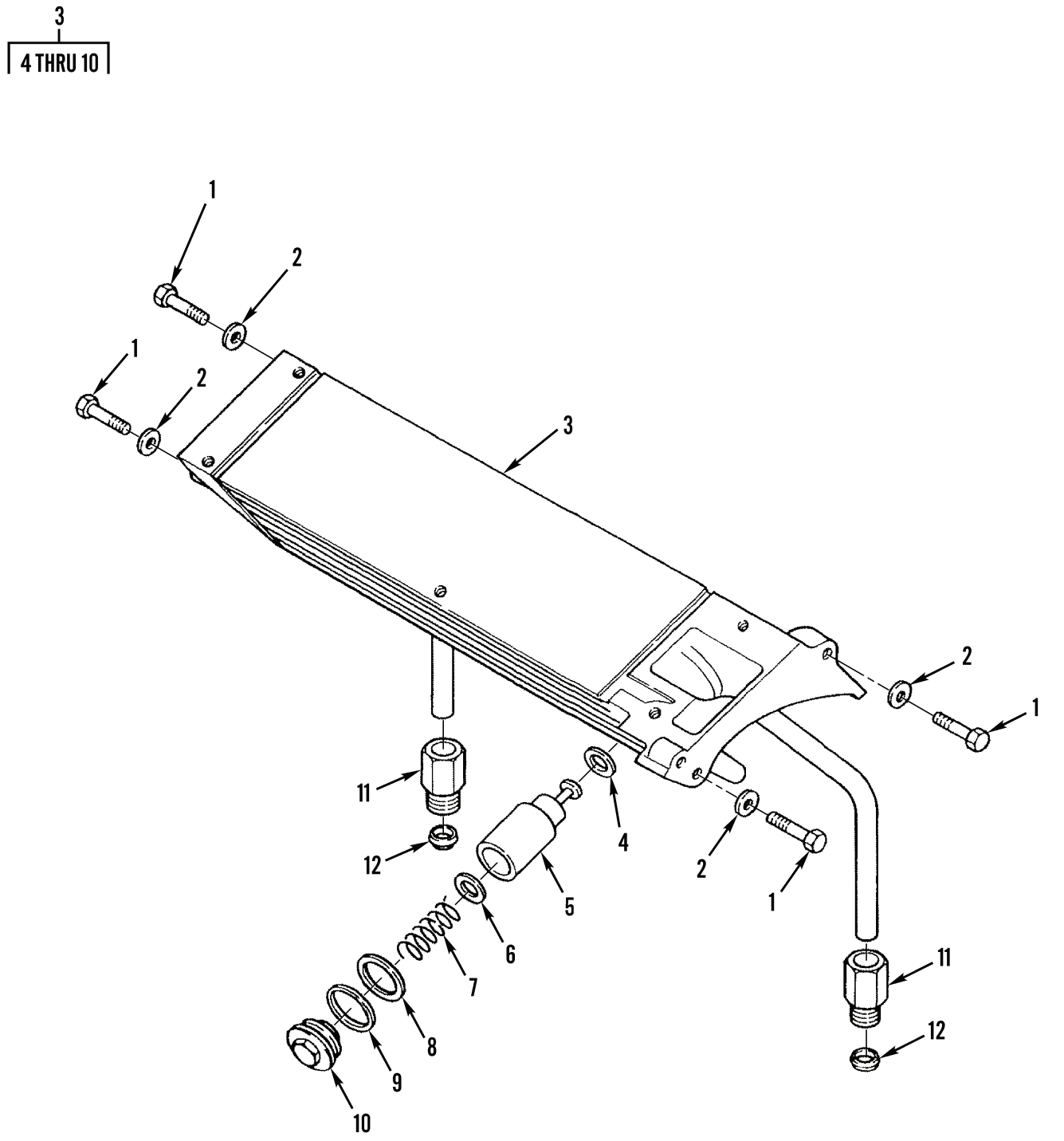
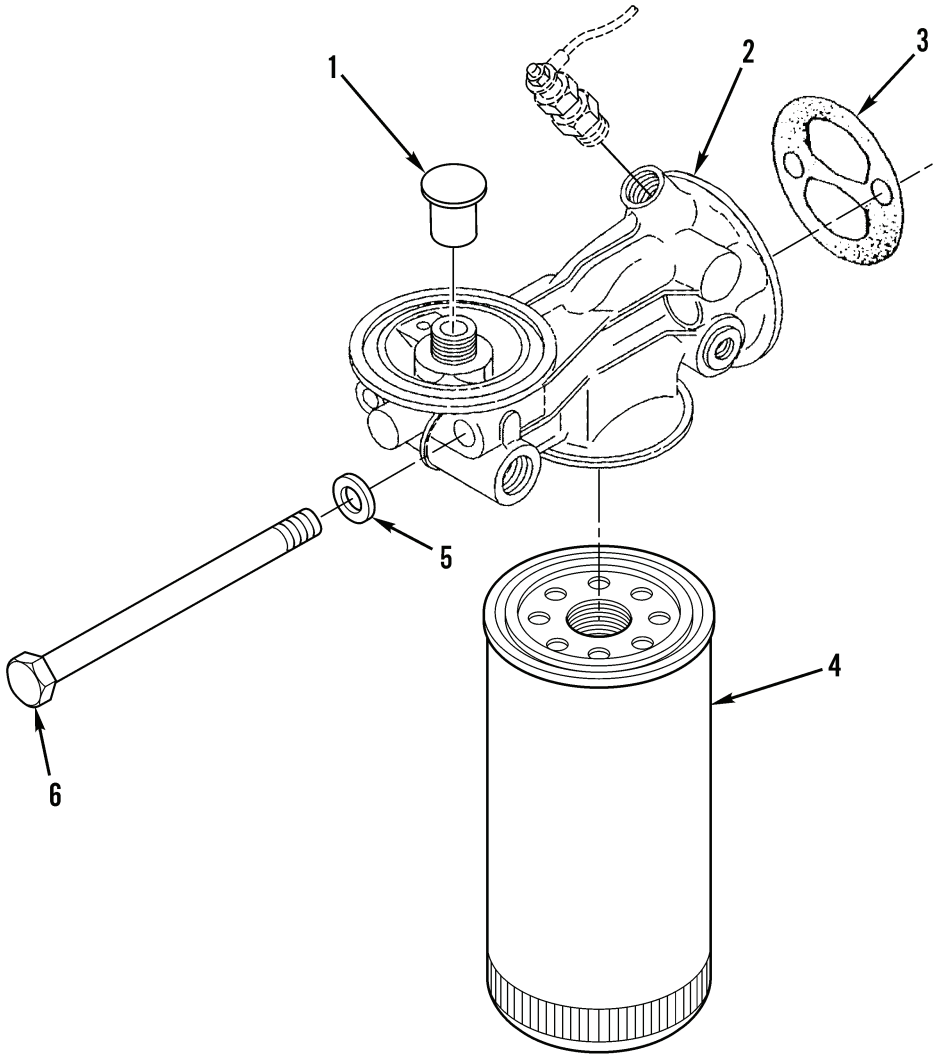


Figure 35. Oil Cooler

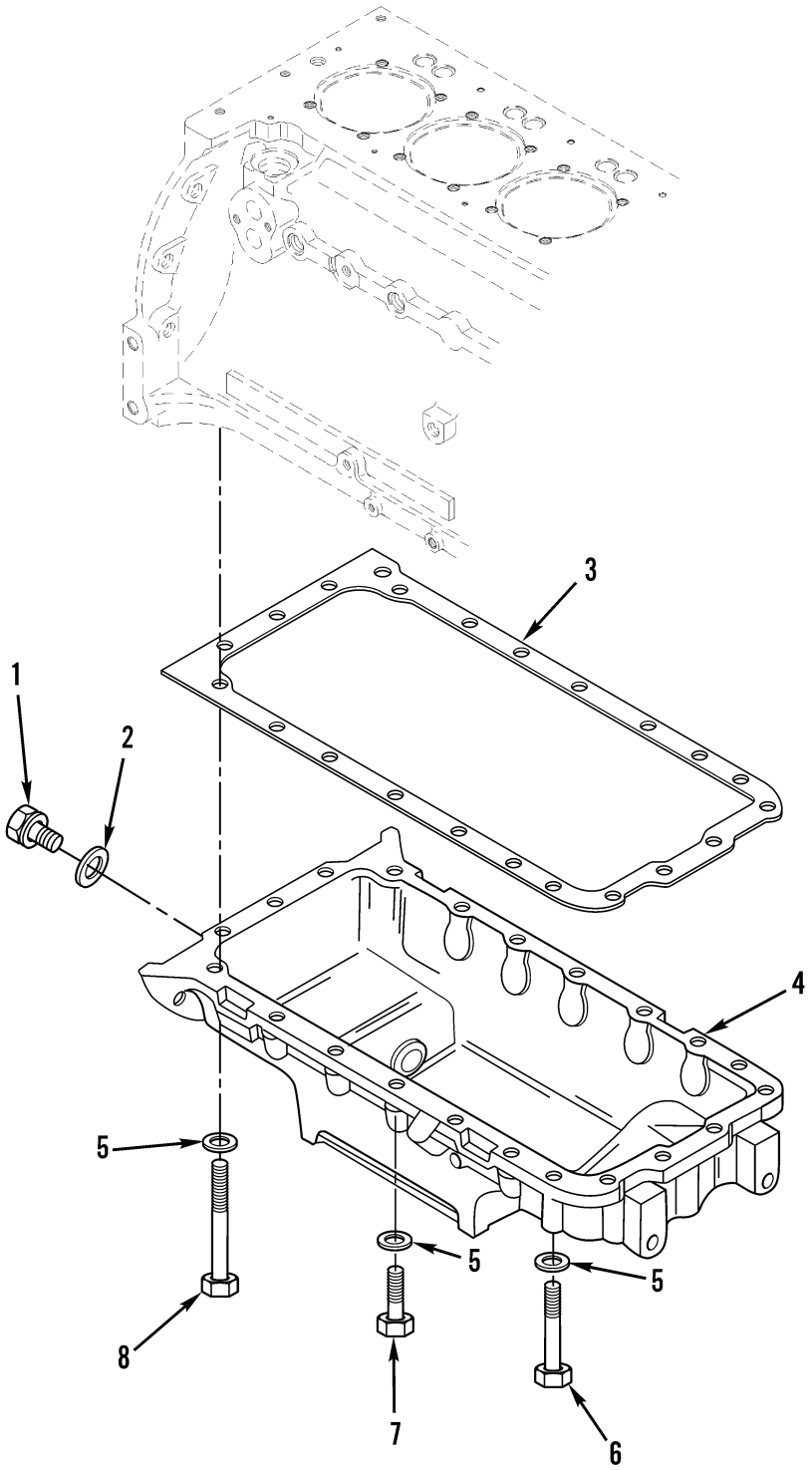
(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2916 ENGINE LUBRICATION SYSTEM	
					FIG. 35 OIL COOLER	
1	PAFZZ		62445	111 2350	BOLT,MACHINE M8SN4X40-10.9.....	4
2	PAFZZ		62445	0331 9863	WASHER,FLAT.....	4
3	PAFFF		62445	0415 8584	OIL COOLER.....	1
4	PAFZZ		62445	0223 8266	.SEALING RING.....	1
5	PAFZZ		62445	0223 8443	.ELEMENT.....	1
6	PAFZZ		62445	0121 6124	.WASHER,FLAT.....	1
7	PAFZZ	5360014383950	62445	0223 3217	.SPRING,HELICAL,COMP.....	1
8	PAFZZ		62445	0223 8267	.SEALING RING.....	1
9	PAFZZ	5310014374499	62445	0111 8835	.WASHER,FLAT.....	1
10	PAFZZ		62445	0223 9229	.SCREW PLUG.....	1
11	PAFZZ		62445	0415 7643	UNION SCREW.....	2
12	PAFZZ	4730011954244	62445	1216511	SLEEVE,COMPRESSION,.....	2
					END OF FIGURE	



461-5036

Figure 36. Oil Filter

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2916 ENGINE LUBRICATION SYSTEM	
					FIG. 36 OIL FILTER	
1	XBFZZ		62445	TBD-0581	COVER.....	1
2	PAFZZ		62445	0415 6002	FILTER HEAD.....	1
3	PAFZZ	5330013432670	62445	4154482	GASKET.....	1
4	PAFZZ		62445	0118 1749	FILTER,ELEMENT OIL SPIN-ON.....	1
5	PAFZZ		62445	1107105	WASHER,FLAT A10.....	2
6	PAFZZ	5306012117442	62445	111-1384	BOLT,MACHINE M10 X 160-8.8.....	2
					END OF FIGURE	



461-5037

Figure 37. Oil Pan and Attaching Hardware

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2916 ENGINE LUBRICATION SYSTEM	
					FIG. 37 OIL PAN AND ATTCHING HARDWARE	
1	PAFZZ		62445	0113 9720	SCREW PLUG.....	2
2	PAFZZ	5365012807191	62445	111 8737	RING,SEALING.....	2
3	PAFZZ	5330013644892	62445	3362574	GASKET.....	1
4	PAFZZ		62445	0223 7981	OIL PAN.....	1
5	PAFZZ	5310121494353	D8286	DIN125-A8,4-140H V-A3P	WASHER,FLAT A8.....	21
6	PAFZZ		D8286	M8X70DIN931-8.8-A4C	SCREW,CAP,HEXAGON H M8 X 70-8.8....	2
7	PAFZZ	5305121818170	D8286	DIN933-M8X25-8.8-A4C	SCREW,CAP,HEXAGON H M8 X 25-8.8....	16
8	PAFZZ		K5476	111-1213	BOLT,MACHINE M8 X 110-8.8.....	3
					END OF FIGURE	

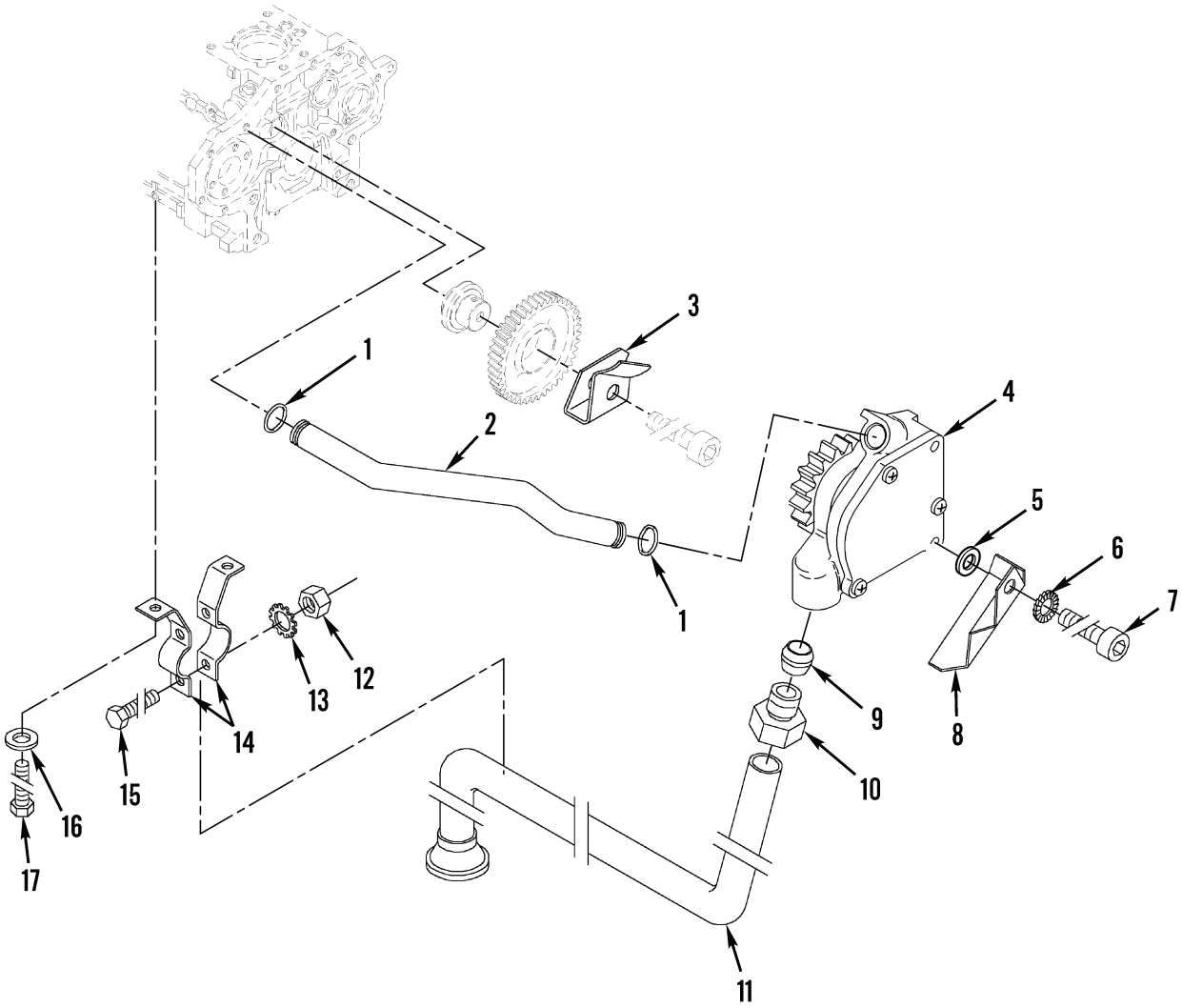


Figure 38. Oil Pump and Lines (Sheet 1 of 2)

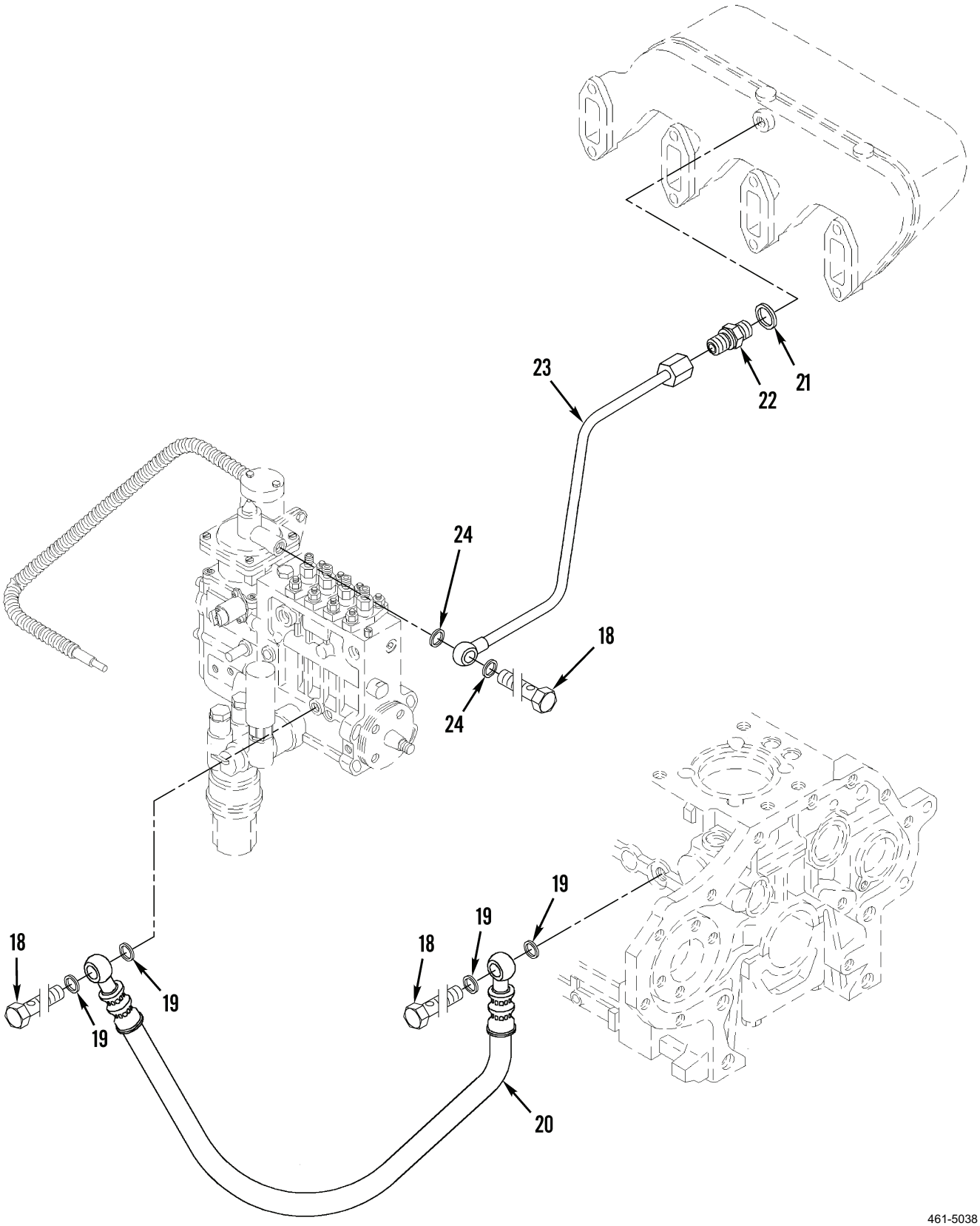


Figure 38. Oil Pump and Lines (Sheet 2 of 2)

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2916 ENGINE LUBRICATION SYSTEM	
					FIG. 38 OIL PUMP AND LINES	
1	PAFZZ	5330013432648	62445	1174706	SEAL,PLAIN.....	2
2	PAFZZ	4710012081313	62445	2239984	TUBE,BENT,METALLIC.....	1
3	PAFZZ		62445	0223 4165	YOKE SPRING.....	1
4	PAFZZ		62445	0423 4146	OIL PUMP.....	1
5	PAFZZ		62445	0117 8272	WASHER,FLAT 8,4X15X3.....	2
6	PAFZZ	5310121485093	D9532	S8A3P	WASHER,SPRING TENSI -8.....	1
7	PAFZZ		62445	0115 1506	SCREW,TORX HEAD.....	2
8	PAFZZ	2815123370096	D2689	0415 9697	BAFFLE,AIRFLOW,DIES.....	1
9	PAFZZ		62445	0121 0231	FERRULE,COMPRESSION.....	1
10	PAFZZ		62445	0121 0230	UNION SCREW.....	1
11	PAFZZ		62445	0415 6193	SUCTION PIPE.....	1
12	PAFZZ		D8286	DIN934-M6-6-A2A	NUT,PLAIN,HEXAGON M6.....	2
13	PAFZZ	5310121564913	D8286	DIN6797-A6,4-FST -A3P	WASHER,LOCK A6.....	6
14	PAFZZ		62445	0223 8148	PIPE CLAMP.....	2
15	PAFZZ		D2689	01103316ES8920-0 7	SCREW,CAP,HEXAGON H M6 X 16-8.8....	2
16	PAFZZ	5310121925415	62445	0110 7548	WASHER,LOCKING 8-140HV-A4C.....	2
17	PAFZZ	5305121419861	D8286	DIN933-M8X12-8.8 -A2P	SCREW,CAP,HEXAGON H M8 X 12-8.8....	2
18	PAFZZ	4730121588862	D8286	DIN7643-6	BOLT,FLUID PASSAGE.....	3
19	PAFZZ	5330121564519	D8286	DIN7603-A10X16-C U	GASKET.....	2
20	PAFZZ		62445	0423 3964	OIL LINE.....	1
21	PAFZZ	5330121429117	D8286	DIN7603-A10X13,5 -AL	GASKET.....	1
22	PAFZZ		62445	0111 6677	SCREW-IN NIPPLE.....	1
23	PAFZZ		62445	0423 5643	TUBE ASSEMBLY.....	1
24	PAFZZ	5330121564518	D8286	A10X14DIN7603-CU	GASKET.....	2
					END OF FIGURE	

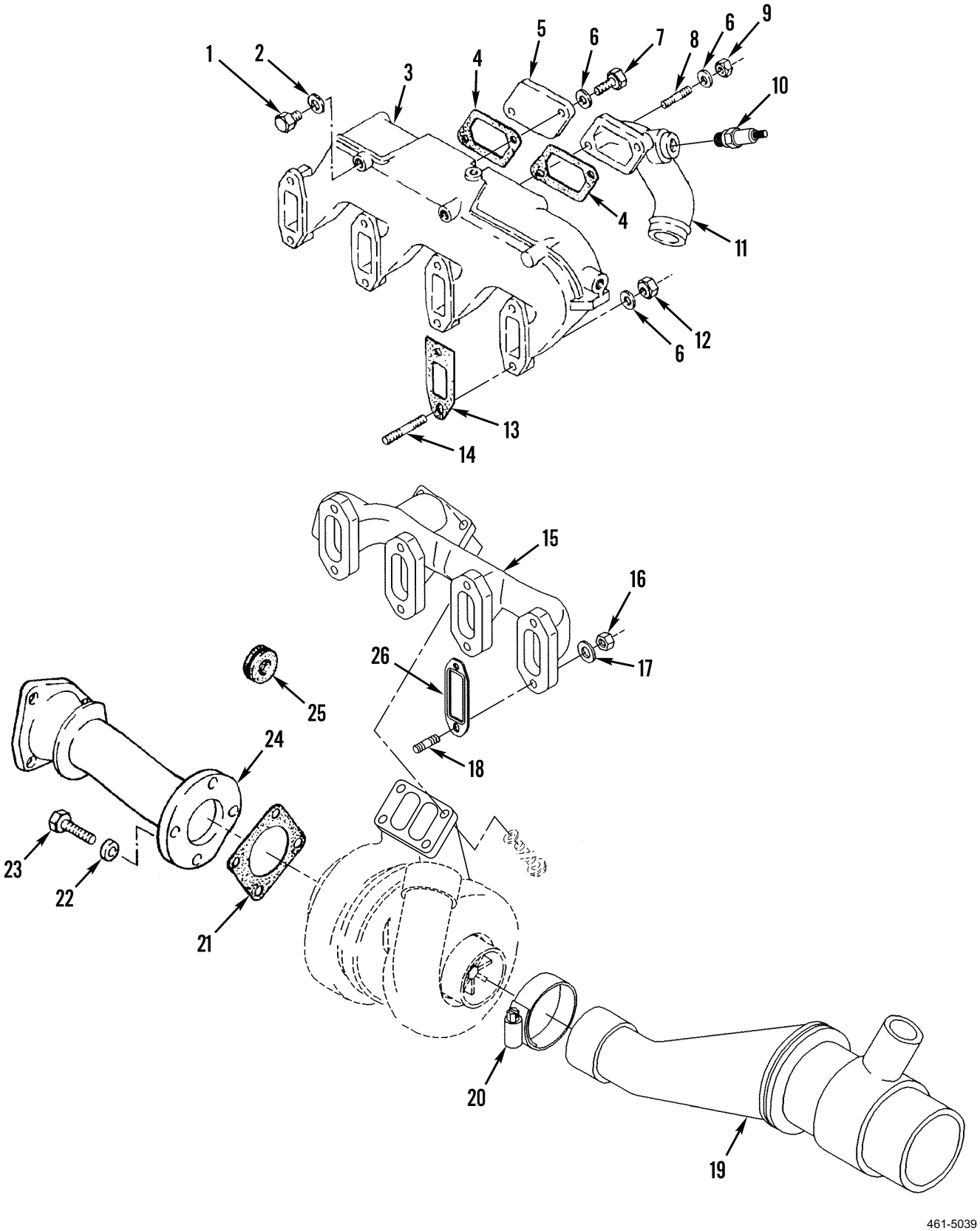
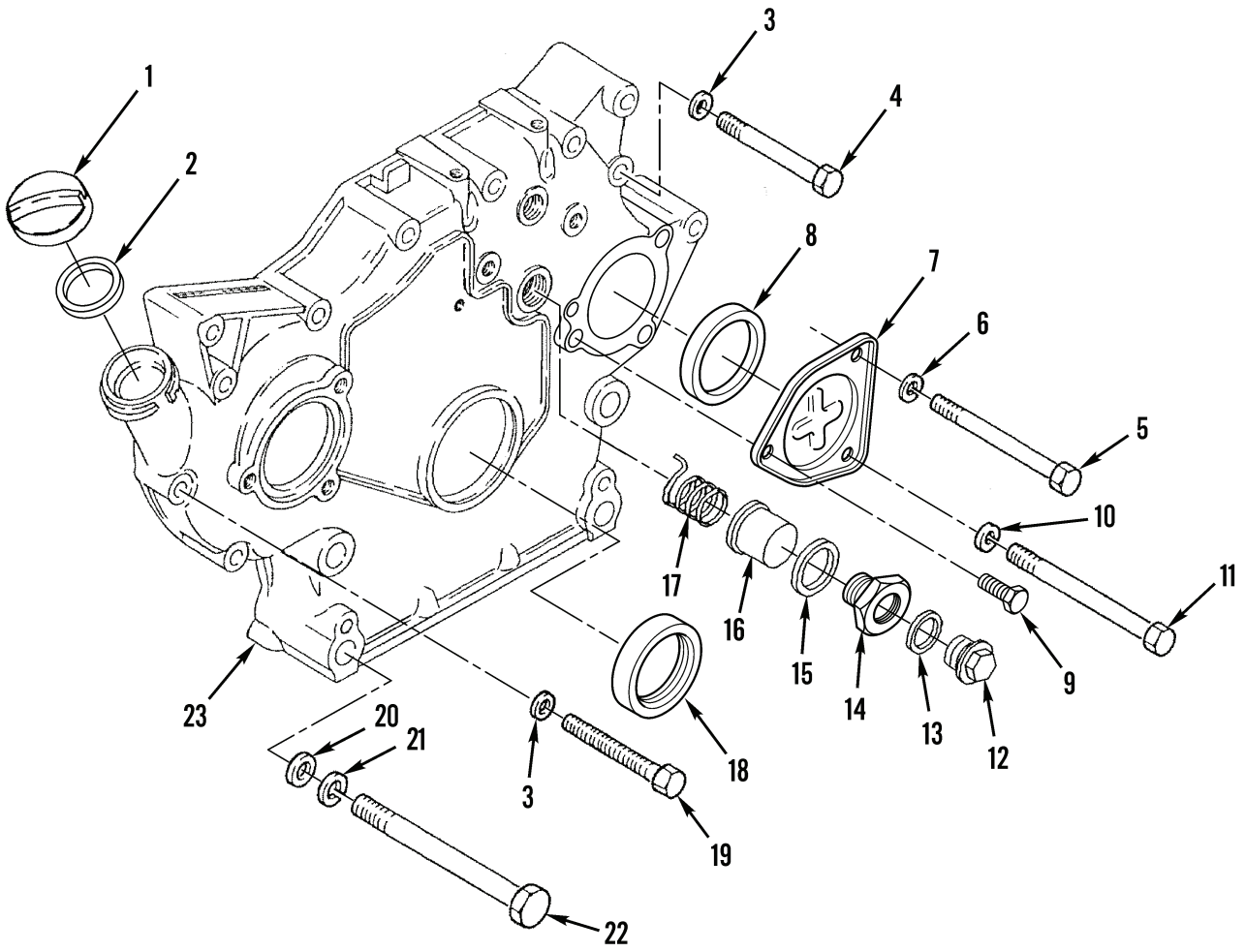


Figure 39. Manifolds

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2918 MANIFOLDS	
					FIG. 39 MANIFOLDS	
1	PAFZZ		62445	0110 0371	SCREW PLUG.....	1
2	PAFZZ	5330121564806	62445	111 8659	GASKET.....	1
3	PAFZZ		62445	0415 3005	CHARGE AIR PIPE.....	1
4	PAFZZ		62445	0415 7250	GASKET.....	2
5	PAFZZ		62445	0415 1892	COVER.....	1
6	PAFZZ	5310121494353	D8286	DIN125-A8,4-140H V-A3P	WASHER,FLAT A8.....	12
7	PAFZZ		62445	0111 2333	BOLT,HEXAGON M8 X 25-8.8.....	2
8	PAFZZ	5307012737532	62445	113 1092	STUD,PLAIN M8 X 35-8.8.....	2
9	PAFZZ	5310012461361	62445	111 2828	NUT,PLAIN,HEXAGON M8.....	2
10	PAFZZ		62445	01179703	GLOW PLUG.....	1
11	PAFZZ		62445	0415 4844	MANIFOLD.....	1
12	PAFZZ		62445	241-1054	NUT,PLAIN,HEXAGON.....	8
13	PAFZZ	5330123290787	62445	0415 7248	GASKET.....	4
14	PAFZZ	5307012737532	62445	113 1092	STUD,PLAIN M8 X 35-8.8.....	8
15	PAFZZ		62445	0415 1565	EXHAUST PIPE.....	1
16	PAFZZ	5310123625414	D2689	0118 2036	NUT,PLAIN,HEXAGON.....	8
17	PAFZZ		62445	0114 8124	WASHER,FLAT 8,4-200HV-A4C.....	8
18	PAFZZ		62445	0118 1780	STUD.....	8
19	PAFZZ		62445	0423 1345	INTAKE ELBOW.....	1
20	PAFZZ		D8286	DIN3017-AS50-70C 8-W2	CLAMP,HOSE.....	1
21	PAFZZ		62445	0420 9204	GASKET.....	1
22	PAFZZ		62445	0415 3053	WASHER,FLAT.....	4
23	PAFZZ		62445	0121 0822	BOLT,HEXAGON.....	4
24	PAFZZ		62445	0415 8044	EXHAUST PIPE.....	1
25	PAFZZ	5325012737620	36719	117-3066	GROMMET,NONMETALLIC.....	1
26	PAFZZ	5330123288837	D2689	0423 3529	GASKET.....	4
					END OF FIGURE	



461-5040

Figure 40. Front Engine Cover

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2919 DRIVING MECHANISMS	
					FIG. 40 FRONT ENGINE COVER	
1	PAFZZ	2590001759502	36719	1236291	CAP,FILLER OPENING.....	1
2	PAFZZ	5365011937160	62445	123-6290	SPACER,RING.....	1
3	PAFZZ	5310121494353	D8286	DIN125-A8,4-140H V-A3P	WASHER,FLAT A8.....	3
4	PAFZZ		D8286	M8X70DIN931-8.8-A4C	SCREW,CAP,HEXAGON H M8 X 70-8.8....	1
5	PAFZZ	5305012636913	81495	071 310 40	SCREW,CAP,HEXAGON H M10 X 75-8.8...	1
6	PAFZZ	5310014390043	62445	0110 2800	WASHER,FLAT A10.....	1
7	PAFZZ		62445	0223 5014	COVER.....	1
8	PAFZZ		62445	0118 0084	O-RING.....	1
9	PAFZZ		62445	0110 2396	BOLT,HEXAGON M8 X 8-8.8.....	1
10	PAFZZ	5310014401417	62445	01102799	WASHER,FLAT A8-FST-A4C.....	1
11	PAFZZ	5305123462196	I9008	ISO4014-M8X85-8.8-A4C	SCREW,CAP,HEXAGON H M8 X 85-8.8....	1
12	PAFZZ		D2689	0111 8971	PLUG,MACHINE THREAD.....	1
13	PAFZZ		62445	1118713	GASKET.....	1
14	PAFZZ	5365012104667	62445	2230937	PLUG.....	1
15	PAFZZ		D8265	005083	GASKET.....	1
16	PAFZZ	5340012097006	62445	2135019	CAP.....	1
17	PAFZZ	5360012134636	62445	2237638	SPRING,HELICAL,COMP.....	1
18	PAFZZ	5330014347270	62445	04154144	SEAL,PLAIN ENCASED.....	1
19	PAFZZ		62445	0112 7046	BOLT,HEXAGON M8 X 60-8.8.....	1
20	PAFZZ		45152	4KK500	WASHER,FLAT M14 X 200-8.8.....	4
21	PAFZZ	5310121514843	D8286	DIN128-A14-FST-A3P	WASHER,LOCK A14.....	4
22	PAFZZ	5306013955877	62445	0111 1770	BOLT,MACHINE M14 X 200-8.8.....	4
23	PAFZZ		62445	0423 1183	FRONT COVER.....	1
					END OF FIGURE	

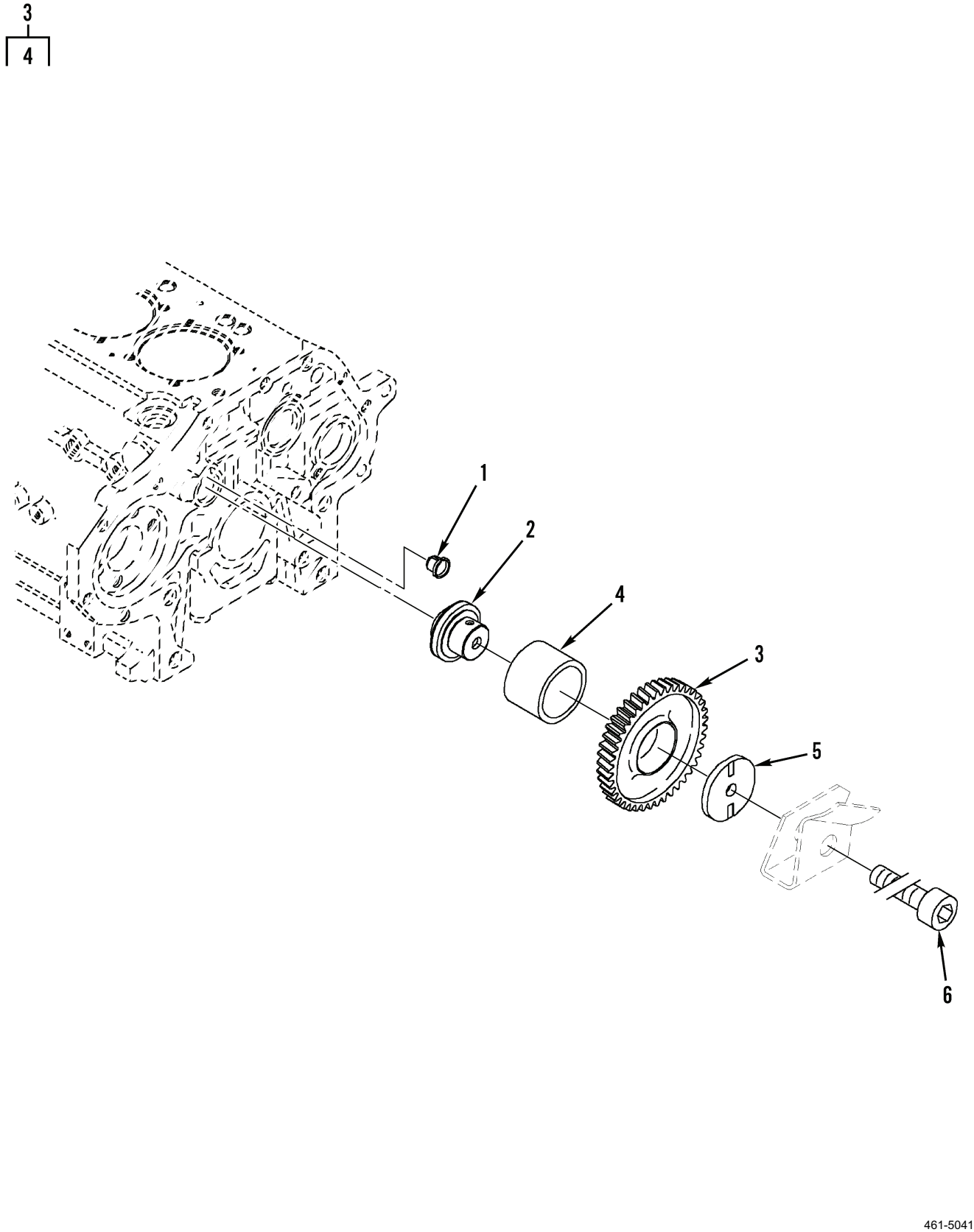


Figure 41. Idler Gear

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2919 DRIVING MECHANISMS	
					FIG. 41 IDLER GEAR	
1	PAFZZ	5310013962856	62445	0415 6283	NUT,PLAIN,HEXAGON.....	1
2	PAFZZ		62445	0415 6285	JOURNAL.....	1
3	PAFFF		62445	0415 4591	IDLER GEAR.....	1
4	PAFZZ		62445	0415 4590	.BUSH.....	1
5	PAFZZ		62445	0415 4593	WASHER,FLAT.....	1
6	PAFZZ		62445	0223 4177	SCREW,TORX HEAD.....	1
					END OF FIGURE	

