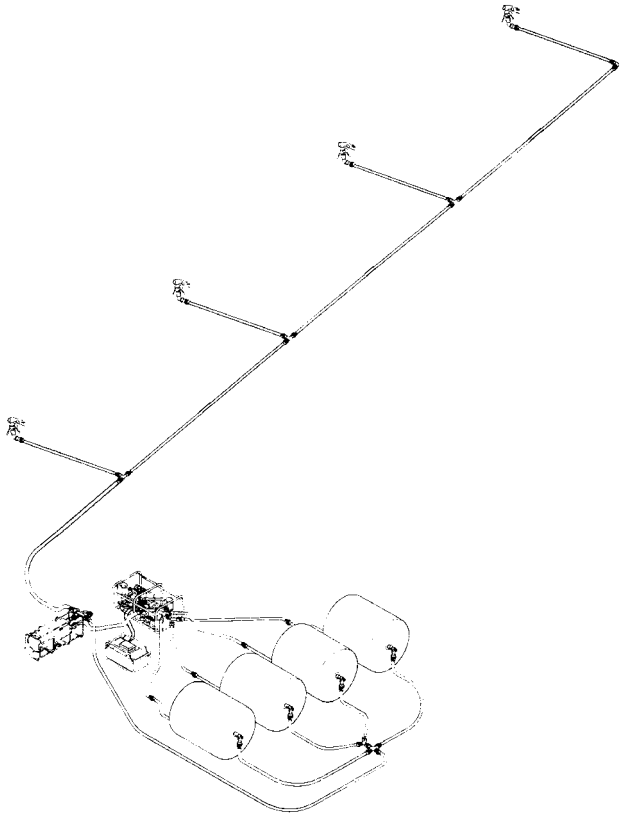
TECHNICAL MANUAL

OPERATOR'S, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL FOR

ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM (AAFARS) MODEL M100A1

NSN 4930-01-495-0024



HEADQUARTERS, DEPARTMENT OF THE ARMY
JUNE 2004

WARNING SUMMARY

Death or serious injury may result if personnel fail to observe the following safety precautions.

FLAMMABLE FUEL

Death or personal injury may result from the explosion of fuel fumes exposed to an open flame or spark, or to static discharge. Do not permit smoking, any open flame, or spark producing equipment within fifty (50) feet of the pumping assembly. Ensure all equipment is well grounded prior to commencing any operation or maintenance task. Always ensure the ground connection from the aircraft is complete prior to beginning any fueling operation.

Death or personal injury may result from the explosion of fuel fumes exposed to an open flame or spark, or to static discharge. Do not permit smoking, any open flame, or spark producing equipment within fifty (50) feet (15.24 m) of the auxiliary pump during repair.

Fuels are toxic and flammable. Do not get on person or clothing. Do not use near open flame. Area should be well-ventilated. Using dry cleaning solvents incorrectly can cause injury or even death. Fuel is flammable. Do not smoke.

Ensure all equipments are well grounded prior to commencing any operation or maintenance task. Always ensure the ground connection from the vehicle is complete prior to beginning any fueling operation.

Death or personal injury may result from explosion of fuel fumes exposed to an open flame or spark, or to a static discharge. Do not permit smoking within fifty feet of the liquid fuel filter separator.

Fuels are toxic and flammable. Wear protective goggles and refuel only in well ventilated areas. 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, flush with clean water and get medical aid for eyes immediately.

Fuel vapors are flammable. Residual fuel may be present in the fuel line. Catch the fuel in a drain pan. Immediately wipe up any fuel that may spill.

During operation, avoid spillage of fuel as much as possible. If spillage of fuel occurs, cover the areas with dry soil to reduce its rate of vaporization. Avoid getting fuel on the body or clothing. If clothing becomes saturated with fuel, remove the clothing immediately and wash the body with hot soapy water.

MODULE MOVEMENT

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. Always use the number of soldiers called for by the procedures to move or relocate the AAFARS equipment. Use proper physical lifting procedures or use a suitable lifting device or dolly. Wear safety shoes, gloves and other suitable protective clothing.

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. The engine module should be removed from the pump-engine module for moving or lifting. If the pump-engine module must be moved as a unit, do not lift the module two feet with less than five personnel, three feet with less than six personnel, or five feet with less than eight personnel.

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. Do not lift the engine module, filter-separator, accessory module, or pump-engine module with engine module removed with less than four personnel.

HOT COMPONENTS

The exhaust system will remain hot for some time after engine shut down. Avoid contact with exhaust system until the components have cooled enough for safe handling. Serious personal injury may occur from contact with hot metal.

SOLVENT HAZARD

Degreasing solvent MIL-PRF-680, Type III, used to clean parts, is potentially dangerous to personnel and property. Eye protection is required. Avoid repeated and prolonged skin contact by wearing rubber gloves 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. 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.

Dry cleaning solvent P-D-680, used to clean parts is potentially dangerous to personnel and property. Use in a well ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100° F - 138° F (38° C - 59° C).

Dry cleaning solvent AA 711 Types I and II, used to clean parts, is potentially dangerous to personnel and property. Use in a well ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near an open flame or excessive heat. The flash point of the solvent is 130° F (54.4° C).

USE CAUTION when using cleaning solvents. Cleaning solvents evaporate quickly and can irritate exposed skin. In cold weather, contact of exposed skin with cleaning solvents can cause frostbite.

PUMPAGE TOXICITY

All petroleum products contain additives that may be harmful to personnel and the environment. All leaks must be corrected as soon as possible. Wash fuel or oil from skin immediately. Remove and wash contaminated clothing immediately. Spills of fuel or oil must be cleaned up in accordance with local area direction to prevent harm to personnel or damage to the environment.

Pumpage fuels contain additives that may be harmful to personnel and the environment. All leaks must be corrected as soon possible. Wash fuel from skin immediately. Spills of fuel must be cleaned up in accordance with local SOPs.

TRICON MAINTENANCE

To gain access to the seals on the bottom door edge, it may be necessary to raise the container above floor level. Use lifting devices rated for a minimum of 10,000 pounds (4536 Kg). Using less than rated equipment could expose personnel to serious injury or death.

D1-NOZZLE MAINTENANCE

Exert caution when using cutting tool to prevent personal injury and damage to part.

To prevent injury to personnel, wear protective gloves when installing bumper. Bumper must be softened in hot water and installed while still hot. Failure to wear protective gloves could result in serious burns.

STATIC DISCHARGE

A static discharge from any system component could ignite the fuel or cause an explosion of fuel vapors. Do not operate the system until it has first been grounded properly.

ARCING

Radio transmitters can cause an arc at antennas. DO NOT ground nozzle to a radio antenna.

SPRING LOADED COMPONENTS

Spring retainer is under spring pressure. Maintain pressure on the wrench to prevent sudden separation. Use care in disassembly to avoid serious injury to personnel and equipment.

Personal injury could result from any attempt to disassemble starter while spring is under tension. Ensure all spring tension is released prior to performing any maintenance.

End cover is under spring pressure. Keep pressure on end cover while removing screws. Personal injury may occur from sudden separation of end cover.

Body and collar are under spring pressure. Maintain pressure on the body wrench to prevent sudden separation. Personal injury could result.

During assembly the components; spring, flow guide and sleeve seal will be under spring pressure. Do not push or pull collar to the rear. Do not remove compression tool until assembly is completed. Personal injury could result.

Piston assembly is under an initial spring load of approximately 65 psi. Use care in disassembly to avoid serious injury to personnel and equipment.

During assembly the piston spring is going to be compressed. Use care in assembly to avoid serious injury to personnel and equipment.

FUEL SPILLAGE ON PERSONNEL

Serious eye and skin injury could occur from venting of fuel when filter vessel manual vent valve is open. Wear suitable protective clothing and eye protection.

Avoid getting fuel on your body or clothing. If clothing becomes saturated with fuel, remove clothing immediately and wash your body with hot soapy water.

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

ELBOW VALVE STEM POSITION

The AAFARS suction and discharge hoses in the recirculation loop are connected to the fuel drums via elbow valves with integral camlock couplings. When the elbow coupling is closed, the valve stem is extended. The stem travel is opposite that of conventional valves and requires the operator to double check valve position during the defueling procedure, since observation is misleading. Failure to heed this warning could result in death or serious injury.

FUEL SPILLAGE

Fuel spillage will occur if elbow valve coupling is opened before connection to a fuel drum. Ensure elbow valve coupling is closed before connection to fuel drum. Failure to heed this warning could result in death or serious injury.

FIRST AID

FIRST AID instructions are given in FM 21-11, First Aid For Soldiers.

NOISE

Use single hearing protection within 22 feet. Hearing can be permanently damaged if exposed to constant high noise.

CARBON MONOXIDE

Carbon monoxide (exhaust gas) can kill you. Operate system outdoors or duct system outdoors.

INSERT LATEST CHANGED PAGES/WORK PACKAGES. DESTROY SUPERSEDED DATA

LIST OF EFFECTIVE PAGES/WORK PACKAGES

NOTE: The portion of text affected by the changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Date of issue for the original manual is:

Original.....0 ..... 30 Jun 04

Total number of pages for front and rear matter is 24 and the total number of work packages is 117, consisting of the following:

Page/WP No.	*Change No.	Page/WP No.	*Change No.	Page/WP No.	*Change No.
Title	0				
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HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 30 JUNE 2004

TECHNICAL MANUAL

OPERATOR'S, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL FOR ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM (AAFARS) MODEL M100A1

NSN 4930-01-495-0024

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 the procedures, please let us know. Submit your DA Form 2028 (Recommended Changes to Equipment Technical Publications) through the Internet, on the Army Electronic Product Support (AEPS) website. The Internet address is http://aeps.ria.army.mil. If you need a password, scroll down and click on "ACCESS REQUEST FORM". The DA Form 2028 is located in the ONLINE FORMS PROCESSING section of the AEPS. Fill out the form and click on SUBMIT. Using this form on the AEPS will enable us to respond quicker to your comments and better manage the DA Form 2028 program. You may also mail, fax or e-mail your letter or DA Form 2028 direct to AMSTA-LC-CI/TECH PUBS, TACOM-RI, 1 Rock Island Arsenal, Rock Island, IL 61299-7630. The e-mail address is TACOM-TECH-PUBS@ria.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726.

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HOW TO USE THIS MANUAL

This technical manual is composed of a series of work packages (WP). Each WP comprises an individual maintenance or operator task, general information section, description section, theory section, operating procedure(s), troubleshooting section, or supporting information section (e.g., Maintenance Allocation Chart, Expendable and Durable Items List, etc.). Each WP is identified by a unique WP number as illustrated. Work Packages are grouped in chapters as in a conventional technical manual (e.g, Chapter 1 – Description and Theory of Operation, Chapter 2 – Operator Instructions, etc.). The most obvious distinction is in the WP numbering and page numbering system.

In the example on the following page, 0015 00 in the upper right corner is the WP number. The first four digits are the WP sequence number, while the fifth and sixth digits indicate the change status of the WP; (00 indicates an original WP). The WP number is repeated at the bottom of the page with a – number (e.g., "-1" added to indicate the page number. Page numbers are sequential within a WP, WPs are sequential within a manual and grouped into chapters according to operation or maintenance level.

Supporting Information WPs at the rear of the manual serve the same function and contain the same information as appendices in older manuals.

Figures and Tables

Figures in WPs are unnumbered and untitled unless there is more than one. If a WP includes more than one figure, the figures are sequentially numbered within the WP. In a Repair and Special Tools List (RPSTL), figures are numbered sequentially within each chapter.

Each table is numbered and titled within a WP.

Unisex Couplings

AAFARS makes extensive use of dry break unisex couplings, both 2-inch and 3-inch. Rather than repeat repair/replacement procedures for each instance of use, this TM provides a single procedure for each task (e.g., "Replace Two-Inch Valved Unisex Coupling") which applies to every occurrence of that task.

TM 10-4930-351-14

OPERATOR MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE UNISEX COUPLING FACE SEAL/DUST CAP SEAL

INITIAL SET-UP:

Tools:
None

Materials/Parts Required:
Rags, Wiping (WP 0114 00, Item 19)

This procedure applies to all AAFARS unisex couplings. All two-inch face seals are the same throughout the system, as are all three-inch face seals. The seal in the coupling face and the dust cap are identical, and may be interchanged as an emergency repair.

The face plate and dust cap of AAFARS unisex couplings employ a U-ring type seal which is designed to seat with pressure. The seal is slightly higher than the groove it sits in, so that the top protrudes above the surface. Pressurized fluid enters beneath this protrusion and expands the seal against the bottom of the seal groove and against the corresponding seal in the dust cap or other face plate. Special care must be taken during installation to ensure the seal is fully seated in the groove. If it is not, pressurized fluid will be forced under the seal and the coupling will leak.

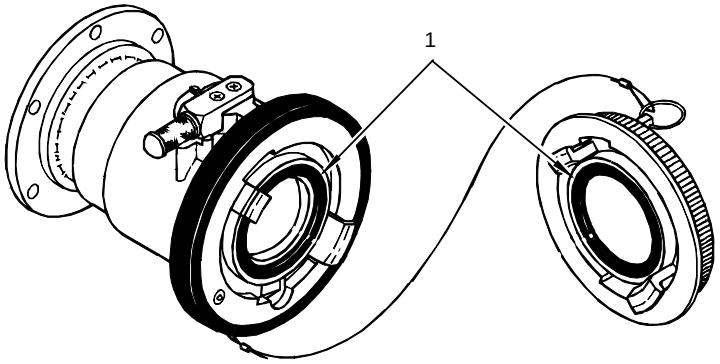
REMOVAL

Remove seal (1) by hand.

INSTALLATION

1. Wipe seal groove clean.

2. Press seal (1) in groove with a smoothing motion of fingertips. Note that when fully seated, the outer lip of the seal protrudes slightly above the surface. Ensure the seal is not twisted or kinked.



END OF WORK PACKAGE

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OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1 GENERAL INFORMATION

SCOPE

Type of Manual:	Operator's, Unit, Direct Support and General Support Maintenance
Model Number and Name:	Advanced Aviation Forward Area Refueling System (AAFARS)
Purpose of Equipment:	To provide a day or night, soldier-portable, four-point refueling system capable of providing filtered fuel at a rate of fifty-five gallons per minute to each of four nozzles separated by a distance of 100 feet (30.5 m), and to operate satisfactorily from 120° F (48.9° C) to -25° F (-31.7° C).

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, Functional User's Manual for the Army Maintenance Management System (TAMMS) or AR 700-138, Army Logistics Readiness and Sustainability.

ACCIDENT REPORTING

Accidents involving injury to personnel or damage to material will be reported on DA Form 285 (Accident Report) in accordance with AR 385-40. Explosives and ammunition malfunctions will be reported in accordance with AR 75-1.

CORROSION PREVENTION AND CONTROL (CPC)

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

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.

If a corrosion problem is identified, it can be reported using SF 368, Product Quality Deficiency Report. Use of keywords such as "corrosion", "rust", "deterioration", or "cracking" will ensure that the information is identified as a CPC problem. The form should be submitted to the address specified in DA Pam 738-750, Functional User's Manual for the Army Maintenance Management System (TAMMS).

OZONE DEPLETING SUBSTANCES

No ozone depleting substances are required for operation or maintenance of AAFARS.

SAFETY, CARE AND HANDLING

The AAFARS liquid fuel filter-separator may be used to filter various fuels. It must be assumed that residual fuel and fuel vapors are present in the liquid fuel filter-separator at all times, even after draining or purging. Therefore the equipment must always be handled with the same degree of caution as actual fuel. One or more fully charged fire extinguishers must be present at all times, not only during operation. In addition, fuels may contain toxic additives. Rubber gloves should always be worn when handling components which are in regular contact with fuel.

A static electric charge is always present in all fuels. The charge increases when the fuel is being pumped, stirred, shook, or splashed. Any physical movement of the fuel will increase the static charge. If the charge is allowed to build sufficiently it will discharge, causing a spark which will ignite fuel vapors. The build up of static electric charge is controlled by bonding

and grounding of all fuel handling equipment. A grounding cable assembly is provided with the liquid fuel filter-separator and must be inspected, maintained and used consistently and conscientiously to prevent fuel ignition due to electrostatic discharge.

Fuels are dangerous under all conditions. Always observe fuel handling safety precautions.

DESTRUCTION OF MATERIEL TO PREVENT ENEMY USE

Refer to TM 750-244-3 for information and instructions covering destruction of Army Materiel.

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your AAFARS 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 (Product Quality Deficiency Report). Mail it to the address specified in DA PAM 738-750, Functional User’s Manual for the Army Maintenance Management System (TAMMS) or as specified by the acquiring activity. We will send you a reply.

PREPARATION FOR STORAGE OR SHIPMENT

Refer to WP 0087 00

REFERENCE INFORMATION

List of Abbreviations/Acronyms

AAFARS	Advanced Aviation Forward Area Refueling System
AMP	Ampere
C	Centigrade
CAGEC	Commercial and Government Entity Code
CCR	Closed Circuit Refueling
cm	centimeter
cm^2	square centimeter
cm^3	cubic centimeter
DC	Direct Current
F	Fahrenheit
ft	foot
GFA	Gravity Fill Adapter
gpm	gallons per minute
HP	Horsepower
in	inch
IAW	In Accordance With
lb	pound
LED	Light Emitting Diode
lpm	liters per minute
Max	Maximum
m	meter
mm	millimeter
NPT	National Pipe Thread
PMCS	Preventive Maintenance Checks and Services
psi	pounds per square inch
PTO	Power Take Off
QD	Quick Disconnect
QTY	Quantity
RPM	Revolutions Per Minute
VDC	Volts, Direct Current

Quality of Material

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

CHAPTER 1

DESCRIPTION AND THEORY OF OPERATION
FOR
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM

OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1 EQUIPMENT DESCRIPTION AND DATA

EQUIPMENT CHARACTERISTICS, CAPABILITIES AND FEATURES

The AAFARS is a modular, four man portable, four-point refueling system. AAFARS provides filtered fuel at fifty-five gallons per minute to each of four nozzles 100 feet (30.5 meters) apart. The system will operate satisfactorily from 120° F (48.9° C) to –25° F (-31.7° C).

The core components of the AAFARS are the pump-engine module; the liquid fuel filter-separator; the accessory module; and the hoses, nozzles and fittings that deliver fuel from the fuel drums to the fueling points. The system allows a choice of recirculation setups to filter the fuel during operation. Fuel recirculation also helps prevent pump overheating due to static pressure build.

All fuel delivery components (hoses, pump, filter, wyes, tees, elbows, etc.) feature unisex dry-break couplings, with the exception of the valved camlock elbow couplings that connect the fuel hoses and pressure control to the fuel drums. Valved unisex couplings are dry break fittings. They can be connected or disconnected only when the valves are closed. This allows components to be separated without spilling fuel. When connected (with valves open), the unisex couplings are locked together, preventing accidental separation. Nozzles are equipped with non-valved unisex couplings to prevent trapping fuel in a disconnected nozzle. Thermal expansion of trapped fuel may damage a nozzle.

The AAFARS is designed to operate normally from four 500-gallon fuel drums. The system includes an adapter kit that allows the AAFARS to be connected to any source which can be accessed through two-inch, three-inch, or four-inch camlock couplings. The adapters also allow connection of AAFARS components to any other fuel system components that use standard two-inch, three-inch, or four-inch camlock couplings.

A twenty-four vdc auxiliary pump is provided to defuel the system after a mission or operation. The auxiliary pump is also useful for pumping down a component before or after removal from the system due to operational reconfiguration or maintenance action.

a. Characteristics

- Modular construction
- Man portable
- Provides the capability to connect to any source that can be accessed through 2-inch, 3-inch, or 4-inch camlock couplings

b. Capabilities

- Provides filtered fuel at 55 gpm to each fueling point
- Provides filtered fuel at 90 gpm to one fueling point
- Operates in a temperature range of +120° F (+48.9° C) to –25° F (-31.7° C)

c. Features

- Uses a D-1, CCR or fuel/oil servicing (open port) nozzle
- Closed circuit recirculation
- Electrical power provided by a maintenance free 24 vdc battery
- All fuel discharge components feature valved unisex couplings with the exception of the camlock couplings at the fuel drums and pressure control and non-valved unisex couplings on the nozzles
- Prime mover is a 2 cylinder diesel engine
- Valved unisex couplings provide fuel discharge component isolation
- Electric or manual start

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

Pump-Engine Module

The Pump-Engine module (figure 1) consists of:

a. A removable engine module (1) that slides in or out on plastic glides. Adjustable-force latches (2) secure the engine module to the pump-engine module.

b. A muffler (3) and an exhaust line (4) with a replaceable insulating cover. A clam shell clamp (5) connects the exhaust line to the engine exhaust manifold.

c. A shaft-driven fuel transfer pump (6) with a positive displacement rotary vane priming pump mounted internally on the same shaft as the main impeller.

d. A three-inch camlock quick disconnect fitting (7) is bolted directly to the inlet of the fuel transfer pump. A four way inlet manifold (stowed, transported and accounted for in a separate storage module) is connected to the quick disconnect fitting during system setup to deliver fuel from the fuel drums to the fuel transfer pump.

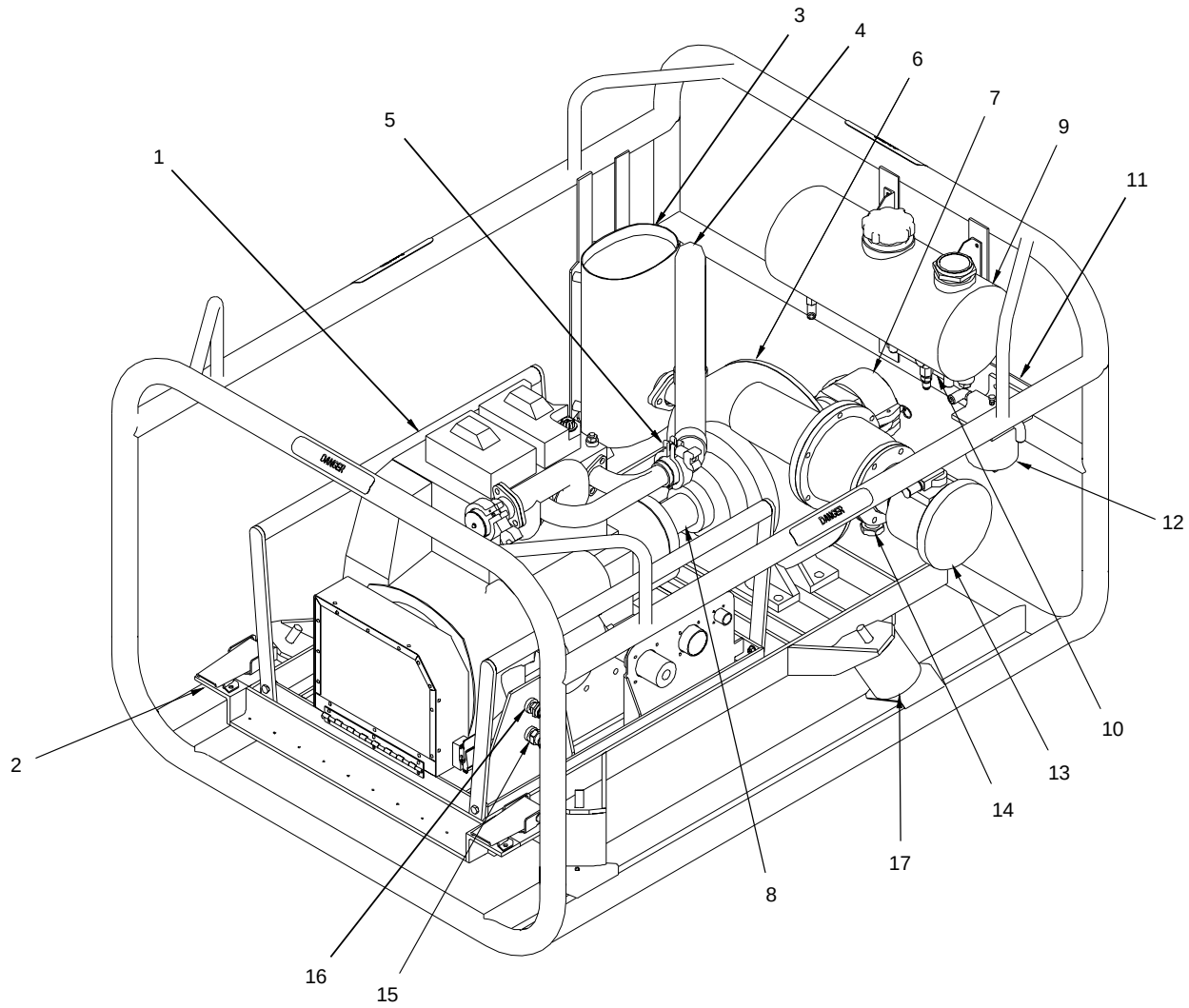


Figure 1. Pump-Engine Module

e. A detachable flexible coupling (8) connects the engine output shaft to the fuel transfer pump input shaft.

f. A 1.2 gallon (4.5 liter) fuel tank (9) provides sufficient fuel to operate the engine for at least one hour fifteen minutes under full load.

g. A 12 ft (3.65 m) ground cable assembly (10) is stowed on two spools mounted below the fuel tank.

h. A three-position fuel selector valve (11) allows engine fuel to be supplied from the fuel tank or an external source.

i. A canister type filter/water coalescer assembly (12) is mounted downstream of the fuel selector valve to remove impurities and water from the fuel before it reaches the engine.

j. A three-inch, valved unisex coupling (13) at the pump outlet provides connection to a three-inch discharge hose and also serves as an emergency shutoff valve.

k. An overtemperature sensor (14) located at the underside of the fuel transfer pump outlet will shut down the engine if the pumpage temperature reaches 175° F (79° C).

l. An engine fuel supply line (15) terminated with a quick disconnect fitting to facilitate removal and installation of the engine module.

m. An engine fuel return line (16) terminated with a quick disconnect fitting to facilitate removal and installation of the engine module.

n. Four solid rubber shock mounts (17) to support and isolate the engine and fuel transfer pump from the module frame.

Engine Module

The engine module (1, figure 2) consists of:

a. A 19-horsepower diesel engine (2) which serves as the prime mover for the pumping assembly.

b. Carrying handles (3) on either side of the engine module that allow the engine module to be carried by four persons.

c. Alignment bolts (4) that engage slots in the pump-engine module frame to eliminate movement from engine vibration.

d. A detachable air intake filter (5) which is attached by a clam shell clamp (6) to the engine intake manifold (7) during setup. (The air intake filter is stowed, transported and accounted for in a storage module.)

e. A Power Take Off (PTO) guard (8) covers the engine output shaft and flexible coupling adapter to provide protection from rotating parts on the rear of the engine.

f. A guard (9) encloses the manual start adapter to provide protection from rotating parts on the front of the engine.

g. A female quick disconnect fitting (10) is used to connect the fuel supply line from the pump-engine module to the engine module.

h. A male quick disconnect fitting (11) is used to connect the fuel return line from the engine module to the pump-engine module.

i. A group of electrical connectors (12) are used to connect the battery power cable, the control cable and the pumpage overtemperature cable to the engine module.

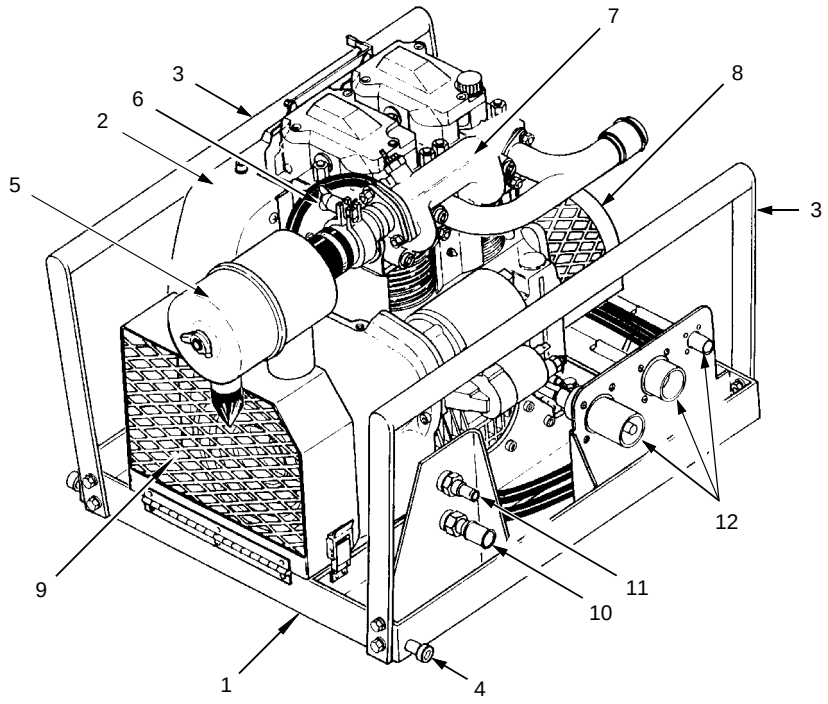


Figure 2. Engine Module

Liquid Fuel Filter-Separator

The liquid fuel filter-separator (figure 3) is an aluminum vessel (1) with an integral frame and is designed to house three coalescer elements (2) and a separator element (3). A sump (4) at the bottom of the vessel (1) collects water and sediment removed from the pumpage by the filter action. A diverter plate (5) located directly behind the inlet port (6) prevents the incoming pressurized pumpage from directly impacting the filter elements (2 and 3) and equalizes pressure across the inlet bulkhead (7). The coalescer elements (2) are one-piece, closed end, threaded-base elements and are retained to the inlet bulkhead (7) by threaded-base adapters (8). The separator element (3) is a one-piece, monel or stainless steel screen coated on both sides with Teflon. It seats over a threaded rod (9) into a friction fit adapter (10) on the inlet bulkhead (7). All four elements are retained in position at the cover (11) end by a cross shaped element retainer (12). An O-ring (13) and a domed aluminum cover (11) seal the access end of the vessel (1). Two handles (14) are provided on the cover (11) for removal and replacement of the cover (11).

3-inch valved unisex couplings (15) bolt to the flanged outlet (16) and inlet (6) ports for interface to the system fuel discharge hoses. Dust caps (17) are provided to protect the unisex couplings (15) when fuel hoses are not connected. A 2-inch valved unisex coupling (18) with a pipe thread adapter is fitted to the sump (4) to provide a drain/defuel connection to the system or an auxiliary pump. A pipe plug (19) located on the bottom of the vessel (1) near the inlet port (6) drains the cavity formed by the inlet bulkhead (7) and the diverter (5). Air is vented from the module through a manual ¼ turn, spring loaded vent valve (20) located on top of the filter vessel (1). A standard fuel sampling port (21) is fitted into the outlet port (16) for fuel testing.

Filter status is monitored by a sight gauge (22) and a differential pressure gauge (23). The differential pressure gauge (23) is connected by hard tubing between the inlet (6) and outlet (16) ports to measure the pressure drop across the filter vessel (1). A clean, properly operating system will register 2-3 pounds differential pressure. The pressure drop will rise gradually as the elements become contaminated by use. When the pressure reaches fifteen pounds, the coalescer elements (2) should be changed and the separator element (3) thoroughly cleaned. A sudden drop in pressure indicates that fuel is flowing through the filter vessel (1) without resistance, probably indicating a ruptured element (2 or 3). A sudden increase in pressure indicates a blockage due to a malfunction or ingestion of a foreign object. The sight gauge (22) on the vessel sump (4) provides visual indication of the amount of water collected in the sump (4). A ball in the sight gauge (22) will float on water but not on fuel, providing a direct indication of the amount of water in the sump (4).

A ¼-turn, ½ inch ball valve (24) on the bottom rear of the sump provides a way to drain accumulated water. The ball valve can be connected by camlock couplings to a ½ inch, 10 foot hose provided with the filter-separator, allowing the sump to be drained to any shallow container.

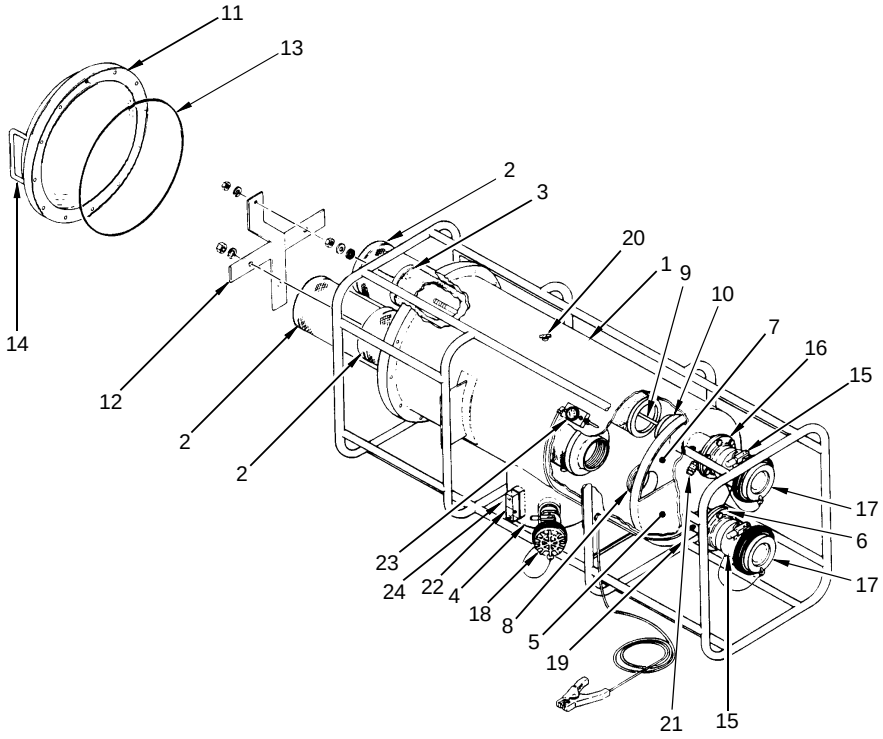


Figure 3. Liquid Fuel Filter-Separator

Accessory Module

The accessory module (figure 4) consists of:

a. A tubular frame (1) housing a two-compartment chest (2). A 28 vdc maintenance free aircraft battery (3) is located inside the battery compartment (4). A two-conductor battery power cable (W202) (5) with an auxiliary pump power leg (6) is connected to the battery and stowed in the electrical stowage compartment (7) of the chest. A multi-conductor control cable (W201) (8) is connected to the control box and also stowed in the electrical cable stowage compartment of the chest

b. A control box (9) located on top of the battery compartment contains the voltage regulator and control panel. Controls and indicators on the control panel, including an emergency stop switch, are used to start and stop the engine and to indicate system malfunctions. A ground cable (10) is attached to a stud on the rear of the control box.

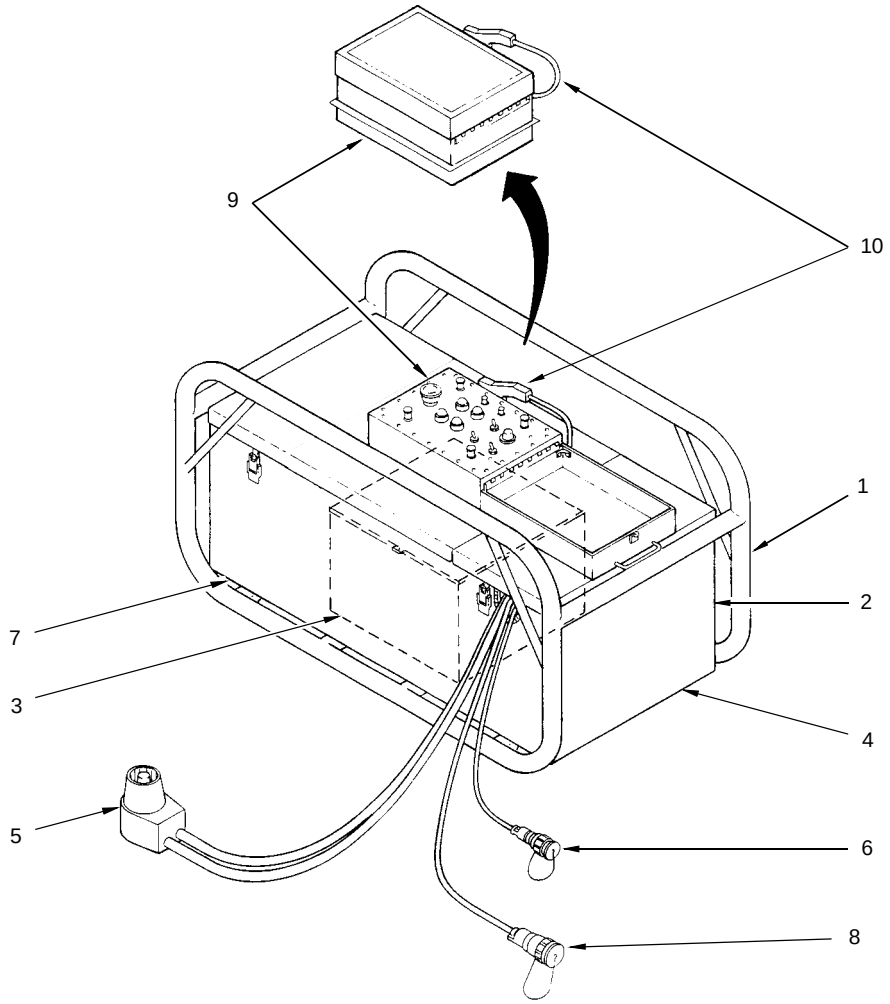


Figure 4. Accessory Module

Fuel Delivery Equipment

The fuel delivery equipment (nozzle kit, discharge hose kits, suction hose kit, drum fitting kit, discharge fitting kit, ground rod kit and drum adapter kit) presented here includes all the hoses, couplings, manifolds and nozzles required to carry fuel from the fuel drums to the four refueling points and to dispense the fuel to aircraft. Figure 5 is a pictorial representation of the AAFARS showing the fuel delivery equipment in the context of its use. Unisex couplings are used throughout with the exception of the fuel drum couplings and pump inlet manifold, which are camlock to interface with the camlock couplings integral to the fuel drums. Individual components are described in the following paragraphs.

Fuel Hoses

AAFARS employs two different types of fuel hoses: collapsible and non-collapsible. The only other distinction between hoses is the size: some are two-inch, some are three-inch. All AAFARS fuel hoses are light weight, elastomer hoses with an imbedded static wire which contacts the coupling at each end to provide electrical continuity from end to end. All the fuel hoses are terminated in valved unisex couplings which allow isolation of any hose length in case of emergency or failure. The unisex couplings are provided with dust caps to prevent entry of dirt or debris when any hose end is not coupled to another hose or fitting.

The suction hoses are two-inch diameter non-collapsible hoses. Non-collapsible hoses are used to ensure a free flow of fuel from the drums to the pump. Since the non-collapsible hoses are semi-rigid and cannot be rolled, the length is restricted to seven feet to facilitate handling, transportation and storage. Two of the non-collapsible hoses also are used for fuel recirculation.

The fuel discharge hoses are three-inch diameter hoses to handle the volume of fuel required for four fueling points. One fuel delivery hose is a three inch diameter hose and the remaining fuel delivery hoses are two-inch diameter as shown in figure 5.

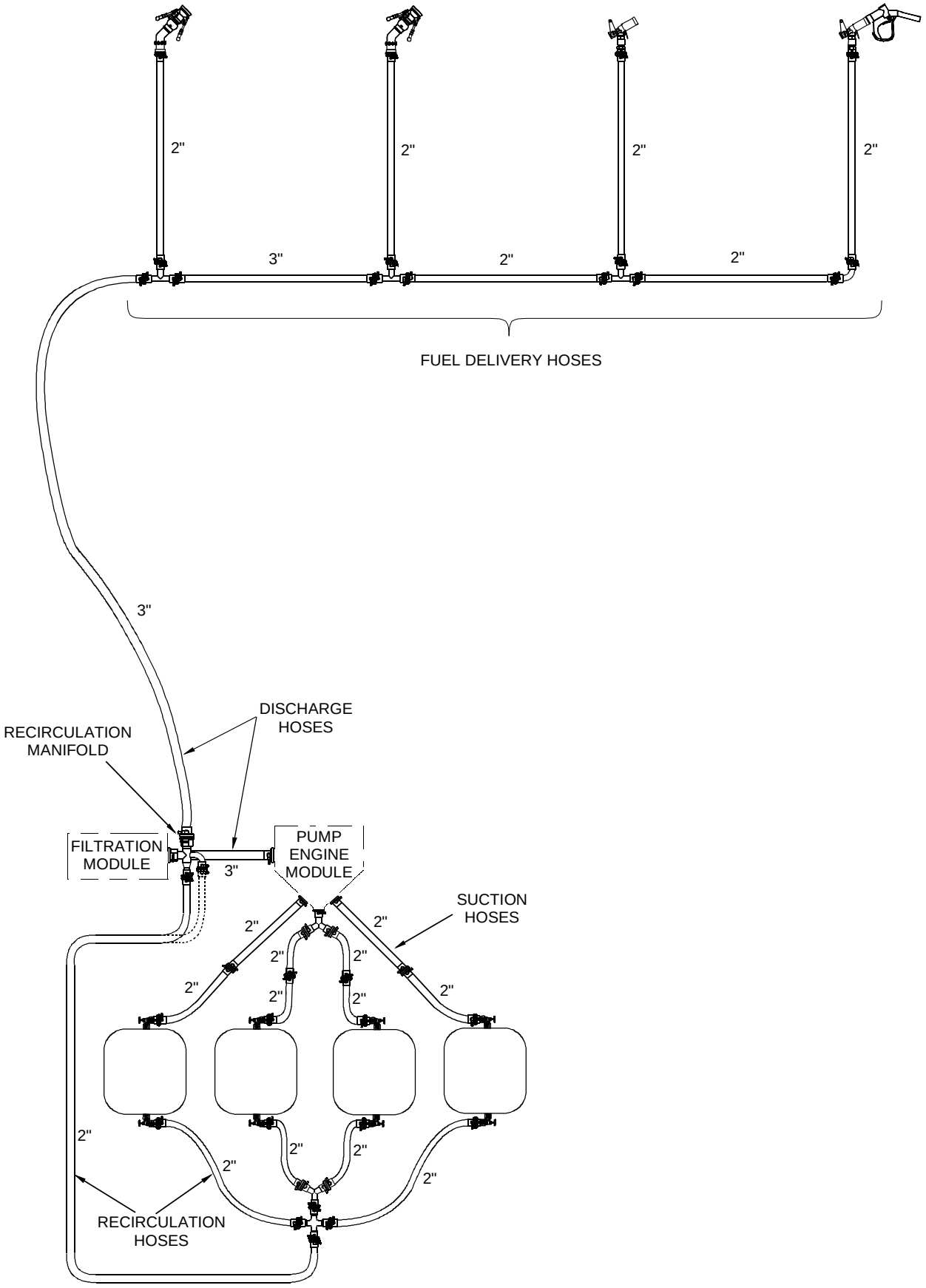


Figure 5. Fuel Delivery Equipment

D-1 Nozzle Assembly

The D-1 nozzle assembly (1), figure 6, is a four part assembly: D-1 nozzle (2) with a ground cable assembly (3), 45 psi regulator (4), 45 degree inlet (5), and a two-inch, non-valved unisex coupling (6). All the component parts rotate around the inlet/outlet for easier connection to the aircraft receiver and fuel hose.

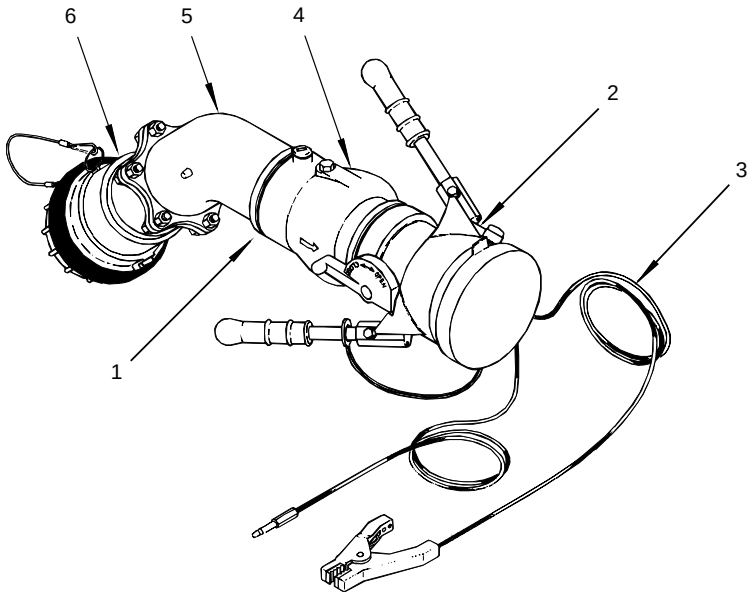


Figure 6. D-1 Nozzle Assembly

CCR Nozzle Assembly

The CCR nozzle assembly (1), figure 7, consists of a standard CCR nozzle (2) fitted with a two-inch, non-valved unisex coupling (3) and a grounding cable (4).

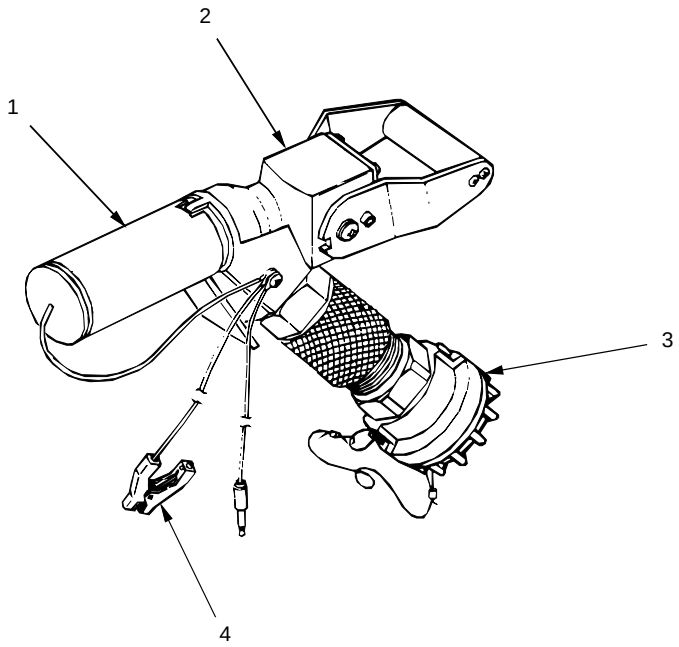


Figure 7. CCR Nozzle Assembly

Oil/Fuel Servicing Nozzle

An automatic shutoff oil/fuel servicing (open port) nozzle, figure 8, is provided to permit servicing of aircraft or vehicles not equipped with a D-1 or CCR receiver. The nozzle is fitted with a non-valved two-inch unisex coupling

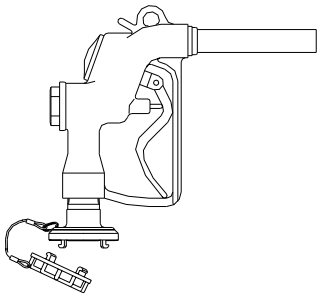


Figure 8. Oil/Fuel Servicing Nozzle

Unisex Couplings

All fuel delivery components are connected with unisex dry-break couplings. The use of valved unisex couplings allows any component to be isolated and removed from the system without defueling. The D-1 and CCR nozzles are subject to damage from fuel expansion and are fitted with non-valved unisex couplings to preclude trapping a quantity of fuel that could expand and damage a nozzle. Non-valved unisex couplings are used also on the fuel drum valved camlock elbow adapters because the elbow valve provides the necessary isolation.

Unisex couplings consist of two basic components: the coupling and the inlet. Figure 9 illustrates the types of inlets provided with the three-inch valved coupling. Figure 10 illustrates the types of 2-inch unisex coupling-inlet combinations. Figure 11 illustrates multiple unisex coupling-inlet combinations.

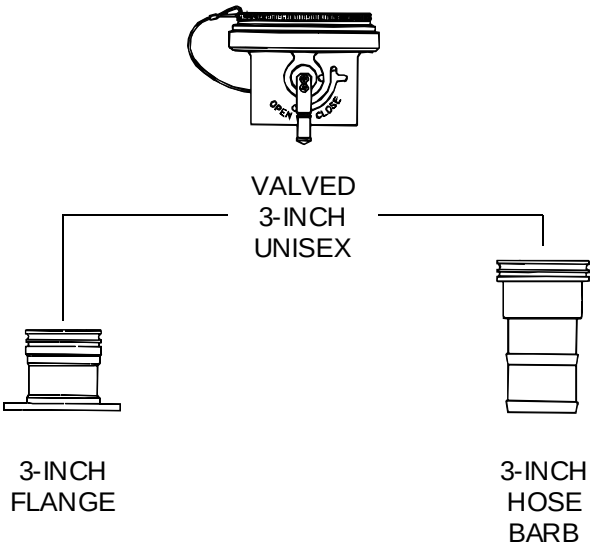


Figure 9. Three-Inch Unisex Coupling-Inlet Combinations

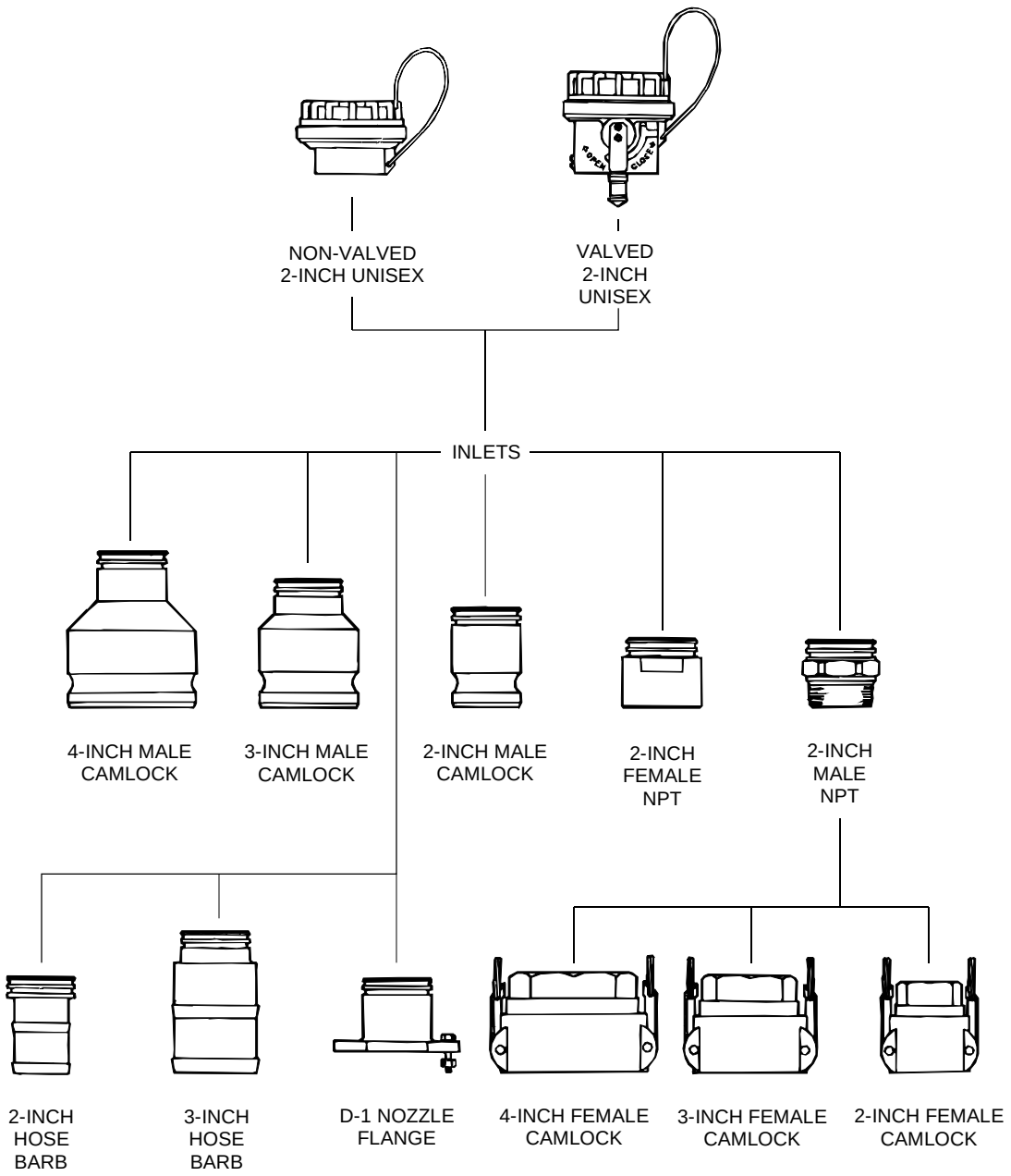


Figure 10. Single Two-Inch Unisex Coupling-Inlet Combinations

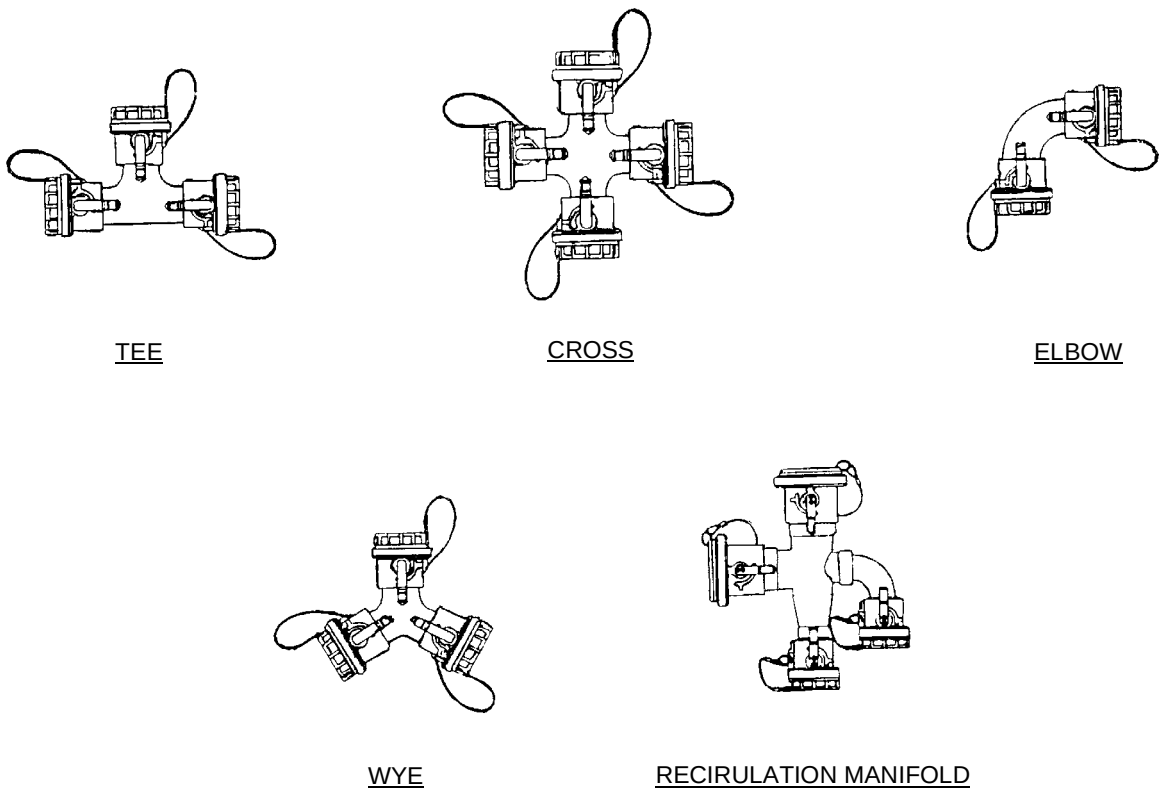


Figure 11. Multiple Unisex Coupling-Inlet Combinations

Drum Couplings

The AAFARS fuel hoses are connected to the fuel drums with valved elbow couplings, figure 12, with integral camlock couplers. The valve handle operates a poppet valve which, when opened, unseats and holds open the spring-loaded inlet or outlet valve in the fuel drum. Full travel (fully closed to fully open) requires approximately seven turns. When the poppet valve is closed, the valve stem is extended; when open, it is retracted. The stem travel is opposite that of conventional valves and requires the operator to double check valve position during system set up and tear down, since observation can be misleading.

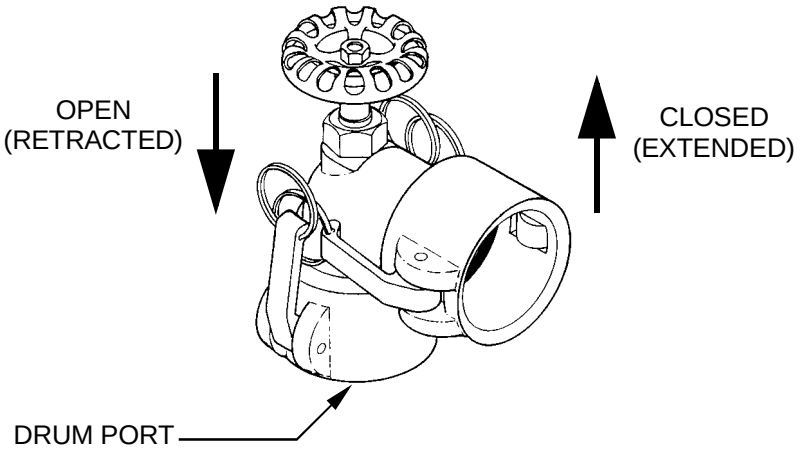


Figure 12. Valved Elbow Coupling

Auxiliary Pump Module

The auxiliary pump module, figure 13, consists of a 24 vdc electric pump (1) mounted in a tubular frame (2). The pump is equipped with an on/off switch (3) and two-inch valved unisex couplings (4) at both inlet and outlet. An electrical power connector (5) allows the pump to be connected to the auxiliary power leg of the battery power cable (W202) from the accessory module. The auxiliary power cable is 50 ft. (15.24 m) in length, allowing the auxiliary pump to be used anywhere within a 50 ft. (15.24 m) radius of the accessory module.

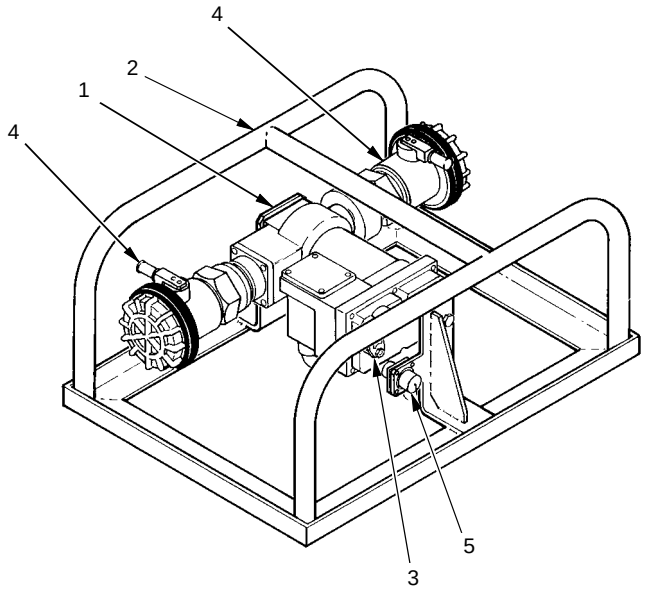


Figure 13. Auxiliary Pump Module

Manual Starter Kit

A manual starter, figure 14, is provided for use in those instances when the electric start system is inoperable due to extreme cold, weak battery, or physical damage to the system. The manual starter will operate reliably at -5° F. The starter is stowed and transported in a reusable container, as illustrated below. The starter is mounted on a bracket that allows it to be clamped to the engine end of the pump-engine module. It interfaces with the engine through a flexible coupling. For use, the starter is wound by hand and then released by a trip release handle.

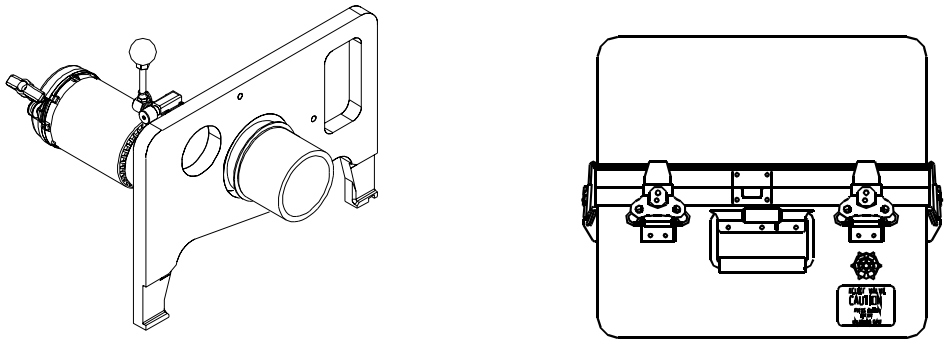


Figure 14. Manual Starter

TRICON Containers

The AAFARS is delivered in two TRICON containers, similar to that shown in figure 15 below. Each TRICON container has a loading plan diagram inside one door. Following the loading plan allows the entire AAFARS, including twelve fuel drums, to be packed in the TRICON containers for inter-theater deployment and storage.

The containers may be used as individual units or latched together by connecting links (4 provided with each container).

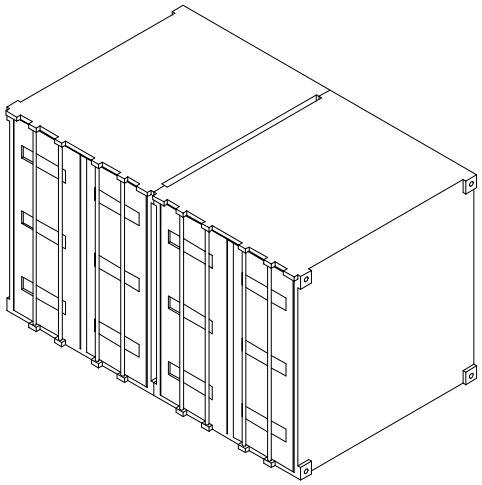


Figure 15. TRICON Containers

Fuel Drums

Twelve 500-gallon shortie fuel drums and one drum towing yoke, figure 16, are provided with each AAFARS. The fuel drums have ports on both ends to accommodate fuel recirculation. The fuel drums are hermetically sealed, non-venting and puncture resistant. However, should a puncture occur, an emergency repair kit is supplied with the system, designed to control the leak until the drum can be emptied.

The towing yoke separates into two pieces that fold flat for transportation and storage.

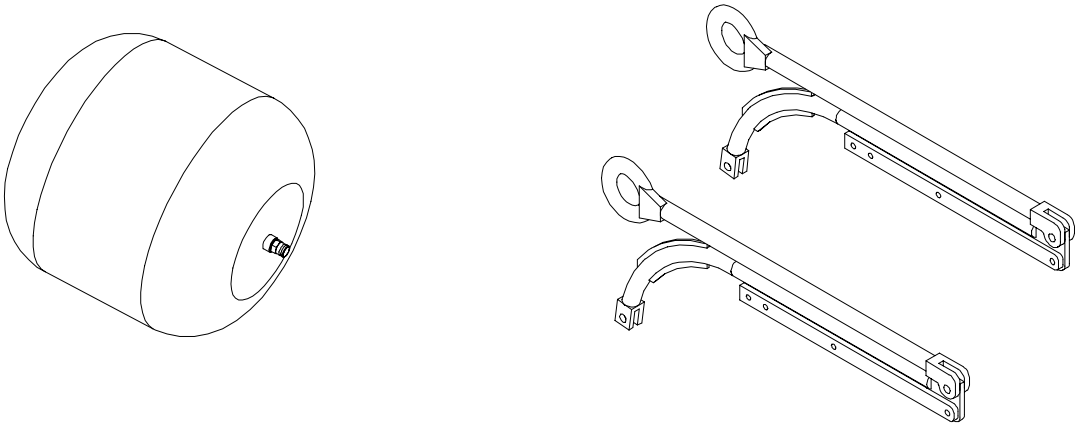


Figure 16. Fuel Drums and Drum Towing Yoke

Fuel Spill Kit

The fuel spill kit, figure 17, contains all the tools and materials required to contain and clean up fuel spills. A detailed list of the kit contents is included in table 1, Equipment Data.

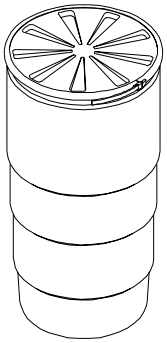


Figure 17. Fuel Spill Kit

Fuel Contamination Test Kit

The fuel contamination test kit, figure 18, contains all the materials and equipment required to perform comprehensive fuel testing to determine the quality of the fuel provided for refueling operations. For protection of the kit contents, the fuel contamination test kit is issued in a hard shell, reusable container. A detailed list of the kit contents is included in table 1, Equipment Data.

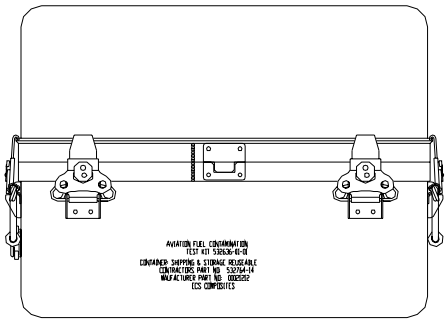


Figure 18. Fuel Contamination Test Kit

Spill Containment Units

The AAFARS system includes two spill containment units (figure 19). Each unit is 25 feet long, 15 feet wide and 12 inches deep, and is equipped with 32 L-shaped, swing away aluminum rods to support the sides. One unit is intended to hold four fuel drums, the second to hold the pump-engine module, the accessory module and the liquid fuel filter separator.

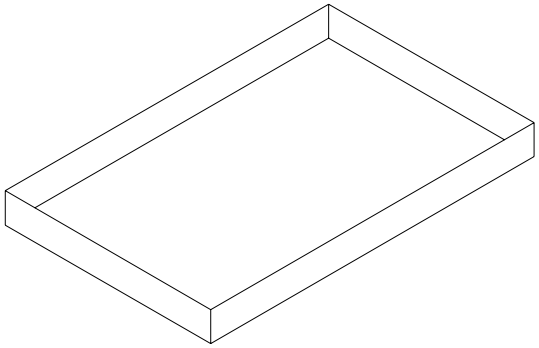


Figure 19. Spill Containment Unit

Pressure Control

A pressure control (figure 20) is provided for use during fuel drum filling. A pressure control is attached between the pump assembly and a drum during filling operations. The purpose of the pressure control is to automatically shut off the fuel flow to the drum when the internal pressure of the drum is 3 to 5 psi (0.3 to 0.4 kg/sq cm). The automatic action prevents over-pressurizing the drum.

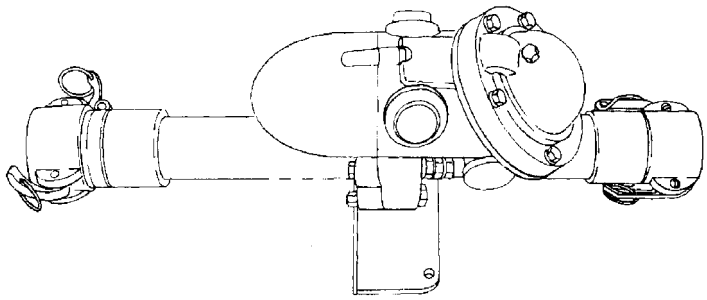


Figure 20. Pressure Control

EQUIPMENT DATA

The following is a tabular presentation of all physical and performance data required for the operation and maintenance of the AAFARS.

Table 1. Equipment Data

DESCRIPTION	QTY	LEADING PARTICULARS	
Pump-Engine Module	1	Weight:	322 lb (146.1 kg) with Engine Module 154 lb (96.9 kg) w/o Engine Module
		Length:	45.48 in. (1155.2 mm)
		Width:	36.25 in. (920.8 mm)
		Height:	28 in. (711.2 mm)
Engine Module	1	Weight:	166 lb (75.3 kg)
		Length:	22.37 in.(568.3 mm)
		Width:	19.64 in. (498.8 mm)
		Height:	18 in. (458.1 mm)

Table 1. Equipment Data (Continued)

DESCRIPTION	QTY	LEADING PARTICULARS
Engine	1	Deutz Ruggerini Model 191_EPA Four cycle, air cooled, direct-injected diesel 2 cylinder Displacement: 52 cu. In. (851 cm3) Output (max): 19 HP (19.27 HP) @ 3400 RPM Torque (max): 29.9 ft. lbs. (40.5 nm) @ 2400 RPM Compression Ratio: 19:1 Dry Weight: 147 lb (66.68 kg) Oil Capacity: 1.9 qts. (1.8 ltrs.) Fuel Capacity: 1.2 gal. (4.5 ltrs.)
Fuel Transfer Pump	1	Weight: 39 lb (17.7 kg) Operating Temperature Range: 120°F (48.9°C) to –25°F (-31.7°C) Flow Rate: 265 gpm (60 m3/hr) minimum rating
Liquid Fuel Filter-Separator	1	Weight (dry): approx. 137 lb (62.1 kg) Weight (drained): approx. 147 lb (66.7 kg) Weight (full): 317 lbs (143.8 kg) Length: 55 in (1397 mm) Width: 20 in (508 mm) Height: 24 in (609.6 mm)
Accessory Module	1	Weight: 132 lb (59.9 kg) with battery installed w/o Battery: 51.92 lb (23.5 kg) Battery: 80.08 lb (36.4 kg) Length: 40.25 in (1022.4 mm) Width: 21.75 in (552.5 mm) Height: 22.00 in (558.8 mm)
Auxiliary Pump Module	1	Weight: 32 lb (14.5 kg)
Pump Assembly, Auxiliary	1	2 in. non-valved unisex input and output couplings 24 Vdc, 10 amp motor Flow rate: 13 gpm (49.2 lpm) maximum
Nozzle Kit	4	Kit weight: 32 lbs (14.52 Kg)
CCR Nozzle Assembly	1	Weight: 10 lbs (4.5 kg) Mil-Spec CCR nozzle with strainer and 2-inch, non-valved unisex inlet coupling Limits outlet pressure to 15 psi (1 kg/cm2)
D1 Nozzle Assembly	1	Weight : 12 lbs (5.4 kg) Mil-Spec D-1 nozzle with 45 psi (32 kg/cm2) regulator and 2-inch, non-valved unisex inlet coupling
Fuel and Oil Servicing Nozzle	1	Weight: 9 lbs (4.1 kg) Mil-Spec oil servicing nozzle with strainer and 2-inch, non-valved unisex inlet coupling

Table 1. Equipment Data (Continued)

DESCRIPTION	QTY	LEADING PARTICULARS
Bag, Fuel System	1	Textured nylon duck cloth IAW MIL-C-43734, class 3
Discharge Hose Kit, PN 532602-01-01	1	Kit weight: 122 lbs (55.3 kg)
Hose, 2 in x 50 ft, Collapsible	3	Elastomer, light weight (approx 38 lbs.), collapsible fuel hose 2 in. valved unisex coupling at each end Working pressure: 75 psi (5.3 kg/cm2) Test pressure: 150 psi (10.5 kg/cm2) Electrical resistance across assembly: Not more than 100 ohms
Hose Strap Assembly	3	Quick release buckle
Bag, Fuel System	1	Textured nylon duck cloth IAW MIL-C-43734, class 3
Discharge Hose Kit, PN 532606-01-01	1	Kit weight: 110 lbs (49.89 kg)
Hose, 3 in x 100 ft, Collapsible	1	Elastomer, light weight (aprox. 105 lbs), collapsible fuel hose 2 in. valved unisex coupling at one end, 3 in. valved unisex coupling at other end Working pressure: 75 psi (5.3 kg/cm2) Test pressure: 150 psi (10.5 kg/cm2) Electrical resistance across assembly: Not more than 100 ohms
Hose Strap Assembly	2	Quick release buckle
Bag, Fuel System	1	Textured nylon duck cloth IAW MIL-C-43734, class 3
Discharge Hose Kit, PN 532603-01-01	1	Kit weight: 111 lbs (50.3 kg)
Hose, 2 in x 50 ft, Collapsible	2	Elastomer, light weight (approx. 38 lbs), collapsible fuel hose 2 in. valved unisex coupling at each end Working pressure: 75 psi (5.3 kg/cm2) Test pressure: 150 psi (10.5 kg/cm2) Electrical resistance across assembly: Not more than 100 ohms
Hose, 2 in x 12 ft, Collapsible	2	Elastomer, light weight (approx. 14 lbs.), collapsible fuel hose 2 in. valved unisex coupling at each end Working pressure: 75 psi (5.3 kg/cm2) Test pressure: 150 psi (10.5 kg/cm2) Electrical resistance across assembly: Not more than 100 ohms
Hose Strap Assembly	4	Quick release buckle
Bag, Fuel System	1	Textured nylon duck cloth IAW MIL-C-43734, class 3
Discharge Hose Kit, PN 532607-01-01	1	Kit weight: 107 lbs (48.53 kg)

Table 1. Equipment Data (Continued)

DESCRIPTION	QTY	LEADING PARTICULARS
Hose, 3 in x 100 ft, Collapsible	1	Elastomer, light weight (approx. 102 lbs), collapsible fuel hose 2 in. valved unisex coupling at each end Working pressure: 75 psi (5.3 kg/cm2) Test pressure: 150 psi (10.5 kg/cm2) Electrical resistance across assembly: Not more than 200 ohms
Hose Strap Assembly	2	Quick release buckle
Bag, Fuel System	1	Textured nylon duck cloth IAW MIL-C-43734, class 3
Discharge Hose Kit, PN 532604 -01-01	1	Kit weight: 74 lbs (33.56 kg)
Hose, 2 in x 100 ft, Collapsible	1	Elastomer, light weight (approx. 69.2 lbs), collapsible fuel hose 2 in. valved unisex coupling at each end Working pressure: 75 psi (5.3 kg/cm2) Test pressure: 150 psi (10.5 kg/cm2) Electrical resistance across assembly: Not more than 100 ohms
Hose Strap Assembly	2	Quick release buckle
Bag, Fuel System	1	Textured nylon duck cloth IAW MIL-C-43734, class 3
Discharge Hose Kit, PN 532605-01-01	1	Kit weight: 94 lbs (42.63 kg)
Hose, 2 in x 100 ft, Collapsible	1	Elastomer, light weight (approx. 69.2 lbs), collapsible fuel hose 2 in. valved unisex coupling at each end Working pressure: 75 psi (5.3 kg/cm2) Test pressure: 150 psi (10.5 kg/cm2) Electrical resistance across assembly: Not more than 100 ohms
Hose, 3 in x 6 ft, Collapsible	1	Elastomer, light weight (approx. 20 lbs.), collapsible fuel hose 2 in. valved unisex coupling at each end Working pressure: 75 psi (5.3 kg/cm2) Test pressure: 150 psi (10.5 kg/cm2) Electrical resistance across assembly: Not more than 34 ohms
Hose Strap Assembly	3	Quick release buckle
Bag, Fuel System	1	Textured nylon duck cloth IAW MIL-C-43734, class 3
Suction Hose Kit PN 532601-01-01	2	Kit weight: 71 lbs (32.2 kg)
Hose, 2 in x 7 ft, Non-Collapsible	5	Elastomer, light weight (approx. 13.0 lbs), non-collapsible fuel hose 2 in. valved unisex coupling at each end Working pressure: 75 psi (5.3 kg/cm2) Test pressure: 150 psi (10.5 kg/cm2) Electrical resistance across assembly: Not more than 34 ohms

Table 1. Equipment Data (Continued)

DESCRIPTION	QTY	LEADING PARTICULARS
Hose Strap Assembly	2	Quick release buckle
Bag, Fuel System	1	Textured nylon duck cloth IAW MIL-C-43734, class 3
Drum/Discharge Fitting Kit PN 532612-01-01	1	Kit weight:
2 in. Non-Valved Unisex to 2 In. Male Camlock Adapter	8	Weight: 2.37 lbs. (1.07 kg) Non-valved 2 in. unisex coupling to 2 in. male camlock coupling Connects 2 in. fuel hoses to valved elbow coupler at fuel drum Electrical resistance across assembly: not more than 25 ohms
Tee	3	Weight: 7 lbs (3.17 kg) 2 in. valved unisex coupling Electrical resistance across assembly: not more than 25 ohms
Valve, Elbow Coupler	8	Weight: 2 lbs (0.9 kg) Test pressure: 150 psi (10.5 kg/cm2) 2 inch female unisex couplings on each end for coupling to 500 gal (1893 l) fuel drum
Reusable Container	1	SAE ARP 1967, 25 lbs
Drum/Discharge Fitting Kit PN 532612-01-02	1	Kit weight: 41 lbs (18.59 kg)
2 in. Cross	1	Weight: 10 lbs. (4.53 kg) 2 in. valved unisex couplings Electrical resistance across assembly: not more than 25 ohms
2 in. Wye	1	Weight: 6.8 lbs. (3.06 kg) 2 in. valved unisex couplings Electrical resistance across assembly: not more than 25 ohms
Elbow	1	Weight: 4.8 lbs (2.17 kg) 2 in. valved unisex coupling Electrical resistance across assembly: not more than 25 ohms
Recirculation Manifold	1	Weight: 16 lbs (7.25 kg) Special Cross: Two 3 in. valved unisex couplings Two 2 in. valved unisex couplings One 2 in. leg has reduced bore to limit re-circulation flow to 5 gpm (18.9 lpm) Electrical resistance across assembly: not more than 25 ohms
Bag, Fuel System	1	Textured nylon duck cloth IAW MIL-C-43734, class 3

Table 1. Equipment Data (Continued)

DESCRIPTION	QTY	LEADING PARTICULARS	
Drum Adapter Kit PN 532611-01-01	1	Kit weight:	79 lbs (35.83 kg)
2 in. Unisex to 2 in. Male Camlock Adapter	4	Weight:	3.1 lbs (1.4 kg)
2 in. Unisex to 3 in. Male Camlock Adapter	2	Weight:	3.5 lbs (1.6 kg)
2 in. Unisex to 3 in. Female Camlock Adapter	2	Weight:	5.5 lbs (2.5 kg)
2 in. Unisex to 2 in. Female Camlock Adapter	4	Weight:	4.6 lbs (2.1 kg)
2 in. Unisex to 4 in. Male Camlock Adapter	1	Weight:	3.75 lbs (1.7 kg)
2 in. Unisex to 4 in. Female Camlock Adapter	1	Weight:	7.3 lbs (3.3 kg)
2 in. Unisex to Female NATO Connector Adapter	1	Weight:	12.75 lb. (5.78 kg)
2 in. Unisex to Male NATO Connector Adapter	1	Weight:	6.75 lb. (3.06 kg)
Adapter, Male by Male, Camlock	1	Weight:	0.5 lb (0.22 kg)
Bag, Fuel System	1	Textured nylon duck cloth IAW MIL-C-43734, class 3	
Storage Module	1	Kit weight:	69 lbs (31.3 kg)
NATO Intervehicular Cable	1	Weight:	30.25 lbs (13.7 kg)
Air Intake Assembly	1	Weight:	3.75 lbs (1.7 kg)
Manifold, Inlet, 2” Unisex	1	Weight:	15.75 lbs (7.1 kg)

Table 1. Equipment Data (Continued)

DESCRIPTION	QTY	LEADING PARTICULARS
Flexible Coupling	1	Weight: 0.75 lbs (0.34 kg)
Engine Special Tools Kit	1	Contents: Bearing remover, flywheel extractor, assembly tool, fuel delivery sight gauge, and gear extractor
Bag, Fuel System	1	Textured nylon duck cloth IAW MIL-C-43734, class 3
Drum, Fuel, 500 gallon	4	Weight (empty): approx. 245 lb (111.1 kg) Weight (full): 3767 lbs (1695 kg) Length: 80 in. (2032 mm) Diameter: 46 in. (1168.4 mm) Cubage (full): 70 cu. Ft. (1.98 m^3) Shipping volume: 125 cu. Ft. (3.54 m^3)
TRICON Container	2	Weight: 2600 lb. (1180 kg) tare 14,900 lb. (6759 kg) max gross 12,300 lb. (5579 kg) payload External Length: 96 in. (2438 mm) Width: 77.5 in. (1968 mm) Height: 96 in. (2438 mm) Internal Volume: 346 cu. Ft. (9.86 m^3)
Grounding Rod Kit	1	Kit Weight: 66 lb. (29.9 kg) Shipping volume: 0.32 cu. Ft. (0.06 m^3)
Grounding Rod	5	Weight: 12 lb. (5.4 kg) Length: 67 in. (1701.8 mm)
Bag, Fuel System	1	Textured nylon duck cloth IAW MIL-C-43734, class 3
Pressure Control	1	Crated: Weight: 40 lbs (18 kg) Length: 25 in. (64 cm) Width: 25 in. (64 cm) Height: 9 in. (23 cm) Uncrated: Weight: 16 lbs (7 kg) Length: 24 in. (61 cm) Width: 6 in. (15 cm) Height: 7½ in. (19 cm)
Fire Extinguisher w/Frame	2	Weight (empty): 18 lbs (8.2 kg) 3 extinguisher rack loaded: 131.7 lbs (59.74 kg) 2 extinguisher rack loaded: 93.8 lbs (42.55 kg) Both racks loaded: 225.5 lbs (102.37 kg) Length: 28 in. (711.2 mm) Width: 10 in. (254 mm) Height: 25 in. (635 mm) Capacity: 3 extinguishers per frame
Extinguisher	5	38 lbs (17.3 kg) Dry Chemical

Table 1. Equipment Data (Continued)

DESCRIPTION	QTY	LEADING PARTICULARS
Spill Containment Unit	2	Weight: 136 lbs (61.7 kg) Length: 300 in. (7620 mm) Width: 180 in. (4572 mm) Height: 12 in. (304.8 mm) Capacity: 2805 U.S. gal. (10,618 l)
Fuel Spill Control Kit	1	Weight: 254 lb (115.2 kg) Contents: Sorbent Oil (Pad, Non-Reusable), 15 ea, PN 39618 (6M644) Sorbent Oil (Particulate, Bag), 3 ea, PN PLP201 (1JA49) Sorbent Oil (Enclosed, Boom Type), 6 ea, PN BOM406 (1JA49) Sorbent Oil (Enclosed, Pillow Type), 12 ea, PN 33426 (6M644) Bag, Disposal, Hazmat, w/Strip Tie, 6 ea, PN BAG202-S (1JA49) Drum, 55 Gallon, 1 ea, PN 28410 (6M644) Gloves, Size 9, 2 ea, PN GRI-2818-09 Gloves, Size 11, 2 ea, PN GRI-2818-11 Goggles, 2 ea, PN 54876 (6M644) Pail, 5 Gallon, 2 ea , PN DRM525 (1JA49) Pan, Drip, 12 ea, PN 13557 (6M644) Tie Strip, Bag, 12 ea, PN 2227-2 (6M644) Plate, Caution, 1 ea, PN 20145AL (6M644) Shovel, Hand, 2 –Piece, 1 ea, PN GEN305 (1JA49)
Drum Towing Yoke	1	Weight: 65 lbs (29.48 kg)
Manual Starter Kit	1	Weight: 76 lbs (34.47 kg)
Fuel Contamination Test Kit	1	Weight: 34.5 lb (15.7 kg) Contents: API Gravity Calculator, 1 ea, PN GTP-3012-1 (32218) Thermohydrometer, 29-41 API Range, 3 ea, PN GTP-1706 (32218) Thermohydrometer, 39-51 API Range, 3 ea, PN GTP-1707 (32218) Thermohydrometer, 49-61 API Range, 2 ea, PN GTP-1708 (32218) Thermohydrometer, 59-71 API Range, 2 ea, PN GTP-1709 (32218) Thermohydrometer, 69-81 API Range, 2 ea, PN GTP-1710 (32218) Hydrometer Cylinder, 2 ea, PN 532677-01 (63631) Mark II Mini Monitor Housing Assembly 1 ea, PN GTP-172H (32218) Syringe, 1 ea, PN GTP-165 (32218) Monitor, Matched Weight, 5 ea, PN GTP-1986 (32218) Flexible Extension Tube, 1 ea, PN GTP-5808 (32218) Dust Cap, 1 ea, PN GTP-1232 (32218) Color Rating Booklet, ASTM, 1 ea, PN GTP-1074-1 (32218) Monitor, Single Membrane With Pad, 6 ea, PN GTP-1985 (32218) Quick Disconnect Coupler, 1 ea, PN GTP-992-4MS (32218)

Table 1. Equipment Data (Continued)

DESCRIPTION	QTY	LEADING PARTICULARS
Fuel Contamination Test Kit (Continued)		Valved Actuator With Cap, 1 ea, PN GTP-1253-1 (32218) Aqua Glo Series III Instrument Pack, Light, Chamber, and Power Cord, 1 ea, PN GTP-2855 (32218) Monitor, For 25mm Pads, 1 ea, PN GTP 3326 (32218) Tweezers, 1 ea, PN GTP-293 (32218) External Battery, 2 ea, PN GTP-2404 (32218) External Battery Power Cord, 1 ea, PN GTP-2403 (32218) Ultraviolet Light Bulb, 1 ea, PN GTP-2380 (32218) Calibration Standard, 1 ea, PN GTP-835 (32218) Water Detector Pads, 50 ea, PN GTP-25 (32218) Solvent Dispenser Bottle, 1 ea, PN 532679-03 (63631) Ether, Petroleum, Technical-Grade, 1 ea, PN O-E-751B Sample Bottle, 1 ea, PN 532678-01 (63631) Antiseize Tape, 1 ea, PN 532763-02 (63631) Wrench, Adjustable, 1 ea, PN 532681-01 (63631) Container, w/Liner Inserts, 1 ea, PN 532636-01 (63631) Ether Storage Bottle, 1 ea, PN 532683-01 (63631) Sorbent Oil Pad (Non-Reusable), 1 ea, PN 39618 (6M644)

OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1 THEORY OF OPERATION

GENERAL FUNCTIONAL DESCRIPTION

The AAFARS setup, figure 1, is composed of four functional subsystems: the pumping subsystem, the power subsystem, the electrical subsystem and the defueling subsystem. The four subsystems are described in detail in the following paragraphs.

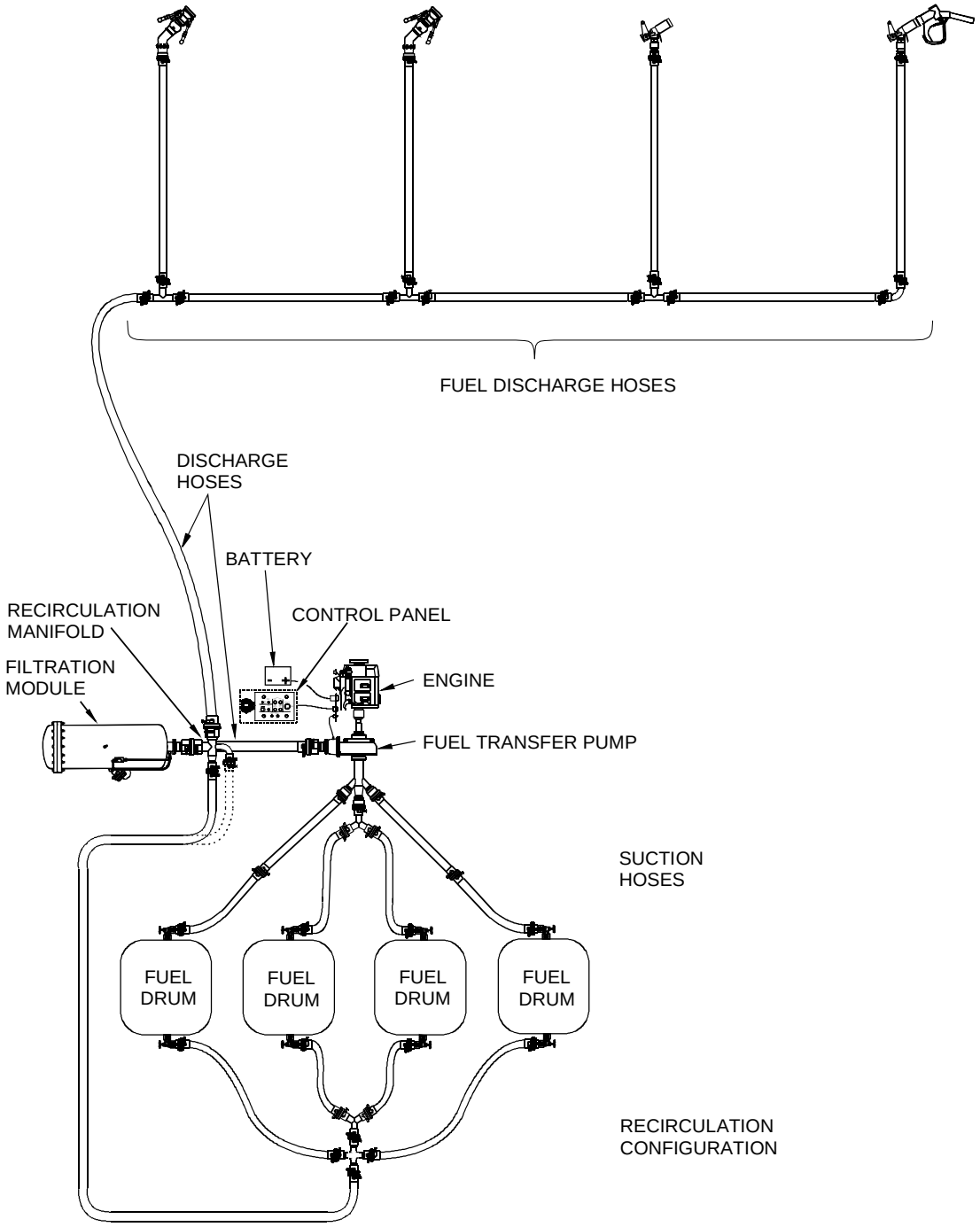


Figure 1. Typical AAFARS Setup

PUMPING SUBSYSTEM

The pumping subsystem, figure 2, performs the functions associated with pumpage flow from the fuel drums to the fueling points: suction, discharge, and recirculation. The primary component of the pumping subsystem is the fuel transfer pump. The suction side of the pump is supplied by non-collapsible hoses connected in parallel to the outlet side of the fuel drums. Pumpage from the discharge side of the pump moves through the liquid fuel filter-separator to the fueling points. Fueling is accomplished at four fueling points, using any combination of D1, CCR or oil/fuel servicing nozzles. Fuel recirculation occurs continually during system operation.

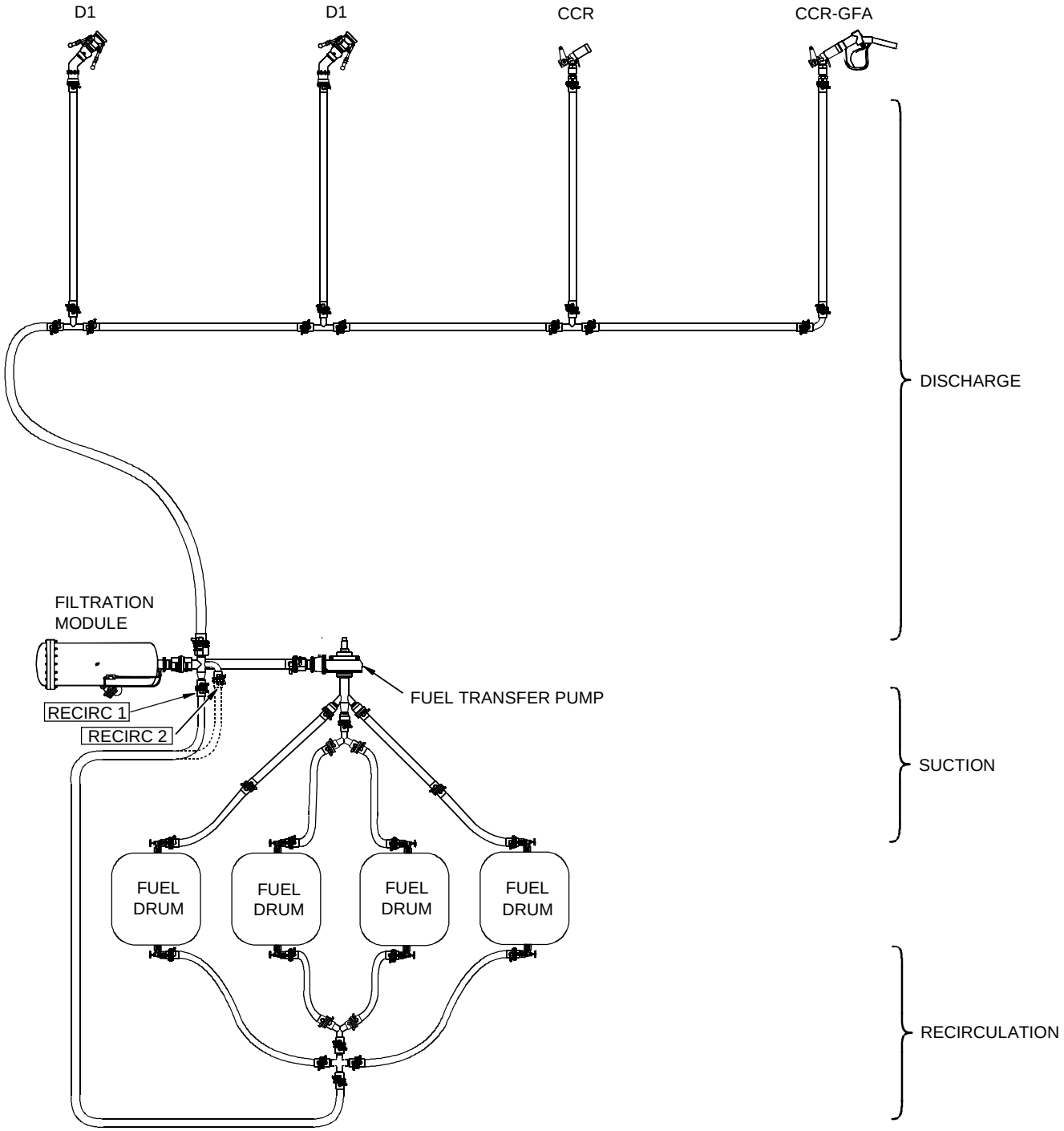


Figure 2. Pumping Subsystem

The fuel transfer pump is a centrifugal pump with an impeller to move the pumpage. A positive displacement, rotary vane pump on the same shaft serves as a priming pump for the main impeller, allowing the pump to be started with a dry system. Fuel is drawn from the fuel drums through suction hoses into a three-way pump inlet manifold. The impeller rotation induces a swirling motion in the fuel in the body of the manifold which, if not corrected, would cause the pump to cavitate. To correct this situation, three equally spaced fins in the manifold outlet straighten the flow, reducing pump cavitation and increasing efficiency. The inlet manifold empties directly into the main impeller cavity of the fuel transfer pump which discharges the pumpage through a discharge housing to the liquid fuel filter-separator. A flapper-type check valve in the discharge housing prevents the flow of fuel back into the fuel transfer pump, enabling the integral vane pump to move fuel.

The filter-separator module, figure 3, houses a horizontal vessel containing three coalescer elements (1) to remove particles from the pumpage and coalesce entrained water, and a separator element (2) covered by a teflon coated screen to remove the water drops from the pumpage. The coalescer elements (1) are arranged in the lower portion of the filter vessel and the separator element (2) is placed in the upper portion. The coalescer elements (1) are mounted to an inlet bulkhead (3) which creates an inlet chamber in the inlet/outlet end of the filter vessel. The outlet port (4) passes completely through the chamber. Incoming pumpage impacts a diverter plate (5) which prevents the pumpage from forcefully impacting the lower coalescer element (1) and equalizes the pressure in the chamber. Pumpage flows from the inlet chamber to the interior of the coalescer elements (1) and through the coalescer elements into the filter vessel. As the pumpage passes through the coalescer elements (1), particles of matter are trapped in the element and droplets of water are coalesced (grouped and formed) into larger drops. As the pumpage is forced up towards the separator element (2), the force of gravity causes more particles to fall down to the sump (6). At the separator element (2), the teflon coated screen allows the fuel to pass but repels the relatively large water drops, which fall into the sump (6). The pumpage flows from the outside to the inside of the separator element (2) and out the filter vessel outlet port (4).

This process continues as long as the pumpage flows. Most of the particulate matter and entrained water is removed during the first pass through the filter separator. Recirculation produces increasingly cleaner pumpage.

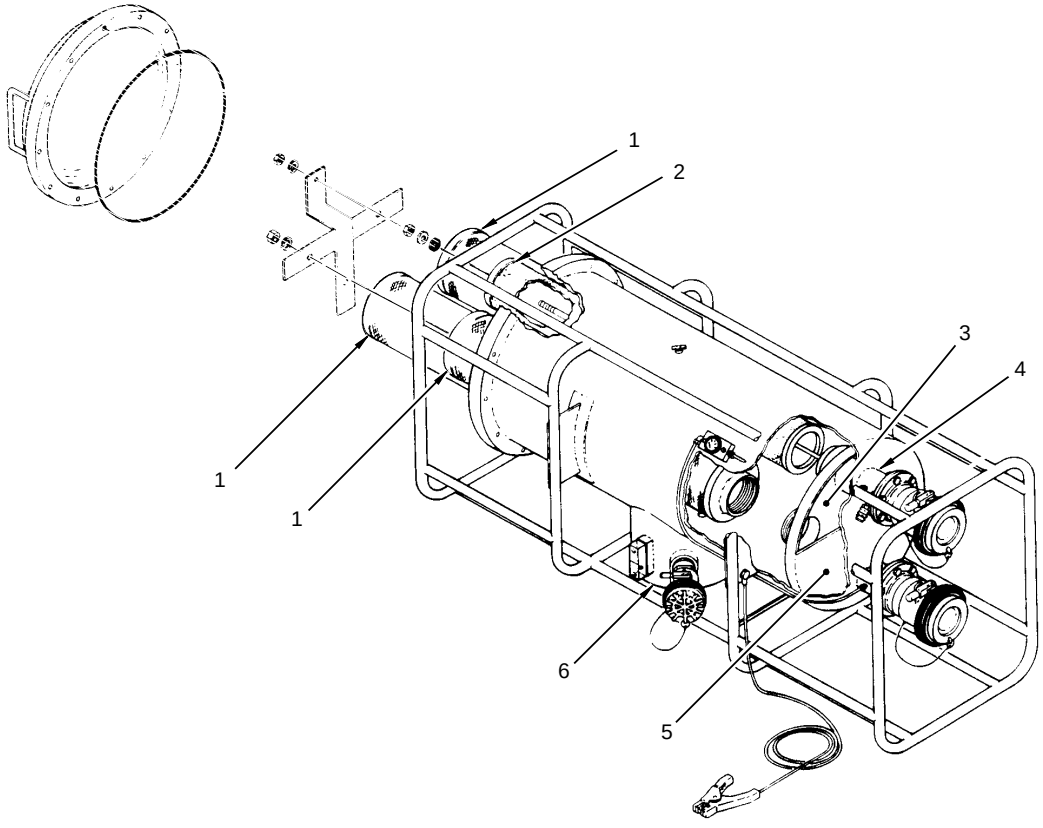


Figure 3. Liquid-Fuel Filter Separator

The recirculation manifold provides three outlet ports. A three-inch outlet passes pumpage to a three-inch, fifty-foot discharge hose and on to the delivery hoses and nozzles. Two-inch outlets are provided for recirculation of a portion of the pumpage. One of the two-inch outlets (RECIRC 2) allows full flow recirculation; the other two-inch outlet (RECIRC 1) has a reduced bore to limit recirculation to five gpm.

The pumping subsystem design incorporates a recirculation capability to continuously filter the pumpage, and maintain pumpage pressure and temperature within safe limits for continuous operation. The system provides two modes of recirculation: RECIRC 1 from the recirculation manifold limits recirculation to five gpm (normal fueling operation) while RECIRC 2 allows full flow recirculation from the recirculation manifold. Each mode routes the pumpage through two-inch hoses and a cross-wye fitting assembly to the fuel drum inlets.

POWER SUBSYSTEM

The diesel engine (1), fuel tank (2), fuel selector valve (3), fuel filter (4), and fuel supply line (5) and return line (6) comprise the diesel power subsystem, figure 4. A splined adapter flexible coupling (7) on the engine output shaft mates with a flexible coupling (8) attached to the input shaft of the fuel transfer pump to provide system power.

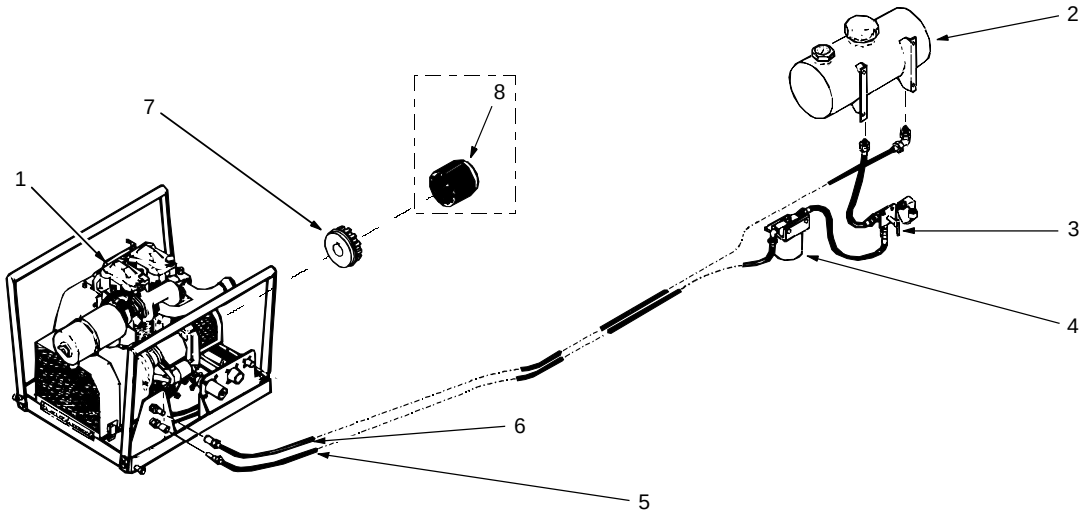


Figure 4. AAFARS Power Subsystem

The diesel is a compression ignition engine: ignition is achieved by compressing a fuel-air mixture in a cylinder until the heat generated by compression causes the mixture to ignite. The resulting combustion causes the mixture to expand, forcing the piston to move. The diesel engine is a two cylinder, direct injection engine. An individual fuel injector and injection pump supplies pressurized fuel alternately to each cylinder.

An on-board fuel tank is the normal fuel source for engine operation. However, a fuel selector valve allows selection of an external fuel source, if desired. A fuel filter/water coalescer in the supply line removes impurities and water from the fuel, regardless of source. The engine fuel pump continuously supplies fuel to the fuel injection pumps; a fuel return line allows surplus fuel to return to the fuel tank.

ELECTRICAL SUBSYSTEM

All electrical power distribution, control and monitoring is performed by the electrical subsystem. The subsystem consists of the system battery, the control panel, the alternator, the voltage regulator, the engine starting motor, the auxiliary pump, various engine and pumpage sensors, controls, and the interconnecting cables.

DEFUELING SUBSYSTEM

The defueling subsystem consists of the auxiliary pump module connected in the AAFARS to pump fuel from system components to the fuel drums. Figure 5 illustrates one common configuration. The auxiliary pump is a rotary vane, positive displacement pump capable of a maximum flow rate of 15 gpm. It is equipped with two-inch unisex couplings at inlet and outlet, allowing it to be connected directly to almost every system component. It may be used to defuel the entire system, or an individual component such as the liquid fuel filter-separator or even a single length of hose.

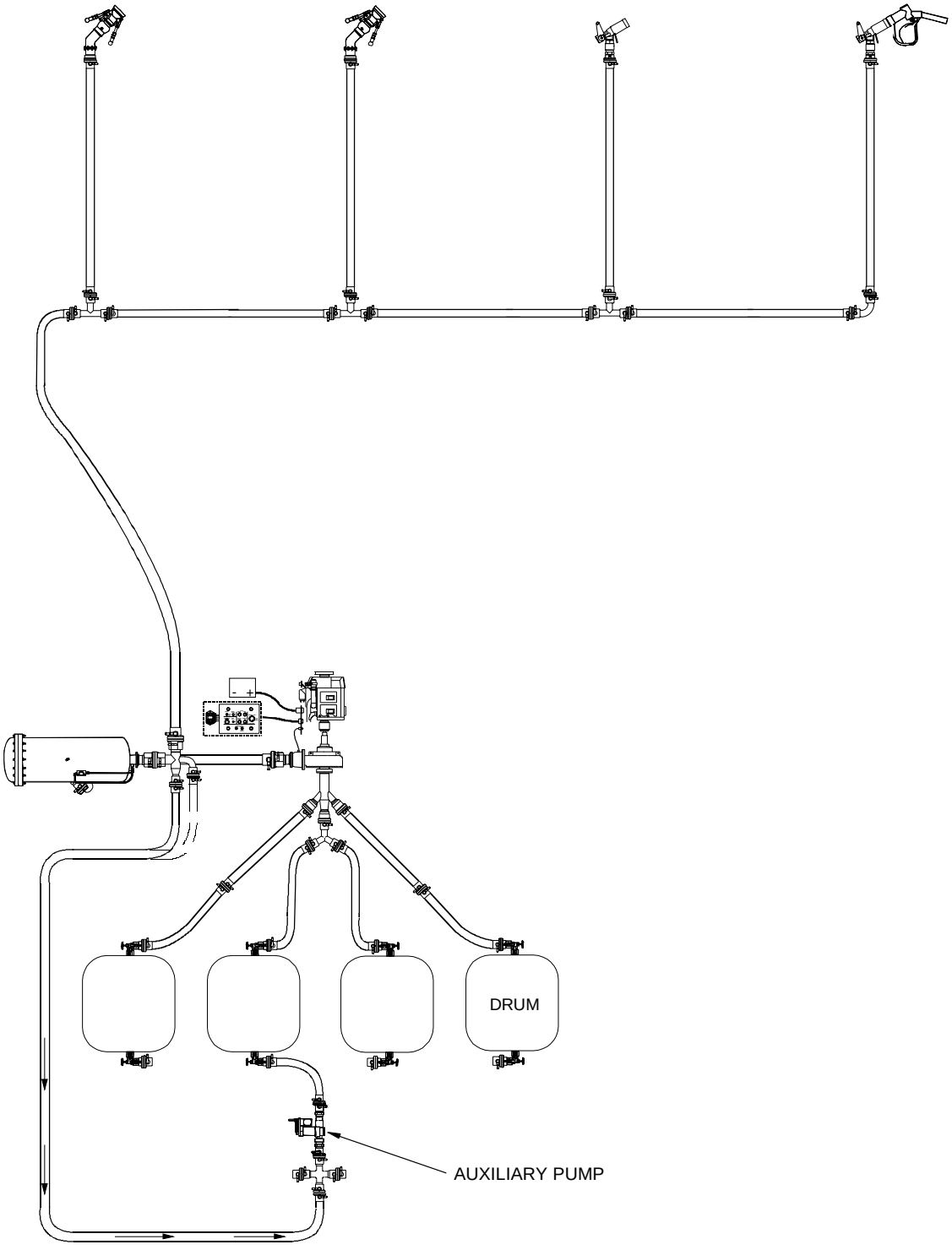


Figure 5. Defueling Subsystem

CHAPTER 2

OPERATOR INSTRUCTIONS
FOR
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM

OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1 DESCRIPTION AND USE OF OPERATOR CONTROLS AND INDICATORS

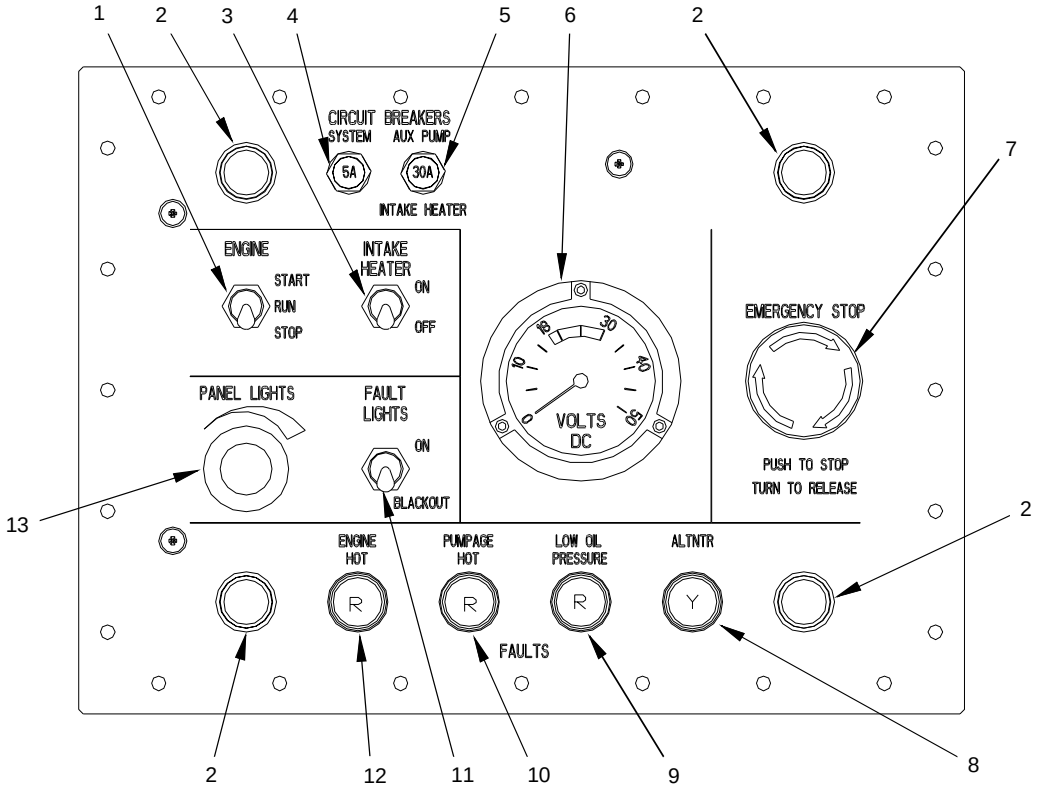


Figure 1. Control Panel

Table 1. Control Panel Controls and Indicators

No.	Name	Function
1	ENGINE START/RUN/STOP toggle switch	Momentary START position operates engine starter; RUN position enables system operating power; STOP position stops engine.
2	Panel Light	Hooded LED's provide illumination for control panel.
3	INTAKE HEATER ON/OFF switch	Enables power to engine intake air heater.
4	SYSTEM circuit breaker	5 amp, push-to-reset circuit breaker for system electrical power.
5	AUX PUMP/INTAKE HEATER circuit breaker	30 amp, push-to-reset circuit breaker for auxiliary pump and engine intake heater.
6	Voltmeter	Provides constant readout of system voltage.
7	EMERGENCY STOP operator	Stops engine when depressed; latches in stop position, must be rotated in direction of arrows to release. Closing control box cover latches operator in stop position.
8	ALTNTR indicator	Illuminates YELLOW when alternator output is less than battery voltage.
9	LOW OIL PRESSURE indicator	Illuminates RED when engine oil pressure decreases below safe limits.
10	PUMPAGE HOT indicator	Illuminates RED when pumpage temperature exceeds 175° F (79° C).
11	FAULT LIGHTS ON/BLACKOUT switch	Enables/disables control panel fault lights and panel lights.
12	ENGINE HOT indicator	Illuminates RED when engine oil temperature exceeds 275° F (135° C).
13	PANEL LIGHTS dimmer	Dims or brightens panel lights when rotated.

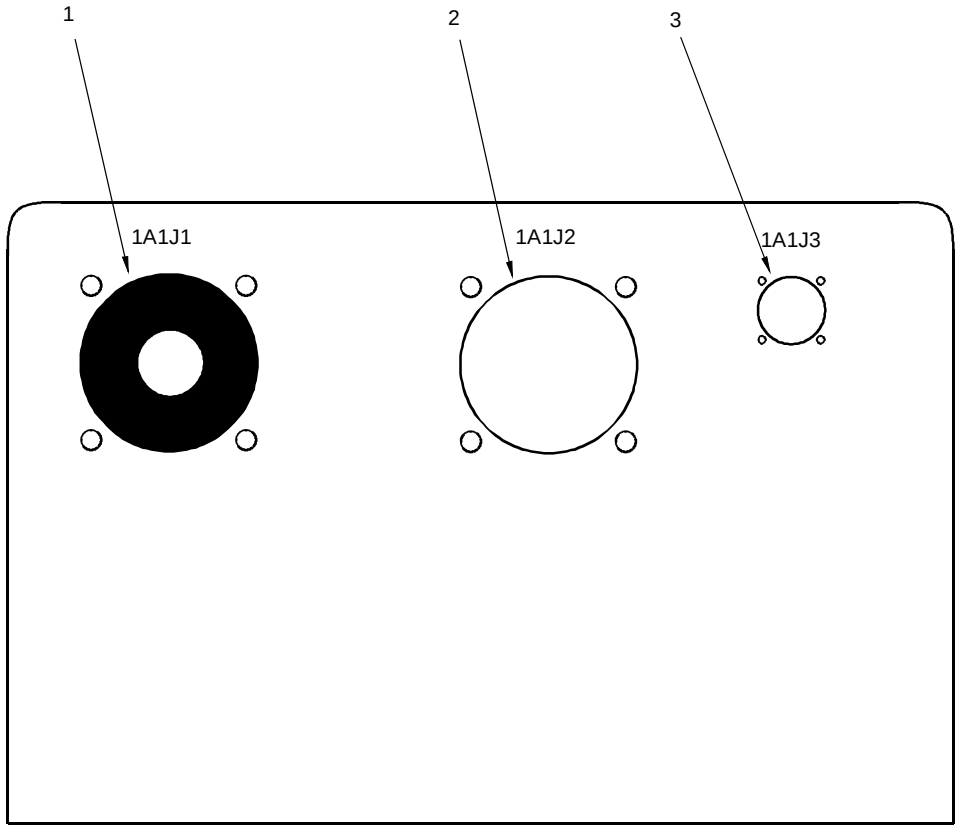


Figure 2. Engine Module Electrical Connection Panel

Table 2. Electrical Connection Panel Controls and Connectors

No.	Name	Function
1	NATO Connector J1	Battery input connector for accessory module battery power cable or external 28 vdc source.
2	Connector J2	Connector from accessory module.
3	Connector J3	Pumpage over temperature sensor cable connector.

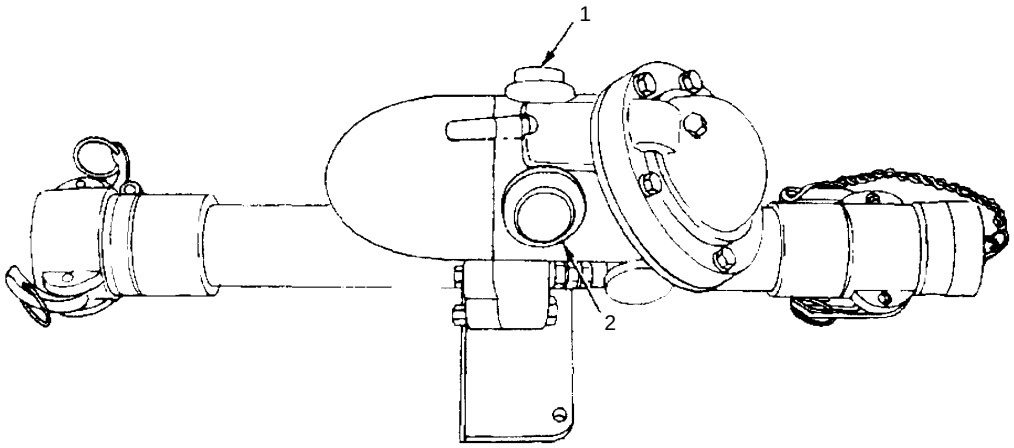


Figure 3. Pressure Control Controls

Table 3. Pressure Control Controls

No.	Name	Function
1	Fill Button	Press button to enable filling of fuel drum.
2	Stop Button	Press button to stop filling of fuel drum. Should automatically operate at 4.5-5 psi of back pressure.

OPERATOR MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
OPERATOR'S PREVENTIVE MAINTENANCE
CHECKS AND SERVICES (PMCS) INTRODUCTION

GENERAL

Preventive Maintenance Checks and Services (PMCS) involves systematic caring, inspection, and servicing of equipment to keep it in good condition and prevent breakdowns. The AAFARS PMCS organizes your PMCS tasks in chronological sequence. Service intervals are divided into categories: Before Operation; During Operation; After Operation; and various other checks and services to be performed at prescribed hourly intervals. As the AAFARS operator, you should:

a. Perform your PMCS as scheduled. Always do your PMCS in the same order, so it gets to be a habit. Always assume explosive vapors are present at the AAFARS. Do not allow any smoking or spark producing equipment within fifty feet of the AAFARS while performing your PMCS.

b. Do your BEFORE PMCS prior to the equipment leaving its staging/service area or performing its intended mission. Keep in mind the WARNINGS and CAUTIONS.

c. Do your DURING PMCS during AAFARS operation. Leaks can be spotted only during operation. Keep in mind the WARNINGS and CAUTIONS.

d. Do your AFTER PMCS as soon as possible after the AAFARS has been taken out of its mission mode or returned to its containment area. Keep in mind the WARNINGS and CAUTIONS.

e. If your equipment fails to operate, perform the operator troubleshooting procedures presented in this manual. Report unresolved maintenance problems to unit maintenance personnel.

f. Cleanliness. Dirt, grease, oil and debris only get in the way and may cover up a serious problem. Use dry cleaning solvent MIL-PRF-680 or some other suitable cleaning solvent on all metal surfaces.

g. Bolts, Nuts and Screws. Check bolts, nuts and screws for obvious looseness and missing, bent or broken conditions. Look for chipped paint, bare metal or rust around bolt heads. If any part seems loose, tighten it or notify Unit Maintenance.

h. Welds. Look for loose or chipped paint, rust or gaps where parts are welded together. If a bad weld is found, notify Unit Maintenance.

i. Electric Wires and Connections. Look for cracked or broken insulation, bare wires and loose connectors. Tighten loose connectors and make sure bare wires are in a serviceable condition. If a bad wire or connector is found, notify Unit Maintenance.

LEAKAGE CRITERIA

Wetness around seals, gaskets, fittings or connections indicates leakage. A stain also indicates leakage. If a fitting or connector is loose, tighten it. If it is broken or defective, report it. Definitions of the classes of leaks are listed below. Become familiar with each class of leak so that you are aware of the status of your equipment. When in doubt, notify your supervisor.

WARNING

AAFARS pumpage fuels and the engine lubricating oil contain additives that may be harmful to personnel and the environment. All leaks must be corrected as soon as possible. Wash fuel or oil from skin immediately. Remove and wash contaminated clothing immediately. Spills of fuel or oil must be cleaned up in accordance with local area direction to prevent harm to personnel or damage to the environment.

Any fuel spill or leakage is cause to stop the operation or maintenance task immediately.

CAUTION

Equipment operation is allowable with minor oil leakages (Class I or Class II). If leakage is present at the engine, check lubricating oil level more often than usual. Do not allow oil level to fall below the ADD OIL mark. When in doubt, notify your supervisor.

a. Class I - Leakage indicated by wetness or discoloration not great enough to form drops.

b. Class II - Leakage great enough to form drops but not enough to cause drops to drip from item being checked or inspected.

c. Class III - Leakage great enough to form drops that fall from item being checked or inspected.

OPERATOR MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
OPERATOR'S PREVENTIVE MAINTENANCE
CHECKS AND SERVICES (PMCS) PROCEDURES

PMCS PROCEDURES

Table 1 lists the checks and services required to keep your AAFARS in good operating condition. They are listed in chronological order and should be performed in this order so they become a habit. An explanation of each column in provided below.

a. The "Item No." column provides the sequential identification number for each task.

b. The "Interval" column tells you when to do a certain check or service.

c. The "Location - Item to Check/Service" column tells you on which item the procedure is performed.

d. The "Procedure" column tells you how to do the required checks and services. Carefully follow these instructions. If you do not have the required tools, or if the procedure tells you to, notify your supervisor.

e. The "Not Fully Mission Capable If" column tells you the conditions under which your AAFARS is not capable of performing its intended mission.

Table 1. Operator's Preventive Maintenance Checks and Services for AAFARS

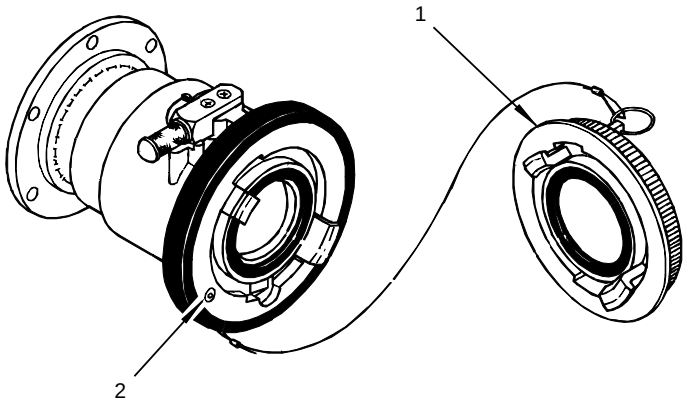
Item No.	Interval	Location / Item to Check/ Service	Procedure	Not Fully Mission Capable If:
			WARNING **Fuel fumes are always present in the vicinity of the AAFARS. Death or personal injury may result from the explosion of fuel fumes exposed to an open flame or spark. Do not permit any smoking, any open flame, or spark producing equipment within fifty (50) feet of the AAFARS.** **Be sure the flex coupling guard is in place. Death or personal injury may result from contact with rotating parts.**	
1	Before	All Ground Cables	Inspect ground cables for cuts, breaks or loose connections.	Cuts, breaks or loose connections make ground cable unusable.
2	Before	All Unisex Couplings	Remove dust cap (1), depress continuity ball (2) on valve seat, release and observe that ball pops back out. If ball does not pop back freely, electrical continuity is lost and static discharge is possible. The coupling must be replaced. Notify unit maintenance.  	Continuity ball does not pop back out.
3	Before	System	Inspect for physical damage that might prevent successful operation.	Physical damage will not allow normal operation of module.
4	Before	Fire Extinguishers	Inspect for fully charged bottles (gauge reading in green area).	Fire extinguishers are not fully charged.

Table 1. Operator's Preventive Maintenance Checks and Services for AAFARS (Continued)

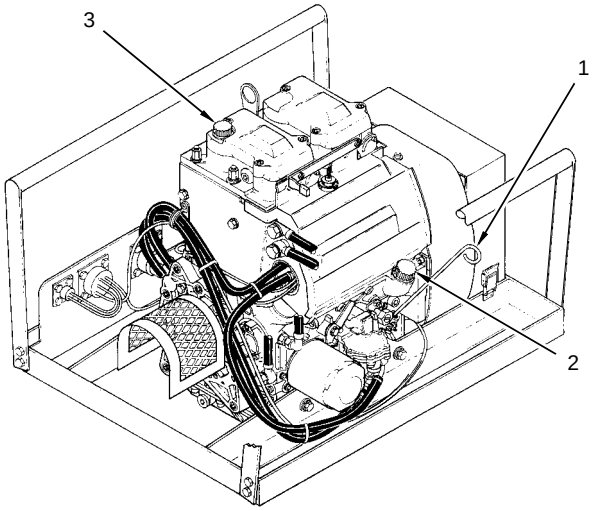
Item No.	Interval	Location / Item to Check/ Service	Procedure	Not Fully Mission Capable If:
5	Before	Fuel Hoses	Inspect for damage, cuts, nicks, abrasions, blistering, or coupling slippage. Coupling slippage usually shows first as a misalignment of the hose and coupling or as a scored or freshly exposed part of the hose where the slippage has occurred. If a coupling is slipping or leaking, remove the hose from service. Most hose failures occur within 12 inches of couplings. Check all the way around the hose. Press lightly and feel for soft spots. If a soft spot is found, remove the hose from service.	Slippage, hoses are damaged. Soft spots exist.
6	Before	Pump-Engine Module	Check engine crankcase oil level on dipstick (1). Oil is at correct level when between upper and lower marks on dipstick. Top off at oil filler (2) or (3) as necessary with premium 15W-40 motor oil. 	Oil level is above upper mark or below lower mark on dipstick.

Table 1. Operator's Preventive Maintenance Checks and Services for AAFARS (Continued)

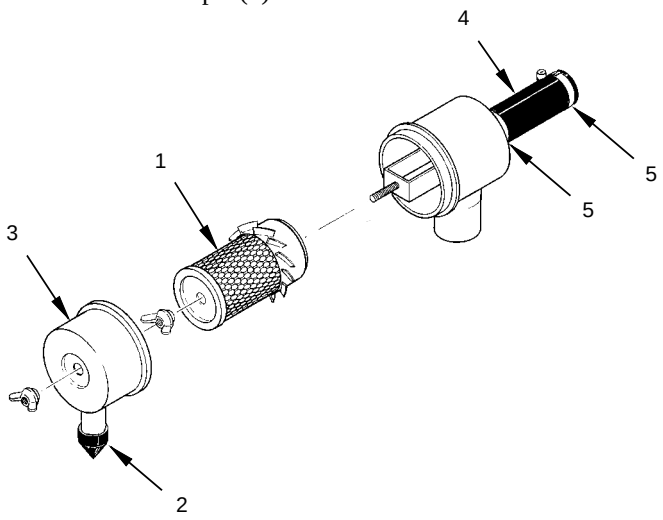
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
7	Before	Engine Air Filter	Check condition of air filter element (1). Remove element and tap lightly against hand to remove clogging. If required, contact unit maintenance to replace filter element. Tighten element hand tight only; do not overtighten. Verify that dust ejector (2) points down when cover (3) is installed. Check condition of hose (4) and tightness of hose clamps. (5).  	Air filter element is clogged.
8	Before	Pump-Engine Module Fuel and Oil Lines	Inspect fuel and oil lines for cuts, breaks or loose connections.	Fuel or oil lines are cut, broken or have loose connections.

Table 1. Operator's Preventive Maintenance Checks and Services for AAFARS (Continued)

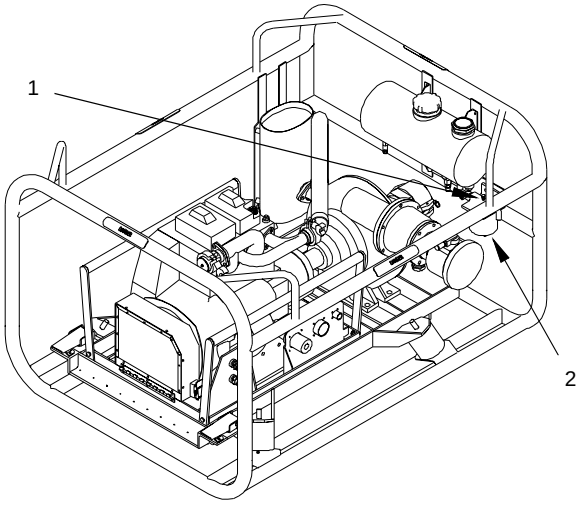
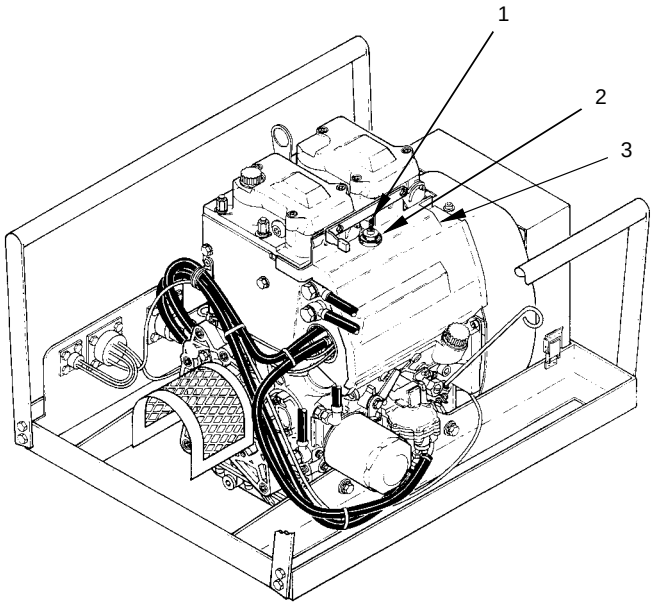
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
9	Before	Engine Fuel Filter	Open vent (1) on filter head assembly. Open drain valve (2) and drain water until fuel appears. 	Filter will not drain or water continues to appear.
10	Before	Engine	Verify that manual start control cable (1) and knob (2) are down against casing (3). 	Knob is up, preventing normal stop.

Table 1. Operator's Preventive Maintenance Checks and Services for AAFARS (Continued)

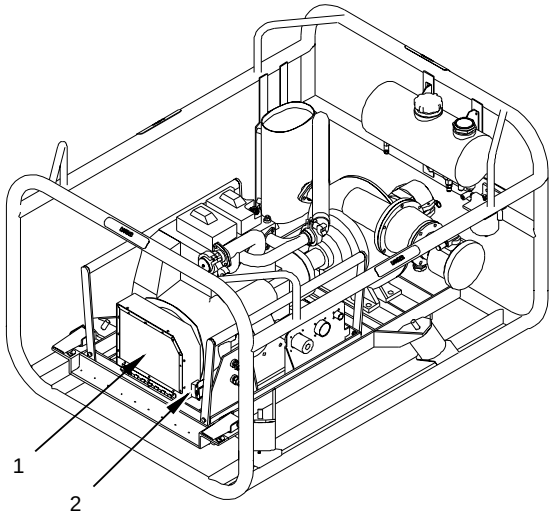
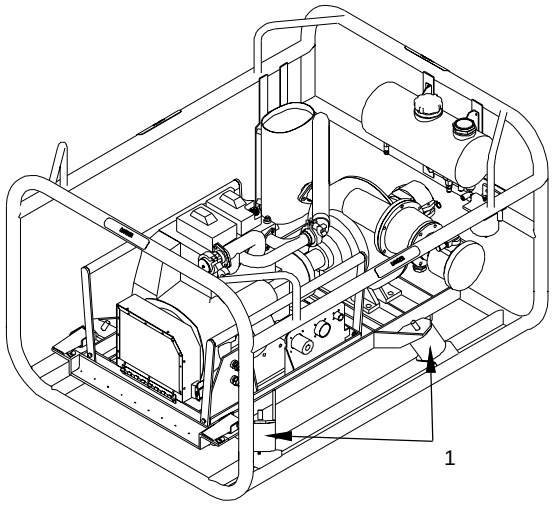
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
11	Before	Pump Engine Module	Check that pulley guard screen (1) and latches (2) are latched and not broken or damaged.  	Screen or latches are broken or damaged.
12	Before	Pump Engine Module	Inspect shock mounts (1) for breaks, cuts or looseness.  	Shock mounts are broken, loose or have deep cuts.
13	Before	Accessory Module Electrical Cables	Inspect for connector tightness, and cuts or breaks in cables. Inspect connectors for bent or broken pins.	Cables are cut or broken, connectors are loose, or pins are damaged.
14	Before	Accessory Module Battery Cable	Inspect connectors at battery for corrosion. Clean as required.	Connector is corroded.

Table 1. Operator's Preventive Maintenance Checks and Services for AAFARS (Continued)

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
15	Before	Auxiliary Pump	Inspect Auxiliary Pump for missing or damaged components.	Components are missing or damaged.
16	Before	Liquid Fuel Filter-Separator	Check bolts on inlet and outlet couplings. If any bolt or nut is loose, notify unit maintenance.	Any coupling is not securely tightened.
17	Before	Liquid Fuel Filter-Separator	Drain water from sump to avoid freezing.	Excessive water is in sump.
18	Before	Containment Berms	Check both containment berms for any damage that might make the berm unusable.	Any berm is not usable.
19	Before	CCR-Nozzle	Remove dust cover. Inspect for missing or damaged lugs (1). There should be three stayback lugs and nine locking lugs.	Lugs missing or damaged.
20	Before	CCR-Nozzle	Inspect nozzle housing (2) for leaks.	Any Class I, Class II or Class III fuel leak is found.
21	Before	CCR-Nozzle	Inspect handle (3) action to see that it operates smoothly.	Fails to operate smoothly.
22	Before	CCR-Nozzle	Inspect bonding cable assembly (4) for loose connection, frayed or damaged cables, bent or damaged plug or clip.	Damaged or frayed cables. Bent or damaged plug or clip.
23	Before	CCR-Nozzle	Inspect cap assembly cap (5) for cracks, burrs or damages. Inspect cable for breaks, frays and security.	Damaged cap or cable.
24	Before	CCR-Nozzle	Inspect coupling assembly (6) for leaks.	Any Class I, Class II or Class III fuel leak is found.

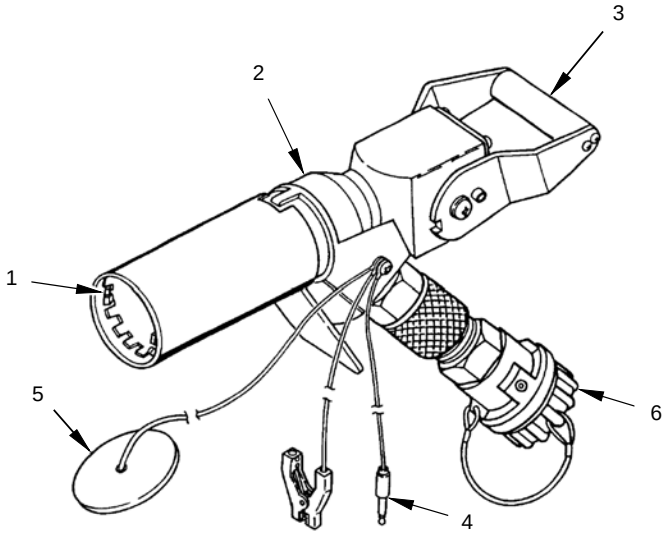


Table 1. Operator's Preventive Maintenance Checks and Services for AAFARS (Continued)

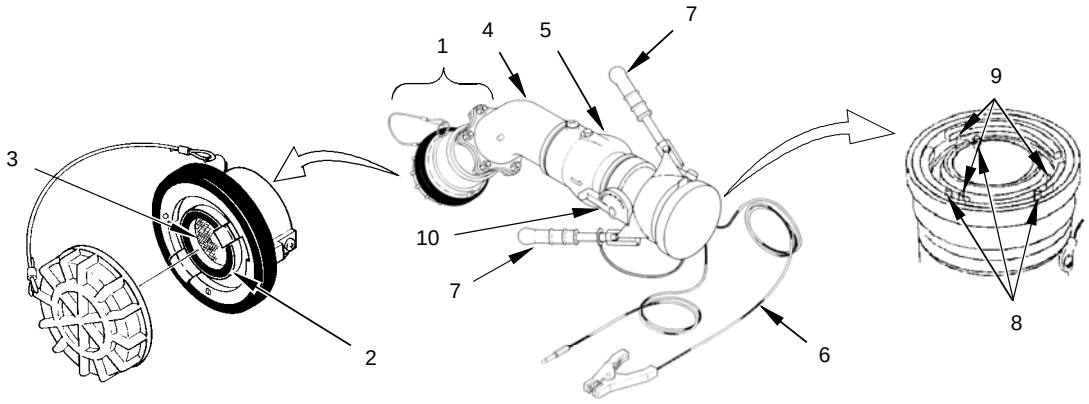
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
25	Before	D1-Nozzle	Check unisex disconnect assembly (1) body for any deformation, cracks, or internal gouges.	Any damage that would interfere with installation or cause leaks.
26	Before	D1-Nozzle	Check that face seal (2) is in place and not damaged.	Face seal is missing or damaged.
27	Before	D1-Nozzle	Check strainer (3) for obstructions or tears.	Strainer obstructed or torn.
				
28	Before	D1-Nozzle	Check inlet elbow (4) and regulator (5) for cracks.	Damaged enough to cause leaking or interfere with operation.
29	Before	D1-Nozzle	Check grounding cable assembly (6) and verify that grounding cable, bonding plug and grounding clamp are in place and in good condition.	Grounding cable, bonding plug and grounding clamp are broken or missing.
30	Before	D1-Nozzle	Check that handles (7) are in place and in good condition.	Handles are missing or damaged enough to prevent operation.
31	Before	D1-Nozzle	Inspect connection end and verify that index pins (8) and collar lock pins (9) are intact, in place and not excessively worn or damaged.	Index pins or collar lock pins missing, worn or damaged.

Table 1. Operator's Preventive Maintenance Checks and Services for AAFARS (Continued)

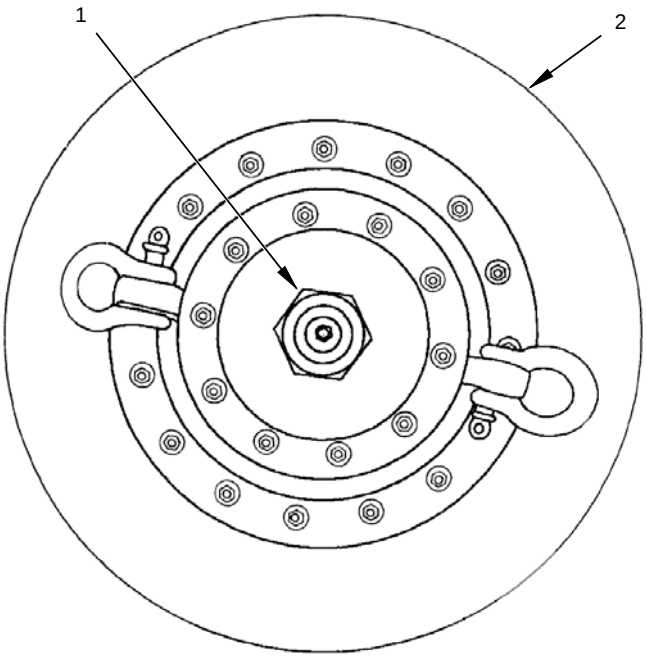
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
32	Before	D1-Nozzle	Verify that all three collar lock pins (9) are intact, undamaged and are extended and engage all three cutouts in the collar and physically prevent collar rotation. If the collar lock pins (9) are not extended and engaged in all three cutouts in the collar, the operator should squeeze the lever and handle grip together while observing the connecting end of the nozzle. This should cause the collar lock pins (9) to spring into the cutouts in the collar.	Index pins are not extended to engage all three collar cutouts.
33	Before	D1-Nozzle	Attempt to open the nozzle with the lever (10).	Nozzle opens.
34	Before	Pressure Control	Check exterior parts for cracks and leaks. Check female coupling half for missing or damaged gasket. Check for missing or damaged dust plug. Check dust cap for missing or damaged gasket.	Any damage that would cause leaks.
35	Before	Fuel Drum	Check the adapter assembly (1) for cracks, leaks, and damaged threads.	Any damage that would interfere with installation or causes leaks.
36	Before	Fuel Drum	Check the fuel drum (2) fabrics for cuts, holes, deterioration, and leaks. Check the metal parts for cracks, leaks, and loose capscrews. No fabric cords should be showing through the rubber ream of the drum body.  	Drum has punctures and/or excessive wear.
37	Before	TRICON Container	Inspect door handles and related hardware (1) for any broken welds or defective parts. Operate handles.	Handle or related hardware are broken or if handles will not open door.

Table 1. Operator's Preventive Maintenance Checks and Services for AAFARS (Continued)

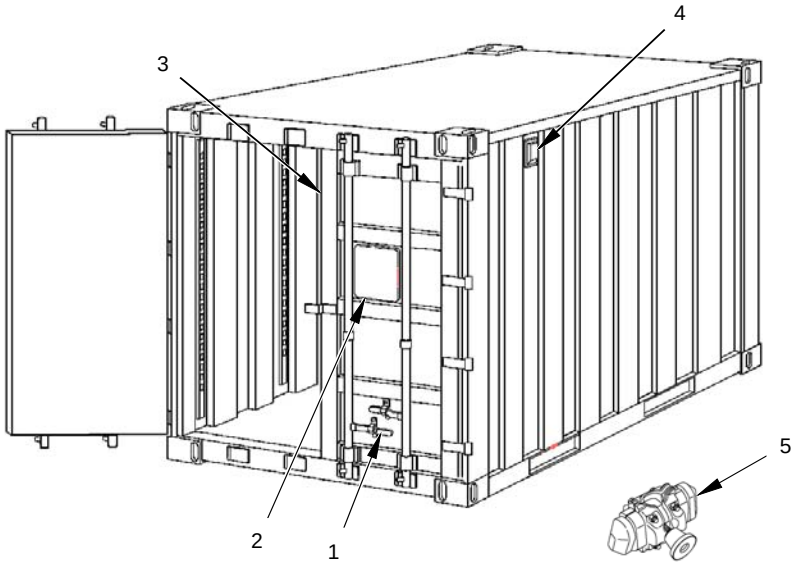
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
38	Before	TRICON Container	Inspect document holder (2) for any large dents that may prevent the holder from being completely opened or closed.	Document holder cannot be completely opened or closed.
39	Before	TRICON Container	Inspect door seals (3) for tears.	Door seals are torn.
40	Before	TRICON Container	Inspect for broken vents (4).	Vents are broken.
41	Before	TRICON Container	Check that connecting link assembly (5) handle can be pulled out and shifted 90 degrees.	If handle is jammed or cannot be shifted.
				
42	During	System	Periodically check for leaks, especially at unisex couplings, pressure control, and the engine module.	Any Class I, Class II or Class III fuel leak is found.
43	During	System	Check hoses for soft spots, often noticed as localized swelling.	Any hose exhibits soft spots, especially one that is spreading.
44	During	Liquid Fuel Filter-Separator	Monitor differential pressure gauge for reading approaching or exceeding 15 psid. Notify unit maintenance that coalescer element replacement is required if reading exceeds 15 psid.	Differential pressure gauge reading exceeds 15 psid.
45	During	Liquid Fuel Filter-Separator	Monitor water level indicator. Drain sump at first opportunity if indicator ball rises near top of sight gauge.	Water level in sump rises to top of sight gauge.

Table 1. Operator's Preventive Maintenance Checks and Services for AAFARS (Continued)

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
46	During	Liquid Fuel Filter-Separator	Perform fuel contamination tests with the Fuel Contamination Test Kit.	Fuel tests fail.
47	During	Auxiliary Pump	Inspect for signs of leakage.	Any Class I, Class II or Class III fuel leak is found.
48	During	CCR-Nozzle	Inspect handle action to see that it operates smoothly.	Handle fails to operate smoothly.
49	During	Pressure Control	Check pressure control for proper operation. Pressure control should shut off as wrinkles are removed from drum.	Fails to shut off properly.
50	After	CCR-Nozzle	Inspect for missing or damaged lugs (1). There should be three stayback lugs and nine locking lugs.	Lugs missing or damaged.
51	After	CCR-Nozzle	Inspect nozzle housing (2) for leaks.	Any Class I, Class II or Class III fuel leak is found.
52	After	CCR-Nozzle	Inspect bonding cable assembly (3) for loose connection, frayed or damaged cables, bent or damaged plug or clip.	Damaged or frayed cables. Bent or damaged plug or clip.
53	After	CCR-Nozzle	Inspect cap assembly cap (4) for cracks, burrs or damage. Inspect cable for breaks, frays and security.	Damaged cap or cable.
54	After	CCR-Nozzle	Inspect coupling assembly (5) for leaks.	Any Class I, Class II or Class III fuel leak is found.

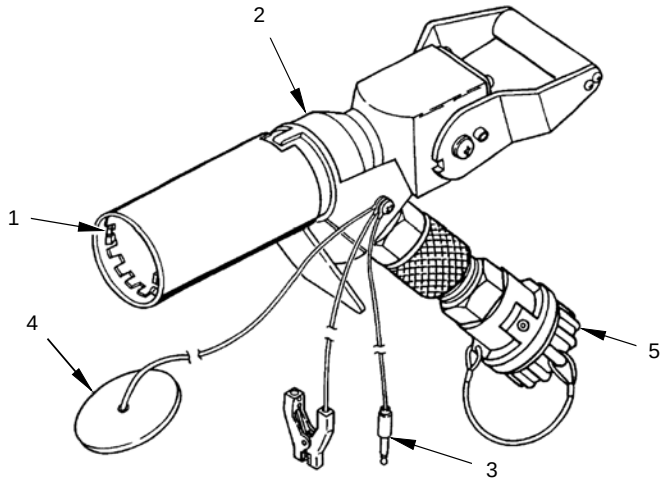


Table 1. Operator's Preventive Maintenance Checks and Services for AAFARS (Continued)

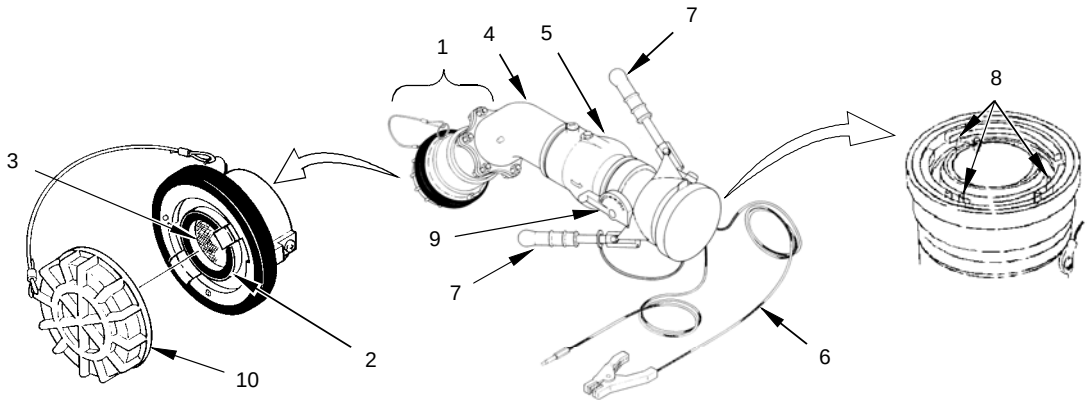
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
55	After	D1-Nozzle	Check unisex disconnect assembly (1) body for any deformation, cracks, or internal gouges.	Any damage would interfere with installation or cause leaks.
56	After	D1-Nozzle	Check that face seal (2) is in place and not damaged.	Face seal is missing or damaged.
57	After	D1-Nozzle	Check strainer (3) for obstructions or tears.	Strainer obstructed or torn.
				
58	After	D1-Nozzle	Check inlet elbow (4) and regulator (5) for cracks.	Damaged enough to cause leaking or interfere with operation.
59	After	D1-Nozzle	Check grounding cable assembly (6) and verify that grounding cable, bonding plug and grounding clamp are in place and in good condition.	Grounding cable, bonding plug, and grounding clamp are broken or missing.
60	After	D1-Nozzle	Check that handles (7) are in place and in good condition.	Handles are missing or damaged enough to prevent operation.
61	After	D1-Nozzle	While disconnecting the nozzle, if the collar lock pins (8) are not extended and engaged in all three cutouts in the collar, the operator should squeeze the lever (9) and handle grip together while observing the connecting end of the nozzle. This should cause the collar lock pins (8) to spring into the cutouts in the collar. Failure of above could also indicate mating adapter problem.	Pins do not spring back into collar cutouts.
62	After	D1-Nozzle	Check that dust cover (10) is in place and in good condition.	Dust cover missing or damaged.

Table 1. Operator's Preventive Maintenance Checks and Services for AAFARS (Continued)

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Item to Check/ Service		
63	After	D1-Nozzle	Attempt to open the nozzle with the lever (9).	Nozzle opens.
64	After	Pressure Control	Check exterior parts for cracks and leaks. Check female coupling half for missing or damaged gasket. Check for missing or damaged dust plug. Check dust cap for missing or damaged gasket.	Any damage that would cause leaks.
65	After	Fuel Drums	Check the adapter assembly for cracks, leaks, and damaged threads.	Any damage that would interfere with installation or cause leaks.
66	After	Fuel Drums	Check the fuel drum fabric for cuts, holes, deterioration, and leaks. Check the metal parts for cracks, leaks, and loose capscrews. No fabric cords should be showing through the rubber ream of the drum body	Drum has puncture and or excessive wear.
67	Quarterly	Pressure Control	Check exterior parts for cracks and leaks. Check for missing or damaged gaskets, dust plug and dust. Check pressure control for proper operation. Test pilot valve; correct shutoff pressure is 4.5 to 5 psi. (WP 0083 00)	Any damage that would cause leaks or shutoff pressure is not correct.

OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1 OPERATION UNDER USUAL CONDITIONS

SYSTEM ASSEMBLY AND PREPARATION FOR USE

Figure 1 illustrates a typical AAFARS emplacement. Actual emplacement may require a slightly different configuration due to terrain or mission constraints.

WARNING

Death or personal injury may result from the explosion of fuel fumes exposed to an open flame or spark, or to static discharge. Do not permit smoking, any open flame, or spark producing equipment within fifty (50) feet of AAFARS. Ensure all equipments are well grounded prior to commencing any operation or maintenance task. Always ensure the ground connection from the aircraft is complete prior to beginning any fueling operation.

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. Always use four personnel to move or relocate the pump-engine module, liquid fuel filter-separator, and accessory module. Use proper physical lifting procedures or use a suitable lifting device or dolly. Wear safety shoes, gloves, and other suitable protective clothing.

The engine module should be removed from the pump-engine module for moving or lifting. If the pump-engine module must be moved as a unit, do not lift the module two feet with less than five personnel, three feet with less than six personnel, or five feet with less than eight personnel.

Use single hearing protection within 22 feet. Hearing can be permanently damaged if exposed to constant high noise.

Personal injury may result from slipping on fuel or oil spilled in the spill containment units. Spills of fuel or oil must be cleaned up in accordance with local SOP. Utilize items in the fuel spill control kit to remove spilled fuel or oil.

CAUTION

All couplings have caps that must be removed before a connection is made. Ensure the cap remains in place until just before connection to prevent contamination of the fueling system by foreign materials. Once the caps are removed, couple adjacent caps to reduce the probability of foreign materials contaminating the aircraft fuel.

NOTE

Site selection criteria should include a relatively flat area of at least 25 ft. by 40 ft. to accommodate the two spill containment units.

1. Unfold and position the spill containment units in the general shape of a “T”. The fuel drums should be positioned in the head of the “T”, and the pump-engine module, accessory module and liquid fuel filter separator in the leg of the “T”. Do not fold up spill containment unit sides until after drums and modules are positioned.

SYSTEM ASSEMBLY AND PREPARATION FOR USE (Continued)

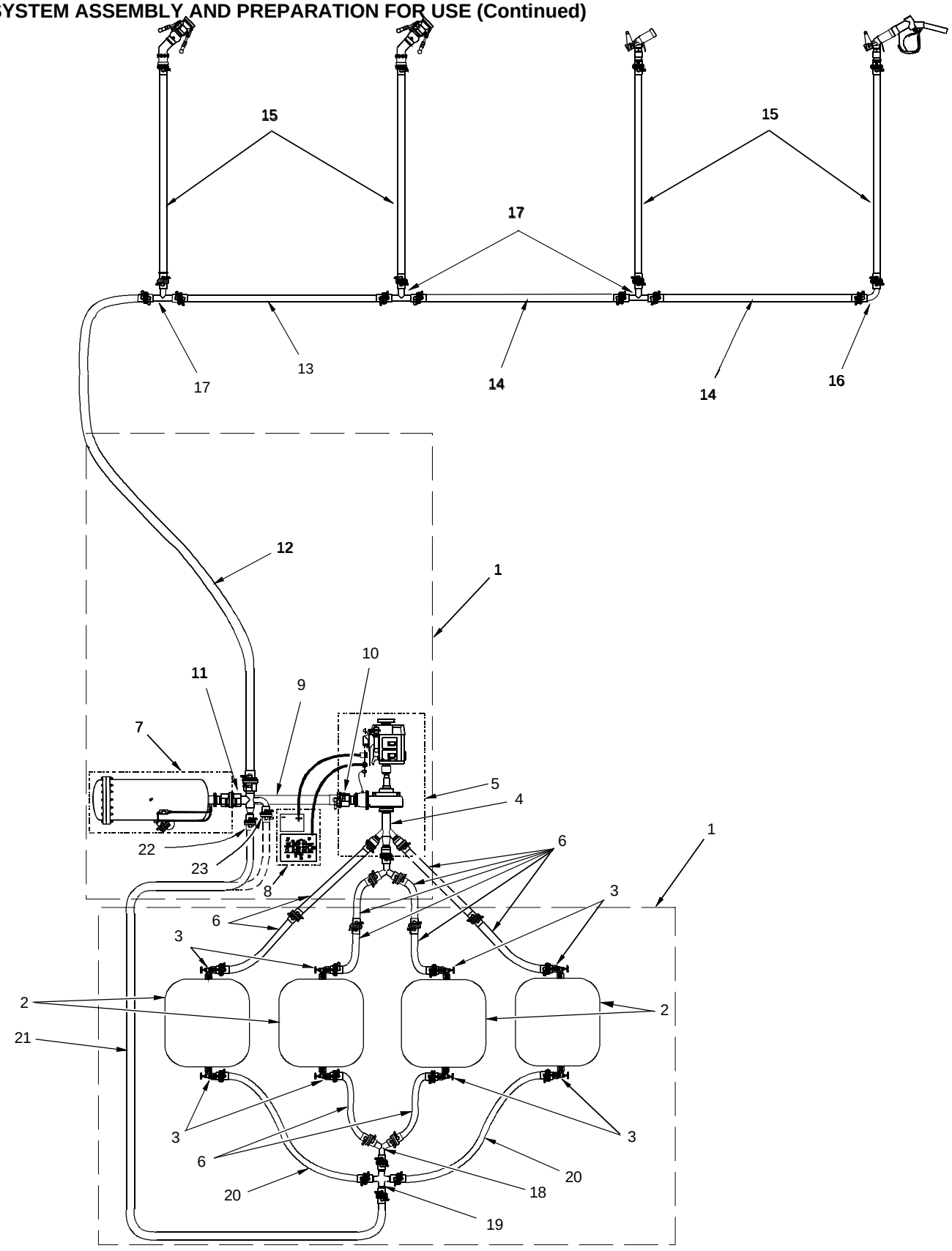


Figure 1. AAFARS Emplacement

SYSTEM ASSEMBLY AND PREPARATION FOR USE (Continued)

2. If fuel drums are delivered full, proceed to step 3. If fuel drums are to be filled on site:

NOTE

For normal operation, all fuel drums will have a 2” x 2” elbow valve coupler installed on each end. Fuel drum filling requires installation of a 2” x 1-1/2” elbow valve coupler on the inlet end of each drum to interface with the pressure control assembly and fuel source.

a. If installed, ensure all elbow valve couplers at inlet and outlet of all affected fuel drums are closed.

b. Remove the 2” x 2” elbow valve coupler from inlet of first fuel drum to be filled.

c. Position the pressure control assembly near the inlet end of the first fuel drum to be filled.

d. Install the supplied 1-1/2” fuel hose to the outlet end of the pressure control assembly.

e. Drum filling crew connect fuel hose from the fuel source to the inlet of the pressure control assembly. Use adapters from the drum adapter kit as necessary.

f. Install a 2” x 1-1/2” elbow valve coupler on the free end of the pressure control assembly hose.

g. Open the elbow valve coupler and hold over a suitable container to catch fuel. Depress and hold the FILL button on the pressure control assembly.

h. At the fuel source, commence pumping.

