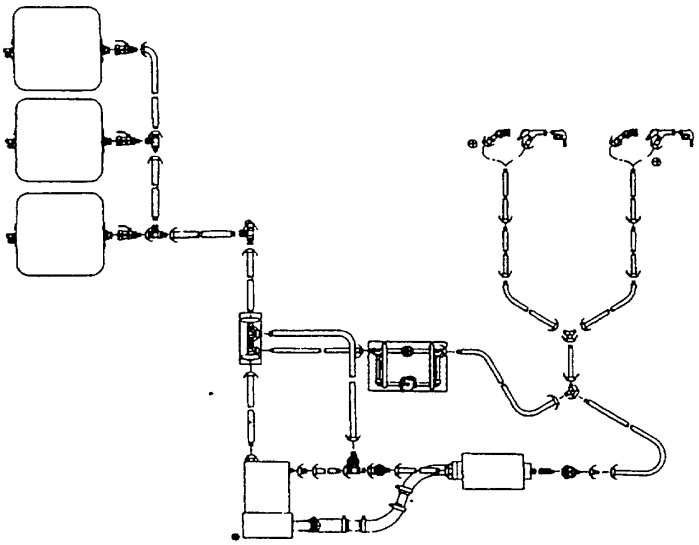
TECHNICAL MANUAL

OPERATOR'S, UNIT AND DIRECT SUPPORT MAINTENANCE MANUAL FOR ARCTIC FORWARD AREA REFUELING EQUIPMENT (AFARE) MODEL AFARE100

NSN: 4930-01-355-9581



HEADQUARTERS, DEPARTMENT OF THE ARMY
30 SEPTEMBER 1995

WARNINGS

- Pay particular attention to specific WARNINGS AND CAUTIONS throughout this manual. DEATH or serious injury may result if personnel fail to observe safety precautions.

- Do not touch cold metal parts with bare hands when operating under arctic conditions. Frostbite can cause permanent injury.

- Lifting or moving heavy equipment incorrectly can cause serious injury. Do not try to lift or move more than 50 pounds by yourself. Get an assistant. Bend legs while lifting. Do not support weight with your back. DEATH or serious injury may result if personnel fail to observe the following safety precautions.

FLAMMABLE FUEL

- Do not breathe fuel vapors. Vapors are toxic and can cause serious illness or death. If dizziness occurs, leave area and get fresh air.

- Before operation be certain all system components are securely connected to avoid fuel spills. If fuel spill occurs, cover the area with dry soil to reduce rate of vaporization. During operation avoid fuel spills as much as possible. Be certain a suitable fire extinguisher is charged and readily available in case of fire.

- Fuel vapors are extremely flammable. Do not allow smoking within 100 feet of the AFARE. Post NO SMOKING signs around the areas. Do not operate system or components near open flame or excessive heat. Death or personnel injury could result from exploding or burning fuel. Be certain a suitable and properly charged fire extinguisher is available at all times.

SOLVENT HAZARD

- Dry-cleaning solvent, P-D-680, Type III, used to clean parts, is potentially dangerous to personnel and property. Eye protection required. Avoid repeated and prolonged skin contact by wearing rubber or nonporous gloves when handling solvents or material wet with dry-cleaning solvent. Wash hands immediately after exposure with soap and water and use a lanolin based skin cream to prevent skin drying.

- Do not use near open flame or excessive heat. Do not work with solvent in a closed room. Be sure there is good ventilation or the solvent vapors will build up in the air and become a poisonous mixture which can cause physical injury or even death.

- Do not breathe dry cleaning solvent vapors for long periods of time or allow solvent to come into contact with skin for an extended time. DO NOT use solvent near open flames or excessive heat.

STATIC DISCHARGE

- Static discharge could ignite the fuel or cause an explosion of the fuel vapor. Do not operate the system until properly grounded or bonded.

- Be certain the nozzles are properly bonded to the vehicle being filled. The vehicle being filled and the dispensing pump must be grounded.

ARCING

Arcing could ignite the fuel or cause an explosion of the fuel vapor. Do Not use radio transmitter while refueling. Radio transmitters can cause an arc at antennas. Do not ground to a radio antenna.

WARNINGS - cont.

FUEL SPILLS ON PERSONNEL

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

- Wear protective goggles and refuel only in well-ventilated area. Use fuel resistant gloves when handling system components due to toxic effects of some fuel additives. Avoid contact with skin, eyes, and clothes. If fuel contacts eyes, flush eyes with clean fresh water and get medical attention immediately.

FIRST AID

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

TECHNICAL MANUAL
NO: 10-4930-240-13

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 30 SEPTEMBER 1995

OPERATOR'S, UNIT AND DIRECT SUPPORT MAINTENANCE MANUAL for ARCTIC FORWARD AREA REFUELING EQUIPMENT (AFARE) MODEL AFARE100 NSN: 4930-01-355-9581

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes, or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to: Commander, US Army Aviation and Troop Command, ATTN: AMSAT-I-MP, 4300 Goodfellow Blvd., St. Louis, Mo. 63120-1798. You may also submit your recommended changes by E-mail directly to <daf2028@st-louis-emh7.army.mil>. A reply will be furnished directly to you.

TABLE OF CONTENTS

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HOW TO USE THIS MANUAL

Be sure to read all Warnings before using your equipment.

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

Cover Page Index

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

Table of Contents

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

Page Numbers and Index Tabs

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

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

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

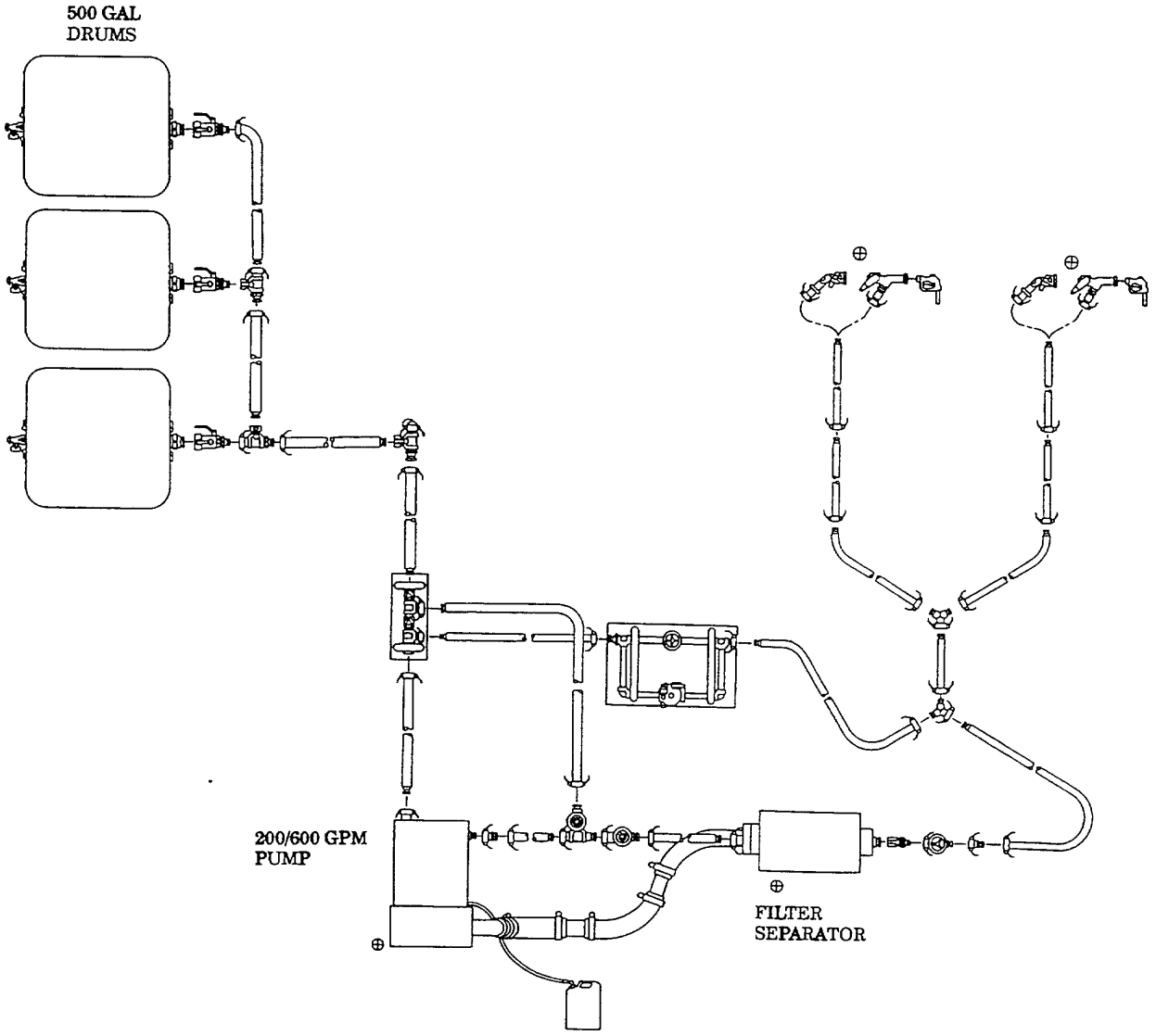


Figure 1-0. Arctic Forward Area Refueling Equipment (AFARE), Model AFARE 100.

CHAPTER 1

INTRODUCTION

SECTION I. GENERAL INFORMATION

1-1. SCOPE.

This manual contains operating instructions, Unit and Direct Support maintenance procedures required to operate and maintain the Arctic Forward Area Refueling Equipment (AFARE). The purpose of the AFARE is to refuel aircraft operating in all environments, including low arctic temperatures

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

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

1-3. CORROSION PREVENTION AND CONTROL.

a. 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.

1-3. CORROSION PREVENTION AND CONTROL - cont.

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

c. If a corrosion problem is identified, it can be reported using Standard Form 368, Product Quality Deficiency Report. Using key words such as "rust", "deterioration", or "cracking" will insure that the information is identified as a CPC problem. The form should be submitted to the address specified in DA Pam 738-750.

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

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

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

If your AFARE 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 (Quality Deficiency Report). Mail it to us at Commander, U S Army Aviation and Troop Command, ATTN **AMSAT-I-MDO**, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798. We'll send you a reply.

1-6. NOMENCLATURE CROSS REFERENCE LIST.

Common Name	Official Nomenclature
CCR Nozzle	Closed Circuit Refueling Nozzle
D1 Nozzle	Single Point Refueling Nozzle

1-7. LIST OF ABBREVIATIONS.

Abbreviation	Nomenclature
AFARE	Arctic Forward Area Refueling Equipment
Assy	Assembly
°C	Degrees Centigrade
DP	Differential Pressure
In.	Inch
K	Kilo (Thousand)
°F	Degrees Fahrenheit
Ft.	Feet or Foot
PSI	Pounds Per Square Inch
PSIG	Pounds Per Square Inch Gage
PMCS	Preventive Maintenance Checks and Services
TM	Technical Manual

1-8. GLOSSARY.

Term	Description
Interchangeable	Two or more like parts with the same function and features that can be exchanged one for the other without changing parts or selecting size to obtain correct fit.
Plenum	Collection point for exhaust gases.

SECTION II. EQUIPMENT DESCRIPTION AND DATA

1-9. EQUIPMENT CHARACTERISTICS, CAPABILITIES AND FEATURES.

a. Characteristics.

(1) Turbine powered pump provides a maximum pumping capacity of 200 gallons per minute (GPM). Turbine powered pump draws fuel from system hoses.

(2) Maximum fuel storage capacity of 1,500 gallons.

(3) Easily transportable. Hoses, nozzles and coupling components are stowed in hose carriers.

(4) Quick disconnect cam-lock couplings on all components allow rapid system assembly and disassembly.

(5) System can be configured to meet varying mission and site requirements.

(6) Major operating assemblies are skid mounted to aid movement in arctic conditions.

(5) No external electrical power source required.

b. Capabilities and Features.

(1) System operating range: -60°F to + 95°F (-51°C to + 35°C).

(1) Two aircraft refueling points. Each point independently controlled by a refueling nozzle 50 GPM minimum fuel flow.

(2) Hand operated valves control fuel flow through the system.

(4) 1,500 gallon fuel storage capacity provided by three 500 gallon collapsible fuel drums. Drums can be transported by truck or aircraft. Fuel drums can be adapted for ground handling.

(5) Turbine powered, 200 GPM pump operates off of system fuel supply. Exhaust gases are used to heat filter separator.

1-10. LOCATIONAND DESCRIPION OFMAJOR COMPONENTS.

Refer to figure 1-1.

The AFARE consists of collapsible fuel drums, a turbine powered fuel pump, filter separator, pressure , reducing valve, fueling manifold, refueling nozzles and the necessary hoses, tees and couplings required to assemble the system. The following paragraphs describe a typical AFARE system. Your mission and operating environment may require connecting the components in a different configuration than the one shown. All components are interchangeable.

a. 500 Gallon Drums (1). Three collapsible 500 gallon drums are supplied. The drums serve as the primary fuel source for operating the system. The drums are cylindrical m shape with rounded ends and are equipped with male quick disconnect adapters. The drums may be refilled or replaced when empty. For location and description of major components on the 500 gallon drum, refer to TM10-8110-203-12&P.

b. Drum Couplers (2). Drum couplers are connected between the 500 gallon drums and the system fuel hoses. Couplers are hand operated by a control lever mounted on top of the valve body.

c. Tees (3). Tees are used to assemble the AFARE system and prevent sharp bends in fuel hoses. All tees are equipped with 3-inch quick disconnect couplings.

d. Suction Hoses (4). Non-collapsible suction hoses are used to distribute fuel from one component to the other and are installed where suction pressures will occur. Suction hoses are supplied in two diameters, 2-inch and 3-inch,and are equipped with quick disconnect couplings at both ends.

e. Skid Mounted Fueling Manifold (5). The fueling manifold is skid mounted and comprised of hand operated gate valves, tees and couplings. A cover is provided to protect the manifold during storage and shipment. The manifold is supplied with 3-inch quick disconnect couplings.

f. Discharge Hoses (6). Collapsible discharge hoses are used to distribute fuel from one component to the other and are installed where discharge pressures will occur. Discharge hoses are supplied in two diameters, 2-inch and 3-inch,and are equipped with quick disconnect couplings at both ends.

g. Pressure Reducing Skid Assembly (7). The skid mounted pressure reducing assembly contains a pressure regulator, gate valve, and related piping mounted on a metal skid. Both ends of the assembly are equipped with quick disconnect couplings. A cover is provided to protect the assembly during storage and shipment.

h. Wyes (8). Wyes are used to assemble the AFARE system and are installed where fuel distribution must be split. All wyes are equipped with 2-inch quick disconnect couplings.

1-10. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - cont.

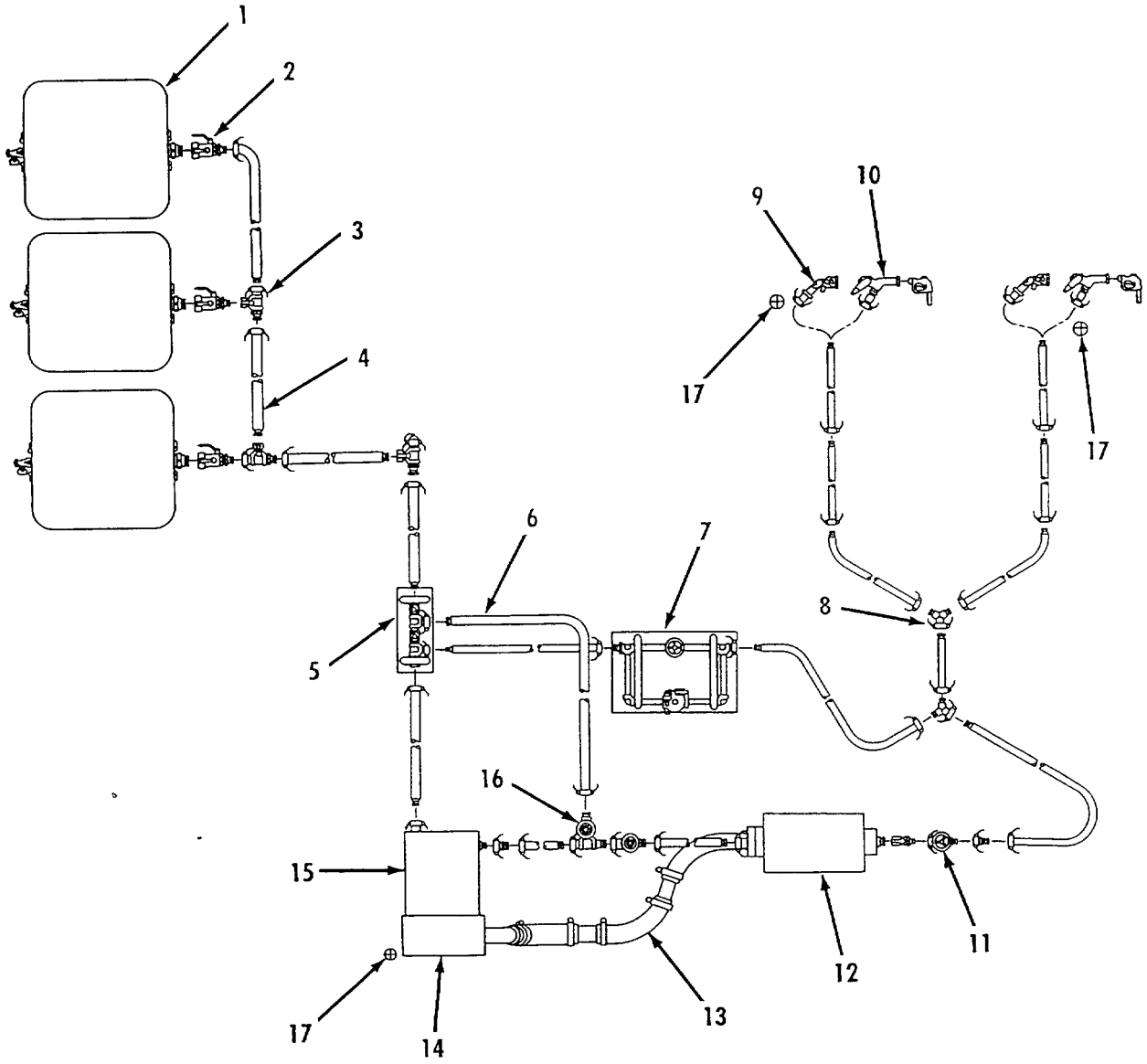


Figure 1-1. Major Components of Arctic Forward Area Refueling Equipment (AFARE).