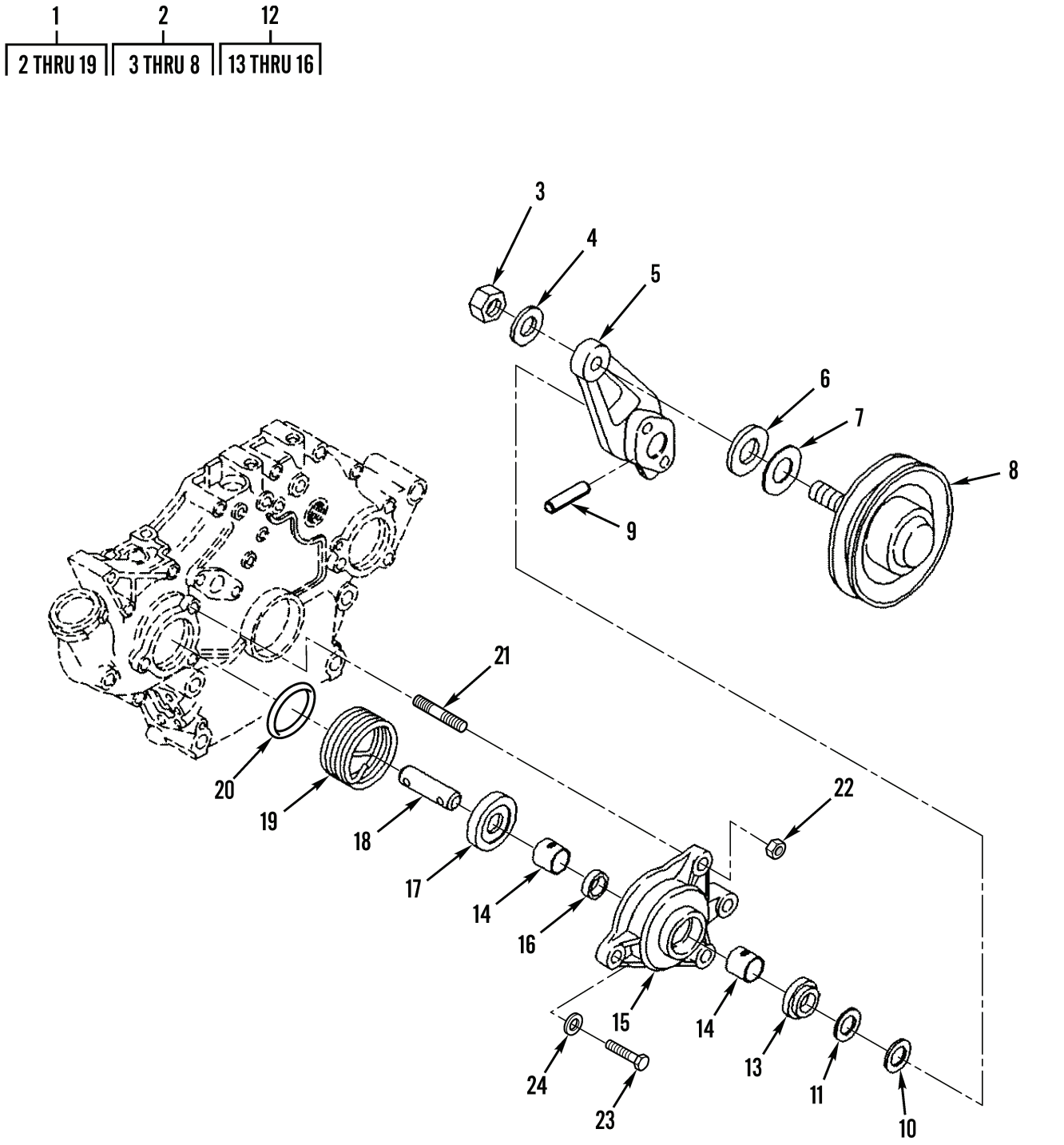


Figure 42. Tensioner Pulley

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2919 DRIVING MECHANISMS	
					FIG. 42 TENSIONER PULLEY	
1	PAFFF		62445	0415 2511	TENSIONING PULLEY.....	1
2	PAFFF		62445	0415 2521	.V-GROOVED PULLEY.....	1
3	PAFZZ	5310012461361	62445	112 2477	..NUT,PLAIN,HEXAGON M8.....	1
4	PAFZZ		62445	0113 2562	..WASHER,FLAT A8.....	1
5	PAFZZ		62445	0423 5708	..PULLEY LEVER.....	1
6	PAFZZ	5310012077205	62445	2134884	..WASHER.....	1
7	PAFZZ	5310012779849	62445	2238196	..WASHER,FLAT.....	3
8	PAFZZ		62445	0423 3228	..TENSIONING PULLEY.....	1
9	PAFZZ	5315011956657	62445	1115470	.PIN,SPRING.....	1
10	PAFZZ	3120013969838	62445	0415 2517	.BEARING,WASHER,THRU.....	1
11	PAFZZ	3120013968372	62445	0415 2509	.BEARING,WASHER,THRU.....	1
12	PAFFF		D2689	0415 3128	.IDLER PULLEY COVER.....	1
13	PAFZZ	5330011945924	62445	4158766	..SEAL.....	1
14	PAFZZ	3120011962582	62445	2238022	..BUSHING,SLEEVE.....	2
15	PAFZZ		62445	0415 3130	..IDLER PULLEY COVER.....	1
16	PAFZZ	5365012742116	36719	223-8084	..SPACER,RING.....	1
17	PAFZZ	5310012077204	62445	2238083	.WASHER.....	1
18	PAFZZ	3040011981130	62445	2238081	.SHAFT,STRAIGHT.....	1
19	PAFZZ	5360012070160	62445	223 8021	.SPRING,HELICAL,COMP.....	1
20	PAFZZ		62445	0117 9670	O-RING.....	1
21	PAFZZ		62445	0117 4191	STUD,SHOULDER.....	1
22	PAFZZ		62445	0121 6108	WASHER,FLAT.....	2
23	PAFZZ		62445	0113 7057	NUT,PLAIN,HEXAGON H.....	1
24	PAFZZ		62445	0117 4194	BOLT,MACHINE.....	1
					END OF FIGURE	

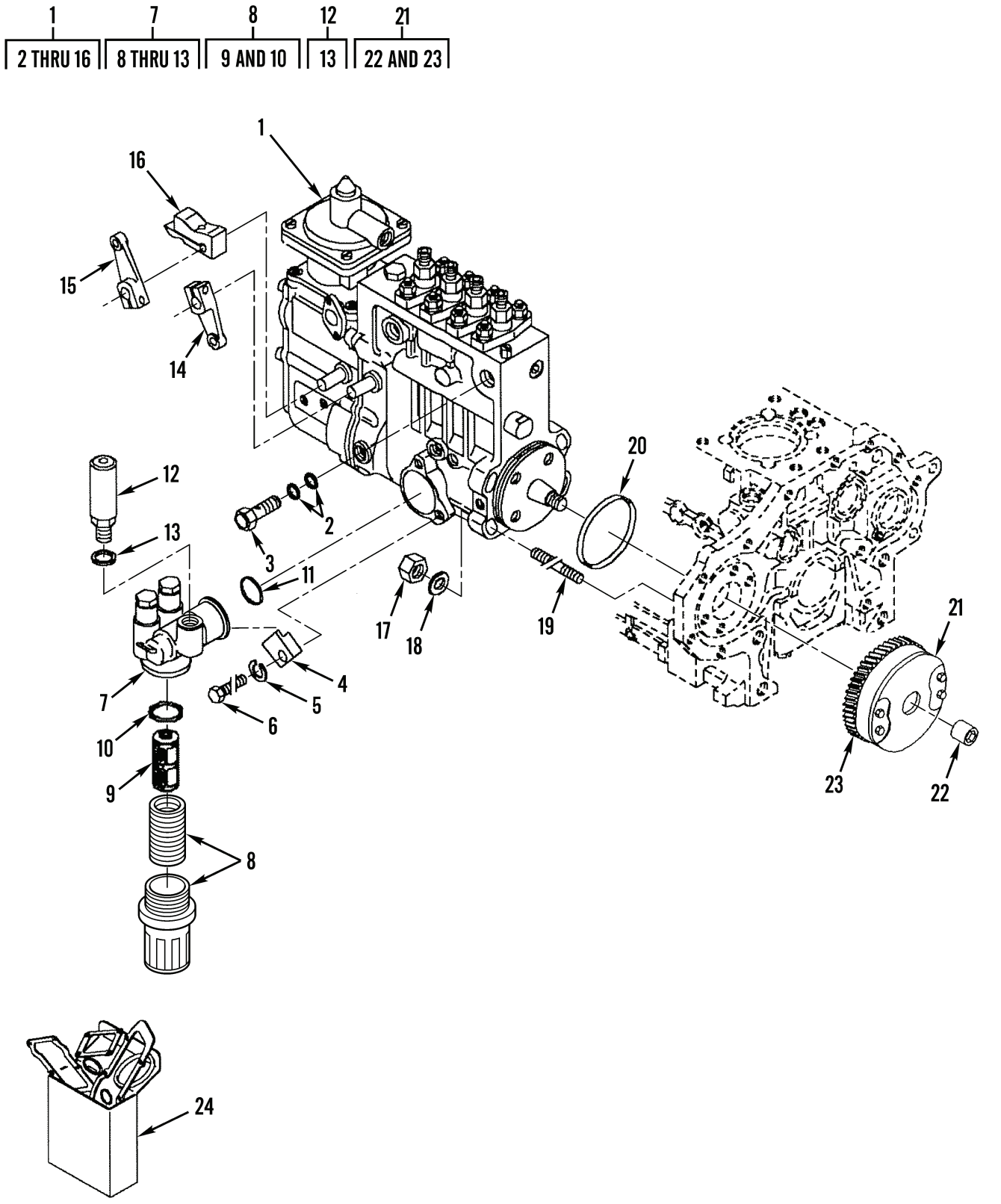
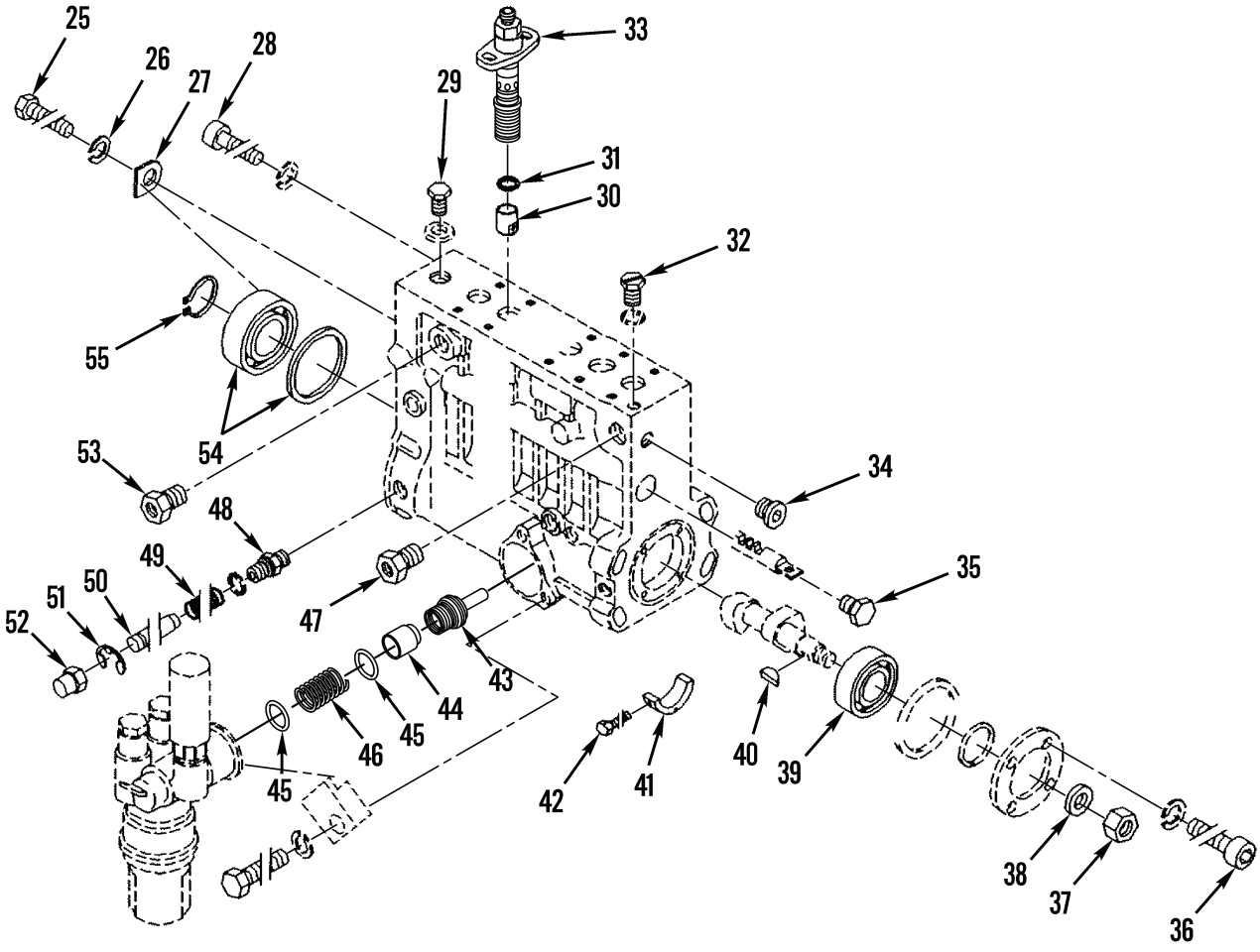


Figure 43. Fuel Injection Pump (Sheet 1 of 3)



461-5043-2

Figure 43. Fuel Injection Pump (Sheet 2 of 3)

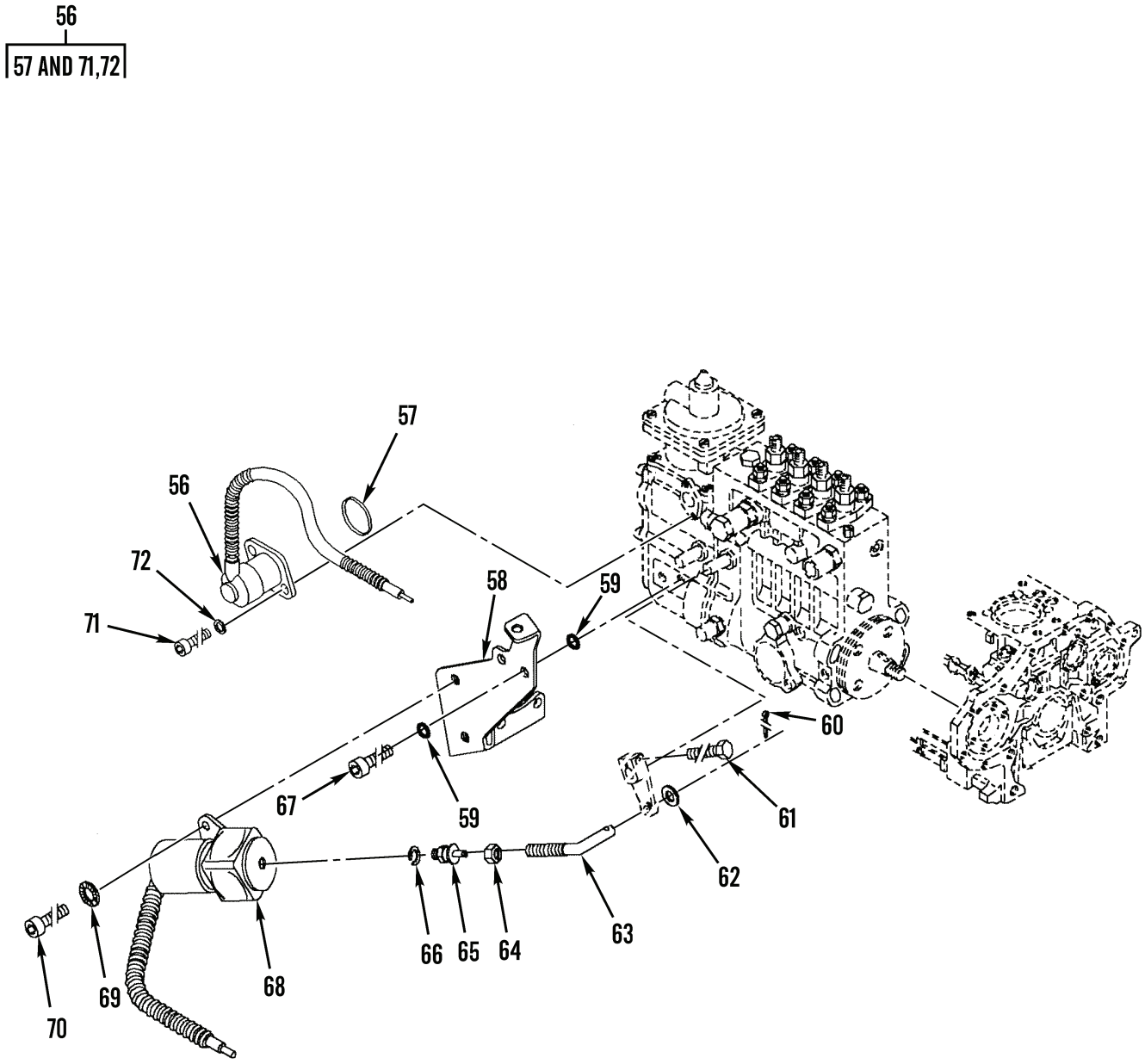


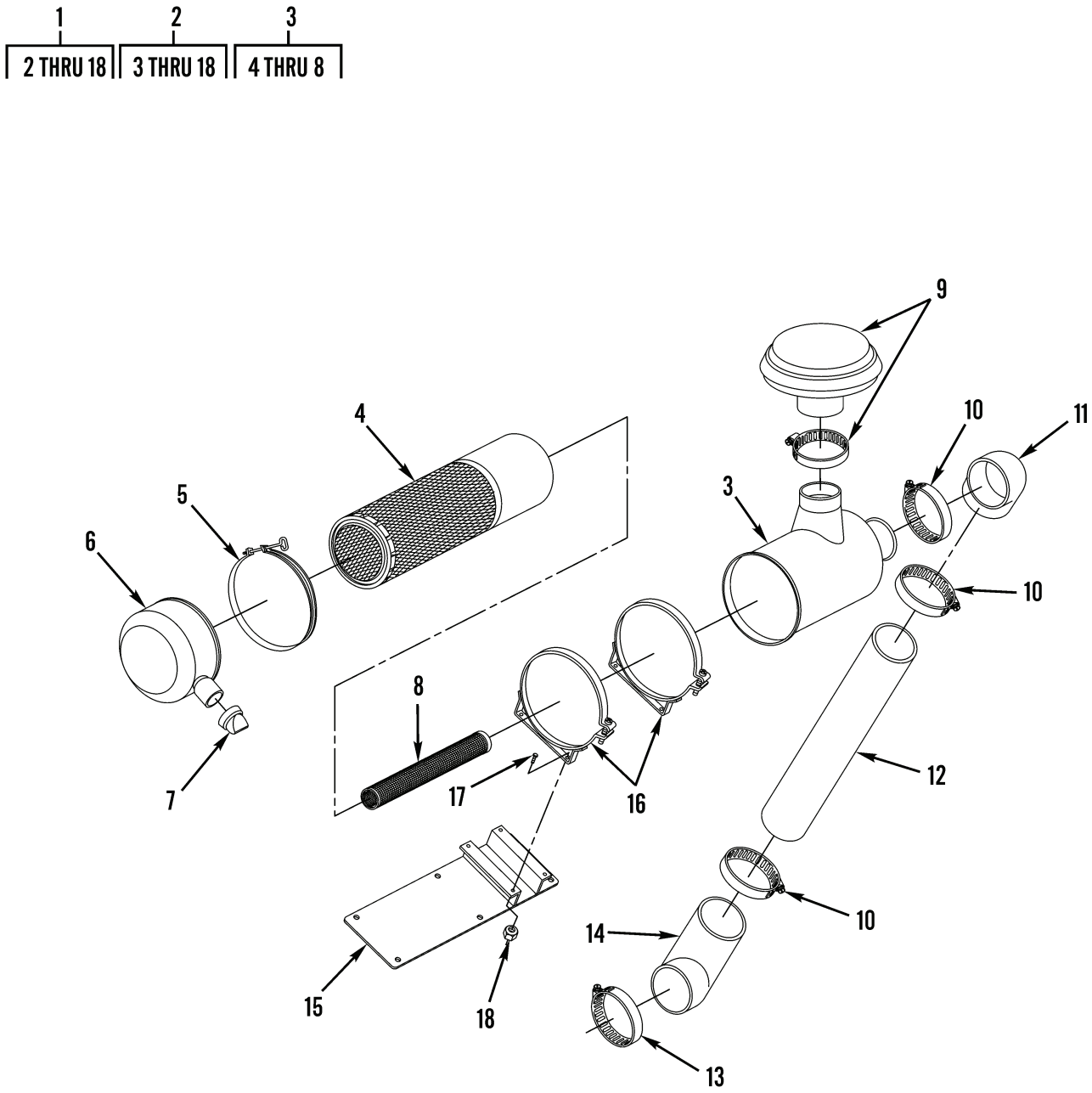
Figure 43. Fuel Injection Pump (Sheet 3 of 3)

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2932 ENGINE FUEL PUMP	
					FIG. 43 FUEL INJECTION PUMP	
1	PAFFF		1JN64	0423 4638	FUEL INJECTION PU WHEN ORDERING INCLUDE ENGINE SERIAL #.....	1
2	PAFZZ	5310014378700	62445	0111 8693	.WASHER,SEAL.....	2
3	PAFZZ		62445	0131 9883	.OVERFLOW VALVE.....	1
4	PAFZZ		62445	0423 3809	.CLIP.....	2
5	PAFZZ	5310014401416	62445	01102797	.WASHER,LOCK A6-FST-A4C.....	2
6	PAFZZ		62445	0114 8201	.BOLT,HEXAGON M6 X 16-8.8.....	2
7	PAFFF		62445	0423 3878	.FUEL PUMP.....	1
8	PAFFF		62445	0293 1529	..SET OF PARTS.....	1
9	PAFZZ		62445	0423 3882	...STRAINER.....	1
10	PAFZZ		62445	0423 3880	...O-RING.....	1
11	PAFZZ		62445	0423 3830	..O-RING.....	1
12	PAFFF		62445	0211 1897	..HAND PUMP.....	1
13	PAFZZ		62445	0128 7773	...SEALING RING.....	1
14	PAFZZ		62445	0423 4130	.SHUT-OFF LEVER.....	1
15	PAFZZ		62445	0131 9882	.SPEED CONTR.LEVER.....	1
16	PAFZZ		62445	0423 4608	.STOP LEVER.....	1
17	PAFZZ		62445	0114 8419	NUT,HEXAGON M10.....	4
18	PAFZZ		62445	0114 0501	WASHER,FLAT 10.....	4
19	PAFZZ	5307012083691	62445	1174190	STUD.....	4
20	PAFZZ	5331011880852	62445	1166103	O-RING.....	1
21	PAFFF		62445	0423 5692	TIMING DEVICE.....	1
22	PAFZZ		62445	0423 4107	.CLAMPING NUT.....	1
23	PAFZZ		62445	0423 4583	.TOOTHED GEAR.....	1
24	PAFZZ		62445	0293 1525	GASKET SET.....	1
25	PAFZZ		62445	0134 0262	SCREW/BOLT.....	4
26	PAFZZ	5310121514842	D8286	DIN 128-A6-FST-A 3P	WASHER,LOCK A6.....	4
27	PAFZZ		62445	0134 0263	SHIM.....	4
28	PAFZZ		62445	0134 0264	SCREW/BOLT.....	4
29	PAFZZ		62445	0134 0261	VENT PLUG.....	1
30	PAFZZ		62445	0134 0248	ROLLER TAPPET.....	6
31	PAFZZ		62445	0134 0223	SHIM.....	6
32	PAFZZ		62445	0134 0260	VENT PLUG.....	1
33	PAFZZ		62445	0293 1528	SET OF PARTS.....	6
34	PAFZZ		62445	0134 0259	SCREW PLUG.....	3
35	PAFZZ		62445	0134 0221	SCREW PLUG.....	1
36	PAFZZ		62445	0134 0254	SCREW/BOLT.....	4
37	PAFZZ		62445	0134 0249	NUT,HEXAGON.....	1
38	PAFZZ		62445	0134 0253	WASHER.....	1
39	PAFZZ		62445	0134 0250	BALL BEARING.....	1
40	PAFZZ		62445	0423 4129	WOODRUFF KEY.....	1
41	PAFZZ		62445	0134 0255	BEARING LINER.....	1
42	PAFZZ		62445	0134 0256	BOLT,HEXAGON.....	1
43	XAFZZ		62445	TBD-0901	PLUNGER.....	1

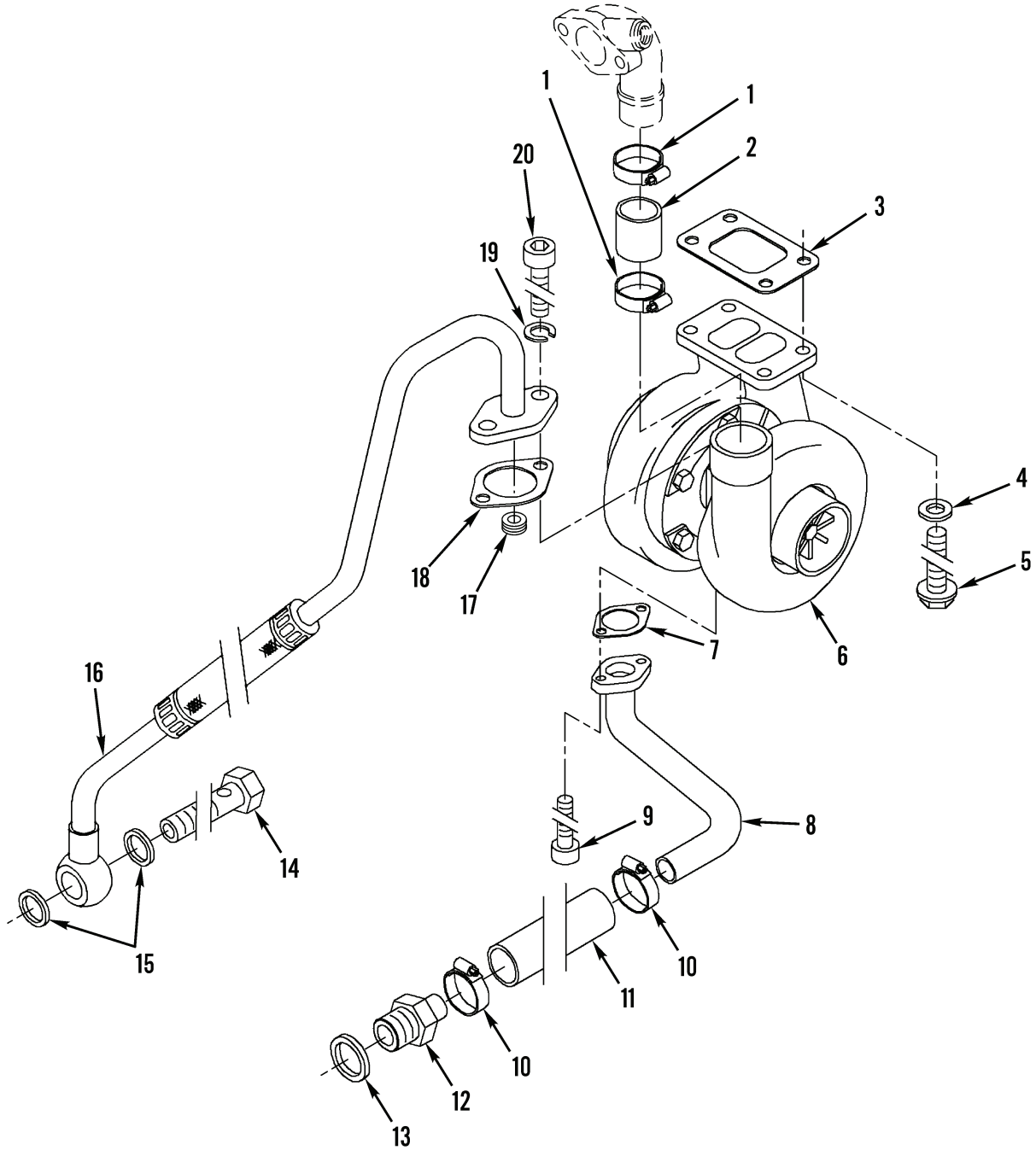
(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
44	PAFZZ		62445	0134 0277	VALVE CONE	2
45	XAFZZ		62445	TBD-0903	WASHER,SPECIAL	2
46	PAFZZ		62445	0134 0276	PISTON SPRING	1
47	PAFZZ		62445	0134 0258	THREADED SOCKET	1
48	PAFZZ		62445	0134 0267	BUSH	1
49	PAFZZ		62445	0134 0266	SPRING	1
50	PAFZZ		62445	0134 0269	CLIEVIS PIN	1
51	PAFZZ		62445	0134 0270	CLIP	1
52	PAFZZ		62445	0134 0268	PLUG	1
53	PAFZZ		62445	0134 0257	THREADED SOCKET	1
54	PAFZZ		62445	0134 0251	BALL BEARING	1
55	PAFZZ		62445	0134 0252	CLIP	1
56	PAFZZ		62445	0423 4502	ELECTROMAGNET	1
57	PAFZZ		62445	0423 4499	.O-RING	1
58	PAFZZ		62445	0423 4592	BRACKET,MOUNTING	1
59	PAFZZ		62445	1118641	O-RING	4
60	PAFZZ		62445	0423 3851	PIN,SPLIT	1
61	PAFZZ		64678	933006130	BOLT,MACHINE	1
62	PAFZZ		62445	0115 1664	WASHER,FLAT	1
63	PAFZZ		62445	0423 3849	CONNECTING LINK,RIG	1
64	PAFZZ		62445	0114 8122	NUT,PLAIN,HEXAGON	1
65	PAFZZ		62445	0423 3850	CONNECTOR,ROD END	1
66	PAFZZ	5310121514842	D8246	0110 2797	WASHER,LOCK	1
67	PAFZZ		62445	0114 4176	BOLT,MACHINE	2
68	PAFZZ		62445	0423 3841	PLINGER,SOLENOID	1
69	PAFZZ	5310121327461	D9532	S6FST	WASHER,LOCKING	2
70	PAFZZ		62445	0115 1488	BOLT,MACHINE	2
71	PAFZZ		62445	0423 4501	.SCREW,CAP,HEXAGON H	2
72	PAFZZ		62445	0423 4500	.WASHER,LOCK	2

END OF FIGURE

Figure 44. Air Cleaner



(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2933 ENGINE AIR CLEANER	
					FIG. 44 AIR CLEANER	
1	PAFFF		1JN64	4-01	AIR CLEANER.....	1
2	PAFFF		1JN64	401-01	.AIR CLEANER ASSEMBL.....	1
3	PAFFF		1JN64	G080585	..AIR CLEANER HOUSING.....	1
4	PAFZZ		1JN64	P601437	...ELEMENT,PRIMARY.....	1
5	PAFZZ		1JN64	P003951	...CLAMP,BODY.....	1
6	PAFZZ		1JN64	P600321	...COVER,ACCESS.....	1
7	PAFZZ		1JN64	P158914	...VACUATOR VALVE.....	1
8	PAFZZ		1JN64	P601476	...ELEMENT,SAFETY.....	1
9	PAFZZ		1JN64	H000473	..HOOD INCLUDES CLAMP.....	1
10	PAFZZ		1JN64	5364 FAB	..CLAMP,HOSE.....	3
11	PAFZZ		1JN64	P114318	..ELBOW,RUBBER 3.5".....	1
12	PAFZZ		1WB54	401-02	..2.5" ALUMINUM AIR F.....	1
13	PAFZZ		1JN64	5348 FAB	..CLAMP,HOSE.....	1
14	PAFZZ		1JN64	P123462	..ELBOW,RUBBER 3.5" X 3".....	1
15	PAFZZ		1WB54	401-03	..AIR CLEANER BRACKET.....	1
16	PAFZZ		1JN64	P004307	..MOUNTING BANDS.....	2
17	PAFZZ	5305015329137	39428	92865A624	..SCREW,CAP,HEXAGON H.....	4
18	PAFZZ	5310014667850	39428	95615A120	..NUT,SELF-LOCKING,HE.....	4
					END OF FIGURE	



461-5045

Figure 45. Turbocharger and Related Parts

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2934 ENGINE SUPERCHARGER OR BLOWER	
					FIG. 45 TURBOCHARGER AND RELATED PARTS	
1	PAFZZ		62445	0117 3971	HOSE CLIP	2
2	PAFZZ		62445	0117 5632	RUBBER SLEEVE	1
3	PAFZZ		62445	0420 9206	GASKET	1
4	PAFZZ		62445	0415 3053	WASHER,FLAT	4
5	PAFZZ		62445	0121 0822	BOLT,HEXAGON	4
6	PAFZZ		62445	0423 5557	TURBOCHARGER	1
7	PAFZZ	5330123288836	D2689	0418 2520	GASKET	1
8	PAFZZ		62445	0423 5823	RETURN LINE	1
9	PAFZZ	5306123610975	D2689	0118 1433	BOLT,MACHINE M8 X 20-LG2,5-10.9	2
10	PAFZZ		62445	0117 8750	HOSE CLIP	2
11	PAFZZ		62445	0117 5905	RUBBER HOSE	1
12	PAFZZ		62445	0223 5163	CONNECTOR	1
13	PAFZZ	5310012077206	62445	1118760	WASHER	1
14	PAFZZ	4730012604395	62445	111-9241	BOLT,FLUID PASSAGE	2
15	PAFZZ	5330121564852	D8286	A12X15,5DIN7603-CU	GASKET	4
16	PAFZZ		62445	0415 9954	LUBRICAT. OIL LINE	1
17	PAFZZ		62445	0117 4549	GROMMET	1
18	PAFZZ		D2689	0418 2519	GASKET	1
19	PAFZZ		D8246	0111 9611	WASHER,LOCK 8-FST-A4C	2
20	PAFZZ		D8286	DIN912-M8X20-8.8-A4C	SCREW,CAP,SOCKET HE	2

END OF FIGURE

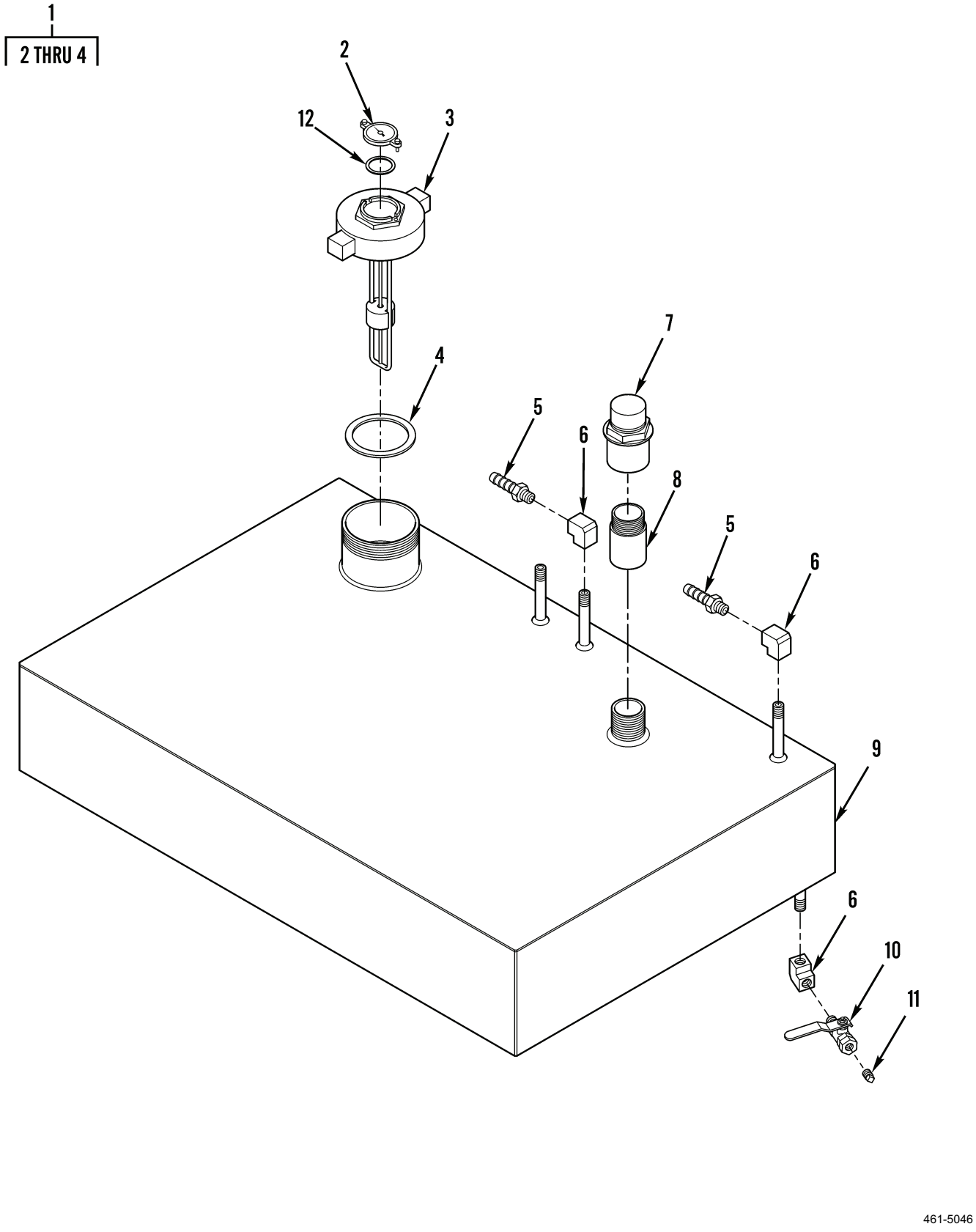
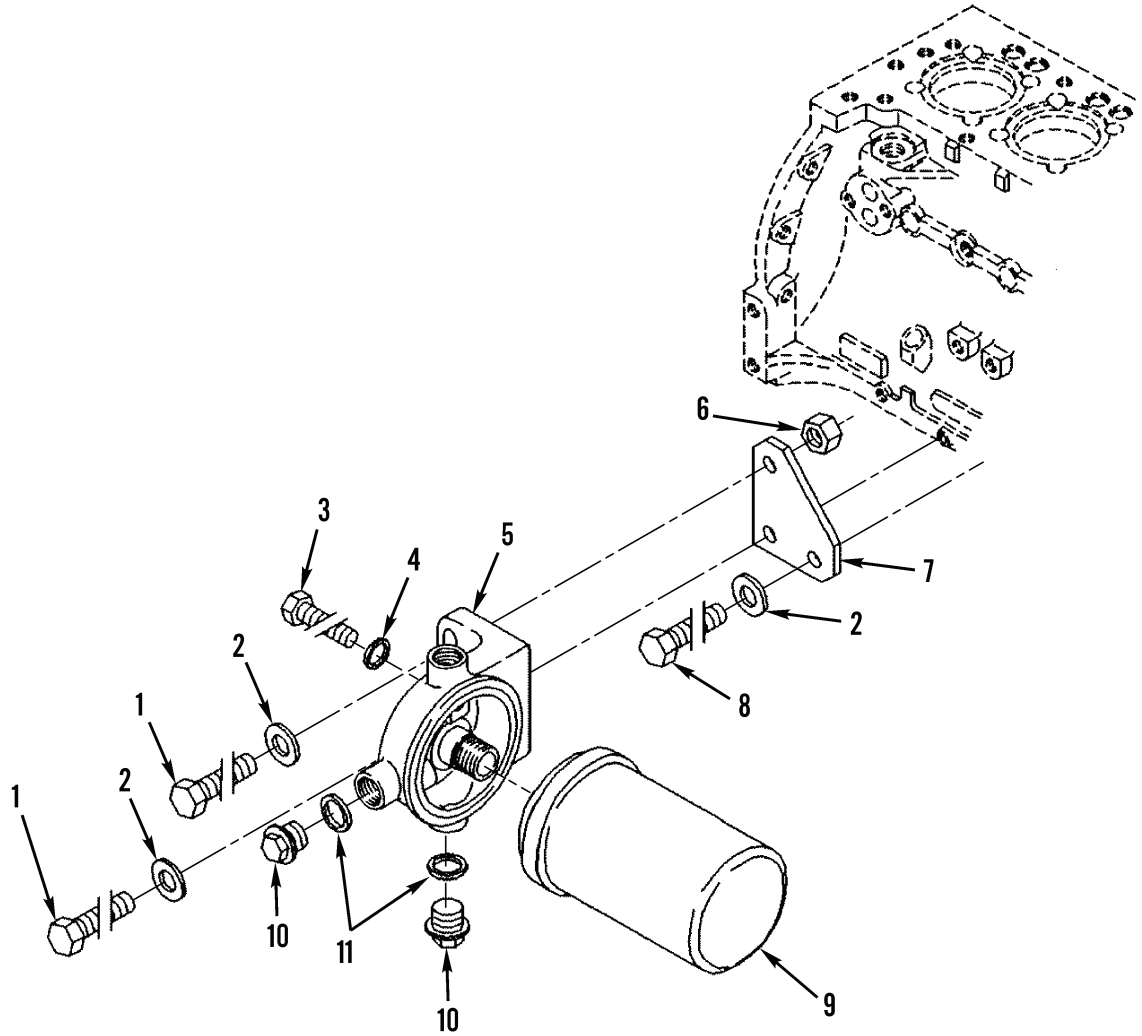


Figure 46. Fuel Tank and Related Parts

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2935 ENGINE FUEL TANK	
					FIG. 46 FUEL TANK AND RELATED PARTS	
1	PAFFF		1WB54	50401-02	FUEL CAP ASSY.....	1
2	PAFZZ		1B467	90-019-345	.GUAGE,FUEL.....	1
3	PAFZZ		1B467	90-019-319	.4" FUEL CAP.....	1
4	PAFZZ		1B467	90-019-320	.4" GASKET.....	1
5	PAFZZ		1B467	90-019-131	BARB,HOSE 3/8" X 1/4" HOSE BARB....	2
6	PAFZZ		1B467	90-019-104	ELBOW 1/4" FEMALE NPT X 1/4" FEMALE	3
7	PAFZZ		1WB54	JUS 08005	NON-METALLIC VERTIC.....	1
8	PAFZZ		1WB54	30-013-37	2" COUPLER.....	1
9	PAFZZ		1WB54	50401-01	FUEL TANK.....	1
10	PAFZZ		1B467	80-018-21	VALVE,BALL 1/4" MALE X 1/4" FEMALE.	1
11	PAFZZ		1B467	30-013-14	PLUG 1/4".....	1
12	PAFZZ		457G7	90-019-372	O-RING 1.5".....	1
					END OF FIGURE	



461-5047

Figure 47. Fuel Filter and Related Parts

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2937 ENGINE FUEL FILTER	
					FIG. 47 FUEL FILTER AND RELATED PARTS	
1	PAFZZ		62445	0114 8239	BOLT,MACHINE M8 X 30-8.8.....	2
2	PAFZZ		62445	0114 8124	WASHER,FLAT 8,4-200HV-A4C.....	3
3	PAFZZ	5305123486727	D8046	304017006034	SCREW,CAP,HEXAGON H M6 X 10-8.8....	1
4	PAHZZ		62445	1118641	O-RING.....	1
5	PAFZZ	2910121562138	D8015	1455522014	HEAD,FLUID FILTER.....	1
6	PAFZZ	5310014347272	62445	0111 2824	NUT,PLAIN,HEXAGON M8-8-A4C.....	1
7	PAFZZ		62445	0223 3310	RETAINING PLATE.....	1
8	PAFZZ		62445	0114 8230	BOLT,HEXAGON M8 X 18-8.8.....	1
9	PAFZZ		62445	0118 1917	SPIN-ON FUEL FILT.....	1
10	PAFZZ	5365121255213	D8286	DIN7604-A-M14X1, 5-ST	PLUG,MACHINE THREAD.....	2
11	PAFZZ	5331014395377	62445	1118692	O-RING.....	2
					END OF FIGURE	

