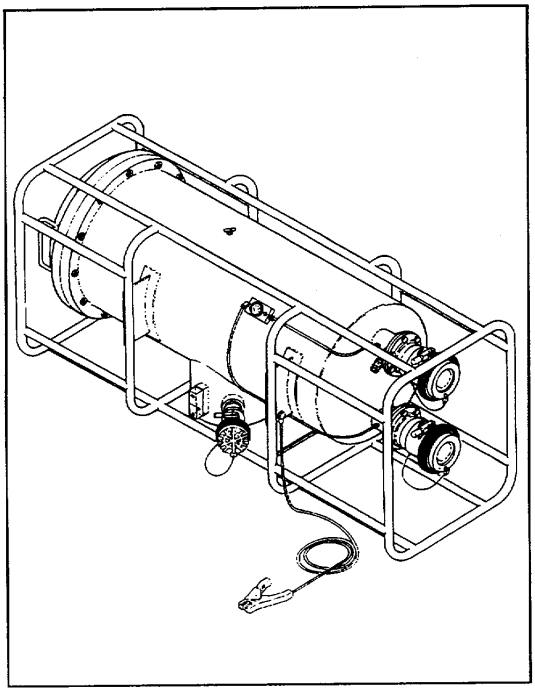
TECHNICAL MANUAL

OPERATOR'S, UNIT AND DIRECT SUPPORT MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST



FILTER-SEPARATOR, WATER, LIQUID FUEL FOR ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM (AAFARS) MODEL 872FS-Z001 NSN 4330-01-434-1824

HEADQUARTERS, DEPARTMENT OF THE ARMY

1 MARCH 1999

WARNING SUMMARY

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

FLAMMABLE FUEL

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.

Before operation be certain liquid fuel filter separator is correctly setup to avoid spillage of fuel. Do not allow any smoking within 50 feet of the fuel servicing areas. Post no smoking signs around the areas. Be certain a suitable fire extinguisher is present.

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. Do not allow smoking within 50 feet of the dispensing area. Post no smoking signs around the areas. Be certain the nozzle is properly bonded to the vehicle being filled. The vehicle being filled and the dispensing pump must be grounded. Be certain a suitable fire extinguisher is present and has been properly filled.

MODULE MOVEMENT

Serious injury could occur if the liquid fuel filter separator is moved/lifted without sufficient personnel to do the job. Always use four persons to move or relocate the liquid fuel filter separator.

SOLVENT HAZARD

Dry cleaning solvent, PD-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, 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. Flash point of solvent is 130° F. (54.4 degrees C).

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.

STATIC DISCHARGE

A static discharge between the liquid fuel filter separator and personnel could ignite the fuel or cause an explosion of fuel vapors. Do not operate until it has first been properly grounded to the vehicle.

ARCING

Radio transmitters can cause an arch at antennas. Do not ground nozzle to a radio antenna.

FIRST AID

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

TECHNICAL MANUAL
NO. 10-4330-237-13&P

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C.
1 MARCH 1999

OPERATOR'S, UNIT, AND DIRECT SUPPORT MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST FILTER-SEPARATOR, WATER, LIQUID FUEL FOR ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM (AAFARS) MODEL 872FS-Z001 NSN 4330-01-434-1824

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Submit your DA Form 2028-2 (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 email your letter, DA Form 2028, or DA Form 2028-2 direct to: Commander, U.S. Army Tank - automotive and Armaments Command, ATTN: AMSTA-AC-NML, Rock Island, IL 61299-7630. The email address is amsta-ac-nml@ria.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726.

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued) Page

Figure LIST OF ILLUSTRATIONS Page

HOW TO USE THIS MANUAL

Be sure you read all warnings before using your equipment.

This manual incorporates a quick reference tab feature that allows you to quickly locate the most often referenced subjects and topics appearing in this manual. The reference tab feature is composed of the following components:

Cover Index Page

Index boxes are located on the right-hand edge of the cover page. Each index box contains a subject title, page number, and black index tab.

Table of Contents

The Table of Contents lists all the major subjects contained in this manual. Subjects that are highlighted correspond to those that appear on the cover page index.

Page Numbers and Index Tabs

Each page of this manual is identified with a page number. Pages that contain the subjects identified on the cover page index also contain a black tab on the right edge of the page that aligns with the cover page index tab.

To use the quick reference tab feature, select the title of the subject you are trying to find from the cover page index. You can turn to the indicated page number or bend the pages back and locate the page tab that aligns with the cover index tab.

If the cover page index is lost or badly worn, page numbers and index tabs can be located by referring to the Table of Contents.

CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

1.1 SCOPE.

Type of Manual:	Operator's, Unit Level, and Direct Support Maintenance
Model Number and Name:	Advanced Aviation Forward Area Refueling System (AAFARS) Filter-Separator, Water, Liquid Fuel, P/N 13230E5875.
Purpose of Equipment:	To provide filtered fuel at a maximum flow rate of 240 gpm.

1.2 MAINTENANCE FORMS AND PROCEDURES.

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750 as contained in Maintenance Management Update.

1.3 CORROSION PREVENTION AND CONTROL.

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 Standard Form 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.

1.4 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.

1.5 DESTRUCTION OF MATERIEL TO PREVENT ENEMY USE.

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

1.6 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 us at:

Commander
U.S. Army Tank-Automotive and Armaments
Command, ATTN: AMSTA-TR-E/MPA Warren, Mi. 48397-50000.

We will send you a reply.

1.7 REFERENCE INFORMATION.

1.7.1 Nomenclature Cross-Reference.

Shortened nomenclature is used in this manual to make procedures easier for you to read. A cross-reference between the shortened nomenclature and the official nomenclature is shown in the following table.

Nomenclature Cross-Reference

Manual Nomenclature	Official Nomenclature
Liquid Fuel Filter-Separator	Filter-Separator, Water, Liquid Fuel

1.7.2 List of Abbreviations.

AAFARS	Advanced Aviation Forward Area Refueling System
C	Centigrade
CAGEC	Commercial and Government Entity Code
cm	centimeter
F	Fahrenheit
ft	foot
gpm	gallons per minute
in	inch
lb	pound
lpm	liters per minute
Max	Maximum
m	meter
mm	millimeter
PMCS	Preventive Maintenance Checks and Services
P/N	Part Number
psi	pounds per square inch
QTY	Quantity
SMR code	Source, Maintenance and Recoverability Code

1.7.3 Glossary.

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 unit 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).
Dry break	Separation of couplings without loss of fuel.
Emulsion	A dispersion of fine water droplets in the pumpage.
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.

Section II. EQUIPMENT DESCRIPTION

1.8 CHARACTERISTICS, CAPABILITIES AND FEATURES. (Refer to figure 1-1.)

a. Characteristics.

(1) Four person portable.

(2) Dry break unisex couplings (1).

b. Capabilities.

(1) Provides filtered fuel by removing impurities and water from fuel.

(2) Maximum flow rate of 240 GPM.

c. Features.

(1) Sight gauge (2).

(2) Differential pressure gauge (3).

(3) Sump (4).

(4) Sampling port (5).

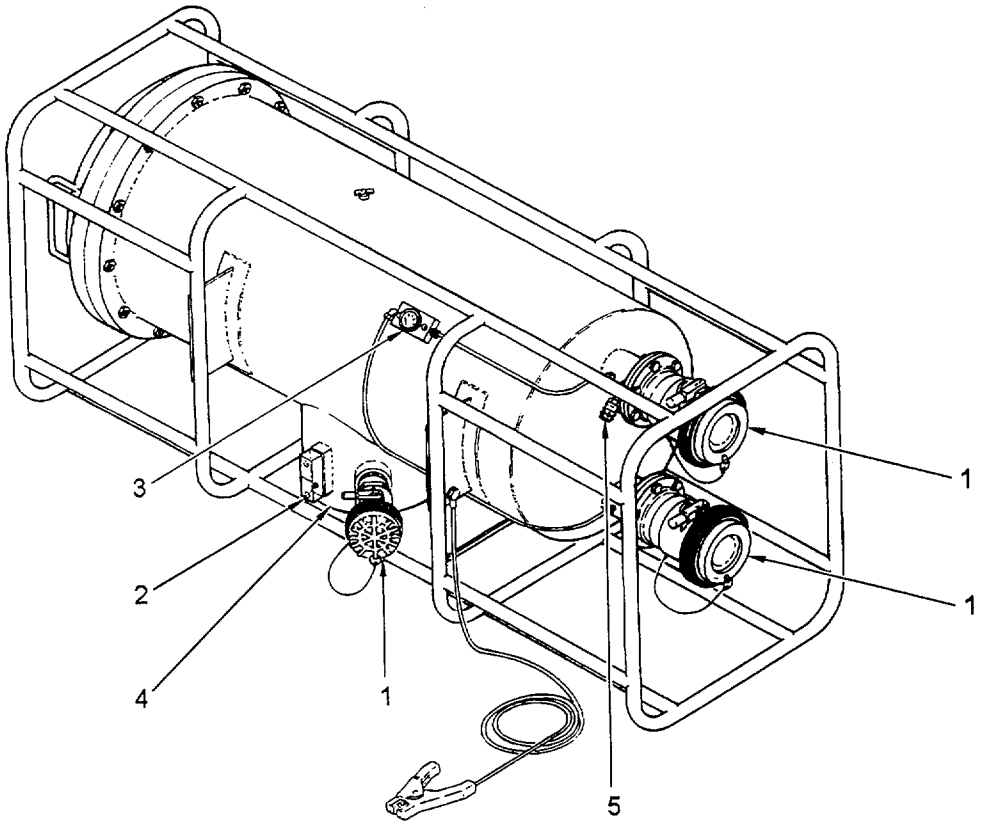


Figure 1-1. Advanced Aviation Forward Area Refueling System (AAFARS) Liquid Fuel Filter-Separator

1.9 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS. (Refer to figure 1-2.)

The liquid fuel filter-separator 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 1/4 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 (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).

1.10 EQUIPMENT DATA.

The following is a tabular presentation of physical and performance data required for operation and/or unit level maintenance.

Table 1-1. Equipment Data

Description	Quantity	Leading Particulars	
Liquid fuel filter-separator	1	Shipping Volume:	15.3 cu ft (0.43m^3)
		Weight (Dry):	137 lbs (62.1 kg)
		Weight (Drained):	147 lbs (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)

Section III. PRINCIPLES OF OPERATION

1.11 GENERAL FUNCTIONAL DESCRIPTION. (Refer to figure 1-2.)

The liquid fuel filter-separator houses a horizontal filter vessel (1) containing three coalescer elements (2) to remove particles from the pumpage and coalesce entrained water, and a separator (3) to remove the water drops from the pumpage. The coalescer elements (2) are arranged in the lower portion of the filter vessel (1) and the separator (3) is placed in the upper portion. The coalescer elements (2) are mounted to an inlet bulkhead (7) which creates an inlet chamber in the inlet/outlet (6 and 16) end of the filter vessel (1). The outlet port (16) passes completely through the chamber. Incoming pumpage impacts a diverter plate (5) which prevents the pumpage from forcefully impacting the lower coalescer elements and equalizes the pressure in the chamber. Pumpage flows from the inlet chamber to the inside of the coalescer elements (2) and through the elements into the filter vessel (1). As the pumpage passes through the coalescer elements (2) 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 (3), the force of gravity causes more particles to fall down to the sump (4). At the separator (3), the Teflon coated screen allows the fuel to pass but repels the relatively large water drops, which fall into the sump (4). The fuel flows from the outside to the inside of the separator (3) and out the filter vessel (1) outlet port (16).

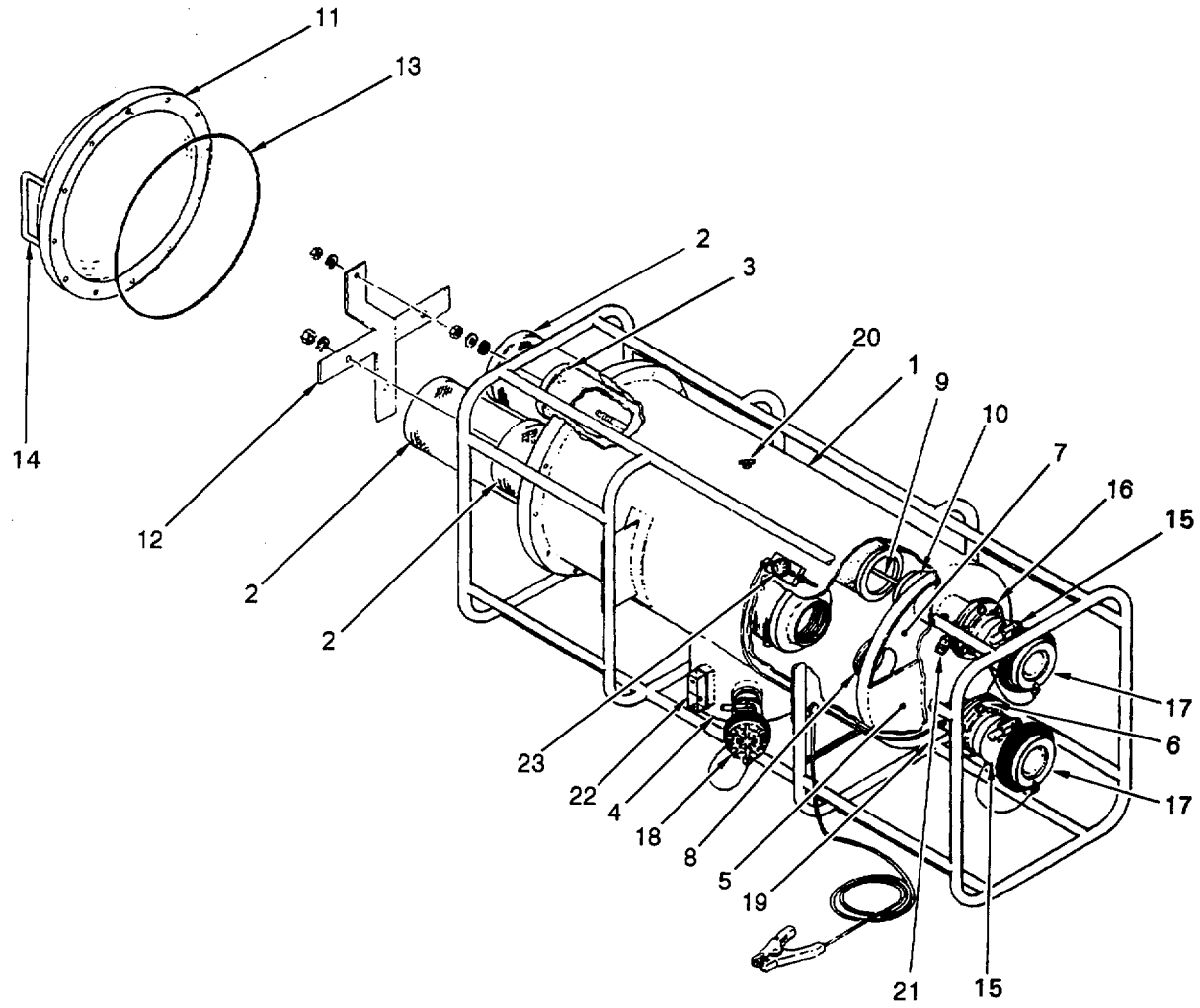


Figure 1-2. Liquid Fuel Filter-Separator Component Location

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

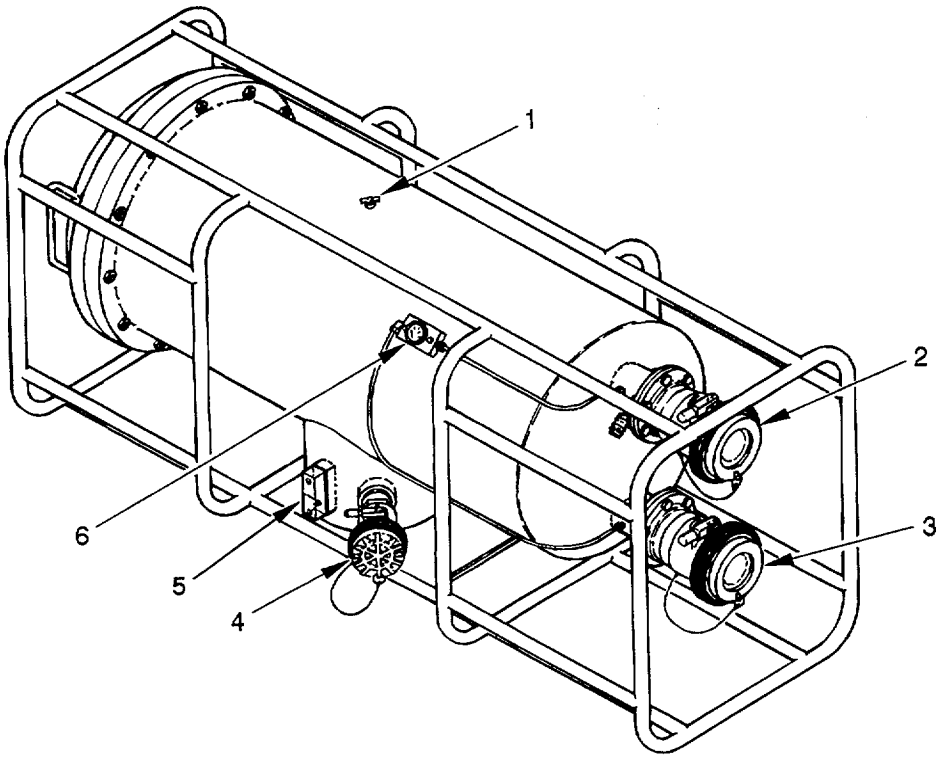


Figure 2-1. Liquid Fuel Filter-Separator

Table 2-1. Liquid Fuel Filter-Separator Controls and Indicators

No.	Name	Function
1	Vent Valve	Spring loaded valve. Depress to open, turn 1/4 turn to latch open. Depress, turn and release to close.
2	Outlet Coupling	Valved unisex coupling can be connected to any 3" unisex fitting to port fuel out of the liquid fuel filter-separator. Normally connected to recirculation manifold for delivery to fueling nozzles and recirculation to fuel drums.
3	Inlet Coupling	Valved unisex coupling can be connected to any 3" unisex fitting to port fuel into liquid fuel filter-separator. Normally connected to output of fuel transfer pump.
4	Defueling Coupling	Valved unisex coupling. Open to drain water from sump. Can be connected to any 2" unisex fitting to pump fuel out of liquid fuel filter-separator. Normally connected to the auxiliary pump during defueling operations.
5	Sight Gauge	Small ball in the gauge floats on water, not on fuel. Observe during operation to check accumulation of water in sump.
6	Differential Pressure Gauge	Indicates the pressure drop across the liquid fuel filter-separator.

Section II. OPERATOR'S PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2.1 GENERAL.

Preventive Maintenance Checks and Services (PMCS) involves systematic caring, inspection, and servicing of equipment to keep it in good condition and prevent breakdowns. Table 2-2 lists the liquid fuel filter-separator PMCS. 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. Table 2-2 organizes your PMCS tasks in chronological sequence. As the liquid fuel filter-separator operator, you should:

a. Perform your PMCS as scheduled in table 2-2. Always do your PMCS in the same order, so it gets to be a habit. Always assume explosive vapors are present at the liquid fuel filter-separator. Do not allow any smoking or spark producing equipment within fifty feet of the liquid fuel filter-separator 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 liquid fuel filter-separator 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 liquid fuel filter-separator 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.

WARNING

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

f. 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.

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.

2.2 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

- **Pumpage fuels contain additives that may be harmful to personnel and the environment. All leaks must be corrected as soon as possible. Wash fuel from skin immediately. Remove and wash contaminated clothing immediately. Spills of fuel 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.**

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.

2.3 PMCS PROCEDURES.

Table 2-2 lists the checks and services required to keep your liquid fuel filter-separator 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.

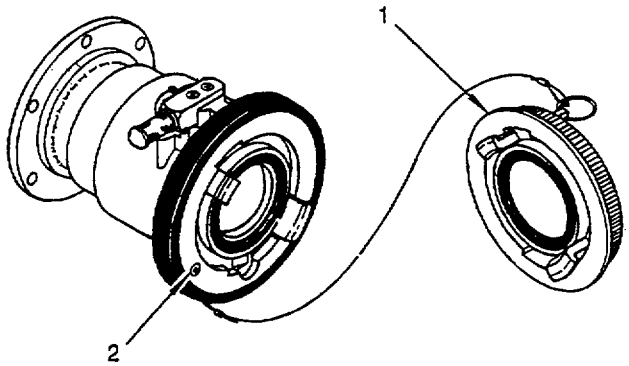
b. The "Interval" column tells you when to do a certain check or service.

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 liquid fuel filter-separator is not capable of performing its intended mission.

Table 2-2. Operator's Preventive Maintenance Checks and Services

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 liquid fuel filter-separator. 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 (15m) of the Pumping Assembly.**	
1	Before	Liquid fuel filter-separator	Inspect for physical damage that might prevent successful operation.	Physical damage will not allow normal operation of module.
2	Before	Liquid fuel filter-separator	Check bolts on inlet and outlet couplings. If any bolt or nut is loose, notify supervisor.	Any coupling is not securely tightened.
3	Before	Liquid fuel filter-separator ground cable assembly	Check that ground cable attachment screw and clamp are tightly fastened. If loose notify Unit Maintenance.	Ground cable connections are loose.
4	Before	Liquid fuel filter-separator unisex couplings	Remove the 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 in place.
5	During	Liquid fuel-filter separator	Drain water from sump to avoid freezing.	
6	During	Liquid fuel-filter separator	Periodically check for leaks, especially at unisex couplings, vessel end cover and sight gauge.	Any Class I, Class II or Class III fuel leak is found.

Section III. OPERATION UNDER USUAL CONDITIONS

2.4 SYSTEM ASSEMBLY AND PREPARATION FOR USE.

Refer to TM 10-4930-250-13&P for system assembly and preparation for use.

2.5 OPERATING PROCEDURES.

Refer to TM 10-4930-250-13&P for operating procedures.

2.6 DECALS AND INSTRUCTION PLATES.

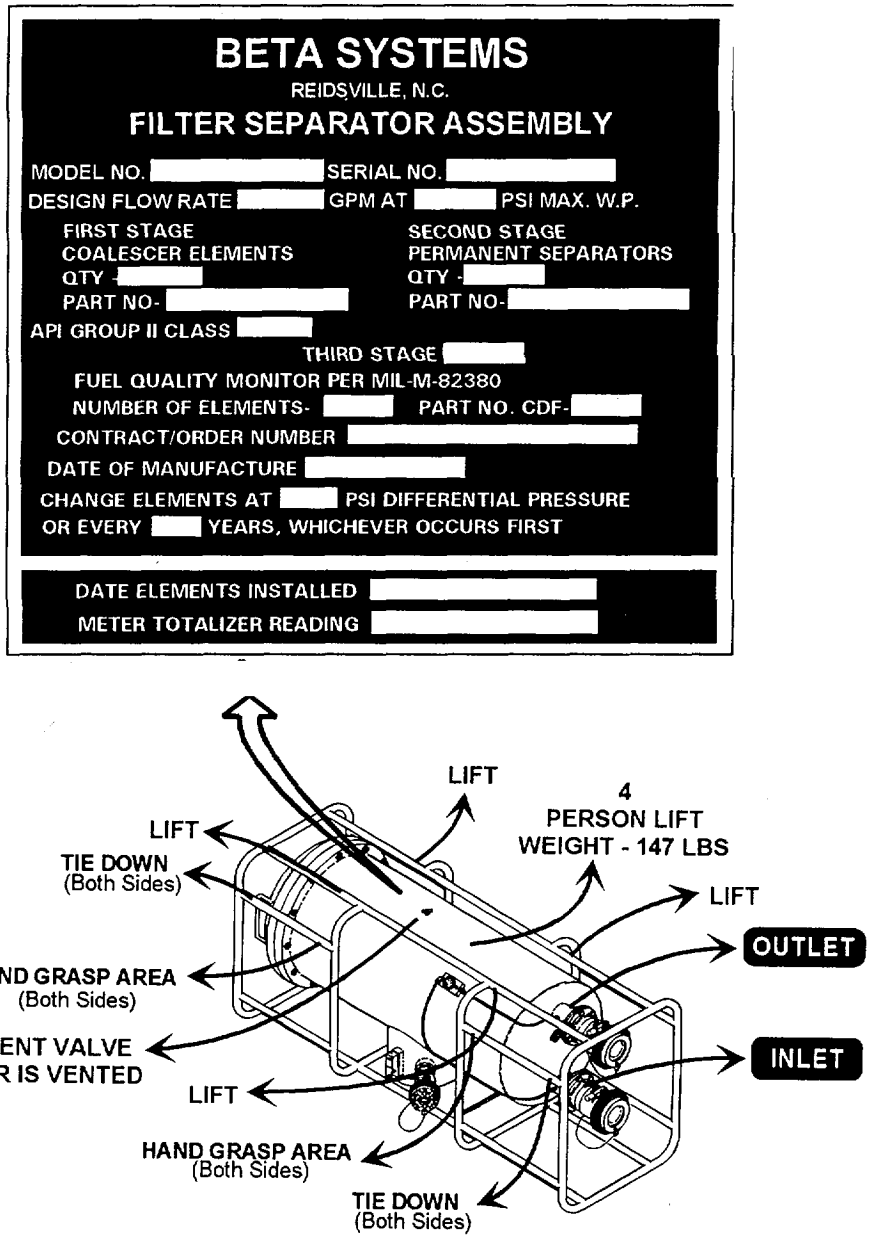


Figure 2-2. Decals and Instruction Plates

2.7 DEFUELING PROCEDURE.

Refer to TM 10-4930-250-13&P for defueling procedures.

