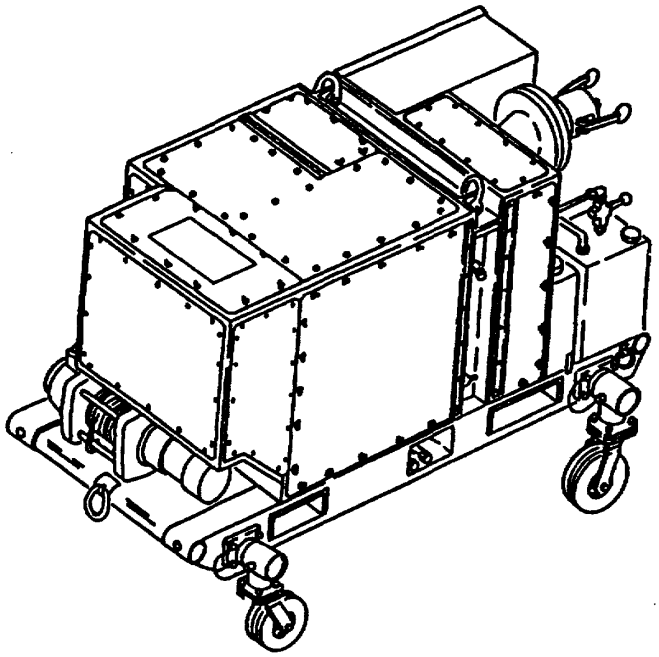
UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL



200 GPM FLAMMABLE LIQUID
LOW TEMPERATURE PUMP
MODEL: AFARE200GPMP
NSN: 4320-01-327-4578
EIC: ODU

600 GPM FLAMMABLE LIQUID
MAINTENANCE
LOW TEMPERATURE PUMP
MODEL: AFSSP600GPMP
NSN: 4320-01-327-4579
EIC: ZDV

HEADQUARTERS, DEPARTMENT OF THE ARMY
1 JULY 1997

WARNINGS

CARBON MONOXIDE (EXHAUST GAS) CAN KILL YOU

Carbon monoxide is without color or smell, but can kill you. Breathing carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, a sleepy feeling, and coma. Brain damage or death can result from heavy exposure. Carbon monoxide occurs in the exhaust fumes of fuel-burning heaters and internal combustion engines. Carbon monoxide can become dangerously concentrated under conditions of no ventilation.

Precautions must be followed to ensure operator's safety when in operation.

- BE ALERT at times during operating procedures for carbon monoxide poisoning. If exposure is present, IMMEDIATELY evacuate personnel to fresh air.

- BE AWARE the field protection mask used for nuclear-biological-chemical attack WILL NOT protect you from carbon monoxide poisoning.

THE BEST DEFENSE AGAINST CARBON MONOXIDE POISONING IS GOOD VENTILATION.

WARNING

JEWELRY

Remove rings, bracelets, wristwatches, and neck chains before working around or on the equipment. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

WARNING

GROUNDING BEFORE OPERATION

Do not operate the unit until the ground terminal stud of the equipment has been connected to a suitable ground. Electrical faults in the equipment can cause death by electrocution from contact with an ungrounded system.

WARNING

COMPRESSED AIR

Death or serious injury could occur if compressed air is directed against the skin. Do not use compressed air for cleaning or drying unless the pressure is/has been reduced to 30 psi (211 kPa) or less. When working with compressed air, always use chip guards, eye protection and other personnel protective equipment.

WARNING

FROSTBITE

Do not touch cold metal parts with bare hands. Cold metal parts can cause permanent injury to personnel.

WARNING

CLEANING

Do not direct high-pressure water hose nozzles or steam cleaner nozzles into electrical connections/junction boxes. Electrical shock can kill you.

WARNING

FLAMMABLE FUELS

Fuels are toxic and flammable. Wear protective goggles and refuel only in a well-ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat. If you become dizzy, get fresh air immediately and get medical aid. If contact with eyes or skin is made, immediately flush with clean water and get medical aid for eyes immediately.

WARNING

EAR PROTECTION

Serious hearing loss or deafness could occur if this equipment is operated without professionally-fitted ear protection for operating and maintaining personnel. The noise level for this equipment exceeds the allowable limits for unprotected personnel. Unprotected/unnecessary personnel must be kept out of the immediate area. Hearing protection is required within 15 feet of equipment while operating.

WARNING

HIGH VOLTAGE HAZARD

Although this is primarily a low voltage 24 vdc system, voltages as high as 10,000 volts are present in the engine ignition system. Never touch exposed contacts of the igniter, igniter cable or igniter unit.

WARNING

SOLVENT HAZARD

Dry cleaning solvent, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact by wearing rubber or nonporous gloves when handling solvents or material, wet with dry cleaning solvent. Wash hands immediately after exposure with soap and water and use a lanolin based skin cream to prevent skin drying. Do not use near open flame or excessive heat. Do not work with solvent in a closed room. Be sure there is good ventilation or the solvent vapors will build up in the air and become a poisonous mixture which can cause physical injury or even death.

WARNING

HEAVY EQUIPMENT HAZARD

Do not try to lift or move more than 50 pounds by yourself and bend legs while lifting. Lifting heavy equipment incorrectly can cause serious injury.

WARNING

SOLDER / WELDING

Chemical Agent Resistance Coating (CARC) produces toxic fumes when flame or heat is applied. It is necessary to remove CARC in area where flame or heat is to be applied. Death can result.

WARNING

FIRST AID

First aid instructions are given in FM 21-11, First Aid for Soldiers.

TECHNICAL MANUAL
NO: TM 10-4320-342-24

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 1 JULY 1997

UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE

200 GPM FLAMMABLE LIQUID LOW TEMPERATURE PUMP MODEL AFARE200GPMP

NSN: 4320-01-327-4578
EIC: ODU

AND

600 GPM FLAMMABLE LIQUID LOW TEMPERATURE PUMP MODEL AFFSP600GPMP

NSN: 4320-01-327-4579
EIC: ZDV

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes, or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to: Commander, US Army Aviation and Troop Command, ATTN: AMSAT-I-MP, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. You may also submit your recommended changes by E-mail directly to <mpmt/t%avma28st-louis-emh7.army.mil>. A reply will be furnished directly to you. Instructions for sending an electronic 2028 may be found at the back of this manual immediately preceding the hard copy 2028.

TABLE OF CONTENTS

TABLE OF CONTENTS - continued

LIST OF APPENDICES

TABLE OF CONTENTS - continued

LIST OF ILLUSTRATIONS - continued

TABLE OF CONTENTS - continued

LIST OF ILLUSTRATIONS - continued

TABLE OF CONTENTS - continued

LIST OF ILLUSTRATIONS - continued

TABLE OF CONTENTS - continued

LIST OF ILLUSTRATIONS - continued

TABLE OF CONTENTS - continued

LIST OF ILLUSTRATIONS - continued

TABLE OF CONTENTS - continued

LIST OF ILLUSTRATIONS - continued

TABLE OF CONTENTS - continued

LIST OF ILLUSTRATIONS - continued

TABLE OF CONTENTS - continued

LIST OF ILLUSTRATIONS - continued

TABLE OF CONTENTS - continued

LIST OF ILLUSTRATIONS - continued

TABLE OF CONTENTS - continued

LIST OF TABLES

LIST OF CHARTS

HOW TO USE THIS MANUAL

Be sure to read all Warnings before using your equipment.

This manual contains maintenance instructions for the 200 / 600 GPM Pump.

- General Introduction - On the cover of the manual are boxes near the right-hand edge with subject titles in them. Bend the pages of the manual and look for a black bar on the right side of the page that corresponds with the subject matter you want. At the beginning of the chapter, there is an index for quick reference for the subject matter of that chapter. The Table of Contents lists the Chapters and Section of this manual for an easy index. A List of Illustrations follow the Table of Contents for easy reference to illustrations.

- Chapter 1 - Introduces you to the equipment and gives you information; such as, weight, height, length, common abbreviations and information on how the unit works. The chapter is preceded by a full page illustration of the equipment.

- Chapter 2 - Provides unit maintenance personnel with troubleshooting procedures for identifying equipment malfunctions PMCS and maintenance instructions for repair of defective equipment.

- Chapter 3 - Provides direct support maintenance personnel with maintenance instructions for performing repairs on equipment as authorized by the maintenance allocation chart.

- Chapter 4 - Provides general support maintenance personnel with maintenance instructions for performing repairs on equipment as authorized by the maintenance allocation chart.

- Appendix A - Lists forms and publications referenced or used in this manual.

- Appendix B - Maintenance Allocation Chart identifies repairable components and the maintenance level authorized to perform repairs.

- Appendix C - Lists Components of End Item and Basic Issue Items.

- Appendix D - Lists Illustrated List of Manufactured Items.

- Appendix E - Provides information about expendable supplies; such as, sealants, lubricants, chemicals, etc. that are used when operating or maintaining equipment.

- Appendix F - Mandatory Replacement Parts List identifies all parts that have to be changed when maintenance is performed by item number, nomenclature and part number.

- Appendix G - Cable diagrams show the electrical diagrams of the equipment wiring.

- Appendix H - Torque limits that provide general torque limits for fasteners.

- Index Index is located in back of this manual for easy alphabetical reference.

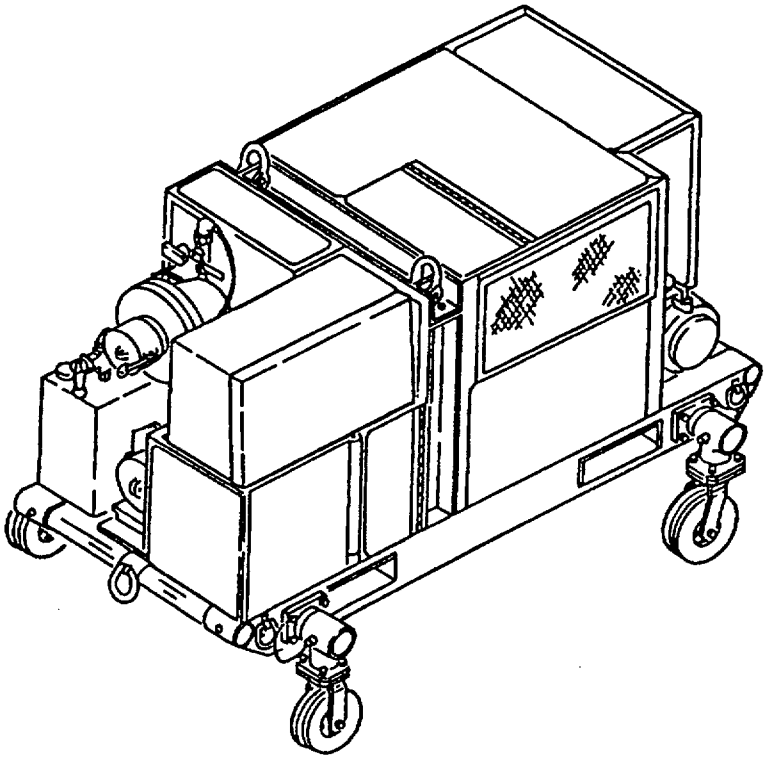


Figure 1-0. 200 / 600 GPM Flammable Liquid Low Temperature Pump

CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

1-1. SCOPE.

This operator's manual contains operating instructions and maintenance procedures required to operate and maintain the 200/600 GPM Flammable Liquid Low Temperature Pump. The purpose of the 200/600 GPM Pump is to transfer and dispense petroleum products.

1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS.

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750 The Army Maintenance Management System (TAMMS).

1-3. CORROSION PREVENTION AND CONTROL (CPC).

a. Corrosion Prevention and Control (CPC) of Army Materiel is a continuing concern. It is important that any problems with this item be reported so the problem can be corrected and improvements made to prevent the problem in future items.

b. While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials; such as, rubber and plastic. Unusual cracking, softening, swelling or breaking of these materials may be a corrosion problem.

c. If a corrosion problem is identified, it can be reported using Standard Form (SF) 368, (Product Quality Deficiency Report). Check the box to indicate that the problem may be corrosion-related. Using key words, such as, "rust", "deterioration", "pitting" or "cracking"; or, even including color photos of the corroded area, will aid problem diagnosis and solution.

d. Submit completed SF 368 to Commander, U.S. Army Aviation and Troop Command, ATTN: AMSAT-I-MDO, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798.

1-4. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.

Methods and procedures for destruction of Army materiel to prevent enemy use are covered in TM 750-244-3.

1-5. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your 200/600 GPM Pump needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368. Mail it to: Commander, U.S. Army Aviation and Troop Command, ATTN: AMSAT-I-MDO, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798. We will send you a reply.

1-6. PREPARATION FOR STORAGE OR SHIPMENT.

Refer to paragraph 2-96 and 2-97 for preparation for storage or shipment.

1-7. NOMENCLATURE CROSS-REFERENCE LIST.

This paragraph includes the nomenclature cross-reference list between common names and official nomenclature.

Common Name	Official Nomenclature
Engine	Power Unit, Gas Turbine
200/600 GPM Pump	Pump, Low Temperature, Flammable Liquid, 200/600 GPM
ESU	Electronic Sequence Unit

1-8. LIST OF ABBREVIATIONS.

This paragraph includes a list, consisting of all abbreviations, acronyms, signs or symbols.

Abbreviation	Nomenclature
K	Kilo (Thousand)
°F	Degrees Fahrenheit
TM	Technical Manual
CCW	Counterclockwise
CW	Clockwise
IAW	In accordance with
ESU	Electronic Sequencing Unit
DS	Direct Support
GS	General Support
BIT	Built-In Test
VDC	Volt Direct Current
GPM	Gallons per Minute
psi	Pounds per Square Inch
kPA	Kilo Pascal
AH	Amp Hours
RPM	revolutions per minute
GTE	Gas Turbine Engine
kg	kilograms
cm	centimeters

1-9. GLOSSARY.

The glossary includes terms that are not adequately defined in this manual.

Common Name	Nomenclature
Bleed Air	Compressed air produced by gas turbine engines as a byproduct. Bleed air on this system is used to prime the pump and purge the air cleaner.
Priming	Prepare for operation. As applied to this system, it means creating a vacuum in the discharge side of the pump assembly. This vacuum allows fuel from the fuel source to flow through the pump assembly and totally submerges the impeller with fuel.
Cranking	As applied to engines, it means turning the main shaft of an engine by electrical or mechanical means with the intent to get the engine started.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-10. EQUIPMENT CHARACTERISTICS, CAPABILITIES AND FEATURES.

a. Characteristics. The 200/600 GPM Pump is to be used in the field to provide support units with capabilities for forward refueling. The 200/600 GPM Pump is mounted on four wheels/skid.

b. Capabilities and Features.

(1) Lightweight construction. Unit is built of lightweight materials.

(2) Portability. Because of the lightweight construction and compact shape, unit is easily replaced and retrieved, using lifting device with sling, forklift truck or helicopter. Unit can also be moved short distances by the use of an integral electric winch. Portability components include the caster type wheels, lifting eyes, forklift pockets, the winch and the compact construction of the units.

(3) Ease of maintenance. Units have been designed for a low maintenance ratio. Accessibility of components, use of quick disconnect fasteners are contributing factors in obtaining the required low maintenance ratio.

(4) Reliability/Durability. Pump assemblies have been designed for difficult environmental conditions, especially for extremely low temperatures encountered in the arctic regions. Many of the components used are highly reliable under similar environmental conditions.

(5) Low weight/power ratio. Low weight/power ratio has been obtained by selecting a lightweight, high powered gas turbine engine and lightweight materials for the pumps, pump frames and other components.

(6) Temperature Extremes. Pump assemblies operate over wide temperature ranges. Although the system was designed and tested specifically for use in arctic regions, it operates at ambient temperatures up to 95°F (36°C).

(7) Designed to operate from internal fuel. Pump is started from fuel in auxiliary 5 gallon fuel can.

1-11. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

The following provides the location and a brief description of the operation and purpose of the 200/600 GPM Pump. Refer to figure 1-1.

a. (1) Priming Vent Drain Tank. Collects fuel and vapor during priming of the 200/600 GPM Pump.

b. (2) Starter - Generator. This unit is mounted to the gearbox of the engine and consists of several windings. It is constantly engaged with the gearbox of the engine. While cranking the engine, all starter coils in the dc starter-generator are used for maximum torque output. When the engine runs, the main starter coil is disabled by external means to convert unit for generator operation.

c. (3) Exhaust Extension and (4) Muffler. Exhaust extension and muffler are used to reduce the noise level of the engine. Exhaust extension is removed and stored inside 200/600 GPM Pump during travel and storage.

d. (5) Control Box. The control box is mounted to the side of the 200/600 GPM Pump. It consists of a box, a door assembly, the components panel and most of the controls and indicators that are necessary to operate and monitor the 200/600 GPM Pump.

e. (6) Battery and Battery Tray. A 24 dc battery provides power to start the engine. Battery is also used to operate the electric winch and various electrical controls and indicators and is constantly recharged by the generator when engine is running. Battery is mounted in the battery box which swings outward, away from enclosure, for replacement or servicing of the battery.

f. (7) 200/600 GPM Fuel Pump. 200/600 GPM fuel pump is driven by the engine output shaft thru a gear reducer. Its purpose is to pump fuel from storage devices to airplanes, helicopters, trucks, tanks, etc., and from bulk fuel vessels; i.e., railroad tank cars, fuel tankers, boats, etc., to system storage tanks.

g. (8) Ball valve. A ball valve at the discharge side of the 200/600 GPM Pump permits isolation of the fuel in the suction side of the discharge side. The purpose of this valve is to prevent flowback of fuel from the discharge side of the system to the suction side. This could occur when the fuel tanks of the vehicles being serviced are at a higher altitude than the supply tanks.

h. (9) Wheels. There are four wheels located on the 200/600 GPM Pump that are used for moving or repositioning the pump.

i. (10) Winch. Winch is electrically operated by the battery and/or from another vehicle when slave cable is deployed. Winch is useful to move 200/600 GPM Pump over short distances.

1-11. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - continued.

j. (11) Engine. The engine is mounted to the engine mounts on the frame. Its purpose is to drive the 200/600 GPM fuel pump. It consists of a compressor, gearbox, turbine wheel, enclosure, combustion assembly and electronic sequencing unit.

k. (12) Boost Pumps. Three boost pumps are provided on each unit. The first supplies a positive pressure of fuel to the fuel control module on the turbine. The second supplies a positive pressure of oil to the inlet of the speed reducer. The third removes oil from the speed reducer and returns it to the reservoir.

l. (13) Fuel/Oil Filters. Provides clean/oil by separating the dirt and water from the contaminated fuel/oil before entering into the gas turbine. Filter assembly is an aluminum construction with operating pressure of 3000 psi at 6 gpm. Also, filter assembly includes an 40 micron element, visual differential pressure indicator and bypass relief valve. When fuel/oil is flowing through the filter assembly a drop in pressure occurs between the inlet side and outlet side. This is due mainly to the flow resistance of the 40 micron element. As contaminates (dirt, water, etc) are collected by the 40 micron element, the drop in pressure increases. Eventually, when the pressure drop reaches 15 psi, the visual differential pressure indicator turns from gold to red. This enables the operator to detect contaminant build up before the 40 micron element is completely plugged and provides ample time to change the 40 micron element. If, the 40 micron element is not changed, the bypass relief valve will activate when the differential pressure reaches 17 psi and start bypassing the 40 micron element within the filter assembly. The bypass relief valve will continue bypassing until the 40 micron element is changed.

m. (14) Speed Reducer. A reduction gear system is used to reduce the speed of the turbine (12,000 rpm) to the operating speed of the pump (8,000 rpm).

n. (15) Clutch. An electromagnetic clutch is incorporated int he centrifugal type pump adapter assembly. The clutch permits decoupling of the centrifugal type pump from the turbine during starting and priming.

o. (16) Air Filters. Provides clean air for the turbine inlet by separating the dirt particles and water droplets from the contaminated air. The contaminated air entering the filter is given a swirling motion induced by the vortex generator. This swirling motion separates the dirt particles and water droplets leaving on the clean air to pass through the filter. The dirt particles and water droplets are scavenged out the exhaust.

1-11. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS – continued.

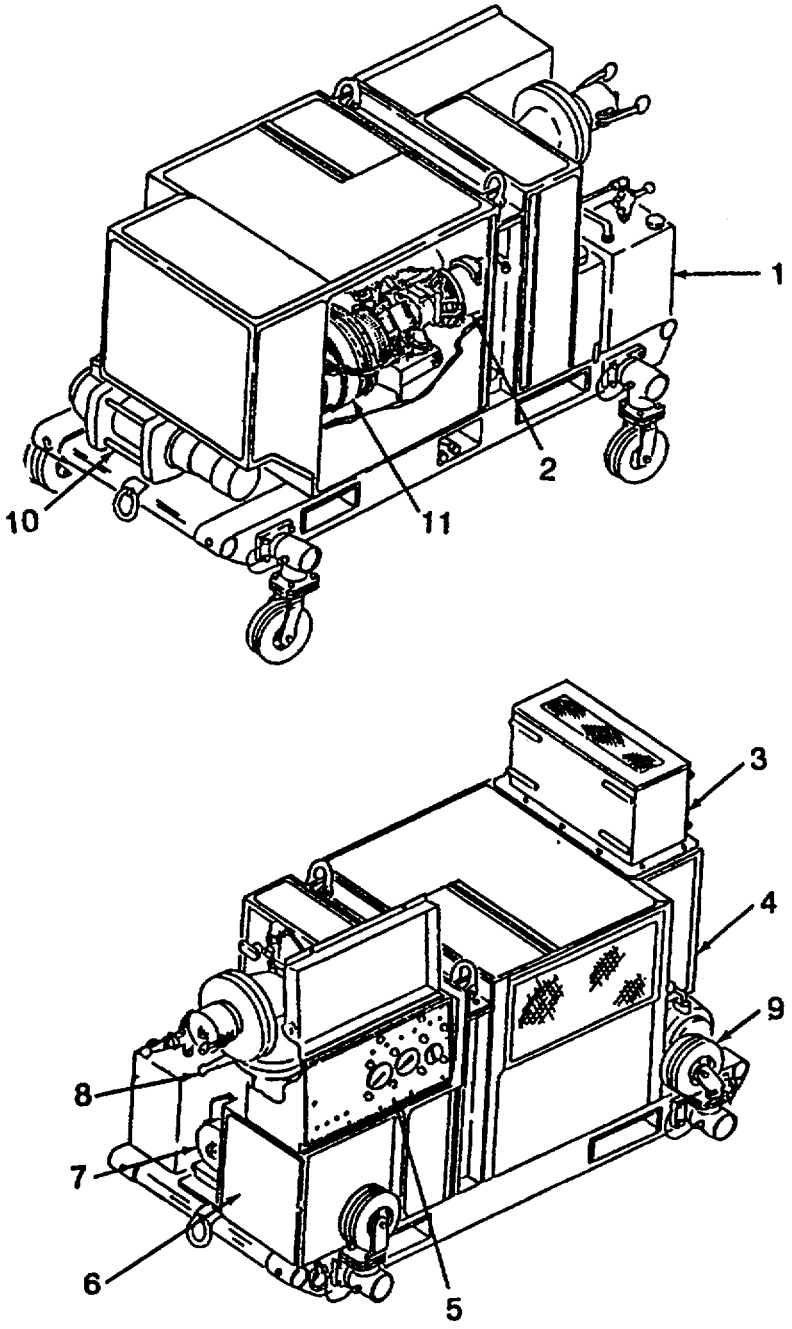


Figure 1-1. Location of Major Components (Sheet 1 of 2)

1-11. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - continued.

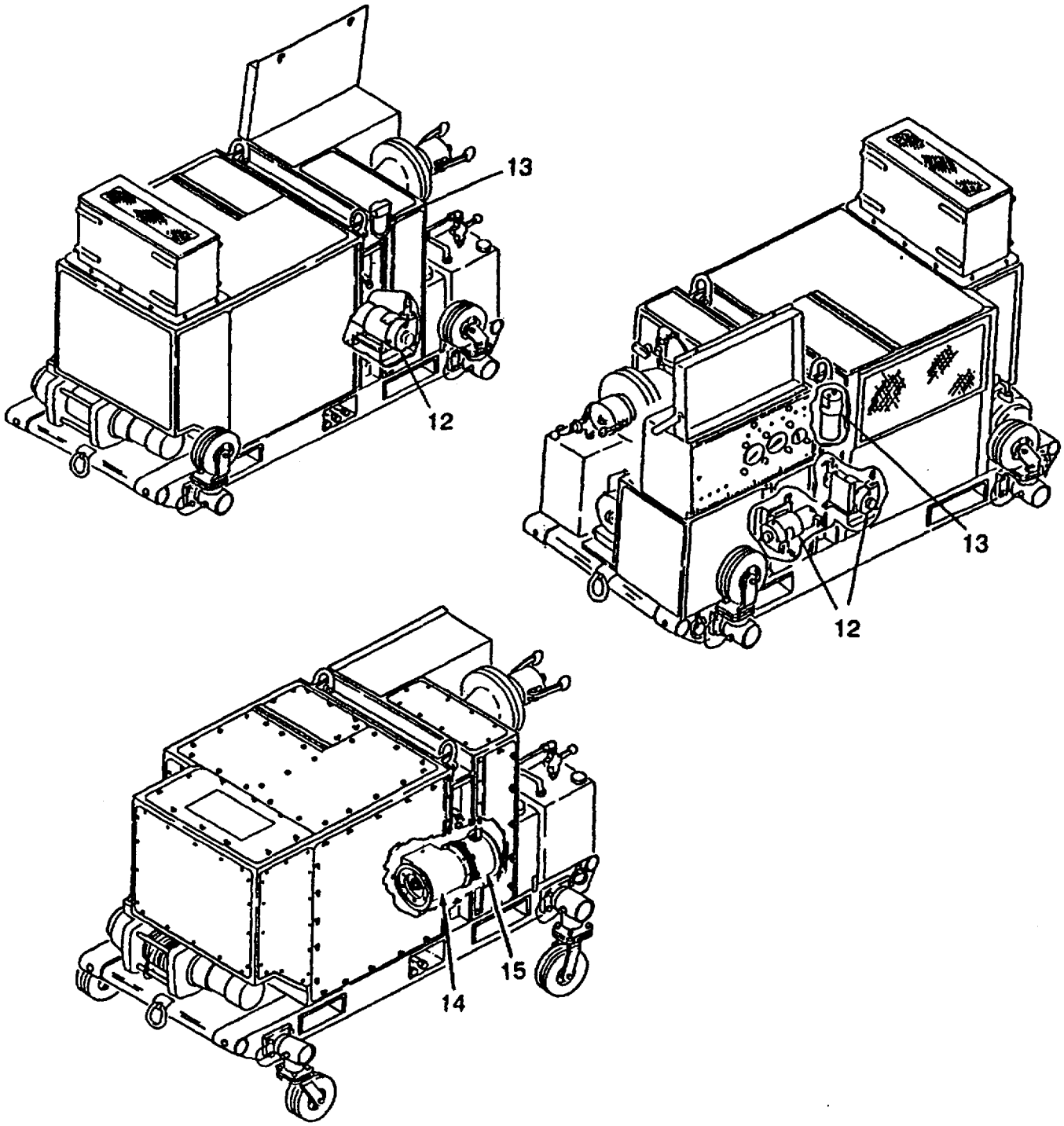


Figure 1-1. Location of Major Components (Sheet 2 of 2)

1-12. DIFFERENCE BETWEEN MODELS.

The difference between the 200 GPM pump and the 600 GPM pump is in the fuel pump assembly. The physical size as well as the internal components are different on the two pump/clutches. The 200 GPM pump has a 3-inch suction and a 2-inch discharge fitting. The 600 GPM pump has a 6-inch suction and a 4-inch discharge fitting. All other components on the two pumps remain the same. In addition, the operation of the pumps is identical.

1-13. EQUIPMENT DATA.

The following items are detailed information needed by the operator to maintain the equipment. See Table 1-1.

TABLE 1-1. EQUIPMENT SPECIFICATIONS

200/600 GPM Pump		
Model Number 200 GPM Pump	AFARE200GPMP	
Model Number 600 GPM Pump	AFSSP600GPMP	
Weight:		
200 GPM Pump	1005 lbs	(452 kg)
600 GPM Pump	1103 lbs	(496 kg)
Height:	46 inches	(117 cm)
Length:	76 inches	(193 cm)
Width: 43 inches	(109 cm)	
Power Requirements	24 vdc	
Fuel Requirements	JP4, JP5, JP8, DF1, DF2, DFA	
Operating Temperature	-60°F to +95°F (-66°C to +36°C)	
MIL-T-5624		
JP-4	-65°F to +130°F (-53°C to +54°C)	
JP-5	-40°F to +130°F (-40°C to +54°C)	
MIL-T-83133		
JP-8	-40°F to +130°F (-40°C to +54°C)	
VV-F800		
DF-A	-40°F to +130°F (-40°C to +54°C)	
DF-1	-25°F to +130°F (-31°C to +54°C)	
DF-2	+25°F to +130°F (-3°C to + 54°C)	
Engine		
Model Number	GTCP36-150(KM)	
Weight	92 lbs	(41 kg) (dry weight)
Type:	Gas Turbine	
RPM (Output Shaft):	12,000	
Exhaust Gas Temperature	1080°F(582°C)	
Horse Power	75	

1-13. EQUIPMENT DATA - continued.

TABLE 1-1. EQUIPMENT SPECIFICATIONS - continued

Engine		
Amp Hours	30 AH	
vdc	24 volts	
Weight	80 lbs	(36kg)
Type	Nickel Cadmium	
200/600 GPM Fuel Pump/Clutch		
Weight:		
200 GPM Pump/Clutch	82 lbs	(37 kg)
600 GPM Pump/Clutch	180 lbs	(81 kg)
Type:	Rotary, Impeller	
Capacity:	200 GPM or 600 GPM	
Clutch:		
Type	Electromagnetic/Friction	
Voltage	24VDC	
Winch		
Model Number	H1150D1-01	
Weight:		
Winch	80 lbs	(36kg)
Wire Rope	28 lbs	(13kg)
Voltage	24VDC	
Starter - Generator		
Model Number	23081-003	
Weight 21.7 lbs	(9.7kg)	
Output Voltage	30VDC	
Rating	6 kilowatts	
Continuous Load with Speed Range	200 amperes	
Speed Range (Rated Load)	7,050 to 12,000 rpm	
Direction of Rotation (Viewing) Drive End	Counterclockwise	
Cooling	Self-cooled	
Speed Reducer		
Model Number	SN2107	
Weight 45 lbs	(20 kg) (dry weight)	
Lube Pressure	20-25 psig	
Temperature Switch Setting	135° F(57°C)	
Rating (continuous)	90 HP at 1,200 rpm	

Section III. PRINCIPLES OF OPERATION

1-14. INTRODUCTION.

Although there are minor differences between the 200 GPM Pump and the 600 GPM Pump (all are confined to the 200/600 GPM fuel pumps) both pump assemblies operate in essentially the same manner.

1-15. PRINCIPLES OF OPERATION.

a. Priming Fuel and Fuel System. Refer to Figures 1-2 and 1-3.

(1) The engine-driven centrifugal pump utilizes an inducer and impeller. Fuel enters the pump through a screen and is discharged through a manually operated ball valve and out the discharge elbow. Pump incorporates an electromechanical clutch to allow engine to be started under no load conditions.

(2) Priming of pump is semiautomatic and is initiated when engine is operating, pump pressure switch is closed (indicating no discharge pressure), clutch engage switch is on and manually operated primer shut-off and ball-valves are open (turn on procedure). When these conditions are satisfied, the ejector solenoid and drain solenoid valves open and allow bleed air from the engine to flow through the compressor discharge solenoid valve, the check valve and the ejector to the fuel drain tank.

(3) The suction created by the ejector orifice evacuates a mixture of air and fuel vapor from the pump at the discharge elbow. The fuel and air mixture is discharged into the drain tank, where the air is vented thru the top opening while fuel is trapped in the tank.

(4) When sufficient vacuum exists in the pump and attached inlet and outlet hoses, fuel in suction line rises above level of impeller. When this occurs, pump is primed and begins to pump fuel.

(5) After the pump is primed, the priming system is deactivated by the pump discharge pressure switch, which causes the compressor discharge solenoid and the drain solenoid valves to close when pump discharge pressure reaches approximately 20 psi.

(6) When pump is primed and operating, the manually operated prime shutoff valve is closed and the tank suction valve is briefly opened to allow draining of drain tank by feeding it to the pump inlet.

b. Engine.

(1) The engine is essentially a self contained power unit requiring only fuel, ambient air and electrical power for operation.

1-15. PRINCIPLES OF OPERATION - continued.

(2) A single stage, rotary compressor delivers compressed ambient air to the combustion chamber. The compressed air is mixed with fuel and ignited by the igniter plug. The gases from this combustion process are then delivered to the turbine blades of a radial inward-flow turbine wheel and exhausted thru the exhaust tube.

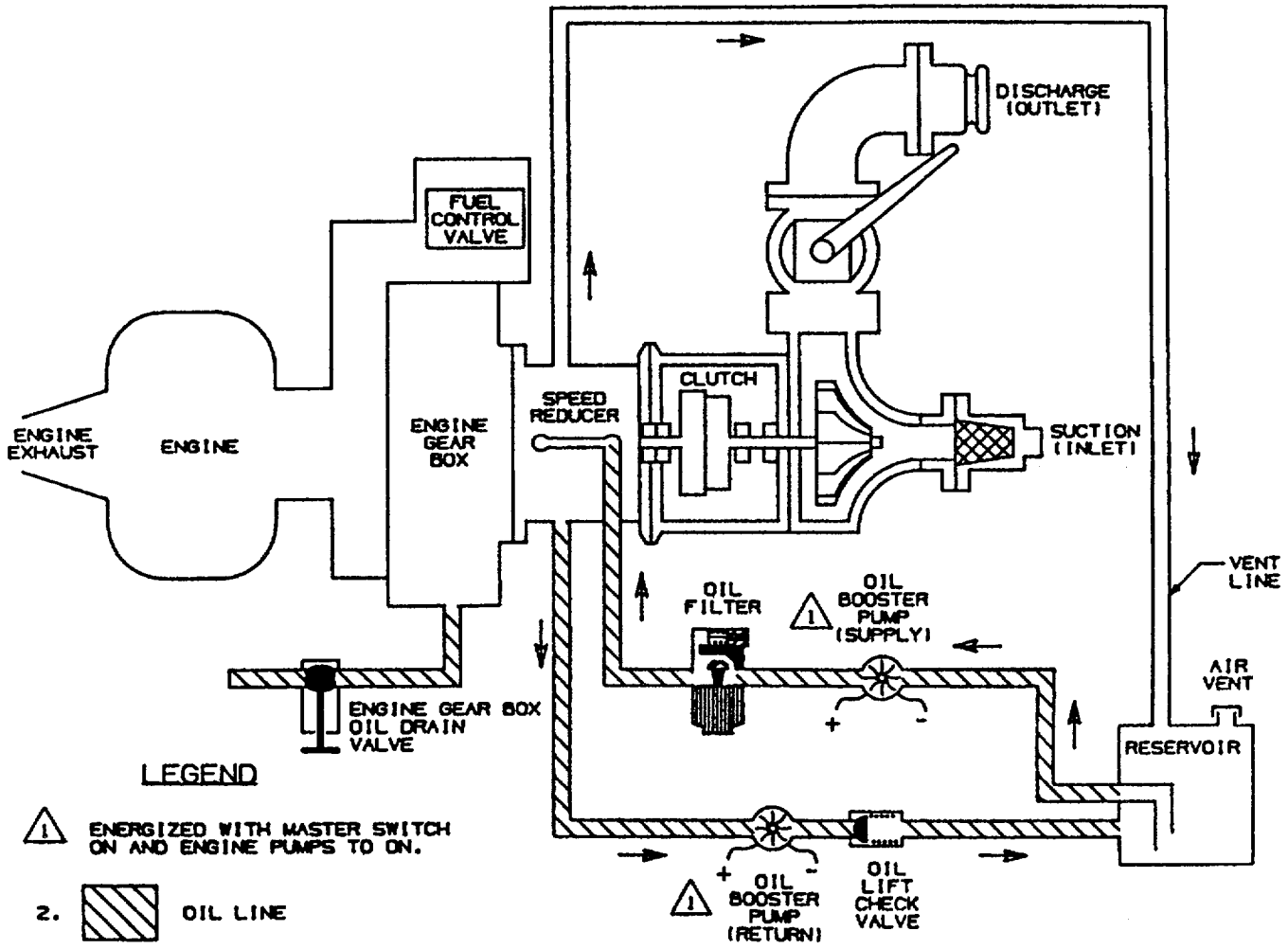


Figure 1-2. Speed Reducer Oil System

1-15. PRINCIPLES OF OPERATION - continued.

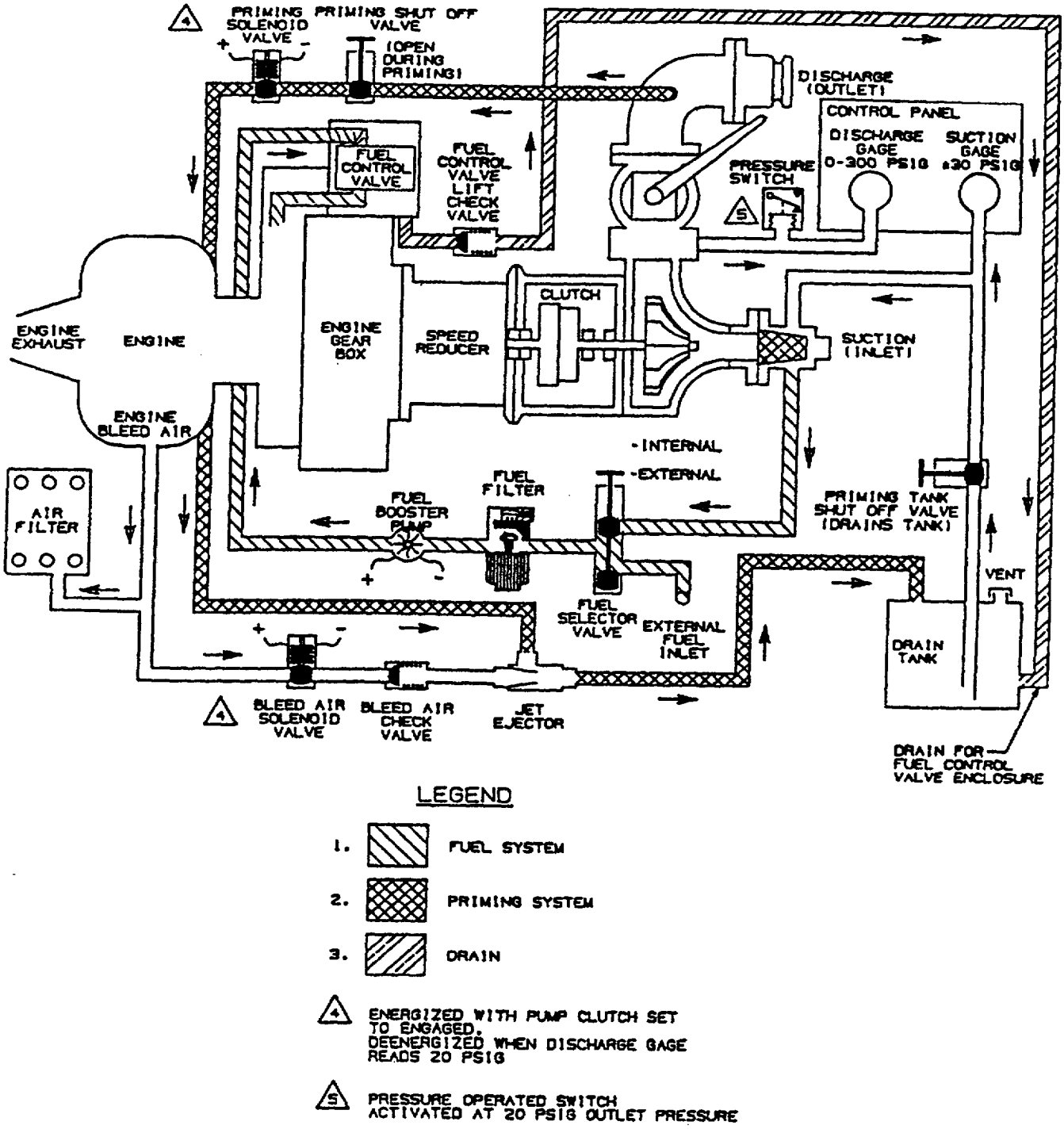


Figure 1-3. Priming Fuel and Fuel System

1-15. PRINCIPLES OF OPERATION- continued.

(3) The turbine shaft is coupled to the engine gearbox which consists of various reduction gears. The main shaft rotates and is coupled to an auxiliary speed reducer for proper pump speed. Other items attached to the gearbox are the starter/generator and the fuel valve.

(4) Engine is electrically controlled through a variety of sensors, the fuel control assembly and the fuel solenoid valve. Engine protection is provided by an oil temperature switch, low oil pressure switch, a thermocouple and an Electronic Sequencing Unit (ESU).

c. Electrical System. Refer to Figure 1-4.

The diagram shows the electrical flow of components in the electrical system.

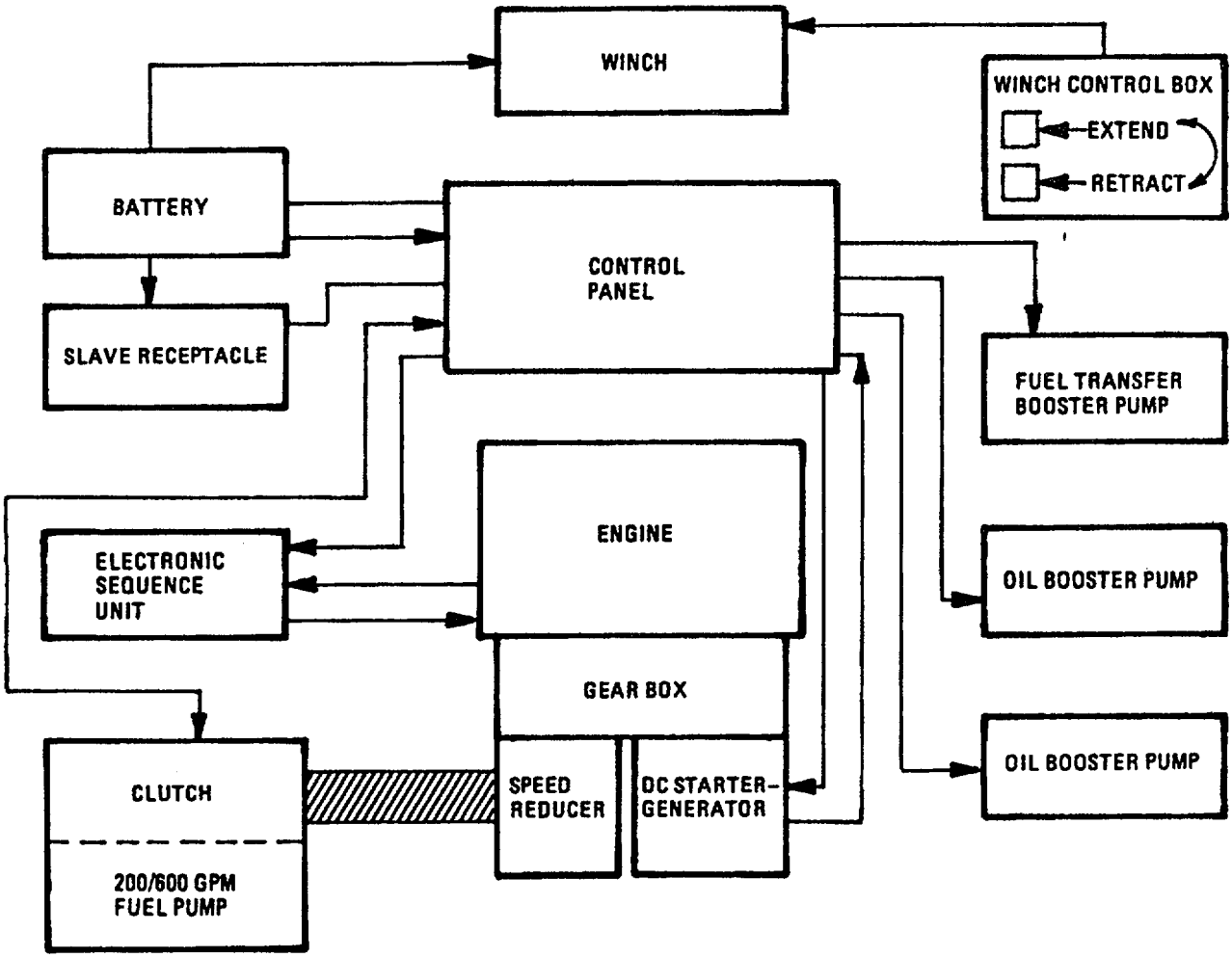


Figure 1-4. Electrical System

1-15. PRINCIPLES OF OPERATION - continued.

d. Winch. Refer to Figure 1-5.

The winch (1) is controlled by the winch control (2). The two switches (3) are used for retracting and extending the wire rope (4). A hook (5) is mounted on the end of the wire rope to attach to an object. The winch control handle (6) has two positions, freewheeling and engaged. In the engaged position, you can extend or retract the wire cable with the control; in the freewheeling position, you can pull the wire rope out as needed.

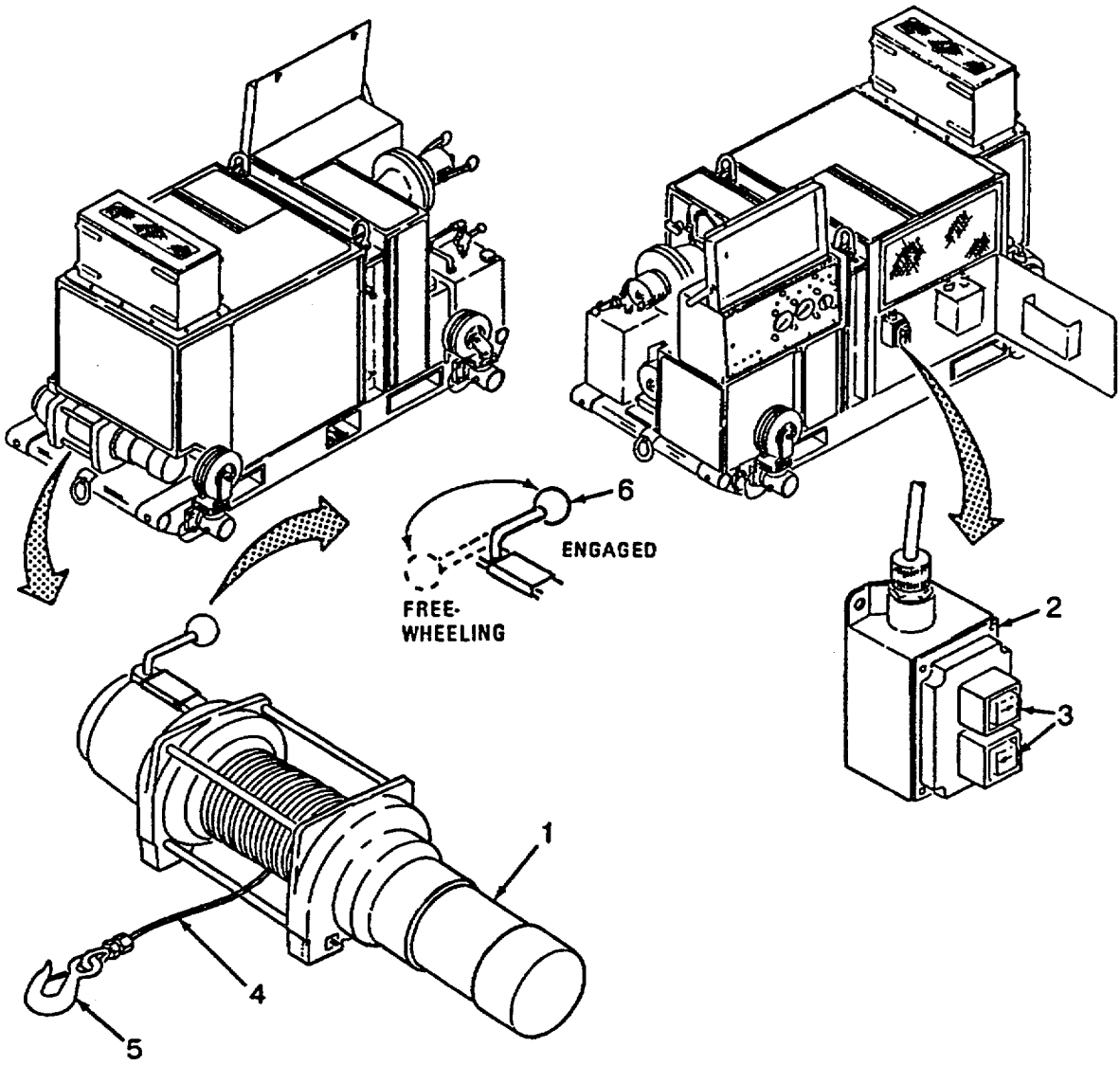


Figure 1-5. Winch

CHAPTER 2

UNIT MAINTENANCE INSTRUCTIONS

Section VI. Unit Maintenance Procedures - continued

Section VI. Unit Maintenance Procedures - continued

Section I. LUBRICATION INSTRUCTIONS

2-1. LUBRICATION INSTRUCTIONS.

200/600 GPM Pump. Refer to LO 10-4320-342-12 for Lubrication Orders.

Section II. REPAIR PARTS, SPECIAL TOOLS, TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE) AND SUPPORT EQUIPMENT

2-2. COMMON TOOLS AND EQUIPMENT.

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) CTA 50-970 or CTA 8-100 applicable to your unit. The tool kit SC 5180-90-CL-N26, General Mechanics Tool Kit.

2-3. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

Refer to Appendix B, Maintenance Allocation Chart, for a list of special tools, TMDE, and Support Equipment and TM 10-4320-342-24P, Repair Parts and Special Tools List.

2-4. REPAIR PARTS.

Repair parts are listed and illustrated in the Repair Parts and Special Tools List, TM 10-4320-342-24P, covering Unit, Direct Support and General Support Maintenance of this equipment. Appendix C lists the Mandatory Replacement Parts which need to be replaced during maintenance.

Section III. SERVICE UPON RECEIPT

2-5. SERVICE UPON RECEIPT OF MATERIEL.

a. 200/600 GPM Pump. Inspect 200/600 GPM Pump for damage incurred during shipment. If the equipment has been damaged, report the damage on SF 364, Report of Discrepancy.

b. Equipment. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions in DA PAM 738-750.

c. Modified Equipment. Check to see whether the equipment has been modified.

2-5. SERVICE UPON RECEIPT OF MATERIEL - continued.

d. Depreservation. Perform needed depreservation. Prepare equipment for inspection and operation as outlined in DA Form 2258. Make a thorough visual inspection of the equipment for loose or missing mounting hardware, parts and components.

e. Lubrication Instructions. Lubricate the unit in accordance with LO 10-4320-342-12.

Section IV. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-6. INTRODUCTION.

a. General. Your Preventive Maintenance Checks and Services Table lists the inspections and care your equipment requires to keep it in good operation condition.

(1) Quarterly Checks Always observe the WARNINGS and CAUTIONS while performing your quarterly PMCS. Observe these WARNINGS and CAUTIONS to prevent serious injury to yourself and others or prevent your equipment from being damaged.

(2) If Your Equipment Fails to Operate If your equipment does not perform as required, refer to Troubleshooting for possible problems. Report any malfunctions or failures on the proper DA Form 2404, Equipment Inspection and Maintenance Worksheet, or refer to DA PAM 738-750, The Army Maintenance Management System (TAAMS).

b. PMCS Columnar Entries. See Table 2-1.

(1) Item number column. Numbers in this column are for reference. When completing DA Form 2404 (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 do checks and services for the intervals listed.

(2) Interval column. This column tells you when you must do the procedure in the procedure column.

(3) Ease of maintenance. Units have been designed for a low maintenance ratio. Accessibility of components, use of quick disconnect fasteners are contributing factors in obtaining the required low maintenance ratio.

(4) Procedure column. This column gives the procedure you must do 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 or for operation. You must do 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 keep your equipment from being capable of performing its primary mission. If you make check and

2-6. INTRODUCTION - continued.

(5) service procedures that show faults listed in this column, do not operate the equipment. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

c. Special Instructions.

Leakage definitions for Unit PMCS shall be classified as follows:

(1) Class I. Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.

(2) Class II. Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked/inspected.

(3) Class III. Leakage of fluid great enough to form drops that fall from the item being checked/inspected.

d. As you perform your PMCS, keep in mind the following:

(1) Cleanliness. Dirt, grease, oil and debris only get in the way and may cover up a serious problem.

(2) Bolts, Nut and Screws. Check them all for obvious looseness and missing, bent or broken condition. Look for chipped paint, bare metal or rust around bolt heads. If you find a problem, report it to your supervisor.

(3) 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.

(4) Electrical Wires and Connections. Look for cracked or broken insulation, bare wires and loose or broken connectors. Tighten loose connections and make sure the wires are in good condition. If you find a bad wire or connector, report it to your supervisor.

(5) Lines and Fittings. Look for wear, damage and leaks. Make sure clamps and fittings are tight. Wet spots show leaks, but a stain around a fitting or connector can mean a leak. If a leak comes from a loose fitting or connector, or if something is broken or worn out, report it to your supervisor.

(6) Corrosion Control.

(a) Corrosion Prevention and Control (CPC) of Army materiel is a continuing concern. It is important that any problems with this item be reported so the problem can be corrected and improvements made to prevent the problem in future items.

(b) While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling or breaking of these materials may be a corrosion problem.

2-6. INTRODUCTION - continued.

(c) If a corrosion problem is identified, it can be reported using SF 368, (Product Quality Deficiency Report). Check the box to indicate that the problem may be corrosion-related. Using key words such as "rust", "deterioration", "pitting" or "cracking" or even including color photos of the corroded area will aid problem diagnosis and solution.

(d) Submit completed SF 368 to Commander, U.S. Army Aviation and Troop Command, ATTN: AMSAT-I-MDO, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798.

2-7. PMCS TABLE.

a. See Table 2-1 for PMCS.

b. Routing Diagram. Routing diagram shows 200/600 GPM Pump PMCS routing which matches the sequence of PMCS to be performed.

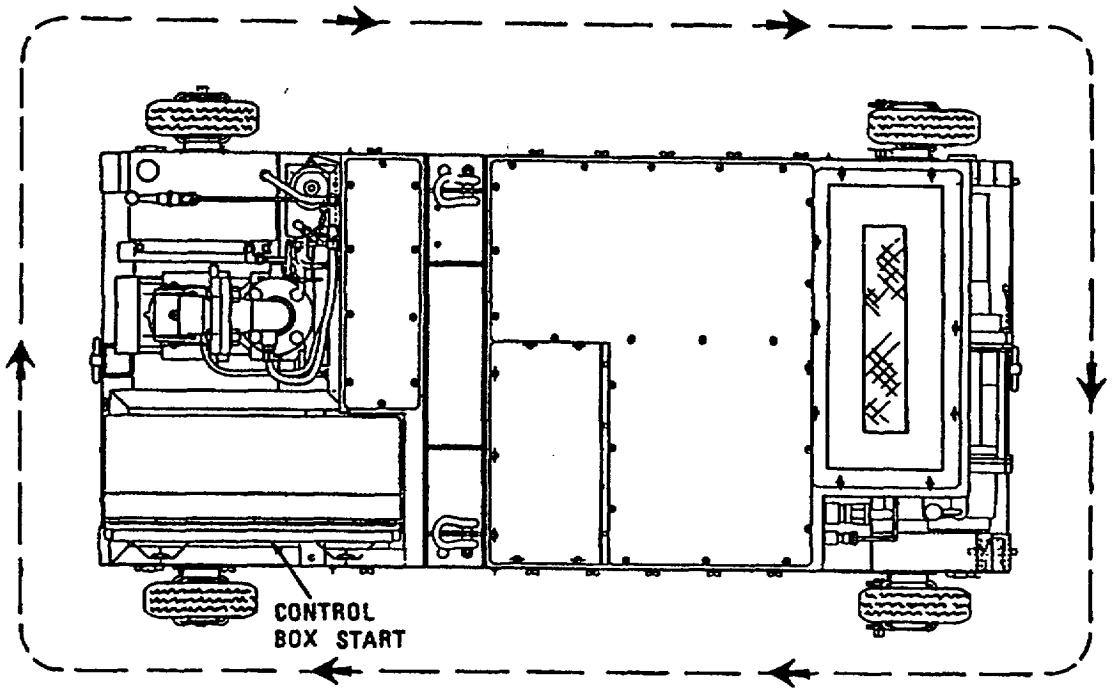


Figure 2-1. PMCS Routing Diagram

Table 2-1. Unit Preventive Maintenance Checks and Services

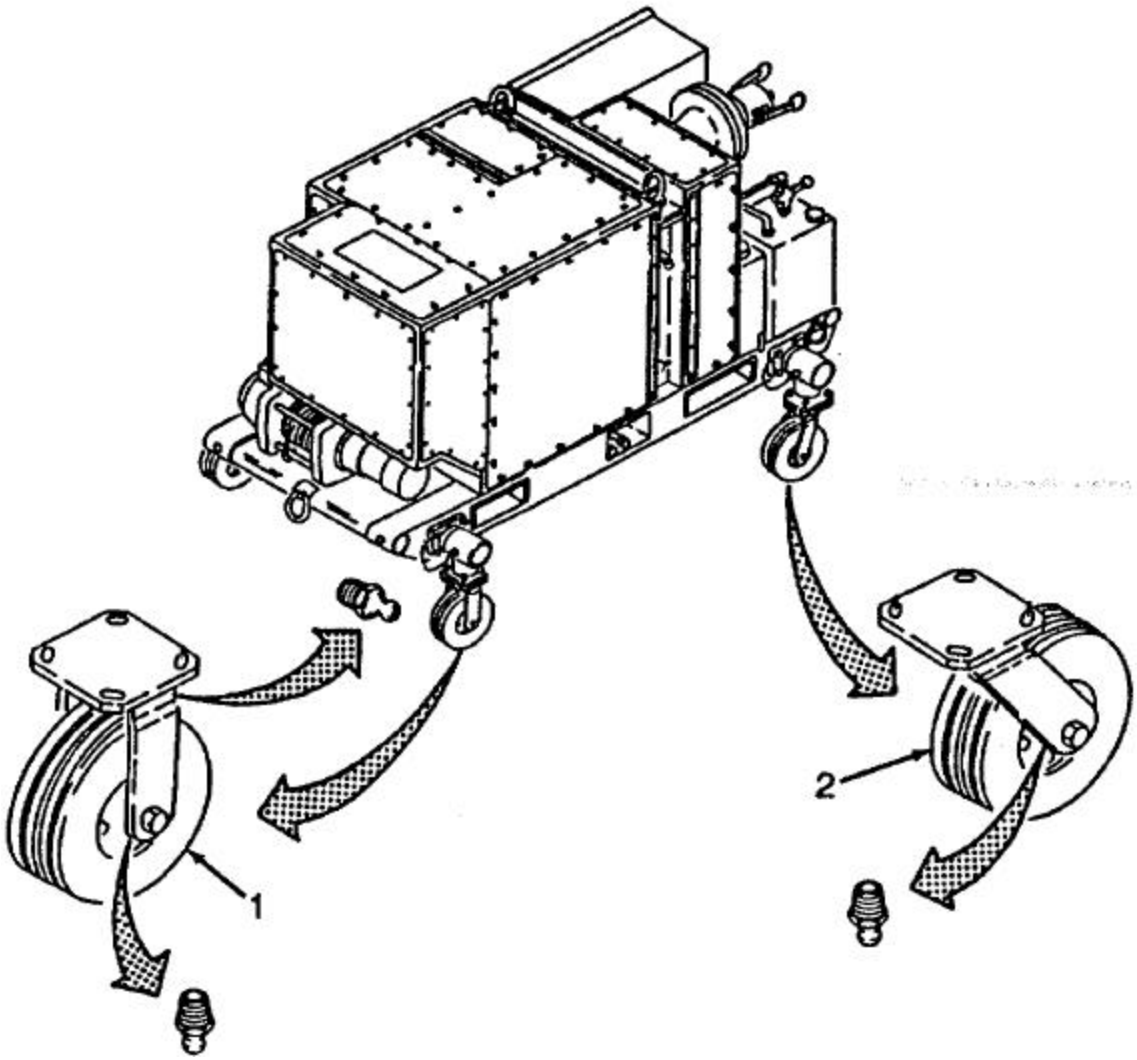
Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
1	Semi-Annual	Rigid/Swivel Wheels	Grease rigid/swivel wheels (1 and 2), refer to LO 10-4320-342-12.	

Table 2-1. Unit Preventive Maintenance Checks and Services

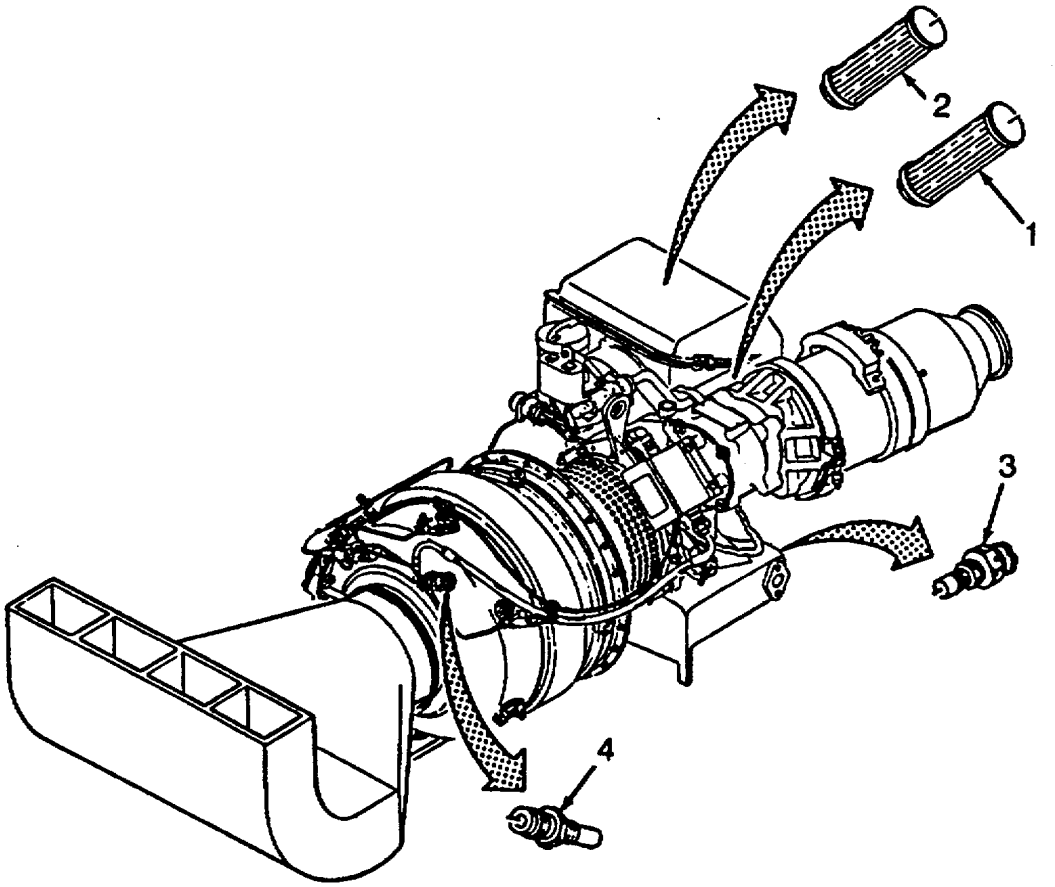
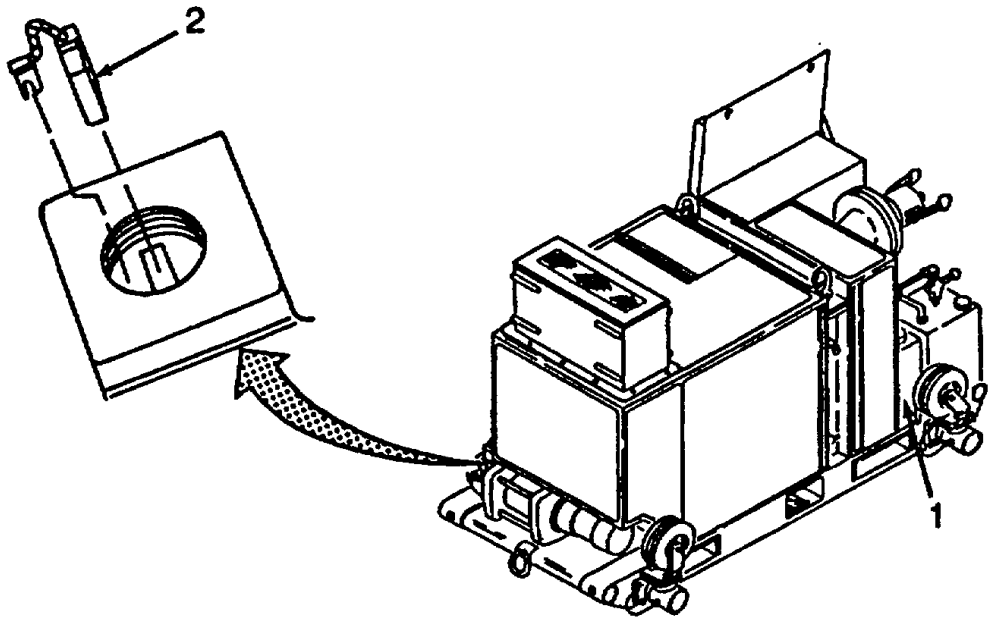
Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
2	Annually or 250 hours, whichever comes first.	Lubrication Oil	Drain and refill oil; refer to LO 10-4320-342-12.	Filter not changed.
3	Annually or 250 hours, whichever comes first.	Oil and Fuel Filter Elements	Remove and replace oil filter (1) and Fuel Filter (2) elements; refer to LO 10-4320-342-12.	Filter not changed.
4	Annually or 250 hours, whichever comes first.	Magnetic Drain Plug Assembly	Inspect magnetic drain plug (3) for debris.	
5	250 hours	Igniter Plug	Inspect electrode (4) for distortion, erosion, cracks or chips.	Igniter plug distorted, eroded, cracked or chipped.

Table 2-1. Unit Preventive Maintenance Checks and Services - continued

Item No.	Interval	Location: Item to Check/Service	Procedure	Not Fully Mission Capable if:
				
6	Semi-annually or 250 hours, whichever comes first.	Oil Reservoir	Change Lubricant in Oil Reservoir (1); refer to LO 10-4320-342-12.	Lubricant low.
7	Annually	Winch	Inspect Brushes (2) for damage or wear. (Minimum length of brush is 1/2 inch).	

Section V. UNIT TROUBLESHOOTING

2-8. INTRODUCTION.

The troubleshooting table lists the common malfunctions you may find during the operation of the pump assemblies. You should perform the tests, inspections and corrective actions in the order in which they appear in the table.

2-9. ENGINE FAULT INDICATORS.

Engine operation and fault indicators are positioned on the ESU front panel. They indicate the operational status of the engine. The status is indicated by a Built-In Test Equipment (BITE) code made up of four indicators which indicate either white or black as illustrated.

The ESU only displays the failure of a circuit; i.e., Fuel Torque Motor Fail. This means that indicated failure could be the torque motor in the fuel control assembly, or in the wiring between the ESU and the torque motor. The troubleshooting table takes this into consideration and gives you the additional checks that must be made to isolate the fault to a specific component.

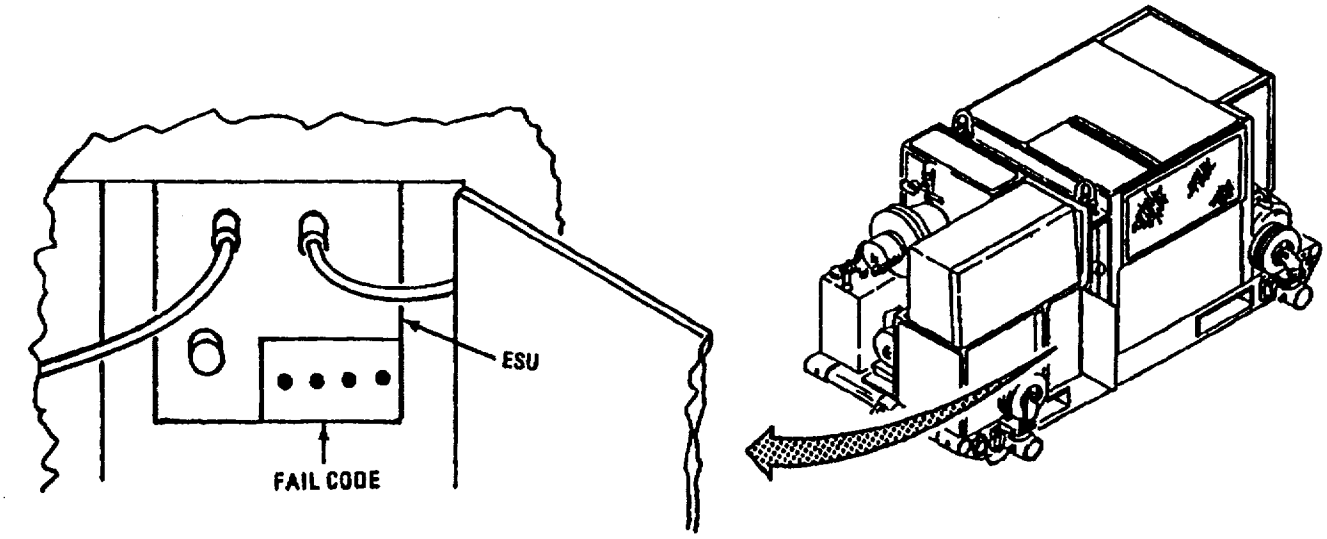


Figure 2-2. Engine Fault Indicators (Sheet 1 of 2)

2-9. ENGINE FAULT INDICATORS - continued.

	BIT CODE 1	2	3	4	FAILURE BIT INFORMATION
START SEQUENCE	●	●	●	●	RESET (START INITIATED)
	○	●	●	●	FUEL VALVE AND IGNITION SIGNAL ON (5%)
	○	○	●	●	START VALVE SIGNAL OFF (70%)
	○	○	○	●	IGNITION SIGNAL OFF (95%)
OPERATION	●	●	●	●	LOSS OF DC POWER
	○	●	●	●	ESU FAILURE
	●	○	●	●	START SYSTEM FAILURE
	○	○	●	●	OVERTEMPERATURE
	●	●	○	●	OVERSPEED
	○	●	○	●	UNDERSPEED
	●	○	○	●	FAIL TO START
	○	○	○	●	LOW OIL PRESSURE
	●	●	●	○	OIL PRESSURE SWITCH FAILURE
	○	●	●	○	THERMOCOUPLE FAILURE
	●	○	●	○	MOTION TRANSDUCER FAILURE
	●	●	○	○	FUEL SOLENOID VALVE FAILURE
	●	○	○	○	FUEL CONTROL ASSEMBLY FAILURE
	○	○	●	○	IGNITION UNIT FAILURE
	○	●	○	○	OIL TEMPERATURE TRANSMITTER FAILURE
	○	○	○	○	NO DATA

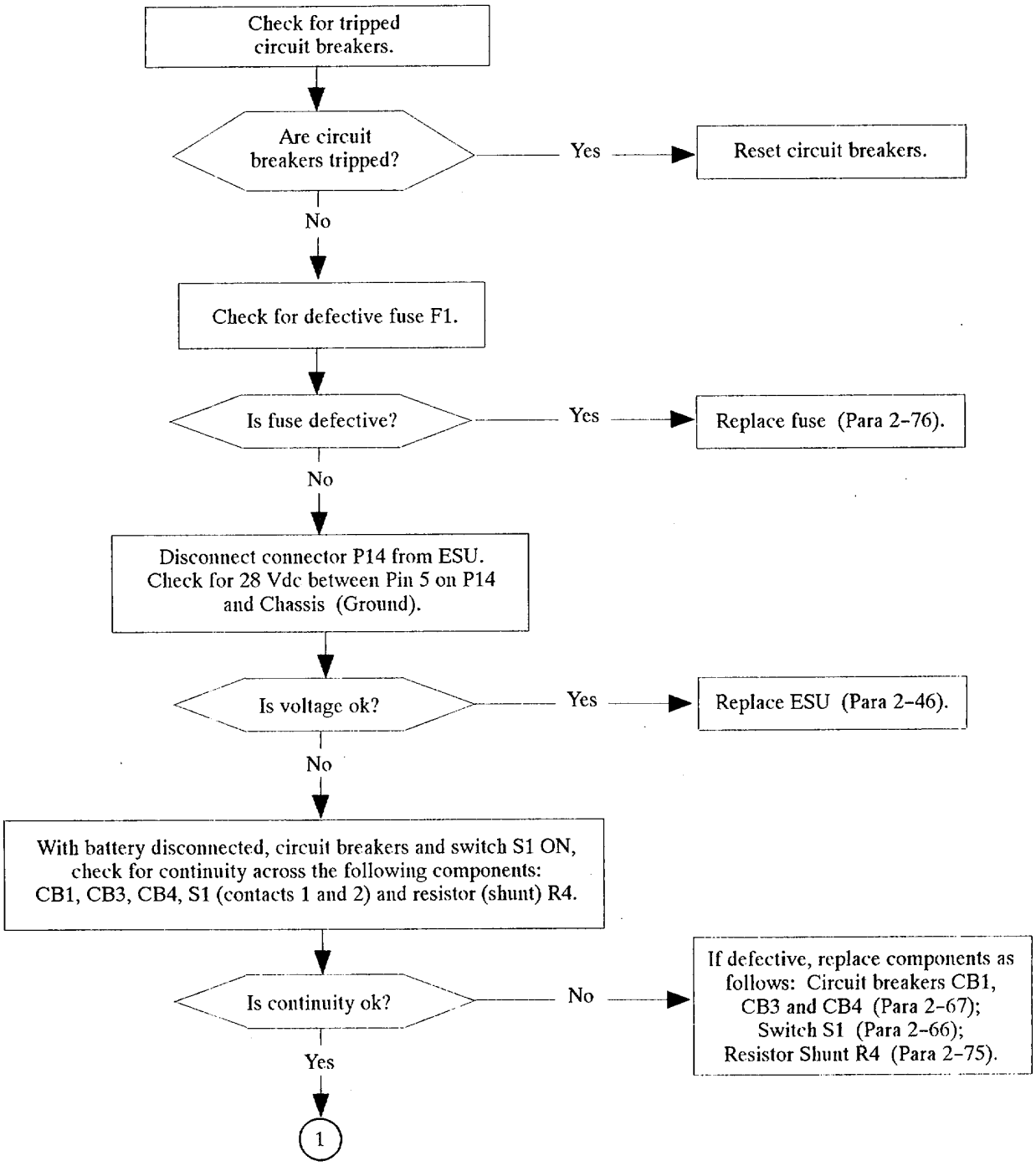
Figure 2-2. Engine Fault Indicators (Sheet 2 of 2)

2-10. TROUBLESHOOTING PROCEDURES.

2-10. TROUBLESHOOTING PROCEDURES - continued.

1. LOSS OF DC POWER.

Refer to Figure 2-4, except where otherwise indicated and proceed as follows:



2-10. TROUBLESHOOTING PROCEDURES - continued.

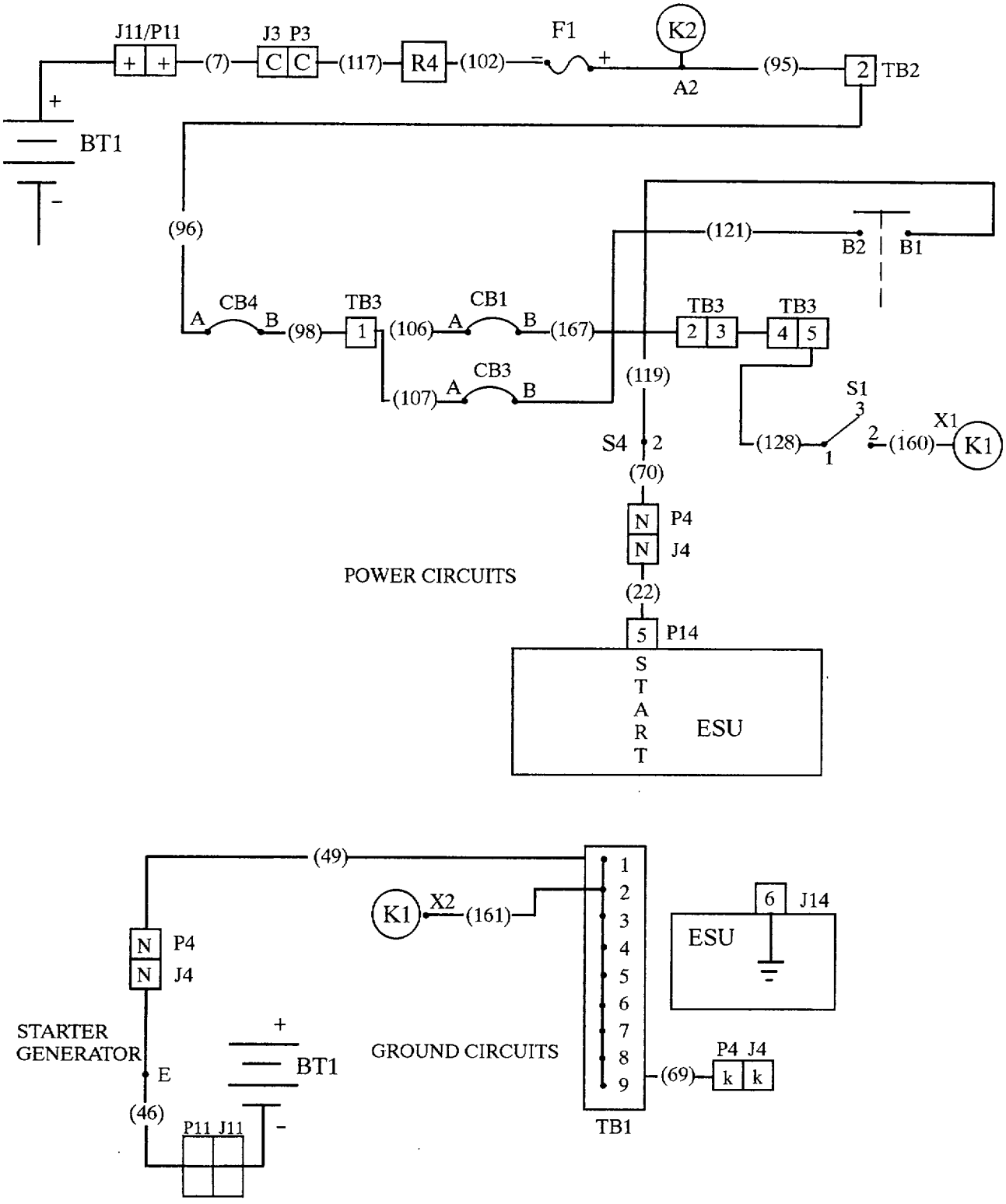
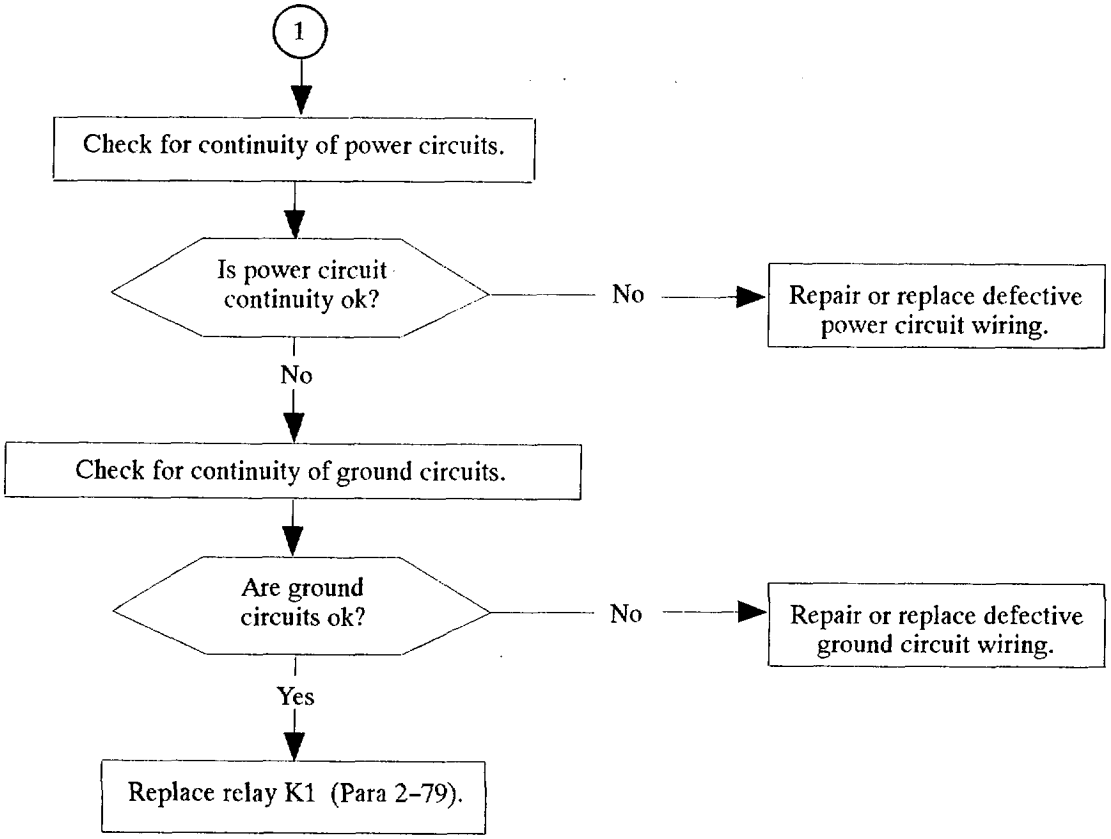


Figure 2-3. Loss of DC Power Circuits.

2-10. TROUBLESHOOTING PROCEDURES - continued.



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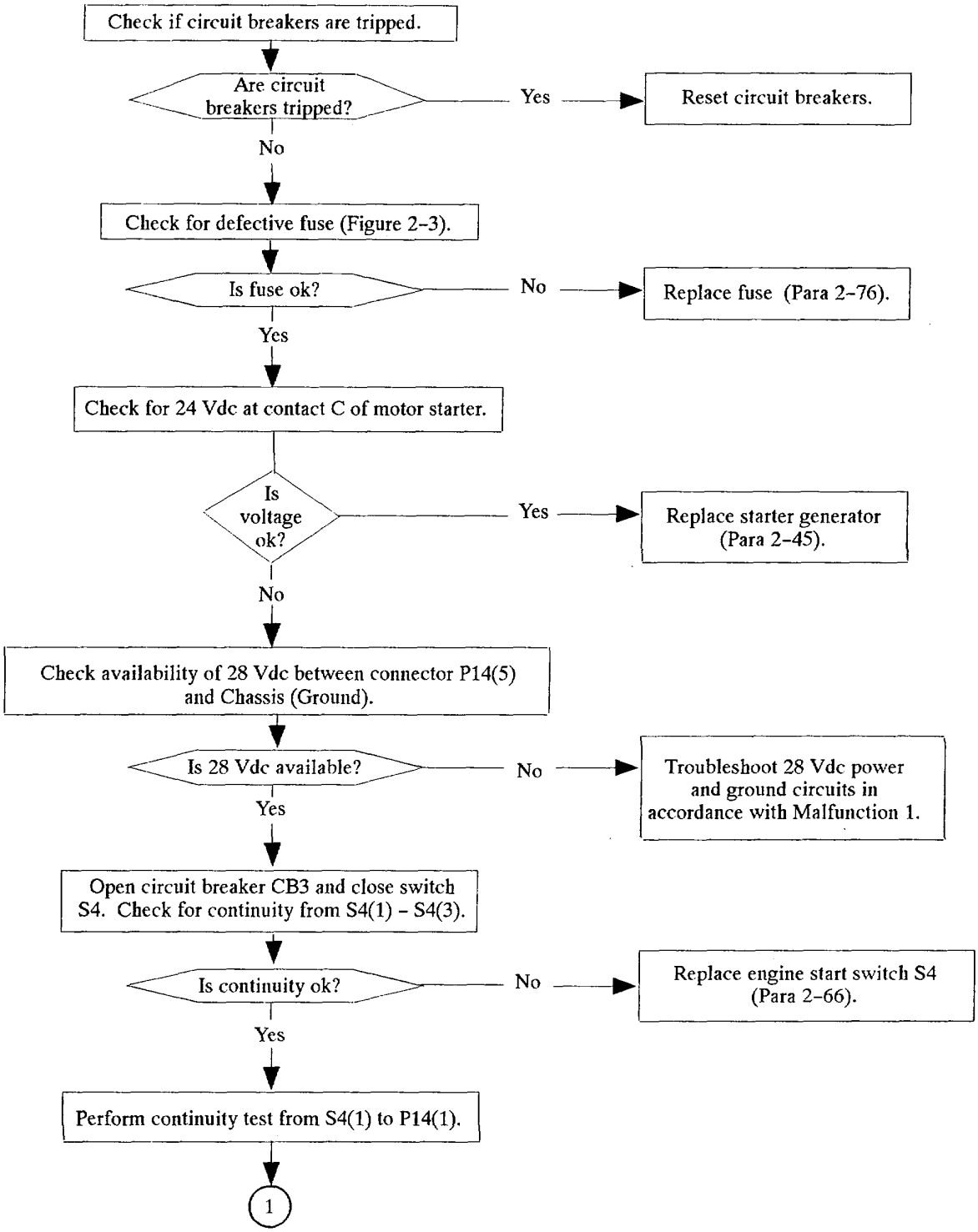
2. ESU FAILURE. ○ ● ● ●

Notify Direct Support Maintenance if this malfunction occurs.

2-10. TROUBLESHOOTING PROCEDURES - continued.

3. START SYSTEM FAILURE. ● ○ ● ●

Refer to Figure 2-4, except where otherwise indicated and proceed as follows:



2-10. TROUBLESHOOTING PROCEDURES - continued.

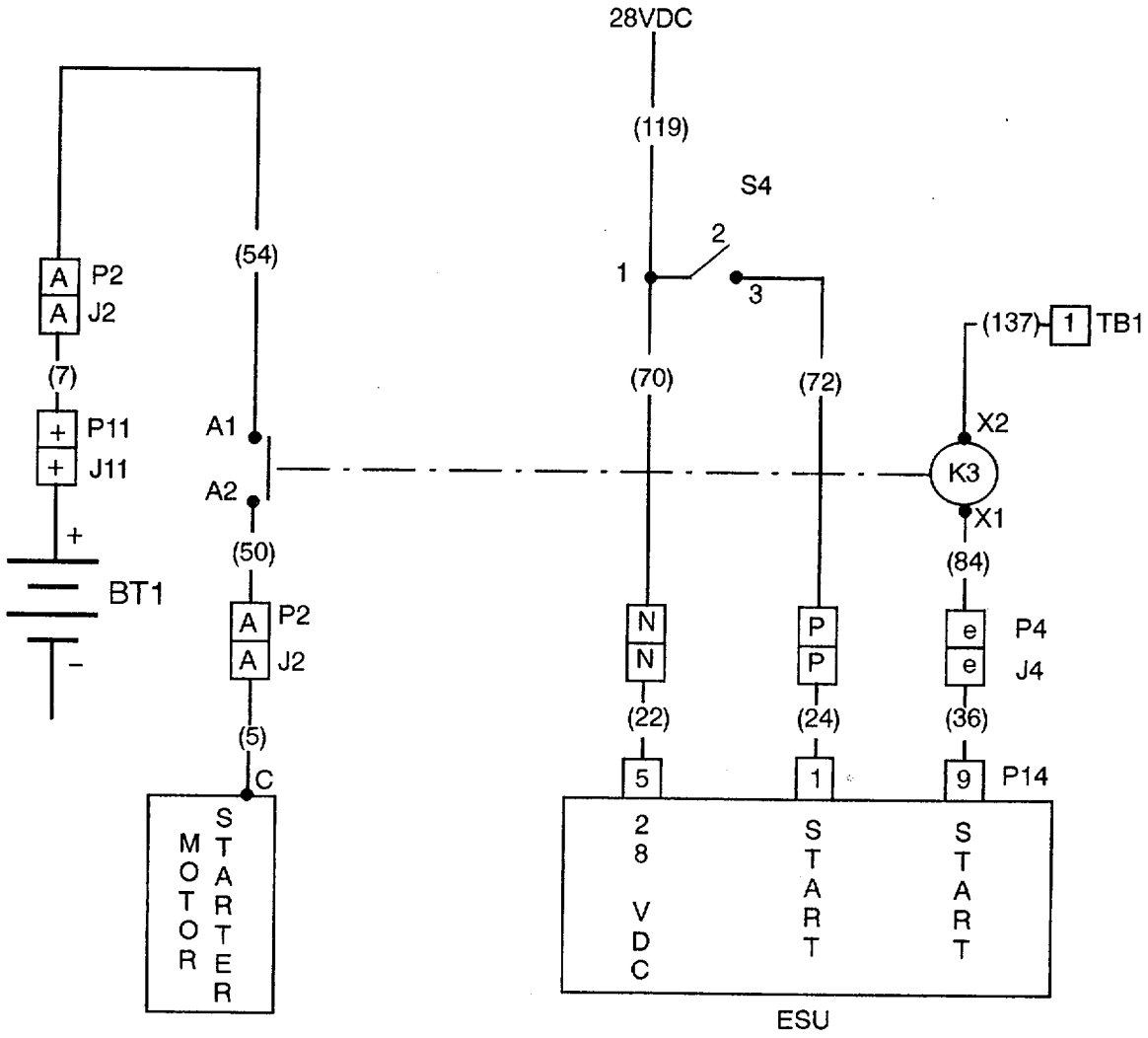
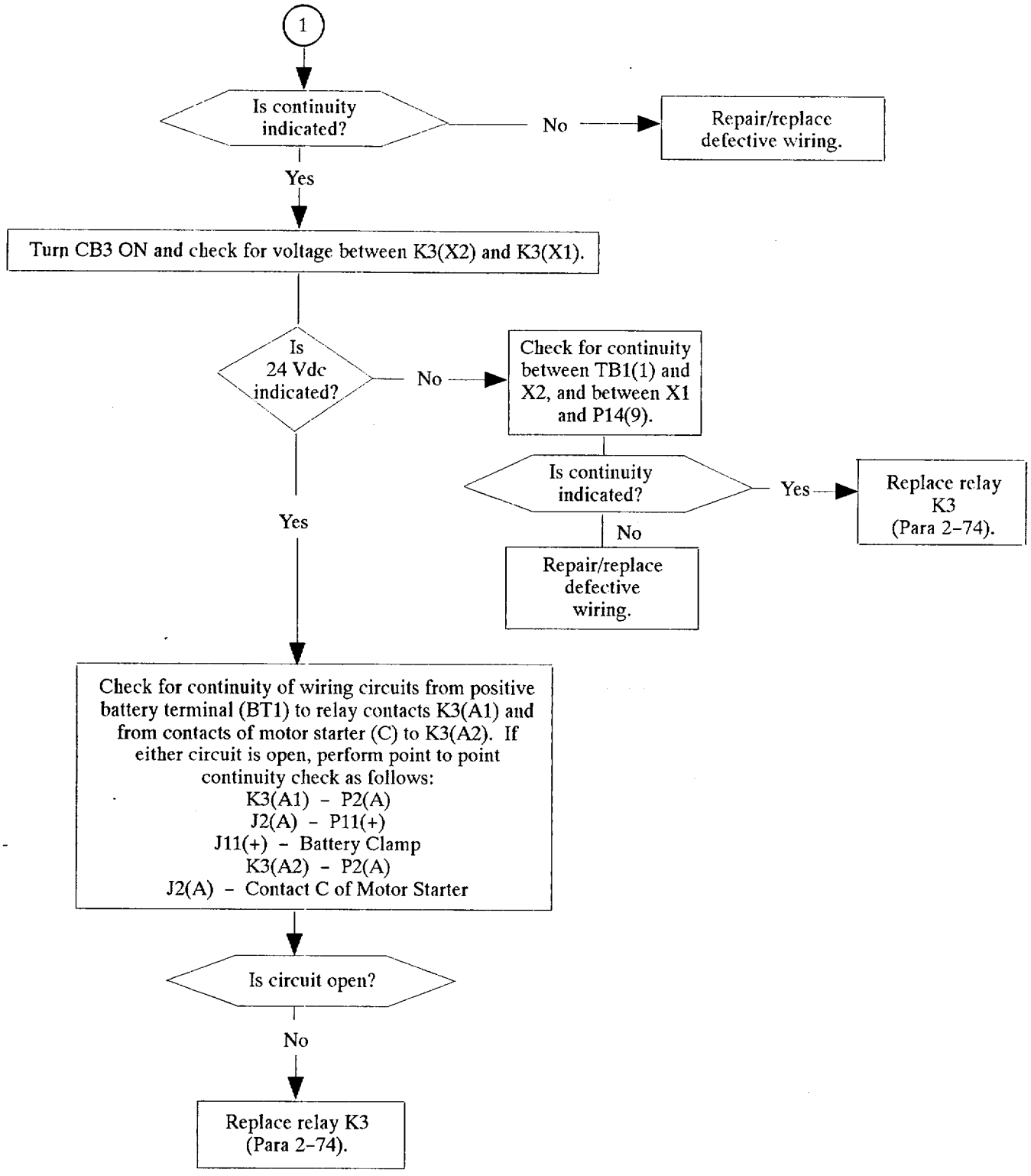


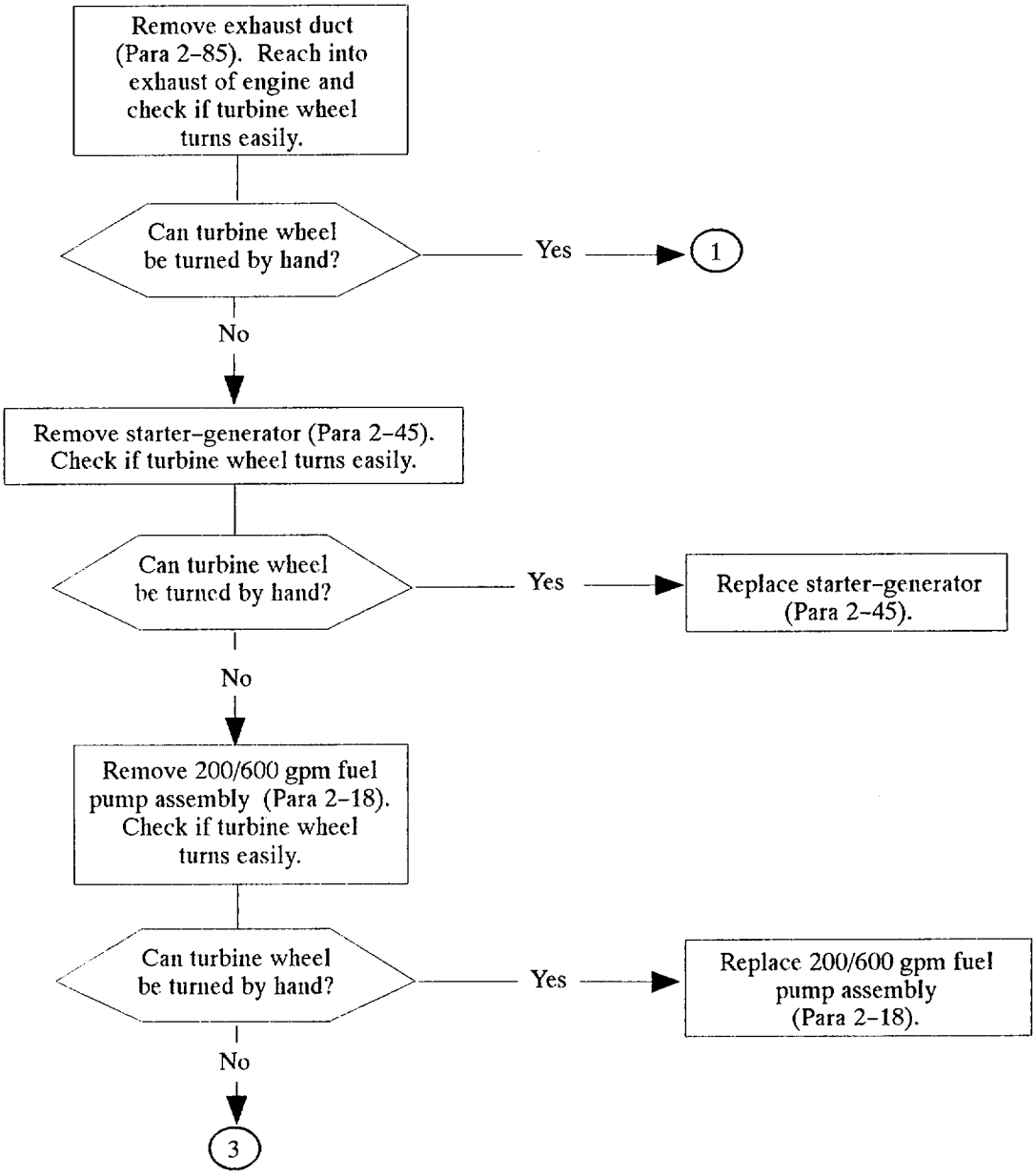
Figure 2-4. Start System Fail Diagram.

2-10. TROUBLESHOOTING PROCEDURES -continued.

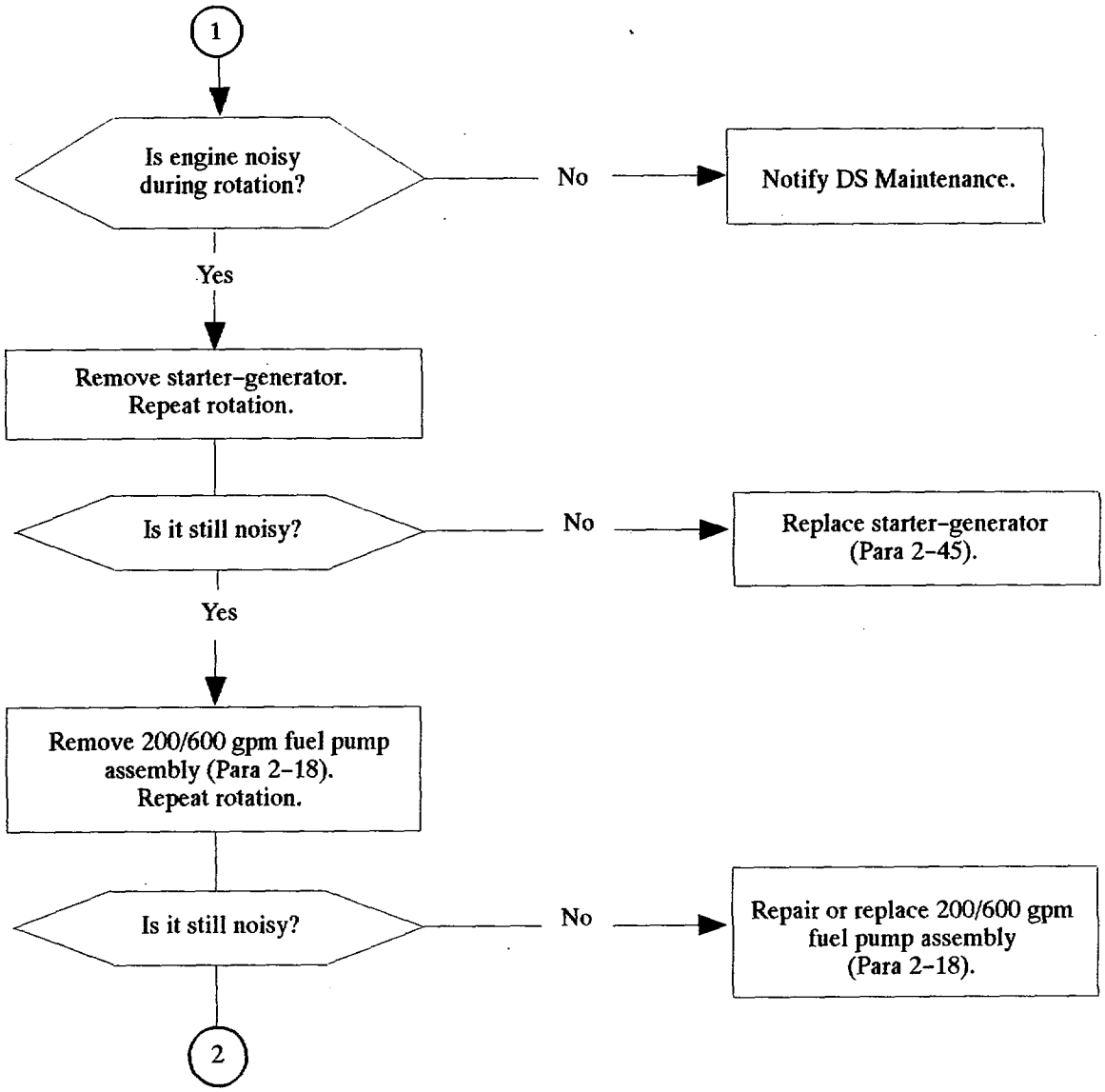


2-10. TROUBLESHOOTING PROCEDURES - continued.

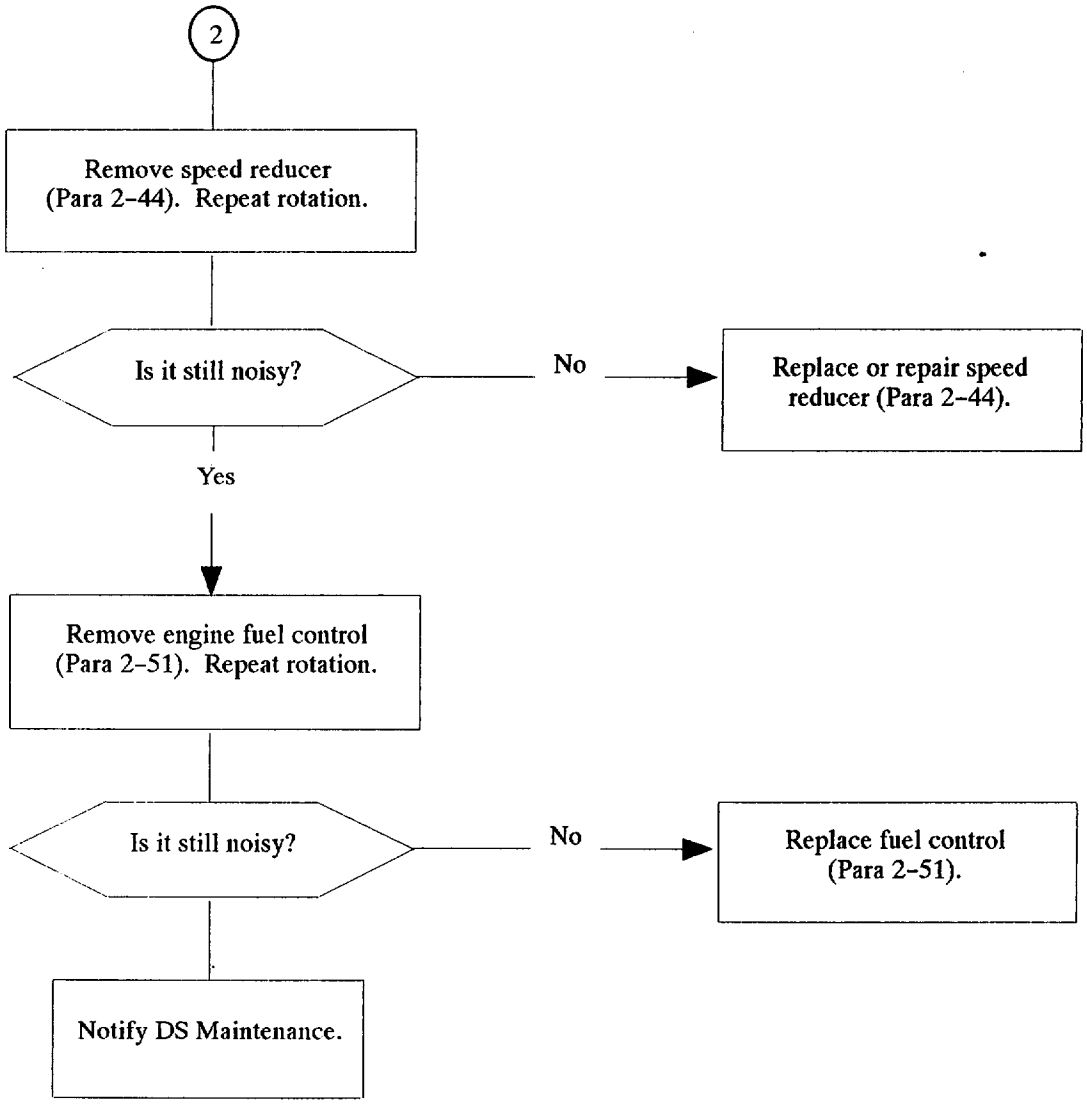
4. OVERTEMPERATURE. ○ ○ ● ●



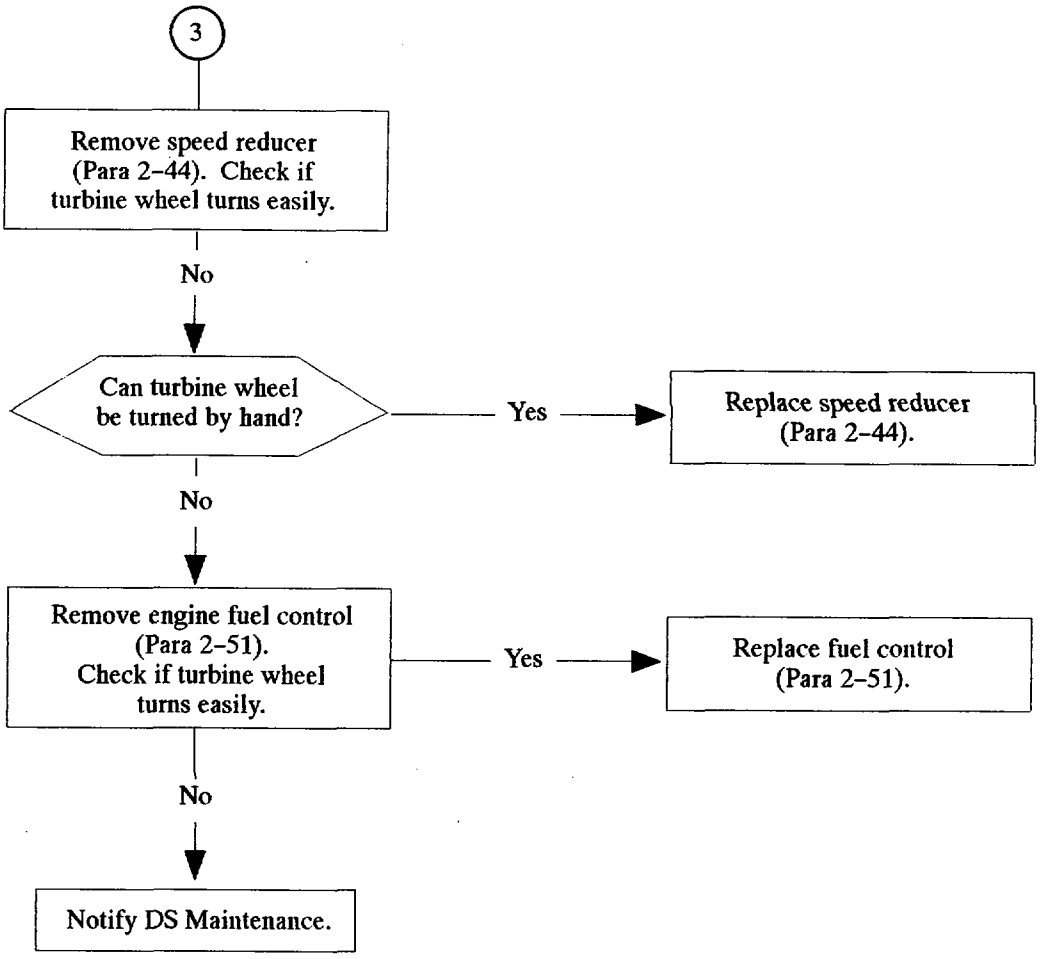
2-10. TROUBLESHOOTING PROCEDURES - continued.



2-10. TROUBLESHOOTING PROCEDURES -continued.



2-10. TROUBLESHOOTING PROCEDURES - continued.



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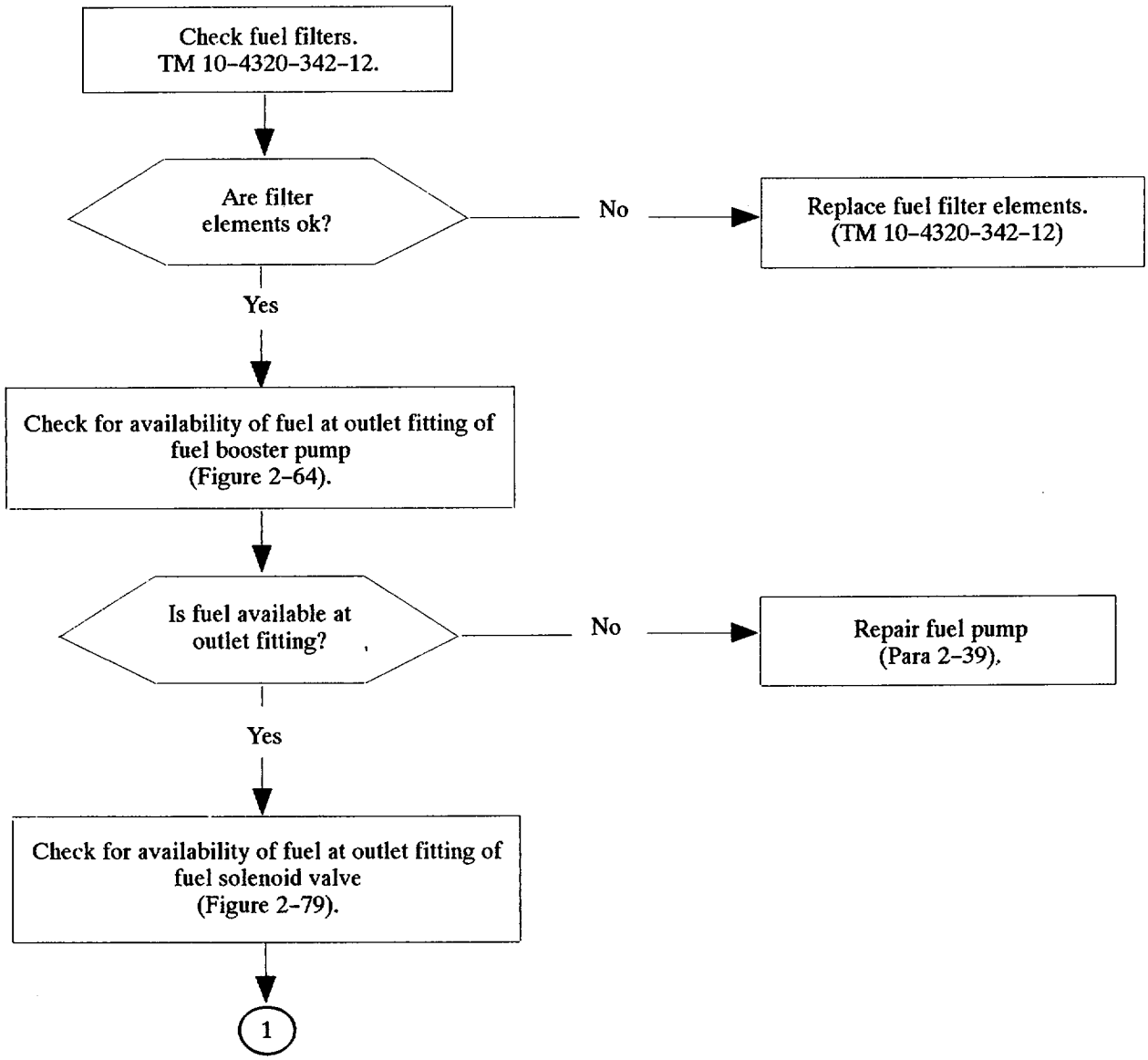
5. OVERSPEED.

● ● ○ ●

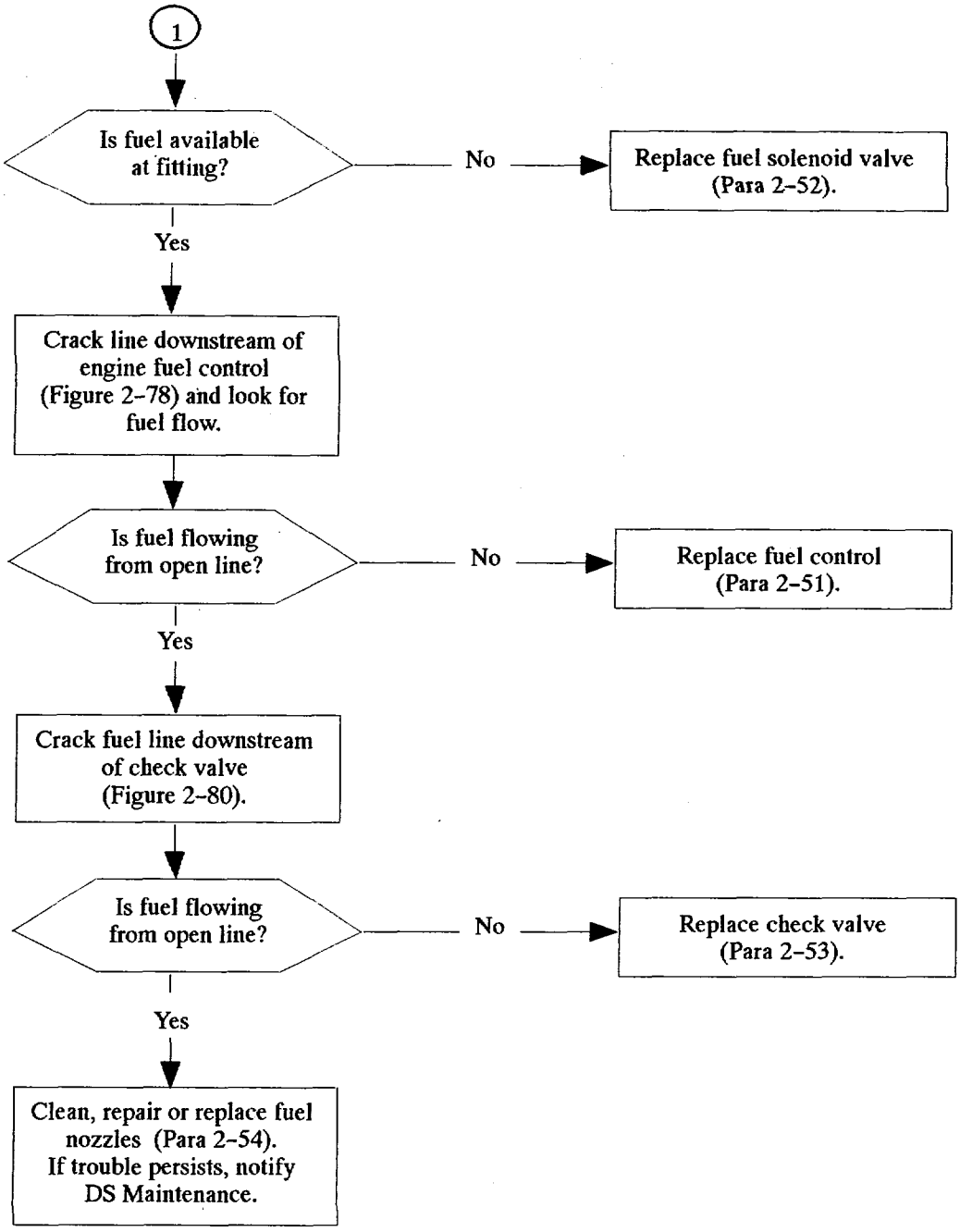
Replace engine fuel control (Para 2-51).
If trouble persists, notify DS Maintenance.

2-10. TROUBLESHOOTING PROCEDURES - continued.

6. UNDERSPEED.

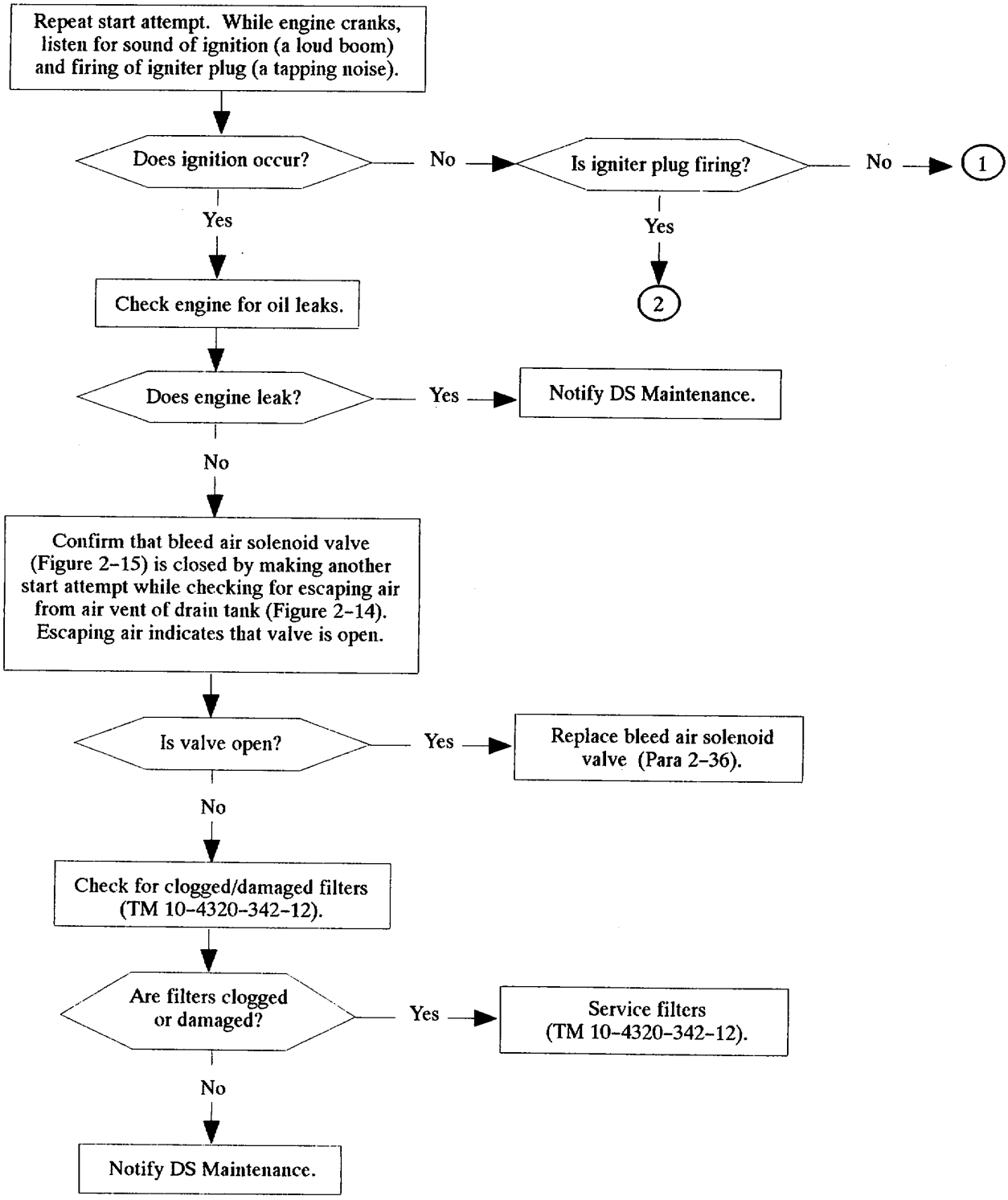


2-10. TROUBLESHOOTING PROCEDURES - continued.

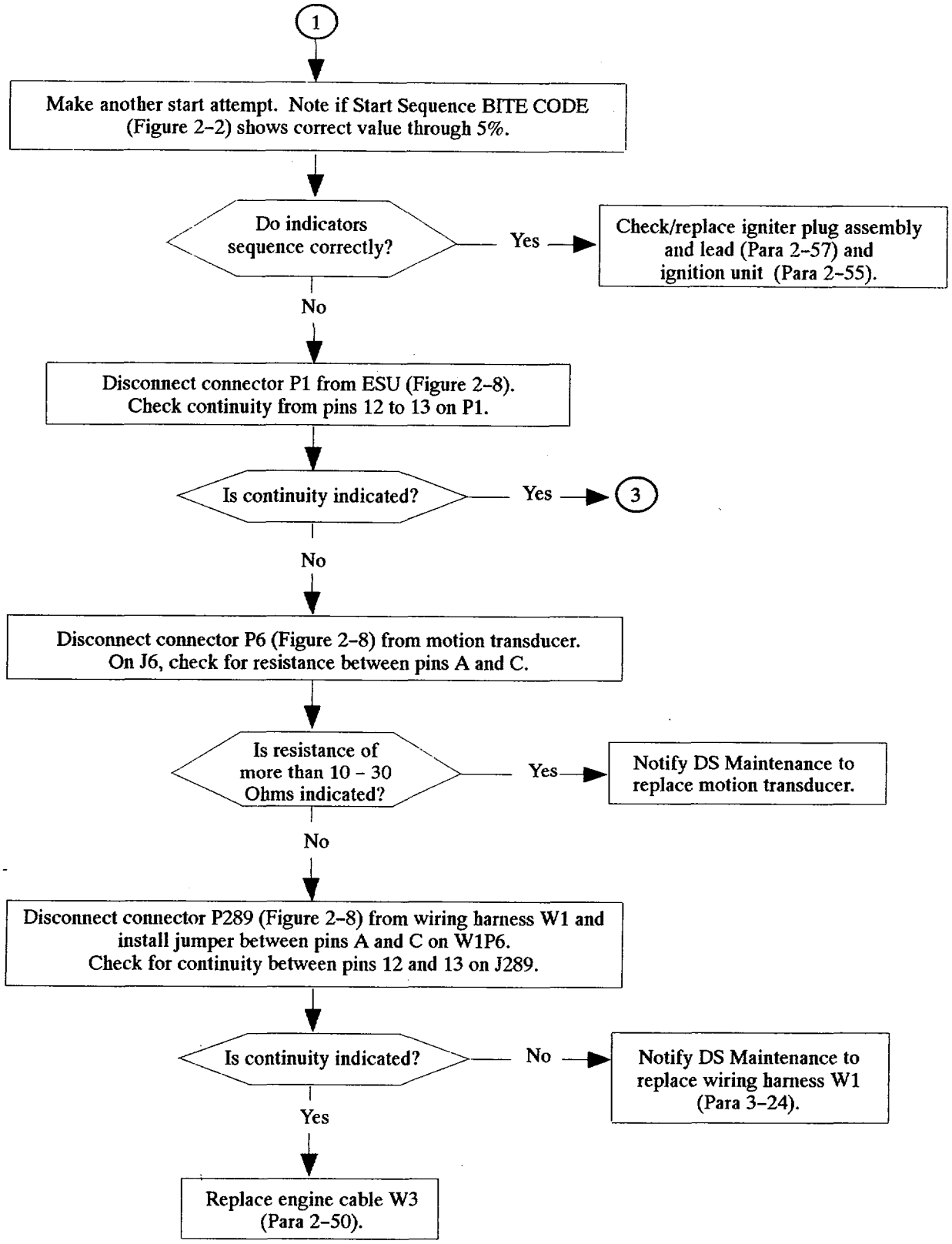


2-10. TROUBLESHOOTING PROCEDURES - continued.

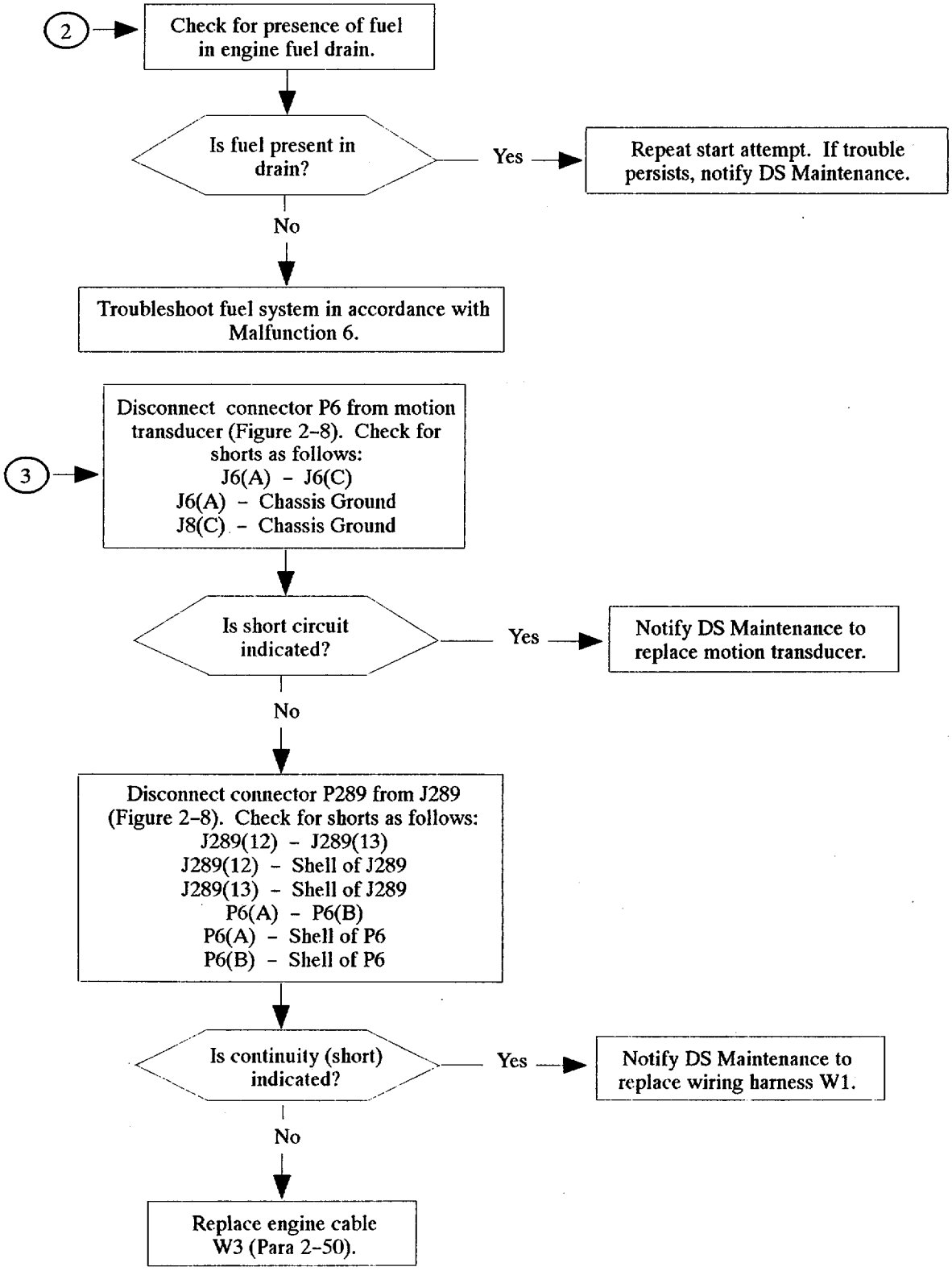
7. ENGINE FAILS TO START.



2-10. TROUBLESHOOTING PROCEDURES- continued.



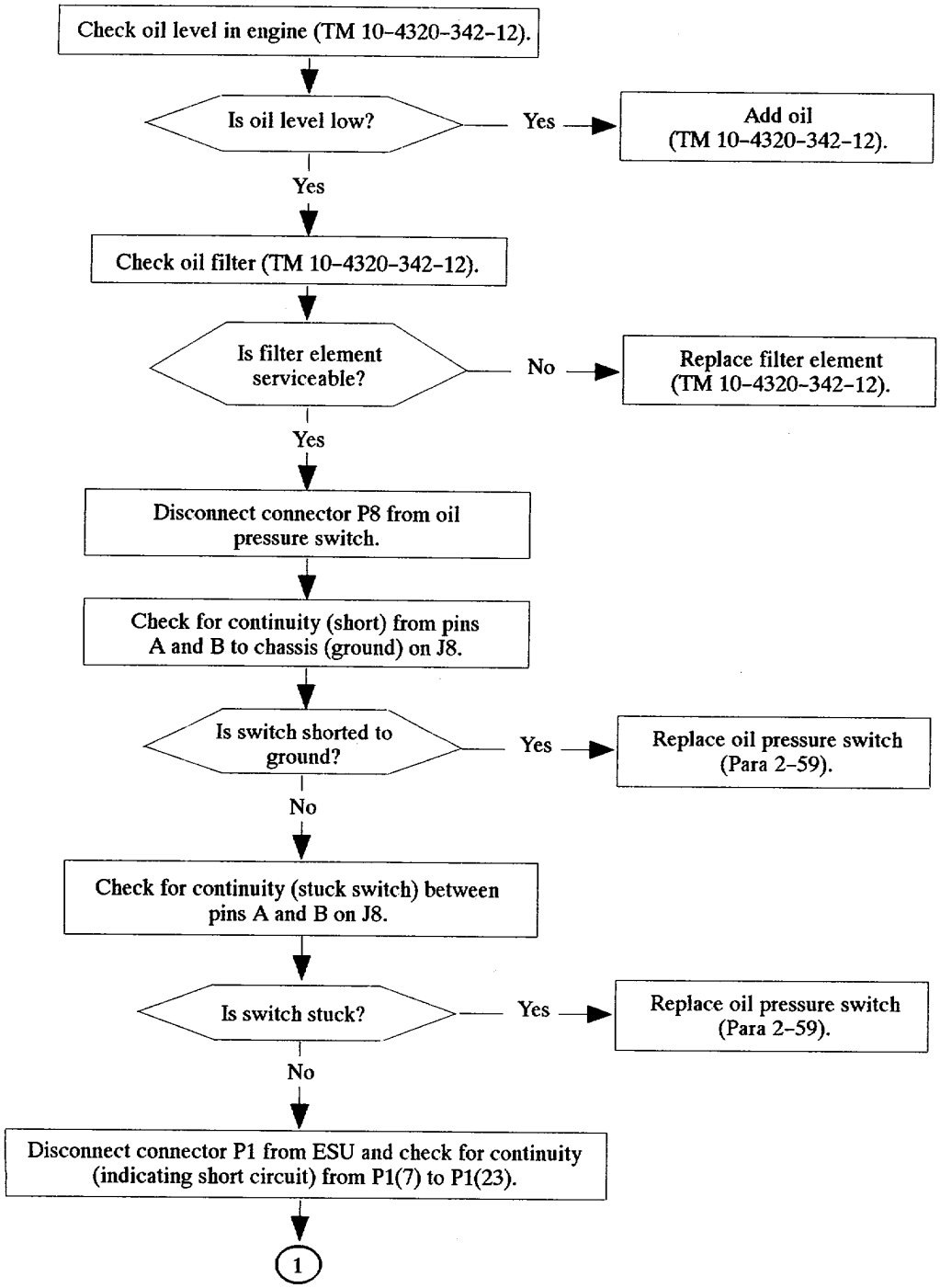
2-10. TROUBLESHOOTING PROCEDURES - continued.



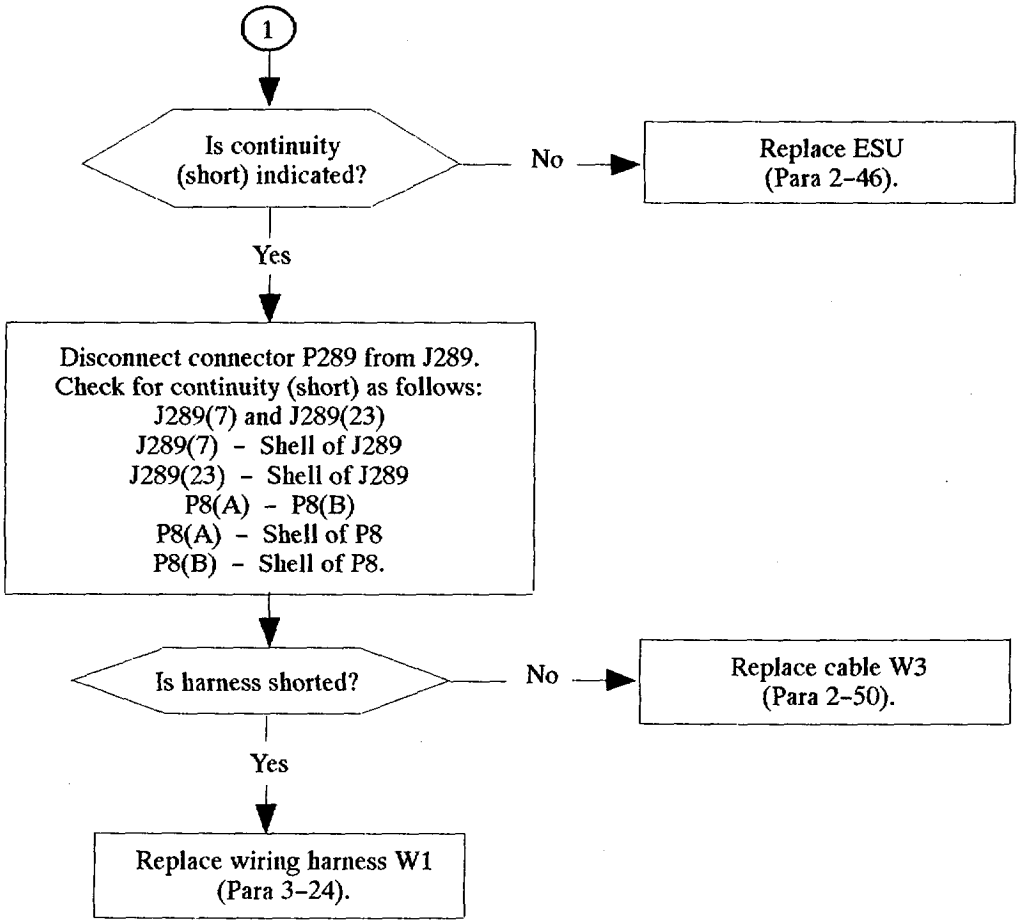
2-10. TROUBLESHOOTING PROCEDURES - continued.

8. BITE CODE INDICATES LOW OIL PRESSURE. ● ○ ○ ●

Refer to Figure 2-5, except where otherwise indicated and proceed as follows:



2-10. TROUBLESHOOTING PROCEDURES - continued.



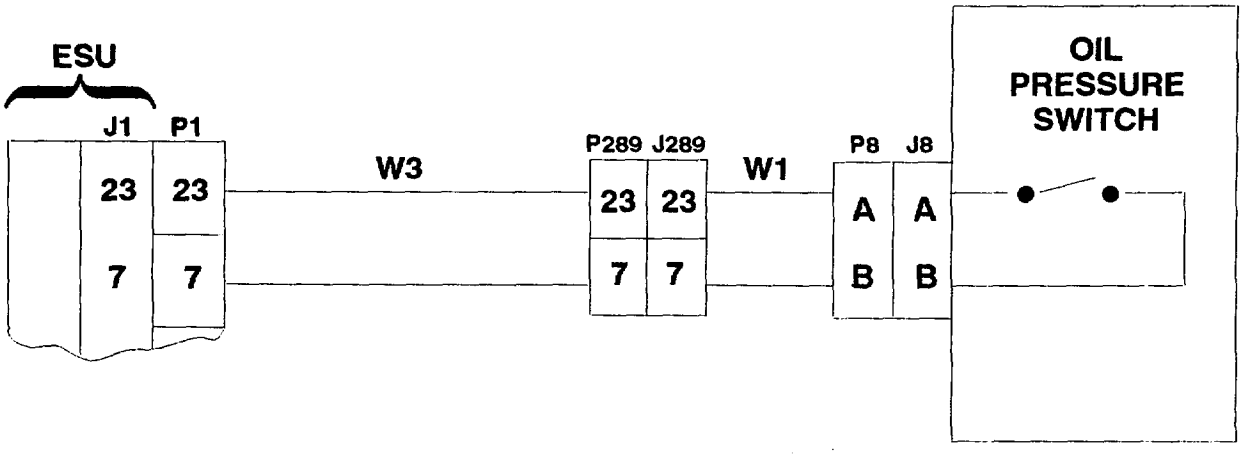


Figure 2-5. Oil Pressure Switch Failure Circuits.

2-10. TROUBLESHOOTING PROCEDURES - continued.

9. OIL PRESSURE SWITCH FAILURE.

Refer to Figure 2-6, except as indicated and proceed as follows:

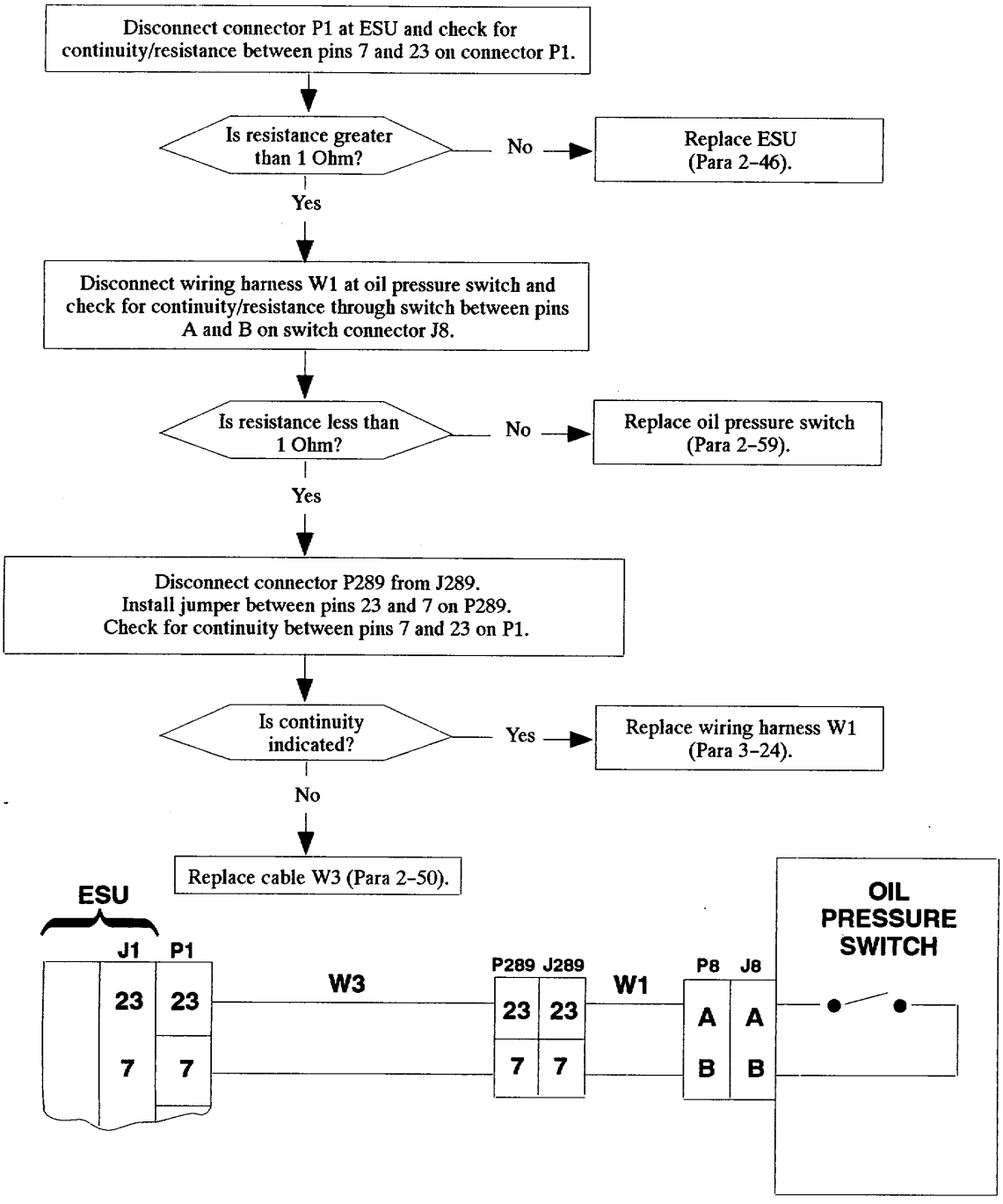


Figure 2-6. Low Oil Pressure Switch Circuits.

2-10. TROUBLESHOOTING PROCEDURES - continued.

10. THERMOCOUPLE FAILURE.

Refer to Figure 2-7, except where otherwise indicated and proceed as follows:

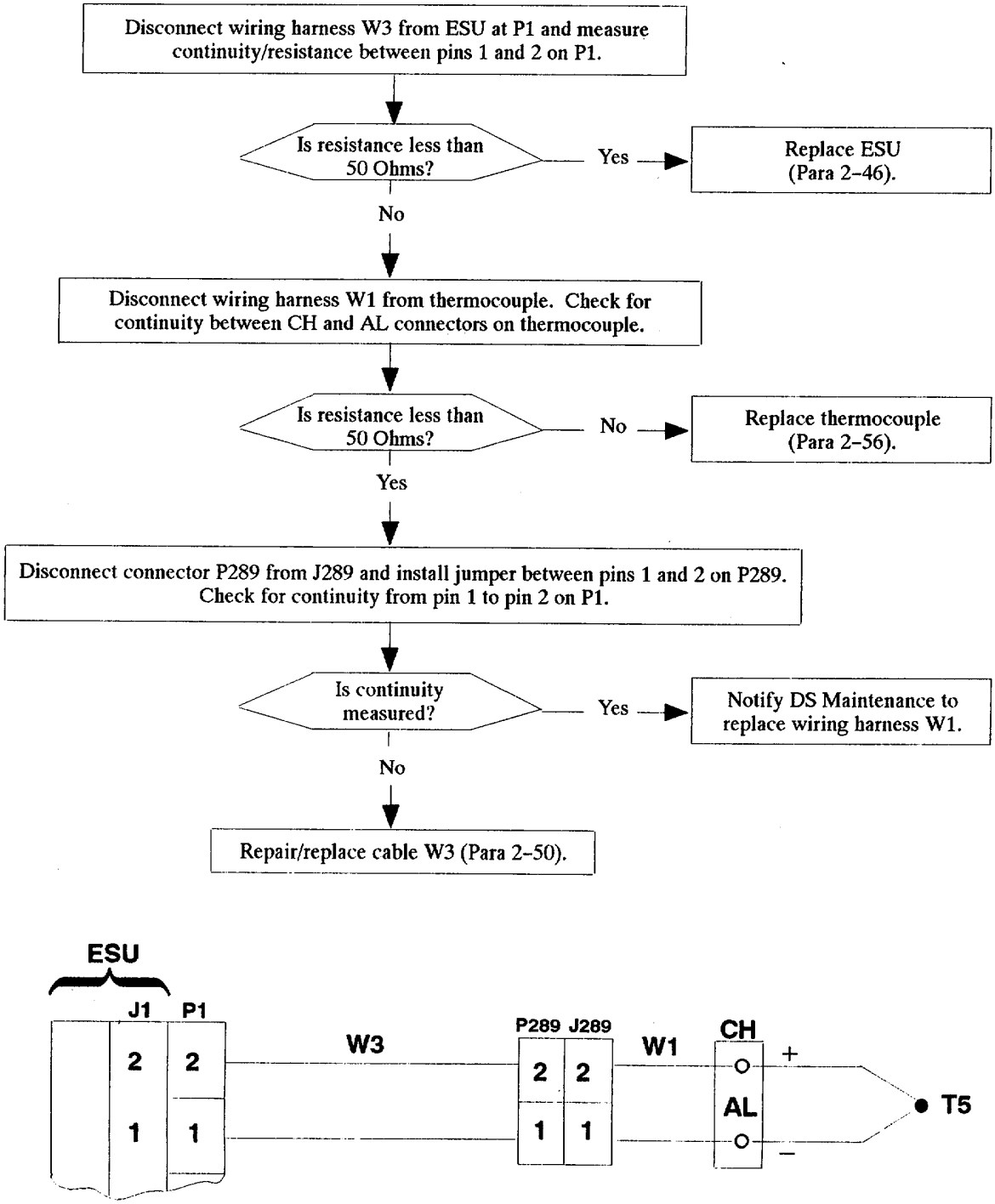


Figure 2-7. Thermocouple Fail Circuits.

2-10. TROUBLESHOOTING PROCEDURES - continued.

11. MOTION TRANSDUCER FAILURE. ● ○ ○ ●

Refer to Figure 2-8, except where otherwise indicated and proceed as follows:

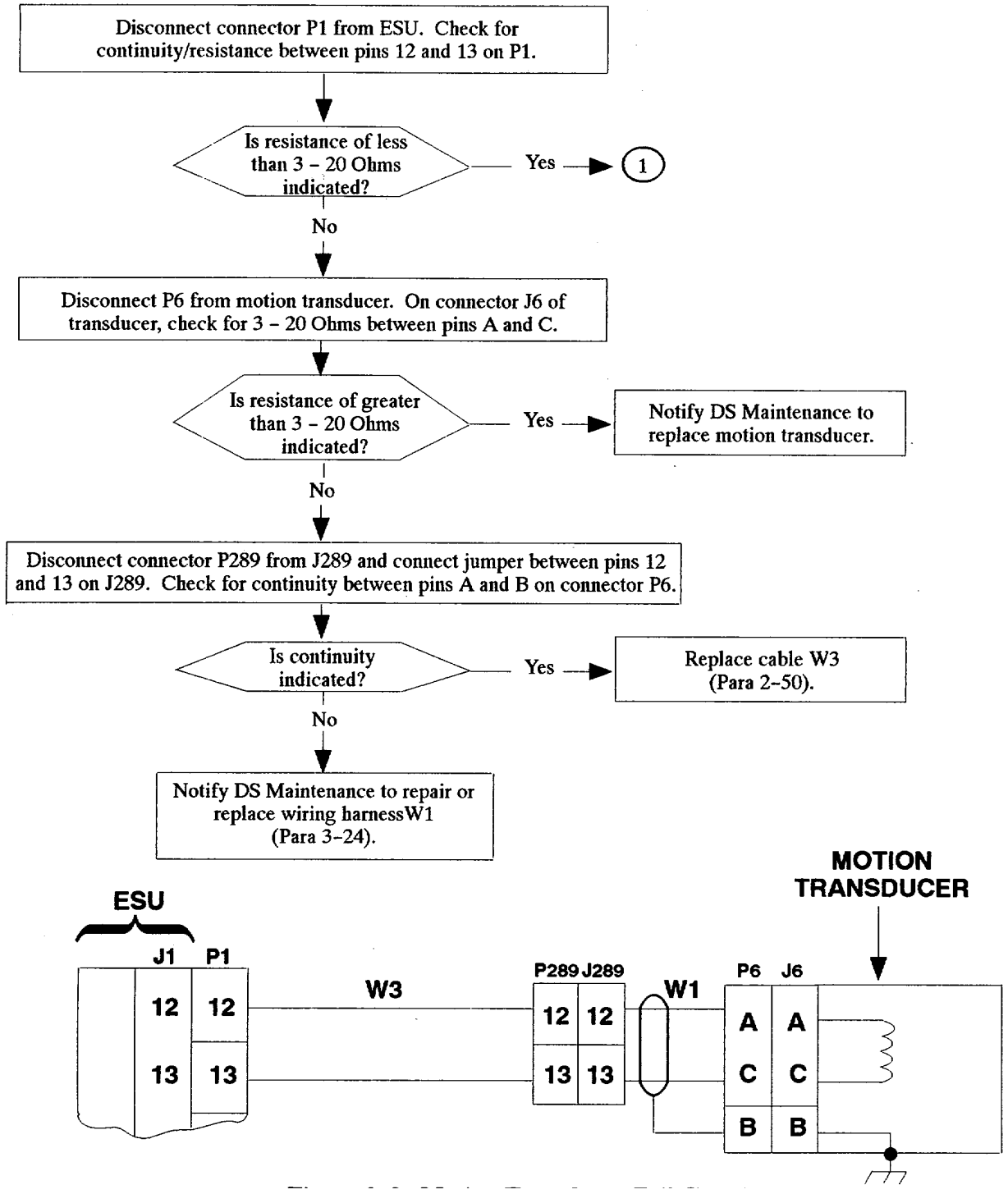
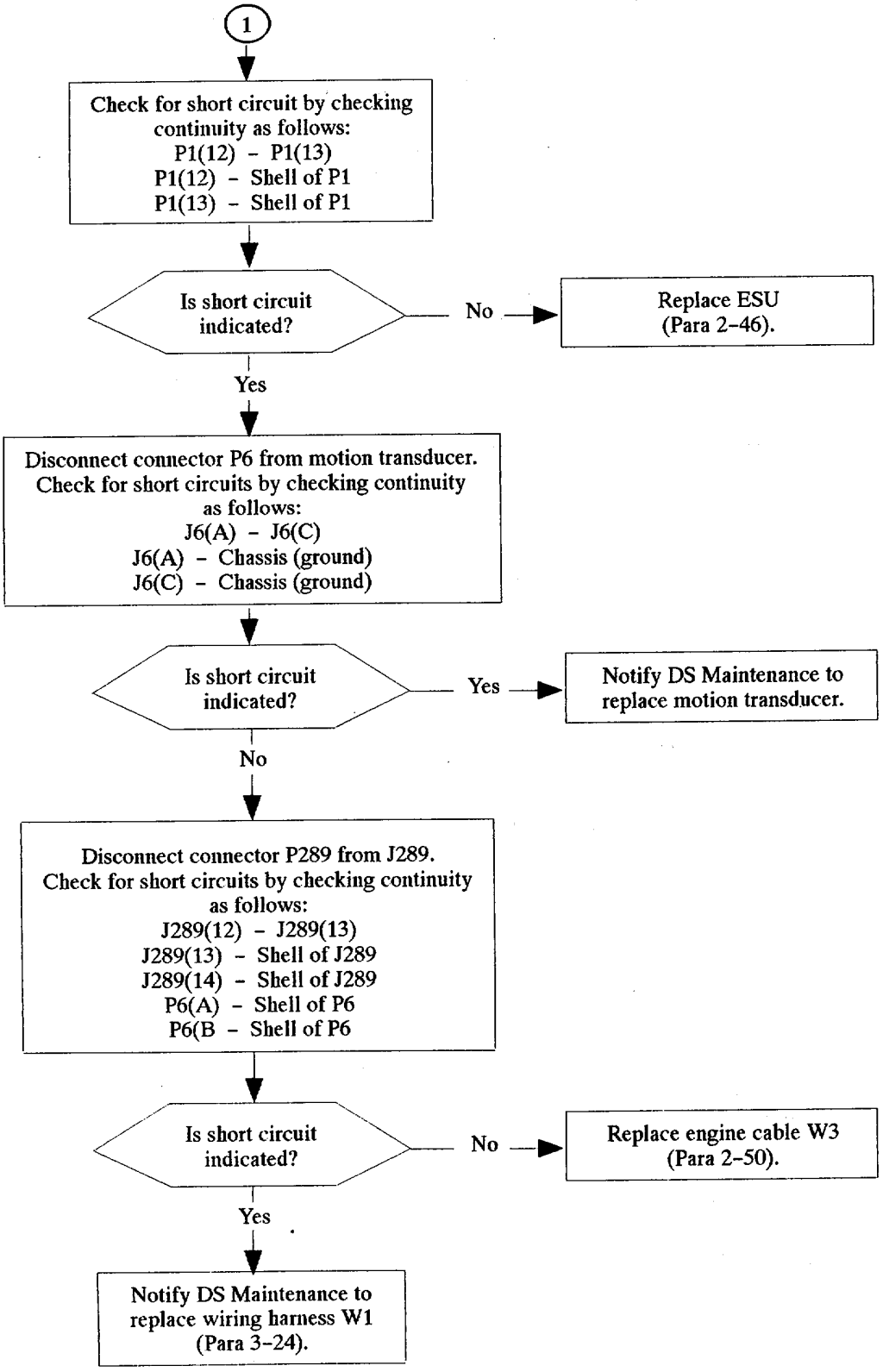


Figure 2-8. Motion Transducer Fail Circuits.

2-10. TROUBLESHOOTING PROCEDURES - continued.



2-10. TROUBLESHOOTING PROCEDURES - continued

12. IGNITION UNIT FAILURE.

Refer to Figure 2-9, except where otherwise indicated and proceed as follows:

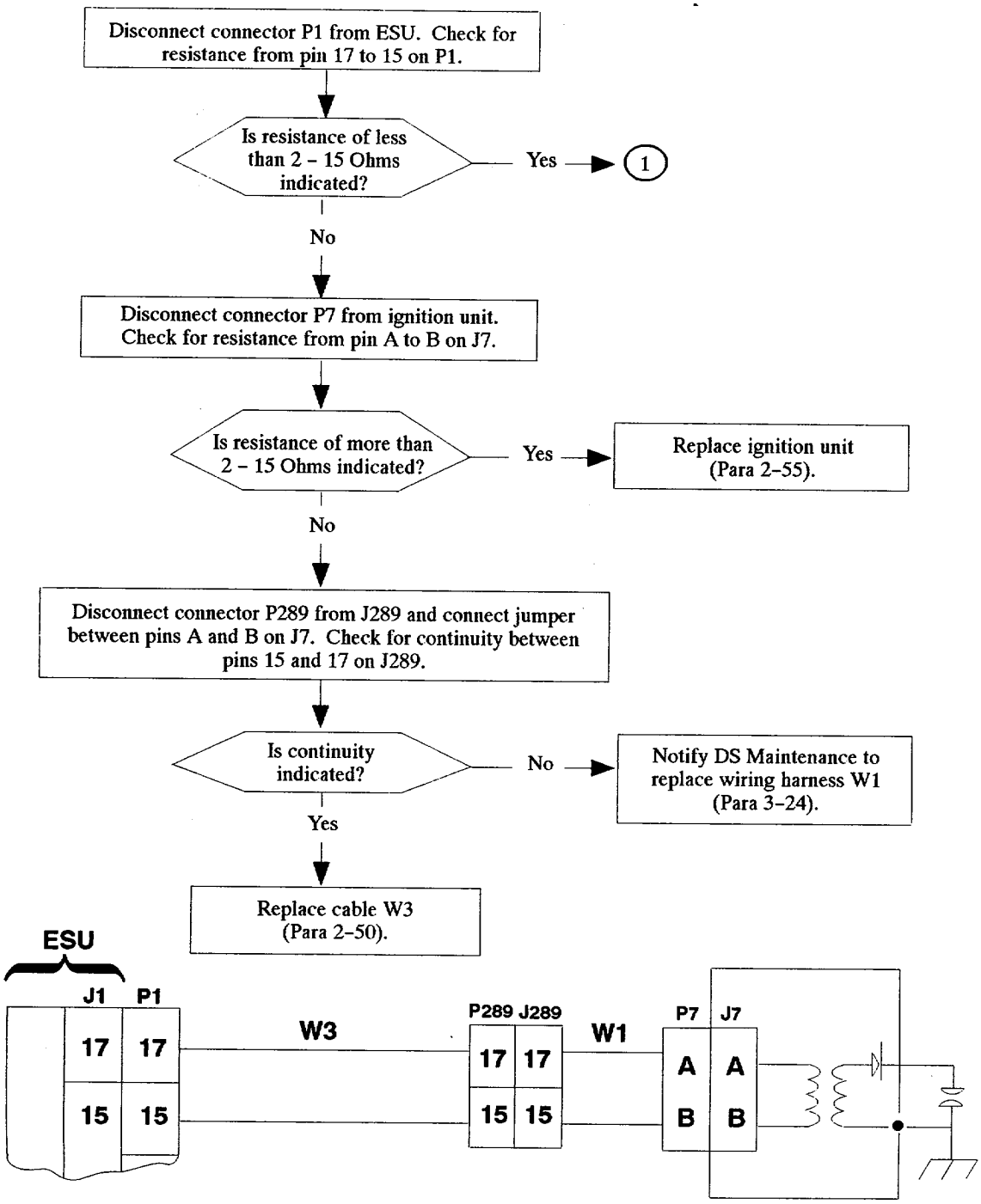
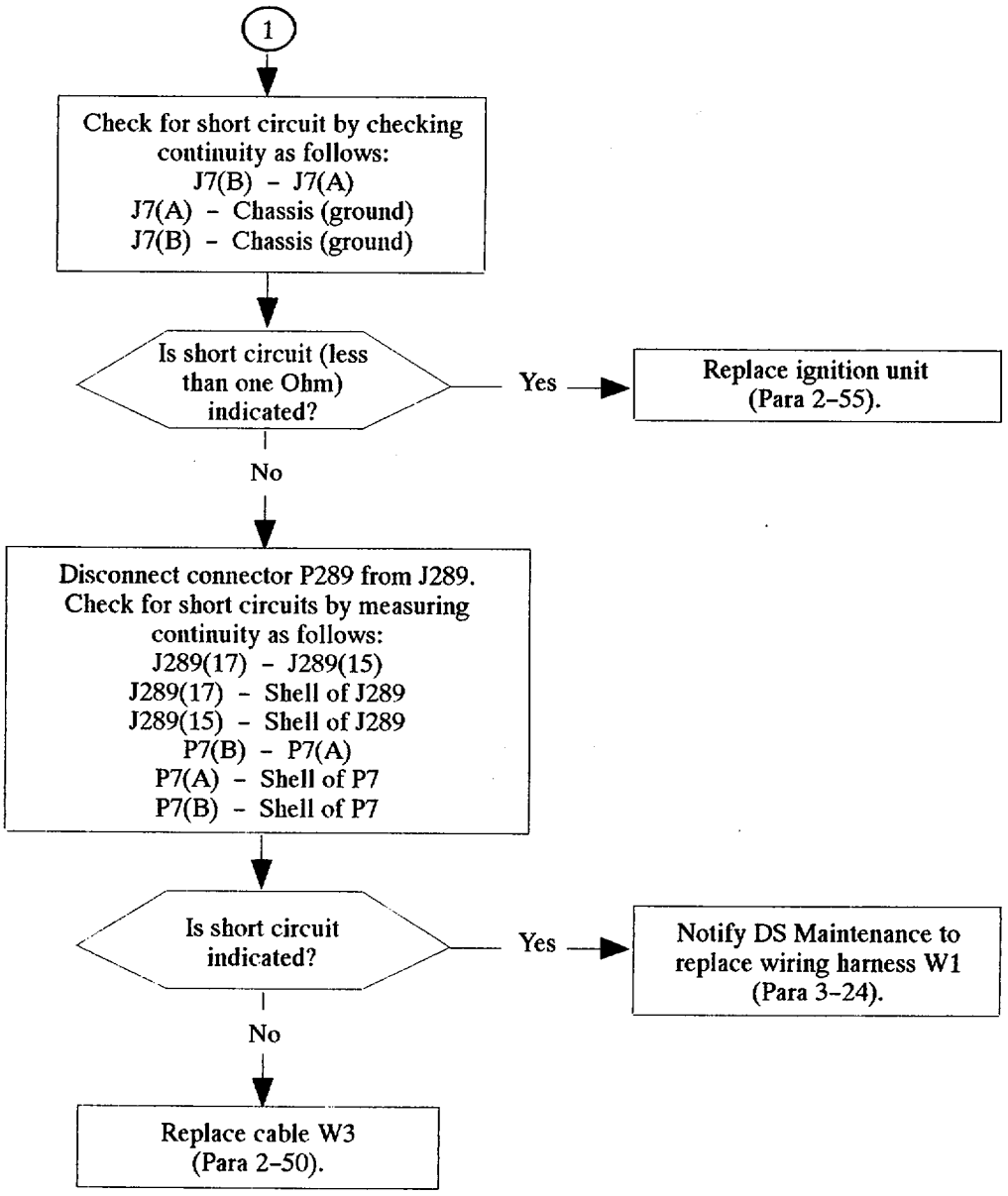


Figure 2-9. Ignition Unit Failure Circuits.

2-10. TROUBLESHOOTING PROCEDURES - continued.



2-10. TROUBLESHOOTING PROCEDURES -continued.

13. FUEL SOLENOID VALVE FAILURE.

Refer to Figure 2-10, except where otherwise indicated and proceed as follows:

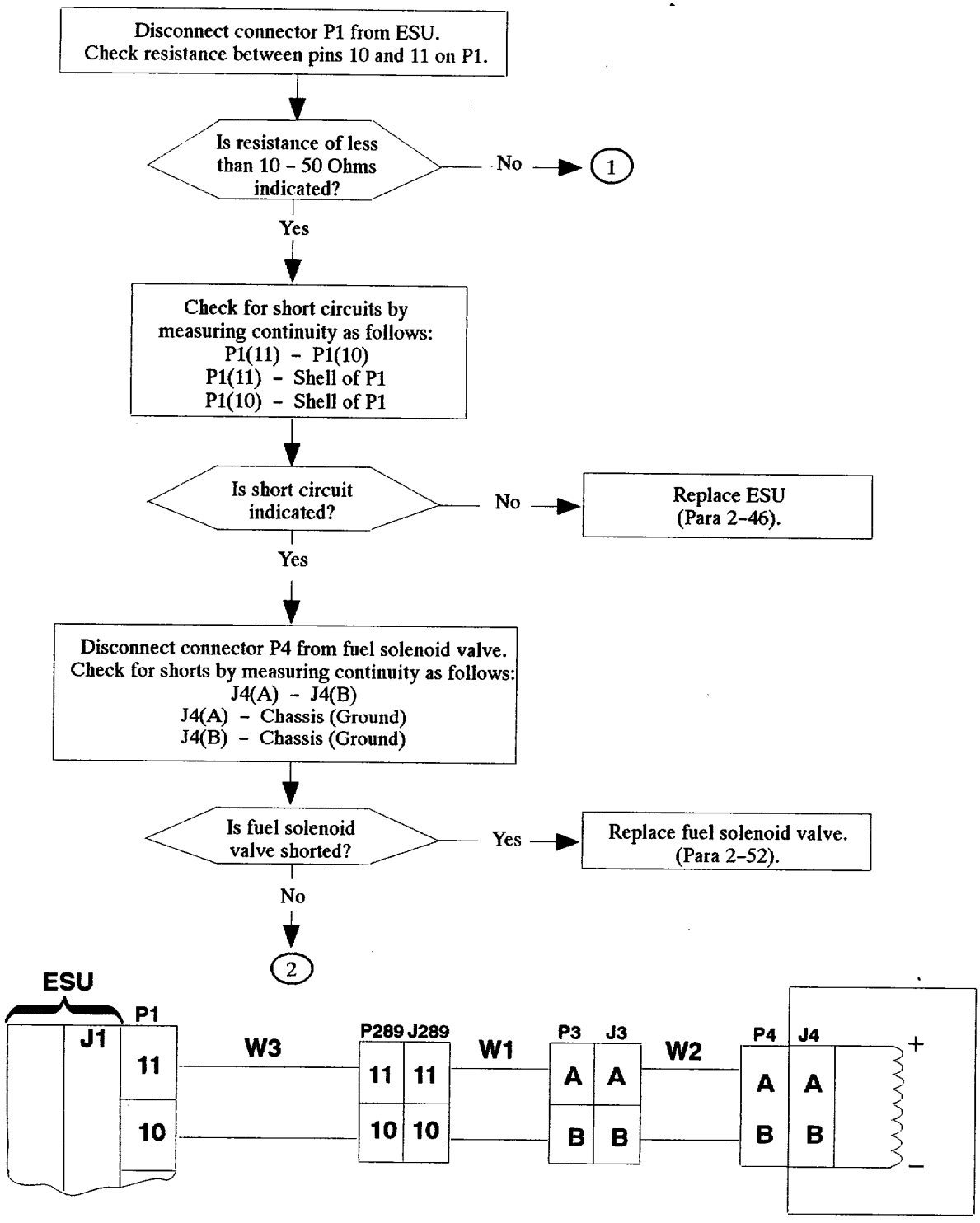
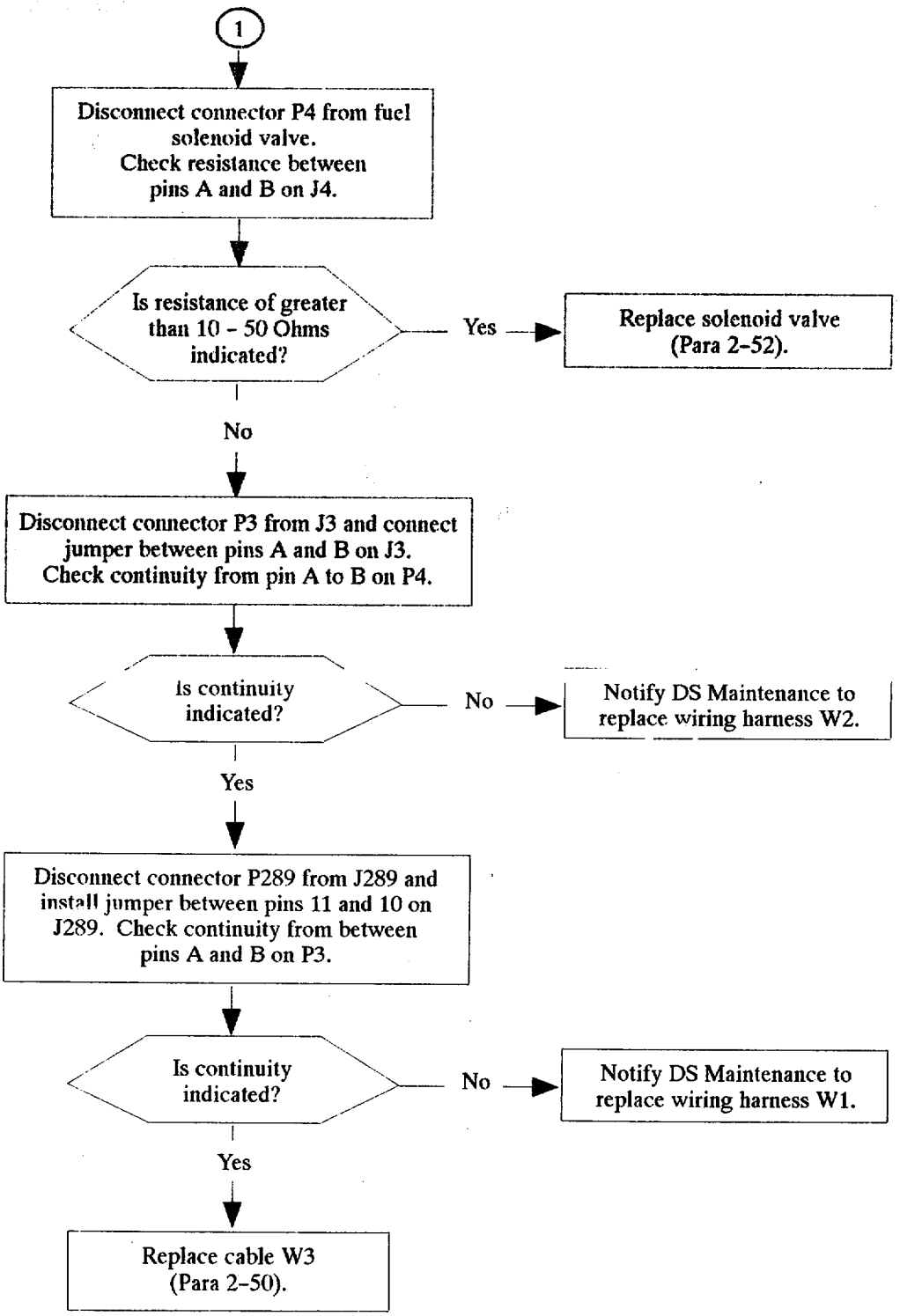
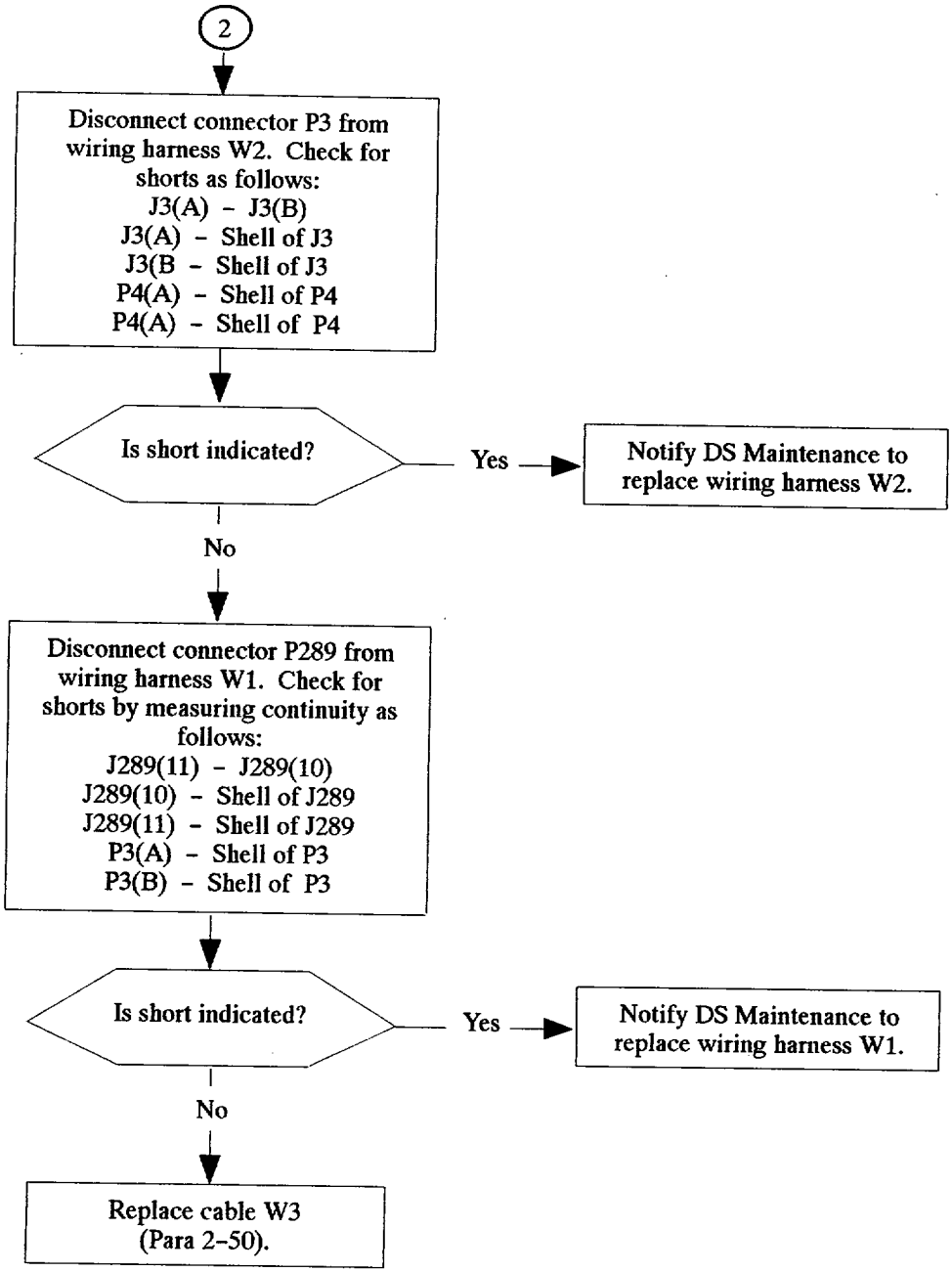


Figure 2-10. Fuel Solenoid Valve Failure Circuits.

2-10. TROUBLESHOOTING PROCEDURES - continued.



2-10. TROUBLESHOOTING PROCEDURES - continued.



2-10. TROUBLESHOOTING PROCEDURES - continued.