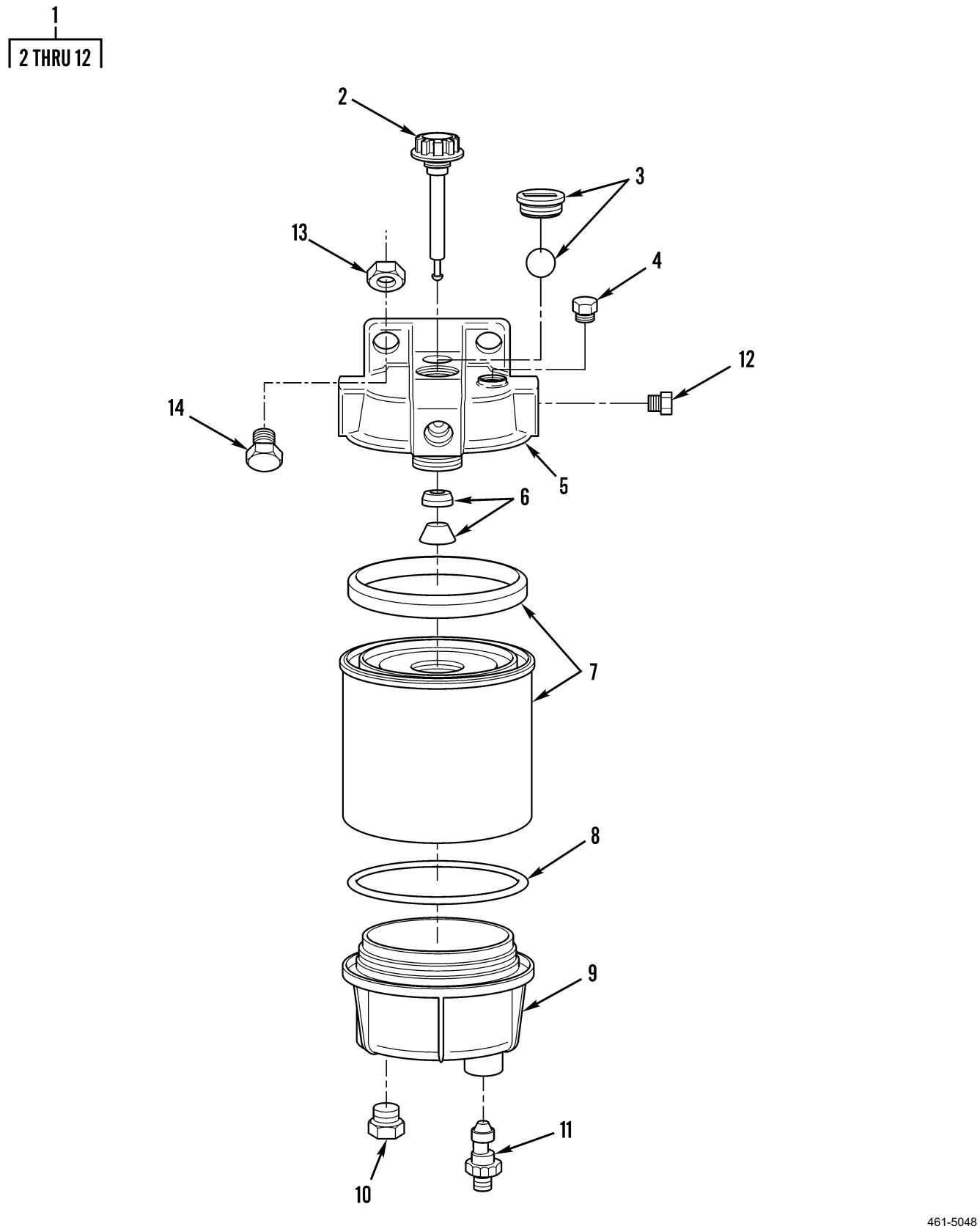


Figure 48. Water Separator/Fuel Filter

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2937 ENGINE FUEL FILTER	
					FIG. 48 WATER SEPERATOR/FUEL FILTER	
1	PAFFZ	2910014340828	55752	230R2	FILTER,FLUID.....	1
2	PAFZZ	4310012759294	55752	RK20025	.PARTS KIT,SEPARATOR.....	1
3	PAFZZ	4820013960881	55752	RK20011	.BALL,CHECK.....	1
4	PAFZZ	5305014286791	55752	RK10110	.SCREW,MACHINE.....	1
5	PAFZZ	4930015077824	55752	RK20046	.HEAD,SEPERATOR,WATE.....	1
6	PAFZZ	4310012759294	55752	RK20025	.PARTS KIT,SEPARATOR.....	1
7	PAFZZ		55752	R20P	.FILTER ELEMENT,FLUI.....	1
8	PAHZZ	5331013600944	55752	RK22244	.O-RING.....	1
9	PAFZZ	2940014353550	55752	RK22350-02	.BOWL,SEDIMENT.....	1
10	PAFZZ	5365013954744	55752	RK20126	.PLUG,MACHINE THREAD 1/2"-20 SAE THREADS.....	1
11	PAFZZ	4820014746910	55752	RK30476	.DISK,VALVE.....	1
12	PAFZZ	5365014338951	55752	RK12041	.PLUG,MACHINE THREAD 1/4"-18 NPTF THREADS.....	1
13	PAFZZ	5310007320558	96906	MS51967-8	NUT,PLAIN,HEXAGON LOCK NUT.....	2
14	PAFZZ	5305000680511	80204	B1821BH038C125N	SCREW,CAP,HEXAGON H 3/8-16 X 1 1/4"	2

END OF FIGURE

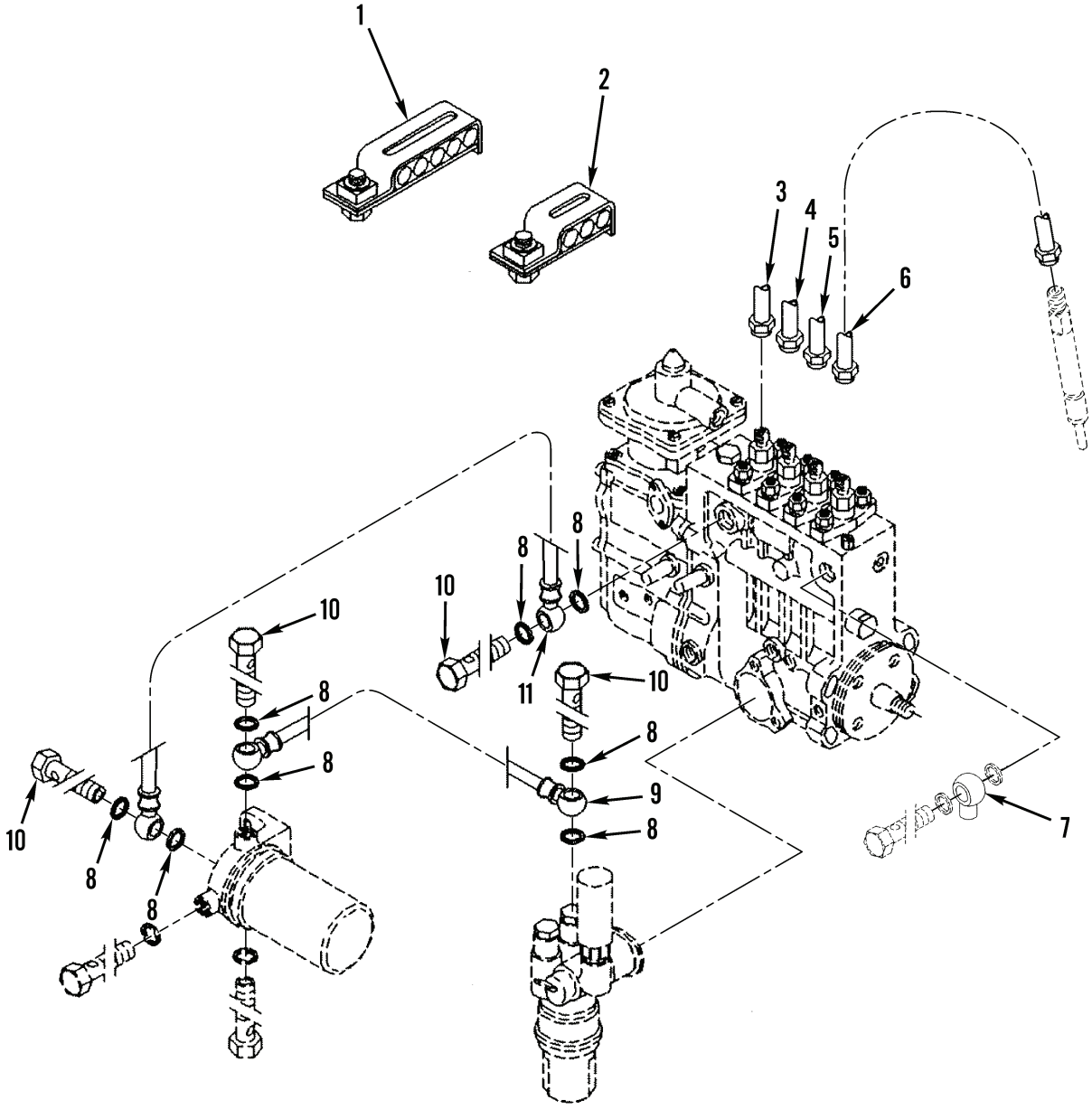


Figure 49. Fuel Lines and Fittings (Sheet 1 of 3)

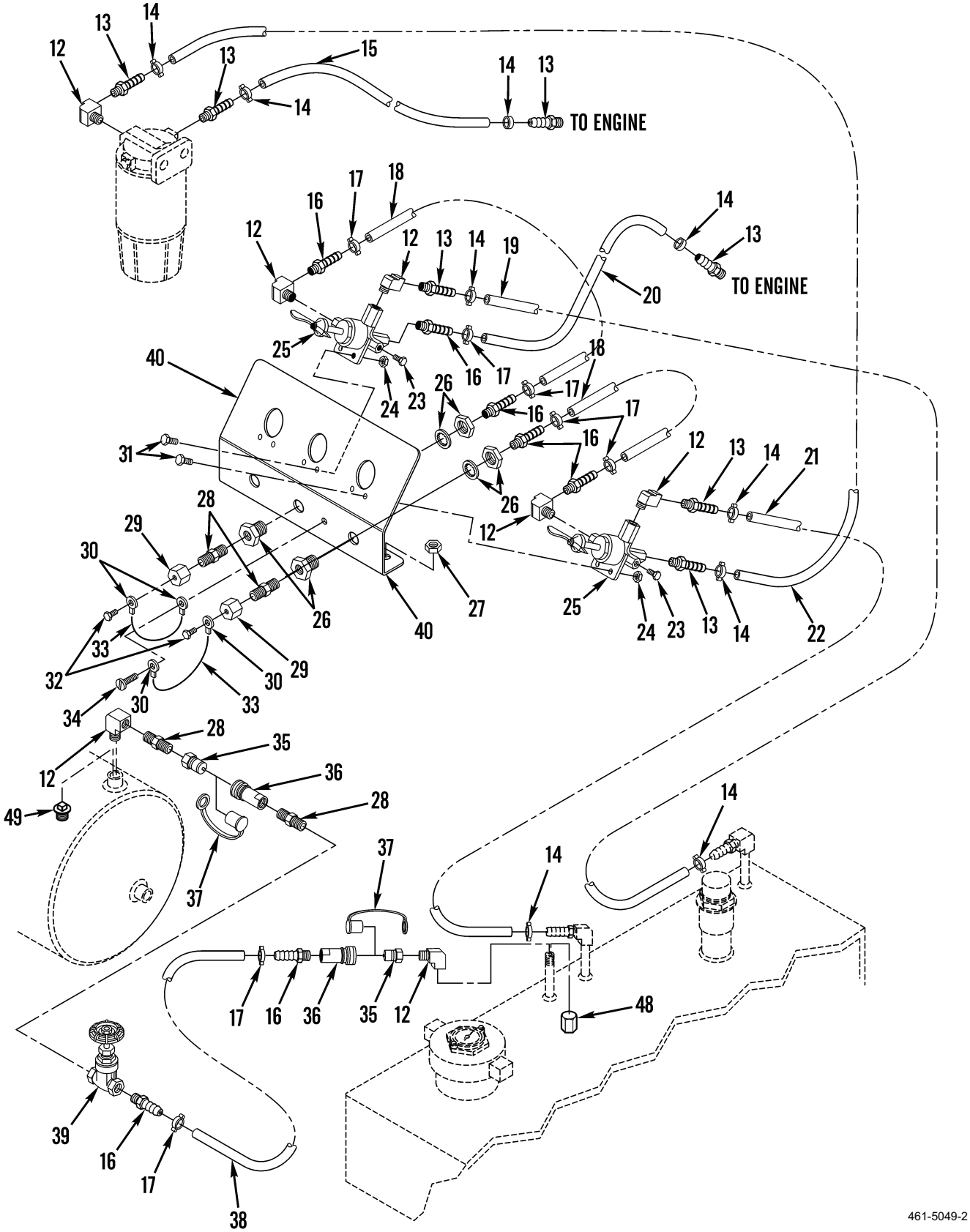
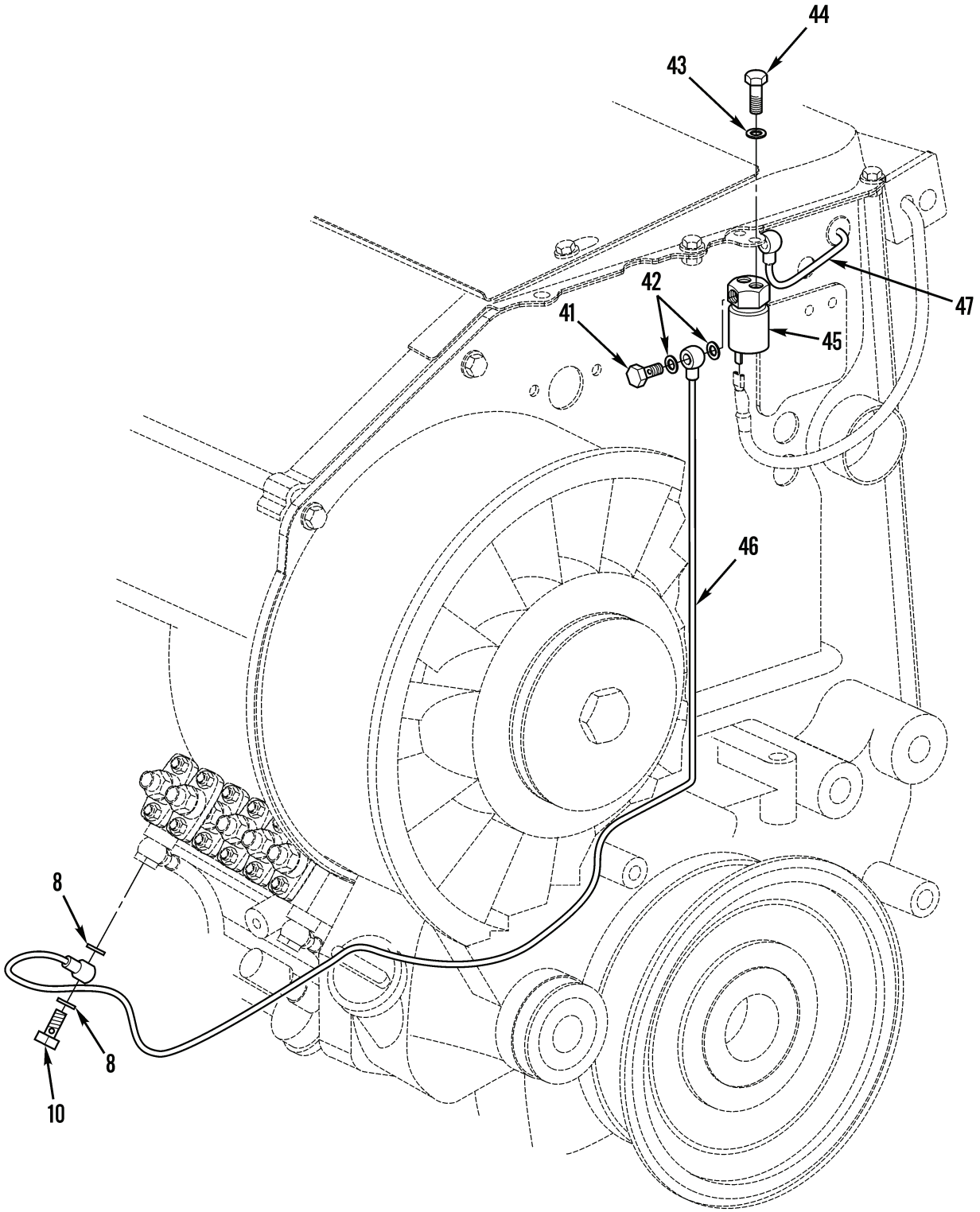


Figure 49. Fuel Lines and Fittings (Sheet 2 of 3)



461-5049-3

Figure 49. Fuel Lines and Fittings (Sheet 3 of 3)

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2938 ENGINE PRIMING SYSTEM, LINES, AND PUMPS	
					FIG. 49 FUEL LINES AND FITTINGS	
1	PAFZZ		62445	0117 6485	PIPE CLAMP.....	1
2	PAFZZ		C3734	H3220-D3X6	CLAMP,LOOP.....	1
3	PAFZZ		62445	0423 5411	HIGH PRESSURE PIPE.....	1
4	PAFZZ		62445	0423 5412	HIGH PRESSURE PIPE.....	1
5	PAFZZ		62445	0423 5413	HIGH PRESSURE PIPE.....	1
6	PAFZZ		62445	0423 5414	HIGH PRESSURE PIPE.....	1
7	PAFZZ		D2689	0129 0579	CONNECTOR,MULTIPLE,.....	1
8	PAFZZ	5331014395377	62445	1118692	O-RING.....	8
9	PAFZZ	4720011957055	62445	1173630	HOSE ASSEMBLY,NONME.....	1
10	PAFZZ	4730014377482	62445	0111 9246	BOLT,FLUID PASSAGE.....	4
11	PAFZZ		62445	0117 4016	HOSE ASSEMBLY.....	1
12	PAFZZ	4730012406108	93061	2202PA-4-4	ELBOW,PIPE 1/4" MALE NPT X 1/4" FEMALE NPT STREET ELBOW (3400X 4)... UOC:BFL	8
13	PAFZZ		1B467	90-019-131	BARB,HOSE 3/8" X 1/4" HOSE BARB....	10
14	PAFZZ		25281	1518	CLAMP,HOSE.....	12
15	MFFZZ		1WB54	H20106-26	HOSE,NONMETALLIC MAKE FROM BULK P/N H20106 CUT TO 26 INCHES.....	1
16	PAOZZ		1B467	30-013-15	BARB,HOSE 1/4" NPT MALE X 1/4"..... UOC:BFL	8
17	PAOZZ		1B467	30-013-28	CLAMP,HOSE 1/4" ID HOSE..... UOC:BFL	8
18	MFFZZ		1WB54	H20104-12	HOSE,NONMETALLIC MAKE FROM BULK P/N H20104 CUT TO 12 INCHES.....	3
19	MFFZZ		1WB54	H20106-26	HOSE,NONMETALLIC MAKE FROM BULK P/N H20106 CUT TO 26 INCHES.....	1
20	MFFZZ		1WB54	H20104-12	HOSE,NONMETALLIC MAKE FROM BULK P/N H20104 CUT TO 12 INCHES.....	1
21	MFFZZ		1WB54	H20106-13	HOSE,NONMETALLIC MAKE FROM BULK P/N H20106 CUT TO 13 INCHES.....	1
22	MFFZZ		1WB54	H20106-42	HOSE,NONMETALLIC MAKE FROM BULK P/N H20106 CUT TO 42 INCHES.....	1
23	PAFZZ	4730000127951	01276	2082-4B	PLUG,PIPE.....	6
24	PAFZZ	5310014161851	39428	91831A029	NUT,SELF-LOCKING,HE.....	8
25	PAFZZ		1B467	90-019-55	VALVE,FOUR WAY 4 WAY 1/4" VALVE....	3
26	PAFZZ		1B467	1344	FITTING,BULKHEAD 1/4" FEMALE NPT X 1/4" FEMALE.....	2
27	PAFZZ	5310012399412	39428	90101A007	NUT,PLAIN,HEXAGON.....	8
28	PAFZZ	4730002778289	81343	4-4 130137B	NIPPLE,PIPE 1/4" MALE X 1/4" MALE.. UOC:BFL	2
29	PAFZZ		1B467	30-013-16	CAP,PIPE 1/4" FEMALE..... UOC:BWT	1
30	PAFZZ		1WB54	90-019-235	TERMINAL,RING.....	4
31	PAFZZ	5305014829880	39428	92240A542	SCREW,CAP,HEXAGON H.....	10

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
32	PAFZZ		39428	91772A144	SCREW,MACHINE.....	2
33	PAFZZ		1B467	50402-09	CABLE,WIRE.....	2
34	PAFZZ		39428	91792A148	SCREW,MACHINE.....	1
35	PAFZZ		1B467	90-019-304	QUICK DISCONNECT FI..... UOC:BFL	2
36	PAFZZ		1B467	90-019-303	QUICK DISCONNECT FI..... UOC:BFL	2
37	PAFZZ		1B467	72PDC-3	COVER,DUST..... UOC:BFL	2
38	MFFZZ		1WB54	H20104-49	HOSE,NONMETALLIC MAKE FROM BULK P/N H20104 CUT TO 45 INCHES..... UOC:BFL	1
39	PAFZZ		1B467	80-018-22	VALVE,GATE 1/4" FEMALE NPT X 1/4" FEMALE..... UOC:BFL	1
40	PAFZZ		1B467	90-019-254	FUEL SELECTOR PLATE.....	1
41	PAFZZ	4730121588862	D8286	DIN7643-6	BOLT,FLUID PASSAGE.....	1
42	PAFZZ	5330121564518	D8286	A10X14DIN7603-CU	GASKET.....	2
43	PAFZZ	5310121848509	D8286	DIN125-A6.4-140HV-A3P	WASHER,FLAT.....	2
44	PAFZZ	5305121419839	D8286	DIN933-M6X10-8.8-A2P	SCREW,CAP,HEXAGON H.....	2
45	PAFZZ		62445	117 9367	SOLENOID.....	1
46	PAFZZ		62445	423 0512	TUBE ASSEMBLY.....	1
47	PAFZZ		62445	415 2076	TUBE ASSEMBLY.....	1
48	PAFZZ		1WB54	30-013-16	PLUG,PIPE 1/4" NPT..... UOC:BWT	1
49	PAFZZ		1WB54	30-013-14	CAP,PIPE 1/4" NPT..... UOC:BWT	1

END OF FIGURE

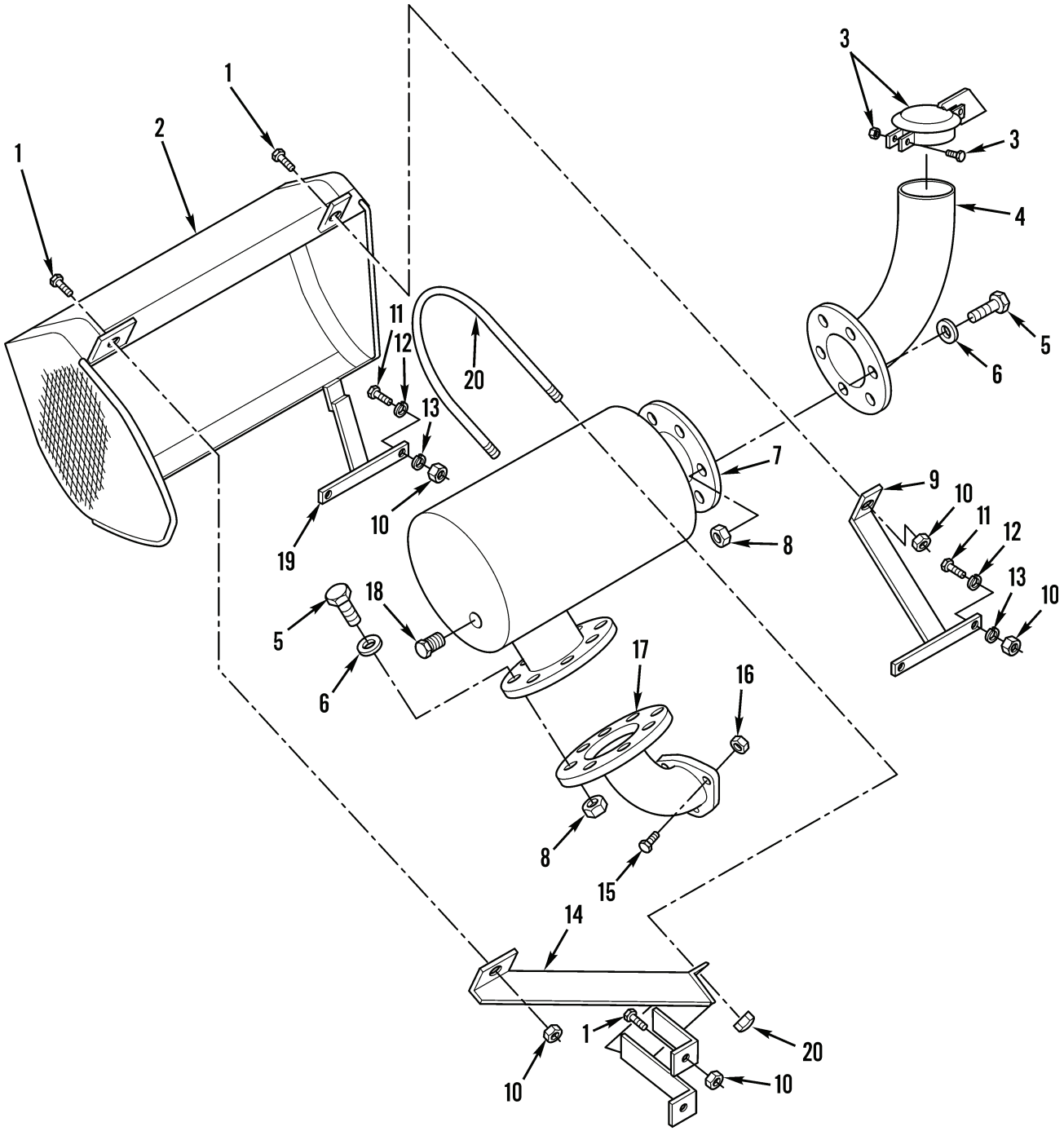


Figure 50. Muffler

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2941 ENGINE MUFFLER, EXHAUST, AND TAIL PIPES	
					FIG. 50 MUFFLER	
1	PAFZZ	5306011939197	39428	91247A628	BOLT,MACHINE.....	5
2	PAFZZ		1WB54	402-06	MUFFLER GUARD SCREE.....	1
3	PAFZZ		1WB54	402-04	4" RAIN CAP.....	1
4	PAFZZ		1WB54	90-019-196	4" STEEL ELBOW.....	1
5	PAFZZ		39428	92865A802	BOLT,MACHINE.....	16
6	PAFZZ	5310013965295	39428	91104A035	WASHER,LOCK 5/8".....	16
7	PAFZZ		1WB54	402-01	SILENCER SPARK ARRE.....	1
8	PAFZZ	5310004025856	08136	54-1048	NUT,PLAIN,HEXAGON.....	16
9	PAFZZ		1WB54	402-09	TOP MUFFLER BRACKET.....	1
10	PAFZZ	5310015353265	39428	95615A140	NUT,SELF-LOCKING,HE.....	10
11	PAFZZ		3A054	91280A540	METRIC 8.8 ZINC-PLT.....	5
12	PAFZZ	5310015022934	39428	91102A760	WASHER,LOCK.....	5
13	PAFZZ	5310015023536	3A054	98032A514	WASHER,FLAT.....	5
14	PAFZZ		1WB54	402-08	MAIN MUFFLER BRACKE.....	1
15	PAFZZ		1JN64	114-8458	12MM X 55MM C/S BOL.....	3
16	PAFZZ		1JN64	113-6454	12MM C/S HEX NUT.....	3
17	PAFZZ		1WB54	402-03	3" STEEL ELBOW.....	1
18	PAFZZ		39428	92865A264	SCREW,CAP,HEXAGON H 3/8" X 1.00"...	1
19	PAFZZ		1WB54	402-05	BOTTOM MUFFLER BRAC.....	1
20	PAFZZ		3A054	8862T38	10" U BOLT INCLUDES NUTS.....	1
					END OF FIGURE	

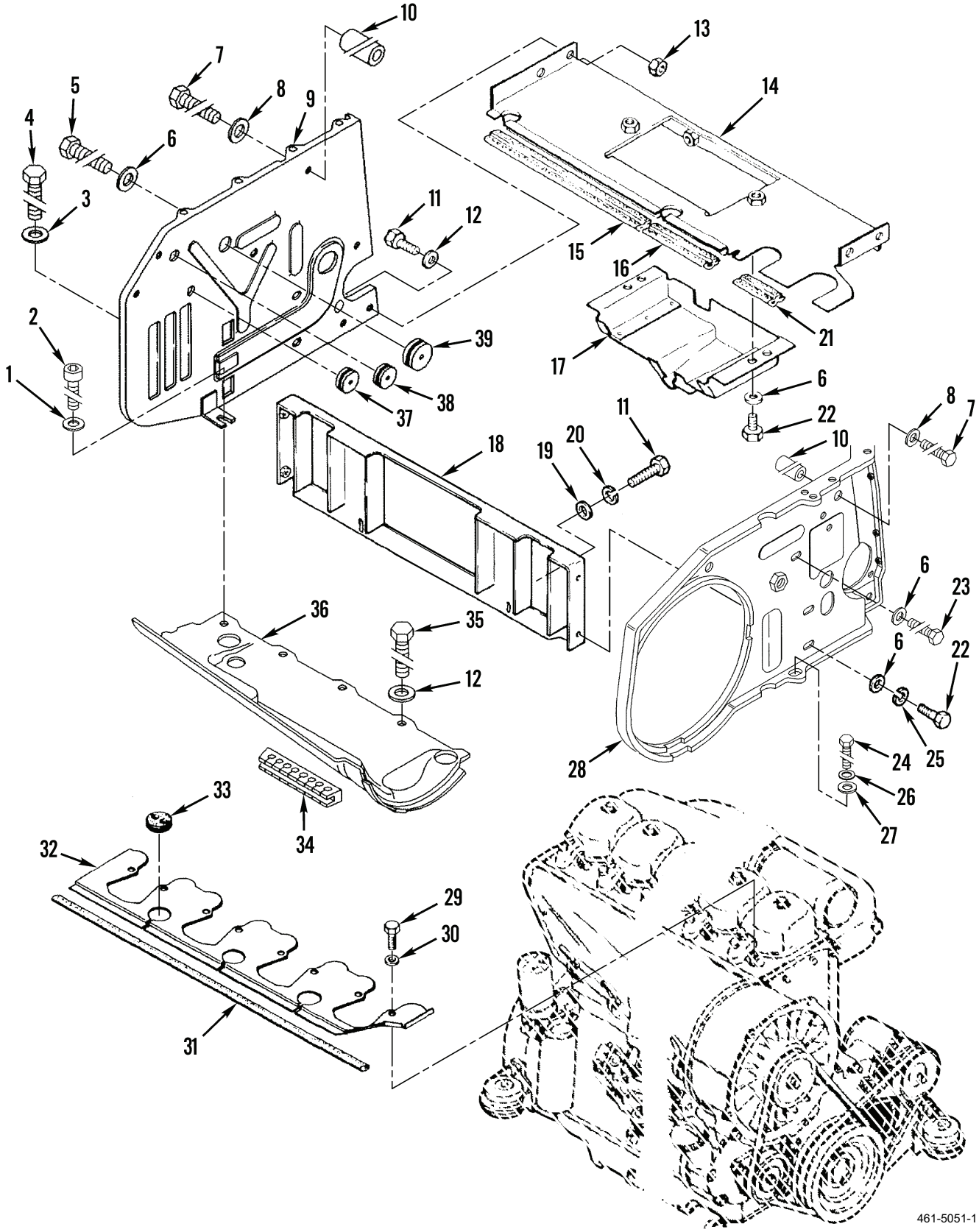
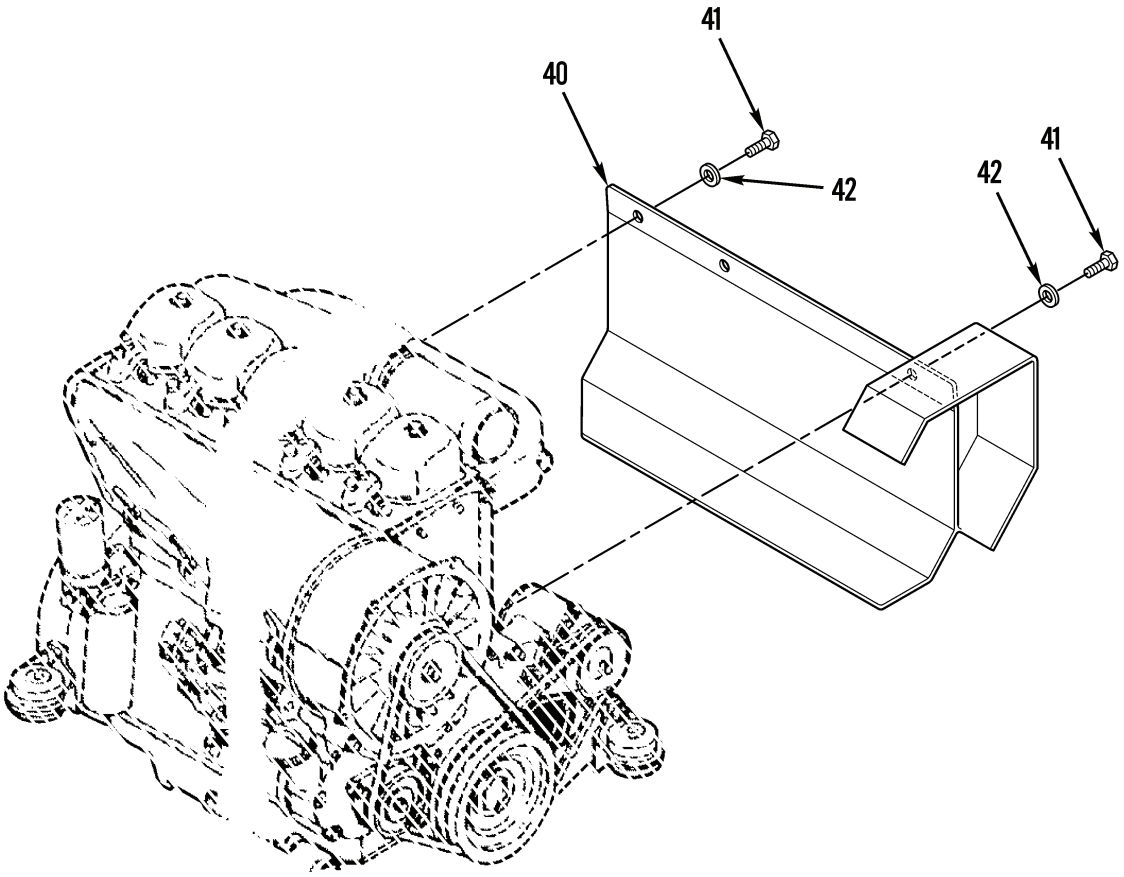


Figure 51. Air Cowling, Duct Walls, and EMI Shield (Sheet 1 of 2)



461-5051-2

Figure 51. Air Cowling, Duct Walls, and EMI Shield (Sheet 2 of 2)

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2952 ENGINE COWLING DEFLECTORS, AIR DUCTS, AND SHROUDS	
					FIG. 51 AIR COWLING, DUCT WALLS, AND EMI SHIELD	
1	PAFZZ	5310121656886	D2689	0240 4201	WASHER,FLAT.....	1
2	PAFZZ		62445	0114 4541	SCREW,TORX HEAD M8 X 16-8.8.....	1
3	PAFZZ		62445	0114 8124	WASHER,FLAT 8,4-200HV-A4C.....	1
4	PAFZZ		D8286	DIN933-M8X16-8.8 -A4C	SCREW,CAP,HEXAGON H M8 X 16-8.8....	1
5	PAFZZ		62445	0114 8199	BOLT,HEXAGON M6 X 12-8.8.....	1
6	PAFZZ	5310014351729	62445	0121 5850	WASHER,FLAT.....	8
7	PAFZZ		62445	0111 2366	BOLT,HEXAGON M8 X 60-8.8.....	2
8	PAFZZ		62445	0223 0053	WASHER,FLAT.....	2
9	PAFZZ		62445	0415 9630	AIR DUCT REAR WALL.....	1
10	PAFZZ		62445	0224 3621	BUSH.....	2
11	PAFZZ		D8286	DIN933-M8X16-8.8 -A4C	SCREW,CAP,HEXAGON H M8 X 16-8.8....	7
12	PAFZZ	5310121494353	D8286	DIN125-A8,4-140H V-A3P	WASHER,FLAT A8.....	7
13	PAFZZ	5310014347272	62445	0111 2824	NUT,PLAIN,HEXAGON M8-8-A4C.....	4
14	PAFZZ		62445	0415 9979	STRIP.....	1
15	PAFZZ		62445	0140 4807	CLAMPING SECTION.....	1
16	PAFZZ		62445	0140 4806	CLAMPING SECTION.....	1
17	PAFZZ		62445	0415 3047	CAP.....	1
18	PAFZZ		62445	0415 6641	COOLING AIR BAFFLE.....	1
19	PAFZZ	5310014417091	62445	0117 2303	WASHER,FLAT 8, 4 X 15 X 3.....	3
20	PAFZZ	5310014401417	62445	01102799	WASHER,LOCK A8-FST-A4C.....	3
21	PAFZZ		62445	0140 4327	CLAMPING SECTION.....	1
22	PAFZZ	5305121419839	D8286	DIN933-M6X10-8.8 -A2P	SCREW,CAP,HEXAGON H M6 X 10-8.8....	6
23	PAFZZ		36719	111 2240	SCREW,CAP,HEXAGON H M6 X 12-8.8....	1
24	PAFZZ		62445	0114 3878	BOLT,HEXAGON M8 X 14-8.8.....	1
25	PAFZZ	5310014401416	62445	01102797	WASHER,LOCK A6-FST-A4C.....	4
26	PAFZZ	5310121428173	D8286	DIN137-B8-FST-A3 P	WASHER,SPRING TENSI B8-FST-A4C.....	1
27	PAFZZ		62445	0113 2562	WASHER,FLAT A8.....	1
28	PAFZZ		62445	0423 2800	AIR DUCT WALL.....	1
29	PAFZZ		D2689	01103316ES8920-0 7	SCREW,CAP,HEXAGON H M6 X 16-8.8....	8
30	PAFZZ	5310121848509	D8286	DIN125-A6,4-140H V-A3P	WASHER,LOCKING A6.....	8
31	PAFZZ		62445	0140 2722	CLAMPING SECTION.....	1
32	PAFZZ		62445	0415 1882	GUIDE RAIL.....	1
33	PAFZZ	5325011925822	62445	3361809	GROMMET,NONMETALLIC.....	3
34	PAFZZ	5330011918167	62445	2101802	SEAL,RUBBER SPECIAL.....	1
35	PAFZZ	5305011583207	15434	C0800205200	SCREW,CAP,HEXAGON H M8 X 12-8.8....	3
36	PAFZZ		62445	0415 9632	AIR GUIDE PART.....	1

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
37	PAFZZ	5325011949154	62445	1167425	GROMMET,NONMETALLIC.....	1
38	PAFZZ	5325121670708	D2689	0116 3944	GROMMET,NONMETALLIC.....	1
39	PAFZZ	5325012737620	36719	117-3066	GROMMET,NONMETALLIC.....	1
41	PAFZZ	5306002264827	80204	B1821BH031C100N	BOLT,MACHINE 5/16-18 X 1.0.....	3
42	PAFZZ	5310000814219	96906	MS27183-12	WASHER,FLAT 5/16.....	3