NOTE

The pressure control assembly will operate to stop fuel flow as soon as the elbow valve coupler is closed.

i. As soon as fuel is dispensed into the container, release the FILL button, close the elbow valve coupler and install to inlet of the fuel drum to be filled.

j. Open the elbow valve coupler, press the FILL button on the pressure control assembly and allow fuel drum to fill.

k. Fill fuel drum until a back pressure of 4.5-5 psi is attained. (The pressure control assembly will operate automatically at 4.5 - 5 psi to stop fuel flow.)

l. Close the elbow valve coupler and remove from fuel drum.

m. Install a 2” x 2” elbow valve coupler on the fuel drum for use during normal AAFARS operation.

n. Repeat steps b through m until all fuel drums are filled.

3. Perform API Specific Gravity Test if there is any doubt concerning the type of fuel delivered.

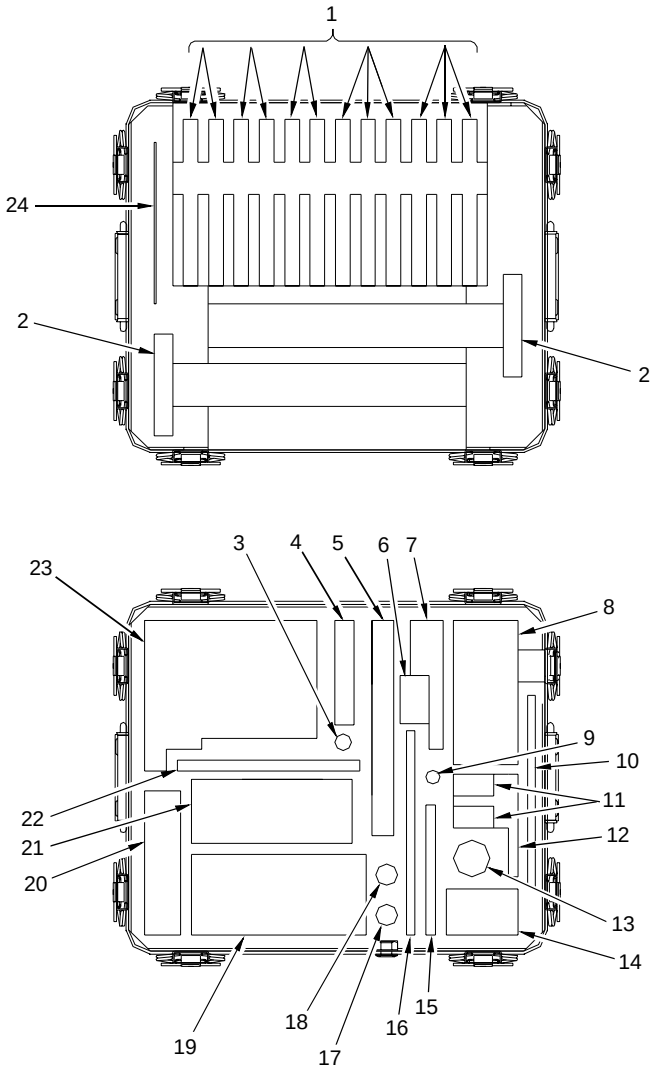
NOTE

Always handle the sampling equipment with care to ensure cleanliness. All sample containers must be clean and free of water, dirt, lint, washing compounds, naphtha, or other solvents.

a. Cautiously open the fuel contamination test kit. Glassware may have become dislodged during transport.

b. Select a thermohydrometer (figure 2, 1) with a specific gravity rating at mid scale for the fuel to be tested. (JP8 has a specific gravity of 45; JET-A has a specific gravity of 43.)

SYSTEM ASSEMBLY AND PREPARATION FOR USE (Continued)



1. Thermohydrometers
2. Hydrometer Cylinder
3. Dust Cap, Flexible Extension
4. Syringe
5. Flexible Extension Tube
6. Power Cord
7. Instrument Pack
8. Water Detector
9. Ultraviolet Light Bulb
10. Calibration Standard Set
11. External Battery
12. Tweezer
13. Monitor, 25 mm Pads (Test Pad Holder)
14. Free Water Detector Pads
15. External Battery Power Cord
16. Color Rating Booklet
17. Quick Disconnect Coupler
18. Valved Actuator with Cap
19. Sample Bottle, 1000 ml, and Solvent Dispensing Bottle
20. Monitor (Matched Weight, 5 ea and Single Membrane, 6 ea)
21. Ether Storage Bottle
22. Wrench, Ajustable, 8 inch
23. Monitor Housing Assembly
24. API Gravity Calculator

Figure 2. Fuel Contamination Test Kit

SYSTEM ASSEMBLY AND PREPARATION FOR USE (Continued)

c. Inspect the thermohydrometer (1) to ensure none of the round beads at the bottom are loose. Also check the thermometer to ensure there is no separation in the mercury column. Discard any thermohydrometer that fails inspection.

d. Remove the 1,000 ml sample bottle (19) and one of the hydrometer cylinders (2) from the fuel contamination test kit.

e. At one of the fuel drums, place the 1,000 ml sample bottle (19) directly beneath the elbow coupler valve, slowly crack open the valve and fill the sample bottle approximately 75 percent full.

f. Pour fuel directly from the sample bottle (19) into the hydrometer cylinder (2) until it is approximately 75 to 85 percent full.

g. Position the hydrometer cylinder (2) on a flat surface once it has been filled.

h. Remove any air bubbles on the top of the liquid surface by gently tapping the palm of the hand on the top of the hydrometer cylinder (2).

i. Lower the thermohydrometer (1) gently into the liquid until it reaches a point where it will float by itself. Using the stem, impart a spin on the thermohydrometer (1). (Spinning the thermohydrometer (1) will help center it in the hydrometer cylinder (2) and keep it from sticking to the side of the hydrometer cylinder (2)).

j. Allow approximately five minutes for the temperature of the thermohydrometer (1) to equilibrate with the temperature of the fuel sample.

k. Position the eye slightly below the surface of the fuel in the hydrometer cylinder (figure 3,1) and read the API specific gravity where the fuel cuts across the scale divisions (2) on the stem of the thermohydrometer (3). Leaving the thermohydrometer (3) in the fuel, read the temperature inside the body of the thermohydrometer (3). Record the readings.

l. Remove the API gravity calculator (figure 2, 24) from the fuel contamination test kit.

m. On the API gravity calculator (figure 3, 4), align the fuel temperature (5) (in Fahrenheit) with the API gravity reading (6) from step k. above.

n. Read the corrected reading on the API gravity calculator (4) at the 60 degree temperature line (7). The corresponding API gravity reading is the corrected API specific gravity and fuel type (8).

o. Repeat steps e through n for the remaining fuel drums. Dispose of the fuel samples IAW local SOP.

p. Fill solvent dispensing bottle (figure 2, 19) from ether storage bottle (21). Flush all test components with ether, wipe dry with a clean rag or paper towel and stow each item in the fuel contamination test kit. Pour any unused ether in ether storage bottle (21). Stow bottles in fuel contamination test kit.

q. Secure the fuel contamination test kit for transport.

4. Position fuel drums (figure 1, 2) on spill containment unit (1). Fuel drums (2) may roll. Insert chocks or dirt berms on both sides. If necessary to tow drums to spill containment unit:
   a. Unfold the towing yoke.
   b. Place the fuel drum shackles in the slots in the end of towing yoke connecting leg and install the quick release pin in each leg.
   c. Connect the towing yoke to the towing vehicle pintle hook.
   d. Maneuver the drum into position on the spill containment unit.

SYSTEM ASSEMBLY AND PREPARATION FOR USE (Continued)

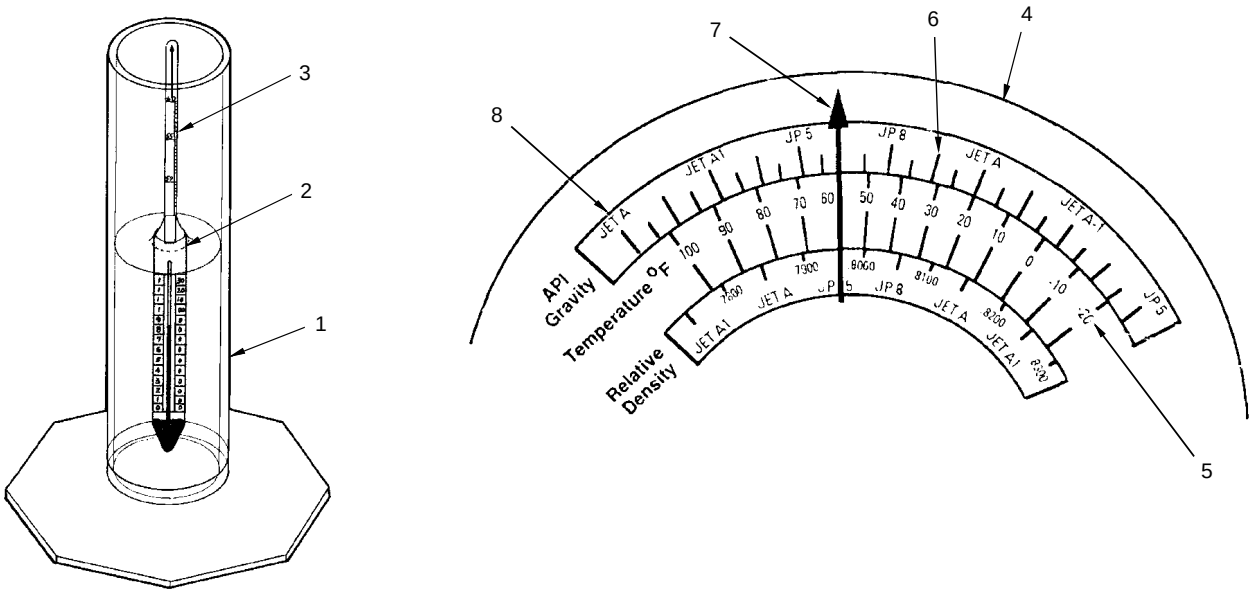


Figure 3. API Specific Gravity Determination

5. Inspect AAFARS for damage that may have occurred during transport and ensure all system components are accounted for.

6. Unlatch and open all AAFARS bags and containers.

WARNING

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. The engine module should be removed from the pump-engine module for moving or lifting. If the pump-engine module must be moved as a unit, do not lift the module two feet with less than five personnel, three feet with less than six personnel, or five feet with less than eight personnel.

7. Remove engine module from pump-engine module. (Refer to figure 4.)

   a. Unclamp exhaust pipe (1) from exhaust manifold (2).

   b. Disconnect pumpage over temperature cable at engine module connection panel J3 (3). Install dust caps on connectors. Wrap free end of cable around fuel transfer pump outlet (5).

   c. Disconnect fuel supply line (6) and fuel return line (7) at engine module. Connect free ends of lines together.

   d. Disengage latches (8) to unlatch engine module (9) from pump-engine frame (10) and slide engine module out of frame.

SYSTEM ASSEMBLY AND PREPARATION FOR USE (Continued)

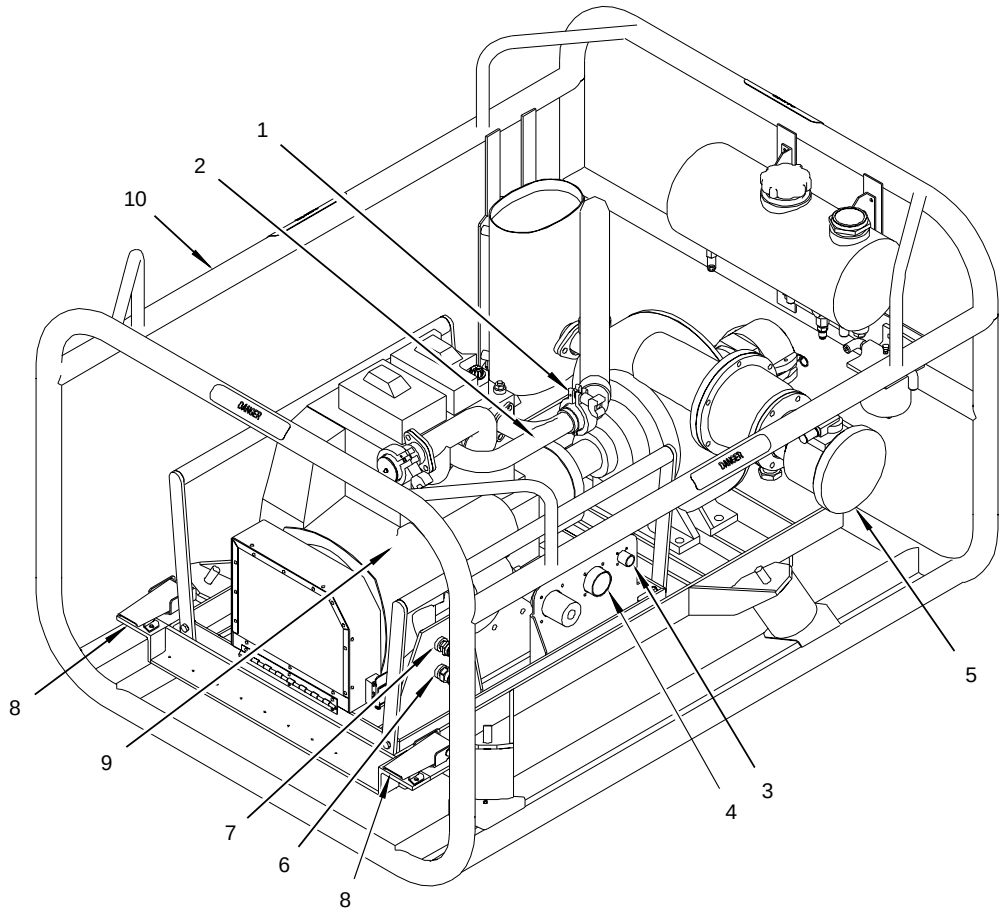


Figure 4. Pump-Engine Emplacement

WARNING

The AAFARS suction and recirculation hoses are connected to the fuel drums via elbow valves with integral camlock couplers. When the elbow valve coupling is closed, the valve stem is extended; when open, it is retracted. The stem travel is opposite that of conventional valves and requires the operator to double check valve position during system set up and tear down, since observation can be misleading. Failure to heed this warning could result in death or serious injury.

Fuel spillage will occur if elbow valve coupling is opened before connection to a fuel drum. Ensure elbow valve coupling is closed before connection to fuel drum. Failure to heed this warning could result in death or serious injury.

SYSTEM ASSEMBLY AND PREPARATION FOR USE (Continued)

NOTE

When connecting system components, open all valves as components are connected except fuel drum outlet elbow valves and filtration module inlet and outlet valves. Opening unisex coupling valves at time of connection will expedite system setup and latch couplings together. Fuel drum outlet elbow valves should remain closed until after engine is started so that engine does not have to start under load. Fuel drum inlet elbow valves may be opened after the unisex-to-camlock adapters are installed. The liquid fuel filter-separator inlet and outlet valves should remain closed until initial system flooding.

8. Inspect the eight fuel drum elbow valve couplings (figure 1, 3) to ensure that each elbow valve coupling (3) is closed (valve stem fully extended).

NOTE

Do not open elbow valve couplings.

9. Install the elbow valve couplings (3) on the inlets and outlets of all four fuel drums.

WARNING

When coupling together unisex couplings, depress continuity ball and observe that ball pops back out. Failure to check or failure of ball to pop back out could allow the buildup of static electric charge that could cause an explosion and death.

10. Install one adapter assembly (2" unisex non-valved coupling to 2" male camlock adapter) (figure 5) on each elbow valve coupling (figure 1, 3).

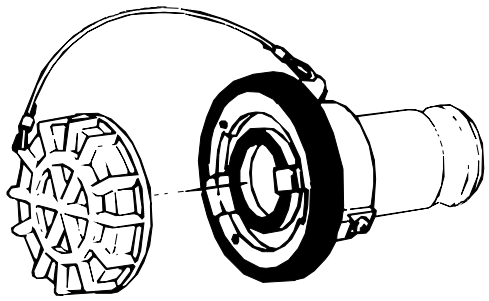


Figure 5. 2" Unisex Non-Valved Coupling to 2" Male Camlock Adapter Assembly

11. Remove inlet manifold (4) from storage module and install to camlock quick disconnect at fuel transfer pump inlet.

12. Position pump-engine module (5) 6-8 feet from fuel drums (2) with the pump inlet manifold (4) facing fuel drum outlets.

NOTE

Figure 1 indicates the use of eight suction hoses to connect four fuel drums to the fuel transfer pump inlet manifold. Actual set up may require fewer than eight suction hose lengths.

13. Install suction hoses (6) as required to connect fuel drums (2) to inlet manifold (4). Reposition pump-engine module (5) as required. Open valved unisex coupling valves on suction hoses and inlet manifold.

SYSTEM ASSEMBLY AND PREPARATION FOR USE (Continued)

14. Install engine module in pump-engine module. (Refer to figure 4.)

    a. Slide engine module (9) into pump-engine frame (10), PTO end first. If flexible coupling splined adapter will not engage, it may be necessary to rotate the flex portion slightly to align with the splined flex coupling adapter.

    b. Engage latches (8) to secure engine module (9) to pump-engine frame (10).

NOTE

When clamping exhaust pipe to exhaust manifold, ensure that the lanyard is not pinched during clamping.

    c. Clamp exhaust pipe (1) to exhaust manifold (2).

    d Connect pumpage over temperature cable at engine module connection panel connector J3 (3). Couple together adjacent dust caps.

    e. Connect fuel supply line (6) and fuel return line (7) at engine module.

    f. Check that throttle control is at maximum position (fully right).

15. Position liquid fuel filter-separator (figure 1, 7) 4-5 feet from pump-engine module (5) with inlet facing fuel transfer pump.

16. Position the accessory module (8) between the pump-engine module (5) and the liquid fuel filter-separator (7) so that operator has a clear view and easy access to all system components.

17. Connect the 3" x 6' discharge hose (9) between fuel transfer pump discharge (10) and liquid fuel filter-separator (7) inlet (lower port). Rotate discharge hose as required to remove any kink or bend. Open shutoff valve and unisex coupling valves on discharge hose.

18. Connect the recirculation manifold (11) to the liquid fuel filter-separator (7) outlet (upper port) and open the manifold unisex coupling valve. Do not open 3" unisex coupling of liquid fuel filter-separator. Rotate manifold so that the 2" unisex couplings are facing the fuel drums and the unoccupied 3" unisex coupling is facing the area selected for the fueling points.

SYSTEM ASSEMBLY AND PREPARATION FOR USE (Continued)

CAUTION

AAFARS fuel hoses are not supplied with scuff jackets. Therefore, hose handling directly affects the useful life of the hose. Do not drag hoses over an improved or abrasive surface. To the extent possible, hoses should be rolled and unrolled during setup or evacuation to prevent abrasion.

NOTE

One 3" x 100' discharge hose has a 3" coupling on one end and a 2" coupling on the other. This is the only hose in the system that can only be laid out one way.

19. On the 3" x 2" x 100' discharge hose (12), identify the 3" unisex coupling and connect the discharge hose to the 3" valved unisex coupling of the recirculation manifold. Open unisex coupling valves on recirculation manifold and discharge hose.

20. Using the remaining 3" x 100' (13), 2" x 100" (14) and 2" x 50' discharge hoses (15), elbow (16) and tees (17) as required, lay out discharge hoses to the selected fueling points as diagrammed on the accessory module control box cover. Open all unisex coupling valves as connections are made.

21. Establish recirculation path.

    a. At the fuel drums (2), connect two suction hoses (6) to non-valved couplings (3) mounted on the inlet of the 2 inner fuel drums.

    b. Connect the suction hoses (6) to a wye fitting (18). Open 2" unisex coupling valves on wye fitting and suction hoses.

    c. Connect a unisex cross fitting (19) to the free leg of the wye fitting (18). Open 2" unisex coupling valve at wye-cross connection.

    d. Connect a 2" x 12' discharge hose (20) to the cross fitting (19) and the non-valved unisex coupling (3) mounted on the inlets of the two outer fuel drums. Open unisex coupling valves at cross discharge hose connections.

NOTE

Two recirculation paths are available for use. RECIRC 1 limits flow to 5 gpm from the recirculation manifold (RECIRC 1 is normal recirculation path during fueling operations). RECIRC 2 allows full flow. The supervisor must select a method based on mission requirements.

22. Connect a 2" x 50' discharge hose (21) between the cross fitting (19) and RECIRC 1 coupler (22) or RECIRC 2 coupler (23) on the recirculation manifold. Open 2" unisex coupling valves at each connection.

23. Open fuel drum inlet elbow valve couplings (3) and 2" unisex valve coupling and discharge hose.

24. Drive a grounding rod between the pump-engine module (5), accessory module (8) and the liquid fuel filter-separator (7) for grounding AAFARS.

25. Connect the pump-engine module (5), accessory module (8) and liquid fuel filter-separator (7) grounding cables to the grounding rod.

26. Position a fire extinguisher at each fueling point and pump-engine module (5).

SYSTEM ASSEMBLY AND PREPARATION FOR USE (Continued)

27. Position one nozzle kit at each fueling point.

28. Position one grounding rod at each fueling point.

29. Drive one grounding rod at each fueling point, approximately 10 ft (3 m) back from discharge hose end.

30. At each fueling point, select the nozzle for use, connect to the discharge hose end and connect the nozzle grounding clamp to the ground rod.

NOTE

When clamping air filter or dust cap to intake manifold, ensure that the lanyard is not pinched during clamping.

31. Remove the engine air filter from the storage module. Remove dust cap from intake manifold and install engine air filter with center clamp facing up.

32. Verify position of toggle switches on control panel as follows.

    a. Open control box cover.

    b. START-RUN-STOP switch in STOP position.

    c. INTAKE HEATER switch in OFF position.

    d. FAULT LIGHTS switch in ON position.

    e. EMERGENCY STOP switch released.

    f. Close control box cover.

33. Remove multi-conductor control cable W201 from the storage cabinet in the accessory module, route through cutout on upper lip of stowage cabinet and connect to 1A1J2 on engine module. Connect adjacent dust caps together.

34. Remove battery power cable W202, NATO connector end, from storage cabinet in the accessory module, route through cut out on upper lip of cabinet and connect to 1A1J1 on engine module. Connect adjacent dust cap together.

35. Position ENGINE SWITCH to RUN position and observe PUMPAGE HOT flashes once, ALTNTR and LOW OIL PRESSURE illuminate and remain lit, and ENGINE HOT indicator does not illuminate. If the listed conditions do not occur, determine cause before operating AAFARS.

36. Restore ENGINE Switch to STOP position.

37. Fill engine fuel tank or connect external fuel source.

OPERATING PROCEDURES

WARNING

Death or personal injury may result from the explosion of fuel fumes exposed to an open flame, spark, or to static discharge. Do not permit smoking, any open flame, or spark producing equipment within fifty (50) feet (15.24 m) of AAFARS. Ensure all equipments are well grounded prior to commencing any operation or maintenance task. Always ensure the ground connection from the aircraft is complete prior to beginning any fueling operation.

Fuels are toxic and flammable. Wear protective goggles and refuel only in well ventilated areas. 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, flush with clean water and get medical aid for eyes immediately.

Use single hearing protection within 22 feet. Hearing can be permanently damaged if exposed to constant high noise.

CAUTION

System components are subject to damage from thermal expansion. As the temperature increases, the pumpage in any component will expand. If trapped in a component, the expanding pumpage may rupture seals and cause a leak or equipment malfunction. For this reason, all system valves should remain open as long as the system is flooded. With all valves open, the hoses will absorb the expansion and protect system seals. If any component must be isolated, it should be drained or defueled immediately to prevent damage.

NOTE

During operation, monitor the filter-separator differential pressure gauge. If a pressure differential of more than fifteen (15) psi is observed, the fuel flow is being restricted and the coalescer elements should be replaced.

Assure that one person stands by the control panel at all times during operation to control the AAFARS.

1. Conduct a visual inspection of the AAFARS setup to ensure the system is properly assembled and ready to pump fuel. Verify system grounding.

2. Verify/Position fuel selector valve in INTERNAL TANK or EXTERNAL TANK position, according to desired fuel source.

3. Verify that manual start control is fully lowered.

4. At the fuel drums, open the fuel drum outlet elbow valve couplings, allowing pumpage to flow.

OPERATING PROCEDURES (Continued)

NOTE

Step 5 describes an electric start of AAFARS. If a manual start is to be attempted, proceed to step 6.

5. Perform normal electric engine start.

   a. Unlatch and open control box cover.

   b. Release emergency stop operator.

   c. At the control panel, hold the ENGINE switch in the START position until the engine starts. If engine fails to start within 15 seconds, release switch and allow starter to cool for a minute before continuing. When the ambient temperature is below 20° F (-7° C), position and hold INTAKE HEATER switch in the ON position while ENGINE switch is in START position.

   d. Adjust the control panel lights to the desired brightness.

   e. Disconnect battery power cable from NATO connector 1A1J1 on engine module. Install dust caps on NATO connector and free end of battery power cable. Proceed to step 7.

6. Perform manual engine start. (Refer to figure 6.)

   a. Remove manual starter (1) from container.

   b. Disconnect battery power cable from NATO connector 1A1J1 on engine module. Install dust caps on NATO connector and free end of battery power cable.

   c. Unlatch and open control box cover.

   d. Release emergency stop operator.

   e. Place START-RUN-STOP switch in RUN position.

   f. Disengage both engine-to-frame latches (2) and lower the latching engine module clamp (3).

   g. At front of pump-engine module, remove two quick disconnect pins (4) attaching coupling guard (5) to pump-engine module. Unlatch and remove the coupling guard (5).

   h. Install flexible coupling (6) on manual starter (1), align flexible coupling (6) with adapter on engine, insert legs of manual starter bracket (7) in pump-engine module frame, adjust position of manual starter (1) as required to engage the flexible coupling (6) on the manual starter (1) with the adapter on the engine, and raise and latch the engine module clamp (3) to hold the manual starter (1) in position.

   i. Grasp start control knob (8) and lift start control (9). Tighten the lower knob (10).

   j. Press the reset button (11) on the manual starter (1).

   k. To wind the manual starter (1), pull the starter rope (12) steadily and smoothly eight full times. If the temperature is below 20 degrees F, pull twelve times. Do not exceed twelve pulls.

   l. Operate trip lever (13) on the manual starter (1) to start engine.

OPERATING PROCEDURES (Continued)

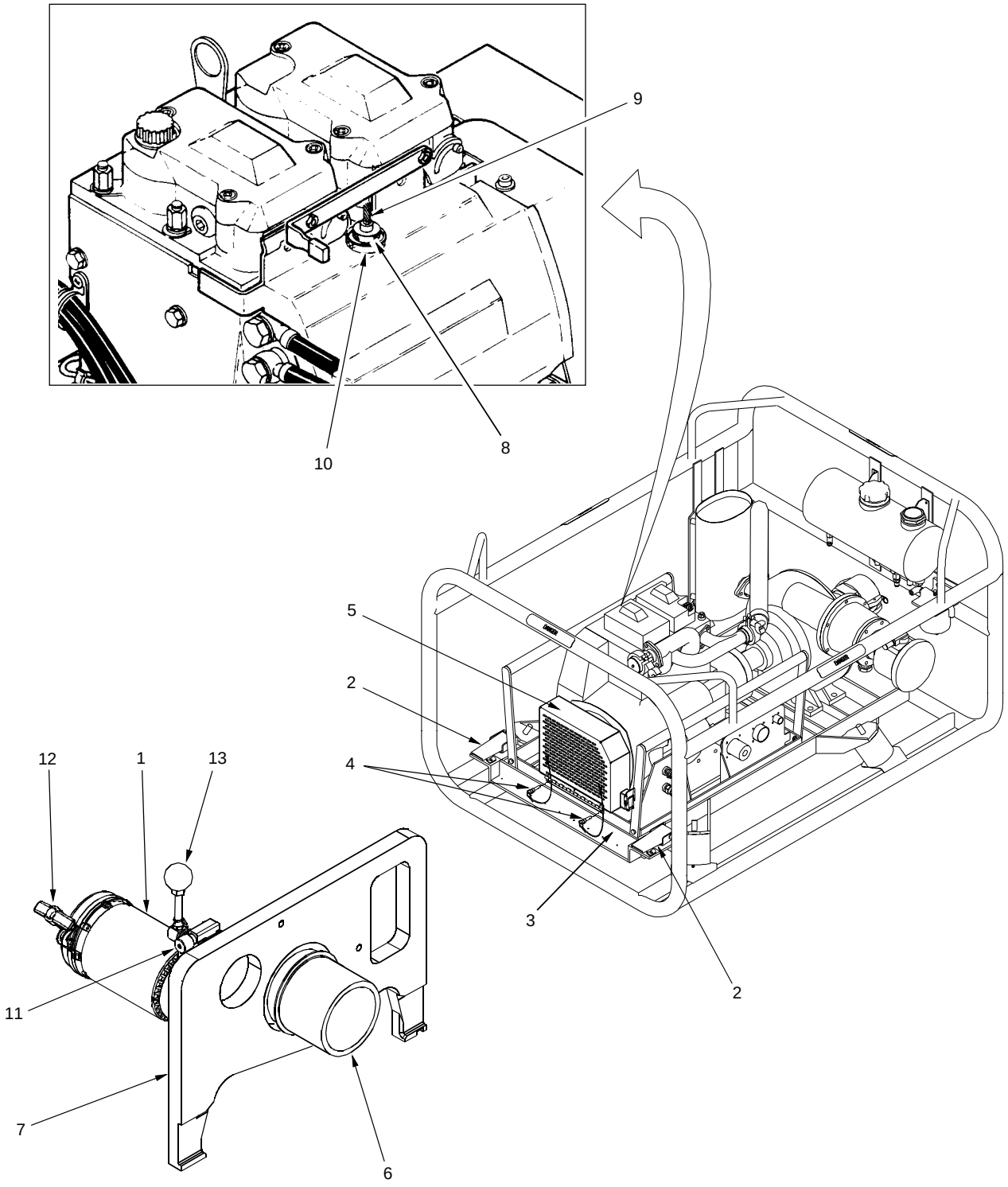


Figure 6. Manual Engine Start

OPERATING PROCEDURES (Continued)

NOTE

The following step restores electrical stop capability to the control panel.

m. After engine is running, lower the manual start control (9) fully by alternately turning the lower and upper manual start control knobs (8 and 10).

WARNING

Serious personal injury could result from contact with rotating parts such as the engine or starter coupling components. Keep body well clear of coupling while rotating. Do not allow loose clothing near engine where it may be caught on rotating parts. Handle coupling guard by sides when raising and keep fingers well clear of coupling.

CAUTION

Equipment damage may occur if the fuel transfer pump is allowed to run dry. When the fuel transfer pump primes and moves pumpage, the outlet hose will expand. If the hose remains flat, the fuel transfer pump has not primed and is running dry.

7. Verify that pump outlet hose pressurizes (hose expands). If hose has not pressurized after two minutes of operation, shut down system and determine why pump has not primed.

WARNING

Serious eye and skin injury could occur from venting of fuel when filter vessel manual vent valve is open. Wear suitable protective clothing and eye protection.

8. At the liquid fuel filter-separator, depress and latch open the manual vent valve.

CAUTION

The fuel transfer pump may be damaged if allowed to run dry. Any air in the system which reaches the fuel transfer pump will cause the pump to run dry. The fuel transfer pump will pump air and regain suction if the air in the pump can be removed within a few minutes. However, a large volume of air may cause the pump to run dry too long and seize. The large volume of air initially in the filter vessel must be vented completely by filling the liquid fuel filter-separator as slowly as possible while venting to allow all the air to escape.

9. Crack open the liquid fuel filter-separator inlet valve. Allow fuel to slowly fill filter vessel, forcing air out the manual vent valve.

10. Close the manual vent valve at first appearance of fuel.

11. Open the liquid fuel filter-separator inlet and outlet valves fully. Allow fuel to recirculate 15 - 20 minutes.

OPERATING PROCEDURES (Continued)

12. Test for undissolved water in aviation fuel (AQUA GLO Test).

WARNING

Micro filters are prolific generators of static electricity. It is essential that no unbonded metal components are present during filtration since they concentrate and develop voltage sufficient to cause static discharge within the test apparatus. This procedure requires that all metal parts and the receiver must be electrically bonded together. The fuel test apparatus and receiver must be grounded to a known ground. Death or personal injury may result from improperly grounded or bonded components.

NOTE

The following procedure is applicable for dynamic line samples only. The fuel is to be taken directly from the system under test, through the test pad without exposing the sample to the atmosphere or to a sample container.

a. Calibrate water detector (figure 7, 8).

NOTE

Calibrate the water detector prior to use each day, after each hour of use and when the ultra violet light is replaced or the batteries are recharged.

(1) Verify a calibrated standard is in the water detector (figure 8, 1) window labeled TEST PAD HERE (2). Note the “Set” rating recorded on the calibrated standard.

(2) Install the instrument pack (figure 7, 7) on the back of the water detector (figure 8, 1).

(3) Place the power selector (3) on the water detector (1) to the desired position (e.g., ON-INT.BAT).

(4) Move the light modulating lever (4) below the power selector (3) fully to one side or the other.

(5) Press and hold the light button (5) located on the back side of the instrument pack (6). Hold the light button (5) until the indicator needle (7) on the instrument pack (6) is steady for 10 to 15 seconds.

(6) When the indicator reading has been steady for 10 to 15 seconds, slowly move the light modulating lever (4) on the water detector (1) in the opposite direction, until the indicator needle (7) on the instrument pack (6) is at zero. Always move the light modulating lever (4) in the same direction when zeroing the water detector (1) in calibration or testing to eliminate errors caused by play in the lever.

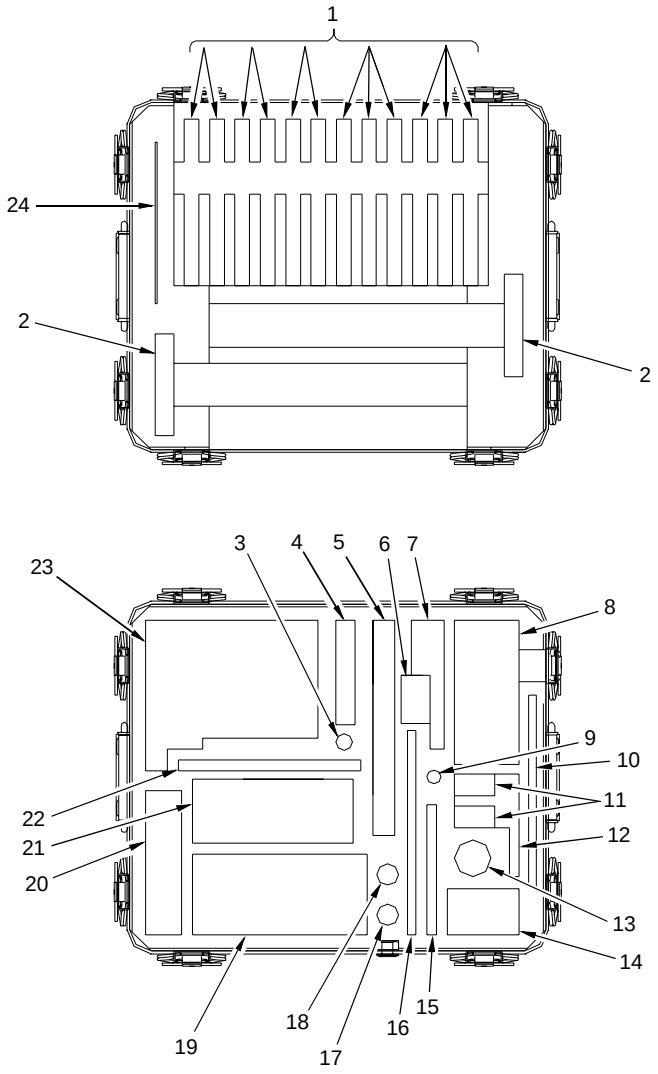
(7) When the indicator needle (7) has been zeroed, observe the number directly below the light modulating lever (4) on the water detector (1). Compare the number below the lever with the “Set” rating on the calibrated standard. The lever position and the “Set” point should match.

(8) If the reading in step (7) above does not agree with the calibration pad rating, adjust the water detector (1) in the following manner:

(a) Remove the plug screw on the side of the instrument pack (6) at the 45 degree bend.

(b) Insert a small screwdriver (8) and adjust the reading to correspond with the calibration set point rating.

OPERATING PROCEDURES (Continued)



1. Thermohydrometers
2. Hydrometer Cylinder
3. Dust Cap, Flexible Extension
4. Syringe
5. Flexible Extension Tube
6. Power Cord
7. Instrument Pack
8. Water Detector
9. Ultraviolet Light Bulb
10. Calibration Standard Set
11. External Battery
12. Tweezer
13. Monitor, 25 mm Pads (Test Pad Holder)
14. Free Water Detector Pads
15. External Battery Power Cord
16. Color Rating Booklet
17. Quick Disconnect Coupler
18. Valved Actuator with Cap
19. Sample Bottle, 1000 ml, and Solvent Dispensing Bottle
20. Monitor (Matched Weight, 5 ea and Single Membrane, 6 ea)
21. Ether Storage Bottle
22. Wrench, Ajustable, 8 inch
23. Monitor Housing Assembly
24. API Gravity Calculator

Figure 7. Fuel Contamination Test Kit

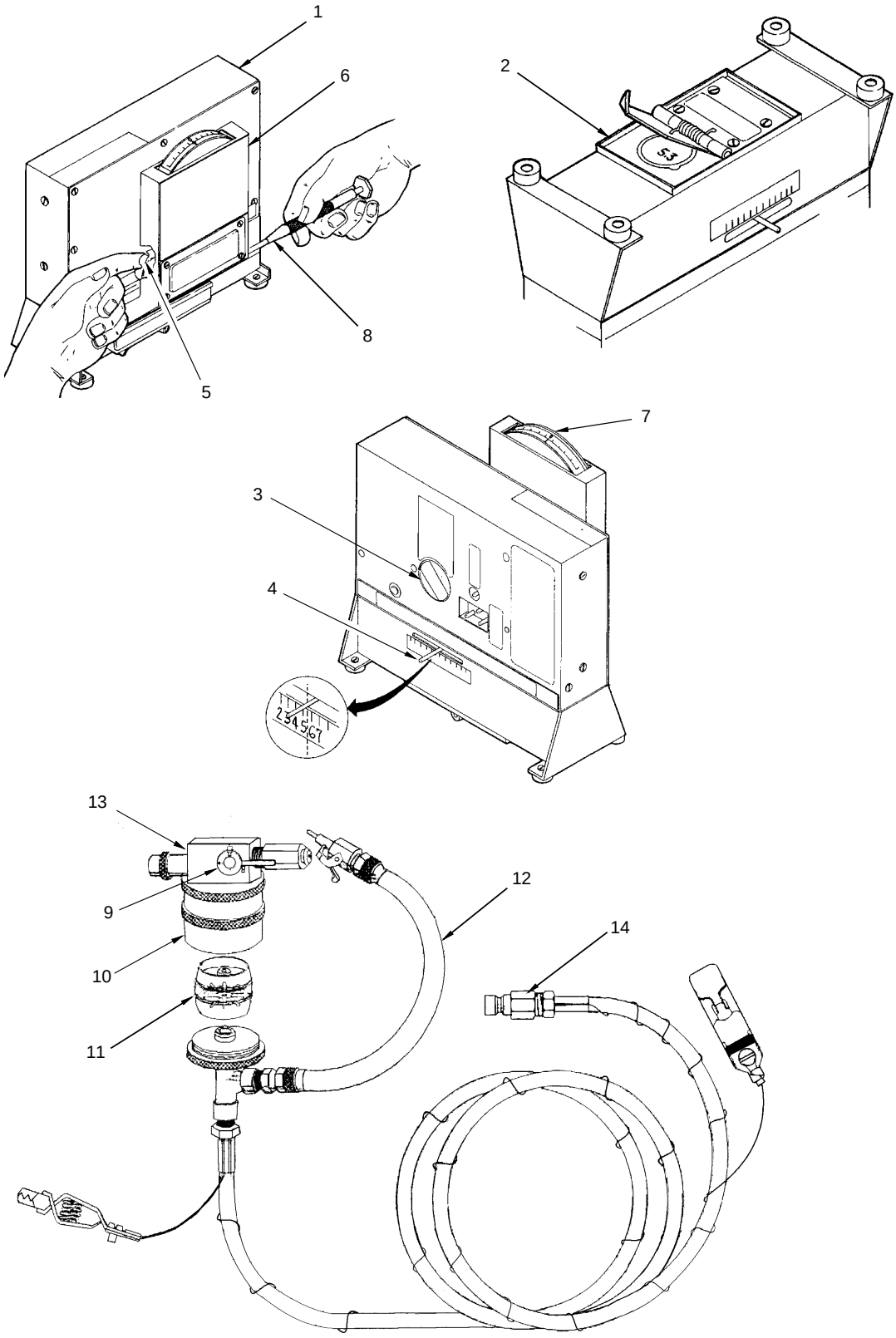


Figure 8. Undissolved Water Test

OPERATING PROCEDURES (Continued)

b. Sampling

(1) Attach the flexible extension tube (figure 7, 5) to the monitor housing assembly (23).

(2) Verify the three position lever (figure 8, 9) is in the STOP position.

(3) Separate the monitor housing (10) and install the monitor (11). Reassemble the monitor housing (10).

(4) Connect the attached monitor housing bypass line (12) to the valve body (13) on top of the monitor housing (10).

(5) Place the 1000 ml sample bottle (figure 7, 19) near the filtration module and monitor housing assembly (23).

(6) Place the monitor housing assembly open line (figure 8, 14) into the 1000 ml sample bottle (figure 7, 19).

WARNING

The filtration module may be under pressure during the next step. Wear proper safety equipment. Prevent fuel from spilling on the ground. Use rags to prevent fuel from spraying on personnel and equipment. Death or personal injury may result.

(7) Attach the monitor housing assembly (23) to the filtration module sample port quick disconnect.

(8) Connect monitor housing assembly (23) ground cables to the ground point on the filtration module.

(9) Move the three position lever (figure 8, 9) on the monitor housing to FLUSH. Flush the monitor (11) assembly immediately prior to sampling. Displace the sampling line with at least two volumes of test fuel. Capture displaced fuel in the 1000 ml sample bottle (figure 7, 19).

(10) Disconnect the monitor housing bypass line (figure 8, 12) from valve body (13) on top of monitor housing (10).

(11) Place the three position lever (9) on the monitor housing (10) to STOP. Remove the monitor (11) from the monitor housing (10), open the monitor (11) and use tweezers (figure 7, 12) to insert a new test pad (14), making sure that the treated side of the pad, (ORANGE), is facing upstream, to the inlet side of the monitor (figure 8, 11).

(12) Reassemble the monitor housing (10) and connect the monitor housing bypass line (12) to the valve body (13).

(13) Place the three position lever (9) on the monitor housing (10) to the TEST position. Pass 500 ml of fuel through the test pad (figure 7, 14). Accurately measure the test sample quantity. The normal volume of test fuel is 500 ml. Place the three position lever (figure 8, 9) on the monitor housing (10) to STOP.

WARNING

Use caution when disconnecting the flexible extension tube from the filtration module. Use rags to prevent fuel from spraying on personnel or equipment. Death or personal injury may result.

(14) Disconnect the flexible extension tube (figure 7, 5) from the filtration module.

OPERATING PROCEDURES (Continued)

c. Rating Procedure

(1) Disconnect the monitor housing bypass line (figure 8, 12) from the valve body (13).

(2) Remove the monitor (11) from the monitor housing (10).

(3) Using tweezers (figure 7, 12), remove the test pad (14) from the monitor (13).

(4) Press the test pad (14) between dry paper blotters or absorbent towels to remove excess fuel. To blot, press firmly (about 5 lbs of force) three or four times with the heel of the hand, moving the pad with tweezers (12).

NOTE

The test pad should be read within three minutes after sampling is initiated. If the test pad is not read immediately after sampling, it must be placed in a desiccator to prevent moisture pickup from the air. Ratings made on dried test pads, not damp with fuel, should be avoided as they will give high and erroneous readings. In addition, rating a pad which has not been well blotted will give a low reading as the excess fuel will absorb part of the UV light and decrease fluorescence.

(5) Using tweezers (12), remove the calibration standard under the water detector window (figure 8, 2). DO NOT DISCARD the calibration standard.

(6) Using tweezers (figure 7, 12), put the test pad (14) under the water detector window (figure 8, 2). Place the power selector (3) to the appropriate power source.

(7) Press and hold the light button (5) located on the back side of the instrument pack (6). The ultra violet light must be on to get a reading. This can be checked by moving the light modulating lever (4) on the water detector (1) from one extreme to another. The instrument pack indicator needle (7) should swing violently when the light modulating lever (4) is moved.

(8) Zero the water detector (1) by adjusting the light modulating lever (4) until there is a steady reading for 10 to 15 seconds. Always move the light modulating lever (4) in the same direction when zeroing the water detector (1) to eliminate errors caused by backlash. Release the light button (5) on the instrument pack (6) when the reading is complete.

(9) Observe the light modulating lever (4) and corresponding number. Record the instrument reading (estimate to the nearest tenth) and the sample volume.

(10) Set the water detector power selector (3) to OFF to conserve power.

(11) Record the temperature of the fuel.

(12) Using tweezers (figure 7, 12), remove the test pad (14) from the water detector (8) assembly for visual observation. Free water in fuel is normally well dispersed and will form an even distribution of many, small points of yellow fluorescence on the test pad when illuminated by ultra violet light. Large drops of water will form a few large spots of yellow fluorescence on the pad. The large spots may give erroneous readings, and should be disregarded and a new sample taken.

d. Calculations

The instrumentation reads directly, IF the sample volume is 500 ml. Correct the readings for other size samples by multiplying reading by 500/sample size in milliliters:

Free water, ppm = (meter reading, ppm) (500) / (sample volume, ml)

OPERATING PROCEDURES (Continued)

e. Reporting

Report the results to the nearest whole number as ppm by volume of undissolved water in fuel, and also the sample volume used in the test. Report the temperature of the sample, if available.

f. Equipment cleaning and stowage

(1) Fill solvent dispenser bottle (19) from ether storage bottle (21). Disassemble the monitor housing assembly (23) and flush with ether. Wipe all components with a clean rag or paper towel. Pour any unused ether into ether storage bottle (21). Stow each item in the fuel contamination test kit.

(2) Verify the power selector on the water detector (8) is in the OFF position.

(3) Remove the instrument pack (7) from the water detector (8) and stow both items in the fuel contamination test kit.

(4) Secure the fuel contamination test kit for transport.

13. Perform particulate contamination fuel test.

WARNING

Micro filters are prolific generators of static electricity. It is essential that no unbonded metal components are present during filtration since they concentrate and develop voltage sufficient to cause static discharge within the test apparatus. This procedure requires that all metal parts and the receiver must be electrically bonded together. The fuel test apparatus and receiver must be grounded to a known ground. Death or personal injury may result from improperly grounded or bonded components.

a. Place the fuel contamination test kit in the vicinity of the filtration module.

b. Attach the flexible extension tube (figure 7, 5) to the monitor housing assembly (23).

c. Verify the three position lever (figure 9, 1) on the monitor housing (2) is in the STOP position.

d. Separate the monitor housing (2).

NOTE

To avoid extraneous contamination, monitor protective plugs must be removed only for sampling and replaced immediately. The monitor must be opened in a laboratory.

e. Select a monitor (figure 7, 20). Use a contamination monitor (figure 9, 3) (blue and red protective plugs) for color comparator testing or a matched-weight monitor (yellow and red protective plugs) for gravimetric testing.

f. Remove the bottom protective plug (4) (outlet) from the monitor (3) and place it in a clean, safe place.

g. Position the monitor (3) in the monitor housing (2).

h. Remove the other protective plug (5) (inlet), from the monitor (3) and place it in a clean, safe place.

i. Reassemble the monitor housing (2) hand tight only. Extreme force is both unnecessary and undesirable.

OPERATING PROCEDURES (Continued)

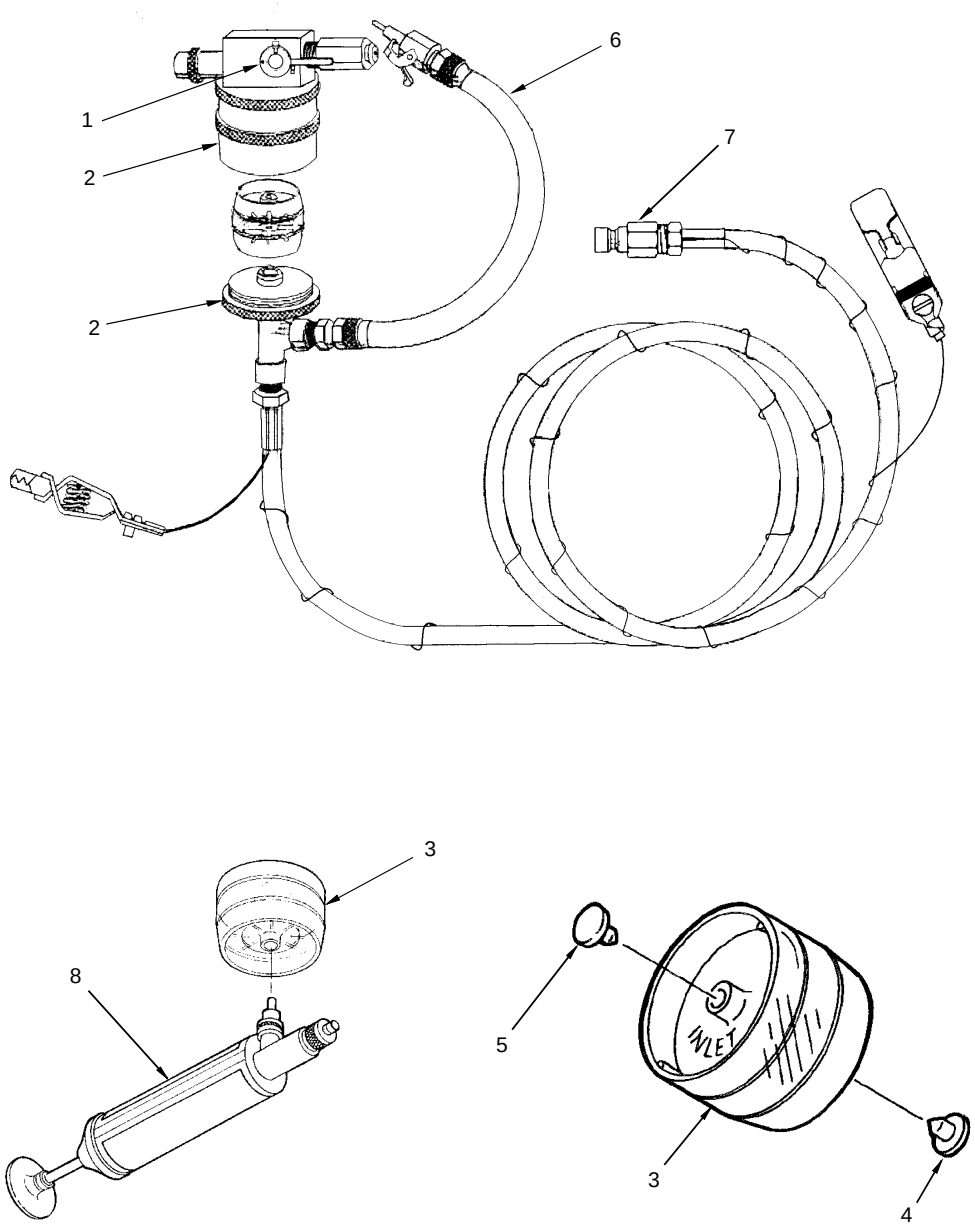


Figure 9. Particulate Fuel Contamination Test

OPERATING PROCEDURES (Continued)

j. Ensure that the monitor housing bypass line (6) is connected to the valve body on top of the assembly. Place the monitor housing assembly open line (7) in a container of at least 1.3 gal (5 l) capacity.

k. Connect all ground clips to the filter separator ground point.

l. Verify the three position lever (figure 9, 1) is in the OFF position.

WARNING

The filtration module may be under pressure during the next step. Wear proper safety equipment. Prevent fuel from spilling on the ground. Use rags to prevent fuel from spraying on personnel and equipment. Death or personal injury may result.

m. Attach the monitor housing assembly (figure 7, 23) to the filtration module sample port quick disconnect fitting.

n. Position the three position lever (1) to FLUSH. Displace the sampling line with 0.5 gal (2 l) of fuel. Capture displaced fuel in a 1.3 gal (5 l) container.

o. When 0.5 gal (2 l) of fuel have been collected, move the three position lever (1) to the TEST position. Take a fuel sample of no more than 1 qt (1 l).

p. When the required amount of fuel is collected, place the three position lever (1) in the OFF position.

WARNING

The one minute wait period in the next step is required as a precaution against electrostatic discharge. A static discharge from any system component could ignite the fuel or cause an explosion of fuel vapors. Do not operate the system until it has first been grounded properly.

Use caution when disconnecting the flexible extension tube from the filtration module. Use rags to prevent fuel from spraying on personnel or equipment. Death or personal injury may result.

q. After sampling is completed, allow one minute to pass, then disconnect the monitor housing assembly (figure 7, 23) from the sample connection on the filtration module.

r. Remove the monitor (figure 9, 3) from the monitor housing (2) and attach the syringe (8) to the lower opening (spiderweb side) of the monitor (3).

s. Pull outward on the syringe (8) handle to draw residual fuel from the monitor (3). If fuel remains in the monitor (3), disconnect the syringe (8) and expel the collected fuel into a suitable container. Repeat the procedure as necessary to withdraw all the fuel from the monitor (3).

t. If the gravimetric method of contamination is to be used, proceed to step u. If the color rating method is to be used:

(1) Use the tweezers (figure 7, 12) to pry off the top of the monitor (20).

(2) Use the tweezers (12) to lift the test pad from the monitor (20).

(3) Dry the test pad by placing on absorbent paper and blotting until the test pad is as dry as possible.

OPERATING PROCEDURES (Continued)

(4) Use tweezers (12) to hold the test pad. Following the instructions under the front cover of the color rating booklet (16), determine the rating of the sample.

(5) Report the nearest rating number and the sample volume used.

u. Replace the protective plugs in the monitor (20). Handle the monitor (20) carefully. DO NOT open the monitor (20) under any circumstances before returning it to the laboratory. If the monitor (20) is opened in the field, it can not be used for gravimetric analysis.

v. Place the monitor (20) in a suitable container and record the following information:
Date
Monitor Serial Number
Sample location and volume of sample
Line pressure and flow rate

w. Forward the monitor (20) to the appropriate laboratory for analysis as soon as possible.

x. Fill solvent dispenser bottle (19) from ether storage bottle (21). Drain and disassemble the monitor housing assembly (23) and flush with ether. Pour any unused ether into ether storage bottle (21).

y. Wipe all components with a clean paper towel. Return all items to the fuel contamination test kit.

14. Periodically monitor condition of the fuel transfer pump discharge hose. A flattened hose indicates a loss of prime. If hose remains flat for two minutes or more, shut down the system and determine why pump has lost prime. The most likely cause is a large air bubble in a fuel drum(s).

15. Periodically monitor differential pressure gauge on liquid fuel filter-separator. Normal reading with clean elements is 2-3 psid (1.41-2.11 gm/mm^2 differential) when operating at full flow. Lower flow rates will cause element clogging at lower differential pressures. If differential pressure approaches 15 psid, notify unit maintenance that coalescer elements need to be replaced.

16. Periodically monitor the water level sight gauge on the liquid fuel filter-separator. The small ball should be afloat at all times. If the ball reaches the top of the sight gauge, the water in the sump has risen to the highest level that can be monitored. As soon as possible, isolate the filter-separator by closing the inlet and outlet valves, vent pressure by opening the manual vent valve and drain the sump until all water has been drained.

CAUTION

System components are subject to damage from thermal expansion. As the temperature increases, the pumpage in any component will expand. If trapped in a component, the expanding pumpage may rupture seals and cause a leak or equipment malfunction. For this reason, all system valves should remain open as long as the system is flooded. With all valves open, the hoses will absorb the expansion and protect system seals. If any component must be isolated, it should be drained or defueled immediately to prevent damage.

17. To change from use of a CCR nozzle to a D-1 nozzle during refueling operations:

a. Close the discharge hose unisex coupling valve at the CCR inlet. Remove CCR nozzle from the hose.

b. Drain the CCR nozzle IAW local SOP.

c. Disconnect the CCR nozzle.

OPERATING PROCEDURES (Continued)

d. Connect the D-1 nozzle to the discharge hose unisex coupling, open the unisex coupling valve and resume fueling operations.

18. To change from use of a D-1 nozzle to a CCR nozzle during refueling operations:

a. Close the discharge hose unisex coupling valve at the D-1 inlet.

b. Close open/close actuator.

c. Drain the D-1 nozzle IAW local SOP.

d. Disconnect D-1 nozzle and install dust caps.

e. Connect the CCR nozzle to the discharge hose unisex coupling valve and resume fueling operation.

19. To change from use of a CCR or D-1 nozzle to the open port nozzle during refueling operations:

a. Close the discharge hose unisex coupling valve at the CCR/D-1 inlet.

b. Drain the CCR/D-1 nozzle IAW local SOP.

c. Disconnect the CCR/D-1 nozzle and install dust caps.

d. Connect the open port nozzle to the discharge hose unisex coupling valve and resume fueling operation.

20. Remove condensation from fuel lines.

NOTE

Perform the following procedure to remove condensation from a flooded system that has been unused for an extended period (e.g., overnight) during which the temperature has decreased significantly.

a. Close unisex coupling (figure 10, 15) on liquid fuel filter-separator (14) outlet valve.

CAUTION

Never subject nozzles to auxiliary pump suction. Seals will rupture.

Drain nozzle immediately after disconnecting it from system. Trapped fuel can cause large internal pressure that can damage the nozzle when the temperature rises.

b. Close discharge unisex coupling valves (12) and disconnect and drain all nozzles (13).

c. Select a fuel drum (figure 11, 2) to defuel into.

d. At selected fuel drum (2), close inlet elbow valve (3) and unisex coupling valve on discharge hose (4), disconnect discharge hose (4) from inlet elbow valve (3), connect the discharge hose (4) to the flow side (5) of auxiliary pump (1), and open unisex coupling valves on flow side (5) of auxiliary pump and discharge hose (4).

e. Connect auxiliary pump (1) unisex coupling to inlet elbow valve (3) unisex coupling, and open unisex coupling valve and inlet elbow valve (3).

DEFUELING PROCEDURE (Continued)

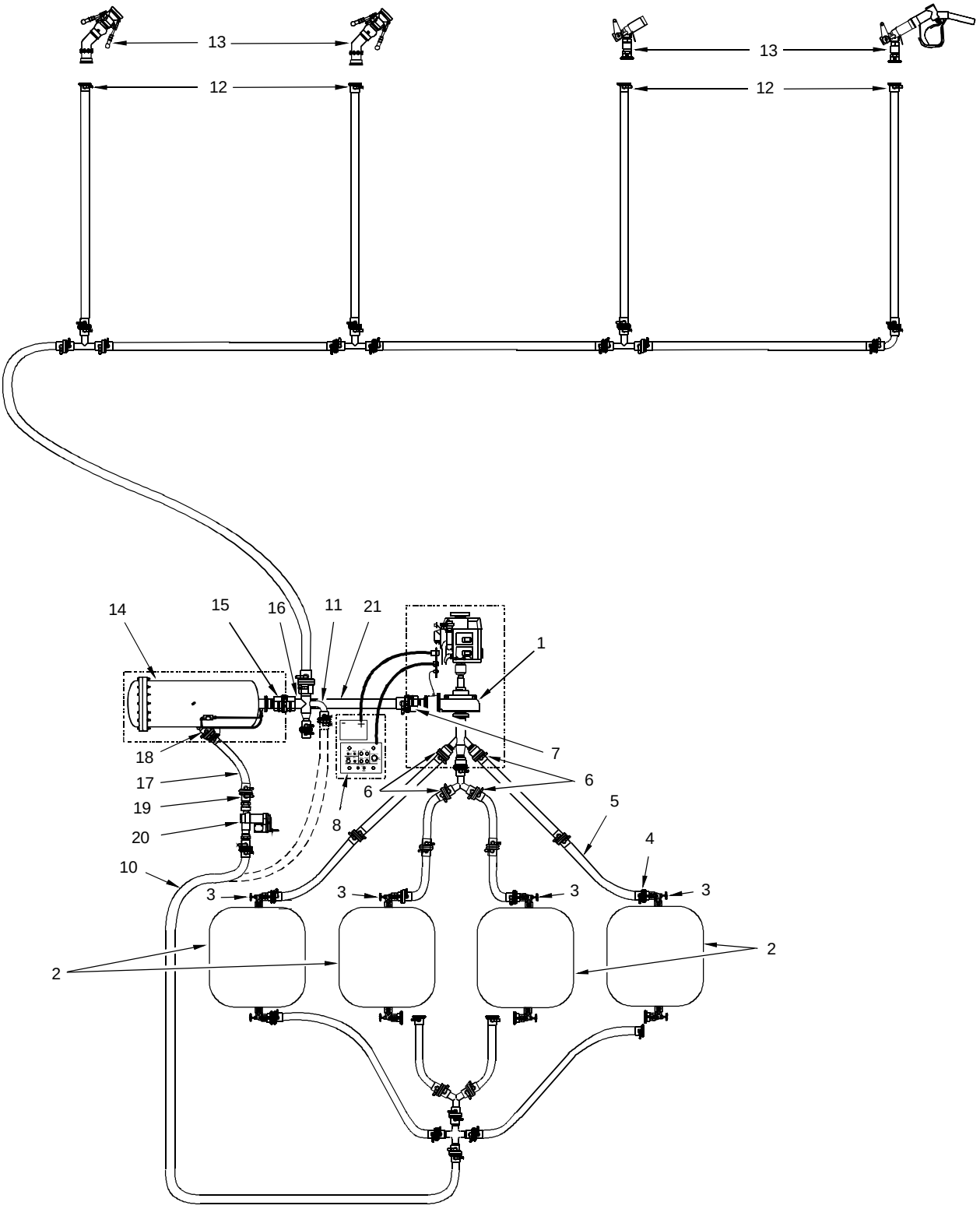


Figure 10. Defueling Liquid Fuel Filter-Separator

DEFUELING PROCEDURE (Continued)

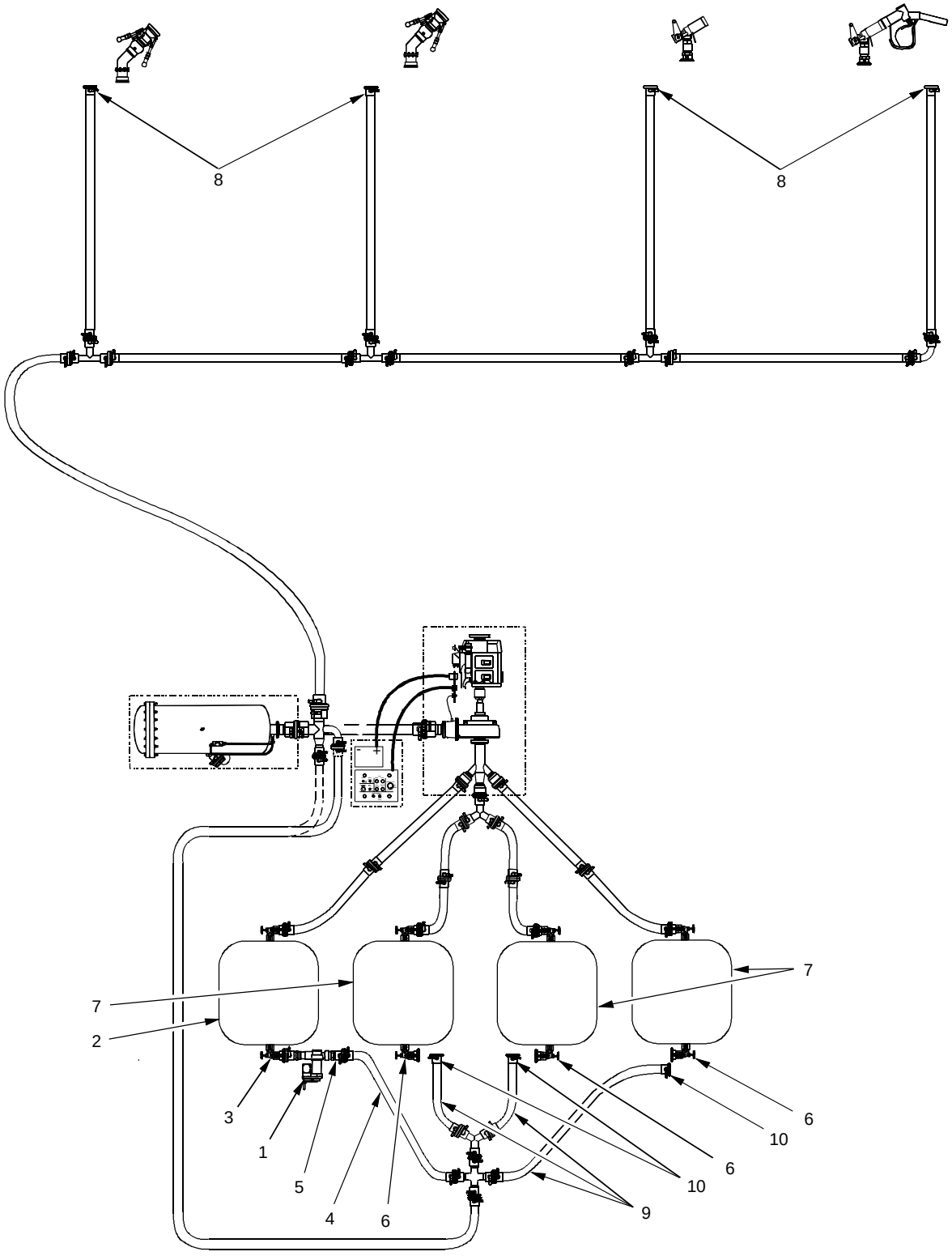


Figure 11. Defueling System Fuel Hoses

OPERATING PROCEDURES (Continued)

WARNING

The AAFARS suction and recirculation hoses are connected to the fuel drums via elbow valves with integral camlock couplers. When the elbow valve coupling is closed, the valve stem is extended; when open, it is retracted. The stem travel is opposite that of conventional valves and requires the operator to double check valve position during system set up and tear down, since observation can be misleading. Failure to heed this warning could result in death or serious injury.

f. Close the fuel drum inlet elbow valve couplings (6) on the remaining drums (7).

g. Turn on auxiliary pump (1).

NOTE

After each hose is defueled and unisex coupling is closed, do not reopen the unisex coupling until after defueling is completed. This will prevent introducing air into the system.

h. One at a time, open unisex valves (8) on discharge hoses at fueling points. Close unisex valve (8) as hose collapses.

i. At recirculation manifold (figure 10, 16) close unisex valve to refueling points to isolate discharge hoses.

j. Turn off auxiliary pump (figure 11, 1).

k. Disconnect inlet elbow valve (3) from fuel drum (2).

l. Disconnect discharge hose (4) from auxiliary pump (1).

m. Hold auxiliary pump (1) over container. Open unisex coupling valve (5) and drain fuel. Close unisex coupling valve (5).

n. Hold auxiliary pump (1) over container and disconnect auxiliary pump (1) from inlet elbow valve (3).

o. Disconnect auxiliary pump power cable from auxiliary pump module (1) and stow cable in accessory module.

p. Install elbow valve coupler (3) on fuel drum (2) and open elbow valve coupler (3).

q. Open elbow valve couplers (6) on remaining fuel drums (7).

r. Start system and recirculate for 10-15 minutes.

s. Install all nozzles at fueling points and open unisex couplings at nozzle.

t. At the recirculation manifold, open unisex coupling to refueling points.

u. Commence normal operation.

DEFUELING PROCEDURE (Refer to figure 10.)

WARNING

Do not attempt defueling of more than one inlet hose at a time. Fuel spillage could occur and pose a hazard to personnel and the environment.

CAUTION

System components are subject to damage from thermal expansion. To prevent damage to equipment, ensure all components are completely defueled prior to transportation or storage.

1. With the fuel transfer pump (1) running:
   a. Close all fuel drum (2) outlet elbow valve couplings (3).
   b. Close all unisex couplings (4) at fuel drum end of suction hoses (5).
   c. Beginning at fuel drums (2), disconnect suction hoses (5) one at a time, open unisex coupling (4), hold hose end higher than intake manifold and close unisex coupling (6) at far end (intake manifold) of suction leg. Close unisex coupling (4) at free end of leg and install dust cap.
   d. Repeat step (c) for each of the three remaining suction legs.

CAUTION

Do not run the fuel transfer pump dry. Running dry for more than 15 minutes may cause damage to the pump.

   e. Close emergency shutoff valve (7) as soon as fuel transfer pump (1) unloads.
2. At the accessory module control panel (8), position ENGINE SWITCH to STOP position.

CAUTION

Never subject nozzles to auxiliary pump suction. Seals will rupture.

Drain nozzle immediately after disconnecting it from system. Trapped fuel can cause large internal pressure that can damage the nozzle when the temperature rises.

3. Close discharge unisex coupling valves (12), and disconnect and drain all nozzles (13).
4. Defuel liquid fuel filter-separator (14).
   a. Close unisex coupling (15) on liquid fuel filter-separator (14) outlet valve.
   b. Disconnect discharge hose (10) from recirculation manifold (16).
   c. Disconnect one of the suction hoses (5) from fuel transfer pump (1) inlet for use in next step.

DEFUELING PROCEDURE (Continued)

d. Connect suction hose (17) removed from fuel transfer pump (1) inlet to the defueling unisex coupling (18) and the unisex coupling (19) on the flow side of the auxiliary pump (20). Open unisex coupling valves.

e. Connect discharge hose (10) to auxiliary pump (20) and open unisex coupling valves.

f. Connect auxiliary power cable to auxiliary pump (20).

g. Open liquid fuel filter-separator (14) manual vent valve.

h. Turn on auxiliary pump (20) to pump down liquid fuel filter-separator (14) and 3 in. x 6 ft discharge hose (21) from fuel transfer pump (1).

i. Close liquid fuel filter-separator (14) inlet valve and manual vent valve when air is seen in the sight gauge.

j. Turn off auxiliary pump (20), and close auxiliary pump unisex inlet and outlet valves.

k. Remove the recirculation manifold (16) from the filter-separator and place flat on ground.

l. Disconnect discharge hose (10) from auxiliary pump (20) and connect to recirculation manifold full flow unisex coupling (11).

m. Disconnect suction hose (17) from auxiliary pump (20) and liquid fuel filter-separator (14).

5. Defuel system fuel hoses. (Refer to figure 11.)

NOTE

Auxiliary pump must be physically supported in the following steps.

a. Select a fuel drum (2) to defuel into.

b. At selected fuel drum (2), close inlet elbow valve (3) and unisex coupling valve on discharge hose (4), disconnect discharge hose (4) from inlet elbow valve (3), connect the discharge hose (4) to the flow side (5) of auxiliary pump (1), and open unisex coupling valves on flow side (5) of auxiliary pump and discharge hose (4).

c. Connect auxiliary pump (1) unisex coupling to inlet elbow valve (3) unisex coupling, and open unisex coupling valve and inlet elbow valve (3).

d. Close the fuel drum inlet elbow valve couplings (6) on the remaining drums (7).

WARNING

The AAFARS suction and recirculation hoses are connected to the fuel drums via elbow valves with integral camlock couplers. When the elbow valve coupling is closed, the valve stem is extended; when open, it is retracted. The stem travel is opposite that of conventional valves and requires the operator to double check valve position during system set up and tear down, since observation can be misleading. Failure to heed this warning could result in death or serious injury.

e. Turn on auxiliary pump (1).

DEFUELING PROCEDURE (Continued)

NOTE

After each hose is defueled and unisex coupling is closed, do not reopen the unisex coupling until after defueling is completed. This will prevent introducing air into the system.

f. One at a time, open unisex valves (8) on discharge hoses at fueling points. Close unisex valve (8) as hose collapses.

g. One at a time, disconnect the inlet elbow valve camlock coupler (6) from the other three fuel drums hoses (9), allow the hose to pump down, and close unisex valve (10).

h. When hoses are collapsed/defueled, close inlet elbow valve (3) on last fuel drum (2).

i. Turn off auxiliary pump (1).

j. Disconnect inlet elbow valve (3) from fuel drum (2).

k. Disconnect discharge hose (4) from auxiliary pump (1).

l. Hold auxiliary pump (1) over container. Open unisex coupling valve (5) and drain fuel. Close unisex coupling valve (5).

m. Hold auxiliary pump (1) over container and disconnect auxiliary pump (1) from inlet elbow valve (3).

n. Disconnect auxiliary pump power cable from auxiliary pump module (1).

o. If fuel drums are to be defueled on site:
   (1) If installed, ensure all elbow valve couplings at inlet and outlet of all affected fuel drums are closed.
   (2) Remove the 2” x 2” elbow valve couplings from both ends of all affected fuel drums.
   (3) Connect fuel suction hose from fuel source to a 2” x 1-1/2” elbow valve coupler.
   (4) Install the 2” x 1-1/2” elbow valve coupler to one end of fuel drum.
   (5) Defuel fuel drum until suction is lost.
   (6) Repeat steps (3), (4) and (5) for all fuel drums to be defueled.

NORMAL SYSTEM SHUTDOWN

At accessory module, position engine switch to STOP position.

EMERGENCY SYSTEM SHUTDOWN

1. At accessory module, press EMERGENCY STOP switch.

2. If emergency stop switch malfunctions, position and hold fuel shut off lever in off position until engine stops.

PREPARATION FOR MOVEMENT

WARNING

The exhaust system will remain hot for some time after engine shut down. Avoid contact with exhaust system components until they have cooled sufficiently for safe handling. Serious personal injury may occur from contact with hot metal.

CAUTION

Drain nozzle immediately after disconnecting it from the system. Trapped fuel can cause large internal pressure that can damage nozzle when the temperature rises.

During recovery, ensure dust caps are installed on couplings immediately after disconnection. This practice will protect the couplings, and reduce fuel contamination and spills.

NOTE

This procedure assumes that defueling has been completed. However, small amounts of residual fuel may remain. Place a shallow container beneath each coupling to catch drainage when coupling is disconnected.

1. At fueling points, remove the ground rods, drain trapped fuel and stow the nozzles, and return the nozzle kits and ground rods to the recovery area.
2. At fueling points, start at end of discharge hose and roll discharge hose toward first fitting. Disconnect unisex couplings and strap hoses. Continue process until all hoses are rolled and secured. Return discharge hoses to recovery area.
3. Disconnect suction hoses, strap and return to recovery area.
4. Return all wyes, tees, elbows and crosses to recovery area.
5. Disconnect and return recirculation manifold to recovery area.
6. At each fuel drum, remove the inlet and outlet elbow valves and return valves to recovery area.
7. At recovery area, sort and stow all fuel handling AAFARS components.
8. Remove and stow ground cables on liquid fuel filter-separator, pump-engine module and accessory module.
9. Return auxiliary pump module to recovery area.

WARNING

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. Always use sufficient personnel to move or relocate the liquid fuel filter-separator. Use proper physical lifting procedures or use a suitable lifting device or dolly. Wear safety shoes, gloves, and other suitable protective clothing.

10. Return liquid fuel filter-separator to recovery area.
11. Remove ground rod at pumping station and return to recovery area.
12. Disconnect and stow electrical cables in accessory module compartment. Install dust caps on connectors. Disconnect battery connector to preserve charge on battery.

PREPARATION FOR MOVEMENT (Continued)

13. Disconnect inlet manifold from fuel transfer pump quick disconnect. Drain inlet manifold and stow in storage module.

14. If attached, remove manual starter from pump-engine module and stow in container.

    a. Lower engine module clamp, and disengage and remove manual starter.

    b. Install and latch the coupling guard at front of engine module.

15. Remove air cleaner from engine and stow in storage module. Install dust cap on intake manifold.

WARNING

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. Always use sufficient personnel to move or relocate the accessory module. Use proper physical lifting procedures or use a suitable lifting device or dolly. Wear safety shoes, gloves, and other suitable protective clothing.

16. Return accessory module to recovery area.

WARNING

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. Always use sufficient personnel to move or relocate the engine module. Use proper physical lifting procedures or use a suitable lifting device or dolly. Wear safety shoes, gloves, and other suitable protective clothing.

17. Remove engine module from pump-engine module.

    a. Unclamp exhaust pipe from exhaust manifold.

    b. Disconnect pumpage overtemperature cable at engine module connection panel. Install dust caps on connectors. Wrap free end of cable around fuel transfer pump outlet.

    c. Disconnect fuel supply and return lines at engine module. Connect free ends of lines together.

    d. Unlatch engine module from pump-engine frame and slide engine module out of frame.

18. Return engine module to recovery area.

19. Return pump-engine module to recovery area.

20. Install engine module in pump-engine module.

    a. Slide engine module into pump-engine module, PTO end first. If flex coupling will not engage, it may be necessary to rotate the flex portion slightly to align with the engine adapter.

    b. Latch engine module to pump-engine frame.

    c. Clamp exhaust pipe to exhaust manifold.

    d. Connect pumpage overtemperature cable at engine module connection panel connector J3. Connect adjacent dust caps together.

PREPARATION FOR MOVEMENT (Continued)

e. Connect fuel supply and return lines at engine module.

21. Clean spill containment units, flood and bag, and return to recovery area.

END OF WORK PACKAGE

OPERATOR MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
SYSTEM COMPONENT REPLACEMENT

The following procedures are provided to assist in the "hot" replacement of system components due to an operational casualty. System defueling is not required if the replacement component is immediately available. If the system will be shut down for an extended period of time, defueling IAW WP 0007 00 is recommended, if the situation permits.

In the event the casualty results in fuel leakage, immediately isolate the leaking component by closing the nearest valves upstream and downstream of the failed component.

REPLACE ENGINE MODULE

WARNING

The exhaust system will remain hot for some time after engine shut down. Avoid contact with exhaust system components until they have cooled sufficiently for safe handling. Serious personal injury may occur from contact with hot metal.

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. Always use sufficient personnel to move or relocate the engine module. Use proper physical lifting procedures or use a suitable lifting device or dolly. Wear safety shoes, gloves, and other suitable protective clothing.

1. Remove engine module (1) from pump-engine module (2) IAW WP 0007 00.

2. Install engine module (1) in pump-engine module (2) IAW WP 0007 00.

REPLACE PUMP-ENGINE MODULE

WARNING

The exhaust system will remain hot for some time after engine shut down. Avoid contact with exhaust system components until they have cooled sufficiently for safe handling. Serious personal injury may occur from contact with hot metal.

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. Always use four personnel to move or relocate the pump-engine module. Use proper physical lifting procedures or use a suitable lifting device or dolly. Wear safety shoes, gloves, and other suitable protective clothing.

The engine module should be removed from the pump-engine module for moving or lifting. If the pump-engine module must be moved as a unit, do not lift the module two feet with less than five personnel, three feet with less than six personnel, or five feet with less than eight personnel.

1. Shut down system IAW WP 0007 00.

2. Close unisex coupling valves on pump inlet manifold (3).

3. Close emergency fuel shutoff valve (4).

REPLACE PUMP-ENGINE MODULE - Continued

4. Remove engine air cleaner and install dust cap IAW WP 0007 00.
5. Disconnect cables W201 (5) and W202 (6) from engine module (1). Stow cables in accessory module (7).
6. Close unisex coupling valves on suction hoses (8) and disconnect the suction hoses (8) from the pump inlet manifold (3).
7. Disconnect the pump inlet manifold (3) from the fuel transfer pump.
8. Drain pump inlet manifold (3) of fuel.
9. Close unisex coupling valves on 3" x 6' discharge hose (9) and disconnect the 3” x 6’ discharge hose (9) from the emergency fuel shutoff valve (4).
10. Remove pump-engine module (2) and position replacement pump-engine module for connection to system IAW WP 0007 00.
11. Install inlet manifold (3), suction hoses (8), and discharge hose (9) on pump-engine module (2).
12. Connect cables W201 (5) and W202 (6) to engine module (1).
13. Install air cleaner IAW WP 0007 00 and acoustic cover (if provided) IAW WP 0007 00 on engine module.
14. Open all inlet and outlet unisex coupling valves.
15. Start system IAW WP 0007 00.

REPLACE ACCESSORY MODULE

WARNING

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. Always use four personnel to move or relocate the accessory module. Use proper physical lifting procedures or use a suitable lifting device or dolly. Wear safety shoes, gloves, and other suitable protective clothing.

1. Shut down system IAW WP 0007 00.
2. Disconnect cables W201 (5) and W202 (6) from engine module (1). Stow cables in accessory module (7).
3. Remove air cleaner from engine and install dust cap on intake manifold IAW WP 0007 00.
4. Remove accessory module (7) and position replacement accessory module for connection to system.
5. Connect cables W201 (5) and W202 (6) to engine module (1).

6 Install air cleaner on engine IAW WP 0007 00.

7. Start system IAW WP 0007 00.

REPLACE LIQUID FUEL FILTER-SEPARATOR

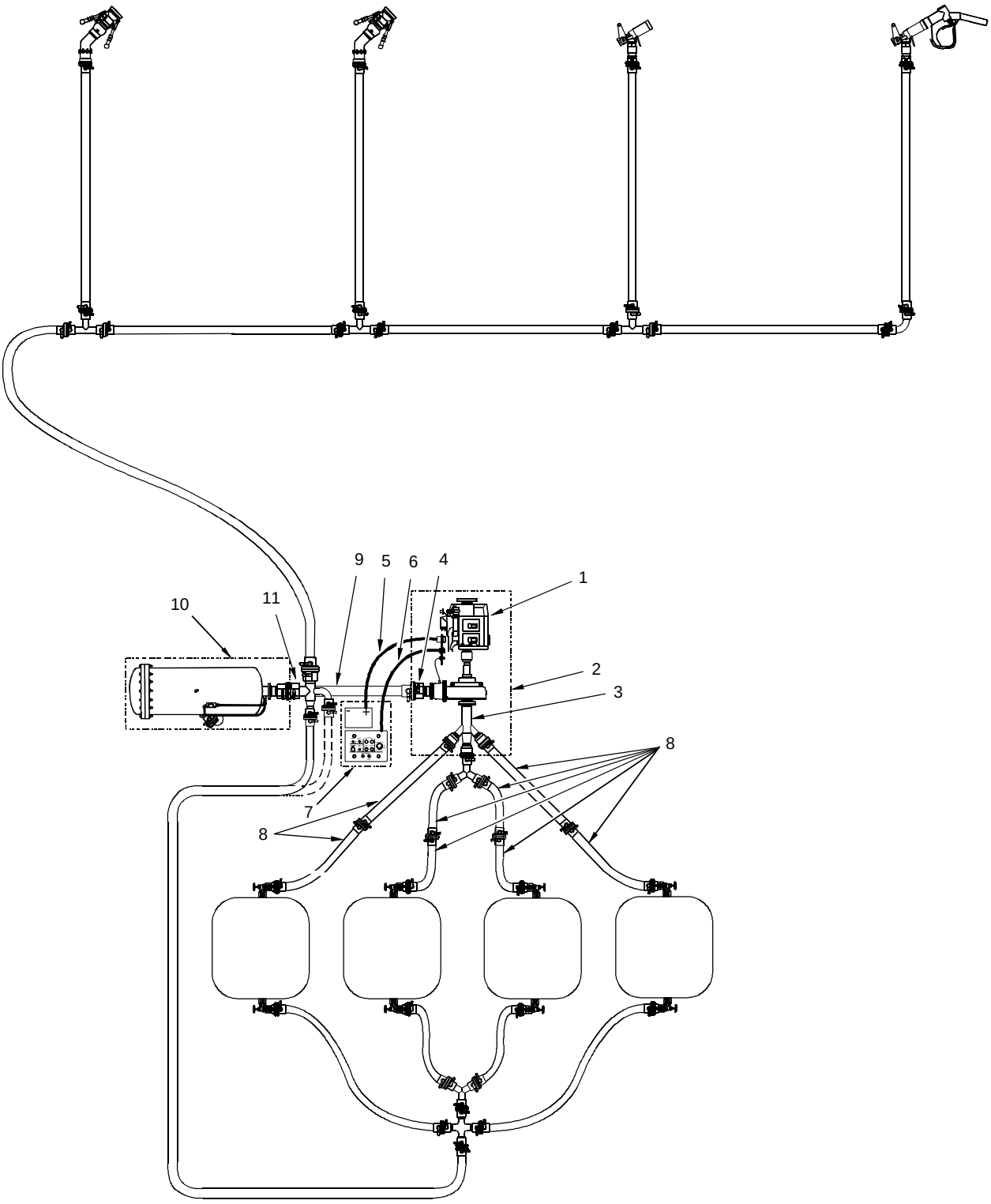
WARNING

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. Always use four personnel to move or relocate the liquid fuel filter-separator. Use proper physical lifting procedures or use a suitable lifting device or dolly. Wear safety shoes, gloves, and other suitable protective clothing.

1. Shut down system IAW WP 0007 00.
2. Defuel liquid fuel filter-separator (10) IAW WP 0007 00.
3. Disconnect 6’ hose (9) from the inlet port.
4. Disconnect recirculation manifold (11) from the outlet port.
5. Remove liquid fuel filter-separator (10) and position replacement liquid fuel filter-separator for connection to system.
6. Install recirculation manifold (11) on outlet port.
7. Connect 6’ hose (9) to the inlet port.
8. Open manual vent valve while liquid fuel filter-separator (10) is flooding. Close vent at first appearance of fuel.
9. Start system IAW WP 0007 00.

REPLACE ANY HOSE OR FITTING

1. Close valves to isolate hose or fitting.
2. Remove hose or fitting from system and drain into a suitable container.
3. Install replacement hose or fitting and open valves.
4. Continue mission.



END OF WORK PACKAGE

OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1 OPERATION UNDER UNUSUAL CONDITIONS

OPERATION IN EXTREME HEAT

Operation under conditions of high heat may cause equipment problems due to thermal expansion. Nozzle seals are especially subject to damage. Basic system operation is as described in WP 0007 00. The following additional steps and recommendations should be implemented to protect the system to the extent possible.

1. Protect the system from direct sunlight if possible.

    a. Position system components in the shade of trees, buildings, etc. If shade is available only part of the day, choose afternoon shade. Do not block air circulation.

    b. Use any material available to create shade. Do not block air circulation.

2. Do not connect the nozzles without opening the hose unisex coupling valve. Disconnect as soon as possible after closing unisex coupling valve to prevent rupture of seals due to expansion of fuel trapped in the nozzle.

3. System components are subject to damage from thermal expansion. As the temperature increases, the pumpage in any component will expand. If trapped in a component, the expanding pumpage may rupture seals and cause a leak or equipment malfunction. For this reason, all system valves should remain open as long as the system is flooded. With all valves open, the hoses will absorb the expansion and protect system seals. If any component must be isolated, it should be drained or defueled immediately to prevent damage.

OPERATION IN EXTREME COLD

Operation under conditions of extreme cold may cause equipment problems due to loss of flexibility. Nozzle seals and coupling face seals are especially subject to damage. Basic system operation is as described in WP 0007 00. The following additional steps and recommendations should be implemented to protect the system to the extent possible.

General Recommendations

1. Set up system in area protected from wind, if possible.

2. Handle all components with care to avoid cracking or fracture.

3. Remove snow or ice from coupling ends before making connections to prevent entry of foreign material into system.

4. Make and break unisex connections slowly and carefully to avoid cracking or splitting of face seals.

5. Do not try to force open couplings that appear jammed. Work back and forth to break loose ice at coupling face.

OPERATION IN EXTREME COLD - Continued

Engine Cold Start

NOTE

Under conditions of extreme cold, it is necessary to use the intake heaters to warm the intake manifold before attempting to start the engine. The amount of warming required increases as the temperature decreases. At 20° F (-7° C), holding the intake heaters on for 30 seconds is sufficient; at -25° F (-31.7° C) approximately 2.5 minutes is required.

1. Unlatch engine module from pump-engine module frame and slide engine module out far enough to disengage engine flexible coupling adapter from the flexible coupling (5-6 inches).
2. Insert spare flexible coupling between the lower part of the engine module and the subframe to prevent the engine accidentally sliding back and engaging fuel transfer pump.
3. At the control panel, hold the ENGINE switch in the START position for 30 seconds, then release. If engine starts, proceed to step 7.
4. Hold INTAKE HEATER switch in the ON position for 2 minutes to heat intake air and allow battery time to thaw.
5. At the control panel, hold INTAKE HEATER switch in the ON position and lift and hold the ENGINE switch in the START position until engine starts. If engine does not start within 2 minutes, release the ENGINE start switch and the INTAKE HEATER switch and allow system to rest for 5 minutes. (Battery will thaw and starter will cool.)
6. Repeat steps 4 and 5 as required.
7. Allow engine to run 2-3 minutes.
8. Shut down engine.
9. Remove spare flexible coupling from subframe and stow in storage module.
10. Slide engine module into pump-engine module and engage engine adapter with flexible coupling.
11. Latch engine module to pump-engine frame.
12. Perform normal engine start.

OPERATION IN STRONG WINDS AND SANDY OR DUSTY CONDITIONS

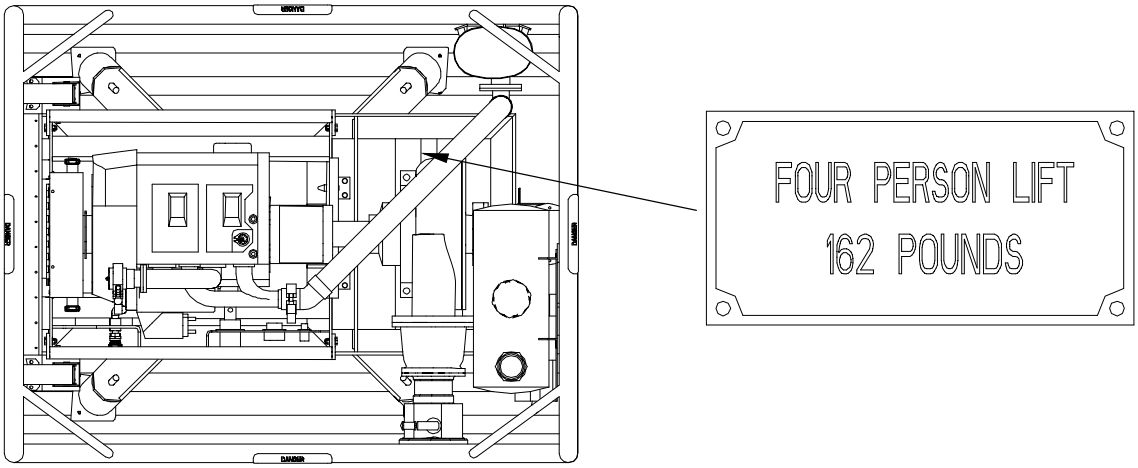
1. Bank soil around fuel drums, especially on down slope side, to a height that will prevent wind from rolling or shifting drums.
2. Shield couplings during connection or disconnection to prevent entry of foreign material into system.
3. Keep dust caps in place on all disconnected couplings.
4. Inspect and clean engine air filter frequently to avoid accumulation of sand or dust.

OPERATION IN RAIN

Cover the pump-engine module and accessory module with some form of water repellant covering, taking care to avoid contact with hot exhaust components.

END OF WORK PACKAGE

OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
STOWAGE AND DECAL/DATA PLATE GUIDE



TOP VIEW

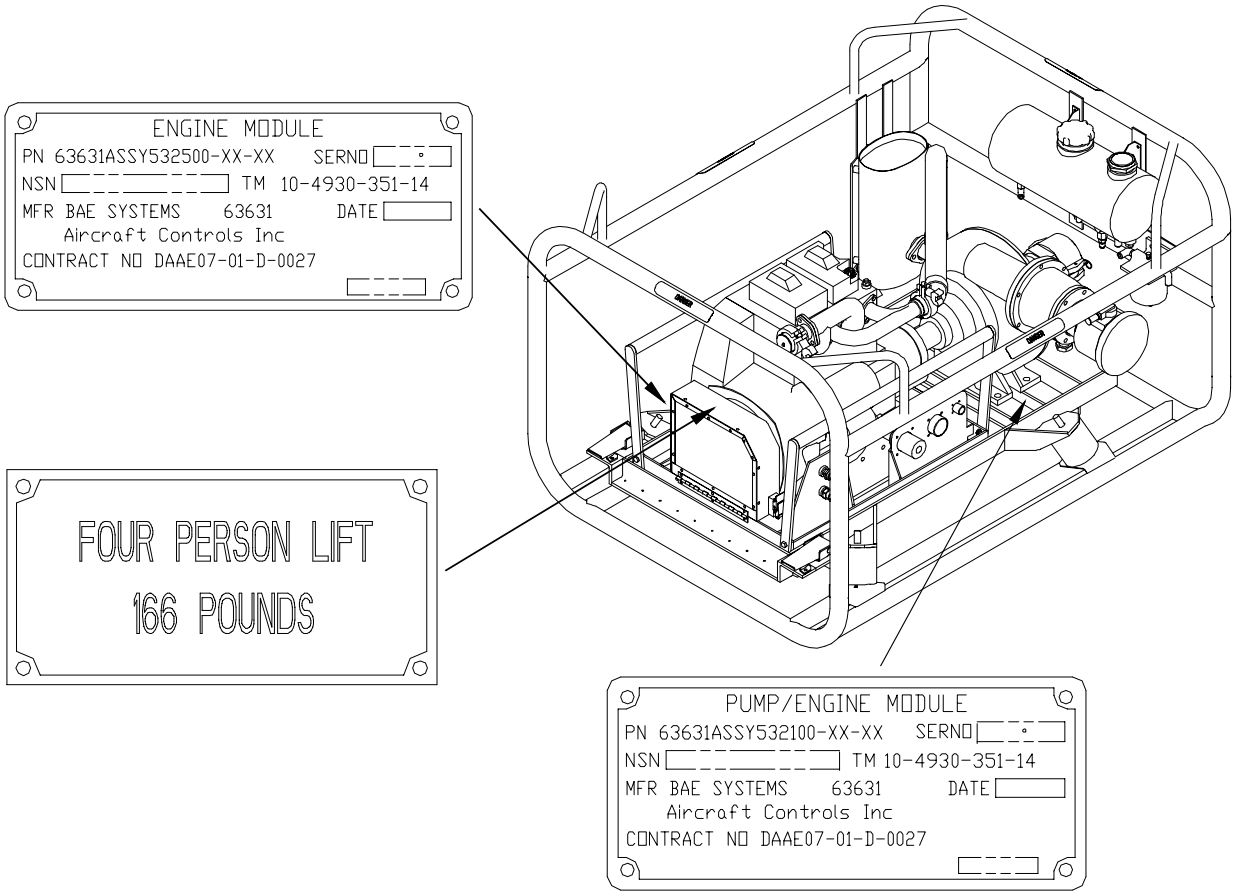
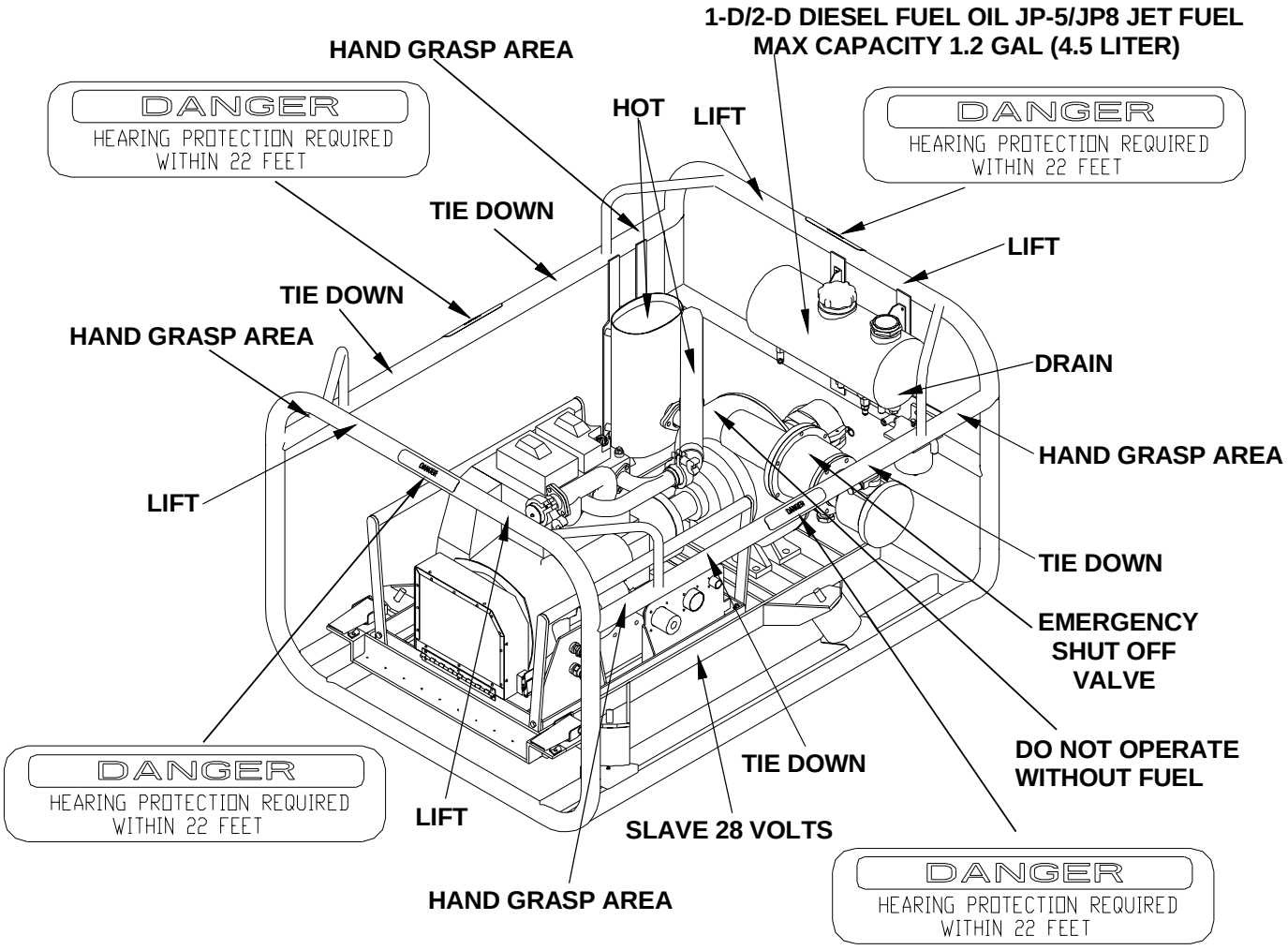
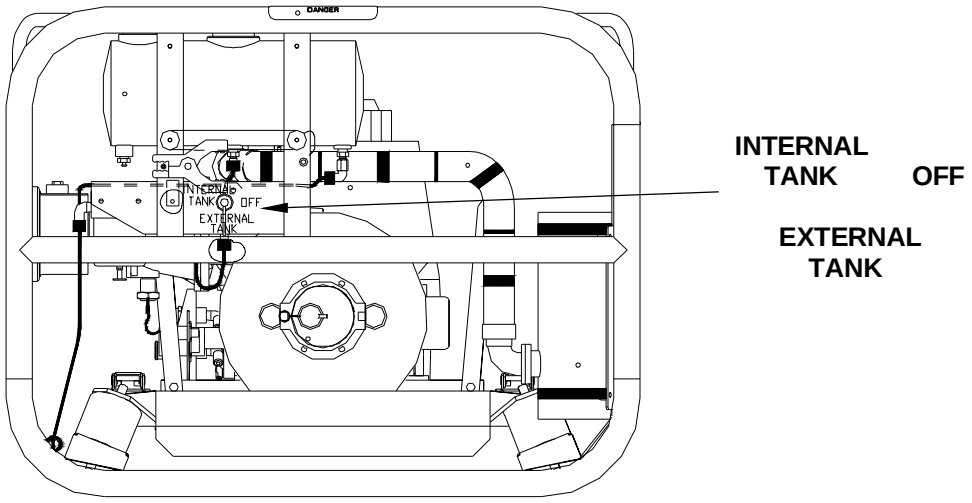


Figure 1. Pump-Engine Module Data Plates





REAR VIEW

Figure 2. Pump Engine Module Decals and Data Plates

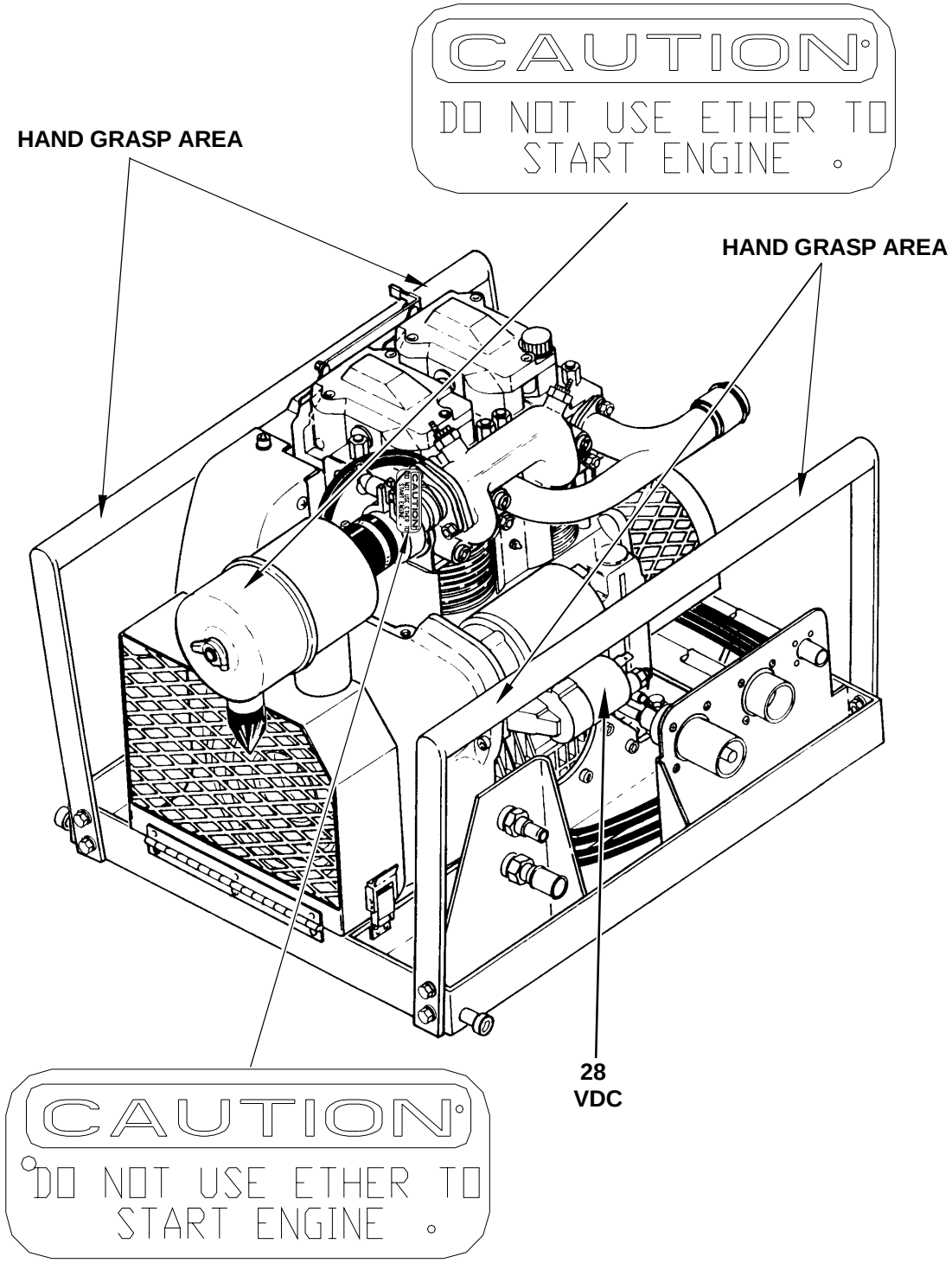


Figure 3. Engine Module Decals and Data Plates

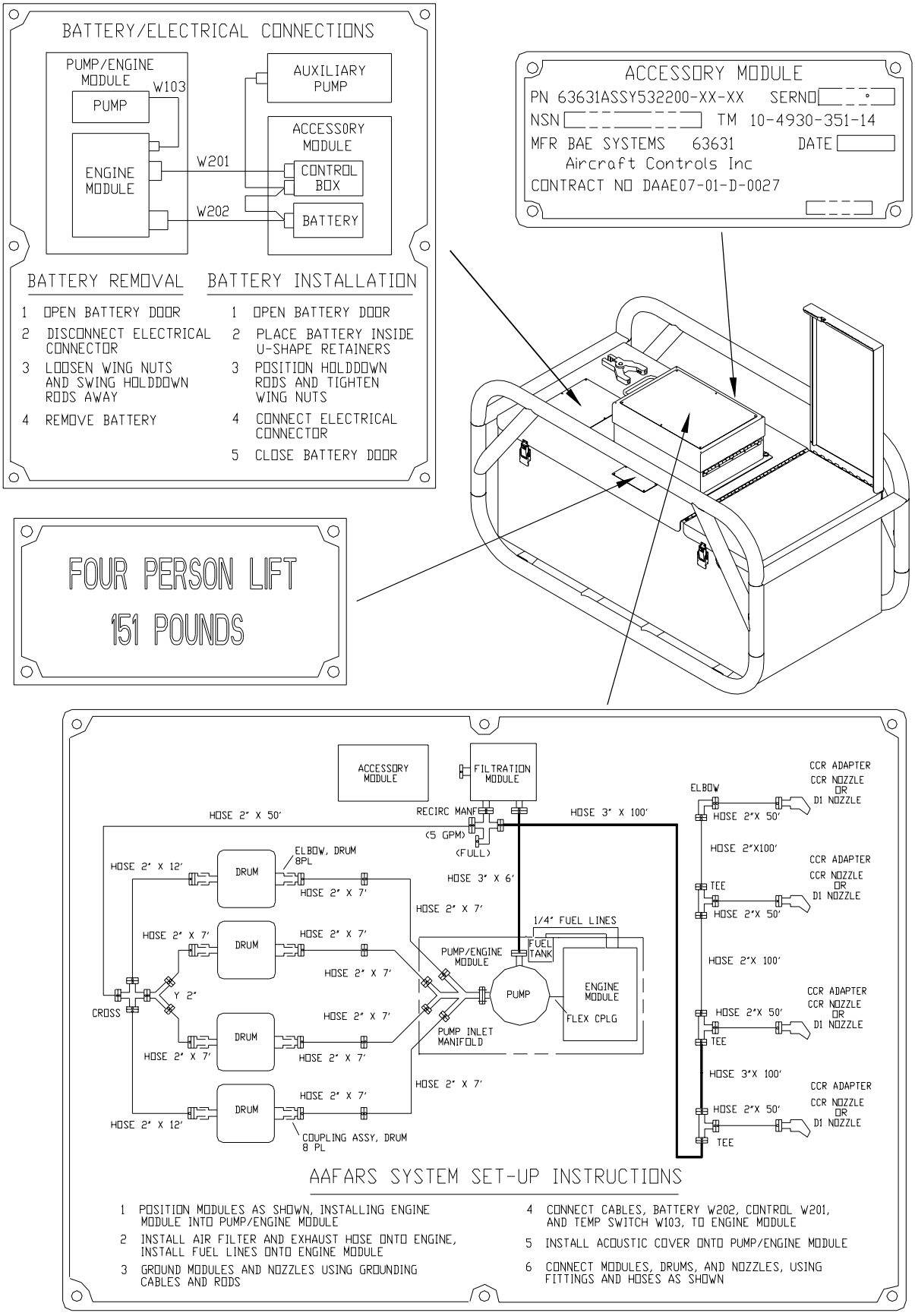


Figure 4. Accessory Module Data Plates (Sheet 1 of 3)

DEFUELING PROCEDURE

WITH THE FUEL TRANSFER PUMP RUNNING:

CLOSE ALL FUEL DRUM OUTLET ELBOW VALVE COUPLINGS AND UNISEX COUPLINGS AT FUEL DRUM END OF SUCTION HOSES.

BEGINNING AT FUEL DRUMS, DISCONNECT SUCTION HOSES ONE AT A TIME, OPEN UNISEX COUPLING, HOLD HOSE END HIGHER THAN INTAKE MANIFOLD AND CLOSE UNISEX COUPLING AT FAR END(INTAKE MANIFOLD) OF SUCTION LEG. CLOSE UNISEX COUPLING AT FREE END OF LEG AND INSTALL DUST CAP.

REPEAT STEP FOR EACH OF THE THREE REMAINING SUCTION LEGS.

CLOSE 3 INCH EMERGENCY SHUT OFF VALVE AS SOON AS FUEL TRANSFER PUMP UNLOADS.

AT THE ACCESSORY MODULE CONTROL PANEL, POSITION ENGINE SWITCH TO STOP POSITION.

NOTE

IF SYSTEM RECIRCULATION WAS CONDUCTED, CONNECT 2 INCH DISCHARGE HOSE TO AUXILLARY PUMP OUTLET SIDE.

CLOSE NOZZLE UNISEX COUPLING VALVES, AND DISCONNECT AND DRAIN NOZZLES.

DEFUEL LIQUID FUEL FILTER-SEPARATOR.

CLOSE UNISEX COUPLING ON LIQUID FUEL FILTER-SEPARATOR OUTLET VALVE.

DISCONNECT 2 INCH DISCHARGE HOSE FROM RECIRCULATION MANIFOLD.

DISCONNECT ONE OF THE SUCTION HOSES FROM FUEL TRANSFER PUMP INLET AND CONNECT TO THE LIQUID FUEL FILTER-SEPARATOR DEFUELING UNISEX COUPLING AND THE UNISEX COUPLING ON THE INLET SIDE OF THE AUXILIARY PUMP. OPEN UNISEX COUPLING VALVES.

CONNECT 2 INCH DISCHARGE HOSE TO AUXILIARY PUMP OUTLET SIDE AND OPEN UNISEX COUPLING VALVES.

CONNECT AUXILIARY POWER CABLE TO AUXILIARY PUMP.

OPEN LIQUID FUEL FILTER-SEPARATOR MANUAL VENT VALVE.

TURN ON AUXILIARY PUMP TO PUMP DOWN LIQUID FUEL FILTER-SEPARATOR AND 3 IN. X 6 FT. DISCHARGE HOSE FROM FUEL TRANSFER PUMP.

CLOSE LIQUID FUEL FILTER-SEPARATOR INLET VALVE AND MANUAL VENT VALVE WHEN AIR IS SEEN IN THE SIGHT GAUGE.

TURN OFF AUXILIARY PUMP, AND CLOSE AUXILIARY PUMP UNISEX INLET AND OUTLET VALVES.

DISCONNECT SUCTION HOSE FROM LIQUID FUEL FILTER-SEPARATOR AND CONNECT TO RECIRCULATION MANIFOLD FULL FLOW UNISEX COUPLING.

DEFUEL SYSTEM FUEL HOSES.

TURN ON AUXILIARY PUMP.

ONE AT A TIME, OPEN UNISEX VALVES ON DISCHARGE HOSES AT FUELING POINTS. CLOSE UNISEX VALVE AS HOSE COLLAPSES.

WHEN HOSES ARE COLLAPSED/DEFUELED, TURN OFF AUXILLARY PUMP.

DISCONNECT DISCHARGE HOSE FROM AUXILIARY PUMP.

AT SELECTED FUEL DRUM, CLOSE INLET ELBOW VALVE AND UNISEX COUPLING VALVE ON DISCHARGE HOSE, DISCONNECT DISCHARGE HOSE FROM THE INLET ELBOW VALVE, CONNECT THE DISCHARGE HOSE TO THE INLET OF THE AUXILIARY PUMP, AND OPEN UNISEX COUPLING VALVES ON INLET OF AUXILIARY PUMP AND DISCHARGE HOSE.

CONNECT AUXILIARY PUMP OUTLET UNISEX COUPLING TO DRUM INLET ELBOW VALVE UNISEX COUPLING, AND OPEN UNISEX COUPLING VALVE AND INLET ELBOW VALVE.

CLOSE THE FUEL DRUM INLET ELBOW VALVE COUPLINGS ON THE REMAINING DRUMS.

TURN ON AUXILLARY PUMP.

ONE AT A TIME, DISCONNECT THE INLET ELBOW VALVE CAMLOCK COUPLER FROM THE OTHER THREE FUEL DRUM HOSES, ALLOW THE HOSE TO PUMP DOWN AND CLOSE UNISEX VALVE.

WHEN HOSES ARE COLLAPSED/DEFUELED, TURN OFF AUXILLARY PUMP.

DISCONNECT INLET ELBOW VALVE FROM FUEL DRUM.

HOLD AUXILIARY PUMP OVER CONTAINER AND DISCONNECT AUXILIARY PUMP FROM INLET ELBOW VALVE.

HOLD AUXILIARY PUMP OVER CONTAINER. OPEN UNISEX COUPLING VALVES AND DRAIN FUEL. CLOSE UNISEX COUPLING VALVES.

DISCONNECT AUXILIARY PUMP POWER CABLE FROM AUXILIARY PUMP MODULE.

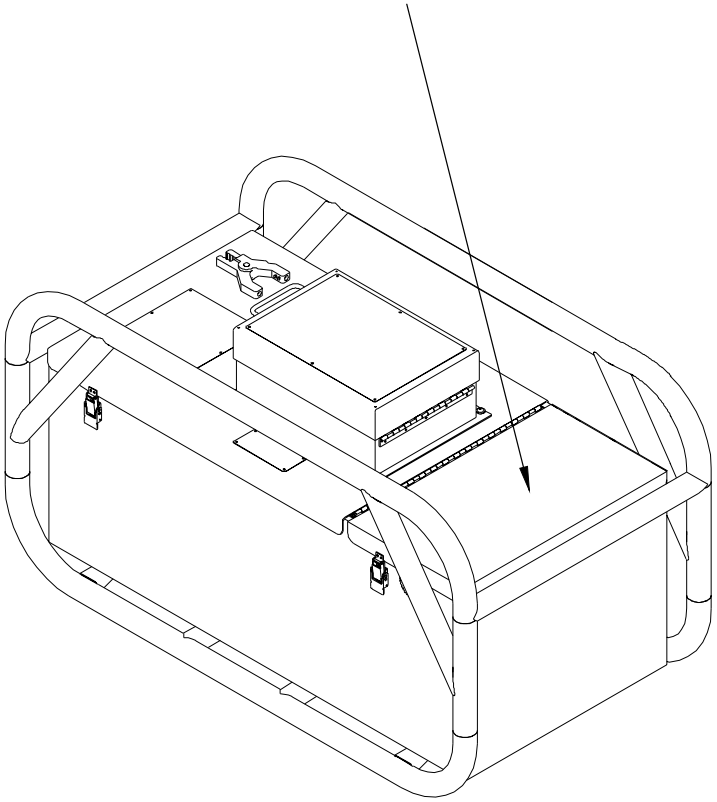


Figure 4. Accessory Module Data Plates (Sheet 2 of 3)

OPERATING INSTRUCTIONS

ELECTRIC START:

STEP	ACTION
1	SET UP AAFARS
2	CHECK GROUNDING
3	PERFORM "BEFORE" PMCS
4	FILL ENGINE FUEL TANK
5	OPEN FUEL DRUM OUTLET VALVES
6	RELEASE EMERGENCY STOP SWITCH
7	HOLD ENGINE SWITCH IN START POSITION UNTIL ENGINE STARTS, RELEASE TO RUN POSITION (BELOW +20 DEGREE F, HOLD INTAKE HEATER SWITCH "ON" UNTIL ENGINE STARTS)
8	VENT AIR FROM FILTER MODULE
9	INSPECT FOR LEAKS
10	PUMP FUEL

NORMAL SHUTDOWN:
PLACE ENGINE SWITCH IN STOP POSITION

EMERGENCY SHUTDOWN:
PRESS EMERGENCY STOP SWITCH

MANUAL SHUTDOWN:
ACTUATE MANUAL SHUTDOWN LEVER
RESET FUEL SOLENOID MANUAL OVERRIDE

MANUAL START:

STEP	ACTION
1	SET UP AAFARS
2	CHECK GROUNDING
3	PERFORM "BEFORE" PMCS
4	FILL ENGINE FUEL TANK
5	ACCESS FLEX COUPLER
6	MANUALLY OPEN FUEL SOLENOID
7	INSTALL STARTING MODULE ONTO FRAME AND FLEX COUPLER
8	DEPRESS RESET BUTTON ON THE SPRING STARTER
9	PULL ROPE TEN TIMES (BELOW +20 DEGREE F, IF SOME BATTERY CHARGE EXISTS, HOLD INTAKE HEATER SWITCH "ON" UNTIL ENGINE STARTS)
10	ACTUATE RELEASE LEVER, (REPEAT STEPS 8 THRU 10 UNTIL ENGINE STARTS
11	OPEN FUEL DRUM OUTLET VALVES
12	VENT AIR FROM FILTER MODULE
13	INSPECT FOR LEAKS
14	PUMP FUEL

LUBRICATION CHART

FUEL TYPES: JP-5, JP-8 AND DIESEL 1-D OR 2-D
REPLACE ENGINE OIL (1.9 QUARTS/1.8 LITERS) AFTER EVERY 100 HOURS OF OPERATION WITH

MIL-PRF-46167 OEA-30 (SAE 0W-30)	OR	MIL-PRF-2104 OE/HDO-15/40 (SAE 15W-40)
-25 DEGREE F TO +120 DEGREE F OPERATION		0 DEGREE F TO +120 DEGREE F OPERATION

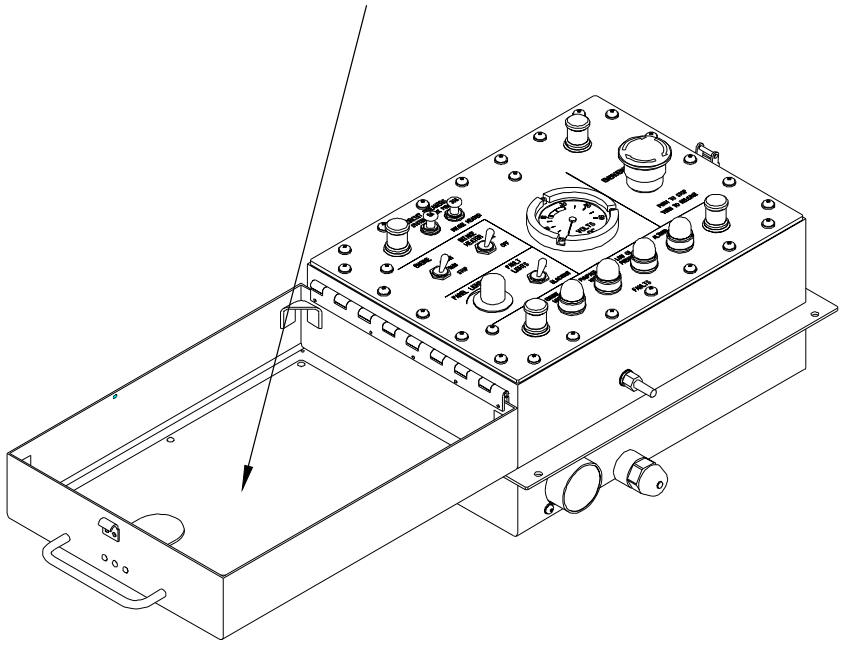


Figure 4. Accessory Module Data Plates (Sheet 3 of 3)

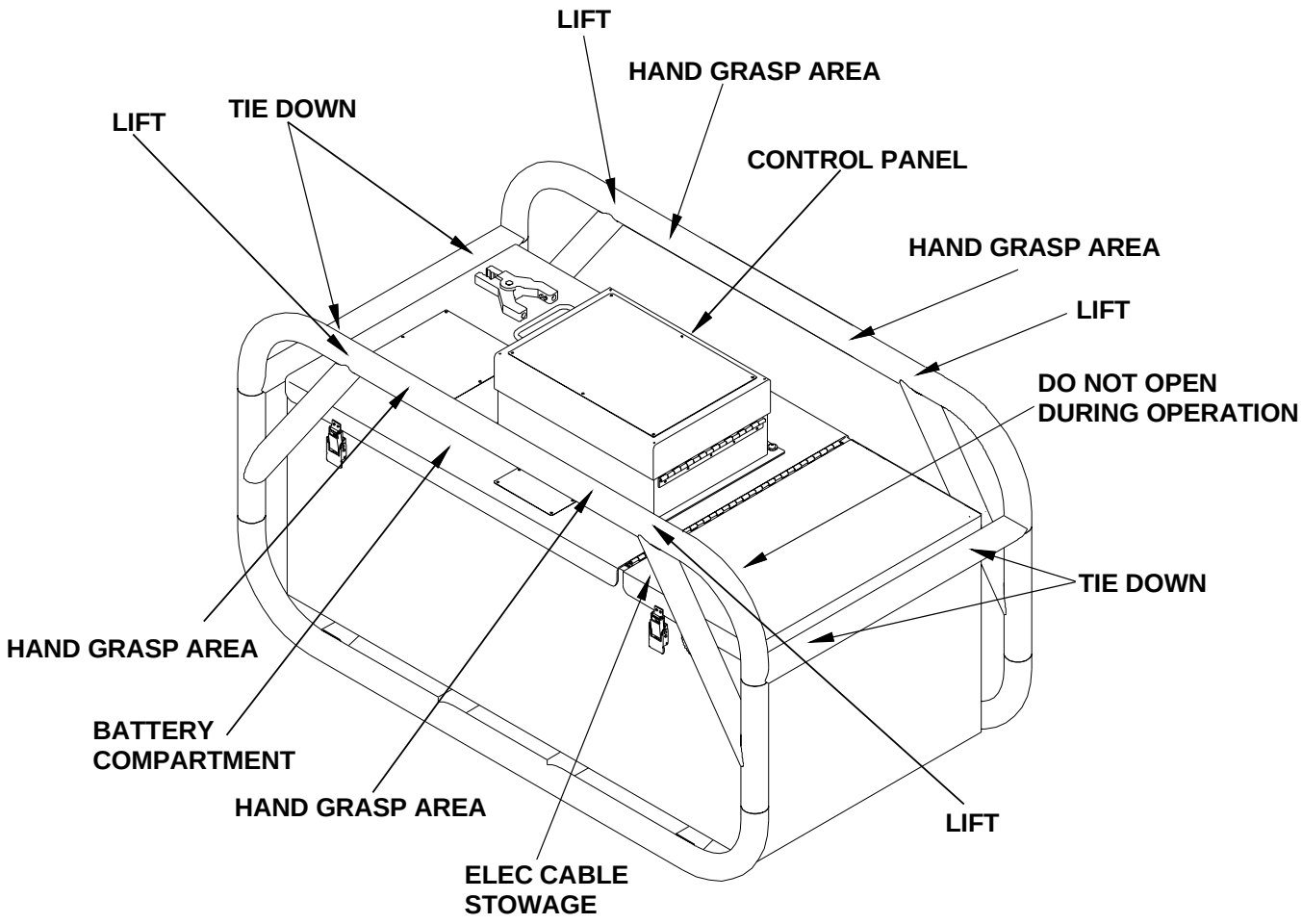


Figure 5. Accessory Module Decals

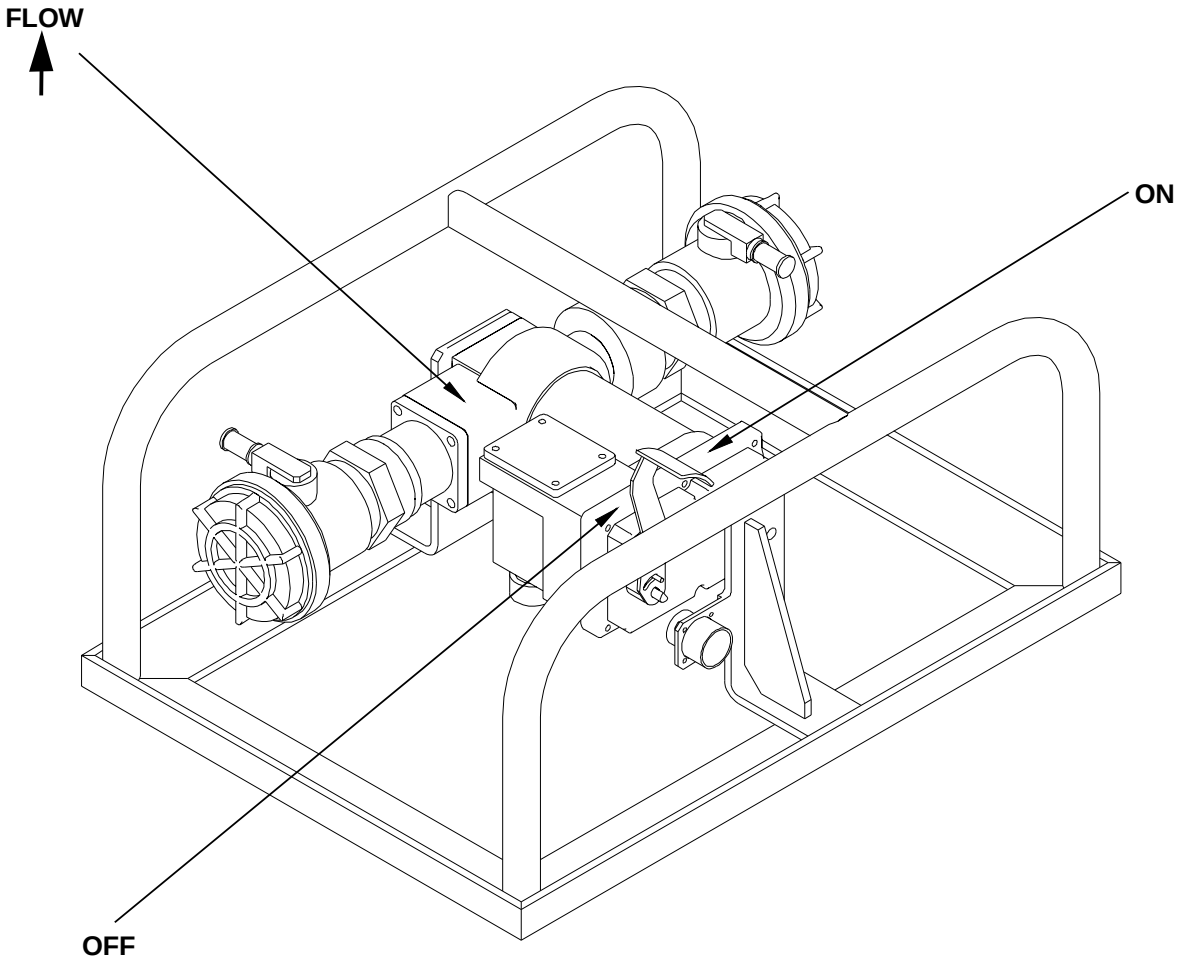


Figure 6. Auxiliary Pump Decals

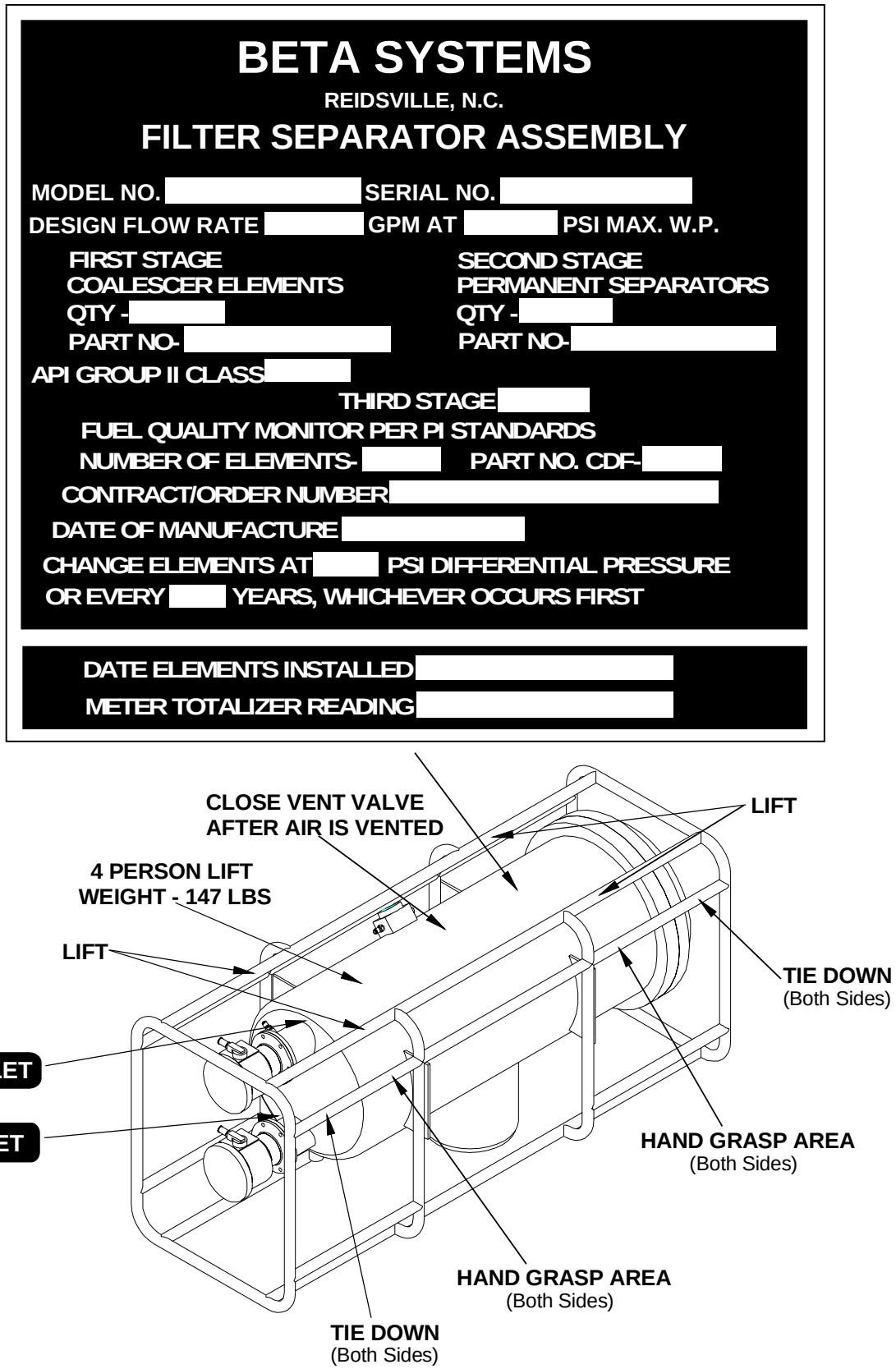


Figure 7. Liquid Fuel Filter-Separator Decals and Data Plates

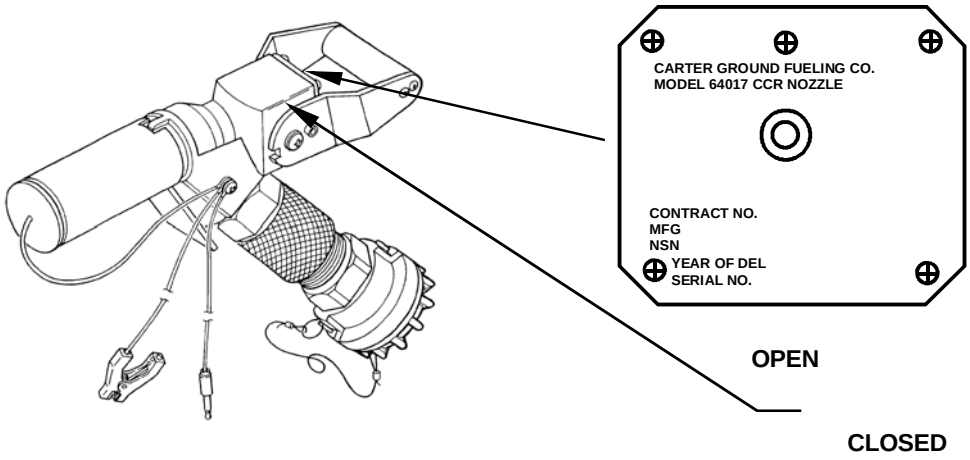


Figure 8. CCR Nozzle Decals and Data Plate

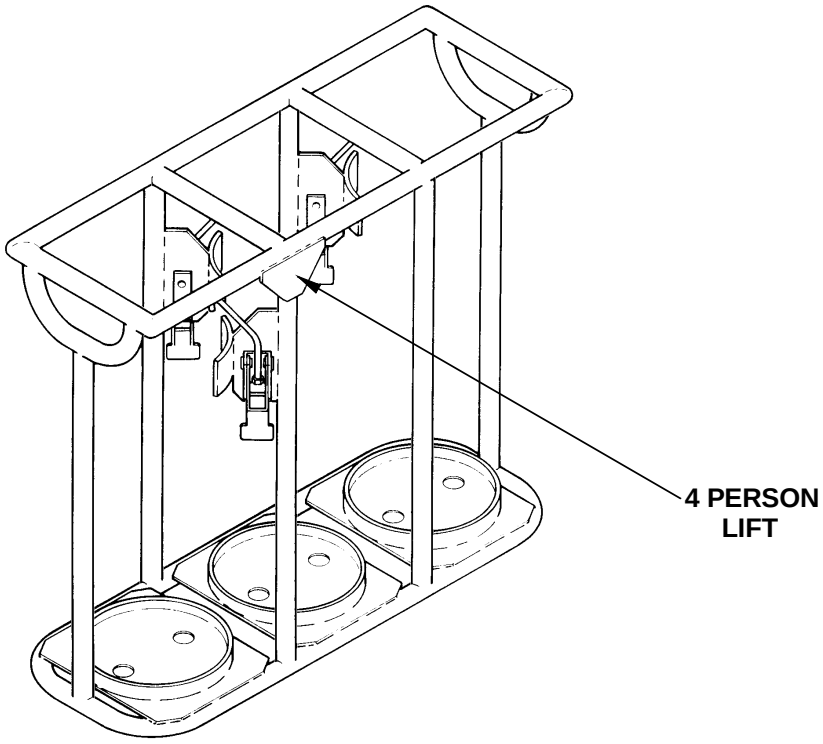


Figure 9. Fire Extinguisher Frame Decals

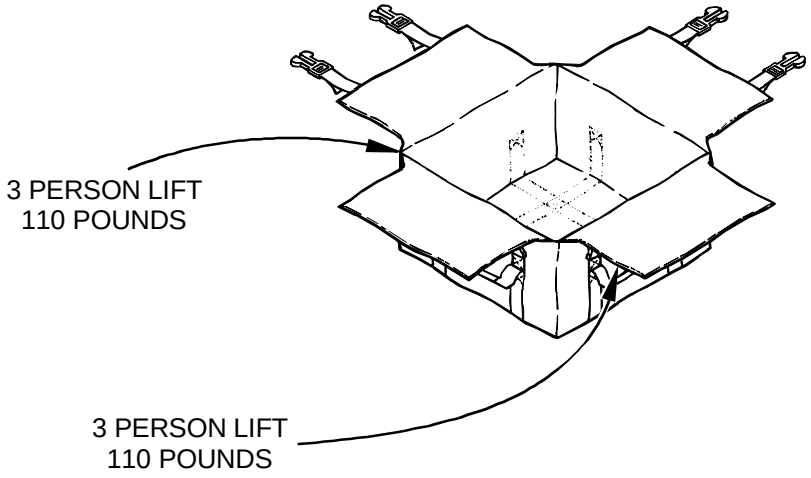


Figure 10. Decals – Discharge Fitting Kit, P/N 532606-01-01

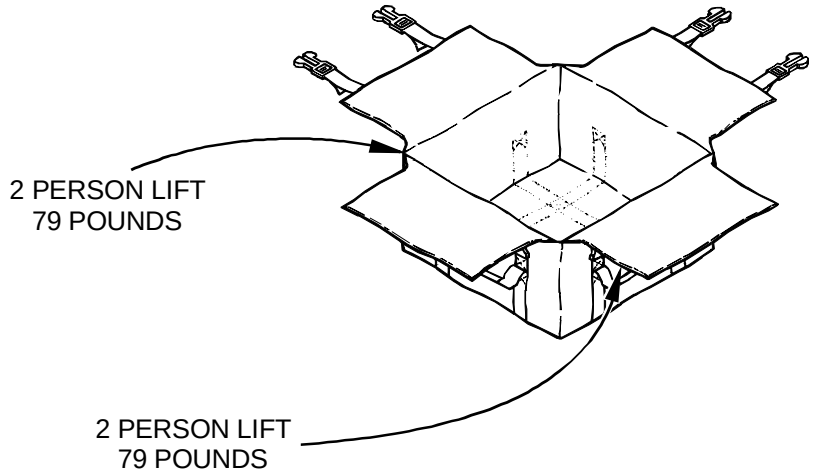


Figure 11. Decals – Drum Adapter Kit, P/N 532611-01-01

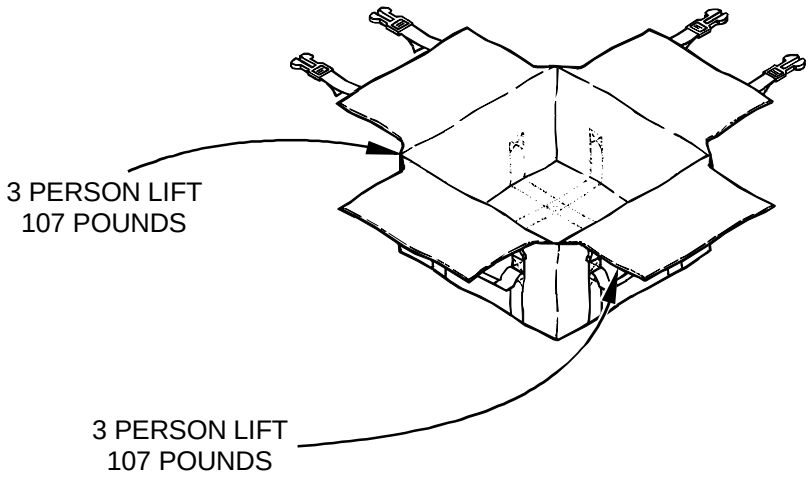


Figure 12. Decals – Discharge Hose Kit, P/N 532607-01-01

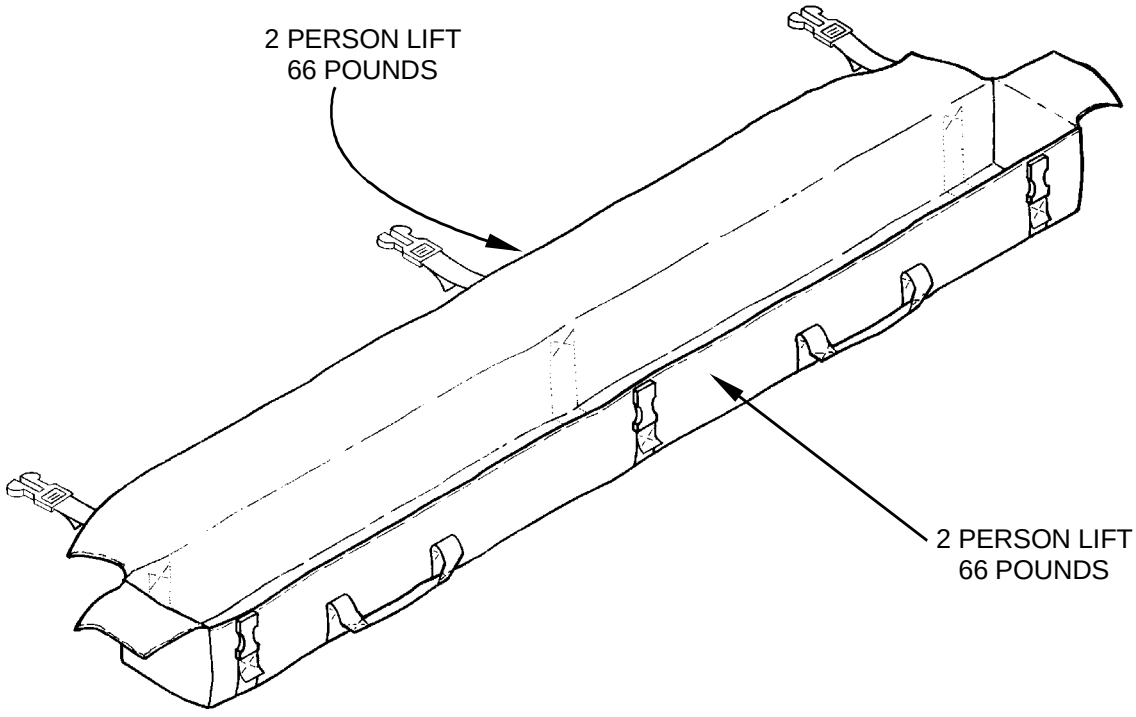


Figure 13. Decals – Ground Rod Kit, P/N 532621-01-01

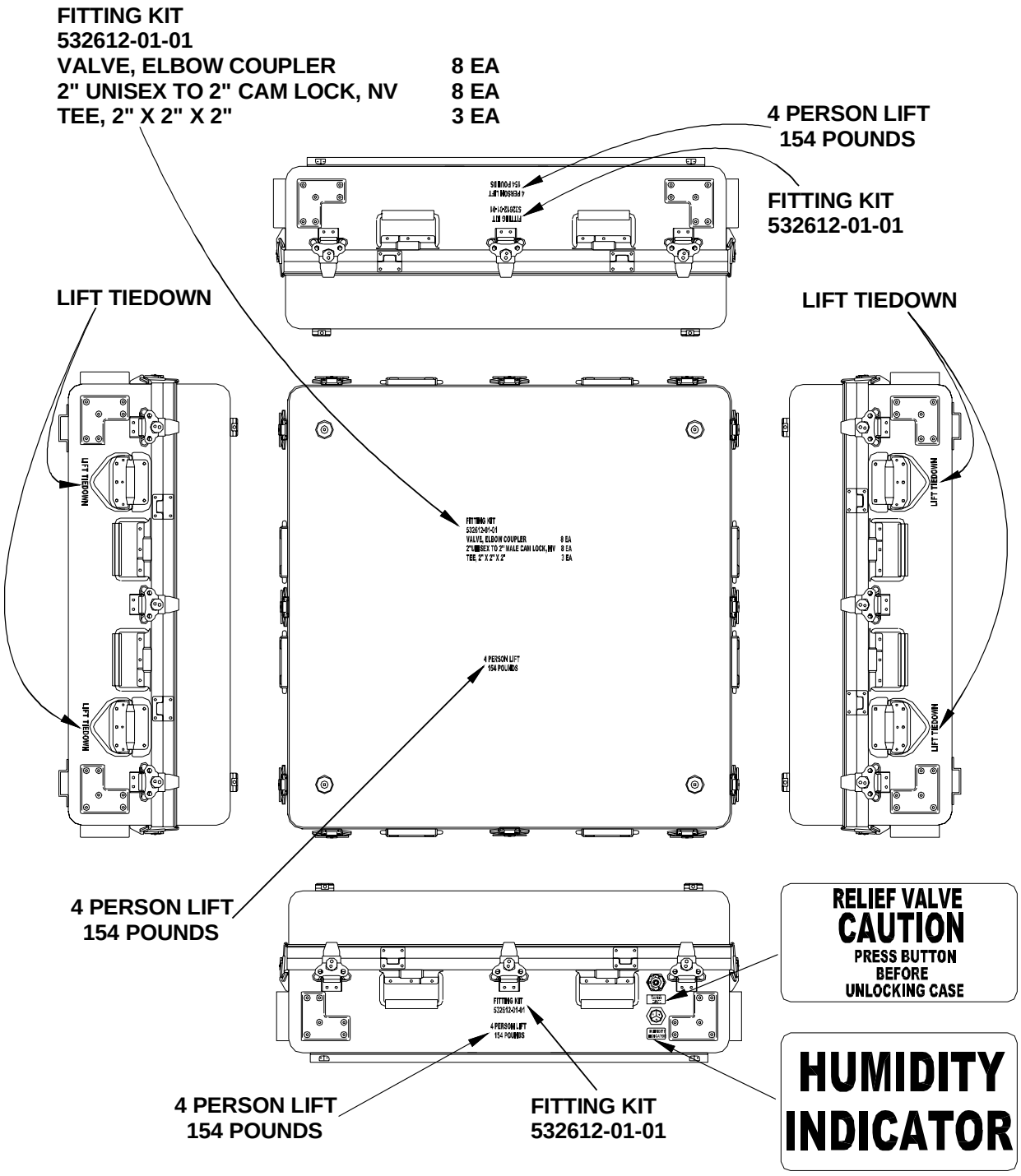


Figure 14. Decals and Data Plates – Drum Fitting Kit, P/N 532612-01-01

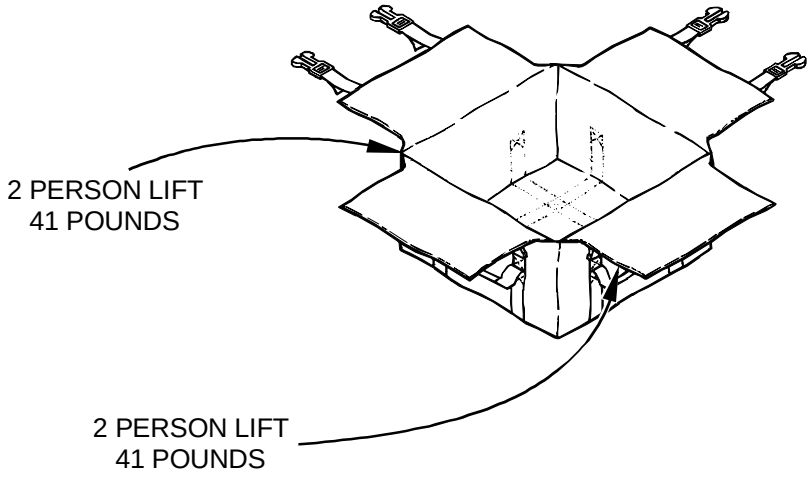


Figure 15. Decals – Drum Fitting Kit, P/N 532612-01-02

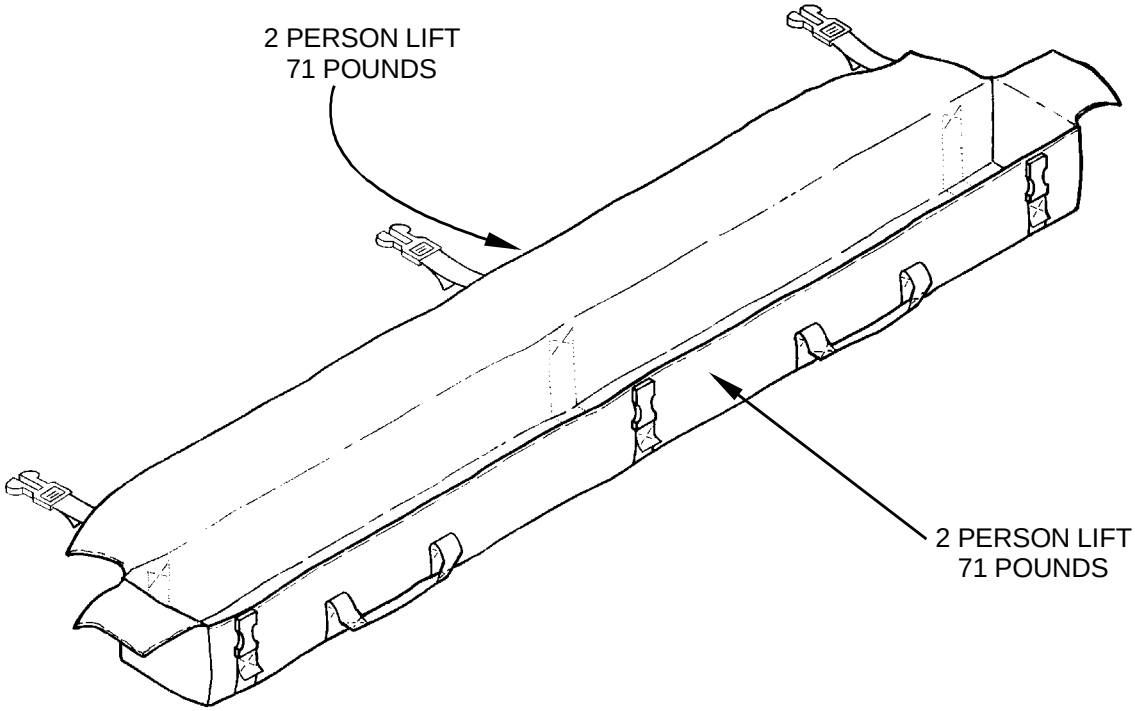


Figure 16. Decals – Suction Hose Kit, P/N 532601-01-01

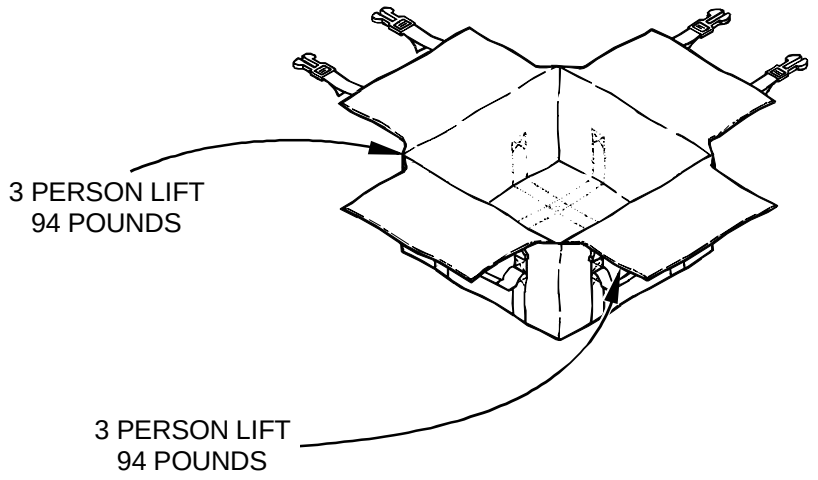


Figure 17. Decals – Discharge Hose Kit, P/N 532605-01-01

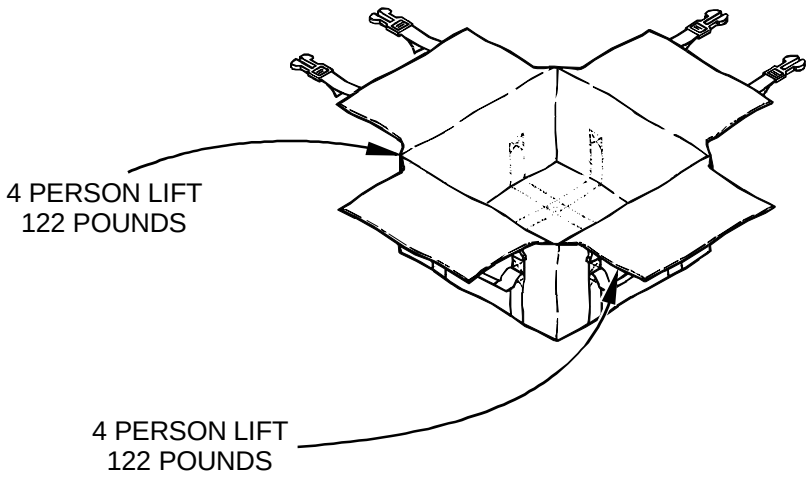


Figure 18. Decals – Discharge Hose Kit, P/N 532602-01-01

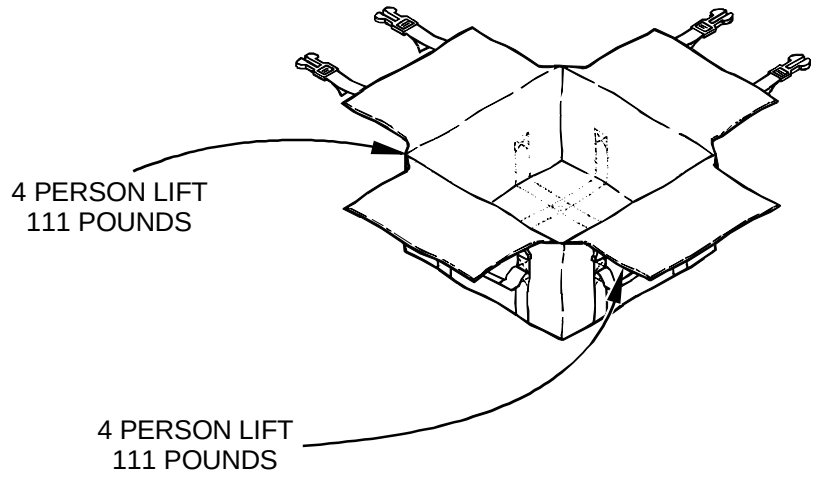


Figure 19. Decals – Discharge Hose Kit, P/N 532603-01-01

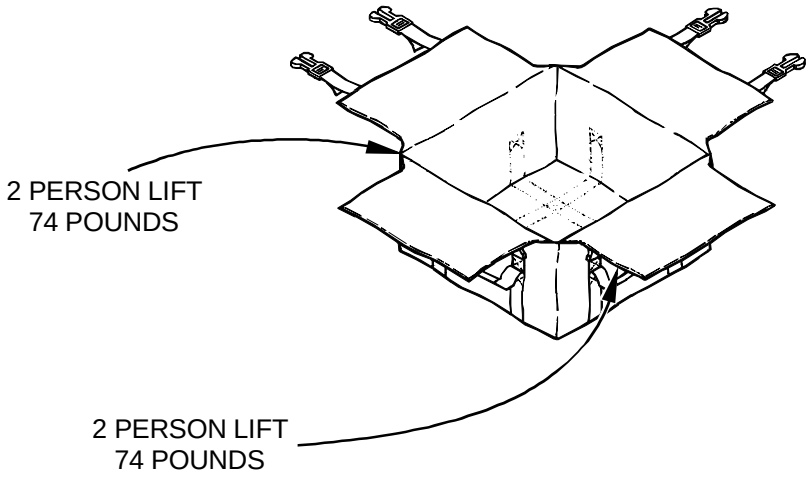


Figure 20. Decals – Discharge Hose Kit, P/N 532604-01-01

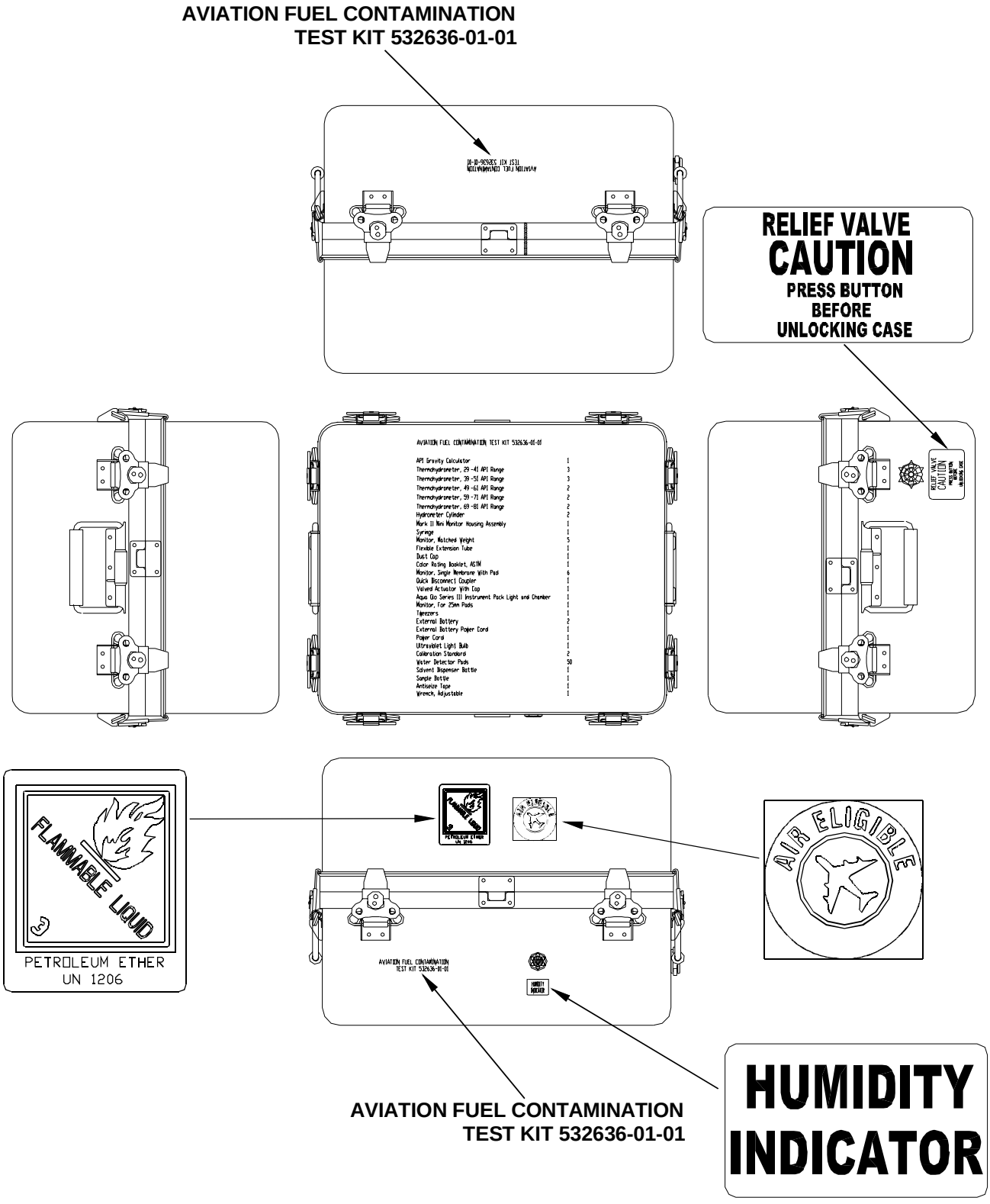


Figure 21. Decals and Data Plates – Fuel Test Kit, P/N 532636-01-01 (Sheet 1 of 2)