2.8 PREPARATION FOR MOVEMENT.

Refer to TM 10-4930-250-13&P for preparation for movement procedures.

SECTION IV. OPERATION UNDER UNUSUAL CONDITIONS

2.9 OPERATION UNDER EXTREME ENVIRONMENTAL CONDITIONS.

2.9.1 Operation in Extreme Heat. Operation under conditions of high heat may cause equipment problems due to thermal expansion. Unisex coupling seals are especially subject to damage. Basic system operation is as described in TM 10-4930-250-13&P. The following additional steps and recommendations should be implemented to protect the system from direct sunlight to the extent possible.

a. Position system components in the shade of trees, buildings, etc. If shade is available only part of the day, choose afternoon shade.
b. Shade components with tarpaulins or other fabric. Keep fabric wet if possible. Do not block air circulation.
c. Shade components with leafy branches. Do not block air circulation.
d. Use any material available to create shade without blocking air circulation.

2.9.2 Operation in Extreme Cold. Operation under conditions of extreme cold may cause equipment problems due to loss of flexibility. Unisex coupling face seals are especially subject to damage. Basic system operation is as described in TM 10-4930-250-13&P. The following additional steps and recommendations should be implemented to protect the system to the extent possible.

a. Set up system in area protected from wind, if possible.
b. Handle all components with care to avoid cracking or fracture.
c. Remove snow or ice from coupling ends before making connections to prevent entry of foreign material into system.
d. Make and break connections slowly and carefully to avoid cracking or splitting of face seals.
e. Drain water from sump to avoid freezing.

2.9.3 Operation in Strong Winds.

a. Shield couplings during connection or disconnection to prevent entry of foreign material into system.
b. Keep dust caps in place on all disconnected couplings.

2.9.4 Operation Under Sandy or Dusty Conditions.

a. Shield couplings during connection or disconnection to prevent entry of foreign material into system.
b. Keep dust caps in place on all disconnected couplings.

2.9.5 Operation in Rain. Shield couplings during connection or disconnection to prevent entry of water into system.

2.10 EMERGENCY OPERATING PROCEDURES.

There are no specific emergency operating procedures for the liquid fuel filter-separator. Operate in accordance with normal operating procedures as long as possible.

2.11 NBC DECONTAMINATION.

Detailed decontamination procedure can be found in FM 3-3, FM 3-4 and FM 3-5. Check with local decontamination team.

CHAPTER 3

OPERATOR MAINTENANCE

Section I. LUBRICATION INSTRUCTIONS

No lubrication is required.

Section II. TROUBLESHOOTING PROCEDURES

3.1 OPERATOR TROUBLESHOOTING.

Troubleshooting table 3-1 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 3-1. TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. Unisex coupling leaks at interface with dust cap or other coupling.
Step 1. Inspect coupling face seal for foreign matter.
Wipe face seal clean.
Step 2. Inspect coupling and dust cap face seals for physical damage or wear.
Replace damaged or worn face seal. Refer to paragraph 3.2.

Section III. OPERATOR MAINTENANCE PROCEDURES

3.2 REPLACE UNISEX COUPLING FACE SEAL/DUST CAP SEAL.

This procedure applies to both 2-inch and 3-inch unisex couplings. The seal in each adjacent coupling face and dust cap are identical and may be interchanged as a temporary repair.

This task consists of: a. Removal b. Installation

INITIAL SET-UP:

Tools:
None

Materials/Parts Required:
Rag, Wiping (Appendix F, Section II, Item 7)

General Safety Requirements:

WARNING

- **Fuels are toxic and flammable. Do not get on person or clothing. Do not use near open flame. Area should be well ventilated.**
- **Fuel is flammable. Do not smoke.**

Equipment Condition:
AAFARS not in operation

NOTE

The face plate and dust cap of liquid fuel filter-separator 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 place. 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.

a. Removal. (Figure 3-1)

1. Remove face seal (1) by hand.

b. Installation. (Figure 3-1)

1. Wipe seal groove clean.

2. Press seal 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.

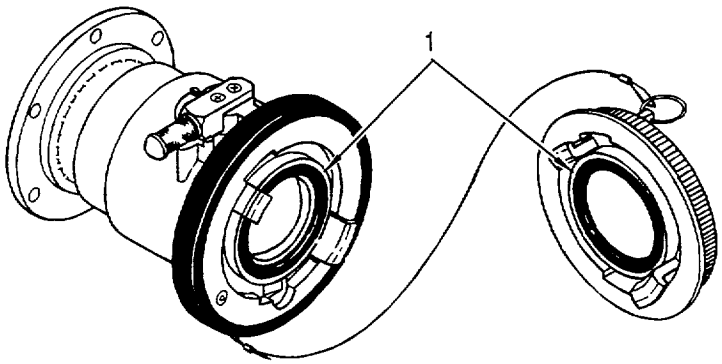


Figure 3-1. Face Seal and Dust Cap Seal

CHAPTER 4

UNIT MAINTENANCE

Section I. REPAIR PARTS; TOOLS; SPECIAL TOOLS; TEST MEASUREMENT AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

Refer to Appendix C.

Section II. SERVICE UPON RECEIPT

4.1 INSPECTION FOR DAMAGE.

Inspect the liquid fuel filter-separator for damage incurred during shipment. If the equipment has been damaged, report the damage on SF 365, Report of Discrepancy.

4.2 INSPECTION FOR COMPLETENESS.

Check the liquid fuel filter-separator against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

None

Section IV. UNIT TROUBLESHOOTING PROCEDURES

4.3 INTRODUCTION.

This section contains trouble shooting guidelines for locating and correcting faults which may develop in the liquid fuel filter-separator. Each listed malfunction is followed by inspections or tests to help you determine the appropriate corrective actions to take. You should perform the tests/inspections and corrective actions in the order listed. This manual cannot list all of the malfunctions that may occur. If a malfunction is not listed or not corrected by a listed corrective action, notify your supervisor.

4.4 MALFUNCTION INDEX.

	MALFUNCTION	TROUBLESHOOTING PROCEDURE PARAGRAPH
1.	Leak at 3-inch unisex coupling flange at inlet or outlet port.	4.5
2.	Unisex defueling coupling leaks at coupling inlet.	4.5
3.	Unisex defueling coupling leaks at filter sump boss.	4.5
4.	Leak at sight gauge.	4.5
5.	Leak at filter vessel cover.	4.5
6.	Differential pressure gauge does not operate.	4.5

4.5 UNIT TROUBLESHOOTING.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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 (paragraphs 4.9 and 4.10).

4.5 UNIT TROUBLESHOOTING - continued.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

2. Unisex defueling coupling leaks at coupling inlet.

   Disconnect coupling from inlet. Replace inlet O-ring (paragraph 4.8).

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. Repair defueling unisex coupling assembly (paragraph 4.8).

4. Leak at sight gauge.

   Inspect gauge body for physical damage.

   Repair sight gauge (paragraph 4.12).

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 (paragraph 4.6).

6. Differential pressure gauge does not operate.

   Step 1. 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 (paragraph 4.11). If lines are open, replace differential pressure gauge (paragraph 4.11).

SECTION V. UNIT MAINTENANCE PROCEDURES

4.6 REPLACE FILTER VESSEL COVER O-RING.

This task consists of: a. Removal b. Installation

INITIAL SET-UP:

Tools:
- Tool Kit, General Mechanics (Appendix B, Section III, Item 1)
- Torque wrench (Appendix B, Section III, Item 2)
- Chemical and Oil Protective Gloves (Appendix B, Section III, Item 2)
- Pan, Drain (Appendix B, Section III, Item 2)
- Goggles (Appendix B, Section III, Item 2)

Materials/Parts Required:
- Washer, Lock (Appendix I, Item 17)
- Cloth, Lint Free (Appendix F, Section II, Item 1)

General Safety Requirements:

WARNING

- Fuels are toxic and flammable. Do not get on person or clothing. Do not use near open flame. Area should be well ventilated.
- Fuel is flammable. Do not smoke.

Equipment Condition:
Liquid fuel filter-separator removed from AAFARS in accordance with TM 10-4930-250-13&P, para. 2.8

a. Removal. (Figure 4-1)

WARNING

- **Pumpage fuels contain additives that may be harmful to personnel and the environment. All leaks must be corrected as soon as 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 equipment is 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).

(5) 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), lock washers (10), flat washers (11), bolts (12) and flat washers (13) from the filter vessel cover (8). Discard 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.

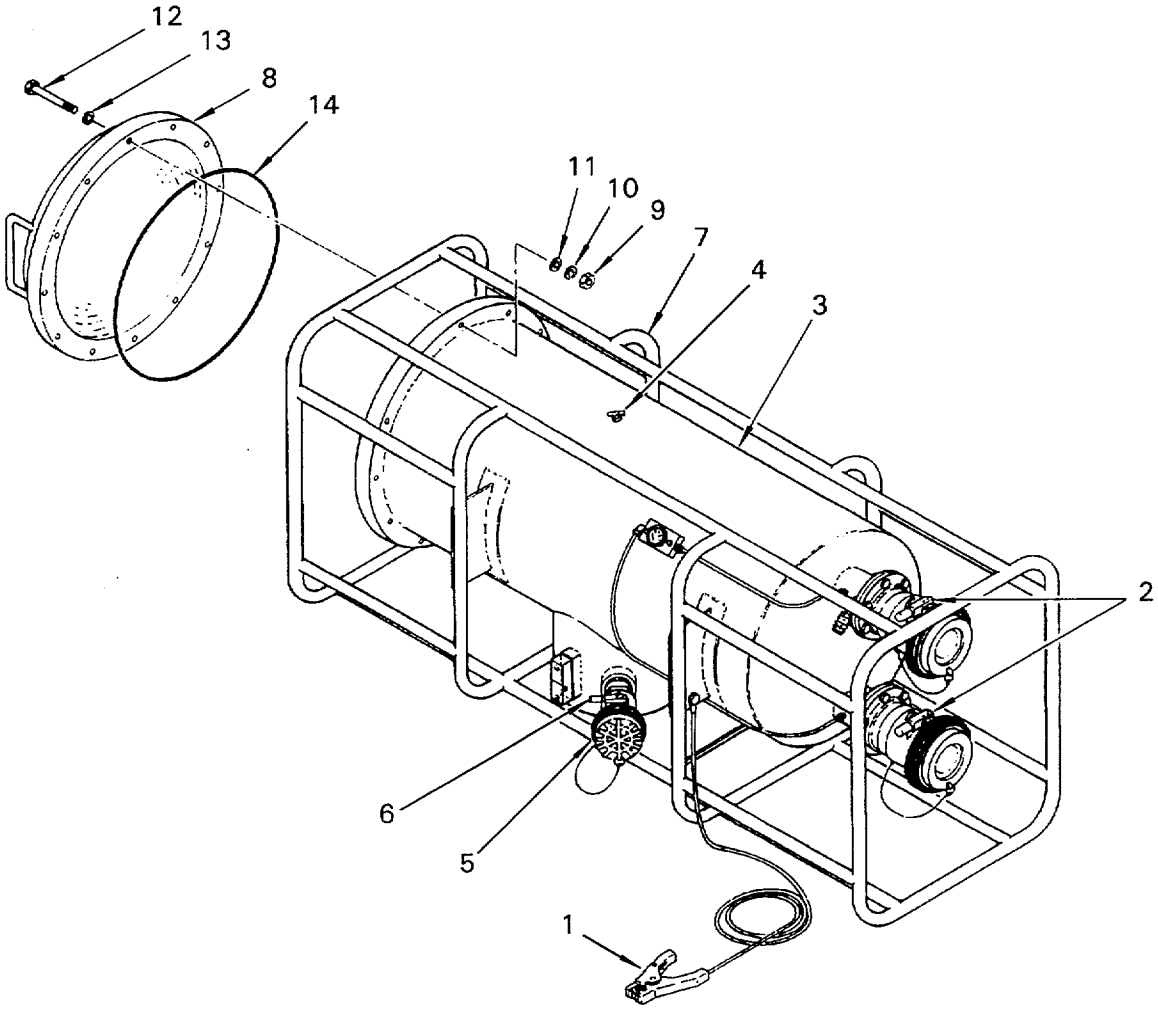


Figure 4-1. Filter Vessel Cover O-Ring Replacement

b. Installation. (Figure 4-1)

(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 (8) 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), lock washers (10) and nuts (9) that secure the filter vessel cover (8) to the filter vessel.

(5) Torque filter vessel cover bolts (12) in a crossing pattern (Figure 4-2). Initially torque to 20 ft. lbs., then torque again to 25 ft. lbs. and a final torque to 30 ft. lbs.

(6) Close manual vent valve (4).

(7) Place ground cable (1) in storage location.

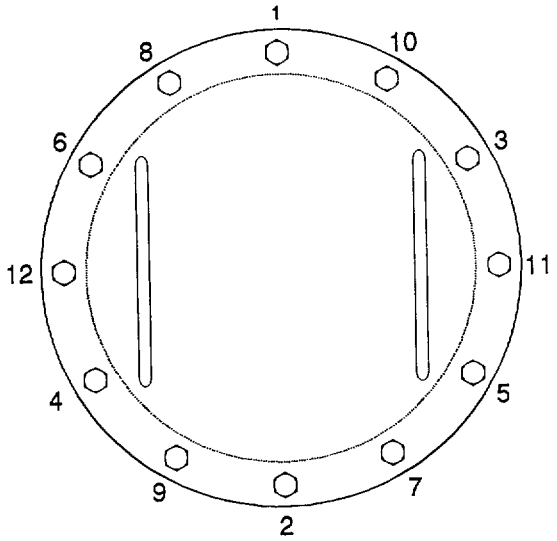


Figure 4-2. Filter Vessel Cover Torque Pattern

4.7 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-4 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.

This task consists of: a. Removal b. Service c. Installation

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(Appendix B, Section III, Item 1)
Chemical and Oil protective gloves
(Appendix B, Section III, Item 2)

Materials/Parts Required:
O-Ring (Appendix I, Item 1)
Washer, Lock (Appendix I, Item 18)
Washer, Lock (Appendix I, Item 19)
Cloth, lint free (Appendix F, Section II, Item 1)

General Safety Requirements:

WARNING

- **Fuels are toxic and flammable. Do not get on person or clothing. Do not use near open flame. Area should be well ventilated.**
- **Fuel is flammable. Do not smoke.**

Equipment Condition:
Liquid fuel filter-separator removed from AAFARS. TM 10-4930-250-13&P, para. 2.8.
Filter vessel cover removed. (para. 4.6)

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

This procedure assumes that the liquid fuel filter-separator has been defueled. However, some fuel will have accumulated in the sump due to normal drainage of saturated coalescer elements after defueling.

a. Removal. (Figure 4-3)

(1) Remove nuts (1), lock washers (2) and element retainer (3).

(2) Remove the nut (4), flat washer (5) and rubber washer (6) that secure the separator element (7) to threaded retaining rod (8).

(3) Remove the separator element (7) and set aside for cleaning and re-use.

(4) Unscrew and remove the three coalescer elements (9) and dispose of in accordance with local SOP.

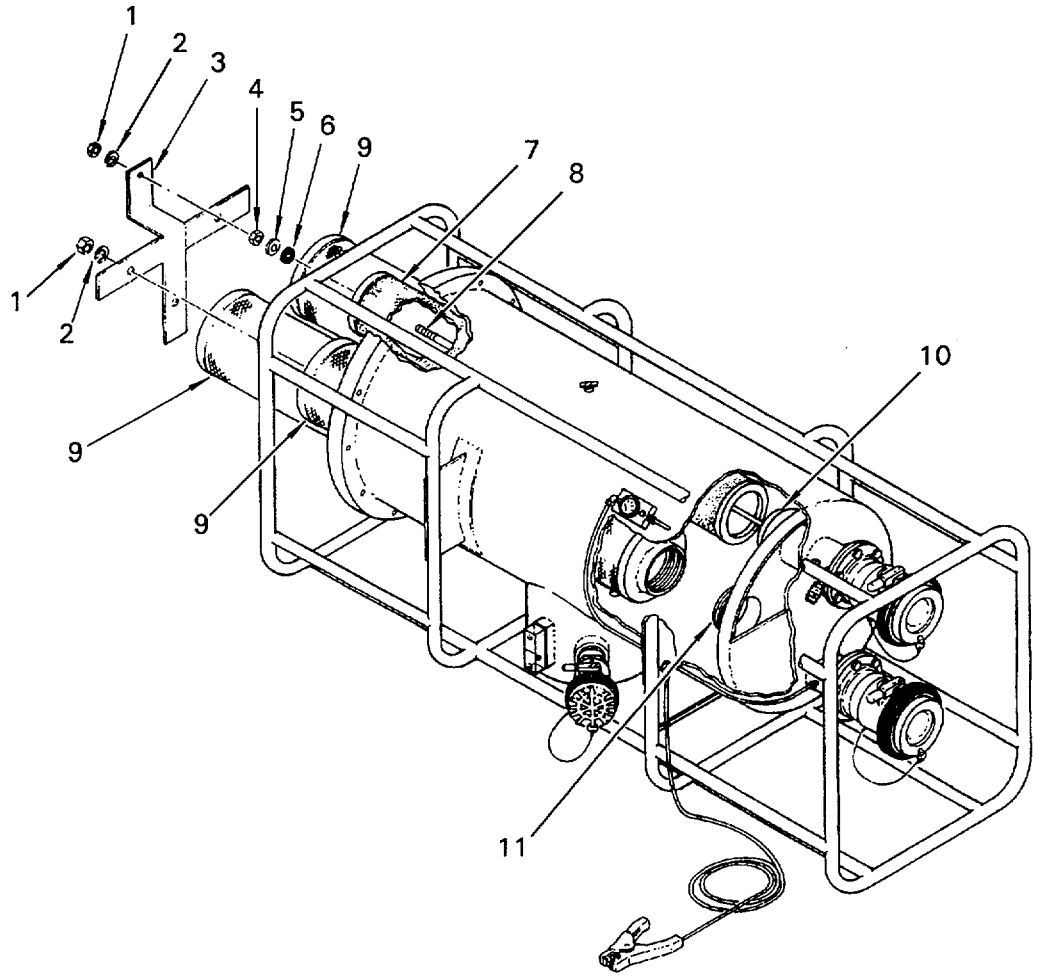


Figure 4-3. Coalescer and Separator Elements Removal

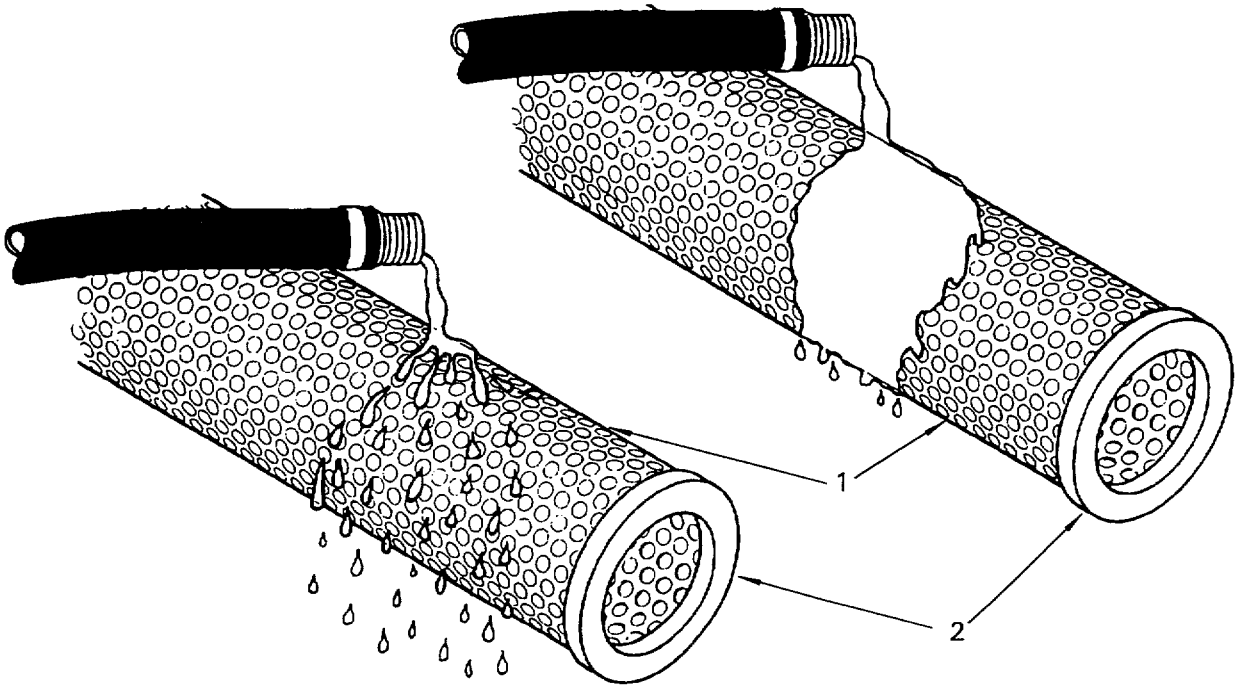
b. Service. (Figure 4-4)

(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 (2). 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 (2) and will not bead) the separator element (1) has failed and must be cleaned again. Proceed to step 4.



Pass (Water Beads) Fail (Water Does Not Bead)

Figure 4-4. Separator Element Cleaning

(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.

c. Installation. (Figure 4-3)

(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) Grasp the top end cap of the coalescer element (9) and tighten an additional 1/4 turn. (Be sure that the coalescer element (9) is not touched by soiled or oily hands).

(7) Repeat steps 3 through 6 for the remaining 2 coalescer elements.

(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 (paragraph 4.6).

4.8 REPLACE DEFUELING UNISEX COUPLING ASSEMBLY.

This task consists of: a. Removal b. Installation

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics (Appendix B, Section III, Item 1)
Chemical and Oil Protective Gloves (Appendix B, Section III, Item 2)
Goggles (Appendix B, Section III, Item 2)

Materials/Parts Required:
O-Ring (Appendix I, Item 12)
O-Ring (Appendix I, Item 8)
O-Ring (Appendix I, Item 9)
Seal (Appendix I, Item 7)
Cloth, Lint Free (Appendix F, Section II, Item 1)
Rag, Wiping (Appendix F, Section II, Item 7)
Petrolatum (Appendix F, Section II, Item 2)

General Safety Requirements:

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.**

Equipment Condition:
Liquid fuel filter-separator removed from AAFARS. (TM 10-4930-250-13&P, Para. 2.8.)

a. Removal. (Figure 4-1)

WARNING

- **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

This procedure assumes that the liquid fuel filter-separator has been defueled. However, some fuel will have accumulated in the sump due to normal drainage of saturated coalescer elements after defueling.

(1) Connect liquid fuel filter-separator grounding cable (1) to a ground rod.

(2) At the filter vessel (3) depress and latch open the manual vent valve (4).

Refer to figure 4-5.

(3) Remove ball retaining screw (1) and O-ring (2).

(4) 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.

(5) Pull unisex coupling (3) from inlet (5).

(6) Remove and discard outside O-ring (6) from inlet (5).

(7) Remove and discard nylon seal (7) and inside O-ring (8) from inlet (5).

(8) Remove and retain the eight springs (9).

