

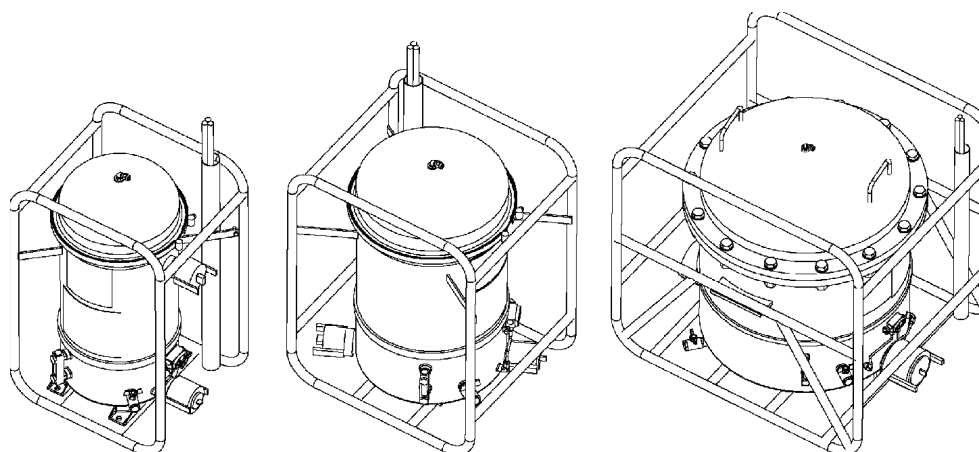
# **TM 5-4330-263-13&P**

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## **TECHNICAL MANUAL OPERATOR AND FIELD MAINTENANCE MANUAL WITH REPAIR PARTS AND SPECIAL TOOLS LIST**

**FOR**

**FILTER/SEPARATOR, LIQUID FUEL,  
50-GPM (NSN 4330-01-483-1068)  
100-GPM (NSN 4330-01-525-3659)  
350-GPM (NSN 4330-01-529-0584)**



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

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**HEADQUARTERS, DEPARTMENT OF THE ARMY**

**July 2008**



## **WARNING SUMMARY**

### **WARNING**

In normal operation, the filter/separator is filled with diesel/jet fuel. Diesel/jet fuel may explode if subjected to high temperatures, sources of ignition or high pressure. Keep all open flames, cigarettes, and any other sources of fire/flare or ignition a minimum of 50 yards from any fuel servicing operations. Failure to follow this warning may result in injury or death to personnel.

### **WARNING**

Rapid filling of the filter/separator can cause a buildup of static electricity, leading to possible explosion. Fill filter/separator units slowly to minimize static buildup. Failure to follow this warning may result in injury or death to personnel.

### **WARNING**

Diesel/jet fuel is toxic and can severely affect skin, eyes and the respiratory tract. Personnel must wear appropriate hand and eye protection (nitrile gloves and goggles). Wash skin thoroughly with soap and water if exposed. In case of contact with diesel/jet fuel, flush eyes with clear water for at least 15 minutes. Failure to follow this warning may result in injury or death to personnel.

### **WARNING**

Diesel/jet fuel fumes are toxic in high concentrations. Avoid prolonged breathing of vapors. Operation and maintenance of the filter/separator should be performed only in a well-ventilated environment. Failure to follow this warning may result in injury or death to personnel.

### **WARNING**

Failure to properly ground the filter/separator units can cause a buildup of static electricity, leading to possible explosion. Always verify that the grounding rod is properly configured to dissipate static electricity. Failure to follow this warning may result in injury or death to personnel.

### **WARNING**

Failure to properly torque the lid bolts on the 350-GPM filter/separator unit can cause fuel leaks, leading to possible explosion. Failure to follow this warning may result in injury or death to personnel.

### **WARNING**

Failure to properly seat the v-band and torque the bolt securing the v-band on the 50-GPM and 100-GPM filter/separator units can cause fuel leaks, leading to possible explosion. Follow maintenance procedures carefully to ensure that v-band is properly seated. Failure to follow this warning may result in injury or death to personnel.

**WARNING**

Improper installation of o-rings and gaskets when repairing the filter/separator units can cause fuel leaks, leading to possible explosion. Follow inspection and maintenance procedures carefully to ensure integrity of o-rings and gaskets. Failure to follow this warning may result in injury or death to personnel.

**WARNING**

Exceeding the maximum pressure limits for the filter/separator units can cause fuel leaks, leading to possible explosion. Do not exceed a static pressure of 115 psi in the 50-GPM or 100-GPM filter/separator units. Failure to follow this warning may result in injury or death to personnel.

**WARNING**

Exceeding the maximum pressure limits for the filter/separator units can cause fuel leaks, leading to possible explosion. Do not exceed a static pressure of 225 psi in the 350-GPM filter/separator unit. Failure to follow this warning may result in injury or death to personnel.

**WARNING**

Rapid closure of downstream valves or nozzles during fueling with a high-pressure pump can result in overpressurization of vessel and cause fuel leaks, leading to possible explosion. Failure to follow this warning may result in injury or death to personnel.

**WARNING**

Avoid prolonged breathing of vapors. Only use the filter/separator in a well-ventilated environment.

**WARNING**

Removing head assembly requires a two-man lift to avoid injury to personnel.

## LIST OF EFFECTIVE PAGES

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HEADQUARTERS,  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C. 31 JULY 2008

TECHNICAL MANUAL

OPERATION AND FIELD MAINTENANCE WITH  
REPAIR PARTS AND SPECIAL TOOLS LIST

FILTER/SEPARATOR, LIQUID FUELS,  
50-GPM (NSN 4330-01-483-1068)  
150-GPM (NSN 4330-01-525-3659)  
350-GPM (NSN 4330-01-529-0584)

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this publication. If you find any errors or if you would like to recommend any improvements to the procedures in this publication, please let us know. The preferred method is to submit your DA Form 2028 (Recommended Changes to Publications and Blank Forms) through the Internet on the Army Electronic Product Support (AEPS) Web site. The Internet address is <https://aeeps.ria.army.mil>. The DA Form 2028 is located under the Public Applications section on the AEPS public home page. Fill out the form and click on SUBMIT. Using this form on the AEPS site will enable us to respond to your comments quicker and to manage the DA Form 2028 program better. You may also mail, e-mail, or fax your comments or DA Form 2028 directly to the U.S. Army TACOM Life Cycle Management Command. The postal address is U.S. Army TACOM Life Cycle Management Command, ATTN: AMSTA-LC-LMPP / TECH PUBS, 1 Rock Island Arsenal, Rock Island, IL 61299-7630. The e-mail address is [tacomlcmmc.daform2028@us.army.mil](mailto:tacomlcmmc.daform2028@us.army.mil). The fax number is DSN 793-0726 or Commercial (309) 782-0726.

**CURRENT AS OF 2 JULY 2008**

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

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## HOW TO USE THIS MANUAL

### OVERVIEW

This technical manual describes operation, maintenance and repair requirements for the filter/separator units. The manual has been prepared in work package format. Each work package is intended as a stand-alone unit, providing specific information and instructions for a single topic or task. Each work package lists tools and expendable items required for the procedures contained in that work package.

To use the maintenance work packages in this manual properly, you should familiarize yourself with the entire work package before beginning the maintenance task. Information in this manual is divided into 24 work packages and an index. Work packages are numbered sequentially.

### CONTENTS

<b>WP No.</b>	<b>Title</b>	<b>Description</b>
0001 00	General Information	General information about the manual and equipment
0002 00	Description and Data	Location and description of major components and equipment specifications
0003 00	Controls and Indicators	Description of all operator controls and their functions
0004 00	Operator Preventive Maintenance Checks and Services	PMCS table for equipment operators
0005 00	Preparation for Operation	Procedures to prepare the units for use
0006 00	Operation	Operating procedures for unit
0007 00	Field Preventive Maintenance Checks and Services	Field-level PMCS table
0008 00	Troubleshooting	Steps for diagnosing and correcting problems with the units
0009 00	Fuel Draining	Procedures for draining fuel from units
0010 00	Element Replacement	Procedures for replacing defective filter elements
0011 00	Sight Gauge Replacement	Procedures for replacing defective sight gauge
0012 00	Differential Pressure Gauge Replacement	Procedures for replacing defective differential pressure gauge
0013 00	Fuel and Water Drain Valve Replacement	Procedures for replacing defective drain valve
0014 00	Purge Valve Replacement	Procedures for replacing defective purge valve
0015 00	Bayonet Replacement	Procedures for replacing defective bayonet
0016 00	Camlock Replacement	Procedures for replacing defective camlock
0017 00	References	List of documents referenced in this manual
0018 00	Maintenance Allocation Chart Introduction	Introduction to the MAC chart
0019 00	Maintenance Allocation Chart (MAC)	MAC charts for the units
0020 00	Repair Parts and Special Tools List (RPSTL)	Illustrated parts list
0021 00	Components of End Item and Basic Issue Items Lists	List of items shipped with the units
0022 00	Additional Authorization List	Additional equipment authorized to be used with units
0023 00	Expendable and Durable Items List	List of consumable materials and items used in maintaining the units
0024 00	Mandatory Replacement Parts	List of parts that must be replaced during maintenance procedures



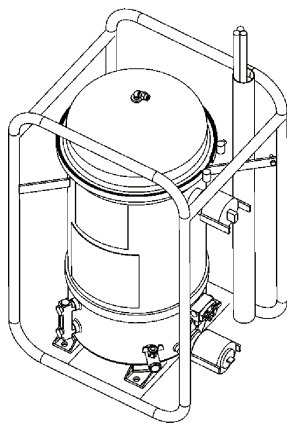
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## OPERATOR AND FIELD MAINTENANCE FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, AND 350-GPM GENERAL INFORMATION

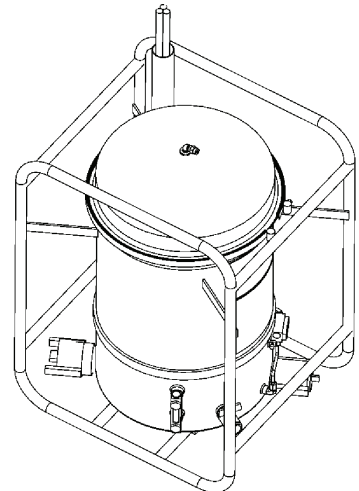
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### SCOPE

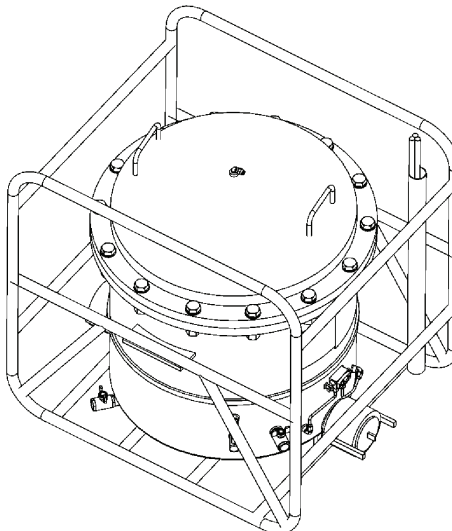
1. Type of Manual: Operator and Field level maintenance and repair parts manual.
2. Equipment Name:  
50-GPM Liquid Fuel Filter/Separator Unit, Frame Mounted, Type II, Class A  
100-GPM Liquid Fuel Filter/Separator Unit, Frame Mounted, Type III  
350-GPM Liquid Fuel Filter/Separator Unit, Frame Mounted, Type IV
3. Purpose of Equipment: Removal of undissolved water and solid contaminants from petroleum fuels.



**50-GPM Filter/Separator  
NSN 4330-01-483-1068**



**100-GPM Filter/Separator  
NSN 4330-01-525-3659**



**350-GPM Filter/Separator  
4330-01-529-0584**

*Figure 1. Filter/Separator Units*

## **MAINTENANCE FORMS AND RECORDS**

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by (as applicable) DAPAM738-750, Functional Users Manual for The Army Maintenance Management System (TAMMS); DA PAM738-751, Functional Users Manual for the Army Maintenance Management System- Aviation (TAMMS-A); or AR 700-138, Army Logistics Readiness and Sustainability.

## **REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATION (EIR)**

If your filter/separator needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to the address specified in DA PAM738-750, or as specified by the contracting activity. We will send you a reply.

## **CORROSION PREVENTION AND CONTROL**

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

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

If a corrosion problem is identified, it can be reported using SF 368, Product Quality Deficiency Report. Use of key words 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 PAM738-750.

## **DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE**

For procedures to destroy this equipment to prevent its use by the enemy, refer to TM750-244-2, Procedures for Destruction of Materiel to Prevent Enemy Use.

## **END OF WORK PACKAGE**

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## **OPERATOR AND FIELD MAINTENANCE FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, AND 350-GPM DESCRIPTION AND DATA**

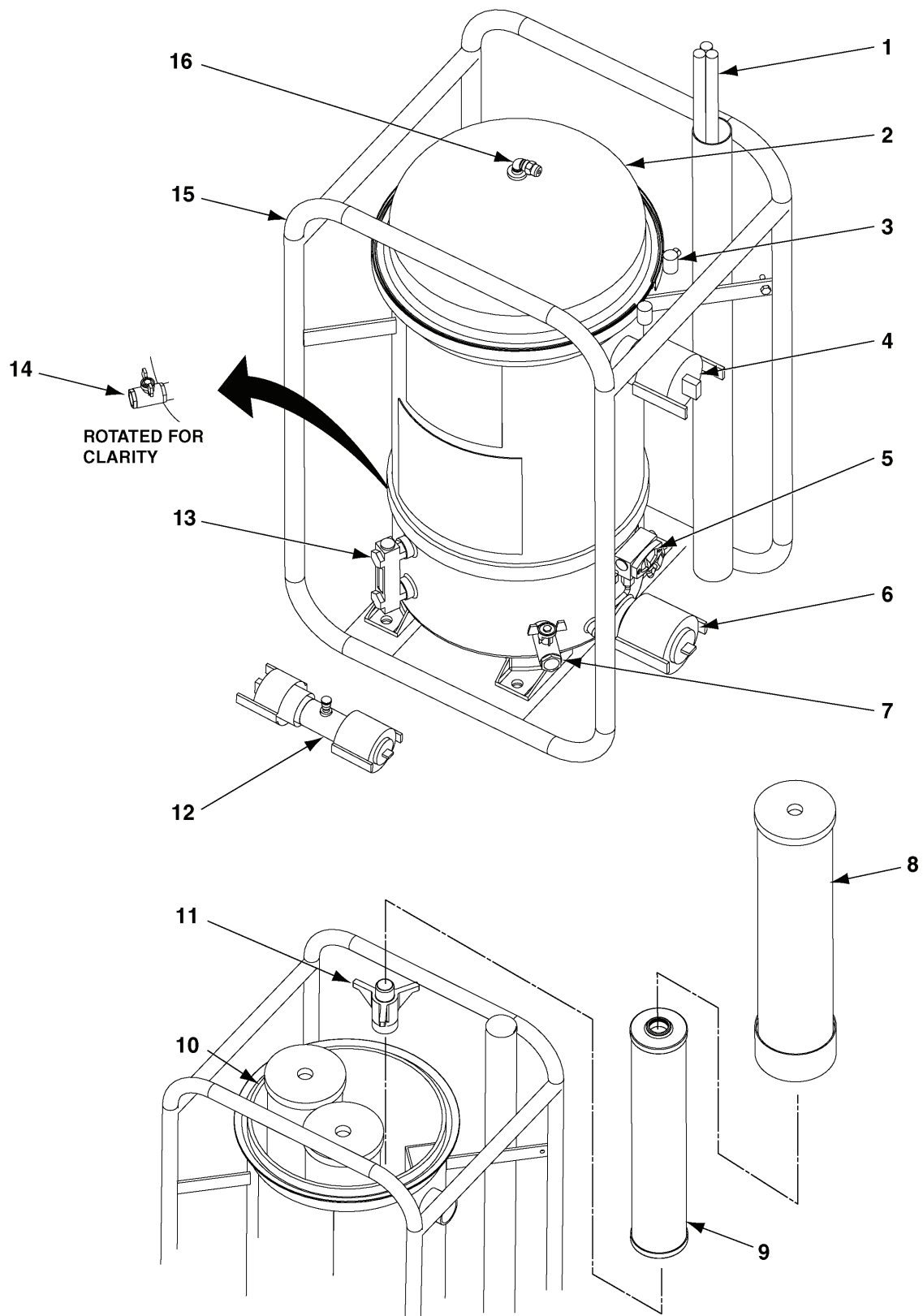
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### **EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES**

The filter/separator units covered in this manual consist of a metal pressure vessel with a removable cover. Inside the vessel are multiple canisters and filter elements. The vessel is fitted with a differential pressure gauge, sight glass, camlock-style inlet and outlet ports, a manually-operated ball valve, and an air purge valve. The filter/separator includes a separate detector kit that can be connected to the unit for testing purposes. The entire unit is mounted inside a protective metal frame. Grounding rods are attached to the frame to provide dissipation of static charges.

### **LOCATION AND DESCRIPTION OF MAJOR COMPONENTS**

The following paragraphs contain physical and functional descriptions of the major components of the filter/separator. The location and appearance of the major components are illustrated in the following figures.



*Figure 1. Major Components of 50-GPM Filter/Separator*

*Table 1. 50-GPM Filter/Separator Major Components*

No.	Item	Description
1	Ground Rod	The grounding rod is driven into the ground and connected to the frame using a copper cable. The grounding rod allows for the dissipation of static electricity that would otherwise build up in the unit as fuel flows through the vessel.
2	Head Assembly	The head assembly is a removable cover secured to the top of the vessel by a stainless steel retaining band. The head assembly is removed to allow access to the coalescer elements inside the vessel.
3	Retaining Band	The retaining band is a stainless steel belt that is used to secure the head assembly to the top of the vessel. A bolt mechanism is used to tighten the retaining band in place.
4	Outlet Coupling	Filtered fuel exits the vessel through the outlet coupling at the top of the vessel. The outlet coupling is a standard camlock-type connection for fuel hoses.
5	Differential Pressure Gauge	The differential pressure gauge displays the pressure difference across the filter/separator elements. When filter elements become contaminated, the flow through the elements is impeded, causing an increase in pressure. The Operator monitors the differential pressure gauge and changes the elements when the pressure difference exceeds a threshold value.
6	Inlet Coupling	Fuel to be filtered enters the vessel through the inlet coupling located at the bottom of the vessel. The inlet coupling is a standard camlock-type connection for fuel hoses.
7	Water Drain Valve	A lever-operated ball valve used by the Operator to evacuate water from the sump.
8	Canister	The canister separates the coalesced water from the fuel.
9	Coalescer	The coalescer is the primary filtering component of the filter separator. The coalescer coalesces suspended water and removes particulate matter from the fuel before it exits the Filter/Separator through the outlet.
10	O-ring	The o-ring provides a seal between the head assembly and the vessel.
11	Bayonet Mount	The bayonet provides a mounting surface for the canisters containing the coalescer elements.
12	Detector Kit	The detector kit consists of a short pipe nipple with camlock fittings on either end that allow it to be installed in the outlet flow of the filter/separator unit. The nipple is equipped with a probe that allows for sampling of the fuel exiting the filter/separator for testing purposes.
13	Sight Gauge	The sight gauge indicates to the operator the level of water collected in the sump.
14	Fuel Drain Valve	A lever-operated ball valve used by the Operator to evacuate fuel from the vessel.
15	Frame and Vessel	The vessel and frame are a single, welded assembly. The vessel contains the coalescer elements of the filter/separator assembly. The frame protects the vessel and attached components from damage and provides a stable, level mounting platform for the vessel.
16	Purge Valve	The purge valve is located on top of the vessel's cover assembly. The Operator activates the purge valve to allow air trapped inside the vessel to escape with minimal fuel loss.