1-10. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS -cont.

i. Single Point Refueling Nozzle (Type D1) (9). D1 nozzles are supplied with AFARE for refueling aircraft with pressurized fuel systems. The D1 nozzles are non-regulating, so fuel pressure must controlled by the pressure reducing skid assembly. For location and description of major component on the D1 nozzle, refer to TM 10-4930-242-13&P.

j. Closed Circuit Refueling (CCR) Nozzle with Gravity Fill Adapter (10). The CCR nozzles and gravity fill adapters supplied with the AFARE are used to connect the fuel system to the aircraft. The hand operated CCR nozzle locks onto the aircraft refueling adapter and regulates fuel pressure to the aircraft Nozzle are supplied with a ground clamp and plug for electrical bonding of the nozzle to the aircraft. Refueling aircraft with gravity feed fuel tanks requires connection of the gravity fill adapter to the CCR nozzle. For location and description of major components on the CCR nozzle and gravity fill adapter, refer to applicable TM 10-4930-243-13&P.

k. Valve Section (11). The valve section is comprised of a gate valve and straight pipe section. The valve section is used to assemble the AFARE system and provide control of fuel flow. Both ends of the valve section are equipped with quick disconnect couplings.

l. Filter Separator 200GPM File Assembly (12). The filter separator is a skid mounted unit containing a separator tank and various valves, gages and piping. The filter separator is installed downline of the 200 GPM pump to remove water and particle contaminants from the fuel. For location and description of major components on the filter separator, refer to TM 10-4330-236-13.

m. Air Duct (13). Three collapsible air ducts connect the deflector assembly to the filter separator Each duct is 12 feet long when extended and 4-feet long when collapsed. The air ducts carry hot exhaust from deflector on the 200 GPM pump to the filter separator defrost shroud.

n. Deflector Assembly (14). The deflector is mounted on top of the 200 GPM pump. The deflector serves as a plenum to collect heat generated by the operating turbine engine and directing it into the attached air ducts.

o. 200 GPM Pump Assembly (15). The pump assembly is a self contained, skid mounted unit powered by a turbine engine. The pump assembly provides the force required to distribute fuel from the 500 gallon drums to the fuel dispensing nozzles. For location and description of major components on the 200 GPM pump assembly, refer to applicable TM 10-4320-342-10.

p. 3-inch Manifold (16). The three inch manifold contains a gate valve and tee. The manifold is used to assemble the AFARE system and provide control of fuel flow. The manifold is equipped with quick disconnect couplings.

q. Ground Rods (17). Three ground rods provide grounding for the fueling points and the 200 GPM pump.

1-11. EQUIPMENT DATA.

The following table provides information pertaining to major components of the AFARE. Refer to the applicable technical manual for additional equipment data on the following equipment:

200 GPM Pump Assembly	TM 10-4320-342-10
Closed Circuit Refueling (CCR) Nozzle and Gravity Fill Adapter	TM 10-4930-243-13&P
Single Point Refueling Nozzle(D-1 Type)	TM 10-4930-242-13&P
500 Gallon Collapsible Drum	TM 10-8110-203-12&P
200 GPM Fuel Filter Separator	TM 10-4330-236-13

Table 1-1. Equipment Data

SINGLE POINT REFUELING NOZZLE (D1)

Length	17 in. (43 cm)
Width (across handles)	13 in. (33 cm)
Height	11 in. (28 cm)
Weight	9.25 lbs (4.2 kg)
Coupling	2 in. (5 cm) quick disconnect

CCR NOZZLE

Length	16in.(41 cm)
Width	6 m. (15 cm)
Height	11 in. (28 cm)
Weight	8 5 lbs. (3 8 kg)
Coupling	2 in. (5 cm) quick disconnect

GRAVITY FILL NOZZLE

Length	18 in (46 cm)
Width	2.5 in. (6.4 cm)
Height	16 in (41 cm)
Weight	4.1 lbs (1.8 kg)
Coupling	self-sealing poppet

200 GPM FUEL FILTER SEPARATOR

Length	40.34 in (102.46 cm)
Width	77.38 in. (196.54 cm)
Height (wheels down)	54.37 in. (137 16 cm)
Weight (empty)	475 lbs. (214 kg)
Operating Pressure	150 psi (10.5 kg/cm2)
Couplings (Inlet)	3 in. (7.7 cm) quick disconnect
Couplings (Outlet)	3 in. (7.7 cm) quick disconnect

200 GPM PUMP ASSEMBLY

Length	76 in. (193 cm)
Width	43 in (109 cm)
Height (Wheels Down)	46 in. (117 cm)
Fuel	JP4, JP5, JP8, DFA, DF1 or DF2
Weight	1005 lbs. (452.3 kg)
Coupling (Inlet)	3 in. (7.7 cm) quick disconnect
Coupling (Outlet)	2 in. (5 cm) quick disconnect

1-11 EQUIPMENT DATA -cont.

PRESSURE REDUCING SKID ASSEMBLY

Length	57 in. (145 cm)
Width	30 in. (76 cm)
Height	24 in. (61 cm)
Coupling	2 in (5 cm) quick disconnect
Output Pressure	75±5 psi (5.25 ± 0.35 kg/cm^2)

SKID MOUNTED FUELING MANIFOLD

Length	47 in. (120 cm)
Width	24 in. (61 cm)
Height	27 in. (69 cm)
Coupling (3 each)	3 in. (7.7 cm) quick disconnect
Coupling (1 each)	2 in. (5 cm) quick disconnect

500 GALLON COLLASIBLE DRUM

Length	63 in. (160 cm)
Diameter	54 in (131 cm)
Capacity	500 gal. (1895 liters)
Weight (empty)	275 lbs. (124 Kg)
Weight (full)	3675 lbs. (1653 Kg)
Coupling	2 in. (5cm) quick disconnect

SECTION III. PRINCIPLES OF OPERATION

1-12. SYSTEM TECHNICAL PRINCIPLES OF OPERATION.

NOTE

The AFARE system described in this manual is configured for a typical mission. Your specific mission and operating requirements will determine how many of the system components must be connected and in what configuration. The type of fuel nozzle used at the refueling points will be determined by the type of aircraft being refueled.

a. The Arctic Forward Area Refueling Equipment (AFARE) is comprised of three fuel drums, a fueling manifold, a turbine powered fuel pump, filter separator, pressure reducing valve, two types of aircraft refueling nozzles and the necessary hoses and valves required to assemble and distribute fuel through the system. The AFARE has two modes of operation, refuel and defuel. In the refuel mode, fuel is removed from the 500 gallon drums and delivered to the aircraft. In the defuel mode, fuel is removed from the aircraft and pumped to the 500 gallon drums for storage.

b. Fuel required to operate the AFARE is stored in three 500 gallon collapsible drums. The drums may be filled at the site or transported to the site while full. The drums expand as they are filled and collapse as they empty. Each drum is connected to the AFARE system by a hand operated coupler. As the coupler handle is set to open, a poppet valve inside the fuel drum coupling is unseated and fuel is allowed to flow from the drum. For additional information on principles of operation for the 500 gallon drums, refer to TM 10-8110-203-12&P.

c. Fuel flows from the 500 gallon drums, through 3-inch suction hoses, to the skid mounted fueling manifold. Two hand operated gate valves are installed on the manifold to control fuel flow through the manifold In the refuel mode, the manifold directs fuel from the 500 gallon drums to the 200 GPM pump for distribution to the aircraft. In defuel mode, the manifold directs fuel from the aircraft, through the 200 GPM pump, back to the 500 gallon drums.

d. The turbine powered 200 GPM pump supplies fuel under pressure to the skid mounted filter separator. Hot exhaust from the pump is collected and routed to the filter separator through collapsible air ducts. For additional information on principles of operation for the 200 GPM pump, refer to TM 10-4320-342-10.

e. Fuel from the 200 GPM pump is processed by the filter separator to remove solid contaminants and water from the fuel before delivery to the aircraft. A heat shroud, mounted below the filter separator tank, receives hot air from the air ducts and disperses it around the tank to prevent freezing of trapped water. For additional information on principles of operation for the filter separator, refer to TM 10-4330-236-13.

f. Clean fuel from the filter separator is distributed through 2-inch discharge hoses to the Closed Circuit Refueling (CCR) nozzle and Single point refueling nozzle (D1).

g. The CCR nozzle is a hand operated refueling nozzle that controls system fuel pressure to prevent over filling and over-pressuring of the aircraft fuel system. The adapter on the outlet end of the nozzle contains an orifice sized to provide a predetermined fuel flow rate. A gravity fill adapter is used with the CCR nozzle to refuel gravity fed, non-pressurized fuel systems. The adapter is

inserted into the fuel tank neck and filled by moving the adapter control lever. For additional information on principles of operation for the CCR nozzle and gravity fill adapter, refer to TM 10-4930-243-13&P.

1-12. SYSTEM TECHNICAL PRINCIPLES OF OPERATION - cont.

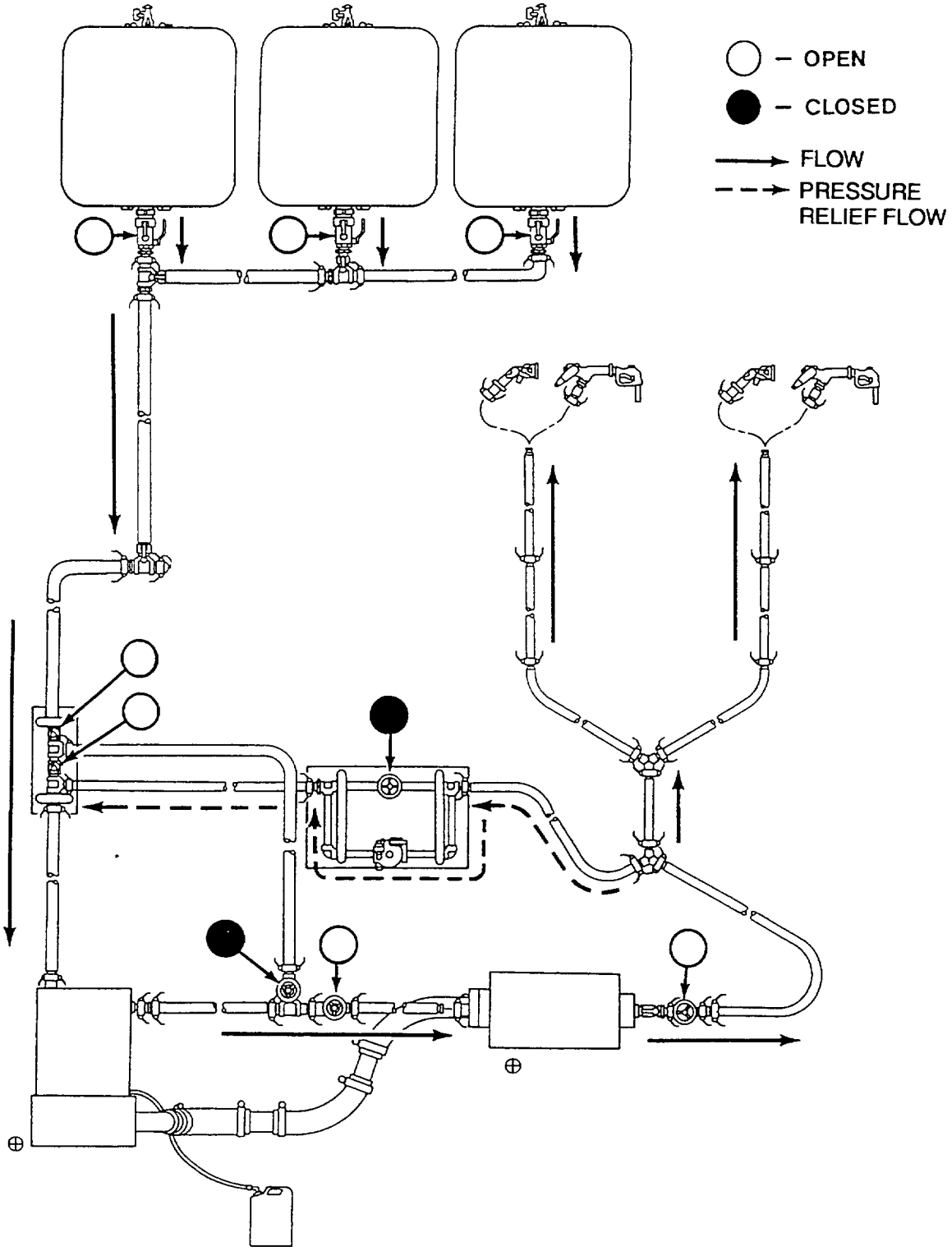


Figure 1-2. AFARE Flow Diagram (Refuel Mode).

1-12. SYSTEM TECHNICAL PRINCIPLES OF OPERATION - cont.

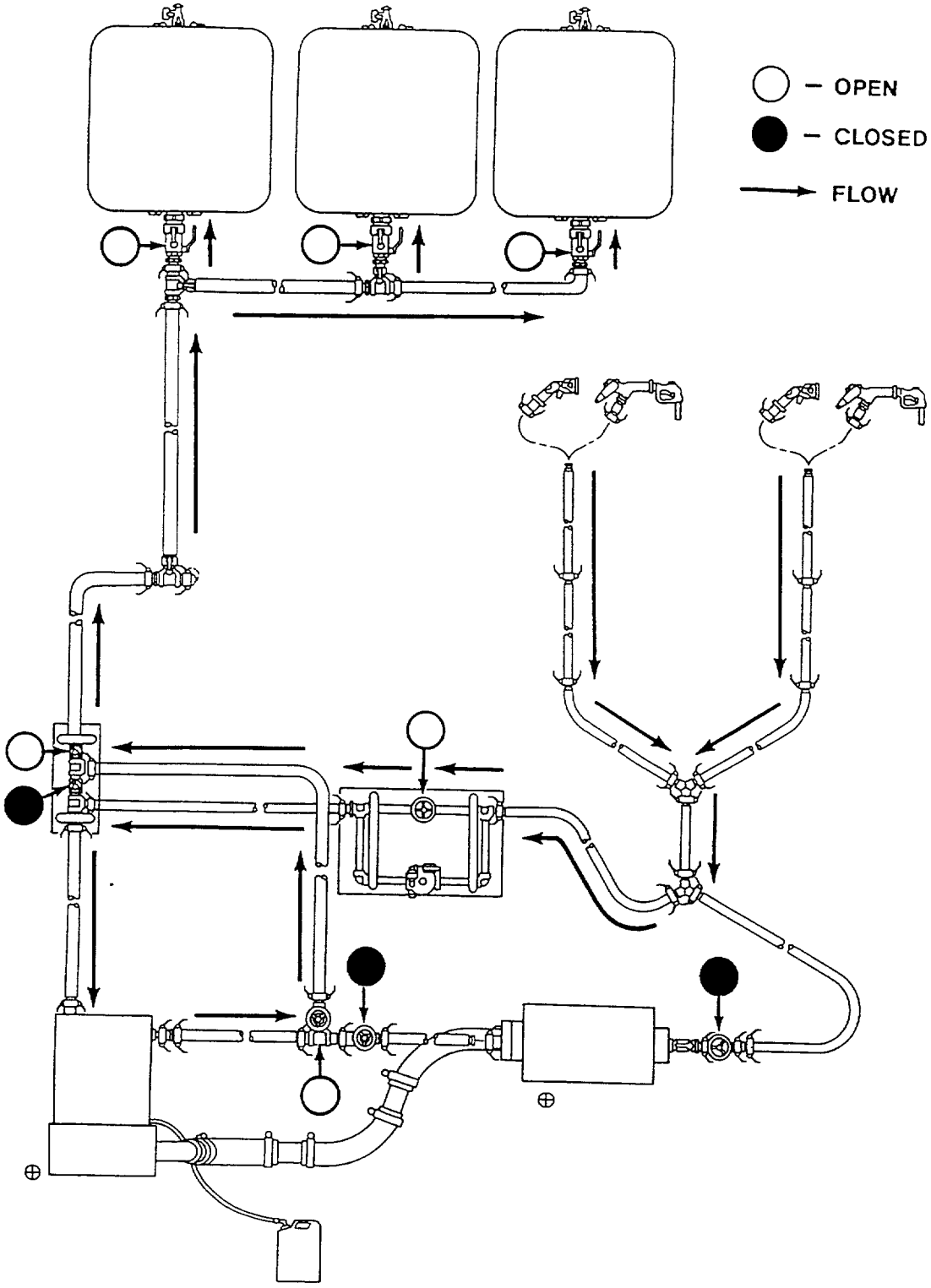


Figure 1-3. AFARE Flow Diagram (Defuel Mode).

CHAPTER 2

OPERATING INSTRUCTIONS

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

This section provides the operator with information needed to locate, identify, and use the controls and indicators on the Arctic Forward Area Refueling Equipment (AFARE). The components and controls identified in this section are applicable to the entire system. Many of the controls are used repeatedly throughout the system.

Refer to the applicable technical manuals for specific operating information on the following equipment:

200 GPM Pump Assembly	TM 10-4320-342-10
Closed Circuit Refueling (CCR) Nozzle and Gravity Fill Adapter	TM 10-4930-243-13&P
Single Point Refueling Nozzle(D-1 Type)	TM 10-4930-242-13&P
500 Gallon Collapsible Drum	TM 10-8110-203-12&P
200 GPM Fuel Filter Separator	TM 10-4330-236-13

2-1. SINGLE POINT RFUELING NOZZLE (D1) CONTROLS.

Refer to figure 2-1.

Locking Handles (1).
Two locking handles on the nozzle body aid positioning and connection of the nozzle to the aircraft refueling adapter. The handles are turned to the right to connect the nozzle; left to disconnect.

Control Lever (2).
The control lever has two positions, OPEN and CLOSE. When the nozzle is connected to the aircraft refueling adapter, rotating the crank handle to OPEN allows fuel flow through the nozzle. When set to CLOSE, fuel flow is stopped. Mechanical locks prevent setting the crank handle to OPEN when the nozzle is not connected or disconnecting the nozzle before the lever is set to CLOSE.

Refer to TM 10-4930-242-13&P for additional information, description and use of the operator's controls and indicators on the D1 Nozzle.