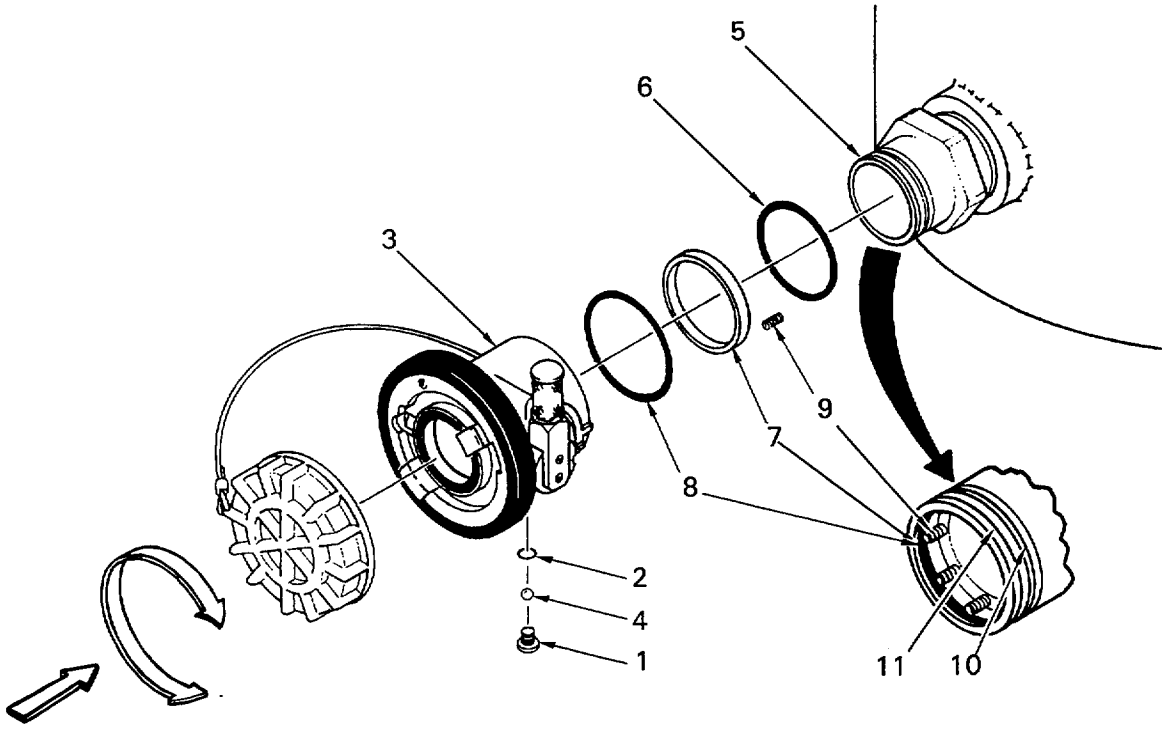


Figure 4-5. Defueling Unisex Coupling Assembly

b. 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 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) Slide the unisex coupling (3) onto the inlet (5). Hold coupling over a wiping rag with screw hole facing up and adjust position until ball race (rounded groove) (11) 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.

Refer to figure 4-1.

(7) Close manual vent valve (4) on filter vessel (3).

(8) Replace grounding cable (1) in storage location.

4.9 REPLACE DEFUELING COUPLING ASSEMBLY.

This task consists of: a. Removal b. Installation

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics (Appendix B, Section III, Item 1)
Chemical and Oil Protective Gloves (Appendix B, Section III, Item 2)
Goggles (Appendix B, Section III, Item 2)

Materials/Parts Required:
Thread Sealant (Appendix F, Item 5)
Tape, Teflon (Appendix F, Item 6)

General Safety Requirements:

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.**

Equipment Condition:
Liquid fuel filter-separator removed from AAFARS. (TM 10-4930-250-13&P, para. 2.8.)

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 equipment is 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

This procedure assumes that the liquid fuel filter-separator has been defueled. However, some fuel will remain in the diverter cavity after defueling.

a. Removal. (Figure 4-6)

(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) Place drain pan beneath defueling unisex coupling (4). Open unisex coupling valve and drain residual fuel from filter vessel (3).

(4) Dispose of fuel in accordance with local SOP.

(5) Remove defueling coupling assembly (4) from filter vessel sump (5).

b. Installation. (Figure 4-6)

(1) Thoroughly clean threads of defueling coupling boss (6) on filter vessel sump (5).

(2) Wrap male pipe threads (7) of defueling coupling assembly (4) with 3-4 complete turns of teflon tape in a right hand (clockwise) direction. Apply an even coat of thread sealant over the teflon tape.

(3) Install defueling coupling assembly (4) in filter vessel sump (5).

(4) Close manual vent valve (2).

(5) Place grounding cable in storage location.

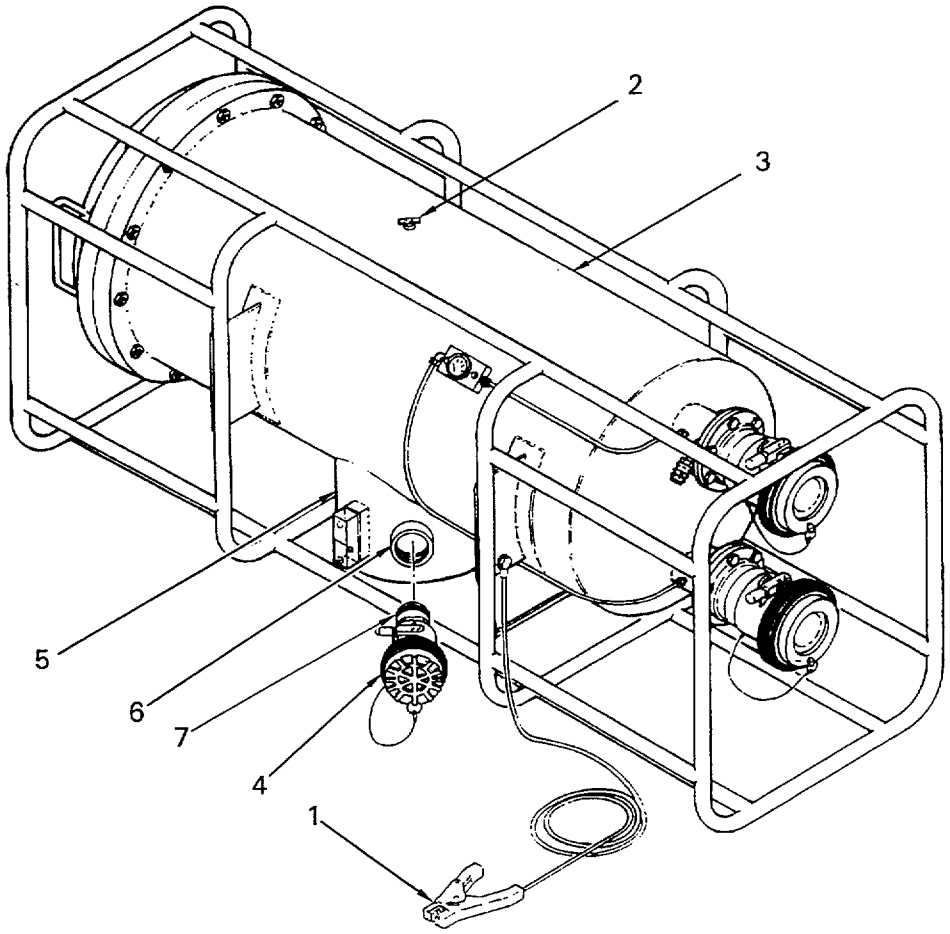


Figure 4-6. Defueling Coupling Assembly

4.10 REPLACE INLET OR OUTLET UNISEX COUPLING.

This task consists of: a. Removal b. Installation

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics (Appendix B, Section III, Item 1)
Chemical and Oil Protective Gloves (Appendix B, Section III, Item 2)
Goggles (Appendix B, Section III, Item 2)

Materials/Parts Required:
Petrolatum (Appendix F, Item 2)
Wiping rag (Appendix F, Item 7)
O-Ring (Appendix I, Item 5)
O-Ring (Appendix I, Item 3)

General Safety Requirements:

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.**

Equipment Condition:
Liquid fuel filter-separator removed from AAFARS. (TM 10-4930-250-13&P, para. 2.8.)

WARNING

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

a. Removal. (Figure 4-7)

(1) Remove ball retaining screw (1) and O-ring (2). Discard O-ring (2).

(2) Place a wiping rag beneath the coupling (3) and, with the screw hole facing toward the wiping rag, rotate the unisex coupling (3) back and forth to allow the 41 balls (4) to fall into the wiping rag.

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.

(3) Pull the unisex coupling (3) from the inlet (5). Collect the continuity ball (6) and spring (7).
(4) Remove and discard inlet O-ring (8).

b. Installation. (Figure 4-7)

(1) Lightly lubricate inlet O-ring (8) with petrolatum and install in second (square) groove (9) on inlet (5).

NOTE

Due to the possibility of losing the continuity ball and spring, the following step is best performed inside a container 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. 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 ball retaining screw(1).

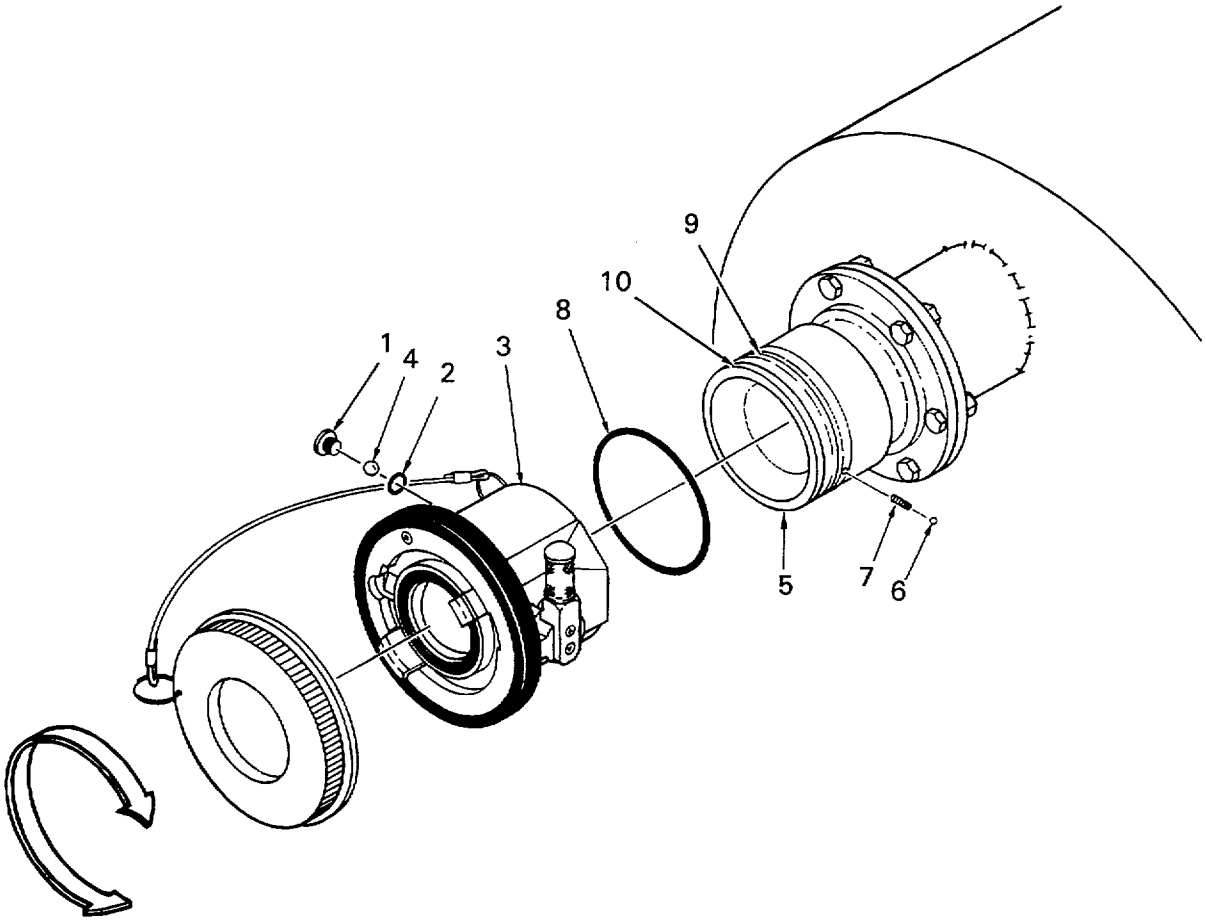


Figure 4-7. Inlet/Outlet Unisex Coupling Removal

4.11 REPLACE FLANGE MOUNT THREE-INCH UNISEX COUPLING.

This task consists of: a. Removal b. Installation

INITIAL SET-UP:

Tools:
- Tool Kit, General Mechanics (Appendix B, Section III, Item 1)
- Chemical and Oil Protective Gloves (Appendix B, Section III, Item 2)
- Pan, Drain (Appendix B, Section III, Item 2)
- Goggles (Appendix B, Section III, Item 2)

Materials/Parts Required:
- O-Ring (Appendix I, Item 3)
- Nut, self-locking (Appendix I, Item 2)
- Cloth, Lint Free (Appendix F, Item 1)
- Petrolatum (Appendix F, Item 2)

General Safety Requirements:

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.**

Equipment Condition:
- Liquid fuel filter-separator removed from AAFARS. (TM 10-4930-250-13&P, para. 2.8.)

a. Removal. (Figure4-8)

WARNING

- **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

This procedure assumes that the liquid fuel filter-separator has been defueled. However, some fuel will remain in the diverter cavity after defueling.

(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) Drain fuel from diverter cavity into a suitable container by removing filter vessel gravity drain plug (4).

(4) Dispose of the drained fuel in accordance with local SOP.

(5) Remove the six bolts (5), flat washers (6) and self-locking nuts (7) that secure the flange mount unisex coupling (8) to the filter vessel (3). Discard the self-locking nuts.

(6) Remove the O-ring (9) from the groove in the flange mount unisex coupling (8) flange face and dispose of in accordance with local SOP.

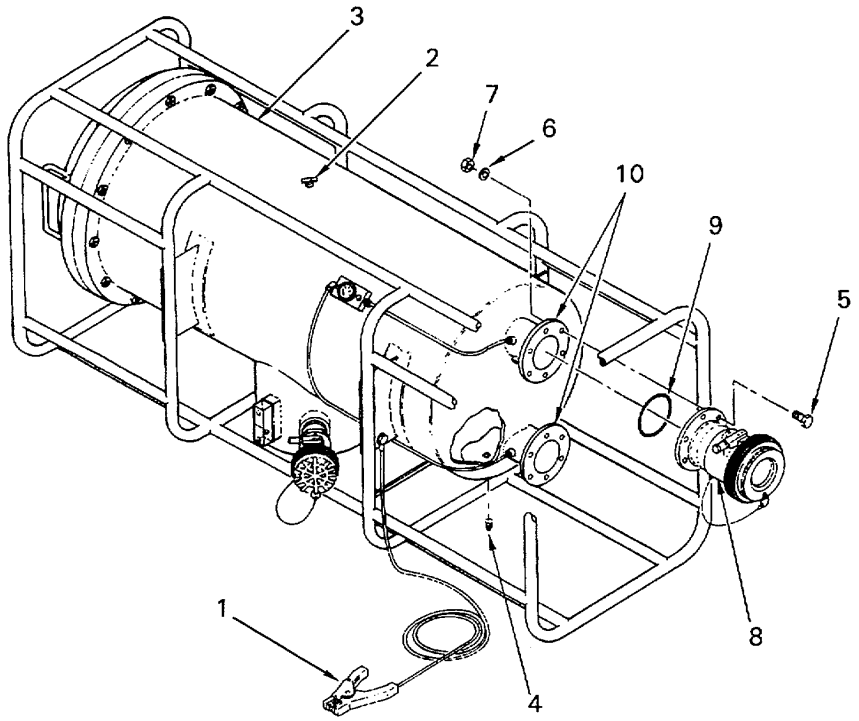


Figure 4-8. Flange Mount Three-Inch Unisex Coupling

b. Installation. (Figure 4-8.)

(1) Wipe clean the flange mount unisex coupling (8) O-ring groove.

CAUTION

Handle and install the O-rings carefully. O-rings can be damaged easily during installation. Do not "roll" the O-rings or install it in such a way that the flange mount unisex coupling (8) can pinch or cut the O-rings when installed.

(2) Lightly lubricate with petrolatum and install O-ring (9) in groove on flange mount unisex coupling (8).

(3) Position flange mount unisex coupling (8) on inlet/outlet port (10) so that valve handle is up and install the six bolts (5), flat washers (6) and self-locking nuts (7). Tighten bolts evenly and securely in a crossing pattern.

(4) Close manual vent valve (2).

(5) Install filtration vessel gravity drain plug (4).

(6) Place grounding cable (1) in storage location.

4.12 REPLACE UNISEX COUPLING DUST CAP.

This task consists of: a. Removal b. Assembly

INITIAL SET-UP:

Tools:
Tool kit, General Mechanics
(Appendix B, Section III, Item 1)
Chemical and Oil Protective Gloves
(Appendix B, Section III, Item 2)

Materials/Parts Required:
None

General Safety Requirements:

WARNING

· **Fuels are toxic and flammable. Do not get on person or clothing. Work in well ventilated area. Do not smoke. Ensure equipment is well grounded.**

Equipment Condition:
Liquid fuel filter-separator removed from AAFARS. (TM 10-4930-250-13&P, para. 2.8.)

a. Removal. (Figure 4-9)

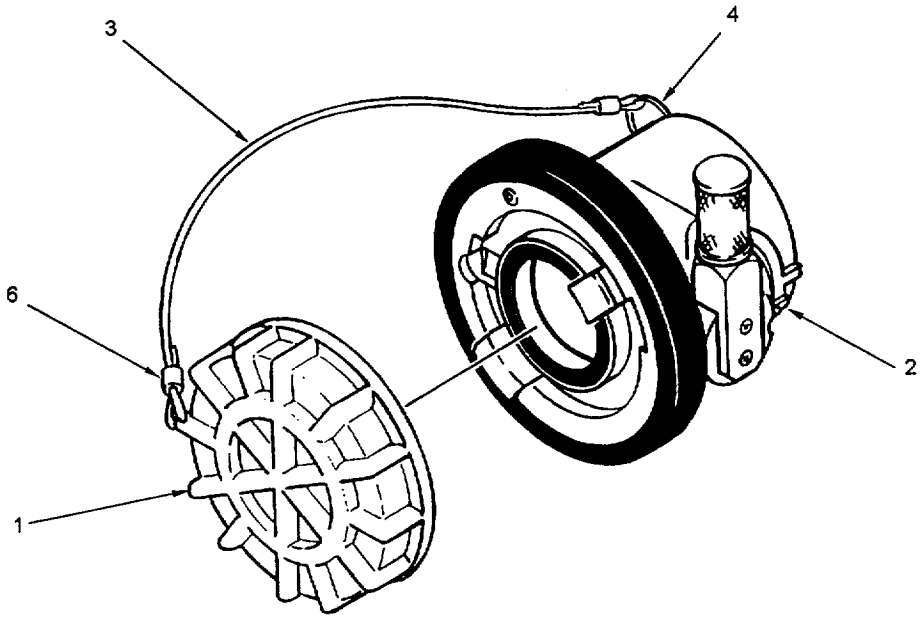
WARNING

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

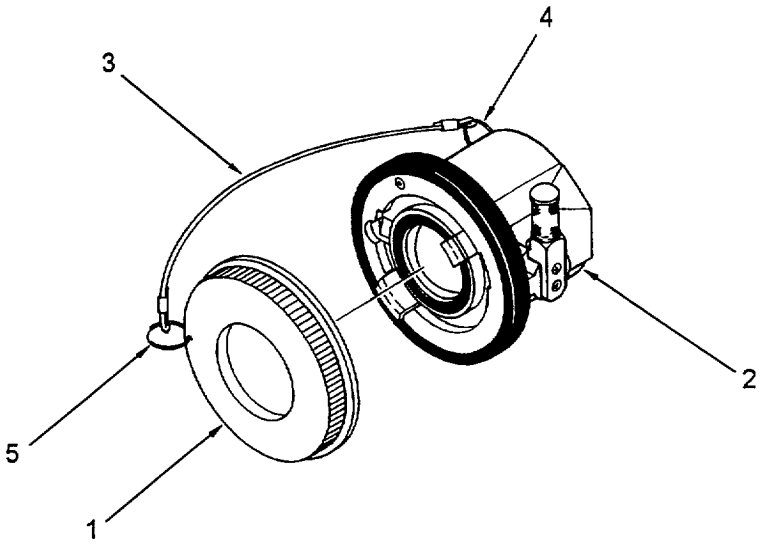
(1) Remove dust cap (1) from unisex coupling (2).

(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 2-inch unisex coupling dust cap (1) by cutting cable loop next to dust cap (1). If necessary, remove attaching cable (3) from 3-inch unisex coupling dust cap (1) by unthreading through split ring (5) on dust cap (1).



a. 2-Inch Unisex Coupling



b. 3-Inch Unisex Coupling

Figure 4-9. Unisex Coupling Dust Cap Replacement

b. Assembly. (Figure 4-9)

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 3-inch unisex coupling dust cap (1), thread attaching cable (3) through split ring (5) on dust cap (1). If necessary to install attaching cable (3) on 2-inch unisex coupling dust cap (1), thread attaching cable (3) through dust cap (1) forming a loop. Use a sleeve (6) 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).

4.13 REPLACE UNISEX COUPLING BUMPER.

This task consists of: a. Removal b. Assembly

INITIAL SET-UP:

Tools:
Tool kit, General Mechanics (Appendix B, Section III, Item 1)
Chemical and Oil Protective Gloves (Appendix B, Section III, Item 2)

Materials/Parts Required:
None

General Safety Requirements:

WARNING

· **Fuels are toxic and flammable. Do not get on person or clothing. Work in well ventilated area. Do not smoke. Ensure equipment is well grounded.**

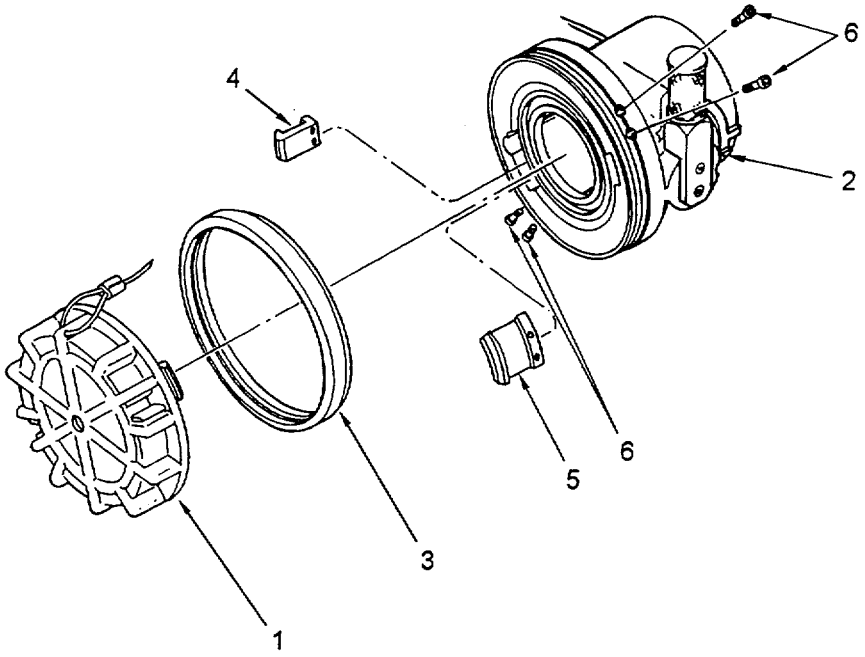
Equipment Condition:
Liquid fuel filter-separator removed from AAFARS. (TM 10-4930-250-13&P, para. 2.8.)

a. Removal. (Figure 4-10)

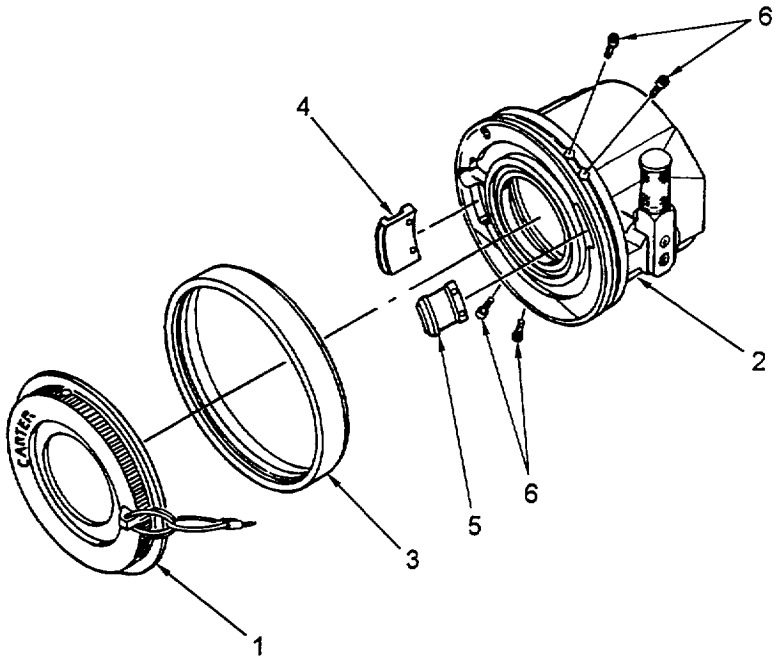
WARNING

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).



a. 2-Inch Unisex Coupling



b. 3-Inch Unisex Coupling

Figure 4-10. Unisex Coupling Bumper and Lug Replacement

(2) Remove bumper (3) from unisex coupling (2) by hand.

b. Assembly. (Figure 4-10)

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).