AVIATION FUEL CONTAMINATION TEST KIT 532636-01-01

API Gravity Calculator	**1**
Thermohydrometer, 19-41 API Range	**3**
Thermohydrometer, 39-51 API Range	**3**
Thermohydrometer, 49-61 API Range	**2**
Thermohydrometer, 59-71 API Range	**2**
Thermohydrometer, 69-81 API Range	**2**
Hydrometer Cylinder	**2**
Mark II Mini Monitor Housing Assembly	**1**
Syringe	**1**
Monitor, Matched Weight	**5**
Flexible Extention Tube	**1**
Dust Cap	**1**
Color Rating Booklet, ASTM	**1**
Monitor, Single Membrane With Pad	**6**
Quick Disconnect Coupler	**1**
Valved Actuator With Cap	**1**
Aqua Glo Series III Instrument Pack Light and Chamber	**1**
Monitor, For 25mm Pads	**1**
Tweezers	**1**
External Battery	**2**
External Battery Power Cord	**1**
Power Cord	**1**
Ultraviolet Light Bulb	**1**
Calibration Standard	**2**
Water Detector Pads	**50**
Solvent Dispenser Bottle	**1**
Sample Bottle	**1**
Antiseize Tape	**1**
Wrench, Adjustable	**1**

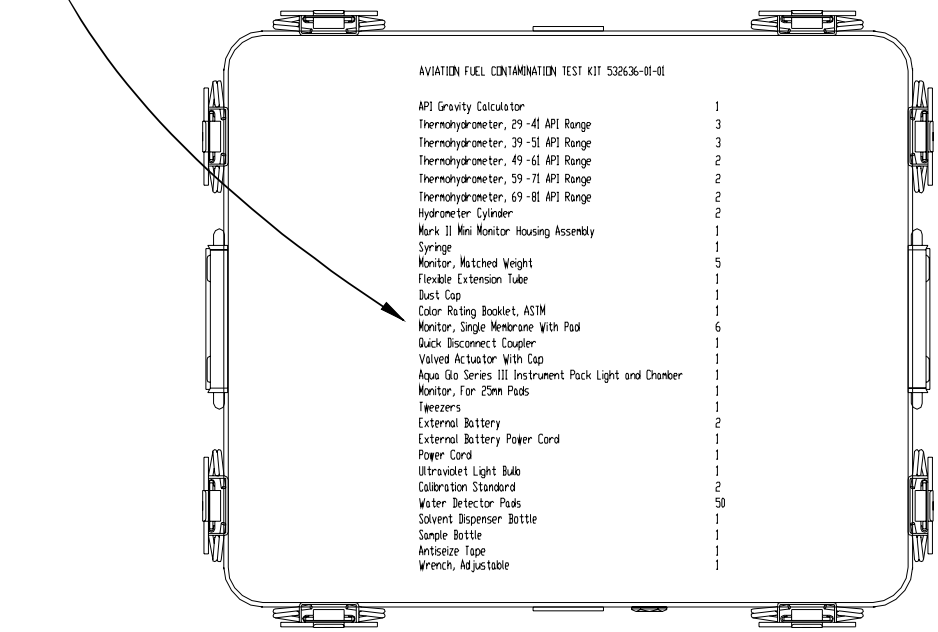


Figure 21. Decals – Fuel Test Kit, P/N 532636-01-01 (Sheet 2 of 2)

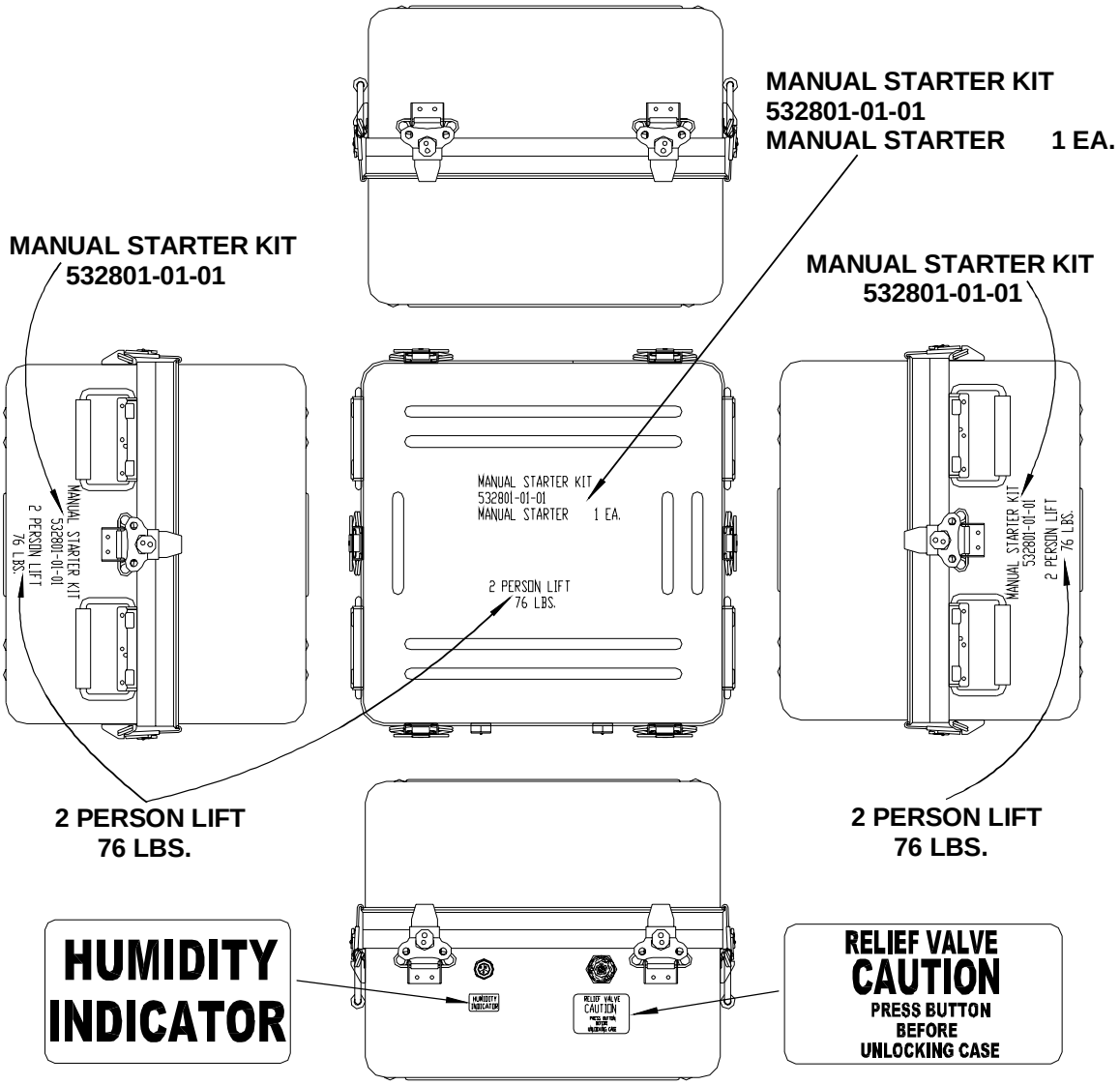


Figure 22. Decals and Data Plates – Manual Starter Kit, P/N 532801-01-01

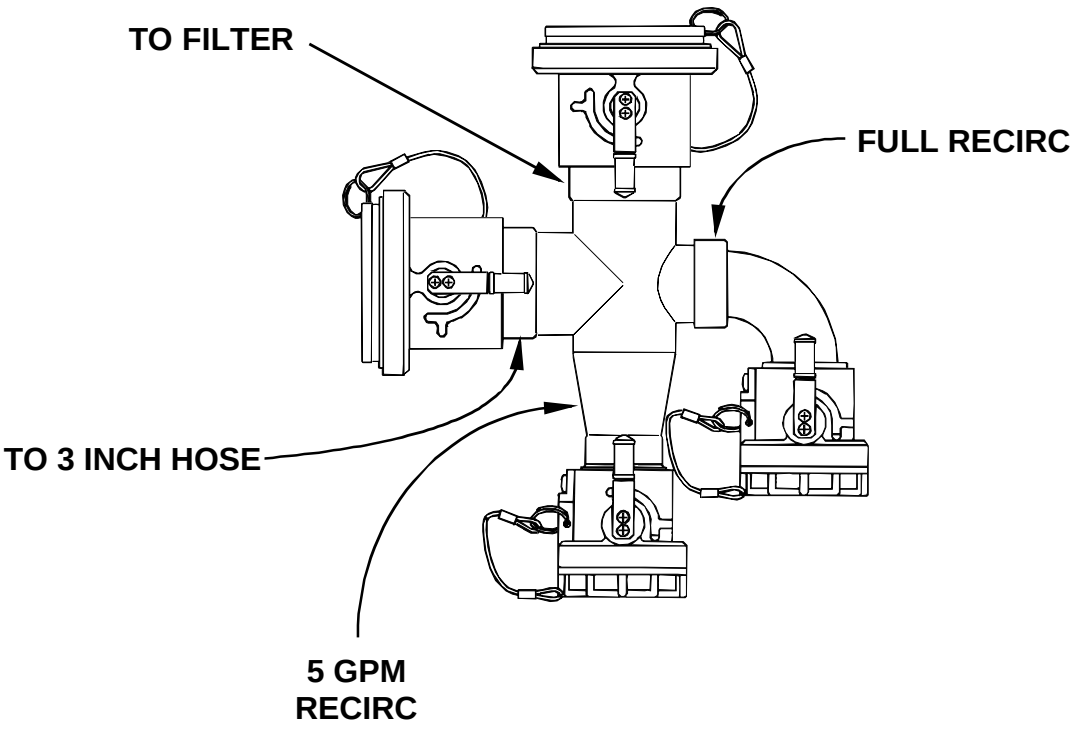


Figure 23. Recirculation Manifold

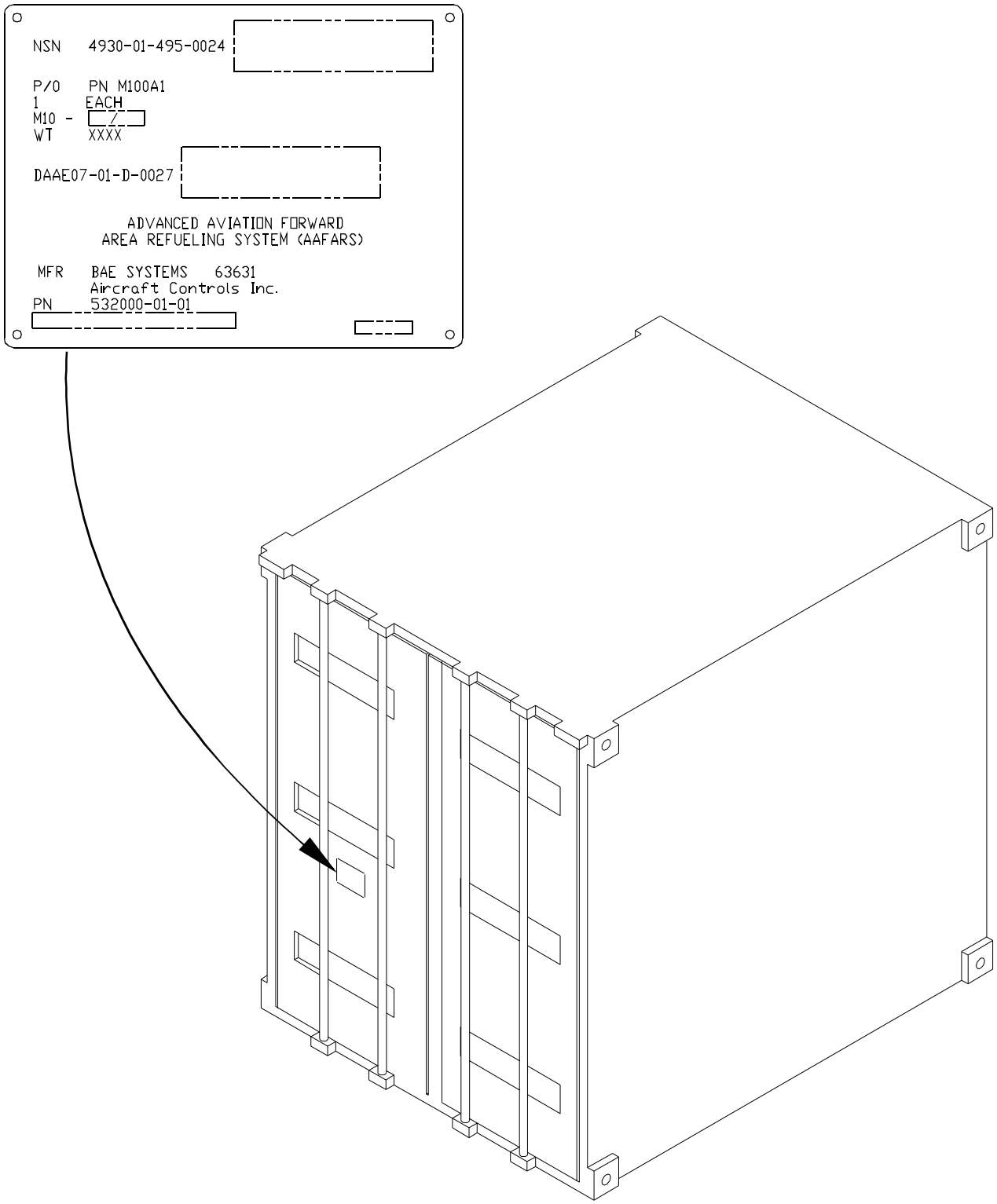


Figure 24. TRICON 1 Data Plate

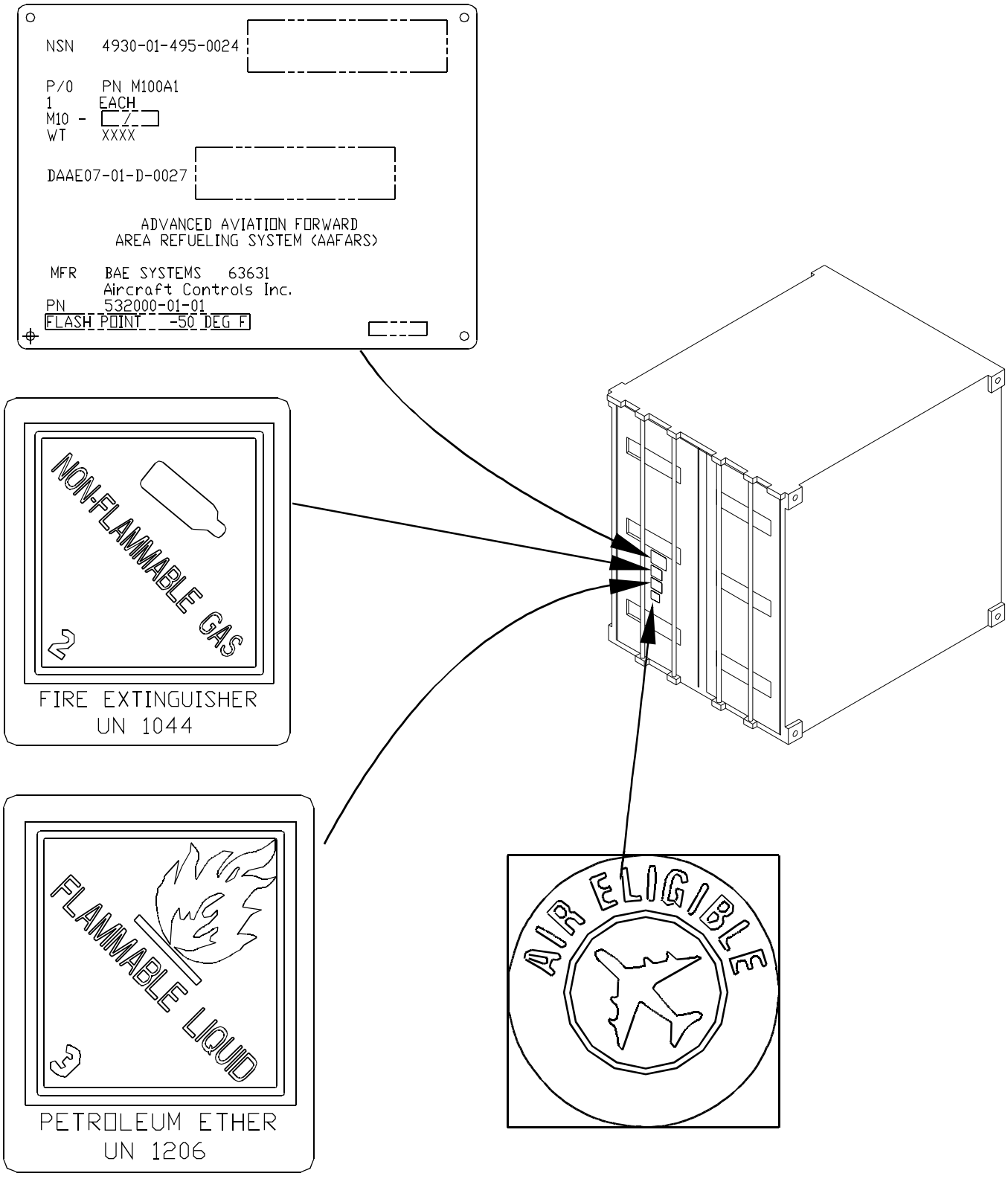
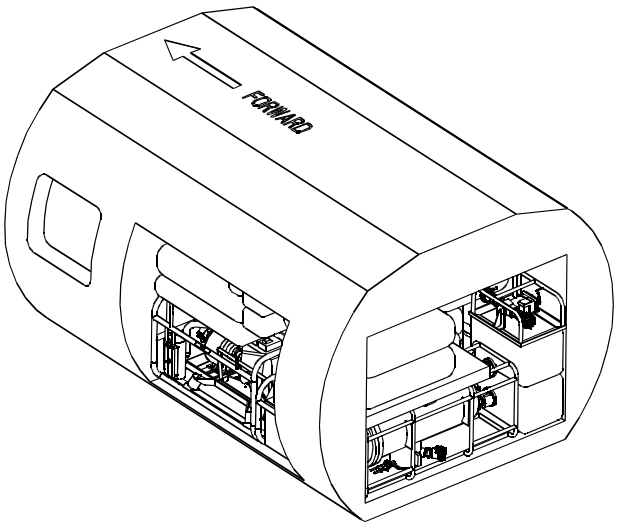


Figure 25. TRICON 2 Decals and Data Plate

OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1 ON-VEHICLE EQUIPMENT LOADING PLAN

UH-60 LOADING PLAN

The UH-60 helicopter provides restricted cargo space in which to load the AAFARS. Figure 1 illustrates a verified equipment loading arrangement that utilizes the cargo space to maximum advantage.



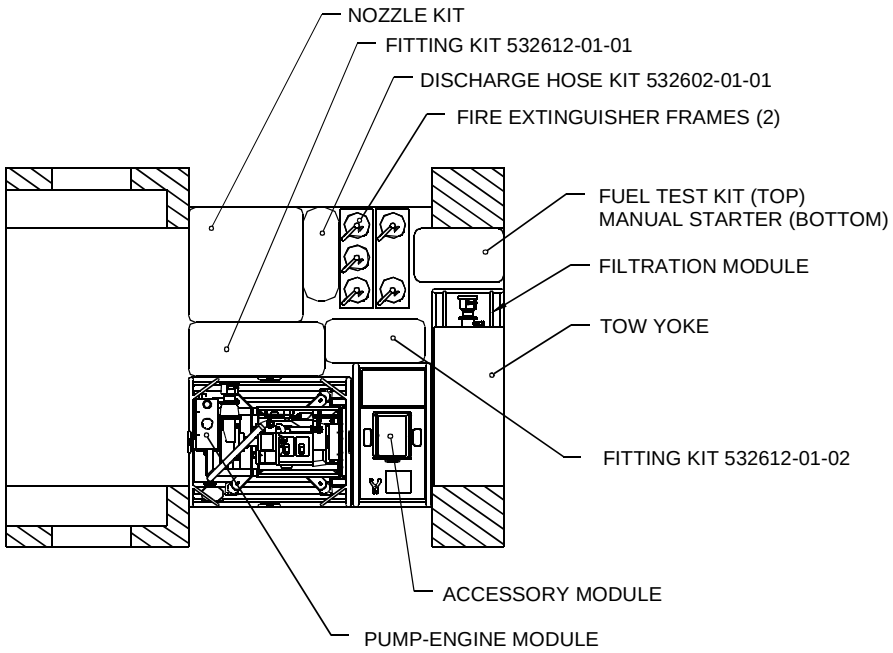
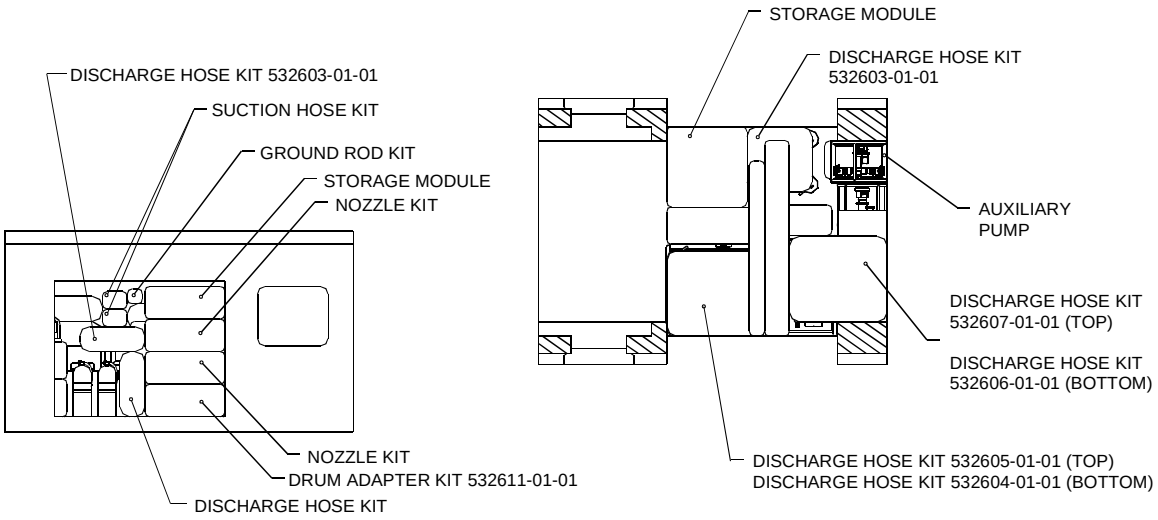


Figure 1. UH-60 Loading Arrangement (Sheet 1)

UH-60 LOADING PLAN – Continued



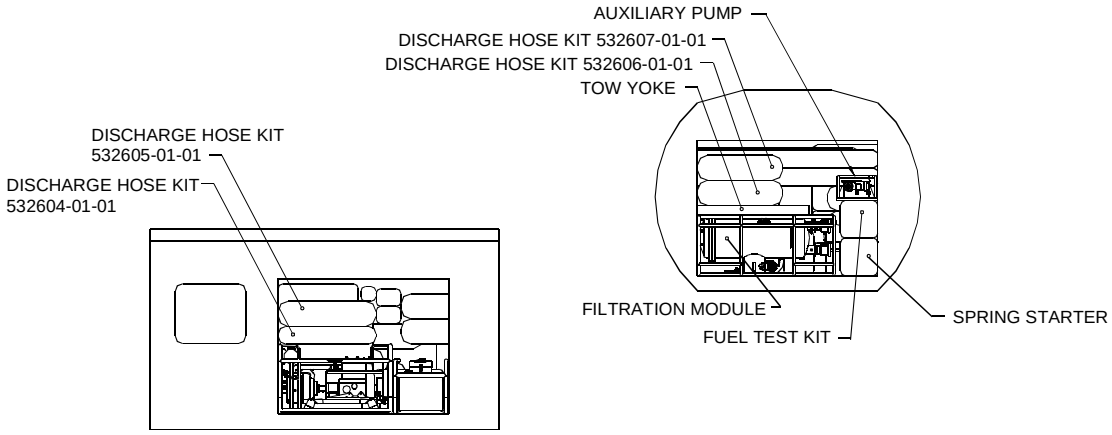


Figure 1. UH-60 Loading Arrangement (Sheet 2)

HMMWV WITH CARGO TRAILER LOADING PLAN

Figure 2 illustrates a verified loading plan for a HMMWV with cargo trailer.

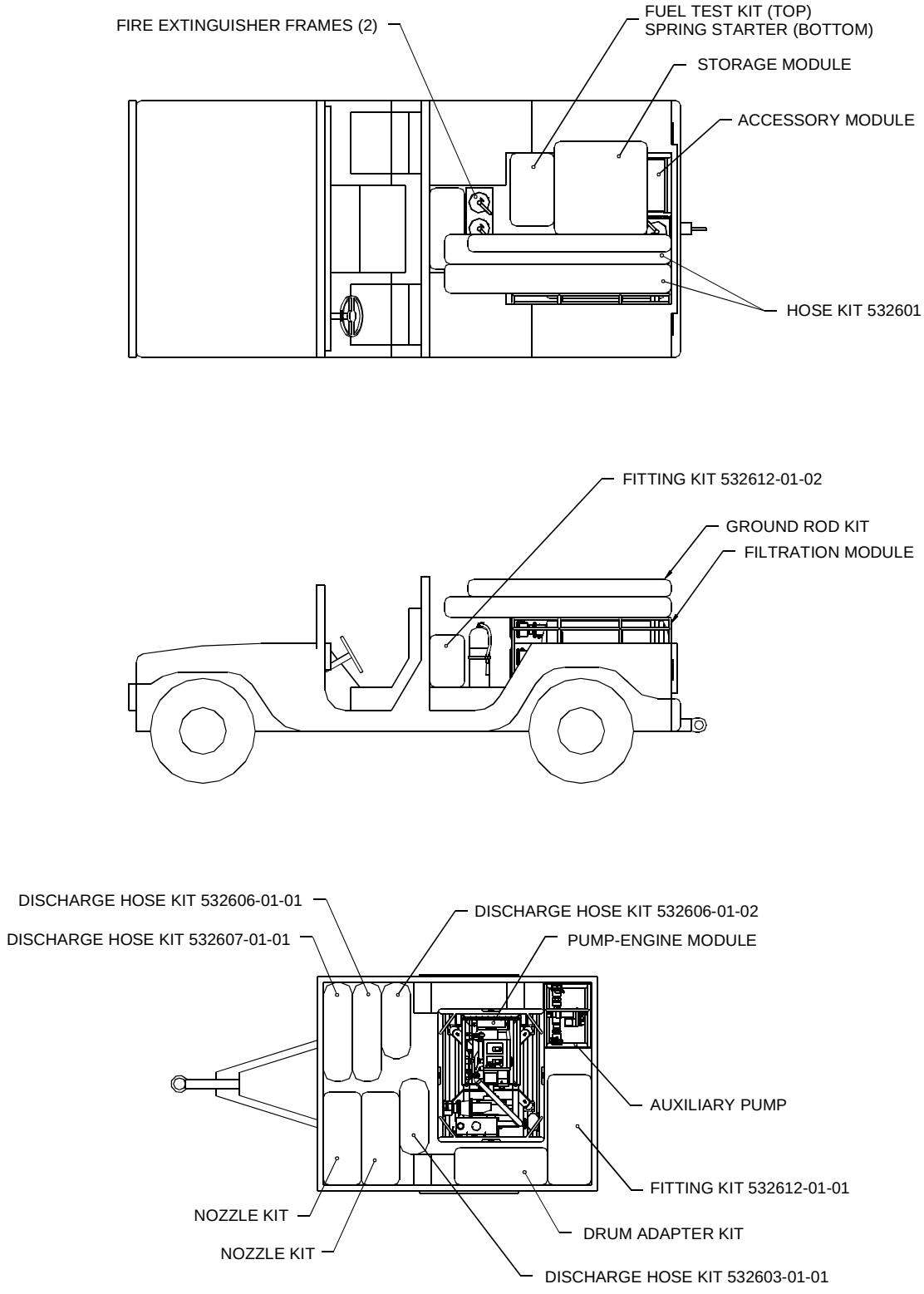


Figure 2. HMMWV With Cargo Trailer Loading Arrangement

CH-47 HELICOPTER LOADING PLAN

The CH-47 helicopter has ample cargo space and requires no specific loading plan. Figure 3 illustrates a typical arrangement.

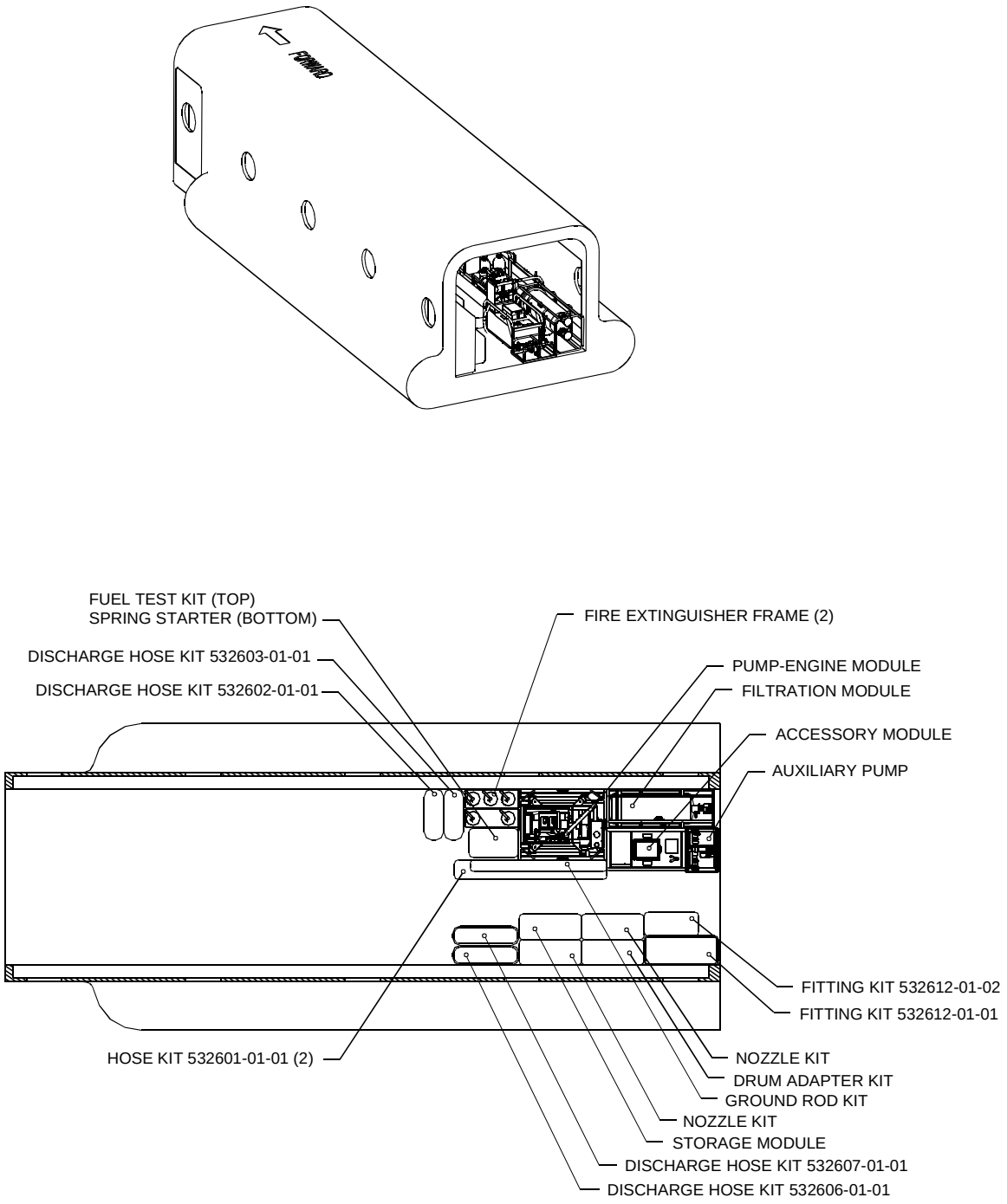


Figure 3. CH-47 Loading Arrangement

5-TON CARGO TRUCK LOADING PLAN

The 5-ton cargo truck has ample cargo space and requires no specific loading plan. Figure 4 illustrates a typical arrangement.

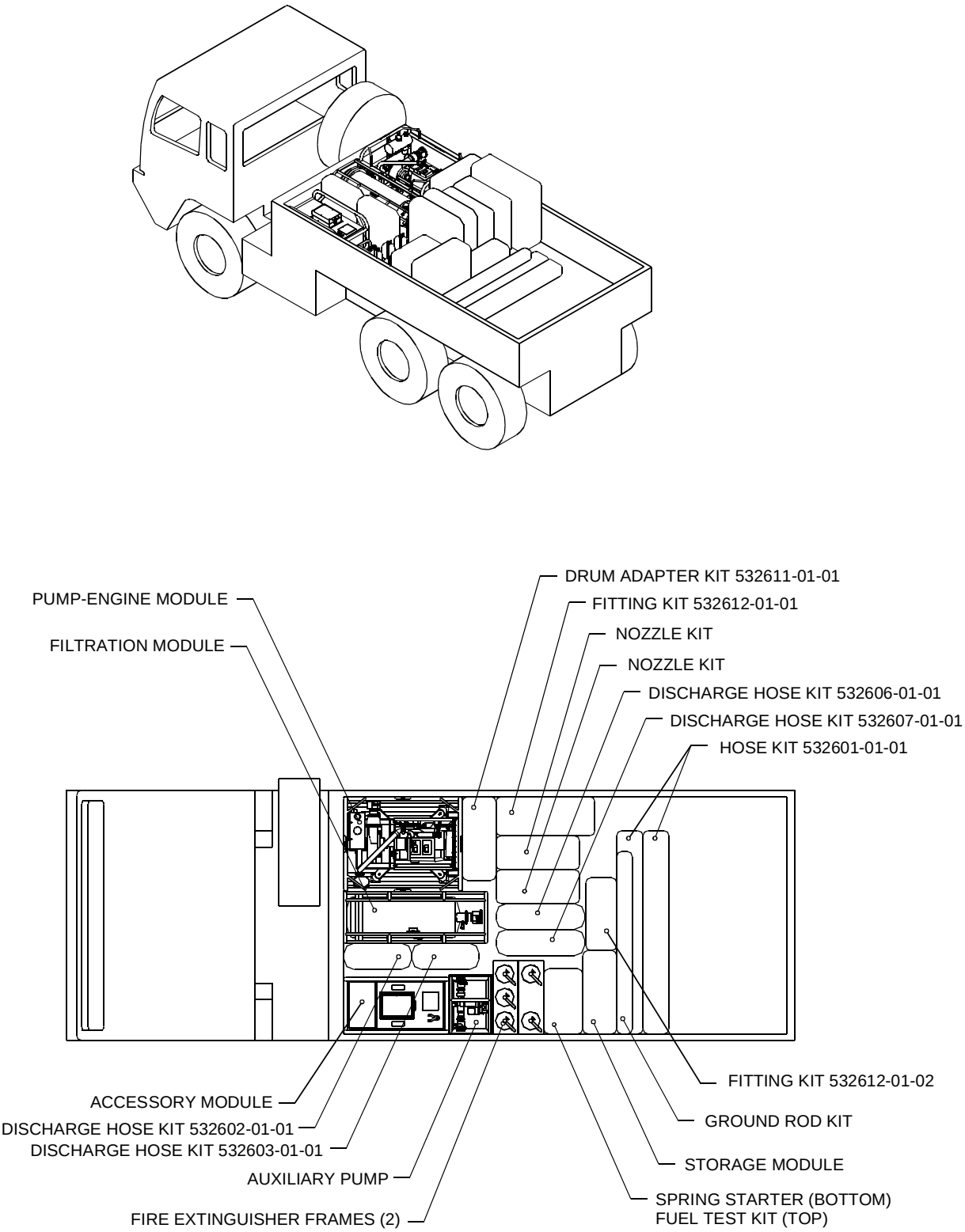


Figure 4. 5-Ton Cargo Truck Loading Arrangement

CHAPTER 3

OPERATOR TROUBLESHOOTING
FOR
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM

OPERATOR MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
OPERATOR TROUBLESHOOTING PROCEDURES

Troubleshooting Table 1 is provided to assist you in locating and correcting system faults. This table cannot list all the malfunctions that may occur, all the tests and inspections needed to find the fault, or all the corrective actions needed to correct the fault. If the equipment malfunction is not listed or actions listed do not correct the fault, notify your supervisor.

Table 1. Operator Troubleshooting

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

1. Unisex coupling leaks at interface with dust cap or other coupling.

   Step 1. Inspect coupling face for foreign matter.

   Remove foreign matter from coupling face.

   Step 2. Inspect coupling and dust cap face seals for physical damage or wear.

   a. Replace damaged or worn face seal.

   b. Notify unit maintenance if unisex coupling continues to leak.

2. Auxiliary pump will not prime.

   Check that inlet and outlet unisex valves are open.

3. Auxiliary pump operates at low capacity.

   Check for blockage.

   a. Disconnect lines from inlet and outlet unisex couplings.

   b. Open coupling valves and visually inspect for blockage. Remove any blockage.

4. Engine will not crank.

   Check electrical connections to starter.

   a. Make sure all connections between battery and starter are tight and clean.

   b. Verify that control cable is connected between accessory module and engine module.

   c. Attempt manual start (WP 0007 00).

   d. If manual start fails, notify unit maintenance.

Table 1. Operator Troubleshooting (Continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
5. Engine cranks but will not start
Check fuel supply to engine.
a. Add fuel to fuel tank if required.
b. Check that fuel selector valve is in ON or EXTERNAL ON position.
c. Make sure all fuel lines between fuel tank and engine are connected.
d. If engine still does not start, notify unit maintenance.
6. Engine starts but lacks power or will not continue running.
Check for blockage at air intake.
a. Inspect air filter element for clogging.
b. Tap lightly against hand to remove clogging.
7. Engine will not start electrically.
Raise manual start control and attempt to start.
If engine starts, notify unit maintenance of electrical problem in fuel shutoff solenoid circuit.
8. Engine exhaust produces black smoke.
Step 1. Check for clogged air intake.
Remove filter element from air filter. Check for blockage at air intake.
Step 2. Inspect filter element for clogging.
Tap lightly against hand to remove clogging.
9. Engine exhaust produces blue smoke.
Stop engine and wait 2-3 minutes for oil to drain down. Check level on dipstick.
If level is above maximum mark, notify unit maintenance.
10. Fuel transfer pump will not prime.
Ensure that all valves on inlet side are open.
If pump still does not prime, notify unit maintenance.
11. Fuel transfer pump does not provide flow and pressure when engine is running.
Step 1. Verify that all system valves are open.
Step 2. Ensure no kinks in hoses.
If pump still does not provide flow and pressure, notify unit maintenance.

Table 1. Operator Troubleshooting (Continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

12. Leakage at discharge end of nozzle during refueling.

    Step 1. Stop refueling operation, disconnect nozzle from adapter.

    Step 2. Inspect nozzle discharge end for foreign matter.

        Remove foreign matter and wipe with a clean rag.

    Step 3. Notify unit maintenance if still leaks.

13. Leakage between nozzle inlet coupling and hose coupling.

    Step 1. Relieve fuel pressure on hose, shut off fuel flow to hose.

    Step 2. Inspect coupling connection for damage.

        Notify unit maintenance if damaged.

    Step 3. Disconnect nozzle from hose.

    Step 4. Inspect coupling gasket for damage.

        Notify unit maintenance if damaged.

    Step 5. Check for leaks after cleaning both ends of Coupling Assembly and reconnecting nozzle to hose.

        Notify unit maintenance if still leaks.

14. Fuel drum leaks at adapter assembly.

    Step 1. Check for looseness.

        Tighten as required.

    Step 2. Check adapter assembly for damage.

        Notify unit maintenance if damaged.

15. Cargo in TRICON is damaged by weather.

    Step 1. Inspect exterior of container for holes or cracks that exist in exterior panels or at welds.

        If holes, cracks, and broken welds are found, notify your supervisor.

    Step 2. Inspect seals along door edges for signs of wear or deterioration.

        If seals need replacing, notify your supervisor.

16. Cargo in TRICON is damaged by movement.

    Inspect tie-downs for broken welds.

        If tie-downs have broken welds, it must be repaired. Notify your supervisor.

Table 1. Operator Troubleshooting (Continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

17. TRICON door does not close.

    Step 1. Check for any cargo or debris interfering with the door closing.

    Move cargo so it clears door and remove any debris.

    Step 2. Check both doors for severe warpage or distortion.

    If damage exist, doors may need replacement. Notify your supervisor.

    Step 3. Check door frame for bent or damaged areas.

    If damage exist, major repair is needed. Notify your supervisor.

18. TRICON door does not open.

    Step 1. Verify that all lockrod assembly handles can be raised from their latches and pulled outward.

    If lockrod assembly is damaged, replacement is needed. Maintenance at a higher level is needed. Notify your supervisor.

    Step 2. Check for proper door operation after all lockrod assembly handles are pulled outward.

    Improper operation can be the result of damaged hinges or bent frame. Notify your supervisor.

19. Documents in document holder of TRICON are damaged.

    Step 1. Inspect document holder for any apparent damages.

    Notify unit maintenance if holder is damaged.

    Step 2. Check document holder for proper operation

    Notify unit maintenance if holder is operating properly.

20. TRICON containers can not be coupled.

    Step 1. Using the connecting link assembly, check for damaged container corners.

    If connecting link assembly does not fit properly or could be remove when locked, corner is damaged. Notify your supervisor.

    Step 2. Replace damaged connecting link assembly.

END OF WORK PACKAGE

CHAPTER 4

UNIT TROUBLESHOOTING
FOR
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
UNIT TROUBLESHOOTING PROCEDURES

Troubleshooting Table 1 is provided to assist you in locating and correcting system faults. This table cannot list all the malfunctions that may occur, all the tests and inspections needed to find the fault, or all the corrective actions needed to correct the fault. If the equipment malfunction is not listed or actions listed do not correct the fault, notify your supervisor.

Table 1. Unit Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

SYSTEM

1. Unisex coupling leaks at interface with dust cap or other coupling.

   Inspect coupling and dust cap face seals for physical damage or wear.

   Replace damaged or worn coupling face seal. If you cannot tell by visual inspection which seal is bad, replace both. The coupling face seal and the dust cap face seal are identical and may be interchanged as a temporary repair.

2. Unisex coupling leaks at inlet.

   Replace two inch coupling (WP 0027 00) or three inch coupling inlet O-ring (WP 0028 00).

AUXILIARY PUMP

1. Unisex coupling leaks at interface with dust cap or other coupling.

   Inspect coupling and dust cap face seals for physical damage or wear.

   Replace damaged or worn coupling face seal. If you cannot tell by visual inspection which seal is bad, replace both. The coupling face seal and dust cap face seal are identical and may be interchanged as a temporary repair.

2. Unisex coupling leaks at coupling inlet.

   Disconnect coupling from inlet. Replace inlet O-ring. (WP 0027 00)

3. Pump will not prime.

   Check that inlet and outlet unisex valves are open.

4. Pump operates at low capacity.

   Step 1. Check for blockage.

   a. Disconnect lines from inlet and outlet unisex couplings.

Table 1. Unit Troubleshooting (Continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

b. Open coupling valves and visually inspect for blockage. Remove any blockage.

Step 2. Check for clogged strainer.

a. Separate pump from inlet reducer. (WP 0071 00)

b. Remove and clean strainer. (WP 0072 00)

Step 3. Replace pump. (WP 0071 00)

ENGINE

1. Engine will not crank

Step 1. Check electrical power to starter.

a. Check for +24 vdc at "+" terminal of starter solenoid. If present, go to step 2.a.

b. Disconnect battery power cable from engine module and check connector for +24 vdc between outer and inner conductor.

Step 2. Check continuity of starter power circuit.

a. Disconnect and remove wires from starter terminal of starter solenoid. Check that resistance from starter wire to ground is approximately zero (0) ohms. If the resistance is infinite or very high, replace starter. (WP 0041 00)

b. Check that resistance from center terminal of engine module NATO connector to "+" terminal of starter solenoid is zero (0). If the resistance is infinite or very high, conduct a visual inspection of the NATO connector and the starter power cable for broken or loose connections or cables.

c. Disconnect battery power cable from battery. Check that resistance from center conductor of NATO connector to "+" terminal of the battery connector is zero (0). Check that resistance from outer conductor of NATO connector to "-" terminal of the battery connector is zero (0). If the resistance is infinite or very high, repair or replace battery power cable W202. (WP 0050 00 or WP 0051 00)

2. Engine cranks but will not start

Check fuel supply to engine

a. Drain and check fuel filter. Replace if clogged. (WP 0021 00)

b. Refer to Direct Support Maintenance for repair.

Table 1. Unit Troubleshooting (Continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

3. Engine starts but lacks power or will not run

   Step 1. Check for clogged air intake.

   a. Remove filter element from air filter.

   b. Check for blockage at air intake.

   c. Inspect filter element for clogging; replace if necessary. (WP 0023 00)

   Step 2. Check for clogged fuel filter.

   a. Drain and check fuel filter. Replace if clogged. (WP 0021 00)

   b. Refer to Direct Support Maintenance for repair.

   Step 3. Replace fuel injectors. (WP 0044 00)

4. Exhaust produces black smoke.

   Replace fuel injectors. (WP 0044 00)

FUEL TRANSFER PUMP

1. Pump will not prime

   Check discharge check valve for proper seating.

   a. Check for debris or damage that prevents check valve from seating fully. Clean valve seat and surface.

   b. Replace discharge check valve. (WP 0036 00)

2. Pump leaks at inlet

   Check inlet mounting screws.

   Verify that all inlet mounting screws are evenly tightened.

3. Emergency Shutoff Valve leaks.

   Inspect to determine area of leak.

   a. If leak is at face of unisex coupling, replace face seal.

   b. Replace emergency shutoff valve. (WP 0028 00)

   c. Refer valve to Direct Support Maintenance for repair.

Table 1. Unit Troubleshooting (Continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

FILTER SEPARATOR

1. Leak at 3-inch unisex coupling flange at inlet or outlet port.

   Step 1. Check mounting bolt tightness.

   Attempt to tighten all six mounting bolts. Tighten any loose bolt(s), ensuring that all six bolts are tightened evenly.

   Step 2. Replace inlet or outlet flange O-ring.

2. Unisex defueling coupling leaks at coupling inlet.

   Disconnect coupling from inlet. Replace inlet O-ring.

3. Unisex defueling coupling leaks at filter sump boss.

   Step 1. Check coupling security.

   Make sure coupling is secure by attempting to tighten. Do not over-tighten.

   Step 2. Replace defueling unisex coupling assembly. (WP 0027 00)

   Step 3. Refer to Direct Support maintenance for repair.

4. Leak at sight gauge.

   Inspect gauge body for physical damage.

   Replace sight gauge. (WP 0058 00)

5. Leak at filter vessel cover.

   Step 1. Check mounting bolt security.

   Verify that all twelve bolts are torqued to 30 ft lbs.

   Step 2. Replace filter vessel cover O-ring. (WP 0055 00)

6. Differential pressure gauge does not operate.

   Check for blockage.

   a. Drain filter vessel into a suitable container.

   b. Remove hard lines connected to the differential pressure gauge and inlet and outlet ports. Blow through lines to verify that lines are not blocked with sediment. Clean or replace lines if blocked. If lines are open, replace differential pressure gauge (WP 0057 00).

CONTROL BOX

ELECTRICAL SYSTEM MALFUNCTIONS.

Pumping assembly electrical system malfunctions are problems related to the control box, interconnecting cables, alternator, starter and pumping assembly sensors. Electrical troubleshooting of the pumping assembly is best accomplished by continuity and voltage checks of the circuitry associated with a reported problem. A system schematic and a functional description of the electrical system is provided in this section, as well as a system interconnecting drawing, as a troubleshooting aid.

PUMPING ASSEMBLY PRINCIPLES OF OPERATION (Refer to System Electrical Schematic).

When the battery is initially connected to the system through the NATO connector (NATO CONN), 28 VDC is applied:

a. to the BATT input of VR1, the system voltage regulator.

b. across circuit breaker CB2 to the auxiliary pump module and the input side of INTAKE HEATER switch S2.

c. across circuit breaker CB1 to the input side of ENGINE START-RUN-STOP switch S3, shown in the STOP position.

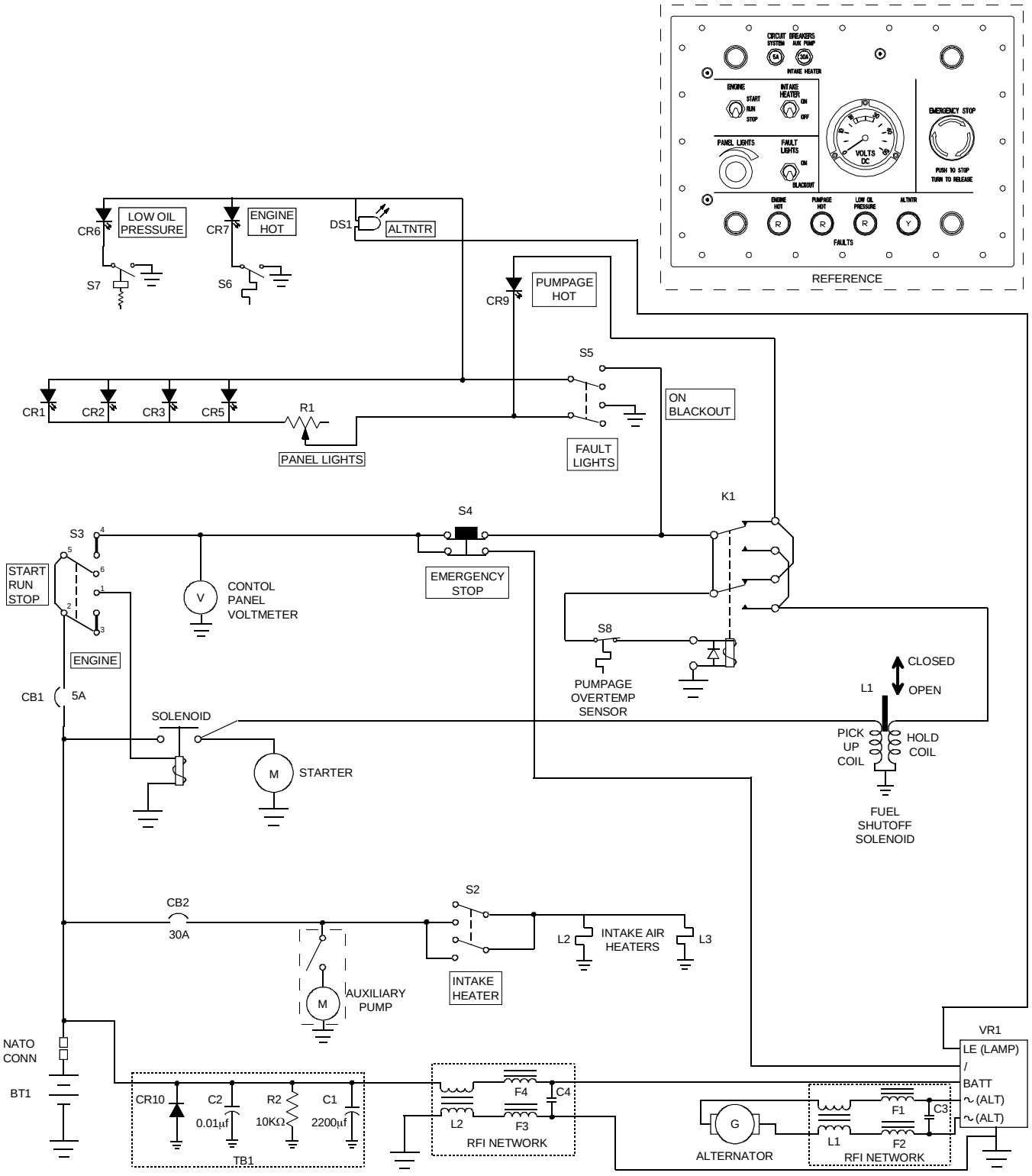
When ENGINE switch S3 is placed in the momentary START position, 28 vdc is applied from switch terminal 1 to the starter solenoid, energizing the starter to crank the engine. At the same time, 28VDC is applied from the output side of the starter solenoid to the pick up coil of FUEL SHUTOFF SOLENOID L1 on the engine, opening fuel ports to the engine fuel injectors.

After the engine starts, the ENGINE switch is released to the RUN position. The starter solenoid is deenergized, power is removed from the starter and FUEL SHUTOFF SOLENOID L1 pick up coil is deenergized. Simultaneously, the alternator output is applied to the voltage regulator/rectifier where it is rectified to DC and regulated to 28 VDC. The regulator output at terminal "/" is applied across the EMERGENCY STOP switch to provide electrical power to the system. The regulator output is also applied through relay K1 to FUEL SHUTOFF SOLENOID L1 hold coil to hold the fuel ports open.

System power is available at the input of FAULT LIGHTS switch S5 any time the system is operating or the ENGINE START-RUN-STOP switch is in the RUN position. In the BLACKOUT position, no power is applied to the panel lights or the fault lights. When switch S5 is placed in the ON position, power is applied across dimmer control R1 to panel lights CR1, CR2, CR3 and CR4. The illumination level is adjusted by operating dimmer control R1. All panel lights are Light Emitting Diodes (LEDs) to assure low power operation and long life.

The four system fault lights are grouped in the center of the control panel. The ENGINE HOT, LOW OIL PRESSURE and PUMPAGE HOT indicators illuminate red to warn the operator of a condition dangerous to personnel or the system. The ALTNTR indicator illuminates yellow to caution the operator of an electrical malfunction which may limit or preclude continued system operation. FAULT LIGHTS switch S5 must be ON for any of the fault lights to operate.

The LOW OIL PRESSURE fault light is controlled by a pressure sensor on the engine. If the oil pressure decreases to an unsafe level during operation, the contacts in sensor S7 close, providing a current path from ground through the sensor, LED CR6 and FAULT LIGHTS switch S5 to the 28 vdc line after EMERGENCY STOP switch S5.



System Electrical Schematic

The ENGINE HOT fault light is controlled by a temperature sensor mounted on the engine. If the engine oil temperature increases to 275° F (135° C) during operation, the contacts in sensor S8 close, providing a current path from ground through the sensor, led CR7 and FAULT LIGHTS switch S5 to the 28 VDC line after EMERGENCY STOP switch S5.

The PUMPAGE HOT fault light is controlled by a temperature sensor mounted on the fuel transfer pump discharge housing. If the pumpage temperature increases to 175° F (79° C) during operation, the contacts in pumpage overtemperature sensor S8 open, removing the ground from relay K1 and the 28 VDC buss. The contacts of relay K1 return to the deenergized position, removing power from the fuel shutoff solenoid which closes the fuel ports to the fuel injectors and stops the engine. When relay K1 deenergizes, a current path is created through FAULT LIGHTS switch S5, LED CR9 and the contacts of relay K1 to the 28 VDC line after EMERGENCY STOP switch S5. High pumpage temperature is the only fault condition which causes an automatic system shut down. The alternator output will decrease to zero when the engine stops but the PUMPAGE HOT fault light will remain illuminated if the battery is connected at the NATO connector.

The ALTNTR fault light is controlled by circuits in the voltage regulator which use battery voltage as a reference. The fault light illuminates any time the rectified alternator output is less than the reference battery voltage.

Two RFI networks, one between the battery and voltage regulator VR1 and one between the alternator and voltage regulator VR1 suppress any Radio Frequency Interference (RFI) generated or radiated by AAFARS.

FUEL DRUM

Adapter assembly stem leaks.

Inspect for damaged adapter assembly preformed packing.

Install serviceable preformed packing on valve stem (WP 0081 00)

CCR NOZZLE ASSEMBLY

1. Leakage between strainer body and strainer housing.

   Step 1. Inspect strainer body/housing connection for looseness.

   Tighten connection as required.

   Step 2. Inspect preformed packing, housing, and body for damage.

   a. Remove strainer body from housing (WP 0075 00).

   b. Replace packing if damaged (WP 0075 00).

   c. Replace housing/body if damaged (WP 0075 00).

2. Leakage between nozzle inlet coupling and hose coupling.

   Step 1. Inspect coupling locks for damage.

   If damaged, replace coupling (WP 0076 00).

   Step 2. Inspect gasket for damage.

   Replace gasket if damaged (WP 0075 00).

3. Inadequate fuel flow from CCR nozzle.

   Step 1. Inspect for dirt or other foreign matter.

   a. Remove strainer (WP 0075 00)

   b. Verify that nozzle and strainer is not block by dirt or foreign matter. Clean or replace strainer (WP 0075 00).

   Step 2. Replace nozzle assembly.

   Step 3. Refer to Direct Support maintenance for repair.

Table 1. Unit Troubleshooting (Continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

TRICON CONTAINER

1. Documents in TRICON are damaged.

   Step 1. Inspect document holder for any apparent damages.

   Replace damaged document holder (WP 0084 00)

   Step 2. Check document holder for proper operation

   Replace defective document holder (WP 0084 00).

2. Cargo is damaged by weather.

   Inspect seals along door edges for signs of wear or deterioration.

   Replace damaged seal (WP 0085 00).

PRESSURE CONTROL

1. Pressure Control coupling halves leak.

   Inspect for damaged or missing gasket.

   Install a serviceable gasket (WP 0083 00).

2. Fuel appears on Pressure Control body between two main castings

   Step 1. Inspect for broken pilot valve bellows assembly.

   Install a serviceable valve (WP 0083 00).

   Step 2. Inspect for damaged preformed packing in pilot valve.

   Install a serviceable preformed packing (WP 0083 00).

   Step 3. Inspect for damaged venturi preformed packing.

   Install a serviceable venturi preformed packing (WP 0083 00).

   Step 4. Inspect venturi throat for damage.

   Install a serviceable venturi (WP 0083 00).

3. Diaphragm Valve fails.

   Step 1. Inspect for ruptured diaphragm.

   Install a serviceable diaphragm (WP 0083 00).

   Step 2. Inspect for compression ring damage.

   Install a serviceable compression ring (WP 0083 00).

4. Pressure Control shuts off prematurely or too late.

   Check pilot valve adjustment.

   Adjust pilot valve (WP 0083 00).

Table 1. Unit Troubleshooting (Continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
5. Cycling Valve: No response to FILL or STOP buttons.
Step 1. Inspect for damaged cycling valve preformed packings.
Install serviceable cycling valve preformed packing (WP 0083 00).
Step 2. Inspect for damaged cycling valve compression ring.
Install a serviceable cycling valve compression ring (WP 0083 00).
Step 3. Inspect for dirty cycling valve.
Clean dirty cycling valve (WP 0083 00).

END OF WORK PACKAGE

CHAPTER 5

DIRECT SUPPORT TROUBLESHOOTING
FOR
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM

DIRECT SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
DIRECT SUPPORT TROUBLESHOOTING PROCEDURES

INTRODUCTION

The troubleshooting procedures provided in this chapter assume that unit troubleshooting has been performed unsuccessfully. Troubleshooting table 1 cannot list all malfunctions that may occur, all the tests and inspections needed to find the fault, or all the corrective actions needed to correct the fault.

Table 1. Direct Support Troubleshooting

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
FUEL TRANSFER PUMP
1. Pump will not prime
Inspect vane pump.
a. Disassemble rotary vane pump, inspect components for cuts, scratches, burrs, etc. and replace any that are damaged
b. Replace vane pump packings. (WP 0092 00 or WP 0096 00)
2. Pump leaks at inlet
Inspect inlet packing.
a. Remove inlet.
b. Check for debris around O-ring. Check physical condition of O-ring. Clean inlet or replace O-ring, as required.
3. Pump leaks at input shaft
Inspect shaft seal and O-rings.
a. Remove shaft seal housing.
b. Replace shaft seal and O-rings. (WP 0091 00 or WP 0094 00)
4. Pump leaks at vane pump housing
Inspect vane pump O-rings.
a. Remove vane pump housing.
b. Replace vane pump housing O-rings. (WP 0095 00)

Table 1. Direct Support Troubleshooting (Continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
5. Pump does not provide flow and pressure when engine is running.
Inspect pump.
a. Disassemble pump.
b. Inspect components. Replace as necessary. (WP 0094 00, WP 0095 00 and WP 0096 00.)
6. Three-inch valved unisex coupling leaks at body or fails to operate properly
Disassemble and inspect coupling.
Repair or replace faulty components. (WP 0098 00)
FUEL DRUM
1. Front and rear plates leak.
Step 1. Inspect for loose, damaged or missing capscrews.
Replace damaged or missing capscrews. Tighten capscrews to 30 foot-pounds (4.15 m-kg) torque.
Step 2. Inspect for damaged front and rear plate or missing components.
Replace damaged or missing components. (WP 0103 00)
2. Fabric of drum leak.
Inspect drums for cuts, punctures or abrasions through all plies.
Notify your supervisor if fabric is damaged.
3. Scuffs and abrasions.
Inspect exterior of drums for scuffs or abrasions where the fabric is exposed but not damaged.
Notify your supervisor if scuffs or abrasions are present.
TRICON CONTAINER
1. Cargo is damaged by weather.
Inspect exterior of container for holes or cracks that exist in exterior panels or at welds.
Holes or cracks need to be repaired. Broken welds need to be re-welded. Return container to depot for structural repairs.
2. Cargo is damaged by movement.
Inspect tie-downs for any broken welds.
Return container to depot for structural repairs.

Table 1. Direct Support Troubleshooting (Continued)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

3. Door does not close.

Step 1. Check both doors for severe warpage or distortion.

Return container to depot for structural repairs.

Step 2. Check door frame for bent or damaged areas.

Return container to depot for structural repairs.

4. Tricon containers can not be coupled.

Step 1. Using the connecting link assembly, check for damaged container corners.

If connecting link assembly does not fit properly or could be removed when locked, corner is damaged. Return container to depot for structural repairs.

Step 2. Inspect connecting link assembly for damage

Replace damaged connecting link assembly.

END OF WORK PACKAGE

CHAPTER 6

OPERATOR MAINTENANCE
FOR
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM

OPERATOR MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE UNISEX COUPLING FACE SEAL/DUST CAP SEAL

INITIAL SET-UP:

Tools:
None

Materials/Parts Required:
Rags, Wiping (WP 0116 00, Item 21)

This procedure applies to all AAFARS unisex couplings. All two-inch face seals are the same throughout the system, as are all three-inch face seals. The seal in the coupling face and the dust cap are identical, and may be interchanged as an emergency repair.

The face plate and dust cap of AAFARS unisex couplings employ a U-ring type seal which is designed to seat with pressure. The seal is slightly higher than the groove it sits in, so that the top protrudes above the surface. Pressurized fluid enters beneath this protrusion and expands the seal against the bottom of the seal groove and against the corresponding seal in the dust cap or other face plate. Special care must be taken during installation to ensure the seal is fully seated in the groove. If it is not, pressurized fluid will be forced under the seal and the coupling will leak.

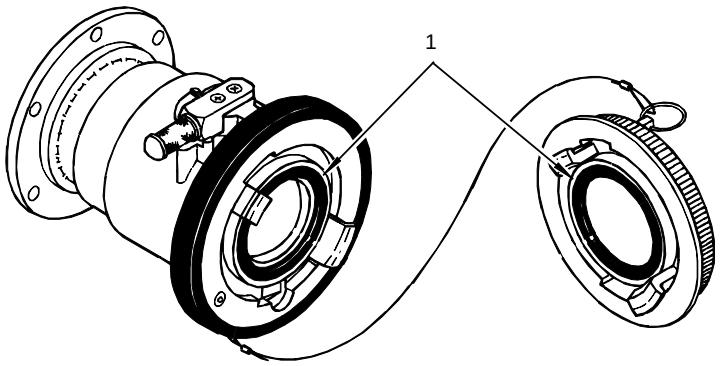
REMOVAL

Remove seal (1) by hand.

INSTALLATION

1. Wipe seal groove clean.

2. Press seal (1) in groove with a smoothing motion of fingertips. Note that when fully seated, the outer lip of the seal protrudes slightly above the surface. Ensure the seal is not twisted or kinked.



END OF WORK PACKAGE

OPERATOR MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
EMERGENCY REPAIR, FUEL DRUM CASING

INITIAL SET-UP:

Tools:
None

Equipment Condition:
Holes in the drum casing not greater than 3/8 inch (0.9525 cm).

Materials/Parts Required:
Fuel Drum Emergency Repair Kit
(Provided with Fuel Drum)

REPAIR

CAUTION

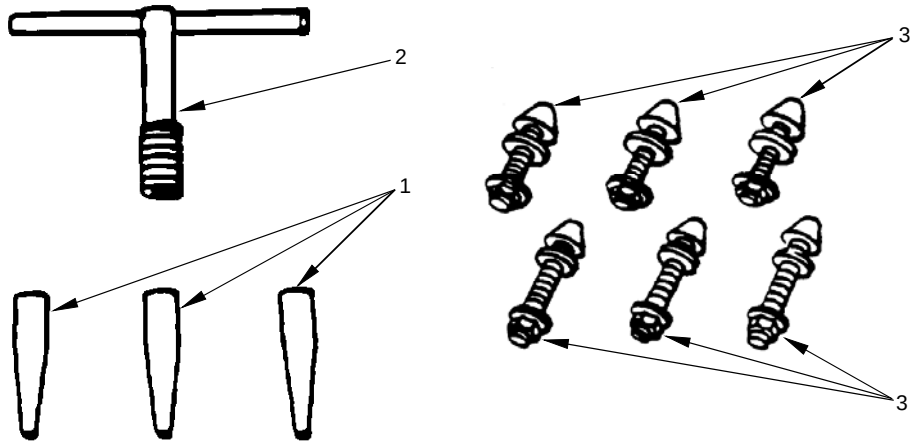
Emergency repair kits are used only to prevent leakage until the operator can empty the drums. Do not attempt to tow, lift or transport partially filled drum, to which emergency repairs have been applied. Empty fuel drum completely before towing, lifting or transporting.

1. When necessary, insert the required size wood plug (1) in the hole to temporarily stop the leak.
2. Roll drum over to position the plugged hole at the highest point on the drum.
3. Use the round cutting tool (2) to cut a clean edge around the hole to prepare hole for patch.
4. Screw the patch assembly (3) into the end of the cutting tool (2) handle.
5. Push the conical end of a mechanical patch assembly (3) through the prepared hole, and pull the patch tight against the interior of the drum wall.
6. Screw aluminum cap and gasket down tight and use the socket end of the cutting tool (2) to tighten the cap on the patch assembly (3) against the exterior drum wall.

CAUTION

To avoid cuts, punctures or abrasions to other drums, do not allow other drum to rest on or roll into the patch assembly shank.

7. If drum casing requires more extensive repair, notify direct and general support maintenance.



END OF WORK PACKAGE

CHAPTER 7

UNIT MAINTENANCE
FOR
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
SERVICE UPON RECEIPT

UNPACKING

1. Open doors on all three (3) TRICON containers.
2. Using a forklift, unload reusable crates from all TRICON containers.
3. Remove top and end from each crate.

INSPECTION

1. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on SF 364, Report of Discrepancy.
2. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA PAM 738-750.

PREPARATION FOR USE

Pump-Engine Module

1. Before placing in service, clean all unpainted surfaces with MIL-PRF-680 (WP 0116, Item 13).
2. Check level of oil in engine crankcase. Add up to 1.9 qt (1.8 l) SAE 15W-40 lubricating oil (WP 0116, Item 17) to the engine crankcase, as required.
3. Add fuel (JP8) to fuel tank.
4. Install air filter on intake manifold.

Accessory Module

1. Open battery compartment cover and remove all wrapping from battery cable connectors.
2. Connect battery cables to battery terminals.
3. Start and run engine for several minutes, checking for oil leaks. Repair any leaks before placing engine in service.

Fuel Drums

Fuel drums may contain some residual water from factory tests. Drain completely and ventilate well to ensure all moisture has evaporated before first use.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) INTRODUCTION

GENERAL

Preventive Maintenance Checks and Services (PMCS) involves systematic caring, inspection, and servicing of equipment to keep it in good condition and prevent breakdowns. WP 0019 00 lists the AAFARS System unit level PMCS. Service intervals are divided into categories: Before Operation; During Operation; After Operation; and various other checks and services to be performed at prescribed monthly interval. WP 0019 00 organizes your PMCS tasks in chronological sequence. You should:

a. Perform your PMCS as scheduled. Always do your PMCS in the same order so it gets to be a habit. Always assume explosive vapors are present at the AAFARS. Do not allow any smoking or spark producing equipment within fifty feet of the AAFARS while performing your PMCS.

b. Do your BEFORE PMCS prior to the equipment leaving its staging/service area or performing its intended mission. Keep in mind the WARNINGS and CAUTIONS.

c. Do your DURING PMCS during filter-separator liquid fuel operation. Leaks can be spotted only during operation. Keep in mind the WARNINGS and CAUTIONS.

d. Do your AFTER PMCS as soon as possible after the AAFARS has been taken out of its mission mode or returned to its containment area. Keep in mind the WARNINGS and CAUTIONS.

e. Cleanliness. Dirt, grease, oil and debris only get in the way and may cover up a serious problem. Use dry cleaning solvent SD (P-D-680) or some other suitable cleaning solvent on all metal surfaces.

f. Bolts, Nuts and Screws. Check bolts, nuts and screws for obvious looseness and missing, bent or broken conditions. Look for chipped paint, bare metal or rust around bolt heads. If any part seems loose, tighten it.

g. Welds. Look for loose or chipped paint, rust or gaps where parts are welded together. If a bad weld is found, notify your supervisor.

h. Electric Wires and Connections. Look for cracked or broken insulation, bare wires and loose connectors. Tighten loose connectors and make sure bare wires are in a serviceable condition. If a bad wire or connector is found, replace it or notify your supervisor.

LEAKAGE CRITERIA

WARNING

Do not operate AAFARS if there is any indication of fuel leakage to avoid injury.

Wetness around seals, gaskets, fittings or connections indicates leakage. A stain also indicates leakage. If a fitting or connector is loose, tighten it. If it is broken or defective, report it. Definitions of the classes of leaks are listed below. Become familiar with each class of leak so that you are aware of the status of your equipment. When in doubt, notify your supervisor.

WARNING

AAFARS pumpage fuels and the engine lubricating oil contain additives that may be harmful to personnel and the environment. All leaks must be corrected as soon as possible. Wash fuel or oil from skin immediately. Remove and wash contaminated clothing immediately. Spills of fuel or oil must be cleaned up in accordance with local area direction to prevent harm to personnel or damage to the environment.

CAUTION

Equipment operation is allowable with minor oil leakages (Class I or Class II). If leakage is present at the engine, check lubricating oil level more often than usual. Do not allow oil level to fall below the ADD OIL mark. When in doubt, notify your supervisor.

a. Class I - Leakage indicated by wetness or discoloration not great enough to form drops.

b. Class II - Leakage great enough to form drops but not enough to cause drops to drip from item being checked or inspected.

c. Class III - Leakage great enough to form drops that fall from item being checked or inspected.

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) PROCEDURES

Table 1 lists the checks and services required to keep your AAFARS in good operating condition. They are listed in chronological order and should be performed in this order so they become a habit. An explanation of each column is provided below.

a. The "Item No." column provides the sequential identification number for each task.

b. The "Interval" column tells you when to do a certain check or service.

c. The "Location - Item to Check/Service" column tells you on which item the procedure is performed.

d. The "Procedure" column tells you how to do the required checks and services. Carefully follow these instructions. If you do not have the required tools, or if the procedure tells you to, notify your supervisor.

e. The "Not Fully Mission Capable If" column tells you the conditions under which your AAFARS is not capable of performing its intended mission.

Table 1. Unit Preventive Maintenance Checks and Services (PMCS) for AAFARS

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
1	Before	Tricon Container	Inspect side, front, and door panels for holes.	Holes exist in any panels.
2	Before	Tricon Container	Inspect all welds at corners and along the corner posts. Inspect all welds that attach the lockrod assemblies to the door assembly.	Welds are damaged.
3	Before	Tricon Container	Inspect door handles and related hardware for any broken welds or defective parts. Operate handles.	Handles or related hardware are broken or if handles will not open door.
4	Before	Tricon Container Document Holders	Inspect for any large dents that may prevent the holder from being completely opened or closed.	Document holder cannot be completely opened or closed.
5	Before	Tricon Container	Inspect door seals for tears.	Door seals are torn.
6	Before	Tricon Container	Inspect for broken vents.	Vents are broken.

Table 1. Unit Preventive Maintenance Checks and Services (PMCS) for AAFARS (Continued)

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
			WARNING **Fuel fumes are always present in the vicinity of the pumping assembly. Death or personal injury may result from the explosion of fuel fumes exposed to an open flame or spark. Do not permit smoking, any open flame, or spark producing equipment within 50 feet (15 m) of the pumping assembly.**	
7	Weekly	Pumpage Overtemp Switch	With engine running, perform electrical circuit test. 1. Disconnect the connector to 1A1J3 receptacle. 2. The engine should shut down. 3. "PUMPAGE HOT" indicator light on the control panel should illuminate. 4. If "2" or "3" do not occur, repair unit before deployment.	Overtermp switch damaged or fails electrical circuit test.
8	Every 2 weeks	CCR-Nozzle	Check strainer for foreign matter and holes. Clean and/or replace as required. Refer to WP 0075 00.	Holes in strainer.
9	Monthly	All Fuel Hoses	Using a multimeter, test fuel hose for broken or disconnected internal ground cable as follows: 1. Place multimeter leads from continuity ball to continuity ball of both couplings. 2. Check for continuity between couplings. Continuity must exist. If continuity does not exist, hose is defective.	Hose fails continuity test.
10	Quarterly	Fuel Drum	Check closure plates for cracks; check exterior of drums for cuts, wear, exposed fabrics or evidence of leaks.	Damaged or leaks.
11	Quarterly	Fuel Drum	Check adapter assembly for cracks and damaged threads.	Damaged adapter assembly.
12	200 hours/ 6 mo	Engine	Perform engine oil change. Oil filters shall be serviced/cleaned/changed as applicable, when: a. They are known to be contaminated or clogged, or b. At prescribed hardtime intervals.	Oil level is above MAX mark or below MIN mark on dipstick.

Table 1. Unit Preventive Maintenance Checks and Services (PMCS) for AAFARS (Continued)

Item No.	Interval	Location / Item to Check/ Service	Procedure	Not Fully Mission Capable If:
			This engine is not enrolled in the Army Oil Analysis Program. HARDTIME INTERVALS APPLY. a. Remove engine module from pump-engine module and place engine module high enough to allow oil drain pan to fit beneath oil drain plug. b. Remove either oil filler cap. c. Place oil drain pan beneath oil drain plug, remove the drain plug and drain the oil. Dispose of in accordance with local SOP. d. Remove the oil filter, taking care not to spill oil from filter. Dispose of in accordance with local SOP. e. Install the oil drain plug. f. Lightly lubricate the seal on the oil filter. **CAUTION** **Do not use oil filter wrench. Over-tightening may damage the seal or allow the filter to seize.** g. Install the oil filter hand tight. h. Add 1.9 qt (1.8 l) premium 15W-40 oil to the engine. i. Install the oil filler cap. j. Install the engine module in the pump-engine module. k. Start and run the engine for two or three minutes, checking for oil leaks. l. Stop engine; wait 2-3 minutes. m. Check the engine oil level. Add oil to a level between MIN and MAX marks on dipstick.	
13	300h/ 6 mo	Engine	Perform valve lash check and adjustment. Refer to WP 0043 00.	Valves are out of adjustment.

Table 1. Unit Preventive Maintenance Checks and Services (PMCS) for AAFARS (Continued)

Item No.	Interval	Location / Item to Check/ Service	Procedure	Not Fully Mission Capable If:
14	Annually	Pumpage Overtemp Switch	Perform test of thermostat overtemperature sensor. (WP 0022 00) **WARNING** **To avoid injury to personnel, adhere to all safety requirements and provide adequate ventilation and fire protection.** **NOTE** Check sensor continuity at room temperature before starting test. 1. Disconnect the overtemperature sensor cable at 1A1J3 receptacle on the engine module. 2. Using a multimeter, connect the overtemperature sensor cable leads to the multimeter leads. 3. Record whether or not the overtemperature sensor is closed (continuity) or open (no continuity). 4. If sensor is open, stop test and replace sensor. If sensor is closed, continue to step 5. **NOTE** The following steps must be performed in the sequence shown. 5. Attach thermometer to the top edge and inside of the test container (WP 0113, Item 9). 6. Using electrical tape, attach the sensor to the test container handle such that the sensor is suspended in the container, close to, but not touching the thermometer or the bottom of the container. 7. Fill the test container with water so that the sensor and at least 2 inches of the thermometer are covered. 8. Plug the test container into a 110v outlet and connect the sensor wire leads to the multimeter leads. Observe temperature and multimeter until the sensor opens and/or the water heats to +190° F. 9. If sensor does not open (no continuity) stop test and replace sensor. If sensor opens, proceed to step 10. 10. Unplug the test container and let water cool to room temperature (less than +100° F). 11. If sensor does not close (continuity) stop, test and replace sensor. If sensor closed, proceed to step 12. 12. If the sensor opened (step 8) and closed (step 11), the sensor is acceptable.	Overtemperature sensor damaged or fails test.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE ENGINE OIL FILTER

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)
Drain Pan
(WP 0113 00, Item 2)
Wrench, Strap
(WP 0113 00, Item 2)

Materials/Parts Required:
Oil, Lubricating, Engine
(WP 0116 00, Item 17)
Rags, Wiping (WP 0116 00, Item 21)

Equipment Condition:
Engine module removed from pump-engine module. (WP 0007 00)

REMOVAL

WARNING

Engine lubricating oil contains additives that may be harmful to personnel and the environment. All leaks must be corrected as soon as possible. Wash oil from skin immediately. Remove and wash contaminated clothing immediately. Spills of oil must be cleaned up in accordance with local area direction to prevent harm to personnel or damage to the environment.

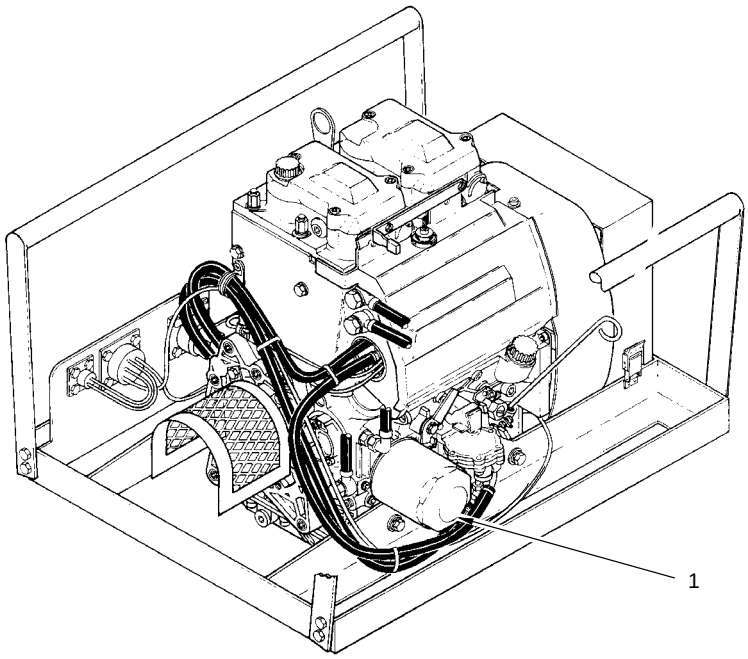
Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. Always use the number of soldiers called for by the procedures to move or relocate the AAFARS equipment. Use proper physical lifting procedures or use a suitable lifting device or dolly. Wear safety shoes, gloves and other suitable protective clothing.

NOTE

This engine is not enrolled in the Army Oil Analysis Program. HARDTIME INTERVALS APPLY.

1. Using four persons or a hoist attached to the lifting eye on the engine, place engine module high enough to allow oil drain pan to fit beneath oil filter (1).

2. Place oil drain pan beneath oil filter (1). Remove the oil filter (1), taking care not to spill oil from filter. Dispose of in accordance with local SOP.



INSTALLATION

CAUTION

Do not use tool for oil filter installation. Over-tightening may damage the seal or allow the filter to seize.

1. Install the oil filter (1) hand tight.
2. Install the engine module in the pump-engine module. (WP 0007 00)
3. Start and run the engine for two or three minutes, checking for oil leaks. Retighten the oil filter (1), if necessary.
4. Stop engine.
5. Check level of oil in crankcase. Top off as necessary with premium 15W40 motor oil.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE ENGINE FUEL FILTER

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
Sealant, Thread, LH-150
(WP 0116 00, Item 24)
Nut, Self-Locking
(WP 0117 00, Item 89)

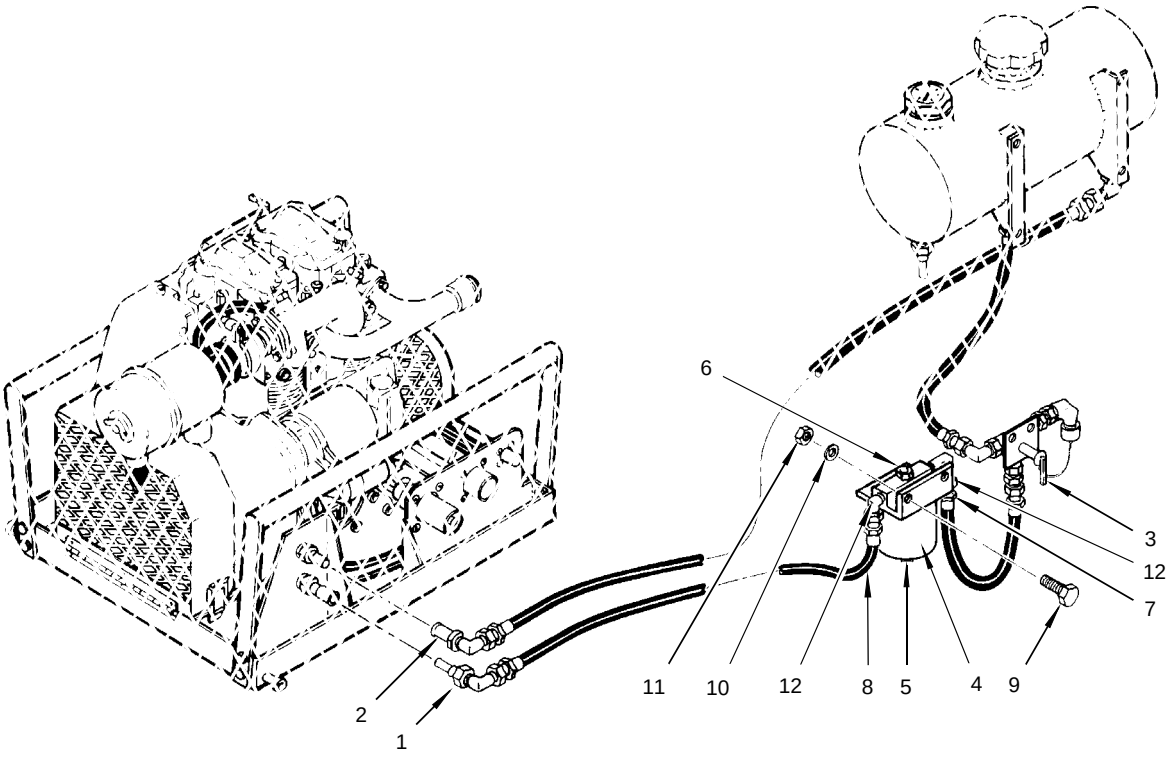
Equipment Condition:
Pumping assembly shut down

WARNING

Death or personal injury may result from the explosion of fuel fumes exposed to an open flame or spark, or to static discharge. Do not permit smoking, any open flame, or spark producing equipment within fifty (50) feet of the pumping assembly. Ensure all equipments are well grounded prior to commencing any operation or maintenance task.

REMOVAL

1. Disconnect fuel supply line (1) and fuel return line (2) at engine module quick-disconnect connections.
2. Place fuel selector valve (3) to OFF.
3. Place container under engine fuel filter (4), open drain valve (5) on bottom of filter and drain completely.
4. Open vent valve (6) on top of engine fuel filter (4) to ensure complete draining. Dispose of drained fuel in accordance with SOP.
5. At the engine fuel filter (4), remove the fuel line (7) from the fuel selector valve (3).
6. At the engine fuel filter (4), remove the fuel supply line (8) to the engine.
7. Remove the two bolts (9), flat washers (10) and self-locking nuts (11) that secure the engine fuel filter (4) to the module. Discard the self-locking nuts.
8. Remove the elbows (12) from the inlet and outlet of the engine fuel filter assembly. Dispose of the engine fuel filter assembly in accordance with SOP.



INSTALLATION

1. Clean threads on elbows (12) as required, apply a light, even coat of thread sealant to threads and install on engine fuel filter assembly.
2. Verify that drain valve (5) and vent valve (6) on engine fuel filter (4) are closed.
3. Install fuel inlet and outlet line elbows (12) on engine fuel filter (4).
4. Install engine fuel filter (4) on module frame with two bolts (9), flat washers (10) and new self-locking nuts (11).
5. Install the fuel lines (7 and 8) to the elbows (12) at the engine fuel filter inlet and outlet.
6. Connect the fuel supply line (1) and fuel return line (2) at the engine module quick disconnect connections.
7. Position the fuel selector valve (3) to ON or EXTERNAL ON.
8. Crack open engine fuel filter vent valve (6) to allow air to escape. Close immediately at first indication of fuel.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE PUMPAGE OVERTEMPERATURE SENSOR/SENSOR CABLE (W103)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)
Drain Pan
(WP 0113 00, Item 2)
Tester, Thermostat
(WP 0113 00, Item 9)

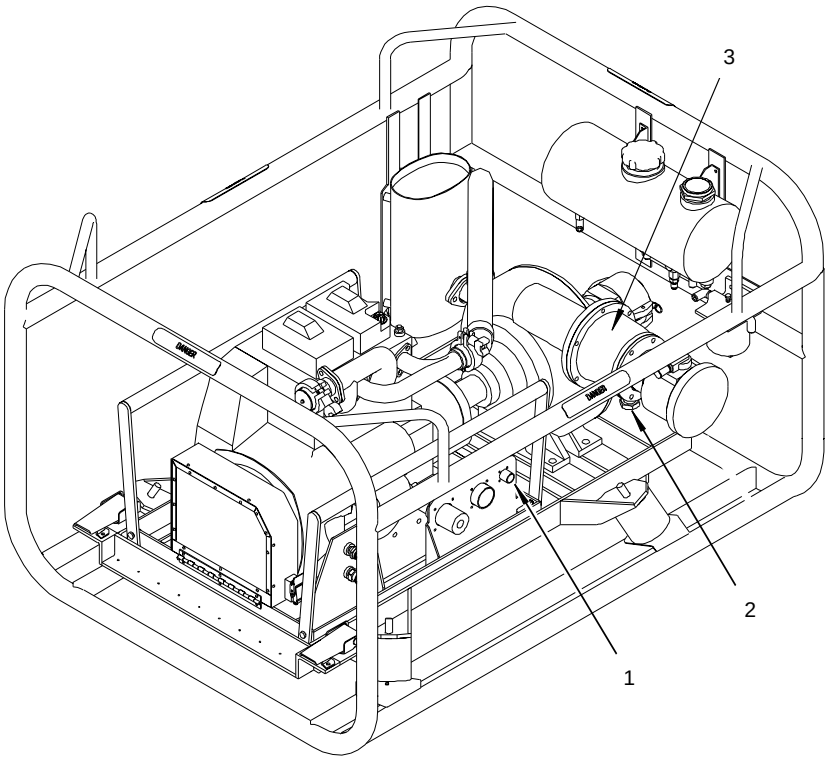
Materials/Parts Required:
Rags, Wiping
(WP 0116 00, Item 21)
Sealant, Thread, LH-150
(WP 0116 00, Item 24)
Electrical Tape
(WP 0116 00, Item 30)

TEST SENSOR CABLE ASSEMBLY

NOTE

The following sensor cable test procedure shall be successfully completed prior to deployment, with the engine operating.

1. Disconnect the connector to 1A1J3 receptacle (1).
2. The engine should shut down.
3. “PUMPAGE HOT” indicator light on the control panel should illuminate.
4. If 2 or 3 do not occur, repair unit before deployment.



REMOVAL

1. Place drain pan under pumpage overtemperature sensor (2).
2. Disconnect cable assembly W103 (1) at engine module electrical connection panel.
3. Remove pumpage overtemperature sensor (2) from bottom of fuel transfer pump discharge housing (3).

TEST SENSOR

WARNING

Adhere to all safety requirements and provide adequate ventilation and fire protection to prevent injury to personnel.

NOTE

Check sensor continuity at room temperature before starting test.

1. Connect the overtemperature sensor (2) wire leads to the multimeter leads.
2. Record whether or not the overtemperature sensor is closed (continuity) or open (no continuity).
3. If sensor is open, stop test and replace sensor. If sensor is closed, continue to step 4.

NOTE

The following steps must be performed in the sequence shown.

4. Attach thermometer to the top edge, and inside, of the test container.
5. Using electrical tape, attach the sensor to the test container handle so that the sensor is suspended in the container, close to, but not touching, the thermometer or the bottom of the container.
6. Fill the test container with water so that the sensor and at least 2 inches of the thermometer are covered.
7. Plug the test container into a 110v outlet and connect the sensor wire leads to the multimeter leads. Observe temperature and multimeter until the sensor opens and/or the water heats to +190° F.
8. If sensor does not open (no continuity), stop test and replace sensor. If sensor opens, proceed to step 9.
9. Unplug the test container and let water cool to room temperature (less than +100° F).
10. If sensor does not close (continuity), stop test and replace sensor. If sensor closed, proceed to step 11.
11. If the sensor opened (step 7) and closed (step 10), the sensor is acceptable.

INSTALLATION

1. Clean sensor threads as required in fuel transfer pump discharge housing (3).
2. Apply a light, even coat of thread sealant to pumpage overtemperature sensor (2) threads and install in fuel transfer pump discharge housing (3).
3. Connect cable assembly W103 (1) at engine module electrical connection panel.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE ENGINE AIR FILTER ELEMENT

INITIAL SET-UP:

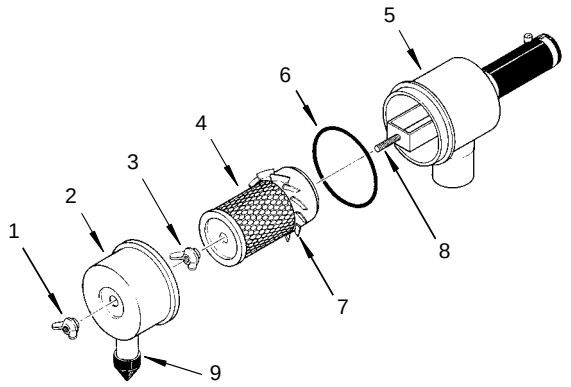
Tools:
No tools required

Materials/Parts Required:
O-Ring (WP 0117 00, Item 133)

Equipment Condition:
Pumping assembly shutdown

REMOVAL

1. Remove wing nut (1) and remove cover (2).
2. Remove wing nut (3) and slide filter element (4) out of filter body (5).
3. Remove and discard O-ring (6).



INSTALLATION

1. Install O-ring (6) on filter body (5).
2. With separator fins (7) at top, slide filter element (4) over threaded rod (8).

CAUTION

Do not overtighten filter element wing nut. Too much stress on the metal disk on the end of the element may cause the disk to fracture and be drawn into the engine.

3. Install and hand tighten wing nut (3) on threaded rod (8). Ensure wing nut (3) is just tight enough to prevent rotation of filter element (4) on threaded rod (8).
4. Using wing nut (1), install cover (2) on filter body (5) with dust ejector (9) pointing down.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE ENGINE AIR FILTER HOSE

INITIAL SET-UP:

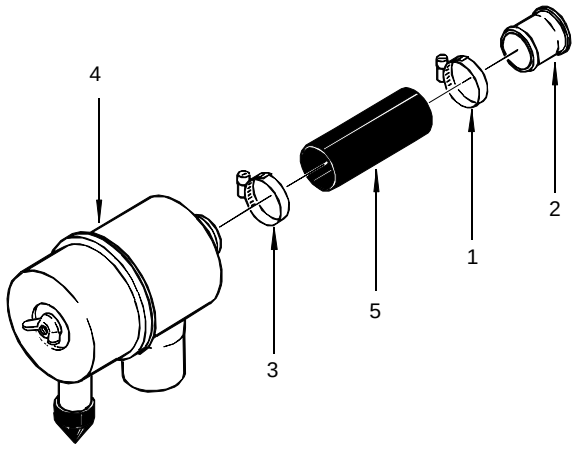
Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
None

Equipment Condition:
Filter assembly removed from engine

REMOVAL

1. Remove clamp (1) from coupler (2).
2. Remove clamp (3) from filter body (4).
3. Remove hose (5) from filter body (4).



INSTALLATION

1. Using clamp (3), install hose (5) on filter body (4).
2. Using clamp (1), install coupler (2) on hose.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE FUEL TRANSFER PUMP PN 8424/PN 60975-5 INLET QUICK DISCONNECT FITTING PACKING

INITIAL SET-UP:

Tools:

Tool Kit, General Mechanics
(WP 0113 00, Item 1)
Chemical and Oil Protective Gloves
(WP 0113 00, Item 2)
Wrench, Torque, 0-300 in. lb.
(WP 0113 00, Item 2)

Materials/Parts Required:

Petrolatum (WP 0116 00, Item 20)
Nut, Self-Locking (Fuel Transfer Pump PN 8424 only) (WP 0117 00, Item 90)

WARNING

Death or personal injury may result from the explosion of fuel fumes exposed to an open flame or spark, or to static discharge. Do not permit smoking, any open flame, or spark producing equipment within fifty (50) feet (15.24 m) of the fuel transfer pump during repair.

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

NOTE

Even with the fuel transfer pump defueled, some residual fuel may remain due to normal drainage after defueling.

REMOVAL

1. Fuel Transfer Pump PN 8424

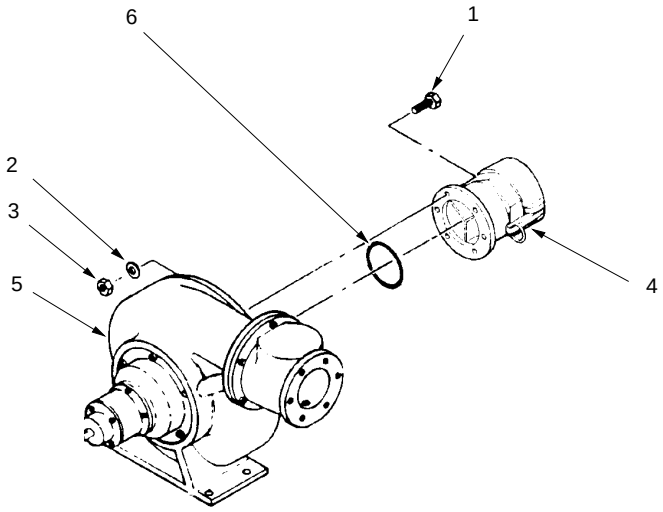
   a. Remove the six bolts (1), flat washers (2) and self-locking nuts (3) that secure the quick disconnect fitting (4) to the fuel transfer pump (5). Discard the self-locking nuts.

   b. Remove the quick disconnect fitting (4) and remove and discard the outlet O-ring (6).

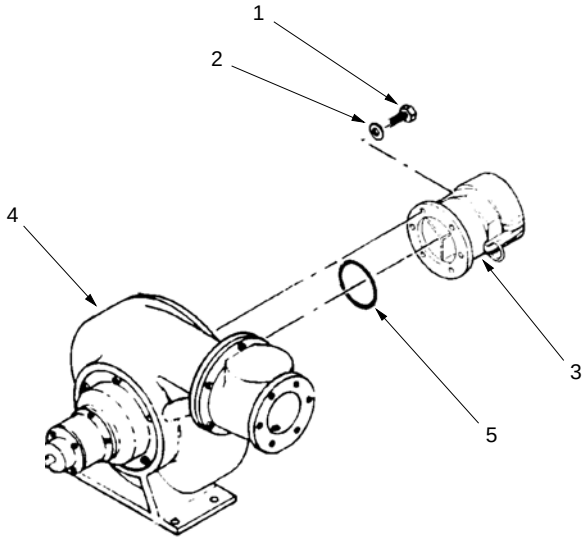
2. Fuel Transfer Pump PN 60975-5

   a. Remove the six bolts (1) and flat washers (2) that secure the quick disconnect fitting (3) to the fuel transfer pump (4).

   b. Remove the quick disconnect fitting (3) and remove and discard the outlet O-ring (5).



FUEL TRANSFER PUMP PN 8424



FUEL TRANSFER PUMP PN 60975-5

INSTALLATION

1. Fuel Transfer Pump PN 8424

   a. Lightly lubricate with petrolatum and install an O-ring (6) on the quick disconnect fitting (4).

   b. Install the six bolts (1), flat washers (2) and self-locking nuts (3) to secure the quick disconnect fitting (4) to the fuel transfer pump (5). Torque in a crossing pattern to 120-130 in. lb. (13.3-14.4 Nm).

2. Fuel Transfer Pump PN 60975-5

   a. Lightly lubricate with petrolatum and install an O-ring (5) on the quick disconnect fitting (3).

   b. Install the six bolts (1) and flat washers (2) to secure the quick disconnect fitting (3) to the fuel transfer pump (4). Torque in a crossing pattern to 120-130 in. lb. (13.3-14.4 Nm).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
INTRODUCTION TO FUEL DELIVERY EQUIPMENT MAINTENANCE

The AAFARS fuel delivery equipment includes all the hoses, couplings, manifolds and nozzles, and the auxiliary pump. Couplings include the elbows, tees, crosses and wyes used as fuel hose connection points; the various unisex to camlock adapters; and the recirculation manifold and recirculation wye. All these equipments are equipped with unisex couplings. The AAFARS uses two-inch, non-valved unisex couplings; two-inch, valved unisex couplings; and three-inch, valved unisex couplings. The following unisex coupling maintenance procedures apply to all unisex couplings throughout the system, including the CCR and D-1 nozzle assemblies. The two-inch suction hoses, the two-inch wyes and all three-inch unisex couplings have stainless steel long and short lugs in the coupling body; three-inch dust caps have aluminum lugs. The discharge hoses, tees, crosses, manifolds and elbows unisex couplings have aluminum long and short lugs. Refer to TM 10-4930-351-24P, Repair Parts and Special Tools List for the correct part number for lugs for the coupling under repair.

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE TWO-INCH VALVED UNISEX COUPLING

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics (WP 0113 00, Item 1)
Chemical and Oil Protective Gloves (WP 0113 00, Item 2)

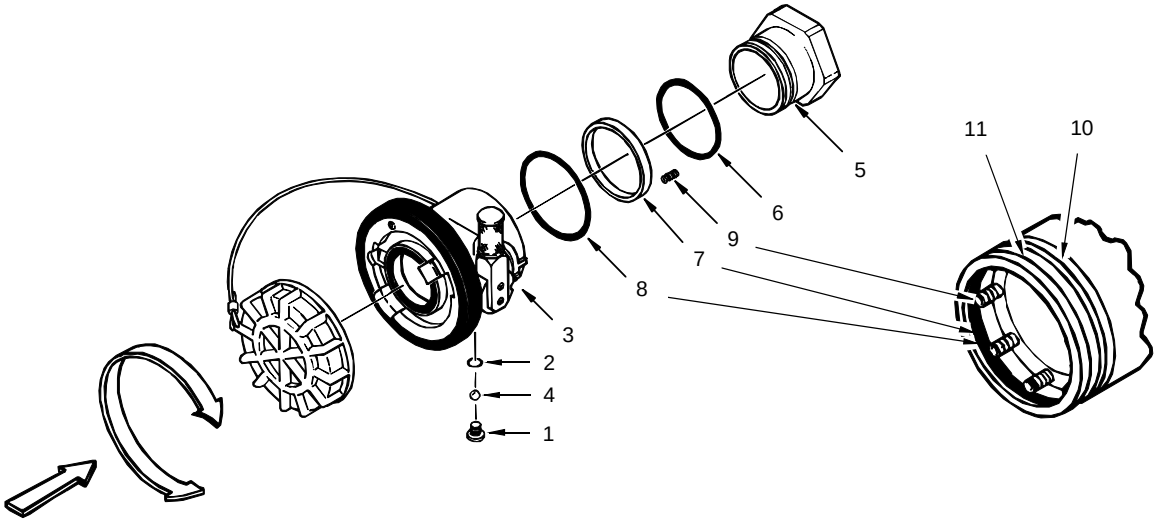
Materials/Parts Required:
Petrolatum (WP 0116 00, Item 20)
Rags, Wiping (WP 0116 00, Item 21)
Seal (WP 0117 00, Item 17)
O-ring (WP 0117 00, Item 103)
O-ring (WP 0117 00, Item 112)
O-ring (WP 0117 00, Item 121)

REMOVAL

WARNING

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

1. Remove ball retaining screw (1) and O-ring (2). Discard O-ring (2).
2. Position a wiping rag under unisex coupling (3) and orient unisex coupling (3) screw hole toward wiping rag. Push in and rotate unisex coupling (3) back and forth until all 41 balls (4) have collected in the wiping rag.
3. Pull unisex coupling (3) from inlet (5).
4. Remove and discard outside O-ring (6) from inlet (5).
5. Remove and discard nylon seal (7) and inside O-ring (8) from inlet (5).
6. Remove and retain eight springs (9).



INSTALLATION

WARNING

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

NOTE

When inserting balls in unisex coupling ball race, use caution to avoid dropping loose balls. Work over a wiping rag.

1. Lightly lubricate outside O-ring (6) with petrolatum and install in second (square) groove (10) of inlet (5).
2. Lightly lubricate inside O-ring (8) with petrolatum and install inside inlet (5).
3. Place springs (9) in inlet (5).
4. Install nylon seal (7) over inside O-ring (8) in inlet (5).

NOTE

Assembly of the unisex coupling on to the inlet requires two persons, one to hold the unisex coupling on the inlet against spring pressure and one to insert the balls. Alternatively, one person can perform the task if the unisex coupling is pressed against some object heavy enough to compress and hold the inlet springs while the balls are inserted in the race.

5. Place a wiping rag under the unisex coupling (3). Slide the unisex coupling (3) onto the inlet (5) and adjust position until screw hole is facing up and ball race (rounded groove) (11) in inlet is centered under screw hole. Install balls (4) one at a time, rotating unisex coupling (3) back and forth until all 41 balls (4) have been inserted.
6. Install ball retaining screw (1) and O-ring (2) in unisex coupling (3). Tighten retaining screw.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE THREE-INCH UNISEX COUPLING

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)
Chemical and Oil Protective Gloves
(WP 0113 00, Item 2)

Materials/Parts Required:
Petrolatum (WP 0116 00, Item 20)
Rags, Wiping (WP 0116 00, Item 21)
O-ring (WP 0117 00, Item 98)
O-ring (WP 0117 00, Item 123)

REMOVAL

WARNING

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

1. Remove ball retaining screw (1) and O-ring (2). Discard O-ring (2).

2. Position a wiping rag under unisex coupling (3) and orient unisex coupling (3) screw hole toward wiping rag. Rotate unisex coupling (3) back and forth to allow the 41 balls (4) to collect in the wiping rag. Do not separate coupling at this time.

CAUTION

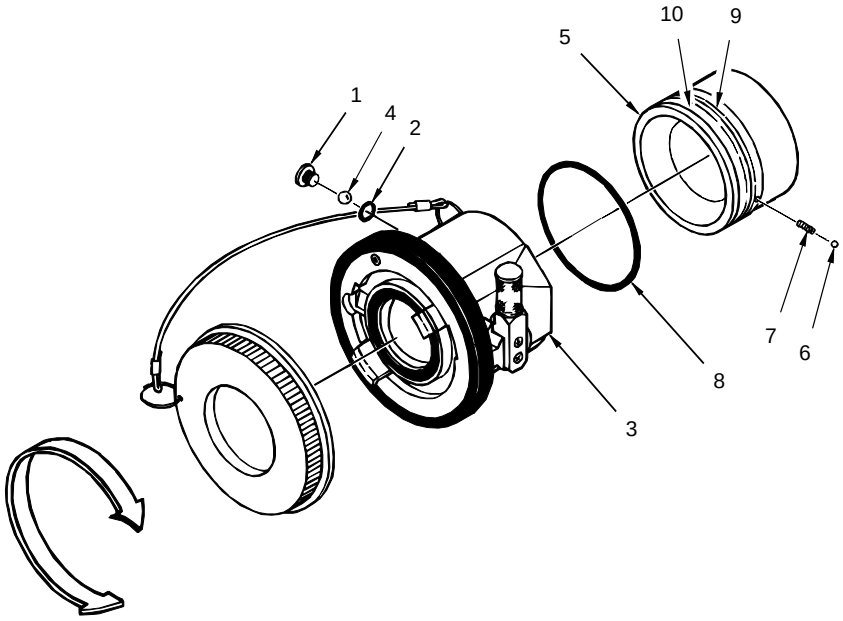
Continuity ball is essential to mission.

NOTE

There is a small ball and spring in the inlet that are used to maintain electrical continuity. The ball and spring **will** pop out when the coupling is separated from the inlet. Coupling removal must be performed in a way that captures the continuity ball and spring, such as wrapping a rag around the joint before separating the coupling from the inlet.

3. Slowly separate the unisex coupling (3) and inlet (5). Collect the continuity ball (6) and spring (7).

4. Remove and discard inlet O-ring (8).



INSTALLATION

WARNING

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

NOTE

When inserting balls in unisex coupling ball race, use caution to avoid dropping loose balls. Recommend working over a wiping rag.

1. Lightly lubricate inlet O-ring (8) with petrolatum and install in second (square) groove (9) of inlet (5).

NOTE

Due to the possibility of losing the continuity ball and spring, the following step is best performed inside a container (e.g., a box) if possible.

2. Start the unisex coupling (3) onto the inlet (5). Install continuity spring (7) and ball (6) into hole in inlet (5) and hold in the compressed position while completing installation of unisex coupling (3) onto inlet (5).

3. Place a wiping rag beneath the unisex coupling (3). Adjust coupling position until screw hole is facing up and ball race (rounded groove) (10) in inlet is centered under screw hole. Insert the 41 balls (4) one at a time into the hole in the housing by rotating the unisex coupling (3) back and forth while installing the balls (4). Once all 41 balls (4) are installed, assemble O-ring (2) onto ball retaining screw (1) and install the assembly into the threaded hole to retain the joint. Tighten retaining screw (1).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE UNISEX COUPLING DUST CAP

INITIAL SET-UP:

Tools:

Tool kit, General Mechanic Automotive
(WP 0113 00, Item 1)
Crimp Tool
(WP 0113 00, Item 2)
Chemical and Oil Protective Gloves
(WP 0113 00, Item 2)

Materials/Parts Required:

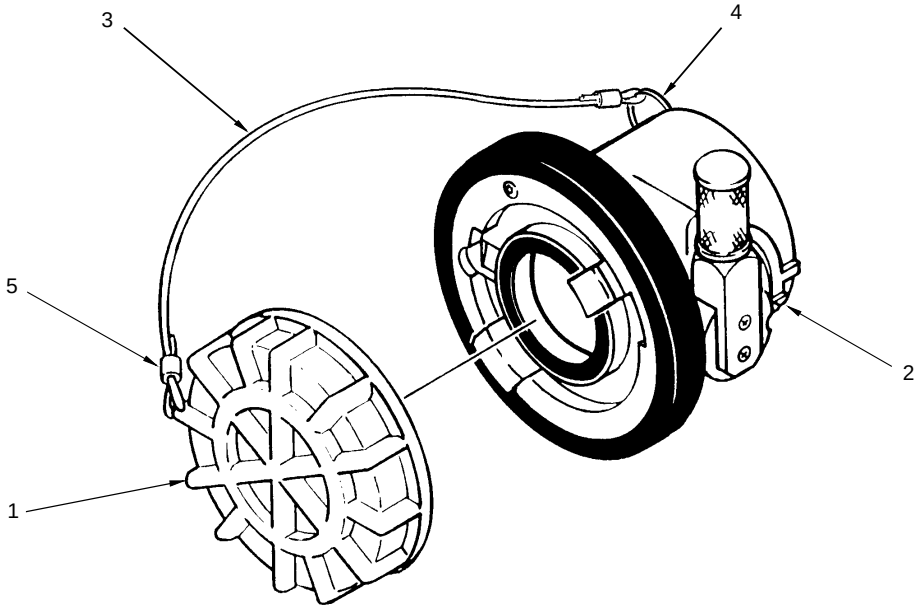
None

REMOVAL

WARNING

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

1. Remove dust cap (1) from unisex coupling (2).
2. Detach dust cap (1) and attaching cable (3) by unthreading attaching cable (3) through attaching split ring (4) on unisex coupling body.
3. If necessary, remove attaching cable (3) from unisex coupling dust cap (1) by cutting cable loop next to dust cap (1).



INSTALLATION

WARNING

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

1. If necessary to install attaching cable (3) on unisex coupling dust cap (1), thread attaching cable (3) through dust cap (1) forming a loop. Use a sleeve (5) and crimp loose end of cable to itself.

2. Install dust cap (1) and attaching cable (3) to unisex coupling (2) by threading attaching cable (3) through split ring (4) on unisex coupling (2).

3. Install dust cap (1) onto unisex coupling (2).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE UNISEX COUPLING BUMPER

INITIAL SET-UP:

Tools:

Tool kit, General Mechanic Automotive
(WP 0113 00, Item 1)
Chemical and Oil Protective Gloves
(WP 0113 00, Item 2)

Materials/Parts Required:

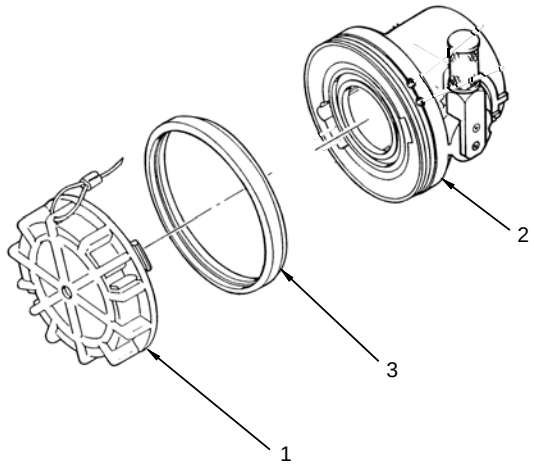
None

REMOVAL

WARNING

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

1. Remove dust cap (1) from unisex coupling (2).
2. Remove bumper (3) from unisex coupling (2) by hand.



INSTALLATION

WARNING

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

1. Install bumper (3) on unisex coupling (2) such that the tapered edge is facing toward the coupling body.
2. Install dust cap (1) on unisex coupling (2).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE UNISEX COUPLING LUGS

INITIAL SET-UP:

Tools:
Tool kit, General Mechanic Automotive
(WP 0113 00, Item 1)
Chemical and Oil Protective Gloves
(WP 0113 00, Item 2)

Reference:
TM 10-4930-351-24P

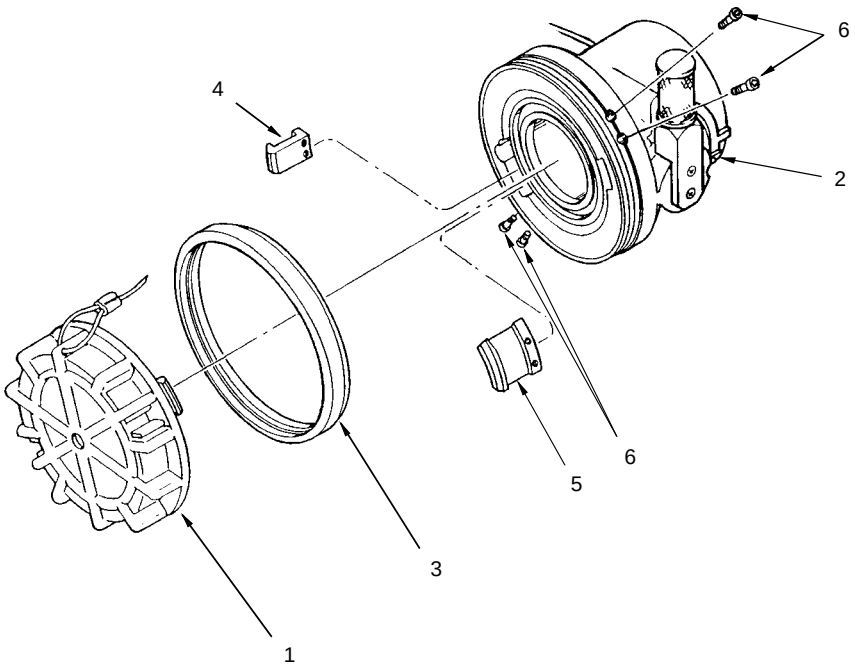
Materials/Parts Required:
None

REMOVAL

WARNING

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

1. Remove dust cap (1) from unisex coupling (2).
2. Remove bumper (3) from unisex coupling (2) by hand.
3. To remove lugs (4 and 5), remove four screws (6).



INSTALLATION

WARNING

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

CAUTION

Do not interchange lugs between the coupling and the dust cap on the three-inch unisex coupling. Dust cap lugs are made of a different material and will fracture if used in coupling.

NOTE

Do not interchange lugs between the coupling and the dust cap on the three-inch unisex coupling. Refer to TM10-4930-351-24P for correct replacement parts.

1. Install lugs (4 and 5) and four screws (6).
2. Install bumper (3) on unisex coupling (2) such that the tapered edge is facing toward the coupling body.
3. Install dust cap (1).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE TWO-INCH NON-VALVED UNISEX COUPLING

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)
Chemical and Oil Protective Gloves
(WP 0113 00, Item 2)

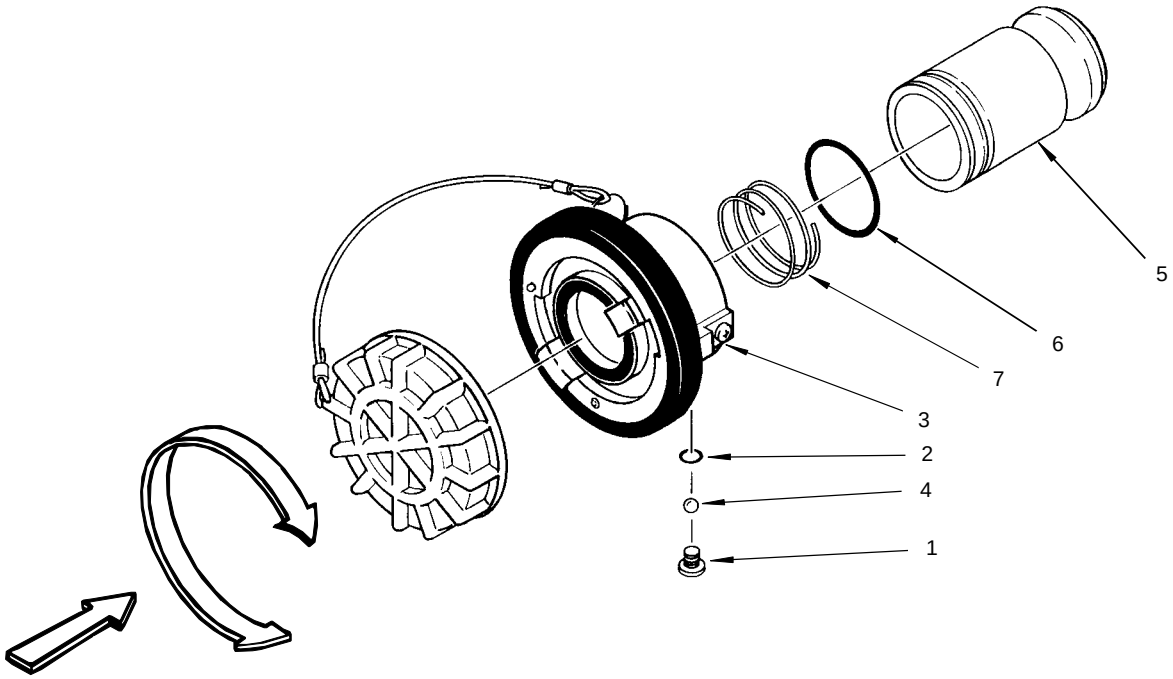
Materials/Parts Required:
O-Ring (WP 0117 00, Item 104)
O-Ring (WP 0117 00, Item 121)
Petrolatum (WP 0116 00, Item 20)
Rag, Wiping (WP 0116 00, Item 21)

REMOVAL

WARNING

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

1. Remove ball retaining screw (1) and O-ring (2). Discard O-ring (2).
2. Position a wiping rag under the unisex coupling (3) with screw hole oriented toward wiping rag. Push in and rotate unisex coupling (3) back and forth until all 41 balls (4) have collected in the wiping rag.
3. Pull unisex coupling (3) from inlet (5).
4. Remove and discard O-ring (6) from inlet (5).
5. Remove and retain spring (7) from unisex coupling (3).



INSTALLATION

WARNING

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

1. Lightly lubricate inlet O-ring (6) with petrolatum and install in second (square) groove of inlet (5).

2. Place spring (7) in unisex coupling.

NOTE

When inserting balls in unisex coupling ball race, use caution to avoid dropping loose balls. Work over a wiping rag.

3. Slide the unisex coupling (3) onto the inlet (5). Hold unit over a wiping rag with screw hole facing up and adjust position until ball race (rounded groove) is centered under screw hole. Install balls (4) one at a time, rotating unisex coupling back and forth until all 41 balls (4) have been inserted.

4. Install ball retaining screw (1) and O-ring (2) in unisex coupling (3). Tighten retaining screw.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPAIR TWO-INCH NON-VALVED UNISEX COUPLING

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)
Crimp Tool
(WP 0113 00, Item 2)
Chemical and Oil Protective Gloves
(WP 0113 00, Item 2)

Materials/Parts Required:
None

Equipment Condition
Coupling removed from inlet (WP 0032 00)

WARNING

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

NOTE

Inspect the coupling components as they are disassembled. Repair is limited to replacement of unserviceable components discovered during disassembly.

DISASSEMBLY AND INSPECTION

1. Remove spring (1) from unisex coupling (2).
2. If the dust cap (3) or cable (4) is to be replaced, cut cable (4) to remove.
3. The split ring (5) attaching cable (4) to unisex coupling (2) may be removed from the cable (4) by rotating it through the split portion of the ring (5).
4. Remove the bumper (6) only if it is to be replaced or the lugs (7 and/or 8) must be replaced.
5. Remove screws (9) to remove lugs (7 and/or 8).
6. Test operation of locking pin (10). Do not remove locking pin (10) and spring (11) unless necessary for replacement.
7. Do not remove continuity ball (12) from unisex coupling body. If continuity ball requires replacement, the entire unisex coupling must be replaced.
8. Inspect all parts. Replace any that are excessively worn or damaged.

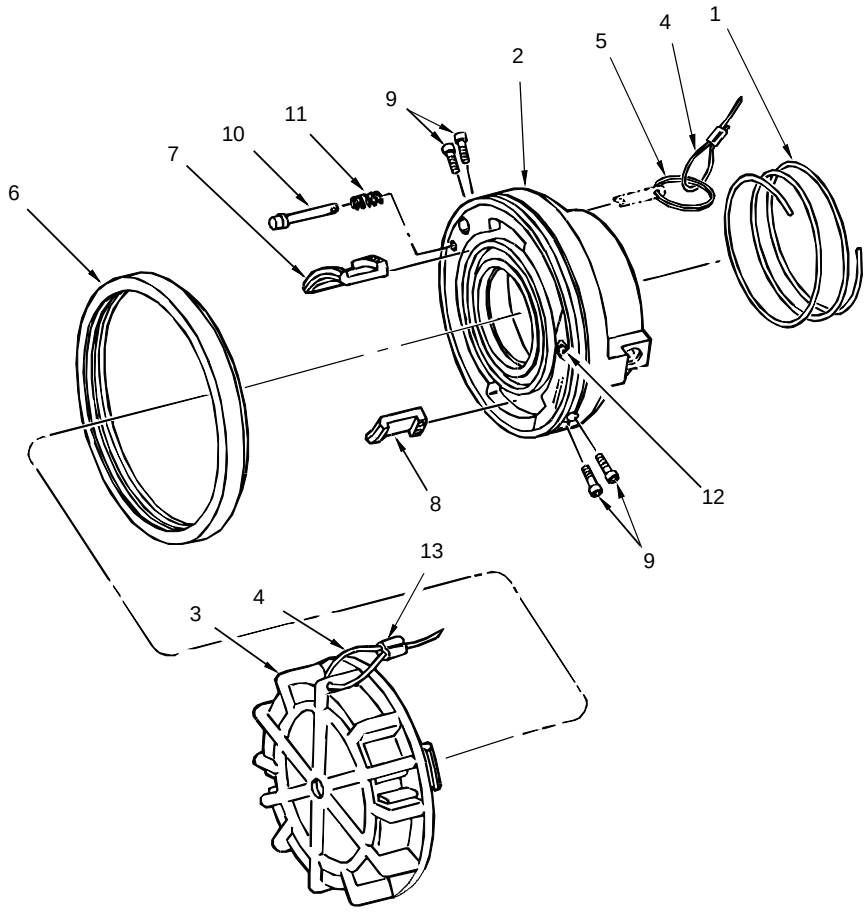
ASSEMBLY

WARNING

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

1. If removed, install locking pin (10) and spring (11).

2. Install lugs (7 and/or 8) with screws (9).



3. Install bumper (6) onto coupling body with the tapered edge facing the unisex coupling (2) body.

4. Attach cable (4) to dust cap (3) by looping about 6 inches of cable through the hole in dust cap (3) forming a loop back on the cable (4). Install and crimp a sleeve (13) over the two sections of cable (4).

5. If cable (4) was cut, attach cable (4) to split ring (5) by looping about 6 inches of cable through the ring (5) forming a loop back on the cable (4). Install and crimp a sleeve (13) over the two sections of cable (4). If cable (4) was not cut, attach to split ring (5) by rotating split ring (5) through cable (4) loop.

6. Install spring (1) in unisex coupling (2).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE FUEL TRANSFER PUMP PN 8424/PN 60975-5

INITIAL SET-UP:

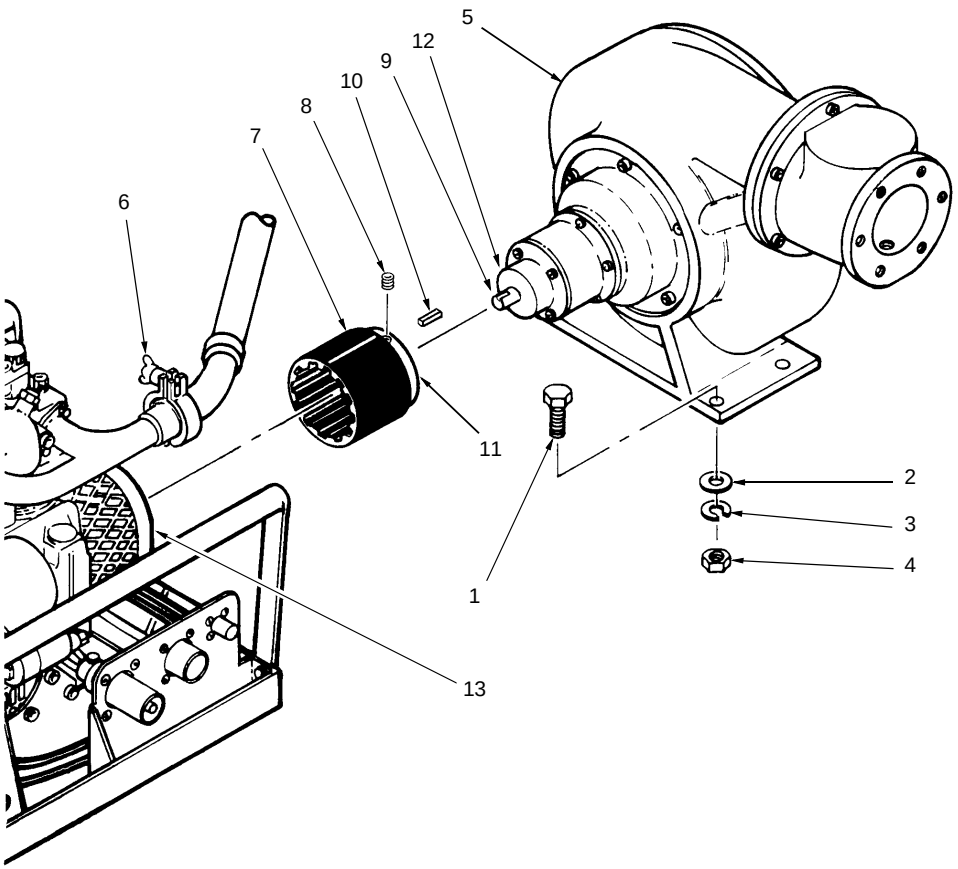
Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
Washer, Lock (WP 0117 00, Item 131)

Equipment Condition:
Pumpage overtemperature sensor removed
(WP 0022 00)
Pump inlet quick disconnect removed
(WP 0025 00)

REMOVAL

1. Remove the four bolts (1), flat washers (2), lock washers (3) and jam nuts (4) that secure the fuel transfer pump (5) to the module sub-frame. Discard the lock washers (3).
2. Disconnect the exhaust line (6) from the engine module, slide the fuel transfer pump (5) away to separate the flexible coupling (7), then lift fuel transfer pump (5) from module.
3. Loosen the set screw (8) and slide the flexible coupling (7) from the fuel transfer pump input shaft (9). Remove key (10) from shaft.



INSTALLATION

1. Place key (9) in slot in fuel transfer pump (5) input shaft and install the flexible coupling (7) on the input shaft of the fuel transfer pump (5). Install and tighten set screw (8). Ensure a gap of approximately 1/16 inch (1.6 mm) between splined flexible coupling adapter (11) and shaft nut cover (12).

CAUTION

Installation of a fuel transfer pump includes alignment of the flexible coupling adapters on the fuel transfer pump and the engine. Damage to the engine or fuel transfer pump may result from misalignment.

2. Position the fuel transfer pump (5) on the module sub-frame and mate the flexible coupling (7) on the pump with the splined flexible coupling adapter (13) on the engine.
3. With the pump fully coupled to the engine, install and tighten the four bolts (1), flat washers (2), lock washers (3) and jam nuts (4) that secure the fuel transfer pump (5) to the module sub-frame.
4. Clamp exhaust line (6) to engine.
5. Install pumpage overtemperature sensor (WP 0022 00).
6. Install pump inlet quick disconnect (WP 0025 00).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE FUEL TRANSFER PUMP PN 8424 DISCHARGE HOUSING O-RING

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

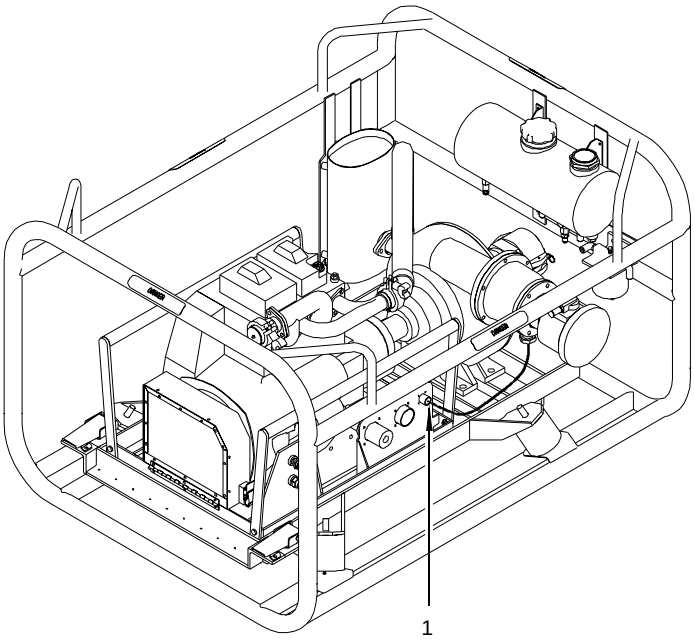
Materials/Parts Required:
Anti-Seize Compound, Molybdenum Disulfide
(WP 0116 00, Item 6)
Petrolatum (WP 0116 00, Item 20)
Rags, Wiping (WP 0116 00, Item 21)
O-ring (WP 0117 00, Item 117)

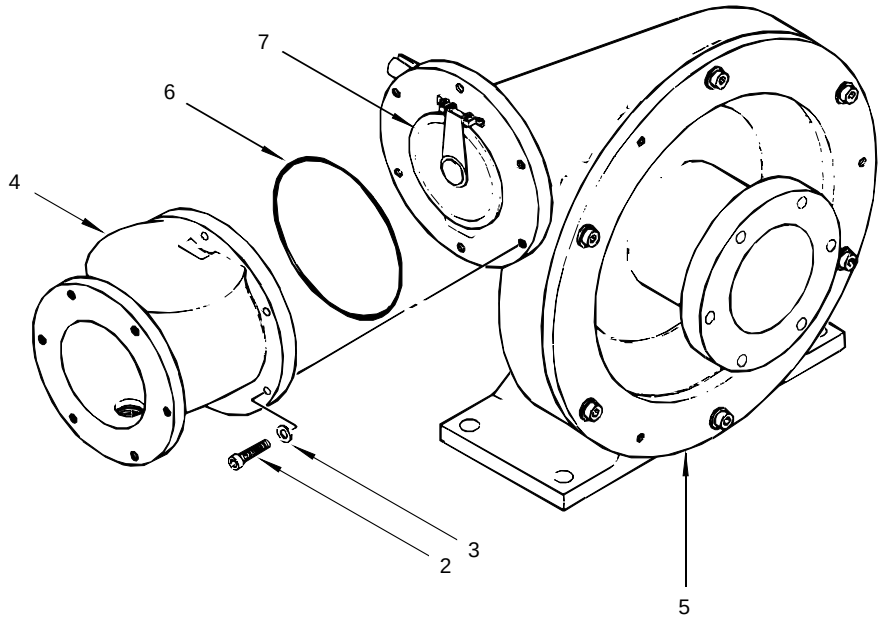
REMOVAL

1. Disconnect pumpage overtemperature cable W103 (1) at engine module electrical connector panel.
2. Remove the six socket head screws (2) and flat washers (3) that secure the discharge housing assembly (4) to the fuel transfer pump (5).
3. Remove discharge housing (4). Use care to avoid damage to the pumpage overtemperature sensor on bottom of housing.
4. Remove and discard the O-ring (6) from the discharge housing assembly.
5. Inspect and clean O-ring groove as required. Any debris or foreign material may prevent the O-ring from seating properly.
6. Inspect discharge valve (7) for dents, bending or any damage that prevents free action or seating. Replace discharge valve if damaged. (WP 0036 00)

INSTALLATION

1. Lightly lubricate O-ring (6) with petrolatum and install in O-ring groove. Do not allow the O-ring to twist or roll during installation.
2. Lubricate with anti-seize compound and install the six socket head screws (2) and flat washers (3) that secure the discharge housing assembly (4) to the fuel transfer pump (5). Tighten socket head screws in a crossing pattern.
3. Connect pumpage overtemperature cable W103 (1) to engine module electrical connector panel.





END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE FUEL TRANSFER PUMP PN 8424 DISCHARGE VALVE

INITIAL SET-UP:

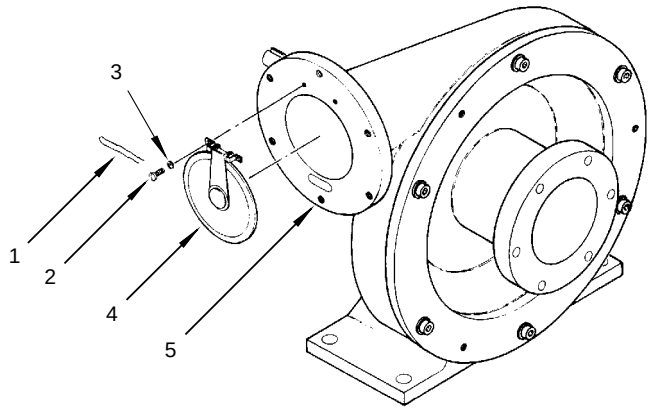
Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
Safety Wire (WP 0116 00, Item 33)
Washer, Lock (WP 0117 00, Item 124)

Equipment Condition:
Discharge housing removed (WP 0035 00)

REMOVAL

1. Remove the safety wire (1) from the discharge valve retaining screws (2).
2. Remove the two screws (2) and lock washers (3) that secure the discharge valve (4) to the fuel transfer pump outlet (5). Discard the lock washers (3).



INSTALLATION

1. Install the two screws (2) and lock washers (3) that secure the discharge valve (4) to the fuel transfer pump outlet (5). Test valve freedom by lifting with finger and allowing to fall back in place.
2. Install safety wire (1) on two screws (2) that attach the discharge valve (4) to the fuel transfer pump outlet (5).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE ENGINE MODULE CARRYING HANDLE

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
Nut, Self-Locking (WP 0117 00, Item 91)

NOTE

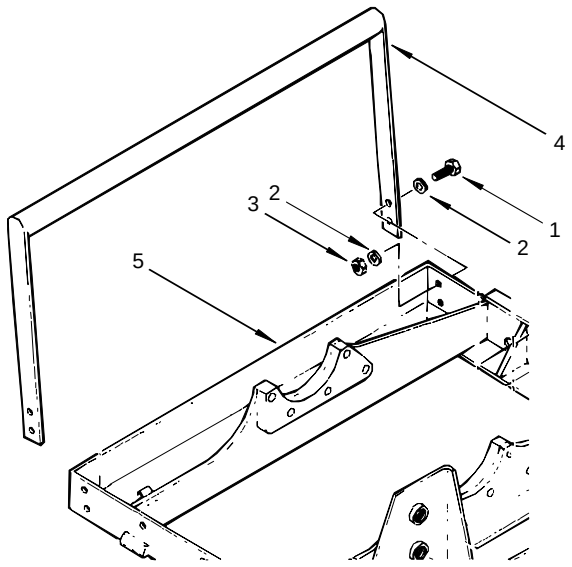
This procedure applies to either carrying handle.

REMOVAL

1. If engine is installed in pump-engine module, unlatch and lower engine module latch bar.
2. Remove the four bolts (1), flat washers (2) and self-locking nuts (3) that secure the carrying handle (4) to the engine module frame (5). Discard the self-locking nuts (3).

INSTALLATION

1. Position the carrying handle (4) and install the four bolts (1), flat washers (2) and self-locking nuts (3) to secure the carrying handle (4) to the engine module frame (5).
2. Raise engine module latch bar and engage latches.



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE ENGINE MODULE PULLEY GUARD

INITIAL SET-UP:

Tools:
None

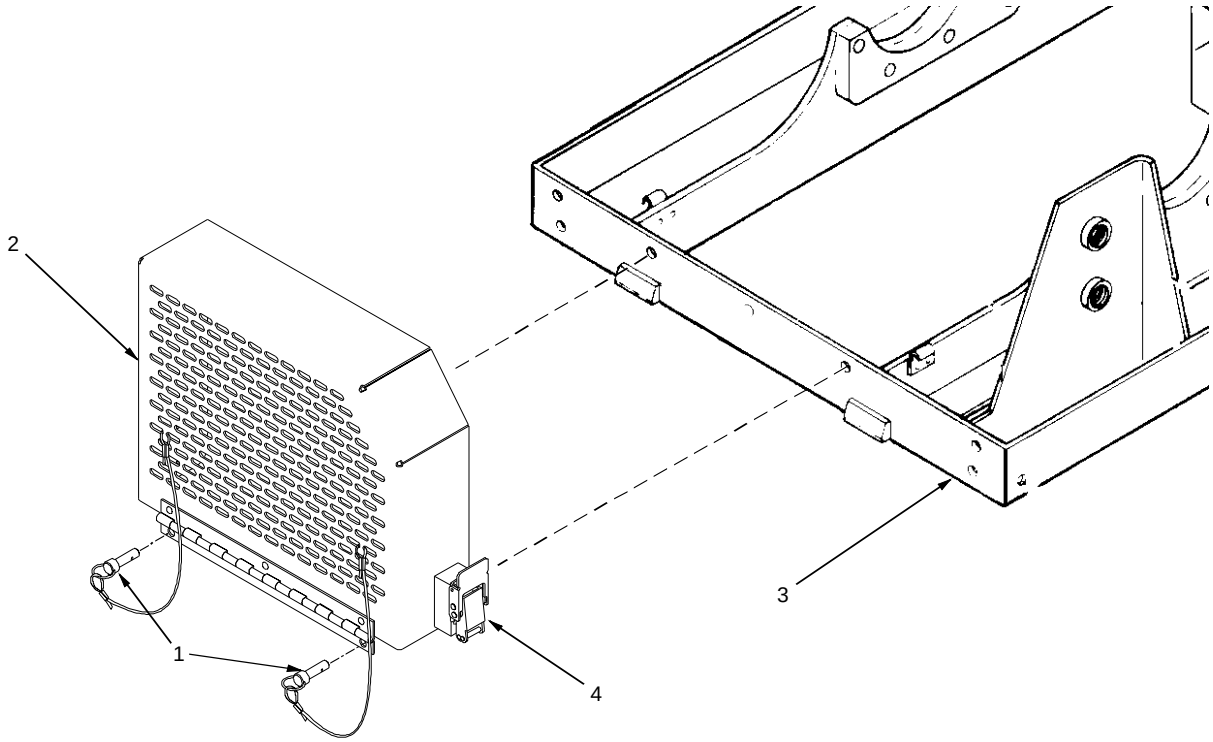
Materials/Parts Required:
None

REMOVAL

1. If engine is installed in pump-engine module, unlatch and lower engine module latch bar.
2. Remove the two quick disconnect pins (1) that secure the pulley guard (2) to the engine module frame (3).
3. Unlatch the latches (4) that secure the pulley guard (2) to the engine module frame (3) and remove pulley guard (2).

INSTALLATION

1. Position pulley guard (2) against engine module frame (3) and install the two quick disconnect pins (1) to secure the pulley guard (2) to the engine module frame (3).
2. Raise the pulley guard (2) and latch the pulley guard (2) to the engine module frame (3).
3. Raise engine module latch bar and engage latches.



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE ENGINE MODULE ALIGNMENT BOLTS

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
None

Equipment Condition:
Engine module removed from pump-engine module.
(WP 0007 00)

NOTE

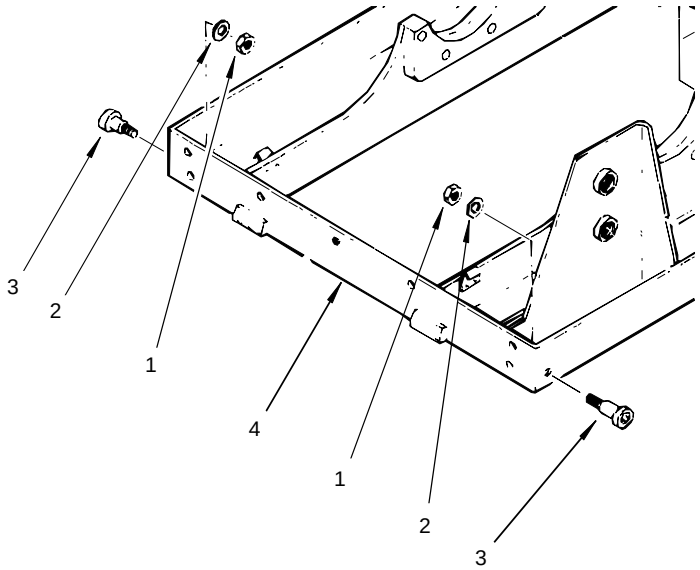
This task applies to either alignment bolt.

REMOVAL

Remove the nut (1) and flat washer (2) that secure the alignment bolt (3) to the engine module frame (4).

INSTALLATION

Install the nut (1) and flat washer (2) to secure the alignment bolt (3) to the engine module frame (4).



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE CABLE ASSEMBLY W101

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:

Strap, Tiedown (WP 0116 00, Item 27)
Tags, Electrical (WP 0116 00, Item 29)
Tape, Electrical (WP 0116 00, Item 30)

Equipment Condition:

Engine module removed from pump-engine module
(WP 0007 00)

REMOVAL

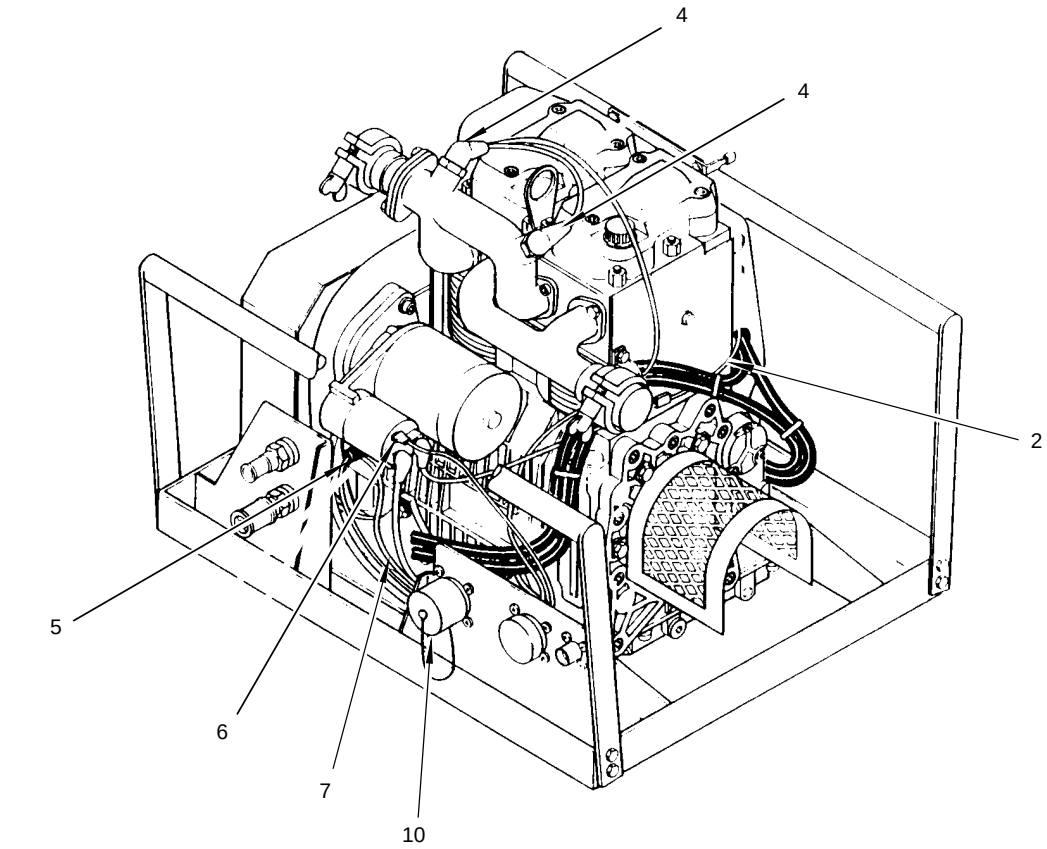
NOTE

Before beginning removal of cable harness W101, observe general layout of cable harness as a guide to installation.

1. Loosen cable loop (1) at rear of engine.
2. Cut and remove tiedown straps from electrical wiring harness.
3. Tag and disconnect two fuel shutoff solenoid electrical wires (2) at in-line connectors in wiring harness.
4. Tag and disconnect electrical wire from engine temperature sensor (3).
5. At intake manifold, lift boots from air intake heaters (4). Tag and remove electrical wires from air intake heaters.
6. Tag and remove electrical wire from oil pressure switch (5).
7. Tag and remove small electrical wire (6) from starter solenoid.
8. Remove electrical tape, and tag and disconnect two alternator wires (7) at in-line connectors.
9. At pumpage overtemperature connector 1A1J3 (8), remove the four cross tip screws and flat washers that secure connector 1A1J3 to module frame. Remove connector; retain mounting flange from rear of connector.
10. At control cable connector 1A1J2 (9), remove the four cross tip screws and flat washers that secure connector 1A1J2 to the module frame. Remove the connector; retain the mounting flange from rear of connector.
11. At rear of NATO connector 1A1J1 (10), tag and remove the small electrical wires (3 terminal lugs) from the negative terminal of connector 1A1J1.