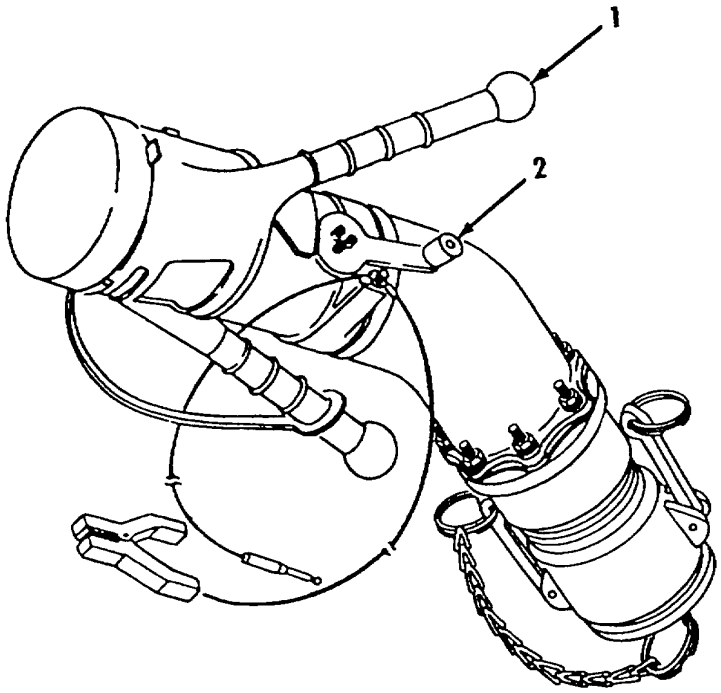


Figure 2-1. Single Point Refueling Nozzle (D1) Controls.

2-2. GRAVITY FILL ADAPTER NOZZLE CONTROLS.

Refer to figure 2-2.

Handle (1)....The handle on the gravity fill adapter nozzle is sized to permit control of the nozzle by an operator wearing arctic mittens. Pushing forward on the handle opens an internal poppet valve and allows fuel flow through the nozzle. Pulling back (releasing) the handle stops fuel flow. The gravity fill adapter nozzle must be used with the Closed Circuit Refueling (CCR) nozzle.

Refer to TM 10-4930-243-13&P for additional information, description and use of the operator's controls and indicators on the gravity fill adapter nozzle. nozzle.

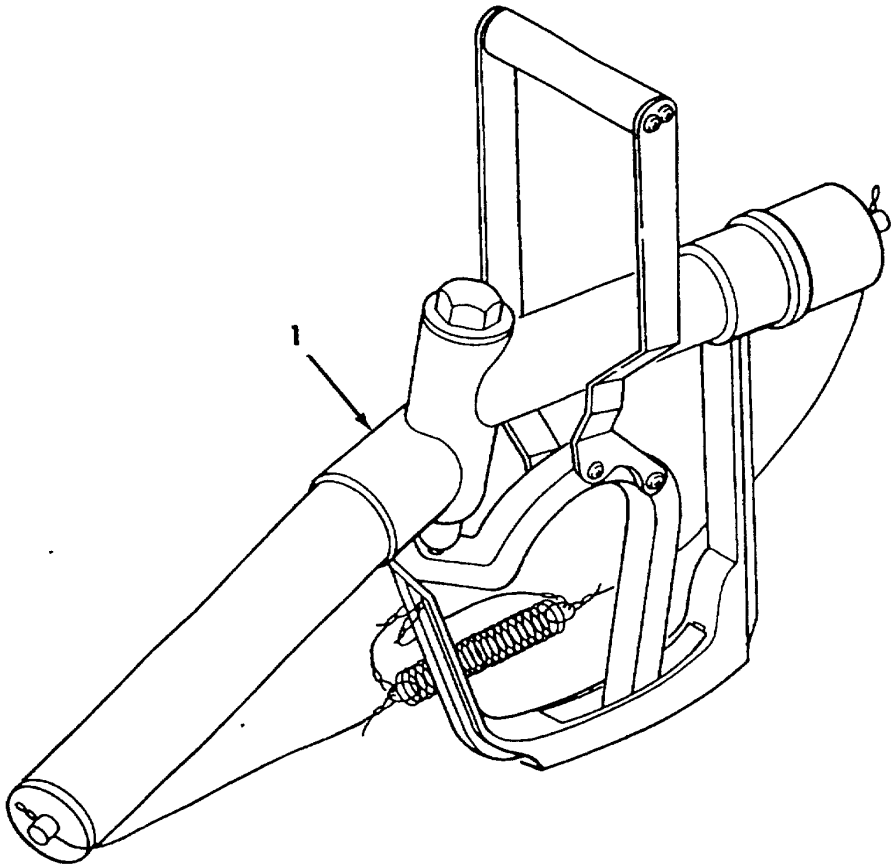


Figure 2-2. Gravity Fill Adapter Nozzle Controls.

2-3. CLOSED CIRCUIT REFUELING (CCR) NOZZLE CONTROLS.

Refer to figure 2-3.

Quick-Disconnect Automatic Shutoff Coupler Collar (1).
Connects nozzle to aircraft refueling adapter. Pull back spring loaded collar to disconnect nozzle. Collar automatically moves forward to lock nozzle in place.

Flow Indicator (2).
Red indicator extends from back of nozzle body when fuel flow through the nozzle has stopped or handle has been moved to CLOSE position.

Handle (3).
Starts and stops fuel flow through the nozzle. The handle is held m the CLOSE position by a spring loaded latch (4) Depress latch and raise handle to OPEN position to allow fuel flow. Pull handle down to CLOSE position to stop fuel flow.

Latch (4).
Holds handle (3) in the CLOSE Position. Depress latch to release handle (3).

Refer to TM 10-4930-243-13&P for additional information, description and use of the operator's controls and indicators on the CCR Nozzle.

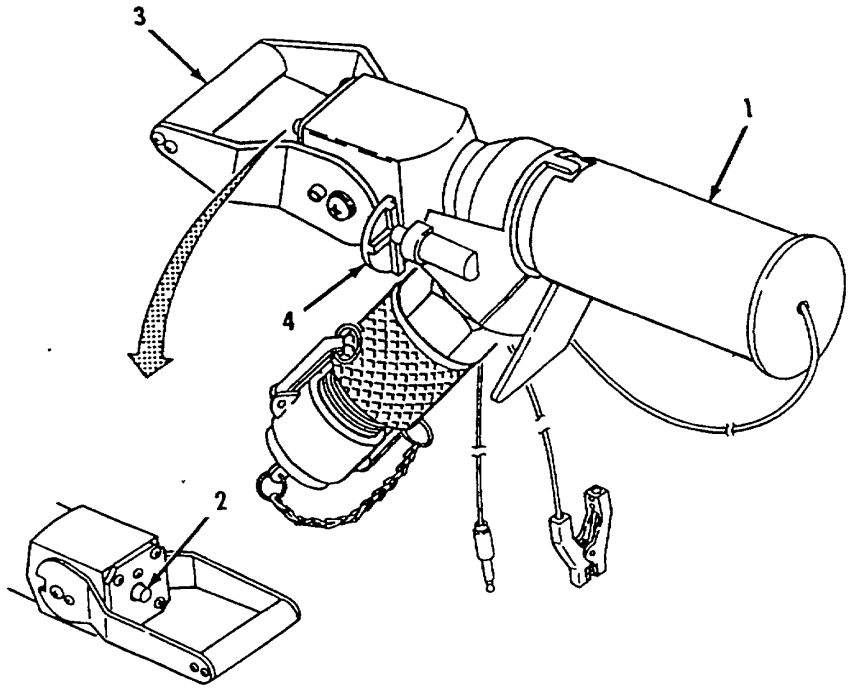


Figure 2-3. CCR Nozzle Controls and Indicators.

2-4. FILTER SEPARATOR CONTROLS AND INDICATORS.

Refer to figure 2-4.

Air Vent Valve (1).
Manually operated valve purges air from tank while filter separator is being filled.

Differential Pressure (DP) Gauge (2).
Indicates pressure differential across filters during operation.

Defrost Door (3).
Defrost door controls heat through defrost shroud. The wider the door is opened, the less heat is applied to the defrost shroud.

Water Detection Kit Adapter Assembly (4).
The adapter is connected to the filter separator outlet coupling. The adapter contains a sampling probe which extends into the fuel flow. A water detector kit may be connected to the probe for fuel sampling.

Water Drain Valve (5).
Manually operated ball valve is used to drain separated water from the tank water sump.

Refer to TM 10-4330-23613 for additional information, description and use of the operator's controls and indicators on the filter separator.

2-4. FILTER SEPARATOR CONTROLS AND INDICATORS-cont.

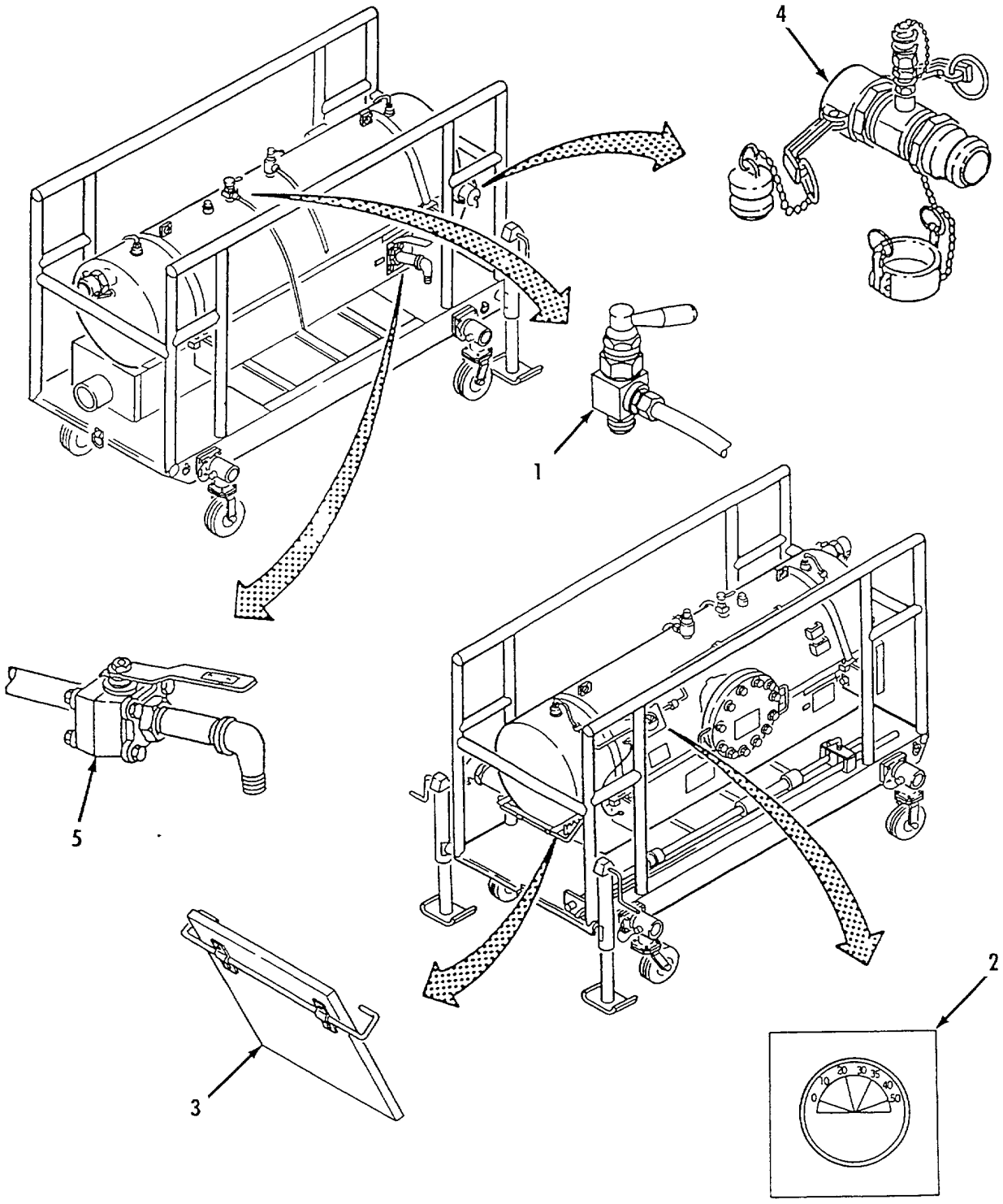


Figure 2-4. Filter Separator Controls and Indicators.

2-5. 200 GPM PUMP ASSEMBLY CONTROLS AND INDICATORS.

Refer to figure 2-5.

MASTER Switch (1).
Applies 24 vdc to electrical system. PULL switch to turn power ON. PUSH switch to turn power OFF.

FUEL HEAT Switch (2).
Fuel heat switch turns fuel heater on and off. Heating of engine fuel is required at temperatures below 10°F.

ENGINE PUMPS Switch (3).
Switch is used to turn gear reducer oil pumps (2 each) and engine fuel pump on and off. Pumps must be on before engine can be started.

START Switch (4).
Switch is used to start and run engine. To start and run engine, switch is set to START/RUN position, then released to RUN for operation. Engine will stop when switch is set to STOP position.

PUMP CLUTCH Switch (5).
Switch is used to engage or disengage clutch in fuel pump. Engine must be running before clutch can be engaged.

Panel Lights Switch (6).
Panel lights illuminate panel to facilitate operation and monitoring of pump.

LIGHTS Switch (7).
Turning switch to the right turns panel lights on and increases brightness of lamps. Turning switch to the left decreases brightness of lamps and turns lights off.

BATTERY Gauge (Ammeter) (8).
Ammeter indicates rate of current at which battery is being charged or discharged.

SUCTION Pressure Gauge (9).
Indicates vacuum/pressure in psi at the fuel pump inlet port.

DISCHARGE Pressure Gauge (10).
Indicates fuel pump outlet pressure in psi.

ENGINE OIL TEMP Light (11).
Engine 011 temperature light Illuminates if engine oil temperature is high. With power on, PRESS TO TEST-light illuminates.

ENGINE Light (12).
Engine light illuminates when engine malfunction occurs. With power on, PRESS TO TEST-light illuminates.

Circuit Breakers (13).
The circuit breakers provide overcurrent protection to the electrical system.

CLUTCH DISENGAGED Light (14).
Light illuminates if the pump clutch is disengaged while the pump clutch switch is engaged.

2-5. 200 GPM PUMP ASSEMBLY CONTROLS AND INDICATORS-cont.

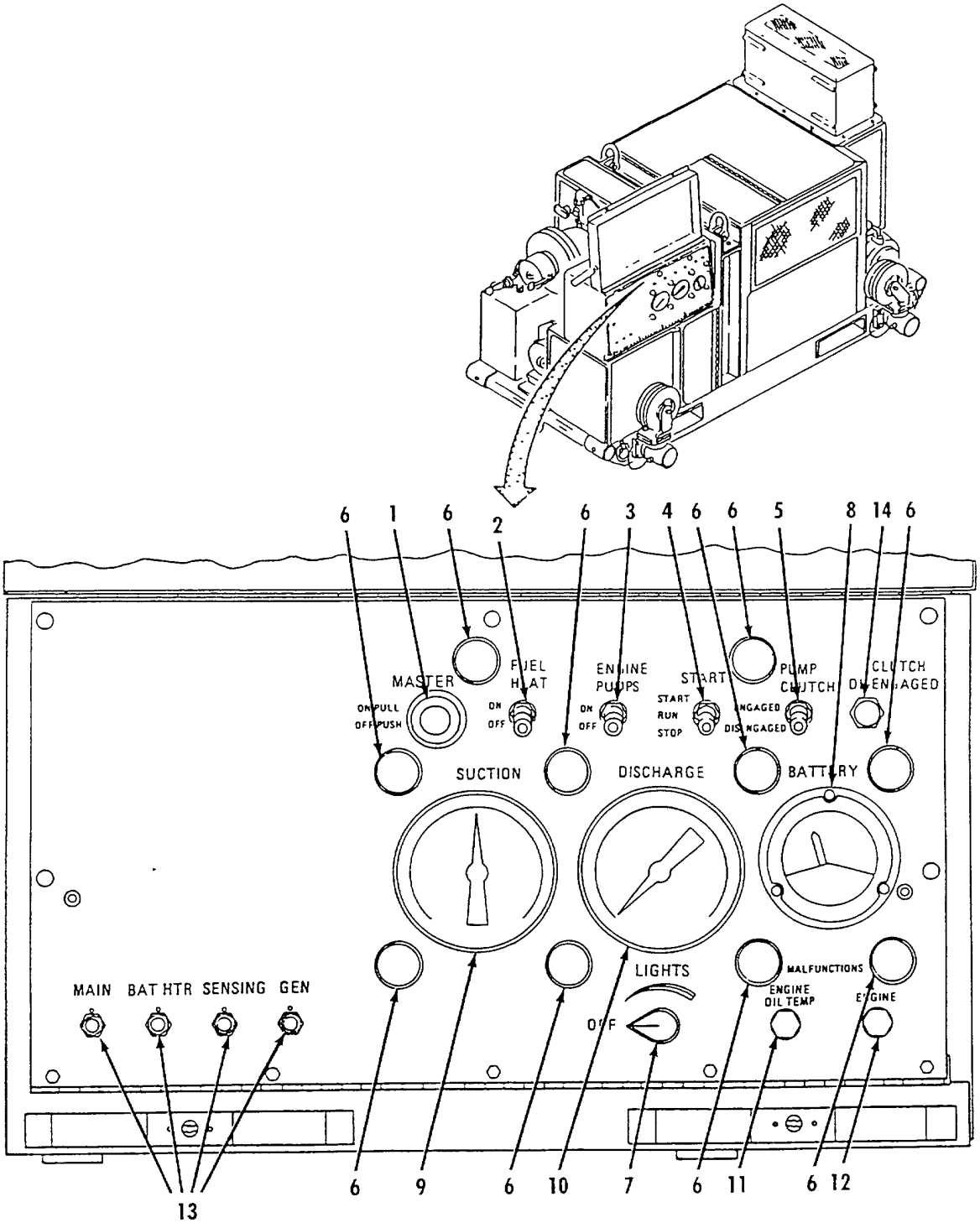


Figure 2-5. 200 Gpm Pump Controls and Indicators (sheet 1 of 2)

2-5. 200 GPM PUMP ASSEMBLY CONTROLS AND INDICATORS-cont.