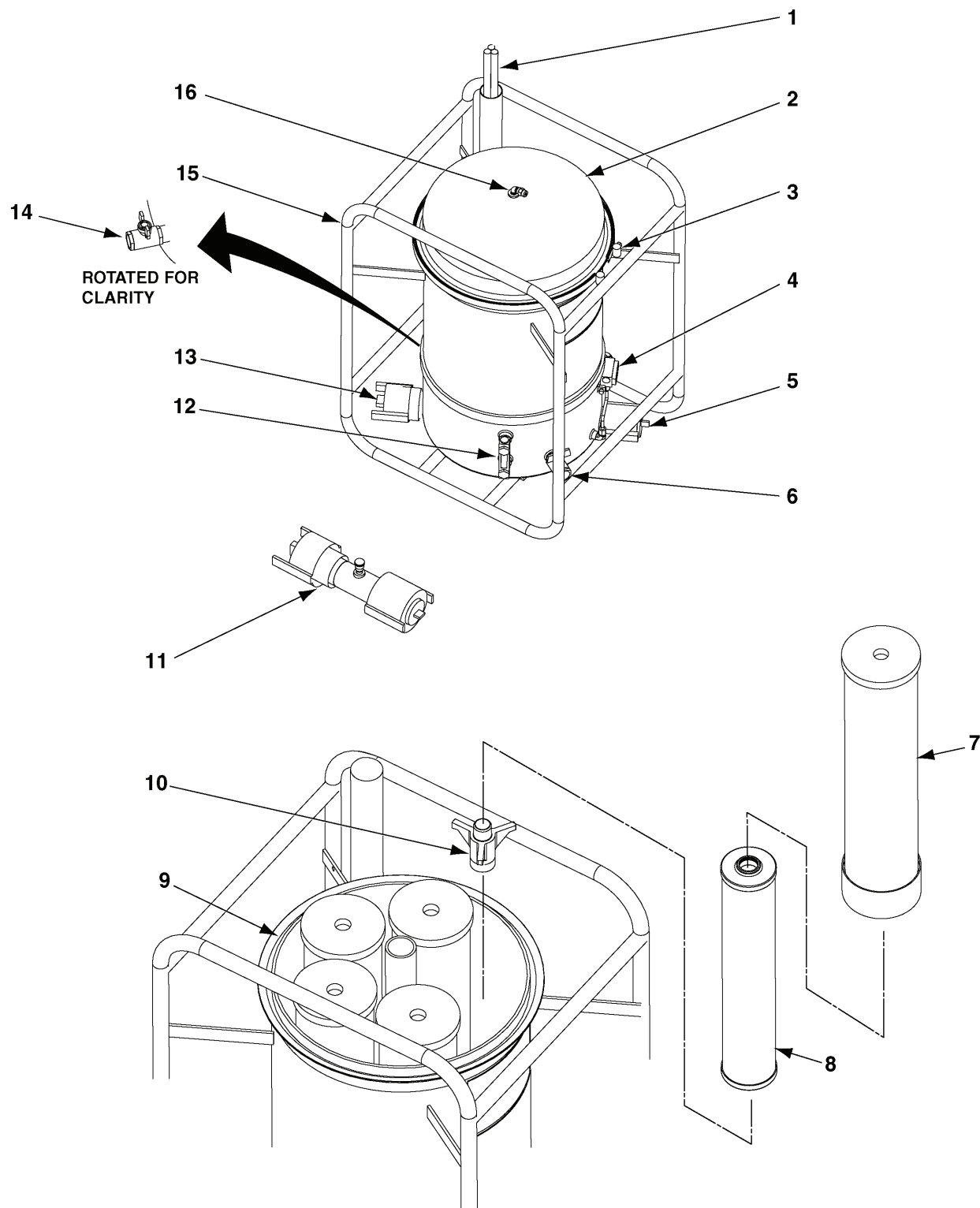


Figure 2. Major Components of 100-GPM Filter/Separator



*Table 2. 100-GPM Filter/Separator Major Components*

No.	Item	Description
1	Ground Rod	The grounding rod is driven into the ground and connected to the frame using a copper cable. The grounding rod allows for the dissipation of static electricity that would otherwise build up in the unit as fuel flows through the vessel.
2	Head Assembly	The head assembly is a removable cover secured to the top of the vessel by a stainless steel retaining band. The head assembly is removed to allow access to the coalescer elements inside the vessel.
3	Retaining Band	The retaining band is a stainless steel belt that is used to secure the head assembly to the top of the vessel. A bolt mechanism is used to tighten the retaining band in place.
4	Differential Pressure Gauge	The differential pressure gauge displays the pressure difference across the filter/separator elements. When filter elements become contaminated, the flow through the elements is impeded, causing an increase in pressure. The Operator monitors the differential pressure gauge and changes the elements when the pressure difference exceeds a threshold value.
5	Inlet Coupling	Fuel to be filtered enters the vessel through the inlet coupling located at the bottom of the vessel. The inlet coupling is a standard camlock-type connection for fuel hoses.
6	Water Drain Valve	A lever-operated ball valve used by the Operator to evacuate water from the sump.
7	Canister	The canister separates the coalesced water from the fuel.
8	Coalescer	The coalescer is the primary filtering component of the filter separator. The coalescer coalesces suspended water and removes particulate matter from the fuel before it exits the Filter/Separator through the outlet.
9	O-ring	The o-ring provides a seal between the head assembly and the vessel.
10	Bayonet Mount	The bayonet provides a mounting surface for the canisters containing the coalescer elements.
11	Detector Kit	The detector kit consists of a short pipe nipple with camlock fittings on either end that allow it to be installed in the outlet flow of the filter/separator unit. The nipple is equipped with a probe that allows for sampling of the fuel exiting the filter/separator for testing purposes.
12	Sight Gauge	The sight gauge indicates to the operator the level of water collected in the sump.
13	Outlet Coupling	Filtered fuel exits the vessel through the outlet coupling at the bottom of the vessel. The outlet coupling is a standard camlock-type connection for fuel hoses.
14	Fuel Drain Valve	A lever-operated ball valve used by the Operator to evacuate fuel from the vessel.
15	Frame and Vessel	The vessel and frame are a single, welded assembly. The vessel contains the coalescer elements of the filter/separator assembly. The frame protects the vessel and attached components from damage and provides a stable, level mounting platform for the vessel.
16	Purge Valve	The purge valve is located on top of the vessel's cover assembly. The Operator activates the purge valve to allow air trapped inside the vessel to escape with minimal fuel loss.

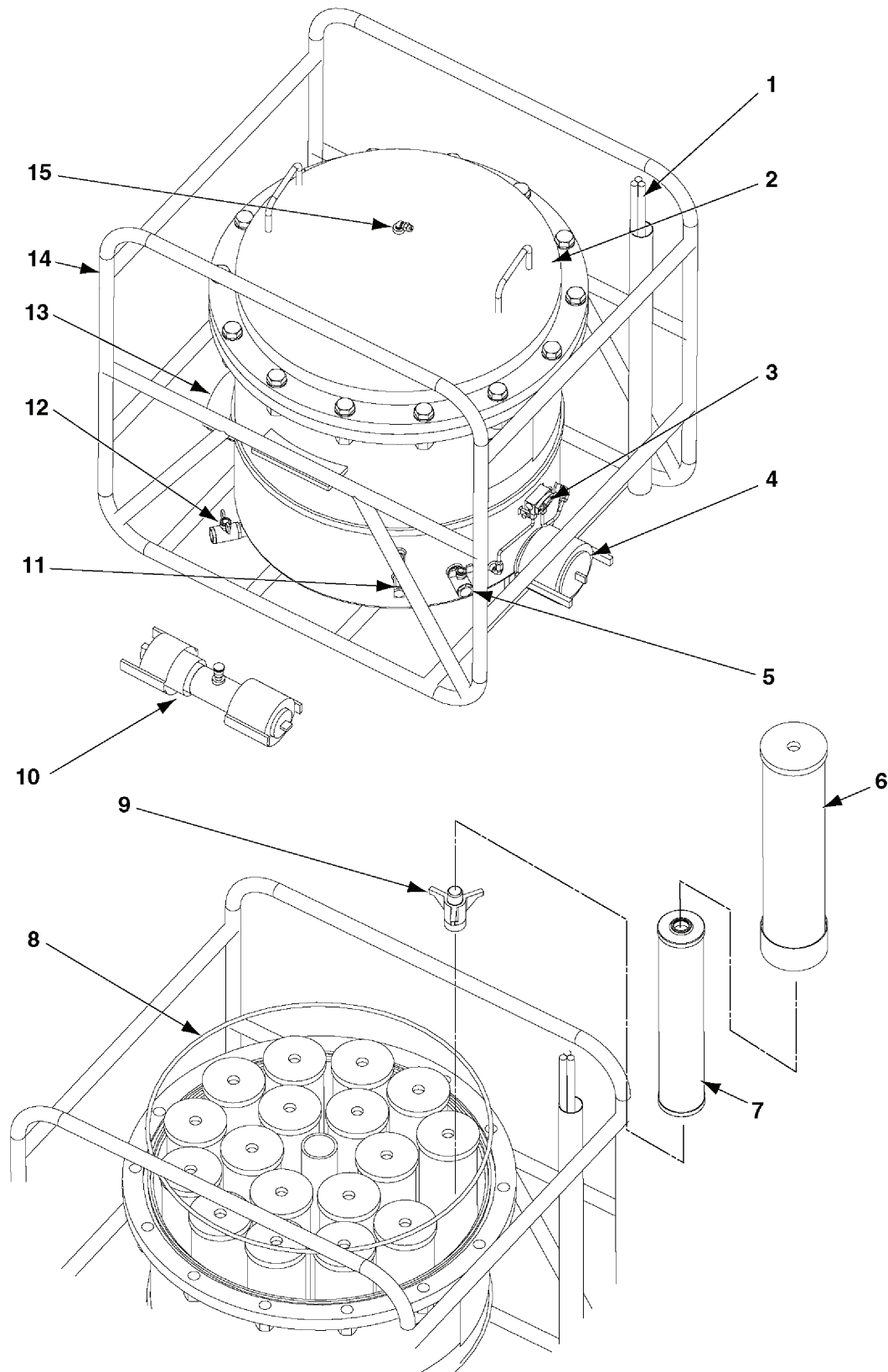


Figure 3. Major Components of 350-GPM Filter/Separator

*Table 3. 350-GPM Filter/Separator Major Components*

No.	Item	Description
1	Grounding Rod	The grounding rod is driven into the ground and connected to the frame using a copper cable. The grounding rod allows for the dissipation of static electricity that would otherwise build up in the unit as fuel flows through the vessel.
2	Head Assembly	The head assembly is a removable cover secured to the top of the vessel by lid bolts. The head assembly is removed to allow access to the coalescer elements inside the vessel.
3	Differential Pressure Gauge	The differential pressure gauge displays the pressure difference across the filter/separator elements. When filter elements become contaminated, the flow through the elements is impeded, causing an increase in pressure. The Operator monitors the differential pressure gauge and changes the elements when the pressure difference exceeds a threshold value.
4	Outlet Coupling	Filtered fuel exits the vessel through the outlet coupling at the top of the vessel. The outlet coupling is a standard camlock-type connection for fuel hoses.
5	Fuel Drain Valve	A lever-operated ball valves that can be opened by the Operator to evacuate fuel from the vessel.
6	Canister	The canister separates the coalesced water from the fuel.
7	Coalescer	The coalescer is the primary filtering component of the filter separator. The coalescer coalesces suspended water and removes particulate matter from the fuel before it exits the Filter/Separator through the outlet.
8	O-ring	The o-ring provides a seal between the head assembly and the vessel.
9	Bayonet Mount	The bayonet provides a mounting surface for the canisters containing the coalescer elements.
10	Detector Kit	The detector kit consists of a short pipe nipple with camlock fittings on either end that allow it to be installed in the outlet flow of the filter/separator unit. The nipple is equipped with a probe that allows for sampling of the fuel exiting the filter/separator for testing purposes.
11	Sight Gauge	The sight gauge indicates to the operator the level of water collected in the sump.
12	Water Drain Valve	A lever-operated ball valves that can be opened by the Operator to evacuate water from the sump.
13	Inlet Coupling	Fuel to be filtered enters the vessel through the inlet coupling located at the bottom of the vessel. The inlet coupling is a standard camlock-type connection for fuel hoses.
14	Frame and Vessel	The vessel and frame are a single, welded assembly. The vessel contains the coalescer elements of the filter/separator assembly. The frame protects the vessel and attached components from damage and provides a stable, level mounting platform for the vessel.
15	Purge Valve	The purge valve is located on top of the vessel's cover assembly. The operator activates the purge valve to allow air trapped inside the vessel to escape with minimal fuel loss.

## EQUIPMENT DATA

*Table 4. 50-GPM Filter/Separator Data*

Item	Value/Description
Height	32.5 inches
Width	17 inches
Length	20 inches
Weight	66 lbs
Maximum Flow Rate	50 GPM
Maximum Working Pressure	76.7 PSI
Operating Temperature Range	Minimum: -25°F (-32°C) Maximum: 140°F (60°C).
Storage Temperature Range	Minimum: -50°F (-46°C) Maximum: 160°F (71°C)
Fuels Processed	A-A-52557 Fuel Oil, Diesel; For Posts, Camps and Stations MIL-DTL-5624 Turbine Fuel, Aviation, Grades JP-4, JP-5, And JP-5/JP-8 ST MIL-DTL-83133 Turbine Fuels, Aviation, Kerosene Types, NATO F-34 (JP-8), NATO F-35, and JP-8+100

*Table 5. 100-GPM Filter/Separator Data*

Item	Value/Description
Height	32 inches
Width	20 inches
Length	24 inches
Weight	88 lbs
Maximum Flow Rate	100 GPM
Maximum Working Pressure	76.7 PSI
Operating Temperature Range	Minimum: -25°F (-32°C) Maximum: 140°F (60°C).
Storage Temperature Range	Minimum: -50°F (-46°C) Maximum: 160°F (71°C)
Fuels Processed	A-A-52557 Fuel Oil, Diesel; For Posts, Camps and Stations MIL-DTL-5624 Turbine Fuel, Aviation, Grades JP-4, JP-5, And JP-5/JP-8 ST MIL-DTL-83133 Turbine Fuels, Aviation, Kerosene Types, NATO F-34 (JP-8), NATO F-35, and JP-8+100

*Table 6. 350-GPM Filter/Separator Data*

Item	Value/Description
Height	39.5 inches
Width	33 inches
Length	40.25 inches
Weight	364 lbs
Maximum Flow Rate	350 GPM
Maximum Working Pressure	150 PSI
Operating Temperature Range	Minimum: -25°F (-32°C) Maximum: 140°F (60°C).
Storage Temperature Range	Minimum: -50°F (-46°C) Maximum: 160°F (71°C)
Fuels Processed	<div>A-A-52557 Fuel Oil, Diesel; For Posts, Camps and Stations</div> <div>MIL-DTL-5624 Turbine Fuel, Aviation, Grades JP-4, JP-5, and JP-5/JP-8 ST</div> <div>MIL-DTL-83133 Turbine Fuels, Aviation, Kerosene Types, NATO F-34 (JP-8), NATO F-35, and JP-8+100</div>

**PRINCIPLES OF OPERATION**

Fuel under pressure enters the Filter/Separator's inlet connection, then passes from the center of the coalescers, and flows out through the coalescer and canister. The coalescer and canister separates suspended water and removes particulate matter from the fuel before it exits the Filter/Separator through the outlet.

**END OF WORK PACKAGE**



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**OPERATOR AND FIELD MAINTENANCE  
FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, AND 350-GPM  
CONTROLS AND INDICATORS**

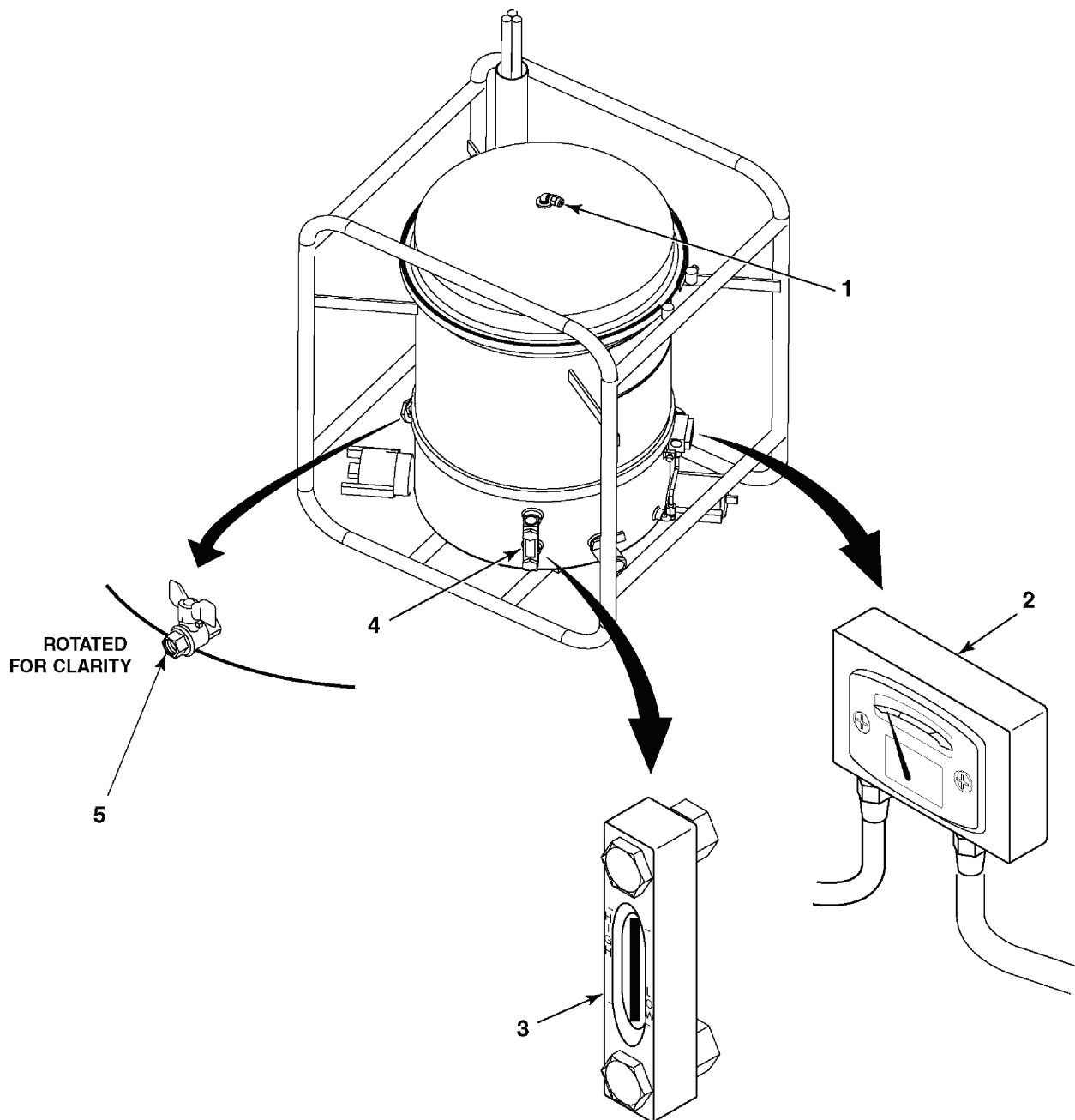
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**CONTROLS AND INDICATORS**

The operating controls and indicators are illustrated in figure 1, and their names and functions are listed in table 1. The numbers in the ITEM column of the table correspond to the index numbers on the illustration.