14. OIL TEMPERATURE TRANSMITTER FAILURE.

Refer to Figure 2-11, except where otherwise indicated and proceed as follows:

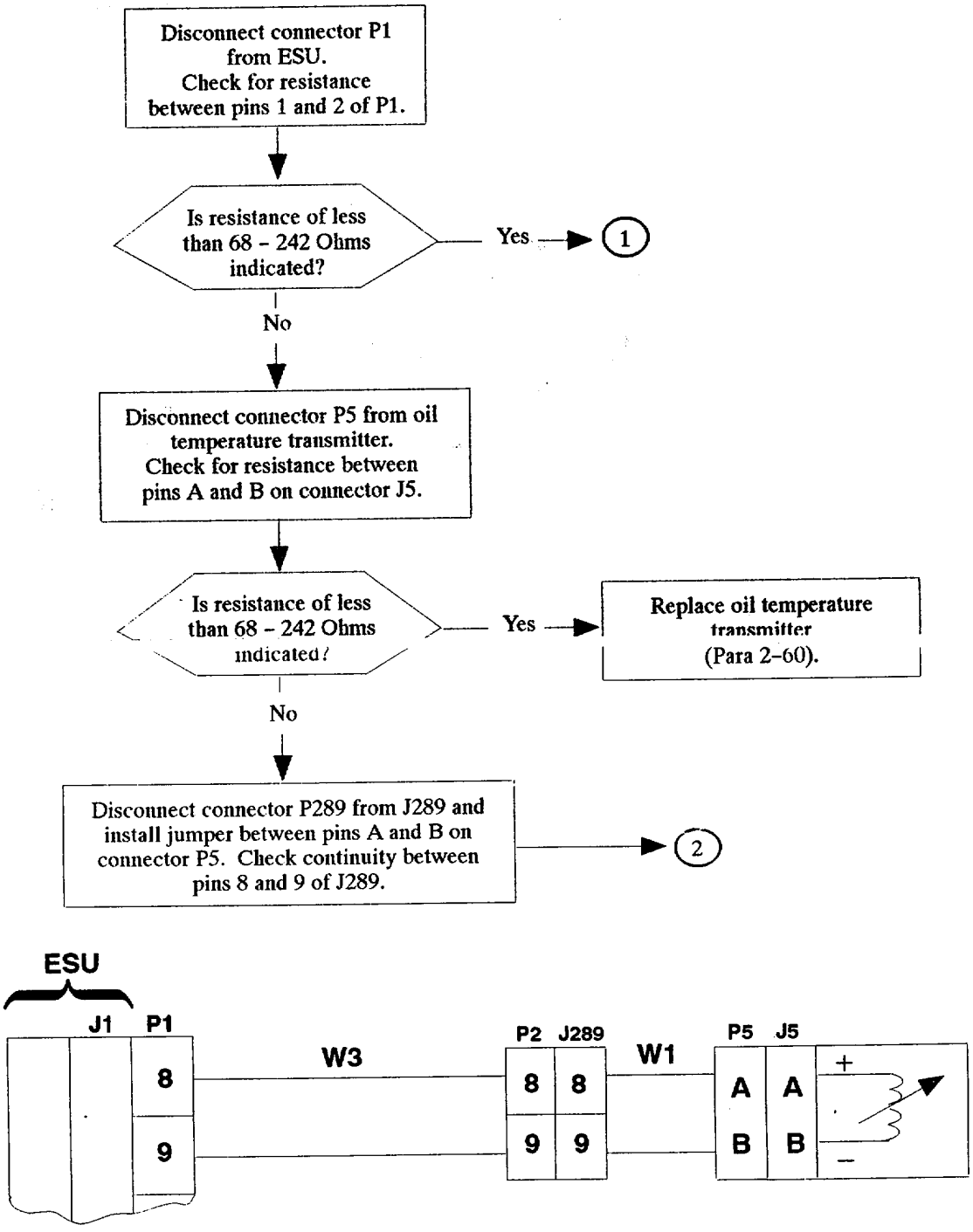
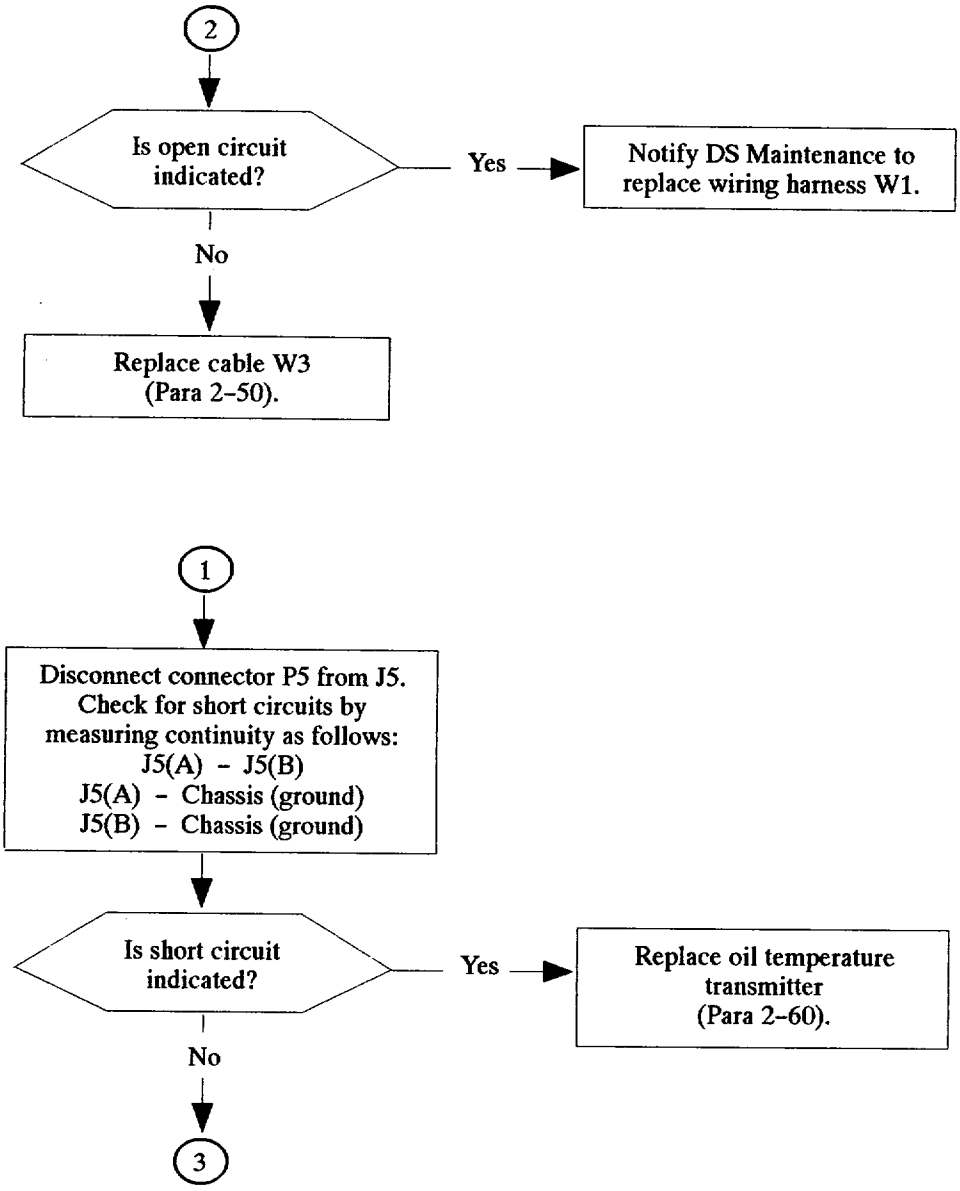
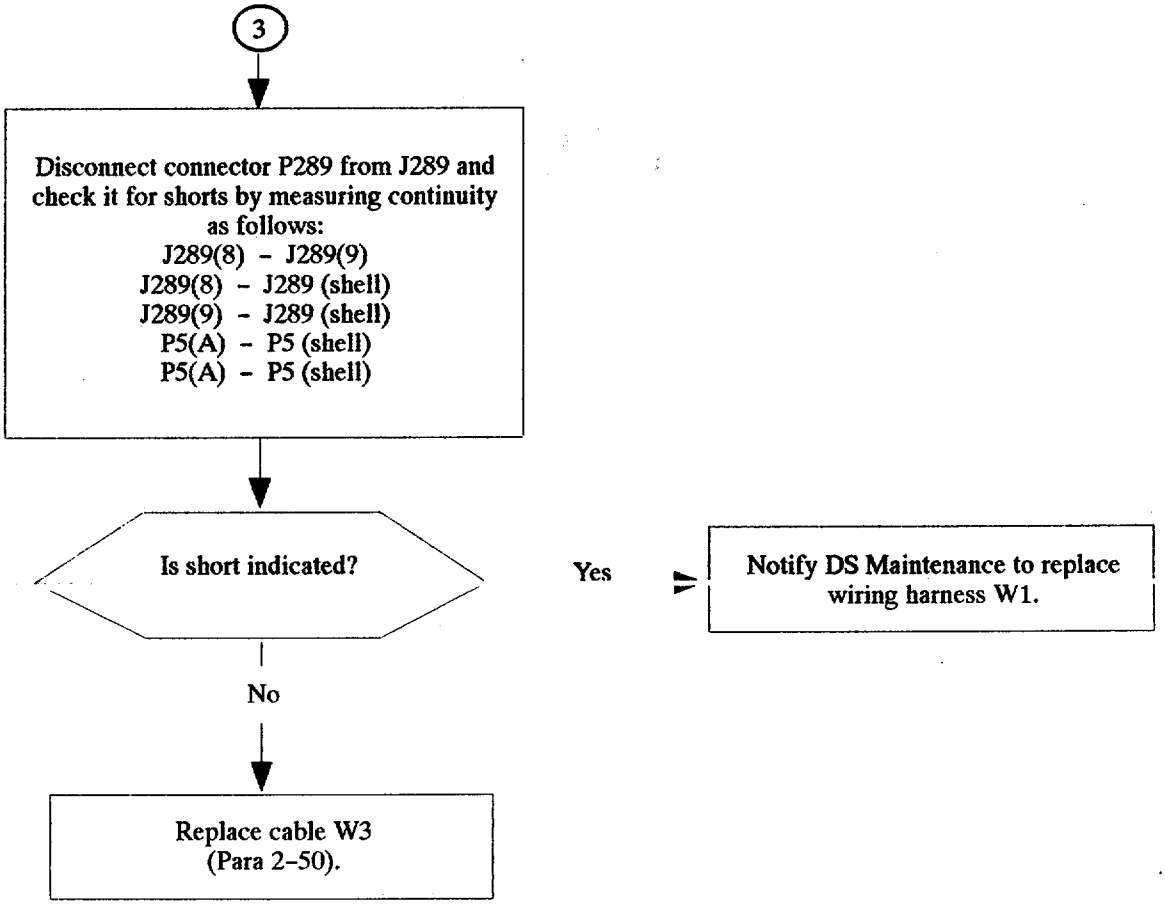


Figure 2-11. Oil Temperature Transmitter Circuits.

2-10. TROUBLESHOOTING PROCEDURES - continued.



2-10. TROUBLESHOOTING PROCEDURES - continued.



2-10. TROUBLESHOOTING PROCEDURES - continued.

15. ENGINE FUEL CONTROL FAILURE. ● ○ ○ ○

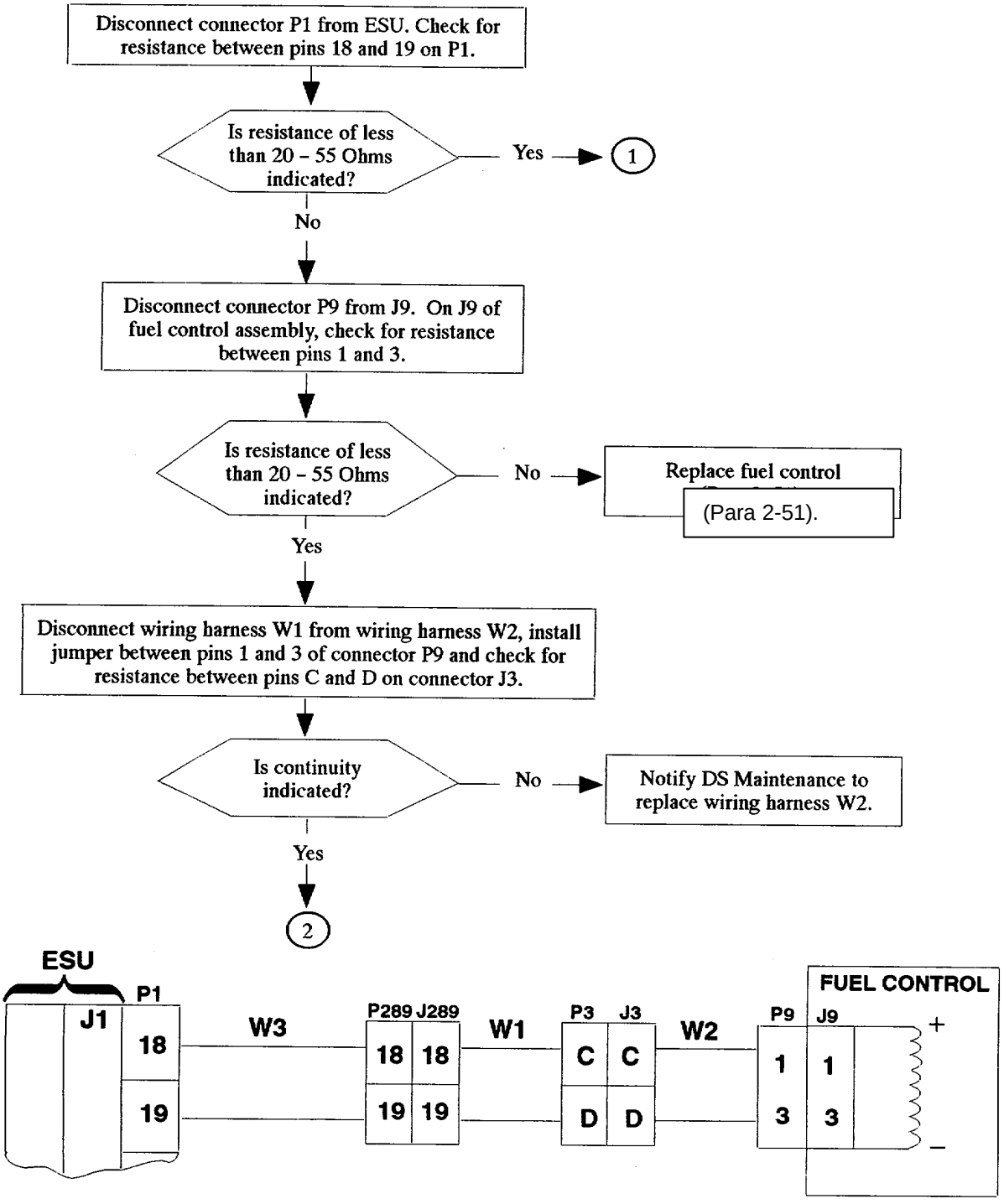
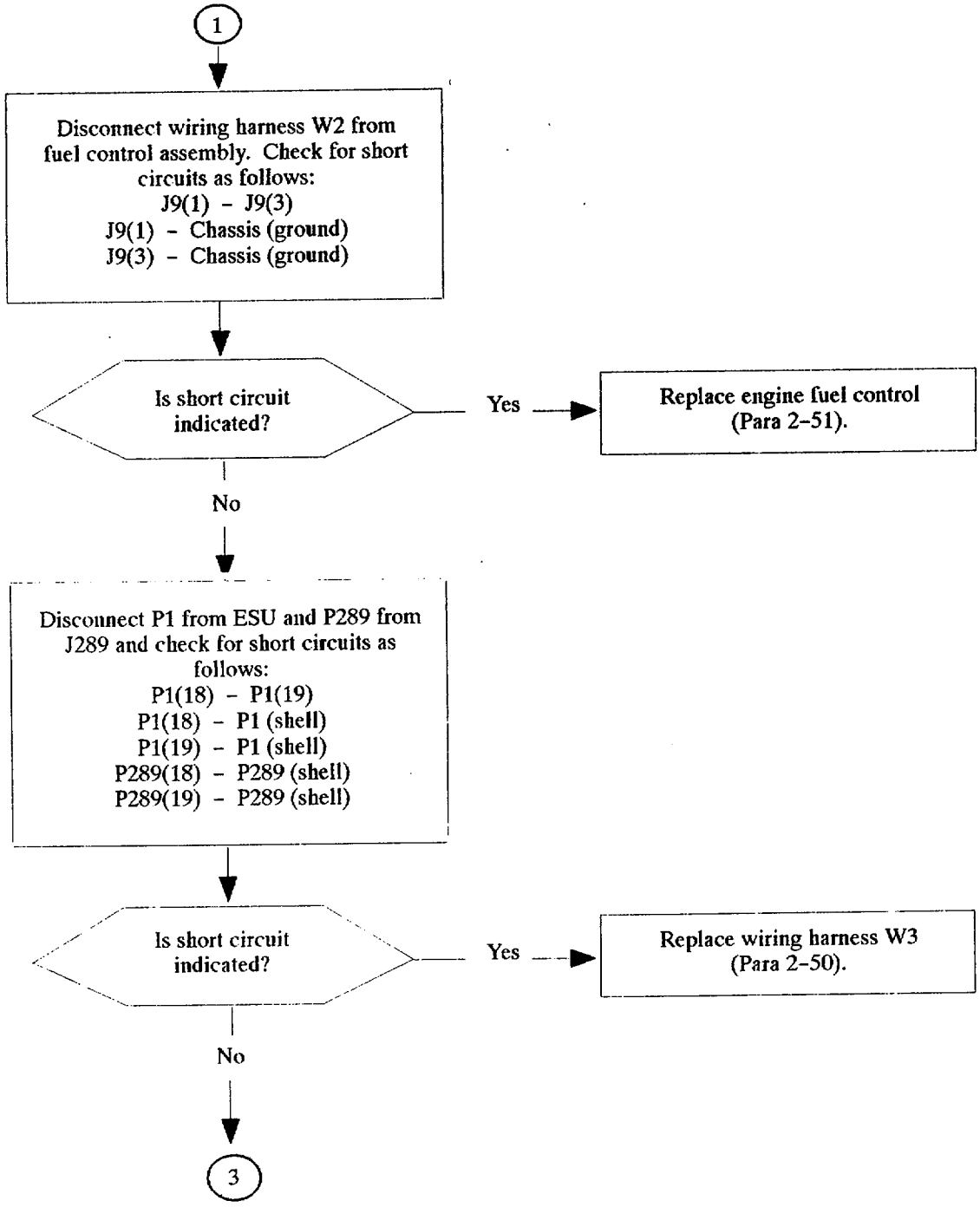
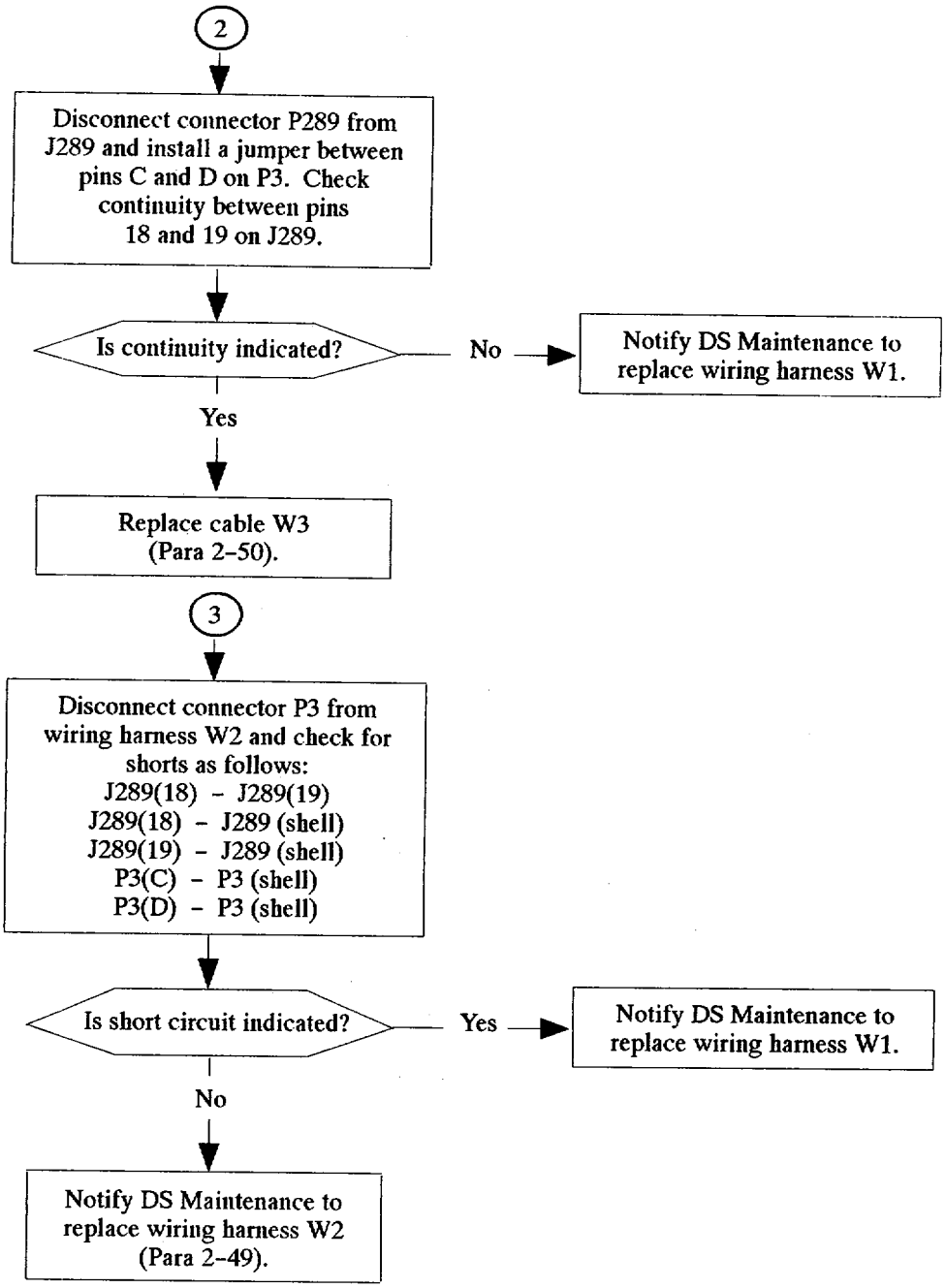


Figure 2-12. Fuel Control Wiring Circuits.

2-10. TROUBLESHOOTING PROCEDURES - continued.



2-10. TROUBLESHOOTING PROCEDURES - continued.



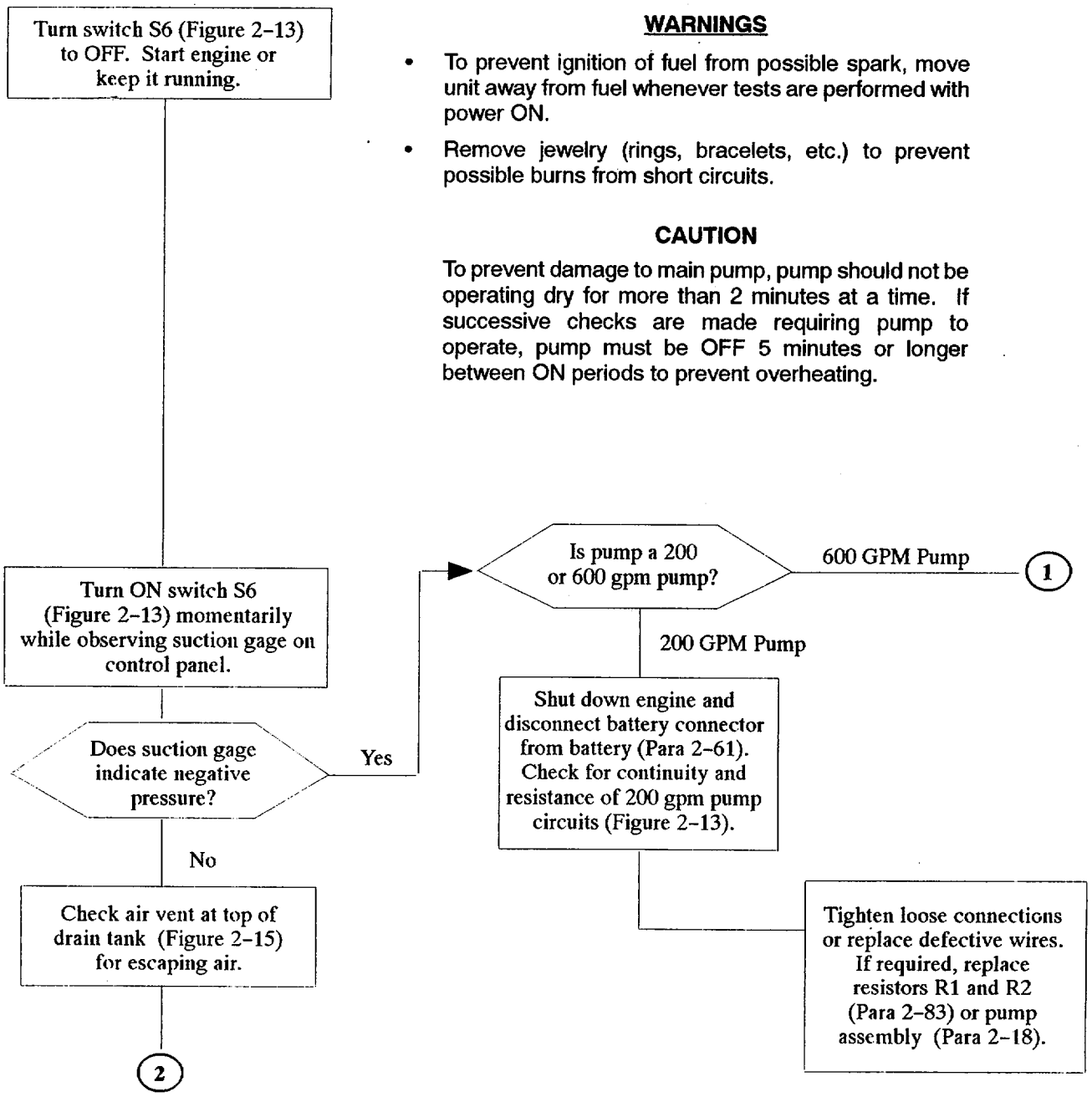
○ ○ ○ ○

16. NO DATA.

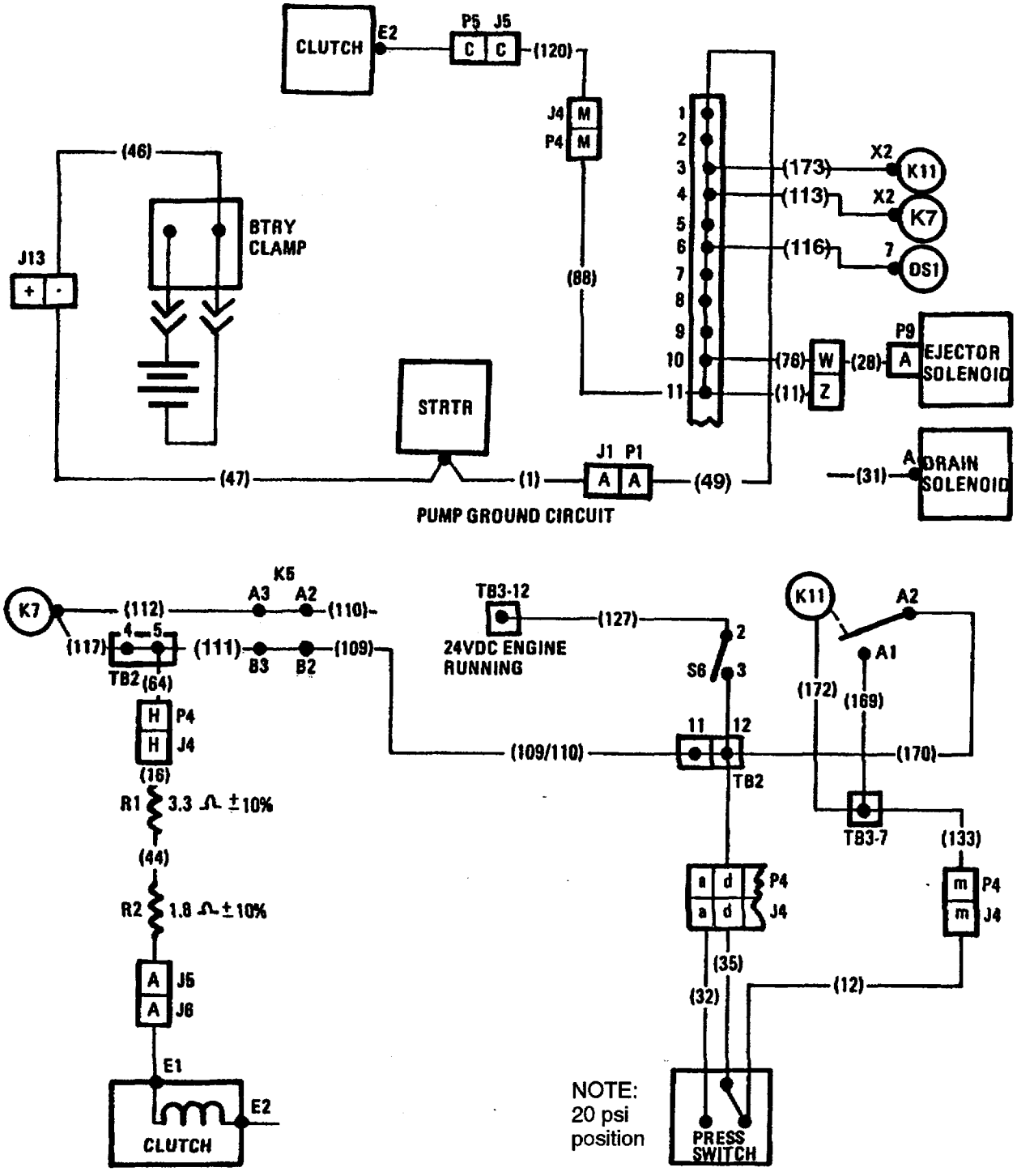
Repeat start attempt. If trouble persists, notify DS Maintenance.

2-10. TROUBLESHOOTING PROCEDURES - continued.

17. PUMP SHUTS DOWN AND/OR FAILS TO PUMP (Engine Running).



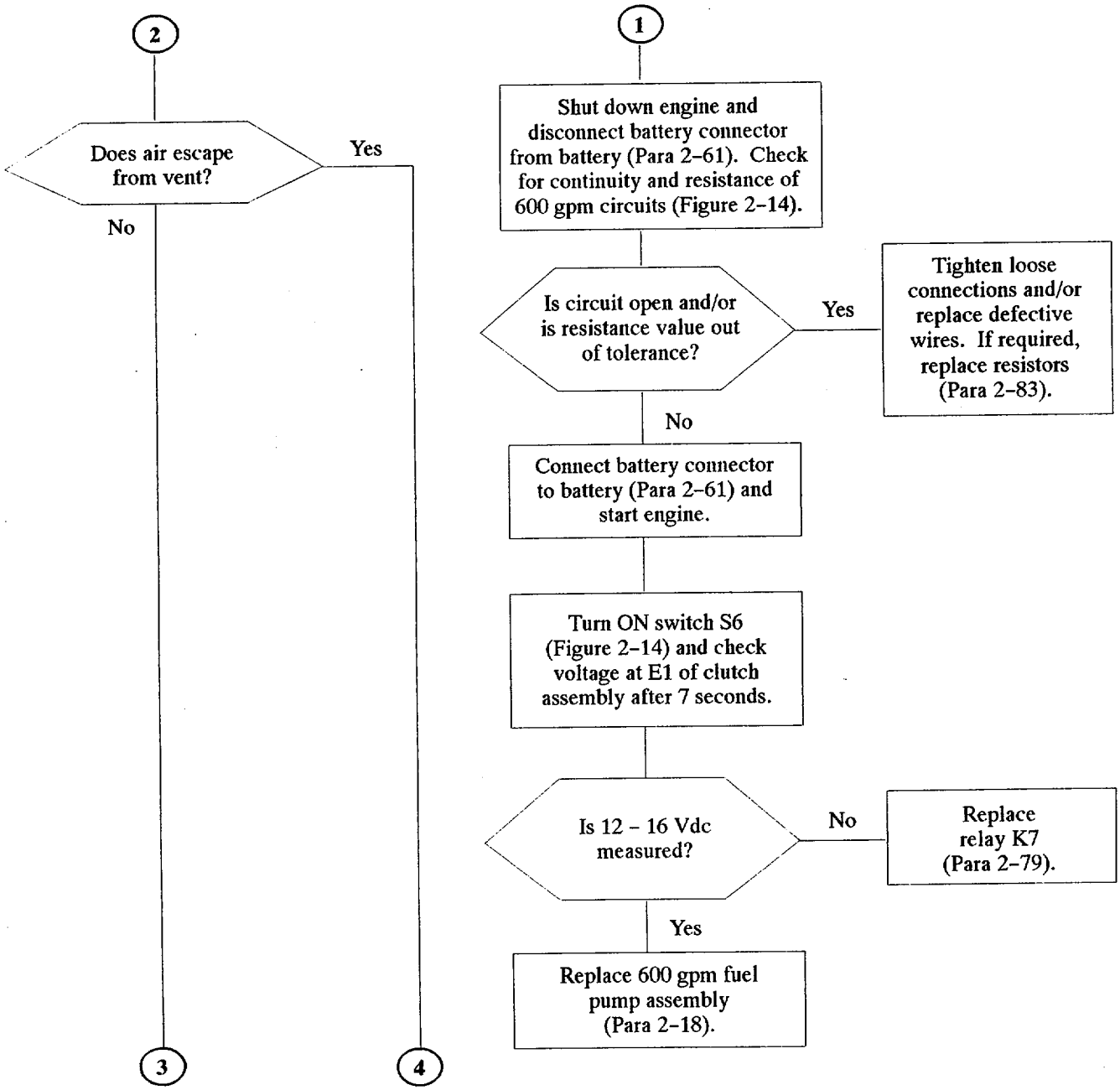
2-10. TROUBLESHOOTING PROCEDURES - continued.



200GPM PUMP POWER CIRCUIT

Figure 2-13. 200 GPM Pump Shutdown/Fail to Start Circuits.

2-10. TROUBLESHOOTING PROCEDURES - continued.



2-10. TROUBLESHOOTING PROCEDURES-continued.

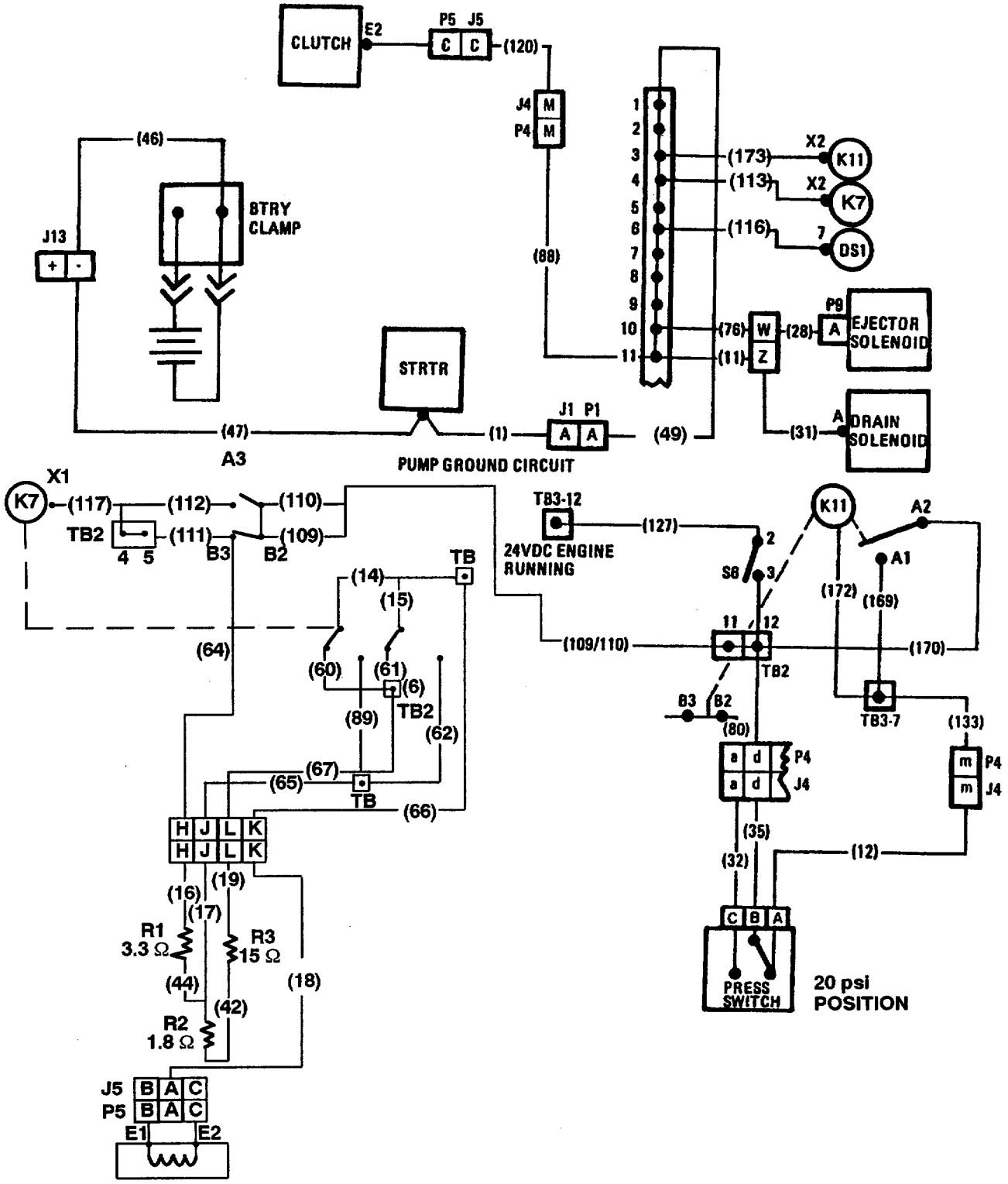
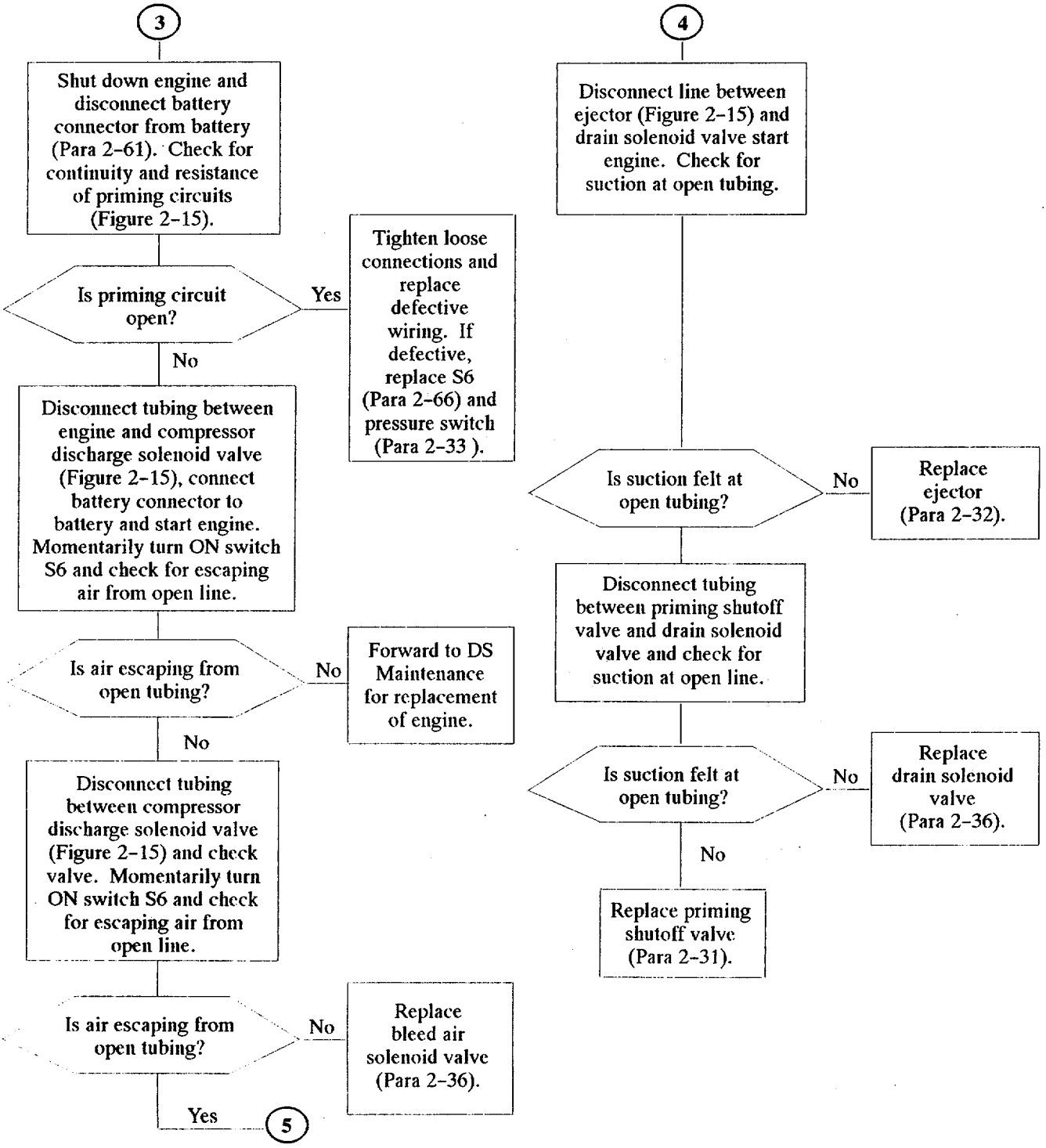
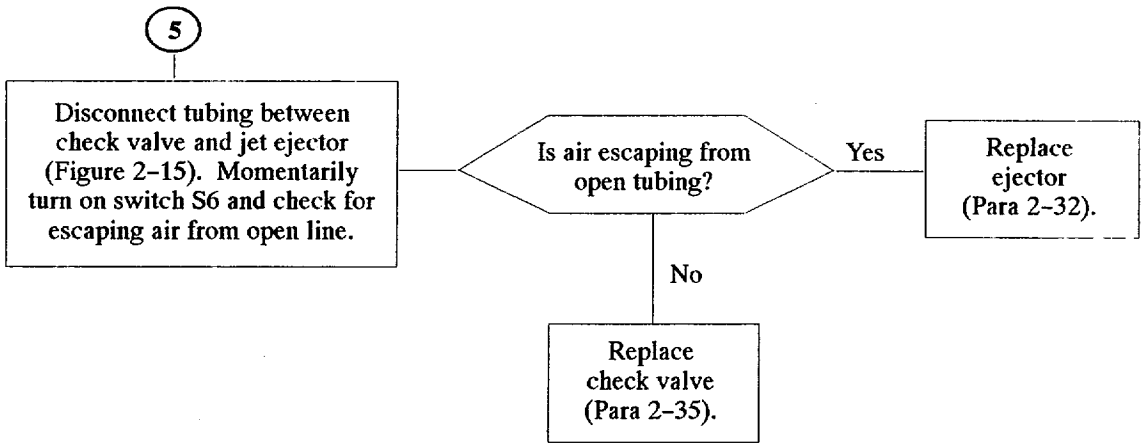


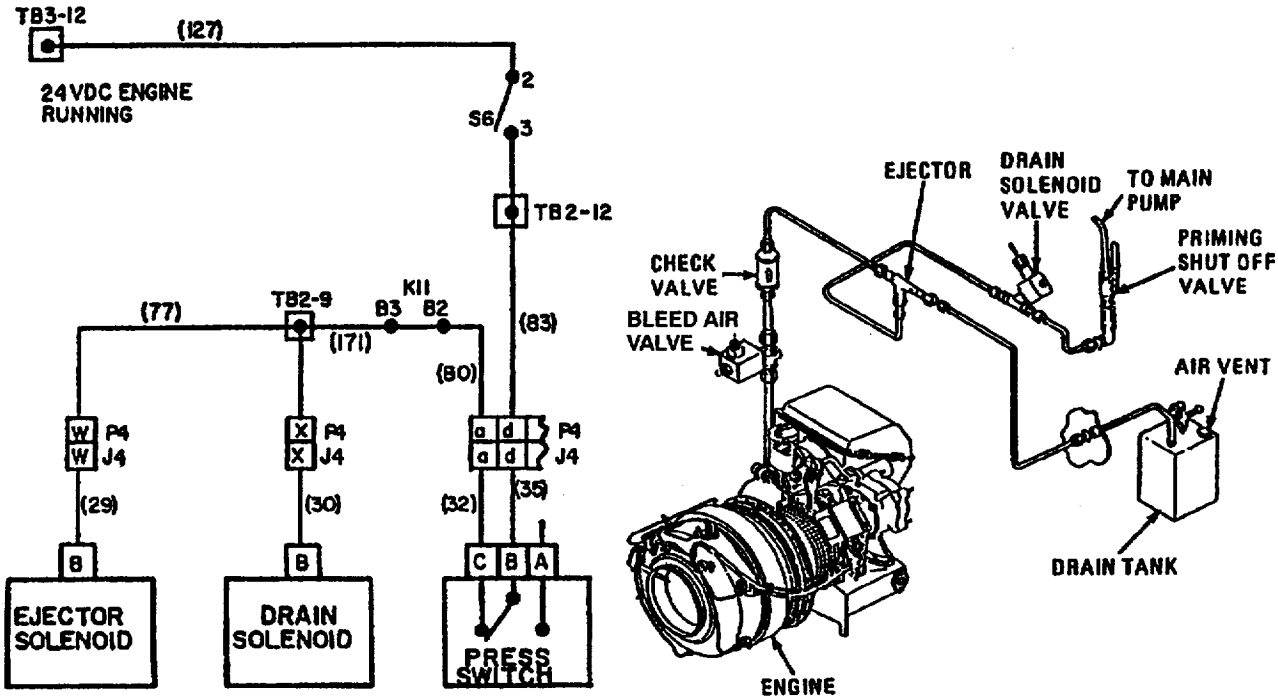
Figure 2-14. 600 GPM Shutdown/Fail to Start Circuits.

2-10. TROUBLESHOOTING PROCEDURES - continued.



2-10. TROUBLESHOOTING PROCEDURES - continued.





PRIMING CIRCUIT

Figure 2-15. Pump Shutdown/Fails to Start Priming Circuits.

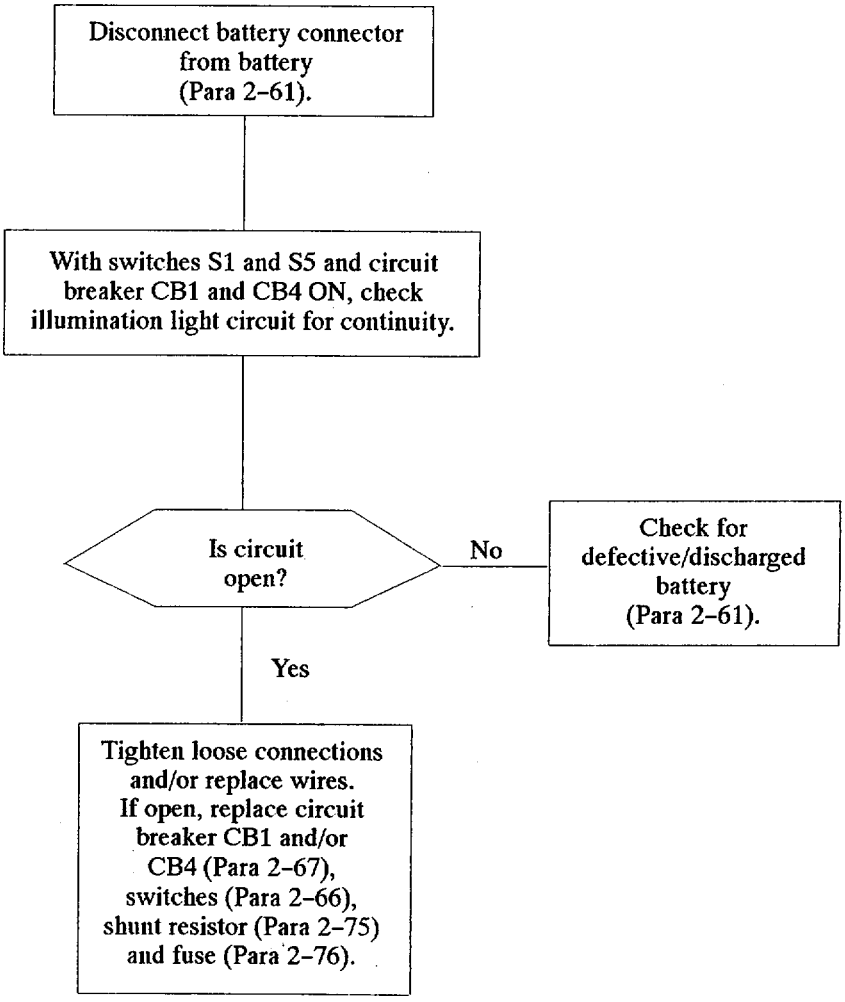
2-10. TROUBLESHOOTING PROCEDURES - continued.

18. ALL ILLUMINATION LIGHTS INOPERABLE.

Refer to Figure 2-16, except as otherwise indicated and proceed as follows:

WARNINGS

- **To prevent ignition of fuel from possible spark, move unit away from fuel whenever tests are performed with power ON.**
- **Remove jewelry (rings, bracelets, etc.) to prevent possible burns from short circuits.**



2-10. TROUBLESHOOTING PROCEDURES - continued.

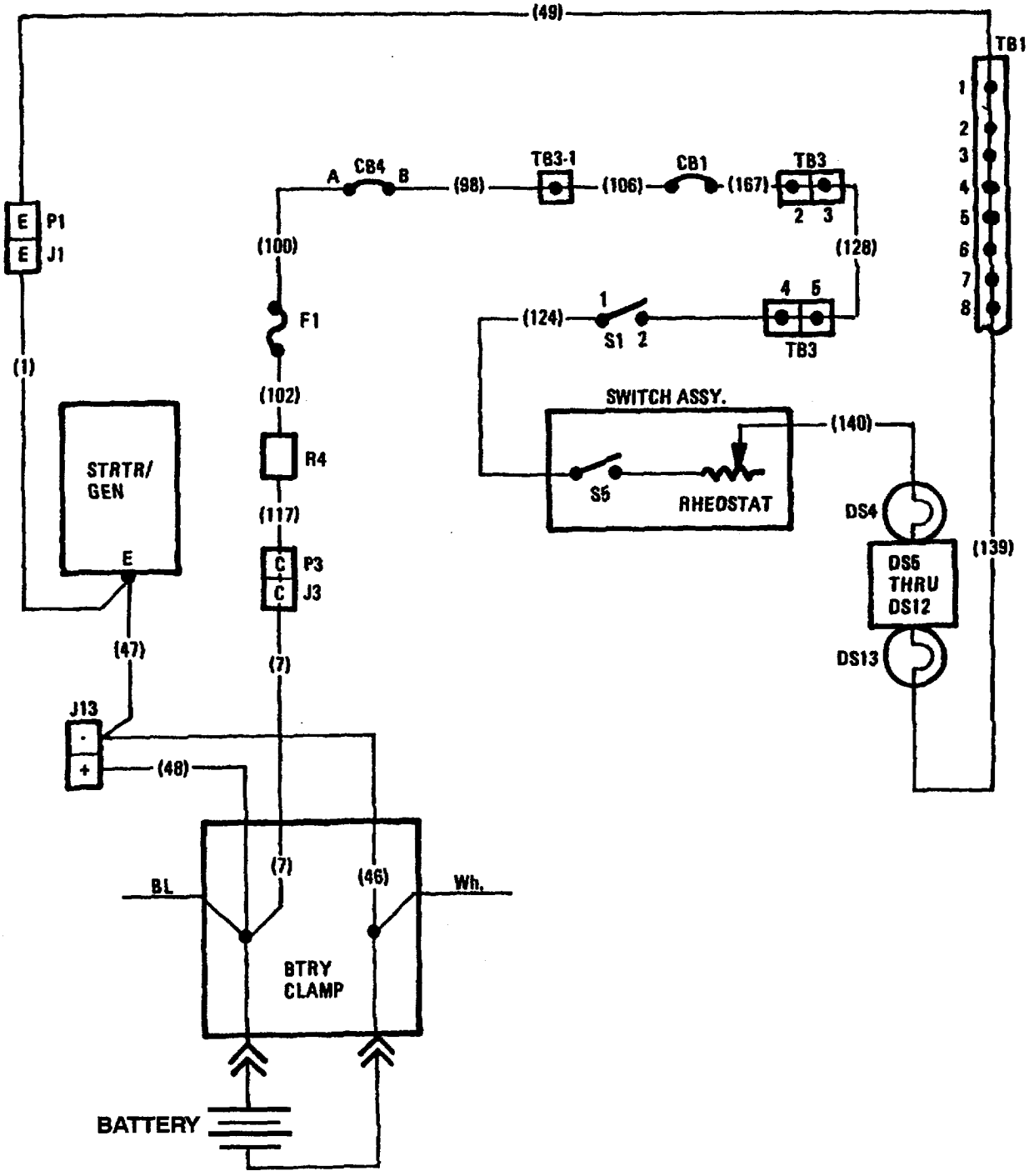
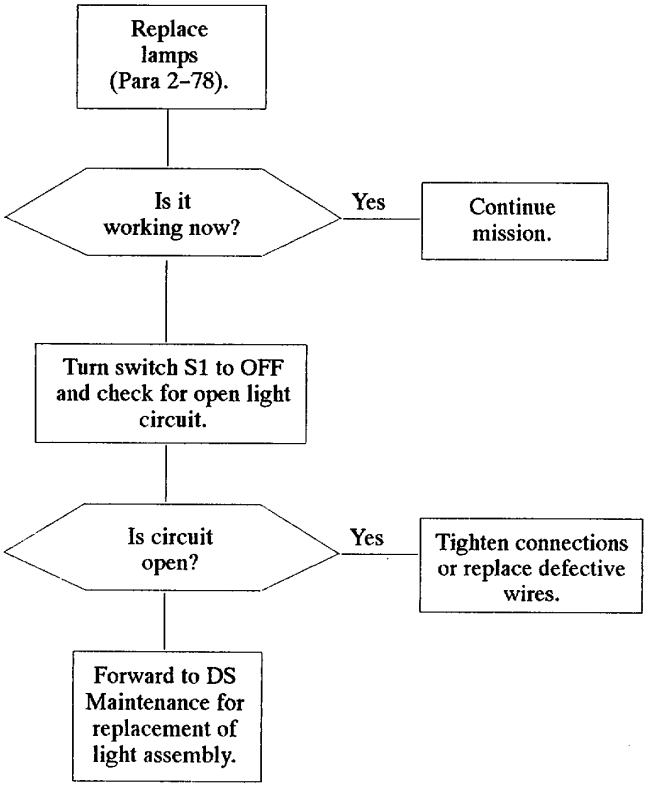


Figure 2-16. Illumination Lights Inoperable Circuits.

2-10. TROUBLESHOOTING PROCEDURES – continued.

19. ONE OR MORE (but not all) ILLUMINATION LIGHTS INOPERABLE.

Refer to Figure 2-17, except as otherwise indicated and proceed as follows:



WARNINGS

- **To prevent ignition of fuel from possible spark, move unit away from fuel whenever tests are performed with power ON.**
- **Remove jewelry (rings, bracelets, etc.) to prevent possible burns from short circuits.**

20. PUMP AND CLUTCH ASSEMBLY IS NOISY.

Replace pump and clutch assembly if this malfunction occurs.

2-10. TROUBLESHOOTING PROCEDURES -continued.

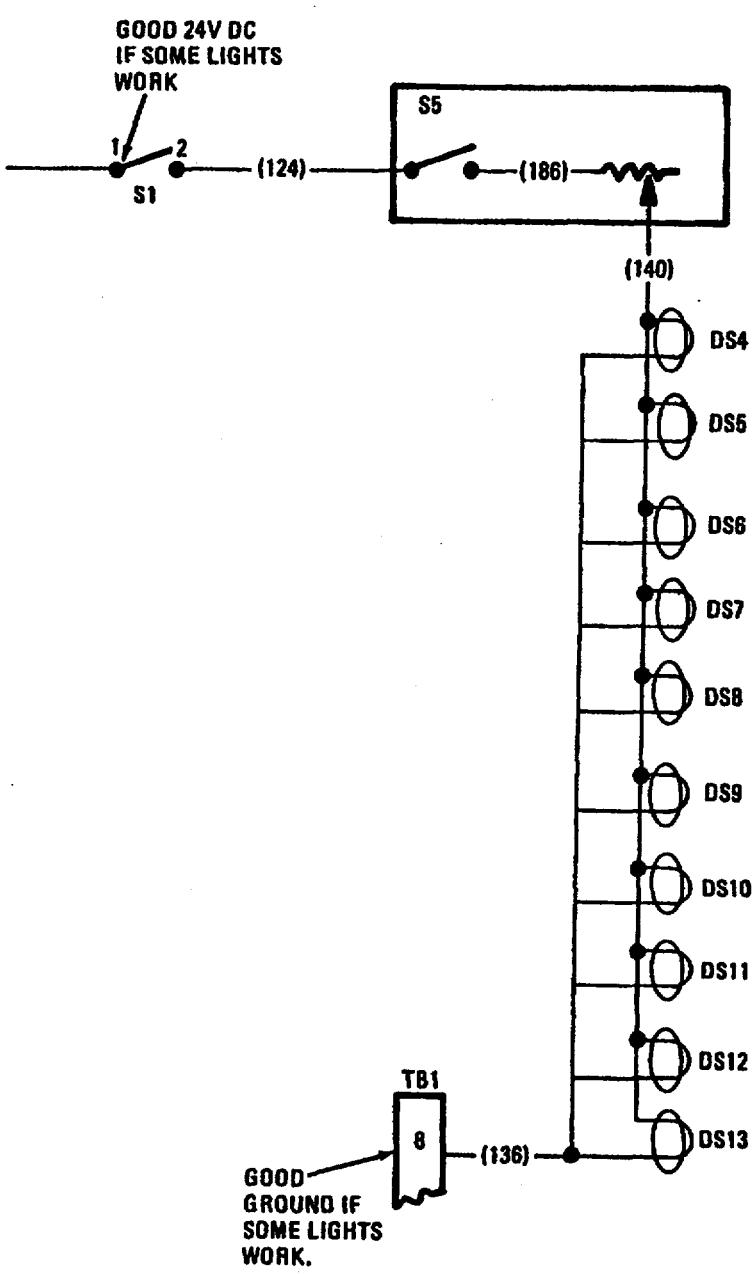


Figure 2-17. One or More Illumination Lights Inoperable Circuits.

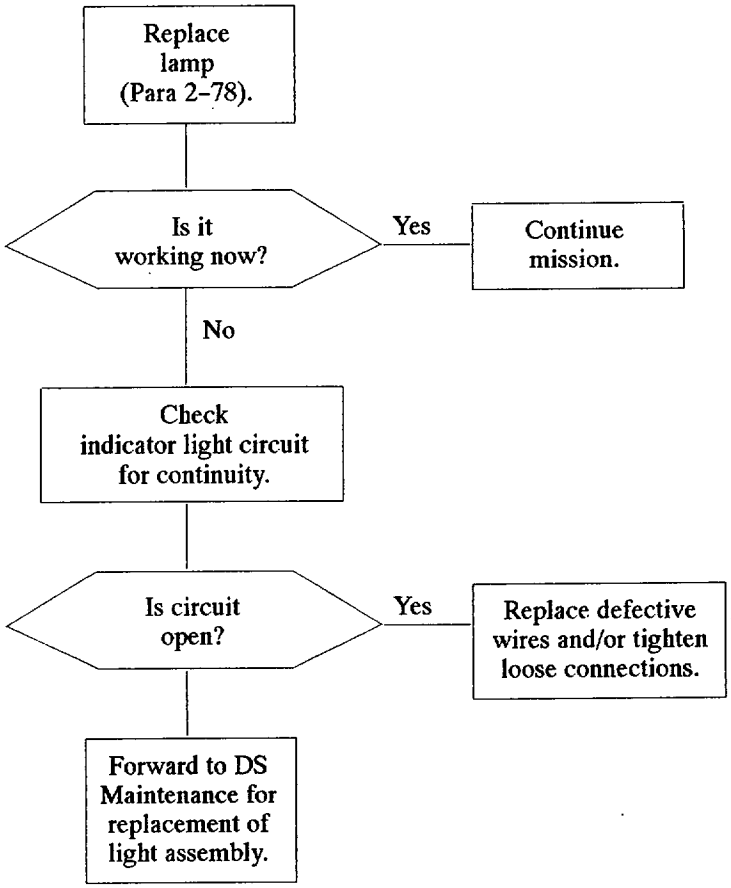
2-10. TROUBLESHOOTING PROCEDURES - continued.

21. CLUTCH DISENGAGED, INDICATOR LIGHT FAILS SELF TEST.

Refer to Figure 2-18, except as otherwise indicated and proceed as follows:

WARNINGS

- **To prevent ignition of fuel from possible spark, move unit away from fuel whenever tests are performed with power ON.**
- **Remove jewelry (rings, bracelets, etc.) to prevent possible burns from short circuits.**



2-10. TROUBLESHOOTING PROCEDURES - continued.

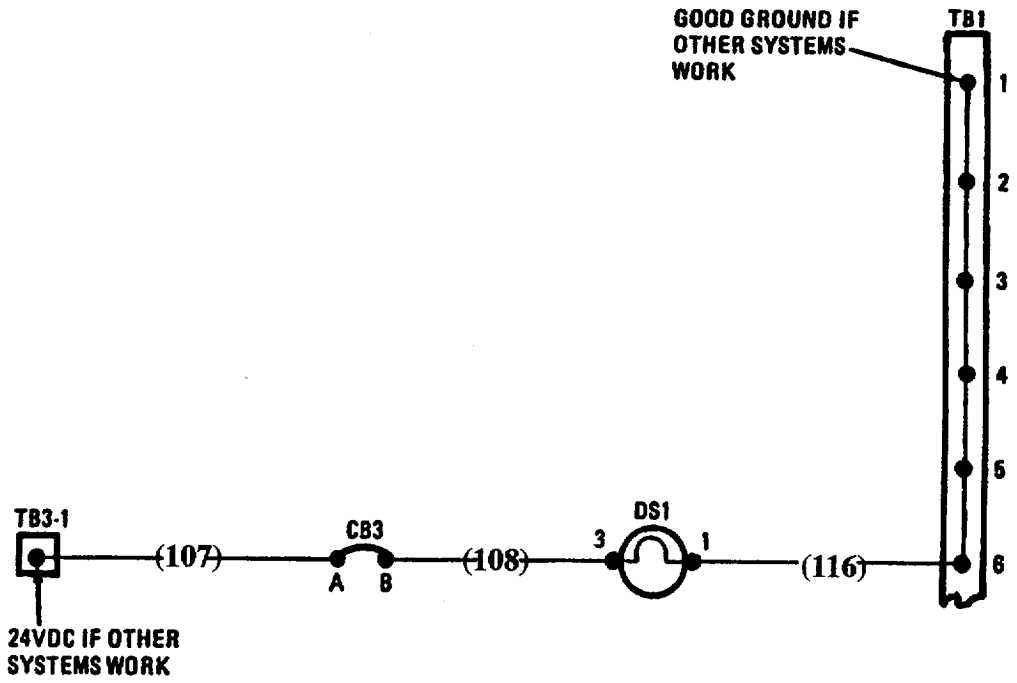


Figure 2-18. Clutch Disengage Off Indicator Lights Fails Self Test.

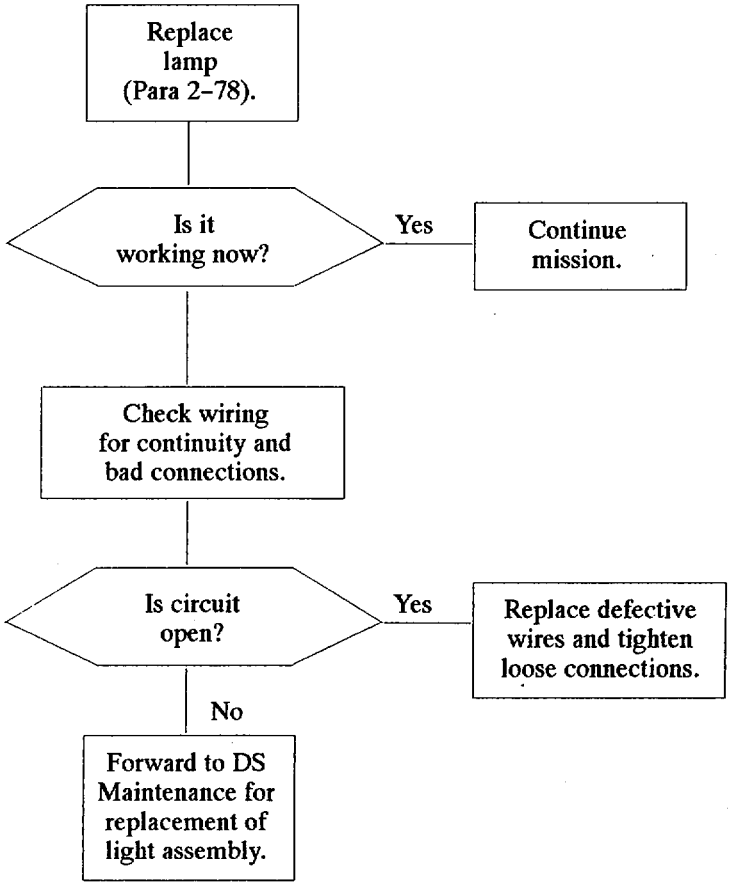
2-10. TROUBLESHOOTING PROCEDURES - continued.

22. ENGINE OIL TEMPERATURE AND/OR ENGINE INDICATOR LIGHT FAILS SELF TEST.

Refer to Figure 2-19, except as otherwise indicated and proceed as follows:

WARNINGS

- **To prevent ignition of fuel from possible spark, move unit away from fuel whenever tests are performed with power ON.**
- **Remove jewelry (rings, bracelets, etc.) to prevent possible burns from short circuits.**



2-10. TROUBLESHOOTING PROCEDURES - continued.

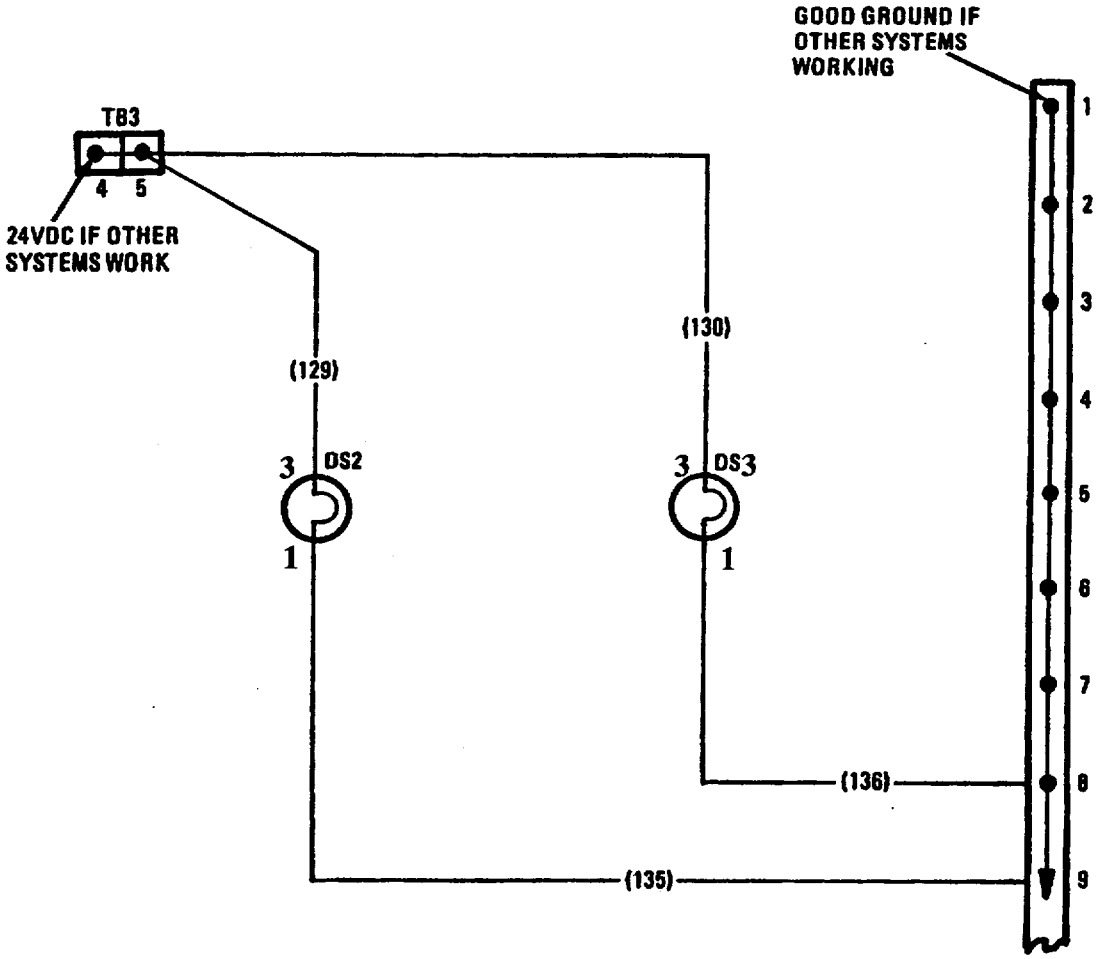


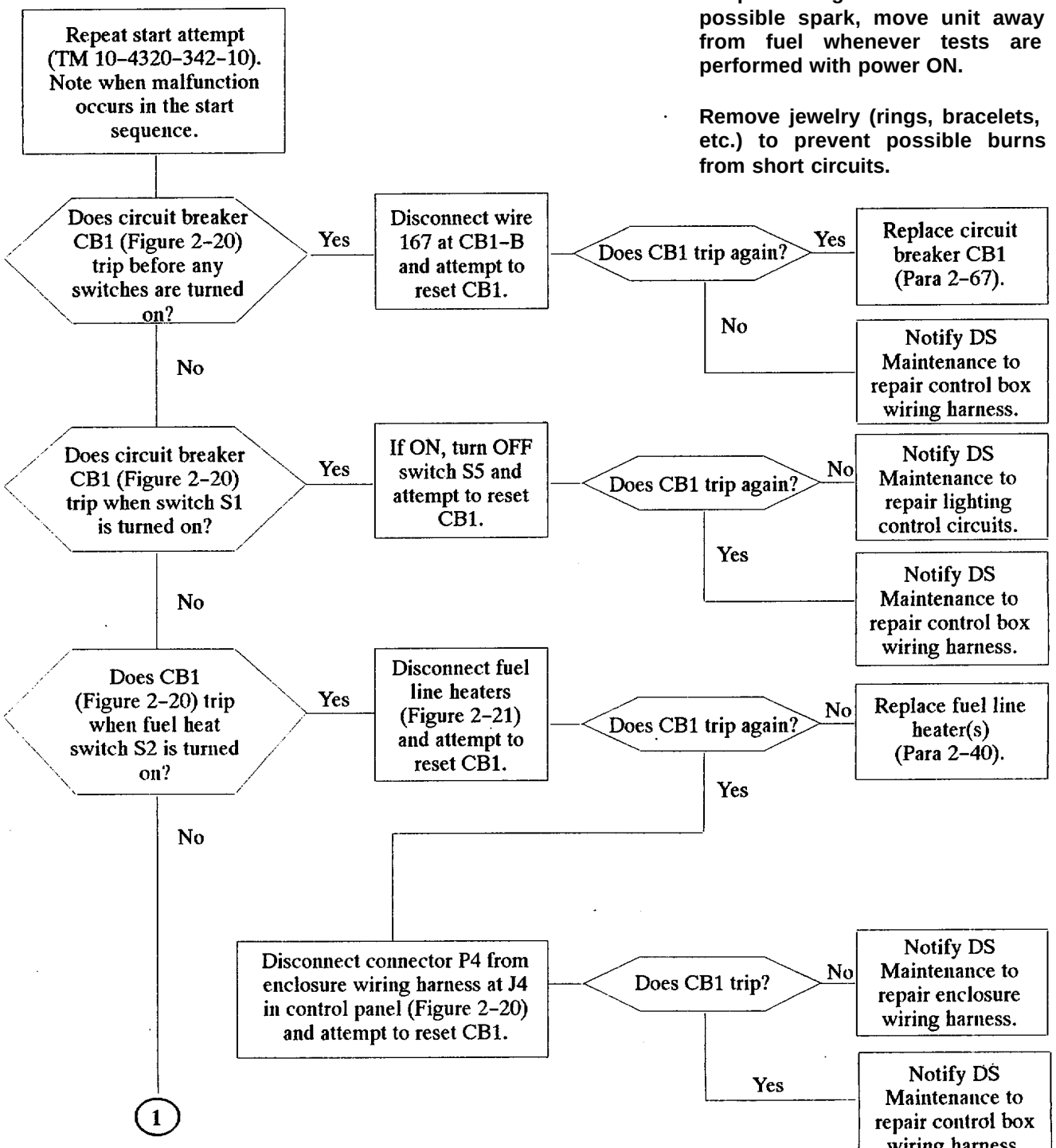
Figure 2-19. Engine Oil Temp and/or Engine Fail Indicator Light Fail Self Test.

2-10. TROUBLESHOOTING PROCEDURES - continued.

23. MAIN CIRCUIT BREAKER (CB1) KEEPS TRIPPING.

WARNINGS

- **To prevent ignition of fuel from possible spark, move unit away from fuel whenever tests are performed with power ON.**
- **Remove jewelry (rings, bracelets, etc.) to prevent possible burns from short circuits.**



2-10. TROUBLESHOOTING PROCEDURES -continued.

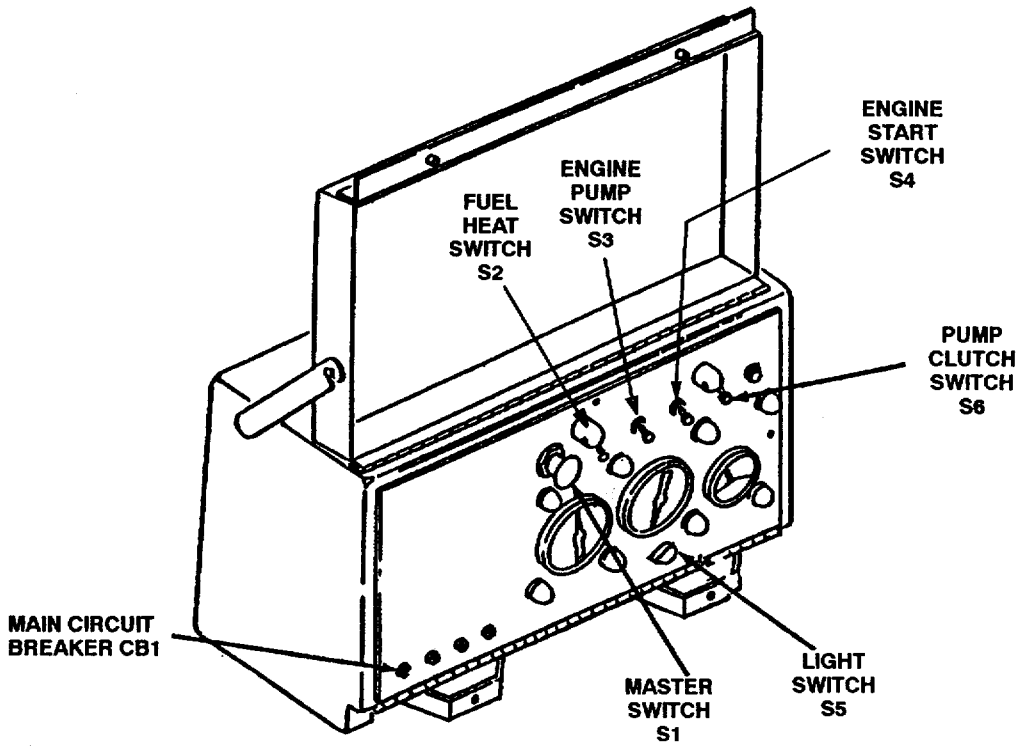
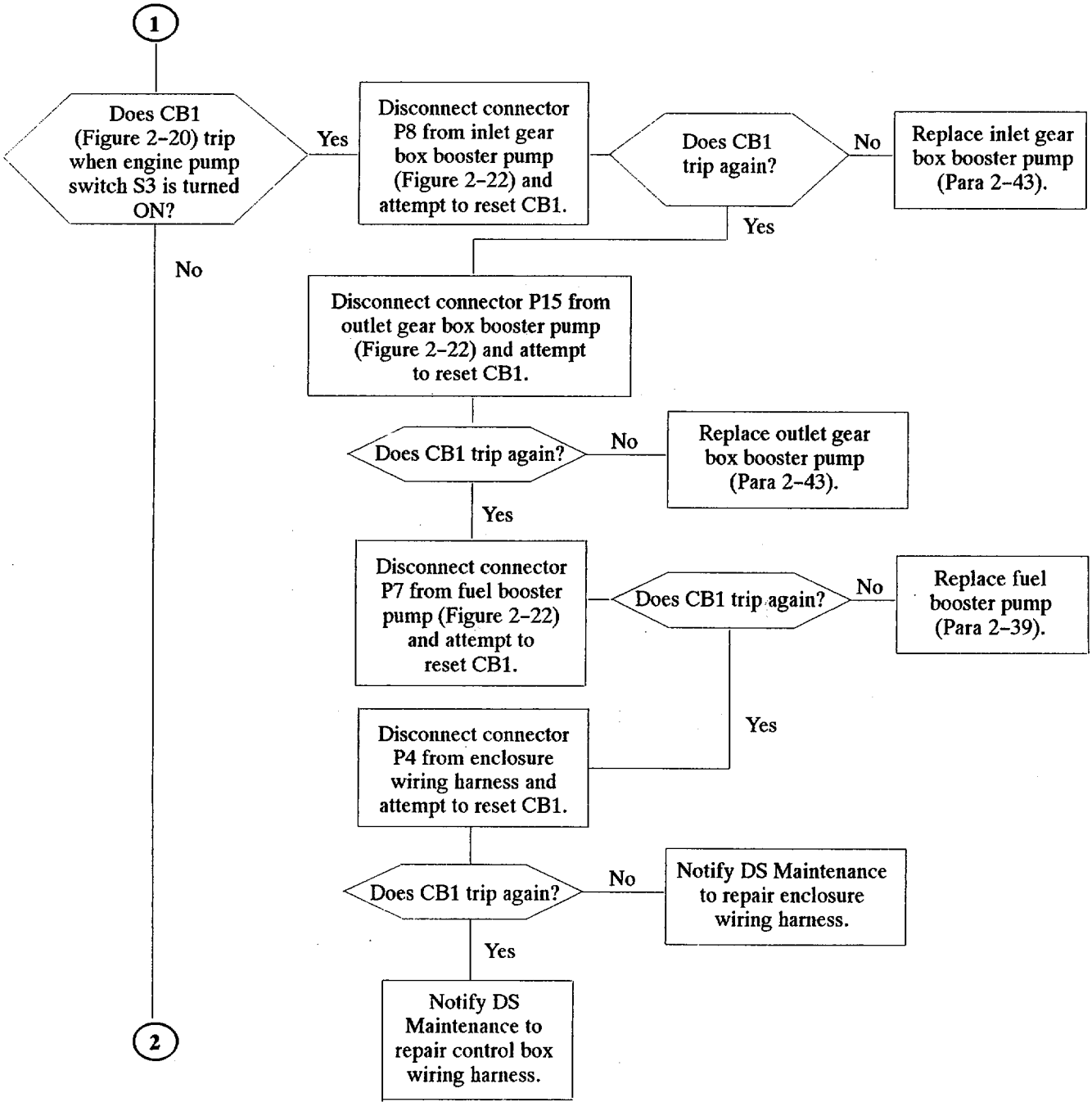


Figure 2-20. Control Panel.

2-10. TROUBLESHOOTING PROCEDURES - continued.



2-10. TROUBLESHOOTING PROCEDURES- continued

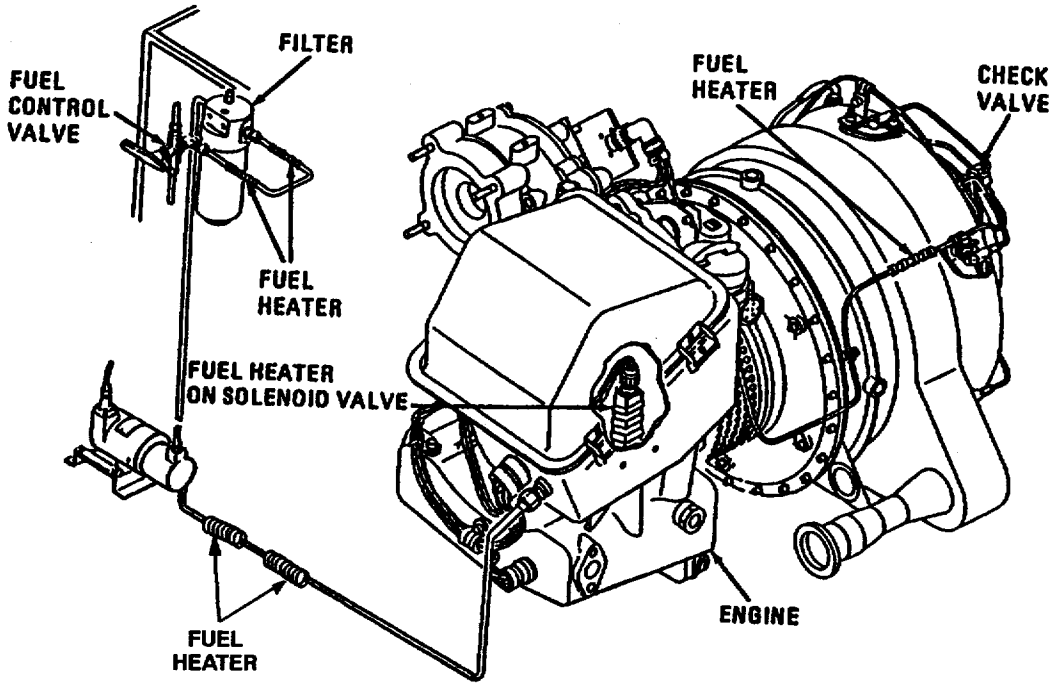
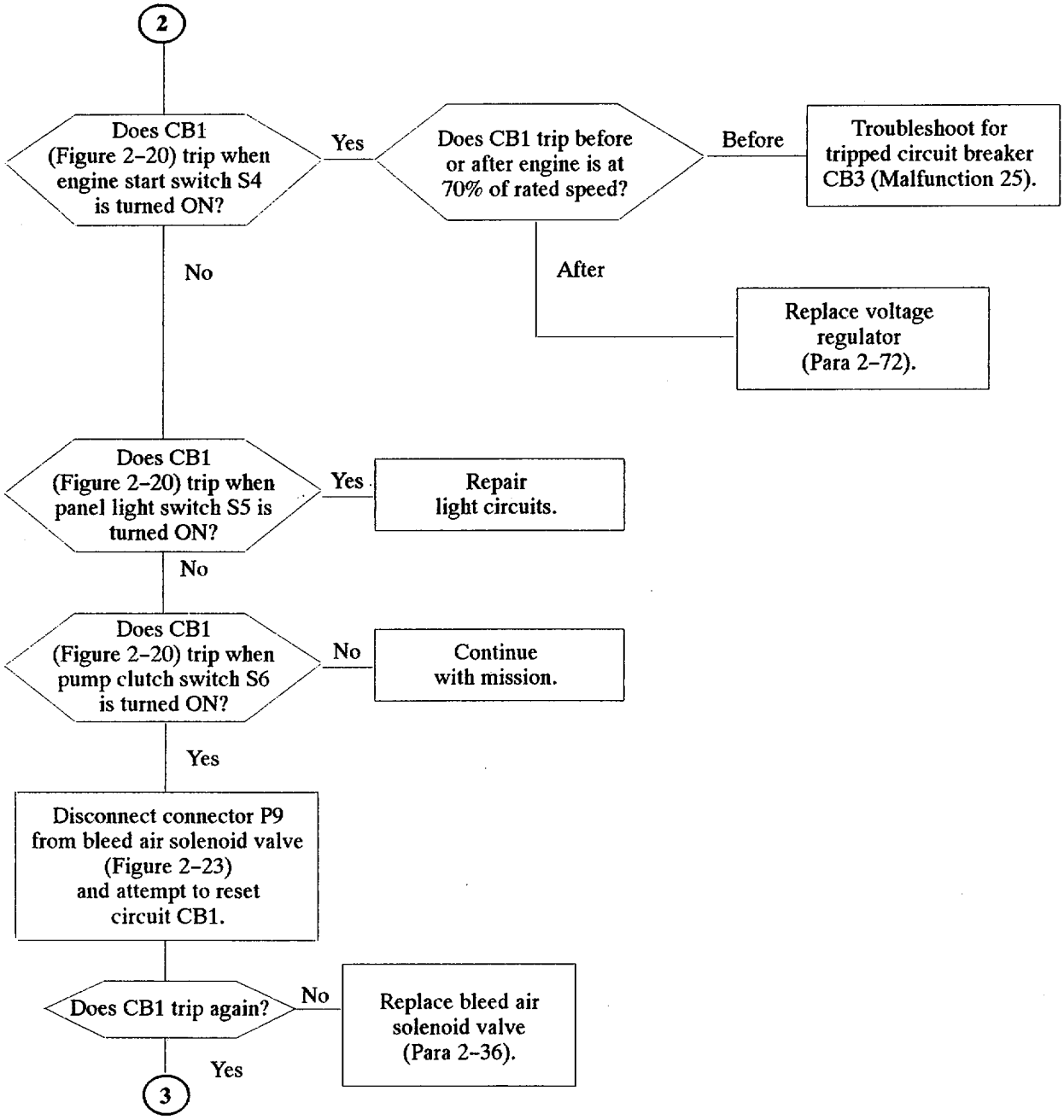


Figure 2-21. Fuel Line Heaters.

2-10. TROUBLESHOOTING PROCEDURES - continued.



2-10. TROUBLESHOOTING PROCEDURES - continued.

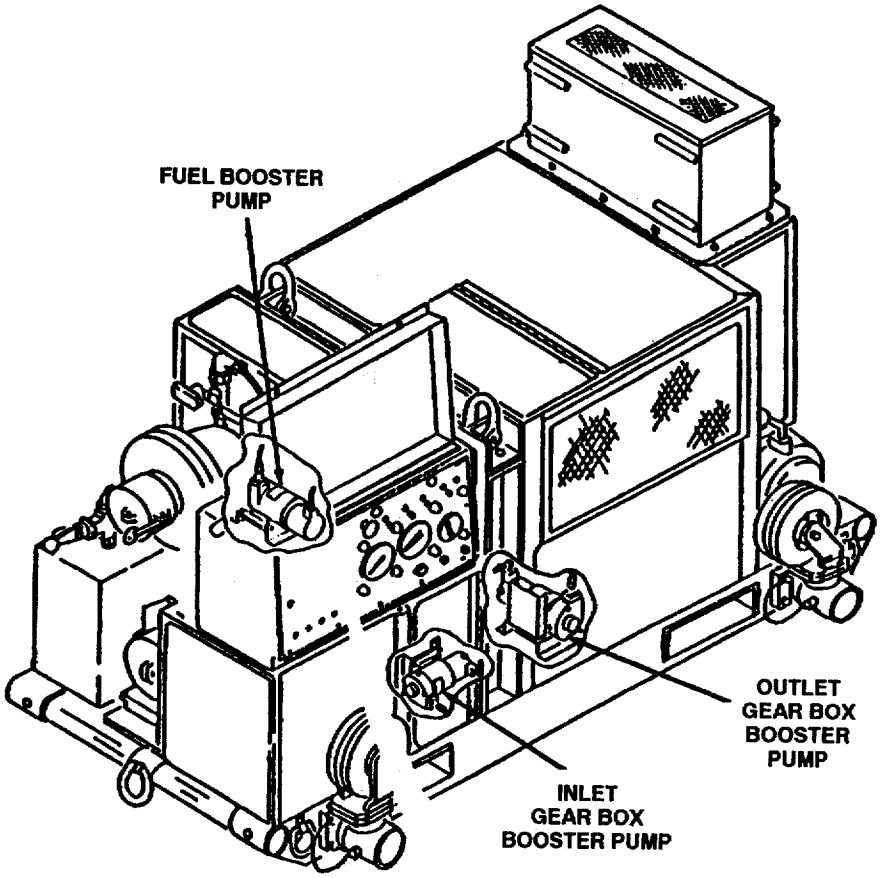
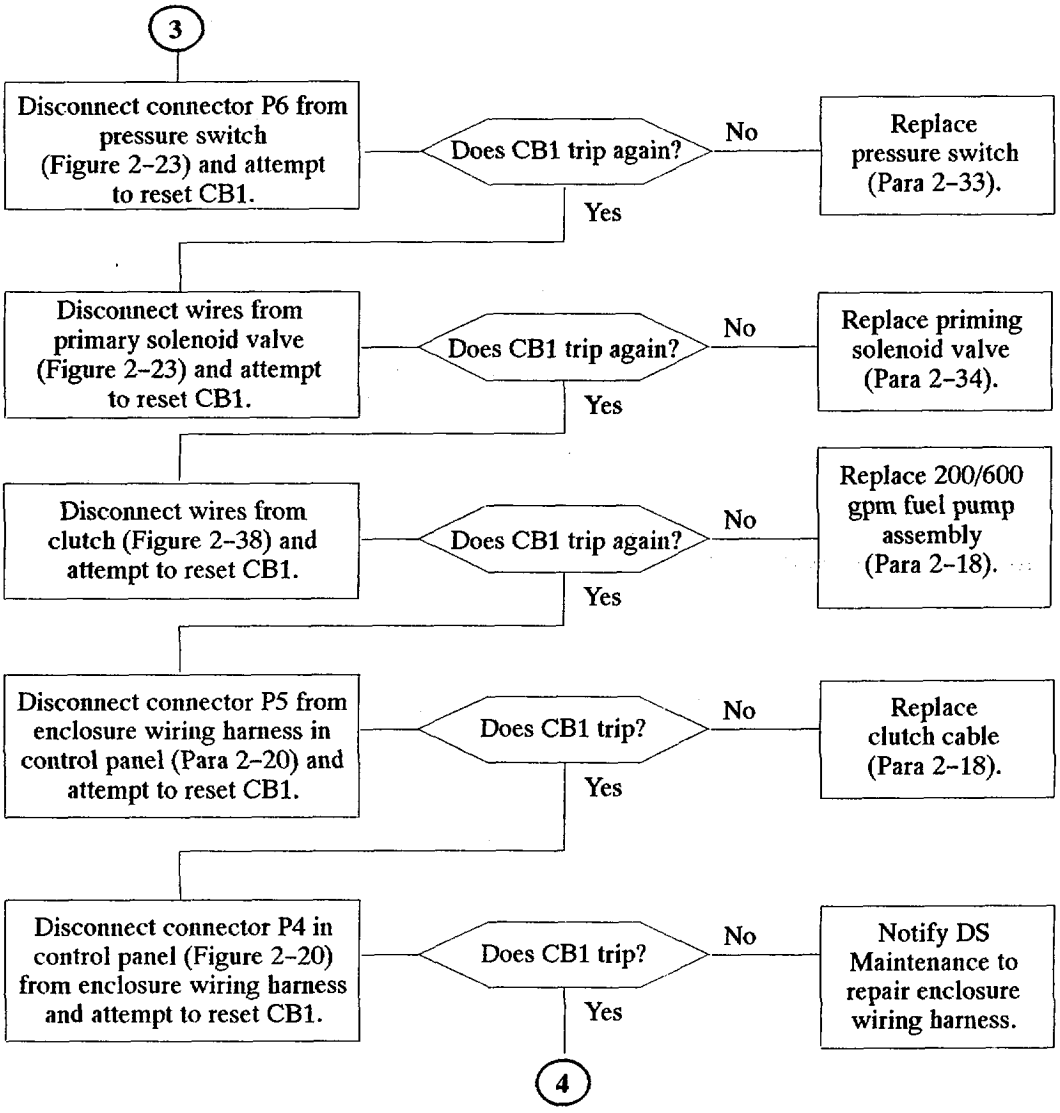
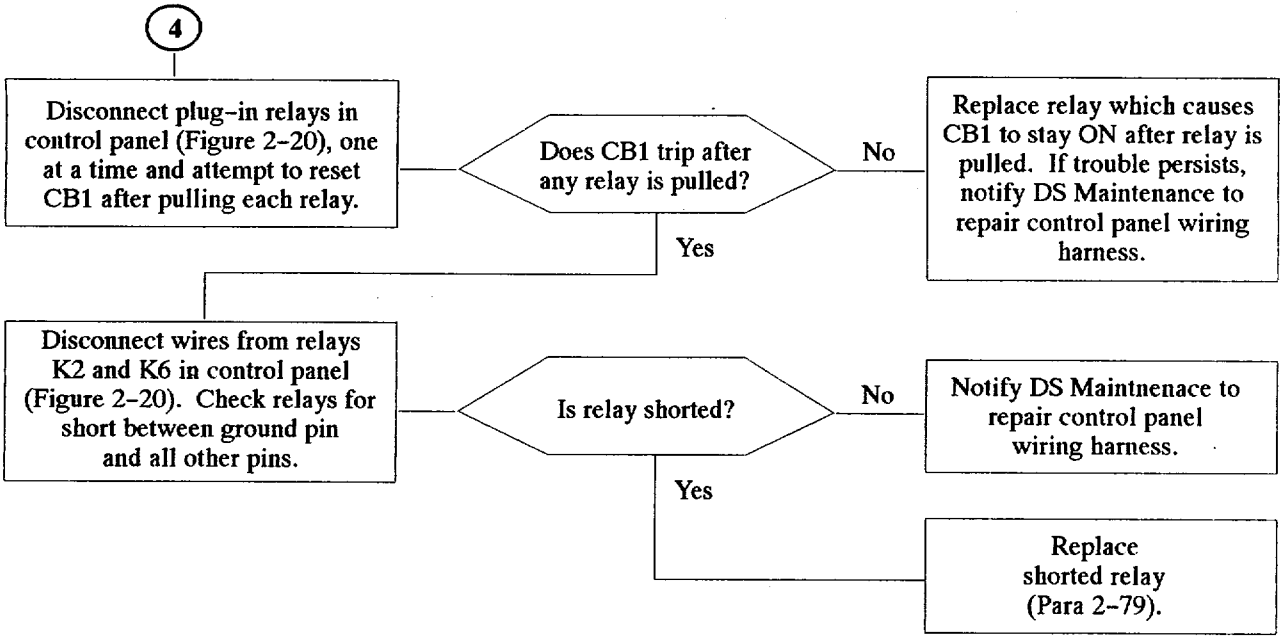


Figure 2-22. Fuel and Oil Pumps.

2-10. TROUBLESHOOTING PROCEDURES - continued.



2-10. TROUBLESHOOTING PROCEDURES -continued.



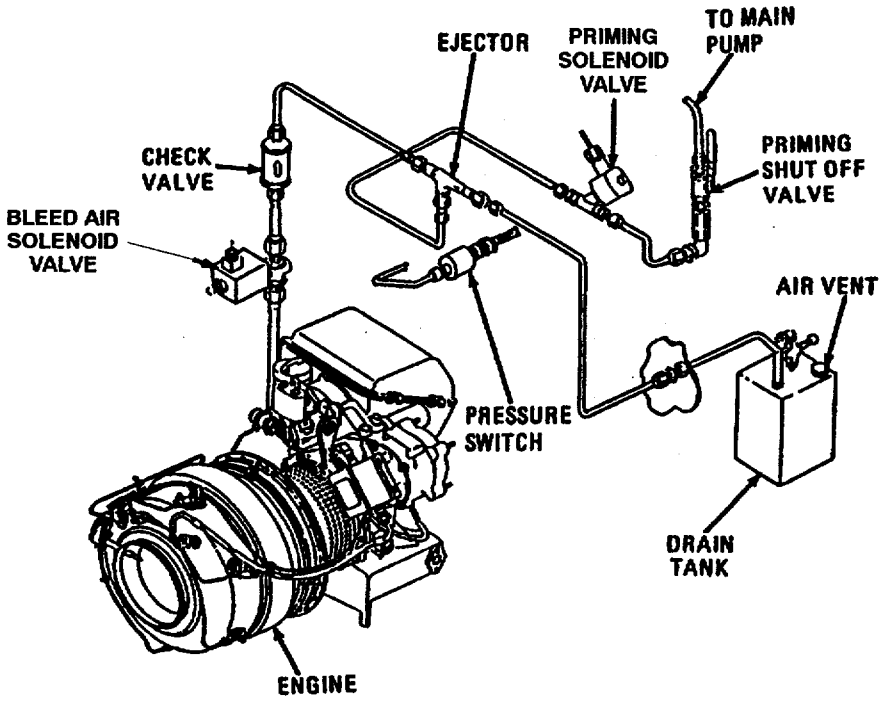


Figure 2-23. Priming Circuit.

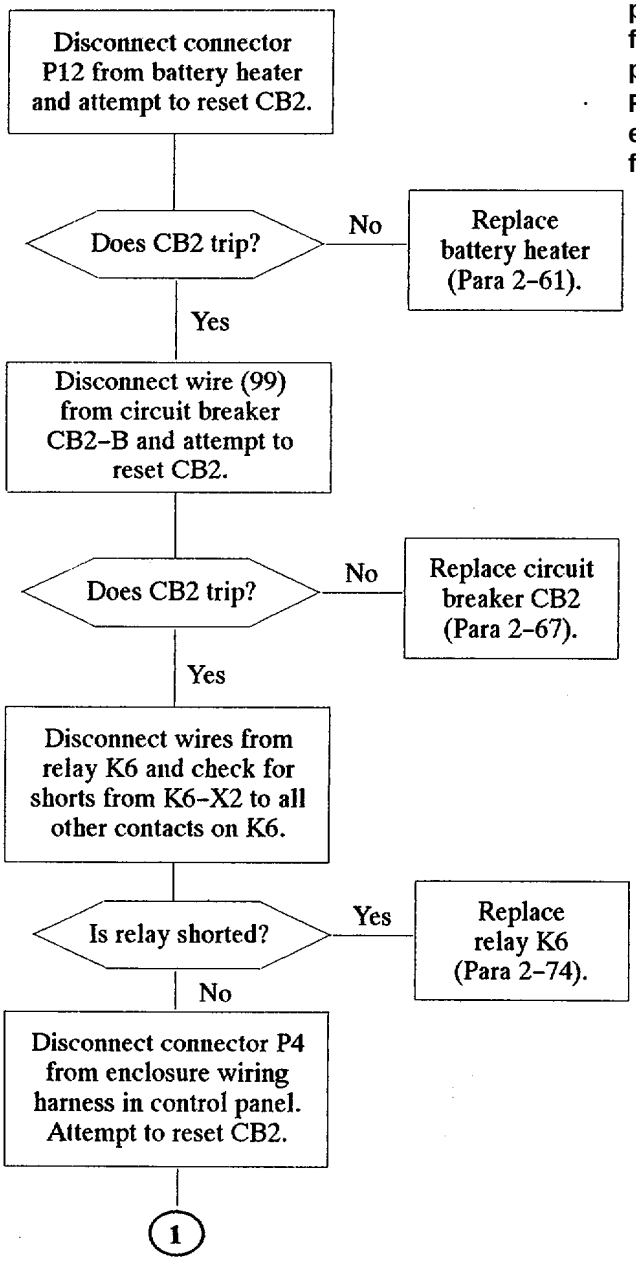
2-10. TROUBLESHOOTING PROCEDURES - continued

24. BATTERY HEATER CIRCUIT BREAKER (CB2) KEEPS TRIPPING.

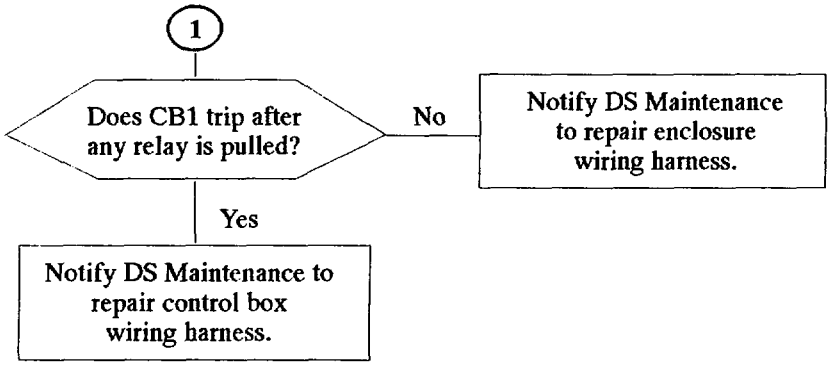
Refer to Figure 2-24, except where otherwise indicated and proceed as follows:

WARNINGS

- **To prevent ignition of fuel from possible spark, move unit away from fuel whenever tests are performed with power ON.**
- **Remove jewelry (rings, bracelets, etc.) to prevent possible burns from short circuits.**



2-10. TROUBLESHOOTING PROCEDURES - continued.



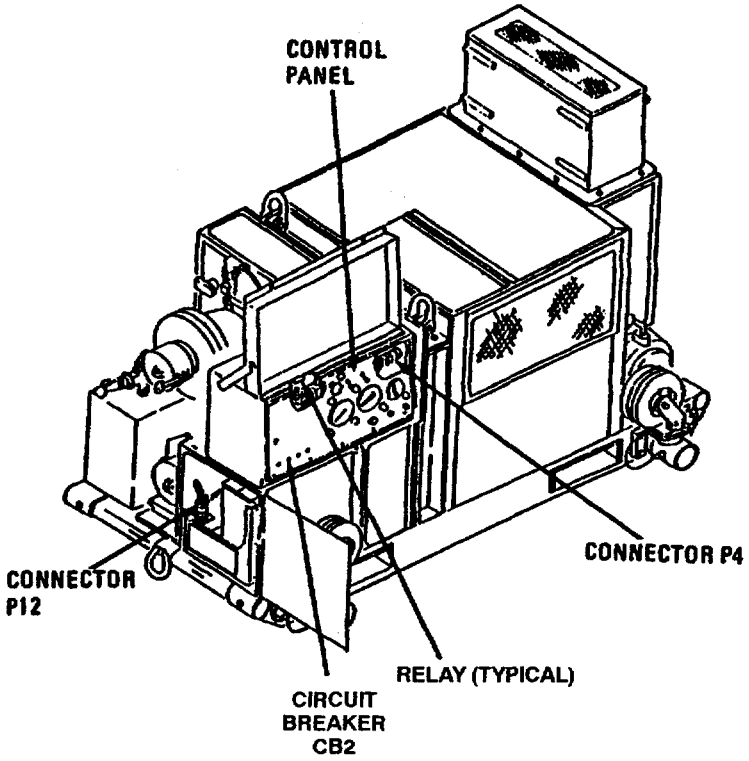


Figure 2-24. Battery Heater Circuit Breaker (CB2) Keeps Tripping.

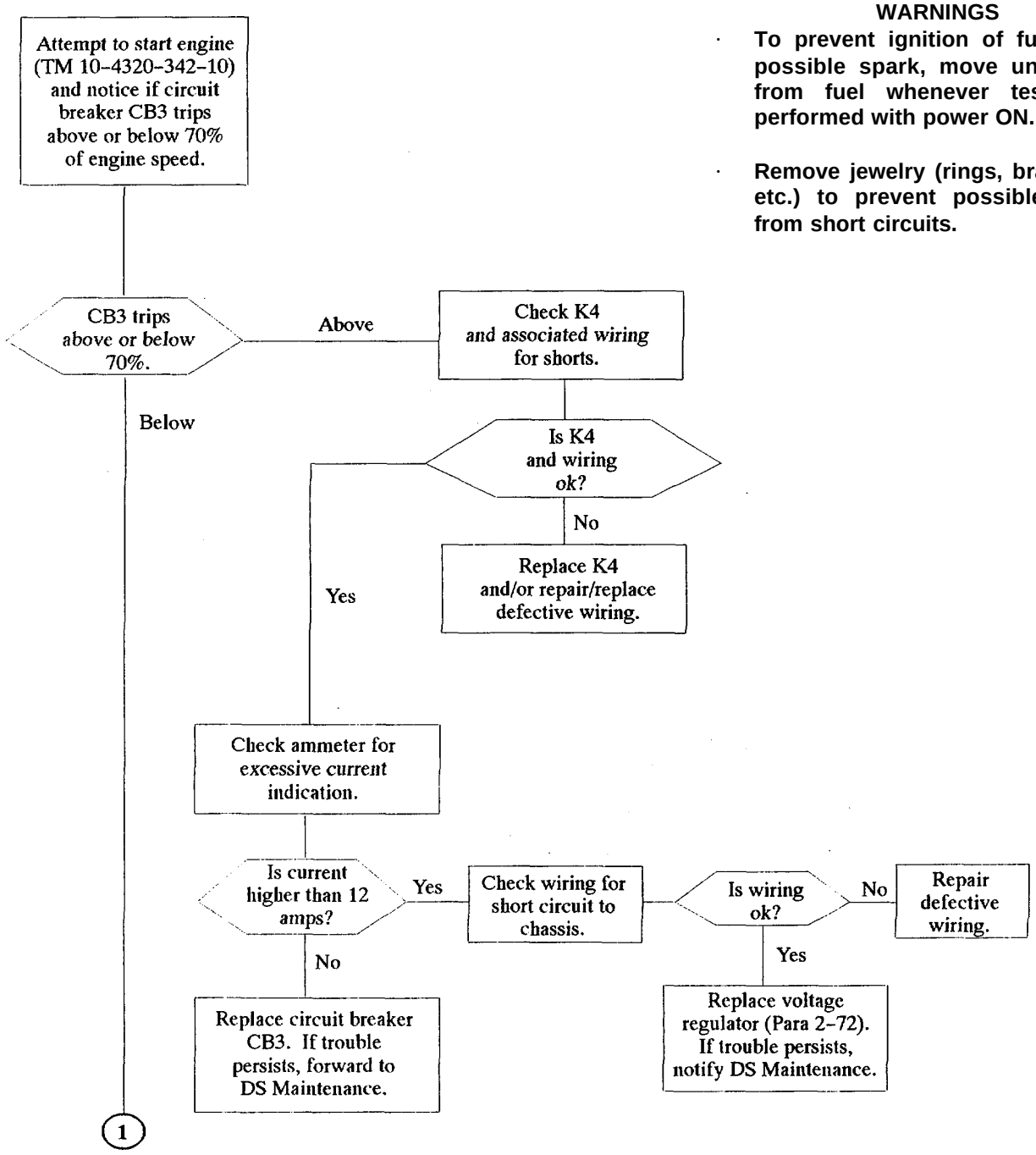
2-10. TROUBLESHOOTING PROCEDURES - continued.

25. CB3 KEEPS TRIPPING.

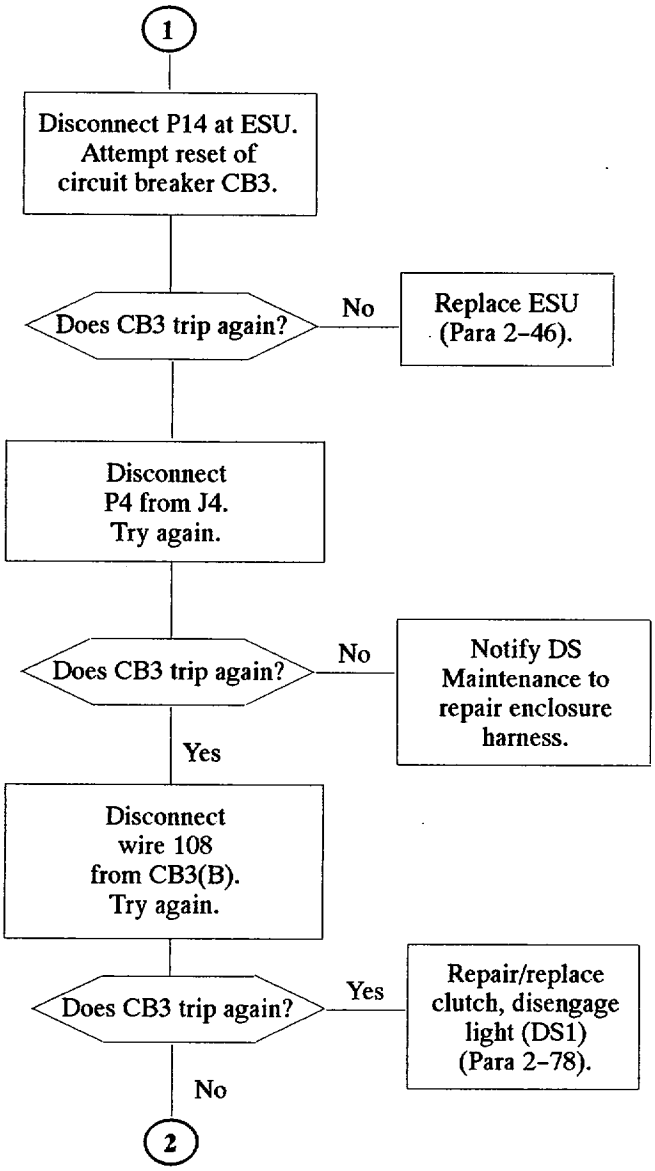
Refer to Figure 2-25, except where otherwise indicated and proceed as follows:

WARNINGS

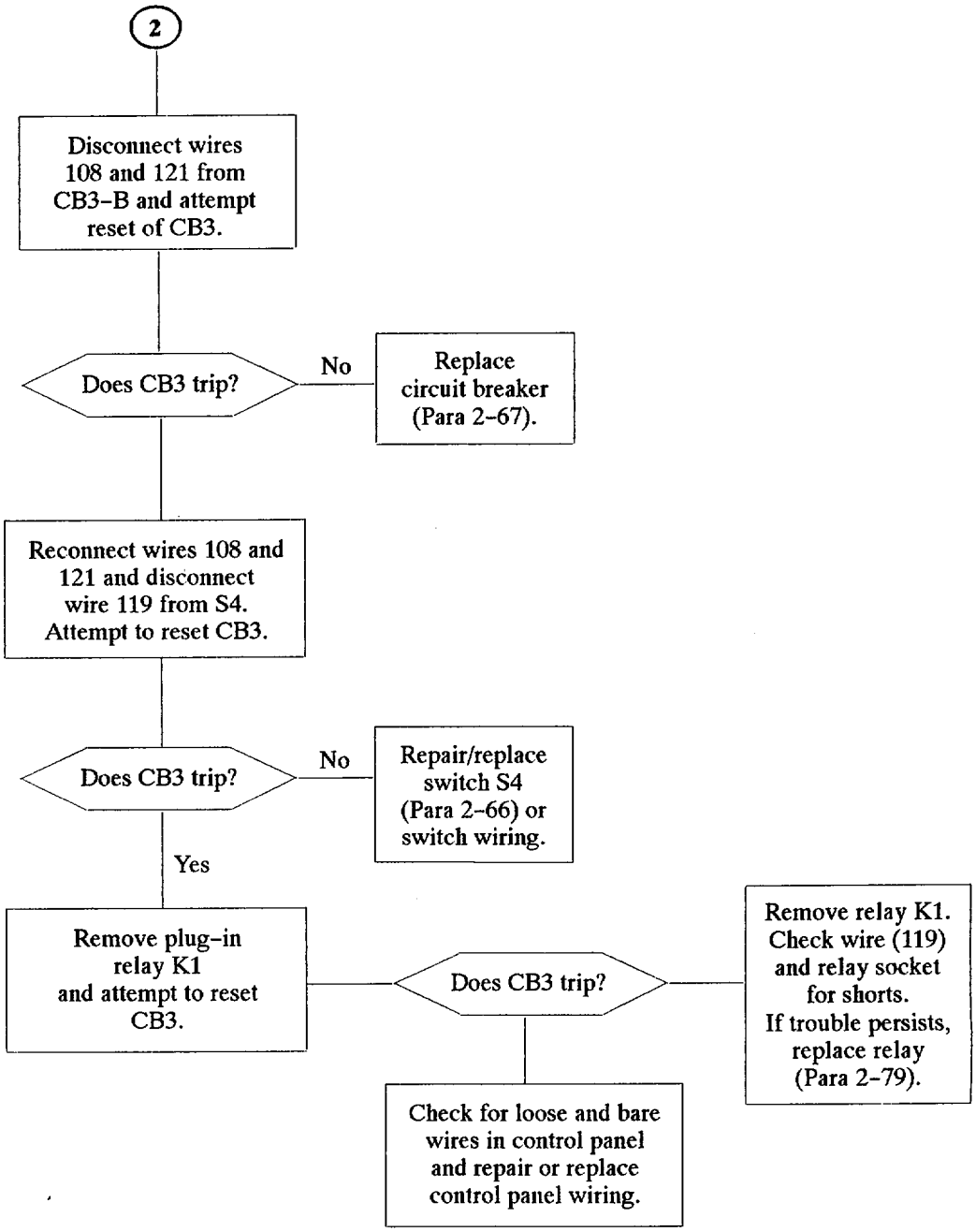
- **To prevent ignition of fuel from possible spark, move unit away from fuel whenever tests are performed with power ON.**
- **Remove jewelry (rings, bracelets, etc.) to prevent possible burns from short circuits.**



2-10. TROUBLESHOOTING PROCEDURES - continued.



2-10. TROUBLESHOOTING PROCEDURES - continued.



2-10. TROUBLESHOOTING PROCEDURES - continued.

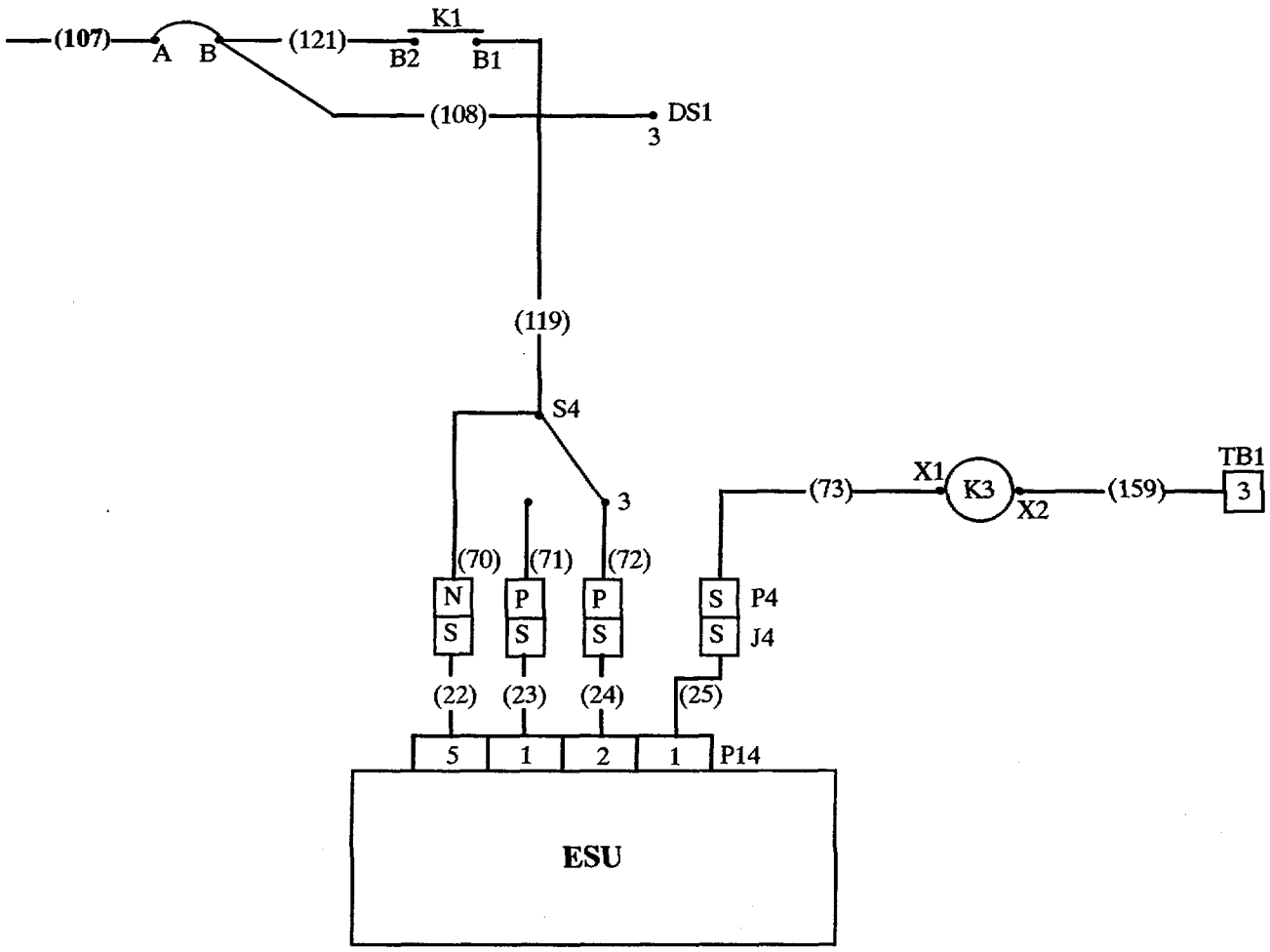


Figure 2-25. CB3 Keeps Tripping.

2-10. TROUBLESHOOTING PROCEDURES - continued.

26. GENERATOR CIRCUIT BREAKER (CB4) KEEPS TRIPPING.

Refer to Figure 2-26, except where otherwise indicated and proceed as follows:

WARNINGS

- **To prevent ignition of fuel from possible spark, move unit away from fuel whenever tests are performed with power ON.**
- **Remove jewelry (rings, bracelets, etc.) to prevent possible burns from short circuits.**

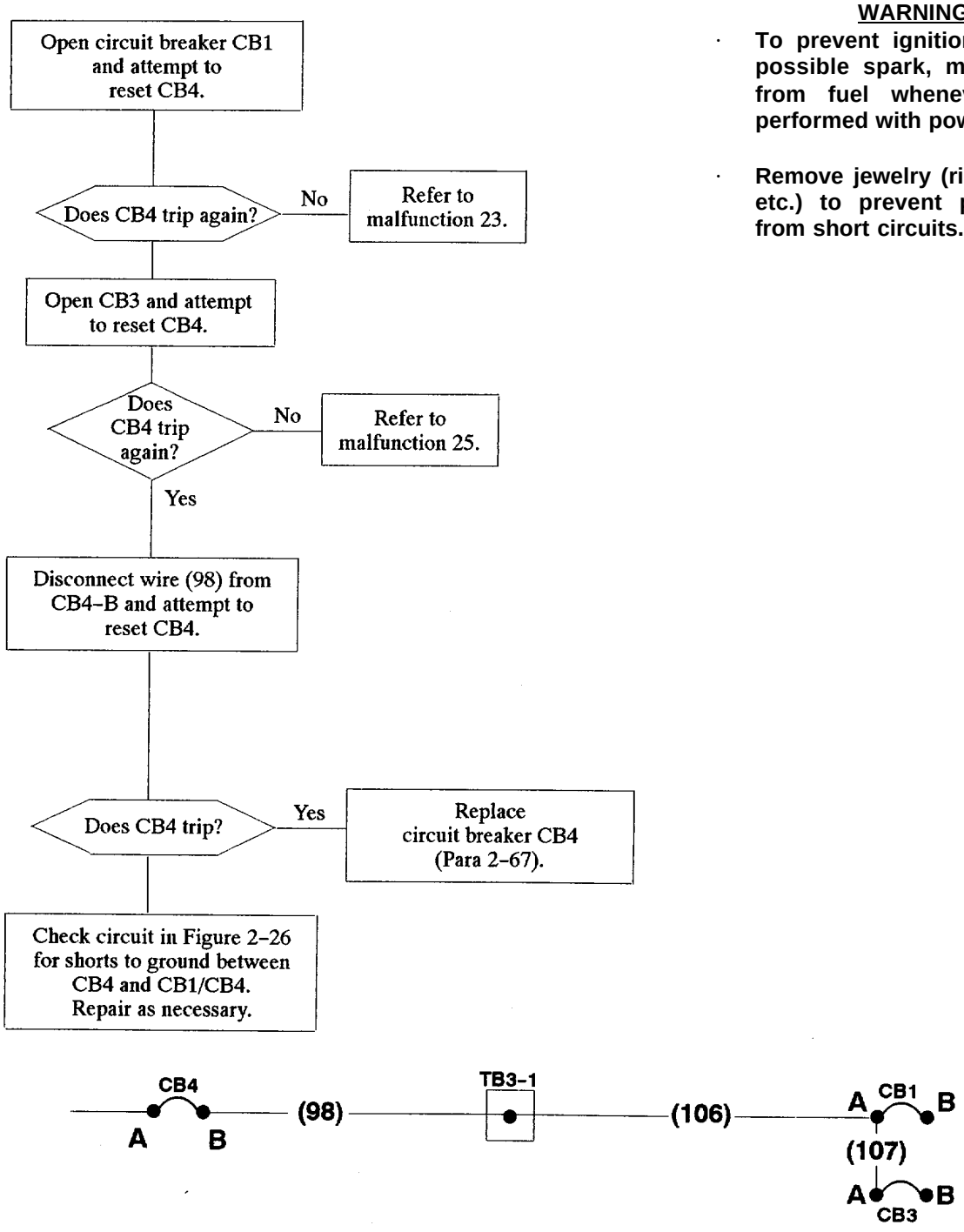


Figure 2-26. Generator Circuit Breaker (CB4) Keeps Tripping.

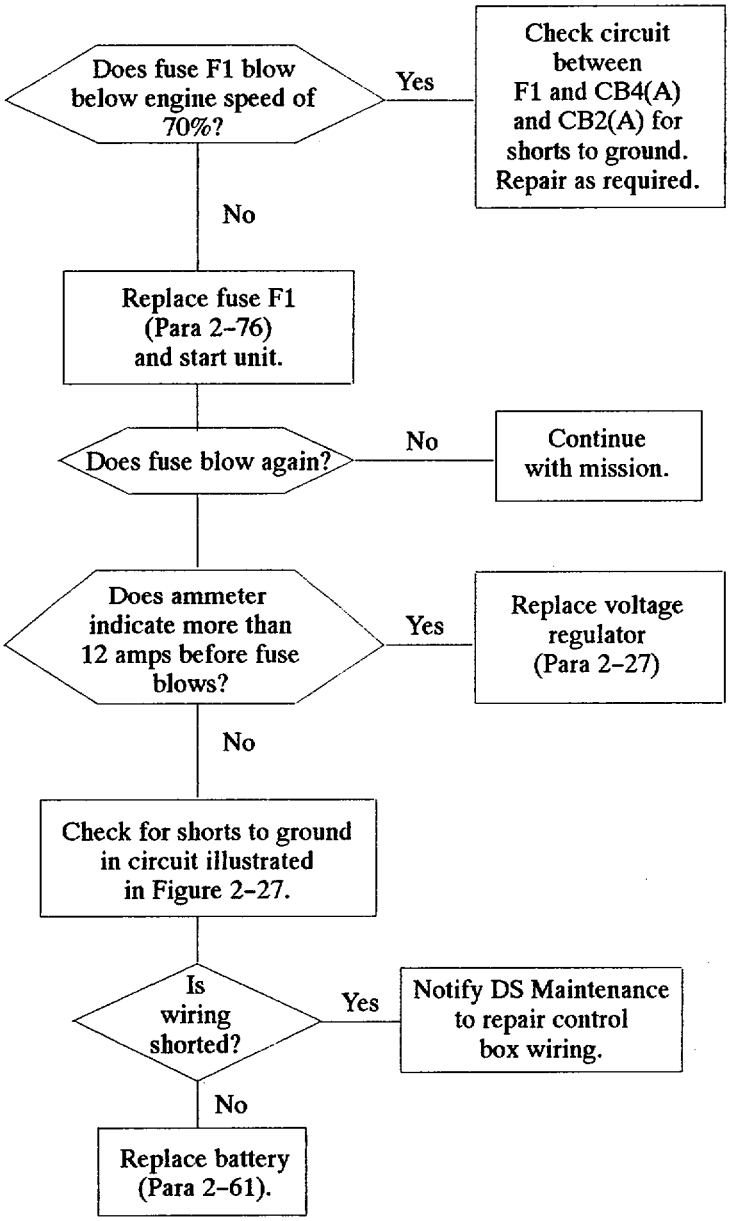
2-10. TROUBLESHOOTING PROCEDURES - continued.

27. FUSE BLOWS (Opens) REPEATEDLY.

Refer to Figure 2-27, except where otherwise indicated and proceed as follows:

WARNINGS

- **To prevent ignition of fuel from possible spark, move unit away from fuel whenever tests are performed with power ON.**
- **Remove jewelry (rings, bracelets, etc.) to prevent possible burns from short circuits.**



2-10. TROUBLESHOOTING PROCEDURES -continued.

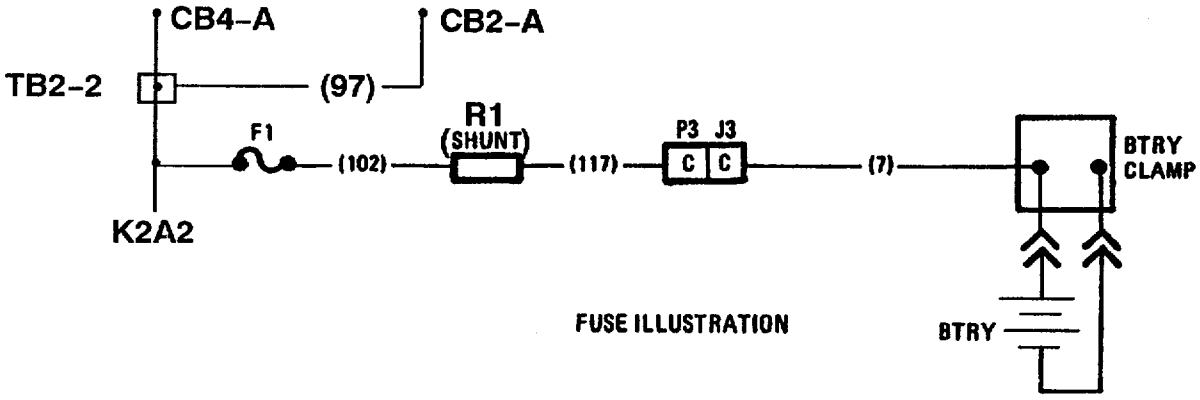


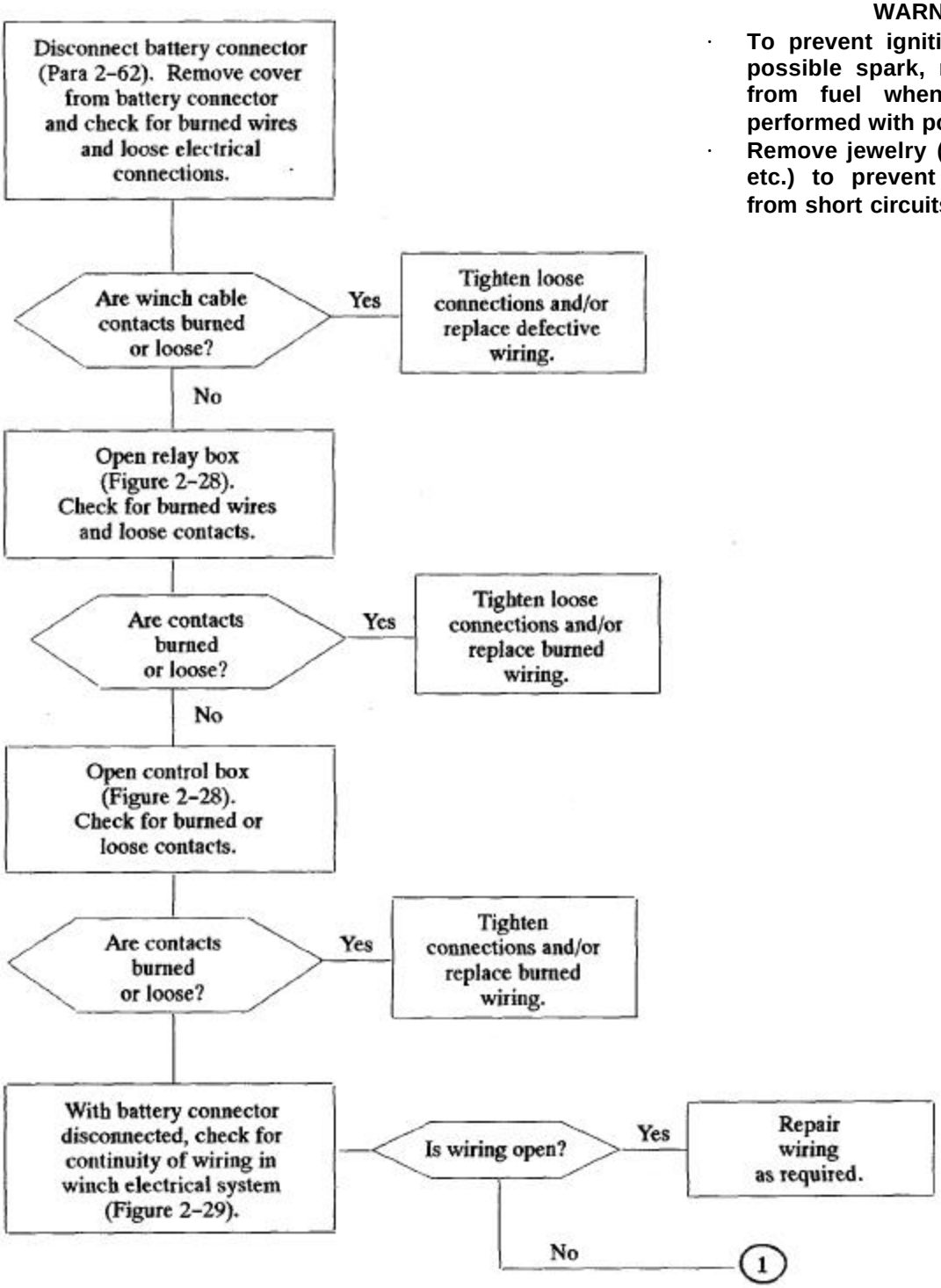
Figure 2-27. Fuse Blows (Opens) Repeatedly.

2-10. TROUBLESHOOTING PROCEDURES - continued.

28. WINCH INOPERABLE.

WARNINGS

- **To prevent ignition of fuel from possible spark, move unit away from fuel whenever tests are performed with power ON.**
- **Remove jewelry (rings, bracelets, etc.) to prevent possible burns from short circuits.**



2-10. TROUBLESHOOTING PROCEDURES - continued.

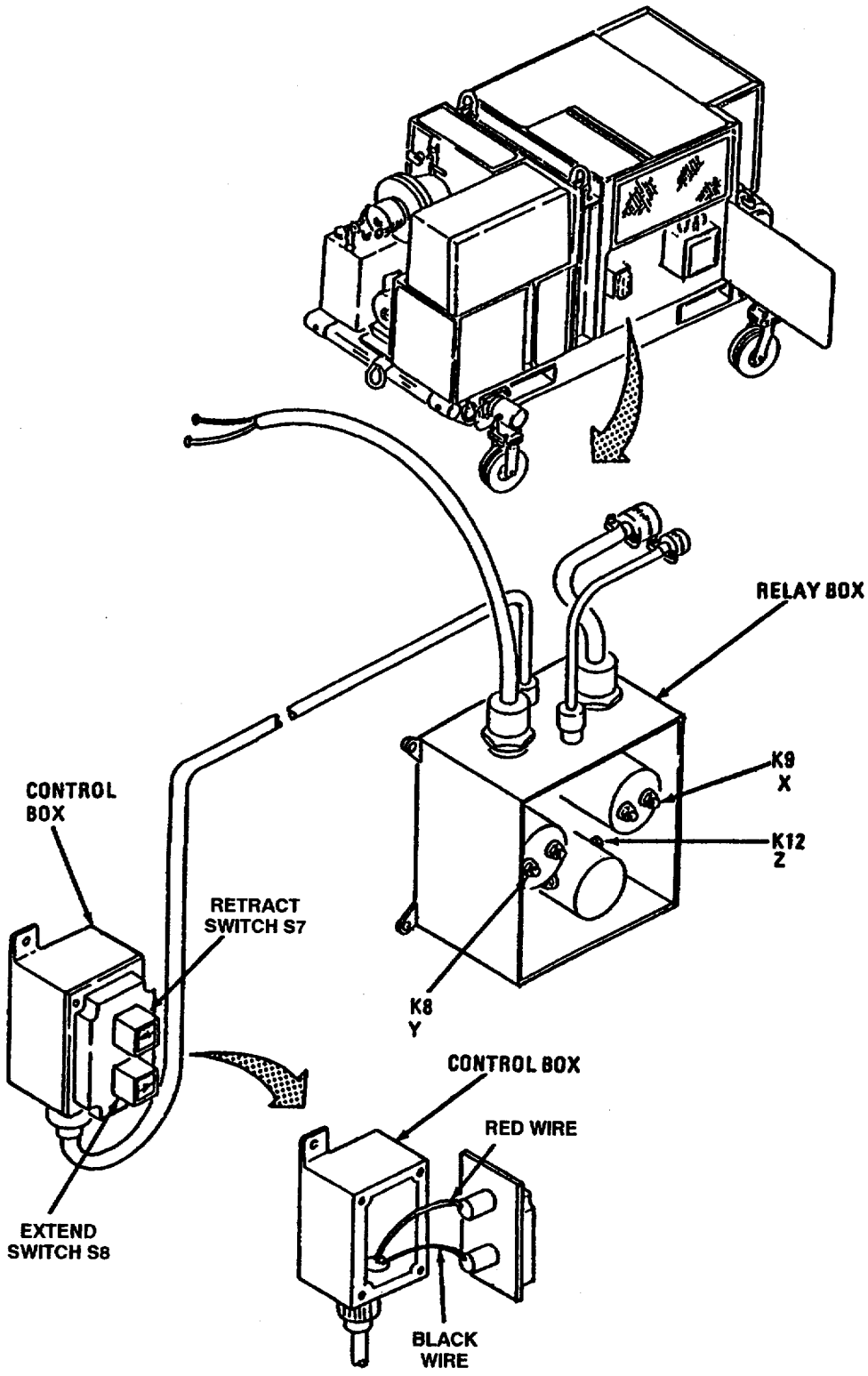
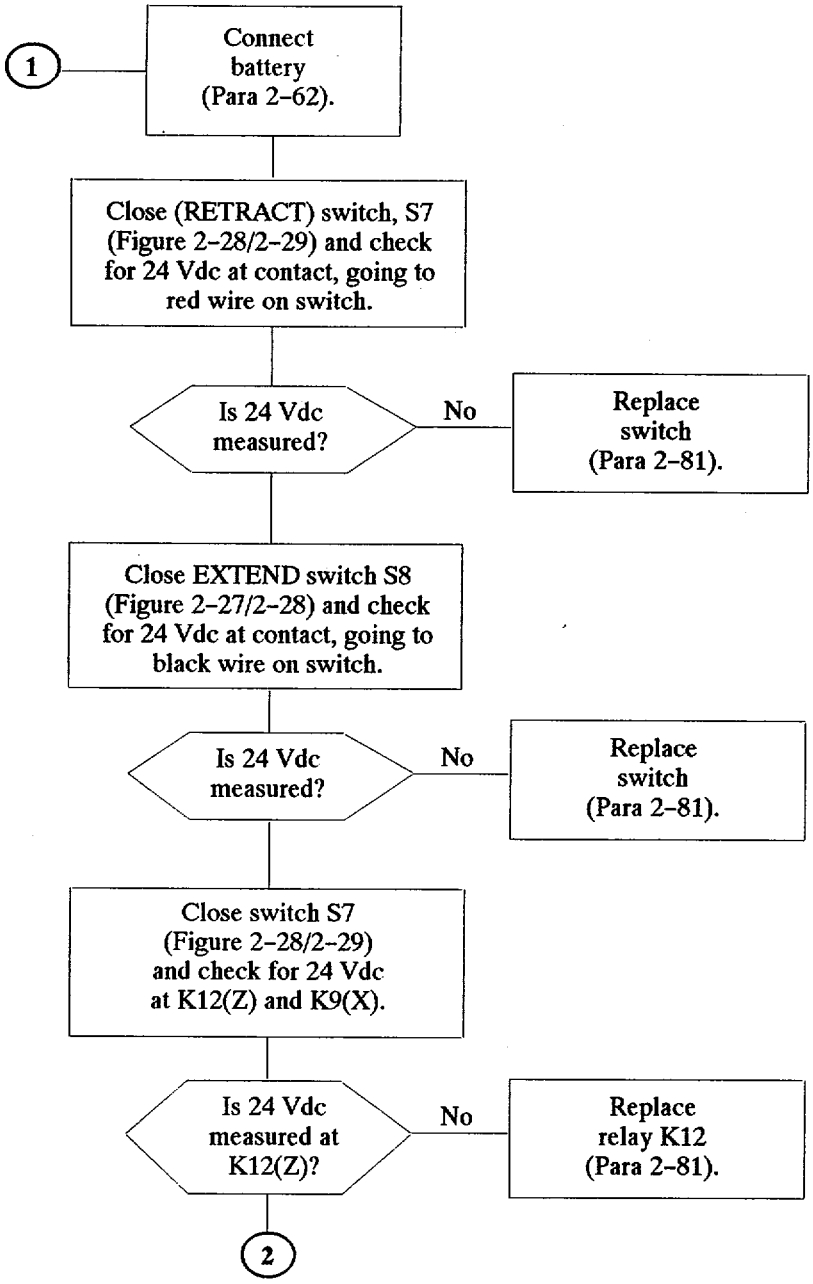


Figure 2-28. Winch Control Boxes.

2-10. TROUBLESHOOTING PROCEDURES - continued.



2-10. TROUBLESHOOTING PROCEDURES - continued.

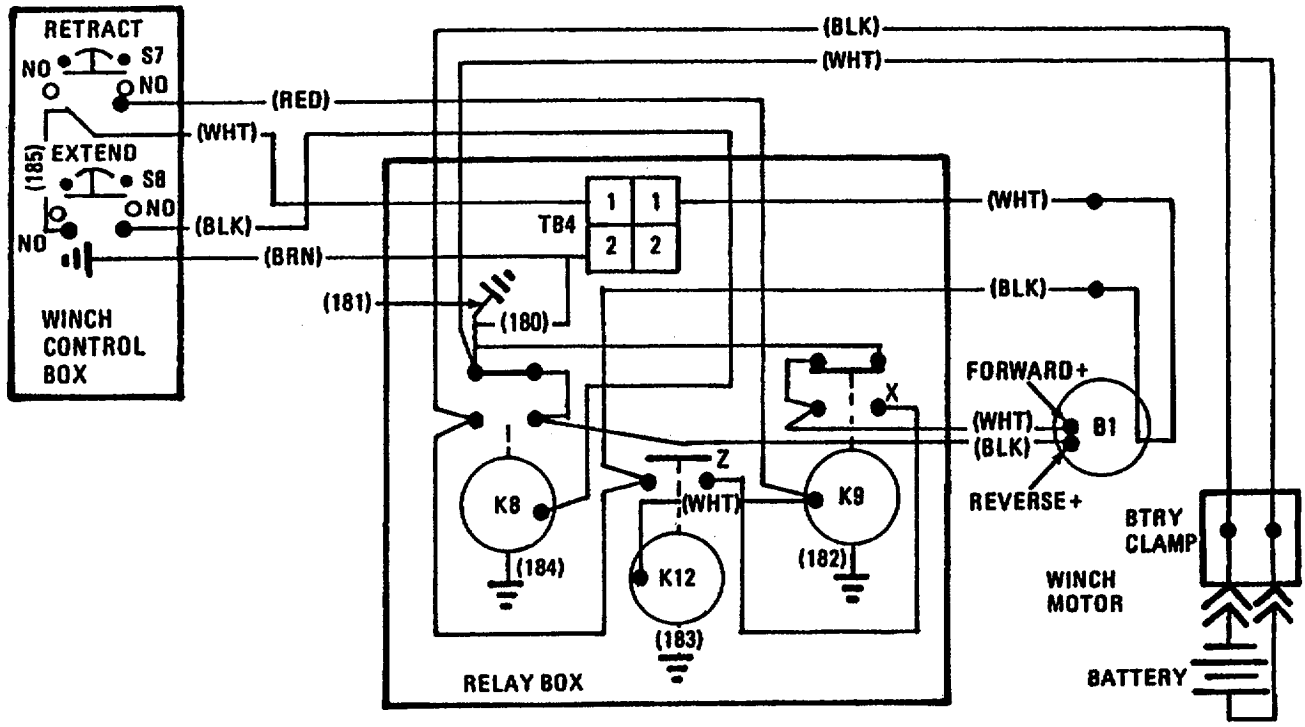
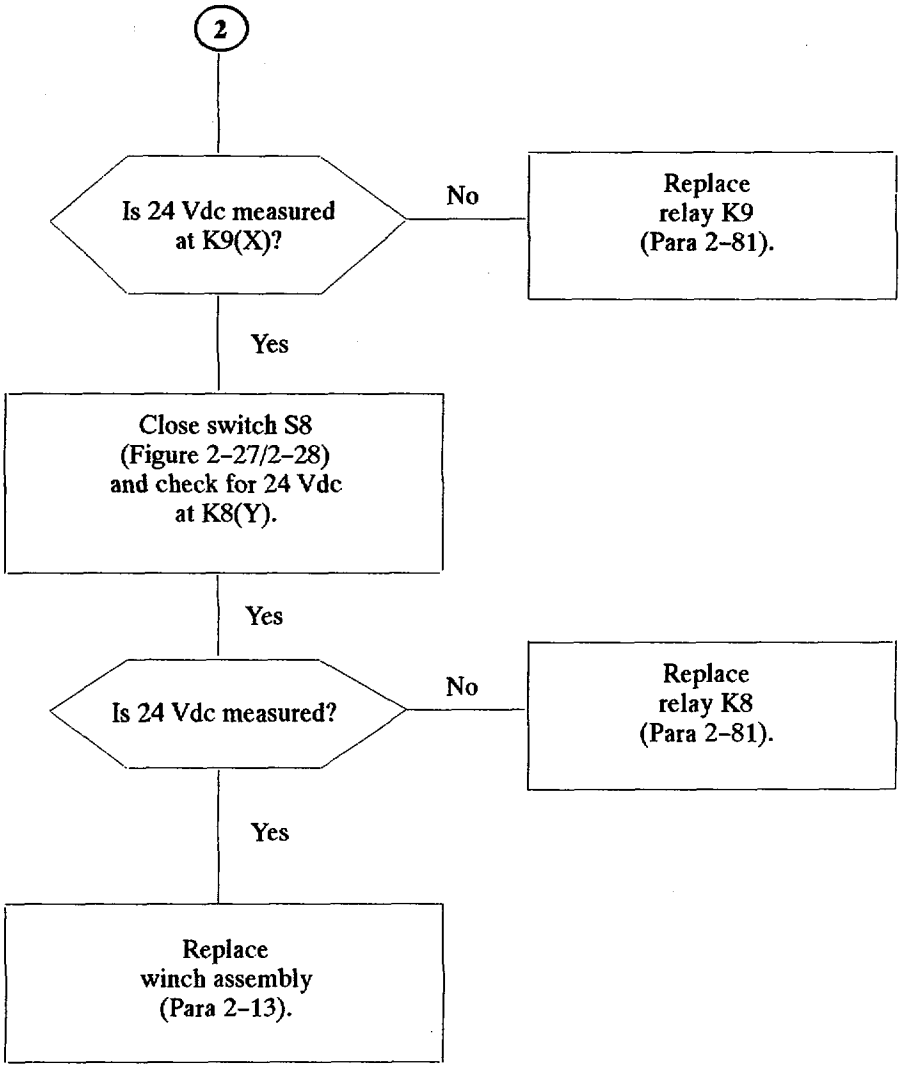


Figure 2-29. Winch Electrical System.

2-10. TROUBLESHOOTING PROCEDURES - continued.



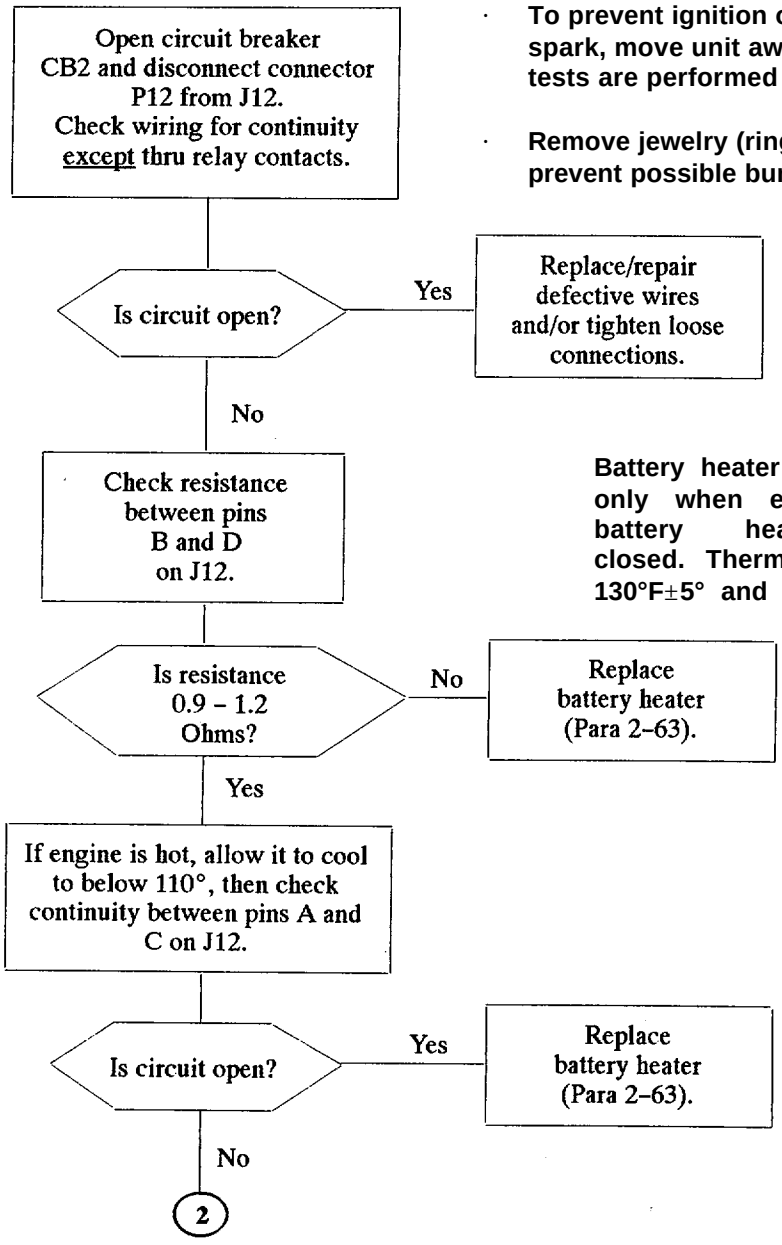
2-10. TROUBLESHOOTING PROCEDURES - continued.

29. BATTERY HEATER INOPERABLE WHEN BATTERY IS COLD.

Refer to Figure 2-30 and proceed as follows:

WARNINGS

- **To prevent ignition of fuel from possible spark, move unit away from fuel whenever tests are performed with power ON.**
- **Remove jewelry (rings, bracelets, etc.) to prevent possible burns from short circuits.**



NOTE

Battery heater is designed to operate only when engine is running and battery heater thermostat is closed. Thermostat cuts out (opens) at 130°F±5° and closes at 115°F± 5°F.

2-10. TROUBLESHOOTING PROCEDURES - continued.

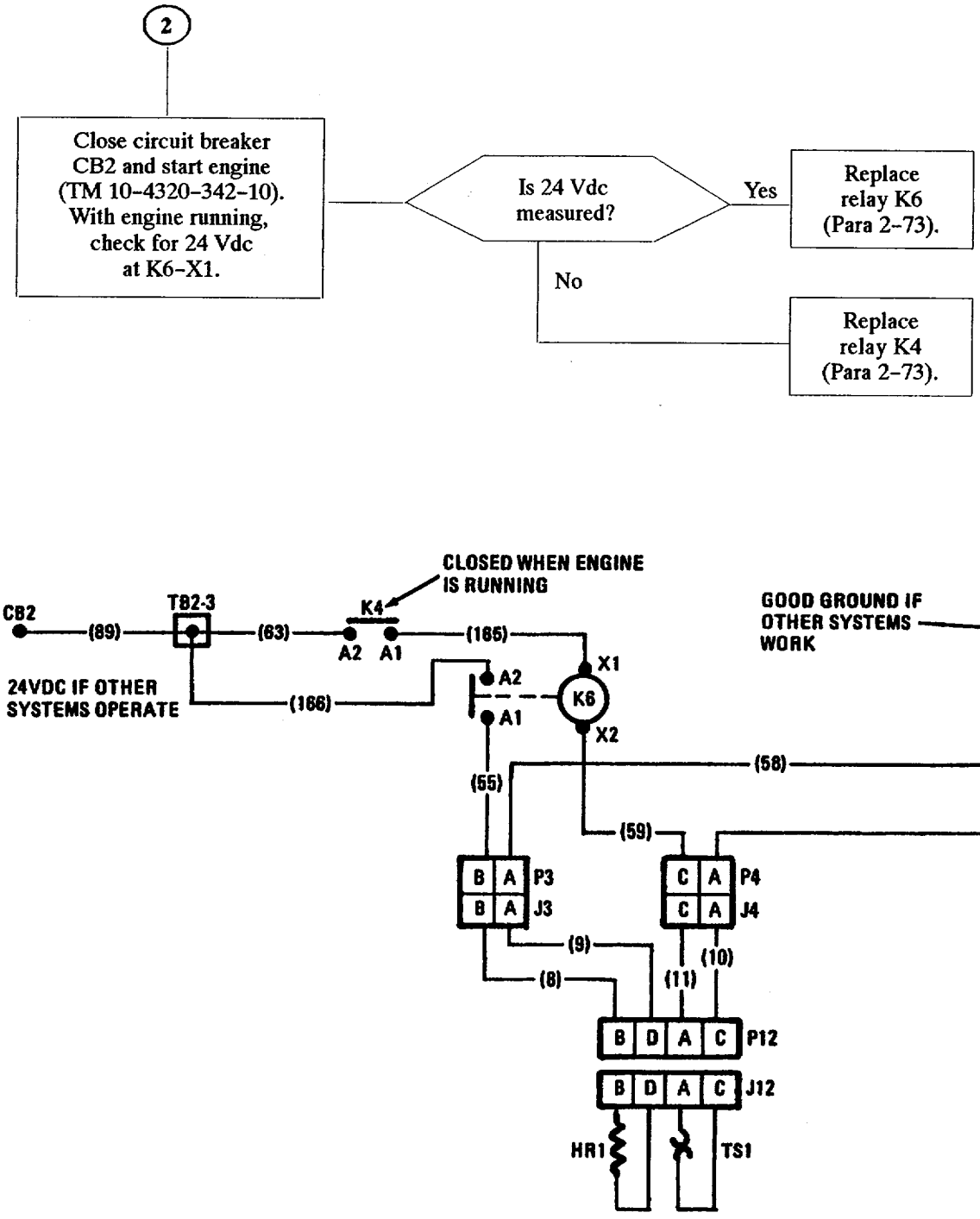


Figure 2-30. Battery Heater Inoperable When Battery is Cold.

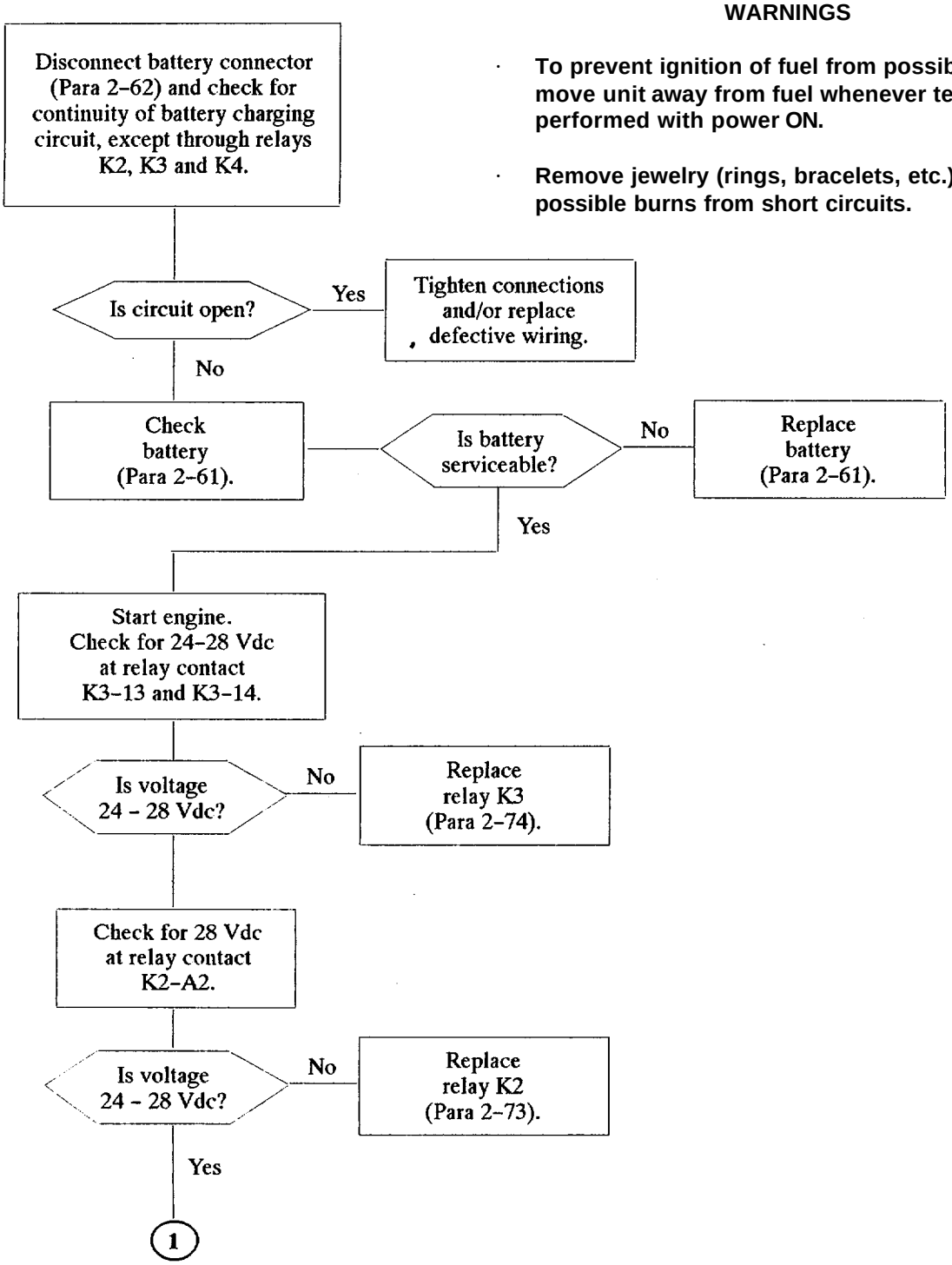
2-10. TROUBLESHOOTING PROCEDURES - continued.

30. AMMETER INDICATES BATTERY IS DISCHARGING (RED BAND) WHEN ENGINE IS RUNNING.

Refer to Figure 2-31, except where otherwise indicated and proceed as follows:

WARNINGS

- **To prevent ignition of fuel from possible spark, move unit away from fuel whenever tests are performed with power ON.**
- **Remove jewelry (rings, bracelets, etc.) to prevent possible burns from short circuits.**



2-10. TROUBLESHOOTING PROCEDURES - continued.

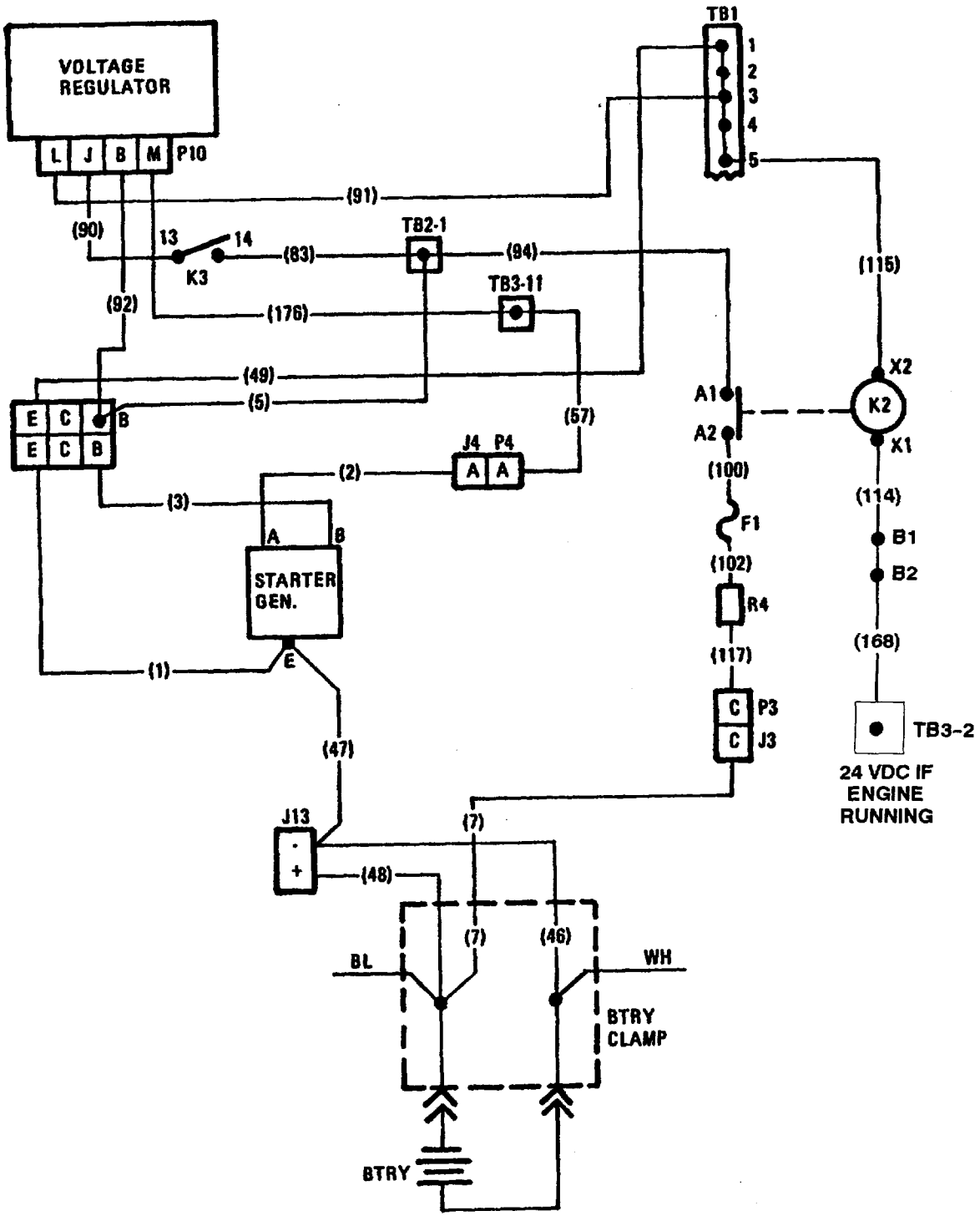
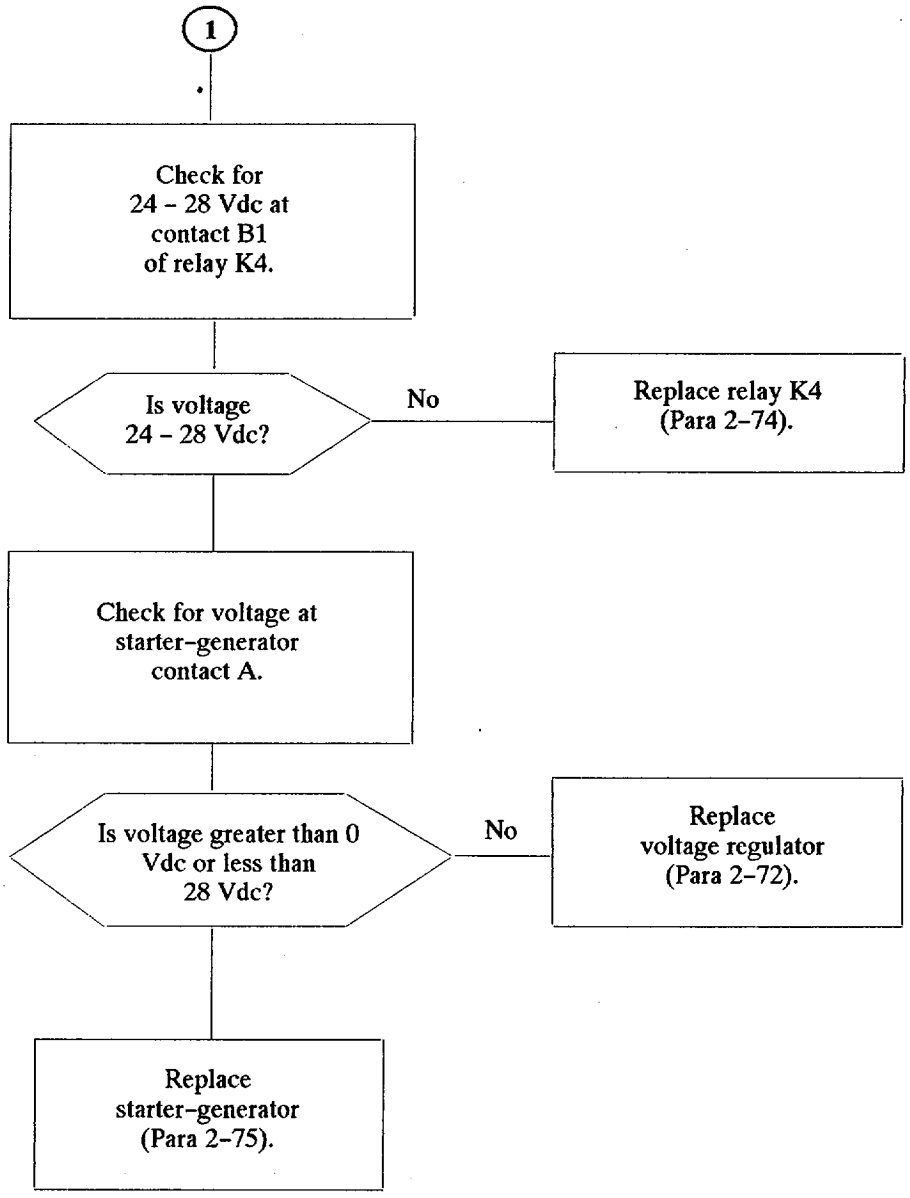


Figure 2-31. Ammeter Indicates Battery Is Discharging (Red Band).

2-10. TROUBLESHOOTING PROCEDURES - continued.



2-10. TROUBLESHOOTING PROCEDURES - continued.

31. BATTERY HEATER ON WHEN NO HEATING IS REQUIRED.

NOTE

Battery heater is designed to operate only when battery heater temperature is below 130°F.

Replace battery heater (Para 2-61) if this malfunction occurs.

32. BATTERY INDICATOR (AMMETER) DOES NOT WORK (System Functions Normally).

Replace ammeter (Para 2-61) if this malfunction occurs.

33. SUCTION / DISCHARGE GAGE INOPERABLE (System Is Operational).

Check for clogged/leaking hoses between pump suction/discharge ports and gages. If hoses are serviceable, replace defective gage (Para 2-69).

2-10. TROUBLESHOOTING PROCEDURES - continued.

34. UNABLE TO CHANGE INTENSITY OF ILLUMINATION LIGHTS.

Replace light switch S5 if this malfunction occurs.

35. PUMP ASSEMBLY CONTINUES TO PRIME AFTER STARTUP.

NOTE

If this malfunction occurs, fuel/air mixture will continue to blow out of vent at top of purge tank, unless and until manual priming valve is closed.

Close manual priming valve(TM 10-4320-342-10).

When mission is completed, replace pressure switch (Para 2-33).

Section VI. UNIT MAINTENANCE PROCEDURES

2-11. GENERAL.

The procedures in this section have been arranged in order in which the items appear in the Unit (O) Maintenance level column on the Maintenance Allocation Chart (MAC) which is provided in Appendix B.

2-12. MUFFLER EXTENSION REPAIR.

This task covers: a. Removal b. Disassembly c. Repair d. Assembly e. Installation

INITIAL SETUP

Tools	Equipment Condition
General Mechanics Tool Kit (App B, Sect III, Item 1)	200/600 GPM Pump shut down (Para 2-7c), TM 10-4320-342-10)

a. REMOVAL. Refer to Figure 2-32.

WARNING

Exhaust extension must be cool before removing or serious injury may result to personnel.

Unlock ten turn-lock fasteners (1) and remove exhaust extension (2) from 200/600 GPM Pump (3).

b. DISASSEMBLY.

NOTE

All turn-lock fasteners are identical, this procedure is for one of them.

(1) Remove retainer (4) from turn-lock fastener (1).

(2) Remove turn-lock fastener (1) and sealing washer (5) from exhaust extension (2).

c. REPAIR.

(1) Clean and inspect all components.

(2) Replace defective components.

2-12. MUFFLER EXTENSION REPAIR - continued.

d. ASSEMBLY.

(1) Install sealing washer (5), turn-lock fastener (1) on exhaust extension (2).

(2) Install retainer (4) on turn-lock fastener (1).

e. INSTALLATION.

(1) Position exhaust extension (2) on 200/600 GPM Pump (3).

(2) Lock ten turn-lock fasteners (1).

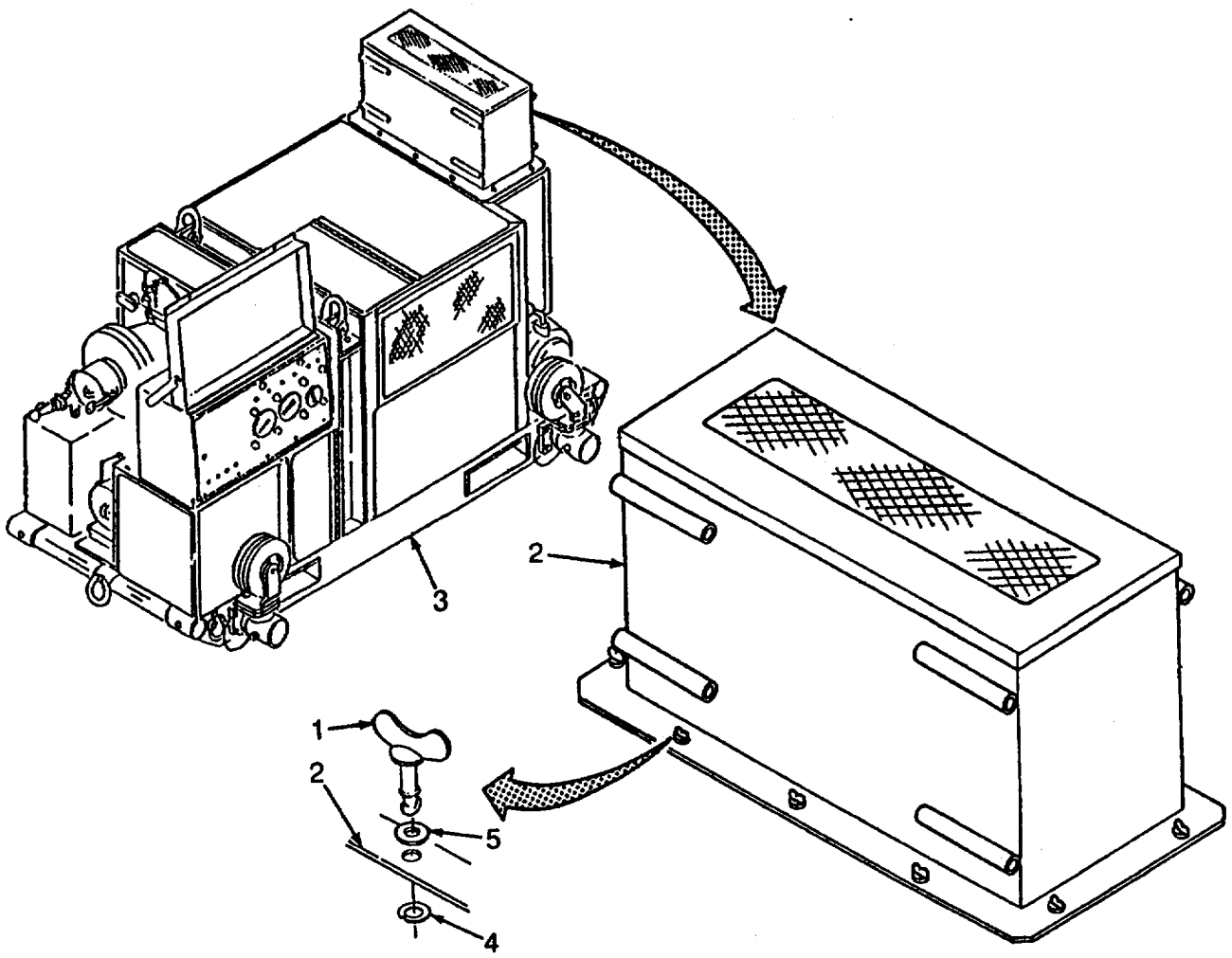


Figure 2-32. Muffler Extension Repair

2-13. WINCH AND CABLES REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Material/Parts
Lockwashers (App F, Item 37)
Straps (App E, Item 17)
Splices (App F, Item 42)
Insulation Sleevings (App F, Item 43 and 54)
Tags (App E, Item 16)

Equipment Condition
Battery disconnected (Para 2-7c, TM 10-4320-342-10)

General Safety Instructions

WARNING

Do not lift more than 50 pounds by yourself and bend legs while lifting. Lifting heavy equipment incorrectly can cause serious injury to personnel.

a. REMOVAL. Refer to Figure 2-33.

NOTE

There are four nuts on the Winch Control Handle side used to secure the winch to the 200/600 GPM Pump.

(1) Remove eight bolts (1), flatwashers (2), and lockwashers (3) and nuts (4). Discard lockwashers.

WARNING

Do not lift more than 50 pounds by yourself and bend legs while lifting. Lifting heavy equipment incorrectly can cause serious injury to personnel.

(2) Remove winch (5).

(3) Cut tie wraps (6) on cables (7 and 8).

(4) Remove insulation sleevings (9 and 10) from cables (7 and 8).

(5) Tag electrical wiring.

(6) Disconnect cables (7 and 8) from 200/600 GPM Pump (11) by cutting splice connector (12) and/or removing nuts (13) and bolts (14).

b. INSTALLATION.

WARNING

Do not lift more than 50 pounds by yourself and bend legs while lifting. Lifting heavy equipment incorrectly can cause serious injury to personnel.

2-13. WINCH AND CABLES REPLACEMENT - continued.

(1) Install winch (5) with cables (7 and 8) on 200/600 GPM Pump (11).

(2) Secure winch (5) on 200/600 GPM Pump (11) with eight bolts (1), flatwashers (2), lockwashers (3) and nuts (4).

(3) Install insulation sleevings (9 and 10) on cables (7 and 8).

(4) Install splice connectors (12) on cable (7) and slide insulation sleeving (9) over splice connectors and shrink.

(5) Install nuts (13) and bolts (14) on cable (8).

(6) Install insulation sleevings (9 and 10) over nuts (13) and bolts (14) and shrink.

(7) Connect ends of cables (7 and 8) to 200/600 GPM Pump (11).