4.14 REPLACE UNISEX COUPLING LUGS.

This task consists of: a. Removal b. Assembly

INITIAL SET-UP:

Tools:
Tool kit, General Mechanics
(Appendix B, Section III, Item 1)
Chemical and Oil Protective Gloves
(Appendix B, Section III, Item 2)

Materials/Parts Required:
None

General Safety Requirements:

WARNING

· **Fuels are toxic and flammable. Do not get on person or clothing. Work in well ventilated area. Do not smoke. Ensure equipment is well grounded.**

Equipment Condition:
Liquid fuel filter-separator removed from AAFARS. (TM 10-4930-250-13&P, para. 2.8.)

a. Removal. (Figure 4-10)

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 screws (6).

b. Assembly. (Figure 4-10)

WARNING

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

(1) Install lugs (4 and 5) and screws (6).

(2) Install bumper (3) on unisex coupling (2) such that the tapered edge is facing toward the coupling body.

4.15 REPLACE THREE-INCH UNISEX COUPLING DUST CAP LUGS.

This task consists of: a. Removal b. Assembly

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(Appendix B, Section III, Item 1)
Chemical and Oil Protective Gloves
(Appendix B, Section III, Item 2)

Materials/Parts Required:
None

General Safety Requirements:

WARNING

· **Fuels are toxic and flammable. Do not get on person or clothing. Work in well ventilated area. Do not smoke. Ensure equipment is well grounded.**

Equipment Condition:
Liquid fuel filter-separator removed from AAFARS. (TM 10-4930-250-13&P, para. 2.8.)

a. Removal. (Figure 4-11)

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) To remove lugs (3 and 4) from dust cap (1), remove screws (5).

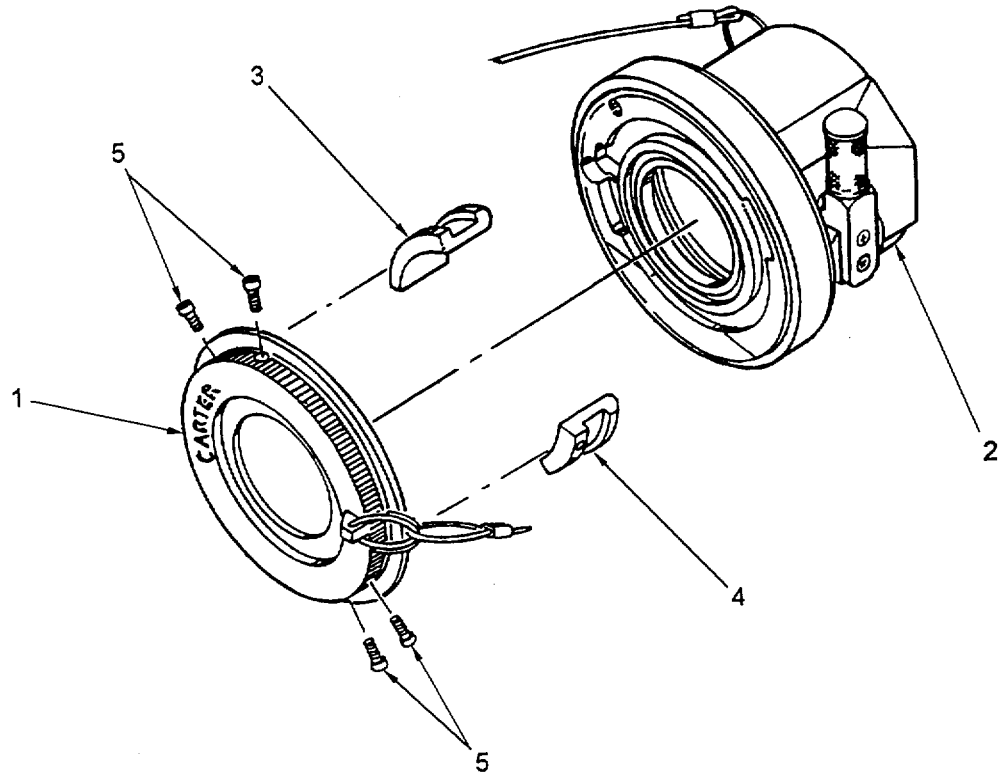


Figure 4-11. Three-Inch Unisex Coupling Dust Cap Lug Replacement

b. Assembly. (Figure 4-11)

WARNING

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

(1) To install lugs (3 and 4) on dust cap (1), install screws (5).

(2) Install dust cap (1) on unisex coupling (2).

4.16 REPLACE DIFFERENTIAL PRESSURE GAUGE AND/OR INLET AND OUTLET LINES.

This task consists of: a. Removal of lines b. Installation of Lines c. Removal of Gauge d. Installation of Gauge

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics (Appendix B, Section III, Item 1)
Chemical and Oil Protective Gloves (Appendix B, Section III, Item 2)
Goggles (Appendix B, Section III, Item 2)

Materials/Parts Required:
Thread sealant (Appendix F, Item 5)
Cloth, Lint Free (Appendix F, Item 1)
Washer, Lock (Appendix I, Item 16)

General Safety Requirements:

WARNING

- **Fuels are toxic and flammable. Do not get on person or clothing. Do not use near open flame. Area should be well ventilated.**
- **Fuel is flammable. Do not smoke.**

Equipment Condition:
Liquid fuel filter-separator removed from AAFARS. (TM 10-4930-250-13&P, para. 2.8.)

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 equipment is 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

This procedure assumes that the liquid fuel filter-separator has been defueled. However, some fuel will remain in the diverter cavity after defueling.

a. Removal of Inlet and Outlet Lines. (Figure 4-12)

(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.

b. Installation of Inlet and Outlet Lines. (Figure 4-12.)

(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).

(4) Close the manual vent valve (2).

(5) Install filter vessel gravity drain plug (4).

(6) Place grounding cable (1) in storage location.

c. Removal of Differential Pressure Gauge. (Figure 4-12.)

(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 (6) 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 (6) 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. Retain connector for use on differential pressure gauge (6).

d. Installation of Differential Pressure Gauge. (Figure 4-12)

(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) fittings (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 fittings (5).

(7) Close the manual vent valve (2).

(8) Place grounding cable (1) in stowage location.

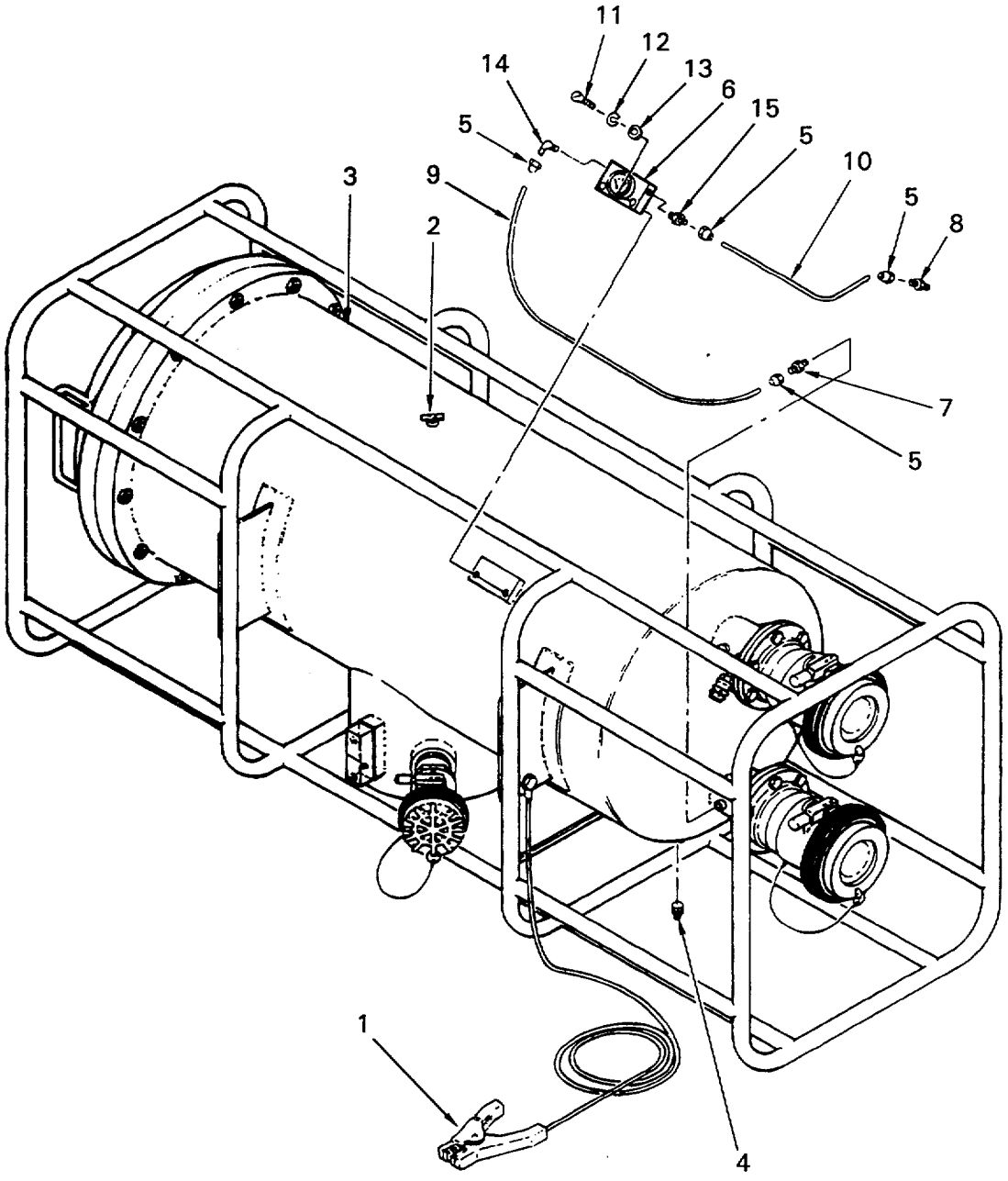


Figure 4-12. Pressure Gauge and Inlet/Outlet Line Removal

4.17 REPLACE SIGHT GAUGE COMPONENTS

This task consists of: a. Removal b. Installation

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics (Appendix B, Section III, Item 1)
Chemical and Oil Protective Gloves (Appendix B, Section III, Item 2)
Pan, Drain (Appendix B, Section III, Item 2)
Goggles (Appendix B, Section III, Item 2)

Materials/Parts Required:
Gasket (Appendix I, Item 4)
Cloth, Lint Free (Appendix F, Item 1)
Washer, Lock (Appendix I, Item 16)

General Safety Requirements:

WARNING

- **Fuels are toxic and flammable. Do not get on person or clothing. Do not use near open flame. Do not smoke. Area should be well ventilated.**

Equipment Condition:
Liquid fuel filter-separator removed from AAFARS. (TM 10-4930-250-13&P, para. 2.8.)

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 equipment is 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

This procedure assumes that the liquid fuel filter-separator has been defueled. However, some fuel will have accumulated in the sump due to normal drainage of saturated coalescer elements after defueling.

a. Removal. (Figure 4-13)

(1) Connect the liquid fuel filter-separator grounding cable (1) to a secure ground.

(2) Tip liquid fuel filter-separator (2) up on end.

(3) Depress and latch open the manual vent valve (3) to relieve any pressure from filter vessel (4).

(4) Place container close beneath sight gauge (5). When sight gauge (5) is separated from filter vessel (4), the small float ball (6) may drop out. Use the container to capture the float ball (6) and prevent loss.

(5) Remove the two mounting screws (7) lock washers (8) and flat washers (9) that secure the sight gauge (5) to the filter vessel (4). Slowly remove the sight gauge body (5), capturing the float ball (6) in the container.

(6) Remove and discard the gasket (10) from the sight gauge.

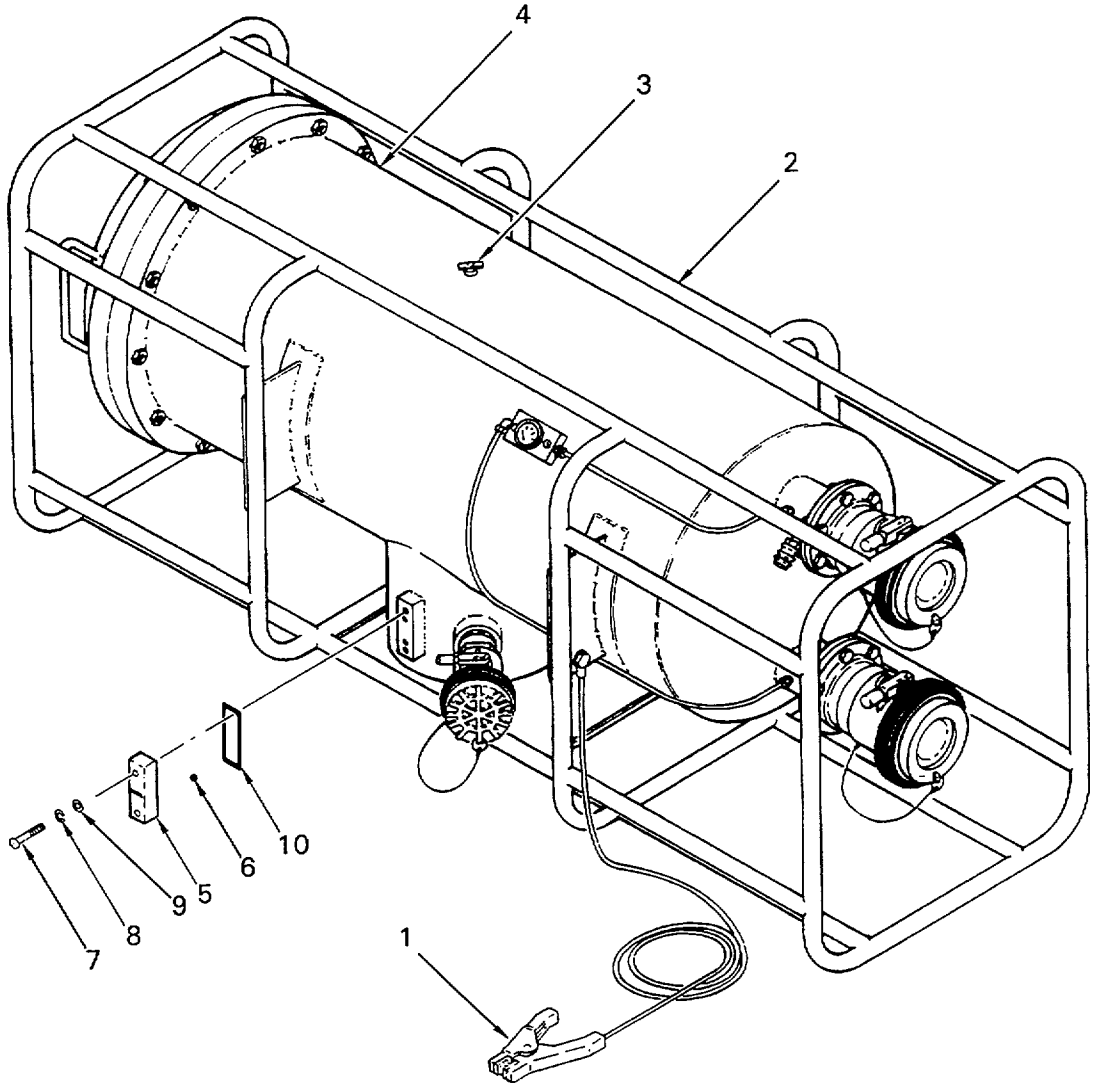


Figure 4-13. Sight Gauge Components

b. Installation. (Figure 4-13.)

(1) Wipe clean the gasket surface.

(2) Insert and hold mounting screws (7), lock washers (8) and flat washers (9) in sight gauge (5) body. Position gasket (10) over screws (7). With sight gauge (5) body in a horizontal position, place float ball (6) in groove. Install as an assembly, bottom first to prevent ball (6) falling out. Tighten mounting screws (7) finger tight.

(3) Torque the mounting screws (7) evenly to 45 in lbs.

(4) Close the manual vent valve (3).

(5) Replace grounding cable (1) in stowage location.

4.18 REPLACE MANUAL VENT VALVE.

This task consists of: a. Removal b. Installation

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics (Appendix B, Section III, Item 1)
Chemical and Oil Protective Gloves (Appendix B, Section III, Item 2)
Goggles (Appendix B, Section III, Item 2)

Materials/Parts Required:
Thread sealant (Appendix F, Item 5)

General Safety Requirements:

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.**

Equipment Condition:
Liquid fuel filter-separator removed from AAFARS. (TM 10-4930-250-13&P, para. 2.8.)

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 equipment is 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

This procedure assumes that the liquid fuel filter-separator has been defueled. However, some fuel will have accumulated in the sump due to normal drainage of saturated coalescer elements after defueling.

a. Removal. (Figure 4-14)

(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).

b. Installation. (Figure 4-14.)

(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) Place grounding cable (1) in stowage location.

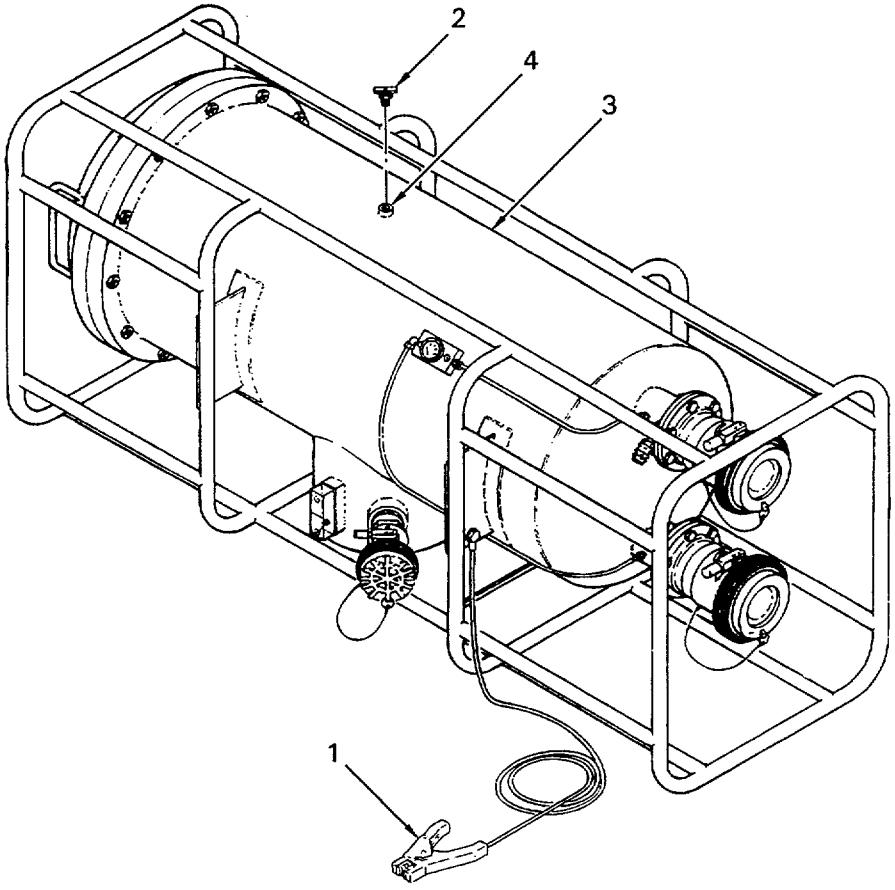


Figure 4-14. Manual Vent Valve Replacement

4.19 REPLACE FILTER VESSEL GRAVITY DRAIN PLUG.

This task consists of: a. Removal b. Installation

INITIAL SET-UP:

Tools:
- Tool Kit, General Mechanics (Appendix B, Section III, Item 1)
- Chemical and Oil Protective Gloves (Appendix B, Section III, Item 2)
- Pan, Drain (Appendix B, Section III, Item 2)
- Goggles (Appendix B, Section III, Item 2)

Materials/Parts Required:
- Sealant, Thread (Appendix F, Item 5)
- Cloth, Lint Free (Appendix F, Item 1)

General Safety Requirements:

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.**

Equipment Condition:
- Liquid fuel filter-separator removed from AAFARS. (TM 10-4930-250-13&P, para. 2.8.)

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 equipment is 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

- **This procedure assumes that the liquid fuel filter-separator has been defueled. However, 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.**

a. Removal. (Figure 4-15)

(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).

b. Installation. (Figure 4-15)

(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.

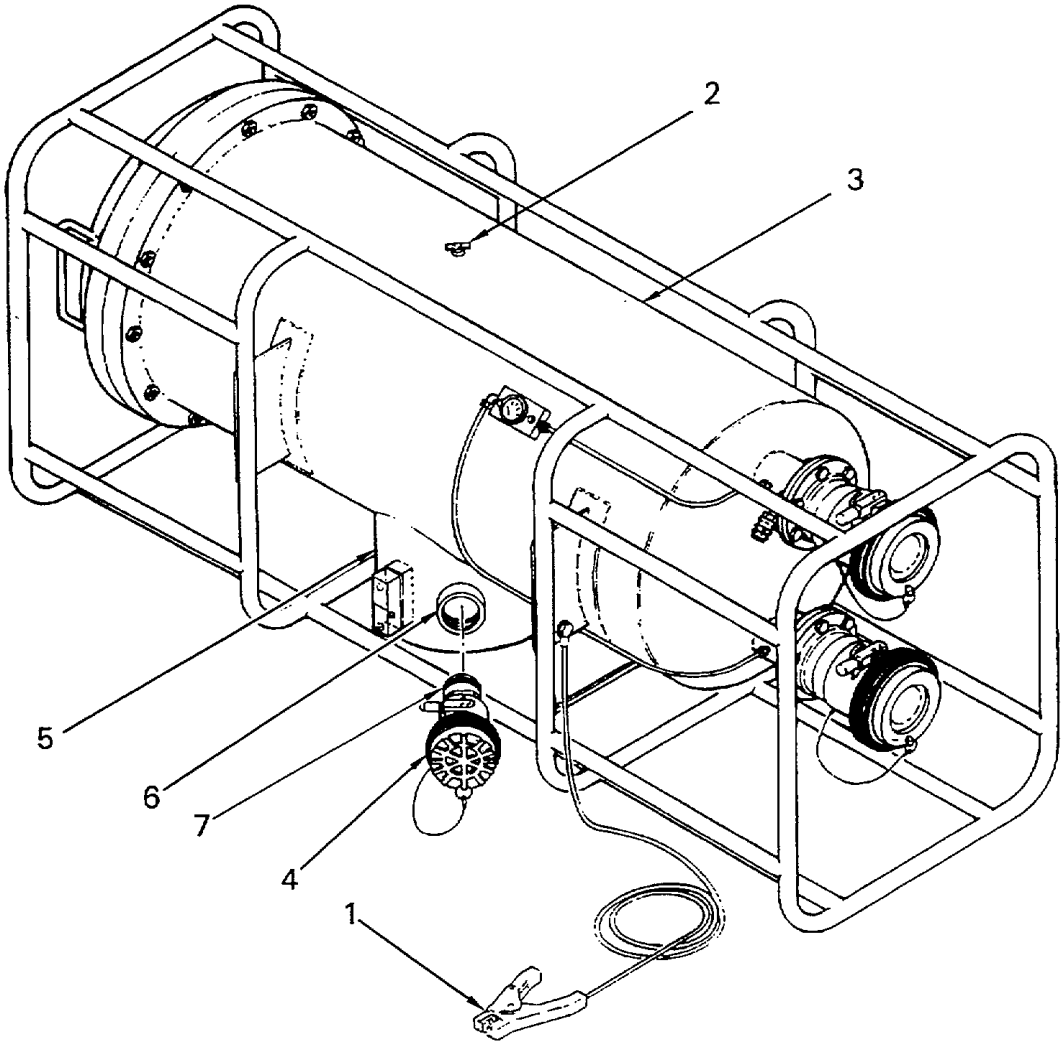


Figure 4-15. Filter Vessel Gravity Drain Plug Replacement

Section VI. PREPARATION FOR SHIPMENT OR STORAGE

4.20 Security Procedures.

Refer to AR 190-11 and AR 190-13.