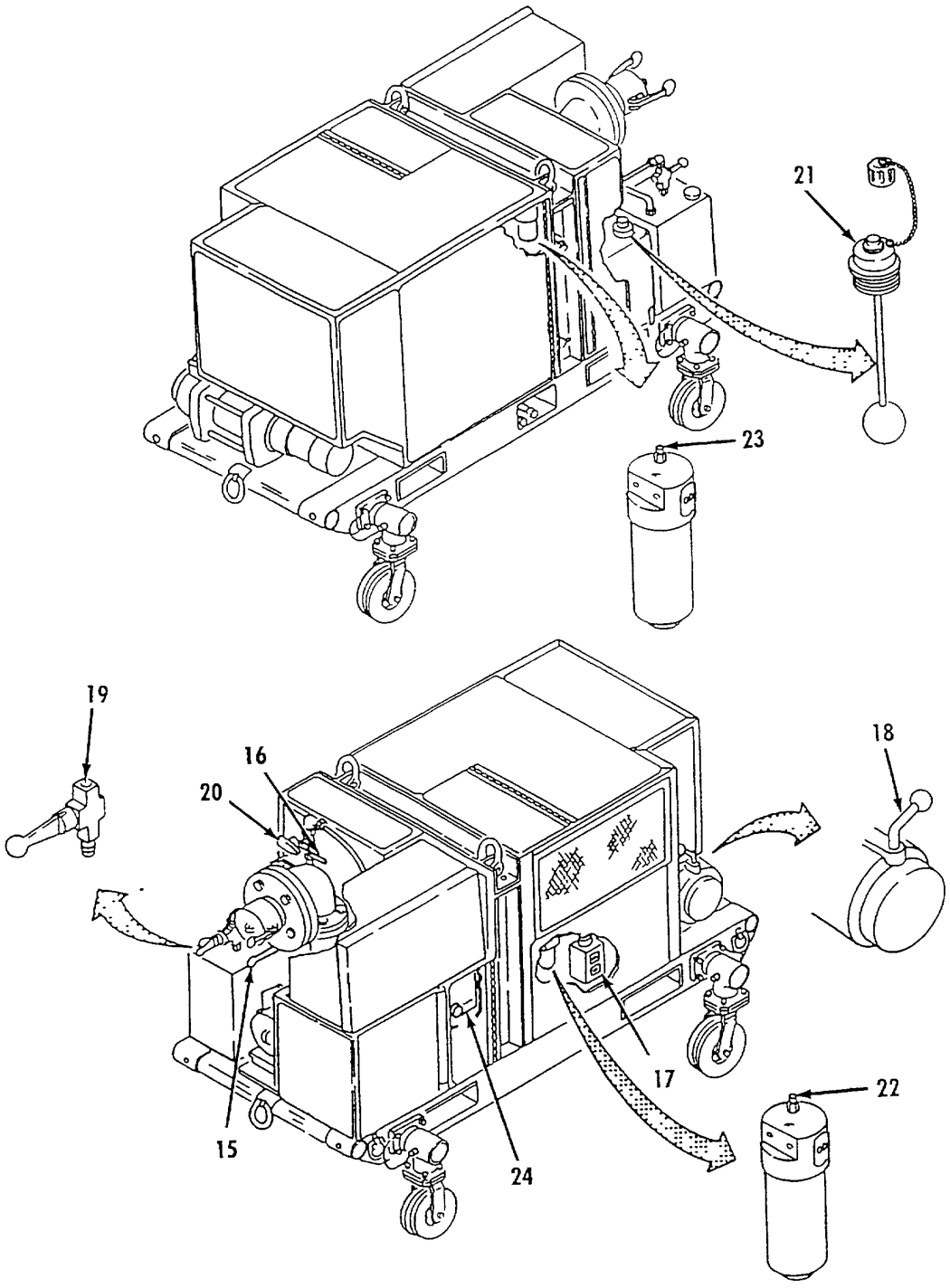


Figure 2-5. 200 Gpm Pump Controls and Indicators (Sheet 2 of 2)

2-5. 200 GPM PUMP ASSEMBLY CONTROLS AND INDICATORS-cont.

Flow Control Valve Handle (15).
Hand operated valve used to control fuel flow and to prevent backflow when pump is shut down. Valve must be open to pump fuel.

PRIMING SHUT OFF VALVE (16).
ON/OFF two-way ball valve used to prime fuel pump. Fuel valve must be open for priming. After priming, valve is shut off manually to prevent backflow of fuel into priming vent drain tank.

Winch Control (17).
Winch box control with two directional control switches used to extend and retract winch cable.

Winch Control Handle (18).
Handle is used to engage or disengage winch mechanically. Winch is disengaged (freewheeling) when handle is in forward position and engaged when handle knob points toward the control panel.

Priming Vent Drain Tank Valve (19).
Valve is used to return fuel, accumulated in tank during priming process, back to the system.

FUEL SELECTOR VALVE (20).
Ball valve for using external fuel or internal fuel (fuel in transfer lines) for engine.

Oil Indicator (21).
Indicates level of oil in speed reducer oil reservoir.

Oil Filter Clogged Indicator (22).
Red indicates when filter elements are dirty. Gold indicates filter is operating properly.

Fuel Filter Clogged Indicator (23).
Red indicates when filter elements are dirty. Gold indicates filter is operating properly.

Electronic Sensing Unit (ESU) (24).
Controls electronics of engine for operating and Built in Test (BIT). There are four indicators that define malfunctions.

Refer to TM 10-4320-342-10 for additional information, description and use of the operator's controls and indicators on the 200 gpm pump assembly.

2-6. VALVE SECTION CONTROLS.

Refer to figure 2-6.

Handwheel (1).
Valve sections are used to control the flow of fuel through the AFARE. A manually operated gate valve mounted in the valve section is opened to allow fuel to flow or closed to stop the flow of fuel.

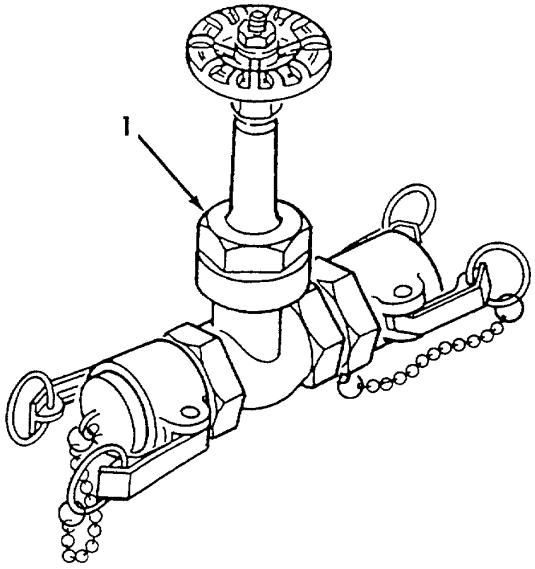


Figure 2-6. Valve Section Controls.

2-7. 3-INCH MANIFOLD CONTROLS.

Refer to figure 2-7.

Handwheel (1).
The 3-inch manifold is used to connect three hoses and control the flow of fuel through the AFARE. A manually operated gate valve, mounted on the manifold, is opened to allow fuel to flow freely through the manifold, or closed to stop the flow of fuel through one leg.

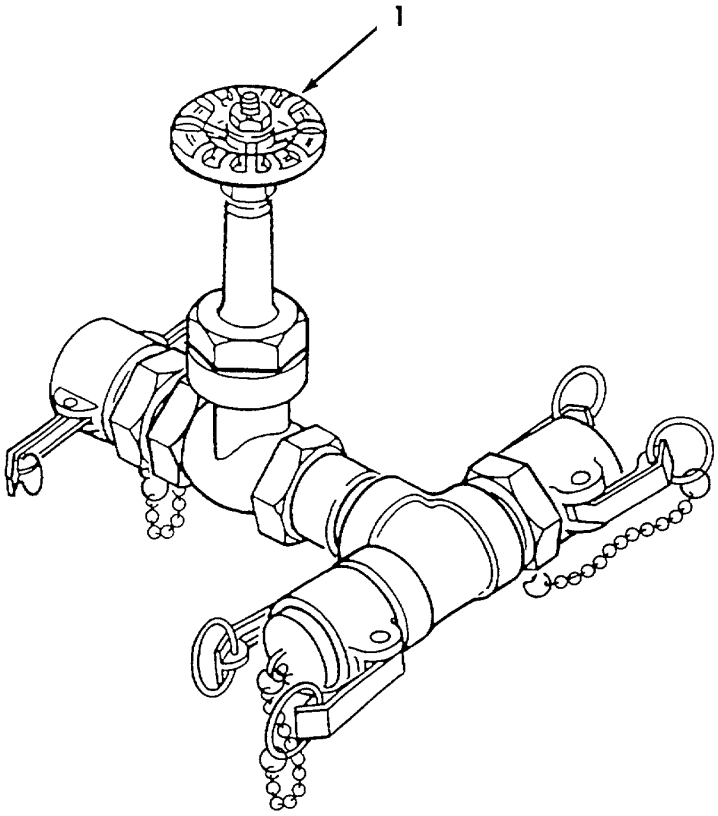


Figure 2-7. 3-Inch Manifold Controls.

2-8. FUELING MANIFOLD CONTROLS.

Refer to figure 2-8.

Handwheels (1 and 2).
The fueling manifold is used to direct fuel between the 500 gallon drums and the 200 gpm pump during refueling, defueling and recirculation. Within the manifold, two manually operated gate valves are opened or closed to control fuel flow between the desired hose(s).

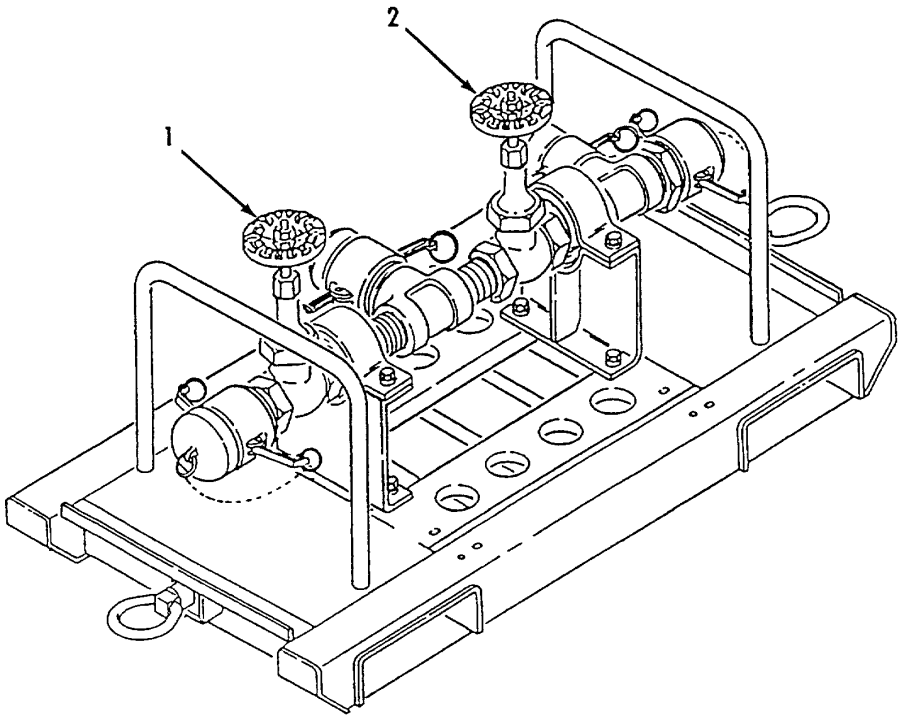


Figure 2-8. Fueling Manifold Controls.

2-9. PRESSURE REDUCING SKID CONTROLS.

Refer to figure 2-9.

Handwheel (1).
During refueling operations, the pressure reducing skid is used to control maximum system operating pressure to 75 ± 5 psi. The manually operated gate valve is closed during refueling and open when defueling.

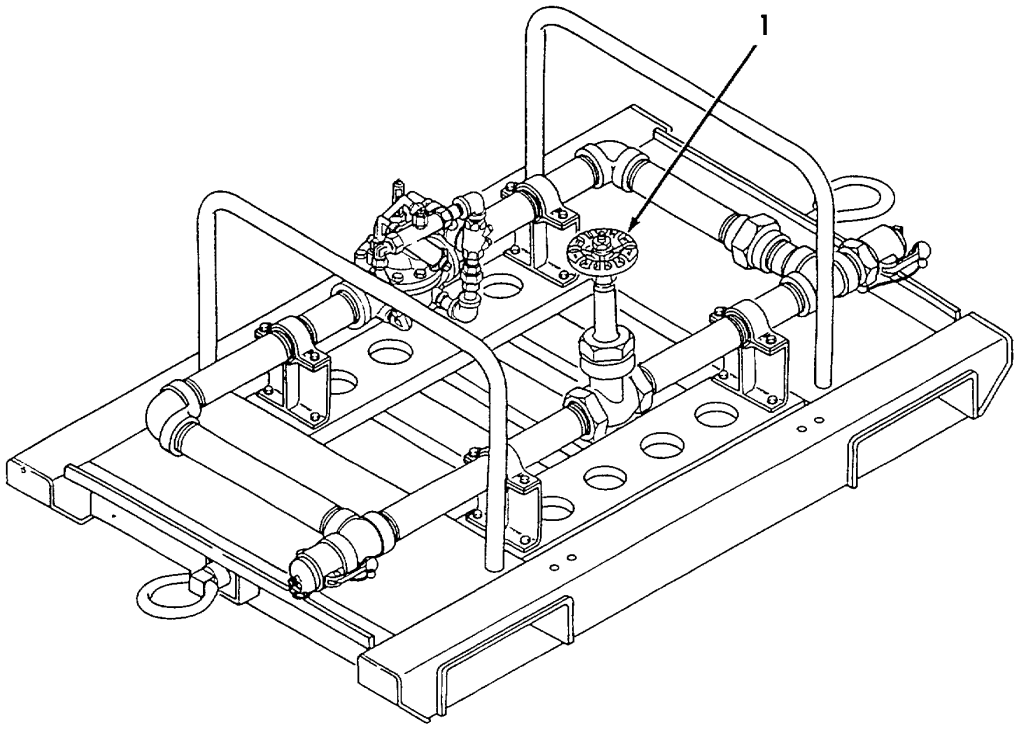


Figure 2-9. Pressure Reducing Skid Controls.

2-10. COUPLER CONTROLS.

Refer to figure 2-10.

Lever Handle (1).
The couplers are used to control the flow of fuel from the 500 gallon drums. Turning the lever handle to the open position causes a poppet inside the coupler to extend and unseat the drum coupling check valve, allowing fuel to flow from the drum. Turning the lever handle to the closed position allows the drum coupling check valve to seat, stopping fuel flow from the drum.

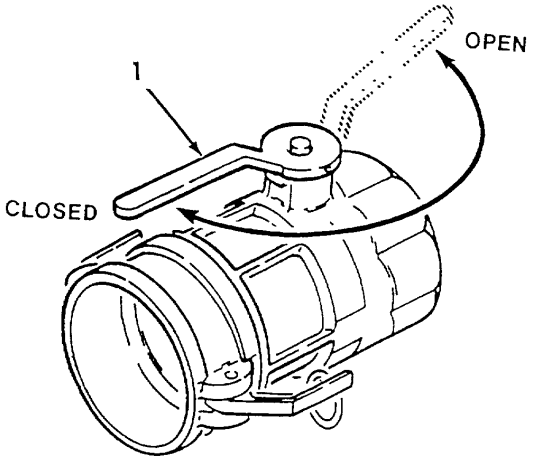


Figure 2-10. Coupler Controls.

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

2-11. GENERAL.

Preventive Maintenance Checks and Services (PMCS) means systematic inspecting and servicing of equipment to keep it in good condition and to prevent breakdowns. As the operator of the Arctic Forward Area Refueling Equipment (AFARE), your mission is to:

a. Be sure to perform your PMCS each time you operate the AFARE. Always do your PMCS In the same order, so it gets to be a habit Once you've had some practice, you'll quickly spot anything wrong.

b. Do your BEFORE (B) PMCS Just before you operate the equipment. Pay attention to WARNINGs, CAUTIONs and NOTEs.

c. Do your DURING (D) PMCS while you operate the equipment. During operation means to monitor the equipment and its related components while it is actually being operated. Pay attention to WARNINGs, CAUTIONs and NOTEs.

d. Do your AFTER (A) PMCS right after final operation has been completed. Pay attention to WARNINGs, CAUTIONs and NOTEs.

e. Use DA Form 2404 (Equipment Inspection and Maintenance Worksheet) to record any faults that you discover before, during, or after operation that cannot be repaired by the operator.

f. Be prepared to assist unit maintenance when required

g. When a check and service procedure is required for both WEEKLY and BEFORE intervals, it is not necessary to do the procedure twice if the equipment is operated during the weekly period

2-12. PMCS PROCEDURES.

a. Your Preventive Maintenance Checks and Services, Table 2-1, lists inspections and care required to keep your equipment in good operating condition. It is setup so you can make BEFORE (B) OPERATION checks as you walk around the equipment.

b. The "INTERVAL" column of Table 2-1 tells you when to do a certain check or service.

c. The "LOCATION, ITEM TO CHECK/SERVICE" column of Table 2-1 tells you the name of the item to be checked or serviced and where the item is located.

d. The "PROCEDURE" column of Table 2-1 tells you how to do required checks and services. Carefully follow these instructions If you cannot perform the procedure, notify your supervisor.

2-12. PMCS PROCEDURES-cont.

e. The "NOT FULLY MISSION CAPABLE IF " column in Table 2-1 tells you when your equipment is not mission capable and why the system cannot be used.

f. If the equipment does not perform as required, refer to Chapter 3, Section II, Troubleshooting.

g. If anything looks wrong and you can't fix it, write it on your DA Form 2404 IMMEDIATELY, report it to your supervisor.

h. The following are checks that are common to the entire fuel system:

(1) Keep the equipment clean. Remove dirt, sand and debris from quick disconnect couplings, hose ends, gate valves and distribution nozzles to prevent excessive wear and contamination of the fuel system. Use cleaning solvent to remove dirt.

(2) Bolts, nuts and screws. Check them for obvious looseness, missing, bent or broken condition on gate valves. If you find a bolt, nut or screw you think Is loose, report it to your supervisor.

(3) Hoses. Look for wear, damage and leaks. Make sure clamps and quick disconnect couplings are tight. Wet spots show leaks, but a stain around a fitting or connector can also mean a leak. If a leak comes from a loose fitting or coupling, tighten. It If something is broken or worn out, report it to your supervisor.

i. When you check for "operating condition", look at the component to see if It's serviceable.

2-13. LEAKAGE CRITERIA

WARNING

- To prevent injury to personnel and damage to equipment, be certain all system components are securely connected before operation to avoid fuel spills.
- Fuel vapors are extremely flammable. Do not allow smoking within 100 feet of the AFARE. Be certain a suitable and properly charged fire extinguisher is available at all times.

No fuel leaks are permissible when operating the AFARE Stop operation. Immediately report all leaks to your supervisor.