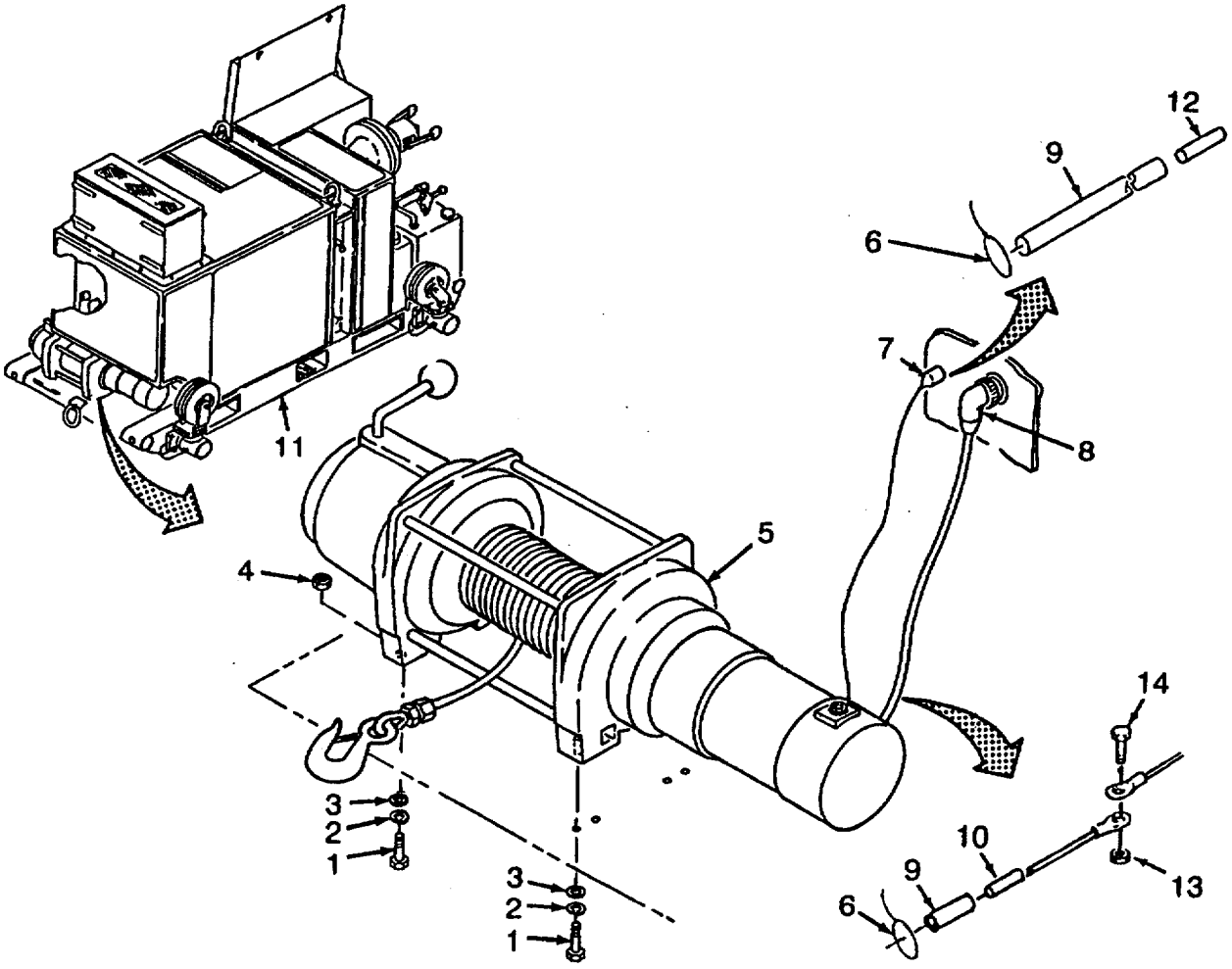


Figure 2-33. Winch and Cables Replacement

2-14. WINCH WIRE ROPE REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
Battery disconnected (Para 2-7c, TM 10-4320-342-10)

General Safety Instructions

WARNING

Do not lift more than 50 pounds by yourself and bend legs while lifting. Lifting heavy equipment incorrectly can cause serious injury to personnel.

WARNING

Always wear heavy leather gloves when handling wire rope to prevent injury to personnel.

a. REMOVAL. Refer to Figure 2-34.

(1) Lift up lock (1) and turn winch control handle (2) to free-wheeling position.

(2) Grasp eye hook (3) and unwind all wire rope (4) from drum (5).

(3) Loosen setscrew (6) and remove wire rope from drum (5).

b. INSTALLATION.

(1) Install clamp nut (7) and half clamp (8) on wire rope (4).

(2) Install thimble (9) on eye hook (3).

(3) Insert end of wire rope (4) through eye hook (3) and wrap around thimble (9) and thread end of wire rope (4) through half clamp (8) and clamp nut (7).

NOTE

End of wire rope should be flush with clamp nut when installed on half clamp.

(4) Pull wire rope (4) tight and screw clamp nut (7) onto half clamp (8).

(5) Rotate drum (5) until hole for cable is located at top and setscrew (6) is centered and facing towards guide bars A and B.

2-14. WINCH WIRE ROPE REPLACEMENT - continued.

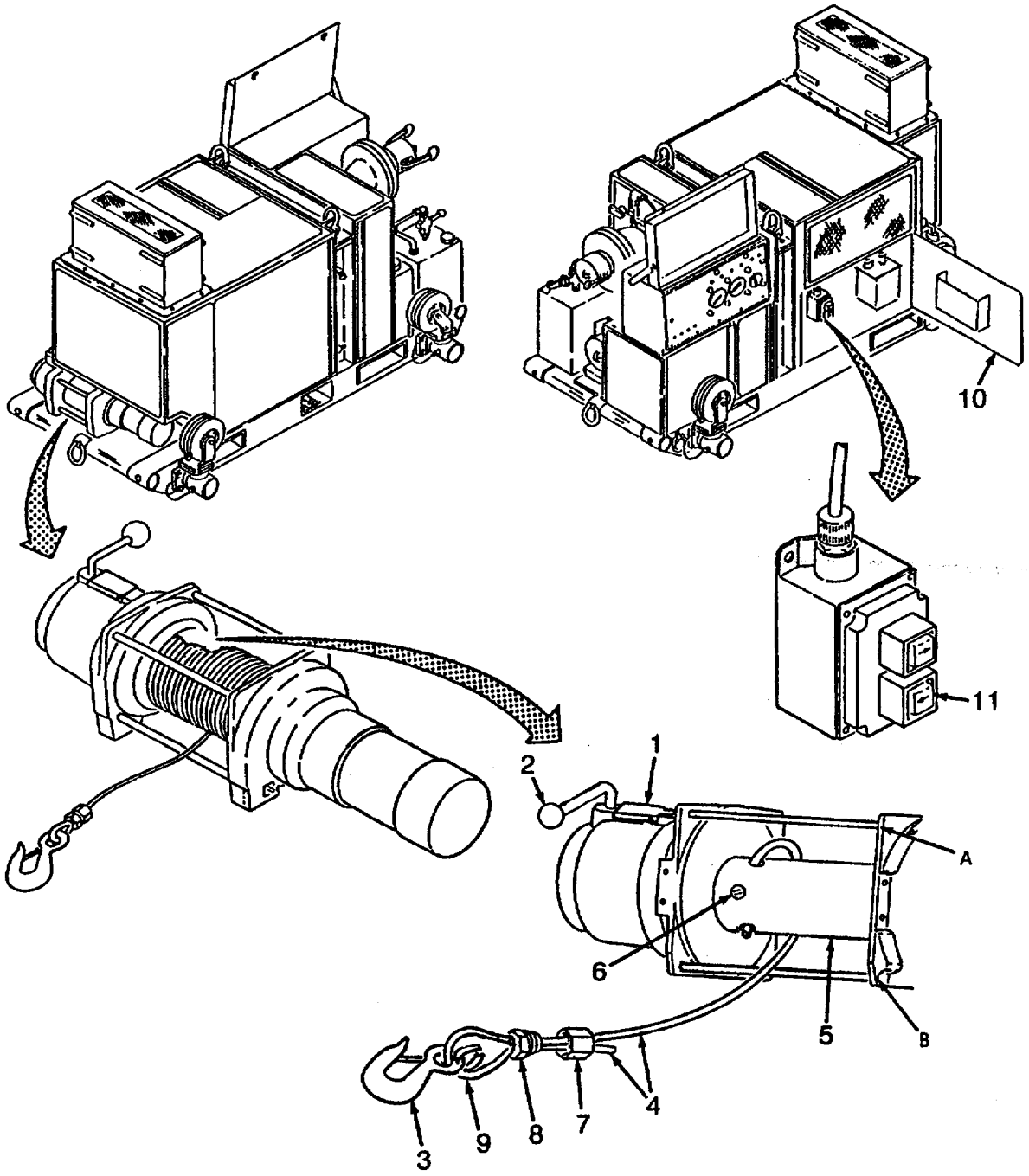


Figure 2-34. Winch Wire Rope Replacement

2-14. WINCH WIRE ROPE REPLACEMENT - continued.

CAUTION

The wire rope must be spooled on the drum according to direction of rotation label on winch or the brake will not function.

(6) Install opposite end of wire rope (4) between guide bars A and B, wrap wire rope (4) under and around drum (5).

(7) Push end of wire rope (4) in top hole on drum (5) until end of wire rope (4) is flush with hole on bottom of drum (5).

NOTE

The setscrew which attaches the wire rope to the drum is not designed to hold rated loads. Keep a minimum of five wraps of wire rope on the drum at all times to achieve rated load.

(8) Tighten setscrew (6) and wrap the wire rope (4) on the drum (5) five times.

(9) Open door panel (10) and remove winch control box (11).

(10) Grasp eye hook (3) and uncoil wire rope (4).

CAUTION

When applying tension to the wire rope, use at least a 500 pound load to prevent the outer wraps from drawing into the inner wraps and damaging the wire rope.

(11) Connect eye hook (3) to a load of at least 500 pounds.

(12) Press retract switch on winch control box (11) and position the wire rope (4) evenly on the drum (5) while retracting wire rope.

(13) Disconnect eye hook (3) from load.

(14) Retract remaining wire rope (4) onto drum (5).

(15) Install winch control box (11) in door panel (10).

(16) Close door panel (10).

2-15. DRAIN TANK AND TUBES REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Material/Parts
Tape, Antiseize (App E, Sect II, Item 6)

Equipment Condition
200/600 GPM pump removed from system (Para 2-9, TM 10-4320-342-10)

General Safety Instructions

WARNING

Fuels are toxic and flammable. Avoid contact with skin, eyes and clothes and don't breathe vapors. Do not use near open flame or excessive heat. Death or serious injury to personnel may result.

a. REMOVAL. Refer to Figure 2-35.

(1) Disconnect and remove tubes (1, 2 and 3).

(2) Remove bolts (4), flatwashers (5) and drain tank (6).

NOTE

Note position of valve, elbows and tee prior to removal.

(3) Remove elbow (7) from drain tank (6).

(4) Remove tee (8) from elbow (9).

(5) Remove elbow (9) from valve (10).

(6) Remove valve (10) from swivel adapter (11).

(7) Remove swivel adaptor (11) from drain tank (6).

b. INSTALLATION.

NOTE

Install antiseizing tape (teflon tape) on all male pipe threads and wrap tape in direction of threads. Do not allow tape to extend beyond end of threads.

(1) Install swivel adapter (11) into valve (10).

2-15. DRAIN TANK AND TUBES REPLACEMENT - continued.

(2) Position and install valve (10) and swivel adapter (11) into drain tank (6) as noted during removal.

(3) Install elbow (9) into valve (10).

(4) Position and install tee (8) onto elbow (9) as noted during removal.

(5) Install elbow (7) on drain tank (6).

(6) Position drain tank (6), install bolts (4) and flatwashers (5).

(7) Install tubes (1, 2 and 3).

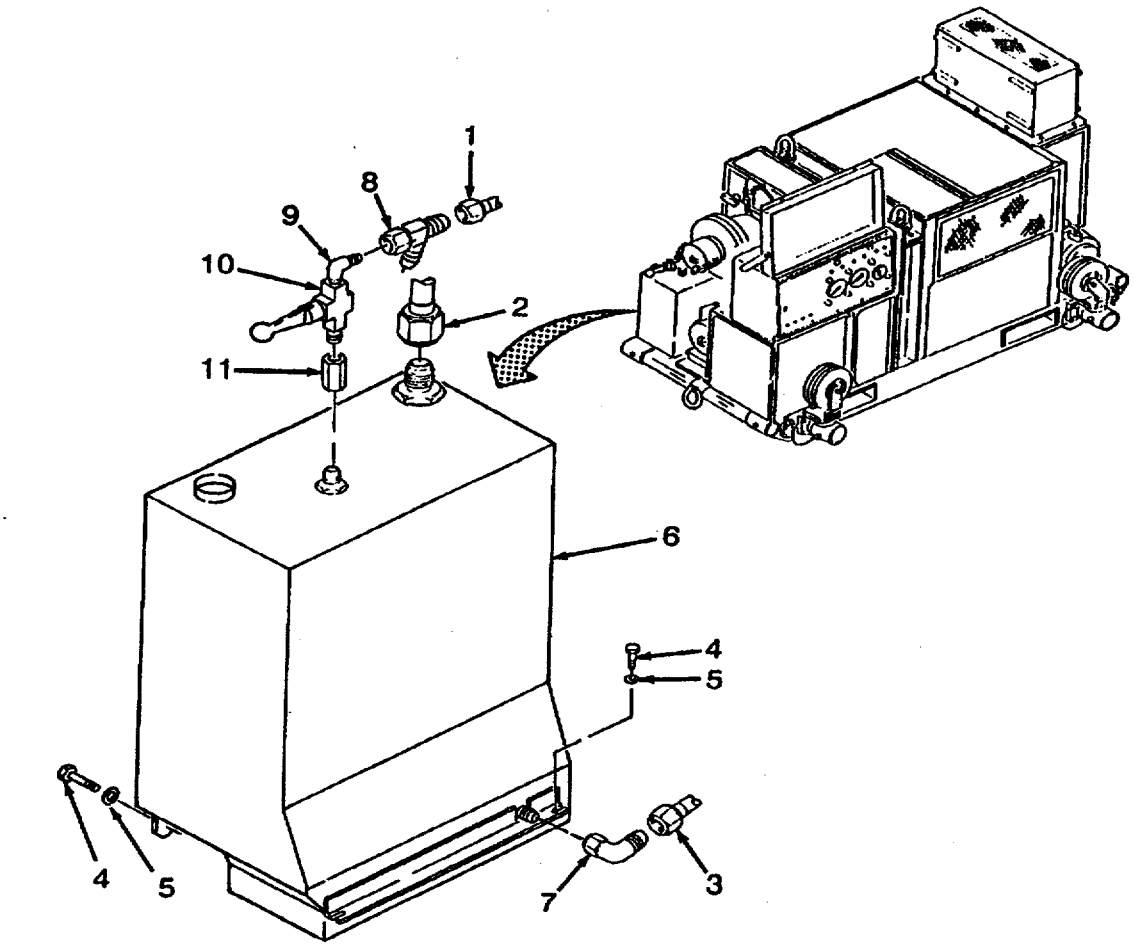


Figure 2-35. Drain Tank and Tubes Replacement

2-16. OIL RESERVOIR AND TUBES REPAIR.

This task covers: a. Removal b. Repair c. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Material/Parts
Antiseize Tape (App E, Item 6)

Equipment Condition
Drain Tank Removed (Para 2-15)
Oil drained from Reservoir (Note 3b, LO 10-4320-342-12)

a. REMOVAL. Refer to Figure 2-36.

(1) Disconnect and remove tubes (1, 2 and 3).
(2) Remove bolts (4), flatwashers (5), one nut (6) and oil reservoir (7).
(3) Remove cap (8) from oil reservoir (7).
(4) Remove swivel elbows (9 and 10) from oil reservoir (7).
(5) Remove oil level indicator (11) from oil reservoir (7).

b. REPAIR.

Repair limited to replacement of damaged components.

c. INSTALLATION.

(1) Install oil level indicator (11) in oil reservoir (7).

NOTE

Install antiseizing tape (teflon tape) on all male pipe threads and wrap tape in direction of threads. Do not allow tape to extend beyond end of threads.

(2) Install swivel elbows (9 and 10) on oil reservoir (7).
(3) Install cap (8) on oil reservoir (7).
(4) Position oil reservoir (7) and install bolts (4), flatwashers (5) and nut (6).
(5) Install tubes (1, 2 and 3).

2-16. OIL RESERVOIR AND TUBES REPAIR - continued.

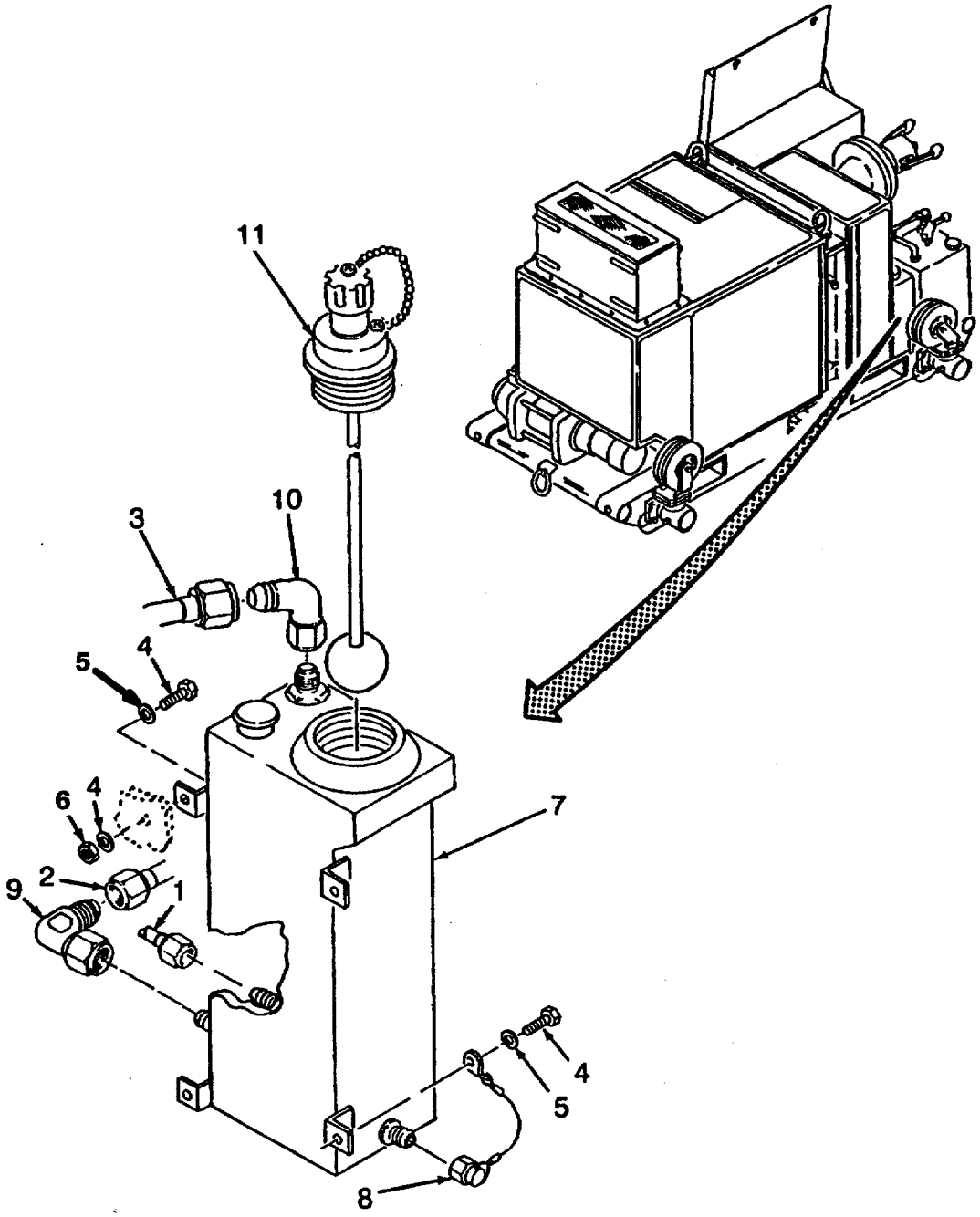


Figure 2-36. Oil Reservoir and Tubes Repair

2-17. NONMETALLIC HOSE REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools	Equipment Condition
General Mechanics Tool Kit (App B, Sect III, Item 1)	200/600 GPM Pump Assembly removed from system (Para 2-9, TM 10-4320-342-10)

a. REMOVAL. Refer to Figure 2-37.

NOTE

This procedure covers the nonmetallic hose. Replacement of other hoses is similar.

(1) Unscrew swivel nuts (1 and 2) and remove hose (3).

(2) Unscrew swivel nuts (4 and 5) and remove hose (6).

(3) Unscrew swivel nuts (7 and 8) and remove hose (9).

(4) Unscrew swivel nuts (10 and 11) and remove hose (12).

b. INSTALLATION.

NOTE

This procedure covers the replacement of tube assembly connected between fuel pump assembly and bulkhead fitting. Other tube assemblies are replaced in a similar manner.

(1) Install hose (12) and tighten swivel nuts (10 and 11).

(2) Install hose (9) and tighten swivel nuts (7 and 8).

(3) Install hose (6) and tighten swivel nuts (4 and 5).

(4) Install hose (3) and tighten swivel nuts (1 and 2).

2-17. NONMETALLIC HOSE REPLACEMENT - continued.

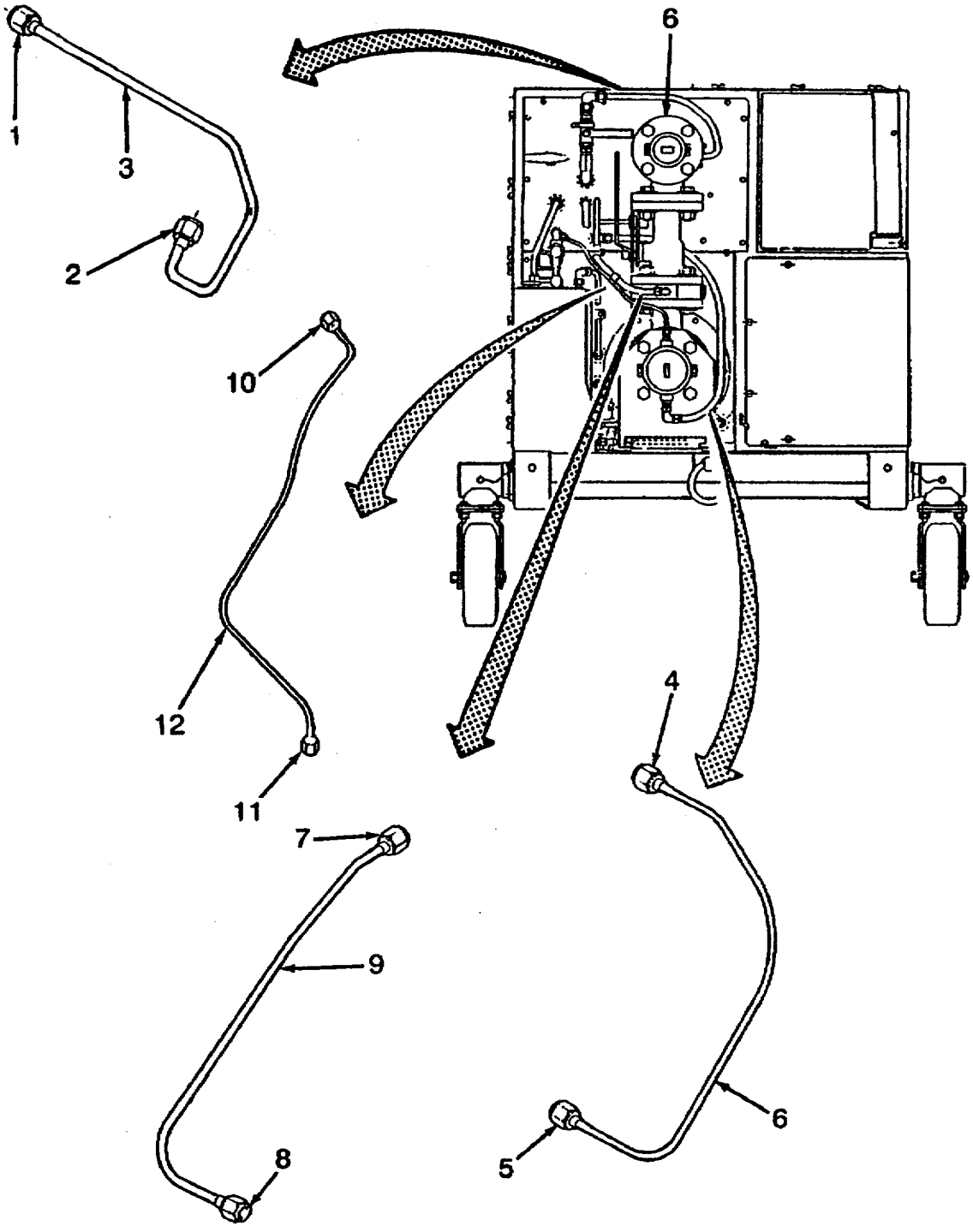


Figure 2-37. Nonmetallic Hose Replacement

2-18. 200600 GPM FUEL PUMP ASSEMBLY REPAIR

This task covers: a. Removal b. Repair c. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Torque Wrench 0-300 inch-pounds (App B, Sect III, Item 2)
Crowbar (App B, Sect III, Item 2)
Torque Wrench: 0-600 foot-pounds (App B, Sect III, Item 2)

Material/Parts
General Purpose Detergent (App E, Item 1

Personnel Required
Two people (200 GPM Pump)
Four people (600 GPM Pump)

Equipment Condition
200/600 GPM pump assembly removed from system (Para 2-9, TM 10-4320-342-10)
Nonmetallic Hose removed (Para 2-17)

General Safety Instructions

WARNING

Do not lift more than 50 pounds by yourself and bend legs while lifting. Lifting heavy equipment incorrectly can cause serious injury to personnel.

NOTE

This procedure covers the 200 GPM fuel pump. (Replacement of the 600 GPM fuel pump is similar.)

a. REMOVAL. Refer to Figure 2-38.

(1) Remove cover (1) and open doors (2 and 3).

(2) Disconnect electrical connector (4).

(3) Loosen nut (5), lift bracket (6) off bolt (7) and slide coupling clamp (8) from fuel pump (9) onto speed reducer (10).

WARNINGS

· **Do not lift more than 50 pounds by yourself and bend legs while lifting. Lifting heavy equipment incorrectly can cause serious injury to personnel.**

· **When removing pump, keep hands and arms from rear of pump. Pump will drop slightly when it is removed and can cause injury to personnel.**

CAUTION

When removing fuel pump, be careful not to damage drain line or electrical wiring.

2-18. 200/600 GPM FUEL PUMP ASSEMBLY REPAIR - continued.

NOTE

Crowbar will be required to remove fuel pump.

(4) Slide and lift fuel pump (9) from support plate (11).

(5) Remove coupling clamp (8) from speed reducer (10).

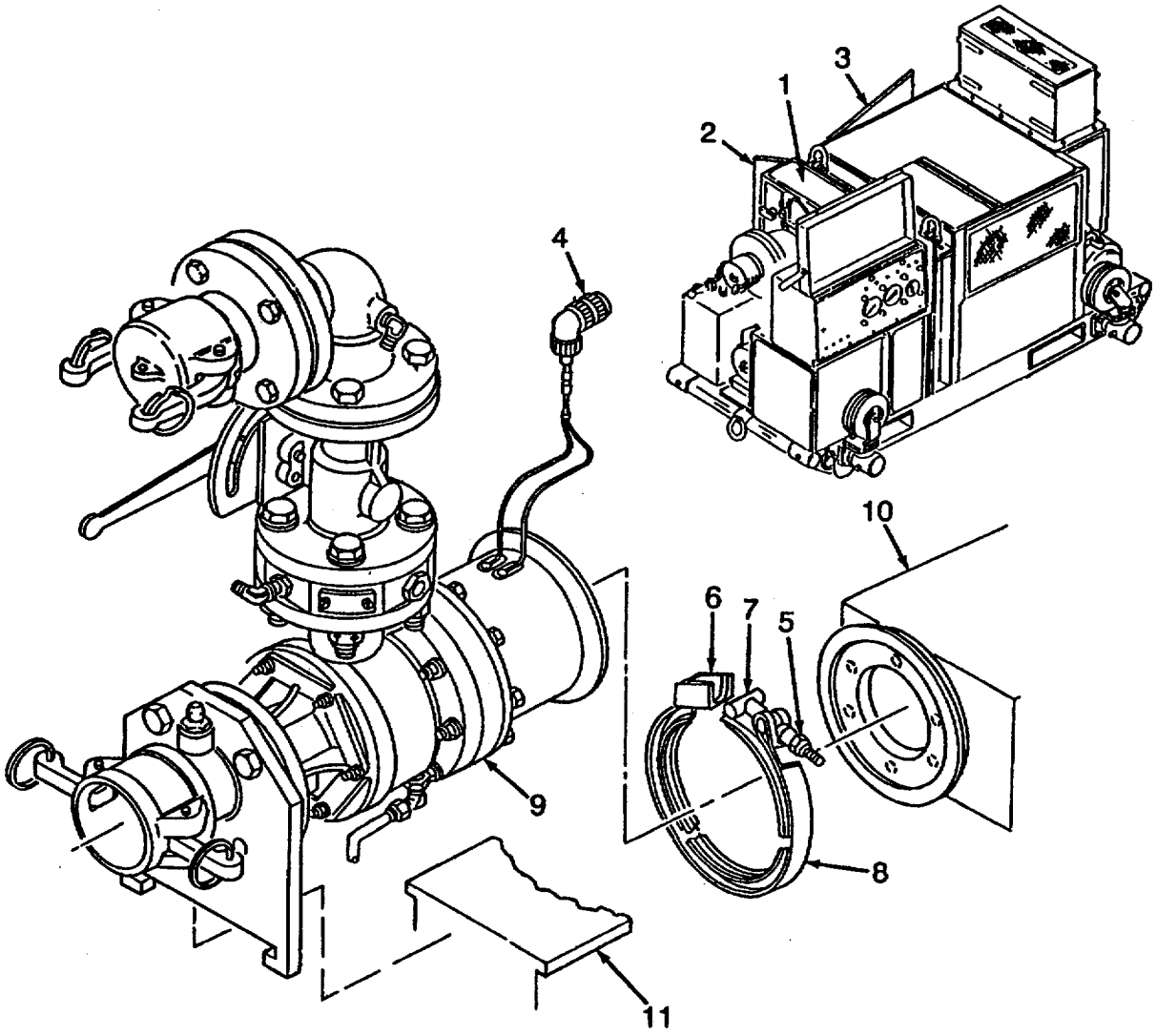


Figure 2-38. 200 or 600 GPM Pump Assembly Repair

2-18. 200/600 GPM FUEL PUMP ASSEMBLY REPAIR - continued.

b. REPAIR.

The repair of 200 or 600 GPM fuel pump consists of replacing the components listed below. Refer to the following paragraphs for applicable maintenance procedures.

c. INSTALLATION. Refer to Figure 2-38.

WARNING

Do not lift more than 50 pounds by yourself and bend legs while lifting. Lifting heavy equipment incorrectly can cause serious injury to personnel.

CAUTION

When installing 200/600 GPM fuel pump, be careful not to damage drain line or electrical wiring.

(1) Position coupling clamp (8) on speed reducer (10).

(2) Lift, slide and position fuel pump (9) on support plate (11).

(3) Install coupling clamp (8) on 200/600 fuel pump (9) and speed reducer (10).

(4) Install bracket (6) on bolt (7).

(5) Torque nut (5) to 125 inch-pounds.

(6) Install electrical connector (4).

(7) Close doors (2 and 3).

(8) Install cover (1).

2-19. MALE FLANGE COUPLING REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Torque Wrench: 0-600 pounds (App B, Sect III, Item 7)

Material/Parts
Preformed Packing (App F, Item 44 and 98)
Lubricant (App E, Item 18)
Locknut (App F, Item 99)

Equipment Condition
200/600 GPM pump assembly removed from the system (Para 2-9, TM 10-4320-342-10)

a. REMOVAL. Refer to Figure 2-39.

NOTES

- **This procedure covers the male flange coupling on the 200 GPM fuel pump. Procedure for the 600 GPM fuel pump is similar.**
- **When installing new dust cap, remove and discard gasket supplied with dust cap. Install new arctic service gasket in dust cap.**

(1) Remove dust cap (1), split rings (2) and chain (3) from male flange coupling (4).

(2) Remove gasket (5) from dust cap (1).

(3) Remove locknuts (6), flatwashers (7) and bolts (8) from male flange coupling (4) and discharge elbow (10). Discard locknuts.

(4) Separate male flange coupling (4) from discharge elbow (10) and remove preformed packing

(9) Discard preformed packing.

b. INSTALLATION.

(1) Lubricate preformed packing (9) and position on flange of discharge elbow (10).

(2) Position male flange coupling (4) on discharge elbow (10).

(3) Install bolts, flatwashers (7) and locknuts (6). Torque locknuts 170 to 187 foot-pounds.

(4) Install arctic service gasket (5) in dust cap (1) and install cap (1).

(5) Install split rings (2) onto male flange coupling (4) and dust cap (1).

2-19. MALE FLANGE COUPLING REPLACEMENT - continued.

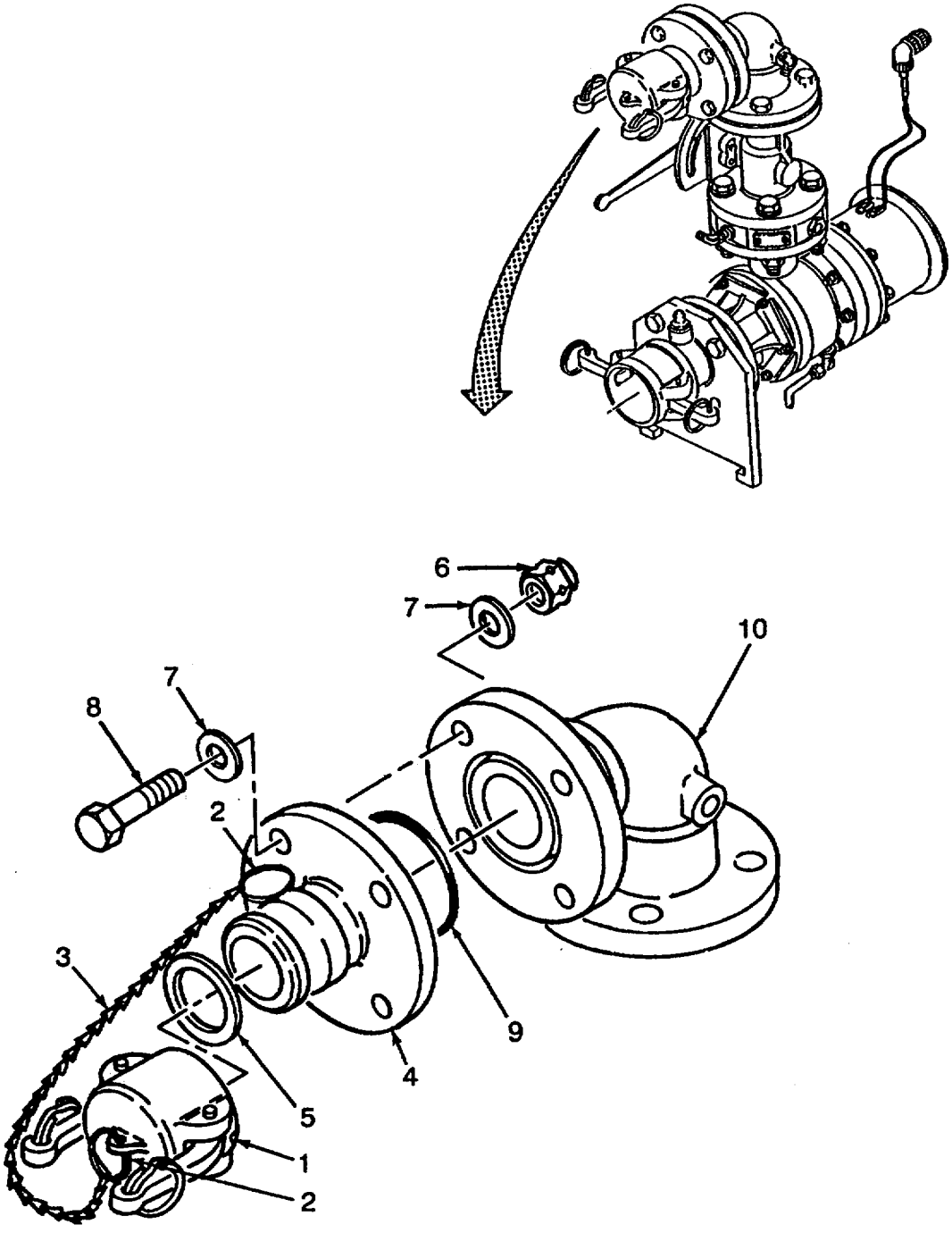


Figure 2-39. Male Flange Coupling Replacement

2-20. DISCHARGE ELBOW REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Torque Wrench: 0-600 foot-pounds (App B, Sect III, Item 2)

Material/Parts
Preformed Packing (App F, Item 44)
Lubricant (App E, Item 18)
Preformed Packing (App F, Item 52)
Locknuts (App F, Item 99)

Equipment Condition
Male Flange Coupling removed (Para 2-9)

NOTE

This procedure covers the elbow on the 200 GPM fuel pump. Replacement of elbow on the 600 GPM fuel pump is similar.

a. REMOVAL. Refer to Figure 2-40.

(1) Remove swivel elbow (1), adapter (2) and preformed packing (3) from discharge elbow (4). Discard preformed packing.

(2) Remove locknuts (5), flatwashers (6) and bolts (7). Discard locknuts.

(3) Remove discharge elbow (4) and preformed packing (8) from ball valve (9). Discard preformed packing.

b. INSTALLATION.

(1) Lubricate preformed packing (8).

(2) Position discharge elbow (4) on ball valve (9).

(3) Install bolts (7), flatwashers (6) and locknuts (5). Torque 170 to 187 foot-pounds.

(4) Lubricate preformed packing (3) and install on adapter (2).

(5) Install swivel elbow (1) and adapter (2) onto discharge elbow (4).

2-20. DISCHARGE ELBOW REPLACEMENT - continued.

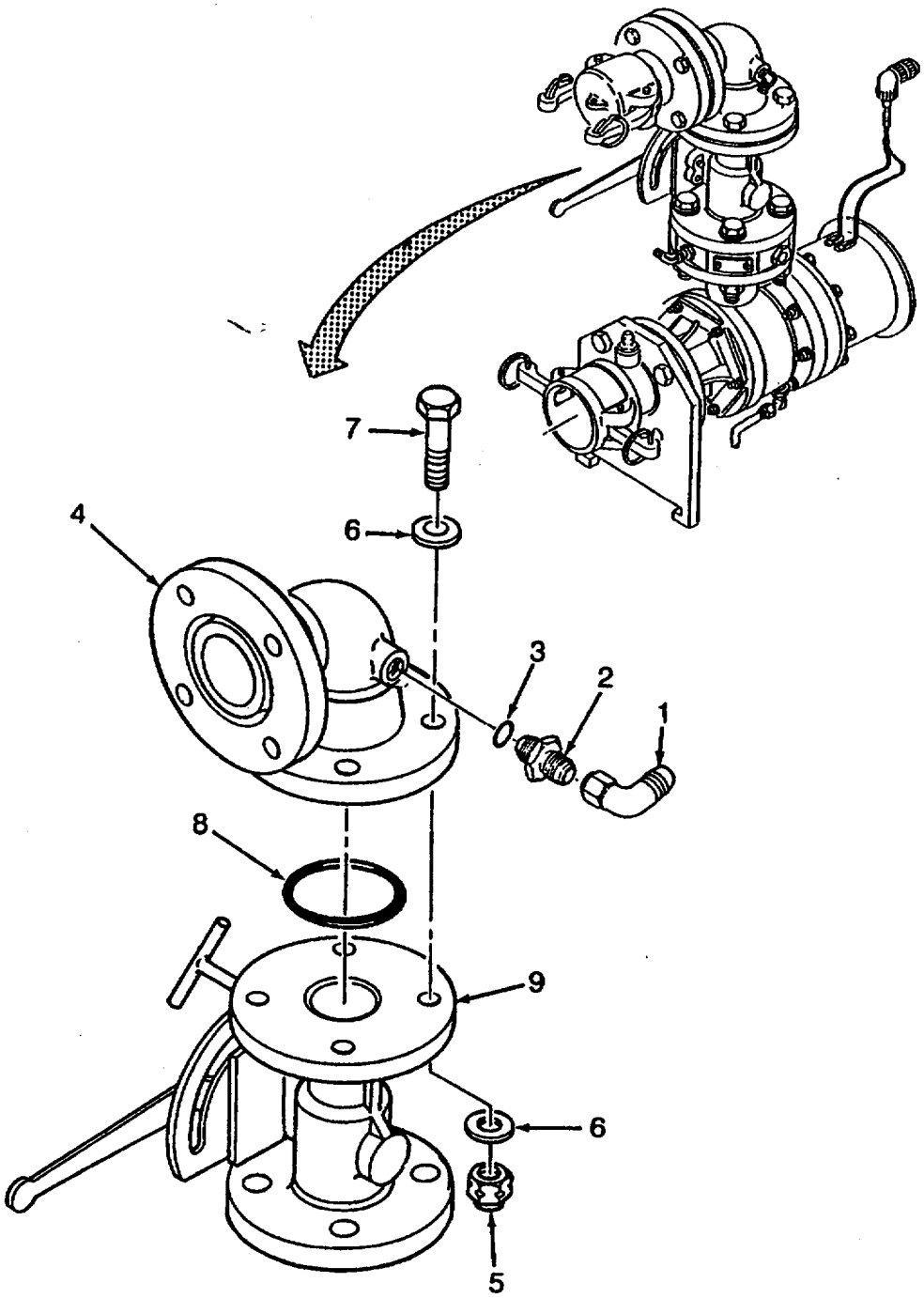


Figure 2-40. Discharge Elbow Replacement

2-21. BALL VALVE AND DISCHARGE ADAPTER REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Torque Wrench 0-600 (App B, Sect III, Item 2)

Material/Parts
Preformed Packings (App F, Item 3, 44, 45 and 108)
Lubricant (App F, Item 18)
Locknuts (App F, Item 99)
Gasket (App F, Item 4)

Equipment Condition
Discharge elbow removed (Para 2-20)

NOTE

This procedure covers the ball valve and discharge adapter on the 200 GPM fuel pump. Replacement of ball valve and discharge adapter on the 600 GPM fuel pump is similar.

a. REMOVAL. Refer to Figure 2-41.

(1) Remove swivel elbow (1), adapter (2) and preformed packing (3) from discharge elbow (4). Discard preformed packing.

(2) Remove plug (5) and preformed packing (6) from discharge adapter (4). Discard preformed packing.

(3) Mark position of discharge adapter (4) prior to removal.

(4) Remove locknuts (7), flatwashers (8) and bolts (9) from ball valve (10) and discharge adapter (4). Discard locknuts.

(5) Remove ball valve (10), discharge adapter (4) and preformed packing (11) from pump clutch assembly (12).

(6) For repair of ball valve (10), refer to para 2-22 for 2-inch ball valve or para 2-23 for 6-inch ball valve.

b. INSTALLATION.

(1) Lubricate preformed packings (11) and install on discharge adapter (4) and pump clutch assembly (12).

2-21. BALL VALVE AND DISCHARGE ADAPTER REPLACEMENT - continued

(2) Align marks and position discharge adapter (4) with ball valve (10) and pump clutch assembly (12).

(3) Install bolts (9), flatwashers (8) and locknuts (7). Torque 170 to 187 foot-pounds.

(4) Lubricate and position preformed packing (6) on plug (5) and install into discharge adapter (4).

(5) Lubricate and position preformed packing (3) onto adapter (2) and install into discharge adapter.

(6) Install swivel elbow (1) on adapter (2).

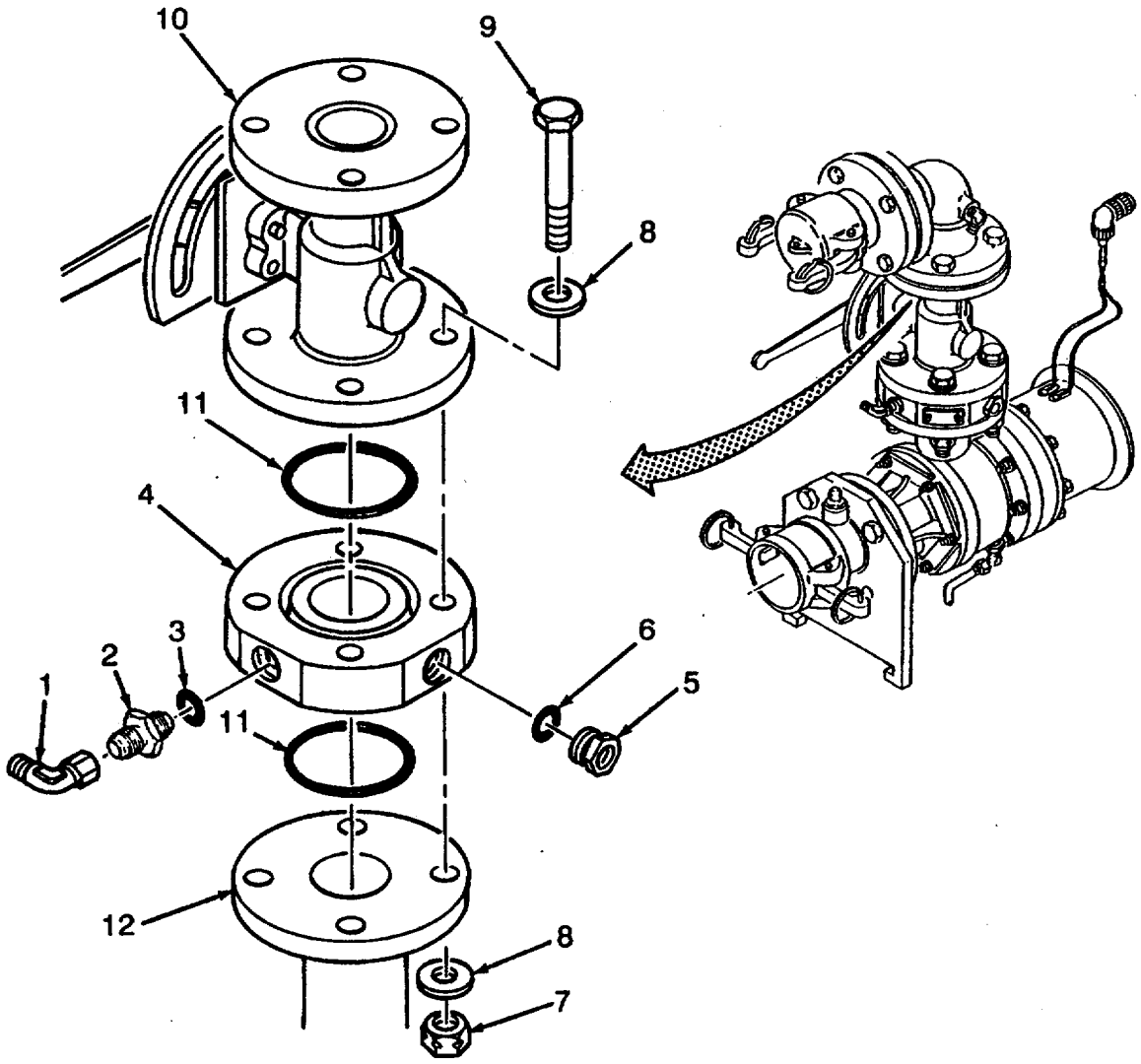


Figure 2-41. Ball Valve and Discharge Adapter Replacement

2-22. 200 GPM BALL VALVE REPAIR.

This task covers: a. Disassemble b. Repair c. Assemble

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Materials/Parts
Nylon Washer (App E, Item 71)

Equipment Condition
Ball Valve removed (Para 2-21)

a. DISASSEMBLE. Refer to Figure 2-42.

(1) Remove nut (1), handle (2) and nut (3) from valve stem (4).

NOTE

Note position of movable stop plate (8) prior to removal.

(2) Remove tee handle (5), nylon washer (6), movable stop plate (7) and spacer (8).

(3) Remove bolts (9) and backing stop plate (10).

b. REPAIR.

Repair at this level is limited to replacement of damaged components.

c. ASSEMBLE.

(1) Install backing stop plate (10) and bolts (9).

(2) Install spacer (8), movable stop plate (7), nylon washer (6) and tee handle (5).

(3) Install nut (3), handle (2) and nut (1) on valve stem (4).

2-22. 200 GPM BALL VALVE REPAIR - continued.

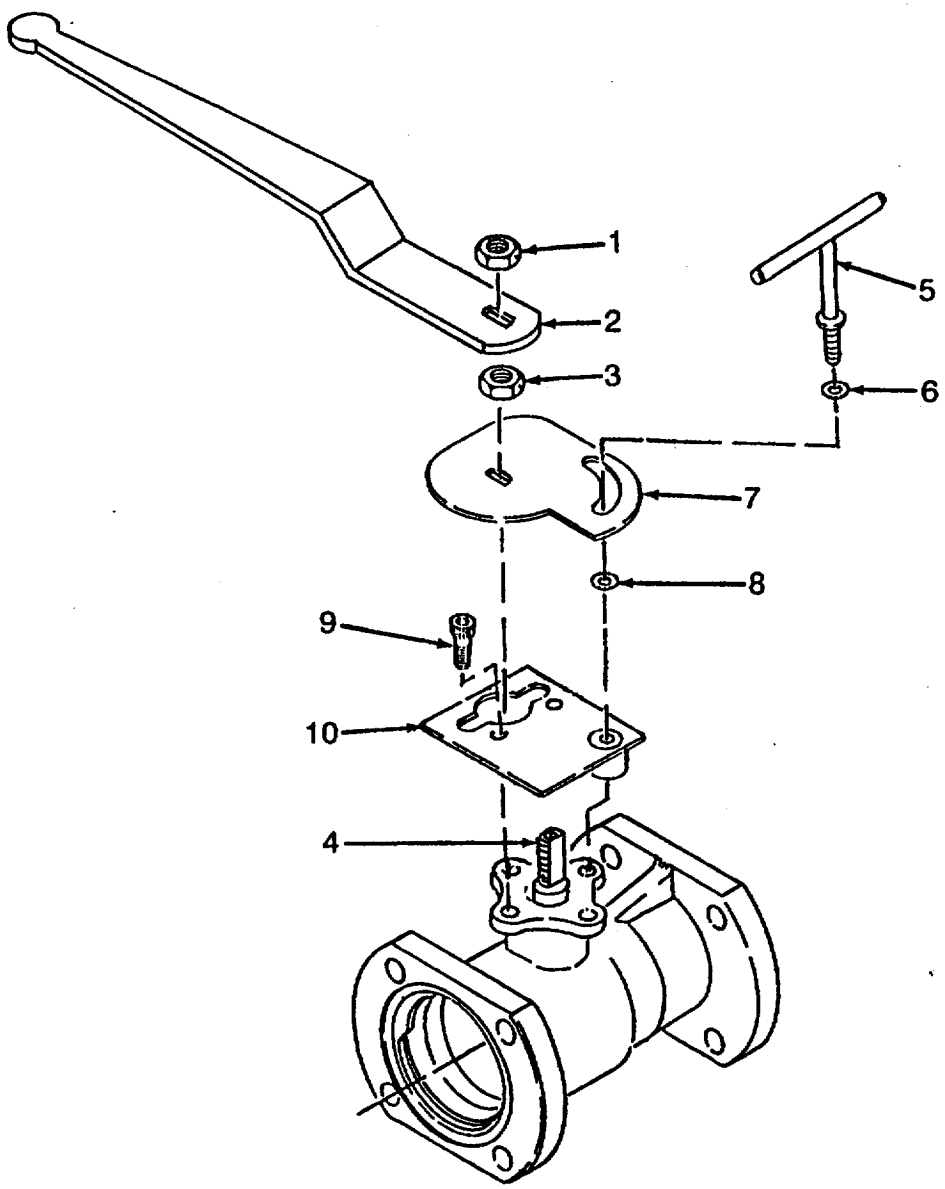


Figure 2-42. 200 GPM Ball Valve Repair

2-23. 600 GPM BALL VALVE REPAIR.

This task covers: a. Disassemble b. Repair c. Assemble

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Materials/Parts
Locknuts (App F, Item 100)
Nylon Washer (App E, Item 71)

Equipment Condition
Ball Valve removed (Para 2-21)

a. DISASSEMBLE. Refer to Figure 2-43.

(1) Remove bolt (1) and handle (2) from valve stem (3).

NOTE

Note position of movable stop plate (8) prior to removal.

(2) Remove tee handle (4), nylon washer (5), two spacers (6) and movable stop plate (7).
(3) Remove indicator stop (8).
(4) Remove screws (9), locknut (10) and backing stop plate (11). Discard locknuts.
(5) Remove bushing adapters (12).

b. REPAIR.

Repair at this level is limited to replacement of damaged components.

c. ASSEMBLE.

(1) Install bushing adapters (12).
(2) Install backing stop plate (11), screws (9) and locknuts (10).
(3) Install indicator stop (8).
(4) Install removable stop plate (7), spacers (6), nylon washers (5) and tee handle (4).
(5) Install handle (2) and bolt (1) on stem (3).

2-23. 600 GPM BALL VALVE REPAIR - continued.

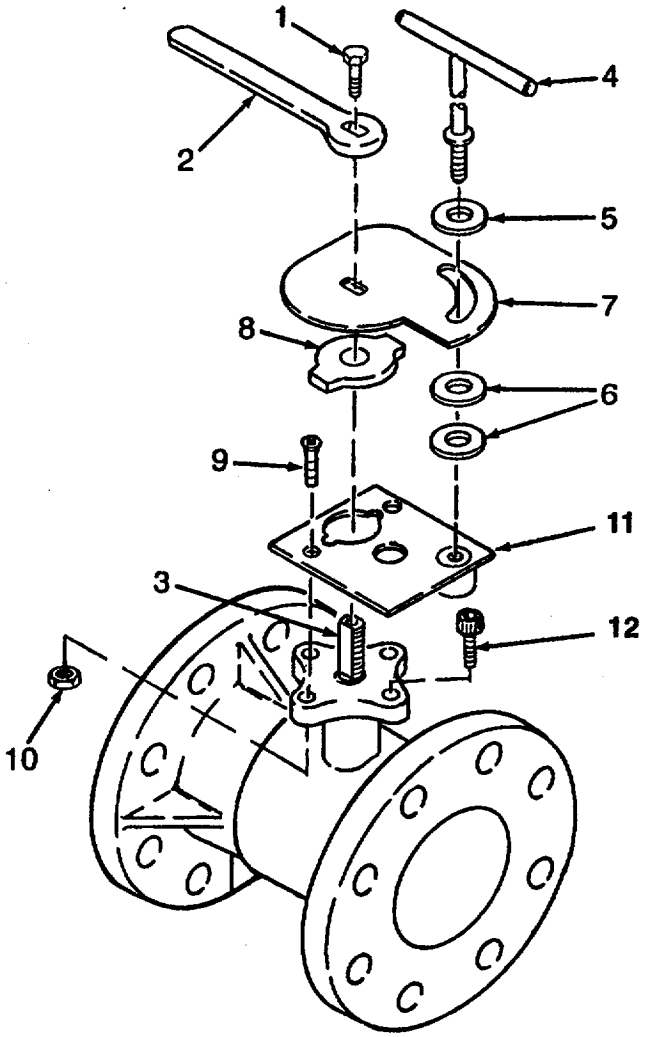


Figure 2-43. 600 GPM Ball Valve Repair

2-24. DRAIN TUBE REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
200/600GPM pump assembly shut down (Para 2-7c, TM 10-4320-342-10)

a. REMOVAL. Refer to Figure 2-44.

(1) Remove drain tube assembly (1) from elbow (2).

(2) Note position of elbow (2) and remove from bushing (3).

b. INSTALLATION.

(1) Install elbow (2) in bushing (3) and position as noted during removal.

(2) Connect tubing (1) on elbow (2).

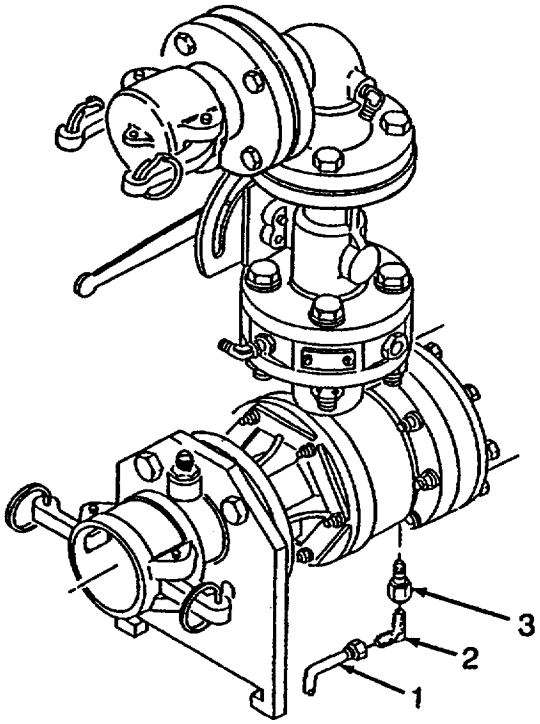


Figure 2-44. Drain Tube Replacement

2-25. FEMALE FLANGE ADAPTER REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Torque Wrench: 0-600 foot-pounds (App B, Sect III, Item 2)

Material/Parts
Locknuts (App F, Item 38)
Lubricate (App E, Item 18)
Gasket (App E, Item 10)

Material/Parts
Preformed Packing (App F, Items 3, 46, 47 and 48)

Equipment Condition
200/600 GPM pump assembly removed system (Para 2-9, TM 10-4320-342-10)

NOTE

This procedure covers the female flange adapter on the 200 GPM pump. Replacement of the female flange adapter on the 600 GPM fuel pump is similar.

a. REMOVAL. Refer to Figure 2-45.

(1) Remove locknuts (1), flatwashers (2) and bolts (3) from female flange adapter (4) and pump and clutch assembly (5). Discard locknuts.

(2) Remove screen (6) and preformed packing (7) from female flange adapter (4). Discard preformed packing.

NOTE

The location of adapter (9) is different between the 200 GPM and 600 GPM pumps. Also, swivel elbow (8) is used only on the 200 GPM pump.

(3) Remove swivel elbow (8), adapter (9) and preformed packing (10). Discard preformed packing.

NOTE

Only remove swivel elbow (11) and preformed packing (13) on the 600 GPM pump.

(4) Remove elbow (11), adapter (12) and preformed packing (13). Discard preformed packing.

2-25. FEMALE FLANGE ADAPTER REPLACEMENT - continued.

(5) Remove split rings (14) and chain (15) from dust plug (16) and female flange adapter (4).

(6) Remove dust plug (16) and gasket (17) from female flange adapter (4).

b. INSTALLATION.

(1) Install gasket (17) and dust plug (16) in female flange adapter (4).

(2) Connect split rings (14) to chain (15), dust plug (16) and female flange adapter (4).

NOTE

Elbow (11) and adapter (12) are used only on the 200 GPM pump. These are replaced with a swivel elbow on the 600 GPM pump.

(3) Lubricate and install preformed packing (13), adapter (12) and elbow (11) in female flange adapter (4).

NOTE

A swivel elbow is used only on the 600 GPM pump.

(4) Lubricate and install preformed packing (10), adapter (9) and swivel elbow (8) in female flange adapter (4).

(5) Position screen (6) into female flange adapter (4).

(6) Lubricate and install new packing (7) on female flange adapter (4).

(7) Position female flange adapter (4) on pump and clutch assembly (5) and install bolts (3), flatwashers (2) and locknuts (1). Torque 297 to 327 foot-pounds.

2-25. FEMALE FLANGE ADAPTER REPLACEMENT - continued.

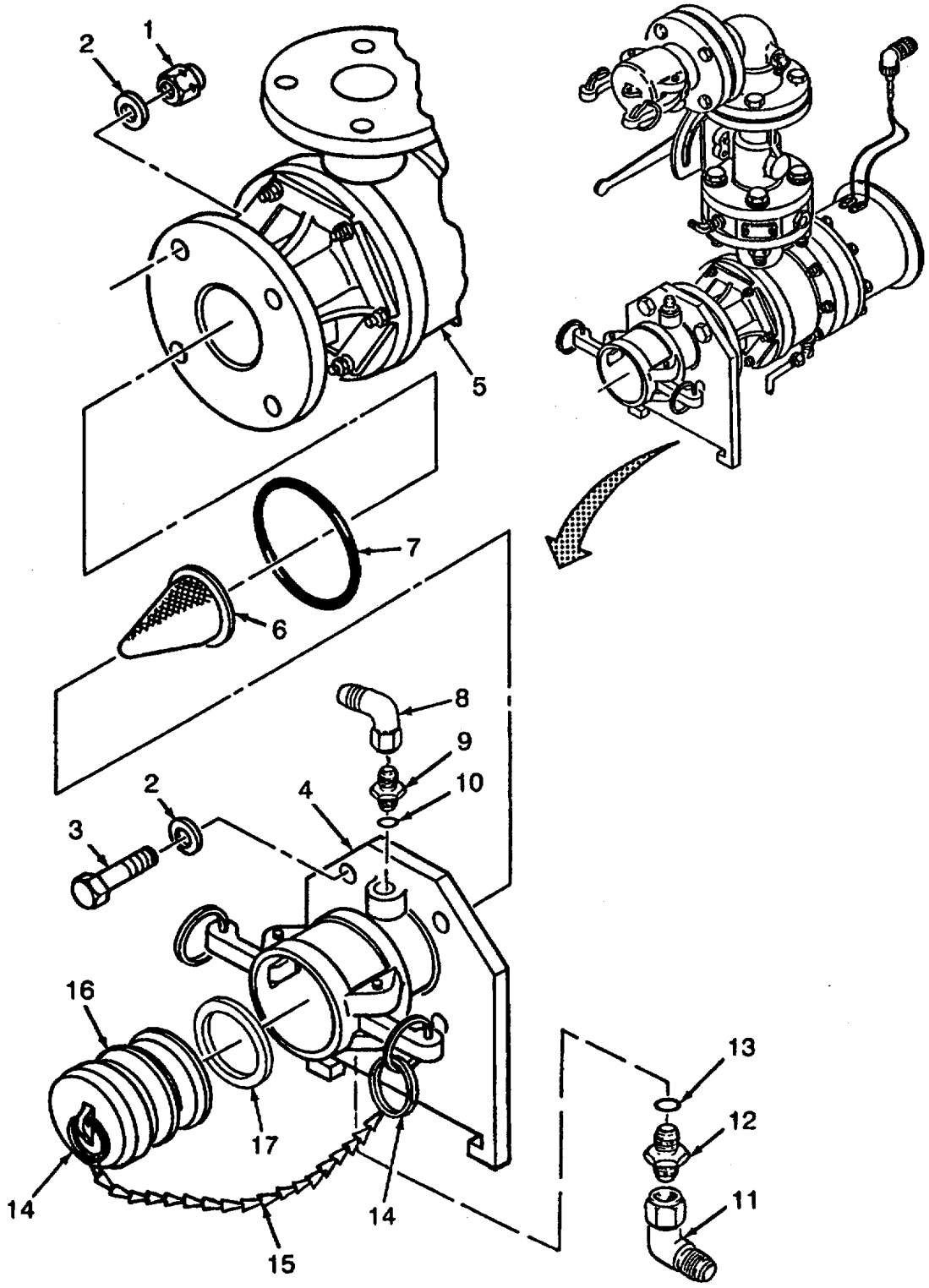


Figure 2-45. Female Flange Adapter Replacement

2-26. PUMP AND CLUTCH WIRING HARNESS REPAIR.

This task covers: a. Removal b. Repair c. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Electrical Connector Kit (App B, Sect III, Item 2)

Equipment Condition
200/600 GPM pump assembly removed from system (Para 2-9, TM 10-4320-342-10)

NOTES

·· This procedure covers the clutch wiring harness for the 200 GPM fuel pump. Replacement of the clutch wiring harness for the 600 GPM fuel pump is similar.

·· On the 200 GPM Pump, screws are installed on the wiring harness. On the 600 GPM Pump, nuts are installed on the wiring harness.

·· When replacing wiring harness only, the pump and clutch do not have to be removed.

a. REMOVAL. Refer to Figure 2-46.

(1) Remove connector (1) from receptacle (2).

(2) Remove screws (3), flatwashers (4) and clutch wiring harness (5) from pump and clutch assembly (6).

b. REPAIR.

(1) Remove damaged electrical connectors (7).

(2) Strip 1/4-inch of insulation from wires (8 and 9).

(3) Crimp electrical connectors (7) onto wires (8 and 9).

c. INSTALLATION.

(1) Install clutch wiring harness (5) on pump and clutch (6) with flatwashers (4) and screws (3).

(2) Install connector (1) on receptacle (2).

2-26. PUMP AND CLUTCH WIRING HARNESS REPAIR - continued.

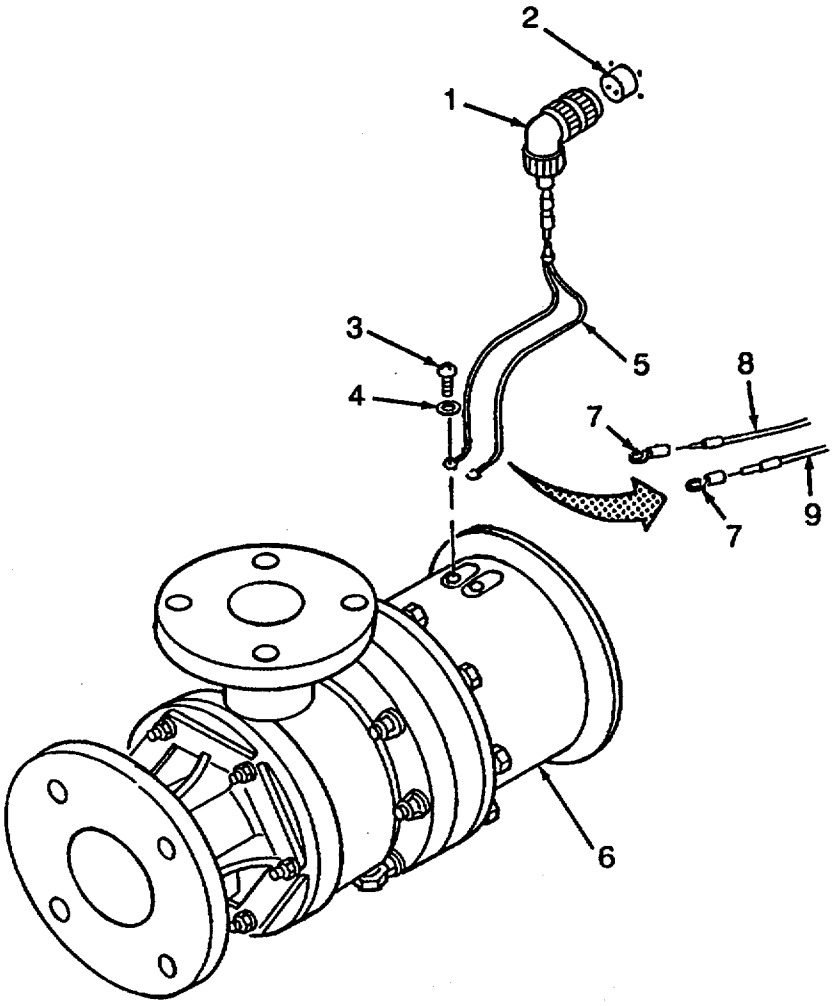


Figure 2-46. Pump, Clutch and Wiring Harness Assemblies Repair

2-27. PUMP SUPPORT PLATE REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Torque Wrench: 0-200 inch-pounds (App B, Sect II, Item 2)

Equipment Condition
200/600 GPM fuel pump removed (Para 2-18)

a. REMOVAL. Refer to Figure 2-47.

Remove screws (1), flatwashers (2) and plate (3) from 200/600 GPM Pump (4).

b. INSTALLATION.

Position plate (3) on 200/600 GPM Pump (4) and install flatwashers (2) and screws (1).

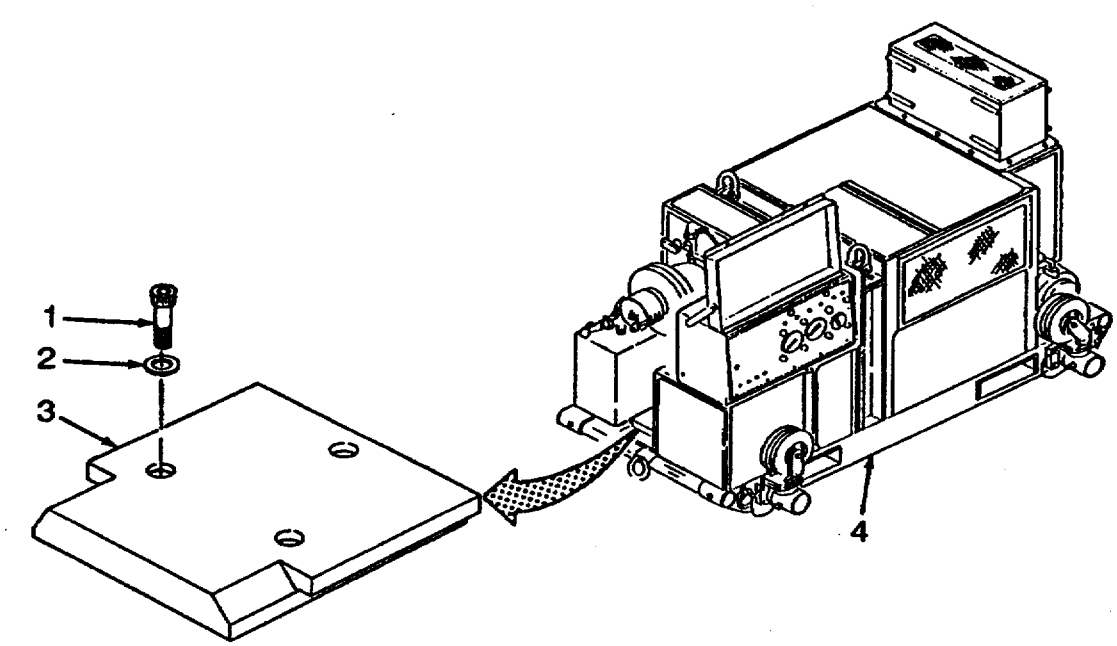


Figure 2-47. Pump Support Plate Replacement

2-28. DOORS AND PANELS REPAIR (TYPICAL).

This task covers: a. Removal b. Disassemble c. Repair d. Assemble e. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
200/600 pump assembly removed from system (Para 2-9, TM 10-4320-342-10)

Material/Parts
Rubber Sheet (App E, Item 4)
Sealing Washers (App F, Item 2)
Foam Rubber (App E, Item 26)
Foam Rubber (App E, Item 27)
Retainer, Ring (App E, Item 1)

NOTE

This procedure covers the replacement and repair of the accessory door panel assembly. Other access doors and panel assemblies are replaced and repaired in a similar manner.

a. REMOVAL. Refer to Figure 2-48.

(1) Remove screws (1) and flat washers (2).

(2) Loosen turn-lock fasteners (3) and remove door panel assembly (4).

b. DISASSEMBLE.

(1) Remove retainer (5), sealing washers (6) and turn-lock fasteners (3).

(2) Remove foam rubber (7 and 8). If necessary, use a putty knife or similar device to remove foam rubber.

c. REPAIR.

Repair consists of replacement of defective components and minor repair of panel by twisting, bending, etc. Refer to Appendix D for manufacture of foam rubber.

2-28. DOORS AND PANELS REPAIR (TYPICAL) - continued.

d. ASSEMBLE.

(1) Install foam rubber (7 and 8) on door panel assembly (4).

(2) Install turn-lock fasteners (3), retainers (5) and sealing washers (6) on door panel assembly (4).

e. INSTALLATION.

(1) Position door panel assembly (4) and install screws (1) and flat washers (2).

(2) Close door panel assembly (4) and rotate turn-lock fasteners (3).

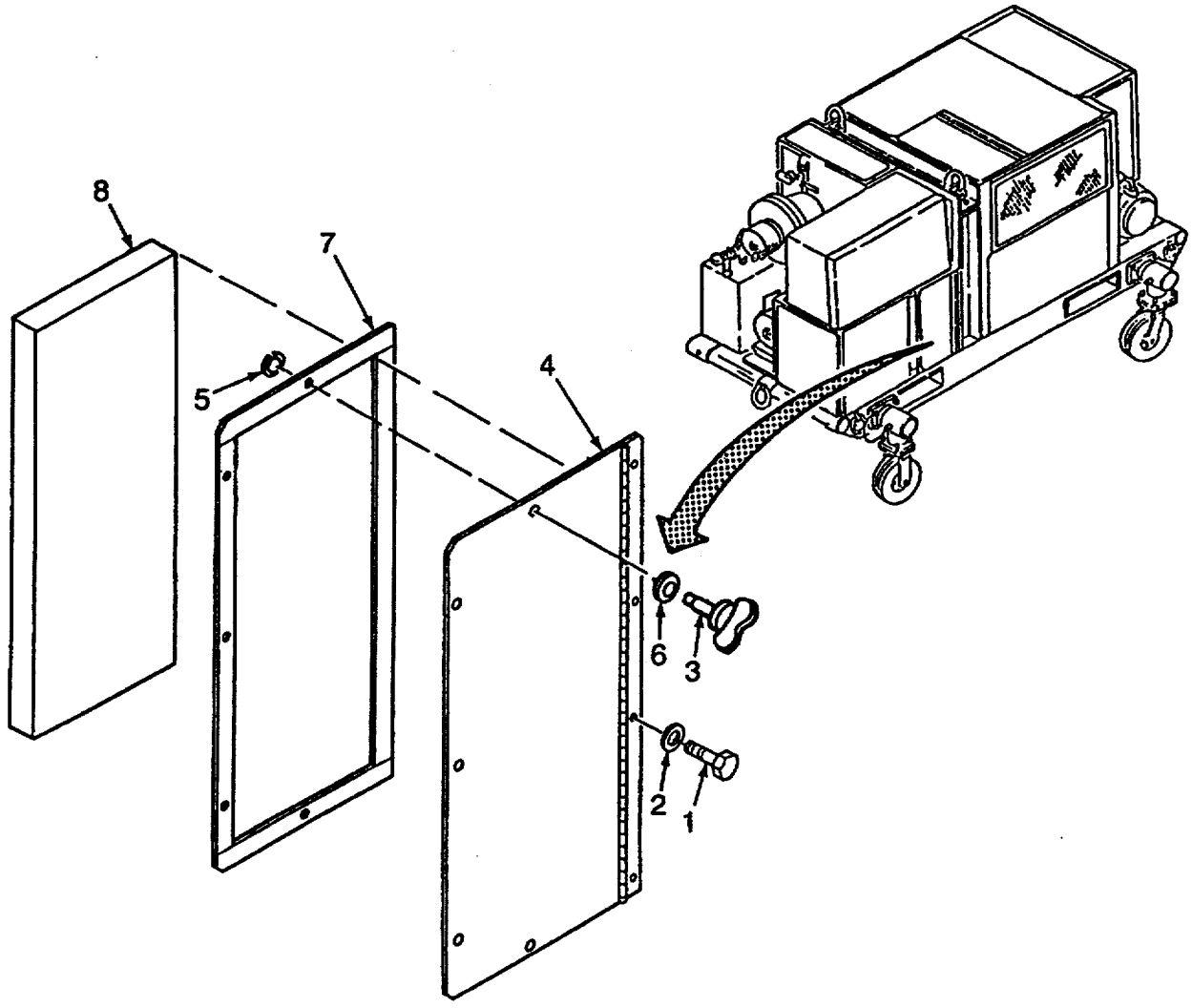


Figure 2-48. Doors and Panels Repair (Typical)

2-29. AIR CLEANER REPAIR.

This task covers: a. Removal b. Disassemble c. Repair d. Assemble e. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
200/600 GPM pump assembly removed from system (Para 2-9, TM 10-4320-342-10)

Material/Parts
Preformed Packing (App F, Item 5)
Gasket (App F, Item 50)
Gasket (App E, Item 27)

a. REMOVAL. Refer to Figure 2-49.

(1) Remove bolts (1) and flatwashers (2) from grille (3) and remove grille.

(2) Open door (4).

(3) Disconnect tube (5) from elbow (6).

(4) Loosen clamp (7) and disconnect hose (8) from air cleaner.

WARNING

Support air cleaner before removing screws and bracket or serious injury could occur.

(5) Remove screws (9) and bracket (10).

(6) Remove air cleaner (11).

b. DISASSEMBLE.

(1) Remove round screens (12).

(2) Remove gaskets (13 and 14).

(3) Unscrew elbow (6) and remove preformed packing (15). Discard preformed packing.

c. REPAIR.

Repair is limited to the replacement of defective parts. Refer to Appendix D for manufacture of gaskets.

2-29. AIR CLEANER REPAIR - continued.

d. ASSEMBLE.

(1) Install elbow (6) and preformed packing (15) onto air cleaner (11).
(2) Install round screens (12).
(3) Install gaskets (13 and 14).

e. INSTALLATION.

(1) Position clamp (7) on hose (8).
(2) Position air cleaner (11) on unit (4), connect hose (8) to air cleaner and tighten clamp (2).
(3) Install support bracket (10) and screws (9).
(4) Connect tube (5) to elbow (6).
(5) Install grille (3) on air cleaner (11) with flatwashers (2) and bolts (1).

2-29. AIR CLEANER REPAIR - continued.

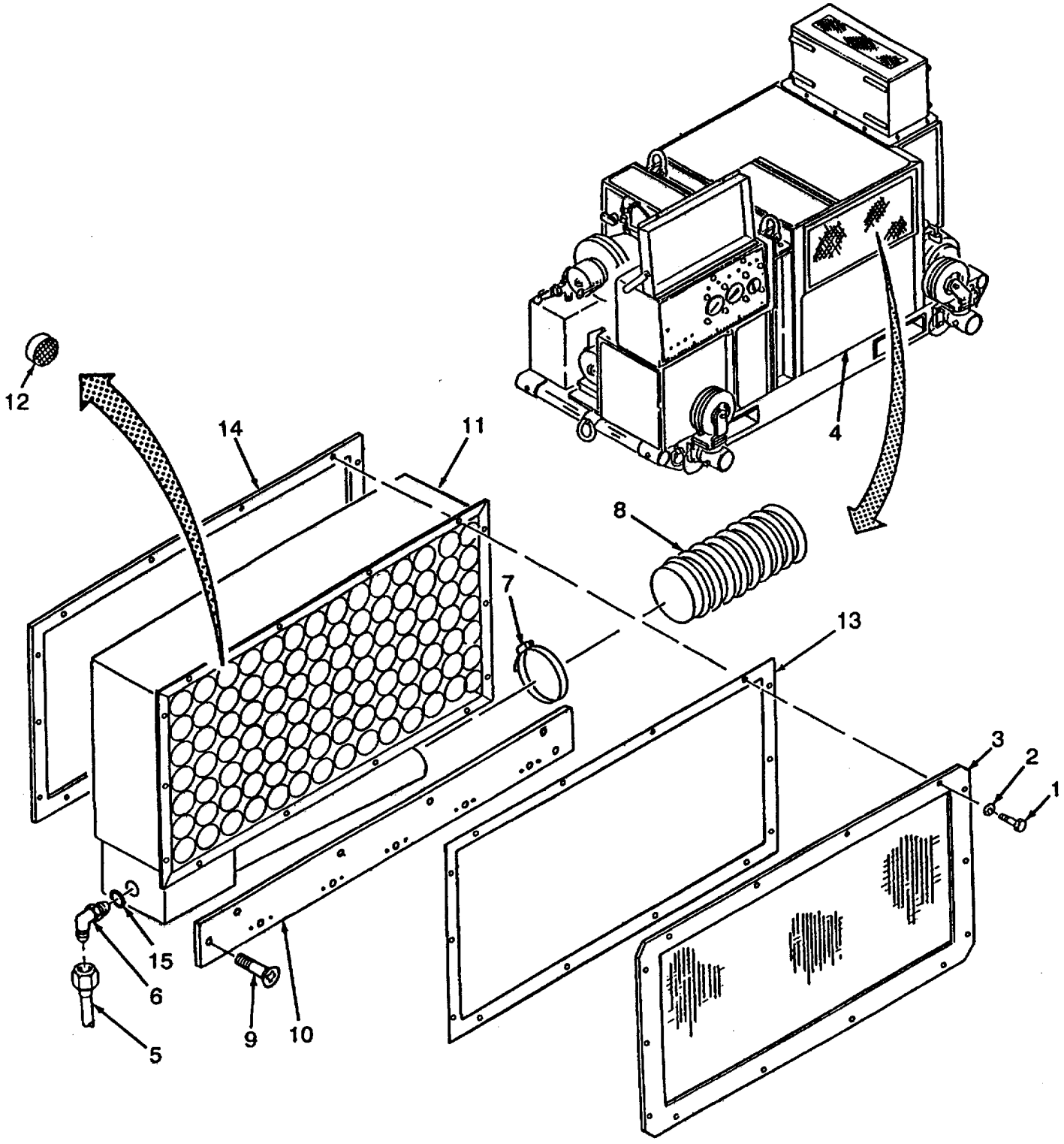


Figure 2-49. Air Cleaner Repair

2-30. FUEL SELECTOR VALVE REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
200/600 GPM pump assembly removed from system (Para 2-9, TM 10-4320-342-10)

Material/Parts
Antiseize Tape (App E, Item 6)

a. REMOVAL. Refer to Figure 2-50.

(1) Disconnect tubes (1, 2 and 3).

(2) Loosen set screw (4) and remove handle (5).

(3) Remove panel nut (6), flatwasher (7) and valve (8) from control panel.

NOTE

Note position of elbows prior to removal.

(4) Remove elbows (9, 10 and 11) from valve (8).

b. INSTALLATION.

NOTE

Install antiseize tape (teflon tape) on all male pipe threads and wrap tape in direction of threads. Do not allow teflon tape to extend beyond end of threads.

(1) Install elbows (9, 10 and 11) on valve (8) as noted during removal.

(2) Install valve (8) on control panel and secure with flatwasher (7) and panel nut (6).

(3) Install handle (5) and tighten set screw (4).

(4) Connect tubes (1, 2 and 3) to elbows (9, 10 and 11).

2-30. FUEL SELECTOR VALVE REPLACEMENT - continued.

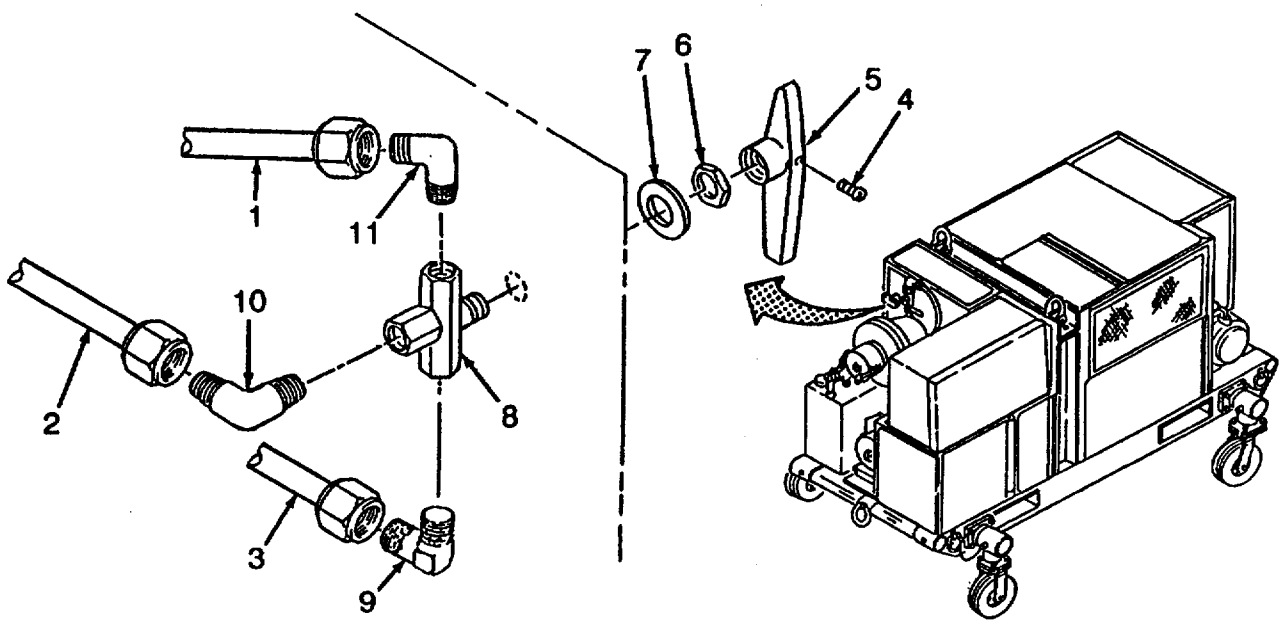


Figure 2-50. Fuel Selector Valve Replacement

2-31. PRIMING SHUT OFF VALVE (BALL VALVE) REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
200/600 GPM pump assembly removed from system (Para 2-9, TM 10-4320-342-10)

Material/Parts
Antiseize Tape (App E, Item 6)

a. REMOVAL. Refer to Figure 2-51.

(1) Remove panel (1).
(2) Disconnect tube (2) from elbow (3).
(3) Remove nut (4), flatwashers (5), bolt (6) and clamp (7).
(4) Remove tube (8) from elbow (9).
(5) Remove nut (10), flatwasher (11) and valve assembly (12).

NOTE

Note position of elbows prior to removal.

(6) Remove elbow (9) from union (13).
(7) Remove union (13) from adapter (14).
(8) Remove adaptor (14) from valve (12).
(9) Remove valve (12) from adapter (15).
(10) Remove adapter (15) from elbow (3).

b. INSTALLATION.

NOTE

Install antiseizing tape (teflon tape) on all male pipe threads and wrap tape in direction of threads. Do not allow teflon tape to extend beyond end of threads.

(1) Install adapter (15) in valve (12).

2-31. PRIMING SHUT OFF VALVE (BALL VALVE) REPLACEMENT - continued.

(2) Install elbow (3) on adapter (15) as noted during removal.

(3) Install adapter (14) in valve (12).

(4) Install union (13) on adapter (14).

(5) Install elbow (9) in union (13) as noted during removal.

(6) Position clamp (7) on valve (12).

(7) Position assembled components on panel and install flatwasher (11) and nut (10).

(8) Install bolt (6), flatwashers (5) and nut (4).

(9) Connect tubes (2 and 8) onto elbows (3 and 9).

(10) Install panel (1).

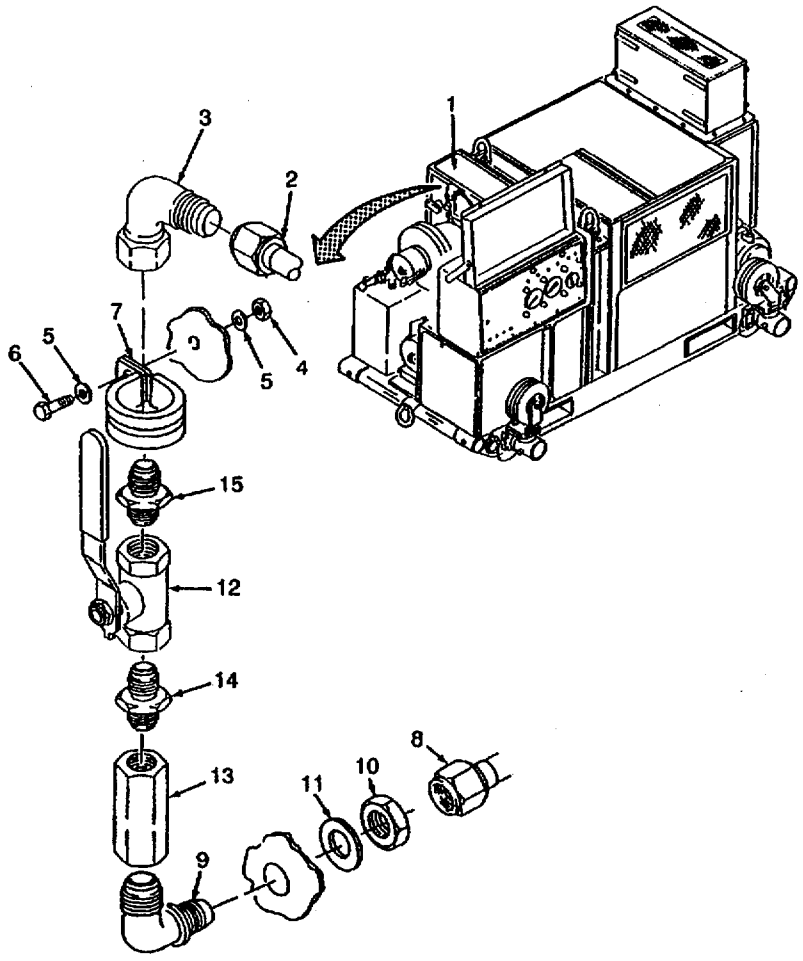


Figure 2-51. Priming Shut Off Valve (Ball Valve) Replacement

2-32. JET EJECTOR REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
200/600 GPM pump assembly removed from system (Para 2-9, TM 10-4320-342-10)

Material/Parts
Antiseize Tape (App E, Item 6)

a. REMOVAL. Refer to Figure 2-52.

(1) Open door panel (1).

(2) Disconnect tubes (2, 3 and 4) from jet ejector (5) and remove jet ejector.

(3) Remove adapters (6, 7 and 8) from jet ejector (5).

b. INSTALLATION.

NOTE

Install antiseizing tape (teflon tape) on all male pipe threads and wrap tape in direction of threads. Do not allow teflon tape to extend beyond end of threads.

(1) Install adapters (6, 7 and 8) on jet ejector (5).

(2) Connect tubes (2, 3 and 4) on jet ejector (5).

(3) Close door panel (1).

2-32. JET EJECTOR REPLACEMENT - continued.

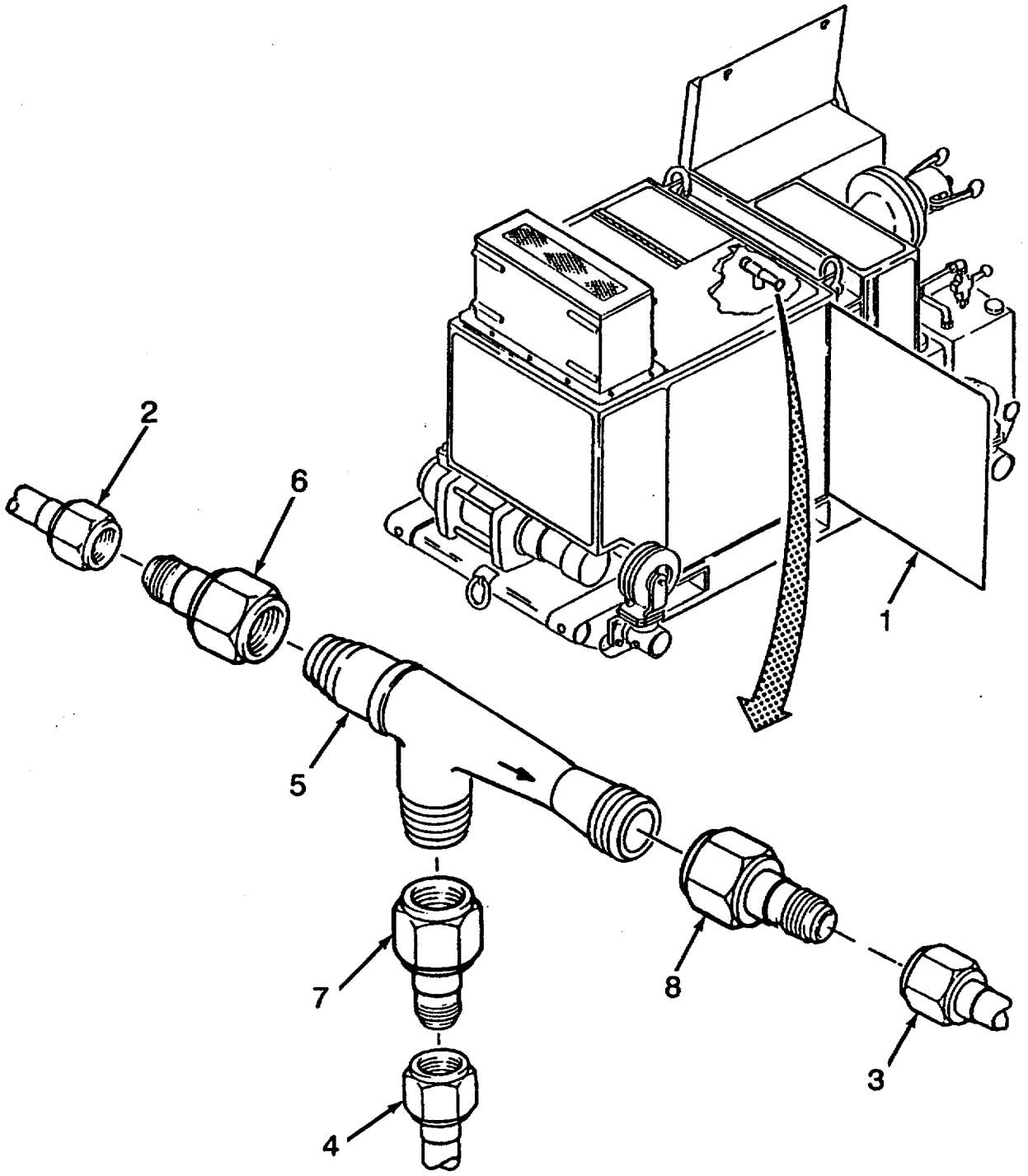


Figure 2-52. Jet Ejector Replacement

2-33. PRESSURE SWITCH REPLACEMENT.

This task covers: a. Removal b. Test and Adjustment c. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Digital Multimeter (App B, Sect B, Sect III, Item 1)
Air Compressor (App B, Sect III, Item 2)
Pressure Regulator (App B, Sect III, Item 2)

Material/Parts
Preformed Packing (App F, Item 11)
Antiseize Tape (App E, Item 6)

Equipment Condition
200/600 GPM pump assembly removed from system (Para 2-9, TM 10-4320-342-10)

a. REMOVAL. Refer to Figure 2-53.

(1) Open door (1).
(2) Disconnect electrical connector (2) from pressure switch (3).
(3) Loosen nut (4) and screw (5) on clamp (6).
(4) Disconnect tube (7) from adapter (8).
(5) Remove pressure switch (3) from clamp (6).
(6) Remove adapter (8) from switch (3).
(7) Remove preformed packing (9) from adapter (8). Discard preformed packing.

2-33. PRESSURE SWITCH REPLACEMENT - continued.

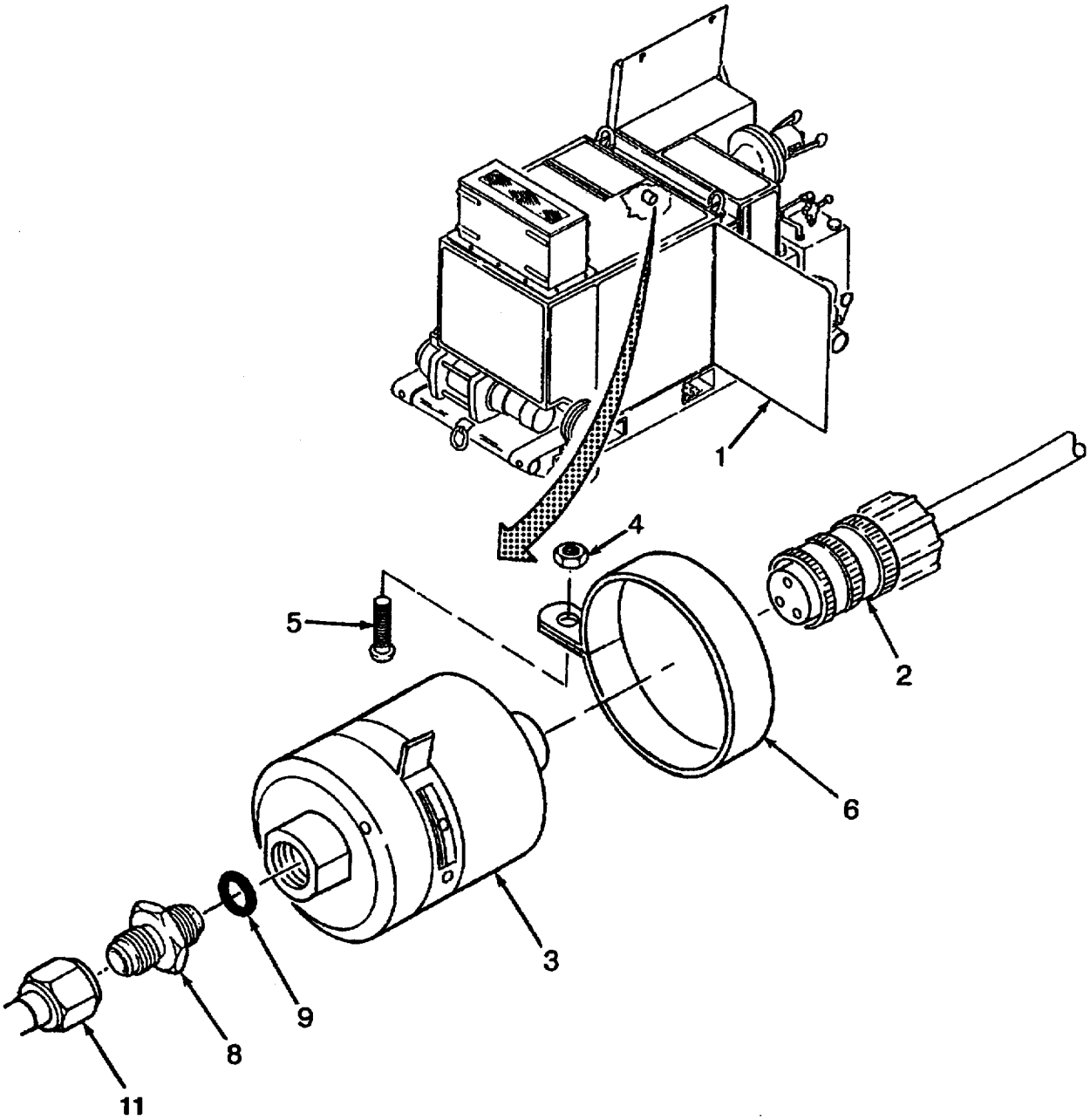


Figure 2-53. Pressure Switch Replacement

2-33. PRESSURE SWITCH REPLACEMENT - continued.

b. TEST AND ADJUSTMENT. Refer to Figure 2-54.

NOTE

If your unit does not have air regulating capability, refer to Direct Support Maintenance for test and adjustment.

Test adjustment of pressure switch to ensure continuity exists between pins A and B at 20 psi as follows:

NOTE

Pins are identified with a letter in the receptacle.

a. Connect the positive lead (1) to pin B and negative lead (2) to pin A on receptacle (3). At 0 pressure, continuity should be present.

b. Connect a regulated air source to the inlet (4) of pressure switch (5).

c. Apply air pressure until continuity is achieved between pins B and C. Record the pressure at which continuity was achieved.

d. If pressure is greater than 22 psi, proceed as follows:

(1) Connect pressure switch to a 20 psi pressure source. Connect multimeter leads to pins B and C.

(2) Lift tab (6) and rotate the name plate (7) to expose the adjustment ring (8) and locking setscrew (9).

(3) Remove the locking setscrew (9).

(4) Insert tip of a pointed object (ink pen) in hole (10) and rotate adjustment ring (8) until continuity is broken.

(5) Install the locking setscrew (9).

(6) Rotate name plate (7) to cover the adjustment screw (8) and set screw (9).

e. If pressure was less than 18 psi, proceed as follows:

(1) Connect pressure switch to a 20 psi pressure source. Connect multimeter leads to pins B and C.

(2) Lift tab (6) and rotate the name plate (7) to expose the adjustment screw (8) and locking setscrew (9).

(3) Remove the locking setscrew (9).

2-33. PRESSURE SWITCH REPLACEMENT - continued.

(4) Insert tip of an ink pen in hole (10) and rotate adjustment screw (8) clockwise until continuity is achieved.

(5) Install the locking setscrew (9).

(6) Rotate name plate (7) to cover the adjustment screw (8) and set screw (9).

f. Repeat steps a thru c and retest the switch.

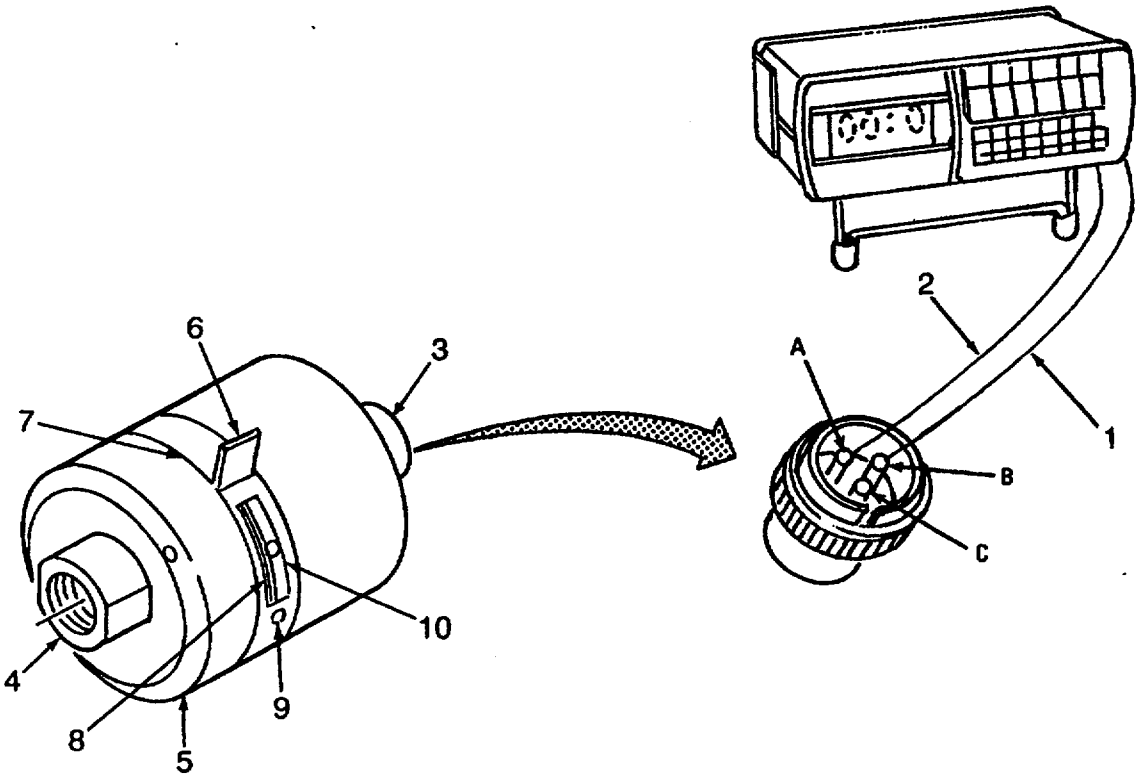


Figure 2-54. Pressure Switch Test and Adjustment

2-33. PRESSURE SWITCH REPLACEMENT - continued.

c. INSTALLATION. Refer to Figure 2-53.

(1) Install performed packing (9) on adapter (8).
(2) Install adapter (8) on pressure switch (3).
(3) Install pressure switch (3) in clamp (6).
(4) Tighten screw (5) and nut (4) on clamp (6).
(5) Connect tube (7) on adapter (8).
(6) Connect electrical connector (2) to pressure switch (3).
(7) Close door (1).

2-34. PRIMING SOLENOID VALVE REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
200/600 GPM pump assembly removed from system (Para 2-9, TM 10-4320-342-10)

Material/Parts
Antiseize Tape (App E, Item 6)
Sleeving Insulation (App F, Item 12)
Electrical Terminals (App F, Item 53)

a. REMOVAL. Refer to Figure 2-55.

(1) Open door (1) and remove panel (2).

(2) Remove sleeving insulation (3) from valve (4).

(3) Tag and disconnect electrical wiring from valve (4).

NOTE

Ensure priming shutoff valve is closed.

(4) Disconnect tubes (5 and 6) from valve (4) and remove valve.

(5) Remove adapters (7 and 8) from valve (4).

b. INSTALLATION.

NOTE

Install antiseizing tape (teflon tape) on all male pipe threads and wrap tape in direction of threads. Do not allow teflon tape to extend beyond end of threads.

(1) Install adapters (7 and 8) on valve (4).

(2) Connect tubes (5 and 6) to valve (4).

(3) Install electrical terminals (9) on valve wiring.

(4) Position sleeving insulation (3) on wiring.

2-34. PRIMING SOLENOID VALVE REPLACEMENT - continued.

NOTE

Wire numbers are stamped on each electrical wire. This information, in conjunction with data on FO-1 and FO-2 200/600 GPM Pump Wiring Diagram, may be used to connect wires if tags are lost or illegible.

(5) Connect electrical wiring as tagged.

(6) Slide sleeving insulation (3) over terminals (9) and shrink sleeving on wiring.

(7) Close door (1) and install panel (2).

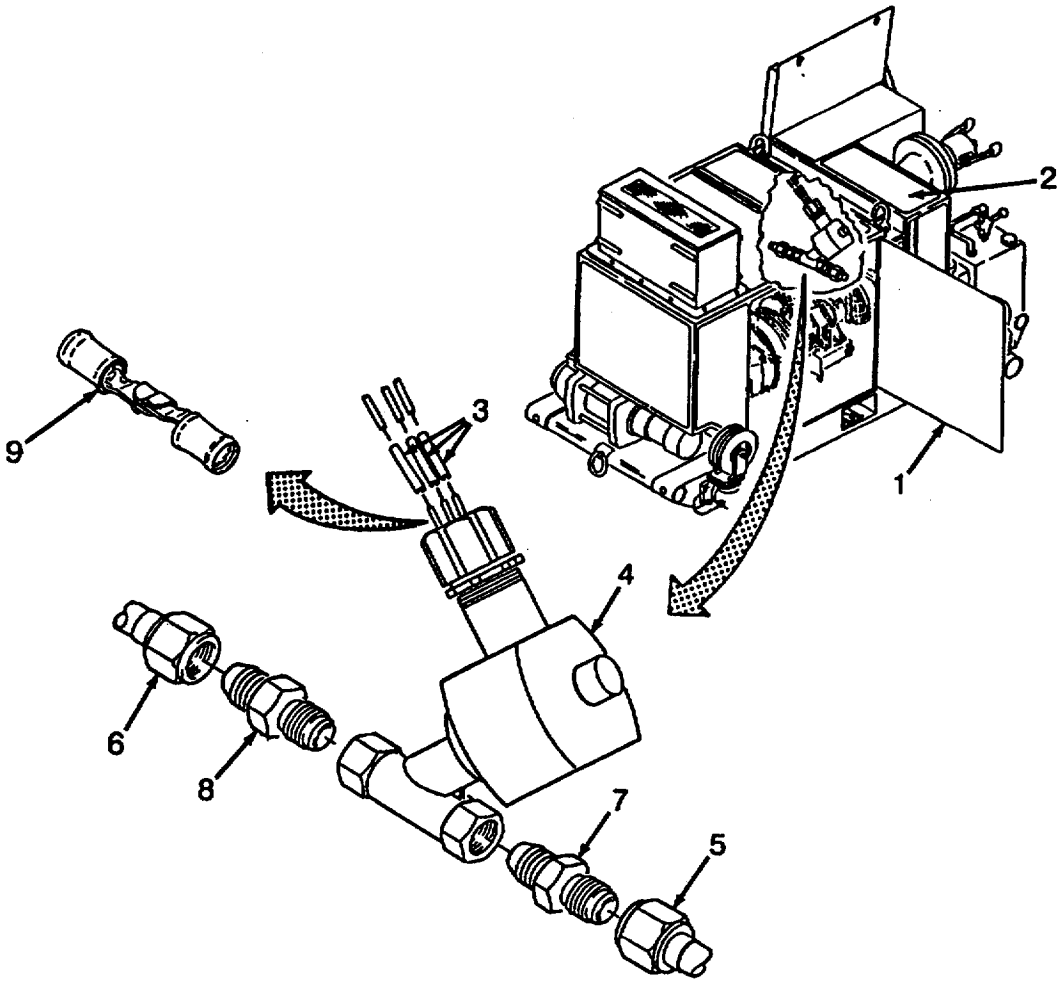


Figure 2-55. Primary Solenoid Valve Replacement

2-35. BLEED AIR CHECK VALVE REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
200/600 GPM pump assembly removed from system (Para 2-9, TM 10-4320-342-10)

Material/Parts
Antiseize Tape (App E, Item 6)

a. REMOVAL. Refer to Figure 2-56.

(1) Open door (1).

(2) Disconnect tubes (2 and 3) and remove valve (4).

(3) Remove reducer (5) from valve (4).

b. INSTALLATION.

NOTE

Install antiseizing tape (teflon tape) on all male pipe threads and wrap tape in direction of threads. Do not allow teflon tape to extend beyond end of threads.

(1) Install reducer (5) on inlet side of valve (4).

NOTE

Insure flow arrow on valve points up.

(2) Install tubes (2 and 3) on valve (4) and reducer (5).

(3) Close door (1).

2-35. BLEED AIR CHECK VALVE REPLACEMENT - continued.

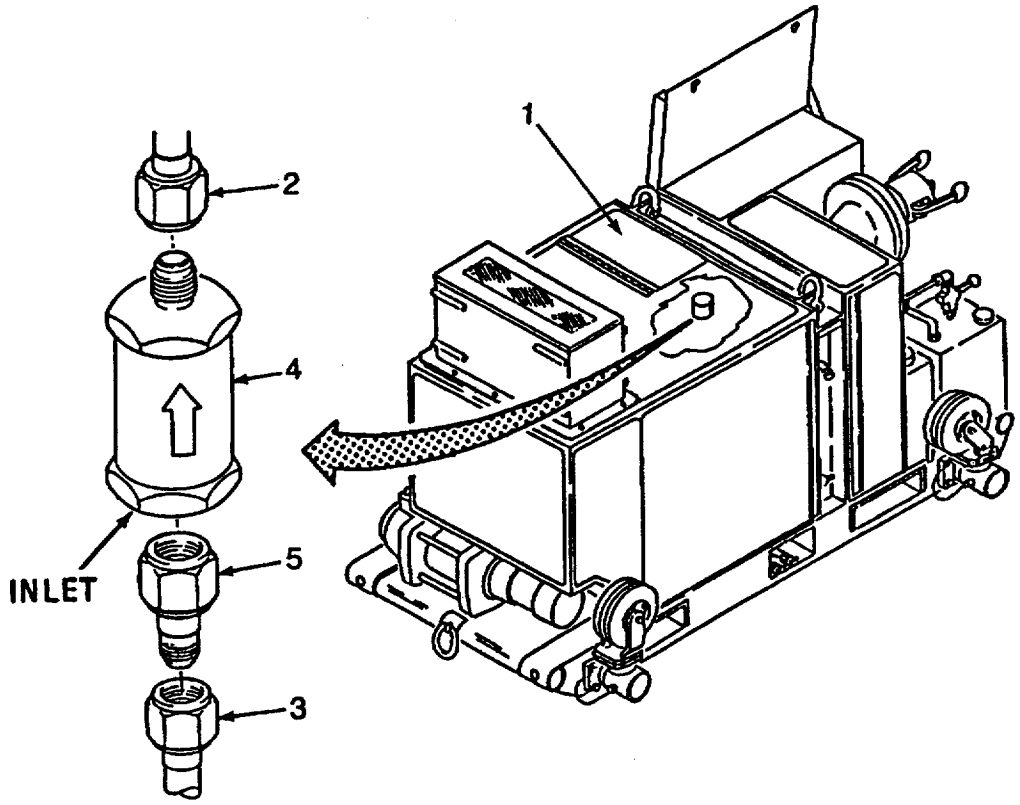


Figure 2-56. Bleed Air Valve Replacement

2-36. BLEED AIR SOLENOID VALVE ASSEMBLY REPLACEMENT. I

This Task Covers: a. Removal b. Test c. Repair d. Installation

INITIAL SETUP

Tools	Equipment Condition
General Mechanics Tool Kit (App B, Sect III, Item 1) Multimeter, Digital (App B, Sect II, Item 2)	200/600 GPM pump assembly removed from system (Para 2-9, TM 10-4320-342-10)

a. REMOVAL. Refer to Figure 2-57.

(1) Open door (1).

NOTE
Note position of connector prior to removal.

(2) Disconnect connector (2) from valve (3).

(3) Disconnect tubes (4 and 5) from valve (3).

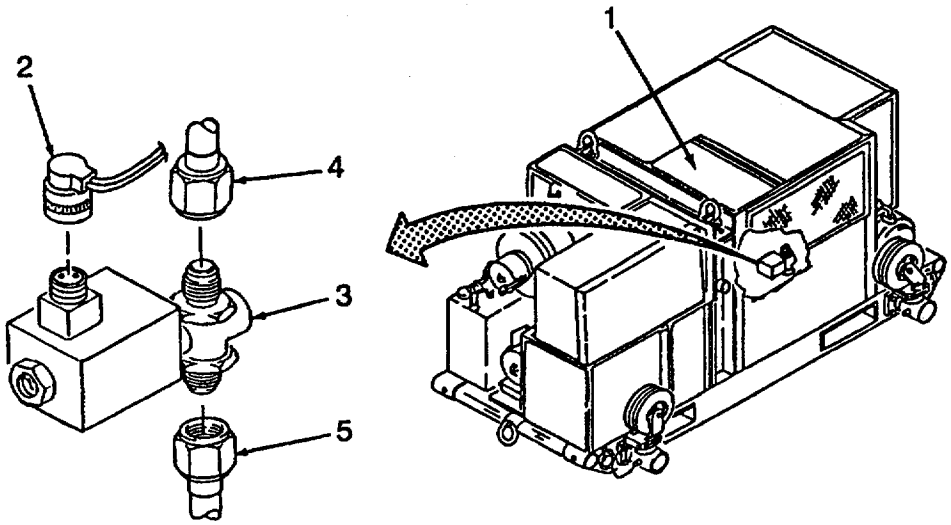


Figure 2-57. Bleed Air Solenoid Valve Assembly Removal

2-36. BLEED AIR SOLENOID VALVE ASSEMBLY REPLACEMENT - continued.

b. TEST. Refer to Figure 2-58.

(1) Connect multimeter negative (Black) lead (1) to pin A and positive (Red) lead (2) to pin B on solenoid (3).

(2) With leads (1 and 2) connected, check reading on multimeter (4) for 25-30 ohms. If multimeter indicates higher than 30 ohms, replace solenoid (3).

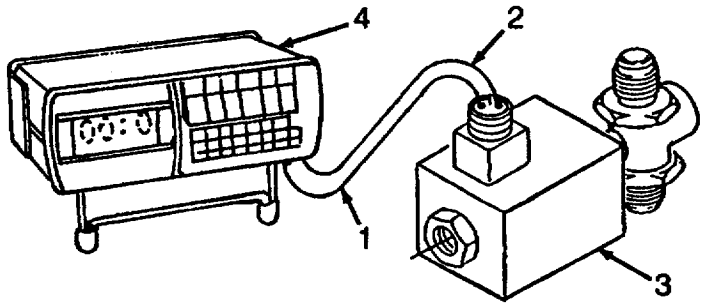


Figure 2-58. Ohms Testing of Bleed Air Solenoid

Refer to Figure 2-59.

(3) If reading indicates 25-30 ohms, check for retraction of plunger (1) in body assembly (2).

(4) Connect negative lead (3) to Pin A on solenoid (4) and negative of a 24 vdc power source (5).

(5) Connect positive lead (6) to Pin B on solenoid (4) and to positive of a 24 vdc power source (5).

(6) With leads (3 and 6) connected to solenoid (4) on 24 vdc power source (5), look through the tube connectors (7 and 8) on the valve body assembly (9). If light can be seen, the plunger (1) in the valve body assembly (9) has retracted and valve body assembly is good. If not, replace valve body assembly (9).

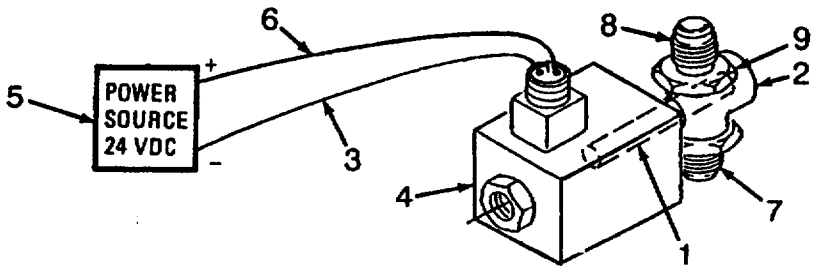


Figure 2-59. Testing Plunger Retraction of Bleed Air Solenoid Valve

2-36. BLEED AIR SOLENOID VALVE ASSEMBLY REPLACEMENT - continued.

c. REPAIR. Refer to Figure 2-60.

Repair is limited to replacement of damaged components.

(1) Disassemble.

(a) Remove nut (1).
(b) Slide solenoid (2) from valve body assembly (3).

(2) Assemble.

(a) Slide solenoid (2) onto valve body assembly (3).
(b) Install nut (1).

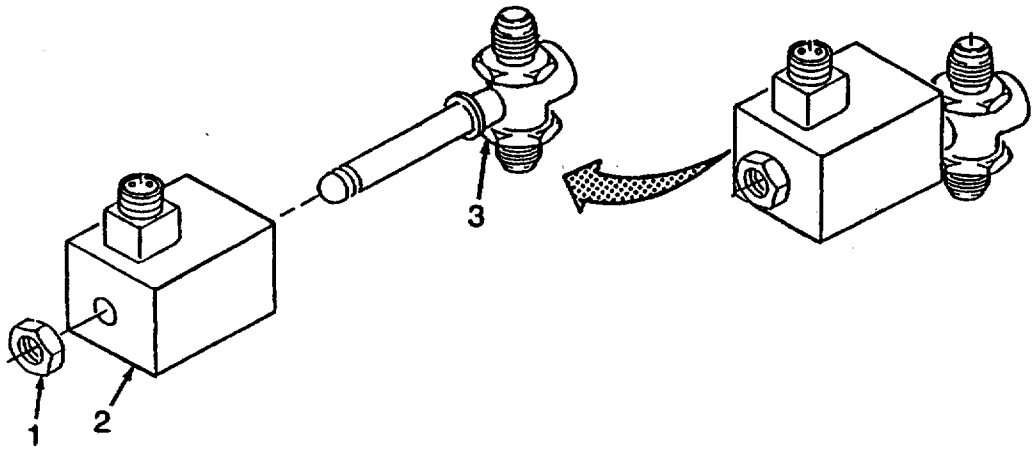


Figure 2-60. Bleed Air Solenoid Valve Repair

2-36. BLEED AIR SOLENOID VALVE ASSEMBLY REPLACEMENT - continued.

d. INSTALLATION. Refer to Figure 2-61.

(1) Position valve (1) and connect tubes (2 and 3).

(2) Connect connector (4) to valve (1).

(3) Close door (5).

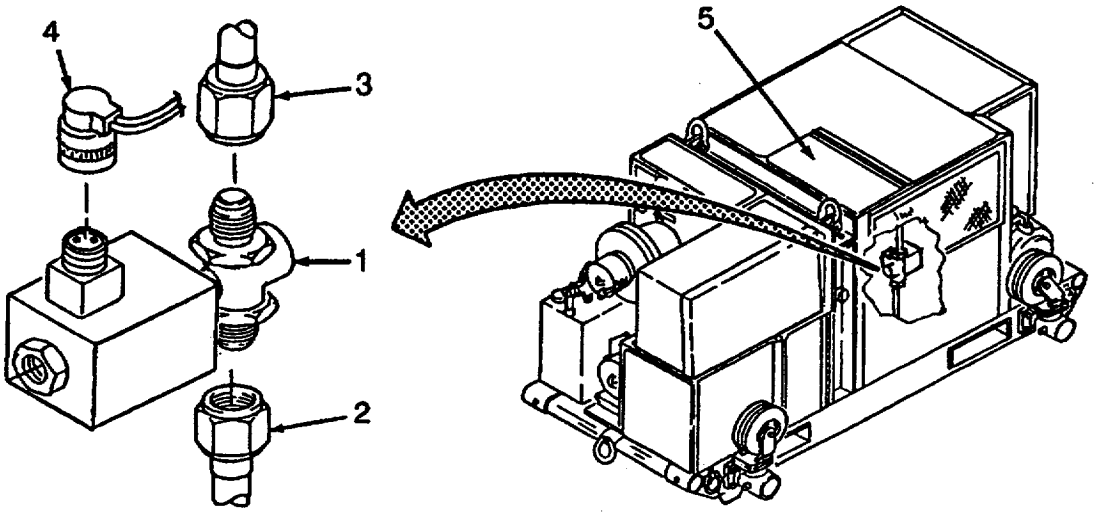


Figure 2-61. Bleed Air Solenoid Valve Assembly Installation

2-37. FUEL FILTER SERVICING AND REPAIR.

This task covers: a. Servicing b. Removal c. Disassembly
d. Assembly e. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Socket 1-1/2 inch (App B, Sect III, Item 2)

Material/Parts
Preformed Packing (App F, Items 13, 14, 15)
Filter Element (App F, Item 7)

Equipment Condition
200/600 GPM pump assembly removed from system (Para 2-9, TM 10-4320-342-10)

General Safety Instructions

WARNING

Fuels and fuel vapors are toxic and flammable. Be careful when working around fuel so not to come in contact. Fuel can cause injury to personnel. For disposal of contaminated fuel, refer to FM 10-20.

a. SERVICING. Refer to Figure 2-62.

(1) Remove panel (1).
(2) Open door (2).
(3) Unscrew bowl (3).
(4) Remove filter (4) and preformed packing (5). Discard filter and preformed packing.
(5) Remove preformed packing (6) from housing (7). Discard preformed packing.
(6) Install preformed packing (6) in housing (7).
(7) Install preformed packing (5) in filter (4).
(8) Install filter (4) in housing (7).
(9) Prime and install bowl (3) on housing (7).

b. REMOVAL.

(1) Remove panel (1).
(2) Open door (2).
(3) Disconnect tubes (8 and 9) from adapters (10).

2-37. FUEL FILTER SERVICING AND REPAIR - continued.

(4) Support filter assembly (11) and remove nuts (12), washers (13), bolts (14) and remove filter assembly.

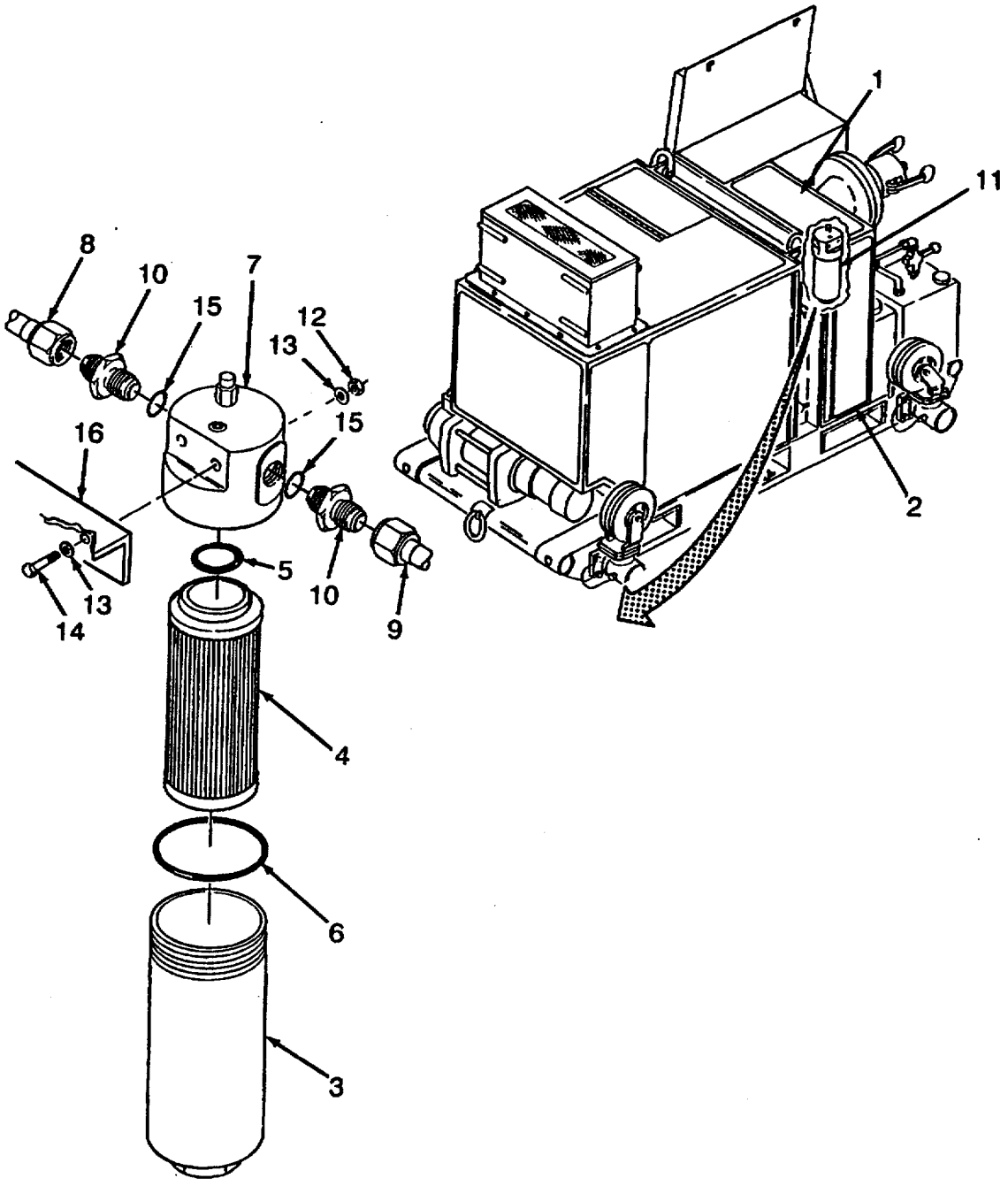


Figure 2-62. Fuel Filter Servicing and Repair

2-37. FUEL FILTER SERVICING AND REPAIR - continued.

c. DISASSEMBLY. Refer to Figure 2-62.

(1) Remove adapters (10) from housing (7).
(2) Remove preformed packing (15) from housing (7). Discard preformed packing.

d. REPAIR.

Repair is limited to replacement of defective components.

e. ASSEMBLY.

(1) Install preformed packing (15) on adapters (10).
(2) Install adapters (10) in housing (7).

f. INSTALLATION.

(1) Position filter assembly (11) on bracket (16) and install bolts (14), washers (13)and nuts (12).
(2) Connect tubes (8 and 9) to adapters (10).
(3) When installing filter assembly (11), prime the bowl (3).
(4) Install panel (1).
(5) Close door (2).

2-38. FUEL DRAIN CHECK VALVE REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Material/Parts
Antiseize Tape (App E, Item 6)

Equipment Condition
200/600 GPM pump assembly removed from system (Para 2-9, TM 10-4320-342-10)

General Safety Instructions

WARNING

Fuels and fuel vapors are toxic and flammable. Be Careful when working around fuel so not to come in contact. Fuel can cause injury to personnel. For disposal of contaminated fuel, refer to FM 10-20.

a. REMOVAL. Refer to Figure 2-63.

(1) Open door (1).

(2) Disconnect tubes (2 and 3).

NOTE

Note position of adaptor and elbow in relation to flow arrow on check valve.

(3) Remove adapter (4) and elbow (5) from check valve (6).

b. INSTALLATION.

NOTE

Install antiseizing tape (teflon tape) on all male threads and wrap tape in direction of threads. Do not allow teflon tape to extend beyond end of threads.

(1) Install adapter (4) and elbow (5) in check valve (6) as noted during removal.

(2) Position check valve (6) and connect tubes (2 and 3).

(3) Close door (1).

2-38. FUEL DRAIN CHECK VALVE REPLACEMENT - continued.

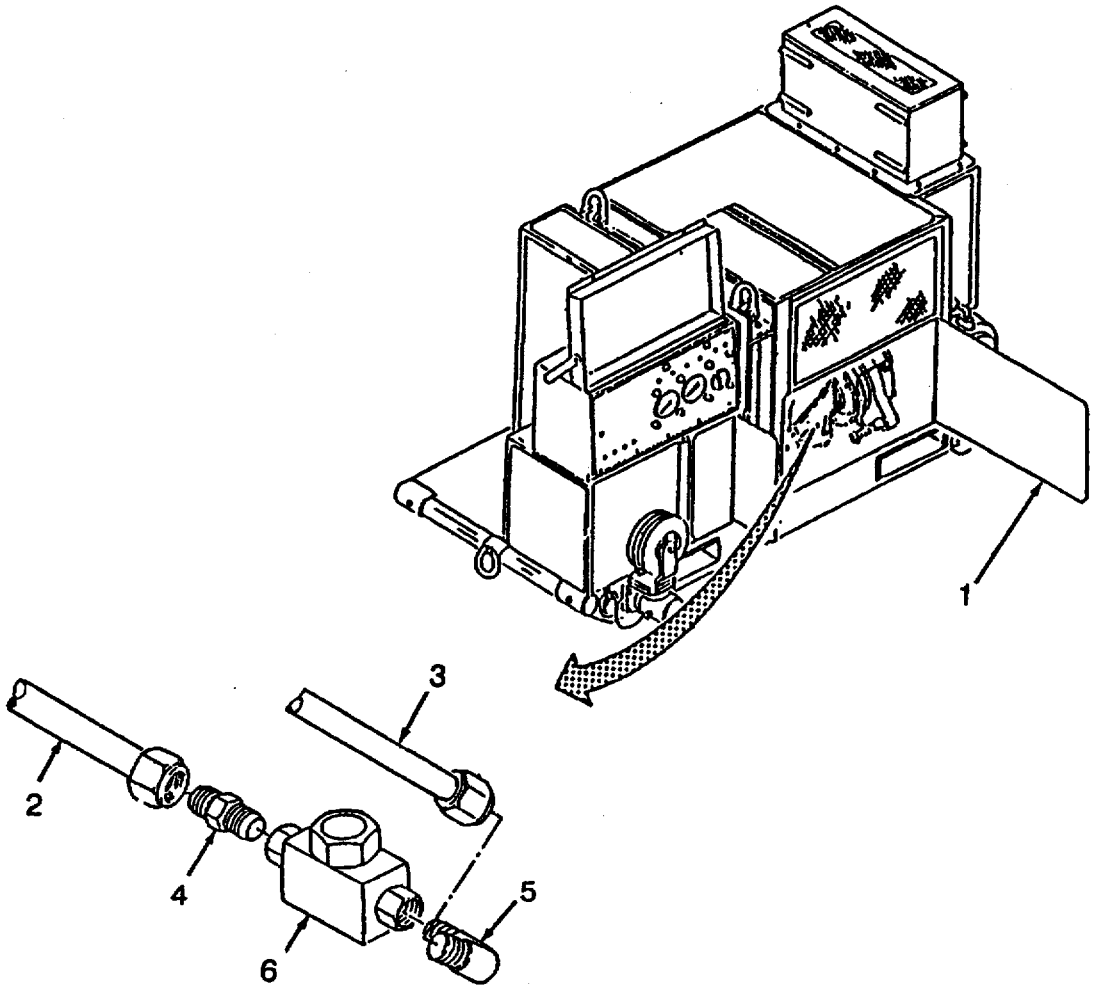


Figure 2-63. Fuel Drain Check Valve Replacement

2-39. FUEL BOOSTER PUMP REPAIR.

This task covers: a. Removal b. Disassembly c. Repair d. Assembly e. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Material/Parts
Antiseize Tape (App E, Item 6)
Preformed Packing (App F, Item 16)

Equipment Condition
200/600 GPM pump assembly removed from system (Para 2-9, TM 10-4320-342-10)

General Safety Instructions

WARNING

Fuels and fuel vapors are toxic and flammable. Be careful when working around fuel so not to come in contact. Fuel can cause injury to personnel. For disposal of contaminated fuel, refer to FM 10-20.

a. REMOVAL. Refer to Figure 2-64.

(1) Open doors (1 and 2).
(2) Disconnect electrical connector (3) from fuel boost pump (4).
(3) Disconnect tubes (5 and 6).
(4) Remove nuts (7), flatwashers (8) and bolts (9).
(5) Remove pump (4) from bracket (10).

b. DISASSEMBLY.

(1) Remove adapter (11) from strainer (12).
(2) Remove strainer (12) and preformed packing (13) from fuel boost pump (4). Discard preformed packing.
(3) Remove elbow (14) from fuel boost pump (4).
(4) Remove caps (15) and brushes (16) from fuel boost pump (4).

c. REPAIR.

Repair consists of replacing damaged and/or missing components of the fuel boost pump.

2-39. FUEL BOOSTER PUMP REPAIR - continued.

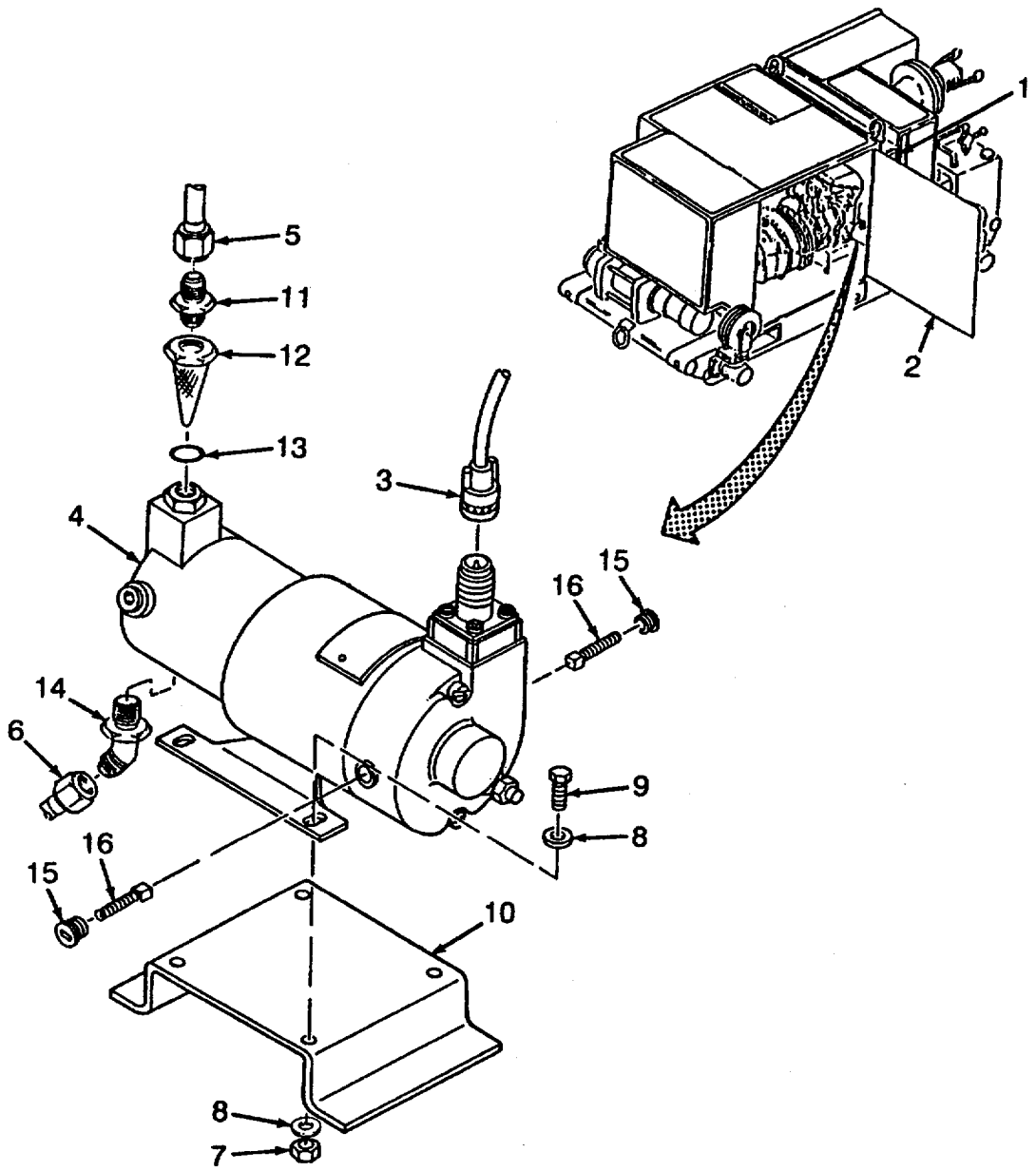


Figure 2-64. Fuel Boost Pump Repair

2-39. FUEL BOOSTER PUMP REPAIR - continued.

d. ASSEMBLY. Refer to Figure 2-64.

(1) Install brushes (16) and caps (15) in pump (4).

NOTE

Install antiseizing tape (teflon tape) on all male threads and wrap tape in direction of threads. Do not allow teflon tape to extend beyond end of threads.

(2) Install elbow (14) in fuel boost pump (4).

(3) Install preformed packing (13) on strainer (12).

(4) Install strainer (12) on pump (4).

(5) Install adapter (11) in strainer (12).

e. INSTALLATION.

(1) Position pump (4) on bracket (10) and install bolts (9), washers (8) and nuts (7).

(2) Connect tubes (5 and 6) to pump (4).

(3) Connect electrical connector (3) to pump (4).

(4) Close doors (1 and 2).

2-40. FUEL FLEXIBLE HEATER REPLACEMENT (TYPICAL).

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
200/600 GPM Pump shut down (Para 2-7c, TM 10-4320-342-10)

Material/Part
Tag (App E, Item 16)
Tie Straps (App E, Item 17)
Splice Connectors (App F, Item 42)

a. REMOVAL. Refer to Figure 2-65.

(1) Open door (1).

(2) Tag and disconnect wiring (2) from fuel heater (3).

(3) Remove tie wraps (4) from fuel heater (3).

(4) Unwrap fuel heater (3) from fuel tube (5).

b. INSTALLATION.

NOTE
Fuel heaters must be wrapped so that thermostats will face out from fuel tube.

(1) Starting at end of fuel tube (5), wrap fuel heater (3) once around tube and secure in place with tie wrap (4).

(2) Continue wrapping fuel heater (3) tightly around fuel tube in a spiral pattern until all heater material is in place. Install tie wrap (4) as required to prevent unwrapping of heater.

(3) Position bottom of thermostat (6) against surface of fuel tube (5) and secure in place with tie wrap (4). Install additional tie wraps at junction of wiring (2) and thermostat to provide strain relief.

NOTE
Wire numbers are stamped on each electrical wire. This information, in conjunction with data on FO-1 and FO-2 200/600 GPM Pump Wiring Diagram, may be used to connect wires if tags are lost or illegible.

2-40. FUEL FLEXIBLE HEATER REPLACEMENT (TYPICAL) - continued.

(4) Install splice connectors (7) on wiring (2) as tagged during removal.

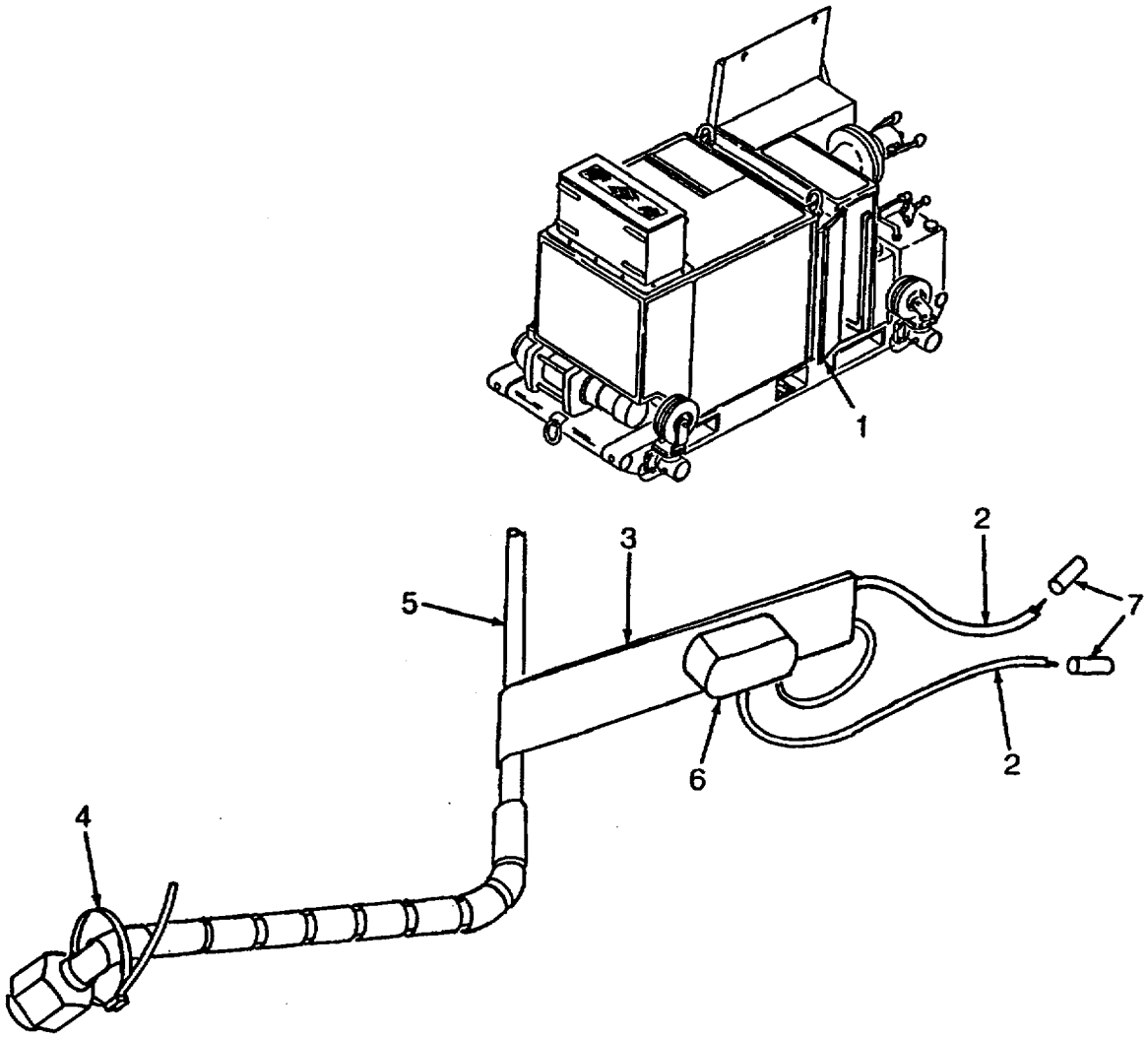


Figure 2-65. Fuel Flexible Heater Replacement (Typical)

2-41. ENGINE GEAR BOX OIL DRAIN VALVE REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Material/Parts
Antiseize Tape (App E, Item 6)

Equipment Condition
200/600 GPM pump assembly removed from system (Para 2-9, TM 10-4320-342-10)
Engine Gear Box Oil drained (LO 10-43210-342-12)

a. REMOVAL. Refer to Figure 2-66.

(1) Open door (1).

(2) Disconnect tubes (2 and 3) from adapter (4) and elbow (5).

(3) Remove adapter (4) and elbow (5) from valve (6).

NOTE

Install antiseizing tape (teflon tape) on all male threads and wrap tape in direction of threads. Do not allow teflon tape to extend beyond end of threads.

b. INSTALLATION.

(1) Install adapter (4) and elbow (5) on valve (6).

(2) Position valve (6) in unit and connect tubes (2 and 3)

(3) Close door (1).

2-41. ENGINE GEAR BOX OIL DRAIN VALVE REPLACEMENT - continued.

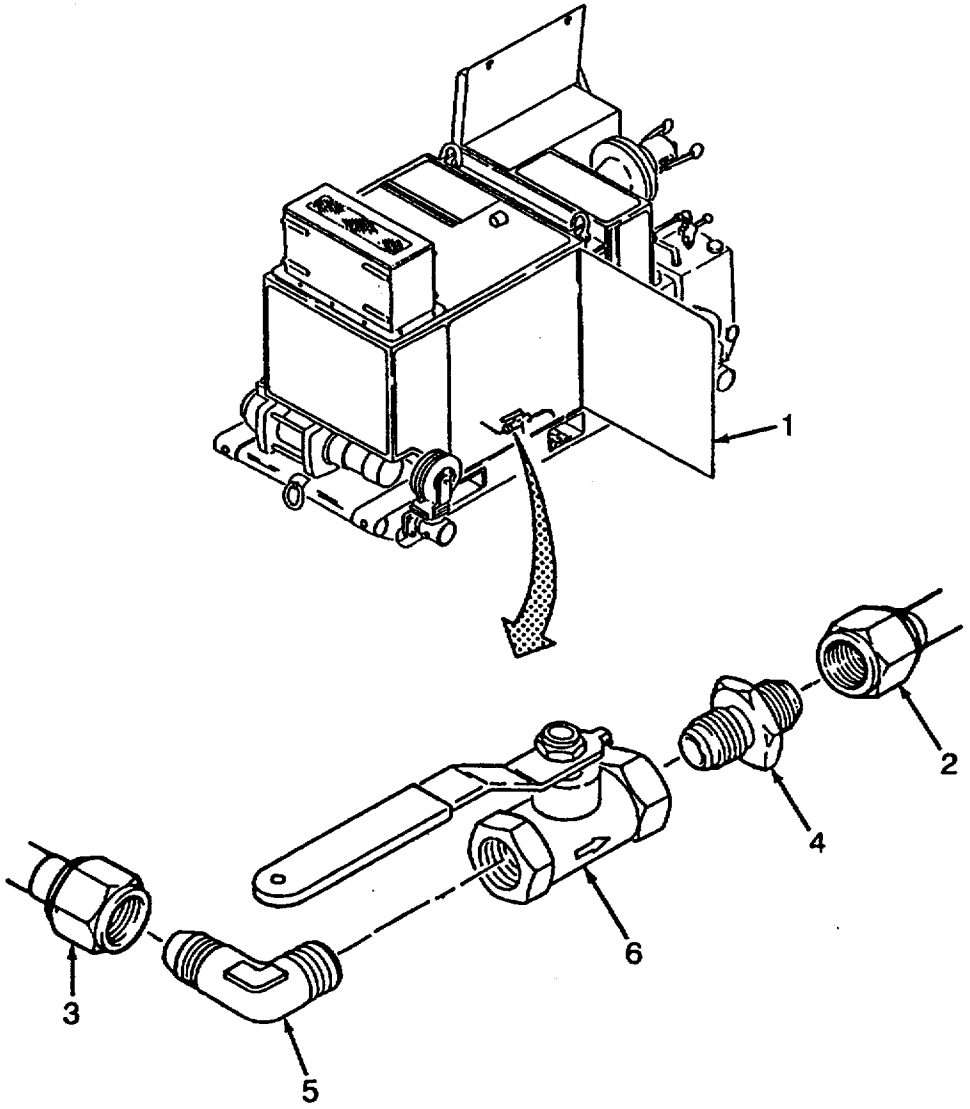


Figure 2-66. Engine Gear Box Oil Drain Valve Replacement

2-42. OIL FILTER SERVICING AND REPAIR.

This task covers: a. Servicing b. Removal c. Disassembly
d. Assembly e. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Socket 1-1/2 inch (App B, Sect III, Item 2)

Material/Parts
Preformed Packing (App F, Item 13, 14, 15)
Filter (App F, Item 7)
Lubricating Oil (LO 10-4320-342-12)

Equipment Condition
200/600 GPM pump assembly removed from system (Para 2-9, TM 10-4320-342-10)

General Safety Instructions

NOTE

For disposal of contaminated oil, refer to FM 10-20.

a. SERVICING. Refer to Figure 2-67.

(1) Open doors (1 and 2).
(2) Remove bowl (3).
(3) Remove filter (4) and preformed packing (5). Discard preformed packing and filter.
(4) Remove preformed packing (6) from housing (7). Discard preformed packing (6).
(5) Install preformed packing (6) on housing (7).
(6) Install preformed packing (5) on filter (4).
(7) Install filter (4) in housing (7).
(8) Rinse, prime and install bowl (3) on housing (7).

b. REMOVAL.

(1) Open doors (1 and 2).
(2) Disconnect tubes (8 and 9) from elbows (10 and 11).
(3) Support filter assembly (12) and remove nuts (13), washers (14), bolts (15) and remove filter from bracket (16).

2-42. OIL FILTER SERVICING AND REPAIR - continued.

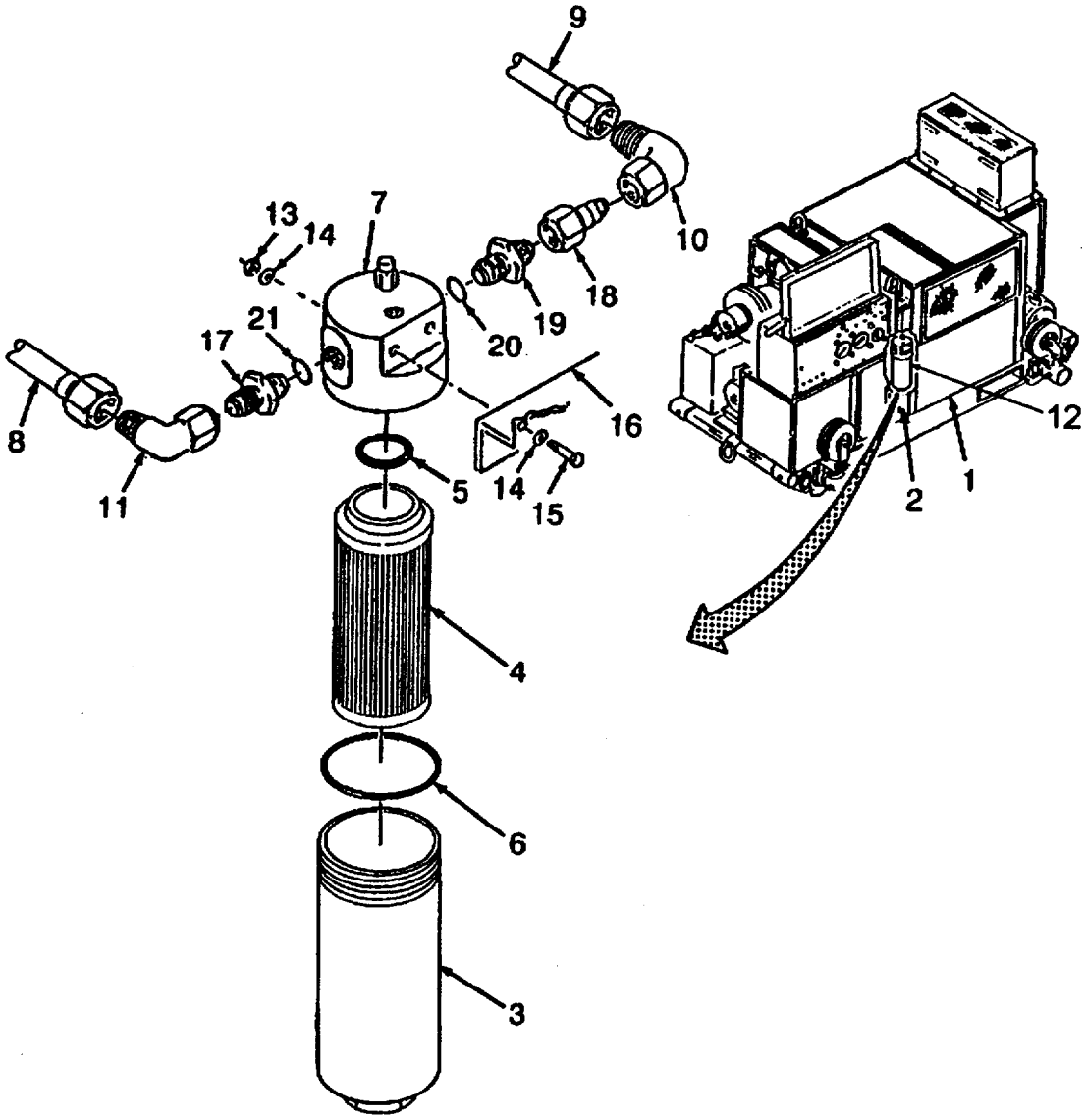


Figure 2-67. Oil Filter Servicing and Repair

2-42. OIL FILTER SERVICING AND REPAIR - continued.

c. DISASSEMBLY. Refer to Figure 2-67.

NOTE
Note position of elbows prior to removal.

(1) Remove elbows (10 and 11) from adapter (17) and bushing (18).
(2) Remove bushing (18) from adapter (19).
(3) Remove adapters (17 and 19) from housing (7).
(4) Remove preformed packings (20 and 21) from housing (7). Discard preformed packing.

d. ASSEMBLY.

(1) Install preformed packings (20 and 21) on adapters (17 and 19).
(2) Install adapters (17 and 19) on housing (7).
(3) Install bushing (18) on adapter (19).
(4) Install elbows (10 and 11) on adapter (17) and bushing (18) as noted during removal.

e. INSTALLATION.

(1) Position filter assembly (12) on bracket (16) and install bolts (15), washers (14) and nuts (13).
(2) Connect tubes (8 and 9) to elbows (10 and 11) as noted during removal.
(3) Close doors (1 and 2).

2-43. OIL BOOST PUMPS REPAIR.

This task covers: a. Removal b. Disassembly c. Repair
d. Assembly e. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Material/Parts
Antiseize Tape (App E, Item 6)
Preformed Packing (App F, Item 16)

Equipment Condition
200/600 GPM pump assembly removed from system (Para 2-9, TM 10-4320-342-10)
Lubricant drained from oil reservoir (LO 10-4320-342-12)

General Safety Instructions

WARNING

Fuels and fuel vapors are toxic and flammable. Be careful when working around fuel so not to come in contact. Fuel can cause injury to personnel. For disposal of contaminated fuel, refer to FM 10-20.

a. REMOVAL. Refer to Figure 2-68.

NOTE
This procedure is for one of the oil boost pumps. The other pump is similar.

(1) Open doors (1 and 2).
(2) Disconnect electrical connector (3) from fuel boost pump (4).
(3) Disconnect tubes (5 and 6) from oil boost pump (4).
(4) Remove nuts (7), washers (8), bolts (9) and pump (4) from bracket (10).

b. DISASSEMBLY.

NOTE
Note position of elbow prior to removal.

(1) Remove elbow (11) from strainer (12).
(2) Remove adapter(13), oil lift checkvalve (14) (return pumponly) and elbow (15) from oil boost pump (4).
(3) Remove strainer (12) and preformed packing (16). Discard preformed packing.

2-43. OIL BOOST PUMPS REPAIR - continued.

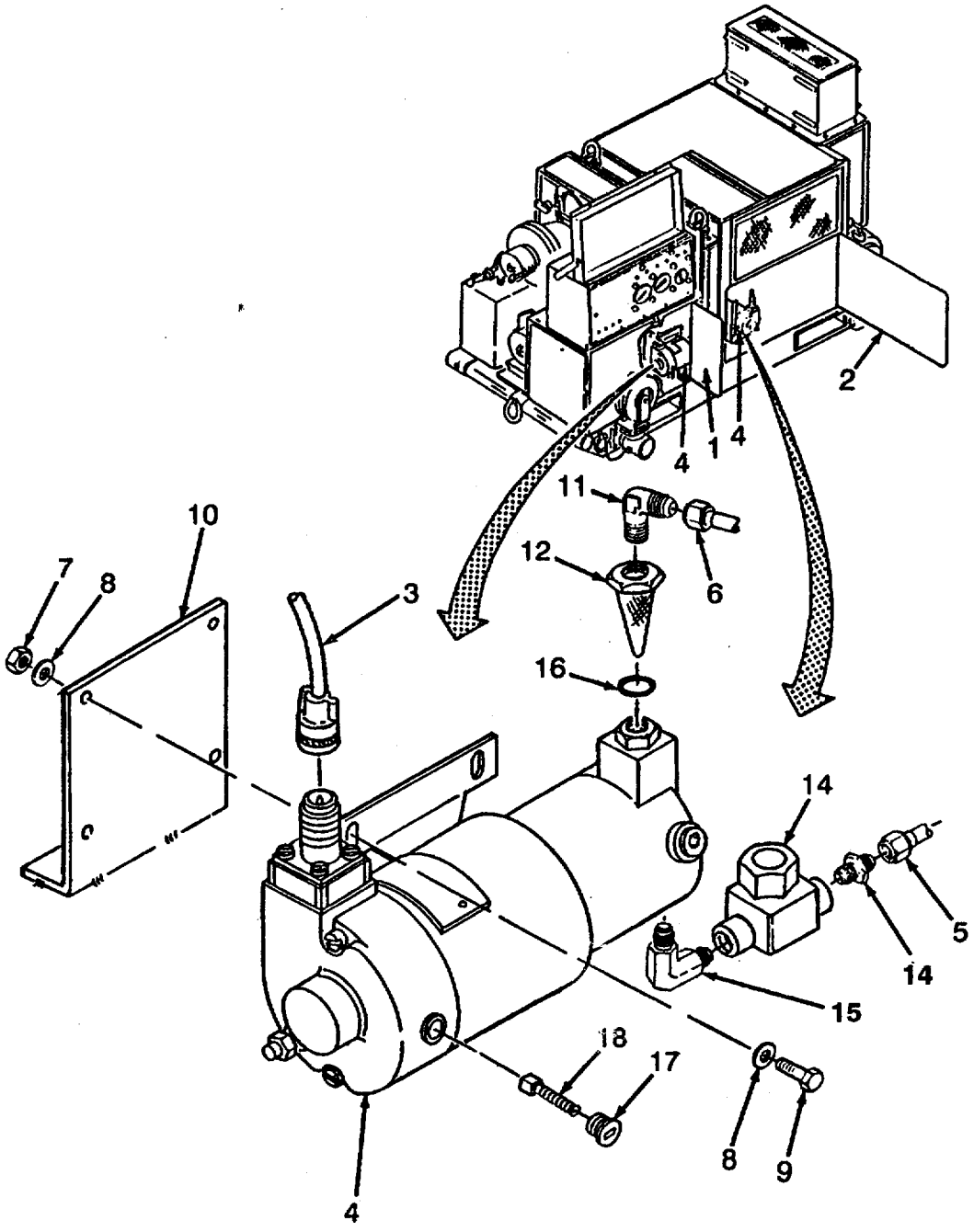


Figure 2-68. Oil Boost Pumps Repair

2-43. OIL BOOST PUMPS REPAIR - continued.

(4) Remove caps (17) and brushes (18).

c. REPAIR. Refer to Figure 2-68.

Repair consists of replacing damaged and/or missing components of the oil boost pumps.

d. ASSEMBLY.

(1) Install brushes (18) and caps (17) in oil boost pump (4).

NOTE

Install antiseizing tape (teflon tape) on all male threads and wrap tape in direction of threads. Do not allow teflon tape to extend beyond end of threads.

(2) Install new preformed packing (16) on strainer (12).
(3) Install strainer (12) on oil boost pump (4).
(4) Install elbow (11).
(5) Install elbow (15).
(6) Install oil lift check valve (14) and adapter (13).

e. INSTALLATION.

(1) Position pump (4) on bracket (10) and install bolts (9), washers (8) and nuts (7).
(2) Connect tubes (5 and 6) to elbows (11 and 15) on oil boost pump (4).
(3) Connect electrical connector (3) on oil boost pump (4).
(4) Close doors (1 and 2).

2-44. SPEED REDUCER REPLACEMENT.

This task covers: a. Removal b. Disassemble c. Assemble d. Installation e. Test

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Torque Wrench 0-300 inch-pounds (App B, Sect III, Item 2)

Material/Parts
Preformed Packing (App F, Items 13 and 16)

Equipment Condition
200/600 GPM fuel pump removed (Para 2-18)
Speed Reducer Reservoir removed (Para 2-16)
Priming Drain Tank removed (Para 2-15)

General Safety Instructions

WARNING

Support speed reducer before removing the last nut that supports speed reducer. Failure to comply could result in injury to personnel.

a. REMOVAL. Refer to Figure 2-69.

(1) Open door (1).

(2) Disconnect tubes (2, 3, 4 and 5) from adapters (6, 7, 8 and 9) on bottom bulkhead panel (10).

(3) Remove fifteen bolts (11), nineteen washers (12), four locknuts (13) and bottom bulkhead panel (10).

(4) Remove nuts (14), flat washers (15) and adapters (6, 7, 8 and 9) from bottom bulkhead panel (10).

2-44. SPEED REDUCER REPLACEMENT - continued.

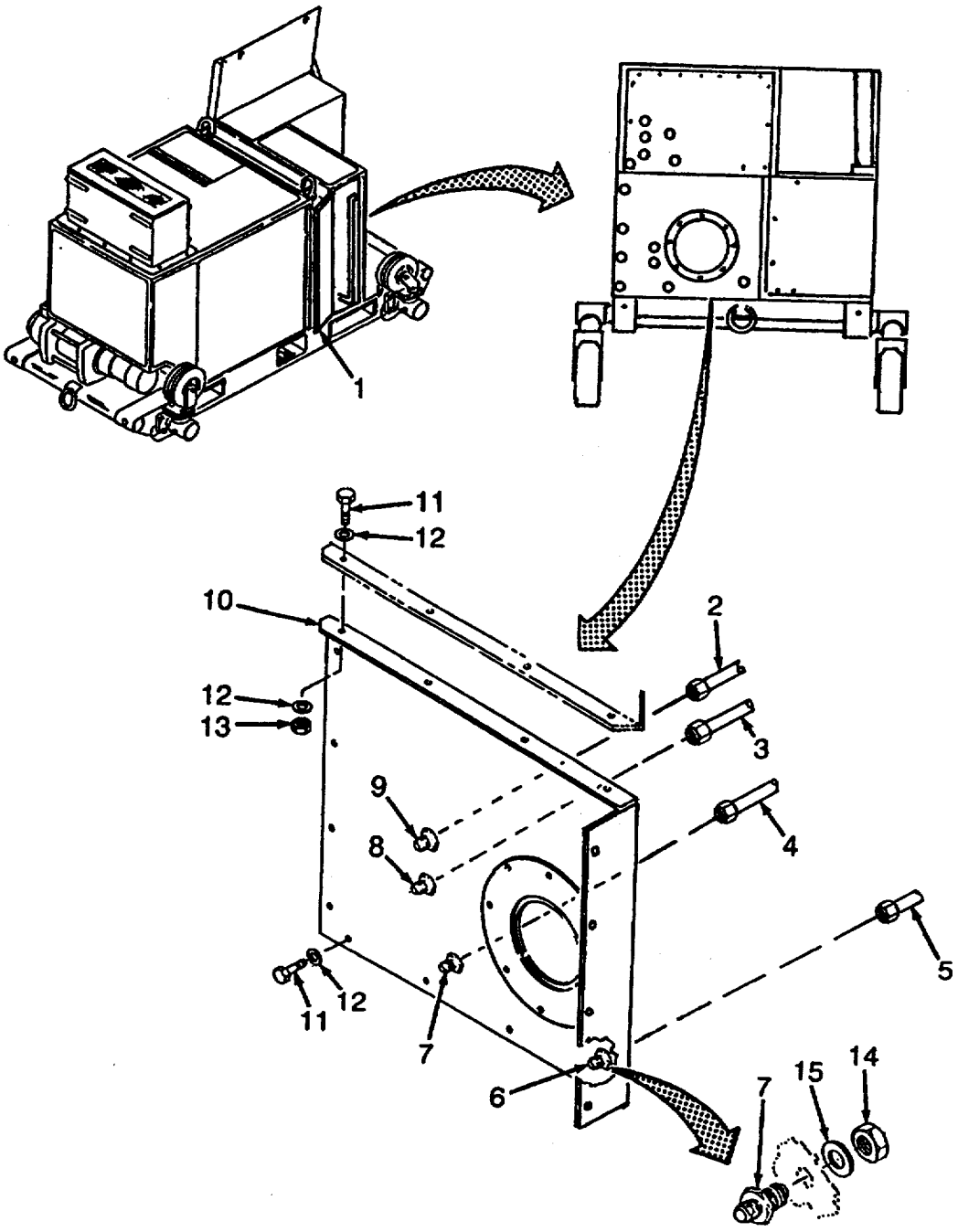


Figure 2-69. Bottom Bulkhead Panel

2-44. SPEED REDUCER REPLACEMENT - continued.

Refer to Figure 2-70.

(4) Disconnect tube (1) from elbow (2).
(5) Disconnect tube (3) from adapter (4).
(6) Disconnect tube (5) from speed reducer (6).
(7) Remove nuts (7) from speed reducer and studs (8) on engine (9).
(8) Remove speed reducer (6).

b. DISASSEMBLE.

(1) Remove adapter (4) and preformed packing (10) from speed reducer (6).
(2) Remove elbow (2) and preformed packing (11) from speed reducer (6).

c. ASSEMBLE.

(1) Install adapter (4) and preformed packing (10) on speed reducer (6).
(2) Install elbow (2) and preformed packing (11) on speed reducer (6).

d. INSTALLATION.

CAUTION
Speed reducer must not bump engine spline during installation or engine may be damaged internally.

(1) Position speed reducer (6) on studs (8). Carefully slide speed reducer (6) towards engine (9) and engine drive spline (11). If splines do not align, rotate output shaft (12) on speed reducer (6) until splines align and slide into position.
(2) Install nuts (7) on studs (8) and perform test in para 2-44e.
(3) Connect tube (5) on speed reducer (6).
(4) Connect tube (3) on adapter (4).
(5) Connect tube (1) on elbow (2).

Refer to Figure 2-69.

(6) Install adapters (6, 7, 8 and 9) with flat washers (15) and nuts (14) on bottom bulkhead panel (10).
(7) Position bottom bulkhead panel (10) and secure with bolts (11), washers (12) and nuts (13).
(8) Connect tubes (2, 3, 4 and 5) to adapters (6, 7, 8 and 9).

2-44. SPEED REDUCER REPLACEMENT - continued.

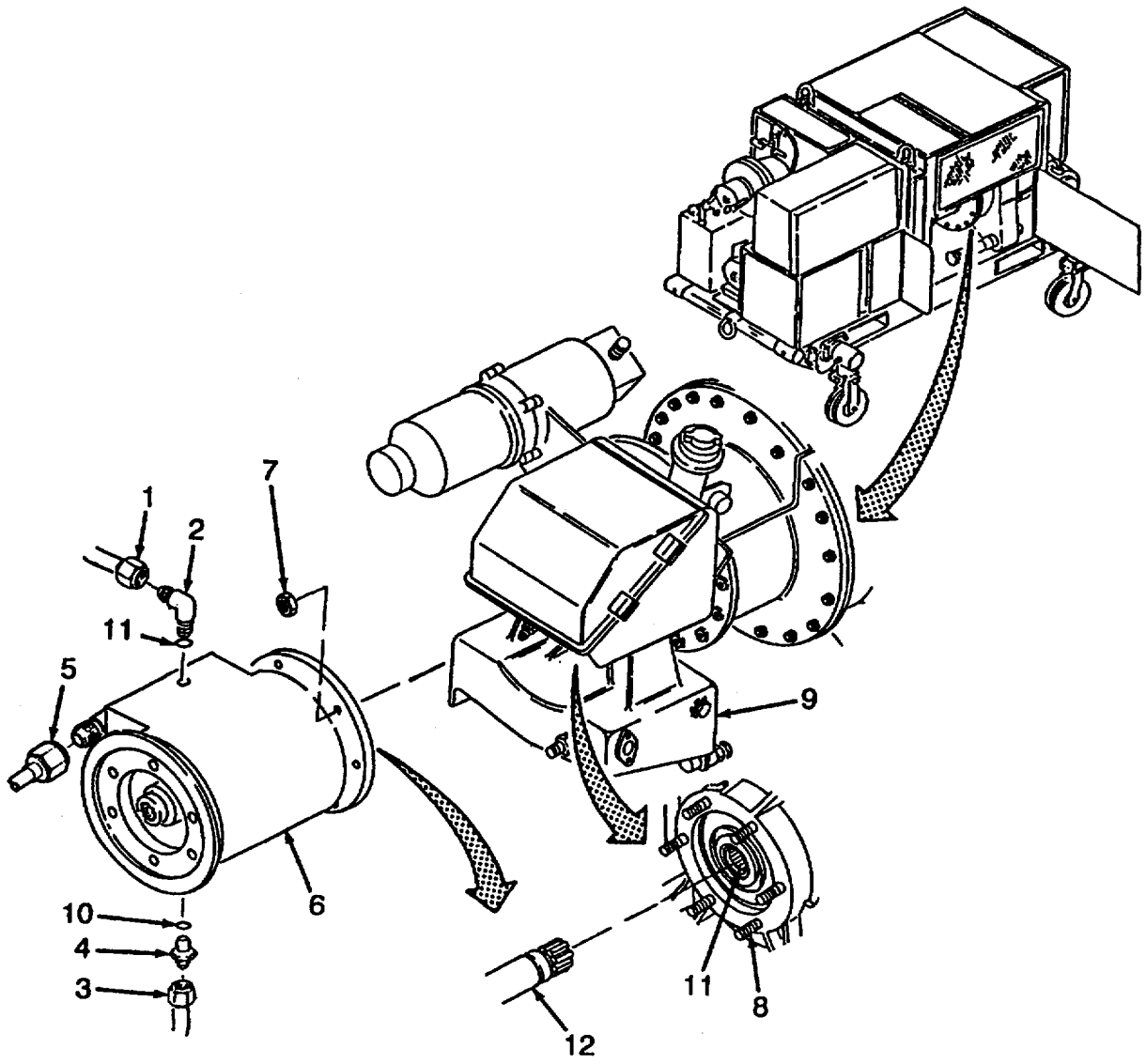


Figure 2-70. Speed Reducer Replacement

2-44. SPEED REDUCER REPLACEMENT - continued.

e. TEST. Refer to Figure 2-71.

(1) Cut safety wire on clamp (1).

(2) Loosen coupling (1) and slide exhaust duct (2) away from engine (3).

WARNING

Fins on turbine wheel may be sharp and cause serious injury to personnel.

CAUTION

Do not use tools or foreign objects to rotate turbine wheel or damage may occur.

(3) Reach into engine (3) and rotate turbine wheel (4) by hand while holding output spline (5) on speed reducer (6). If output spline (5) does not rotate while rotating turbine wheel (4), engine (3) damage has occurred. Engine must be removed and forwarded for repair.

(4) Position exhaust duct (2) on engine (3) and tighten clamp (1).

(5) Torque clamp (1) nut to 33 to 37 inch-pounds.

(6) Tap clamp outer diameter with rubber mallet and retorque clamp nut to 47 to 53 inch-pounds. K'''

(7) Repeat tap and retorque until torque remains at 47 to 53 inch-pounds. Lock wire clamp (1).

(8) Continue speed reducer installation para 2-44d (3).

2-44. SPEED REDUCER REPLACEMENT - continued.