4.21 Preparation for Movement.

NOTE

For removal of contaminated fuel, refer to FM 10-20, Organizational Maintenance of Military Petroleum Pipelines, Tanks and Related Equipment.

Isolate the liquid fuel filter-separator in accordance with TM 10-4930-250-13&P.

4.22 Intermediate Term Storage.

Refer to the following documents for information relative to storing the liquid fuel filter-separator.

a. TM 38-230-1, Preservation and Packing of Military Equipment.

b. AR 750-1, Army Materiel Maintenance Policy and Retail Maintenance Operations.

4.23 Administrative Storage of Equipment.

a. 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.

b. Before placing equipment in administrative storage, current maintenance services and equipment serviceable criteria evaluations should be completed, shortcomings and deficiencies should be corrected, and all Modification Work Orders (MWOs) should be applied.

c. Storage site selection. Inside storage is preferred for items selected for administrative storage. If inside storage is not available, trucks, conex containers and other containers may be used.

4.24 Preparation for Shipment.

Refer to TM 38-230-1, Preservation and Packing of Military Equipment.

CHAPTER 5

DIRECT SUPPORT MAINTENANCE

Section I. DIRECT SUPPORT MAINTENANCE PROCEDURES

5.1 REPAIR THREE-INCH VALVED UNISEX COUPLING. (Refer to figure 5-1.)

This task consists of: a. Removal b. Installation c. Assembly

INITIAL SET-UP:

Tools:
- Screwdriver, Cross Tip, Size 2 (Appendix B, Section III, Item 2)
- Key, Socket Head Screw, 7/64 in. (Appendix B, Section III, Item 2)
- Key, Socket Head Screw, 9/64 in. (Appendix B, Section III, Item 2)
- Key, Socket Head Screw, 7/32 in. (Appendix B, Section III, Item 2)
- Punch (Drift Pin), (Appendix B, Section III, Item 2)
- Pick (or machinist's scribe) (Appendix B, Section III, Item 2)
- Chemical and Oil protective gloves, (Appendix B, Section III, Item 2)

Materials/Parts Required:
- Solvent, Dry Cleaning (Appendix F, Section II, Item 4)
- Cloth, Lint Free (Appendix F, Section II, Item 1)
- Petrolatum (Appendix F, Section II, Item 2)
- Grit Paper (Appendix F, Section II, Item 3)
- O-Ring (Appendix I, Item 5)
- O-Ring (Appendix I, Item 15)
- O-Ring (Appendix I, Item 14)
- Bushing (Appendix I, Item 10)
- Bushing (Appendix I, Item 11)
- Seal (Appendix I, Item 7)

General Safety Requirements:

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.**

Equipment Condition:

Three-inch valved unisex coupling removed from liquid fuel filter-separator IAW para 4.10.

a. 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 rings (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 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).

CAUTION

Avoid scratching or gouging beveled edge of seal retainer (25) under seal wire (24), 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).

(17) Remove screws (32) and lug (33).

(18) Remove screws (34) and lug (35).

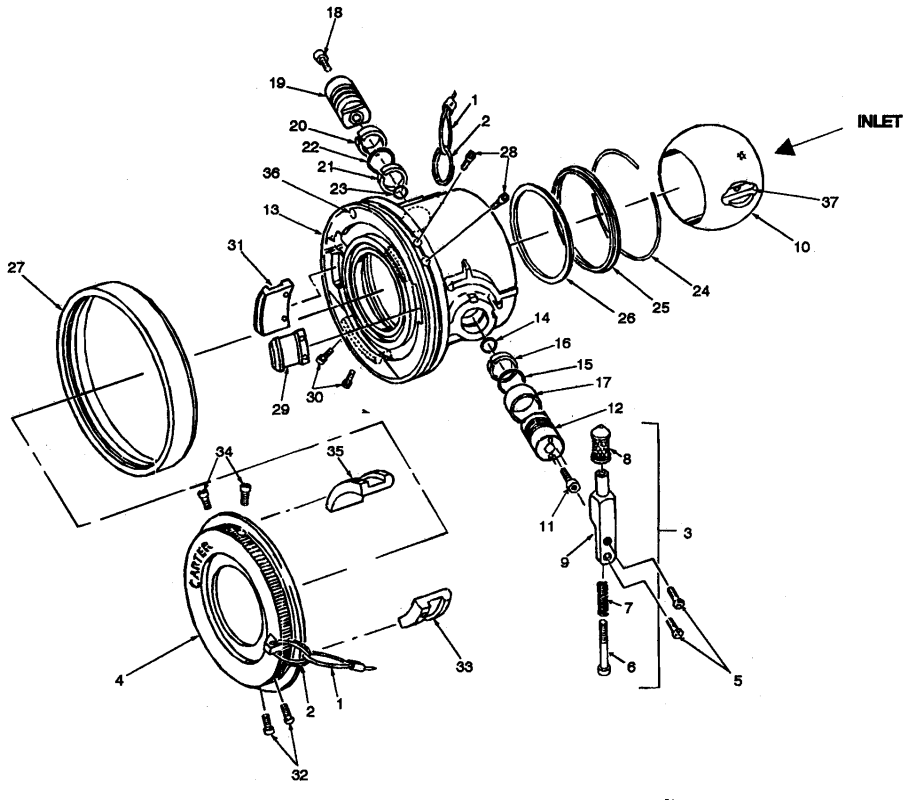


Figure 5-1. Three-Inch Valved Unisex Coupling

a. 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 (36) 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

- **Dry cleaning solvent, P-D-680, Type III, is potentially dangerous to personnel and property. Eye and skin protection is required. Avoid repeated and prolonged skin contact. Wash hands immediately after exposure. Do not use near open flame or excessive heat. Use only in areas with good ventilation.**

- **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 apprroved dry cleaning solvent and dry thoroughly with a clean, lint-free, cloth.

c. **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 (25) 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 screws (32) and lug (33).

(7) Install screws (34) and lug (35).

(8) Install bumper (27) onto housing (13) such that the tapered edge is facing toward the housing.

(9) Insert valve ball (10) into housing (13) with shaft flats (37) on ball aligned with shaft holes in housing.

(10) Lightly lubricate replacement O-ring (22) with petrolatum and install bushings (20) and (21) and O-ring (22) onto attaching-cable-side shaft (19).

(11) 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).

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.

(12) 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 handleside 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).

(13) Install screw (18) to attach attaching-cable-side shaft (19) to valve ball. Hold valve ball with fingers while tightening screw (18).

(14) If removed, install spring (7) and socket head screw (6) into handle (9), place knob (8) on handle and tighten.

(15) Install handle assembly (3) to housing (13) using screws (5).

(16) Open and close coupling valve twice to be sure it operates properly.

(17) Place handle assembly (3) in closed position and install dust cap (4).

(18) Thread attaching cable (1) through split rings (2).

5.2 REPAIR TWO-INCH VALVED UNISEX COUPLING. (Refer to figure 5-2.)

This task consists of: a. Disassembly b. Inspection c. Assembly

INITIAL SET-UP:

Tools:
Tool Kit, General Mechanics
(Appendix B, Section III, Item 1)
Chemical and Oil Protective Gloves
(Appendix B, Section III, Item 2)

Materials/Parts Required:
Solvent, Dry Cleaning
(Appendix F, Section II, Item 4)
Lint Free Cloth (Appendix F, Section II, Item 1)
Grit Paper (Appendix F, Section II, Item 3)
Petrolatum (Appendix F, Section II, Item 2)
Kit, Parts (Appendix I, Item 20)

General Safety Requirements:

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.**

Equipment Condition:
2-inch valved unisex coupling removed from liquid fuel filter-separator IAW para. 4.8

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.

a. 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).

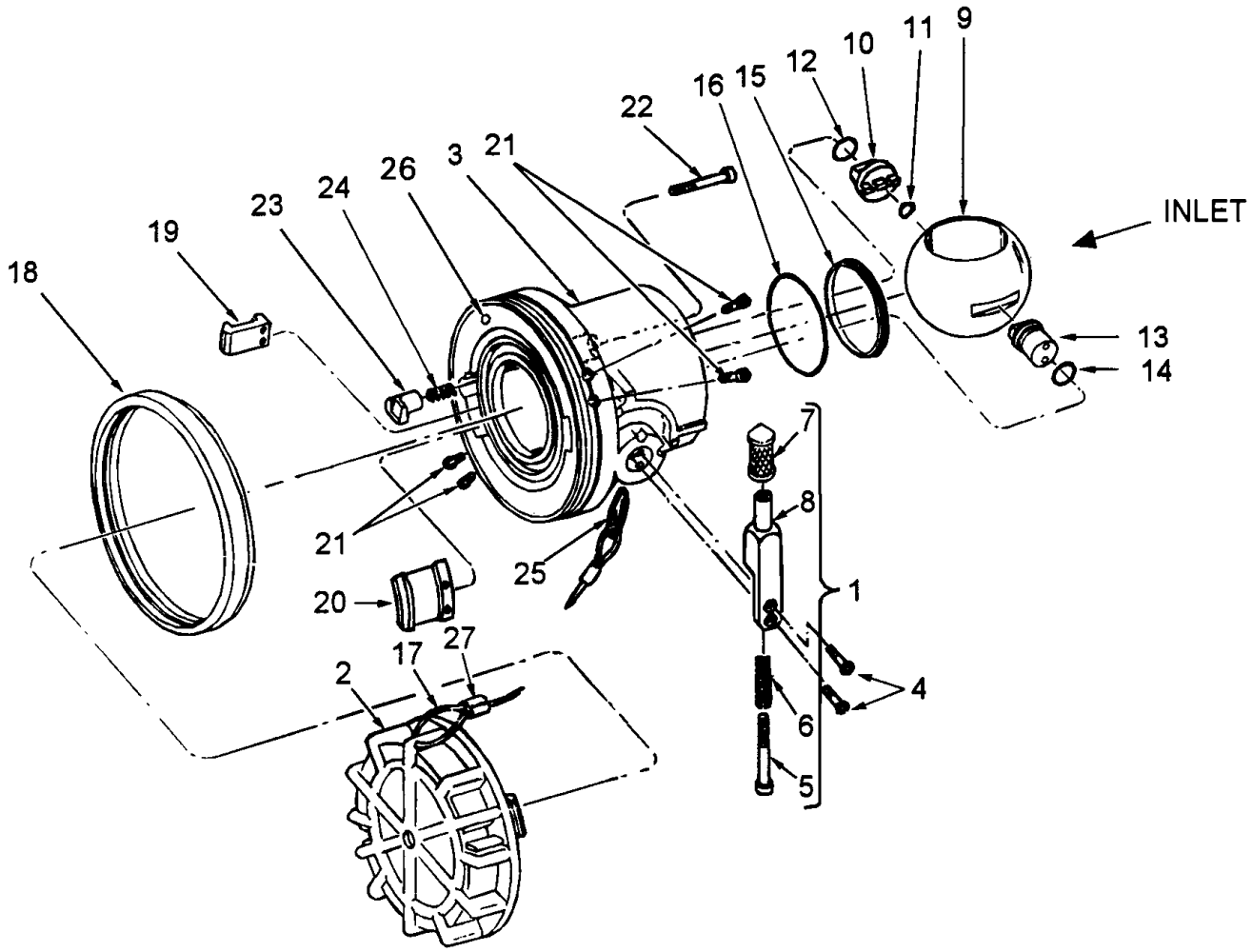


Figure 5-2. Two-Inch Valved Unisex Coupling

(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 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).

a. 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

- **Dry cleaning solvent, P-D-680, Type HI, is potentially dangerous to personnel and property. Eye and skin protection is required. Avoid repeated and prolonged skin contact. Wash hands immediately after exposure. Do not use near open flame or excessive heat. Use only in areas with good ventilation.**

- **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.

b. 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 two-inch valved unisex coupling (3).

CAUTION

The lugs used in the 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 Appendix C of this manual.

(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 two-inch valved unisex coupling (3).

(6) Install O-ring (14) on shaft (13) and install shaft from inside two-inch valved unisex coupling (3).

(7) Using screws (4) install handle assembly (1) on shaft (13). Rotate handle assembly 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 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).

APPENDIX A

REFERENCES

A-1. Scope

This appendix lists all forms, field manuals, technical manuals and miscellaneous publications referenced in this manual. Also listed are publications that should be consulted for additional information.

A-2. Forms

Recommended Changes to Publications and Blank Forms ..... DA Form 2028
Recommended Changes to Equipment Technical Publications ..... DA Form 2028-2
Equipment Inspection and Maintenance Worksheet ..... DA Form 2404
Maintenance Request ..... DA Form 5504
Equipment Log Assembly (Records) ..... DA Form 2408-9
Product Quality Deficiency Report ..... SF 368

A-3. Field Manuals

Chemical and Biological Contamination Avoidance ..... FM 3-3
NBC Protection ..... FM 3-4
NBC Decontamination ..... FM 3-5
Organizational Maintenance of Military Petroleum, Pipelines, Tanks, Related Equipment ..... FM 10-20
Aircraft Refueling ..... FM 10-68
Petroleum Supply Point Equipment and Operations ..... FM 10-69
Rigging, Loading and Dropping Procedures ..... FM 10-564
First Aid for Soldiers ..... FM 21-11
Basic Cold Weather Manual ..... FM 31-70
Northern Operations ..... FM 31-71

A-4. Technical Manuals

Procedures for Destruction of Equipment to Prevent Enemy Use ..... TM 750-244-3
Operator's and Unit Maintenance Manual Including Repair Parts and Special Tools:
Advanced Aviation Forward Area Refueling System (AAFARS) ..... TM 10-4930-250-13&P
Packaging of Material: Preservation (Vol.1) ..... TM 38-230-1

A-5. Miscellaneous

Maintenance Management Update ..... DA PAM 738-750
Army Materiel Maintenance Policy and Retail Maintenance Operations ..... AR 750-1
Physical Security of Arms, Ammunition and Explosives ..... AR 190-11
The Army Physical Security Program ..... AR 190-13
Packing of Army Materiel for Shipment and Storage ..... AR 746-1

APPENDIX B
MAINTENANCE ALLOCATION CHART (MAC)

Section I. INTRODUCTION

B.1 THE ARMY MAINTENANCE SYSTEM MAC.

a. This introduction (section I) provides a general explanation of all maintenance and repair functions authorized at various maintenance levels under the standard Army Maintenance System concept.

b. The Maintenance Allocation Chart (MAC) in section II 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.

c. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from section II.

d. Section IV contains supplemental instruction and explanatory notes for a particular maintenance function.

B.2 MAINTENANCE FUNCTIONS. Maintenance functions are limited to and defined a follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination (e.g., by sight, sound or feel).

b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic or electrical characteristics of an end item and comparing those characteristics with prescribed standards.

c. 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.

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or 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.

g. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating or fixing onto position a spare, repair part or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and assigned maintenance level is shown as the third position code of the SMR code.

i. Repair. The application of maintenance services[1] including fault location/troubleshooting[2], removal/installation, disassembly/assembly[3] procedures, and maintenance actions[4] to identify troubles and restore serviceability to an item by correcting specific damage, faults, malfunction or failure in a part, subassembly, module (component or assembly), end item or system.

j. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/ operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like-new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a likenew condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying Army equipment/components.

B.3 EXPLANATION OF COLUMNS IN THE MAC, SECTION II.

a. Column 1, Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules to the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the item names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Function. Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see paragraph B.2.)

d. 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 vary 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.

---

[1]Services - Inspect, test, service, adjust, align, calibrate and/or replace.

[2]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.

[3]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).

[4]Actions - Welding, grinding, riveting, straightening, facing, machining, and /or resurfacing.

C .....Operator or crew maintenance
O .....Unit maintenance
F.....Direct Support maintenance
L.....Specialized Repair Activity (SRA)5
H .....General Support maintenance
D .....Depot maintenance

e. Column 5, Tools and Test Equipment reference code. Column 5 specifies, by code, those common tool sets (not individual tools), common TMDE, and special tools, special TMDE, and special support equipment required to perform the designated function. Codes are keyed to tools and test equipment in section m.

f. Column 6, Remarks. When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks contained in section IV.

B.4 EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENTS, SECTION III.

a. Column 1, Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, section II, column 5.

b. Column 2, Maintenance Level. The lowest level of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National Stock Number. The National Stock Number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer's part number, model number, or type number.

B.5 EXPLANATION OF COLUMNS IN REMARKS, SECTION IV.

a. Column 1, Remarks Code. The code recorded in column 6, section II.

b. Column 2, Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, section II.

[5]This maintenance level is not included in section I, column (4) of the MAC. Functions to this level of maintenance are identified by a work-time figure in the "H" column of section II, column (4) and an associated reference code is used in the Remarks column (6). This code is keyed to section IV, Remarks, and SRA complete repair application is explained there.

Section II. MAINTENANCE ALLOCATION CHART FOR FILTER-SEPARATOR, WATER, LIQUID FUEL

(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	Filter-Separator, Liquid Fuel	Inspect	0.1						
		Service		0.5				1	
		Repair	0.1	0.5				2	
01	Unisex Coupling, 3 in, Flange Mount	Inspect	0.1						
		Replace		0.3				1	
		Repair	0.1	0.2	1.0			2	
02	Unisex Coupling, 2 in, MNPT	Inspect	0.1						
		Replace		0.5				1	
		Repair	0.1	0.2	1.0			2	

Section III. TOOLS AND TEST EQUIPMENT FOR FILTER-SEPARATOR, WATER, LIQUID FUEL

Tool or Test Equipment Ref Code	Maintenance Level	Nomenclature Stock Number	National	Tool Number
1	O	Tool Kit, General Mechanics: Automotive	5180-00-177-7033	
2	O	Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance Common No. 1	4910-00-754-0654	

Section IV. REMARKS FOR FILTER-SEPARATOR, WATER, LIQUID FUEL

Remarks Code	Remarks
	None

APPENDIX C

UNIT AND DIRECT SUPPORT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)

Section I. INTRODUCTION

1. SCOPE. This RPSTL lists and authorizes spares and repair parts, special tools, special test, measurement, and diagnostic equipment (TMDE), and other special support equipment required for performance of unit, direct support and general support maintenance of the Liquid Fuel Filter-Separator. It authorizes the requisitioning, issue, and disposition of spares, repair parts and special tools as indicated by the source, maintenance, and recoverability (SMR) codes.

2. GENERAL. In addition to this section, Introduction, this Repair Parts and Special Tools List is divided into the following sections:

a. Section II. Repair Parts List. A list of spares and repair parts authorized by this RPSTL for use in the performance of maintenance. This lists also includes parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in ascending alphanumeric sequence, with the parts in each group listed in ascending figure and item number sequence. Bulk materials are listed in item name sequence in FIG. BULK at the end of the section. Repair kits are listed separately in their own functional group within Section II. Items are shown in the associated illustration.

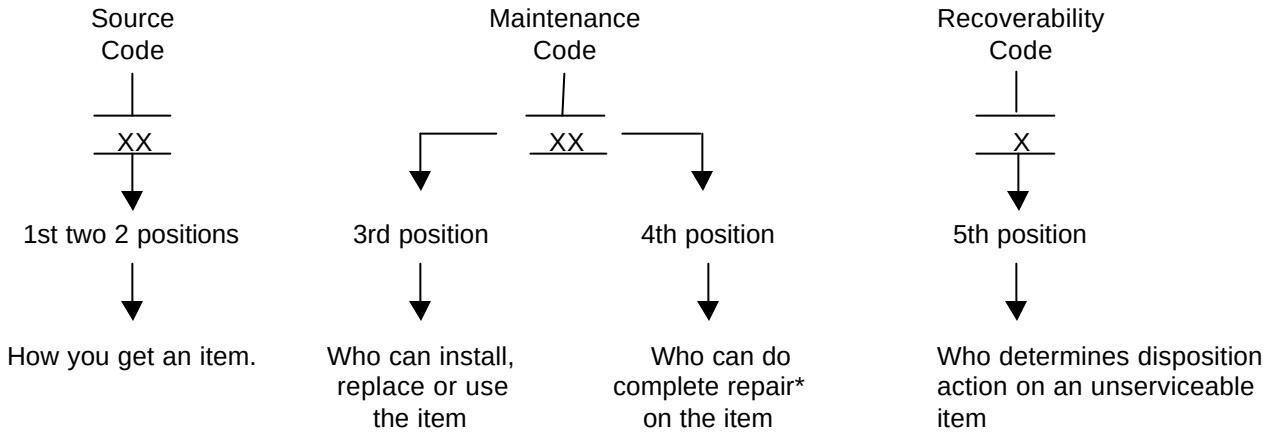
b. Section III. Special Tools List. A list of special tools, special TMDE, and special support equipment authorized by this RPSTL (as indicated by Basis of Issue (BOI) information in DESCRIPTION AND USABLE ON CODE (UOC) column) for the performance of maintenance.

c. Section IV. Cross-Reference Index. There are two cross reference indexes in this RPSTL: The National Stock Number Index, listed in the National Item Identification Number sequence and Part Number Index, listed in alphanumeric sequence of part numbers appearing in the listing. National stock numbers and part numbers are cross referenced to each illustration figure and item number appearance.

3. EXPLANATION OF COLUMNS (SECTIONS II AND III).

a. ITEM NO. (Column [11]). Indicates the number used to identify items called out on the illustration.

b. SMR Code (Column [21]). The Source, Maintenance and Recoverability (SMR) code is a 5-position code containing supply/requisitioning information, maintenance level authorization criteria, and disposition instructions, as shown in the following breakout:



*Complete Repair. Maintenance capacity, capability, and authority to perform all corrective maintenance tasks of the "Repair" function in a use/user environment in order to restore serviceability to a failed item.

(1) **Source Code**. The source code tells you how to get an item needed for maintenance, repair or overhaul of an end item/equipment. Explanations of source codes follow:

Source Code		Application/Explanation
PA PB PC** PD PE PF PG		Stocked items; use the applicable NSN to request/requisition items with these source codes. They are authorized to the category indicated by the code entered in the 3rd position of the SMR code. ****NOTE: Items coded PC are subject to deterioration.**
KD KF KB		Items with these codes are not to be requested/requisitioned individually. They are part of a kit which is authorized to the maintenance level indicated in the 3rd position of the SMR code. The complete kit must be requisitioned and applied.
MO	(Made at Unit/AVUM Level)	Items with these codes are not to be requested/requisitioned individually. They must be made from bulk material which is identified by the part number in the DESCRIPTION AND USABLE ON CODE (UOC) column and listed in the Bulk Material group of the repair parts list in this RPSTL. If the item is authorized to you by the 3rd position code of the SMR code, but the source code indicates it is made at a higher level, order the item from the higher level of maintenance.
MF	(Made at DS/AVIM Level)	
MH	(Made at GS Level)	
ML	(Made at Specialized Repair Activity [SRA])	
MD	(Made at Depot)	
AO	(Assembled by Unit/AVUM Level)	Items with these codes are not to be requested/requisitioned individually. The parts that make up the assembled item must be requisitioned or fabricated and assembled at the level of maintenance indicated by the source code. If the 3rd position code of the SMR code authorizes you to replace the item, but the source code indicates the item is assembled at a higher level, order the item from the higher level of maintenance.
AF	(Assembled by DS/AVIM Level)	
AH	(Assembled by GS Level)	
AL	(Assembled by SRA)	
AD	(Assembled by Depot)	
XA	Do not requisition an "XA"-coded item. Order its next higher assembly. (Also, refer to the NOTE below.)	
XB	If an "XB" item is not available from salvage, order it using the CAGEC and part number.	
XC	Installation drawing, diagram, instruction sheet, or field service drawing that is identified by manufacturer's part number.	
XD	Item is not stocked. Order an "XD"-coded item through normal supply channels using the CAGEC and part number given, if no NSN is available.	