2-14. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

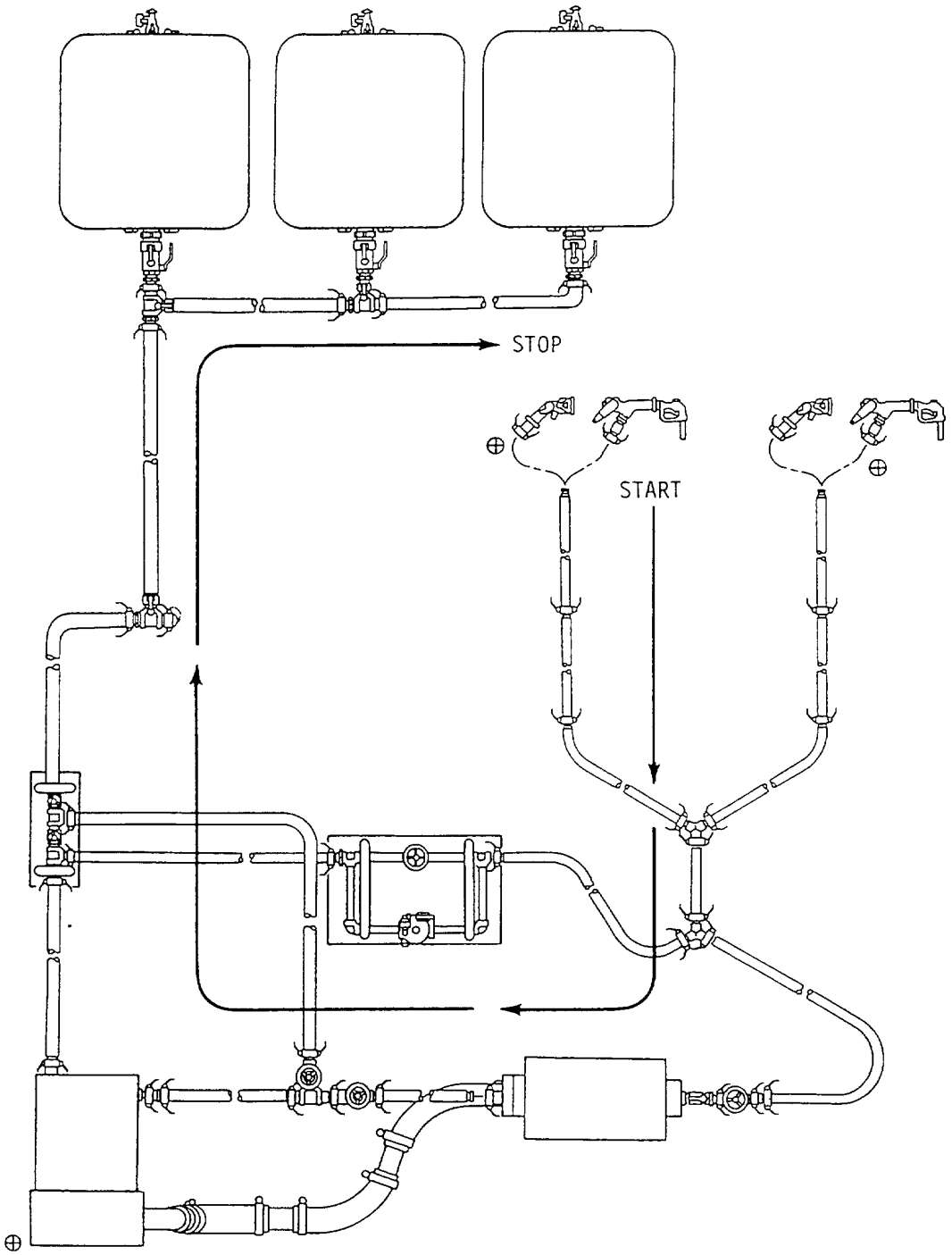


Figure 2-6. PMCS Routing Diagram.

2-14. OPERATOR PREVENTIVE MAI NTENANCE CHECKS AND SERVICES-cont.

NOTE

If the equipment must be kept in continuous operation, do only the procedures that can be done without disturbing operation. Make complete checks and services when the equipment is shut down.

Table 2-1. Operator Preventive Maintenance Checks and Services for Model AFARE100.

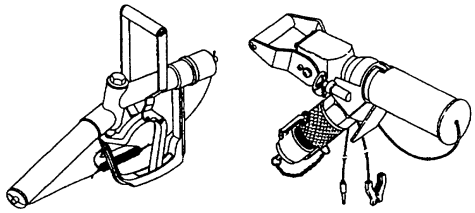
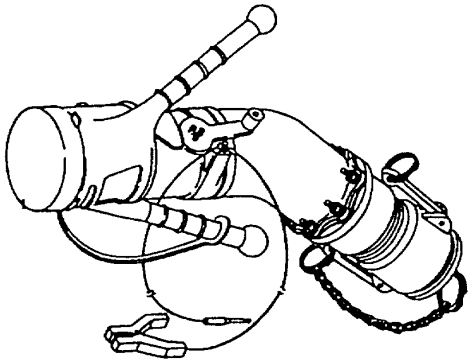
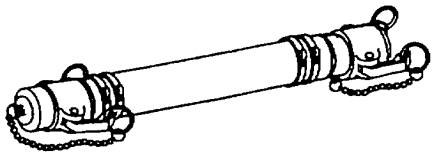
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
1	Before	AFARE CCR Nozzle and Gravity Fill Adapter	Perform "BEFORE" PMCS in accordance with TM10-4930-243-13&P. 	
2	Before	Single Point Refueling Nozzle (D1)	Perform "BEFORE" PMCS in accordance with TM 10-4930-242-13&P. 	

Table 2-1. Operator Preventive Maintenance Checks and Services for Model AFARE100 - cont.

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
3	Before	Discharge Hose, 2 in x 50 ft.	a. Inspect for cuts, tears and deep abrasions in hose material. b. Check for and straighten kinked hoses. c. Inspect quick disconnect couplings for cracks, broken lock arms and damaged or musing gaskets. d. Inspect for damaged or missing dust caps and plugs 	Hoses cut or torn. Coupling cracked; lock arms damaged, gaskets damaged or missing.
4	Before	Wyes/Reducers	a. Inspect body for cracks and Corrosion. c. Inspect quick disconnect couplings for cracks, broken lock arms and damaged or missing gaskets. c. Inspect for damaged or missing dust caps and plugs.	Body cracked. Coupling cracked; lock arms damaged; gaskets damaged or missing.

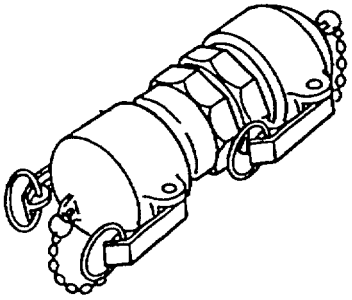
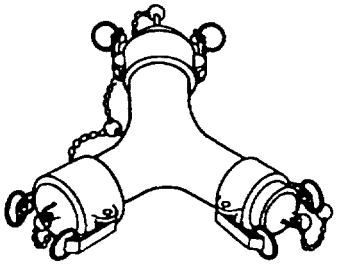
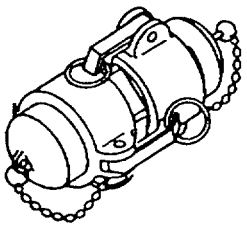




Table 2-1. Operator Preventive Maintenance Checks and Services for Model AFARE100 - cont.

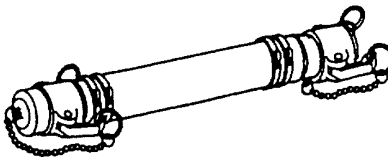
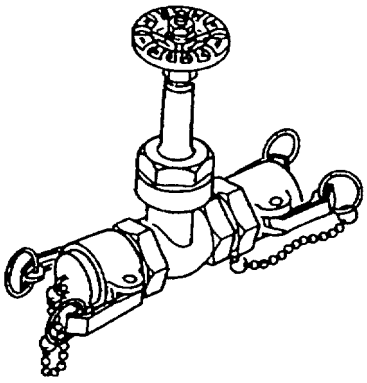
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
5	Before	Discharge Hose, 2 in x 10 ft.	a. Inspect hose for cuts, tears and deep abrasions in hose material. b. Check for and straighten kinked or twisted hose. c. Inspect quick disconnect couplings for cracks, broken lock arms and damaged or missing gaskets. d. Inspect for damaged or missing dust caps and plugs 	Hose cut or torn. Coupling cracked; lock arms damaged; gaskets damaged or missing.
6	Before	Valve Section	a. Inspect valve body for cracks. b. Inspect for missing, loose or damaged handwheel. c. Check operation of valve. Valve should turn freely without sticking or binding. d. Inspect quick disconnect couplings for cracks, broken lock arms and damaged or missing gaskets. e. Inspect for damaged or missing dust caps and plugs. 	Valve body cracked. Handwheel missing. Valve sticks or binds. Coupling cracked; lock arms damaged; gaskets damaged or missing.

Table 2-1. Operator Preventive Maintenance Checks and Services for Model AFARE100 - cont.

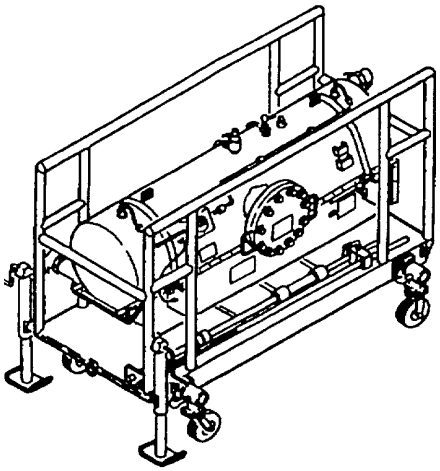
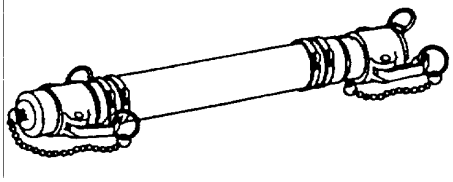
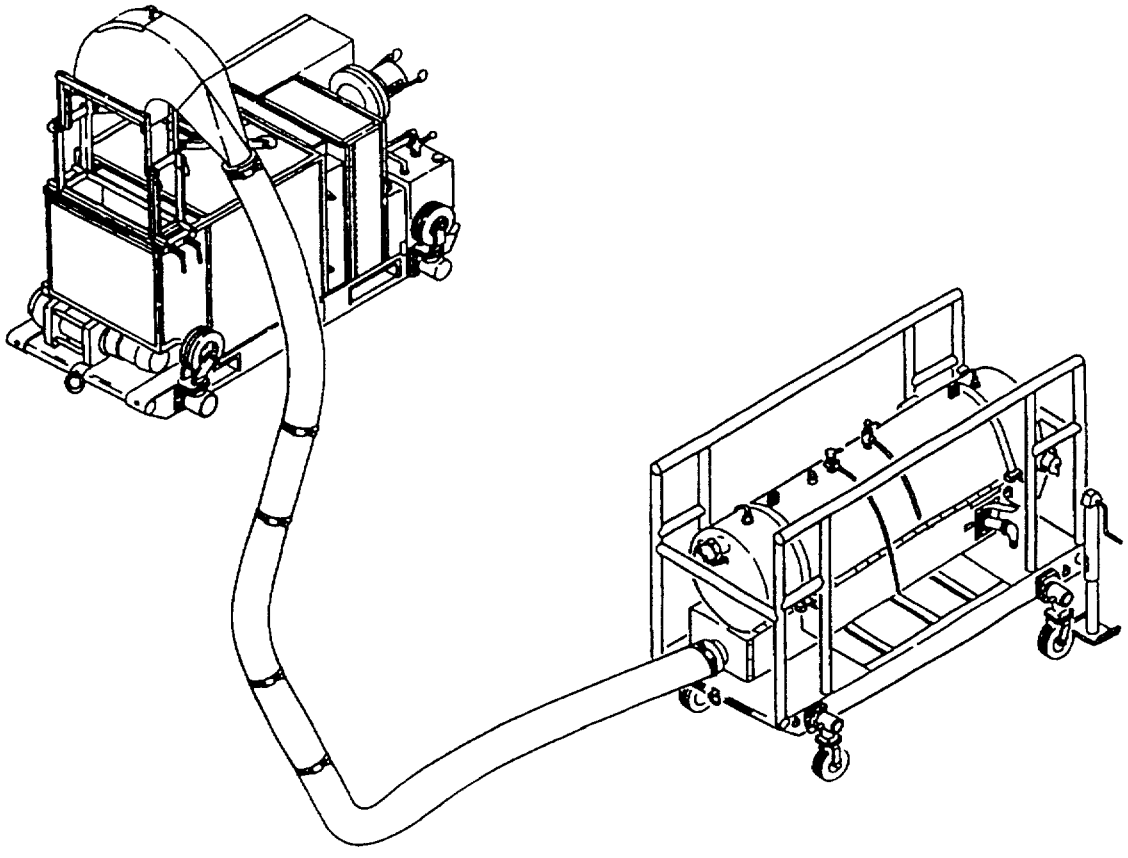
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
7	Before	Filter Separator	Perform "BEFORE" PMCS in accordance with TM 10-4330-23613. 	
8	Before	Discharge Hoses, 3inx 10ft.	a. Inspect for cuts, tears and deep abrasions in hose material. b. Check for and straighten kinked hoses. c. Inspect quick disconnect couplings for cracks, broken lock arms and damaged or missing gaskets. d. Inspect for damaged or missing dust caps and plugs 	Hoses cut or torn. Coupling cracked; lock arms damaged; gaskets damaged or missing.

Table 2-1. Operator Preventive Maintenance Checks and Services for Model AFARE100 - cont.

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
9	Before	Air Ducts	Inspect ducts for tears and damaged or missing clamps	Ducts torn, clamps damaged or missing.
10	Before	Deflector Assembly	a. Inspect deflector for secure connection to 200 gpm pump.	Deflector loose
			b. Inspect for loose, damaged or missing attaching hardware.	Hardware damaged or missing.
			c. Inspect deflector for bent, cracked or damaged frame	Deflector not serviceable.



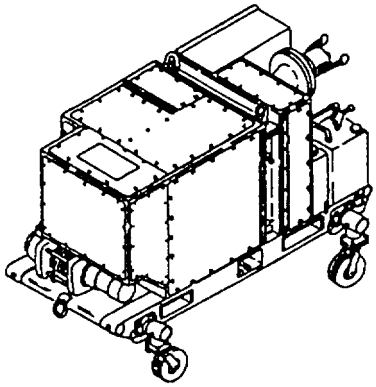
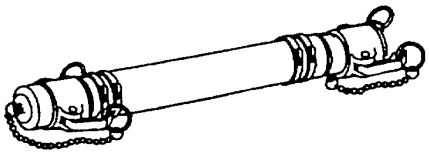
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
11	Before	200 Gpm Pump	Perform "BEFORE" PMCS in accordance with TM 10-4320-342-10. a. Inspect pump to ensure it is properly grounded. b. Inspect external fuel hose for damaged threads, cuts, tears or damage. c. Check external fuel source for fuel. 	Pump not properly grounded Fuel line cut, torn or damaged.
12	Before	Suction Hose, 3 in x 10 ft.	a. Inspect for cuts, tears, deep abrasions and collapsed hose material. b. Check for and straighten kinked hoses. c. Inspect quick disconnect couplings for cracks, broken lock arms and damaged or massing gaskets. d. Inspect for damaged or missing dust caps and plugs. 	Hoses cut, torn or collapsed. Coupling cracked, lock arms damaged; gaskets damaged or missing

Table 2-1. Operator Preventive Maintenance Checks and Services for Model AFARE100 - cont.

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
13	Before	Fueling Manifold Assembly	a. Inspect components for cracks, damage, broken welds and corrosion.	Components corroded, cracked or damaged.
			b. Inspect for missing, loose or damaged handwheels.	Handwheels missing.
			c. Check operation of valves. Valves should turn freely without sticking or binding.	Valve sticks or binds.
			d. Inspect quick disconnect couplings for cracks, broken lock arms and damaged or missing gaskets.	Coupling cracked; lock arms damaged, gaskets damaged or missing
			e. Inspect for damaged or missing dust caps and plugs	
			f. Inspect for loose, damaged or missing mounting hardware	Hardware missing or damaged.

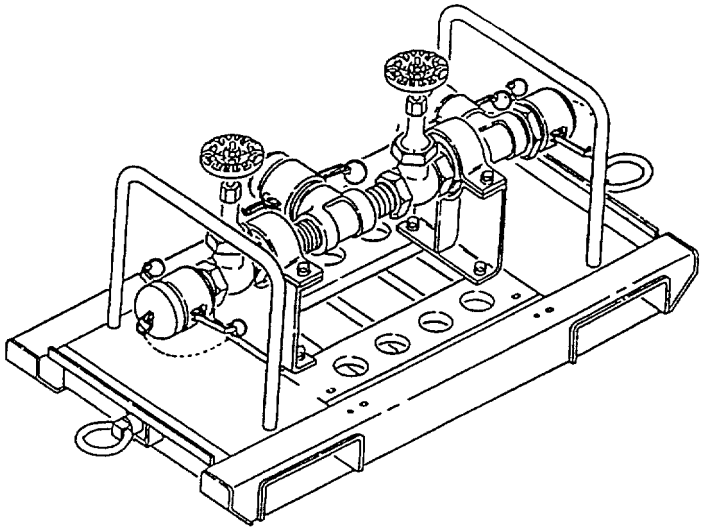


Table 2-1. Operator Preventive Maintenance Checks and Services for Model AFARE100 - cont.

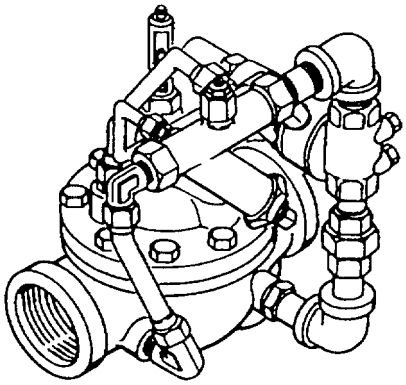
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
14	Before	Pressure Reducing Manifold	a. Inspect components for cracks, damage, broken welds and corrosion.	Components corroded, cracked or damaged.
			b. Inspect for missing, loose or damaged handwheels.	Handwheels missing.
			c. Check operation of valves. Valves should turn freely without sticking or binding.	Valve sticks or binds.
			d. Inspect quick disconnect couplings for cracks, broken lock arms and damaged or missing gaskets.	Coupling cracked; lock arms damaged; gaskets damaged or missing.
			e. Inspect for damaged or missing dust caps and plugs.	
			f. Inspect for loose, damaged or missing mounting hardware.	Hardware missing or damaged
			g. View pressure reducing valve sight glass from side. Check that valve stem is not visible.	Valve stem visible.
				

Table 2-1. Operator Preventive Maintenance Checks and Services for Model AFARE100 - cont.