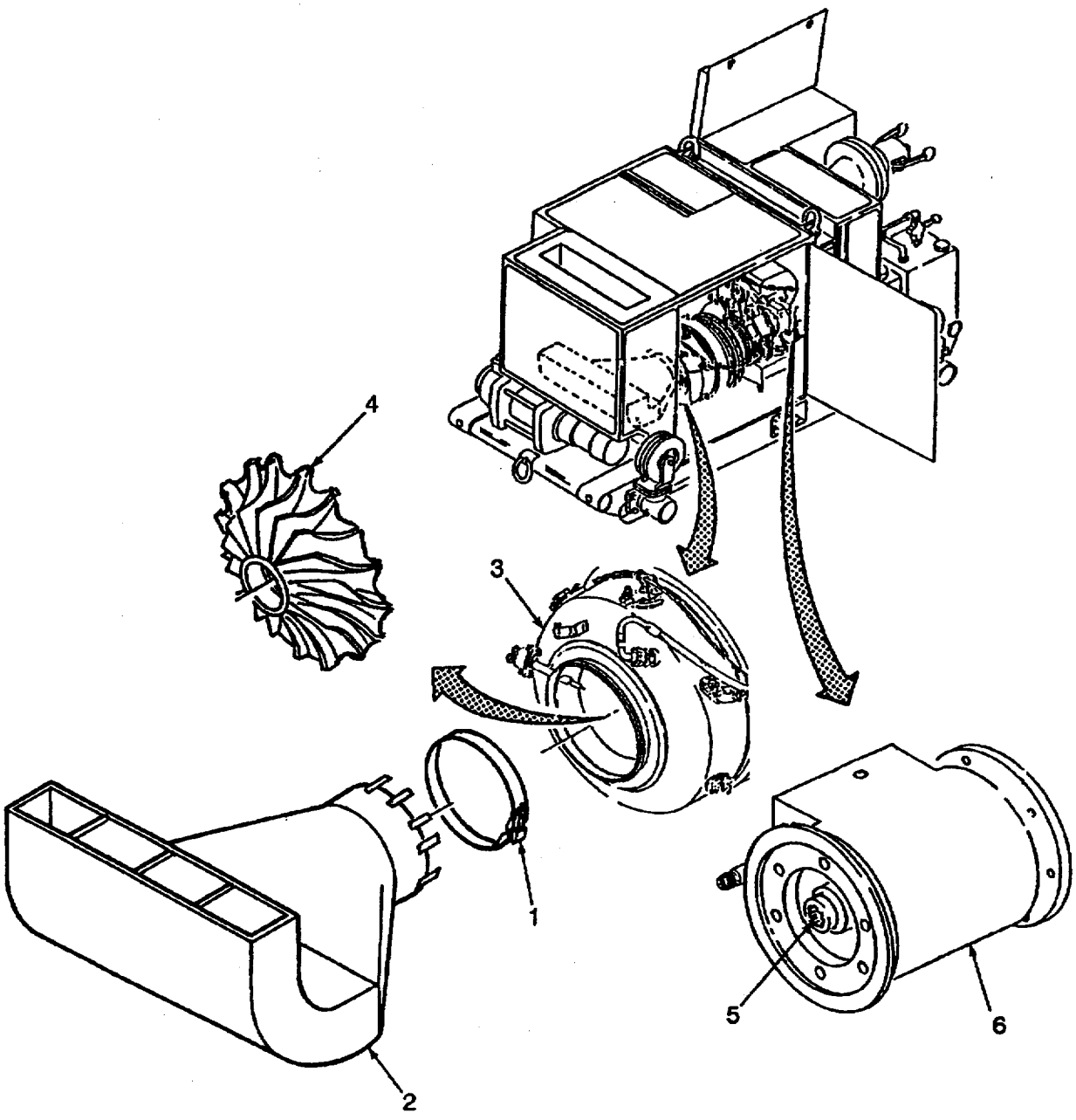


Figure 2-71. Speed Reducer Test

2-45. STARTER-GENERATOR REPLACEMENT. I

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1).
Torque Wrench: 0-200 inch-pounds (App B, Sect III, Item 2

Material/Parts
Tag (App E, Item 16)

Equipment Condition
200/600 GPM Pump shut down (Para 2-7c, TM 10-4320-342-10)

a. REMOVAL. Refer to Figure 2-72.

(1) Open doors (1 and 2).
(2) Tag electrical wires and remove nuts (3) and flatwashers (4) from starter-generator (5).
(3) Loosen nut (6) and lift bracket (7) on clamp (8).
(4) Remove starter-generator (5) and clamp (8).
(5) Remove nuts (9) from studs (10).
(6) Remove housing (11) from engine (12).

b. INSTALLATION.

(1) Position housing (11) on engine (12).
(2) Install nuts (9) on studs (10).
(3) Position clamp (8) on housing (11) for installation of starter-generator (5).
(4) Position starter-generator (5) on housing (11).
(5) Install clamp (8) on starter-generator (5) and torque nut (6) to 33 to 37 inch-pounds.
(6) Tap clamp (8) outer diameter with rubber mallet and retorque clamp nut to 47 to 43 inch-pounds.
(7) Repeat tap and retorque until torque remains at 47 to 53 inch-pounds.

2-45. STARTER-GENERATOR REPLACEMENT - continued.

NOTE

Wire numbers are stamped on each electrical wire. This information, in conjunction with data on FO-1 and FO-2, 200/600 GPM Pump Wiring Diagram, may be used to connect wires if tags are lost or illegible.

(8) Connect electrical wiring as tagged and install flatwashers (4) and nuts (3).

(9) Close doors (1 and 2).

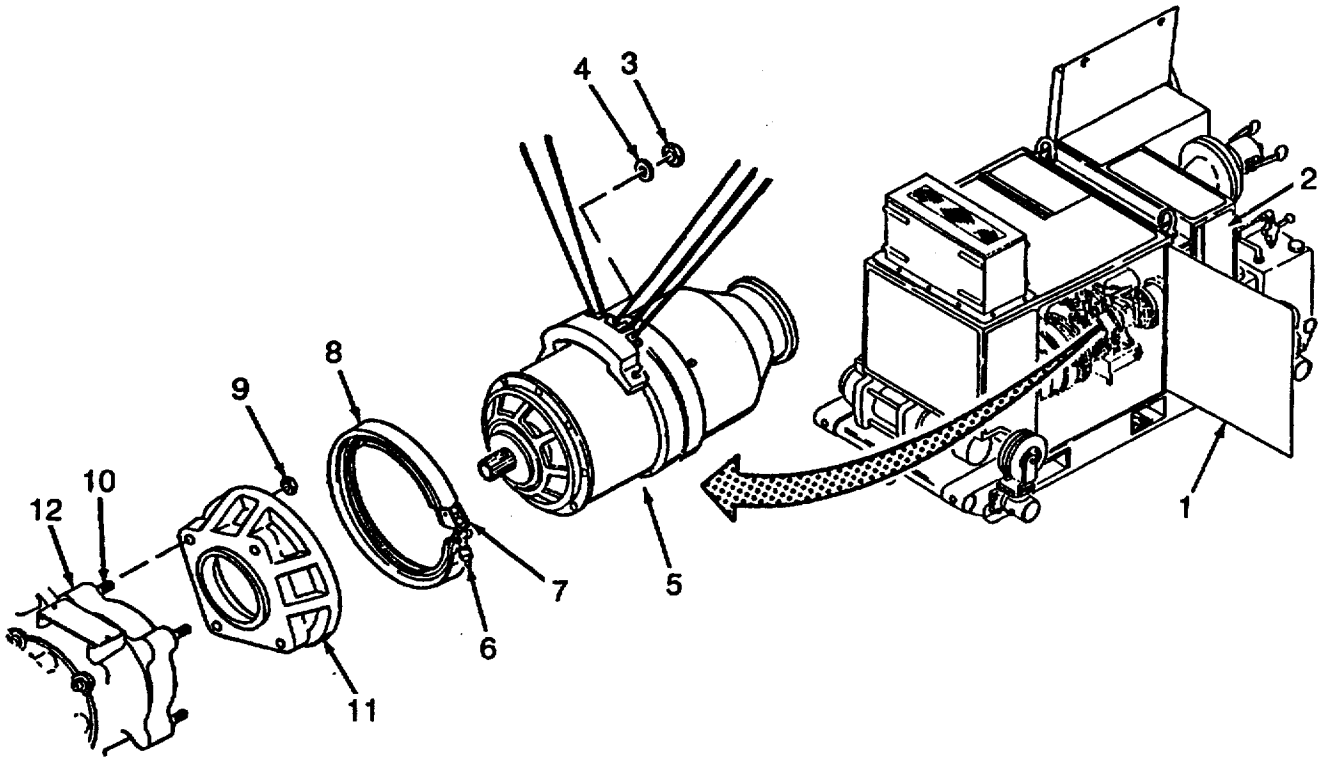


Figure 2-72. Starter-Generator Replacement

2-46. ELECTRONIC SEQUENCE UNIT (ESU) REPLACEMENT.

This Task Covers a. Removal b. Installation

INITIAL SETUP

This Task Covers

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
200/600 GPM Pump shut down (Para 2-7c, TM 10-4320-342-10)

a. REMOVAL. Refer to Figure 2-73.

(1) Open door (1).

(2) Disconnect electrical connectors (2 and 3) from ESU (4).

(3) Support ESU (4) and remove bolts (5), flatwashers (6) and ESU (4) from bracket (7).

b. INSTALLATION.

(1) Position ESU (4) on bracket (7) and install bolts (5) and flatwashers (6).

(2) Connect cable connectors (2 and 3) to ESU (4).

(3) Close panel (1).

2-46. ELECTRONIC SEQUENCE UNIT (ESU) REPLACEMENT - continued.

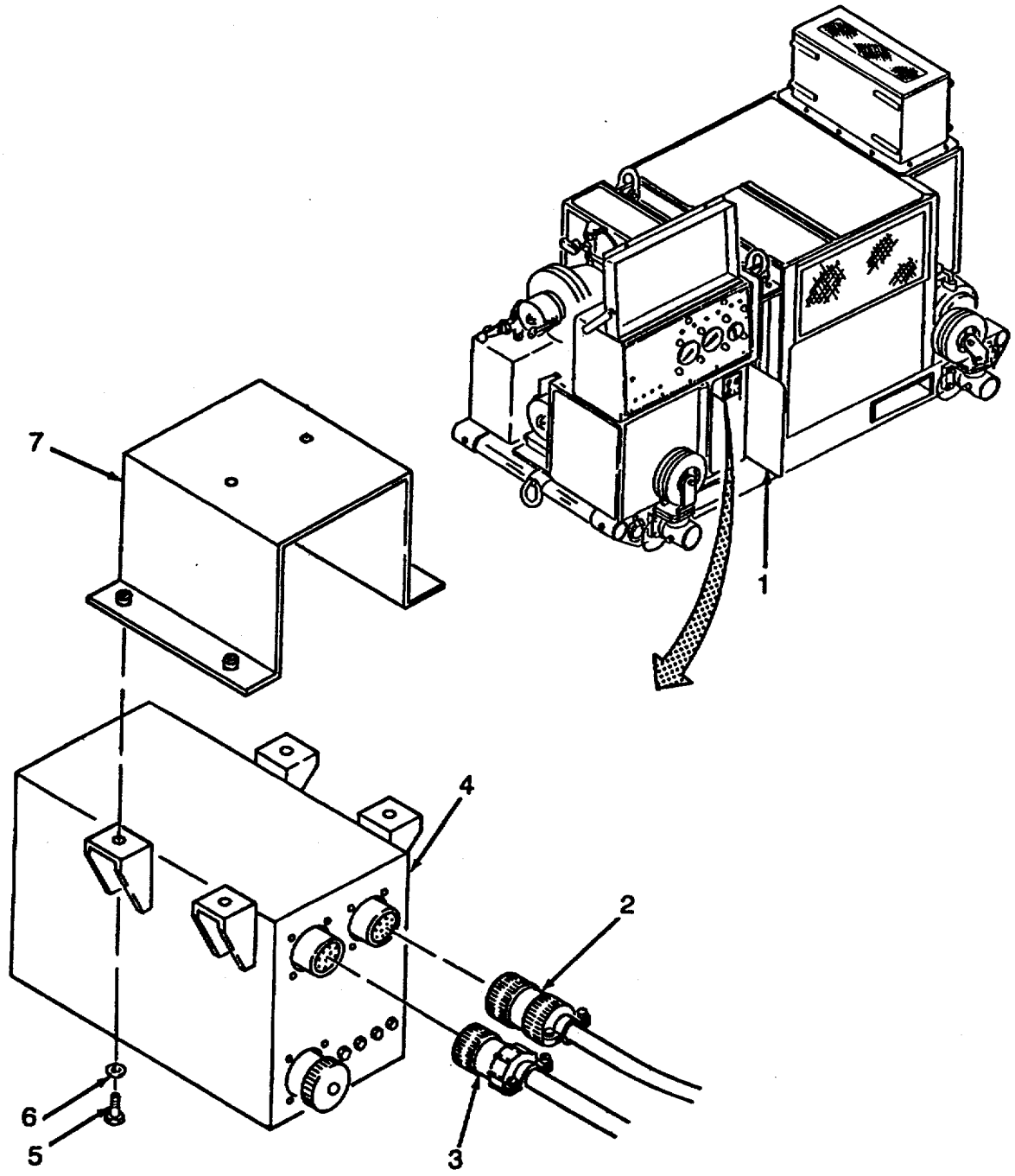


Figure 2-73. Electronic Sequence Unit (ESU) Replacement

2-47. ENGINE FUEL CONTROL UPPER COVER AND FUEL FILTER REPLACEMENT.

This Task Covers a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Torque Wrench 0-200 inch-pounds (App B, Sect III, Item 2)

Material/Parts
Fuel Filter Assembly (App F, Item 101)
Preformed Packing (App F, Items 102 and 103)
Rags (App E, Item 2)
Lubricant (App E, Item 18)

Equipment Condition
200/600 GPM pump removed from system (Para 2-9, TM 10-4320-342-10)

General Safety Instructions

WARNING

Fuel and fuel vapors are toxic and flammable. Be careful when working around fuel so not to come in contact. Fuel can cause injury to personnel. For disposal of contaminated fuel refer to FM 10-20.

a. REMOVAL. Refer to Figure 2-74.

(1) Open door (1).

(2) Remove bolts (2), flatwashers (3) and upper fuel control cover (4).

WARNING

The fuel filter cover will contain fuel. To prevent fire hazards, be sure no sparks or open flame within 50 feet.

(3) Loosen bolts (5) (do not remove) and rotate fuel filter cover (6) approximately one-eighth turn and pull fuel filter cover (6) off.

(4) Using thumb and forefinger, pull fuel filter (7) out of fuel control assembly (8).

(5) Remove preformed packing (9) from fuel filter (7). Discard preformed packing and fuel filter.

(6) Remove preformed packing (10) from fuel filter cover (6). Discard preformed packing.

(7) Clean filter cover (6) with lint free rags.

2-47. ENGINE FUEL CONTROL UPPER COVER AND FUEL FILTER REPLACEMENT - continued.

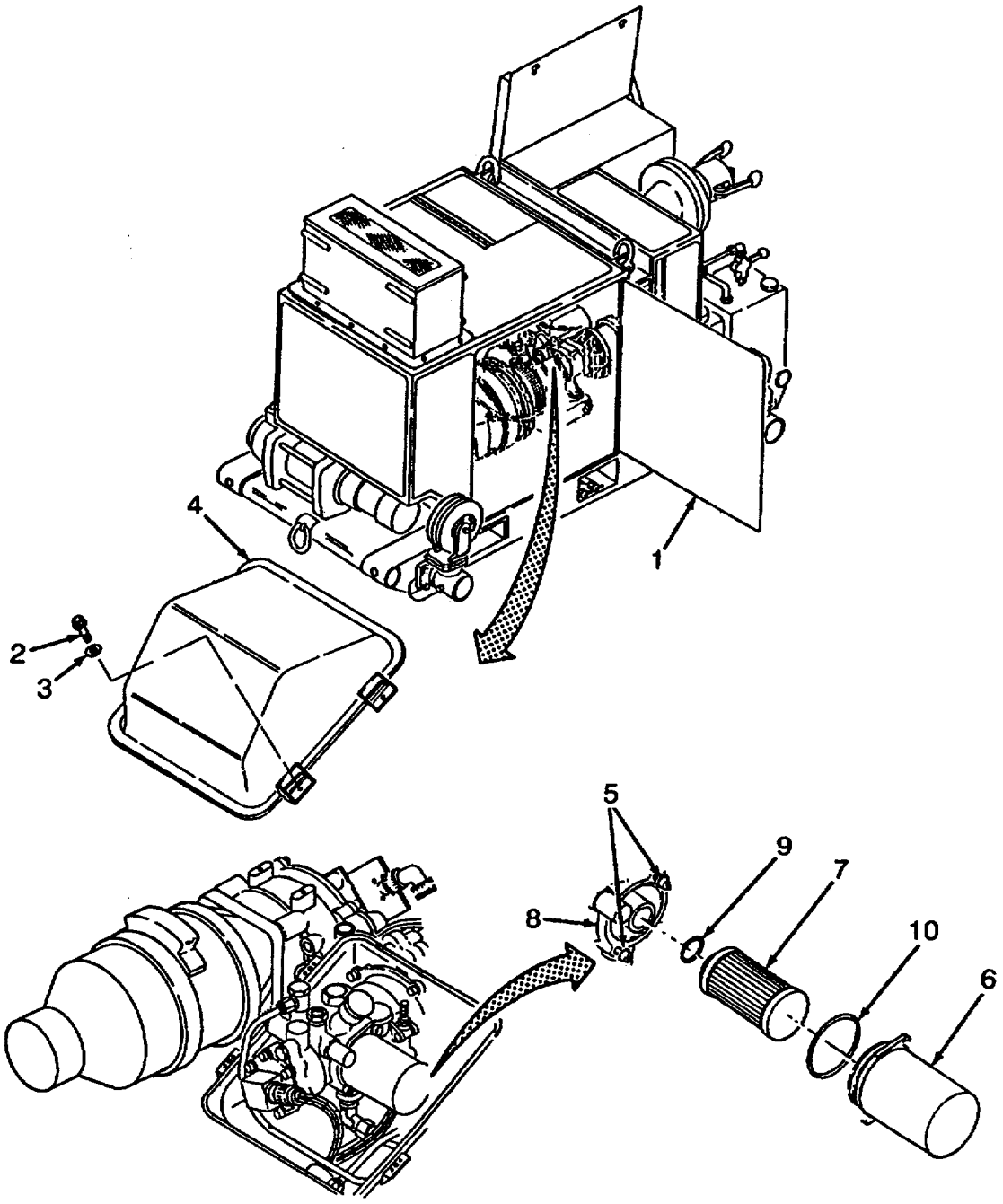


Figure 2-74. Engine Fuel Control Upper Cover and Fuel Filter Replacement

2-47. ENGINE FUEL CONTROL UPPER COVER AND FUEL FILTER REPLACEMENT - continued.

b. INSTALLATION. Refer to Figure 2-74.

(1) Lubricate packing (9) inside of fuel filter (7).

(2) Lubricate packing (10) and install on fuel filter cover (6).

(3) Place fuel filter (7) in fuel filter cover (6) with packing end out.

(4) Align fuel filter (7) and install fuel filter cover (6) on fuel control assembly (8). Rotate fuel filter cover (6) approximately one-eighth turn onto bolts (5).

CAUTION

To prevent breaking fuel filter cover ears, be sure fuel filter cover is fully seated prior to tightening bolts.

(5) Secure fuel filter cover (6) to fuel control assembly (8) with bolts (5). Torque bolts to 37 to 43 inch-pounds.

(6) Install fuel control upper cover (4) and secure with bolts (2) and flatwashers (3). Torque bolts to 37 to 43 inch-pounds.

(7) Close door (1).

2-48. ENGINE OIL FILTER REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Material/Parts
Filter Element (App F, Item 17)
Preformed Packing (App F, Items 18)
Rags (App E, Item 2)

Equipment Condition
Engine Fuel Upper Cover removed (Para 2-47)
Starter-generator removed (Para 2-45)

General Safety Instructions

WARNING

For disposal of contaminated lubricants, refer to FM10-20.

a. REMOVAL. Refer to Figure 2-75.

(1) Open door (1).

(2) Loosen but do not remove bolts (2) from oil filter cover (3).

WARNING

The oil filter cover will contain engine oil. To prevent personnel injury, avoid contact with eyes and repeated or prolonged contact with skin.

(3) Rotate oil filter cover (3) approximately one-eighth turn and remove from engine (4).

(4) Remove preformed packing (5) from oil filter cover (3). Discard preformed packing.

(5) Remove oil filter (6) from engine (4).

(6) Clean oil filter cover (3) with lint-free rags.

b. INSTALLATION.

(1) Lubricate preformed packing (5) and install an oil filter cover (3).

(2) Install oil filter (6) on engine (4).

(3) Install oil filter cover (3) on engine (4) and rotate approximately one-eighth turn onto bolts (2).

2-48. ENGINE OIL FILTER REPLACEMENT - continued.

WARNING

To prevent leaking of oil filter, cover ears. Be sure oil filter cover is fully seated prior to tightening bolts.

(4) Tighten bolts (2). Torque to 38 to 42 inch-pounds.

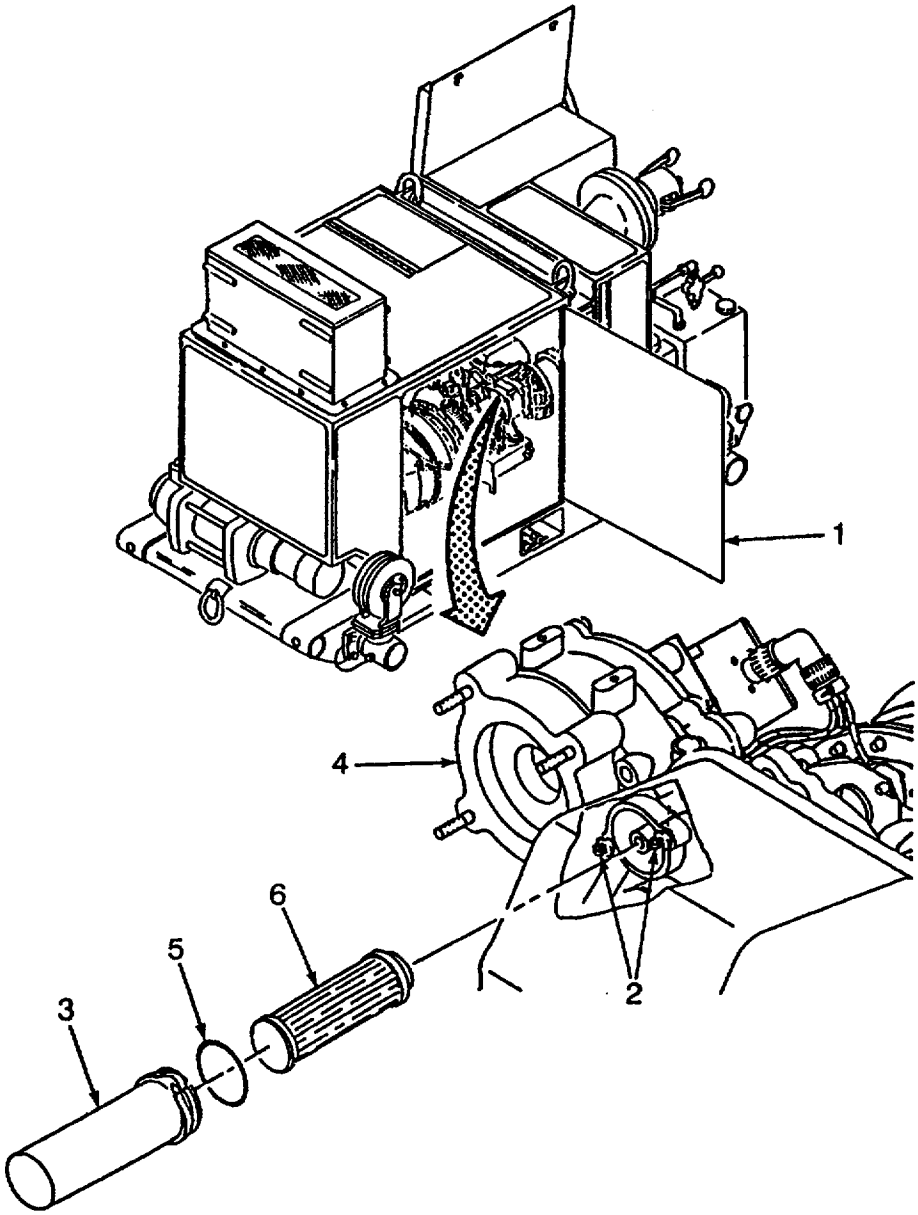


Figure 2-75. Engine Oil Filter Replacement

2-49. ENGINE WIRING HARNESS W2 REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
Engine Fuel Upper Cover removed (Para 2-47)

Material/Parts
Preformed Packing (App F, Items 18)
Safety Wire (App E, Item 15)

a. REMOVAL. Refer to Figure 2-76.

(1) Remove safety wire from connectors (1, 2 and 6).
(2) Disconnect connector (1) from fuel solenoid valve (4).
(3) Disconnect connector (2) from fuel control valve (5).
(4) Disconnect electrical connector (6) from connector (3).
(5) Remove nut (7) from connector (3).
(6) Remove engine wiring harness W2 (8) from fuel control lower cover (9).
(7) Remove preformed packing (10) from engine wiring harness W2 (8). Discard preformed packing.

b. INSTALLATION.

(1) Install preformed packing (10) on engine wiring harness W2 (8).
(2) Position engine wiring harness W2 (8) on fuel control lower cover (9).
(3) Install nut (7) on connector (3).
(4) Connect connector (6) to connector (3).
(5) Connect connector (1) to fuel solenoid valve (4).
(6) Install connector (2) on fuel control (5).
(7) Install safety wire on connectors (1, 2 and 6).

2-49. ENGINE WIRING HARNESS W2 REPLACEMENT - continued

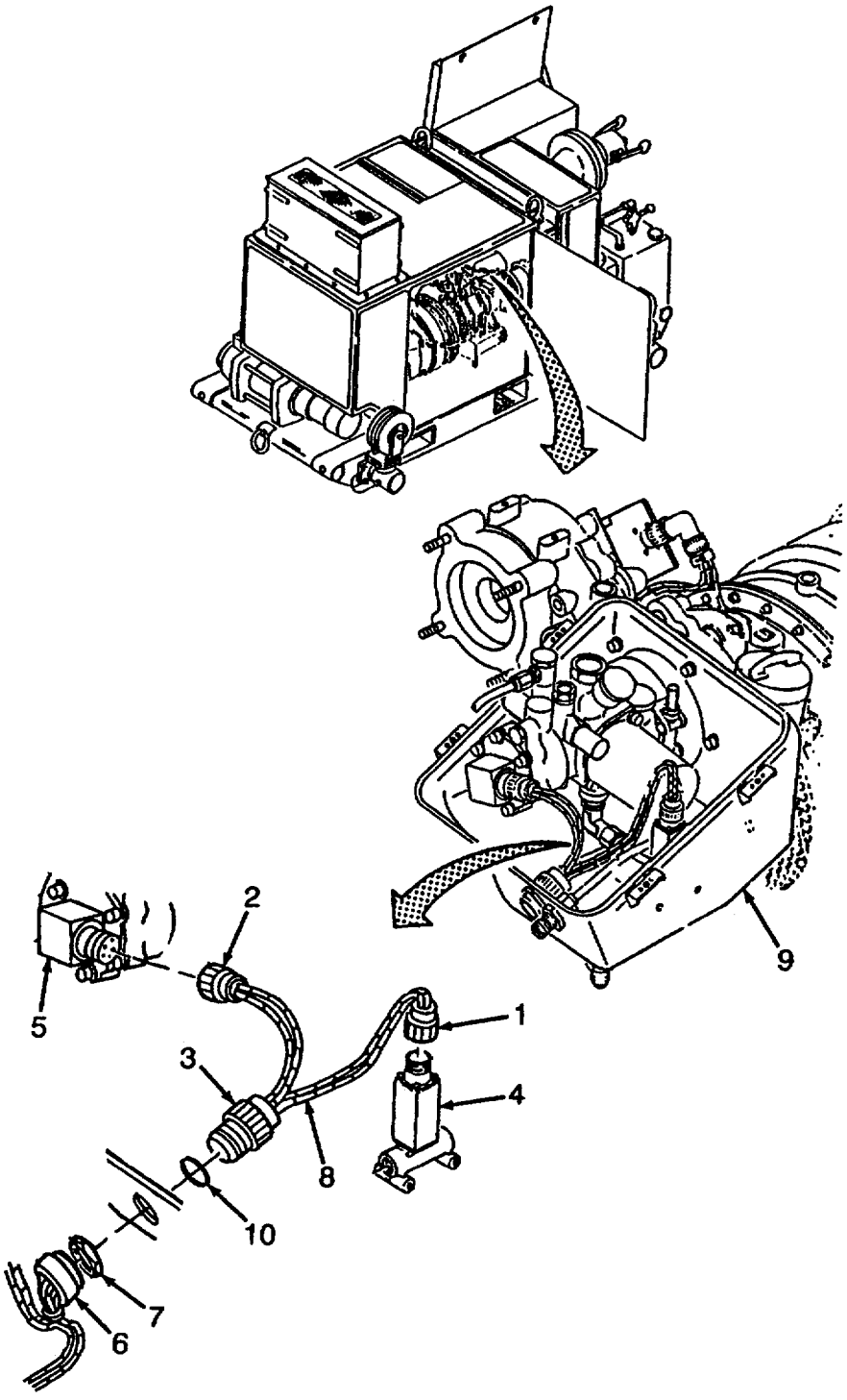


Figure 2-76. Engine Wiring Harness W2 Replacement

2-50. ENGINE CABLE W3 REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools	Equipment Condition
General Mechanics Tool Kit (App B, Sect III, Item 1)	200/600 Pump shut down (Para 2-7c, TM 10-4320-342-10)

a. REMOVAL. Refer to Figure 2-77.

(1) Open doors (1 and 2).

(2) Disconnect connector (3) from ESU (4).

(3) Disconnect connector (5) from connector (6) and remove cable (7).

b. INSTALLATION.

(1) Connect cable connector (5) to connector (6).

(2) Connect cable connector (3) to ESU (4).

(3) Close doors (1 and 2).

2-50. ENGINE CABLE W3 REPLACEMENT - continued.

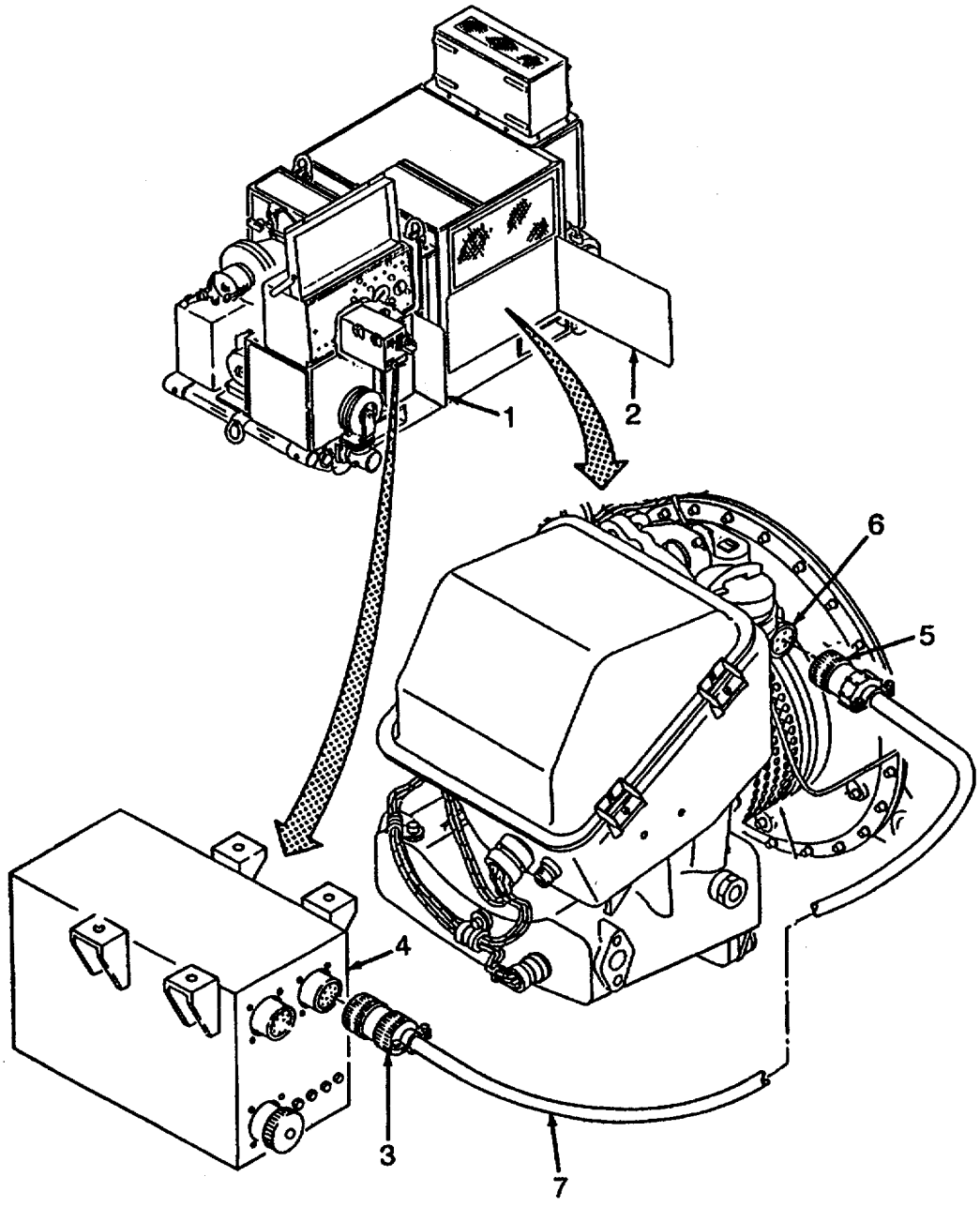


Figure 2-77. Engine Cable W3 Replacement

2-51. ENGINE MAIN FUEL CONTROL REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Torque Wrench: 0-200 inch-pounds (App B, Sect III, Item 2)

Material/Parts
Preformed Packing (App F, Items 19, 20, 21)
Safety Wire (App E, Item 9)
Lubricating Oil (App E, Item 18)

Equipment Condition
Engine Wiring Harness (W2) removed (Para 2-49)
Engine Fuel Solenoid Valve removed (Para 2-52)

General Safety Instructions

WARNING

Fuels and fuel vapors are toxic and flammable. Be careful when working around fuel so not to come in contact. Fuel can cause injury to personnel. For disposal of contaminated fuel, refer to FM 10-20.

a. REMOVAL. Refer to Figure 2-78.

(1) Remove safety wire from electrical connector on wiring harness (1).

(2) Remove electrical wiring harness (W2) (1) from engine main fuel control (2). Refer to para

(3) Disconnect tube (3) from elbow (42-49.

(3) Disconnect tube (3) from elbow (4).

(4) Disconnect tube (5) from elbow (6).

(5) Loosen nut (7), lift bracket and remove clamp (8).

(6) Remove engine main fuel control (2) and preformed packing (9) from fuel control adapter (10). Discard preformed packing.

NOTE
Note position of elbows prior to removal.

(7) Loosen nut (11), remove elbow (4) and preformed packing (12). Discard preformed packing.

(8) Loosen nut (13), remove elbow (6) and preformed packing (14). Discard preformed packing.

(9) Remove bolts (15) and lower cover (16) from engine (17).

2-51. ENGINE MAIN FUEL CONTROL REPLACEMENT - continued.

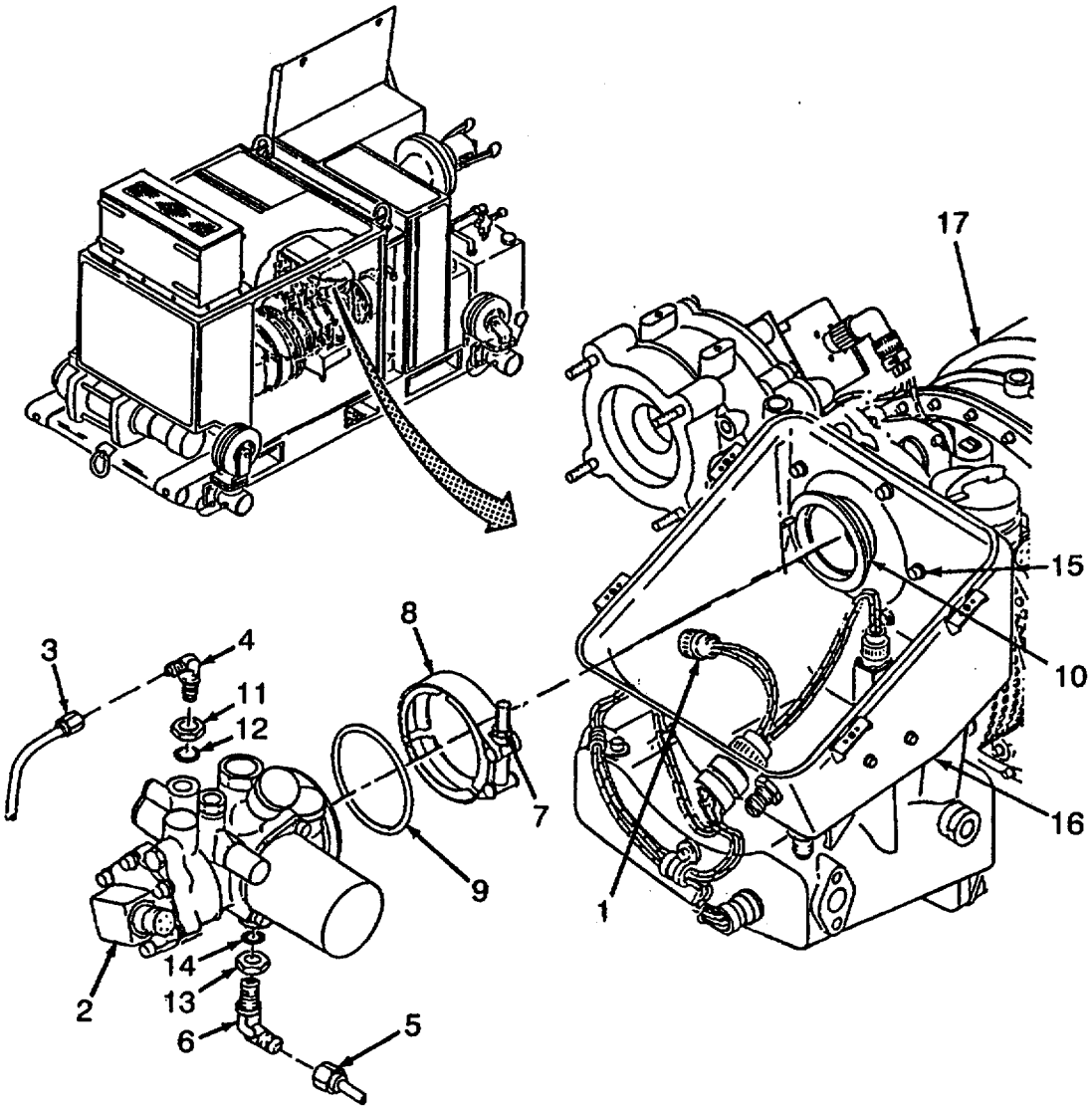


Figure 2-78. Engine Fuel Control Replacement

2-51. ENGINE MAIN FUEL CONTROL REPLACEMENT - continued.

b. INSTALLATION. Refer to Figure 2-78.

(1) Install lower cover (16) with bolts (15) onto engine (17).

(2) Lubricate preformed packing (14) and install on elbow (6).

(3) Install elbow (6) in fuel control (2) as noted during removal and tighten nut (13).

(4) Lubricate preformed packing (12) and install on elbow (4).

(5) Install elbow (4) in fuel control (2) as noted during removal and tighten nut (11).

(6) Lubricate preformed packing (9) and install on fuel control (2) mounting flange.

CAUTION

Use care when installing fuel control assembly. Be sure fuel control assembly shaft and engine splines are aligned. Failure to do so could result in damage to fuel control assembly or engine.

(7) Align fuel control shaft and engine splines and install fuel control assembly (2) onto fuel control adapter (10).

(8) Install clamp (8) and torque nut (7) to 33 to 37 inch-pounds.

(9) Top clamp (8) outer diameter with rubber mallet. Retorque nut (7) to 47 to 53 inch-pounds.

(10) Repeat tap and torque until torque of clamp (8) remains at 47 to 53 inch-pounds.

(11) Connect tube (5) to elbow (6). Torque to 190 to 220 inch-pounds.

(12) Connect tube (3) to elbow (4). Torque to 100 to 120 inch-pounds.

(13) Connect electrical connector on wiring harness (1) to fuel control (2) and lock wire electrical connector.

2-52. ENGINE FUEL SOLENOID VALVE REPIACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Torque Wrench 0-200 inch-pounds (App B, Sect III, Item 2)

Material/Parts
Preformed Packing (App F, Item 8)
Safety Wire (App E, Item 9)
Self-locking Nut (App F, Item 84)

Equipment Condition
Engine Fuel Upper Cover removed (Para 2-47)

General Safety Instructions

WARNING

Fuels and fuel vapors are toxic and flammable. Be careful when working around fuel so not to come in contact. Fuel can cause injury to personnel. For disposal of contaminated fuel, refer to FM 10-20.

a. REMOVAL. Refer to Figure 2-79.

(1) Remove safety wire and disconnect electrical connector (1) from engine fuel solenoid valve (2).

(2) Disconnect tube (3) from adapter (4).

(3) Disconnect tube (5) from adapter (6).

(4) Remove self-locking nuts (7), flatwashers (8), spacers (9), sealing washers (10) and bolts (11).

(5) Remove engine fuel solenoid valve (2) from fuel control lower cover (12).

(6) Remove adapters (4 and 6) and preformed packings (13 and 14) from engine fuel solenoid valve (2). Discard preformed packing.

b. INSTALLATION.

(1) Install preformed packings (13 and 14) and adapters (4 and 6) in engine fuel solenoid valve (2).

(2) Position engine fuel solenoid valve (2) on fuel control lower cover (12).

(3) Install bolts (11), sealing washers (10), spacers (9), flatwashers (8) and self-locking nuts (7). Torque 28 to 32 inch-pounds.

(4) Connect tubes (3 and 5) to adapters (4 and 6). Torque tubes to 70 to 80 inch-pounds.

2-52. ENGINE FUEL SOLENOID VALVE REPLACEMENT - continued.

(5) Connect electrical connector (1) to engine fuel solenoid valve (2). Secure with safety wire.

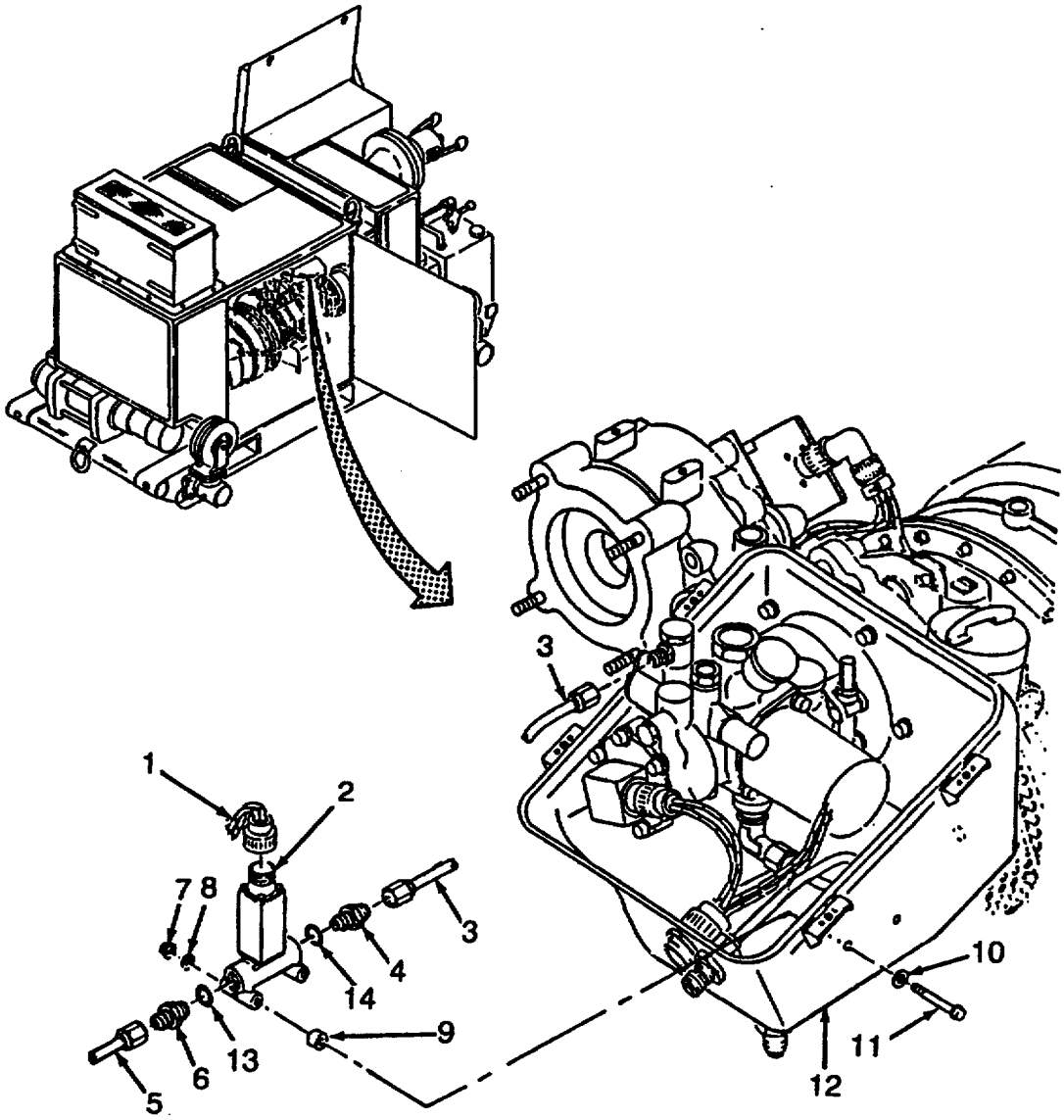


Figure 2-79. Engine Fuel Solenoid Valve Replacement

2-53. ENGINE FUEL MANIFOLD AND CHECK VALVE REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Torque Wrench: 0-200 inch-pounds (App B, Sect III)

Material/Parts
Preformed Packings (App F, Items 23 and 104)
Safety Wire (App E, Item 9)
Antiseize Compounds (App E, Item 5)

Equipment Condition
200/600 GPM pump assembly removed from system (Para 2-9, TM 10-4320-342-10)

General Safety Instructions

WARNING

Fuels and fuel vapors are toxic and flammable. Be careful when working around fuel so not to come in contact. Fuel can cause injury to personnel. For disposal of contaminated fuel, refer to FM 10-20.

a. REMOVAL. Refer to Figure 2-80.

(1) Open door (1).

(2) Disconnect tube (2) from engine fuel manifold (3).

(3) Disconnect tubes (4) from nozzles (5).

(4) Remove bolts (6) from mounting bracket (7) and remove engine fuel manifold (3) and wire bracket (8) from combustor case (9).

(5) Remove safety wire from check valve (10).

(6) Remove check valve (10) and preformed packings (11 and 12). Discard performed packings.

b. INSTALLATION.

(1) Lubricate and install preformed packings (11 and 12) on check valve (10).

(2) Install check valve (10) on fuel manifold (3). Torque to 43 to 47 inch-pounds.

(3) Apply antiseize compound to bolts (6).

NOTE

Be sure bolt with predrilled hole is positioned on right side of fuel manifold assembly.

2-53. ENGINE FUEL MANIFOLD AND CHECK VALVE REPLACEMENT - continued.

(4) Position fuel manifold (3) and wire bracket (8) on mounting bracket (7) and secure with bolts (6). Torque to 40 inch-pounds.

(5) Connect tubes (4) to nozzles (5). Torque to 70 inch-pounds.

(6) Connect tube (2) to fuel manifold assembly (3). Torque to 35 inch-pounds.

(7) Safety wire bolts (6) and check valve (10).

(8) Close door (1).

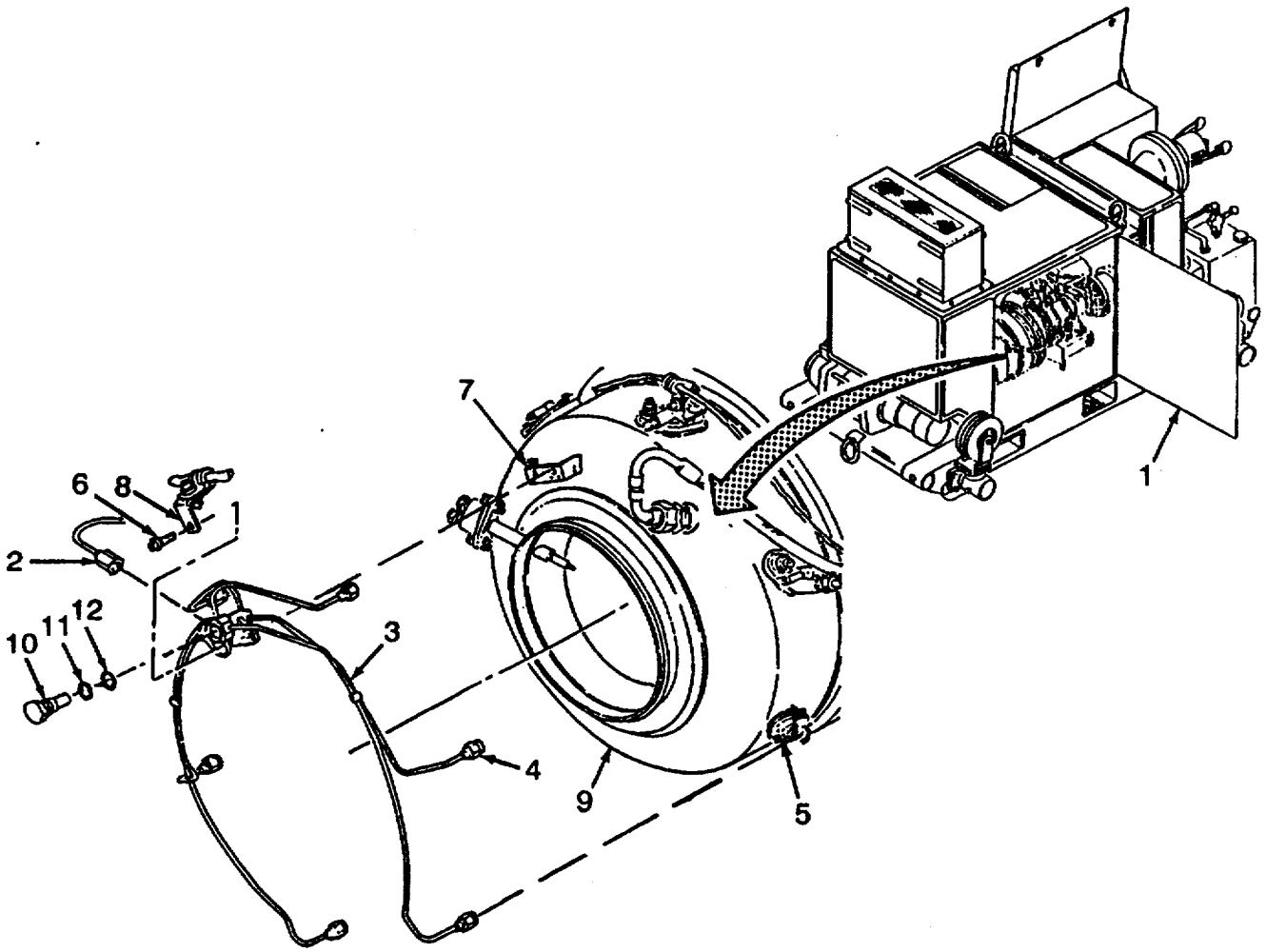


Figure 2-80. Engine Fuel Manifold and Check Valve Replacement

2-54. ENGINE FUEL INJECTION NOZZLE REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Torque Wrench 0-200 inch-pounds (App B, Sect III, Item 2)

Material/Parts
Seal Plate (App F, Item 24)
Safety Wire (App E, Item 9)
disposal of contaminated fuel, refer to FM 10-20.

Equipment Condition
200/600 GPM pump assembly removed from system (Para 2-9, TM 10-4320-342-10)

General Safety Instructions

WARNING

Fuels and fuel vapors are toxic and flammable. Be careful when working around fuel so not to come in contact. Fuel can cause injury to personnel. For

NOTE

This procedure covers the replacement of one of the engine fuel injection nozzle.

a. REMOVAL. Refer to Figure 2-81.

(1) Open door (1).

(2) Disconnect tube (2) from engine fuel nozzle (3).

NOTE

Note position and location of nozzles and studs.

(3) Remove safety wire, bolt (4) and washer (5).

(4) Remove nut (6) and bracket (7) from stud (8).

(5) Remove stud (8) and washer (9).

(6) Remove engine fuel nozzle (3), seal plate (10) and atomizer shroud (11) from combustor case (12). Discard seal plate.

2-54. ENGINE FUEL INJECTION NOZZLE REPLACEMENT - continued.

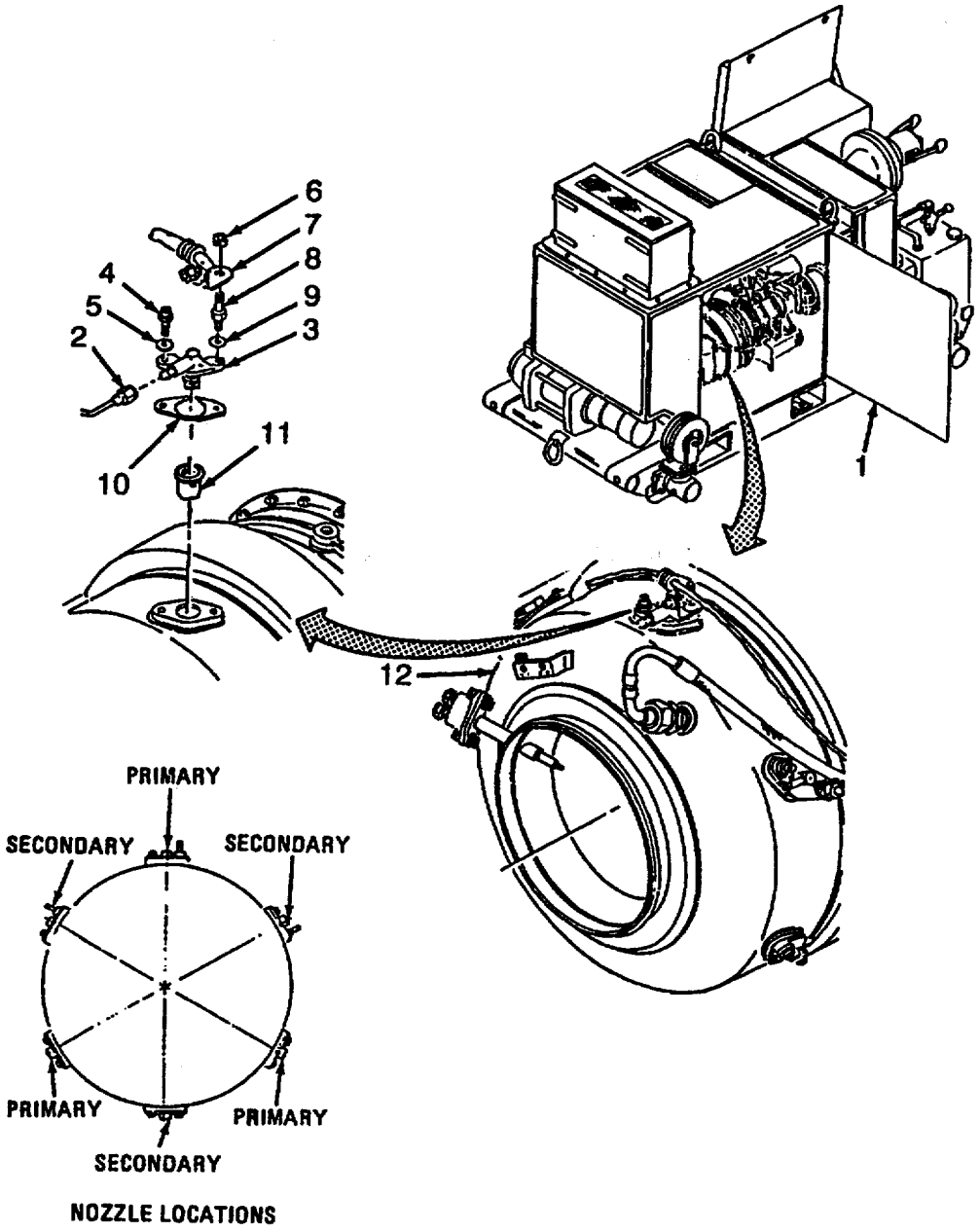


Figure 2-81. Engine Fuel Nozzle Replacement

2-54. ENGINE FUEL INJECTION NOZZLE REPLACEMENT - continued.

b. INSTALLATION. Refer to Figure 2-81.

CAUTION

Make sure that primary and secondary engine fuel injection nozzles are installed in their correct location or engine will not work properly.

(1) Install atomizer shroud (11) in combustor case (12).

(2) Install seal plate (10) on nozzle (3).

(3) Press fuel nozzle (3) into atomizer (11).

(4) Apply antiseize compound on bolt (4) and stud (8).

(5) Secure fuel nozzle (3) with bolt (4), washers (5 and 9) and stud (8) on combustor case (12).

(6) Install bracket (7) on stud (8) and secure with nut (6).

(7) Connect tube (2) to fuel nozzle (3). Torque to 35 inch-pounds.

(8) Safety wire bolt (4).

(9) Close door (1).

2-55. ENGINE IGNITION UNIT REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Torque Wrench 0-200 inch-pounds (App B, Sectue WrencI 02) 0inchp Sect III, Item 2)
Material/Parts
Safety Wire (App E, Item 15)

Equipment Condition
200/600 GPM pump assembly shutdown (Para 2-7c, TM 10-4320-342-10)

General Safety Instructions

WARNING

High voltage is present on this equipment. Do not perform maintenance with power on. Death or serious injury may result.

a. REMOVAL. Refer to Figure 2-82.

(1) Open door (1).
(2) Remove safety wire and disconnect electrical connector (2) from engine ignition unit (3).
(3) Remove safety wire and electrical lead (4).
(4) Remove bolts (5), washers (6) and engine ignition unit (3) from engine (7).

b. INSTALLATION.

(1) Position engine ignition unit (3) on engine (7) and install washers (6) and bolts (5).
(2) Install electrical lead (4) to engine ignition unit (3) and torque to 35 inch-pounds. Secure with safety wire.
(3) Install electrical connector (2) to engine ignition unit (3) and secure with safety wire.
(4) Close door (1).

2-55. ENGINE IGNITION UNIT REPLACEMENT - continued.

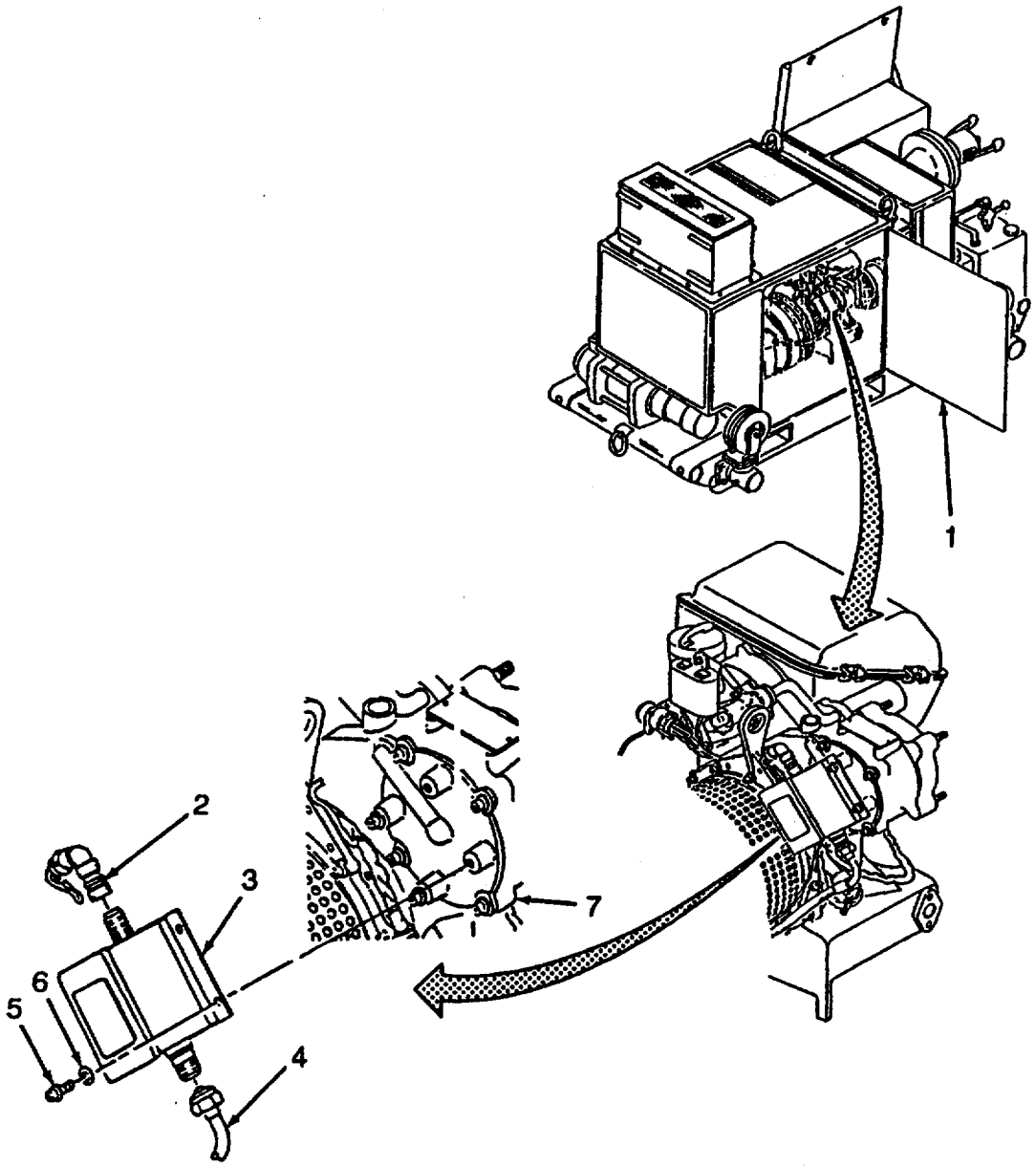


Figure 2-82. Engine Ignition Unit Replacement

2-56. ENGINE THERMOCOUPLE REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Torque Wrench: 0-200 inch-pounds (App B, Sect III, Item 2)

Material/Parts
Gasket (App F, Item 25)
Tag (App E, Item 16)

Equipment Condition
200/600 GPM pump assembly shut down (Para 2-7c, TM 10-4320-342-10)

a. REMOVAL. Refer to Figure 2-83.

(1) Open door (1).

NOTE
Note position of wire leads on thermocouple prior to removal.

(2) Tag wire leads (2 and 3). Remove nuts (4) and remove wire leads (2 and 3) from thermocouple (5).

(3) Remove nuts (6), bolts (7) and ground wire lead (8) from thermocouple (5).

(4) Remove thermocouple (5) and gasket (9) from combustor case (10). Discard gasket.

b. INSTALLATION.

(1) Install thermocouple (5) and gasket (9) on combustor case (10) with the large stud facing towards exhaust opening on combustor case.

(2) Position ground wire lead (8) on thermocouple as noted during removal and install bolts (7) and nuts (6). Torque to 40 inch-pounds.

(3) Install wire leads (2 and 3) on thermocouple (5) as noted during removal and secure with nuts (4) Torque to 40 inch-pounds.

2-56. ENGINE THERMOCOUPLE REPLACEMENT continued.

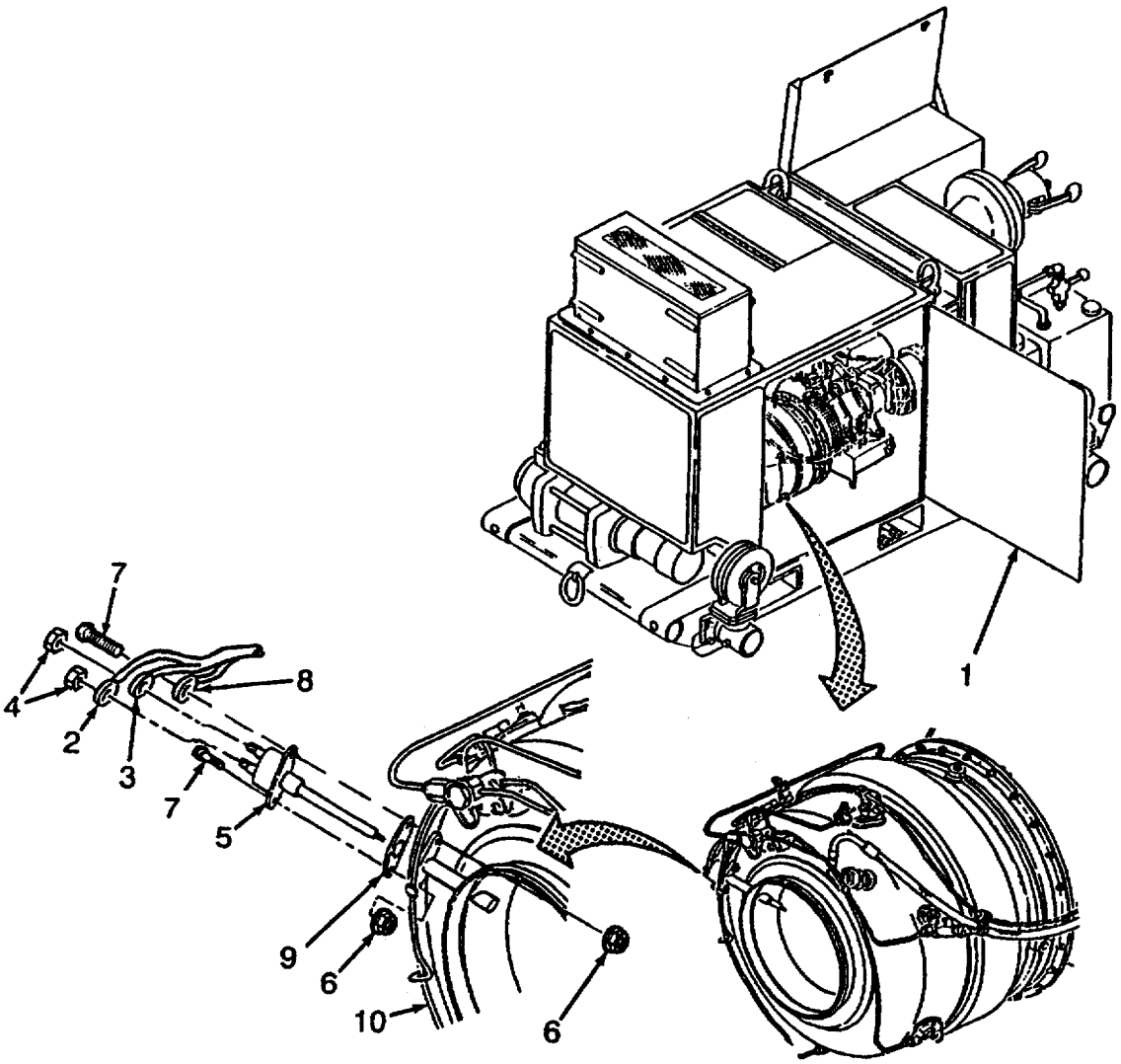


Figure 2-83. Engine Thermocouple Replacement

2-57. ENGINE IGNITER PLUG AND ELECTRICAL LEAD (IGNITION CABLE) REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Torque Wrench: 0-200 inch-pounds (App B, Sect III, Item 2)

Material/Parts
Safety Wire (App E, Item 15)
Antiseize Compound (App E, Item 5)

Equipment Condition
200/600 GPM pump assembly shut down (Para 2-7c, TM 10-4320-342-10

General Safety Instructions

WARNING

High voltage is present on this equipment. Do not perform maintenance with power on. Death or serious injury may result.

a. REMOVAL. Refer to Figure 2-84.

(1) Open door (1).
(2) Remove safety wire and disconnect engine electrical lead (2) from engine igniter plug (3).
(3) Remove safety wire and disconnect engine electrical lead (4) from engine ignition unit (5).
(4) Remove nut (6), bolt (7) and clamp (8) from bracket (9).
(5) Remove engine electrical lead (10).
(6) Remove engine igniter plug (3) and washer (11) from combustor case (12).

b. INSTALLATION.

(1) Apply antiseizing compound to threads on igniter plug (3) and install washer (19) on igniter plug.
(2) Install igniter plug (3) in combustor case (12). Torque to 100 inch-pounds.
(3) Connect electrical lead (2) to igniter plug (3). Torque to 40 inch-pounds and safety wire.
(4) Connect electrical lead (4) to ignition unit (5). Torque to 40 inch-pounds and safety wire.
(5) Install clamp (8) on electrical lead (10) and secure with bolt (7) and nut (6) on bracket (9).

2-57. ENGINE IGNITER PLUG AND) ELECTRICAL LEAD (IGNITION CABLE) REPLACEMENT - continued.

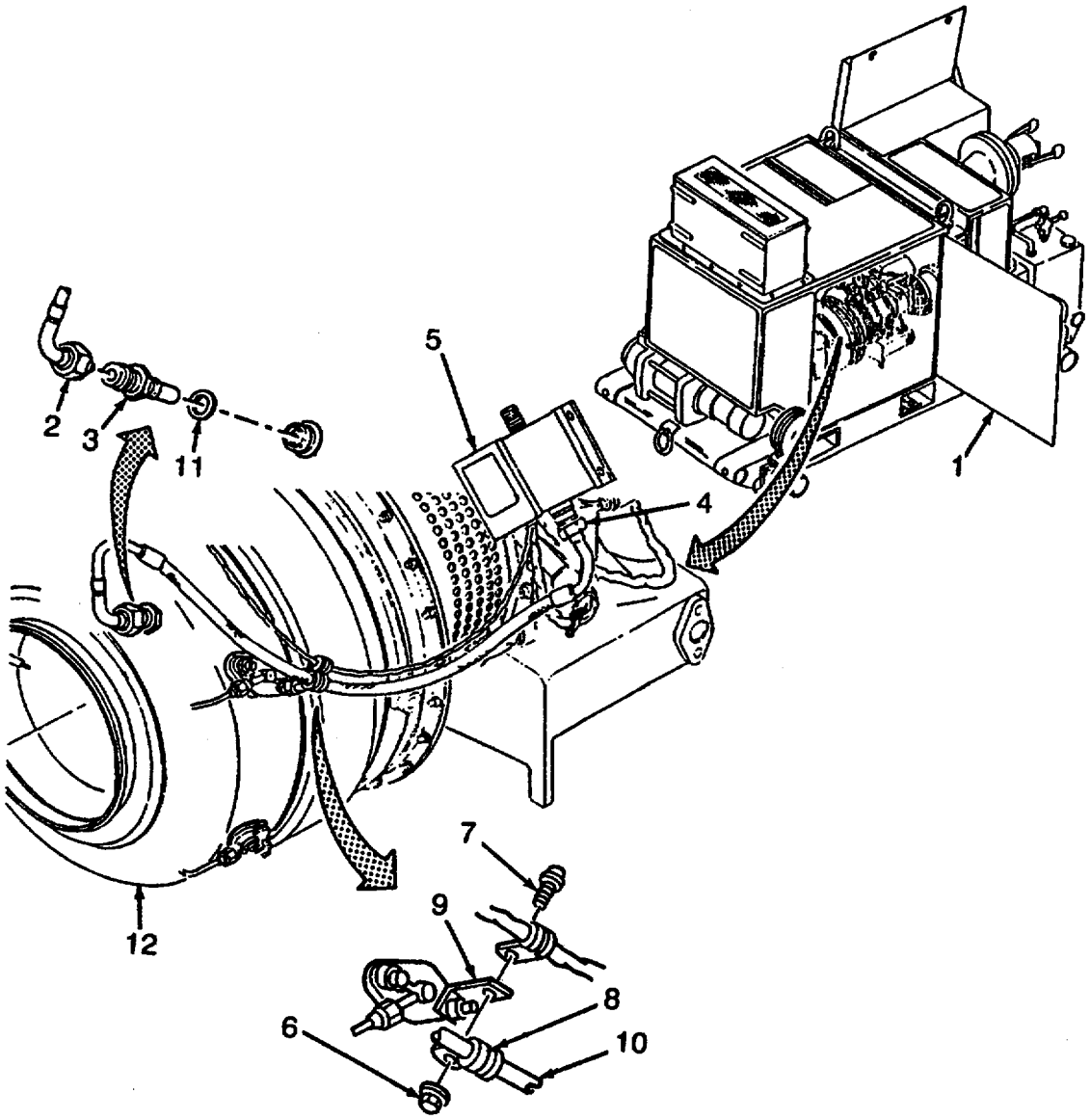


Figure 2-84. Igniter Plug and Electrical Lead (Ignition Cable) Replacement

2-58. TOTAL TIME METER REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Torque Wrench: 0-300 inch-pounds (App B, Sect III, Item 2)

Material/Parts
Textile Braid (App E, Item 19)
Tag (App E, Item 16)
Insulation Sleeving (App E, Item 31)

Equipment Condition
200/600 GPM pump assembly shut down (Para 2-7c, TM 10-4320-342-10)

a. REMOVAL. Refer to Figure 2-85.

(1) Open door (1).

(2) Remove textile braids (2) and slide sleeving (3) off connectors (4 and 5).

(3) Tag and disconnect connectors (4 and 5).

(4) Remove bolts (6), washers (7) and total time meter (8).

b. INSTALLATION.

(1) Position total time meter (8) on engine and install washers (7) and bolts (6). Torque 40 inch-pounds.

NOTE

Wire numbers are stamped on each electrical wire. This information, in conjunction with data on FO- 1 and FO-2, 200/600 GPM Pump Wiring Diagram, may be used to connect wires if tags are lost or illegible.

(2) Connect connectors (4 and 5).

(3) Slide sleeving (3) over connectors (4 and 5) and tie textile braids (2) on sleeving.

(4) Close door (1).

2-58. TOTAL TIME METER REPLACEMENT - continued.

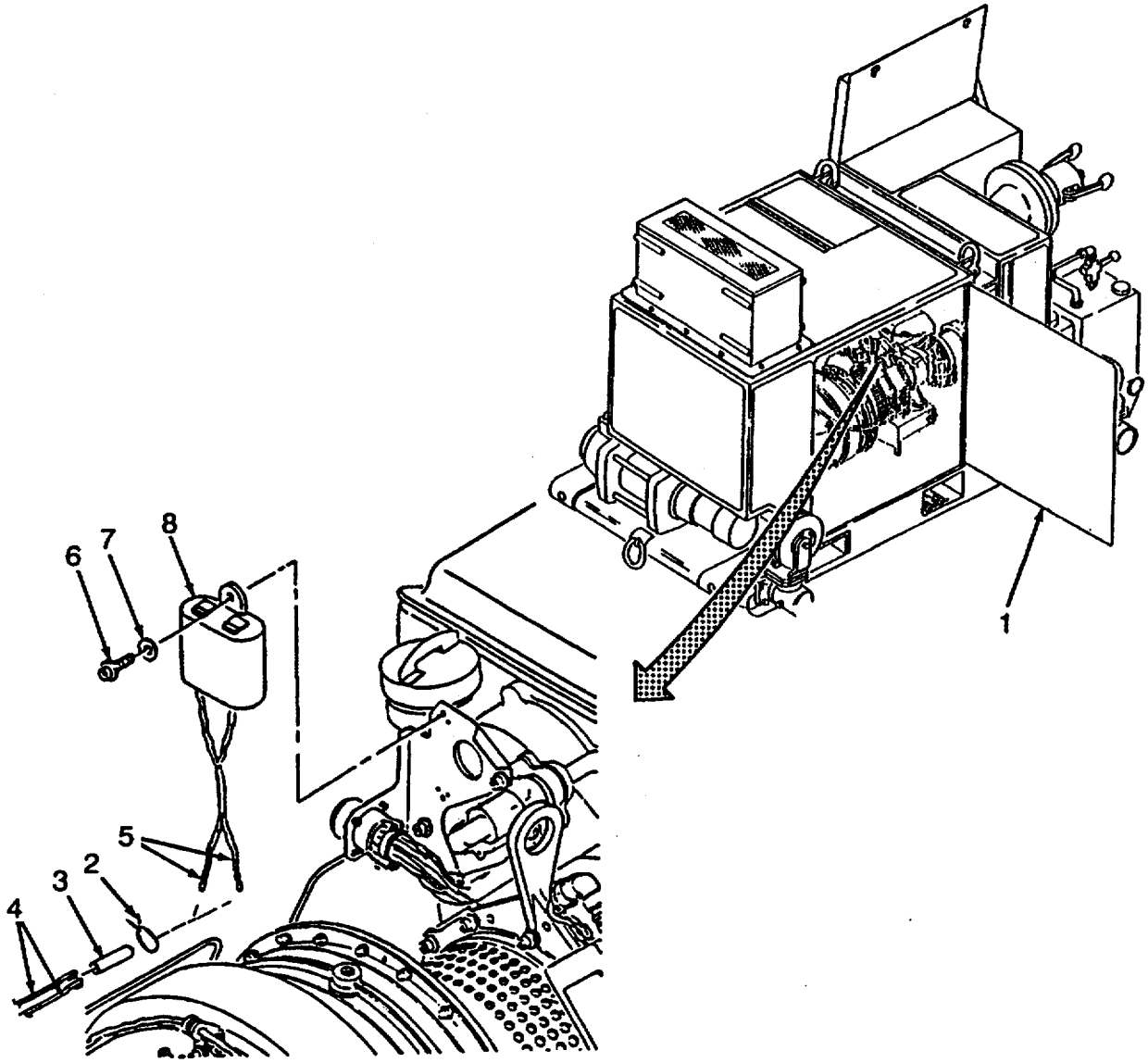


Figure 2-85. Total Time Meter Replacement

2-59. ENGINE OIL PRESSURE SWITCH REPLACEMENT.

This Task Covers a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Torque Wrench: 0-200 inch-pounds (App B, Sect III, Item 2)

Material/Parts
Safety Wire (App E, Item 15)
Preformed Packing (App F, Item 6)
Lubricating Oil (App E, Item 20)

Equipment Condition
Starter-Generator removed (Para 2-45)

a. REMOVAL. Refer to Figure 2-86.

(1) Remove safety wire and disconnect connector (1) from engine oil pressure switch (2).

(2) Remove engine oil pressure switch (2) from engine (4).

(3) Remove preformed packing (3) from engine (4). Discard preformed packing.

b. INSTALLATION.

(1) Lubricate performed packing (3).

(2) Position preformed packing (3) on engine oil pressure switch (2).

(3) Install engine oil pressure switch (2) on engine (4). Torque to 65 inch-pounds and safety wire.

(4) Install connector (1) on oil pressure switch (2) and secure with safety wire.

2-59. ENGINE OIL PRESSURE SWITCH REPLACEMENT - continued.

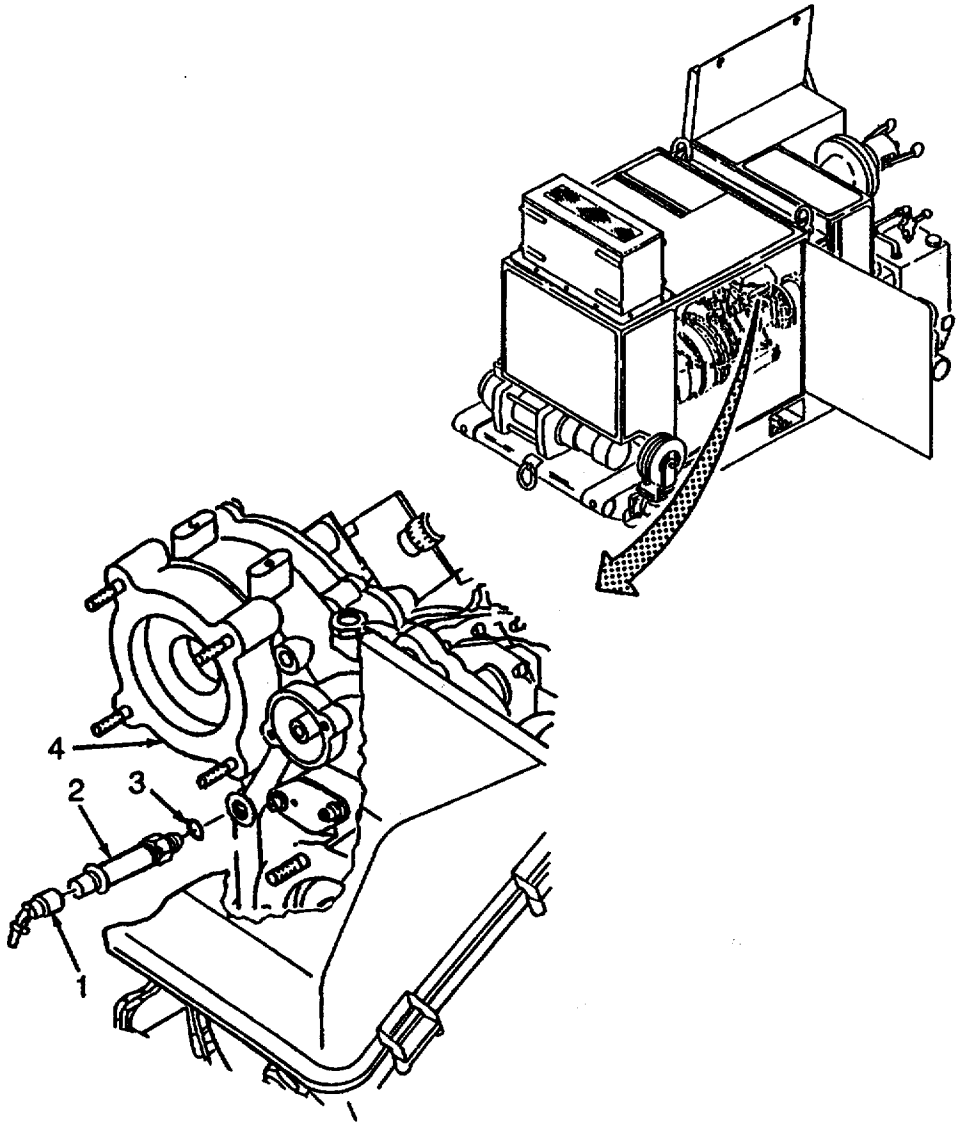


Figure 2-86. Engine Oil Pressure Switch Replacement

2-60. ENGINE OIL TEMPERATURE TRANSMITTER REPLACEMENT.

This Task Covers a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Torque Wrench: 0-200 inch-pounds (App B, Sect III, Item 2)

Material/Parts
Preformed Packing (App F, Item 6)
Safety Wire (App E, Item 15)
Lubricating Oil (App E, Item 20)

Equipment Condition
Oil drained from engine (LO 10-4320-342-12)
200/600 GPM Pump shut down (Para 2-7c, TM 10-4320-342-10)

a. REMOVAL. Refer to Figure 2-87.

(1) Remove safety wire from connector (1) and engine oil temperature transmitter (2).

(2) Disconnect connector (1) from engine oil temperature transmitter (2).

(3) Remove engine oil temperature transmitter (2) and preformed packing (3) from engine (4). Discard preformed packing.

b. INSTALLATION.

(1) Lubricate and install preformed packing (3) on engine oil temperature transmitter (2).

(2) Install engine oil temperature transmitter (2) in engine (4). Torque 60 inch-pounds.

(3) Connect connector (1) to engine oil temperature transmitter (2).

(4) Secure connector (1) and engine oil temperature transmitter (2) with safety wire.

2-60. ENGINE OIL TEMPERATURE TRANSMITTER REPLACEMENT - continued.

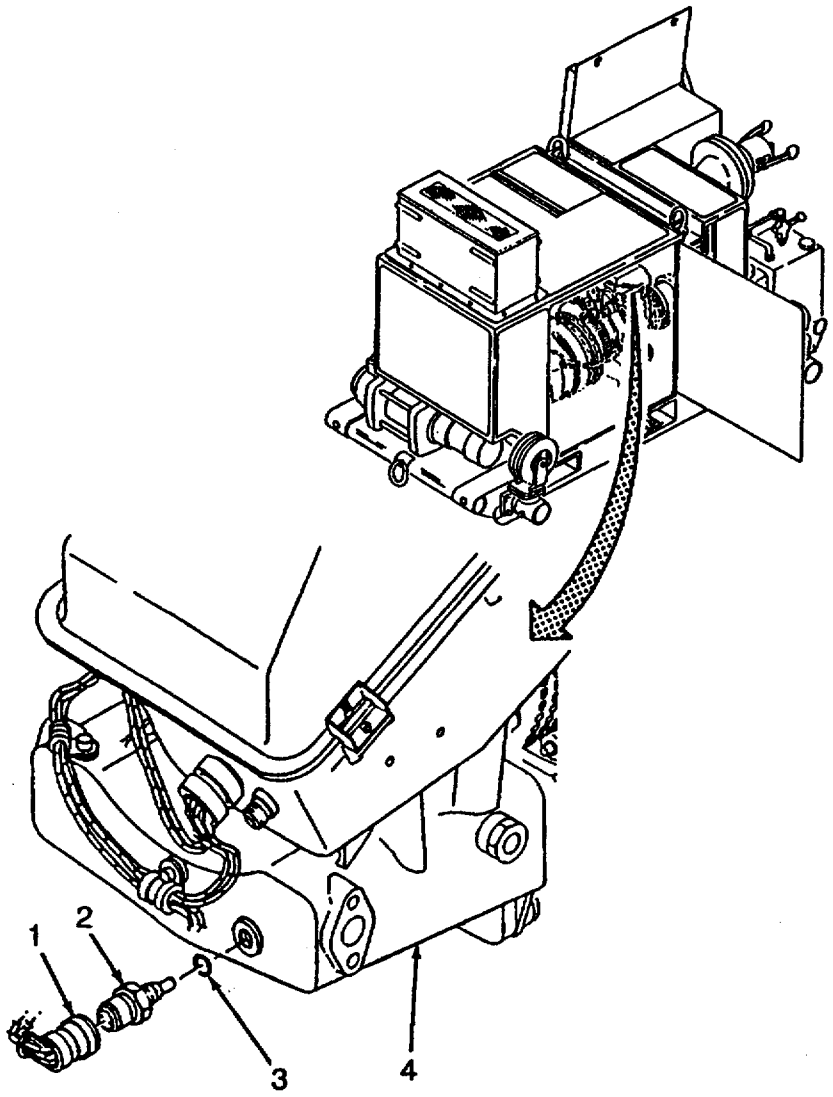


Figure 2-87. Engine Temperature Transmitter Replacement

2-61. BATTERY REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 3)

Equipment Condition
200/600 GPM pump assembly shut down (Para 2-7c, TM 10-4320-342-10)
Wheels in down position (Para 2-9c, TM 10-4320-342-10)

General Safety Instructions

WARNING
High voltage is present on this equipment. Do not perform maintenance with power on. Death or serious injury may result.

a. REMOVAL. Refer to Figure 2-88.

(1) Open door (1).

(2) Disconnect connector (2) from battery (3).

(3) Disconnect connector (4) from receptacle (5).

(4) Swing battery tray (6) open.

(5) Loosen wingnuts (7) and move rods (9) away for battery (3) removal.

WARNING
Do not try to lift or move more than 50 pounds by yourself and bend legs while lifting. Lifting heavy equipment/components incorrectly can cause serious injury.

CAUTION
To avoid damage to the battery, the battery must be serviced only in an authorized nickel-cadmium battery shop per TM 11-6140-203-23.

(6) Remove battery (3) from battery tray (6).

2-61. BATTERY REPLACEMENT - continued.

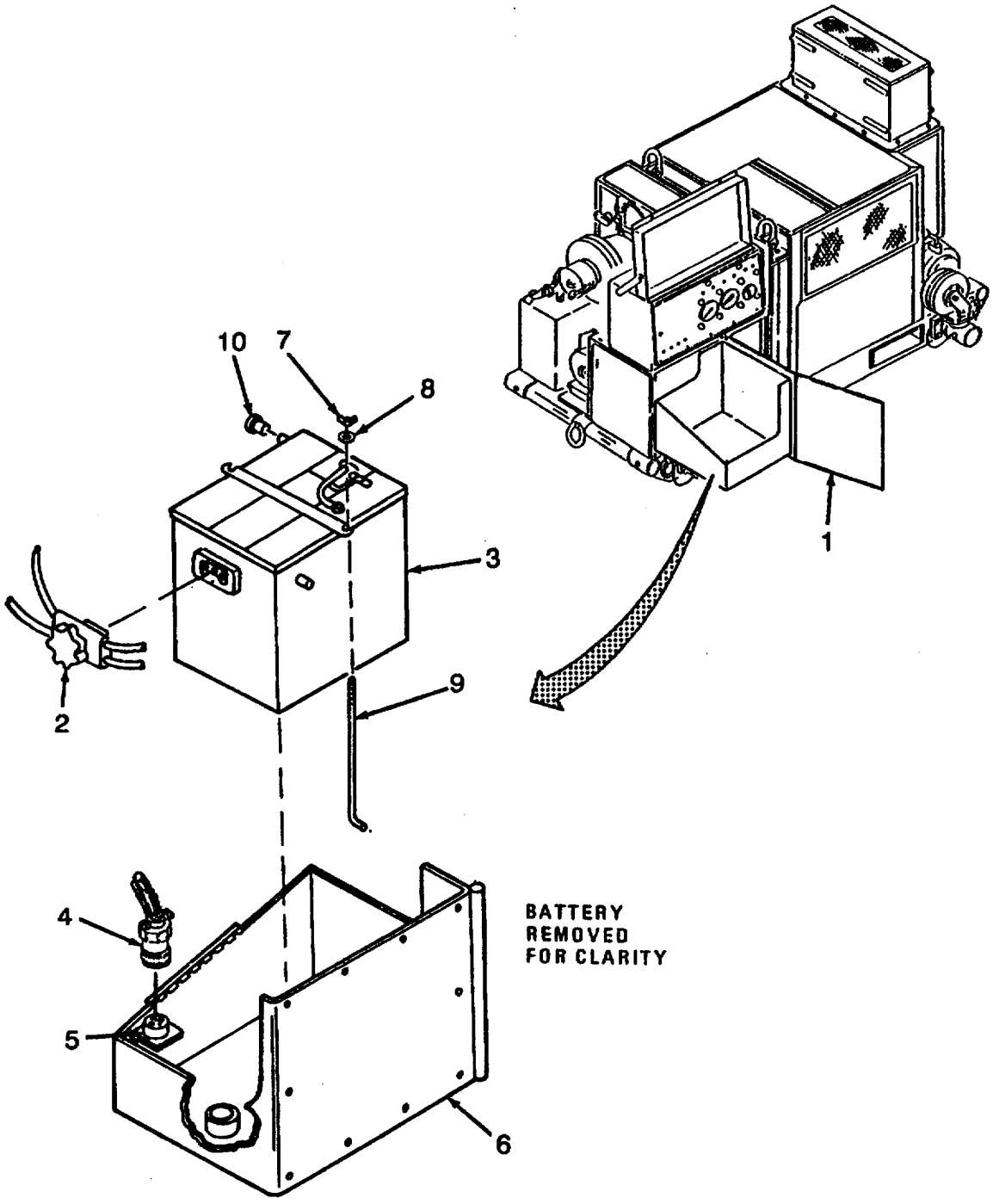


Figure 2-88. Battery Replacement

2-61. BATTERY REPLACEMENT - continued.

b. INSTALLATION. Refer to Figure 2-88.

WARNING

Do not try to lift or move more than 50 pounds by yourself and bend legs while lifting. Lifting heavy equipment/components incorrectly can cause serious injury.

CAUTION

To avoid damage to the battery, the battery must be serviced only in an authorized nickel-cadmium battery shop per TM 11-6140-203-23.

(1) Position battery (3) in battery tray (6).

(2) Install rods (9), washers (8) and wingnuts (7) and secure battery (3) in battery tray (6).

(3) Remove caps (10) from battery (3).

(4) Swing battery tray (6) close enough to connect connector (2) and connector (4) to battery (3) and receptacle (5).

(5) Close door (1).

2-62. BATTERY ELECTRICAL CONNECTOR REPLACEMENT. I

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Material/Parts
Tags (App E, Item 16)

Equipment Condition
200/600 GPM pump assembly shut down (Para 2-7c, TM 10-4320-342-10)

a. REMOVAL. Refer to Figure 2-89.

(1) Open door (1).

(2) Disconnect battery electrical connector (2) from battery (3).

(3) Remove screws (4), flatwashers (5) and nuts (6).

(4) Remove top battery electrical connector (7).

(5) Tag all wires and note markings on bottom battery electrical connector (11).

(6) Remove nuts (8), lockwashers (9) and lugs (10) from bottom battery electrical connector (11).

b. INSTALLATION.

CAUTION

Damage to the equipment could occur if polarity is reversed.

NOTE

Wire numbers are stamped on each electrical wire. This information, in conjunction with data on FO-1 and FO-2, 200/600 GPM Pump Wiring Diagram, may be used to connect wires if tags are lost or illegible.

(1) Install lugs (10), lockwashers (9) and nuts (8) on bottom battery electrical connector (11).

(2) Install top battery electrical connector (7) with screws (4), flatwashers (5) and nuts (6).

(3) Connect battery electrical connector (2) on battery (3).

(4) Close door (1).

2-62. BATTERY ELECTRICAL CONNECTOR REPLACEMENT- continued.

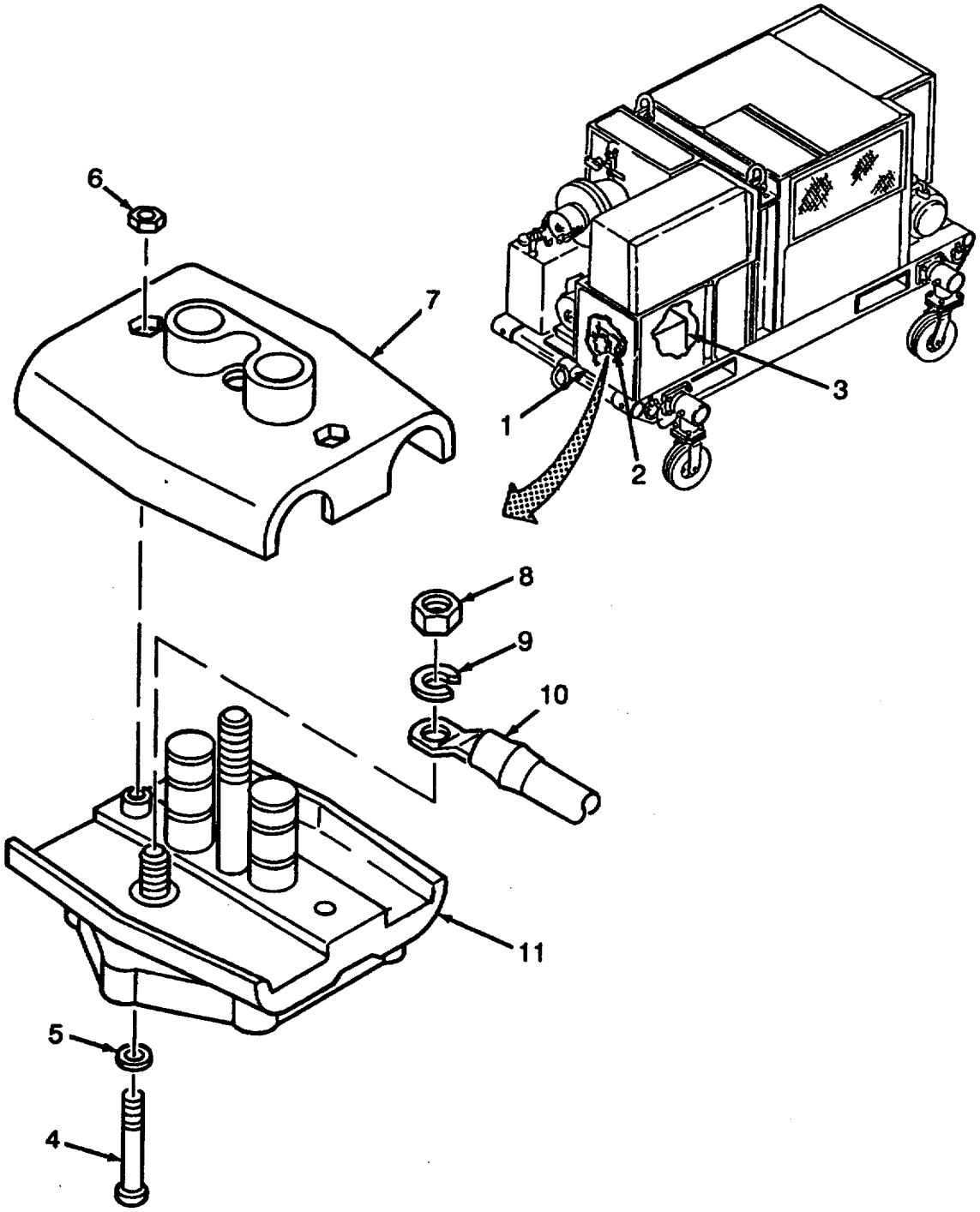


Figure 2-89. Battery Electrical Connector Replacement

2-63. BATTERY HEATER ASSEMBLY REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
Battery removed (Para 2-62)

Material/Parts
Adhesive (App E, Item 3)
Locknuts (App F, Item 59 and 63)
Lockwashers (App F, Item 60)

a. REMOVAL. Refer to Figure 2-90.

(1) Remove locknuts (1), washers (2), bolts (3) and connector (4) from bracket (5).

(2) Remove bolts (6), lockwashers (7), flatwashers (8) and plate (9) from battery box (10).

(3) Remove adhesive and thermostat (11) from bottom of plate (12).

(4) Remove locknuts (13), flatwashers (14) and screws (15) from plate (12) and remove plate (12).

(5) Remove battery heater assembly (16) from battery box (10).

b. INSTALLATION.

(1) Position battery heater assembly (16) on battery box (10).

(2) Position battery heater assembly (16) on bottom of battery box (10) and with plate (12) install screws (15), flatwashers (14) and locknuts (13).

(3) Apply a coat of adhesive to flat surface of thermostat (11) and attach to bottom of plate (12) close to center as possible. Hold in place until adhesive is dry.

(4) Install plate (9), lockwashers (7), flatwashers (8) and bolts (6) on battery box (10).

(5) Install connector (4) on bracket (5) with bolts (3), washers (2) and locknuts (1).

2-63. BATTERY HEATER ASSEMBLY REPLACEMENT - continued.

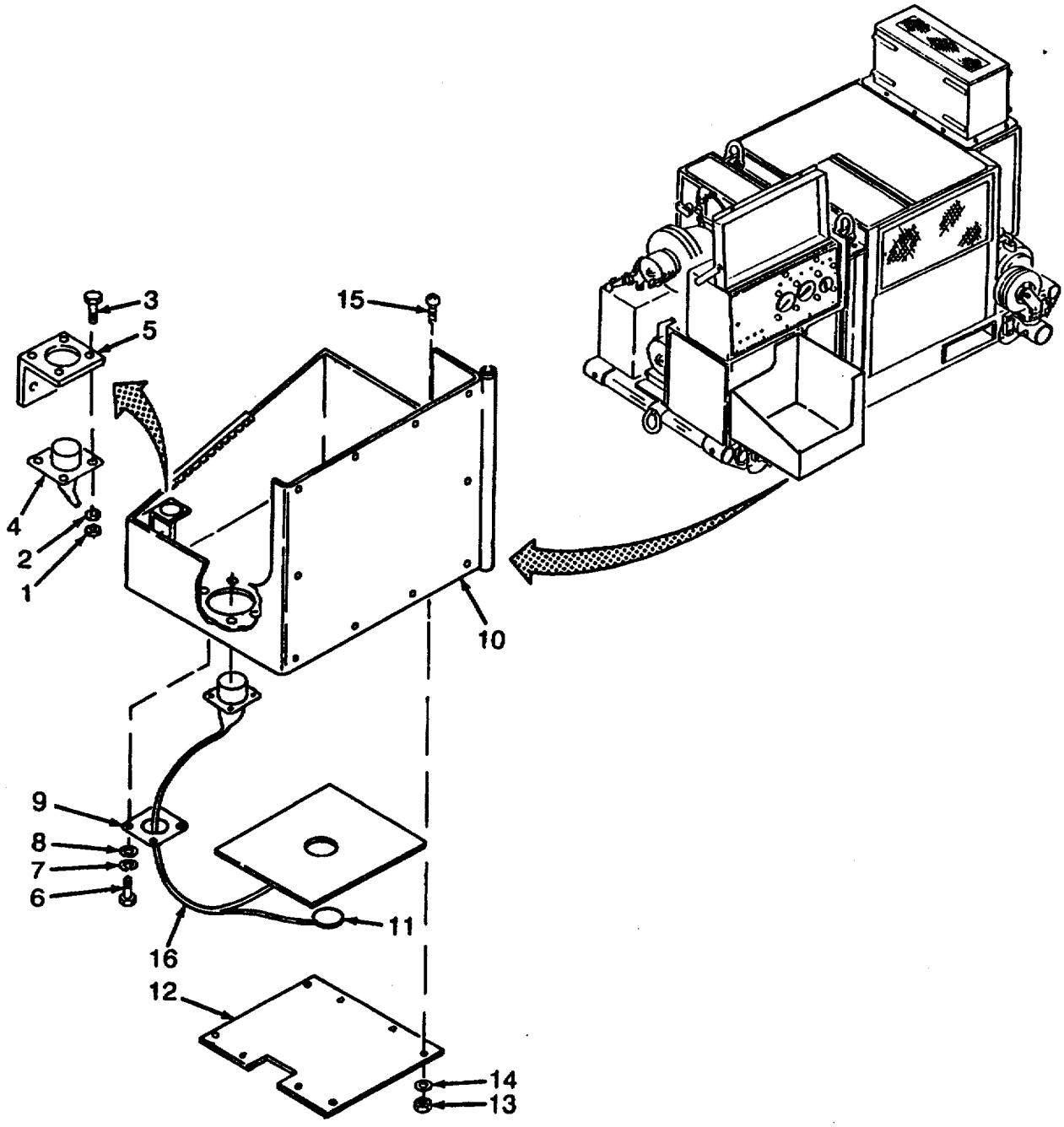


Figure 2-90. Battery Heater Assembly Replacement

2-64. BATTERY TRAY REPAIR.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 2)
Tool Kit, Blind Rivet (App B, Sect III, Item 2)
Drill (App B, Sect III, Item 2)
Twist Drill Set (App B, Sect III, Item 2)

Material/Parts
Adhesive (App E, Item 3)
Grommet (App E, Item 28)
Foam (App E, Item 26)
Lockwasher (App E, Item 105)

Equipment Condition
Battery Heater removed (Para 2-63)
Battery Cover removed (Para 2-28)

a. REMOVAL. Refer to Figure 2-91, Sheet 1 of 2.

(1) Remove pin (1) from 200/600 GPM Pump (2) and battery tray (3).

(2) Remove battery tray (3) from 200/600 GPM Pump (2).

(3) Remove bushings (4) from 200/600 GPM Pump (2) and battery tray (3).

b. DISASSEMBLE.

(1) Remove bolts (5), lockwashers (6), flatwashers (7) and pin block (8) from battery tray (3).

(2) Remove nut (9), flatwashers (10 and 11), lock plate (12), spacer (13), flatwashers (14 and 15), spring (16), bushing (17), flatwasher (18) and bolt (19) from battery tray (3).

(3) Remove wing nut (20), flatwasher (21) and nut (22) from rod (23).

(4) Remove cotter pin (24), flatwasher (25) and rod (23) from battery tray (3).

(5) Remove nuts (26), flatwashers (27 and 28), screws (29) and bracket (30) from battery tray (3).

(6) Remove foams (31 and 32) and grommet (33) from battery tray (3).

(7) Drill out rivnut (34) from battery tray (3).

Refer to Figure 2-91, Sheet 2 of 2.

(8) Remove insulations (1, 2, 3 and 4).

(9) Remove screw (5), lockwasher (6), flatwasher (7), lock plate (8) and spacers (9 and 10).

2-64. BATTERY TRAY REPAIR - continued.

c. REPAIR.
Replace damaged or defective components. Refer to Appendix D for replacement of foam and grommet.

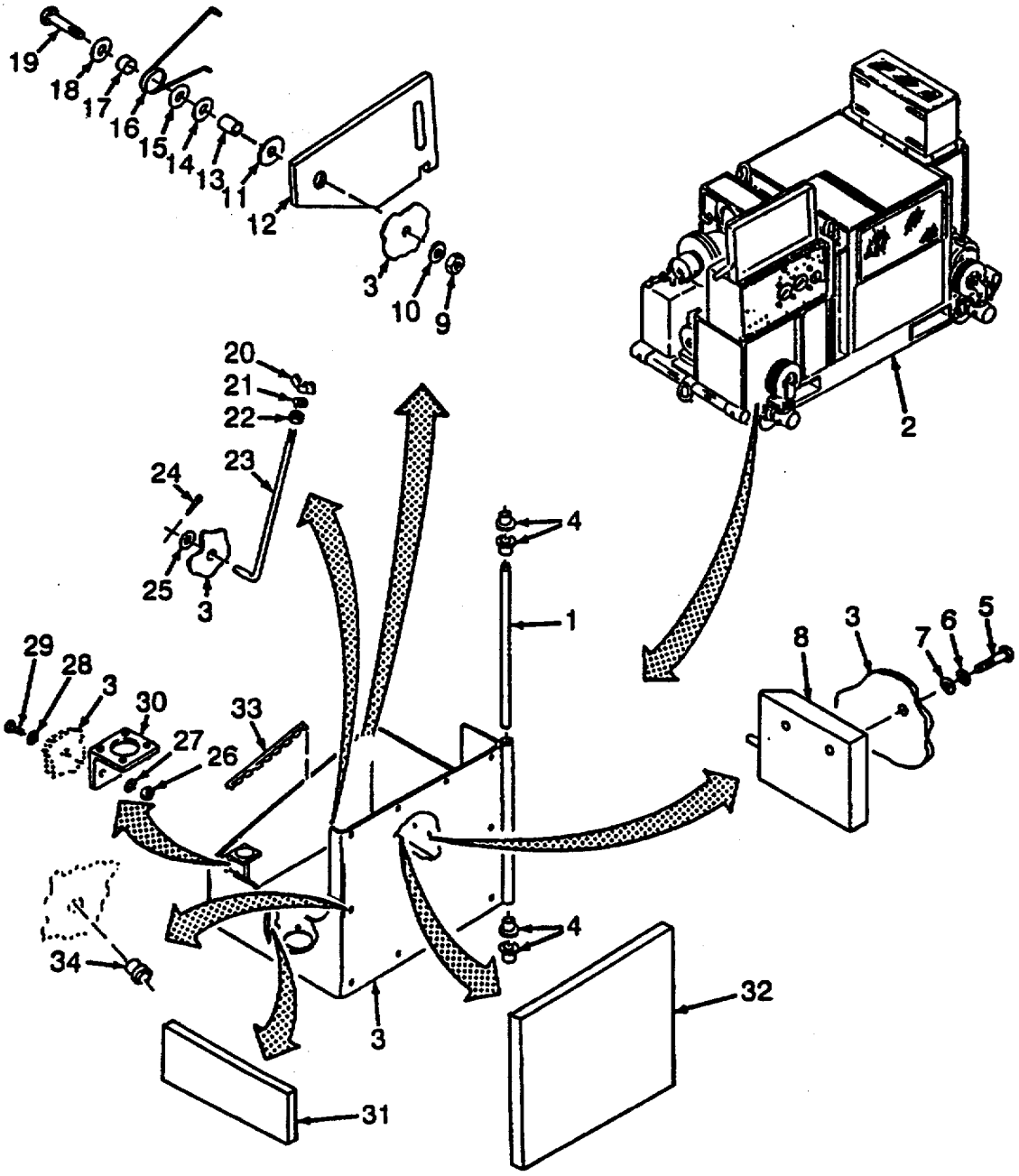


Figure 2-91. Battery Tray Repair (Sheet 1 of 2)

2-64. BATTERY TRAY REPAIR - continued.

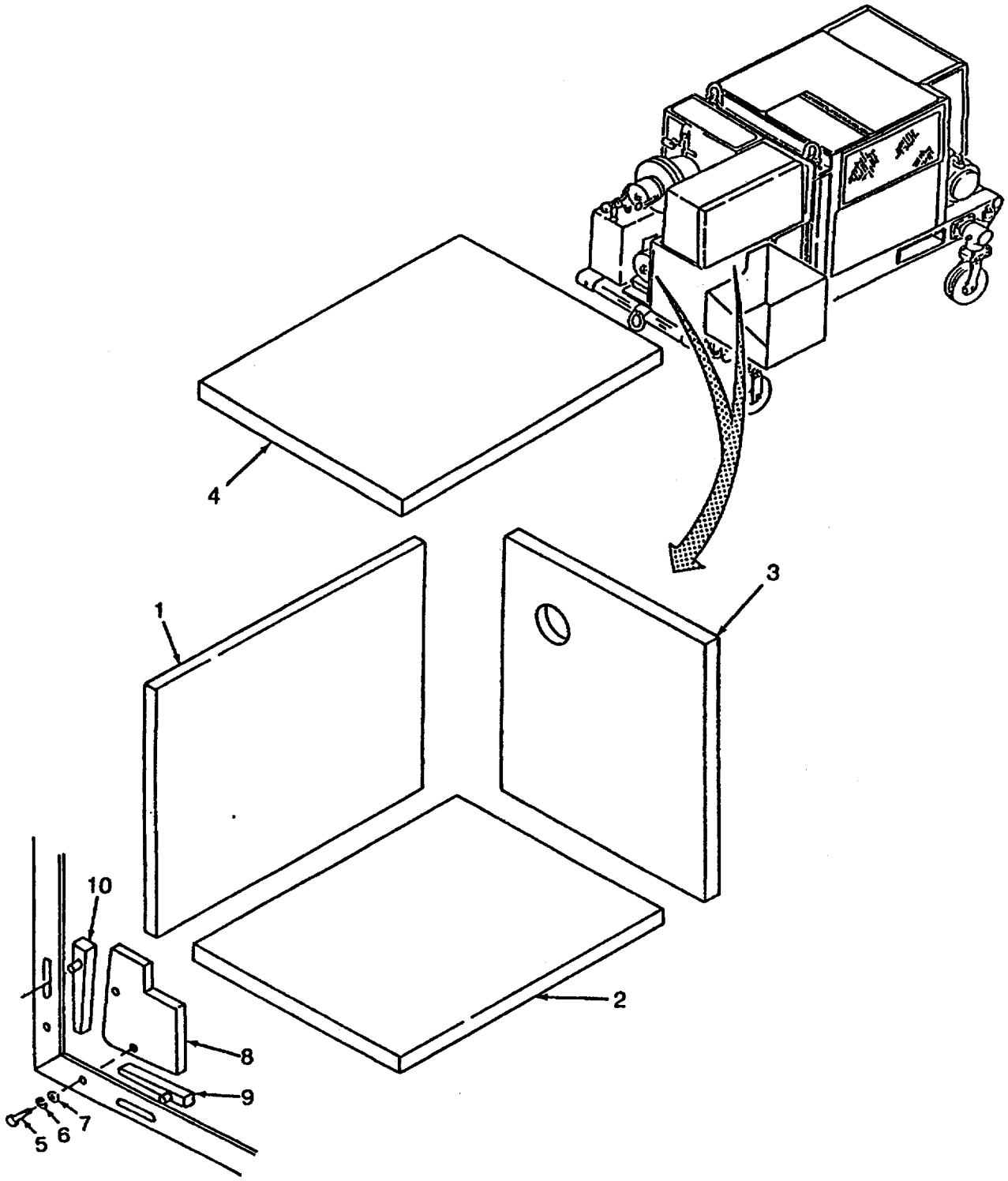


Figure 2-91. Battery Tray Repair (Sheet 2 of 2)

2-64. BATTERY TRAY REPAIR - continued.

d. ASSEMBLE. Refer to Figure 2-91, Sheet 2 of 2.

(1) Install spacers (9 and 10), lock plate (8), flat washer (7), lock washer (6) and screw (5).

(2) Install insulations (1, 2, 3 and 4).

Refer to Figure 2-91, Sheet 1 of 2.

(3) Apply adhesive to grommet (33) and install on battery tray (3).

(4) Install foams (31 and 32) and rivnuts (34) on battery tray (3).

(5) Position bracket (30) on battery tray (3) and install screw (29), flatwashers (27 and 28) and nuts (26)

(6) Install rod (23), flatwasher (25) and cotter pin (24) on battery tray (3).

(7) Install nut (22), flatwasher (21) and wing nut (20) on rod (23).

(8) Install flatwasher (18), bushing (17), spring (16), flatwashers (14 and 15), spacer (13), lock plate (12) and flatwasher (11) on bolt (19).

(9) Install bolt (19) on battery tray (3) and secure with flatwasher (10) and nut (9).

(10) Position pin block (8) on battery tray (3) and secure with flatwasher (7), lockwasher (6) and bolt (5).

e. INSTALLATION.

(1) Install bushings (4) in battery tray (3) and 200/600 GPM Pump (2).

(2) Position battery tray (3) on 200/600 GPM Pump (2) and install pin (1).

2-65. CONTROL BOX ASSEMBLY REMOVAL AND INSTALLATION.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
Battery disconnected (Para 2-62)
200/600 GPM pump assembly removed from system (Para 2-9, TM 10-4320-342-10)

a. REMOVAL. Refer to Figure 2-92.

(1) Open cover (1) and lock in place.

(2) Open control panel (2).

(3) Remove connectors (3, 4, 5 and 6) from receptacle connectors (7, 8, 9 and 10).

(4) Remove hose assemblies (11 and 12) from straight adapters (13 and 14).

(5) Remove bolt (15), flatwashers (16) and control box assembly (17).

b. INSTALLATION.

(1) Install control box assembly (17) and secure with bolts (15) and flatwashers (16).

(2) Install hose assemblies (11 and 12) onto straight adapters (13 and 14).

(3) Install connectors (3, 4, 5 and 6) onto the receptacle connectors (7, 8, 9 and 10).

(4) Close control panel (2) and lower cover (1).

2-65. CONTROL BOX ASSEMBLY REMOVAL AND INSTALLATION - continued.

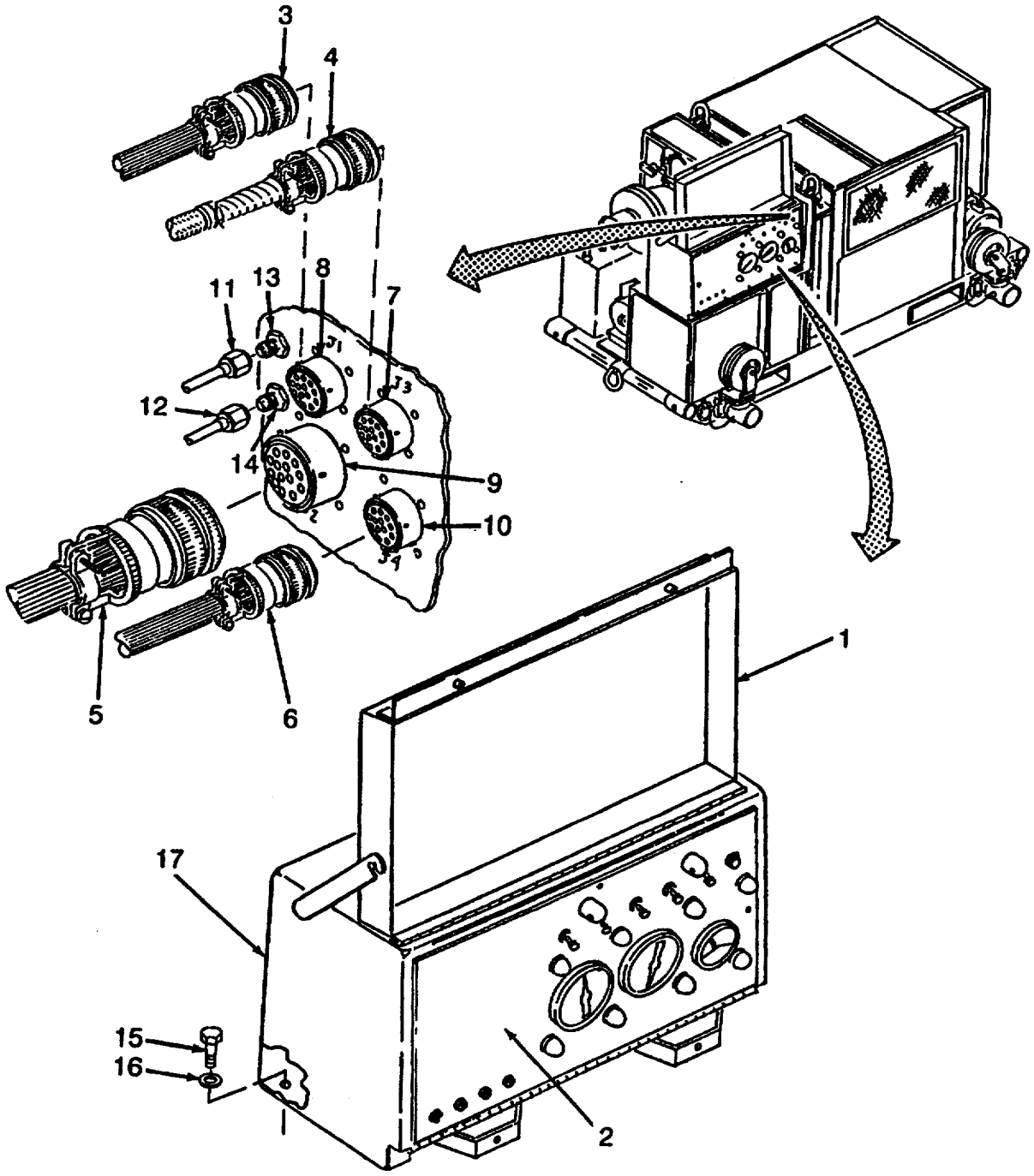


Figure 2-92. Control Box Assembly Removal and Installation

2-66. TOGGLE SWITCHES (FUEL HEAT, ENGINE PUMPS, START, PUMP CLUTCH REPLACEMENT TYPICAL.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Material/Parts
Tag (App E, Item 16)

Equipment Condition
Battery disconnected (Para 2-61)

NOTE

This procedure covers the replacement of the PUMPCLUTCH switch. Replacement of the other three toggle switches is identical.

a. REMOVAL. Refer to Figure 2-93.

(1) Open and lock in place cover (1).

(2) Open control panel (2).

(3) Tag electrical wires (3).

(4) Remove screws (4), lockwashers (5) and electrical wires (3) from toggle switch (6).

(5) Remove compression nut (7) and extension (8) from toggle switch (6).

(6) Remove nut (9), index ring (10), toggle switch (6) and star washer (11) from control panel (2).

b. INSTALLATION.

(1) Install star washer (11) on toggle switch (6) and secure on control panel (2) with index ring (10) and nut (9).

(2) Install compression nut (7) and extension (8) on toggle switch (6) and tighten compression nut.

(3) Position wires (3) on toggle switch (6) and secure with lockwashers (5) and screws (4) as tagged during removal.

(4) Close control panel (2) and lower cover (1).

2-66. TOGGLE SWITCHES (FUEL HEAT, ENGINE PUMPS, START, PUMP CLUTCH REPLACEMENT TYPICAL - continued.

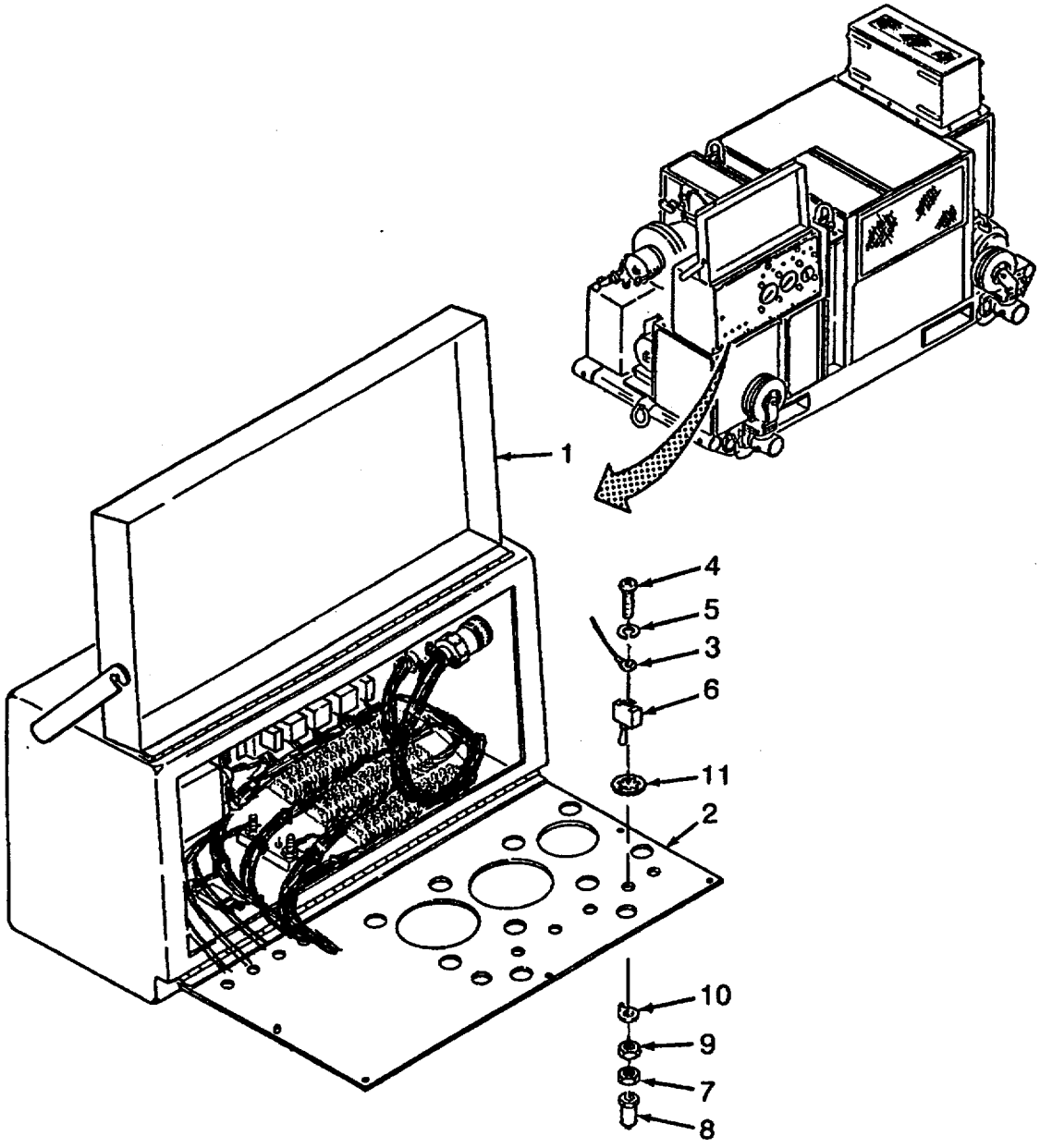


Figure 2-93. Toggle Switches Replacement (Typical)

2-67. CIRCUIT BREAKERS (MAIN, BAT HTR, SENSING, GEN) REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Material/Parts
Tags (App E, Item 16)

Equipment Condition
Battery disconnected (Para 2-62)

NOTE

This procedure covers the MAIN circuit breaker. Replacement of all circuit breakers is similar.

a. REMOVAL. Refer to Figure 2-94.

(1) Open and lock in place cover (1).

(2) Open control panel (2).

(3) Tag electrical wiring (3) on circuit breaker (4).

(4) Remove screws (5), lockwashers (6) and electrical wire (3) from circuit breakers (4).

(5) Remove nut (7), lockwasher (8) and circuit breaker (4) from control panel (2).

b. INSTALLATION.

(1) Install circuit breaker (4), lockwasher (8) and nut (7) on control panel (2).

NOTE

Wire numbers are stamped on each electrical wire. This information, in conjunction with data on FO-1 and FO-2, 200/600 GPM Pump Wiring Diagram, may be used to connect wires if tags are lost or illegible.

(2) Install screw (5), lockwasher (6) and electrical wires (3) as tagged onto circuit breaker (4).

(3) Close control panel (2).

(4) Unlock and close cover (1).

2-67. CIRCUIT BREAKERS (MAIN, BAT HTR, SENSING, GEN) REPLACEMENT - continued.

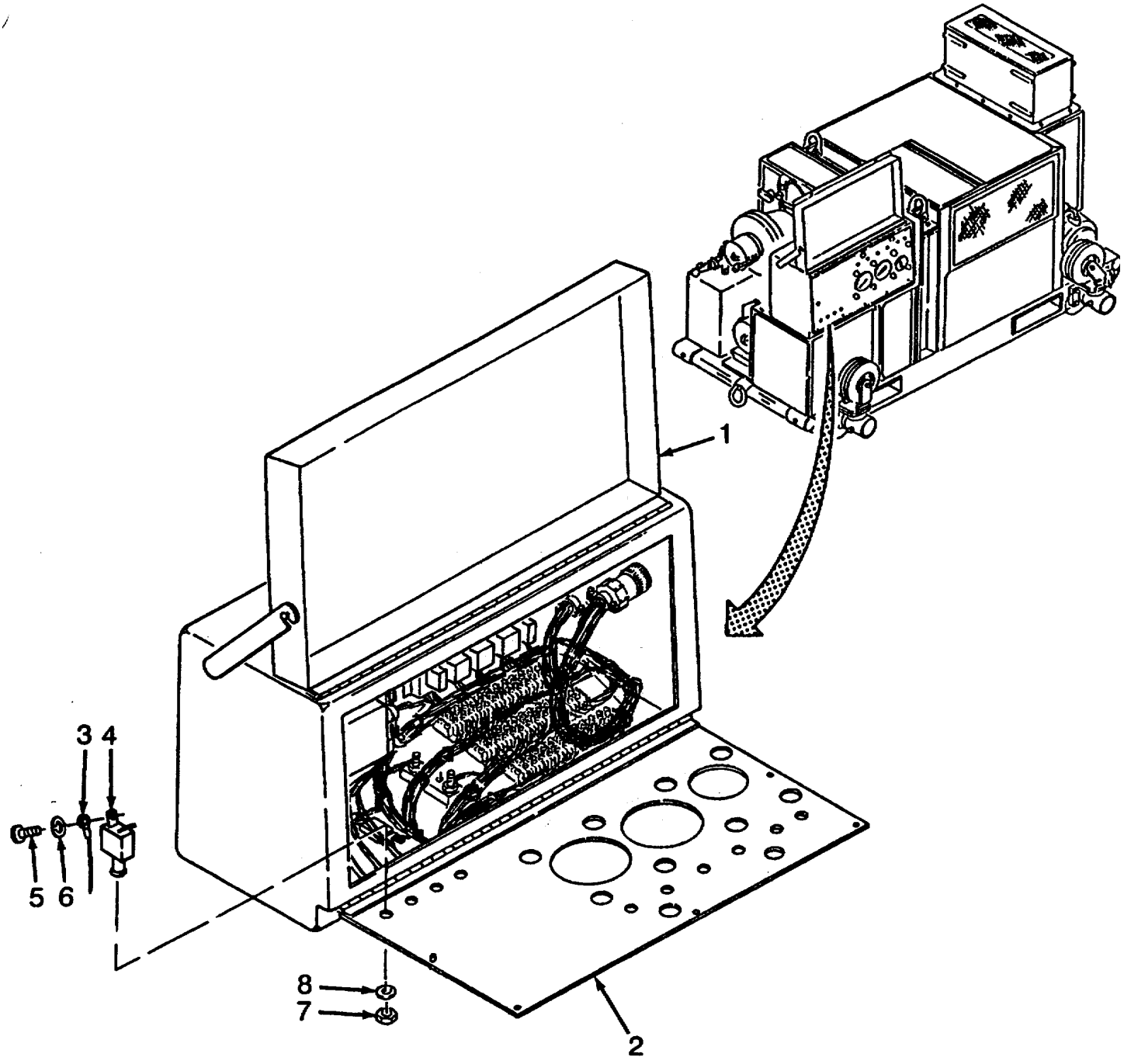


Figure 2-94. Circuit Breaker Replacement

2-68. AMMETER (BATTERY) REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Material/Parts
Tags (App E, Item 16)

Equipment Condition
Battery disconnected (Para 2-61)

a. REMOVAL. Refer to Figure 2-95.

(1) Open cover (1) and lock in place.

(2) Open control panel (2).

(3) Tag electrical wires (3).

(4) Remove nuts (4), two flatwashers (5) and electrical wires (3) from ammeter (6).

(5) Remove nuts (7), lockwashers (8), screws (9) and ammeter (6).

b. INSTALLATION.

(1) Position ammeter (6) in cutout on control panel (2).

(2) Secure with screws (9), lockwasher (8) and nuts (7).

NOTE

Wire numbers are stamped on each electrical wire. This information, in conjunction with data on FO-1 and FO-2, 200/600 GPM Pump Wiring Diagram, may be used to connect wires if tags are lost or illegible.

(3) Install two flatwashers (5), electrical wiring (3) and nuts (4) to ammeter (6).

(4) Close control panel (2).

(5) Unlock and close cover (1).

2-68. AMMETER (BATTERY) REPLACEMENT- continued.

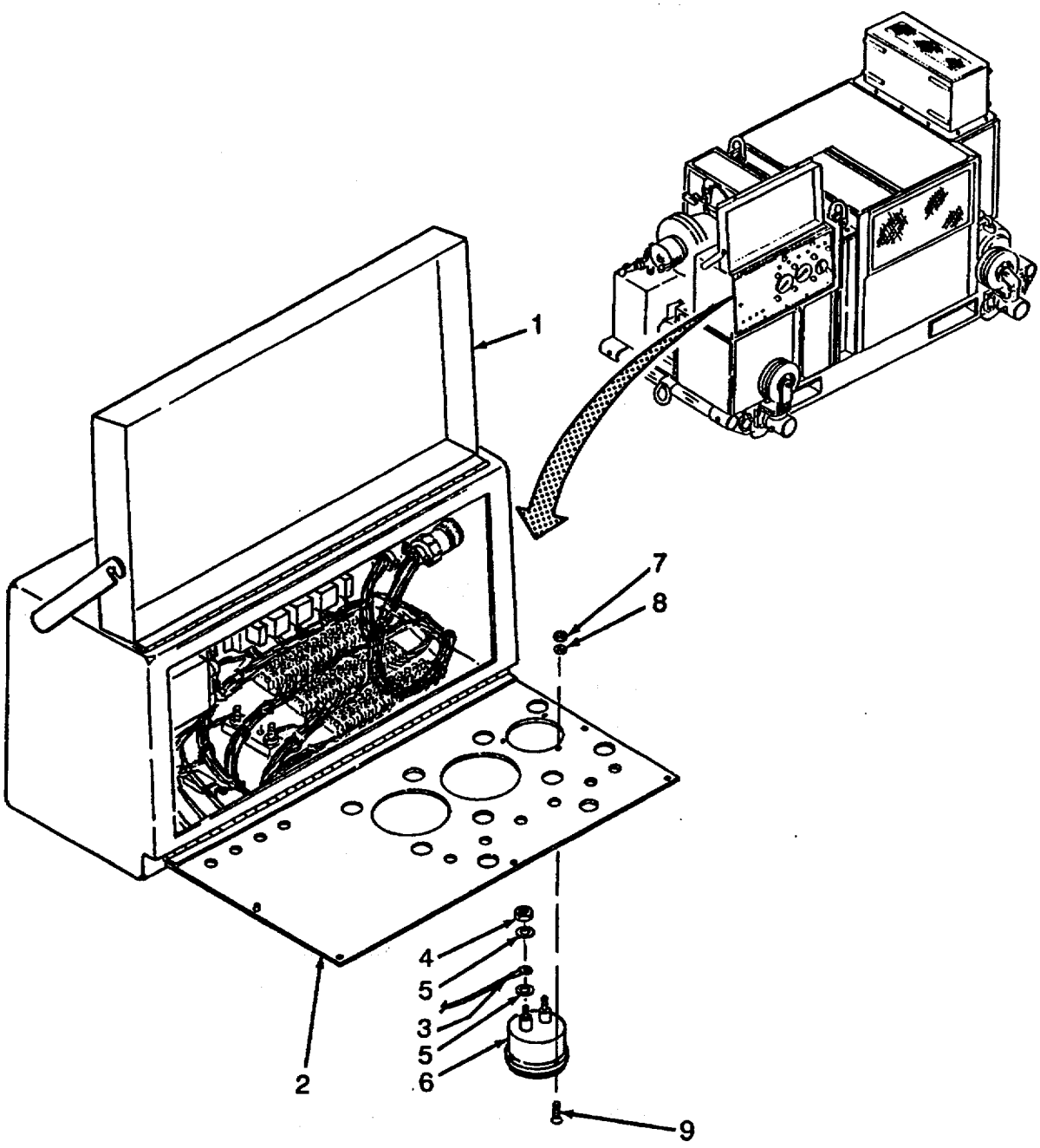


Figure 2-95. Ammeter (Battery) Replacement

2-69. PRESSURE GAGES (SUCTION/DISCHARGE) REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Material/Parts
Antiseizing Tape (App E, Item 6)
Rags (App E, Item 2)
Crush Washers (App F, Item 61)

Equipment Condition
Battery disconnected (Para 2-62)

NOTE

This procedure covers the DISCHARGE gage. Replacement of the SUCTION gage is identical.

WARNING

Fuels and fuel vapors are toxic and flammable. Be careful when working around fuel so not to come in contact. Fuel can cause injury to personnel. For disposal of contaminated fuel, refer to FM 10-20.

a. REMOVAL. Refer to Figure 2-96.

(1) Open cover (1) and lock in place.

(2) Open control panel (2).

(3) Disconnect hose (3) from adapter (4) and bulkhead connector (5).

(4) Remove screws (6), wedge clips (7) and spring (8).

(5) Remove ring (9) and gage (10).

(6) Remove adapter (4), crush washer (11), elbow (12) from gage (10).

b. INSTALLATION.

(1) Position elbow (12), crush washer (11) and adapter (4) on gage (10).

(2) Install gage (10) and ring (9) in cutout in control panel (2).

(3) Install springs (8), wedge clips (7) and screws (6).

2-69. PRESSURE GAGES (SUCTION/DISCHARGE) REPLACEMENT - continued.

(4) Connect hose (3) to bulkhead connector (5) and adapter (4).

(5) Close control panel (2) and cover (1).

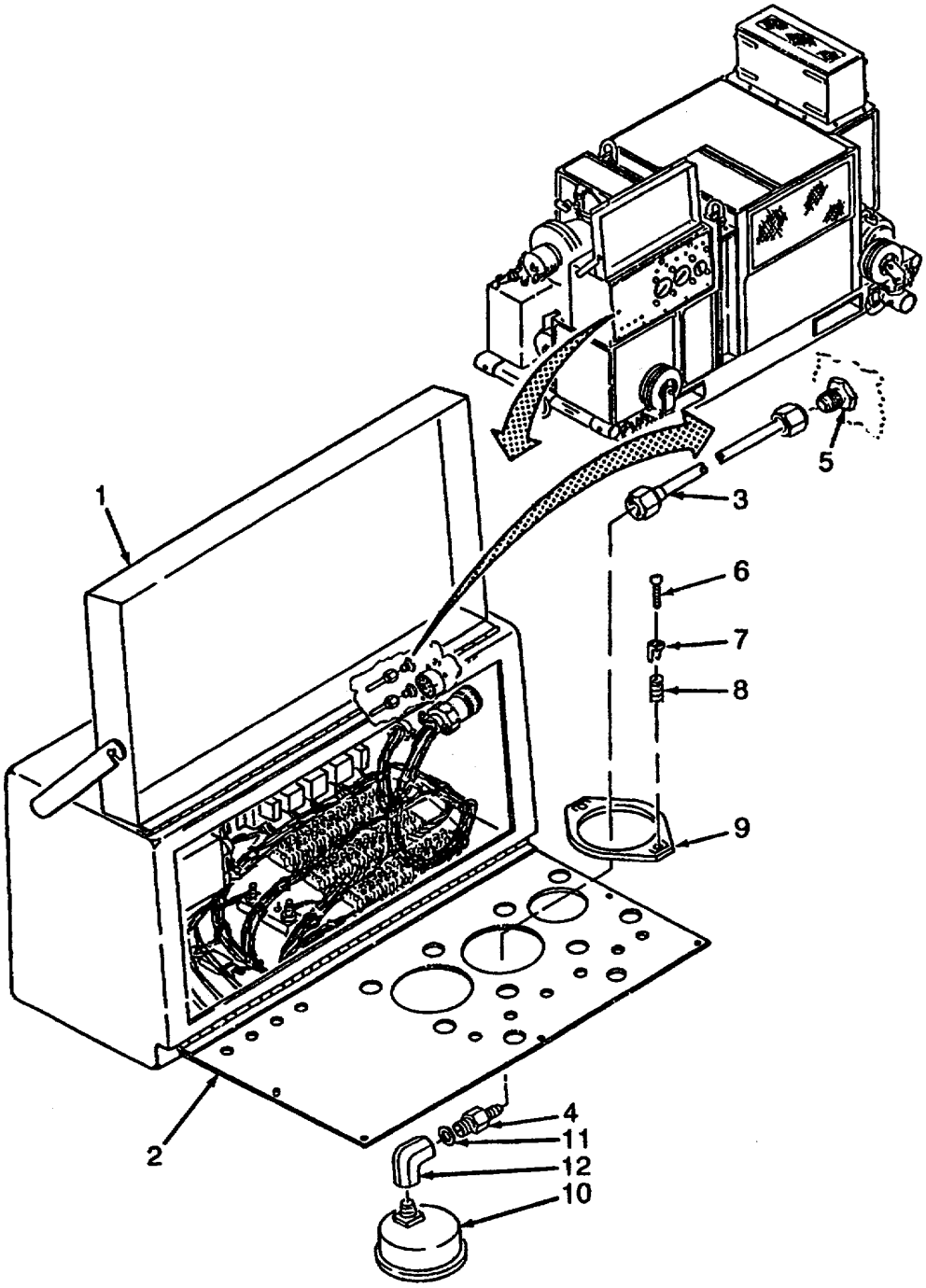


Figure 2-96. Pressure Gages (Suction/Discharge) Replacement

2-70. PANEL LIGHTS REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Material/Parts
Tags (App E, Item 16)

Equipment Condition
Battery disconnected (Para 2-61)

NOTE

This procedure covers one of the panel lights. Replacement of the other panel lights are identical.

a. REMOVAL. Refer to Figure 2-97.

(1) Open cover (1) and lock in place.

(2) Open control panel (2).

(3) Tag electrical wires (3).

(4) Remove screw (4) and electrical wires (3) from panel light socket (8).

(5) Unscrew and remove shade socket (5), light bulb (6) and ring (7).

(6) Remove light socket (8), lockwasher (9) and nut (10) from control panel (2).

b. INSTALLATION.

(1) Install light socket (8), lockwasher (9) and nut (10) on control panel (2).

(2) Install ring (7), light bulb (6) and shade (5) on light socket (8) so opening in shade is in the down position when the control panel (2) is raised. Tighten ring (7) against shade (5).

NOTE

Wire numbers are stamped on each electrical wire. This information, in conjunction with data on FO-1 and FO-2, 200/600 GPM Pump Wiring Diagram, may be used to connect wires if tags are lost or illegible.

(3) Tighten nut (10) against control panel (2).

2-70. PANEL LIGHTS REPLACEMENT - continued.

(4) Connect electrical wiring (3) as tagged.

(5) Close control panel (2).

(6) Unlock and close cover (1).

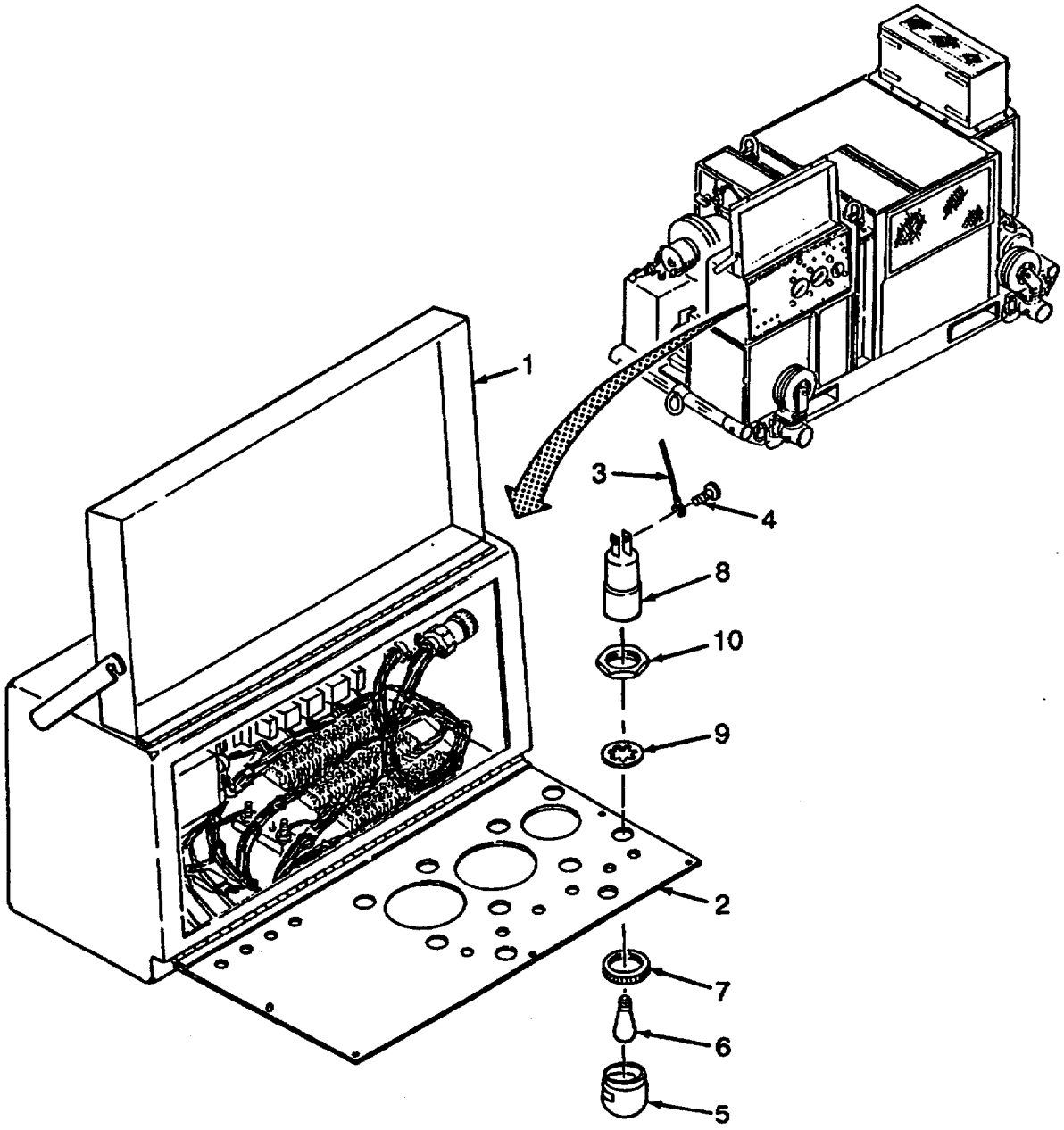


Figure 2-97. Panel Lights Replacement

2-71. MASTER SWITCH REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Material/Parts
Tags (App E, Item 16)

Equipment Condition
Battery disconnected (Para 2-61)

a. REMOVAL. Refer to Figure 2-98.

(1) Open cover (1) and lock in place.

(2) Open control panel (2).

(3) Tag electrical wiring (3).

(4) Remove screw (4) and washer (5) from master switch (6).

(5) Unscrew and remove cover (7) and gasket (8).

(6) Remove nut (9) and switch (6) from control panel (2).

(7) Remove gasket (10) from switch (6).

b. INSTALLATION.

(1) Install switch (6), gasket (10) and nut (9) on control panel (2).

(2) Install gasket (8) and cover (7) on master switch (6).

NOTE

Wire numbers are stamped on each electrical wire. This information, in conjunction with data on FO-1 and FO-2, 200/600 GPM Pump Wiring Diagram, may be used to connect wires if tags are lost or illegible.

(3) Install screw (4), washer (5) and electrical wiring (3) as tagged on master switch (6).

(4) Close control panel (2).

(5) Unlock and close cover (1).

2-71. MASTER SWITCH REPLACEMENT - continued.

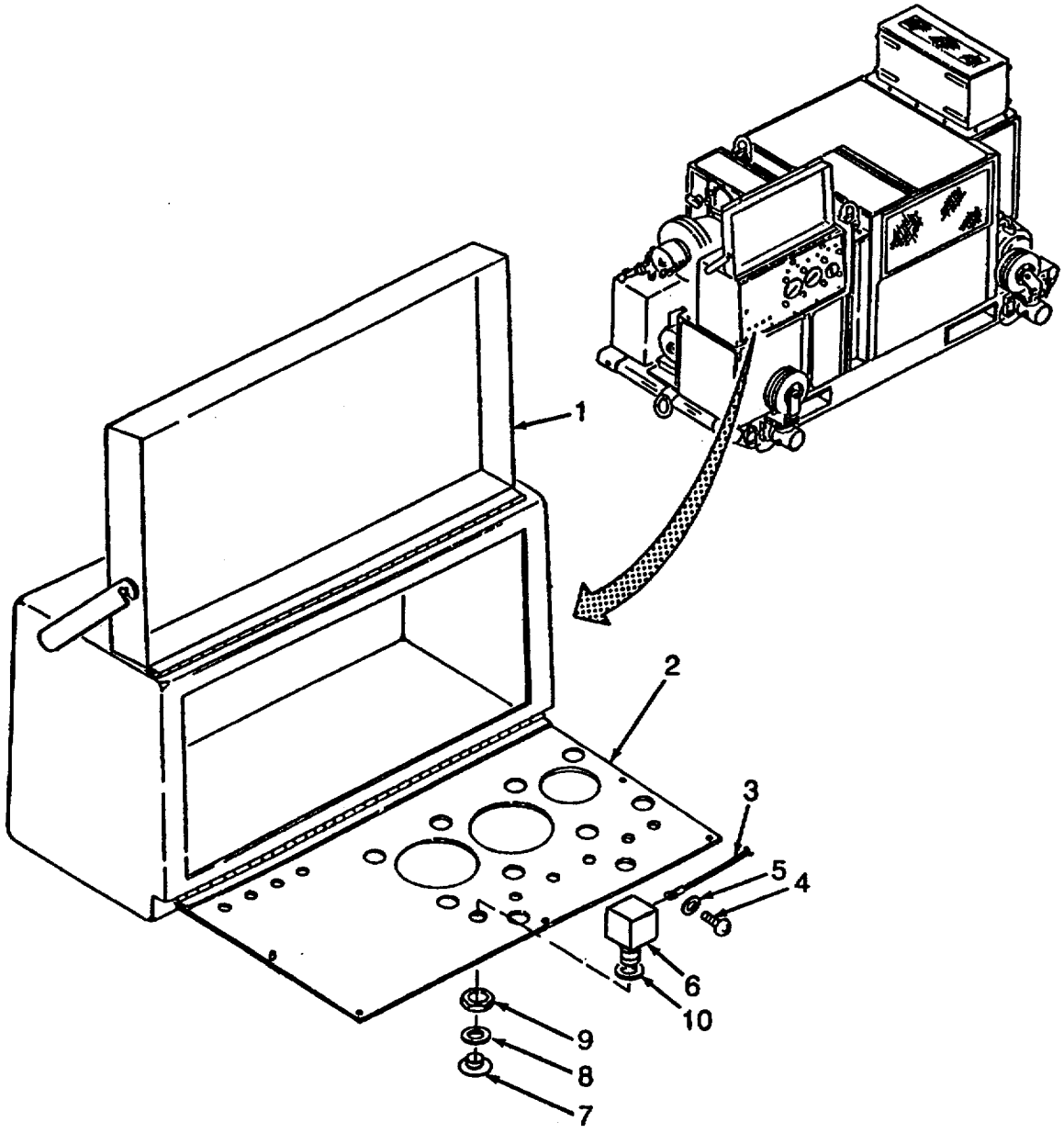


Figure 2-98. Master Switch Replacement

2-72. VOLTAGE REGULATOR REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Material/Parts
Sealing Compound (App E, Item 23)

Equipment Condition
Battery disconnected (Para 2-61)

a. REMOVAL. Refer to Figure 2-99.

(1) Open cover (1) and lock in place.

(2) Open control panel (2).

(3) Disconnect connector (3) from voltage regulator (4).

(4) Remove nuts (5), flatwashers (6), bolts (7) and voltage regulator (4) from control box (8).

b. INSTALLATION.

(1) Apply sealing compound to heads of bolts (7).

(2) Position voltage regulator (4) in back of control box (8) and install bolts (7), flatwashers (6) and nuts (5).

(3) Connect connector (3) to voltage regular (4).

(4) Close control panel (2).

(5) Unlock and close cover (1).

2-72. VOLTAGE REGULATOR REPLACEMENT - continued.

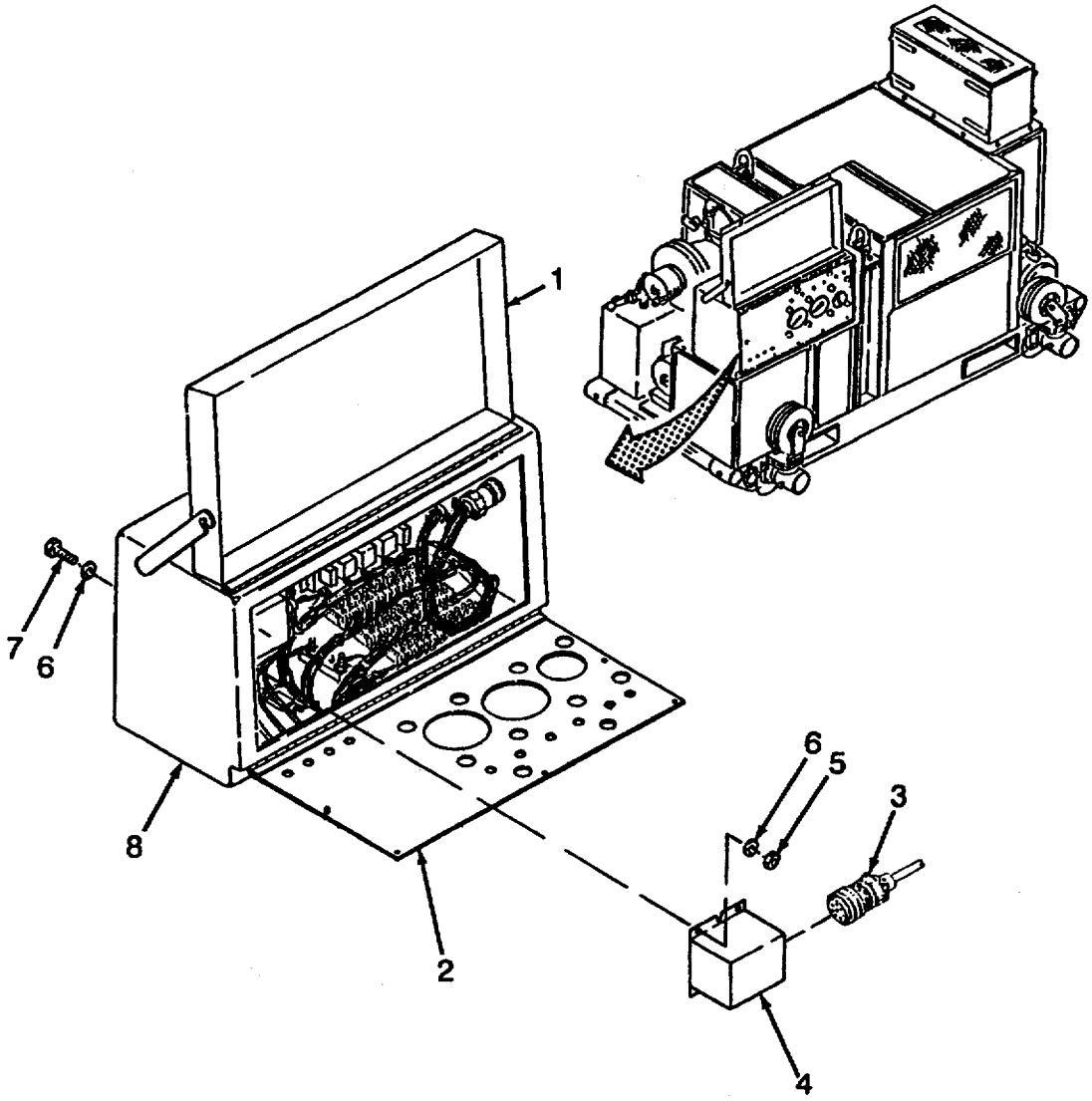


Figure 2-99. Voltage Regulator Replacement

2-73. RELAYS K2 AND K6 REPLACEMENT.

This Task Covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
200/600 GPM Pump shut down (Para 2-7c, TM 10-4320-320-10)
Battery disconnected (Para 2-61)

Materials/Parts
Tags (App E, Item 16)
Locknut (App F, Item 63)
Sealing Compound (App E, Item 23)

a. REMOVAL. Refer to Figure 2-100.

NOTE

This procedure covers the K2 relay. Replacement of the K6 relay is similar.

(1) Open cover (1) and lock in place.

(2) Open control panel (2).

(3) Tag electrical wires (3).

(4) Remove nuts (4), lockwashers (5) and remove electrical wires (3) from relay (6).

(5) Remove locknuts (7), flatwashers (8), bolts (9) and relay (6) from control box (10).

b. INSTALLATION.

(1) Apply sealing compound to heads of bolts (9).

(2) Install relay (6) with bolts (9), flatwashers (8) and locknuts (7).

NOTE

Wire numbers are stamped on each electrical wire. This information, in conjunction with data on FO-1 and FO-2, 200/600 GPM Pump Wiring Diagram, may be used to connect wires if tags are lost or illegible.

(3) Connect electrical wires (3) as tagged and secure with lockwashers (5) and nuts (4) on relay (6).

2-73. RELAYS K2 AND K6 REPLACEMENT - continued.

(4) Close control panel (2).

(5) Unlock and close cover (1).

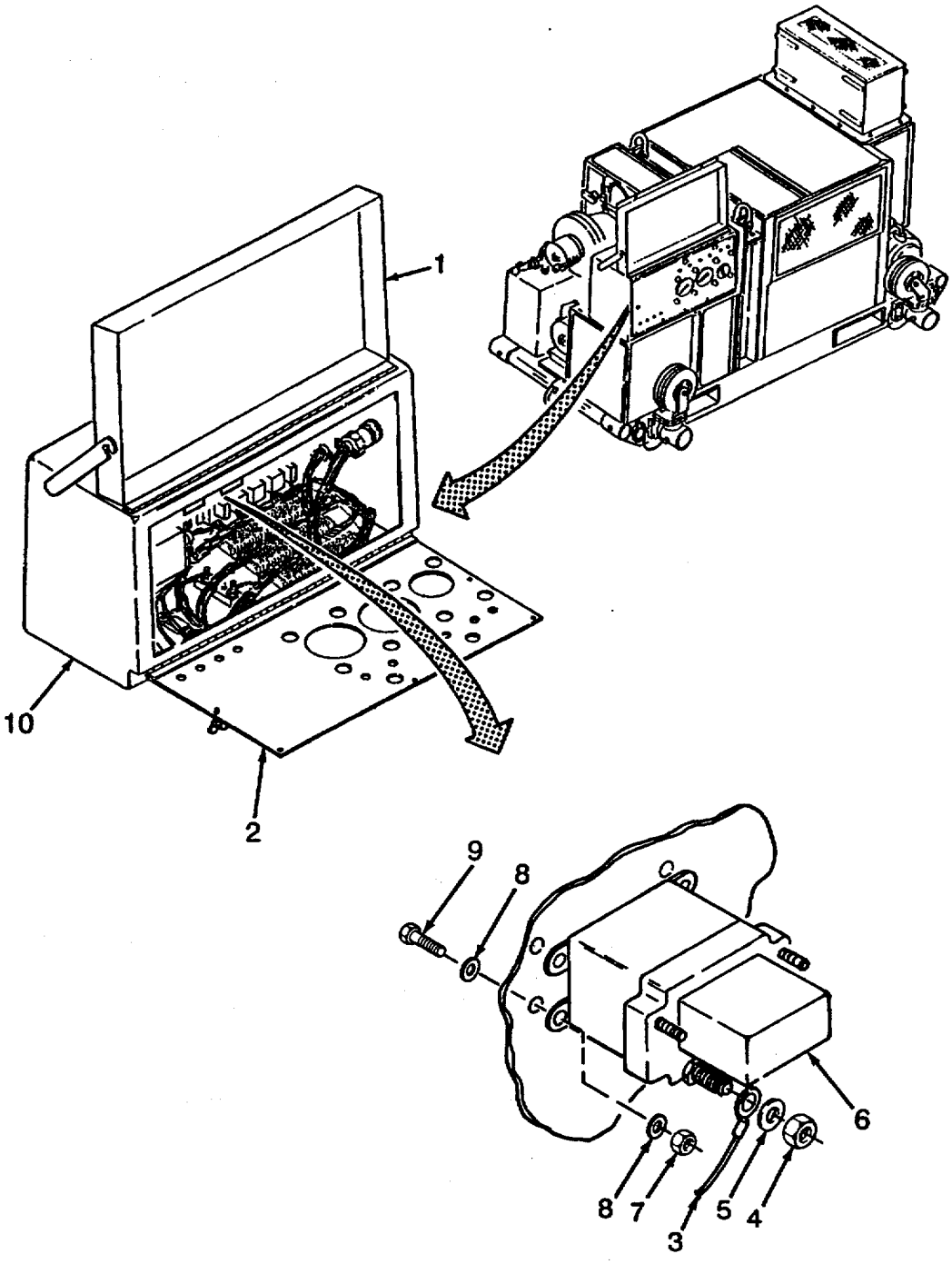


Figure 2-100. Relays K2 and K6 Replacement

2-74. RELAY K3 REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Too Kit (App B, Sect III, Item 1)

Equipment Condition
200/600 GPM Pump shut down (Para 2-7c, TM 10-4320-320-10)

Materials/Parts
Tags (App E, Item 16)
Sealing Compound (App E, Item 23)
Locknuts (App F, Item 63)

a. REMOVAL. Refer to Figure 2-101.

(1) Open cover (1) and lock in place.

(2) Open control panel (2).

(3) Tag wiring (3).

(4) Remove nuts (4) ,washers (5) and wiring (3) from relay (6).

(5) Remove screw (7), flatwashers (8) and relay (6).

(6) Remove locknuts (11), flatwashers (10), bolts (9) and mounting plate (12) from control box (13).

b. INSTALLATION.

(1) Install sealing compound to head of bolts (9).

(2) Install bolts (9), flatwashers (10), locknuts (11) and mounting plate (12) on control box (13).

(3) Install relay (6) and secure with flatwasher (8) and screw (7).

NOTE

Wire numbers are stamped on each electrical wire. This information, in conjunction with data on FO-1 and FO-2, 200/600 GPM Pump Wiring Diagram, may be used to connect wires if tags are lost or illegible.

(4) Connect electrical wiring (3) as tagged to relay (6) and secure with washers (5) and nuts (4).

(5) Close control panel (2).

2-74. RELAY K3 REPLACEMENT - continued.

(6) Unlock and close cover (1).

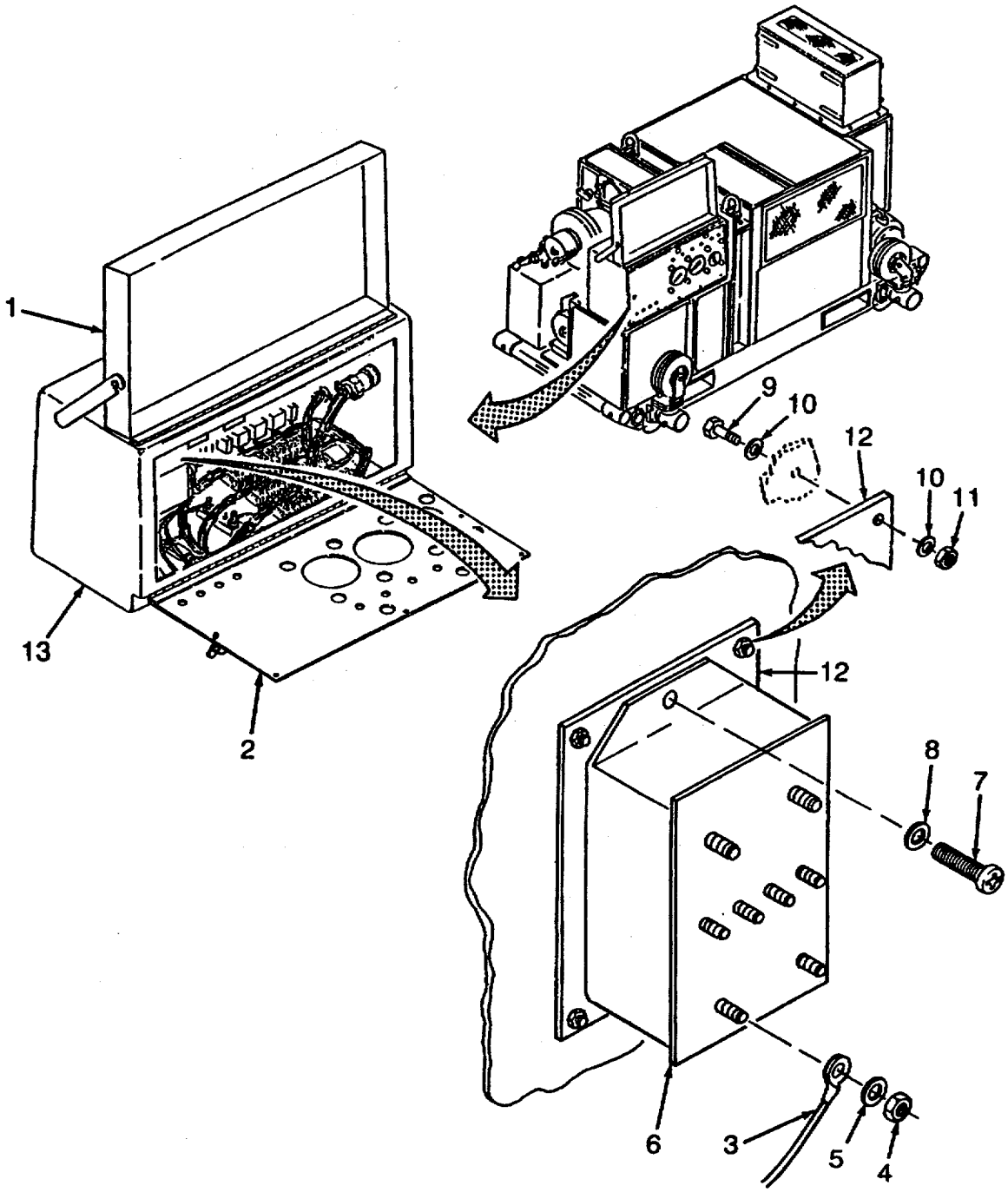


Figure 2-101. Relays K3 Replacement

2-75. SHUNT R4 REPLACEMENT

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
200/600 GPM Pump shut down (Para 2-7c, TM 10-4320-320-10)

Materials/Parts
Tags (App E, Item 16)
Locknut (App F, Item 63)

a. REMOVAL. Refer to Figure 2-102.

(1) Open cover (1) and lock in place.

(2) Open control panel (2).

(3) Tag electrical wires (3 and 4)

(4) Remove nuts (5), flatwashers (6) and wires (3) from shunt (7).

(5) Remove screws (8), lockwasher (9) and wire (4) from shunt (7).

(6) Remove locknuts (10), flatwashers (11), screws (12) and shunt (7) from control box (13).

b. INSTALLATION.

(1) Position shunt (7) in control box (13) and secure with screws (12), flatwashers (11) and locknuts (10).

(2) Install screws (8), lockwashers (9) and wire (4) onto shunt (7) as tagged during removal.

(3) Install nuts (5), flatwashers (6) and wire (3) onto shunt (7) as tagged during removal.

(4) Close control panel (2) and cover (1).

2-75. SHUNT R4 REPLACEMENT - continued

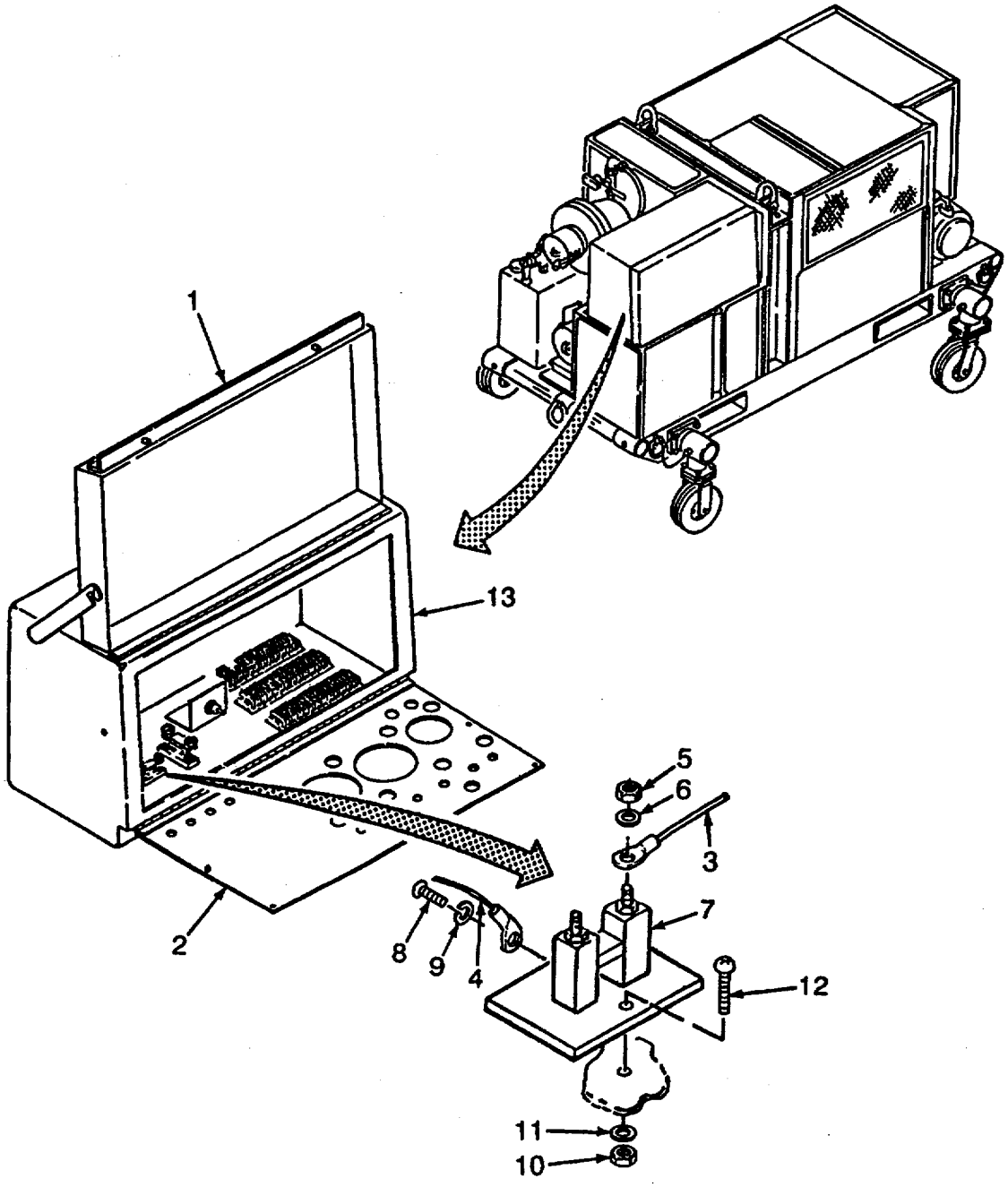


Figure 2-102. Shunt R4 Replacement

2-76. FUSE LINK AND HOLDER REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
200/600 GPM Pump shut down (Para 2-7c, TM 10-4320-320-10)

Materials/Parts
Tags (App E, Item 16)
Locknut (App F, Item 63)

a. REMOVAL. Refer to Figure 2-103.

(1) Open and lock in place cover (1).

(2) Open control panel (2).

(3) Tag electrical wiring (3).

(4) Remove locknut (4), flatwashers (5) and fuse link (6) from fuse holder (7).

(5) Remove wiring (3) from fuse holder (7).

(6) Remove locknuts (8), flatwashers (9), screws (10) and fuse holder (7) from control box (11).

b. INSTALLATION.

(1) Install fuse holder (7) in control box (11) and secure with screws (10), flatwashers (9) and locknuts (8).

NOTE

Wire numbers are stamped on each electrical wire. This information, in conjunction with data on FO-1 and FO-2, 200/600 GPM Pump Wiring Diagram, may be used to connect wires if tags are lost or illegible.

(2) Install wiring (3) on fuse holder (7).

(3) Install wiring (3) and fuse link (6) on fuse holder (7) and secure with flatwashers (5) and locknuts (4).

(4) Close control panel (2) and cover (1).

2-76. FUSE LINK AND HOLDER REPLACEMENT - continued.

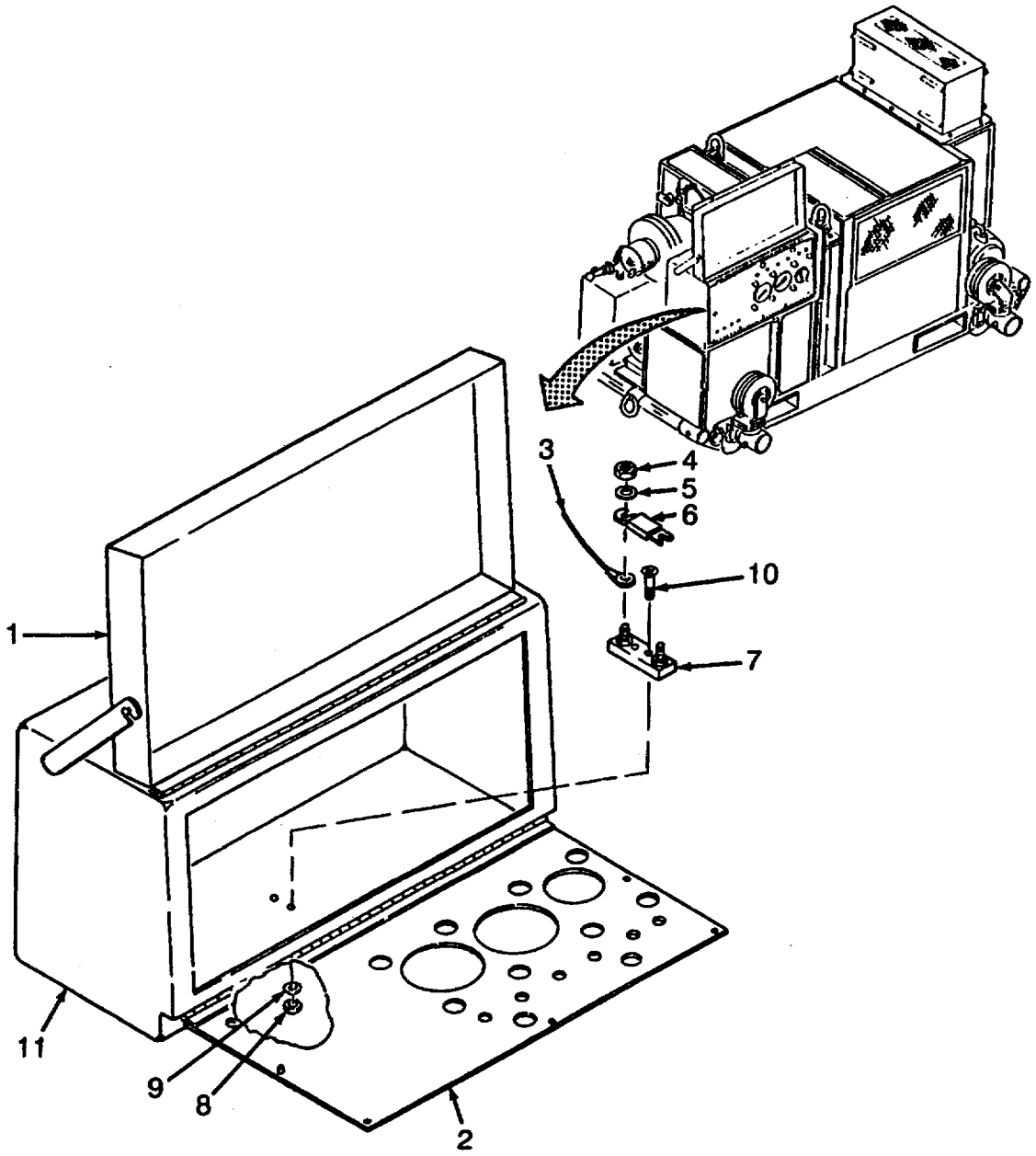


Figure 2-103. Fuse Link and Holder Replacement

2-77. TERMINAL BOARD REPLACEMENT (TYPICAL).