END OF FIGURE

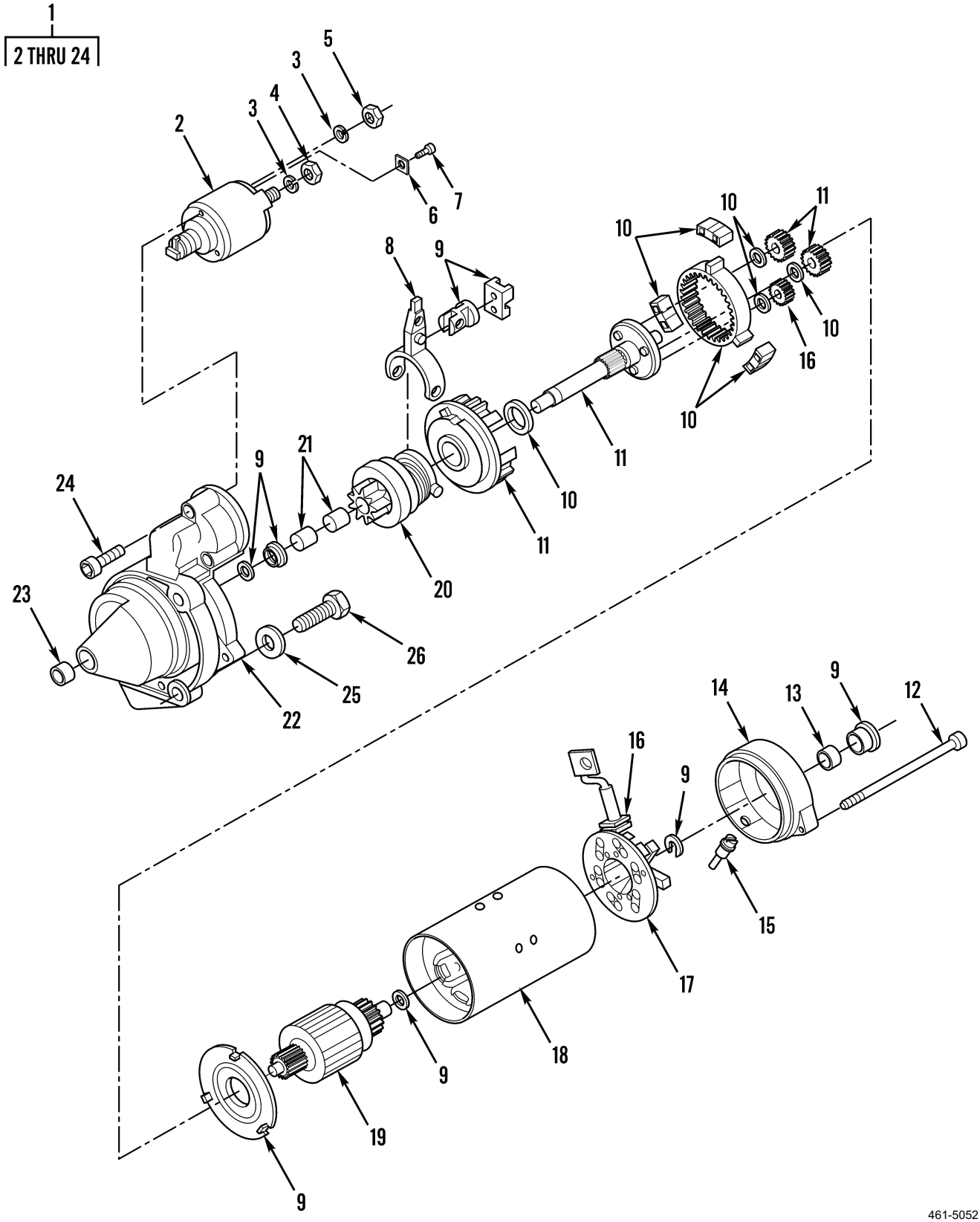


Figure 52. Starter

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2963 STARTER, SOLENOIDS, CIRCUITS BREAKERS, WIRING, AND SWITCHES	
					FIG. 52 STARTER	
1	PAFFZ	2920015180947	53867	0 001 231 005	MOTOR,ENGINE STARTE.....	1
2	PAFZZ		53867	2 339 402 133	.SOLENOID,ELECTRICAL.....	1
3	PAFZZ	5310015176906	53867	2 918 740 008	.WASHER,SPRING TENSI.....	2
4	PAFZZ	5310011741491	S3465	4537769-629	.NUT,PLAIN,HEXAGON.....	1
5	PAFZZ	5310015176900	53867	2 915 011 039	.NUT,PLAIN,HEXAGON.....	1
6	PAFZZ		53867	1901321209	.TERMINAL,LUG.....	1
7	PAFZZ	5305218984493	98883	B183998267	.SCREW,MACHINE.....	1
8	PAFZZ	2920015180943	53867	9 003 331 931	.FORK LEVER.....	1
9	PAFZZ	2920123592999	D8015	9003337010	.PARTS KIT,ELECTRICA.....	1
10	PAFZZ	3020015176980	53867	9 003 337 009	.GEAR SET,SPUR,MATCH.....	1
11	PAFZZ	3020015176987	53867	9 001 336 244	.GEAR CLUSTER.....	1
12	PAFZZ	5305015176913	53867	9 001 333 446	.SCREW,MACHINE.....	2
13	PAFZZ	5365015172850	53867	9 003 330 317	.BUSHING,MACHINE THR.....	1
14	PAFZZ	2920015179438	53867	6 033 AD0 183	.END BELL,ELECTRICAL.....	1
15	PAFZZ	5365015173346	53867	1 000 306 002	.BUSHING,MACHINE THR.....	1
16	PAFZZ	5977015178945	53867	6 033 AD0 130	.HOLDER,ELECTRICAL C.....	1
17	PAFZZ	5977015180284	53867	6 033 AD0 151	.HOLDER,ELECTRICAL C.....	1
18	PAFZZ	2920015180975	53867	6 033 AD0 128	.STATOR ASSEMBLY,IGN.....	1
19	PAFZZ	2920015180395	53867	9 003 334 039	.ARMATURE,IGNITION.....	1
20	PAFZZ	2920015180949	53867	9 002 336 236	.DRIVE,ENGINE,ELECTR.....	1
21	PAFZZ	5365015172849	53867	2 000 310 002	.BUSHING,MACHINE THR.....	1
22	PAFZZ	2920015179265	53867	6 033 AD0 082	.DRIVE END SHIELD.....	1
23	PAFZZ	3120012737507	53867	2 000 301 000	.BUSHING,SLEEVE.....	1
24	PAFZZ	5305015176910	53867	9 001 333 448	.SCREW,MACHINE.....	2
25	PAFZZ		62445	1107105	WASHER,FLAT A10.....	3
26	PAFZZ		D8286	DIN933-M10X25-8.8	SCREW,CAP,HEXAGON H.....	3
					END OF FIGURE	

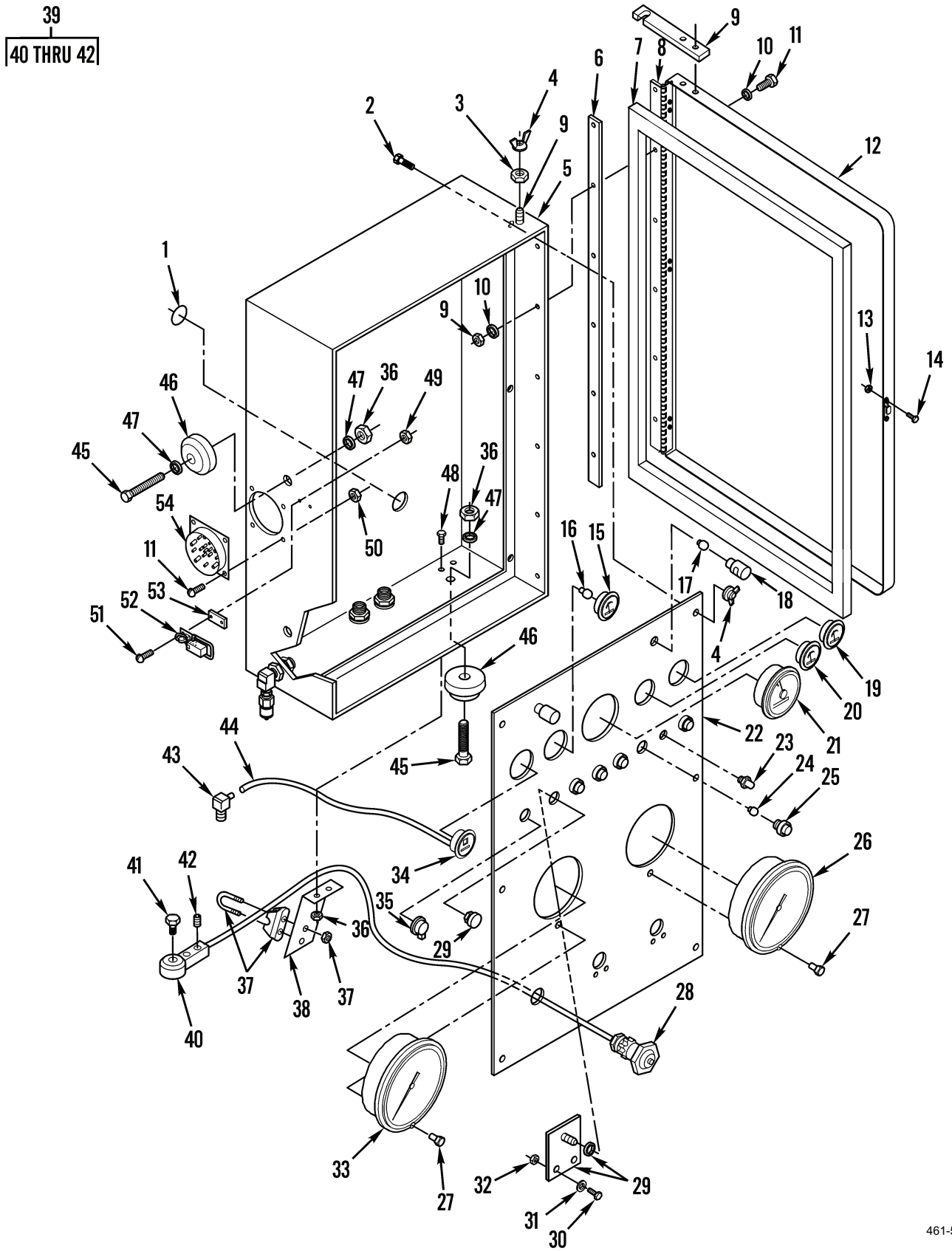


Figure 53. Control Panel

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2967 INSTRUMENT PANEL	
					FIG. 53 CONTROL PANEL	
1	PAFZZ		1WB54	50301-07	GROMMET,NONMETALLIC.....	1
2	PAFZZ		39428	92240A539	SCREW,CAP,HEXAGON H.....	6
3	PAFZZ	5310014161851	39428	91831A029	NUT,SELF-LOCKING,HE.....	1
4	PAFZZ	5310015011403	39428	92001A321	NUT,PLAIN,WING.....	7
5	PAFZZ		1WB54	50301-05	CONTROL PANEL BOX.....	1
6	PAFZZ		1WB54	50301-10	HINGE SPACER.....	1
7	PAFZZ		1WB54	50301-04	WEATHERSTRIPPING.....	1
8	PAFZZ		1WB54	50301-09	DOOR HINGE.....	1
9	PAFZZ		1WB54	50301-12	DOOR RETAINER BRACK.....	1
10	PAFZZ	5310015462651	39428	98017A625	WASHER,FLAT 8/32.....	12
11	PAFZZ		39428	91772A194	SCREW,MACHINE.....	10
12	PAFZZ		1WB54	50301-08	CONTROL PANEL DOOR.....	1
13	PAFZZ		3A054	91855A271	NUT,PLAIN,HEXAGON.....	2
14	PAFZZ		3A054	91792A146	SCREW,MACHINE.....	2
15	PAFZZ		2K743	R8666	AMPMETER.....	1
16	PAFZZ		1WB54	653	LAMP,INCANDESCENT 24 VOLT.....	1
17	PAFZZ		1WB54	623	24 VOLT LIGHT BULB.....	2
18	PAFZZ		1WB54	20-012-04	PANEL LIGHT FIXTURE.....	2
19	PAFZZ		1WB54	40-014-30	OIL PRESSURE GUAGE.....	1
20	PAFZZ		1WB54	40-014-23	TEMPERATURE GUAGE.....	1
21	PAFZZ		1WB54	ATHA-30-24-A	TACHOMETER.....	1
22	PAFZZ		1WB54	50302-02	CONTROL PANEL GAUGE.....	1
23	PAFZZ		2K743	9003	OIL PRESSURE BYPASS.....	1
24	PAFZZ		1WB54	356	24 VOLT LIGHT BULB.....	5
25	PAFZZ		2K743	PL-118-RC001	WARNING LIGHT.....	5
26	PAFZZ		59105	42060721	PRESSURE GAUGE.....	1
27	PAFZZ		59105	735-2	SETSCREW SNUBBER.....	2
28	PAFZZ		2K743	194-33090-0042	THROTTLE CABLE.....	1
29	PAFZZ		1WB51	50302-03	SWITCH ASSEMBLY BLACKOUT.....	1
30	PAFZZ	5305000546654	96906	MS51957-30	SCREW,MACHINE 6-32 X 1/2".....	2
31	PAFZZ		39428	90126A509	WASHER,FLAT 6-32".....	2
32	PAFZZ		1WB54	90-019-412	SPACER,SLEEVE.....	2
33	PAFZZ		59105	42062521	SUCTION GAUGE.....	1
34	PAFZZ	6680014750101	59150	168501-00225	INDICATOR,LIQUID QU.....	1
35	PAFZZ		2K743	956-4124	IGNITION SWITCH.....	1
36	PAFZZ	5310015353265	39428	95615A140	NUT,SELF-LOCKING,HE.....	5
37	PAFZZ		058D1	4DV35	THROTTLE CABLE CLAM INCLUDES NUTS..	1
38	PAFZZ		1WB54	40105-01	THROTTLE CABLE BRAC.....	1
39	PAFFF		1WB54	40102-08	THROTTLE CABLE BALL.....	1
40	PAFZZ		1WB55	0304677	.BALL JOINT (0304677.....	1
41	PAFZZ		1WB57	DEU1112264	.RETAINER BOLT.....	1
42	PAFZZ		1WB56	0304746	.SET SCREW.....	2
43	PAFZZ		1B467	1070 X 4	90 DEGREE ELBOW 1/8" HOSE BARB X 1/4" NPT.....	1
44	PAFZZ		1B647	PT24044BK-1000	HOSE,AIR FILTER.....	1

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
45	PAFZZ	5305000712071	80204	B1821BH050C200N	SCREW,CAP,HEXAGON H.....	3
46	PAFZZ		1WB54	90-019-229	SHOCK MOUNT.....	3
47	PAFZZ	5310015023536	3A054	98032A514	WASHER,FLAT.....	6
48	PAFZZ	5305015294401	2V507	92865A628	SCREW,CAP,HEXAGON H.....	2
49	PAFZZ		39428	91841A007	NUT,PLAIN,HEXAGON.....	2
50	PAFZZ	5310013592589	39428	91831A009	NUT,SELF-LOCKING,HE 8/32.....	10
51	PAFZZ		39428	91792A150	SCREW,MACHINE.....	2
52	PAFZZ		3A054	1590A45	DRAW LATCH.....	1
53	PAFZZ		1WB54	50301-11	LATCH SPACER.....	1
54	PAFZZ		96906	MS3452W36-14P	CONNECTOR,RECEPTACL.....	1

END OF FIGURE

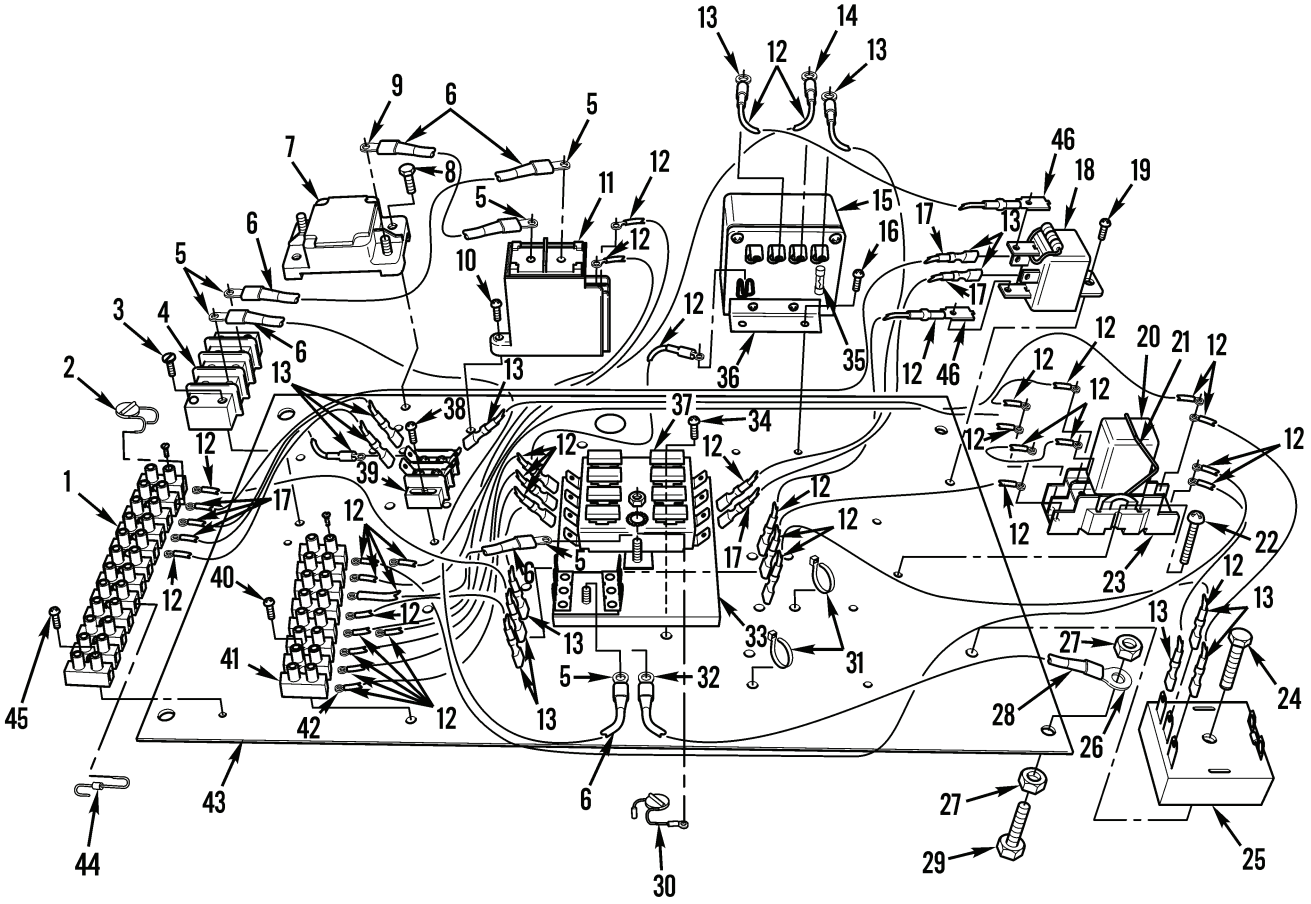
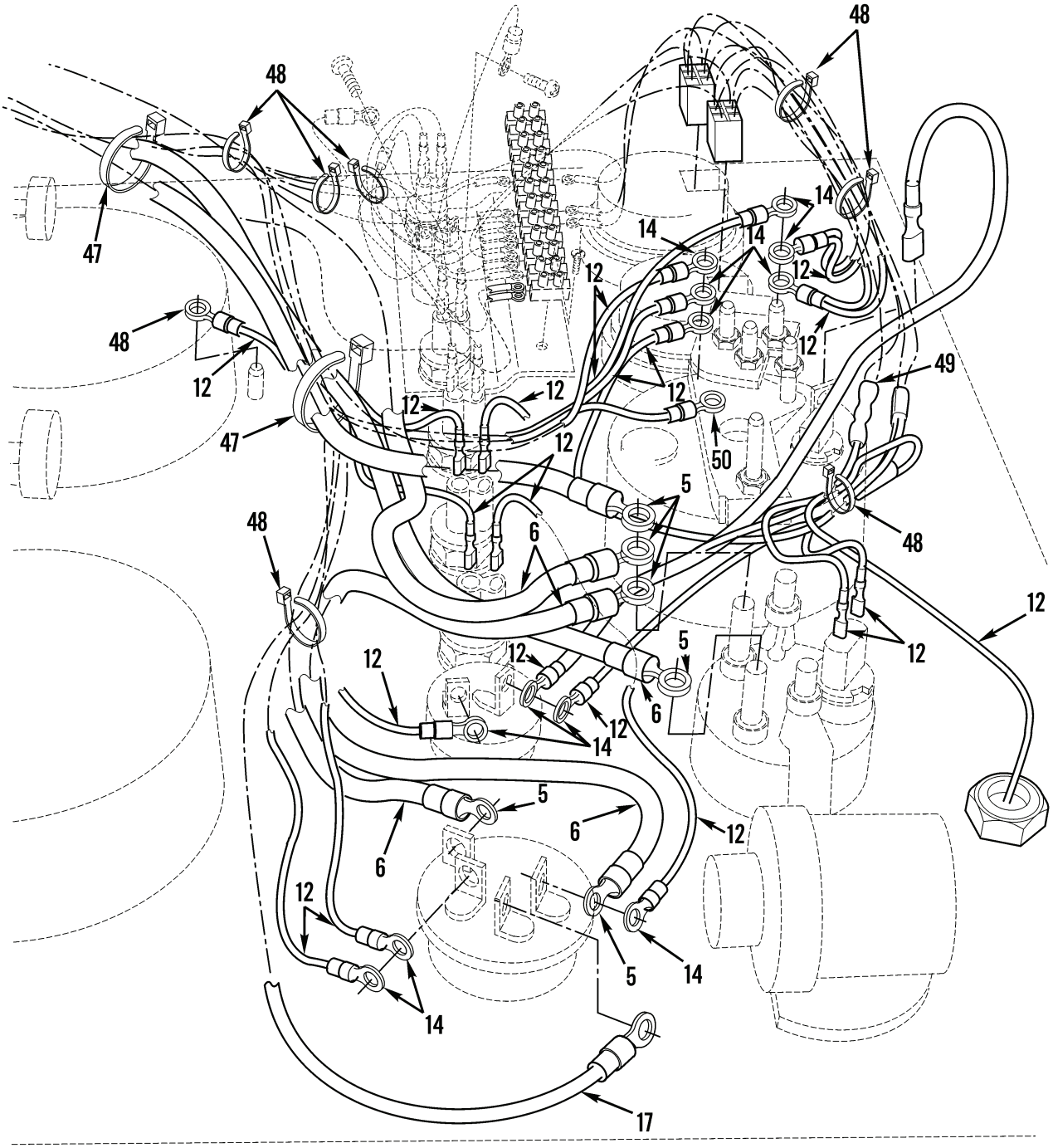


Figure 54. Control Panel Wiring (Sheet 1 of 2)



461-5054-2

Figure 54. Control Panel Wiring (Sheet 2 of 2)

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 2968 SWITCHES, CIRCUIT BREAKERS, AND FUSES	
					FIG. 54 CONTROL PANEL WIRING	
1	PAFZZ		1WB54	47160	TERMINAL BLOCK LARGE,12 CONNECTION BLOCK #1.....	2
2	PAFZZ		1WB54	6A10DICT-ND	DIODE.....	1
3	PAFZZ	5305014977834	39428	91772A829	SCREW,MACHINE.....	2
4	PAFZZ		1WB54	602.3	TERMINAL BLOCK 3 GANG, BLOCK # 2...	1
5	PAFZZ		2K743	7113K242	RING,TERMINAL.....	5
6	MFFZZ		81348	JC30-AR	WIRE,ELECTRICAL MAKE FROM BULK P/N J-C-30USE06CE1/10SRSJO CUT FOR FIT..	V
7	PAFZZ		58961	46933	HIGH AMP FUSE 80 AMP.....	1
8	PAFZZ		3A054	92240A105	BOLT,MACHINE.....	2
9	PAFZZ	5940001141305	81343	MS25036-116	TERMINAL,LUG 8 GAUGE,1/4" STUD.....	5
10	PAFZZ	5305000593661	2V507	91772A831	SCREW,MACHINE.....	8
11	PAFZZ		1WB54	Z1611-N	PREHEAT RELAY.....	1
12	MFFZZ		07909	A62802-01-AR	WIRE,ELECTRICAL MAKE FROM BULK P/N A62802-01-AR, CUT TO FIT.....	V
13	PAFZZ		1WB54	964205	TERMINAL LUG 16-14 PUSH ON TERMINAL,.250.....	22
14	PAFZZ	5940001434774	81343	MS25036-153	TERMINAL,LUG 16-14,8 STUD.....	13
15	PAFZZ		1WB54	760A-30-24	STOP BOX.....	1
16	PAFZZ		39428	91772A190	SCREW,MACHINE.....	2
17	MFFZZ		81349	M16878/1BKE3-AR	WIRE,ELECTRICAL MAKE FROM BULK P/N M16878/1BKE3-AR, CUT TO FIT.....	V
18	PAFZZ		1WB54	AZ979-1A-24DR	RELAY.....	1
19	PAFZZ		39428	91772A825	SCREW,MACHINE.....	1
20	PAFZZ		1WB54	814-3098	POWER RELAY.....	1
21	PAFZZ		1WB54	814-0198	POWER RELAY SPRING.....	1
22	PAFZZ		3A054	91772A199	SCREW,MACHINE.....	2
23	PAFZZ		25795	2A582	SOCKET,PLUG-IN ELEC.....	1
24	PAFZZ		39428	92240A108	SCREW,CAP,HEXAGON H.....	1
25	PAFZZ		1WB54	EPC-13857	RELAY,TIMING.....	1
26	PAFZZ	5940001434794	81343	MS25036-112	TERMINAL,LUG 12-10,10 STUD.....	1
27	PAFZZ	5310014161851	39428	91831A029	NUT,SELF-LOCKING,HE.....	8
28	MFFZZ		81348	JC30-AR	WIRE,ELECTRICAL MAKE FROM BULK P/N J-C-30USE06CE1/10SRSSJO, CUT TO FIT.	V
29	PAFZZ	5305014829880	39428	92240A542	SCREW,CAP,HEXAGON H.....	4
30	PAFZZ		1WB54	6A10DICT	DIODE.....	1
31	PAFZZ		058D1	1A868	STRAP,TIEDOWN,ELEC 7.5 IN.....	20
32	PAFZZ	5940001434777	81343	AS25036-157	TERMINAL,LUG 12-10,1/4" STUD.....	1
33	PAFZZ		1WB54	70285	FUSE BLOCK.....	1
34	PAFZZ	5305015347417	39428	91772A833	SCREW,MACHINE.....	4
35	PAFZZ		1WB54	78155	FUSE 15AMP.....	1
36	PAFZZ		1WB54	50301-02	STOP BOX BRACKET.....	1
37	PAFZZ		1WB54	78155	FUSE 15 AMP.....	8

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
38	PAFZZ		39428	91772A194	SCREW,MACHINE.....	6
39	PAFZZ		58961	47302	TERMINAL BLOCK 2 GANG, BLOCK # 4...	1
40	PAFZZ		39428	91792A148	SCREW,MACHINE.....	2
41	PAFZZ		1WB54	47162	TERMINAL BLOCK SMALL,12 CONNECTION, BLOCK # 3.....	1
42	PAFZZ	5940002835280	81343	MS25036-106	TERMINAL,LUG 16-14,6 STUD.....	2
43	PAFZZ		1WB54	50301-01	INSIDE CIRCUIT BOAR.....	1
44	PAFZZ		1WB54	IN4006DICT-ND	DIODE.....	6
45	PAFZZ		3A054	91772A151	SCREW,MACHINE 6-32 X .75".....	4
46	PAFZZ		1WB54	964305	TERMINAL,LUG PUSH -ON,16-14 GAUGE, MALE.....	2
47	PAFZZ		058D1	3LP21	CABLE TIE 11.1".....	6
48	PAFZZ		25795	6X750	STRAP,TIEDOWN,ELECT.....	30
49	PAFZZ		1WB54	922005	CONNECTOR,BUTT,ELEC 16-14 SHRINK TUBE BUTT CONNECTOR.....	2
50	PAFZZ	5940001434780	81343	MS25036-108	TERMINAL,LUG 16-14,10 STUD.....	3

END OF FIGURE

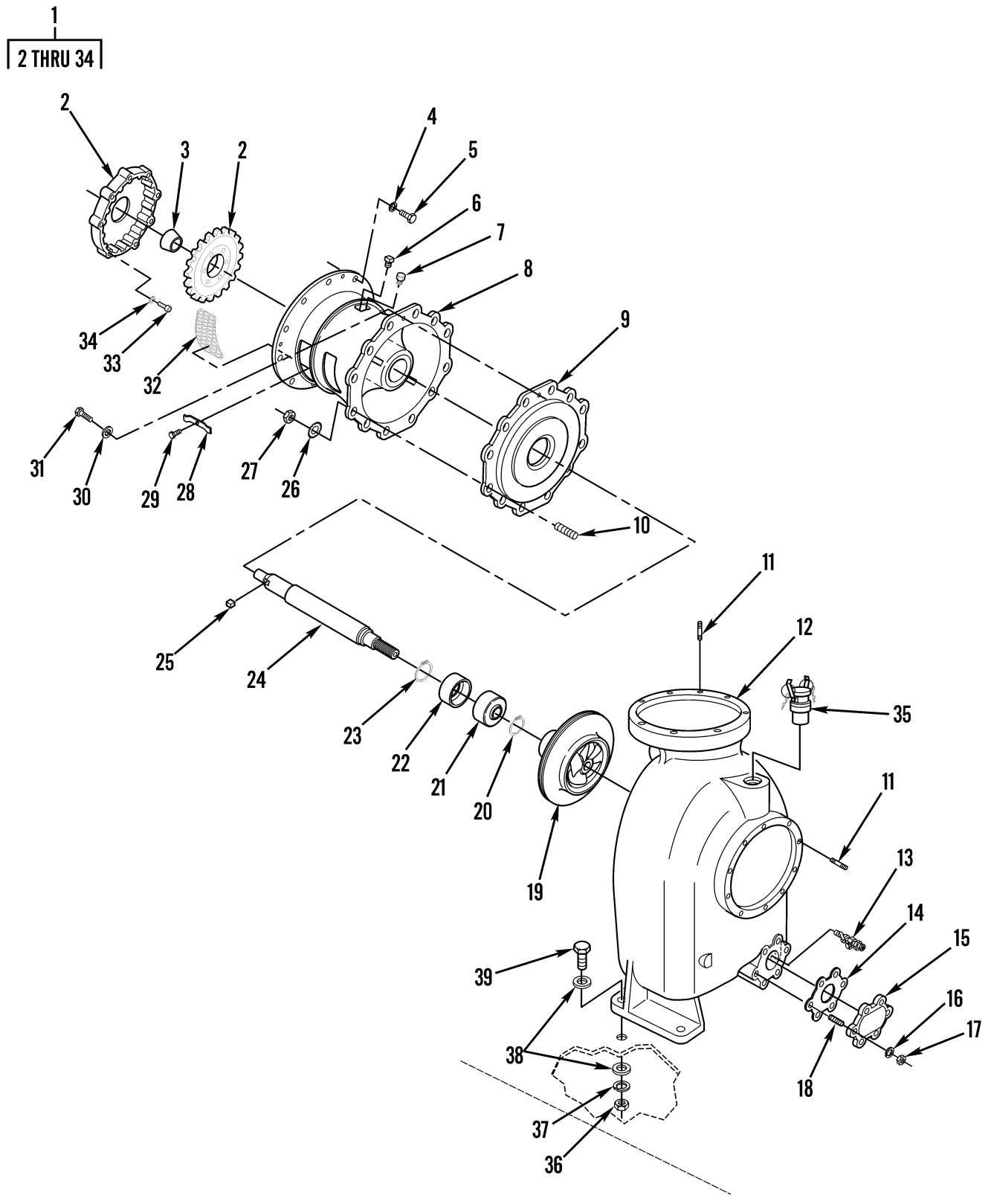


Figure 55. Pump Assembly

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 55 PUMPS	
					GROUP 5500 PUMP ASSEMBLY	
					FIG. 55 PUMP ASSEMBLY	
1	PAFFF		1WB54	DPE-604F(PEO)	GORMAN RUPP 604 PEO.....	1
2	PAHZZ		25567	44165-011	.COUPLING ASSY.....	1
3	PAFZZ		25567	24131-345	.BUSHING,LOCKING.....	1
4	PAFZZ		25567	21171?536	.LOCK WASHER.....	8
5	PAFZZ		25567	22645-164	.HEX HD CAPSCREW.....	12
6	PAHZZ	4730012061284	25567	P04-15079	.PLUG,PIPE.....	1
7	PAFZZ		25567	GA0403	.SETSCREW.....	1
8	PAFZZ		25567	7765E	.INTERMEDIATE BRACKE.....	1
9	PAFZZ		25567	5792	.PLATE,SEAL.....	1
10	PAFZZ		25567	C1011	.STUD.....	12
11	PAFZZ		25567	15991	.STUD,SHOULDER.....	1
12	PAFZZ		25567	46471-256	.PUMP CASING INCLUDES STUDS AND COVER PLATE.....	1
13	PAFZZ		25567	S1073	.DRAIN COCK.....	1
14	PAFZZ		25567	4822 13040	.COVER PLATE.....	1
15	PAFZZ		25567	1822GA	.COVER PLATE GASKET.....	1
16	PAFZZ	5310004705974	25567	JO815991	.WASHER,LOCK.....	6
17	PAFZZ		1CC55	D08	.HEX NUT.....	6
18	PAFZZ	5307009854918	25567	C0808	.STUD,PLAIN.....	6
19	PAFZZ		25567	5401N	.IMPELLER.....	1
20	PAFZZ		25567	31134-099	.SPACER.....	1
21	PAFZZ		25567	25271-554	.PARTS SET INCLUDES SHIMS, SEAL RETAINING RING, SPRING.....	1
22	PAFZZ		25567	13886	.SPACER.....	1
23	PAFZZ		25567	S215	.RING,RETAINING.....	2
24	PAFZZ		25567	38517-516	.IMPELLER SHAFT.....	1
25	PAFZZ		25567	N0607	.KEY,WOODRUFF.....	1
26	PAFZZ		25567	BL10	.T-TYPE LOCK WASHER.....	12
27	PAFZZ	5310013157028	25567	D10	.NUT,PLAIN,HEXAGON.....	12
28	XBFZZ		25567	TBD-2039	.RETAINER BAR.....	4
29	XBFZZ		25567	TBD-2041	.BOLT,MACHINE.....	4
30	PAFZZ		25567	AK04	.T-TYPE LOCK WASHER.....	2
31	PAFZZ	5305009881727	80205	MS35206-283	.SCREW,MACHINE.....	2
32	PAFZZ	4720013515953	25567	42381-504	.GUARD,HOSE-TUBING.....	2
33	PAFZZ		25567	22644-220	.SOCKET HD CAPSCREW.....	8
34	PAFZZ		25567	BL06	.T-TYPE LOCK WASHER.....	12
35	PAFZZ		457G7	AH150EZ	CAMLOCK 1 1/2".....	1
36	PAFZZ		39428	97135A270	NYLON INSERT NUT 5/8".....	2
37	PAFZZ	5310013965295	39428	91104A035	WASHER,LOCK 5/8".....	4
38	PAFZZ		96906	MS27183-21	WASHER,FLAT 5/8".....	4
39	PAFZZ	5305007247224	80204	B1821BH063C250N	SCREW,CAP,HEXAGON H 5/8" X 2.5"....	2

END OF FIGURE

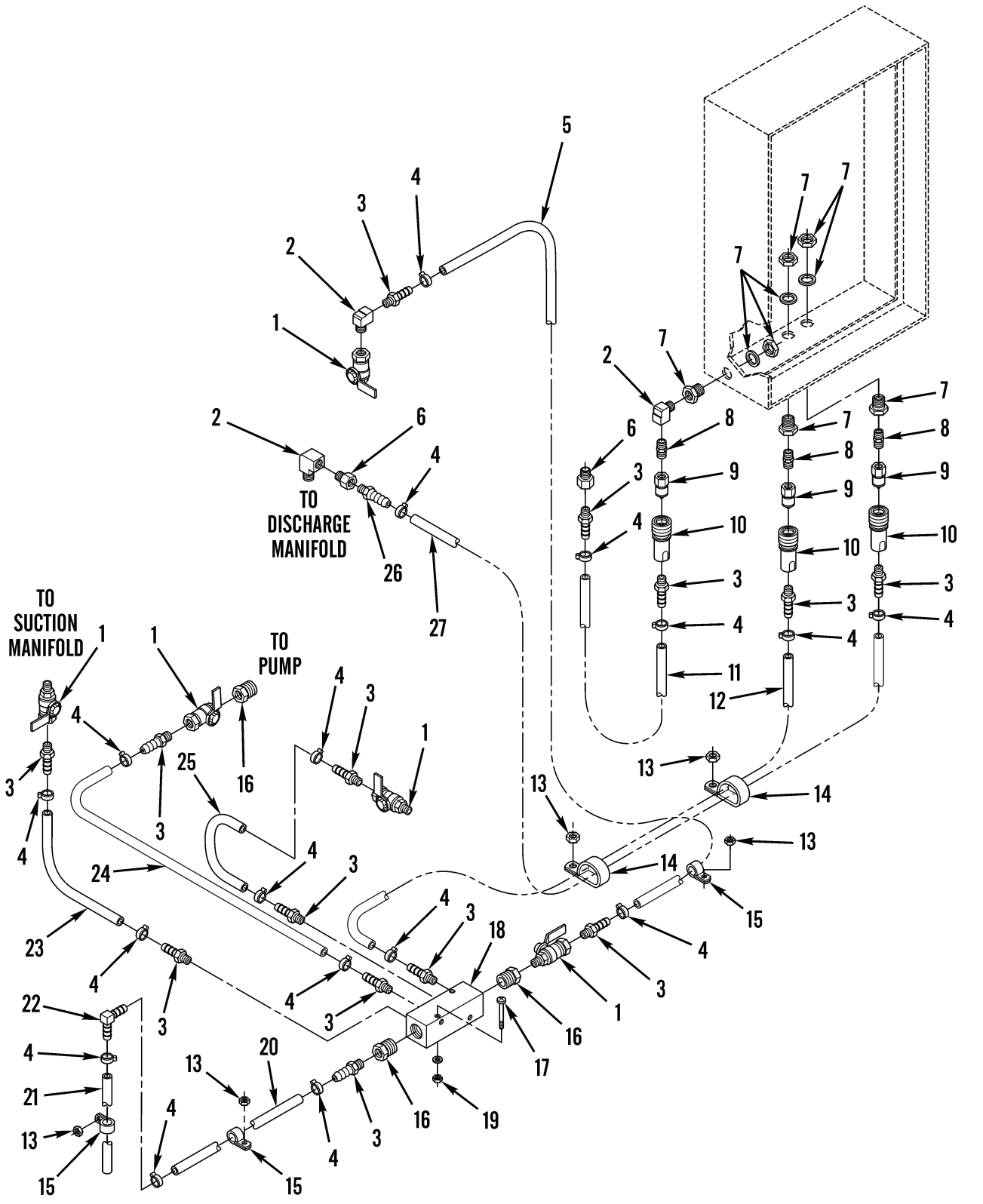


Figure 56. Pump Lines and Fittings (Sheet 1 of 3)

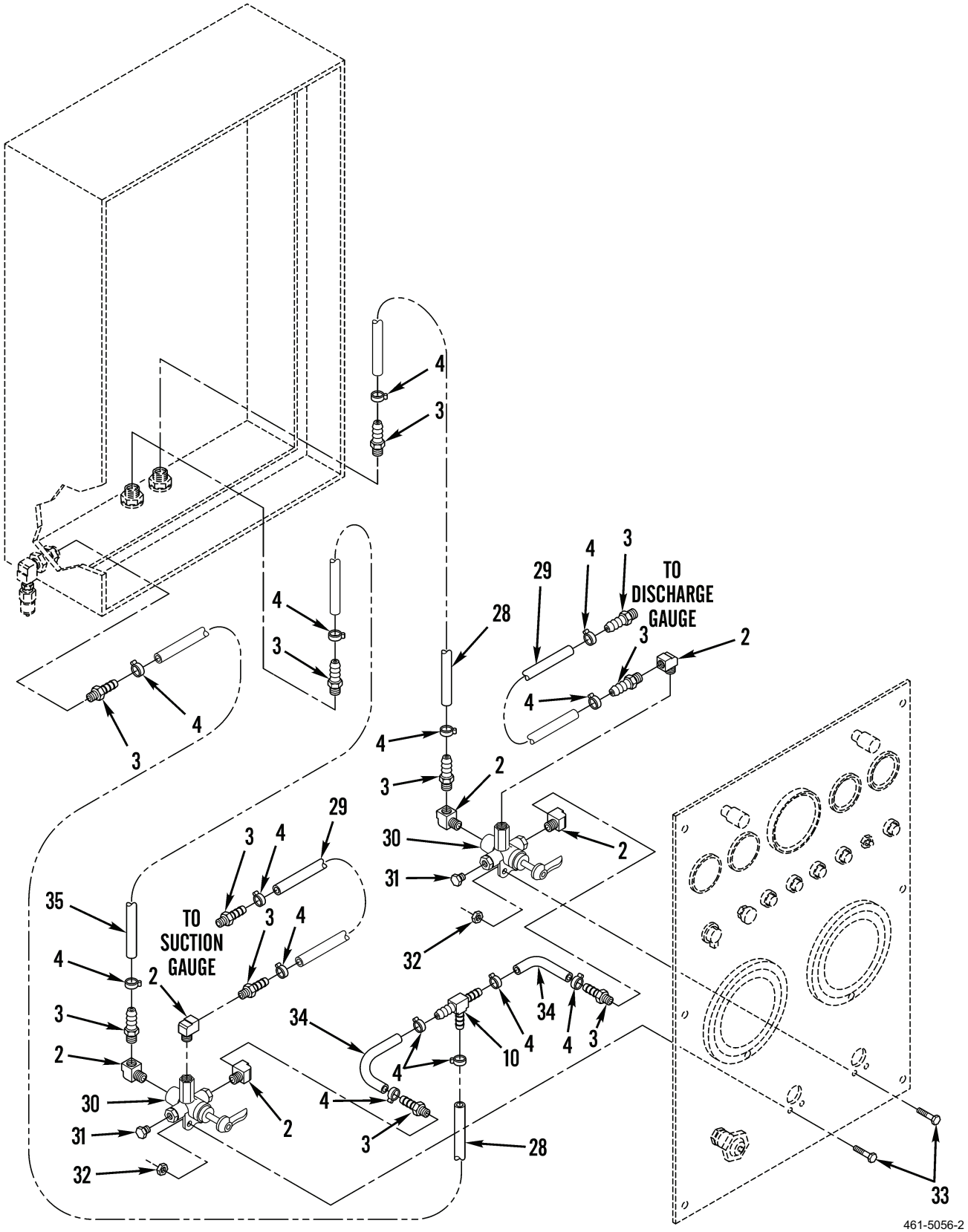
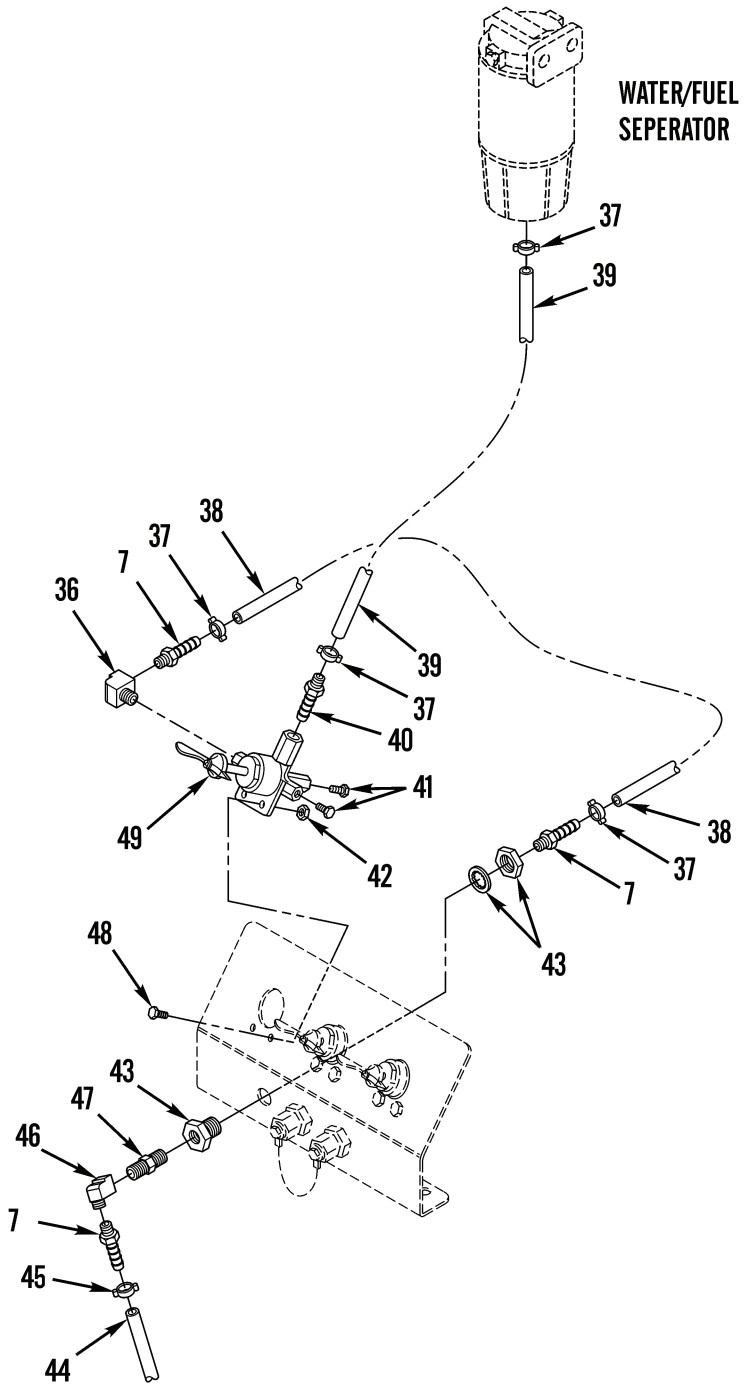