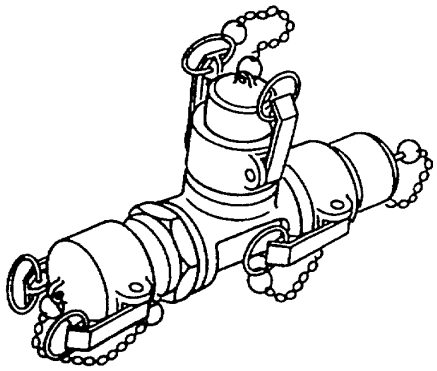
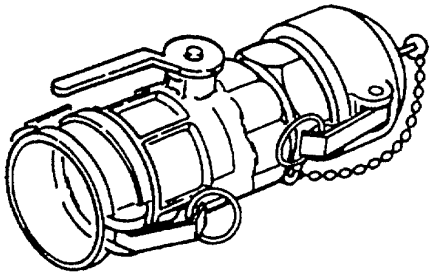
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
15	Before	Tees	a. Inspect tee body for cracks and corrosion. b. Inspect quick disconnect couplings for cracks, broken lock arms and damaged or miring gaskets. c. Inspect for damaged or missing dust caps and plugs 	Tee body cracked. Coupling cracked; lock arms damaged; gaskets damaged or missing
16	Before	Couplers	a. Inspect coupler body for cracks, damage and corrosion. b. Inspect for damaged or missing lever handle. c. Inspect quick disconnect couplings for cracks, broken lock arms and damaged or missing gaskets. d. Inspect for damaged or missing dust caps and plugs. 	Coupler body cracked or damaged. Lever handle damaged or missing. Coupling cracked; lock arms damaged; gaskets damaged or missing.

Table 2-1. Operator Preventive Maintenance Checks and Services for Model AFARE100 - cont.

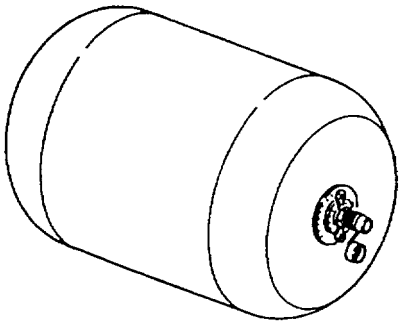
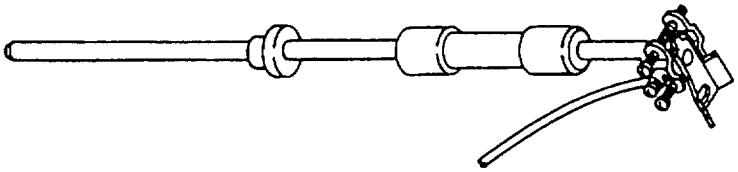
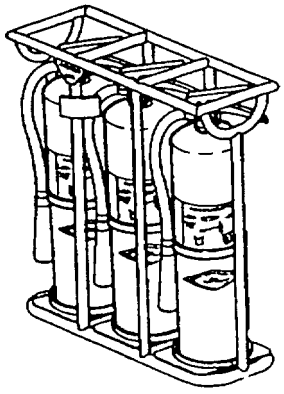
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
17	Before	500 Gallon Collapsible	Perform "BEFORE" PMCS in accordance with TM 108110-203-12&E 	
18	Before	Grounding Rods	a. Inspect grounding rods for severe bends, cracks and corrosion b. Verify that grounding clamp is securely connected. Reconnect if required. 	Grounding rod missing or broken.
19	Before	Fire Extinguishers	Check that extinguishers are fully charged. Inspect for damage. 	Fire extinguishers discharged or damaged.

Table 2-1. Operator Preventive Maintenance Checks and Services for Model AFARE100 - cont.

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
20	During	CCR Nozzle and Gravity Fill Adapter	Perform "DURING" PMCS in accordance with TM 10-4930-243-13&PE!	
21	During	Single Point Refueling Nozzle (D1)	Perform "DURING" PMCS in accordance with TM 104930-242-13&P	
22	During	Discharge Hoses	Inspect hose material and quick disconnect couplings for leaks	Any fuel leak
23	During	Wyes/Reducers	Inspect body and quick disconnect couplings for leaks.	Any fuel leak.
24	During	Valve Section	Inspect valve and quick disconnect couplings for leaks.	Any fuel leak.
25	During	Filter Separator	Perform "DURING" PMCS in accordance with TM 10-4330-23613.	
26	During	Air Duct	Check that air ducts are securely connected between deflector assembly and filter separator.	Air duct not connected.
27	During	Deflector Assembly	Check that deflector is securely mounted to 200 gpm pump.	Deflector loose.
28	During	200 Gpm Pump	Perform "DURING" PMCS in accordance with TM 10-4320-342-10.	
29	During	Suction Hoses	Inspect for leaking or collapsed hose. Inspect quick disconnect couplings for leaks	Hose collapsed; any fuel leak.
30	During	Fueling Manifold Assembly	Inspect manifold piping, gate valves and quick disconnect couplings for leaks.	Any fuel leak.
31	During	Pressure Reducing Assembly	Inspect pressure reducer, piping, gate valve and quick disconnect couplings for leaks.	Any fuel leak
32	During	Tees	Inspect tee body and quick disconnect couplings for leaks.	Any fuel leak
33	During	Couplers	Inspect coupler body and quick disconnect coupling for leaks.	Any fuel leak

Table 2-1. Operator Preventive Maintenance Checks and Services for Model AFARE100 - cont.

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
34	During	500 Gallon Collapsible Drums	Perform "DURING" PMCS in accordance with TM 10-110-203-12&P	
35	During	Grounding Rods	Check connection of grounding clamps. Clamps must be securely fastened.	Grounding clamp (s) disconnected.
36	During	Fire Extinguishers	Check for full charge. Inspect for damage.	Fire extinguishers discharged or damaged.
37	After	OCR Nozzle and Gravity Fill Adapter	Perform "AFTER" PMCS in accordance with TM 10-4930-243-13&P	
38	After	Single Point Refueling Nozzle	Perform "AFTER" PMCS in accordance with TM 10-4930-242-13&P (D1)	
39	After	Discharge Hoses	a. Inspect for cuts, tears and deep abrasions in hose material.	Hose cut or torn
			b. Inspect quick disconnect couplings for damaged or missing gaskets.	Gaskets damaged or missing.
			c. Inspect for missing dust caps or plugs.	
			d. Inspect for fuel leaks.	Any fuel leak
40	After	Wyes/Reducers	a. Inspect body for cracks and corrosion.	Body cracked
			b. Inspect quick disconnect couplings for damaged or missing gaskets.	Gaskets damaged or missing.
			c. Inspect for missing dust caps or plugs.	
			d. Inspect for fuel leaks.	Any fuel leak.
41	After	Valve Sections	a. Inspect valve body for cracks	Valve body cracked.
			b. Inspect for missing, loose or damaged handwheel.	Handwheel missing.
			c. Check operation of valve. Valve should turn freely without sticking or binding	Valve sticks or binds

Table 2-1. Operator Preventive Maintenance Checks and Services for Model AFARE100 - cont.

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
41 - cont			d. Inspect quick disconnect couplings for cracks, broken lock arms and damaged or missing gaskets.	Coupling cracked; lock arms damaged; gaskets damaged or missing.
			e. Inspect for damaged or nmssing dust caps and plugs.	
			f. Inspect for fuel leaks.	Any fuel leak.
42	After	Filter Separator	Perform "AFTER" PMCS in accordance with TM 10-4330-23613.	
43	After	200 Gpm Pump	Perform "AFTER" PMCS in accordance with TM 10-4320-342-10.	
44	After	Suction Hoses	a. Inspect hose for crushed or collapsed hose material.	Hose collapsed or crushed.
			b. Inspect quick disconnect couplings for damaged or missing gaskets.	Gaskets damaged or missing.
			c. Inspect for missing dust caps or plugs.	
			d. Inspect for fuel leaks	Any fuel leak.
45	After	Fueling Manifold Assembly	a. Inspect piping components for cracks, damage, broken welds and corrosion.	Components corroded, cracked or damaged.
			b. Inspect for missing, loose or damaged handwheels.	Handwheels missing.
			c. Check operation of valves. Valves should turn freely without sticking or binding.	Valve sticks or binds
			d. Inspect quick disconnect couplings for cracks, broken lock arms and damaged or missing gaskets.	Coupling cracked; lock arms damaged; gaskets damaged or missing.
			e. Inspect for damaged or missing dust caps and plugs.	
			f. Inspect for loose, damaged or missing mounting hardware.	Hardware missing or damaged.
			g. Inspect for fuel leaks.	Any fuel leak

Table 2-1. Operator Preventive Maintenance Checks and Services for Model AFARE100 - cont.

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
46	After	Pressure Reducing Assembly	a. Inspect piping components for cracks, damage, broken welds and corrosion.	Components corroded, cracked or damaged.
			b. Inspect for missing, loose or damaged handwheels.	Handwheels missing.
			c. Check operation of valves. Valves should turn freely without sticking or binding.	Valve sticks or binds.
			d. Inspect quick disconnect couplings for cracks, broken lock arms and damaged or missing gaskets.	Coupling cracked; lock arms damaged; gaskets damaged or missing.
			e. Inspect for damaged or missing dust caps and plugs.	
			f. Inspect for loose, damaged or missing mounting hardware.	Hardware missing or damaged.
			g. View pressure reducing valve sight glass from side. Check that valve stem is not visible.	Valve stem visible.
			h. Inspect for fuel leaks.	Any fuel leak.
47	After	Tees	a. Inspect tee body for cracks and corrosion.	Tee body damaged.
			b. Inspect quick disconnect couplings for damaged or missing gaskets.	Gaskets damaged or missing.
			c. Inspect for missing dust caps or plugs.	
			d. Inspect for fuel leaks.	Any fuel leak.
48	After	Couplers	a. Inspect coupler for loose hardware, corrosion and bent lever handle.	Coupler body damaged; Lever handle bent.
			b. Inspect quick disconnect couplings for damaged or missing gaskets.	Gaskets damaged or missing.
			c. Inspect for missing dust caps or plugs	
49	After	500 Gallon Collapsible Drums	Perform "AFTER" PMCS in accordance with TM 10-8110-203-12&P	
50	After	Fire Extinguishers	Inspect extinguishers for damage. Check that all extinguishers are fully charged	Extinguisher(s) damaged or discharged.

Section III OPERATION UNDER USUAL CONDITIONS

12-15. ASSEMBLY AND PREPARATION FOR USE.

NOTE

Two persons are required to assemble the AFARE safely.

a Site Selection. Select a firm, level installation area large enough to contain all system components. Melting and refreezing soil, ice and blowing snow present special hazards that must be anticipated before setting up the equipment. The site must provide access to the fuel system for resupply by trucks and aircraft and provide adequate clearance for approaching aircraft at the refueling points.

For additional information on selecting a site for the AFARE, refer to FM 10-69.

After selecting the installation area, position all AFARE equipment near the site.

b Unpacking.

(1) Remove AFARE components from the transport vehicle.

(2) To aid assembly, separate components into groups of similar parts during removal. For example, group all the fuel hoses together, then all the tees, elbows and nozzles.

(3) Unpack 500 gallon collapsible drums. Refer to TM 10-8110-203-12P.

(4) Unpack the 200 GPM pump. Refer to TM 10-4320-342-10.

(5) Unpack the filter separator. Refer to TM 10-4330-236-13.

c. Position Components.

(1) Using rough terrain forklift or suitable equipment, position fuel drums, fueling manifold, filter separator, 200 GPM pump and pressure reducing skid within the installation site.

(2) Position deflector storage box next to 200 GPM pump.

(3) Position bundled 3-inch suction hoses next to 500 gallon drums.

(4) Assemble and prepare 500 collapsible drums for use Refer to TM 10-8110-203-12.

(5) Assemble and prepare 200 GPM pump for use. Refer to TM 104320-342-10.

(

6) Assemble and prepare filter separator for use. Refer TM 10-4330-236-13.

2-15. ASSEMBLY AND PREPARATION FOR USE - cont.

d. Remove Covers. Refer to figure 2-11.

NOTE

The following procedures are applicable to the pressure reducing and fueling manifold skids.

(1) Lift and unhook four fasteners (1) from catches (2).

(2) Remove cover (3) from skid (4).

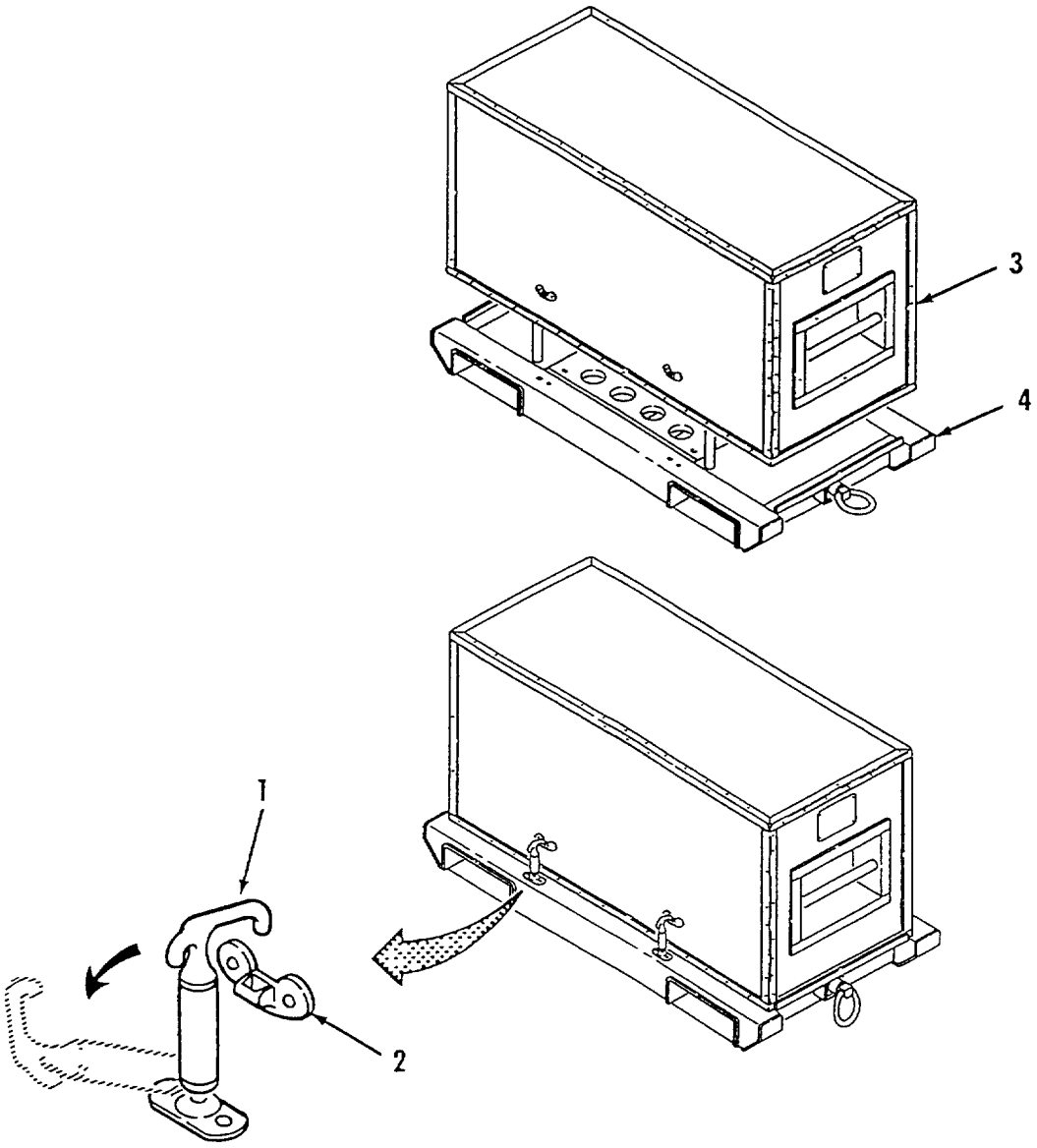


Figure 2-11. Cover Removal.

2-15. ASSEMBLY AND PREPARATION FOR USE - cont.

e. Install Deflector. Refer to figure 2-12.

NOTE

Deflector components are kept in the storage box.

(1) Lower locator arms (1) on lower frame (2) to unlock position.

(2) Center lower frame (2) over exhaust extension (3) on 200 GPM pump.

(3) Position brace (4) on lower frame (2) and install pin (5).

(4) Aline other end of brace (4) with mount (6) on 200 GPM pump and install pin (7).

(5) Repeat steps (3) and (4) for other brace (8).

(6) When lower frame (2) is correctly positioned, raise both locator arms (1) to lock position.

(7) Position upper frame (9) and attach deflector (10) on lower frame (2).

(8) Allne mounting holes in upper frame (9) with holes In lower frame (2), then secure in place with four pins (11).

f. Install Air Ducts. Refer to figure 2-13.

NOTE

Air ducts, couplers and clamps are kept in the storage box

(1) Position clamp (2) over end of air duct (3).

(2) Slide end of air duct (3) onto deflector (1), then tighten clamp (2).

(3) Position clamp (4) on end of air duct (3).

(4) Position clamp (6) on end of air duct (7).

(5) Slide ends of air ducts (3 and 7) onto coupler (5).

(6) Tighten clamps (4 and 6).

(7) Position clamp (8) on end of air duct (7).

(8) Position clamp (10) on end of air duct (11).

(9) Slide ends of air ducts (7 and 11) onto coupler (9).

(10) Tighten clamps (8 and 10).

2-15. ASSEMBLY AND PREPARATION FOR USE - cont.

(11) Position clamp (12) on end of air duct (11).

(12) Slide end of air duct (11) onto defrost shroud of filter separator (13), then tighten clamp (12).