INSTALLATION

1. At rear of NATO connector 1A1J1 (10), install the small electrical wires (3 terminal lugs) to the negative terminal of connector 1A1J1 as tagged.
2. From rear of electrical connection panel, insert control cable connector 1A1J2 (9) through center hole in panel, position and hold the mounting flange on rear of connector, and install and tighten the four cross tip screws and flat washers that secure connector 1A1J2 to the module frame.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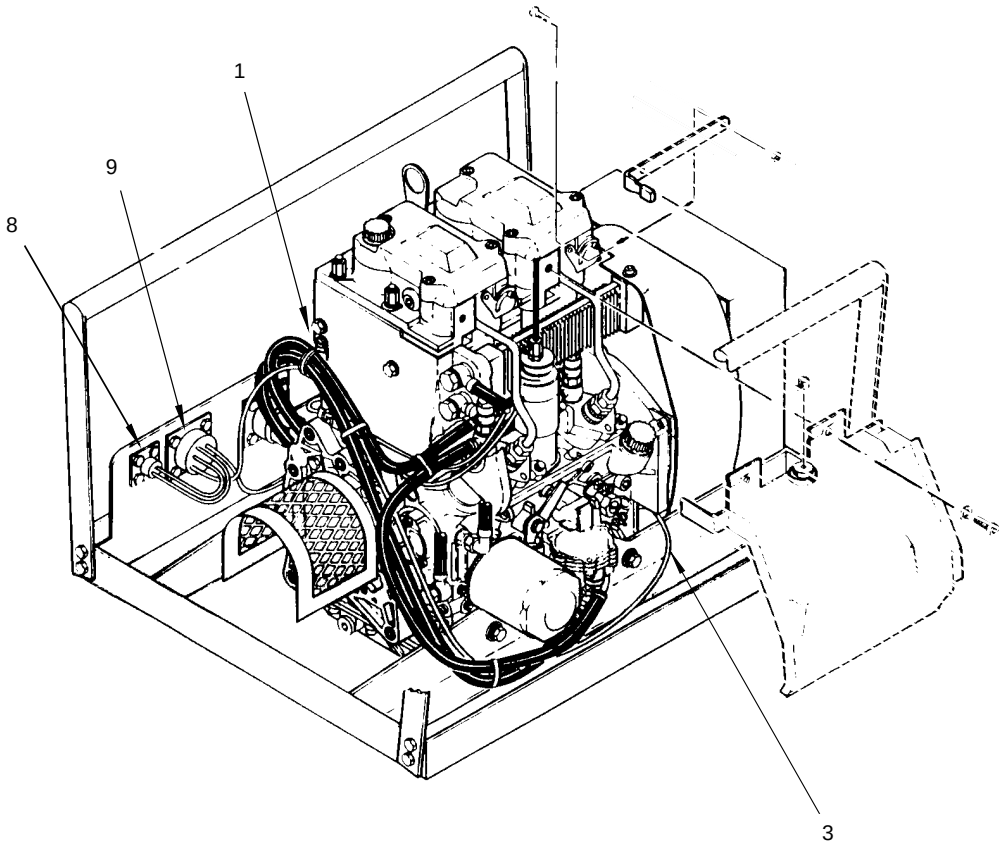

1
9
8
3

3. From rear of electrical connection panel, insert pumpage overtemperature connector 1A1J3 (8) through right-hand hole in panel, position and hold the mounting flange on rear of connector, and install and tighten the four cross tip screws and flat washers that secure connector 1A1J3 to the module frame.
4. Connect alternator wires (7) at in-line connectors as tagged.
5. Connect small electrical wire (6) to starter solenoid as tagged.
6. Connect electrical wire to oil pressure switch (5) as tagged.
7. At intake manifold, connect electrical wires to air intake heaters (4) as tagged. Install boots over connectors.
8. Install electrical wire to engine temperature sensor (3) as tagged.
9. Connect fuel shutoff solenoid electrical wires (2) at in-line connectors as tagged.
10. Group and route wires of cable assembly W101 in general layout observed at removal, and install tiedown straps as necessary to secure wiring harness.
11. Tighten cable loop (1).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE STARTER

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

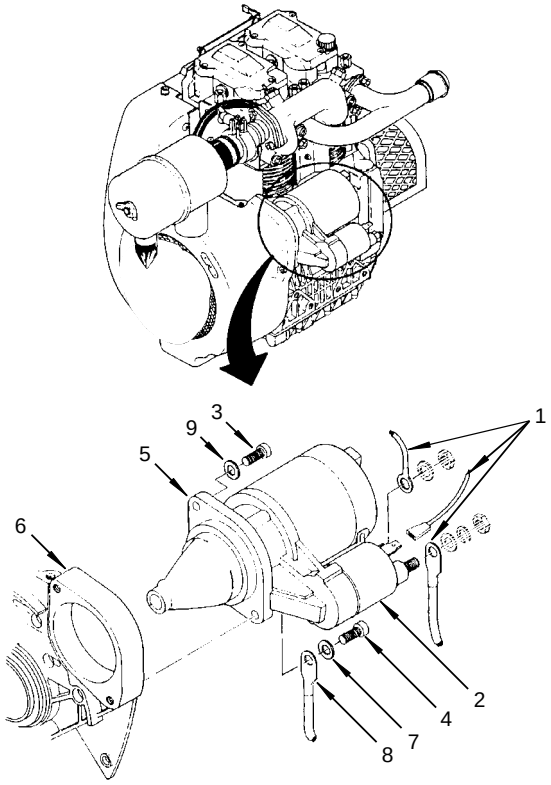
Materials/Parts Required:
Tags, Electrical (WP 0116 00, Item 29)

REMOVAL

1. Remove attaching hardware, and tag and remove electrical leads (1) from solenoid (2).
2. Loosen the two cap screws (3 and 4) that secure the starter (5) to the engine block (6).
3. Tag leads, and remove the lower cap screw (4), washer (7) and ground leads (8).
4. Support the starter and remove the upper cap screw (3) and washer (9). Remove the starter.

INSTALLATION

1. Position the starter (5) on the engine block (6) and loosely install the upper mounting cap screw (3) and washer (9).
2. Install washer (7) and ground leads (8) on cap screw (4), and install in lower mounting hole. Remove tags.
3. Tighten cap screws (3 and 4).
4. Install electrical leads (1) to solenoid (2) as tagged. Remove tags.



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE FUEL PUMP

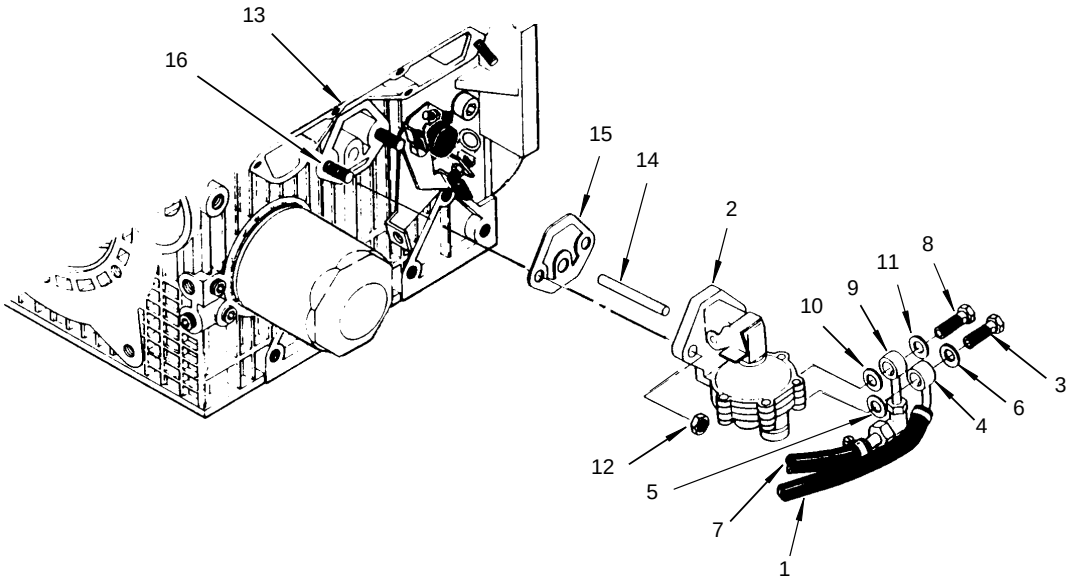
INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
Metric Nut, Self-Locking (WP 0117 00, Item 32)
Copper Washer (WP 0117 00, Item 58)
Rags, Wiping (WP 0116 00, Item 21)

REMOVAL

1. Disconnect fuel feed line (1) from fuel pump (2). Remove union bolt (3), union (4) and two copper washers (5 and 6). Discard copper washers (5 and 6).
2. Remove the two self-locking nuts (12) that attach the fuel pump to the engine block (13). Discard the self-locking nuts (12).
3. Disconnect fuel supply line (7) from fuel pump (2). Remove union bolt (8), union (9) and two copper washers (10 and 11). Discard copper washers (10 and 11).
4. Remove the fuel pump (2), drive rod (14) and gasket (15).



INSTALLATION

1. Clean gasket surface on block (13).
2. Install gasket (15) over mounting studs (16).
3. Using two new copper washers, assemble washers (10 and 11) and fuel supply line (7) as illustrated on union (9). Use union bolt (8) to install assembly loosely on fuel pump (2).
4. Install drive rod (14) in fuel pump (2) and position fuel pump on mounting studs (16).
5. Install and tighten the two self-locking nuts (12) that secure the fuel pump (2) to the engine block (13).
6. Using two new copper washers, assemble washers (5 and 6) and fuel feed line (1) as illustrated on union (4). Use union bolt (3) to install assembly on fuel pump (2).
7. Tighten securely union bolt (8) on fuel supply line assembly.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
ADJUST ENGINE INTAKE AND EXHAUST VALVES

This procedure may be performed with the engine module mounted in the pump-engine module or removed to a workbench, as desired. The procedure applies to either cylinder head.

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

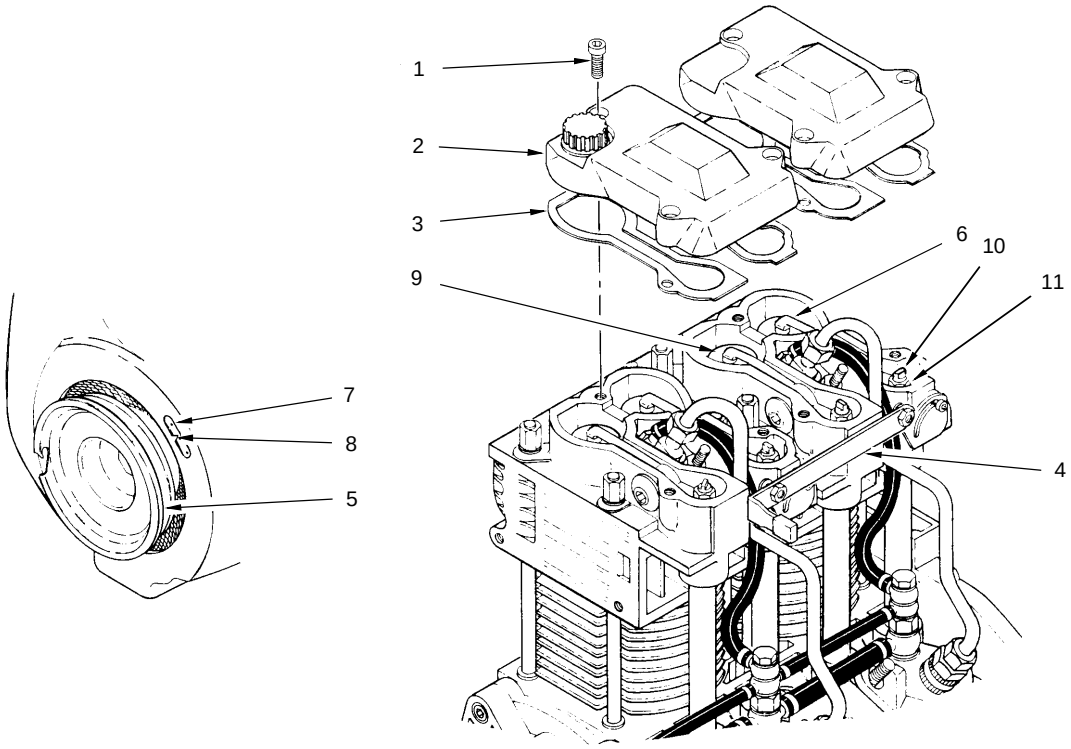
Materials/Parts Required:
Gasket (WP 0117 00, Item 50)

1. Remove the three socket head screws (1) that secure each valve cover (2). Remove valve cover and gasket (3) from each cylinder head. Discard gaskets (3).
2. Lower pulley guard.

NOTE

To adjust valves, piston must be at TDC on the compression stroke.

3. While holding decompression lever (4) in engaged position, rotate crankshaft (5) until intake valve (6) opens and closes. Continue to rotate to align timing mark (7) with indicator on shroud (8). Piston should be at TDC on the compression stroke.
4. Check intake valve clearance for 0.006 in. (0.15 mm) gap. Perform the following steps if adjustment is necessary. If valve clearance is satisfactory, repeat procedure for exhaust valve (9).
5. Loosen intake valve push rod retaining nut (10).
6. Turn push rod adjusting screw (11) to adjust intake valve (6) gap to 0.006 in. (0.15 mm).
7. Hold adjusting screw (11) in position and tighten push rod retaining nut (10).
8. Check valve clearance to ensure gap remains at 0.006 in. (0.15 mm). If gap has changed, repeat adjustment procedure.
9. Repeat procedure for exhaust valve (9).
10. Repeat entire procedure for both valves in other cylinder head.
11. Use gasket (3) and three socket head screws (1) to install valve covers (2).



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE FUEL INJECTOR NOZZLE

INITIAL SET-UP:

Tools:

Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:

Gaskets (WP 0117 00, Item 50)
Washer, Copper (WP 0117 00, Item 62)
Washer, Copper (WP 0117 00, Item 63)

REMOVAL

1. Remove screws (1) and nuts (2) from decompression lever (3).
2. Remove cable clamp (4) from fuel flow solenoid wire cable at black start control knob (5).
3. Remove two socket head cap screws (6) and washers (7) securing cylinder casing (8) to cylinder heads (9).
4. Remove three socket head cap screws (10) from valve cover (11). Remove cover and gasket (12). Discard gasket (12).
5. Remove any remaining gasket material from the valve cover (11) and cylinder head (9).
6. Disconnect and remove fuel feed line (13) between fuel injector pump and fuel injector (14).
7. Remove brace nut (15), washer (16) and brace (17) from mounting stud.
8. Raise injector to access union bolt (18). Remove bolt, union (19), and washers (20) and (21). Discard washers (20 and 21).
9. Remove fuel injector. If copper washers (22) come out with fuel injector, remove and install in cylinder head.

INSTALLATION

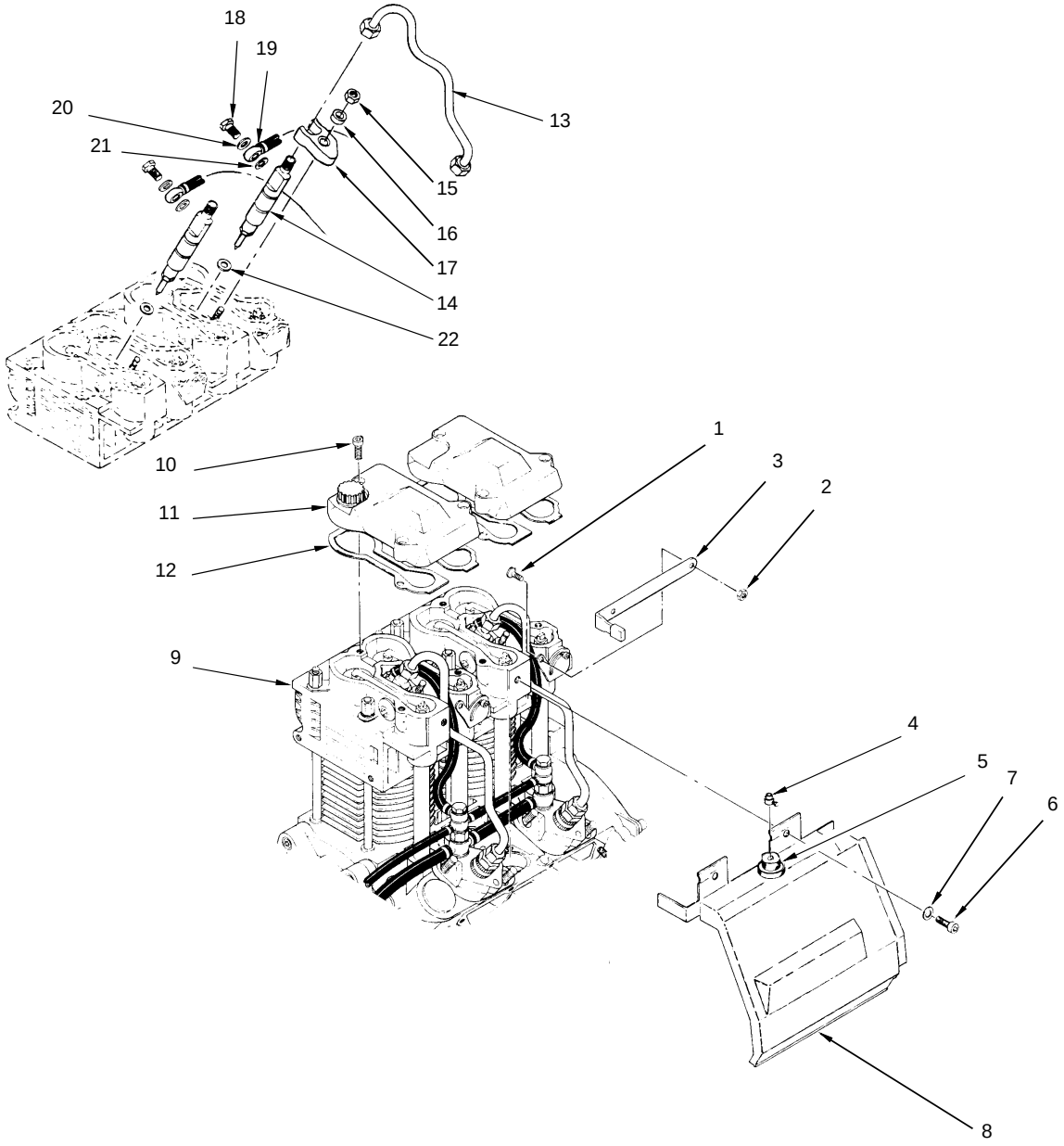
1. Install and tighten union bolt (18), union (19) and new copper washers (20 - thick) and (21).
2. Position fuel injector (14) in cylinder head.
3. Install and tighten brace (17), washer (16) and nut (15) on mounting stud.
4. Install and tighten fuel supply line (13) on fuel injector.
5. Position gasket (12) on cylinder head.

NOTE

Valve cover with oil fill cap is positioned toward the PTO end of the engine.

6. Position valve cover (11) on gasket (12) and cylinder head (9).
7. Install and alternately tighten the socket head screws (10) attaching valve covers (11) to cylinder head (9).
8. Thread fuel solenoid wire cable through the black start control knob (5), position cylinder casing (8) on engine, and install and tighten the two socket head cap screws (6) and washers (7) that secure the casing to the cylinder heads (9).

9. Install cable clamp (4) on fuel solenoid cable.
10. Position decompression lever (3) and install screws (1) and secure nuts (2).
11. Cycle the decompression lever to ensure freedom of movement.



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE EXHAUST MANIFOLD

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

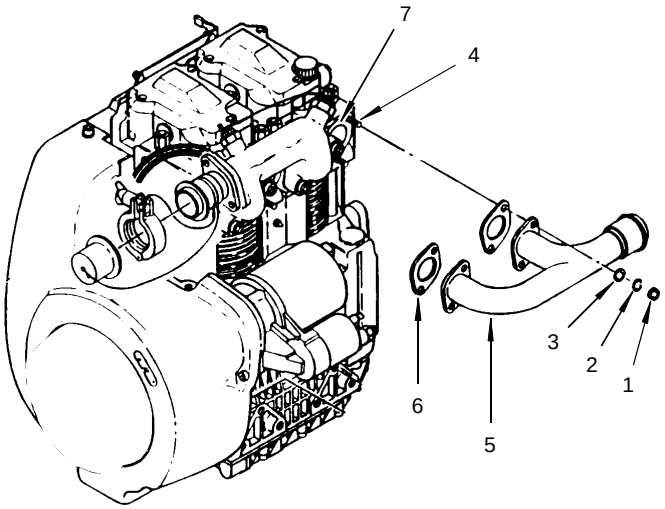
Materials/Parts Required:
Gasket (WP 0117 00, Item 49)
Lock Washer (WP 0117 00, Item 128)
Rags, Wiping (WP 0116 00, Item 21)

REMOVAL

1. Remove the four nuts (1), lock washers (2) and flat washers (3) from cylinder head studs (4). Discard lock washers.
2. Remove exhaust manifold (5) and two gaskets (6). Discard gaskets (6).
3. Clean remaining gasket material from cylinder head flange (7) and exhaust manifold (5) flange.

INSTALLATION

1. Position gaskets (6) on cylinder heads (4).
2. Place exhaust manifold (5) on cylinder heads (4).
3. Install and hand tighten nuts (1), lock washers (2) and flat washers (3) that secure exhaust manifold (5). Tighten nuts (1) alternately.



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE INTAKE MANIFOLD

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
Gasket (WP 0117 00, Item 43)
Washer (WP 0117 00, Item 65)
Rags, Wiping (WP 0116 00, Item 21)

REMOVAL

1. Loosen clamp (1) and detach air filter, if installed. Install and clamp dust cap (2).
2. Lift boots (3), and remove power lead (4) and connecting wire (5) from intake air heaters (6).
3. Remove intake air heaters (6) from intake manifold (7).
4. Remove two nuts (8) and flat washers (9) attaching air intake adapter (10) to the intake manifold (7).
5. Remove clamp (11) and hose (12) from intake manifold (7).

CAUTION

The four socket head cap screws are of two lengths. Note that the longer cap screws come out of the portion of the intake manifold with thicker lands to avoid equipment damage.

6. Remove the four socket head cap screws (13) and washers (14) from the cylinder heads. Discard washers (14).
7. Remove intake manifold (7) and two gaskets (15). Discard gaskets (15).
8. Clean any gasket material residue from cylinder head flange (16) and intake manifold (7) flange.

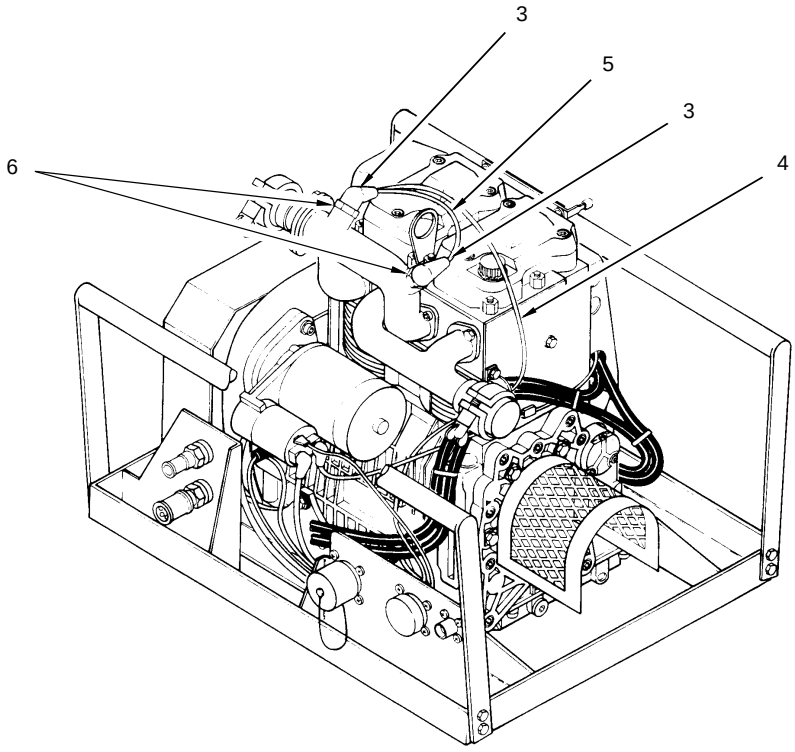
INSTALLATION

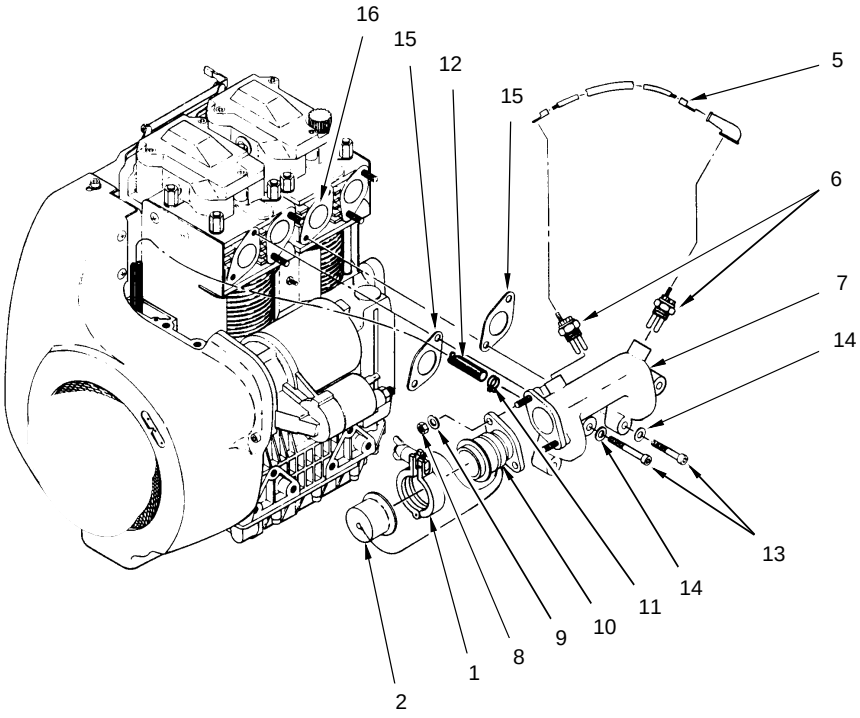
1. Install two gaskets (15) on cylinder heads (16).

CAUTION

Ensure that the two longer socket head cap screws are used to secure the portion of the intake manifold with thicker lands to avoid equipment damage.

2. Position intake manifold (7), and install the four socket head cap screws (13) and washers (14) to attach manifold to cylinder heads (16). Alternately tighten the socket head cap screws (13).
3. Install and tighten two nuts (8) and flat washers (9) to attach intake adapter (10), clamp (1) and dust cap (2).
4. Spread clamp (11) and attach hose (12) to intake manifold (7).
5. Install intake air heaters (6) on intake manifold (7).
6. Install power lead (4) and connecting wire (5) on intake air heaters (6). Install boots (3) over terminals.
7. If previously removed, attach air filter to air intake adapter (10) with clamp (1).





END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE DECOMPRESSION ARM O-RING

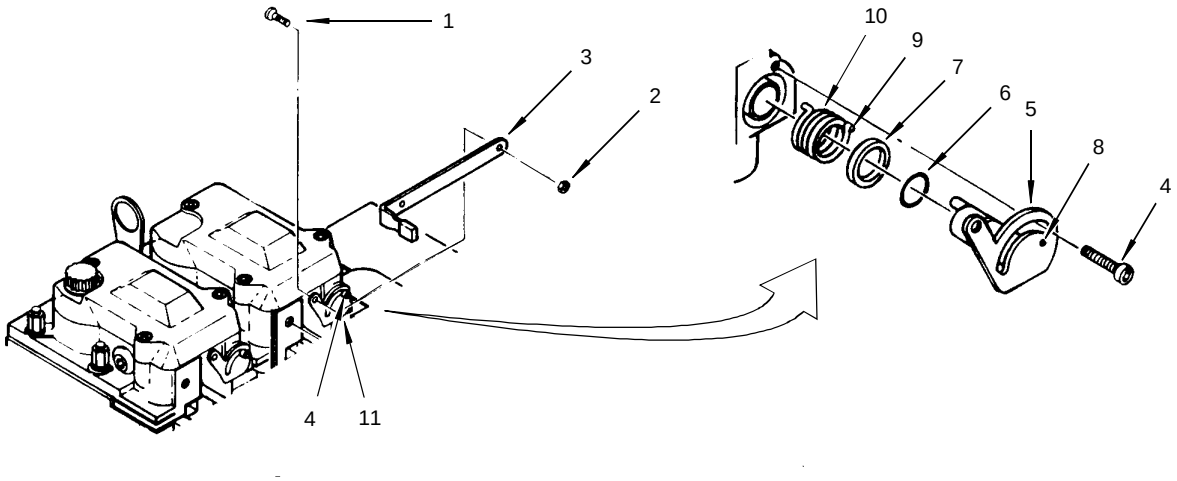
INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
Petrolatum (WP 0116 00, Item 20)

REMOVAL

1. Remove screws (1) and nuts (2) from decompression lever (3). Remove decompression lever (3).
2. Remove screw (4). Remove decompression arm (5).
3. Remove O-ring (6) from decompression arm (5). Discard O-ring (6).



INSTALLATION

1. Position spacer (7) flush on decompression arm (5) shaft.
2. Lightly lubricate with petrolatum and install O-ring (6) on decompression arm (5).
3. Mate small hole (8) in decompression arm (5) with tang (9) on spring (10) and slide decompression arm (5) into place in cylinder head (11).
4. Install screw (4) to attach decompression arm (5) to cylinder head (11).
5. Use screws (1) and nuts (2) to install decompression lever (3).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE BATTERY

INITIAL SET-UP:

Tools:
No tools required.

Materials/Parts Required:
Compound, Corrosion Preventive
(WP 0116 00, Item 7)

Personnel Required:
Two, any MOS

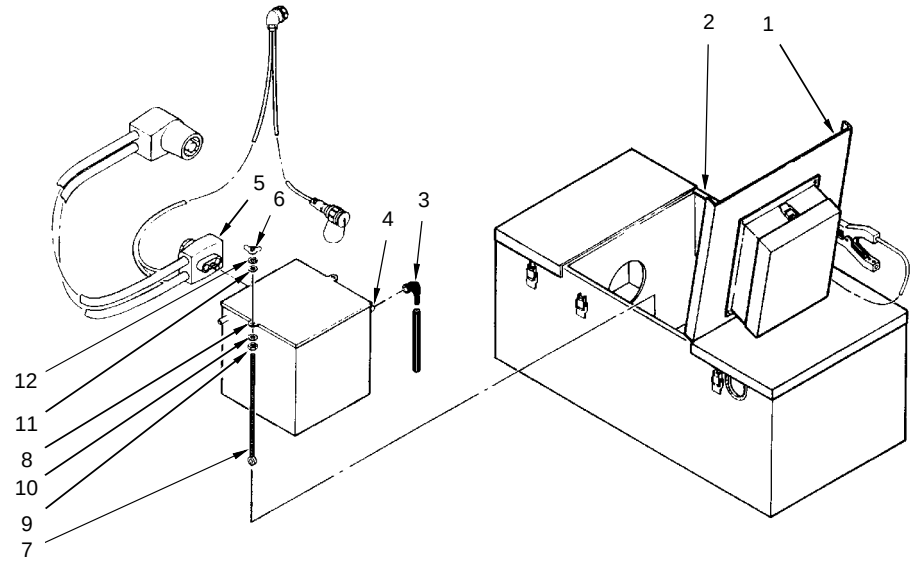
REMOVAL

1. At accessory module, unlatch and open fully the cover (1) on the stowage chest battery compartment (2).
2. Pull vent line (3) from battery vent tube (4).
3. Unscrew and remove battery cable (5) from battery.
4. Loosen wing nuts (6) on battery hold down rods (7) and push rods out of hold down ears (8).

WARNING

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. Always use the number of soldiers called for by the procedures to move or relocate the AAFARS equipment. Use proper physical lifting procedures or use a suitable lifting device or dolly. Wear safety shoes, gloves and other suitable protective clothing.

5. Two persons lift battery from chest.



INSTALLATION

WARNING

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. Always use the number of soldiers called for by the procedures to move or relocate the AAFARS equipment. Use proper physical lifting procedures or use a suitable lifting device or dolly. Wear safety shoes, gloves and other suitable protective clothing.

1. Two persons lower replacement battery into compartment, ensuring battery is fully seated.
2. Install hold down rods (7) on hold down ears (8) with a nut (9) and one flat washer (10) below and one flat washer (11), lock washer (12) and wing nut (6) above each ear.
3. Tighten wing nuts finger tight to secure battery in place. Do not wrench wing nuts.
4. Install vent line (3) on battery vent tube (4).
5. Apply corrosion preventive compound and attach battery cable (5) to battery.
6. Lower and latch the battery compartment cover (1).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE CONTROL BOX

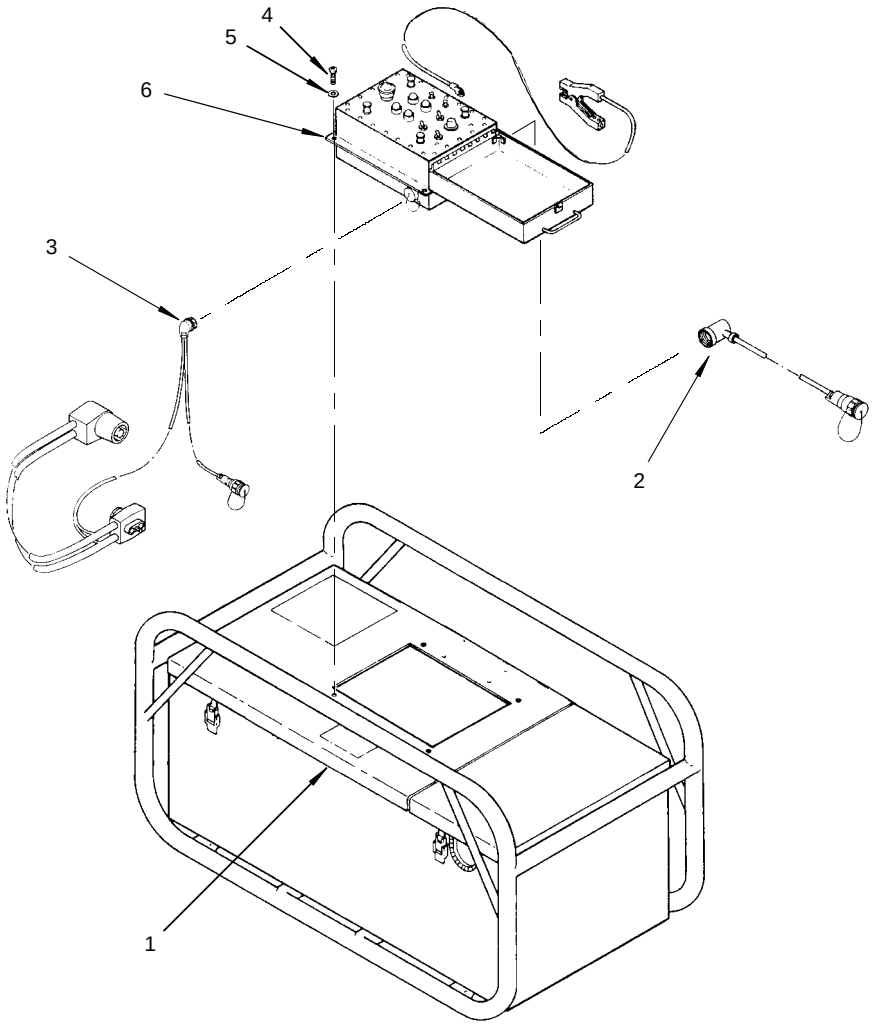
INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
None

REMOVAL

1. At the accessory module, open BATTERY COMPARTMENT cover (1).
2. Disconnect control cable W201 (2) from control box. Install dust caps on connector and cable end.
3. Disconnect battery cable W202 (3) from control box. Install dust caps on connector and cable end.
4. Close BATTERY COMPARTMENT cover (1).
5. Remove the four cross tip screws (4) and washers (5) that secure the control box (6) to the accessory module and remove the control box.



INSTALLATION

1. Install the control box (6) on the accessory module with four cross tip screws (4) and washers (5).
2. Open BATTERY COMPARTMENT cover (1).
3. Remove dust caps from control cable (2) and connector, and install control cable W201 to control box connector. Connect dust caps together.
4. Remove dust caps from battery cable (3) and connector, and install control cable W202 to control box connector. Connect dust caps together.
5. Close and latch BATTERY COMPARTMENT cover (1).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE BATTERY CABLE W202

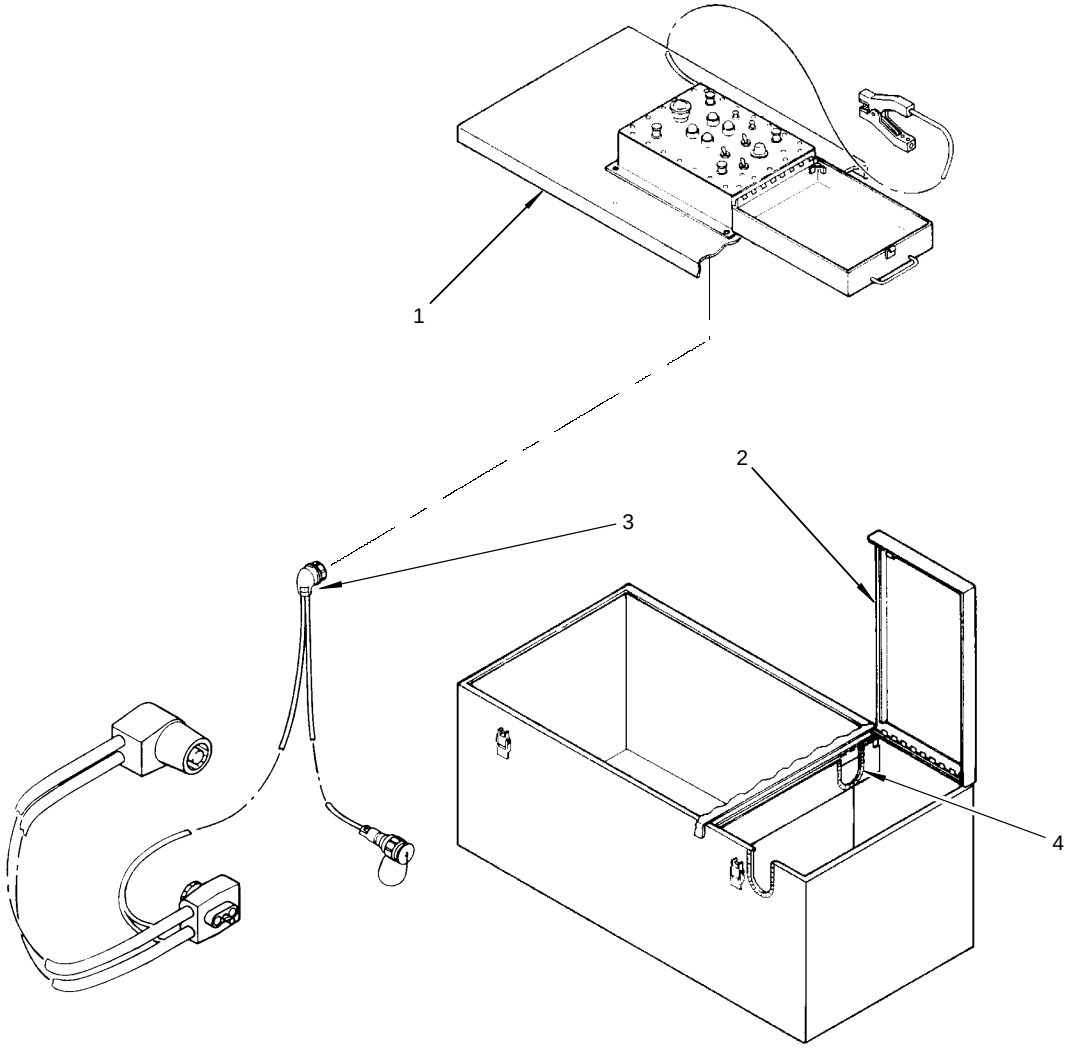
INITIAL SET-UP:

Tools:
No tools required.

Materials/Parts Required:
None

REMOVAL

1. At the accessory module, open the BATTERY COMPARTMENT cover (1) and ELEC CABLE STORAGE compartment cover (2).
2. Disconnect battery cable W202 (3) from control box and battery.
3. Install dust caps on battery cable (3) and control box connector.
4. Push battery cable through lower cut out (4) into cable storage compartment and remove from accessory module.



INSTALLATION

1. Push battery cable connectors (3) through lower cut out (4) in cable storage compartment, remove dust caps from battery cable (3) and control box connector, and install connector on control box. Install battery connector on battery. Coil remainder of cable in cable storage compartment.
2. Close and latch the BATTERY COMPARTMENT cover (1) and ELEC CABLE STORAGE compartment cover (2).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPAIR BATTERY CABLE

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
Strap, Tiedown (WP 0116 00, Item 27)
O-Ring (WP 0117 00, Item 81)
Washer, Lock (WP 0117 00, Item 127)
Washer, Lock (WP 0117 00, Item 130)

REMOVAL

1. At the accessory module, open the battery compartment cover (1) and cable storage compartment cover (2).
2. Disconnect battery cable from battery and control box.
3. Push battery cable through lower cut out into cable storage compartment and remove from accessory module.

DISASSEMBLY

1. Remove tiedown straps and cable tags from battery cable.
2. At NATO connector (3), remove the six screws (4) and washers (5) that secure the cover (6) to the connector.
3. Loosen the two jam nuts (7) completely.
4. Remove the two bolts (8) and lock washers (9) from the cable terminations. Remove the cables, jam nuts (7), bushings (10) and O-rings (11) from the connector (3). Discard the lock washers (9) and O-rings (11).
5. At the battery connector, remove two bolts (12) and flat washers (13) to separate connector (14).
6. Remove the two nuts (15) and lock washers (16) from the cable terminations. Remove the cables. Discard the lock washers (16).

ASSEMBLY

CAUTION

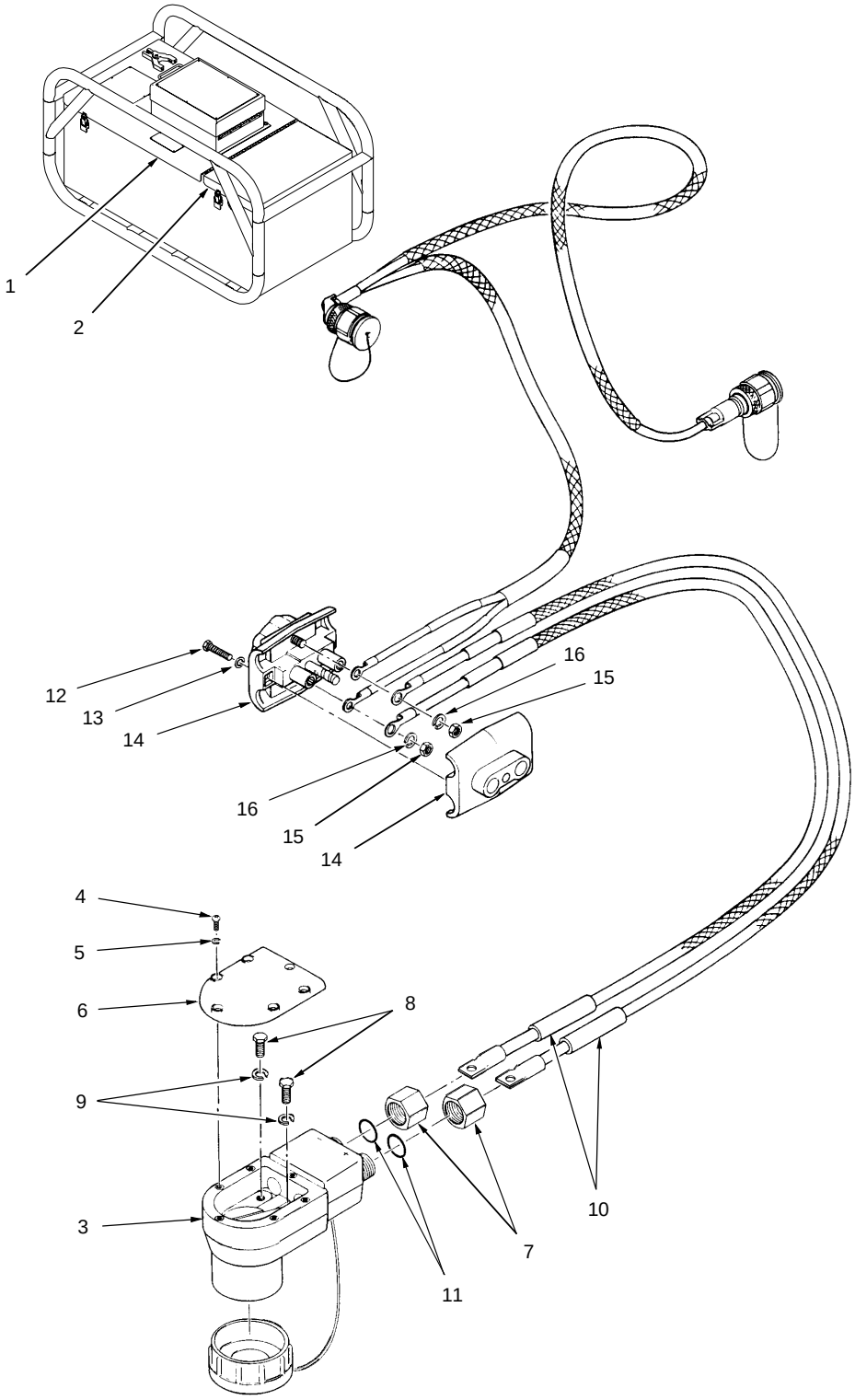
Make sure each cable is connected to the same polarity terminal in each connector ("+" to "+" and "-" to "-"). Equipment damage may result from improper connections.

1. At the battery connector (14), install two nuts (15) and lock washers (16) to secure the cable terminations to the connector (14).
2. Install two bolts (12) and flat washers (13) to secure the connector (14) halves together.
3. At the NATO connector (3), slide the jam nuts (7), bushings (10) and O-rings (11) onto the cables and insert the cables into the connector (3).
4. Install the two bolts (8) and lock washers (9) to secure cables to connector (3) and tighten jam nuts (7). Observe proper polarity. Ensure cable connected to "-" terminal of battery connector is connected to "-" terminal of NATO connector.

ASSEMBLY-Continued

5. Install the six screws (4) and washers (5) that secure the cover (6) to the connector. Ensure the cover lanyard is secured to one of the screws.

6. Install tiedown straps as required. Thread tiedown straps through slots in cable tags and attach to cable, one near each end and one near the middle.



INSTALLATION

1. At the accessory module, push battery connector through lower cut out in cable storage compartment (2) and install connector on battery. Coil remainder of cable in cable storage compartment (2).
2. Close and latch the battery compartment cover (1) and cable storage compartment cover (2).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE CONTROL CABLE W201

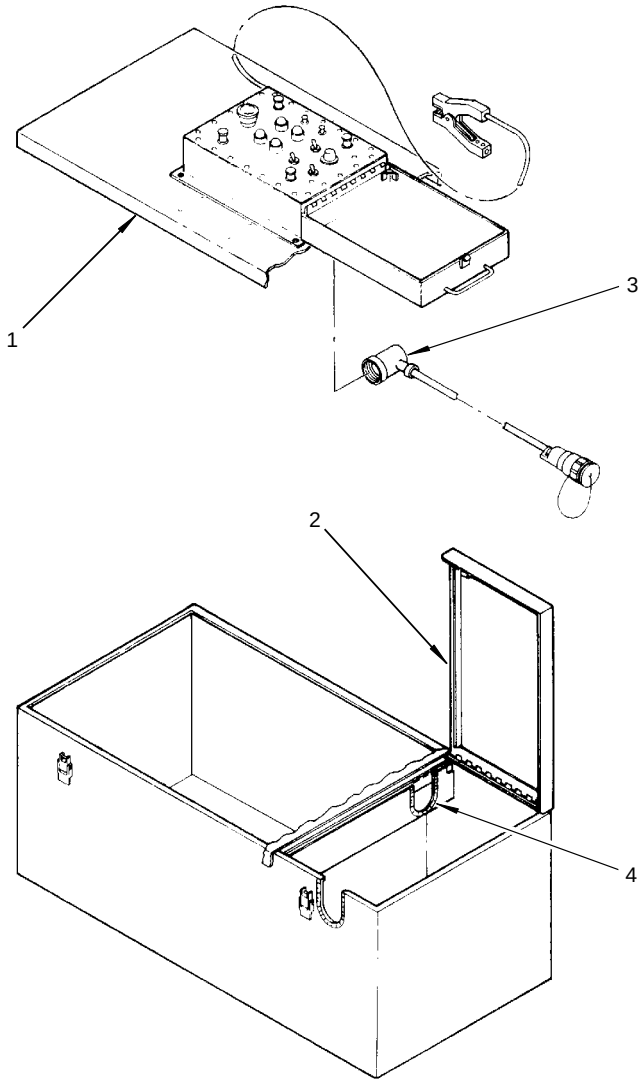
INITIAL SET-UP:

Tools:
No tools required.

Materials/Parts Required:
None

REMOVAL

1. At the accessory module, open the battery compartment cover (1) and cable storage compartment cover (2).
2. Disconnect control cable W201 (3) from control box.
3. Install dust caps on control cable (3) and control box connector.
4. Push control cable through upper cut out (4) into cable storage compartment and remove from accessory module.



INSTALLATION

1. Push control box connector (right angle connector) (3) through upper cut out (4) in cable storage compartment, remove dust caps from control cable (3) and control box connector, and install connector on control box. Coil remainder of cable in cable storage compartment.
2. Close and latch the battery compartment cover (1) and cable storage compartment cover (2).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPAIR BATTERY HOLDDOWN

INITIAL SET-UP:

Tools:
Took Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
Washer, Lock (WP 0117 00, Item 126)
Washer, Lock (WP 0117 00, Item 130)
Nut, Self-Locking (WP 0117 00, Item 132)

NOTE

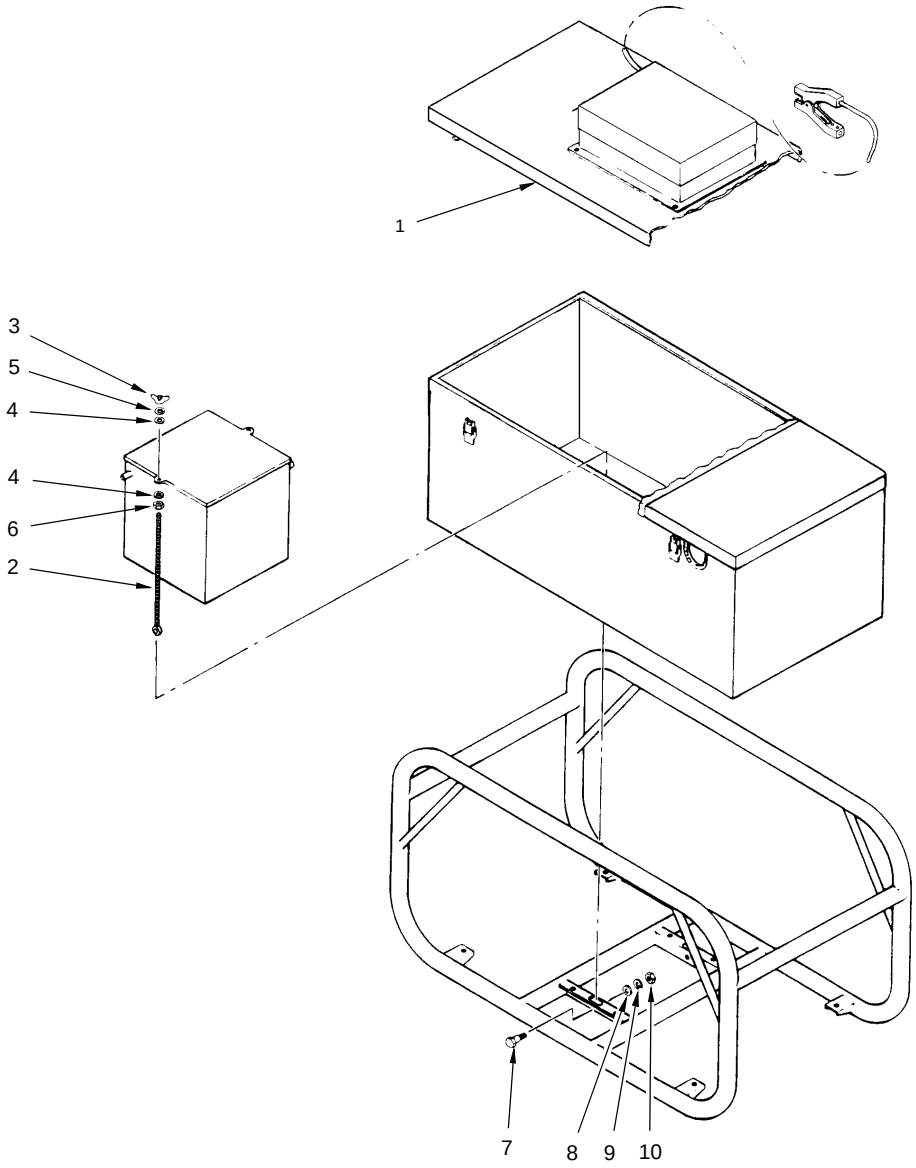
This procedure applies to either battery holddown.

REMOVAL

1. At accessory module, unlatch and raise battery compartment cover (1).
2. At holddown eyebolt (2), remove wingnut (3), two flat washers (4), lock washer (5) and self-locking nut (6). Discard lock washer (5) and self-locking nut (6).
3. At bottom of eyebolt (2), remove shoulder bolt (7), flat washer (8), lock washer (9) and hex nut (10). Discard lock washer (9). Remove eyebolt from battery compartment.

INSTALLATION

1. Insert eyebolt (2) through bottom of battery compartment, align eye with mounting hole in frame, and install shoulder bolt (7), flat washer (8), lock washer (9) and hex nut (10).
2. At upper end of holddown eyebolt (2), install self-locking nut (6), two flat washers (4), lock washer (5) and wingnut (3).
3. Adjust wingnut for snug fit of holddown assembly under battery ear.
4. Lower and latch battery compartment cover (1).



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
DATA PLATE REPLACEMENT (TYPICAL)

INITIAL SET-UP:

Tools:
Drill, Electric, 3/8 inch
(WP 0113 00, Item 2)
Drill Set, Twist
(WP 0113 00, Item 2)
Tool Kit, Blind Rivet
(WP 0113 00, Item 2)
Goggles, Industrial
(WP 0113 00, Item 2)

Materials/Parts Required:
Rivet (WP 0117 00, Item 87)

REMOVAL

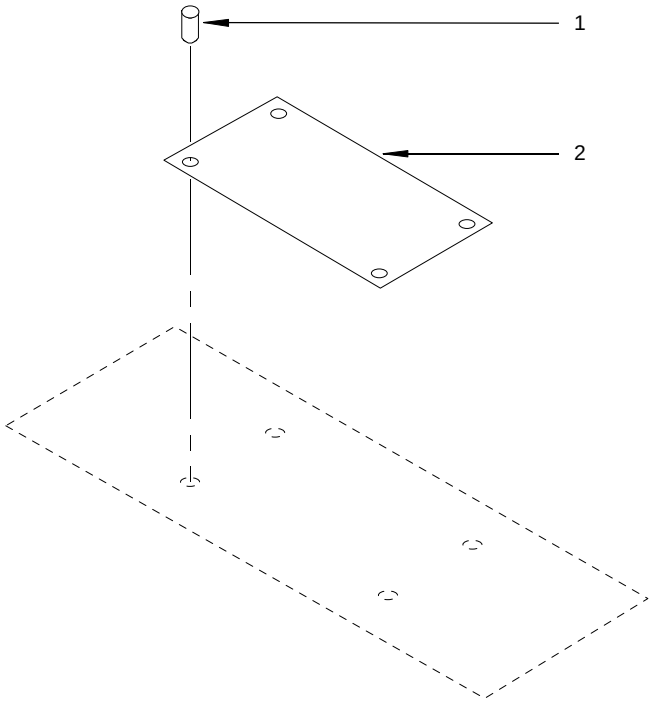
WARNING

Serious personal eye injury may result from flying particles when operating power tools. Always wear eye protection.

Drill out rivets (1) attaching the data plate (2).

INSTALLATION

Attach data plate (2) with 1/8-inch pop rivets (1).



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE FILTER VESSEL COVER O-RING

INITIAL SET-UP

Tools:
Tool Kit, General Mechanics (WP 0113 00, Item 1)
Torque wrench (WP 0113 00, Item 2)
Chemical and Oil Protective Gloves (WP 0113 00, Item 2)
Pan, Drain (WP 0113 00, Item 2)
Goggles (WP 0113 00, Item 2)

Materials/Parts Required:
Washer, Split Lock (WP 0117 00, Item 135)
Cloth, Lint Free (WP 0116 00, Item 4)

Equipment Condition
Filter Separator Defueled

Personnel Required:
Two, any MOS

REMOVAL (Figure 1)

WARNING

Pumpage fuels contain additives that may be harmful to personnel and the environment. All leaks must be corrected as soon possible. Wash fuel from skin immediately. Spills of fuel must be cleaned up in accordance with local SOPs.

Death or personal injury may result from explosion of fuel fumes exposed to an open flame or spark, or to a static discharge. Do not permit smoking within fifty feet of the liquid fuel filter separator.

Ensure all equipments are well grounded prior to commencing any operation or maintenance task. Always ensure the ground connection from the vehicle is complete prior to beginning any fueling operation.

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

Serious eye and skin injury could occur from venting of fuel when manual vent valve is opened. Wear suitable protective clothing and eye protection.

1. Connect liquid fuel filter-separator ground cable (1) to a grounding rod.
2. Close inlet and outlet valves (2) on filter vessel (3) and open manual vent valve (4).
3. Place a container under the defueling coupling (5), open the defueling coupling valve (6) and drain the filter vessel (3).
4. Close the defueling coupling valve (6).

REMOVAL-Continued

WARNING

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. Always use the number of soldiers called for by the procedures to move or relocate the AAFARS equipment. Use proper physical lifting procedures or use a suitable lifting device or dolly. Wear safety shoes, gloves and other suitable protective clothing.

5. Two persons raise the liquid fuel filter-separator (7) to a vertical position with the filter vessel cover (8) facing up.
6. Remove the 12 nuts (9), split lock washers (10), flat washers (11), bolts (12) and flat washers (13) from the filter vessel cover (8). Discard split lock washers (10).
7. Remove the filter vessel cover (8).
8. Remove the filter vessel cover O-ring (14) and dispose of in accordance with local SOP.

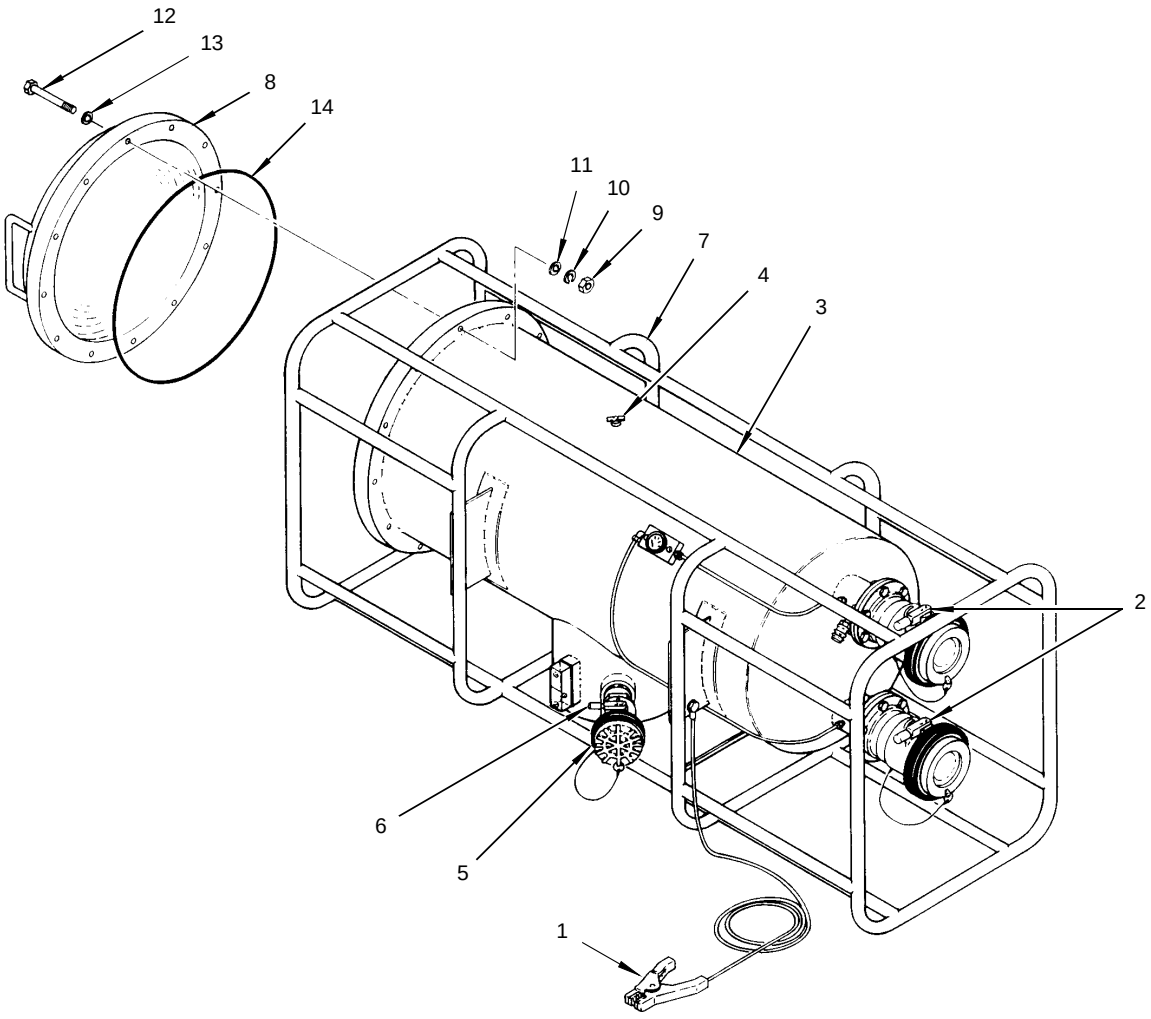


Figure 1. Filter Vessel Cover O-Ring Replacement

INSTALLATION (Figure 1)

1. Clean O-ring groove and filter vessel (3) seating surface.

CAUTION

Handle and install O-ring carefully. O-rings can be damaged easily during installation. Do not install the O-ring in such a way that the filter vessel cover can pinch or cut the O-ring.

2. Install O-ring (14) in groove.

CAUTION

To avoid damage to O-ring do not rotate filter vessel cover after positioning. If bolt holes do not align, lift filter vessel cover to reposition.

3. Clean filter vessel cover (8) and position on filter vessel (3).

4. Loosely install bolts (12), flat washers (13), flat washers (11), split lock washers (10) and nuts (9) that secure the filter vessel cover (8) to the filter vessel (3).

5. Torque filter vessel cover bolts (12) in a crossing pattern (Figure 2). Initially torque to 20 ft. lbs., then torque again to 25 ft. lbs. and a final torque to 30 ft. lbs.

WARNING

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. Always use the number of soldiers called for by the procedures to move or relocate the AAFARS equipment. Use proper physical lifting procedures or use a suitable lifting device or dolly. Wear safety shoes, gloves and other suitable protective clothing.

6. Two persons lower filter separator (7) to horizontal position.

7. Close manual vent valve (4).

8. Place ground cable (1) in storage location.

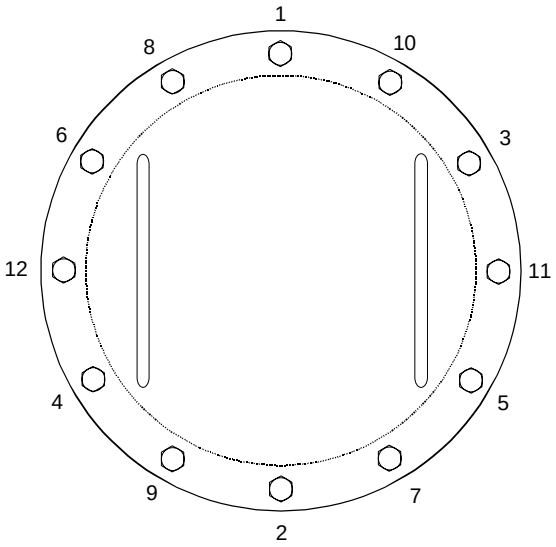


Figure 2. Filter Vessel Cover Torque Pattern

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE COALESCER ELEMENTS AND SEPARATOR ELEMENT

This procedure is performed when the reading observed on the differential pressure gauge during operation reaches or exceeds fifteen psi, or when the liquid fuel filter-separator is to be used with a different type of pumpage. (Coalescer elements should be dedicated to one type of pumpage [e.g., JP-8 only]). Used elements should be handled with rubber gloves due to the toxic effects of some fuel additives. New elements should be handled with clean rubber gloves or the packing bag to avoid hand contact with the element surface. Soiled hands - even normal skin oils - may contaminate the filter element and render it ineffective.

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)
Chemical and Oil protective gloves
(WP 0113 00, Item 2)
Brush (WP 0113 00, Item 2)

Materials/Parts Required:
Washer, Seal (WP 0117 00, Item 1)
Washer, Split Lock (WP 0117 00, Item 136)
Washer, Split Lock (WP 0117 00, Item 137)
Cloth, lint free (WP 0116 00, Item 4)

Equipment Condition
Filter-Separator defueled

WARNING

Death or personal injury may result from the explosion of fuel fumes exposed to an open flame or spark, or to static discharge. Do not permit smoking, any open flame, or spark producing equipment within fifty (50) feet of the liquid fuel filter-separator. Ensure all equipments are well grounded prior to commencing any operation or maintenance task.

Rubber gloves should be worn when handling refueling system components due to the toxic effects of some fuel additives.

NOTE

Even with the liquid fuel filter-separator defueled, some fuel will have accumulated in the sump due to normal drainage of saturated coalescer elements after defueling.

REMOVAL (Figure 1)

1. Remove filter vessel cover. (WP 0055 00)
2. Remove four nuts (1), lock washers (2) and element retainer (3). Discard the lock washers.
3. Remove the nut (4), flat washer (5) and rubber washer (6) that secure the separator element (7) to threaded retaining rod (8). Discard the rubber washer.
4. Remove the separator element (7) and set aside for cleaning and re-use.
5. Remove the three coalescer elements (9) and dispose of in accordance with local SOP.

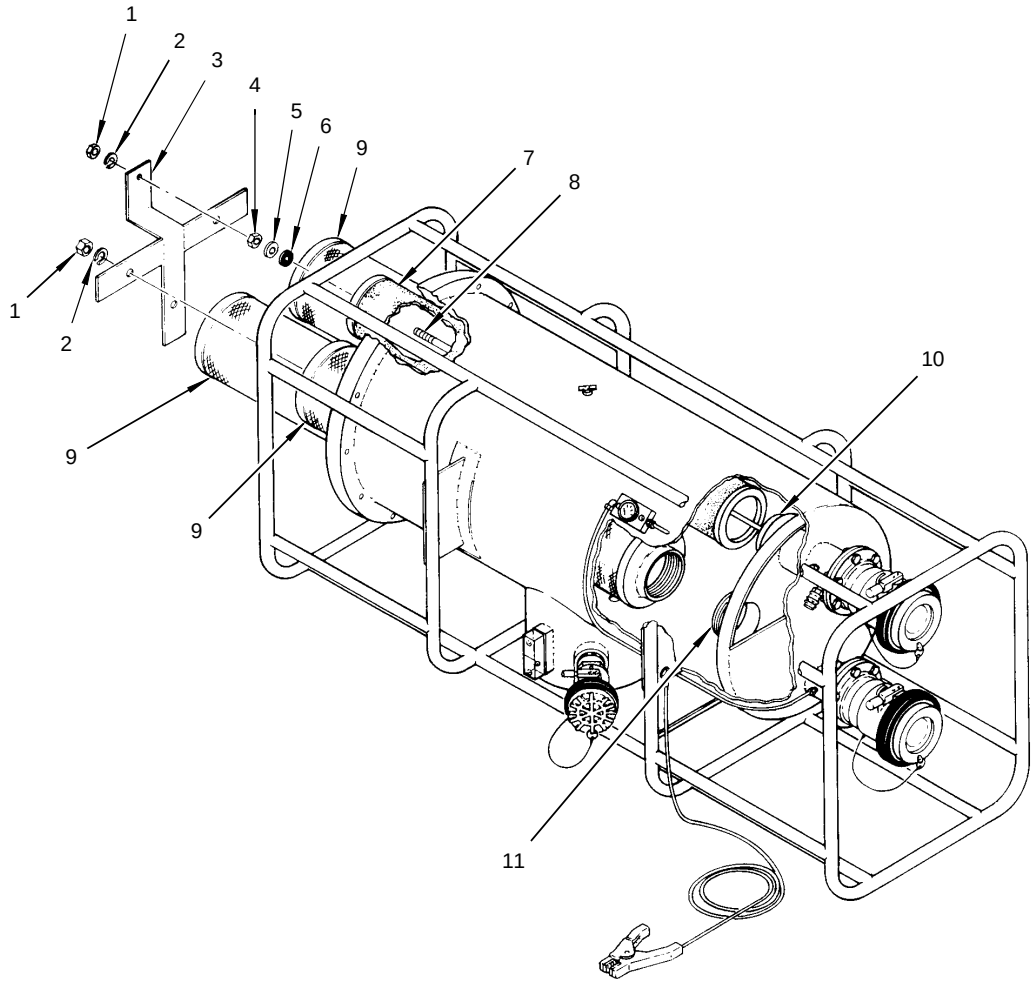
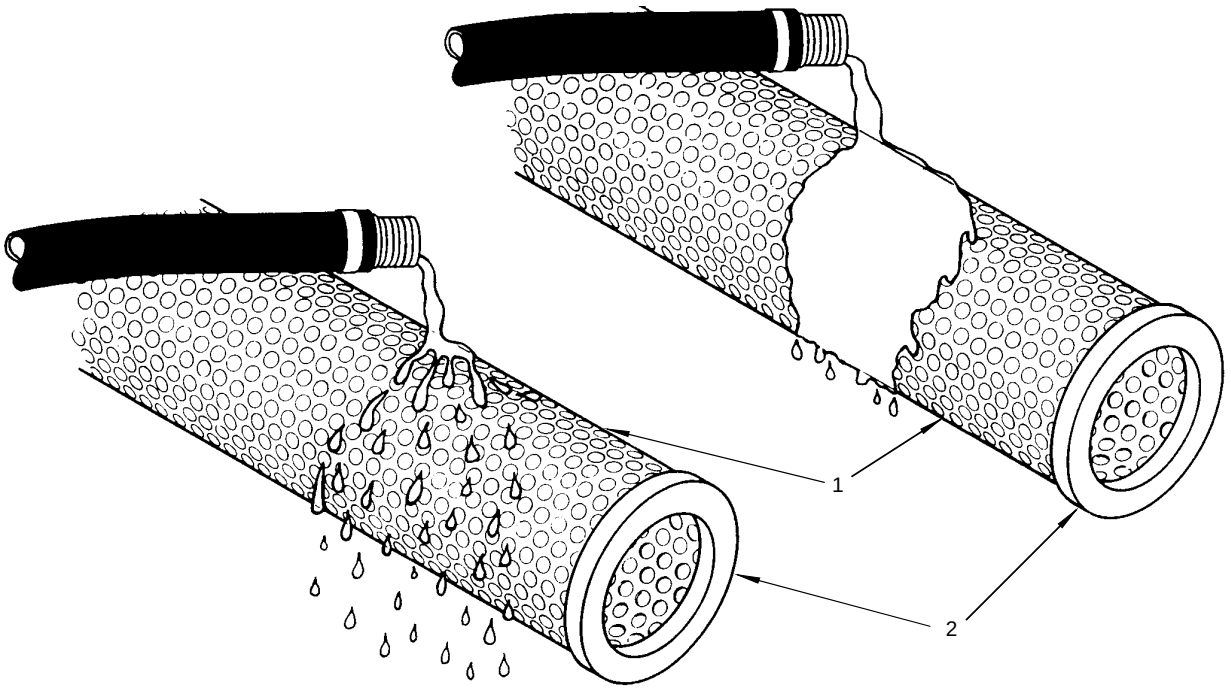


Figure 1. Coalescer and Separator Elements Removal

SERVICE (Figure 2)

1. Clean the separator element (1) in clean fuel and gently wipe the entire screen surface with a soft cloth or very soft bristle brush.
2. Holding the separator element (1) by the end caps (2), visually inspect the entire surface for any nicks or cuts. If there are any visible flaws, the separator element (1) should be replaced.
3. Perform water test.
    a. Touching only the end cap (2), hold the separator element (1) at an angle and gradually pour water over the entire surface. Do not spray the water and do not let it fall more than three inches before contacting the screen. The water will bead and roll off the surface of a properly functioning separator element (1) (similar to a freshly waxed surface). If any portion of the screen appears wetted (water has soaked into the pores of the screen and will not bead) the separator element (1) has failed and must be cleaned again. Proceed to step 4.
    b. Rinse the separator (1) thoroughly in clean fuel to remove all traces of water.
    c. Stand the separator (1) on end and allow to air dry.
4. Re-clean separator (1) using hot water and a soft cloth or very soft brush.
5. Repeat water test (step 3). If separator (1) continues to fail, it must be replaced.



Pass (Water Beads) Fail (Water Does Not Bead)

Figure 2. Separator Element Cleaning

INSTALLATION (Figure 1)

1. Lower separator element (7) in filter vessel and position in seat (10) (seating will be distinctly felt).
2. Install rubber washer (6), flat washer (5) and hex nut (4) on threaded rod (8) and hand tighten securely.

CAUTION

Do not touch the coalescer element with bare hands. The poly bag protects the coalescer element during transport and installation.

3. Open the coalescer element's (9) protective poly bag and slide it back a few inches.
4. Holding the coalescer element (9) with the poly bag still protecting the coalescer element (9), place the coalescer element (9) over the threaded seat (11) and screw the coalescer element (9) on hand tight.
5. Remove the poly bag slowly from the coalescer element (9) after the coalescer element (9) is in place.
6. Repeat steps 3 through 5 for the remaining 2 coalescer elements.
7. Torque to 30 ft. lb. each coalescer element (9). (Be sure that the coalescer element (9) is not touched by soiled or oily hands).
8. Install element retainer (3).
9. Install element retainer lock washers (2) and hex nuts (1), and tighten securely.
10. Install filter vessel O-ring and cover. (WP 0055 00)

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE DIFFERENTIAL PRESSURE GAUGE AND/OR INLET AND OUTLET LINES

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics (WP 0113 00, Item 1)
Chemical and Oil Protective Gloves (WP 0113 00, Item 2)
Goggles (WP 0113 00, Item 2)

Materials/Parts Required:
Cloth, Lint Free (WP 0116 00, Item 4)
Sealant, Thread, LH-150 (WP 0116 00, Item 24)
Washer, Lock (WP 0117 00, Item 134)

Equipment Condition
Liquid Fuel Filter-Separator defueled

WARNING

Death or personal injury may result from the explosion of fuel fumes exposed to an open flame or spark, or to static discharge. Do not permit smoking, any open flame, or spark producing equipment within fifty (50) feet of the liquid fuel filter-separator. Ensure all equipments are well grounded prior to commencing any operation or maintenance task.

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

Serious eye and skin injury could occur from venting of fuel when manual vent valve is opened. Wear suitable protective clothing and eye protection.

NOTE

Even with the liquid fuel filter-separator defueled, some fuel will remain in the diverter cavity after defueling.

REMOVAL OF INLET AND OUTLET LINES

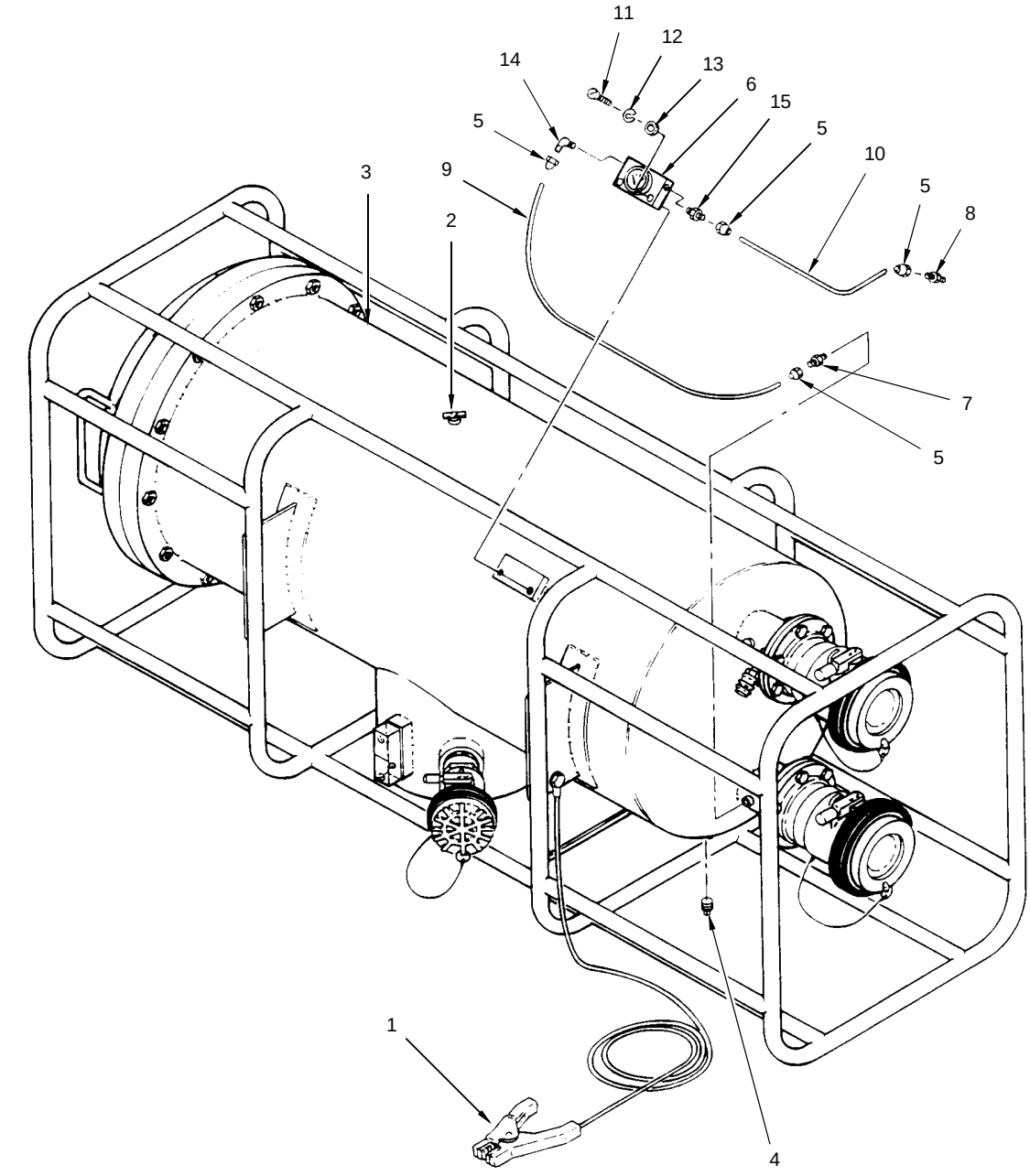
1. Connect the liquid fuel filter-separator grounding cable (1) to a ground rod.
2. Depress and latch open the manual vent valve (2) to relieve any pressure from the filter vessel (3).
3. Drain fuel from diverter cavity into a suitable container by removing filter vessel gravity drain plug (4).
4. Dispose of fuel in accordance with the local SOP.
5. Loosen and separate flare nuts (5) on both sides of the differential pressure gauge (6) and on the inlet and outlet port connectors (7, 8) of the filter vessel (3).
6. Blow through the lines to ensure they are clear.

INSTALLATION OF INLET AND OUTLET LINES

1. Clean threads of the flare nuts (5), differential pressure gauge (6) and the inlet and outlet ports (7, 8).
2. Position the inlet line (9) and/or outlet line (10) and loosely attach flare nuts (5).
3. Tighten flare nuts (5) on each side of the differential pressure gauge (6) and on the inlet and outlet port connectors (7, 8).

INSTALLATION OF INLET AND OUTLET LINES-Continued

4. Close the manual vent valve (2).
5. Install filter vessel gravity drain plug (4).
6. Place grounding cable (1) in storage location.



REMOVAL OF DIFFERENTIAL PRESSURE GAUGE

1. Connect the liquid fuel filter-separator grounding cable (1) to a ground rod.
2. Depress and latch open the manual vent valve (2) to relieve any pressure from filter vessel (3).
3. Loosen and separate flare nuts (5) on differential pressure gauge (6) inlet and outlet lines (9, 10).
4. Loosen and remove the two screws (11), lock washers (12) and flat washers (13) that secure differential pressure gauge (6) to filter vessel (3). Discard the lock washers (12).

NOTE

The flared tube connectors on the inlet and outlet of the differential pressure gauge may be removed by holding the gauge body with an adjustable wrench. If the gauge inlet or outlet port turns, it will be necessary to hold the port(s) with slip joint pliers to remove the connector(s). Damage to the ports is acceptable since the replacement differential pressure gauge is supplied with new ports.

5. Remove the threaded flared tube elbow (14) from the inlet side of the differential pressure gauge (6). Retain elbow for use on differential pressure gauge (6).
6. Remove the threaded flared tube connector (15) from the outlet side of the differential pressure gauge (6). Retain connector for use on differential pressure gauge (6).

INSTALLATION OF DIFFERENTIAL PRESSURE GAUGE

1. Clean the threads on the elbow (14) and connector (15) retained from the removal procedure.
2. Apply a light, even coat of thread sealant to the elbow (14) and connector (15) threads and install on the differential pressure gauge (6).
3. Position differential pressure gauge (6) on mount, and loosely install the two screws (11), lock washers (12) and flat washers (13) that secure the differential pressure gauge (6) to filter vessel (3).
4. Clean threads on inlet and outlet line (9, 10) flare nuts (5), apply a light, even coat of thread sealant and install the inlet and outlet lines (9, 10) finger tight to the differential pressure gauge (6).
5. Install the two screws (11) that secure the differential pressure gauge (6) to the filter vessel (3).
6. Tighten the inlet and outlet flare nuts (5).
7. Close the manual vent valve (2).
8. Disconnect the grounding cable (1) and place in stowage location.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE SIGHT GAUGE COMPONENTS

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)
Chemical and Oil Protective Gloves
(WP 0113 00, Item 2)
Pan, Drain (WP 0113 00, Item 2)
Goggles (WP 0113 00, Item 2)
Torque Wrench
(WP 0113 00, Item 2)

Materials/Parts Required:
Cloth, Lint Free (WP 0116 00, Item 4)
Gasket, Sight Gauge (WP 0117 00, Item 9)
Washer, Lock (WP 0117 00, Item 134)

Equipment Condition
Liquid Fuel Filter-Separator defueled

WARNING

Death or personal injury may result from the explosion of fuel fumes exposed to an open flame or spark, or to static discharge. Do not permit smoking, any open flame, or spark producing equipment within fifty (50) feet of the liquid fuel filter-separator. Ensure all equipments are well grounded prior to commencing any operation or maintenance task.

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

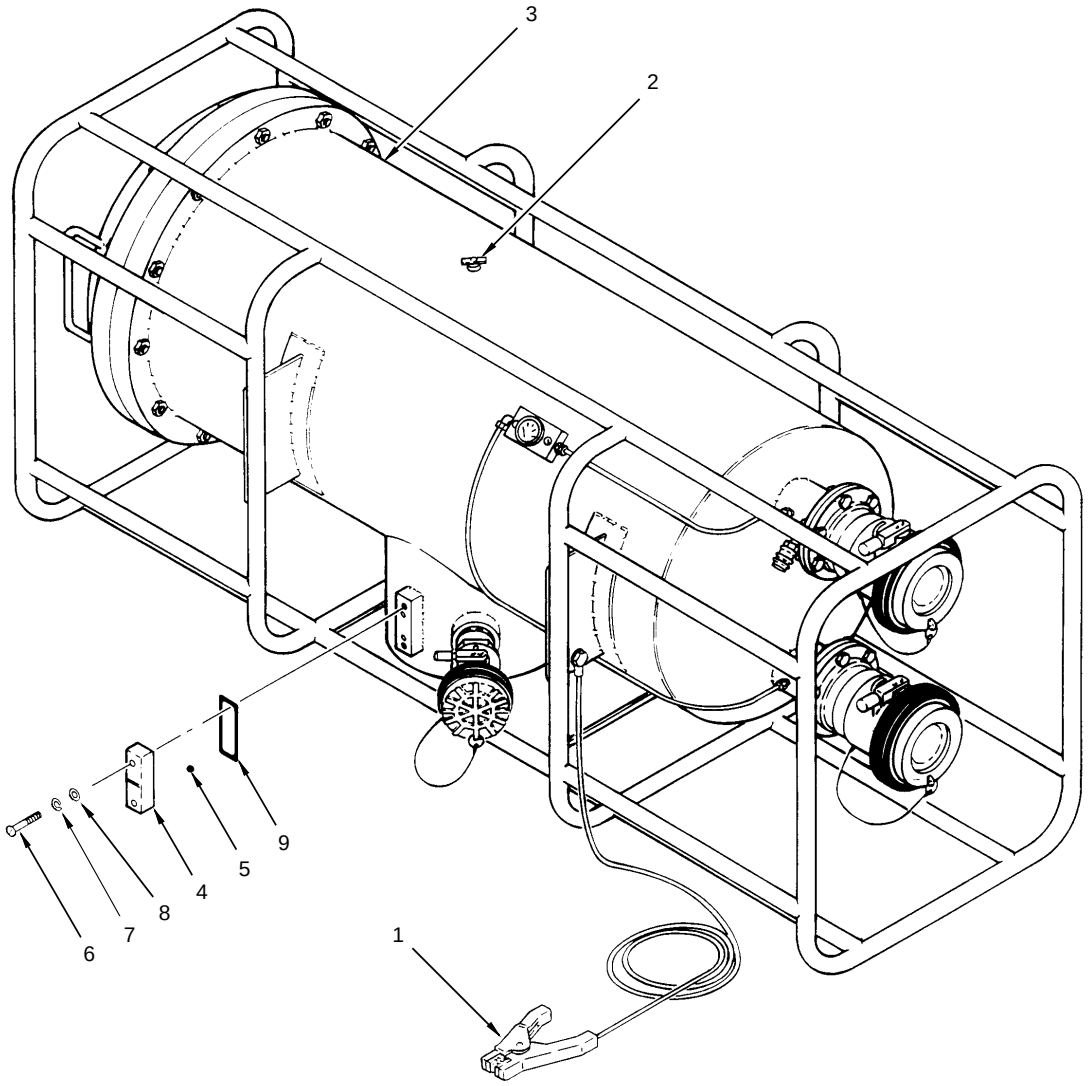
Serious eye and skin injury could occur from venting of fuel when manual vent valve is opened. Wear suitable protective clothing and eye protection.

NOTE

Even with the liquid fuel filter-separator defueled, some fuel will have accumulated in the sump due to normal drainage of saturated coalescer elements after defueling.

REMOVAL

1. Connect the liquid fuel filter-separator grounding cable (1) to a secure ground.
2. Depress and latch open the manual vent valve (2) to relieve any pressure from filter vessel (3).
3. Block up liquid fuel filter separator approximately two inches for ease of access to sight gauge.
4. Place container close beneath sight gauge (4). When sight gauge (4) is separated from filter vessel (3), the small float ball (5) may drop out. Use the container to capture the float ball (5) and prevent loss.
5. Remove the two mounting screws (6), lock washers (7) and flat washers (8) that secure the sight gauge (4) to the filter vessel (3). Slowly remove the sight gauge body (4), capturing the float ball (5) in the container. Discard lock washers.
6. Remove and discard the gasket (9) from the sight gauge (4).



INSTALLATION

1. Wipe clean the gasket surface.
2. Insert and hold mounting screws (6), lock washers (7) and flat washers (8) in sight gauge (4) body. Position gasket (9) over screws (6). With sight gauge (4) body in a horizontal position, place float ball (5) in groove. Install as an assembly, bottom first to prevent ball (5) falling out. Tighten mounting screws (6) finger tight.
3. Torque the mounting screws (6) evenly to 45 in lbs.
4. Close the manual vent valve (2).
5. Remove blocks from beneath liquid fuel filter separator.
6. Replace grounding cable (1) in stowage location.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE FILTER SEPARATOR MANUAL VENT VALVE

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics (WP 0113 00, Item 1)
Chemical and Oil Protective Gloves (WP 0113 00, Item 2)
Goggles (WP 0113 00, Item 2)

Materials/Parts Required:
Sealant, Thread, LH-150 (WP 0116 00, Item 24)

Equipment Condition
Liquid Fuel Filter-Separator defueled

WARNING

Death or personal injury may result from the explosion of fuel fumes exposed to an open flame or spark, or to static discharge. Do not permit smoking, any open flame, or spark producing equipment within fifty (50) feet of the liquid fuel filter-separator. Ensure all equipments are well grounded prior to commencing any operation or maintenance task.

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

Serious eye and skin injury could occur from venting of fuel when manual vent valve is opened. Wear suitable protective clothing and eye protection.

NOTE

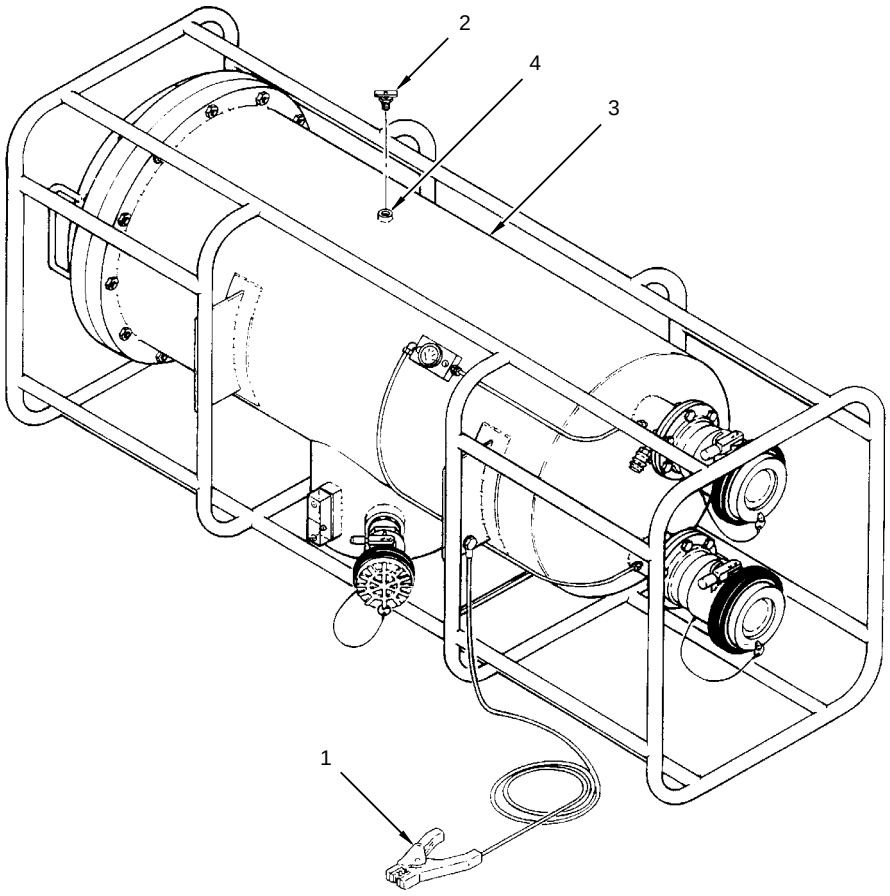
Even with the liquid fuel filter-separator defueled, some fuel will have accumulated in the sump due to normal drainage of saturated coalescer elements after defueling.

REMOVAL

1. Connect the liquid fuel filter-separator grounding cable (1) to a ground rod.
2. Depress and latch open the manual vent valve (2) to relieve any pressure from filter vessel (3).
3. Remove manual vent valve (2) from filter vessel (3).

INSTALLATION

1. Apply a light, even coat of thread sealant to the threads on the manual vent valve (2). Clean off any thread sealant from below the threaded area. Thread sealant or any foreign material on the bottom end of the manual vent valve (2) may clog the manual vent valve (2) and prevent it from operating properly.
2. Install the manual vent valve (2) in the filter vessel boss (4).
3. Close the manual vent valve (2).
4. Disconnect grounding cable (1) and place in stowage location.



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE FILTER SEPARATOR GRAVITY DRAIN PLUG

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics (WP 0113 00, Item 1)
Chemical and Oil Protective Gloves (WP 0113 00, Item 2)
Pan, Drain (WP 0113 00, Item 2)
Goggles (WP 0113 00, Item 2)

Materials/Parts Required:
Cloth, Lint Free (WP 0116 00, Item 4)
Sealant, Thread, LH-150 (WP 0116 00, Item 24)

Equipment Condition
Liquid Fuel Filter-Separator defueled

WARNING

Death or personal injury may result from the explosion of fuel fumes exposed to an open flame or spark, or to static discharge. Do not permit smoking, any open flame, or spark producing equipment within fifty (50) feet of the liquid fuel filter-separator. Ensure all equipments are well grounded prior to commencing any operation or maintenance task.

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

Serious eye and skin injury could occur from venting of fuel when manual vent valve is opened. Wear suitable protective clothing and eye protection.

NOTE

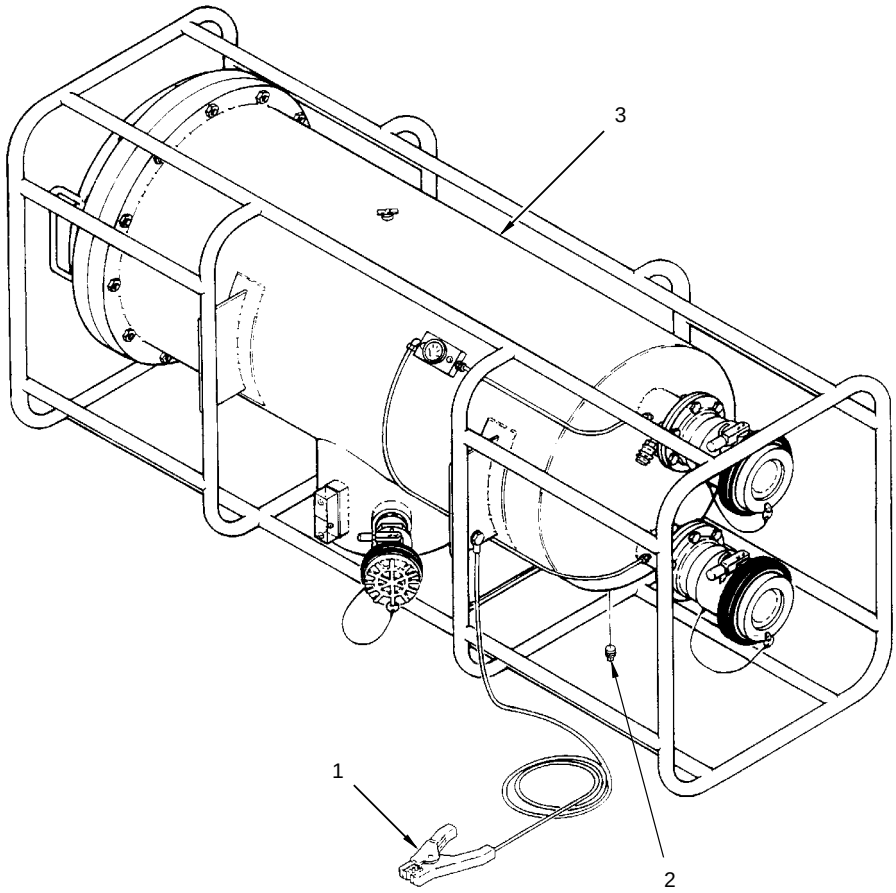
Even with the liquid fuel filter-separator defueled, some fuel will have accumulated in the sump due to normal drainage of saturated coalescer elements after defueling.

For disposal of contaminated fuel, refer to FM 10-20, Organization Maintenance of Military Petroleum Pipelines, Tanks, and Related Equipment.

To perform filter vessel gravity drain plug removal it is recommended the liquid fuel filter-separator be in the horizontal position.

REMOVAL

1. Connect the liquid fuel filter-separator grounding cable (1) to a secure ground.
2. Position a drain pan beneath the filter vessel gravity drain plug (2). The drain pan should be of sufficient size to hold between 2 to 3 gals. of fuel.
3. Remove the filter vessel gravity drain plug (2).



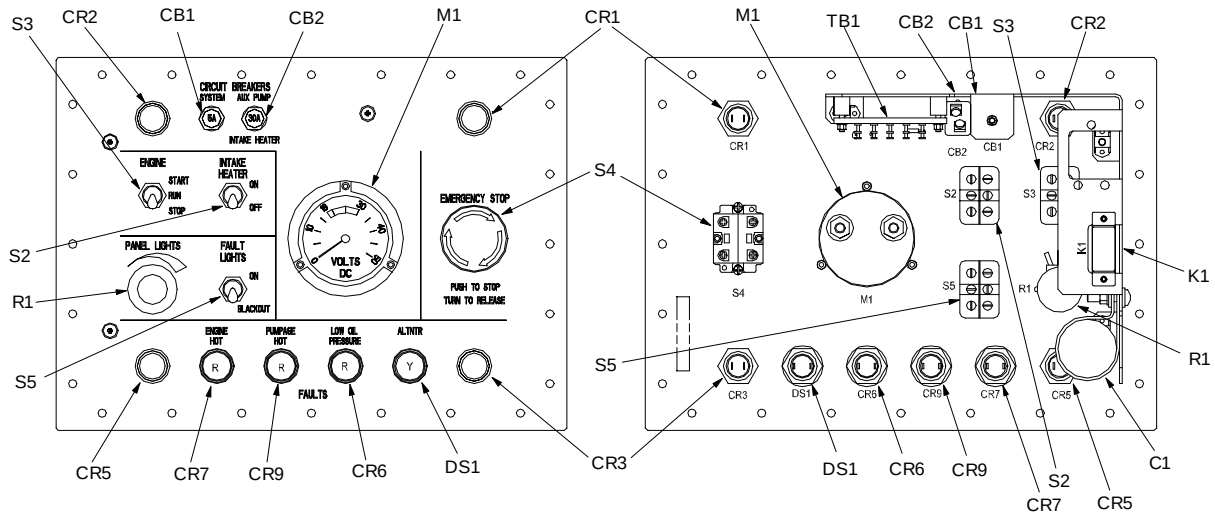
INSTALLATION

1. Inspect and clean drain plug threads on filter vessel (3) and filter vessel gravity drain plug (2).
2. Apply thread sealant to the filter vessel gravity drain plug (2).
3. Install the filter vessel gravity drain plug (2).
4. Place grounding cable (1) in stowage location.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPAIR OF CONTROL BOX

All control box components with the exception of the voltage regulator are mounted on the rear of the control panel. Access is most convenient if the control box is removed from the accessory module to a work bench. However, all control box components may be tested, removed and replaced with the box installed in the module, using the storage chest surface for a work space. The illustration below provides a front and rear view of control panel components location. For clarity, wiring is not shown.



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE CONTROL PANEL LAMP ASSEMBLIES/PANEL LIGHTS

This procedure applies to the four panel lamps (CR1, CR2, CR3 and CR5), and the four malfunction indicators (CR6, CR7, CR8 and CR9). Refer to WP 0061 00 for component location.

INITIAL SET-UP:

Tools:
- Screwdriver, Cross Tip, #2 (WP 0113 00, Item 1)
- Combination Wrench, 1/2" (WP 0113 00, Item 1)
- Pliers, Long Nose, 8" (WP 0113 00, Item 1)
- Soldering Gun (WP 0113 00, Item 2)

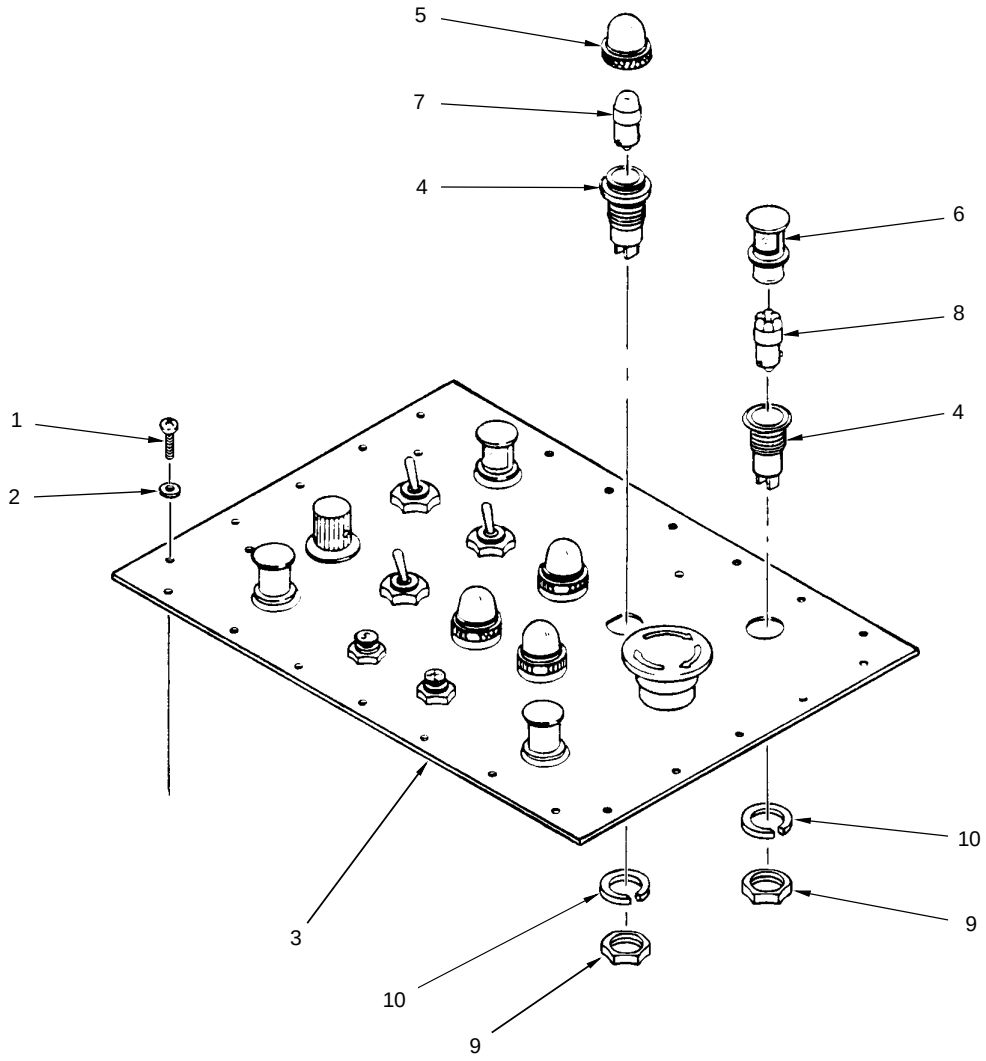
Materials/Parts Required:
- Flux, Soldering (WP 0116 00, Item 15)
- Solder (WP 0116 00, Item 25)
- Strap, Tiedown (WP 0116 00, Item 27)
- Strap, Tiedown (WP 0116 00, Item 28)
- Tags, Electrical (WP 0116 00, Item 29)

REMOVE LAMP ASSEMBLY/PANEL LIGHT

1. Remove the twenty-four screws (1) and flat washers (2) that secure the control panel (3) to the control box.
2. Lift the control panel (3) from the control box and set on edge convenient to lamp assembly to be replaced.
3. Remove tie wraps from lamp assembly wires as required.
4. Tag leads near base of lamp assembly (4) for installation.
5. Remove indicator light lens (5)/miniature indicator cap (6) and lamp (7 or 8).
6. Desolder leads from indicator light housing (4) terminals.
7. Remove nut (9) and lock washer (10) that secure indicator light housing to control panel (3).

INSTALL LAMP ASSEMBLY/PANEL LIGHT

1. Install indicator light housing (4) on control panel (3) with nut (9) and lock washer (10).
2. Solder leads to indicator light housing (4) terminals as tagged. Remove tags.
3. Install tie wraps on wiring harness as required.
4. Install lamp (7 or 8) and indicator light lens (5)/miniature indicator cap (6).
5. Install control panel (3) in control box with twenty-four screws (1) and flat washers (2).



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE PANEL LIGHTS DIMMER POTENTIOMETER R1

INITIAL SET-UP:

Tools:
- Screwdriver, Cross Tip, #2 (WP 0113 00, Item 1)
- Combination Wrench, 1/2" (WP 0113 00, Item 1)
- Pliers, Long Nose, 8" (WP 0113 00, Item 1)
- Key, Socket Head Screw, .050" (WP 0113 00, Item 1)
- Soldering Gun (WP 0113 00, Item 2)

Materials/Parts Required:
- Flux, Soldering (WP 0116 00, Item 15)
- Solder (WP 0116 00, Item 25)
- Strap, Tiedown (WP 0116 00, Item 27)
- Strap, Tiedown (WP 0116 00, Item 28)
- Tags, Electrical (WP 0116 00, Item 29)

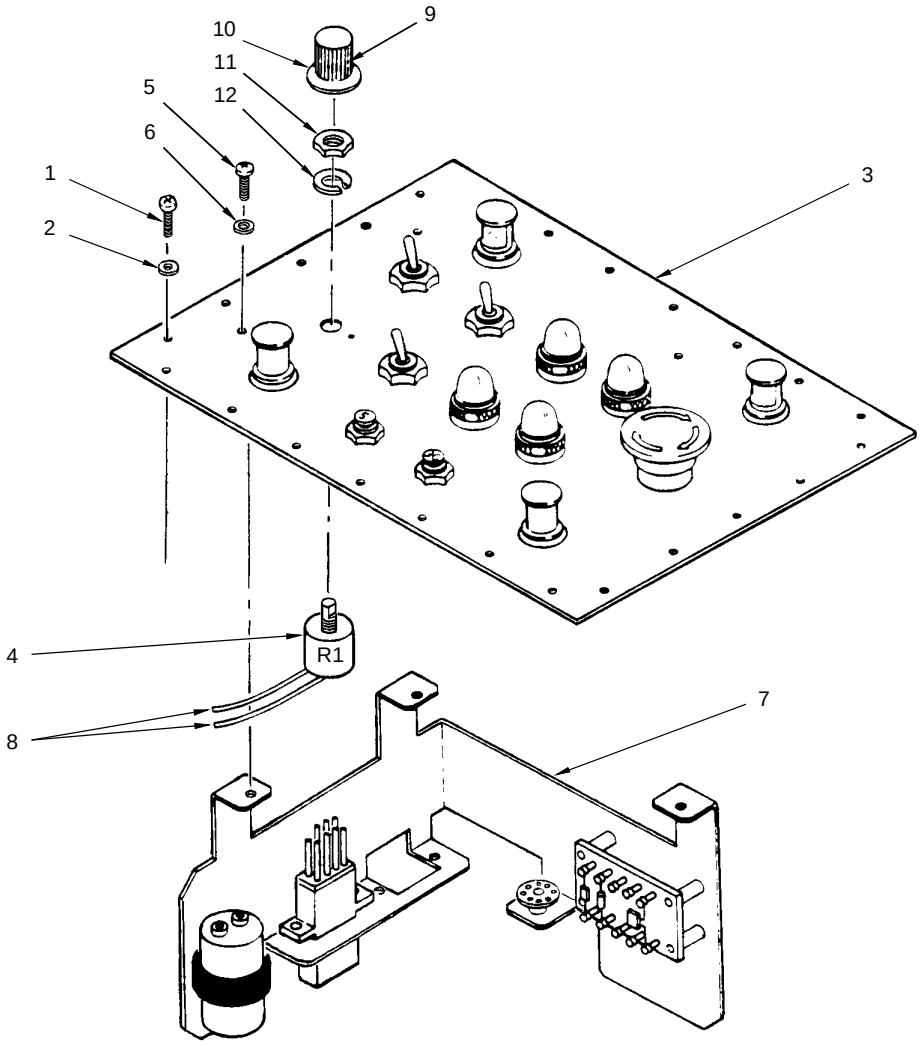
REMOVAL

1. Remove the twenty-four screws (1) and flat washers (2) that secure the control panel (3) to the control box.
2. Lift the control panel (3) from the control box and set on edge convenient to potentiometer R1 (4).
3. Remove tiedown straps as required.

NOTE

Access to potentiometer R1 is partially blocked by an L-shaped bracket. To provide easier access and prevent damage to other components, separate the bracket from the control panel and move aside. The wiring harnesses have enough slack to allow this.

4. Remove the three screws (5) and flat washers (6) that secure the "L" bracket (7) to the panel. Move the bracket aside for access to potentiometer R1 (4).
5. Tag leads (8) near terminals of potentiometer R1 (4) for installation on replacement potentiometer R1 (4).
6. Desolder leads (8) from potentiometer R1 (4) terminals.
7. Loosen two set screws (9) and remove control knob (10).
8. Remove nut (11) and lock washer (12) that secure potentiometer R1 (4) to control panel (3).



INSTALLATION

1. Install potentiometer R1 (4) on control panel (3) with nut (11) and lock washer (12).
2. Install knob (10) on potentiometer shaft and tighten two set screws (9).
3. Solder leads (8) to potentiometer terminals as tagged. Remove tags.
4. Install tiedown straps on wiring harness as required.
5. Install the "L" bracket (7) on the control panel (3) with three screws (5) and flat washers (6).
6. Install control panel (3) in control box with twenty-four screws (1) and flat washers (2).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPAIR EMERGENCY STOP SWITCH (S4)

The emergency stop switch is a four part component, as shown: a spring loaded operator (red button), a mounting base and two contact blocks. When mounted on the control panel, these parts form a double pole, normally closed switch. Depressing the operator (red button) opens both switch sections. The physical configuration of the operator (red button) and the mounting base causes the operator (red button) to latch when depressed, holding the parallel switch sections in the open position. Rotating the operator in the direction of the arrows releases it from the latched position and allows the switches in the contact blocks to close.

The contact blocks are the most likely electrical failure, but the operator (red button) is subject to physical abuse and also may have to be replaced. The four parts can be replaced individually.

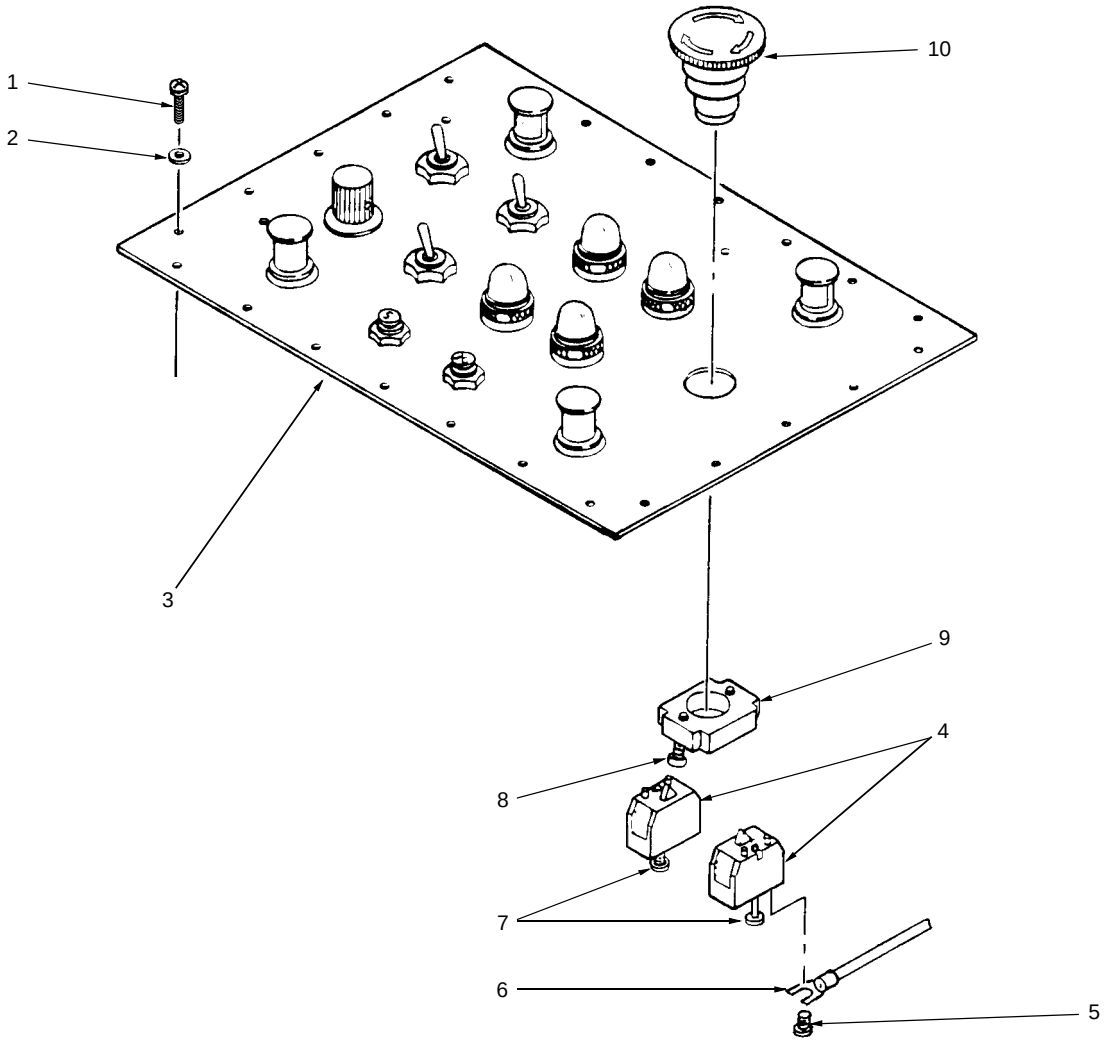
INITIAL SET-UP:

Tools:
- Screwdriver, Cross Tip, #2 (WP 0113 00, Item 1)
- Screwdriver, Flat Blade, ¼" (WP 0113 00, Item 1)
- Soldering Gun (WP 0113 00, Item 2)

Materials/Parts Required:
- Flux, Soldering (WP 0116 00, Item 15)
- Solder (WP 0116 00, Item 25)
- Strap, Tiedown (WP 0116 00, Item 27)
- Strap, Tiedown (WP 0116 00, Item 28)
- Tags, Electrical (WP 0116 00, Item 29)

REMOVAL

1. Remove the twenty-four screws (1) and flat washers (2) that secure the control panel (3) to the control box.
2. Lift the control panel (3) from the control box and set on edge convenient to emergency stop switch S4.
3. Tag the wires associated with the contact block(s) (4) to be removed.
4. On the contact block (4), loosen the wire terminal retaining screws (5) and pull the terminals (6) from the contact block (4).
5. Desolder terminals (6) from wires.
6. Loosen the contact block (4) retaining screw (7) and remove the contact block (4).
7. Loosen the two compression screws (8) on the mounting base (9); rotate and remove the mounting base from the operator (red button) (10).
8. Lift operator (red button) (10) clear of the control panel (3).



INSTALLATION

1. Insert operator (red button) (10) through control panel (3), slip mounting base (9) over operator (red button) (10) and hold in place while tightening the two compression screws (8). Test operation for assurance of proper mounting and mechanical action.

NOTE

Contact blocks are keyed so they will only fit one way.

2. Install contact blocks (4) on mounting base (9).
3. Remove terminals (6) from contact block (4). Solder wires as tagged to terminals (6).
4. Install terminals (6) onto contact block (4) with wire terminal retaining screws (5). Remove tags.
5. Install two contact blocks (4) with two contact block retaining screws (7) onto mounting base (9).
6. Install control panel (3) in control box with twenty-four screws (1) and flat washers (2).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE CONTROL PANEL TOGGLE SWITCHES

This procedure applies to replacement of the INTAKE HEATER, ENGINE START/RUN/STOP and FAULT LIGHTS ON/BLACKOUT toggle switches (S2, S3 and S5) on the control panel. Although not interchangeable, the switches are physically similar and the replacement procedures are identical.

INITIAL SET-UP:

Tools:
Screwdriver, Cross Tip, #2
(WP 0113 00, Item 1)
Screwdriver, Flat Blade, 1/4"
(WP 0113 00, Item 1)
Combination Wrench, 9/16”
(WP 0113 00, Item 1)

Materials/Parts Required:
Tags, Electrical (WP 0116 00, Item 29)

REMOVAL

1. Remove the twenty-four screws (1) and flat washers (2) that secure the control panel (3) to the control box.
2. Lift the control panel (3) from the control box and set on edge convenient to toggle switch to be replaced.
3. Tag all leads attached to the toggle switch (4).
4. Remove all leads from the toggle switch (4).

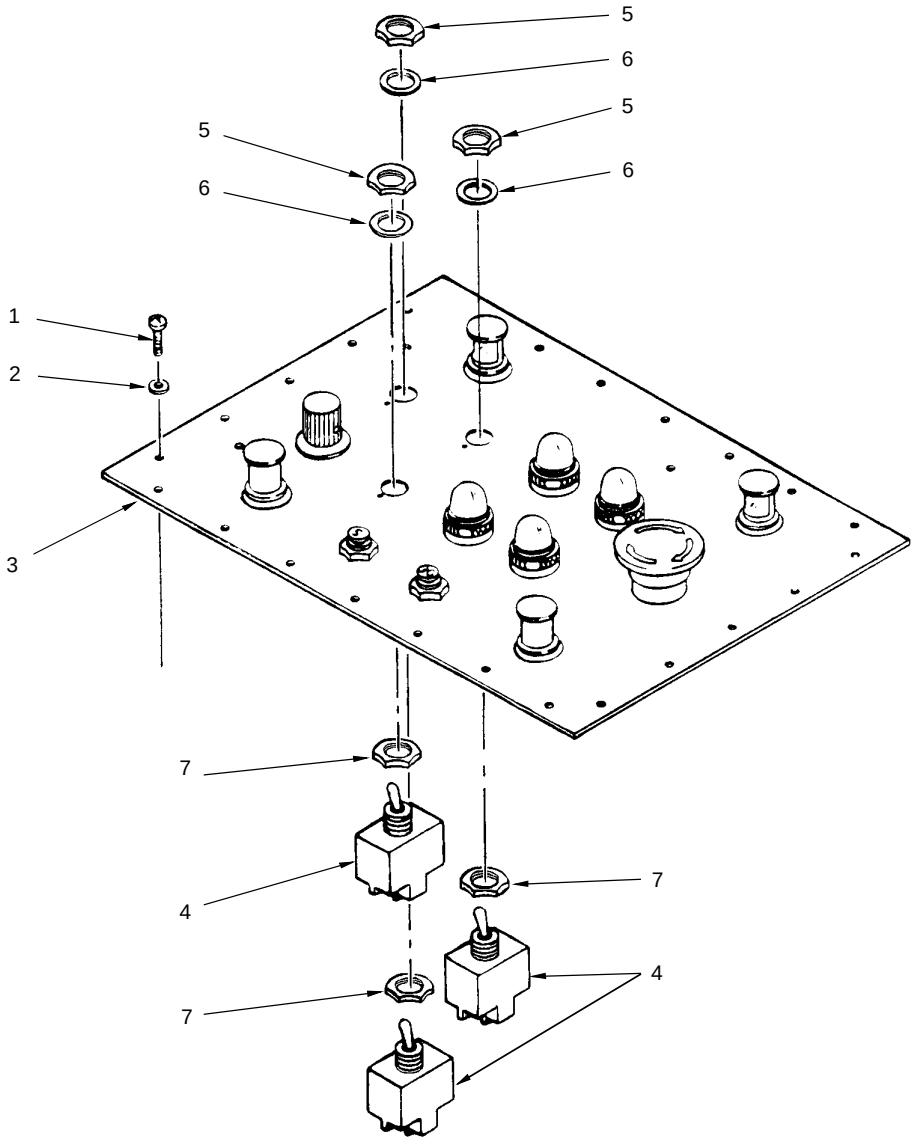
NOTE

Note mounting orientation of switch, using one of the switch terminal numbers as a reference, to avoid installing the replacement switch upside down.

5. Remove nut (5), washer (6) and toggle switch (4) from control panel.

INSTALLATION

1. Insert toggle switch (4) in control panel (3) in the orientation noted during removal. Adjust rear nut (7) as required to obtain a protrusion that just allows complete threading of front nut (5) and washer (6). Tighten front nut and washer.
2. Install leads to switch terminals as tagged. Remove tags.
3. Install control panel (3) in control box with twenty-four screws (1) and flat washers (2).



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE CAPACITOR C1

INITIAL SET-UP:

Tools:
Screwdriver, Cross Tip, #2
(WP 0113 00, Item 1)
Wrench Socket, 1/4", 1/4" square drive
(WP 0113 00, Item 1)
Handle, Socket Wrench (Nutdriver Type)
(WP 0113 00, Item 1)

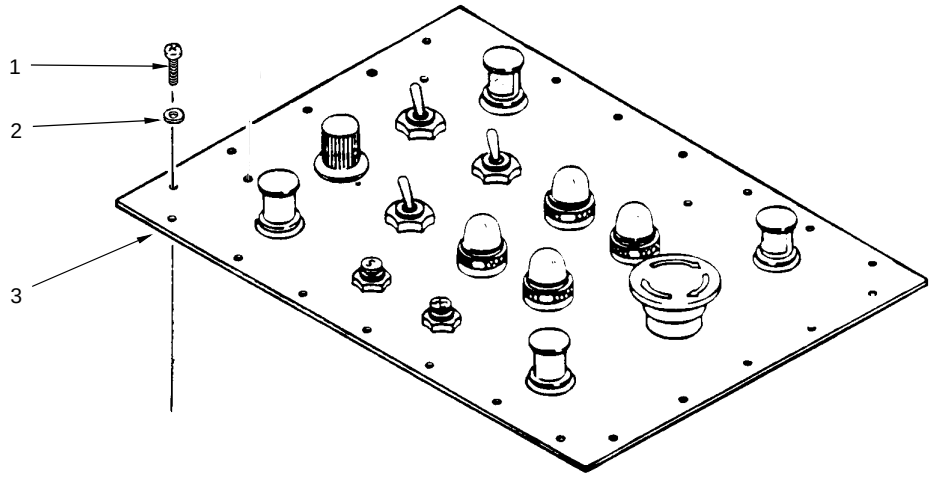
Materials/Parts Required:
Tags, Electrical (WP 0116 00, Item 29)

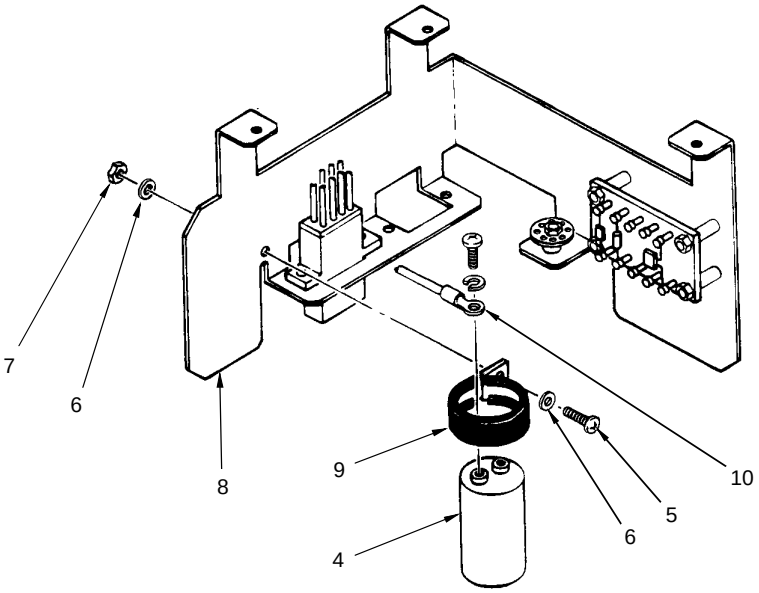
REMOVAL

1. Remove the twenty-four screws (1) and flat washers (2) that secure the control panel (3) to the control box.
2. Lift the control panel (3) from the control box and set on edge convenient to capacitor C1 (4).
3. Remove screw (5), washers (6), and nut (7) attaching capacitor C1 (4) to the "L" bracket (8). Retain mounting hardware.
4. Remove clamp (9) from capacitor C1 (4).
5. Tag and remove leads (10) from capacitor C1 (4).

INSTALLATION

1. Install leads on capacitor C1 (4) as tagged. Remove tags.
2. Position clamp (9) around center of capacitor C1 (4).
3. Attach capacitor C1 (4) to "L" bracket (8) using screw (5), washers (6) and nut (7).
4. Install control panel (3) in control box using twenty-four screws (1) and flat washers (2).





END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE CIRCUIT BREAKERS CB1 OR CB2

INITIAL SET-UP:

Tools:
Screwdriver, Cross Tip, #2
(WP 0113 00, Item 1)
Combination Wrench, 1/2"
(WP 0113 00, Item 1)

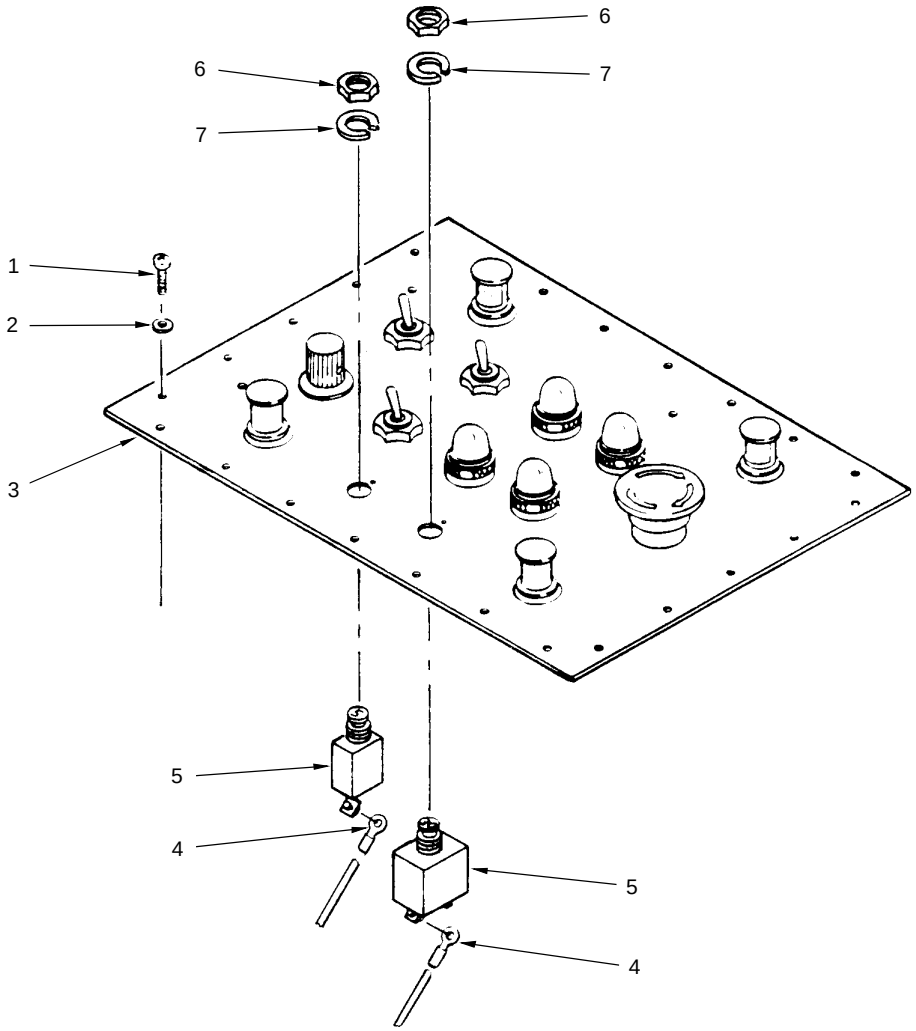
Materials/Parts Required:
Tags, Electrical (WP 0116 00, Item 29)

REMOVAL

1. Remove the twenty-four screws (1) and flat washers (2) that secure the control panel (3) to the control box.
2. Lift the control panel (3) from the control box and set on edge convenient to circuit breaker (5) to be replaced.
3. Tag and remove the leads (4) attached to the circuit breaker (5).
4. Remove the nut (6) and lock washer (7) that secure the circuit breaker (5) to the panel. Remove the circuit breaker (5).

INSTALLATION

1. Install circuit breaker (5) on control panel (3) with key fully engaged. Install and tighten nut (6) and washer (7).
2. Install leads (4) on circuit breaker (5) as tagged. Remove tags.
3. Install control panel (3) in control box with twenty-four screws (1) and flat washers (2).



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE RELAY K1

INITIAL SET-UP:

Tools:
Screwdriver, Cross Tip, #2
(WP 0113 00, Item 1)
Combination Wrench, 1/4"
(WP 0113 00, Item 1)
Combination Wrench, 3/16”
(WP 0113 00, Item 1)

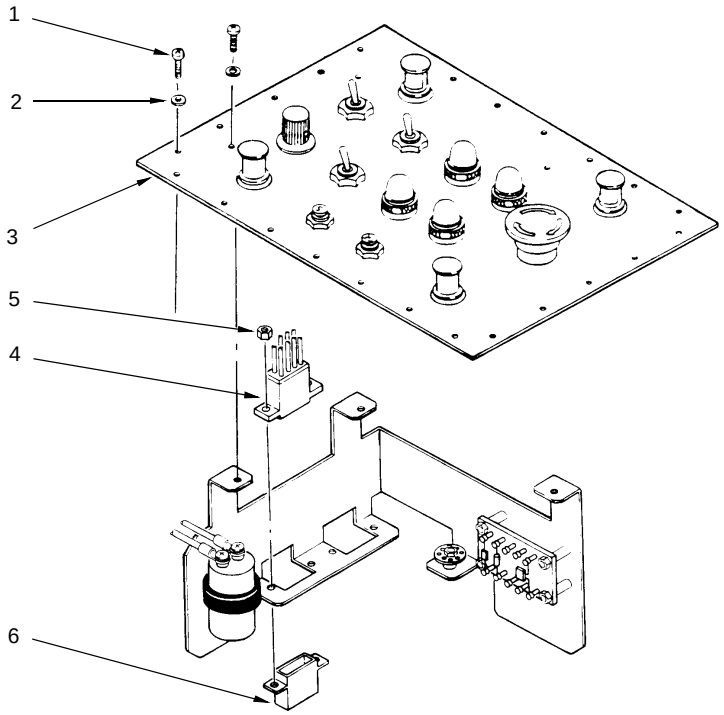
Materials/Parts Required:
Nut, Self-Locking (WP 0117 00, Item 89)

REMOVAL

1. Remove twenty-four screws (1) and flat washers (2) that secure the control panel (3) to the control box.
2. Lift the control panel (3) from the control box and set on edge convenient to relay K1 (4).
3. Remove the two self-locking nuts (5) and remove the K1 relay (4). Discard the self-locking nuts (5).

INSTALLATION

1. Install relay K1 (4) in socket (6) with two self-locking nuts (5). (Relay is keyed to fit one way only.)
2. Install control panel (3) in control box with twenty-four screws (1) and flat washers (2).



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE VOLTAGE REGULATOR

INITIAL SET-UP:

Tools:
Screwdriver, Cross Tip, #2
(WP 0113 00, Item 1)
Key, Socket Head Screw, 3/16”
(WP 0113 00, Item 1)

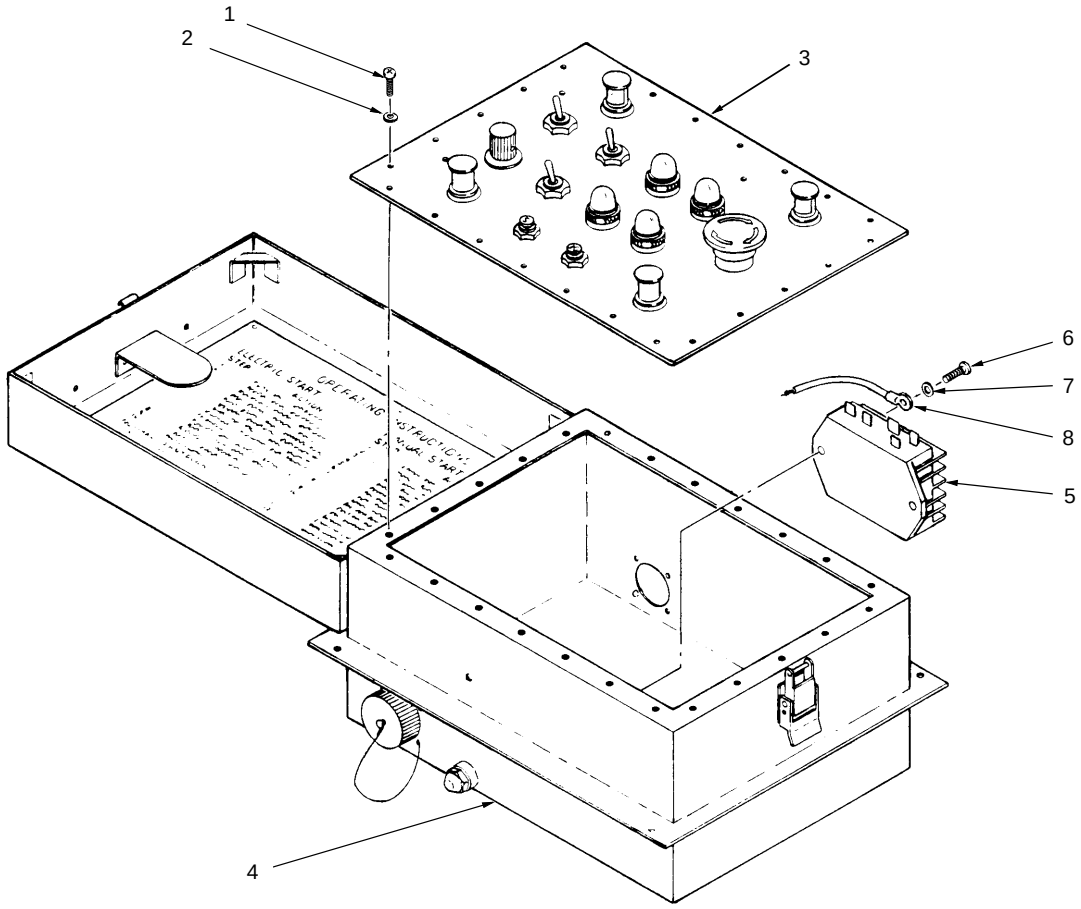
Materials/Parts Required:
Tags, Electrical (WP 0116 00, Item 29)

REMOVAL

1. Remove the twenty-four screws (1) and flat washers (2) that secure the control panel (3) to the control box (4).
2. Lift the control panel (3) from the control box (4) and set on edge clear of work area.
3. Tag all voltage regulator leads and remove from voltage regulator (5).
4. Remove the two socket head screws (6), flat washers (7) and ground wire (8). Remove the voltage regulator (5).

INSTALLATION

1. Install voltage regulator (5) and ground wire (8) in control box (4) with two socket head screws (6) and flat washers (7).
2. Install leads on voltage regulator (5) as tagged. Remove tags.
3. Install control panel (3) in control box (4) with twenty-four screws (1) and flat washers (2).



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE CONTROL BOX VOLTMETER

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics Automotive (WP 0113 00, Item 1)

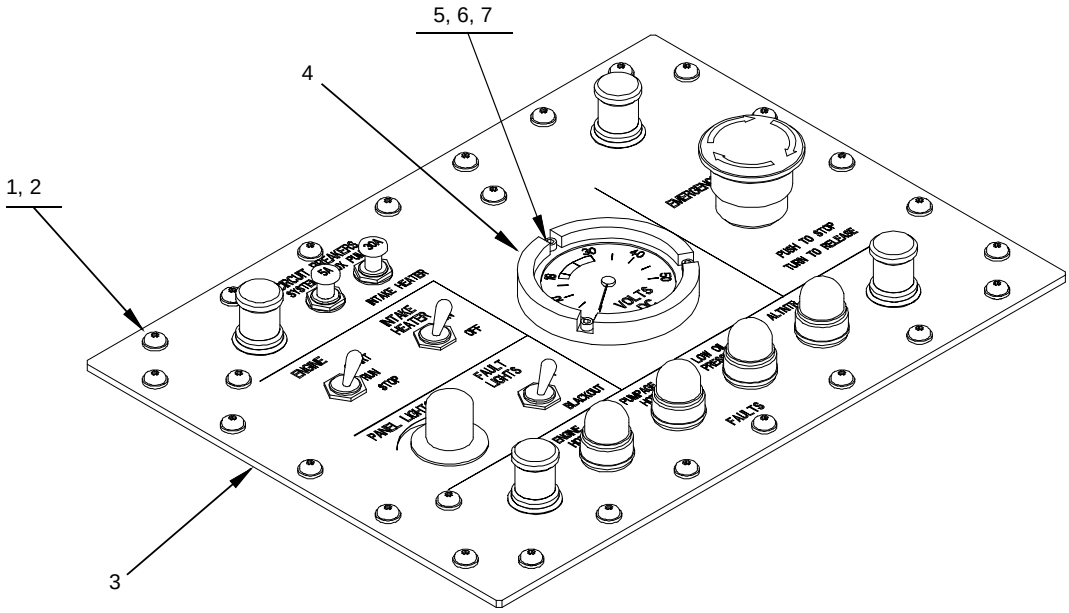
Materials/Parts Required:
Tags, Electrical (WP 0116 00, Item 29)

REMOVAL

1. Remove the twenty-four screws (1) and flat washers (2) that secure the control panel (3) to the control box.
2. Lift the control panel (3) from the control box and set on edge convenient to the voltmeter (4).
3. Tag all leads attached to the voltmeter (4).
4. Remove all leads from the voltmeter (4).
5. Remove screw (5), washer (6) and nut (7) attaching voltmeter to control panel.
6. Remove voltmeter (4) from control panel.

INSTALLATION

1. Using the new hardware supplied with the voltmeter (4), install voltmeter on control panel (3).
2. Install leads to voltmeter (4) as tagged. Remove tags.
3. Install control panel (3) in control box with twenty-four screws (1) and flat washers (2).



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE AUXILIARY PUMP

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive (WP 0113 00, Item 1)
Machinist's Vise (WP 0113 00, Item 2)
Wash Pan (WP 0113 00, Item 2)
Chemical and Oil Protective Gloves (WP 0113 00, Item 2)

Materials/Parts Required:
Rags, Wiping (WP 0116 00, Item 21)
Sealant, Thread, LH-150 (WP 0116 00, Item 24)
Tape, Teflon (WP 0116 00, Item 32)

Equipment Condition
Auxiliary pump module defueled

WARNING

Death or personal injury may result from the explosion of fuel fumes exposed to an open flame or spark, or to static discharge. Do not permit smoking, any open flame, or spark producing equipment within fifty (50) feet (15.24 m) of the auxiliary pump during repair.

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

NOTE

Even with the auxiliary pump module defueled, some residual fuel may remain due to normal drainage after defueling.

REMOVAL

1. Remove the four screws (1), nuts (2) and washers (3) that attach the power cable connector (4) and the dust cap lanyard (5) to the module frame (6).

2. Remove the two hex head bolts (7), lock washers (8) and flat washers (9) that attach the motor end of the pump assembly (10) to the frame (6).

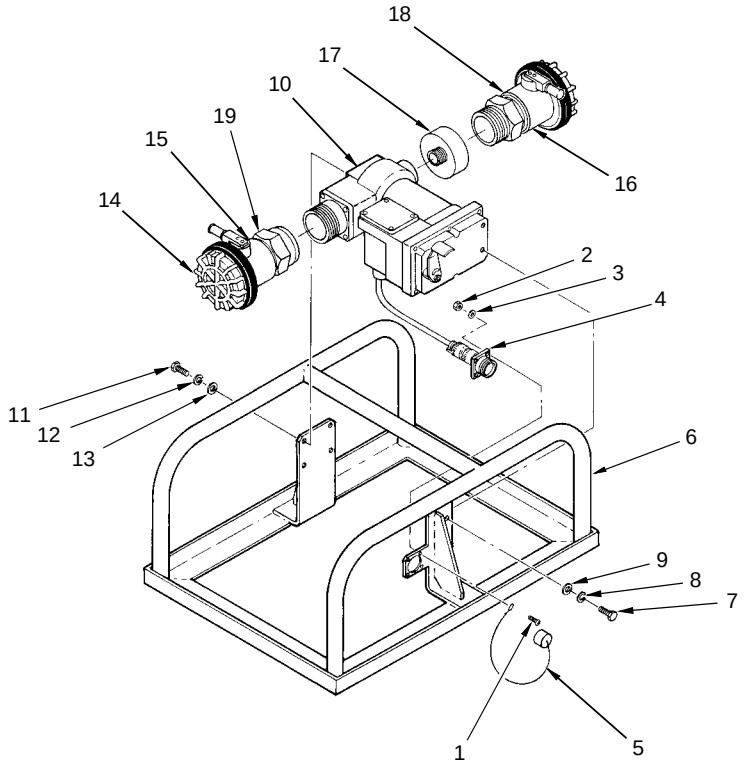
3. Support the pump assembly (10) and remove the four hex head bolts (11), lock washers (12) and flat washers (13) that attach the pump assembly end to the frame (6). Remove the pump assembly (10) from the frame (6). Install four bolts (11), washers (12 and 13) in the pump assembly (10).

4. Hold the pump assembly (10) over a wash pan, remove the dust cap (14) from one of the unisex couplings (15 or 16), open the unisex coupling valve and drain all residual fuel. Close the unisex coupling valve, install the dust cap (14) and repeat the procedure with the other unisex coupling (15 or 16).

5. Place the pump end of the pump assembly (10) in a vise.

6. Remove outlet reducer (17) and outlet coupling (18) as an assembly.

7. Remove the inlet unisex coupling (19) from the pump assembly (10).



INSTALLATION

WARNING

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

1. Clean the threads on the outlet reducer (17) and pump assembly (10) inlet coupling as required.

2. Place the pump end of the pump assembly (10) in a vise.

3. Wrap three or four complete layers of teflon tape on the threads of the pump inlet coupling (19). Apply a bead of thread sealant over the teflon tape and install and tighten the pump inlet coupling (19) on the pump assembly (10).

4. Wrap three or four complete layers of teflon tape on the threads of the outlet reducer (17). Apply a bead of thread sealant over the teflon tape and install and tighten the reducer/outlet coupling assembly on the pump assembly (10).

5. Remove the pump assembly (10) from the vise and remove four bolts (11), lock washers (12) and flat washers (13) from pump assembly (10), position pump assembly in the frame (6) and loosely install the four bolts (11), lock washers (12) and flat washers (13) that hold the pump end to the frame (6).

6. Install and tighten the two bolts (7), lock washers (8) and flat washers (9) that hold the motor end to the frame (6).

7. Tighten the four pump end bolts (11).

8. Use the four screws (1), nuts (2) and washers (3) to attach the power cable connector (4) to the module frame (6). Install the dust cap lanyard (5) to the upper left mounting screw (1).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
CLEAN AND REPLACE AUXILIARY PUMP INLET COMPONENTS

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive (WP 0113 00, Item 1)
Chemical and Oil Protective Gloves (WP 0113 00, Item 2)

Materials/Parts Required:
Gasket, Inlet Flange (WP 0117 00, Item 2)

Equipment Condition
Auxiliary pump module defueled

WARNING

Death or personal injury may result from the explosion of fuel fumes exposed to an open flame or spark, or to static discharge. Do not permit smoking, any open flame, or spark producing equipment within fifty (50) feet (15.24 m) of the auxiliary pump during repair.

NOTE

Even with the auxiliary pump defueled, some residual fuel may remain due to normal drainage after defueling.

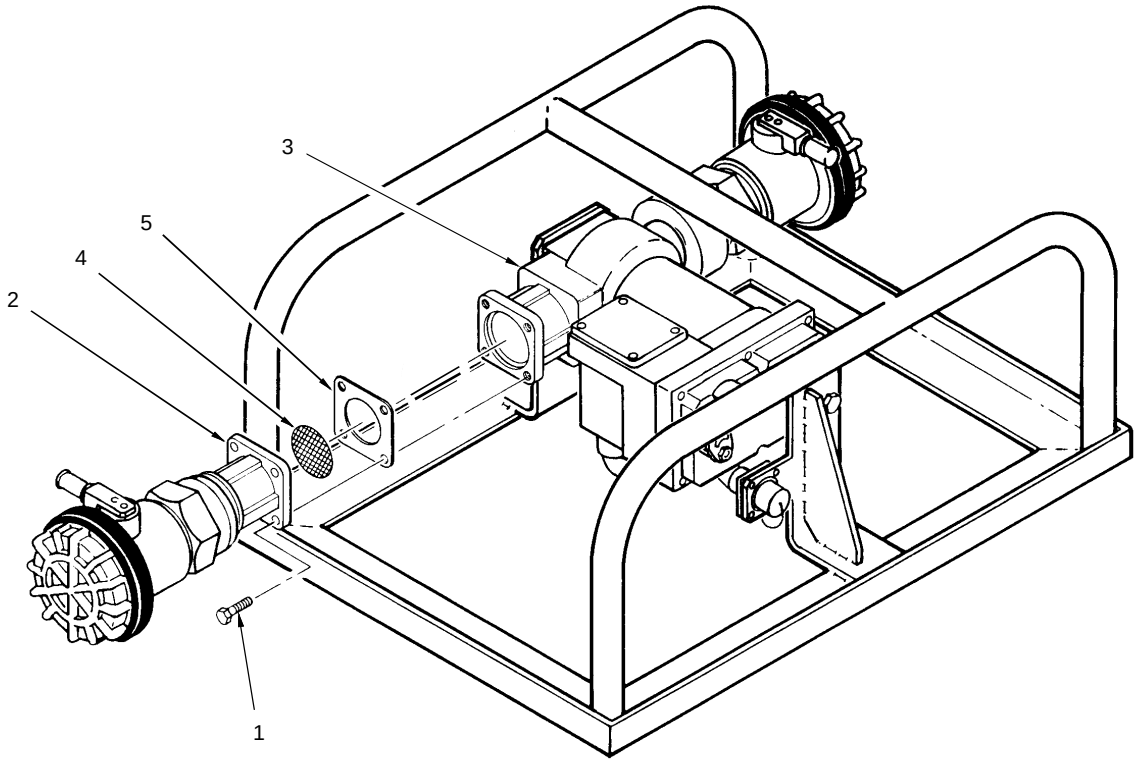
Inspect all components as they are disassembled. Repair is limited to replacement of unserviceable components discovered during disassembly.

DISASSEMBLY AND INSPECTION

1. Remove the four bolts (1) that attach inlet flange (2) to pump housing (3).
2. Remove and clean inlet screen (4).
3. Remove and discard inlet flange gasket (5).

ASSEMBLY

1. Position inlet flange gasket (5) on pump housing (3).
2. Position inlet screen (4) on pump housing (3).
3. Install inlet flange (2) on pump housing (3) using the four bolts (1).



END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE AUXILIARY PUMP ROTOR VANES

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive (WP 0113 00, Item 1)
Chemical and Oil Protective Gloves (WP 0113 00, Item 2)

Materials/Parts Required:
Gasket, Rotor Cover (WP 0117 00, Item 6)

Equipment Condition
Auxiliary pump module defueled

WARNING

Death or personal injury may result from the explosion of fuel fumes exposed to an open flame or spark, or to static discharge. Do not permit smoking, any open flame, or spark producing equipment within fifty (50) feet (15.24 m) of the auxiliary pump during repair.

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

NOTE

Even with the auxiliary pump defueled, some residual fuel may remain due to normal drainage after defueling.

Inspect all components as they are disassembled. Repair is limited to replacement of unserviceable components discovered during disassembly.

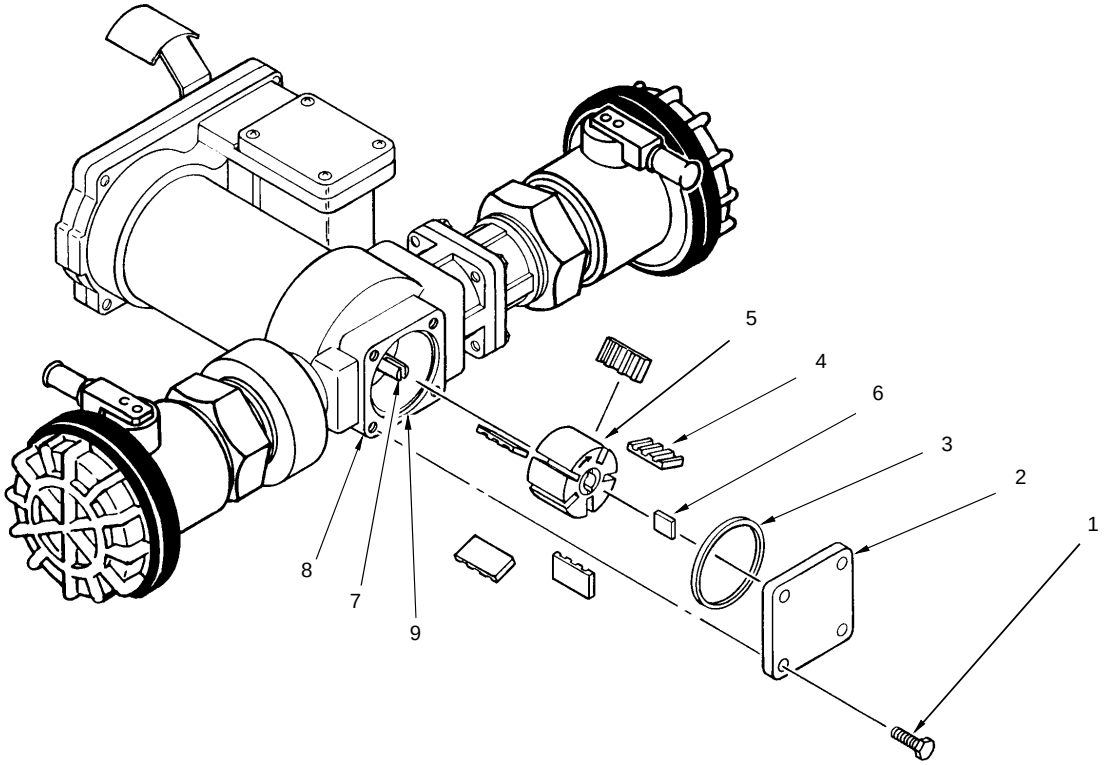
DISASSEMBLY AND INSPECTION

1. Remove auxiliary pump from module frame. (WP 0071 00)
2. Remove four bolts (1) that attach pump rotor cover (2). Remove cover (2).
3. Remove and discard rotor cover gasket (3).

NOTE

A new pump rotor vane is 7/16 in. high. Replace vane if height is 9/32 in. or less. A vane that does not make good contact with pump chamber will cause loss of suction.

4. Remove the five vanes (4) from rotor (5). Inspect vanes (4) for damage and wear.
5. Remove rotor key (6). Inspect for damage or deformation. Replace if damaged or deformed.
6. Remove rotor (5). Inspect for damage. Scratches will not affect the rotor; however, burrs should be removed.



ASSEMBLY

1. Slide rotor (5) on armature shaft over shaft seal assembly.
2. Align slots in rotor (5) with slot (7) on armature shaft. Install rotor key (6).
3. Install the five rotor vanes (4), with smooth side of vanes facing direction of rotor (5) rotation (clockwise).
4. Install rotor cover gasket (3) in pump housing (8) groove (9).
5. Position rotor cover (2) on pump housing (8). Install the four bolts (1) that attach pump rotor cover (2) to pump housing (8). Do not over tighten the four bolts (1).
6. Install auxiliary pump in pump frame. (WP 0071 00)

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPAIR AUXILIARY PUMP

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive (WP 0113 00, Item 1)
Chemical and Oil Protective Gloves (WP 0113 00, Item 2)

Materials/Parts Required:
Gasket, Inlet Flange (WP 0117 00, Item 2)
Shaft Seal Assembly (WP 0117 00, Item 7)

WARNING

Death or personal injury may result from the explosion of fuel fumes exposed to an open flame or spark, or to static discharge. Do not permit smoking, any open flame, or spark producing equipment within fifty (50) feet (15.24 m) of the auxiliary pump during repair.

NOTE

This procedure assumes that the auxiliary pump has been defueled. However, some residual fuel may remain due to normal drainage after defueling.

Inspect all components as they are disassembled. Repair is limited to replacement of unserviceable components discovered during disassembly.

PUMP DISASSEMBLY AND INSPECTION

WARNING

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

1. Remove four bolts (1) that attach pump rotor cover (2). Remove cover (2).
2. Remove rotor cover gasket (3) and inspect for damage. Replace if damaged.

NOTE

A new pump rotor vane is 7/16 in. high. Replace vane if height is 9/32 in. or less. A vane that does not make good contact with pump chamber will cause loss of suction.

3. Remove the five vanes (4) from rotor (5). Inspect vanes (4) for damage and wear.
4. Remove rotor key (6). Inspect for damage or deformation. Replace if damaged or deformed.
5. Remove rotor (5). Inspect for damage. Scratches will not affect the rotor; however, burrs should be removed.

PUMP DISASSEMBLY AND INSPECTION-Continued

NOTE

Carefully examine shaft seal assembly for signs of fluid leakage at the shaft weep hole. Note arrangement of components of the shaft seal assembly.

6. Remove snap ring (8) that secures shaft seal assembly (7) to armature shaft.
7. Remove shaft seal assembly (7), noting position of assembly components. Discard shaft seal assembly (7).
8. Inspect pump cavity for damage and foreign material. Clean cavity as required. Replace pump housing (9) if cavity wall is damaged.
9. Remove bypass valve cap (10). Inspect bypass valve cap gasket (11), replace if damaged.
10. Remove bypass spring (12) and bypass valve (13). Inspect bypass valve (13) seat for damage or deterioration. Replace bypass valve (13) if damaged or worn.
11. Clean bypass valve cavity of pump housing (9).
12. Remove the four bolts (14) that attach inlet flange (15) to pump housing (9).
13. Remove and discard inlet flange gasket (16).
14. Remove and clean inlet screen (17).