NOTE

Cannibalization or controlled exchange, when authorized, may be used as a source of supply for items with the above source codes, except for those source coded "XA" or those aircraft support items restricted by requirements of AR 750-1.

(2) Maintenance Code. Maintenance codes tell you the level(s) of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth positions of the SMR code as follows:

(a) The maintenance code entered in the third position tells you the lowest maintenance level authorized to remove, replace and use an item. The maintenance code entered in the third position will indicate authorization to one of the following levels of maintenance.

Maintenance Code	Application/Explanation
C	Crew or operator maintenance done within unit/AVUM maintenance.
O	Unit level/AVUM maintenance can remove, replace and use the item.
F	Direct support/AVIM maintenance can remove, replace and use the item.
H	General support maintenance can remove, replace and use the item.
L	Specialized repair activity can remove, replace and use the item.
D	Depot can remove, replace and use the item.

(b) The maintenance code entered in the fourth position tells whether or not the item is to be repaired and identifies the lowest maintenance level with the capability to do complete repair (i.e., perform all authorized repair functions).

NOTE

Some limited repair may be done on the item at a lower level of maintenance, if authorized by the Maintenance Allocation Chart and SMR code.

Maintenance Code	Application/Explanation
O	Unit/AVUM is the lowest level that can do complete repair of the item.
F	Direct support/AVIM is the lowest level that can do complete repair of the item.
H	General support is the lowest level that can do complete repair of the item.
L	Specialized repair activity is the lowest level that can do complete repair of the item.
D	Depot is the lowest level that can do complete repair of the item.
Z	Nonreparable. No repair is authorized.
B	No repair is authorized. No parts or special tools are authorized for the maintenance of a "B" coded item. However, the item may be reconditioned by adjusting, lubricating, etc. at the user level.

(3) Recoverability Code. Recoverability codes are assigned to items to indicate the disposition action on unserviceable items. The recoverability code is shown in the fifth position of SMR code as follows:

Recoverability Code	Application/Explanation
Z	Nonreparable item. When unserviceable, condemn and dispose of the item at the level of maintenance shown in the 3rd position of the SMR code.
0	Reparable item. When uneconomically reparable, condemn and dispose of the item at the unit or AVUM level.
F	Reparable item. When uneconomically reparable, condemn and dispose of the item at the direct support or AVIM level.
H	Reparable item. When uneconomically reparable, condemn and dispose of the item at the general support level.
D	Reparable item. When beyond lower level repair capability, return to depot. Condemnation and disposal of the item is not authorized below depot level.
L	Reparable item. Condemnation and disposal not authorized below Specialized Repair Activity (SRA).
A	Item requires special handling or condemnation procedures because of specific reasons (e.g., precious metal content, high dollar value, critical material, or hazardous material). Refer to appropriate manuals/directives for specific instructions.

c. NSN (Column [3]). The national stock number for the item is listed in this column.

d. CAGEC (Column [4]). The Commercial and Government Entity Code (CAGEC) is a 5-digit numeric code which is used to identify the manufacturer, distributor, or Government agency/activity that supplies the item.

e. PART NUMBER (Column [5]). Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity) which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards and inspection requirements to identify an item or range of items.

NOTE

When you use an NSN to requisition an item, the item you receive may have a different part number from the number listed.

f. DESCRIPTION AND USABLE ON CODE (UOC) (Column [6]). This column includes the following information:

(1) The Federal item name and, when required, a minimum description to identify the item.

(2) Part numbers of bulk materials are referenced in this column in the line item entry for the item to be manufactured/fabricated.

(3) The statement "END OF FIGURE" appears just below the last item description in column (6) for a given figure in both section II and section III.

g. QTY (Column [7]). The QTY (quantity per figure) column indicates the quantity of the item used in the breakout shown on the illustration figure, which is prepared for a functional group, subfunctional group, or an assembly. A "V" appearing in this column instead of a quantity indicates that the quantity is variable and may vary from application to application.

4. EXPLANATION OF INDEX FORMAT AND COLUMNS (SECTION IV).

a. NATIONAL STOCK NUMBER (NSN) INDEX.

(1) STOCK NUMBER Column. This column lists the NSN IN National Item Identification Number (NIIN) sequence. The NIIN consists of the last nine digits of the NSN.

NSN
(E.G., 5305-01-574-1467)
NIIN

When using this column to locate an item, ignore the first four digits of the NSN. Use the complete NSN (13 digits) when requisitioning items by stock number.

(2) FIG. Column. This column lists the number of the figure where the item is identified/located. The figures are in numerical order in Section II and IIII.

(3) ITEM Column. The item number identifies the item associated with the figure listed in the adjacent FIG. column. This item is also identified by the NSN listed on the same line.

b. PART NUMBER INDEX. Part numbers in this index are listed by part number in ascending alphanumeric sequence (i.e., vertical arrangement of letter and number combination which places the first letter or digit of each group in order A through Z, followed by the numbers 0 through 9, and each following letter or digit in like order).

(1) PART NUMBER Column. Indicates the primary number assigned to the item by the manufacturer (individual, firm, corporation or Government activity) which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards and inspection requirements to identify an item or range of items.

(2) FIG. Column. This column lists the number of the figure where the item is identified/located in Section II and III.

(3) ITEM Column. The item number is that number assigned to the item as it appears in the figure referenced in the adjacent figure number column.

5. SPECIAL INFORMATION.

a. USABLE ON CODE. The usable on code appears in the lower left corner of the Description column heading. Usable on codes are shown as "UOC . . ." in the Description Column (justified left) on the last line of the applicable item description/nomenclature. Uncoded items are applicable to all models.

b. FABRICATION INSTRUCTIONS. Bulk materials required to manufacture items are listed in the Bulk Material Functional Group of the RPSTL. Part numbers for bulk materials are also referenced in the description column of the line entry for the item to be manufactured/fabricated. Detailed fabrication instructions for items source coded to be manufactured or fabricated are found in Appendix G of this manual.

c. INDEX NUMBERS. Items which have the word BULK in the figure column will have an index number shown in the item number column. This index number is a cross-reference between the National Stock Number/Part Number Index and the bulk material list in section II.

d. ASSOCIATED PUBLICATIONS. The publications listed below pertain to the Liquid Fuel Filter-Separator and its components.

Publication	Short Title
TM 10-4330-250-13&P	Operator's, Unit, and Direct Support Maintenance Manual

6. HOW TO LOCATE REPAIR PARTS.

a. When National Stock Number or Part Number is NOT Known.

(1) First. Using the table of contents, determine the assembly or subassembly group to which the item belongs. This is necessary since figures are prepared for assembly groups and subassembly groups, and listings are divided into the same groups.

(2) Second. Find the figure covering the functional group or subfunctional group to which the item belongs.

(3) Third. Identify the item on the figure and note the Figure and Item Number to find the NSN.

(4) Fourth. Look in the repair parts list for the figure and item numbers. The NSNs and part numbers are on the same line as the associated item numbers.

b. When National Stock Number or Part Number is Known.

(1) First. If you have the national stock number, look in the STOCK NUMBER column of the National Stock Number index. The NSN index is arranged in National Item Identification Number (NIIN) sequence (see 4.a). Note the figure and item number next to the NSN.

(2) Second. Turn to the figure and locate the item number. Verify the item is the one you are looking for.

7. ABBREVIATIONS. Abbreviations used in this manual are listed in MIL-STD-12.

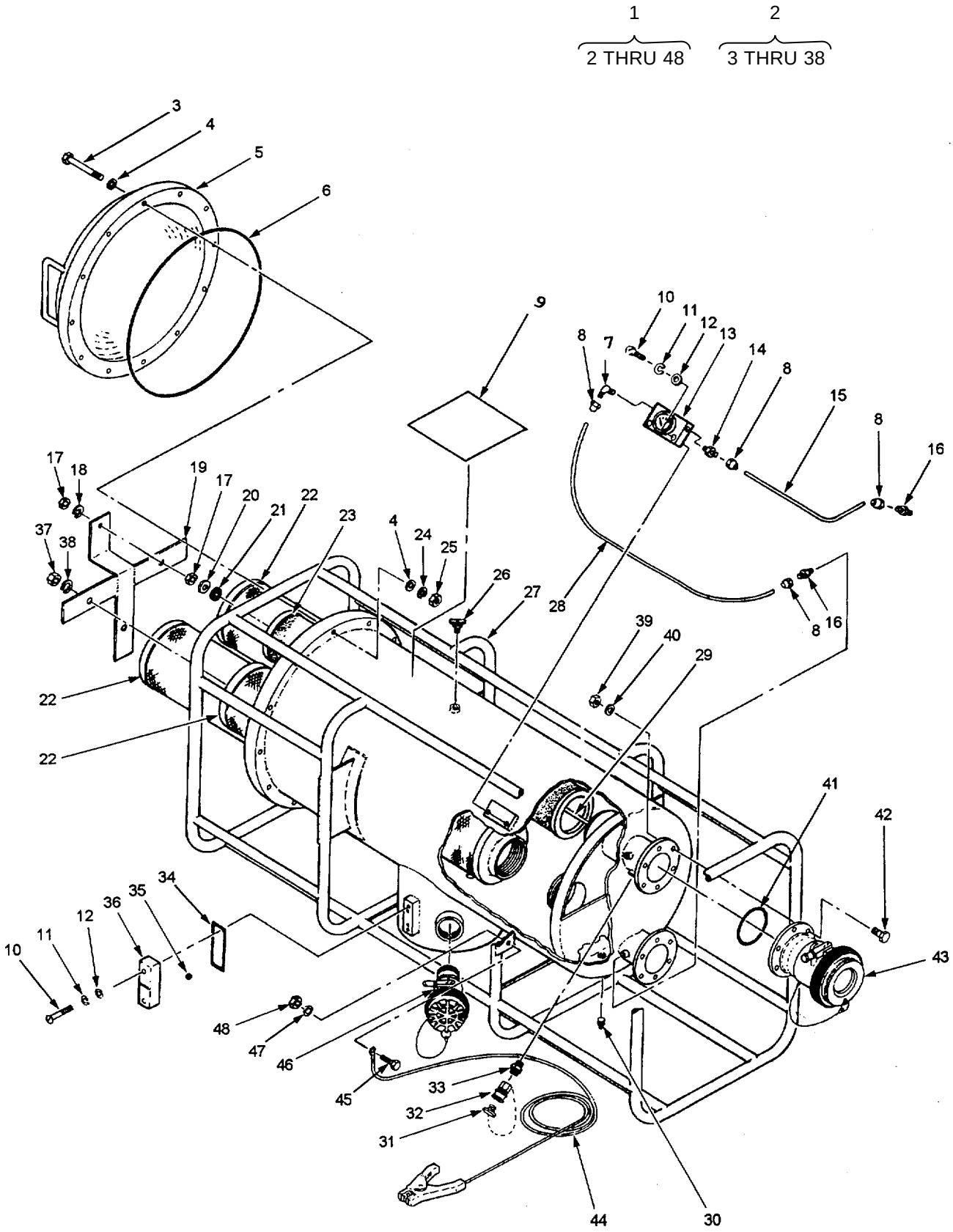


Figure C-1. Filter-Separator, Water, Liquid Fuel

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES (UOC)	(7) QTY
					FIGURE C-1. FILTER-SEPERATOR, WATER, LIQUID FUEL	
1	PAOOF		97403	13230E5875-102	FILTER, UNIT PURIFIC	1
2	XBOOO		97403	13230E5919-01	FILTRATION MODULE	1
3	XDOZZ		51744	8LHX0375-16X0375 0GRSS	.BOLT, MACHINE 0.375-16UNC X 3.75 LG, GRADE 5	2
4	PAOZZ		51744	WAF0375S	.WASHER, FLAT 0.375 NOM ID X 1.00 OD	24
5	XDOZZ		51744	872FS-F002	.COVER, WELDMENT	1
6	PCOZZ		51744	OOOU-Z015-14	.O-RING 0.312 THK X 15.75 ID, CL 1, GR 70	1
7	PAOZZ	4730006399869	88044	AN817-5D	.NUT, TUBE COUPLING 5/16 TUBE	4
8	PAOZZ	4730002783678	96906	MS20822-SD	.ELBOW, PIPE TO TUBE 1/8 NPT X 5/16 FLARED TUBE	1
9	XDOZZ		51744	OOOU-Z048(C)	.LABEL, IDENTIFICATIO	1
10	PAOZZ		51744	SCPHO250-20X0150 OS	.SCREW, MACHINE 1/4 - 20 UNC 1.50 LG	4
11	PAOZZ		51744	WAL0250S	.WASHER, LOCK 0.25 NOM ID	4
12	PAOZZ		51744	WAF0250S	.WASHER, FLAT 0.25 NOM ID	4
13	PAOZZ		51744	30839-1201PG-2-2 A	.GAGE, DIFFERENTIAL, D	1
14	PAOZZ	4730001870088	88044	AN816-5D	.ADAPTER, STRAIGHT, PI 1/8 NPT X 5/16 FLARED TUBE	1
15	MOOZZ		51744	872FS-2001-21	.TUBE MAKE FROM RD AL TUBE, P/N WW-T-700/4 (5/16 OD X 0.035 WALL) APPROX 32 IN LONG	V
16	PAOZZ	4730001969585	88044	AN816-5-4D	.ADAPTER, STRAIGHT, PI 1/4 NPT X 5/16 FLARED TUBE	2
17	PAOZZ		51744	UT0375-16SS	.NUT PLAIN, HEXAGON 0.375-16 UNC SS	2
18	PAOZZ		51744	WAL0375SS	.WASHER, LOCK 3/8 NOM ID SS	1
19	PAOZZ		51744	872FS-FOO3A	.BRACKET, ANGLE CANISTER AND ELEMENT	1
20	PAOZZ		51744	WAF0375SS	.WASHER, FLAT 0.375 NOM ID SS	1
21	PCOZZ		51744	OOOU-ZO01-2	.WASHER, SEAL 0.375 ID X 1.00 OD X 0.06 THK	1
22	PAOZZ	4330013622178	13573	163387TB	.ELEMENT	3
23	PAOZZ	4930012380258	13573	S0-436V	.FILTER ELEMENT, FLUI	1
24	PAOZZ		51744	WAL0375S	.WASHER, LOCK 0.375 NOM ID	12
25	PAOZZ		51744	NUT0375-16S-1	.SCREW, CAP, HEXAGON H 0.375-16 UNC, ASTM 1, GRADE 2	12
26	PAOZZ	4820004072581	97403	13216E2798	.VALVE, SAFETY RELIEF 1/4 NPT	1
27	XBOZZ		51744	872FS-FO01(C)	.VESSEL, WELDMENT	1
28	MOOZZ		51744	872FS-2001-22	.TUBE MAKE FROM ALUMINUM TUBING P/N WW-T-700/4 (5/16 OD X .035 WALL) APPROX 18 IN LONG	V
29	PBOZZ		51744	872FS-F004	.ROD, THREADED END	1
30	PAOZZ		51744	1/2SP-SS	.PLUG, PIPE 1/2 NPT SS	1
31	XDOZZ		78357	AMPE-4	.DUST CAP .	1
32	PAOZZ		78357	AVEAC-4-4F	.COUPLER HALF, QUICK	1
33	PAOZZ		51744	OOOU-Z045	.NIPPLE, PIPE PROBE, 1/4 NPT	1
34	PAOZZ	5330002354716	97403	13217E5363	.GASKET	1
35	PAOZZ	6680001974942	97403	13217E5362	.FLOAT, SIGHT INDICAT	1
36	PAOZZ	6680010304391	97403	13217E5361	.INDICATOR, SIGHT, LIQ	1

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES (UOC)	(7) QTY
37	PAOZZ		51744	WAL050SS	.WASHER,LOCK	3
38	PAOZZ		51744	NUT0500-14SS	.NUT,PLAIN HEXAGON	3
39	PAOZA	5310008810944	96906	MS21043-5	NUT,SELF-LOCKING,EX 0.313-24 UNF	12
40	PAOZZ	5310001670814	80205	NAS1149C0532R	WASHER,FLAT	12
41	PCOZZ	5331002519367	96906	MS29513-234	O-RING	2
42	PAOZZ	5306001821952	88044	ANSCH11A	BOLT,MACHINE 0.313-24 UNF X 1.219 LG	12
43	PAOFF		97403	13230E6058-01 FOR BREAKDOWN	COUPLING,HALF CLAMP SEE FIG. C-2	2
44	PAOOZ		97403	13230E5921-102	ASSEMBLY,GROUND SEE FIG. C-4 FOR BREAKDOWN	1
45	PAOZZ	5306001562337	88044	AN4C5A	BOLT,MACHINE 1/4-28 X 0.66 LG	1
46	PAOZZ	4730014567469	97403	13230E6063-01	ADAPTER,STRAIGHT SEE FIG. C-3 FOR BREAKDOWN	1
47	PAOZZ	5310013529593	80205	NAS1149C0463R	WASHER,FLAT 1/4 ID	1
48	PAOZA	5310008444872	96906	MS21043-4	NUT,SELF-LOCKING,EX	1

END OF FIGURE

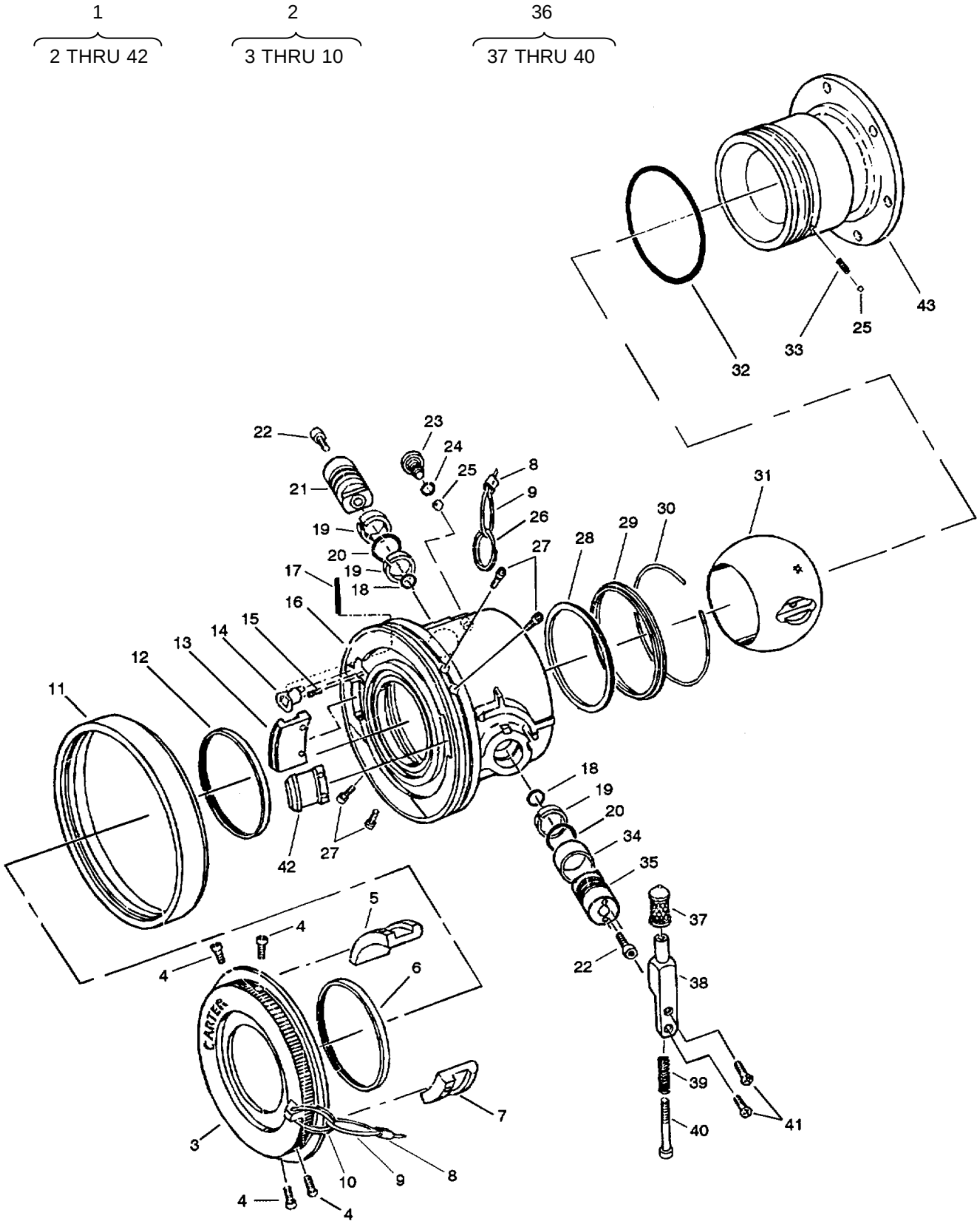


Figure C-2. Unisex Coupling, 3-Inch, Flange Mount

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES (UOC)	(7) QTY
					FIGURE C-2. UNISEX COUPLING, 3-INCH, FLANGE MOUNT	
1	XDOOZ		ODT23	64031VZ	.COUPLING,UNISEX,3" SEE FIG. C-2 FOR BREAKDOWN	1
2	XDOOZ		ODT23	470121-2	.SLEEVE SEAL COUPLER	1
3	XBOZZ		ODT23	220469-2	...CAP,GREEN	1
4	PAOZZ	5305011914578	96906	MS16997-20L	...SCREW,CAP,SOCKET HE	4
5	PAOZZ		ODT23	220446-1	...CLAMP,SYNCHRO LONG	1
6	PAOZZ		ODT23	220467	...SEAL,3",UNISEX	1
7	PAOZZ		ODT23	220446-2	...CLAMP,SYNCHRO SHORT	1
8	XDOZZ		ODT23	28-2-G	...SLEEVE	2
9	XDOZZ		ODT23	220201-1-20	...ROPE,WIRE	1
10	XDOZZ		ODT23	220482	...RING	1
11	PAOZZ	2910014562274	ODT23	220468	..CAP,BUMPER	1
12	PAOZZ		ODT23	220467	..SEAL,3",UNISEX	1
13	XDOZZ		ODT23	220800-1	..CLAMP,SYNCHRO LONG	1
14	XDFZZ		ODT23	220457	..PIN,QUICK RELEASE	1
15	XDFZZ		ODT23	LC030D-8	..SPRING,HELICAL	1
16	XAFZZ		ODT23	220429-2	..HOUSING,GREEN GREEN	1
17	XDFZZ		ODT23	0.094X1.000LDP	..PIN,SPRING	1
18	PCFZZ		96906	MS29513-009	..O-RING	2
19	XDFZZ		ODT23	220464	...BUSHING,SLEEVE	3
20	PCFZZ	5331002483845	96906	MS29513-016	..O-RING	2
21	XDFZZ		ODT23	220432	..CONTROL,SHAFT ASSEM	1
22	PAFZZ	5305012101648	96906	MS16997-32L	..SCREW,CAP,SOCKET HE	2
23	PAFZZ		ODT23	220484	..SCREW,CAP	1
24	PCFZZ	5331002638011	96906	MS29512-03	..O-RING	1
25	XDFZZ		ODT23	220265	..BALL	42
26	XDFZZ		ODT23	220482	..RING	1
27	PAOZZ	5305011914578	96906	MS16997-20L	..SCREW, CAP, SOCKET HE	4
28	PAFZZ		ODT23	220465	..SEAL, PLAIN	1
29	PAFZZ		ODT23	220459	..RETAINER, SEAL	1
30	XDFZZ		ODT23	220470	..WIRE, SEAL	1
31	XDFZZ		ODT23	220449	..BALL, VALVED PORTED	1
32	PCFZZ	5331002519367	96906	MS29513-234	..O-RING	1
33	XDFZZ		ODT23	220153	..SPRING	1
34	PAFZZ	3120014563926	ODT23	220466	..BEARING SLEEVE	1
35	XBFZZ		ODT23	220430	..SHAFT, UPPER	1
36	PBFFZ	5340014561334	ODT23	47119	..HANDLE, MANUAL CONTR	1
37	XDFZZ		ODT23	220142	...GRIP	1
38	XDFZZ		ODT23	220435	...HANDLE, LEVER CONTRO	1
39	XDFZZ		ODT23	220145	...SPRING	1
40	XDFZZ		ODT23	220204	...SCREW	1
41	PAFZZ	5305000795835	96906	MS24693C50	..SCREW,MACHINE	2
42	XDOZZ		ODT23	220800-2	..CLAMP,SYNCHRO .45 SHORT	1
43	XAOZZ		ODT23	220503-2	..INLET, FLANGE GREEN	1
					END OF FIGURE	