Figure 56. Pump Lines and Fittings (Sheet 2 of 3)



461-5056-3

Figure 56. Pump Lines and Fittings (Sheet 3 of 3)

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 5513 FLUID LINES	
					FIG. 56 PUMP LINES AND FITTINGS	
1	PAFZZ		1B467	80-018-21	VALVE,BALL 1/4" MALE X 1/4" FEMALE.	5
2	PAFZZ		1WB54	90-019-98	ELBOW,STREET 1/4" MALE NPT X 1/4" FEMALE..... UOC:BFL	2
3	PAFZZ		1B467	44	BARB,HOSE 1/4" NPT MALE X 1/4".....	10
4	PAFZZ		1B467	30-013-28	CLAMP,HOSE 1/4" ID HOSE.....	30
5	MFFZZ		01276	H20104-54	HOSE,NONMETALLIC MAKE FROM BULK P/N H20104 CUT TO 54 INCHES.....	1
6	PAFZZ		1WB54	GSO-20-BR	FILTER,INLINE 1/4" X 1/4" INLINE BRASS FILTER.....	2
7	PAFZZ		1B467	1344	FITTING,BULKHEAD 1/4" FEMALE NPT X 1/4" FEMALE NPT.....	3
8	PAFZZ	4730002778289	81343	4-4 130137B	NIPPLE,PIPE 1/4" MALE X 1/4" MALE..	3
9	PAFZZ		1B467	B72N4-4F	QUICK DISCONNECT FI MALE.....	3
10	PAFZZ		1B467	B72C4-4F	QUICK DISCONNECT FI FEMALE.....	3
11	MFFZZ		01276	H20104-21	HOSE,NONMETALLIC MAKE FROM BULK P/N H20104 CUT TO 21 INCHES.....	1
12	MFFZZ		01276	H20104-55	HOSE,NONMETALLIC MAKE FROM BULK P/N H20104 CUT TO 55 INCHES.....	1
13	PAFZZ	5310014161851	39428	91831A029	NUT,SELF-LOCKING,HE.....	6
14	PAFZZ	5340015406545	39428	8863T16	CLAMP,LOOP.....	2
15	PAFZZ		39428	8863T15	CLAMP,LOOP.....	3
16	PAFZZ		1B467	3220X 6X 4	REDUCER 3/8 MALE NPT X 1/4 FEMALE..	3
17	PAFZZ		3A054	91772A253	SCREW,MACHINE 10-24 X 2".....	2
18	PAFZZ		3A054	5469K123	MANIFOLD,DRAIN.....	1
19	PAFZZ	5310015049412	3A054	90101A011	NUT,PLAIN,HEXAGON 10-24 LOCKING FIBER NUT.....	2
20	MFFZZ		01276	H20104-11.25	HOSE,NONMETALLIC MAKE FROM BULK P/N H20104 CUT TO 11-1/4 INCHES.....	1
21	MFFZZ		01276	H20104-10	HOSE,NONMETALLIC MAKE FROM BULK P/N H20104 CUT TO 10 INCHES.....	1
22	PAFZZ		1WB54	225-6-6	90 DEGREE 1/4 DOUBL.....	1
23	MFFZZ		01276	H20104-14	HOSE,NONMETALLIC MAKE FROM BULK P/N H20104 CUT TO 14 INCHES.....	1
24	MFFZZ		01276	H20104-20	HOSE,NONMETALLIC MAKE FROM BULK P/N H20104 CUT TO 20 INCHES.....	1
25	MFFZZ		01276	H20104-11	HOSE,NONMETALLIC MAKE FROM BULK P/N H20104 CUT TO LENGTH.....	1
26	PAFZZ		1B467	10004B-605	BARB,HOSE 1/4" NPT MALE X 1/4".....	1
27	MFFZZ		01276	H20104-80	HOSE,NONMETALLIC MAKE FROM BULK P/N H20104 CUT TO 80 INCHES.....	1
28	MFFZZ		01276	H20104-6	HOSE,NONMETALLIC MAKE FROM BULK P/N H20104 CUT TO LENGTH.....	1
29	MFFZZ		01276	H20104-15	HOSE,NONMETALLIC MAKE FROM BULK P/N H20104 CUT TO 15 INCHES.....	1

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
30	PAFZZ		1B467	6747	4-WAY SELECTOR VALV.....	2
31	PAFZZ		1B467	3152X 4	PLUG,PIPE 1/4".....	6
32	PAFZZ	5310014161851	39428	91831A029	NUT,SELF-LOCKING,HE.....	6
33	PAFZZ	5305014829880	39428	92240A542	SCREW,CAP,HEXAGON H.....	6
34	MFFZZ		01276	H20104-4.5	HOSE,NONMETALLIC MAKE FROM BULK P/N H20104 CUT TO 4-1/2 INCHES.....	2
35	MFFZZ		01276	H20104-15	HOSE,NONMETALLIC MAKE FROM BULK P/N H20104 CUT TO 15 INCHES.....	1
36	PAFZZ		1B467	3400X4	ELBOW,STREET.....	1
37	PAFZZ		25281	1518	CLAMP,HOSE.....	2
38	MFFZZ		1WB54	H20104-12	HOSE,NONMETALLIC MAKE FROM BULK P/N H20104 CUT TO 12 INCHES.....	1
39	MFFZZ		01276	H20106-24	HOSE,NONMETALLIC MAKE FROM BULK P/N H20106 CUT TO 24 INCHES.....	2
40	PAFZZ		1B467	90-019-131	BARB,HOSE 3/8" X 1/4" HOSE BARB....	1
41	PAFZZ	4730000127951	01276	2082-4B	PLUG,PIPE.....	2
42	PAFZZ	5310014161851	39428	91831A029	NUT,SELF-LOCKING,HE.....	2
43	PAFZZ		1B467	1344	FITTING,BULKHEAD 1/4" FEMALE NPT X 1/4" FEMALE.....	1
44	MFFZZ		01276	H20104-10	HOSE,NONMETALLIC MAKE FROM BULK P/N H20104 CUT TO 10 INCHES.....	1
45	PAFZZ	4730004697820	7Z588	6604 B	CLAMP,HOSE.....	1
46	PAFZZ		1B467	3500X4	ELBOW,90 DEGREE.....	1
47	PAFZZ	4730002778289	81343	4-4 130137B	NIPPLE,PIPE 1/4" MALE X 1/4" MALE..	1
48	PAFZZ	5305014829880	39428	92240A542	SCREW,CAP,HEXAGON H.....	2
49	PAFZZ		1B467	90-019-55	VALVE,FOUR WAY 4 WAY 1/4" VALVE....	1

END OF FIGURE

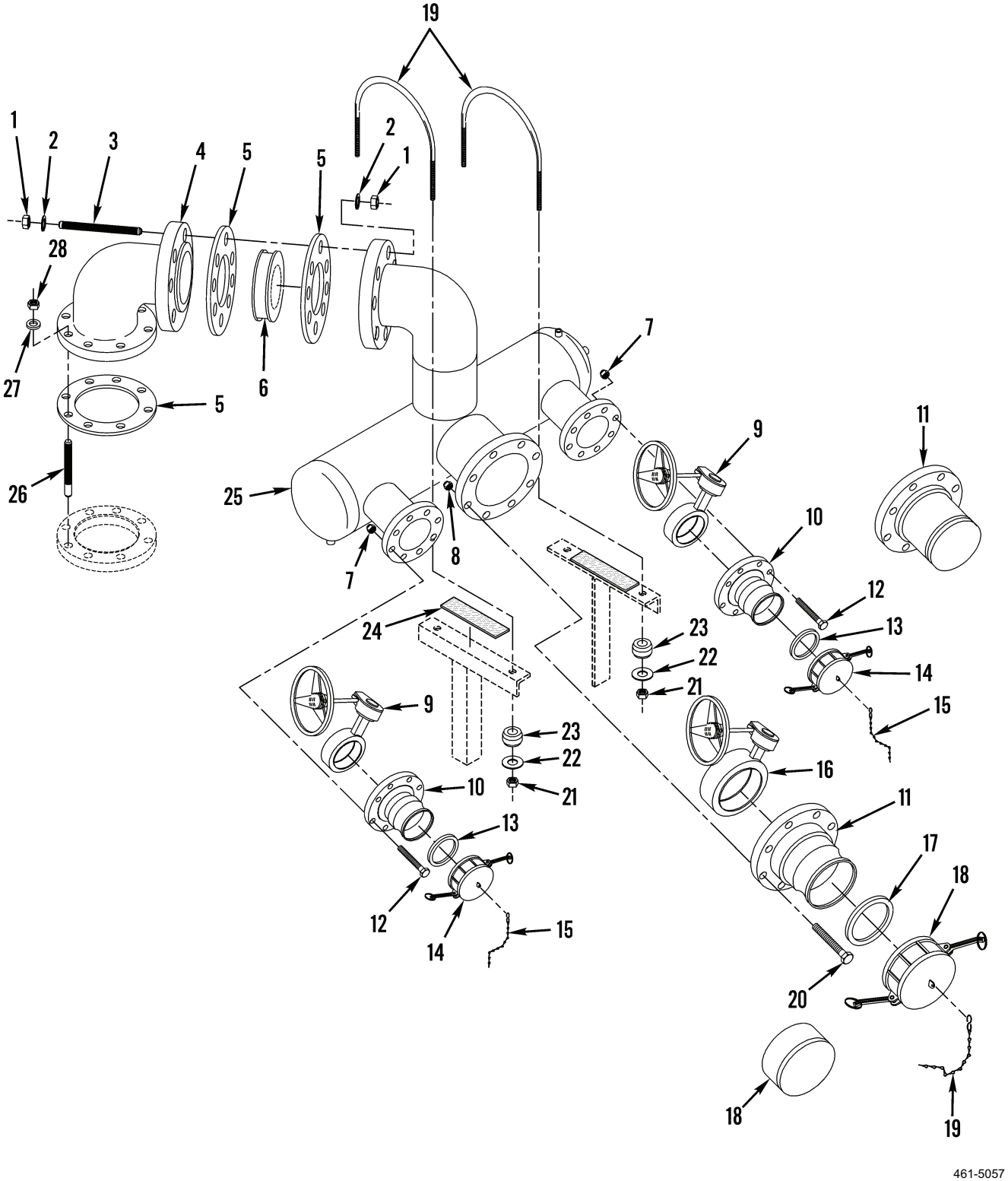
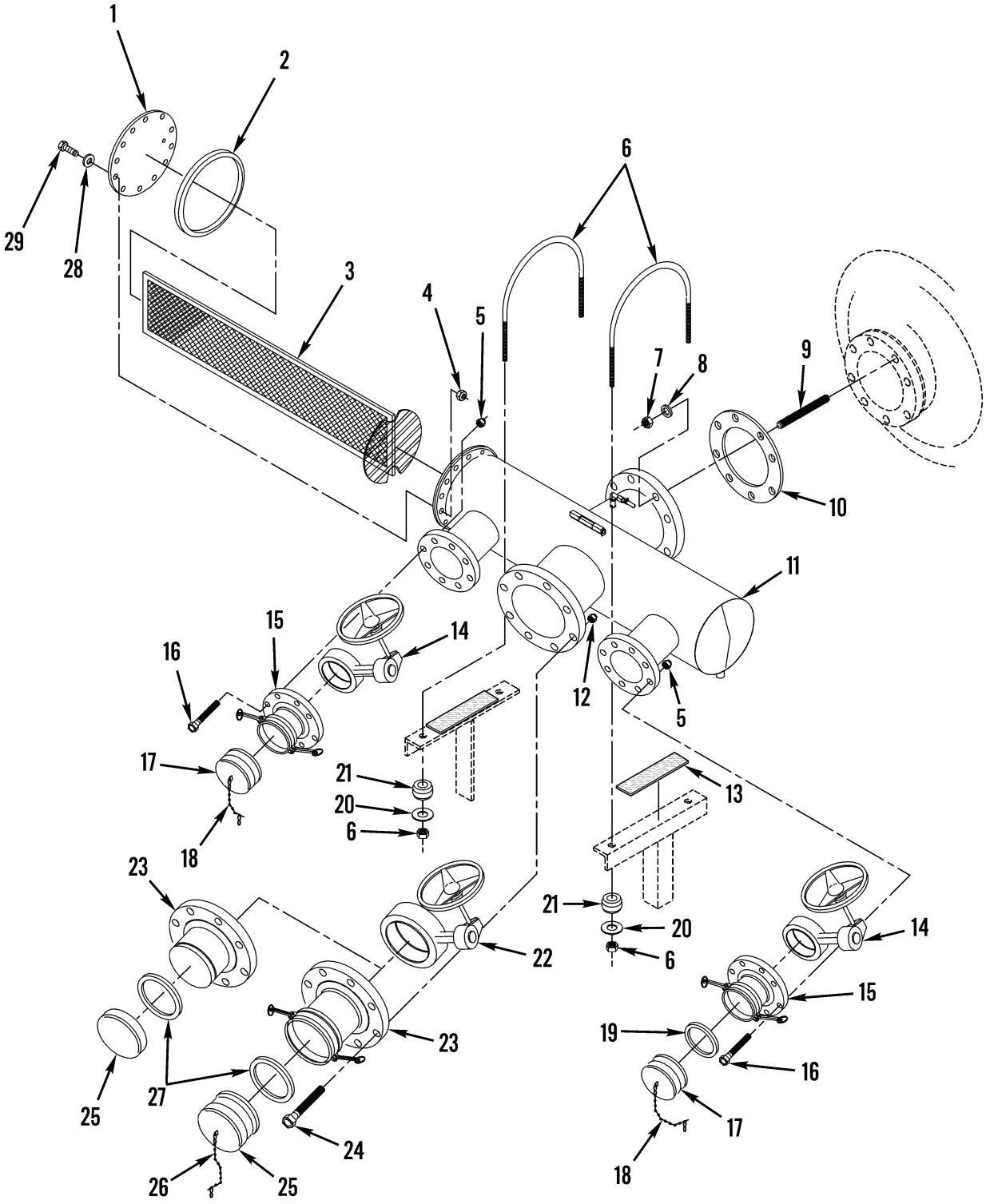


Figure 57. Discharge Manifold

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 5518 MANIFOLD ASSEMBLY	
					FIG. 57 DISCHARGE MANIFOLD	
1	PAFZZ		39428	95462A538	NUT,PLAIN,HEXAGON.....	16
2	PAFZZ		26916	004-003005-060	WASHER,LOCK 3/4".....	16
3	PAFZZ		1WB54	90-019-73	STUD,PLAIN.....	8
4	PAFZZ		1WB54	602-02	DISCHARGE ELBOW.....	1
5	PAFZZ		1WB54	90-019-130	GASKET.....	3
6	PAFZZ		1S763	G12HMP	VALVE,CHECK.....	1
7	PAFZZ		39428	97135A270	NYLON INSERT NUT 5/8".....	16
8	PAFZZ	5310000676356	81349	M45913/2-12CG5C	NUT,SELF-LOCKING,HE 3/4".....	8
9	PAFZZ		1WB54	80-018-12	4" VALVE.....	2
10	PAFZZ		1WB54	80-018-8	COUPLING TO FLANGE 4".....	2
11	PAFZZ		1WB54	80-018-9	COUPLING TO FLANGE 6".....	1
12	PAFZZ	5305007262568	96906	MS90727-177	SCREW,CAP,HEXAGON H 5/8-18 X 5 1/2"	16
13	PAFZZ		457G7	APG340GSKBUMS	SEAL RING 4".....	2
14	PAFZZ		1WB54	80-018-8	COUPLING TO FLANGE 4".....	2
15	PAFZZ		1WB54	90-019-62	6" BRASS CHAIN.....	2
16	PAFZZ		1WB54	80-018-14	6" VALVE.....	1
17	PAFZZ		457G7	APG360GSKBUMS	SEAL RING 6".....	1
18	PAFZZ		1WB54	80-018-9	COUPLING TO FLANGE 6".....	1
19	PAFZZ		1WB54	10-011-23	12" BRASS CHAIN.....	1
20	PAFZZ	5305009474363	80204	B1821BH075C550N	SCREW,CAP,HEXAGON H 3/4" X 5.50"...	8
21	PAFZZ		1WB54	62C800BUNOH	MANIFOLD BODY CLAMP INCLUDES NUTS..	2
22	PAFZZ		96906	MS27183-21	WASHER,FLAT 5/8".....	8
23	PAFZZ		3A054	64865K1	SHOCK MOUNT.....	4
24	MFFZZ		1WB54	6-0201-05	PAD,RUBBER MAKE FROM BULK RUBBER PN 90-019-193.....	2
25	PAFZZ		1WB54	602-01	DISCHARGE MANIFOLD.....	1
26	PAFZZ		25567	C1210	STUD.....	8
27	PAFZZ		53711	124-4322621 PC 130	WASHER,LOCK 3/4".....	8
28	PAFZZ	5310007616882	96906	MS51967-2	NUT,PLAIN,HEXAGON 1/4-20.....	8
					END OF FIGURE	



461-5058

Figure 58. Suction Manifold

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 5518 MANIFOLD ASSEMBLY	
					FIG. 58 SUCTION MANIFOLD	
1	PAFZZ		1WB54	90-019-420	STRAINER COVER.....	1
2	PAFZZ		457G7	90-019-426	GASKET.....	1
3	PAFZZ		1WB54	601-03	STRAINER.....	1
4	PAFZZ	5310007680318	96906	MS51967-14	NUT,PLAIN,HEXAGON 1/2-13.....	10
5	PAFZZ		39428	97135A270	NYLON INSERT NUT 5/8".....	16
6	PAFZZ		1WB54	62C800BUNOH	MANIFOLD BODY CLAMP INCLUDES NUTS..	2
7	PAFZZ	5310007616882	96906	MS51967-2	NUT,PLAIN,HEXAGON 1/4-20.....	8
8	PAFZZ		53711	124-4322621 PC 1 30	WASHER,LOCK 3/4".....	8
9	PAFZZ		25567	C1210	STUD.....	8
10	PAFZZ		1WB54	90-019-130	GASKET.....	1
11	PAFZZ		1WB54	601-01	MANIFOLD BODY.....	1
12	PAFZZ	5310007616882	96906	MS51967-2	NUT,PLAIN,HEXAGON 1/4-20.....	8
13	MFFZZ		1WB54	6-0201-05	PAD,RUBBER MAKE FROM BULK RUBBER PN 90-019-193.....	2
14	PAFZZ		1WB54	80-018-12	4" VALVE.....	2
15	PAFZZ		1WB54	10-011-19	4" CAMLOCK INLET.....	2
16	PAFZZ	5305007262568	96906	MS90727-177	SCREW,CAP,HEXAGON H 5/8-18 X 5 1/2"	16
17	PAFZZ		1WB54	10-011-20	4" PLUG.....	2
18	PAFZZ		1WB54	90-019-62	6" BRASS CHAIN.....	2
19	PAFZZ		457G7	APG340GSKBUMS	SEAL RING 4".....	2
20	PAFZZ		96906	MS27183-21	WASHER,FLAT 5/8".....	4
21	PAFZZ		3A054	64865K1	SHOCK MOUNT.....	4
22	PAFZZ		1WB54	80-018-14	6" VALVE.....	1
23	PAFZZ		1WB54	10-011-17	6"CAMLOCK INLET FOR USE ON FUEL PUMP.....	1
24	PAFZZ	5305009474363	80204	B1821BH075C550N	SCREW,CAP,HEXAGON H 3/4" X 5.50"...	8
25	PAFZZ		1WB54	10-011-18	6" PLUG FOR USE ON FUEL PUMP.....	1
26	PAFZZ		1WB54	10-011-23	12" BRASS CHAIN.....	1
27	PAFZZ		457G7	APG360GSKBUMS	SEAL RING 6".....	2
28	PAFZZ	5310008095997	96906	MS27183-17	WASHER,FLAT 1/2".....	10
29	PAFZZ		96906	MS51095-418	SCREW,CAP,HEXAGON H.....	10
					END OF FIGURE	

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 95 GENERAL USE STANDARDIZED PARTS	
					GROUP 9501 BULK MATERIEL	
					FIG. BULK MATERIEL	
1	PAFZZ	4720004845765	01276	H20104	HOSE,NONMETALLIC.....	V
2	PAFZZ	4720013719919	01276	H20106	HOSE,NONMETALLIC.....	V
3	PAFZZ		1WB54	90-019-193	RUBBER STRIP 1 1/2 X 60".....	V
4	PAFZZ		07909	A62802-01	WIRE,ELECTRICAL 16 AWG,MTW.....	V
5	PAFZZ		81349	M16878/1BKE3	WIRE,ELECTRICAL 14 AWG.....	V
6	PAFZZ	6145000608964	81348	J-C-30USE06CE1/10SRSJO	WIRE,ELECTRICAL 10 AWG.....	V
					END OF FIGURE	

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

SPECIAL TOOLS LIST

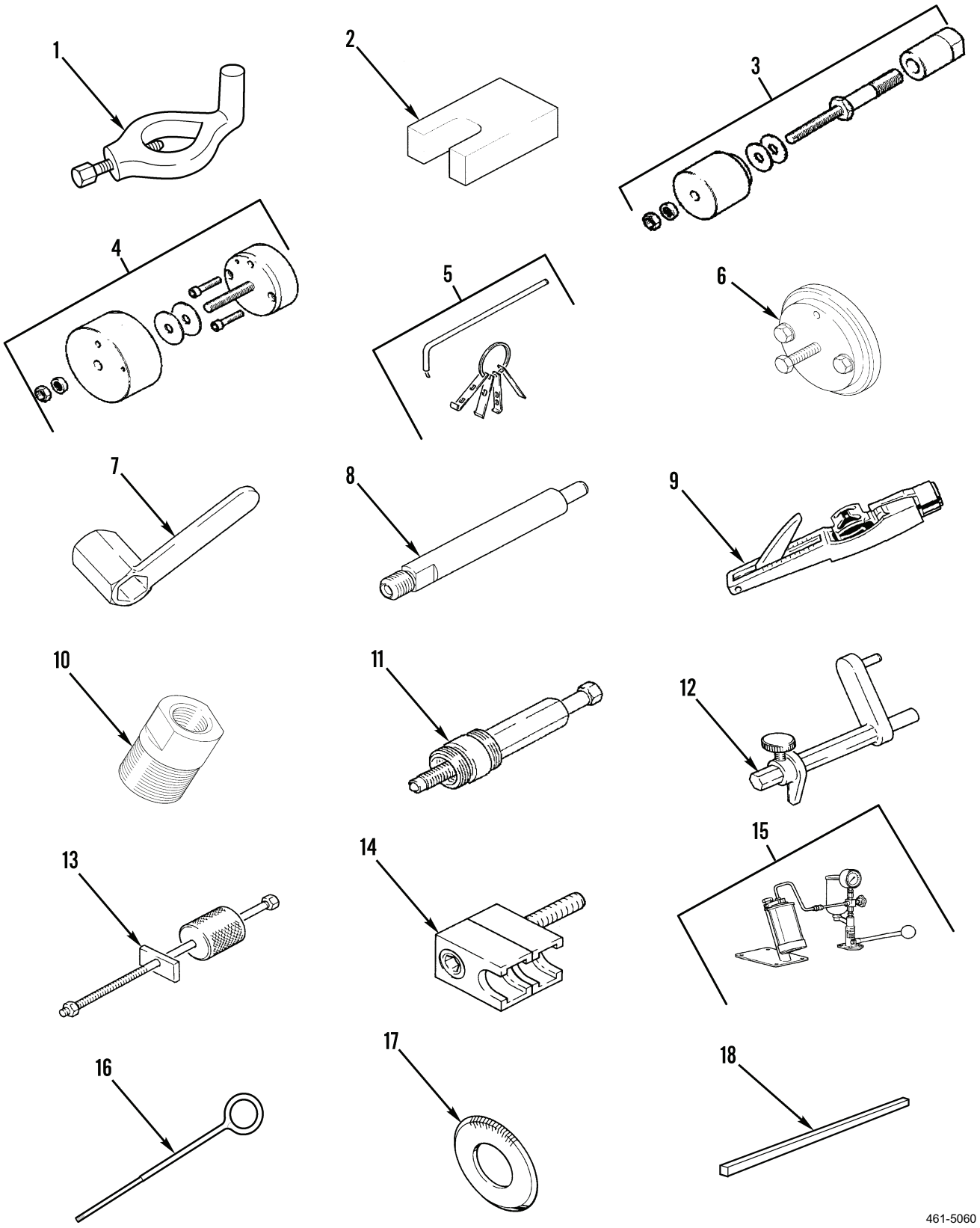


Figure 59. Special Tools

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES(UOC)	(7) QTY
					GROUP 26 TOOLS AND TEST EQUIPMENT	
					GROUP 2604 SPECIAL TOOLS	
					FIG. 59 SPECIAL TOOLS	
1	PEFZZ	3460014330460	0MJX4	SE52150	DOG,LATHE.....	
2	PEFZZ		62445	110110	FIXTURE,HOLDING.....	
3	PEFZZ		62445	142060	INSTALLER.....	
4	PEFZZ		62445	142080	INSTALLER.....	
5	PEFZZ	5120012037950	36719	142700	REMOVER,PREFORMED P.....	
6	PEFZZ		62445	143110	FIXTURE,CENTERING.....	
7	PEFZZ		62445	143400	RETAINER.....	
8	PEFZZ		62445	100120	CONNECTOR.....	
9	PEFZZ		62445	8115	GAGE UNIT.....	
10	PEFZZ		62445	110410	ADAPTOR,SLEEVE.....	
11	PEFZZ		62445	110340	TIMING TOOL,INJECTO.....	
12	PEFZZ		62445	100740	POINTER TOOL,TIMING.....	
13	PEFZZ	5120121704739	D8400	150800	FIXTURE,PULLER.....	
14	PEFZZ		62445	125310	SPRING COMPRESSOR.....	
15	PEFZZ	4910002558641	19204	7551255	TESTER,DIESEL FUEL.....	
16	PEFZZ		62445	DEUSA-0027-0935	EYE BOLT.....	
17	PEFZZ	5210012803591	62445	003 1189	INJECTOR PUMP,TIME.....	
18	PEFZZ		1WB54	9105-K33-M	BAR,BRASS.....	

END OF FIGURE

REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

CROSS REFERENCE INDEXES

CROSS-REFERENCE INDEXES

NATIONAL STOCK NUMBER INDEX

STOCK NUMBER	FIG.	ITEM	STOCK NUMBER	FIG.	ITEM
5315-00-012-0123	11	17	5940-00-283-5280	54	42
4730-00-012-7951	49	23	3110-00-293-9163	2	5
	56	41	5310-00-402-5856	50	8
6240-00-044-6914	4	5	5331-00-462-0907	4	2
5305-00-054-6654	49	34	4730-00-469-7820	56	45
	53	30	5310-00-470-5974	55	16
	54	40	4720-00-484-5765	BULK	1
5305-00-059-3661	54	10	5315-00-584-9053	9	4
6145-00-060-8964	BULK	6	5310-00-637-9541	4	10
5310-00-067-6356	57	8	5340-00-714-3113	10	4
5305-00-068-0511	15	17	5305-00-724-7224	23	7
	18	1		55	39
	48	14	5305-00-726-2568	15	16
5305-00-071-2067	17	2		57	12
5305-00-071-2071	53	45		58	16
5305-00-071-2079	11	25	5310-00-732-0558	48	13
	16	8	5310-00-761-6882	7	13
5975-00-074-2072	11	2		18	8
5310-00-080-6004	15	9		57	28
5310-00-081-4219	9	3		58	7
	51	42		58	12
5310-00-087-4652	15	8	5310-00-763-8905	15	14
	18	4	5310-00-768-0318	11	22
3110-00-100-3541	12	7		58	4
5940-00-114-1305	54	9	5310-00-809-3079	11	28
3110-00-142-4355	12	5	5310-00-809-5997	11	23
5940-00-143-4774	54	14		15	13
5940-00-143-4777	54	32		16	9
5940-00-143-4780	54	50		17	3
5940-00-143-4794	54	26		58	28
2530-00-161-7575	10	30	5310-00-809-8540	11	26
2530-00-161-7576	10	30	5310-00-823-8804	7	12
2590-00-175-9502	40	1		18	9
5310-00-176-8117	12	2	5315-00-846-0126	16	7
9905-00-202-3639	21	4	5305-00-947-4363	57	20
9905-00-205-2795	21	2		58	24
5305-00-225-3843	7	10	5307-00-985-4918	55	18
	18	11	5305-00-988-1727	55	31
5310-00-225-6993	15	12	2815-01-021-9093	24	12
	16	10	2815-01-022-0094	31	11
	17	4	3020-01-022-3663	28	10
5306-00-226-4827	51	41	5342-01-029-1194	24	9
5306-00-226-4832	9	6	5325-01-049-3976	24	6
4910-00-255-8641	59	15	5310-01-100-5112	11	7
5310-00-269-4040	11	27	5306-01-100-5113	10	25
	15	18	2530-01-121-0786	11	11
5325-00-276-6056	7	7	5320-01-140-1479	7	8
4730-00-277-8289	49	28	5310-01-149-3703	32	2
	56	8	3030-01-157-9621	3	18
	56	47	5305-01-158-3207	51	35

CROSS-REFERENCE INDEXES

NATIONAL STOCK NUMBER INDEX

STOCK NUMBER	FIG.	ITEM	STOCK NUMBER	FIG.	ITEM
6150-01-167-6522	7	1	5310-01-239-9412	49	27
5310-01-174-1491	52	4	4730-01-240-6108	49	12
5331-01-188-0850	25	25	5306-01-244-3716	3	17
5331-01-188-0851	25	27	5310-01-246-1361	39	9
5331-01-188-0852	43	20		42	3
5365-01-188-1089	24	22	5305-01-246-1404	33	18
5310-01-190-7468	31	8	5305-01-246-4430	28	1
5330-01-191-8167	51	34	5310-01-250-3735	19	4
5325-01-192-5822	51	33	3120-01-253-0354	3	26
2815-01-192-9756	28	9	3120-01-253-0355	3	15
2815-01-192-9801	31	12	5306-01-253-1591	3	19
5365-01-193-7160	40	2	5306-01-258-0830	11	14
5306-01-193-9197	50	1	4730-01-260-4395	45	14
5330-01-194-5924	42	13	5305-01-263-6913	40	5
3120-01-194-6285	30	1	2530-01-263-7061	10	14
5325-01-194-9154	51	37	5305-01-268-5796	34	5
4730-01-195-4244	35	12	5360-01-269-7264	11	9
5315-01-195-6657	42	9	5330-01-269-7265	10	24
4720-01-195-7055	49	9		11	8
3120-01-196-2582	42	14	5360-01-269-7266	11	4
5306-01-196-7899	28	8	1740-01-269-7270	11	19
5315-01-197-1478	25	22	5310-01-273-7433	33	3
5340-01-197-1502	25	5	3120-01-273-7507	52	23
3120-01-197-6657	29	6	5310-01-273-7518	33	12
5930-01-198-0916	7	25	5307-01-273-7532	39	8
3040-01-198-1130	42	18		39	14
5340-01-203-1070	55	9	5305-01-273-7553	7	24
5120-01-203-7950	59	5	5305-01-273-7556	2	13
4730-01-206-1284	55	6	5325-01-273-7620	39	25
5360-01-207-0160	42	19		51	39
5307-01-207-0170	24	11	5365-01-274-2116	42	16
5310-01-207-7204	42	17	4310-01-275-9294	48	2
5310-01-207-7205	42	6		48	6
5310-01-207-7206	45	13	5340-01-277-0300	10	22
4710-01-208-1313	38	2	5310-01-277-9849	42	7
5307-01-208-3691	43	19	5210-01-280-3591	59	17
5310-01-208-6603	25	19	5365-01-280-7191	37	2
5340-01-209-7006	40	16	6220-01-284-2709	4	6
5310-01-210-1673	26	10	2530-01-287-4451	10	27
5365-01-210-4667	40	14	5315-01-287-6522	27	12
5330-01-210-4983	25	3	5360-01-287-7297	10	21
5315-01-211-1139	30	3	5315-01-287-8770	10	2
5306-01-211-7442	36	6	2530-01-287-9409	10	15
5360-01-213-4636	40	17	2530-01-288-3979	10	16
3110-01-215-9553	2	8	5360-01-288-5870	10	19
4010-01-224-9207	16	3	5310-01-315-7028	55	27
5340-01-236-6391	25	18	4030-01-316-1551	15	15
5310-01-237-2050	34	6	5305-01-317-3243	2	12
3120-01-239-1374	25	23		3	16
5315-01-239-5263	27	8	5325-01-317-8119	2	9

CROSS-REFERENCE INDEXES

NATIONAL STOCK NUMBER INDEX

STOCK NUMBER	FIG.	ITEM	STOCK NUMBER	FIG.	ITEM
5305-01-318-3287	2	11	3120-01-396-8372	42	11
5315-01-319-9194	10	6	3120-01-396-9838	42	10
2530-01-320-1686	10	28	5330-01-398-6652	1	3
2530-01-320-1687	10	28	5310-01-412-0861	10	20
5310-01-320-1980	10	5	5340-01-412-1278	11	3
5310-01-320-1987	10	23	5340-01-412-1281	11	12
5360-01-320-5815	10	10	4010-01-412-1282	17	1
5360-01-320-5818	10	18	5340-01-412-1284	11	5
5360-01-320-5819	10	13	5340-01-412-1285	10	8
5360-01-320-5820	10	17	5310-01-412-1774	9	2
5305-01-321-3522	10	3	2530-01-412-3863	11	13
2815-01-324-3705	31	13	5330-01-412-4447	12	8
5935-01-327-0956	7	18	2530-01-412-5209	10	29
5360-01-342-8510	31	10	2530-01-412-5210	10	11
5330-01-343-2648	38	1	2530-01-412-5211	10	11
5330-01-343-2670	36	3	5325-01-412-5998	10	12
3040-01-349-6927	11	21	5305-01-412-6287	10	9
4720-01-351-5953	55	32	4730-01-412-6769	11	6
5310-01-351-7793	20	1	5320-01-412-8088	7	6
5310-01-359-2589	6	4	5340-01-414-1453	7	5
	53	50	5320-01-414-1459	7	3
6220-01-359-2870	4	3		9	10
5331-01-360-0944	48	8	5320-01-414-2171	21	1
5330-01-364-4892	37	3	5340-01-414-2173	9	9
5930-01-365-6928	7	23	5310-01-414-6476	12	10
4720-01-371-9919	BULK	2	2530-01-414-9314	10	1
6220-01-372-3883	4	1	2530-01-414-9317	10	1
5315-01-372-8923	9	5	2510-01-415-2636	9	1
5306-01-373-6085	19	11	5310-01-416-1851	49	24
6220-01-387-4250	4	7		53	3
5365-01-395-4737	25	10		54	27
5365-01-395-4744	48	10		56	13
5306-01-395-5877	40	22		56	32
5340-01-395-6279	19	16		56	42
5340-01-395-6281	19	17	4720-01-416-5916	11	33
5340-01-395-6282	25	20	5315-01-417-1051	12	3
5340-01-395-6288	28	3	5310-01-417-2927	12	4
5340-01-395-7693	25	21	5306-01-418-9086	12	9
5305-01-395-7700	25	12	5305-01-428-6791	48	4
6150-01-396-0274	7	17	5365-01-433-8951	48	12
5330-01-396-0443	34	20	2910-01-434-0828	48	1
4820-01-396-0881	48	3	5330-01-434-7270	40	18
5315-01-396-2214	26	5	5310-01-434-7272	2	15
5310-01-396-2856	41	1		3	24
5310-01-396-2857	25	15		19	8
5310-01-396-2859	31	3		24	16
5310-01-396-5295	23	4		47	6
	50	6		51	13
	55	37	5310-01-434-8646	31	6
4820-01-396-7742	34	2	5310-01-435-1729	51	6

CROSS-REFERENCE INDEXES

NATIONAL STOCK NUMBER INDEX

STOCK NUMBER	FIG.	ITEM	STOCK NUMBER	FIG.	ITEM
2940-01-435-3550	48	9	5365-01-517-3346	52	15
5310-01-437-4499	35	9	5310-01-517-6900	52	5
4730-01-437-7482	49	10	5310-01-517-6906	52	3
5310-01-437-8700	43	2	5305-01-517-6910	52	24
5360-01-438-3950	35	7	5305-01-517-6913	52	12
5310-01-439-0043	28	6	3020-01-517-6980	52	10
	40	6	3020-01-517-6987	52	11
5306-01-439-4308	19	3	5977-01-517-8945	52	16
5331-01-439-5377	47	11	2920-01-517-9265	52	22
	49	8	2920-01-517-9438	52	14
5310-01-440-1416	43	5	5977-01-518-0284	52	17
	51	25	2920-01-518-0395	52	19
5310-01-440-1417	28	2	2920-01-518-0943	52	8
	40	10	2920-01-518-0947	52	1
	51	20	2920-01-518-0949	52	20
5310-01-441-2807	3	23	2920-01-518-0975	52	18
5310-01-441-7091	51	19	5310-01-524-7436	5	13
5940-01-458-1939	5	7	5305-01-529-4401	53	48
5940-01-458-1940	5	2	2530-01-530-5068	10	7
5310-01-466-7850	44	18		10	27
4820-01-474-6910	48	11	5305-01-532-9137	44	17
6680-01-475-0101	53	34	5340-01-533-3344	22	10
5305-01-482-9880	49	31	5310-01-533-6193	20	2
	54	29	5305-01-534-4818	6	15
	56	33	5305-01-534-7417	54	34
	56	48	5310-01-535-3265	50	10
5310-01-484-0489	10	32		53	36
5305-01-484-2488	11	31	5340-01-540-6545	56	14
5305-01-485-0771	11	16	5310-01-546-2651	6	2
6150-01-485-1459	7	2		6	7
6140-01-485-1472	5	8		53	10
5310-01-491-1474	6	10	2815-12-123-0936	31	4
5315-01-494-8535	11	32	5365-12-124-1048	25	14
3120-01-494-9220	11	20	5305-12-125-0321	33	11
3120-01-494-9225	11	30	5365-12-125-5213	47	10
5305-01-497-7834	54	3	5325-12-126-3410	31	7
5310-01-501-1403	53	4	5310-12-132-7461	43	69
5310-01-502-2934	50	12	5305-12-141-9839	19	13
5310-01-502-3536	50	13		49	44
	53	47		51	22
5310-01-504-8245	5	12	5305-12-141-9861	38	17
5310-01-504-9412	5	3	5310-12-142-8173	51	26
	5	15	5330-12-142-9117	38	21
	20	6	5310-12-148-5093	38	6
	56	19	5310-12-149-4353	2	14
4930-01-507-7824	48	5		3	12
5310-01-508-5907	8	4		19	7
5305-01-508-6879	8	2		37	5
5365-01-517-2849	52	21		39	6
5365-01-517-2850	52	13		40	3