**NOTE**

The controls and indicators are identical for all filter/separator units. Only the 100-GPM filter/separator unit is shown to illustrate the controls and indicators.



*Figure 1. Filter/Separator Controls and Indicators*



*Table 1. Filter/Separator Controls and Indicators*

Item	Name	Description
1	Purge Valve	Manually operated valve that allows air trapped inside the filter/separator to be released.
2	Differential Pressure Gauge	Indicates the difference in pressure between the inlet and outlet of the filter/separator in pounds per square inch differential (PSID). This is used as an indication of the condition of the filter elements. Clean elements should generate between 2 and 4 PSID. The maximum allowable pressure differential is 15 PSID.
3	Sight Gauge	Indicates the water level in the filter sump.
4	Water Drain Valve	Ball valve that is used to drain water from the filter sump.
5	Fuel Drain Valve	Ball valve that is used to drain fuel from the vessel.

**END OF WORK PACKAGE**



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## OPERATOR AND FIELD MAINTENANCE FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, AND 350-GPM OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

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### INTRODUCTION

A PMCS table, Table 1, has been provided so you can keep your equipment in good operating condition and ready for its primary mission. Always observe WARNINGS and CAUTIONS appearing in the PMCS table. WARNINGS and CAUTIONS appear before the procedure to which they apply. WARNINGS and CAUTIONS must be observed to avoid serious injury to yourself and others and to prevent damage to the equipment.

The following paragraphs describe the columns of the PMCS table:

1. Item No. Numbers in this column are for reference. When completing DA Form 2404 (Equipment Inspection and Maintenance Worksheet), include the item number for the check/service indicating a fault. Item numbers appear in the order of completion for the intervals listed.
2. Interval. This column tells you when the corresponding procedure must be performed. BEFORE procedures must be done before you operate or use the equipment for its intended mission. DURING procedures must be done during the time you are operating or using the equipment for its intended mission. AFTER procedures must be done immediately after you have operated or used the equipment.
3. Item to Check/Service. This column lists the name of the item to be checked or serviced.
4. Procedure. This column gives the procedure to follow to perform the required check or service and determine if the equipment is ready or available for its intended mission or for operation. You must do this procedure at the time stated in the interval column.
5. Not Fully Mission Capable If. Information in this column tells you what faults will keep your equipment from being capable of performing its primary mission. If the check and service procedures show faults listed in this column, do not operate the equipment. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

*Table 1. Operator Preventive Maintenance Checks and Services*

Item No.	Interval	Item to Check/Service	Procedure	Not Fully Mission Capable If:
1	Daily	Couplings, gauges, valves, and vessel seals and joints	Visually inspect for signs of fuel leaks	Any fuel leaks are visible
2	Daily	Differential pressure gauge	Observe differential pressure gauge during operation	Differential pressure gauge reading is in RED area
3	Daily	Sump sight gauge	Observe sight gauge during operation	Sight gauge water level is in the HIGH range
4	Monthly	Painted surfaces	Check all painted surfaces for rust, chips, peeling, or damage revealing bare metal	Excessive rust, peeling or damaged paint impedes normal operation of unit

**END OF WORK PACKAGE**

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**OPERATOR AND FIELD MAINTENANCE  
FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, AND 350-GPM  
PREPARATION FOR OPERATION**

---

**WARNING**

- In normal operation, the filter/separator is filled with diesel/jet fuel. Diesel/jet fuel may explode if subjected to high temperatures, sources of ignition or high pressure. Keep all open flames, cigarettes, and any other sources of fire/flame or ignition a minimum of 50 yards from any fuel servicing operations. Failure to follow this warning may result in injury or death to personnel.
  - Diesel/jet fuel fumes are toxic in high concentrations. Avoid prolonged breathing of vapors. Operation and maintenance of the filter/separator should be performed only in a well-ventilated environment. Failure to follow this warning may result in injury or death to personnel.
1. Position filter/separator unit on a level surface in a position convenient to fuel supply and fueling hoses.
  2. Ensure that ground cable is securely fastened to ground rod.
  3. Drive ground rod securely into ground to a minimum depth of 3 feet.
  4. Check that ground cable is securely connected to filter/separator frame.

**END OF WORK PACKAGE**



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**OPERATOR AND FIELD MAINTENANCE  
FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, AND 350-GPM  
OPERATION**

---

**INITIAL SETUP:****Tools and Special Tools**

Protective goggles  
Nitrile gloves

**Personnel Required**

One

**Materials/Parts**

None

**References**

WP 0005 00

**Equipment Condition**

Pre-operation procedures performed  
(WP 0005 00)

---

**INTRODUCTION**

This work package provides instructions for operating all the filter/separator units. Procedures are the same for all models.

## OPERATION UNDER USUAL CONDITIONS

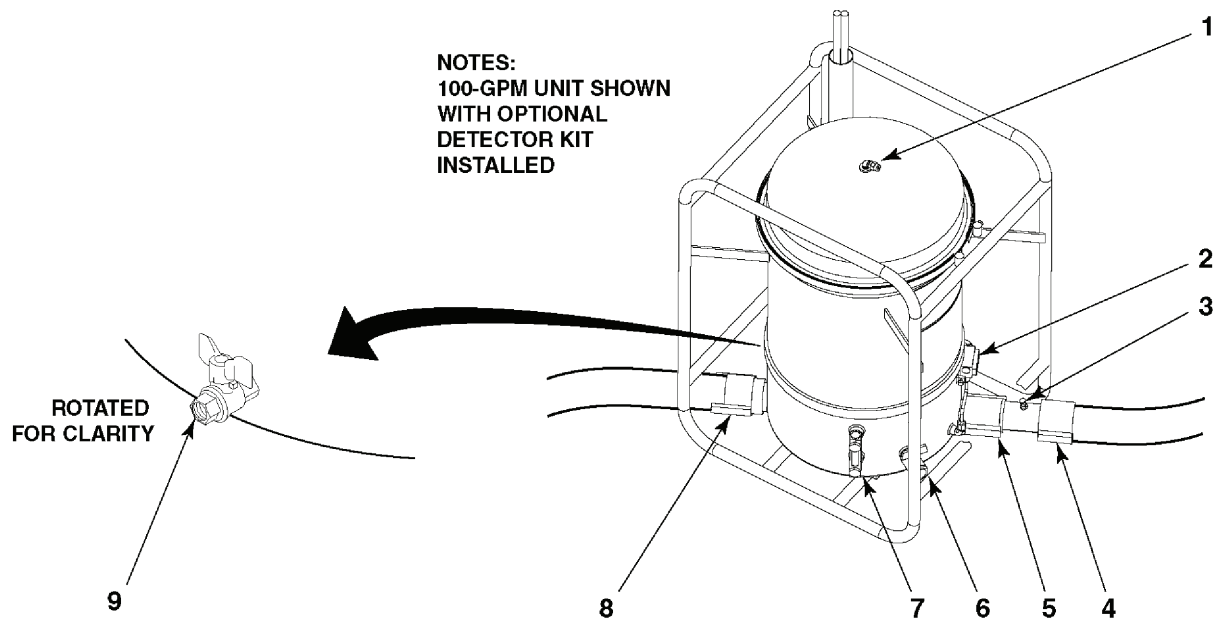


Figure 1. Filter/Separator Unit Operation

**WARNING**

- In normal operation, the filter/separator is filled with diesel/jet fuel. Diesel/jet fuel may explode if subjected to high temperatures, sources of ignition or high pressure. Keep all open flames, cigarettes, and any other sources of fire/flare or ignition a minimum of 50 yards from any fuel servicing operations. Failure to follow this warning may result in injury or death to personnel.
- Diesel/jet fuel fumes are toxic in high concentrations. Avoid prolonged breathing of vapors. Operation and maintenance of the filter/separator should be performed only in a well-ventilated environment. Failure to follow this warning may result in injury or death to personnel.
- Diesel/jet fuel is toxic and can severely affect skin, eyes and the respiratory tract. Personnel must wear appropriate hand and eye protection (nitrile gloves and goggles). Wash skin thoroughly with soap and water if exposed. In case of contact with diesel/jet fuel, flush eyes with clear water for at least 15 minutes. Failure to follow this warning may result in injury or death to personnel.

**NOTE**

The detector kit can be placed in inlet or outlet side of vessel.

1. If fuel sampling will be conducted, install detector kit (figure 1, 3) on filter/separator inlet or outlet connection (5 or 8) and close camlocks completely.
2. With the pump turned off and no fuel flowing, attach supply hose to inlet connection (5) and close camlocks completely.
3. Attach fueling hose to outlet connection (8) and close camlocks completely.



**WARNING**

Purge valve may release a small amount of fuel during venting. Wear protective gear when venting and place a rag over valve.

4. Open the air purge valve (1) by turning counter-clockwise.
5. Start system pump and set to low speed.

**WARNING**

Rapid filling of the filter/separator can cause a buildup of static electricity, leading to possible explosion. Fill filter/separator units slowly to minimize static buildup. Failure to follow this warning may result in injury or death to personnel.

**NOTE**

Recommended flow rates are:

50-GPM	2 GPM
100-GPM	3.5 GPM
350-GPM	11 GPM

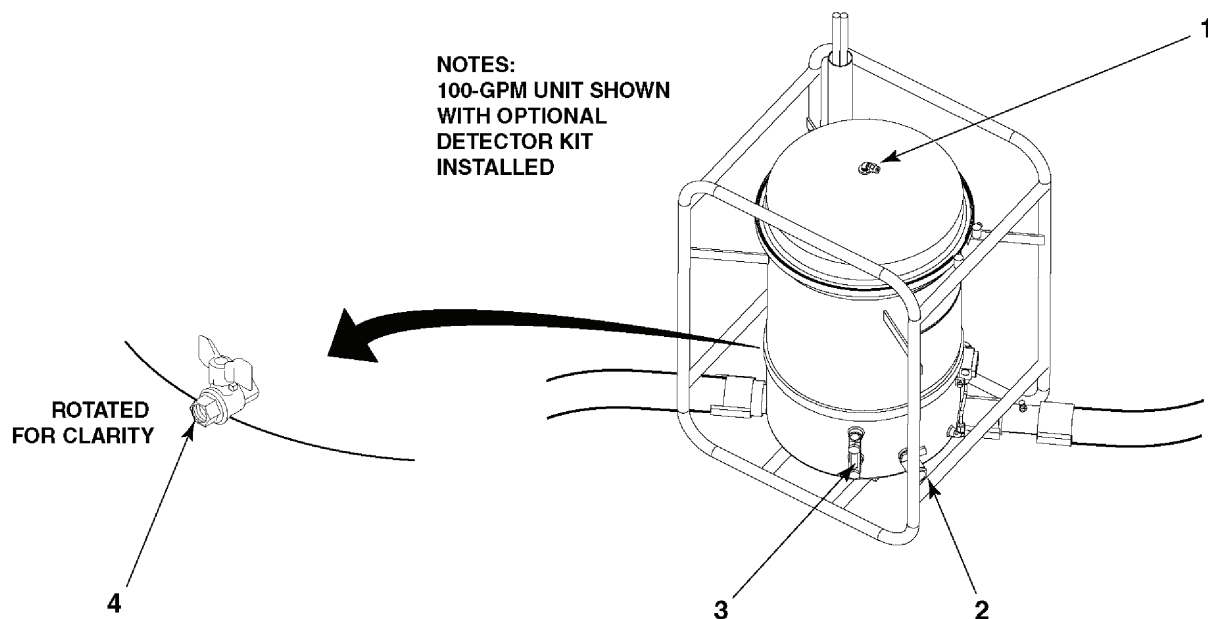
6. Open external upstream valve slightly to fill vessel slowly.
7. As vessel fills, observe purge valve (figure 1, 1) and stop filling vessel when purge valve (1) stops venting air.
8. Close purge valve (1) by turning clockwise.
9. When vessel is full, check all connections for possible leaks.
10. Open downstream valve or nozzle and adjust pump speed to obtain desired flow rate. See WP 0002 00 for maximum flow rate for each model of filter/separator.
11. During operation, periodically observe differential pressure gauge (2). If gauge indication reaches red indicator, coalescers should be replaced. See WP 0004 00 for replacement procedures.
12. During operation, samples of filtered fuel can be taken from sampling port (3) using an appropriate sampling device to determine amount of water in fuel.
13. During operation, periodically observe sight gauge (7). If water level float in sight gauge (7) approaches HIGH mark, stop operation and open purge valve (1) and water drain valve (6) to empty sump. Refer to steps 1 through 9 and repeat process for filling vessel.

**WARNING**

Rapid closure of downstream valves or nozzles during fueling with a high-pressure pump can result in overpressurization of vessel and cause fuel leaks, leading to possible explosion. Failure to follow this warning may result in injury or death to personnel.

**NOTE**

Water should be drained from the sump daily, or after each fueling operation. See "Post-Operation Procedures" on page 0006 00-4 for more information.



*Figure 2. Filter/Separator Unit Post-Operation*

**POST-OPERATION PROCEDURES**

1. When fueling operations are complete, shut down pumping system and close upstream and downstream valves to isolate filter/separator.
2. Open purge valve (figure 2, 1) by turning counter-clockwise.
3. Place a suitable container under water drain valve (2) and open water drain valve (2) to drain any water that has accumulated in sump.
4. When all water has drained and green ball in sight gauge (3) reaches bottom, fuel will begin to flow from valve. Close water drain valve (2).
5. Dispose of contaminated liquids in accordance with federal and local regulations.

**NOTE**

If filter/separator vessel is to remain installed in fueling system, open upstream valve and refer to “Operation Under Usual Conditions” on page 0006 00-2 to fill vessel with fuel.

6. If filter/separator vessel is to be removed and relocated, obtain a suitable container and place it below fuel drain valve (4).

**WARNING**

Diesel/jet fuel is toxic to skin, eyes and respiratory tract. Personnel must wear appropriate hand and eye protection (nitrile gloves and goggles). Wash skin thoroughly with soap and water if exposed. Flush eyes with clear water for at least 15 minutes in case of contact with diesel/jet fuel.

7. Open fuel drain valve (4) and drain contents of vessel.
8. When all fuel has drained, close fuel drain valve (4) and purge valve (1) and disconnect hoses from inlet and outlet couplings.
9. If installed, disconnect and stow detector kit.
10. Drain residual fuel from hoses.
11. Dispose of excess fuel in accordance with federal and local regulations.

**END OF WORK PACKAGE**



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## OPERATOR AND FIELD MAINTENANCE

### FILTER/SEPARATOR, LIQUID FUEL, 50- 100-, AND 350-GPM

### FIELD PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

---

#### INTRODUCTION

A PMCS table, Table 1, has been provided so you can keep your equipment in good operating condition and ready for its primary mission. Always observe WARNINGS and CAUTIONS appearing in the PMCS table. WARNINGS and CAUTIONS appear before the procedure to which they apply. WARNINGS and CAUTIONS must be observed to avoid serious injury to yourself and others and to prevent damage to the equipment.

The following paragraphs describe the columns of the PMCS table

1. Item No. Numbers in this column are for reference. When completing DA Form 2404 (Equipment Inspection and Maintenance Worksheet), include the item number for the check/service indicating a fault. Item numbers appear in the order of completion for the intervals listed.
2. Interval. This column tells you when the corresponding procedure must be performed. BEFORE procedures must be done before you operate or use the equipment for its intended mission. DURING procedures must be done during the time you are operating or using the equipment for its intended mission. AFTER procedures must be done immediately after you have operated or used the equipment.
3. Item to Check/Service. This column lists the name of the item to be checked or serviced.
4. Procedure. This column gives the procedure to follow to perform the required check or service and determine if the equipment is ready or available for its intended mission or for operation. You must do this procedure at the time stated in the interval column.
5. Not Fully Mission Capable If. Information in this column tells you what faults will keep your equipment from being capable of performing its primary mission. If the check and service procedures show faults listed in this column, do not operate the equipment. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

*Table 1. Field Maintenance Preventive Maintenance Checks and Services*

ITEM NO.	INTERVAL	ITEM TO CHECK/SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
1	Quarterly	Retaining Band Bolts (50- and 100-GPM)	Check for tightness and torque as required	Loose or damaged
2	Quarterly	Lid Bolts (350-GPM)	Check for tightness and torque as required	Loose or damages
3	Quarterly	Differential Pressure Gauge	Check for damage	Gauge is damaged
4	Quarterly	Sight Gauge	Check body for cracks and ball float for damage	Gauge is damaged
5	Quarterly	Ground Rod	Check for missing or damaged sections	Ground rod or connections are missing or damaged
6	Quarterly	Frame and Vessel	Inspect for damage. Clean and repaint	Tank leaks or frame is damaged such that it does not fully protect vessel and fittings.

**END OF WORK PACKAGE**

**0007 00-1/(0007 00-2 blank)**



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## OPERATOR AND FIELD MAINTENANCE FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, AND 350-GPM TROUBLESHOOTING

---

### INTRODUCTION

Table 1 lists common malfunctions that you may find with your equipment. Perform the tests, inspections, and corrective actions in the order they appear in the table. This table cannot list all the malfunctions that can occur, all tests and inspections needed to find the fault, or all the corrective actions needed to correct the fault. If the equipment malfunction is not listed or actions listed do not correct the fault, notify your supervisor.