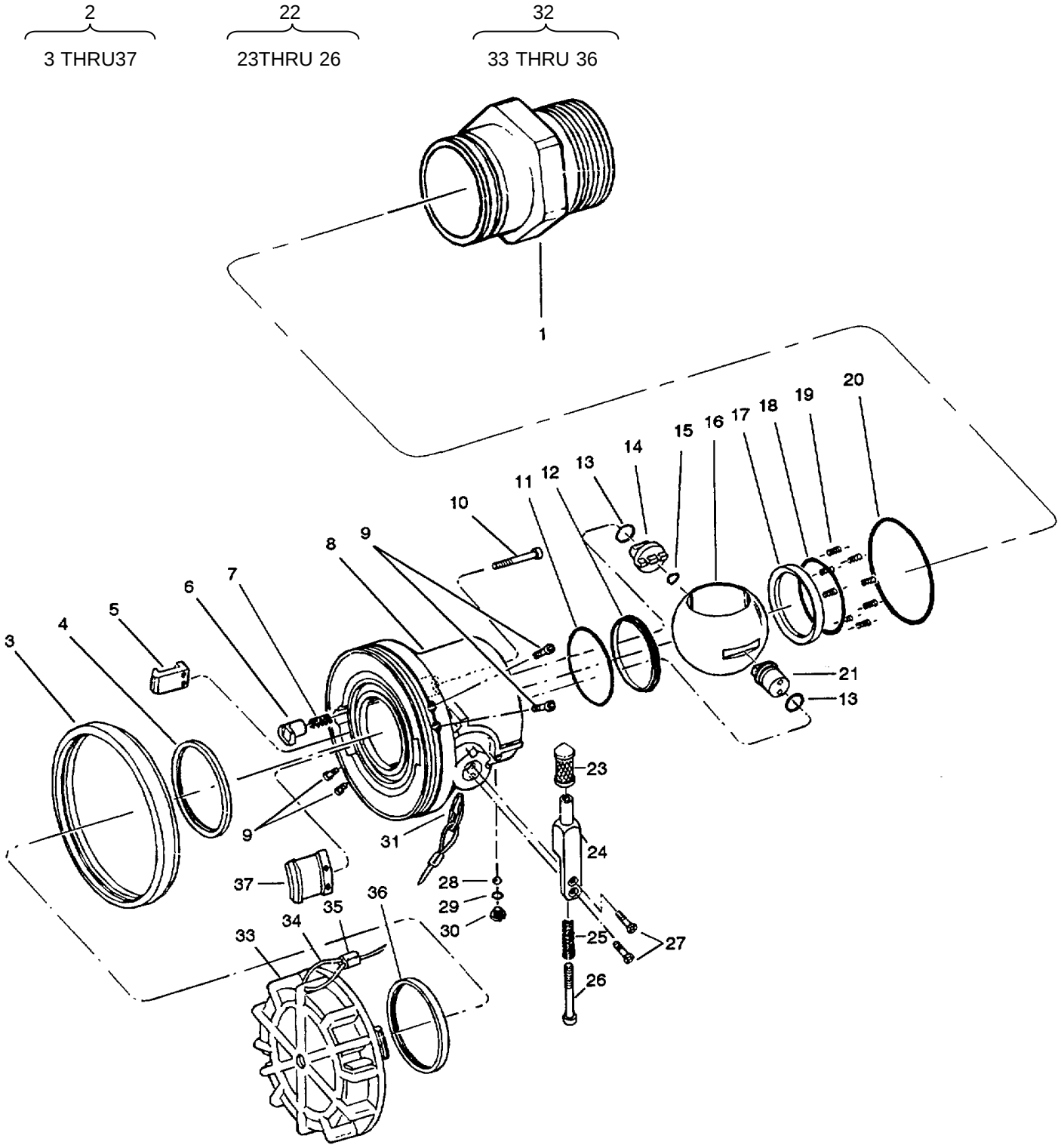


Figure C-3. Unisex Coupling, 2-Inch, MNPT

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES (UOC)	(7) QTY
					FIGURE C-3. UNISEX COUPLING, 2-INCH, MNPT	
1	PAFZZ	4730014563895	ODT23	220132-2	.NIPPLE, QUICK DISCON GREEN	1
2	XAOFF		ODT23	64020V	.COUPLING, UNISEX, 2"	1
3	XDOZZ	2510014567850	ODT23	220161	..CAP, BUMPER	1
4	PAOZZ	5330014339203	ODT23	220146	..SEAL, PLAIN PART OF KIT P/N KD64020-1	1
5	XDOZZ		ODT23	220159-2	..CLAMP, SYNCHRO SHORT	1
6	XDFZZ		ODT23	220151	..PIN, QUICK RELEASE	1
7	PAFZZ	5360014541830	ODT23	220149	..PIN, SPRING	1
8	XAFZZ		ODT23	220163-2	..BODY (GREEN)	1
9	PAOZZ	5305011914578	96906	MS16997-20L	..SCREW, CAP, SOCKET HE	4
10	PAFZZ	5305014561139	96906	MS16997-24L	..SCREW	1
11	PCFZZ	5331006410119	96906	MS29513-134	..O-RING PART OF KIT P/N KD64020-1	1
12	PAFZZ		ODT23	220158	..SEAL, PLAIN PART OF KIT P/N KD64020-1	1
13	PCFZZ	5331002483840	96906	MS29513-014	..O-RING PART OF KIT P/N KD64020-1	2
14	XDFZZ		ODT23	220150	..PIN, QUICK RELEASE	1
15	PAFZZ	5310006053789	83553	W0367-006-S	..WASHER, SPRING TENSI	1
16	XDFZZ		ODT23	220152	..BALL, VALVED PORTED	1
17	PAFZZ		ODT23	220157	..SEAL, PLAIN PART OF KIT P/N KD64020-1	1
18	PCFZZ	5331002917384	96906	MS29513-133	..O-RING PART OF KIT P/N KD64020-1	1
19	XDFZZ		ODT23	220153	..SPRING	8
20	PCFZZ	5331002609338	96906	MS29513-227	..O-RING PART OF KIT P/N KD64020-1	1
21	XDFZZ		ODT23	220154	..CONTROL SHAFT ASSEM	1
22	XDFZZ		ODT23	47085	..HANDLE, MANUAL ASSEM	1
23	XDFZZ		ODT23	220142	...GRIP	1
24	XAFZZ		ODT23	220147	...ARM	1
25	XDFZZ		ODT23	220145	...SPRING	1
26	XDFZZ		ODT23	220204	...SCREW	1
27	PAFZZ	5305000795835	96906	MS24693C50	..SCREW, MACHINE	2
28	XDFZZ		ODT23	220265	..BALL	41
29	PCFZZ	5331002483835	96906	MS29513-010	..O-RING PART OF KIT P/N KD64020-1	1
30	PAFZZ	5305009881720	96906	MS35206-276	..SCREW, MACHINE	1
31	XDOZZ		ODT23	220482	..RING	1
32	PAOOO	2910014562273	ODT23	47062	..CAP, DUST	1
33	XBOZZ		ODT23	220162	...BUMPER	1
34	XDOZZ		ODT23	28-2-G	...SLEEVE	1
35	XDOZZ		ODT23	220201-1-18	...WIRE ROPE	1
36	PAOZZ	5330014339203	ODT23	220146	...SEAL, PLAIN	1
37	XDOZZ		ODT23	220159-1	..CLAMP, SYNCHRO LONG.	1

END OF FIGURE

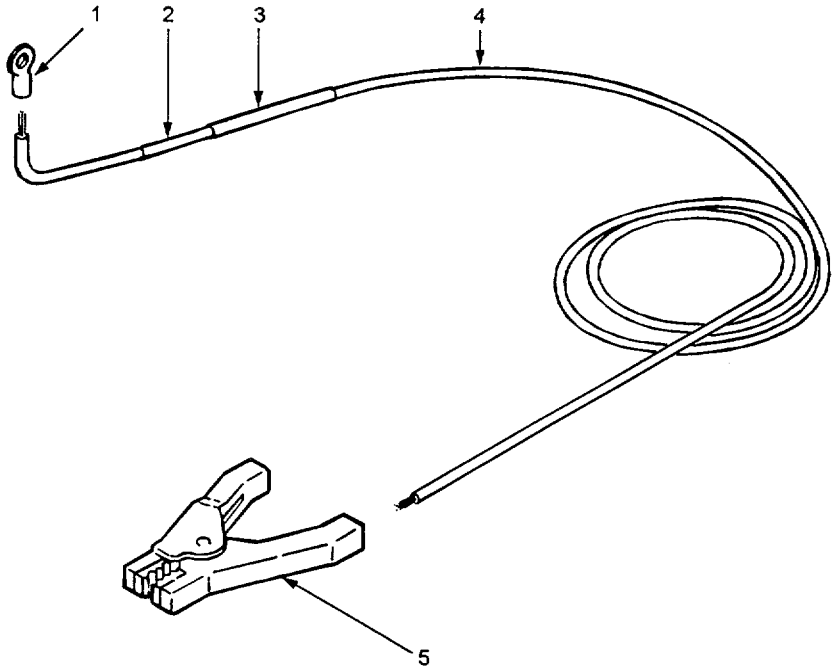


Figure C-4. Cable Assembly, Ground

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES (UOC)	(7) QTY
					FIGURE C-4. CABLE ASSEMBLY GROUP	
1	PAOZZ	5940001434777	96906	MS25036-157	.TERMINAL, LUG DIA .187/.062 CLR	1
2	XDOZZ		97403	13230E5925-01	.SLEEVE, MARKER HEAT SHRINKABLE	4
3	PAOZZ	5970013516800	81349	M23053/18-205-C	.INSULATION SLEEVING DIA 0.187/..... V 0.062 CLR	
4	XDOZZ		08716	04DSNC7702-03	.WIRE ROPE 12 AW V	
5	MOOZZ		97403	13230E5923-01	.CLAMP, GROUNDING MAKE FROM 81349/..... M83413/7-1	1

END OF FIGURE

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES (UOC)	(7) QTY
					GROUP 94 REPAIR KIT FIGURE KIT	
	PAOZZ		ODT23	KD64020-1	PARTS KIT, SEAL REPL	1
					O-RING (1) C-3-29 O-RING (1) C-3-18 O-RING (1) C-3-20 O-RING (2) C-3-13 O-RING (1) C-3-11 SEAL, PLAIN (1) C-3-17 SEAL, PLAIN (1) C-3-12 SEAL, PLAIN (1) C-3-4	

END OF FIGURE

(1) ITEM NO	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODES (UOC)	(7) QTY
					GROUP 9501. BULK ITEMS	
1	PAOZZ		97403	13230E5936-01	TAPE TEFLON V	
2	PAOZZ		81348	WW-T-700/4 TY1, TEMP, 12 FT	TUBE, METALLIC	1

END OF FIGURE

Section III. Special Tools List
(Not Applicable)

CROSS-REFERENCE INDEXES

NATIONAL STOCK NUMBER INDEX

STOCK NUMBER	FIG.	ITEM
5305-00-079-5835	C-2	41
	C-3	27
5940-00-143-4777	C-4	1
5306-00-156-2337	C-1	45
5310-00-167-0814	C-1	40
5306-00-182-1952	C-1	42
4730-00-187-0088	C-1	14
4730-00-196-9585	C-1	16
6680-00-197-4942	C-1	35
5330-00-235-4716	C-1	34
5330-00-248-3834	C-2	18
5331-00-248-3835	C-3	29
5331-00-248-3840	C-3	13
5331-00-248-3845	C-2	20
5331-00-251-9367	C-1	41
	C-2	32
5331-00-260-9338	C-3	20
5331-00-263-8011	C-2	24
4730-00-278-3678	C-1	8
5331-00-291-7384	C-3	18
4820-00-407-2581	C-1	26
5310-00-605-3789	C-3	15
4730-00-639-9869	C-1	7
5331-00-641-0119	C-3	11
5310-00-844-4872	C-1	48
5310-00-881-0944	C-1	39
5305-00-988-1720	C-3	30
6680-01-030-4391	C-1	36
5305-01-191-4578	C-2	4
	C-2	27
	C-3	9
5305-01-210-1648	C-2	22
4930-01-238-0258	C-1	23
5970-01-351-6800	C-4	3
5310-01-352-9593	C-1	47
4330-01-362-2178	C-1	22
5330-01-433-9203	C-3	4
	C-3	36
5360-01-454-1830	C-3	7
5305-01-456-1139	C-3	10
5340-01-456-1334	C-2	36
2910-01-456-2273	C-3	32
2910-01-456-2274	C-2	11
4730-01-456-3895	C-3	1
3120-01-456-3926	C-2	34
4730-01-456-7469	C-1	46
5330-01-456-8757	C-2	29
4610-01-456-9428	C-1	1
5330-01-456-9662	C-3	17
5330-01-456-9663	C-3	12
5342-01-458-2093	C-1	43
5310-01-458-4377	C-1	24
5330-01-458-5113	KITS	
5330-01-458-5461	C-2	28
5340-01-458-5526	C-2	7
5340-01-458-5529	C-2	5
5331-01-458-5559	C-1	6
6150-01-458-9060	C-1	44
5310-01-458-9990	C-1	11
5310-01-458-9993	C-1	18
5306-01-459-0256	C-1	29
5310-01-459-0772	C-1	38
4730-01-459-1125	C-1	33
5310-01-459-1147	C-1	37
5310-01-459-1150	C-1	12
5310-01-459-1241	C-1	20
5310-01-459-3696	C-1	4
5310-01-459-3769	C-1	21
5305-01-459-4210	C-2	23
5310-01-460-3127	C-1	17
5340-01-460-5537	C-1	19
4730-01-460-6420	C-1	32
5330-01-460-8998	C-2	6
	C-2	12

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
78357	AMPE-4		C-1	31
88044	AN4C5A	5306-00-156-2337	C-1	45
88044	ANSCH11A	5306-00-182-1952	C-1	42
88044	AN8 16-5-4D	4730-00-196-9585	C-1	16
88044	AN8 16-5D	4730-00-187-0088	C-1	14
88044	AN8 17-5D	4730-00-639-9869	C-1	7
78357	AVEAC-4-4F	4730-01-460-6420	C-1	32
13573	I63387TB	4330-01-362-2178	C-1	22
ODT23	KD64020-1	5330-01-458-5113	KITS	
ODT23	LC0300-8		C-2	15
96906	MS16997-20L	5305-01-191-4578	C-2	4
			C-2	27
			C-3	9
96906	MS16997-24L	5305-01-456-1139	C-3	10
96906	MS16997-32L	5305-01-210-1648	C-2	22
96906	MS20822-5D	4730-00-278-3678	C-1	8
96906	MS21043-4	5310-00-844-4872	C-1	48
96906	MS21043-5	5310-00-881-0944	C-1	39
96906	MS24693C50	5305-00-079-5835	C-2	41
			C-3	27
96906	MS25036-157	5940-00-143-4777	C-4	1
96906	MS29512-03	5331-00-263-8011	C-2	24
96906	MS29513-009	5330-00-248-3834	C-2	18
96906	MS29513-010	5331-00-248-3835	C-3	29
96906	MS29513-014	5331-00-248-3840	C-3	13
96906	MS29513-016	5331-00-248-3845	C-2	20
96906	MS29513-133	5331-00-291-7384	C-3	18
96906	MS29513-134	5331-00-641-0119	C-3	11
96906	MS29513-227	5331-00-260-9338	C-3	20
96906	MS29513-234	5331-00-251-9367	C-1	41
			C-2	32
96906	MS35206-276	5305-00-988-1720	C-3	30
81349	M23053/18-205-C	5970-01-351-6800	C-4	3
80205	NAS1149C0463R	5310-01-352-9593	C-1	47
80205	NAS1149C0532R	5310-00-167-0814	C-1	40
51744	NUT0375-16S-1		C-1	25
51744	NUT0375-16SS	5310-01-460-3127	C-1	17
51744	NUT0500-14SS	5310-01-459-0772	C-1	38
51744	OOOU-Z001-2	5310-01-459-3769	C-1	21
51744	OOOU-Z015-14	5331-01-458-5559	C-1	6
51744	OOOU-Z045	4730-01-459-1125	C-1	33
51744	OOOU-Z048(C)		C-1	9
51744	SCPH0250-20X0150S		C-1	10
13573	S0-436V	4930-01-238-0258	C-1	23
51744	WAF0250S	5310-01-459-1150	C-1	12
51744	WAF0375S	5310-01-459-3696	C-1	4
51744	WAF0375SS	5310-01-459-1241	C-1	20
51744	WAL0250S	5310-01-458-9990	C-1	11
51744	WAL0375S	5310-01-458-4377	C-1	24
51744	WAL0375SS	5310-01-458-9993	C-1	18

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
51744	WAL0500SS	5310-01-459-1147	C-1	37
81348	WW-T-700/4 TY1, T EMP,12 FT		BULK	2
83553	W0367-006-S	5310-00-605-3789	C-3	15
ODT23	0.094X1.000LDP		C-2	17
08716	04DSNC7702-03		C-4	4
51744	1/2SP-SS		C-1	30
97403	13216E2798	4820-00-407-2581	C-1	26
97403	13217E5361	6680-01-030-4391	C-1	36
97403	13217E5362	6680-00-197-4942	C-1	35
97403	13217E5363	5330-00-235-4716	C-1	34
97403	13230E5875-102	4610-01-456-9428	C-1	1
97403	13230E5919-01		C-1	2
97403	13230E5921-102	6150-01-458-9060	C-1	44
97403	13230E5923-01		C-4	5
97403	13230E5925-01		C-4	2
97403	13230E5936-01		BULK	1
97403	13230E6058-01	5342-01-458-2093	C-1	43
97403	13230E6063-01	4730-01-456-7469	C-1	46
ODT23	220132-2	4730-01-456-3895	C-3	1
ODT23	220142		C-2	37
			C-3	23
ODT23	220145		C-2	39
			C-3	25
ODT23	220146	5330-01-433-9203	C-3	4
			C-3	36
ODT23	220147		C-3	24
ODT23	220149	5360-01-454-1830	C-3	7
ODT23	220150		C-3	14
ODT23	220151		C-3	6
ODT23	220152		C-3	16
ODT23	220153		C-2	33
			C-3	19
ODT23	220154		C-3	21
ODT23	220157	5330-01-456-9662	C-3	17
ODT23	220158	5330-01-456-9663	C-3	12
ODT23	220159-1		C-3	37
ODT23	220159-2		C-3	5
ODT23	220161		C-3	3
ODT23	220162		C-3	33
ODT23	220163-2		C-3	8
ODT23	220201-1-18		C-3	35
ODT23	220201-1-20		C-2	9
ODT23	220204		C-2	40
			C-3	26
ODT23	220265		C-2	25
			C-3	28
ODT23	220429-2		C-2	16
ODT23	220430		C-2	35
ODT23	220432		C-2	21
ODT23	220435		C-2	38

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
ODT23	220446-1	5340-01-458-5529	C-2	5
ODT23	220446-2	5340-01-458-5526	C-2	7
ODT23	220449		C-2	31
ODT23	220457		C-2	14
ODT23	220459	5330-Q1-456-8757	C-2	29
ODT23	220464		C-2	19
ODT23	220465	5330-01-458-5461	C-2	28
ODT23	220466	3120-01-456-3926	C-2	34
ODT23	220467	5330-01-460-8998	C-2	6
			C-2	12
ODT23	220468	2910-01-456-2274	C-2	11
ODT23	220469-2		C-2	3
ODT23	220470		C-2	30
ODT23	220482		C-2	10
			C-2	26
			C-3	31
ODT23	220484	5305-01-459-4210	C-2	23
ODT23	220503-2		C-2	43
ODT23	220800-1		C-2	13
ODT23	220800-2		C-2	42
ODT23	28-2-G		C-2	8
			C-3	34
51744	30839-1201PG-2-2 A		C-1	13
ODT23	470121-2		C-2	2
ODT23	47062	2910-01-456-2273	C-3	32
ODT23	47085		C-3	22
ODT23	47119	5340-01-456-1334	C-2	36
ODT23	64020V		C-3	2
ODT23	64031VZ		C-2	1
51744	8LHX0375-16X0375 OGR5S		C-1	3
51744	872FS-F001(C)		C-1	27
51744	872FS-F002		C-1	5
51744	872FS-F003A	5340-01-460-5537	C-1	19
51744	872FS-F004	5306-01-459-0256	C-1	29
51744	872FS-2001-21		C-1	15
51744	872FS-2001-22		C-1	28

APPENDIX D
COMPONENTS OF END ITEM AND BASIC ISSUE ITEM LIST

Section I. INTRODUCTION

D.1 SCOPE.

This appendix lists components of the end item and basic issue items for the AAFARS liquid fuel filter-separator to help you inventory the items for safe and efficient operation of the equipment.

D.2 GENERAL.

The Components of End Item (COEI) and Basic Issue Items (BII) List is divided into the following sections.

a. Section II, Components of End Item. This listing is for information purposes only and is not authority to requisition replacements. These items are part of the AAFARS liquid fuel filter-separator. 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.

b. Section III, Basic Issue Items. These essential items are required to place the AAFARS liquid fuel filter-separator in operation, operate it, and to do emergency repairs. Although shipped separately, BII must be with the AAFARS liquid fuel filter-separator during operation and when it is transferred between property accounts. This list 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.

D.3 EXPLANATION OF COLUMNS.

a. Column (1), Illus. Number, gives you the number of the item illustrated.

b. Column (2), National Stock Number, identifies the stock number of the item to be used for requisitioning purposes.

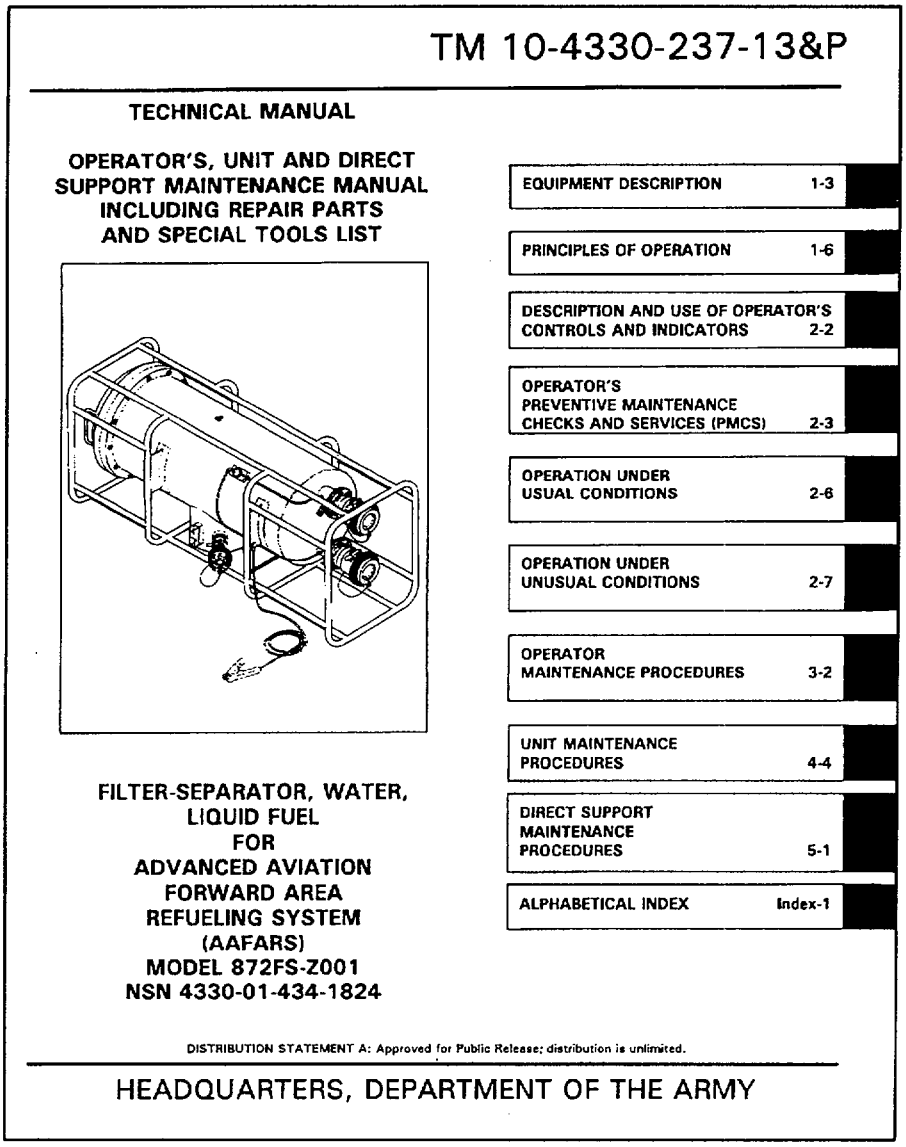
c. Column (3), Description and Usable On Code, identifies the federal item name followed by a minimum description when needed. The last line below the description is the Commercial and Government Entity Code (CAGEC) and the part number.

d. Column (4), U/I (Unit of Issue) indicates how the item is issued for National Stock Number shown in column two.

e. Column (5), Qty Rqd, indicated the quantity required.