CROSS-REFERENCE INDEXES

NATIONAL STOCK NUMBER INDEX

STOCK NUMBER	FIG.	ITEM	STOCK NUMBER	FIG.	ITEM
5310-12-149-4353	51	12			
5310-12-151-4842	43	26			
	43	66			
5310-12-151-4843	40	21			
2910-12-156-2138	47	5			
5330-12-156-4518	38	24			
	49	42			
5330-12-156-4519	38	19			
5365-12-156-4725	29	2			
5330-12-156-4806	39	2			
5330-12-156-4852	25	7			
	45	15			
5310-12-156-4913	38	13			
5310-12-156-4982	2	2			
5305-12-158-0033	7	19			
4730-12-158-8862	38	18			
	49	41			
4730-12-161-4632	34	11			
5310-12-165-6886	34	4			
	51	1			
5325-12-167-0708	51	38			
5305-12-181-8170	37	7			
5305-12-181-8173	28	7			
5310-12-184-8509	19	12			
	51	30			
5310-12-192-5415	38	16			
5330-12-328-8836	45	7			
5330-12-328-8837	39	26			
5330-12-329-0787	39	13			
5310-12-334-4063	31	5			
2815-12-337-0096	38	8			
5305-12-346-2196	40	11			
5305-12-348-6727	47	3			
2920-12-359-2999	52	9			
5306-12-361-0975	45	9			
5310-12-362-5414	39	16			
5305-21-898-4493	52	7			

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
0CJB0	ABORD954		5	9
457G7	AH150EZ		55	35
25567	AK04		55	30
80205	AN320-16	5310-00-176-8117	12	2
80059	AN380-4-5	5315-00-012-0123	11	17
457G7	APG340GSKBUMS		57	13
			58	19
457G7	APG360GSKBUMS		57	17
			58	27
81343	AS25036-157	5940-00-143-4777	54	32
1WB54	ATHA-30-24-A		53	21
1WB54	AZ979-1A-24DR		54	18
D8286	A10X14DIN7603-CU	5330-12-156-4518	38	24
			49	42
D8286	A12X15,5DIN7603-CU	5330-12-156-4852	45	15
D8090	A21	5325-12-126-3410	31	7
07909	A62802-01		BULK	4
07909	A62802-01-AR		54	12
08806	A6324		4	4
11815	BAPK-69	5320-01-414-2171	21	1
1WB54	BF4L914		23	1
25567	BL06		55	34
25567	BL10		55	26
9K475	BOM-R8-10	5320-01-140-1479	7	8
17446	B0M-R8-9	5320-01-412-8088	7	6
80204	B1821BH025C100N	5305-00-225-3843	7	10
			18	11
80204	B1821BH031C100N	5306-00-226-4827	51	41
80204	B1821BH031C175N	5306-00-226-4832	9	6
80204	B1821BH038C125N	5305-00-068-0511	15	17
			18	1
			48	14
80204	B1821BH050C125N	5305-00-071-2067	17	2
80204	B1821BH050C200N	5305-00-071-2071	53	45
80204	B1821BH050C400N	5305-00-071-2079	11	25
			16	8
80204	B1821BH063C250N	5305-00-724-7224	23	7
			55	39
80204	B1821BH075C550N	5305-00-947-4363	57	20
			58	24
98883	B183998267	5305-21-898-4493	52	7
80204	B210NA00CAP39354BNBA1	5305-01-484-2488	11	31
1B467	B72C4-4F		56	10
1B467	B72N4-4F		56	9
15434	C0800205200	5305-01-158-3207	51	35
25567	C0808	5307-00-985-4918	55	18
25567	C1011		55	10

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
25567	C1210		57	26
			58	9
62445	DEUSA-0027-0935		59	16
1WB57	DEU1112264		53	41
D8286	DIN 128-A6-FST-A 3P	5310-12-151-4842	43	26
D8286	DIN125-A6.4-140H V-A3P		49	43
D8286	DIN125-A6,4-140H V-A3P	5310-12-184-8509	19	12
			51	30
D8286	DIN125-A8,4-140H V-A3P	5310-12-149-4353	3	12
			19	7
			37	5
			39	6
			40	3
			51	12
D8286	DIN128-A14-FST-A 3P	5310-12-151-4843	40	21
D8286	DIN137-B8-FST-A3 P	5310-12-142-8173	51	26
D8286	DIN3017-AS50-70C 8-W2		39	20
D8286	DIN6797-A6,4-FST -A3P	5310-12-156-4913	38	13
D8286	DIN7603-A10X13,5 -AL	5330-12-142-9117	38	21
D8286	DIN7603-A10X16-C U	5330-12-156-4519	38	19
D8286	DIN7604-A-M10X1- ST-ZNPHRF	5365-12-124-1048	25	14
D8286	DIN7604-A-M14X1, 5-ST	5365-12-125-5213	47	10
D8286	DIN7643-6	4730-12-158-8862	38	18
			49	41
D8286	DIN80705-M18X1,5 -14H-A2P		7	26
D8286	DIN912-M8X20-8.8 -A4C		45	20
D8286	DIN933-M10X25-8. 8		52	26
D8286	DIN933-M10X30-8. 8-A4C	5305-12-181-8173	28	7
D8286	DIN933-M6X10-8.8 -A2P	5305-12-141-9839	19	13
			49	44
			51	22
D8286	DIN933-M6X12-8.8 -A4C		19	18

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
15526	DIN933-M8-1.25X30-8.8-A4C	5305-01-268-5796	34	5
D8286	DIN933-M8X12-8.8-A2P	5305-12-141-9861	38	17
D8286	DIN933-M8X16-8.8-A4C		19	6
			33	8
			51	4
			51	11
D8286	DIN933-M8X20-8.8	5305-12-125-0321	33	11
D8286	DIN933-M8X25-8.8-A4C	5305-12-181-8170	37	7
D8286	DIN934-M12-B-A2P	5310-12-156-4982	2	2
D8286	DIN934-M6-6-A2A		38	12
1WB54	DPE-604F(PEO)		55	1
1CC55	D08		55	17
25567	D10	5310-01-315-7028	55	27
1WB54	EPC-13857		54	25
25567	GA0403		55	7
1WB54	GSO-20-BR		56	6
1JN64	G080585		44	3
1S763	G12HMP		57	6
1JN64	H000473		44	9
01276	H20104	4720-00-484-5765	BULK	1
01276	H20104-10		56	21
			56	44
01276	H20104-11		56	25
01276	H20104-11.25		56	20
1WB54	H20104-12		49	18
			49	20
			56	38
01276	H20104-14		56	23
01276	H20104-15		56	29
			56	35
01276	H20104-20		56	24
01276	H20104-21		56	11
01276	H20104-4.5		56	34
1WB54	H20104-49		49	38
01276	H20104-54		56	5
01276	H20104-55		56	12
01276	H20104-6		56	28
01276	H20104-80		56	27
01276	H20106	4720-01-371-9919	BULK	2
1WB54	H20106-13		49	21
01276	H20106-24		56	39
1WB54	H20106-26		49	15
			49	19
1WB54	H20106-42		49	22
C3734	H3220-D3X6		49	2
1WB54	IN4006DICT-ND		54	44

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
I9008	ISO4014-M8X85-8.8-A4C	5305-12-346-2196	40	11
I9008	ISO4017-M10X16-8.8-A3P	5305-12-158-0033	7	19
81348	J-C-30USE06CE1/10SRSJO	6145-00-060-8964	BULK	6
81348	JC30-AR		54	6
			54	28
25567	JO815991	5310-00-470-5974	55	16
1WB54	JUS 08005		46	7
D8090	J35	5365-12-156-4725	29	2
80205	MS24665-628	5315-00-846-0126	16	7
81343	MS25036-106	5940-00-283-5280	54	42
81343	MS25036-108	5940-00-143-4780	54	50
81343	MS25036-112	5940-00-143-4794	54	26
81343	MS25036-116	5940-00-114-1305	54	9
81343	MS25036-153	5940-00-143-4774	54	14
96906	MS27183-12	5310-00-081-4219	9	3
			51	42
96906	MS27183-14	5310-00-080-6004	15	9
96906	MS27183-17	5310-00-809-5997	11	23
			15	13
			16	9
			17	3
			58	28
96906	MS27183-21		15	19
			18	2
			55	38
			57	22
			58	20
96906	MS27183-9	5310-00-823-8804	7	12
			18	9
96906	MS3452W36-14P		53	54
80205	MS35206-283	5305-00-988-1727	55	31
94135	MS35489-106	5325-00-276-6056	7	7
96906	MS51095-418		58	29
96906	MS51957-30	5305-00-054-6654	53	30
96906	MS51967-14	5310-00-768-0318	11	22
			58	4
96906	MS51967-2	5310-00-761-6882	7	13
			18	8
			57	28
			58	7
			58	12
96906	MS51967-8	5310-00-732-0558	48	13
96906	MS51968-20	5310-00-763-8905	15	14
96906	MS90727-177	5305-00-726-2568	15	16
			57	12
			58	16
81349	M16878/1BKE3		BULK	5

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
81349	M16878/1BKE3-AR		54	17
81349	M45913/1-10CG5C	5310-00-269-4040	11	27
			15	18
81349	M45913/1-6CG5C	5310-00-087-4652	15	8
			18	4
81349	M45913/1-8CG5C	5310-00-225-6993	15	12
			16	10
81349	M45913/1-8CG5C	5310-00-225-6993	17	4
81349	M45913/2-12CG5C	5310-00-067-6356	57	8
D8286	M8X70DIN931-8.8-A4C		34	19
			37	6
			40	4
25567	N0607		55	25
74410	PH-T-60-AL		16	1
2K743	PL-118-RC001		53	25
06383	PLT2S	5975-00-074-2072	11	2
1B647	PT24044BK-1000		53	44
1JN64	P003951		44	5
1JN64	P004307		44	16
25567	P04-15079	4730-01-206-1284	55	6
1JN64	P114318		44	11
1JN64	P123462		44	14
1JN64	P158914		44	7
1JN64	P600321		44	6
1JN64	P601437		44	4
1JN64	P601476		44	8
55752	RK10110	5305-01-428-6791	48	4
55752	RK12041	5365-01-433-8951	48	12
55752	RK20011	4820-01-396-0881	48	3
55752	RK20025	4310-01-275-9294	48	2
			48	6
55752	RK20046	4930-01-507-7824	48	5
55752	RK20126	5365-01-395-4744	48	10
55752	RK22244	5331-01-360-0944	48	8
55752	RK22350-02	2940-01-435-3550	48	9
55752	RK30476	4820-01-474-6910	48	11
55752	R20P		48	7
2K743	R8666		53	15
0MJX4	SE52150		59	1
D8773	SGT20-32/13C8-W2	4730-12-161-4632	34	11
25567	S1073		55	13
25567	S215		55	23
18076	S325DG3		7	4
D9532	S6FST	5310-12-132-7461	43	69
80204	S630NA84CAG12354BNBA3	5305-01-485-0771	11	16
D9532	S8A3P	5310-12-148-5093	38	6
62445	TBD-0164		3	13
62445	TBD-0581		36	1

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
62445	TBD-0901		43	43
62445	TBD-0903		43	45
92867	TBD-1395		9	7
1GSL0	TBD-1455		10	26
01084	TBD-1501		11	15
25567	TBD-2039		55	28
25567	TBD-2041		55	29
80204	W221NAAW062NN039 NNBA1	5310-00-809-3079	11	28
80204	W221NAAW087NN039 NNBA1	5310-00-809-8540	11	26
74410	XA-T-60-A		16	6
74410	XA-T-62-XA-1		16	4
74410	XA-199-4	4010-01-224-9207	16	3
74410	XB-T-64-S		16	2
74410	XB-647		16	5
1WB54	Z1611-N		54	11
53867	0 001 231 005	2920-01-518-0947	52	1
62445	003 1189	5210-01-280-3591	59	17
62445	003 1477		22	12
26916	004-003005-060		57	2
D8265	005083		40	15
62445	0081 0311		33	14
62445	0110 0371		39	1
62445	0110 2396		40	9
D8246	0110 2797	5310-12-151-4842	43	66
62445	0110 2800	5310-01-439-0043	28	6
			40	6
62445	0110 7092		34	15
D2689	0110 7101	5310-12-149-4353	2	14
62445	0110 7548	5310-12-192-5415	38	16
62445	01102659	5310-01-441-2807	3	23
62445	01102797	5310-01-440-1416	43	5
			51	25
62445	01102799	5310-01-440-1417	28	2
			40	10
			51	20
D2689	01103316ES8920-07		33	17
			34	12
			38	15
			51	29
62445	0111 0523		34	7
62445	0111 0582		33	6
62445	0111 1207		3	25
62445	0111 1514		23	8
62445	0111 1770	5306-01-395-5877	40	22
62445	0111 2322	5306-01-373-6085	19	11
62445	0111 2333		39	7
62445	0111 2366		51	7

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
62445	0111 2824	5310-01-434-7272	2	15
			3	24
			19	8
			24	16
			47	6
			51	13
62445	0111 5464		26	2
62445	0111 6677		38	22
62445	0111 8659		25	13
62445	0111 8693	5310-01-437-8700	43	2
62445	0111 8835	5310-01-437-4499	35	9
D2689	0111 8971		40	12
62445	0111 9246	4730-01-437-7482	49	10
D8246	0111 9611		45	19
62445	0112 4457	5306-01-439-4308	19	3
62445	0112 7046		40	19
62445	0113 1115		3	10
62445	0113 1116		27	17
62445	0113 2562		25	16
			32	3
			33	5
			34	18
			42	4
			51	27
62445	0113 7057		42	23
62445	0113 7239	5315-01-396-2214	26	5
62445	0113 9357		27	16
62445	0113 9565		19	1
62445	0113 9720		37	1
62445	0114 0501		43	18
62445	0114 3878		51	24
62445	0114 4115		27	3
62445	0114 4176		43	67
62445	0114 4541		51	2
62445	0114 4544		33	9
62445	0114 4573		33	7
62445	0114 8122		33	15
			34	16
			43	64
62445	0114 8124		39	17
			47	2
			51	3
62445	0114 8136		24	17
62445	0114 8199		51	5
62445	0114 8201		43	6
62445	0114 8230		47	8
62445	0114 8233		25	17
62445	0114 8239		32	1
			47	1

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
62445	0114 8419		24	1
			43	17
62445	0114 8425		24	4
62445	0115 1488		43	70
62445	0115 1506		38	7
62445	0115 1664		43	62
62445	0116 0480	5330-01-396-0443	34	20
D2689	0116 3944	5325-12-167-0708	51	38
62445	0116 6366		34	9
62445	0116 8145		34	13
62445	0117 2303	5310-01-441-7091	51	19
62445	0117 3971		45	1
62445	0117 4016		49	11
62445	0117 4191		42	21
62445	0117 4194		42	24
62445	0117 4549		45	17
62445	0117 4580		27	1
62445	0117 5632		45	2
62445	0117 5905		45	11
62445	0117 6197	5340-01-395-6282	25	20
62445	0117 6485		49	1
62445	0117 8272		27	2
			27	15
			38	5
62445	0117 8750		45	10
62445	0117 9155	5310-01-396-2857	25	15
62445	0117 9670		42	20
62445	01177351		3	9
62445	01178931		26	9
62445	01179703		39	10
62445	0118 0084		40	8
D2689	0118 1433	5306-12-361-0975	45	9
62445	0118 1749		36	4
62445	0118 1780		39	18
62445	0118 1859		3	6
62445	0118 1917		47	9
62445	0118 2010		3	7
D2689	0118 2036	5310-12-362-5414	39	16
62445	0118 2190		3	11
62445	0118 2199		3	5
62445	0118 2271		3	8
62445	01180830		2	16
92867	01191510	2510-01-415-2636	9	1
62445	0121 0230		38	10
62445	0121 0231		38	9
62445	0121 0822		39	23
			45	5
62445	0121 2482	5340-01-395-6279	19	16
62445	0121 2483	5340-01-395-6281	19	17
D2689	0121 5749		3	22

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
62445	0121 5850	5310-01-435-1729	51	6
62445	0121 6105	5310-01-434-8646	31	6
62445	0121 6108		42	22
62445	0121 6124		35	6
62445	0121 8426		25	11
62445	0122 3255		22	14
62445	0128 7773		43	13
D2689	0129 0579		49	7
62445	0131 9882		43	15
62445	0131 9883		43	3
62445	0134 0221		43	35
62445	0134 0223		43	31
62445	0134 0248		43	30
62445	0134 0249		43	37
62445	0134 0250		43	39
62445	0134 0251		43	54
62445	0134 0252		43	55
62445	0134 0253		43	38
62445	0134 0254		43	36
62445	0134 0255		43	41
62445	0134 0256		43	42
62445	0134 0257		43	53
62445	0134 0258		43	47
62445	0134 0259		43	34
62445	0134 0260		43	32
62445	0134 0261		43	29
62445	0134 0262		43	25
62445	0134 0263		43	27
62445	0134 0264		43	28
62445	0134 0266		43	49
62445	0134 0267		43	48
62445	0134 0268		43	52
62445	0134 0269		43	50
62445	0134 0270		43	51
62445	0134 0276		43	46
62445	0134 0277		43	44
62445	0140 2722		51	31
62445	0140 4327		51	21
62445	0140 4806		51	16
62445	0140 4807		51	15
59556	019-00004-42	5310-00-637-9541	4	10
62445	0210 2313	5340-01-395-6288	28	3
62445	0210 8102		24	10
D2689	0210 9637	5310-12-334-4063	31	5
62445	0211 1897		43	12
62445	0213 5196		27	20
62445	0216 3215		23	6
62445	0223 0053		51	8
62445	0223 2166		27	9
62445	0223 3217	5360-01-438-3950	35	7

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
62445	0223 3310		47	7
62445	0223 3443		2	3
62445	0223 4165		38	3
62445	0223 4177		41	6
62445	0223 4870		25	2
62445	0223 5014		40	7
62445	0223 5163		45	12
62445	0223 5459		2	1
62445	0223 5466		2	4
62445	0223 5467		2	6
62445	0223 5470		2	10
62445	0223 6479		27	18
62445	0223 6507		27	11
62445	0223 6511		27	19
62445	0223 6578	5310-01-396-2859	31	3
62445	0223 6999		27	13
62445	0223 7255		26	4
62445	0223 7670		3	14
62445	0223 7981		37	4
62445	0223 8148		38	14
62445	0223 8160		19	5
62445	0223 8266		35	4
62445	0223 8267		35	8
62445	0223 8443		35	5
62445	0223 8626		24	19
62445	0223 8632		24	18
62445	0223 9178		33	2
62445	0223 9180		33	10
62445	0223 9181		33	16
62445	0223 9229		35	10
D2689	0224 3287		3	21
62445	0224 3621		51	10
62445	0224 7670		3	2
62445	0224 8490	6150-01-396-0274	7	17
62445	02248935		7	21
D2689	0240 4201	5310-12-165-6886	34	4
			51	1
62445	0293 1492		26	1
62445	0293 1525		43	24
62445	0293 1528		43	33
62445	0293 1529		43	8
1WB55	0304677		53	40
1WB56	0304746		53	42
62445	0331 9863		35	2
62445	0333 1884		34	17
62445	0336 4025		23	9
D2689	0336 5861	2815-12-123-0936	31	4
62445	0336 7024		33	1
62445	0337 1876	5360-01-342-8510	31	10
D2689	0415 0820		34	21

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
62445	0415 1399		19	15
62445	0415 1565		39	15
62445	0415 1882		51	32
62445	0415 1892		39	5
62445	0415 1993		34	8
D2689	0415 2424		34	3
62445	0415 2509	3120-01-396-8372	42	11
62445	0415 2511		42	1
62445	0415 2517	3120-01-396-9838	42	10
62445	0415 2521		42	2
62445	0415 2750		31	1
D2689	0415 2752		31	2
62445	0415 2843		19	9
62445	0415 2845		19	2
62445	0415 3000		19	10
62445	0415 3005		39	3
62445	0415 3047		51	17
62445	0415 3053		39	22
			45	4
D2689	0415 3128		42	12
62445	0415 3130		42	15
62445	0415 3618		34	14
62445	0415 4590		41	4
62445	0415 4591		41	3
62445	0415 4593		41	5
62445	0415 4844		39	11
62445	0415 6002		36	2
62445	0415 6058	5305-01-395-7700	25	12
62445	0415 6193		38	11
62445	0415 6283	5310-01-396-2856	41	1
62445	0415 6285		41	2
62445	0415 6548		25	8
62445	0415 6641		51	18
62445	0415 6862	5340-01-395-7693	25	21
62445	0415 7248	5330-12-329-0787	39	13
62445	0415 7250		39	4
62445	0415 7643		35	11
62445	0415 8044		39	24
62445	0415 8323		24	20
62445	0415 8584		35	3
62445	0415 9629		19	14
62445	0415 9630		51	9
62445	0415 9632		51	36
D2689	0415 9697	2815-12-337-0096	38	8
62445	0415 9954		45	16
62445	0415 9979		51	14
62445	04153683		26	11
62445	04154144	5330-01-434-7270	40	18
62445	0416 0764	5365-01-395-4737	25	10
62445	04175610	5330-01-398-6652	1	3

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
D2689	0418 2519		45	18
D2689	0418 2520	5330-12-328-8836	45	7
62445	0420 9204		39	21
62445	0420 9206		45	3
62445	0423 0382		2	7
62445	0423 0431		27	4
62445	0423 0658		27	6
62445	0423 0659		27	7
62445	0423 1079		26	7
62445	0423 1132		34	1
62445	0423 1183		40	23
62445	0423 1303		29	3
62445	0423 1345		39	19
62445	0423 1475		34	10
62445	0423 1519		24	21
62445	0423 1543		30	2
62445	0423 1976		24	5
62445	0423 2070		24	7
62445	0423 2267		25	1
62445	0423 2679		26	3
62445	0423 2790		26	8
62445	0423 2791		26	6
62445	0423 2800		51	28
62445	0423 3073		33	4
62445	0423 3228		42	8
D2689	0423 3529	5330-12-328-8837	39	26
62445	0423 3808		31	9
62445	0423 3809		43	4
62445	0423 3830		43	11
62445	0423 3841		43	68
62445	0423 3849		43	63
62445	0423 3850		43	65
62445	0423 3851		43	60
62445	0423 3861		24	2
62445	0423 3878		43	7
62445	0423 3880		43	10
62445	0423 3882		43	9
62445	0423 3934		27	14
62445	0423 3964		38	20
62445	0423 4001		32	5
62445	0423 4074		27	10
62445	0423 4075		27	5
62445	0423 4107		43	22
62445	0423 4117		29	7
62445	0423 4129		43	40
62445	0423 4130		43	14
62445	0423 4146		38	4
62445	0423 4181		29	5
62445	0423 4349		1	1
62445	0423 4350		1	2

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
62445	0423 4395		25	4
62445	0423 4499		43	57
62445	0423 4500		43	72
62445	0423 4501		43	71
62445	0423 4502		43	56
62445	0423 4583		43	23
62445	0423 4592		43	58
62445	0423 4608		43	16
1JN64	0423 4638		43	1
62445	0423 4953		24	14
62445	0423 5280		29	1
62445	0423 5316		25	26
62445	0423 5409		24	3
62445	0423 5411		49	3
62445	0423 5412		49	4
62445	0423 5413		49	5
62445	0423 5414		49	6
62445	0423 5422		32	4
62445	0423 5557		45	6
62445	0423 5643		38	23
62445	0423 5692		43	21
62445	0423 5708		42	5
62445	0423 5823		45	8
62445	04234958		24	15
81495	071 310 40	5305-01-263-6913	40	5
1TUY2	0777801184	5325-01-412-5998	10	12
1TUY2	0953700	2530-01-320-1687	10	28
1TUY2	0978600	5360-01-288-5870	10	19
53867	1 000 306 002	5365-01-517-3346	52	15
058D1	1A868		7	22
			54	31
1WB54	10-011-17		58	23
1WB54	10-011-18		58	25
1WB54	10-011-19		58	15
1WB54	10-011-20		58	17
1WB54	10-011-23		57	19
			58	26
1B467	10004B-605		56	26
62445	100120		59	8
62445	100740		59	12
01084	10231		15	4
01084	10232		15	6
20076	10271	2530-01-121-0786	11	11
94189	10273	5306-01-258-0830	11	14
8X093	10274	5360-01-269-7264	11	9
1B467	1070 X 4		53	43
19207	10891263-1	6150-01-167-6522	7	1
62445	110 3735	5305-01-273-7556	2	13
62445	110-7844	5325-01-317-8119	2	9
62445	110110		59	2

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
62445	110340		59	11
62445	110410		59	10
62445	1104847	5306-01-196-7899	28	8
62445	1107105		7	20
			36	5
			52	25
62445	111 1218	5305-01-317-3243	2	12
			3	16
62445	111 1540		23	10
36719	111 1602	5305-01-318-3287	2	11
36719	111 2240		51	23
36719	111 2264	5305-01-246-1404	33	18
62445	111 2350		35	1
62445	111 2828	5310-01-246-1361	39	9
62445	111 8659	5330-12-156-4806	39	2
62445	111 8737	5365-01-280-7191	37	2
K5476	111-1213		37	8
62445	111-1384	5306-01-211-7442	36	6
62445	111-2295	5305-01-246-4430	28	1
62445	111-5333	5315-01-197-1478	25	22
62445	111-5406	5315-01-239-5263	27	8
62445	111-9241	4730-01-260-4395	45	14
62445	1115403	5315-01-287-6522	27	12
62445	1115470	5315-01-195-6657	42	9
62445	1118641		43	59
			47	4
62445	1118692	5331-01-439-5377	47	11
			49	8
62445	1118713		40	13
62445	1118760	5310-01-207-7206	45	13
62445	112 2477	5310-01-246-1361	42	3
62445	112-4803	5306-01-244-3716	3	17
62445	1123665	3110-01-215-9553	2	8
62445	1126979	5306-01-253-1591	3	19
62445	113 1092	5307-01-273-7532	39	8
			39	14
1JN64	113-6454		50	16
1JN64	114-8458		50	15
62445	1144534	5307-01-207-0170	24	11
19207	11639519-2	5331-00-462-0907	4	2
62445	1166103	5331-01-188-0852	43	20
62445	1167010	5310-01-208-6603	25	19
62445	1167266		25	9
62445	1167269	3120-01-239-1374	25	23
62445	1167425	5325-01-194-9154	51	37
62445	117 9367		49	45
36719	117-3066	5325-01-273-7620	39	25
			51	39
62445	1170580	5340-01-236-6391	25	18
62445	1171763	5305-01-273-7553	7	24

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
62445	1173630	4720-01-195-7055	49	9
62445	1173838	5331-01-188-0851	25	27
62445	1174190	5307-01-208-3691	43	19
62445	1174311	5331-01-188-0850	25	25
62445	1174706	5330-01-343-2648	38	1
5P512	12098	4730-01-412-6769	11	6
36719	121-6240	5340-01-197-1502	25	5
36719	1215500	5325-01-049-3976	24	6
62445	1216128	5310-01-210-1673	26	10
62445	1216307	5310-01-149-3703	32	2
62445	1216511	4730-01-195-4244	35	12
62445	123-6290	5365-01-193-7160	40	2
19207	12342354	4030-01-316-1551	15	15
19207	12360850-1	6220-01-284-2709	4	6
19207	12360850-2	6220-01-387-4250	4	7
36719	1236291	2590-00-175-9502	40	1
19207	12375837	6220-01-372-3883	4	1
34623	12375838		4	8
19207	12375841	6220-01-359-2870	4	3
53711	124-4322621 PC 1 30		57	27
			58	8
25900	12411431		33	13
1TUY2	12426	3040-01-349-6927	11	21
18076	12449366-1	5340-01-414-2173	9	9
19207	12449366-2	5340-01-414-1453	7	5
19207	12449377-5	5310-01-484-0489	10	32
19207	12449377-9	5310-01-412-1774	9	2
33875	12449392		10	31
19207	12449500-3	5320-01-414-1459	7	3
			9	10
33875	12449501	4010-01-412-1282	17	1
19207	12449997	6150-01-485-1459	7	2
19207	12479775	3120-01-494-9225	11	30
19207	12479776	3120-01-494-9220	11	20
19207	12479777	5315-01-494-8535	11	32
19207	12479779	1740-01-269-7270	11	19
62445	125310		59	14
62445	126 0659	3120-01-253-0355	3	15
01084	12758	2530-01-287-4451	10	27
1TUY2	12972	5305-01-412-6287	10	9
62445	131 8549		3	4
29510	131033R1	5340-00-714-3113	10	4
1B467	1344		49	26
			56	7
			56	43
66195	135273-1		21	6
25567	13886		55	22
60038	14125A	3110-00-142-4355	12	5
62445	142060		59	3

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
62445	142080		59	4
36719	142700	5120-01-203-7950	59	5
62445	143110		59	6
62445	143400		59	7
D8015	1455522014	2910-12-156-2138	47	5
01084	14966		11	24
D8400	150800		59	13
25281	1518		49	14
			56	37
01084	15300		9	8
1VZM7	15465	3030-01-157-9621	3	18
3A054	1590A45		53	52
25567	15991		55	11
1ML14	160606	3110-00-293-9163	2	5
08108	1683	6240-00-044-6914	4	5
59150	168501-00225	6680-01-475-0101	53	34
1TUY2	17406	5310-01-320-1980	10	5
01084	17421		15	2
01084	17422		15	7
01084	17423		15	10
01084	17424		18	3
01084	17425		18	12
01084	17427		15	11
01084	17428		15	3
01084	17467		18	5
01084	17469		18	6
01084	17470		18	7
01084	17475		13	1
01084	17476		14	1
01084	17477		8	1
01084	17508		11	1
01084	17509		11	29
01084	17521		11	18
01084	17536		7	11
01084	17537		15	1
01084	17546		11	41
01084	17547		11	38
01084	17549		11	36
01084	17550		11	40
20076	17556		11	10
01084	17574		18	10
1TUY2	17762	5340-01-412-1281	11	12
01084	17798		13	2
81996	17803	5360-01-269-7266	11	4
1TUY2	17917	2530-01-412-5209	10	29
01084	18022		15	5
1TUY2	1806600317	5340-01-412-1284	11	5
01084	18201		12	1
25567	1822GA		55	15
94189	18502	5340-01-412-1285	10	8

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
1TUY2	18508	5315-01-287-8770	10	2
1TUY2	18836	2530-01-287-9409	10	15
1TUY2	18950	5310-01-412-0861	10	20
53867	1901321209		52	6
2K743	194-33090-0042		53	28
53867	2 000 301 000	3120-01-273-7507	52	23
53867	2 000 310 002	5365-01-517-2849	52	21
53867	2 339 402 133		52	2
53867	2 915 011 039	5310-01-517-6900	52	5
53867	2 918 740 008	5310-01-517-6906	52	3
25795	2A582		54	23
1WB54	20-012-04		53	18
1CSL0	2026023	2530-01-530-5068	10	7
			10	27
01276	2082-4B	4730-00-012-7951	49	23
			56	41
62445	2101802	5330-01-191-8167	51	34
25567	21171?536		55	4
62445	213-7306	2815-01-021-9093	24	12
62445	2131081	3020-01-022-3663	28	10
62445	2134884	5310-01-207-7205	42	6
62445	2135019	5340-01-209-7006	40	16
62445	2137015	5315-01-211-1139	30	3
36719	216-4969	5310-01-273-7433	33	3
93061	2202PA-4-4	4730-01-240-6108	49	12
62445	223 8021	5360-01-207-0160	42	19
36719	223-4263	5310-01-250-3735	19	4
36719	223-8084	5365-01-274-2116	42	16
62445	2230937	5365-01-210-4667	40	14
62445	2232840	5310-01-190-7468	31	8
62445	2237638	5360-01-213-4636	40	17
62445	2238022	3120-01-196-2582	42	14
62445	2238081	3040-01-198-1130	42	18
62445	2238083	5310-01-207-7204	42	17
62445	2238196	5310-01-277-9849	42	7
62445	2239984	4710-01-208-1313	38	2
62445	224 2433	3120-01-253-0354	3	26
62445	224-5054	5935-01-327-0956	7	18
62445	2242050		28	4
62445	2245062	5930-01-198-0916	7	25
1WB54	225-6-6		56	22
80201	22532	5330-01-412-4447	12	8
25567	22644-220		55	33
25567	22645-164		55	5
55752	230R2	2910-01-434-0828	48	1
1TUY2	23323	2530-01-288-3979	10	16
1TUY2	23457	5305-01-321-3522	10	3
62445	241-1054		39	12
25567	24131-345		55	3
25567	25271-554		55	21

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
5H671	253-50128-13000	4720-01-416-5916	11	33
60038	25580	3110-00-100-3541	12	7
62445	274541		3	3
058D1	3LP21		54	47
1B467	30-013-14		46	11
			49	49
1B467	30-013-15		49	16
1B467	30-013-16		49	29
			49	48
1B467	30-013-28		49	17
			56	4
1WB54	30-013-37		46	8
1WB54	30-21-WH		20	3
D8046	304017006034	5305-12-348-6727	47	3
25567	31134-099		55	20
1B467	3152X 4		56	31
1B467	3220X 6X 4		56	16
62445	331-2840	5310-01-237-2050	34	6
62445	336 3948	5310-01-273-7518	33	12
62445	336 3993		3	20
62445	336-9305		24	8
62445	3361809	5325-01-192-5822	51	33
62445	3362337	5330-01-210-4983	25	3
62445	3362574	5330-01-364-4892	37	3
62445	3367789	3120-01-194-6285	30	1
62445	3371612	3120-01-197-6657	29	6
36719	3371660		29	4
62445	3371748	5342-01-029-1194	24	9
62445	3371885	2815-01-192-9801	31	12
36719	3371887	2815-01-022-0094	31	11
01084	3382	2530-01-414-9314	10	1
1B467	3400X4		56	36
01084	3484	2530-01-414-9317	10	1
1B467	3500X4		56	46
01084	3527		11	39
1WB54	356		53	24
0Z890	363259	5310-01-417-2927	12	4
25567	38517-516		55	24
1CC55	38818-020	5340-01-533-3344	22	10
1JN64	4-01		44	1
81343	4-4 130137B	4730-00-277-8289	49	28
			56	8
			56	47
058D1	4DV35		53	37
45152	4KK500		40	20
1WB54	40-014-23		53	20
1WB54	40-014-25		7	15
1WB54	40-014-30		53	19
1WB54	40-014-31		7	16
D0210	40-70056-00	5330-12-156-4852	25	7

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
1JN64	401-01		44	2
1WB54	401-02		44	12
1WB54	401-03		44	15
1WB54	40102-08		53	39
1WB54	40105-01		53	38
1WB54	402-01		50	7
1WB54	402-03		50	17
1WB54	402-04		50	3
1WB54	402-05		50	19
1WB54	402-06		50	2
1WB54	402-08		50	14
1WB54	402-09		50	9
62445	415 2076		49	47
62445	4152877	2815-01-324-3705	31	13
62445	4154482	5330-01-343-2670	36	3
62445	4158766	5330-01-194-5924	42	13
62445	4191001	5930-01-365-6928	7	23
62445	420-4326	2815-01-192-9756	28	9
59105	42060721		53	26
59105	42062521		53	33
62445	423 0512		49	46
62445	4231246	4820-01-396-7742	34	2
62445	4231432	5365-01-188-1089	24	22
62445	4231804		24	13
25567	42381-504	4720-01-351-5953	55	32
94189	43593	5340-01-412-1278	11	3
1TUY2	4390500	2530-01-412-3863	11	13
1B467	44		56	3
62445	44144-003		28	11
25567	44165-011		55	2
1TUY2	44863	2530-01-412-5210	10	11
1TUY2	44864	2530-01-412-5211	10	11
1TUY2	4486500	2530-01-320-1686	10	28
S3465	4537769-629	5310-01-174-1491	52	4
25567	46471-256		55	12
58961	46933		54	7
1WB54	47160		54	1
1WB54	47162		54	41
58961	47302		54	39
25567	4822 13040		55	14
10988	496-21053	5310-01-351-7793	20	1
1WB54	501-01		6	13
1WB54	501-02		6	8
1WB54	501-04		6	12
1WB54	501-05		6	11
1WB54	501-06		6	3
41HK8	50103-01		6	9
41HK8	50103-03		6	16
D0116	5011145		25	6
01084	50201-01		20	5

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
1WB54	503-04		7	14
1WB54	50301-01		54	43
1WB54	50301-02		54	36
1WB54	50301-04		53	7
1WB54	50301-05		53	5
1WB54	50301-07		53	1
1WB54	50301-08		53	12
1WB54	50301-09		53	8
1WB54	50301-10		53	6
1WB54	50301-11		53	53
1WB54	50301-12		53	9
1WB54	50302-02		53	22
1WB51	50302-03		53	29
1WB54	50401-01		46	9
1WB54	50401-02		46	1
1B467	50402-09		49	33
1JN64	5348 FAB		44	13
1JN64	5364 FAB		44	10
08136	54-1048	5310-00-402-5856	50	8
25567	5401N		55	19
3A054	5469K123		56	18
25567	5792	5340-01-203-1070	55	9
53867	6 033 AD0 082	2920-01-517-9265	52	22
53867	6 033 AD0 128	2920-01-518-0975	52	18
53867	6 033 AD0 130	5977-01-517-8945	52	16
53867	6 033 AD0 151	5977-01-518-0284	52	17
53867	6 033 AD0 183	2920-01-517-9438	52	14
1WB54	6-0201-05		57	24
			58	13
1WB54	6A10DICT		54	30
1WB54	6A10DICT-ND		54	2
25795	6X750		54	48
1WB54	601-01		58	11
1WB54	601-03		58	3
1WB54	602.3		54	4
1WB54	602-01		57	25
1WB54	602-02		57	4
D3273	6020990155		28	5
81346	611265		21	3
19207	6161059A	9905-00-205-2795	21	2
1WB54	62C800BUNOH		57	21
			58	6
1WB54	623		53	17
3A054	64865K1		57	23
			58	21
1WB54	653		53	16
7Z588	6604 B	4730-00-469-7820	56	45
1B467	6747		56	30
1TUY2	6814	5360-01-320-5820	10	17
39428	69645K58	5940-01-458-1939	5	7

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
39428	69645K59	5940-01-458-1940	5	2
1WB54	70285		54	33
2K743	7113K242		54	5
1B467	72PDC-3		49	37
59105	735-2		53	27
19207	7410482	9905-00-202-3639	21	4
01084	7507		11	34
19204	7551255	4910-00-255-8641	59	15
1WB54	760A-30-24		54	15
19027	7731428.00		7	9
01084	7749		11	35
			11	37
25567	7765E		55	8
1WB54	78155		54	35
			54	37
94189	7820	5330-01-269-7265	10	24
			11	8
1TUY2	7949	5306-01-100-5113	10	25
0VSH3	7976	5310-01-100-5112	11	7
1WB54	80-018-12		57	9
			58	14
1WB54	80-018-14		57	16
			58	22
1B467	80-018-21		46	10
			56	1
1B467	80-018-22		49	39
1WB54	80-018-8		57	10
			57	14
1WB54	80-018-9		57	11
			57	18
92867	81000129	5315-00-584-9053	9	4
62445	0301191		59	9
1WB54	814-0198		54	21
1WB54	814-3098		54	20
92867	84000139	5315-01-372-8923	9	5
01084	8654		12	6
3A054	8862T38		50	20
39428	8863T15		56	15
39428	8863T16	5340-01-540-6545	56	14
01084	8903		22	9
01084	8974		22	9
53867	9 001 333 446	5305-01-517-6913	52	12
53867	9 001 333 448	5305-01-517-6910	52	24
53867	9 001 336 244	3020-01-517-6987	52	11
53867	9 002 336 236	2920-01-518-0949	52	20
53867	9 003 330 317	5365-01-517-2850	52	13
53867	9 003 331 931	2920-01-518-0943	52	8
53867	9 003 334 039	2920-01-518-0395	52	19
53867	9 003 337 009	3020-01-517-6980	52	10
01084	90-019-01		20	4

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
1B467	90-019-104		46	6
1WB54	90-019-130		57	5
			58	10
1B467	90-019-131		46	5
			49	13
			56	40
1WB54	90-019-193		BULK	3
1WB54	90-019-196		50	4
1WB54	90-019-229		53	46
1WB54	90-019-235		49	30
1WB54	90-019-237		6	5
1WB54	90-019-241		22	11
1WB54	90-019-242		22	13
1WB54	90-019-244		5	6
1WB54	90-019-245		5	5
1WB54	90-019-246		5	11
1WB54	90-019-247		5	4
1WB54	90-019-248		5	10
1B467	90-019-254		49	40
1B467	90-019-303		49	36
1B467	90-019-304		49	35
1B467	90-019-319		46	3
1B467	90-019-320		46	4
1B467	90-019-345		46	2
457G7	90-019-372		46	12
1GE78	90-019-405		22	7
1GE78	90-019-406		22	6
1GE78	90-019-407		22	1
1GE78	90-019-408		22	2
1WB54	90-019-412		53	32
1WB54	90-019-416		22	5
1WB54	90-019-417		22	4
1WB54	90-019-420		58	1
457G7	90-019-426		58	2
1WB54	90-019-436		22	3
3A054	90-019-5		23	3
1B467	90-019-55		49	25
			56	49
1WB54	90-019-62		57	15
			58	18
1WB54	90-019-73		57	3
1WB54	90-019-98		56	2
2K743	9003		53	23
D8015	9003337010	2920-12-359-2999	52	9
39428	90101A007	5310-01-239-9412	49	27
3A054	90101A011	5310-01-504-9412	5	3
			5	15
			20	6
			56	19
39428	90126A509		53	31

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
39428	90130A031		4	9
39428	90272A245		20	7
0Z890	90640	5310-01-414-6476	12	10
1WB54	9105-K33-M		59	18
39428	91102A760	5310-01-502-2934	50	12
39428	91104A035	5310-01-396-5295	23	4
			50	6
			55	37
39428	91247A628	5306-01-193-9197	50	1
3A054	91257A814		23	2
39428	91257A822		15	20
3A054	91280A540		50	11
39428	91772A144		49	32
3A054	91772A151		54	45
39428	91772A190		54	16
39428	91772A194		53	11
			54	38
3A054	91772A199		54	22
39428	91772A247		5	1
			5	14
3A054	91772A253		56	17
39428	91772A825		54	19
39428	91772A829	5305-01-497-7834	54	3
2V507	91772A831	5305-00-059-3661	54	10
39428	91772A833	5305-01-534-7417	54	34
39428	91781A638		4	11
3A054	91792A146		53	14
39428	91792A148	5305-00-054-6654	49	34
			54	40
39428	91792A150		53	51
39428	91792A197		6	1
			6	6
39428	91831A009	5310-01-359-2589	6	4
			53	50
39428	91831A029	5310-01-416-1851	49	24
			53	3
			54	27
			56	13
			56	32
			56	42
39428	91831A140		6	14
39428	91841A007		53	49
3A054	91855A271		53	13
0Z890	91901	5315-01-417-1051	12	3
39428	92001A321	5310-01-501-1403	53	4
39428	92001A339	5310-01-491-1474	6	10
1WB54	922005		54	49
3A054	92240A105		54	8
39428	92240A108		54	24
39428	92240A539		53	2

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
39428	92240A542	5305-01-482-9880	49	31
			54	29
			56	33
			56	48
0Z890	9251100	5306-01-418-9086	12	9
39428	92620A798	5305-01-508-6879	8	2
39428	92865A217	5305-01-534-4818	6	15
39428	92865A264		50	18
39428	92865A624	5305-01-532-9137	44	17
2V507	92865A628	5305-01-529-4401	53	48
39428	92865A802		50	5
64678	933006130		43	61
39428	95462A030	5310-01-524-7436	5	13
39428	95462A031	5310-01-504-8245	5	12
39428	95462A033	5310-01-533-6193	20	2
39428	95462A538		57	1
2K743	956-4124		53	35
39428	95601A365		8	3
39428	95615A120	5310-01-466-7850	44	18
39428	95615A140	5310-01-535-3265	50	10
			53	36
1WB54	964205		54	13
1WB54	964305		54	46
39428	97135A270		23	5
			55	36
			57	7
			58	5
39428	97135A275	5310-01-508-5907	8	4
0WY95	9750N7025	6140-01-485-1472	5	8
3A054	97525A435		22	8
1TUY2	9776	2530-00-161-7575	10	30
1TUY2	9777	2530-00-161-7576	10	30
1TUY2	9784	5360-01-320-5815	10	10
1TUY2	9785	5360-01-320-5818	10	18
1TUY2	9789	2530-01-263-7061	10	14
94189	9790	5360-01-320-5819	10	13
1TUY2	9791	5360-01-287-7297	10	21
94189	9794	5310-01-320-1987	10	23
1TUY2	9795	5340-01-277-0300	10	22
94189	9796	5315-01-319-9194	10	6
39428	98017A625	5310-01-546-2651	6	2
			6	7
			53	10
3A054	98032A514	5310-01-502-3536	50	13
			53	47

CHAPTER 8

SUPPORTING INFORMATION

SUPPORTING INFORMATION

REFERENCES

SCOPE

This work package lists all forms, field manuals, technical bulletins, technical manuals, and miscellaneous publications referenced in this manual.