*Table 1. Troubleshooting*

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
Differential pressure gauge indication is in the RED area of the gauge.	<ol style="list-style-type: none"> <li>1. Check pump operating speed and verify that it is within specified limits</li> <li>2. Coalescer element contaminated</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust pump speed as necessary</li> <li>2. Immediately cease operation and replace all canisters and coalescer elements</li> </ol>
Fuel leaking from input or output coupling	<ol style="list-style-type: none"> <li>1. Verify that camlocks are securely fastened</li> <li>2. Stop operation and inspect couplings to verify that gaskets are in place, properly seated, and free from damage</li> </ol>	<ol style="list-style-type: none"> <li>1. Secure camlocks properly</li> <li>2. Properly seat gaskets or replace defective gaskets</li> </ol>
Fuel leaking from vessel cover	<ol style="list-style-type: none"> <li>1. Check retaining band (50- and 100-GPM) nuts for proper tightness.</li> <li>2. Check lid nuts (350-GPM) for proper tightness</li> <li>3. Inspect head assembly o-ring for wear or damage</li> </ol>	<ol style="list-style-type: none"> <li>1. Ensure retaining band locks properly, with nut torqued to 14 ft-lbs. (50- and 100-GPM).</li> <li>2. Ensure lid bolts are torqued to 150 ft-lbs. (350-GPM).</li> <li>3. Remove head assembly and replace o-ring</li> </ol>
Sudden drop in differential pressure gauge indication	<ol style="list-style-type: none"> <li>1. Check for ruptured coalescer elements</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace all coalescer elements</li> </ol>
Filter/Separator output flow is inadequate	<ol style="list-style-type: none"> <li>1. Check pump flow rate and performance</li> <li>2. Inspect discharge line for kinks or obstructions</li> <li>3. Check differential pressure gauge and verify that reading is within limits (below red/15)</li> </ol>	<ol style="list-style-type: none"> <li>1. Perform maintenance on pump</li> <li>2. Remove obstructions and straighten line as necessary</li> <li>3. If reading is above limit, cease operations and replace all coalescer elements.</li> </ol>

**END OF WORK PACKAGE**





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## OPERATOR AND FIELD MAINTENANCE FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, 350-GPM ELEMENT REPLACEMENT

---

**INITIAL SETUP:****Tools and Special Tools**

General Mechanics Tool Kit  
3/8" Drive Torque Wrench (Item 2, WP 0019 00)  
1/2" Drive Torque Wrench (Item 3, WP 0019 00)  
Socket, 1 5/16" , 1/2-in. drive (Item 7, WP 0019 00)  
Combination wrench, 1 5/16" (Item 9, WP 0019 00)  
Rubber Mallet (Item 4, WP 0019 00)  
Deep Socket, 1/2" (Item 6, WP 0019 00)  
Protective goggles  
Nitrile gloves  
Cleaning cloth (Item 3, WP 0022 00)  
Drip Pan (Item 2, WP 0022 00)

**Personnel Required**

Two

**Materials/Parts**

Coalescer, 50-GPM (Item 5, Figure 1, WP 0019 00)  
Coalescer, 100-GPM (Item 5, Figure 3, WP 0019 00)  
Coalescer, 350-GPM (Item 6, Figure 4, WP 0019 00)  
O-ring (Item 1, WP 0022 00)  
Self-locking nut (Item 2, WP 0023 00)  
Lockwashers (Item 3, WP 0023 00)

**References**

WP 0006 00  
WP 0019 00  
WP 0022 00  
WP 0023 00

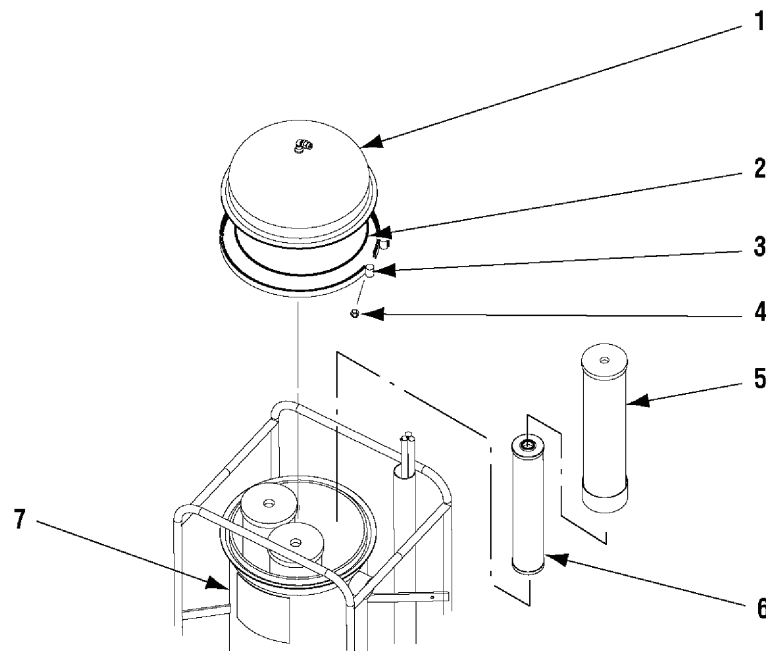
**Equipment Condition**

Fuel Drained (WP 0006 00)

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**INTRODUCTION**

This work package provides instructions for the removal and replacement of the coalescer elements in the filter/separator units.



*Figure 1. 50- and 100-GPM Unit Element Replacement*

## 50- AND 100-GPM UNIT ELEMENT REMOVAL

### WARNING

- In normal operation, the filter/separator is filled with diesel/jet fuel. Diesel/jet fuel may explode if subjected to high temperatures, sources of ignition or high pressure, resulting in bodily injury or death to personnel. Keep all open flames, cigarettes, and any other sources of fire/flame or ignition a minimum of 50 yards from any fuel servicing operations.
- Diesel/jet fuel is toxic to skin, eyes and respiratory tract. Personnel must wear appropriate hand and eye protection (nitrile gloves and goggles). Wash skin thoroughly with soap and water if exposed. Flush eyes with clear water for at least 15 minutes in case of contact with diesel/jet fuel.
- Diesel/jet fuel fumes are toxic in high concentrations. Avoid prolonged breathing of vapors. Operation and maintenance of the filter/separator should be performed only in a well-ventilated environment. Failure to follow this warning may result in injury or death to personnel.

### CAUTION

Inside surfaces of vessel cover should not be touched in order to minimize the possibility of contamination of the filter/separator unit. Do not place the vessel cover on the bare ground or in grass to avoid possible contamination.

1. Unscrew self-locking nut (figure 1, 4) on retaining band (3) and remove retaining band (3) and head assembly (1). Discard self-locking nut (4).
2. Remove o-ring (2) from vessel (7).
3. Press canister (5) down and turn counter-clockwise approximately 120 degrees to disengage locking mechanism.

**NOTE**

Coalescer element may remain in vessel when canister is removed in the following step.

4. Remove canister (5) from vessel (7) by pulling straight up out of the vessel.
5. Remove coalescers (6) from canister (5) by tapping open end of canister (5) on clean, hard surface.
6. Dispose of used coalescers (6) in accordance with local and federal regulations.

**50- AND 150-GPM UNIT ELEMENT REPLACEMENT****CAUTION**

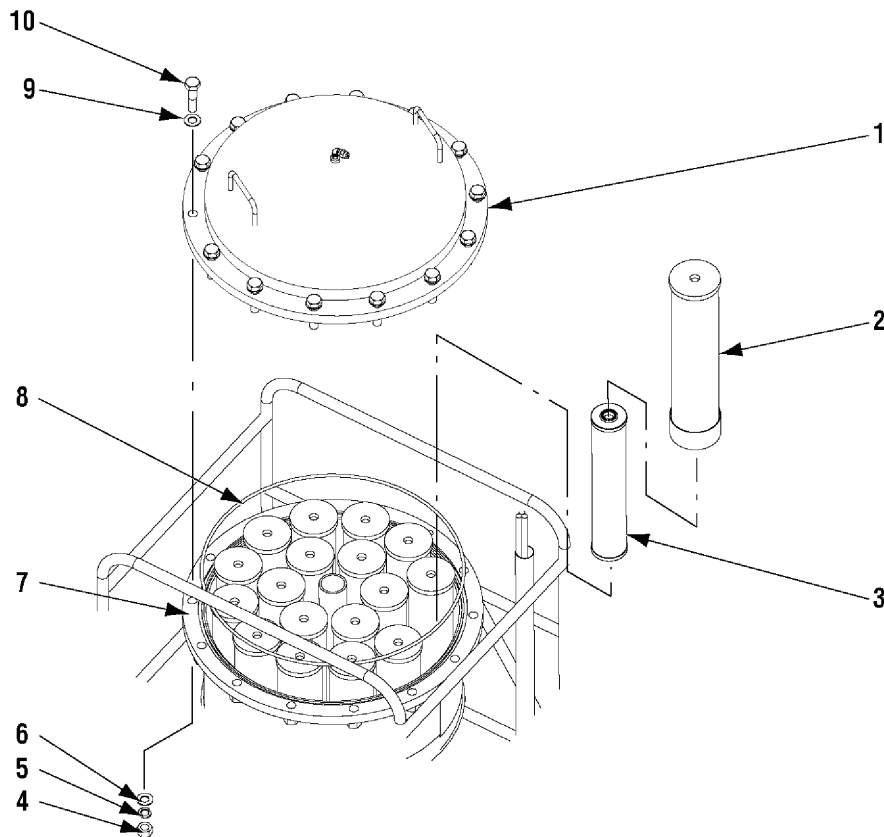
Handling canisters and coalescers with bare hands can damage or contaminate the unit and shorten service life. Canisters and coalescers should only be handled with nitrile gloves.

1. Inspect o-rings on top and bottom of coalescer (6) for signs of damage. Inspect canister (5) screen for tears.
2. Lubricate o-rings on top and bottom of each coalescer (6) with diesel/jet fuel and install in canister (5).
3. Install canister (5) and coalescer (6) in vessel (7) and secure in place by pressing straight down and turning approximately 120 degrees clockwise.
4. Lubricate o-ring (2) with diesel/jet fuel and install on vessel (7).
5. Install head assembly (1) on vessel (7) and secure head assembly (1) with locking retaining band (3).

**NOTE**

To properly seat the retaining band it is necessary to strike the retaining band with a rubber mallet as it is being torqued.

6. While striking retaining band (3) with rubber mallet at points all around the circumference of the vessel, torque new self-locking nut (4) on retaining band (3) to 14 ft-lbs.



*Figure 2. 350-GPM Unit Element Replacement*

### 350-GPM UNIT ELEMENT REMOVAL

#### **WARNING**

- Diesel/jet fuel is toxic to skin, eyes and respiratory tract. Personnel must wear appropriate hand and eye protection (nitrile gloves and goggles). Wash skin thoroughly with soap and water if exposed. Flush eyes with clear water for at least 15 minutes in case of contact with diesel/jet fuel.
- Diesel/jet fuel fumes are toxic in high concentrations. Avoid prolonged breathing of vapors. Operation and maintenance of the filter/separator should be performed only in a well-ventilated environment. Failure to follow this warning may result in injury or death to personnel.
- Removing head assembly requires a two-man lift to avoid injury to personnel.

#### **CAUTION**

Inside surfaces of vessel cover should not be touched in order to minimize the possibility of contamination of the filter/separator unit. Do not place the vessel cover on the bare ground or in grass to avoid possible contamination.

1. Remove 14 lid bolts (10), flat washers (9) and (6), lockwashers (5), and nuts (4) and remove head assembly (1). Discard lockwashers (5).
2. Remove o-ring (8) from vessel (7).

3. Remove canister (2) by pressing down and turn counter-clockwise approximately 120 degrees to disengage locking mechanism.

#### **NOTE**

Coalescer element may remain in vessel when canister is removed in the following step.

4. Remove canister (2) from vessel (7) by pulling straight up out of the vessel.
5. Remove coalescers (3) from canister (2) by pulling straight up from bayonet nozzle.
6. Dispose of used coalescers (3) in accordance with local and federal regulations.

### **350-GPM UNIT ELEMENT REPLACEMENT**

#### **CAUTION**

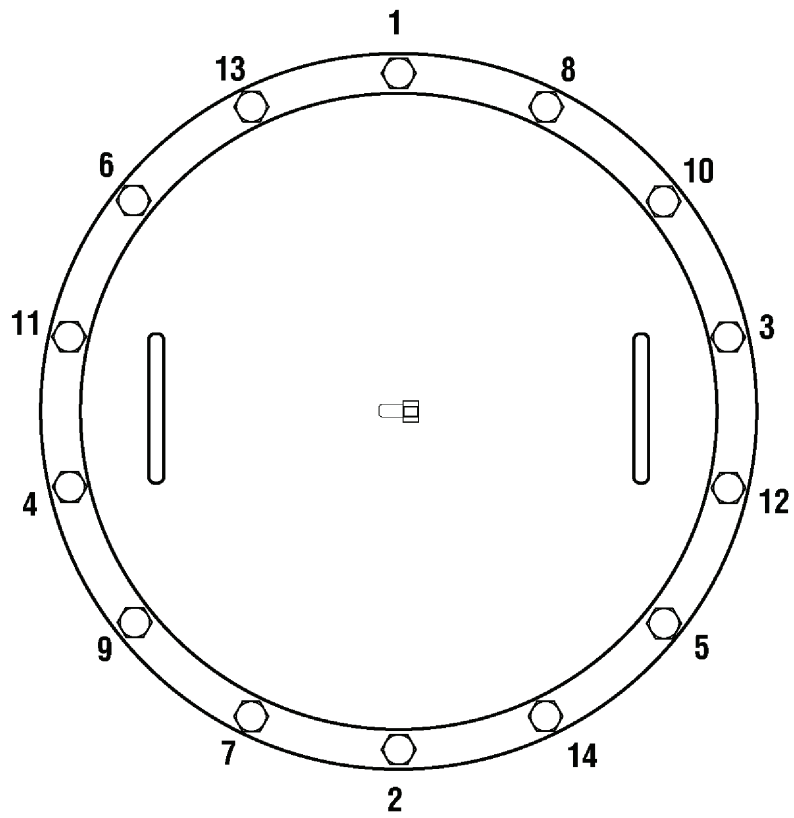
Handling canisters and coalescers with bare hands can damage or contaminate the unit and shorten service life. Canisters and coalescers should only be handled with nitrile gloves.

1. Inspect o-rings on top and bottom of coalescer (3) for signs of damage. Inspect canister (2) screen for tears.
2. Lubricate o-rings on top and bottom of each coalescer (3) with diesel/jet fuel and install in canister (2).
3. Install canister (2) and coalescer (3) in vessel (7) and secure in place by pressing straight down and turning approximately 120 degrees clockwise.

#### **NOTE**

The head assembly o-ring is a mandatory replacement part. Always install a new o-ring after removal of the head assembly.

4. Lubricate o-ring (8) with diesel/jet fuel and install on vessel (7).
5. Install head assembly (1) and secure with fourteen lid bolts (10), flat washers (9) and (6), new lockwashers (5), and nuts (4).
6. Torque lid bolts (10) to 150 ft-lbs. in a cross pattern according to Figure 3.



*Figure 3. Lid Bolt Torqueing Pattern*

END OF WORK PACKAGE

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## OPERATOR AND FIELD MAINTENANCE

### FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, AND 350-GPM

### SIGHT GAUGE REPLACEMENT

---

**INITIAL SETUP:****Tools and Special Tools**

General Mechanics Tool Kit  
Protective goggles  
Nitrile gloves  
Cleaning cloth (Item 3, WP 0022 00)  
Drip Pan (Item 2, WP 0022 00)

**Personnel Required**

One

**Materials/Parts**

Sight gauge, 50-GPM (Item 21, Figure 1, WP0019)  
Sight gauge, 100-GPM (Item 31, Figure 3, WP0019)  
Sight gauge, 350-GPM (Item 29, Figure 4, WP0019)  
Compound, Antiseize (Item 2, WP 0022 00)

**References**

WP 0006 00  
WP 0022 00

**Equipment Condition**

Fuel Drained (WP 0006 00)

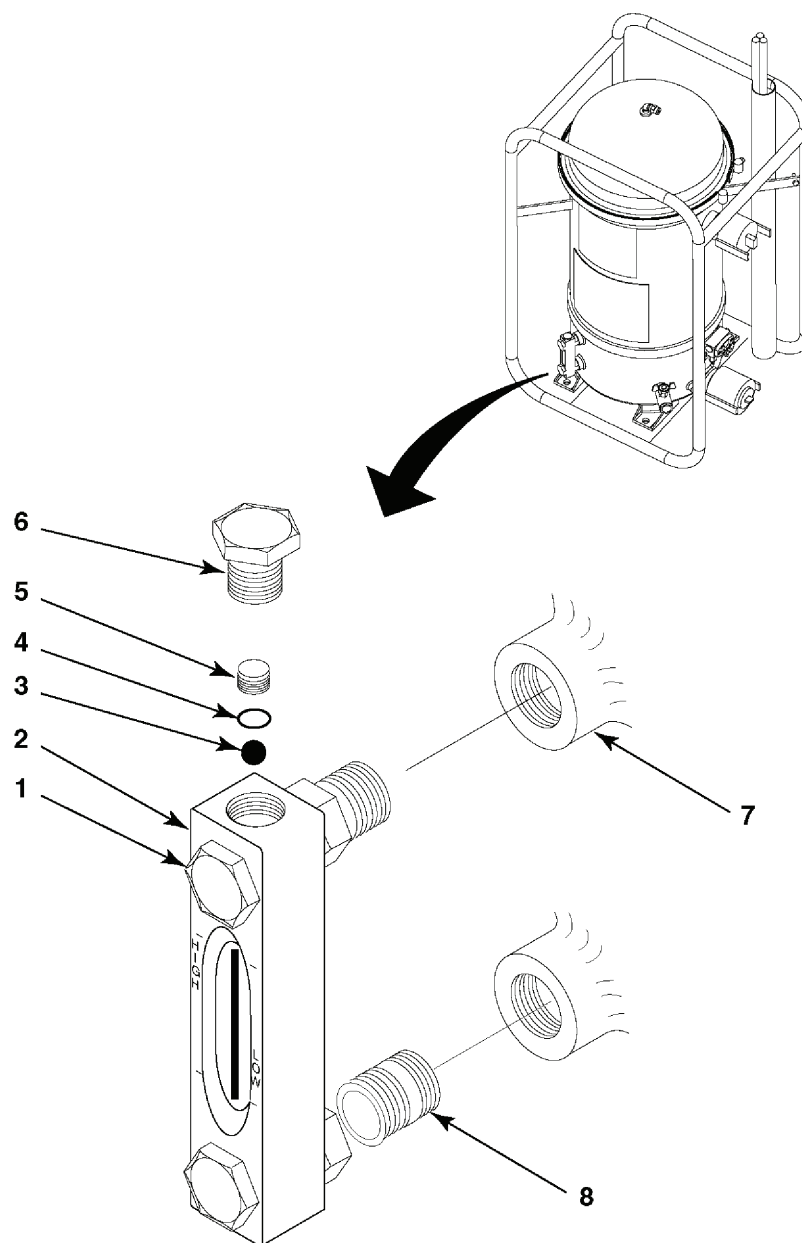
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**INTRODUCTION**

This work package provides instructions for replacing the sight gauge. The procedure is the same for all three models of the filter separator.

**REMOVAL****WARNING**

- In normal operation, the filter/separator is filled with diesel/jet fuel. Diesel/jet fuel may explode if subjected to high temperatures, sources of ignition or high pressure, resulting in bodily injury or death to personnel. Keep all open flames, cigarettes, and any other sources of fire/flare or ignition a minimum of 50 yards from any fuel servicing operations.
- Diesel/jet fuel is toxic to skin, eyes and respiratory tract. Personnel must wear appropriate hand and eye protection (nitrile gloves and goggles). Wash skin thoroughly with soap and water if exposed. Flush eyes with clear water for at least 15 minutes in case of contact with diesel/jet fuel.
- Diesel/jet fuel fumes are toxic in high concentrations. Avoid prolonged breathing of vapors. Operation and maintenance of the filter/separator should be performed only in a well-ventilated environment. Failure to follow this warning may result in injury or death to personnel.



*Figure 1. Sight Gauge Replacement*

**NOTE**

New sight gauge does not come with the float ball installed. You can retain the old float ball from the defective sight gauge for installation in the new gauge, or you can install a new float ball.