PUMP ASSEMBLY

WARNING

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

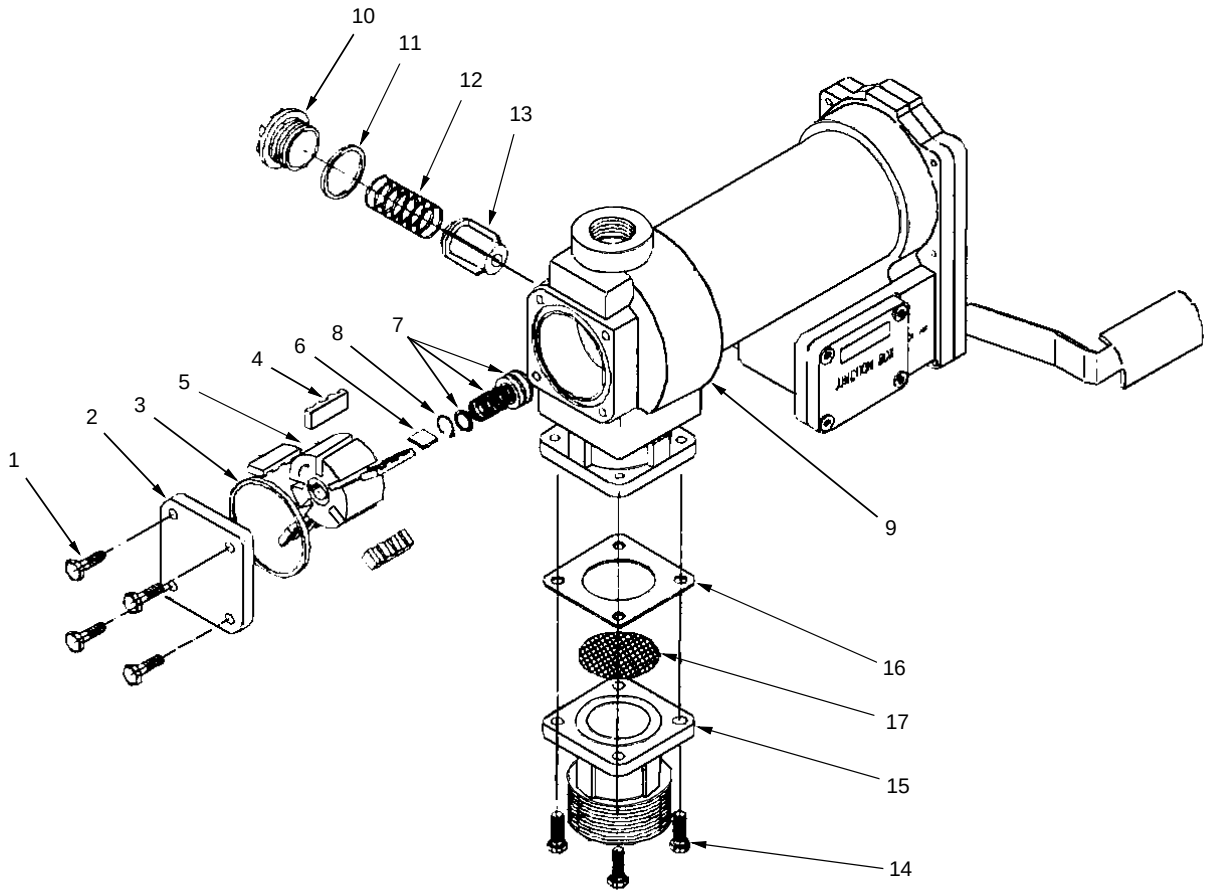
1. Position inlet flange gasket (16) on pump housing (9).
2. Position inlet screen (17) on pump housing (9).
3. Install inlet flange (15) on pump housing (9) using the four bolts (14).
4. Install bypass valve (13) in pump housing (9).
5. Install bypass spring (12) in pump housing (9).
6. Install bypass valve cap gasket (11) on bypass valve cap (10).
7. Install bypass valve cap (10) in pump housing (9).

CAUTION

Do not allow components of the shaft seal assembly or the snap ring to drop into pump cavity as components are installed.

8. Install shaft seal assembly (7) components on armature shaft in order of removal.

PUMP ASSEMBLY-Continued



9. Install snap ring (8) that secures shaft seal assembly (7) to armature shaft.

10. Slide rotor (5) on armature shaft over shaft seal assembly (7).

11. Align slots in rotor (5) with slot on armature shaft. Install rotor key (6).

12. Install the five rotor vanes (4), with smooth side of vanes facing direction of rotor (5) rotation (clockwise).

13. Install rotor cover gasket (3) in pump housing (9) groove.

14. Position rotor cover (2) on pump housing (9). Install the four bolts (1) that attach pump rotor cover (2) to pump housing (9). Do not over tighten the four bolts (1).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPAIR CCR NOZZLE ASSEMBLY

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive
(WP 0113 00, Item 1)
Vise (WP 0113 00, Item 2)
Chemical and Oil Protective Gloves
(WP 0113 00, Item 2)

Materials/Parts Required:
Compound, Sealing
(WP 0116 00, Item 9)
Compound, Silicone
(WP 0116 00, Item 11)
Dry Cleaning Solvent
(WP 0116 00, Item 13)

Materials/Parts Required:-Continued
Rags, Wiping (WP 0116 00, Item 21)
Seal (WP 0117 00, Item 16)
Packing, Preformed (WP 0117 00, Item 120)

Equipment Condition:
CCR Nozzle removed from fuel system.

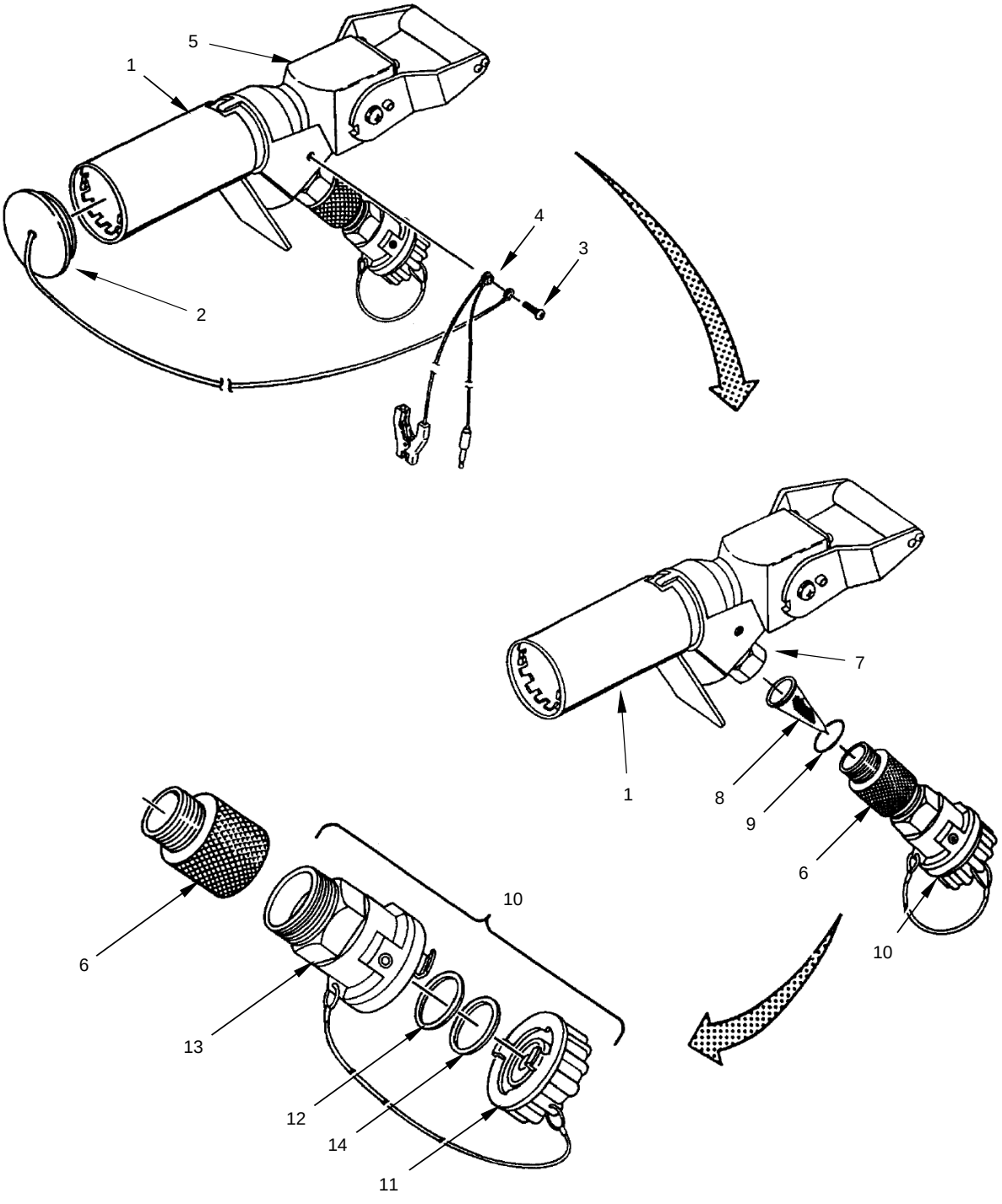
DISASSEMBLY

WARNING

Fuels are toxic and flammable. Do not get on person or clothing. Do not use near open flame. Area should be well-ventilated. Using drycleaning solvents incorrectly can cause injury or even death. Fuel is flammable. Do not smoke.

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

1. Pull the nozzle collar (1) back to release the cap (2) from the discharge end of the nozzle. Remove the cap (2).
2. Remove screw (3) holding the ground cable assembly (4) and cap assembly cable to the nozzle housing (5).
3. Remove strainer body (6) and attached coupling assembly (10) from strainer housing (7).
4. Remove strainer (8) and preformed packing (9) from strainer housing (7). Discard preformed packing (9).
5. Place strainer body (6) into a soft face vise.
6. Unscrew coupling assembly (10) from strainer body (6).
7. Remove dust cover (11) from coupling half (13).
8. Remove and discard seal (12) from coupling half (13).
9. Remove and discard seal (14) from dust cover (11).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INSPECTION

WARNING

Degreasing solvent MIL-PRF-680, Type III, used to clean parts, is potentially dangerous to personnel and property. Eye protection is required. Avoid repeated and prolonged skin contact by wearing rubber gloves 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. 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.

1. Clean parts with drycleaning solvent. Dry with clean wiping rag.
2. Inspect all parts for damage. Look for damaged threads, worn, scored, or deformed parts, cracks or corrosion.
3. Replace damaged or defective components.

ASSEMBLY

WARNING

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

1. Install seal (14) in dust cover (11).
2. Install seal (12) in coupling half (13).
3. Install dust cover (11) on coupling half (13).
4. Coat threads of coupling half (13) with sealing compound. Wipe off excess compound with clean, dry wiping rag.
5. Clamp strainer body (6) in a soft face vise and screw coupling assembly (10) into strainer body (6). Remove from vise.
6. Position strainer (8) in strainer housing (7).
7. Coat preformed packing (9) with silicone compound. Install packing over strainer and press into groove at end of strainer housing (7).
8. Screw strainer body (6) onto strainer housing (7) until hand tight.

NOTE

The two grounding cable lugs should be closest to the housing.

9. Install ground cable assembly (4) and cap assembly cable on the housing (5) with screw (3).
10. Push cap (2) onto collar (1).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE CCR NOZZLE UNISEX COUPLING

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive
(WP 0113 00, Item 1)
Chemical and Oil Protective Gloves
(WP 0113 00, Item 2)

Equipment Condition:
CCR Nozzle removed from fuel system.

Materials/Parts Required:
O-Ring (WP 0117 00, Item 103)
O-Ring (WP 0117 00, Item 121)
Petrolatum (WP 0116 00, Item 20)
Rags, Wiping (WP 0116 00, Item 21)

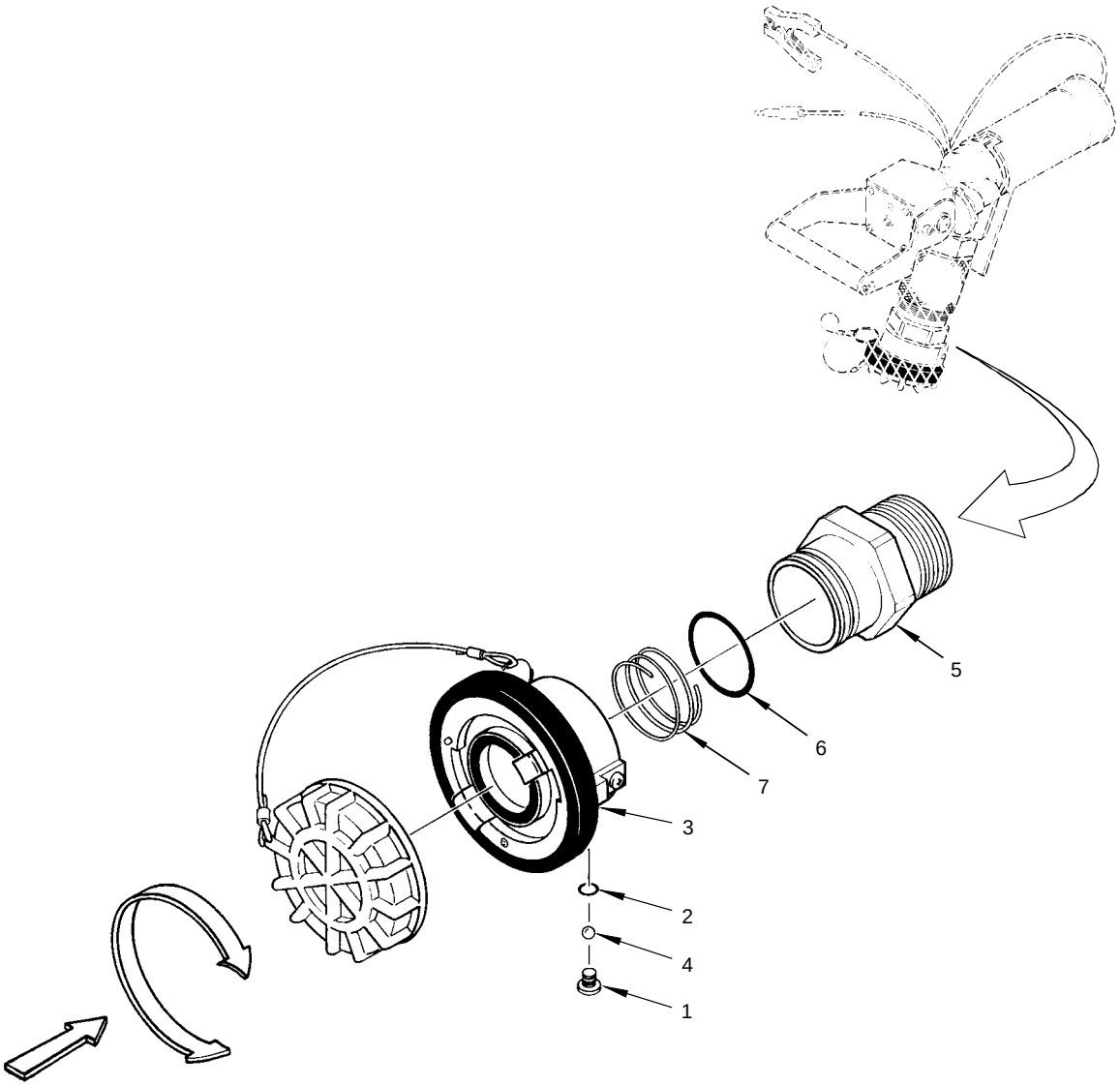
REMOVAL

WARNING

Fuels are toxic and flammable. Do not get on person or clothing. Do not use near open flame. Area should be well-ventilated. Using drycleaning solvents incorrectly can cause injury or even death. Fuel is flammable. Do not smoke.

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

1. Remove ball retaining screw (1) and O-Ring (2). Discard O-Ring (2).
2. Position a wiping rag under the coupling (3) with screw hole oriented toward wiping rag. Push in and rotate unisex coupling (3) back and forth until all 41 balls (4) have collected in the wiping rag.
3. Pull unisex coupling (3) from inlet (5).
4. Remove and discard O-Ring (6) from inlet (5).
5. Remove and retain spring (7) from unisex coupling.



INSTALLATION

NOTE

When inserting balls in unisex coupling ball race, use caution to avoid dropping loose balls. Work over a wiping rag.

1. Lightly lubricate inlet O-Ring (6) with petrolatum and install in second (square) groove of inlet (5).
2. Place spring (7) in unisex coupling.
3. Slide the unisex coupling (3) onto the inlet (5). Hold unit over a wiping rag with screw hole facing up and adjust position until ball race (rounded groove) is centered under screw hole. Install balls (4) one at a time, rotating unisex coupling back and forth until all 41 balls (4) have been inserted.
4. Install ball retaining screw (1) and O-Ring (2) in unisex coupling (3). Tighten retaining screw.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPAIR D1-NOZZLE TWO-INCH NON-VALVED UNISEX COUPLING

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive (WP 0113 00, Item 1)
Chemical and Oil Protective Gloves (WP 0113 00, Item 2)

Materials/Parts Required:
O-Ring (WP 0117 00, Item 103)
O-Ring (WP 0117 00, Item 121)
Petrolatum (WP 0116 00, Item 20)
Rags, Wiping (WP 0116 00, Item 21)

Equipment Condition:
D1-Nozzle removed from fuel system.

DISASSEMBLY AND INSPECTION

WARNING

Fuels are toxic and flammable. Do not get on person or clothing. Do not use near open flame. Area should be well ventilated. Using dry cleaning, solvents incorrectly can cause injury or even death. Fuel is flammable. Do not smoke.

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

NOTE

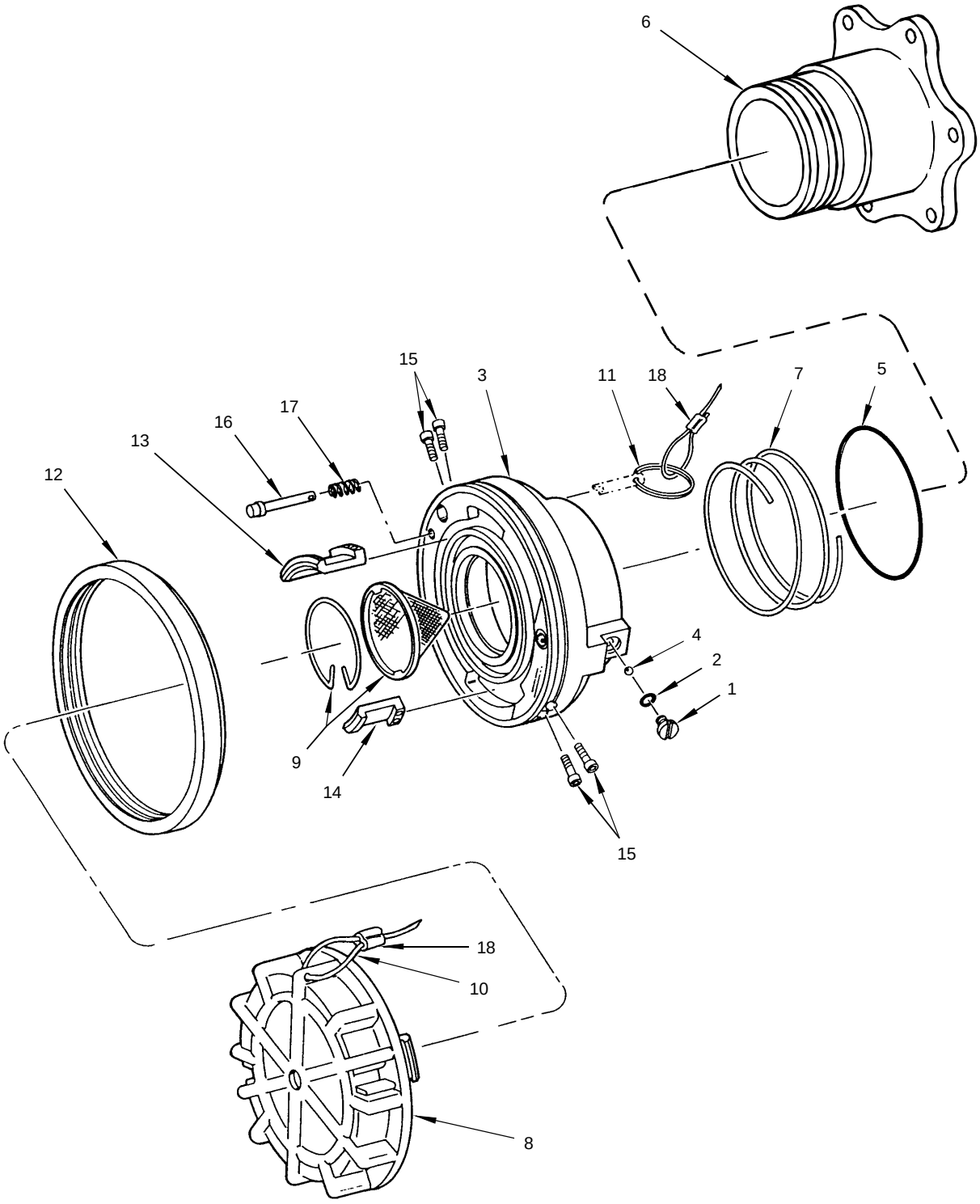
Inspect the coupling components as they are disassembled. Repair is limited to replacement of unserviceable components discovered during disassembly. Removed O-Ring shall be replaced.

1. Remove ball retaining screw (1) and O-Ring (2). Discard O-ring.
2. Hold unit over a suitable container with screw hole oriented toward container. Rotate 2-inch non-valved unisex coupling (3) back and forth until all 41 balls (4) have collected in the container.
3. Remove 2-inch non-valved unisex coupling (3) and O-Ring (5) from D-1 nozzle inlet adapter (6). Discard O-ring.
4. Remove spring (7) from 2-inch non-valved unisex coupling (3).
5. Remove dust cap (8) from 2-inch non-valved unisex coupling (3).
6. Remove screen assembly (9) from 2-inch non-valved unisex coupling (3).
7. If dust cap (8) or cable (10) is to be replaced cut cable (10) to remove.
8. Ring (11) attaching dust cap (8) to 2-inch non-valved unisex coupling (3) may be removed from the cable (10) by rotating it through the split portion of the ring (11).
9. Remove the bumper (12) only if it is to be replaced or the lugs (13 and/or 14) must be replaced.

DISASSEMBLY AND INSPECTION-Continued

10. Remove screws (15) to remove lugs (13 and/or 14).

11. Remove locking pin (16) and spring (17).



ASSEMBLY

NOTE

During assembly, apply a light coating of petrolatum to O-Rings before installation.

1. Install locking pin (16) and spring (17).
2. Install lugs (13 and/or 14) and screws (15).
3. Install bumper (12) with the thin lip seal end facing away from the 2-inch non-valved unisex coupling (3).
4. Attach cable (10) to dust cap (8) by looping about 6 inches of cable (10) through the hole in dust cap (8) forming a loop back on the cable (10). Install and crimp a sleeve (18) over the two sections of cable (10).
5. If cable (10) was cut, attach cable (10) to split ring (11) by looping about 6 inches of cable (10) through the split ring (11) forming a loop back on the cable (10). Install and crimp a sleeve (18) over the two sections of cable (10). If cable (10) was not cut, attach to split ring (11) by rotating split ring (11) through the cable (10) loop.
6. Install screen assembly (9) in 2-inch non-valved unisex coupling (3).
7. Install spring (7) in 2-inch non-valved unisex coupling (3).
8. Install dust cap (8) on 2-inch non-valved unisex coupling (3).
9. Install O-Ring (5) and 2-inch non-valved unisex coupling (3) on D-1 nozzle inlet adapter (6).

NOTE

When inserting balls in unisex coupling ball race, use caution to avoid dropping loose balls. Recommend working over a container.

10. Hold unit over a suitable container with screw hole facing up and adjust position until ball race (rounded groove) is centered under ball retaining screw (1) hole. Install balls (4) one at a time, rotating 2-inch non-valved unisex coupling back and forth until all 41 balls (4) have been inserted.
11. Install O-Ring (2) and ball retaining screw (1) in 2-inch non-valved unisex coupling (3). Tighten ball retaining screw (1).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE D1-NOZZLE BONDING CABLE ASSEMBLY

INITIAL SET-UP:

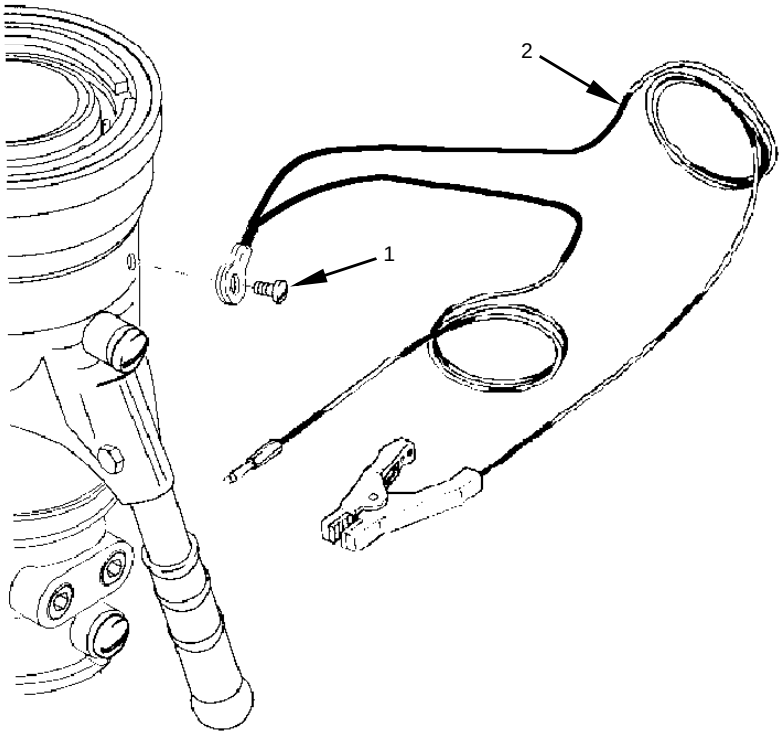
Tools:
Tool Kit, General Mechanic Automotive
(WP 0113 00, Item 1)

Equipment Condition:
D1-Nozzle removed from fuel system.

Materials/Parts Required:
None

REMOVE

Remove screw (1) and bonding cable assembly (2).



INSTALLATION

Install bonding cable assembly (2) using screw (1).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE D1-NOZZLE HANDLE ASSEMBLY

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive
(WP 0113 00, Item 1)

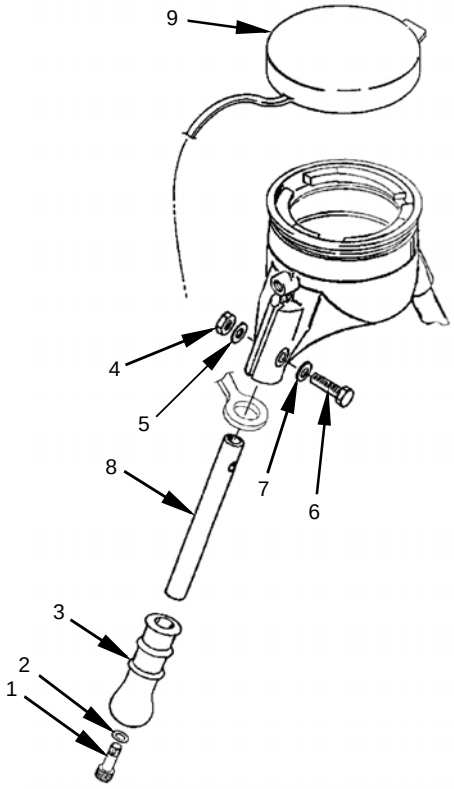
Equipment Condition:
D1-Nozzle removed from fuel system.

Materials/Parts Required:
Capscrews (WP 0117 00, Item 86)
Self locking nut (WP 0117 00, Item 88)

DISASSEMBLY

1. Remove capscrew (1), washer (2), and grip (3). Discard capscrew (1).

2. Remove self locking nut (4), flat washer (5), screw (6), flat washer (7), handle (8), and cover (9). Discard self locking nut.



ASSEMBLY

1 Slip cover (9) onto handle (8).

2. Install handle (8), flat washer (7), screw (6), flat washer (5), and new self locking nut (4).

3. Install grip (3), washer (2), and capscrew (1).

END OF WORK PAGAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE D1-NOZZLE HOSE END REGULATOR

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive (WP 0113 00, Item 1)
Chemical and Oil protective gloves (WP 0113 00, Item 2)

Materials/Parts Required:
Petrolatum (WP 0116 00, Item 20)
Rags, Wiping (WP 0116 00, Item 21)
Seal (WP 0117 00, Item 11)

Materials/Parts Required:-Continued
O-Ring (WP 0117 00, Item 72)
O-Ring (WP 0117 00, Item 78)
O-Ring (WP 0117 00, Item 99)

Equipment Condition:
D1 Nozzle removed from fuel system.

REMOVAL

WARNING

Death or personal injury may result from explosion of fuel fumes exposed to an open flame or spark or to static discharge. Do not permit smoking, any open flame or spark producing equipment within fifty feet of the repair location.

Rubber gloves should be worn when handling nozzle parts due to toxic effects of some fuel additives.

NOTE

Disassemble equipment only to the extent necessary for repair.

1. Remove D1 inlet elbow from the hose end regulator.

   a. Remove screw (1) and O-ring (2). Discard O-ring (2).

NOTE

To prevent loss of balls, place a suitable container under hose end regulator opening.

   b. Hold the hose end regulator (3) with the screw hole pointed down to allow 39 balls (4) to fall out.

   c. Rotate the hose end regulator (3) back and forth allowing all balls (4) to fall out.

   d. Separate the inlet elbow (5) and the hose end regulator (3).

   e. O-ring (6) and seal (7) should only be removed if damaged. If removed replace both during assembly. Remove O-ring (6), seal (7) and O-ring (8) from inlet elbow (5) and discard O-rings and seal.

REMOVAL-Continued

2. Remove hose end regulator from nozzle body.

   a. Remove screw (9) and O-ring (10). Discard O-ring (10).

NOTE

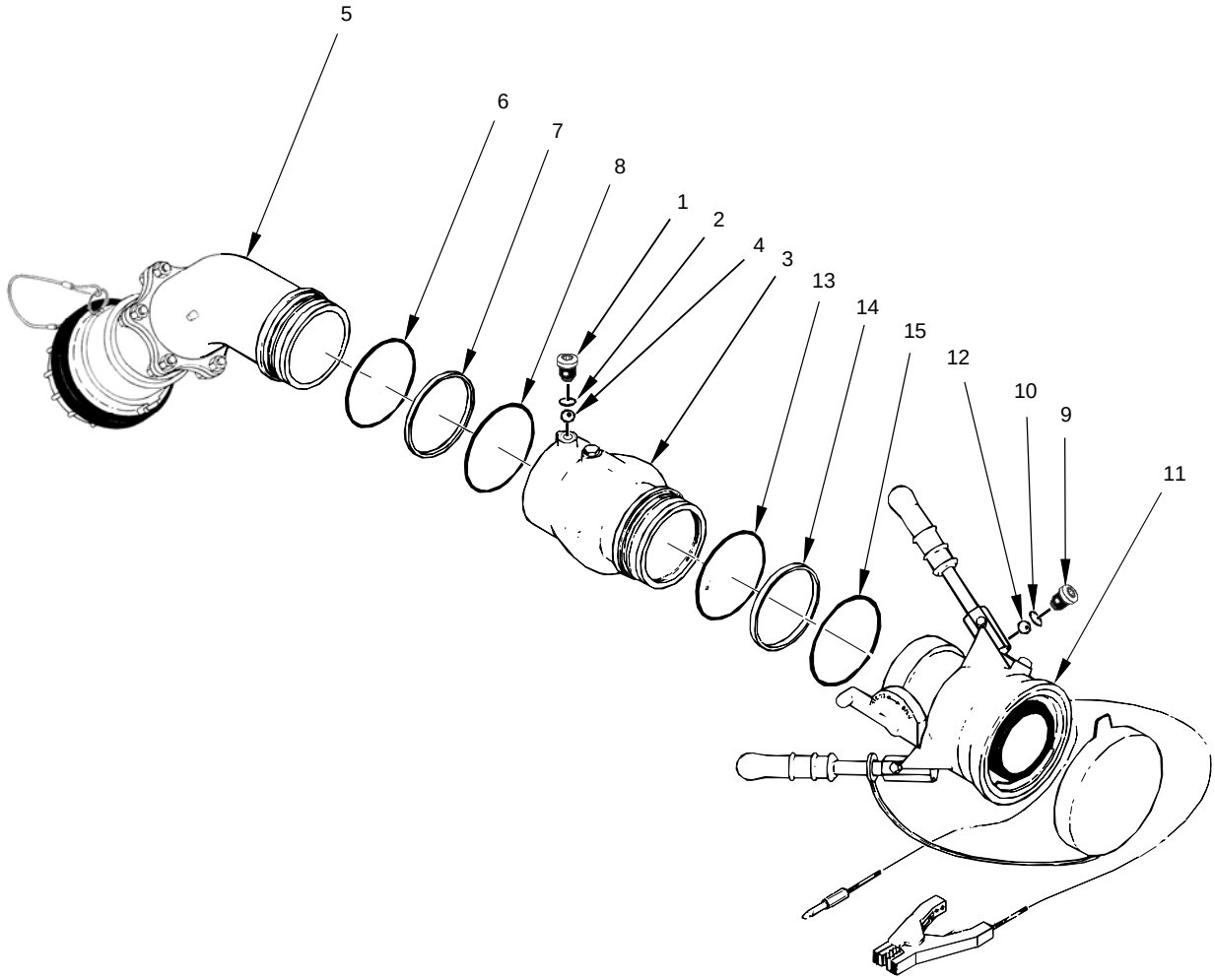
To prevent loss of balls, place a suitable container under nozzle body opening.

   b. Hold the nozzle body (11) with the screw hole pointed down to allow 39 balls (12) to fall out.

   c. Rotate the nozzle body (11) back and forth allowing all balls (12) to fall out.

   d. Separate the nozzle body (11) and the hose end regulator (3).

   e. O-ring (13) and seal (14) should only be removed if damaged. If removed, replace both during assembly. Remove O-ring (13), seal (14) and O-ring (15) from hose end regulator (3) and discard O-rings and seal.



INSTALLATION

1. Attach D1 inlet elbow on hose end regulator.

    a. If removed, install O-ring (6), seal (7) and O-ring (8) on inlet elbow (5).

    b. Attach and hold together the inlet elbow (5) and the hose end regulator (3).

NOTE

To prevent loss of balls, place a suitable container under hose end regulator opening.

    c. Rotate the hose end regulator (3) and inlet elbow (5) back and forth allowing all 39 balls (12) to fall into the groove as they are dropped in the hose end regulator (3).

    d. When all balls (4) are installed, position O-ring (2) and install screw (1).

2. Attach hose end regulator to nozzle body.

    a. If removed, install O-ring (13), seal (14) and O-ring (15) in hose end regulator (3).

    b. Attach and hold together the nozzle body (11) and the hose end regulator (3).

NOTE

To prevent loss of balls place a suitable container under nozzle body opening.

    c. Rotate the nozzle body (11) and hose end regulator (3) back and forth allowing all 39 balls (12) to fall into the groove as they are dropped in the nozzle body (11).

    d. When all balls (12) are installed, position O-ring (10) and install screw (9).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPAIR FUEL DRUM ADAPTER ASSEMBLY

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive
(WP 0113 00, Item 1)
Spring Retainer Wrench
(WP 0113 00, Item 10)

Equipment Condition:
Fuel Drum Drained

Materials/Parts Required:
Gasket (WP 0117 00, Item 8)
Anti-seize Compound (WP 0116 00, Item 5)

DISASSEMBLY

1. Remove dust cap (1) and adapter assembly (2) from fuel drum.

WARNING

Spring retainer is under spring pressure. Maintain pressure on the wrench to prevent sudden separation. Use care in disassembly to avoid serious injury to personnel and equipment.

2. Unscrew and remove spring retainer (3), spring (4) and spring housing (5) using spring retainer wrench. Turn counterclockwise to remove spring retainer (3).

3. Remove pin guide (6), washer (7), and gasket (8) from spring housing (5). Discard gasket.

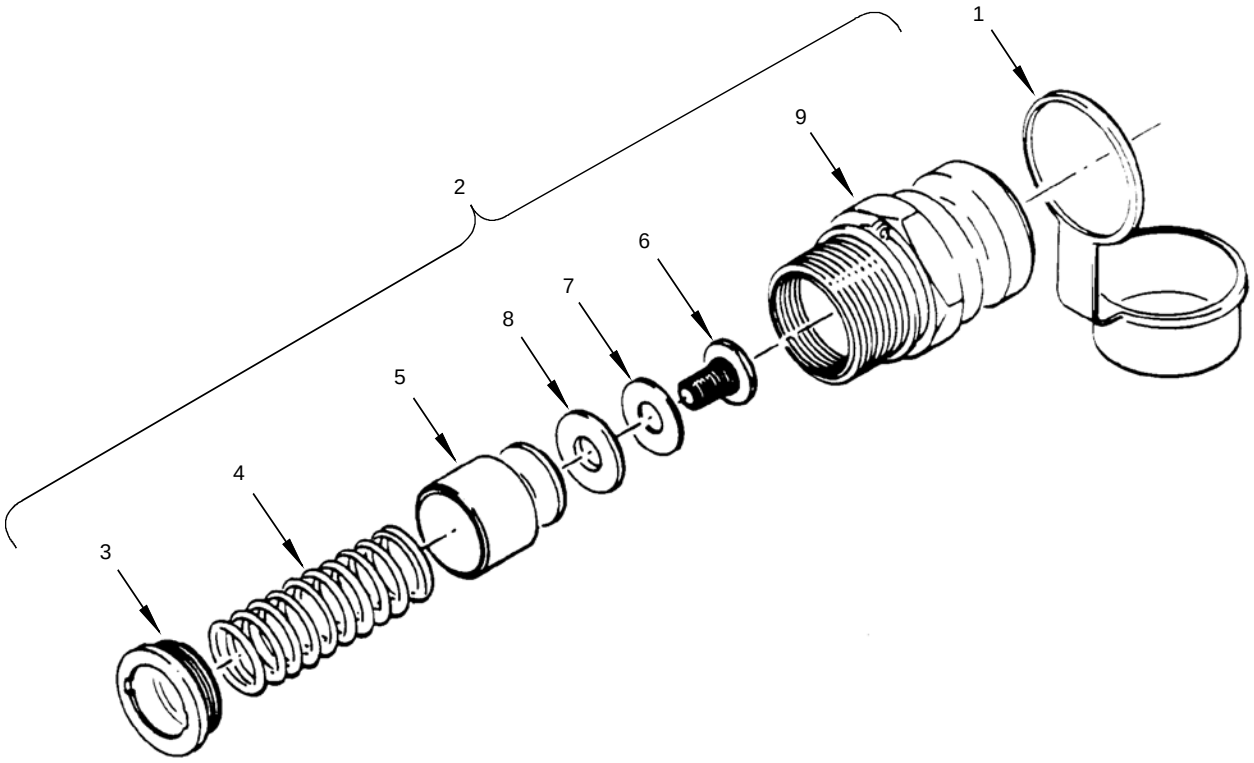
4. If necessary, pull dust cap (1) free from the adapter body (9).

INSPECTION

1. Inspect parts for signs of damage or defects.

2. Replace any unserviceable parts.

3. Replace all gaskets.



ASSEMBLY

1. If removed, install dust cap (1) on adapter body (9).
2. Install gasket (8) and washer (7) using pin guide (6) on spring housing (5).
3. Insert spring (4) in spring housing (5) and install spring retainer (3) using spring retainer wrench. Turn clockwise to install spring retainer.

NOTE

Apply firm pressure as required when installing the assembled spring housing into the adapter body.

4. Insert assembled spring housing into the adapter body (9) and install spring retainer (3) .
5. Apply a coating of anti-seize compound to threads of adapter assembly (2).
6. Install the adapter assembly (2) to drum.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPAIR TOWING YOKE

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive
(WP 0113 00, Item 1)

Materials/Parts Required:
Dry Cleaning Solvent
(WP 0116 00, Item 14)

DISASSEMBLY

WARNING

Dry cleaning solvent P-D-680, used to clean parts is potentially dangerous to personnel and property. Use in a well ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100° F - 138° F (38° C - 59° C).

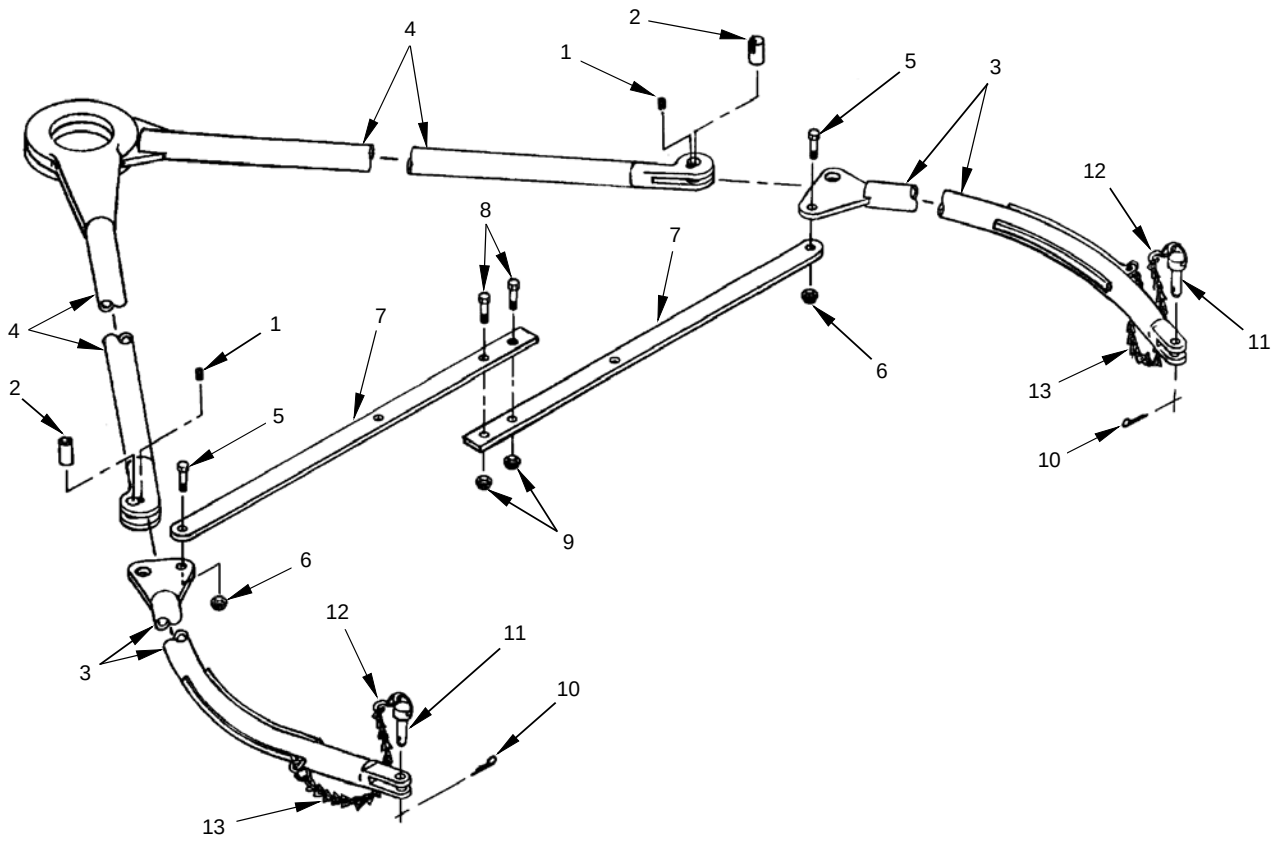
NOTE

Perform disassembly one leg at a time.

1. Wash the towing and lifting yoke with dry cleaning solvent to remove foreign matter.
2. Remove setscrews (1) and pins (2) and separate connecting legs (3) from upper legs (4).
3. Remove screws (5) and nuts (6) and separate the two braces (7) from the connecting legs (3).
4. If necessary, separate the two braces (7) by removing the capscrews (8) and nuts (9).
5. Pull cotter pins (10) and remove clevis pins (11), hooks and key rings (12), and chains (13) from connecting legs.

INSPECTION

1. Inspect connecting legs (3) and upper legs (4) for breaks, cracks or bends.
2. Inspect chains (13), pins (2, 10, and 11) and hooks and key ring (12) for damage or missing parts.
3. Inspect the two braces (7) for breaks, bends, or cracks.
4. Using the proper tools, straighten any bent legs or braces. Replace any leg or brace that is damaged beyond repair.
5. If either chain is damaged, cut a new one approximately 6 inches (15 cm) or 10 links in length from bulk chain (NSN 4010-00-567-2325).
6. Replace any remaining parts that are damaged or defective.



ASSEMBLY

NOTE

Perform assembly one leg at a time.

1. Attach chains (13), hooks and key rings (12), and clevis pins (11) to connecting legs (3) and secure with cotter pin (10).
2. Connect the two braces (7) and install capscrews (8) and nuts (9).
3. Connect the two braces (7) to the connecting legs (3) and secure with screws (5) and nuts (6).
4. Attach the upper legs (4) to the connecting legs (3) with pins (2) and setscrews (1).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPAIR PRESSURE CONTROL

DIAPHRAGM VALVE REMOVAL AND DISASSEMBLY (Refer to figure 1.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive
(WP 0113 00, Item 1)
Shop Equipment, Automotive Maintenance and
Repair: Organizational Maintenance Common No. 1
(WP 0113 00, Item 2)

Materials/Parts Required:
Rags, Wiping (WP 0116 00, Item 21)

1. Remove the plug (1) from the cover (2), position pressure control over a drip pan and drain residual fuel from cover (2).
2. Hold down the cover (2) firmly to prevent spring action and remove nuts (3) from studs (4). Gradually release pressure on cover and remove cover from studs.
3. Unscrew and remove guide shaft (5) from cover (2).
4. Remove spring (6) from pressure control. Carefully lift diaphragm valve (10) from pressure control, taking care not to damage diaphragm on cover mounting studs (4).
5. Remove nut (7) from machine screw (8).
6. Remove large washer (9), diaphragm (10), poppet (11), disk (12), spacer (13), and small washer (14) from machine screw (8).

DIAPHRAGM VALVE CLEANING, INSPECTION AND REPAIR (Refer to figure 1.)

INITIAL SET-UP:

Tools:
None

Materials/Parts Required:
Wiping Rag (WP 0116 00, Item 21)

1. Wash all metal parts in a hot, mild commercially available soap and water solution. Dry parts with clean rag.
2. Inspect machine screw (8) and guide shaft (5) to determine if bent, cracked, broken, burred or have stripped threads.
3. Inspect nut (7) for stripped threads or a burred surface.
4. Inspect diaphragm (10) and disk (12) to determine if cut or deteriorated.
5. Inspect spring (6) to determine if broken or collapsed.
6. Inspect poppet (11), spacer (13) washers (9 and 14) and disk (12) to determine if cracked or burred.
7. Replace parts that are damaged or defective as authorized.

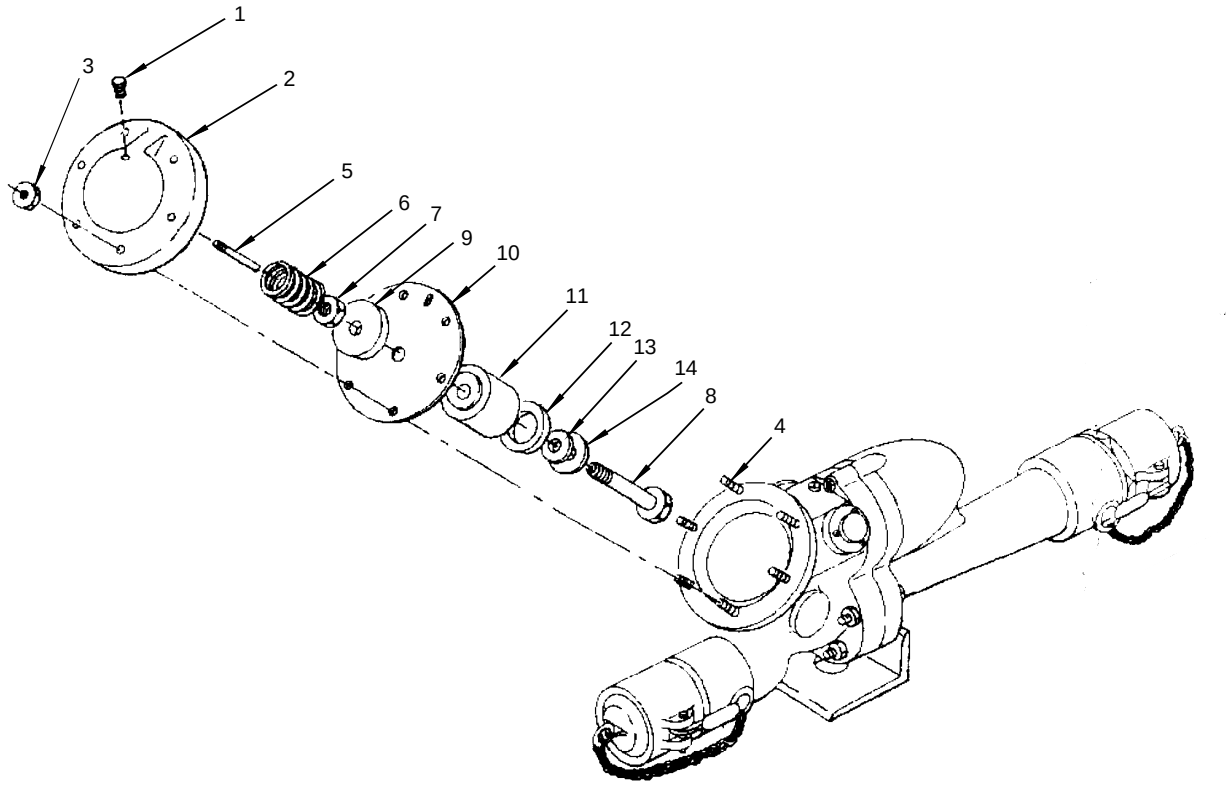


Figure 1. Pressure Control Diaphragm Valve

DIAPHRAGM VALVE ASSEMBLY (Refer to figure 1.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive
(WP 0113 00, Item 1)

Materials/Parts Required:
None

1. Place small washer (14), spacer (13), disk (12) and poppet (11) on machine screw (8).
2. Place diaphragm (10) on machine screw (8).
3. Place large washer (9) on machine screw (8) with raised side against diaphragm (10). Install nut (7) on machine screw (8) and tighten securely. To avoid damage to diaphragm (10), do not overtighten nut (7).
4. Align holes in diaphragm with studs (4) and place diaphragm (10) on pressure control.
5. Screw guide shaft (5) into cover (2).
6. Place spring (6) over diaphragm valve (10).

NOTE

Assure guide shaft is in hole in machine screw.

7. Align notch in cover (2) with hole in flanged area of pressure control body and place cover (2) on pressure control.
8. Install nuts (3) on studs (4) and tighten nuts in crossing pattern to 20 foot-pounds (2.77 m-kg) torque.
9. Insert plug (1) in cover.

STOP CYCLING VALVE ASSEMBLY REMOVAL AND DISASSEMBLY (Refer to figure 2.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive (WP 0113 00, Item 1)
Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance Common No. 1 (WP 0113 00, Item 2)

Materials/Parts Required:
Wiping Rag (WP 0116 00, Item 21)

1. Hold ring (1) in place and remove capscrews (2).
2. Remove ring and cover (3) from pressure control.
3. Grasp button (4) and twist and pull until cycling valve assembly is removed from pressure control.
4. Invert pressure control over drip pan and drain all residual fuel.
5. Remove O-rings (5) from valve body (6). Discard O-rings.
6. Apply pressure on spring (7) with washer (8) and remove retaining ring (9) from valve body (6).
7. Remove retaining ring (10) from cycling valve stem (11) and remove valve body (6) from cycling valve stem (11).
8. Remove washer (8) and spring (7) from cycling valve stem (11).
9. Remove O-rings (12) from cycling valve stem (11). Discard O-rings.
10. Remove setscrew (13) from button (4), and remove button (4) from cycling valve assembly.

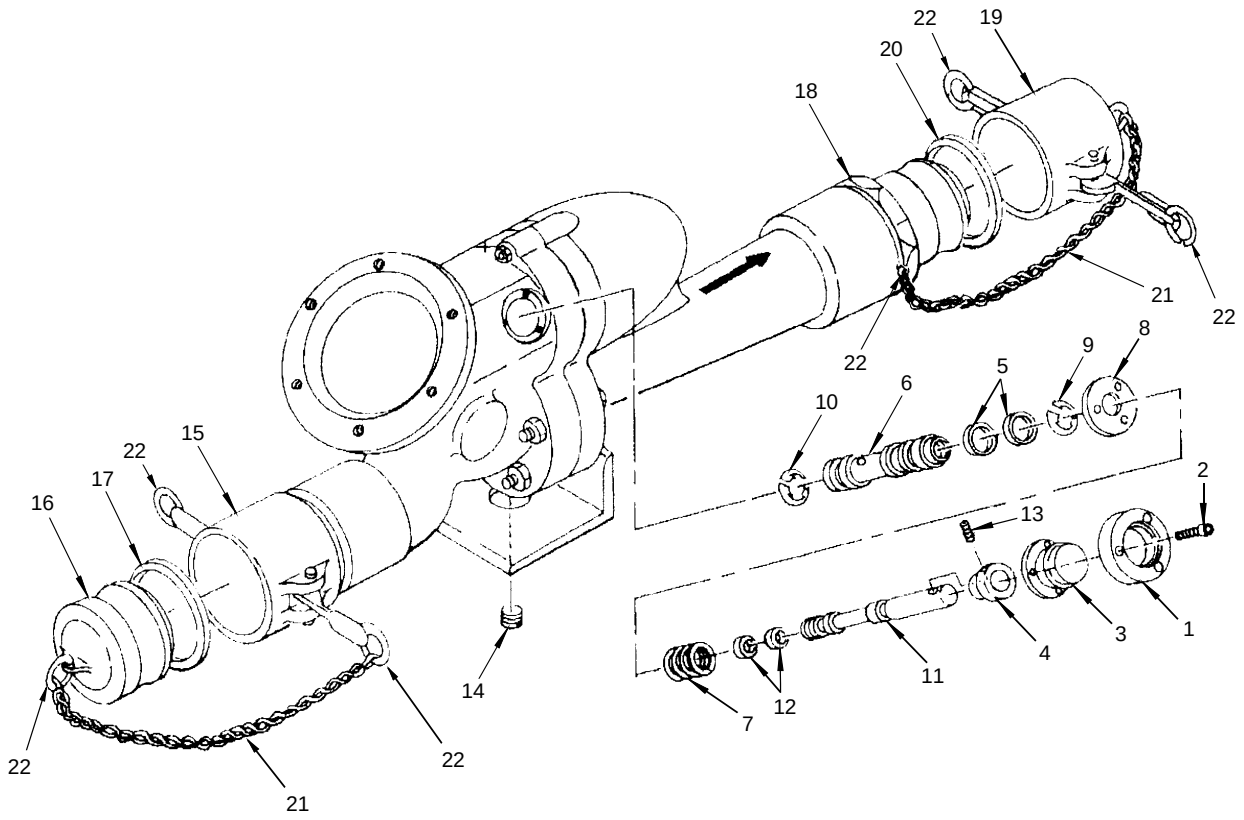


Figure 2. Pressure Control Cycling Valve

STOP CYCLING VALVE ASSEMBLY CLEANING, REPAIR, REASSEMBLY AND INSTALLATION

(Refer to figure 2.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive (WP 0113 00, Item 1)
Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance Common No. 1 (WP 0113 00, Item 2)

Materials/Parts Required:
Silicone Compound (WP 0116, Item 12)
Wiping Rag (WP 0116 00, Item 21)
Retaining Ring (WP 0117, Item 83)
Retaining Ring (WP 0117, Item 84)
O-Ring (WP 0117 00, Item 101)
O-Ring (WP 0117 00, Item 105)
Petrolatum (WP 0116, Item 20)

1. Wash all metal parts in a hot, mild commercially available soap and water solution. Dry parts with clean rag.

2. Inspect ring (1), valve body (6), washer (8), cycling valve stem (11) and button (4) to determine if chipped or burred. Ensure threads on setscrew (13) and in button (4) and cycling valve stem (11) are not stripped.

3. Inspect spring (7) to determine if broken or collapsed.

4. Inspect cover (3) to determine if cut or deteriorated.

5. Replace all O-rings and retaining rings with new O-rings coated with silicone compound and new retaining rings.

6. Replace parts that are damaged or defective as authorized.

NOTE

Apply light coat of petrolatum to all O-ring and other contacting surfaces.

7. Coat O-rings with silicone compound. Install O-rings (12) on cycling valve stem (11) and O-rings (5) on valve body (6).

8. Install retaining ring (9) on valve body (6) with the convex side towards the washer (8).

9. Place spring (7), washer (8) and valve body (6) on the cycling valve stem (11).

10. Place button (4) on cycling valve stem (11) and align hole in button with hole in cycling valve stem (11).

11. Install setscrew (13) in button (4) and cycling valve stem (11).

12. Hold valve body (6), and apply pressure on spring (7) with washer (8) until valve body (6) is on cycling valve stem (11).

13. Install retaining ring (10) on cycling valve stem (11) to hold valve body (6) in place.

CAUTION

Do not apply excess pressure on cycling valve while installing as action could damage exposed O-rings.

14. Place assembled cycling valve in the pressure control and adjust cycling valve assembly to align holes in washer (8) with mounting holes in pressure control.

15. Install cover (3) over cycling valve assembly, aligning mounting holes with mounting holes in pressure control body.

16. Place ring (1) over cycling valve assembly and align ring holes with mounting holes in pressure control body.

17. Install capscrews (2) through ring (1) and tighten securely.

FILL CYCLING VALVE ASSEMBLY REMOVAL AND DISASSEMBLY (Refer to figure 2.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive
(WP 0113 00, Item 1)
Shop Equipment, Automotive Maintenance and
Repair: Organizational Maintenance Common No. 1
(WP 0113 00, Item 2)

Materials/Parts Required:
Wiping Rag (WP 0116 00, Item 21)

1. Hold ring (1) in place and remove capscrews (2).
2. Remove ring and cover (3) from pressure control.
3. Grasp button (4) and twist and pull until cycling valve assembly is removed from pressure control.
4. Invert pressure control over drip pan and drain all residual fuel..
5. Remove O-rings (5) from valve body (6). Discard O-rings.
6. Apply pressure on spring (7) with washer (8) and remove retaining ring (9) from valve body (6).
7. Remove retaining ring (10) from cycling valve stem (11) and remove valve body (6) from cycling valve stem (11).
8. Remove washer (8) and spring (7) from cycling valve stem (11).
9. Remove O-rings (12) from cycling valve stem (11). Discard O-rings.
10. Remove setscrew (13) from button (4), and remove button (4) from cycling valve assembly.

FILL CYCLING VALVE ASSEMBLY CLEANING, REPAIR AND INSTALLATION (Refer to figure 2.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive
(WP 0113 00, Item 1)
Shop Equipment, Automotive Maintenance and
Repair: Organizational Maintenance Common No. 1
(WP 0113 00, Item 2)

Materials/Parts Required:
Silicone Compound (WP 0116, Item 12)
Wiping Rag (WP 0116 00, Item 21)
Retaining Ring (WP 0117, Item 83)
Retaining Ring (WP 0117, Item 84)
O-Ring (WP 0117 00, Item 101)
O-Ring (WP 0117 00, Item 105)

1. Wash all metal parts in a hot, mild commercially available soap and water solution. Dry parts with clean rag.
2. Inspect ring (1), valve body (6), washer (8), cycling valve stem (11) and button (4) to determine if chipped or burred. Ensure threads on setscrew (13) and in button (4) and cycling valve stem (11) are not stripped.
3. Inspect spring (7) to determine if broken or collapsed.

4. Inspect cover (3) to determine if cut or deteriorated.
5. Replace all O-rings and retaining rings with new O-rings coated with silicone compound and new retaining rings.
6. Replace parts that are damaged or defective as authorized.

NOTE

Apply light coat of petrolatum to all O-ring and other contacting surfaces.

7. Coat O-rings with silicone compound. Install O-rings (12) on cycling valve stem (11) and O-rings (5) on valve body (6).
8. Install retaining ring (9) on valve body (6) with the convex side towards the washer (8).
9. Place spring (7), washer (8) and valve body (6) on the cycling valve stem (11).
10. Place button (4) on cycling valve stem (11) and align hole in button with hole in cycling valve stem (11).
11. Install setscrew (13) in button (4) and cycling valve stem (11).
12. Hold valve body (6), and apply pressure on spring (7) with washer (8) until valve body is on cycling valve stem (11).
13. Install retaining ring (10) on cycling valve stem (11) to hold valve body (6) in place.

CAUTION

Do not apply excess pressure on cycling valve while installing as action could damage exposed O-rings.

14. Place assembled cycling valve in the pressure control and adjust cycling valve assembly to align holes in washer (8) with mounting holes in pressure control.
15. Install cover (3) over cycling valve assembly, aligning mounting holes with mounting holes in pressure control body.
16. Place ring (1) over cycling valve assembly and align ring holes with mounting holes in pressure control body.
17. Install capscrews (2) through ring (1) and tighten securely.

PILOT VALVE TESTING

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive (WP 0113 00, Item 1)
Pressure Gauge (WP 0113 00, Item 17)

Materials/Parts Required:
500 Gallon Collapsible Fuel Drum
. Pressurized Fuel Source

NOTE

Pilot valve testing requires a 500 gallon fuel drum and a pressurized fuel source.

1. Connect pressure control inlet to a fuel source.
2. Connect pressure control outlet to fuel drum.
3. Block pressure control off of ground as shown in figure 3.
4. Remove bottom plug (figure 2, 14) from pressure control.
5. Connect pressure gauge to pressure control where bottom plug was removed.
6. Monitor pressure gauge while starting fuel flow into fuel drum. If pressure gauge reaches 5.5 psi and pressure control does not shut off, press STOP button. Adjust pilot valve assembly as described in pilot valve adjustment procedure.
7. If pressure control shuts off before pressure gauge reaches 4.5 psi, adjust pilot valve assembly as described in pilot valve adjustment procedure.

PILOT VALVE ADJUSTMENT (Refer to figures 4 and 5.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive (WP 0113 00, Item 1)

Materials/Parts Required:
Silicone Compound (WP 0116, Item 12)
O-Ring (WP 0117, Item 109)

1. Remove capscrew (figure 4, 1) from housing bodies (2 and 3).
2. Remove nuts (4) from four screws (5 and 6). Remove screws from housing bodies (2 and 3).
3. Separate the housing bodies (2 and 3).
4. Loosen nut (figure 4, 7) as shown in figure 5A.

NOTE

Turning valve stem ¼ of a turn changes pressure approximately 1 psi.

5. Turn valve stem as shown in figure 5B clockwise to increase pressure; counterclockwise to decrease pressure.
6. Tighten nut (figure 4, 7) to lock valve stem (8).

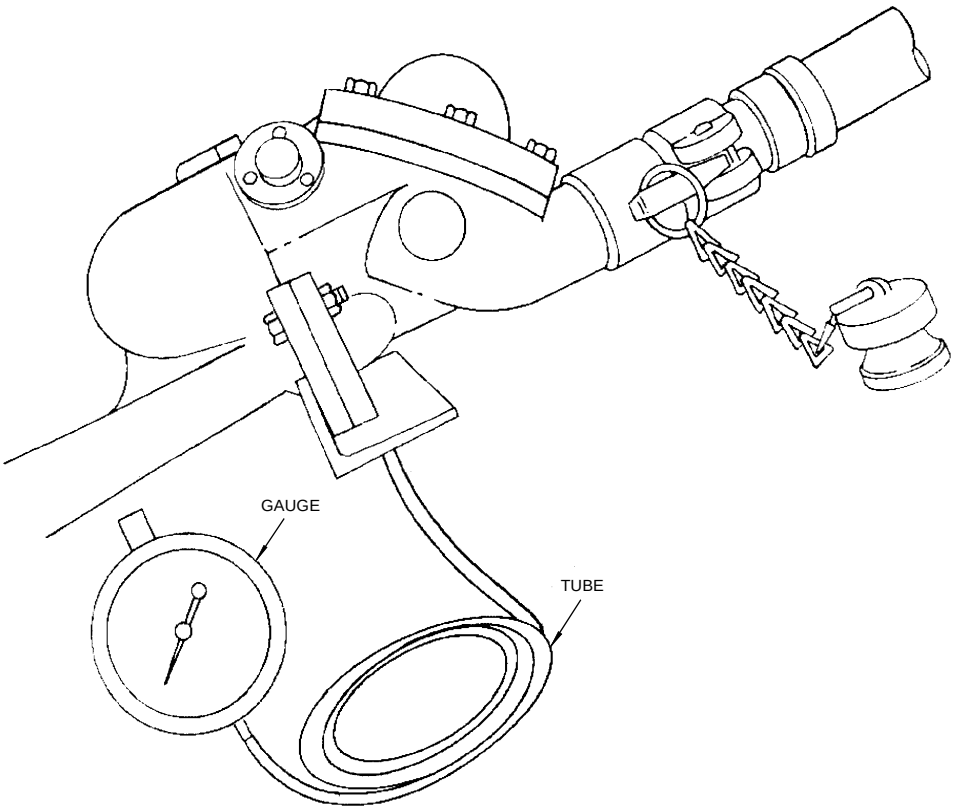


Figure 3. Pressure Control Testing

7. Place the housing bodies (2 and 3) together, align holes in bodies, and install screws (6) and nuts (4) finger tight.
8. Position stand (10) and install screws (5) and nuts (4) finger tight.
9. Torque nuts installed in steps 7 and 8 to 20 foot-pounds (2.77 m-kg).
10. Install capscrew (1).
11. Retest pilot valve using procedure in pilot valve testing paragraph.
12. Readjust and retest until shut off pressure is 5.00 psi ± 0.50 psi.
13. Perform step 1 through 4 above, and remove and replace O-rings (9) with new O-rings coated with silicone compound.
14. Perform steps 7 through 10 above.

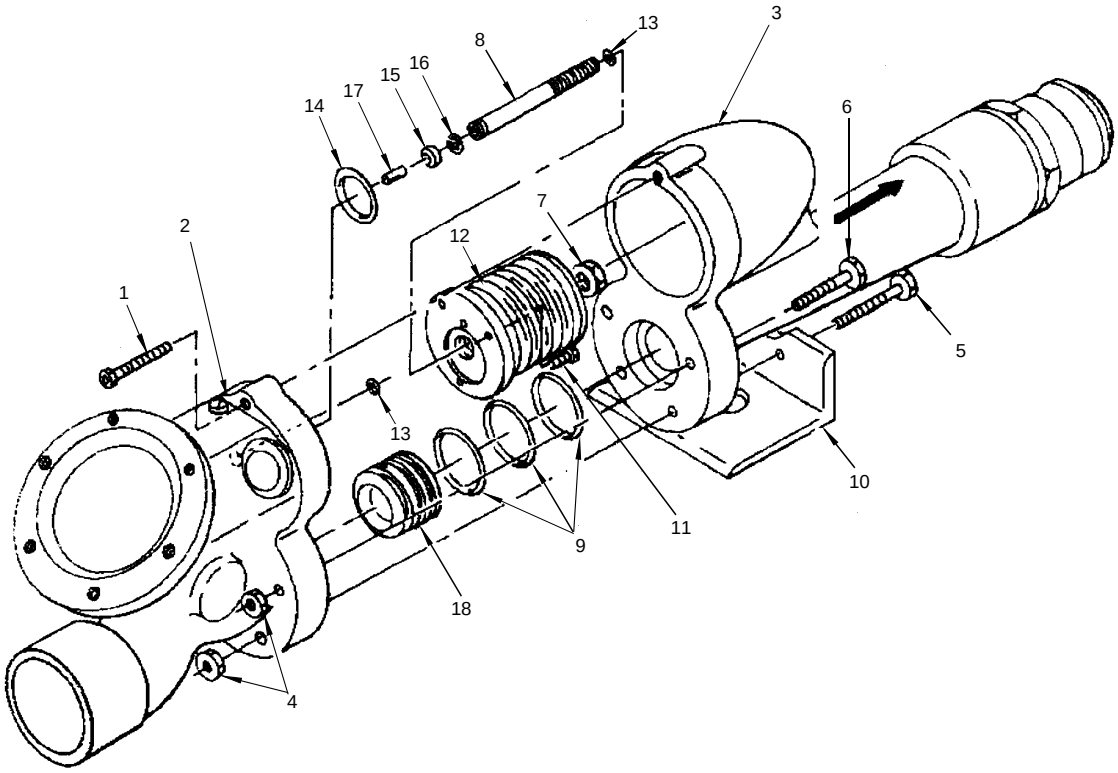


Figure 4. Pressure Control Pilot Valve

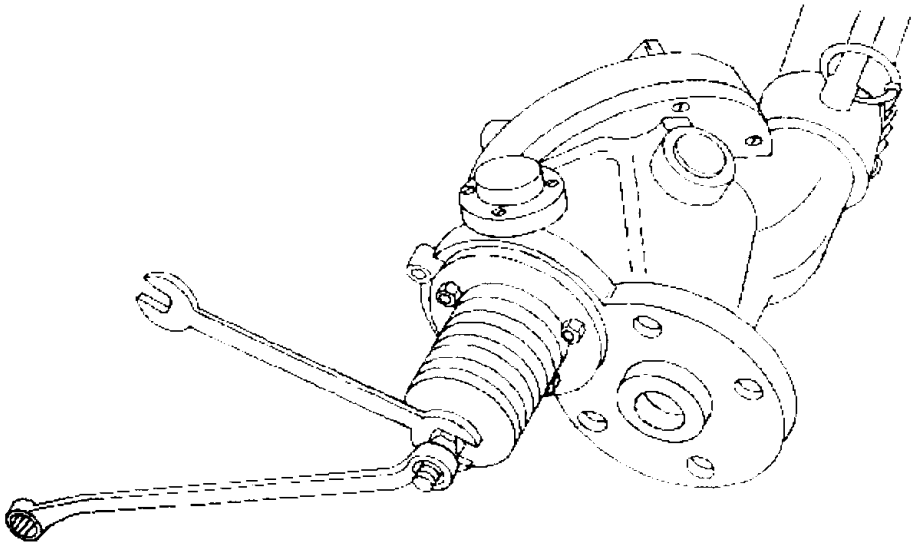
PILOT VALVE REMOVAL AND DISASSEMBLY (Refer to figure 4.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive
(WP 0113 00, Item 1)

Materials/Parts Required:
None

1. Remove capscrew (1) from housing bodies (2 and 3).
2. Remove nuts (4) from four screws (5 and 6). Remove screws from housing bodies (2 and 3).
3. Separate the housing bodies (2 and 3) and stand (10).
4. Remove three screws (11) from bellows assembly (12) and remove bellows assembly from pressure control.
5. Remove nut (7) from valve stem (8).
6. Remove and discard O-rings (13 and 14) and seal (15).
7. Grasp threaded end of valve stem (8), turn clockwise and remove valve stem from bellows assembly (12).
8. Remove retaining ring (16) and valve guide (17) from valve stem. Discard retaining ring.



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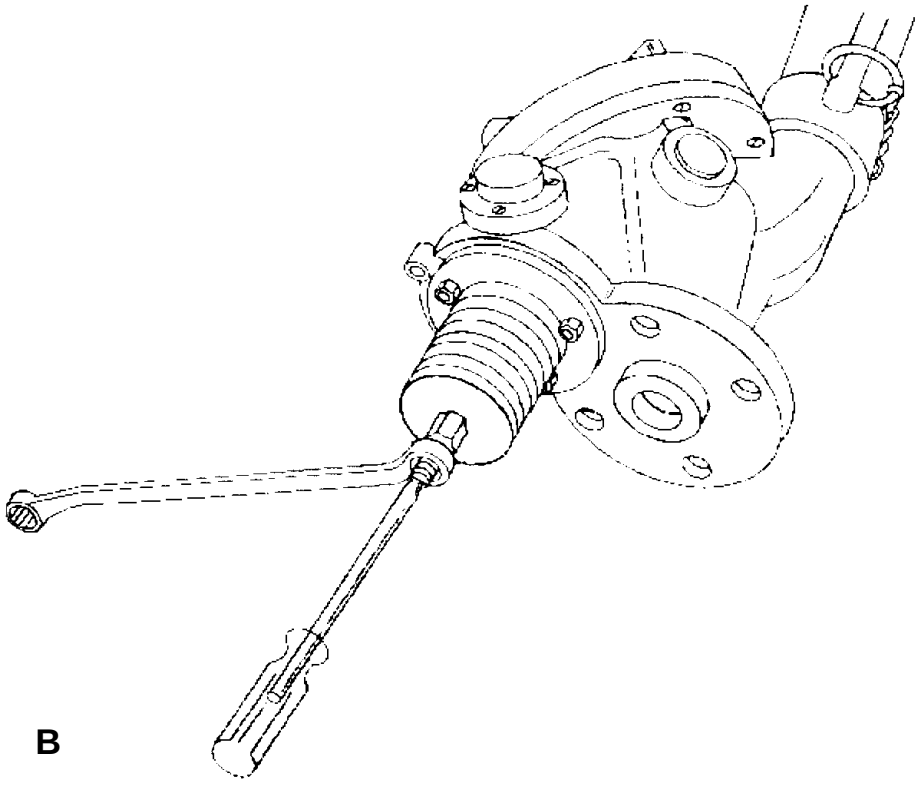


B

Figure 5. Adjusting Pilot Valve Shut Off Pressure

PILOT VALVE CLEANING, INSPECTION AND REPAIR (Refer to figure 4.)

INITIAL SET-UP:

Tools:
None

Materials/Parts Required:
Wiping Rag (WP 0116 00, Item 21)

1. Wash all metal parts in a hot, mild commercially available soap and water solution. Dry parts with wiping rag.
2. Inspect bellows assembly (12) for cracks or breaks.
3. Inspect for burred valve stem (8) or damaged valve stem threads.
4. Replace all damaged parts.

PILOT VALVE ASSEMBLY AND INSTALLATION (Refer to figure 4.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive
(WP 0113 00, Item 1)

Materials/Parts Required:
Silicone Compound (WP 0116, Item 12)
Seal (WP 0117, Item 68)
Retaining Ring (WP 0117, Item 82)
O-Ring (WP 0117 00, Item 100)
O-Ring (WP 0117 00, Item 108)

1. Install valve guide (17) and retaining ring (16) on valve stem (8).
2. Grasp the unthreaded end of valve stem (8), place threaded end in bellows assembly (12), and turn valve stem clockwise to install valve stem through bellows assembly.
3. Install seal (15) and O-rings (13 and 14) coated with silicone compound.
4. Screw nut (7) on valve stem (8) until approximately one half of valve stem threads are through nut.
5. Place bellows assembly (12) against housing body (2), aligning holes in bellows assembly (12) with holes in housing body.
6. Install three screws (11) through bellows assembly (12) into housing assembly. Tighten screws securely.
7. Place two housing bodies (2 and 3) together, align holes in bodies, and install four screws (5 and 6) and nuts (4). Torque nuts to 20 foot-pounds (2.77 m-kg).
8. Test and adjust pilot valve in accordance with procedures in pilot valve test and pilot valve adjustment paragraphs.

VENTURI REMOVAL AND DISASSEMBLY (Refer to figure 4.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive
(WP 0113 00, Item 1)

Materials/Parts Required:
None

1. Remove capscrew (1) from housing bodies (2 and 3).
2. Remove nuts (4) from four screws (5 and 6). Remove screws from housing bodies (2 and 3).
3. Separate the housing bodies and pull venturi (18) from housing body.
4. Remove and discard O-rings (9) from venturi.

VENTURI CLEANING, INSPECTION AND REPAIR (Refer to figure 4.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive
(WP 0113 00, Item 1)

Materials/Parts Required:
Silicone Compound (WP 0116, Item 12)
O-Ring (WP 0117 00, Item 109)

1. Inspect venturi (18) to determine if worn, cracked, or burred.
2. Replace damaged venturi.
3. Replace three O-rings (9) with new O-rings coated with silicone compound.

VENTURI ASSEMBLY AND INSTALLATION (Refer to figure 4.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive (WP 0113 00, Item 1)

Materials/Parts Required:
Silicone Compound (WP 0116, Item 12)
Retaining Ring (WP 0117, Item 83)
O-Ring (WP 0117 00, Item 109)

1. Install three O-rings (9) coated with silicone compound on venturi (18) and install venturi in housing body (2).
2. Place two housing bodies (2 and 3) together, align holes in bodies, and install four screws (5 and 6) and nuts (4). Torque nuts to 20 foot-pounds (2.77 m-kg).
3. Install capscrew (1) into housing body (2).

FEMALE COUPLING HALF CLEANING AND INSPECTION (Refer to figure 2.)

INITIAL SET-UP:

Tools:
None

Materials/Parts Required:
Wiping Rag (WP 0116 00, Item 21)

1. Wash female coupling half (15) with a hot water and commercially available soap solution. Dry with a wiping rag.
2. Inspect female coupling half (15) to determine if cracked, burred, or leaking.
3. Inspect female coupling half (15) for damaged or missing dust plug (16), gasket (17), chain (21), or key rings (22).

FEMALE COUPLING HALF REPAIR (Refer to figure 2.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive (WP 0113 00, Item 1)

Materials/Parts Required:
Silicone Compound (WP 0116, Item 12)
Dust Plug (WP 0117, Item 95)
Gasket (WP 0117, Item 96)

1. Replace Gasket. Remove damaged gasket (17) from female coupling half (15). Apply silicone compound to all surfaces of new gasket and install in the female coupling half (15).
2. Replace Dust Plug. Remove damaged dust plug (16) and chain (21) from female coupling half (15) key ring (22). Pry open key ring (22) and install new dust plug with chain (21) on key ring (22).
3. Replace Chains (21) and Key Rings (22). Follow steps 5 and 6 in female coupling half (15) replacement procedure.

FEMALE COUPLING HALF REPLACEMENT (Refer to figure 2.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive (WP 0113 00, Item 1)

Materials/Parts Required:
Silicone Compound (WP 0116, Item 12)
Sealing Compound (WP 0116, Item 10)
Dust Plug (WP 0117, Item 95)
Gasket (WP 0117, Item 96)

1. Remove dust plug (16) with chain and key rings from damaged female coupling half (15).
2. Remove damaged female coupling half (15) from pressure control.
3. Apply coating of sealing compound to threads of new female coupling half (15) and install into pressure control.
4. Apply silicone compound to all surfaces of gasket (17). Install gasket in the female coupling half (15).
5. Pry open key ring (22) and install on female coupling half (15). Install chain (21) on key ring (22).
6. Pry open second key ring (22) and install on dust plug end of chain (21). Install dust plug (16) on key ring (22).

MALE COUPLING HALF CLEANING AND INSPECTION (Refer to figure 2.)

INITIAL SET-UP:

Tools:
None

Materials/Parts Required:
Wiping Rag (WP 0116 00, Item 21)

1. Wash male coupling half (18) with a hot water and commercially available soap solution. Dry with a wiping rag.
2. Inspect male coupling half (18) to determine if cracked, burred, or leaking.
3. Inspect male coupling half (18) for damaged or missing dust cap (19), chain (21), or key rings (22).
4. Inspect dust cap for damaged gasket (20).

MALE COUPLING HALF REPAIR (Refer to figure 2.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive
(WP 0113 00, Item 1)

Materials/Parts Required:
Silicone Compound (WP 0116, Item 12)
Dust Cap (WP 0117, Item 94)
Gasket (WP 0117, Item 96)

1. Replace Gasket. Remove damaged gasket (20) from dust cap (19). Apply silicone compound to all surfaces of new gasket. Install gasket in the dust cap (19).
2. Replace Dust Cap (19). Remove damaged dust cap (19) and chain (21) from male coupling half key ring (22). Pry open key ring (22), and install dust cap with chain (21) on key ring (22).
3. Replace Chains (21) and Key Rings (22). Follow steps 5 and 6 in male coupling half replacement procedure.

MALE COUPLING HALF REPLACEMENT (Refer to figure 2.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive
(WP 0113 00, Item 1)

Materials/Parts Required:
Sealing Compound (WP 0116, Item 10)
Silicone Compound (WP 0116, Item 12)
Dust Cap (WP 0117, Item 94)
Gasket (WP 0117, Item 96)

1. Remove dust cap (19) with chain (21) and key rings (22) from damaged male coupling half (18).
2. Remove damaged male coupling half (18) from pressure control.
3. Apply coating of sealing compound to threads of male coupling half (18) and install into pressure control.
4. Apply silicone compound to all surfaces of gasket (20). Install gasket (20) in dust cap.
5. Pry open key ring (22) and install on male coupling half (18). Install chain (21) on key ring (22).
6. Pry open second key ring (22) and install on dust cap end of chain (21). Install dust cap (19) on key ring (22).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE TRICON DOCUMENT HOLDER

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive
(WP 0113 00, Item 1)

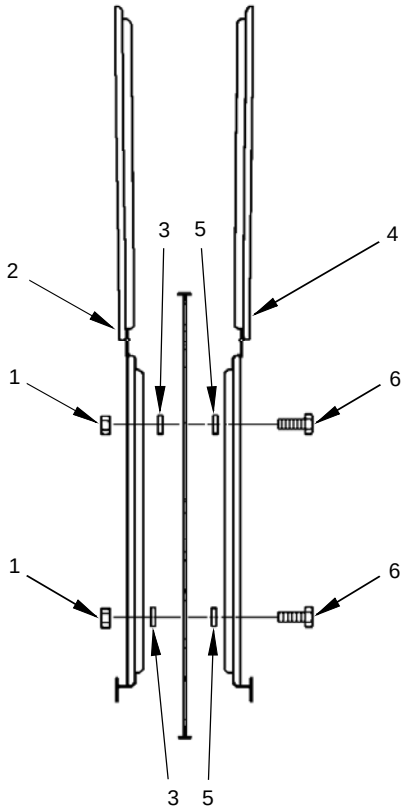
Materials/Parts Required:
None

Equipment Condition:
Both document holder doors are raised.

Personnel Required:
Two

REMOVAL

1. Open right hand-door.
2. Remove four nuts (1) from the inside document holder (2).
3. Remove inside document holder (2), four insulating washers (3), and outside document holder (4) along with insulating washers (5) and bolts (6).



INSTALLATION

1. Insert four bolts (6) through the outside document holder (4). Place four insulating washers (5) onto the bolts (6) and position the assembly through the holes in the door. Install four insulating washers (3) and inside document holder (2).

2. Install and tighten four nuts (1) to secure document holders.

3. Close both document holders.

4. Close right-hand door.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE TRICON SEAL SET

INITIAL SET-UP:

Tools:
Rivet tool (WP 0113 00, Item 2)
Hand drill (WP 0113 00, Item 2)

Materials/Parts Required:
Sealant, Polyurethane
(WP 0116 00, Item 23)
Set, Seal (WP 0117 00, Item 3)
Carrier, Long (WP 0117 00, Item 4)

Materials/Parts Required:-Continued
Carrier, Short (WP 0117 00, Item 5)
Rivet (WP 0117 00, Item 35)

Equipment Condition:
Both doors open.

Personnel Required:
Two

REMOVAL

WARNING

To gain access to the seals on the bottom door edge, it may be necessary to raise the container above floor level. Use lifting devices rated for a minimum of 10,000 pounds (4536 Kg). Using less than rated equipment could expose personnel to serious injury or death.

NOTE

Removal of the seals is the same for both left- and right-hand doors.

1. Using a 3/16” drill bit drill out rivets (figure 1, 1). There are seven rivets on each top and bottom edge and 14 rivets on each side edge. The left-hand door does not have rivets on the edge that mates with the right-hand door.

2. Remove and discard all short carriers (figure 1, 2) and long carriers (3). The right-hand door has carriers on all four door edges. The left-hand door does not have a carrier or seal on the edge that mates with the right-hand door.

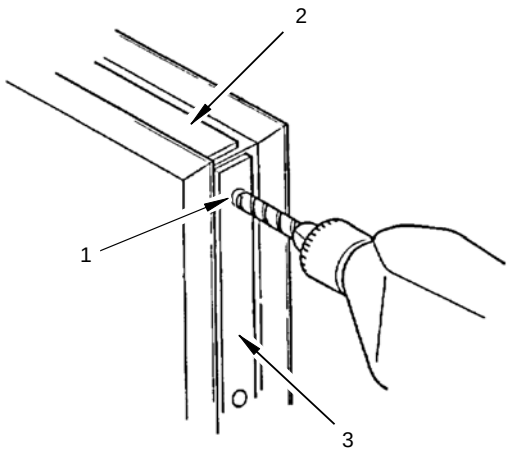


Figure 1. Left-Hand Door Seals and Carriers Removal

INSTALLATION

1. Stretch the C-shaped seal (figure 2, 1) over the left-hand door's inside edge (2). Make sure seal is orientated so the large, curved lip of the seal is on the outside portion of the door and extends over the end.

NOTE

Installation of the carriers must be complete before polyurethane is allowed to dry.

2. Starting from the front about eight inches above the inside bottom edge of the left door, apply a 1/8 inch bead of polyurethane sealant (figure 2, 3) down and along the C-shaped seal (1) to the end.

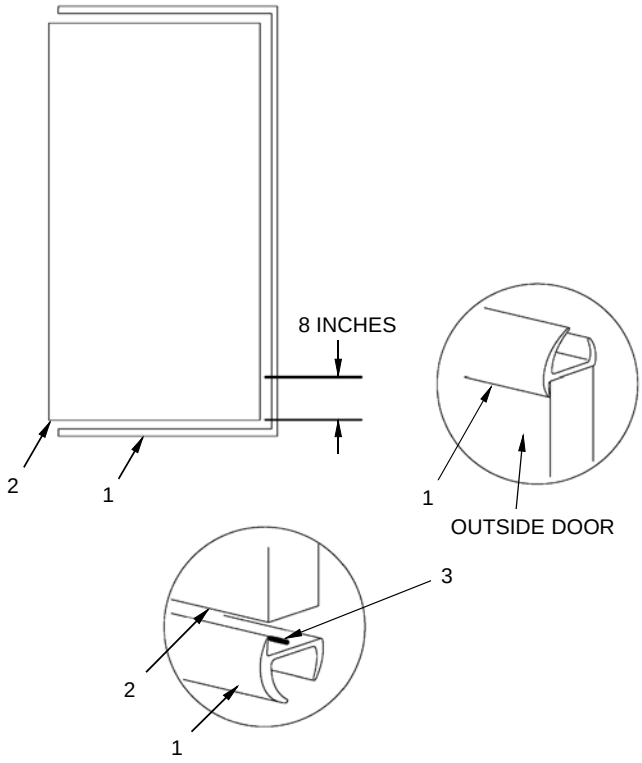


Figure 2. Left-Hand Door C-Shaped Seal Installation

3. Position long carrier (figure 3, 1) against the seal (2) on outside edge of door (3).

4. Aline existing holes of long carrier (figure 3, 1) with existing holes on door (3) and drill a 3/16 inch hole through seal (2) for the rivet at the two end holes on the long carrier (1).

5. Install a rivet (4) in each end of long carrier (figure 3, 1).

6. Repeat Steps (4) and (5) for center hole in long carrier (figure 3, 1).

7. Repeat Steps (4) and (5) working from the center toward each end and install the remaining rivets (figure 3, 4).

INSTALLATION-Continued

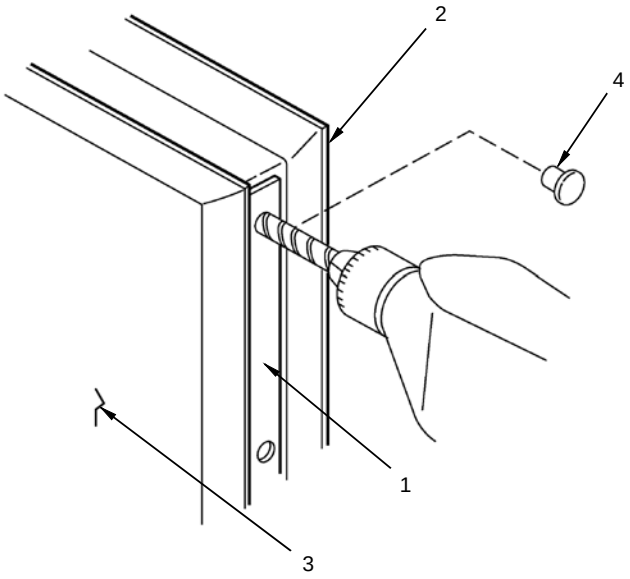


Figure 3. Left-Hand Door Long Carrier Installation

8. Position top of seal (figure 4, 1) over door, gently pulling the seal toward the inside edge of door (2). The seal will extend beyond the inside door edge. This excess will be trimmed later.

9. Position short carrier (figure 4, 3) along the top edge of the door (2).

10. Repeat Steps (4) through (7) for short carrier (figure 4, 3).

11. Repeat Steps (9) and (10) for the bottom edge of the door (figure 4, 2).

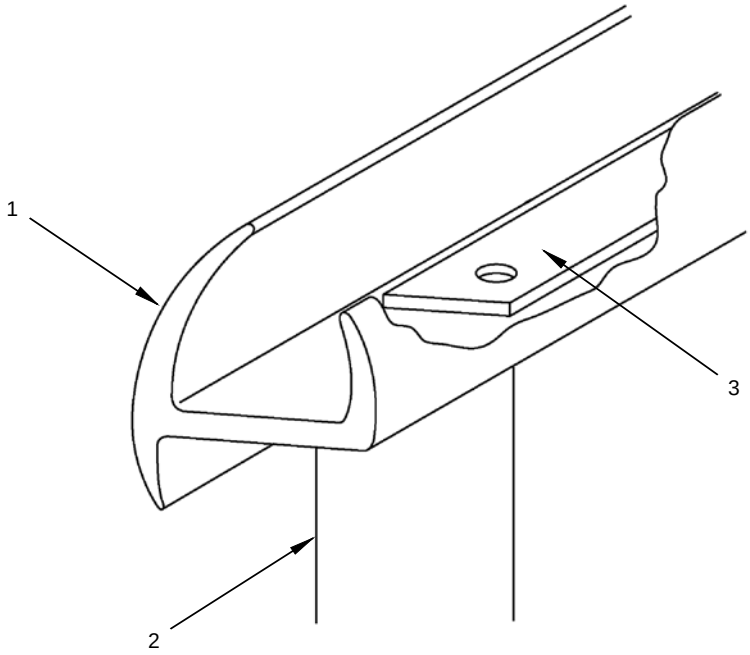


Figure 4. Left-Hand Door Short Carriers Installation

INSTALLATION-Continued

12. At top and bottom of door (figure 5, 1) trim the ends of the seal (2) so they extend 1/8 inch beyond inside door edge.

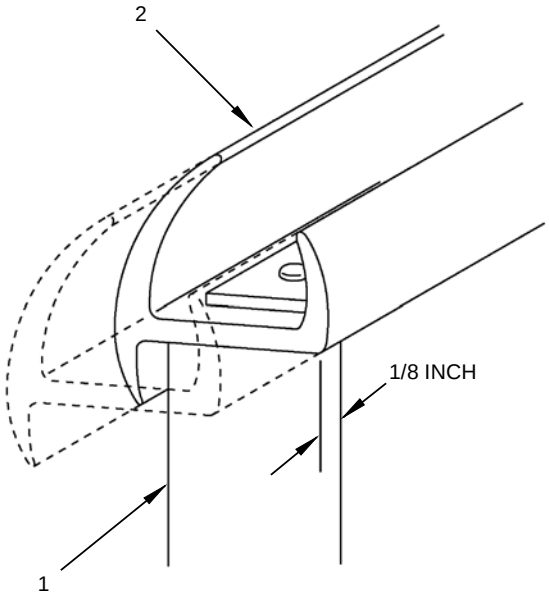


Figure 5. Left-Hand Door Top and Bottom Seal Trimmed

13. Stretch the rectangular seal (figure 6, 1) around the right hand door (2). Make sure the large curved lip of the seal is on the outside portion of the door.

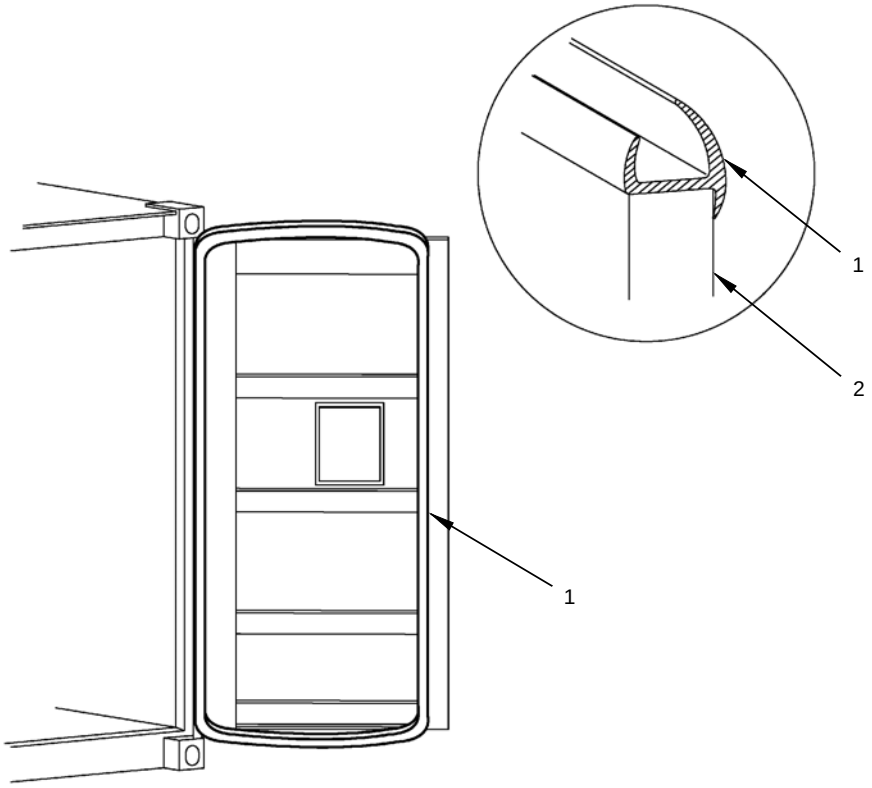


Figure 6. Right-Hand Door Rectangular Seal Installation

INSTALLATION-Continued

14. Pull the seal (figure 7, 1) away from the bottom edge of door (2) allowing access to the inside edge of the seal.

NOTE

Installation of the carriers must be complete before polyurethane is allowed to dry.

15. Starting from about eight inches above the inside bottom edge of the door (figure 7, 2), apply a 1/8 inch bead of polyurethane sealant (3) along the middle of the seal (1) facing the edge of the door. Continue the application to the other side of the seal and up the edge for about another eight inches.

16. Install the sealant (figure 7, 3) around the bottom edge of the door (2).

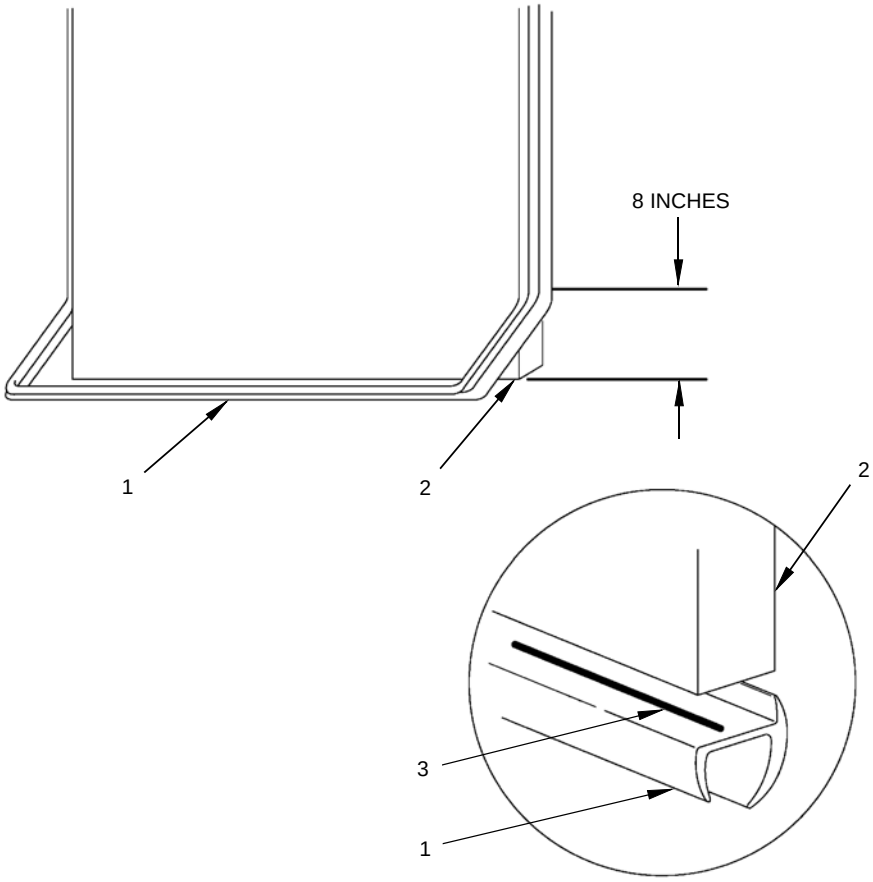


Figure 7. Right-Hand Door Seal Installation (Polyurethane Application)

17. Position the long carrier (figure 8, 1) along the outside edge of the right hand door (2).

18. Repeat Steps (4) through (7) for long carrier (figure 8, 1).

19. Position second long carrier along the inside edge of the right hand door.

20. Repeat Steps (4) through (7) for second long carrier.

INSTALLATION-Continued

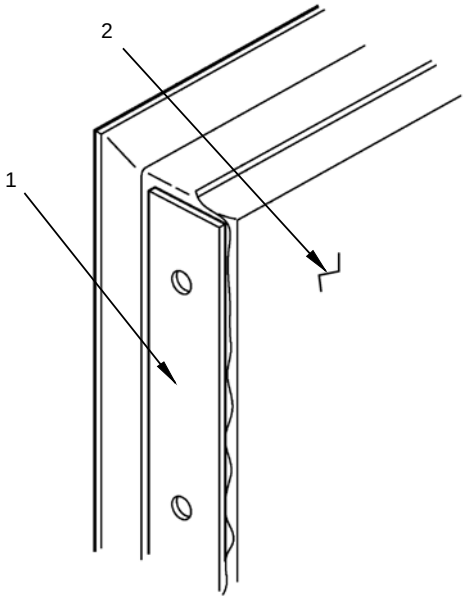


Figure 8. Right-Hand Door Long Carrier Installation

21. Position the short carrier (figure 9, 1) along the top edge of the door (2).

22. Repeat Steps (4) through (7) for the short carrier (figure 9, 1).

23. Position second short carrier along the bottom edge of the door.

24. Repeat Steps (4) through (7) for second short carrier.

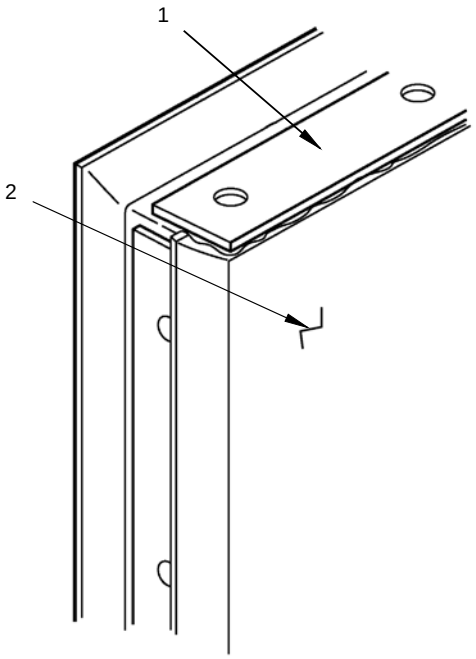


Figure 9. Right-Hand Door Short Carriers Installation

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE SPRING STARTER END CAP

INITIAL SET-UP:

Tools:
Screwdriver, Flat Blade, 1/8", 3 ea.
(WP 0113 00, Item 1)
Screwdriver, Flat Blade, 3/6"
(WP 0113 00, Item 1)

REMOVAL

WARNING

Personal injury could result from any attempt to disassemble starter while spring is under tension. Ensure all spring tension is released prior to performing any maintenance.

1. Depress trip lever (1) to release any tension that may be on spring. Do not depress reset button (2); this will enable the spring ratchet action.

2. Mark position of rope pull bracket (3) on body of spring pack assembly (4) for later reassembly.

3. Observe the method of attaching the end cap (5) to the body of the spring pack assembly (4): A series of latching tabs (6) around the circumference of the end cap inserted through slots (7) in the spring pack assembly.

CAUTION

Both the end cap and the body of the spring pack are made of semi-flexible plastic. Avoid overstressing to avoid tearing or cracking either part.

4. At the end cap (5), wedge a small screwdriver through one slot (7) of the spring pack body so that the matching latching tab (6) is depressed. Repeat this action on an adjacent latching tab. Repeat on the next adjacent latching tab in the same direction.

5. At the location of the first screwdriver, pry the latching tab out a fraction of an inch. Remove the wedged screwdriver and wedge into the next open slot in the same direction as the first three.

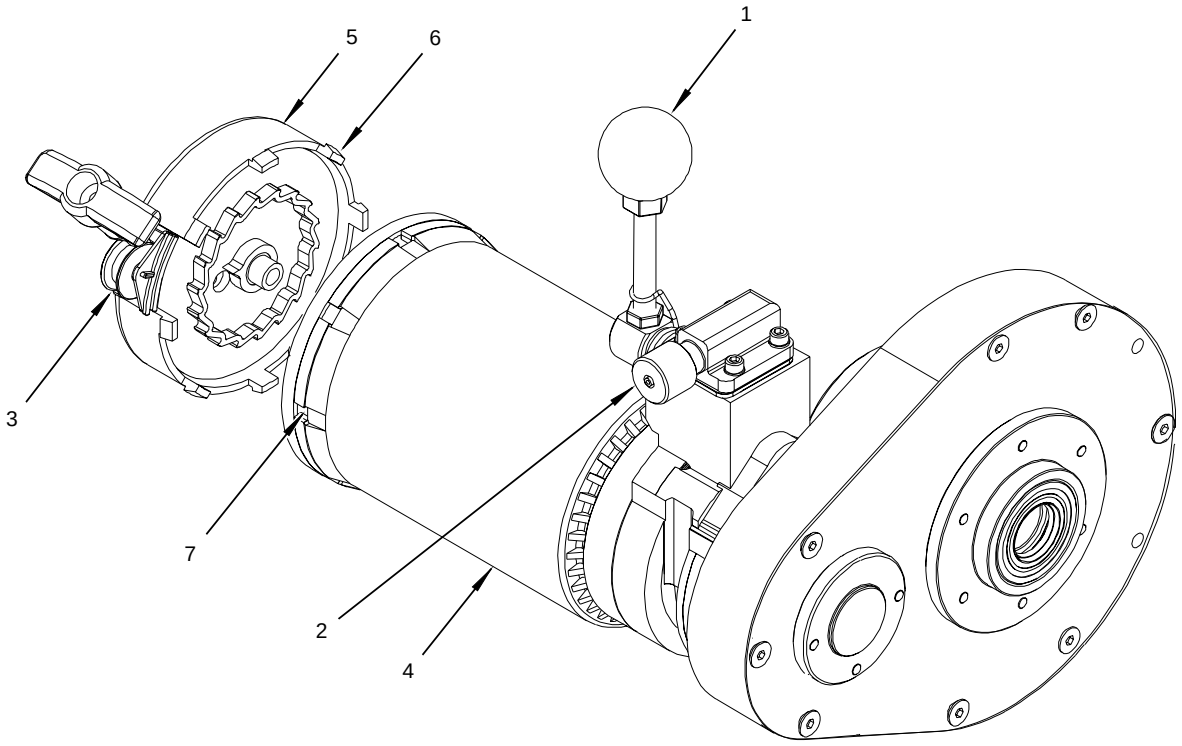
6. Pry the second tab out a fraction of an inch.

7. Repeat this process around the circumference of the starter body until the end cap is free.

CAUTION

A series of spring loaded pawls are located in this end of the spring pack assembly. The springs are easily dislodged and may cause damage to the starter if one or more inadvertently remains loose when the end cap is installed.

8. Hold starter with end cap facing up. Slowly and carefully lift end cap away from spring pack body (4).



INSTALLATION

1. In the open end of the spring pack assembly (4), rotate the nylon plate fully clockwise. Ensure that all springs are captured by a pawl.

2. Align end cap (5) with alignment marks. Verify that latching tabs (6) are exactly aligned with slots in the spring pack. Carefully press or tap end cap (5) into a fully latched condition. Test with one or two rope pulls to verify shaft rotation.

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
PREPARATION FOR STORAGE OR SHIPMENT

FILTER-SEPARATOR

Preparation for Shipment/Storage

For this assembly, short and long term storage instructions are identical.

NOTE

The filter-separator and all couplings are constructed of aluminum. Preservation is not required. This procedure assumes the filter-separator has been defueled but may contain some residual fuel in the sump.

1. Unwrap drain hose from end cap, extend hose to a shallow container and drain residual fuel. Close the drain valve. Dispose of drained fuel IAW local SOP. Wrap drain hose around handles on end cap.
2. Place a drain pan directly beneath the two-inch unisex defueling connection, and uncap and open the defueling unisex coupling. Allow the filter-separator to ventilate for approximately four hours.
3. Repeat step 1 to drain any fuel that may have collected from filter element drainage.

Preparation for Use After Shipment/Storage

Not required.

PUMP-ENGINE MODULE

NOTE

Performance of this procedure requires the use of the Accessory Module to provide electrical power.

Preparation for Storage/Shipment (Refer to WP 007 00 for more detailed operating procedures)

1. Preparation for short term storage.

CAUTION

Do not allow fuel transfer pump to run dry. Bearings may be destroyed. Decouple engine from fuel transfer pump to avoid damage to pump.

a. Drain all fuel from fuel tank and engine fuel filter.

b. At the engine module, disconnect the fuel supply and return lines.

c. Disconnect the exhaust line at the exhaust manifold.

d. Disconnect the pumpage overtemperature cable from the engine module.

e. Unlatch engine module and remove from pump-engine module.

f. Tip pump-engine module up on end so that fuel transfer pump inlet quick disconnect fitting faces down.

g. Block up pump-engine module 4-6 inches and place a shallow drain pan beneath inlet quick disconnect.

h. Remove camlock cap from inlet quick disconnect fitting and drain any residual fuel from fuel transfer pump. Allow fuel transfer pump to ventilate until all fuel fumes have dissipated.

i. Return pump-engine module to normal horizontal position.

j. Install camlock cap on inlet quick disconnect fitting.

k. Remove the flexible coupling section from the fuel transfer pump.

l. Slide engine module into pump-engine module and latch in place.

m. Connect the exhaust line to the exhaust manifold.

n. Connect the fuel supply line and fuel return line to the engine module.

o. Connect the accessory module control cable to the engine module.

p. Connect the accessory module battery cable to the engine module.

q. Connect the pumpage overtemperature cable to the engine module.

r. Remove the engine air intake filter from the storage module and install on the intake manifold using the attached clam shell clamp.

s. Add approximately one quart MIL-PRF-21260E, Grade PE-10 preservative oil (WP 0116, Item 18) to fuel tank.

t. Ensure the 3-position fuel selector valve is in the INTERNAL TANK position.

u. Start and run the engine at fast idle until the engine exhaust begins to smoke. (The engine may die at this point.)

PUMP-ENGINE MODULE (Continued)

v. Stop engine and allow to cool.

w. Remove the air intake filter and stow in the storage module. Install dust cap on intake manifold.

x. Disconnect the exhaust line, remove all fuel and electrical lines from engine module, and remove engine module from pump-engine module.

y. Drain oil from engine crankcase and dispose of in accordance with local SOP.

z. Remove engine oil filter. Dispose of oil filter in accordance with local SOP.

aa. Install new engine oil filter and fill crankcase with 1.7 qt (1.6 l) MIL-PRF-21260, PE 15W-40 preservative oil (WP 0116, Item 19).

ab. Spray MIL-PRF-21260E, grade PE-10 (WP 0116, Item 18) in the intake and exhaust manifolds.

ac. Thoroughly clean all external engine surfaces with MIL-PRF-680 degreasing solvent (WP 0116, Item 13).

ad. Reinstall flexible coupling on fuel transfer pump shaft.

ae. Install engine module in pump engine module. Reconnect exhaust line and all fuel lines and electrical cables.

2. Preparation for long term storage IAW 1.a through 1.ae above.

a. Prepare for short term storage.

b. Inspect every six months for rust or corrosion. Clean as required.

Preparation for Use After Storage/Shipment

1. Before placing in service, clean all unpainted surfaces with MIL-PRF-680 (WP 0116, Item 13).
2. Check engine crankcase oil level. Replenish as required with SAE 15W-40 lubricating oil (WP 0116, Item 17).
3. Add fuel (JP8) to fuel tank.
4. Ensure cap is installed on intake manifold air inlet to choke air and ensure engine does not start.
5. Connect accessory module cables to pump engine module.
6. At the accessory module control panel, briefly engage start switch (to bump over engine). Repeat this action two or three times to ensure engine rotates freely.
7. Install engine air intake filter on intake manifold.
8. Start and run engine for several minutes, checking for oil leaks. Repair any leaks before placing engine in service.

ACCESSORY MODULE

Preparation for Storage/Shipment

1. Open cover and disconnect battery cables at battery. Ensure battery holddowns are securely fastened. (The battery is a non-spillable, absorbed-electrolyte type and is exempt from hazardous material shipping regulations when secured in the equipment in which it is used.)

2. Clean battery terminals and cable connectors with a solution of one-half pound A-A-374 sodium bicarbonate (WP 0116, Item 26) to one gallon of water. Wash battery terminals and cable connectors with clear water and dry thoroughly.

3. Wrap cable connectors in paperboard cushioning conforming to A-A-1051 and secure with ASTM-D5330 filament tape (WP 0116, Item 31).

4. Ensure all covers are latched.

Care During Storage

WARNING

Do not store lead acid batteries in the same area as nickel-cadmium batteries. The components of the two battery types will react violently in case of fire or puncture. Each battery type will be damaged or destroyed if contacted by the electrolyte of the other battery type. Personal injury or death may result.

Every 3 months:

a. Clean battery terminals and cable connectors with a solution of one-half pound A-A-374 sodium bicarbonate (WP 0116, Item 26) to one gallon of water. Wash battery terminals and cable connectors with clear water and dry thoroughly.

b. Measure the open-circuit voltage of the battery.

   (1) If voltage is 25.3 volts or greater, battery is ready for use.
   (2) If voltage is less than 25.3 volts, charge at a constant voltage of 30 volts for about 2 hours.

c. Wrap cable connectors in paperboard cushioning conforming to A-A-1051 and secure with ASTM-D5330 filament tape (WP 0116, Item 31).

Preparation for Use After Storage/Shipment

1. Remove cushioning from battery cable connectors.

2. Clean battery terminals and cable connectors with a solution of one-half pound A-A-374 sodium bicarbonate (WP 0116, Item 26) to one gallon of water. Wash battery terminals and cable connectors with clear water and dry thoroughly.

3. Connect battery cables at battery.

4. Close and latch battery compartment cover.

AUXILIARY PUMP

Preparation for Storage/Shipment

1. Open unisex couplings and drain any residual fuel. Allow pump to ventilate until all trace of fuel fumes has dissipated.
2. With unisex couplings open, spray MIL-PRF-21260E, grade PE-10 preservative oil (WP 0116, Item 18) into pump body. Close unisex couplings and install dust caps.
3. Inspect electrical connector. If required, clean connectors and body interior with ethyl alcohol or equivalent, non-conducting cleaning agent. Ensure dust cap is secured hand tight.

Preparation for Use After Storage/Shipment

Not required.

HOSES/FITTINGS/COUPLINGS/NOZZLES

Preparation for Storage/Shipment

NOTE

All nozzles, fittings and couplings of the AAFARS are made of anodized aluminum. No special preparation for storage is required.

1. Remove all components from reusable containers/bags.
2. Open couplings/remove caps from kit components and drain any residual fuel. Allow component(s) to ventilate until all trace of fuel fumes has dissipated.
3. Repack components in reusable containers/bags.

Preparation for Use After Storage/Shipment

None required.

PRESSURE CONTROL

Preparation for Storage/Shipment

1. Remove pressure control from container.
2. Remove caps/plugs and drain any residual fuel. Allow pressure control to ventilate until all traces of fuel fumes have dissipated.
3. Repack pressure control in container.

Preparation for Use After Storage/Shipment

None required.

FUEL DRUMS

Preparation for Storage/Shipment

NOTE

Always anticipate some residual fuel, even in a fuel drum that has been previously defueled. All fuel must be drained before storage or shipment.

1. Using a hoist or fork lift, suspend the drum from one end above a container with a capacity of 5-10 gallons.
2. At the lower end, the drum will sag to a level lower than the coupling adapter. Block up the sides of the drum to form a “funnel” with the coupling adapter at the low point to ensure complete drainage.
3. Remove the coupling adapter and allow the residual fuel to drain into the container.
4. Allow the fuel drum to ventilate until all fuel fumes have dissipated. Install the coupling adapter.
5. Use a mild soap and water solution to clean exterior surface. Rinse well with clear water.

Preparation for Use After Storage/Shipment

None required.

TRIPLE CONTAINER (TRICON)

1. Clean exterior of container using a high-pressure hose with water and commercially available laundry detergent.
2. Remove all stored items from container.
3. Remove any debris, dirt or dust from the interior of the container.
4. Clean interior of TRICON using a high-pressure hose with water and soap, or other available cleaning compound.
5. Inspect exterior of TRICON for condition of paint, and any signs of damage or corrosion. TRICONs have CARC (chemical agent resistant coating) paint on exterior. Repair/repaint as required. CARC painting is not authorized at the unit level. Refer painting needs to supervisor.
   a. Steel components being repaired shall be abrasively cleaned to bare metal, and will be free of oil, grease, dirt, corrosion, or other foreign matter.
   b. Requirements for TRICON exterior CARC painting are:
      Primer coat conforming to MIL-P-53022 or MIL-P-53030.
      Finish coats conforming to MIL-C-53072 or MIL-C-46168, desert tan, color #33446, FED-STD-595.
   c. Requirement for interior painting of TRICON is:
      Commercial practice: Sand, color no. 33303, FED-STD 595.
6. All moving parts of the door locking mechanism, door hinges, and document holder hinges and hasps, if not permanently lubricated, shall be lubricated with P-13 grease conforming to MIL-G-10924 (WP 0116, Item 16).

END OF WORK PACKAGE

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
SPECIAL INSTRUCTIONS FOR 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 the equipment in administrative storage, current preventative maintenance should be completed, shortcomings and deficiencies should be corrected, and all Modification Work Orders (MWO) should be applied.

Storage site selection. Inside storage is preferred for items selected for administrative storage. If inside storage is not available, truck, vans, conex containers, and other containers may be used.

UNIT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
ILLUSTRATED LIST OF MANUFACTURED ITEMS

INTRODUCTION

Scope

This work package includes complete instructions for making items authorized to be manufactured or fabricated at unit maintenance level.

How to Use the Index of Manufactured Items

A part number index in alphanumeric order is provided for cross-referencing the part number of the item to be manufactured to the page which covers fabrication criteria.

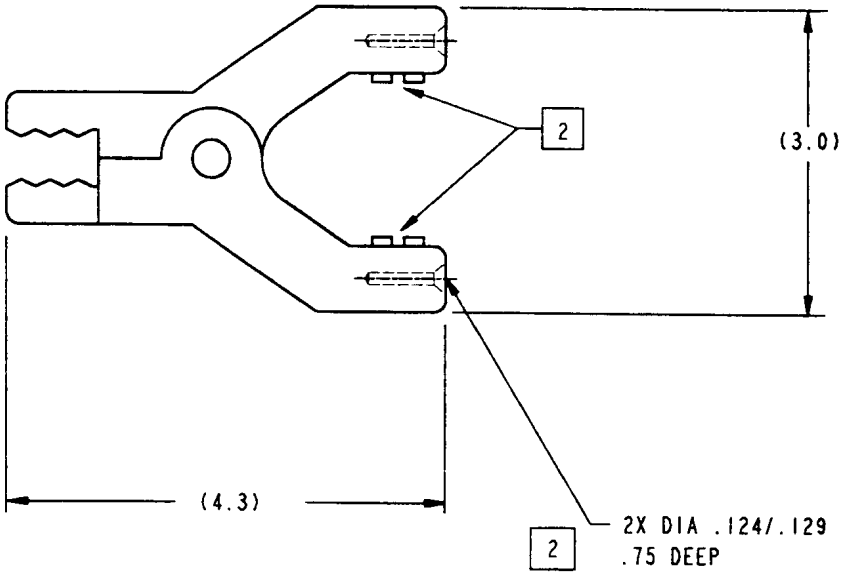
Explanation of the Illustrations of Manufactured Items

All instructions needed by maintenance personnel to manufacture the item are included on the illustrations.

MANUFACTURED ITEMS PART NUMBER INDEX

NOTES: UNLESS OTHERWISE SPECIFIED

1. MAKE FROM CLAMP CONNECTOR PN M83413/7-1, CAGE NO 81349.
2. REMOVE SET SCREWS, DRILL AND COUNTERSINK AS SHOW AND REINSTALL SET SCREWS.



CLAMP, GROUNDING

SIZE		DWG NO.	13230E5923	
C				
SCALE	1 / 1			SHEET 1 OF 1

Figure 1. Clamp, Grounding

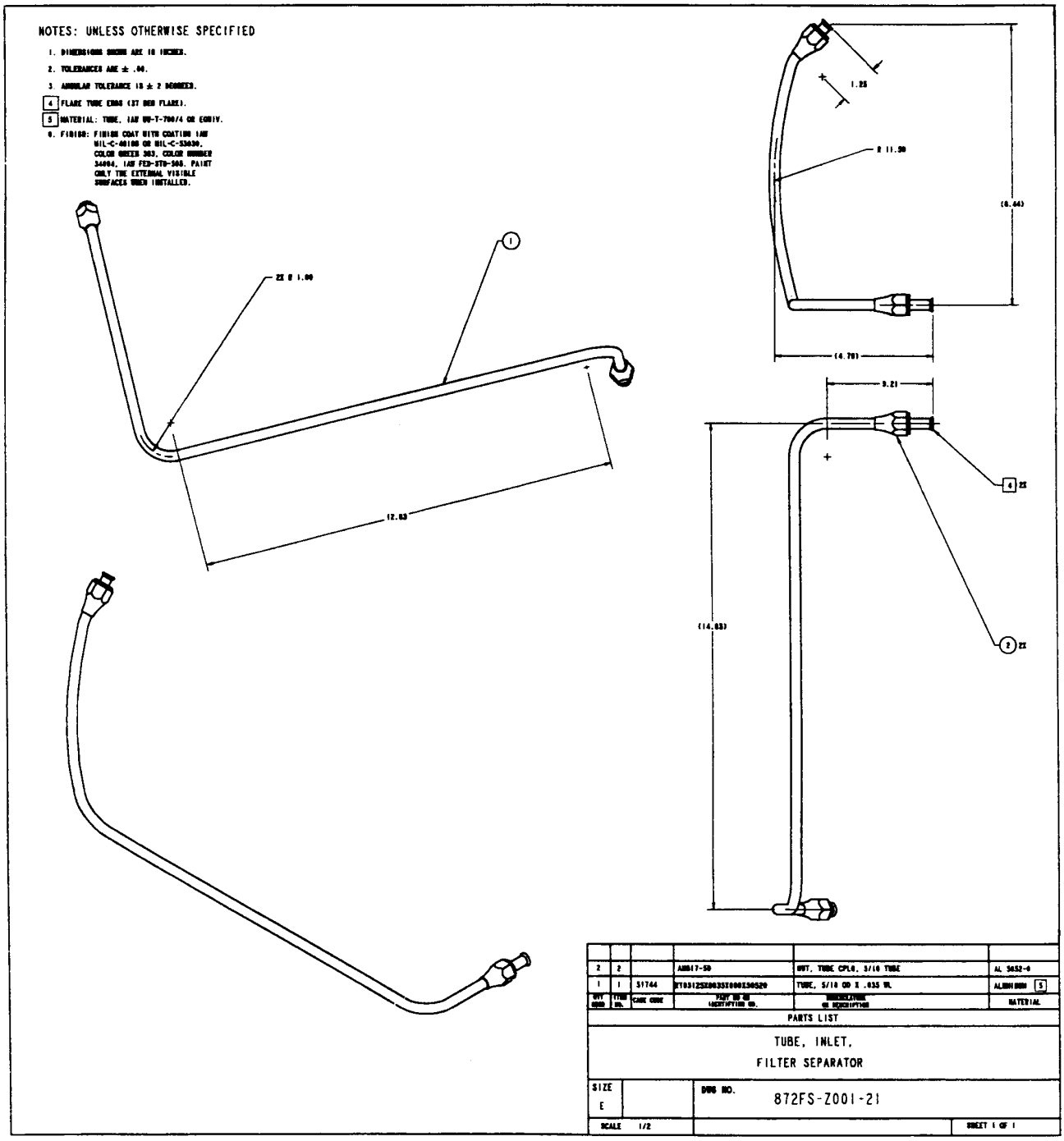


Figure 2. Tube, Inlet, Filter-Separator

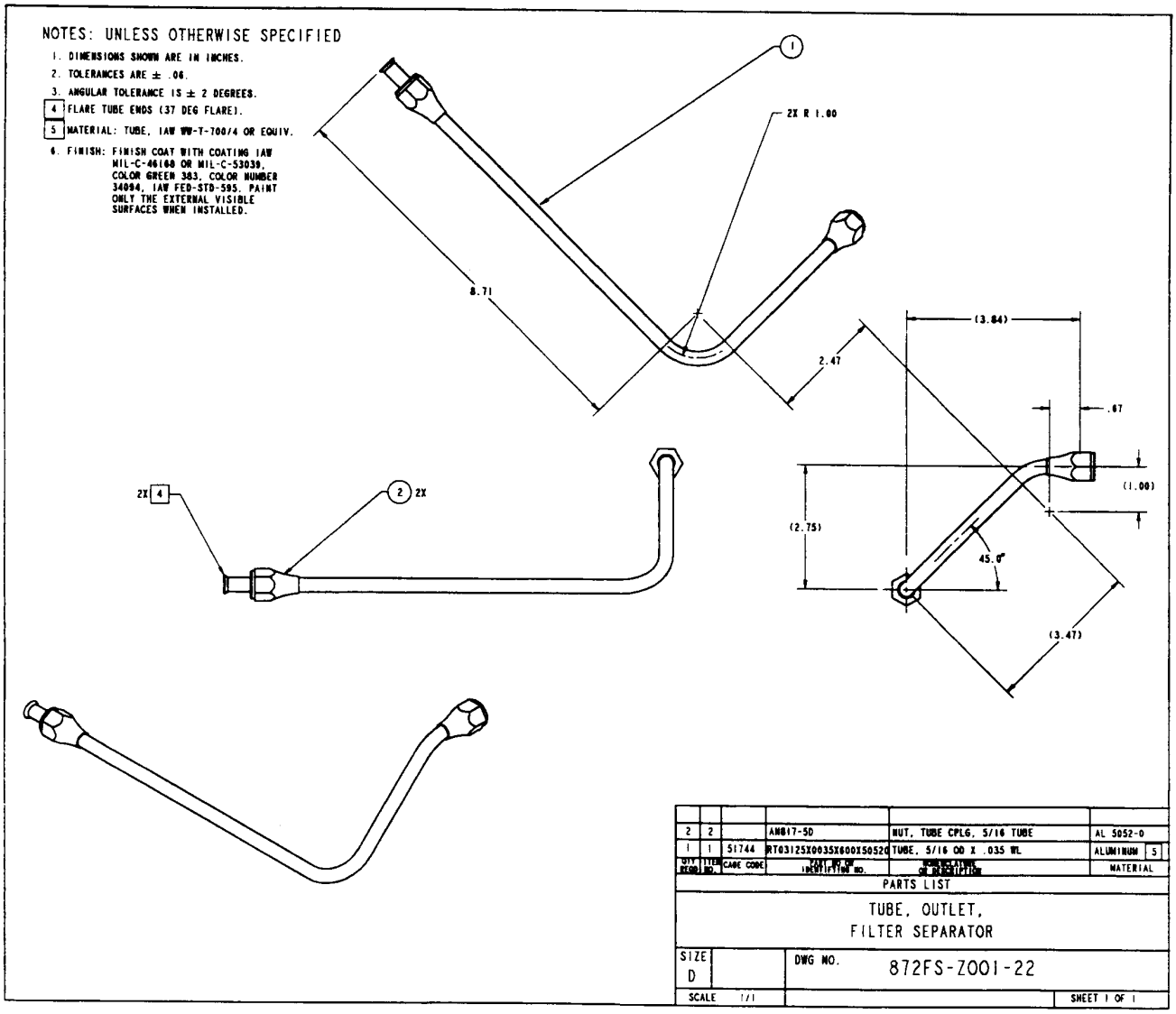
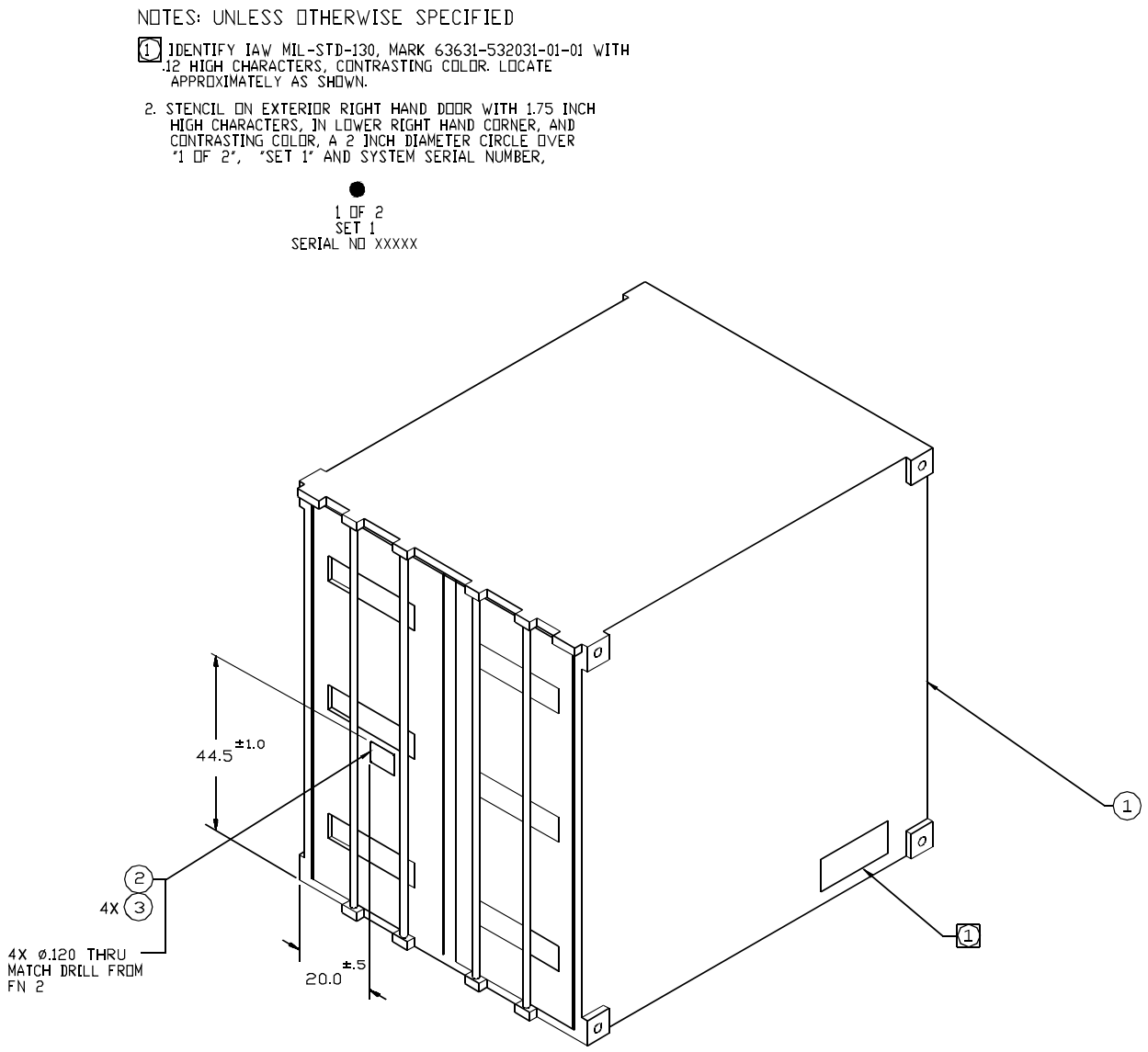


Figure 3. Tube, Outlet, Filter-Separator



FN	SMR CODE	NSN	CAGEC	PART NO.	DESCRIPTION	QTY
1	PAOOO	8145-01-475-9570	09PD1	CMCI-101C	TRICON 1	1
2	XDOZZ		63631	532060-01	PLATE, IDENT	1
3	PAOZZ	5305-00-253-5618	96906	MS21318-28	SCREW, DRIVE	4

TRICON 1

DWG NO 532031

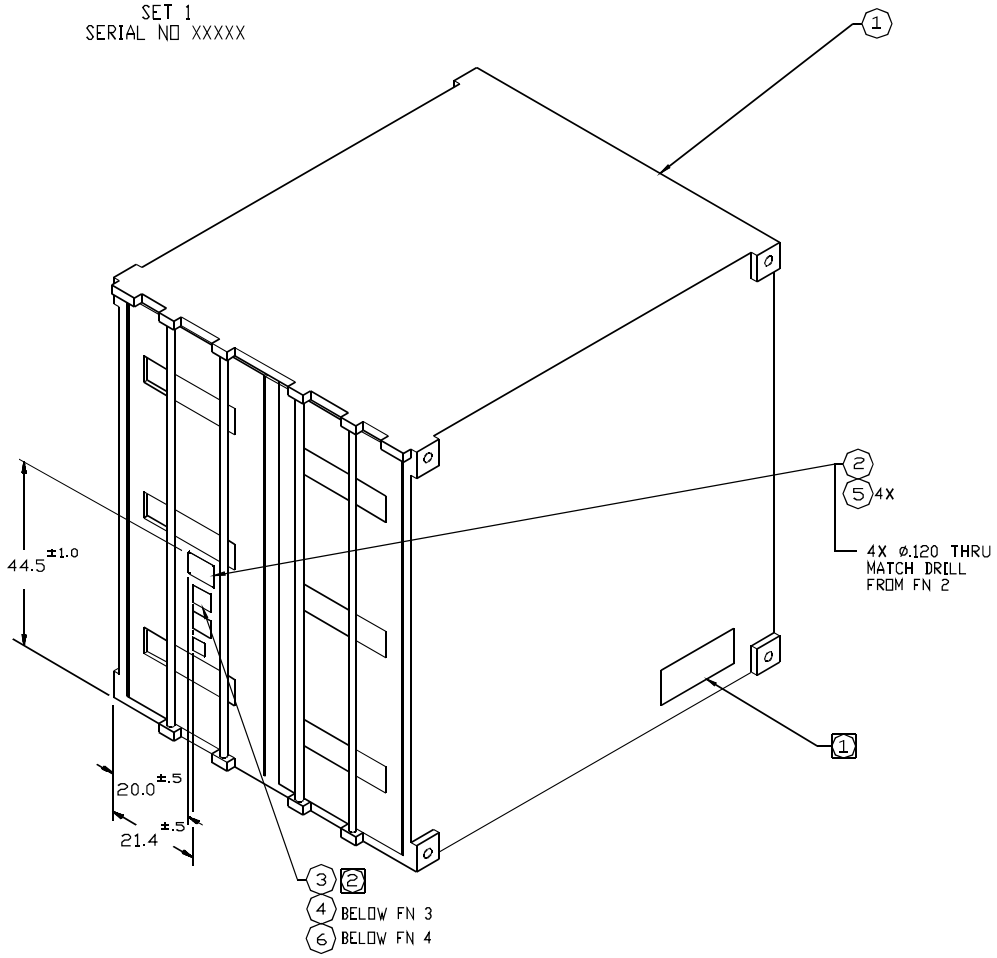
Figure 4. TRICON 1

(1) IDENTIFY IAW MIL-STD-130, MARK 63631-532032-01-01 WITH .12 HIGH CHARACTERS, CONTRASTING COLOR. LOCATE APPROXIMATELY AS SHOWN.

(2) APPLY SELF ADHESIVE LABEL, FLAMMABLE LIQUID, FN 3 FOLLOWED BY LABELS, NON-FLAMMABLE GAS, FN 4 AND AIR ELIGIBLE, FN 6 APPROXIMATELY 1 INCH BELOW IDENTIFICATION PLATE.

3. STENCIL ON EXTERIOR RIGHT HAND DOOR WITH 1.75 INCH HIGH CHARACTERS, IN LOWER RIGHT HAND CORNER, AND CONTRASTING COLOR, A 2 INCH DIAMETER CIRCLE OVER "2 OF 2", "SET 1" AND SYSTEM SERIAL NUMBER,

2 OF 2
SET 1
SERIAL NO XXXXX



FN	SMR CODE	NSN	CAGEC	PART NO.	DESCRIPTION	QTY
1	AOOOO	8145-01-475-9570	09PD1	CMCI-101C	TRICON 2	1
2	XDOZZ		63631	532060-02	PLATE, IDENT	1
3	XDOZZ		1BK62	1107181-001-Z-EV-H32	LABEL, FLAMMABLE LIQUID	1
4	XDOZZ		1BK62	1107181-003-Z-EV-H32	LABEL, NON-FLAMMABLE GAS	1
5	PAOZZ	5305-00-253-5618	96906	MS21318-28	SCREW, DRIVE	4
6	XDOZZ		1BK62	D455	LABEL, AIR ELIGIBLE	1

TRICON 2
DWG NO 532032

Figure 5. TRICON 2

CHAPTER 8

DIRECT SUPPORT MAINTENANCE
FOR
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM

DIRECT SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE FUEL TRANSFER PUMP PN 60975-5 OUTLET FLAPPER VALVE/O-RINGS

INITIAL SET-UP:

Tools:
Tool kit, General Mechanic Automotive
(WP 0113 00, Item 1)
Torque Wrench, 0-300 in. lb.
(WP 0113 00, Item 2)

Equipment Condition

Fuel transfer pump defueled

Materials/Parts Required:
Petrolatum (WP 0116 00, Item 20)

REMOVAL

1. Remove the three hex head screws (1) and flat washers (2) that secure the outlet (3) to the diffuser case (4). Lift the outlet (3) off the diffuser case (4).

2. Remove and discard O-rings (5) and (6).

NOTE

The flapper valve is a butterfly valve designed to open when fuel pump full flow has been attained. Before disassembly, note the orientation of the springs on the valve body and the valve body position in the pump outlet for assembly and installation. The springs appear to be identical when installed; the difference can be seen only when the springs have been removed. The springs are properly installed when the flapper valve matches the one shown in the figure inset. Use care not to lose any spacer when removing flapper valve assembly.

3. Remove flapper valve assembly (7, 8, 9, 10, and 11) by pushing down on outer pin (7) from the top, just enough so that the top of the outer pin (7) clear diffuser case (4) top outer pin hole. Pull the top of flapper valve assembly out far enough to push up on outer pin (7) from the bottom to clear diffuser case (4) bottom outer pin hole, using care not to lose any of the six small spacers (9) remove flapper valve assembly. Inspect flapper valve assembly for damage. Replace if damaged or otherwise unfit for use. Do not disassemble flapper valve assembly unless replacement is required. If disassembly is not required, proceed to step 5.

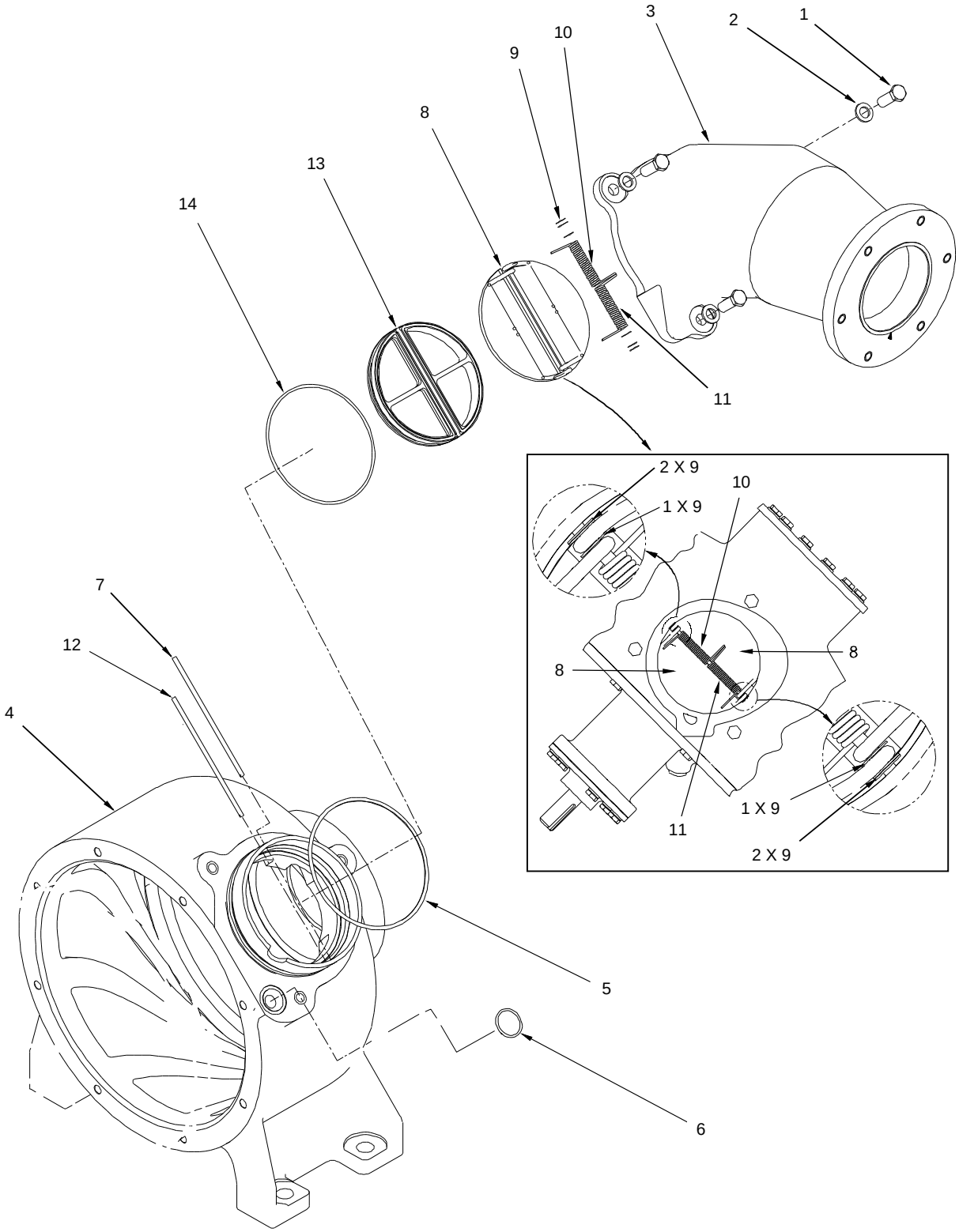
4. To disassemble flapper valve assembly, remove the center pin that secures the springs (10 and 11) to the two flapper valves (8).

NOTE

The check valve seat is a tight fit but can be removed by hand. It is not secured by any type of fastener.

5. Remove the inner pin (12) and the check valve seat (13). Inspect the check valve seat (13) for damage. Replace if damaged or otherwise unfit for use.

6. Remove and discard O-ring (14) from check valve seat (13).


1
2
3
4
5
6
7
8
9
10
11
12
13
14
2 X 9
1 X 9
10
8
8
1 X 9
11
2 X 9

INSTALLATION

1. Install O-rings (5 and 6) on diffuser case (4).

2. Install O-ring (14) on check valve seat (13).

3. Lubricate the check valve seat (13) and insert in diffuser case (4), aligning slot in check valve seat (13) with pin holes in diffuser case (4).

4. Install inner pin (12) through holes in diffuser case (4) and slot in check valve seat (13).

NOTE

The flapper valve is a butterfly valve designed to open when fuel pump full flow has been attained. The springs appear to be identical when installed; the difference can be seen only when the springs have been removed. The springs are properly installed when the flapper valve matches the one shown in the figure inset.

5. Hold two halves of flapper valve (8) on flat surface and assemble spring (11) and springs (10) as shown in the illustration inset. Insert one small plastic spacer (9) between the upper arms of the flapper valve (8) and one between the lower arms of the flapper valve (8). Insert the outer pin (7) through the flapper arm spacers (9) and springs (10 and 11).

6. Install flapper valve (8) as an assembly (7, 8, 9, 10, and 11) in diffuser case (4). Ensure that small plastic spacers (9) are arranged as indicated with one spacer captured by spring at each end and two spacers outside the spring at each end. Hold spacers in place and adjust outer pin (7) to install first the lower end of outer pin (7) and then upper end of outer pin (7). Adjust outer pin (7) position as necessary to fit flush with diffuser case (4) at either end.

7. Align bolt holes in outlet (3) and diffuser case (4), and install outlet (3) on diffuser case. Secure with three hex head screws (1) and flat washers (2). Torque to 75-80 in-lbs.

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE FUEL TRANSFER PUMP PN 60975-5 INPUT SEALS

INITIAL SET-UP:

Tools:
Wrench, Combination, 1/2"
(WP 0113 00, Item 1)
Wrench, Combination, 7/16”
(WP 0113, Item 1)
Torque Wrench, 0-300 in. lb.
(WP 0113 00, Item 2)

Equipment Condition
Fuel transfer pump defueled
Fuel transfer pump removed from pump-engine module (WP 0034 00)
Quick disconnect fitting removed from pump (WP 0025 00)

Materials/Parts Required:
Compound, Anti-Seize, Molybdenum Disulfide
(WP 0116 00, Item 6)
Petrolatum (WP 0116 00, Item 20)

REMOVAL

1. Mark the bearing housing assembly (1) and diffuser case (2) for reassembly. Remove the eight hex head screws (3) and flat washers (4) that secure the bearing housing assembly (1) to the diffuser case (2). Pull the bearing housing assembly (1) from the diffuser case (2).
2. Remove and discard O-rings (5) and (6).
3. Remove the six screws (7) and flat washers (8) that secure the shaft seal cap (9) to the bearing housing assembly (1). Remove the shaft seal cap (9).
4. Remove and discard O-ring (10).
5. Remove retainer ring (11) from shaft seal cap (9).
6. Push rotary seal (12) out of shaft seal cap (9).

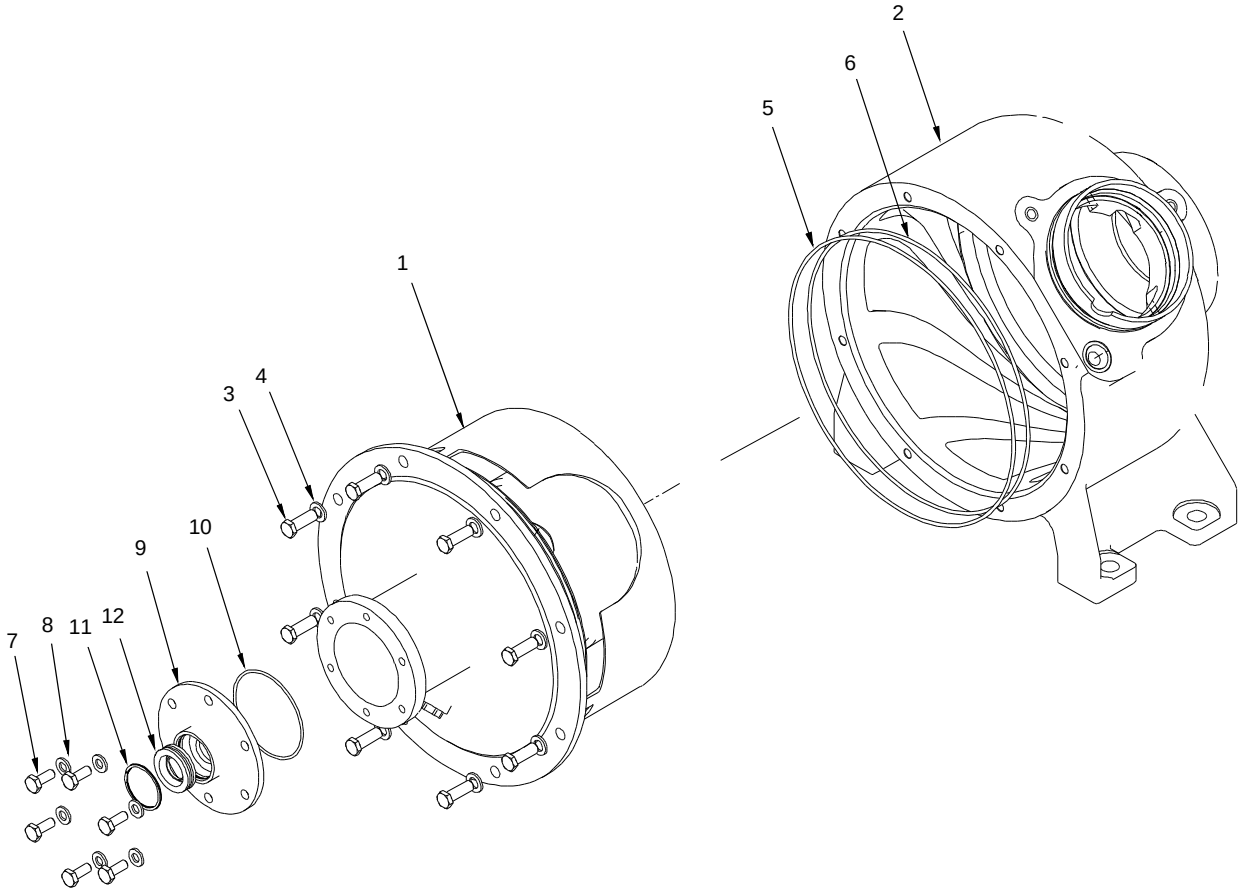
INSTALLATION

1. Install rotary seal (12) in shaft seal cap (9) so that the metal ring is visible (facing out).
2. Install retainer ring (11) in shaft seal cap (9).
3. Lightly lubricate and install O-ring (10) onto shaft seal cap (9).
4. Install shaft seal cap (9) to bearing housing assembly (1). Install six hex head screws (7) and flat washers (8). Torque in a crossing pattern to 42-46 in-lbs.
5. Lightly lubricate and install O-rings (5 and 6) on bearing housing assembly (1).

INSTALLATION - Continued

6. Align to previous marks and insert bearing housing assembly (1) in diffuser case (2)

7. Install the eight hex head screws (3) and flat washers (4) that secure the bearing housing assembly (1) to the diffuser case (2). Torque in a crossing pattern to 75-80 in-lbs.



END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPAIR FUEL TRANSFER PUMP PN 60975-5 ROTARY VANE PUMP

INITIAL SET-UP:

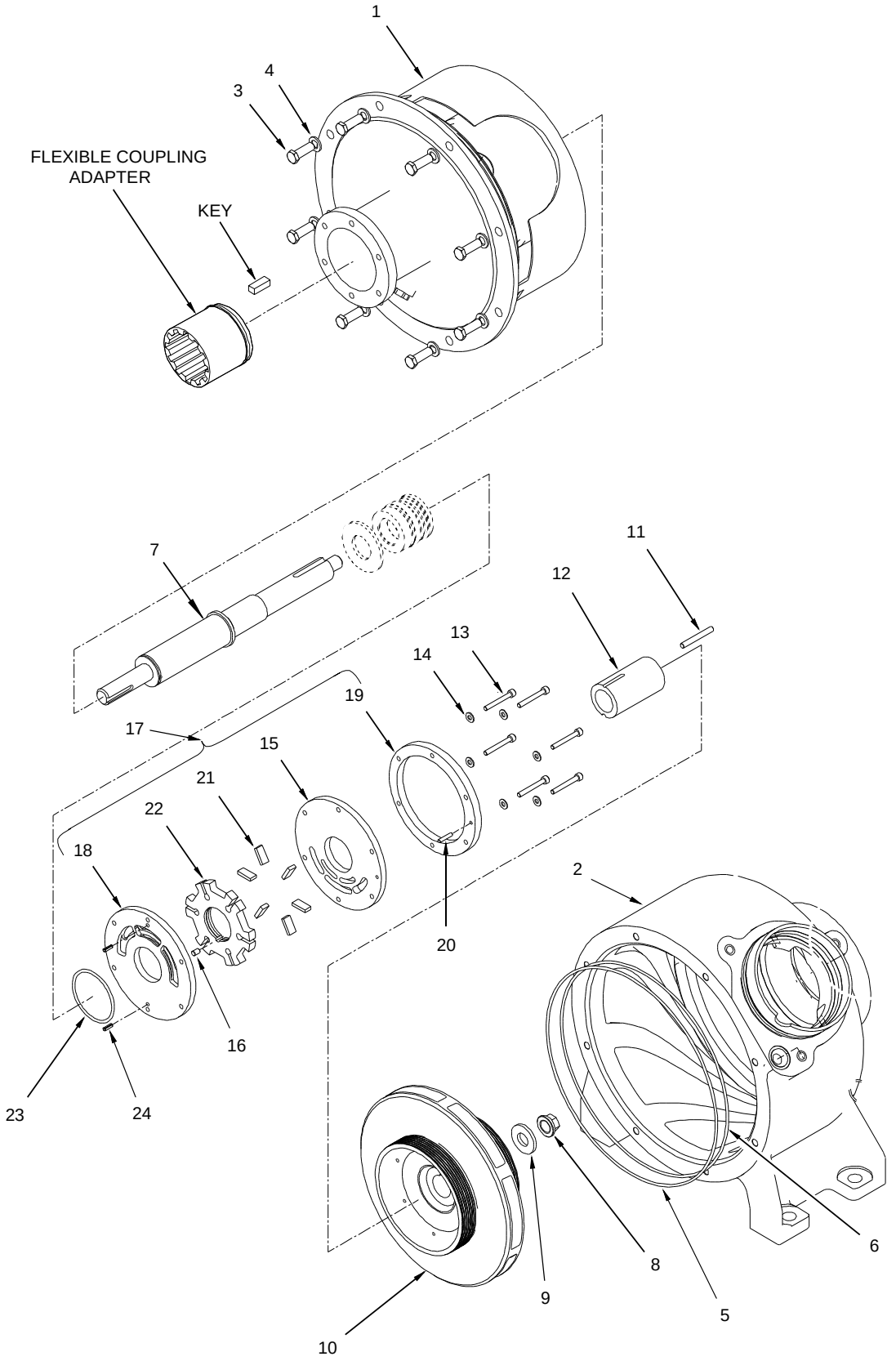
Tools:
- Torque Wrench, 0-300 in. lb. (WP 0113 00, Item 2)
- Wrench, Combination, 1/2' (WP 0113 00, Item 3)
- Wrench, Combination, 9/16" (WP 0113 00, Item 3)
- Key, Socket Head Screw, 9/64" (WP 0113 00, Item 3)
- Key, Socket Head Screw, 3/16" (WP 0113 00, Item 3)
- Wrench, Strap (WP 0113 00, Item 3)

Materials/Parts Required:
- Compound, Anti-Seize, Molybdenum Disulfide (WP 0116 00, Item 6)
- Petrolatum (WP 0116 00, Item 20)
- O-Ring (WP 0117, Item 73)
- O-Ring (WP 0117, Item 76)
- O-Ring (WP 0117, Item 77)

Equipment Condition:
- Fuel transfer pump defueled
- Fuel transfer pump removed from pump-engine module (WP 0034 00)
- Quick disconnect fitting removed from pump (WP 0025 00)

DISASSEMBLY

1. Mark the bearing housing assembly (1) and diffuser case (2) for reassembly. Remove the eight hex head screws (3) and flat washers (4) that secure the bearing housing assembly (1) to the diffuser case (2). Pull the bearing housing assembly (1) from the diffuser case (2).
2. Remove and discard O-rings (5) and (6).
3. Install flexible coupling adapter and key on pump shaft (7).
4. Position strap wrench around flexible coupling adapter as near to set screw as possible to hold pump shaft (7). Loosen shaft nut (8).
5. Remove the flexible coupling adapter and key from pump shaft (7).
6. Remove shaft nut (8), flat washer (9), and impeller (10).
7. Remove pin (11) from drive sleeve (12).
8. Remove the six socket head screws (13) and flat washers (14) that secure the inlet port plate (15).
9. Remove the drive sleeve (12) and rotor drive pin (16).
10. Remove the rotary vane pump (17) as an assembly.
11. The inlet port plate (15), discharge port plate (18) and cam ring (19) are held together by pin (20). Rotate inlet port plate (15) around pin (20) to expose rotor vanes (21) and rotor (22). Remove and discard rotor vanes (21) from rotor (22).
12. Examine all parts of the rotary vane pump (17) for damage. Replace if required.
13. Remove and discard O-ring (23) from bearing housing assembly (1).


1
4
3
FLEXIBLE COUPLING
ADAPTER
KEY
7
11
12
13
14
19
17
15
21
22
18
20
2
16
23
24
6
8
9
5
10

ASSEMBLY

1. Lightly lubricate and install O-ring (23).

2. Install discharge port plate (18) so that side with two alignment pin holes engages the alignment pins (24). Press down discharge port plate (18), adjusting position as required until plate engages alignment pins (24). Maintain this position until vane pump assembly is complete.

3. Install alignment pin (20) in discharge port plate (18).

4. Install cam ring (19) on alignment pin (20).

5. Install rotor (22) inside cam ring (19).

6. Install drive sleeve (12) onto shaft (7). Ensure that the end with two grooves is facing the discharge port plate (18).

CAUTION

After rotor drive pin is installed, do not disturb position of drive sleeve. Rotor pin will fall into pump and damage pump at first attempt to operate.

7. Rotate rotor (22) or drive sleeve (12) to align notch in the rotor (22) with the largest of the two grooves on drive sleeve (12). Install rotor drive pin (16) in the aligned groove to engage rotor (22) to drive sleeve (12).