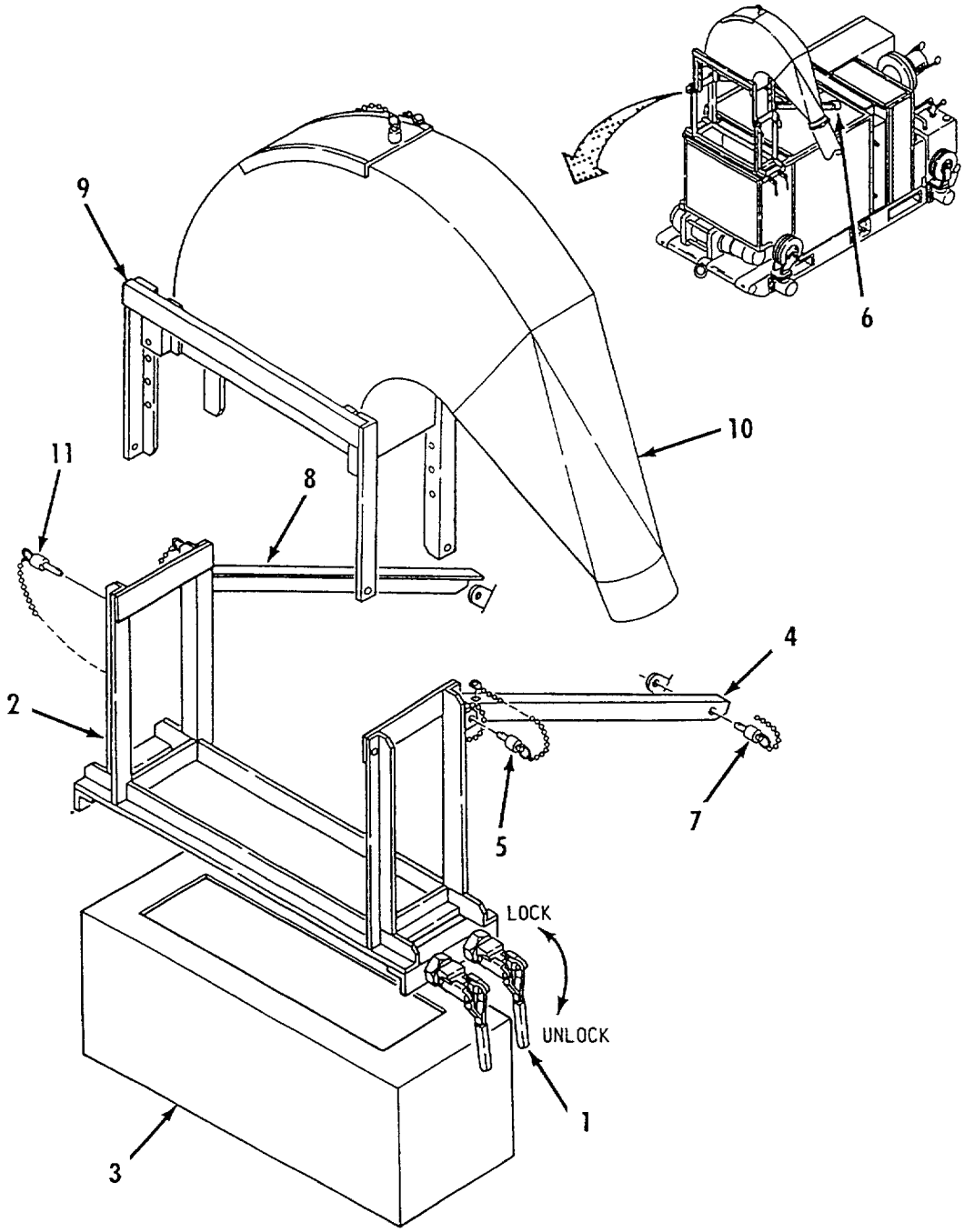


Figure 2-12. Deflector Installation.

2-15. ASSEMBLY AND PREPARATION FOR USE - cont.

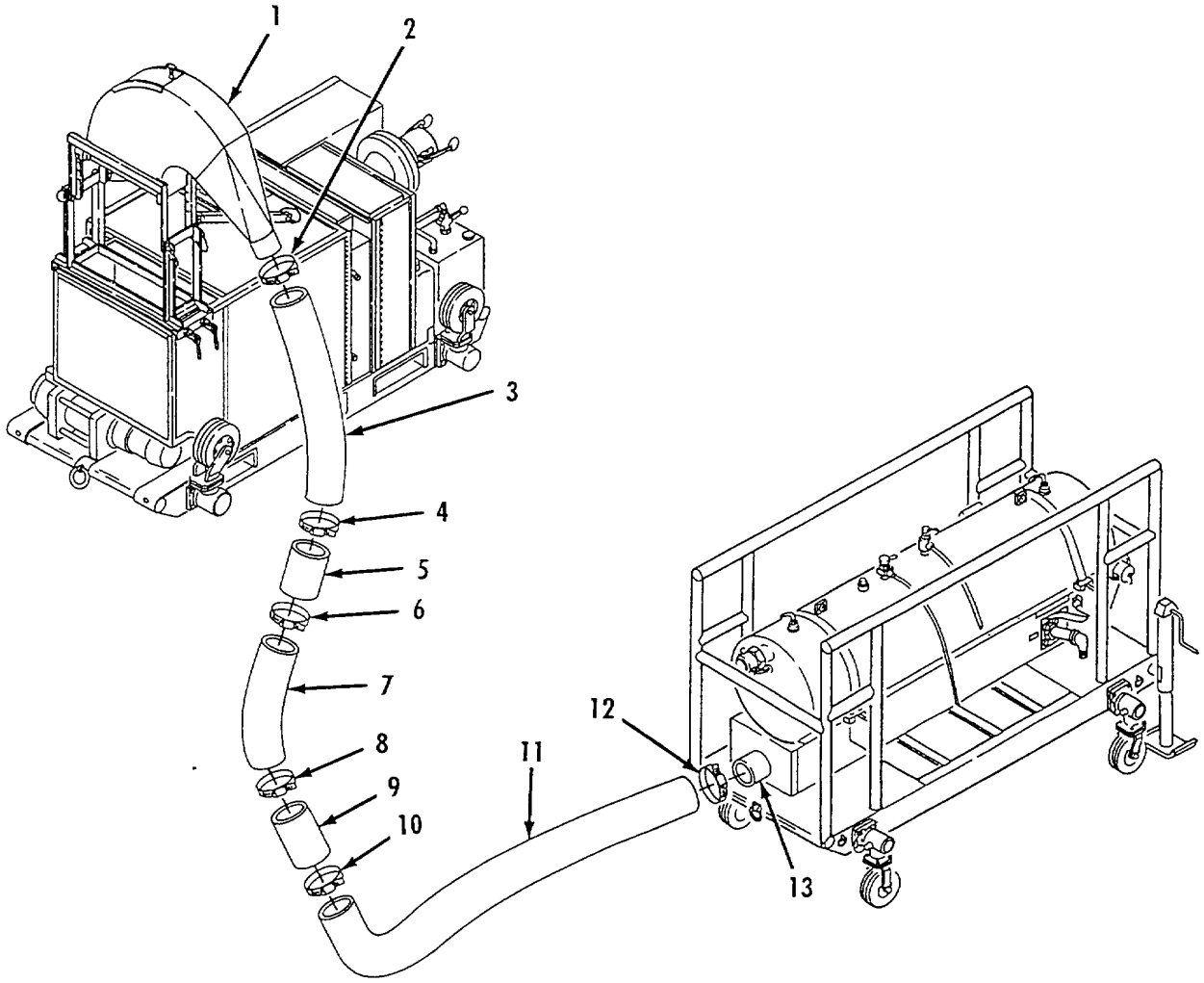


Figure 2-13. Air Duct Installation.

2-15. ASSEMBLY AND PREPARATION FOR USE - cont.

g. Install 200 GPM Pump External Fuel Tank. Refer to figure 14.

(1) Remove cap (1) from fuel can (2).

(2) Lower handle (3) on adapter (4) to release position.

(3) Place adapter (4) In fuel can (2).

(4) Press adapter (4) into neck of fuel can (2) and raise handle (3) to lock position. Adapter seal will expand and secure adapter In place.

(5) Remove cap (5) from external fuel connector (6) on 200 GPM pump (7).

(6) Connect one end of fuel hose (8) to external fuel connector (6).

(7) Connect other end of fuel hose (8) to coupling (9) on adapter (4).

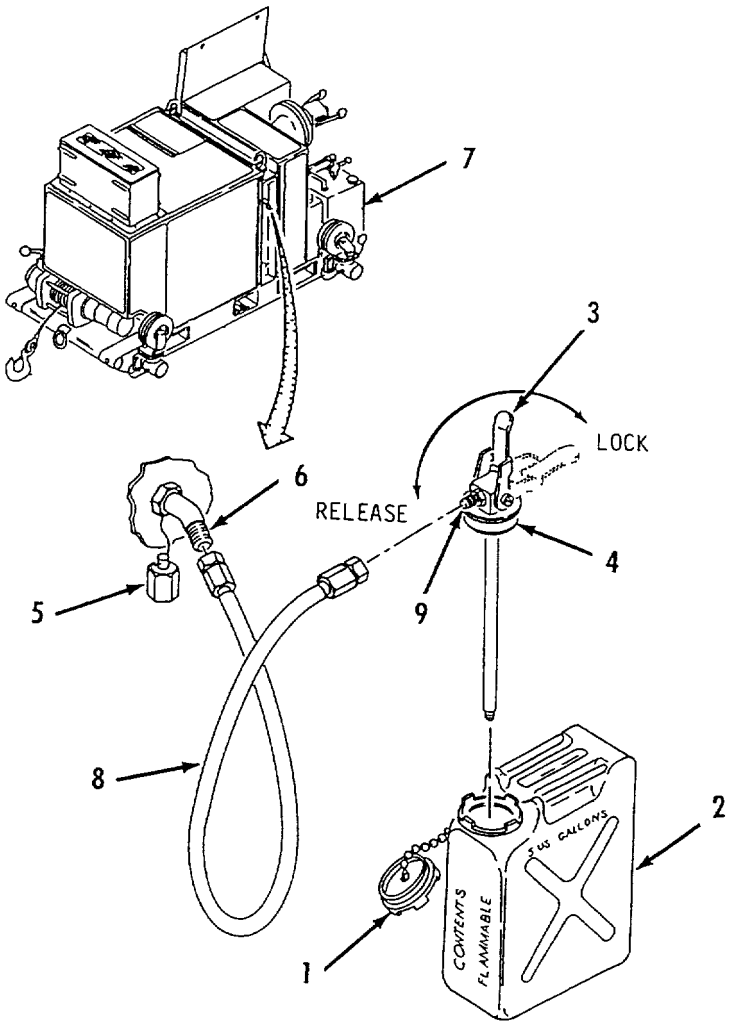


Figure 14. External Fuel Tank Installation.

2-15. ASSEMBLY AND PREPARATION FOR USE - cont.

h. Quick Disconnect Couplings. Refer to figure 2-15.

All components of the AFARE are equipped with quick disconnect couplings to permit rapid assembly and disassembly of components. The following instructions apply to all operator installation and removal tasks.

WARNING

Do not touch metal surfaces with bare skin. Bare skin will freeze to metal surfaces In sub-zero temperatures Always wear arctic mittens when handling components.

CAUTIONS

- Use care when connecting couplings to avoid getting Ice, snow, dirt, sand and debris on coupling mating surfaces or In hoses.
- To prevent leaks and ensure tight connections, make sure gaskets are installed in all female quick disconnect couplings before connecting components.

CONNECTION

(1) Pull locking arms (1) out from female coupling (2).

(2) Remove plug (3) from female coupling (2).

(3) Pull locking arms (5) out from cap (4).

(4) Remove cap (4) from male coupling (6).

(5) Position male coupling (6) in female coupling (2) and hold in place.

(6) Pull both locking arms (1) back at the same time until arms are down against body of female coupling (2).

(7) Verify that male coupling (6) and female coupling (2) are connected by pulling on couplings. Couplings should remain securely connected and locking arms (1) must be remain snug against coupling body.

DISCONNECTION

WARNINGS

- Do not disconnect hose couplings while fuel system is pressurized. Hose ends may whip, causing severe injury to personnel and damage to equipment.
- Whenever hoses are disconnected, fuel spills may occur and potential for fire exists.

(8) Pull locking arms (1) out from female coupling (2).

(9) Pull female coupling (2) from male coupling (6)

.

(10) Insert plug (3) in female coupling (2) and pull locking arms (1) back against coupling body.

(11) Place cap (4) over male coupling (6) and pull locking arms (5) back against coupling body.

2-15. ASSEMBLY AND PREPARATION FOR USE - cont.

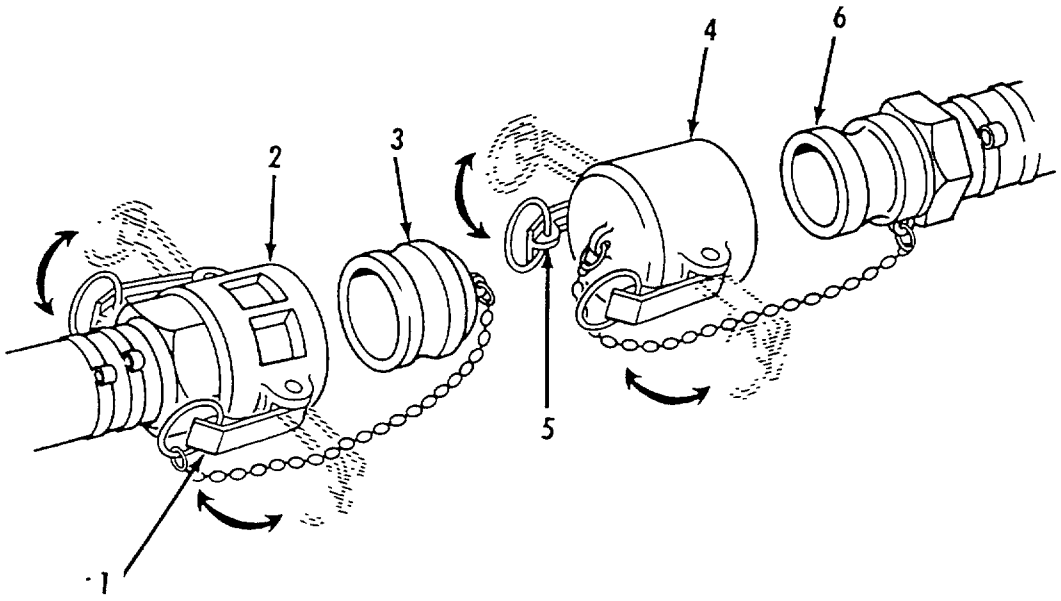


Figure 2-15. Quick Disconnect Couplings.

2-15. ASSEMBLY AND PREPARATION FOR USE - cont.

i. Fuel System Assembly. Refer to figure 2-16.

(1) Loosen straps and remove all Items from fuel hose carriers and component carriers.

CAUTION

To prevent contamination of fuel system components, keep dirt, ice and snow from entering open couplings during assembly.

NOTES

- This manual covers installation of a typical AFARE system. You may need to adjust the number of components used, and their position. In the system, to meet your mission requirements. Additional hoses, couplings, adapters and elbows are supplied with the AFARE as accessories.
- Refer to para 2-15h for connection of quick disconnect couplings.

(2) Connect coupler (1) (4 in F x 3 in M) to 500 gallon drum (2).

(3) Connect coupler (3) (4 In F x 3 in M) to 500 gallon drum (4).

(4) Connect coupler (5) (4 In F x 3 in M) to 500 gallon drum (6).

(5) Connect tee (7) to coupler (3) (4 in. F x 3 in. M).

(6) Connect tee (8) to coupler (5) (4 in F x 3 in M).

(7) Connect 3 in. x 10 ft. suction hose (9) between coupler (1) and tee (7).

(8) Connect 3 in. x 10 ft. suction hose (10) between tee (7) and tee (8).

(9) Connect 3 in. x 10 ft. suction hose (11) to tee (8).

(10) Connect tee (12) (3 in. M x 3 in. F x 3 in. F) to 3 in. x 10 ft. suction hose (11).

(11) Connect 3 in. x 10 ft. suction hose (13) between tee (12) and fueling manifold assembly (14).

(12) Connect 3 in. x 10 ft. suction hose (15) between fueling manifold assembly (14) and suction coupling on 200 GPM pump (16).

(13) Connect 3 in. male x 2 in. female reducer (17) to discharge coupling on 200 GPM pump (16).

(14) Connect 3 in. x 10 ft. discharge hose (18) to reducer (17).

(15) Connect 3-inch manifold (19) (3 in. M x 3 in. M x 3 in. F) and valve section (20) to 3 in. x 10 ft discharge hose (18).

(16) Connect 3 in. x 10 ft. discharge hose (21) between valve section (20) and filter separator (22).

2-15. ASSEMBLY AND PREPARATION FOR USE - cont.

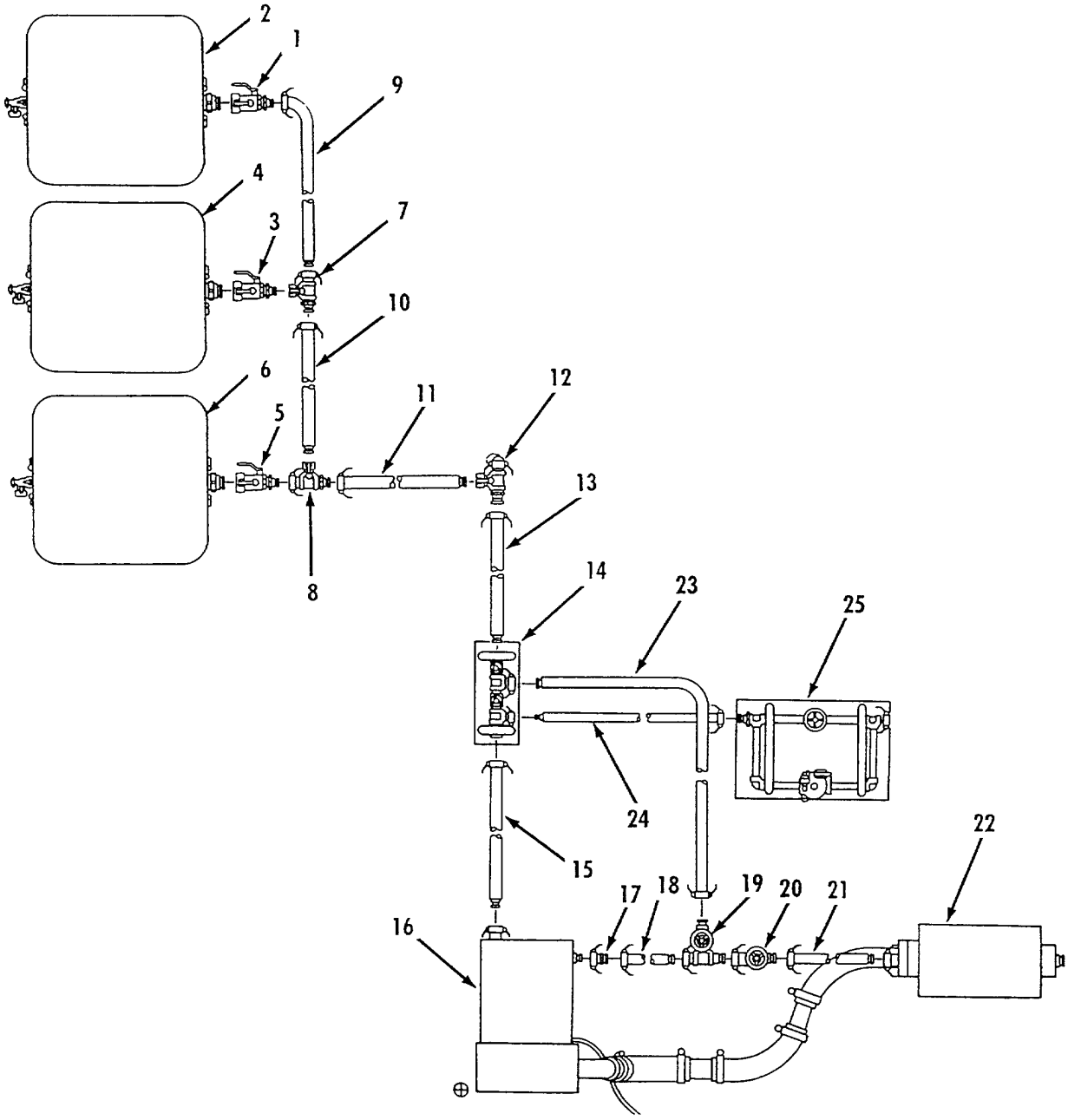


Figure 2-16. Fuel System Assembly (Sheet 1 of 2)

2-15. ASSEMBLY AND PREPARATION FOR USE - cont.