FORMS

Equipment Inspection and Maintenance Worksheet . . . . . DA Form 2404
Equipment Inspection Maintenance Worksheet (EGA) . . . . . DA Form 5988-E
Preventive Maintenance Schedule and Record . . . . . DD Form 314
Product Quality Deficiency Report . . . . . SF Form 368
Recommended Changes to Publications and Blank Forms . . . . . DA Form 2028
Recommended Changes to Publications and Blank Forms (EGA) . . . . . DA Form 2028-E
Transportation Discrepancy Report (TDR) . . . . . DD Form 361

FIELD MANUALS

Concepts and Equipment of Petroleum Operations . . . . . FM 10-67-1
Manual for the Wheeled Vehicle Driver . . . . . FM 21-305
Multiservice Helicopter Sling Load: Basic Operations and Equipment . . . . . FM 4-20.197
Operation and Maintenance of Ordnance Materiel in Cold Weather . . . . . FM 9-207

TECHNICAL BULLETINS

Color, Marking, and Camouflage Painting of Military Vehicles . . . . . TB 43-0209
Solder and Soldering . . . . . TB SIG 222

TECHNICAL MANUALS

Materials Used for Cleaning, Preserving, Abrading and Cementing Ordnance Materiel and Related Materials Including Chemicals . . . . . TM 9-247
Operator's, Unit, Direct Support and General Support Maintenance Manual for Care, Maintenance, Repair, and Inspection of Pneumatic Tires and Inner Tubes . . . . . TM 9-2610-200-14
Procedures for Destruction of Equipment to Prevent Enemy Use (Mobility Equipment Command) . . . . . TM 750-244-3

MISCELLANEOUS PUBLICATIONS

Abbreviations and Acronyms . . . . . ASME Y14.38-1999
Army Medical Department Expendable/Durable Items . . . . . CTA 8-100
Department of Defense Interface Standard for Lifting and Tiedown Provisions MIL-STD-209K
Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items) . . . . . CTA 50-970
First Aid . . . . . FM 4-25.11
Military Specification for Lubricating Oil, Preservative, Type I, Grade 10, 30, 50 . . . . . MIL-L-21260B
Operator's Circular Welding Theory and Application . . . . . TC 9-237
The Army Maintenance Management System (TAMMS) Users Manual . . . . . PAM 750-8
Treatment and Painting of Materiel MIL-T-704

END OF WORK PACKAGE

SUPPORTING INFORMATION

MAINTENANCE ALLOCATION CHART (MAC) INTRODUCTION

THE ARMY MAINTENANCE SYSTEM MAC

1. This introduction provides a general explanation of all maintenance and repair functions authorized at the two maintenance levels under the Two-Level Maintenance System concept.
2. The MAC (WP 0126) designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component shall be consistent with the capacities of the designated maintenance levels, which are shown in the MAC (WP 0126) in column (4) as:

   Field - includes subcolumns:

   C - Operator/Crew
   O - Service
   F - Field

   Sustainment - includes subcolumns:

   H - Below Depot
   D - Depot
3. The Tools and Test Equipment Requirements (WP 0126) list the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from the MAC.
4. The Remarks column (WP 0126) contain supplemental instructions and explanatory notes for a particular maintenance function.

MAINTENANCE FUNCTIONS

Maintenance functions are limited to and defined as follows:

1. **Inspect.** To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).
2. **Test.** To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards on a scheduled basis, i.e., load testing of lift equipment and hydrostatic testing of pressure hoses.
3. **Service.** Operations required periodically to keep an item in proper operating condition; e.g., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.
4. **Adjust.** To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.
5. **Align.** To adjust specified variable elements of an item to bring about optimum or desired performance.
6. **Calibrate.** To determine and cause corrections to be made or to be adjusted on instruments of test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.
7. **Remove/Install.** To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.
8. **Replace.** To remove an unserviceable item and install a serviceable counterpart in its place. “Replace” is authorized by the MAC and assigned maintenance level is shown as the third position code of the Source, Maintenance, and Recoverability (SMR) code.
9. **Repair.** The application of maintenance services, including fault location/troubleshooting, removal/installation, disassembly/assembly procedures, and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

MAINTENANCE FUNCTIONS - CONTINUED

NOTE

The following definitions are applicable to the "repair" maintenance function:

- Services - Inspect, test, service, adjust, align, calibrate, and/or replace.
- Fault location/troubleshooting - The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or Unit Under Test (UUT).
- Disassembly/assembly - The step-by-step breakdown (taking apart) of a spare/functional group coded item and to the level of its least component, that is assigned a SMR code for the level of maintenance under consideration (i.e., identified as maintenance significant).
- Actions - Weld, grind, rivet, straighten, face, machine, and/or resurface.

10. **Overhaul.** That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.
11. **Rebuild.** Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipment/components.

EXPLANATION OF COLUMNS IN THE MAC, TABLE 1

1. **Column (1) - Group Number.** Column (1) lists Functional Group Code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the Next Higher Assembly (NHA).
2. **Column (2) - Component/Assembly.** Column (2) contains the item names of components, assemblies, subassemblies, and modules for which maintenance is authorized.
3. **Column (3) - Maintenance Function.** Column (3) lists the functions to be performed on the item listed in Column (2). (For a detailed explanation of these functions refer to *Maintenance Functions* outlined above).
4. **Column (4) - Maintenance Level.** Column (4) specifies each level of maintenance authorized to perform each function listed in column (3), by indicating work time required (expressed as manhours in whole hours or decimals) in the appropriate subcolumn. This work time figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance levels, appropriate work time figures are to be shown for each level. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. The symbol designations for the various maintenance levels are as follows:

Field - includes subcolumns:

C - Operator/Crew
O - Service
F - Field

Sustainment - includes subcolumns:

H - Below Depot
D - Depot

MAINTENANCE FUNCTIONS - CONTINUED

NOTE

The “L” maintenance level is not included in column (4) of the MAC. Functions to this level of maintenance are identified by a work time figure in the “H” column of column (4) and an associated reference code is used in the REMARKS CODE column (6). This code is keyed to the remarks and the SRA complete repair application is explained there.

5. **Column (5) - Tools and Equipment Reference Code.** Column (5) specifies, by code, those common tool sets (not individual tools), common Test, Measurement, and Diagnostic Equipment (TMDE), special tools, special TMDE, and special support equipment required to perform the designated function. Codes are keyed to the entries in the tools and test equipment table.
6. **Column (6) - Remarks Code.** When applicable, this column contains a letter code, in alphabetical order, which is keyed to the Remarks table entries (Table 3).

EXPLANATION OF COLUMNS IN TOOLS AND TEST EQUIPMENT REQUIREMENTS, TABLE 2

1. **Column (1) - Tool or Test Equipment Reference Code.** The tool and test equipment reference code correlates with a code used in column (5) of the MAC.
2. **Column (2) - Maintenance Level.** The lowest level of maintenance authorized to use the tool or test equipment.
3. **Column (3) - Nomenclature.** Name or identification of the tool or test equipment.
4. **Column (4) - National Stock Number (NSN).** The NSN of the tool or test equipment.
5. **Column (5) - Tool Number.** The manufacturer's part number, model number, or type number.

EXPLANATION OF COLUMNS IN REMARKS, TABLE 3

1. **Column (1) - Remarks Code.** The code recorded in column (6) of the MAC.
2. **Column (2) - Remarks.** This column lists information pertinent to the maintenance function being performed as indicated in the MAC.

END OF WORK PACKAGE

SUPPORTING INFORMATION

MAINTENANCE ALLOCATION CHART (MAC)

Table 1. MAC for the 600 GPM Pump Assemblies.

Group Number	Component/ Assembly	Maintenance Function	Maintenance Level					Tools/ Equipment Ref Code	Remarks Code
			Field			Sustainment			
			Crew	Service	Field	Below Depot	Depot		
			C	O	F	H	D		
03	**FUEL SYSTEM**								
0301	Fuel Injectors	Test			1.5			9,13,15,22, 23,24	
		Replace			1.0			13,15,23,24	
05	**COOLING SYSTEM**								
0505	Cooling Fan Assembly	Inspect	0.1						
		Replace			1.5			23	
		Repair			1.0			12,23,24	
	Cooling Fan V-Belt	Inspect			0.5			8,23	
		Replace			0.5			23	
06	**ELECTRICAL SYSTEM**								
0601	Alternator	Inspect			0.5			23	
		Replace			1.0			23,24	
		Repair			0.5			23,24	
	Alternator V-Belt	Inspect			0.5			8,23	
		Adjust			0.7			8,23	
		Replace			0.7			8,23	
0609	Taillights	Replace			0.5			23	
		Repair			0.7			23	
0610	Sending Units	Replace			0.3			23	
0612	Batteries	Inspect	0.2						
		Test			0.5			23,24	
		Replace			1.0			23	
	Battery Cables	Inspect	0.2						
		Replace			1.0			23	

Table 1. MAC for the 600 GPM Pump Assemblies - Continued.

Group Number	Component/ Assembly	Maintenance Function	Maintenance Level					Tools/ Equipment Ref Code	Remarks Code
			Field			Sustainment			
			Crew	Service	Field	Below Depot	Depot		
			C	O	F	H	D		
06	**ELECTRICAL SYSTEM - CONTINUED**								
	Battery Box	Inspect			1.0			23	
		Replace			1.5			23	
	NATO Electrical Receptacle	Inspect	0.1						
		Replace			0.5			23	
0613	Intervehicular Electrical Cable	Inspect	0.1						
		Replace			2.0			23,24	
	Trailer Wiring Harness	Inspect	0.1						
		Replace			1.0			23	
	Engine/Control Panel Wiring Harness	Inspect	0.1						
		Replace			1.0			23	
	24V Trailer Receptacle Connector	Inspect	0.1						
		Replace			0.5			23	
10	**FRONT AXLE**								
1000	Front Axle	Replace			2.5			23,24	
12	**BRAKE SYSTEM**								
1201	Hand Brake Lever	Inspect	0.1						
		Adjust	0.2						
		Replace			0.5			23	
	Hand Brake Cable	Replace			1.5			23	
1202	Service Brakes	Inspect			0.5			23	
		Adjust			0.5			23,24	
		Repair			2.0			23,24	
1204	Hydraulic Brake Actuator Assembly	Inspect	0.1						
		Service	0.2						A
		Replace			1.0			23,24	B
		Repair			1.0			23,24	
	Hydraulic Brake Lines and Fittings	Replace			1.0			23,24	

Table 1. MAC for the 600 GPM Pump Assemblies - Continued.

Group Number	Component/ Assembly	Maintenance Function	Maintenance Level					Tools/ Equipment Ref Code	Remarks Code
			Field			Sustainment			
			Crew	Service	Field	Below Depot	Depot		
			C	O	F	H	D		
13	**WHEELS AND TRACKS**								
1311	Wheel/Hub Drum Assembly	Inspect	0.1						
		Adjust			0.5			23,24	
		Service	0.2		1.0			23,24	C
		Repair			1.5			23,24	
	Wheels	Replace			0.5			23,24	
1313	Tires	Inspect	0.1						
		Replace			0.5			23,24	
15	**FRAME, TOWING ATTACHMENT, AND DRAWBAR**								
1501	Frame Assembly	Inspect	0.5		0.5				
		Repair			1.0			19,23,24	D
1503	Pintle Assembly	Inspect	0.1						
		Replace			0.5			23	
		Repair			0.5			23	
	Safety Chains	Inspect	0.1						
		Replace			0.3			23	
1507	Front/Rear Leveling Jack Assemblies	Inspect	0.1						
		Service	0.2						E
		Replace			0.3			23	
18	**BODY, CAB, HOOD, AND HULL**								
1801	Engine Covers	Replace			0.3			23	
1808	Storage Box	Replace			0.5			23	
22	**BODY, CHASSIS, AND HULL ASSEMBLY ITEMS**								
2202	Reflectors	Inspect	0.1						
		Replace			0.3			23,24	

Table 1. MAC for the 600 GPM Pump Assemblies - Continued.

Group Number	Component/ Assembly	Maintenance Function	Maintenance Level					Tools/ Equipment Ref Code	Remarks Code
			Field			Sustainment			
			Crew	Service	Field	Below Depot	Depot		
			C	O	F	H	D		
22	**BODY, CHASSIS, AND HULL ASSEMBLY ITEMS - CONTINUED**								
	Ground Terminal Stud	Inspect	0.1						
		Replace			0.2			23,24	
2210	Decals and Data Plates	Inspect	0.2						
		Replace			0.2			23,24	
29	**AUXILIARY GENERATOR AND ENGINE, AND CONTROLS (SPECIAL PURPOSE)**								
2910	Engine Assembly	Inspect	0.2		0.3			23,24	
		Test			0.5			5,21,23,24	F
		Service	0.2		0.5			23,24	G
		Replace			3.5			3,23,24	
		Repair			1.0			11,23,24	
		Overhaul				16.0		23,24	
	Engine Mounts	Inspect			0.2				
		Replace			1.0			3,23,24	
2911	Cylinder and Cylinder Head Assembly	Replace			2.0			20,23,24	
		Repair				4.0		23,24	
	Cylinder Block	Repair			2.0			23,24	
		Overhaul				6.0		23,24	
2912	Rear Main Seal and Rear Cover	Replace			4.0			2,4,17,23,24	
	Crankshaft	Replace				2.0		23,24	
		Repair				0.5		23,24	
	Dynamic Balancer	Replace				2.0		23,24	
2913	Flywheel	Replace			4.0			23,24	
2914	Pistons and Connecting Rods	Replace				2.0		23,24	
2915	Camshaft	Replace				1.0		23,24	

Table 1. MAC for the 600 GPM Pump Assemblies - Continued.

Group Number	Component/ Assembly	Maintenance Function	Maintenance Level					Tools/ Equipment Ref Code	Remarks Code
			Field			Sustainment			
			Crew	Service	Field	Below Depot	Depot		
			C	O	F	H	D		
29	**AUXILIARY GENERATOR AND ENGINE, AND CONTROLS (SPECIAL PURPOSE) - CONTINUED**								
	Rocker Arm	Adjust			0.5			23,24	
	Assembly	Replace			1.0			22,24	
	Valve Cover	Replace			0.3			23,24	
	V-belt Guard	Replace			0.5			23	
2916	Crankcase Breather	Replace			1.0			23	
	Engine Oil Cooler	Replace			1.5			23,24	
		Repair			0.5			23,24	
	Oil Filter and Filter Head	Replace			1.0			23,24	
	Oil Pan	Replace			2.0			23,24	
	Oil Pump and Lines	Replace			3.0			23,24	
2918	Manifolds	Replace			2.0			23,24	
	Flame Glow Plug	Test			0.1				
		Replace			0.4			23	
2919	Front Main Seal and Front Cover	Replace			2.0			1,16,23,24	
	Idler Gear	Replace			2.5			23,24	
	V-belt Tensioner	Replace			1.5			23,24	
	Pulley Assembly	Repair			1.0			12,23,24	
2932	Fuel Injection Pump	Adjust			0.5			10,11,23,24	
		Replace			1.5			7,10,11,14, 23,24	
		Repair			1.0			23,24	
2933	Air Cleaner Assembly	Service	0.5						
		Replace			0.7			23	
		Repair			1.0			23	
2934	Turbocharger and Oil Lines	Replace			1.5			23,24	
2935	Engine Fuel Tank	Replace			1.0			23,24	
		Repair			0.5			23,24	

Table 1. MAC for the 600 GPM Pump Assemblies - Continued.

Group Number	Component/ Assembly	Maintenance Function	Maintenance Level					Tools/ Equipment Ref Code	Remarks Code
			Field			Sustainment			
			Crew	Service	Field	Below Depot	Depot		
			C	O	F	H	D		
29	**AUXILIARY GENERATOR AND ENGINE, AND CONTROLS (SPECIAL PURPOSE) - CONTINUED**								
2937	Fuel Filter	Replace			0.5			23,24	
	Fuel Filter/Water Separator	Service	0.2		0.3			23,24	H
		Replace			0.7			23,24	
		Repair			0.5			23,24	
2938	Fuel Lines and Fittings	Replace			1.0			23,24	
2941	Engine Muffler and Exhaust Pipes	Replace			1.0			23	
2952	Air Cowling and Duct Walls	Replace			1.5			23,24	
2963	Starter	Replace			0.7			23,24	
	Starter Solenoid	Replace			0.7			23	
2967	Control Panel Assembly	Replace Repair			1.0 1.5			23 23	
2968	Switches, Circuit Breakers, and Fuses	Replace			2.0			23	
55	**PUMPS**								
5500	Pump Assembly	Replace			1.5			23,24	
		Repair			1.0			6,12,18,23, 24	
5513	Fluid Lines and Fittings	Replace			0.5			23,24	
5518	Discharge Manifold	Replace			1.0			23,24	
	Suction Manifold	Service			0.5			23,24	
		Replace			1.0			23,24	

Table 2. Tools and Test Equipment for the 600 GPM Pump Assemblies.

(1) TOOLS OR TEST EQUIPMENT REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER (NSN)	(5) TOOL NUMBER
1	F	Assembly device		142060 (62445)
2	F	Assembly device		142080 (62445)
3	F	Bolt, eye, engine lifting		DEUSA-0027-0935 (62445)
4	F	Centering device		143110 (62445)
5	F	Connector		100120 (62445)
6	F	Dog, lathe: 1-1//2 in.	3460-01-433-0460	SE52150 (0MJX4)
7	F	Extra sleeve		110410 (62445)
8	F	Gauge unit		0301191 (62445)
9	F	Holder		110110 (62445)
10	F	Injection pump, time (graduated disc, magnetic)	5210-01-280-3591	003 1189 (62445)
11	F	Pointer tool		100740 (62445)
12	F	Press, arbor, hand operated	3444-00-449-7295	AA59384-12A060 (58536)
13	F	Puller fixture	5120-01-333-3140	150800 (36719)
14	F	Removal tool, fuel injection pump		110340 (62445)
15	F	Removal tool, seal ring	5120-01-189-3440	120630 (36719)
16	F	Remover, preformed (extracting device)	5120-01-203-7950	142700 (36719)
17	F	Retainer		143400 (62445)
18	F	Rod, brass, impeller holding: 1/2 in. x 18 in. long		9105-K33-M (1WB54)
19	F	Shop equipment, welding	4940-00-357-7268	SC3470-95CLA08
20	F	Spring compressor		125310 (62445)
21	F	Tester, cylinder com	4910-12-130-6254	623-000-1009 (D8153)
22	F	Tester, diesel fuel injector nozzle	4910-00-255-8641	7551255 (19204)
23	F	Tool kit, general mechanic's: automotive	5180-01-483-0249	SC 9999-01-SKO LIN: T28688
24	F	Tool set, SATS base	4910-01-490-6453	SC 9999-01-SKO LIN: S25885

Table 3. Remarks for the 600 GPM Pump Assemblies.

REFERENCE CODE	REMARKS
A	Service by checking brake fluid level in master cylinder and adding as required.
B	Trailer towing height may be adjusted by using one of three possible mounting bolt holes in actuator bracket.
C	Operator/crew services Bearing Buddy grease fittings. Field Maintenance performs wheel bearing service.
D	Repair of frame consists of replacement of frame huckbolts, brackets, and minor welding.
E	Operator/crew services front jack assembly caster wheel grease fittings.
F	Test consists of checking engine compression.
G	Operator/crew services engine by checking oil level in crankcase and adding oil as required. Field Maintenance performs oil and oil filter service.
H	Operator/crew drains fuel/water separator sediment bowl. Field Maintenance performs fuel filter service.

END OF WORK PACKAGE

SUPPORTING INFORMATION

BASIC ISSUE ITEMS (BII) LIST

Scope, General, Explanation of Columns, Basic Issue Items (BII) List for the 600 GPM Pump Assemblies

SCOPE

This work package lists Basic Issue Items (BII) for the 600 GPM Pump Assemblies to help you inventory items for safe and efficient operation of the equipment.

GENERAL

BII are required to place the pump assembly in operation, operate it, and do emergency repairs. Although shipped separately packaged, BII must be with the pump assembly during operation and when it is transferred between property accounts. Listing these items is your authority to request/requisition them for replacement based on authorization of the end item by the Table of Organization and Equipment (TOE)/Modified Table of Organization and Equipment (MTOE).

EXPLANATION OF COLUMNS

1. **Column (1), Illustration Number (Illus No.).** Indicates the number of the item illustrated.
2. **Column (2) - National Stock Number (NSN).** Identifies the stock number of the item to be used for requisitioning purposes.
3. **Column (3) - Description, Commercial and Government Entity Code (CAGEC), and Part Number (P/N).** Identifies the Federal item name followed by a minimum description when needed. The line below the name and description is the CAGEC (in parentheses), the part number and manufacturer.
4. **Column (4) - Usable On Code (UOC).** When applicable, provides a code if the item needed is not the same for different models of equipment. These codes are identified below:

Code	*Used On*
BFL	Fuel Pump Assembly
BWT	Water Pump Assembly

5. **Column (5) - Unit of Measure (U/M).** Indicates how the item is issued for the NSN shown in column 2.
6. **Column (6) - Quantity Required (Qty Rqr).** Indicates the quantity of the item authorized to be used with/on the equipment.

Table 1. Basic Issue Items (BII) List for the 600 GPM Pump Assemblies.

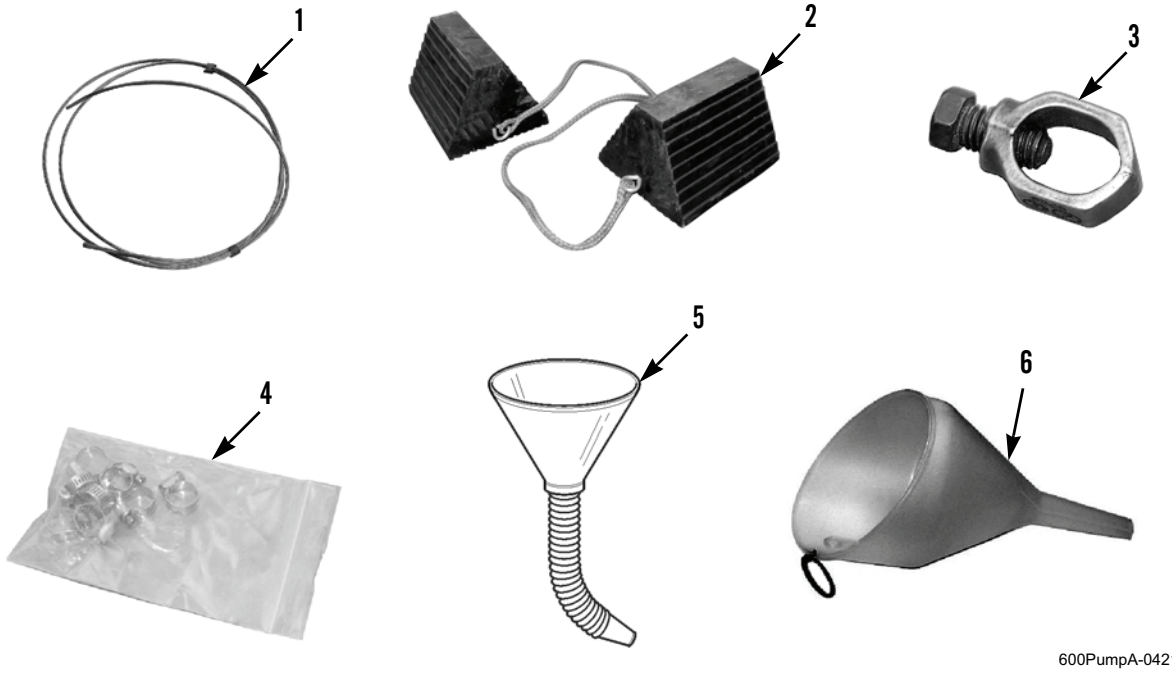
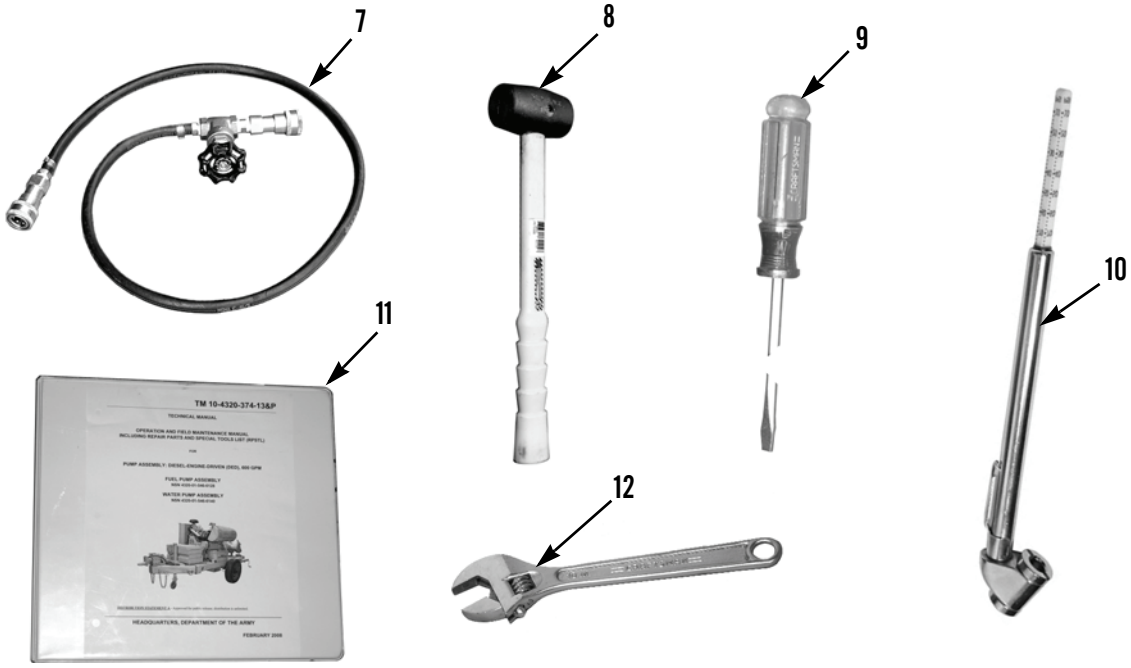
(1) ILLUS NO.	(2) NSN	(3) DESCRIPTION, CAGEC, P/N	(4) UOC	(5) U/M	(6) QTY RQR
					
1		Cable, Ground Rod (01084) 18105		EA	1
2	2540-01-494-0078	Chock, Wheel-Track (032T9) RC815		EA	1
3		Clamp, Ground Rod (1WB54) CP58		EA	1
4	4730-00-469-7820	Clamp, Hose 749076-1 (73030)		EA	10
5	7240-00-559-7364	Funnel, Engine Oil Service (0T115) 495		EA	1
6		Funnel, Plastic (Pump Priming) (457G7) WIR900800		EA	1

Table 1. Basic Issue Items (BII) List for the 600 GPM Pump Assemblies - Continued.

(1) ILLUS NO.	(2) NSN	(3) DESCRIPTION, CAGEC, P/N	(4) UOC	(5) U/M	(6) QTY RQR
					
7		Hose Assembly, Fuel, Jumper (1WB54) 504-03	BFL	EA	1
8		Mallet, Bronze (1WB54) 3.0BPF16		EA	1
9	5120-00-227-7356	Screwdriver, Flat Tip (64067) 5120-00-227-7356		EA	1
10	5210-01-430-5185	Tire Pressure Gage (1DJ82) TG120		EA	1
11		TM 10-4320-374-13&P Operation and Field Maintenance Manual Including RPSTL for 600 GPM Pump Assembly		EA	1
12	5120-01-264-3796	Wrench, Adjustable, 12-1/2 in. long (96508) 0712		EA	1

END OF WORK PACKAGE

SUPPORTING INFORMATION

ADDITIONAL AUTHORIZATION LIST (AAL)

SCOPE

This work package lists additional items you are authorized in support of the 600 GPM Pump Assemblies.

EXPLANATION OF COLUMNS

1. **Column (1) - National Stock Number (NSN).** Indicates the National Stock Number (NSN) assigned to the item and will be used for requisitioning purposes.
2. **Column (2) - Description, CAGEC, and Part Number.** Indicates the Federal item name (in all capital letters) followed by a minimum description when needed. The entry for each item ends with the Commercial and Government Entity Code (CAGEC) in parentheses followed by the part number.
3. **Column (3) - Usable on Code.** When applicable, provides a code if the item needed is not the same for different models of equipment.

Code	*Used On*
BFL	Fuel Pump Assembly
BWT	Water Pump Assembly

4. **Column (4) - Unit of Measure (U/M).** Indicates how the item is issued for the National Stock Number shown in Column (1).
5. **Column (5) - Qty Recm.** Indicates the quantity recommended.

Table 1. Additional Authorization List for the 600 GPM Pump Assemblies.

NSN	Description, CAGEC, and P/N	UOC	U/M	QTY RECM
7240-01-337-5269	Can, Fuel, Military: 5 gallon (56161) 10502788	BFL	EA	1
7240-00-089-3827	Can, Water, Military: 5 gallon (81349) Mil-C-43613D Type 1	BWT	EA	1
	Cover, Fabric: Tan (1WB54) 90-019-198		EA	1

END OF WORK PACKAGE

SUPPORTING INFORMATION

EXPENDABLE AND DURABLE ITEMS LIST

SCOPE

1. This work package lists expendable and durable items you will need to operate and maintain the 600 GPM Pump Assemblies.
2. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, *Expendable/Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items)*, or CTA 8-100, *Army Medical Department Expendable/Durable Items*.

EXPLANATION OF COLUMNS

1. **Column (1) - Item Number.** This number is assigned to each item in the listing and is used in the narrative instructions to identify the material, (e.g., Use solvent cleaning compound (Item 6, WP 0129)).
2. **Column (2) - Level.** This column identifies the lowest level of maintenance that requires the listed item.

   C - Operator/Crew

   F - Field Maintenance
3. **Column (3) - National Stock Number.** This is the National Stock Number assigned to the item. Use it to request or requisition the item.
4. **Column (4) - Description, CAGEC, and Part Number.** Indicates the federal item name and, if required, a description to identify the item. The last line for each item indicates the Commercial and Government Entity Code (CAGEC) in parentheses, followed by the part number.
5. **Column (5) - U/M (Unit of Measure).** Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., EA, GAL.). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Table 1. Expendable and Durable Items List for the 600 GPM Pump Assemblies.

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
1	F	8040-01-250-3969	Adhesive (05972) 242	OZ
2	F		Adhesive (1A9T3) 90	
		8040-01-469-3238	24-Ounce Aerosol Can Box of 12	OZ
3	F		Antiseize compound (26916) 034-000750	
		8030-00-251-3980	1 Pound Tube or Can	TU or CN
4	C		Brake fluid, automotive, silicone	
		9150-01-059-2586	(81349) MIL-B-46176 1 Gallon Can	GAL.
		9150-01-123-3152	(81349) MIL-PRF-46176 5 Gallon Can	GAL.
5	F	5340-00-450-5718	Cap set, protective, dust and moisture (19207) 10935405	EA
6	C		Cleaning compound, solvent, Type III (81349) MIL-PRF-680	
		6850-01-474-2318	1 Gallon Can	GAL.
		6850-01-474-2320	5 Gallon Can	GAL.
		6850-01-474-2321	55 Gallon Drum	GAL.
7	F		Cloth, abrasive (80204) ANSI B74.18	
		5350-00-584-4654	50 Sheet Package	PG
8	F		Compound, silicone, RTV (7X677) 12346141	
		6850-01-159-4844	Box of four 1.9-Ounce Tubes	OZ
9	C		Detergent, general purpose, liquid (83421) 7930-00-282-9699	
		7930-00-282-9699	1 Gallon Can	GAL.
10	C		Diesel fuel, DF-1 (81346) ASTM D 975	
		9140-00-286-5286	Bulk	GL
		9140-00-286-5287	5 Gallon Can	CN
		9140-00-286-5288	55 Gallon Drum	DR

Table 1. Expendable and Durable Items List for the 600 GPM Pump Assemblies - Continued.

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
11	C	9140-00-286-5294	Diesel fuel, DF-2 ASTM D 975 (81346)	GAL.
12	F		Flux, soldering (58536) A-A-51145TY 1 FORM A	
		3439-00-255-9935	1 Pound Can	LB
13	F		Glycerin, USP (47908) NDC51552-0094-16	
		6505-00-153-8220	1 Pound Bottle	LB
14	C		Grease, automotive and artillery, GAA	
		9150-01-197-7688	(81349) M-10924-A 2-1/4 Ounce Tube	OZ
		9150-01-197-7693	(81349) M-10924-B 14 Ounce Cartridge	OZ
		9150-01-197-7690	(81349) M-10924-C 1-3/4 Pound Can	LB
		9150-01-197-7692	(81349) M-10924-E 35 Pound Can	LB
15	C		Grease, multipurpose, NLG12 high temperature, NLG12 (07083) CATO JT6	
		9150-01-112-8209	14 Ounce Cartridge	OZ
16	F		Insulating sleeving, electrical (11530) 08-196485-06	
		5970-00-815-1295	250 Foot Spool	FT
17	F		Insulating varnish, electrical (75037) 1602	
		5970-00-476-6717	1 Aerosol Can	EA
18	C		Oil, lubricating, OEA-30 (81349) MIL-PRF-46167	
		9150-00-402-2372	5 Gallon Container	GAL.
19	C		Oil, lubricating, OE/HDO-10	
		9150-00-189-6727	(81349) M2104-1-10W 1 Quart Can	QT
		9150-00-186-6668	(81349) M2104-3-10W 5 Quart Can	QT
		9150-00-191-2772	(81349) M2104-4-10W 55 Gallon Drum	GAL.

Table 1. Expendable and Durable Items List for the 600 GPM Pump Assemblies - Continued.

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
20	C		Oil, lubricating, OE/HDO-15/40	
		9150-01-152-4117	(81349) M2104-1-15W40 1 Quart Can	QT
		9150-01-152-4119	(81349) M2104-4-15W40 55 Gallon Drum	GAL.
21	C		Petrolatum, technical (82146) 14P1	
		9150-00-250-0926	1.75 Pound Can	CN
22	C		Rag, wiping (80244) 7920-00-205-1711	
		7290-00-205-1711	50 Pound Bale	LB
23	C		Sodium bicarbonate, technical (58539) AA374-2	
		6810-00-264-6618	1 Pound Box	LB
24	F		Solder, tin alloy (81346) SN60WRP2 0.032 1LB	
		3439-00-555-4629	1 Pound Spool	LB
25	F		Spray coating, battery box (1WB54) PKP265	OZ
26	F		Strap, tiedown, electrical components	
		5975-01-526-8849	(81343)MS3367-4-0 2.72 Inch Length, Package of 100	HD
		5975-00-984-6582	(96906) MS3367-1-0 6 Inch Length, Package of 100	HD
		5975-00-935-5946	(96906) MS3367-2-1 13.35 Inch Minimum Length, Package of 100	HD
27	F		Tag, marker (64067) 9905-00-537-8954	
		9905-00-537-8954	50 Each	EA
28	F		Tape, antiseizing (58536) AA58092-2-2	
		8030-00-889-3535	260 Inch Roll	IN.
29	C		Tape, duct, 2 inches wide (39482) 1791K70	
		5640-00-103-2254	60 Yard Roll	YD

Table 1. Expendable and Durable Items List for the 600 GPM Pump Assemblies - Continued.

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/M
30	C		Tape, pressure sensitive adhesive (81755) P5113-3	
		7510-00-040-5895	1.5 Inches Wide, 72 Yard Roll	RL
31	C	9130-00-273-2379	Turbine fuel, aviation, JP-5 (81349) MIL-DTL-5624T	GAL.
32	C	9130-01-031-5816	Turbine fuel, aviation, JP-8 (81349) MILT83133 GR JP8	GAL.

END OF WORK PACKAGE

INDEX

Subject **WP Sequence No.-Page No.**

Numerics

24V Trailer Electrical Receptacle Replacement . . . . . WP 0039-1

A

Abbreviations, List of . . . . . WP 0001-2
Access Plates Replacement . . . . . WP 0068-1
Additional Authorization List (AAL) . . . . . WP 0128-1
Air Cleaner
  Housing Assembly Replacement . . . . . WP 0097-1
  Service . . . . . WP 0015-1
Air Duct Panels Replacement, Cooling . . . . . WP 0108-1
Alternator V-Belts Inspection and Tension Check . . . . . WP 0028-1
Alternator Maintenance . . . . . WP 0030-1
Axle Replacement . . . . . WP 0047-1

B

Basic Issue Items (BII) List . . . . . WP 0127-1
Battery
  Box Maintenance . . . . . WP 0034-1
  Cables Replacement . . . . . WP 0033-1
  Replacement . . . . . WP 0033-1
  Testing and Charging . . . . . WP 0032-1
Bleeding
  Fuel System . . . . . WP 0106-1
  Hydraulic Brake System . . . . . WP 0057-1
Brake Actuator Breakaway Lever and Leaf Spring Replacement . . . . . WP 0054-1

C

Changing Engine Oil and Replacing Oil Filter . . . . . WP 0084-1
Cleaning
  Engine . . . . . WP 0025-1
  Suction Manifold Strainer . . . . . WP 0115-1
Compression Check, Engine . . . . . WP 0075-1
Control Panel
  Box Replacement . . . . . WP 0110-1
  Controls and Indicators . . . . . WP 0005-2
  Repair . . . . . WP 0111-1
Controls and Indicators
  Control Panel . . . . . WP 0005-2
  Engine Fuel System . . . . . WP 0019-5
  Miscellaneous . . . . . WP 0005-15
  Pumping System . . . . . WP 0005-12
Cooling Air Duct Panels Replacement . . . . . WP 0108-1
Cooling Fan
  Tensioner Pulley Assembly Maintenance . . . . . WP 0092-1
  V-Belt Inspection and Tension Check . . . . . WP 0028-1
  V-Belt Shutdown Switch Check . . . . . WP 0045-1
  V-Belt Shutdown Switch Replacement . . . . . WP 0046-1

INDEX - CONTINUED

Subject **WP Sequence No.-Page No.**

C - Continued

Cooling Fan and Alternator V-Belts Replacement . . . . . WP 0029-1
Cooling Fan Assembly Maintenance . . . . . WP 0027-1
Cooling Fan V-Belt Shutdown Switch Check . . . . . WP 0045-1
Corrosion Prevention and Control (CPC) . . . . . WP 0001-1
Coupling Pump Assembly to Towing Vehicle . . . . . WP 0006-20
Crankcase Breather and Lines Replacement . . . . . WP 0082-1
Crankshaft V-Belt Pulley and Vibration Damper Replacement . . . . . WP 0093-1
Cylinder Head Assembly Replacement . . . . . WP 0076-1

D

Data, Equipment . . . . . WP 0002-8
Decal, Data Plate, and Stencil Guide . . . . . WP 0008-2
Description and Use of Operator Controls and Indicators . . . . . WP 0005-1
Destruction of Army Materiel to Prevent Enemy Use . . . . . WP 0001-1
Differences Between Models . . . . . WP 0002-2
Discharge Manifold Assembly Maintenance, Pump . . . . . WP 0114-1
Draining
  Pump . . . . . WP 0006-17
  Suction and Discharge Gauges . . . . . WP 0006-18
  Suction and Discharge Manifolds . . . . . WP 0006-18
Draining System . . . . . WP 0006-17

E

Electrical General Maintenance Instructions . . . . . WP 0024-1
Engine
  Cleaning . . . . . WP 0025-1
  Compression Check . . . . . WP 0075-1
  Front Cover Replacement . . . . . WP 0091-1
  Front Main Seal Replacement . . . . . WP 0090-1
  Mounts Replacement . . . . . WP 0072-1
  Preparation Before Starting . . . . . WP 0006-7
  Rear Main Seal and Rear Cover Replacement . . . . . WP 0078-1
  Replacement . . . . . WP 0073-1
  Setting Top Dead Center (TDC) . . . . . WP 0074-1
  Starting . . . . . WP 0006-11
  Theory of Operation . . . . . WP 0003-7
  Valve Clearance Check and Adjustment . . . . . WP 0080-1
Engine/Control Panel Wiring Harness Replacement . . . . . WP 0038-1
Equipment
  Characteristics, Capabilities, and Features . . . . . WP 0002-1
  Data . . . . . WP 0002-8
  Improvement Recommendations (EIRs), Reporting . . . . . WP 0001-1
Exhaust
  Manifold Replacement . . . . . WP 0089-1
  System Replacement . . . . . WP 0107-1
Expendable and Durable Items List . . . . . WP 0129-1
External Air Transport by Helicopter . . . . . WP 0117-2

INDEX - CONTINUED

Subject	WP Sequence No.-Page No.