1. Unscrew top and bottom outer bolts (figure 1, 1) to remove sight gauge (2) from bushings (8).
2. Remove bushings (8) from vessel ports (7).



**NOTE**

Perform steps 3 and 4 only if you are retaining the float ball for use in the new gauge. If you are using a new float ball, proceed to replacement procedure.

3. Remove top capscrew (6), setscrew (5), and gasket (4) from top of sight gauge (2).
4. Remove float ball (3) from sight gauge (2).

**REPLACEMENT**

1. Insert float ball (3) in sight gauge (2).

**NOTE**

Verify that glass tube inside sight gauge is properly oriented before installing setscrew. Glass tube should be turned so that the red background is to the rear of the gauge. Ensure that HIGH and LOW markers on sight gauge are properly oriented.

2. Install gasket (4), setscrew (5), and top capscrew (6).
3. Apply antiseize compound to threads of top and bottom bushings (8).
4. Install bushings (8) in vessel ports (7).
5. Install sight gauge (2) on bushings (8) by alternately tightening top and bottom outer bolts (1).

**END OF WORK PACKAGE**



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## OPERATOR AND FIELD MAINTENANCE

### FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, AND 350-GPM

### DIFFERENTIAL PRESSURE GAUGE REPLACEMENT

---

**INITIAL SETUP:****Tools and Special Tools**

General Mechanics Tool Kit  
Protective goggles  
Nitrile gloves  
Cleaning cloth (Item 3, WP 0022 00)  
Drip Pan (Item 2, WP 0022 00)

**Personnel Required**

One

**Materials/Parts**

Sight gauge, 50-GPM (Item 13, Figure 1, WP0019)  
Sight gauge, 100-GPM (Item 9, Figure 3, WP0019)  
Sight gauge, 350-GPM (Item 16, Figure 4, WP0019)  
Compound, Antiseize (Item 2, WP 0022 00)

**References**

WP 0006 00  
WP 0022 00

**Equipment Condition**

Fuel Drained (WP 0006 00)

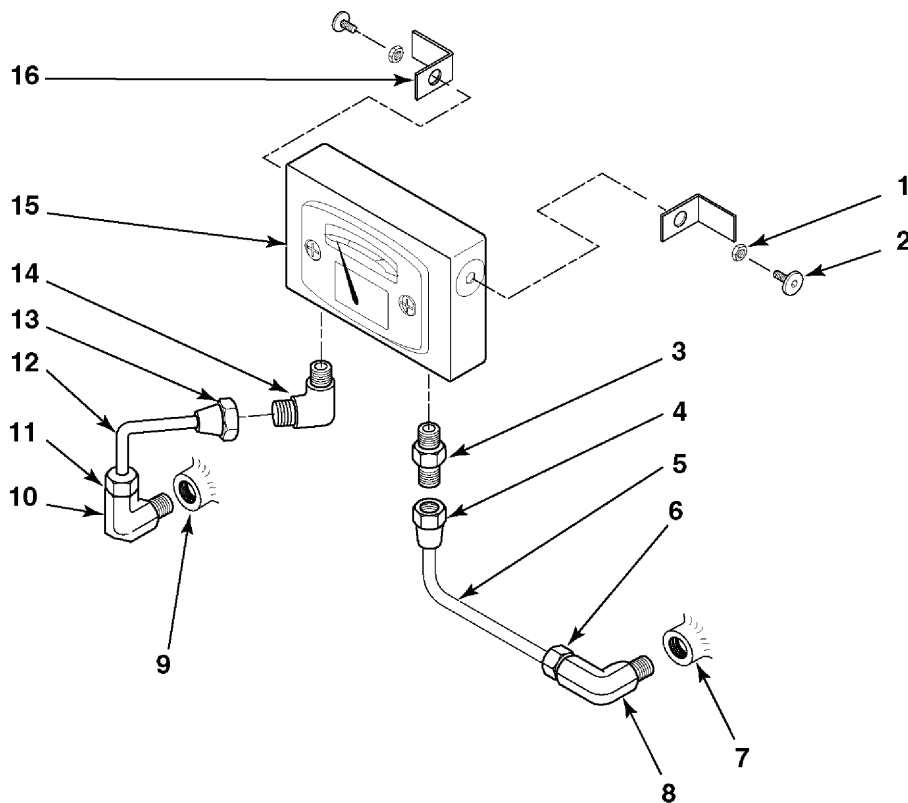
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**INTRODUCTION**

This work package provides instructions for replacing the differential pressure gauge. The procedure is the same for all three models of the filter separator.

**WARNING**

- In normal operation, the filter/separator is filled with diesel/jet fuel. Diesel/jet fuel may explode if subjected to high temperatures, sources of ignition or high pressure, resulting in bodily injury or death to personnel. Keep all open flames, cigarettes, and any other sources of fire/flame or ignition a minimum of 50 yards from any fuel servicing operations.
- Diesel/jet fuel is toxic to skin, eyes and respiratory tract. Personnel must wear appropriate hand and eye protection (nitrile gloves and goggles). Wash skin thoroughly with soap and water if exposed. Flush eyes with clear water for at least 15 minutes in case of contact with diesel/jet fuel.
- Diesel/jet fuel fumes are toxic in high concentrations. Avoid prolonged breathing of vapors. Operation and maintenance of the filter/separator should be performed only in a well-ventilated environment. Failure to follow this warning may result in injury or death to personnel.



*Figure 1. Differential Pressure Gauge Replacement*

## REMOVAL

### NOTE

If gauge remains at 0 during operation, replacement is unnecessary.

1. Unscrew two tube nuts (figure 1, 4) and (13) and disconnect from adapter (3) and elbow (14).
2. Remove two bolts (2) and two nuts (1) to remove differential pressure gauge (15) from brackets (16).
3. Remove adapter (3) and elbow (14) from differential pressure gauge (15).
4. Unscrew two tube nuts (6) and (11) and remove tube elbows (5) and (12) from elbows (8) and (10).
5. Unscrew elbows (8) and (10) from vessel ports (7) and (9).

## REPLACEMENT

1. Apply antiseize compound to threads of two elbows (8) and (10).
2. Install elbows (8) and (10) on vessel.
3. Install two tube elbows (5) and (12) on elbows (8) and (10) and securing by tightening tube nuts (6) and (11).

4. Install adapter (3) and elbow (14) on differential pressure gauge (15).
5. Connect adapter (3) and elbow (14) to tube elbows (5) and (12) and tighten tube nuts (4) and (13).
6. Install differential pressure gauge (15) on brackets (16) and secure with two bolts (2) and two nuts (1).

**END OF WORK PACKAGE**



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## OPERATOR AND FIELD MAINTENANCE

### FILTER/SEPARATOR, LIQUID FUEL, 50- AND 100-GPM

### FUEL AND WATER DRAIN VALVE REPLACEMENT

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**INITIAL SETUP:****Tools and Special Tools**

Combination wrench, 1 1/4" (Item 8, WP 0019 00)  
Combination wrench, 1" (Item 10, WP 0019 00)  
Protective goggles  
Nitrile gloves  
Cleaning cloth (Item 3, WP 0022 00)  
Drip Pan (Item 2, WP 0022 00)

**Personnel Required**

One

**Materials/Parts**

Drain valve, 50-GPM (Item 27, Figure 1, WP 0019 00)  
Drain valve, 100-GPM (Item 19, Figure 3, WP 0019 00)  
Drain valve, 350-GPM (Item 27, Figure 4, WP 0019 00)  
Compound, Antiseize (Item 2, WP 0022 00)

**References**

WP 0006 00  
WP 0019 00  
WP 0022 00

**Equipment Condition**

Fuel Drained (WP 0006 00)

---

**INTRODUCTION**

This work package provides instructions for replacing the fuel and water drain valves. The procedure is the same for all three models of the filter separator.

**WARNING**

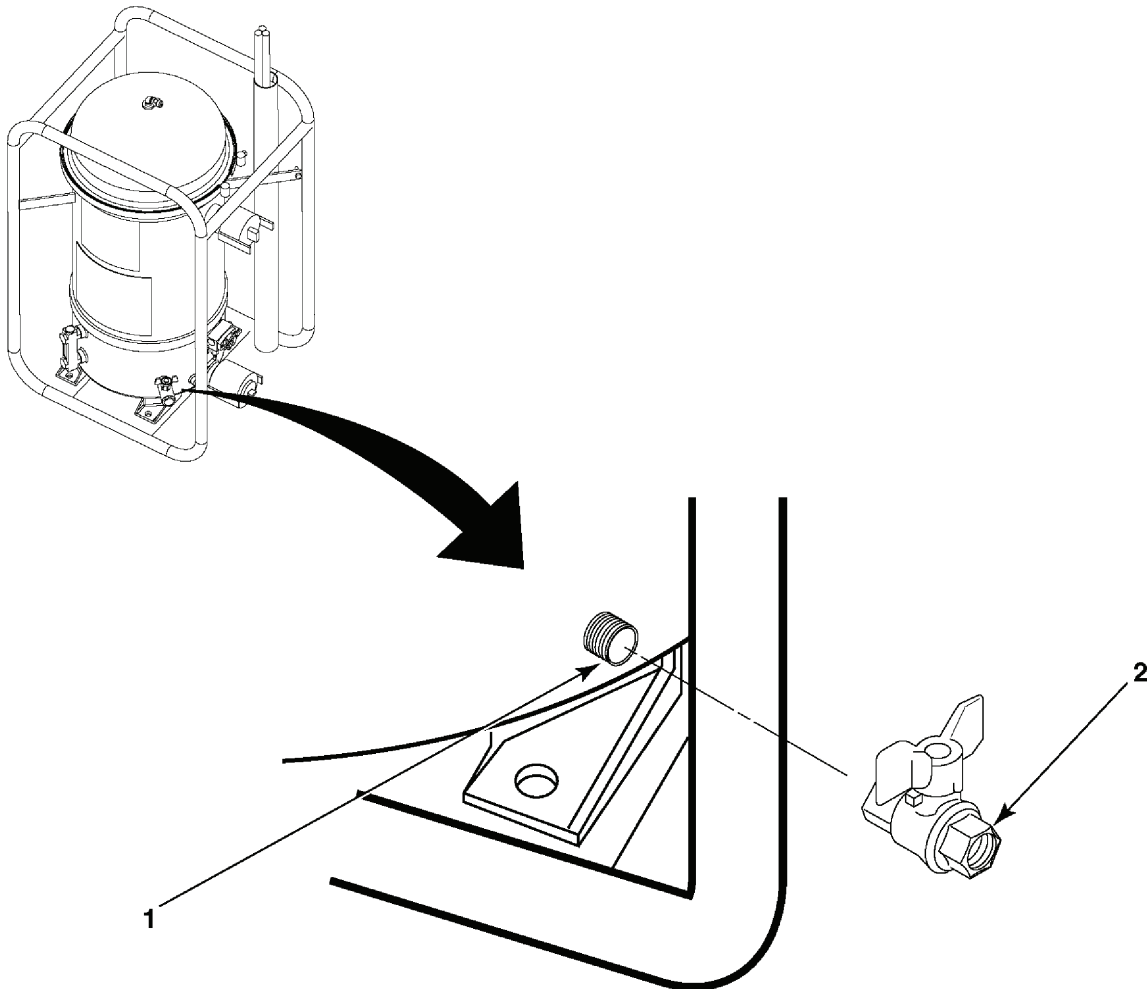
- In normal operation, the filter/separator is filled with diesel/jet fuel. Diesel/jet fuel may explode if subjected to high temperatures, sources of ignition or high pressure, resulting in bodily injury or death to personnel. Keep all open flames, cigarettes, and any other sources of fire/flame or ignition a minimum of 50 yards from any fuel servicing operations.
- Diesel/jet fuel is toxic to skin, eyes and respiratory tract. Personnel must wear appropriate hand and eye protection (nitrile gloves and goggles). Wash skin thoroughly with soap and water if exposed. Flush eyes with clear water for at least 15 minutes in case of contact with diesel/jet fuel.
- Diesel/jet fuel fumes are toxic in high concentrations. Avoid prolonged breathing of vapors. Operation and maintenance of the filter/separator should be performed only in a well-ventilated environment. Failure to follow this warning may result in injury or death to personnel.

**REMOVAL**

Unscrew drain valve (figure 1, 2) from vessel nipple (1).

**REPLACEMENT**

1. Apply antiseize compound to threads of vessel nipple (1).
2. Install drain valve (2) on vessel nipple (1).



*Figure 1. Drain Valve Replacement*

**END OF WORK PACKAGE**



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## OPERATOR AND UNIT MAINTENANCE

### FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, AND 350-GPM

### PURGE VALVE REPLACEMENT

---

**INITIAL SETUP:****Tools and Special Tools**

General Mechanics Tool Kit  
Protective goggles  
Nitrile gloves  
Cleaning cloth (Item 3, WP 0022 00)  
Drip Pan (Item 2, WP 0022 00)

**Personnel Required**

One

**Materials/Parts**

Purge valve, 50-GPM (Item 2, Figure 1, WP 0019 00)  
Purge valve, 100-GPM (Item 2, Figure 3, WP 0019 00)  
Purge valve, 350-GPM (Item 2, Figure 4, WP 0019 00)  
Compound, antiseize (Item 2, WP 0022 00)

**References**

WP 0006 00  
WP 0022 00

**Equipment Condition**

Not applicable

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**INTRODUCTION**

This work package provides instructions for replacing the fuel and water drain valves. The procedure is the same for all three models of the filter separator.

**WARNING**

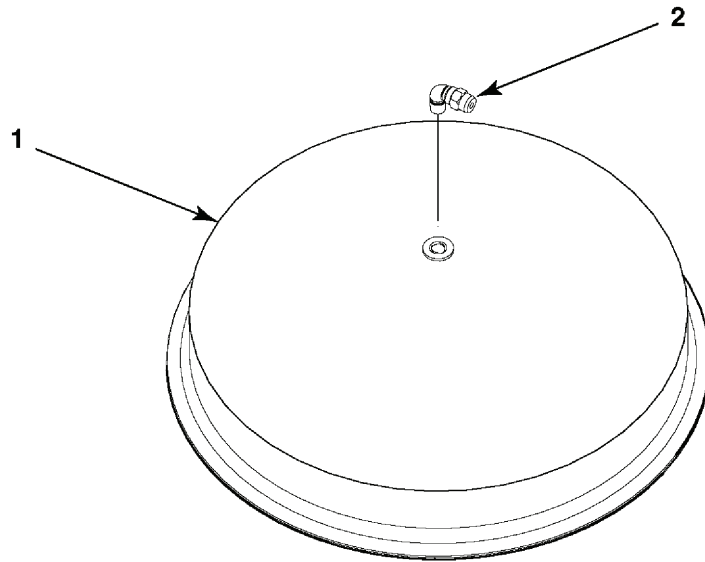
- In normal operation, the filter/separator is filled with diesel/jet fuel. Diesel/jet fuel may explode if subjected to high temperatures, sources of ignition or high pressure, resulting in bodily injury or death to personnel. Keep all open flames, cigarettes, and any other sources of fire/flame or ignition a minimum of 50 yards from any fuel servicing operations.
- Diesel/jet fuel is toxic to skin, eyes and respiratory tract. Personnel must wear appropriate hand and eye protection (nitrile gloves and goggles). Wash skin thoroughly with soap and water if exposed. Flush eyes with clear water for at least 15 minutes in case of contact with diesel/jet fuel.
- Diesel/jet fuel fumes are toxic in high concentrations. Avoid prolonged breathing of vapors. Operation and maintenance of the filter/separator should be performed only in a well-ventilated environment. Failure to follow this warning may result in injury or death to personnel.

**REMOVAL**

Unscrew purge valve (figure 1, 2) from top of head assembly (1).

**REPLACEMENT**

1. Apply antiseize compound to threads of purge valve (2).
2. Install purge valve (2) in top of head assembly (1).



*Figure 1. Purge Valve Replacement*

**END OF WORK PACKAGE**

---

## OPERATOR AND FIELD MAINTENANCE FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, AND 350-GPM BAYONET REPLACEMENT

---

**INITIAL SETUP:****Tools and Special Tools**

General Mechanics Tool Kit  
Bayonet Socket (Item 1, WP 0019 00)  
Torque Wrench, 1/2" drive (Item 3, WP 0019 00)  
Protective goggles  
Nitrile gloves  
Cleaning cloth (Item 3, WP 0022 00)  
Drip Pan (Item 2, WP 0022 00)

**Personnel Required**

One

**Materials/Parts**

Bayonet, 50-GPM (Item 6, Figure 1, WP 0019 00)  
Bayonet, 100-GPM (Item 6, Figure 3, WP 0019 00)  
Bayonet, 350-GPM (Item 7, Figure 4, WP 0019 00)  
Compound, Antiseize (Item 2, WP 0022 00)

**References**

WP 0006 00  
WP 0018 00  
WP 0022 00

**Equipment Condition**

Canisters and Coalescer Elements removed  
(WP 0006 00)

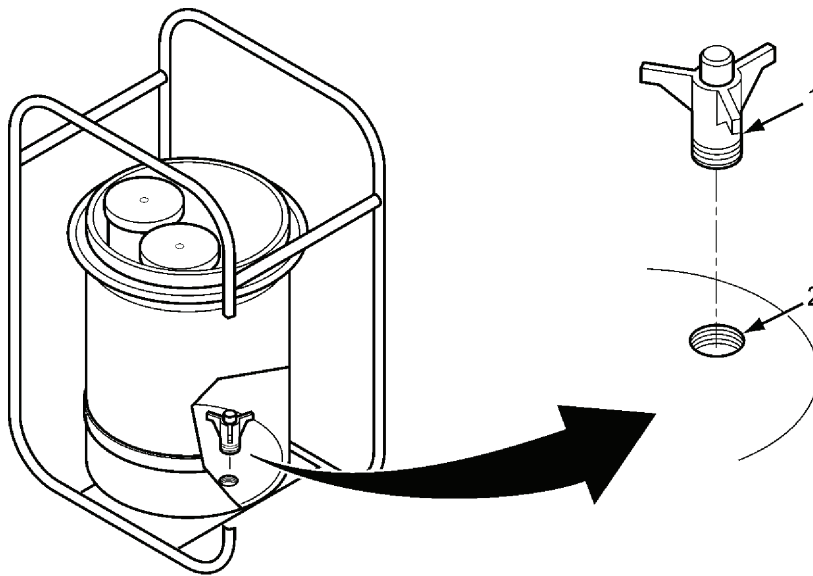
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**INTRODUCTION**

This work package provides instructions for replacing the bayonet. The procedure is the same for all three models of the filter separator.

**WARNING**

- In normal operation, the filter/separator is filled with diesel/jet fuel. Diesel/jet fuel may explode if subjected to high temperatures, sources of ignition or high pressure, resulting in bodily injury or death to personnel. Keep all open flames, cigarettes, and any other sources of fire/flame or ignition a minimum of 50 yards from any fuel servicing operations.
- Diesel/jet fuel is toxic to skin, eyes and respiratory tract. Personnel must wear appropriate hand and eye protection (nitrile gloves and goggles). Wash skin thoroughly with soap and water if exposed. Flush eyes with clear water for at least 15 minutes in case of contact with diesel/jet fuel.
- Diesel/jet fuel fumes are toxic in high concentrations. Avoid prolonged breathing of vapors. Operation and maintenance of the filter/separator should be performed only in a well-ventilated environment. Failure to follow this warning may result in injury or death to personnel.