8. Install six vanes (21) in rotor (22).

9. Install inlet port plate (15) so that alignment pin hole engages alignment pin (20).

10. Press down on inlet port plate (15) and rotate until rotary vane pump assembly (17) engages alignment pins (24). Hold in place and loosely install six socket head screws (13) and flat washers (14). Torque in crossing pattern to 20-25 in-lbs.

NOTE

Do not lift drive sleeve or disturb position after pin installation.

11. Turn pump shaft (7) to align notch on pump shaft (7) and drive sleeve (12). Install pin (11) in drive sleeve (12) and pump shaft (7).

12. Install impeller (10), flat washer (9) and secure (hand tight) with shaft nut (8).

13. Install flexible coupling adapter and key on keyed end of pump shaft (7).

14. Position strap wrench around flexible coupling adapter as near to set screw as possible to hold pump shaft (7). Torque shaft nut (8) to 193-208 in-lbs.

15. Remove flexible coupling adapter and key from pump shaft (7)

16. Lightly lubricate and install O-rings (5 and 6) on bearing housing assembly (1).

17. Align to previous marks and insert bearing housing assembly (1) in diffuser case (2)

18. Install the eight hex head screws (3) and flat washers (4) that secure the bearing housing assembly (1) to the diffuser case (2). Torque in crossing pattern to 75-80 in-lbs.

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE FUEL TRANSFER PUMP PN 8424 INLET O-RING

INITIAL SET-UP:

Tools:
Goggles (WP 0113 00, Item 2)
Gloves (WP 0113 00, Item 2)
Wrench, Combination, 7/16 in. (WP 0113 00, Item 3)
Key, Socket Head Screw, 5/16 in. (WP 0113 00, Item 3)
Rubber Mallet (WP 0113 00, Item 3)

Materials/Parts Required:
Compound, Anti-Seize, Molybdenum Disulfide (WP 0116 00, Item 6)
Dry Cleaning Solvent (WP 0116 00, Item 13)
Petrolatum (WP 0116 00, Item 20)
Washer, Lock (WP 0117 00, Item 30)
O-Ring (WP 0117 00, Item 119)

Equipment Condition
Fuel transfer pump defueled

REMOVAL

NOTE

Mark inlet and pump housing to establish assembly orientation.

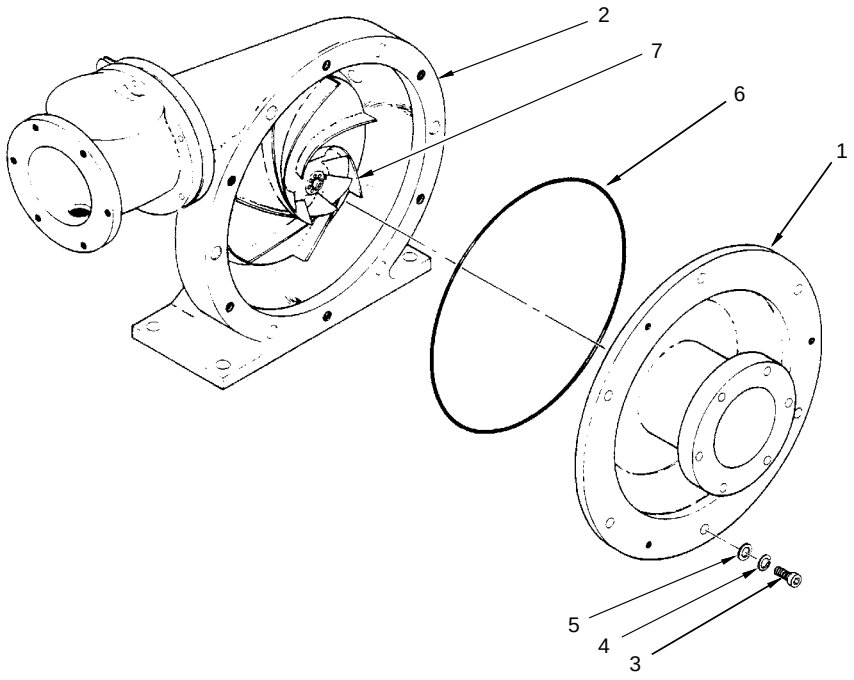
1. Remove inlet (1) from pump housing (2).
   a. Remove the six socket head screws (3), lock washers (4) and flat washers (5) that secure the inlet (1) to the pump. Discard lock washers (4).
   b. Install three, 1/4-28 x 1-1/2 inch jack bolts in the threaded holes spaced around the inlet circumference. Remove inlet (1) from pump housing (2) by alternately tightening the jack bolts until inlet is free. Remove jack bolts from inlet (1).
2. Remove O-ring (6) from inlet (1) and discard O-ring (6).
3. Inspect impeller (7) and housing interior for damage. Minor scratches and dents will not affect operation. If severe damage is noted, report to supervisor.
4. Inspect and clean O-ring groove as required. Any debris or foreign material may prevent the O-ring from seating properly.

WARNING

Degreasing solvent MIL-PRF-680, Type III, used to clean parts, is potentially dangerous to personnel and property. Eye protection is required. Avoid repeated and prolonged skin contact by wearing rubber gloves 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. 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.

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives and the dry cleaning solvent.

5. Clean interior of pump housing (2) with dry cleaning solvent SD (MIL-PRF-680), if required.



INSTALLATION

1. Lightly lubricate O-ring (6) with petrolatum and install in inlet O-ring groove. Do not allow the O-ring (6) to twist or roll during installation.

2. Install inlet (1) in pump.

   a. Install the inlet (1) by aligning the six retaining screw holes and the jack bolt holes with corresponding holes in the pump housing (2). Tap inlet (1) lightly around circumference with rubber mallet or heel of palm to seat inlet (1) in housing. If inlet (1) does not install easily, install the 1/4-28 x 1-1/2" jack bolts in the inlet and adjust bolts until inlet (1) is parallel to impeller housing, then back out jack bolts alternately 1/2 turn at a time until mounting screws (3) can be started.

   b. Lubricate with anti-seize compound and loosely install the six socket head screws (3), lock washers (4) and flat washers (5) in the inlet (1). Tighten in a crossing pattern, one or two turns at a time, to fully seat the inlet (1) in the pump housing (2). When all six screws are snug, tighten alternately until secure. Rotate shaft by hand to check for freedom of rotation. Some slight rubbing at the inlet (1) is normal but if the shaft binds or will not turn, adjust tightness of inlet mounting screw (3) until shaft turns freely.

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE FUEL TRANSFER PUMP PN 8424 SHAFT SEAL ASSEMBLY/O-RINGS

INITIAL SET-UP:

Tools:
Wrench, Strap
(WP 0113 00, Item 3)
Key, Socket Head Screw, 3/16”
(WP 0113 00, Item 3)
Wrench, Combination, 1-1/16”
(WP 0113 00, Item 3)
Adapter, Crow Foot
(WP 0113 00, Item 3)
Screwdriver, Flat Blade, 1/4” x 4”
(WP 0113 00, Item 3)
Wire, Twister, Plier
(WP 0113 00, Item 3)
Plier, Diagonal Cutting
(WP 0113 00, Item 3)
Wrench, Torque, 0-150 ft lb
(WP 0113 00, Item 3)

Materials/Parts Required:

Compound, Anti-Seize, Molybdenum Disulfide
(WP 0116 00, Item 6)
Petrolatum (WP 0116 00, Item 20)
Safety Wire (WP 0116 00, Item 33)
O-Ring (WP 0117 00, Item 106)
O-Ring (WP 0117 00, Item 115)

Personnel Required:

Two, any MOS

Equipment Condition

Fuel transfer pump defueled

REMOVAL

1. Lay fuel transfer pump on inlet side.
2. Remove safety wire from shaft nut cover screws (1).
3. Remove the four screws (1) and flat washers (2) that secure the shaft nut cover (3) to the seal housing (4). Remove the cover.
4. Install splined flexible coupling adapter (5) and key (6) on pump shaft.

NOTE

Removal of the fuel transfer pump shaft nut will require two persons. The nut is torqued to 100-110 ft lb (135-149 Nm) and may require one person to hold the strap wrench and one person to turn the nut.

5. Position strap wrench around splined flexible coupling adapter (5) as near to set screw as possible to hold pump shaft. Loosen shaft nut (7) as far as possible without jamming the nut against the splined flexible coupling adapter.
6. Remove the flexible coupling adapter (5).
7. Remove the shaft nut (7) and flat washer (8).
8. Remove safety wire from seal housing screws (9).
9. Remove the five seal housing screws (9) and flat washers (10); remove the shaft seal housing (4).

REMOVAL - Continued

NOTE

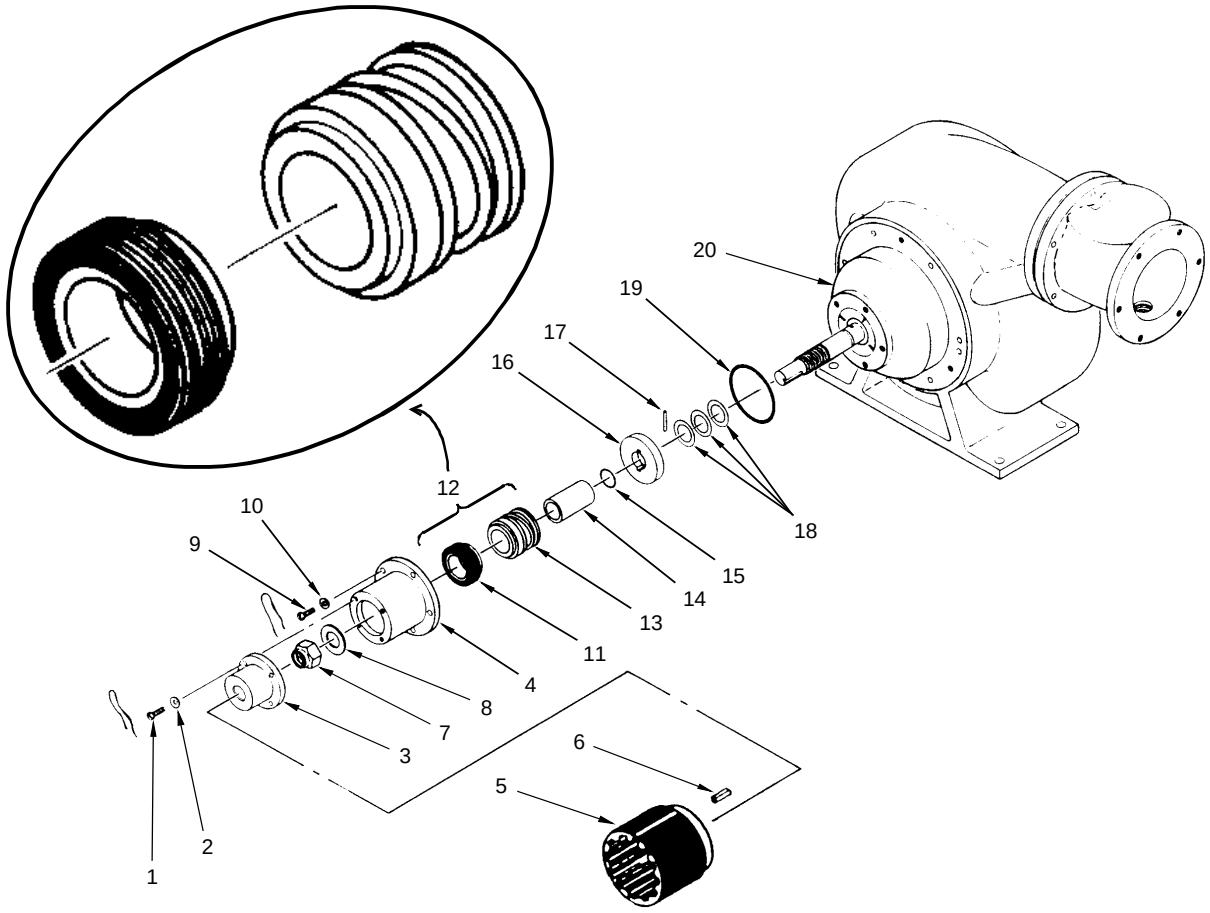
The stationary seal portion of the rotating shaft seal will remain in the shaft seal housing and must be pushed out.

10. Remove the stationary seal portion (11) of the rotating shaft seal (12) from the shaft seal housing (4). Discard the seal (11).

NOTE

Note installation direction of rotating spring portion of shaft seal for reassembly.

11. Remove spring (13) and spacer (14) as a unit.
12. Press spring (13) off spacer (14) and discard spring (13).
13. Remove and discard shaft O-ring (15). Do not remove other shaft components (thrust washer [16], dowel [17] and shims [18]) unless replacement is necessary.
14. Remove and discard the shaft seal housing O-ring (19).
15. Inspect and clean O-ring grooves as required. Any debris or foreign material may prevent the O-rings from seating properly.



INSTALLATION

1. Lubricate lightly and install O-ring (19) in vane pump housing (20).
2. Lubricate lightly and install O-ring (15) on shaft.
3. Lubricate stationary seal (11) and push into shaft seal housing (4) so that elastomer portion seats against housing.
4. Install rotating spring (13) on spacer (14), and install on shaft so that lipped portion of seal faces out (to interface with stationary seal installed in previous step).
5. Apply anti-seize compound to the five shaft seal housing screws (9). Place shaft seal housing (4) over shaft with weep hole facing down and mounting holes aligned, hold housing down against spring pressure, and install the five seal housing screws (9) and flat washers (10) that secure shaft seal housing (4) to vane pump housing (20).
6. Rotate shaft by hand to check freedom of rotation. Some rubbing at the inlet is normal but if the shaft binds or will not turn, remove shaft seal housing (4) and check rotating shaft seal (12) for proper assembly.
7. Install washer (8) and shaft nut (7) on shaft hand tight.
8. Install splined flexible coupling adapter (5) on pump shaft. Tighten set screw against shaft key (6).

NOTE

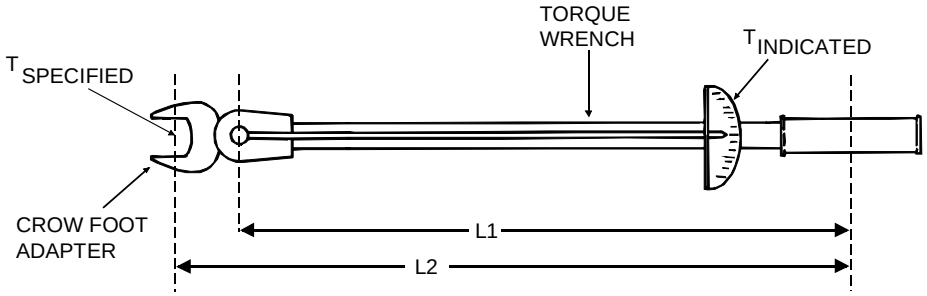
The shaft nut must be torqued to a specific value to provide the proper tension on the rotating shaft seal. However, a standard socket on a torque wrench cannot be used. A crow foot adapter, as shown in the illustration below, will allow access to the nut but adding the adapter will also cause the torque reading on the wrench to be different from the actual torque applied to the nut. To calculate the torque value to be indicated when the required torque is known, perform the following procedure:

a. Measure the distance L1 on the torque wrench to be used.

b. Install the crow foot adapter and measure the distance L2.

c. Divide L2 into L1.

d. Multiply the quotient by the torque specified for the nut. The product is the torque value that will be indicated on the wrench when the specified torque has been reached on the nut.



For example: The specified torque value for the shaft nut is 100-110 ft lb (135-149 Nm). The distance L1 measured on your torque wrench is 19 inches. The distance L2 measured on your torque wrench is 21 inches. In the following formula, $T_{INDICATED}$ is the value you should read on your torque wrench with the crow foot adapter installed. $T_{SPECIFIED}$ is the torque value specified for the nut.

INSTALLATION - Continued

$T_{INDICATED} = (L1/L2)T_{SPECIFIED}$

Substituting actual values: $T_{INDICATED} = (19/21)100\text{-}110$

$T_{INDICATED}$ = 90-99 ft lb (122-134 Nm)

In this example, 100-110 ft lb (135-149 Nm) is applied to the nut when your torque wrench reads 90-99 ft lb (122-134 Nm).

9. Position strap wrench around flexible coupling adapter (5) as near to set screw as possible to hold pump shaft. Torque the shaft nut (7) to 100-110 ft lb (135-149 Nm).
10. Rotate shaft by hand to check for freedom of rotation. Some rubbing at the inlet is normal but if the shaft binds or will not turn, remove shaft seal housing (4) and inspect for proper assembly or cause of misalignment.
11. Remove flexible coupling adapter (5) from input shaft.
12. Install shaft nut cover (3) using four screws (1) and flat washers (2).
13. Install safety wire on shaft nut cover retaining screws (1).
14. Install splined flexible coupling adapter (5) on pump shaft. Tighten set screw securely against shaft key (6).

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE FUEL TRANSFER PUMP PN 8424 VANE PUMP HOUSING O-RINGS

INITIAL SET-UP:

Tools:
Key, Socket Head Screw, 3/16” (WP 0113 00, Item 3)
Wrench, Combination, 7/16” (WP 0113 00, Item 3)

Materials/Parts Required:
Compound, Anti-Seize, Molybdenum Disulfide (WP 0116 00, Item 6)
O-Ring (WP 0117 00, Item 117)
O-Ring (WP 0117 00, Item 118)

REMOVAL

1. Lay pump on inlet.
2. Remove rotary shaft seal housing and components. Refer to WP 0094 00.
3. Remove thrust washer (1) from shaft.
4. Remove dowel pin (2) from shaft.
5. Remove the six socket head screws (3) and flat washers (4) that secure the vane pump housing (5) to the impeller housing (6).
6. Install three 1/4-28 x 1-1/2 inch jack bolts in the threaded holes spaced around the vane pump housing circumference. Remove vane pump housing by alternately tightening the jack bolts until housing is free. Remove jack bolts.

NOTE

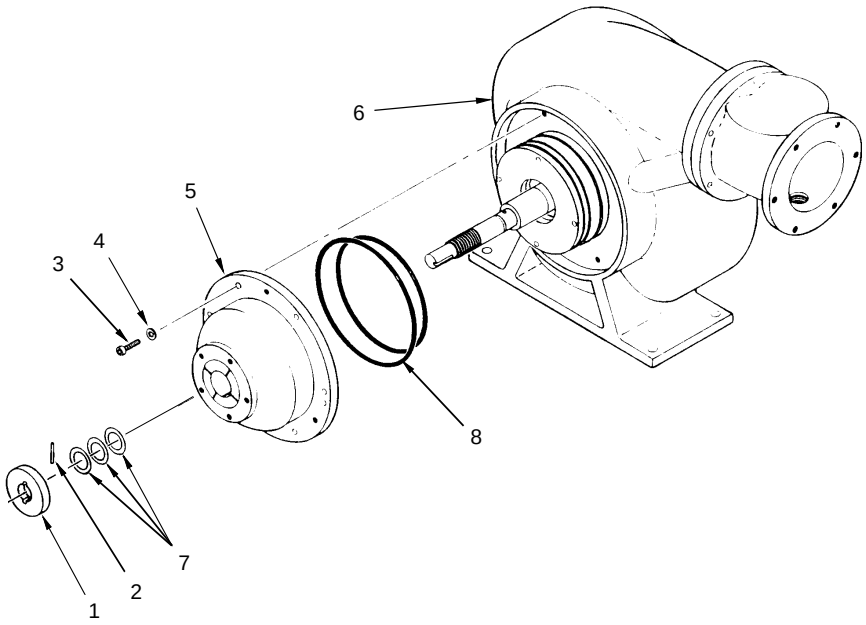
Count shims to ensure same number is installed during assembly.

7. Lift housing (5) and shims (7) from shaft.

CAUTION

Do not attempt to remove carbon bearing in vane pump housing. Bearing can only be replaced at the depot.

8. Remove and discard both O-rings (8) from face of vane pump housing.
9. Inspect and clean O-ring grooves as required. Any debris or foreign matter may prevent O-ring from seating properly.
10. Inspect and clean the mounting surface and vertical lip of the pump housing where the vane pump housing is attached. Ensure all paint and debris have been removed.



INSTALLATION

CAUTION

Ensure inlet is installed before commencing this procedure. Inlet installation will prevent the thrust washer dowel falling out of place. Equipment damage will occur if pump is run with a loose dowel. Ensure all paint and debris have been removed from area of vane pump housing seat. Any debris will cause vane pump housing to be misaligned and equipment damage will result.

1. Lightly lubricate O-rings (8) with petrolatum and install in O-ring grooves on vane pump housing (5). Do not allow the O-rings to twist or roll during installation.
2. Install vane pump housing (5).
   a. Hold vane pump housing (5) over shaft so that mounting holes and guide pin holes are aligned, and install three 1/4-28 x 1-1/2 jack bolts through housing into mounting holes. Space the bolts approximately equal distances apart and tighten finger tight. Using the bolts as guides, push the vane pump housing onto the shaft. Remove the three jack bolts.
   b. Apply anti-seize compound to and install the six socket head screws (3) and flat washers (4) to secure the vane pump housing (5) to the impeller housing (6). Alternately tighten screw pairs to draw housing down evenly. Rotate shaft by hand after each tightening sequence to ensure binding has not occurred. When all six screws are finger tight, repeat pattern to secure tightly. Verify proper alignment by rotating shaft by hand. Shaft will rotate freely without binding when all screws are tightened evenly.
3. Install shims (7) on shaft.
4. Install thrust washer (1).
   a. Install dowel pin (2) in shaft.
   b. Install thrust washer (1) so that dowel pin (2) engages slots in washer.
5. Install shaft seal assembly and shaft nut. Refer to WP 0094 00.

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPAIR OF FUEL TRANSFER PUMP PN 8424 ROTARY VANE PUMP

INITIAL SET-UP:

Tools:
Key, Socket Head Screw, 9/64" (WP 0113 00, Item 3)

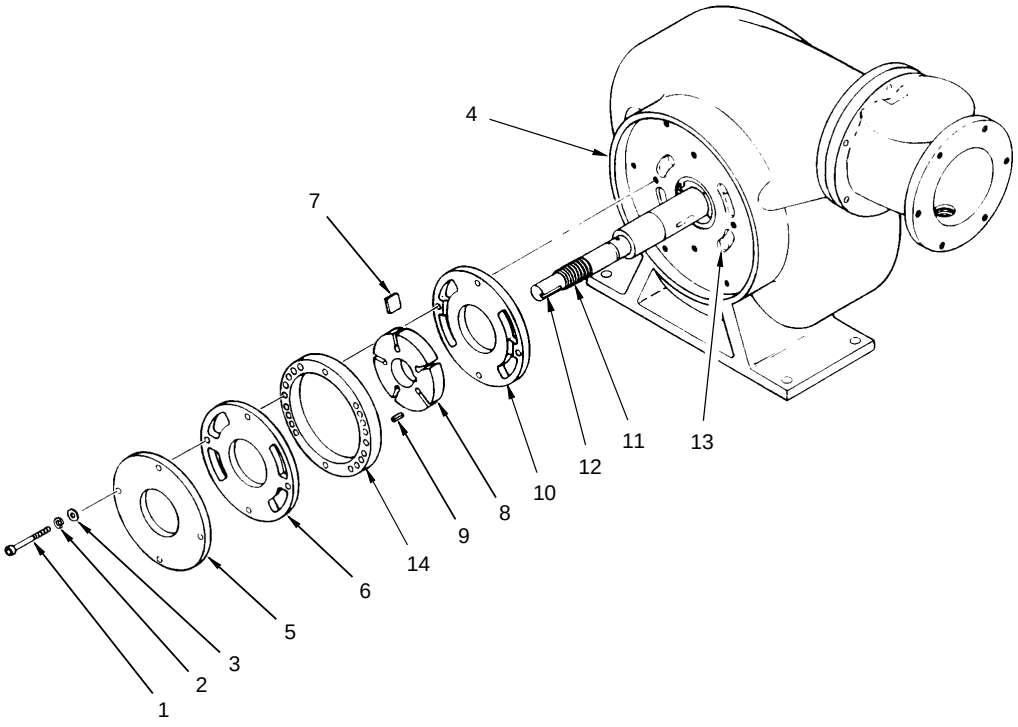
Materials/Parts Required:
Compound, Anti-Seize, Molybdenum Disulfide (WP 0116 00, Item 6)
Washer, Lock (WP 0117 00, Item 125)

REMOVAL

1. Remove rotary shaft seal housing and components. Refer to WP 0094 00.
2. Remove rotary vane pump housing. Refer to WP 0095 00.
3. Remove the four socket head screws (1), lock washers (2) and flat washers (3) that secure the rotary vane pump to the impeller housing (4). Discard lock washers (2).

REPAIR

1. Lift off the vane pump clamp plate (5) and outer side plate (6), and inspect pump for physical damage (nicks, burrs, scratches, etc.). Replace any component that has physical damage exceeding minor scratching.
2. Observe length of vanes (7); each vane should be long enough to be easily retained in rotor (8) at farthest extension. Replace vanes if excessively worn.
3. Remove vane pump components (7, 8, 10 and 14) as required for inspection. Be careful to retrieve rotor key (9) when removing rotor. Replace any component that has physical damage exceeding minor scratching.



INSTALLATION

1. Set pump on base.
2. Place vane pump inner side plate (10) over shaft with outside face towards the impeller. (The inside face has grooves connecting the inlet/outlet ports.)
3. Rotate impeller-shaft assembly (11) to place vane pump rotor key way (12) at top of shaft.
4. Place rotor key (9) in key way (12).
5. Hold impeller shaft (11) and slide vane pump rotor (8) over shaft and key (9).
6. Lay fuel transfer pump on inlet side and align inner side plate (10) mounting holes and fuel inlet/outlet ports (13).
7. Place cam ring (14) over rotor (8) so that mounting holes are aligned, and the sixteen flow holes are aligned with the corresponding inlet/outlet ports in the inner side plate (10).
8. Carefully place a carbon vane (7) in each of the five slots in the rotor (8). New vanes will be square on both ends and may be installed without regard for direction. Vanes that have been run in will have worn shorter in the direction of rotation. Install used vanes so that short side leads in the clockwise direction of rotation.
9. Place the outer side plate (6) over the rotor (8) so that mounting holes are aligned, and the fuel inlet/outlet ports are aligned with sixteen flow holes in the cam ring (14). (The inside face has grooves connecting the inlet/outlet ports.)
10. Place the clamp plate (5) over the outer side plate (6) so that mounting holes are aligned. Apply anti-seize compound to and install the four socket head screws (1), lock washers (2) and flat washers (3). Tighten the screws finger tight, then tighten in a crossing pattern.
11. Install rotary vane pump housing. Refer to WP 0095 00.
12. Install rotary shaft seal housing and components. Refer to WP 0094 00.

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPLACE FUEL TRANSFER PUMP PN 8424 IMPELLER-SHAFT ASSEMBLY

INITIAL SET-UP:

Tools:
Key, Socket Head Screw, 9/64 in.
(WP 0113 00, Item 3)
Key, Socket Head Screw, 3/16”
(WP 0113 00, Item 3)
Key, Socket Head Screw, 5/16 in.
(WP 0113 00, Item 3)
Wrench, Combination, 7/16 in.
(WP 0113 00, Item 3)
Wrench, Combination, 1-1/16 in.
(WP 0113 00, Item 3)
Wrench, Strap (WP 0113 00, Item 3)
Adapter Crow Foot (WP 0113 00, Item 3)
Screwdriver, Flat Blade, 1/4 in x 4 in.
(WP 0113 00, Item 3)
Wire Twister, Plier (WP 0113 00, Item 3)
Plier, Diagonal Cutting
(WP 0113 00, Item 3)
Wrench, Torque, 0-150 ft lb
(WP 0113 00, Item 3)

Materials/Parts Required:
Compound, Anti-Seize, Molybdenum Disulfide
(WP 0116 00, Item 6)
Petrolatum (WP 0116 00, Item 20)
Safety Wire, MS20995C20
(WP 0116 00, Item 33)

Personnel Required:
Two, any MOS

REMOVAL

1. Remove rotary shaft seal housing and components. Refer to WP 0094 00.
2. Remove rotary vane pump housing. Refer to WP 0095 00.
3. Remove rotary vane pump components. Refer to WP 0096 00.
4. Remove inlet. Refer to WP 0093 00.
5. Slide impeller-shaft assembly out of housing.

NOTE

Do not attempt to remove carbon bearing in impeller housing. This bearing can only be installed at depot level.

INSTALLATION

1. Slide replacement impeller-shaft assembly into housing.
2. Install inlet. Refer to WP 0093 00.

INSTALLATION - Continued

3. Install rotary vane pump components. Refer to WP 0096 00.
4. Install rotary vane pump housing. Refer to WP 0095 00.
5. Install rotary shaft seal housing and components. Refer to WP 0094 00.

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPAIR THREE-INCH VALVED UNISEX COUPLING

INITIAL SET-UP:

Tools:
- Screwdriver, Cross Tip, Size 2 (WP 0113 00, Item 2)
- Key, Socket Head Screw, 7/64" (WP 0113 00, Item 2)
- Key, Socket Head Screw, 9/64" (WP 0113 00, Item 2)
- Key, Socket Head Screw, 7/32 in. (WP 0113 00, Item 2)
- Punch (Drift Pin) (WP 0113 00, Item 2)
- Pick (or machinist's scribe) (WP 0113 00, Item 2)
- Chemical and Oil Protective Gloves (WP 0113 00, Item 2)
- Goggles (WP 0113 00, Item 2)

Materials/Parts Required:
- 320 Grit Paper (WP 0116 00, Item 1)
- Cloth, Lint Free (WP 0116 00, Item 4)
- Dry Cleaning Solvent (WP 0116 00, Item 13)
- Petrolatum (WP 0116 00, Item 20)
- Bushing (WP 0117 00, Item 19)
- Seal (WP 0117 00, Item 20)
- Bushing (WP 0117 00, Item 21)
- O-Ring (WP 0117 00, Item 102)
- O-Ring (WP 0117 00, Item 107)

Equipment Condition
- Coupling removed from inlet

DISASSEMBLY

WARNING

Rubber gloves should be worn when handling fuel system components due to toxic effects of some additives.

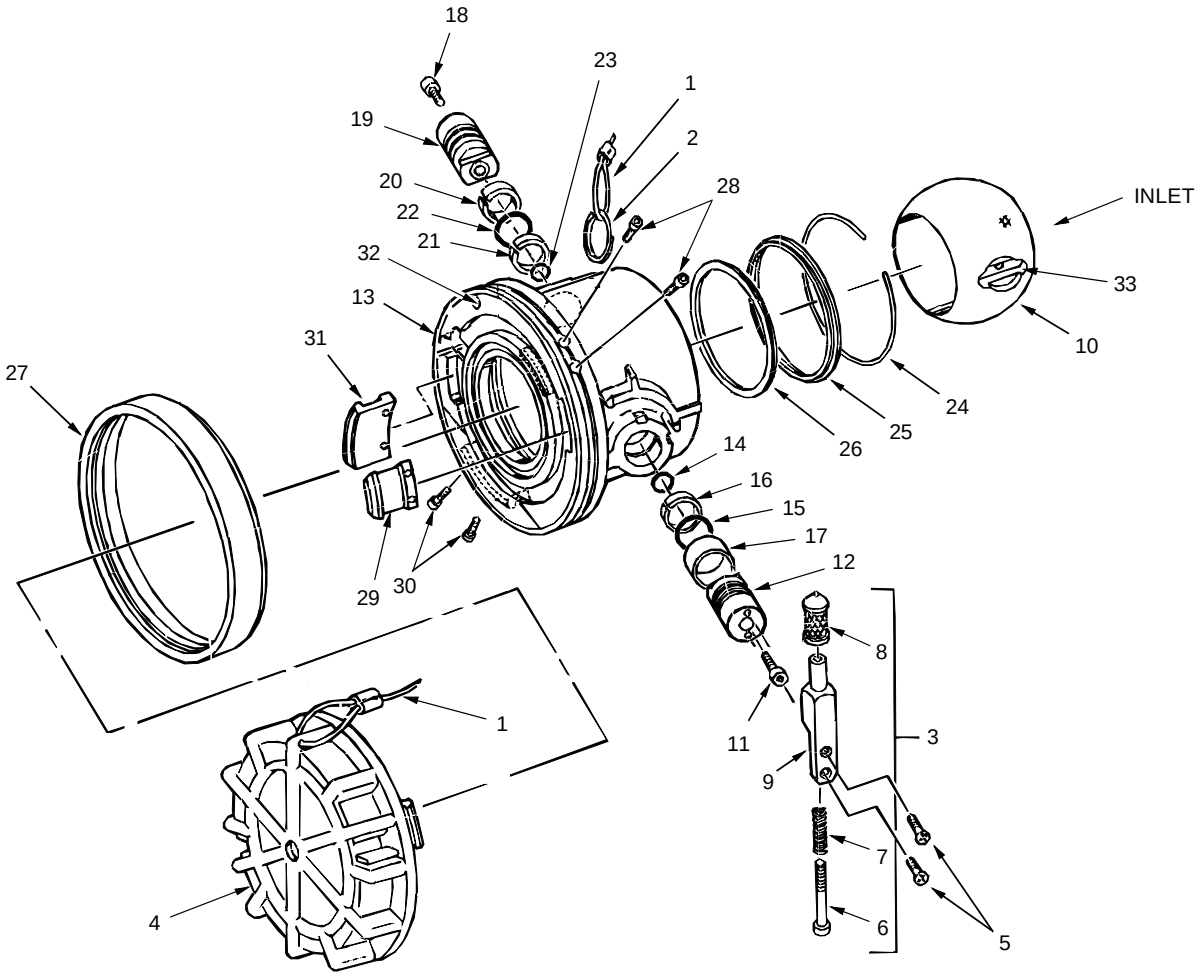
1. Unthread dust cap attaching cable (1) from split ring (2).
2. Place handle assembly (3) in closed position, rotate and remove dust cap (4) from coupling, then place handle assembly (3) in open position.
3. Remove two screws (5) and handle assembly (3).
4. If handle assembly (3) requires repair, remove socket head screw (6), spring (7), and knob (8) from handle (9).
5. Hold valve ball (10) with thumb and remove socket head screw (11) from handle-side shaft (12).
6. Install one screw (5) in the handle-side shaft (12) and pull shaft (12) from housing (13). Remove and discard O-ring (14).
7. Remove and discard O-ring (15) and bushings (16) and (17).
8. Hold valve ball (10) with thumb and remove socket head screw (18) from attaching-cable-side shaft (19).
9. Reaching in the inlet end, rotate the valve ball (10) by hand and remove it from the housing (13).
10. Push out the attaching-cable-side shaft (19). Remove and discard bushings (20) and (21) and O-rings (22) and (23).
11. Use pick or scribe to remove seal wire (24).

DISASSEMBLY - Continued

CAUTION

Avoid scratching or gouging beveled edge of seal retainer under seal wire, or any sealing surface. Gouges or burrs may cause the valve to malfunction.

12. Use pick (or scribe) to remove seal retainer (25). Insert pick between inner edge of retainer and seal, work down to bottom of retainer, rotate under retainer and lift to unseat and remove retainer. Repeat this process all around inner edge of the retainer until it is free.
13. Remove and discard seal (26).
14. Remove the bumper (27) by hand.
15. Remove screws (28) and lug (29).
16. Remove screws (30) and lug (31).



INSPECTION

1. Inspect all metal parts for dings, gouges, abrasions etc. On all parts except the ball (10), use 320 grit paper to smooth and remove sharp edges. If ball (10) is damaged (scratched, gouged, etc.) it should be replaced.
2. Check the groove (round bottom) in the inlet for burrs on the corners. If groove is worn such that burrs exist, use 320 grit paper to smooth and remove sharp edges.
3. Inspect the small spring-loaded continuity ball (32) located in the face of the unit. Push the ball in and be sure that it pops back into place. If the ball does not pop back freely, electrical continuity is lost and static discharge is possible. Replace entire coupling if continuity ball does not pop back out.
4. Inspect screw (6) and handle (9) for damage. If either part is bent, replace it.

WARNING

Degreasing solvent MIL-PRF-680, Type III, used to clean parts, is potentially dangerous to personnel and property. Eye protection is required. Avoid repeated and prolonged skin contact by wearing rubber gloves 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. 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.

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

5. Make certain all components are clean and free from oil, grease, or dirt. Wash all parts with an approved dry cleaning solvent and dry thoroughly with a clean, lint-free cloth.

ASSEMBLY

1. Place seal (26) into housing (13) with the flat surface inserted into the housing. Press into place with fingers.
2. Insert seal retainer (25). Work into place with fingers to seat seal (26) and clear groove for seal wire (24).

CAUTION

Avoid damage (scratching, gouging, etc.) to housing surfaces and seal retainer during installation of wire seal. Gouges or burrs may cause valve to malfunction.

3. Install open end of seal wire (24) into housing (13) at an angle and slide seal wire down into groove.
4. Install screws (28) and lug (29).
5. Install screws (30) and lug (31).
6. Install bumper (27) onto housing (13) such that the tapered edge is facing toward the housing.
7. Insert valve ball (10) into housing (13) with shaft flats (33) on ball aligned with shaft holes in housing.
8. Lightly lubricate replacement O-ring (22) with petrolatum and install bushings (20) and (21) and O-ring (22) onto attaching-cable-side shaft (19).
9. Place O-ring (23) into groove in inside end of attaching-cable-side shaft (19) and insert attaching-cable-side shaft (19) into housing (13) and ball (10).

ASSEMBLY - Continued

NOTE

It is normally possible to install the valve ball without regard to left-right or front-rear position. Occasionally, however, a ball will not be perfectly machined and the operating shafts will engage in one position only. If this problem occurs when installing the shafts, it will be necessary to remove the valve ball and install in a different position to allow the shafts to align properly for engagement with the valve ball.

10. Install bushing (17) onto the handle-side shaft (12). Lightly lubricate O-ring (15) with petrolatum and install bushing (16) and O-ring (15) onto handle-side shaft (12). Place O-ring (14) into inside end of groove in handle- side shaft (12) and insert handle-side shaft (12) into housing (13) and valve ball (10). If handle-side shaft (12) will not mate with ball (10), remove handle-side shaft (12), rotate ball (10) and insert handle-side shaft (12). Install retaining screw (11) to secure handle-side shaft (12) to valve ball (10). Hold valve ball (10) with fingers while tightening screw (11).
11. Install screw (18) to attach attaching-cable-side shaft (19) to valve ball (10). Hold valve ball with fingers while tightening screw (18).
12. If removed, install spring (7) and socket head screw (6) into handle (9), place knob (8) on handle and tighten.
13. Install handle assembly (3) to housing (13) using screws (5).
14. Open and close coupling valve twice to be sure it operates properly.
15. Place handle assembly (3) in closed position and install dust cap (4).
16. Thread attaching cable (1) through split ring (2).

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPAIR TWO-INCH VALVED UNISEX COUPLING

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics (WP 0113 00, Item 1)
Chemical and Oil Protective Gloves (WP 0113 00, Item 2)
Goggles (WP 0113 00, Item 2)

Materials/Parts Required:
320 Grit Paper (WP 0116 00, Item 1)
Cloth, Lint Free (WP 0116 00, Item 4)
Dry Cleaning Solvent (WP 0116 00, Item 13)
Petrolatum (WP 0116 00, Item 20)
Seal (WP 0117 00, Item 18)
O-Ring (WP 0117 00, Item 104)
O-Ring (WP 0117 00, Item 113)

Equipment Condition
Coupling removed from inlet

WARNING

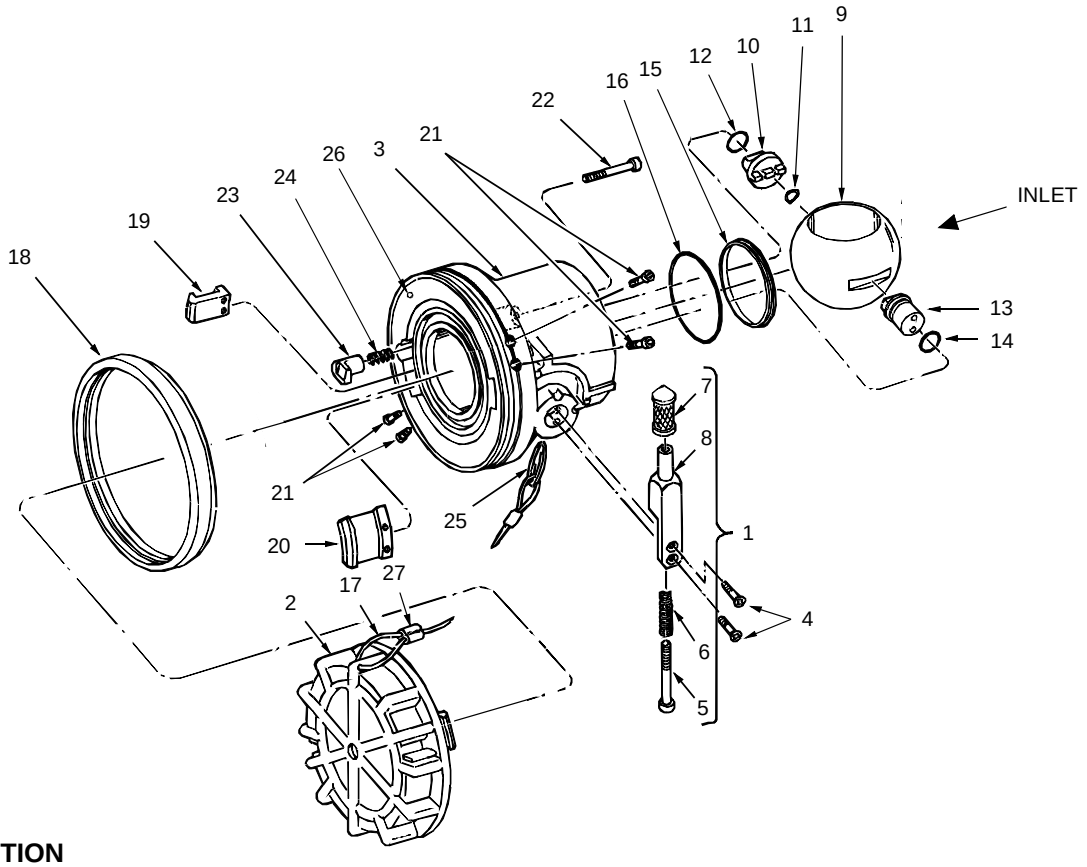
Rubber gloves should be worn when handling fuel system components due to toxic effects of some additives.

NOTE

Inspect the coupling components as they are disassembled. Repair is limited to replacement of unserviceable components discovered during disassembly. Removed O-rings and seals shall be replaced.

DISASSEMBLY

1. Place handle assembly (1) in closed position and remove dust cap (2) from 2 inch valved unisex coupling (3).
2. Remove screws (4) from handle assembly (1). Remove handle assembly (1).
3. If necessary to disassemble handle assembly (1), remove screw (5), spring (6) and grip (7) from handle (8).
4. Remove ball (9) from 2 inch valved unisex coupling (3).
5. Remove stop pin (10) and wave washer (11) along with O-ring (12). Discard O-ring.
6. Remove shaft (13) from inside 2 inch valved unisex coupling (3). Remove and discard O-ring (14).
7. Remove and discard downstream seal (15) and O-ring (16) from 2 inch valved unisex coupling (3).
8. If the dust cap (2) or attaching cable (17) is to be replaced, cut the cable (17).
9. Remove bumper (18) only if it is to be replaced or it is necessary to remove lugs (19 or 20).
10. To remove lugs (19 or 20), remove screws (21).
11. If interlock mechanism removal is necessary, remove screw (22), lockout pin (23) and spring (24).
12. If cable (17) is to be removed from 2 inch valved unisex coupling (3) remove split ring (25) from 2 inch valved unisex coupling (3).



INSPECTION

1. Inspect all metal parts for dings, gouges, abrasions etc. On all parts except the ball (9), use 320 grit paper to smooth and remove sharp edges. If ball (9) is damaged (scratched, gouged, etc.) it should be replaced.

2. Check the groove (round bottom) in the inlet for burrs on the corners. If groove is worn such that burrs exist, use 320 grit paper to smooth and remove sharp edges.

3. Inspect the small spring-loaded continuity ball (26) located in the face of the unit. Push the ball in and be sure that it pops back into place. If the ball does not pop back freely, electrical continuity is lost and static discharge is possible. Replace entire coupling if continuity ball does not pop back out.

4. Inspect screw (5) and handle (8) for damage. If either part is bent, replace it.

WARNING

Degreasing solvent MIL-PRF-680, Type III, used to clean parts, is potentially dangerous to personnel and property. Eye protection is required. Avoid repeated and prolonged skin contact by wearing rubber gloves 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. 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.

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives and the dry cleaning solvent.

5. Make certain all components are clean and free from oil, grease, or dirt. Wash all parts with an approved dry cleaning solvent and dry thoroughly with a clean, lint-free cloth.

ASSEMBLY

NOTE

During assembly, apply a light coat of petrolatum to O-rings before installation.

1. If interlock mechanism was removed, install lockout pin (23), spring (24) and screw (22) in 2 inch valved unisex coupling (3).

CAUTION

The lugs used in AAFARS unisex couplings are made of two different materials, stainless steel and aluminum. The two-inch suction hoses, two-inch wyes and all three-inch unisex couplings have stainless steel long and short lugs in the coupling body; three-inch dust caps have aluminum lugs. The discharge hoses, tees, crosses, manifolds and elbow unisex couplings have aluminum long and short lugs. Verify the correct lugs by using the parts listing in TM 10-4930-351-24P.

2. If lugs (19 or 20) were removed, install lugs (19 or 20) and screws (21).
3. If removed, install bumper (18) such that tapered edge is facing toward the housing.
4. If dust cap cable (17) was cut to remove it from dust cap (2), thread cable through dust cap (2) forming a loop. Use a sleeve (27) and crimp loose end of cable to itself.
5. Install O-ring (16) and downstream seal (15) in 2 inch valved unisex coupling (3).
6. Install O-ring (14) on shaft (13) and install shaft from inside 2 inch valved unisex coupling (3).
7. Using screws (4) install handle assembly (1) on shaft (13). Rotate handle assembly (1) to closed position.

NOTE

When installing stop pin, position the coupling body with the inlet toward you and rotated so hole for stop pin is at the bottom. Install the stop pin in the hole with the half shaft to your left. After stop pin installation, depress lock pin to ensure it can be fully depressed into the cavity.

8. Install O-ring (12) in groove on stop pin (10).
9. Position wave washer (11) on stop pin and install stop pin (10).

NOTE

When installing the ball in the valve body, some movement of the ball and valve lever arm may be necessary to align the stop pin, lever arm shaft and the ball.

10. Install ball (9) in 2 inch valved unisex coupling (3).
11. Install dust cap (2) on 2 inch valved unisex coupling (3).

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPAIR CCR NOZZLE ASSEMBLY

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive (WP 0113 00, Item 1)
Chemical and Oil Protective Gloves (WP 0113 00, Item 2)
Torque Wrench, 0-300 in. lb. (WP 0113 00, Item 2)
Vise (with soft face jaws) (WP 0113 00, Item 3)
Body Wrench (WP 0113 00, Item 11)
Piston Compression Tool (WP 0113 00, Item 12)
Locking Lug Assembly Tool (WP 0113 00, Item 13)
Poppet Wrench (WP 0113 00, Item 14)

Materials/Parts Required:
Alcohol, Rubbing (WP 0116 00, Item 2)
Compound, Sealing (WP 0116 00, Item 9)
Compound, Silicone (WP 0116 00, Item 11)
Dry Cleaning Solvent (WP 0116 00, Item 13)
Rags, Wiping (WP 0116 00, Item 21)

Materials/Parts Required:-Continued
Seal, Sleeve (WP 0117 00, Item 13)
Seal, Wiper (WP 0117 00, Item 14)
Bushing (WP 0117 00, Item 15)
Piston (WP 0117 00, Item 23)
Nut (WP 0117 00, Item 24)
Ring, Backup (WP 0117 00, Item 25)
Seal, Teflon (WP 0117 00, Item 26)
Seal (WP 0117 00, Item 31)
O-Ring (WP 0117 00, Item 110)
Packing, Preformed (WP 0117 00, Item 114)

Equipment Condition:
CCR Nozzle removed from fuel system.
CCR Nozzle Strainer and Coupling Assembly removed. (Refer to WP 0075 00.)

DISASSEMBLY

WARNING

Fuels are toxic and flammable. Do not get on person or clothing. Do not use near open flame. Area should be well-ventilated. Using drycleaning solvents incorrectly can cause injury or even death. Fuel is flammable. Do not smoke.

Rubber gloves should be worn when handling fueling system components due to the toxic effects of some fuel additives.

1. Install piston compression tool in coupling end of nozzle until it latches in place. Do not remove piston compression tool until directed to do so.

2. Push in latch actuator (1) and move handle (2) to OPEN position.

DISASSEMBLY-Continued

WARNING

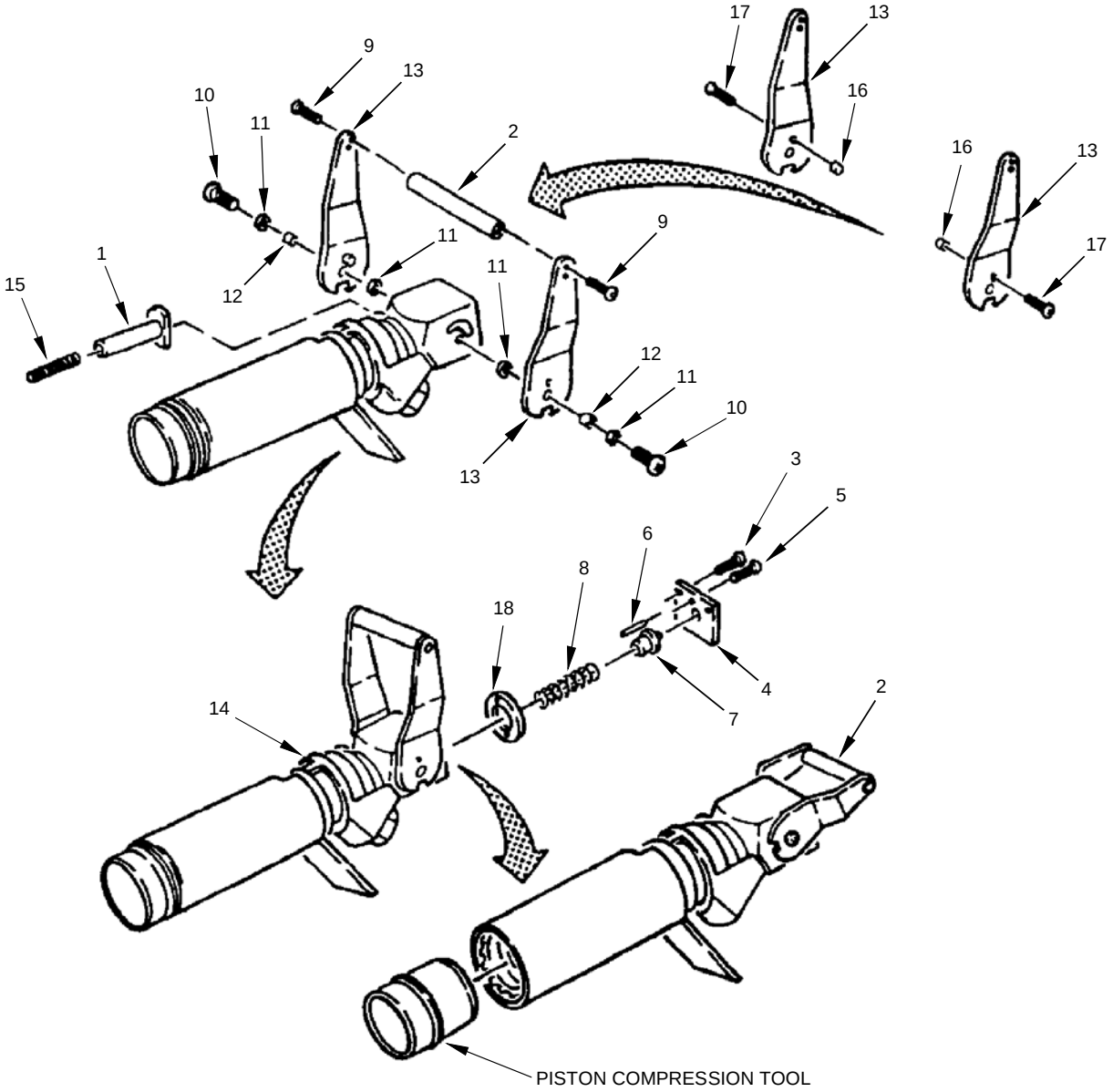
End cover is under spring pressure. Keep pressure on end cover while removing screws. Personal injury may occur from sudden separation of end cover.

NOTE

Removing the bonding cable assembly during repair of the CCR nozzle is optional. If removal is to be done, remove the single screw attaching the assembly to the nozzle housing.

3. Remove four corner screws (3) and end cover (4).

4. Single screw (5) and locking pin (6) should not be removed unless damaged. If damaged, use a soft jaw chuck or vise to hold locking pin (6) in place and remove screw (5).



DISASSEMBLY-Continued

5. Remove spring retainer (7) and spring (8).

6. Remove four side handle plate screws (9) and handle (2).

7. On the nozzle left side, remove screw (10), one washer (11), bushing (12) and side handle plate (13). Remove bushing (12) and washer (11) from screw (10). Remove second washer (11) from nozzle housing (14). Discard bushing.

8. On right side of nozzle housing (14) loosen screw (10).

9. While compressing valve latch actuator (1) on right hand side of nozzle, remove screw (10), one washer (11), bushing (12) and side handle plate (13). Remove bushing (12) and washer (11) from screw (10). Remove second washer (11) from housing (14). Discard bushing.

10. Slowly release valve latch actuator (1) and remove along with spring (15) from housing (14).

NOTE

Do not remove screw and actuating cam from side plate unless damaged and replacement is required.

11. Hold actuating cam (16) in place with a soft jawed vise and remove screw (17).

12. Temporarily install end cover (4) without spring (8) and spring retainer (7) in nozzle housing (14). Align locking pin (6) with one of the holes in valve actuating ring (18).

13. Using the poppet wrench at the coupling end of nozzle, unscrew poppet (29). Do not remove poppet (29) at this time. Remove poppet wrench.

14. Remove end cover (4) from housing (14).

NOTE

The piston assembly consists of the piston, valve actuating ring, seal and nut.

15. Remove piston assembly (20, 18, 22, and 21) from nozzle housing (14).

16. Remove four screws (19) attaching valve actuating ring (18) to piston (20).

17. Remove and discard nut (21) and seal (22) from piston (20). Discard piston.

18. Remove screws (23) attaching sleeve (24) to nozzle housing (14), remove sleeve (24) from nozzle housing (14).

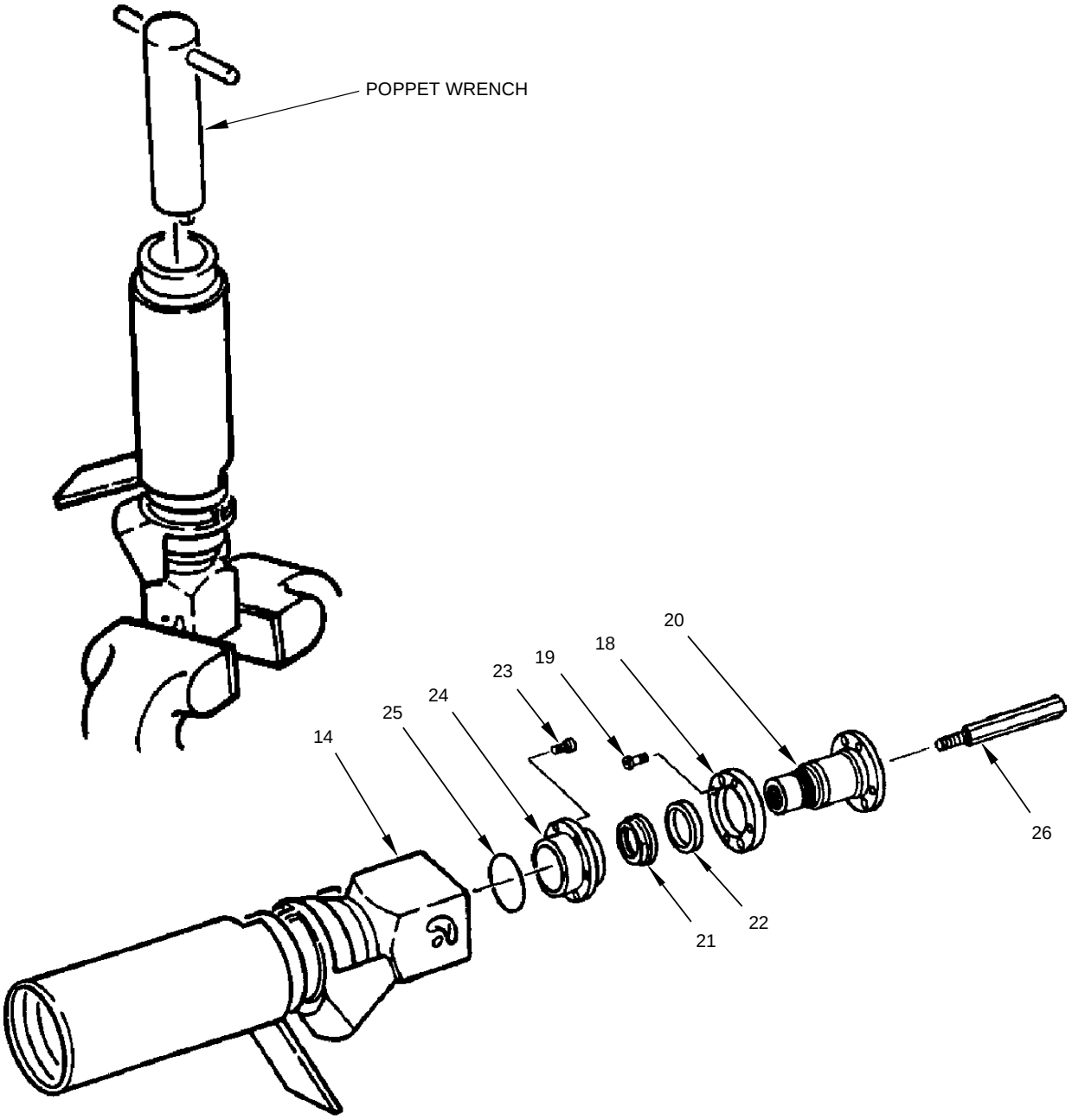
19. Remove and discard preformed packing (25) from sleeve (24).

NOTE

Position indicator should only be removed if piston is to be replaced.

20. Remove position indicator (26).

DISASSEMBLY-Continued

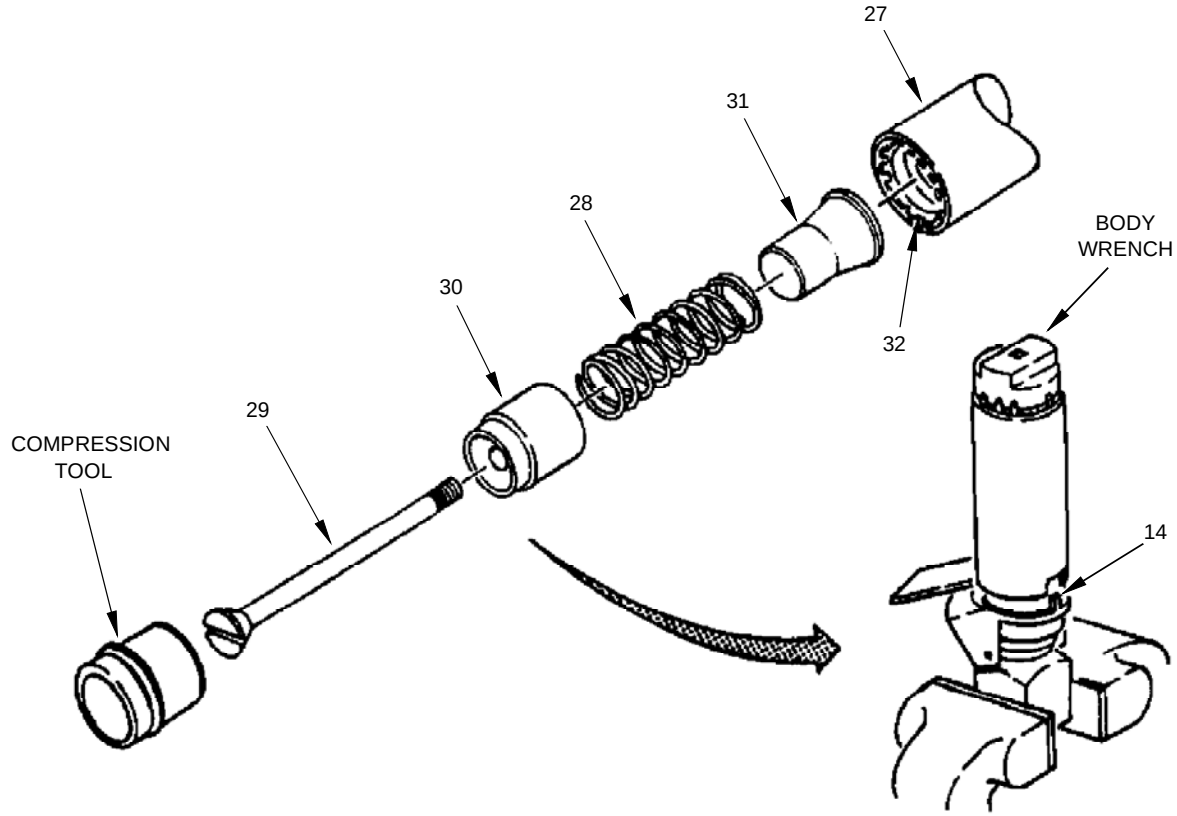


DISASSEMBLY-Continued

21. While holding the piston compression tool, slowly pull back on the collar (27). Spring (28) will push the piston compression tool, poppet (29), and sleeve seal (30) out of the nozzle housing (14). Discard sleeve seal.

22. Remove spring (28) and flow guide (31) from coupling end of nozzle housing (14).

23. Place nozzle housing (14) in a soft face vise with coupling end of nozzle facing up. Only tighten the vise enough to retain the nozzle housing (14).



CAUTION

Failure to trip the collar latch with the body wrench will cause damage to stayback detents.

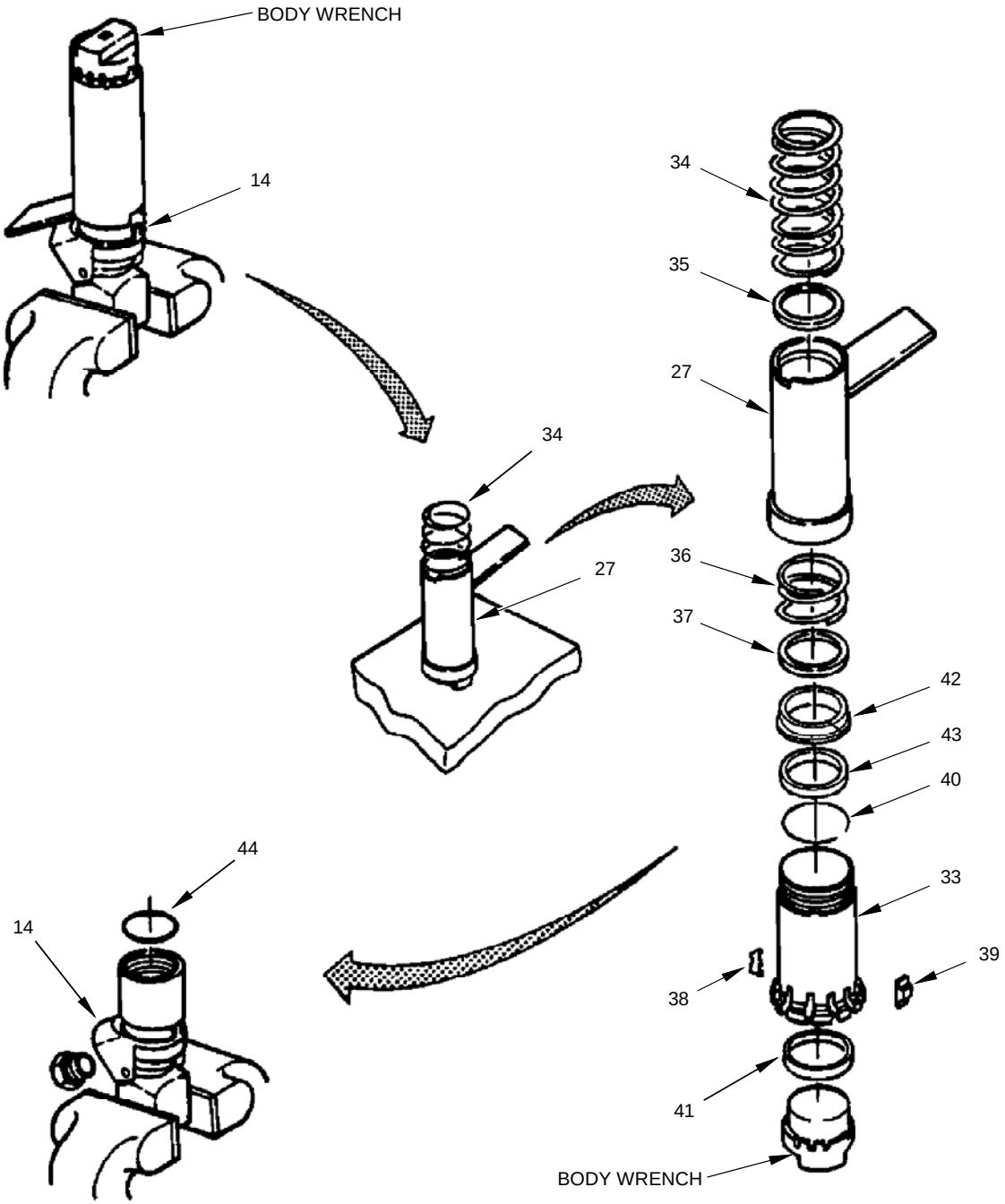
24. Align body wrench with locking lugs (32) and press into coupling end of nozzle until the collar (27) trips to the forward position.

DISASSEMBLY-Continued

WARNING

Body and collar are under spring pressure. Maintain pressure on the body wrench to prevent sudden separation. Personal injury could result.

25. Turn body wrench and loosen nozzle body (33) from nozzle housing (14).
26. While holding collar spring (34) and collar (27) together, remove collar (27) and spring (34) from nozzle housing (14).
27. Place collar (27), with body wrench still attached, on a workbench with coupling end down.
28. Remove collar spring (34) from collar (27).
29. Remove spring retainer (35) and stayback spring (36) from collar (27).
30. Remove lug retaining ring (37), nine locking lugs (38), three stayback detents (39) and lug wire (40) from body (33).
31. Remove and discard wiper seal (41) from nozzle body (33).
32. Remove and discard backup ring (42) and teflon seal (43) from nozzle body (33).
33. Remove and discard preformed packing (44) from nozzle housing (14).


BODY WRENCH
14
34
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BODY WRENCH

INSPECTION

WARNING

Degreasing solvent MIL-PRF-680, Type III, used to clean parts, is potentially dangerous to personnel and property. Eye protection is required. Avoid repeated and prolonged skin contact by wearing rubber gloves 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. 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.

1. Clean all components removed using a wiping rag moistened with dry cleaning solvent. Dry with a clean, dry wiping rag.
2. Inspect all parts for damage. Look for damaged threads, broken, worn, scored, or deformed parts, cracks or corrosion.
3. Replace damaged or defective components.

ASSEMBLY

1. Install wiper seal (41) in coupling end of nozzle body (33). The open end of the "V" of wiper seal (41) must face toward the coupling end of nozzle body (33). Smooth in with a finger to assure it is properly seated in the groove.
2. Install teflon seal (43) in the remaining groove. Open end (spring is visible) of teflon seal (43) must face the threaded end of the nozzle body (33).
3. Install backup ring (42) in the inside groove closest to the threaded end of nozzle body (33). The thin lip of the backup ring (42) faces the threaded portion of the nozzle body (33).
4. Smooth the teflon seal (43) into place with your finger to ensure it is installed correctly.
5. Install lug wire (40) into lower groove on nozzle body (33) and insert body onto the lug assembly tool.

NOTE

The lug assembly tool should remain level and stable during installation of the stayback detents and locking lugs.

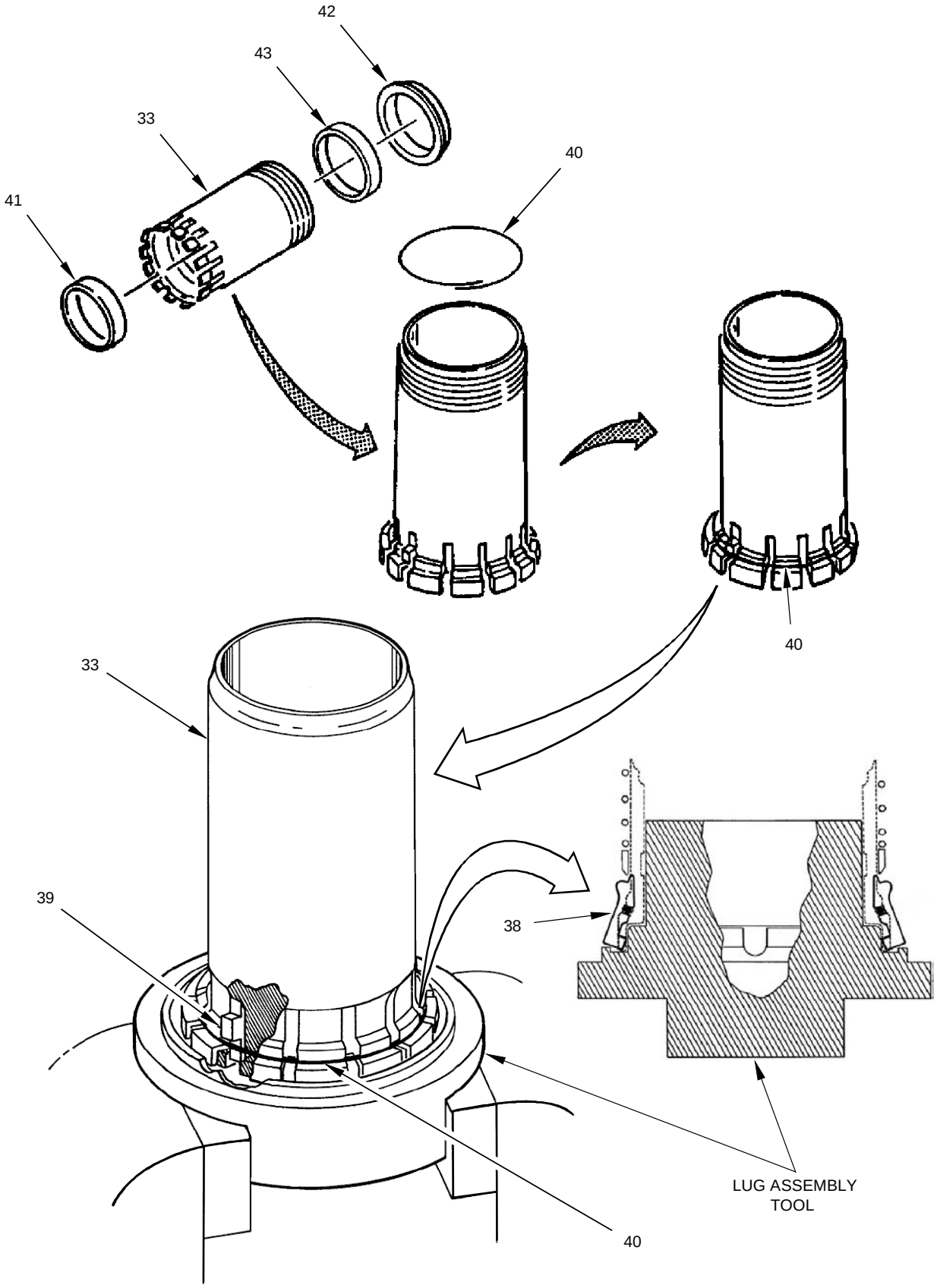
6. Place lug assembly tool in a vise.

NOTE

Stayback detents align with slots in the body and the three slots in the lug assembly tool. The detents are inserted behind the lug wire.

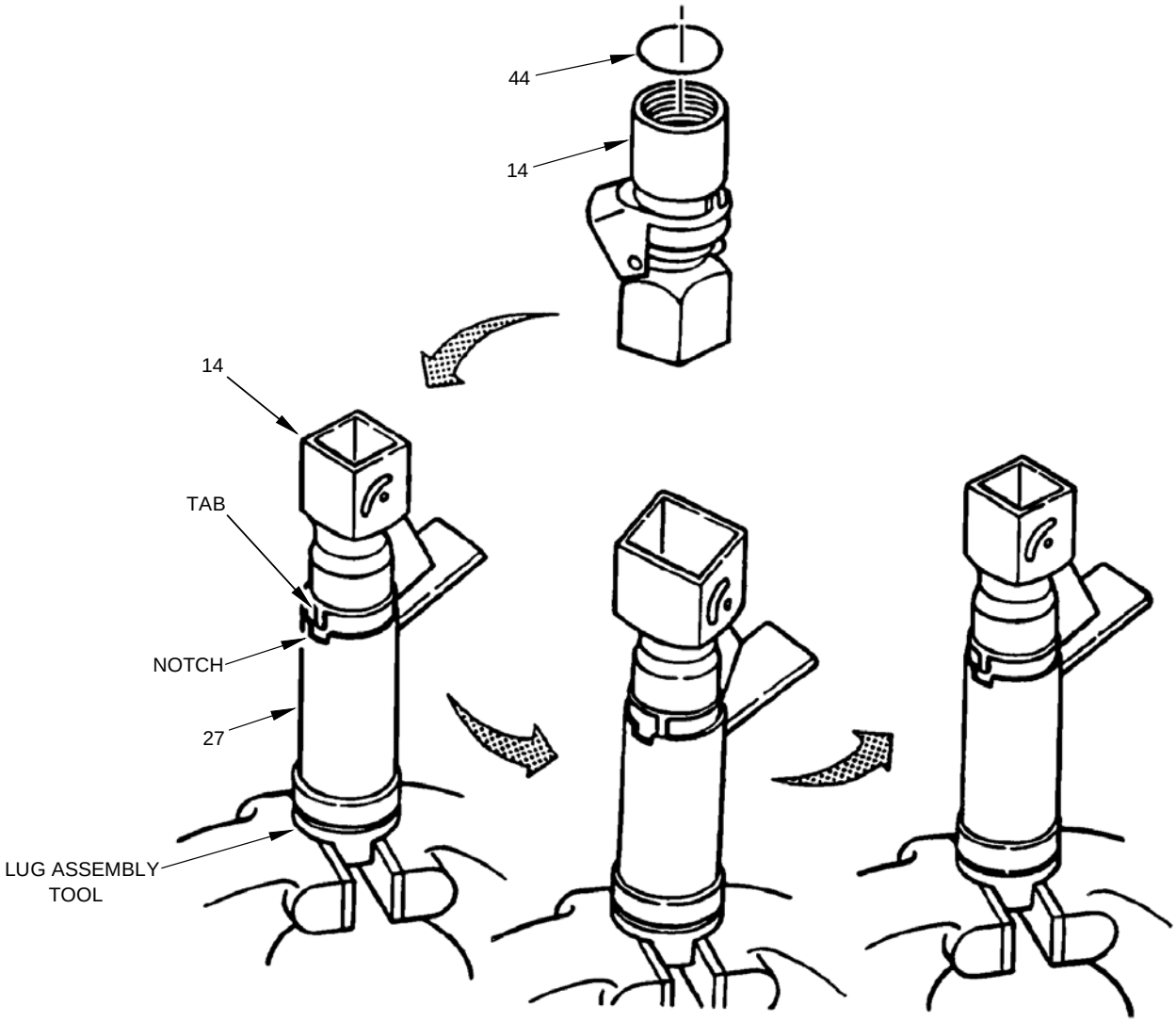
7. Install three stayback detents (39) on nozzle body (33).
8. Insert nine locking lugs (38) onto lug wire (40). Align locking lugs (38) with remaining slots in nozzle body (33).
9. Install lug retaining ring (37) onto nozzle body (33) with beveled end of retaining ring (37) facing locking lugs (38).
10. Lightly lubricate threads on nozzle body (33) with silicone compound.
11. Install stayback spring (36) onto nozzle body (33).

ASSEMBLY-Continued



ASSEMBLY-Continued

12. Install collar (27) over nozzle body (33), down over locking lugs (38) and stayback detents (39).
13. Install spring retainer (35) with groove facing down and install collar spring (34).
14. Lubricate preformed packing (44) with silicone compound and install into nozzle housing (14).
15. Slide nozzle housing (14) into collar (27). Align the notch on the collar (27) with tab on top of nozzle housing (14).



ASSEMBLY-Continued

CAUTION

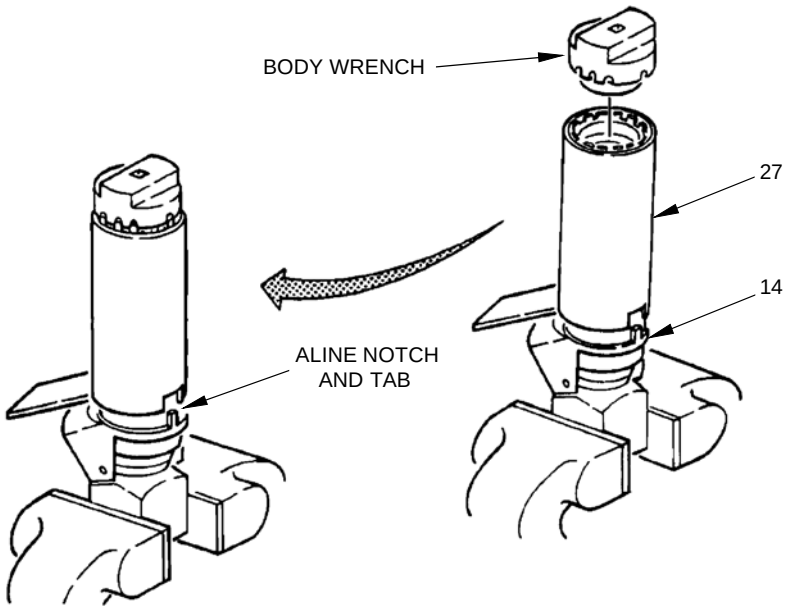
Use the lug assembly tool to tighten the body. Use the body wrench to complete the tightening process.

16. Push down on nozzle housing (14) and rotate clockwise until tab contacts the collar (27). Rotate housing (14) counterclockwise until notch and tab are aligned.

17. Remove the assembled components from lug assembly tool and remove tool from vise.

18. Place nozzle housing (14), with coupling end facing up, into a soft jawed vise and tighten only enough to prevent the housing from turning or falling from vise.

19. Align body wrench with the nine locking lugs (38) and press the body wrench down until the collar (27) trips to the forward position.



ASSEMBLY-Continued

CAUTION

To reduce the friction between locking lugs and collar, pull back slightly on the collar.

NOTE

Always align the slot in the collar and the tab on the housing.

20. Tighten and torque the assembly to 250 in. lbs.

21. Pull back on the collar (27) to release the body wrench, remove body wrench. Remove nozzle assembly from vise.

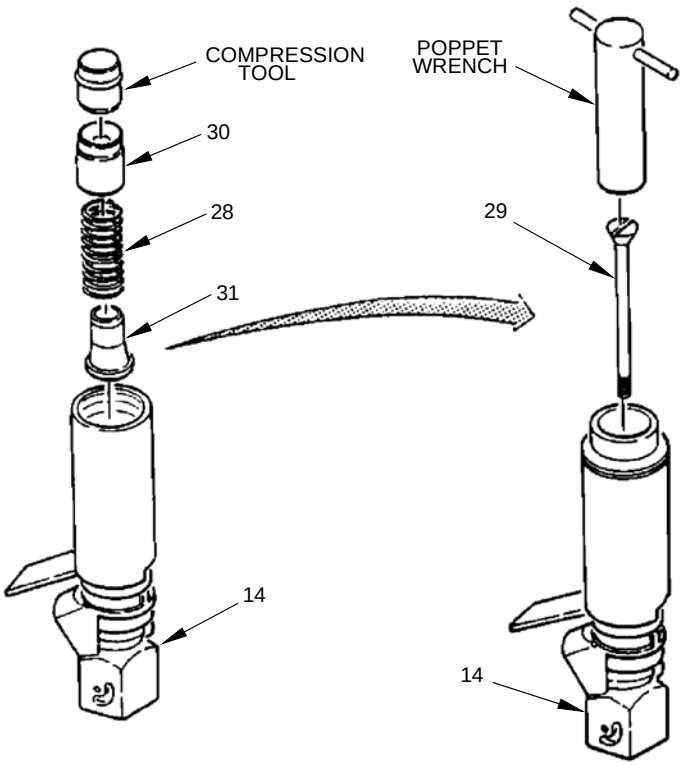
22. Insert flow guide (31), spring (28) and sleeve seal (30) into nozzle housing (14).

WARNING

During assembly the components; spring, flow guide and sleeve seal will be under spring pressure. Do not push or pull collar to the rear. Do not remove compression tool until assembly is completed. Personal injury could result.

23. Using compression tool push sleeve seal (30) and spring (28) into nozzle housing (14) until compression tool locks in collar (27).

24. Insert poppet (29) through compression tool into nozzle housing (14).



ASSEMBLY-Continued

NOTE

The piston assembly consists of the piston, valve actuating ring, seal, and nut.

25. Install preformed packing (25) in groove on sleeve (24) and install in nozzle housing (14) using screws (23). Tighten in an "x" pattern and torque to 23 in. lbs.

26. Place seal (22) on threaded end of piston (20) with open end facing toward the threaded end of piston (20).

27. Screw nut (21) onto piston (20), torque nut (21) to 125 in. lbs.

28. Install valve actuating ring (18) over small end of piston (20) and attach with four screws (19). Tighten screws enough to seat the valve actuating ring (18). Do not over tighten.

CAUTION

Exercise care in installing flow indicator. Do not over tighten so as not to twist it off in the piston assembly.

29. If removed, screw position indicator (26) in piston assembly.

30. Install piston assembly in nozzle housing (14) by threading piston assembly onto poppet (29).

31. If the actuating cam (16) was removed use a soft jawed vise to attach the actuating cam (16) to either side handle plate (13) with screw (17). Torque screw (17) to 100 + 10 in. lbs. Repeat with the other side handle plate (13).

32. Attach side handle plate (13) on left side of nozzle housing (14) first. Attach side handle plate(s) (13) in to nozzle housing (14) in the open position.

33. Position actuating cam (16) of left side handle plate (13) into banana shaped slot in nozzle housing (14) such that actuating cam (16) is positioned between actuating ring (18) and sleeve (24).

34. Install washer (11) between side handle plate (13) and nozzle housing (14). Insert bushing (12) in side handle plate (13). Position a washer (11) on outside of side handle plate (13) and attach parts to nozzle housing (14) using screw (10). Torque screw (10) to 125 ± 10 in. lbs.

35. Insert spring (15) into right side of nozzle housing (14) followed by latch actuator (1).

36. Position actuating cam (16) of right hand side handle plate (13) into banana shaped slot in nozzle housing (14) such that actuating cam (16) is positioned between actuating ring (18) and sleeve (24).

37. Install washer (11) between side handle plate (13) and nozzle housing (14). Insert bushing (12) in side handle plate (13). Position a washer (11) on outside of side handle plate (13) and attach parts to nozzle housing (14) using screw (10). Torque screw (10) to 125 + 10 in. lbs.

38. Position handle (2) and install four side handle plate screws (9). Torque side handle plate screws (9) to 35 ± 5 in. lbs.

ASSEMBLY-Continued

39. If screw (5) and locking pin (6) were removed from end cover (4) use a soft jaw chuck or vise to hold locking pin (6) in place and install screw (5).

CAUTION

Spring pressure will be present when installing the end cover.

NOTE

It may be necessary to reposition actuating ring to allow for lock pin when installing end cover.

40. Position spring retainer (7) and spring (8) over position indicator.

41. Install end cover (4) using screws (3). Tighten screws (3).

42. Use poppet tool to tighten poppet (29) securely in piston assembly in nozzle housing (14).

43. Remove compression tool by pulling back on collar (27).

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPAIR D1-NOZZLE BODY ASSEMBLY

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive
(WP 0113 00, Item 1)
Chemical and Oil Protective Gloves
(WP 0113 00, Item 2)
Adapter MS24484
(WP 0113 00, Item 15)
Knife, Craftsman
(WP 0113 00, Item 16)
Hammer, Dead Blow
(WP 0113 00, Item 16)

Materials/Parts Required:
Cloth, Lint Free
(WP 0116 00, Item 4)
Dry cleaning solvent
(WP 0116 00, Item 14)
Petrolatum (WP 0116 00, Item 20)
Rags, Wiping (WP 0116 00, Item 21)
Tape, Teflon (WP 0116 00, Item 32)

Materials/Parts Required:-Continued
O-Ring (WP 0117 00, Item 10)
Wave Washer (WP 0117 00, Item 34)
O-Ring (WP 0117 00, Item 74)
Screw (WP 0117 00, Item 85)
Cotter Pin (WP 0117 00, Item 92)
Cotter Pin (WP 0117 00, Item 93)
Back-up ring (WP 0117 00, Item 97)
O-Ring (WP 0117 00, Item 103)

Equipment Condition:
Hose End Regulator and Inlet
Elbow removed. (WP 0080 00)
Bonding cable removed. (WP 0078 00)

DISASSEMBLY

WARNING

Exert caution when using cutting tool to prevent personal injury and damage part.

NOTE

Disassemble equipment only to the extent necessary for repair.

1. Remove collar bumper (figure 1, 1) by cutting through the bumper.

NOTE

To prevent loss of balls and aid assembly, place a suitable container under body opening. Catch all balls as they fall from opening.

2. Remove screw (figure 1, 2). Hold the nozzle collar (3) with bolt hole vertical (pointed down) and allow all balls (4) to be removed through the bolt hole. Manipulate nozzle collar to allow 49 balls to fall out of hole.

3. Engage nozzle collar (figure 2, 3) to adapter.

4. Remove fuel nozzle body assembly (figure 1, 6) from nozzle collar (3) by aligning the groove in the collar with dent on body and pulling body from collar.

DISASSEMBLY-Continued

5. Remove adapter (figure 2).
6. Turn lever (figure 1, 7) to open poppet (8).
7. Remove cotter pin (figure 1, 9) and unscrew the poppet (8) from the shaft (10). Discard cotter pin.
8. Remove the nozzle seal assembly (figure 1, 11), (12), and (13) by lifting off fuel nozzle body (6).
9. Remove bearing retaining plate (figure 1, 12) from the seal (11) by spreading the ends of the retaining ring (13) and removing it from the groove in the seal. Slide plate (12) off seal (11).

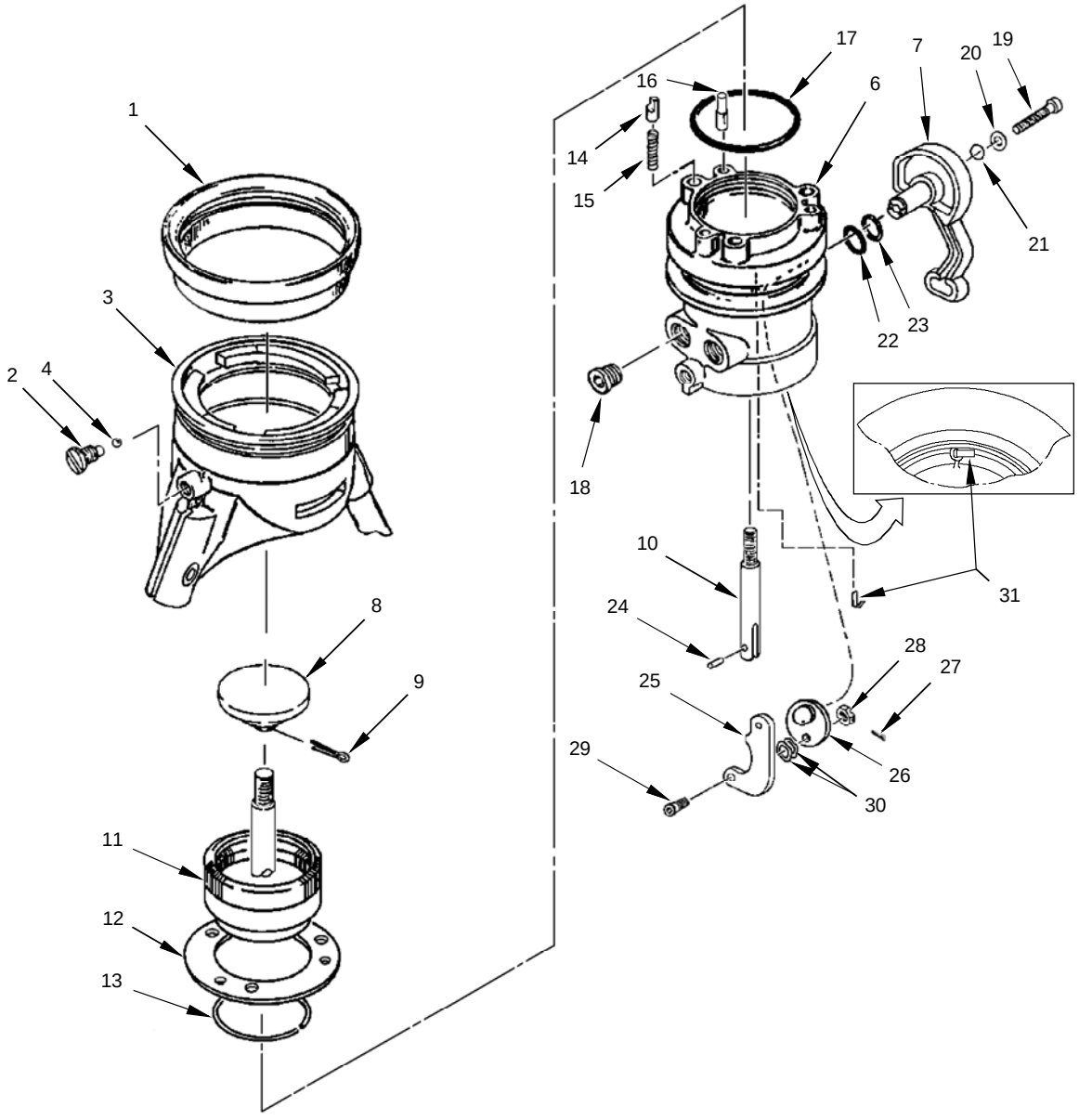


Figure 1. Nozzle Body

DISASSEMBLY-Continued

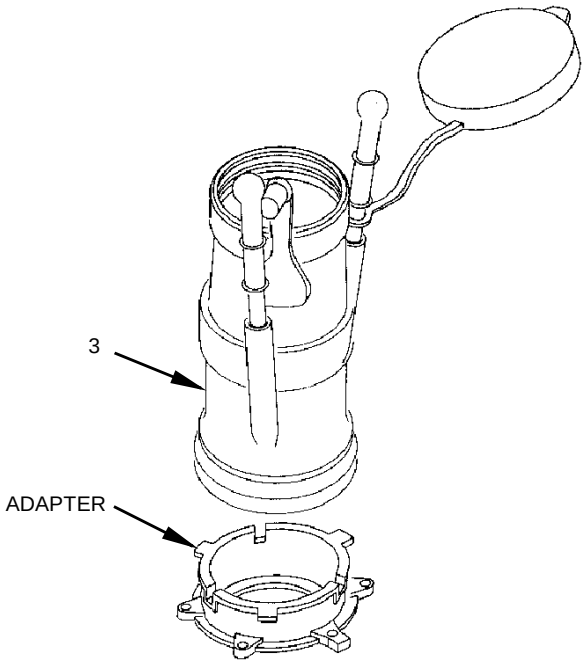


Figure 2. Adapter

10. Remove three lock pins (figure 1, 14), three lock pin springs (15), three index pins (16) and O-ring (17). Discard O-ring.

NOTE

Do not remove plugs unless a leak has been observed.

11. Remove two plugs (figure 1, 18).

NOTE

Observe the orientation of the cam plate with respect to lever so that it can be duplicated during reassembly. Mis-orientation will result in not being able to close nozzle properly.

12. Remove screw (figure 1, 19), washer (20) and O-ring (21) from the center of the lever (7). Discard screw (19) and O-ring (21).

13. Remove lever (figure 1, 7) from nozzle body (6).

14. Remove and discard O-ring (figure 1, 22) and backup ring (23) from lever (7).

NOTE

Crank pin will be loose and can fall out when removing link assembly.

15. Remove assembled shaft (figure 1, 10), pin (24), link (25) and cam plate (26) from fuel nozzle body (6).

16. Remove cotter pin (figure 1, 27), nut (28), screw (29), pin (24), and washers (30). Discard cotter pin (27) and washers (30).

17. Use needle nose pliers to remove continuity clip (figure 1, 31) if it is to be replaced.

INSPECTION

WARNING

Dry cleaning solvent P-D-680, used to clean parts is potentially dangerous to personnel and property. Use in a well ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100°F - 138°F (38°C - 59°C).

1. Wash all metal parts with dry cleaning solvent.
2. Dry thoroughly with clean, lint free cloth.
3. Be sure that continuity clip hole is clean and free of all debris.
4. Inspect all metal parts for dings, gouges, abrasion, etc.

ASSEMBLY

NOTE

A light coat of petrolatum can be applied to all gaskets, springs, and O-rings to ease assembly.

1. Insert screw (figure 1, 29) through link (25), washers (30), and plate (26). Install nut (28) and tighten to align slots in nut with hole in crank pin and install new cotter pin (27).
2. Slip link (figure 1, 25) into slot in shaft (10) and secure with pin (24).
3. Insert the above subassembly through the inlet end of the fuel nozzle body (figure 1, 6). Be sure that the shaft (10) is inserted into the body's axial guide bore far enough that the bore contains the pin (24).

NOTE

Orientation of plate must be the same as observed during disassembly.

4. Install new backup ring (figure 1, 23) and new O-ring (22) on lever (7).
5. Install lever (figure 1, 7).

CAUTION

Correct alignment of plate and lever is critical to proper operation of the nozzle. Align plate and lever before securing with screw.

6. Install O-ring (figure 1, 21) and washer (20). Aline plate (26) to lever (7) so that lever (7) is in the nine o’clock position when in the closed position and three o’clock in the opened position and secure with screw (19).

ASSEMBLY-Continued

7. Install O-ring (figure 1, 17) into fuel nozzle body (6).

CAUTION

Lock pins must be installed with flat surfaces facing out from body. Installing lock pins in the wrong direction will cause body to lock onto collar, preventing nozzle operation.

8. Install three each springs (figure 1, 15), index pins (16), and lock pins (14).

9. Assemble plate (figure 1, 12) to seal (11) and secure with retaining ring (13). Install onto fuel nozzle body (6).

10. Aline fuel nozzle body (figure 1, 6) lug with nozzle collar (3) groove and insert fuel nozzle body (6) into nozzle collar (3). Turn body to the right until body and collar engage so that bearing race alines with screw hole in nozzle collar.

NOTE

Do not use any form of grease on screw or balls.

11. Install all 49 ball bearings (figure 1, 4) through screw hole in nozzle collar (3) and install screw (2).

12. Using adapter (figure 2), engage the collar (3) and rotate lever (figure 1, 7) to the open position to extend shaft (10) to its fullest open position.

13. Screw poppet (figure 1, 8) onto the shaft (10) such that the hole in the shaft is approximately centered in the slotted area of the poppet (8).

14. Close the poppet (figure 1, 8) and disengage the collar (3) from the adapter flange and set the nozzle on its inlet end. If the poppet is difficult to close, reopen the unit and loosen the poppet one half turn and repeat until the nozzle closes. Place a straight edge across the center of the elastomer lip of the seal . Use feeler gages to measure the average dimension between the bottom of the straight edge and the poppet face. This dimension should be 0.070 to 0.110 inch (1.8 to 2.8 mm). If it is not, calculate the required poppet dimension as follows.

NOTE

One quarter (1/4) turn of the poppet axially displaces the poppet face about 0.020 inch (0.51 mm).

a. If gap is too large, unscrew (loosen) the poppet (figure 1, 8) one quarter (1/4) turn for each 0.020 inch (0.51 mm) of required adjustment.

b. If gap is too small, tighten the poppet (figure 1, 8) one quarter (1/4) turn for each 0.020 inch (0.51 mm) of required adjustment.

15. Once the proper poppet (figure 1, 8) adjustment is made, rotate the poppet toward the tightening direction until the next slot in the poppet is in line with the hole in the shaft (10). Insert the cotter pin (9) and bend over the ends to retain in place.

ASSEMBLY-Continued

WARNING

To prevent injury to personnel, wear protective gloves when installing bumper. Bumper must be softened in hot water and installed while still hot. Failure to wear protective gloves could result in serious bums.

16. Soak new bumper (1) in hot water (160 - 180° F (71 - 82° C)) until soft. While still soft and pliable, press bumper (1) onto collar (3).

17. If plugs (18) were removed during disassembly, apply teflon tape on threads of plugs (18) and install plugs into fuel nozzle body (6).

18. Install continuity clip (31). Be sure continuity clip (31) is laying on the lip of the nozzle body (6) as shown in Figure 1.

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPAIR D1 NOZZLE HOSE END REGULATOR

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive (WP 0113 00, Item 1)
Chemical and Oil Protective Gloves (WP 0113 00, Item 2)
Torque wrench (WP 0113 00, Item 2)
Arbor Press (WP 0113 00, Item 3)

Materials/Parts Required:
320 Grit Paper (WP 0116 00, Item 1)
Petrolatum (WP 0116 00, Item 20)
Rags, Wiping (WP 0116 00, Item 21)
Spring (WP 0117 00, Item 12)

Materials/Parts Required: -Continued
O-Ring (WP 0117 00, Item 22)
Seal (WP 0117 00, Item 27)
Seal Spacer (WP 0117 00, Item 28)
Seal (WP 0117 00, Item 29)
Screw (WP 0117 00, Item 69)
O-Ring (WP 0117 00, Item 78)
O-Ring (WP 0117 00, Item 111)
O-Ring (WP 0117 00, Item 116)
Quad-Ring (WP 0117 00, Item 122)

Equipment Condition:
Hose end regulator removed. (WP 0080 00)

DISASSEMBLY

WARNING

Death or personal injury may result from explosion of fuel fumes exposed to an open flame or spark or to static discharge. Do not permit smoking, any open flame or spark producing equipment within fifty feet of the repair location.

Rubber gloves should be worn when handling nozzle parts due to toxic effects of some fuel additives.

Piston assembly is under an initial spring load of approximately 65 psi. Use care in disassembly to avoid serious injury to personnel and equipment.

NOTE

Disassemble equipment only to the extent necessary for repair.

1. Depress piston assembly [outer piston (1), screw (2), Stat-O-Seal (3) and inner piston (4)], using an arbor press, drill press or equivalent and remove retaining ring (5) from housing (6).

2. Slowly release load from arbor press, allowing the piston spring (7) to push the piston assembly out of housing (6). Remove piston assembly and piston spring (7).

NOTE

It is not necessary to separate the piston assembly parts unless replacing part(s). If disassembly is required, continue with step 3, otherwise go to step 4.

DISASSEMBLY-Continued

3. Remove screw (2) to separate the piston assembly. Discard screw (2)

4. Use a torque wrench to measure the force necessary to remove self-locking screws (8) and washers (9). If the force to remove screws (8) is less than 1.5 in. lbs. (0.17 Nm), replace the screws during assembly.

CAUTION

When seal retainer is removed spring, ball and O-ring are free to fall out and get lost. Work over a rag that will capture spring, ball and O-ring.

5. Remove seal retainer (10) by removing the four screws (8) and flat washers (9).

6. Remove remaining parts; spring (11), ball (12), quad ring (13), O-ring (14), seals (15), seal spacer (16), and O-rings (17). Retain ball (12). Discard all other parts.

7. Teflon seal (18) and O-ring (19) should only be removed if damaged. If removed replace both during assembly.

8. Remove and discard outer teflon seal (20) and O-ring (21) from housing (6).

NOTE

It is not necessary to remove the breather assembly unless the filter or screen is suspected of being clogged.

9. If breather assembly (22) is removed for cleaning, flush it vigorously in clean solvent. If unable to get the breather assembly (22) clean, replace the breather assembly (22) during hose end regulator assembly.

10. Remove O-ring (23) and clip (24) from housing (6). Discard O-ring (23).

INSPECTION

NOTE

Inspect all metal parts for dings, gouges and abrasions. Complete the following steps as they apply.

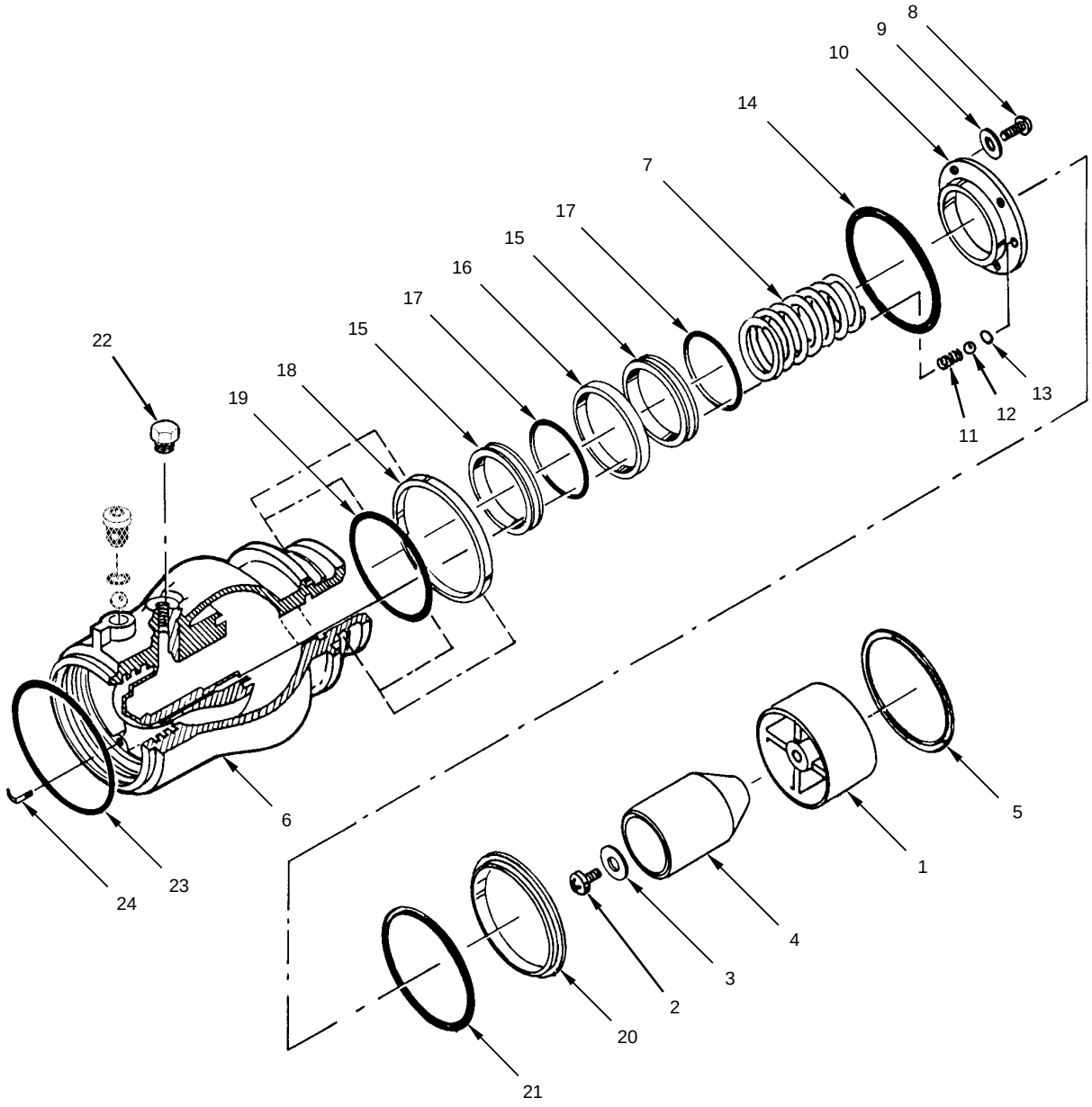
1. Use 320 grit paper to smooth and remove sharp edges.

2. Replace any part with damage that cannot be smoothed with grit paper.

3. Check both ends of housing (6) hall races for excessive wear or burrs. Remove any burrs or sharp edges.

4. The ball races are dry film lubricated. If a ball race is shiny the housing should be replaced or a dry film lubricant applied.

5. Inspect outer diameters of inner piston (4) and outer piston (1) for scratches. If scratched, replace during assembly.



ASSEMBLY

NOTE

O-rings and seals may be lightly lubricated with petrolatum for ease of installation.

1. Install O-rings (17) in seals (15). Install seal (15) in housing (6).
2. Install seal spacer (16), then second seal (15).
3. Install O-ring (23) and clip (24) in housing (6).

4. If removed, install breather assembly (22) in housing (6).

5. Install O-ring (21) in outside groove of teflon seal (20) and install teflon seal (20) in housing (6).

6. If removed, install teflon seal (18) and O-ring (19) in housing (6).

7. Install O-ring (14) in housing (6).

NOTE

To install spring, ball and O-ring, recommend applying petrolatum to one end of spring and drop spring in housing. Balance the ball on top of the spring. Apply petrolatum to the matching hole on the seal retainer and position the O-ring over the matching hole. The petrolatum will hold the O-ring in position on the seal retainer. Carefully lower the seal retainer in place. This recommended procedure may have to be tried multiple times.

8. Install spring (11), ball (12) and quad ring (13).

9. Install seal retainer (10) using screws (8) and washers (9). Hand tighten screws (8) securely.

10. Attach inner piston (4) to outer piston (1) with screw (2) and Stat-O-Seal (3). Torque screw (2) to between 18 to 20 in. lbs. (2.03 to 2.26 Nm).

11. Position spring (7), piston assembly and retaining ring (5) in housing (6).

WARNING

During assembly the piston spring is going to be compressed. Use care in assembly to avoid serious injury to personnel and equipment.

12. Use an arbor press or equivalent to compress the piston assembly and spring (7) into housing (6).

13. Install retaining ring (5) in housing (6) to secure piston assembly in housing (6).

14. Remove housing from arbor press or equivalent.

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REPAIR FUEL DRUM ASSEMBLY

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanic Automotive
(WP 0113 00, Item 1)
Torque Wrench
(WP 0113 00, Item 2)

Equipment Condition:
Fuel Drum Drained

Personnel:
Two

Materials/Parts Required:
Compound, Anti-seize
(WP 0116 00, Item 5)

DISASSEMBLY

CAUTION

Mark the drum, bearing plate, swivel plate and closure ring to facilitate and assure same alignment when assembled. This action will prevent twisting the wire ropes.

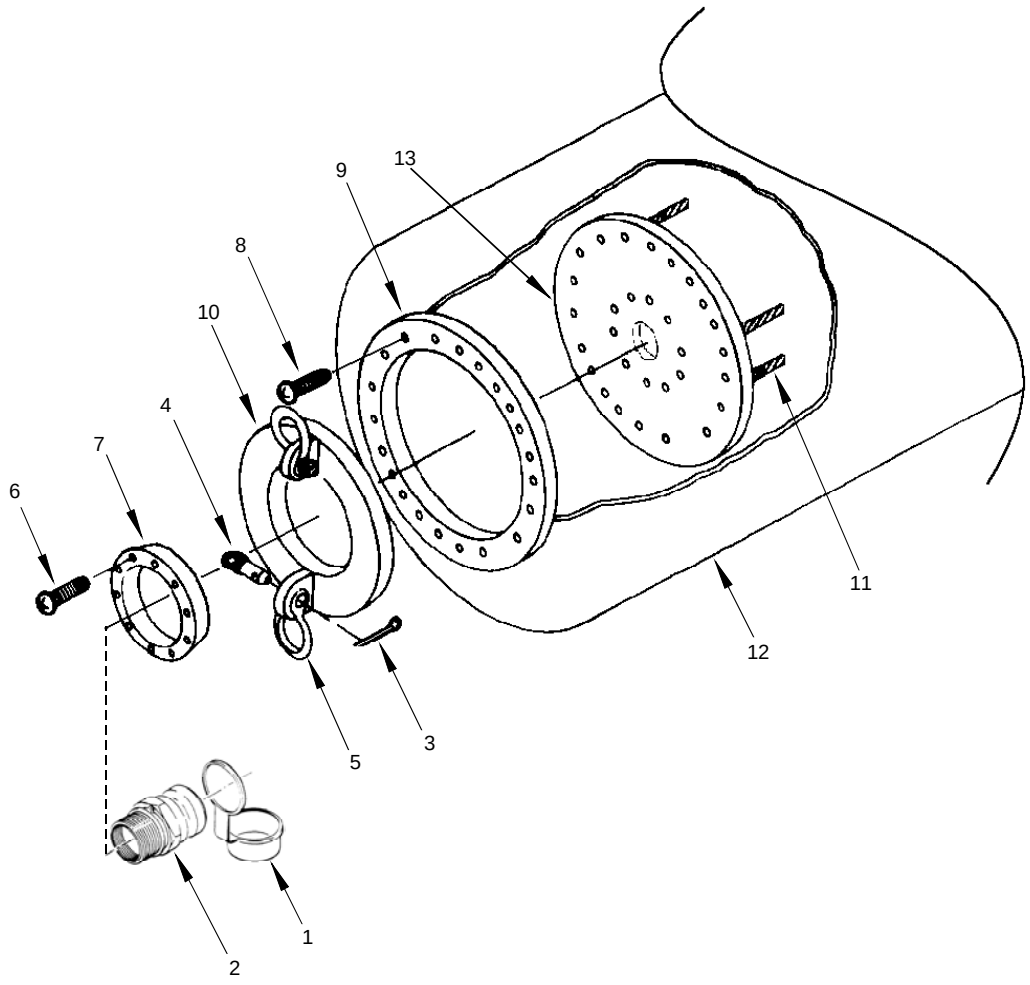
NOTE

Both ends of the drum contain identical parts.

1. Remove dust cap (1) and adapter assembly (2) from both ends of drum.
2. Remove cotter pin (3), screw-pin (4) and shackle (5).
3. Repeat step (2) to remove the remaining shackles (5).
4. Remove 10 capscrews (6) from bearing plate (7) and remove bearing plate (7) from fuel drum.
5. Repeat step (4) to remove bearing plate (7) from other end of drum.
6. Remove 21 capscrews (8) from closure ring (9) and remove closure ring (9) along with the swivel plate (10).
7. Perform step (6) to remove closure ring (9) and swivel plate (10) from other end of the drum.
8. Remove cable assembly (11) from inside of drum body (12).
9. Remove closure plate (13) from inside of drum body (12).

INSPECTION

1. Remove all dirt and debris from drum hardware.
2. Inspect parts for signs of damage or defects.
3. Replace any unserviceable parts.



ASSEMBLY

1. Position cable assembly (11) inside of drum body (12). Line up plate bosses with screw holes in collar.
2. Install closure plates (13), closure rings (9), swivel plates (10), and bearing plates (7) and secure with capscrews (6) and capscrews (8).
3. Torque capscrews (6) and capscrews (8) in a crossing pattern to 30 foot-pounds (4.15 m-kg).
4. Install four shackles (5) and secure with screw-pins (4) and cotter pins (3).
5. Apply a coating of anti-seize compound to threads of adapter assembly (2).
6. Install the adapter assembly (2).
7. Install dust cap (1).

END OF WORK PACKAGE

OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
MAINTENANCE
TORQUE LIMITS

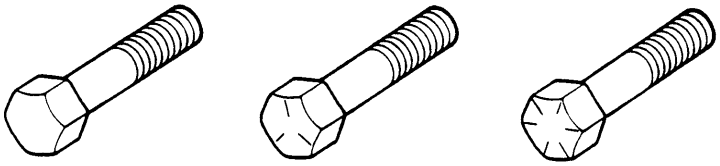
INTRODUCTION

This work package provides general torque data to allow you to determine the torque requirements if a specific value is not listed in the text. Specific values are provided for the most critical requirements. Most threaded fasteners are covered by specifications that define mechanical properties such as tensile strength, yield strength, proof load and hardness. These specifications are carefully considered in initial selection of fasteners for a given application. To assure continued satisfactory performance, replacement fasteners should be of the correct strength, nominal diameter, thread pitch, length and finish.

Most original equipment fasteners (English or metric) are identified with markings or numbers indicating the strength of the fastener. These markings are identified in the paragraphs that follow. Attention to these markings is important in assuring that the proper replacement fasteners are used.

GENERAL TORQUE DATA.

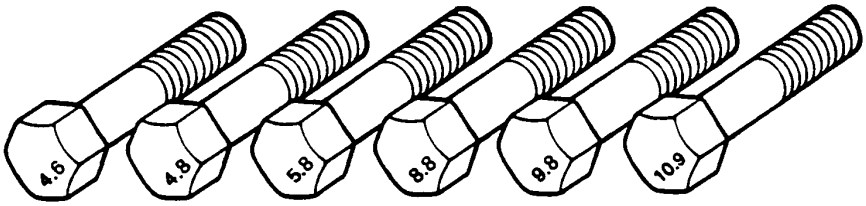
BOLT STRENGTH IDENTIFICATION, ENGLISH SYSTEM



Grade 1 or 2 Grade 5 Grade 8

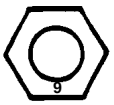
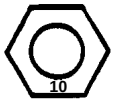
Identification marks correspond to bolt strength - increasing number of slashes represent increasing strength.

BOLT STRENGTH IDENTIFICATION, METRIC SYSTEM

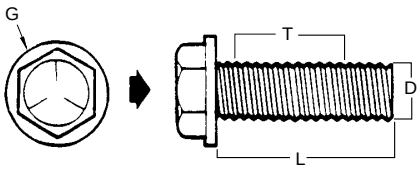
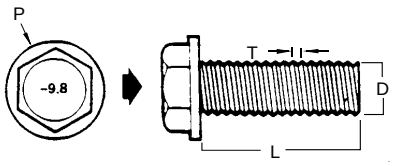


Identification class numbers correspond to bolt strength - increasing numbers represent increasing strength.

HEX NUT STRENGTH IDENTIFICATION

English System		Metric System	
Grade	Identification	Grade	Identification
Hex Nut Grade 5	 3 Dots	Hex Nut Property Class 9	 Arabic 9
Hex Nut Grade 8	 6 Dots	Hex Nut Property Class 10	 Arabic 10
Increasing dots represent increasing strength		Increasing numbers represent increasing strength	

BOLT NOMENCLATURE

ENGLISH SYSTEM	METRIC SYSTEM
Example: 1/4 - 28 x 1.25 D T L	Example: M8 - 1.0 x 25 D T L
	
D = Diameter (inches) G = Grade (bolt strength) L = Length (inches) T = Threads/inch	D = Diameter (millimeters) P = Property (bolt strength) L = Length (millimeters) T = Thread width (millimeters)

STANDARD TORQUE VALUES - ENGLISH SYSTEM

In the absence of specific torque values, the following chart can be used as a guide to the maximum safe torque for a particular size/grade of fastener. There is no torque difference for fine or coarse threads. Torque values are based on clean,dry threads. Reduce value by 10% if threads are oiled before assembly.

SAE Grade Number		1		2		5		8	
Number of slashes always 2 less than grade number									
	Wrench	Maximum Torque		Maximum Torque		Maximum Torque		Maximum Torque	
Dia.	Size	lb in	Nm	lb in	Nm	lb in	Nm	lb in	Nm
#6		6	0.7			15	1.7		
#8		11	1.2			28	3.2		
#10		16	1.8			41	4.6		
#12		25	2.8			65	7.3		
		lb ft	Nm	lb ft	Nm	lb ft	Nm	lb ft	Nm
1/4	7/16	3	4	5	7	8	11	12	16
5/16	1/2	6.5	9	10	14	17	23	24	32
3/8	9/16	12	16	18	24	30	41	40	54
7/16	5/8	19	26	30	41	50	68	70	95
1/2	3/4	30	41	45	61	75	102	105	142
9/16	13/16	40	54	65	88	105	142	150	203
5/8	15/16	55	75	90	122	145	197	205	278
3/4	1-1/8	100	136	160	217	260	353	365	495
7/8	1-5/16	165	224	165	224	415	563	590	800
1	1/12	245	332	245	332	625	848	880	1193
1-1/8	1-11/16	345	468	345	468	780	1058	1250	1695
1-1/4	1-7/8	490	664	490	664	1100	1492	1765	2393
1-3/8	2-1/16	640	868	640	868	1440	1953	2315	3140
1-1/2	2-1/4	850	1153	850	1153	1910	2590	3070	4163

STANDARD TORQUE VALUES - METRIC SYSTEM

In the absence of specific torque values, the following chart can be used as a guide to the maximum safe torque for a particular size/grade of fastener. There is no torque difference for fine or coarse threads. Torque values are based on clean,dry threads. Reduce value by 10% if threads are oiled before assembly.

Relative Strength Marking		4.6		4.8		8.8 or 9.8		10.9		12.9	
Bolt Markings											
Dia.	Wrench Size	Maximum Torque		Maximum Torque		Maximum Torque		Maximum Torque		Maximum Torque	
		lb ft	Nm	lb ft	Nm	lb ft	Nm	lb ft	Nm	lb ft	Nm
M3	5.5mm	.3	.5	.5	.7	1	1.3	1.5	2	1.5	2
M4	7mm	.8	1.1	1	1.5	2	3	3	4.5	4	5
M5	8mm	1.5	2.5	2	3	4.5	6	6.5	9	7.5	10
M6	10mm	3	4	4	5.5	7.5	10	11	15	13	18
M8	13mm	7	9.5	10	13	18	25	26	35	33	45
M10	16mm	14	19	18	25	37	50	55	75	63	85
M12	18mm	26	35	33	45	63	85	97	130	111	150
M14	21mm	37	50	55	75	103	140	151	205	177	240
M16	24mm	59	80	85	115	159	215	232	315	273	370
M18	27mm	81	110	118	160	225	305	321	435	376	510
M20	30mm	118	160	166	225	321	435	457	620	535	725
M22	33mm	159	215	225	305	435	590	620	840	726	985
M24	36mm	203	275	288	390	553	750	789	1070	926	1255
M27	41mm	295	400	417	565	811	1100	1154	1565	1353	1835
M30	46mm	402	545	568	770	1103	1495	1571	2130	1837	2490

DIRECT SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
WIRING DIAGRAMS

SCOPE

This work package contains the pumping assembly wiring diagrams for the accessory module control box and all cables. These diagrams are provided as troubleshooting aids and do not include all the information required to manufacture the component parts illustrated.

ABBREVIATIONS

All abbreviations used in the wiring diagrams in this work package conform to the requirements of MIL-STD-12.

CONTENTS

Each diagram in this work package is listed below. Cable wiring diagram titles include the cable designation and common name.

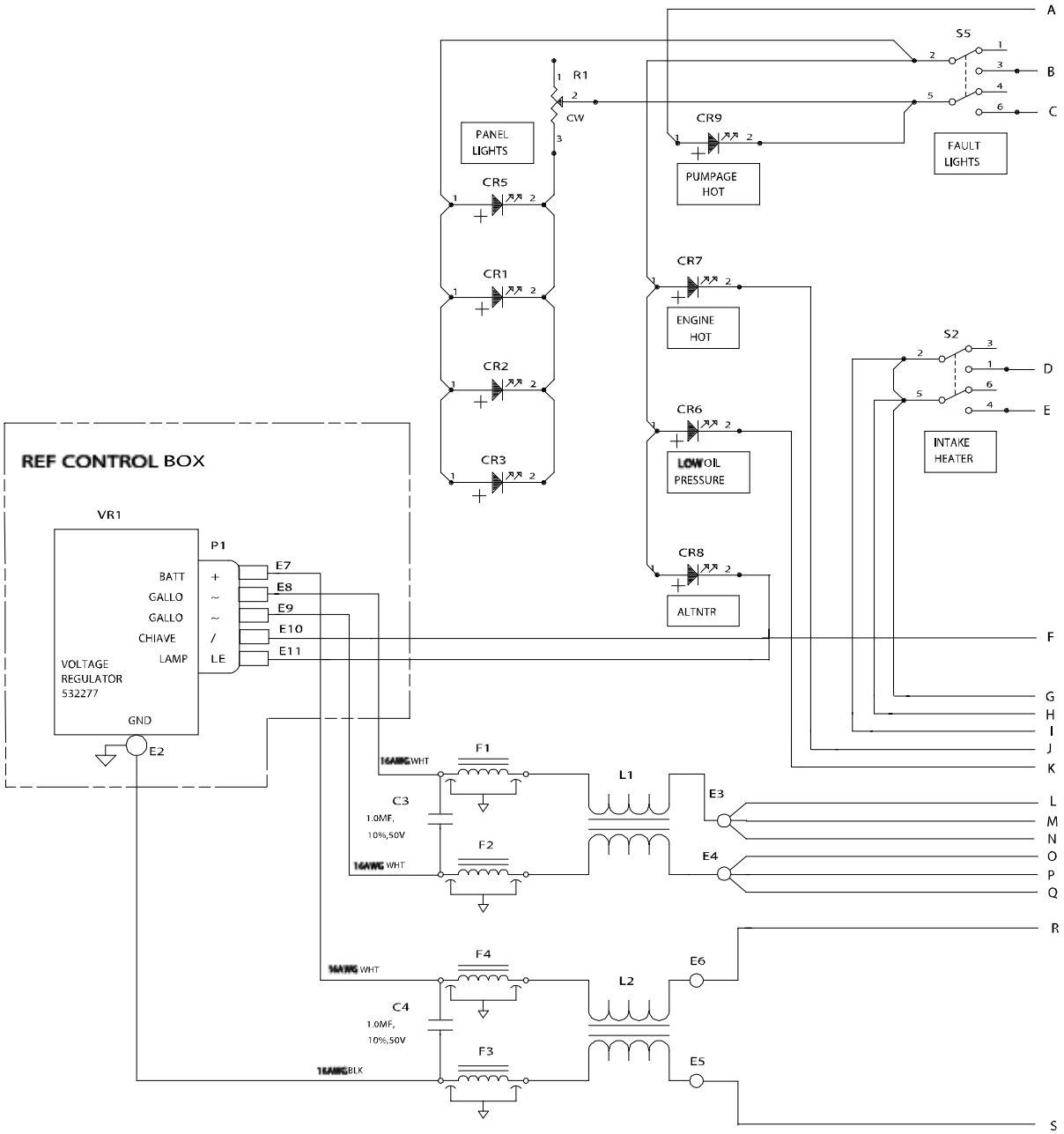


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Figure 1. Control Panel Wiring Diagram (Sheet 1 of 2)

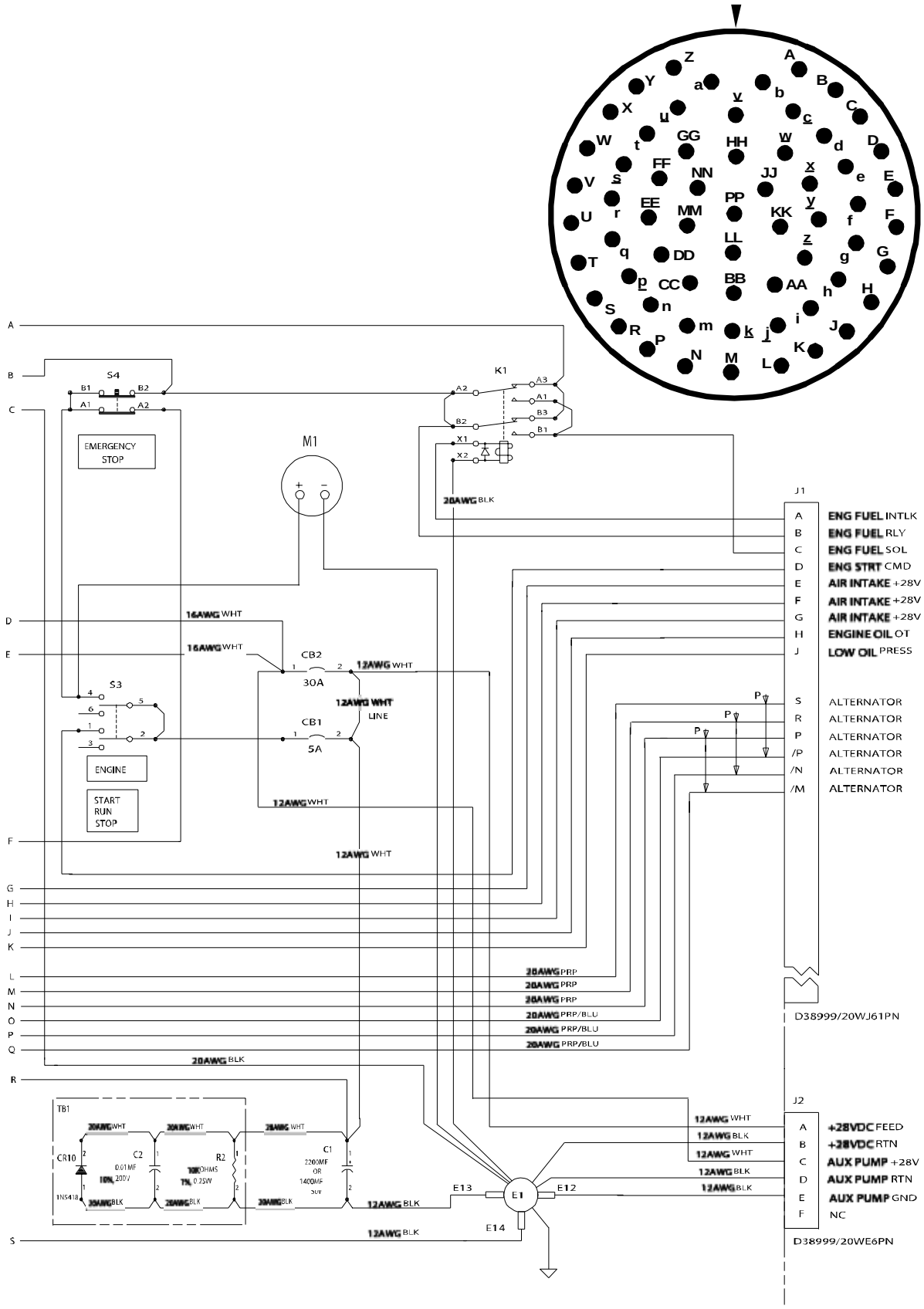


Figure 1. Control Panel Wiring Diagram (Sheet 2 of 2)

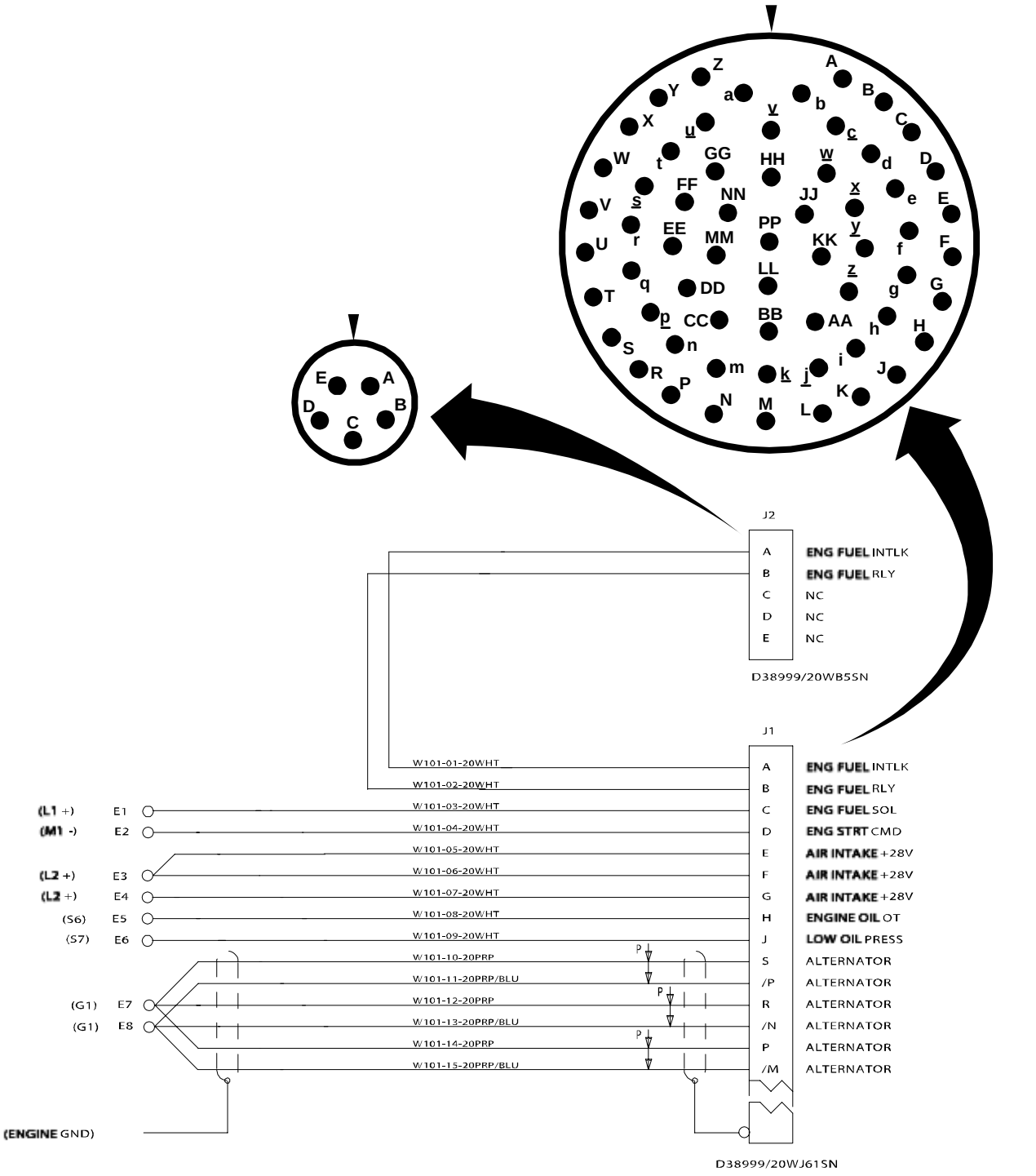
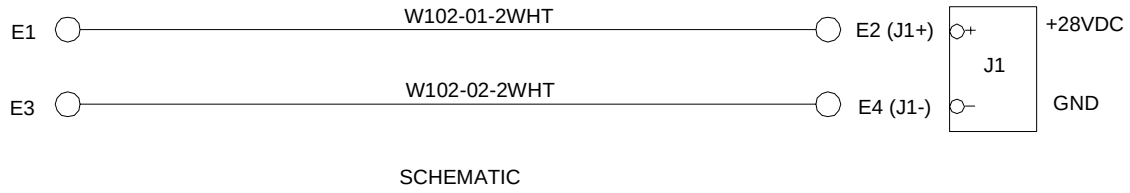


Figure 2. Cable Assembly W101 Wiring Diagram (Engine Wiring Harness)



SCHEMATIC

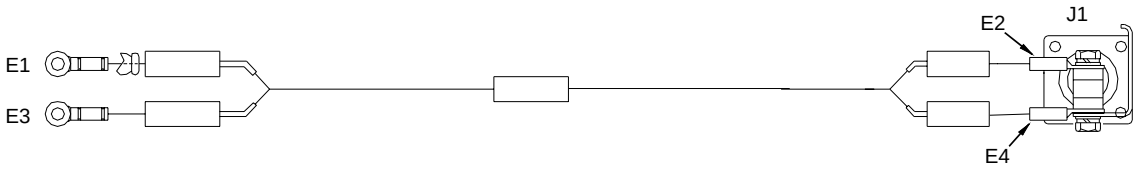


Figure 3. Cable Assembly W102 Wiring Diagram (Engine Starter Cable)

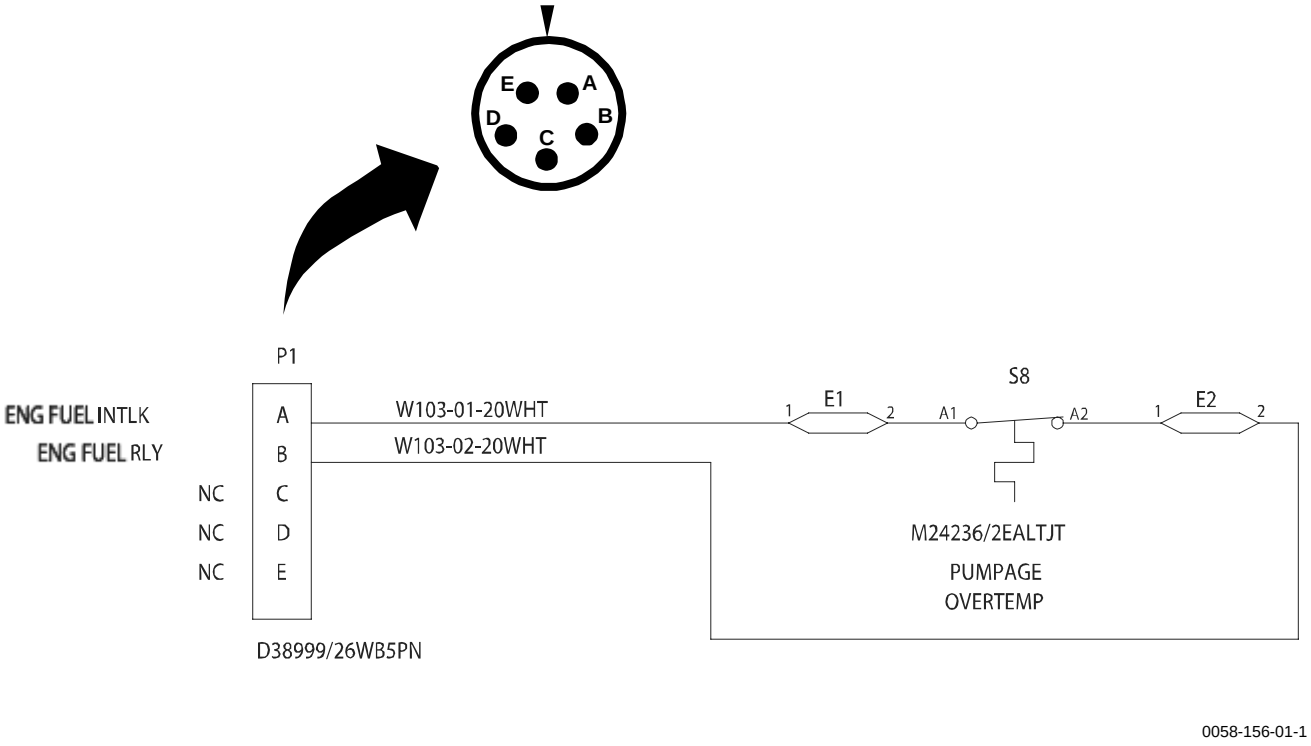


Figure 4. Cable Assembly W103 Wiring Diagram (Pumpage Overtemperature Cable)

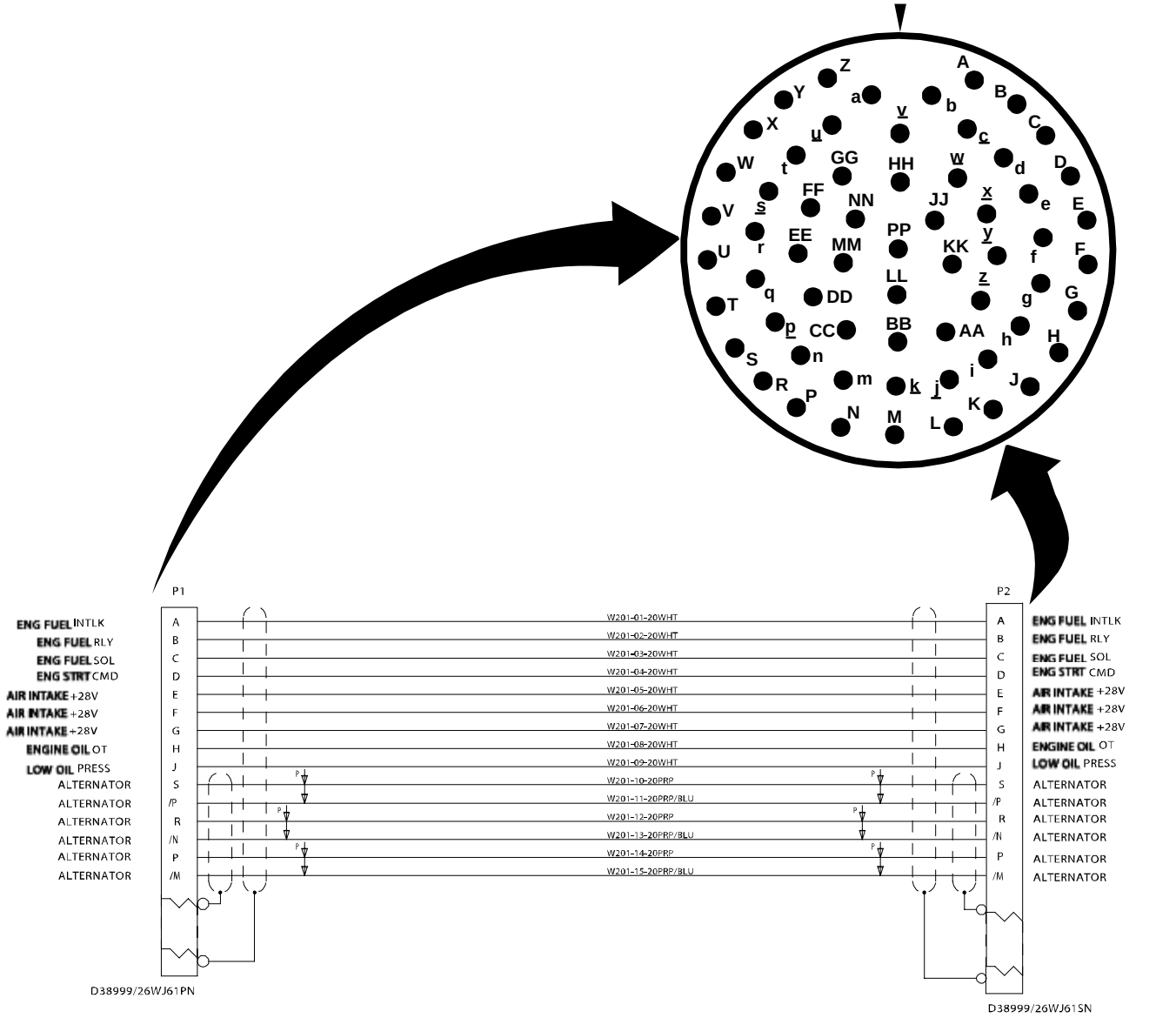


Figure 5. Cable Assembly W201 Wiring Diagram (Accessory Module Control Cable)

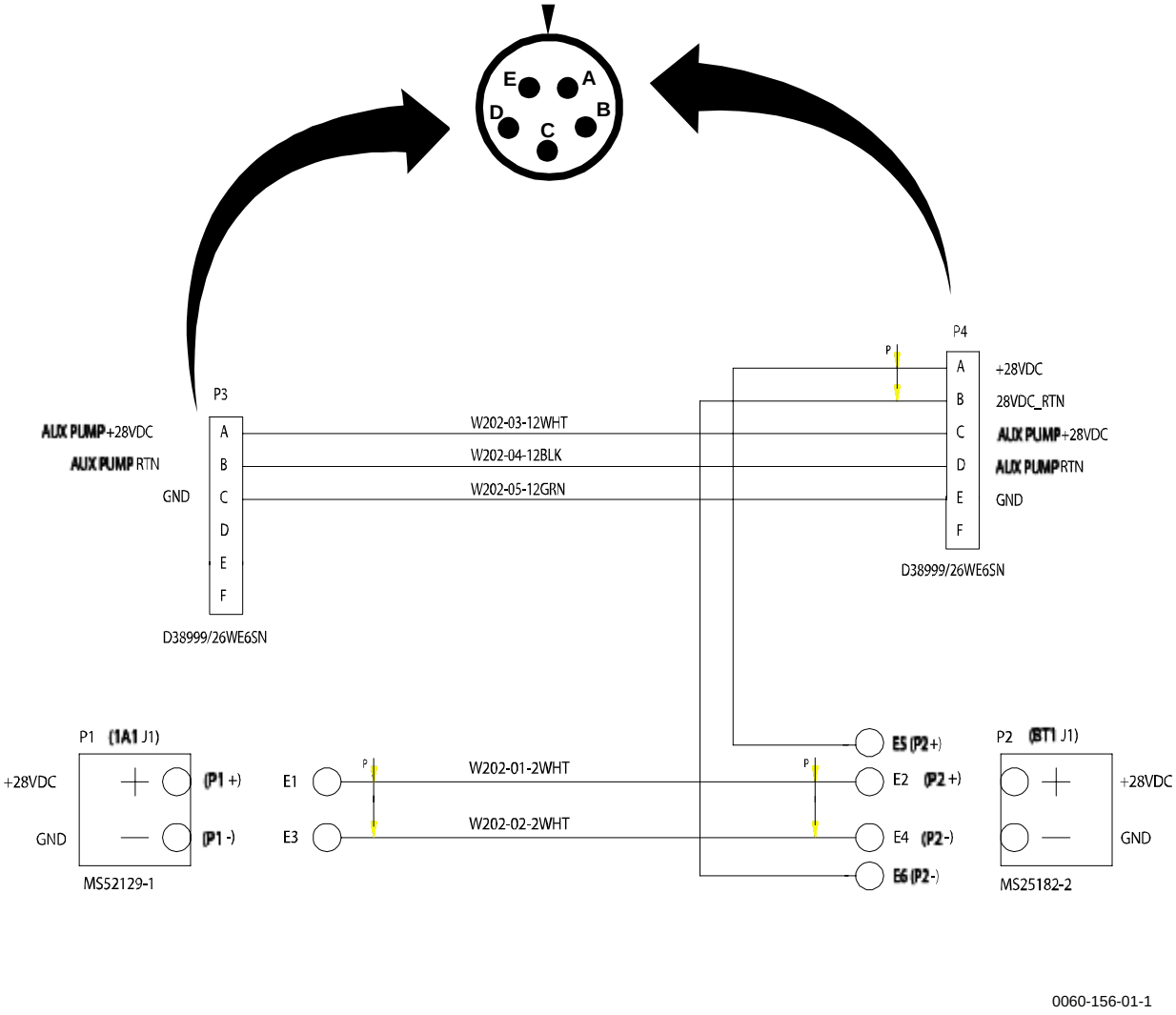


Figure 6. Cable Assembly W202 Wiring Diagram (Battery Power Cable)

CHAPTER 9

GENERAL SUPPORT MAINTENANCE
FOR
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM

GENERAL SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
ENGINE OVERHAUL INTRODUCTION

GENERAL

The engine maintenance procedures provided in this chapter are presented in disassembly-reassembly order. Performance of all procedures in sequence will accomplish a total engine overhaul. Maintenance functions not comprising an overhaul may be performed by selecting the appropriate disassembly procedures and corresponding assembly procedures.

Follow good engineering practice during performance of all procedures. Virtually all the tools required for engine maintenance are metric. A set of engine overhaul special tools is provided with each AAFARS. If replacement is required, refer to TM 10-4930-351-24P, AAFARS Repair Parts and Special Tools list (RPSTL).

GENERAL SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
REMOVE ENGINE FROM ENGINE MODULE

INITIAL SET-UP:

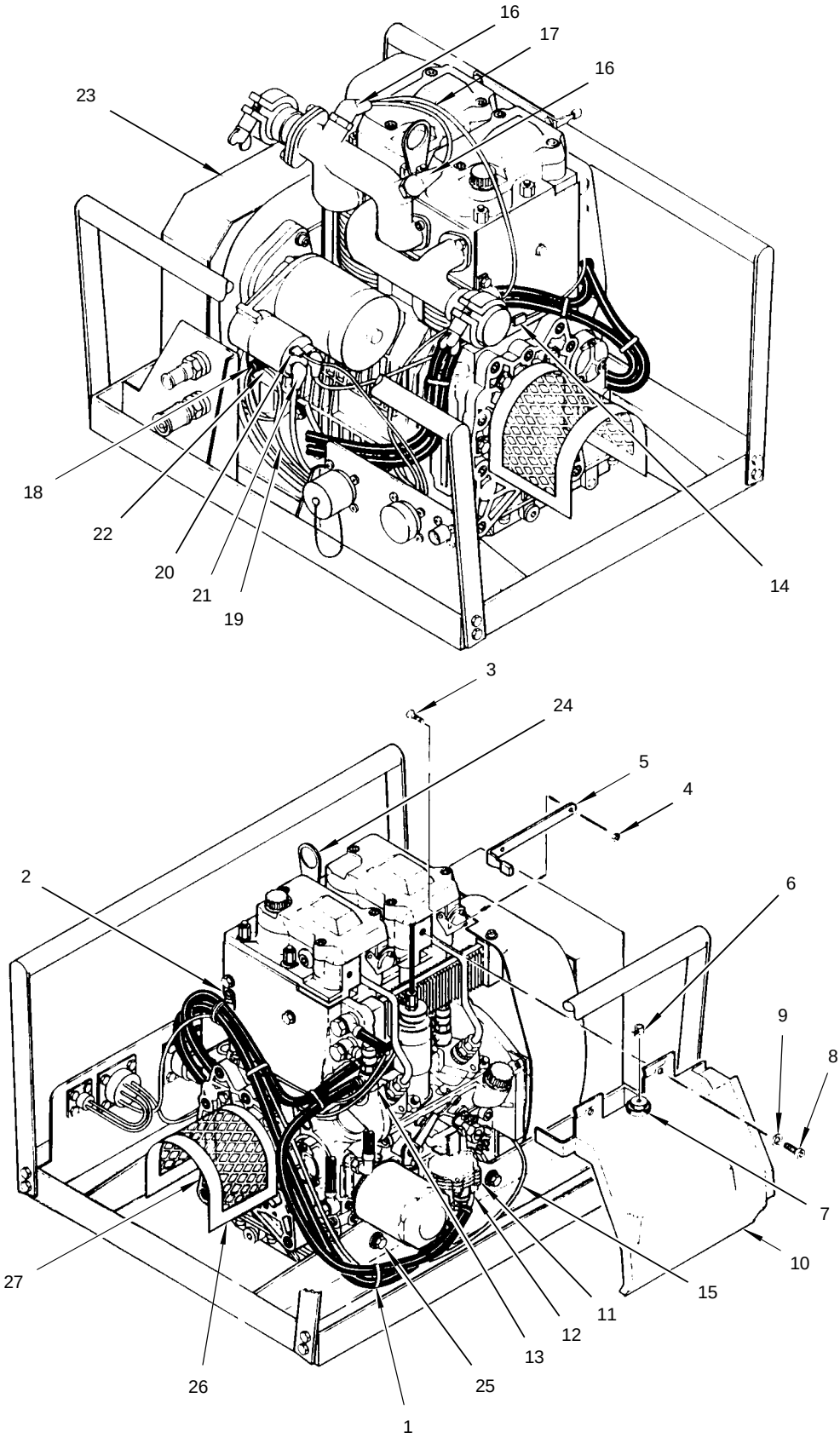
Tools:
Plier, Diagonal Cutting
(WP 0113 00, Item 3)
Wrench, Combination, 7/16”
(WP 0113 00, Item 3)
Screwdriver, Cross-Tip, Size 2
(WP 0113 00, Item 3)
Screwdriver, Flat Blade, 1/4" x 4”
(WP 0113 00, Item 3)
Drain Pan
(WP 0113 00, Item 3)
Wrench, Combination, 6 mm
(WP 0113 00, Item 3)
Key, Socket Head Screw, 6 mm
(WP 0113 00, Item 3)
Key, Socket Head Screw 3 mm
(WP 0113 00, Item 3)
Wrench, Combination, 13 mm
(WP 0113 00, Item 3)
Wrench Combination, 17 mm
(WP 0113 00, Item 3)
Strap Wrench
(WP 0113 00, Item 3)

Materials/Parts Required:
Tags, Electrical (WP 0116 00, Item 29)

Equipment Condition:
Engine module removed from pump-engine module

Personnel Required:
Four

1. Place engine module high enough to allow oil drain pan to fit beneath oil drain plug.
2. Remove either oil filler cap.
3. Place oil drain pain beneath oil drain plug, remove the drain plug and drain the oil. Dispose of oil in accordance with local SOP.
4. Remove the oil filter, taking care not to spill oil from filter. Dispose of filter in accordance with local SOP.
5. Install the oil drain plug.
6. Cut and remove tiedown straps (1) from engine fuel supply line and engine fuel return line.
7. Remove cable loop (2) from PTO end of engine.
8. Remove screws (3) and nuts (4) from decompression lever (5). Remove lever (5).
9. Remove cable clamp (6) from fuel flow solenoid wire cable at black start control knob (7).
10. Remove two socket head cap screws (8) and washers (9) securing cylinder casing (10) to cylinder heads. Remove casing (10).
11. Place drain pan under fuel pump (11).
12. Remove fuel supply line (12) from fuel pump (11).
13. Remove fuel return line from fuel fitting (13) on #2 fuel injection pump.


16
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14. Cut and remove tiedown straps from electrical wiring harness.
15. Tag and disconnect fuel shutoff solenoid electrical wires (14) at sensor.
16. Tag and disconnect engine temperature sensor electrical wire (15) at sensor.
17. At intake manifold, lift boots (16) from air intake heaters.
18. Tag and remove electrical wires (17) from air intake heaters.
19. Tag and remove electrical wire (18) from oil pressure switch.
20. Locate alternator wires in braided sheathing on left side of engine. Separate and push back sheathing from alternator wire connectors. Tag and disconnect alternator wires (19) at in-line connector in wiring harness.
21. Tag and remove small electrical wire (20) from starter solenoid.
22. Tag and remove starter cables (21) from starter solenoid.
23. At lower starter mounting bolt (22), tag and remove electrical wire.
24. Unlatch and lower pulley guard (23).

WARNING

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. If manually moving/lifting, always use four personnel to move or relocate the engine module. Use proper physical lifting procedures or use a suitable lifting device or dolly. Wear safety shoes, gloves and other suitable protective clothing.

NOTE

The engine is secured to the module frame by ten hex head bolts, five on each side of the engine. Before removing these bolts, the engine must be supported to take the weight off the mounting bolts. A hoist may be attached to the engine lifting eye or the engine may be blocked from underneath if a hoist is not available.

25. Attach hoist to engine lifting eye (24) and take all slack out of hoist cable/chain, or block engine from underneath to take engine weight off mounting bolts.
26. Remove the ten mounting bolts (25), lock washers and flat washers and hoist the engine from the module. Discard the lock washers.
27. Remove four bolts, lock washers and flat washers that secure coupling guard (26) to the engine. Remove coupling guard (26).
28. Remove the bolt and splined flexible coupling adapter (27) from PTO end of engine crankshaft.

END OF WORK PACKAGE

GENERAL SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
ENGINE DISASSEMBLY

This work package (Engine Disassembly) and the succeeding work package (Engine Assembly) are presented in disassembly-reassembly order and comprise a complete engine overhaul. Maintenance functions not comprising an overhaul may be performed by selecting the appropriate disassembly procedures and corresponding assembly procedures.

REMOVE EXHAUST MANIFOLD (Refer to figure 1.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
None

Equipment Condition:
Oil drained from engine

1. Remove the four nuts (1), lock washers (2) and flat washers (3) from cylinder head studs (4). Discard lock washers.
2. Remove exhaust manifold (5) and two gaskets (6). Discard gaskets (6).
3. Clean remaining gasket material from cylinder head flange (7) and exhaust manifold (5) flange.

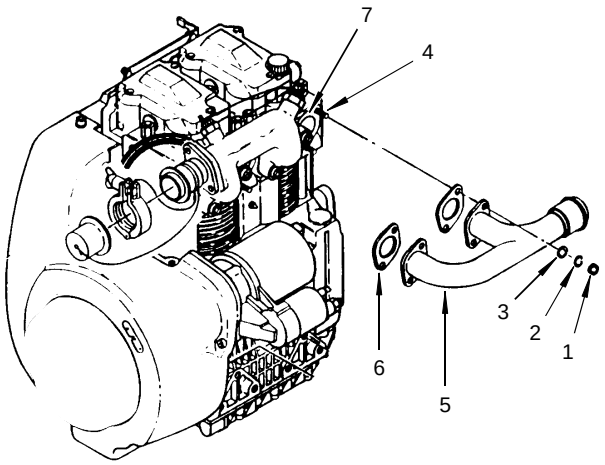


Figure 1. Exhaust Manifold Removal

REMOVE INTAKE MANIFOLD (Refer to figure 2.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
None

Equipment Condition:
Pumping assembly shut down

1. Loosen clamp (1) and detach air filter, if installed. Install and clamp dust cap (2).
2 Lift boots (3), and remove power lead (4) and connecting wire (5) from intake air heaters (6).
3. Remove intake air heaters (6) from intake manifold (7).
4. Remove two nuts (8) and flat washers (9) attaching air intake adapter (10) to the intake manifold (7).
5. Remove clamp (11) and hose (12) from intake manifold (7).

CAUTION

The four socket head cap screws are of two lengths. Note that the longer cap screws come out of the portion of the intake manifold with thicker lands.

6. Remove the four socket head cap screws (13) and lock washers (14) from the cylinder heads. Discard lock washers (14).
7. Remove intake manifold (7) and two gaskets (15). Discard gaskets (15).
8. Clean any gasket material residue from cylinder head flange (16) and intake manifold (7) flange.