F

Field Maintenance Troubleshooting Procedures . . . . . WP 0019-1
Flame Glow Plug
- Fuel Lines Replacement . . . . . WP 0105-1
- Maintenance . . . . . WP 0040-1

Frame Repair . . . . . WP 0062-1
Front Cover Replacement, Engine . . . . . WP 0091-1
Front Leveling Jack Assembly Replacement . . . . . WP 0066-1
Front Main Seal Replacement . . . . . WP 0090-1
Fuel
- Filter/Water Separator Maintenance . . . . . WP 0101-1
- Lines Replacement, Low Pressure . . . . . WP 0102-1
- Pump Maintenance . . . . . WP 0096-1
- Selector Valve Replacement . . . . . WP 0104-1
- Stage III Filter Maintenance . . . . . WP 0100-1
- System Bleeding . . . . . WP 0106-1
- Tank Maintenance . . . . . WP 0099-1

Fuel Injection Pump
- Electromagnet Replacement . . . . . WP 0095-1
- Replacement . . . . . WP 0094-1
- Solenoid Replacement . . . . . WP 0095-1
- Timing - Positioning Pin Method . . . . . WP 0094-10

Fuel Injector
- Lines Replacement . . . . . WP 0103-1
- Replacement . . . . . WP 0026-1
- Testing . . . . . WP 0026-3

G

General
- Information . . . . . WP 0001-1
- Safety Instructions . . . . . WP 0004-1

General Maintenance Instructions
- General . . . . . WP 0023-1
- Electrical . . . . . WP 0024-1

Ground Terminal Stud Replacement . . . . . WP 0070-1
Guard Replacement, V-Belt . . . . . WP 0081-1

H

Hand Brake
- Inspection and Adjustment . . . . . WP 0016-1
- Maintenance . . . . . WP 0048-1

Hydraulic Brake
- Actuator Assembly Maintenance . . . . . WP 0053-1
- Lines Replacement . . . . . WP 0056-1
- System Bleeding . . . . . WP 0057-1

INDEX - CONTINUED

Subject — **WP Sequence No.-Page No.**

I

Illustrated List of Manfactured Items . . . . . WP 0119-1
Impeller Shaft, Seal Assembly, and Bearing Replacement, Pump . . . . . WP 0113-1
Intake Manifold Replacement . . . . . WP 0088-1
Intervehicular Electrical Cable Replacement . . . . . WP 0036-1

J

Jack Assembly Replacement
  Front Leveling . . . . . WP 0066-1
  Rear Leveling . . . . . WP 0067-1

L

Lifting/Tiedown Ring Replacement . . . . . WP 0063-1
Lines Replacement
  Crankcase Breather . . . . . WP 0082-1
  Fuel Injector . . . . . WP 0103-1
List
  Abbreviations . . . . . WP 0001-2
  Additional Authorization List (AAL) . . . . . WP 0128-1
  Basic Issue Items (BII) . . . . . WP 0127-1
  Expendable and Durable Items . . . . . WP 0129-1
  Manufactured Items, Illustrated . . . . . WP 0119-1
  Special Tools . . . . . WP 0122-1
Location and Description of Major Components . . . . . WP 0002-2
Low Pressure Fuel Lines Replacement . . . . . WP 0102-1
Lunette Ring Replacement . . . . . WP 0058-1

M

Maintenance Allocation Chart (MAC) . . . . . WP 0126-1
Maintenance Allocation Chart (MAC) Introduction . . . . . WP 0125-1
Maintenance Forms, Records, and Reports . . . . . WP 0001-1
Maintenance Instructions, General . . . . . WP 0023-1
Major Components, Location and Description of . . . . . WP 0002-2
Manifold Replacement, Engine
  Exhaust . . . . . WP 0089-1
  Intake . . . . . WP 0088-1
Master Cylinder Replacement . . . . . WP 0055-1
Mounts Replacement, Engine . . . . . WP 0072-1

N

NATO Electrical Receptacle and Cables Replacement . . . . . WP 0035-1

INDEX - CONTINUED

Subject **WP Sequence No.-Page No.**

O

Oil
- Cooler Maintenance . . . . . WP 0083-1
- Filter Head Assembly Replacement . . . . . WP 0085-1
- Filter Replacement, Engine . . . . . WP 0084-1
- Pan Replacement . . . . . WP 0086-1
- Pump Replacement . . . . . WP 0087-1

Oil Pressure Sender
- Check . . . . . WP 0041-1
- Replacement . . . . . WP 0042-1

Oil Temperature Sender
- Check . . . . . WP 0043-1
- Replacement . . . . . WP 0044-1

Operation
- At High Ambient Temperatures and Altitudes . . . . . WP 0007-3
- Under Usual Conditions . . . . . WP 0006-1

Operation In
- Extreme Cold . . . . . WP 0007-1
- Extreme Heat . . . . . WP 0007-2
- Saltwater Areas . . . . . WP 0007-2
- Sandy or Dusty Conditions . . . . . WP 0007-2

P

Pintle Hook Assembly Maintenance . . . . . WP 0064-1
Piston Crown Clearance Measurement . . . . . WP 0077-1
Preheat Fuel Solenoid Replacement . . . . . WP 0105-1
Preparation Before Starting
- Engine . . . . . WP 0006-7
- Pump Assembly . . . . . WP 0006-2

Preparation for
- Shipment . . . . . WP 0001-2, WP 0117-1
- Storage. . . . . WP 0001-2

Preparation for Relocation of Pump Assembly . . . . . WP 0006-19
Preparation for Storage or Shipment
- General Information . . . . . WP 0001-2

Preparation for Use . . . . . WP 0006-2
Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions
- Introduction, Operator . . . . . WP 0012-1
- Table, Field Maintenance . . . . . WP 0022-1
- Table, Operator . . . . . WP 0013-1

Preventive Maintenance Checks and Services (PMCS), Including Lubrication Instructions Introduction
- Field Maintenance . . . . . WP 0021-1

INDEX - CONTINUED

Subject **WP Sequence No.-Page No.**

P - Continued

Pump
- Discharge Manifold Assembly Maintenance . . . . . WP 0114-1
- Impeller Shaft, Seal Assembly, and Bearing Replacement . . . . . WP 0113-1
- Pumping (Fuel and Water) . . . . . WP 0006-14
- Replacement . . . . . WP 0112-1
- Shutting Down . . . . . WP 0006-16
- Suction Manifold Assembly Maintenance . . . . . WP 0116-1
- Theory of Operation . . . . . WP 0003-11

Pump Assembly
- Coupling to Towing Vehicle . . . . . WP 0006-20
- Preparation Before Starting . . . . . WP 0006-2
- Preparation for Relocation . . . . . WP 0006-19
- Theory of Operation . . . . . WP 0003-1
- Uncoupling from Towing Vehicle . . . . . WP 0006-21

Q

Quality of Material . . . . . WP 0001-3

R

Rear Leveling Jack Assembly Replacement . . . . . WP 0067-1
Rear Main Seal and Rear Cover Replacement . . . . . WP 0078-1
References . . . . . WP 0124-1
Reflector Replacement . . . . . WP 0071-1
Relocation of Pump Assembly, Preparation for . . . . . WP 0006-19
Repair Parts and Special Tools List (RPSTL)
- Cross Reference Indexes . . . . . WP 0123-1
- Introduction . . . . . WP 0120-1
- Repair Parts List . . . . . WP 0121-1
- Special Tools List . . . . . WP 0122-1

Reporting Equipment Improvement Recommendations (EIRs) . . . . . WP 0001-1
Rocker Arm and Rocker Arm Bracket Replacement . . . . . WP 0079-1

S

Safety Chains Replacement . . . . . WP 0065-1
Safety Instructions
- General . . . . . WP 0004-1
- Fuel Pump-Related . . . . . WP 0004-3

Selector Valve Replacement, Fuel . . . . . WP 0104-1
Service Brake
- Adjustment . . . . . WP 0049-1
- Inspection . . . . . WP 0050-1
- Maintenance . . . . . WP 0051-1

Service Upon Receipt . . . . . WP 0020-1
Setting Engine at Top Dead Center (TDC) . . . . . WP 0074-1
Shutting Down Pump . . . . . WP 0006-16
Slave Starting . . . . . WP 0007-4

INDEX - CONTINUED

Subject **WP Sequence No.-Page No.**

S - Continued

Solenoid Replacement
- Fuel Injection Pump . . . . . WP 0095-1
- Preheat Fuel . . . . . WP 0105-1
- Starter . . . . . WP 0109-1

Stage III Fuel Filter Maintenance . . . . . WP 0100-1
Starter and Starter Solenoid Replacement . . . . . WP 0109-1
Starting Engine . . . . . WP 0006-11
Storage Box Maintenance . . . . . WP 0069-1
Storage of Pump Assembly
- Long-Term . . . . . WP 00014-2
- Short-Term . . . . . WP 0014-1

Storage or Shipment, Preparation for . . . . . WP 0001-2
Stowage and Decal, Data Plate, and Stencil Guide . . . . . WP 0008-1
Stowage Guide . . . . . WP 0008-1
Suction Manifold
- Assembly Maintenance . . . . . WP 0116-1
- Cleaning Strainer . . . . . WP 0115-1

T

Taillight Maintenance . . . . . WP 0031-1
Tensioner Pulley Assembly . . . . . WP 0092-1
Theory of Operation . . . . . WP 0003-1
- Engine . . . . . WP 0003-7
- Pump . . . . . WP 0003-11
- Pump Assembly . . . . . WP 0003-1
- Trailer . . . . . WP 0003-14

Torque Limits . . . . . WP 0118-1
Towing Instructions . . . . . WP 0006-21
Trailer Wiring Harness Replacement . . . . . WP 0037-1
Trailer, Theory of Operation . . . . . WP 0003-14
Transport
- Highway . . . . . WP 000117-1
- Rail . . . . . WP 000117-1

Troubleshooting
- Introduction, Field Maintenance . . . . . WP 0017-1
- Introduction, Operator . . . . . WP 0009-1
- Procedures, Field Maintenance . . . . . WP 0019-1
- Procedures, Operator . . . . . WP 0011-1
- Symptom Index, Field Maintenance . . . . . WP 0018-1
- Symptom Index, Operator . . . . . WP 0010-1

Turbocharger Replacement . . . . . WP 0098-1

U

Uncoupling Pump Assembly from Towing Vehicle . . . . . WP 0006-21

INDEX - CONTINUED

Subject — **WP Sequence No.-Page No.**

V

Valve Clearance Check and Adjustment, Engine . . . . . WP 0080-1
V-Belt, Cooling Fan and Alternator Inspection and Tension Check. . . . . WP 0028-1
V-Belts, Cooling Fan and Alternator Replacement . . . . . WP 0029-1
V-Belt Guard Replacement . . . . . WP 0081-1
V-Belt Pulley and Vibration Damper Replacement, Crankshaft . . . . . WP 0093-1

W

Wheel and Tire Assembly
  Maintenance . . . . . WP 0061-1
  Replacement . . . . . WP 0060-1
Wheel Cylinder Replacement . . . . . WP 0052-1
Wheel Hub/Drum and Wheel Bearings Maintenance . . . . . WP 0059-1
Wiring Diagrams and Schematics FP-1
Wiring Harness Replacement
  Engine/Control Panel . . . . . WP 0038-1
  Trailer . . . . . WP 0037-1

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is OAASA	Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE **1 July 2009**

TO: *(Forward to proponent of publication or form) (Include ZIP Code)*	**FROM:** *(Activity and location) (Include ZIP Code)*
AMSTA-LC-LMPP/TECH PUBS 1 Rock Island Arsenal Rock Island, IL 61299-7630	

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM 10-4320-374-13&P	30 May 2008	Operation and Field Maintenance Manual Including RPSTL for Pump Assy: DED, 600 GPM

ITEM	PAGE	PARA-	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON
	0017 00-2					Part number supplied for item 2 is incorrect.

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

TO: *(Forward direct to addressee listed in publication)*	FROM: *(Activity and location) (Include ZIP Code)*	DATE
AMSTA-LC-LMPP/TECH PUBS 1 Rock Island Arsenal Rock Island, IL 61299-7630		

PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE
TM 10-4320-374-13&P	30 May 2008	Operation and Field Maintenance Manual Incld RPSTL for Pump Assembly DED 600 GPM

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III - REMARK *(Use this page for remarks, recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is OAASA	Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE

TO: *(Forward to proponent of publication or form) (Include ZIP Code)* AMSTA-LC-LMPP/TECH PUBS 1 Rock Island Arsenal Rock Island, IL 61299-7630	**FROM:** *(Activity and location) (Include ZIP Code)*

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM 10-4320-374-13&P	30 May 2008	Operation and Field Maintenance Manual Including RPSTL for Pump Assy: DED, 600 GPM

ITEM	PAGE	PARA-	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

TO: *(Forward direct to addressee listed in publication)*	FROM: *(Activity and location) (Include ZIP Code)*	DATE
AMSTA-LC-LMPP/TECH PUBS 1 Rock Island Arsenal Rock Island, IL 61299-7630		

PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE
TM10-4320-374-13&P	30 May 2008	Operation and Field Maintenance Manual Including RPSTL for Pump Assy: DED,600GP

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III - REMARKS *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is OAASA	Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE

TO: *(Forward to proponent of publication or form) (Include ZIP Code)* AMSTA-LC-LMPP/TECH PUBS 1 Rock Island Arsenal Rock Island, IL 61299-7630	**FROM:** *(Activity and location) (Include ZIP Code)*

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM 10-4320-374-13&P	30 May 008	Operation and Field Maintenance Manual Including RPSTL for Pump Assy: DED, 600 GPM

ITEM	PAGE	PARA-	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

TO: *(Forward direct to addressee listed in publication)*	FROM: *(Activity and location) (Include ZIP Code)*	DATE
AMSTA-LC-LMPP/TECH PUBS 1 Rock Island Arsenal Rock Island, IL 61299-7630		

PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE
TM 10-4320-374-13&P	30 May 2008	Operation and Field Maintenance Manual Including RPSTL for Pump Assembly DED 600 GPM

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III - REMARKS *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is OAASA	Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE

TO: *(Forward to proponent of publication or form) (Include ZIP Code)* AMSTA-LC-LMPP/TECH PUBS 1 Rock Island Arsenal Rock Island, IL 61299-7630	**FROM:** *(Activity and location) (Include ZIP Code)*

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM 10-4320-374-13&P	30 May 2008	Operation and Field Maintenance Manual Including RPSTL for Pump Assy: DED, 600 GPM

ITEM	PAGE	PARA-	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

TO: *(Forward direct to addressee listed in publication)*	FROM: *(Activity and location) (Include ZIP Code)*	DATE
AMSTA-LC-LMPP/TECH PUBS 1 Rock Island Arsenal Rock Island, IL 61299-7630		

PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE
TM 10-4320-374-13&P	30 May 2008	Operation and Field Maintenance Manual Including RPSTL for Pump Assembly DED 600 GPM

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III - REMARKS *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

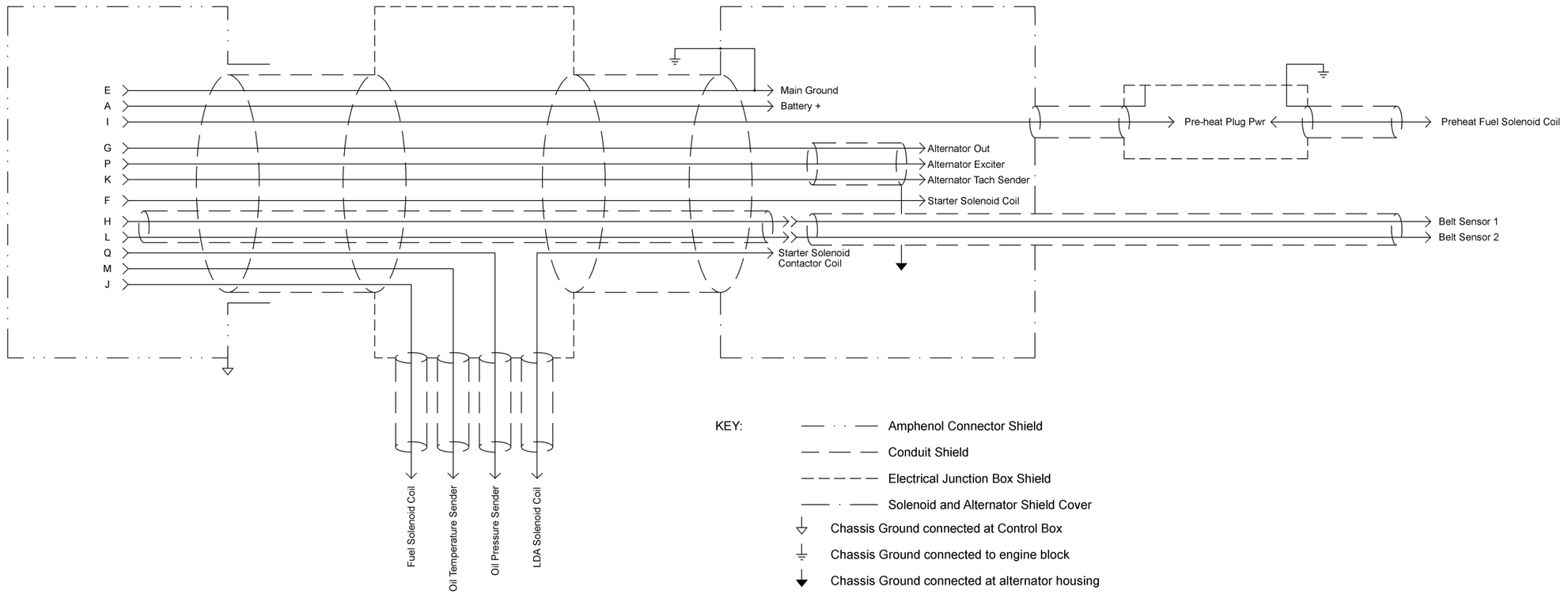
By Order of the Secretary of the Army:

GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

Official:

JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army
0812801

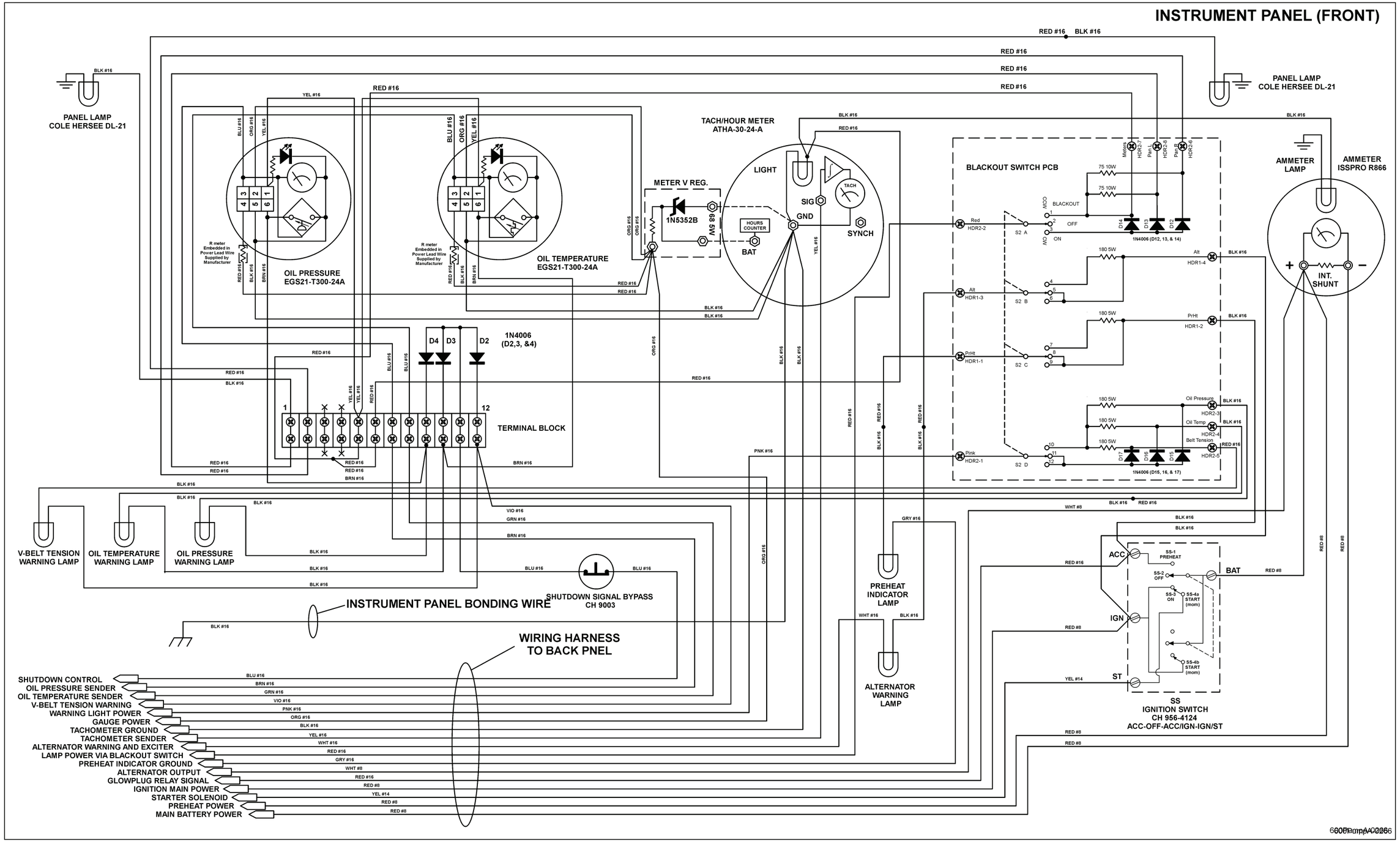
DISTRIBUTION: To be distributed in accordance with the initial distribution requirements for IDN: 256963, requirements for TM 10-4320-374-13&P.



600PumpA-0365

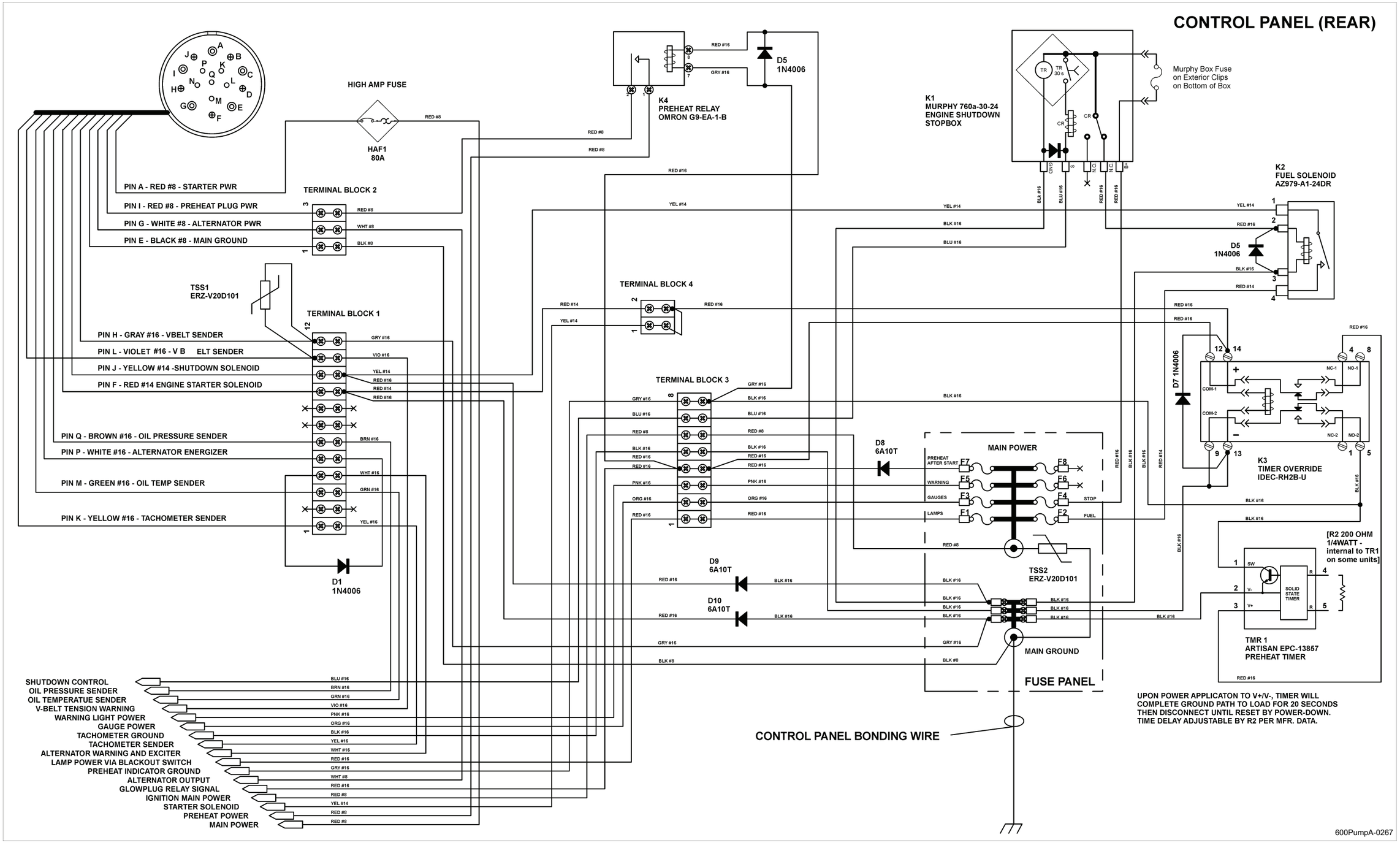
FO-1. Pump EMI Shield Diagram

FP-1/(FP-2 Blank)



FO-2. Control Panel Wiring (Sheet 1 of 2)

FP-3/(FP-4 Blank)



FO-2. Control Panel Wiring (Sheet 2 of 2)

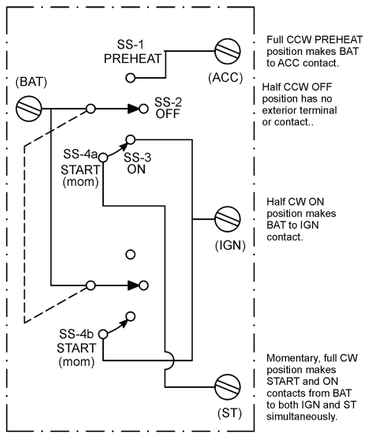
FP-5/(FP-6 Blank)

NOTES:

Pre-heat time delay relay designated TDR1 here.

Ignition key switch symbol is designated SS (Starter Switch). It has three positions that remain selected as with any conventional rotary selector switch, and one momentary double pole position that is at full clockwise rotation. This contact returns to the half CW position as indicated by the arched arrow from the full CW to the half CW positions. The second pole is drawn as the second switch section.

The panel labels are PREHEAT, OFF, ON, and START, while the terminal lables on the switch at the back side are in parentheses.

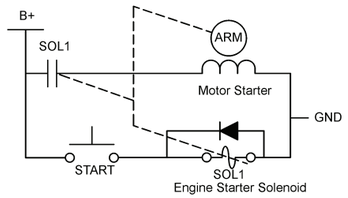


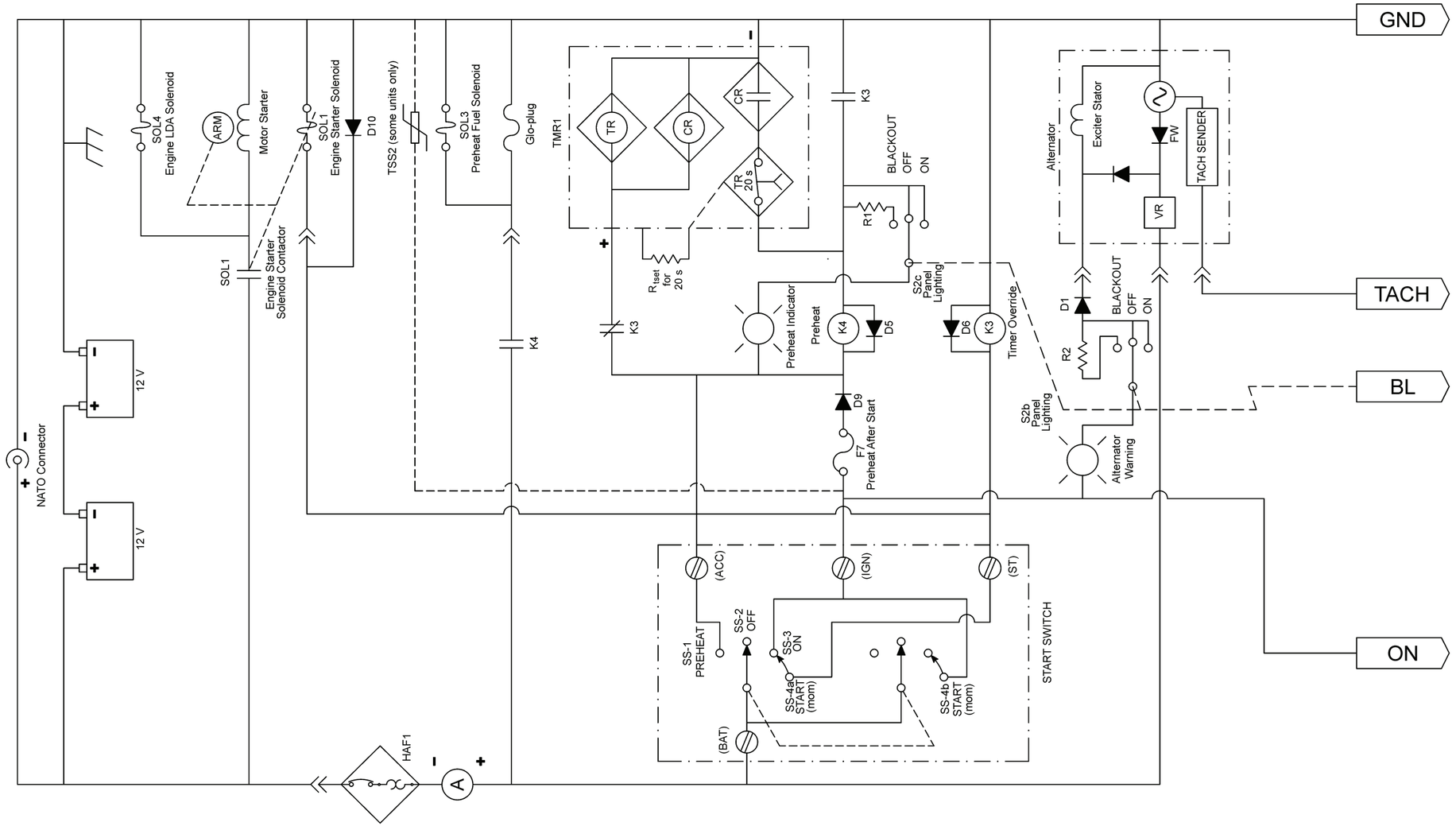
For convenience in locating components, items outside control box are shown connected by this symbol:

This symbol abreviates a full-wave diode set

Dash-dot outlines indicate all enclosed elements are in one package, but is used only for components which might be misinterpretted as independent, otherwise.

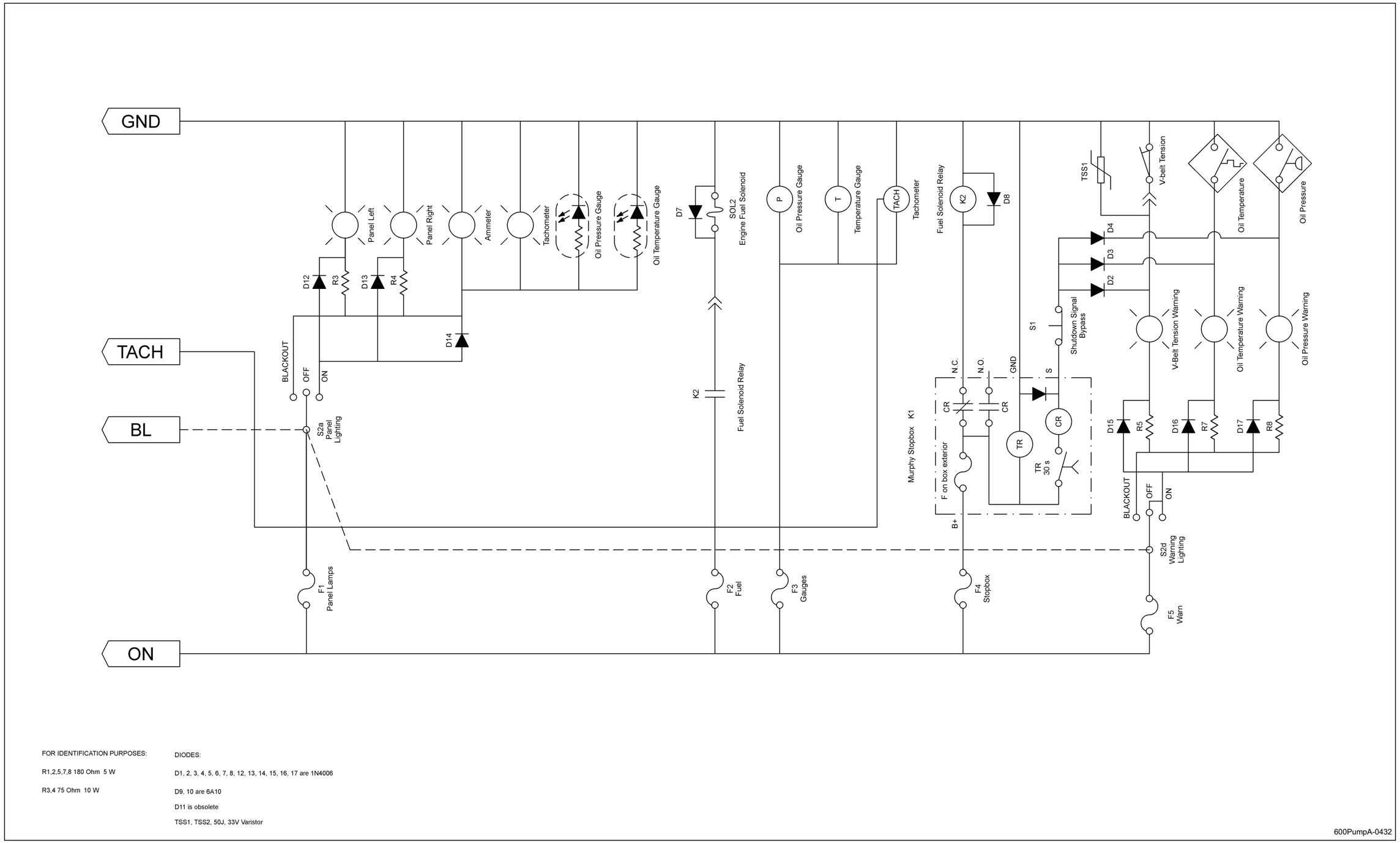
Engine Starter Solenoid shows linkage to both th starter motor pinion and the contacts. Actual device has dual pull-in and hold windings with contact to the pull-in breaking as the armature pulls into final position.





600PumpA-0431

FO-3. Pump Ladder Logic Diagram (Sheet 1 of 2)



FOR IDENTIFICATION PURPOSES:

R1,2,5,7,8 180 Ohm 5 W

R3,4 75 Ohm 10 W

DIODES:

D1, 2, 3, 4, 5, 6, 7, 8, 12, 13, 14, 15, 16, 17 are 1N4006

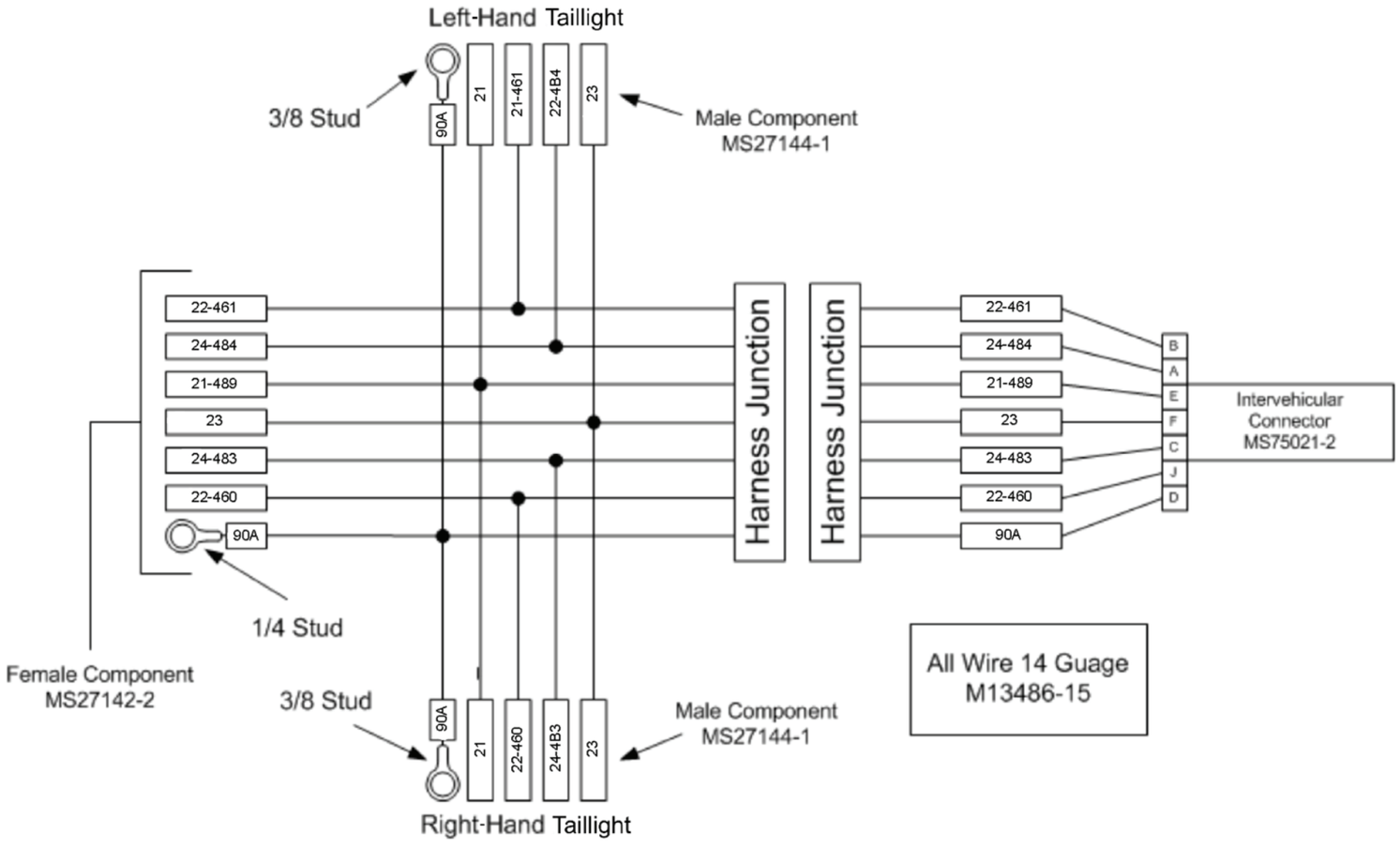
D9, 10 are 6A10

D11 is obsolete

TSS1, TSS2, 50J, 33V Varistor

600PumpA-0432

FO-3. Pump Ladder Logic Diagram (Sheet 2 of 2)



600PumpA-0268

FO-4. Trailer Wiring

FP-11/(FP-12 Blank)

THE METRIC SYSTEM AND EQUIVALENTS

Linear Measure

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

Weights

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 Pounds
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

Liquid Measure

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

Square Measure

1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches
1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet
1 Sq Kilometer = 1,000,000 Sq Meters = 0.0386 Sq Miles

Cubic Measure

1 Cu Centimeter = 1,000 Cu Millimeters = 0.06 Cu Inches
1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

Temperature

5/9 (°F - 32) = °C
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5 C° +32 = F°

APPROXIMATE CONVERSION FACTORS

To Change	To	Multiply By
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Sq Inches	Sq Centimeters	6.451
Sq Feet	Sq Meters	0.093
Sq Yards	Sq Meters	0.836
Sq Miles	Sq Kilometers	2.590
Acres	Sq Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Sq Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

To Change	To	Multiply By
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Sq Centimeters	Sq Inches	0.155
Sq Meters	Sq Feet	10.764
Sq Meters	Sq Yards	1.196
Sq Kilometers	Sq Miles	0.386
Sq Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Sq Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621

PIN: 084872-000