*Figure 1. Bayonet Replacement*

**REMOVAL**

Using 1/2-inch drive socket wrench, long extension, and bayonet socket, unscrew bayonet (1) from fitting (2).

**REPLACEMENT**

1. Apply anti-seize pipe antiseize compound to threads of bayonet (1).
2. Install bayonet (1) on fitting (2) and torque to 50 ft-lbs.

**END OF WORK PACKAGE**

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## OPERATOR AND FIELD MAINTENANCE

### FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, AND 350-GPM

### CAMLOCK REPLACEMENT

---

**INITIAL SETUP:****Tools and Special Tools**

General Mechanics Tool Kit  
Pipe Wrench (Item 5, WP 0019 00)  
Protective goggles  
Nitrile gloves  
Cleaning cloth (Item 3, WP 0022 00)  
Drip Pan (Item 4, WP 0022 00)

**Personnel Required**

Two

**Materials/Parts**

Camlock, Female 50-GPM (Item 26, Figure 1, WP 0019 00)  
Camlock, Male 50-GPM (Item 10, Figure 1, WP 0019 00)  
Camlock, Female 100-GPM (Item 18, Figure 3, WP 0019 00)  
Camlock, Male 100-GPM (Item 24, Figure 3, WP 0019 00)  
Camlock, Female 50-GPM (Item 25, Figure 4, WP 0019 00)  
Camlock, Male 50-GPM (Item 33, Figure 4, WP 0019 00)  
Compound, antiseize (Item 2, WP 0022 00)

**References**

WP 0006 00  
WP 0019 00  
WP 0022 00

**Equipment Condition**

Fuel Drained and Filter Separator removed from system (WP 0006 00)

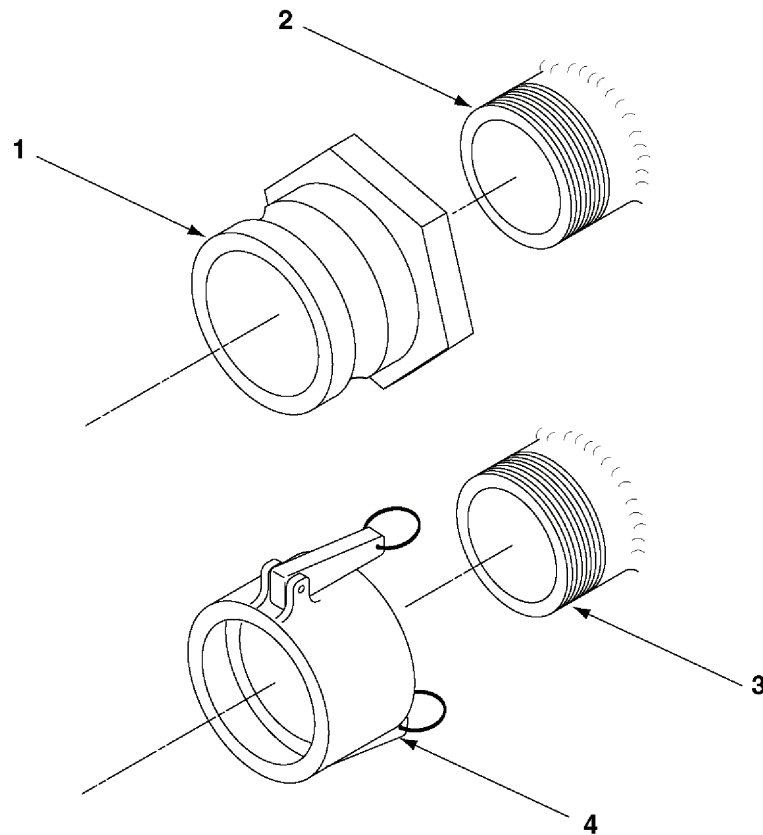
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**INTRODUCTION**

This work package provides instructions for replacing the camlocks. The procedure is the same for all three models of the filter separator.

**WARNING**

- In normal operation, the filter/separator is filled with diesel/jet fuel. Diesel/jet fuel may explode if subjected to high temperatures, sources of ignition or high pressure, resulting in bodily injury or death to personnel. Keep all open flames, cigarettes, and any other sources of fire/flame or ignition a minimum of 50 yards from any fuel servicing operations.
- Diesel/jet fuel is toxic to skin, eyes and respiratory tract. Personnel must wear appropriate hand and eye protection (nitrile gloves and goggles). Wash skin thoroughly with soap and water if exposed. Flush eyes with clear water for at least 15 minutes in case of contact with diesel/jet fuel.
- Diesel/jet fuel fumes are toxic in high concentrations. Avoid prolonged breathing of vapors. Operation and maintenance of the filter/separator should be performed only in a well-ventilated environment. Failure to follow this warning may result in injury or death to personnel.



*Figure 1. Camlock Replacement*

## REMOVAL

### WARNING

- Inverting the filter/separator unit requires a two-man lift to avoid injury to personnel.
- Ensure purge valve is fully closed prior to inverting filter/separator unit to prevent spillage of fuel.

1. Invert filter/separator unit to access camlock fittings.
2. Unscrew camlock fitting (figure 1, 1) or (4) from vessel fitting (2) or (3).

## REPLACEMENT

1. Inspect camlock gaskets and replace if any signs of damage or wear are noted.
2. Apply antiseize compound to threads of vessel fitting (2) or (3).
3. Install camlock fitting (1) or (4) on vessel fitting (2) or (3).

## END OF WORK PACKAGE

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**EQUIPMENT MANUAL**  
**FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, AND 350-GPM**  
**REFERENCES**

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**SCOPE**

This work package contains all forms, pamphlets, and technical manuals referenced in this manual.

**FORMS**

SF 364	Report of Discrepancies
SF 368	Product Quality Deficiency Report

**PAMPHLETS**

DA PAM738-750	Functional Users Manual for the Army Maintenance Management System (TAMMS)
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**TECHNICAL MANUALS**

TM 750-244-3	Procedures for Destruction of Equipment to Prevent Enemy Use
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**END OF WORK PACKAGE**





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## EQUIPMENT MANUAL

### FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, AND 350-GPM

### MAINTENANCE ALLOCATION CHART INTRODUCTION

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#### THE ARMY MAINTENANCE SYSTEM MAC

This introduction provides a general explanation of all maintenance and repair functions authorized at the two maintenance levels under the Two-Level Maintenance System concept.

This MAC designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component shall be consistent with the capacities and capabilities of the designated maintenance levels, which are shown on the MAC in column (4) as:

Field – includes three subcolumns, Crew maintenance (C), Service maintenance (O), and Field maintenance (F).

Sustainment – includes two subcolumns, Below Depot (H) and Depot (D)

The tools and test equipment requirements (immediately following the MAC) list the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from the MAC.

The remarks (immediately following the tools and test equipment requirements) contain supplemental instructions and explanatory notes for a particular maintenance function.

#### Maintenance Functions

Maintenance functions are limited to and defined as follows:

1. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel). This includes scheduled inspection and gagings and evaluation of cannon tubes.
2. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards on a scheduled basis, i.e., load testing of lift devices and hydrostatic testing of pressure hoses.
3. Service. Operations required periodically to keep an item in proper operating condition; e.g., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases. This includes scheduled exercising and purging of recoil mechanisms. The following are examples of service functions:
  - a. Unpack. To remove from packing box for service or when required for the performance of maintenance operations.
  - b. Repack. To return item to packing box after service and other maintenance operations.
  - c. Clean. To rid the item of contamination.
  - d. Touch up. To spot paint scratched or blistered surfaces.
  - e. Mark. To restore obliterated identification.

4. **Adjust.** To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.
5. **Align.** To adjust specified variable elements of an item to bring about optimum or desired performance.
6. **Calibrate.** To determine and cause corrections to be made or to be adjusted on instruments of test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.
7. **Remove/Install.** To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.
8. **Paint (ammunition only).** To prepare and spray color coats of paint so that the ammunition can be identified and protected. The color indicating primary use is applied, preferably, to the entire exterior surface as the background color of the item. Other markings are to be repainted as original so as to retain proper ammunition identification.
9. **Replace.** To remove an unserviceable item and install a serviceable counterpart in its place "Replace" is authorized by the MAC and assigned maintenance level is shown as the third position code of the Source, Maintenance and Recoverability (SMR) code.
10. **Repair.** The application of maintenance services, including fault location/troubleshooting, removal/installation, disassembly/assembly procedures and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

#### NOTE

The following definitions are applicable to the "repair" maintenance function: Services. Inspect, test, service, adjust, align, calibrate, and/or replace.

**Fault location/troubleshooting.** The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or Unit Under Test (UUT).

**Disassembly/assembly.** The step-by-step breakdown (taking apart) of a spare/functional group coded item to the level of its least component, that is assigned an SMR code for the level of maintenance under consideration (i.e., identified as maintenance significant).

**Actions.** Welding, grinding, riveting, straightening, facing, machining, and/or resurfacing

11. **Overhaul.** That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.
12. **Rebuild.** Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying Army equipment/components.

#### Explanation of Columns in the MAC

**Column (1) Group Number.** Column (1) lists Functional Group Code (FGC) numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the Next Higher Assembly (NHA).

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

Column (3) Maintenance Function. Column (3) lists the functions to be performed on the item listed in column (2). (For a detailed explanation of these functions refer to "Maintenance Functions" outlined above).

Column (4) Maintenance Level. Column (4) specifies each level of maintenance authorized to perform each function listed in column (3), by indicating work time required (expressed as manhours in whole hours or decimals) in the appropriate subcolumn. This work time figure represents the active time required to perform that

maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance levels, appropriate work time figures are to be shown for each level. The work time figure represents the average time required to restore an item (assembly, subassembly,

component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. The symbol designations for the various maintenance levels are as follows:

Field:

C Crew maintenance  
O Service maintenance  
F Field maintenance

Sustainment:

H Below Depot maintenance  
D Depot maintenance

#### NOTE

The "L" maintenance level is not included in column (4) of the MAC. Functions to this level of maintenance are identified by work time figure in the "H" column of column (4), and an associated reference code is used in the REMARKS column (6). This code is keyed to the remarks and the SRA complete repair application is explained there.

Column (5) Tools and Equipment Reference Code. Column (5) specifies, by code, those common tool sets (not individual tools), common Test, Measurement and Diagnostic Equipment (TMDE), and special tools, special TMDE and special support equipment required to perform the designated function. Codes are keyed to the entries in the tools and test equipment table.

Column (6) Remarks Code. When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks table entries.

#### Explanation of Columns in the Tools and Test Equipment Requirements

Column (1) Tool or Test Equipment Reference Code. The tool or test equipment reference code correlates with a code used in column (5) of the MAC.

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

Column (3) Nomenclature. Name or identification of the tool or test equipment.

Column (4) National Stock Number (NSN). The NSN of the tool or test equipment.

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

**Explanation of Columns in the Remarks**

Column (1) Remarks Code. The code recorded in column (6) of the MAC.

Column (2) Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC.

**END OF WORK PACKAGE**

**EQUIPMENT MANUAL**  
**FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, AND 350-GPM**  
**MAINTENANCE ALLOCATION CHART**

*Table 1. MAC for Filter/Separator Units*

GROUP NUMBER	COMPONENT/ASSEMBLY	MAINTENANCE FUNCTION	MAINTENANCE LEVEL					TOOLS AND EQUIPMENT REF CODE	REMARKS CODE
			FIELD			SUSTAINMENT			
			CREW	SERVICE	FIELD	BELOW DEPOT	DEPOT		
			C	O	F	H	D		
01	50-GPM FILTER/SEP								
0101	FRAME AND VESSEL	Inspect Repair Replace	0.1	1.0 4.0				B, D	
0102	AIR PURGE VALVE	Inspect Replace	0.1	0.1					
0103	HEAD ASSEMBLY	Inspect Replace	0.1	0.2					
0104	CANISTERS	Inspect Replace		0.1 0.1					
0105	COALESCERS	Inspect Replace		0.2 0.1					
0106	FUEL/WATER DRAIN VALVE	Inspect  Replace Test	0.1	0.2 0.1				I	
0107	SIGHT GAUGE	Inspect Replace	0.1	0.5					
0108	DIFFERENTIAL PRESSURE GAUGE	Inspect  Replace	0.1	0.4					
0109	CAMLOCK FITTING	Inspect Replace	0.1	0.5				C	

Table 1. MAC for Filter/Separator Units, Continued

GROUP NUMBER	COMPONENT/ASSEMBLY	MAINTENANCE FUNCTION	MAINTENANCE LEVEL					TOOLS AND EQUIPMENT REF CODE	REMARKS CODE
			FIELD			SUSTAINMENT			
			CREW	SERVICE	FIELD	BELOW DEPOT	DEPOT		
			C	O	F	H	D		
0010	DETECTOR KIT	Inspect Replace	0.1	0.1					
02	100-GPM FILTER/SEP								
0201	FRAME AND VESSEL	Inspect Repair Replace	0.1	1.0 4.0					
0202	AIR PURGE VALVE	Inspect Replace	0.1	0.1					
0203	HEAD ASSEMBLY	Inspect Replace	0.1	0.2				B, D	
0204	CANISTERS	Inspect Replace		0.1 0.1					
0205	COALESCERS	Inspect Replace		0.2 0.1					
0206	FUEL/WATER DRAIN VALVE	Inspect  Replace Test	0.1	 0.2 0.1				F	
0207	SIGHT GAUGE	Inspect Replace	0.1	0.5					
0208	DIFFERENTIAL PRESSURE GAUGE	Inspect  Replace	0.1	 0.4					
0209	CAMLOCK FITTING	Inspect Replace	0.1	0.5				C	
0210	DETECTOR KIT	Inspect Replace	0.1	0.1					

Table 1. MAC for Filter/Separator Units, Continued

GROUP NUMBER	COMPONENT/ASSEMBLY	MAINTENANCE FUNCTION	MAINTENANCE LEVEL					TOOLS AND EQUIPMENT REF CODE	REMARKS CODE
			FIELD			SUSTAINMENT			
			CREW	SERVICE	FIELD	BELOW DEPOT	DEPOT		
			C	O	F	H	D		
03	350-GPM FILTER/SEP	Inspect							
0301	FRAME AND VESSEL	Inspect	0.1						
		Repair		1.0					
		Replace		4.0					
0302	AIR PURGE VALVE	Inspect	0.1						
		Replace		0.1					
0303	HEAD ASSEMBLY	Inspect	0.1						
		Replace		0.2				E, G, H	
0304	CANISTERS	Inspect		0.1					
		Replace		0.1				A	
0305	COALESCERS	Inspect		0.2					
		Replace		0.1					
0306	FUEL/WATER DRAIN VALVE	Inspect	0.1						
		Replace		0.2				F	
		Test		0.1					
0307	SIGHT GAUGE	Inspect	0.1						
		Replace		0.5					
0308	DIFFERENTIAL PRESSURE GAUGE	Inspect	0.1						
		Replace		0.4					
0309	CAMLOCK FITTING	Inspect	0.1						
		Replace		0.5				C	
0310	DETECTOR KIT	Inspect	0.1						
		Replace		0.1					

*Table 2. Tools and Test Equipment for Filter/Separator Units*

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL STOCK NUMBER	TOOL NUMBER
A	O	Socket, bayonet		493X500_SOCKET
B	F	Torque wrench, 3/8" drive	5120-01-524-4399	
C	F	Pipe wrench	5120-01-536-7826	
D	F	Socket, deep, 1/2"	5120-01-335-0955	
E	F	Torque wrench, 1/2" drive	5120-01-430-8547	2952
F	F	Wrench, 1-1/4"	5120-00-228-9517	A-A-1358
G	F	Wrench, 1-5/16"	5120-00-184-8438	A-A-1356
H	F	Socket, 1-5/16"	5120-01-135-0995	11669754
I	F	Wrench, 1"	5120-01-279-3588	

**END OF WORK PACKAGE**



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**EQUIPMENT MANUAL**  
**FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, AND 350-GPM**  
**REPAIR PARTS AND SPECIAL TOOLS LIST**

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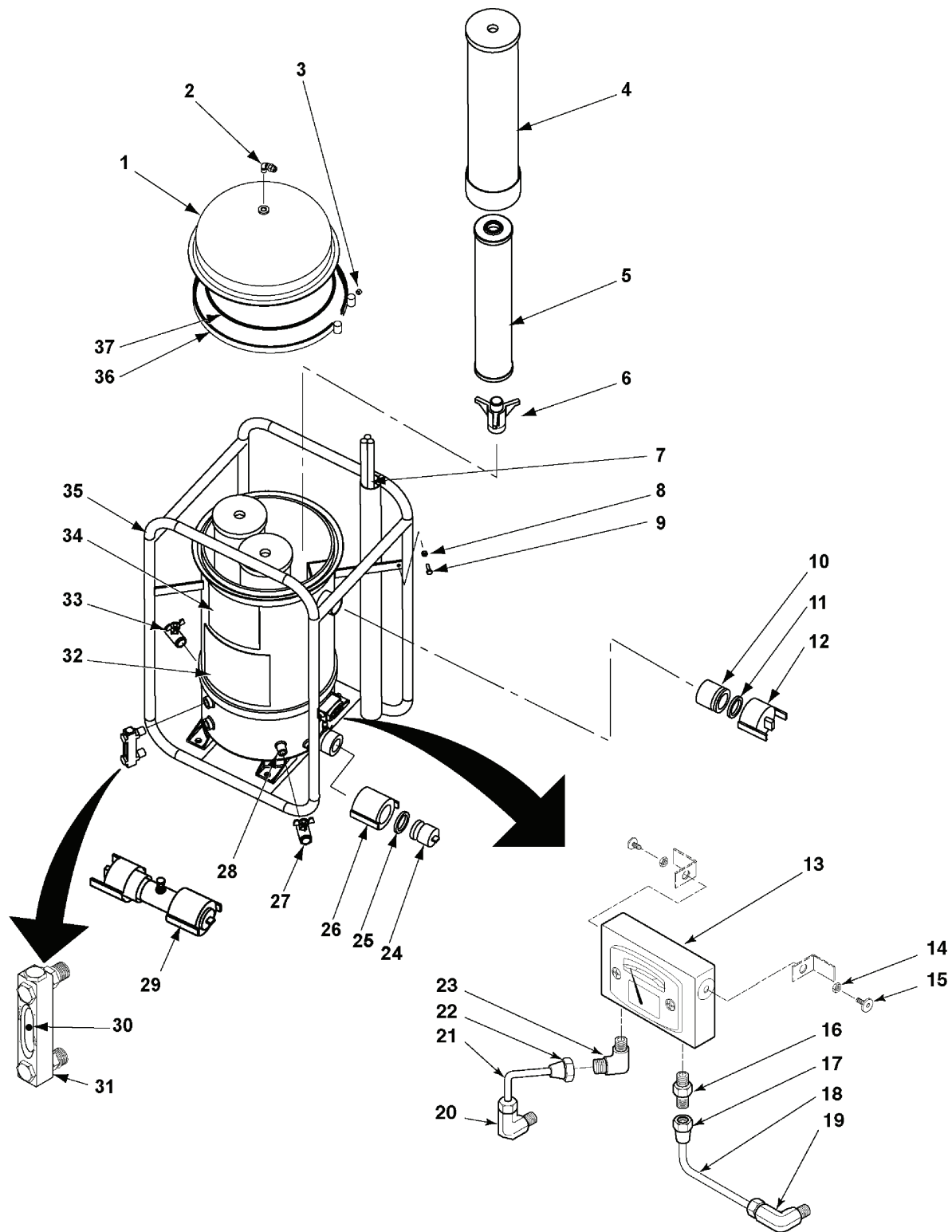
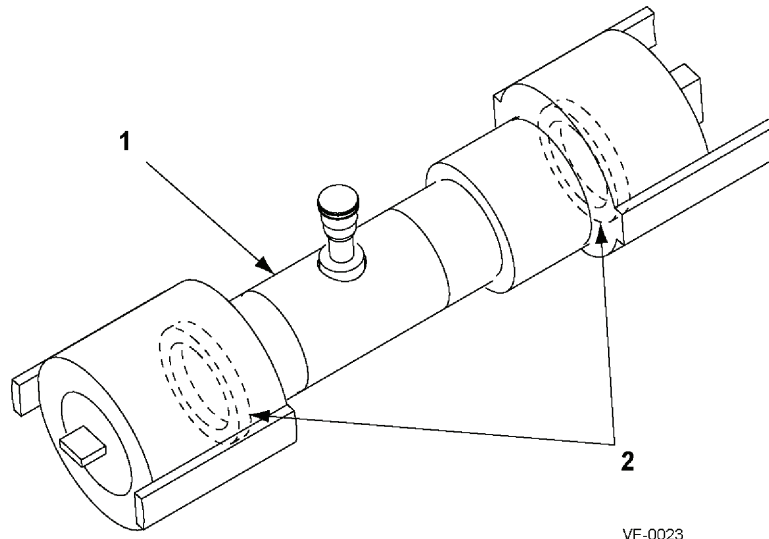