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
200/600 GPM Pump shut down (Para 2-7c, TM 10-4320-320-10)

Materials/Parts
Tags (App E, Item 16)
Locknuts (App F, Item 63)

a. REMOVAL. Refer to Figure 2-104.

(1) Open cover (1) and lock in place.

(2) Open control panel (2).

(3) Tag electrical wiring (3).

(4) Remove screws (4) and electrical wiring (3) from terminal board (5).

NOTE

Note location of buss connectors prior to removal.

(5) Remove screw (4) and buss connector (6) from terminal board (5).

(6) Remove locknuts (7), flatwashers (8), screws (9) and terminal board (5) from control box (10).

b. INSTALLATION.

(1) Position terminal board (5) in bottom of control box (10) and install screws (9), flatwashers (8) and locknuts (7).

NOTE

Wire numbers are stamped on each electrical wire. This information, in conjunction with data on FO-1 and FO-2, 200/600 GPM Pump Wiring Diagram, may be used to connect wires if tags are lost or illegible.

(2) Connect electrical wiring (3) on terminal board (5) and secure with screws (4).

(3) Install buss connector (6) with screw (4) on terminal board (5).

(4) Close control panel (2).

2-77. TERMINAL BOARD REPLACEMENT (TYPICAL) - continued.

(5) Unlock and close cover (1).

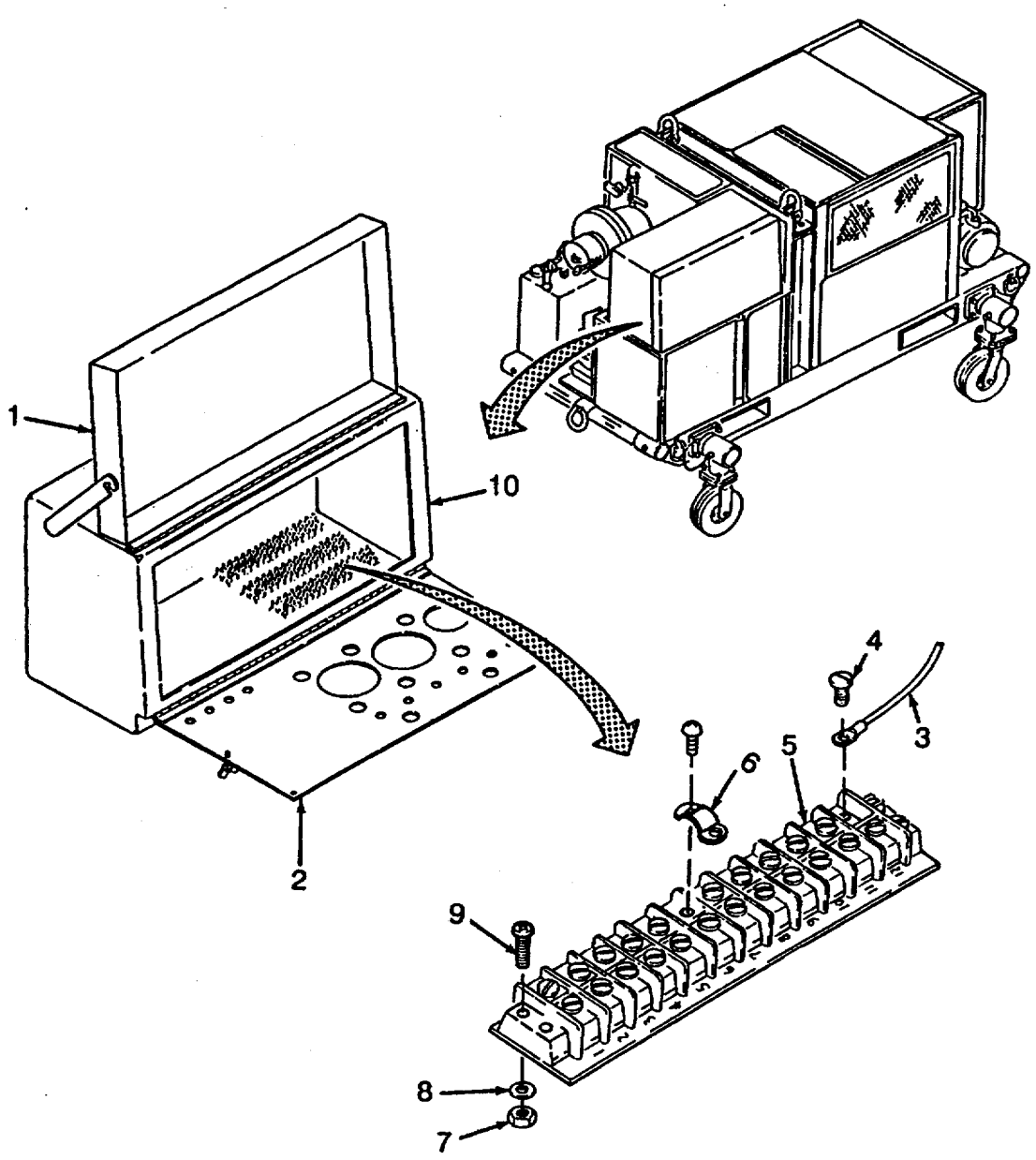


Figure 2-104. Terminal Board Replacement (Typical)

2-78. INCANDESCENT LIGHT (BULB) (ENGINE, ENGINE OIL TEMP AND CLUTCH DISENGAGED) REPLACEMENT (TYPICAL).

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
200/600 GPM Pump shutdown (Para 2-7c, TM 10-4320-342-10)

NOTE

This procedure covers the replacement of incandescent light (bulb) for the ENGINE INDICATOR. Replacement of incandescent light (bulb) for ENGINE OIL TEMP (Oil Temperature) and CLUTCH DISENGAGED are identical.

a. REMOVAL. Refer to Figure 2-105.

(1) Open and lock control panel door (1) in place with door latch (2).

(2) Remove lens cap (3) from indicator light assembly (4) on control panel (5).

(3) Remove incandescent light (bulb) (6) from indicator light assembly (4) on control panel (5).

b. INSTALLATION.

(1) Install incandescent light (bulb) (6) in indicator light assembly (4) on control panel (5).

(2) Install lens cap (3) on indicator light assembly (4) on control panel (5).

(3) Unlatch door latch (2) and close control panel (1).

2-78. INCANDESCENT LIGHT (BULB) (ENGINE, ENGINE OIL TEMP AND CLUTCH DISENGAGED) REPLACEMENT (TYPICAL) - continued.

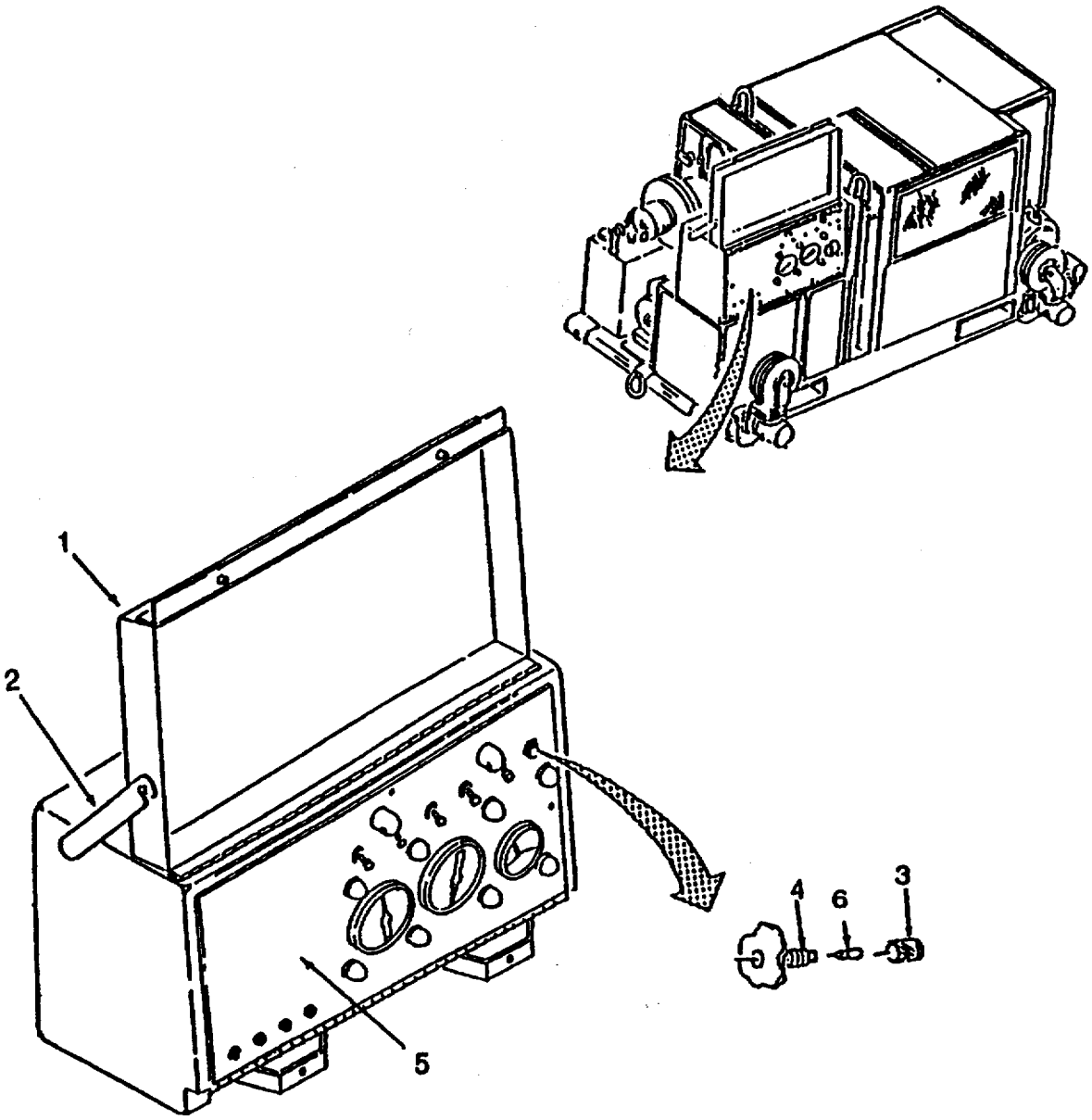


Figure 2-105. Incandescent Light (Bulb) (ENGINE, ENGINE OIL TEMP AND CLUTCH DISENGAGED) Replacement (Typical)

2-79. RELAYS (K1, K4, K5, K7 and K11) REPLACEMENT (TYPICAL).

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Tools
200/600 GPM Pump shutdown (Para 2-7c, TM 10-4320-342-10)

NOTE

This procedure covers the replacement of relay K1. Replacement of K4, KS, K7 and K11 relays are identical to K4 relay.

a. REMOVAL. Refer to Figure 2-106.

(1) Open and lock control panel door (1) in place with door latch (2).

(2) Open control panel (3).

(3) Remove nut (4) and washer (5) from stud (6).

(4) Remove relay (7) from plug (8).

b. INSTALLATION.

(1) Install relay (7) in plug (8).

(2) Install washer (5) and nut (4) on stud (6).

(3) Close control panel (3).

(4) Unlatch door latch (2) and close control panel (1).

2-79. RELAYS (K1, K4, KS, K7 and K11) REPLACEMENT (TYPICAL) - continued.

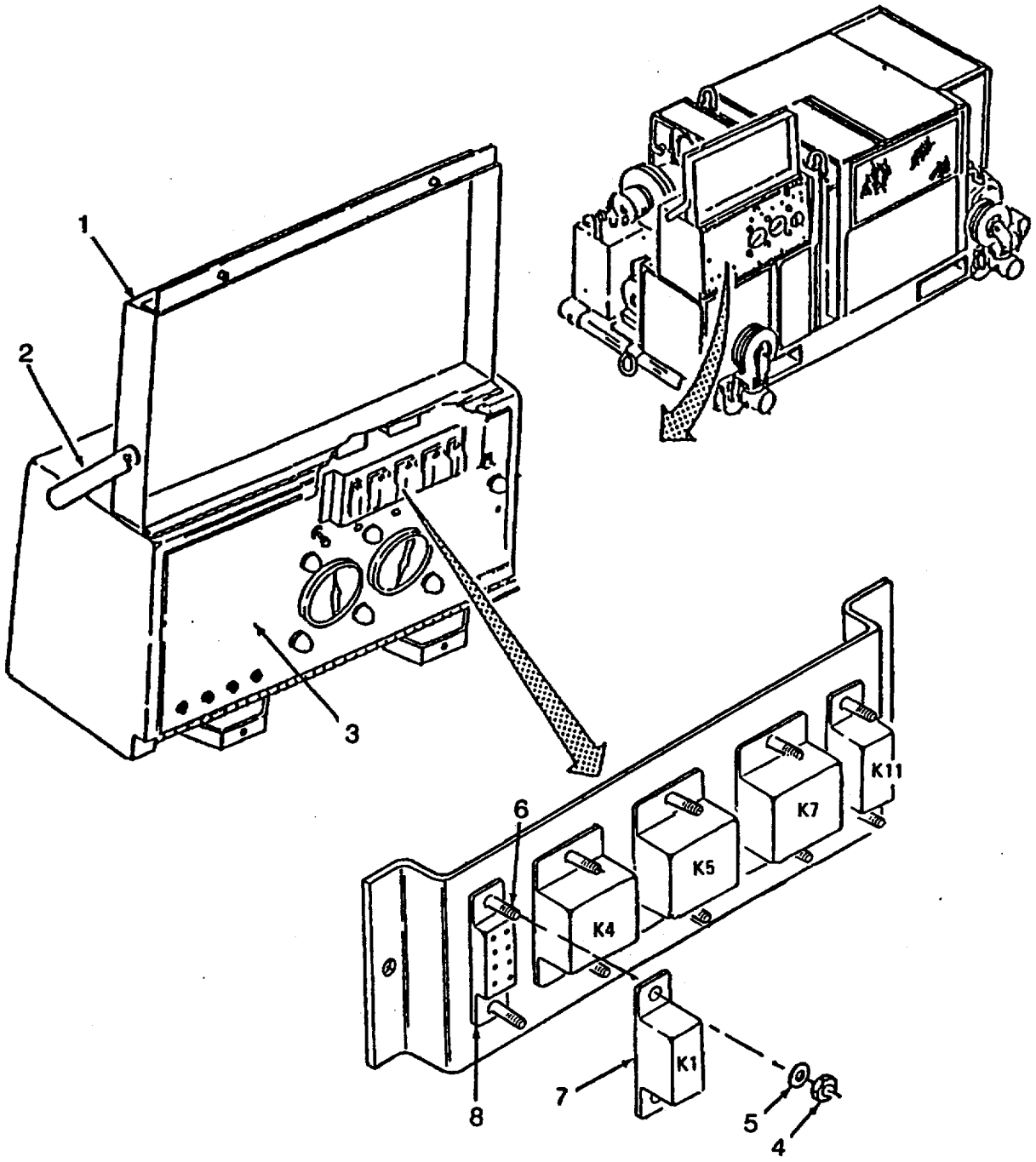


Figure 2-106. Relays (K1, K4, K5, K7 and K11) Replacement (Typical)

2-80. CONTROL BOX (ENCLOSURE) REPAIR.

This task covers: a. Removal b. Disassemble c. Repair
d. Assemble e. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
Components removed (Paras 2-67 thru 2-89)
200/600 GPM Pump Assembly removed from system (Para 2-9, TM 10-4320-342-10)

Material/Parts
Adhesive (App E, Item 3)
Foam (App E, Item 26)
Grommet (App E, Item 28)
Nut, Self-locking (App F, Item 62)
Nut, Self-locking (App F, Item 63)

a. REMOVAL. Refer to Figure 2-107.

(1) Open enclosure box cover (1) and control panel (2).

(2) Remove screws (3), flatwashers (4) and control box (5).

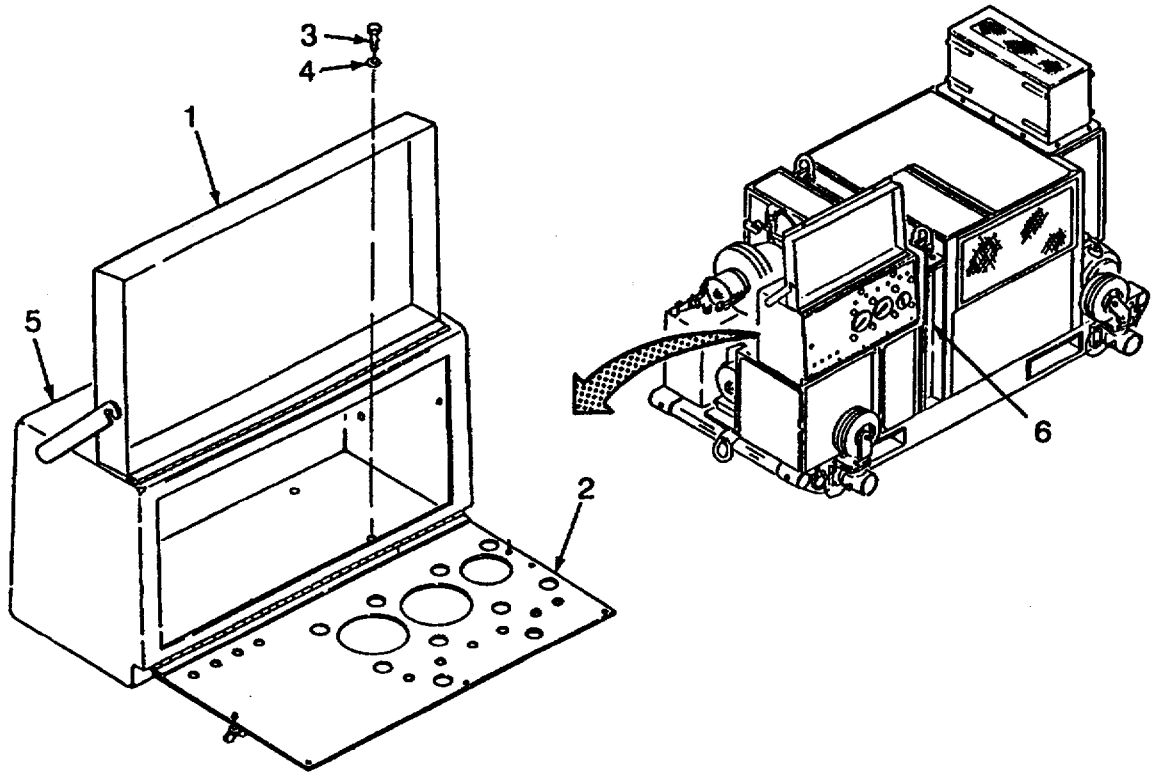


Figure 2-107. Control Box (Enclosure) Removal

2-80. CONTROL BOX (ENCLOSURE) REPAIR - continued.

b. DISASSEMBLE. Refer to Figure 2-108.

(1) Remove screw (1), locknut (2), flatwashers (3) and lanyard (4) from control box (5).

(2) Remove screw (6), nut (7), flatwasher (8) and lanyard (4) from control panel (9).

(3) Remove split washer (10), turn lock stud (11) and sealing washer (12) from control panel (9).

(4) Remove screw (13), nut (14), flatwasher (15) and control panel (9) from control box (5).

(5) Remove locknut (16), flatwasher (17), screw (18), flatwasher (19), spacer (20) and door latch (21) from control box (5).

(6) Remove split washer (22), turnlock stud (23) and sealing washers (24) from control box cover (25).

(7) Remove foams (26, 27, 28 and 29) from control box cover (25).

(8) Remove foams (30, 31, 32, 33, 34 and 35) and grommet (36) from control box (5).

c. REPAIR.

Repair is replacement of damaged components. Refer to Appendix D for manufacture of foam replacement and grommet.

d. ASSEMBLE.

(1) Using adhesive, install grommet (36) and foams (26, 27, 28, 29, 30, 31, 32, 33, 34 and 35) on control box (5).

(2) Install turnlock stud (23), sealing washers (24) and split washer (22) on enclosure box cover (25).

(3) Install screw (18), flatwasher (19), spacer (20), door latch (21), flatwasher (17), locknut (16) on enclosure box (5).

(4) Install screw (13), flatwasher (15), nut (14) and control panel (9) on enclosure box (5).

(5) Install turnlock stud (11), sealing washer (12) and split washer (10) on control panel (9).

(6) Install screw (6), lanyard (4), flatwasher (8) and locknut (7) on control panel (9).

(7) Install screw (1), flatwashers (3), locknut (2), lanyard (4) and locknut (2) on control box (5).

2-80. CONTROL BOX (ENCLOSURE) REPAIR -continued.

e. INSTALLATION. Refer to Figure 2-107.

(1) Position control box (5) on 200/600 GPM Pump (8) and secure with screws (3) and flatwashers (4).

(2) Close control panel (2) and control box cover (1).

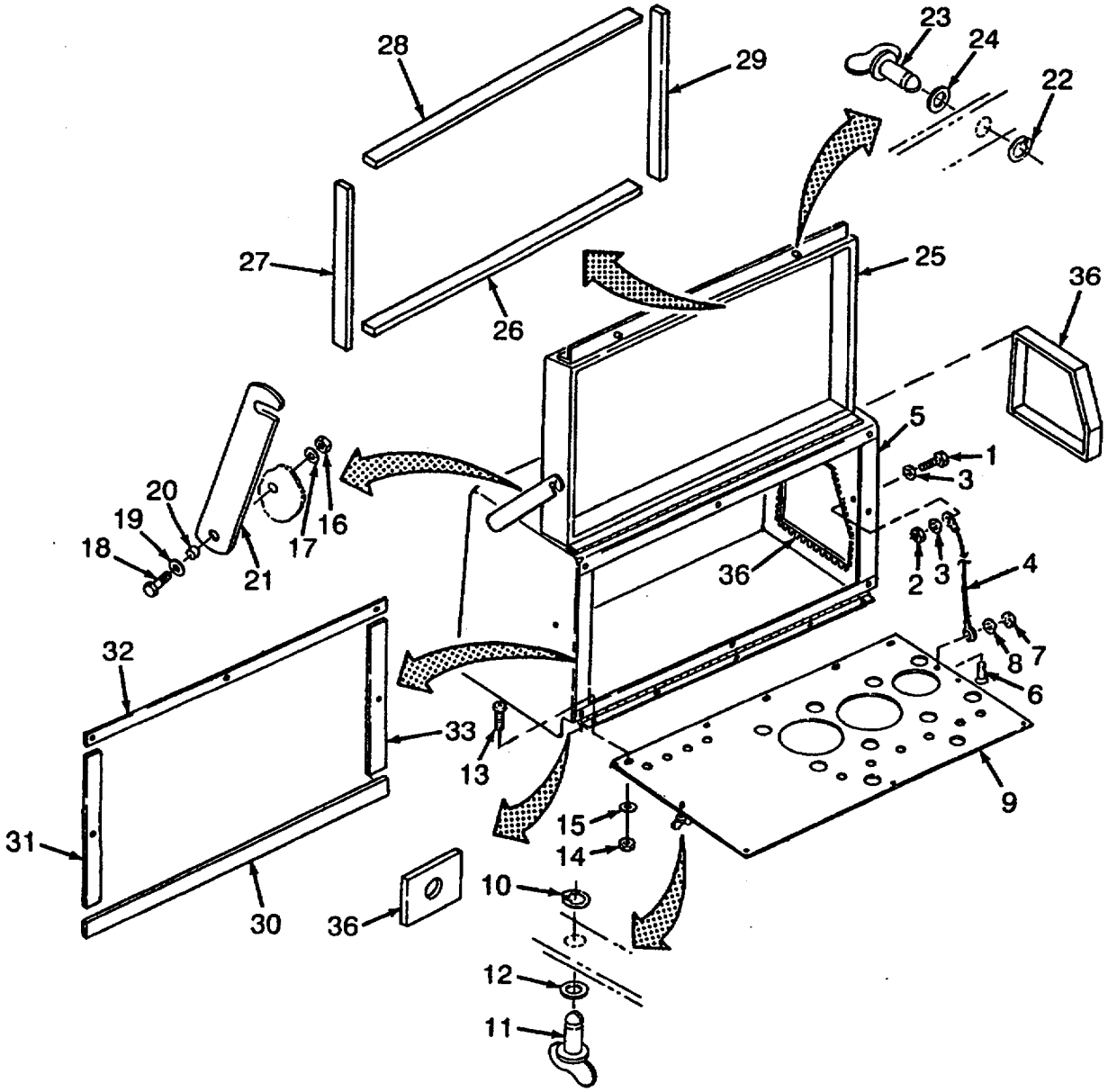


Figure 2-108. Control Box (Enclosure) Repair

2-81. WINCH CONTROL BOX ASSEMBLY REPAIR.

This task covers: a. Removal b. Disassemble c. Repair
d. Assemble e. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
Battery Electrical Connector removed (Para 2-62)

Material/Parts
Lockwashers (App F, Item 27)
Tag (App E, Item 16)

a. REMOVAL. Refer to Figure 2-109.

(1) Open door panel (1).

(2) Disconnect connectors (2 and 3) from receptacles (4 and 5)

(3) Remove nuts (6), lockwashers (7), flatwashers (8), bolts (9) and box assembly (10) including attached cables (11 and 12) and control station (13).

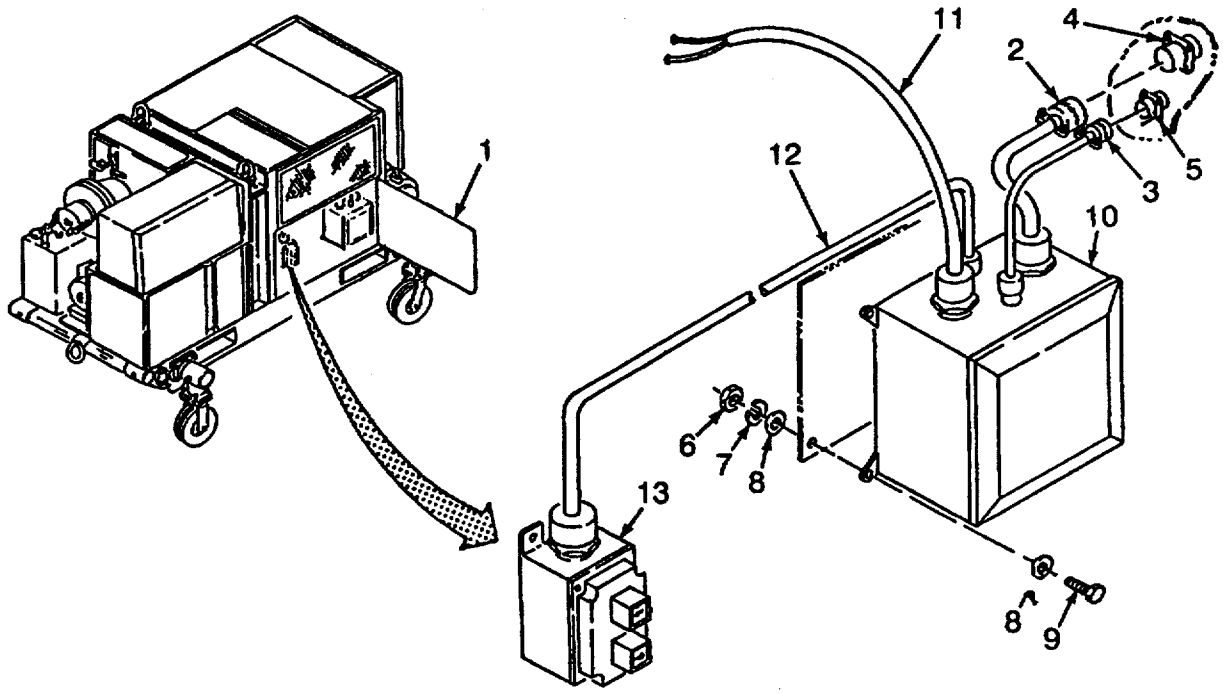


Figure 2-109. Winch Box Assembly Removal

2-81. WINCH CONTROL BOX ASSEMBLY REPAIR - continued.

b. DISASSEMBLE. Refer to Figure 2-110.

(1) Remove screws (1), flatwashers (2) and cover (3) from box (4).

(2) Tag electrical leads (5 and 6).

(3) Remove screw (7), lockwasher (8) and electrical lead (5) from box (4).

(4) Remove screws (9) and electrical leads (6) from switches (10).

(5) Unscrew seal nut (11) and remove cable (12) from box (4).

(6) Remove seal (13), seal ring (14) and seal nut (11) from cable (12).

(7) Remove adapter (15) from box (4).

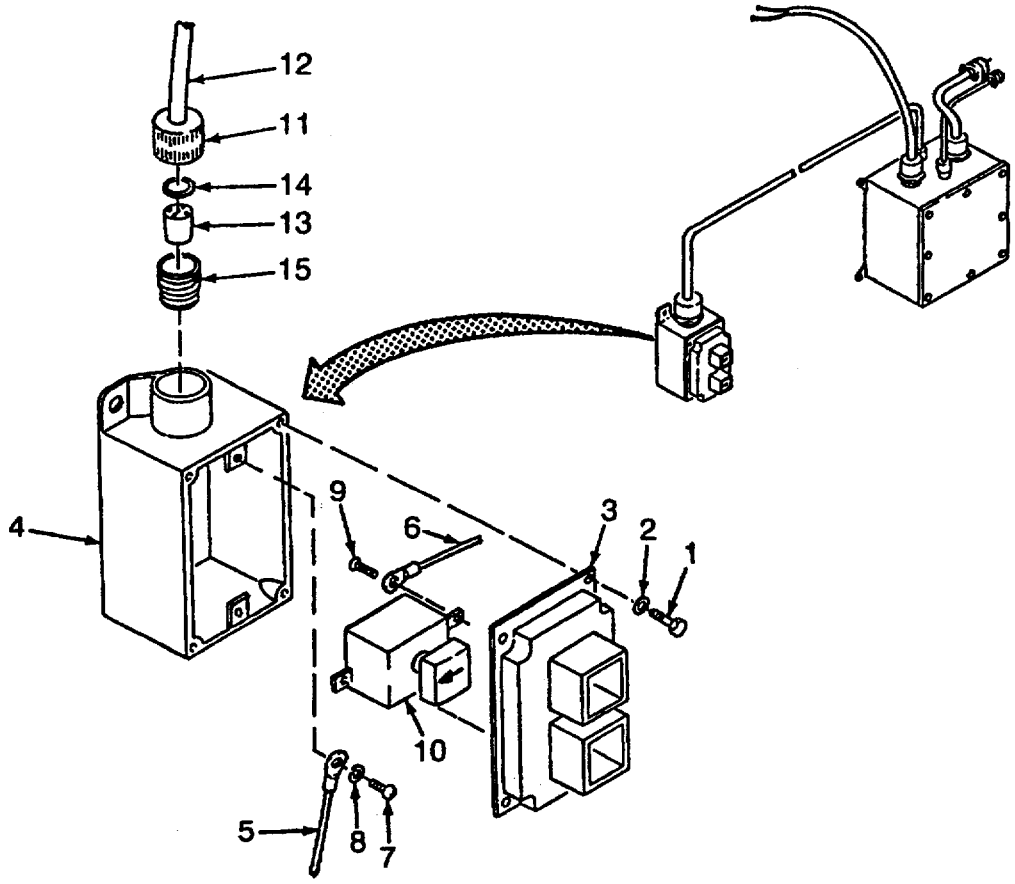


Figure 2-110. Winch Control Station

2-81. WINCH CONTROL BOX ASSEMBLY REPAIR - continued.

Refer to Figure 2-111.

(8) Remove screws (1) and cover (2) from junction box (3).

(9) Tag all electrical leads (4 and 5 typical).

NOTE

Note location and position of electrical and buss connectors prior to removal.

(10) Remove nuts (6), lockwashers (7), electrical leads (4) and connectors (9, 10, 11, 12 and 13) from solenoid valves (8).

(11) Remove screws (14), flatwashers (15) and solenoid valves (8) from junction box (3).

(12) Remove screws (16) and electrical leads (5) from terminal board (17).

(13) Remove screws (18) and terminal board (17) from junction box (3).

(14) Unscrew seal nut (19) and remove cables (20) from junction box (3).

(15) Remove seal (21), seal ring (22) and seal nut (19) from cable.

(16) Remove adapter (23) from junction box (3).

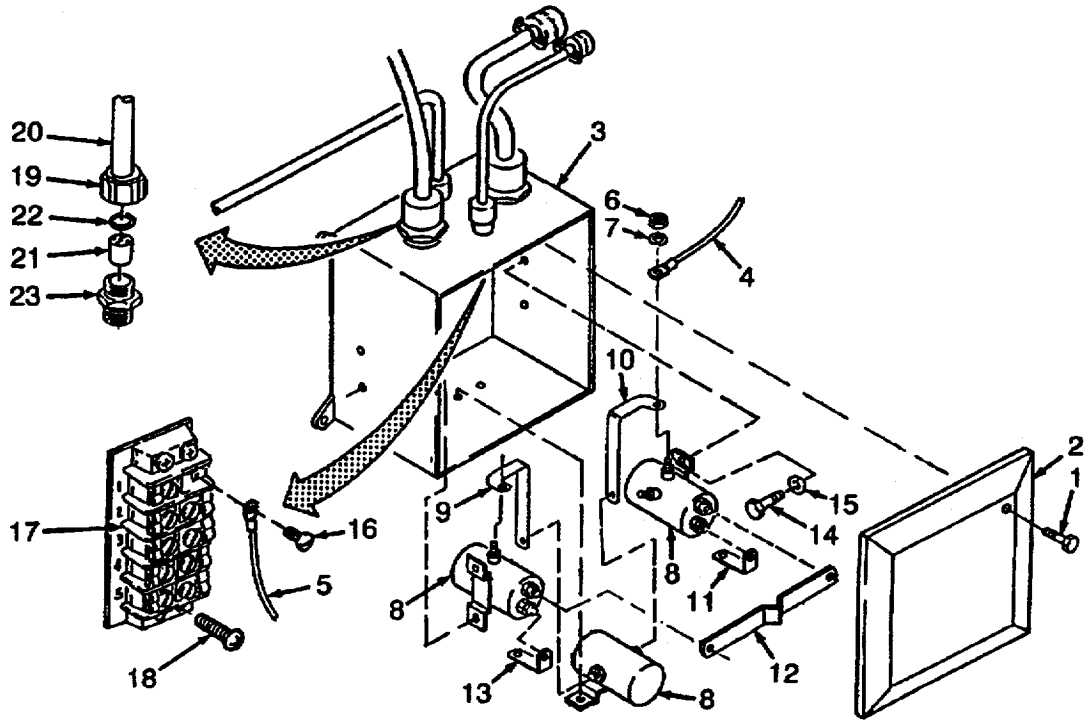


Figure 2-111. Winch Junction Box

2-81. WINCH CONTROL BOX ASSEMBLY REPAIR continued.

c. REPAIR.

Repair is limited to the replacement of damaged components.

d. ASSEMBLE. Refer to Figure 2-111.

(1) Install adapter (23) in junction box (3).

(2) Slide seal nut (19), seal ring (22) and seal (21) and cable (20).

(3) Install cable (20) in adapter (23).

(4) Install terminal board (17) and secure with screws (18) in junction box (3).

(5) Position solenoid valves (8) in junction box (3) and secure with screws (14) and flatwashers (15).

NOTE

Wire numbers are stamped on each electrical wire. This information, in conjunction with data on FO-1 and FO-2, 200/600 GPM Pump Wiring Diagram, may be used to connect wires if tags are lost or illegible.

(6) Install connectors (9, 10, 11, 12 and 13), electrical leads (4 and 5), lockwashers (7) and nuts (6) on solenoid valves (8) as tagged.

(7) Slide seal nut (19), seal ring (22) and seal (21) down cable (20).

(8) Position seal (21) in adapter (23) and tighten seal nut (19).

(9) Install cover (2) and screws (1) on junction box (3).

Refer to Figure 2-110.

(10) Install adapter (15) in box (4).

(11) Slide seal nut (11), seal ring (14) and seal (13) on cable (12).

(12) Install cable (12) in adapter (15) on box (4).

(13) Install electrical leads (6) on switches (10).

(14) Install electrical lead (5), screw (7) and lockwasher (8) on box (4).

(15) Install seal (13) in adapter (15) and tighten seal nut (11) on adapter.

(16) Install cover (3), flatwashers (2) and screws (1) on box (4).

2-81. WINCH CONTROL BOX ASSEMBLY REPAIR continued.

e. INSTALLATION. Refer to Figure 2-109.

(1) Position box assembly (10), with attached cables (11 and 12) and control station (13), and secure with nuts (6), lockwashers (7), flatwashers (8) and bolts (9).

(2) Connect connectors (2 and 3) onto receptacles (4 and 5) and close panel door (1).

2-82. ELECTRICAL CABLE REPAIR (TYPICAL).

This task covers: Repair

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Shop Electric Repair (App B, Sect III, Item 3)

Equipment Condition
Electrical Cables removed

Reference
Electric Power Generation in the Field (FM 20-31)

REPAIR.

Refer to FM 20-31 for repair of cables (1).

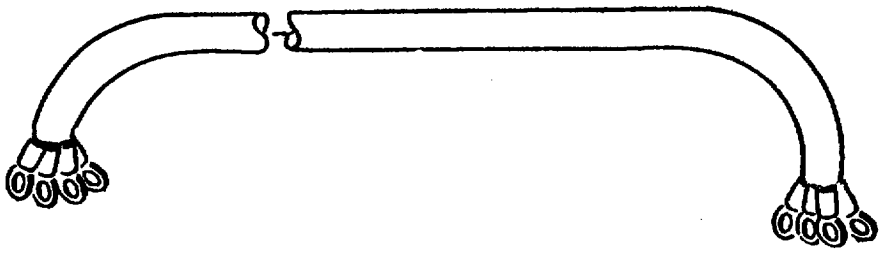


Figure 2-112. Electrical Cable Repair (Typical)

2-83. POWER RESISTORS REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
Battery disconnected (Para 2-62)

Materials/Parts
Self-locking Nut (App F, Item 62)
Tags (App E, Item 16)

NOTE

This procedure covers one of the power resistors. Replacement of the other two is similar.

a. REMOVAL. Refer to Figure 2-113.

(1) Remove panel (1) and open door (2).

(2) Tag electrical wiring (3).

(3) Remove nuts (4), lockwashers (5), flatwashers (6) and electrical wiring (3) from resistor (7).

(4) Remove self-locking nuts (8), screws (9), flatwashers (10) and resistor (7).

b. INSTALLATION.

(1) Position resistor (7) on unit and secure with flatwashers (10), screws (9) and self-locking nuts (8).

NOTE

Wire numbers are stamped on each electrical wire. This information, in conjunction with data on FO-1 and FO-2, 200/600 GPM Pump Wiring Diagram, may be used to connect wires if tags are lost or illegible.

(2) Position electrical wiring (3) on resistor (7) as tagged. Secure electrical wiring (3) with flatwasher (6), lockwasher (5) and nut (4).

(3) Close door (2) and install panel (1).

2-83. POWER RESISTORS REPLACEMENT - continued.

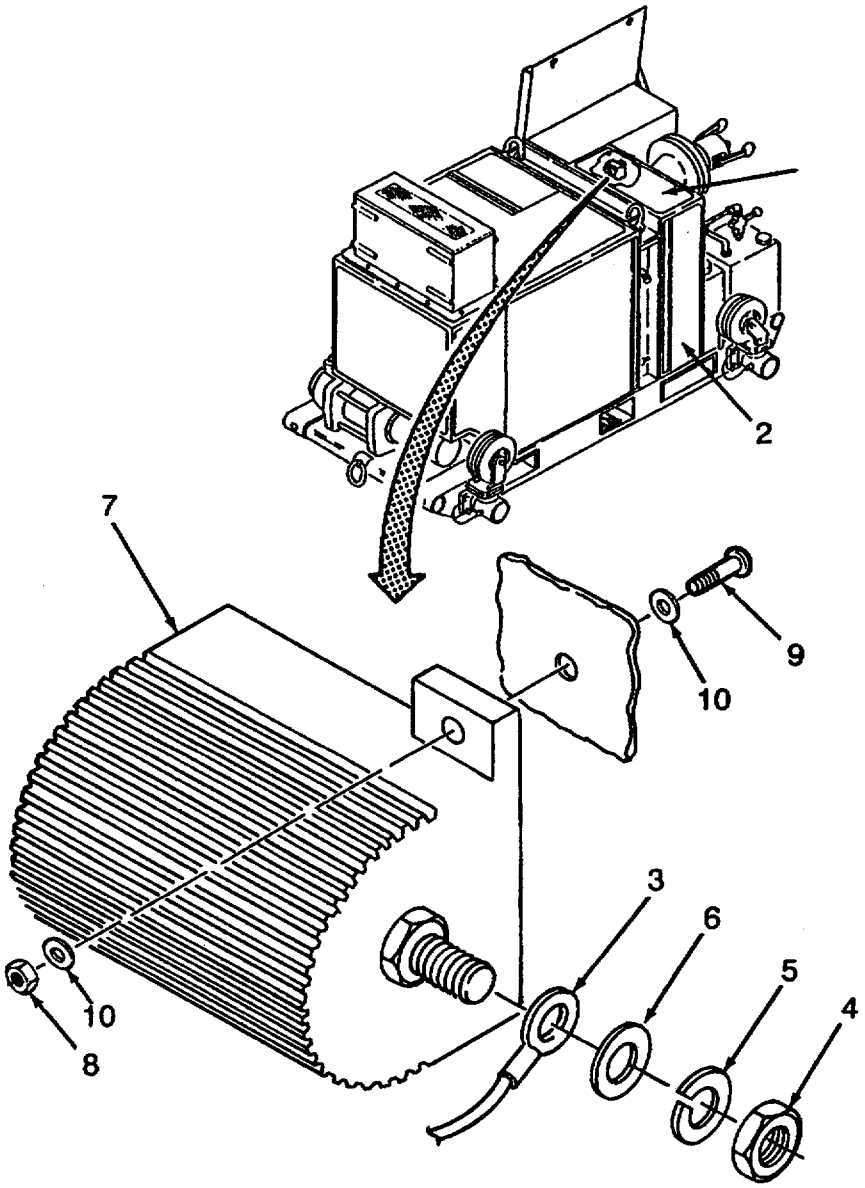


Figure 2-113. Power Resistor Replacement

2-84. TERMINAL BOARD (TB-S) REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
Battery disconnected (Para 2-62)

Materials/Parts
Tags (App E, Item 16)
Self-locking Nut (App F, Item 62)

a. REMOVAL. Refer to Figure 2-114.

(1) Remove panel (1) from 200/600 GPM pump (2).

(2) Tag electrical wiring (3).

NOTE

Note location of buss connectors prior to removal.

(3) Remove screws (4), flatwashers (5) and electrical wiring (3) from terminal board (6).

(4) Remove self-locking nuts (7), flatwashers (8), screws (9) and terminal board (6).

b. INSTALLATION.

(1) Position terminal board (6) on 200/600 GPM pump and secure with self-locking nuts (7), flatwashers (8) and screws (9).

NOTE

Wire numbers are stamped on each electrical wire. This information, in conjunction with data on FO-1 and FO-2, 200/600 GPM Pump Wiring Diagram, may be used to connect wires if tags are lost or illegible.

(2) Position electrical wiring (3) on terminal board (6) as tagged during removal. Secure electrical wiring (3) with screws (4) and flatwashers (5).

(3) Install panel (1) on 200/600 GPM Pump (2).

2-84. TERMINAL BOARD (TB-5) REPLACEMENT-continued.

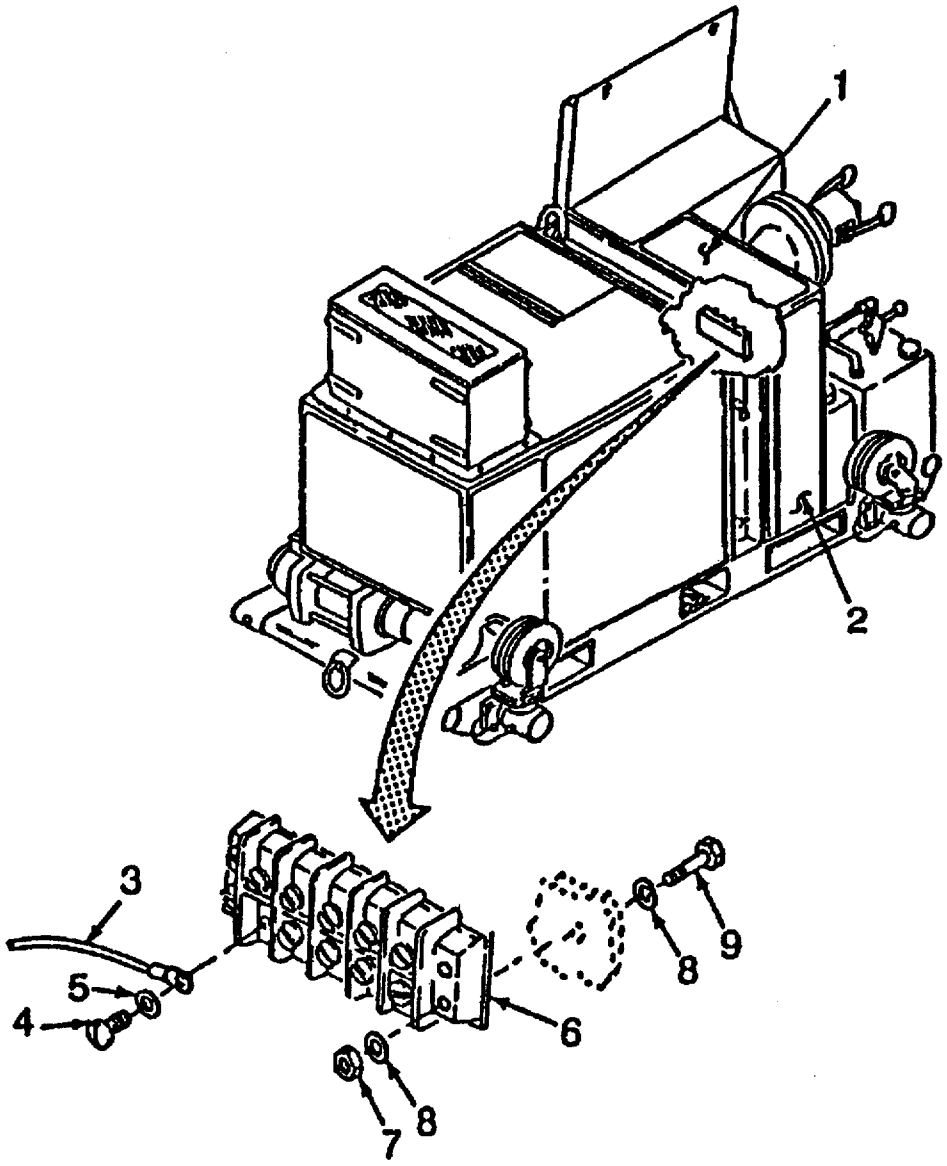


Figure 2-114. Terminal Board (TB-5) Replacement

2-85. EXHAUST DUCT AND MUFFLER REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Torque Wrench: 0-200 inch-pounds (App B, Sect II, Item 2)

Materials/Parts
Safety Wire (App E, Item 9)

Equipment Condition
200/600 GPM Pump shut down (Para 2-7c, TM 10-4320-342-10)
Muffler Extension removed (Para 2-12)

a. REMOVAL. Refer to Figure 2-115.

(1) Open door panel (1) on 200/600 GPM pump (2).

(2) Remove screws (3) and plate (4) from bulkhead panel (5).

(3) Remove safety wire and loosen coupling clamp (6) on engine (7).

(4) Remove exhaust duct (8) from bulkhead panel (5) and engine (6).

(5) Loosen clamp (9) and remove flexible duct (10) from bracket (11).

(6) Remove bolts (12), flatwashers (13) and bracket (11) from bulkhead panel (5).

(7) Lift muffler (14) from 200/600 GPM pump (2).

(8) Remove bolts (15), flatwashers (16), angle bracket (17), bulkhead panel (5) and muffler mount (18) from 200/600 GPM pump (2).

b. INSTALLATION.

(1) Install bulkhead panel (5), muffler mount (18), bolts (15), flatwashers (16) and angle bracket (17) on 200/600GPM pump (2).

(2) Install muffler (14) in 200/600 GPM pump (2).

(3) Install bracket (11), bolts (12) and flatwashers (13) on bulkhead panel (5).

(4) Connect flexible duct (10) to bracket (11) and tighten clamp (9).

(5) Position exhaust duct (8) in bulkhead panel (5) and install plate (4) and screws (3).

(6) Install exhaust duct (8) onto engine (7).

2-85. EXHAUST DUCT AND MUFFLER REPLACEMENT - continued.

(7) Position coupling clamp (6) on exhaust duct (8) and engine (7).

(8) Tighten nut on coupling clamp (6). Torque to 33 to 37 inch-pounds.

(9) Tap coupling clamp (6) outer diameter with a rubber mallet. Torque coupling clamp (6) to 47 to 53 inch-pounds.

(10) Safety wire coupling clamp (6).

(11) Close door panel (1).

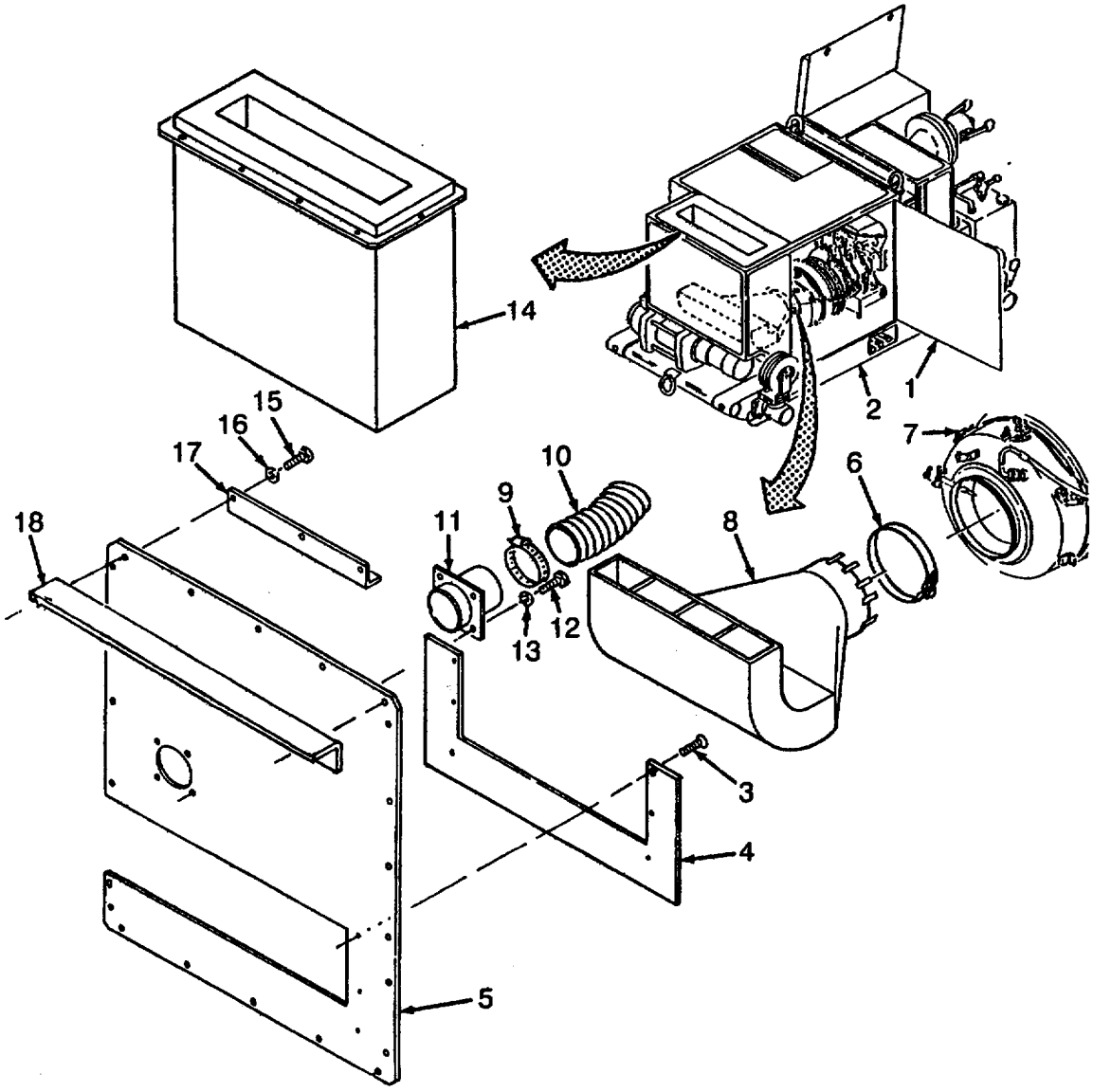


Figure 2-115. Exhaust Duct and Muffler Replacement

2-86. WHEEL, DETENT PIN, GEAR MOUNT AND PIVOT REPLACEMENT.

This Task Covers	a. Removal	b. Service	c. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Materials/Parts
Lockwashers (App F, Item 41)

Equipment Condition
Wheel Assembly in the Up position (Para 2-6, TM 10-4320-342-10)
Drain Tank removed (Para 2-15)

NOTE

- **The following procedure is typical for the swivel and rigid wheel assemblies.**
- **This procedure covers three of the four gear mounts. The gear mount located under the battery compartment is similar but is attached with rivnuts.**
- **When removing the gear mount located next to the drain tank, removal of the drain tank is required.**

a. REMOVAL. Refer to Figure 2-116.

(1) Remove wheel assembly (1) by removing nuts (2), lockwashers (3), flatwashers (4) and screws (5).

(2) Pull detent pin (6) and slide pivot (7) off gear mount (8).

(3) Remove detent pin (6) and gear mount (8) by removing nuts (9), lockwashers (10), flatwashers (11) and screws (12).

b. SERVICE.

Refer to LO 10-4320-342-10 for servicing of wheel assembly.

c. INSTALLATION.

(1) Install detent pin (6) and gear mount (8) onto frame with screws (12), flatwashers (11), lockwashers (10) and nuts (9).

(2) Slide pivot (7) on gear mount (8), align holes and insert detent pin (6).

(3) Secure wheel assembly (1) on pivot (6) with screws (5), flatwashers (4), lockwashers (3) and nuts (2).

2-86. WHEEL, DETENT PIN, GEAR MOUNT AND PIVOT REPLACEMENT - continued.

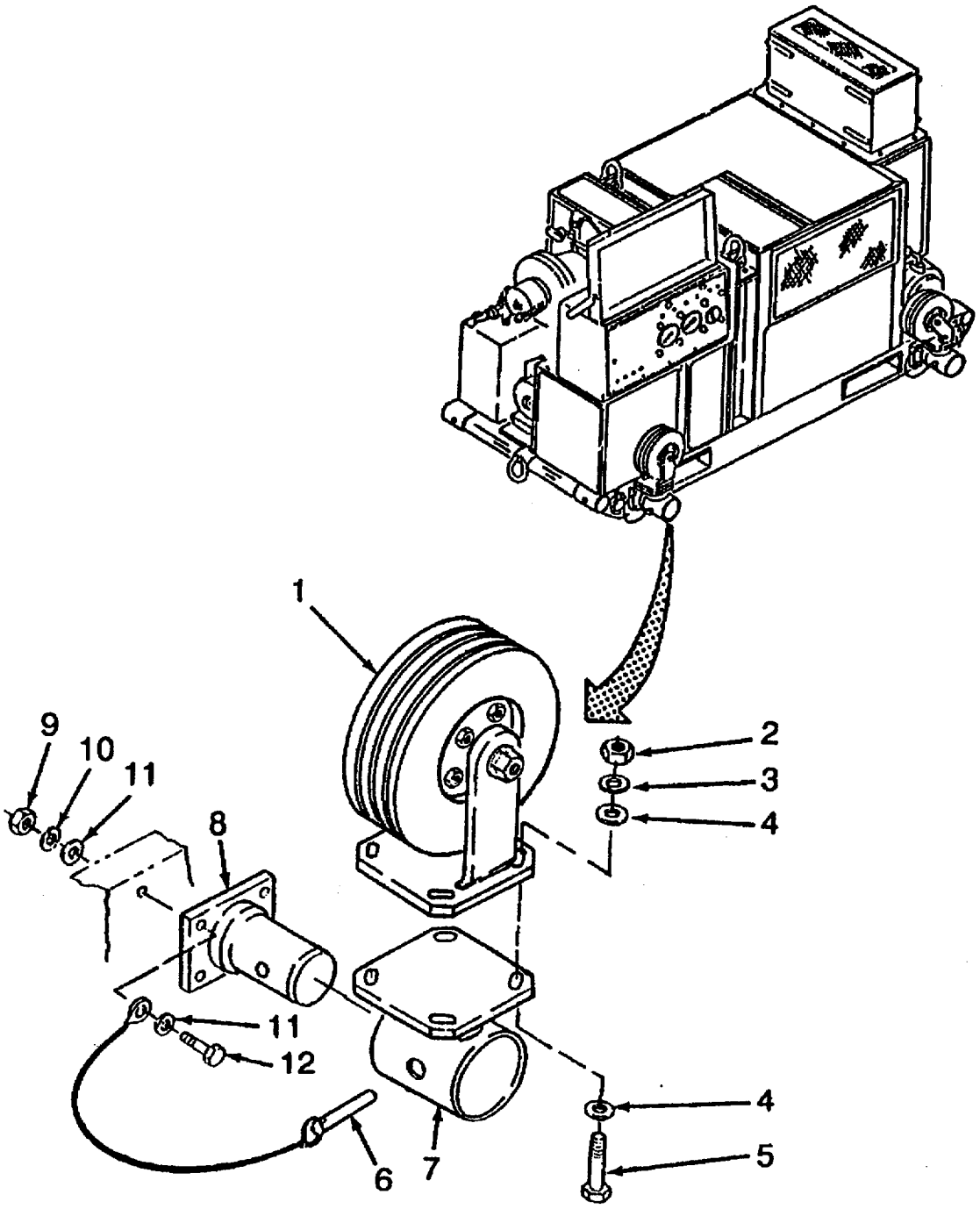


Figure 2-116. Wheel, Detent Pin, Gear Mount and Pivot Replacement

2-87. SHACKLES AND RING BOLT REPLACEMENT.

This Task Covers	a. Removal	b. Service	c. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B,
Sect III, Item 1)

a. REMOVAL. Refer to Figure 2-117.

(1) Unscrew shackle pin (1) from shackle (2) and remove shackle.

(2) Unscrew ring bolt (3).

b. INSTALLATION.

(1) Install ringbolt (3).

(2) Position shackle (2) on unit and install pin (1).

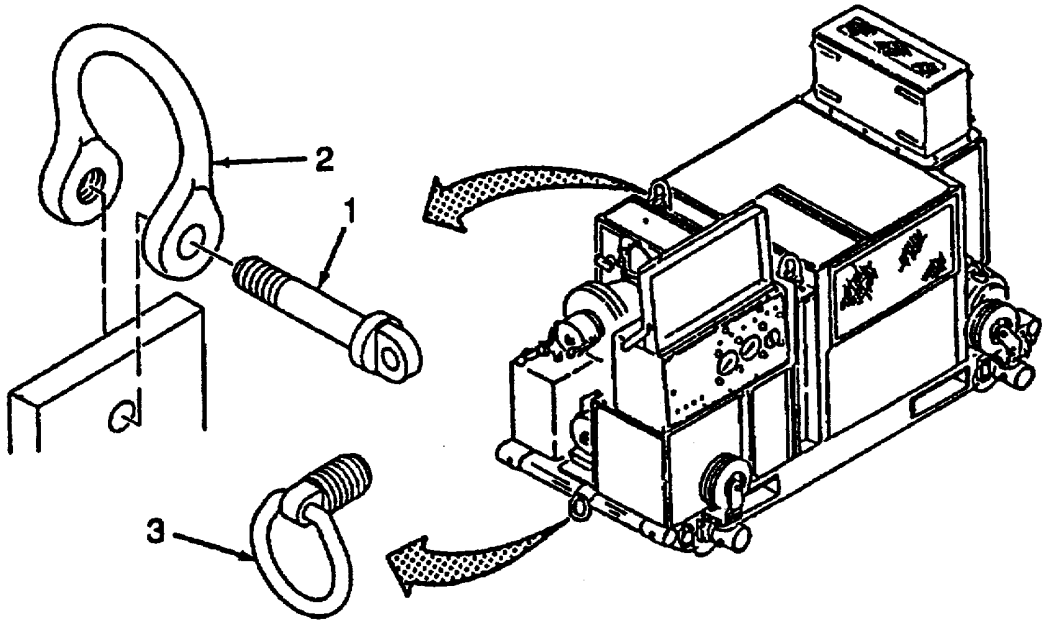


Figure 2-117. Shackle and Ring Bolt Replacement

2-88. RECEPTACLE CONNECTOR (SLAVE) REPLACEMENT]

This Task Covers a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
Battery disconnected (Para 2-61)

Materials/Parts
Tags (App E, Item 16)
Self-locking Nut (App F, Item 63)

a. REMOVAL. Refer to Figure 2-118.

(1) Open doors (1 and 2).

(2) Tag electrical wiring (3).

(3) Remove bolts (4), lockwashers (5) and wiring (3) from receptacle connector (6).

(4) Remove self-locking nuts (7), flatwashers (8), bolts (9), packing plate (10), gasket (11) and receptacle connector (6) from frame (12).

b. INSTALLATION,

(1) Install gasket (11) on receptacle connector (6) and position receptacle connector (6) in frame (12).

(2) Align terminal ring (13), receptacle connector (6), gasket (11) and backing plate (10) on frame (12) and install bolts (9).

(3) Install flatwashers (8) and self-locking nuts (7) on bolts (9).

NOTE

Wire numbers are stamped on each electrical wire. This information, in conjunction with data on FO-1 and FO-2, 200/600 GPM Pump Wiring Diagram, may be used to connect wires if tags are lost or illegible.

(4) Position electrical wiring (3) as tagged during removing and install lockwashers (5) and bolts (4).

(5) Close doors (1 and 2

2-88. RECEPTACLE CONNECTOR (SLAVE) REPLACEMENT - continued.

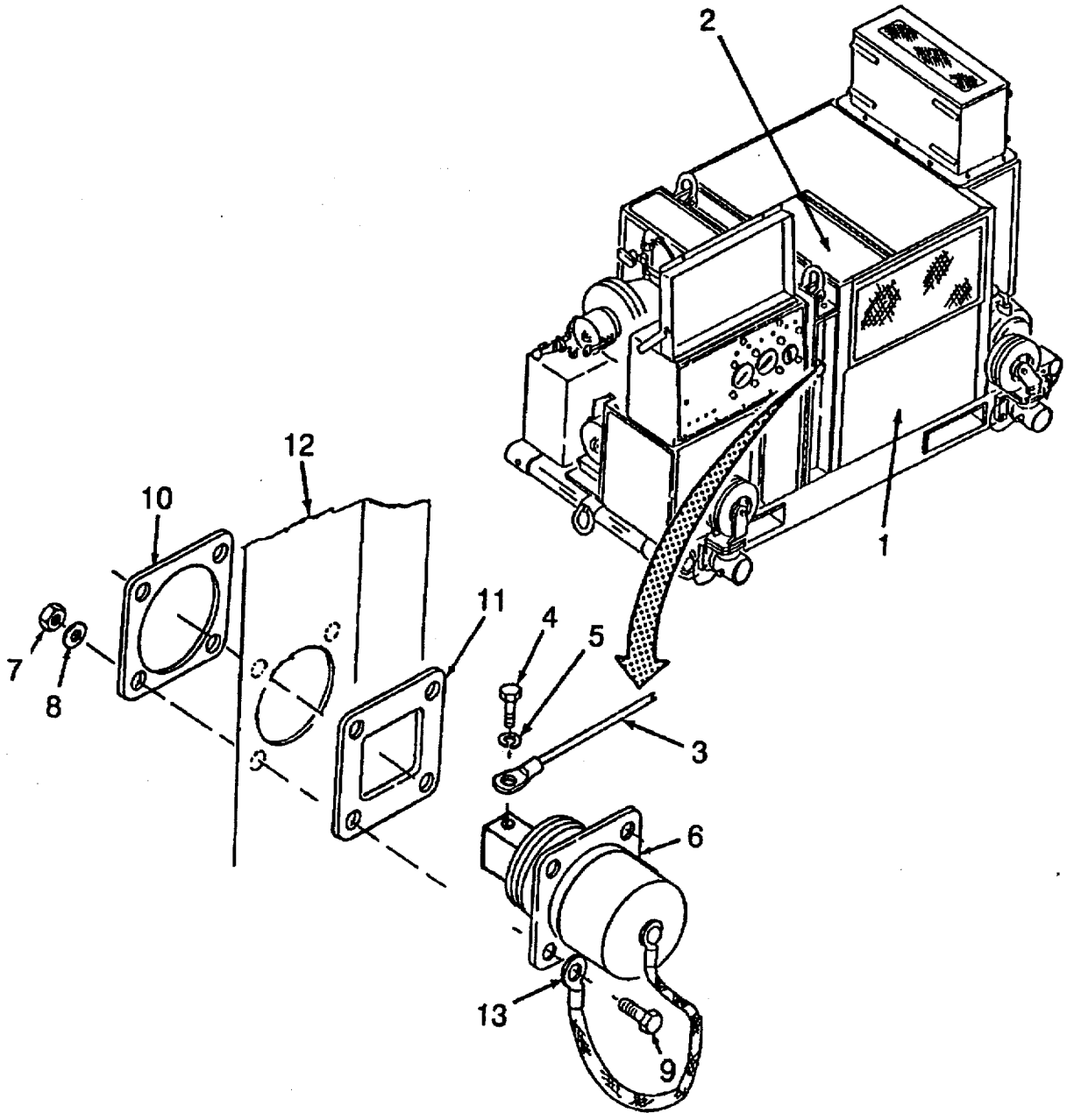


Figure 2-118. Receptacle Connector (Slave) Replacement

2-89. STUD TERMINAL (GROUND) REPLACEMENT.

This Task Covers	a. Removal	b. Service	c. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
Ground Wire disconnected (System TM)
200/600 GPM Pump shut down (Para 2-7c, TM 10-4320-342-10)

Materials/Parts
Lockwasher (App F, Item 64)
Self-locking Nut (App F, Item 106)

a. REMOVAL. Refer to Figure 2-119.

(1) Open door (1).

(2) Remove self-locking nut (2), lockwasher (3), wiring (4) and lockwasher (5) from ground terminal (6).

(3) Remove ground terminal (6) from 200/600 GPM (7).

b. INSTALLATION.

WARNING

Improper grounding (bonding) connections between wiring, frame and ground terminal can generate a static discharge (spark). Make sure connections provide a metal-to-metal contact between wiring, frame and ground terminal. A static discharge could ignite fuel or cause an explosion of fuel vapor and cause personnel injury or death.

(1) Install ground terminal (6) on 200/600 GPM pump (7).

(2) Install lockwasher (5), wiring (4), lockwasher (3) and self-locking nut (2) on ground terminal (6).

(3) Close door (1).

2-89. STUD TERMINAL (GROUND) REPLACEMENT - continued.

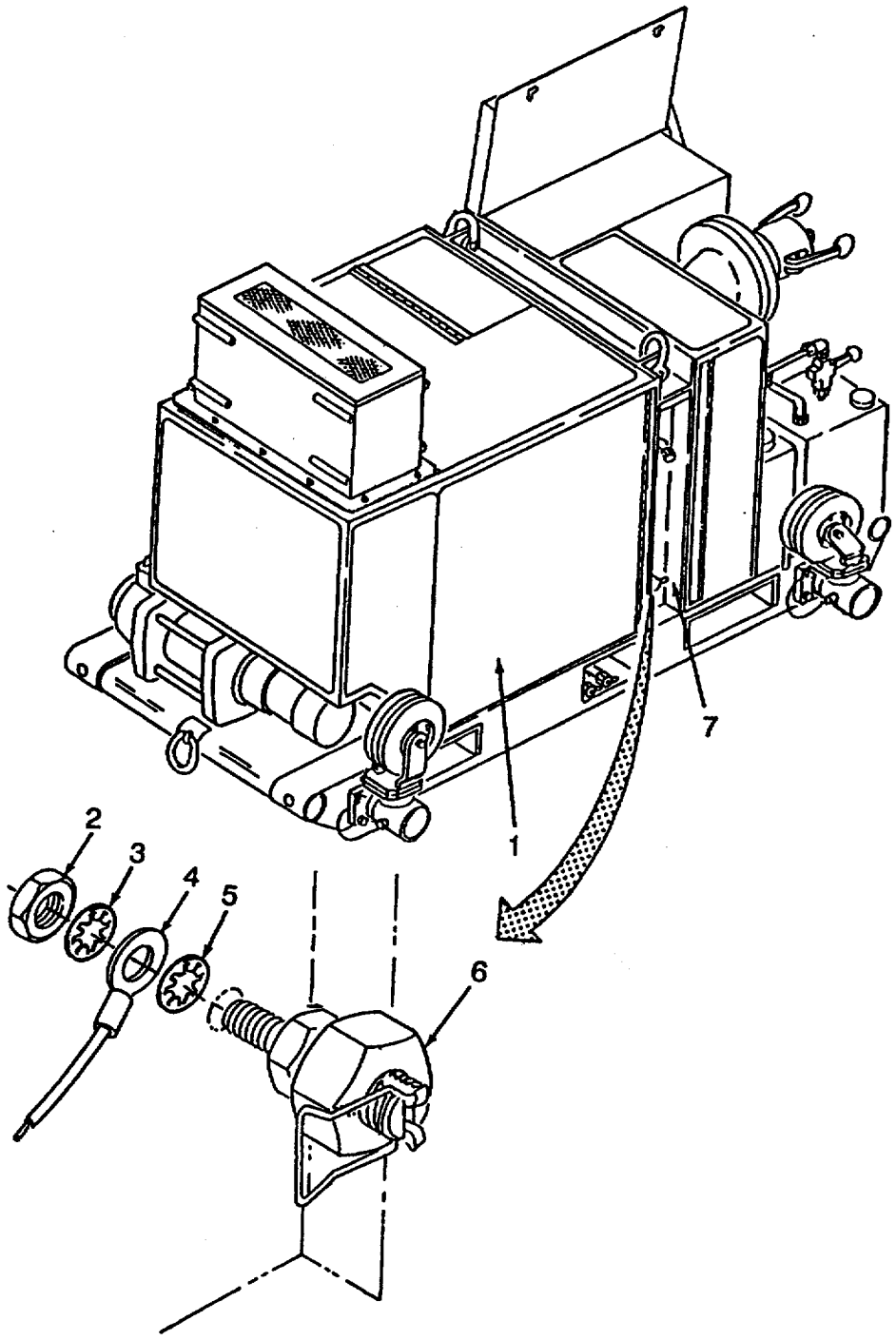


Figure 2-119. Stud Terminal (Ground) Replacement

2-90. REMOVABLE BRACKET ASSEMBLY REPLACEMENT.

This Task Covers a. Removal c. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 2)

Materials/Parts
Nut, Self-locking (App F, Item 65)

Equipment Condition
200/600 GPM Pump removed from system (Para 2-9, TM 10-4320-342-10)
Terminal Board (TB-5) removed (Para 2-82)

a. REMOVAL. Refer to Figure 2-120.

(1) Remove panel (1) from 200/600 GPM pump (2). Refer to para 2-28.
(2) Remove door (3) from 200/600 GPM pump (2). Refer to para 2-28.
(3) Remove bolts (4), flatwashers (5), nuts (6) and bracket assembly (7).
(4) Remove screws (8), flatwashers (9), nuts (10) and bracket assembly (11).

b. INSTALLATION.

(1) Install screws (8), flatwashers (9), nuts (10) and bracket assembly (11).
(2) Install bolts (4), flatwashers (5), nuts (6) and bracket assembly (7).
(3) Install door (3) on 200/600 GPM pump (2). Refer to para 2-28.
(4) Install panel (1) on 200/600 GPM pump (2). Refer to para 2-28.

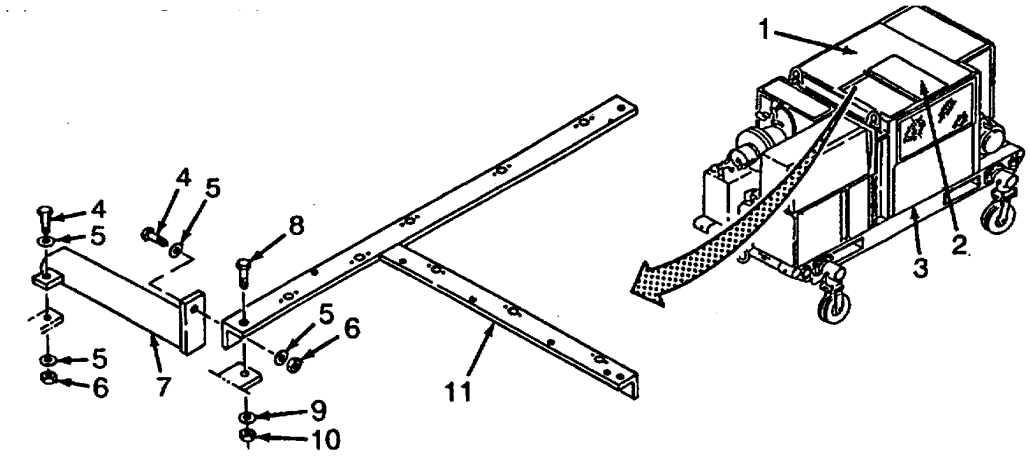


Figure 2-120. Removable Bracket Assembly Replacement

2-91. LIFTING BAR REPLACEMENT.

This Task Covers	a. Removal	c. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Materials/Parts
Nut, Self-locking (App F, Items 63 and 65)

Equipment Condition
200/600 GPM Pump removed from system (Para 2-7c, TM 10-4320-342-10)
Terminal Board (TB-5) removed (para 2-82)
Bracket assembly removed (para 2-90)

a. REMOVAL. Refer to Figure 2-121.

(1) Remove self-locking nut (1), flatwashers (2), bolt (3) and loop clamp (4).

(2) Remove shackle pin (6) from shackle (7) from lifting bar (8).

(3) Remove bolts (9), flatwashers (10), self-locking nuts (11) and lifting bar (8) from 200/600 GPM pump (5). Discard self-locking nuts.

b. INSTALLATION.

(1) Position lifting bar (8) on 200/600 GPM pump (5) and secure with bolts (9), flatwashers (10) and self-locking nuts (11).

(2) Align holes on shackle (7) and lifting bar (8) and install shackle pin (6).

(3) Install loop clamp (4), bolt (3), flatwashers (2) and self-locking nut (1).

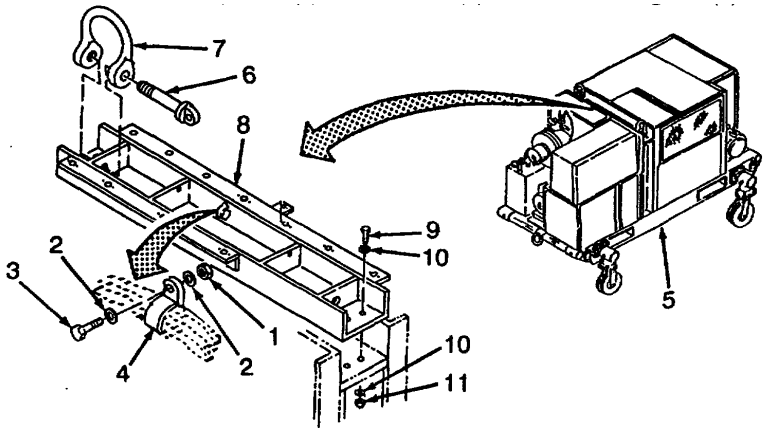


Figure 2-121. Lifting Bar Replacement

2-92. ESU BRACKET REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools	Equipment Condition
General Mechanics Tool Kit (App B, Sect III, Item 2)	200/600 GPM Pump removed from system (Para 2-9, TM 10-4320-342-10) Control Box removed (Para 2-80) ESU removed (Para 2-46)

a. REMOVAL. Refer to Figure 2-122.

(1) Open door (1) on 200/600 GPM pump (2).

(2) Remove bolts (3), flatwashers (4) and ESU bracket (5).

b. INSTALLATION.

(1) Install bolts (3), flatwashers (4) and ESU bracket (5).

(2) Install door (1) on 200/600 GPM pump (3).

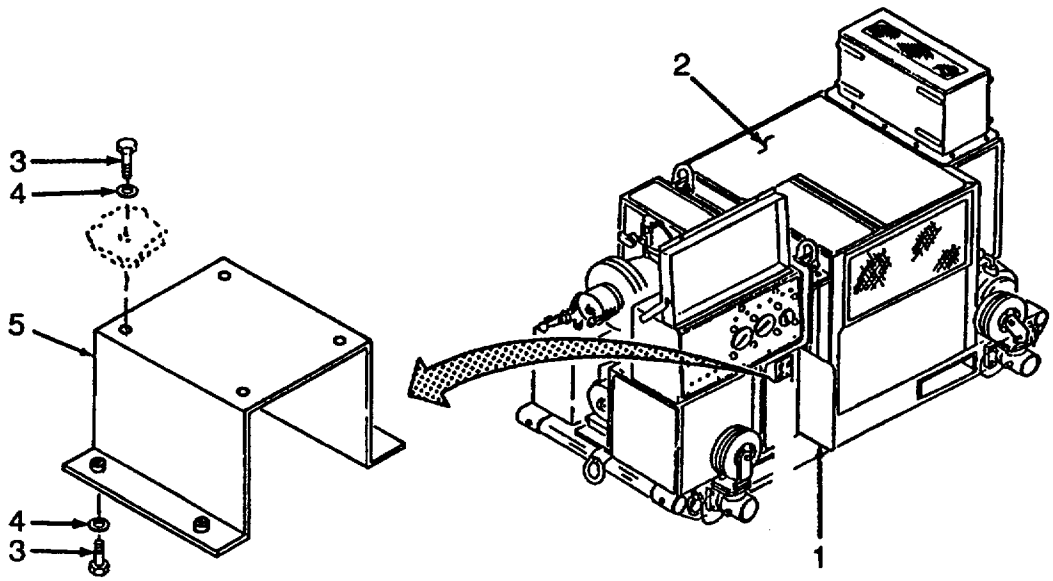


Figure 2-122. ESU Bracket Replacement

2-93. AIR CLEANER MOUNTING BAR REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools	Equipment Condition
General Mechanics Tool Kit (App B, Sect III, Item 1)	200/600 GPM Pump Assembly removed from system (Para 2-9, TM 10-4320-342-10) Air Cleaner removed (Para 2-29)

a. REMOVAL. Refer to Figure 2-123.

(1) Open door (1) on 200/600 GPM pump (2).

(2) Remove screws (3) and air cleaner mounting bar (4) from 200 GPM pump (2).

b. INSTALLATION.

(1) Position air cleaner mounting bar (4) on 200 GPM pump (2) and secure with screws (3).

(2) Close door (1).

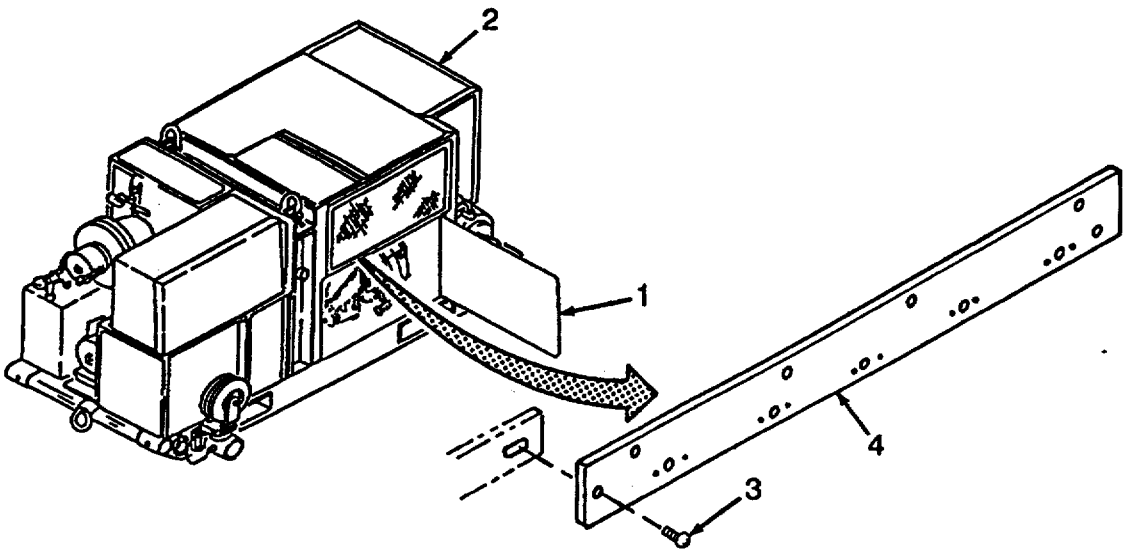


Figure 2-123. Air Cleaner Mounting Bar Replacement

2-94. FRAME REPAIR.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
200/600 GPM Pump shutdown (Para 2-7c, TM 10-4320-342-10)

Materials/Parts
Self-locking Nut (App F, Item 107)

NOTE

This procedure covers three of the four dee rings. The dee ring located under the battery compartment is similar but is attached with blind rivnuts.

a. REMOVAL. Refer to Figure 2-124.

Remove bolts (1), flatwashers (2), self-locking nuts (3) and dee rings (4) from frame (5).

b. INSTALLATION.

Position dee ring (4) on frame (5) and secure with bolts (1), flatwashers (2) and self-locking nuts (3).

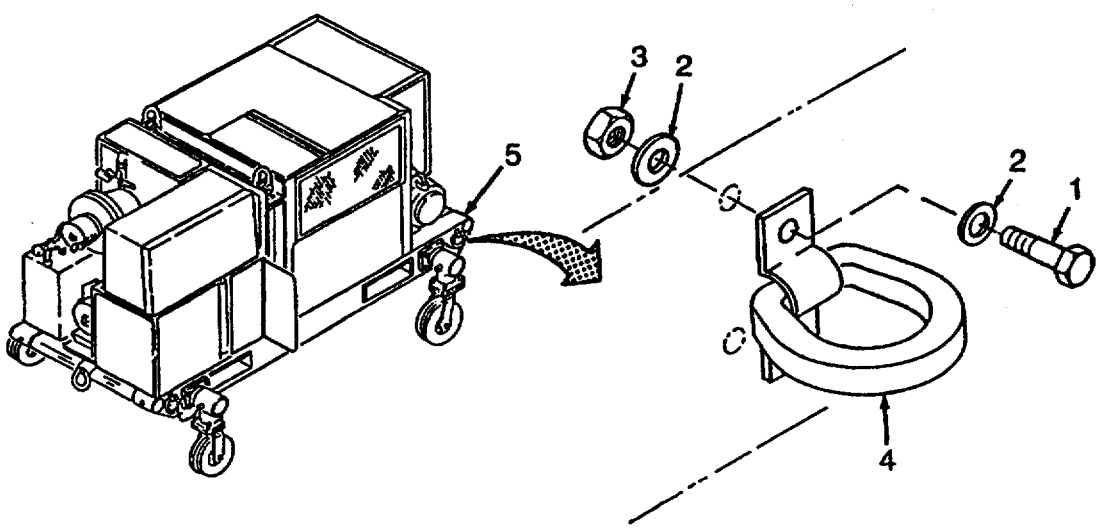


Figure 2-124. Frame Repair

Section VII. PREPARATION FOR STORAGE OR SHIPMENT

2-95. SECURITY PROCEDURES.

Refer to AR 190-1 or AR 190-13.

2-96. ADMINISTRATIVE STORAGE.

Placement of equipment in administrative storage should be for short periods of time when a shortage of maintenance effort exists. Items should be in mission readiness within 24 hours or within the time factors as determined by the directing authority. During the storage period, appropriate maintenance records will be kept. Before placing equipment in administrative storage, current maintenance services and equipment serviceable criteria (ESC) evaluations should be completed, shortcomings and deficiencies should be corrected, and all modification work orders (MWO's) should be applied. Refer to AR 750-1.

Inside storage is preferred for items selected for administrative storage. If inside storage is not available, trucks, vans, conex containers and other containers may be used.

2-97. PREPARATION FOR SHIPMENT.

After preparation for movement reference TM 10-4320-342-10 has been accomplished, equipment is ready for shipment.

CHAPTER 3

DIRECT SUPPORT MAINTENANCE

Section I. DIRECT SUPPORT GENERAL

3-1. INTRODUCTION.

This chapter contains some important information that you need to know about the direct support maintenance requirements of the equipment. This information includes but is not limited to technical support and maintenance of the various systems and subsystems which comprises the unit.

3-2. SCOPE.

This chapter contains maintenance instructions for removing, installing and repairing the equipment at the direct support maintenance level. Maintenance personnel should become familiar with the information in this section.

3-3. COMMON TOOLS AND EQUIPMENT.

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

3-4. SPECIAL TOOLS, TMDE AND SUPPORT EQUIPMENT.

Refer to Appendix B (Maintenance Allocation Chart) for a list of special tools, TMDE and support equipment.

3-5. SERVICE UPON RECEIPT OF MATERIEL.

Repair parts are listed and illustrated in the repair parts and special tools list, TM 10-4320-342-24, covering repair parts for this equipment. Refer to Appendix B, Maintenance Allocation Chart, TMDE and Support Equipment and TM 10-4320-342-24P, Repair Parts and Special Tools List.

Section II. DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

3-6. GENERAL.

The procedures in this section have been arranged in order in which the items appear in the Direct Support (F) Maintenance level column on the Maintenance Allocation Chart (MAC) which is provided in Appendix B.

3-7. MUFFLER EXTENSION REPAIR.

This task covers: Repair

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Welder (App B, Sect III, Item 4)

Reference
Welding Theory and Application (TM 9-237)

Equipment Condition
Muffler Extension removed (Para 2-12)
General Safety Instructions

WARNING

Chemical agent resistance coating (CARC) produces toxic fumes when flame is applied. It is necessary to remove CARC in areas where flame is to be applied.

REPAIR.

Repair is limited to straightening and welding. Refer to TM 9-237.

3-8. WINCH ASSEMBLY REPAIR.

The winch assembly consists of the components listed below. Refer to paragraphs for applicable maintenance procedures.

3-9. WINCH CABLE ASSEMBLIES REPAIR. I

This task covers: Repair

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Shop Electric Repair (App B, Sect III, Item 3)

Equipment Condition
Winch Cable removed (Para 2-13)

Reference
Electric Power Generation in the Field (FM 20-31)

REPAIR.

Refer to FM 20-31 for repair of winch cables.

3-10. WINCH REPAIR.

This task covers: a. Disassembly b. Cleaning c. Inspection d. Repair e. Assembly

INITIAL SETUP

Tools
Shop Equipment, Automotive Maintenance and Repair (App B, Sect III, Item 3)

Equipment Condition
Winch Assembly removed (Para 2-13)
Wire Rope Removed (Para 2-14)

Material/Parts
Wiping Rags (App E, Item 2)
Grease (App E, Item 11)
Seal (2) (App F, Item 68)
Gasket (App F, Item 66)
Preformed Packing (App F, Item 69)
Cleaning Solvent (App E, Item 8)
Gasket (App F, Item 70)
Bushing (2) (App F, Item 67)

a. DISASSEMBLY. Refer to Figure 3-1.

(1) Position assembled winch on workbench.

3-10. WINCH REPAIR - continued.

NOTE

To aid in assembly, mark and record location of rods (3) on gear box.

(2) Remove six screws (1 and 2) and three rods (3) from gearbox (4) and motor (5).

(3) Separate gearbox (4) and motor (5) from drum (6).

(4) Remove output shaft (7) from gearbox (4).

(5) Remove thrust washer (8) from end of drum (6).

(6) Remove input shaft (9) from coupling (10).

(7) Loosen setscrew (11), pull off coupling (10) and remove key (12) from shaft of motor (5).

(8) Remove thrust washer (13) from end of drum (6).

(9) Remove snap rings (14), spacer (15), thrust plate (16), bearing (17) and brake assembly (18) from inside of drum (6).

3-10. WINCH REPAIR - continued.

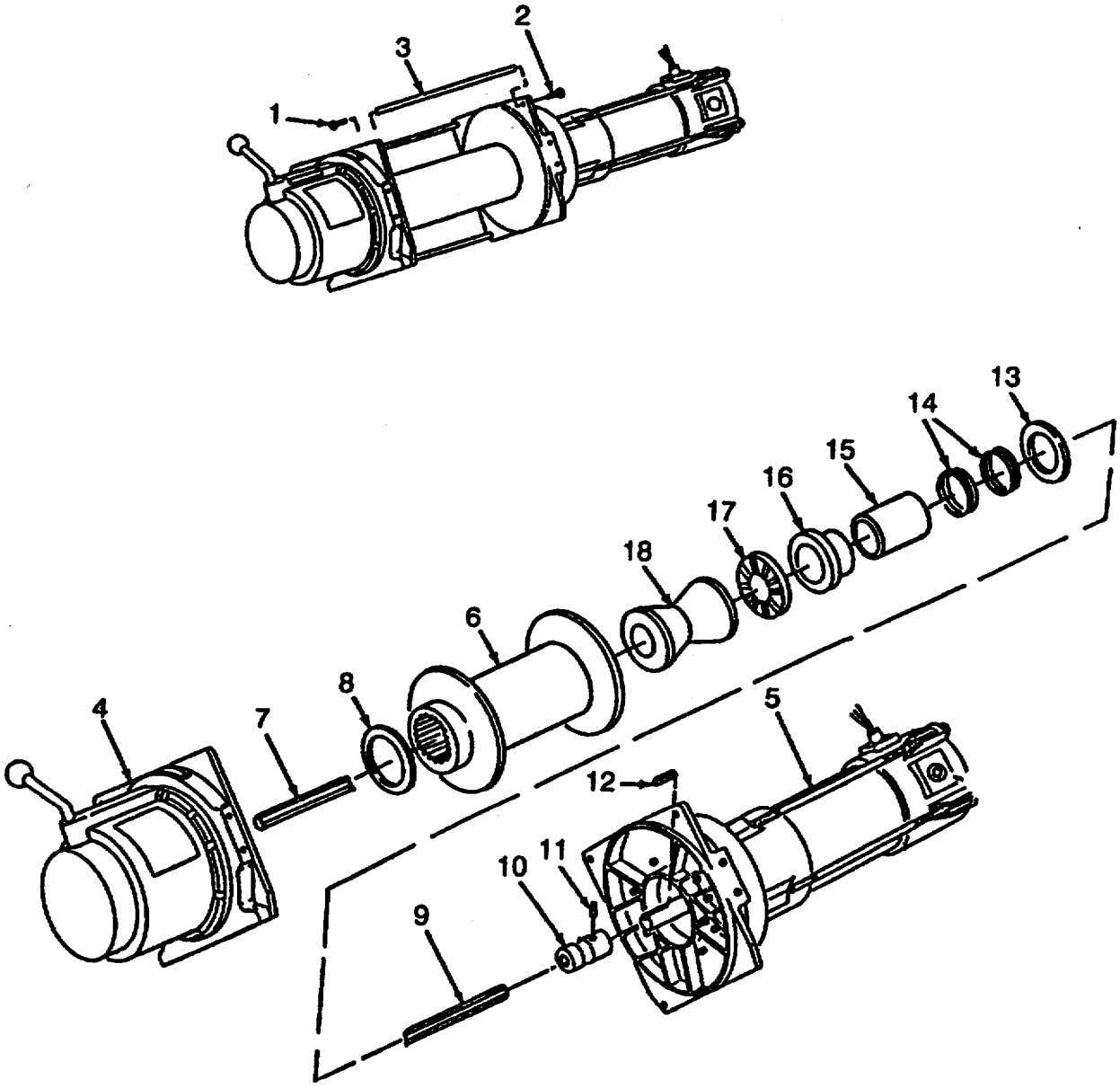


Figure 3-1. Winch Repair (SEPARATING OF GEARBOX, MOTOR AND DRUM)

3-10. WINCH REPAIR - continued.

Refer to Figure 3-2.

NOTE

To aid in assembly, mark and record position of drum support (2) on housing (6).

(10) Remove ten screws ,(1). While holding housing (2) and drum support (3) together, position housing on bench with drum support up.

(11) Separate drum support (3) and gasket (4) from housing (2).

(12) Remove seal (5) and bushing (6) from drum support (3).

(13) Remove two screws (7) and latch (8).

(14) Remove detent spacer (9), spring (10) and ball (11) from housing (2).

(15) Remove clutch lever (12) from housing (2).

(16) Remove preformed packing (13) from lever (12). Discard preformed packing.

(17) Remove third stage carrier assembly (14) from housing (2).

(18) Remove second stage carrier assembly (15) from housing (2).

(19) Remove first stage carrier assembly (16) and sun gear input (17) from housing (2).

(20) Remove thrust washer (18) from housing (2).

(21) Remove ring gear (19) from housing (2).

(22) Remove retaining ring (20) from housing (2).

CAUTION

Steel ball set consist of 85 steel balls and fall out easily. Use care when removing sliding gear to prevent loss or damage to steel balls.

(23) Remove sliding ring gear (21) and steel ball set (22) from housing (2).

3-10. WINCH REPAIR - continued.

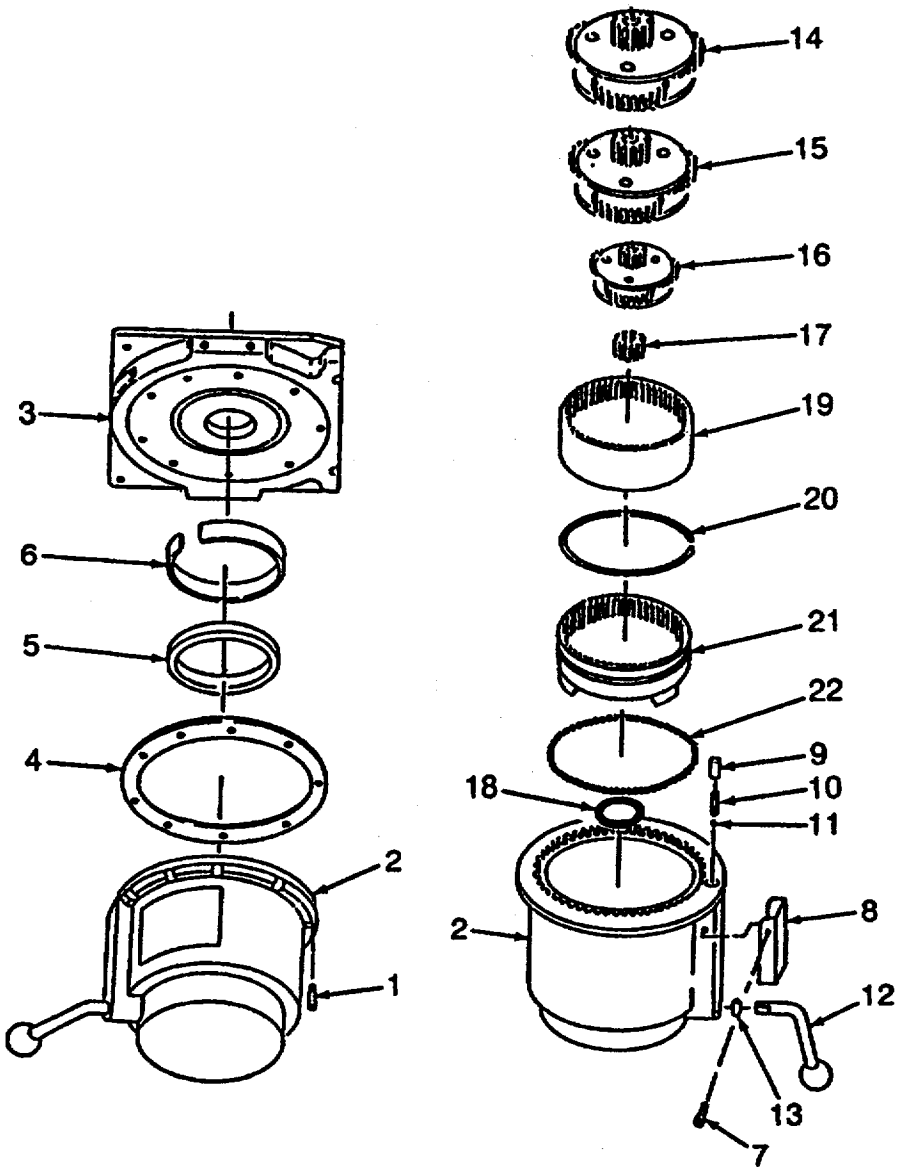


Figure 3-2. Winch Repair (HOUSING, DRUM SUPPORT, CLUTCH LEVER, CARRIER ASSEMBLIES AND STEEL BALL SET)

3-10. WINCH REPAIR - continued.

Refer to Figure 3-3.

NOTE

To aid in assembly, mark and record position of drum support (2) on housing (6).

(24) Remove ten screws (1), drum support (2) and gasket (3) from adapter (4).

(25) Remove seal (5) and bushing (6) from drum support (2).

(26) Remove four screws (7) and adapter (4) from motor (8).

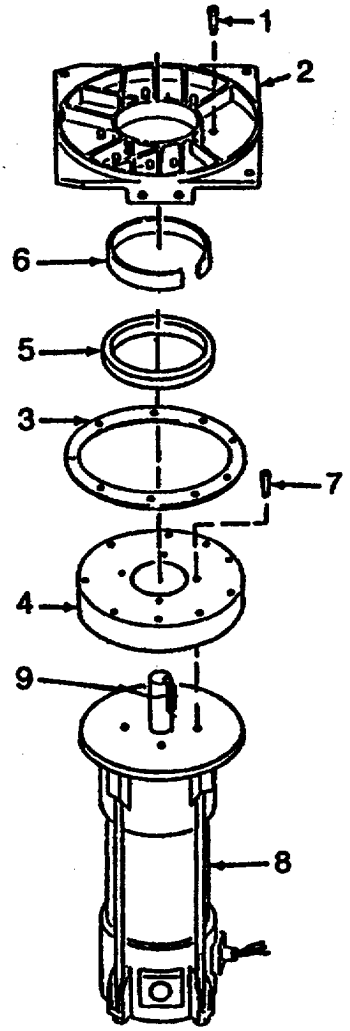


Figure 3-3. Winch Repair (SEPARATE DRUM SUPPORT, ADAPTER AND MOTOR)

3-10. WINCH REPAIR - continued.

b. CLEANING.

WARNING

Dry cleaning solvent, P-D-680, Type III, is potentially dangerous to personnel and equipment. Eye and skin protection is required. Avoid repeated and prolonged skin contact. Wash immediately after exposure. Do not use near open flame or excessive heat. Use only in area with good ventilation.

Using wiping rags and cleaning solvent, remove dirt, grease, oil and contaminants from all components.

c. INSPECTION. Refer to Figure 3-3.

(1) Inspect drum support (2) and adapter (4) for cracks, corrosion and stripped or damaged threads.

(2) Check rotation of motor (8). Motor shaft (9) should turn smoothly without binding. Inspect motor shaft for damaged keyway, corrosion and signs of wear. Check security of attaching hardware.

Refer to Figure 3-2.

(3) Inspect carrier assemblies (14, 15 and 16) for cracks, chipped, worn or missing gear teeth, jammed gears, loose or broken shafts and excessive wear.

(4) Inspect sun gear input (17), ring gear (19) and sliding ring gear (21) for worn, cracked, chipped or missing gear teeth.

(5) Inspect drum support (3) for cracks, corrosion and stripped or damaged threads.

(6) Inspect housing (2) for cracks, excessive wear and corrosion.

(7) Inspect clutch lever (12) and retaining ring (20) for wear and serviceability.

Refer to Figure 3-1.

(8) Inspect snap rings (14) for deformation.

(9) Inspect for bent or damaged rods (3).

(10) Inspect drum (6) for cracks, broken welds and bent parts.

(11) Inspect brake (18) for cracks, damage, worn friction surfaces and corrosion.

(12) Inspect bearing (17) for bends or twists, missing or damaged rollers and corrosion.

(13) Inspect spacer (15) and thrust plate (16) for corrosion or damage.

13-10. WINCH REPAIR - continued.

(14) Inspect motor shaft coupling (10), setscrew (11) and key (12) for stripped threads or signs of wear.

(15) Inspect output shaft (7) and input shaft (9) for bends or damage.

d. REPAIR.

Repair is limited to replacement of damaged or defective components.

e. ASSEMBLY. Refer to Figure 3-3.

(1) Install adapter (4) and four screws (7) on motor (8).

(2) Install bushing (6) and seal (5) in drum support (2).

(3) Position gasket (3) and drum support (2) on adapter (4) as noted during disassembly. Install ten screws (1).

Refer to Figure 3-2.

NOTE

Applying grease to ring gear ball race will aid installation of steel ball set. Apply as much grease as needed to hold balls in place on the ring gear.

(4) Apply grease to ball raceway on ring gear (21). Position steel ball set (22) on ring gear.

CAUTIONS

- **Use care when installing ring gear to prevent loss or damage to steel balls.**
- **To ensure proper operation of repaired winch, ears of ring gear must point down into housing.**

(5) Carefully lower ring gear (21) in place with retaining ring (20).

(6) Secure ring gear (21) in place with retaining ring (20).

(7) Apply a heavy coat of grease to teeth of ring gear (19), ring gear (21), sun gear (17) and carriers (14, 15 and 16). Rotate carrier gears to ensure grease penetrates to inside of carrier.

(8) Install thrust washer (18) in housing (2).

(9) Install sun gear (17) and first stage carrier (16). Rotate parts as required to ensure gear teeth mesh properly.

(10) Install second stage carrier assembly (15). Rotate parts as required to ensure gear teeth mesh properly.

3-10. WINCH REPAIR - continued.

(11) Install third stage carrier assembly (14). Rotate parts as required to ensure gear teeth mesh properly.

(12) Install preformed packing (13) on lever (12).

(13) Install lever (12) in housing (2).

(14) Install steel ball (11), spring (10) and detent spacer (9) in housing (2).

(15) Install latch (8) and two screws (7).

(16) Install bushing (6) and seal (5) in drum support (3).

(17) Position drum support (3) and gasket (4) on housing (2) as marked during disassembly.

(18) While holding housing (2) and drum support (3) together, position on bench with drum support down. Install ten screws (1).

Refer to Figure 3-1.

(19) Apply light coat of grease to inside of drum (6) and on nylon bands of brake assembly (18). Pack bearing (17) with grease.

(20) Install brake (18), bearing (17), thrust plate (16) and spacer (15) in drum (6). Secure parts in place with two snap rings (14).

(21) Install thrust washer (13) on end of drum (6).

(22) Install key (12) on shaft of motor (5). Slide coupling (10) over key (12), then tighten setscrew (11).

(23) Install input shaft (9) in coupling (10).

(24) Install thrust washer (8) on end of drum (6).

(25) Install output shaft (7) in gearbox (4).

NOTE

Geared end of drum must be installed facing gearbox.

(26) With gearbox (4) and motor (5) positioned on flat workbench as shown, slide drum (6) onto input shaft (9) and motor (5).

(27) Slide gearbox (4) and output shaft (7) onto drum (6).

(28) Verify that drum (6), gearbox (4) and motor (5) have mated correctly.

3-10. WINCH REPAIR -continued.

NOTE

Only three rods are required for installation. Make sure rods are installed in the positions recorded during disassembly.

(29) Install three rods (3) and six screws (1 and 2) between gearbox (4) and motor (5).

3-11. WINCH BRAKE ASSEMBLY REPAIR.

This task covers: Repair

INITIAL SETUP

Equipment Condition
Brake Assembly removed (Para 3-10)

NOTE

Brake assembly is removed and installed in the drum assembly during winch repair.

REPAIR. Refer to Figure 3-4.

Repair consists of replacing damaged or defective snap ring (1), tube spacer (2) and brake (3).

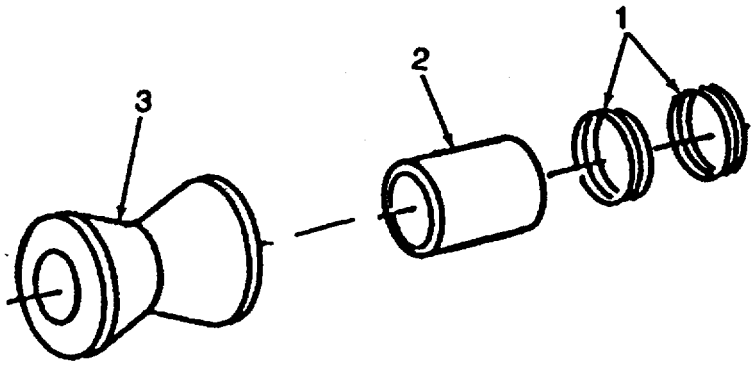


Figure 3-4. Winch Brake Assembly Repair

3-12. WINCH MOTOR REPAIR.

This task covers: a. Disassembly b. Inspect c. Repair d. Assembly

INITIAL SETUP

Tools	Equipment Condition
General Mechanics Tool Kit (App B, Sect III, Item 1)	Winch Assembly removed (Para 2-13)

a. DISASSEMBLY. Refer to Figure 3-5.

(1) Remove cover (1) from motor (2).

CAUTION

Loss of screw and/or flatwasher inside of motor will result in damage to the motor. Use care to prevent dropping screw or flatwasher during removal.

(2) Loosen screw (3) and remove lead (4) from under flatwasher (5).

(3) While holding back spring clips (6), remove brushes (7) from motor (2).

(4) Repeat steps (1) through (3) for brush (7) on other side of motor (2).

b. INSPECT.

Inspect top of slot (8) on brush (7) for maximum wear point. Minimum length is 1/2 inch.

c. REPAIR.

Repair is limited to replacement of brushes.

d. ASSEMBLY.

(1) While holding back spring clips (6), install brushes (7) in motor (2).

CAUTION

Loss of screw and/or flatwasher inside of motor will result in damage to the motor. Use care to prevent dropping screw or flatwasher during removal.

(2) Install lead (4) under flatwasher (5) and tighten screw (3).

(3) Repeat steps (1 and 2) for installation of brush (7) on other side of motor (2).

(4) Install cover (1) on motor (2).

3-12. WINCH MOTOR REPAIR - continued

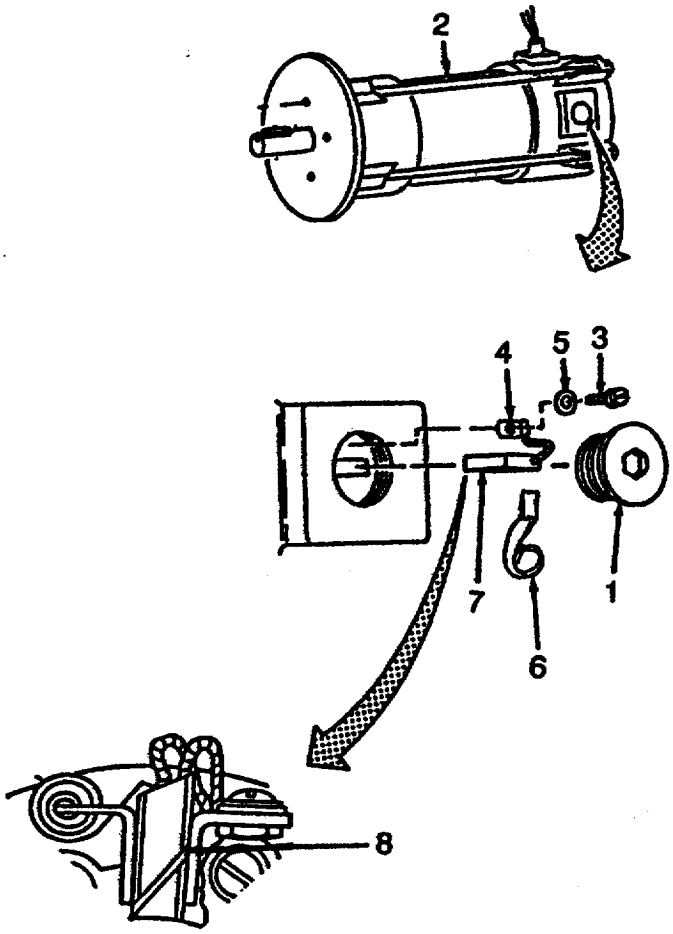


Figure 3-5. Winch Motor Repair

3-13. METAL TUBE ASSEMBLY REPAIR (TYPICAL).

This task covers: a. Repair b. Assemble

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Bender, Tube Set (App B, Sect III, Item 3)

Equipment Condition
Metal Tube Assembly removed (Para 2-15)

NOTE

- **This procedure covers the typical repair for all metal tube assemblies.**
- **Dimensions may be altered to facilitate installation of tube assembly.**

a. REPAIR.

Repair consists of local manufacturing and assembling metal tube assembly.

b. ASSEMBLY. Refer to Figure 3-6.

(1) Refer to Appendix D for manufacture (cutting and bending) of tubing (1).

(2) Slide nuts (2) and sleeves (3) onto tubing (1).

(3) Flare both ends of tubing (1).

(4) Slide sleeves (3) and nuts (2) over flared ends.

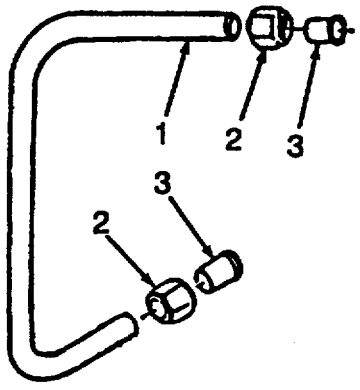


Figure 3-6. Metal Tube Assembly Repair (Typical)

3-14. DRAIN TANK REPAIR.

This task covers: Repair

INITIAL SETUP

Tools
Welder (App B, Sect III, Item 4)

Equipment Condition
Drain tank removed (Para 2-15)

Reference
Welding Theory and Application (TM 9-237)

REPAIR.

WARNING

Do not attempt to weld or heat tank until tank has been purged of all fuel and fuel vapors. Failure to purge tank properly before welding will result in an explosion. Death or serious injury to personnel could occur.

Repair of the drain tank is limited to welding.

3-15. OIL RESERVOIR ASSEMBLY REPAIR.

This task covers: Repair

INITIAL SETUP

Tools
Welder (App B, Sect III, Item 4)

Equipment Condition
Oil reservoir removed (Para 2-15)

Reference
Welding Theory and Application (TM 9-237)

REPAIR.

WARNING

Do not attempt to weld or heat tank until tank has been purged of all fuel and fuel vapors. Failure to purge tank properly before welding will result in an explosion. Death or serious injury to personnel could occur.

Repair of the oil reservoir assembly is limited to welding.

3-16. FUEL PUMP ASSEMBLY REPAIR.

This task covers: Repair

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
Fuel Pump Assembly removed (Para 2-18)

REPAIR.

The fuel pump assembly consists of the components listed below. Refer to paragraphs for applicable maintenance procedures.

3-17. BALL VALVE (200/600 GPM PUMP) REPAIR.

This task covers: a. Repair of 600 GPM Ball Valve
b. Repair of 200 GPM Ball Valve

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Breechlock Tool (App B, Sect III, Item 6)
Tool, 200 GPM Ball Valve (App D, Item 112)
Body Seal (App F, Item 55)

200 GPM Pump Materials/Parts
Lockwashers (App F, Item 72)
Seals and Packing (App F, Item 73)
Seal (App F, Item 74)
Seat (2) (App F, Item 109)
Lubricant (App E, Item 20)

600 GPM Pump Materials/Parts
Nut, Self-locking (App F, Item 59)
Upper Stem Seal (App F, Item 58)
Lower Stem Seal (App F, Item 57)
Seat (2) (App F, Item 56)
Lubricant (App E, Item 20)

Equipment Condition
200 GPM Ball Valve removed (Para 2-26)
600 GPM Ball Valve removed (Para 2-27)

a. REPAIR OF 600 GPM BALL VALVE.

(1) Disassembly. Refer to Figure 3-7.

(a) Remove cap screw (1), handle (2) from valve stem (3).

NOTE
Note position of movable stop plate (8) prior to removal.

(b) Remove tee handle (4), nylon washer (5), movable stop plate (6) and two spacers (7).

(c) Remove indicator stop (8).

(d) Remove screws (9), locknut (10) and backing plate (11).

(e) Remove bushing adapters (12).

(f) Remove nut (13) and compression ring (14) from valve body (15).

3-17. BALL VALVE (200/600 GPM PUMP) REPAIR - continued.

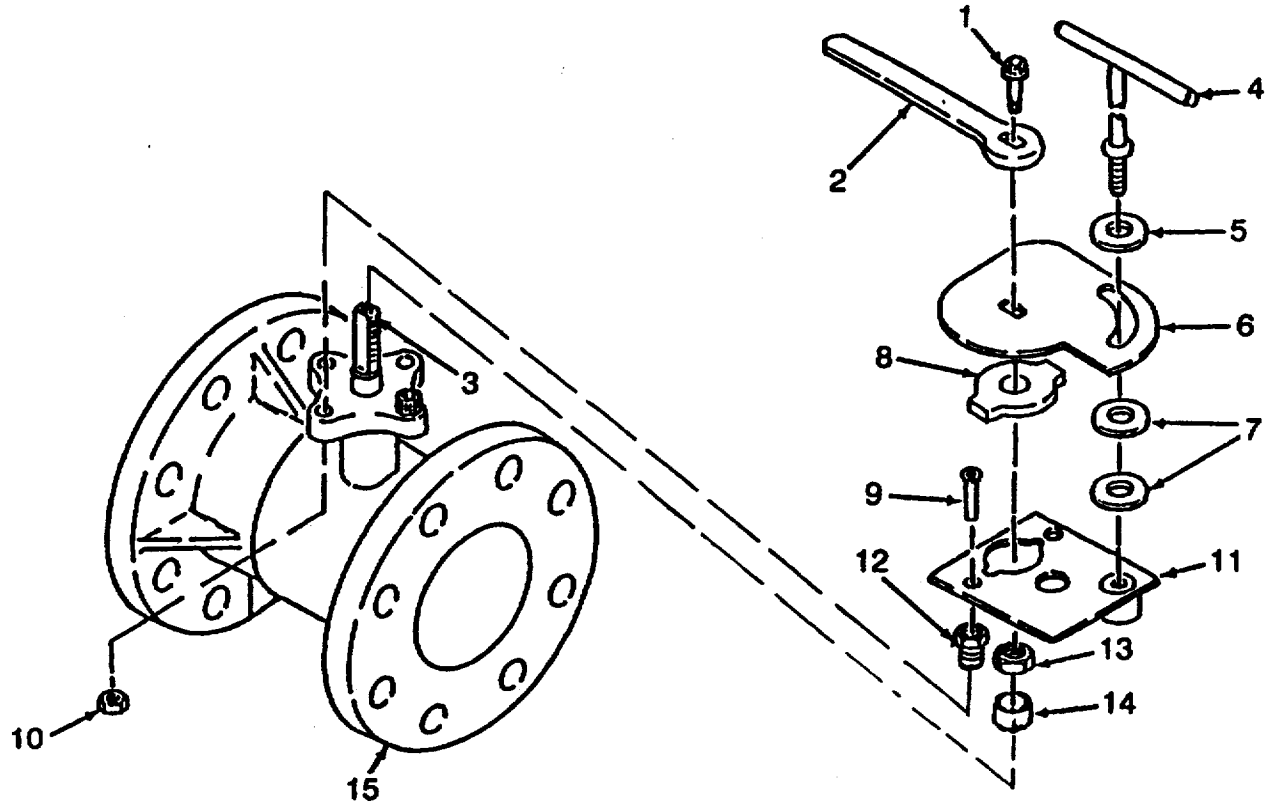


Figure 3-7. Repair of 600 GPM Ball Valve (HANDLE, TEE HANDLE AND STOP INDICATOR)

3-17. BALL VALVE (200/600 GPM PUMP REPAIR - continued.

Refer to Figure 3-8.

(g) Install breechlock tool on valve as follows:

(1) Install nut (1), base (2), lockwasher (3), and nut (4) on end of rod (5).

(2) With valve in open position, install rod (5) through center of valve body (6).

(3) Position plate (7) on end of rod (5). Engage dowel pins on plate with slots in insert (8).

(4) Install handle (9) over dowel pins on plate (7).

CAUTION

Failure to correctly align notch before preloading and removing insert may result in damage to insert or valve body.

(5) Install washer (10) and nut (11). Tighten nut to preload insert (8) enough to ease rotation. Face of insert should be flush with mating surface of flange on valve body (6).

NOTE
Locate OPEN and LOCK stamped into valve flange.

(6) Turn tool handle (9) to the left until notch on insert (8) is aligned with the OPEN mark on the flange of valve body (6).

(7) Remove breechlock tool (items 1 through 5 and 7 through 11) and pull insert (8) from valve body (6). If insert does not come out easily, close ball (12) and with a piece of wood or other soft material, gently tap ball from end opposite insert (8).

(8) Remove seal (13) and seat (14).

(9) Turn ball (12) to closed position and remove from valve body (6).

(10) Remove seat (15) from valve body (6).

NOTE
Note position of stem prior to removal from inside of valve body.

(11) Remove upper seal (16), stem (17) and lower seal (18) from valve body (6).

3-17. BALL VALVE (200/600 GPM PUMP) REPAIR - continued.

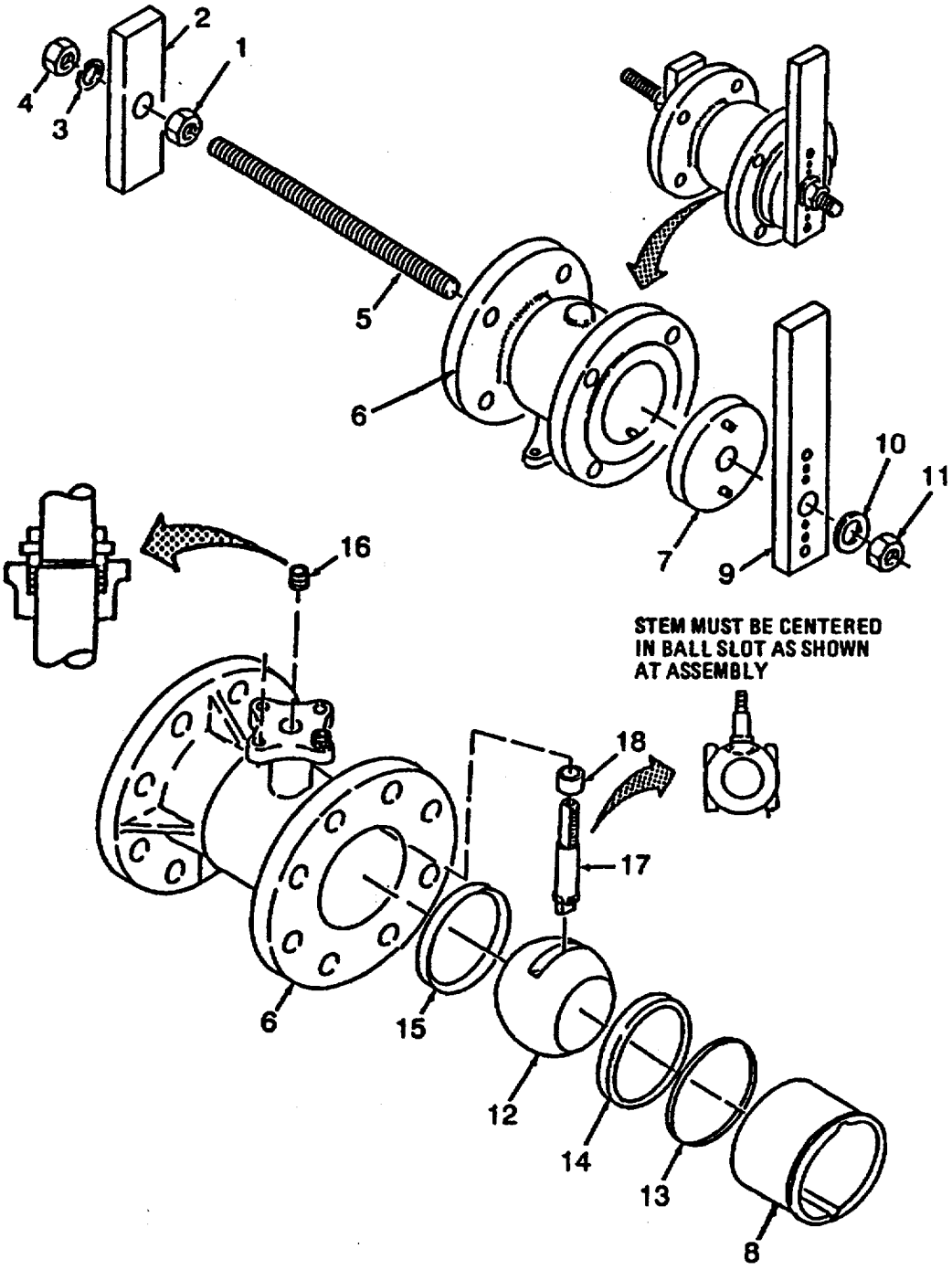


Figure 3-8. Repair of 600 GPM Ball Valve (Use of Breechlock Tool)

3-17. BALL VALVE (200/600 GPM PUMP) REPAIR - continued.

(2) Cleaning and Inspection.

WARNING

Dry cleaning solvent, P-D-680, TYPE III, is potentially dangerous to personnel and equipment. Eye and skin protection is required. Avoid repeated and prolonged skin contact. Wash immediately after exposure. Do not use near open flame or excessive heat. Use only in areas with good ventilation.

(a) Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

(b) Inspect threaded parts for stretched, stripped, damaged or corroded threads.

(c) Inspect valve body for cracks, damage and corroded sealing surfaces.

(d) Inspect plates for deformation and damaged threads.

(e) Inspect insert for cracks and excessive corrosion.

(f) Inspect ball for corrosion, scratches, gouges, chips and other surface damage that could result in leaks.

(3) Repair.

Replace damaged or defective components and all mandatory replacement parts.

(4) Assembly. Refer to Figure 3-8.

(a) Apply a thin coat of lubricant to seats (14 and 15), seals (13, 16 and 18) and ball (12) to aid assembly.

(b) Position valve body (6) on bench with large opening facing up.

(c) Install seat (15) in valve body (6) with flat surface of seat facing down.

(d) Press lower seal (18) into stem bore in valve body (6).

(e) Install stem (17) up through stem bore in valve body (6).

CAUTION

To prevent premature failure of bail valve, upper stem seals must be installed correctly. Bottom seal of the seal set must be installed first with flat surface down. Remaining seals must be stacked as shown.

(f) While holding valve stem (17) in place, install upper seal (16) over valve stem (17) and into valve body (6).

3-17. BALL VALVE (200/600 GPM PUMP) REPAIR- continued.

Refer to Figure 3-7.

(g) Install compression ring (14) and nut (13) over stem (3) and tighten until seals are fully seated, then tighten an additional 1/8 to 1/4 turn.

Refer to Figure 3-8.

(h) Align stem (17) as noted during removal.

(i) Align slot in ball (12) with blade on end of stem (17). Insert ball (12) into valve body (6) If required, turn stem to align with slot in ball. Make certain that stem blade is in the middle of the ball slot (equal distance from ends of slot) as shown. Reposition ball, if required.

(j) Gently press seal (13) into groove in valve body (6).

(k) Turn stem (17) and ball (12) to open position.

(l) Apply liberal amount of lubricant to locking grooves and tabs on valve body (6) and insert (8).

CAUTION

Failure to correctly align notch before installing insert may result in damage to insert or valve body.

NOTE

Locate OPEN and LOCK stamped into valve flange.

(m) Place seat (14) and insert (8) in valve body (6). Align notch with OPEN mark on valve body (6) so that breechlock tabs engage correctly. Make sure seal (13) has not been dislodged.

(n) Install breechlock tool as described in disassembly, para 3-17a. (1) (g), steps 1 thru 5.

(o) Turn handle (9) to the right until notch in insert (8) aligns with the LOCK mark on valve body (6). If handle is difficult to turn, further compression of insert (8) by tightening of nut (11).

(p) Remove breechlock tool from valve body (6).

Refer to Figure 3-7.

(q) Install bushing adapters (12), backing plate (11), nylon washer (5) and screws (9).

(u) Install indicator stop (8).

3-17. BALL VALVE (200/600 GPM PUMP) REPAIR - continued.

(s) Install two spacers (7), removable stop plate (6), nylon washer (5) and tee handle (4).

(t) Install handle (2) and bolt (1) on stem (3).

CAUTION

Turning the handle in fast motion before the seats have a chance to form a proper seal may cut the seats and cause the valve to leak.

NOTE

Cycling the handle slowly will allow the seats to properly seal against the ball.

(u) Cycle the valve slowly by turning handle (3) with a gentle back and forth motion to obtain the full quarter turn.

b. REPAIR OF 200 GPM BALL VALVE.

(1) Disassembly. Refer to Figure 3-9.

(a) With valve in closed position, remove nut (1), lockwasher (2) and handle (3) from valve stem (4).

NOTE

Note position of movable stop plate (7) prior to removal.

(b) Remove tee handle (5), plastic washer (6), movable plate (7) and washer (8).

(c) Remove bolts (9), stop screws (10) and backing stop plate (11).

3-17. BALL VALVE (200/600GPM PUMP) REPAIR -continued.

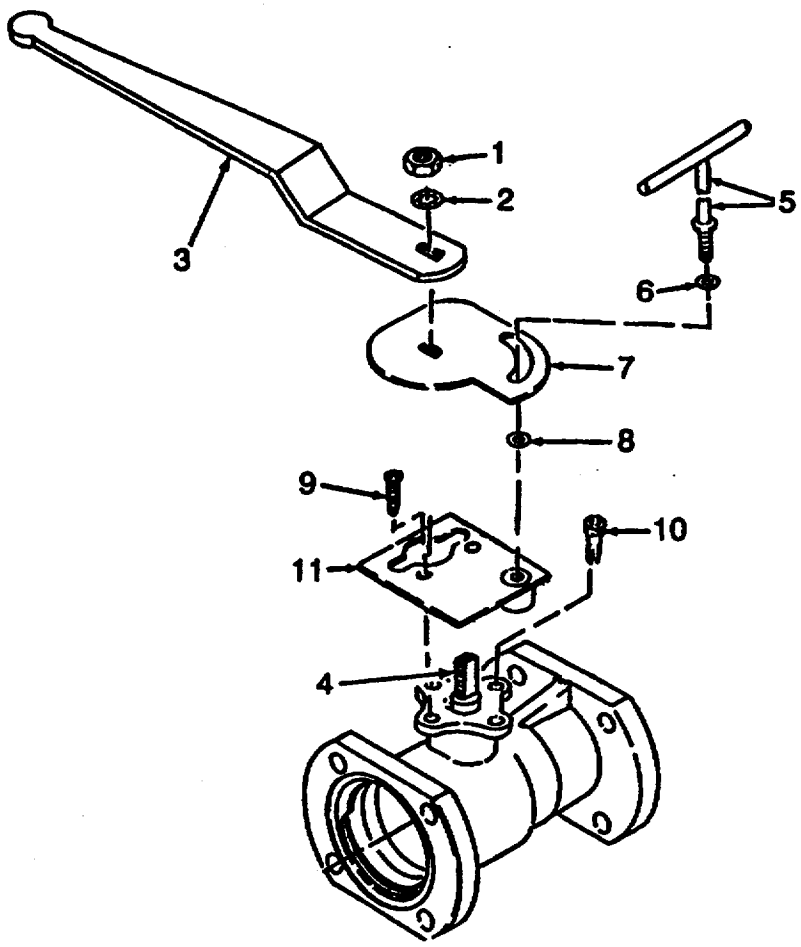


Figure 3-9. Repair of 200 GPM Ball Valve (HANDLE, TEE HANDLE AND STOP PLATE)

3-17. BALL VALVE (200/600 GPM PUMP) REPAIR - continued.

Refer to Figure 3-10.

(d) Remove nut (1) and compression ring (2) from stem (3).

NOTE
Count number of turns during removal of insert.

(e) Place ball valve assembly in vise and unscrew insert (4) with spanner wrench or local manufactured tool.

(f) Remove body seal (5) and seat (6). Discard body seal.

(g) Remove ball (7) from valve body (8).

NOTE
Note position of stem and seals in valve body.

(h) Remove stem (3) from valve body (8).

(i) Remove lower and upper seals (9 and 10) from valve body (8). Discard seals.

(j) Remove seat (11) from valve body (8).

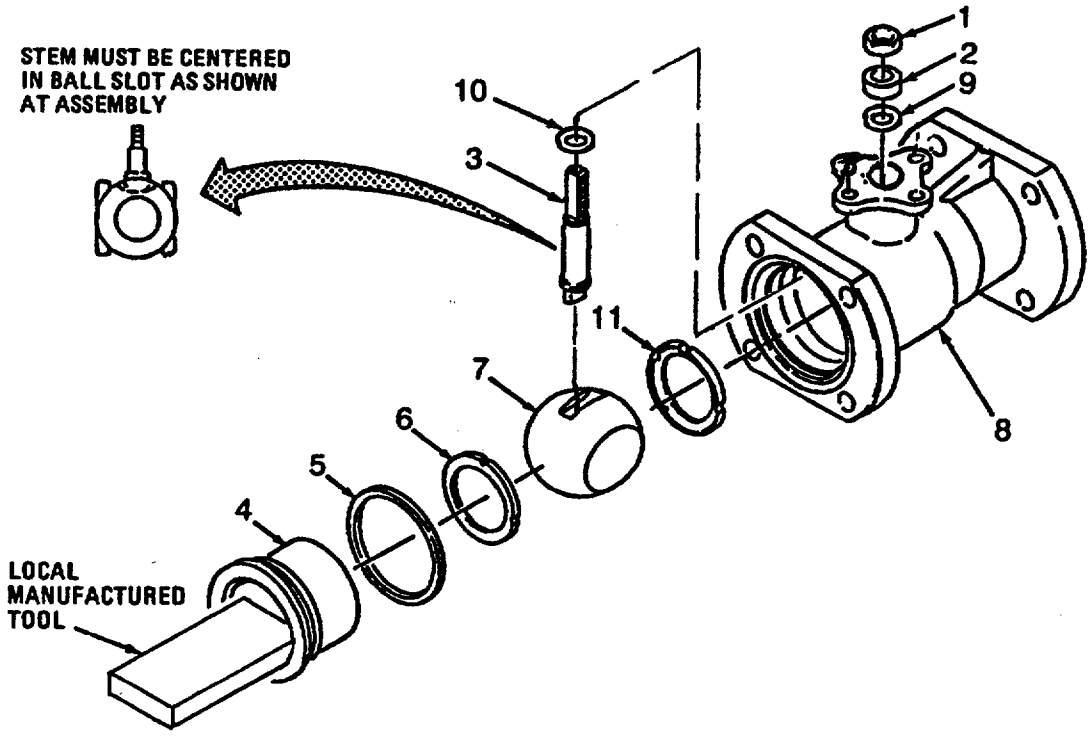


Figure 3-10. Repair of 200 GPM Ball Valve (Use of Spanner Wrench or Manufactured Tool)

3-17. BALL VALVE (200/600 GPM PUMP) REPAIR - continued.

(2) Cleaning and Inspection.

(a) Inspect threaded parts for damaged and corrosion threads.

(b) Inspect valve body (8) for cracks, damaged and corroded bearing surfaces.

(c) Inspect insert for cracks and excessive corrosion.

(d) Inspect ball and seats for corrosion, scratches, gouges, chips and other surface damage that could result in leaks.

(3) Repair.

Replace damaged or defective components and all mandatory replacement parts.

(4) Assembly. Refer to Figure 3-10.

(a) Apply a thin coat of lubricant to seats (6 and 11), seals (5, 9 and 10) and ball (7) to aid assembly.

(b) Position valve body (8) on bench with large opening facing up.

(c) Install seat (11) in valve body (8) with flat surface of seat facing down.

(d) Press seal (9) into stem bore in valve body (8).

(e) Install stem (3) up through stem bore in valve body (8). Position as noted during removal.

CAUTION

To prevent premature failure of ball valve, upper stem seals must be installed correctly. Bottom seal of the seal set must be installed first with flat surface down.

(f) While holding stem (3) in place, install upper seal (9) over valve stem and into valve body (3).

(g) Install compression ring (2) and nut (1) on stem (3) and tighten until seals are fully seated, then tighten an additional 1/8 to 1/4 turn.

(h) Align stem (3) as noted during removal.

(i) Align slot in ball (7) with blade on end of stem (3). Insert ball (7) into valve body (8). If required, turn stem to align with slot in ball. Make certain that stem blade is in the middle of the ball slot (equal distance from ends of slot). Reposition ball, if required.

(j) Gently press seal (5) into groove in valve body (8).

3-17. BALL VALVE (200/600 GPM PUMP) REPAIR - continued.

(k) Apply liberal amount of lubricant to threads of insert (4).

(l) Place seat (6) and insert (4) in valve body (8) and screw into valve body using a spanner wrench or manufactured tool. Tighten the insert the same number of turns noted during removal.

Refer to Figure 3-9.

(n) Position backing stop plate (11) on stem (4) as noted during removal.

(o) Install stop screws (10) and bolts (9).

(p) Install washer (8), movable stop plate (7), plastic washer (6) and tee handle (5) as noted during removal.

(q) Install handle (3), lockwasher (2) and nut (1) on stem (4).

CAUTION

Turning the handle in fast motion before the seats have a chance to form a proper seal may cut the seats and cause the valve to leak.

NOTE

Cycling the handle slowly will allow the seats to properly seal against the ball.

(u) Cycle the valve slowly by turning handle (3) with a gentle back and forth motion to obtain the full quarter turn.

3-18. FUEL PUMP AND CLUTCH (WIRING HARNESS) REPAIR (TYPICAL).

This task covers: Repair

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Shop Electric Repair (App B, Sect III, Item 3)

Equipment Condition
Wiring Harness removed (Para 2-24)

Reference
Electric Power Generation in the Field (FM 20-31)

REPAIR.

Refer to FM 20-31 for repair of cables.

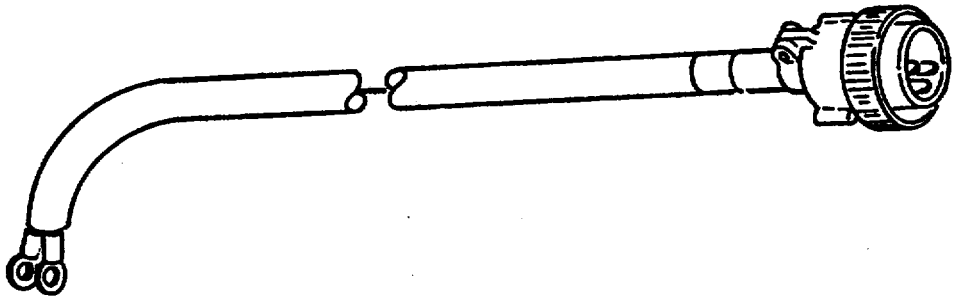


Figure 3-11. Fuel Pump and Clutch (Wiring Harness) Repair (Typical)

3-19. PUMP AND CLUTCH (600 GPM FUEL PUMP) REPAIR.

This task covers: a. Disassembly b. Repair c. Assembly

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Shop Equipment, Automotive Maintenance and Repair (App B, Sect III, Item 3)
Torque Wrench 0-300 foot-pounds (App B, Sect III, Item 3)
Micrometer (App B, Sect III, Item 3)
Caliper (App B, Sect III, Item 3)
Depth Gage (App B, Sect III, Item 3)
Tool Kit, Screw Thread Insert (App B, Sect III, Item 3)
Crowsfoot (App B, Sect III, Item 3)
Hi-Torque Adapter (App B, Sect III, Item 3)
Breechlock Field Wrench (App B, Sect III, Item 5)
Special Clutch Tool (App B, Sect III, Item 9)

Materials/Parts
Rags (App E, Item 2)
Antiseize Tape (App E, Item 6)
Sealing Compound (App E, Item 23)
Seal (App F, Item 83)
Grease (App E, Item 11)
Detergent (App E, Item 1)
Drycleaning Solvent P-D-680 (App E, Item 8)
Carbon Seal (shaft) (App F, Item 51)
Bearings (App F, Item 82)
Preformed Packings (App F, Items 33 and 75)
Shims (App F, Items 31, 77, 78, 79, 80 and 81)
Nuts, Self-Locking (App F, Items 32, 38, 76, 84 and 99)
Safety Wire (App E, Item 15)

Equipment Condition
Clutch and Pump Assembly removed (Para 2-24)

a. DISASSEMBLY. Refer to Figure 3-12.

(1) Remove eight nuts (1) and washers (2). Studs (3) may come out with nuts.

(2) Using crows foot wrench and allen wrench, remove nut (4) and washer (5).

CAUTION
Diffuser diameter is larger than inside diameter of manifold. Do not attempt to fully remove housing without first removing diffuser screw.

(3) Tap suction manifold (6) out from diffuser housing (7) until inducer (8) is loose on shaft (9).

(4) Note position of inducer and remove inducer (8) and key (10) from shaft (9).

(5) Separate suction manifold (6) from diffuser housing (7).

(6) Remove spacer (11), impeller (12) and key (13) from shaft (9).

(7) Remove seal (14) and carbon seal (15) from suction manifold (6).

(8) Remove preformed packing (16) from suction manifold (6). Discard performed packing.

3-19. PUMP AND CLUTCH (600 GPM FUEL PUMP) REPAIR - continued.

(9) Remove elbow (17) and bushing (18) from bearing carrier (19).

(10) Remove eight nuts (20) and washers (21) and separate bearing carrier (19) from diffuser housing (7).

(11) Cut safety wire and remove plug (22), preformed packing (23) and studs (24) from diffuser housing (7). Discard preformed packing.

(12) Remove eight nuts (25), washers (26), bolts (27) and washers (28). Separate clutch housing (29) from bearing carrier (19).

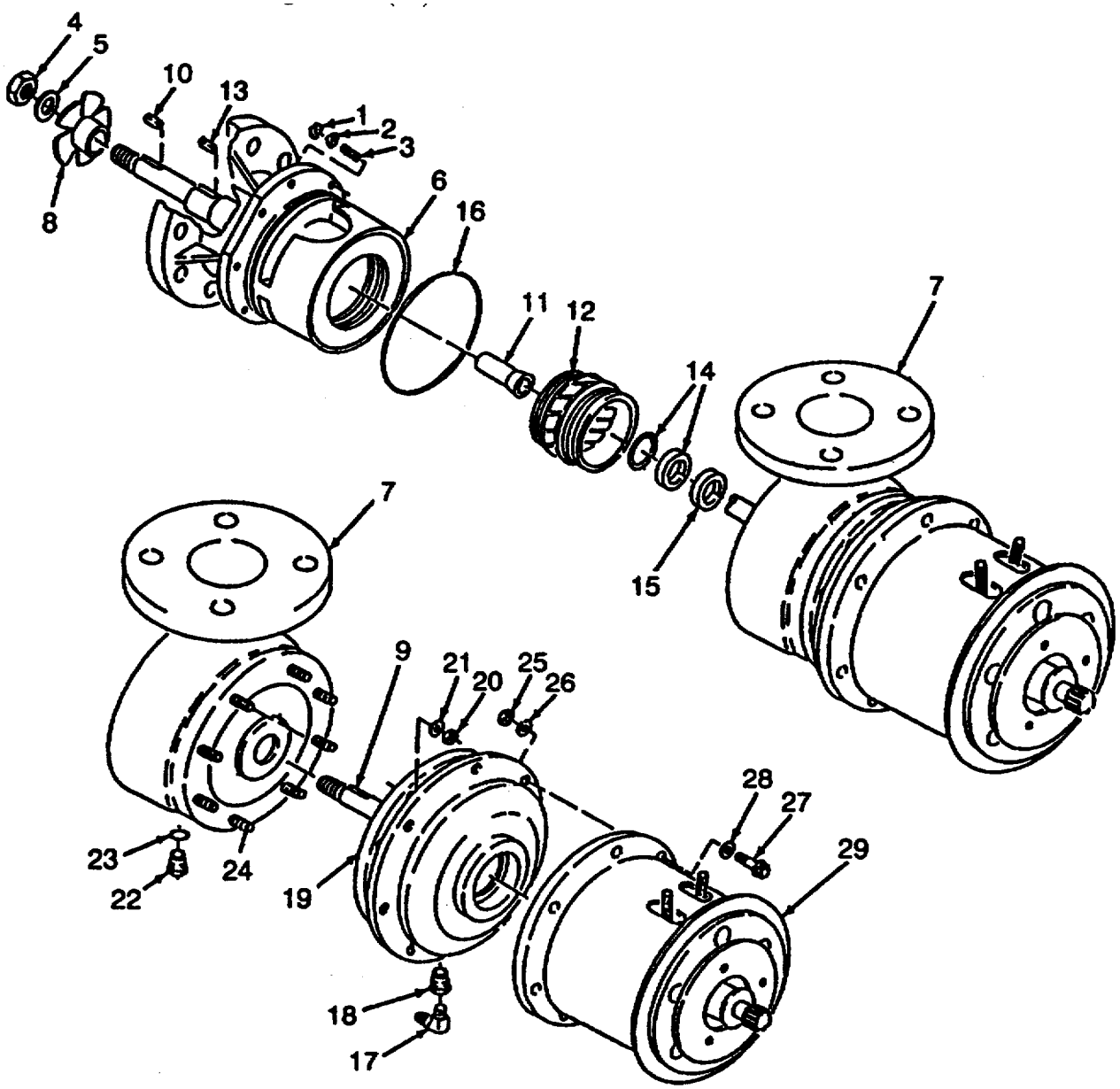


Figure 3-12. Pump and Clutch (600 GPM Fuel Pump) Disassembly

3-19. PUMP AND CLUTCH (600 GPM FUEL PUMP) REPAIR - continued.

Refer to Figure 3-13.

(13) Pull bearing (1) from pump shaft (2).

(14) Secure opposite end of shaft (2) with allen wrench and remove nut (3) and flat washer (4).

(15) Remove assembled clutch components (5) and key (6) from shaft (2).

(16) Remove shim stack (7).

NOTE

To aid assembly of pump and clutch, measure and record thickness of shim stacks.

(17) Using hi-torque adapter, remove three screws (8) and bearing retainer (9).

(18) Press shaft (2) out of bearing carrier (10).

(19) Press bearing (11), shim stack (12) and seal (13) from bearing carrier (10).

(20) Remove inserts (14) from bearing carrier (10).

(21) Remove four nuts (15) and screws (16) from clutch components (5).

(22) Separate armature clutch (17), carrier armature (18), retaining ring (19), hub armature (20), flat washer (21), spring tension (wavy) washer (22) and retainer plate (23).

3-19. PUMP AND CLUTCH (600 GPM FUEL PUMP) REPAIR - continued.

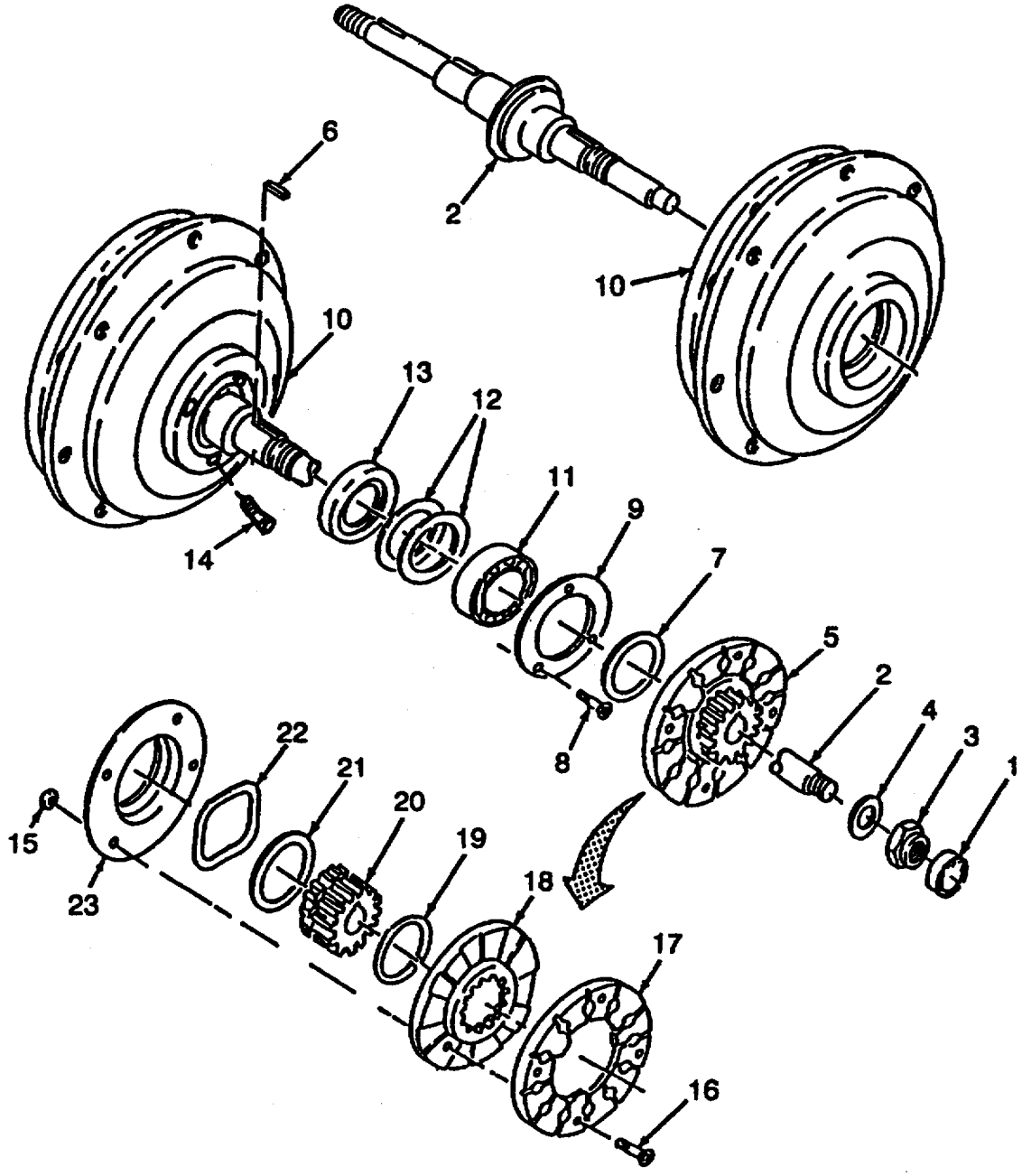


Figure 3-13. Clutch Carrier and Clutch Components (600 GPM Fuel Pump) Disassembly

3-19. PUMP AND CLUTCH (600 GPM FUEL PUMPP) REPAIR - continued.

Refer to Figure 3-14.

(23) Disengage (bend up) tabs (1) on tab washer (2) from nut (3).

(24) Remove nut (3) and tab washer (2) from end of shaft (4).

(25) Remove rotor assembly (5) from shaft (4).

(26) Remove three screws (6) and field retainer plate (7) from field clutch (8).

(27) Remove field clutch (8) and shim stack (9) from clutch housing (10).

NOTE
To aid in assembly, measure and record thickness of shim stack.

(28) Press out shaft (4) from clutch housing (10).

(29) Remove spring tension (wavy) washer (11) and shim stack (12) from inside of shaft (4).

NOTE
To aid in assembly, measure and record thickness of shim stack.

(30) Remove three screws (13), bearing retainer (14) from clutch housing (10).

(31) Press out bearings (15 and 16) from clutch housing (10).

(32) Remove spring tension (wavy) washer (17), shim stack (18) and bearing spacer (19) from clutch housing (10).

(33) Remove insert (20) from clutch housing (10).

3-19. PUMP AND CLUTCH (600 GPM FUEL PUMP) REPAIR - continued.

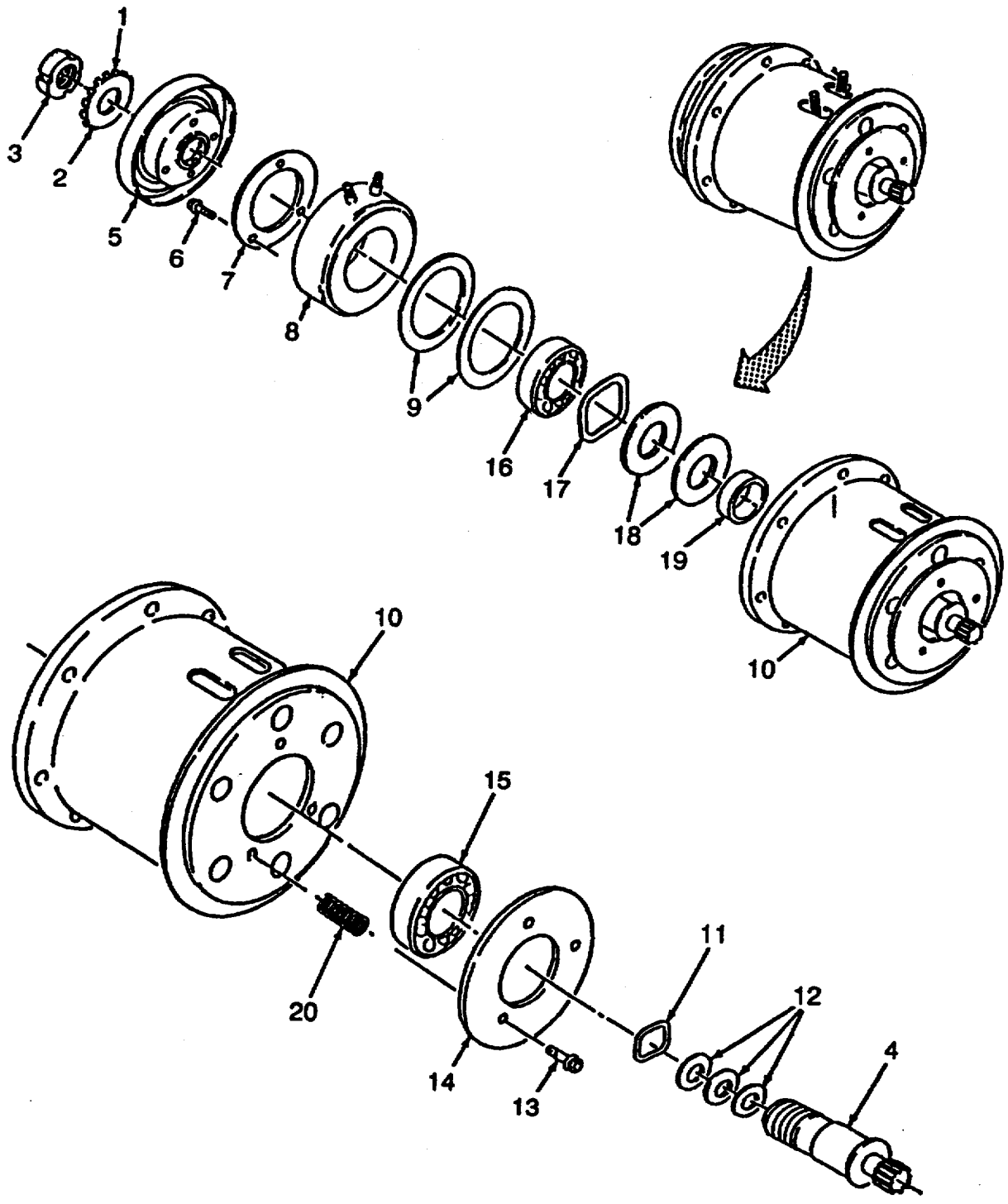


Figure 3-14. Clutch Housing (600 GPM Fuel Pump) Disassembly

3-19. PUMP AND CLUTCH (600 GPM FUEL PUMP) REPAIR - continued.

b. REPAIR.

WARNING

Dry cleaning solvent, P-D-680, Type III, is potentially dangerous to personnel and equipment. Eye and skin protection is required. Avoid repeated and prolonged skin contact. Wash immediately after exposure. Do not use near open flame or excessive heat. Use only in area with good ventilation.

(1) Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

CAUTION

Do not use crocus cloth to clean aluminum parts. Crocus cloth contains iron oxide which causes rapid corrosion of aluminum.

(2) Dry parts with clean wiping rag.

Refer to Figure 3-12.

(3) Inspect inducer (8) for cracks, missing vanes and corrosion.

(4) Inspect the labyrinth grooves on the upper and lower wear ring surfaces of the impeller (12). If either of these surfaces has worn smooth, the impeller should be replaced.

(5) Inspect suction manifold (6) and clutch housing (7) for cracks, corrosion, stripped threads or excessive wear and worn or damaged bearing seats. Inspect wear ring for wear. Tolerance differences between the inside diameter of the wear ring on suction manifold and outside diameter of the wear ringing on impeller should not exceed 0.024 inches for 200 GPM or 0.026 inches for 600 GPM.

(6) Inspect all attaching hardware (bolts, nuts, screws and studs) for stripped or damaged threads, cracks and burrs.

Refer to Figure 3-13.

(7) Inspect clutch carrier (10) for cracks, corrosion and worn or damaged bearing seats.

(8) Inspect bearing retainers (9 and 23) for cracks, corrosion and excessive wear.

(9) Inspect clutch armature (17) and carrier armature (18) for cracks, excessive wear and glazing.

(10) Inspect hub armature (20) for cracked or broken splines and corrosion.

(11) Inspect shaft (2) for cracks, signs of wear, damage, worn keyways or discoloration.

(12) Inspect all attaching hardware (bolts, nuts and inserts) for stripped threads, cracks or burrs.

3-19. PUMP AND CLUTCH (600 GPM FUEL PUMP) REPAIR - continued.

Refer to Figure 3-14.

(13) Inspect rotor assembly (5) for wear, glazed friction surfaces and corrosion.

(14) Inspect field clutch (8) for damaged insulation, exposed windings and damaged terminal studs.

(15) Inspect field retainer and bearing plates (8 and 14) for cracks, corrosion and excessive wear.

(16) Inspect clutch housing (10) for cracks, corrosion and worn or damaged bearing seats.

(17) Inspect all attaching hardware (bolts, nuts and inserts) for stripped threads, cracks or burrs.

c. ASSEMBLY. Refer to Figure 3-15.

(1) Use formula A - B - C = D to determine thickness of shim stack number one.

(a) Measure thickness of bearing spacer (2) to determine dimension A.

(b) Measure the inner lip (3) on clutch housing (4) to determine dimension B and subtract from dimension A.

(c) Subtract dimension C (0.050 inch) from dimension A.

(d) Dimension D is the required thickness of shim stack number one (1) based on the above.

(e) Example of formula: 0.400 - 0.285 - 0.050 = 0.067

(2) Select shim stack number one (1).

NOTE

One or more shims may be used to obtain dimension D above. Shim is made up of laminated layers and thickness of each layer is 0.002.

(a) Select appropriate number of shims (1) to obtain dimension D above.

(b) If necessary, peel appropriate number of laminated layers (5) from shim to achieve dimension D above.

(3) Install outer bearing (6) in clutch housing (4).

(4) Install bearing retainer (7) with bolts (8) on clutch housing (4).

(5) Press rotor shaft (9) through outer bearing (6) until fully seated in clutch housing (4).

3-19. PUMP AND CLUTCH (600 GPM FUEL PUMP) REPAIR - continued.

CAUTION

To prevent damage to bearing, support inner race on bearing when pressing shaft through bearing.

(6) Install bearing spacer (2), shim stack number one (1) and stack and spring (wavy) washer (10) in clutch housing (4).

(7) Press inner bearing (11) onto shaft (9) and on inner lip (3) in clutch housing (4) until fully seated.

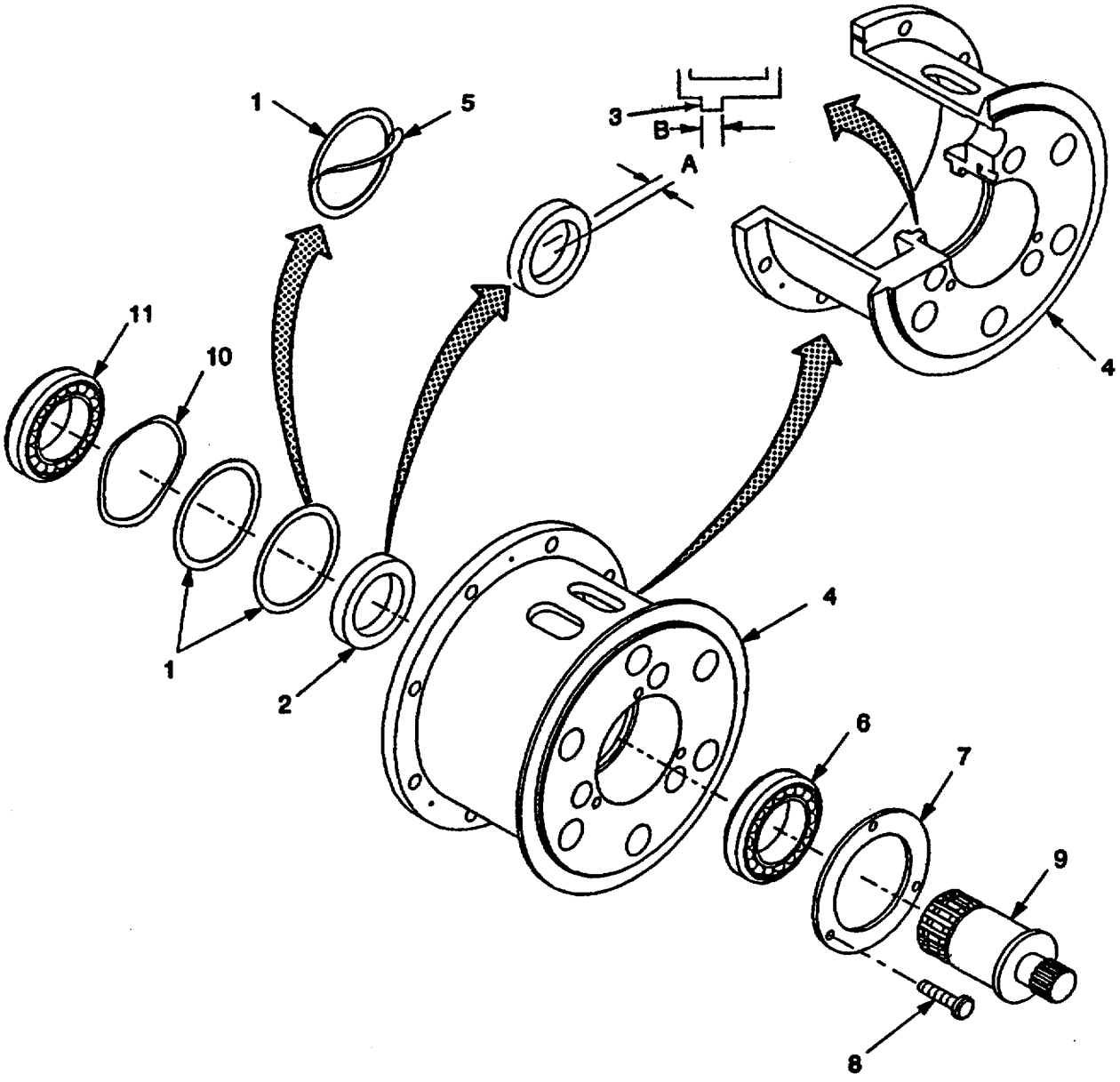


Figure 3-15. Selecting Shim Stack Number One (600 GPM Fuel Pump)

3-19. PUMP AND CLUTCH (600 GPM FUEL PUMP) REPAIR - continued.

Refer to Figure 3-16.

(8) Use formula E - F - G - H = I to determine thickness of shim stack number two (1).

(a) Measure depth from top edge of clutch housing (2) to bottom of housing to determine dimension E.

(b) Position field clutch (4) in housing (2) with winding side facing out and terminals through slots. Assemble field retainer (3) on field clutch (4) with screws (5).

(c) Position clutch rotor (6) on field clutch (4) and install on shaft (7). Install washer (9) and nut (10) on shaft (9) and torque to 420 inch-pounds.

(d) Measure distance from top edge of housing to top of clutch rotor to determine dimension F. Subtract dimension F from dimension E.

(e) Remove nut (10), washer (9) and clutch rotor (6) from shaft (7).

(f) Remove screw (5), field clutch (4) and field retainer (3).

(g) Position clutch rotor (6) on field clutch (4) and place on flat surface. Make two measurements to get an average measurement for dimension G.

(h) Subtract dimension H from dimension E.

(i) Dimension I is the required thickness of shim stack number two (1) based on the above.

(j) Example of formula: 3.120 - 1.586 - 1.450 - 0.015 = 0.069

(9) Select shim stack number two (1).

NOTE

One or more shims may be used to obtain dimension I above. Shim is made up of laminated layers and thickness of each layer is 0.002.

(a) Select appropriate number of shims (1) to obtain dimension I above.

(b) If necessary, peel appropriate number of laminated layers (8) from shim to achieve dimension I above.

(10) Install shim stack number two (1) and field clutch (4) with winding side facing out and terminals through slots in housing (2).

(11) Install field retainer (3) on field clutch (4) with screws (5).

3-19. PUMP AND CLUTCH (600 GPM FUEL PUMP) REPAIR - continued.

(12) Install clutch rotor (6), tab washer (9) and nut (10) on shaft (7) in housing (2).

CAUTION
Equipment may be damaged if 40 inch-pounds (480 lb-in) of torque is exceeded.

(13) Using torque wrench and special clutch tool, tighten nut (10) to 35 to 38 inch-pounds (410 to 430 lb-in); then loosen nut and retorque to 30 inch-pounds (360 lb-in).

(14) Continue to tighten nut (10) until a tab on tab washer (9) aligns with a groove on nut (10) and bend tab on tab washer (9) into groove on nut (10).

(15) Rotate clutch rotor (6) by hand. Clutch rotor should turn freely without binding.

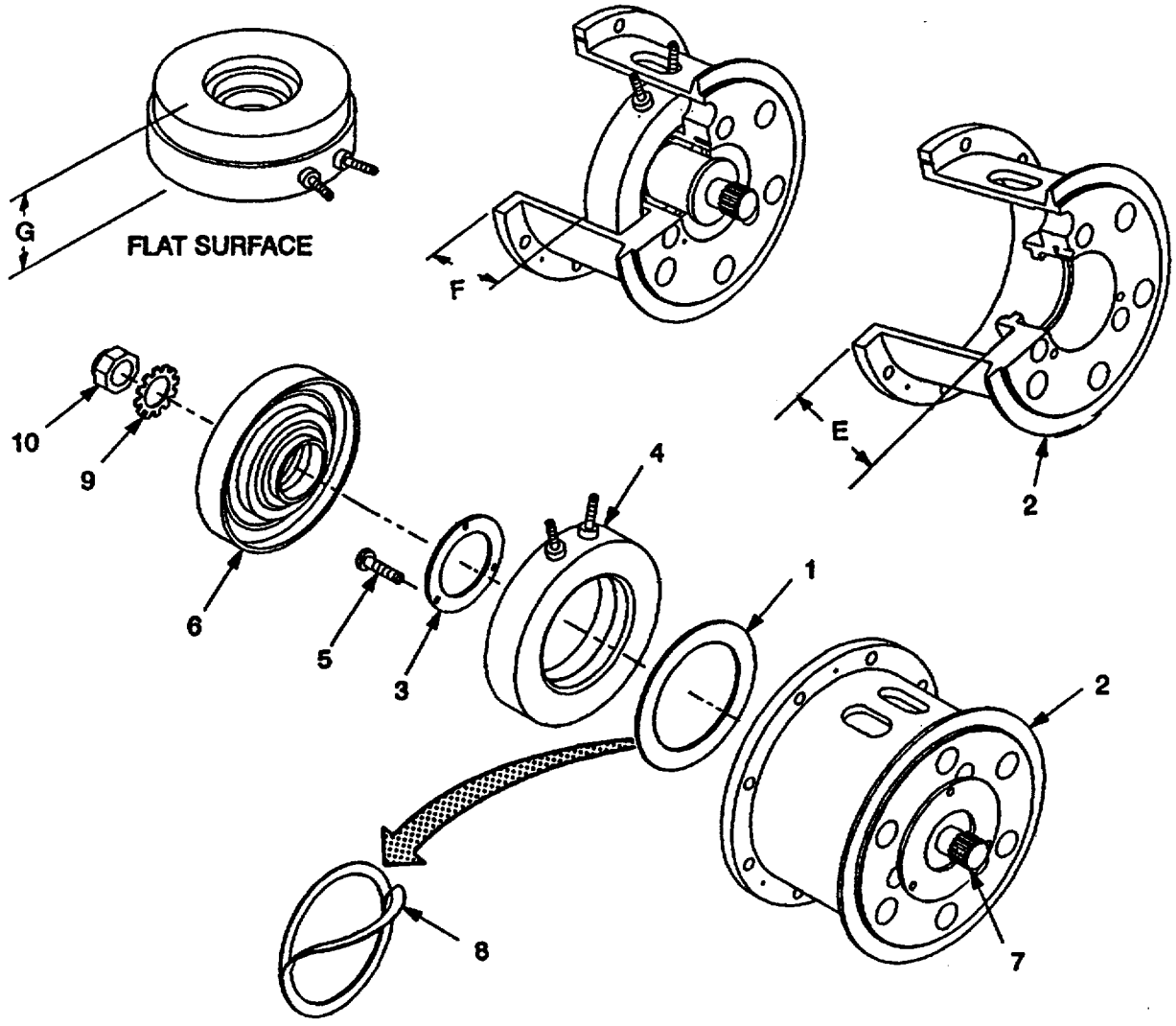


Figure 3-16. Selecting Shim Stack Number Two (600 GPM Fuel Pump)

3-19. PUMP AND CLUTCH (600 GPM FUEL PUMP) REPAIR - continued.

Refer to Figure 3-17.

(17) Use formula K + L - J - M = N to determine thickness of shim stack number three (1).

(a) Measure shaft (3) to determine dimension K.

(b) Measure bearing carrier (2) to determine dimension J.

(c) Measure bearing carrier (2) to determine dimension L(L1 - L2 = L). Determine dimension L by subtracting L1 from L2.

(d) Add dimensions K and L.

(e) Subtract dimension J and M from sum of dimension K and L. Dimension M is a constant.).700.

(f) Dimension N is the required thickness of shim stack number three (1) based on the above.

(g) Example of formula: 2.320 + .220 - 1.820 - 0.700 = .020

(18) Select shim stack number three (1).

NOTE

One or more shims may be used to obtain dimension N above. Shim is made up of laminated layers and thickness of each layer is 0.002.

(a) Select appropriate number of shims (1) to obtain dimension N above.

(b) If necessary, peel appropriate number of laminated layers (4) from shim to achieve dimension N above.

(19) Apply sealing compound to outside seal (5) and pack grease on back of seal seat.

(20) Install seal (5) in bearing carrier (2) and pack grease in front of seal.

(21) Install shim stack number three (1), bearing (6) and bearing retainer (7) in bearing carrier (2). Secure retainer (7) with three screws (8).

(22) Support inner race of bearing (6) and press shaft (3) through bearing.

(23) Install retaining ring (9) on hub (10).

3-9. PUMP AND CLUTCH (600 GPM FUEL PUMP) REPAIR -continued.

CAUTION

To prevent premature failure of pump and clutch, beveled end of hub must face away from retainer plate.

Refer to Figure 3-14.

(24) Position spring washer (11), washer (12), hub (10), carrier (13) and armature (14) on retainer plate (15). Secure components to retainer plate (15) with four screws (16) and nuts (17).

(25) Install key (18) on shaft (3).

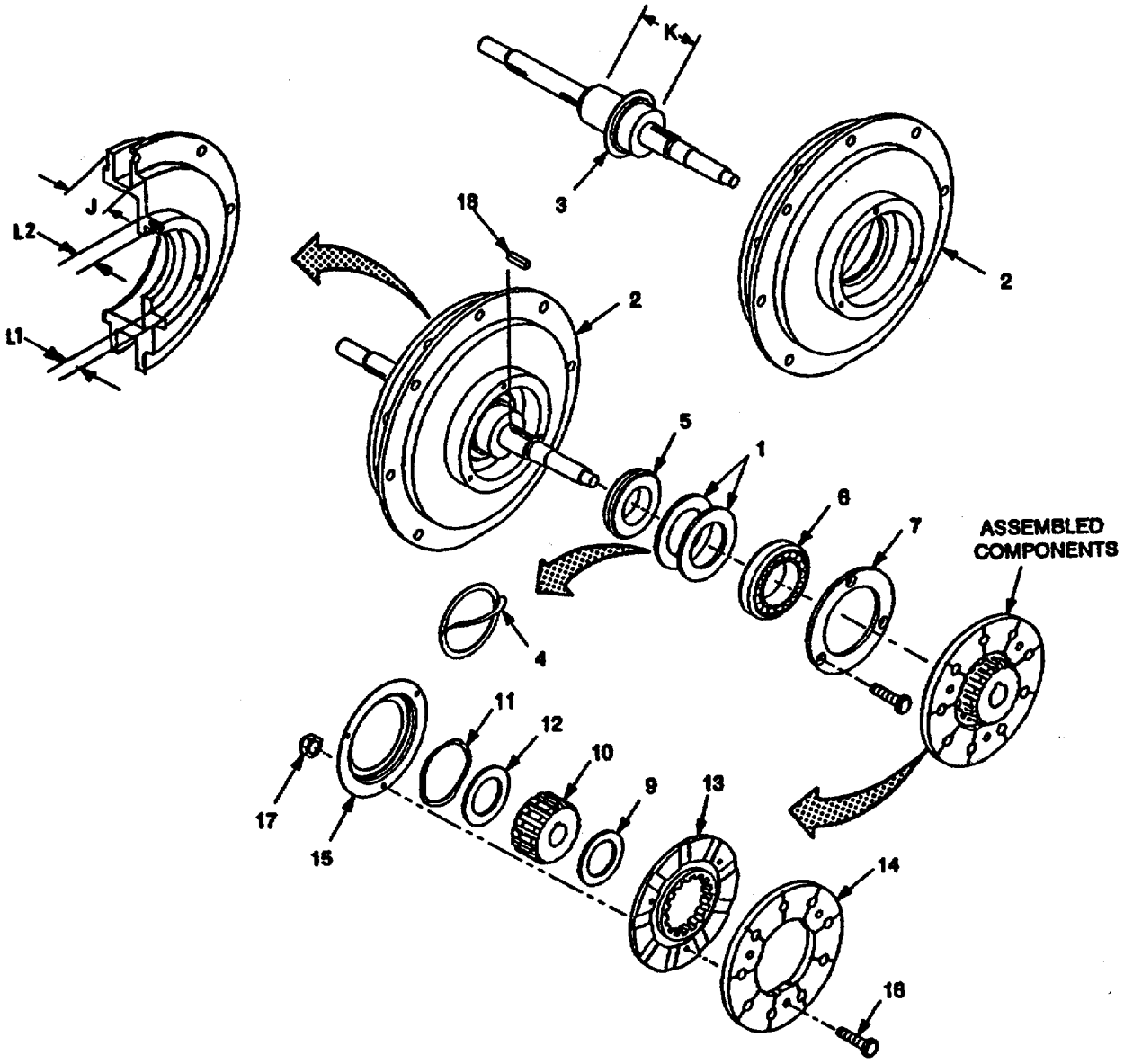


Figure 3-17. Selecting Shim Stack Number Three (600 GPM Fuel Pump)

3-19. PUMP AND CLUTCH (600 GPM FUEL PUMP) REPAIR - continued.

Refer to Figure 3-18.

(26) Use formula P - F - R = S to determine thickness of shim stack number four (1).

(a) Install assembled components (2) on shaft (3).

(b) Install washer (4) and nut (5) on shaft (3). Torque nut to 180 lb-in.

(c) Measure distance from flange of bearing carrier (6) to top edge of assembled components (2) to determine dimension P.

(d) Subtract dimensions P from dimension F. Dimension F was determined in para 3-19(.8)(d) shim stack number two procedures.

(e) Subtract dimension R. Dimension R is a constant. R = 0.040.

(f) Dimension S is the required thickness of shim stack number four (1) based on the above.

(g) Example of formula: 1.690 - 1.610 - 0.040 = 0.040 (27) Select shim stack number four (1).

NOTE

One or more shims may be used to obtain dimension S above. Shim is made up of laminated layers and thickness of each layer is 0.002.