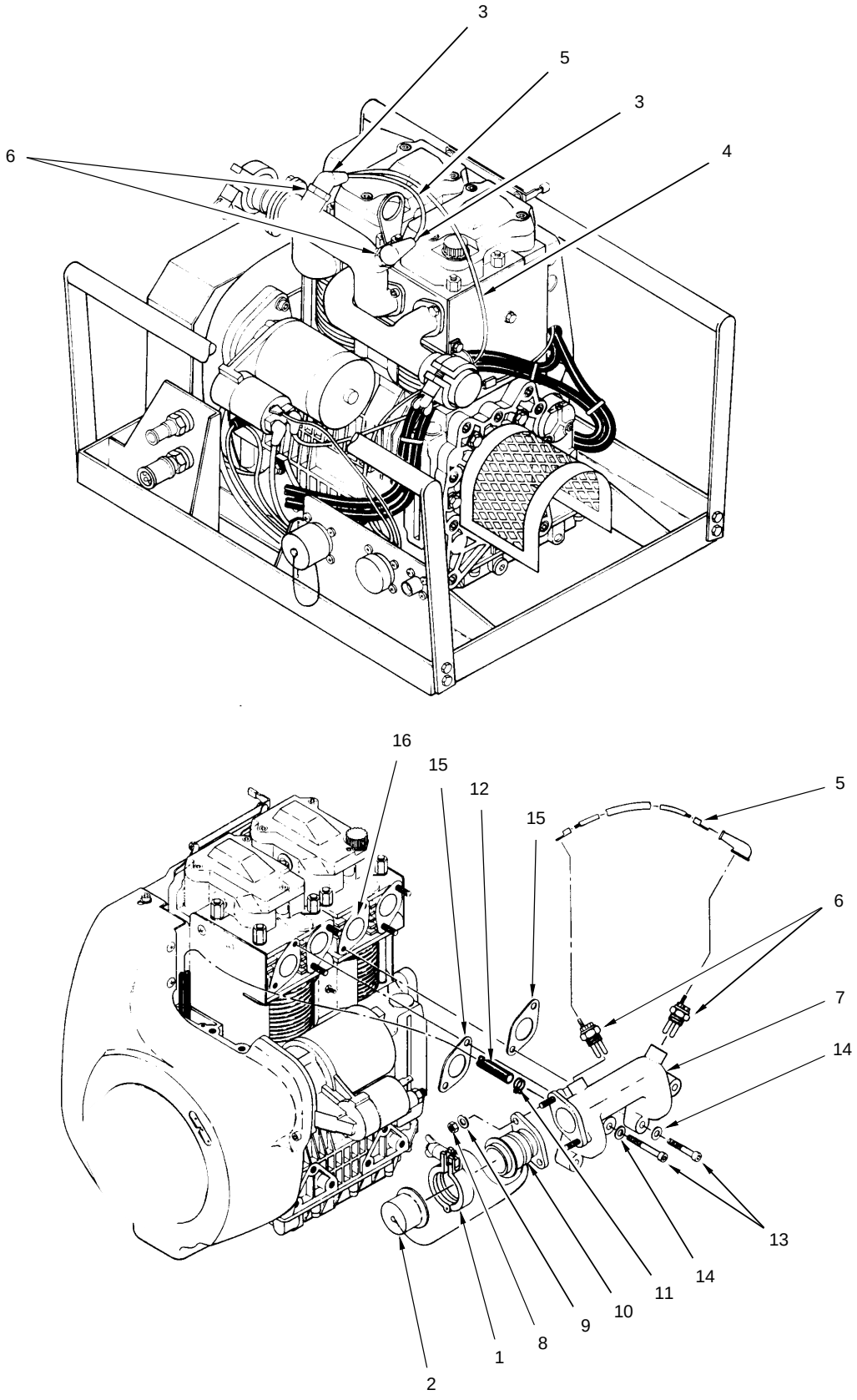


Figure 2. Intake Manifold Removal

REMOVE AND CLEAN OIL PAN. (Refer to figure 3.)

INITIAL SET-UP:

Tools:
Key, Socket Head Screw, 6 mm
(WP 0113 00, Item 3)
Key, Socket Head Screw, 5 mm
(WP 0113 00, Item 3)
Socket, 10 mm
(WP 0113 00, Item 3)
Socket, 13 mm, deep well
(WP 0113 00, Item 3)
Ratchet wrench, 3/8” drive
(WP 0113 00, Item 3)

Materials/Parts Required:
None

Equipment Condition:
Engine removed from engine module
Engine oil drained

1. Remove dipstick (1).
2. Place engine on pulley end.
3. Rotate engine to a position to allow for oil pan removal.
4. Remove the fifteen cap screws (2) and flat washers (3) attaching oil pan (4) to crankcase (5). Remove oil pan.
5. Remove and discard gasket (6). Clean gasket residue from crankcase and oil pan.
6. Remove cap screw (7), washer (8) and net (9). Inspect and clean net and oil pan. Reinstall net.
7. Restore engine to upright position.

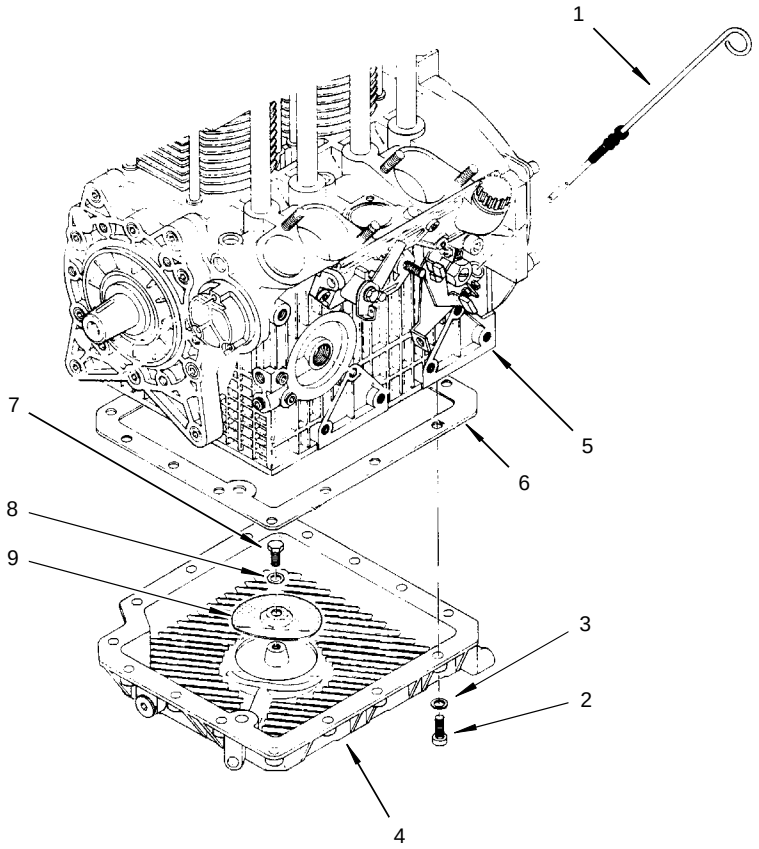


Figure 3. Engine Oil Pan Removal

REMOVE ENGINE SHROUD, CYLINDER CASING AND GATES. (Refer to figure 4.)

INITIAL SET-UP:

Tools:
Combination Wrench, 6 mm
(WP 0113 00, Item 3)
Key, socket Head Screw, 5 mm
(WP 0113 00, Item 3)
Combination Wrench, 19 mm
(WP 0113 00, Item 3)
Combination Wrench, 13 mm
Handle, Socket Wrench, Ratchet, 1/4" Drive
(WP 0113 00, Item 3)
Socket, Deep Well, 7 mm, 1/4" Drive
(WP 0113 00, Item 3)
Extension, Socket, 3 in., 1/4" Drive
(WP 0113 00, Item 3)
Handle, Socket Wrench, Ratchet, 1/2" Drive
(WP 0113 00, Item 3)
Socket, Deep Well, 13 mm, 1/2" Drive
(WP 0113 00, Item 3)
Extension, Socket, 3 in., 1/2" Drive
(WP 0113 00, Item 3)
Screwdriver, Cross Tip, #2
(WP 0113 00, Item 3)
Combination Wrench, 1/4 in.
(WP 0113 00, Item 3)

Materials/Parts Required:
None

Equipment Condition:
Engine module removed from pump-engine module
Engine oil drained

1. Remove cable clamp (1) from fuel flow solenoid cable at black start control knob (2).
2. Remove two socket head cap screws (3) and washers (4). Remove cylinder casing (5).
3. Remove the socket head cap screw (6), lock washer (7) and flat washer (8) attaching oil cooler (9) to shroud (10). Discard lock washer (7).
4. Remove the two cross tip screws (11) at top/intake side of shroud (10).
5. Remove four socket head cap screws (12) and washers (13) attaching shroud (10). Remove shroud (10).
6. Remove two cross tip screws (14) attaching gate (15) and bracket (16).

WARNING

Fuel vapors are flammable. Residual fuel may be present in the fuel line. Catch the fuel in a drain pan. Immediately wipe up any fuel that may spill.

7. Remove union bolt (17), union (18) and washers (19). Discard washers (19).

NOTE

Support oil cooler during removal of oil lines.

8. Remove union bolt (20), washer (21) union (22), and spacer (23) connecting the oil supply line to the oil cooler (9). Discard washer (21).

9. Remove union bolt (24), washer (25), union (26), and spacer (27) connecting the oil return line to the oil cooler (9). Discard washer. (25).
10. Remove the socket head cap screw (28) and washer (29) securing the oil cooler to gate (30). Remove oil cooler (9).
11. Remove oil supply line (31) at the crankcase.
12. Remove oil return line (32) at the crankcase.
13. Remove fuel shutoff solenoid wire from clip (33) if not already done.
14. Remove the two bolts (34) and washers (35) attaching gate (30). Remove gate, snaking fuel feed line from the fuel feed pump through the gate.
15. Remove nut (36) and washer (37) attaching gate (38) to tie rod (39).
16. Remove tie rod (39) from between cylinders.
17. Remove nut (40) and washer (41) attaching lifting eye (42) to cylinder head.

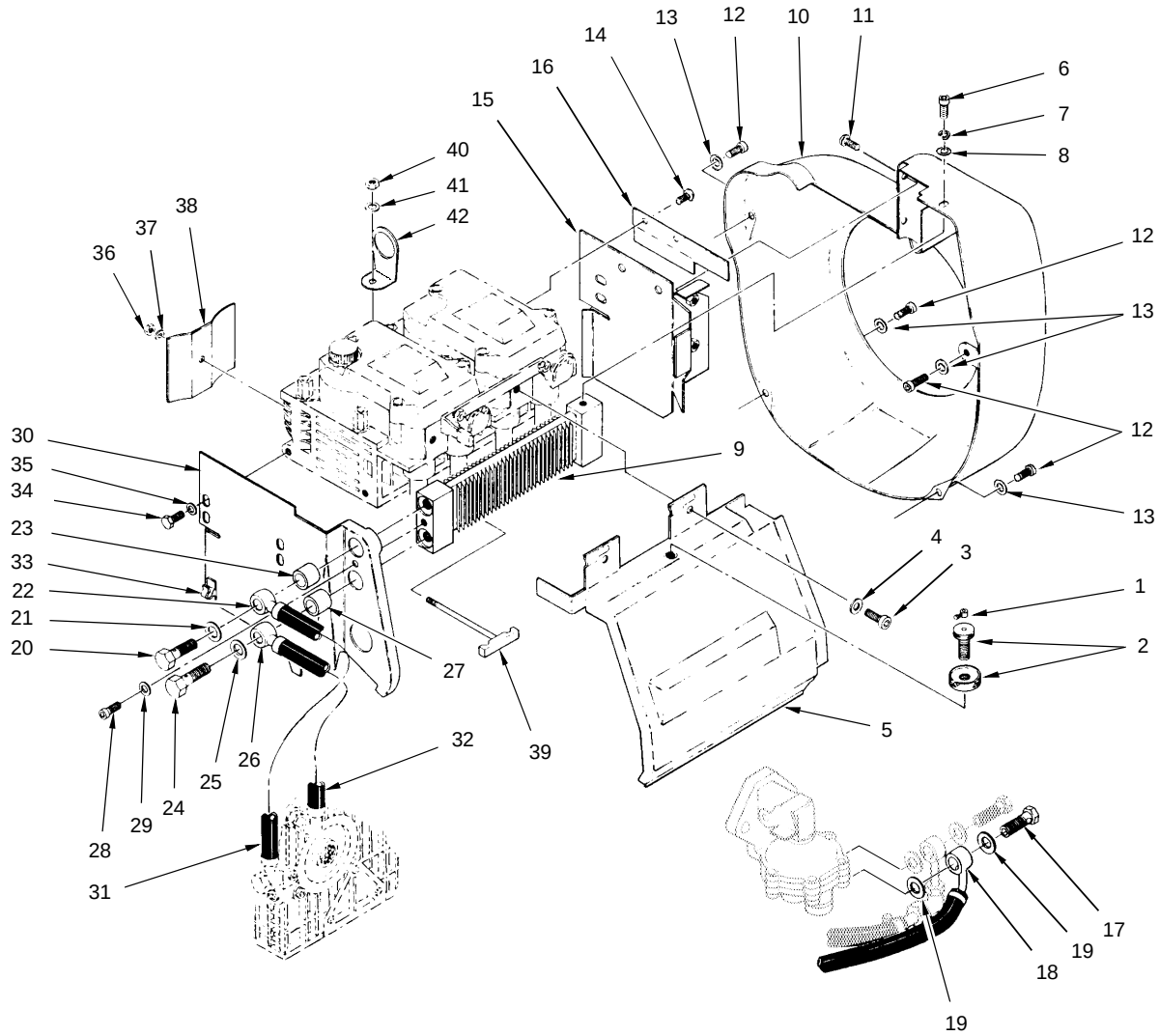


Figure 4. Shroud, Cylinder Casing and Gates Removal

REMOVE STARTER (Refer to figure 5)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
Tags, Electrical (WP 0116 00, Item 29)

Equipment Condition:
Pumping assembly shutdown

1. Tag and remove electrical leads (1) from solenoid (2) if not already done.
2. Loosen the two cap screws (3 and 4) that secure the starter (5) to the engine block (6).
3. Tag leads, and remove the lower cap screw (4), washer (7) and ground leads (8) if not already done.
4. Support the starter and remove the upper cap screw (3) and washer (9). Remove the starter.

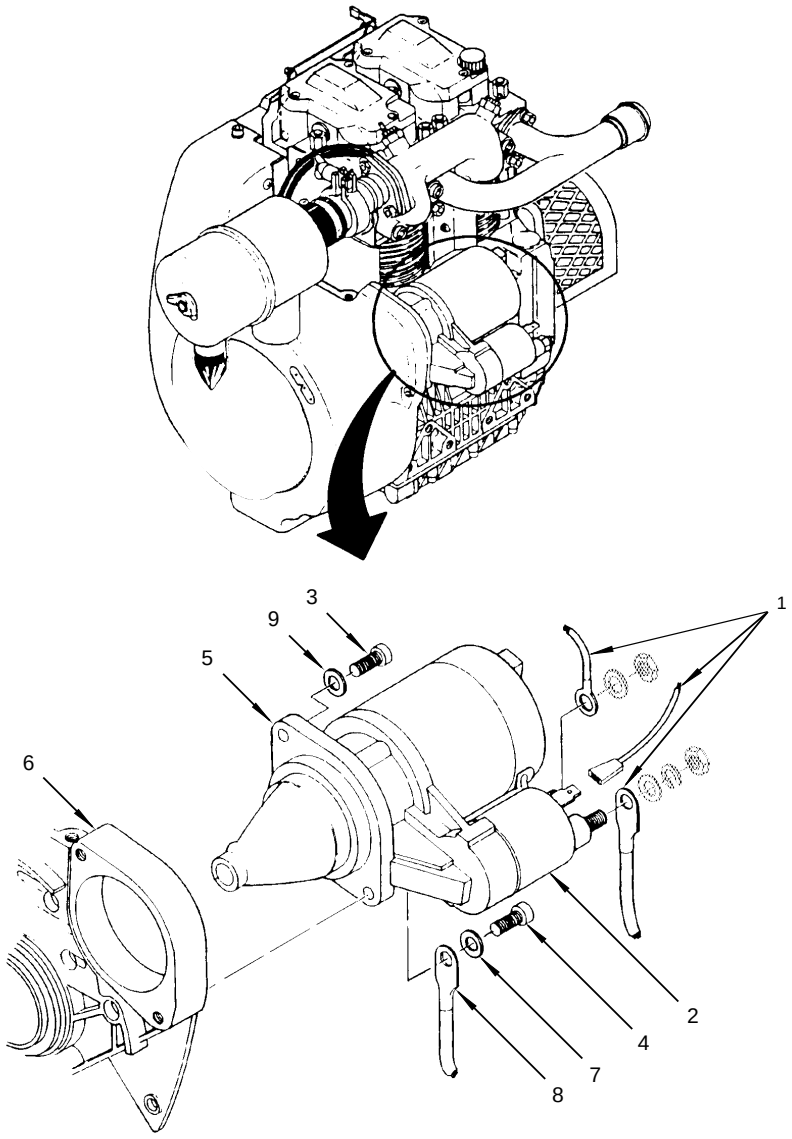


Figure 5. Starter Removal

REMOVE FLYWHEEL/ALTERNATOR ROTOR AND STATOR. (Refer to figure 6.)

INITIAL SET-UP:

Tools:
Socket, 1-1/4", 1/2" Drive
(WP 0113 00, Item 3)
Flywheel Puller
(WP 0113 00, Item 3)
Key, Socket Head Screw, 5 mm
(WP 0113 00, Item 3)
Key, Socket Head Screw, 4 mm
(WP 0113 00, Item 3)
Key, Socket Head Screw, 6 mm
(WP 0113 00, Item 3)
Handle, Socket Wrench, Ratchet, 1/2" Drive
(WP 0113 00, Item 3)
Pliers, Vise Grip
(WP 0113 00, Item 3)
Adapter, Socket, 1/2" to 3/4"
(WP 0113 00, Item 3)

Materials/Parts Required
None

Equipment Condition:
Engine removed from engine module
Engine oil drained

1. Remove three capscrews (1). Remove splined adapter (2).
2. Hold/lock flywheel (3) in place.
3. Remove nut (4), flat washer (5), spacer (6), and roll pin (7).

CAUTION

Do not allow flywheel to drop when removing from shaft. Jack screws must not protrude more than 5/16" beyond puller.

4. Using the AAFARS engine flywheel puller with four jack screws (8 x 1.25 m), remove flywheel (3) and tab (8).
5. Remove the five socket head cap screws (9) attaching the alternator rotor (10) to flywheel (3). Remove rotor (10).
6. Remove socket head screw (11) and washer (12) and outboard clamp (13).
7. Remove RFI bulkhead fitting. Cut stator wires (14) near connectors (15). Discard connectors (15).
8. Remove four socket head cap screws (16) attaching the alternator stator (17) to the timing cover (18). Remove alternator stator (17).
9. Remove socket head screw (19), washer (20) and wire clamp (21) under alternator stator (17).

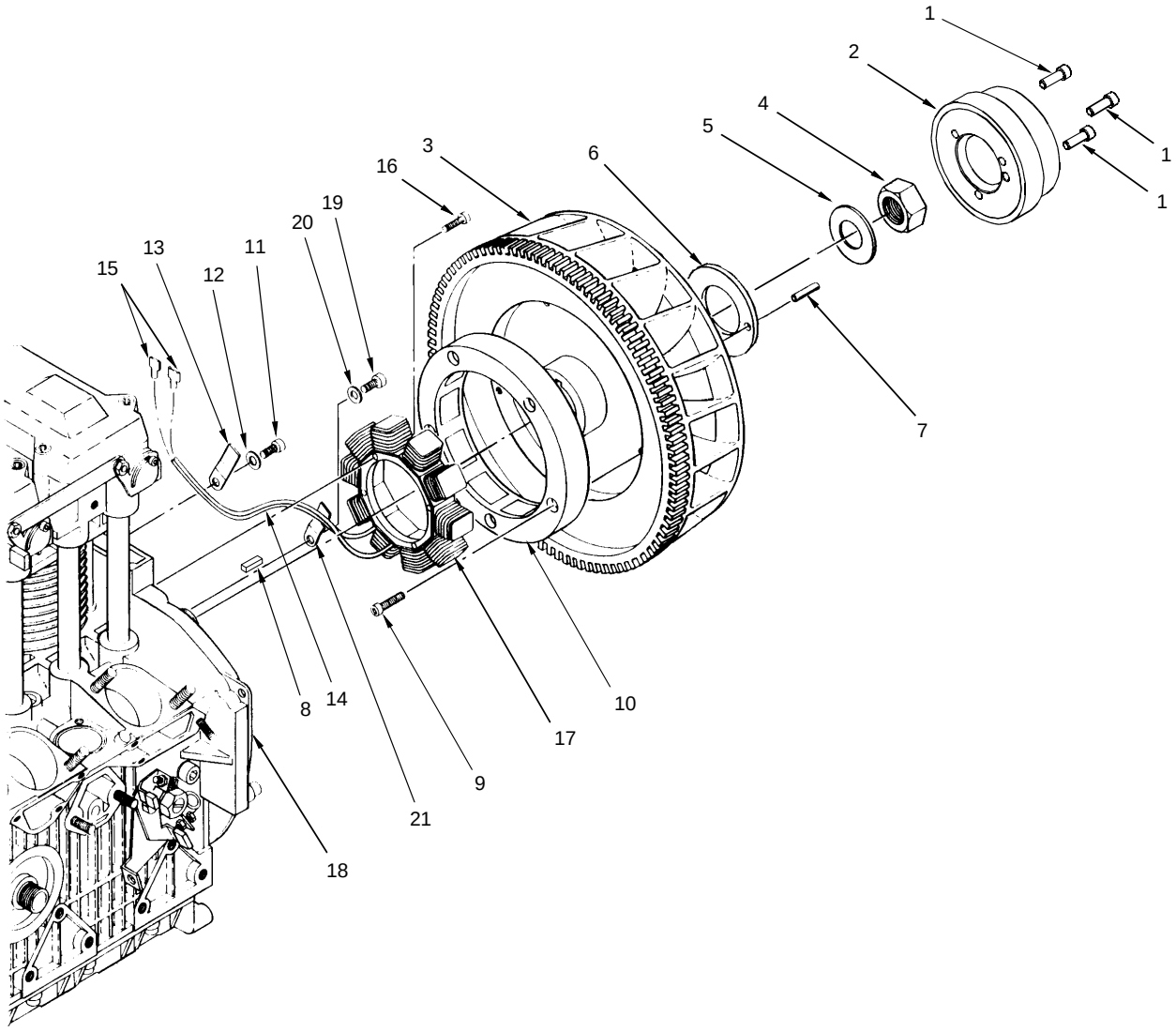


Figure 6. Flywheel and Alternator Removal

REMOVE FUEL FLOW SOLENOID. (Refer to figure 7.)

INITIAL SET-UP:

Tools:
Key, Socket Head Screw, 5 mm
(WP 0113 00, Item 3)

Materials/Parts Required:
None

Equipment Condition:
Cylinder casing removed

1. Disconnect electrical wires (1).
2. Remove two socket head screws (2) attaching fuel flow solenoid (3) to crankcase (4). Remove and discard O-ring (5).

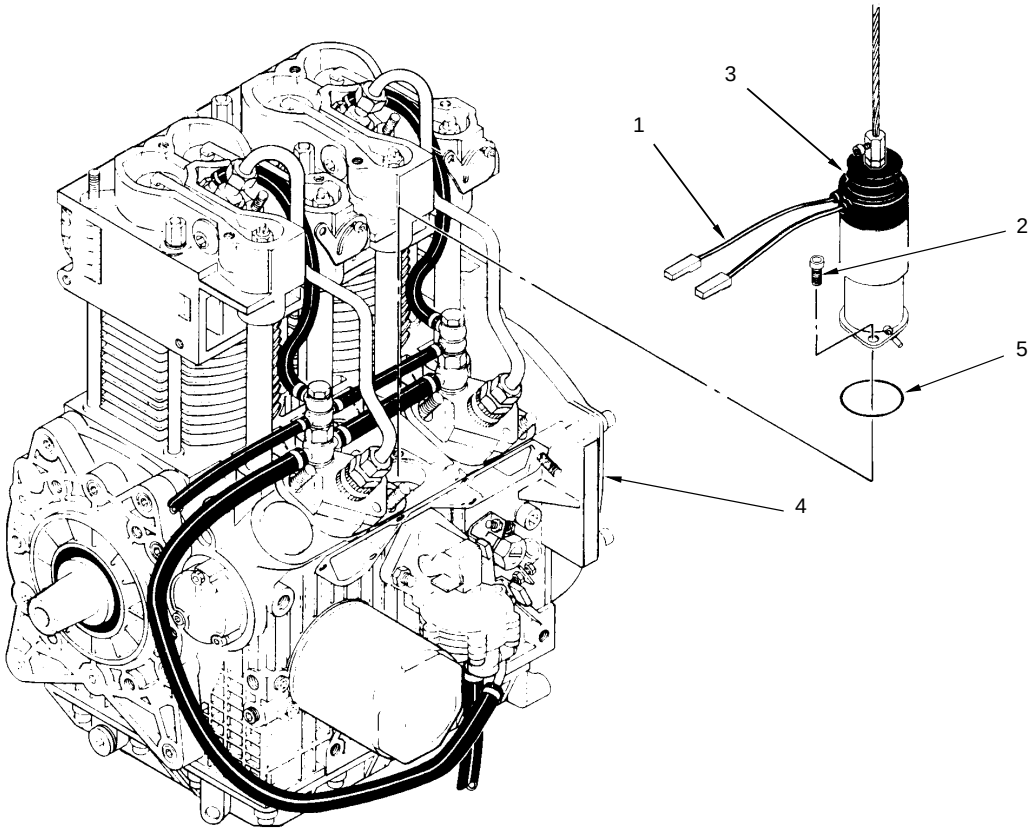


Figure 7. Fuel Flow Solenoid Removal

REMOVE VALVE COVERS (Refer to figure 8.)

This procedure applies to either cylinder head.

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
None

Equipment Condition:
Pumping assembly shut down

Remove the three socket head screws (1) that secure each valve cover (2). Remove valve cover and gasket (3) from each cylinder head. Discard gaskets (3).

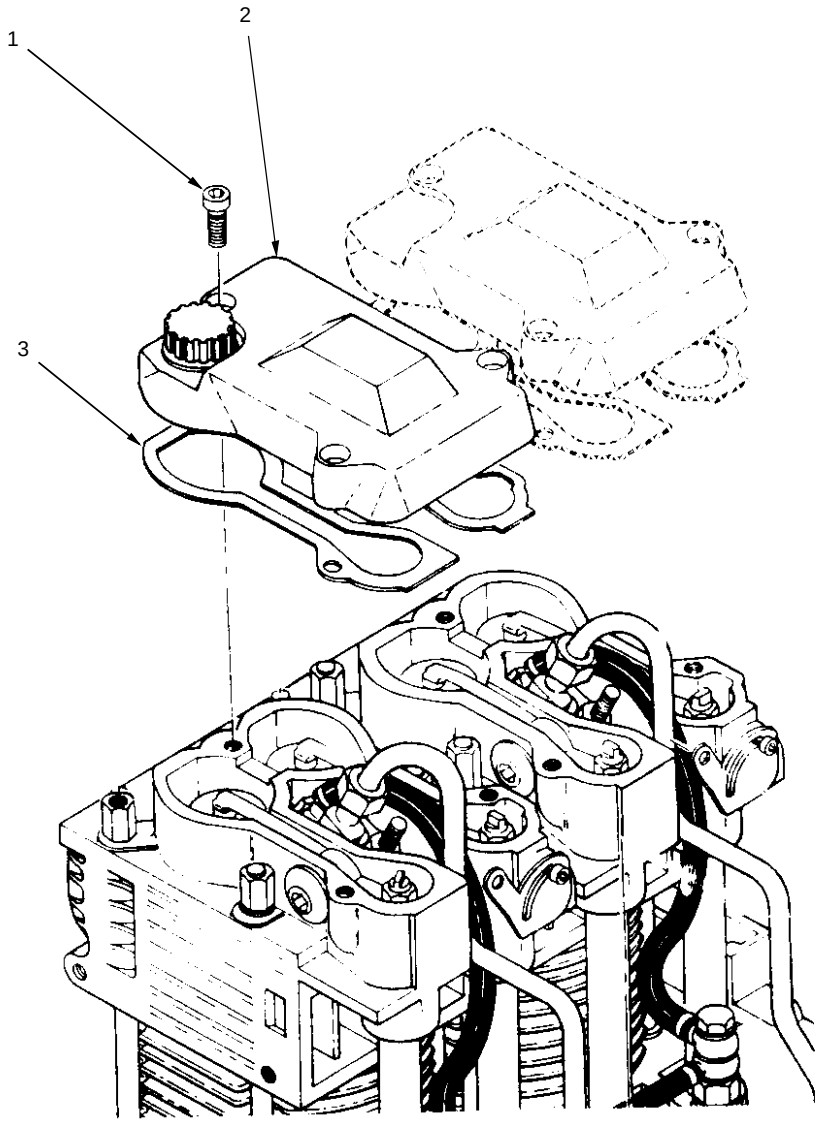


Figure 8. Valve Cover Removal

REMOVE DECOMPRESSION LEVER. (Refer to figure 9.)

INITIAL SET-UP:

Tools:
Key, Socket Head Screw, 3 mm
(WP 0113 00, Item 3)
Combination Wrench, 13 mm
(WP 0113 00, Item 3)

Materials/Parts Required:
None

Equipment Condition:
Pumping assembly shut down

If decompression lever has not been removed, remove two screws (1) and two nuts (2) from decompression lever (3). Remove lever.

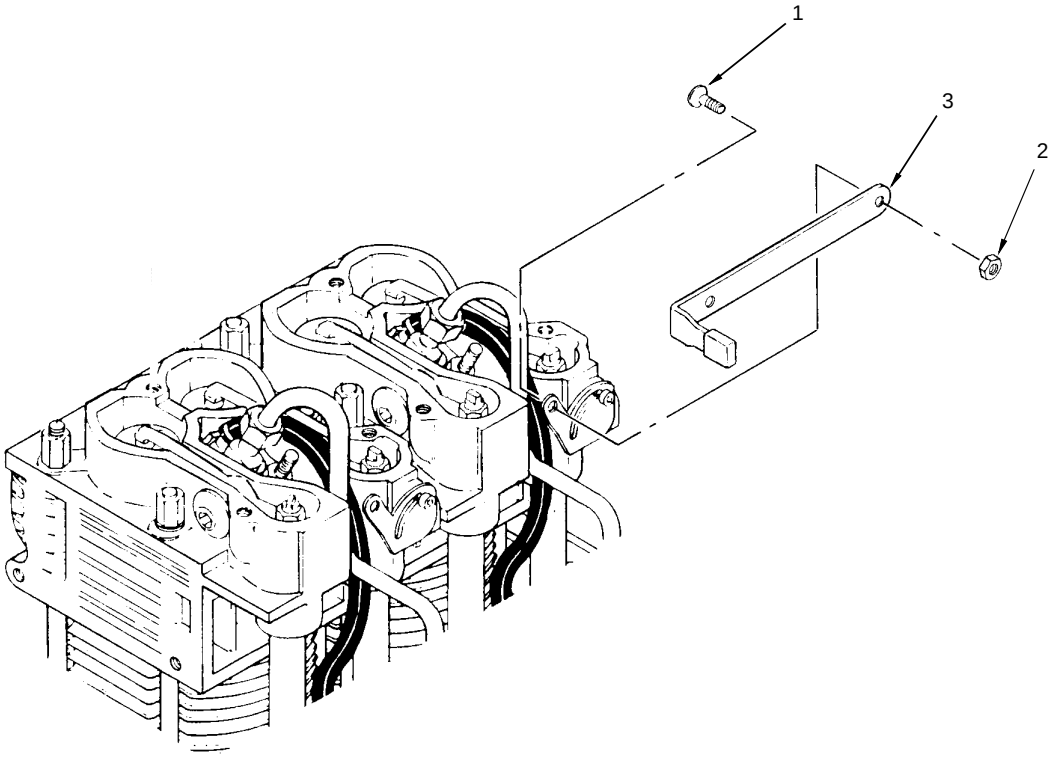


Figure 9. Decompression Lever Removal

REMOVE INJECTION PUMP. (Refer to figures 10 and 11.)

INITIAL SET-UP:

Tools:
Key, Socket Head Screw, 5 mm (WP 0113 00, Item 3)
Key, Socket Head Screw, 3 mm (WP 0113 00, Item 3)
Combination Wrench, 13 mm (WP 0113 00, Item 3)
Combination Wrench, 17 mm (WP 0113 00, Item 3)
Socket, Socket Wrench, 10 mm (WP 0113 00, Item 3)
Socket, Socket Wrench, 13 mm (WP 0113 00, Item 3)
Handle, Socket Wrench, 3/8” Drive (WP 0113 00, Item 3)
Pliers, Needle Nose (WP 0113 00, Item 3)

Materials/Parts Required
None

Equipment Condition:
Cylinder casing removed

Refer to figure 10.

NOTE

The following task applies to removal of either injection pump.

1. Remove fuel line (1) at fuel injection pump (2) and fuel injector (3).
2. Disconnect fuel return lines by removing union bolt (4), washer (5), union (6), and washer (7). Retain used washers (5 and 7) for injector pump adjustments.
3. Disconnect fuel supply line by removing union bolt (8), washer (9), union (10) and washer (11). Retain used washers (9 and 11) for injector pump adjustments.
4. Loosen nut (12) securing injection pump to crankcase.

NOTE

Copper washers are used under the two socket head cap screws at the lower side of the fuel control cover.

5. Remove the five socket head cap screws (13) and flat washers (14 and 15) attaching fuel control cover (16) to crankcase. Discard the two copper washers (15).
6. Remove the nut (17) and washer (18) attaching fuel control cover (16) to crankcase.
7. Remove fuel control cover (16) and gasket (19). Discard gasket (19). Remove any gasket residue from the fuel control cover (16) and crankcase.
8. Remove nut (12), spacer (20), and yoke (21) securing injection pump (2) to crankcase.
9. Using needle nose pliers, remove three spring clips (22) from control rod (23), fuel injection pump and governor. Raise fuel injection pumps enough to allow removal of control rod (23) from crankcase.

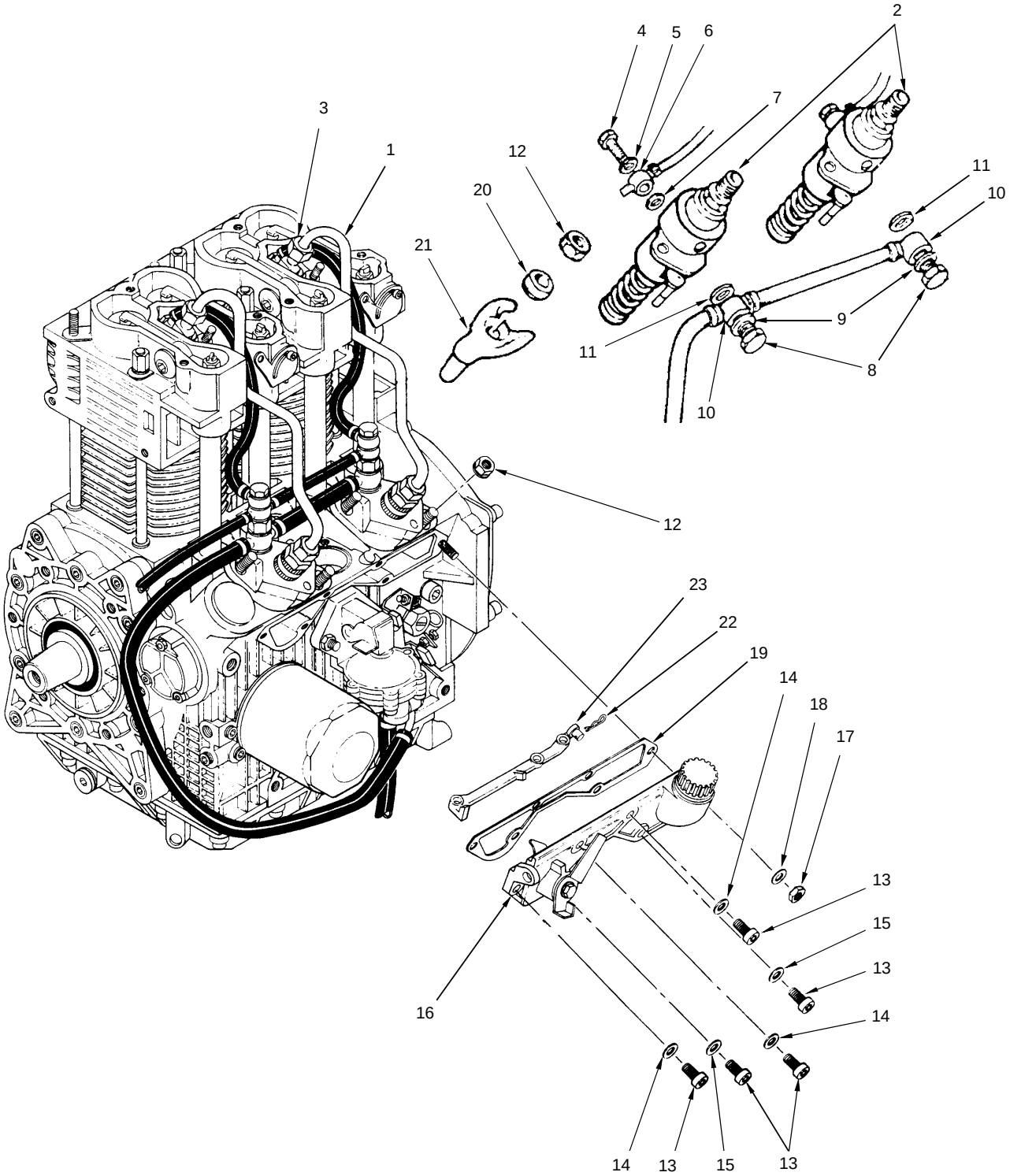


Figure 10. Fuel System Components Removal

Refer to figure 11.

NOTE

The following task applies to removal of either injection pump. Before removal, mark each fuel injection pump to ensure that the pump will be reinstalled in the same location. Record and retain the number of gaskets, if any, that were between the injection pump and the crankcase. The same number of gaskets must be used upon reassembly. Rotate crankshaft counterclockwise until tappets are resting in the down position to relieve pressure on injection pump.

10. Remove injection pump (1) and gasket(s) (2) from crankcase.

NOTE

Injection pumps are supplied by two different manufacturers: Ruggerini and Bosch. Ruggerini injection pumps do not have expansion plugs.

11. Remove expansion plug (3) and tappet (4) from crankcase.

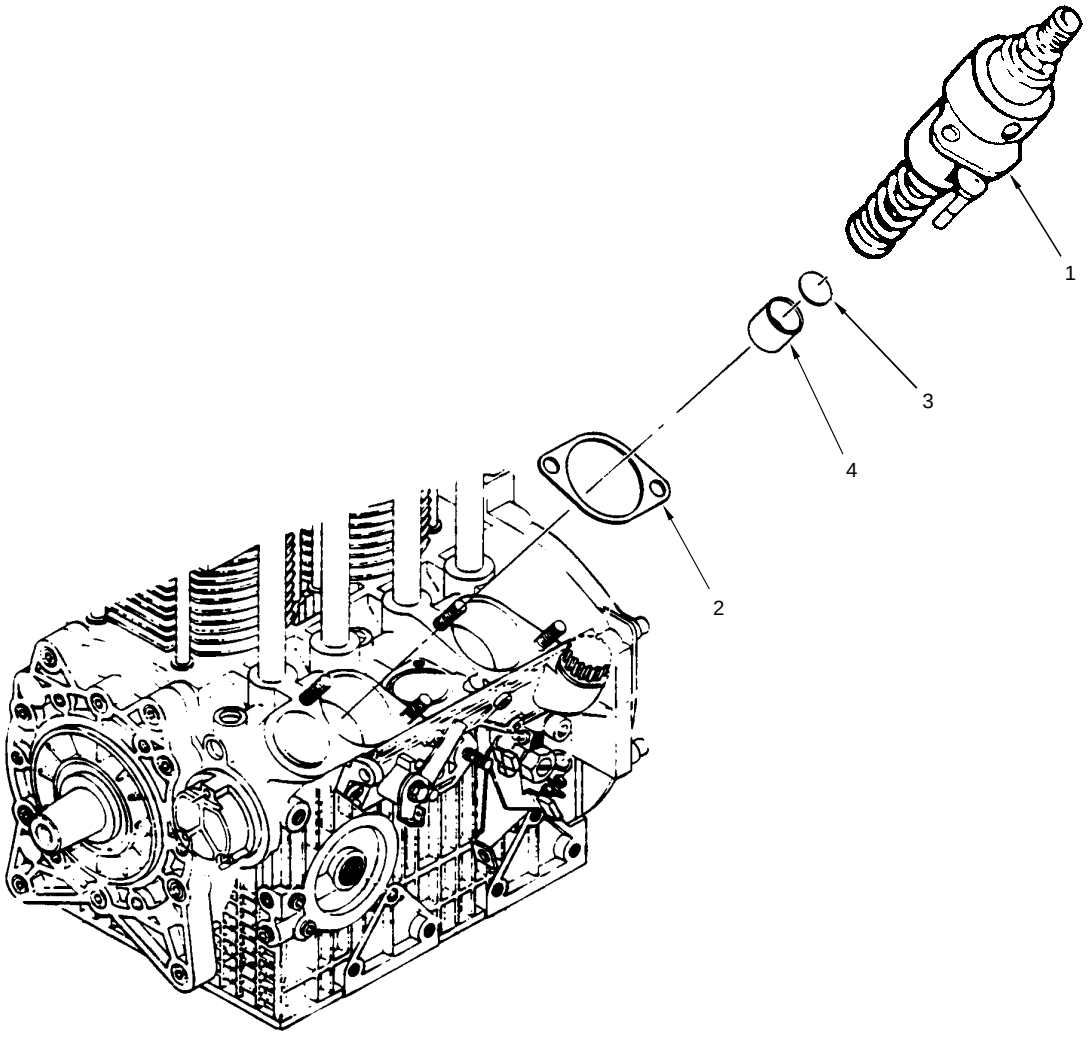


Figure 11. Injection Pump Removal

REMOVE FUEL PUMP (Refer to figure 12.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
None

Equipment Condition:
Pumping assembly shut down

1. If fuel feed line (1) has not been removed from fuel pump (2) disconnect fuel feed line (1) from fuel pump (2). Remove union bolt (3), union (4) and two copper washers (5 and 6). Discard copper washers (5 and 6).
2. If fuel supply line (7) has not been removed from fuel pump (2) disconnect fuel supply line (7) from fuel pump (2). Remove union bolt (8), union (9) and two copper washers (10 and 11). Discard copper washers (10 and 11).
3. Remove the two self-locking nuts (12) that attach the fuel pump to the block (13). Discard the self-locking nuts (12).
4. Remove the fuel pump (2), drive rod (14) and gasket (15). Discard gasket.

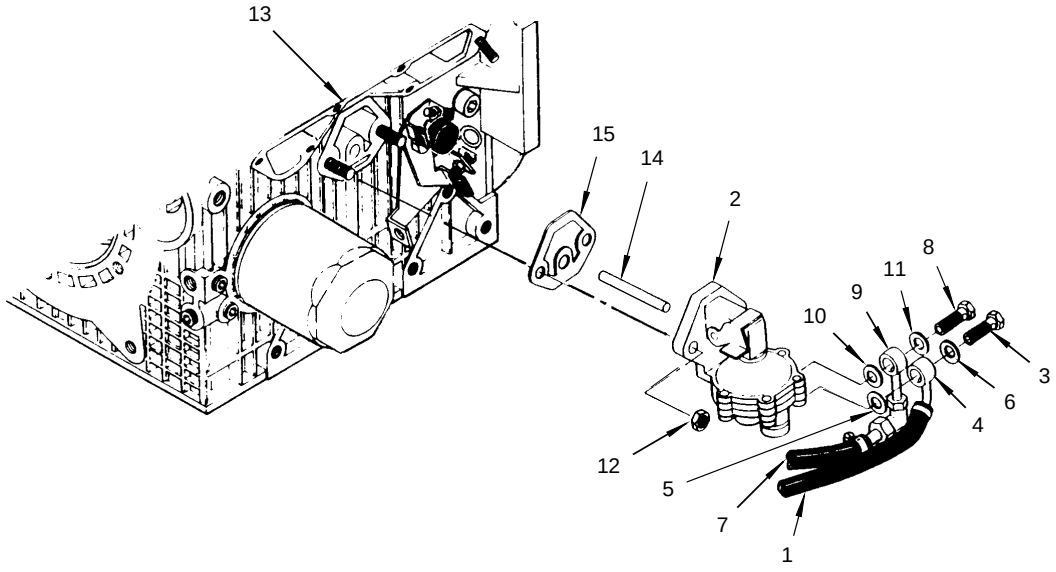


Figure 12. Fuel Pump Removal

REMOVE FUEL INJECTORS. (Refer to figure 13.)

This task applies to either fuel injector.

INITIAL SET-UP:

Tools:
Combination Wrench, 10 mm (WP 0113 00, Item 3)
Combination Wrench, 13 mm (WP 0113 00, Item 3)
Combination Wrench, 17 mm (WP 0113 00, Item 3)

Materials/Parts Required:
None

Equipment Condition:
Cylinder casing removed
Valve covers removed
Injector fuel feed lines removed

NOTE

Copper washers under fuel injectors are used to adjust fuel injector protrusion into combustion chamber of cylinder head. Record the number of washers removed, if any, so that the same number of new washers will be installed upon reassembly.

1. Remove brace nut (1), washer (2) and brace (3) from mounting stud (4).
2. Raise fuel injector (5) for access and remove bolt (6), washer (7), union (8) and washer (9). Discard washers (7 and 9).
3. Remove fuel injector (5) and washer(s) (10). Note number of washers (10) under fuel injector. Discard washers (10).

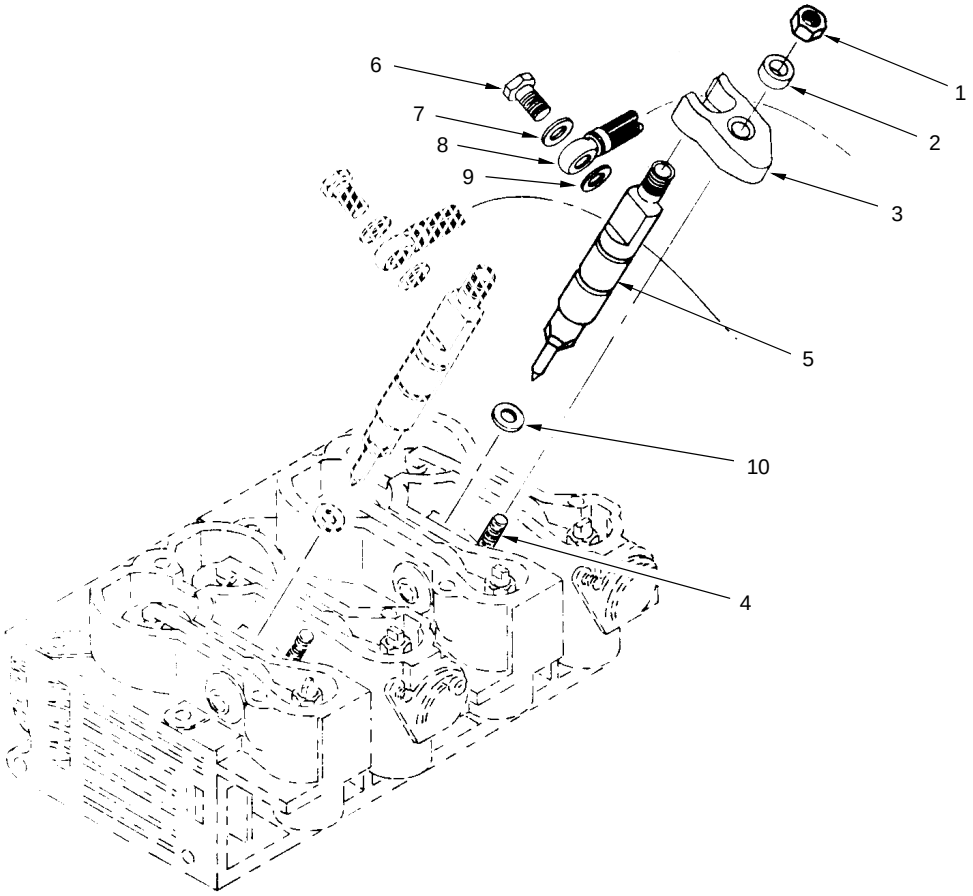


Figure 13. Fuel Injector Removal

REMOVE CYLINDER HEAD AND CYLINDER (Refer to figures 14 and 15.)

This task applies to either cylinder head or cylinder.

INITIAL SET-UP:

Tools:
Socket, Socket Wrench, Deep Well, 13 mm (WP 0113 00, Item 3)
Handle, Socket Wrench, Ratchet, 3/8” Drive (WP 0113 00, Item 3)

Materials/Parts Required:
Tags, Electrical (WP 0116 00, Item 29)

Equipment Condition:
Fuel injectors removed

Refer to Figure 14.

NOTE

One cylinder head nut is a studnut used to mount the lifting eye and oil fill cap lanyard. Note location for reassembly.

1. Remove the four cylinder head nuts (1) and washers (2).
2. Mark cylinder head to ensure replacement on same cylinder.
3. Remove cylinder head (3) and copper gasket (4). Discard copper gasket (4).
4. Remove any remaining gasket material from flange.

NOTE

Tag the location of pushrods before removal. Valve pushrods wear differently. Ensure pushrods are put back in the same location or the engine may not run properly.

5. Tag and remove pushrods (5). Remove pushrod pipes (6) and O-rings (7). Discard O-rings (7).

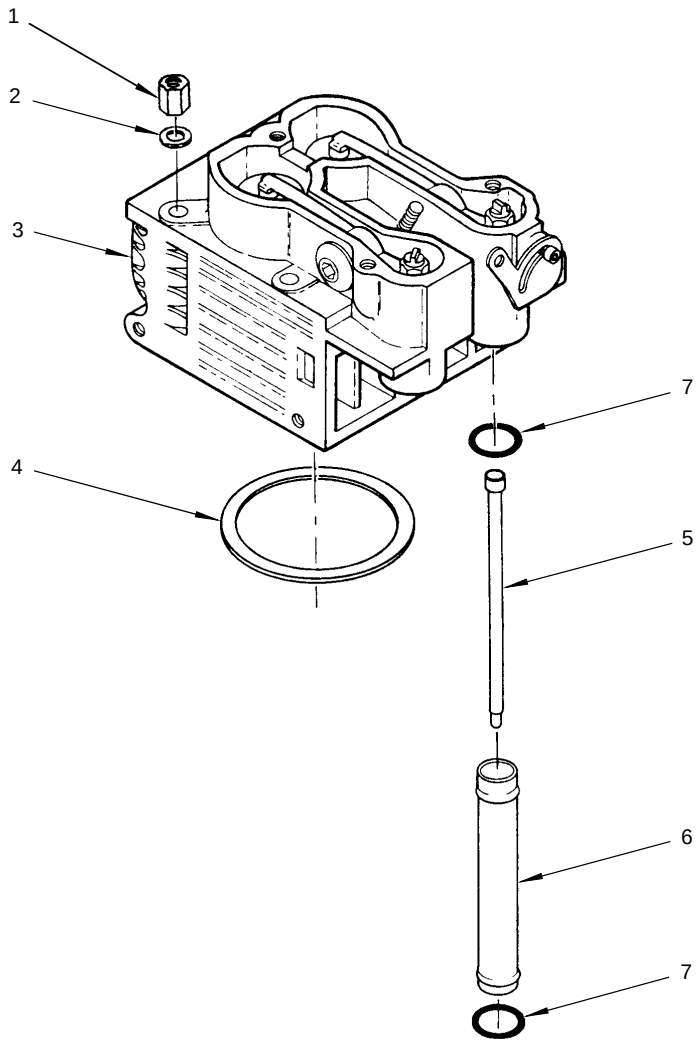


Figure 14. Cylinder Head Removal

Refer to figure 15.

NOTE

Removing the studs during engine overhaul is optional.

6. Remove eight studs (1).

NOTE

Mark cylinder before removing to show which side faces injection pumps.

7. Turn flywheel to TDC of each cylinder. Lift cylinder (2) from crankcase (3). Remove and discard cylinder gasket(s) (4). Note quantity of gaskets (4) removed. The same quantity must be installed initially during assembly.

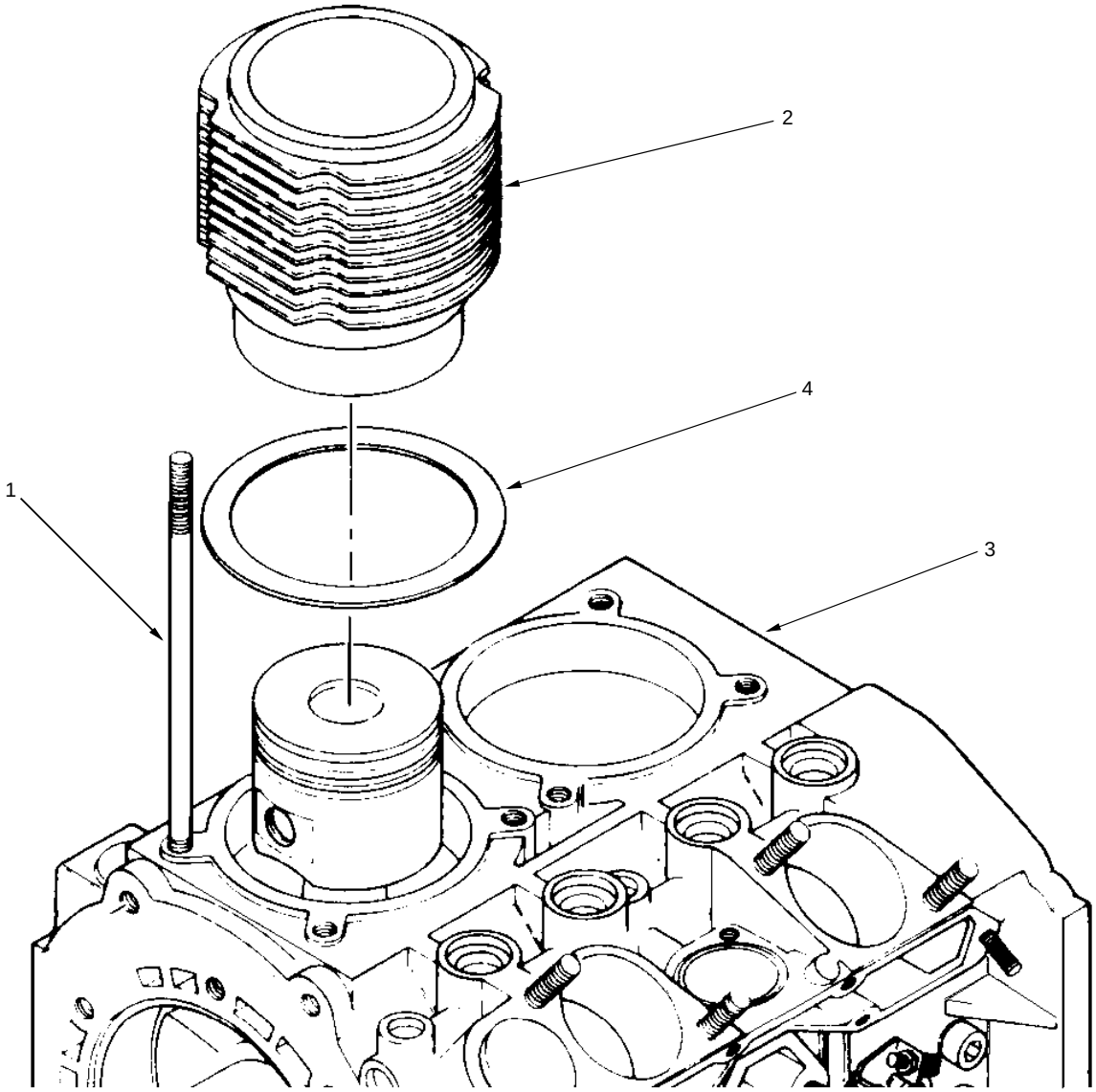


Figure 15. Cylinder Removal

REMOVE PISTON AND RINGS. (Refer to figure 16.)

This task applies to either cylinder.

INITIAL SET-UP:

Tools:
Socket, Socket Wrench, 14 mm
(WP 0113 00, Item 3)
Handle, Socket Wrench, Ratchet, 3/8” Drive
(WP 0113 00, Item 3)
Pliers, Needle Nose
(WP 0113 00, Item 3)

Materials/Parts Required:
None

Equipment Condition:
Cylinder head and cylinder removed

CAUTION

With piston detached from connecting rod, the connecting rod can easily jam and cause damage in the crankcase. Use caution when turning crankshaft in order to avoid damage.

Mark each piston to ensure replacement in correct cylinder; i.e., flywheel-end piston and PTO-end piston.

1. Remove the two piston pin snap rings (1) and push the piston pin (2) free of the piston (3). Separate and remove piston (3) from connecting rod (4).
2. Remove three rings (5) from piston (3). Discard rings (5).

CAUTION

Note markings on connecting rod and cap or mark them to ensure that they can be reassembled properly.

3. Remove cap screws (6) from caps (7) at bottom of connecting rod (4). Remove connecting rod (4) and cap (7) from crankshaft (8).
4. Remove and discard rod bearings (9).

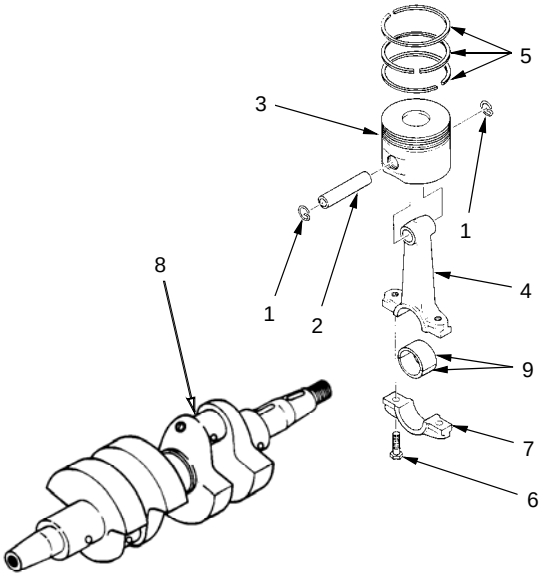


Figure 16. Piston and Rings Removal

REMOVE AND CHECK OIL PUMP. (Refer to figure 17.)

INITIAL SET-UP:

Tools:
Combination Wrench, 7 mm
(WP 0113 00, Item 3)
Key, Socket Head Screw, 4 mm
(WP 0113 00, Item 3)
Rule, Machinist's, 6 in.
(WP 0113 00, Item 3)
Caliper, Vernier
(WP 0113 00, Item 3)
Gauge, Thickness
(WP 0113 00, Item 3)

Materials/Parts Required:
None

Equipment Condition:
Engine removed from engine module

1. Remove three socket head cap screws (1).

NOTE

Use care when removing oil pump cover. The rotor's position in the oil pump cover are to be measured.

2. Remove the oil pump cover (2) with inner rotor (3), outer rotor (4) and O-ring (5). Discard O-ring (5). Wipe rotors (3 and 4) and oil pump cover (2) clean.
3. Lay the oil pump cover (2) on a flat surface with the rotors (3 and 4) facing up. Measure the clearance (A) between the outer rotor and the cover mating surface. The rotor must be 0.010-0.024 in. (0.27-0.60 mm) below the mating edge of the oil pump cover. If measurement is out of tolerance, replace the rotor.
4. Remove rotors (3 and 4) from oil pump cover (2) and measure for wears. If any measurement is out of tolerance, replace the rotor(s).
   a. Measurement B (Inner Rotor Diameter): 1.167-1.172 in. (29.65-29.77 mm)
   b. Measurement C (Outer Rotor Diameter): 1.592-1.597 in. (40.45-40.58 mm)
   c. Measurement D (Outer Rotor Inside Diameter): 1.182-1.185 in. (30.03-30.1 mm)
   d. Measurement E (Rotor Thickness - Both Rotors): 0.704-0.706 in. (17.89-17.94 mm)

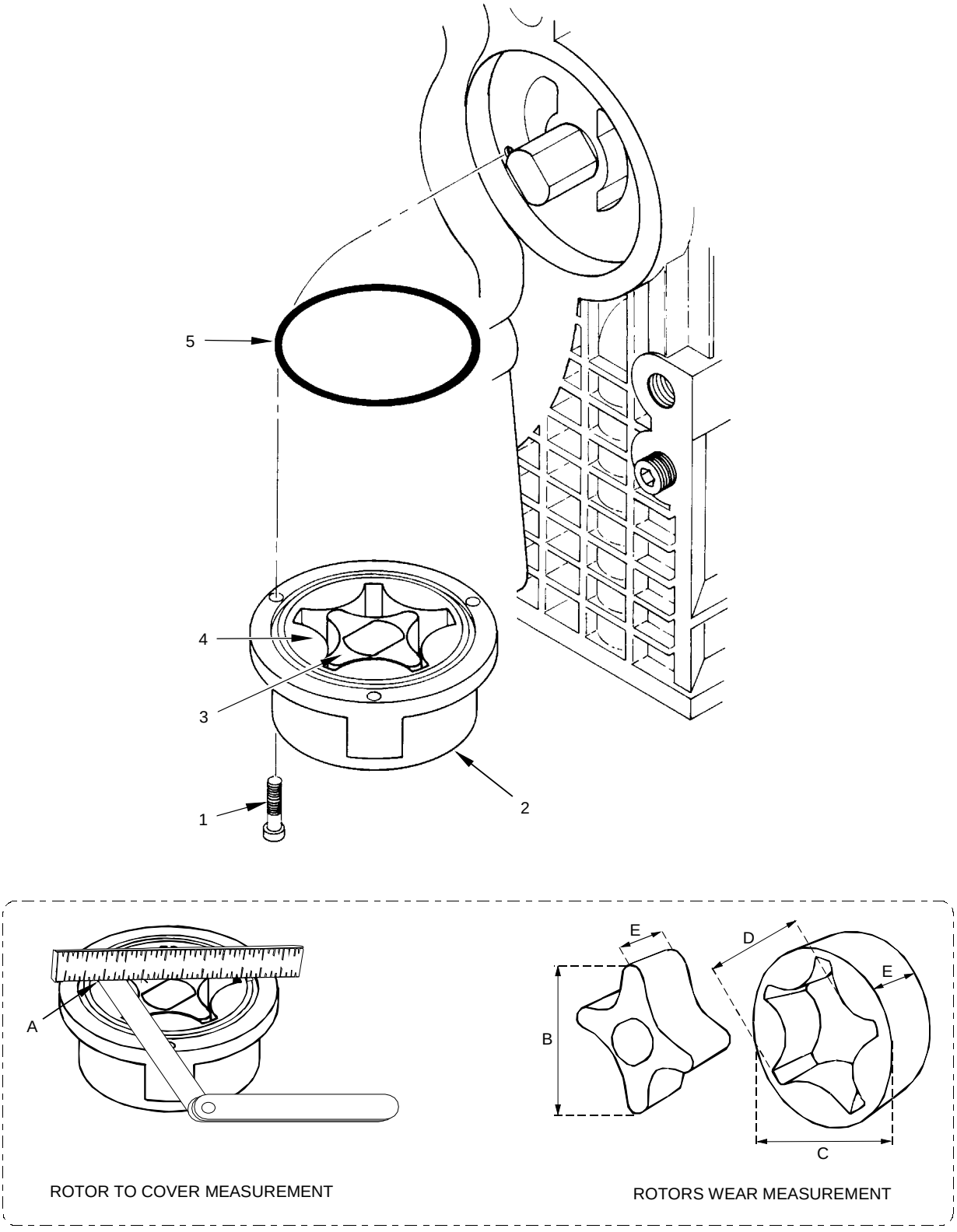


Figure 17. Oil Pump Removal

REMOVE TIMING (PULLEY END) COVER. (Refer to figure 18.)

INITIAL SET-UP:

Tools:
Key, Socket Head Screw, 6 mm
(WP 0113 00, Item 3)

Materials/Parts Required:
None

Equipment Condition:
Flywheel and alternator stator removed

1. Remove crankcase breather hose (1).
2. Remove the ten socket head cap screws (2) from engine timing cover (3).
3. Remove timing cover (3) and gasket (4). Discard gasket (4). Remove gasket material residue from crankcase (5) and timing cover (3).
4. Remove rear engine oil seal (6) from timing cover. Discard seal (6).

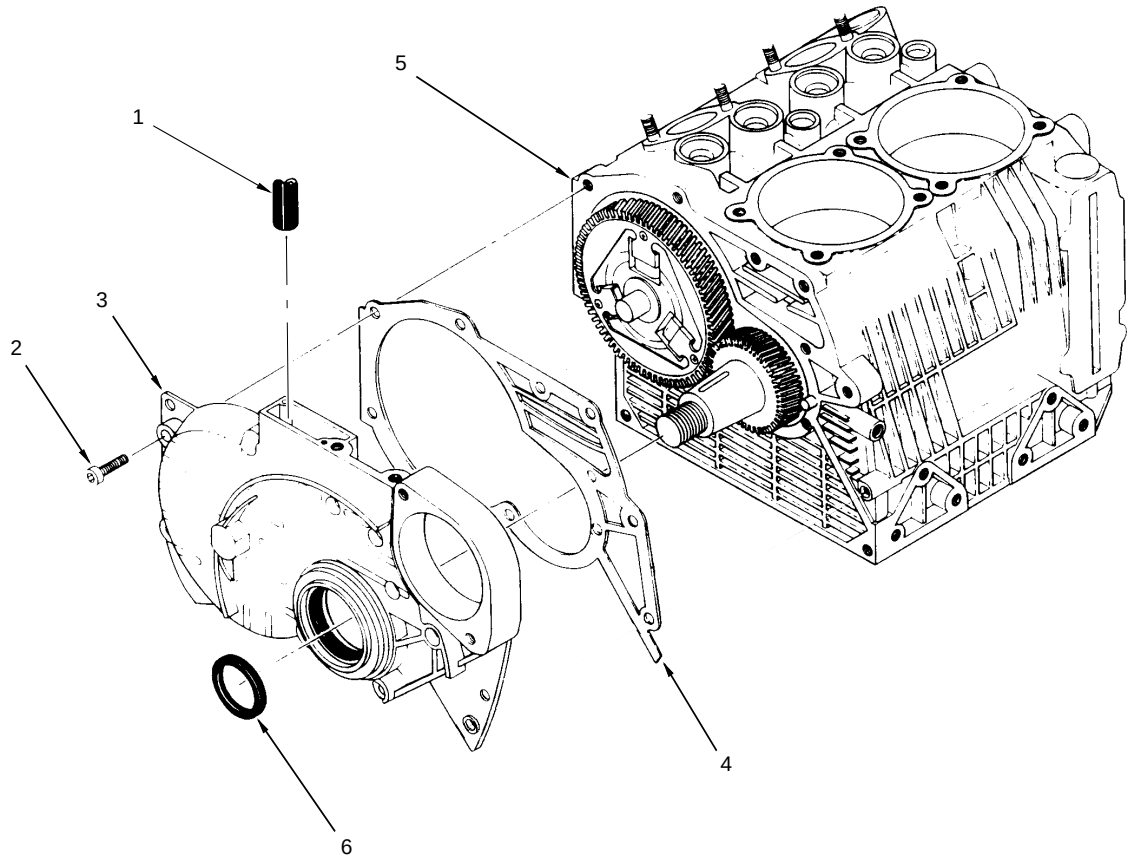


Figure 18. Timing Cover Removal

REMOVE GOVERNOR ASSEMBLY AND SPEED CONTROL (Refer to figures 19 and 20.)

INITIAL SET-UP:

Tools:
Socket, Socket Wrench, 10 mm
(WP 0113 00, Item 3)
Handle, Socket Wrench, Ratchet, 3/8” Drive
(WP 0113 00, Item 3)
Pliers, Needle Nose
(WP 0113 00, Item 3)
Key, Socket Head Screw, 8 mm
(WP 0113 00, Item 3)
Magnetic Retrieval Tool
(WP 0113 00, Item 3)
Combination Wrench, 19 mm
(WP 0113 00, Item 3)
Screwdriver, Flat Blade, Large
(WP 0113 00, Item 3)

Materials/Parts Required
None

Equipment Condition:
Oil pan removed
Fuel control cover removed

Refer to figure 19.

1. Position crankcase with oil sump facing up.
2. Remove governor arm retaining clip (1) securing governor spring (2) to governor arm (3); remove governor spring from governor arm. Remove other end of governor spring (2) from speed control lever (inside crankcase) (4).
3. Partially extend camshaft out of crankcase for easier access to governor assembly.
4. Remove engine governor plug (5) and washer (6).
5. Using a magnetic retrieval tool, remove the governor journal (7) from crankcase.
6. Remove governor (8) with governor joint (9).
7. From outside crankcase, remove mounting screw (10), flat washer (11), throttle lever (12) and three compression springs (13).
8. Remove compression washers (14) and three compression springs (15).
9. Remove mounting screw (16) and safety plate (17).
10. Remove and discard inside speed control retaining clip (18).
11. Remove and discard inside speed control lever O-ring (19). From inside crankcase, remove inside speed control lever (4).

Refer to figure 20.

Remove protective cover (1) from high speed adjustment screw (2). Loosen jam nut (3) and remove high speed adjustment screw (2) from crankcase.

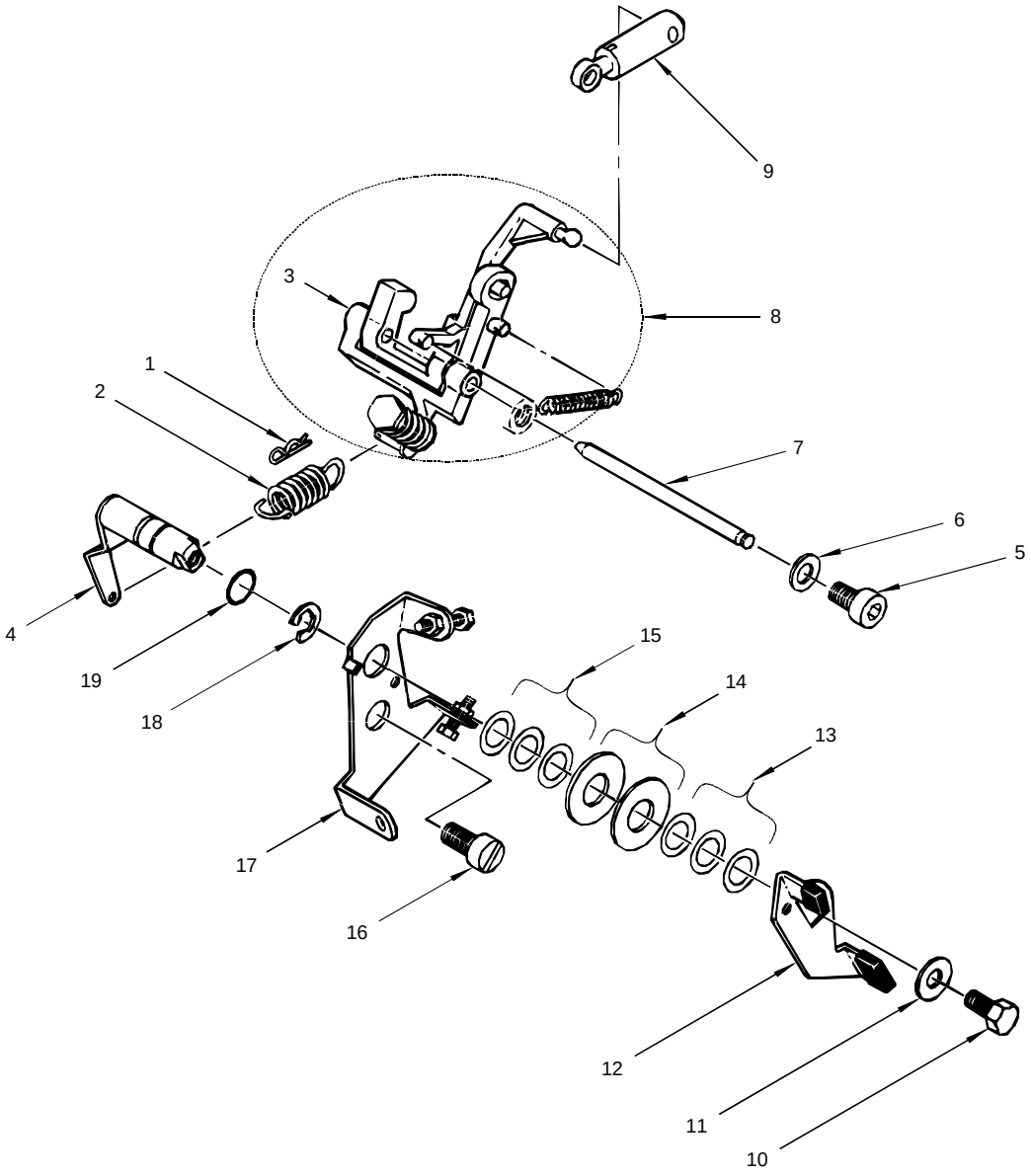


Figure 19. Governor Removal

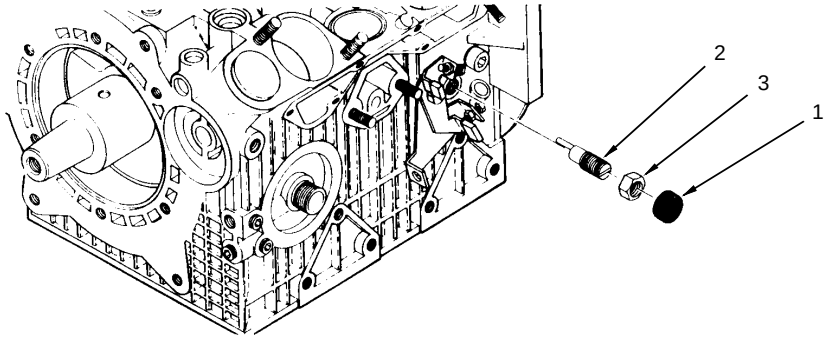


Figure 20. High Speed Adjustment Screw Removal

REMOVE CAMSHAFT AND VALVE TAPPETS. (Refer to figure 21.)

INITIAL SET-UP:

Tools:
None

Materials/Parts Required:
None

Equipment Condition:
Governor assembly and speed control removed

1. Remove camshaft (1).

NOTE

Ensure valve tappets are marked for reinstallation. If they are to be reused they should go back in the same place.

2. Remove intake and exhaust valve tappets (2) from crankcase. Mark tappets for installation in original location.

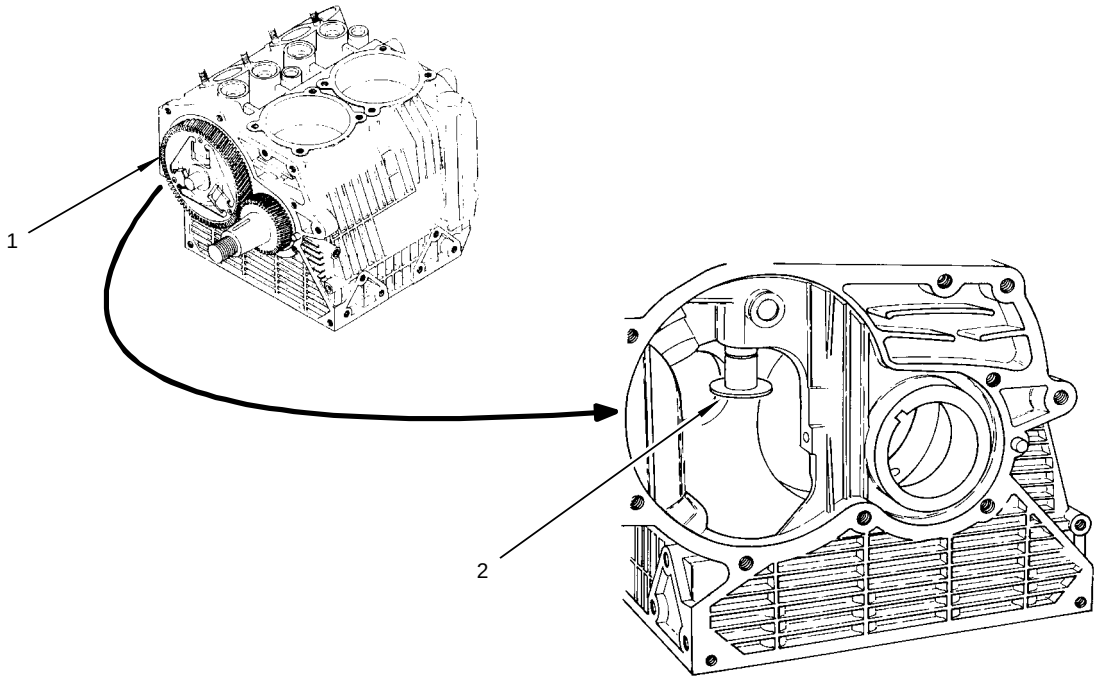


Figure 21. Camshaft and Valve Tappets Removal

REMOVE REAR CRANKSHAFT SUPPORT. (Refer to figure 22.)

INITIAL SET-UP:

Tools:
Key, Socket Head Screw, 6 mm
(WP 0113 00, Item 3)
Flywheel Puller
(WP 0113 00, Item 4)
Remover, Bearing and Bushing
(WP 0113 00, Item 6)

Materials/Parts Required:
None

Equipment Condition:
Camshaft and tappets removed

1. Remove the ten socket head cap screws (1) from engine rear support (2).
2. Using flywheel puller and two of the rear support mounting screws, remove engine rear support (2) and O-ring (3). Discard O-ring (3).
3. Remove rear engine oil seal (4). Discard seal (4).
4. Using bushing extractor tool, remove engine rear main bearing (5) from engine rear support. Discard bearing (5).

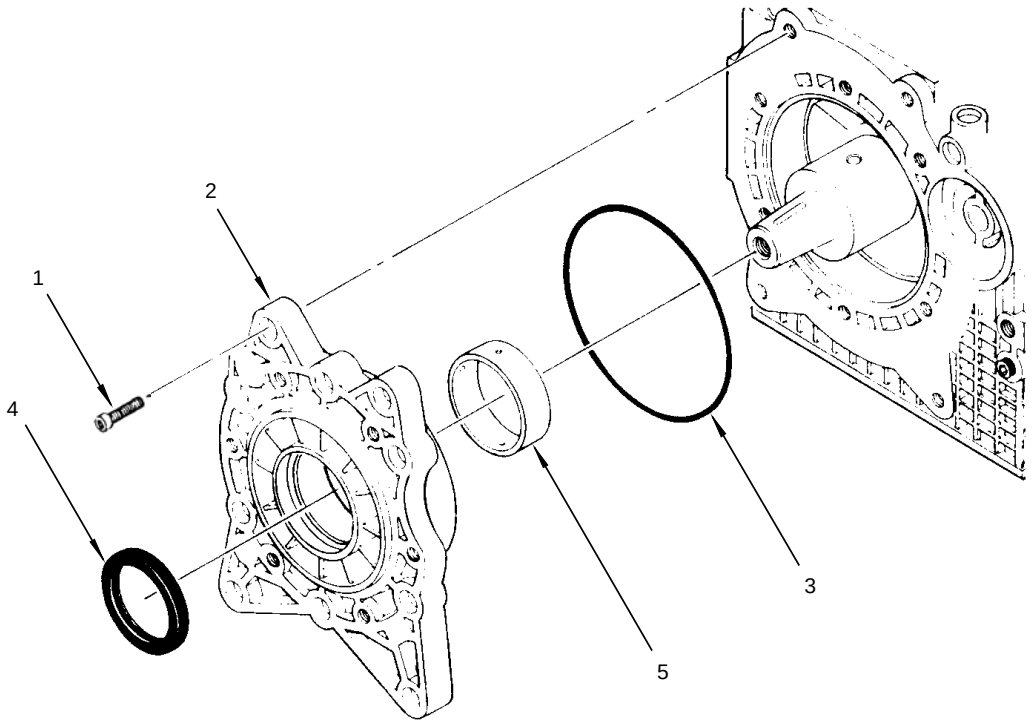


Figure 22. Rear Crankshaft Support Removal

REMOVE CRANKSHAFT GEAR, CRANKSHAFT AND BEARINGS. (Refer to figure 23.)

INITIAL SET-UP:

Tools:
Socket, Socket Wrench, 6 mm
(WP 0113 00, Item 3)
Handle, Socket Wrench, Ratchet, 3/8” Drive
(WP 0113 00, Item 3)
Extension, 3 in., 3/8 in. drive
(WP 0113 00, Item 3)
Gear Extractor
(WP 0113 00, Item 5)
Remover, Bearing and Bushing
(WP 0113 00, Item 6)

Materials/Parts Required
None

Equipment Condition:
Rear crankshaft support removed

NOTE

Use a block of wood or other soft material to prevent the crankshaft from rotating.

1. Using crankshaft gear extractor tool, with four screws, remove crankshaft gear (1) and key (2).
2. Remove two 6 mm screws (3) and flat washers (4) holding center crankshaft bearing support (5).
3. Gently tap on front end of crankshaft (6) to break free and move crankshaft with crankshaft bearing support toward rear of cylinder block. Slide crankshaft (6) to the rear and remove from cylinder block.
4. Remove two 6 mm crankshaft bearing support screws (7) holding two parts of center crankshaft bearing support (5) to crankshaft (6). Remove center crankshaft bearing support (5).
5. Remove two crankshaft bearing halves (8) from center crankshaft bearing support (5). Discard crankshaft bearing halves (8).
6. Using the bearing and bushing remover, remove rear crankshaft bearing (9) from crankcase. Discard bearing (9).

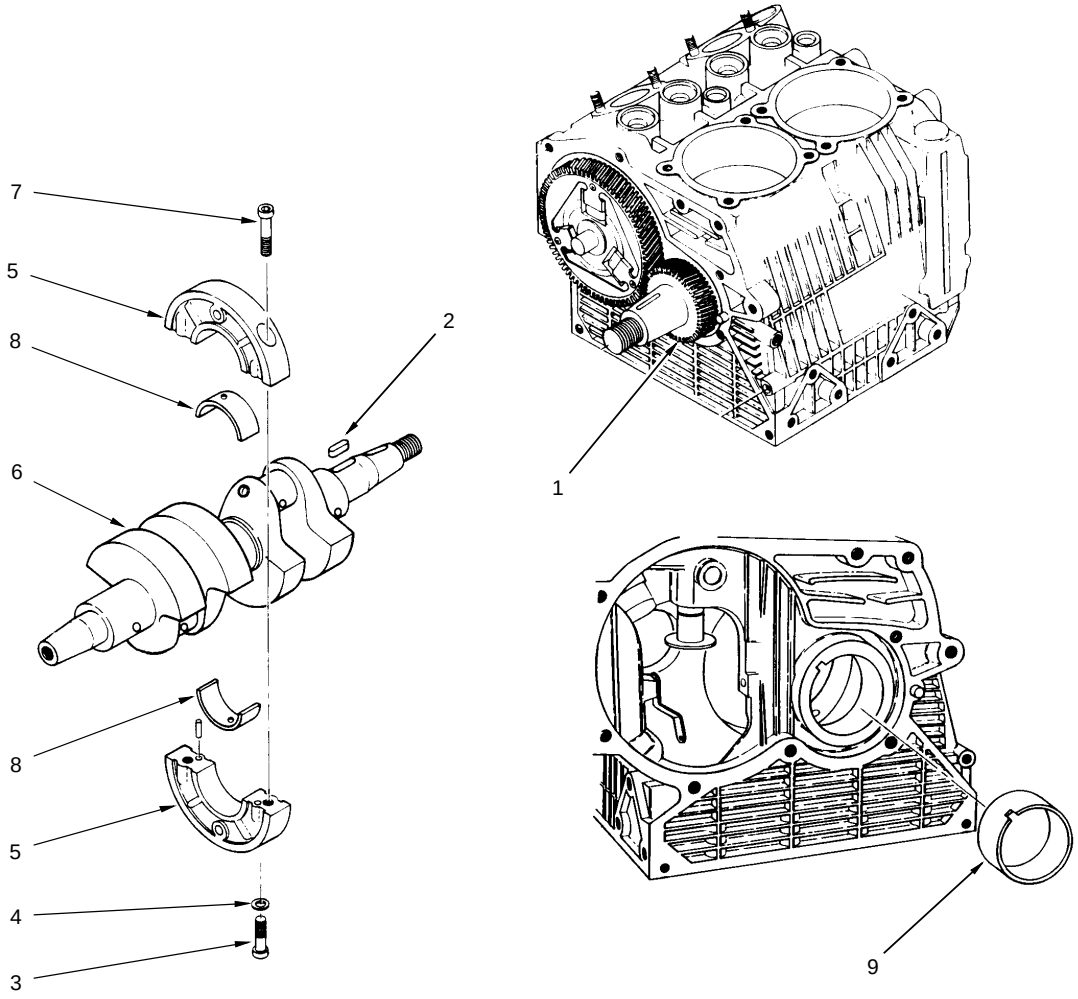


Figure 23. Crankshaft Gear, Crankshaft and Bearings Removal

REMOVE OIL PRESSURE RELIEF VALVE. (Refer to figure 24.)

INITIAL SET-UP:

Tools:
Key, Socket Head Screw, 7 mm (WP 0113 00, Item 3)
Pliers, Snap ring (0.046 straight tips) (WP 0113 00, Item 3)

Materials/Parts Required
Dry Cleaning Solvent (WP 0116 00, Item 13)
Rags, Wiping (WP 0116 00, Item 21)

Equipment Condition:
Oil pan removed

WARNING

Dry cleaning solvent, P-D-680 Type III, used to clean parts is potentially dangerous to personnel and property. Use in a well ventilated area as the fumes are dangerous if inhaled. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 138°F.

1. Remove oil pressure relief valve plug (1) from inside lower crankcase (2) at the power take off end.
2. Remove plug and relief valve assembly (3). Inspect valve parts. If undamaged, clean thoroughly and reassemble. If any part if damaged, discard entire assembly.

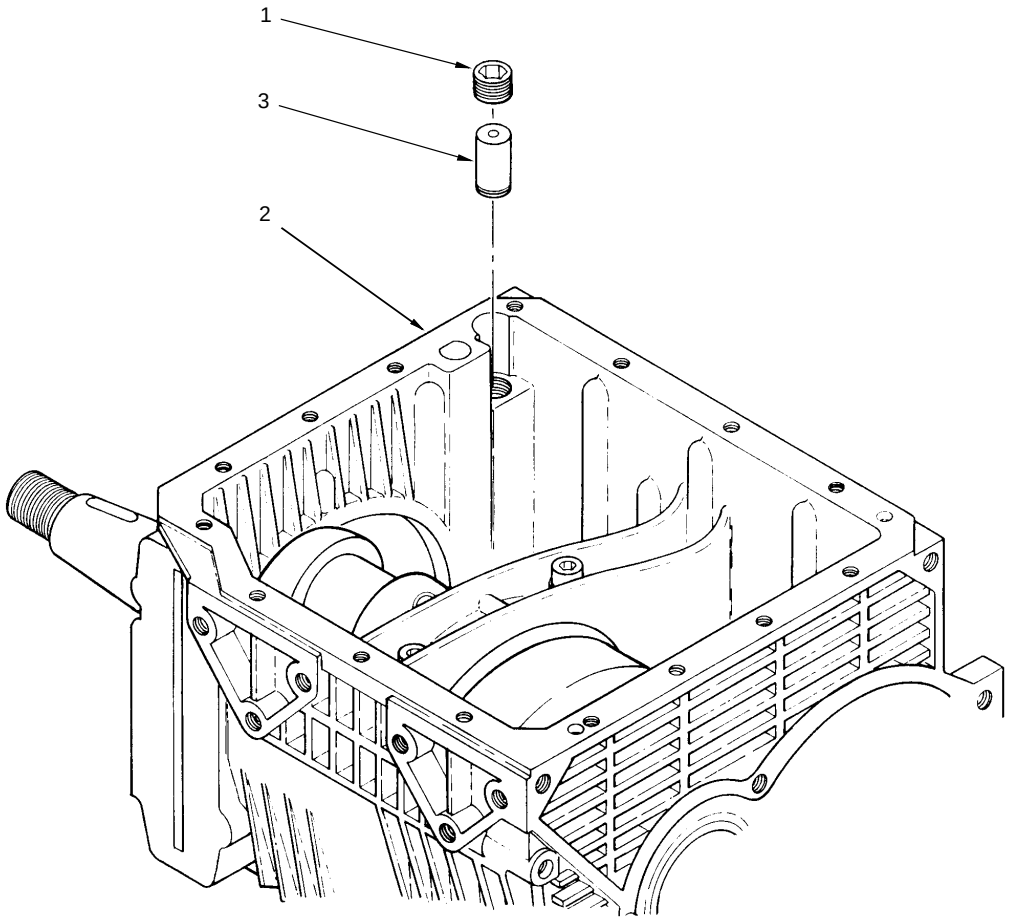


Figure 24. Oil Pressure Relief Valve Removal

DISASSEMBLE CYLINDER HEAD. (Refer to figure 25.)

INITIAL SET-UP:

Tools:
Key, Socket Head Screw, 8 mm
(WP 0113 00, Item 3)
Key, Socket Head Screw, 3 mm
(WP 0113 00, Item 3)
Valve Spring Compressor
(WP 0113 00, Item 3)
Pliers, Needle Nose
(WP 0113 00, Item 3)

Materials/Parts Required
None

Equipment Condition:
Cylinder head removed

NOTE

For clarity, only the exhaust valve assembly is shown exploded in figure 25. The following procedure also applies to the intake rocker arm assembly and to either cylinder head.

1. Remove exhaust rocker arm journal (1), and washer (2) from cylinder head (3). Discard washer (2). Remove rocker arm (4) from cylinder head.
2. Inspect and clean rocker arm lubrication hole (5).
3. Using a valve spring compressor, push down on upper exhaust valve spring retainer (6) and spring (7). Remove valve cotter (8).
4. Remove upper exhaust valve spring retainer (6), spring (7), lower valve spring retainer (9), valve guide seal (10), and ring (11).
5. Remove exhaust valve (12) and valve guide (13) from cylinder head. Inspect for damage.
6. Remove socket head screw (14) from decompression arm (15). Remove decompression arm (15), O-ring (16), washer (17) and spring (18). Discard O-ring (16). Thoroughly clean decompression arm cavity (19).

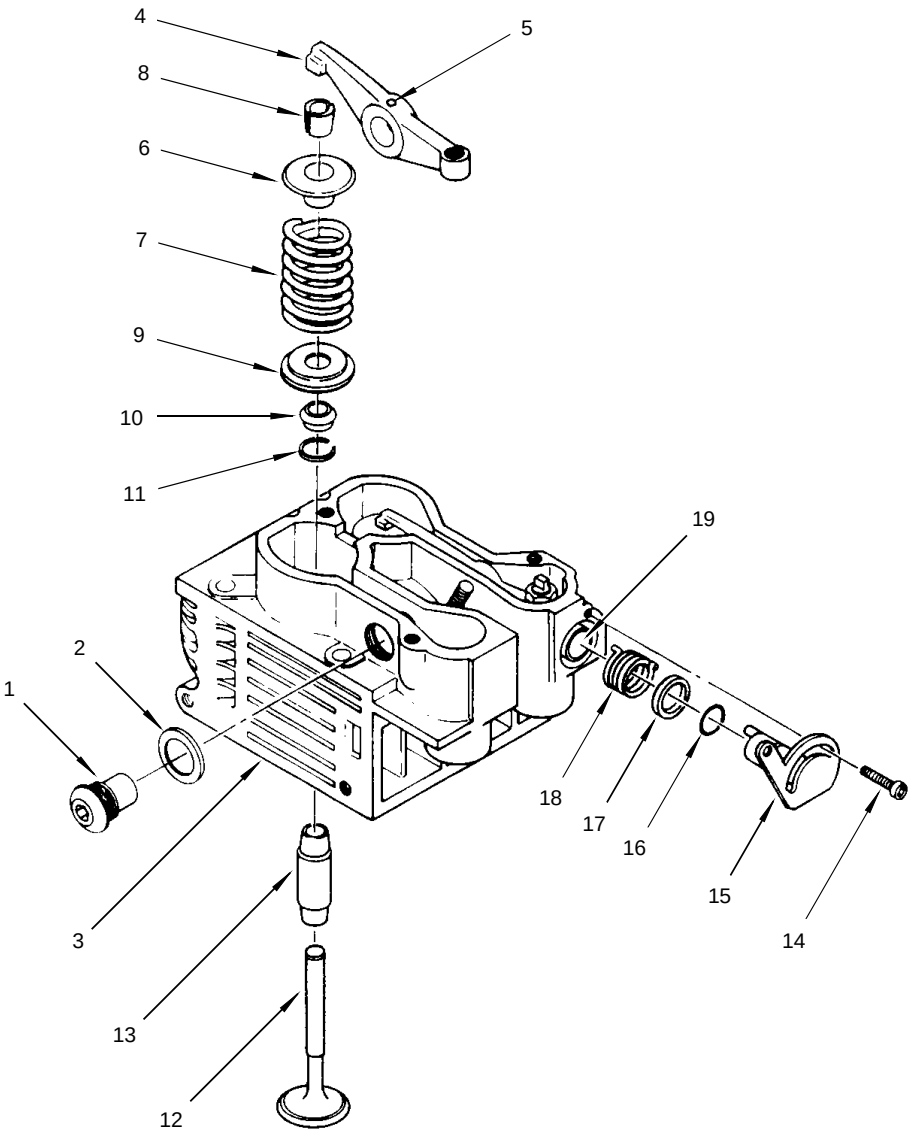


Figure 25. Cylinder Head Disassembly

END OF WORK PACKAGE

GENERAL SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
ENGINE ASSEMBLY

Follow good engineering practice during engine assembly. Clean and inspect all parts before assembly. Replace any part which is damaged or out of tolerance. Use assembly lube (WP 0116 00, Item 3) or equivalent on all mechanical parts to prevent damage during first start of reassembled engine. Clean oil passages in block and all components before assembly.

INSTALL CRANKSHAFT AND REAR CRANKSHAFT SUPPORT (Refer to Figures 1, 2 and 3.)

INITIAL SET-UP:

Tools:
- Screwdriver, Flat Blade (WP 0113 00, Item 3)
- Thickness Gauge, 0.006 (WP 0113 00, Item 3)
- Wrench, Torque, 0-300 in. lb (WP 0113 00, Item 3)
- Extension, 6 in., 3/8 in. drive (WP 0113 00, Item 3)
- Socket, Socket Wrench, 6 mm (WP 0113 00, Item 3)
- Gloves, Welder (WP 0113 00, Item 3)
- Remover, Bearing and Bushing (WP 0113 00, Item 6)
- Central Bearing Assembly Tool (WP 0113 00, Item 7)

Materials/Parts Required
- Oil Seal (WP 0117 00, Item 37)
- Bearing (WP 0117 00, Item 39)
- Bearing (WP 0117 00, Item 40)
- O-Ring (WP 0117 00, Item 55)

Equipment Condition:
- Crankshaft removed
- Rear crankshaft support removed

Refer to Figure 1.

1. Temporarily reassemble the two halves (1) of the center crankshaft bearing support. Check for excessive wear of the center crankshaft bearing support as follows. If any measurement is out of tolerance, replace the bearing support.
   a. Measurement A (Bearing Support Outer Diameter): 4.645-4.646 in. (117.99-118.01 mm).
   b. Measurement B (Bearing Support Inner Diameter): 1.888-1.889 in. (47.965-47.985 mm).
   c. Measurement C (Bearing Support Thickness): Not less than 1.06 in. (27 mm).
2. Measure diameter of crankshaft main journal, the two end journals and the two connecting rod journals. Measure again at points that are 90° from first measurement. Use the smaller of the two numbers for each measurement. Check for excessive wear in accordance with the following. If any measurement is out of tolerance, replace the crankshaft.
   a Measurement D (Main and End Journals): 1.772-1.769 in. (45.01-44.93 mm).
   b Measurement E (Connecting Rod Journals): 1.575-1.572 in. (40.005-39.925 mm)
3. Install crankshaft bearing halves (2) in center bearing support halves (1).
4. Line up the matching reference numbers on the center bearing support halves (1) and install the center bearing support halves around the crankshaft (3).
5. Install two 6 mm crankshaft support screws (4).
6. Torque crankshaft support screws to 190 to 195 in. lbs (21-23 Nm).

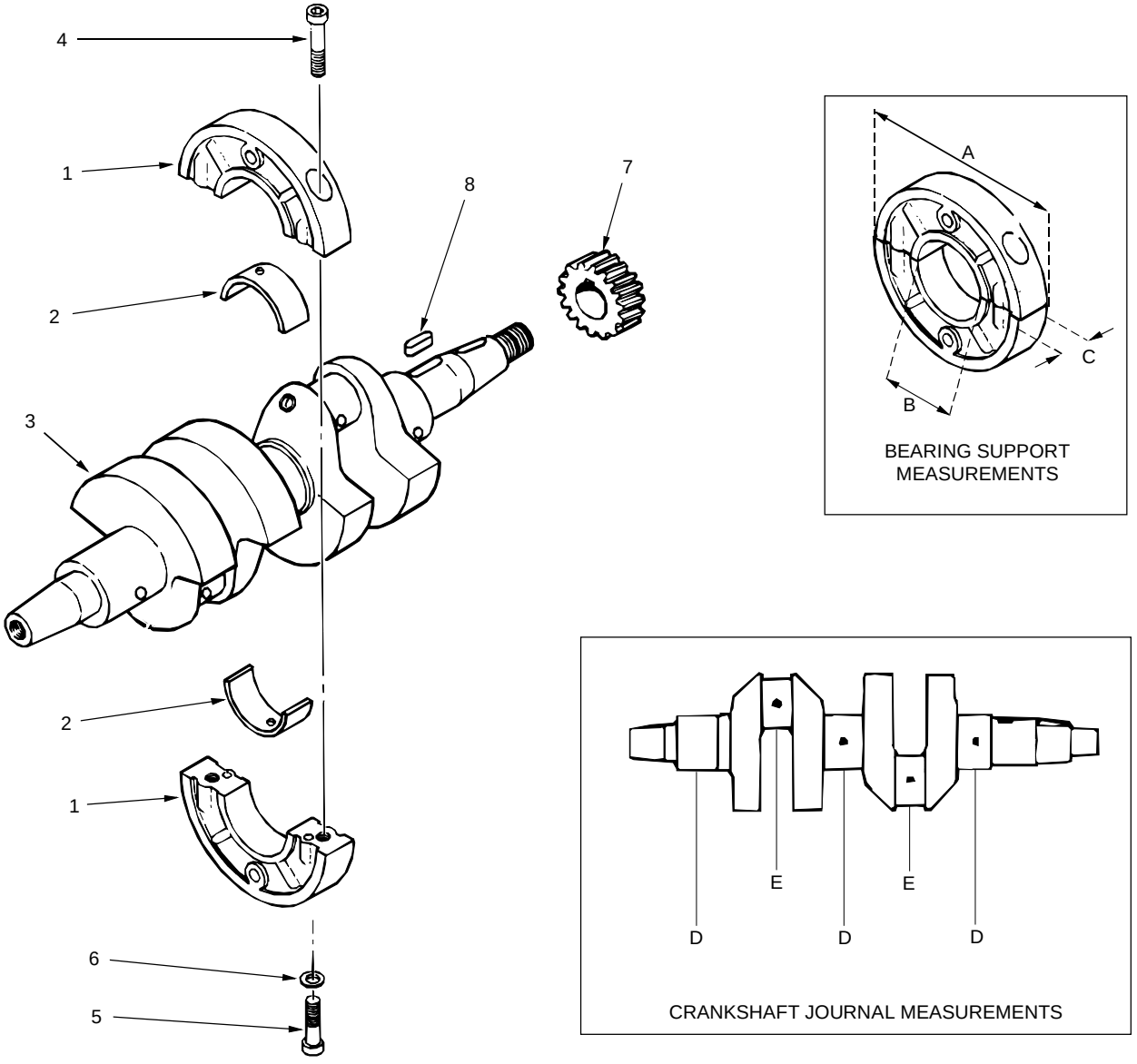


Figure 1. Crankshaft Assembly Installation

Refer to Figure 2.

NOTE

The rear crankshaft bearing oil passage hole must be aligned with matching oil holes on crankcase during installation.

7. Using bushing extractor tool, carefully install front crankshaft bearing (1) into flywheel end of crankcase (2).

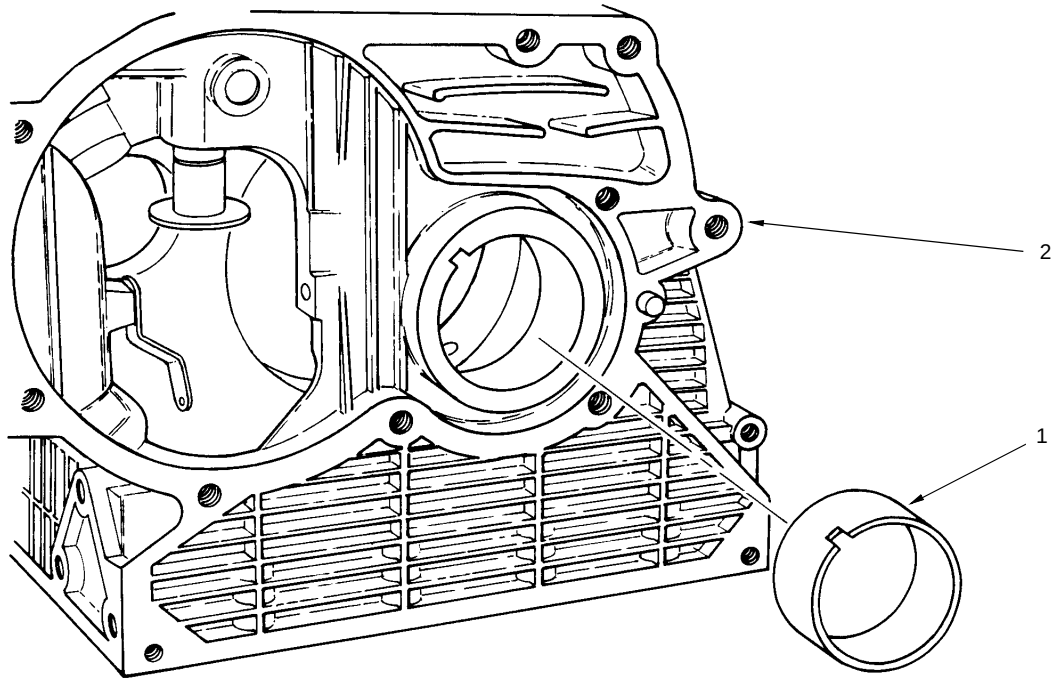


Figure 2. Front Crankshaft Bearing Installation

Refer to Figure 1.

8. Install crankshaft (3) in crankcase using center bearing mounting tool to match hole in crankcase with hole in center bearing support. Install center bearing support retaining screws (5) and flat washers (6).

9. Torque center bearing support retaining screws (5) to 190 to 195 in. lbs. (21-23 Nm).

Refer to Figure 3.

NOTE

Alignment of rear main bearing oil passage hole and rear crankshaft support oil holes must be maintained during installation of rear main bearing.

10. Align rear main bearing (1) oil passage hole (2) with rear crankshaft support (3) oil holes. Using bushing extractor tool, install engine rear main bearing (1) in rear crankshaft support (3).

11. Install rear engine oil seal (4) in rear crankshaft support (3).

12. Install O-ring (5) on rear crankshaft support (3).

NOTE

Two of the socket head cap screws are slightly shorter than the other eight. They are to be inserted at the 11 and 12 o'clock screw holes.

13. Position rear crankshaft support (3) and install ten socket head cap screws (6) attaching engine rear crankshaft support to crankcase (7).

14. Using a crossing pattern, torque socket head cap screws (6) to 190-195 in. lbs (21-23 Nm).

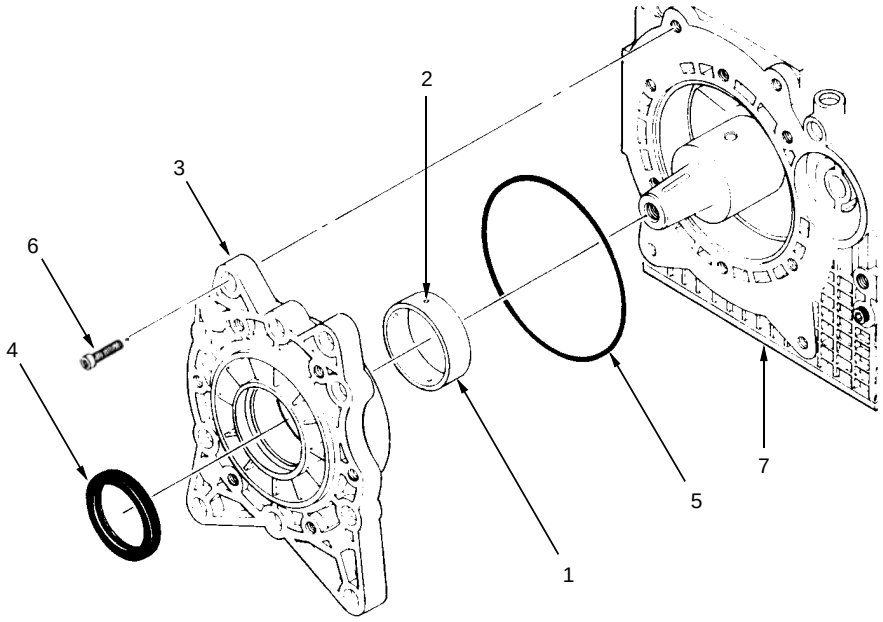


Figure 3. Rear Crankshaft Support Installation

Refer to Figure 1.

15. Insert a 0.006 in. (0.15 mm) thickness gauge between crankshaft (3) and crankcase (figure 2, 2). Place a screwdriver between the crankcase center bearing support web and crankshaft throw to force crankshaft toward front (flywheel end) of crankcase (figure 2, 2).

WARNING

Hot metal can burn and cause severe personal injury. Wear protective gloves as needed.

16. Using a warming oven, heat crankshaft gear (7) to 356° F - 392° F (180° C - 200° C) for 20 to 30 minutes.

17. Install key (8) on flywheel end of crankshaft (3).

18. With crankshaft gear (7) timing mark facing flywheel end, install hot crankshaft gear over key (8) on crankshaft (3). Allow crankshaft gear (7) to cool down. Remove screwdriver and thickness gage from crankcase.

19. Check crankshaft end float clearance between crankcase and crankshaft gear (7). Clearance should be 0.004-0.008 in. (0.10-0.20 mm). Crankshaft (3) should turn freely.

INSTALL OIL PRESSURE RELIEF VALVE (Refer to Figure 4.)

INITIAL SET-UP:

Tools:
Key, Socket Head Screw, 7 mm
(WP 0113 00, Item 3)
Pliers, Snap ring (.046 straight tips)
(WP 0113 00, Item 3)

Materials/Parts Required
None

Equipment Condition:
Oil pan removed

1. Position crankcase (1) bottom side up.
2. Install oil pressure relief valve assembly (2) in crankcase (1).
3. Install and tighten relief valve plug (3).

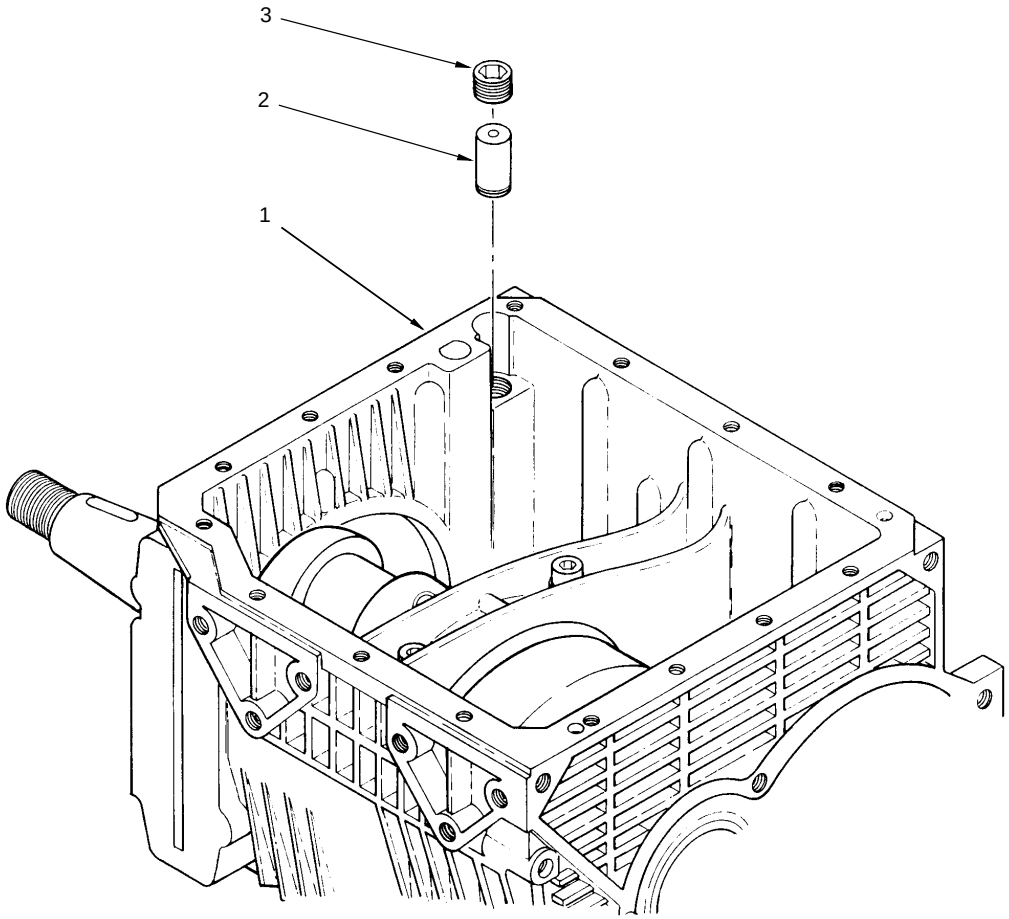


Figure 4. Oil Pressure Relief Valve Installation

INSTALL PISTON RINGS (Refer to Figure 5)

INITIAL SET-UP:

Tools:
Caliper, Vernier
(WP 0113 00, Item 3)
Feeler Gauge
(WP 0113 00, Item 3)

Materials/Parts Required
None

Equipment Condition:
Piston and rings removed

1. Inspect cylinder, piston and piston rings.
   a. Insert the first compression ring (1) in the top of the cylinder. Measure and record the gap between the ends of the ring. Remove the ring and repeat the procedure with the second compression ring (2) and the oil scraper ring (3). If the ring gap is more than 0.02 inches or less than 0.01 inches, replace the cylinder.
   b. Measure and record the piston skirt diameter (4) between 0.200 and 0.393 inches from the base of the piston skirt.
   c. Measure and record the inside diameter of the cylinder.
   d. Subtract the piston skirt diameter (4) from the cylinder inside diameter. The difference should be 0.002 - 0.003 inches. If clearance is greater than 0.003 inches, replace cylinder/piston.
2. Thoroughly clean piston (5) ensuring all carbon deposits are removed from piston top and ring grooves.
3. Install rings on piston (5) using the following steps:

NOTE

Install piston rings from top of piston.

   a. Install oil scraper ring (3) in bottom piston groove. Rotate ring to place gap in line with one end of piston pin (6).
   b. Install second compression ring (2) in middle piston ring groove with internal bevel toward top of piston (5). Rotate ring to place gap 120° in either direction from the gap in the oil scraper ring (3).
   c. Install first compression ring (1) in top piston groove. Rotate ring to place gap midway on the longer arc between oil scraper ring (3) gap and second compression ring (2) gap (120° from each of the other two rings).
4. Inspect rings to ensure all three piston rings move freely in grooves. Check the clearance between each piston groove and each piston ring as follows. If any measurement exceeds the specified value, replace the piston.
   a. First compression ring (1) must have 0.009 inches clearance.
   b. Second compression ring (2) must have 0.007 inches clearance.
   c. Oil scraper ring (3) must have 0.006 inches clearance

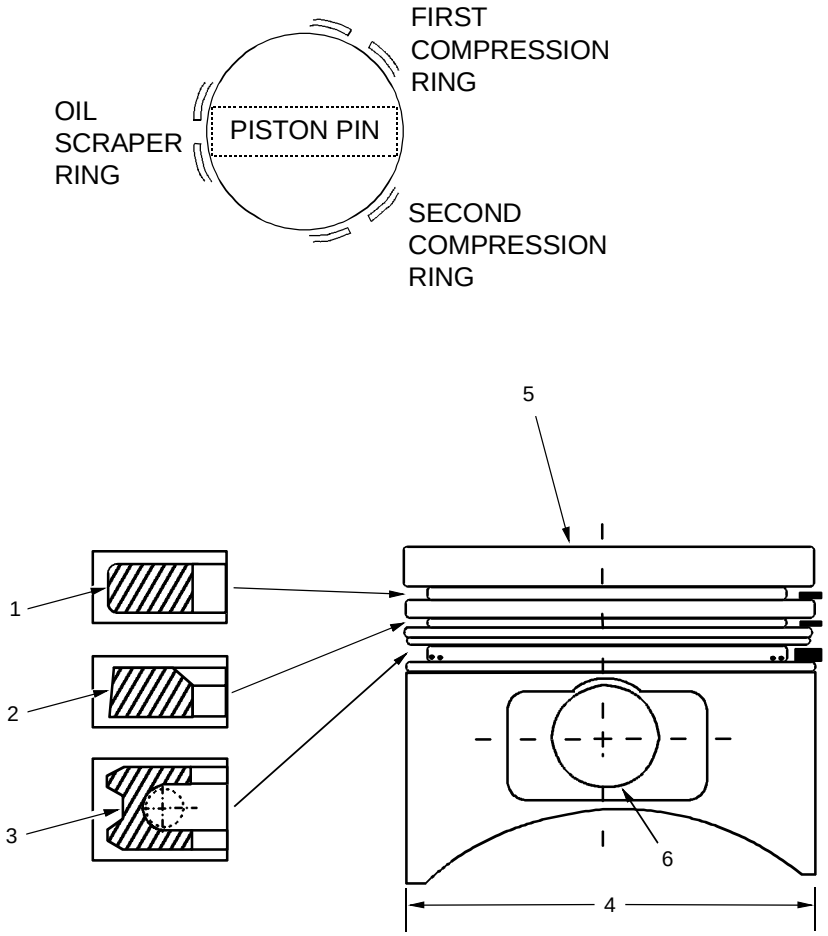


Figure 5. Piston Ring Installation

CHECK CYLINDER (Refer to Figure 6.)

This procedure applies to either cylinder.

INITIAL SET-UP:

Tools:
Caliper, Vernier
(WP 0113 00, Item 1)
Chemical and Oil Protective Gloves
(WP 0113 00, Item 2)
Goggles (WP 0113 00, Item 2)
Honing Kit, Cylinder
(WP 0113 00, Item 3)

Materials/Parts Required:
Dry Cleaning Solvent
(WP 0116 00, Item 13)

Equipment Condition:
Cylinder head and cylinder removed

1. Check cylinder bore (1) for taper and out-of-round.

   Cylinder bore is checked for taper by measuring at bottom of finned area (2), middle of finned area (3) and top of finned area (4). Maximum difference between bottom of finned area and top of finned area is 0.002 in. (0.05 mm). Measure middle of finned area approximately midway between bottom of finned area and top of finned area. Measure for out-of-round by measuring diameter of cylinder bore and then measuring again at 90° from first measurement. The two measurements must be within 0.002 in. (0.05 mm).

2. Inspect cylinder (5) for a ridge at top of finned area. A pronounced ridge is cause for replacement.

NOTE

Failure to properly hone cylinder can cause early failure and excessive oil consumption. Cross-hatch pattern generally indicates proper honing.

3. Using a honing unit and 80 to 100 grit honing stones, hone cylinder wall to develop a 90° to 120° cross hatch pattern.

WARNING

Dry cleaning solvent is toxic and flammable. Wear protective goggles and gloves. Use only in a well ventilated area. Avoid contact with the skin, eyes and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. If you become dizzy while using the solvent get fresh air immediately as well as medical aid. If contact with eyes is made, flood your eyes with water and get immediate medical aid.

4. Thoroughly clean cylinder with dry cleaning solvent to eliminate any residue from the honing process.

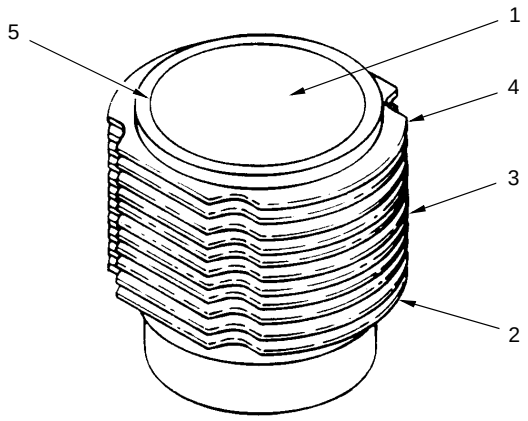


Figure 6. Cylinder Check

INSTALL PISTON ASSEMBLY AND CYLINDER (Refer to Figure 7.)

This procedure applies to either piston assembly and cylinder.

INITIAL SET-UP:

Tools:
Snap Ring Pliers (or Needle Nose) (WP 0113 00, Item 3)
Socket, Socket Wrench, 14 mm (WP 0113 00, Item 3)
Torque Wrench, 50 ft. lb. capacity (WP 0113 00, Item 3)

Materials/Parts Required
Bearing (WP 0117 00, Item 41)
Gasket, Cylinder (WP 0117 00, Item 51)

Equipment Condition:
Crankshaft installed
Piston rings installed
Cylinder checked

1. If removed during engine disassembly, install and tighten securely eight cylinder studs (1).

NOTE

The cylinder is off-set. Ensure cylinder is correctly positioned inside cylinder studs.

2. Position cylinder (2) inside cylinder studs (1).
3. Turn flywheel so that crankshaft journal (3) for cylinder being installed is at TDC.
4. Insert connecting rod (4) in piston (5). Install piston pin (6) through piston (5) and connecting rod (4). Install the two snap rings (7) to hold piston pin (6) in place.

NOTE

When installing piston, combustion chamber recess must be positioned toward injector side of engine. Bottom end of cylinders are chamfered for easier piston ring installation.

5. Insert piston assembly (4 thru 7) up into bottom end of cylinder (2) until piston rings have passed into cylinder.

NOTE

Quantity of cylinder gaskets may vary. Ensure that the same number of gaskets that were removed are replaced.

6. Install cylinder gasket (8). Set cylinder (2) in crankcase (9). Press cylinder (2) into crankcase (9).

NOTE

Bearing halves are keyed together one way. Connecting rod and rod cap are also keyed together one way.

7. Align and install new bearing half (10) on rod cap (11).
8. Position rod cap (11) on underside of crankshaft journal (3).
9. Align and install new bearing half (10) on the topside of crankshaft journal (3).
10. Position connecting rod (4) around crankshaft journal (3). Insert and start cap screws (12) in rod cap (11).
11. Install and torque cap screws (12) to 26 to 30 ft. lbs. (35-41 Nm).

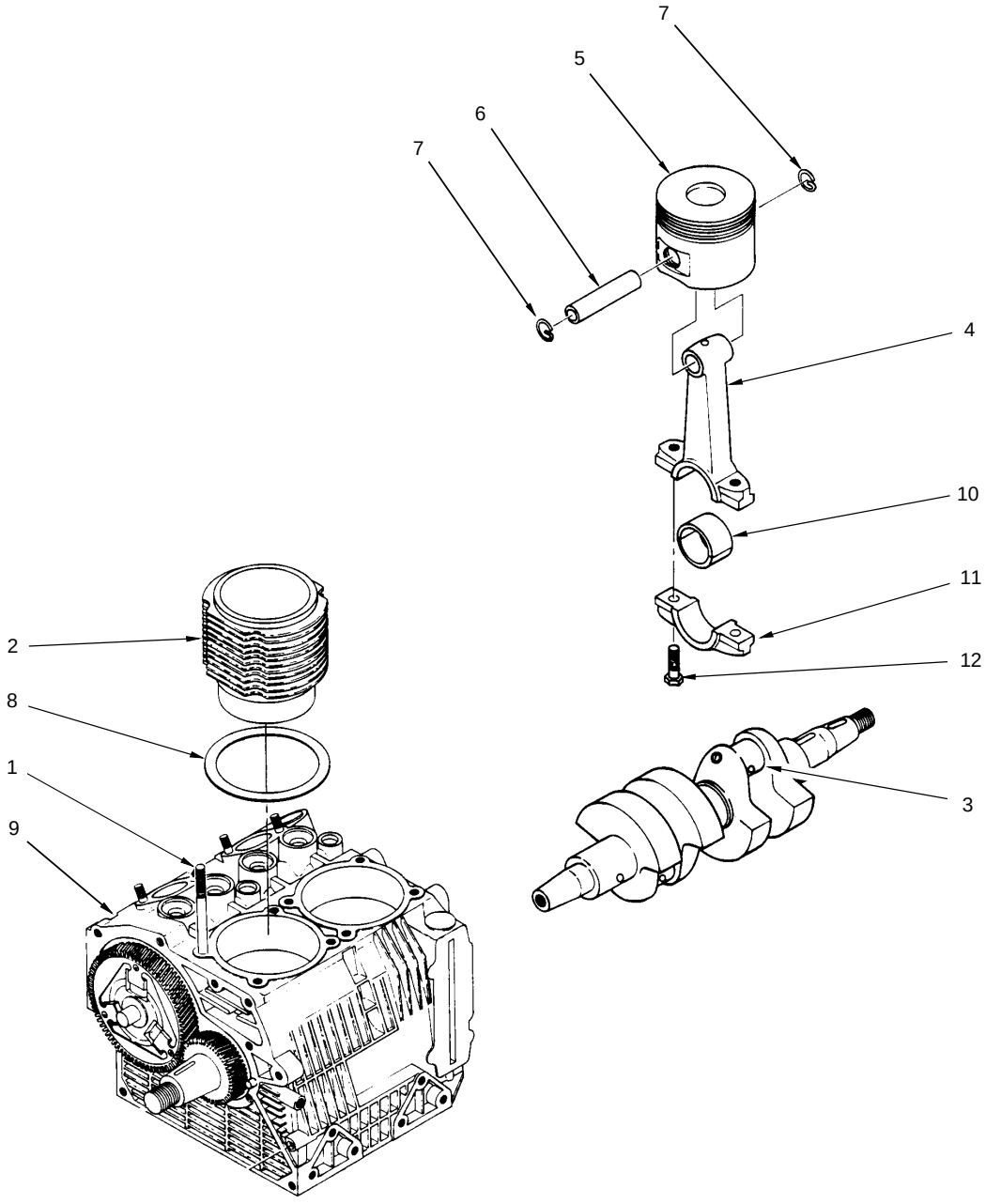


Figure 7. Piston Assembly Installation

INSTALL CAMSHAFT (Refer to Figures 8 and 9.)

INITIAL SET-UP:

Tools:
Dial caliper
(WP 0113 00, Item 3)
Micrometer
(WP 0113 00, Item 3)

Materials/Parts Required
None

Equipment Condition:
Camshaft and tappets removed
Crankshaft installed

Refer to Figure 8.

1. Clean and inspect camshaft gear (1) for worn or broken teeth and loose or unserviceable counter weights (2).
2. Using dial caliper inspect camshaft (3) and bearing surfaces for wear in accordance with the following. If any measurement is out of tolerance, replace the camshaft.
   a. Valve lifter cams (A) must be no less than 1.366 inches from tip of cam to opposite point.
   b. Flattened injection pump cams (B) must be no less than 1.377 inches from center of flattened area to opposite point.
   c. Fuel pump cam (C) must be no less than 0.984 inches in diameter.
   d. Outer bearing surface (D) must be no less than 0.708 inches in diameter.
   e. Inner bearing surface (E) must be no less than 1.690 inches in diameter.

NOTE

Valve tappets to be reused were marked for reinstallation and should be installed in same bores.

3. Using a micrometer check tappets for wear. Small end of tappet (4) (F) must be 0.471-0.472 in. (11.977-11.993 mm) in diameter. If not within limits, replace tappet (4).

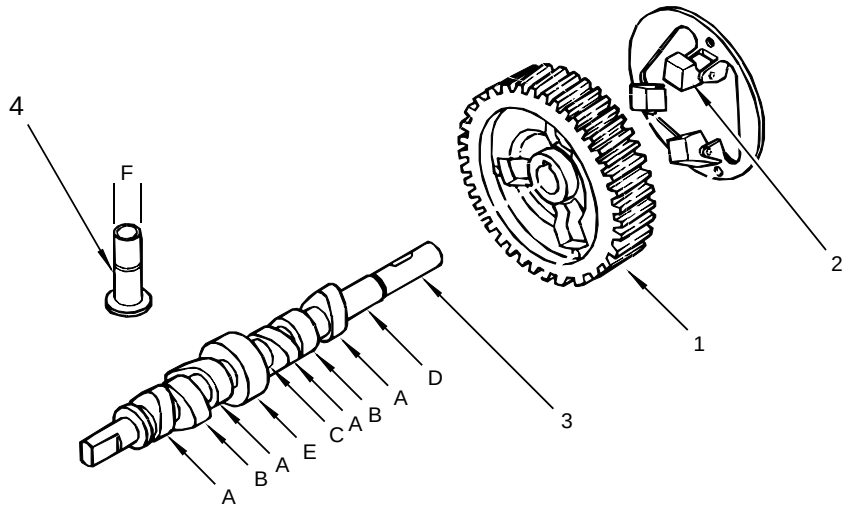


Figure 8. Camshaft Inspection

Refer to Figure 9.

4. Position crankcase so tappets (1) will not fall out during installation. Install intake and exhaust valve tappets (1) in crankcase bores.
5. Install camshaft. Ensure timing marks (2) on camshaft gear are on either side of timing mark (3) on crankshaft gear.

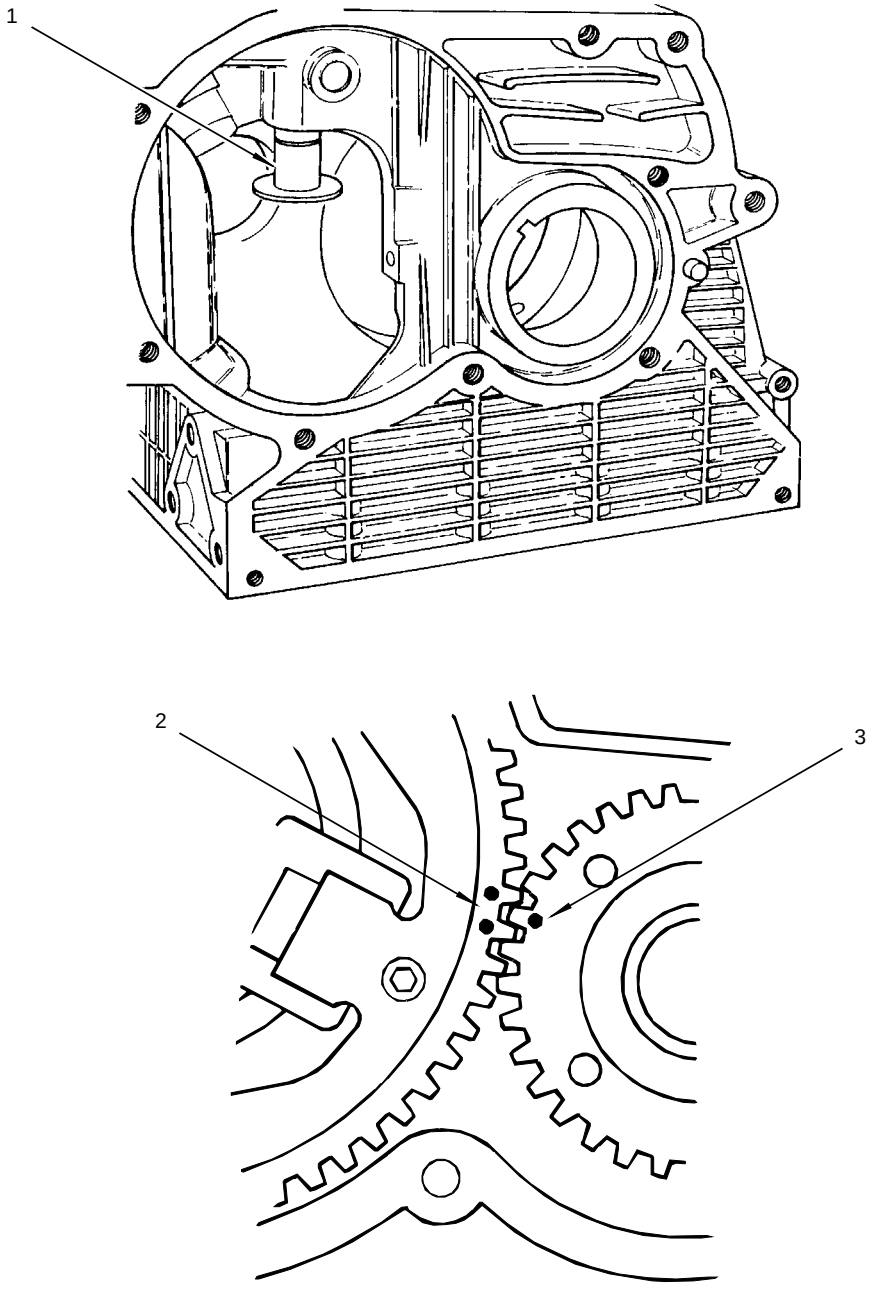


Figure 9. Camshaft and Tappet Installation

INSTALL GOVERNOR ASSEMBLY AND SPEED CONTROL (Refer to Figures 10 and 11)

INITIAL SET-UP:

Tools:
Caliper, Vernier (WP 0113 00, Item 3)
Socket, Socket Wrench, 10 mm (WP 0113 00, Item 3)
Combination, 19 mm (WP 0113 00, Item 3)
Handle, Socket Wrench, Ratchet, 3/8” Drive (WP 0113 00, Item 3)
Key, Socket Head Screw, 8 mm (WP 0113 00, Item 3)
Screwdriver, Flat Blade (1/8 x 6 in. (WP 0113 00, Item 3)

Materials/Parts Required
Rubber Band (WP 0116 00, Item 22)
Clip, Retaining (WP 00117 00, Item 36)
O-Ring (WP 0117 00, Item 52)

Equipment Condition:
Camshaft installed

Refer to Figure 10.

NOTE

The adjustments described in the following steps are critical to proper operation of the engine. Improper adjustment will cause RPM fluctuation, hard starting and loss of engine power.

Installation of the governor assembly and speed control involves shifting the camshaft in and out of the crankcase to provide access for installation of governor assembly and speed control.

1. Using a vernier caliper, adjust governor rod (1) until the distance (A) between governor rod bearing holes is 1.476 in. (36.5 mm) center to center, ± 1 turn.
2. Assemble the two pieces (2 and 3) of the governor assembly (4), using a rubber band to temporarily hold those two pieces of the governor assembly together. Attach governor rod (1) to governor assembly (4).

NOTE

For ease of installation of the governor assembly, as necessary, partially remove the camshaft to gain access during installation of the governor assembly.

3. Lift the camshaft enough to insert and align the governor assembly in the crankcase. Insert the governor journal (5) through external crankcase hole (6), through the holes (7) in the governor assembly (4) and into mounting hole on opposite side of crankcase. Press governor journal (5) into position. Ensure governor is free to move without binding. Remove rubber band.
4. Install washer (8) and governor plug (9) over the governor journal (5).
5. Install O-ring (10) on inside speed control lever (11).
6. Attach governor spring (12) to inside engine speed control lever (11).

NOTE

It may be necessary to rotate camshaft to allow for installation of speed control lever. After completion of speed control lever installation, ensure timing marks on camshaft gear are on either side of timing mark on crankshaft gear (figure 9).

7. Install inside speed control lever (11) from inside crankcase. On outside of crankcase install retaining clip (13) on inside speed control lever (11).

NOTE

Ensure retaining clip is installed so the governor has full freedom of movement and does not come in contact with the crankcase.

8. Attach governor spring (12) to governor assembly connection point (2). Install retaining clip (14).
9. Install safety plate (15) and mounting screw (16).

NOTE

Compression washers are concave. When reassembling, the concave faces of the washers should face each other.

10. Position compression springs (17), compression washers (18), compression springs (19) and throttle lever (20) on speed control lever (11).

NOTE

The safety plate should be moveable, but not move freely, after tightening screw.

11. Install and tighten screw (21) and washer (22).

Refer to Figure 11.

NOTE

Set screw adjusts top end RPM of the engine. The set screw has a small “indented dot” that should be positioned at 7:00 o’clock. This will provide a top engine speed of approximately 3600 RPM.

12. Install set screw (1) and jam nut (2) in crankcase. Install protective cover (3).

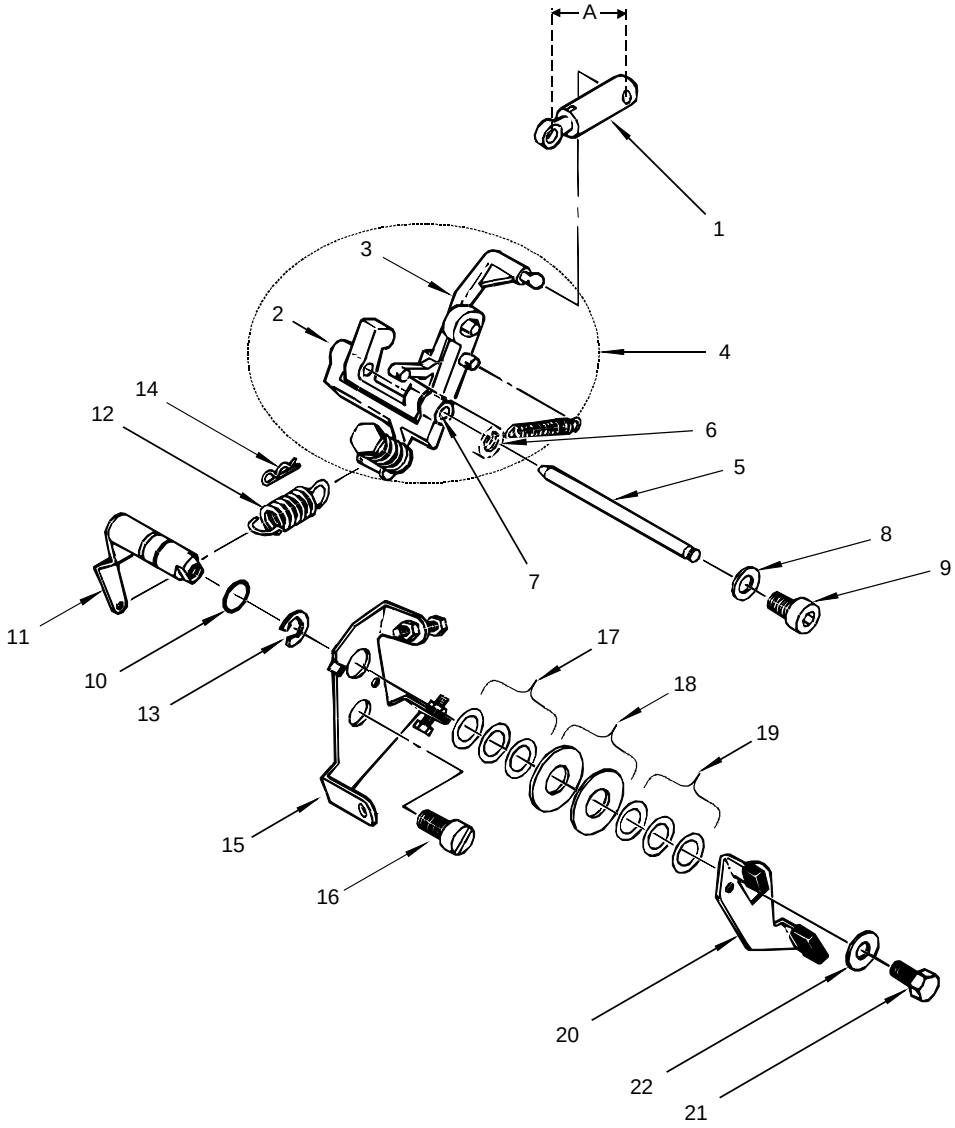


Figure 10. Governor and Speed Control Installation

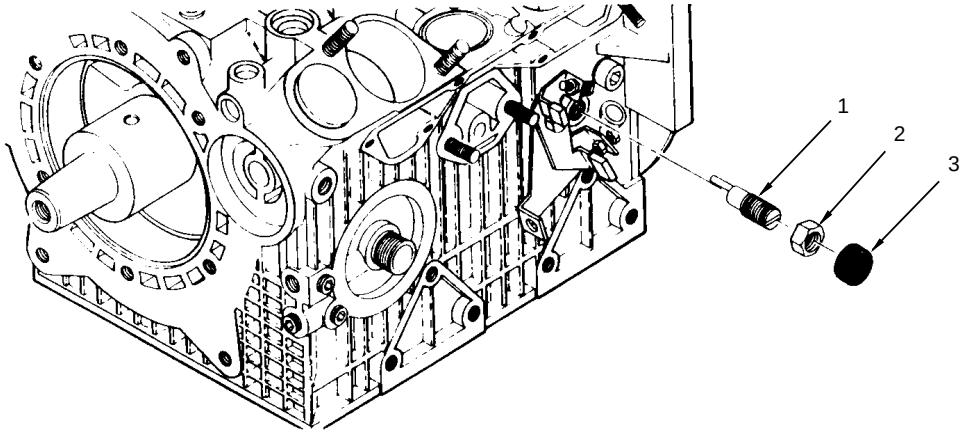


Figure 11. High Speed Adjustment Screw

INSTALL OIL PUMP (Refer to Figure 12.)

INITIAL SET-UP:

Tools:
Combination Wrench, 7 mm
(WP 0113 00, Item 3)
Key, Socket Head Screw, 4 mm
(WP 0113 00, Item 3)
Torque Wrench, 75 in. lb capacity
(WP 0113 00, Item 3)

Materials/Parts Required
O-Ring (WP 0117 00, Item 54)

Equipment Condition:
Crankshaft installed

1. Position O-ring (1) in oil pump cover (2).
2. Insert external oil pump rotor (3) in oil pump cover (2) with bevel facing oil pump cover.
3. Install internal oil pump rotor (4) on camshaft (5).
4. Insert oil pump cover (2) with external oil pump rotor (3) over internal oil pump rotor (4) on camshaft (5).
5. Install three oil pump cover socket head screws (6).
6. Using a crossing pattern, torque socket head screws (6) to 43-52 in. lbs (5-6 Nm).

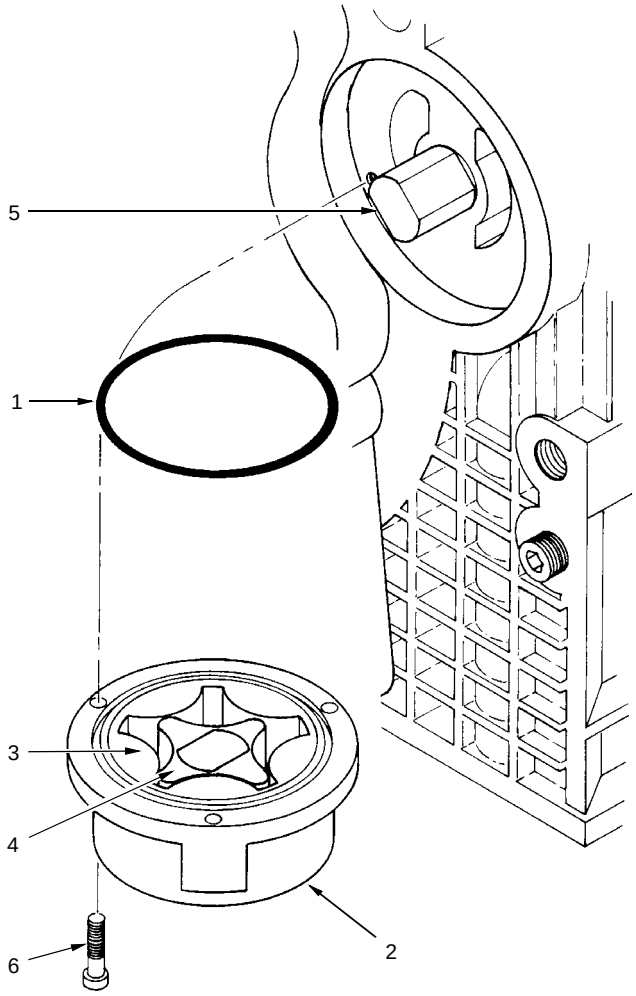


Figure 12. Oil Pump Installation

INSTALL TIMING (PULLEY END) COVER (Refer to Figure 13.)

INITIAL SET-UP:

Tools:
Socket, Hex Driver, 6 mm
(WP 0113 00, Item 3)
Torque Wrench, 0-250 in. lb.
(WP 0113 00, Item 3)

Materials/Parts Required
Seal, Oil (WP 0117 00, Item 37)
Gasket, Timing Cover (WP 0117 00, Item 42)

Equipment Condition:
Camshaft installed

1. Insert new oil seal (1) in timing cover (2).
2. Attach new timing cover gasket (3) to crankcase (4).

NOTE

Two stator wire clamps are attached to timing cover with two of the ten cap screws attaching timing cover. These two cap screws and flat washers do not need to be torqued down until the procedure attaching the stator to timing cover. The two screws are located at the 5 and 6 o'clock positions of the timing cover.

3. Install the eight socket head cap screws (5) attaching timing cover (2) to crankcase (4). Torque to 190 to 195 in. lbs. (21-23 Nm). Install and hand tighten two cap screws (6) and flat washers (7).
4. Attach crankcase breather hose (8) to timing cover (2).

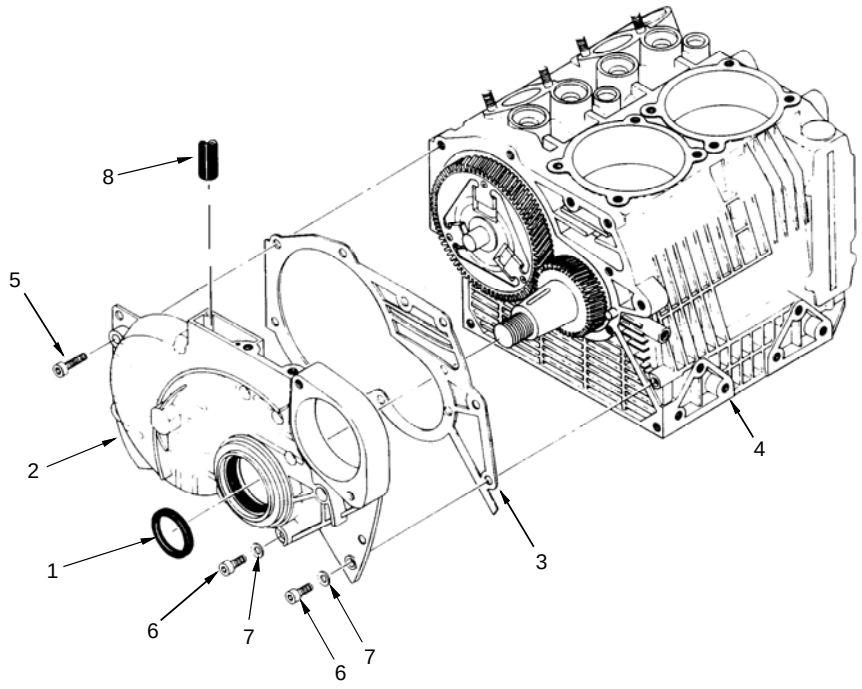


Figure 13. Timing Cover Installation

CHECK PISTON PROTRUSION (Refer to Figure 14.)

This procedure applies to both/either cylinder.

INITIAL SET-UP:

Tools:
Feeler Gauge with 0.004 and 0.008 inch leafs (WP 0113 00, Item 3)
Machinists Rule (WP 0113 00, Item 3)

Materials/Parts Required
Gasket, Cylinder (WP 0117 00, Item 51)

Equipment Condition:
Piston assembly installed in cylinder

1. Slowly rotate flywheel to the right until piston (1) is at TDC (highest point).

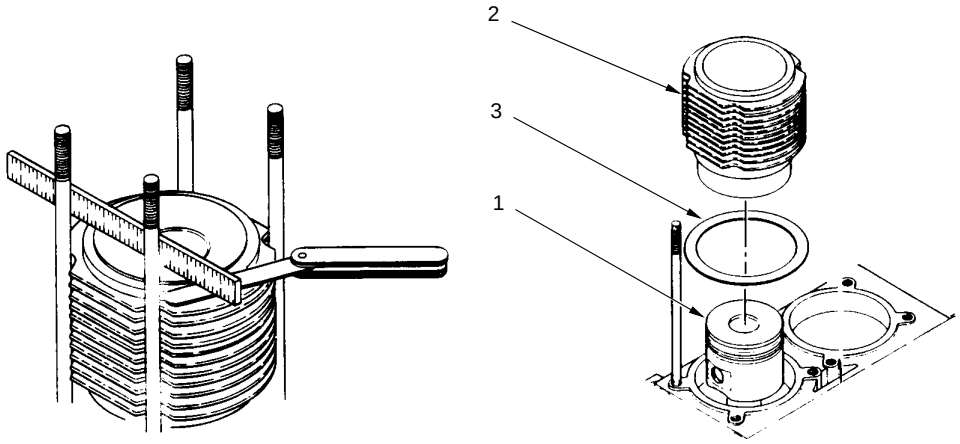


Figure 14. Piston Protrusion Check

2. Using a feeler gauge and a machinist's rule (or other straight edge) as illustrated, verify piston (1) is above top of cylinder (2) by 0.004 to 0.008 in. (0.1-0.2 mm). If measurement is within this range, piston (1) protrusion is satisfactory. If reading is less than 0.004 in. (0.1 mm) above top of cylinder (2), gaskets (3) must be added between cylinder and crankcase. If reading is more than 0.008 in. (0.2 mm) above top of cylinder (2), gaskets (3) must be removed between cylinder and crankcase.

NOTE

When adding or removing cylinder gaskets, measure thickness of gasket(s) to ensure proper range will be attained.

3. Remove cylinder (2) from piston (1). Add or remove gaskets (3) as required to obtain piston (1) protrusion of 0.004 to 0.008 in. (0.1-0.2 mm).

4. Slide cylinder (2) over piston (1) and press into crankcase.

ASSEMBLE CYLINDER HEAD (Refer to Figure 15)

INITIAL SET-UP:

Tools:
Caliper, Vernier
(WP 0113 00, Item 3)
Depth Micrometer
(WP 0113 00, Item 3)
Key, Socket Head Wrench, 8 mm
(WP 0113 00, Item 3)
Valve Grinding Kit
(WP 0113 00, Item 3)
Valve Spring Compressor
(WP 0113 00, Item 3)
Torque Wrench, 50 ft. lb capacity
(WP 0113 00, Item 3)

Materials/Parts Required
Lapping Compound
(WP 0116 00, Item 8)
Petrolatum (WP 0116 00, Item 20)
O-Ring (WP 0117 00, Item 33)
Washer, Copper (WP 0117 00, Item 59)

Equipment Condition:
Cylinder head disassembled

1. Using a dial caliper, measure journals, cylinder head and rocker arms for excessive wear in accordance with the following.
   a. Measurement A (Cylinder Head Rocker Arm Cavity): 0.355-0.356 in. (9.03-9.06 mm) in width at the position of the journal hole.
   b. Measurement B (Rocker Arm Journal Hole): 0.591-0.592 in. (15.00-15.05 mm) in diameter.
   c. Measurement C (Rocker arm): 0.352-0.354 in. (8.93-8.98 mm) in width at the position of the journal hole.
   d. Measurement D (Journal): 0.590-0.591 in. (14.99-15.00 mm) in diameter at the narrow end.
2. Remove carbon deposits from cylinder head (1). Check cylinder head (1) combustion chamber for deformation. If deformed, smooth out to a maximum depth of 0.010 in. (0.254 mm). If deformation remains after smoothing of combustion chamber, replace cylinder head (1).
3. Measure valve stem diameter (a) and valve guide inner diameter (b) for each valve. If the difference between the two measurements is greater than 0.004 in. (0.10 mm), replace the valve (4 or 6) and the valve guide (5 or 7).
4. Using a 45 degree seat grinding wheel, carefully polish the hardened surface of valve seat faces (2 and 3) in cylinder head (1) until an even seating surface is achieved.
5. Coat valve seat faces (2 and 3) with lapping compound.
6. Place a new intake valve (4) in valve guide (5) in cylinder head (1). Using a valve lapper, lap intake valve (4) until a perfect finished surface is achieved on valve seat (2).
7. Place a new exhaust valve (6) in valve guide (7) in cylinder head (1). Using a valve lapper, lap exhaust valve (5) until a perfect finished surface is achieved on valve seat (3).
8. Remove both valves and clean all lapping compound from cylinder head valve seat faces (2 and 3) and valves.
9. Install intake and exhaust valve rings (8).
10. Install intake and exhaust valve guide seals (9).
11. Install intake and exhaust lower valve spring retainers (10).
12. Install intake valve (4) in valve guide (5) and exhaust valve (6) in valve guide (7). Position both valves in cylinder head (1).

CAUTION

Depth measurement between valve faces and cylinder head surface is critical. If not within tolerance, piston and valve may strike each other and cause damage.

13. Using a depth micrometer, check depth of valve faces (11 and 12) relative to cylinder head surface (13). The measurements must be 0.031 to 0.051 in. (0.8 to 1.3 mm).
14. Assemble valve spring (14) and upper valve spring retainer (15). Install intake valve (4) stem. Use valve spring compressor or equivalent to push down on upper valve spring retainer (15) and install valve cotters (16).
15. Repeat procedure (step 14) for exhaust valve (6).

NOTE

For clarity of illustration, the exhaust rocker arm assembly is not illustrated. Assembly is the same as the intake rocker arm.

16. Loosely install rocker arm adjusting screw (17) and jam nut (18) in rocker arm (19). The rocker arm screw (17) and jam nut (18) will be secured during valve adjustment procedure.
17. Install rocker arm (19) in cylinder head (20).
18. Install rocker arm journal (21) through cylinder head (20) and into rocker arm (19) with new copper washer (22).
19. Position spacer (23) flush on decompression arm (24) shaft.
20. Lightly lubricate with petrolatum and install O-ring (25) on decompression arm (24).
21. Mate small hole (26) in decompression arm (24) with tang (27) on spring (28) and slide decompression arm (24) into place in cylinder head (20).
22. Install screw (29) to attach decompression arm (24) to cylinder head (20).

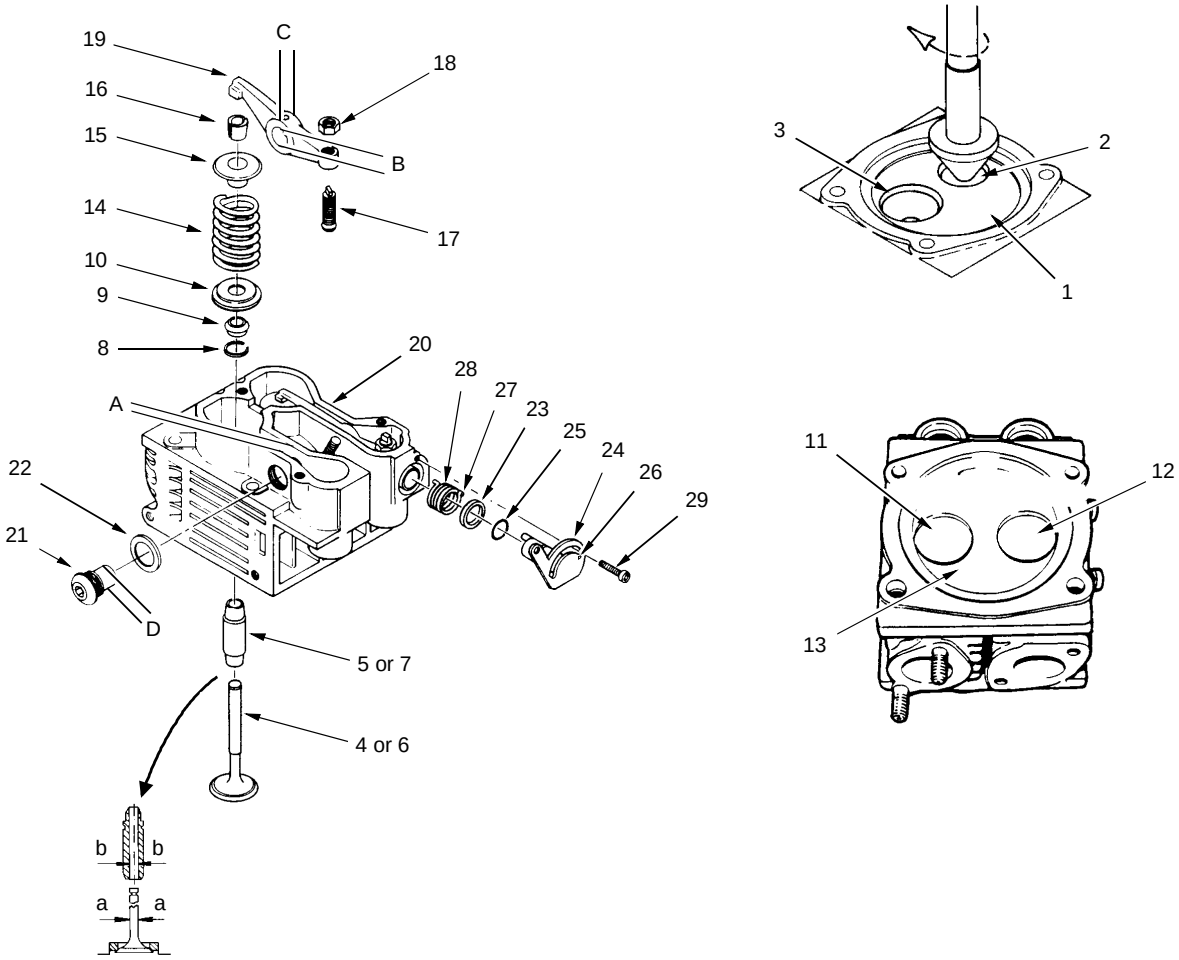


Figure 15. Cylinder Head Repair and Assembly

INSTALL CYLINDER HEAD (Refer to Figures 16, 17, 18 and 19.)