Figure 1. Filter/Separator, 50-GPM

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
		4330-01-483-1068	13573	AVV1320MIL	FIG. 1 FILTER/SEPARATOR, LIQUID FUELS, P/N AVV1320MIL (50-GPM)	
1	PFOZZA		13573	519Y500	HEAD, FLUID FILTER. ....	1
2	PBOZZA		54938	4M-PG4A-SS	VALVE, PURGE. ....	1
3	PBOZZA		81349	M45913/3-5FS6	NUT, SELF LOCKING. ....	1
4	PAOZZA	4330-01-477-7985	13573	I-420MMA	FILTER ELEMENT, FLUID ...	3
5	PAOZZA	4330-00-112-0256	13573	SI-522E	FILTER ELEMENT. ....	3
6	PFOZZA		13573	493X500	BAYONET. ....	3
7	PBOZZA	5975-00-878-3791	58536	AA55804-3B	ROD, GROUND. ....	1
8	PBOZZA	5310-01-512-5105	81349	M45913/1-5CS6	NUT, SELF-LOCKING. ....	1
9	PBOZZA	5305-00-071-2505	80204	B1821BH025C088N	CAPSCREW. ....	1
10	PBOZZA	4730-00-948-1719	58536	AA59326I15	COUPLING HALF. ....	1
12	PBOZZA	4730-00-869-5246	58536	AA59326/10-5	CAP, QUICK DISCONN. ....	1
13	PFOZZA		12762	126-0032	GAUGE, PRESSURE. ....	1
14	PBOZZA	5310-00-989-0908	96906	MS35691-3	NUT, HEX, JAM. ....	2
15	PAOZZA	5305-00-021-3620	80205	MS35307-307	SCREW. ....	2
16	PFOZZA	4730-00-892-5348	81343	4-2 080202SA	ADAPTER, PIPE TO TUBE. .	1
18	PFOZZA		13573	320Z501	TUBE ASSEMBLY. ....	1
19	PFOZZA	4730-00-812-1175	30780	FBUSS	ELBOW, PIPE TO TUBE. ....	3
20	PFOZZA	4730-00-812-1175	30780	FBUSS	ELBOW, PIPE TO TUBE. ....	3
21	PFOZZA		13573	320Z500	TUBE ASSEMBLY. ....	1
23	PFOZZA	4730-00-812-1175	30780	FBUSS	ELBOW, PIPE TO TUBE. ....	3
24	PBOZZA	4730-00-823-5316	58536	AA59326X15	PLUG, QUICK DISCONN. ....	1
25	PBOZZA	5330-00-360-0595	58536	AA59326G-5	GASKET. ....	2
26	PBOZZA	4730-00-980-9411	58536	AA59326V15	COUPLING HALF. ....	1
27	PBOZZA		39428	4073T13	VALVE, BALL. ....	1
28	PBOZZA		39428	C3942846755K14	NIPPLE. ....	2
29	KFOOOA		13573	166Y500	DETECTOR KIT. ....	1
30	PBOZZA		13573	246X800	BALL, NONMETALLIC. ....	1
31	PFOZZA		24346	G607-03-A-1-4-AL	INDICATOR, SIGHT. ....	1
32	PFOZZA		13573	380X501	PLATE, INSTRUCTION. ....	1
33	PBOZZA		39428	4073T13	VALVE, BALL. ....	1
34	PFOZZA		13573	380X500	PLATE, IDENTIFICATION. ....	1
35	PFOZZA		13573	644z500	FRAME ASSEMBLY, SHELL. .	1
36	PBOZZA		54646	V01-3-92-00-N-1412	BAND, RETAINING. ....	1
37	PAOZZA		13573	421x500	O-RING. ....	1
END OF FIGURE						



VF-0023

*Figure 2. Detector Kit*

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
					FIG. 2 DETECTOR KIT P/N 166Y500 (See Figure 1 for NHA)	
1	PFOZZA		13573	241Y500	NIPPLE, COUPLING. . . . .	1
2	PBOZZA	5330-00-360-0595	58536	AA59326G-5	GASKET . . . . .	2
END OF FIGURE						



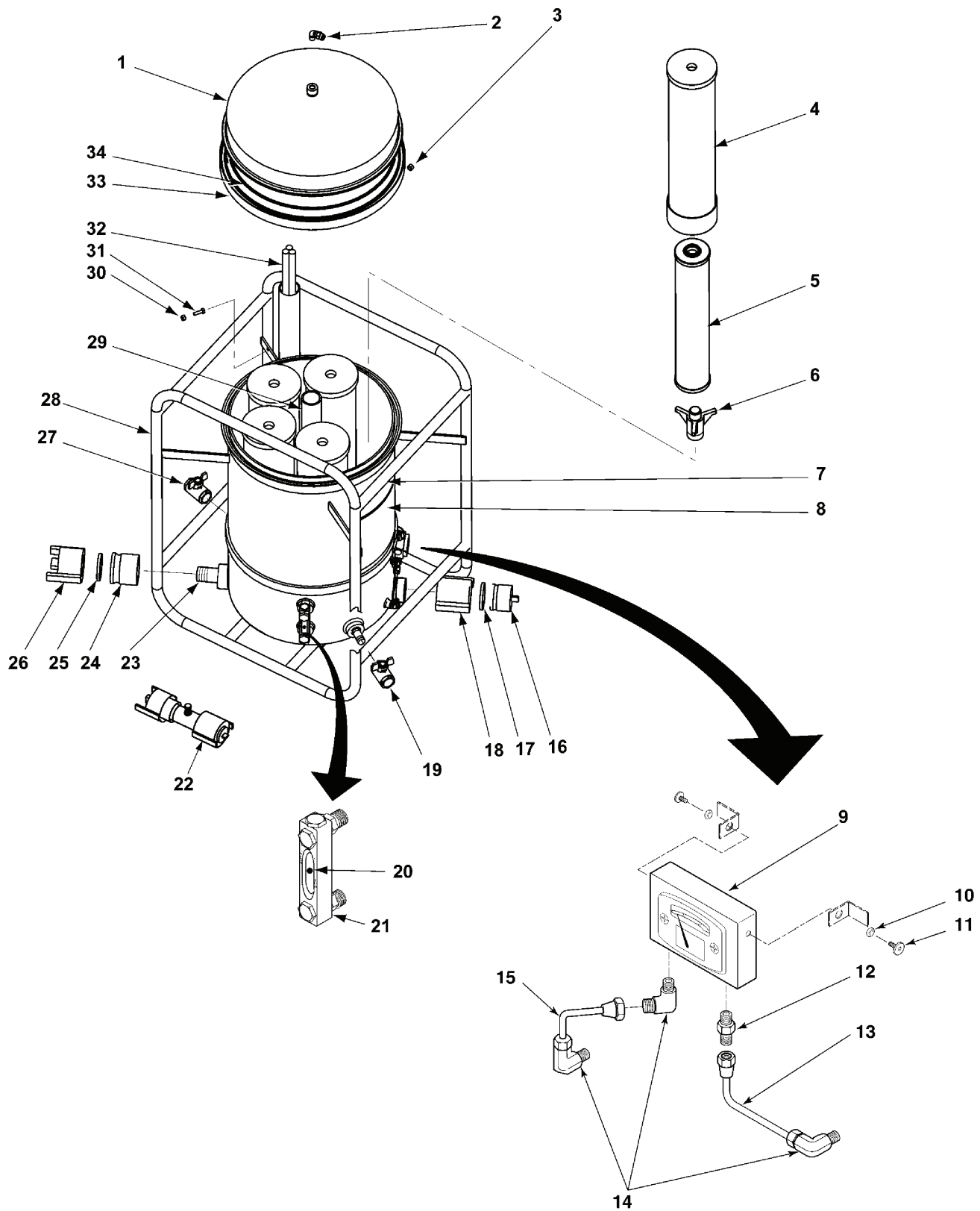


Figure 3. Filter/Separator, 100-GPM

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ITEM NO.	SMR CODE	NSN	CAGEC	PART NUMBER	DESCRIPTION AND USABLE ON CODE (UOC)	QTY
		4330-01-525-3659	13573	AVV1620MIL	FIG. 3 FILTER/SEPARATOR, LIQUID FUELS, P/N AVV1620MIL (100-GPM)	
1	PFOZZA		13573	519Y600	HEAD, FLUID FILTER.....	1
2	PBOZZA		54938	4M-PG4A-SS	VALVE, PURGE .....	1
3	PBOZZA		81349	M45913/3-5FS6	NUT, SELF LOCKING.....	1
4	PAOZZA	4330-01-477-7985	13573	I-420MMA	FILTER ELEMENT, FLUID ...	5
5	PAOZZA	4330-00-112-0256	13573	SI-522E	FILTER ELEMENT .....	5
6	PFOZZA		13573	493X500	BAYONET .....	5
7	PFOZZA		13573	380X600	PLATE, IDENTIFICATION....	1
8	PFOZZA		13573	380X601	PLATE, INSTRUCTION .....	1
9	PFOZZA		12762	126-0032	GAUGE, PRESSURE.....	1
10	PBOZZA	5310-00-989-0908	96906	MS35691-3	NUT, HEX JAM .....	2
11	PAOZZA	5305-00-021-3620	80205	MS35307-307	SCREW .....	2
12	PFOZZA	4730-00-892-5348	81343	4-2 080202SA	ADAPTER, PIPE TO TUBE ..	1
13	PFOZZA		13573	320Z601	TUBE ASSEMBLY .....	1
14	PFOZZA	4730-00-812-1175	30780	FBUSS	ELBOW, PIPE TO TUBE.....	3
15	PFOZZA		13573	320Z600	TUBE ASSEMBLY .....	1
16	PBOZZA	4730-00-915-5127	58536	AA59326X16	PLUG, QUICK DISCONN....	1
17	PBOZZA	5330-00-612-2414	58536	AA59326G-6	GASKET .....	1
18	PBOZZA	4730-00-649-9103	58536	AA59326V16	COUPLING HALF.....	1
19	PBOZZA		39428	4073T14	VALVE, BALL .....	1
20	PBOZZA		13573	246X800	BALL, FLOAT .....	1
21	PFOZZA		24346	G607-03-A-1-4-AL	INDICATOR, SIGHT .....	1
22	KFOOOA		13573	166Y600	DETECTOR KIT .....	1
23	PBOZZA	4730-00-079-1362	96906	MS27020-11	COUPLING HALF.....	1
24	PFOZZA		39428	C3942846755K15	NIPPLE, PIPE .....	2
25	PBOZZA	5330-00-612-2414	58536	AA59326G-6	GASKET .....	1
26	PBOZZA	4730-00-869-5246	58536	AA59326IX16	CAP, QUICK DISCONN .....	1
27	PBOZZA		39428	4073T14	VALVE, BALL .....	1
28	PFOZZA		13573	644Z600	FRAME ASSEMBLY, SHELL..	1
29	PFOZZA		13573	323Y600	STANDPIPE .....	1
30	PBOZZA	5310-01-504-5702	81349	90715A125	NUT, SELF-LOCKING.....	1
31	PBOZZA	5305-00-071-2505	80204	B1821BH025C088N	CAPSCREW.....	1
32	PBOZZA	5975-00-878-3791	58536	AA55804-3B	ROD, GROUND .....	1
33	PBOZZA		54646	V01-3-92-00-N-1745	BAND, RETAINING.....	1
34	PAOZZA		13573	421X600	O-RING.....	1
END OF FIGURE						

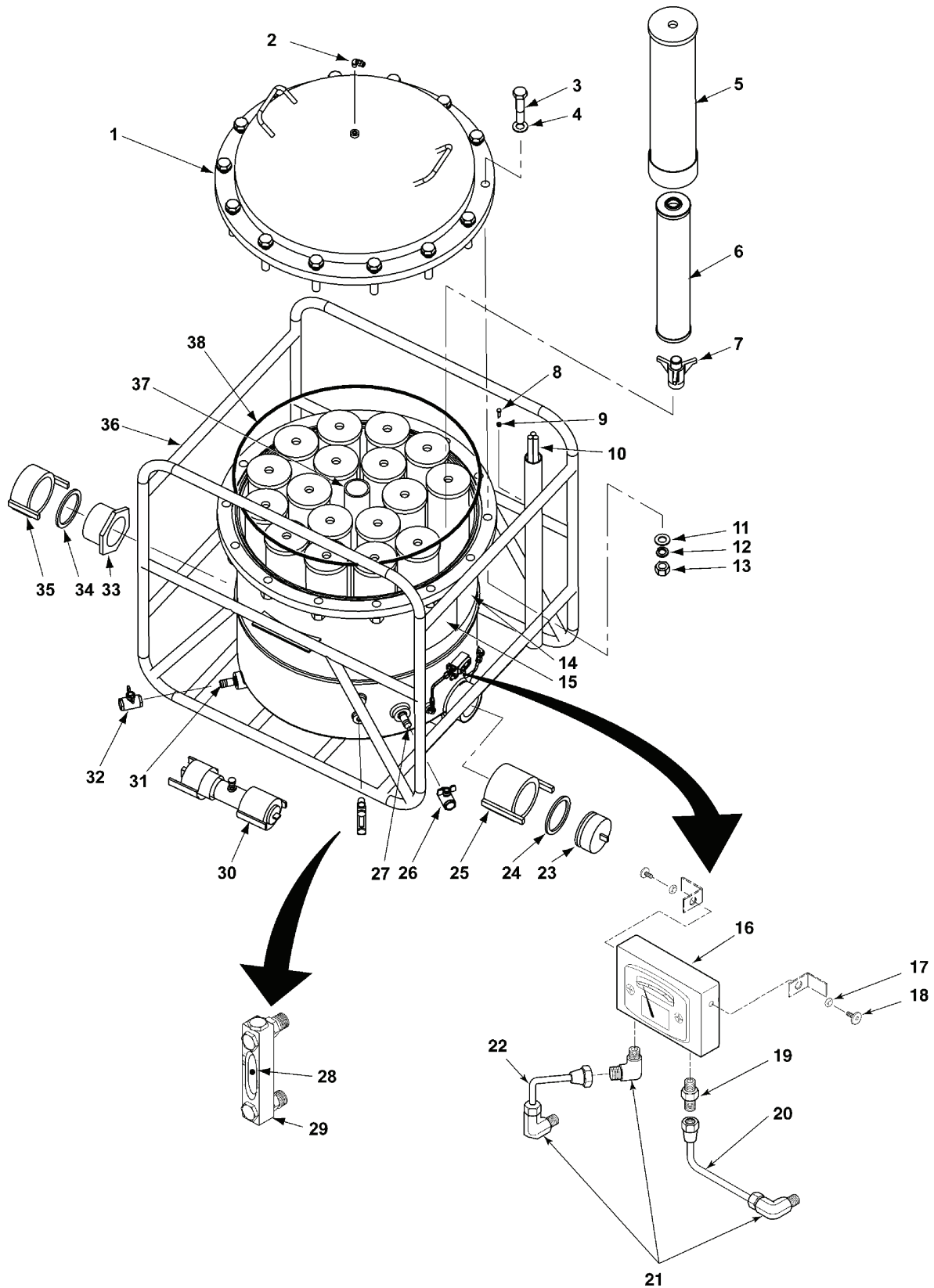


Figure 4. Filter/Separator, 350-GPM



(1) ITEM NO.	(2) SMR CODE	(3) NSN	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODE (UOC)	(7) QTY
		4330-01-529-0584	13573	AVV2820MIL	FIG. 3 FILTER/SEPARATOR, LIQUID FUELS, P/N AVV2820MIL (350-GPM)	
1	PFOZZA		13573	519Y700	HEAD, FLUID FILTER. ....	1
2	PBOZZA		54938	4M-PG4A-SS	VALVE, PURGE. ....	1
3	PAOZZA		96906	MS35307-522	BOLT. ....	14
4	PAOZZA		96906	MS15794-824	FLAT WASHER. ....	14
5	PAOZZA	4330-01-477-7985	13573	I-420MMA	FILTER ELEMENT, FLUID ...	18
6	PAOZZA	4330-00-112-0256	13573	SI-522E	FILTER ELEMENT. ....	18
7	PFOZZA		13573	493X500	BAYONET. ....	18
8	PBOZZA	5305-00-071-2505	80204	B1821BH025C088N	CAPSCREW. ....	1
9	PBOZZA	5310-01-504-5702	39428	90715A125	NUT, SELF-LOCKING. ....	1
10	PBOZZA	5975-00-878-3791	58536	AA55804-3B	ROD, GROUND. ....	1
11	PAOZZA		96906	MS15794-824	FLAT WASHER. ....	14
12	PAOZZA		96906	MS35338-147	LOCKWASHER. ....	14
13	PAOZZA		96906	MS35690-1410	HEX NUT. ....	14
14	PFOZZA		13573	380X700	PLATE, IDENTIFICATION. ...	1
15	PFOZZA		13573	380X701	PLATE, INSTRUCTION. ....	1
16	PFOZZA		12762	126-0032	GAUGE, PRESSURE. ....	1
17	PBOZZA	5310-00-989-0908	96906	MS35691-3	NUT, HEX JAM. ....	2
18	PAOZZA	5305-00-021-3620	80205	MS35307-307	SCREW. ....	2
19	PFOZZA	4730-00-892-5348	81343	4-2 080202SA	ADAPTER, PIPE TO TUBE. ...	1
20	PFOZZA		13573	320Z701	TUBE ASSEMBLY. ....	1
21	PFOZZA	4730-00-812-1175	30780	FBUSS	ELBOW, PIPE TO TUBE. ....	3
22	PFOZZA		13573	320Z700	TUBE ASSEMBLY. ....	1
23	PBOZZA	4730-00-640-6188	58536	AA59326X19	PLUG, QUICK DISCONN. ....	1
24	PBOZZA	5330-00-899-4509	58536	AA59326-9	GASKET. ....	1
25	PBOZZA		58536	AA59326/5-9-A-1	COUPLING HALF. ....	1
26	PBOZZA		39428	4073T14	VALVE, BALL. ....	2
27	PFOZZA	C3942846755K15	39428	46755K15	NIPPLE, PIPE. ....	1
28	PBOZZA		13573	246X800	BALL, FLOAT. ....	1
29	PFOZZA		24346	G607-03-A-1-4-AL	INDICATOR, SIGHT. ....	1
30	KFOOOA		13573	166Y700	DETECTOR KIT. ....	1
31	PFOZZA	C3942846755K15	39428	46755K15	NIPPLE, PIPE. ....	1
32	PBOZZA		39428	4073T14	VALVE, BALL. ....	2
33	PBOZZA	4730-00-840-0796	58536	AA59326I19	COUPLING HALF. ....	1
34	PBOZZA	5330-00-899-4509	58536	AA59326-9	GASKET. ....	1
35	PBOZZA	4730-00-623-7537	58536	AA59326/10-9	CAP, QUICK DISCONN. ....	1
36	PFOZZA		13573	644Z700	FRAME ASSEMBLY, SHELL. ...	1
37	PFOZZA		13573	323Y700	STANDPIPE. ....	1
38	PAOZZA		13573	421X700	O-RING. ....	1
END OF FIGURE						