(a) Select appropriate number of shims (1) to obtain dimension S above.

(b) If necessary, peel appropriate number of laminated layers (7) from shim to achieve dimension S above.

(28) Remove nut (5), washer (4) and assembled components (2) from shaft (3).

(29) Install shim stack number four (1), assembled components (2), washer (4) and nut (5) on shaft (3). Torque nut to 171 - 188 inches-pounds.

(30) Install assembled components in clutch housing (8). Gap may be verified by measuring between rotor (9) and armature (10) thru slot on clutch housing. Gap should be between 0.035 to 0.045. If not, adjust last shim stack number four (1).

3-19. PUMP AND CLUTCH (600 GPM FUEL PUMP) REPAIR - continued.

(31) Remove assembled components from clutch housing (8) and press bearing (11) on shaft (3).

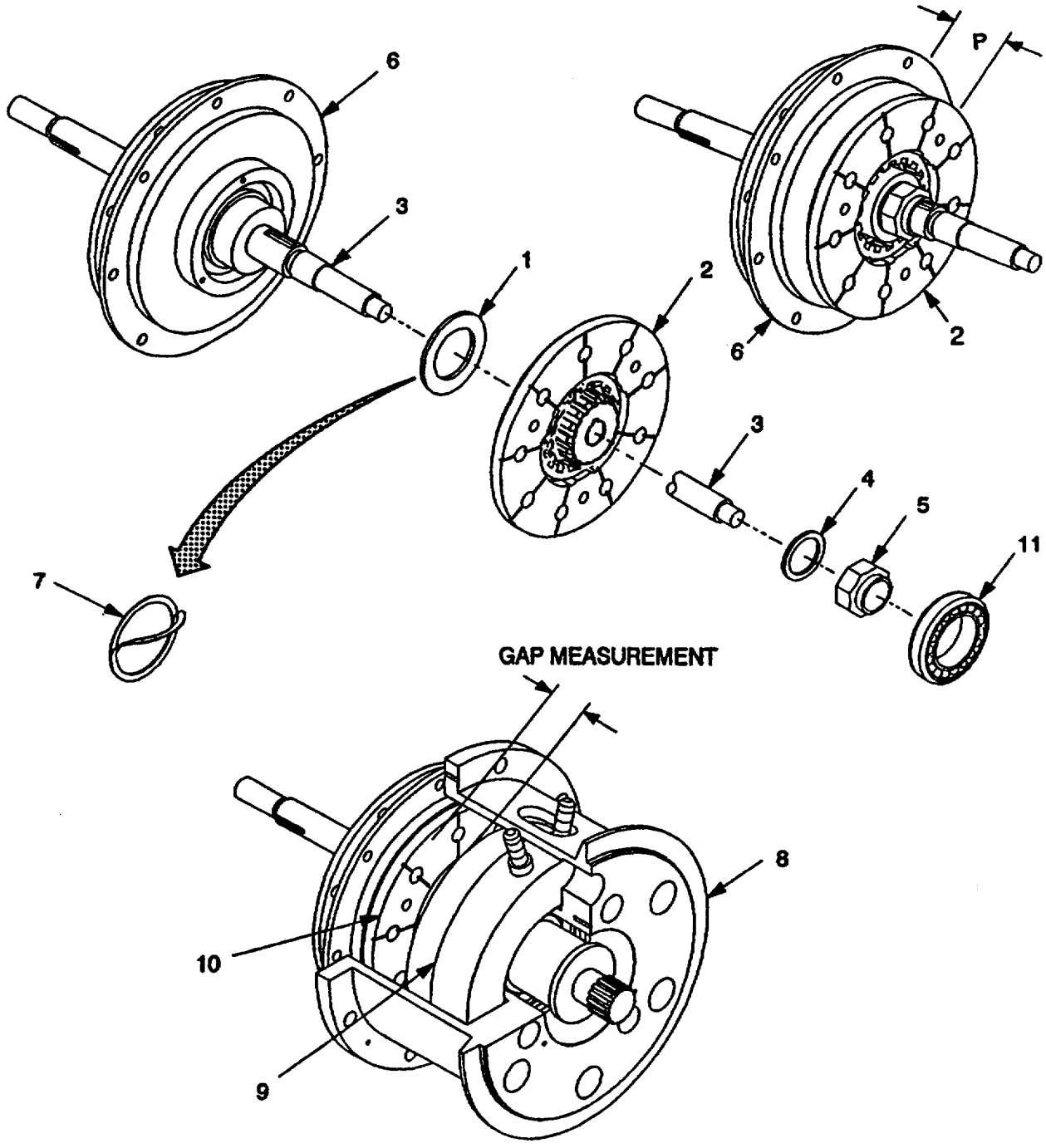


Figure 3-18. Selecting Shim Stack Number Four (600 GPM Fuel Pump)

3-19. PUMP AND CLUTCH (600 GPM FUEL PUMP) REPAIR - continued.

Refer to Figure 3-18.

(32) Use formula T - U - V = W to determine thickness of shim stack number five (1).

(a) Measure distance from flange of clutch housing (2) to bottom (inside) of rotor shaft (3) to determine dimension T.

(b) Measure distance from flange on bearing carrier (4) to top of bearing (5) to determine dimension U. Subtract dimension U from dimension T.

(c) Subtract dimension V. Dimension V is a constant. V = 0.080.

(d) Dimension W is the required thickness of shim stack number five (1) based on the above.

(e) Example of formula: 4.790 - 4.670 - .080 = 0.040

(33) Select shim stack number five (1).

NOTE

One or more shims may be used to obtain dimension S above. Shim is made up of laminated layers and thickness of each layer is 0.002.

(a) Select appropriate number of shims (1) to obtain dimension W above.

(b) If necessary, peel appropriate number of laminated layers (6) from shim to achieve dimension W above.

(34) Install shim stack number five (1) and wavy washer (7) inside of rotor shaft (3).

(35) Position clutch housing (2) on bearing carrier (4) with drain port (8) of bearing carrier down and slots (9) on clutch housing up.

(36) Install eight bolts (10), flat washers (11) and nuts (12). Torque nuts to 25 - 28 lb-ft.

3-19. PUMP AND CLUTCH (600 GPM FUEL PUMP) REPAIR - continued.

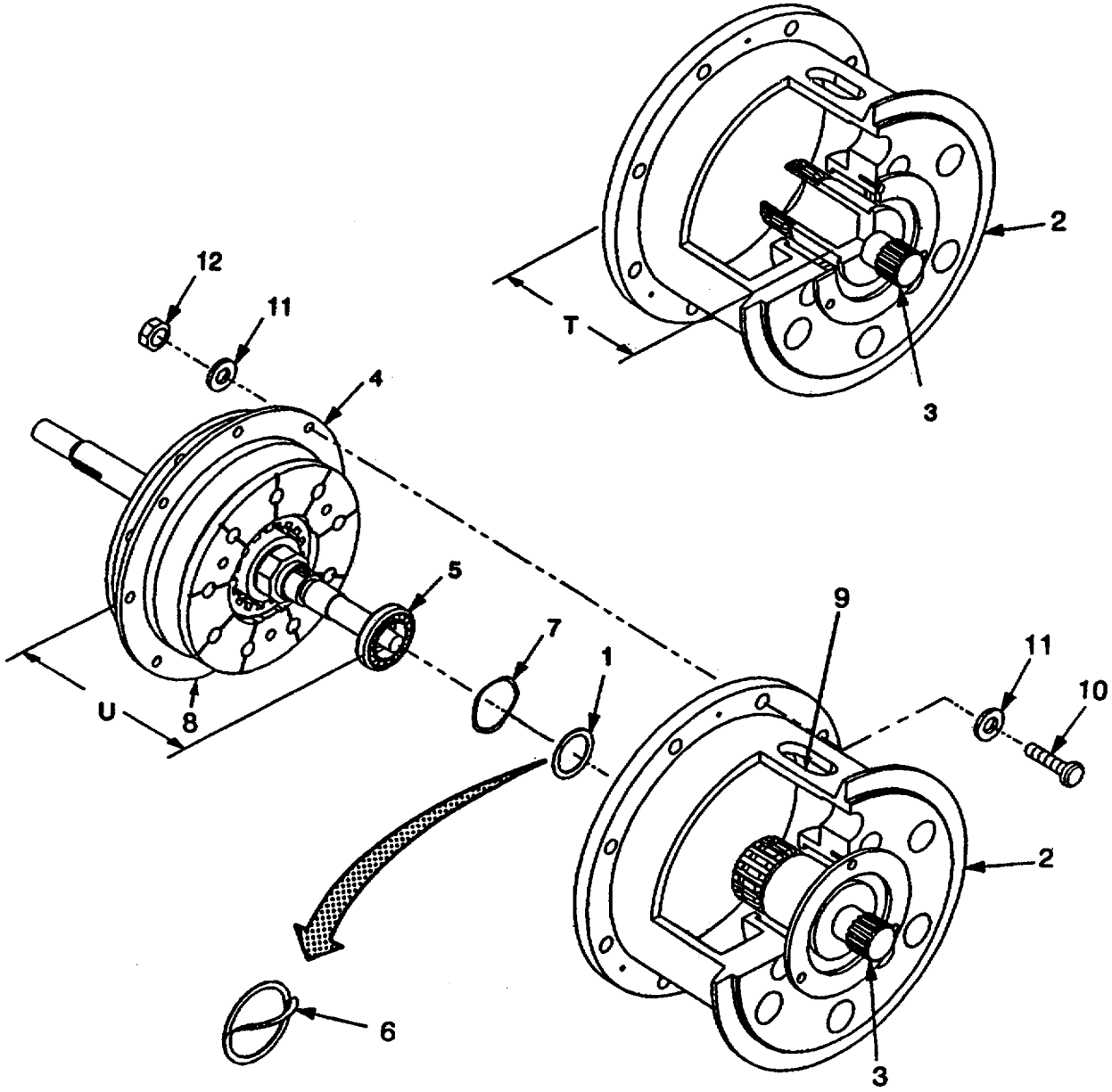


Figure 3-19. Selecting Shim Stack Number Five (600 GPM Fuel Pump)

3-19. PUMP AND CLUTCH (600 GPM FUEL PUMP) REPAIR - continued.

Refer to Figure 3-20.

NOTE

Insure drain ports on diffuser housing and bearing carrier align and slots are located on top position of the clutch housing.

(37) Align shaft (1) with diffuser housing (2) and install diffuser housing (2) with discharge port (3) pointing up and slots (5) pointing up.

(38) Install eight washers (6) and nuts (7) on studs (8). Torque nuts 120 to 130 lb-in.

(39) Install bushing (9) and elbow (10) in drain port (4) on bearing carrier (3) as noted during removal.

(40) Install carbon seal (11) in diffuser housing (2).

(41) Lubricate packing with grease in seal (12) and install on shaft (1).

(42) Install key (13) on shaft (1).

(43) Install impeller (14) with deep open end pointing out (toward inlet port).

(44) Lubricate preformed packing (15) and install packing on suction manifold (16).

(45) Position suction manifold (16) in diffuser housing (2) with discharge port aligned. Install eight studs (17) (if removed), washers (18) and nuts (19). Torque nuts 120 - 130 lb-in.

(46) Install spacer (20), large end first, on shaft (1).

(47) Install key (21) in keyway on shaft (1).

(48) Install inducer (22) on shaft (2).

(49) Install flatwasher (23) and nut (24) on shaft (2). Using allen wrench and crowsfoot wrench, torque nut 220 - 245 lb-in.

(50) Manually rotate shaft (1) to ensure free operation.

3-19. PUMP AND CLUTCH (600 GPM FUEL PUMP) Repair - continued.

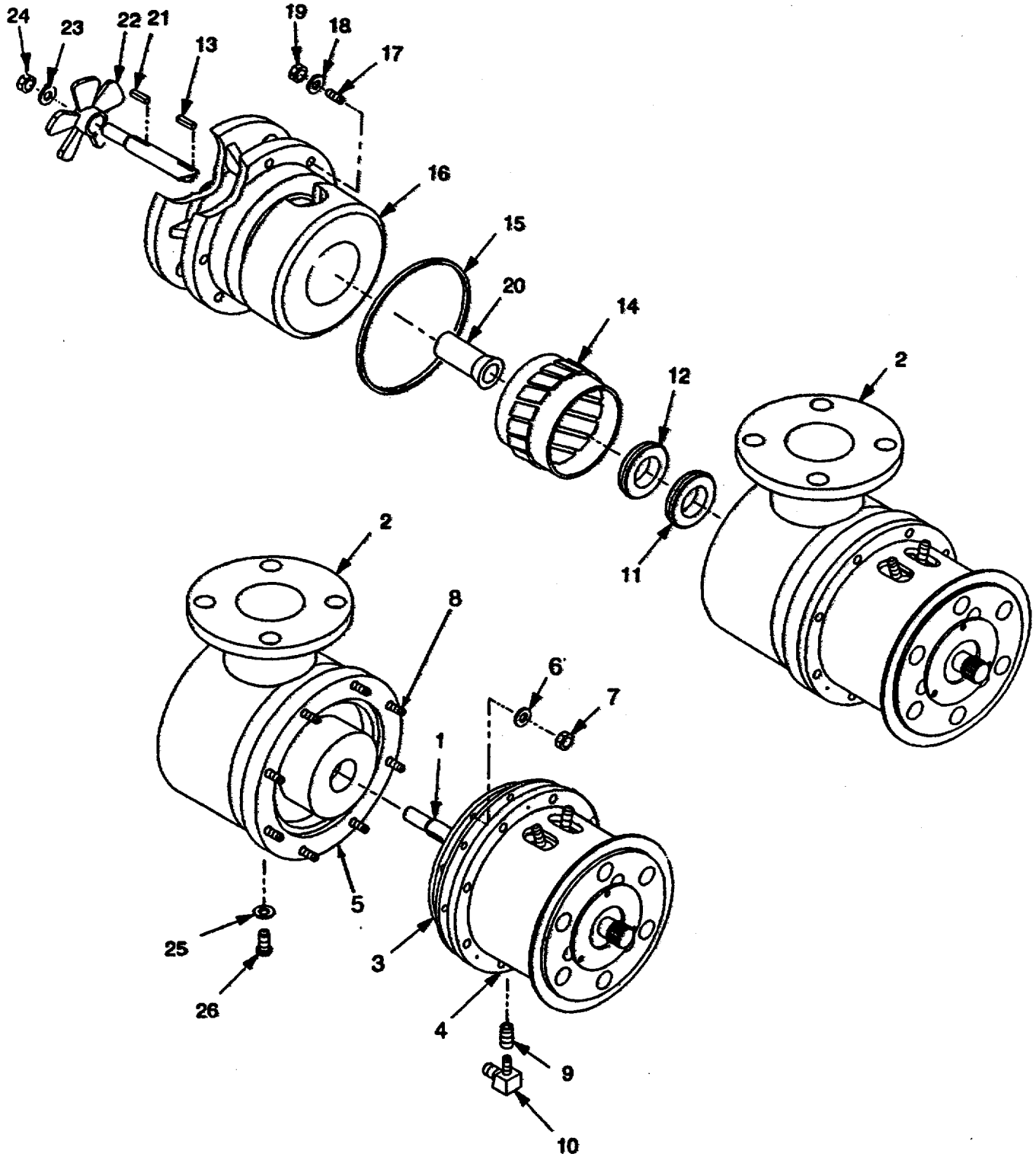


Figure 3-20. Pump and Clutch (600 GPM Fuel Pump) Assembly

3-20. PUMP AND CLUTCH (200 GPM FUEL PUMP) REPAIR.

This task covers: a. Disassembly b. Repair c. Assembly

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Tool Kit, Screw Thread Insert (App B, Sect III, Item 3)
Special Clutch Cloth (App B, Sect III, Item 10)
Torque Wrench 0-300 ft-lbs (App B, Sect III, Item 3)
Micrometer (App B, Sect III, Item 3)
Caliper (App B, Sect III, Item 3)
Depth Gauge (App B, Sect III, Item 3)
Tool Kit Thread Insert (App B, Sect III, Item 3)
Crows Foot (App B, Sect III, Item 3)
Bearing (App F, Item 82)

Materials/Parts
Grease (App E, Item 11)
Detergent (App E, Item 1)
Drycleaning Solvent P-D-680 (App E, Item 8)
Rags (App E, Item 2)
Tape, Antiseize (App E, Item 6)
Gasket (App F, Item 86)
Carbon Seal (App F, Item 51)
Preformed Packings (App F, Items 47 and 75)
Safety Wire (App E, Item 15)
Shims (App F, Items 29, 78, 80, 81, 87, 88 and 89)
Nut, Self-Locking (App F, Items 30, 38, 84, 92 and 99)
Wear Ring (App F, Items 40 and 41)

Equipment Condition
Pump and Clutch removed (Para 2-18)

a. DISASSEMBLY. Refer to Figure 3-21.

(1) Using crows foot wrench and allen wrench, remove nut (1) and washer (2) from pump shaft (3).

(2) Remove inducer (4) and key (5) from pump shaft (3).

(3) Remove nuts (6) and washers (7). Studs (8) may come out with nuts and washer.

(4) Separate suction manifold (9) from pump case (10).

(5) Remove gasket (11) from suction manifold (9). Discard gasket.

(6) Remove sleeve (12), impeller (13), key (14), seal (15), carbon seal (16) from shaft (3) in pump case (10). Discard seals.

(7) Cut and remove safety wire (17) from plug (18) and pump case (10).

(8) Remove plug (18) and preformed packing (19) from pump case (10). Discard preformed packing.

(9) Remove nuts (20), flat washers (21), bolts (22) and flat washers (23); then slide pump case (10) off pump shaft (3).

3-20. PUMP AND CLUTCH (200 GPM FUEL PUMP) REPAIR - continued.

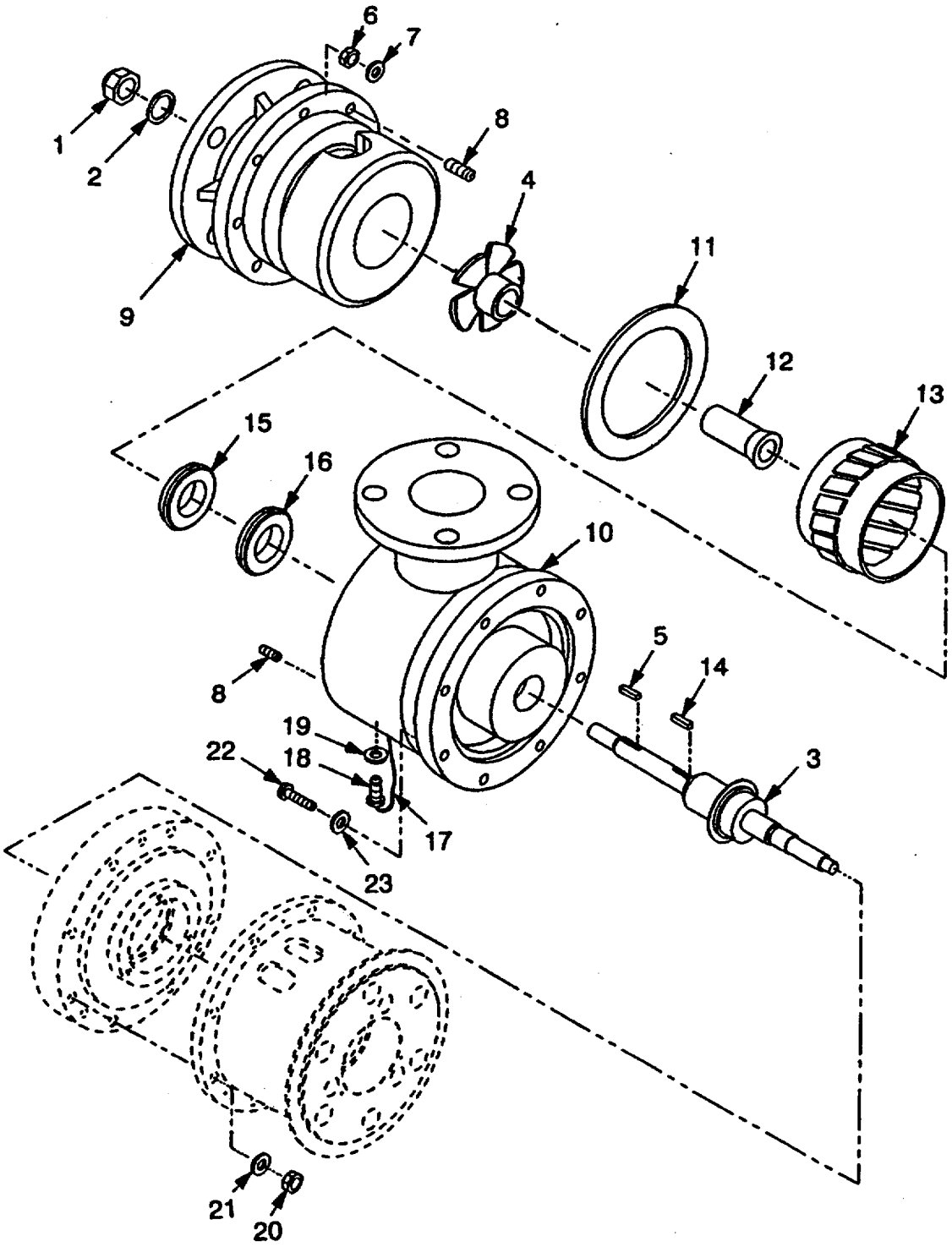


Figure 3-21. Pump and Clutch (200 GPM Fuel Pump) Disassembly

3-20. PUMP AND CLUTCH (200 GPM FUEL PUMP) REPAIR - continued.

Refer to Figure 3-22.

(10) Remove elbow (1) and bushing (2) from bearing carrier (3).

(11) Remove bolts (4) and flat washers (5) from bearing carrier (3).

(12) Separate bearing carrier (3) (with attached clutch components) from clutch housing (6).

(13) Remove bearing (7) from pump shaft (8).

(14) Remove nut (9) and flat washer (10) from pump shaft (8).

(15) Remove armature hub (11), key (12) and shim stack (13) from pump shaft (8).

(16) Remove nuts (14), screws (15) and separate clutch armature (16), clutch carrier (17), flat washer (18), spring tension washer (19) and retainer plate (20).

(17) Remove retaining ring (21) from armature hub (11).

(18) Press out pump shaft (8) from bearing carrier (3).

(19) Remove screws (22) and bearing retainer plate (23) from bearing carrier (3).

(20) Remove bearing (24), shim stack (25) and spring tension washer (26) from bearing carrier (3).

(21) Remove threaded inserts (27) from bearing carrier (3).

(22) Remove spring tension washer (28) and shim stacks (29) from clutch rotor (30).

(23) Disengage nut key (31) and remove bearing nut (32) and key nut.

(24) Press out clutch rotor (30) from clutch housing (6).

(25) Remove screws (33), flat washers (34), clutch field (35) and shim stack (36) from clutch housing (6).

(26) Remove screws (37) and flat washers (38) from clutch field (35).

(27) Remove screws (39), retainer plate (40), bearing (41), spacer (42), bearing (43), shim stack (44) and spring tension washer (45) from clutch housing (6).

(28) Remove threaded inserts (46 and 47) from clutch housing (6).

3-20. PUMP AND CLUTCH (200 GPM FUEL PUMP) REPAIR - continued.

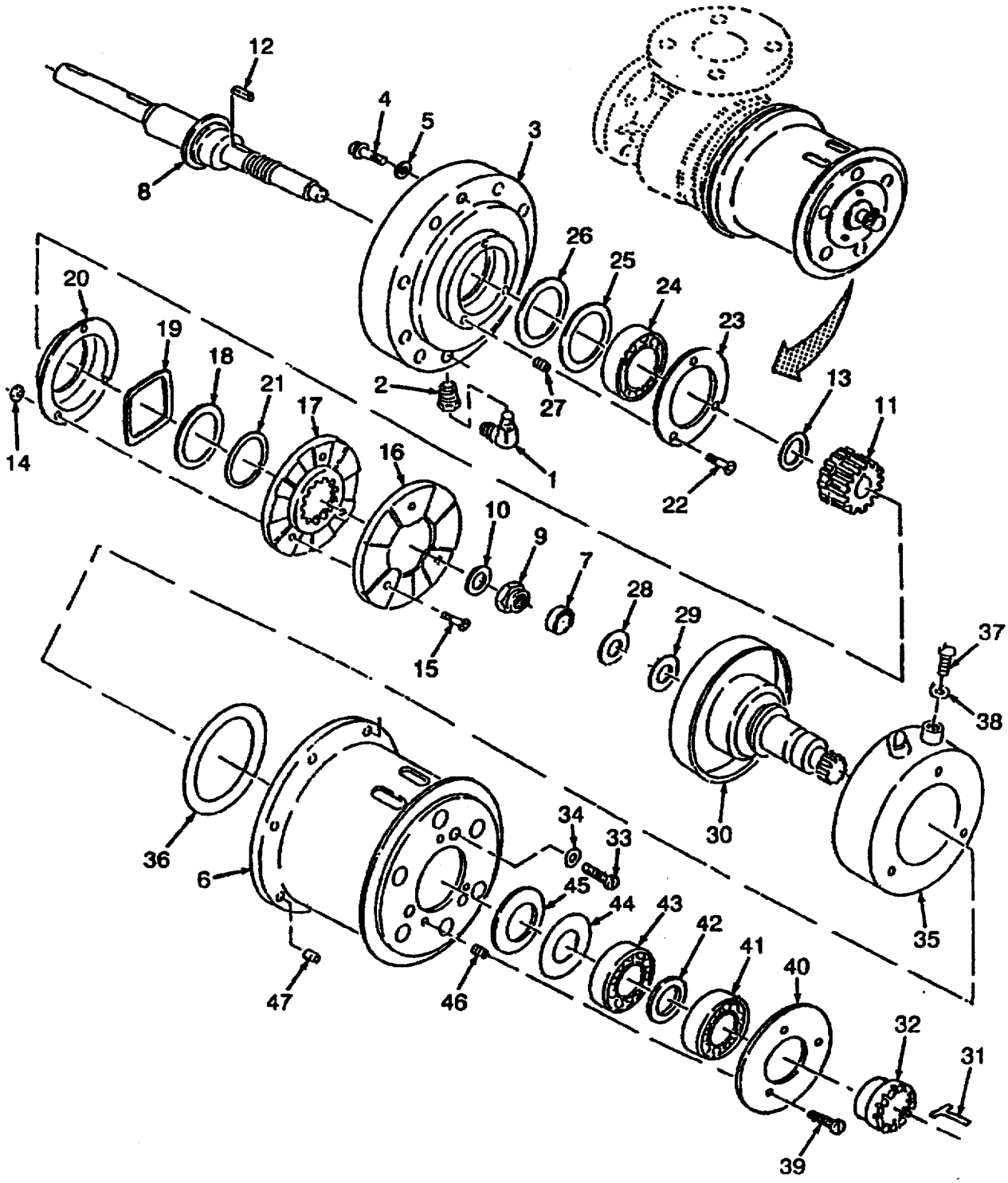


Figure 3-22. Clutch Carrier and Clutch Components (200 GPM Fuel Pump) Disassembly

3-20. PUMP AND CLUTCH (200 GPM FUEL PUMP) REPAIR - continued.

b. REPAIR.

WARNING

Dry cleaning solvent, P-D-680, Type III, is potentially dangerous to personnel and equipment. Eye and skin protection is required. Avoid repeated and prolonged skin contact. Wash immediately after exposure. Do not use near open flame or excessive heat. Use only in area with good ventilation.

(1) Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

CAUTION

Do not use crocus cloth to clean aluminum parts. Crocus cloth contains iron oxide which causes rapid corrosion of aluminum.

(2) Dry parts with clean wiping rag.

Refer to Figure 3-21.

(3) Inspect inducer (4) for cracks, missing vanes and corrosion.

(4) Inspect the labyrinth grooves on the upper and lower wear ring surfaces of the impeller (13). If either of these surfaces has worn smooth, the impeller should be replaced.

(5) Inspect suction manifold (9) and pump case (10) for cracks, corrosion, stripped threads or excessive wear and worn or damaged bearing seats. Inspect wear ring for wear. Tolerance between inside diameter of wear ring on suction manifold and wear ring on impeller ring should not exceed 0.024 inches.

(6) Inspect all attaching hardware (bolts, nuts, screws and studs) for stripped or damaged threads, cracks and burrs.

(7) Replace gasket (11) and preformed packing (19).

(8) Replace seal (15) and seal (16) with seal assembly.

Refer to Figure 3-22.

(9) Inspect bearing carrier (3) for cracks, corrosion and worn or damaged bearing seats.

(10) Inspect bearing retainers (23 and 40) for cracks, corrosion and excessive wear.

(11) Inspect clutch armature (16) and clutch carrier (17) for cracks, excessive wear and glazing.

(12) Inspect hub armature (11) for cracked or broken splines and corrosion.

3-20. PUMP AND CLUTCH (200 GPM FUEL PUMP) REPAIR - continued.

(13) Inspect shaft (8) for cracks, signs of wear, damage, worn keyways or discoloration.

(14) Inspect all attaching hardware (bolts, nuts and inserts) for stripped threads, cracks or burrs.

(15) Inspect rotor assembly (30) for wear, glazed friction surfaces and corrosion.

(16) Inspect field clutch (35) for damaged insulation, exposed windings and damaged terminal studs.

(17) Replace shim stacks (13, 25, 29, 36 and 44).

c. ASSEMBLY. Refer to Figure 3-23.

(1) Determine and record the following measurements:

(a) Measure distance on clutch housing (1) to determine dimension A.

(b) Measure thickness of bearing (2) to determine dimension B.

(c) Measure thickness of spacer (3) to determine dimension C.

(d) Measure thickness of inner lip (4) on clutch housing (1) to determine dimension D. Record for use later during shimming procedures.

(2) Use formula: A - (B x 2) - C - E = F to determine thickness of shim stack number one (5).

(a) Use dimension B measurement from above and multiply by two; then subtract product from dimension A.

(b) Subtract dimension C.

(c) Subtract dimension E. Dimension E is a constant. E = 0.050.

(d) Dimension F is the required thickness of shim stack number one (1) based on the above. Record for use later during shimming procedures.

(e) Example of formula: 1.318 - 1.180 (.590 x 2) - .048 - .050 = 0.040

(3) Select shim stack number one (5).

NOTE

One or more shims may be used to obtain dimension F above. Shims are made up of laminated layers and thickness of each layer is 0.002.

(a) Select appropriate number of shims to obtain dimension F above.

3-20. PUMP AND CLUTCH (200 GPM FUEL PUMP) REPAIR - continued.

(b) If necessary, peel appropriate number of laminated layers (6) from shim to achieve dimension F above.

(4) Install shim stock number one (5), spring washer (7), shim (5) and bearing (2) in clutch housing (1).

(5) Position spacer (3) on bearing (2) and install bearing (8) in clutch housing (1).

(6) Install bearing retainer plate (9) with screws (10).

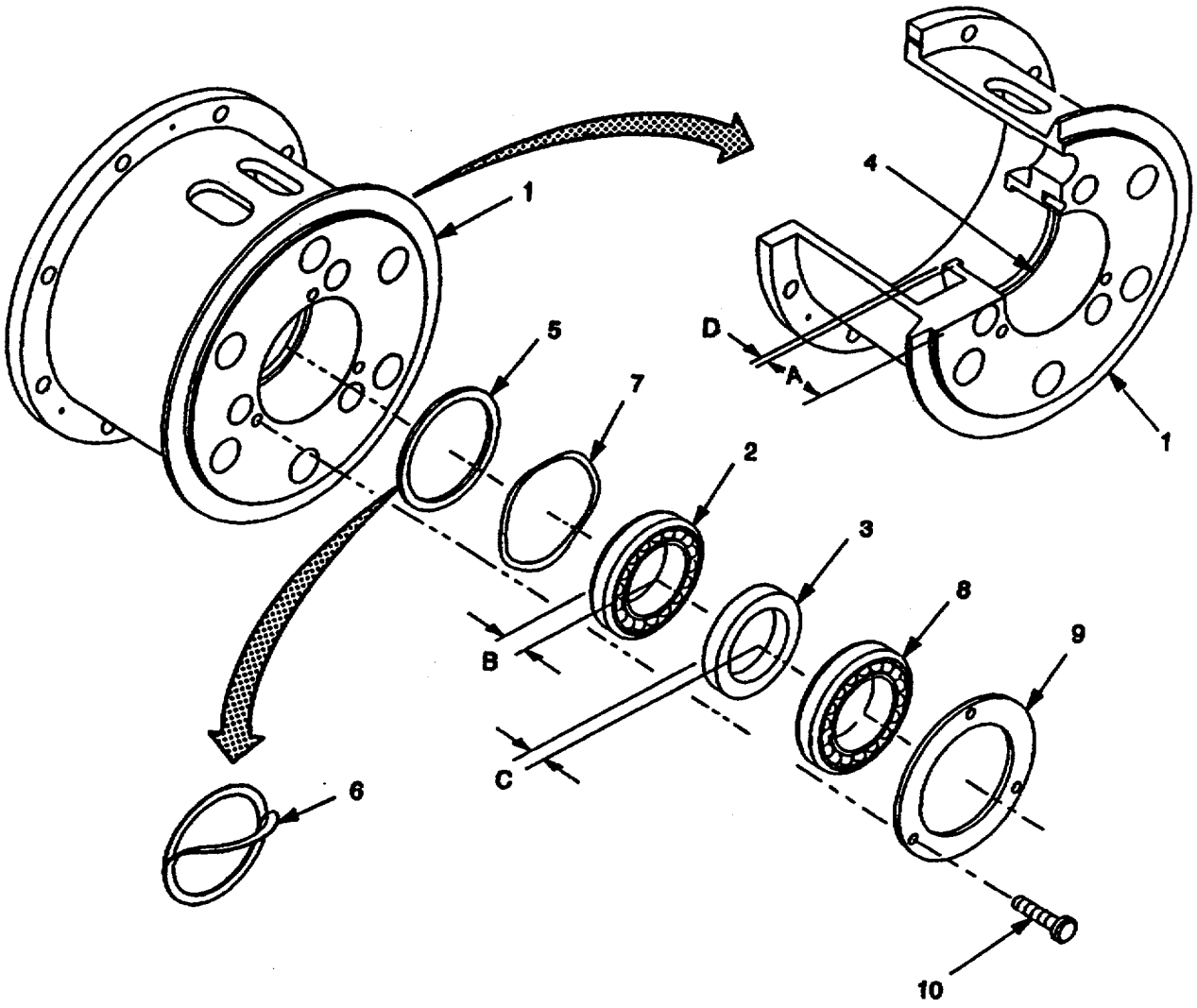


Figure 3-23. Selecting Shim Stack Number One (200 GPM Fuel Pump)

3-20. PUMP AND CLUTCH (200 GPM FUEL PUMP) REPAIR - continued

Refer to Figure 3-24.

(7) Use formula G - H - D + I - J - K - L = M to determine thickness of shim stack number two (1).

(a) Measure clutch rotor set (2) to determine dimension G.

(b) Subtract dimension H from dimension G. Dimension H is same as dimension F from shim stack number one.

(c) Subtract dimension D as recorded earlier in para 3c(d).

(d) Measure clutch housing (3) to determine dimension I. Add dimension I.

(e) Install clutch rotor set (2) in field clutch (4). Measure from surface of clutch rotor set (2) to edge of field clutch (4) to determine dimension J. Subtract dimension J.

(f) Measure field clutch (4) to determine dimension K Subtract dimension K.

(g) Subtract dimension L. Dimension L is constant. L = 0.050.

(h) Dimension M is the required thickness of shim stack number two (1) based on the above.

Example of formula: 1.300 - 0.090 - .162 + 0.655 - 0.188 - 1.475 - 0.050 = .040

(8) Select shim stack number two (1).

NOTE

Three or more shims may be used to obtain dimension M above. Shims are made up of laminated layers and thickness of each layer is 0.002.

(a) Select appropriate number of shims (1) to obtain dimension M above.

(b) If necessary, peel appropriate number of laminated layers (5) from shim to achieve dimension M above.

NOTE

Insure electrical connections on field clutch are aligned with slots on clutch housing.

(9) Install required shim stack number two (1), field clutch (4) in clutch housing (3) and secure with screws (6) and flat washers (7).

(10) Press clutch rotor set (2) through bearings in clutch housing (3) and install nut (8).

3-20. PUMP AND CLUTCH (200 GPM FUEL PUMP) REPAIR - continued.

CAUTION
Do not exceed 480 pounds/inches.

(11) Torque nut (8) to 420 inch-pounds, then loosen nut and re-torque to 360 inch-pounds.

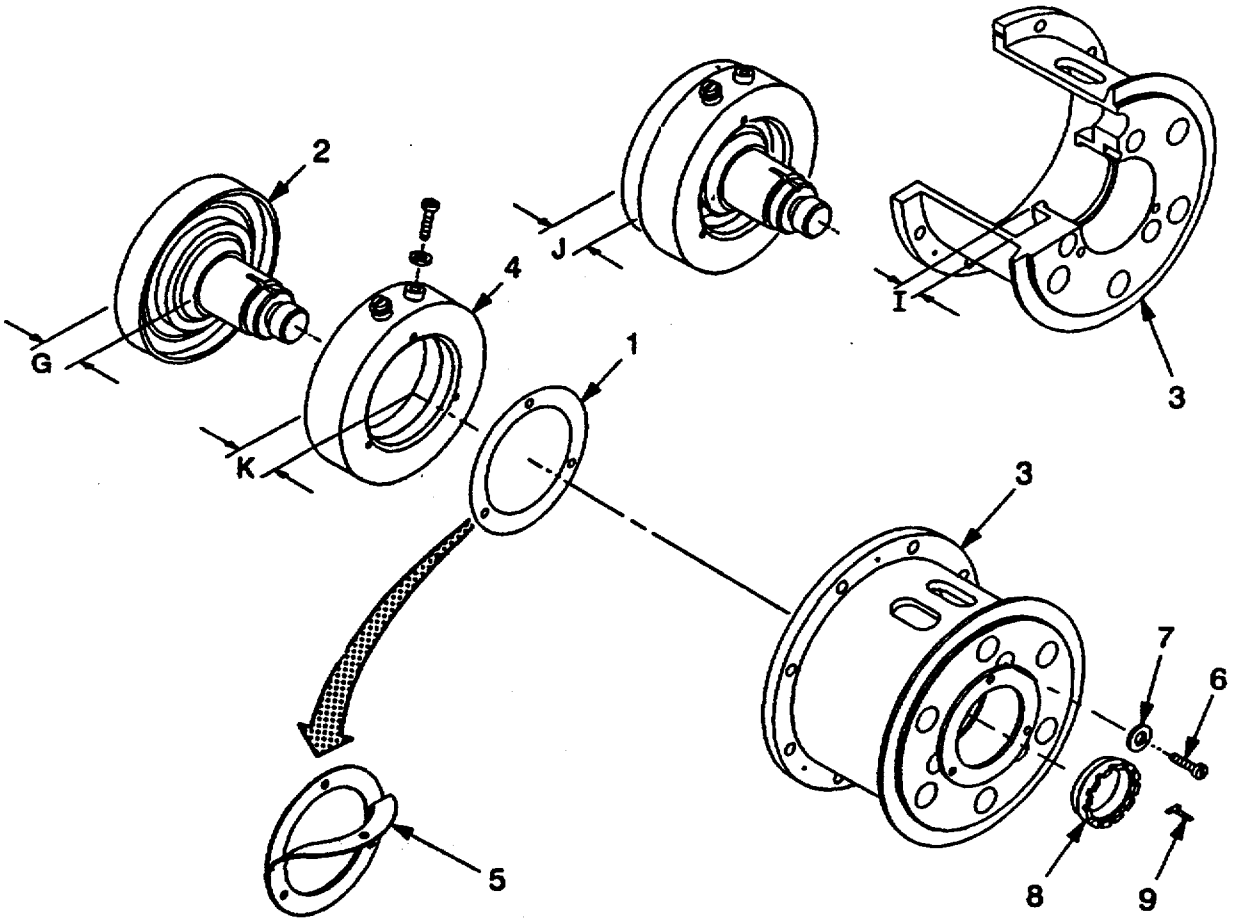


Figure 3-24. Selecting Shim Stack Number Two (200 GPM Fuel Pump)

3-20. PUMP AND CLUTCH (200 GPM FUEL PUMP) REPAIR - continued.

(12) Verify gap by measuring from surface of clutch rotor set (2) to edge of field clutch (4). Subtract dimension J from this measurement. The difference must equal 0.045 to 0.055. If not, disassemble and add or subtract thickness of shims per step (8) above.

(13) If required, tighten nut (8) until key (9) lines up with slot in nut (8) and bend key.

Refer to Figure 3-25.

(14) Use formula N - O + P - Q = R to determine thickness of shim stack number three (1).

(a) Measure shaft (2) to determine dimension N.

(b) Measure bearing carrier (3) to determine dimension O. Subtract from dimension N.

(c) Measure depth of bearing housing in carrier (3) to determine dimension P. Add dimension P.

(d) Dimension Q is constant. Q = 0.468.

(e) Dimension R is the required thickness of shim stack number three (1) based on the above.

(f) Example of formula: 1.805 - 1.895 + .598 - .468 = 0.040

(15) Select shim stack number three (1).

NOTE

One or more shims may be used to obtain dimension R above. Shims are made up of laminated layers and thickness of each layer is 0.002.

(a) Select appropriate number of shims (1) to obtain dimension R above.

(b) If necessary, peel appropriate number of laminated layers (4) from shim to achieve dimension R above.

(16) Install shim stack number three (1) and bearing (5) in bearing carrier (3).

(17) Position retaining ring (6) on bearing carrier (3) and secure with screws (7).

3-20. PUMP AND CLUTCH (200 GPM FUEL PUMP) REPAIR - continued.

CAUTIONS

- **Support inner race of bearing as pressure is applied to shaft to prevent damage to bearing.**
- **Adequately support back of shaft to prevent damage to shaft.**

(18) Press shaft (2) in bearing carrier (3).

(19) Install split ring (8) on armature hub (9).

(20) Install washer (10), spring washer (11) and cover (12) on flat side of armature hub (9).

(21) Install clutch carrier (13) and clutch armature (14) on beveled side of armature hub (9) and secure with screws (15) and nuts (16).

CAUTION

Adequately support back of shaft to prevent damage to shaft.

(22) Press armature hub (9) and assembled components (17) on shaft (2) and install flat washer (18) and nut (19).

3-20. PUMP AND CLUTCH (200 GPM FUEL PUMP) REPAIR - continued.

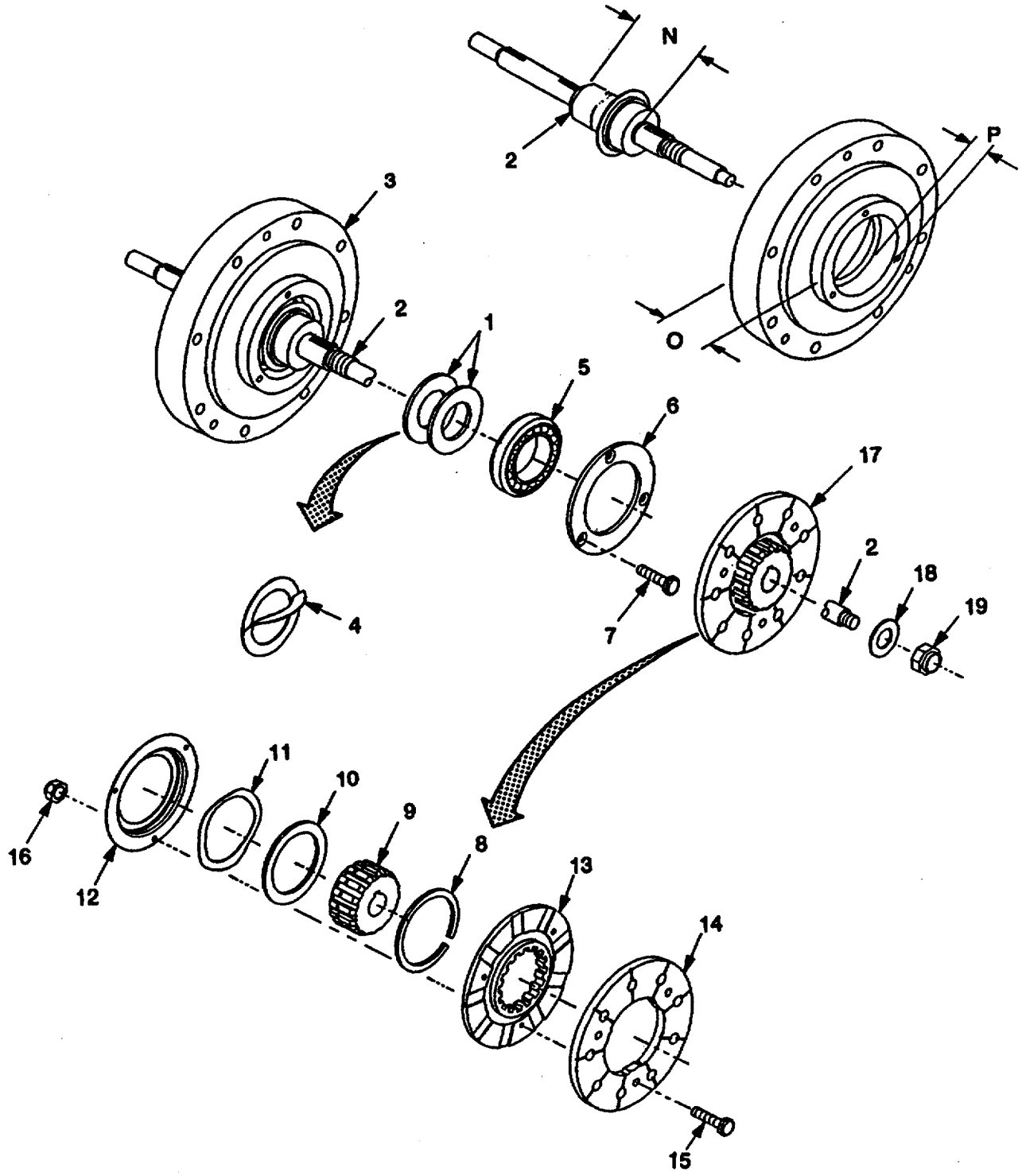


Figure 3-25. Selecting Shim Stack Number Three (200 GPM Fuel Pump)

3-20. PUMP AND CLUTCH (200 GPM FUEL PUMP) REPAIR - continued.

Refer to Figure 3-26.

(23) Use formula S - T - U = V to determine thickness of shim stack number four (1).

(a) Measure from flange of clutch housing (2) to top of clutch rotor (3) to determine dimension S.

(b) Measure from flange of bearing carrier (4) to topside of clutch armature (5) to determine dimension T. Subtract dimension T.

(c) Subtract dimension U. Dimension U is constant. U = 0.500.

(d) Dimension V is the required thickness of shim stack number four (1) based on the above.

(e) Example of formula: 1.985 - 1.895 - 0.050 = 0.040

(24) Select shim stack number four (1).

NOTE

One or more shims may be used to obtain dimension V above. Shims are made up of laminated layers and thickness of each layer is 0.002.

(a) Select appropriate number of shims to obtain dimension V above.

(b) If necessary, peel appropriate number of laminated layers (6) from shim to achieve dimension V above.

(25) Remove nut (7), flat washer (8) and assembled armature unit (9) from shaft (10).

(26) Install key (11) in keyway on shaft (10).

(27) Install shim stack number four (1), spring washer (12) and assembled armature unit (9) on shaft (10) and press into position.

(28) Install flat washer (8) and nut (7) on shaft (10). Torque nut 220 to 240 inch-pounds.

(29) Press bearing (13) on shaft (10).

3-20. PUMP AND CLUTCH (200 GPM FUEL PUMP) REPAIR - continued.

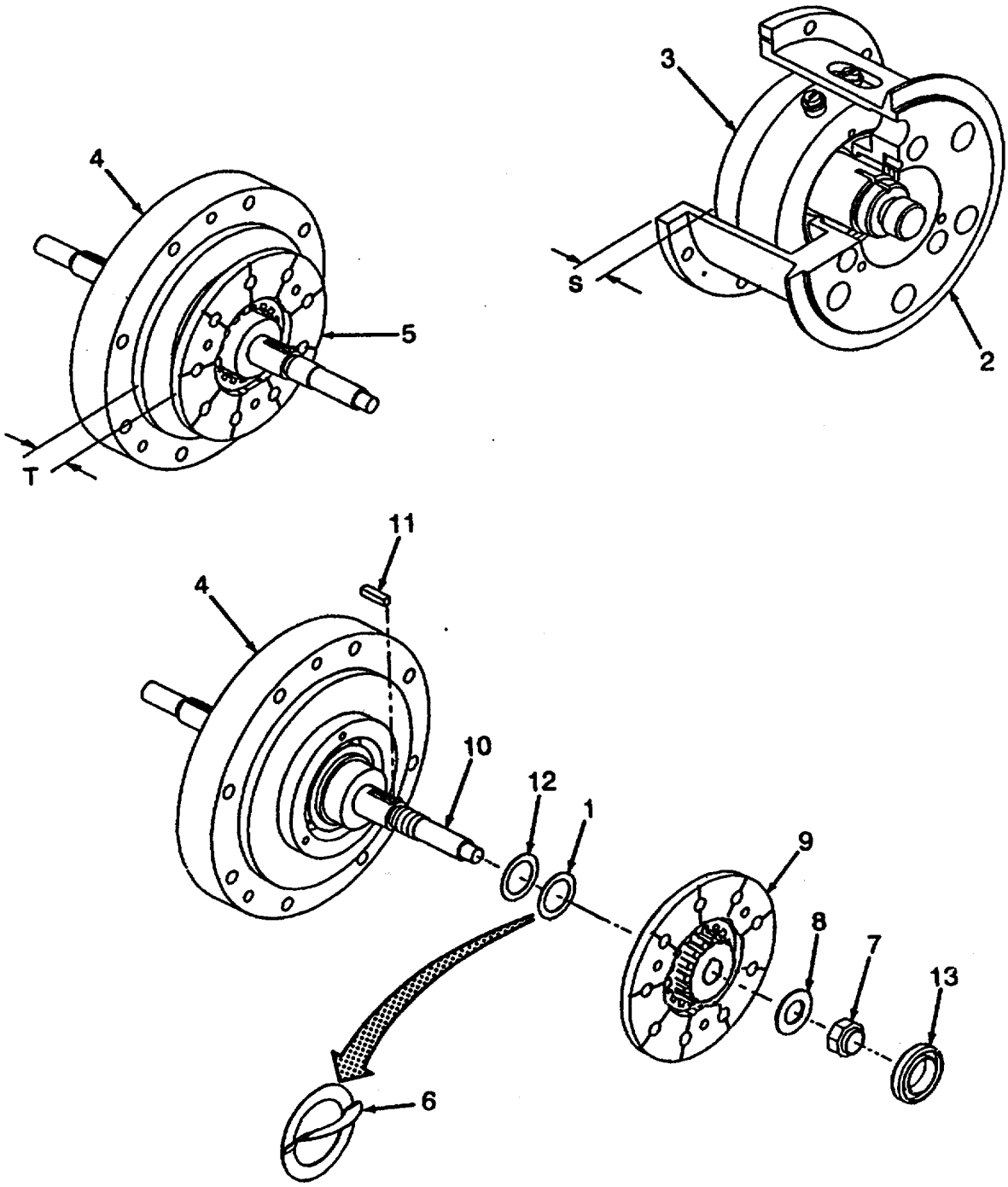


Figure 3-26. Selecting Shim Stack Number Four (200 GPM Fuel Pump)

3-20. PUMP AND CLUTCH (200 GPM FUEL PUMP) REPAIR - continued.

Refer to Figure 3-27.

(30) Use formula W - X - Y = Z to determine thickness of shim stack number five (1).

(a) Measure from flange of clutch housing (2) to inside bottom of clutch rotor set (3) to determine dimension W.

(b) Measure flange surface of bearing carrier (4) to top of bearing (5) to determine dimension X. Subtract from dimension W.

(c) Subtract dimension Y. Dimension Y is a constant. Y = 0.080.

(d) Dimension Z is the required thickness of shim stack number five (1) based on the above.

(e) Example of formula: 4.675 - 4.527 - 0.080 = 0.068 (31) Select shim stack number five (1).

NOTE

Two or more shims may be used to obtain dimension Z above. Shims are made up of laminated layers and thickness of each layer is 0.002.

(a) Select appropriate number of shims to obtain dimension Z above.

(b) If necessary, peel appropriate number of laminated layers (6) from shims to achieve dimension Z above.

(32) Install shim stack number five (1) and spring washer (7) inside of clutch rotor shaft (3).

NOTE

Ensure slots on clutch housing and drain hole on bearing carrier are opposite of each other.

(33) Install assembled components (8) in clutch housing (2) and secure with flat washers (9) and screws (10). Torque screws 168 to 185 inch-pounds.

(34) Insert a feeler gauge through the slots on clutch housing (2) to verify the gap between clutch armature (11) and clutch rotor (12). The gap measurement must equal .0.045 to 0.055. if not, disassemble and add or subtract thickness of shims per step (31) above.

(35) Rotate clutch rotor shaft (3) by hand to verify proper operation.

3-20. PUMP AND CLUTCH (200 GPM FUEL PUMP) REPAIR - continued.

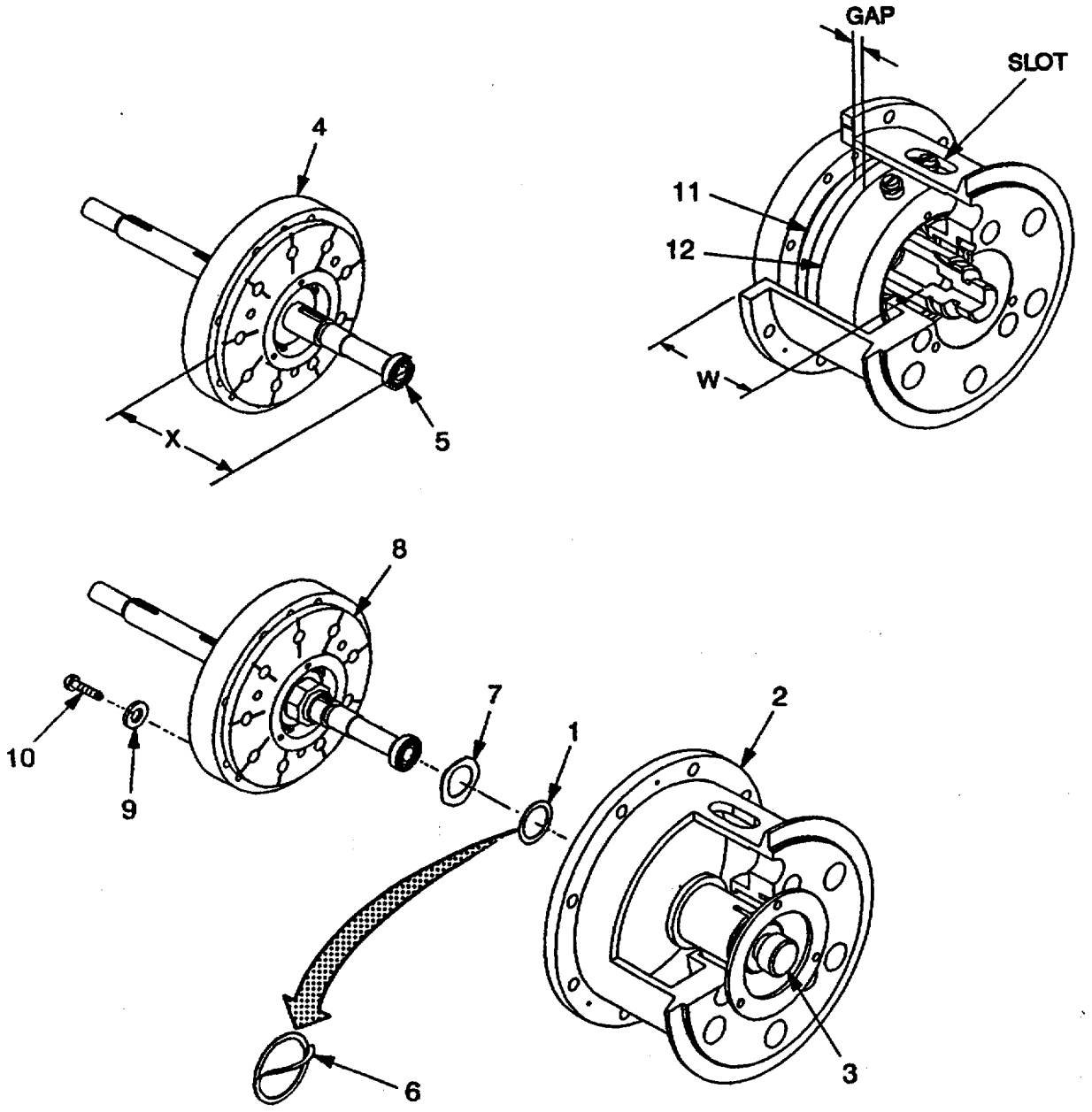


Figure 3-27. Selecting Shim Stack Number Five (200 GPM Fuel Pump)

3-20. PUMP AND CLUTCH (200 GPM FUEL PUMP) REPAIR - continued.

Refer to Figure 3-28.

CAUTION

The drain ports on the bearing carrier and pump case assembly must align or damage to pump and clutch may occur.

(36) Align clutch assembly (1)with pump case assembly (2) and install screws (3), flat washers (4 and 5) and nuts (6). Torque nuts 120 to 130 inch-pounds.

CAUTION

Do not touch mating surface of carbon seal or damage to seal may occur.

(37) Install carbon seal assembly (7) in pump case assembly (2) on shaft (8).

(38) Lubricate preformed packing in seal (9) and install seal on shaft (8).

(39) install key (10) and impeller (11) on shaft (9) (large opening out) in pump case assembly (2),

(40) Slide sleeve (12) into place on shaft (8).

(41) Coat suction manifold (17), gasket (18) and pump case assembly (2) with sealing compound and install gasket on suction manifold.

(42) Align suction manifold (17) on pump case assembly (2) and install nuts (19) and washers (20) on studs (21).

(43) Install key (13) in shaft (8) and slide inducer (14) against sleeve (12).

(44) Install flat washer (15) and nut (16) on shaft (8). Use a 1/4 inch allen wrench to secure shaft while tightening nut. Torque nut 220 to 240 inch-pounds.

(45) Rotate pump shaft (8) to verify proper operation.

(46) Install bushing (22) and elbow (23) in drain port on clutch assembly (1).

NOTE

Elbow must point toward suction manifold or drain tube will not align.

(47) Install preformed packing (24) and plug (25) in pump case assembly (2).

(48) Install lockwire (26) in plug (25) and lockwire to pump case assembly (2).

3-20. PUMP AND CLUTCH (200 GPM FUEL PUMP) REPAIR - continued.

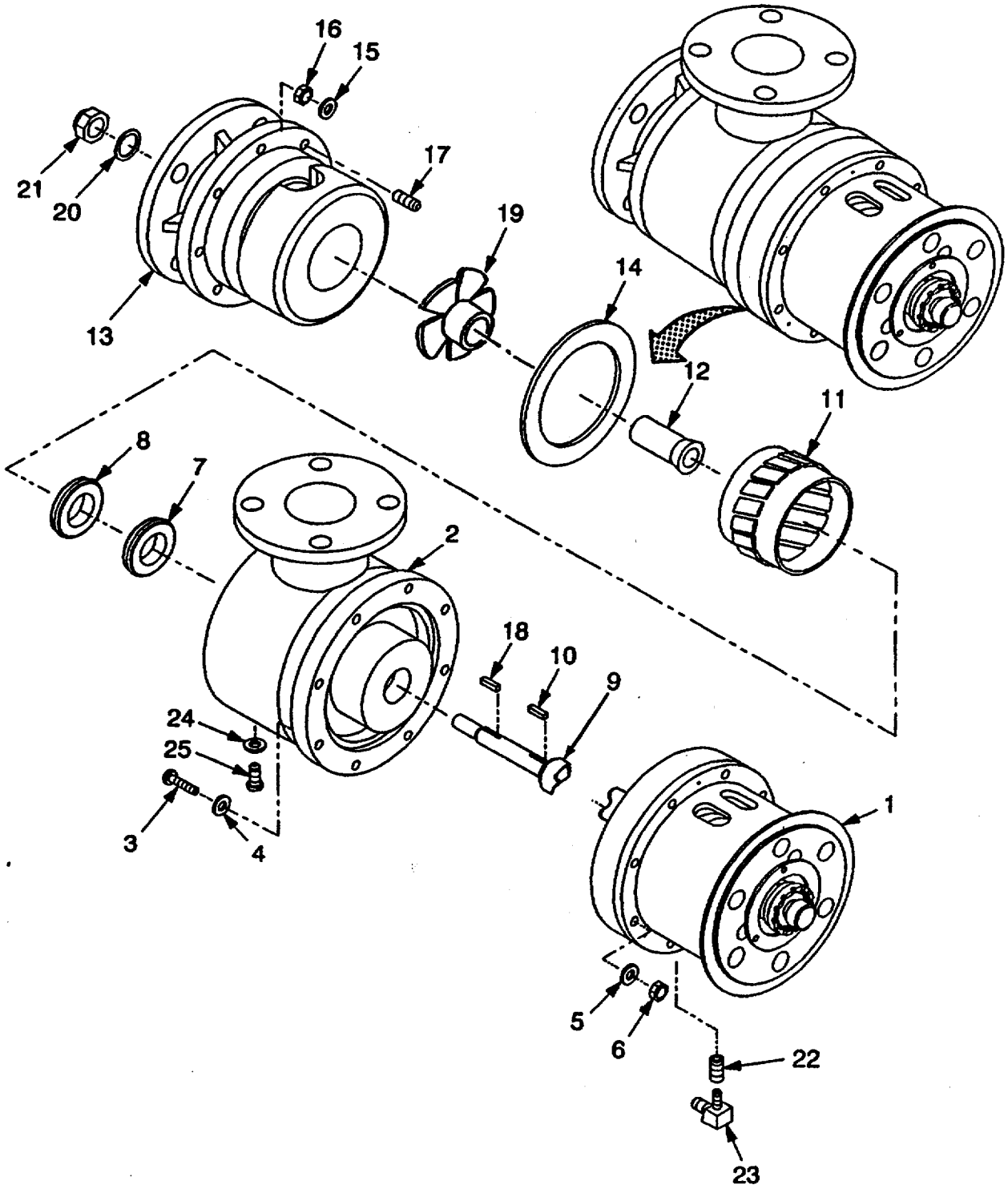


Figure 3-28. Pump and Clutch (200 GPM Fuel Pump) Installation

3-21. SPEED REDUCER REPAIR.

This task covers: a. Disassembly b. Cleaning c. Inspection d. Repair e. Assembly

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Arbor Press (App B, Sect III, Item 3)
Bearing Puller (App B, Sect III, Item 3)

Materials/Parts
Compound, Antiseize (App E, Item 7)
Lubricant (App E, Item 20)
Adhesive Sealant (App E, Item 3)

Materials/Parts - continued
Seal (App F, Items 90 and 97)
Bearing (App F, Item 110)
Nut, Self-Locking (App F, Item 28)

Equipment Condition
Speed reducer removed from Pump (Para 2-44)

a. DISASSEMBLY. Refer to Figure 3-29.

(1) Remove tube assembly (1), tee (2) and elbow (3).

(2) To aid assembly, mark and record position of adapter housing (4) on case (5).

(3) Remove twelve screws (6) from adapter housing (4) then separate adapter housing and attached parts from case (5).

(4) Remove eight screws (7). Install two of the screws in jack holes of seal housing (8) and tighten screws evenly until seal housing (8) separates from adapter housing (4).

(5) Press seal (9) from seal housing (8). Discard seal.

(6) Remove plug (10) from adapter housing (4).

(7) Remove retaining ring (11) and press shaft (12) from adapter housing (4).

(8) Remove race (13) from adapter housing (4).

(9) Remove retaining ring (14) and press bearing (15), spacer (16) and bearing (17) from adapter housing (4).

(10) Press race (18) from shaft (12).

(11) To aid assembly, mark and record position of adapter housing (19) on case (5).

(12) Remove eight screws (20). Install two of the screws in jack holes of seal housing (21) and tighten screws evenly until seal housing separates from adapter housing (19).

3-21. SPEED REDUCER REPAIR - continued.

(13) Press seal (22) from seal housing (21). Discard seal.

(14) Separate adapter housing (19) and attached parts from case (5).

(15) Remove retaining ring (23) from end of shaft (24).

(16) Press shaft (24) from adapter housing (19) and remove race (25).

(17) Remove retaining ring (26) and press bearing (27), spacer (28) and bearing (29) from adapter housing (19).

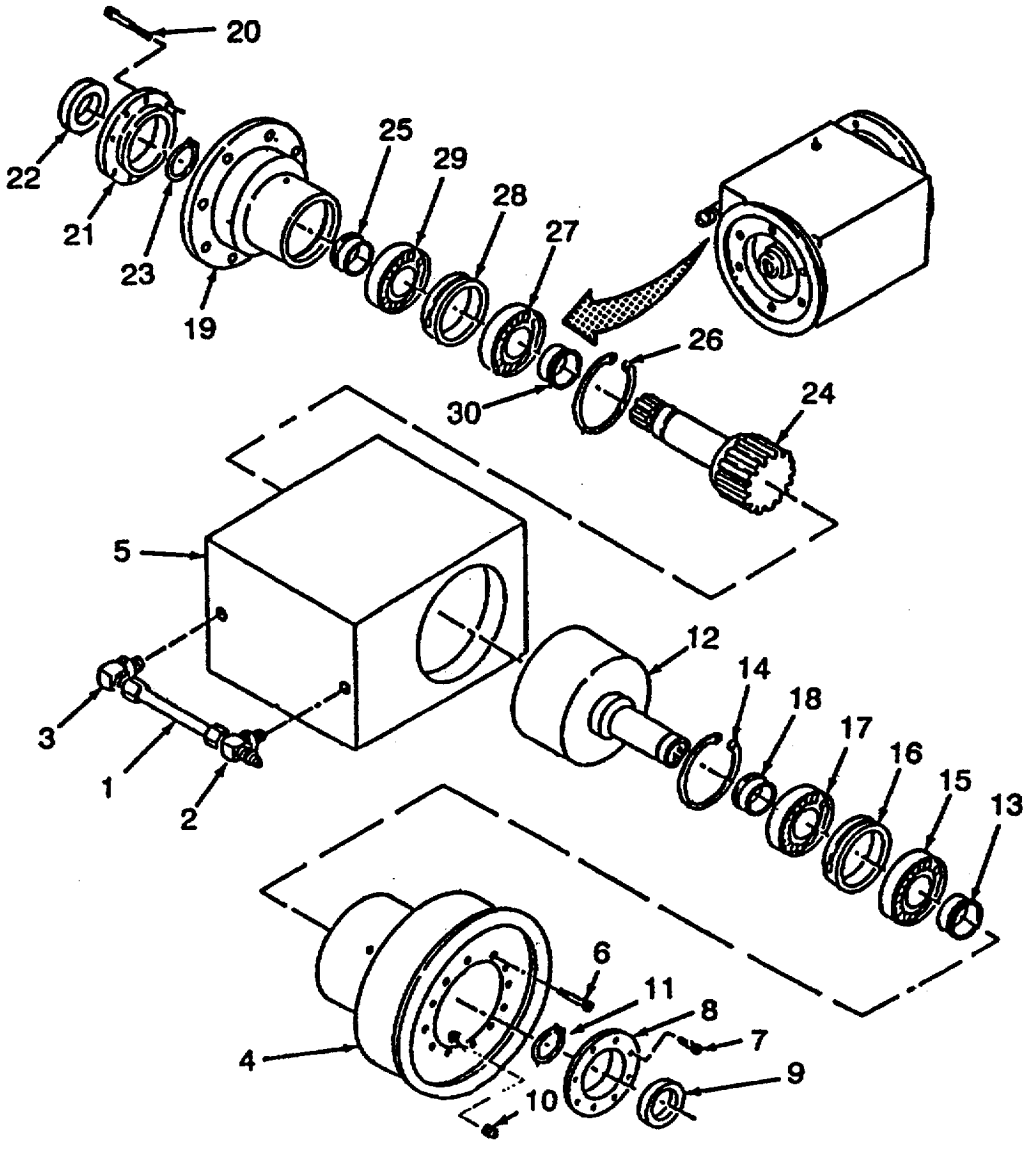


Figure 3-29. Speed Reducer Disassembly

3-21. SPEED REDUCER REPAIR - continued.

(18) Press race (30) from shaft (24).

b. CLEANING.

WARNING

Dry cleaning solvent, P-D-680, Type III, is potentially dangerous to personnel and equipment. Eye and skin protection is required. Avoid repeated and prolonged skin contact. Wash immediately after exposure. Do not use near open flame or excessive heat. Use only in area with good ventilation.

c. INSPECTION.

(1) Inspect shafts (12'and 24) for cracks, broken teeth or splines, corrosion and signs of wear.

(2) Inspect adapter housings (4 and 19) and seal housings (8 and 21) for cracks and corrosion.

(3) Inspect case (5) for cracks, corrosion and stripped or damaged threads.

d. ASSEMBLY. Refer to Figure 3-30.

(1) Press race (30) onto shaft (24).

(2) Install retaining ring (26) and press bearing (27), spacer (28) and bearing (29) into adapter housing (19).

(3) Press race (25) onto shaft (24).

(4) Install retaining ring (23) on end of shaft (24).

(5) Press seal (22) into seal housing (21).

(6) Apply a light coat of sealant to mating surfaces of adapter housing (19) and case (5).

CAUTION

To prevent premature failure of speed reducer, oil ports between adapter housing and case must be aligned correctly.

(7) Position adapter housing (19) and attached parts on case (5) as marked during disassembly. Verify that the oil ports on case and housing are aligned.

(8) Position seal housing (21) on adapter housing (19) and install eight screws (20).

(9) Press race (18) onto shaft (12).

3-21. SPEED REDUCER REPAIR - continued.

(10) Install retaining ring (14) and press bearing (17), spacer (16) and bearing (15) into adapter housing (4).

(11) Press shaft (12) and race (13) into adapter housing (4) and install retaining ring (11).

(12) Apply a light coat of sealant to-mating surfaces of adapter housing (4) and case (5).

CAUTION

To prevent premature failure of speed reducer, oil ports between adapter housing and case must be aligned correctly.

(13) Position adapter housing (4) on case (5). Verify that the oil ports on adapter housing and case are aligned and shafts (12 and 24) mesh correctly.

(14) Install twelve screws (6) in adapter housing (4).

(15) Install plug (10) in adapter housing (4).

(16) Install seal housing (8), seal (9) and eight screws (7) on adapter housing (4).

(17) Install elbow (3), tee (2) and tube assembly (1) on case (5).

3-21. SPEED REDUCER REPAIR - continued.

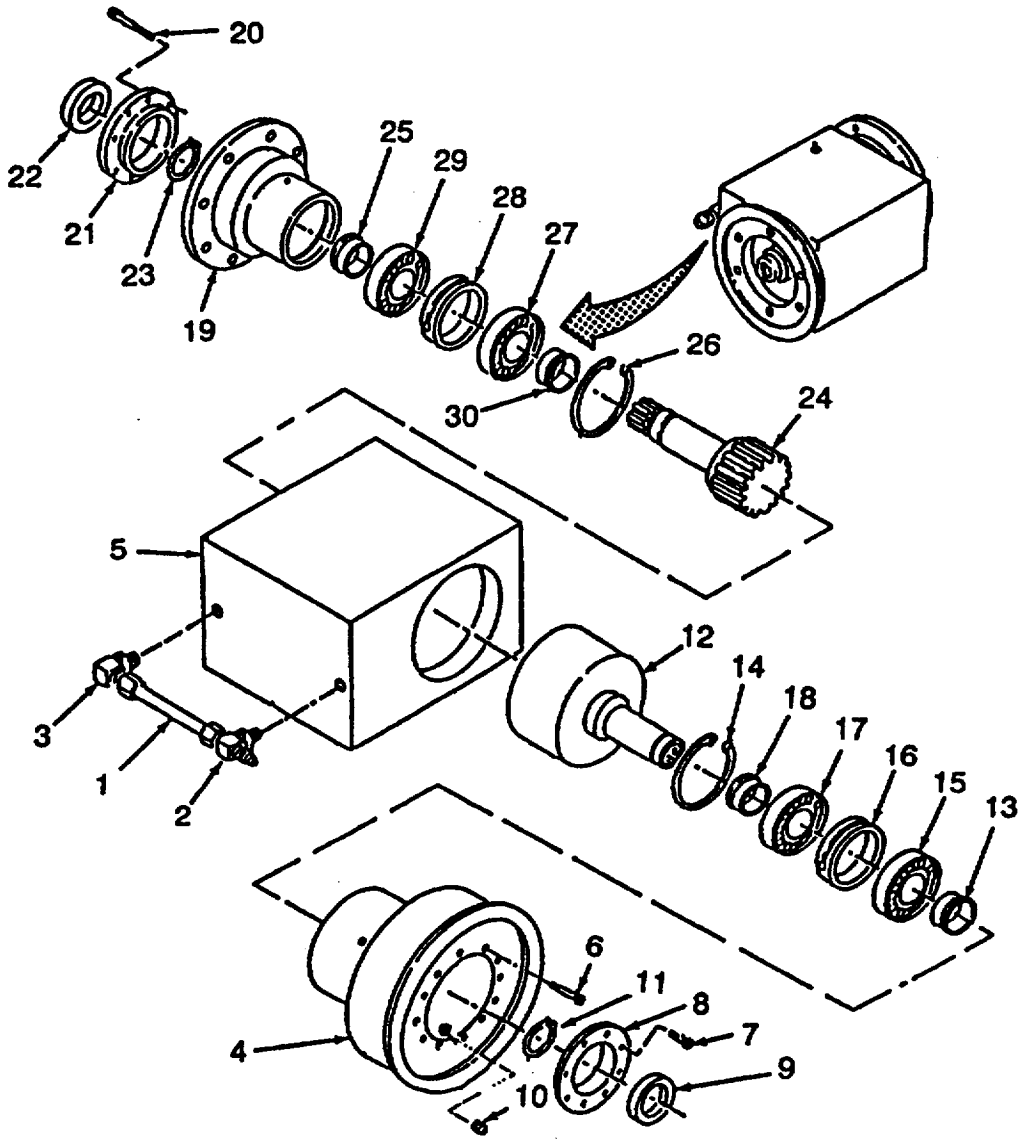


Figure 3-30. Speed Reducer Assembly

3-22. STARTER-GENERATOR REPAIR.

This task covers: a. Disassembly b. Cleaning c. Inspection
d. Test Before Assembly e. Repair f. Assembly

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Bearing Puller (App B, Sect III, Item 3)
Micrometer (App B, Sect III, Item 3)
Soft Mallet (App B, Sect III, Item 3)

Materials/Parts
Cleaning Solvent (App E, Item 8)
Rags, Wiping (App E, Item 2)
Sealing Compound (App E, Item 23)

Materials/Parts - continued
Lubricating Grease (App E, Item 11)
Sandpaper (App E, Item 12)
Chromate Primer (App E, Item 29)
Bearings (App F, Item 9 and 93)
Nuts, Self-Locking (App F, Items 26, 84, 91 and 111)
Lockwashers (App F, Items 94 and 112)
Tape, Masking (App E, Item 35)

Equipment Condition
Starter-generator removed (Para 2-45)

a. DISASSEMBLY. Refer to Figure 3-31.

(1) Remove clamp (1) and adapter (2).

(2) Remove screws (3) and air inlet (4) from end bell (5).

(3) Hold fan (6) and remove nut (7) and washer (8).

(4) Remove fan (6) from drive shaft (9).

NOTE

Remove damper hub only if hub or drive shaft is damaged or replacement is necessary.

(5) Tap drive shaft (9) out of drive end of starter-generator (10) using a soft face hammer. Remove friction ring (11) and damper plate (12).

(6) Remove damper hub (13) from drive shaft (9).

CAUTION

Tape jaws of bearing puller to prevent damage to chamfered face of dampener back plate during removal.

(7) Carefully remove dampener back plate (14) from armature shaft (15).

(8) Remove screws (16) from brush holders (17).

3-22. STARTER-GENERATOR REPAIR - continued.

NOTE
To aid in assembly, note position of brushes prior to removal from brush holders.

(9) Raise spring clips (18) and remove brushes (19).

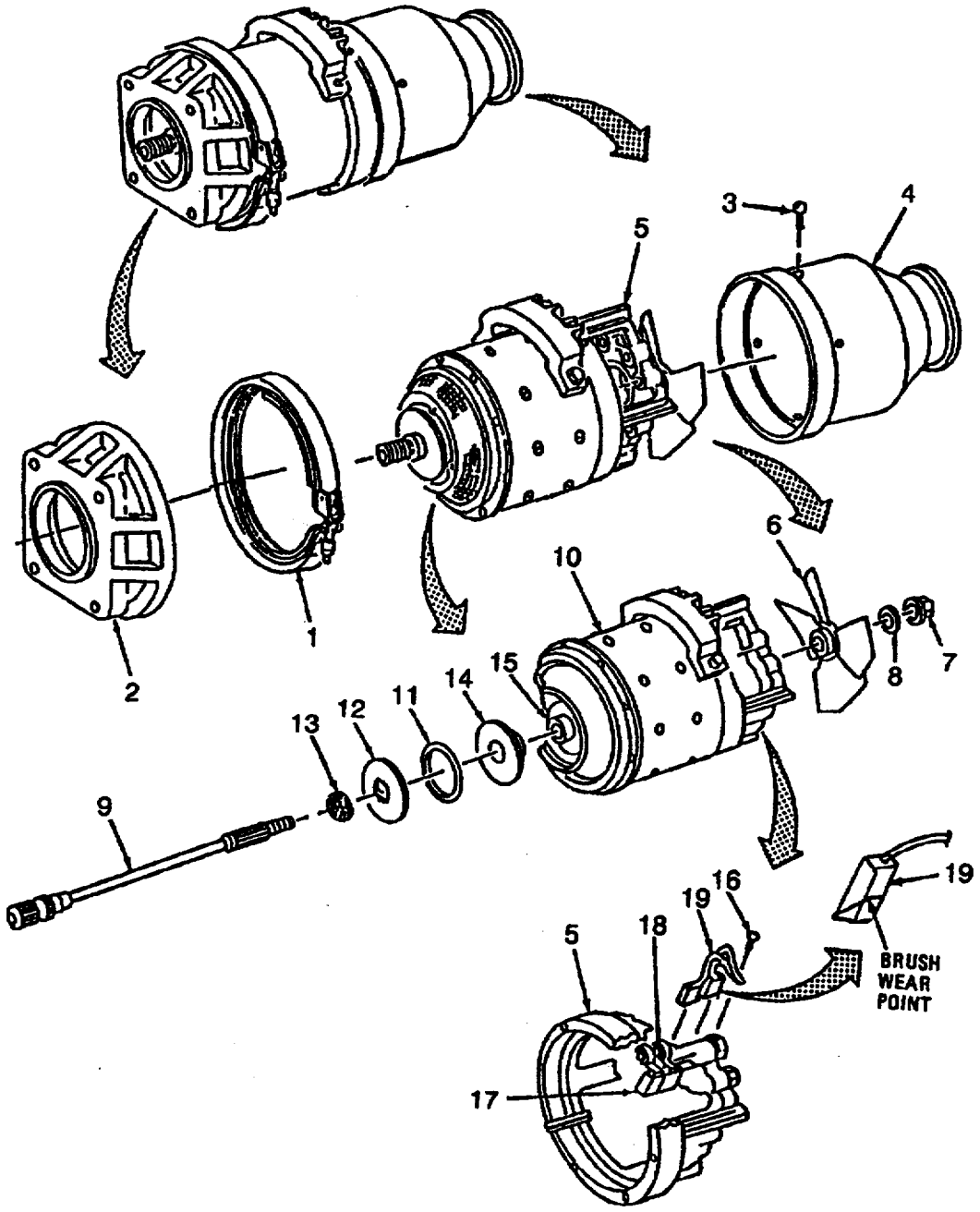


Figure 3-31. Starter-Generator Disassembly

3-22. STARTER-GENERATOR REPAIR - continued.

Refer to Figure 3-32.

(10) Remove drive screws (1), washers (2) and screen (3) from end bell (4).

NOTES

- **A soft face mallet may be used to tap the outside edge of the end bell during removal, if necessary.**
- **To aid in assembly, note position of tooth lockwasher (5) prior to removal.**

(11) Remove eight screws (5), six lockwashers (6), six flat washers (7) and two tooth lockwashers (8). Remove end bell (4) from stator assembly (9).

(12) Remove eight screws (10), eight lockwashers (11) and eight flat washers (12) from end bell

(13)

(13) Remove end bell (13) from stator (9) with armature (14) attached.

(14) Support end bell (13) in an arbor press and press armature (14) out of bearing (15).

(15) Remove retaining ring (16) and one baffle disc (17) from shaft (18) on armature (14).

(16) Using a bearing puller, remove bearing (19) from shaft (18) on armature (14). Remove second baffle disc (20) from shaft (18).

(17) Remove four screws (21), four lockwashers (22) and bearing retainer (23) from end bell (13).

(18) Press bearing (15) out of end bell (13).

(19) Remove two screws (24), nuts (25), washers (26), plastic washer (27) from end bell (13).

(20) Remove two spacers (29), washers (28) and brush holder (30) from end bell (13).

(21) Repeat steps (18) and (19) for three remaining brush holders (30).

3-22. STARTER-GENERATOR REPAIR - continued.

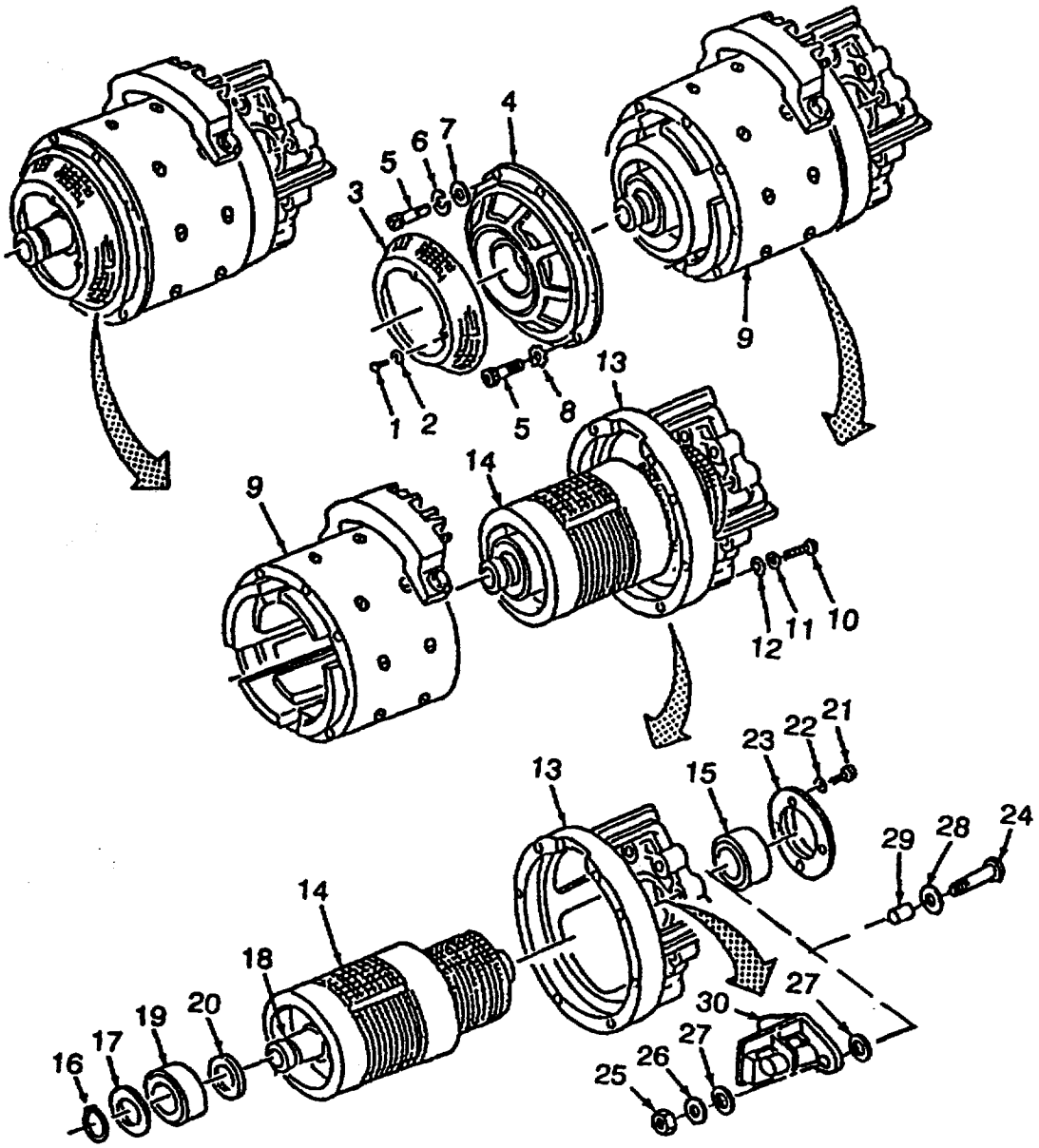


Figure 3-32. Stator, Armature and Brush Removal

3-22. STARTER-GENERATOR REPAIR - continued.

Refer to Figure 3-33.

NOTE

Do not disassemble stator assembly. If terminal block requires replacement, proceed as follows:

(22) Remove two nuts (1), washers (2) and leads (3) from studs marked A and D on terminal block (3).

(23) Remove three nuts (5) and washers (6) from studs marked B, C and E on terminal block (4).

(24) Remove two screws (7), lockwashers (8), flat washers (9) and disconnect wire terminal (10) from terminal block (3).

(25) Disconnect leads (11) from studs B, C and E and remove terminal block (3) from stator (12).

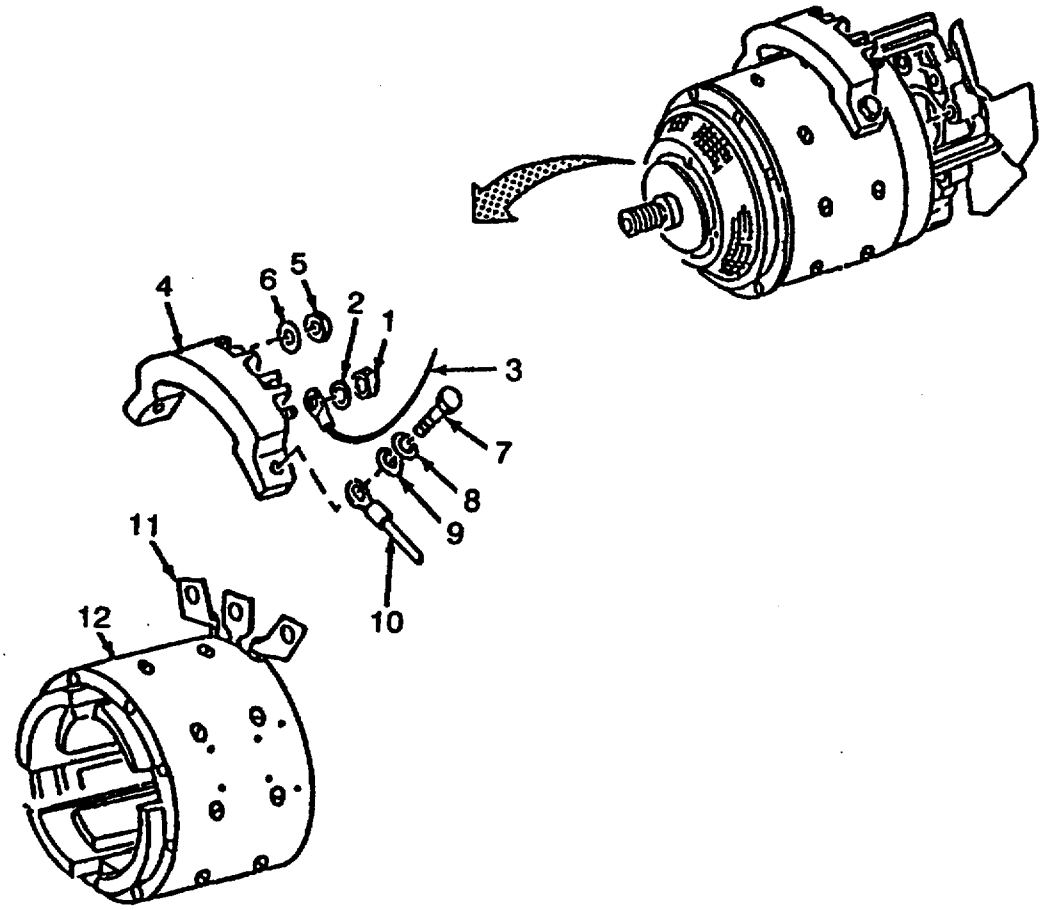


Figure 3-33. Terminal Block Removal

3-22. STARTER-GENERATOR REPAIR - continued.

b. CLEANING.

WARNING

Dry cleaning solvent, P-D-680, Type III, is potentially dangerous to personnel and equipment. Eye and skin protection is required. Avoid repeated and prolonged skin contact. Wash immediately after exposure. Do not use near open flame or excessive heat. Use only in area with good ventilation.

(1) Thoroughly clean all parts of starter-generator except brushes, bearings, armature and stator assembly by washing in cleaning solvent.

WARNING

Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psig air pressure.

(2) Rinse parts in clean solvent and dry with low pressure filtered compressed air (5 to 10 psi).

(3) Clean stator assembly as follows:

(a) Blow dust and other foreign matter form inside stator assembly by using low pressure filtered compressed air.

(b) Wipe with a cloth moistened in cleaning solvent.

(4) Clean armature using low pressure filtered compressed air and a soft bristle brush to clean foreign material from slots between commutator bars.

(5) After cleaning armature and stator assembly, let dry completely.

c. INSPECTION. Refer to Figure 3-31.

(1) Inspect air inlet (4) for dents or other damage. Replace, if defective.

(2) Inspect fan (6) for cracked, damaged or broken blades. Replace, if defective.

(3) Inspect brushes (19) for cracks, chips, frayed leads, loose rivets and brush wear. Replace if remaining allowable wear will be exceeded before next inspection.

(4) Visually inspect drive shaft (9) for broken or damaged splines or spline wear. If spline is damaged or indicates wear, forward shaft to general support for further inspection.

(5) Inspect damper plate (12) for cracks, warps or signs of wear. Replace, if defective.

(6) Visually inspect damper hub (13) for cracks or damage. If defective, replace.

(7) Inspect friction ring (11). Replace if oil soaked or scored.

3-22. STARTER-GENERATOR REPAIR - continued.

(8) Visually inspect damper back plate (14) for cracks or damage. If defective, replace.

Refer to Figure 3-32.

(9) Inspect end bell (4) for wear or warps. Replace, if defective.

(10) Inspect baffle discs (17 and 20) for dents, wear or other damage. Replace, if defective.

(11) Inspect armature (14) for worn, pitted or burned commutator bars, damage to windings, retainer band or shaft. If defective, forward to general support.

(12) Inspect bearing retainer (23) for dents, wear or other defects. Replace, if defective.

(13) Inspect end bell assembly (13) for chipped paint, cracks or warps. If paint has been chipped, forward end bell to general support. If end bell is cracked or warped, replace end bell.

(14) Inspect brush holder (30) for cracks, warps or weak springs. Replace, if defective.

(15) Inspect stator (9) for cracks, burned or damaged insulation, loose pole shoes and damaged coils. Replace, if defective.

Refer to Figure 3-33.

(16) Inspect terminal block (3) as follows:

(a) Inspect for cracks and loose or damaged terminal stubs. Replace, if defective.

(b) Check for burned or damaged insulation between terminals. Replace, if defective.

d. REPAIR.

Replace any damaged parts found during inspection. Replace all mandatory replacement items.

3-22. STARTER-GENERATOR REPAIR - continued.

e. ASSEMBLY. Refer to Figure 3-34.

(1) Position terminal block (4) on stator assembly (12). Place wire terminal (10) on terminal block and install washers (9), lockwashers (8) and screws.

(2) Place leads (11) over studs B, C and E on terminal block (4).

(3) Install a washer (6) and nut (5) on terminal block (3) studs B, C and E.

(4) Install leads (3), washer (2) and nut (1) on terminal block (3) studs A and D.

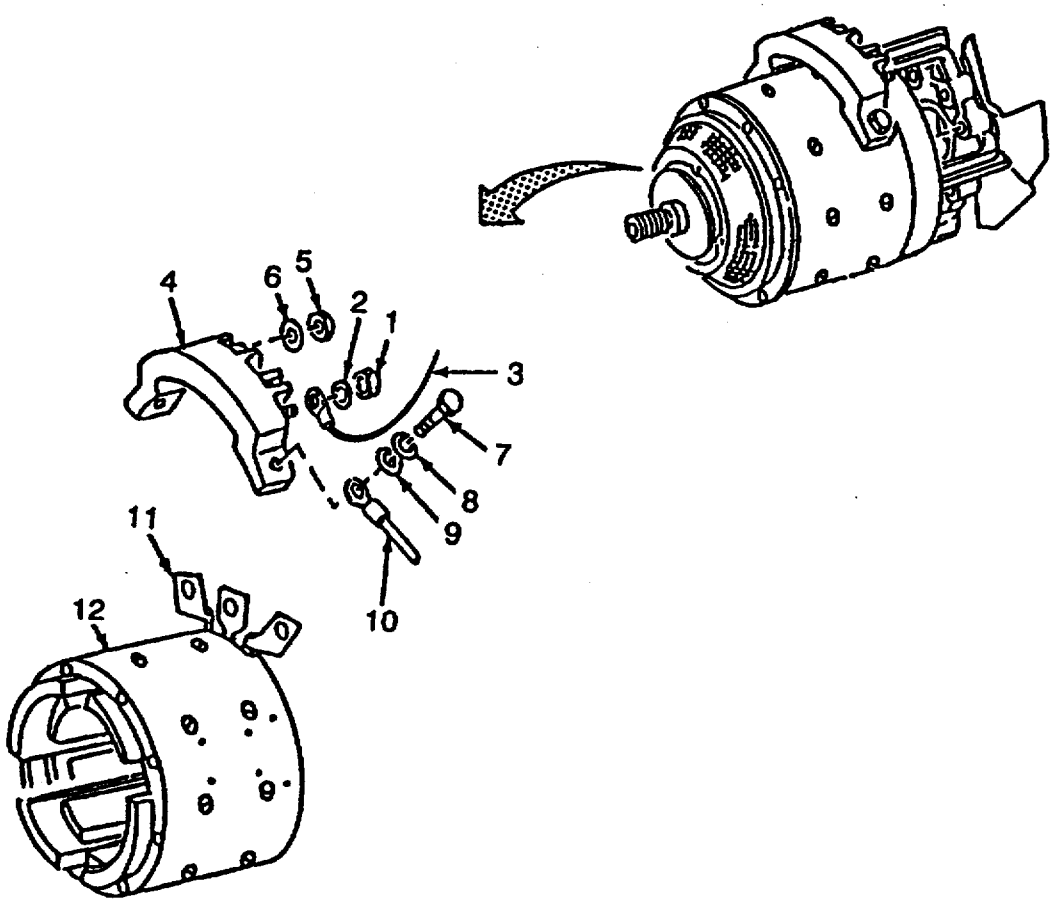


Figure 3-34. Terminal Block Installation

3-22. STARTER-GENERATOR REPAIR - continued

Refer to Figure 3-35.

(5) Install two spacers (29) in insulation sleeve of end bell (13).

(6) Place flatwasher (28) on screw (24).

(7) Insert screw (24) through spacer (29) until tip of screw is flush with end of spacer.

(8) Place plastic washer (27) on screw (24).

(9) Slide brush holder (30) onto screw (24).

(10) Place second plastic washer (27) on screw (24).

(11) Secure brush holder (30) in place with flat washer (26) and nut (25).

(12) Repeat steps (5 through 11) for remaining brush holders (30).

CAUTION

To prevent premature failure of bearing, brown colored bearing seal must face out from end bell.

(13) Press bearing (15) into end bell (13) until bearing is fully seated on shoulder of bearing liner.

(14) Apply sealing compound to threads of screws (21). Position bearing retainer (23) on end bell (13) and install lockwashers (22) and screws (21).

(15) Install one baffle disc (20) with recessed surface of disc facing in toward armature (14) windings on drive end.

(16) Support armature (14) on end of shaft (18) in an arbor press and press bearing (19) on drive end of armature (14). Make certain bearing (19) is seated against shoulder on armature shaft (18).

(17) Install second baffle disc (17) with recessed surface of disc facing away from armature (14) on drive end.

(18) Install retaining ring (16) in groove on armature shaft (18).

(19) Insert armature (14) into stator assembly (9) and align end bell (13) with stator assembly.

(20) Apply sealing compound to threads of screws (10) and secure stator assembly (9) with washers (12), lockwashers (11) and screws (10). Tighten screws (10) to 18-24 in-lb.

(21) Position drive end bell (4) on stator assembly (9). Ensure end bell assembly is fully seated on ball bearing (15).

3-22. STARTER-GENERATOR REPAIR - continued.

(22) Apply sealing compound to threads on eight screws (5) and coat face of tooth lockwashers (8) with zinc chromate primer.

(23) Install tooth lockwashers (8), coated face toward stator assembly (9) and two screws (5) 180° apart. Hand tighten only.

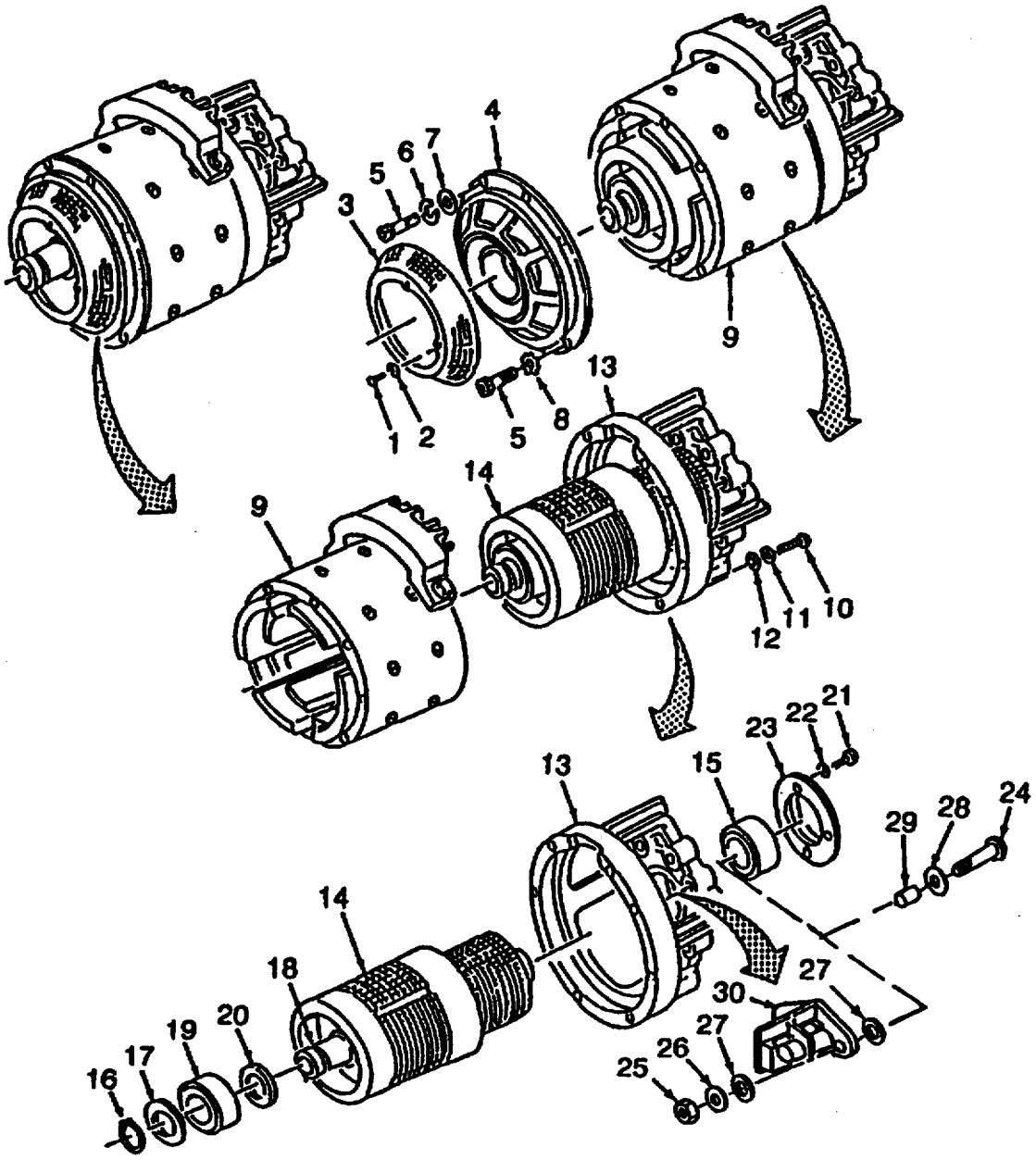


Figure 3-35. Stator, Armature and Brush Holder Installation

3-22. STARTER-GENERATOR REPAIR - continued.

(24) Install six flat washers (7), six lockwashers (8) and six screws (5) in remaining mounting holes in statorassembly (9). Hand tighten only.

(25) Tighten the eight screws (5) to 18-24 in-lb.

(26) Position screen (3) on end bell (4) and secure with four washers (2) and screws (1).

Refer to Figure 3-36.

CAUTION

Do not use an arbor press to force dampener back plate onto armature shaft. Improper seating will result if arbor press is used.

(27) Place dampener back plate (1) on drive end of armature shaft (2) with back plate taper fully seated on shaft taper. Work back plate onto the shaft by hand.

(28) Place friction ring (3) in recess of dampener back plate (1).

CAUTION

Do not use an arbor press to force dampener back plate onto armature shaft. Improper seating will result if arbor press is used.

(29) If dampener hub (4) was removed, install hub on drive shaft (5), making certain that hub taper is fully seated on drive shaft taper by working it onto the shaft by hand.

(30) Position dampener plate (6) on dampener hub (4), ensure spline on plate engages with spline on hub and rests against shoulder of hub.

(31) Insert drive shaft (5) through armature (7) making sure drive shaft spline engages with spline in armature.

(32) Apply a light coat of lubricating grease on threads end of drive shaft (5).

(33) Install fan (8), washer (9) and self-locking nut (10) on drive shaft (5).

(34) Secure drive-end of drive shaft (5) and torque nut (10) to 100 to 120 in-lb.

Brush Installation.

(35) Raise each brush spring (11) and insert brush (12) into brush holder (13) in bell (14) as noted during disassembly. Gently lower spring until it rests on top of brushes. Repeat step for each brush.

3-22. STARTER-GENERATOR REPAIR - continued.

CAUTION

Brush leads must be positioned over the top of brush springs to prevent jamming or sticking of brush.

(36) Secure leads (15) with screw (16).

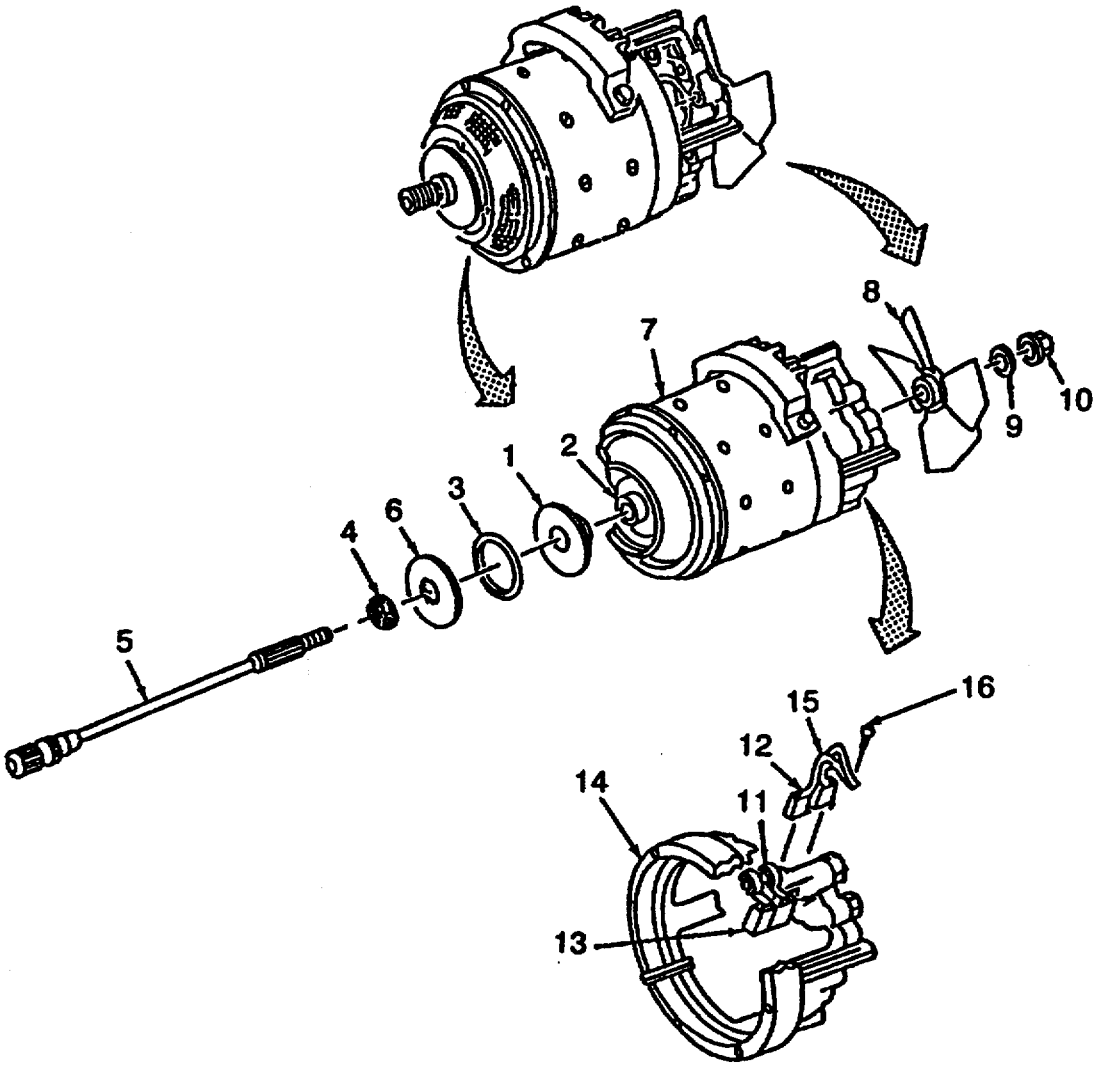


Figure 3-36. Armature Shaft, Fan and Brush Installation

3-22. STARTER-GENERATOR REPAIR - continued.

Refer to Figure 3-37.

(37) Seat new brushes as follows:

(a) Raise each brush spring clip (1) and lift brush (2) away from the commutator (3) until the brush spring can hold the brush in position by resting against the side of the brush.

(b) Place a strip of 5/0 or finer sandpaper, slightly wider than the width of the brush, around the commutator (3) with the sand side out. Cut the sandpaper strip to one inch greater than the commutator circumference. Secure one end of the sandpaper strip to the commutator surface with masking tape so that the taped end will lead in the direction of rotation, and the other end will remain loose and overlap taped end.

(c) Lower brush (2) in place against the sandpaper, and carefully rotate the armature shaft (4) by hand in the normal direction of rotation until a full seat is obtained on each brush. Do not sand excessively.

WARNING

Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psig air pressure.

(d) Remove the sandpaper, remove all carbon dust with dry, compressed air.

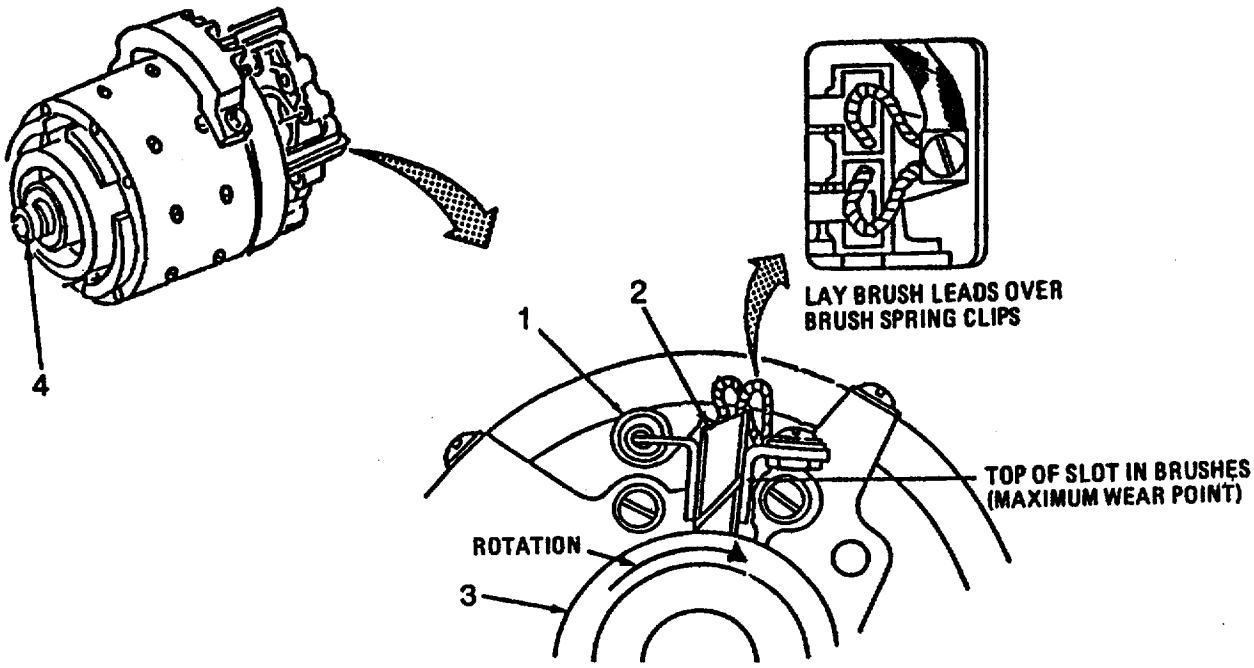


Figure 3-37. Seating New Brushes

3-22. STARTER-GENERATOR REPAIR - continued.

Refer to Figure 3-38.

(38) Position air inlet (1) on end bell assembly (2) and install screws (3).

(39) Position adapter (4) on drive end bell (5) and secure with clamp (6).

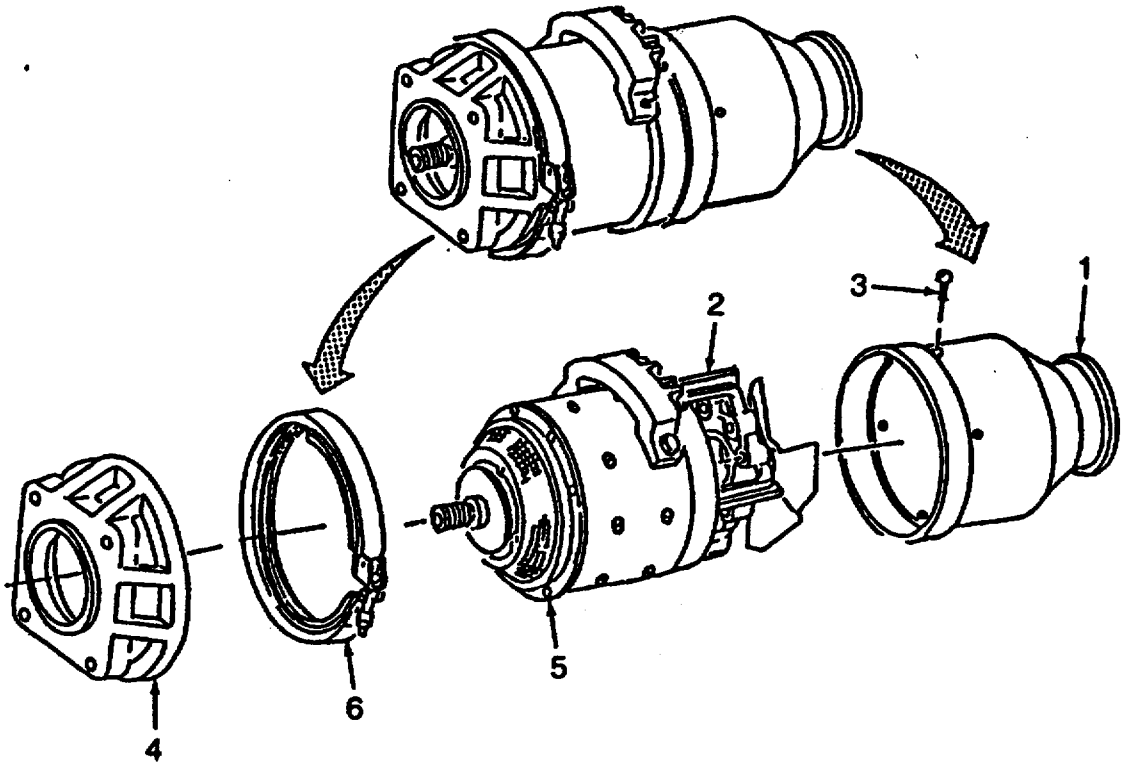


Figure 3-38. Air Inlet and Adapter Installation

3-23. ENGINE ASSEMBLY REMOVAL.

This Task Covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Suitable Lifting Device

Materials/Parts
Safety Wire (App E, Items 9 and 15)
Lockwasher (App F, Item 27)
Self-locking Nut (App F, Item 49)

Equipment Condition
Speed Reducer removed (Para 2-45)
Muffler Extension removed (Para 2-12)
Starter-Generator removed (Para 2-44)
Oil drained from oil reservoir (LO 10-4320-342-12)
For T Bracket removed (Para 2-88)
Muffler removed (Para 2-12)

Personnel Required
Two

General Safety Instructions

WARNINGS

- **Engine weighs approximately 160 lbs. and requires a lifting device. Lifting heavy/difficult to handle equipment can cause serious injury to personnel.**
- **Fuels and vapors are toxic and flammable. Be careful when working around fuel so not to come in contact. Fuel can cause injury to personnel. disposal of contaminated fuel, refer to FM 10-10.**

a. REMOVAL. Refer to Figure 3-39.

(1) Open door (1).
(2) Disconnect electrical connector (2) from engine (3).
(3) Remove tubes (4 and 5) from elbows (6 and 7).
(4) Remove tubes (8, 9 and 10) from adapters (11, 12 and 13).
(5) Remove screws (14), washers (15) and panel (16).
(6) Remove clamp (17) from exhaust (18) and engine (3) and remove exhaust (18).
(7) Remove safety wire, bolts (19), washers (20) from brackets (21).
(8) Remove safety wire, bolts (22), washers (23) and brackets (21).
(9) Attach a suitable lifting device to engine lifting lug (24).
(10) Tighten suitable lifting device enough to remove slack.
(11) Remove nut (25), lockwashers (26), flatwasher. (27) and bolt (28).

3-23. ENGINE ASSEMBLY REMOVAL - continued.

(12) Carefully remove engine (3).

(13) Remove elbow (7) from engine (3).

(14) Remove bolt (29), lockwasher (30), flatwasher (31) and bracket (32).

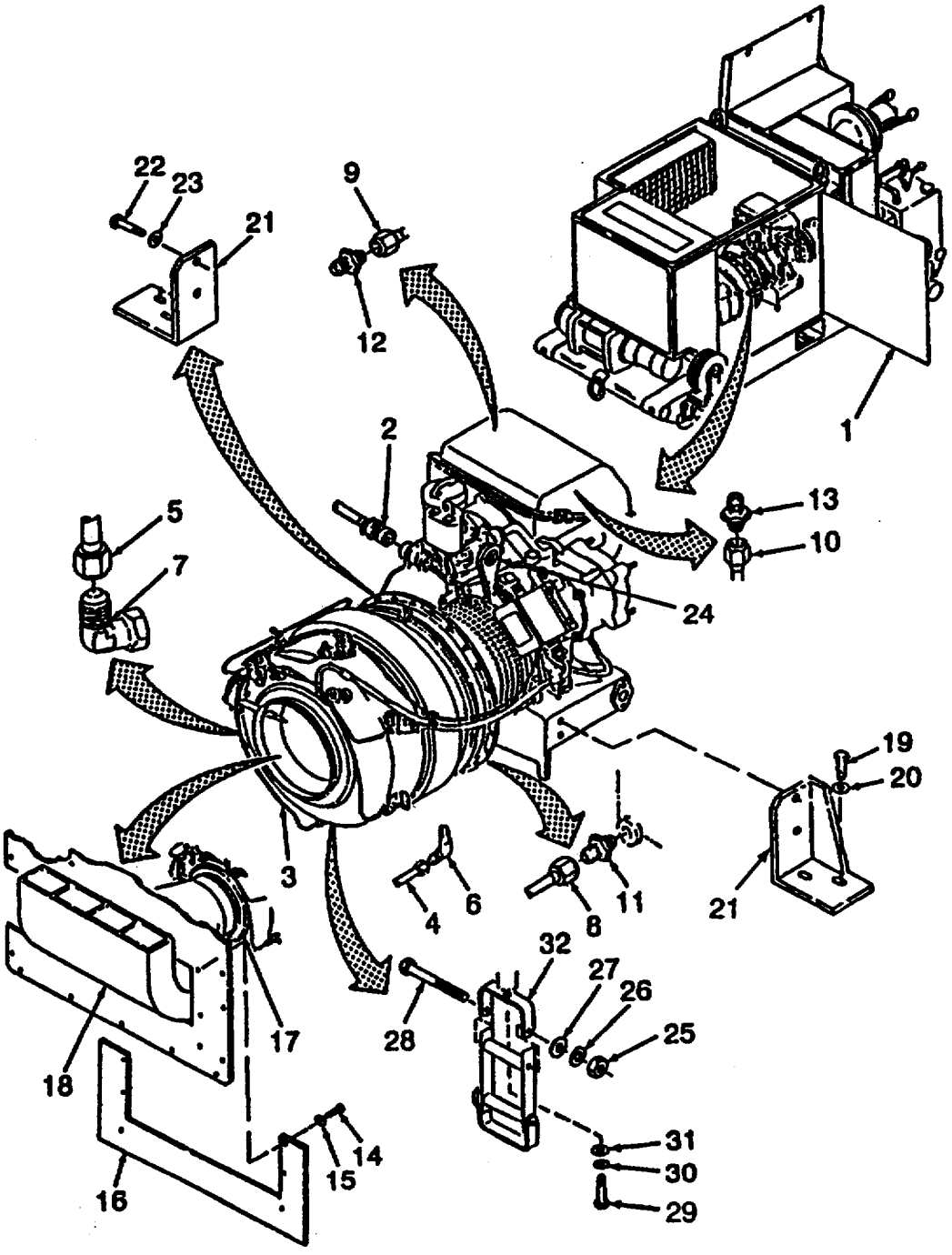


Figure 3-39. Engine Assembly Removal

3-23. ENGINE ASSEMBLY REMOVAL - continued.

b. INSTALLATION. Refer to Figure 3-40.

(1) Install bracket (32), flatwasher (31), lockwashers (30) and bolts (29) on engine (3).

(2) Install elbow (7) on engine (3).

WARNING

Be careful when installing engine assembly or damage to equipment could occur.

(3) Attach a suitable lifting device to engine lifting lug (24).

(4) Carefully lower engine assembly (3) into unit.

(5) Align with mounting holes and install bolt (28), flatwasher (27), lockwasher (26) and nut (25).

(6) Install bolts (22), washers (23) and brackets (21).

(7) Install bolts (19), washer (20) on brackets (21).

(8) Secure bolts (19 and 22) with safety wire.

(9) Position exhaust (18) on engine assembly (3) and install clamp (17).

(10) Install panel (16) with screws (14) and washers (15).

(11) Install tubes (8, 9 and 10) on adapters (11, 12 and 13).

(12) Install tubes (4 and 5) on elbows (6 and 7).

(13) Connect electrical connector (2) on engine (30).

(14) Close door (1).

3-23. ENGINE ASSEMBLY REMOVAL - continued.

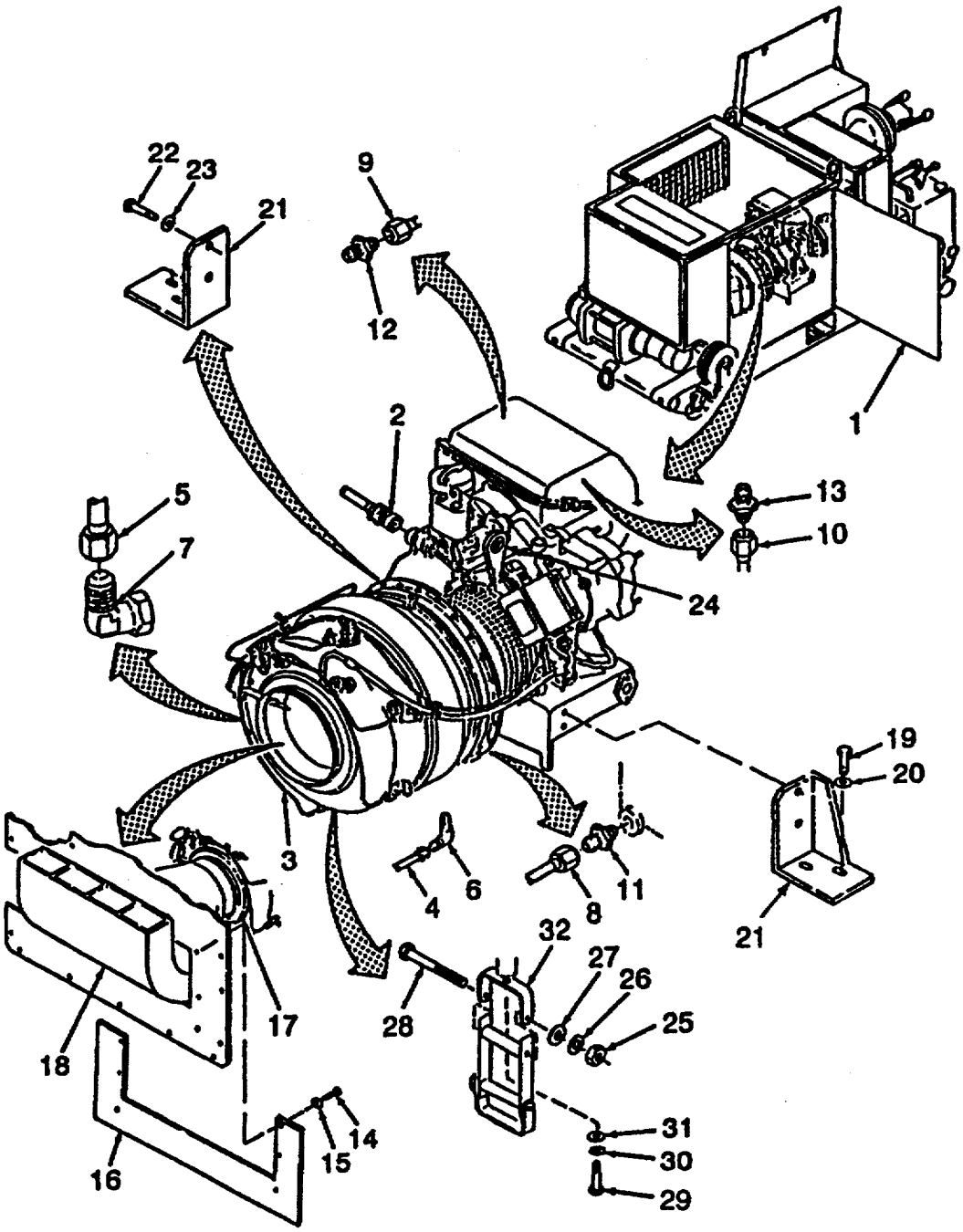


Figure 3-40. Engine Assembly Installation

3-24. ENGINE WIRING HARNESS W1 REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)

Equipment Condition
Speed Reducer removed (Para 2-45)

Materials/Parts
Safety Wire (App E, Item 15)
Textile Braid (App E, Item 19)
Sleeving (App E, Item 31)
Coating (App E, Item 21)
Tag (App E, Item 16)
Nut, Self-locking (App F, Items 34 and 35)

a. REMOVAL. Refer to Figure 3-41.

(1) Open door (1).
(2) Disconnect electrical connector (2) from electrical connector (3).
(3) Remove self-locking nuts (4), bolts (5), washers (6) from bracket (7) and remove connector (3).
(4) Remove textile braid (8) and slide sleeving (9) to expose electrical connectors (10, 11, 12 and 13).
(5) Disconnect electrical connectors (10 and 11) from electrical connectors (12 and 13) on total time meter (14).
(6) Remove safety wire and disconnect electrical connector (15) from engine ignition unit (16).
(7) Remove self-locking nut (17), bolt (18) and clamp (19) from angle bracket (20).
(8) Remove safety wire and disconnect electrical connector (21) from engine motion transducer (22).
(9) Remove self-locking nuts (23), bolts (24) and clamps (25) from engine (26).
(10) Tag wire leads (27) and remove self-locking nuts (28) from thermocouple (29).
(11) Install self-locking nuts (28) on thermocouple (29).

3-24. ENGINE WIRING HARNESS W1 REPLACEMENT - continued.

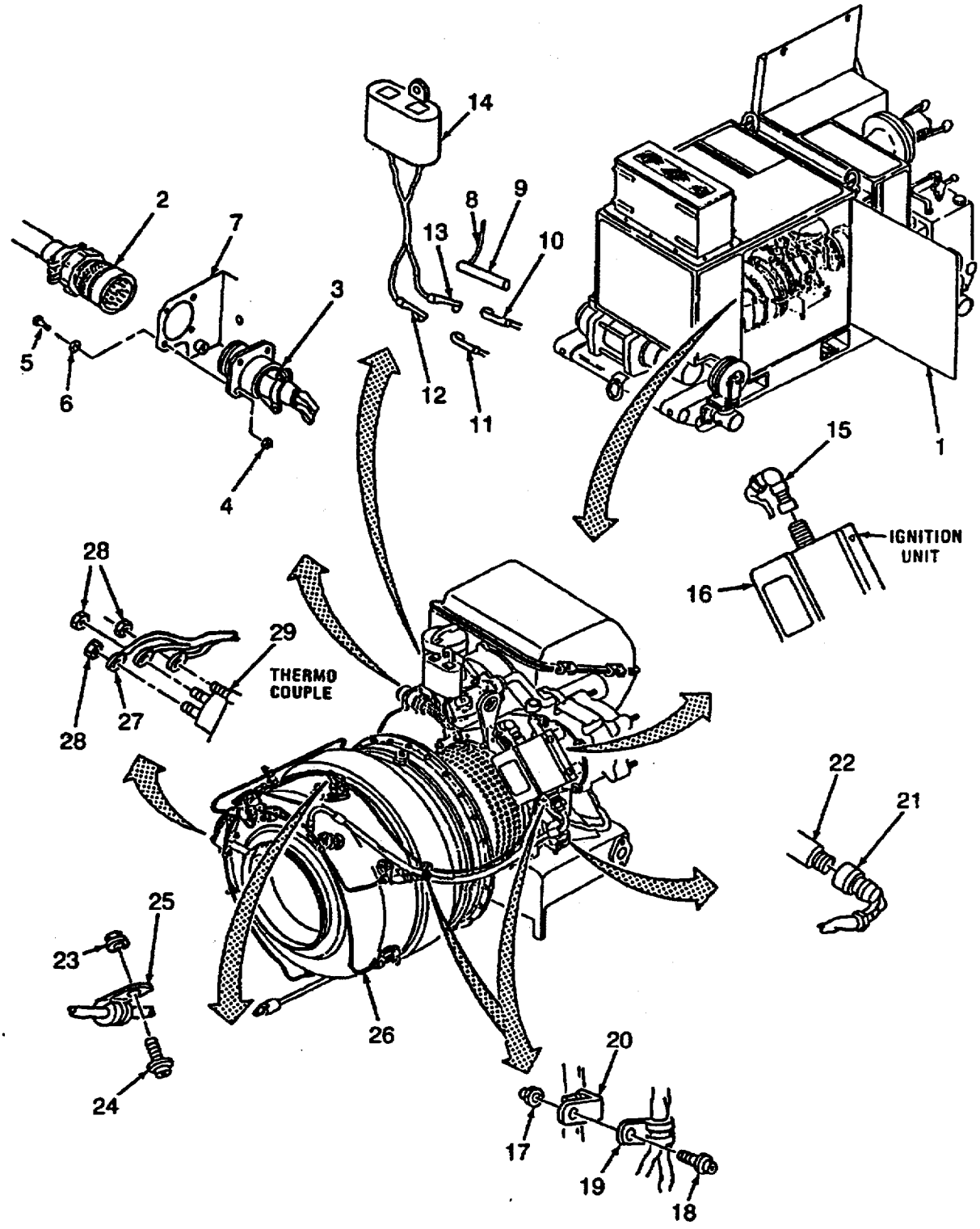


Figure 3-41. Engine Wiring Harness W1 (TOTAL TIME METER, IGNITION UNIT, THERMOCOUPLE AND TRANSDUCER) Removal

3-24. ENGINE WIRING HARNESS W1 REPLACEMENT - continued.

Refer to Figure 3-42.

(12) Remove safety wire and disconnect electrical connector (1) from electrical connector (2) on lower fuel control cover (3).

(13) Remove safety wire and electrical connector (4) from oil temperature bulb (5).

(14) Remove bolts (6) and clamps (7) from engine assembly (8).

(15) Remove safety wire and disconnect electrical connector (9) from oil pressure switch (10).

(16) Remove engine wiring harness W1 (11) from engine assembly (8).

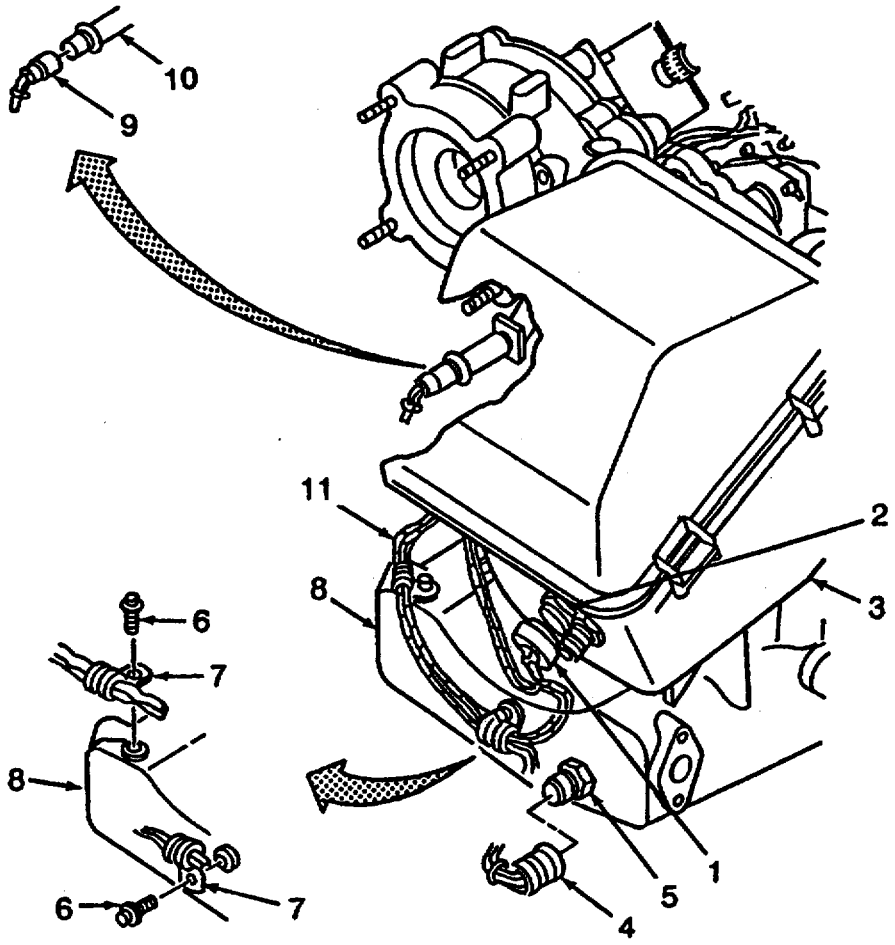


Figure 3-42. Engine Wiring Harness W1 (OIL PRESSURE SWITCH, OIL TEMPERATURE BULB, LOWER FUEL CONTROL COVER) Removal

3-24. ENGINE WIRING HARNESS W1 REPLACEMENT - continued.

b. INSTALLATION. Refer to Figure 3-43.

(1) Position engine wiring harness W1 (11) on engine assembly (8).
(2) Connect electrical connector (9) to oil pressure switch (10) and safety wire.
(3) Install clamps (7) on wiring harness W1 (11) and secure to engine assembly (8) with bolts (6).
(4) Connect electrical connector (4) to oil temperature bulb (5) and safety wire.
(5) Connect electrical connector (1) to electrical connector (2) on lower fuel control cover (3) and safety wire.

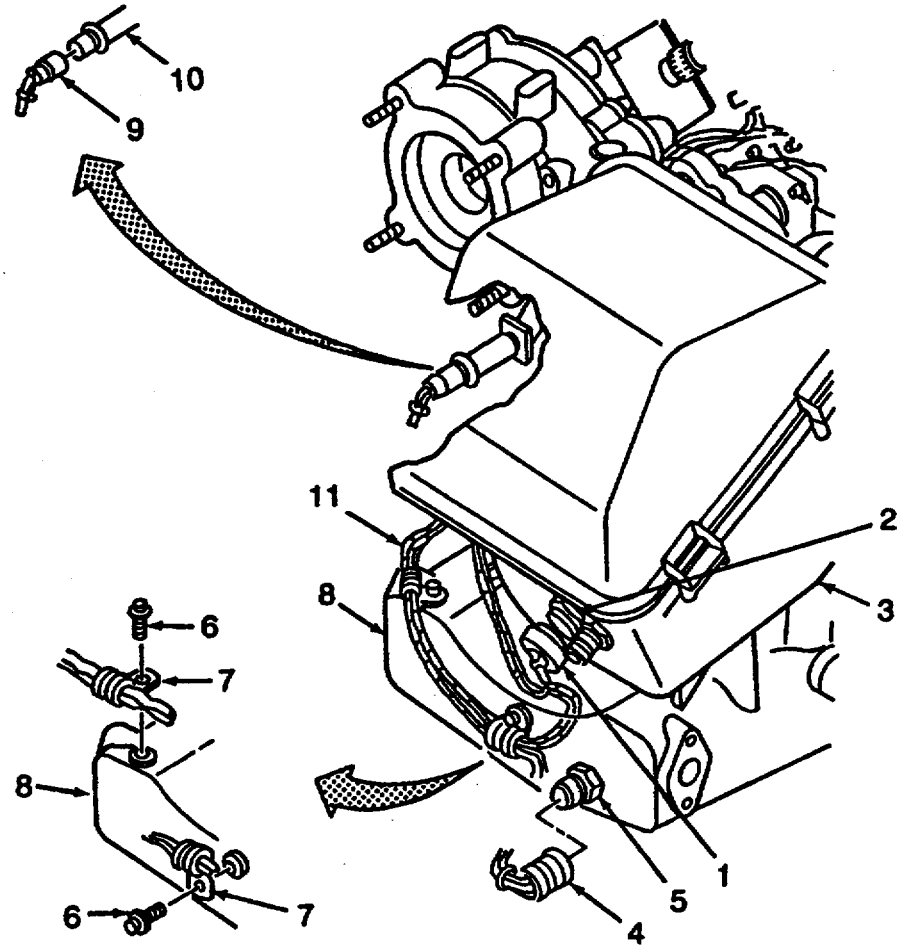


Figure 3-43. Engine Wiring Harness W1 (OIL PRESSURE SWITCH, OIL TEMPERATURE BULB, LOWER FUEL CONTROL COVER) Installation

3-24. ENGINE WIRING HARNESS W1 REPLACEMENT - continued.

Refer to Figure 3-44.

(6) Remove self-locking nuts (28) from thermocouple (29).

(7) Remove tags and install wire leads (27) and self-locking nuts (28) on thermocouple (29).

(8) Install clamp (25) on wiring harness and attach to engine (26) with bolt (24) and self-locking nut (23). Torque bolt to 33 to 37 in-lbs.

(9) Connect electrical connector (21) to engine motion transducer (22) and lockwire.

(10) Install clamps (19) on wiring harness and attach to angle brackets (20) with bolts (18) and self-locking nuts (17). Torque bolts to 33 to 37 in-lbs.

(11) Connect electrical connector (15) to engine ignition unit (16) and lockwire.

(12) Connect electrical connectors (10 and 11) to electrical connectors (12 and 13) on total time meter (14).

(13) Slide sleevings (9) on wiring harness and center over electrical connectors (10, 11, 12 and 13).

(14) Install textile braid (8) two places on each sleeving (9) and tie textile braid in a square knot.

WARNING

Humiseal coating is toxic. To prevent personnel injury, avoid contact with eyes and repeated or prolonged contact with skin.

NOTE

Textile braid must be 0.20 to 0.30 inch from ends of sleevings.

(15) Apply coating to knot and ends of textile braid (8).

(16) Install electrical connector (3) in bracket (7) and secure with self-locking nuts (4), bolts (5) and washers (6). Torque bolts to 6 to 8 in-lbs.

(17) Connect electrical connector (2) to electrical connector (3).

(18) Close door (1).

3-24. ENGINE WIRING HARNESS W1 REPLACEMENT - continued.

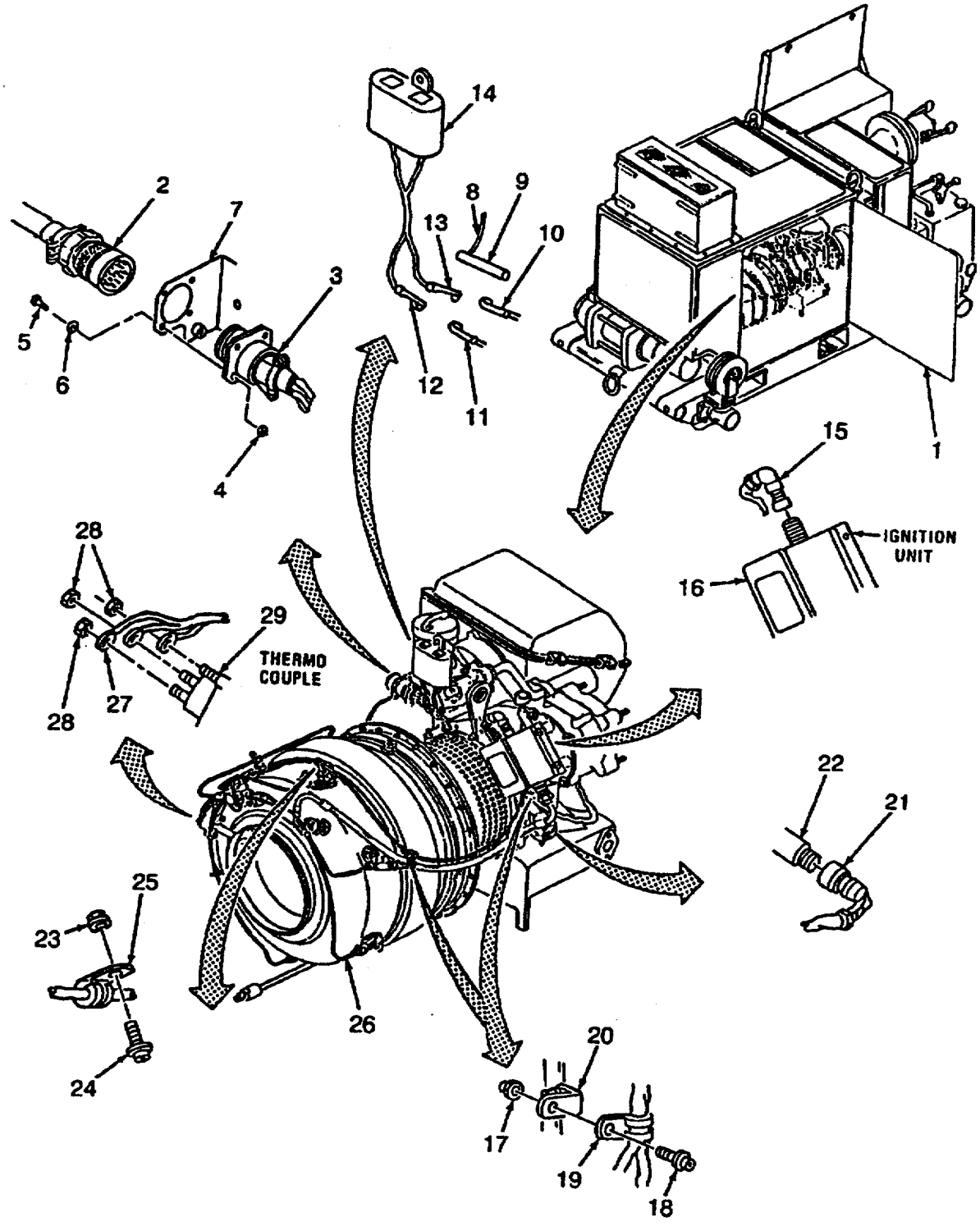


Figure 3-44. Engine Wiring Harness W1 (TOTAL TIME METER, IGNITION UNIT, THERMOCOUPLE AND TRANSDUCER) Installation

3-25. ENGINE WIRING HARNESS W1, W2 and W3 REPAIR (TYPICAL).

This task covers: Repair

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sec III, Item 1)
Soldering Gun Kit (App B, Sect III, Item 3)
Multimeter (App B, Sect III, Item 3)
Tool Kit Electrical Connector Repair (App B, Sect III, Item 3)
Crimping Tool (App B, Sect III, Item 3)
Wire Stripper (App B, Sect III, Item 3)

Materials/Parts
Solder (App E, Item 24)
Sleeve (App E, Item 31)

Equipment Condition
Battery Disconnected (Para 2-7, TM 10-4320-342-10)
Wiring Harness removed (Para 3-24)

b. REPAIR

Refer to FM 20-31 for repair of winch cables.

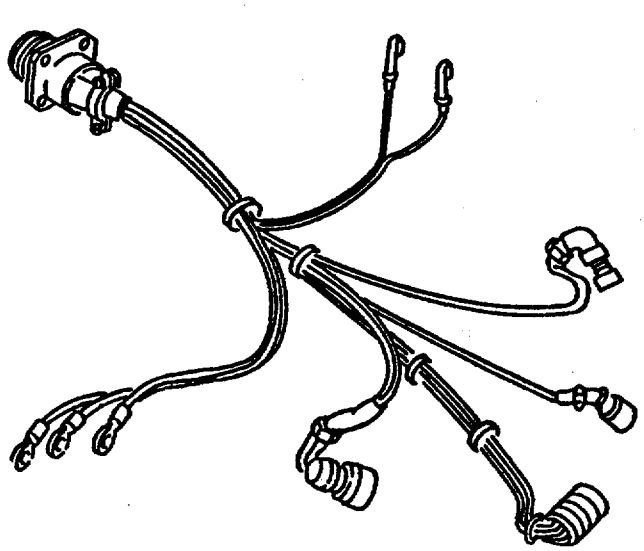


Figure 3-45. Engine Wiring Harness W1, W2 and W3 Repair (Typical)

3-26. ENGINE MOTION TRANSDUCER REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Vernier Caliper (App B, Sect III, Item 3)

Materials/Parts
Antiseize Compound (App E, Item 7)
(App E, Item 15)
Lubricating Oil (App E, Item 18)
Preformed Packing (App F, Item 96)
Shim (App F, Item 95)

Equipment Condition
200/600 Pump Assembly removed from system (Para 2-9, TM 10-4320-342-10)
General Safety Instructions

WARNING

Chemical agent resistance coating (CARC) Lockwire produces toxic fumes when flame is applied. It is necessary to remove CARC in areas where flame is to be applied.

a. REMOVAL. Refer to Figure 3-46.

(1) Open door (1).

(2) Cut lockwire from connector (2) and engine motion transducer (3).

(3) Disconnect electrical connector (2) from engine motion transducer (3).

(4) Remove bolts (4) and flatwashers (5).

(5) Remove engine motion transducer (3) from gearbox assembly (6).

(6) Remove preformed packing (7) from engine motion transducer (3). Discard preformed packing.

NOTE

Measure thickness of shim to aid in installation of shim.

(7) Remove shim (8) from engine motion transducer (3). Discard shim.

3-26. ENGINE MOTION TRANSDUCER REPLACEMENT - continued.

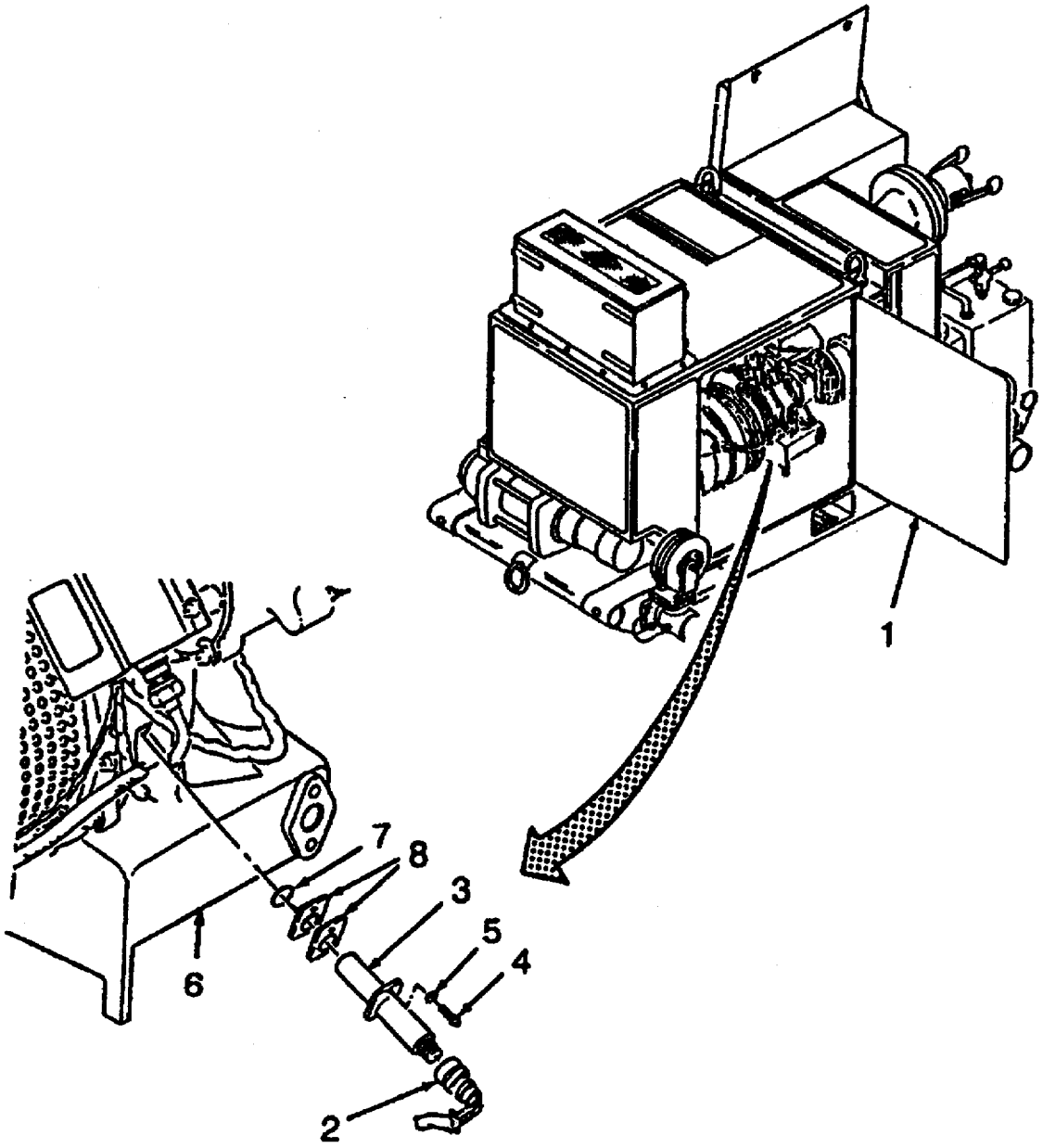


Figure 3-46. Engine Motion Transducer Removal

3-26. ENGINE MOTION TRANSDUCER REPLACEMENT.

b. INSTALLATION. Refer to Figure 3-47.

(1) Use formula A B + C = D plus or minus 0.002 to determine thickness of shim stack (1).

(a) Using micrometer, measure motion transducer from tip of face to mount to determine dimension A. Record measurement.

(b) Using micrometer, measure from gearbox surface to crown of gear tooth of accessory drive gear to determine dimension B Subtract dimension B from dimension A.

(c) Add dimension C. Dimension C is a constant. C = 0.009.

(d) Dimension D plus or minus 0.002 is the required thickness of shim stack (1).

(e) Example of formula: 1.705 1.676 + 0.009 = 0.020 (f) Select shim.

NOTE

One or more shims may be used to obtain dimension D above. Shim is made up of laminated layers and each layer is 0.002 inches.

(1) Select appropriate number of shim to obtain dimension D above.

NOTE

Shim is made up of laminated layers and each layer is 0.002 inch.

(2) If necessary, peel appropriate number of laminated layers from shim stack to achieve dimension D above.

(2) Install shim stack (1) on motion transducer (2).

(3) Lubricate performed packing (3) with lubricating oil and install on engine motion transducer (2).

(4) Install engine motion transducer (2) in gear box assembly (4).

(5) Apply antiseize compound to bolts (5) and secure engine motion transducer (2) with bolts (5) and flat washer (6). Torque bolts to 33 to 37 in-lbs.

(6) Connect electrical connector (7) to engine motion transducer (2).

(7) Lock wire electrical connector (7).

3-26. ENGINE MOTION TRANSDUCER REPLACEMENT - continued.

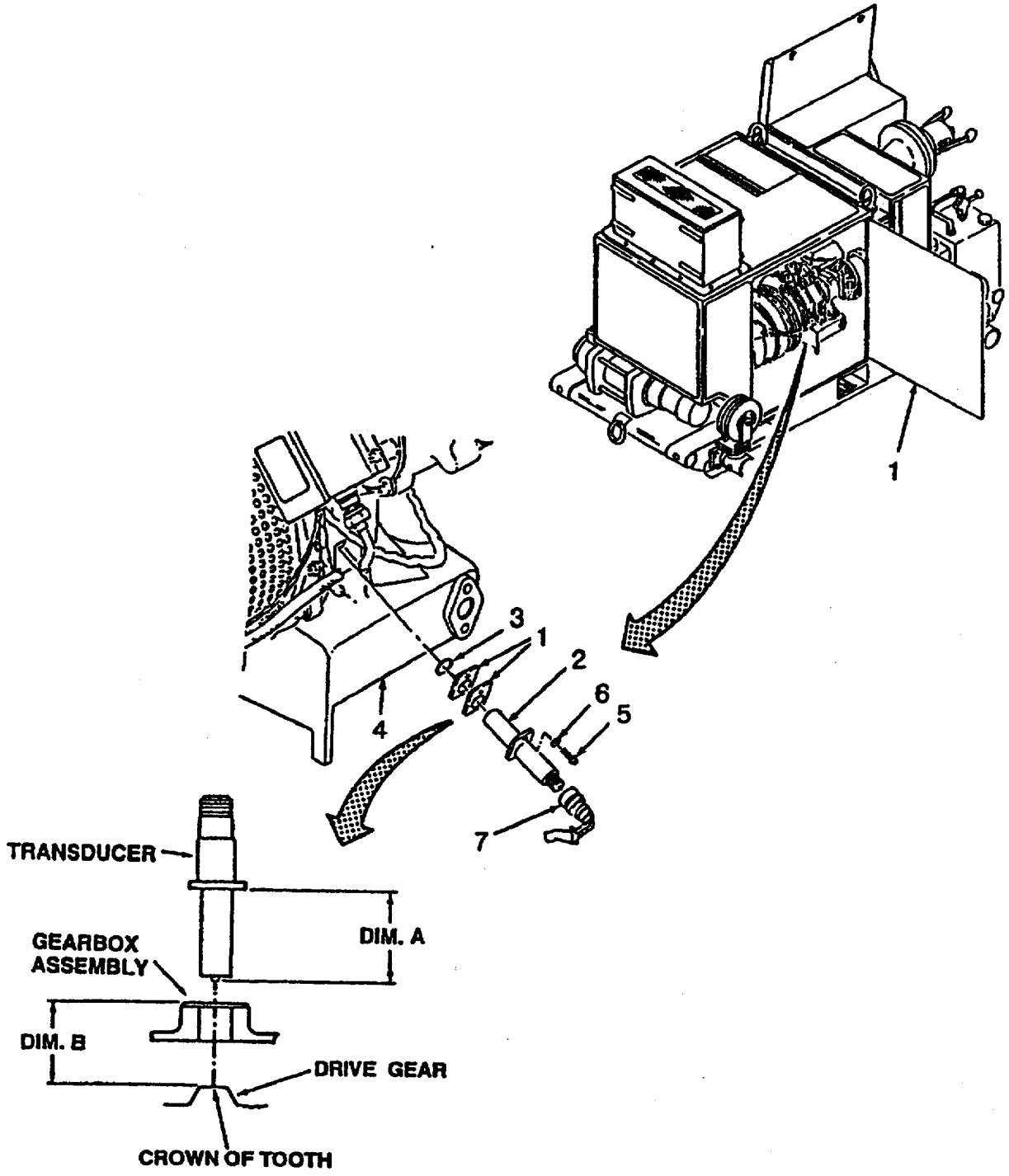


Figure 3-47. Engine Motion Transducer Installation

3-27. ENGINE FUEL CONTROL LOWER COVER REPAIR.

This task covers: a. Disassemble b. Inspect c. Repair d. Assemble

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 3)
Drill (App B, Sect III, Item 2)
Drill Set, Twist (App B, Sect III, Item 2)

Equipment Condition
Engine Fuel Control Lower Cover removed (Para 2-51)

Materials/Parts
Adhesive RTV (App E, Item 10)
Primer (App E, Item 13)
Primer (App E, Item 14)
Brush, Acid Swabbing (App E, Item 36)
Tape, Pressure Sensitive (App E, Items 22 and 25)

a. DISASSEMBLE. Refer to Figure 3-48.

(1) Remove seal (1) from fuel control lower cover (2).

(2) Drill out rivets (3) and remove nut plates (4) from fuel control lower cover (2).

b. INSPECT.

Inspect fuel control lower cover (2) for cracks. If cracked, forward to depot for repair.

c. REPAIR.

Replace defective components.

d. ASSEMBLE.

CAUTION

Keep primers closed as much as possible to prevent premature drying.

(1) Apply a wet coat of epoxy primer to grip area of rivets (3) and holes on nut plate (4) with acid swabbing brush. Air dry for 3 minutes.

(2) Align rivet holes on nut plate (4) and fuel control lower cover (2) and install rivets (3).

3-27. ENGINE FUEL CONTROL LOWER COVER REPAIR - continued.

CAUTION

Keep primers closed as much as possible to prevent premature drying.

(3) Coat head and tail rivets (3) with wet coat of epoxy primer.

(4) Apply thin coat of primer to engine fuel control lower cover (2) bonding surface. Allow to dry for 30 minutes.

CAUTION

Applied RTV should not sit more than 2 to 3 minutes prior to assembly. A surface skin will develop that will interfere with prior bonding.

NOTE

Do not apply RTV to more area than can be done in 2 to 3 minute interval.

(5) Apply a uniform layer of RTV approximately 0.010 inch thick to bonding surfaces of engine fuel control lower cover (2) and seal (1) with acid swabbing brush.

(6) Install seal (1) on engine fuel control lower cover (2). Apply a small amount of finger pressure to obtain smoothing and contact.

(7) With pressure sensitive tape, tape seal (1) to engine fuel control lower cover (2) to maintain alignment during cure cycle. Cure at room temperature for 72 hours.

(9) Remove pressure sensitive tape and trim excessive RTV.

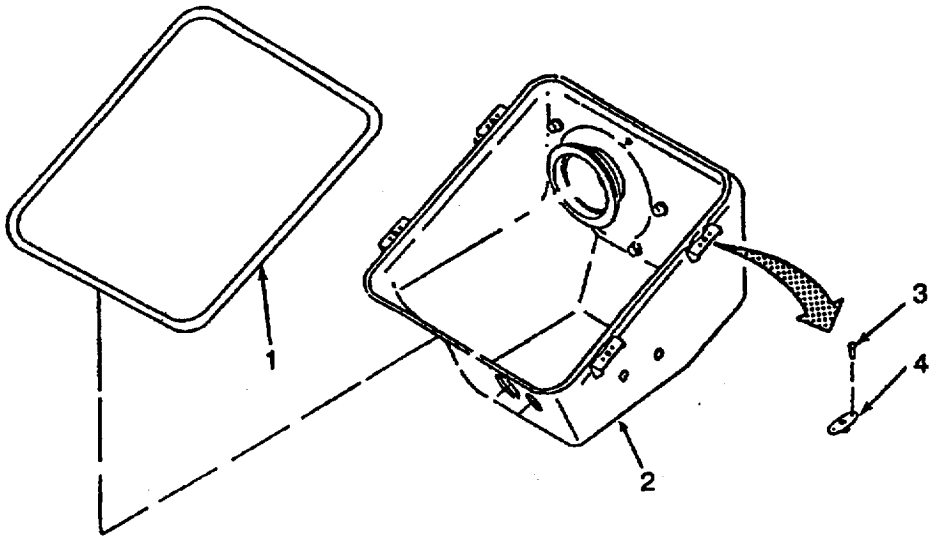


Figure 3-48. Engine Fuel Control Lower Cover Repair

3-28. NICKEL-CADMIUM BATTERY REPAIR.

This task covers: Repair

INITIAL SETUP

Equipment Condition
Battery Heater Assembly removed (Para 2-13)

REPAIR.

Refer to TM 10-6140-203-23 for repair of nickel-cadmium battery.

3-29. BATTERY HEATER ASSEMBLY REPAIR.

This task covers: a. Disassembly b. Repair c. Assembly

INITIAL SETUP

Tools
Tool Kit, General Mechanics (App B, Sect III, Item 1
Wire Stripper (App B, Sect III, Item 3)
Electrical Repair Kit (App B, Sect III, Item 3)
Solder Gun (App B, Sect III, Item 3)

Materials/Parts
Solder (App E, Item 24)
Sleeve (App E, Item 31)
Grommet (App F, Item 32)
Tie Straps (App E, Item 17)

Equipment Condition
Battery Heater Assembly removed (Para 2-63)

a. DISASSEMBLY. Refer to Figure 3-49.

(1) Cut tie straps (1) from wire leads (2).

(2) Remove contacts (3) from insert (4) on electrical connector (5).

(3) Unsolder wire leads (2) and remove from contacts (3).

(4) Slide adapter plate (6) off wire leads (2).

(5) Remove grommet (7) from adapter plate (6).

3-29. BATTERY HEATER ASSEMBLY REPAIR - continued.

b. REPAIR.

Replace all damaged components.

c. INSTALLATION.

(1) Install grommet (7) in adapter plate (6).
(2) Slide adapter plate (6) over wire leads (2).
(3) Strip insulation from wire lead (2) to the length of socket (8) on contact (3).
(4) Insert stripped end of wire lead (2) in contact (3) and solder.
(5) Install contact (2) into insert (4) on electrical connector (5).
(6) Repeat steps 3, 4 and 5 for installation of remaining wire leads (2).
(7) Install tie straps (1) on wire leads (2). Space tie straps approximately 1 inch apart.

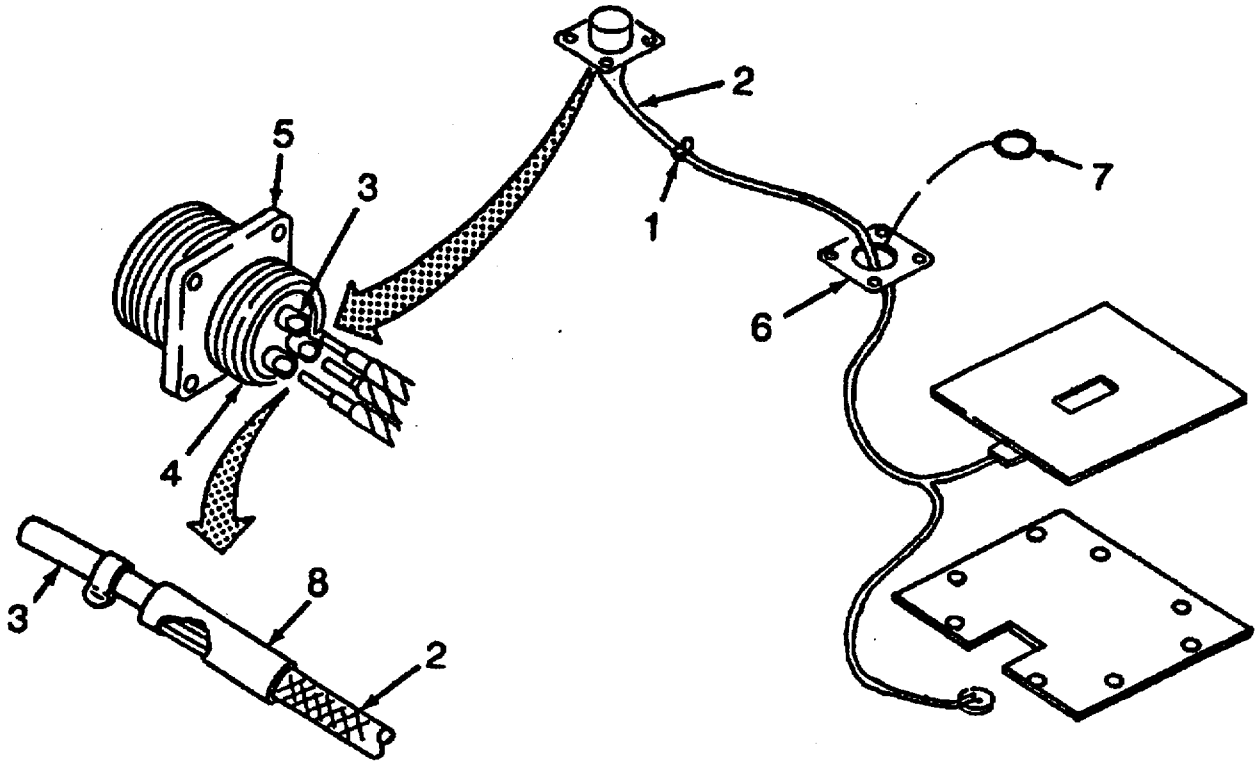


Figure 3-49. Battery Heater Assembly Repair

3-30. CONTROL BOX WIRING HARNESS REPAIR.

This task covers: a. Removal b. Repair c. Installation

INITIAL

Tools
Tool Kit, General Mechanics (APP B, Sect III, Item/) 1
Wire stripper (App B, III, Item 3)
Electrical Repair Kit (App B, Sect III, Item 3)
Solder Gun (App B, Sect III, Item 3)

Materials/Parts
Solder (App E, Item 24)
Sleeve (Heat Shrink) (App g, Item 3-
Tags (App E, Item 16)

Equipment Condition
200/600 GPM Pump Assembly removed from system (Para 2-9, TM 10-4320-342-10)

a. REMOVAL-Refer to Figure 3-50.

(1) Open and lock cover (1) in place.

(2) Open control panel (2).

NOTE
Installing tags on wire connections will help during installation of wiring harness.

(3) Install tags on all wiring harness (3) leads.

(4) Remove screws (4), lockwashers (5) and wire leads (6) from toggle switches (7).

(5) Remove screws (8) and wire leads (9) from panel lights (10).

(6) Remove screws (11), lockwashers (12) and wire leads (13) from master switch (14).

(7) Remove screws (15), lockwashers (16) and wire leads (17) from circuit breakers (18).

(8) Remove nuts (19), flat washers (20) and wire leads (21) from ammeter (22).

NOTE
Heat shrink should be one inch back of wire end to avoid burning during soldering.

(9) Remove heat shrink (23) and unsolder wire leads (24) from variable resistor (25).

(10) Remove heat shrink (26) and unsolder wire leads (17) from indicator lights (28).

3-30. CONTROL BOX WIRING HARNESS REPAIR.

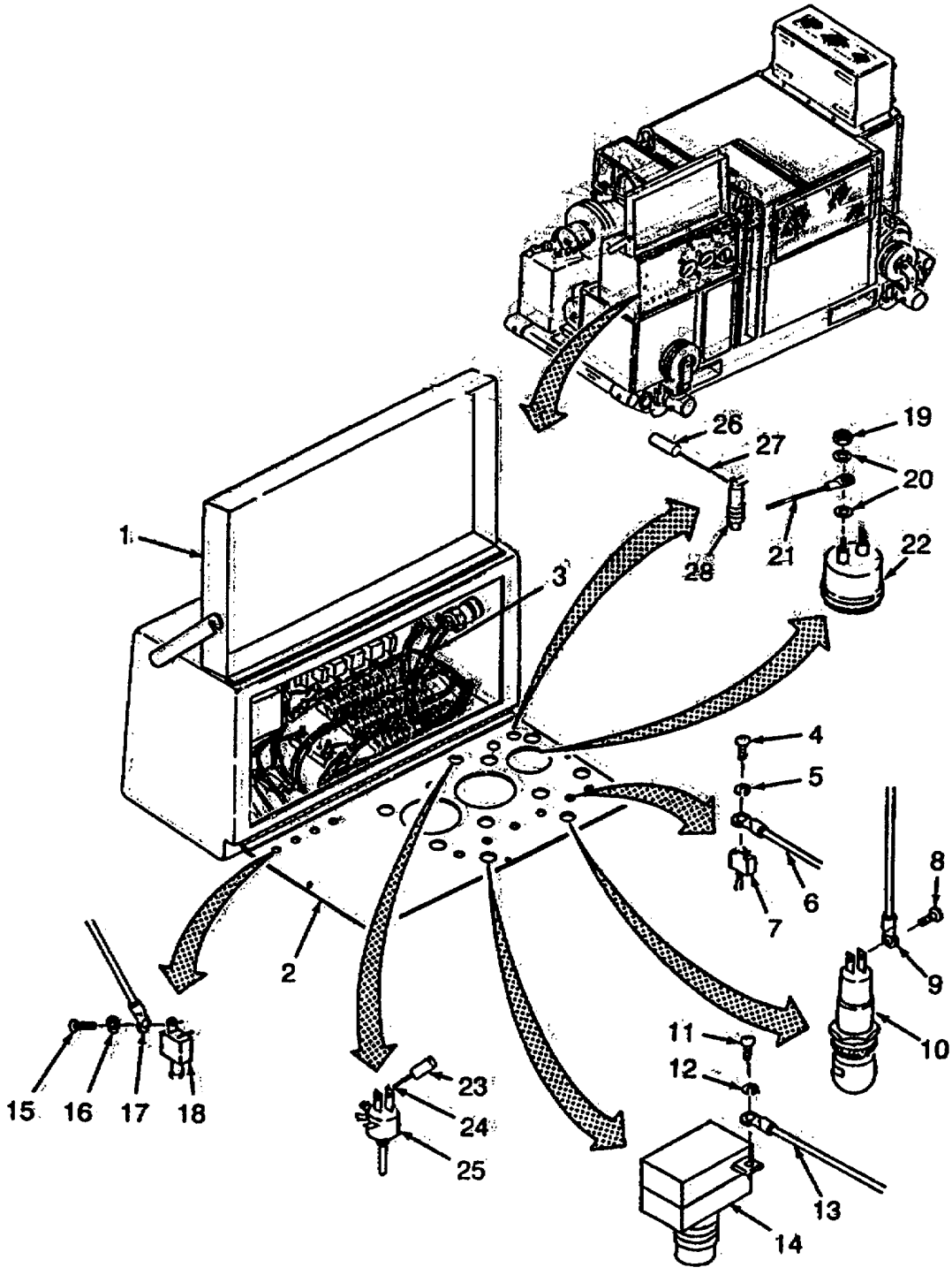


Figure 3-50. Control Panel (Components)Wiring Harness Removal

3-30. CONTROL BOX WIRING HARNESS REPAIR - continued

Refer to Figure 3-51.

(11) Disconnect electrical connector (1) from voltage regulator (2).

(12) Remove nuts (3), lockwashers (4) and wire leads (5) from K3 relay (6).

(13) Remove locknuts (7), flat washers (8) and wire leads from K2 and K6 relays (10).

(14) Remove nuts (11), flat washers (12) and wire leads (13) from R4 shunt (14).

(15) Remove screws (15), lockwashers (16) and wire leads (17) from R4 shunt (14).

(16) Remove locknuts (18), flat washers (19), fuse link (20) and wire leads (21) from fuse holder (22).

(17) Remove screws (23) and wire leads (24) from terminal boards (25).

(18) Remove self-locking nuts (26), flat washers (27) and relays (28, 29, 30, 31 and 32) from studs (33) on mounting bracket (34).

(19) Remove nuts (35), flat washers (36), screws (37) and mounting bracket (34).

(20) Tag and disconnect wiring from back of relay sockets (40, 41, 42, 43 and 44).

(21) Remove self-locking nuts (38) and flat washers (39) from studs (33).

(22) Remove relay sockets (40, 41, 42, 43 and 44) from mounting bracket (34).

(23) Disconnect electrical connectors (45, 46, 47 and 48) from electrical connectors (49, 50, 51 and 52).

(24) Remove wiring harness (53) from control box (54).

b. REPAIR.

Refer to FM 20-31 for repair of control box wiring harness.

3-30. CONTROL BOX WIRING HARNESS REPAIR - continued.

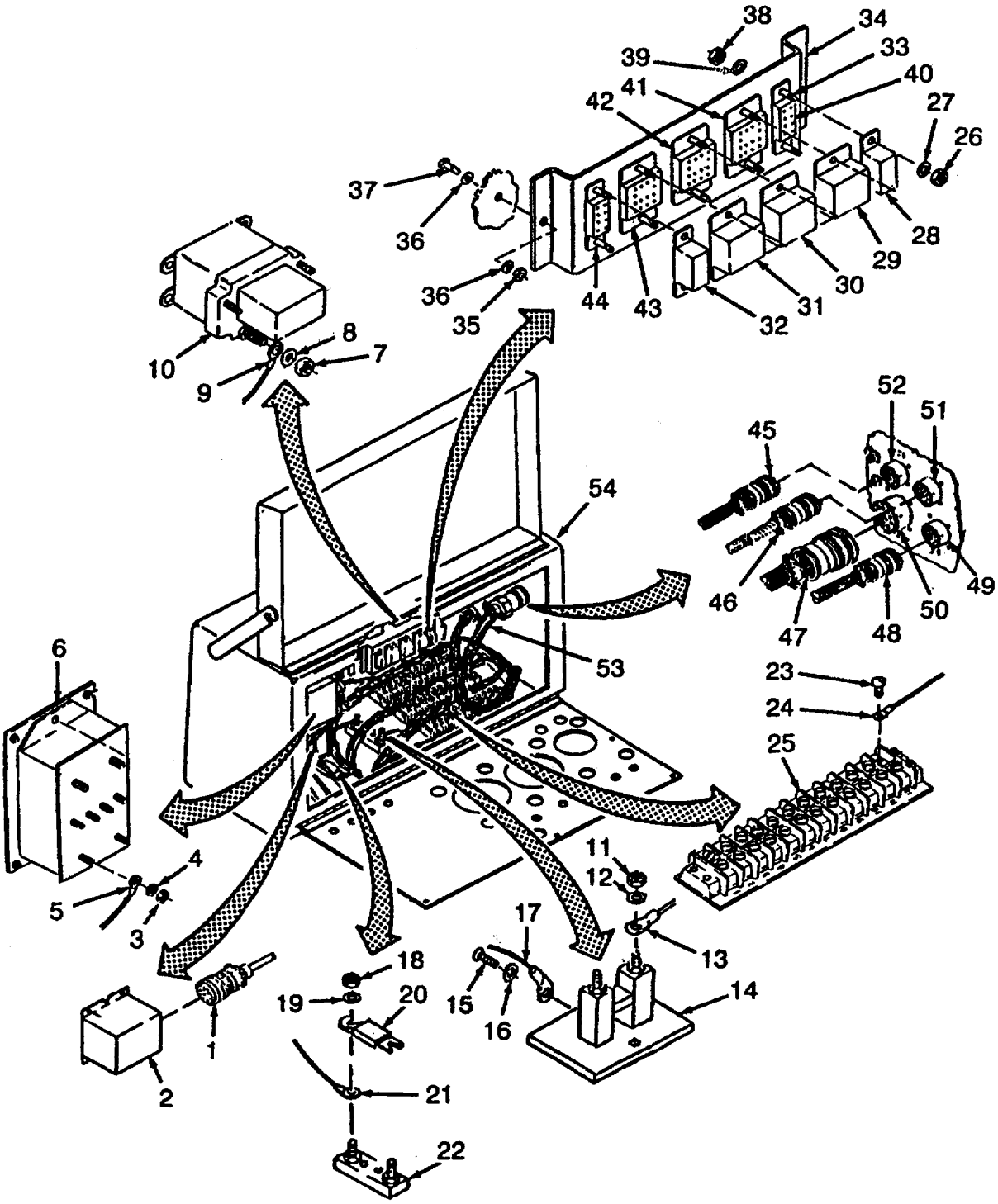


Figure 3-51. Control Box (Components) Wiring Harness Removal

3-30. CONTROL BOX WIRING HARNESS REPAIR - continued.

c. INSTALLATION. Refer to Figure 3-52.