This procedure applies to either or both cylinder heads.

INITIAL SET-UP:

Tools:
Torque Wrench, 50 ft. lb. capacity
(WP 0113 00, Item 3)
Socket, Socket Wrench, Deep Well, 13 mm
(WP 0113 00, Item 3)
Handle, Socket Wrench, Ratchet
(WP 0113 00, Item 3)
Straight Edge
(WP 0113 00, Item 3)
Depth Micrometer
(WP 0113 00, Item 3)

Materials/Parts Required
Gasket (WP 0117 00, Item 47)
O-Ring (WP 0117 00, Item 53)
Washer, Copper
(WP 0117, Item 60)

Equipment Condition:
Cylinder head assembled
Timing cover installed
Piston protrusion checked

Refer to Figure 16.

1. Clean each pushrod (1). Ensure lubrication passages in pushrods are clean and clear.
2. Measure overall length of pushrod (2). Using a depth micrometer, measure depth of pushrod cup (3). Subtract cup depth from overall length. The result should be 6.362-6.386 in. (161.6-162.2 mm). If measurement is out of tolerance, replace pushrod.
3. While holding cylinder in place, slowly turn engine crankshaft to position piston at Top Dead Center (TDC).
4. Clean carbon, dirt and other foreign material from piston surface. Remove any remaining gasket materials.

Refer to Figure 17.

5. Insert the same number of copper washers (1) in fuel injector port as were removed from cylinder head (2).
6. Temporarily secure fuel injector in cylinder head by installing injector (3), brace (4), flat washer (5) and nut (6) on stud (7). Tighten nut.
7. Using a depth gauge (8), measure protrusion of fuel injector tip (9) into combustion chamber (10) of cylinder head. Protrusion should be 0.069-0.088 in. (1.75-2.25 mm). If adjustment is required, remove the fuel injector and remove or add new copper washer(s) (1) to adjust the tip protrusion.
8. Remove fuel injector (3), brace (4), flat washer (5) and nut (6) after protrusion check is completed.

Refer to Figure 18.

9. Install new O-rings (1) on the pushrod pipes (2) and insert pipes in crankcase. Insert pushrods (3) in same pipes they were removed from.
10. Install new head gasket (4) on cylinder.
11. Install cylinder head (5) on cylinder. Ensure pushrods are aligned with rocker arms (6) and pushrod pipes are aligned with cylinder head.
12. Install cylinder head nuts (7) and washers (8) finger tight, with lifting eye studnut in same location as observed during removal.

Refer to Figure 19.

13. Place a straight edge (1) across intake and exhaust ports to align the cylinder heads. Use a 13 mm socket to snug the cylinder head nuts (2).
14. Gradually torque the head nuts in an alternating diagonal pattern. to 15 ft. lbs. (21.8 Nm), then to 23 ft. lbs. (33.5 Nm) and finally to 30 ft. lbs. (43.7 Nm).

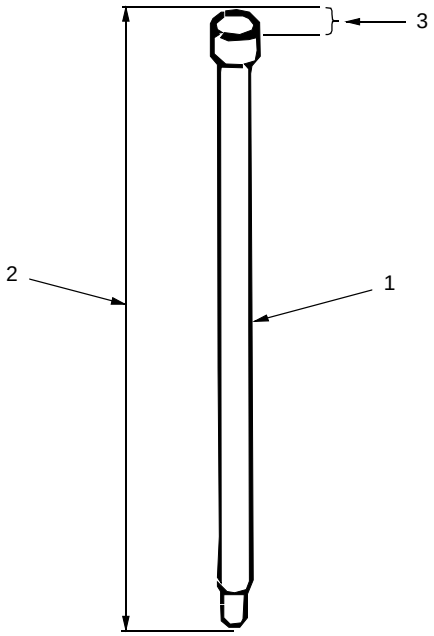


Figure 16. Pushrod Measurement

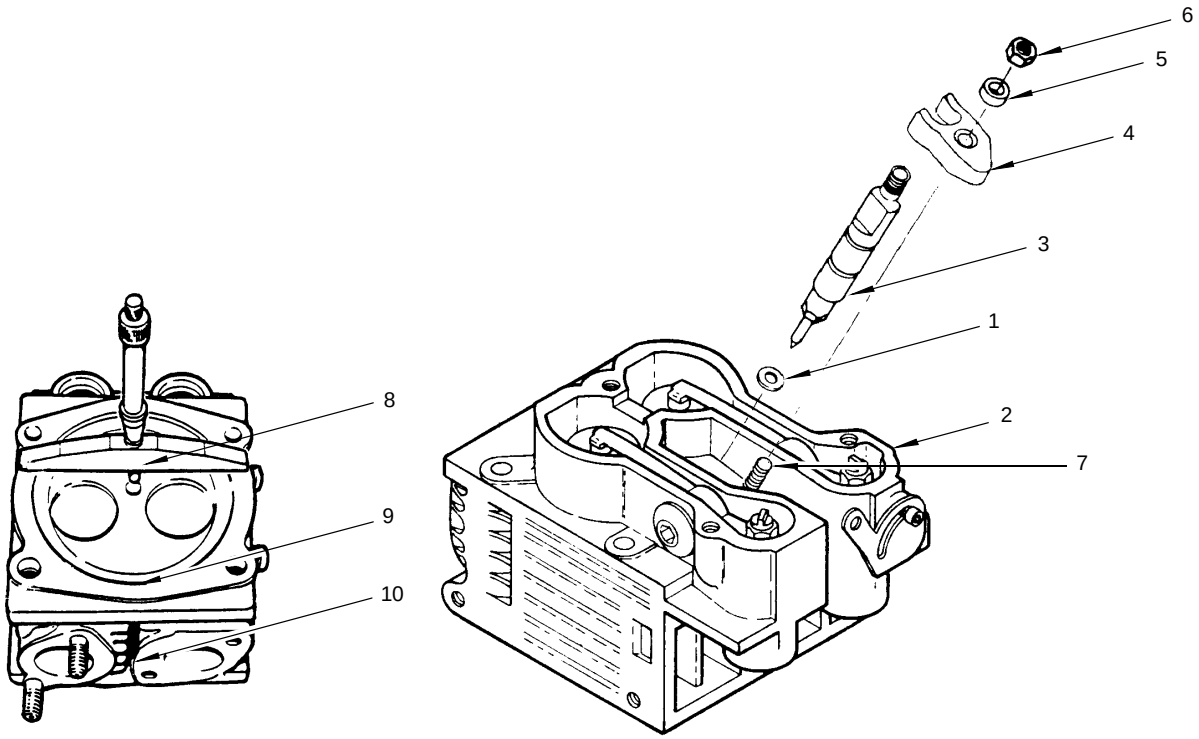


Figure 17. Injector Protrusion Measurement

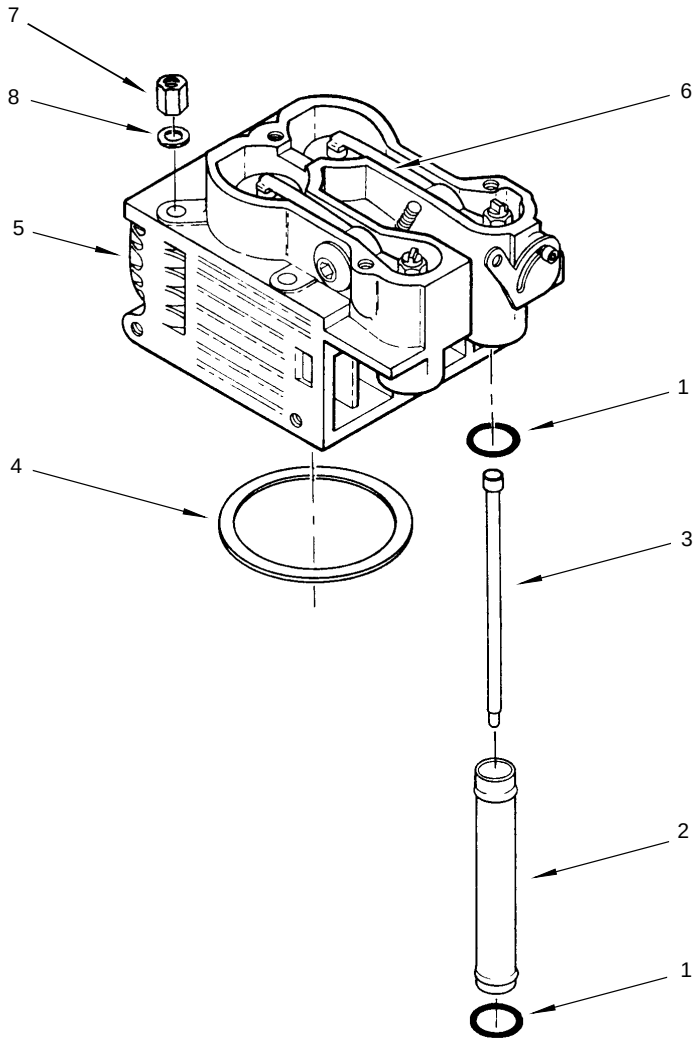


Figure 18. Cylinder Head Installation

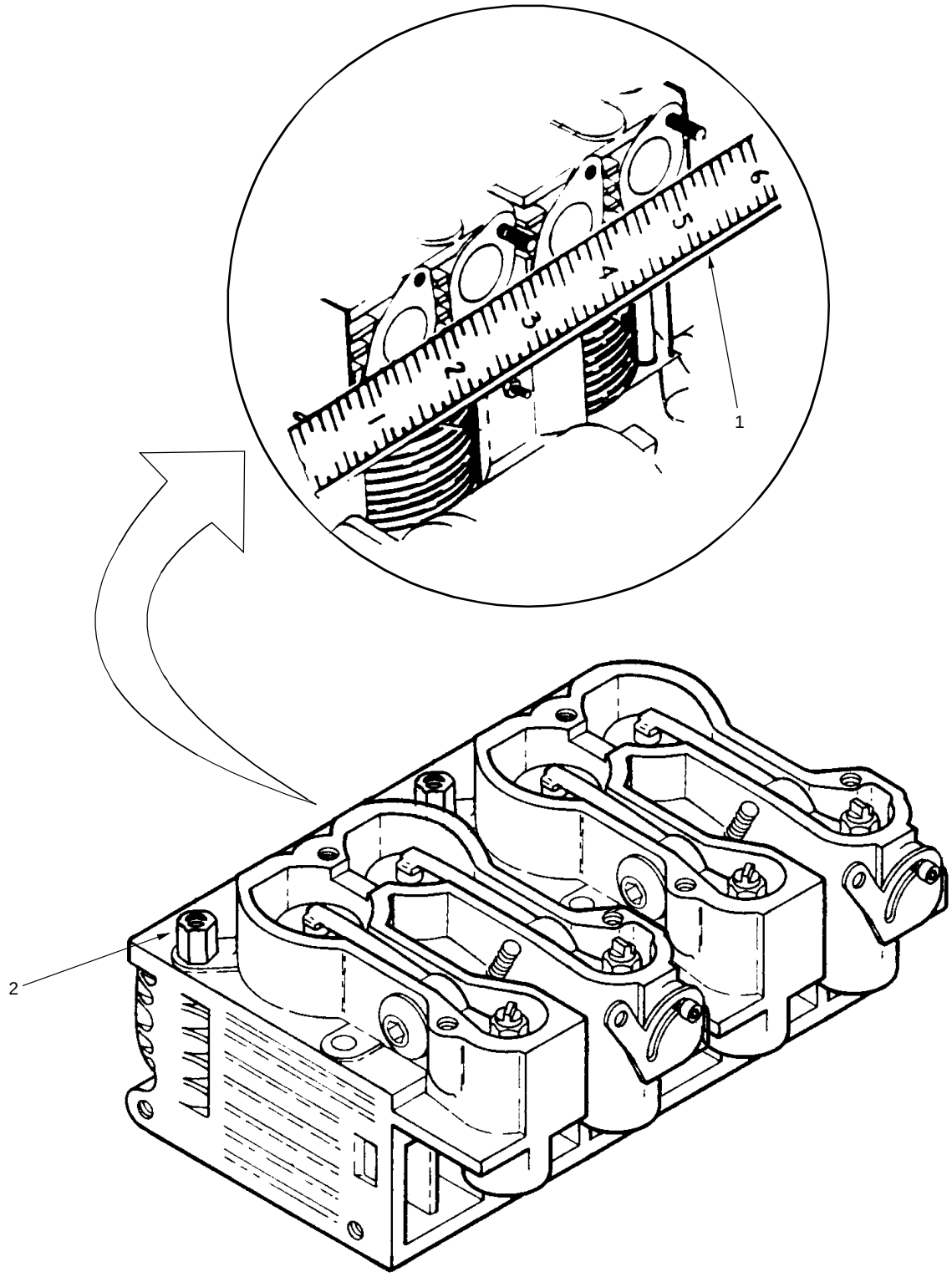


Figure 19. Cylinder Head Alignment

INSTALL FLYWHEEL/ALTERNATOR ROTOR AND STATOR (Refer to Figure 20.)

INITIAL SET-UP:

Tools:
CrimpTool
(WP 0113 00, Item 2)
Socket, Hex Driver, 4 mm
(WP 0113 00, Item 3)
Socket, Hex Driver, 5 mm
(WP 0113 00, Item 3)
Socket, Hex Driver, 6 mm
(WP 0113 00, Item 3)
Soft Tip Hammer/Mallet
(WP 0113 00, Item 3)
Torque Wrench, 200 ft. lb. Capacity
(WP 0113 00, Item 3)
Socket, Socket Wrench, 1-5/8 in.
(WP 0113 00, Item 3)
Handle, Socket Wrench, Ratchet
(WP 0113 00, Item 3)

Materials/Parts Required
Lug, Spade, Female (WP 0117 00, Item 66)
Lug, Spade, Male (WP 0117 00, Item 67)

Equipment Condition:
Cylinder heads installed

1. Insert tab/key (1) on crankshaft.
2. Position the alternator rotor (2) in the flywheel (3). Install the five socket head cap screws (4) attaching the rotor to the flywheel (3).
3. Position the alternator stator (5) on the timing cover (6).
4. Remove two washers (7) and socket head cap screws (8) located at the 5 and 6 o'clock position on the timing cover (6).
5. Attach a cable clamp (9) under each removed washer (7) and socket head cap screw (8). Install screws (8) with cable clamps (9). Lace wires (10) attached to stator (5) under cable clamps (9) and through hole in timing cover (6) above socket head cap screw (8) and clamp at 5 o'clock position. Thread wires (10) through the RFI bulkhead fitting. Ensure wires (10) connected to the stator (5) will be clear of the rotor (2).
6. Torque the two socket head cap screws (8) to 190 to 195 in. lbs (21-23 Nm).
7. Install the four socket head cap screws (11) attaching the stator (5) to the timing cover (6).
8. Using a soft tip hammer/mallet, position and tap the roll pin (12) in flywheel (3).
9. Install flywheel (3), spacer (13), washer (14), and nut (15) on crankshaft. Lock flywheel (3) in position and torque nut (15) to 130-135 ft. lbs. (19.7. Nm).
10. Install splined adapter (16) and secure with three socket head cap screws (17).
11. Crimp male spade lug (18) and female spade lug (19) to wires (10).

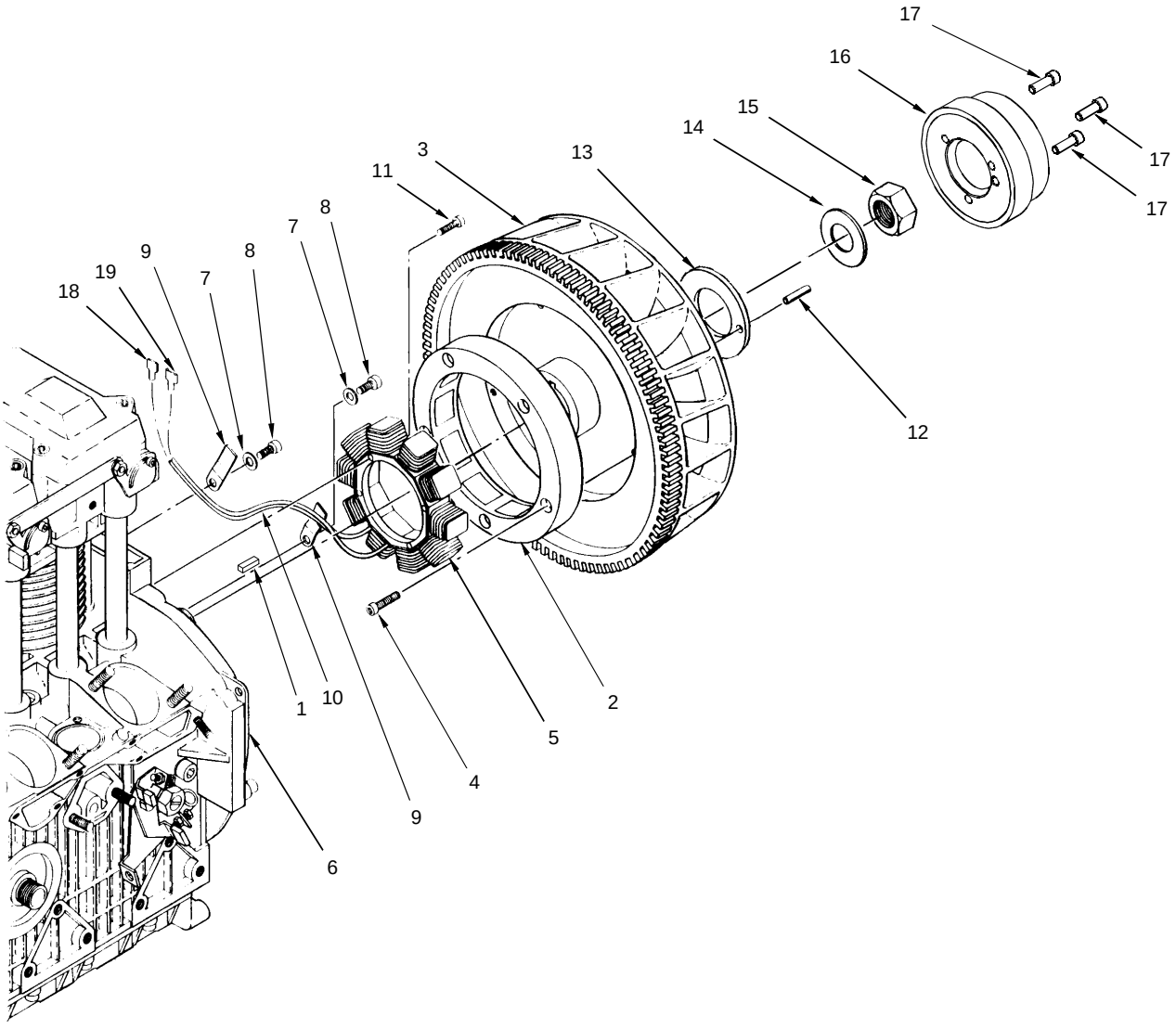


Figure 20. Flywheel/Alternator Installation

INSTALL INTAKE MANIFOLD (Refer to Figure 21.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
Gasket, Intake Manifold (WP 0117 00, Item 43)
Washer (WP 0117 00, Item 65)

1. Install two gaskets (1) on cylinder heads (2).

CAUTION

Ensure that the two longer socket head cap screws are used to secure the portion of intake manifold with thicker lands.

2. Position intake manifold (3), and install the four socket head cap screws (4) and lock washers (5) to attach manifold to cylinder heads (2). Alternately tighten the socket head cap screws (4).
3. Install and tighten two nuts (6) and flat washers (7) to attach intake adapter (8), clamp (9) and dust cap (10).
4. Spread clamp (11) and attach hose (12) to intake manifold (3).
5. Install intake air heaters (13) on intake manifold (3).

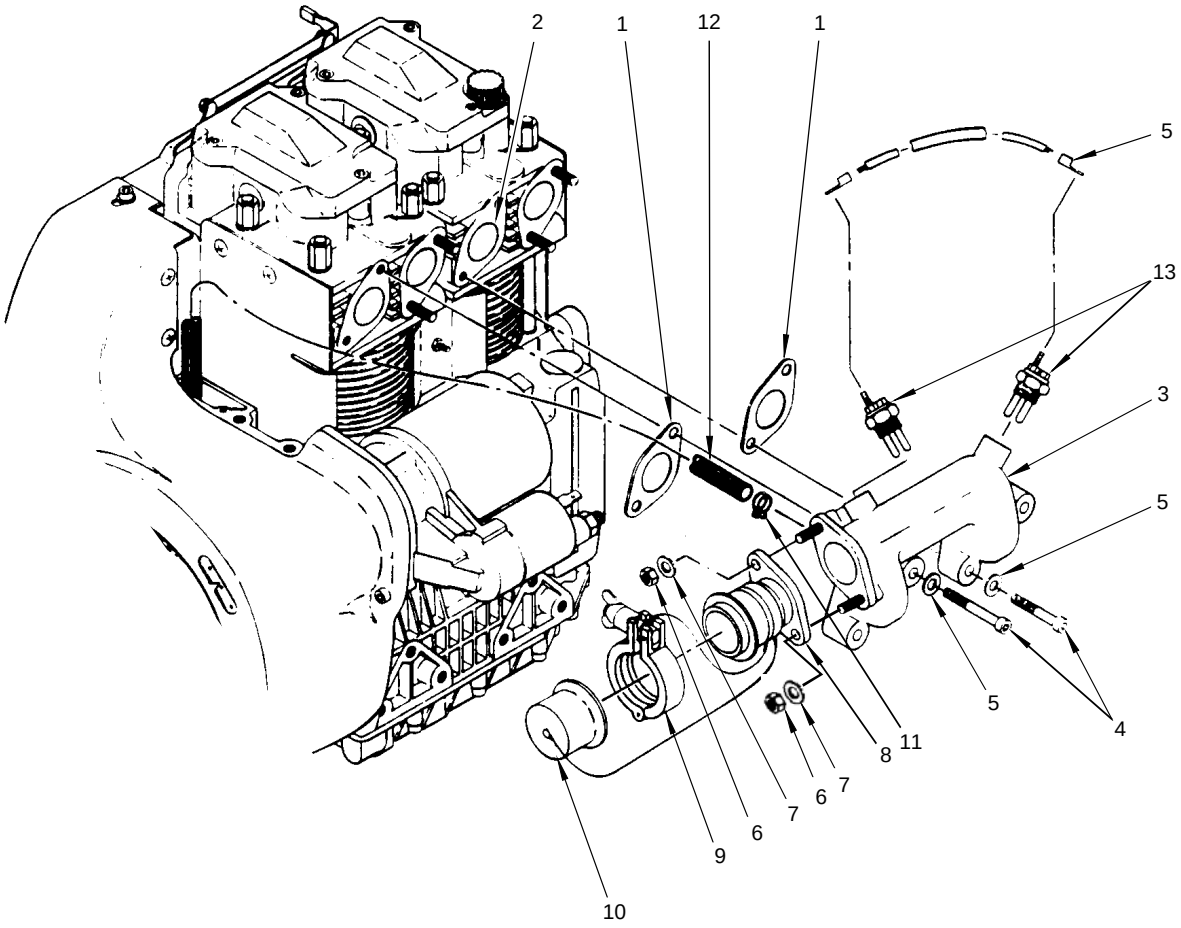


Figure 21. Intake Manifold Installation

INSTALL EXHAUST MANIFOLD (Refer to Figure 22.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
Gasket, Exhaust Manifold (WP 0117 00, Item 49)
Lock Washers (WP 0117 00, Item 128)

1. Position gaskets (1) on cylinder heads (2).
2. Place exhaust manifold (3) on cylinder heads (2).
3. Install and hand tighten nuts (4), lock washers (5) and flat washers (6) that secure exhaust manifold (3). Tighten nuts (4) alternately.

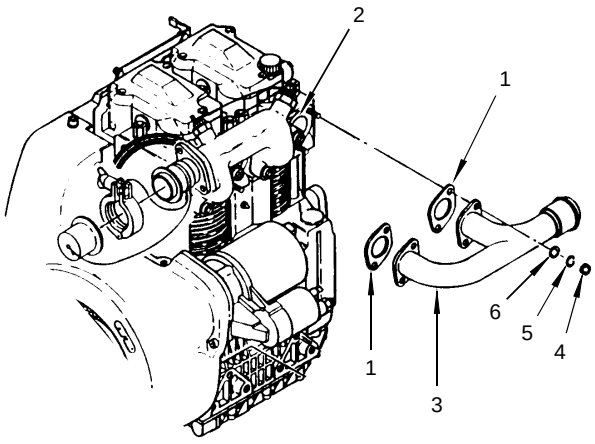


Figure 22. Install Exhaust Manifold

INSTALL INJECTION PUMP (Refer to Figure 23.)

INITIAL SET-UP:

Tools:
Combination Wrench, 13 mm
(WP 0113 00, Item 3)
Combination Wrench, 17 mm
(WP 0113 00, Item 3)
Pliers, Needle Nose
(WP 0113 00, Item 3)

Materials/Parts Required
Safety Wire
(WP 0116 00, Item 33)
Gasket (WP 0117 00, Item 44)

Equipment Condition:
Cylinder head installed

1. Install and align tappet (1) in crankcase (2). If reinstalling previously used tappet, ensure tappet (1) is reinstalled in same hole. Secure with screw (3).

NOTE

Injection pumps are supplied by two different manufacturers: Ruggerini and Bosch. Ruggerine injection pumps do not have expansion plugs.

2. Install expansion plug (4) in crankcase (2).
3. Install gaskets (5) in crankcase (2).
4. Rotate flywheel counterclockwise until tappet (1) is resting in the down position.

NOTE

When installing spring clip, run a length of safety wire through the eye of the clip to prevent the clip from falling into the crankcase.

5. Attach control rod (6) to governor joint (7) and secure with spring clip (8).
6. Position injection pump (9) in crankcase (2). Ensure injection pump (9) is in same position as it was removed from. Ensure same number of gaskets (5) that were removed are placed between fuel injection pump (9) and crankcase (2).
7. Attach control rod (6) to fuel injection pump(s) (9) and secure with spring clip (10).
8. Install yoke (11), spacer (12), nut (13) securing injection pump (9) to crankcase (2).

NOTE

For step 9 and 10, install previously removed washers that were saved for use later in injector pump timing and delivery tests.

9. Connect fuel supply line (14) (to fuel pump) by installing washer (15), union (16), washer (17) and union bolt (18).
10. Connect fuel return line (19) (to fuel pump) by installing washer (20), union (21), washer (22) and union bolt (23).

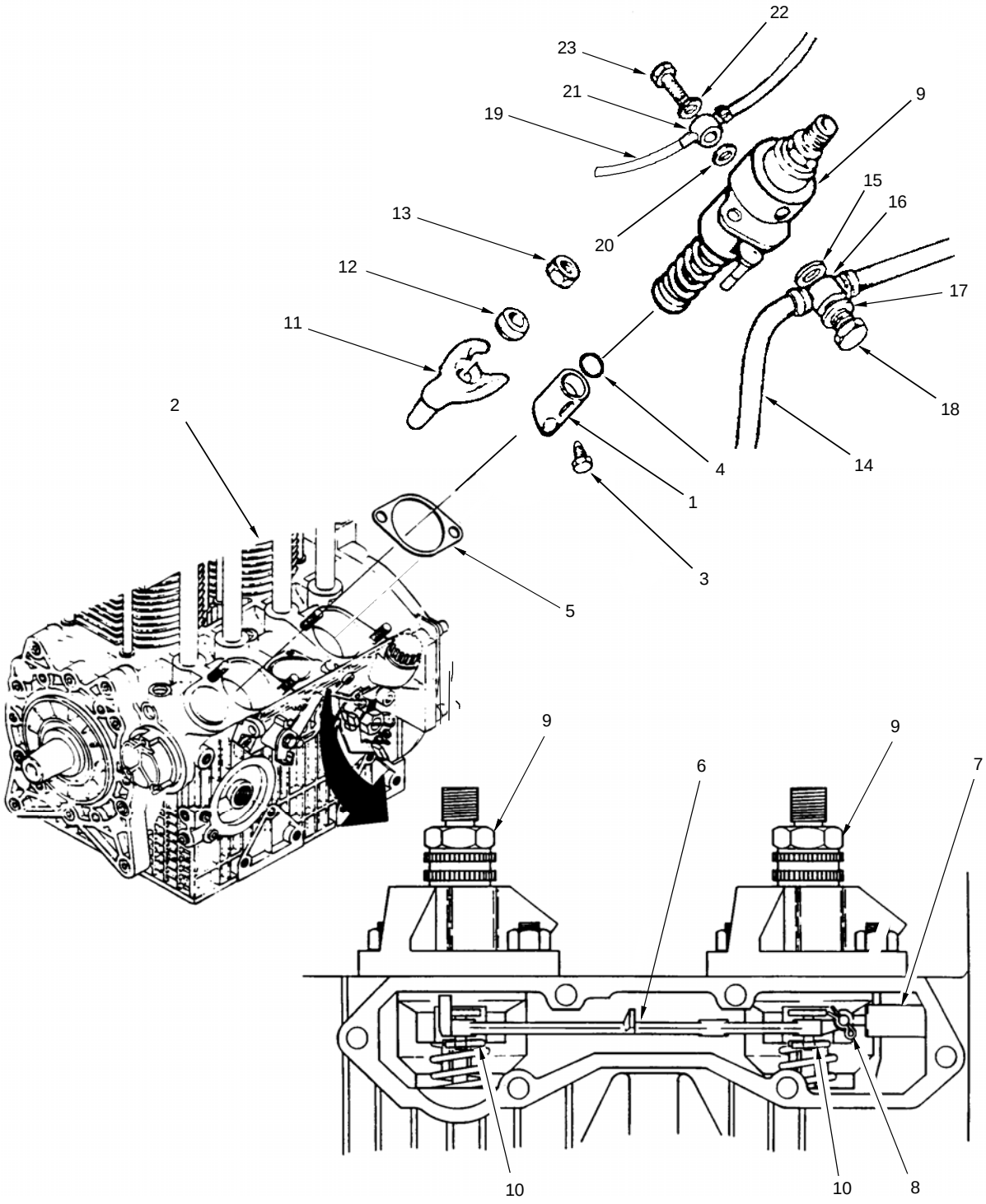


Figure 23. Install Injection Pump

INSTALL FUEL INJECTOR (Refer to Figure 24.)

INITIAL SET-UP:

Tools:
Ratchet Wrench, 3/8 in. Drive (WP 0113 00, Item 3)
Socket, Socket Wrench, 13 mm (WP 0113 00, Item 3)
Combination Wrench, 10 mm (WP 0113 00, Item 3)
Combination Wrench, 7 mm (WP 0113 00, Item 3)

Materials/Parts Required
Copper Washer (WP 0117 00, Item 60)
Copper Washer (WP 0117 00, Item 62)
Copper Washer (WP 0117 00, Item 63)

Equipment Condition:
Cylinder head installed

NOTE

Copper washers under fuel injectors are used to adjust injector protrusion into the combustion chamber of cylinder head. If the old fuel injector is being installed, ensure number of washers installed is the same number that was removed. If a new fuel injector is to be installed measure the nozzle length of the old and new injectors, remove or insert copper washers to adjust the protrusion of the new injector in the cylinder head to achieve the same protrusion as with the old injector.

1. Insert copper washer(s) (1) in cylinder head.
2. Install and tighten union bolt (2), union (3) and copper washers (4 and 5).
3. Position fuel injector (6) in cylinder head.
4. Install and tighten brace (7), washer (8) and nut (9) on mounting stud (10).
5. Install and tighten fuel supply line (11) on fuel injector.

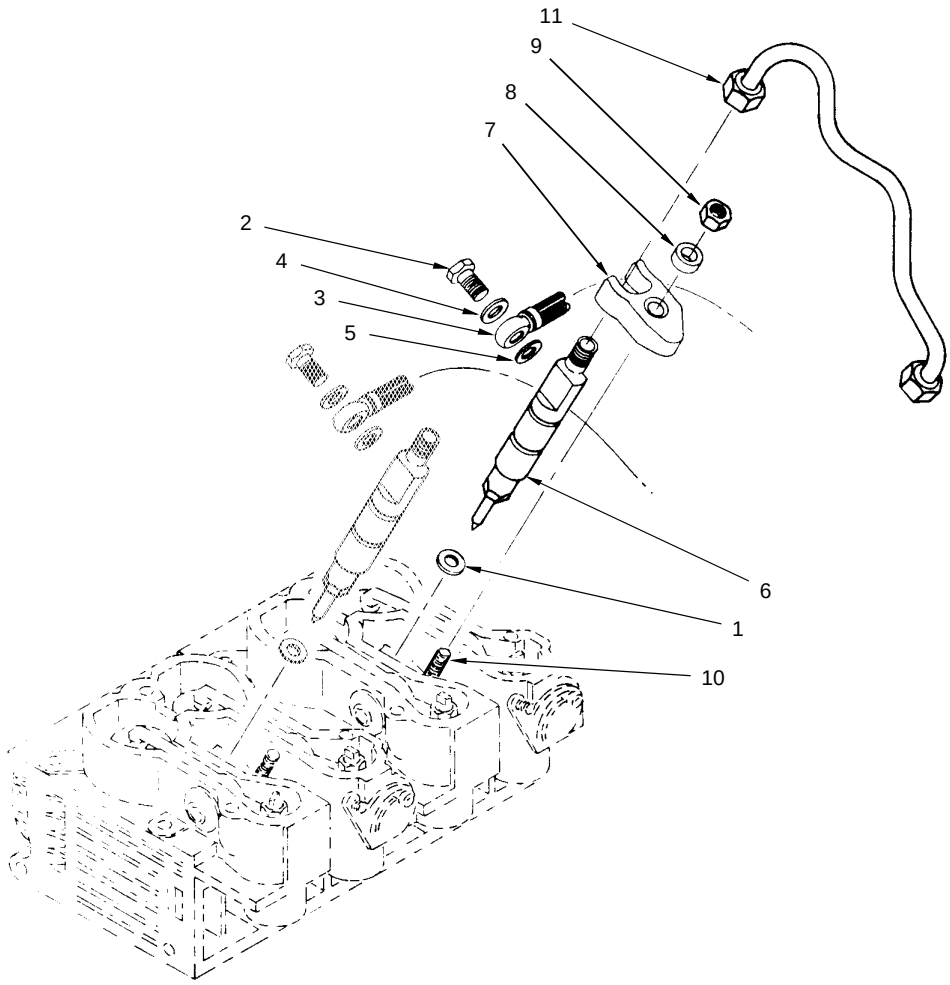


Figure 24. Fuel Injector Installation

INSTALL FUEL PUMP (Refer to Figure 25.)

INITIAL SET-UP:

Tools:
10 mm socket wrench
(WP 0113 00, Item 3)
3/8 in. drive ratchet wrench
(WP 0113 00, Item 3)

Materials/Parts Required
Nut, Self-Locking (WP 0117 00, Item 32)
Gasket (WP 0117 00, Item 45)

1. Position gasket (1) on crankcase (2).
2. Position drive rod (3) and fuel pump (4) on crankcase (2).
3. Install and tighten self-locking nuts (5) securing fuel pump (4).

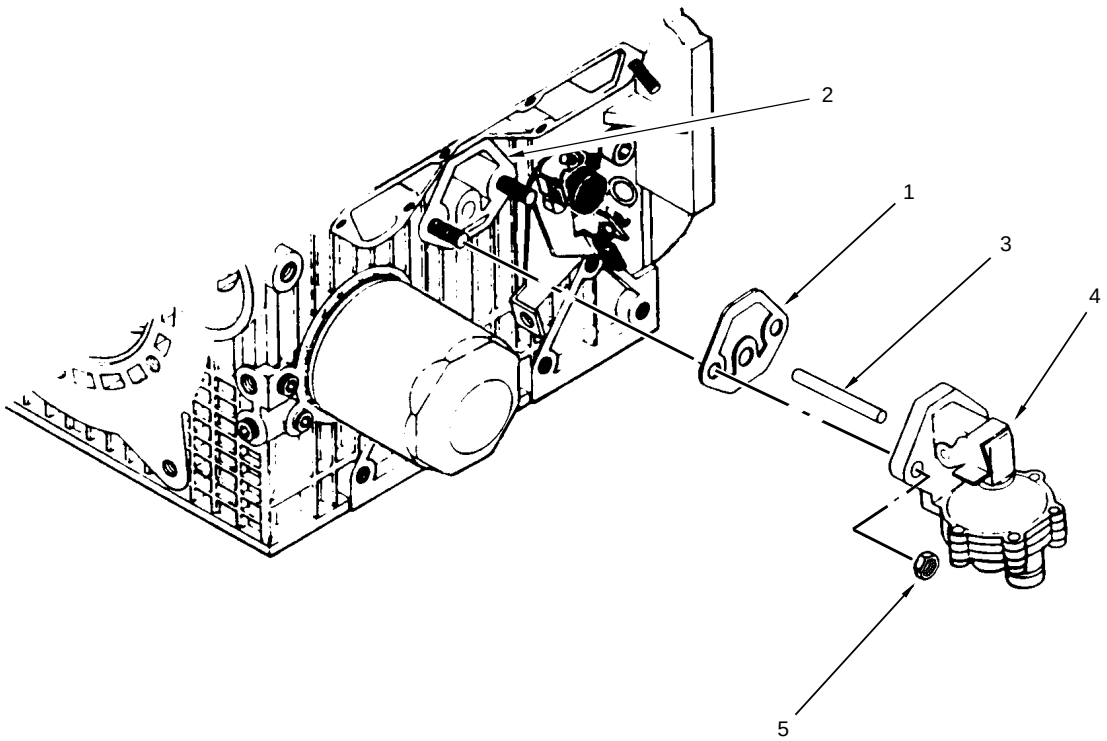


Figure 25. Fuel Pump Installation

INSTALL VALVE COVERS (Refer to Figure 26.)

INITIAL SET-UP:

Tools:
5 mm socket head wrench (WP 0113 00, Item 3)
3/8 in. drive ratchet wrench (WP 0113 00, Item 3)

Materials/Parts Required
Gasket (WP 0117 00, Item 50)

Equipment Condition:
Fuel injectors installed

1. Position valve cover gasket (1) on cylinder head.

NOTE

Valve cover with oil fill cap is positioned toward the PTO end of the engine.

2. Position valve cover (2) on gasket (1) and cylinder head (3).
3. If not adjusting fuel injection pump later, install and alternately tighten the socket head screws (4) attaching valve covers (2) to cylinder head (3). If adjusting fuel injection pump or engine intake and exhaust valve, hand tighten only.

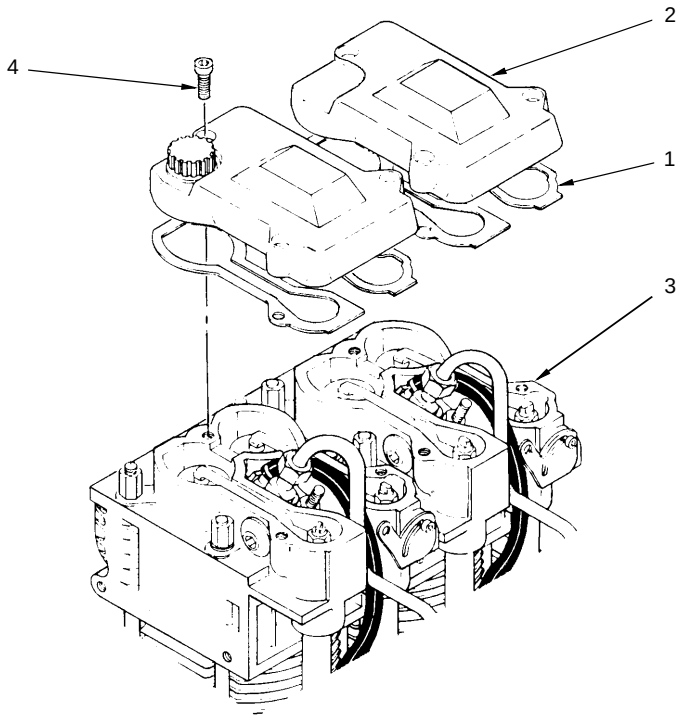


Figure 26. Valve Cover Installation

INSTALL DECOMPRESSION LEVER (Refer to Figure 27.)

INITIAL SET-UP:

Tools:
3 mm key wrench
(WP 0113 00, Item 3)
13 mm combination wrench
(WP 0113 00, Item 3)

Materials/Parts Required
None

Equipment Condition:
Fuel injectors installed

1. Position decompression lever (1) on plates (2), and install and tighten screws (3) and nuts (4).
2. Operate the decompression lever to ensure freedom of movement.

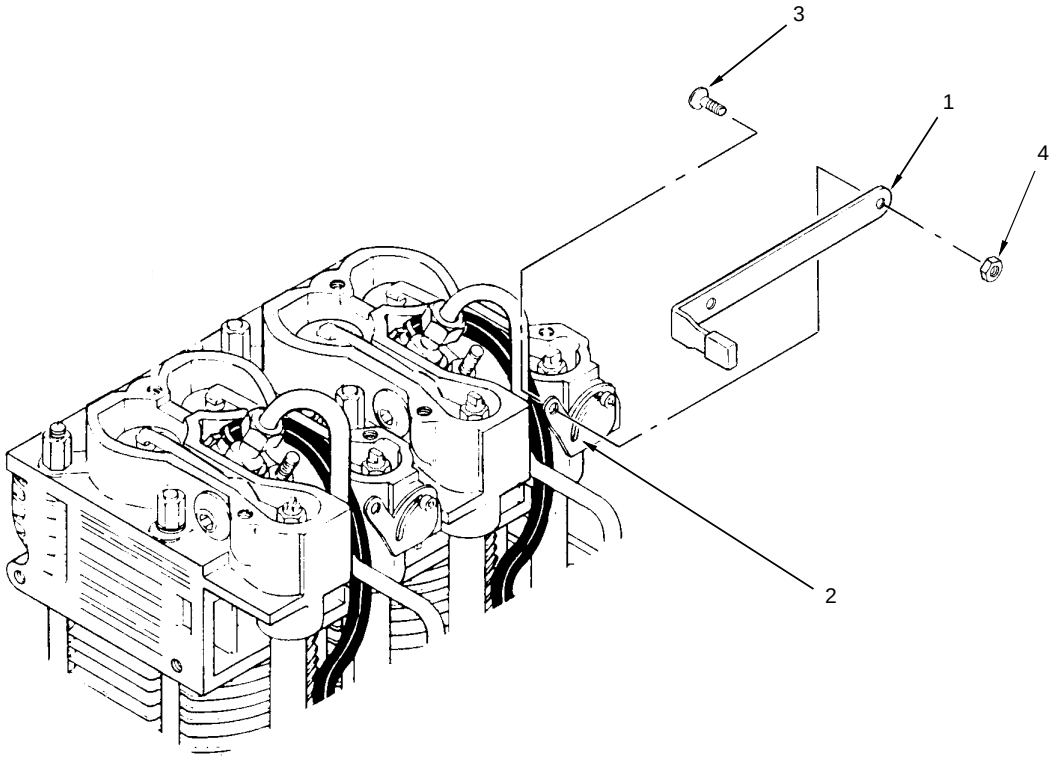


Figure 27. Decompression Lever Installation

INSTALL FUEL FLOW SOLENOID (Refer to Figure 28.)

INITIAL SET-UP:

Tools:
Socket, Socket Wrench, 5 mm (WP 0113 00, Item 3)
Ratchet Wrench, 3/8 in. Drive (WP 0113 00, Item 3)
Extension, 6 in., 3/8 in. Drive (WP 0113 00, Item 3)

Materials/Parts Required
Gasket (WP 0117 00, Item 46)
O-Ring (WP 0117 00, Item 56)
Copper Washers (WP 0117, Item 61)

Equipment Condition:
Fuel injectors installed

1. Insert O-ring (1) in crankcase.

NOTE

When the solenoid is installed in the crankcase, ensure solenoid arm is positioned to the right of the control rod center lever arm.

2. Hold control rod (2) center lever arm (3) fully to the left, position solenoid (4) on crankcase and install two socket head screws (5) to attach solenoid to crankcase. Release control rod (2) and verify that solenoid arm (6) is to the right of the control rod center lever arm (3).

NOTE

Copper washers are used under the two socket head cap screws at the lower side of the fuel control cover.

3. Loosely install the five socket head screws (7), flat washers (8), nut (9) and washer (10) to attach the fuel control cover (11) and gasket (12) to the crankcase. (Fuel control cover (11) must be removed later for injector timing.)

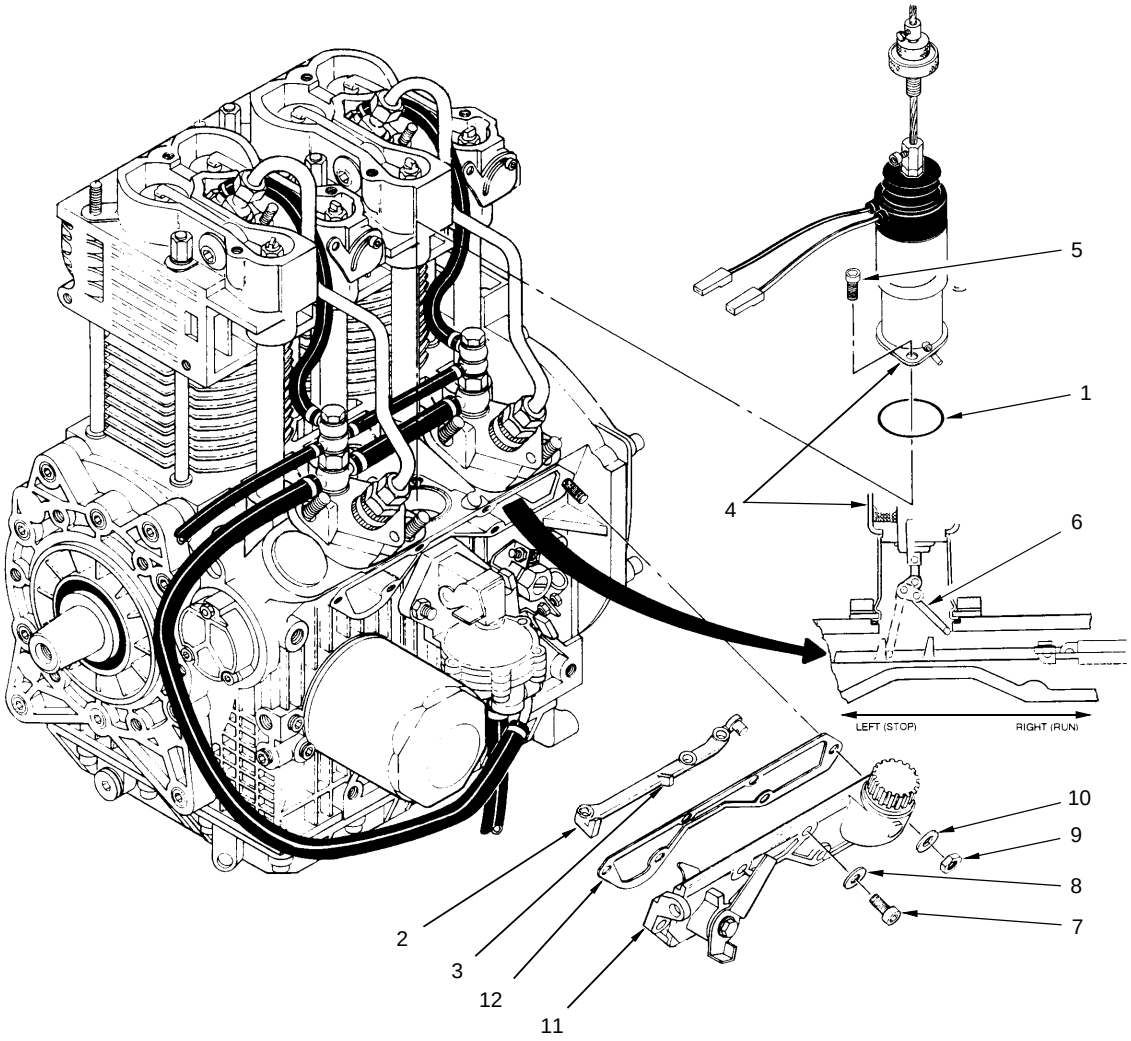


Figure 28. Fuel Flow Solenoid Installation

INSTALL OIL PAN (Refer to Figure 29.)

INITIAL SET-UP:

Tools:
7/8 in. combination wrench
(WP 0113 00, Item 3)
6 mm socket
(WP 0113 00, Item 3)
3/8 in. drive ratchet wrench
(WP 0113 00, Item 3)
10 mm socket
(WP 0113 00, Item 3)
6 mm socket head wrench
(WP 0113 00, Item 3)
Torque Wrench, 50 ft. lb.
(WP 0113 00, Item 3)

Materials/Parts Required
Gasket, Pan (WP 0117 00, Item 48)

1. Install cap screw (1), washer (2) and net (3).
2. Position pan gasket (4) on oil pan (5).
3. Insert and tighten in an alternating pattern the fifteen socket head cap screws (6) and washers (7) attaching oil pan (5) to the crankcase (8).
4. Install oil drain plug (9) and washer (10).
5. Install oil temperature sensor (11). Torque to 22.11-29.48 ft. lbs. (30-40 Nm).
6. Install dipstick (12).

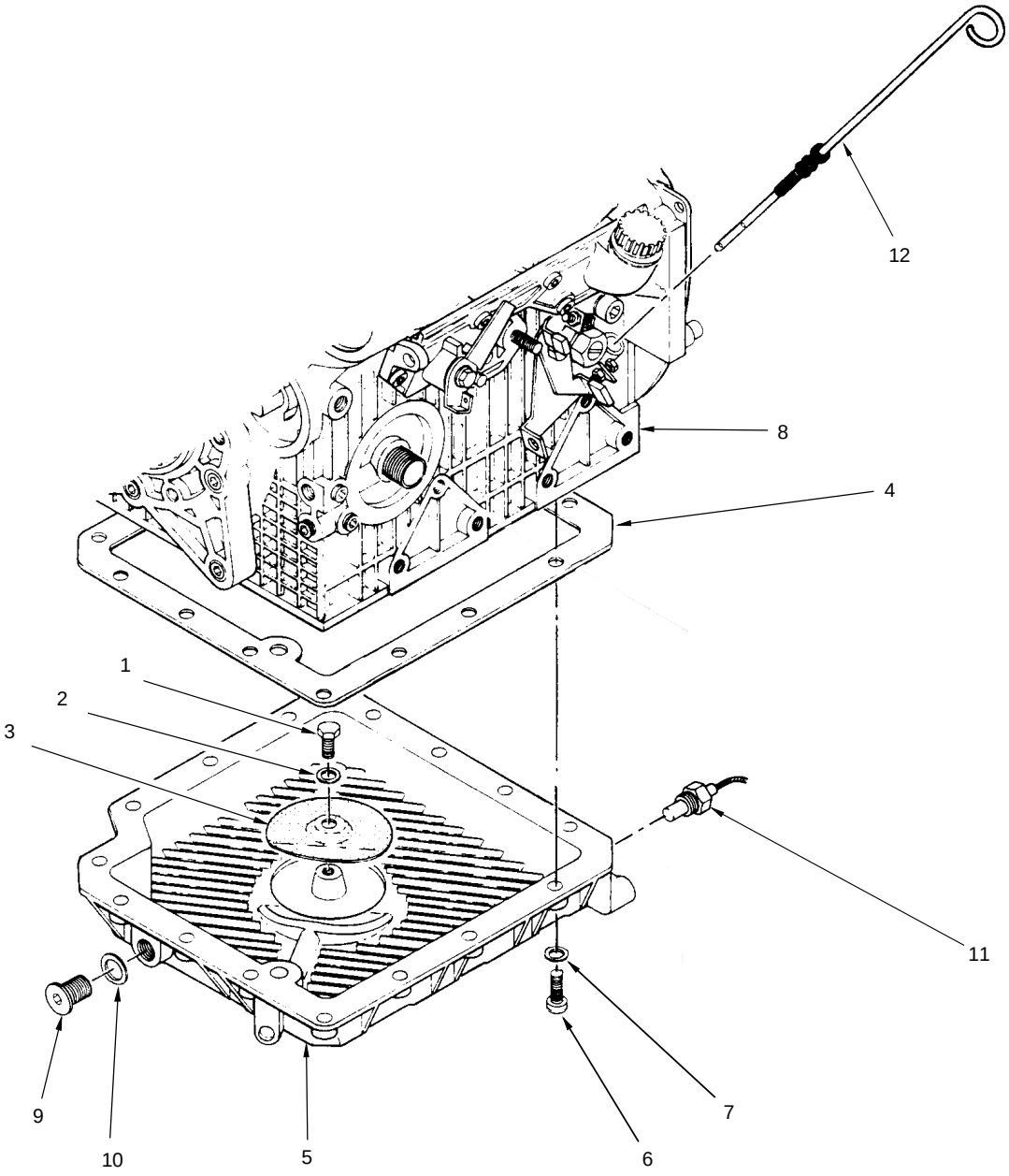


Figure 29. Oil Pan Installation

INSTALL STARTER (Refer to Figure 30.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
None

1. Position the starter (1) on the engine (2) and loosely install the upper mounting cap screw (3) and washer (4).
2. Loosely install cap screw (5) and washer (6) in lower mounting hole.

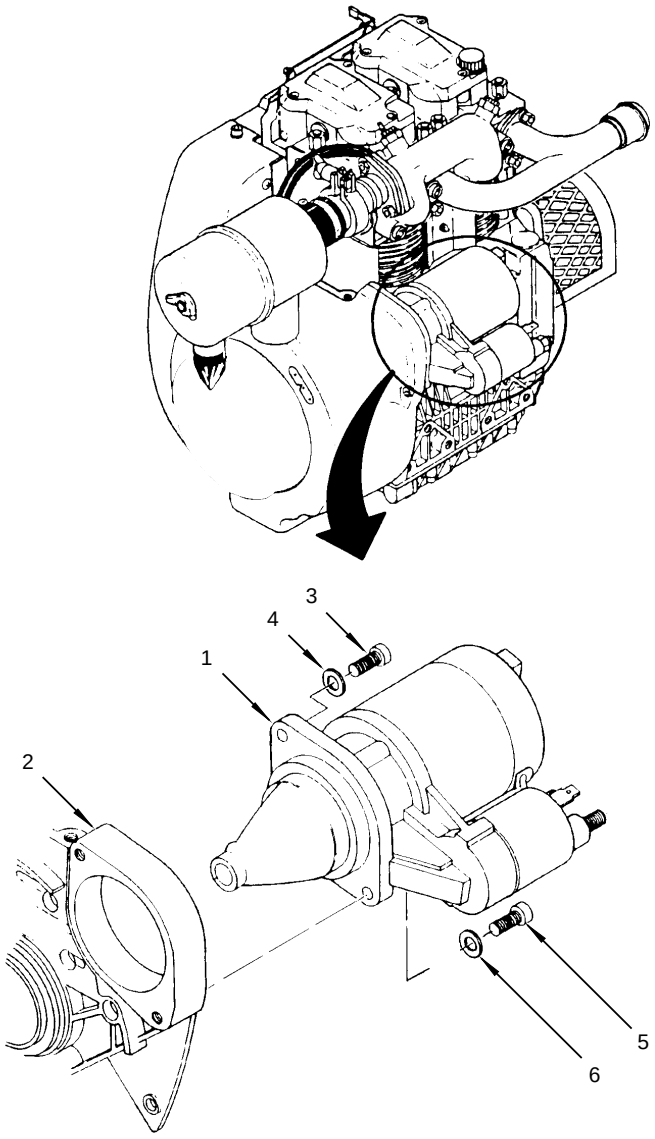


Figure 30. Starter Installation

INSTALL GATES, SHROUD AND OIL COOLER (Refer to Figure 31.)

INITIAL SET-UP:

Tools:
Wrench, combination, 6 mm (WP 0113 00, Item 3)
Wrench, combination, 1/4 in. (WP 0113 00, Item 3)
Socket, socket wrench, 5 mm (WP 0113 00, Item 3)
Key, socket head wrench, 5 mm (WP 0113 00, Item 3)
Screwdriver, cross tip, #2 (WP 0113 00, Item 3)
Combination wrench, 19 mm (WP 0113 00, Item 3)
Combination wrench, 13 mm (WP 0113 00, Item 3)
Socket, socket wrench, deep well, 5 mm (WP 0113 00, Item 3)
Socket, socket wrench, deep well, 13 mm (WP 0113 00, Item 3)
Extension, Socket Wrench, 3/8 in. drive, 3 in. (WP 0113 00, Item 3)
Wrench, ratchet, 1/4 in. drive (WP 0113 00, Item 3)
Wrench, ratchet 3/8 in. drive (WP 0113 00, Item 3)

Materials/Parts Required:
Oil, Lubricating, Engine, 2 quarts (WP 0116 00, Item 17)
Filter, Oil (WP 0117 00, Item 38)
Washer (WP 0117 00, Item 57)
Copper Washer (WP 0117 00, Item 58)
Copper Washer (WP 0117 00, Item 61)
Washer, Lock (WP 0117 00, Item 64)

Equipment Condition:
Oil pan and oil filter installed
Starter installed

1. From fuel injector side of engine, insert tie rod (1) between cylinders, hooking tie rod to the two inboard cylinder head studs.
2. Install nut (2) and washer (3) attaching gate (4) to tie rod.

NOTE

Fuel supply line from fuel feed pump to injection pumps, fuel return line and fuel solenoid wires will have to be fed through gate. They may have been connected in a previous procedure. Disconnect and reconnect after installing gate.

3. Install the two bolts (5) and washers (6) attaching gate (7). Feed fuel lines from injection pumps through lower hole in gate (7).
4. Position oil cooler (8) between crankcase and the fuel lines from injection pumps to the fuel injectors.
5. Install socket head cap screw (9) and washer (10) attaching oil cooler to gate (7).
6. Install two cross tip screws (11) attaching gate (12) and bracket (13) to cylinder head.
7. Install union bolt (14), union (15), washer (16) and spacer (17) connecting the oil supply line at the oil cooler.
8. Install union bolt (18), union (19), washer (20) and spacer (21) connecting the oil return line at the oil cooler.
9. Install oil return line (22) to union (23) on crankcase.
10. Install union bolt (24), washer (25), washer (26) and union (27) to connect oil supply line to crankcase.
11. Position shroud (28) onto engine.

12. Install hand tight socket head cap screw (29) and washer (30) on back side of shroud (28).
13. Install hand tight two cross tip screws (31) at top/intake side of shroud.
14. Install hand tight socket head cap screws (32, 34 and 36) and washers (33, 35 and 37) attaching shroud.
15. Tighten securely all shroud fasteners.
16. Align oil cooler (8) and shroud (30). Install socket head cap screw (38), lock washer (39) and flat washer (40) attaching shroud (30) to oil cooler (8).
17. Install lifting eye (41), washer (42) and nut (43) on lifting eye studnut.
18. On fuel feed line, assemble washers (44 and 45) as illustrated on union (46). Use bolt (47) to install assembly on fuel pump (48).
19. Use screw (49), washer (50) and nut (51) to loosely install clamp (52) on gate (7).
20. Install hand tight new oil filter (53) at filter port (54).
21. Fill engine with 1.9 qts. of 15W-40 lubricating oil.

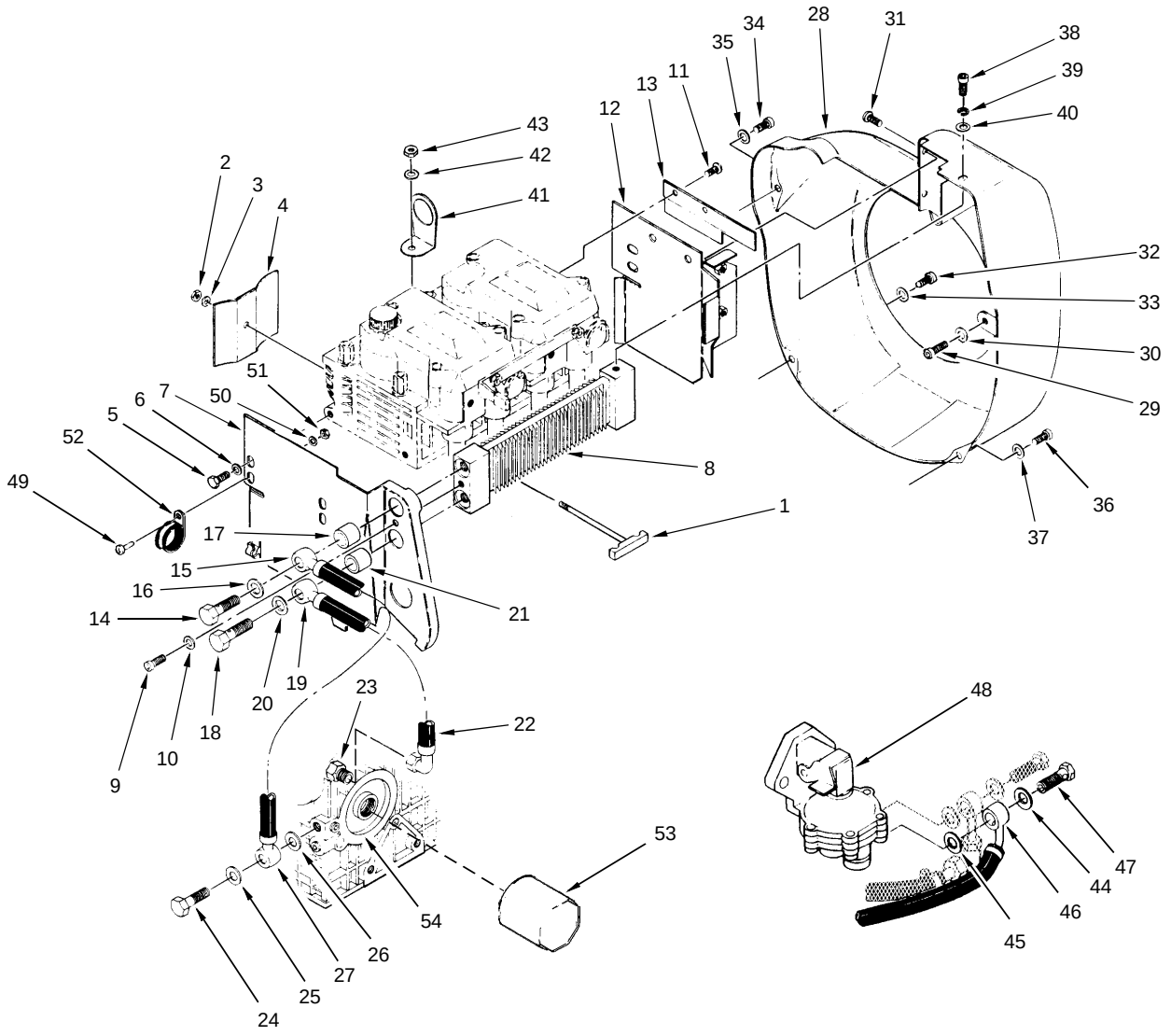


Figure 31. Shroud, Gates and Oil Cooler Installation

INSTALL FLEXIBLE COUPLING ADAPTER AND GUARD TO ENGINE (Refer to Figure 32.)

INITIAL SET-UP:

Tools:
Socket, Socket Wrench, 1-5/8 inch (WP 0113 00, Item 3)
Wrench, Torque, 150 ft lb capacity (WP 0113 00, Item 3)
Wrench, Combination, ½ inch (WP 0113 00, Item 3)

Materials/Parts Required
Washers, Lock (WP 0117 00, Item 128)

Equipment Condition:
Gates, shroud and oil cooler installed

1. Install splined flexible coupling adapter (1), bushing (2) and bolt (3) on PTO. Torque to 80 ft. lbs. (109.76 Nm).
2. Install the four bolts (4), lock washers (5) and flat washers (6) to secure the flexible coupling guard (7) to the engine.

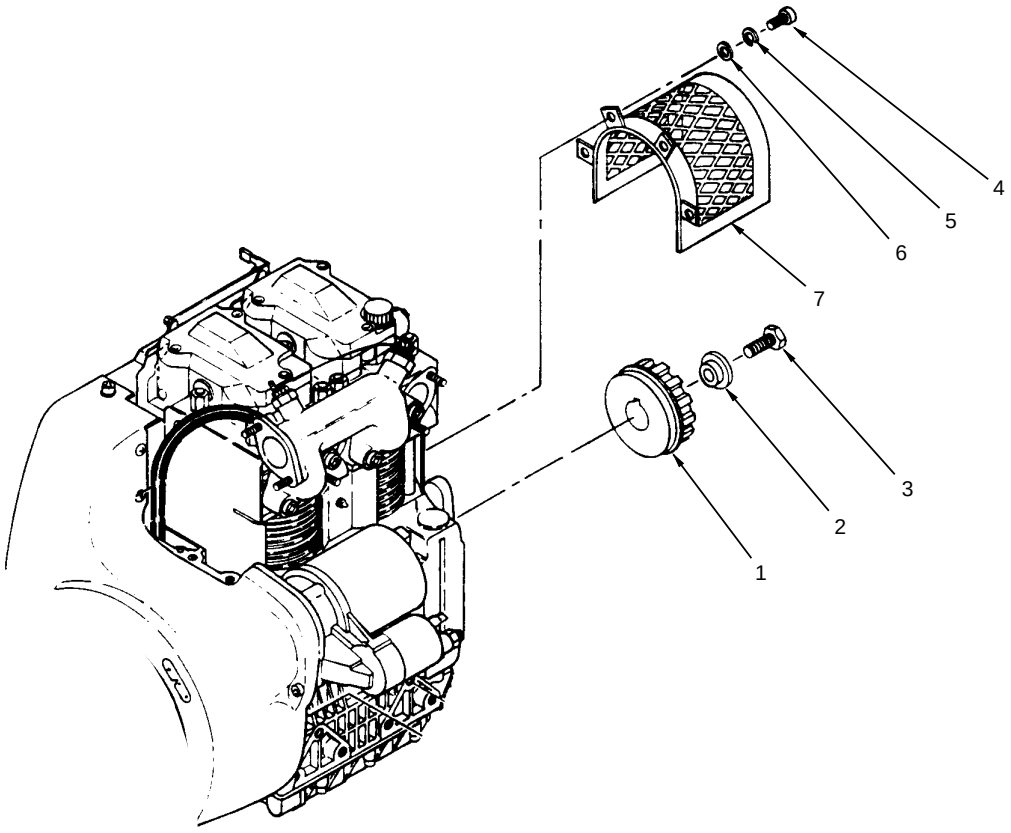


Figure 32. Engine Flexible Coupling Adapter and Guard Installation

INSTALL ENGINE IN ENGINE MODULE (Refer to Figure 33.)

INITIAL SET-UP:

Tools:
Socket, Socket Wrench, 1-5/8 inch (WP 0113 00, Item 3)
Wrench, Torque, 150 ft lb capacity (WP 0113 00, Item 3)
Wrench, Combination, ½ inch (WP 0113 00, Item 3)

Materials/Parts Required
Washers, Lock (WP 0117 00, Item 129)

Equipment Condition:
Gates, shroud and oil cooler installed

Personnel Required:
Four

NOTE

Block engine from underneath for ease of installation of engine in engine module.

1. Attach hoist to engine lifting eye, raise engine and position above engine module with engine manual starter adapter aligned with pulley guard (1) on module.
2. Lower pulley guard (1) and carefully lower replacement engine into module frame, aligning mounting holes in frame and engine.
3. Install and alternately tighten the ten bolts (2), lock washers and flat washers that secure the engine to the frame. Remove hoist (or blocks) and check that mounting bolts are securely tightened.
4. Locate alternator wires (3) in wiring harness and connect at in-line connectors as tagged. Remove tags.
5. At lower starter mounting bolt (4), connect starter ground cable and other ground wires as tagged. Remove tags.
6. At starter solenoid, install the cables (5) and other wires as tagged to the solenoid studs. Remove tags.
7. At the oil pressure switch (6), connect the switch wire as tagged. Remove tag.
8. At intake manifold, connect the electrical wires (7) to the air intake heaters as tagged. Remove tags. Place boots (8) over connector.
9. Connect the engine temperature sensor wire (9) at in-line connector in wiring harness as tagged. Remove tag.
10. Locate the fuel shutoff solenoid wires (10) and connect to the wiring harness as tagged. Remove tags.
11. Group and route wires of cable in general layout observed at removal, and install wire ties as necessary to secure wiring harness.
12. Install fuel return line at fuel fitting (11) on #2 fuel injection pump.
13. Install fuel supply line (12) on fuel pump (13).

WARNING

Do not lift the engine module with less than four (4) personnel. Serious personal injury may result.

14. Install engine module in pump-engine module.

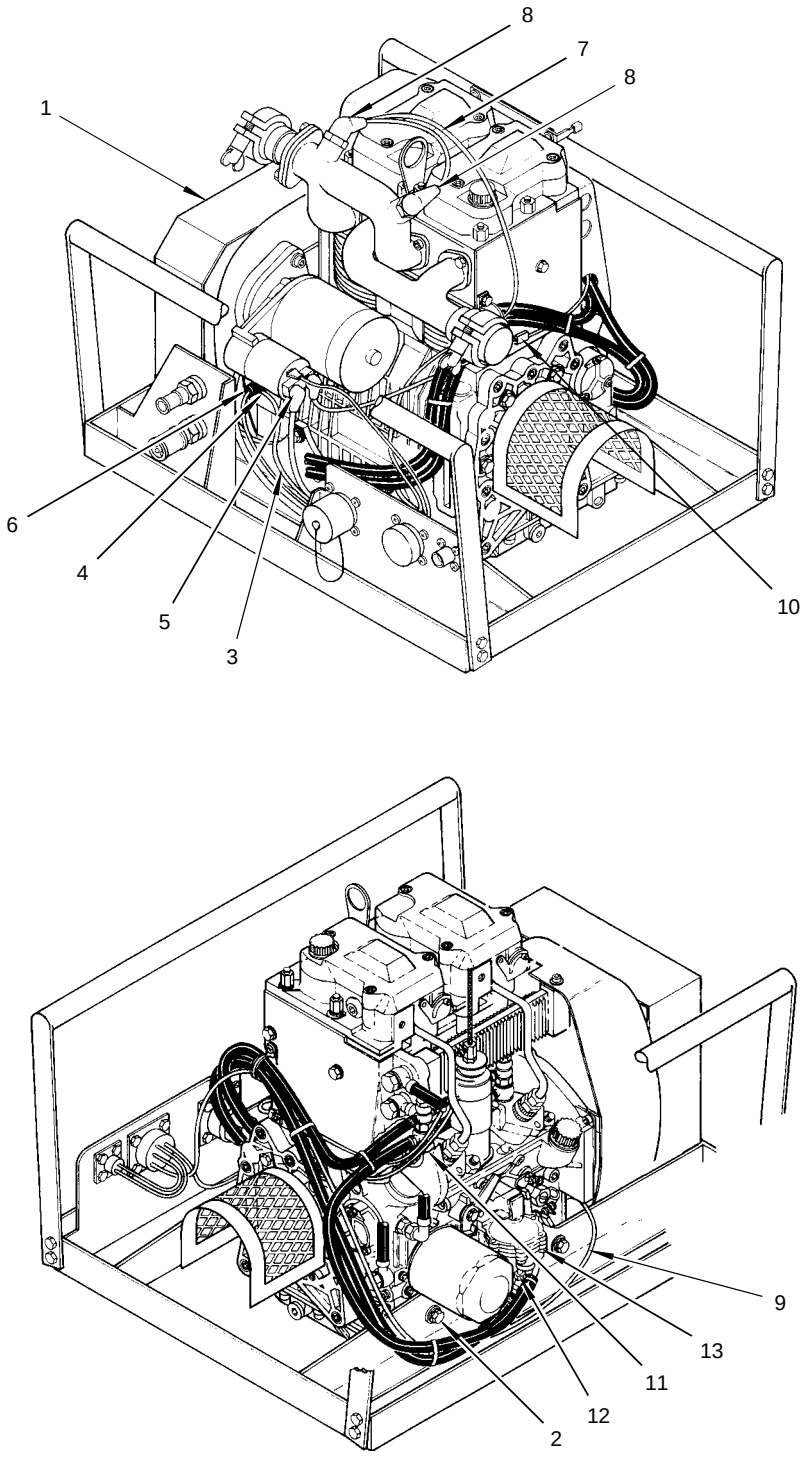


Figure 33. Installation of Engine in Engine Module

ADJUST FUEL INJECTION PUMP. (Refer to Figure 34.)

This task must be accomplished any time the fuel injection pumps have been removed and replaced.

INITIAL SET-UP:

Tools:
Key, Socket Head Screw, 5 mm (WP 0113 00, Item 1)
Combination Wrench, 10 mm (WP 0113 00, Item 2)
Combination Wrench, 13 mm (WP 0113 00, Item 2)
Combination Wrench, 17 mm (WP 0113 00, Item 2)
Combination Wrench, 19 mm (WP 0113 00, Item 2)
Screwdriver, Flat Blade (1/8 x 8 in.) (WP 0113 00, Item 2)
Injection Advance Control Tool (WP 0113 00, Item 8)

Materials/Parts Required:
Rubber Band (WP 0116 00, Item 22)
Gasket (WP 0117 00, Item 46)

Equipment Condition:
Engine module installed in pump-engine module.
Valve covers removed

NOTE

Copper washers are used under the two socket head cap screws at the lower side of the fuel control cover. Ensure copper washers are reinstalled on the correct socket head cap screws.

1. Remove five socket head screws (1) and washers (2 and 3) attaching fuel control rod cover (4) to crankcase.
2. Remove remaining nut (5) and washer (6) from fuel control rod cover (4). Remove cover and gasket (7); discard gasket if socket head screws (1) and nut (5) were fully tightened. Remove gasket residue from crankcase and cover.
3. Attach a rubber band to control rod end (8) and any attaching point at the pulley end of the engine to hold control rod fully right. Set throttle lever (9) to maximum fuel position.
4. Set cylinder of injection pump (10) being timed to TDC on the compression stroke. Turn flywheel until intake valve (11) opens. Rotate flywheel to the right until intake valve (11) closes. Continue turning flywheel until timing mark (12) on flywheel is aligned with indicator (13) on shroud.
5. Remove fuel feed line (14) from injection pump (10) and fuel injector (15) being timed.
6. Install injector pump adjustment tool (16) on pump being timed.
7. Slowly turn flywheel clockwise until column of fuel in tool starts to move.
8. At this point fuel would be going in the injector nozzle. Check timing mark (12) and indicator (13) on the shroud to see that they are aligned.
    a. If timing mark on the flywheel is before the indicator on the shroud, injection pump timing is too fast. The fuel injection pump must be removed and additional gasket(s) must be added between the injection pump and the crankcase.
    b. If timing mark on the flywheel is after the indicator on the shroud, injection pump timing is to slow. The fuel injection pump must be removed and gasket(s) must be removed from between the injection pump and the crankcase.
9. Repeat steps 4 through 8 until timing is correct.
10. Adjust the other fuel injection pump by repeating steps 4 through 9.
11. Remove rubber band from control rod (8) and engine.

NOTE

Copper washers are used under the two socket head cap screws at the lower side of the fuel control cover.

12. Attach new gasket (7) to control rod cover (4) if previous gasket was discarded. Position control rod cover (4) on the crankcase. Install five socket head cap screws (1) and washers (2 and 3) attaching the control rod cover (4) to the crankcase.
13. Install nut (5) and washer (6) attaching the control rod cover (4) to the crankcase.
14. Install valve covers.

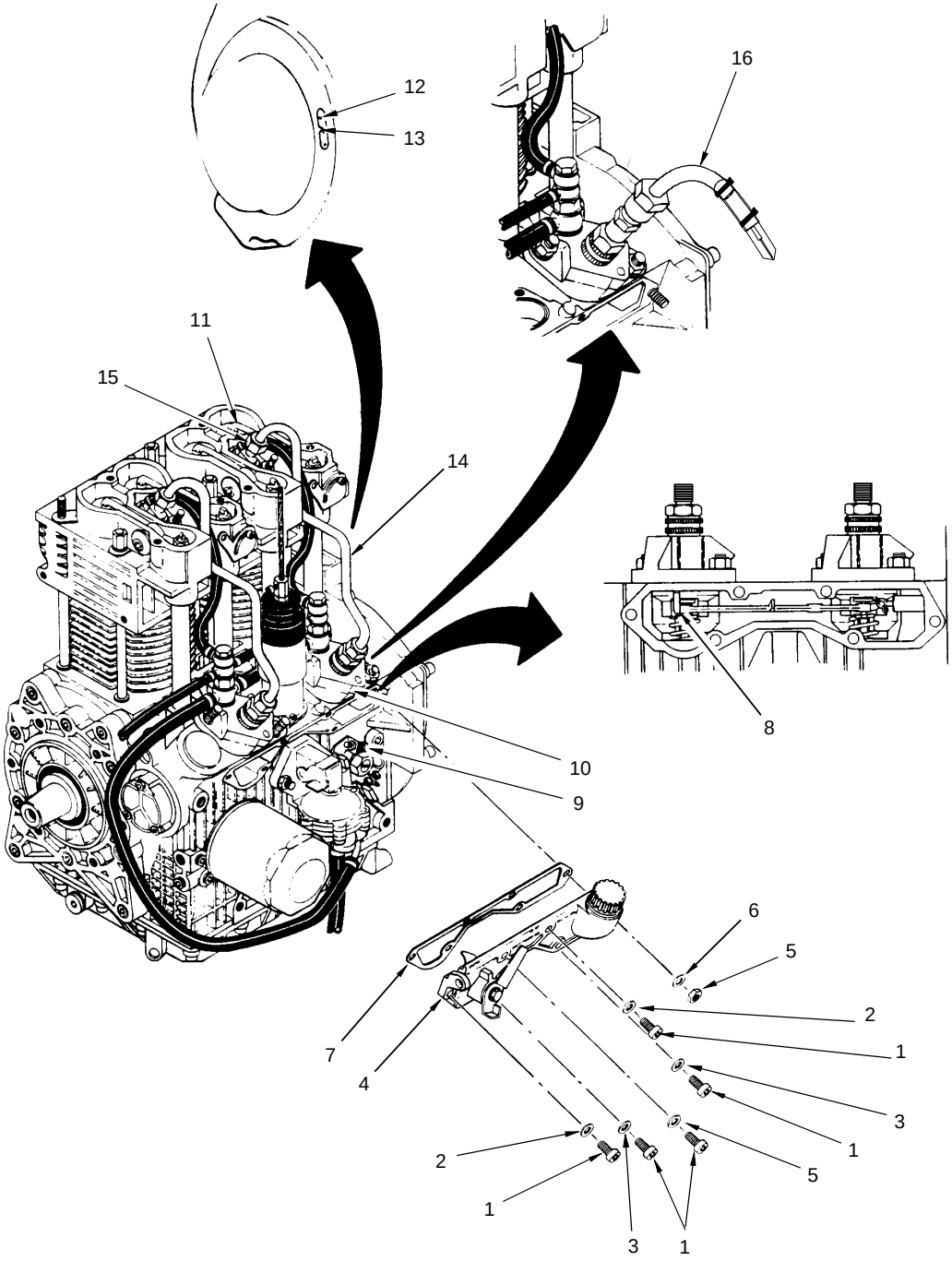


Figure 34. Fuel Injection Pump Timing Adjustment

ADJUST ENGINE INTAKE AND EXHAUST VALVES (Refer to Figure 35.)

This procedure applies to either cylinder head.

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required:
Gasket (WP 0117 00, Item 50)

Equipment Condition:
Pumping assembly shutdown

1. Remove the three socket head screws (1) that secure each valve cover (2). Remove valve cover and gasket (3) from each cylinder head. Discard gaskets (3).
2. Lower pulley guard.

NOTE

To adjust valves, piston must be at TDC on the compression stroke.

3. While holding decompression lever (4) in engaged position, rotate crankshaft (5) until intake valve (6) opens and closes. Continue to rotate to align timing mark (7) with indicator on shroud (8). Piston should be at TDC on the compression stroke.
4. Check intake valve clearance for 0.006 in. (0.15 mm) gap. Perform the following steps if adjustment is necessary. If valve clearance is satisfactory, repeat procedure for exhaust valve (9).
5. Loosen intake valve push rod retaining nut (10).
6. Turn push rod adjusting screw (11) to adjust intake valve (6) gap to 0.006 in. (0.15 mm).
7. Hold adjusting screw (11) in position and tighten push rod retaining nut (10).
8. Check valve clearance to ensure gap remains at 0.006 in. (0.15 mm). If gap has changed, repeat adjustment procedure.
9. Repeat procedure for exhaust valve (9).
10. Repeat entire procedure for both valves in other cylinder head.
11. Use gasket (3) and three socket head screws (1) to install valve covers (2).

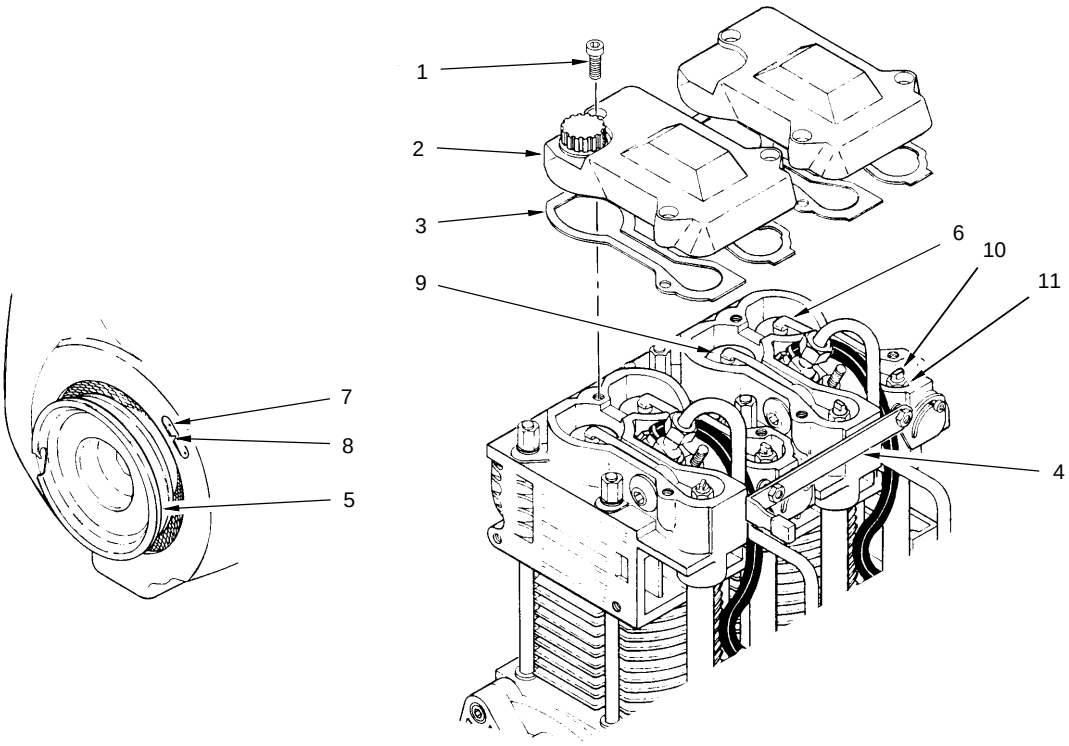


Figure 35. Valve Adjustment

INSTALL CASING (Refer to Figure 36.)

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(WP 0113 00, Item 1)

Materials/Parts Required
None

Equipment Condition:
Fuel injection pump adjusted
or
All maintenance complete

1. Thread fuel solenoid wire cable (1) through the black start control knob (2), position cylinder casing (3) on engine, and install and tighten the two socket head cap screws (4) and washers (5) that secure the casing to the cylinder heads (6).
2. Install cable clamp (7) on fuel solenoid cable.

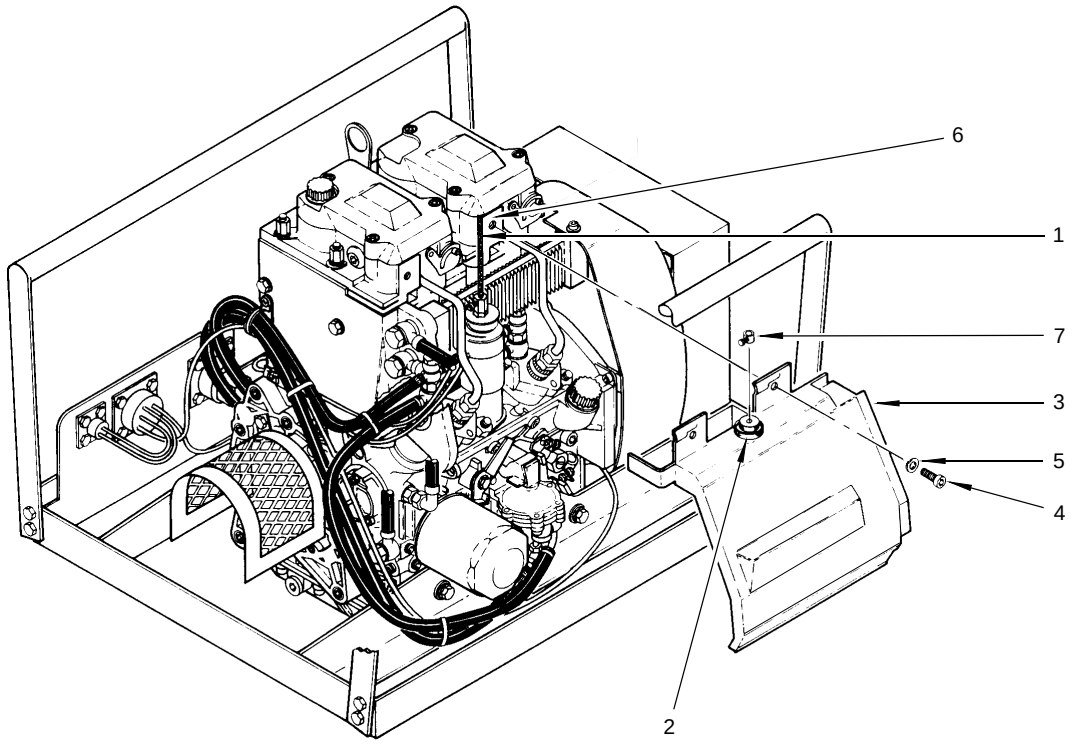


Figure 36. Casing Installation

END OF WORK PACKAGE

GENERAL SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
OVERHAUL FUEL TRANSFER PUMP PN 60975-7

INITIAL SET-UP:

Tools:

Wrench, Combination, 1/2”
(WP 0113 00, Item 1)
Wrench, Combination, 7/16”
(WP 0113 00, Item 1)
Key, Socket Head Screw, 9/64”
(WP 0113 00, Item 1)
Key, Socket Head Screw, 3/16”
(WP 0113 00, Item 1)
Strap Wrench (WP 0113 00, Item 3)
Wrench, Combination, 9/16”
(WP 0113 00, Item 1)
Wrench, Combination, 1-5/8”
(WP 0113 00, Item 1)
Screwdriver, Flat Blade, 1/8”
(WP 0113 00, Item 1)
Hammer, Ball Peen, 2 lb.
(WP 0113 00, Item 2)
Torque Wrench, 0-300 in. lb.
(WP 0113 00, Item 2)

Materials/Parts Required:

Anti-Seize Compound, Molybdenum Disulfide
(WP 0116 00, Item 6)
Petrolatum (WP 0116 00, Item 20)
O-Ring (WP 0117 00, Item 70)
O-Ring (WP 0117 00, Item 71)
O-Ring (WP 0117 00, Item 73)
O-Ring (WP 0117 00, Item 75)
O-Ring (WP 0117 00, Item 76)
O-Ring (WP 0117 00, Item 77)
O-Ring (WP 0117 00, Item 79)
O-Ring (WP 0117 00, Item 80)

Equipment Condition

Fuel transfer pump defueled
Fuel transfer pump removed from pump-engine module (WP 0034 00)
Quick disconnect fitting removed from pump (WP 0025 00)

DISASSEMBLY

1. Remove the three hex head screws (1) and flat washers (2) that secure the outlet (3) to the diffuser case (4). Lift the outlet (3) off the diffuser case (4).

2. Remove and discard O-rings (5) and (6).

NOTE

The flapper valve is a butterfly valve designed to open when fuel pump full flow has been attained. Before disassembly, note the orientation of the springs on the valve body and the valve body position in the pump outlet for assembly and installation. The springs appear to be identical when installed; the difference can be seen only when the springs have been removed. The springs are properly installed when the flapper valve matches the one shown in the figure inset. Use care not to lose any spacer when removing flapper valve assembly.

3. Remove flapper valve assembly (7, 8, 9, 10, and 11) by pushing down on outer pin (7) from the top, just enough so that the top of the outer pin (7) clear diffuser case (4) top outer pin hole. Pull the top of flapper valve assembly out far enough to push up on outer pin (7) from the bottom to clear diffuser case (4) bottom outer pin hole, using care not to lose any of the six small spacers (9), remove flapper valve assembly. Inspect flapper valve assembly for damage. Replace if damaged or otherwise unfit for use. Do not disassemble flapper valve (8) unless replacement is required. Refer to WP 0088 00 for flapper valve disassembly and assembly.

DISASSEMBLY – Continued

NOTE

The check valve seat is a tight fit but can be removed by hand. It is not secured by any type of fastener.

4. Remove the inner pin (12) and the check valve seat (13). Inspect the check valve seat (13) for damage. Replace if damaged or otherwise unfit for use.

5. Remove and discard O-ring (14) from check valve seat (13).

6. Mark the bearing housing assembly (15) and diffuser case (4) for reassembly. Remove the eight hex head screws (16) and flat washers (17) that secure the bearing housing assembly (15) to the diffuser case (4). Pull the bearing housing assembly (15) from the diffuser case (4).

7. Remove and discard O-rings (18) and (19).

8. Remove the six screws (20) and flat washers (21) that secure the shaft seal cap (22) to the bearing housing assembly (15). Remove the shaft seal cap (22).

9. Remove retainer ring (23) from shaft seal cap (22).

10. Push rotary seal (24) out of shaft seal cap (22).

11. Remove and discard O-ring (25).

12. With a 1-5/8” wrench across retainer (26) flats and a strap wrench on impeller (27), turn shaft (28) until end of retaining wire (29) is visible on face of retainer (26). Continue turning until retaining wire (29) is forced out of its groove and begins to feed itself outside retainer (26). (It may be helpful to lift end of retaining wire (29) with a small screwdriver.) Continue turning until hidden end of retaining wire (29) detaches from anchor hole in shaft (28). Remove retainer (26) and retaining wire (29).

13. Install flex coupling and key on keyed end of shaft (28).

14. Hold flex coupling with strap wrench and loosen shaft nut (30) and flat washer (31).

15. Remove flex coupling and key from shaft (28).

16. Remove shaft nut (30), flat washer (31), impeller (27), and pin (32).

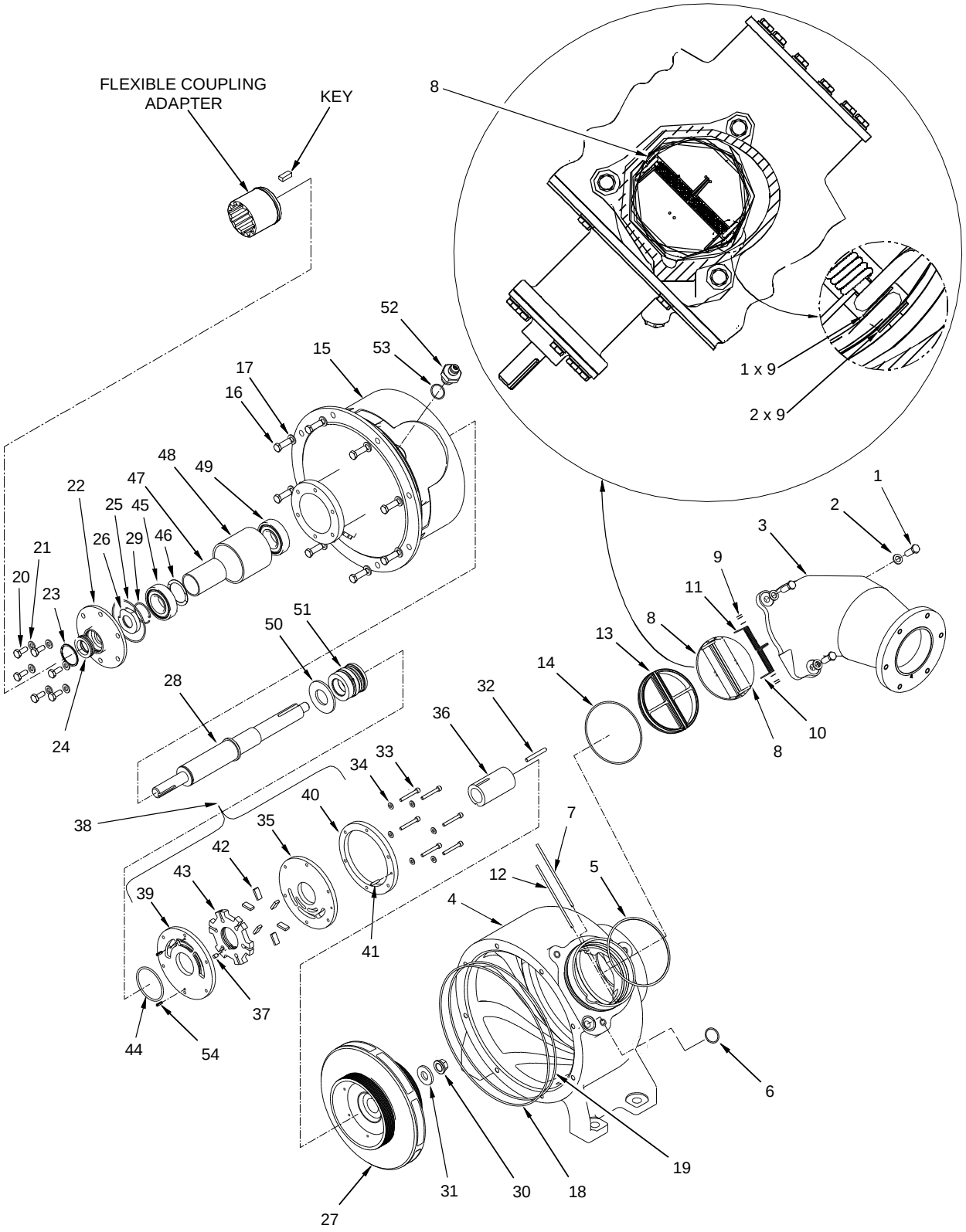
17. Remove the six socket head screws (33) and flat washers (34) that secure the inlet port plate (35).

18. Remove the drive sleeve (36) and rotor pin (37).

19. Remove the rotary vane pump (38) as an assembly. To prevent loss, do not remove index pins (54).

20. The inlet port plate (35), discharge port plate (39) and cam ring (40) are held together by pin (41). Rotate inlet port plate (35) around pin (41) to expose rotor vanes (42) and rotor (43). Remove and discard rotor vanes (42) from rotor (43).

21. Examine all parts of the rotary vane pump (38) for damage. Replace if required.


FLEXIBLE COUPLING ADAPTER
KEY
8
1 x 9
2 x 9
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27

DISASSEMBLY – Continued

22. Remove and discard O-ring (44) from bearing assembly housing (15).

23. The shaft assembly (28, 45, 46, 47, 48, 49, 50, and 51) is removed by forcing it out of the bearing housing assembly (15). Use a spare nut or a block of wood on threaded end of shaft (28), strike moderately to drive the shaft assembly from bearing housing assembly (15).

24. Remove bearing (45), wave washer (46) and spacers (47 and 48), bearing (49), slinger (50) and face seal assembly (51) from shaft (28).

25. Remove relief valve (52) from bearing assembly housing (15). Remove and discard O-ring (53) from relief valve (52).

ASSEMBLY

1. Place bearing housing assembly (15) in warming oven at 200 degrees for 30 minutes.

2. Assemble slinger (50), bearing (49), spacer (47), wave washer (46), spacer (48), and bearing (45) on shaft (28).

3. When the bearing housing assembly (15) has warmed, remove from oven. Install shaft assembly in bearing housing assembly (15), inserting from output end. Allow assembly to cool to ambient. Turn shaft by hand to verify freedom of rotation.

4. Rotate shaft (28) so that hole near bearing (45) is facing up.

5. Place retaining collar (26) against bearing (45) and align retaining wire hole in retaining collar (26) with the hole in the shaft (28).

6. Insert bent end of retaining wire (29) through hole in retaining collar (26) and into hole in shaft (28).

7. Install shaft nut (30) snugly on shaft (28).

8. Place 1-5/8” wrench on retaining collar (26) and a 9/16” wrench on shaft nut (30). Rotate shaft clockwise. Observe retaining wire (29). The wire should feed into the retaining collar as shaft is rotated. Continue rotating shaft (28) until retaining wire (29) is fully seated in retaining collar groove. A small portion of the wire end will still be visible. Using flex coupling, remove shaft nut (30) from shaft (28).

9. From inlet side, lubricate shaft (28) and bearing housing cavity with petrolatum.

10. Assemble carbon and metal cap part of the rotating face seal assembly (51) so that dimples match. Place the assemblage over the shaft (28) with the carbon seal on the bottom. Use two tongue depressors or equivalent non-metallic objects to press against metal cap to seat the seal fully against the bearing housing assembly (15).

11. Install spring and metal cap part of face seal assembly (51) over the shaft (28) to complete rotating face seal assembly (51).

12. Lightly lubricate and install O-ring (44).

13. Install discharge port plate (39) so that side with two alignment pin holes engages the index pins (54). Press down discharge port plate (39), adjusting position as required until plate engages index pins (54). Maintain this position until vane pump assembly is complete.

14. Install alignment pin (41) in discharge port plate (39).

15. Install cam ring (40) on alignment pin (41).

ASSEMBLY – Continued

16. Install rotor (43) inside cam ring (40).

17. Install drive sleeve (36) onto shaft (28). Ensure that the end with two grooves is facing the discharge port plate (39).

CAUTION

After rotor drive pin is installed, do not disturb position of drive sleeve. Rotor pin will fall into pump and damage pump at first attempt to operate.

18. Rotate rotor (43) or drive sleeve (36) to align notch in the rotor (43) with the largest of the two grooves on drive sleeve (36). Install rotor drive pin (37) in the aligned groove to engage rotor (43) to drive sleeve (36).

19. Install six vanes (42) in rotor (43).

20. Install inlet port plate (35) so that alignment pin hole engages alignment pin (41)

21. Press down on inlet port plate (35) and rotate until rotary vane pump assembly (38) engages two index pins (54). While holding in place, loosely install six socket head screws (33) and washers (34). Torque in crossing pattern to 20-25 in-lbs.

22. Rotate shaft (28) to align grove on drive sleeve (36) and shaft (28). Install pin (32) in drive sleeve (36) and shaft (28). Do not lift drive sleeve (36) or disturb position after pin (32) installation.

23. Install impeller (27), washer (31) and secure (hand tight) with shaft nut (30).

24. Install flexible coupling adapter and key on keyed end of shaft (28).

25. Position strap wrench around the flexible coupling as near to set screw as possible to hold shaft (28). Torque shaft nut (30) to 193-208 in-lbs.

26. Remove flexible coupling adapter and key from shaft (28).

27. Lightly lubricate and install O-ring (53) on relief valve (52). Install and tighten relief valve (52). Torque to 93-98 in-lbs.

28. Install rotary seal (24) in shaft seal cap (22) so that metal ring is visible (facing out).

29. Install retainer ring (23) in shaft seal cap (22).

30. Lightly lubricate and install O-ring (25) on shaft seal cap (22).

31. Install shaft seal cap (22) to bearing housing assembly (15). Install six hex head screws (20) and flat washers (21). Torque in a crossing pattern to 42-46 in-lbs.

32. Lubricate and install O-rings (18 and 19) on bearing housing assembly (15).

33. Align to previous marks and insert bearing housing assembly (15) in diffuser case (4).

34. Install the eight hex head screws (16) and flat washers (17) that secure the bearing housing assembly (15) to the diffuser case (4). Torque in a crossing pattern to 75-80 in-lbs.

35. Lubricate and install O-rings (5 and 6) on diffuser case (4).

ASSEMBLY – Continued

36. Lubricate and install O-ring (14) on check valve seat (13).

37. Lubricate the check valve seat (13) and insert in diffuser case (4), aligning slot in check valve seat (13) with pin holes in diffuser case (4).

38. Install pin (12) through holes in diffuser case (4) and slot in check valve seat (13).

39. Install flapper valve assembly in diffuser case (4). Ensure that small plastic spacers (9) are arranged as indicated with one spacer (9) captured by spring at each end and two spacers (9) outside spring at each end. Hold spacers (9) in place and adjust pin (7) to install first the lower end of pin (7) and then upper end of spring (7). Adjust pin (7) position as necessary to fit flush with diffuser case at either end.

40. Align bolt holes in outlet (3) and diffuser case (4), and install outlet (3) on diffuser case. Secure with three hex head screws (1) and flat washers (2). Torque to 75-80 in-lbs.

END OF WORK PACKAGE

CHAPTER 10

SUPPORTING INFORMATION
FOR
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM

OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1 SUPPORTING INFORMATION REFERENCES

REFERENCES

Scope

This work package lists all forms, pamphlets, field manuals, technical manuals and miscellaneous publications referenced in this manual. Also listed are publications that should be consulted for additional information.

Forms

DA Form 2028	Recommended Changes to Publications and Blank Forms
DA Form 2404	Equipment Inspection and Maintenance Worksheet
DA Form 5504	Maintenance Request
DA Form 2408-9	Equipment Control Record
SF 364	Report of Discrepancy
SF 368	Product Quality Deficiency Report
DA Form 285	U.S. Army Accident Report

Pamphlets

DA PAM 738-750	Functional User's Manual for the Army Maintenance Management System (TAMMS)
DA PAM 738-751	Functional User's Manual for the Army Maintenance Management System –Aviation (TAMMS - A)

Field Manuals

FM 1-104	Tactics, Techniques, and Procedures for Forward Arming and Refueling Points
FM 3-3	Chemical and Biological Contamination Avoidance
FM 3-4	NBC Protection
FM-3-5	NBC Decontamination
FM 10-20	Organizational Maintenance of Military Petroleum, Pipelines, Tanks, and Related Equipment
FM 10-67-1	Concepts and Equipment of Petroleum Operations
FM 10-69	Petroleum Supply Point Equipment and Operations
FM 10-564	Airdrop of Supplies and Equipment: Rigging Fuel Drums
FM 21-11	First Aid for Soldiers
FM 31-70	Basic Cold Weather Manual
FM 31-71	Northern Operations
FM 450-2	Army Helicopter Internal Load Operations

Technical Manuals

TM 750-244-3	Procedures for Destruction of Equipment to Prevent Enemy Use
TM 38-230-1	Packaging of Materiel: Preservation (Vol.1)
TM 10-4930-351-24P Special	Advanced Aviation Forward Area Refueling System (AAFARS) Repair Parts And Tools List (RPSTL)
TM 43-0139	CARC Painting

Regulations

AR 385-40	Accident Reporting and Records
AR 75-1	Malfunctions Involving Ammunition and Explosives
AR 750-1	Army Materiel Maintenance Policy and Retail Maintenance Operations
AR 700-138	Army Logistics Readiness and Sustainability

OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1 SUPPORTING INFORMATION MAINTENANCE ALLOCATION CHART (MAC) INTRODUCTION

INTRODUCTION

The Army Maintenance System MAC

This introduction provides a general explanation of all maintenance and repair functions authorized at various maintenance levels under the standard Army Maintenance System concept.

The MAC (immediately following the introduction) designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance levels, which are shown on the MAC in column (4) as:

Unit - includes two subcolumns, C (operator/crew) and O (unit) maintenance.

Direct Support - includes an F subcolumn.

General Support - includes an H subcolumn.

Depot - includes a D subcolumn.

The tools and test equipment requirements (immediately following the MAC) list the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from the MAC.

The remarks (immediately following the tools and test equipment requirements) contain supplemental instructions and explanatory notes for a particular maintenance function.

Maintenance Functions

Maintenance functions are limited to and defined as follows.

1. Inspect. To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination (e.g., by sight, sound or feel). This includes scheduled inspections and gagings and evaluation of cannon tubes.

2. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic or electrical characteristics of an item and comparing those characteristics with prescribed standards on a scheduled basis; i.e., load testing of lift devices and hydrostatic testing of pressure hoses.

3. Service. Operations required periodically to keep an item in proper operating condition; e.g., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids or gases. This includes scheduled exercising and purging of recoil mechanisms.

4. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.

5. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

6. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments of test, measuring and diagnostic equipment used in precise measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

7. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating or fixing into position a spare, repair part or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

8. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and assigned maintenance level is shown as the third position code of the Source, Maintenance, and Recoverability (SMR) code.

9. Repair. The application of maintenance services including fault location/troubleshooting, removal/installation, disassembly/assembly procedures, and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction or failure in a part, subassembly, module (component or assembly), end item or system.

NOTE

The following definitions are applicable to the “repair” function.

Services — Inspect, test, service, adjust, align, calibrate and/or replace.

Fault location/troubleshooting — The process of investigating and detecting the cause of equipment malfunction; the act of isolating a fault within a system or Unit Under Test (UUT).

Disassembly/assembly — The step-by-step breakdown (taking apart) of a spare/functional group coded item to the level of its least component that is assigned a SMR code for the level of maintenance under consideration (i.e., identified as maintenance significant).

Actions — Welding, grinding, riveting, straightening, facing, machining, and/or resurfacing.

10. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like-new condition.

11. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like-new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying Army equipment/components.

Explanation of Columns in the MAC

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 to the Next Higher Assembly (NHA).

Column (2) — Component/Assembly. Column (2) contains the item names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

Column (3) — Maintenance Function. Column (3) lists the functions to be performed on the item listed in column (2). (For detailed explanation of these functions, refer to “Maintenance Functions” outlined above.)

Column (4) — Maintenance Level. Column (4) specifies each level of maintenance authorized to perform each function listed in column (3) by indicating work time required (expressed as man-hours in whole hours or decimals) in the appropriate subcolumn. This work-time figure represents the active time required to perform that maintenance

function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance levels, appropriate work-time figures are shown for each level. The work-time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. The symbol designations for the various maintenance levels are as follows.

C — Operator or crew maintenance

O — Unit maintenance

F — Direct support maintenance

L — Specialized Repair Activity (SRA)

H — General support maintenance

D — Depot maintenance

NOTE

The “L” maintenance level is not included in column (4) of the MAC. Functions to this level of maintenance are identified by a work-time figure in the "H" column of column (4) and an associated reference code is used in the REMARKS column (6). This code is keyed to the remarks, and the SRA complete repair application is explained there.

Column (5) — Tools and Equipment Reference Code. Column (5) specifies, by code, those common tool sets (not individual tools), common Test, Measurement, and Diagnostic Equipment (TMDE), and special tools, special TMDE, and special support equipment required to perform the designated function. Codes are keyed to the entries in the tools and test equipment table.

Column (6) — Remarks Code. When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks table entries.

Explanation of Columns in the Tools and Test Equipment Requirements

Column (1) — Tools or Test Equipment Reference Code. The tool or test equipment reference code correlates with a code used in column (5) of the MAC.

Column (2) — Maintenance Level. The lowest level of maintenance authorized to use the tool or test equipment.

Column (3) — Nomenclature. Name or identification of the tool or test equipment.

Column (4) — National Stock Number (NSN). The NSN of the tool or test equipment.

Column (5) — Tool Number. The manufacturer's part number, model number, or type number.

Explanation of Columns in the Remarks

Column (1) — Remarks Code. The code recorded in column (6) of the MAC.

Column (2) — Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC.

OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
SUPPORTING INFORMATION
MAINTENANCE ALLOCATION CHART

Table 1. MAC for AAFARS M100A1

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
00	AAFARS								
01	Pump-Engine Module	Inspect	0.1						
		Service		0.5				2	
		Repair		0.5				2	
		Replace	0.1						B
0101	Engine Module Assembly	Inspect	0.1						
		Repair		0.5				2, 10	
		Replace	0.1						
010101	Engine, PN 532501	Inspect	0.1						
		Service		0.5				2	
		Adjust				0.5		2, 9	
		Repair		1.0		16.0		2, 4, 5, 6, 7, 8, 9	
		Replace				2.0		3	
010102	Cable Assembly W101	Inspect	0.1						
	(Engine Harness)	Replace		0.5				1	
010103	Cable Assembly W102	Inspect	0.1						
	(Starter Cables)	Replace		0.3				1	
0102	Pump, Fuel Transfer,	Inspect	0.1						
	PN 8424	Repair		0.3	1.0			2	
		Replace		0.5				1	

Table 1. MAC for AAFARS M100A1 – (Continued)

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
0102	Pump, Fuel Transfer,	Inspect	0.1						
	PN 60975-5	Repair		0.3		1.5		2	
		Replace		0.5				1	
0103	Subframe Assembly, Pump-	Inspect	0.1						
	Engine Module	Repair		0.5		0.5		1	C
0104	Frame Assembly, Pump-	Inspect	0.1						
	Engine Module	Repair			0.5				D
0105	Fuel System	Inspect	0.1						
		Repair		0.5				1	
		Replace		0.3				1	
0106	Exhaust System	Inspect	0.1						
		Repair		0.5				1	
		Replace		0.3				1	
0107	Unisex Coupling, 3 in.,	Inspect	0.1						
	Flange Mount	Repair	0.1	0.3	0.5			2	A
		Replace		0.3				1	
02	Filter-Separator, Liquid Fuel	Inspect	0.1					18	
		Service		0.5				1	
		Repair		0.5				2	
		Replace	0.1						B
0201	Unisex Coupling, 3 in,	Inspect	0.1						
	Flange Mount	Repair	0.1	0.3	0.5			2	A
		Replace		0.3				1	
0202	Unisex Coupling, 2 in,	Inspect	0.1						
	MNPT	Repair	0.1	0.3	1.0			2	A
		Replace		0.5				1	

Table 1. MAC for AAFARS M100A1 – (Continued)

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
03	Accessory Module	Inspect	0.1						
		Repair		0.3				2	
		Replace	0.1						B
0301	Battery	Inspect	0.1						
		Clean		0.3					
		Test		0.2				1	
		Replace		0.2					
0302	Cable Assembly, Control	Inspect	0.1						
	(W201)	Replace		0.1					
0303	Control Box Assembly	Test		0.3				1	
		Repair		0.5				1, 2	
		Replace		0.2				1	
030301	Control Panel Assembly	Test		0.3				1	
		Repair		1.0				1, 2	
0304	Cable Assembly, Battery	Test		0.1				1	
	Power	Repair		0.5				1	
		Replace		0.1					
04	Pump Assembly, Auxiliary	Inspect	0.1						
		Repair	0.1	0.5					
0401	Auxiliary Pump Assembly	Inspect	0.1	0.5					
		Repair		0.5				1,2	
		Replace	0.1						
0402	Unisex Coupling, 2 in.	Inspect	0.1						
		Repair	0.1	0.3	1.0			2	A
		Replace		0.5				1	
0403	Frame Assembly	Inspect	0.1						
		Repair				0.5			D
05	Nozzle Kit								

Table 1. MAC for AAFARS M100A1 – (Continued)

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
0501	Nozzle Assembly, CCR	Inspect	0.5						
		Repair			2.5			1, 11, 12, 13, 14	
0502	Nozzle Assembly, D-1	Inspect	0.5						
		Repair			1.5			1, 15, 16	
06	Discharge Hose Kit, PN 532602								
0601	Hose, 2 in. x 50 ft. Collapsible	Inspect	0.1						
		Test		0.3				10	
		Repair	0.1	0.3	1.0			1,9	A
		Replace	0.1						B
07	Discharge Hose Kit, PN 532606								
0701	Hose, 3 in. x 100 ft. Collapsible (3 x 2)	Inspect	0.1						
		Test		0.3				10	
		Repair	0.1	0.3	1.0			1,9	A
		Replace	0.1						B
08	Discharge Hose Kit, PN 532603								
0801	Hose, 2 in. x 50 ft./ 2 in. x 12 ft. Collapsible	Inspect	0.1						
		Test		0.3				10	
		Repair	0.1	0.3	1.0			1,9	A
		Replace	0.1						B
09	Discharge Hose Kit, PN 532607								

Table 1. MAC for AAFARS M100A1 – (Continued)

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
0901	Hose, 3 in. x 100 ft. Collapsible	Inspect	0.1						
		Test		0.3				10	
		Repair	0.1	0.3	1.0			1,9	A
		Replace	0.1						B
10	Discharge Hose Kit, PN 532604								
1001	Hose, 2 in. x 100 ft. collapsible	Inspect	0.1						
		Test		0.3				10	
		Repair	0.1	0.3	1.0			1,9	A
		Replace	0.1						B
11	Discharge Hose Kit, PN 532605								
1101	Hose, 2 in. x 100 ft. collapsible	Inspect	0.1						
		Test		0.3				10	
		Repair	0.1	0.3	1.0			1,9	A
		Replace	0.1						B
1102	Hose, 3 in. x 6 ft. collapsible	Inspect	0.1						
		Test		0.3				10	
		Repair	0.1	0.3	1.0			1,9	A
		Replace	0.1						B
12	Suction Hose Kit								
1201	Hose, 2 in. x 7 ft., Non-Collapsible	Inspect	0.1						
		Test		0.3				10	
		Repair	0.1	0.3	1.0			1,9	A
		Replace	0.1						B
13	Drum/Discharge Fitting Kit, PN 532612-01-01								
1301	Coupling, non-valved, 2 in. unisex to 2 in. male camlock	Inspect	0.1						
		Repair	0.1	0.3	1.0			1	A
		Replace	0.1						B

Table 1. MAC for AAFARS M100A1 – (Continued)

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
1302	Tee, 2 in. Unisex	Inspect	0.1						
		Repair	0.1	0.3	1.0			1	A
		Replace	0.1						B
14	Drum/Discharge Fitting Kit PN 532612-01-02								
1401	Cross, 2 in. Unisex	Inspect	0.1						
		Repair	0.1	0.3	1.0			1	A
		Replace	0.1						B
1402	Wye, 2 in. Unisex	Inspect	0.1						
		Repair	0.1	0.3	1.0			1	A
		Replace	0.1						B
1403	Elbow, 2 in. Unisex	Inspect	0.1						
		Repair	0.1	0.3	1.0			1	A
		Replace	0.1						B
1404	Manifold, Recirculation	Inspect	0.1						
		Repair	0.1	0.3	1.0			1	A
		Replace	0.1						B
15	Drum Adapter Kit								
1501	2 in. unisex to 2 in. male camlock	Inspect	0.1						
		Repair	0.1	0.3	1.0			1	A
		Replace	0.1						B
1502	2 in. unisex to 2 in. female camlock	Inspect	0.1						
		Repair	0.1	0.3	1.0			1	A
		Replace	0.1						B
1503	2 in. unisex to 3 in. male camlock	Inspect	0.1						
		Repair	0.1	0.3	1.0			1	A
		Replace	0.1						B
1504	2 in. unisex to 3 in. female camlock	Inspect	0.1						
		Repair	0.1	0.3	1.0			1	A
		Replace	0.1						B

Table 1. MAC for AAFARS M100A1 – (Continued)

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
1505	2 in. unisex to 4 in. male camlock	Inspect	0.1						
		Repair	0.1	0.3	1.0			1	A
		Replace	0.1						B
1506	2 in. unisex to 4 in. female camlock	Inspect	0.1						
		Repair	0.1	0.3	1.0			1	A
		Replace	0.1						B
16	Storage Module								
1602	Air Intake Assembly	Inspect	0.1						
		Repair		0.2				1	
1603	Manifold, Inlet, 2” Unisex	Inspect	0.1						
		Repair	0.1	0.3	1.0			1	A
		Replace	0.1						B
17	Fuel Drum, 500-gallon	Inspect	0.2						
		Repair	0.5	0.5					
18	Yoke, Towing	Inspect	0.2						
		Repair		1.0				1	
19	Pressure Control	Inspect	1.0						
		Adjust		0.2				17	
		Replace	0.5						
		Repair		3.0					
20	Container, TRICON	Inspect		0.3					
		Repair		0.5				1	
		Clean		0.5					
21	Frame, Fire Extinguisher	Inspect	0.1						
		Repair	0.1		0.5			1	D
22	Manual Starter	Inspect	0.1						
		Repair		1.0				1	
23	Misc. Kits	Inspect	0.1						
		Replace		1.0				18, 19, 20, 21	E

Table 2. Tools and Test Equipment For AAFARS

Tool or Test Equipment Ref Code	Maintenance Level	Nomenclature	National Stock Number	Tool Number
1	O	Tool Kit, General Mechanics: Automotive	5180-00-177-7033	SC5180-90-N26
2	O	Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance Common No. 1	4910-00-754-0654	SC4910-95-A74
3	F	Shop Equipment, Automotive Maintenance and Repair: Field Maintenance, Basic, less Power	4910-00-754-0705	
4	H	Flywheel Puller	5120-01-496-2392	7700365180020
5	H	Gear Extractor	5120-01-411-2234	7700365180890
6	H	Remover, Bearing and Bushing	5120-01-410-8262	7700365180900
7	H	Central Bearing Assembly Tool	5120-01-413-8731	7700365180910
8	H	Injection Advance Control Tool	5120-01-413-8732	770014600240
9	O	Tester, Thermostat	4910-01-023-7842	678
10	O	Wrench, Spring Retainer		MEPN 91-0501
11	F	Body Wrench	5120-01-391-5129	220281
12	F	Piston Compression Tool	5120-01-392-4141	220283
13	F	Locking Lug Assembly Tool	5120-01-397-4789	220284
14	F	Poppet Wrench	5120-01-393-6290	220329
15	F	Adapter, Pressure Fuel Servicing	1560-00-949-2087	MS24484-5
16	F	Shop Equipment, Electrical Repair	4940-00-294-9517	SC4940-95-CL-BO5
17	O	Pressure Gauge, 0-15 psi, 1/8” MNPT		3847K11
18	C	Fuel Test Kit	6630-01-515-5386	532636-01-01
19	C	Fuel Spill Control Kit	4325-01-515-4255	532635-01-01
20	C	Containment Berm	4325-20-517-1526	IBLR251512A
21	C	Grounding Rod Kit	5975-01-517-1526	532621-01-01

Table 3. Remarks for AAFARS

Remarks Code	Remarks
A	Operator replace unisex coupling face seal using seal from dust cap for temporary repair.
B	Replace defective assembly during mission.
C	Weld fractures in accordance with American Welding Society specification D1.2.
D	Weld fractures in accordance with American Welding Society specification D1.1.
E	Contents of Kits are in WP 2, Table 1.

OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1 SUPPORTING INFORMATION COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEM (BII) LISTS

INTRODUCTION

SCOPE

This work package lists COEI and BII for the AAFARS M100A1 to help you inventory the items for safe and efficient operation of the equipment.

GENERAL

The COEI and BII information is divided into the following lists:

Components of End Item (COEI). This list is for information purposes only and is not authority to requisition replacements. These items are part of the AAFARS M100A1. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Items of COEI are removed and separately packaged for transportation or shipment only when necessary. Illustrations are furnished to help you find and identify the items.

Basic Issue Items (BII). These essential items are required to place the AAFARS M100A1 in operation, operate it, and to do emergency repairs. Although shipped separately packaged, BII must be with the AAFARS M100A1 during operation and when it is transferred between property accounts. Listing these items is your authority to request/requisition them for replacement based on authorization of the end item by the TOE/MTOE. Illustrations are furnished to help you find and identify the items.

EXPLANATION OF COLUMNS IN THE COEI LIST AND BII LIST

Column (1) – Illus Number. Gives you the number of the item illustrated.

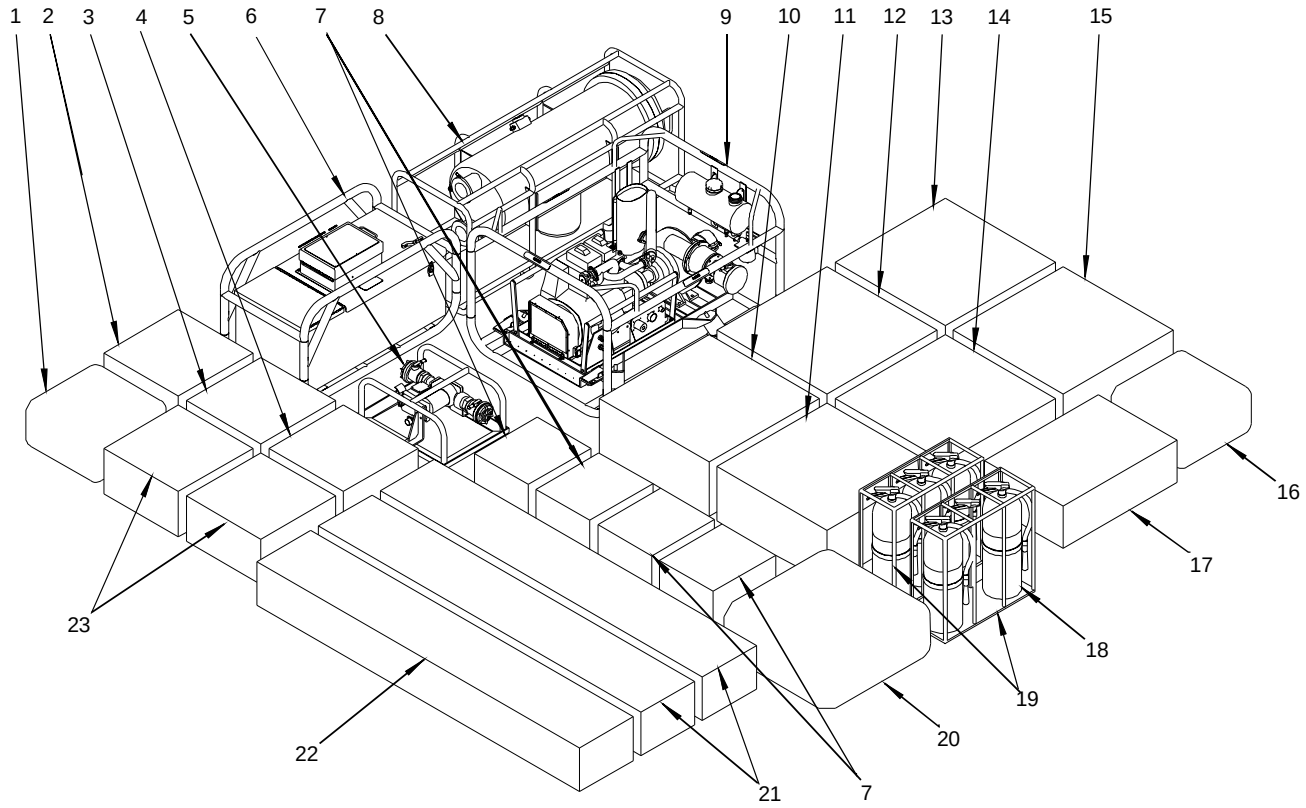
Column (2) – National Stock Number (NSN). Identifies the stock number of the item to be used for requisitioning purposes.

Column (3) – Description, CAGEC and Part Number. Identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The stowage location of COEI and BII is also included in this column. The last line below the description is the Commercial and Government Entity Code (CAGEC) (in parentheses) and the part number.

Column (4) – Usable On Code. When applicable, gives you a code if the item you need is not the same for different models of equipment.

Column (5) – Unit of Measure (U/M). Indicates the physical measurement or count of the item as issued per the National Stock Number shown in the column (2).

Column (6) – Qty Rqr. Indicates the quantity required.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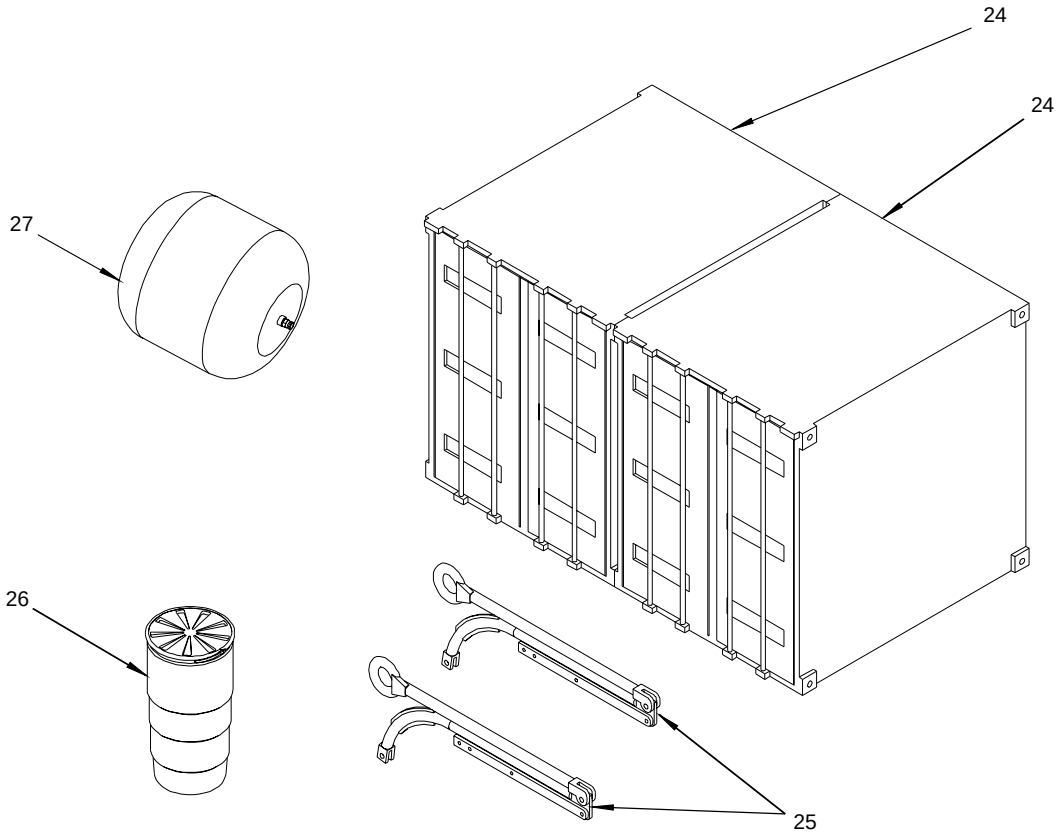
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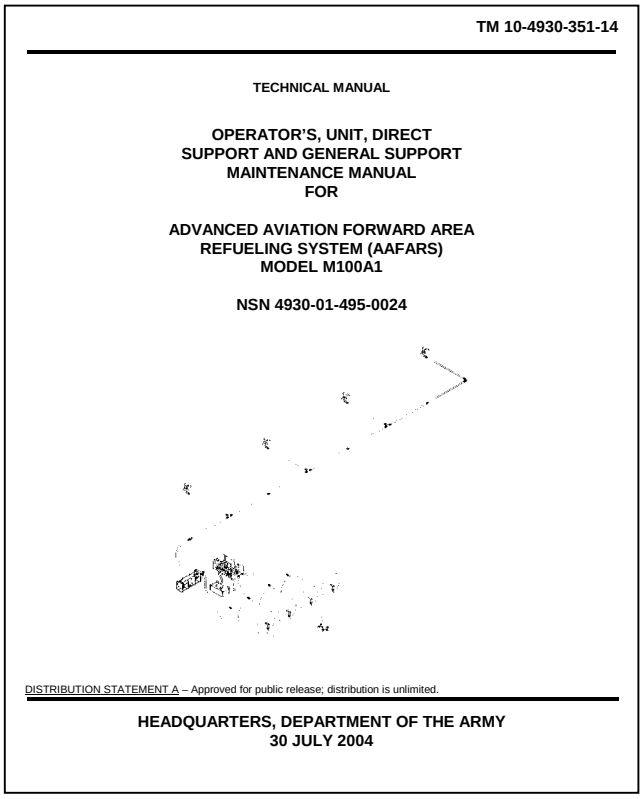
Table 1. Components of End Item List

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
1	6630-01-515-5386	FUEL TEST KIT (63631) 532636-01-01		EA	1
2	4720-01-517-1421	DISCHARGE HOSE KIT (63631) 532603-01-01		EA	1
3	4720-01-517-1423	DISCHARGE HOSE KIT (63631) 532602-01-01		EA	1
4	4930-01-517-1771	DRUM/DISCHARGE FITTING KIT (63631) 532612-01-02		EA	1
5	4320-01-517-1774	PUMP ASSY, AUXILIARY (DEFUELING) (63631) 532400-01-01		EA	1
6	2540-01-517-1769	ACCESSORY MODULE (63631) 532200-01-01		EA	1
7	4930-01-517-1773	NOZZLE KIT (63631) 532613-01-01		EA	4
8	4930-01-517-1775	FILTRATION MODULE ASSY (63631) 532300-01-01		EA	1
9	4320-01-515-4731	PUMP/ENGINE MODULE ASSEMBLY (63631) 532100-01-01		EA	1
10	4720-01-517-1425	DISCHARGE HOSE KIT (63631) 532604-01-01		EA	1
11	4720-01-517-1435	DISCHARGE HOSE KIT (63631) 532605-01-01		EA	1
12	4720-01-517-1431	DISCHARGE HOSE KIT (63631) 532607-01-01		EA	1
13	2540-01-517-1768	STORAGE MODULE (63631) 532622-01-01		EA	1
14	4720-01-517-1438	DISCHARGE HOSE KIT (63631) 532606-01-01		EA	1
15	8110-01-517-1772	DRUM ADAPTER KIT (63631) 532611-01-01		EA	1
16	2990-01-517-6249	MANUAL STARTER KIT (63631) 532801-01-01		EA	1
17	4930-00-855-8739	CONTROL ASSEMBLY, PRESSURE FILLING (97403) 13215E8372		EA	1
18	4210-01-515-4061	FIRE EXTINGUISHER (63631) 532071-01		EA	5
19	4210-01-517-1483	FRAME, FIRE EXTINGUISHER (63631) 532623-01-01		EA	2
20	4930-01-517-1770	DRUM/DISCHARGE FITTING KIT (63631) 532612-01-01		EA	1
21	4720-01-517-1452	SUCTION HOSE KIT (63631) 532601-01-01		EA	2
22	5975-01-517-1526	GROUNDING ROD KIT (63631) 532621-01-01		EA	1
23	4325-20-001-1867	SPILL CONTAINMENT UNIT, HAZARDOUS MATERIAL (0CAE9) IBLR251512A		EA	2
24	8145-01-475-9570	TRICON (09PD1) CMCI-101C		EA	2
25	8110-00-856-6243	TOW YOKE, DRUM (05476) 91070		EA	1
26	4235-01-515-4255	ASSEMBLY, FUEL SPILL CONTROL KIT (63631) 532635-01-01		EA	1
27	8110-01-515-4727	DRUM, 500 GAL (05476) 91146-14		EA	12

BASIC ISSUE ITEMS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TECHNICAL MANUAL

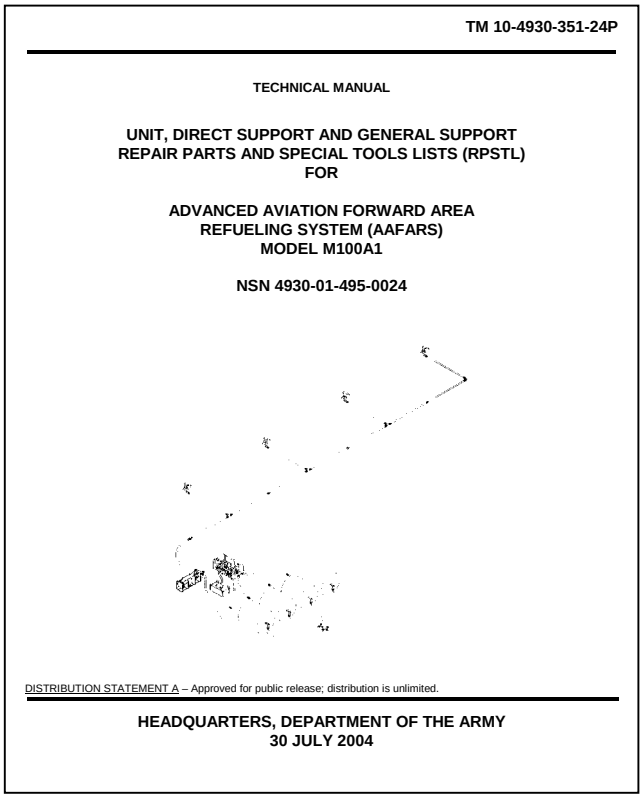
OPERATOR'S, UNIT, DIRECT
SUPPORT AND GENERAL SUPPORT
MAINTENANCE MANUAL
FOR

ADVANCED AVIATION FORWARD AREA
REFUELING SYSTEM (AAFARS)
MODEL M100A1

NSN 4930-01-495-0024

DISTRIBUTION STATEMENT A – Approved for public release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY
30 JULY 2004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TECHNICAL MANUAL

UNIT, DIRECT SUPPORT AND GENERAL SUPPORT
REPAIR PARTS AND SPECIAL TOOLS LISTS (RPSTL)
FOR

ADVANCED AVIATION FORWARD AREA
REFUELING SYSTEM (AAFARS)
MODEL M100A1

NSN 4930-01-495-0024

DISTRIBUTION STATEMENT A – Approved for public release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY
30 JULY 2004

Table 2. Basic Issue Item List

(1) ILLUS NO.	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) Usable On Code	(5) U/M	(6) QTY RQR
1		Operator's, Unit, Direct Support and General Support Maintenance Manual for Advanced Aviation Forward Area Refueling System (AAFARS). TM 10-4930-351-14		EA	1
2		Repair Parts and Special Tools List (RPSTL) for Advanced Aviation Forward Area Refueling System (AAFARS). TM 10-4930-351-24P		EA	1

OPERATOR, UNIT, DIRECT AND GENERAL SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
SUPPORTING INFORMATION
ADDITIONAL AUTHORIZATION LIST

There are no additional items authorized for the AAFARS.

OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1 SUPPORTING INFORMATION EXPENDABLE AND DURABLE ITEMS LIST

INTRODUCTION

Scope

This work package lists expendable and durable items that you will need to operate and maintain the AAFARS. This listing is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-790, Expendable/Durable Items (except medical, class V repair parts, and heraldic items) or CTA 8-100, Army Medical Department Expendable/Durable Items.

Explanation of Columns

Column (1), Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the item (e.g., "Use anti-seize compound item 5, WP 0116 00).

Column (2), Level. This column identifies the lowest level of maintenance that requires the item.

Column (3), National Stock Number (NSN). This is the national stock number assigned to the item, which you can use to requisition it.

Column (4), Item Name, Description, Commercial and Government Entity Code (CAGEC), and Part Number (P/N). This column provides the other information you need to identify the item.

Column (5), Unit of Measure (U/M). This code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

EXPENDABLE AND DURABLE ITEMS LIST

Table 1. Expendable and Durable Items List

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) ITEM NAME, DESCRIPTION, CAGE, AND PART NUMBER	(5) U/M
1	F	5350-00-867-7665	320 Grit Paper ..... (06565) DURITE320A	SH
2	F	6505-00-655-8366	Alcohol, Rubbing (IDZ38) Isopropyl Rubbing Alcohol.....	BT
3	H	7050-00-961-7663	Assembly Lube (Lubriplate) ..... (90536) ST40334	TU
4	O	7920-00-401-8034	Cloth, Lint Free ..... (81348) CCC-C-46	HD
5	C	8030-00-515-2477	Compound, Anti-seize	PT
6	O	6810-00-816-1025	Compound, Anti-Seize, Molybdenum Disulfide..... (81349) MIL-M-7866	BT

Table 1. Expendable and Durable Items List - Continued

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) ITEM NAME, DESCRIPTION, CAGE, AND PART NUMBER	(5) U/M
7	O	8030-00-546-8637	Compound, Corrosion Preventive (81349) M81309-B2	PG
8	H	5350-00-193-7227	Compound, Lapping and Grinding	LB
9	O		Compound, Sealing (77247) MIL-S-45180	TU
10	O		Compound, Sealing (81349) MIL-S-7916	TU
11	O	9150-00-119-9291	Compound, Silicone (81349) MIL-G-4343	TU
12	O		Compound, Silicone (81349) MIL–S-8660	TU
13	O	6850-01-331-3349	Dry Cleaning Solvent (81348) MIL-PRF-680	CN
14	O	6850-01-377-1809	Dry Cleaning Solvent (81348) P-D-680, Type II	GL
15	O	3439-01-463-9544	Flux, Soldering, HF1189	
16	O		Grease, P-13, MIL-G-10924	
17	O	9150-01-152-4117	Oil, Lubricating, Engine (+5° F [-15° C] to +120° F [49° C]) MIL-L-2104 OE/HDO-15/40 (SAE 15W-40)	GL
18	O		Oil, Preservative, Grade PE-10 MIL-PRF-21260E	GL
19	O		Oil, Preservative, Grade PE-15W-40 MIL-PRF-21260E	GL
20	O	9150-00-250-0926	Petrolatum VV-P-236 (81348)	PG
21	C	7920-00-295-1711	Rags, Wiping (58536) A-A-531	LB
22	H	7510-00-285-1787	Rubber Band	HD
23	O		Sealant, Polyurethane, Tube (38650) 221	EA
24	O	8030-01-329-6338	Sealant, Thread, Multipurpose (61078) LH-150	EA
25	O	3439-01-415-2258	Solder, Paste SN63PB37 (81348)	EA
26	O		Sodium Bicarbonate, A-A-374	BX
27	O	5975-00-984-6582	Strap, Tiedown (96906) MS3367-1-0	EA
28	O	5975-00-903-2284	Strap, Tiedown (96906) MS3367-4-0	HD
29	O		Tags, Electrical	HD
30	O		Tape, Electrical	RL
31	O		Tape, Filament, ASTM-D5330	RL
32	O		Tape, Teflon (3A054) 6802K55	RL
33	O	9505-00-221-2650	Wire, Nonelectrical (Safety Wire, 0.020 in. [0.51 mm]) (96906) MS20995C20	LB

OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE
ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1
SUPPORTING INFORMATION
MANDATORY REPLACEMENT PARTS LIST

Table 1. Mandatory Replacement Parts List

Item No.	Part Number/CAGEC	NSN	Nomenclature	Qty Req
1	000U-Z-001-2 (51744)		Washer, Seal	1
2	100F0790 (08915)	5330-01-435-3780	Gasket, Inlet Flange	1
3	1029-00 (09PD1)	5330-01-503-4873	Set, Seal	1
4	1030-00 (09PD1)	5330-01-503-4883	Carrier, Long	3
5	1031-00 (09PD1)	5330-01-503-4885	Carrier, Short	4
6	1200F6505 (08915)	5330-01-435-3786	Gasket, Rotor Cover	1
7	1200KTF6446 (08915)	5330-01-435-3782	Shaft Seal Assembly	1
8	13216E9176 (97403)	5330-01-109-1369	Gasket	1
9	13217E5363 (97403)	5330-00-235-4716	Gasket, Sight Gauge	1
10	207792 (0DT23)	5331-01-246-7351	O-Ring	1
11	207807 (0DT23)	5330-01-247-1080	Seal	2
12	210189 (0DT23)	5360-01-338-0240	Spring	1
13	220083-1 (0DT23)		Seal, Sleeve	3
14	220094-1 (0DT23)		Seal, Wiper	1
15	220101 (0DT23)		Bushing	2
16	220146 (0DT23)	5330-01-433-9203	Seal	2
17	220157 (0DT23)	5330-01-456-9662	Seal, Upstream	1
18	220158 (0DT23)	5330-01-456-9663	Seal, Downstream	1
19	220464 (0DT23)		Bushing	3
20	220465 (0DT23)	5330-01-458-5461	Seal	1
21	220466 (0DT23)	3120-01-456-3926	Bushing	1
22	220724-007 (0DT23)		O-Ring	1
23	220768 (0DT23)		Piston	1
24	220777 (0DT23)		Nut	1
25	220778 (0DT23)		Ring, Backup	1
26	220779 (0DT23)		Seal, Teflon	1
27	23893 (0DT23)	4930-01-053-0187	Seal	1
28	24059 (0DT23)	5365-01-053-0186	Seal Spacer	1

Table 1. Mandatory Replacement Parts List (Continued)

Item No.	Part Number/CAGEC	NSN	Nomenclature	Qty Req
29	24085 (0DT23)	5330-01-053-0221	Seal	2
30	3/8 IN LOCK WASHER (61604)		Washer, Lock, Stainless Steel, 3/8 Inch	6
31	415MC-212-GC (0DT23)		Seal	1
32	51710 (0MFN7)		Nut, Metric, Self-Locking	2
33	532574-01 (63631)		O-Ring	2
34	5806-21-3 (0DT23)		Wave Washer	2
35	75-07 (09PD1)		Rivet	70
36	7701601 (62445)	5325-01-396-2274	Clip, Retaining	1
37	7712125 (62445)	5330-01-396-5884	Oil Seal	1
38	7717525 (62445)	4330-01-331-2704	Filter, Oil	1
39	7731031 (62445)	3120-01-397-0872	Bearing	1
40	7731077 (62445)	3120-01-396-8425	Bearing	2
41	7731657 (62445)		Bearing	1
42	7745059 (62445)	5330-01-393-2902	Gasket, Timing Cover	1
43	7745062 (62445)	5330-01-396-8052	Gasket, Intake Manifold	2
44	7745067 (62445)	5365-01-406-6401	Gasket	2
45	7745076 (62445)		Gasket, Fuel Pump	1
46	7745108 (62445)	5330-01-393-2897	Gasket	1
47	7745115 (62445)	5330-01-459-2063	Gasket	1
48	7745122 (62445)		Gasket, Pan	1
49	7745124 (62445)		Gasket, Exhaust Manifold	2
50	7745131 (62445)		Gasket	2
51	7745173 (62445)		Gasket, Cylinder	2
52	7757901 (62445)		O-Ring	1
53	7757912 (62445)	5330-01-396-5886	O-Ring	4
54	7757949 (62445)		O-Ring	1
55	7757978 (62445)		O-Ring	1
56	7757979 (62445)		O-Ring	1
57	7775407 (62445)		Washer	2
58	7775409 (62445)	5310-01-397-5142	Washer, Copper	4
59	7775434 (62445)		Washer, Copper	2
60	7775435 (62445)	5330-01-313-7899	Washer, Copper	2
61	7775438 (62445)		Washer, Copper	3

Table 1. Mandatory Replacement Parts List (Continued)

Item No.	Part Number/CAGEC	NSN	Nomenclature	Qty Req
62	7775439 (62445)	5310-01-357-5762	Washer, Copper	2
63	7775450 (62445)		Washer, Copper	2
64	7777105 (62445)		Washer, Lock	1
65	7777111 (62445)	5310-01-422-0728	Washer	4
66	964205 (19328)		Lug, Spade, Female	1
67	964305 (19328)		Lug, Spade, Male	1
68	B13215E4219 (97403)		Seal	1
69	LP526C1024R8 (0DT23)		Screw	1
70	M25988/1-018 (81349)	5331-00-328-9131	O-Ring	1
71	M25988/1-036 (81349)	5331-00-364-9762	O-Ring	1
72	M25988/1-040 (81349)	5331-01-244-2274	O-Ring	2
73	M25988/1-134 (81349)	5331-01-007-1600	O-Ring	1
74	M25988/1-145 (81349)	5331-01-010-2419	O-Ring	1
75	M25988/1-152 (81349)	5331-00-498-5806	O-Ring	1
76	M25988/1-171 (81349)	5331-01-281-6513	O-Ring	1
77	M25988/1-172 (81349)	5331-01-424-0680	O-Ring	1
78	M25988/1-235 (81349)	5331-01-007-4899	O-Ring	2
79	M25988/1-240 (81349)	5331-00-279-9351	O-Ring	1
80	M25988/1-908 (81349)	5331-00-279-9322	O-Ring	1
81	M83461/1-207 (81349)	5331-01-458-5562	O-Ring	2
82	MS1633-1031 (96906)		Retaining Ring	1
83	MS1633-1031 (96906)		Retaining Ring	2
84	MS1634-1062 (96906)		Retaining Ring	2
85	MS16697-69 (96906)		Screw	1
86	MS16997-78L (96906)	5305-01-189-3761	Capscrew	1
87	MS20604R4W2 (96906)	5320-01-359-4667	Rivet, 0.125 dia	AR
88	MS21042-4 (96906)	5310-00-807-1468	Nut, Self-Locking	1
89	MS21043-04 (96906)	5310-00-844-4872	Nut, Self-Locking	2
90	MS21043-05 (96906)	5310-00-881-0944	Nut, Self-Locking	6
91	MS21044C4 (96906)	5310-00-889-2589	Nut, Self-Locking	4
92	MS24665-1013 (96906)	5315-01-025-4510	Cotter Pin	1
93	MS24665-302 (96906)	5315-00-234-1864	Cotter Pin	1
94	MS27028-9 (96906)	4730-00-869-5246	Dust Cap	1

Table 1. Mandatory Replacement Parts List (Continued)

Item No.	Part Number/CAGEC	NSN	Nomenclature	Qty Req
95	MS27029-9 (96906)	4730-00-823-5316	Dust Plug	1
96	MS27030-5 (96906)	5330-00-360-0595	Gasket	1
97	MS28774-017 (96906)	5330-00-833-4210	Back-up Ring	1
98	MS29512-03 (96906)	5330-00-263-8011	O-Ring	1
99	MS29512-03 (96906)	5330-00-263-8011	O-Ring	2
100	MS29513-008 (96906)	5331-00-248-3833	O-Ring	2
101	MS29513-008 (96906)	5331-00-248-3833	O-Ring	4
102	MS29513-009 (96906)	5330-00-248-3834	O-Ring	2
103	MS29513-010 (96906)	5330-00-248-3835	O-Ring	1
104	MS29513-014 (96906)	5330-00-248-3840	O-Ring	2
105	MS29513-014 (96906)	5330-00-248-3840	O-Ring	4
106	MS29513-016 (96906)	5330-00-248-3845	O-Ring	1
107	MS29513-016 (96906)	5330-00-248-3845	O-Ring	2
108	MS29513-028 (96906)		O-Ring	1
109	MS29513-028 (96906)		O-Ring	3
110	MS29513-125 (96906)	5331-00-265-1089	O-Ring	1
111	MS29513-126 (96906)	5331-00-265-1076	O-Ring	2
112	MS29513-133 (96906)	5330-00-291-7384	O-Ring	1
113	MS29513-134 (96906)	5330-00-641-0119	O-Ring	1
114	MS29513-136 (96906)	5331-00-291-7295	Packing, Preformed	1
115	MS29513-141 (96906)	5330-00-527-8555	O-Ring	1
116	MS29513-147 (96906)	5331-00-531-4588	O-Ring	1
117	MS29513-157 (96906)	5330-00-182-3170	O-Ring	1
118	MS29513-160 (96906)	5330-00-860-2395	O-Ring	1
119	MS29513-175 (96906)	5330-00-172-6348	O-Ring	1
120	MS29513-226 (96906)	5331-00-263-5173	Packing, Preformed	1
121	MS29513-228 (96906)		O-Ring	1
122	MS29513-229 (96906)	5331-00-291-3273	Quad-Ring	1
123	MS29513-234 (96906)	5330-00-251-9367	O-Ring	1
124	MS35338-137 (96906)	5330-00-933-8119	Washer, Lock	2
125	MS35338-137 (96906)	5330-00-933-8119	Washer, Lock	4
126	MS35338-139 (96906)	5310-00-933-8121	Washer, Lock	2
127	MS35338-140 (96906)	5310-00-974-6623	Washer, Lock	2
128	MS35338-140 (96906)	5310-00-974-6623	Washer, Lock	4

Table 1. Mandatory Replacement Parts List (Continued)

Item No.	Part Number/CAGEC	NSN	Nomenclature	Qty Req
129	MS35338-140 (96906)	5310-00-974-6623	Washer, Lock	10
130	MS35338-141 (96906)	5310-01-385-9419	Washer, Lock	2
131	MS35338-143 (96906)	5310-01-180-7157	Washer, Lock	4
132	MS51922-2 (96906)	5310-00-929-1807	Nut, Self-Locking	2
133	Q04188 (76700)	5331-01-459-2046	O-Ring	1
134	WAL0250S (51744)	5310-01-458-9990	Washer, Lock	2
135	WAL0375S (51744)	5310-01-458-4377	Washer, Split Lock	12
136	WAL0375SS (51744)	5310-01-458-9993	Washer, Split Lock	1
137	WAL0500SS (51744)	5310-01-459-1147	Washer, Split Lock	3

OPERATOR, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM MODEL M100A1 SUPPORTING INFORMATION GLOSSARY

Ballooning	Localized area of swelling on a fuel hose under pressure, indicating a weak area which may burst.
Bonding	Electrically connecting units before operations begin in order to equalize any static potential that might exist and to provide a continuous path for any static potential that might be generated after operations begin. Static potential is eliminated or prevented by grounding one or more of the bonded units.
Coalesce	To grow together. To unite into a whole. To cause small droplets of water to unite into larger drops.
Coalescer Element	A filter element designed to remove solid contaminants, and to break the emulsion of water in the pumpage into large droplets. The pumpage flows from the inside to the outside of the element.
Defective	Condition of a part that prevents the part from performing its intended function, caused by normal aging, accident or manufacturing imperfection.
Deterioration	Condition of a part caused by weathering, excessive heat, excessive cold, chemical action, etc.
Differential pressure	Difference between inlet and outlet pressure at a filter or pump. An increase of differential pressure indicates a restriction or blockage in the unit (e.g., a build up of sediment in a filter).
Discharge Hose	Collapsible hose used on the output (discharge) side of the fuel transfer pump.
Dry break	Separation of couplings without loss of fuel.
Emulsion	A dispersion of fine water droplets in the pumpage.
Energize	Apply electrical power.
Grounding	Connecting single or bonded units to a ground rod so that any static potential will be discharged into the earth. If two or more units are bonded and one is grounded, the entire system is effectively grounded.
Malfunction	Failure to operate in a normal manner.
Monitor	To observe a condition or operation such as that indicated by an indicator light or meter.
Pumpage	The fluid being pumped by the fuel transfer pump.
Separator Element	A filter element that repels coalesced water droplets. The pumpage flows from the outside to the inside of the element.
Suction Hose	Non-collapsible fuel hose used on the input (suction) side of the fuel transfer pump.

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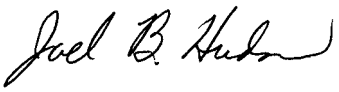
By Order of the Secretary of the Army:

PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

Official:



Administrative Assistant to the
Secretary of the Army
0413804

DISTRIBUTION: To be distributed in accordance with the Initial Distribution Number (IDN) 314125, requirements for TM 10-4930-351-14.

These are the instructions for sending an electronic 2028

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however, only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17 and 27.

From: **"Whomever" whomever@avma27.army.mil**
To: **tacom-tech-pubs@tacom.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:*** 55-1915-200-10
9. ***Pub Title:*** TM
10. ***Publication Date:*** 11-APR-88
11. ***Change Number:*** 12
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:*** 1
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 PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is OAASA	Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
TO: *(Forward to proponent of publication or form) (Include ZIP Code)*	**FROM:** *(Activity and location) (Include ZIP Code)*	

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM 10-4930-351-14	30 JULY 2004	OPERATOR'S, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL FOR (AAFARS) MODEL M100A1

ITEM	PAGE	PARA-GRAPH	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON

** Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

TO: *(Forward direct to addressee listed in publication)*	**FROM:** *(Activity and location) (Include ZIP Code)*	DATE

PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE
TM 10-4930-351-14	30 JULY 2004	OPERATOR'S, UNIT, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL FOR (AAFARS) MODEL M100A1

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III - REMARKS *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

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DA FORM 2028, FEB 74 REPLACES DA FORM 2028, 1 DEC 68, WHICH WILL BE USED. USAPA V3.01

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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

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

Liquid Measure

1 centiliter = 10 milliliters = .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

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	6.451	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