Section II. COMPONENTS OF END ITEM (NOT APPLICABLE)

Section III. BASIC ISSUE ITEMS


TM 10-4330-237-13&P

TECHNICAL MANUAL

OPERATOR'S, UNIT AND DIRECT SUPPORT MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST

FILTER-SEPARATOR, WATER, LIQUID FUEL FOR ADVANCED AVIATION FORWARD AREA REFUELING SYSTEM (AAFARS) MODEL 872FS-Z001 NSN 4330-01-434-1824

1

DISTRIBUTION STATEMENT A: Approved for Public Release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY

Item Number	National Stock Number	Description CAGEC and Part Number	U/I	Qty. Reqd
1		Operator's, Unit and Direct Support Maintenance Manual Including Repair Parts and Special Tools List for Filter-Separator, Water, Liquid Fuel for Advanced Aviation Forward Area Refueling System (AAFARS). TM 10-4330-237-13&P	EA	1

APPENDIX E

ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

E.1 SCOPE.

This appendix lists additional items that you are authorized for the support of the AAFARS liquid fuel filter-separator.

E.2 GENERAL.

This list identifies items that do not have to accompany the AAFARS liquid fuel filter-separator and that do not have to be turned in with it. These items are authorized to you by MTOE, TDA, CTA or JTA.

E.3 EXPLANATION OF LISTING.

National Stock Numbers, description and quantities are provided to help you identify and request the additional items you require to support this equipment.

Section II. ADDITIONAL AUTHORIZATION LIST

There are no additional items authorized to support the liquid fuel filter-separator.

APPENDIX F

EXPENDABLE/DURABLE ITEMS LIST

Section I. INTRODUCTION

F.1 SCOPE.

This appendix lists expendable and durable items that you will need to operate and maintain the AAFARS Liquid Fuel Filter-Separator. This listing is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50790, Expendable/Durable Items (except medical, class V repair parts, and heraldic items) or CTA 8-100, Army Medical Department Expendable/Durable Items.

F.2 EXPLANATION OF COLUMNS.

a. 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 cleaning compound, item 5, appendix F).

b. Column (2), Level. This column identifies the lowest level of maintenance that requires the item.

c. Column (3), National Stock Number. This is the national stock number assigned to the item, which you can use to requisition it.

d. Column (4), Item Name, Description, Commercial and Government Entity Code (CAGEC), and Part Number. This provides additional information you can use to identify the item.

e. Column (5), Unit of Measure (U/M). This code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

Section II. EXPENDABLE/DURABLE ITEMS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) (U/M)/ (U/I)
1	O	7920-00-401-8034	Cloth, lint free ..... (81348) CCC-C-46	LB
2	O	9150-00-250-0926	Petrolatum ..... (81348) VV-P-236	LB
3	O	5350-00-867-7665	Grit paper, 320 grain ..... (06565) DURITE320A	SL
4	O	6850-01-377-1809	Solvent, Dry Cleaning ..... (81348) SD (P-D-680)	GL
5	O		Sealant, Thread, Multipurpose..... (97403) 13230E5929	EA
6	O		Tape, Teflon..... (3A054) 6802K55	RL
7	O	7920-00-295-1711	Rag, wiping..... (58536) A-A-531	LB

APPENDIX G

ILLUSTRATED LIST OF MANUFACTURED ITEMS

G-1 INTRODUCTION.

a. This appendix includes complete instructions for making items authorized to be manufactured or fabricated at unit maintenance level.

b. A part number index in alphanumeric order is provided for cross-referencing the part number of the item to be manufactured to the figure which covers fabrication criteria.

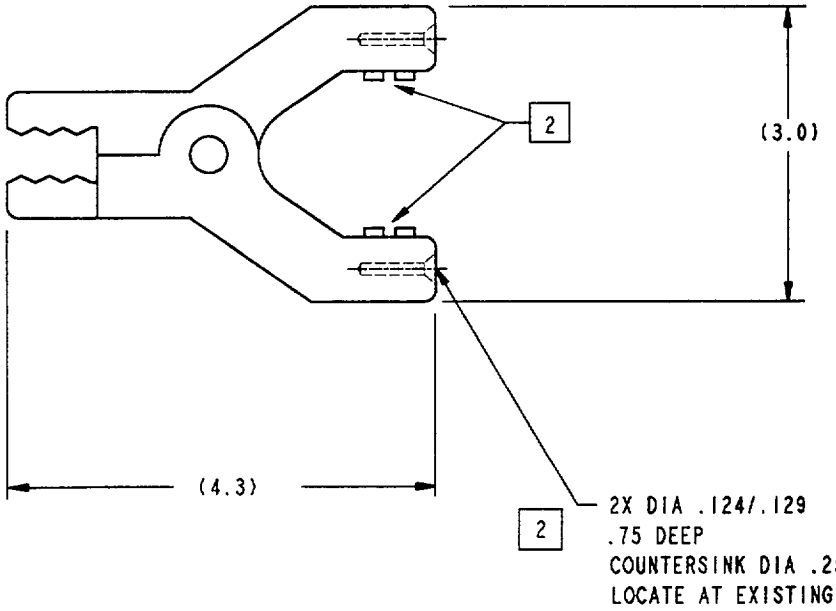
c. All bulk materials needed for manufacture of an item are listed by part number or specification number in a tabular listing on the illustration.

G-2 MANUFACTURED ITEMS PART NUMBER INDEX.

Part Number	Figure
13230E5923	G-1
872FS-Z001-21	G-2
872FS-Z001-22	G-3

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 G-1. Clamp, Grounding

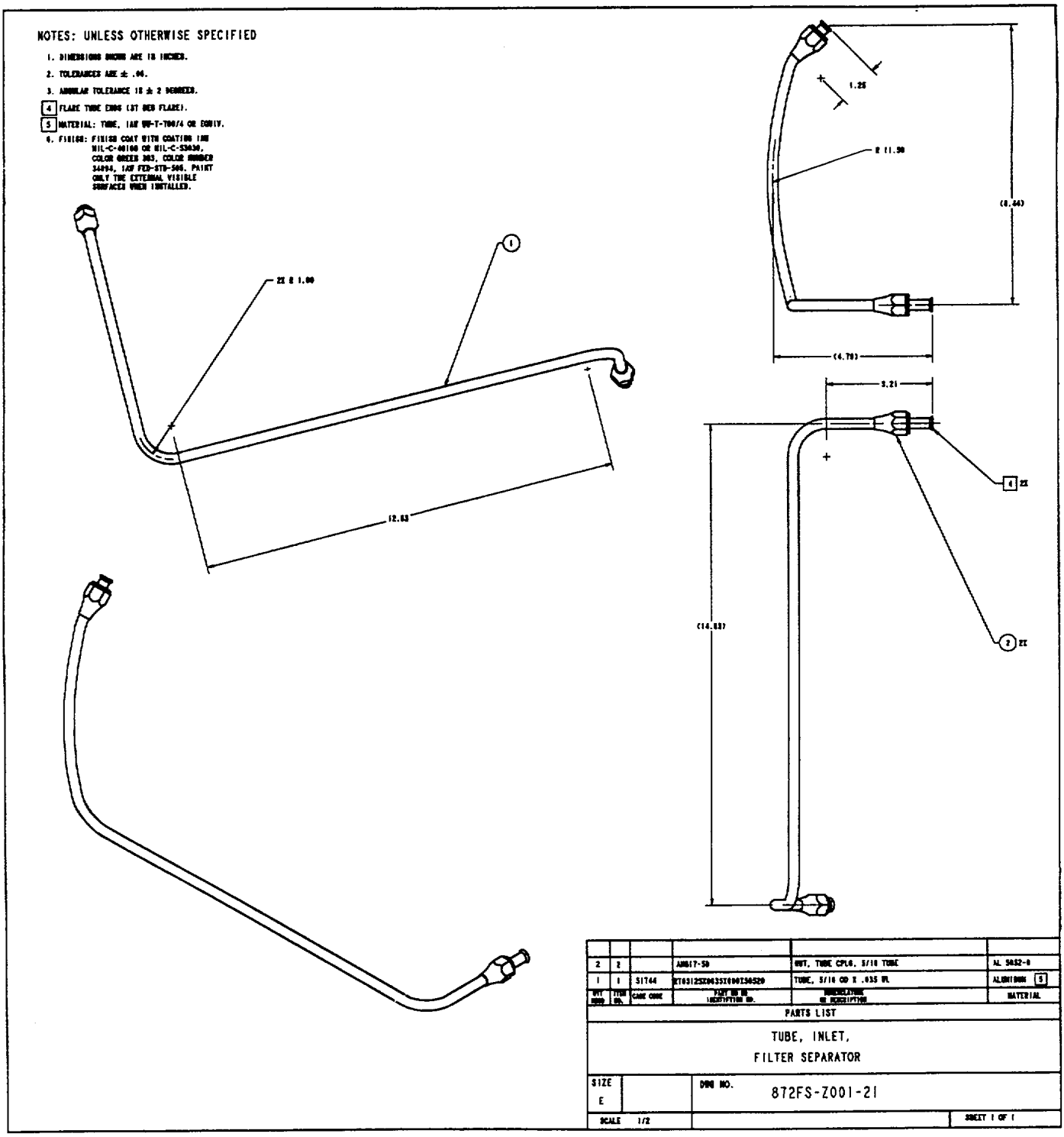


Figure G-2. Tube, Inlet, Filter-Separator

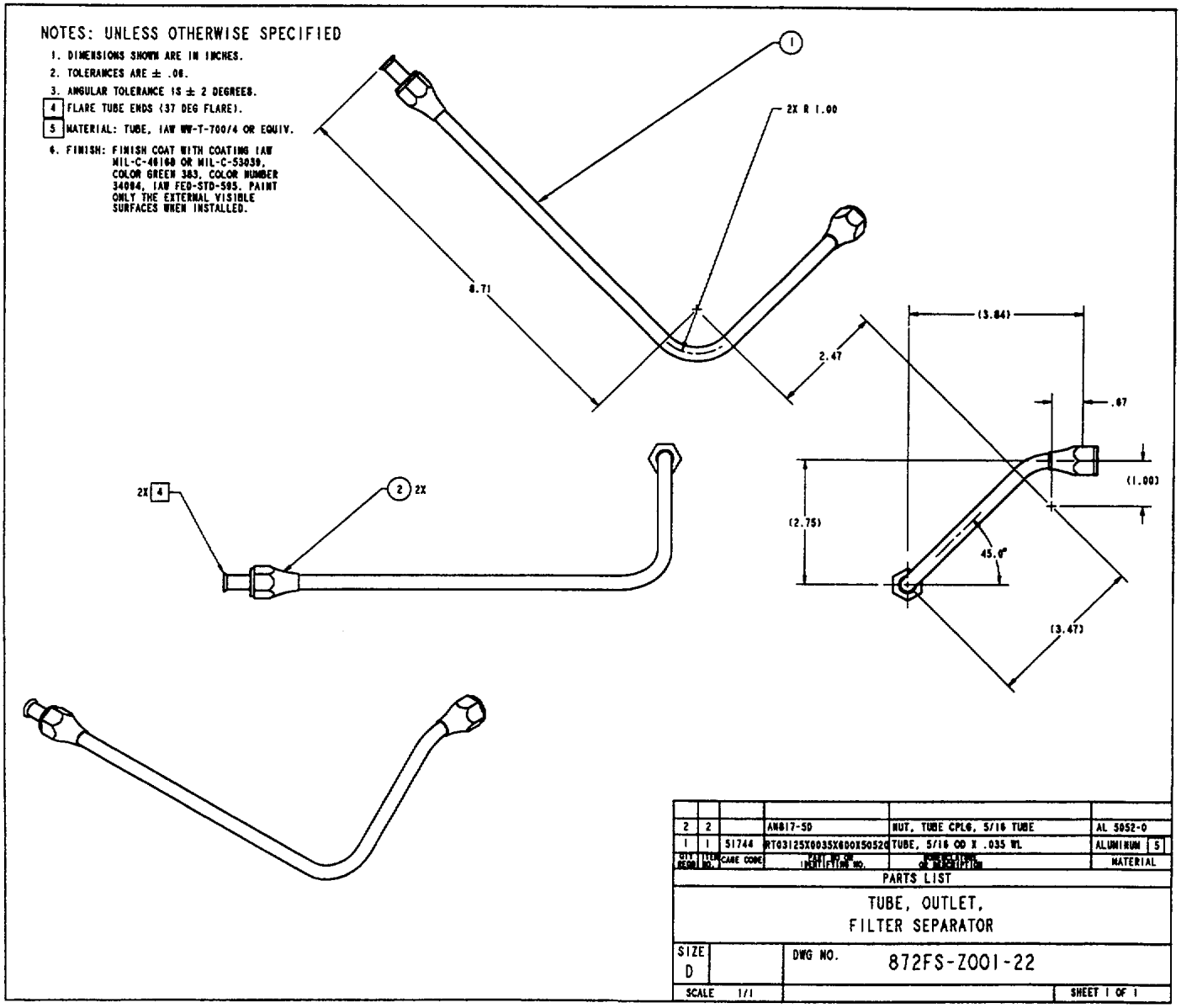


Figure G-3. Tube, Outlet, Filter-Separator

APPENDIX H

TORQUE LIMITS

H-1 INTRODUCTION.

This appendix provides general torque data to allow you to determine the torque requirements for a filter-separator, liquid fuel fastener 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.

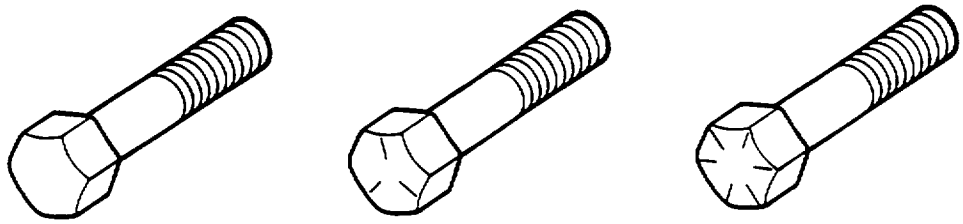
H-2 FILTER-SEPARATOR, LIQUID FUEL SPECIFIC TORQUE DATA.

Filter-Separator, Liquid Fuel Specific Torque Data

Item	Torque Value
Filter-Separator, Liquid Fuel End Cap Bolts	30 ft. lbs (433 Nm)
Sight Gauge Mounting Screws	45 in. lbs (5.08 Nm)

H-3 GENERAL TORQUE DATA.

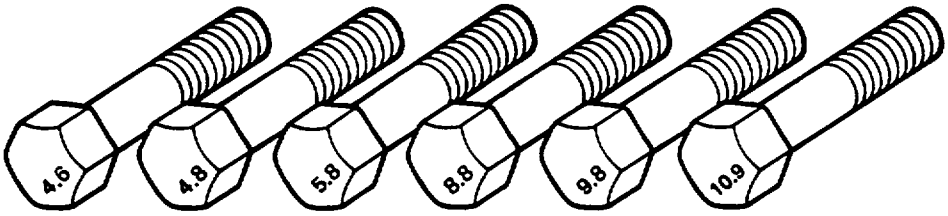
BOLT STRENGTH IDENTIFICATION, ENGLISH SYSTEM



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

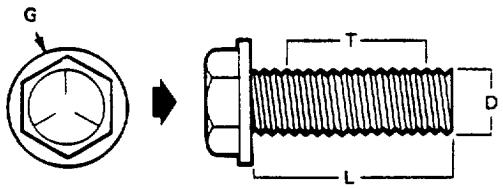
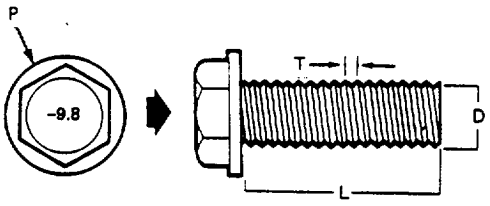


Identification class numbers correspond to bolt strength - increasing numbers represent increasing strength.

HEX NUT STRENGTH IDENTIFICATION

English System		Metric System	
Grade	**Identification**	**Grade**	**Identification**
Hex Nut Grade 5		Hex Nut Property Class 9	
Hex Nut Grade 8		Hex Nut Property Class 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) L = Length (inches) G = Grade (bolt strength) T = Threads/inch	D = Diameter (millimeters) L = Length (millimeters) P = Property (bolt strength) 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

APPENDIX I

MANDATORY REPLACEMENT PARTS

ITEM NO.	PART NUMBER	NSN	NOMENCLATURE	QTY
1	OOOU-Z015-13		O-RING	1
2	MS21043-5 (96906)	5330-00-881-0944	NUT, SELF-LOCKING	6
3	MS29513-234 (96906)	5330-00-251-9367	O-RING	1
4	13217E5363 (97403)	5330-00-235-4716	GASKET, SIGHT GAUGE	1
5	MS29512-03 (96906)	5330-00-263-8011	O-RING	1
6	220465 (ODT23)		SEAL	1
7	220157 (ODT23)		SEAL	1
8	MS29513-133 (96906)	5330-00-291-7384	O-RING	1
9	MS29513-227 (96906)	5330-00-269-9338	O-RING	1
10	220464 (ODT23)		BUSHING	3
11	220466 (ODT23)		BUSHING	1
12	MS29513-010 (96906)	5300-00-004-3096	O-RING	1
13	MS29513-014 (96906)	5330-00-248-3840	O-RING	2
14	MS29513-009 (96906)	5330-00-248-3834	O-RING	2
15	MS29513-016 (96906)	5330-00-248-3845	O-RING	2
16	WAL0250S		WASHER, SPLIT LOCK	2
17	WAL0375S		WASHER, SPLIT LOCK	12
18	WAL0375SS		WASHER, SPLIT LOCK	1
19	WAL0500SS		WASHER, SPLIT LOCK	3
20	KD64020-1		KIT, PARTS	1

GLOSSARY

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 unit 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).
Dry break	Separation of couplings without loss of fuel.
Emulsion	A dispersion of fine water droplets in the pumpage.
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.

ALPHABETICAL INDEX

Subject Page

By Order of the Secretary of the Army:

DENNIS J. REIMER
General, United States Army
Chief of Staff

Official

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
05756

DISTRIBUTION: To be distributed in accordance with the Initial Distribution Number (IDN) 256428, requirements for TM 10-4330-237-13&P.

☆**U.S. GOVERNMENT PRINTING OFFICE: 1999-746-025/80188**

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)
PFC JOHN DOE
COA, 3d ENGINEER BN
FT. LEONARDWOOD, MO 63108

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 10-4330-237-13&P	1 MARCH 1999	Operator's Unit & Direct Support Maint. Manual Incl. RPSTL Filter-Separator, Water, Liquid Fuel for (AAFARS) MODEL 872FS-Z001

BE EXACT. PIN-POINT WHERE IT IS

PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO
6	2-1 a		
B1		4-3	
125	line 20		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

In line 6 of paragraph 2-1a the manual states the engine has 6 Cylenders. The engine on my set only has 4 Cylenders. Change the manual to show 4 Cylende

c[illegible] figure 4-3 is a bolt. In key 4-3, item 16 is called a rim - Please Correct one the other.

I ordered a gasket, item 19 on figure B-16 key NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is wrong. Please give me a good NSN

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
JOHN DOE, PFC (262) 317-7111

SIGN HERE John Doe
JOHN DOE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

DRSTS-M Overprint 1, 1 Nov 80

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS

TEAR ALONG PERFORATED LINE

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

THEN . JOT DOWN THE DOPE ABOUT IT ON THIS FORM,CAREFULLYTEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 10-4330-237-13&P	1 MARCH 1999	Operator's Unit & Direct Support Maint. Manual Incl. RPSTL Filter-Separator, Water, Liquid Fuel for (AAFARS) MODEL 872FS-Z001

BE EXACT PIN-POINT WHERE IT IS:

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO

IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

SIGN HERE

DA FORM 1 JUL 79 2028–2

PREVIOUS EDITIONS ARE OBSOLETE.

DRSTS-M verprint2, 1 Nov 80

P.S.- - IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION, MAKE A CARBON COPY OF THIS AND GIVE TO YOUR HEADQUARTERS.

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICAL BUSINESS

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS BRM PERMIT NO. 82 ROCK ISLAND, IL

POSTAGE WILL BE PAID BY ROCK ISLAND ARSENAL

HQ, US ARMY TANK-AUTOMOTIVE AND ARMAMENTS COMMAND
ATTN: AMSTA-LC-CI (TECH PUBS CONTROL POINT)
ROCK ISLAND, IL 61201-9948

TEAR ALONG PERFORATED LINE

THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meter = 0.3937 Inch
1 Decimeter= 10 Centimeters = 3.94 Inches
1 Meter = 10 Decimeters = 100 Centimeters
= 1000 Millimeters = 39.37 Inches
1 Dekameter = 10 Meters = 32.8 Feet
1 Hectometer = 10 Dekameters = 328.08 Feet
1 Kilometer 2 10 Hectometers = 1000 Meters
= 0.621 Mile = 3,280.8 Feet
Millimeters = Inches times 25.4
Inches = Millimeters divided by 25.4

WEIGHTS

1 Centigram = 10 Milligrams = 0.154 Grain
1 Decigram = 10 Centigrams = 1.543 Grains
1 Gram = 0.001 Kilogram = 10 Decigrams
= 1000 Milligrams = 0.035 Ounce
1 Dekagram = 10 Grams = 0.353 Ounce
1 Hectogram = 10 Dekagrams = 3.527 Ounces
1 Kilogram = 10 Hectograms = 1000 Grams = 2.205 Pounds
1 Quintal = 100 Kilograms = 220.46 Pounds
1 Metric Ton = 10 Quintals = 1000 Kilograms = 1.102 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liter = 0.034 Fluid Ounce
1 Centiliter = 10 Milliliters = 0.34 Fluid Ounce
1 Deciliter = 10 Centiliters = 3.38 Fluid Ounces
1 Liter = 10 Deciliters = 1000 Millileters = 33.82 Fluid 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 = 0.155 Sq Inch
1 Sq Decimeter= 100 Sq Centimeters = 15.5 Sq Inches
1 Sq Meter (Centare) = 100 Sq Decimeters
= 10,000 Sq Centimeters = 10.764 Sq Feet
1 Sq Dekameter (Are) = 100 Sq Meters = 1,076.4 Sq Feet
1 Sq Hectometer (Hectare) = 100 Sq Dekameters = 2.471 Acres
1 Sq Kilometer = 100 Sq Hectometers = 1,000,000 Sq Meters
= 0.386 Sq Mile

CUBIC MEASURE

1 Cu Centimeter = 1000 Cu Millimeters = 0.061 Cu Inch
1 Cu Decimeter = 1000 Cu Centimeters = 61.02 Cu Inches
1 Cu Meter = 1000 Cu Decimeters = 1,000,000 Cu Centimeters
= 35.31 Cu Feet

TEMPERATURE

5/9 (F - 320) = °C
9/5 (°C+ 320) = °F
-35° Fahrenheit is equivalent to -37° Celsius
0° Fahrenheit is equivalent to -18° Celsius
32° Fahrenheit is equivalent to 0° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
100° Fahrenheit is equivalent to 38° Celsius
212^0 Fahrenheit is equivalent to 100° Celsius

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.452
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectom eters	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.574
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.350
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds-Inches	Newton-Meters	0.11298
Pounds per Square Inch	Kilopascals	6.895
Ounce-Inches	Newton-Meters	0.007062
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609
Centimeters	Inches	0.394

TO CHANGE	TO	MULTIPLY BY
Meters	Feet	3.281
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2:352
Kilometers per Hour	Miles per Hour	0.621
°Fahrenheit	° Celsius	C = (°F-32)x5/9
°Celsius	°Fahrenheit	F = (9/5x° C)+32

PIN: 077194-000