NOTE

Wire numbers are stamped on each wire lead. This information, in conjunction with data on FO-1 and FO-2, 200/600 GPM Pump Wiring Diagram, may be used to connect wire leads if tags are lost or illegible.

(1) Position wiring harness (53) in control box (54).

(2) Connect electrical connectors (45, 46, 47 and 48) to electrical connectors (49, 50, 51 and 52).

(3) Install relay sockets (40, 41, 42, 43 and 44) in mounting bracket (34).

(4) Install self-locking nuts (38) and flat washers (39) on studs (33) to secure relay sockets (40, 41, 42, 43 and 44) in mounting bracket (34).

(5) Connect wiring to back of relay sockets (40, 41, 42, 43 and 44).

(6) Position mounting bracket (34) in control box (54) and secure with screws (37), flat washers (36) and nuts (35).

(7) Install relays (28, 29, 30, 31 and 32) on studs (33) and secure with flat washers (27) and self-locking nuts (26).

(8) Install wire leads (24) and screws (23) on terminal boards (25).

(9) Install wire leads (21), fuse link (20),'flat washers (19) and locknuts (18) on fuse holder (22).

(10) Install wire leads (17), lockwashers (16) and screws (15) on R4 shunt (14).

(11) Install wire leads (13), flat washers (12) and nuts (11) on R4 shunt (14).

(12) Install wire leads (9), flat washers (8) and locknuts (7) on K2 and K6 relays (10).

(13) Install wire leads (5), lockwashers (4) and nuts (3) on K3 relay (6).

(14) Connect electrical connector (1) to voltage regulator (2).

3-30. CONTROL BOX WIRING HARNESS REPAIR - continued.

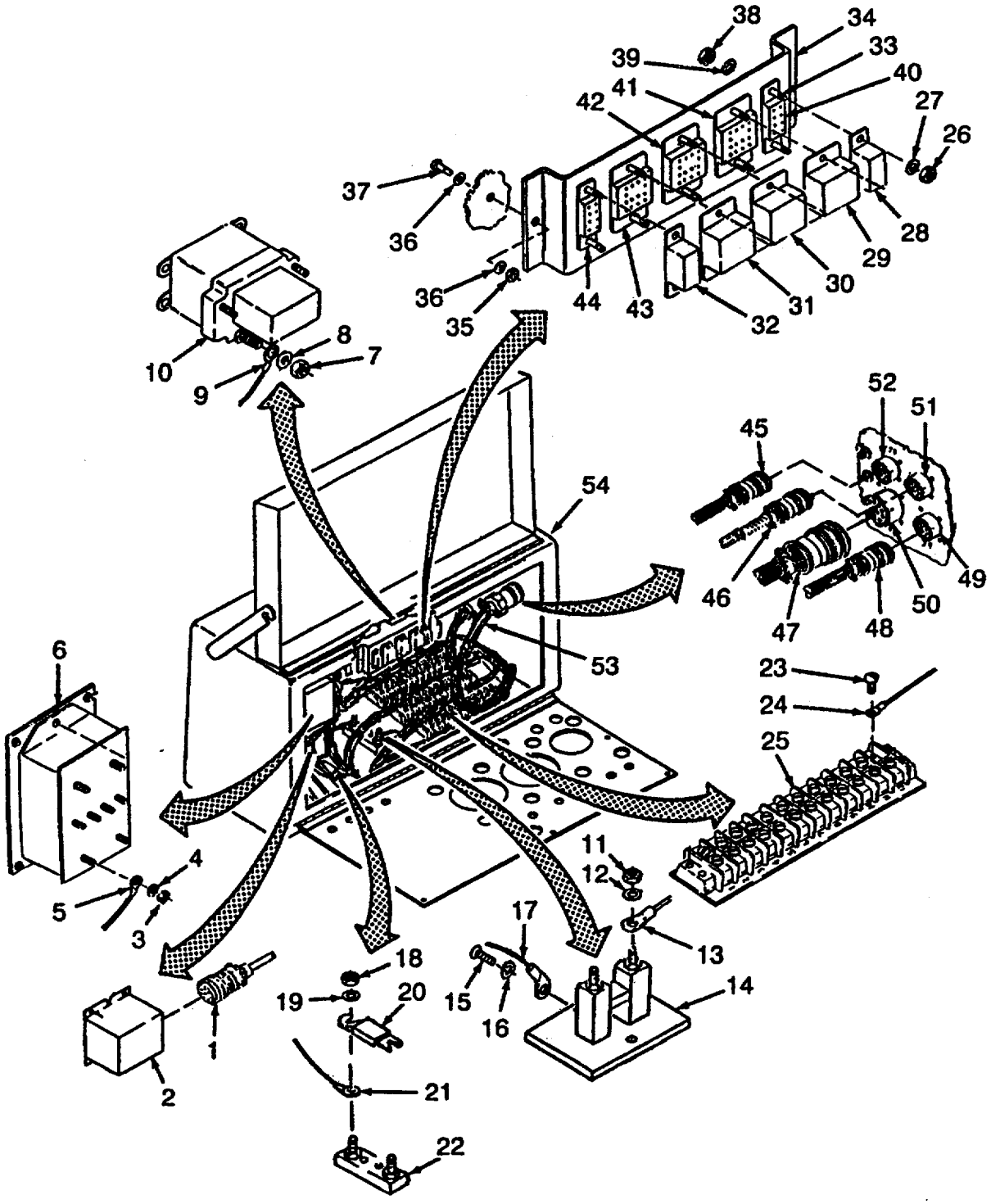


Figure 3-52. Control Box (Components) Wiring Harness Installation

3-30. CONTROL BOX WIRING HARNESS REPAIR - continued.

Refer to Figure 3-53.

NOTES

- **Heat shrinks should be positioned one inch from wire end to avoid burning during soldering.**
- **Wire leads without terminals should be stripped .250 inch and tinned.**

(1) Position heat shrinks (26) on wire leads (27).

(2) Strip and tin end of wire leads (27).

(3) Install and solder end of wire leads (27) on indicator lights (28).

(4) Slide heat shrinks (26) over soldered connections on indicator lights (28) and shrink.

(5) Position heat shrinks (23) on wire leads (24).

(6) Strip and tin end of wire leads (24).

(7) Install and solder end of wire leads (24) on variable resistor (25).

(8) Slide heat shrinks (23) over soldered connections on variable resistor (25) and shrink.

(9) Install wire leads (21), flat washers (20) and nuts (19) on ammeter (22).

(10) Install wire leads (17), lockwashers (16) and screws (15) on circuit breakers (18).

(11) Install wire leads (13), lockwashers (12) and screws (11) on master switch (14).

(12) Install wire leads (9) and screws (8) on panel lights (10).

(13) Install wire leads (6), lockwashers (5) and screws (4) on toggle switches (7).

(14) Remove tags from wiring harness (3).

(15) Close and secure control panel (2).

(16) Close and secure cover (1).

3-30. CONTROL BOX WIRING HARNESS REPAIR - continued.

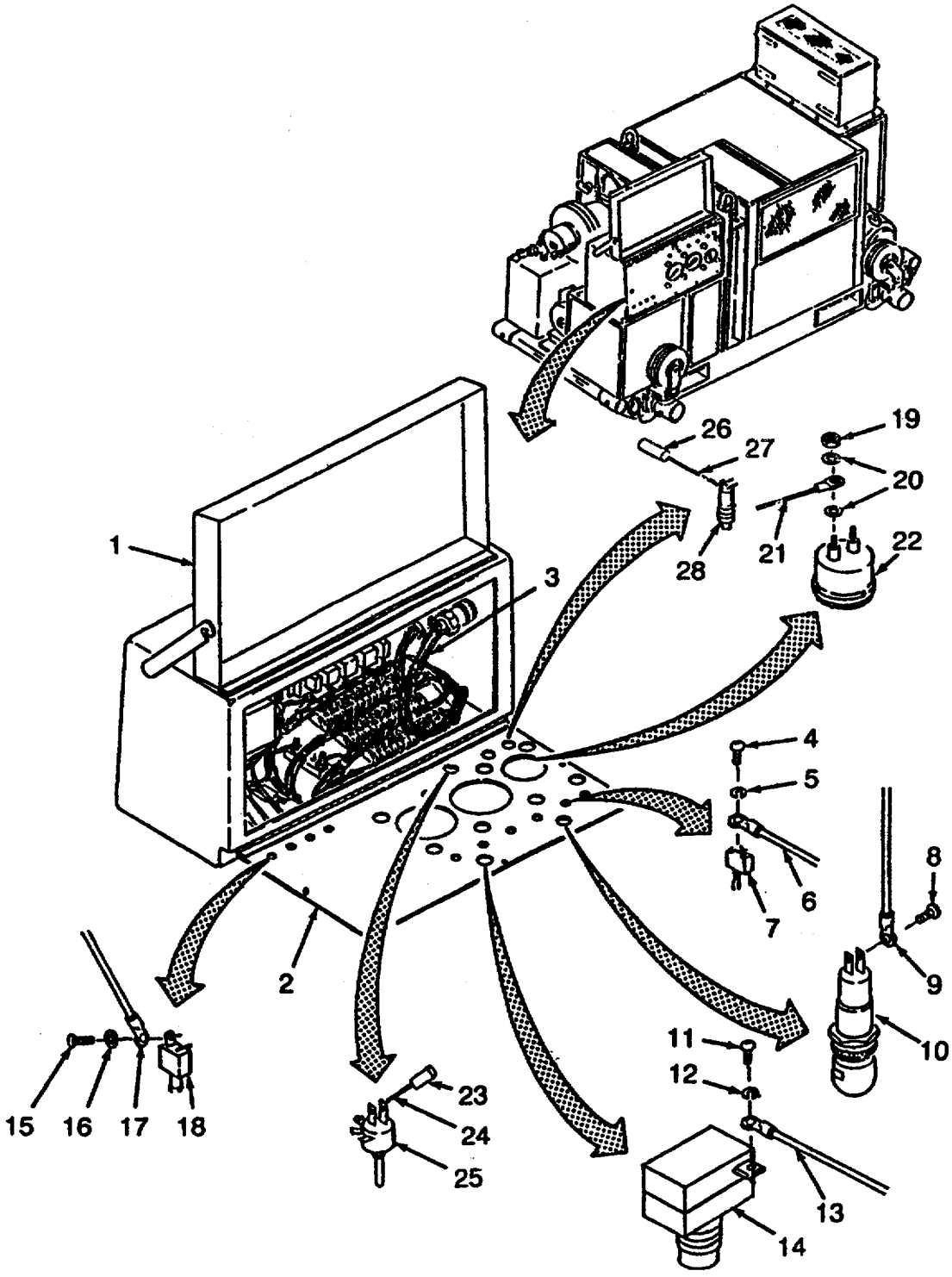


Figure 3-53. Control Panel (Components) Wiring Harness Installation

3-31. VARIABLE RESISTOR (LIGHTS) REPLACEMENT.

This task covers: a. Removal b. Repair c. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 3)
Wire Stripper (App B, Sect III, Item 3)
Electrical Repair Kit (App B, Sect III, Item 3)
Solder Gun (App B, Sect III, Item 3)

Materials/Parts
Solder (App E, Item 24)
Sleeve (Heat Shrink) (App E, Item 31)
Tags (App E, Item 16)

Equipment Condition
200/600 GPM Pump Assembly removed from system (PARA 2-9, TM 10-4320-342-10)

a. REMOVAL. Refer to Figure 3-54.

(1) Open and lock cover (1) in place.

(2) Open control panel (2).

(3) Remove heat shrink (3) and tag wire leads (4) on variable resistor (5).

(4) Unsolder and remove wire leads (4) from variable resistor (5).

(5) Loosen two setscrews (6) in knob (7) and remove knob.

(6) Remove nut (8), lockwasher (9), flat washer (10) and resistor (5) from control panel (2).

b. INSTALLATION.

(1) Install resistor (5), flat washer (10), lockwasher (9) and nut (8) on control panel (2).

(2) Install knob (7) on resistor (5) and tighten two setscrews (6).

NOTE

Heat shrink should be positioned one inch from wire end to avoid burning during soldering.

(3) Position heat shrink (3) on wire leads (4).

3-31. VARIABLE RESISTOR (LIGHTS) REPLACEMENT- continued,

(4) Strip and tin wire leads (4).

(5) Install and solder wire leads (4) on variable resistor (5).

(6) Slide heat shrink (3) over soldered connection and shrink. Remove tags from wire leads (4).

(7) Close and secure control panel (2).

(8) Close and secure cover (1).

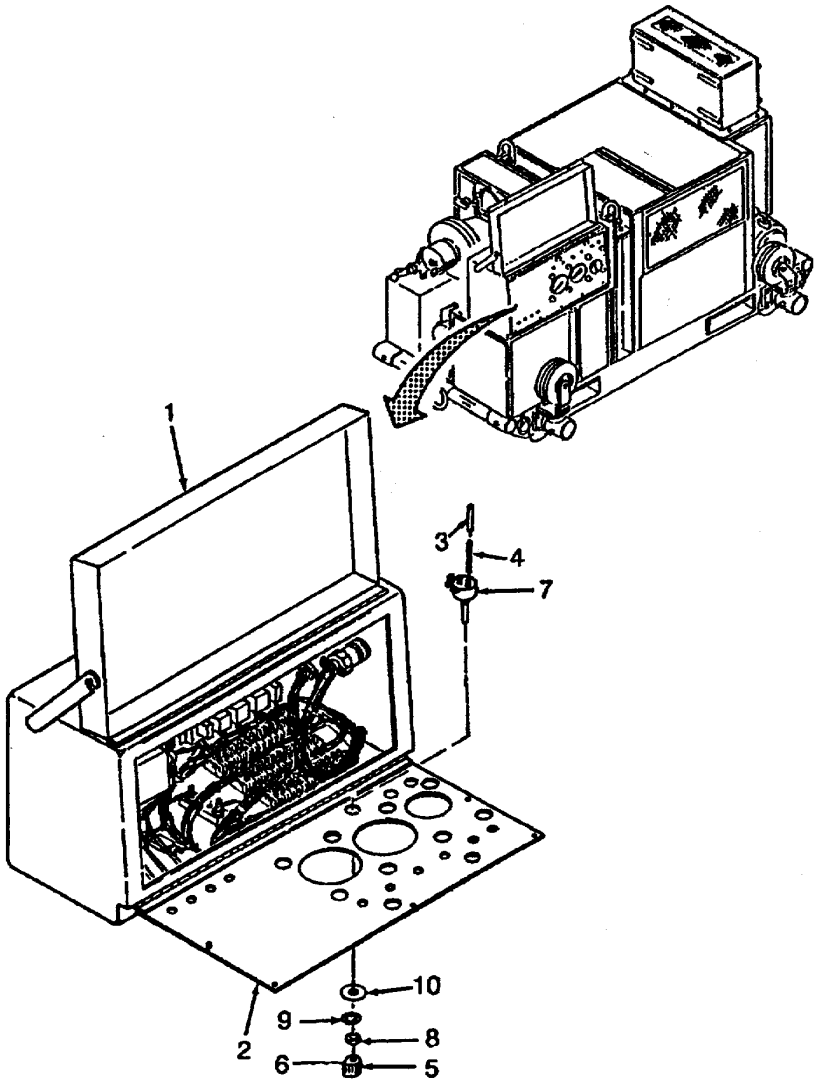


Figure 3-54. Variable Resistor Replacement

3-32. INDICATOR LIGHTS (ENGINE, ENGINE OIL TEMP AND CLUTCH DISENGAGED) REPLACEMENT (TYPICAL).

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Wire Stripper (App B, Sect III, Item 3)
Electrical Repair Kit (App B, Sect III, Item 3)
Solder Gun (App B, Sect III, Item 3)

Materials/Parts
Solder (App E, Item 24)
Sleeve (Heat Shrink) (App E, Item 31)
Tags (App E, Item 16)

Equipment Condition
Battery disconnected (Para 2-62)
200/600 GPM Pump Assembly removed from system (Para 2-9, TM 10-4320-342-10)

NOTE

This procedure covers the ENGINE INDICATOR light. Replacement of ENGINE OIL TEMP (Oil Temperature) and CLUTCH DISENGAGED lights are identical.

a. REMOVAL. Refer to Figure 3-55.

(1) Open and lock cover (1) in place.

(2) Open control panel (2).

(3) Remove lens cap (3) and incandescent lamp (4) from indicator light (5).

(4) Remove heat shrinks (6) and tag wire leads (7) on indicator light (5).

(5) Unsolder and remove wire leads (7) from indicator light (5).

(6) Remove nut (8), washer (9), nut (10) and indicator light (5) from control panel (2).

b. INSTALLATION.

(1) Install indicator light (5), nut (8), washer (9) on control panel (2).

3-32. INDICATOR LIGHTS (ENGINE, ENGINE OIL TEMP AND CLUTCH DISENGAGED) REPLACEMENT (TYPICAL).

NOTE

Heat shrink should be positioned one inch from wire end to avoid burning during soldering.

(2) Position new heat shrinks (6) on wire leads (7).

(3) Strip and tin wire leads (7).

(4) Install and solder wire leads (7) on indicator light (5).

(5) Position new heat shrinks (6) over soldered connection and shrink. Remove tags from wire leads (7).

(6) Install incandescent lamp (4) and lens cap (3) on indicator light (5).

(7) Close and secure control panel (2).

(8) Close and secure cover (1).

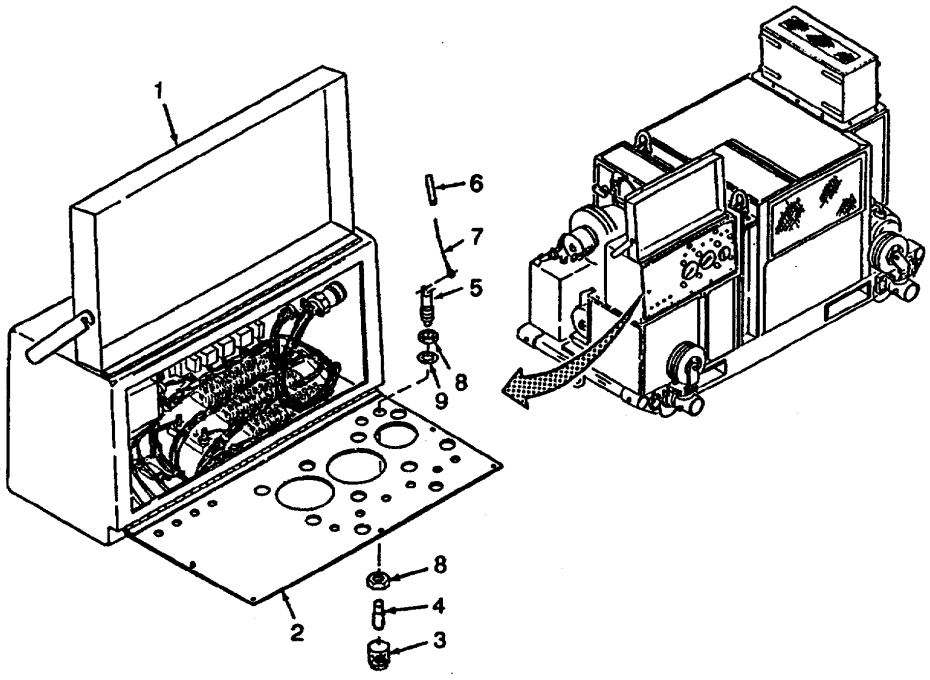


Figure 3-55. Indicator Lights (ENGINE, ENGINE OIL TEMP AND CLUTCH DISENGAGED) Replacement (Typical)

3-33. CONTROL BOX ENCLOSURE REPAIR.

This task covers: Repair

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Shop Equipment, Welding Field Maintenance
Shop Equipment, Welding Field Maintenance (App B, Sect III, Item 4)

Equipment Condition
Control box removed (Para 2-66)
Components removed (Paras 2-67 thru 2-78)
Control Box Wiring Harness removed (Para 3-29)
Variable Resistor (Lights) removed (Para 3-30)
Indicator Lights removed (Para 3-31)

General Safety Instructions

WARNING

Chemical agent resistance coating (CARC)
Chemical agent resistance coating (CARC) produces toxic fumes when flame is applied. It is necessary to remove CARC in areas where flame is to be applied.

REPAIR.

Repair of control box enclosure is limited to bending, removal of dents, painting, welding, etc., as necessary to return it to serviceable condition. Refer to TM 9-237, Welding Theory and Applications for welding.

3-34. WINCH CONTROL CABLE ASSEMBLIES REPAIR

This task covers: a. Removal b. Repair c. Installation

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Wire Stripper (App B, Sect III, Item 3)
Solder Gun (App B, Sect III, Item 3)
Heat Gun (App B, Sect III, Item 3)

Materials/Parts
Solder (App E, Item 24)
Tags (App E, Item 16)

Equipment Condition
Battery disconnected (Para 2-62)
200/600 GPM Pump Assembly removed from system (Para 2-9, TM 10-4320-342-10)

Reference
Electric Power Generation in the Field (FM 20-31)

a. REMOVAL. Refer to Figure 3-56.

(1) Open door panel (1).

(2) Disconnect electrical connectors (2 and 3) from receptacles (4 and 5).

(3) Remove screws (6) and cover (7) from junction box (8).

NOTE
Installing tags on wire connections will help during installation of cables.

(4) Tag electrical leads (9, 10, 11 and 12).

(5) Remove screw (13) and electrical lead (9) from terminal board (14).

(6) Remove nuts (15), lockwashers (16) and electrical leads (10, 11 and 12) from solenoid valves (17, 18 and 19).

(7) Unscrew seal nut (20) and remove cable (21) from adapter (22) on junction box (8).

(8) Remove seal (23), seal ring (24) and seal nut (20) from cable (21).

(9) Unscrew seal nut (25) and remove cable (26) from adapter (27) on junction box (8).

(10) Remove seal (28), seal ring (29) and seal nut (25) from cable (26).

b. REPAIR.

Refer to Appendix D, Item 15 and FM 20-31, Electric Power Generation in the Field to manufacture/repair the winch control cable assemblies.

3-34. WINCH CONTROL CABLE ASSEMBLIES REPAIR - continued.

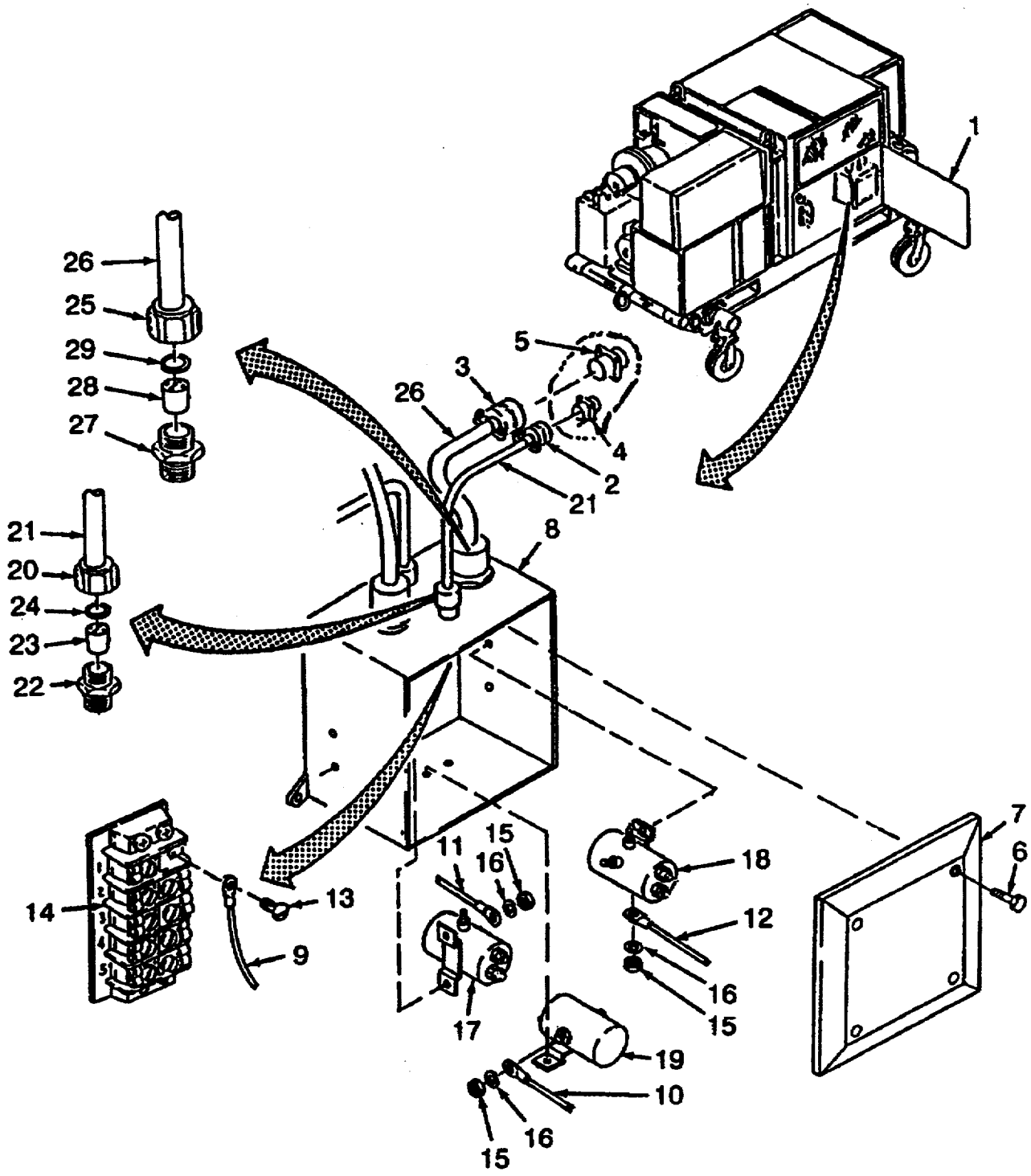


Figure 3-56. Winch Control Cable Assemblies Removal

3-34. WINCH CONTROL CABLE ASSEMBLIES REPAIR - continued.

c. INSTALLATION. Refer to Figure 3-57.

(1) Slide seal nut (25), seal ring (29) and seal (28) on cable (26).

(2) Push electrical leads (11 and 12) through adapter (27) on junction box (8).

NOTE

Wire numbers are stamped on each wire lead. This information, in conjunction with data on FO-1 and FO-2, 200/600 GPM Pump Wiring Diagram, may be used to connect wire leads if tags are lost or illegible.

(3) Install electrical leads (11 and 12) on solenoid valves (17 and 18) and secure with lockwashers (16) and nuts (15).

(4) Install seal (28), seal ring (29) and seal nut (25) on adapter (27).

(5) Seal seal nut (20), seal ring (24) and seal (23) on cable (21).

(6) Push electrical leads (9 and 10) through adapter (22) on junction box (8).

(7) Install electrical lead (10) on solenoid valve (17) and secure with lockwasher (16) and nut (15).

(8) Install electrical lead 99) on terminal board (14) and secure with screw (13).

(9) Install seal (23), seal ring (24) and seal nut (20) on adapter (22).

(10) Remove tags from electrical leads (9, 10, 11 and 12).

(11) Position cover (7) on junction box (2) and secure with screws (6).

(12) Install electrical connectors (2 and 3) on receptacles (4 and 5),

(13) Close door panel (1).

3-34. WINCH CONTROL CABLE ASSEMBLIES REPAIR - continued.

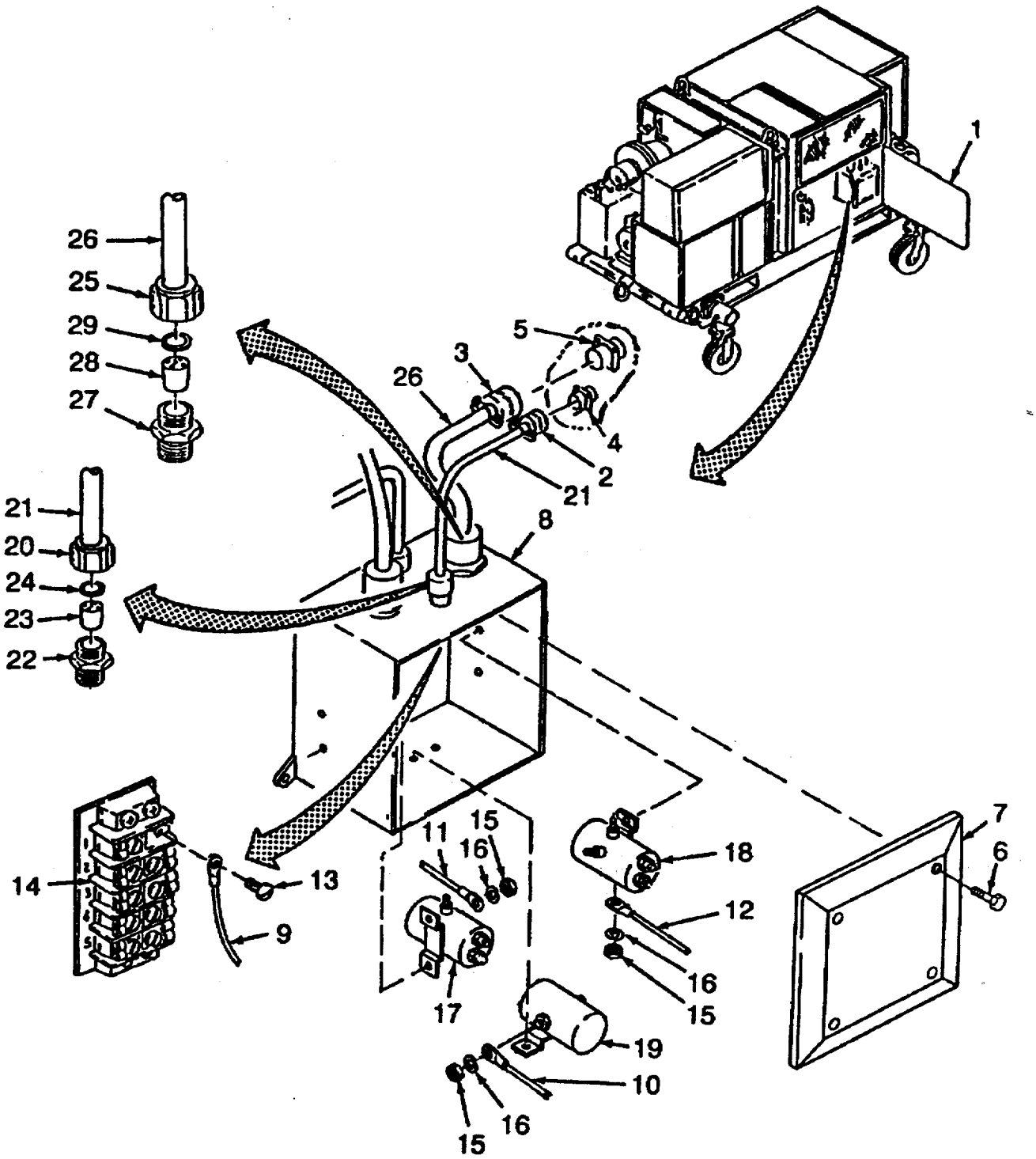


Figure 3-57. Winch Control Cable Assemblies Installation

3-35. MUFFLER MOUNT (TYPICAL) REPAIR.

This task covers: a. Disassembly b. Repair c. Assembly

INITIAL SETUP

Tools
Blind Riveter (App B, Sect III, Items 7, 8 and 9)
Drill (App B, Sect III, Item 3)
Set, Drill Twist (App B, Sect III, Item 3)

Equipment Condition
Muffler Mount removed (Para 2-84)

a. DISASSEMBLY. Refer to Figure 3-58.

As required, remove blind rivnuts (1) on muffler mount (2).

b. REPAIR.

Repair consists of replacing damaged and/or missing components.

c. ASSEMBLY.

If removed, install blind rivnuts (1) on muffler mount (2).

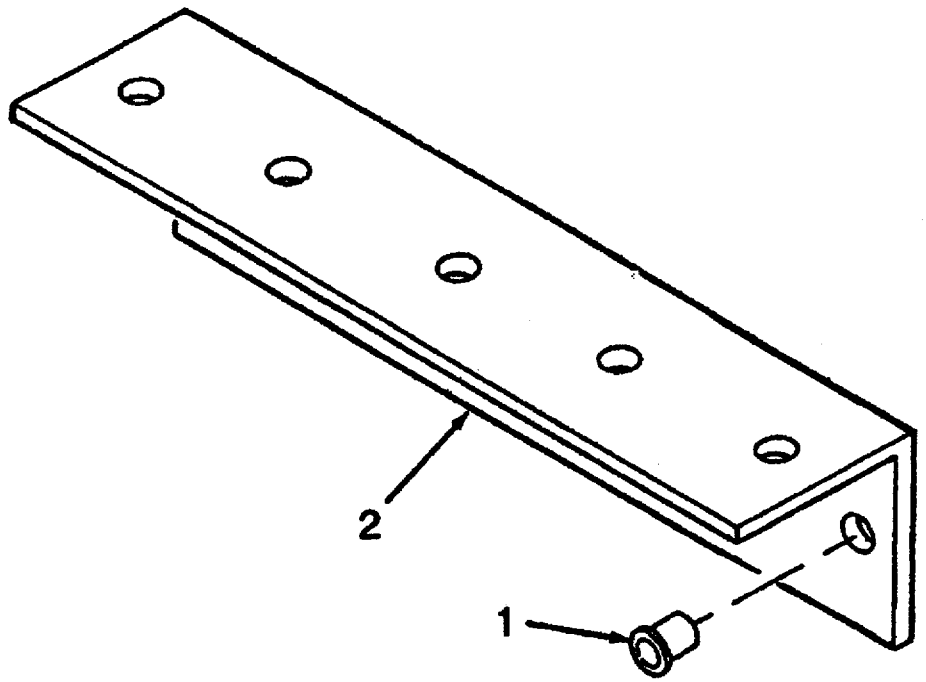


Figure 3-58. Muffler Mount (Typical) Repair

3-36. EXHAUST INTERFACE COVER REPAIR.

This task covers: a. Disassembly b. Repair c. Assembly

INITIAL SETUP

Tools
Blind Riveter (App B, Sect III, Items 6, 7 and 8)
Drill (App B, Sect III, Item 3)
Set, Drill Twist (App B, Sect III, Item 3)

Equipment Condition
Exhaust Cover removed (Para 2-85)

a. DISASSEMBLY. Refer to Figure 3-59.

As required, remove blind rivnuts (1) from exhaust cover (2).

b. REPAIR.

Repair consists of replacing damaged and/or missing components.

c. ASSEMBLY.

If removed, install blind rivnuts (1) on exhaust cover (2).

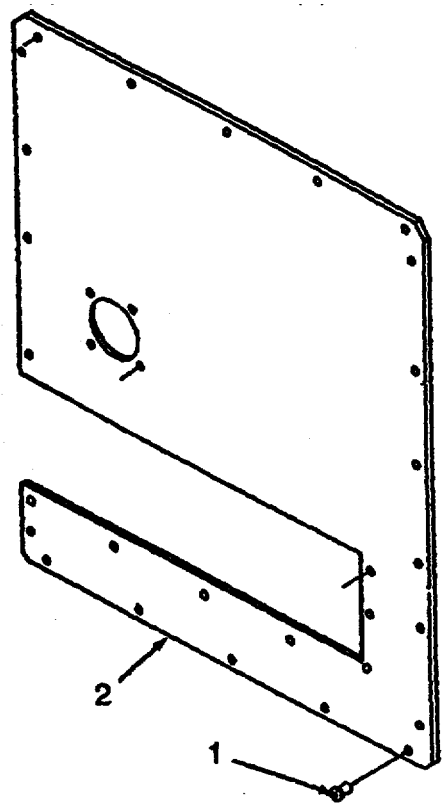


Figure 3-59. Exhaust Cover Repair

3-37. LIFTING BAR ASSEMBLY REPAIR.

This task covers: a. Disassembly b. Repair c. Assembly

INITIAL SETUP

Tools	Equipment Condition
Blind, Riveter (App B, Sect III, Item 3)	Lifting Bar Assembly removed (Para 2-91)
Drill (App B, Sect III, Item 3)	
Set, Drill Twist (App B, Sect III, Item 3)	

a. DISASSEMBLY. Refer to Figure 3-60.

As required, remove rivets (1) and turnlock receptacles (2) from lifting bar (3).

b. REPAIR.

Repair consists of replacing damaged and/or missing components.

c. ASSEMBLY.

If removed, install rivets (1) and turnlock receptacles (2) on lifting bar (3).

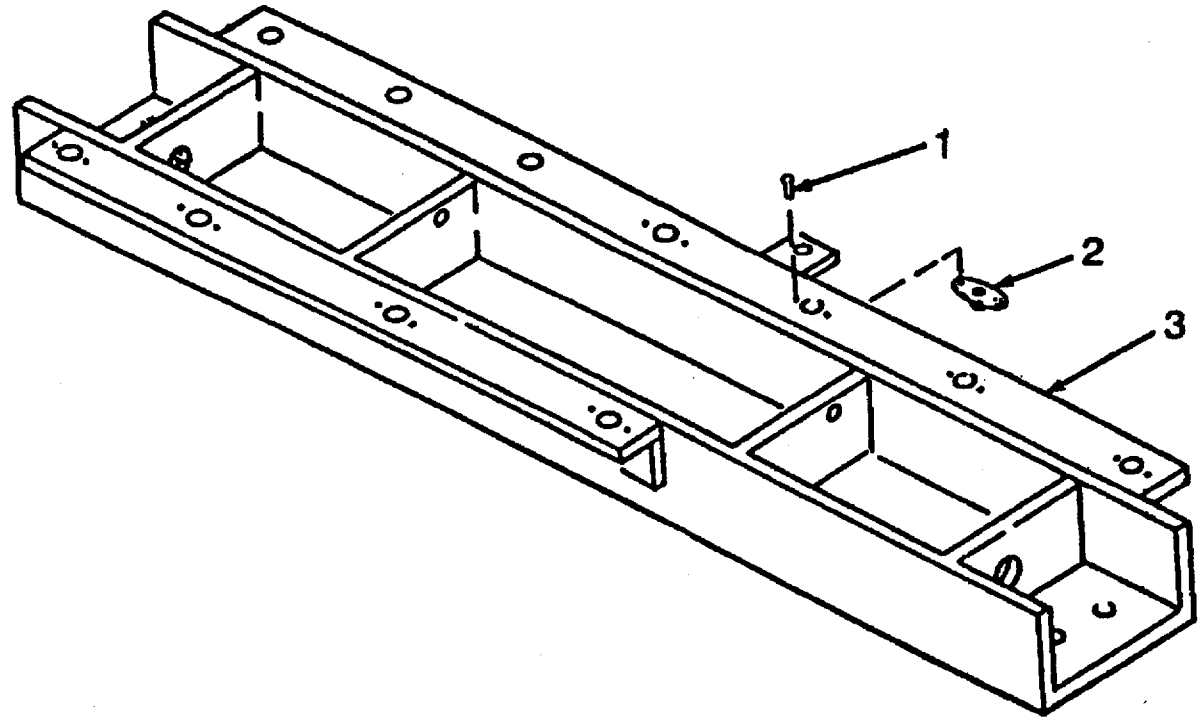


Figure 3-60. Lifting Bar Assembly Repair

3-38. REMOVABLE BRACKET ASSEMBLY REPAIR.

This task covers: a. Disassembly b. Repair c. Assembly

INITIAL SETUP

Tools	Equipment Condition
Blind Riveter (App B, Sect III, Item 2)	Removable Bracket Assembly removed
Drill (App B, Sect III, Item 3)	(Para 2-90)
Set, Drill Twist (App B, Sect III, Item 3)	

a. DISASSEMBLY. Refer to Figure 3-61.

(1) As required, remove rivets (1) and turnlock receptacles (2) from removable bracket (3).

(2) As required, remove blind rivnuts (4) from removable bracket (3).

b. REPAIR.

Repair consists of replacing damaged and/or missing components.

c. ASSEMBLY.

(1) If removed, install rivets (1) and turnlock receptacles (2) on removable bracket (3).

(2) If removed, install blind rivnuts (4) on removable bracket (3).

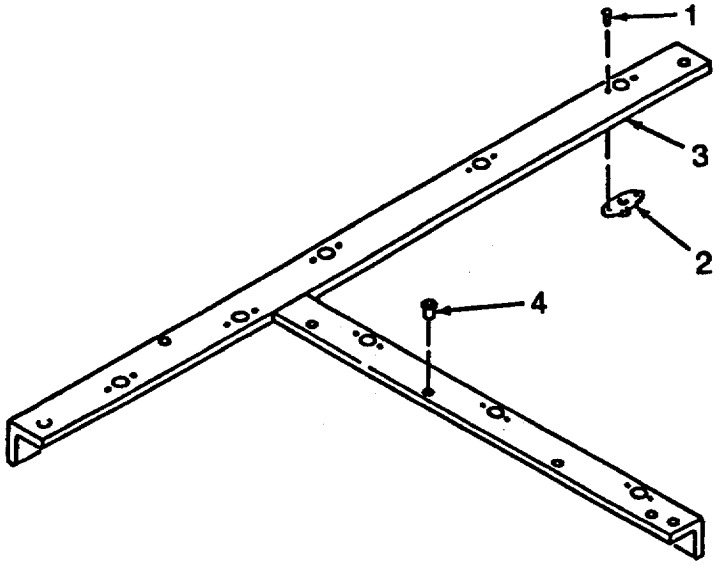


Figure 3-61. Removable Bracket Assembly Repair

3-39. ESU BRACKET ASSEMBLY REPAIR.

This task covers: a. Disassembly b. Repair c. Assembly

INITIAL SETUP

Tools
Blind Riveter (App B, Sect III, Item 2)
Drill (App B, Sect III, Item 2)
Set, Drill Twist (App B, Sect III, Item 2)

Equipment Condition
ESU Bracket Assembly removed (Para 2-92)

a. DISASSEMBLY. Refer to Figure 3-62.

As required, remove blind rivnut (1) from ESU bracket (2).

b. REPAIR.

Repair consists of replacing damaged and/or missing components.

c. ASSEMBLY.

If removed, install blind rivnut (1) on ESU bracket (2).

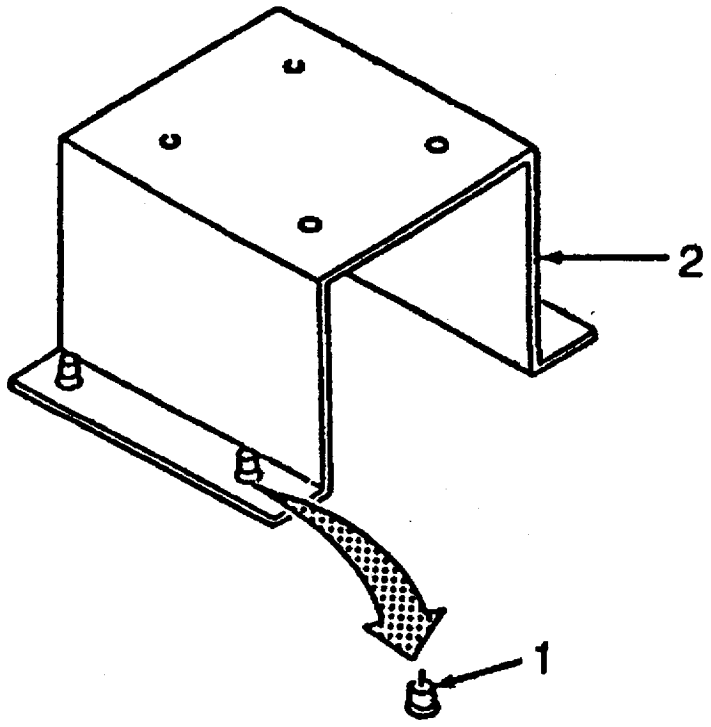


Figure 3-62. ESU Bracket Assembly Repair

3-40. AIR CLEANER MOUNTING BAR ASSEMBLY REPAIR.

This task covers: a. Disassembly b. Repair c. Assembly

INITIAL SETUP

Tools	Equipment Condition
Blind Riveter (App B, Sect III, Item 2)	Air Cleaner Mounting Bar Assembly removed
Drill (App B, Sect III, Item 2)	(Para 2-93)
Set, Drill Twist (App B, Sect III, Item 2)	

a. DISASSEMBLY. Refer to Figure 3-63.

(1) As required, remove rivets (1) and turnlock receptacles (2) from air cleaning mounting bar (3).

(2) As required, remove blind rivnuts (4) from air cleaner mounting bar (3).

b. REPAIR.

Repair consists of replacing damaged and/or missing components.

c. ASSEMBLY.

(1) If removed, install rivets (1) and turnlock receptacles (2) on air cleaner mounting bar (3).

(2) If removed, install blind rivnuts (4) on air cleaner mounting bar (3).

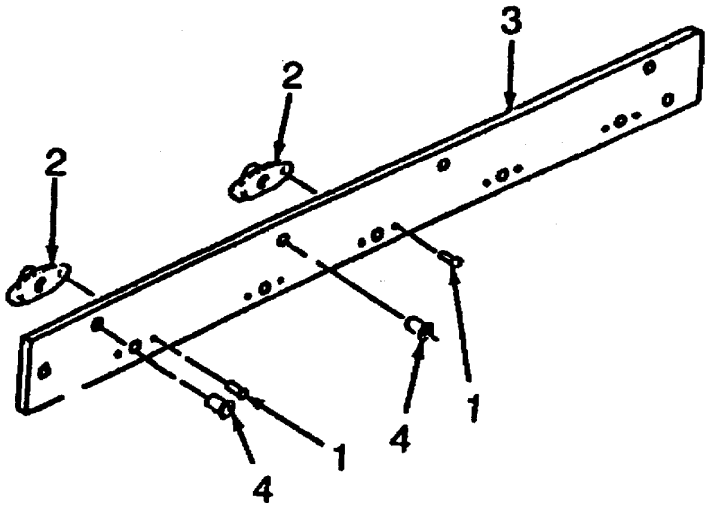


Figure 3-63. Air Cleaner Mounting Bar Assembly Repair

3-41. FRAME AND SKID ASSEMBLY REPAIR.

This task covers: a. Disassembly b. Repair c. Assembly

INITIAL SETUP

'Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Shop Equipment, Welding Field Maintenance (App B, Sect III, Item 4)
Blind Riveter (App B, Sect III, Item 2)
Tool Kit, Screw Thread Insert (App B, Sect III, Item 3)
Drill (App B, Sect III, Item 2)
Set, Drill (App B, Sect III, Item 2)

Equipment Condition
200/600 GPM Pump Assembly removed from system (Para 2-9, TM 10-4320-342-10)
Components removed as required

a. DISASSEMBLY. Refer to Figure 3-64.

(1) As required, remove rivets (1) and turnlock receptacles (2) from frame (3).

(2) As required, remove blind rivnuts (4) from frame (3) and skid (5).

(3) As required, remove inserts (6) from frame (3) and skid (5).

b. REPAIR.

(1) Repair consists of replacing damaged and/or missing components.

(2) Weld cracks or breaks on frame (3) and skid (5) in accordance with TM 9-237.

c. ASSEMBLY.

(1) If removed, install rivets (1) and turnlock receptacles (2) on frame (3).

(2) If removed, install blind rivnuts (4) on frame (3) and skid (5).

(3) If removed, install inserts (6) on frame (3) and skid (5).

3-41. FRAME AND SKID ASSEMBLY REPAIR - continued.

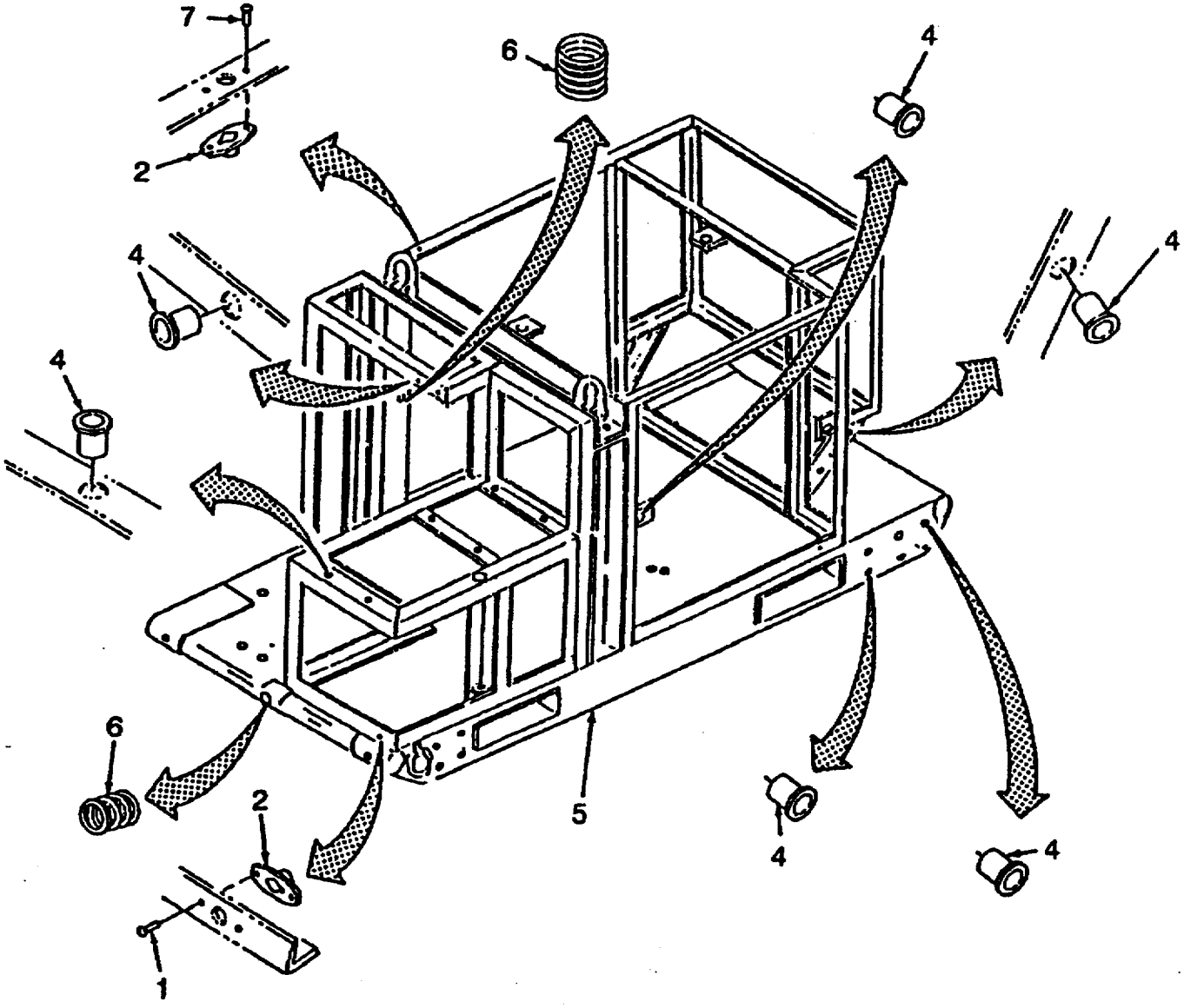


Figure 3-64. Frame and Skid Assembly Repair

Section III. PREPARATION FOR STORAGE OR SHIPMENT

3-42. ADMINISTRATIVE STORAGE.

Placement of equipment in administrative storage should be for short periods of time when a shortage of maintenance effort exists. Items should be in mission readiness within 24 hours or within the time factors as determined by the directing authority. During the storage period, appropriate maintenance records will be kept. Before placing equipment in administrative storage, current maintenance services and equipment serviceable criteria (ESC) evaluations should be completed, shortcomings and deficiencies should be corrected, and all modification work orders (MWO's) should be applied. Refer to AR 750-1.

Inside storage is preferred for items selected for administrative storage. If inside storage is not available, trucks, vans, conex containers and other containers may be used.

3-43. SHIPMENT.

After preparation for movement reference TM 10-4320-342-10 has been accomplished, equipment is ready for shipment.

CHAPTER 4
GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

4-1. INTRODUCTION.

This chapter contains instruction for performing general support level maintenance on components of the 200/600 GPM Pump.

14-2. SUCTION MANIFOLD ASSEMBLY REPAIR.

This task covers: a. Inspect b. Disassembly c. Repair d. Assembly

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Calipers (App B, Sect III, Item 3)

Equipment Condition
Suction Manifold removed (Para 3-19)

Materials/Parts
Wear Ring (App F, Item 39)

NOTE

Repair of the 600 GPM suction manifold is shown, repair of 200 GPM suction manifold is similar.

a. INSPECT. Refer to Figure 4-1.

(1) Inspect the bronze wear ring (1) in suction manifold (2) for wear. If wear is noticeable, use formula A - B = C to determine wear on the bronze wear ring (1).

(a) Measure the inside diameter of the bronze wear ring (1) to determine dimension A.

(b) Measure the outside diameter of the impeller wear ring (3) to determine dimension B.

(c) Subtract dimension B from dimension A.

(d) Dimension C is the difference between dimension A and B

NOTES

- **If the difference between dimensions A and B on the 200 GPM suction manifold P/N 43865 exceeds 0.024 inch, replace the bronze wear ring.**
- **If the difference between dimensions A and B on the 600 GPM exceeds 0.026 inch, replace the bronze wear ring.**

(2) Inspect suction manifold (2) for cracks, corrosion and worn or damaged seats.

b. DISASSEMBLY.

(1) Remove setscrews (4) from suction manifold (2).

4-2. SUCTION MANIFOLD ASSEMBLY REPAIR.

CAUTION

When machining out the bronze wear ring, do not machine into suction manifold or damage will occur.

(2) Machine out the bronze wear ring (1) from the suction manifold (2).

c. REPAIR.

Repair is limited to replacement of damaged or defective components.

d. ASSEMBLY.

(1) Cool the new bronze wear ring (1) in liquid nitrogen and install it in suction manifold (2).

(2) Install setscrews (3) in suction manifold (2).

NOTES

- **Machine bronze wear ring to 2.625/2.627 inch on the 200 GPM suction manifold, P/N 43865.**
- **Machine bronze wear ring to 3.812/3.814 inch on the 600 GPM suction manifold, P/N 4399-1.**

(3) When suction manifold (2) and bronze wear ring (1) has warmed to ambient temperature, finish machining inside diameter of bronze wear ring.

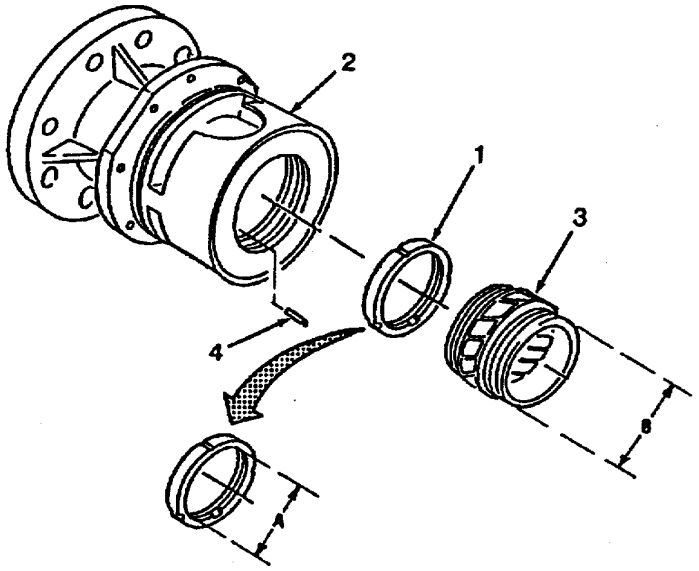


Figure 4-1. Suction Manifold Assembly Repair

14-3. DIFFUSER HOUSING ASSEMBLY REPAIR.

This task covers: a. Inspect b. Disassembly c. Repair d. Assembly

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Calipers (App B, Sect III, Item 3)

Equipment Condition
Diffuser Housing removed (Para 3-19)

Materials/Parts
Wear Ring (App F, Item 36)

NOTE

Repair of the 600 GPM suction manifold is shown, repair of 200 GPM suction manifold is similar.

a. INSPECT. Refer to Figure 4-2.

(1) Inspect the bronze wear ring (1) in diffuser housing (2) for wear. If wear is noticeable, use formula A - B = C to determine wear on the bronze wear ring (1).

(a) Measure the inside diameter of the bronze wear ring (1) to determine dimension A.

(b) Measure the outside diameter of the impeller wear ring (3) to determine dimension B.

(c) Subtract dimension B from dimension A.

(d) Dimension C is the difference between dimension A and B

NOTES

- **If the difference between dimensions A and B on the 200 GPM diffuser housing, P/N 43880, exceeds 0.024 inch, replace the bronze wear ring.**
- **If the difference between dimensions A and B on the 600 GPM diffuser housing, P/N 4398-1, exceeds 0.026 inch, replace the bronze wear ring.**

(2) Inspect diffuser housing (2) for cracks, corrosion and worn or damaged seats.

b. DISASSEMBLY.

(1) Remove spring pins (3) from diffuser housing (2).

(2) Remove studs (4) from diffuser housing assembly (2).

4-3. DIFFUSER HOUSING ASSEMBLY REPAIR - continued.

CAUTION

When machining out the bronze wear ring, do not machine into diffuser housing or damage will occur.

(3) Machine out the bronze wear ring (1) from the diffuser housing (2).

c. REPAIR.

Repair is limited to replacement of damaged or defective components.

d. ASSEMBLY.

(1) Cool the new bronze wear ring (1) in liquid nitrogen and install it in diffuser housing (2).

(2) Install spring pins (3) in diffuser housing (2).

NOTES

- **Machine bronze wear ring to 2.625/2.627 inch on the 200 GPM suction manifold, P/N 43865.**
- **Machine bronze wear ring to 3.812/3.814 inch on the 600 GPM suction manifold, P/N 4399-1.**

(3) When diffuser housing (2) and bronze wear ring (1) has warmed to ambient temperature, finish machining inside diameter of bronze wear ring.

(4) Install studs (4) in diffuser housing assembly (2).

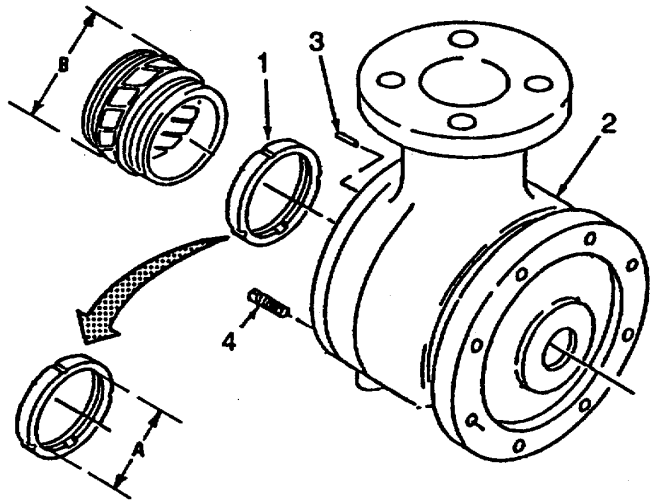


Figure 4-2. Diffuser Housing Assembly Repair

4-4. STARTER-GENERATOR REPAIR

This task covers:	a. Disassembly	b. Cleaning	c. Inspection
	d. Repair	e. Assembly	f. Test after Assembly

INITIAL SETUP

Tools
General Mechanics Tool Kit (App B, Sect III, Item 1)
Bearing Puller (App B, Sect III, Item 3)
Micrometer (App B, Sect III, Item 3)
Suitable Oven
Variable Speed Test Stand
Dial Indicator

Materials/Parts
Cleaning Solvent (App E, Item 8)
Rags, Wiping (App E, Item 2)
Sealing Compound (App E, Item 23)

Materials/Parts
Lubricating Grease (App E, Item 11)
Sandpaper (App E, Item 12)
Chromate Primer (App E, Item 29)
Bearings (App E, Items 9 and 93)
Enamel, Red Insulating Baking (App E, Item 30)
Nuts, Self-Locking (App F, Items 26, 84, 91 and 111)
Lockwashers (App F, Items 94 and 112)
Masking Tape (App E, Item 35)
Coating Humiseal (App E, Item 21)

Equipment Condition
Starter-Generator removed (Para 2-45)

a. DISASSEMBLY. Refer to Figure 4-3.

(1) Remove clamp (1) and adapter (2).

(2) Remove screws (3) and air inlet (4) from end bell (5).

(3) Hold fan (6) and remove nut (7) and washer (8).

(4) Remove fan (6) from drive shaft (9).

(5) Tap drive shaft (9) out of drive end of starter-generator (10) using a soft face hammer. Remove friction ring (11) and damper plate (12).

NOTE

Remove damper hub only if hub (13) or drive shaft (9) is damaged and replacement is necessary.

(6) Remove damper hub (13) from drive shaft (9).

CAUTION

Tape jaws of bearing puller to prevent damage to chamfered face of dampener back plate during removal.

(7) Carefully remove dampener back plate (14) from armature shaft (15).

4-4. STARTER-GENERATOR REPAIR -continued.

(8) Remove screws (16) from brush holders (17).

NOTE
To aid in assembly, note position of brushes prior to removal from brush holders.

(9) Raise spring clips (18) and remove brushes (19).

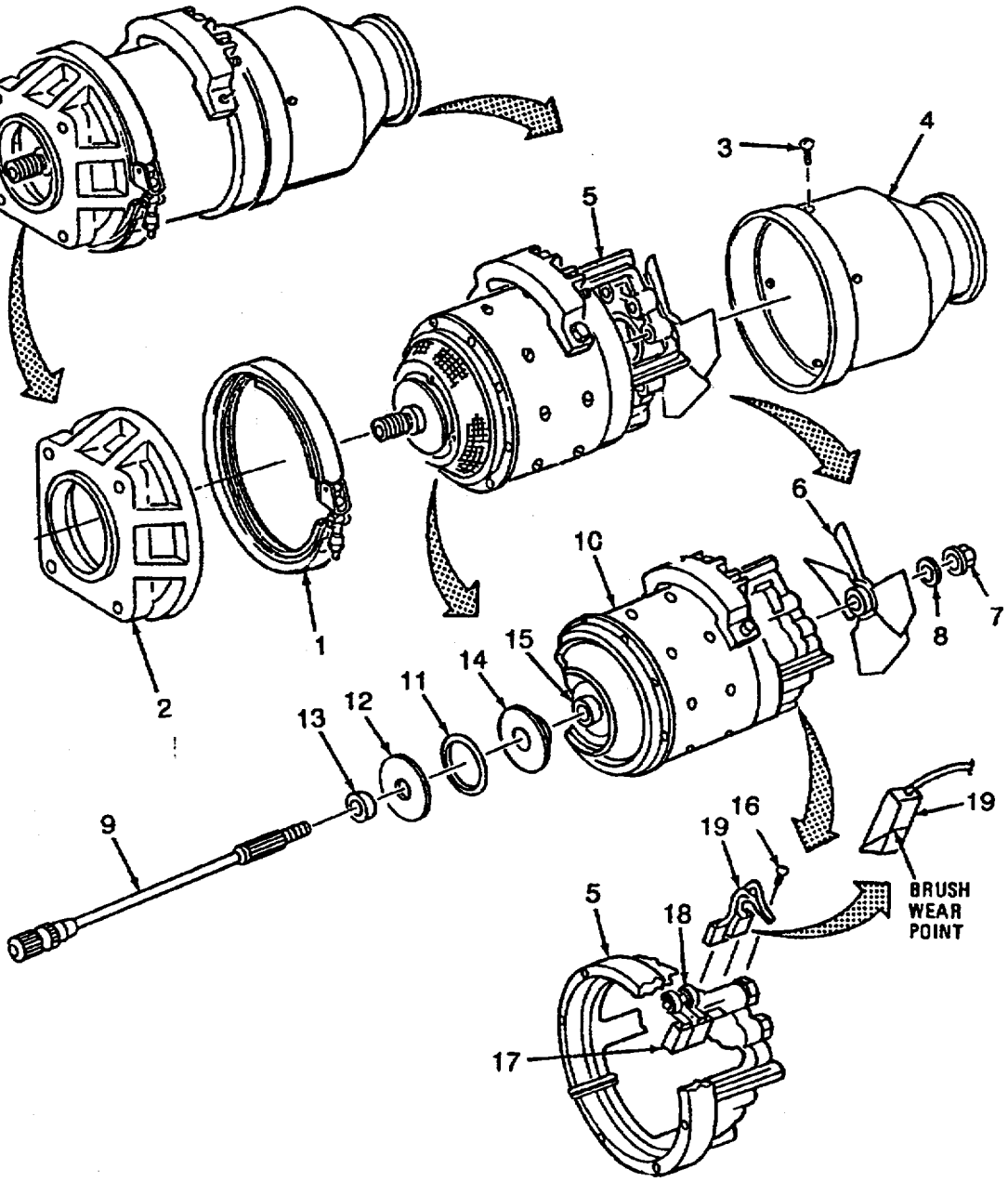


Figure 4-3. Starter Generator Disassembly

4-4. STARTER-GENERATOR REPAIR - continued.

Refer to Figure 4-4.

(10) Remove drive screws (1), washers (2) and screen (3) from end bell (4).

NOTES

- **A soft face mallet may be used to tap the outside edge of the end bell during removal, if necessary.**
- **To aid in assembly, note position of tooth lockwasher (5) prior to removal.**

(11) Remove eight screws (5), six lockwashers (6), six flat washers (7) and two tooth lockwashers (8). Remove end bell (4) from stator assembly (9).

(12) Remove eight screws (10), eight lockwashers (11) and eight flat washers (12) from end bell (13).

(13) Remove end bell (13) from stator (9) with armature (14) attached.

(14) Support end bell (13) in an arbor press and press armature (14) out of bearing (15).

(15) Remove retaining ring (16) and one baffle disc (17) from shaft (18) on armature (14).

(16) Using a bearing puller, remove bearing (19) from shaft (18) on armature (14). Remove second "J baffle disc (20) from shaft (18). Discard bearing.

(17) Remove four screws (21), four lockwashers (22) and bearing retainer (23) from end bell (13).

(18) Press bearing (15) out of end bell (13). Discard bearing.

(19) Remove two screws (24), nuts (25), washers (26), plastic washer (27) from end bell (13).

(20) Remove two spacers (29), washers (28) and brush holder (30) from end bell (13).

(21) Repeat steps (18) and (19) for three remaining brush holders (30).

4-4. STARTER-GENERATOR REPAIR - continued.

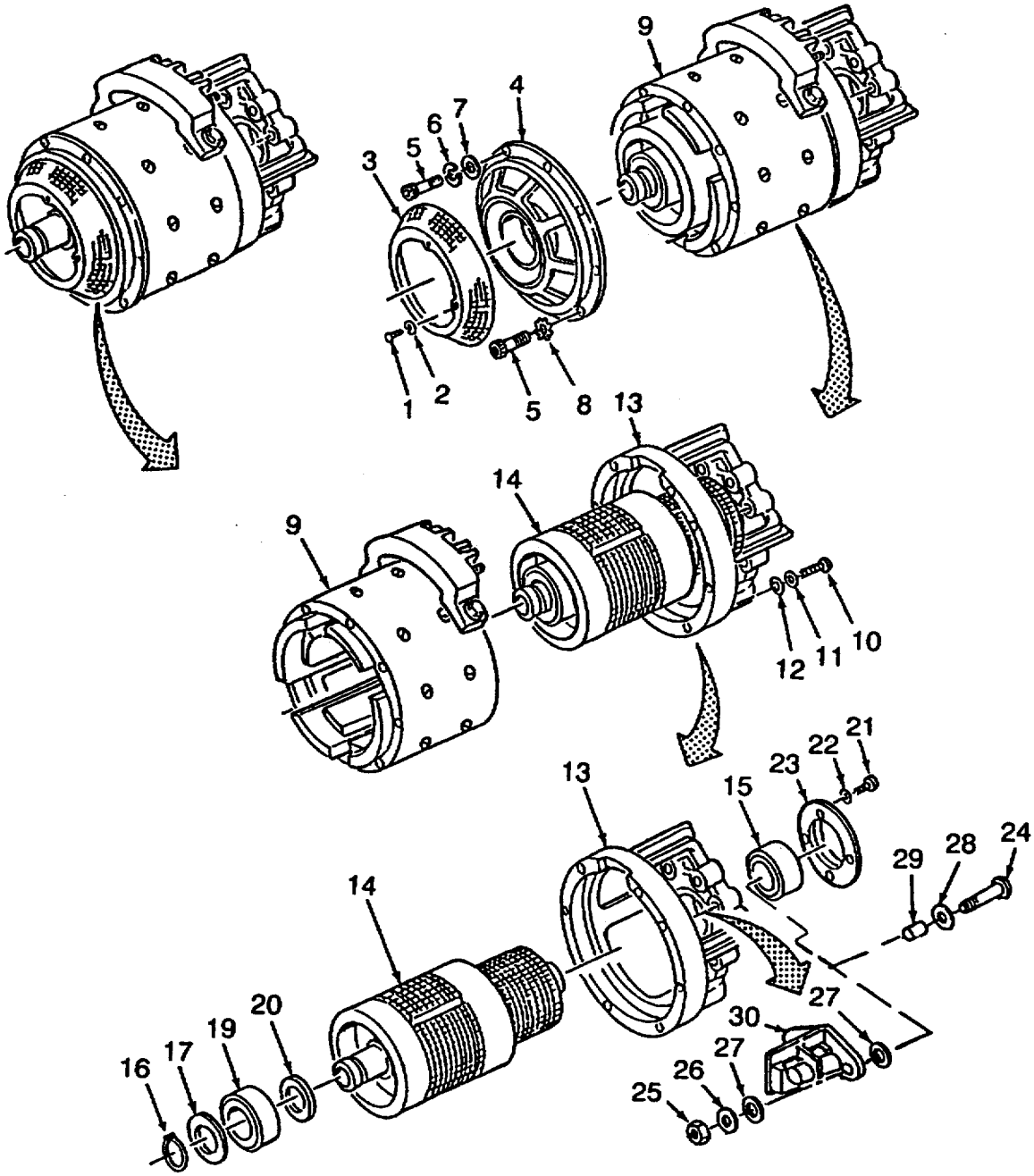


Figure 4-4. Stator, Armature and Brush Removal

4-4. STARTER-GENERATOR REPAIR - continued.

Refer to Figure 4-5.

NOTE

Do not disassemble stator assembly. If terminal block requires replacement, proceed as follows:

(22) Remove two nuts (1), washers (2) and leads (3) from studs marked A and D on terminal block (3).

(23) Remove three nuts (5) and washers (6) from studs marked B, C and E on terminal block (4).

(24) Remove two screws (7), lockwashers (8), flat washers (9) and disconnect wire terminal (10) from terminal block (4).

(25) Disconnect leads (11) from studs B, C and E and remove terminal block (4) from stator (12).

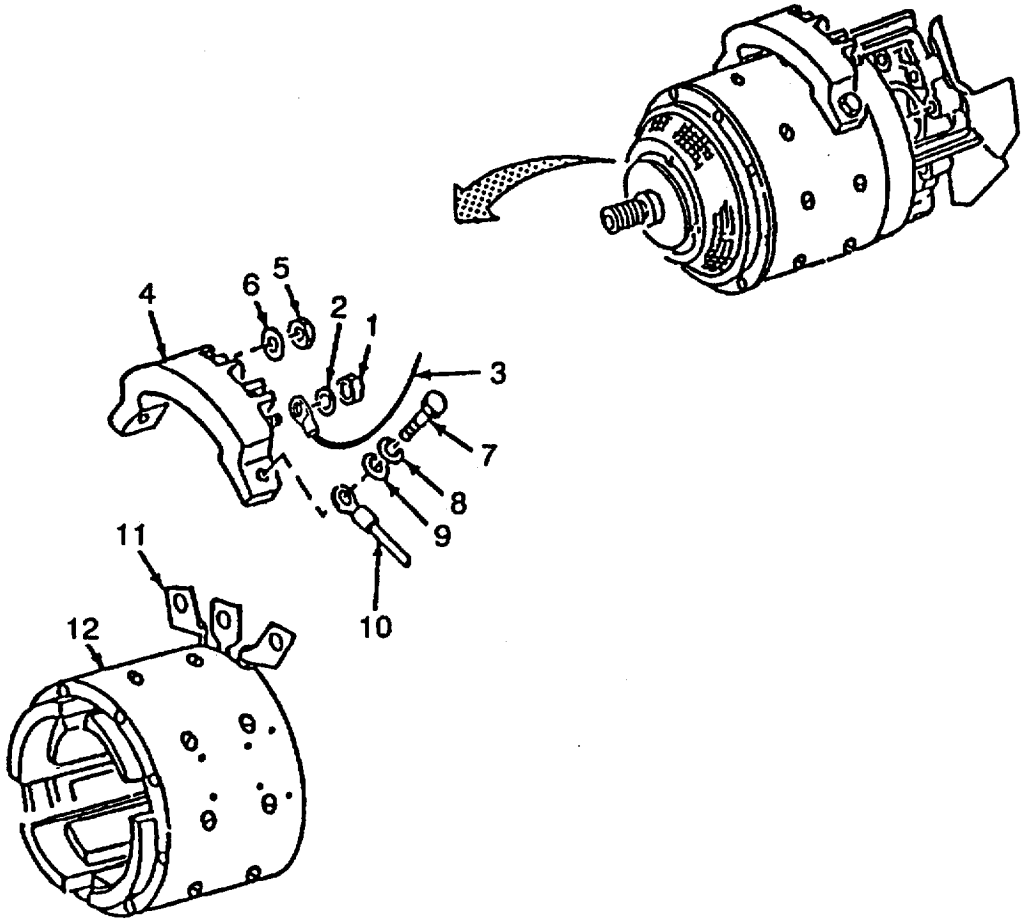


Figure 4-5. Terminal Block Removal

4-4. STARTER-GENERATOR REPAIR - continued.

b. CLEANING.

WARNING

Dry cleaning solvent, P-D-680, Type III, is potentially dangerous to personnel and equipment. Eye and skin protection is required. Avoid repeated and prolonged skin contact. Wash immediately after exposure. Do not use near open flame or excessive heat. Use only in areas with good ventilation.

(1) Thoroughly clean all parts of starter-generator except brushes, bearings, armature and stator assembly by washing in cleaning solvent.

WARNING

Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 psig air pressure.

(2) Rinse parts in clean solvent and dry with low pressure filtered compressed air (5 to 10 psi).

(3) Clean stator assembly as follows:

(a) Blow dust and other foreign matter from inside stator assembly by using low pressure filtered compressed air.

(b) Wipe with a cloth moistened in cleaning solvent.

(4) Clean armature using low pressure filtered compressed air and a soft bristle brush to clean foreign material from slots between commutator bars.

(5) After cleaning armature and stator assembly, let dry completely.

c. INSPECTION. Refer to Figure 4-3.

(1) Inspect air inlet (4) for dents or other damage. Replace if defective.

(2) Inspect fan (6) for cracked, damaged or broken blades. Replace if defective.

(3) Inspect brushes (19) for cracks, chips, frayed leads, loose rivets and brush wear. Replace if remaining allowable wear will be exceeded before next inspection.

(4) Inspect dampener plate (12) for cracks, chips, frayed leads, loose rivets and brush wear, warps or signs of wear. Replace, if defective.

(5) Inspect dampener back plate (14) for cracks using magnetic particle inspection per MIL-I-6868. Replace if defective.

(6) Inspect dampener hub (13) for cracks using magnetic particle inspection per MIL-I-6868. Replace if defective.

4-4. STARTER-GENERATOR REPAIR - continued.

Refer to Figure 4-4.

(7) Inspect baffle discs (17 and 20) for dents, wear or other damage. Replace if defective.

(8) Inspect bearing retainer (23) for dents, wear or other defects. Replace if defective. Refer to Figure 4-6.

(9) Inspect friction ring (1) as follow:

(a) Inspect friction ring (1) for scored or oil soaked. Replace if scored or oil soaked.

(b) Measure thickness of friction ring (1). Replace if thickness is less than 0.060 inch.

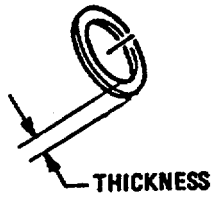


Figure 4-6. Friction Ring Measurement

Refer to Figure 4-7.

(10) Inspect drive shaft as follows:

(a) Inspect drive shaft (1) for cracks using magnetic particle inspection per MIL-I-6868.

(b) Measure large spline (2) dimension A, on drive shaft (1) by installing two 0.1094 inch diameter pins (3) in large spline. Replace shaft if dimension is less than 0.757.

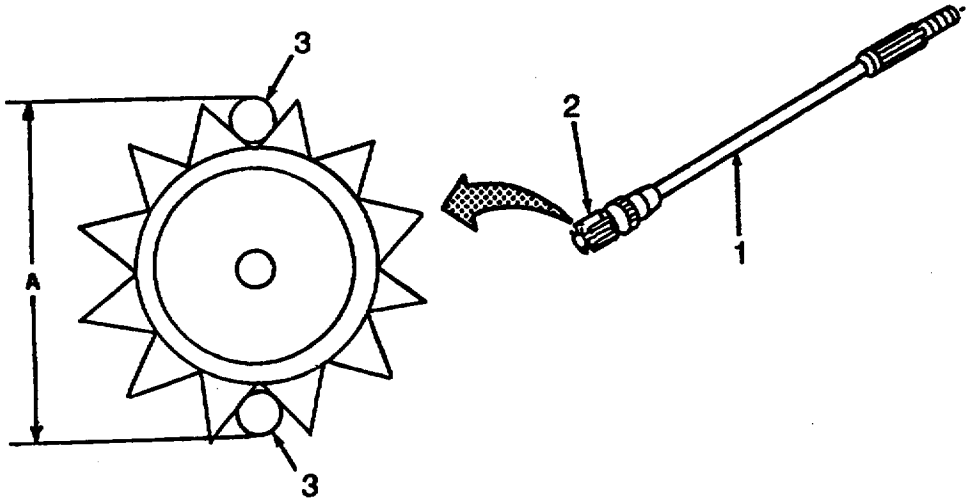


Figure 4-7. Drive Shaft Measurement

4-4. STARTER-GENERATOR REPAIR - continued.

Refer to Figure 4-8.

(11) Inspect end bell (drive end) (1) as follow:

(a) Inspect end bell (drive end) (1) for wear or warpage. Replace if worn or warped.

(b) Measure inside of diameter of liner (2). Replace if inside diameter is not within 1.5745 to 1.5748.

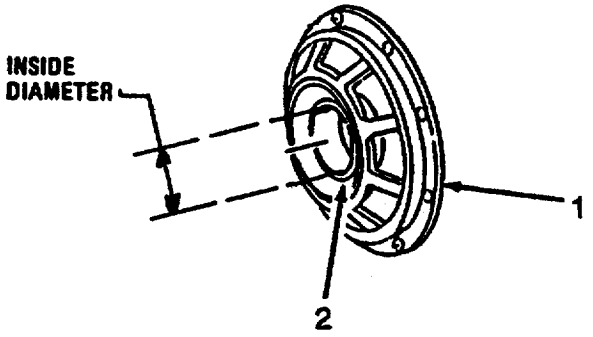


Figure 4-8. End Bell (Drive End) Measurement

Refer to Figure 4-9.

(12) Inspect end bell assembly (1) as follows:

(a) Inspect end bell assembly (1) for wear and warpage. Replace if worn or warped.

(b) Measure inside diameter of liner (2). Replace if inside diameter is not within 1.5747 to 1.5750.

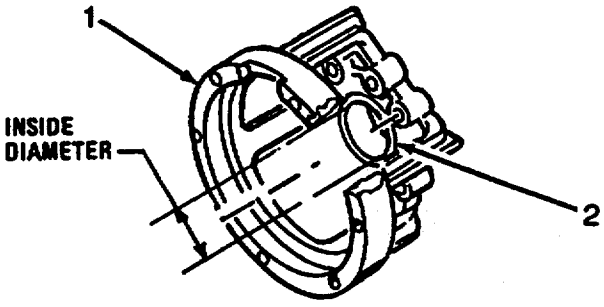


Figure 4-9. End Bell Assembly Measurement

4-4. STARTER-GENERATOR REPAIR- continued.

Refer to Figure 4-10.

(13) Inspect terminal board (1) as follows:

(a) Inspect for cracks, and loose or damaged studs (2) on terminal board (1). Replace if defective.

(b) Check for burned or damaged insulation (3) on terminal board (1) between terminals. Replace if defective.

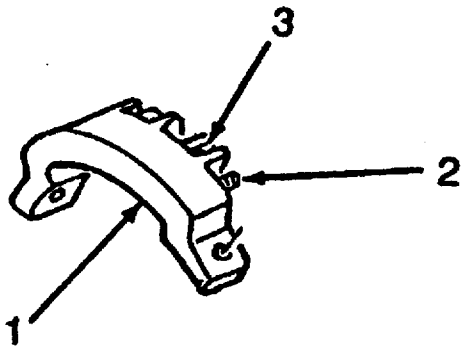


Figure 4-10. Terminal Board Inspection

Refer to Figure 4-11.

(12) Inspect armature (1) as follows:

(a) Inspect for worn, pitted or burned commutator bars (2). Refinish commutator.

(b) Inspect for damage to windings (3), retainer bands (4) or shaft (5).

(c) Inspect for worn, pitted or burned bearing journals (6). Replace armature.

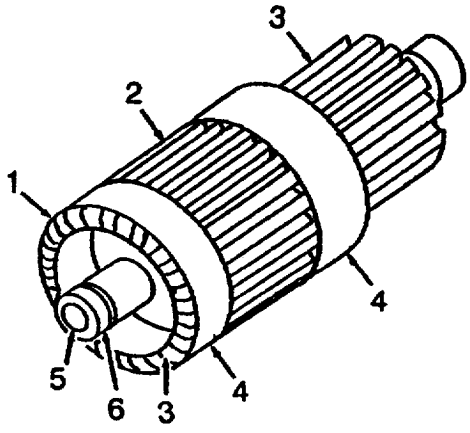


Figure 4-11. Armature Inspection

4-4. STARTER-GENERATOR REPAIR - continued

d. REPAIR.

(1) Replace any damaged parts found during inspection.

Refer to Figure 4-12.

(2) Repair end bell assembly as follows:

(a) Coat any chipped area on end bell assembly (1) with red insulating enamel.

(b) Place end bell assembly (1) in an oven for one hour at the temperature of 150°F (66°C). Remove and let cool to ambient (room)temperature.

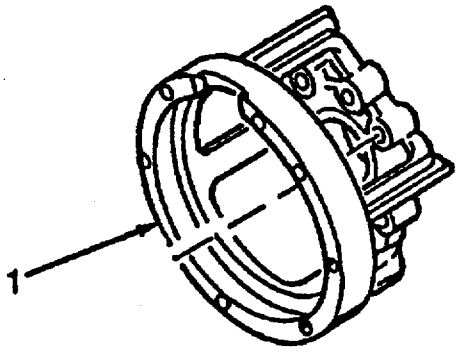


Figure 4-12. End Bell Assembly Repair

Refer to Figure 4-13.

(3) Repair armature (1) as follows:

(a) Perform measurements A and B to obtain diameter of bearing journals on shaft (2). Replace armature if diameter is not within 0.6691 to 0.6694 inches.

(b) Perform measurement C to obtain diameter of commutator (3). Replace armature (1) if commutator diameter is less than 1.960 inches.

(c) Install armature (1) in a lathe and refinish commutator (3). Remove only the material necessary to clean and true-up commutator surface. Replace armature if commutator diameter must be refinished to less than 1.960 inches.

NOTE

If capabilities (tools and facilities) exist, perform bar concentricity of commutator on armature. If not, replace armature.

(d) Place measuring tool on commutator bar (3) and rotate armature (1) slowly for one complete turn to obtain bar concentricity. Bar concentricity must be within 0.0002 inch.

4-4. STARTER-GENERATOR REPAIR - continued.

(e) Place dial indicator on bearing journals (5) and rotate armature slowly for one complete turn to obtain shaft concentricity. Shaft concentricity must be within 0.0008 inch total indicator reading (T.I.R.). Repeat step for other bearing journal.

(f) Measure the mica depth between commutator bars (4) with a caliber to obtain measurement D. If depth is less than 0.015 inch, undercut the mica to 0.042 inch wide by 0.055 inch deep.

(g) Remove all excess mica, sharp edges and burrs from between the commutator bars (4).

(h) Repeat step d for bar concentricity.

(i) Position the armature (1) in a balancing machine and check for proper balance. Balance should be within 10 grain-inches at each end. If not, milling is required.

CAUTION

Two 0.25 inch wide and 0.031 inch deep cuts are permitted in each band to maintain adequate hoop strength or damage to armature could occur.

(j) Mill the stainless steel bands (6) at each end until proper balance is obtained.

(1) First cut in band shall be 0.09 inch from commutator side of band.

(2) Second cut shall be 0.04 inch from stack side of band.

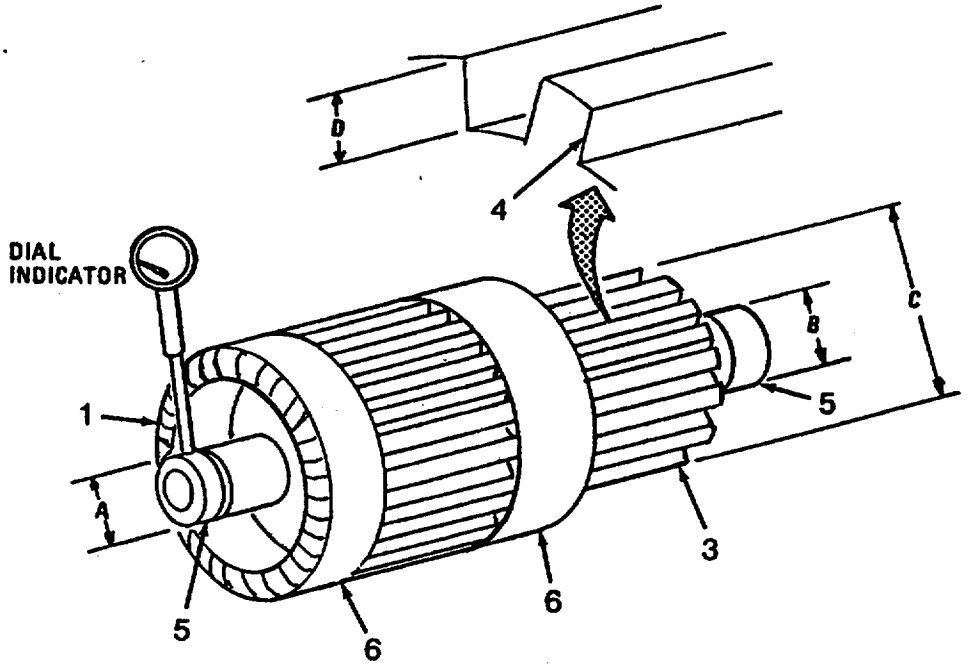


Figure 4-13. Armature Repair

4-4. STARTER-GENERATOR REPAIR-continued.

e. ASSEMBLY. Refer to Figure 4-14.

(1) Position terminal board (4) on stator assembly (12). Place wire terminal (10) on terminal board and install two flat washers (9), lockwashers (8) and screws (7).

(2) Place terminal leads (3) over studs B, C and E on terminal board (4).

(3) Install washers (6) and nuts (5) on terminal board (4) studs B, C and E.

(4) Install leads (3), washers (2) and nuts (1) on terminal board (4) studs A and D.

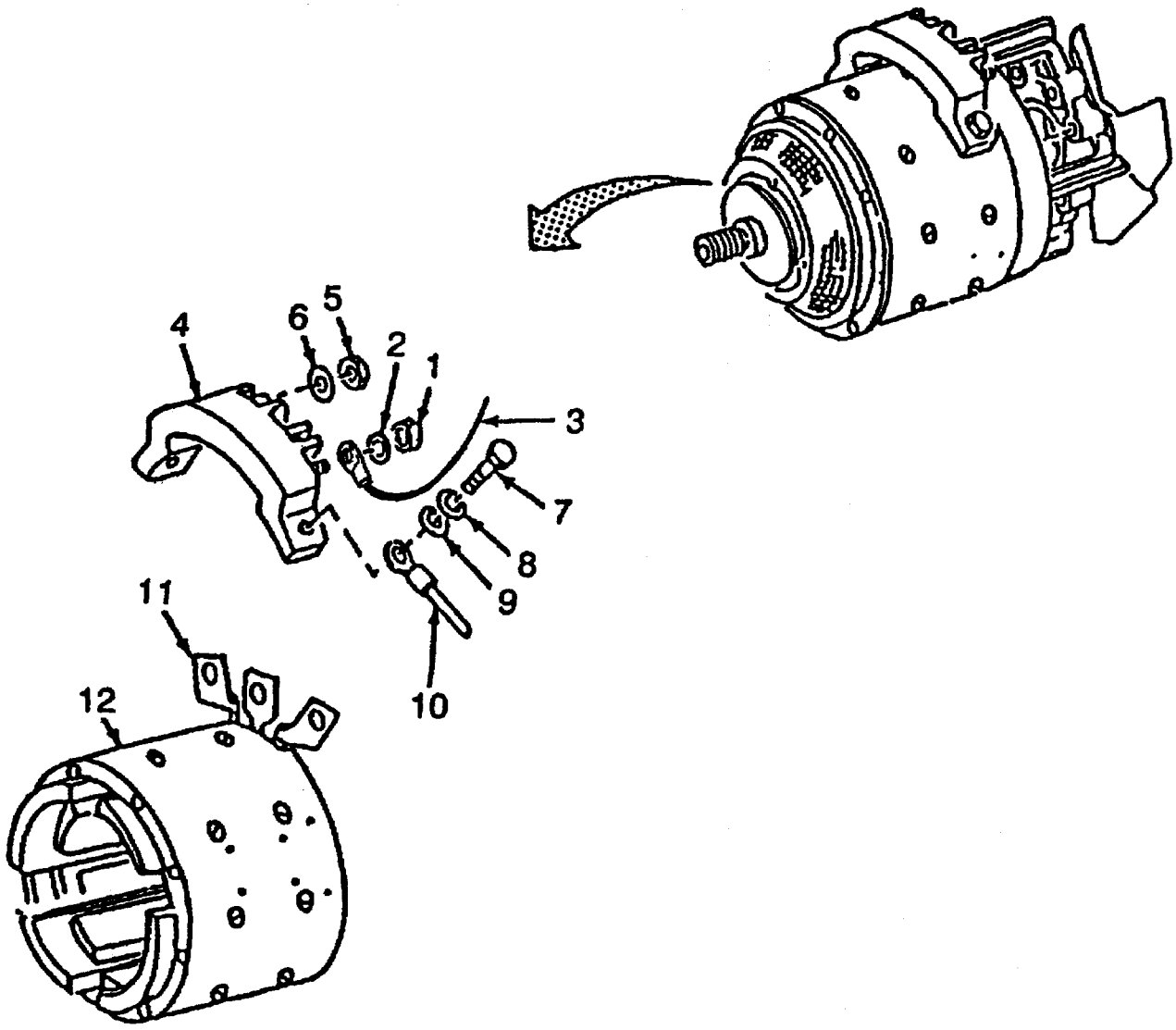


Figure 4-14. Terminal Board Installation

4-4. TARTER-GENERATOR REPAIR - continued.

Refer to 4-15.

(5) Install two spacers (29) in insulation sleeve of end bell (13).

(6) Place flatwasher (28) on screw (24).

(7) Insert screw (24) through spacer (29) until tip of screw is flush with end of spacer.

(8) Place plastic washer (27) on screw (24).

(9) Slide brush holder (30) onto screw (24).

(10) Place second plastic washer (28) on screw (24).

(11) Secure brush holder (30) in place with flat washer (26) and nut (25).

(12) Repeat steps (5 through 11) for remaining brush holders (30).

CAUTION

To prevent premature failure of bearing, brown colored bearing seal must face away from armature.

(13) Press bearing (15) into end bell (13) until bearing is fully seated on shoulder of bearing liner.

(14) Apply sealing compound to threads of screws (21). Position bearing retainer (23) on end bell (13) and install lockwashers (22) and screws (21).

(15) Install baffle disc (20) with recessed surface of disc facing in toward armature (14) windings on drive end.

(16) Support armature (14) on end of shaft (18) in an arbor press and press bearing (19) on drive end of armature (14). Make certain bearing (19) is seated against shoulder on shaft (18).

(17) Install second baffle disc (17) with recessed surface of disc facing away from armature (14) on drive end.

(18) Install retaining ring (16) in groove on armature shaft (18).

(19) Insert armature (14) into stator assembly (9) and align end bell (13) with stator assembly.

(20) Apply sealing compound to threads of screws (10) and secure stator assembly (9) with washers (12), lockwashers (11) and screws (10). Tighten screws (10) to 18-24 in-lb.

(21) Position drive end bell (4) on stator assembly (9). Ensure end bell assembly is fully seated on ball bearing (15).

(22) Apply sealing compound to threads on eight screws (24) and coat face of tooth lockwashers (25) with zinc chromate primer.

4-4. STARTER-GENERATOR REPAIR - continued.

(23) Install tooth lockwashers (25), coated face toward stator assembly (19) and two screws (24) 180° apart. Hand tighten only.

(24) Install six flat washers (26), six lockwashers (27) and six screws (24) in remaining mounting holes in stator assembly (19). Hand tighten only.

(25) Tighten the eight screws (24) to 18-24 in-lb.

(26) Position screen (28) on end bell (23) and secure with four washers (29) and screws (30).

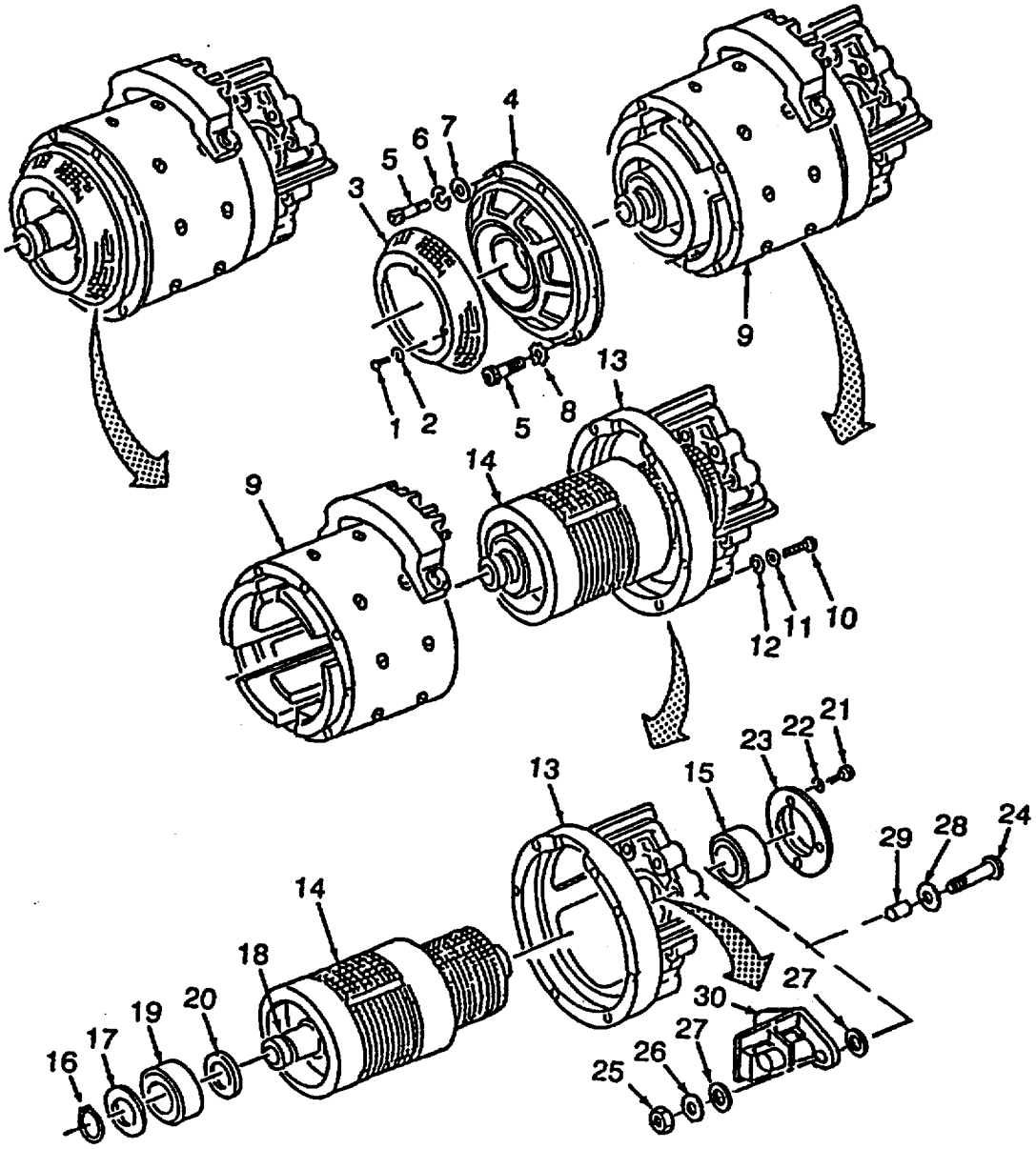


Figure 4-15. Stator, Armature and Brush Holder Installation

4-4. STARTER-GENERATOR REPAIR - continued.

Refer to 4-16.

CAUTION

Do not use an arbor press to force dampener back plate onto armature shaft. Improper seating will result, if arbor press is used.

(27) Place dampener back plate (1) on drive end of armature shaft (2) with back plate taper fully seated on shaft taper. Work back plate onto the shaft by hand.

(28) Place friction ring (3) in recess of dampener back plate (1).

CAUTION

Do not use an arbor press to force dampener hub onto drive shaft. Improper seating will result, if arbor press is used.

(29) If dampener hub (4) was removed, install hub on drive shaft (5), making certain that hub taper is fully seated on drive shaft taper by working it onto the shaft by hand.

(30) Position dampener plate (6) on dampener hub (4), ensure spline on plate engages with spline on hub and rests against shoulder of hub.

(31) Insert drive shaft (5) through armature shaft (7) making sure drive shaft spline engages with spline in armature.

(32) Apply a light coat of lubricating grease on threads end of drive shaft (5).

(33) Install fan (8), washer (9) and self-locking nut (10) on drive shaft (5).

(34) Secure drive-end of drive shaft (5) and torque nut (10) to 100 to 120 in-lb.

Brush Installation.

(35) Raise each brush spring (11) and insert brush (10) into brush holder (13) in bell (14) as noted during disassembly. Gently lower spring until it rests on top of brushes. Repeat step for each brush.

CAUTION

Brush leads must be positioned over the top of brush springs to prevent jamming or sticking of brush.

(36) Secure leads (15) with screw (16) on end bell (14).

4-4. STARTER-GENERATOR REPAIR - continued.

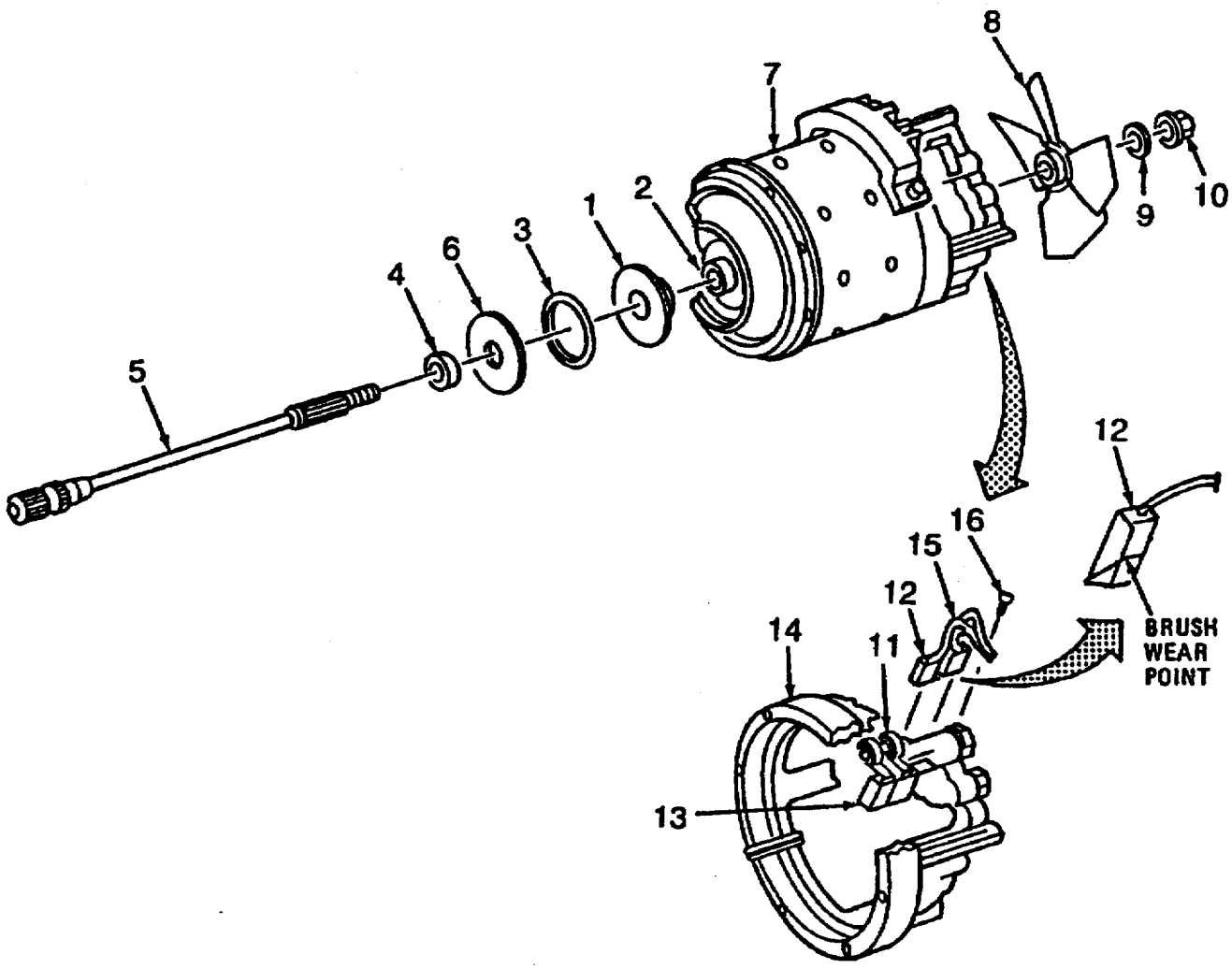


Figure 4-16. Armature Shaft, Fan and Brush Installation

4-4. STARTER-GENERATOR REPAIR- continued.

Refer to 4-17.

(37) Seat new brushes as follows:

(a) Raise each brush spring clip (1) and lift brush (2) away from the commutator (3) until the brush spring can hold the brush in position by resting against the side of the brush.

(b) Place a strip of 5/0 or finer sandpaper, slightly wider than the width of the brush, around the commutator (3) with the sand side out. Cut the sandpaper strip to one inch greater than the commutator circumference. Secure one end of the sandpaper strip to the commutator surface with masking tape so that the taped end will lead in the direction of rotation, and the other end will remain loose and overlap taped end.

(c) Lower brush (2) in place against the sandpaper, and carefully rotate the armature shaft (4) by hand in the normal direction of rotation until a full seat is obtained on each brush. Do not sand excessively.

WARNING

Compressed air can blow dust into the eyes. Wear eye protection. Do not exceed 30 spig air pressure.

(d) Remove the sandpaper, remove all carbon dust with dry, compressed air.

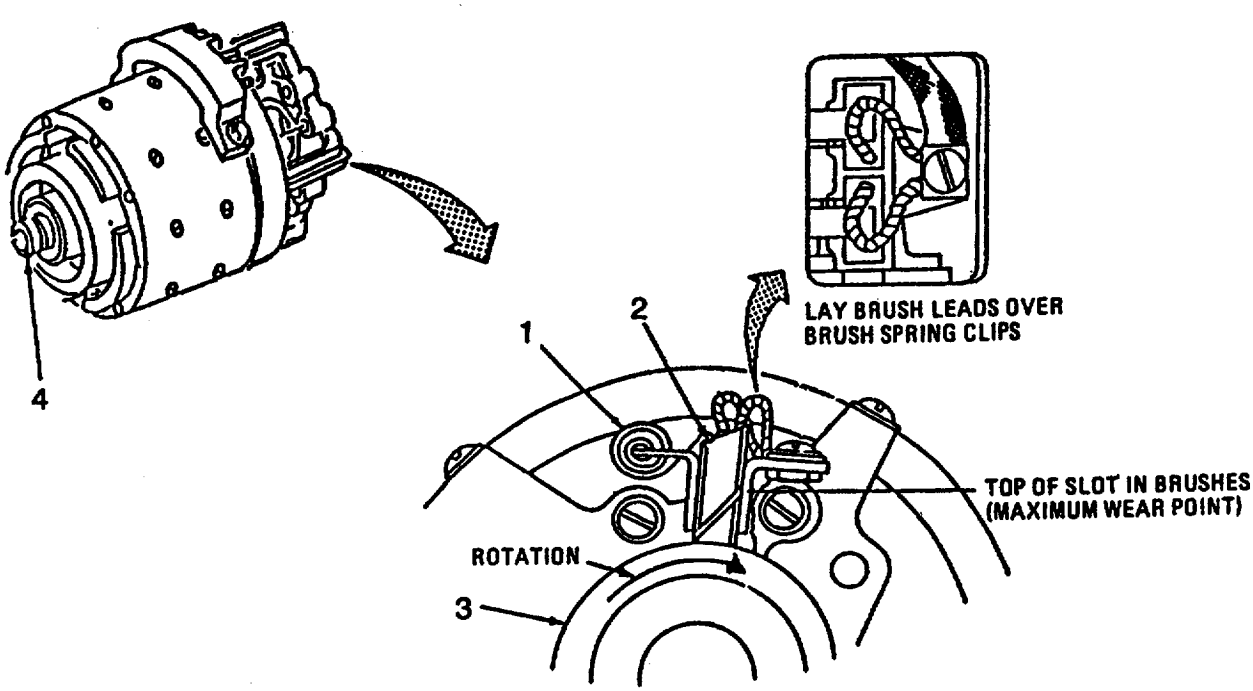


Figure 4-17. Seating New Brushes

4-4. STARTER-GENERATOR REPAIR - continued.

Refer to 4-18.

(38) Position air inlet (1) on end bell assembly (2) and install screws (3).

(39) Position adapter (4) on drive end bell (5) and secure with clamp (6).

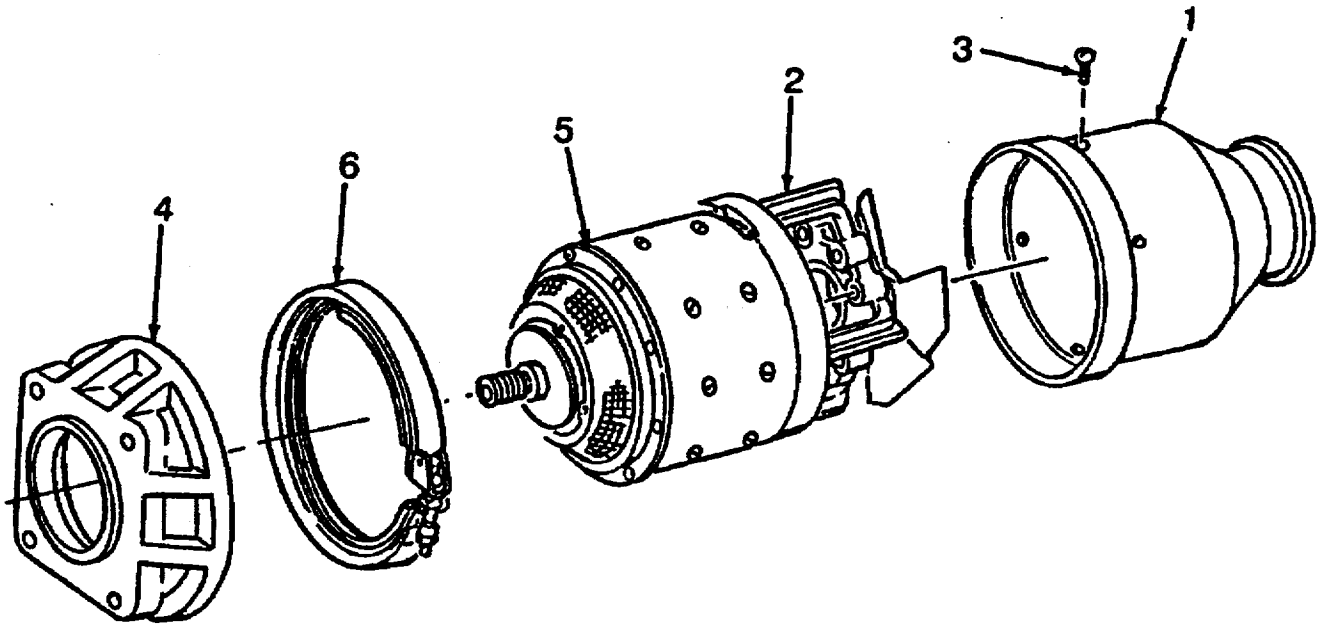


Figure 4-18. Air Inlet and Adapter Installation

f. TEST AFTER ASSEMBLY.

(1) Test Equipment.

(a) Test equipment shall include a variable speed test stand capable of driving the starter-generator at speeds of 7,000 to 12,000 rpm at rated load, and 13,000 rpm at no load.

(b) The test stand shall be equipped with suitable instrumentation to measure torque, speed, voltage, current and temperature. Adequate circuitry must also be provided to load the generator. Refer to Figure 4-19 for starter-generator electrical connections and Figure 4-20 for typical test setup.

4-4. STARTER-GENERATOR REPAIR -continued.

(2) Test Conditions.

(a) Inlet air temperature during test shall be 50° to 104°F (10° to 400C).

(b) Brushes shall be seated 100 percent in the direction of rotation.

(c) If required, remove clamp and adapter from end bell.

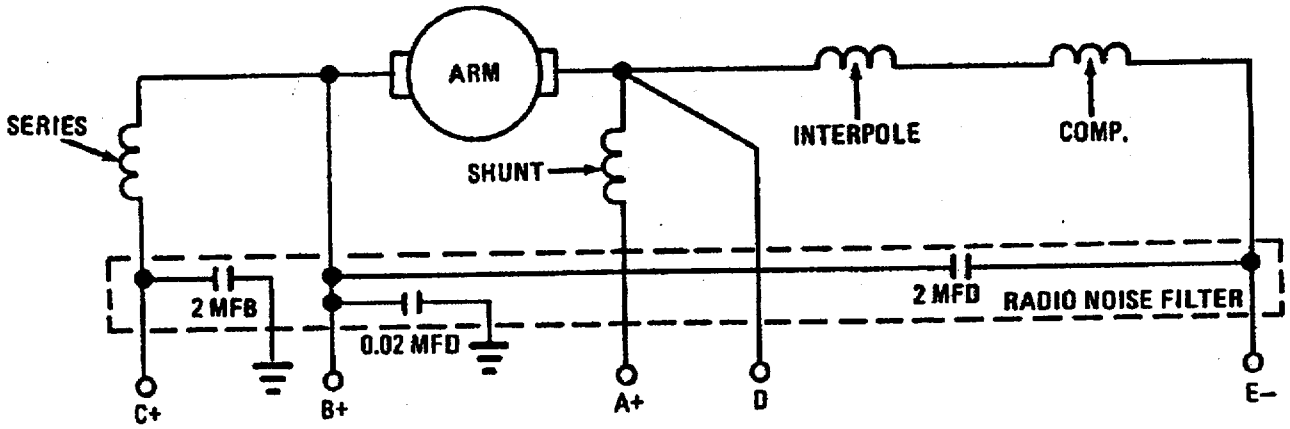


Figure 4-19. Starter-Generator Electrical Connections

4-4. STARTER-GENERATOR REPAIR - continued.

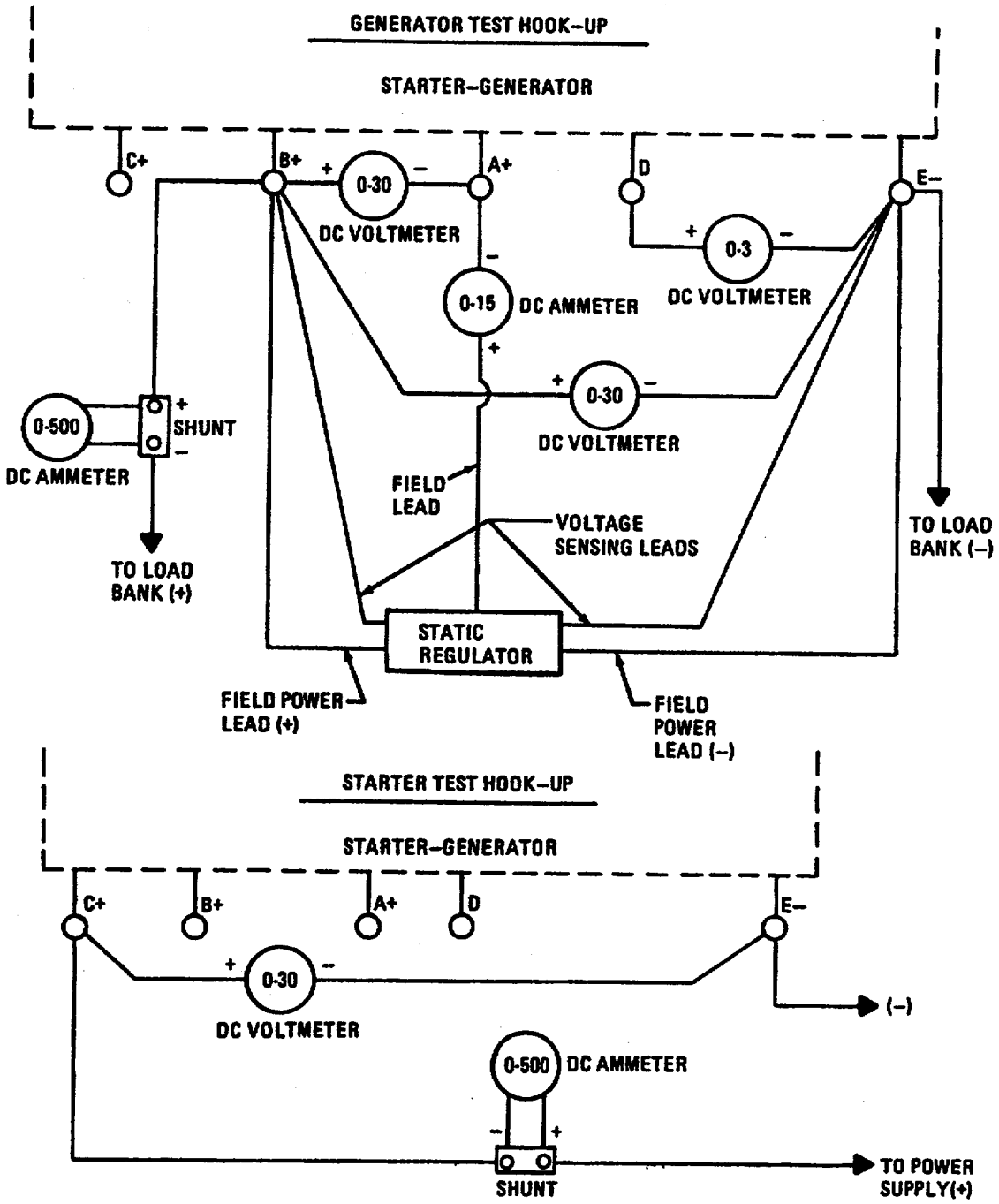


Figure 4-20. Test Setup

4-4. STARTER-GENERATOR REPAIR - continued.

(3) Tests.

(a) Maximum Speed for Regulation. Without operational warmup and with regulator connected to the starter-generator, operate the starter self-excited at 13,000 rpm 28.5 volts DC, and no load. Calculate resistance between terminals B and A by dividing B to A voltage by the field current. B to A resistance shall not be greater than 35 ohms.

Refer to Figure 4-21.

(b) Continuous Operating Speed and Equalizing Voltage. With regulator connected to the starter-generator, operate starter-generator at 12,000 rpm, 30 volts, 200 amperes for 15 minutes. Record the voltage between terminals D and E, inlet air temperature and winding or frame temperature. Frame temperature shall not exceed inlet air temperature by more than 175 °F (79.5°C). The equalizing voltage between terminals D and E shall be within the limits shown in Figure 4-18.

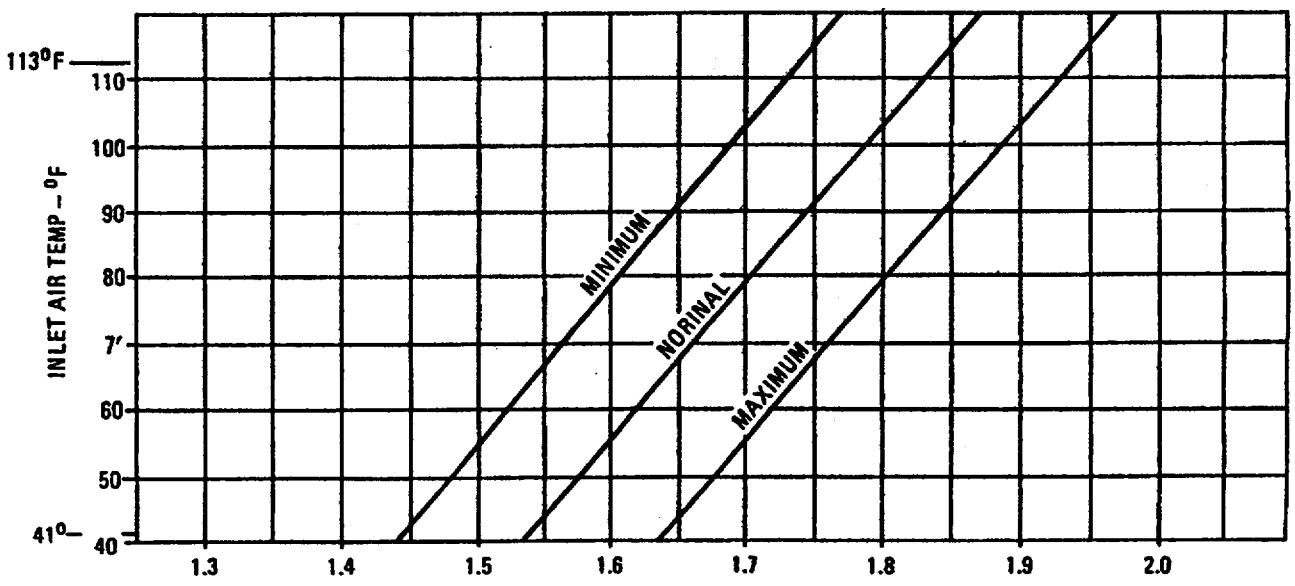


Figure 4-21. Equalizing Voltage - Volts

4-4. STARTER-GENERATOR REPAIR - continued.

(c) Minimum Speed for Regulation. Operate starter-generator at 7,050 rpm, 27 volts and 200 amperes (stabilization not required), to demonstrate ability to operate at minimum speed for regulation. Record field current which shall not exceed 10 amperes. Calculate resistance between terminals B and Aby dividing B to A voltage by field current. External field circuit resistance (B to A) shall be 0.4 ohms minimum.

(d) Compounding. Operate starter-generator at 12,000 rpm and 30 volts. Apply loads of 0, 50, 100, 150 and 200 amperes. Record field current. Field current must rise with increasing load.

(e) Commutation. Reconnect regulator and observe commutation at 30 volts, 0 amps, 100 amps and 200 amps at speeds of 7,050, 10,000 and 12,000 rpm. Record the worst condition for commutation. Commutation must not exceed pinpoints.

CAUTION

Disconnect stator leads from terminal block and filter board leads from bearing retainer when conducting dielectric test. Capacitors embedded in radio noise filters will be damaged if subjected to dielectric test. A dummy terminal block may be used for this test.

(f) Dielectric Test. Remove starter-generator from test stand and, while still hot from testing, conduct a hi-potential to ground test of 220 volts AC rms, 60 Hz for one minutes. Apply test voltage between each circuit and frame. No evidence of insulation breakdown shall occur as a result of this test.

(g) Starting Test.

CAUTION

Shunt field shall be open during starting test. Do not energize unit for more than four seconds during test.

(1) Rigidly mount starter-generator by its flange in a horizontal position and lock rotor.

(2) Apply and increase voltage between terminals C and E until output torque is 13 foot-pounds. Record terminal voltage and line current. C to E voltage shall not exceed 12 volts. Line current shall not exceed 400 amperes.

(h) Commutator Run-Out. Rotate armature of starter-generator on its own bearings and record commutator total indicated run-out and the maximum bar-to-bar difference. Total indicated run-out shall not exceed 0.0008 inch. Bar-to-bar run-out shall not exceed 0.0002 inch.

4-4. STARTER-GENERATOR REPAIR - continued.

(c) Minimum Speed for Regulation. Operate starter-generator at 7,050 rpm, 27 volts and 200 amperes (stabilization not required), to demonstrate ability to operate at minimum speed for regulation. Record field current which shall not exceed 10 amperes. Calculate resistance between terminals B and A by dividing B to A voltage by field current. External field circuit resistance (B to A) shall be 0.4 ohms minimum.

(d) Compounding. Operate starter-generator at 12,000 rpm and 30 volts. Apply loads of 0, 50, 100, 150 and 200 amperes. Record field current. Field current must rise with increasing load.

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APPENDIX A

REFERENCES

A-1. SCOPE.

This appendix lists all forms, field manuals, technical manuals, and miscellaneous publications referenced in this manual. Also listed are those publications that should be consulted for additional information about the Laundry Unit and its major components.

A-2. FORMS.

Recommended Changes to Publications and Blank Forms	DA FORM 2028
Recommended Changes to Equipment Technical Publications	DA FORM 2028-2
Depreservation Guide for Vehicles and Equipment	DA FORM 2258
Equipment Inspection and Maintenance Worksheet	DA FORM 2404
Maintenance Work Request .	DA FORM 2407
Equipment Control Record	DA FORM 2408-9
Discrepancy in Shipment Report	SF 361
Report of Discrepancy (ROD)	SF 364
Quality Deficiency Report	SF 368

A-3. FIELD MANUALS.

Decontamination Manuals	FM 3-3, 3-4, 3-5
Operation and Maintenance of Ordinance Material in Cold Weather	FM9-207
Organizational Maintenance of Military Petroleum Pipelines, Tanks and Related Equipment	FM 10-20
First Aid for Soldiers .	FM 21-11
Basic Cold Weather Manual	FM 31-70
Northern Operations	FM 31-71
Electric Power Generation in the Field	FM 20-31

A-4. TECHNICAL MANUALS.

Welding Theory and Application	TM 9-237
Unit, Direct Support, and General Support Maintenance Manual; 200/600 GPM Pump	TM 10-3510-222-24
Unit, Direct Support, and General Support Maintenance Repair Parts and Special Tools List, 200/600 GPM Pump	TM 10-4320-342-24P
Aviation Unit and Intermediate Maintenance Manual for Aircraft Nickel-Cadmium Batteries	TM 11-6140-203-23
Aviation Unit and Intermediate Maintenance Repair Parts and Special Tools List for Aircraft Nickel-Cadmium Batteries	TM 11-6140-203-24P
Painting Instructions for Army Materiel	TM 43-0139
Procedures for Destruction of Equipment to Prevent Enemy Use	TM 750-244-3

A-5. LUBRICATION ORDER.

Lubricating Order, 200/600GPM Pump	LO 10-4320-342-12

A-6. MISCELLANEOUS PUBLICATIONS.

Army Material Maintenance Policy and Retail Maintenance Operations	AR 750-1
The Army Maintenance Management System (TAMMS)	DA PAM 738-750
Consolidated Index of Army Publications and Blank Forms	DA PAM 25-30
Expendable/Durable (Except Medical, Class V Repair Parts and Heraldic Items)	CTA 50-970
Environmental Protection and Enhancement Subscription Form	AR 200-1

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. GENERAL.

a. This section provides a general explanation of all maintenance and repair function authorized at various maintenance categories.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall authority and responsibility for performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance categories.

c. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

B-2. MAINTENANCE FUNCTIONS.

Maintenance functions will be limited to and are defined as follows:

a. 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).

b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Align. To adjust specified variable elements of an item to bring about a optimum performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipments 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.

B-2. MAINTENANCE JUNCTIONS - continued.

g. 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.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and is shown as the 3rd position code of the SMR code.

i. Repair. The application of maintenance services, including fault location/troubleshooting, removal/installation, and 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.

j. 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 (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. 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 material 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.

B-3. EXPLANATION OF COLUMNS IN THE MAC, SECTION II.

a. 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. End item group numbers are "00".

b. Column 2. Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. 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, see paragraph B-2).

d. Column 4. Maintenance Level. Column 4 specifies, by the listing of a work time figure (expressed as man-hours shown as whole hours or decimals) in the appropriate subcolumn(s), the level of maintenance authorized to perform the function listed in Column (3). This figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or the complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate work time figures will be shown for each level. The work time figure represents the average time required to restore an item

B-3. EXPLANATION OF COLUMNS IN THE MAC, SECTION II - continued.

(assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation item including any necessary disassembly/assembly time), troubleshooting/fault the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The system designations for the various maintenance levels are shown on the following page.

C ..... Operator or crew
O ..... Unit Maintenance
F ..... Direct Support Maintenance
H ..... General Support Maintenance
D ..... Depot Maintenance

e. Column 5. Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) common TMDE, and special tools, special TMDE, and support equipment required to perform the designated function.

f. Column 6. Remarks. This column, when applicable, contains a letter code, in alphabetic order, which is keyed to the remarks contained in Section IV.

B-4. EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENTS, SECTION III.

a. Column 1. Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, Section II, Column 5.

b. Column 2. Maintenance Level. The lowest category of maintenance authorized to use the tool or test equipment.

c. Column 3. Nomenclature. Name or identification of the tool or test equipment.

d. Column 4. National Stock Number. The national stock number of the tool or test equipment.

e. Column 5. Tool Number. The manufacturer's part number.

B-5. EXPLANATION OF COLUMNS IN REMARKS, SECTION IV.

a. Column 1. Reference Code. The code recorded in column 6, Section II.

b. Column 2. Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS & EQUIP.	(6) REMARKS
			UNIT		DS	GS	Depot		
			C	O	F	H	D		
00	POWER UNIT AND 200/600 GPM PUMP ASSEMBLIES								
01	MUFFLER EXTENSION	INSPECT	0.2						
		REPLACE		0.2					
		REPAIR		0.5	1.0			1,4	A
02	WINCH ASSEMBLY	INSPECT	0.5						
		REPLACE		1.5	1.0			1, 2, 3	
		REPAIR		1.0	2.0			1, 2,3	B
0201	CABLES	INSPECT		0.2					
		REPLACE		0.5				1,2	
		REPAIR		0.5	0.5			1, 2,3	B
0202	WINCH	INSPECT		0.3					
		REPLACE		1.0				1, 2	
		REPAIR		0.5	1.5			1, 2, 3	
020201	BRAKE ASSEMBLY	INSPECT		0.2					
		REPLACE			0.5				
		REPAIR			0.5			1	
020202	MOTOR	INSPECT			0.2				
		REPLACE			0.5				
		REPAIR			0.5			1, 3	
03	DRAIN TANK/TUBES	INSPECT	0.5	0.4					
		REPLACE		1.0				1, 2	
		REPAIR			2.0			1, 3, 4	
0301	TUBES	INSPECT		0.2					
		REPLACE		0.5				1,2	
		REPAIR			1.0			1, 3, 4	
0302	TANK, DRAIN	INSPECT		0.2					
		REPLACE		0.5				1, 2	
		REPAIR			1.0			1, 3, 4	A
04	OIL RESERVOIR/TUBES	INSPECT	0.5	0.4					
		REPLACE		1.0				1,2	
		REPAIR			2.0			1, 3, 4	

Section II. MAINTENANCE ALLOCATION CHART - continued

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS & EQUIP.	(6) REMARKS
			UNIT		DS	GS	Depot		
			C	O	F	H	D		
0401	TUBES	INSPECT		0.2					
		REPLACE		0.5				1, 2	
		REPAIR			1.0			1, 3	
0402	OIL RESERVOIR	INSPECT		0.2					
		REPLACE		0.5				1, 2	
		REPAIR			1.0			1, 3, 4	A
05	FUEL PUMP ASSEMBLY	INSPECT	0.5						
		REPLACE		1.0				1, 2	
		REPAIR		1.0	7.0	3.0		1, 3, 6	
0501	BALL VALVE	INSPECT		0.2					
		REPLACE		0.5				1, 2	
		REPAIR		0.5	1.0			1, 3, 6	
0502	DRAIN TUBE	INSPECT		0.2					
		REPLACE		0.5				1	
		REPAIR			1.0			1, 3	
0503	PUMP AND CLUTCH ASSEMBLY	INSPECT		0.5					
		REPLACE		1.0				1, 2	
		REPAIR			5.0			1, 3	
050301	CLUTCH WIRING HARNESS	INSPECT		0.3					
		REPLACE		0.5				1, 2	
		REPAIR		0.5	1.0			1, 2, 3	B
050302	PUMP ASSEMBLY	INSPECT			0.8				
		REPLACE			2.0				
		REPAIR			2.0	3.0		1, 3	
05030201	SUCTION MANIFOLD ASSEMBLY	INSPECT			0.3				
		REPLACE			1.0				
		REPAIR				1.5		1, 3	
05030202	DIFFUSER CASE	INSPECT			0.5				
		REPLACE			1.0				
		REPAIR				1.5		1, 3	
050303	BEARING CARRIER	INSPECT			0.2				
		REPLACE			2.0				
		REPAIR			1.0			1, 3	
050304	HOUSING CLUTCH	INSPECT			0.3				
		REPLACE			2.0				
		REPAIR			1.0			1, 3	

Section II. MAINTENANCE ALLOCATION CHART - continued

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS & EQUIP.	(6) REMARKS
			UNIT		DS	GS	Depot		
			C	O	F	H	D		
06	PANELS/DOORS/MOUNTS	INSPECT	0.5						
		REPLACE		0.5					
		REPAIR		1.0				1, 2, 5	
07	AIR CLEANER	INSPECT	0.5						
		REPLACE		1.0					
		REPAIR		1.0				1, 2	
08	OIL AND FUEL TUBES/ VALVES/FILTERS	INSPECT	0.5	0.7					
		REPLACE		2.0				1, 2	
		REPAIR		1.5	1.0			1, 2, 3	
0801	TUBE ASSEMBLIES	INSPECT		0.2					
		REPLACE		0.5				1, 2	
		REPAIR			1.0			1, 2, 3	
0802	VALVES, SOLENOID	INSPECT		0.5					
		REPLACE		1.0				1, 2	
		TEST		0.5					
		REPAIR		0.5				1, 2	
0803	FILTERS	INSPECT		0.1					
		REPLACE		0.5					
		REPAIR		1.0				1, 2	
09	OIL AND FUEL BOOST PUMPS	INSPECT	0.5						
		REPLACE		1.0					
		REPAIR		0.5				1, 2	
10	SPEED REDUCER/TUBES	INSPECT		0.7					
		REPLACE		2.5				1, 2	
		REPAIR			3.0			1, 3	
1001	TUBES	INSPECT		0.2					
		REPLACE		0.5				1, 2	
		REPAIR			1.0			1, 2, 3	
1002	SPEED REDUCER	INSPECT		0.5					
		REPLACE		2.0				1, 2	
		TEST		0.5					
		REPAIR			2.0			1, 3	
11	STARTER -GENERATOR ASSEMBLY	INSPECT	0.5						
		REPLACE		2.0				1, 2	

Section II. MAINTENANCE ALLOCATION CHART - continued

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS & EQUIP.	(6) REMARKS
			UNIT		DS	GS	Depot		
			C	O	F	H	D		
1101	STARTER-GENERATOR	INSPECT		0.5	0.8	0.8			
		REPLACE		2.0				1, 2	
		TEST				2.0			
		REPAIR			5.0	4.0		1, 3	
110101	END BELL ASSEMBLIES	INSPECT			0.3	0.3			
		REPLACE			1.0			1, 2	
		REPAIR				1.0		1, 3	
110102	STATOR ASSEMBLY	INSPECT			0.2				
		REPLACE			0.7			1, 3	
		REPAIR			3.0			1, 3	
110103	ARMATURE	INSPECT			0.3	0.5			
		REPLACE			1.0	2.0		1, 3	
		REPAIR				3.0		1, 3	
12	POWER UNIT, GAS TURBINE	INSPECT							
		REPLACE							
		REPAIR							
1201	OUTLINE, ELECTRICAL SEQUENCING UNIT	INSPECT	0.2	0.2					
		REPLACE		0.5	1.2				
		REPAIR					X	1, 2, 3	D
1202	ENGINE ASSEMBLY, GAS TURBINE	INSPECT	0.2	0.5					
		REPLACE			2.0			1, 3	
		REPAIR		4.0	2.0		X	1, 2, 3, 4	E
120201	PLUMBING AND ELECTRICAL ASSEMBLY	INSPECT	0.5						
		REPLACE		1.0				1, 2	
120202	COVER ASSEMBLIES	INSPECT		0.2					
		REPLACE		1.0				1, 2	
		REPAIR		1.0			X	1, 3, 4	A, E
120203	FUEL CONTROL ASSEMBLY	INSPECT	0.2						
		REPLACE		0.5				1, 2	
		REPAIR		0.5			X	1, 3, 4	F, G
120204	GEARBOX ASSEMBLY	INSPECT					X		
		REPLACE					X		
		REPAIR					X		E

Section II. MAINTENANCE ALLOCATION CHART - continued

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS & EQUIP.	(6) REMARKS
			UNIT		DS	GS	Depot		
			C	O	F	H	D		
12020401	CARRIER ASSEMBLY	INSPECT					X		
		REPLACE					X		
		REPAIR					X		E
12020402	GEARSHAFT ASSEMBLY	INSPECT					X		
		REPLACE					X		
		REPAIR					X		E
12020403	COUPLING SHAFT	INSPECT					X		
		REPLACE					X		
		REPAIR					X		E
12020404	GEAR HOUSING	INSPECT					X		
		REPLACE					X		
		REPAIR					X		E
1202040401	ADAPTER (CONNECTOR FLUID)	INSPECT					X		
		REPLACE					X		
		REPAIR					X		E
120205	POWER SECTION ASSEMBLY	INSPECT					X		
		REPLACE					X		
		REPAIR					X		E
12020501	NOZZLE, FUEL INJECTOR	INSPECT		0.2					
		REPLACE		1.0				1, 2	
		REPAIR					X		E
12020502	CASE ASSEMBLY	INSPECT					X		
		REPLACE					X		
		REPAIR					X		E
12020503	CHAMBER COMBUSTION	INSPECT					X		
		REPLACE					X		
		REPAIR					X		E
12020504	VANE TURBINE ENGINE	INSPECT					X		
		REPLACE					X		
		REPAIR					X		E
12020505	CARRIER ASSEMBLY	INSPECT					X		
		REPLACE					X		
		REPAIR					X		E
12020506	HOUSING. ANTIFRICTION	INSPECT					X		
		REPLACE					X		
		REPAIR					X		E

Section II. MAINTENANCE ALLOCATION CHART - continued

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS & EQUIP.	(6) REMARKS
			UNIT		DS	GS	Depot		
			C	O	F	H	D		
12020507	CASE, GAS TURBINE	INSPECT					X		
		REPLACE					X		
		REPAIR					X		E
13	BATTERY AND TRAY	INSPECT	0.2						
		REPLACE		1.5				1, 2	
		REPAIR		2.0	1.0			1, 2, 3	
1301	BATTERY	INSPECT		0.2					
		REPLACE		0.5					
		SERVICE				1.2			
		REPAIR				3.0		1, 3	C
1302	HEATER ASSEMBLY	INSPECT	0.2						
		REPLACE		0.5				1, 2	
		REPAIR			1.0			1, 3	
1303	TRAY	INSPECT		0.5					
		REPLACE		1.0				1, 2	
		REPAIR		2.0				1, 2	
14	CONTROL BOX ASSEMBLY	INSPECT	0.5						
		REPLACE		1.0				1, 2	
1401	WIRING HARNESS	INSPECT		0.5					
		REPLACE		1.0				1, 2	
		REPAIR			2.0			1, 3	B
1402	LIGHT INDICATORS	INSPECT		0.2					
		REPLACE			0.5			1, 3	
		REPAIR		0.2				1, 2	
1403	PANEL INSTRUMENT	INSPECT		0.2					
		REPLACE		1.0					
		REPAIR		1.0				1, 2	
1404	CONTROL BOX	INSPECT		0.2	0.3				
		REPLACE			1.0			1, 3	
		REPAIR			2.0			1, 3	A
15	ENCLOSURE WIRING HARNESS	INSPECT		0.5					
		REPLACE			2.0			1, 3	
		REPAIR		0.5	3.0			1, 2, 3	B

Section II. MAINTENANCE ALLOCATION CHART - continued

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS & EQUIP.	(6) REMARKS
			UNIT		DS	GS	Depot		
			C	O	F	H	D		
16	WINCH CONTROL BOX ASSEMBLY	INSPECT		0.5					
		REPLACE		1.0				1, 2	
		REPAIR		2.0	2.0			1, 2, 3	B
1601	WINCH CONTROL CABLE ASSEMBLIES	INSPECT		0.2					
		REPLACE		1.0				1, 2	
		REPAIR		1.5	1.5			1, 2, 3	B
17	MOUNT/COVER/BARS/ BRACKETS	INSPECT	0.5						
1701	MUFFLER MOUNT	INSPECT		0.2					
		REPLACE		0.5				1, 2	
		REPAIR			1.0			1, 3, 7	
1702	EXHAUST INTERFACE COVER	INSPECT		0.2					
		REPLACE		0.5				1, 2	
		REPAIR			1.0			1, 3, 6	
1703	BAR ASSEMBLIES	INSPECT		0.2					
		REPLACE		0.5				1, 2	
		REPAIR			1.0			1, 3, 6	
1704	BRACKET ASSEMBLIES	INSPECT		0.2					
		REPLACE		0.5				1, 2	
		REPAIR			1.0			1, 3, 6	
18	PUMP FRAME ASSEMBLY								
1801	FRAME ASSEMBLY	INSPECT		0.5					
		REPLACE			8.0			1,3	
		REPAIR		2.0	3.0			1, 3, 4, 6, 7, 8	A
1802	SKID ASSEMBLY	INSPECT		0.5					
		REPAIR		0.5	0.5			1, 3, 4, 6, 7, 8	A

Section III. TOOLS AND TEST EQUIPMENT REQUIREMENTS

(1) REFERENCE CODE	(2) MAINTENANCE CATEGORY	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER (NSN)	(5) TOOL NUMBER
1	O	Tool Kit, General Mechanics Automotive	5180-00-177-7033	SC-5180-90-CL-N26
2	O	Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance Common No. 1, Less Power	4910-00-754-0654	SC-4910-95-CL-A74
3	F	Shop Equipment, Automotive Maintenance and Repair: Field Maintenance, Basic, Less Power	4910-00-754-0705	SC-4910-95-CL-A31
4	F	Shop Equipment, Welding Field Maintenance	4940-00-357-7268	SC-4940-95-CL-B19-HR
5	F	Breechlock Field Wrench (4 Inch)		4" BREECHLOCK (CAGE 86090)
6	F	Riveter, Blind, Hand	5120-00-177-9839	C-845-10-32 (CAGE 03841)
7	F	Riveter, Blind, Hand	5120-01-020-7814	C-722-5/16-18 (CAGE 03841)
8	F	Riveter, Blind, Hand		C-845-1/4-20 (CAGE 03841)
9	F	Driver, Nut, Set, Clutch (600 GPM)		MFG0354 (CAGE 90598)
10	F	Driver, Nut, Set, Clutch (200 GPM)		MFG0355 (CAGE 90598)

Section IV. REMARKS

REFERENCE CODE	REMARKS
A	Welding procedures refer to T"M 9-237 (Welding Theory and Application).
B	Repair electrical cables and wiring harnesses refer to FM 20-31 (Electric Power Generation in the Field).
C	Repair of nickel-cadmium battery refer to TM 10-6140-203-23 (Aviation Unit and Intermediate Maintenance Manual for Aircraft Nickel-Cadmium Batteries).
D	Refer to DMWR 1-1560-309 for Repair of ESIJ.
E	Refer to DMWR 10-2835-275 for Repair of Gas Turbine Engine.
F	Refer to DMWR 1-2915-215 for Fuel Control Assembly Repair.
G	Organizational Repair Limited to Replacement of Filter Element.

APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

C-1. SCOPE.

This appendix lists components of end item and basic issue items for the 200/600 GPM Pump to help you inventory items required for safe and efficient operation.

C-2. GENERAL.

The Components of End Item and Basic Issue Items List are divided into the following sections:

a. Section II. Components of End Item. This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the 200/600 GPM Pump into operation. Although shipped separately packaged, BII must be with the 200/600 GPM Pump during operation and whenever it is transferred between property accounts. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of the end item.

C-3. EXPLANATION OF COLUMNS.

The following provides an explanation of columns found in the tabular listing:

a. Column (1) - Illustration Number (Illus Number). This column indicates the number of the illustration in which the item is shown.

b. Column (2) - National Stock Number. Indicates the national stock number assigned to the item and will be used for requisitioning purposes.

c. Column (3) Description. Indicates the Federal item and name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the CAGE (in parentheses) followed by the part number.

d. Column (4) - Unit of Measure (U/M). Indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr).

e. Column (5) - Quantity Required (Qty Rqd). Indicates the quantity of the item authorized to be used with/on the equipment.

Section II. COMPONENTS OF END ITEM

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGEC and Part Number	(4) U/M	(5) QTY. RQD
1		JACK, SCREW		
		(97403) 13230E2987	EA	2
2		MUFFLER, EXTENSION		
		(97403) 13230E3040	EA	1
3		HANDLE, MUFFLER		
		(97403) 13230E3048	EA	1

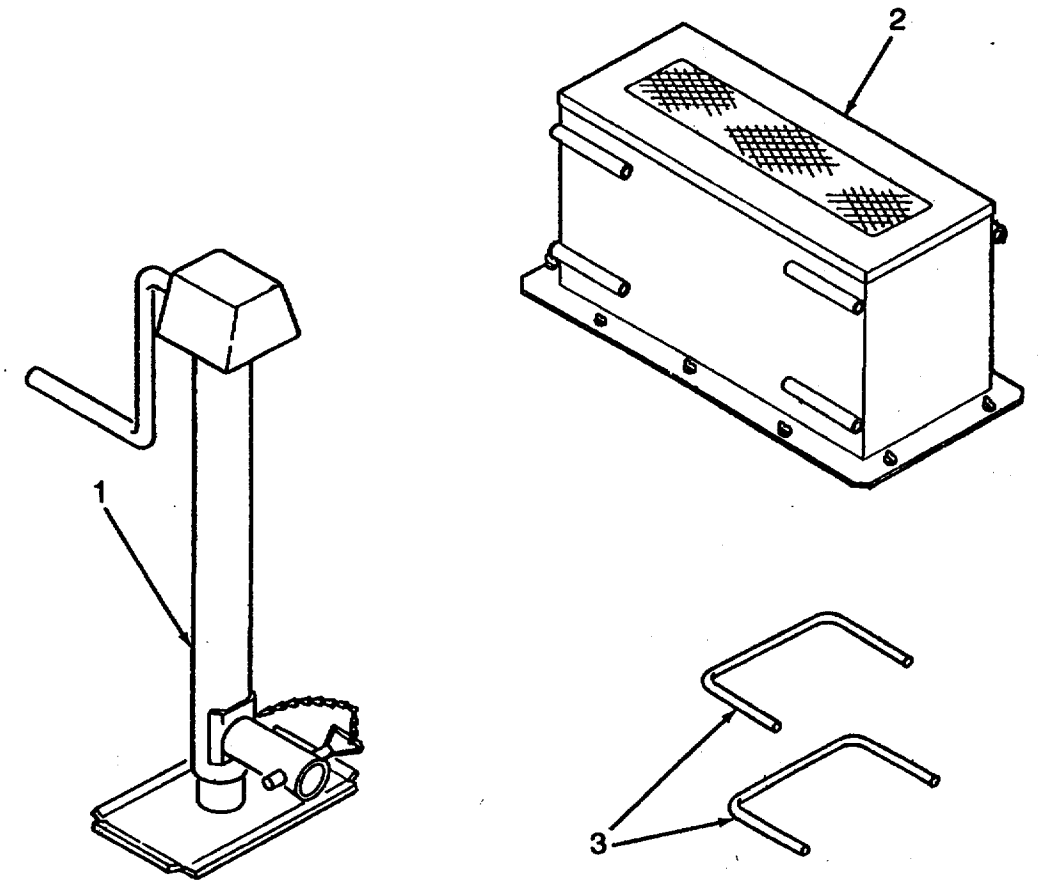


Figure C-1. Components of End Item.

Section III. BASIC ISSUE ITEMS

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGEC and Part Number	(4) U/M	(5) QTY. RQD
1		OPERATOR'S MANUAL TM 10-4320-342-10	EA	1
2		LUBRICATION ORDER LO 10-4320-342-12	EA	1
3		UNIT,DIRECT SUPPORT AND GENERAL MAINTENANCE MANUAL TM 10-4320-342-24	EA	1

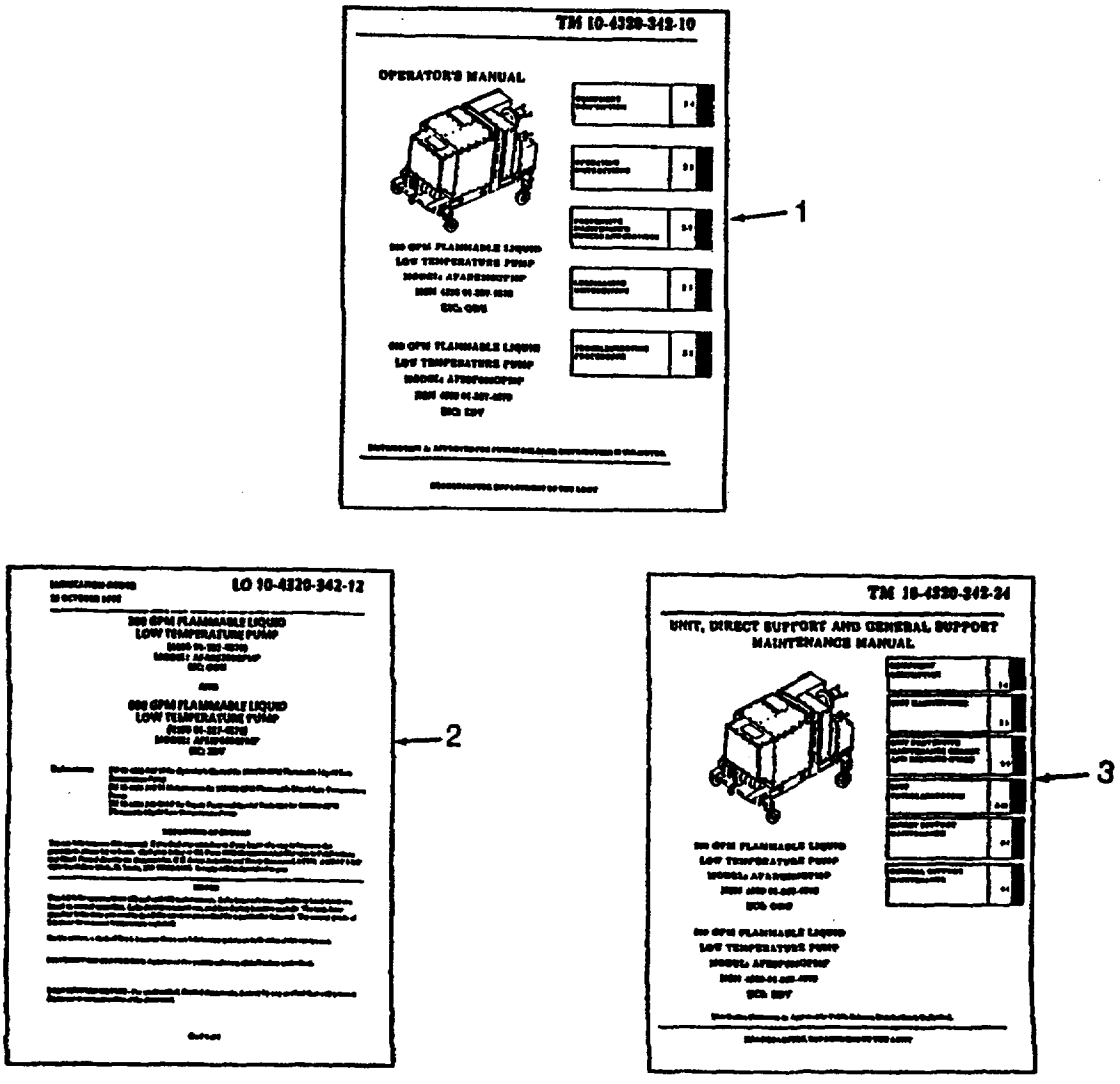


Figure C-2. Basic Issue Item.

APPENDIX D

ILLUSTRATED LIST OF MANUFACTURED ITEMS

D-1. INTRODUCTION.

This appendix includes complete instructions for making items authorized to be manufactured or fabricated at unit maintenance. A part number index in alphanumeric order is provided for cross-referencing the part number of the item to be manufactured to the figure which covers the fabrication criteria. All bulk materials needed for manufacture of an item are listed by part number or specification number in a tabular list of the illustrations.

D-2. MANUFACTURED ITEMS PART NUMBER INDEX.

ITEM NUMBER	PART NUMBER	FIGURE NUMBER	INDEX NUMBER
1	13229E3900-250	D-1	1
2	13229E3900-250	D-1	2
3	13229E3900-251	D-2	3
4	13229E3866-4	D-3	4
5	13229E4011-23	D-4	5
6	13229E4011-42	D-5	6
7	13229E3982-2	D-6	7
8	13229E3851-2	D-6	8
9	13230E3071-1	D-7	9
10	13230E3972-1	D-7	10
11	13230E3070-1	D-7	12
12	13230E3067-1	D-7	12
13	13230E3069-1	D-7	13
14	13230E3068-1	D-7	14
15	SILFAB-2FLX2001 3-1/4 DIA	D-5	15
16	13230E3047-2	D-9	16

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.

ITEM NUMBER	PART NUMBER	FIGURE NUMBER	INDEX NUMBER
17	13230E3047-3	D-9	17
18	13230E3836-2	D-9	18
19	13229E3821-2	D-9	19
20	13229E3846-5	D-9	20
21	13229E3822-2	D-9	21
22	13230E3037-2	D-9	22
23	13229E3820-5	D-9	23
24	13229E3820-6	D-9	24
25	13229E3834-2	D-9	25
26	13229E3827-2	D-9	26
27	13229E3829-2	D-9	27
28	13229E3813-2	D-9	28
29	13229E3833-5	D-9	29
30	13229E3833-6	D-9	30
31	13229E3859-5	D-9	31
32	13229E3859-4	D-9	32
33	13229E3814-2	D-9	33
34	13229E3802-1	D-9	34
35	13229E3894-12	D-9	35
36	13229E3894-13	D-9	36
37	13229E3894-25	D-9	37
38	13229E3835-2	D-9	38
39	13229E3894-14	D-9	39
40	13230E3836-4	D-10	40
41	13230E3836-3	D-10	41

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.

ITEM NUMBER	PART NUMBER	FIGURE NUMBER	INDEX NUMBER
42	13229E3821-3	D-10	42
43	13229E3846-6	D-10	43
44	13229E3822-3	D-10	44
45	13229E3820-7	D-10	45
46	13229E3820-4	D-10	46
47	13229E3835-3	D-10	47
48	13229E3834-3	D-10	48
49	13229E3829-3	D-10	49
50	13229E3833-6	D-10	50
51	13229E3813-3	D-10	51
52	13229E3859-3	D-10	52
53	13229E3814-3	D-10	53
54	13230E3829-8	D-11	54
55	13230E3833-8	D-11	55
56	13229E3894-26	D-11	56
57	13229E3894-17	D-11	57
58	13229E3894-18	D-11	58
59	13229E3851-7	D-11	59
60	13229E3851-4	D-11	60
61	13230E3839	D-12	61
62	13230E3840	D-12	62
63	13230E3847	D-12	63
64	13230E3837	D-12	64
65	13230E3921-1	D-13	65
66	13229E3945-1	D-13	66

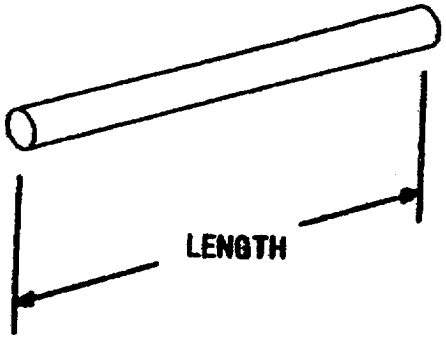
D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.

ITEM NUMBER	PART NUMBER	FIGURE NUMBER	INDEX NUMBER
67	13229E4012-10	D-13	67
67	13229E4012-8	D-13	68
68	13229E4012-12	D-13	69
69	13229E4012-3	D-13	70
70	13229E4012-16	D-13	71
72	13229E4012-42	D-13	72
73	13229E4011-34	D-13	73
74	13229E4011-20	D-13	74
75	13229E4011-18	D-13	75
76	13229E4011-12	D-13	76
77	13229E4011-45	D-13	77
78	13229E3996	D-14	N/A
79	13229E3994	D-15	N/A
80	13230E3114	D-16	N/A
81	13230E3087	D-17	N/A
82	13230E3088	D-18	N/A
83	13230E3089	D-19	N/A
84	13229E3969	D-20	N/A
85	13230E3085	D-21	N/A
86	13230E3086	D-22	N/A
87	13229E4002	D-23	N/A
88	13229E3991	D-24	N/A
89	13229E3987	D-25	N/A
90	13229E3992	D-26	N/A
91	13229E4006	D-27	N/A

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.

ITEM NUMBER	PART NUMBER	FIGURE NUMBER	INDEX NUMBER
92	13229E3993	D-28	N/A
93	13229E4007	D-29	N/A
94	13229E4001	D-30	N/A
95	13229E3988-1	D-31	N/A
96	13230E3095	D-32	N/A
97	13230E4004	D-33	N/A
98	13230E4003	D-34	N/A
99	13230E3999	D-35	N/A
100	13230E3988	D-36	N/A
101	13230E3997	D-37	N/A
102	13230E3084	D-38	N/A
103	13230E3998	D-39	N/A
104	13230E3995	D-40	N/A
105	13230E3091	D-41	N/A
106	13230E3093	D-42	N/A
107	13230E3125	D-43	N/A
108	13230E3090	D-44	N/A
109	13230E3094	D-45	N/A
110	13230E3092	D-46	N/A
111	13229E3986	D-47	N/A
112	13230E3089	D-48	N/A
113	Manufacture Tool (200 Ball Valve)	D-49	N/A

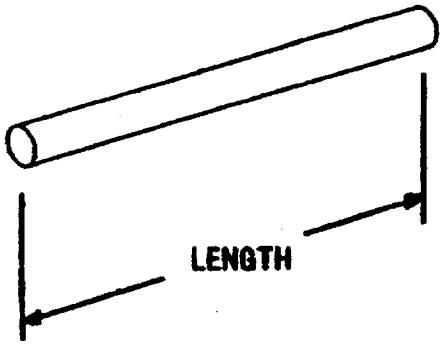
D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



INDEX NUMBER	LENGTH (INCHES)
1	6
2	4

1. Make from insulation sleeving part number M23053/16-003-0.
2. Cut insulation sleeving to required length.

Figure D-1. Insulation Sleeving

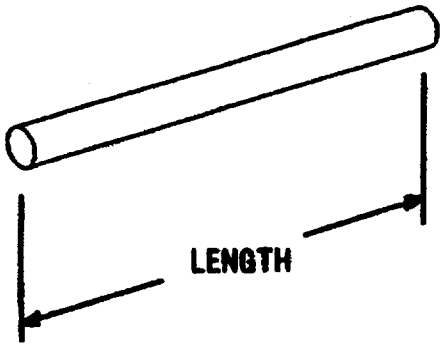


INDEX NUMBER	LENGTH (INCHES)
3	6

1. Make from insulation sleeving part number M23053/16-005-0.
2. Cut insulation sleeving to required length.

Figure D-2. Insulation Sleeving

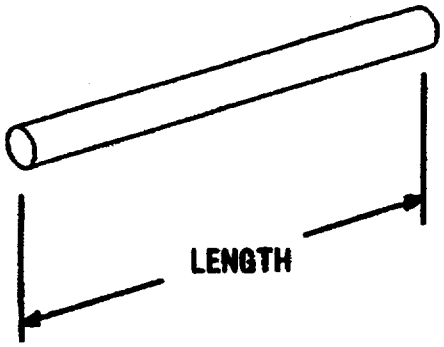
D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



INDEX NUMBER	LENGTH (INCHES)
4	1.125

1. Make from insulation sleeving part number M23053/16-001-0.
2. Cut insulation sleeving to required length.

Figure D-3. Insulation Sleeving

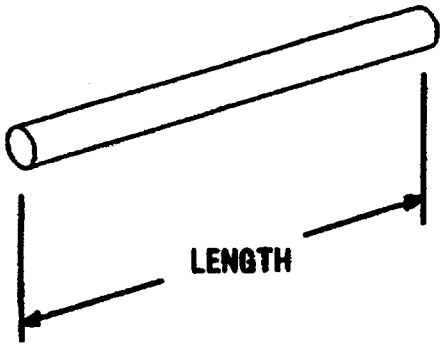


INDEX NUMBER	LENGTH (INCHES)
5	4

1. Make from insulation sleeving part number M23053/5-106-9.
2. Cut insulation sleeving to required length.

Figure D-4. Insulation Sleeving

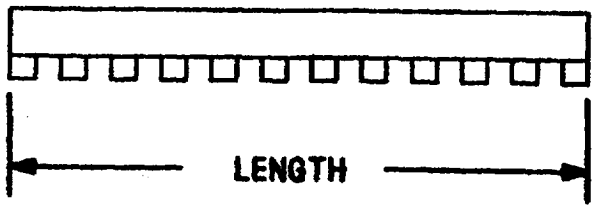
D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



INDEX NUMBER	LENGTH (INCHES)
6	1.125

1. Make from insulation sleeving part number M23053/1-201-0.
2. Cut insulation sleeving to required length.

Figure D-5. Insulation Sleeving

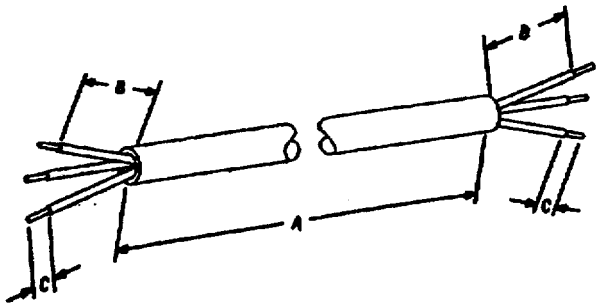


INDEX NUMBER	LENGTH (INCHES)
7	6
8	6

1. Make from grommet part number MS21266-3N.
2. Cut grommet to required length.

Figure D-6. Grommet

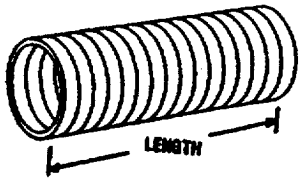
D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



INDEX NUMBER	PART NUMBER	MAKE FROM PART NUMBER	A (INCHES)	B (INCHES)	C (INCHES)
9	13230E3071-1	J-C-580SE06CK3/16EEJ	44	6	1/4
10	13230E3972-11	J-C-580SE06CK3/16EEJ	44	6	1/4
11	13230E3070-1	01351	120	6	1/4
12	13230E3067-1	SOW-A 6/2	72	6	1/4
13	13230E3069-1	SJOW-A 16/2	16	6	1/4
14	13230E3068-1	SOW-A 6/2	14	6	1/4

1. Make from part number listed above.
2. Cut cable to length listed above.
3. Strip 6 inches of insulation from both ends of cable.
4. Strip 1/4 inch of insulation from ends of each wire leads.

Figure D-7. Electrical Cables

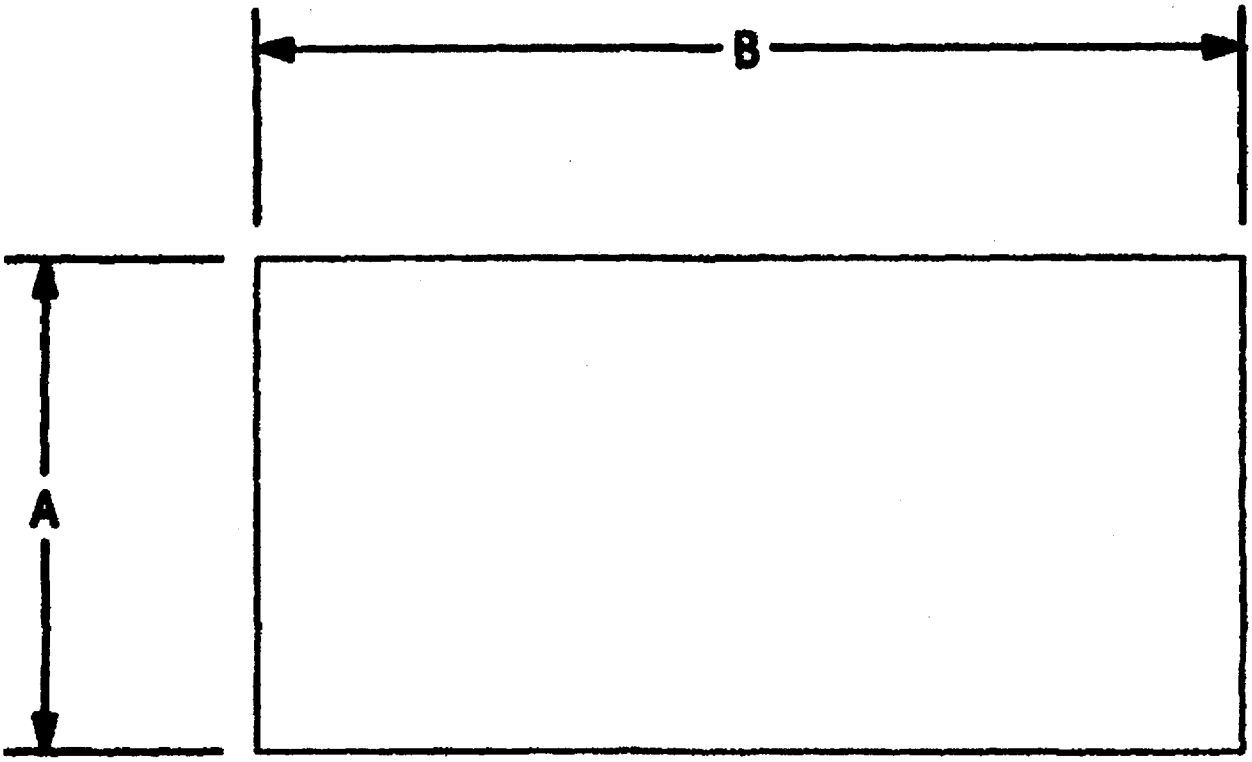


INDEX NUMBER	LENGTH (INCHES)
15	24

1. Make from flexible duct part number FLX200126057600.
2. Cut to required length.

Figure D-8. Duct, Flex

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Make from closed cell foam part number 07320206.
2. Cut foam to required length. Place along rear panel and mark hole location, remove and punch holes.
3. Peel plastic strip off back of foam and install on rear panel.

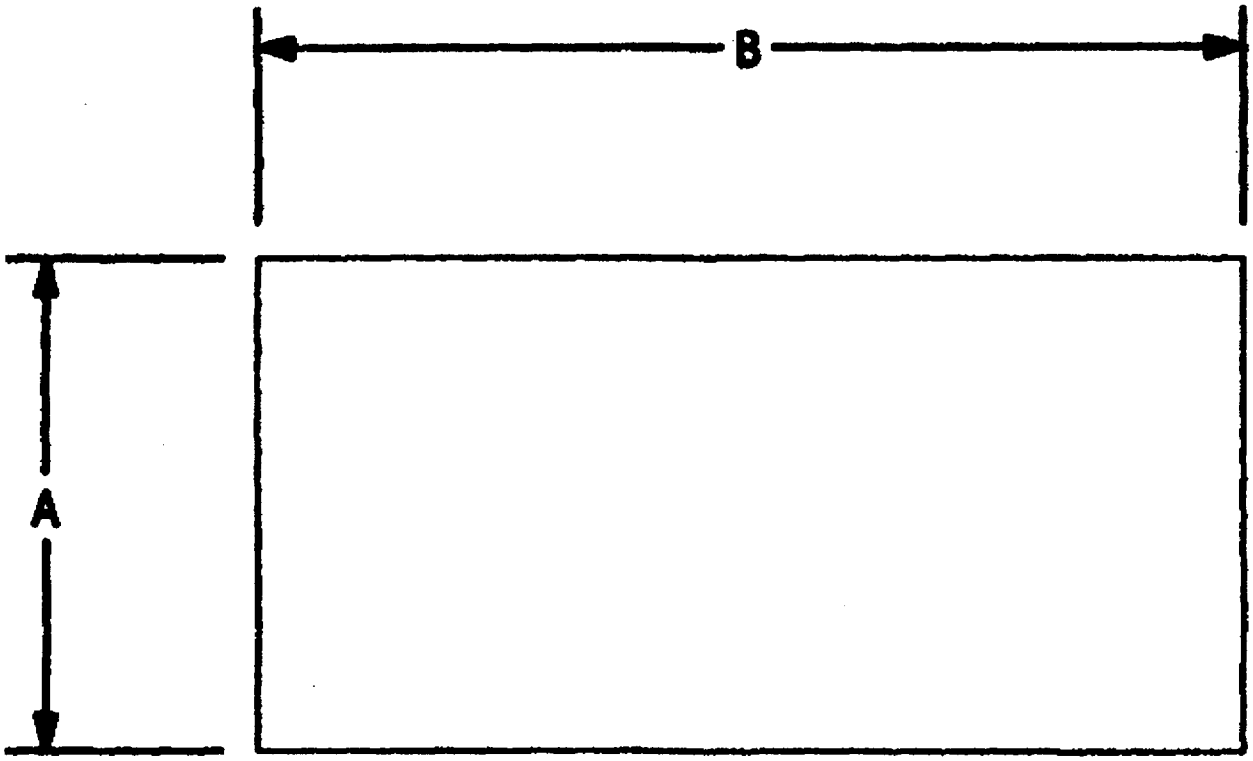
Figure D-9. Foam, Closed Cell (Sheet 1 of 2)

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.

INDEX NUMBER	PART NUMBER	MAKE FROM PART NUMBER	A	B
16	13230E3047-2	07320206	1.00	23.53
17	13230E3047-3	07320206	1.00	10.00
18	13230E3836-2	07320206	26.00	32.50
19	13229E3821-2	07320206	.72	18.59
20	13229E3846-5	07320206	6.13	19.88
21	13229E3822-2	07320206	13.22	19.12
22	13230E3037-2	07320206	10.56	.56
23	13229E3820-5	07320206	18.062	2.370
24	13229E3820-6	07320206	16.27	2.370
25	13229E3834-2	07320206	.66	30.25
26	13229E3827-2	07320206	5.465	28.305
27	13229E3829-2	07320206	16.12	26.04
28	13229E3813-2	07320206	16.25	6.88
29	13229E3833-5	07320206	1.00	15.34
30	13229E3833-6	07320206	1.00	30.25
31	13229E3859-5	07320206	9.875	9.500
32	13229E3859-4	07320206	9.875	12.00
33	13229E3814-2	07320206	3.35	11.00
34	13229E3802-1	07320206	25.75	13.75
35	13229E3894-12	07320206	1.00	22.82
36	13229E3894-13	07320206	.66	22.82
37	13229E3894-25	07320206	1.59	16.00

Figure D-9. Foam, Closed Cell (Sheet 2 of 2)

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Make from closed cell foam part number 07320208.
2. Cut foam to required length. Place along rear panel and mark hole location, remove and punch holes.
3. Peel plastic strip off back of foam and install on rear panel.

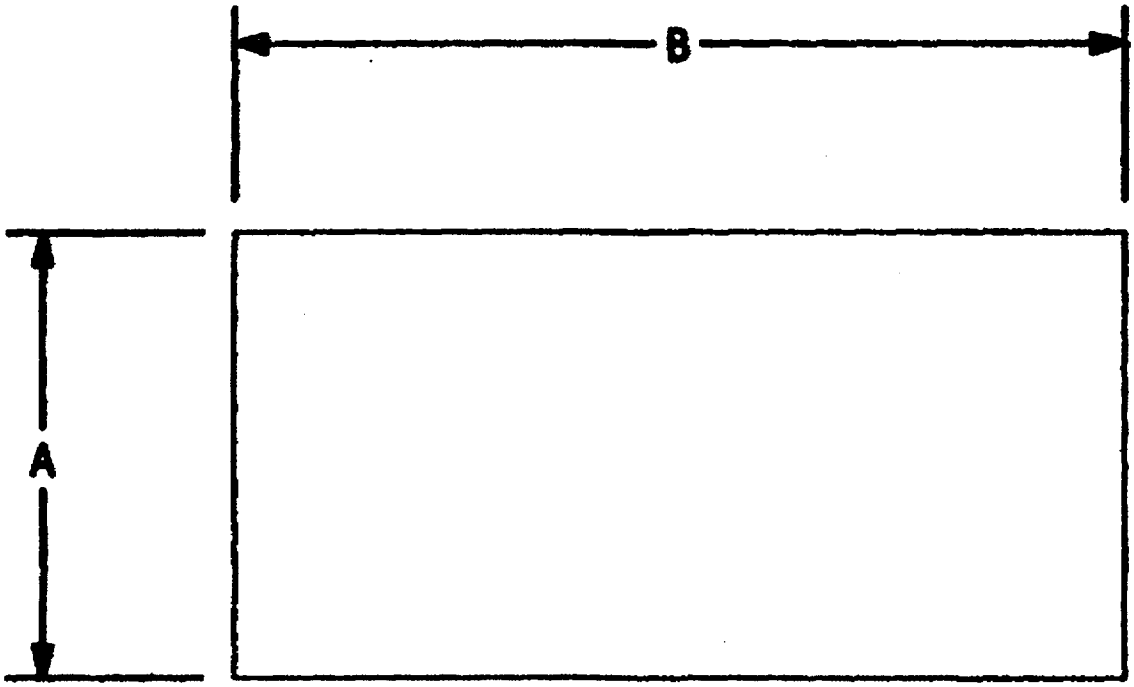
Figure D-10. Foam, Closed Cell (Sheet 1 of 2)

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.