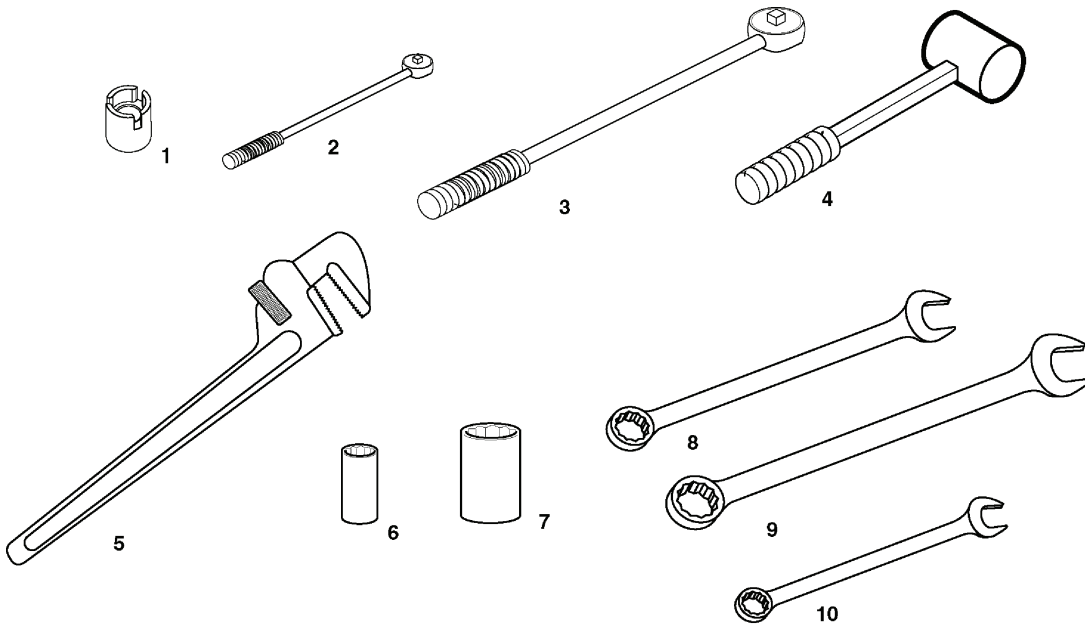


Figure 5. Special Tools

(1) ITEM NO.	(2) SMR CODE	(4) CAGEC	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODE (UOC)	(7) QTY
				FIG. 4 SPECIAL TOOLS	
1		13573	493X500_SOCKET	SOCKET, Bayonet	1
2		39428	5120-01-524-4399	TORQUE WRENCH, 3/8" DRIVE	1
3		08292	5120-01-430-8547	TORQUE WRENCH, 1/2" DRIVE	1
4		80244	5120-00-293-3399	RUBBER Mallet	1
5		50893	5120-01-536-7826	PIPE WRENCH	1
6		55719	5120-01-335-0955	SOCKET, DEEP, 7/16" 1/2-INCH DRIVE	1
7		55719	5120-01-135-0995	SOCKET, 1 5/16" , 1/2-INCH DRIVE	1
8		58536	5120-00-228-9517	WRENCH, COMBINATION, 1 1/4"	1
9		58536	5120-00-184-8438	WRENCH, COMBINATION, 1 5/16"	1
10		03306	5120-01-279-3588	WRENCH, COMBINATION, 1"	1
				END OF FIGURE	

END OF WORK PACKAGE

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**EQUIPMENT MANUAL**  
**FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, 350-GPM**  
**COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS**

---

## **INTRODUCTION**

### **Scope**

This work package lists COEI and BII for the filter/separator to help you inventory items for safe and efficient operation of the equipment.

### **General**

The COEI and BII information is divided into the following lists:

**Components of End Item (COEI).** This list is for information purposes only and is not authority to requisition replacements. These items are part of the 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. Illustrations are furnished to help you find and identify the items.

**Basic Issue Items (BII).** These essential items are required to place the filter/separator in operation, operate it, and to do emergency repairs. Although shipped separately packaged, BII must be with the filter/separator during operation and when it is transferred between property accounts. Listing these items is your authority to request/requisition them for replacement based on authorization of the end item by the TOE/MTOE., Illustrations are furnished to help you find and identify the items.

### **Explanation of Columns in the COEI List and BII List**

Column (1) Illus Number. Gives you the number of the item illustrated.

Column (2) National Stock Number (NSN). Identifies the stock number of the item to be used for requisitioning purposes.

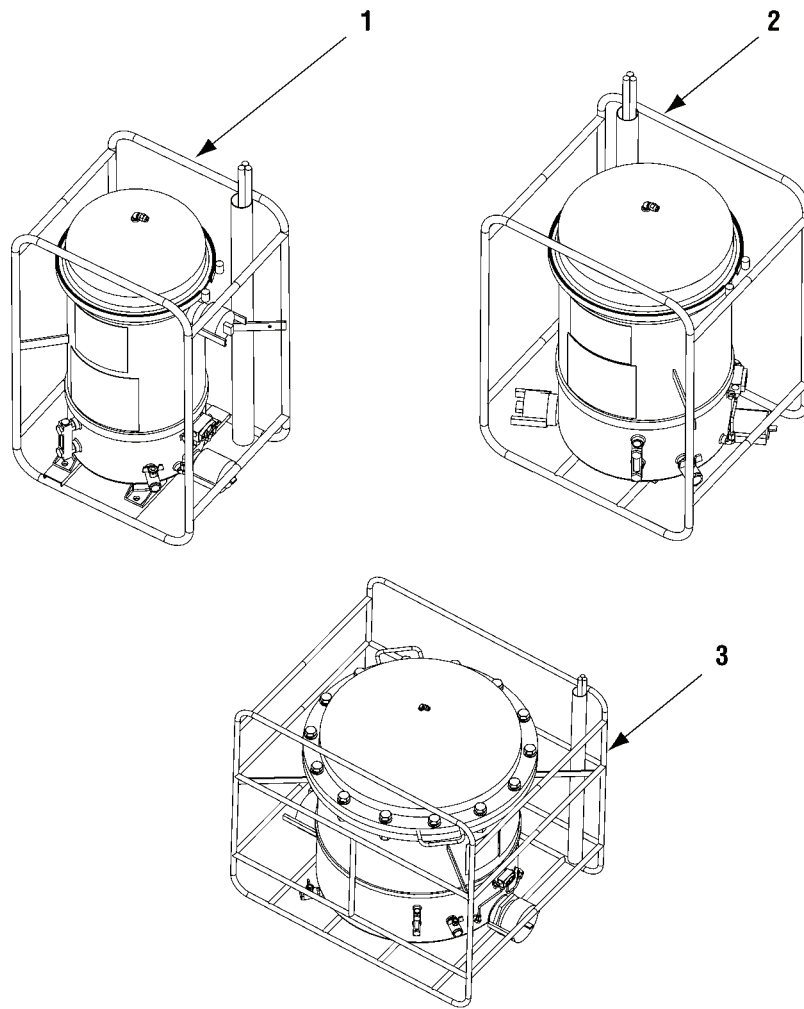
Column (3) Description, CAGEC, and Part Number. Identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The stowage location of COEI and BII is also included in this column. The last line below the description is the CAGEC (Commercial and Government Entity Code) (in parentheses) and the part number.

Column (4) Usable On Code. When applicable, gives you a code if the item you need is not the same for different models of equipment. These codes are identified below:

<b><u>Code</u></b>	<b><u>Used on</u></b>
A	50-GPM Unit (NSN 4330-01-483-1068)
B	100-GPM Unit (NSN 4330-01-525-3659)
C	350-GPM Unit (NSN 4330-01-529-0584)

Column (5) Unit of Issue (U/I). Indicates the physical measurement or count of the item as issued per the National Stock Number shown in column (2).

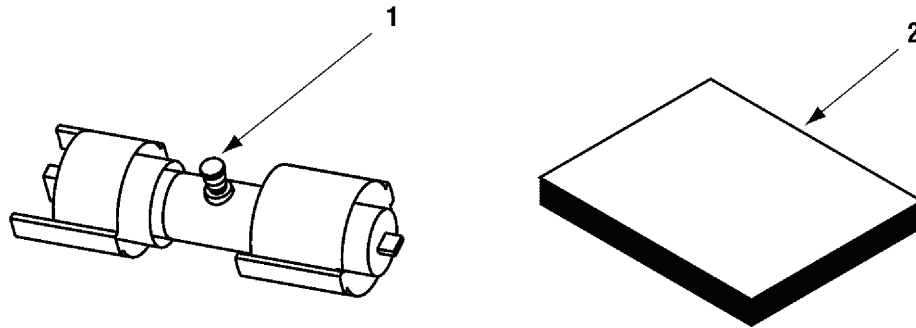
Column (6) Qty Rqr. Indicates the quantity required.



*Figure 1. Components of End Item*

**Table 1. Components of End Item List**

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(6) QTY RQR
1	4330-01-483-1068	FILTER SEPARATOR, LIQUID FUELS, 50 GPM, (13573) AVV1320MIL	1
2	4330-01-525-3659	FILTER SEPARATOR, LIQUID FUELS, 100 GPM, (13573) AVV1620MIL	1
3	4330-01-529-0584	FILTER SEPARATOR, LIQUID FUELS, 350 GPM, (13573) AVV2820MIL	1



*Figure 2. Basic Issue Items*

**Table 2. Basic Issue Items List**

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/I	(6) QTY RQR
1		DETECTOR KIT, (13573) 166Y500	A	EA	1
		DETECTOR KIT, (13573) 166Y600	B	EA	1
		DETECTOR KIT, (13573) 166Y700	C	EA	1
2		TECHNICAL MANUAL (13573) TM 5-4330-263-13&P	A, B, C	EA	1

**END OF WORK PACKAGE**



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**EQUIPMENT MANUAL**  
**FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, 350-GPM**  
**ADDITIONAL AUTHORIZATION LIST**

---

There are no additional authorized items for the filter/separators.

**END OF WORK PACKAGE**





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## EQUIPMENT MANUAL

### FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, AND 350-GPM

### EXPENDABLE AND DURABLE ITEMS LIST

---

#### INTRODUCTION

##### Scope

This work package lists expendable and durable items that you will need to operate and maintain the (enter equipment/end item name). This list is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

##### Explanation of Columns in the Expendable/Durable Items List

Column (1) Item Number. This number is assigned to the entry in the list and is referenced in the narrative instructions to identify the item (e.g., "Use brake fluid (item 5, WP 0098 00).").

Column (2) Level. This column identifies the lowest level of maintenance that requires the listed item (include as applicable: C = Operator/Crew, O = Unit/AVUM, F = Direct Support/AVIM, H = General Support, D = Depot).

Column (3) National Stock Number (NSN). This is the NSN assigned to the item which you can use to requisition it.

Column (4) Item Name, Description, Commercial and Government Entity Code (CAGEC), and Part Number (P/N). This column provides the other information you need to identify the item.

Column (5) Unit of Issue (U/I). Indicates the physical measurement or count of the item as issued per the National Stock Number shown in column (3).

**Table 1. Expendable and Durable Items List**

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) ITEM NAME, DESCRIPTION, CAGEC, AND PART NUMBER	(5) U/I
1	C	7930-00-056-8144	DETERGENT, GENERAL PURPOSE	BX
2	O		COMPOUND, ANTISEIZE (TT-S-1732), 5W425, P/N NPBT-8	CN
3	O	7920-00-044-9281	CLOTH, CLEANING, 51200	BX
4	O	4940-01-419-6444	DRIP PAN, METAL, RECTANGULAR, 97403	EA

**END OF WORK PACKAGE**



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**EQUIPMENT MANUAL**  
**FILTER/SEPARATOR, LIQUID FUEL, 50-, 100-, AND 350-GPM**  
**MANDATORY REPLACEMENT PARTS**

---

**INTRODUCTION**

This work package includes a list of all mandatory replacement parts referenced in the task initial setups and procedures. These are items that must be replaced during maintenance whether they have failed or not. This includes items based on usage intervals such as miles, time, rounds, fired, etc.

**Table 1. Mandatory Replacement Parts List**

ITEM NUMBER	PART NUMBER/CAGEC	NATIONAL STOCK NUMBER	NOMENCLATURE	QTY
1	421X700, 13573		O-RING	1
2	M45913/3-5FS6, 81349		NUT, SELF-LOCKING	1
3	MS35338-147, 81349		LOCKWASHER	28

**END OF WORK PACKAGE**



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<b>RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS</b> For use of this form, see AR 25-30; the proponent agency is ODISC4.				Use Part II (reverse) for Repair Parts and Special Tools Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).		DATE: <b>30 August 2007</b>
TO: (Forward to proponent of publication or form) (include ZIP code) <b>AMSTA-LC-LMIT Tech Pubs, TACOM-RI</b> <b>1 Rock Island Arsenal</b> <b>Rock Island, IL 61299-7630</b>				FROM: (Activity and location) (include ZIP code) <b>Co. B, 1st BN, 2nd Brigade</b> <b>Ft. Hood, TX 76445</b>		
PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS						
PUBLICATION/FORM NUMBER <b>TM 10-4930-361-14</b>			DATE <b>30 August 2007</b>		TITLE <b>TECHNICAL MANUAL, OPERATOR'S, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT FOR THE FUEL SYSTEM SUPPLY POINT (FSSP)</b>	
ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.*	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON (Provide exact wording of recommended changes, if possible).
	0141-1					Disassembly, Step 3, reference to Air Filter Canister (Figure 1, Item 7) should read (Figure 1, Item 8).
<h1>SAMPLE</h1>						
*Reference to line numbers within the paragraph or subparagraph.						
TYPED NAME, GRADE, OR TITLE <b>Pat Smith</b>				TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION <b>AV272-4162</b>		SIGNATURE <i>Pat Smith</i>

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<b>PAGE NO.</b>	<b>COLM NO.</b>	<b>LINE NO.</b>	<b>NATIONAL STOCK NUMBER</b>	<b>REFERENCE NO.</b>	<b>FIGURE NO.</b>	<b>ITEM NO.</b>	<b>TOTAL NO. OF MAJOR ITEMS SUPPORTED</b>	<b>RECOMMENDED ACTION</b>	
								<h1>SAMPLE</h1>	
PART III - REMARKS <i>(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)</i>									
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PUBLICATION NUMBER				DATE			TITLE		
PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFEREN CENO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION	
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PAGE NO.	COLM NO.	LINE NO.	FEDERAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPROTED	RECOMMENDED ACTION
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By Order of the Secretary of the Army:

GEORGE W. CASEY, JR.  
General, United States Army  
Chief of Staff

Official:

A handwritten signature in black ink, reading "Joyce E. Morrow". The signature is written in a cursive, flowing style.

JOYCE E. MORROW  
Administrative Assistant to the  
Secretary of the Army

0819806

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## THE METRIC SYSTEM AND EQUIVALENTS

### LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches  
 1 Meter = 100 Centimeters = 1,000 Millimeters = 39.37 Inches  
 1 Kilometer = 1,000 Meters = 0.621 Miles

### SQUARE MEASURE

1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches  
 1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet  
 1 Sq Kilometer = 1,000,000 Sq Meters = 0.386 Sq Miles

### CUBIC MEASURE

1 Cu Centimeter = 1,000 Cu Millimeters = 0.06 Cu Inches  
 1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

### LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces  
 1 Liter = 1,000 Milliliters = 33.82 Fluid Ounces

### TEMPERATURE

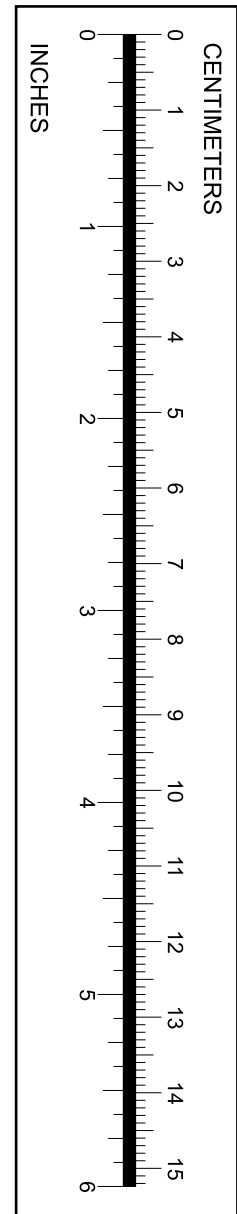
Degrees Fahrenheit (F) =  $^{\circ}\text{C} \cdot 9 \div 5 + 32$   
 Degrees Celsius (C) =  $\text{F}^{\circ} - 32 \cdot 5 \div 9$   
 212° Fahrenheit is equivalent to 100° Celsius  
 90° Fahrenheit is equivalent to 32.2° Celsius  
 32° Fahrenheit is equivalent to 0° Celsius

### WEIGHTS

1 Gram = 0.001 Kilograms = 1,000 Milligrams = 0.035 Ounces  
 1 Kilogram = 1,000 Grams = 2.2 Lb  
 1 Metric Ton = 1,000 Kilograms = 1 Megagram = 1.1 Short Tons

### APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Millimeters	25.4
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.4536
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds Per Square Inch	Kilopascals	6.895
Miles Per Gallon	Kilometers Per Liter	0.425
Miles Per Hour	Kilometers Per Hour	1.609
TO CHANGE	TO	MULTIPLY BY
Millimeters	Inches	0.03937
Centimeters	Inches	0.3937
Meters	Feet	3.280
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	2.2046
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	2.354
Kilometers Per Hour	Miles Per Hour	0.621





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