INDEX NUMBER	PART NUMBER	MAKE FROM PART NUMBER	A	B
38	13229E3835-2	07320206	.64	26.625
39	13229E3894-14	07320206	1.00	12.55
40	13230E3836-4	07320208	16.00	16.30
41	13230E3836-3	07320208	12.50	24.15
42	13229E3821-3	07320208	7.69	14.75
43	13229E3846-6	07320208	3.625	17.37
44	13229E3822-3	07320208	12.22	17.12
45	13229E3820-7	07320208	13.71	2.37
46	13229E3820-4	07320208	15.02	17.687
47	13229E3835-3	07320208	3.61	29.125
48	13229E3834-3	07320208	27.00	26.71
49	13229E3829-3	07320208	13.99	23.54
50	13229E3833-6	07320208	1.00	13.47
51	13229E3813-3	07320208	5.02	15.54
52	13229E3859-3	07320208	11.00	7.50
53	13229E3814-3	07320208	10.24	2.35

Figure D-10. Foam, Closed Cell (Sheet 2 of 2)

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.

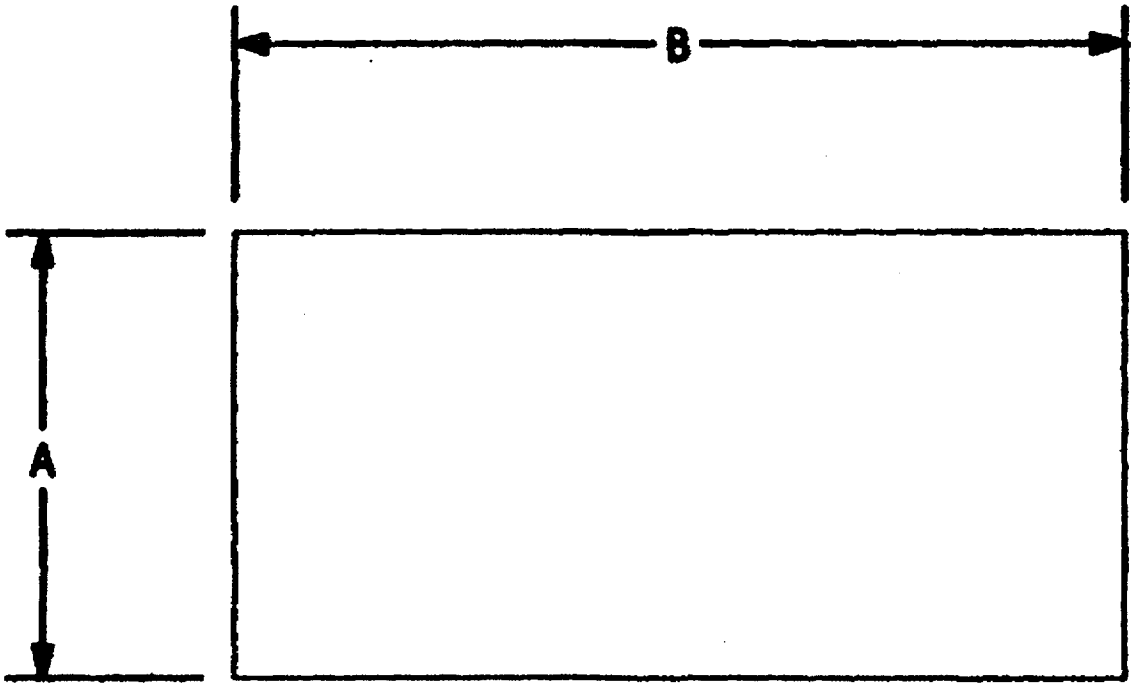


INDEX NUMBER	PART NUMBER	MAKEFROM PART NUMBER	A	B
54	13230E3829-8	07320207	11.12	9.06
55	13230E3833-8	07320207	8.21	11.64
56	13229E3894-26	07320207	6.62	7.25
57	13229E3894-17	07320207	1.00	23.24
58	13229E3894-18	07320207	1.00	24.24
59	13229E3851-7	07320207	13.44	14.50
60	13229E3851-4	07320207	5.00	12.70

1. Make from closed cell foam part number 07320207.
2. Cut foam to required length. Place along rear panel and mark hole location, remove and punch holes.
3. Peel plastic strip off back of foam and install on rear panel.

Figure D-11. Foam, Closed Cell

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



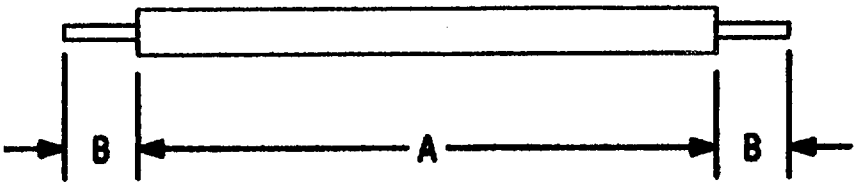
INDEX NUMBER	PART NUMBER	MAKE FROM PART NUMBER	A	B
61	13230E3839	EI-475-1	14.87	16.85
62	13230E3840	EI-475-1	13.75	16.85
63	13230E3847	EI-475-1	14.87	11.14
64	13230E3837	EI-475-1.5	13.69	16.85

1. Make from insulation part number as listed above.

2. Cut insulation to required length.

Figure D-12. Insulation

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.

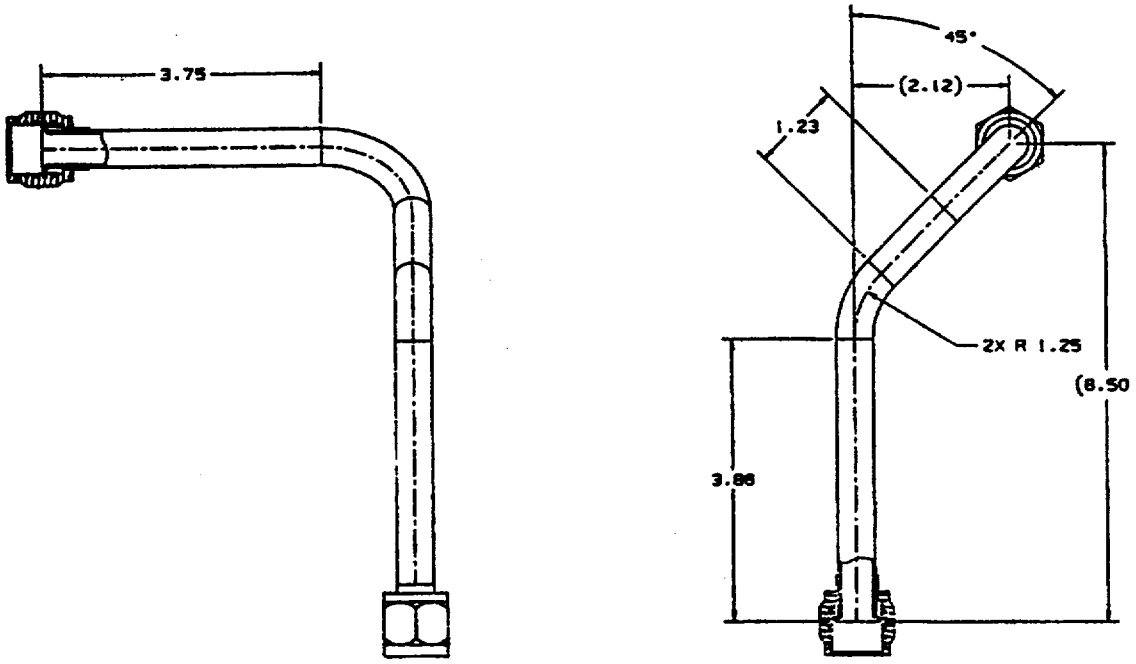


INDEX NUMBER	PART NUMBER	MAKEFROM PART NUMBER	A (INCHES)	B (INCHES)
65	13230E3921-1	M5086/2-16-9	12.0	1/4
66	13229E3945-1	M5086/2-16-9	12.0	1/4
67	13229E4012-10	M5986/2-10-9	Cut to Length	1/4
68	13229E4012-8	M5086/2-8-9	Cut to Length	1/4
69	13229E4012-12	M5086/2-12-9	Cut to Length	1/4
70	13229E4012-3	M5086/2-0-9	Cut to Length	1/4
71	13229E4012-16	M5086/2-16-9	Cut to Length	1/4
72	13229E4012-42	M5086/2-18-9	Cut to Length	1/4
73	13229E4011-34	M5086/2-16-9	Cut to Length	1/4
74	13229E4011-20	M5086/2-8-9	Cut to Length	1/4
75	13229E4011-18	M5086/2-10-9	Cut to Length	1/4
76	13229E4011-12	M5086/2-0-9	Cut to Length	1/4
77	13229E4011-45	M5086/2-18-9	Cut to Length	1/4

1. Make from electrical wire part number as listed above.
2. Cut electrical wire to required length.
3. Strip insulation 1/4 inch on both ends of wire.

Figure D-13. Electrical Wire

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .500 OD x .035 Wall.

2. Cut and bend tubing as illustrated above.

NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**

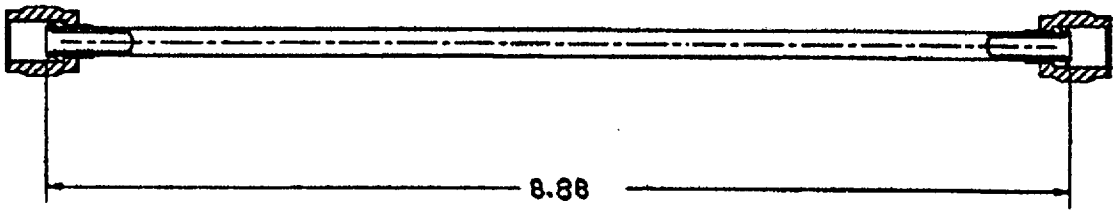
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-8J and sleeve, part number MS20819-8J on ends of tubing.

4. Flare both ends of tubing.

Figure D-14. Tube Assembly, P/N 13229E3996

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .250 OD x .035 Wall.

2. Cut and bend tubing as illustrated above.

NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**

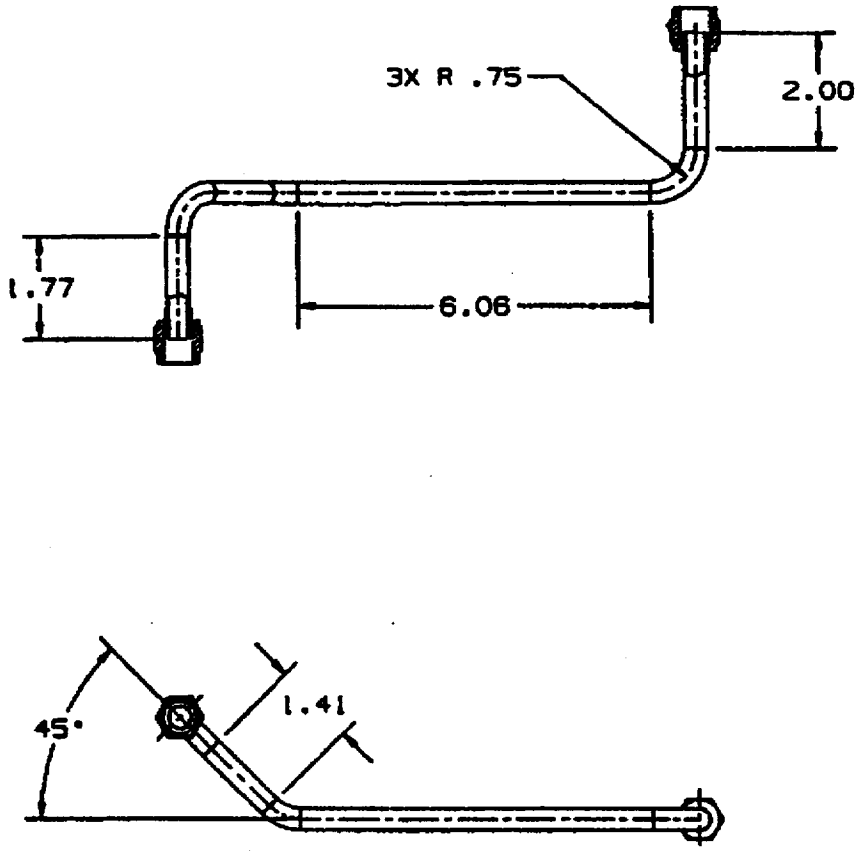
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-4J and sleeve, part number MS20819-4J on ends of tubing.

4. Flare both ends of tubing.

Figure D-15. Tube Assembly, P/N 13229E3994

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .375 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

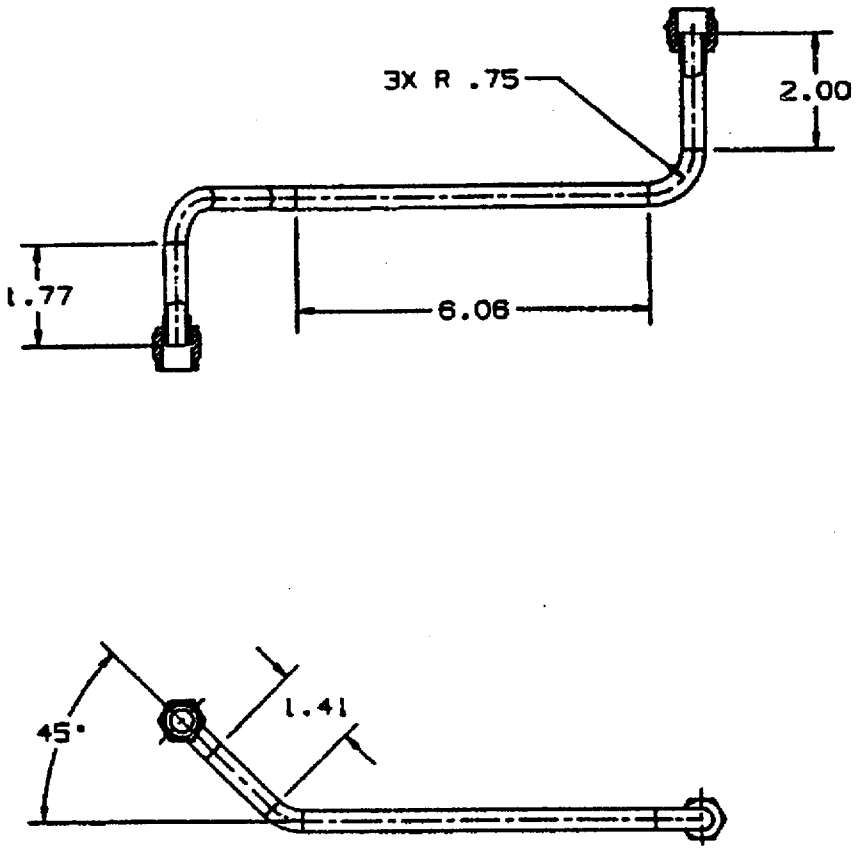
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-6C and sleeve, part number MS20819-6J on ends of tubing.
4. Flare both ends of tubing.

Figure D-16. Tube Assembly, P/N 13230E3114

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .375 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

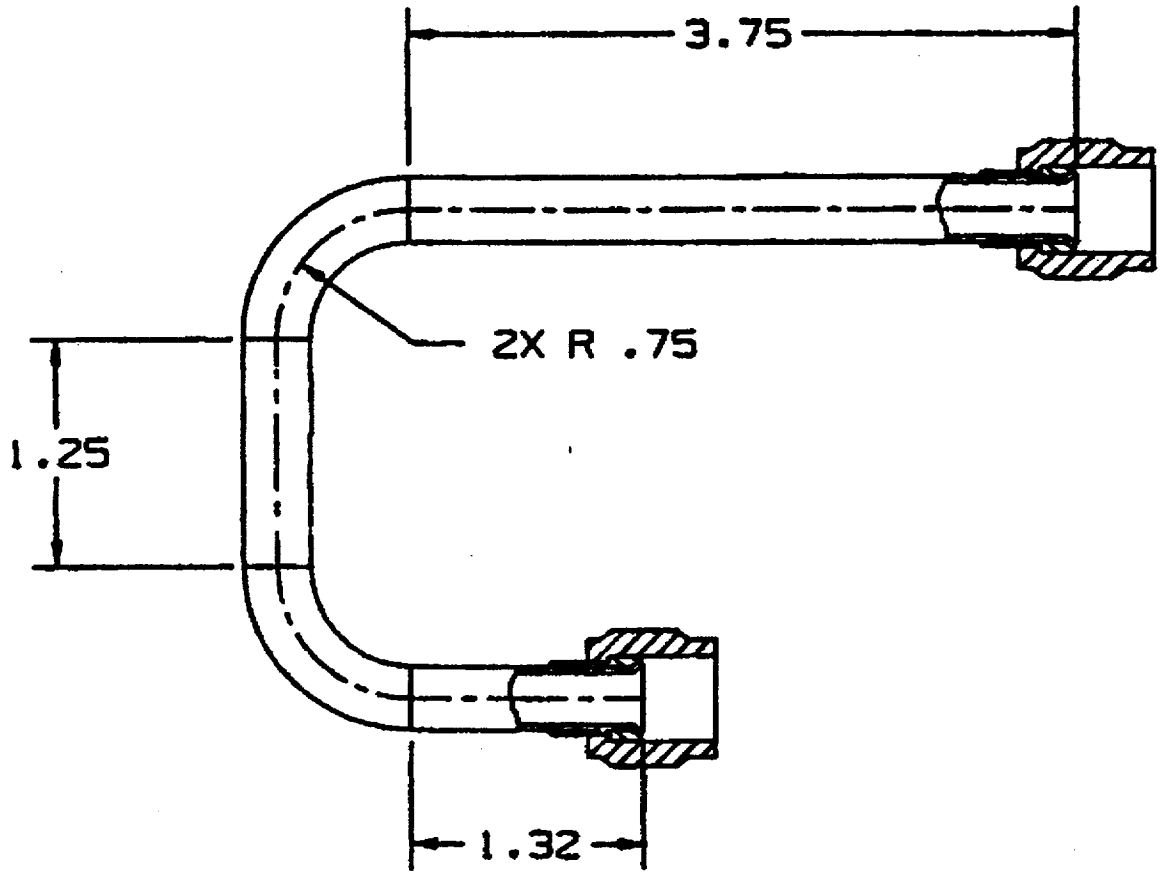
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-6C and sleeve, part number MS20819-6J on ends of tubing.
4. Flare both ends of tubing.

Figure D-17. Tube Assembly, P/N 13230E3087

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .375 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

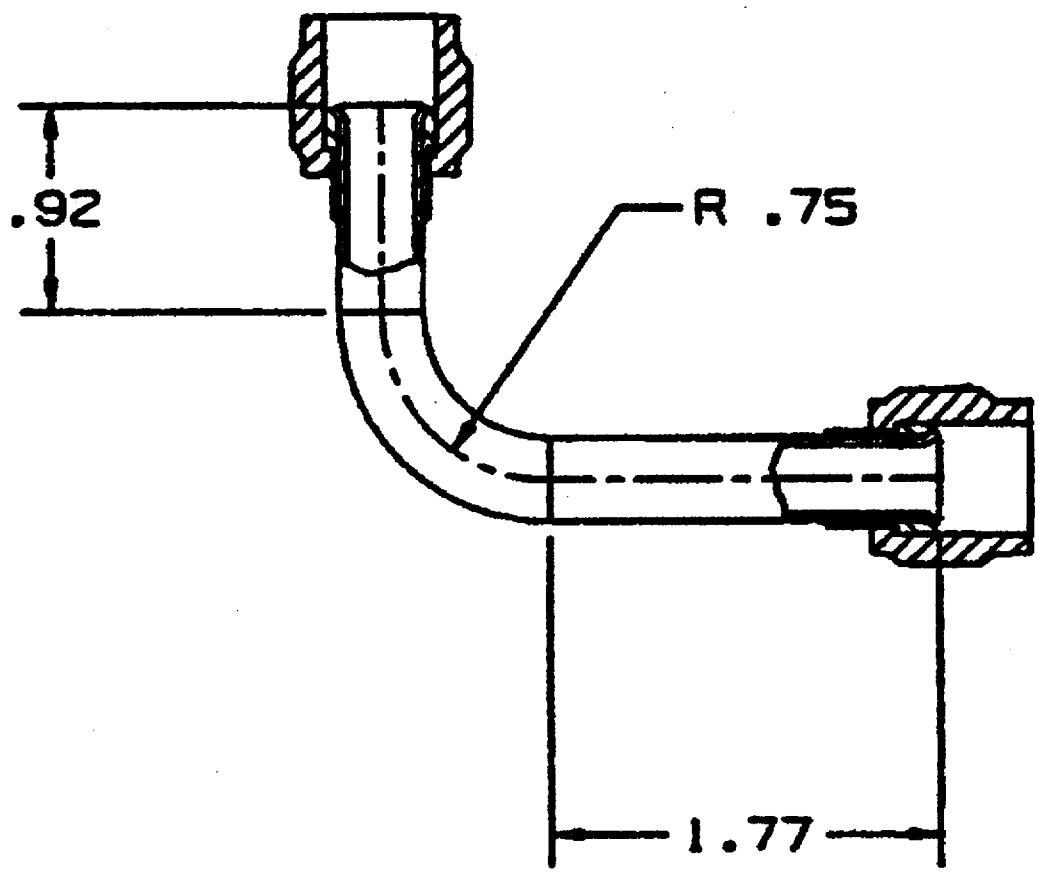
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-6C and sleeve, part number MS20819-6J on ends of tubing.
4. Flare both ends of tubing.

Figure D-18. Tube Assembly, P/N 13230E3088

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .375 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

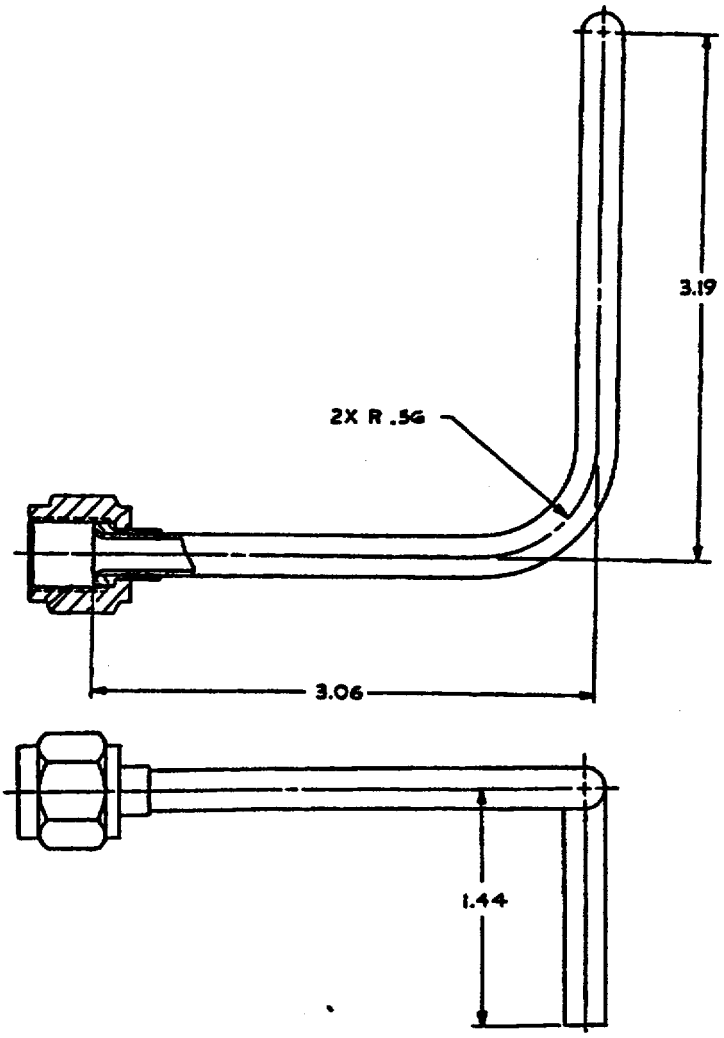
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-6C and sleeve, part number MS20819-6J on ends of tubing.
4. Flare both ends of tubing.

Figure D-19. Tube Assembly, P/N 13230E3089

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from ASTM A269, Type 304, CRES, .250 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

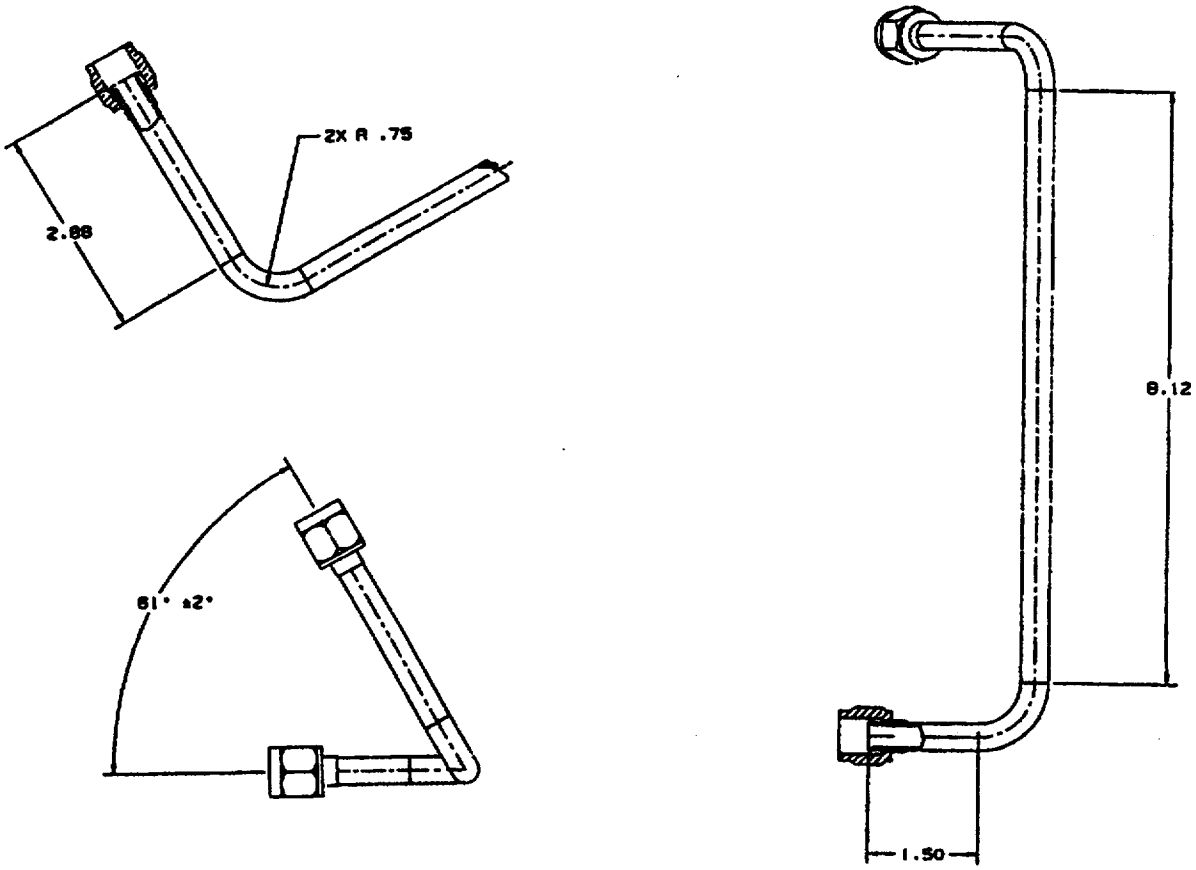
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-6C and sleeve, part number MS20819-6J on ends of tubing.
4. Flare both ends of tubing.

Figure D-20. Drain Tube Assembly, P/N 13229E3969

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .375 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

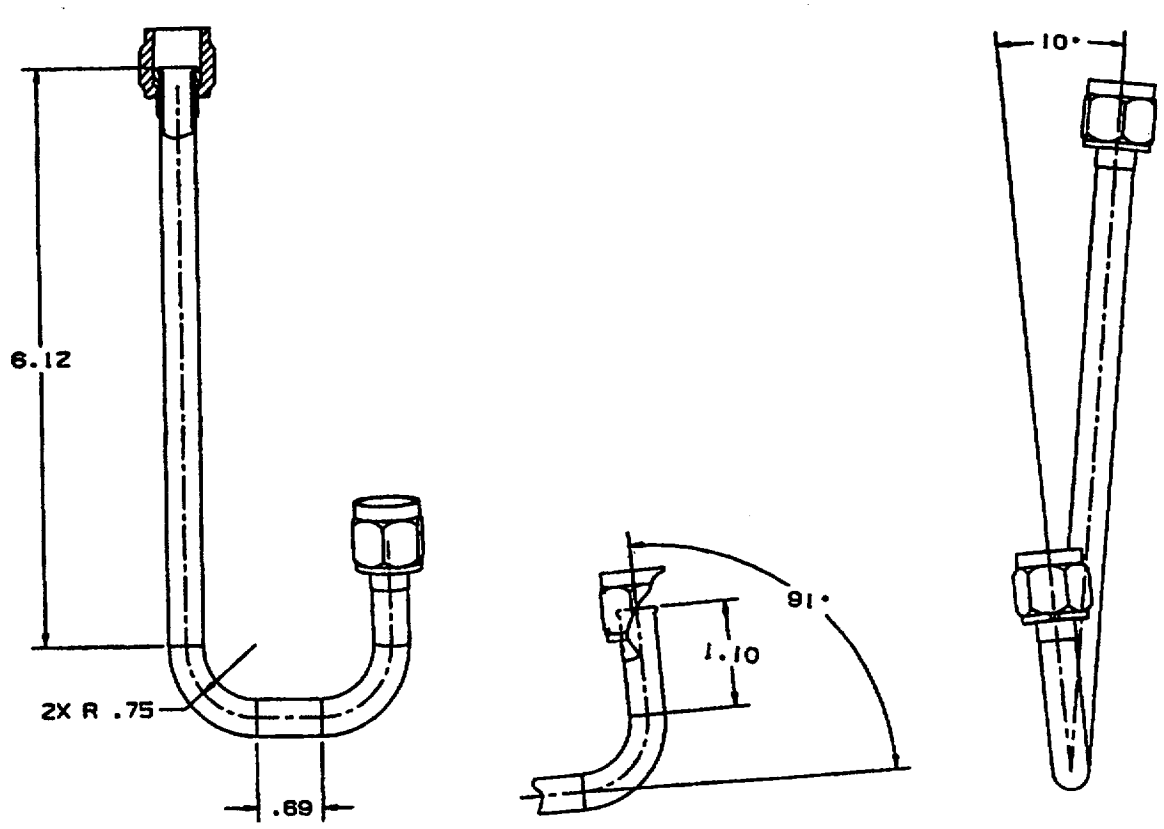
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-6C and sleeve, part number MS20819-6J on ends of tubing.
4. Flare both ends of tubing.

Figure D-21. Tube Assembly, P/N 13230E3085

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .375 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

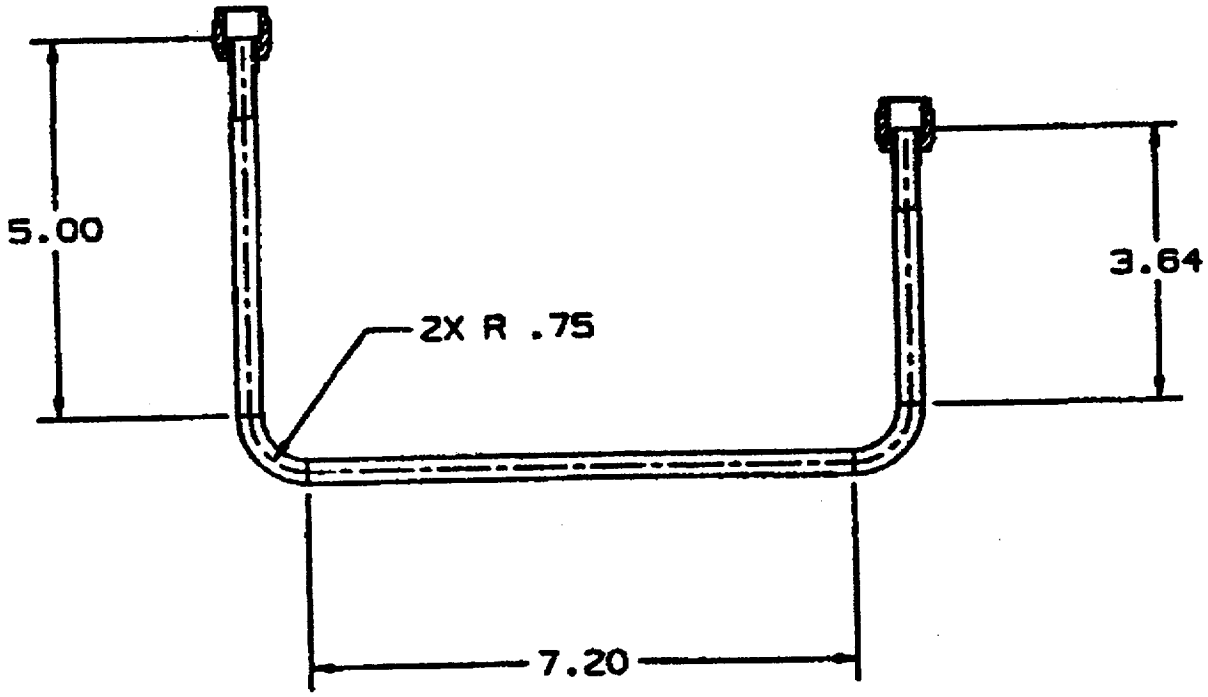
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-6C and sleeve, part number MS20819-6J on ends of tubing.
4. Flare both ends of tubing.

Figure D-22. Tube Assembly, P/N 13230E3086

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .312 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

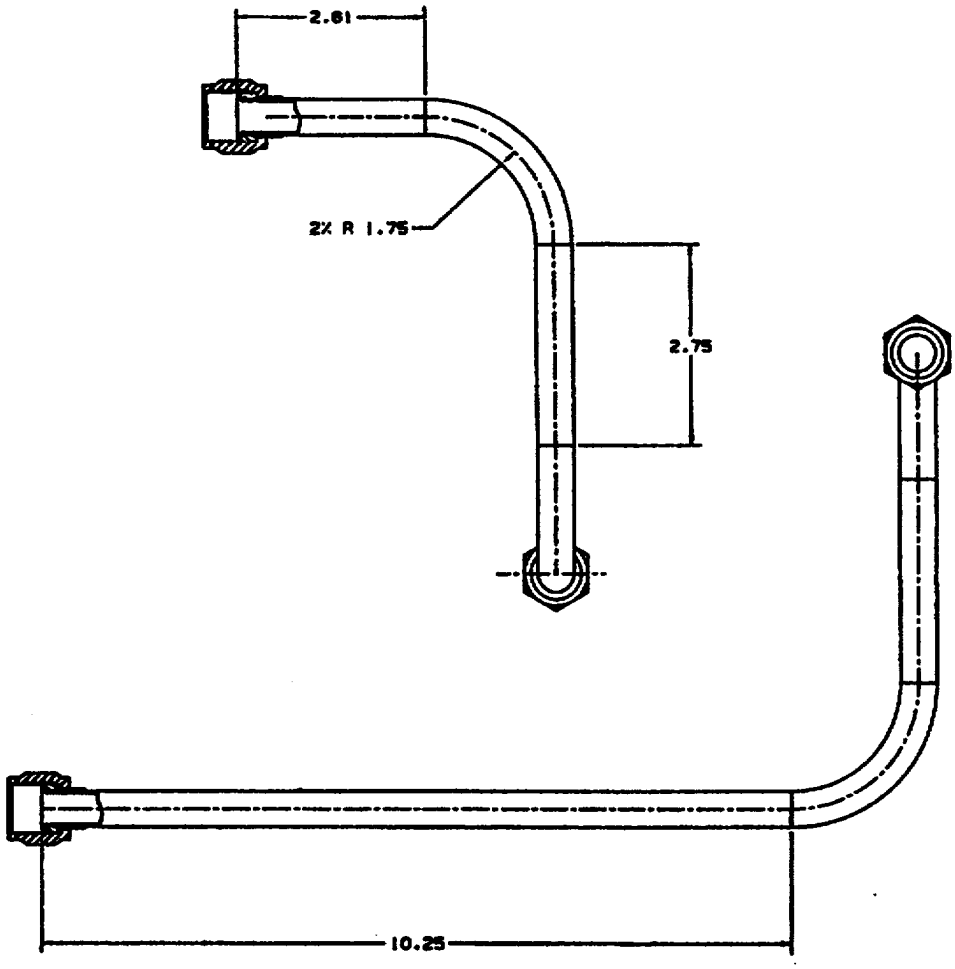
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-5J and sleeve, part number MS20819-5J on ends of tubing.
4. Flare both ends of tubing.

Figure D-23. Tube Assembly, P/N 13229E4002

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .500 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

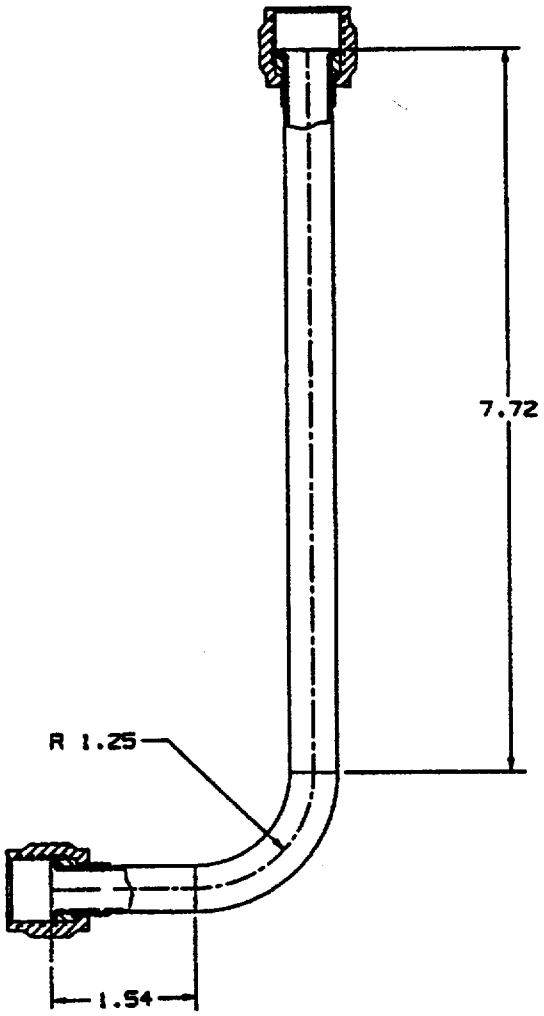
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-8J and sleeve, part number MS20819-8J on ends of tubing.
4. Flare both ends of tubing.

Figure D-24. Tube Assembly, P/N 13229E3991

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .500 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

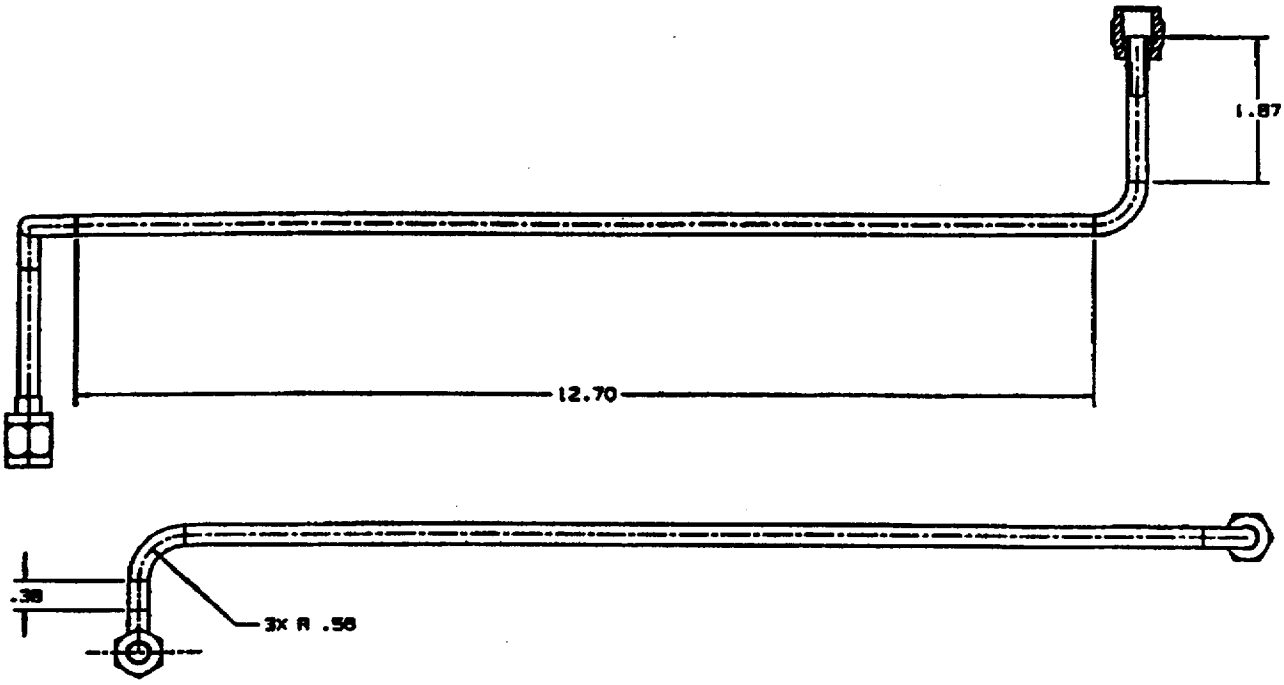
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-8J and sleeve, part number MS20819-8J on ends of tubing.
4. Flare both ends of tubing.

Figure D-25. Tube Assembly, P/N 13229E3987

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .250 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

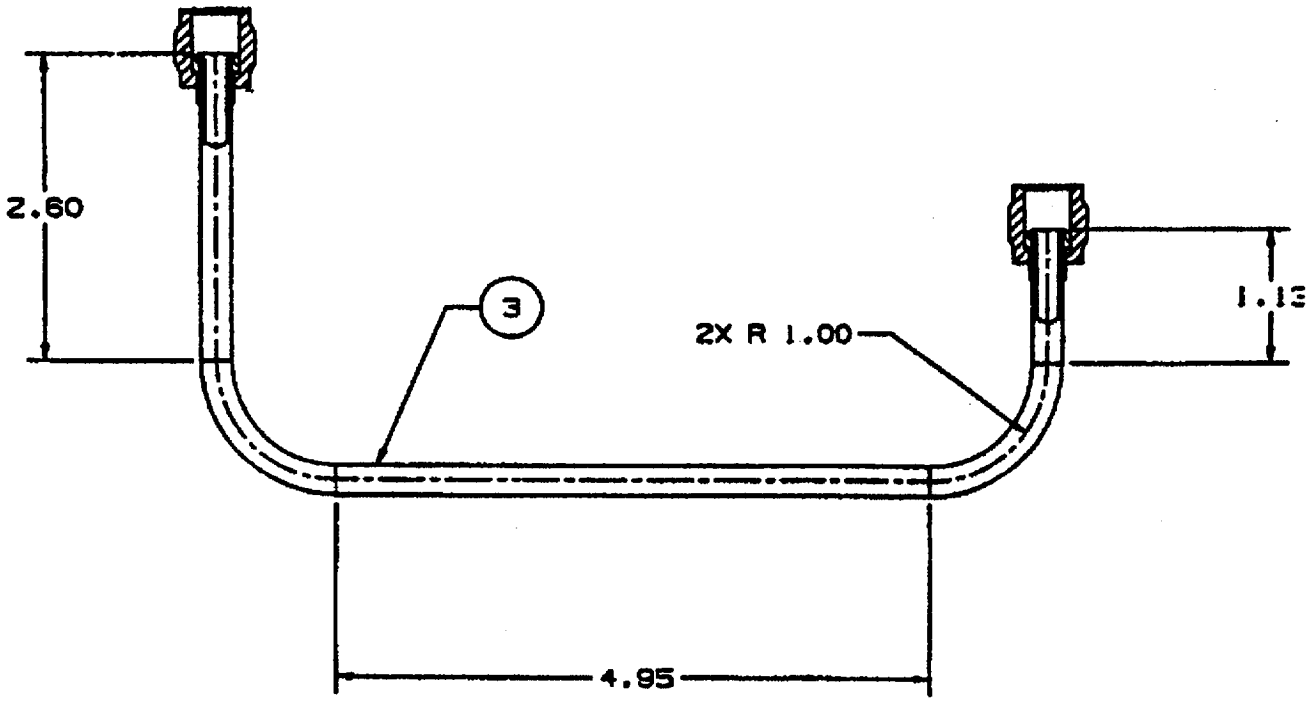
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-4J and sleeve, part number MS20819-4J on ends of tubing.
4. Flare both ends of tubing.

Figure D-26. Tube Assembly, P/N 13229E3992

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .250 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

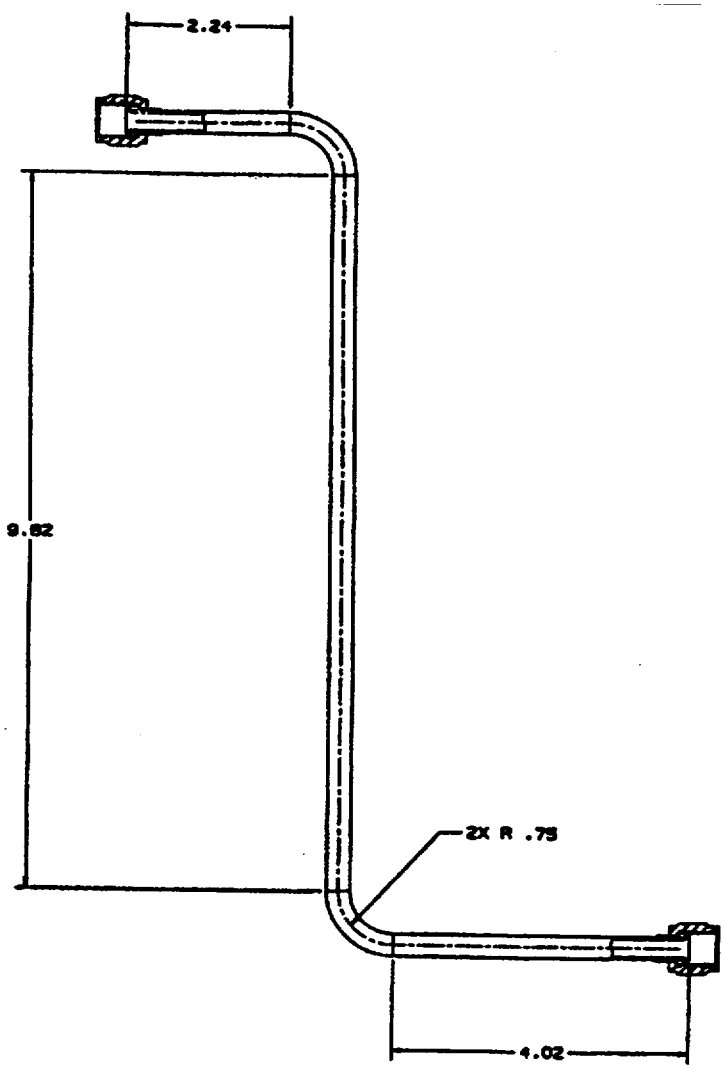
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-4J and sleeve, part number MS20819-4J on ends of tubing.
4. Flare both ends of tubing.

Figure D-27. Tube Assembly, P/N 13229E4006

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .312 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

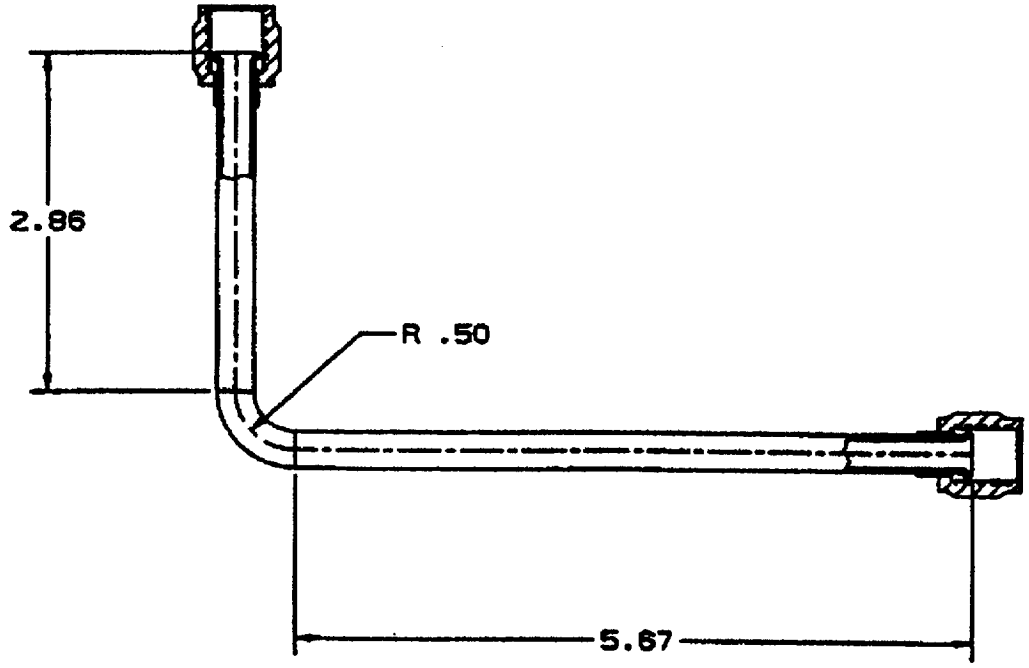
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-5J and sleeve, part number MS20819-5J on ends of tubing.
4. Flare both ends of tubing.

Figure D-28. Tube Assembly, P/N 13229E3993

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .312 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

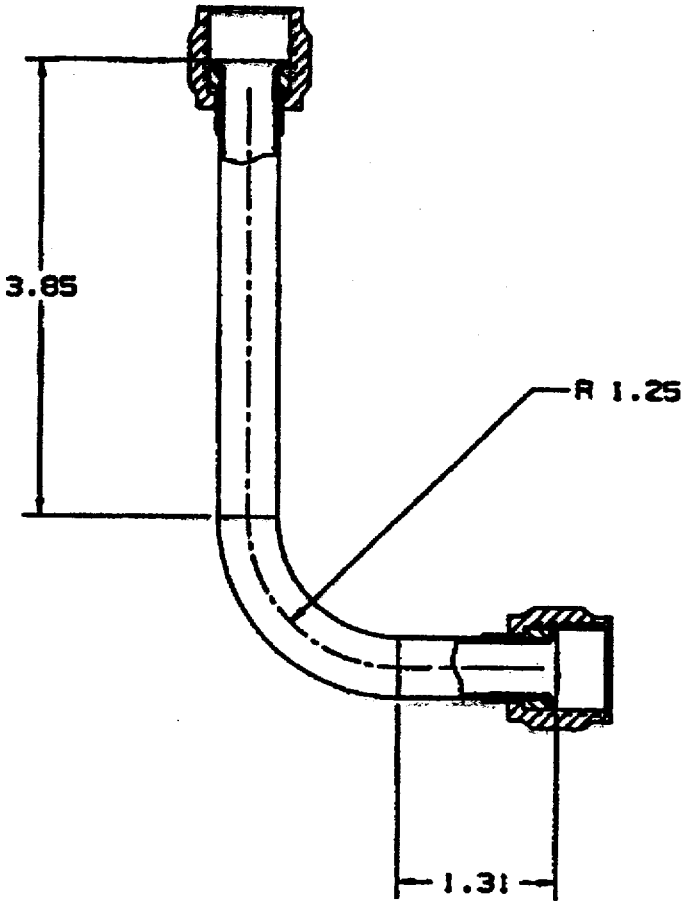
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-5J and sleeve, part number MS20819-5J on ends of tubing.
4. Flare both ends of tubing.

Figure D-29. Tube Assembly, P/N 13229E4007

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .312 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

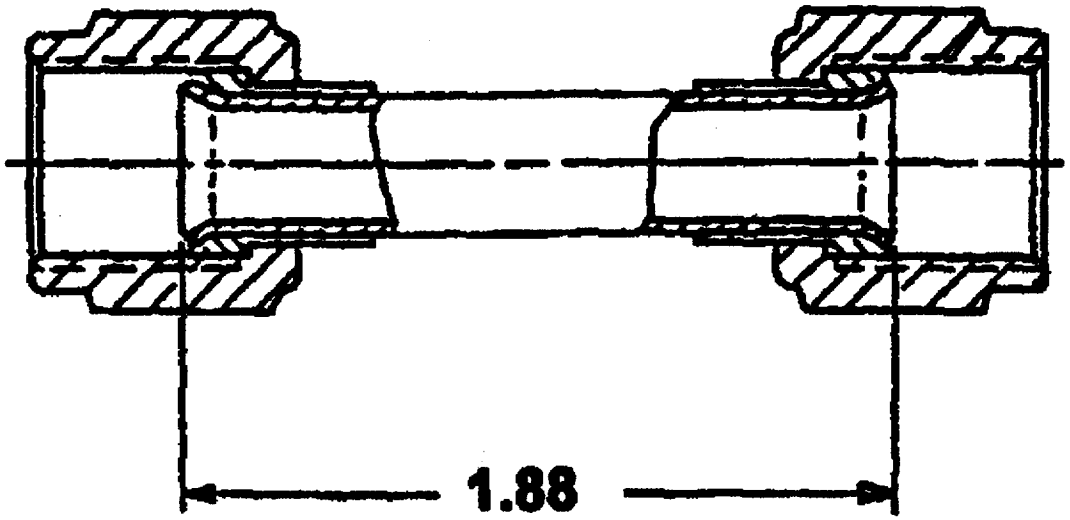
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-5J and sleeve, part number MS20819-5J on ends of tubing.
4. Flare both ends of tubing.

Figure D-30. Tube Assembly, P/N 13229E4001

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .375 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

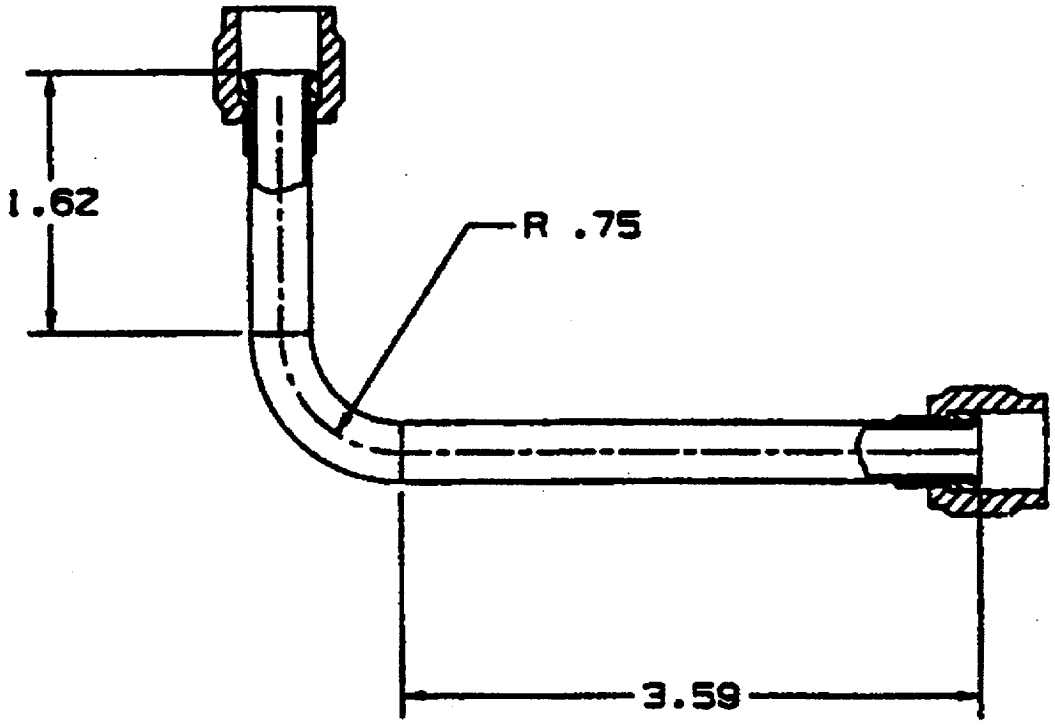
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-6C and sleeve, part number MS20819-6J on ends of tubing.
4. Flare both ends of tubing.

Figure D-31. Tube Assembly, P/N 13229E3988-1

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .375 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

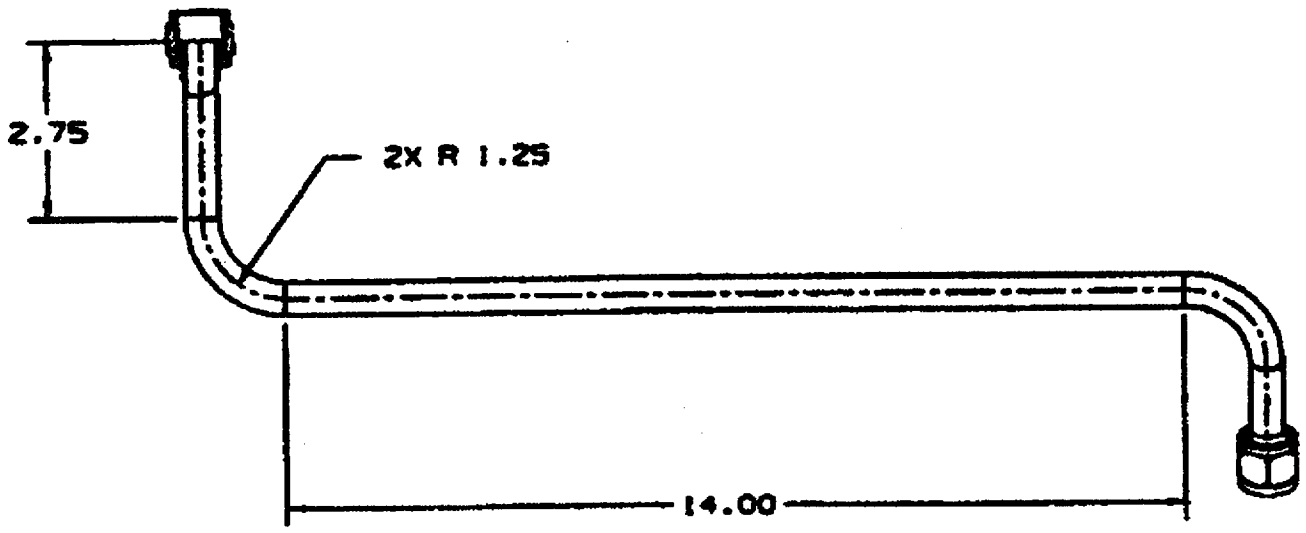
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-6C and sleeve, part number MS20819-6J on ends of tubing.
4. Flare both ends of tubing.

Figure D-32. Tube Assembly, P/N 13230E3095

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .500 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

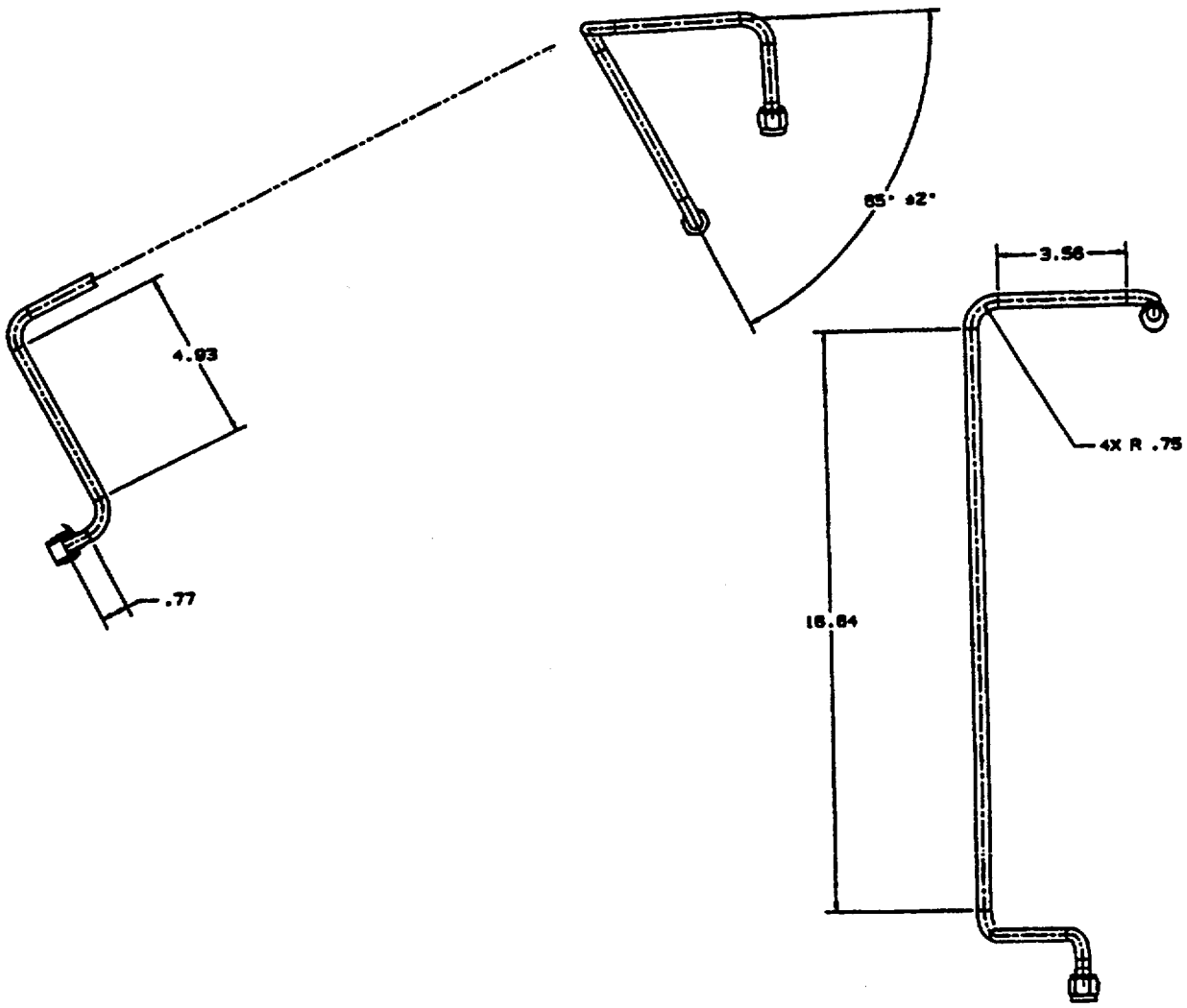
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-8J and sleeve, part number MS20819-8J on ends of tubing.
4. Flare both ends of tubing.

Figure D-33. Tube Assembly, P/N 13230E4004

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .375 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

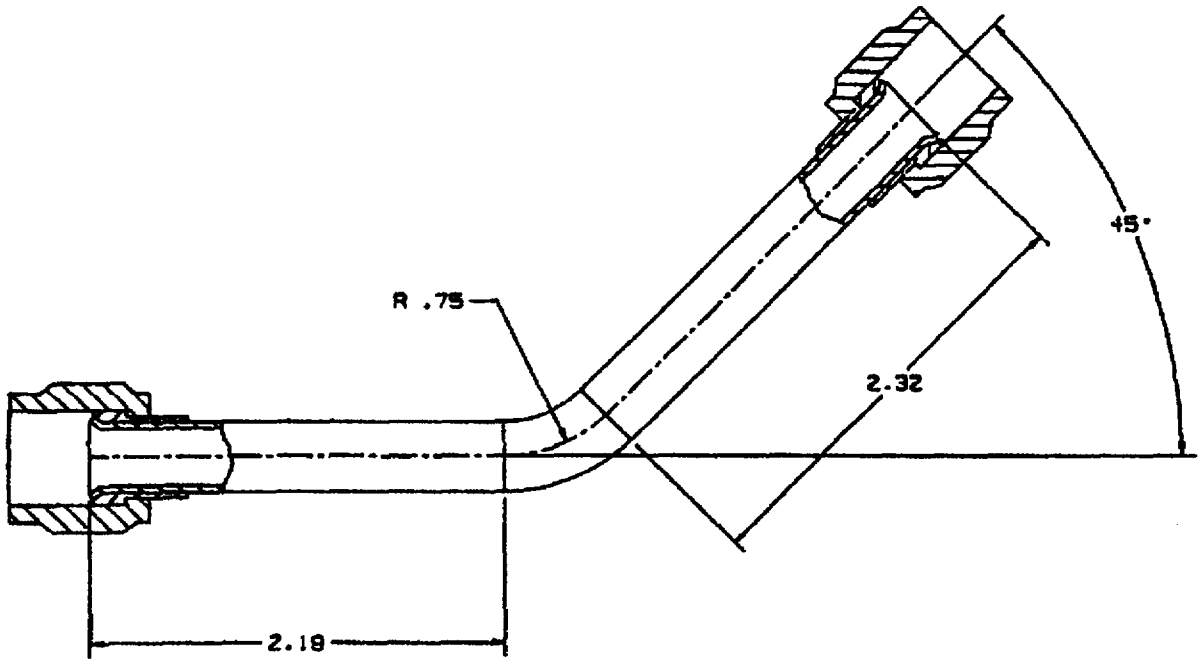
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-6C and sleeve, part number MS20819-6J on ends of tubing.
4. Flare both ends of tubing.

Figure D-34. Tube Assembly, P/N 13230E4003

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .375 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

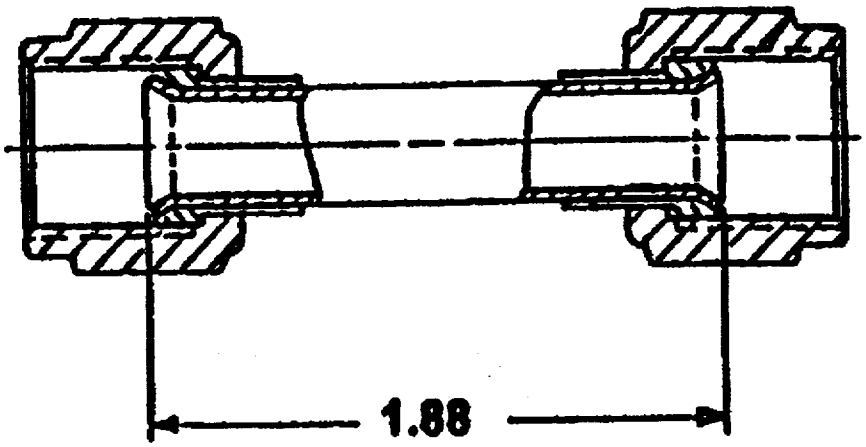
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-6C and sleeve, part number MS20819-6J on ends of tubing.
4. Flare ends both ends of tubing.

Figure D-35. Tube Assembly, P/N 13230E3999

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .375 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

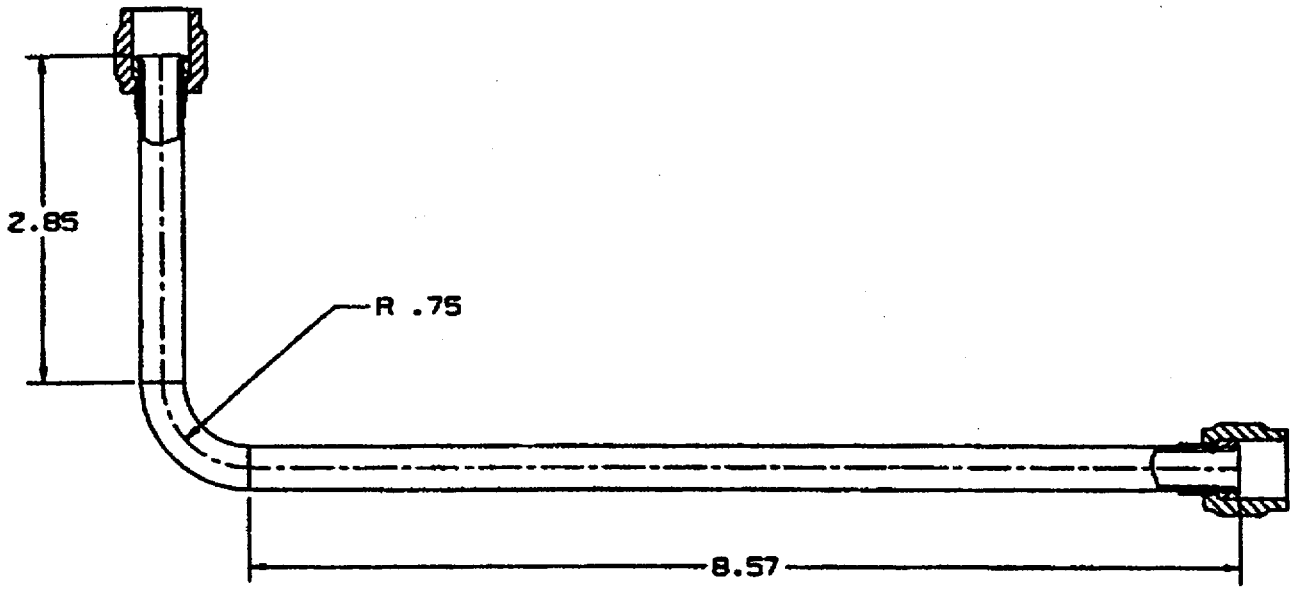
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-6C and sleeve, part number MS20819-6J on ends of tubing.
4. Flare both ends of tubing.

Figure D-36. Tube Assembly, P/N 13230E3988

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .375 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

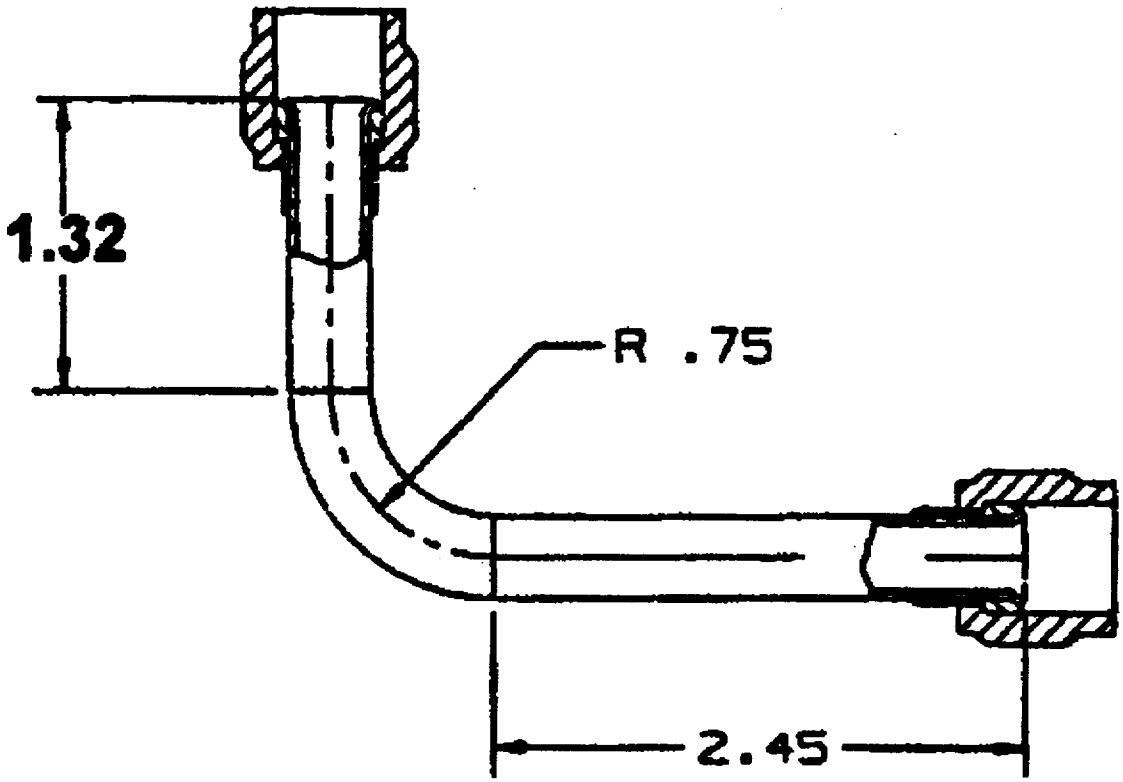
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-6C and sleeve, part number MS20819-6J on ends of tubing.
4. Flare ends both ends of tubing.

Figure D-37. Tube Assembly, P/N 13230E3997

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .375 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

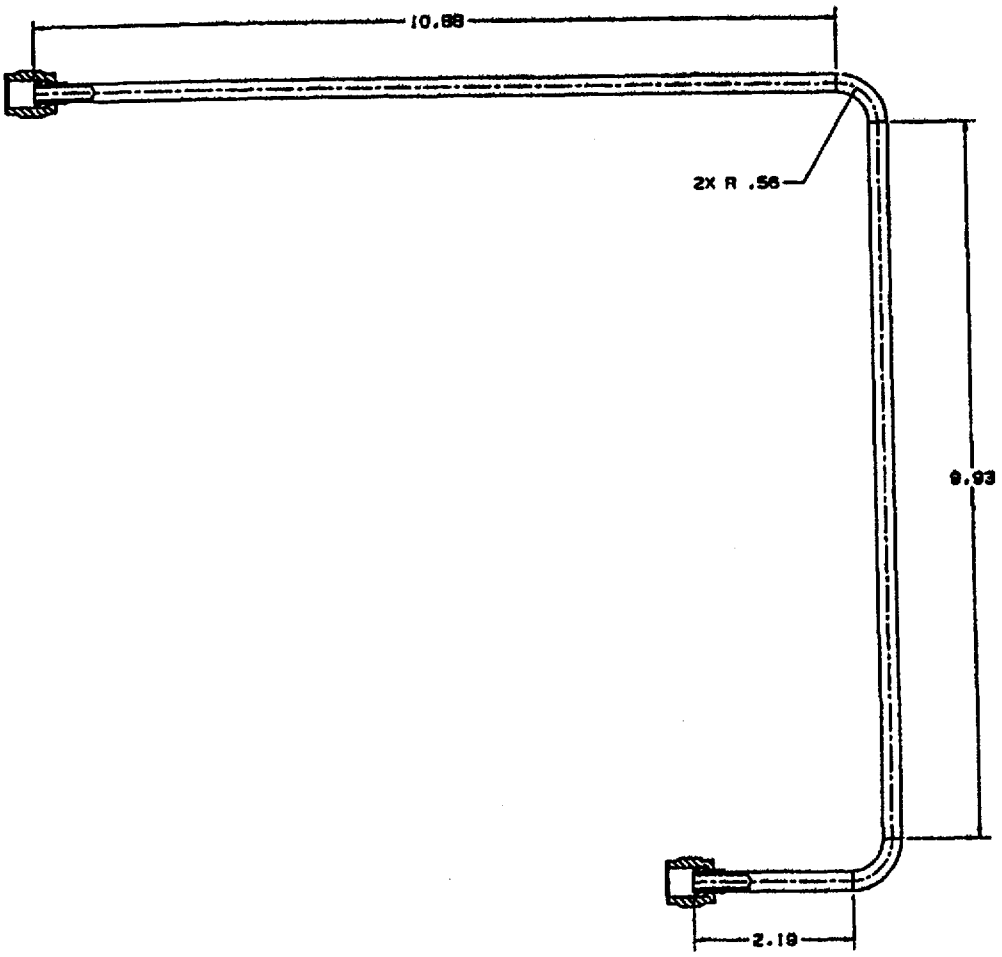
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-6C and sleeve, part number MS20819-6J on ends of tubing.
4. Flare ends both ends of tubing.

Figure D-38. Tube Assembly, P/N 13230E3084

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .250 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

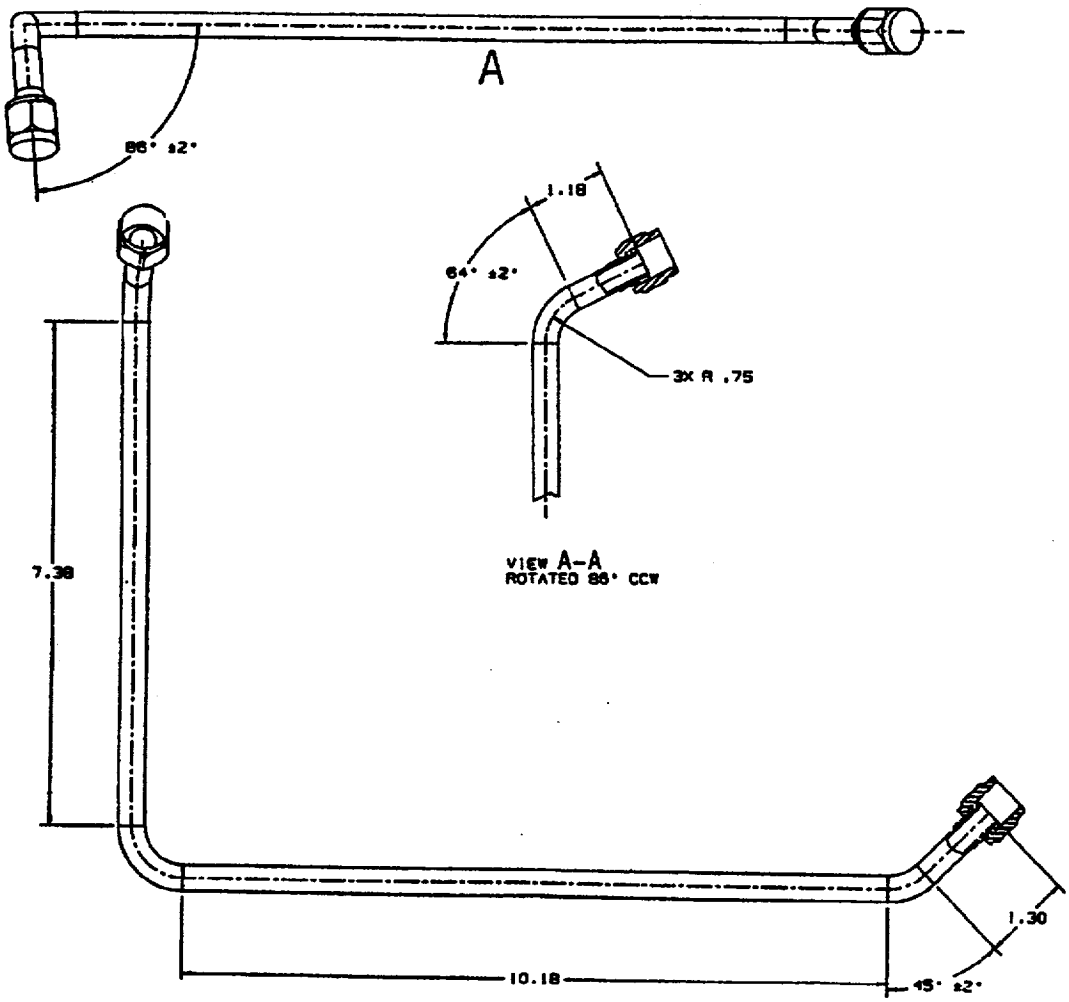
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-4J and sleeve, part number MS20819-4J on ends of tubing.
4. Flare both ends of tubing.

Figure D-39. Tube Assembly, P/N 13230E3998

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .375 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

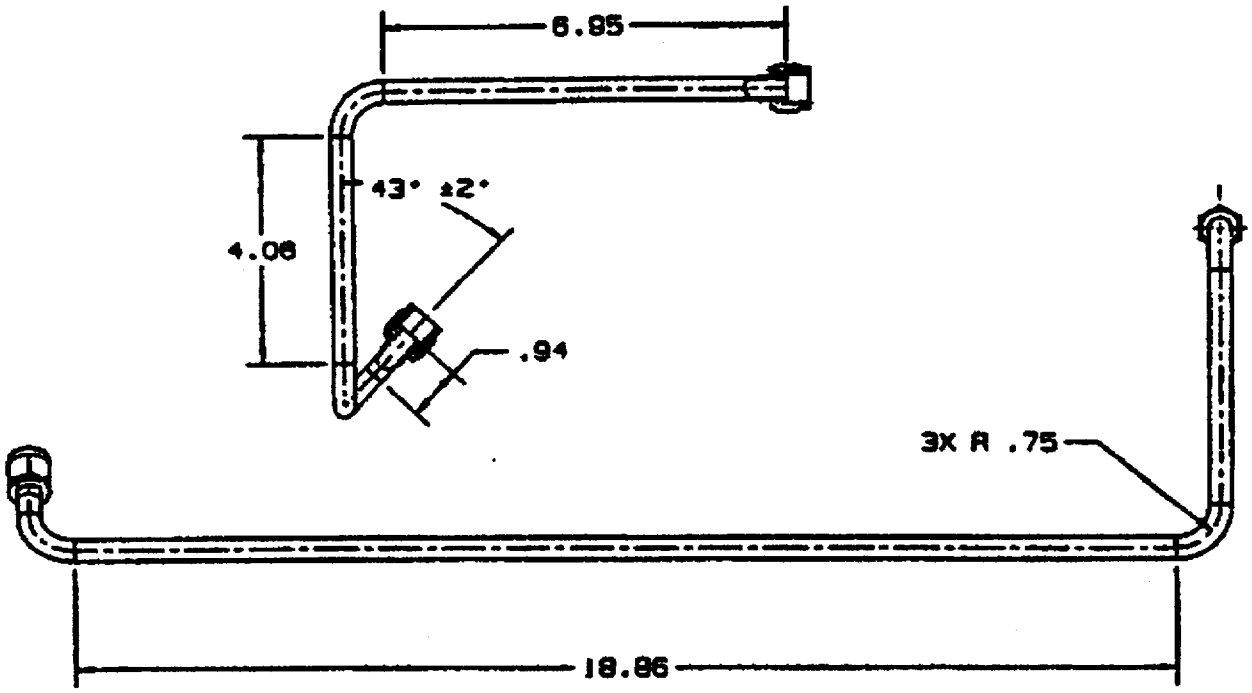
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-6C and sleeve, part number MS20819-6J on ends of tubing.
4. Flare both ends of tubing.

Figure D-40. Tube Assembly, P/N 13230E3995

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .375 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

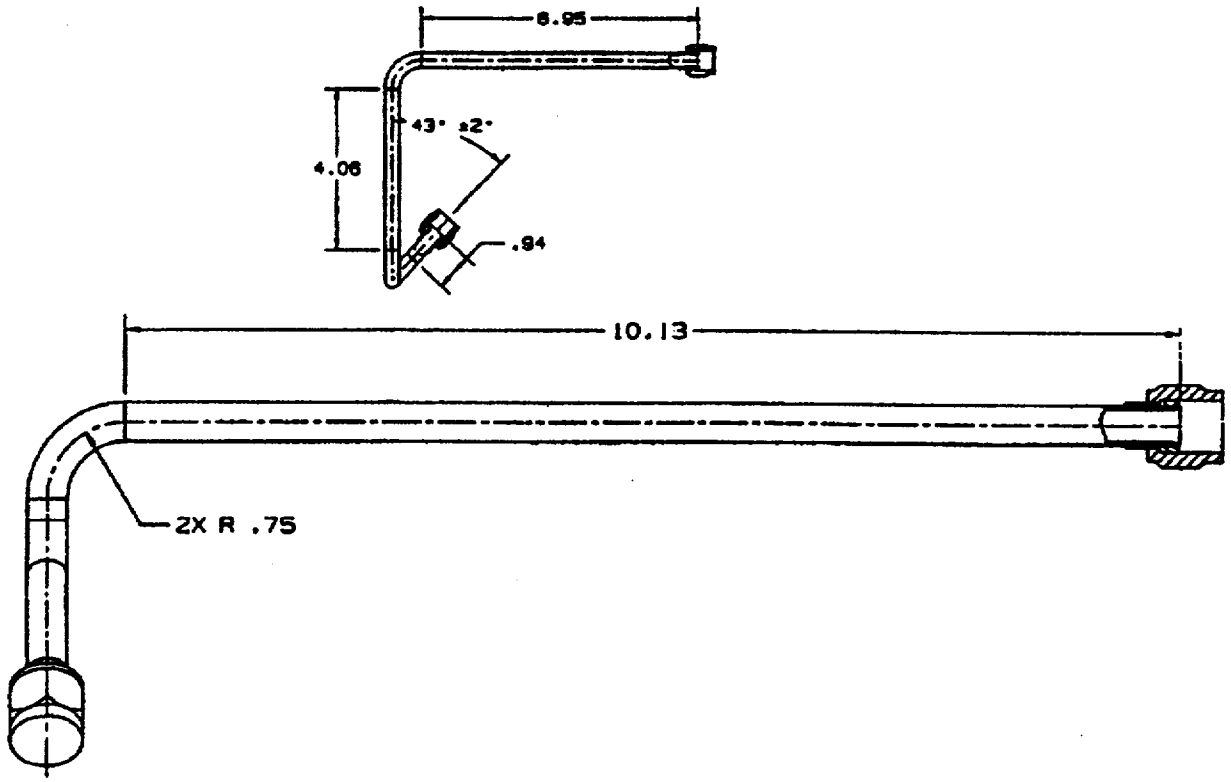
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-6C and sleeve, part number MS20819-6J on ends of tubing.
4. Flare both ends of tubing.

Figure D-41. Tube Assembly, P/N 13230E3091

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .375 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

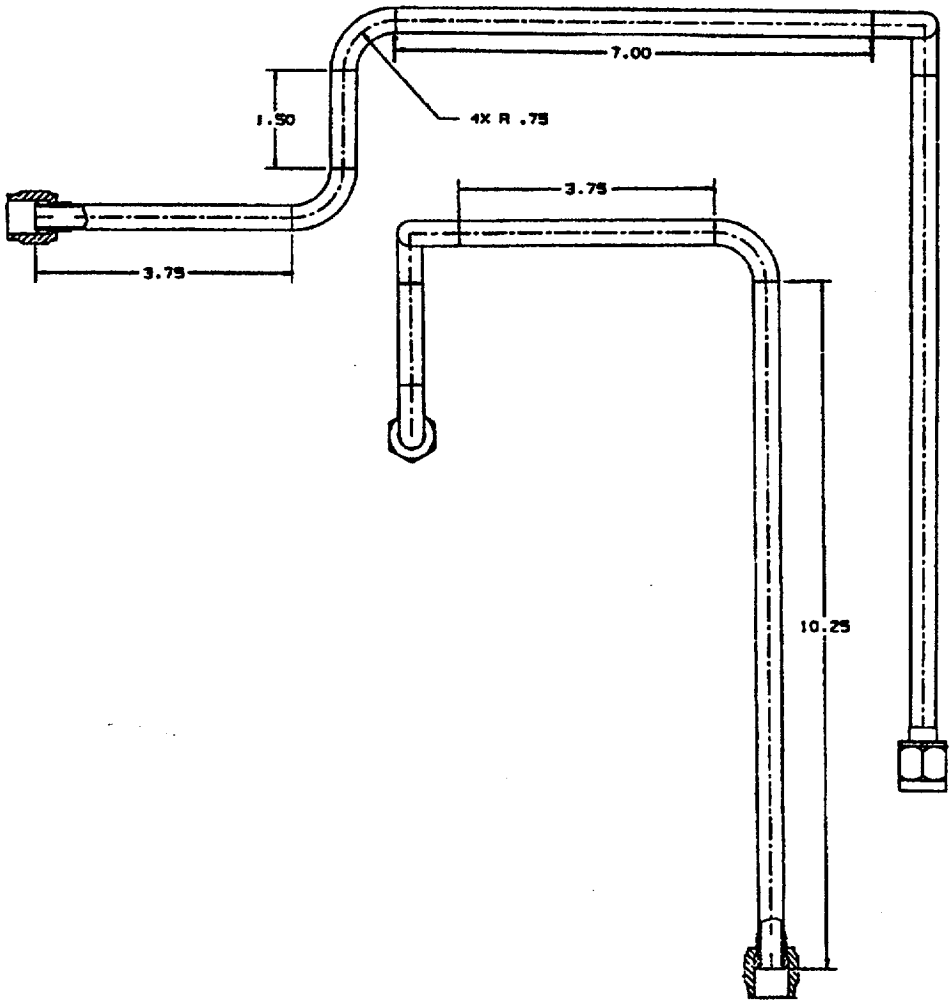
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-6C and sleeve, part number MS20819-6J on ends of tubing.
4. Flare both ends of tubing.

Figure D-42. Tube Assembly, P/N 13230E3093

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .375 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

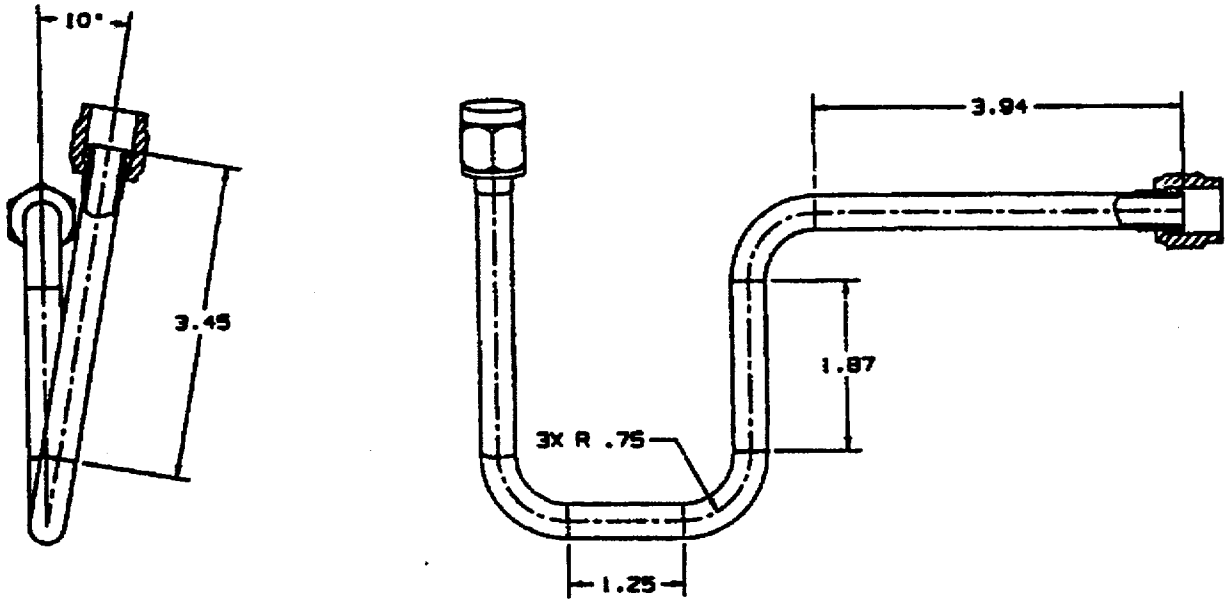
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-6J and sleeve, part number MS20819-6J on ends of tubing.
4. Flare ends both ends of tubing.

Figure D-43. Tube Assembly, P/N 13230E3125

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .375 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

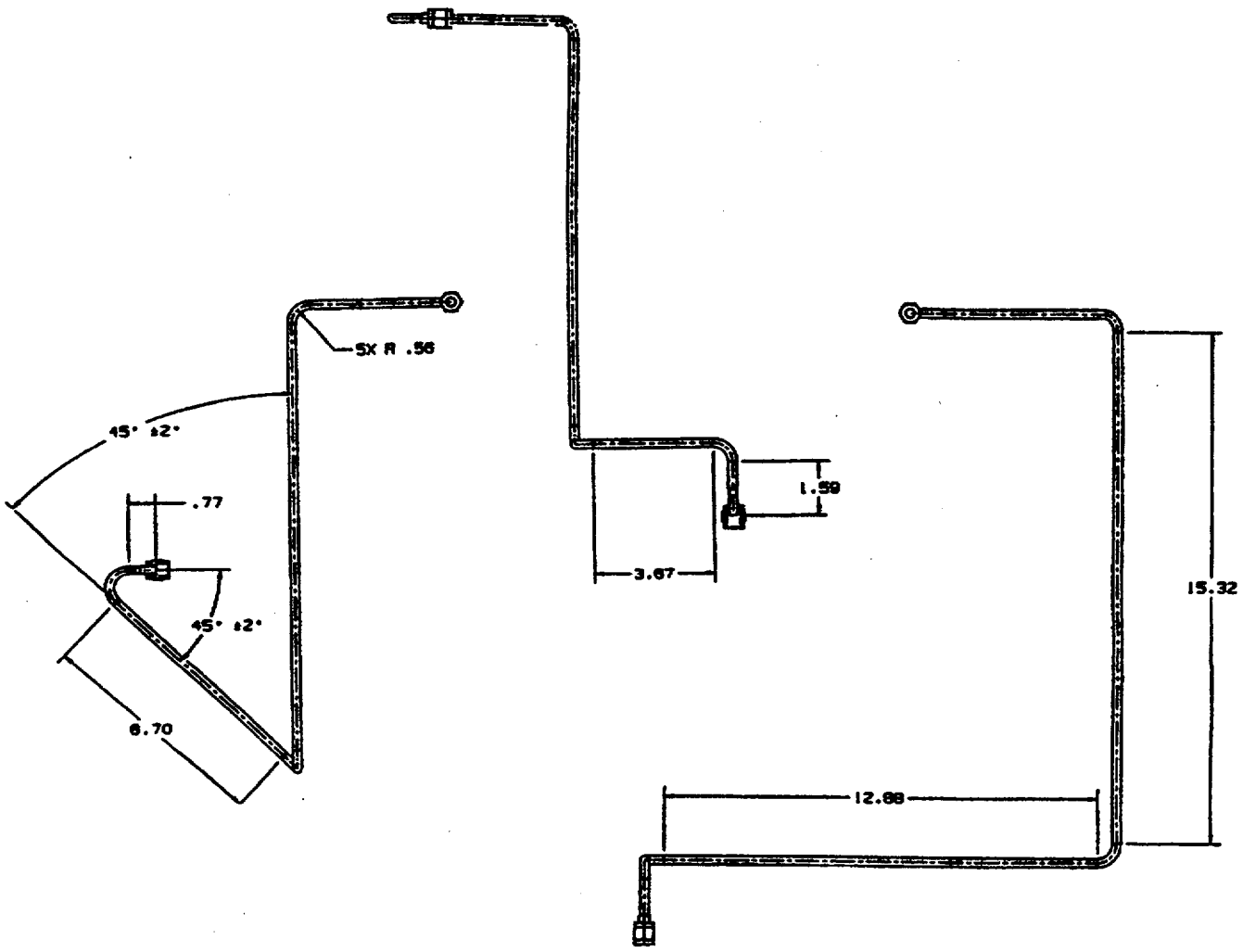
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-6C and sleeve, part number MS20819-6J on ends of tubing.
4. Flare both ends of tubing.

Figure D-44. Tube Assembly, P/N 13230E3090

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .250 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

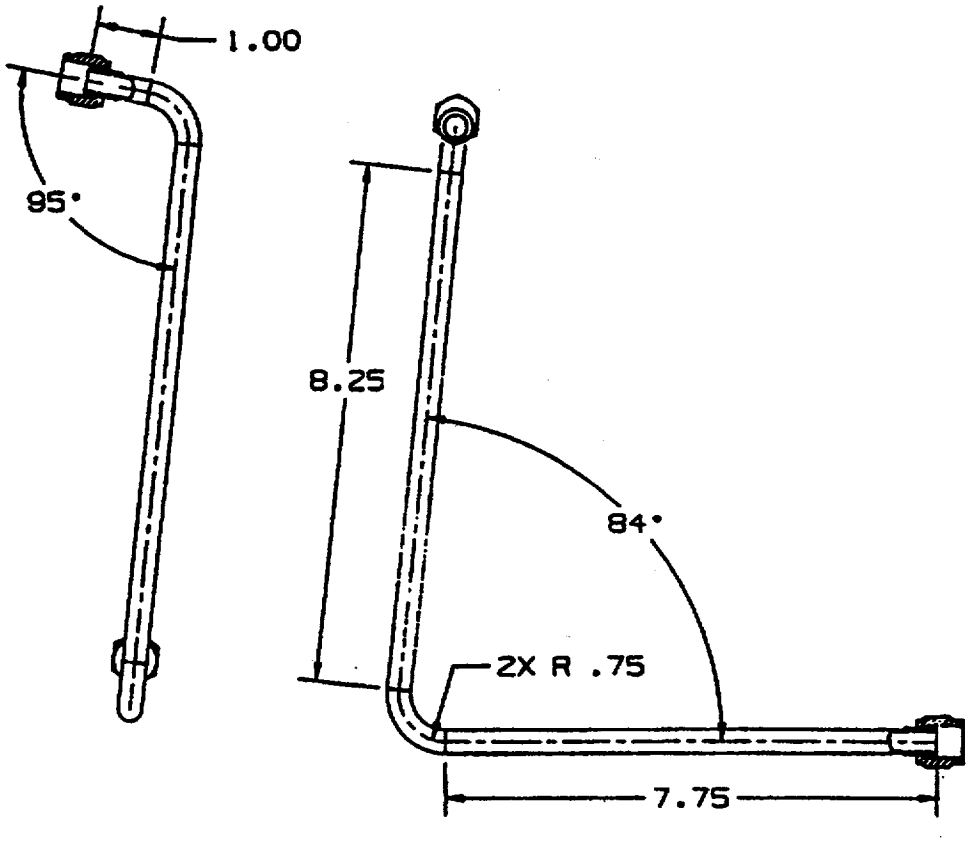
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-4J and sleeve, part number MS20819-4J on ends of tubing.
4. Flare ends both ends of tubing.

Figure D-45. Tube Assembly, P/N 13230E3094

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .250 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

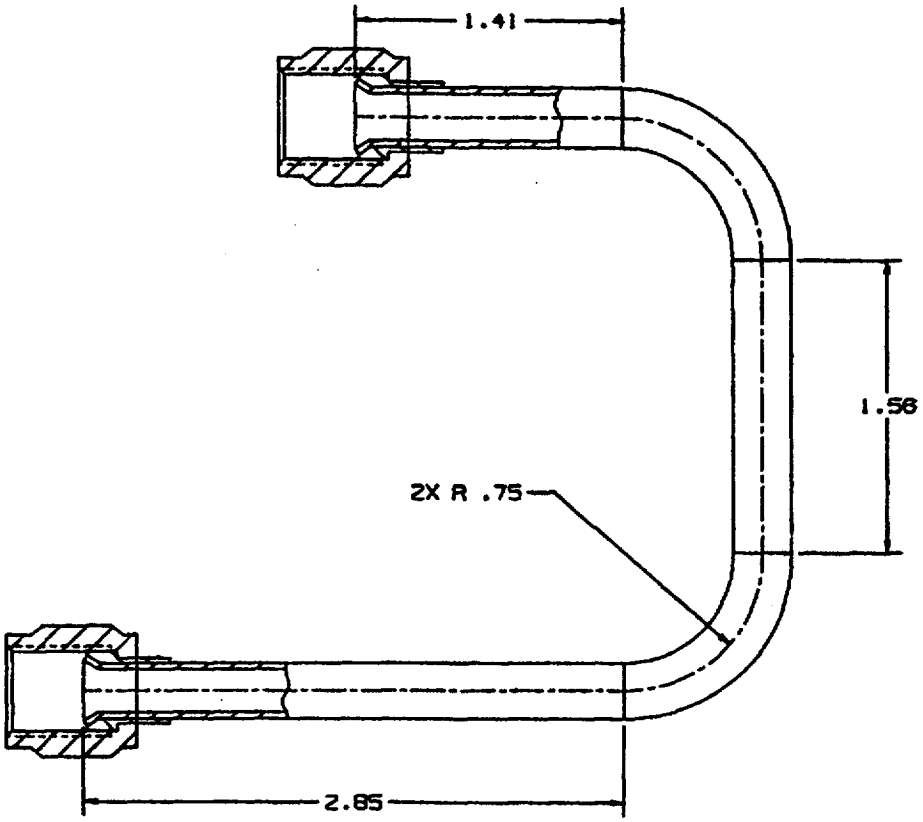
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-4J and sleeve, part number MS20819-4J on ends of tubing.
4. Flare ends both ends of tubing.

Figure D-46. Tube Assembly, P/N 13230E3092

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .250 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

NOTES

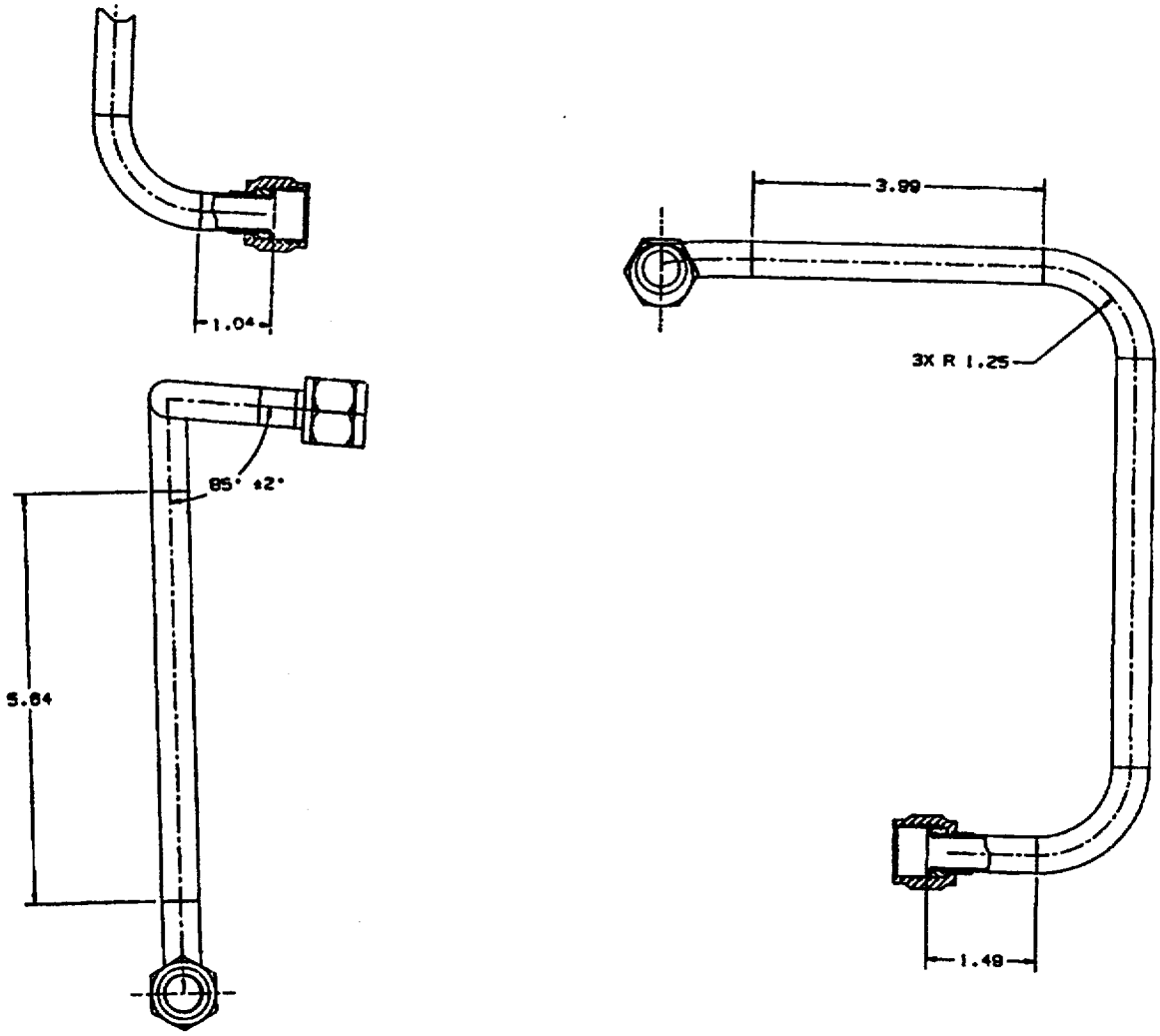
- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**

- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-4J and sleeve, part number MS20819-4J on ends of tubing.
4. Flare both ends of tubing.

Figure D-47. Tube Assembly, P/N 13229E3986

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Fabricate tubing from MIL-T-8808, Type I, COMP 347, CRES, .250 OD x .035 Wall.
2. Cut and bend tubing as illustrated above.

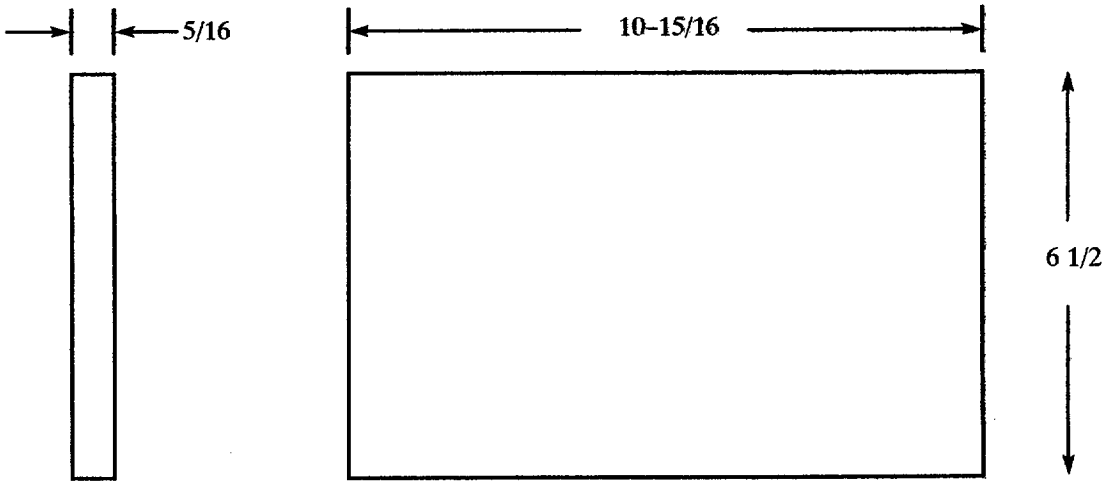
NOTES

- **To prevent the tubing being too short, figure out the total length required before cutting the tubing and add 6 inches. This will allow for the required bends in the tubing.**
- **Dimensions are for general routing and may be altered to facilitate installation.**

3. Install nut, part number AN818-4J and sleeve, part number MS20819-4J on ends of tubing.
4. Flare both ends of tubing.

Figure D-48. Tube Assembly, P/N 13229E3989

D-2. MANUFACTURED ITEMS PART NUMBER INDEX - continued.



1. Make from steel or aluminum.
2 File edges to remove burrs.

Figure D-49. Local Manufacture Tool for 200 Ball Valve Repair

APPENDIX E

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

E-1. SCOPE.

This appendix lists expendable and durable items you will need to maintain the 200/600 GPM Pump. 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 Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

E-2. EXPLANATION OF COLUMNS.

a. ITEM NUMBER Column. This number is assigned to the entry in the listing and is referenced when required.

b. LEVEL Column. This column identifies the lowest level of maintenance that requires the listed item:

C - Operator/Crew
O - Unit Maintenance
F - Direct Support Maintenance
H - General Support Maintenance

c. NATIONAL STOCK NUMBER Column. This is the national stock number assigned to the item; use it to request or requisition the item.

d. ITEM NAME. DESCRIPTION. CAGE CODE. PART NUMBER Column. 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 (CAGE) Code for Manufacturer in parentheses, followed by the part number.

e. UNIT OF MEASURE (UM)/ UNIT OF ISSUE (U/I) Column. This measure is expressed by a two character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

ITEM NUMBER	LEVEL	NATIONAL STOCK NUMBER	ITEM NAME, DESCRIPTION, CAGE CODE, PART NUMBER	U/M	TASK PARA
1	O	7930-00-985-6911	Detergent, General Purpose (81349) MIL-D-16791	gl	2-18
2	O	7920-00-205-1711	Rags, Wiping (58536) A-A-531	lb	2-47
3	O	8040-00-843-0802	Adhesive (RTV) (01139) MIL-A-46106A	oz	2-63, 2-80
4	O		Sheet, Rubber, Solid (81349) M6855/1-024827	sh	2-78
5	O	8030-00597-5367	Compound, Antisieze (81349) MIL-A-907D	cn	2-53
6	O	8030-00-889-3535	Tape, Antisiezing, 21 ft (81349) MIL-T-27730	ri	2-15,3-19
7	O	8030-01-009-2590	Compound, Antiseize (08854) SLIC-TITE (thread compound) Lock-Tite	tu	3-21
8	O	6850-00-281-1985	Cleaning Solvent (81348) P-D-680, TYPE 1	gl	3-9
9	0	9525-00-355-6072	Wire, Safety (.032) (96906) MS20995NC32	rl	2-51
10	O	8040-00-851-0211	Adhesive, RTV32 (81349) MIL-A-46106	oz	3-27
11	O	9150-01-024-6469	Grease,Ball Bearing (81349) MIL-G-23699	qt	3-9
12	F	5350-00-224-7203	Paper, Abrasive (GR) (58536) A-A-1047	pg	3-22
13	F	8030-00-322-3453	Primer, Sealing Compound (81349) MIL-S-22473 GRN	pt	3-27
14	F	8040-00-845-4304	Primer, Adhesive (71984) 1200	pt	3-27
15	O	9525-00-618-0257	Wire, Safety (.020) (96906) MS20995NC20	sl	2-49
16	O	9905-00-537-8954	Tag, Identification (wire tags) (81349) MIL-T-12755	pg	2-13, 2-40

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - continued

ITEM NUMBER	LEVEL NUMBER	NATIONAL STOCK NUMBER	ITEM NAME, DESCRIPTION, CAGE CODE, PART NUMBER	UM	TASK PARA
17	O	9905-00-027-4577	Strap, Tiedown, Adjustable, Plastic (59730) TY523M	pg	2-13, 2-40
18	O	9150-01-078-9586	Oil, Lubricating (81349) MIL-L-60326	oz	2-20, 2-47
19	O	8315-01-244-7225	Textile, Braid (59364) S8999-10	yd	2-58
20	O	9150-00-180-6266	Oil, Lubricating (81349) MIL-L-23699	oz	2-59
21	H	5970-00-990-4924	Coating, Humseal, (99109) 1B15	ea	4-4
22	F	7906-00-514-2417	Brush, Acid Swabbing (81348) H-B-643	rl	3-27
23	F	8030-00-247-2525	Compound, Sealing (81349) MIL-S-45180	tu	2-72
24	F	3439-00-198-3406	Solder, Tin Alloy, SN50WS (81348) QQ-S-571	lb	3-25
25	F	7510-00-074-4946	Tape, Pressure Sensitive (81348) PPP-T-60	rl	3-27
26	O		Foam, Rubber, Closed Cell, (1C G98) 07320207	sh	2-64
27	O		Foam, Rubber, Closed Cell, (1C G98) 07320206	sh	2-29
28	O	5325-00-926-1394	Grommet (96906) MS21266-3N	rl	2-64
29	H	8010-00-209-8034	Primer, Zinc Chromate (81348) TT-P-1757	pt	3-22
30	H	5970-00-076-8988	Enamel, Red Insulating Baking, Synthite (08852) ER-41	cn	4-4

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST- continued

ITEM NUMBER	LEVEL	NATIONAL STOCK NUMBER	ITEM NAME, DESCRIPTION, CAGE CODE, PART NUMBER	UM	TASK PARA
31	F	5970-01-307-5102	Sleeving, Insulation (99193) S9046-3-9-204	ft	2-58
32	O	5325-01-025-4479	Grommet, Nonmetallic (96906) MS21266-3N	ft	3-28
33	O		Insulation (64591) EI-475-1.5	sh	2-64
34	O		Insulation (64594) EI-475-1	sh	2-64
35	O	7510-00-835-1274	Tape, Pressure Sensitive (81349) MIL-T-14379	rl	

APPENDIX F

MANDATORY REPLACEMENT PARTS

F-1. INTRODUCTION.

This appendix lists all mandatory replacements specified in the maintenance procedures described in Chapters 2, 3, and 4.

MANDATORY REPLACEMENT PARTS

ITEM NO.	NOMENCLATURE	PART NUMBER
1	Retainer, Split Ring	13229E3889
2	Washer, Sealing	13229E3888
3	Packing	MS28778-6
4	Gasket, Coupling Half	13228E1768-8
5	Preformed packing	MS28778-6
6	Preformed Packing	M83248/1-904
7	Element, Filter	6927-40W
8	Preformed Packing	M25988/2-904
9	Bearing, Ball (2 ea.)	07-111140
10	Gasket, coupling	13228E1768-10
11	Preformed Packing	M25988/1-905
12	Sleeving Insulation	M23053/1-201-0
13	Preformed Packing	M25980/1-203
14	Preformed Packing	F ELEMENT
15	Preformed Packing	F HOUSING
16	Preformed Packing	M25988/1-906
17	Filter	3609044-1
18	Preformed Packing	M83248/1-128
19	Preformed Packing	600-3130-5-8
20	Preformed Packing	M83248/1-036
21	Preformed Packing	M83248/2-906
22	Preformed Packing	S9412-672
23	Preformed Packing	M25988/2-903

APPENDIX F
MANDATORY REPLACEMENT PARTS - continued

ITEM NO.	NOMENCLATURE	PART NUMBER
24	Seal Plate	3830159-1
25	Gasket	3612517-1
26	Preformed Packing	M83248/1-016
27	Lockwasher	MS35338-159
28	Preformed Packing	15605 (OEEM4)
29	Gasket, Flange (gate valve)	235RF-05092G
30	Lockwasher	235RF-02212W
31	Gasket (roll for top cover)	22036-9
32	Gasket (end panel)	22036-8
33	Gasket (side panel)	22002-17
34	Packing	AP-39-9
35	Gasket, Body	SP-20-13
36	Wear Ring	20079
37	Lockwasher	MS35338-161
38	Locking Nut	MS21046C10
39	Wear Ring	20081
40	Wear Ring	25507
41	Lockwasher	MS35338-141
42	Splice, Connector	M7928/5-04
43	Insulation, Sleeving	13229E3900-250
44	Packing, Preformed	M25988/1-132
45	Packing Preformed	M25988/1-235
46	Packing Preformed	MS28778-5
47	Packing, Preformed	M25988-1-904
48	Packing, Preformed	M25988/1-241
49	Gasket	P532305
50	Seal Assembly (Carbon)	44569
51	Preformed Packing	MS28778-8ES
52	Electrical Terminals	32446
53	Insulation, Sleeving	M23053/16-003-0

APPENDIX F
MANDATORY REPLACEMENT PARTS - continued

ITEM NO.	NOMENCLATURE	PART NUMBER
54	Body Seal	004-0365-50
55	Seat	002-0701-49
56	Lower Stem Seal	004-0434-50
57	Upper Stem Seal	004-0286-50
58	Nut, Self-locking	MS21046C04
59	Lockwasher	MS35338-136
60	Crush Washers	X2GF-8
61	Nut, Self-locking	MS21046C08
62	Nut, Self-locking	MS21046C3
63	Lockwasher (Star)	MS35334-21
64	Nut, Self-locking	MS21046C9
65	Gasket	14964
66	Bushing	16336
67	Seal	17150
68	Preformed Packing	15605
69	Gasket	19844
70	Plastic Washer	13229E3961-1
71	Lockwasher (Internal)	044-0007-22-24
72	Seal	004-0209-50
73	Seal	004-0339-50
74	Preformed Packing	MS29153-259
75	Nut, Self-locking	MS21043-08
76	Shim	13229E4013-7
77	Shim	13229E4013-3
78	Shim	13229E4013-4
79	Shim	13229E4013-1
80	Shim	13229E4013-2
81	Bearing	111X04010X4000
82	Seal	13229E3952

APPENDIX F
MANDATORY REPLACEMENT PARTS - continued

ITEM NO.	NOMENCLATURE	PART NUMBER
83	Nut, Self-locking	MS21043-5
84	Nut, Self-locking	MS21043-06
85	Gasket	20092-1
86	Shim	13229E3904-1
87	Shim	13229E3904-2
88	Shim	13229E3904-3
89	Seal	80TX857
90	Nut, Self-locking	MS21042-3
91	Nut, Self-locking	MS21043-6
92	Bearing	03-6009-19
93	Lockwasher	MS35338-42
94	Shim	3876006-1
95	Preformed Packing	M83248/1-016
96	Seal	80TX856
97	Preformed Packing	MS28778-8
98	Locknut	MS20500-1018
99	Locknut	MS21046C4
100	Filter Assembly, Fuel	3882693-1
101	Preformed Packing	M25988/2-138
102	Preformed Packing	M25988/2-212
103	Preformed Packing	89412-672
104	Lock Washer	MS35338-138
105	Nut, Self-locking	MS17830-6C
106	Nut, Self-locking	MS51922-2
107	Preformed Packing	M25988/1-250
108	Seat	002-0626-49
109	Bearing, Roller	80GX1654
110	Nut, Self-locking	02-4107-01
111	Lockwasher	MS35338-43

APPENDIX F
MANDATORY REPLACEMENT PARTS- continued

ITEM NO.	NOMENCLATURE	PART NUMBER
112	Nut, Self-locking	MS21046C7
113	Nut, Self-locking	MS21043-3
114	Nut, Self-Locking	MS21043-04
115	Preformed Packing	MS29512-04
116	Nut, Self-locking	MS21245L10
117	Shim, Plain	13229E4013-6
118	Nut, Self-locking	MS21046C8
119	Shim	13229E4013-5
120	Nut, Self-locking	MS21046C6
121	Nut, Self-locking	MS21042-6

APPENDIX G

WIRING DIAGRAMS

G-1. SCOPE.

The following wiring diagrams after the index shows the electrical interconnect wiring used on the 200/600 GPM Pump.

Figure G-1. Engine Wiring Harnesses (W1 and W2).

Figure G-2. Engine Wiring Harness (W3).

Figure G-3. Control Panel Reference Designators.

Figure FO-1. 200 GPM Pump Wiring Diagram.

Figure FO-2. 600 GPM Pump Wiring Diagram.

G-2. ENGINE WIRING HARNESSES (CABLES W1 AND W2).

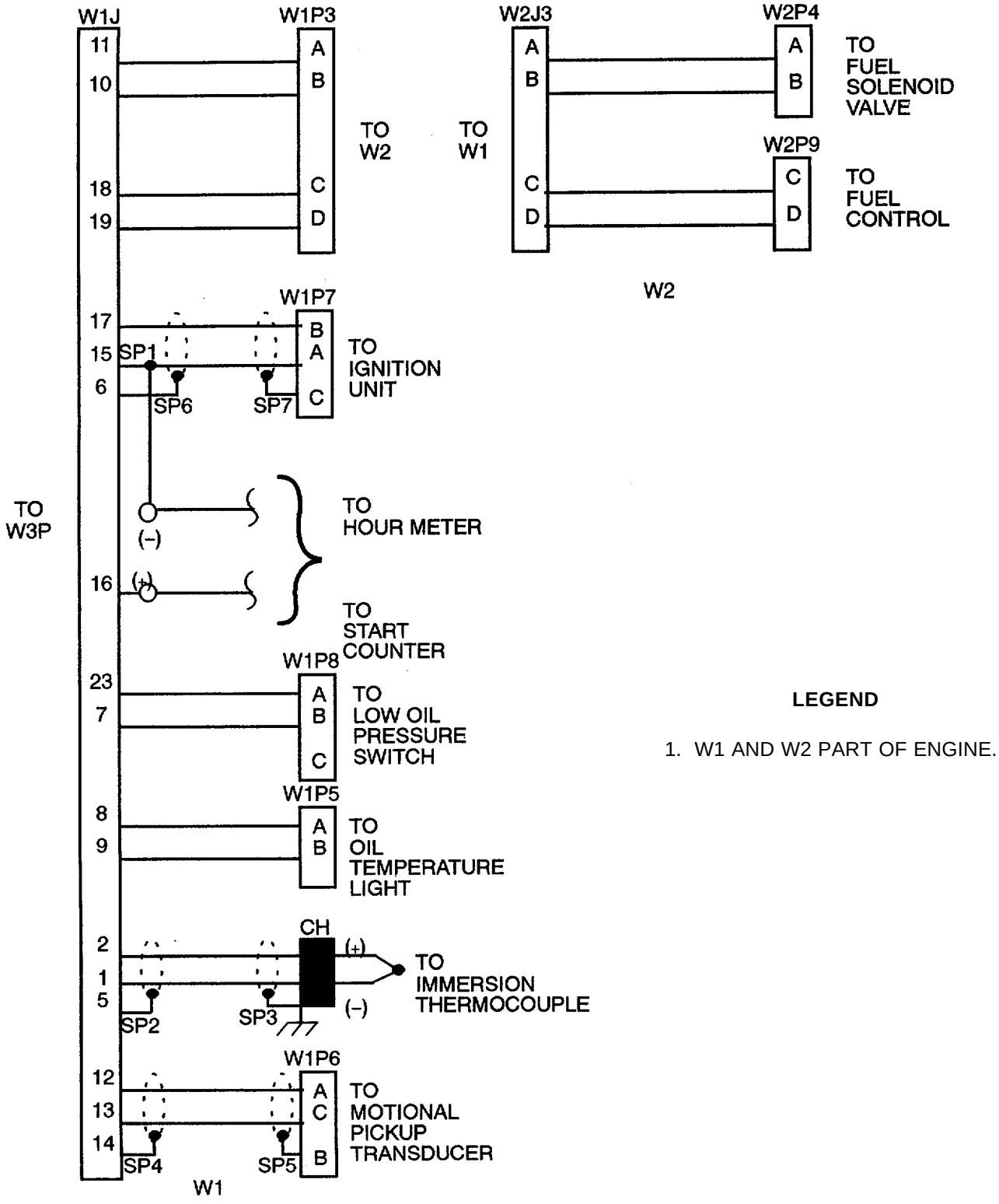
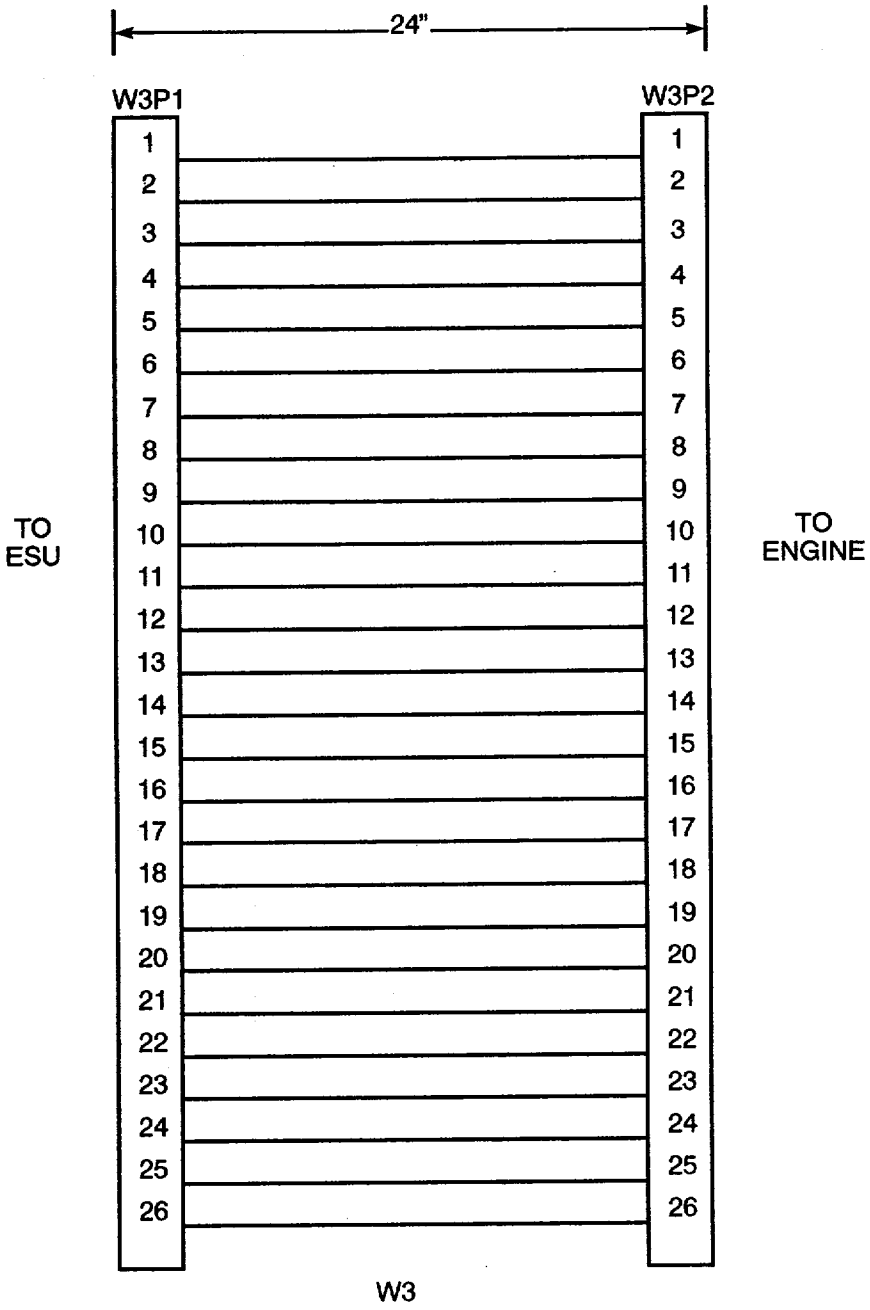


Figure G-1. Engine Wiring Harnesses (Cables W1 and W2).

G-3. ENGINE WIRING HARNESS (CABLE W3).

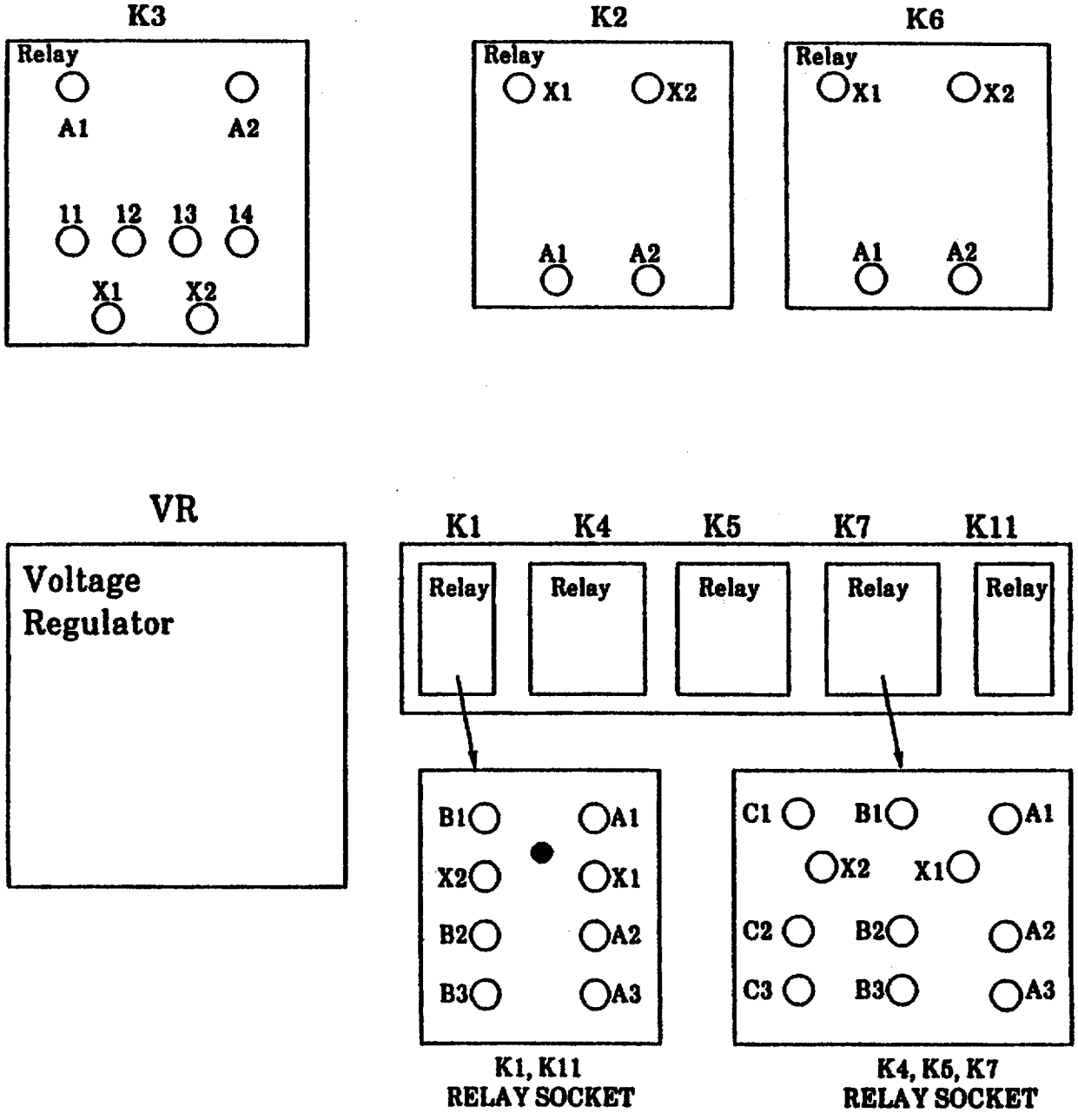


LEGEND

1. PART OF 200/600 GPM PUMP.
2. ELECTRICAL WIRE IS MIL-W-5086/2-20-0, 20 GAUGE.

Figure G-2. Engine Wiring Harness (Cable W3).

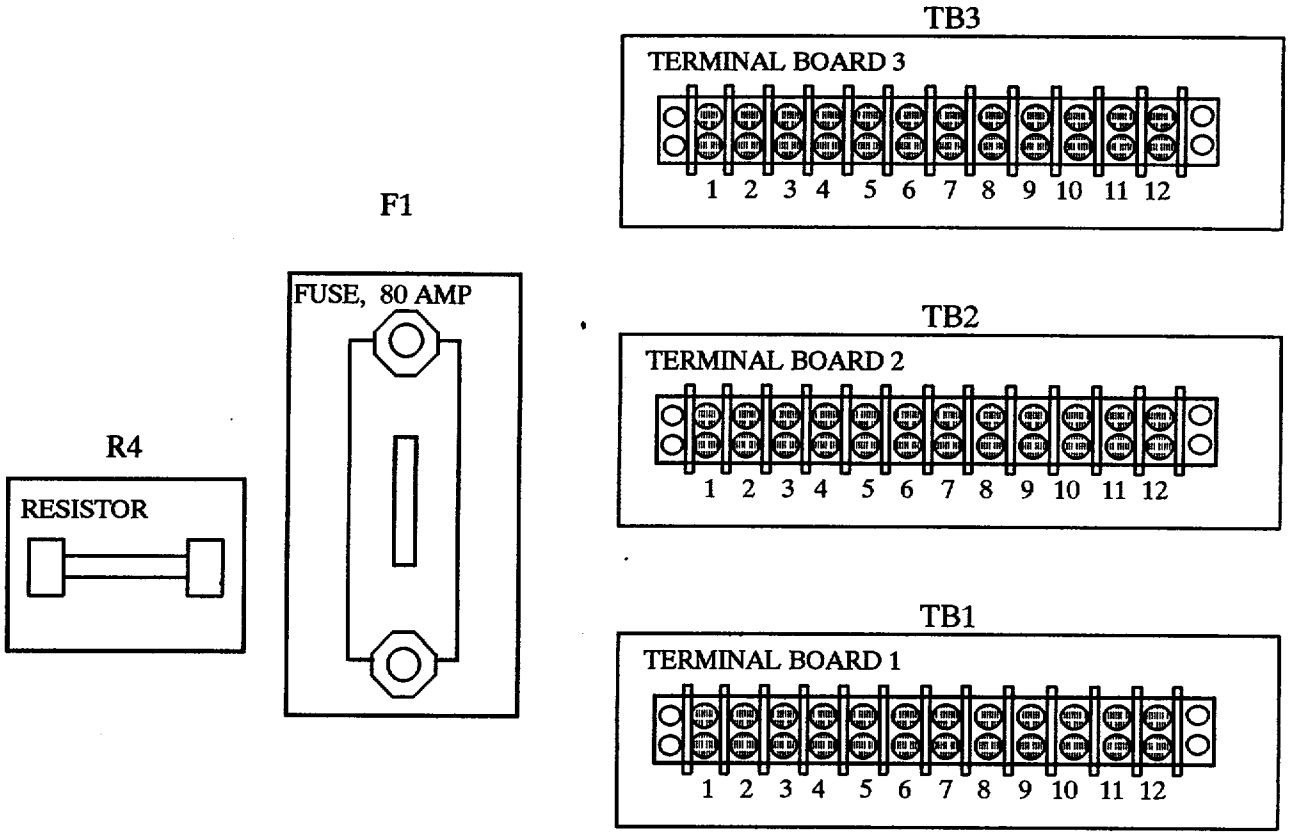
G-4. CONTROL PANEL REFERENCE DESIGNATOR



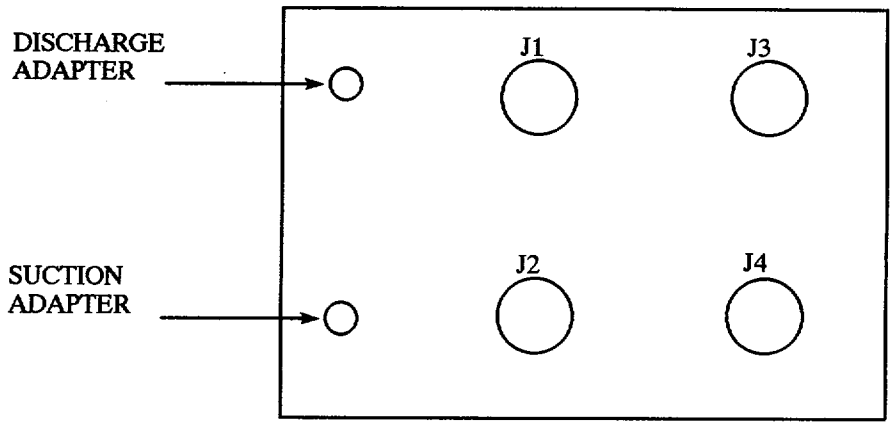
BACK PANEL WITH CONTROL PANEL OPEN.

Figure G-3. Control Panel Reference Designators (Sheet 1 of 3).

G-4. CONTROL PANEL REFERENCE DESIGNATORS - continued.



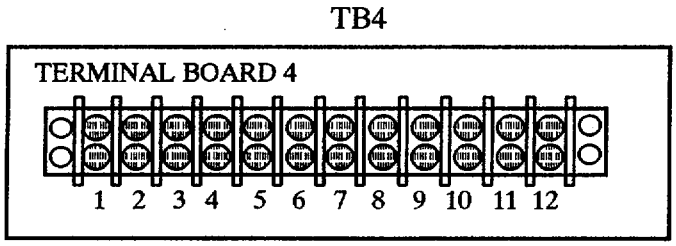
LOOKING DOWN WITH CONTROL PANEL OPEN.



RIGHT SIDE WITH CONTROL PANEL OPEN.

Figure G-3. Control Panel Reference Designators (Sheet 2 of 3).

G-4. CONTROL PANEL REFERENCE DESIGNATORS - continued.



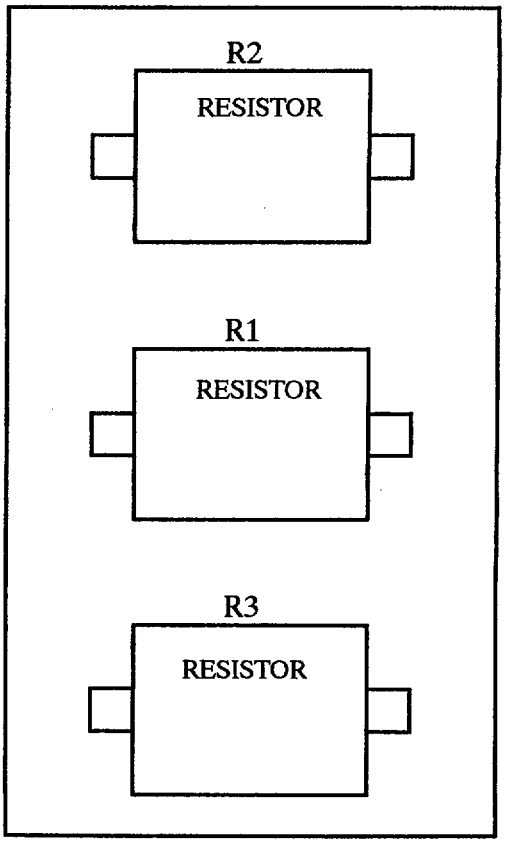


Figure G-3. Control Panel Reference Designators (Sheet 3 of 3).

APPENDIX H

TORQUE LIMITS

H-1. SCOPE.

This appendix provides torque limits for general use type fasteners. The torque values given in this appendix shall be used when specific torque values are not identified in the maintenance instructions.

H-2. TORQUE LIMITS.

Torque limits for fine threaded fasteners as compared to coarse threaded fasteners of the same diameter are slightly higher, but are not significant to general use. The following table identifies the torque limits for various sizes and types of fasteners.

APPENDIX H
TORQUE LIMITS

TYPE	MINIMUM TENSILE STRENGTH	MATERIAL	BODY SIZE OR OUTSIDE DIAMETER OF FASTENER												
			#2	#3	#4	#5	#6	#8	#10	1/4	1/10	1/8	1/16	1/2	5/16
SAE 0-1-2	74.000 PSI	LOW CARBON STEEL								6 (8)	12 (16)	20 (27)	32 (44)	47 (64)	69 (94)
SAE 3	100,000 PSI	MEDIUM CARBON STEEL								9 (12)	17 (23)	30 (41)	47 (64)	69 (94)	103 (140)
SAE 5	120,000 PSI	MEDIUM CARBON HEAT TREAT STEEL								10 (14)	19 (26)	33 (45)	54 (73)	78 (106)	114 (155)
SAE 6	133.000 PSI	MEDIUM CARBON STEEL QUENCHED TEMPERED								12 (16)	24 (33)	43 (58)	69 (94)	106 (144)	150 (203)
SAE 7	133,000 PSI	MEDIUM CARBON ALLOY STEEL								13 (18)	25 (34)	44 (60)	71 (96)	110 (141)	154 (209)
SAE 8	150,000 PSI	MEDIUM CARBON ALLOY STEEL								14 (19)	29 (39)	47 (64)	78 (106)	119 (161)	169 (229)
SOCKET HEAD CAP SCREW	160.000 PSI	HIGH CARBON CASE HARDENED STEEL								16 (22)	33 (45)	54 (73)	84 (114)	125 (170)	180 (244)
SOCKET SET SCREW	212.000 PSI	HIGH CARBON CASE HARDENED STEEL					9 (1.0)	16 (1.8)	30 (3.4)	70 (7.9)	140 (15.8)	18 (2)	29 (3.3)	43 (4.9)	63 (7.1)

APPENDIX H
TORQUE LIMITS -continued

TYPE	BODY SIZE OR OUTSIDE DIAMETER OF FASTENER															
	3/8	3/4	7/8	1	1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8	2	2 1/4	2 1/2	2 3/4	3
SAE 0-1-2	96 (130)	155 (210)	206 (279)	310 (420)	480 (651)	675 (915)	900 (1220)	1100 (1492)	1470 (1993)	1900 (2576)	2360 (3200)	2750 (3729)	3450 (4678)	4400 (5966)	7350 (9967)	9500 (12882)
SAE 3	145 (197)	234 (317)	372 (504)	551 (747)	872 (1182)	1211 (1642)	1624 (2202)	1943 (2635)	2660 (3607)	3463 (4696)	4695 (6366)	5427 (7359)	7226 (9798)	8049 (10914)	13450 (18238)	17548 (23795)
SAE 5	154 (209)	257 (349)	382 (518)	587 (796)	794 (1077)	1105 (1498)	1500 (2034)	1775 (2407)	2425 (3288)	3150 (4271)	4200 (5695)	4550 (6170)	6550 (8882)	7175 (9729)	13000 (17628)	16000 (21696)
SAE 6	209 (283)	350 (475)	550 (746)	825 (1119)	1304 (1768)	1815 (2461)	2434 (3301)	2913 (3950)	3985 (5404)	5189 (7036)	6980 (9465)	7491 (10158)	10825 (14679)	14983 (20317)	20151 (27325)	26286 (35644)
SAE 7	215 (292)	360 (488)	570 (773)	840 (1139)	1325 (1797)	1825 (2475)	2500 (3390)	3000 (4068)	4000 (5424)	5300 (7187)	7000 (9492)	7500 (10170)	11000 (14916)	15500 (21018)	21000 (28476)	27000 (36612)
SAE 8	230 (312)	380 (515)	600 (814)	900 (1220)	1430 (1940)	1975 (2678)	2650 (3593)	3200 (4339)	4400 (5966)	5650 (7661)	7600 (10306)	8200 (11119)	12000 (16272)	17000 (23052)	23000 (31188)	29000 (39324)
SOCKET HEAD CAP SCREW	250 (339)	400 (542)	640 (868)	970 (1315)	1520 (2061)	2130 (2888)	2850 (3865)	3450 (4678)	4700 (6373)	6100 (8272)	8200 (11119)	8800 (11933)	13000 (17628)	18000 (24408)	24000 (32544)	31000 (42036)
SOCKET SET SCREW	100 (136)	146 (198)														

APPENDIX H
TORQUE LIMITS - continued

TYPE	MINIMUM TENSILE STRENGTH	MATERIAL	BODY SIZE OR OUTSIDE DIAMETER OF FASTENER												
			#2	#3	#4	#5	#6	#8	#10	1/4	1/10	1/8	1/16	1/2	5/16
MACHINE SCREW YELLOW BRASS	60,000 PSI	COPPER (CU) 63% ZINC (ZN) 37%	2 (.2)	3.3 (.3)	4.4 (.5)	6.4 (.7)	8 (.9)	16 (1.8)	20 (2.3)	65 (7.3)	110 (12.4)	17 (23)	27 (37)	37 (50)	49 (66)
SILOCONE BRONZE TYPE "B"	70,000 PSI	COPPER (CU) 96% ZINC (ZN) 2% SILICON (SI) 2%	2.3 (.2)	3.7 (.3)	4.9 (.5)	7.2 (.8)	10 (1.1)	19 (2.1)	22 (2,5)	70 (7.9)	125 (14.1)	20 (27)	30 (41)	41 (56)	53 (72)

TYPE	BODY SIZE OR OUTSIDE DIAMETER OF FASTENER														
	3/8	3/4	7/8	1	11/8	11/4	13/8	11/2	15/8	13/4	17/8	2	21/4	21/2	23/4	3
MACHINE SCREW YELLOW BRASS	78 (106)	104 (141)	160 (217)	215 (292)	325 (441)	400 (542)		595 (807)								
SILICONE BRONZE TYPE "B"	88 (119)	117 (159)	180 (244)	250 (339)	365 (495)	450 (610)		655 (888)								

LEGEND

1. TORQUE VALUES: All numbers are in foot-pounds except those that are underlined, which are inch-pounds.
2. Numbers in parentheses are Newton-Meters.

INDEX

INDEX, continued

INDEX, continued

INDEX, continued

INDEX

INDEX

INDEX

INDEX

INDEX

INDEX

INDEX

INDEX

PARAGRAPH TITLE **PAGE**

- W -
(continued)

- X -

- Y -

- Z -

By Order of the Secretary of the Army:

DENNIS J. REIMER
General, United States Army
Chief of Staff

Official:

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
03450

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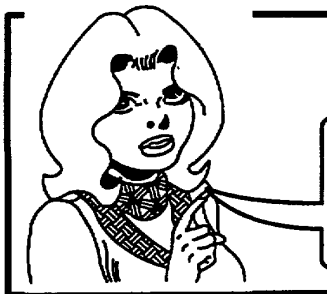
To: mpmto/avma28@st-louis-emh7.army.mil

Subject: DA Form 2028

1. **From:** Joe Smith
2. Unit: home
3. **Address:** 4300 Park
4. **City**: Hometown
5. **St:** MO
6. **Zip:** 77777
7. **Date Sent:** 19-OCT-93
8. **Pub no:** 55-2840-229-23
9. **Pub Title:** TM
10. **Publication Date:** 04-JUL-85
11. Change Number: 7
12. Submitter Rank: MSG
13. **Submitter FName:** Joe
14. Submitter MName: T
15. **Submitter LName:** Smith
16. **Submitter Phone:** 123-123-1234
17. **Problem: 1**
18. Page: 2
19. Paragraph: 3
20. Line: 4
21. NSN: 5
22. Reference: 6
23. Figure: 7
24. Table: 8
25. Item: 9
26. Total: 123
27. **Text:**

This is the text for the problem below line 27.

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



THEN . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM, CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)
PFC John DOE
CO A 3rd Engineer Bn
Ft. Leonardwood, MO 63108

DATE SENT: 22 August 1992

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 1-1520-250-10	15 June 1992	Operator's manual MH60K Helicopter

BE EXACT · PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO
6	2-1 a		
B1		4-3	

IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

In line 6 of paragraph 2-1a the manual states the engine has 6 cylinders. The engine on my set only has 4 cylinders. Change the manual to show 4 cylinders.

Callout 16 on figure 4-3 is pointed at a bolt. In key to figure 4-3, item 16 is calle a shim. Please correct one or the other

EXAMPLE

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER: JOHN DOE, PFC (268) 317-7111

SIGN HERE: JOHN DOE John Doe

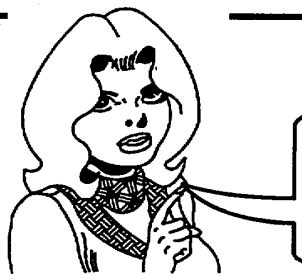
DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

DRSTS-M verprint2, 1 Nov 80

P.S.- - IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION, MAKE A CARBON COPY OF THIS AND GIVE TO YOUR HEADQUARTERS.

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 10-4320-342-24	1 JULY 1997	200/600 GPM LOW TEMPERATURE PUMP

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO

IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

SIGN HERE

DA FORM 1 JUL 79 2028-2

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REVERSE OF DA FORM 2028-2 Reverse of DRSTS-M Overprint 2, 1 Nov 80

TEAR ALONG PERFORATED LINE

FILL IN YOUR UNITS ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS

COMMANDER
U.S. ARMY AVIATION AND TROOP COMMAND
ATTN: AMSAT-I-MP
4300 GOODFELLOW BOULEVARD
ST. LOUIS, MO 63120-1798

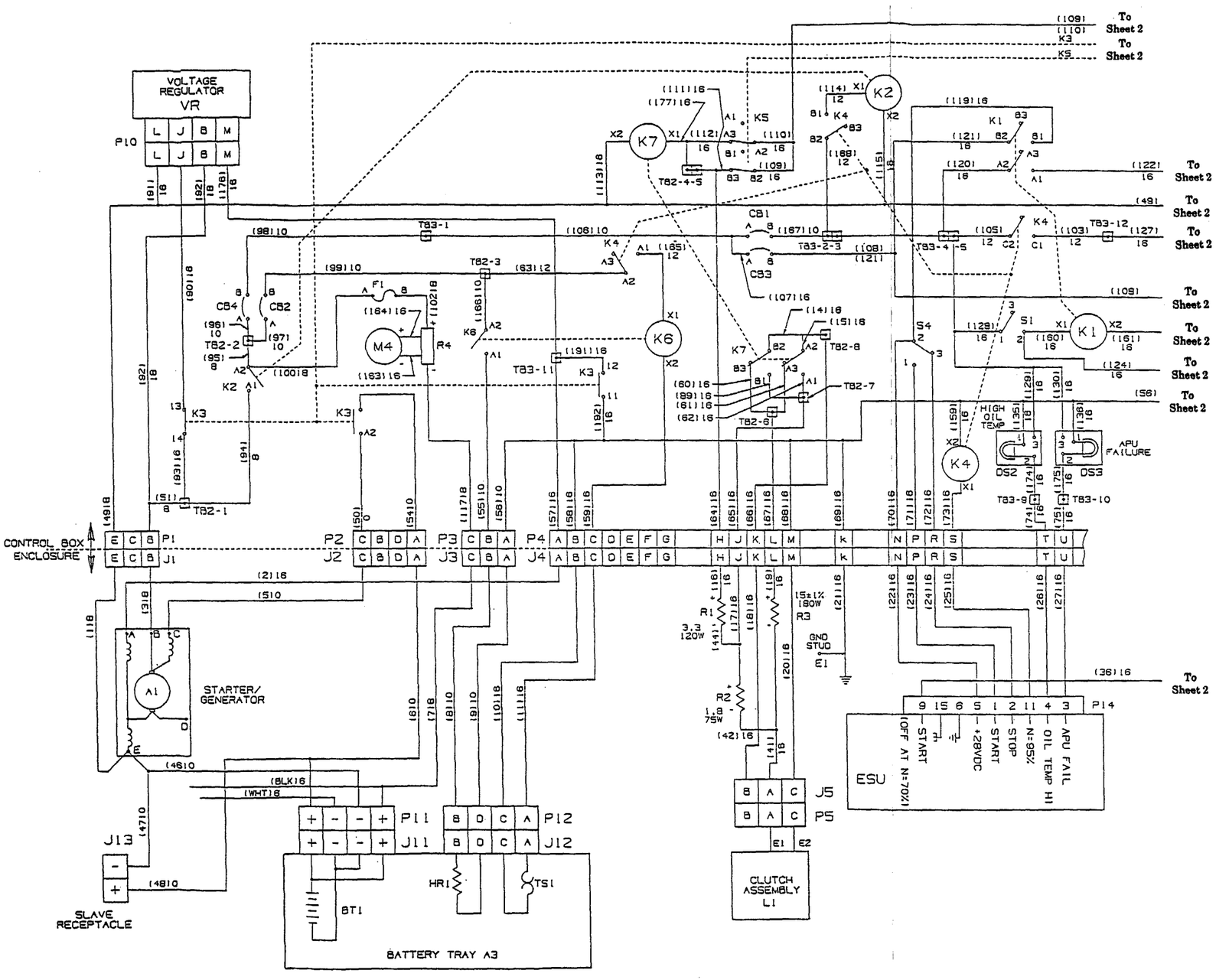

Figure FO-1. 200 GPM Pump Wiring Diagram (Sheet 1 of 3)

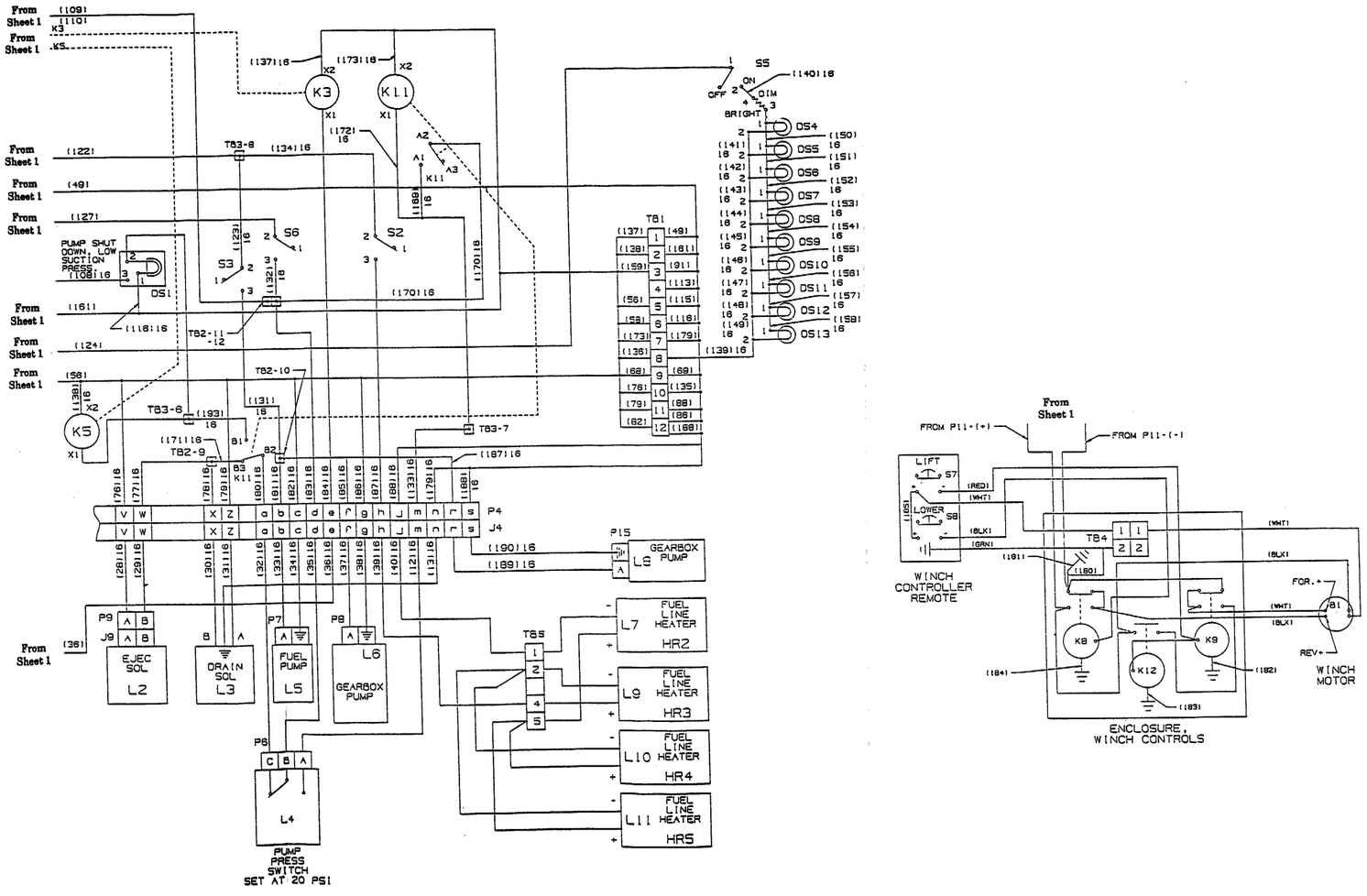

Figure FO-1. 200 GPM Pump Wiring Diagram (Sheet 2 of 3)

LEGEND FOR FIGURE FO-1

ITEM	DESCRIPTION
A-1	Starter/Generator: Start: 28 volts DC, 1000 amps Operating: 30 volts DC, 6 kilowatts, 200 amps, 7,050 to 12,000 rpm
A-3	Battery Tray
B1	Winch Motor, 24 volts dc, 1/2 horsepower
BT1	Battery, 24 volts de, 30AH/1HR/80°F/18V
CB1	Circuit Breaker, Main 15 amps
CB2	Circuit Breaker, Battery Heater, 50 amps
CB3	Circuit Breaker, Sensing, 5 amps
CB4	Circuit Breaker, Generator, 35 amps
DS1	Light, Clutch Disengaged
DS2	Light, Engine Oil Temperature
DS3	Light, Engine (APU) Failure
DS4	Light, Control Panel, 30 volts, 75 watts
DS5	Light, Control Panel, 30 volts, 75 watts
DS6	Light, Control Panel, 30 volts, 75 watts
DS7	Light, Control Panel, 30 volts, 75 watts
DS8	Light, Control Panel, 30 volts, 75 watts
DS9	Light, Control Panel, 30 volts, 75 watts
DS10	Light, Control Panel, 30 volts, 75 watts
DS11	Light, Control Panel, 30 volts, 75 watts
DS12	Light, Control Panel, 30 volts, 75 watts
DS13	Light, Control Panel, 30 volts, 75 watts
E-1	Ground Stud
ESU	Electronic Sequencing Unit
F1	Fuse, 130 volts, 80 amps, slow acting
HR1	Heater, Battery, 28 volts de, 75 watts
HR2	Fuel Line Heater, 24 volts dc, 50 watts
HR3	Fuel Line Heater, 24 volts dc, 50 watts
HR4	Fuel Line Heater, 24 volts dc, 50 watts
HR5	Fuel Line Heater, 24 volts dc, 50 watts
J1	Connector, Control Box
J2	Connector, Control Box
J3	Connector, Control Box
J4	Connector, Control Box
J5	Connector, Clutch Assembly
J9	Connector, Ejector Solenoid
J11	Connector, Battery
J12	Connector, Battery Heater/Thermostat
J13	Connector, Slave Receptacle
K1	Relay, Main Power (S2, S4 and S6) Circuit
K2	Relay, Charging Circuit
K3	Relay, Engine Start and Starter/Generator Circuit
K4	Relay, Electronic Sequencing Unit/95% Circuit
KS	Relay, 3 Second Delay, Clutch Holding Circuit
K6	Relay, Battery Heater Circuit
K7	Relay, 3 Second Delay, Clutch Circuit
K8	Relay, Winch Circuit, 24 volts, dc, normally open, 100 amps
K9	Relay, Winch Circuit, 24 volts, dc, normally open, 100 amps
K11	Relay, Pump Pressure Switch Circuit
K12	Relay, Winch Circuit, 24 volts dc, normally closed, 200 amps
L1	Clutch Assembly, 200GPM, 6 volts dc, 1.076 ohms, 8000 ± 500 rpm
L2	Solenoid, Ejector, 24 volts DC, 0-60 psi
L3	Solenoid, Drain, 24 volts, 11.2 watts, 40 psi
L4	Pump Pressure Switch, 24 volts, DC, 5 amps, 20 psi
L5	Fuel Pump, 24 volts DC, 3.25 amps, 20 psi, 40 gph
L6	Gearbox Pump, 24 volts DC, 3.25 amps, 20 psi, 40 gph
L7	Fuel Line Healer (HR2), 24 volts dc, 50 watts
L8	Gearbox Pump, 24 volts DC, 3.25 amps, 20 psi, 40 gph
L9	Fuel Line Heater (HR3), 24 volts dc, 50 watts
L10	Fuel Line Heater (HR4), 24 volts dc, 50 watts
L11	Fuel Line Heater (HR5), 24 volts de, 50 watts
M4	Ammeter, -10/0/+20 amps
P1	Connector Plug, Control Box
P2	Connector Plug, Control Box
P3	Connector Plug, Control Box
P4	Connector Plug, Control Box
P5	Connector Plug, Clutch Assembly
P6	Connector Plug, Pump Pressure Switch
P7	Connector Plug, Boost Pump (Fuel Pump)
P8	Connector Plug, Boost Pump (Gearbox)
P9	Connector Plug, Ejector Solenoid
P10	Connector Plug, Voltage Regular
P11	Connector Plug, Battery
P12	Connector Plug, Battery Heater/Thermostat
P14	Connector Plug, Electronic Sequencing Unit
P15	Connector Plug, Boost Pump (Gearbox)
R1	Resistor, 3.3 ohms, 75 watts
R2	Resistor, 1.8 ohms, 75 watts
R3	Resistor, 15 ohms, 180 watts
R4	Resistor, Shunt, 20 amps
S1	Switch, Master
S2	Switch, Fuel Heater
S3	Switch, Engine Pumps
S4	Switch, Start
S5	Switch, Control Panel Lights
S6	Switch, Pump Clutch
S7	Switch, Remote Winch Controller
S8	Switch, Remote Winch Controller
TB1	Terminal Board, Control Box
TB2	Terminal Board, Control Box
TB3	Terminal Board, Control Box
TB4	Terminal Board, Winch Enclosure
TB5	Terminal Board, Heaters
TS1	Thermostat, Battery, 120 volts, 1,500 watts, shutoff +230°F (112°C)
VR	Voltage Regulator, 25-31 volts, 10 amps continuous, 15 amps overload

Figure FO-1. 200 GPM Pump Wiring Diagram (Sheet 3 of 3)

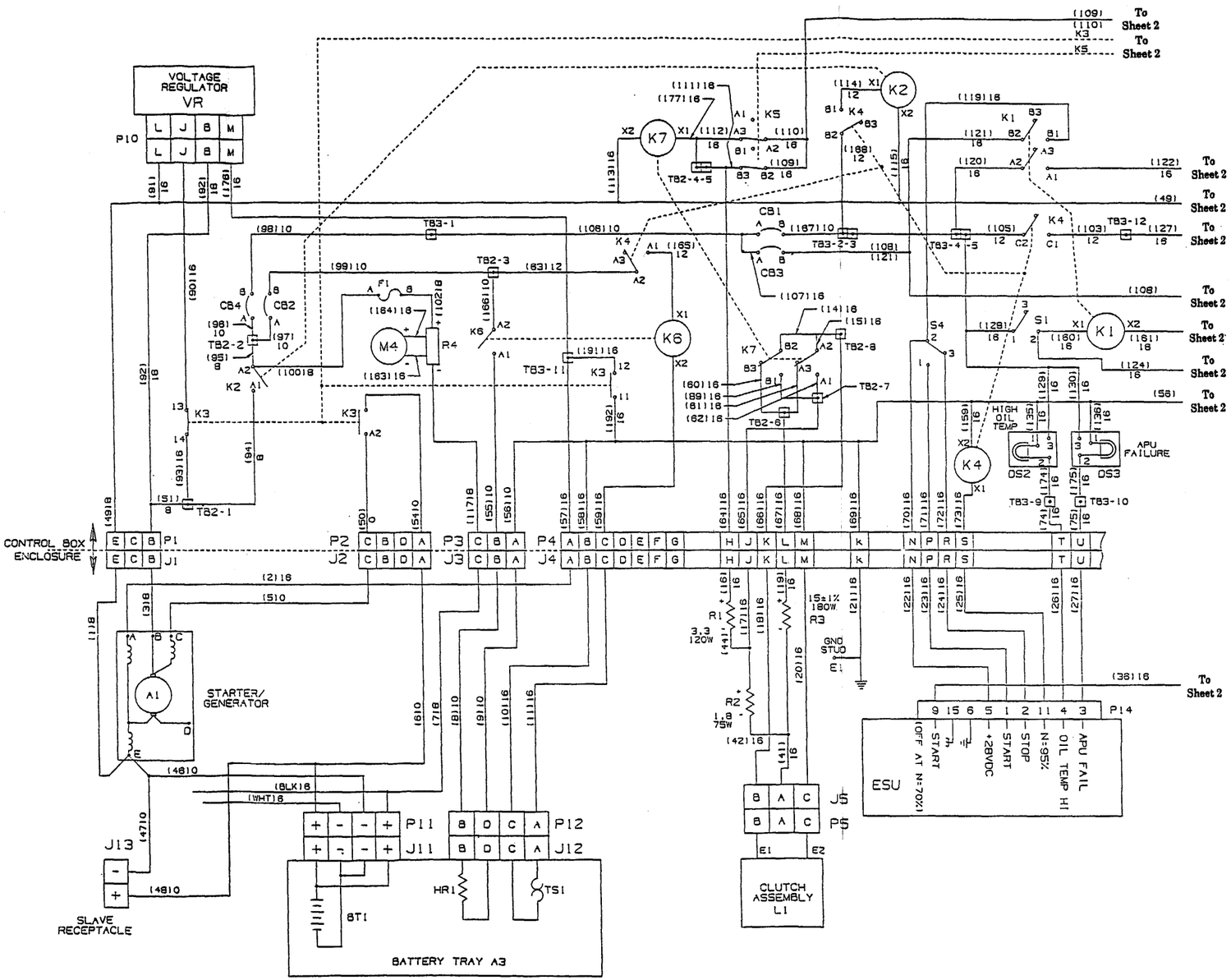

Figure FO-2. 600 GPM PUMP WIRING Diagram (Sheet 1 of 3)

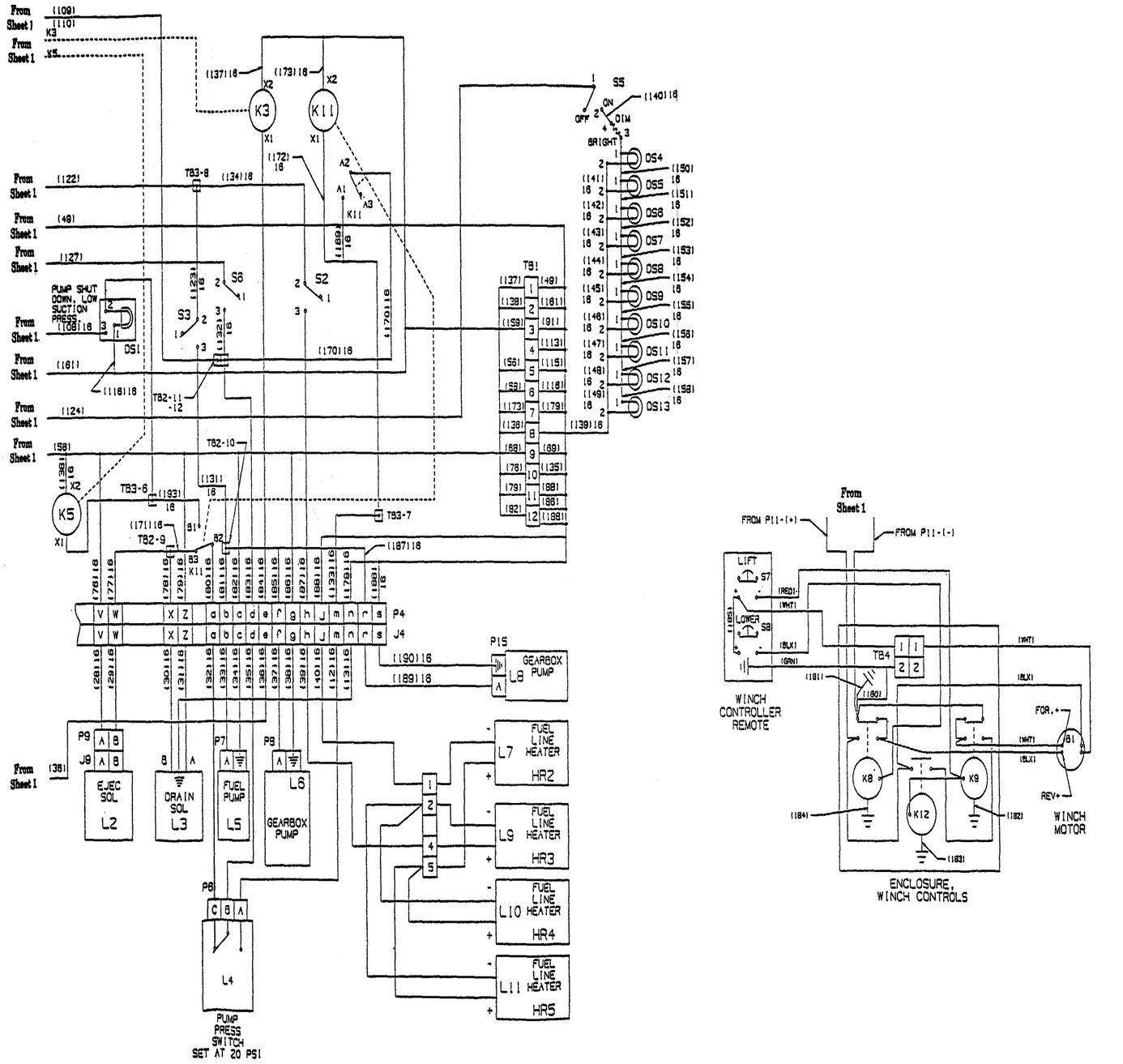

Figure FO-2. 600 GPM Pump Wiring Diagram (Sheet 2 of 3)

LEGEND FOR FIGURE FO-2

ITEM	DESCRIPTION
A-1	Starter/Generator: Start: 28 volts DC, 1000 amps Operating: 30 volts DC, 6 kilowatts, 200 amps, 7,050 to 12,000 rpm
A-3	Battery Tray
B1	Winch Motor, 24 volts de, 1/2 horsepower
BT1	Battery, 24 volts de, 30AH/1HR/800F/18V
CB1	Circuit Breaker, Main 15 amps
CB2	Circuit Breaker, Battery Heater, 50 amps
CB3	Circuit Breaker, Sensing, 5 amps
CB4	Circuit Breaker, Generator, 35 amps
DS1	Light, Clutch Disengaged
DS2	Light, Engine Oil Temperature
DS3	Light, Engine (APU) Failure
DS4	Light, Control Panel, 30 volts, 75 watts
DS5	Light, Control Panel, 30 volts, 75 watts
DS6	Light, Control Panel, 30 volts, 75 watts
DS7	Light, Control Panel, 30 volts, 75 watts
DS8	Light, Control Panel, 30 volts, 75 watts
DS9	Light, Control Panel, 30 volts, 75 watts
DS10	Light, Control Panel, 30 volts, 75 watts
DS11	Light, Control Panel, 30 volts, 75 watts
DS12	Light, Control Panel, 30 volts, 75 watts
DS13	Light, Control Panel, 30 volts, 75 watts
E-1	Ground Stud
ESU	Electronic Sequencing Unit
F1	Fuse, 130 volts, 80 amps, slow acting
HR1	Heater, Battery, 28 volt dc, 75 watts
HR2	Fuel Line Heater, 24 volts dc, 50 watts
HR3	Fuel Line Heater, 24 volts dc, 50 watts
HR4	Fuel Line Heater, 24 volts dc, 50 watts
HRS	Fuel Line Heater, 24 volts dc, 50 watts
J1	Connector, Control Box
J2	Connector, Control Box
J3	Connector, Control Box
J4	Connector, Control Box
J5	Connector, Clutch Assembly
J9	Connector, Ejector solenoid
J11	Connector, Battery
J12	Connector, Battery Heater/Thermostat
J13	Connector, Slave Receptacle
K1	Relay, Main Power (S2, S4 and S6) Circuit
K2	Relay, Charging Circuit
K3	Relay, Engine Start and Starter/Generator Circuit
K4	Relay, Electronic Sequencing Unit/95% Circuit
K5	Relay, 3 Second Delay, Clutch Holding Circuit
K6	Relay, Battery Heater Circuit
K7	Relay, 3 Second Delay, Clutch Circuit
K8	Relay, Winch Circuit, 24 volts, dc, normally open, 100 amps
K9	Relay, Winch Circuit, 24 volts, dc, normally open, 100 amps
K11	Relay, Pump Pressure Switch Circuit
K12	Relay, Winch Circuit, 24 volts dc, normally closed, 200 amps
L1	Clutch Assembly, 600 GPM, 6 volts dc, 1.076 ohms, 8000 ± 500 rpm
L2	Solenoid, Ejector, 24 volts DC, 0-60 psi
L3	Solenoid, Drain, 24 volts, 11.2 watts, 40 psi
L4	Pump Pressure Switch, 24 volts, DC, 5 amps, 20 psi
L5	Fuel Pump, 24 volts DC, 3.25 amps, 20 psi, 40 gph
L6	Gearbox Pump, 24 volts DC, 3.25 amps, 20 psi, 40 gph
L7	Fuel Line Heater (HR2), 24 volts de, 50 watts
L8	Gearbox Pump, 24 volts DC, 3.25 amps, 20 psi, 40 gph
L9	Fuel Line Heater (HR3), 24 volts dc, 50 watts
L10	Fuel Line Heater (HR4), 24 volts dc, 50 watts
L11	Fuel Line Heater (HR5), 24 volts de, 50 watts
M4	Ammeter, -10/0/+20 amps
P1	Connector Plug, Control Box
P2	Connector Plug, Control Box
P3	Connector Plug, Control Box
P4	Connector Plug, Control Box
P5	Connector Plug, Clutch Assembly
P6	Connector Plug, Pump Pressure Switch
P7	Connector Plug, Boost Pump (Fuel Pump)
P8	Connector Plug, Boost Pump (Gearbox)
P9	Connector Plug, Ejector Solenoid
P10	Connector Plug, Voltage Regular
P11	Connector Plug, Battery
P12	Connector Plug, Battery Heater/Thermostat
P14	Connector Plug, Electronic Sequencing Unit
P15	Connector Plug, Boost Pump (Gearbox)
R1	Resistor, 3.3 ohms, 75 watts
R2	Resistor, 1.8 ohms, 75 watts
R3	Resistor, 15 ohms, 180 watts
R4	Resistor, Shunt, 20 amps
S1	Switch, Master
S2	Switch, Fuel Heater
S3	Switch, Engine Pumps
S4	Switch, Start
S5	Switch, Control Panel Lights
S6	Switch, Pump Clutch
S7	Switch, Remote Winch Controller
S8	Switch, Remote Winch Controller
TB1	Terminal Board, Control Box
TB2	Terminal Board, Control Box
TB3	Terminal Board, Control Box
TB4	Terminal Board, Winch Enclosure
TB5	Terminal Board, Heaters
TS1	Thermostat, Battery, 120 volts, 1,500 watts, shutoff +230°F (112°C)
VR	Voltage Regulator, 25-31 volts, 10 amps continuous, 15 amps overload

Figure FO-2. 600 GPM Pump Wiring Diagram (Sheet 3 of 3)

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.461	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN : 075398-000