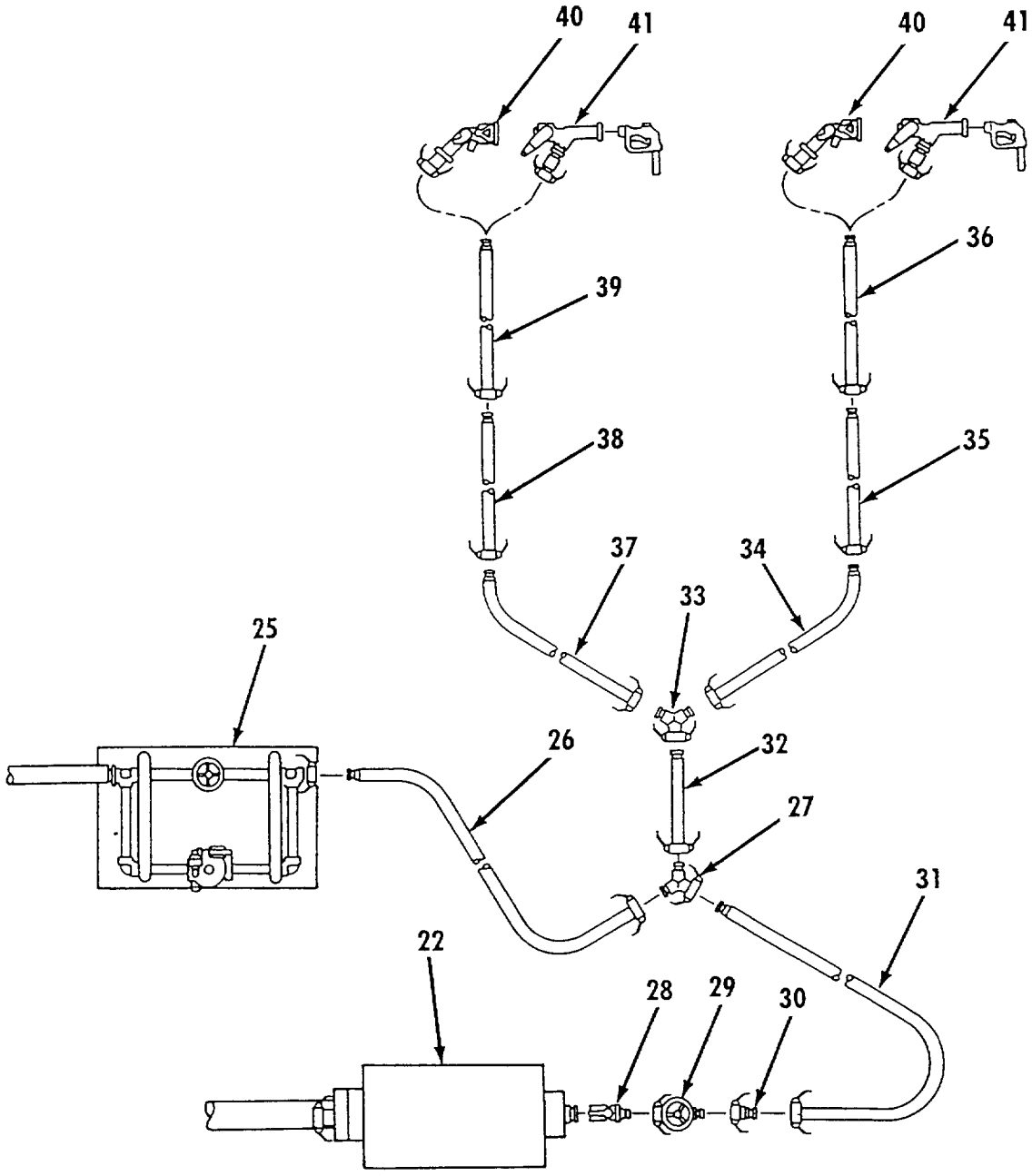


Figure 2-16. Fuel System Assembly (Sheet 2 of 2).

2-15. ASSEMBLY AND PREPARATION FOR USE - cont.

(17) Connect 3 in. x 10 ft. discharge hose (23) between refueling manifold assembly (14) and 3-inch manifold (19).

(18) Connect 2 in. x 10 ft. discharge hose (24) between refueling manifold assembly (14) and pressure reducing assembly (25).

(19) Connect 2 in. x 10 ft. suction hose (26) to pressure reducing assembly (25).

(20) Connect wye (27) (2 in. M x 2 in. M x 2 in. F) to 2 in. x 10 ft. suction hose (26).

(21) Connect water detection kit adapter assembly (28) to filter separator (22).

(22) Connect valve section (29) to water detection kit adapter assembly (28).

(23) Connect 3 in. female x 2 in male reducer (30) to valve section (29).

(24) Connect 2 in. x 10 ft. discharge hose (31) between reducer (30) and wye (27).

(25) Connect 2 in. x 10 ft. discharge hose (32) and wye (33) (2 in. M x 2 in. M x 2 in. F) to wye (27).

(26) Connect three 2 in. x 50 ft. discharge hoses (34, 35, and 36) to wye (33).

(27) Connect three 2 in. x 50 ft. discharge hoses (37, 38, and 39) to wye (33).

(28) Connect D1 nozzle (40) or CCR nozzle (41) to 2 in. x 50 ft. discharge hose (39).

(29) Connect D1 nozzle (40) or CCR nozzle (41) to 2 in, x 50 ft. discharge hose (36).

j. Refueling Point Ground Rod Installation. Refer to figure 2-17. Before the AFARE can be placed In operation, it must be properly grounded Install ground rods at both refueling points. Rods must be installed within 6 feet of each refueling point to provide enough slack In grounding cable to connect nozzles to aircraft adapters.

WARNINGS

- Use care to prevent injury when driving ground rod into the soil. Wear gloves to protect your hands. Do not hold ground rod above the stop collar.
- Do NOT operate the fuel system until it has been properly grounded. Flow fuel can generate static charges within the fuel hoses. A static discharge could ignite the fuel or cause an explosion of fuel vapor.

(1) Place ground rod (1) in vertical position.

2-15. ASSEMBLY AND PREPARATION FOR USE - cont.

(2) Raise, then lower slide (2) forcefully against stop collar (3). Repeat until collar is flush with surface of soil (rod will be at least three feet deep).

NOTES

- If ground cannot be sufficiently penetrated, bury the ground rod in a trench not less than four feet long and at least eight inches beneath the surface.
- When using separate grounding cable to ground aircraft to grounding rod, nozzle ground clamps may be used to supplement aircraft bonding.

(3) Connect ground clamp (4) (from nozzle) to ground rod (1).

(4) Repeat steps (1) through (4) for other refueling point.

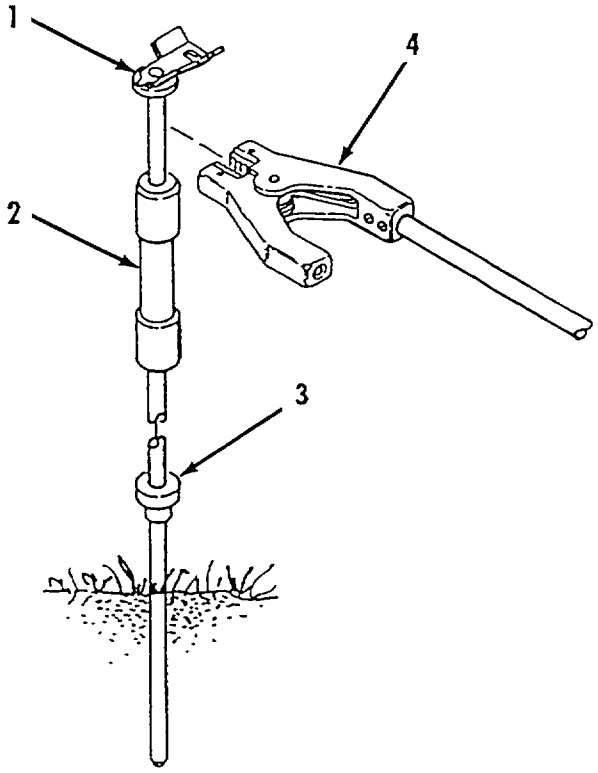


Figure 2-17. Refueling Point Ground Rod Installation.

2-15. ASSEMBLY AND PREPARATION FOR USE - cont.

k. 200 GPM Pump Ground Rod Installation. Refer to figure 2-18

WARNINGS

- Use care to prevent injury when driving ground rod into the soil Wear gloves to protect your hands Do not hold ground rod above the stop collar.
- Do NOT operate the fuel system until it has been properly grounded. Flowing fuel can generate static charges within the fuel hoses. A static discharge could ignite the fuel or cause an explosion of fuel vapor.

(1) Place ground rod (1) In vertical position.

(2) Raise, then lower slide (2) forcefully against stop collar (3). Repeat until collar is flush with surface of soil (rod will be at least three feet deep).

NOTE

If ground cannot be sufficiently penetrated, bury the ground rod in a trench not less than four feet long and at least eight inches beneath the surface.

(3) Loosen two screws (4) and rotate front plate (5) to open clamp.

NOTE

Position of back plate may be reversed to fit smaller diameter ground rods.

(4) Position front plate (5) and back plate (6) around ground rod (1). Secure plates to ground rod with two screws (4).

(5) Place end of ground wire (7) In front plate (5) and tighten screw (8).

(6) Locate ground lug (10) on 200 GPM pump (11), then loosen nut (9).

(7) Place free end of ground wire (7) through slot in ground lug (10).

(8) Tighten nut (9) until ground wire (7) is held securely.

2-15. ASSEMBLY AND PREPARATION FOR USE - cont.

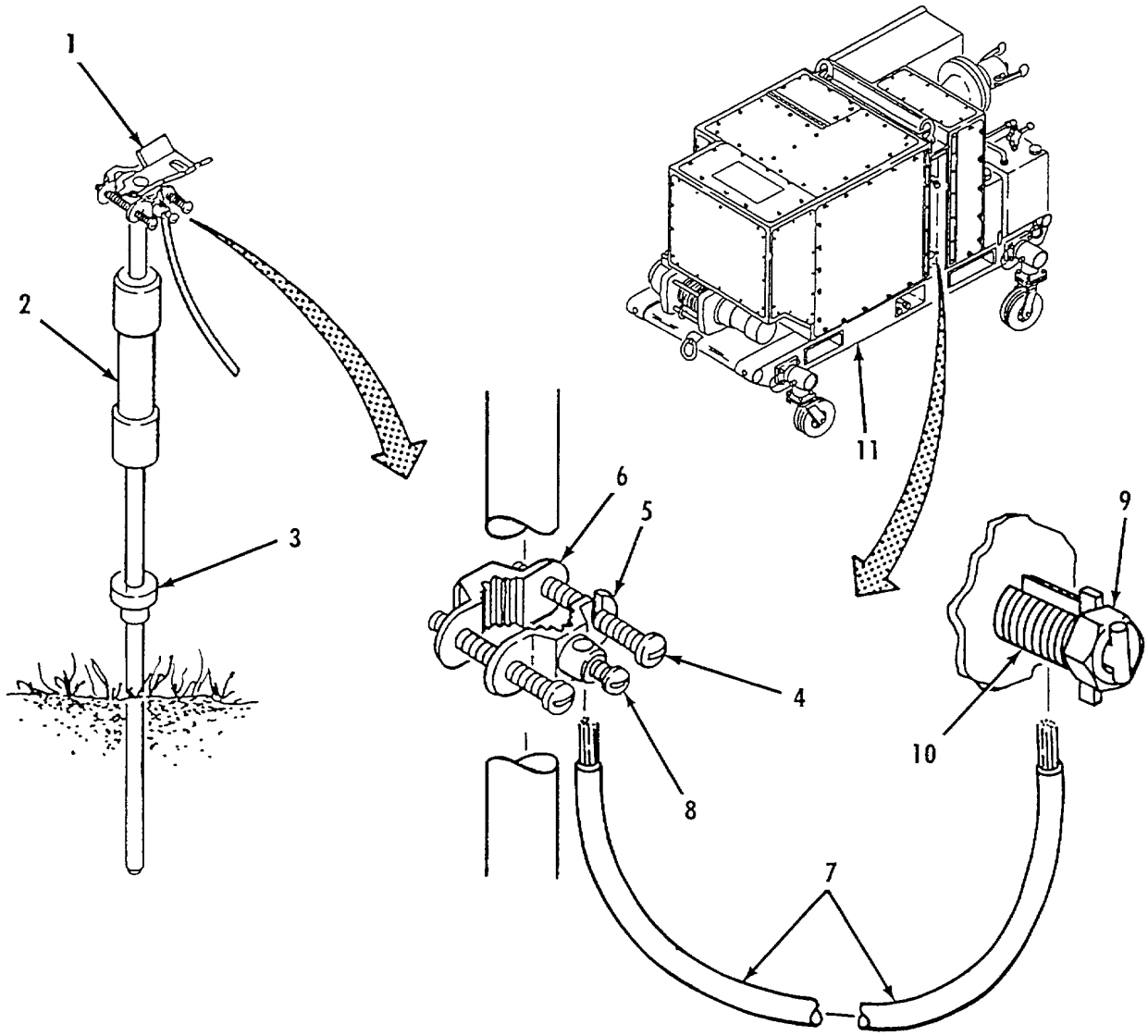


Figure 2-18. 200 GPM Pump Ground Rod Installation.

2-15. ASSEMBLY AND PREPARATION FOR USE - cont.

l. Fire Extinguisher Installation. Before operating the AFARE, fire extinguishers must be positioned in the fuel system in the event of a fire. Refer to local standard operating procedures for placement of the fire extinguishers within the fuel system.

(1) Lift handle (1) and unlatch hook (2) from fire extinguisher (3).

(2) Remove fire extinguisher (3) from frame (4).

(3) Repeat steps (1) and (2) for two remaining fire extinguishers.

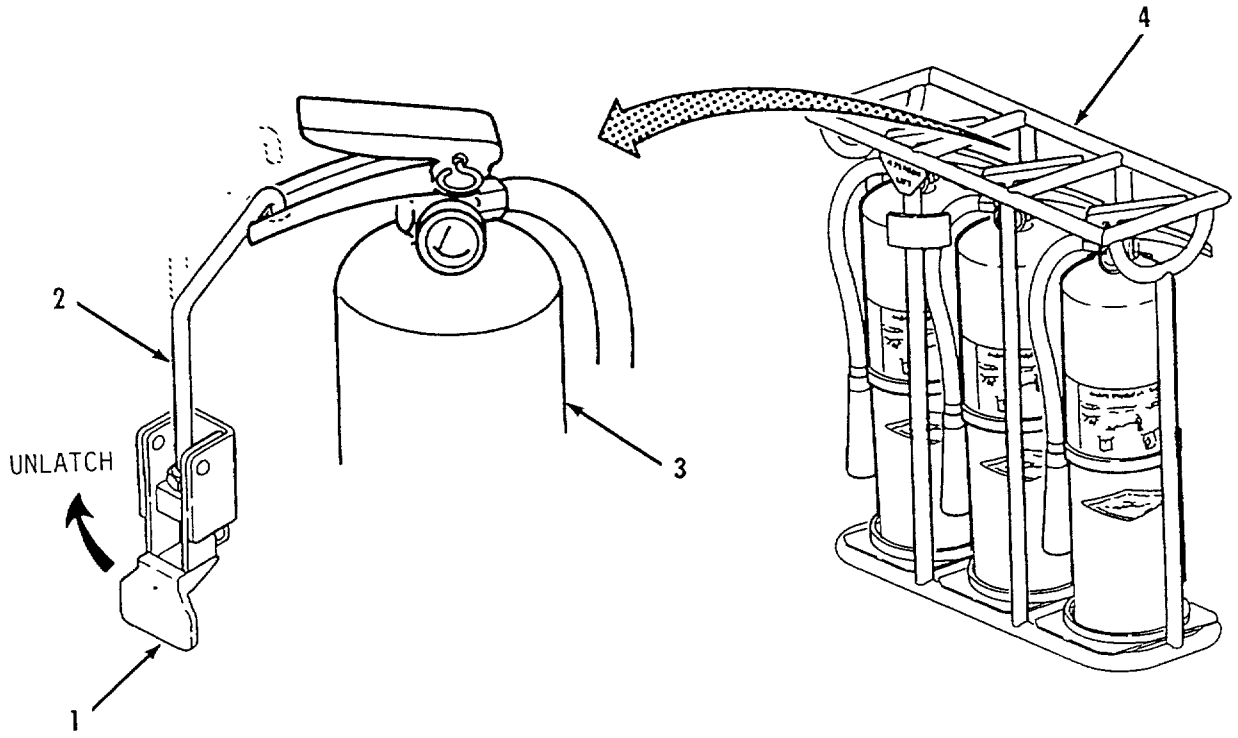


Figure 2-19. Fire Extinguisher Installation.

2-16. INITIAL ADJUSTMENT.

a. Hoses, Couplings and Valves.

(1) Verify that all quick disconnect coupling connections are secure.

(2) Verify that all valve sections are positioned with handwheels facing up and closed.

(3) Verify that caps and plugs are installed on all open components.

(4) Inspect fuel hoses for kinks, twists and tight bends. Straighten hoses as required.

b. 500 Gallon Collapsible Drums. Perform initial adjustments m accordance with TM 10-8110-203-12&P.

c. 200 GPM Pump. Perform initial adjustments in accordance with TM 10-4320-342-10.

d. Filter Separator. Perform initial adjustments in accordance with TM 10-4330-23613.

e. CCR Nozzle and Gravity Fill Adapter. Perform initial adjustments in accordance with TM 10-4930-243-13&P.

f. Single Point Refueling Nozzle (D1). Perform initial adjustment in accordance with TM 10-4930-242-13&P.

g. Fire Extinguishers. Position fire extinguishers.

2-17. OPERATING PROCEDURES.

a General. The AFARE has two primary modes of operation, refueling and defueling. In the refueling mode, fuel is removed from the 500 gallon collapsible drums and distributed to the refueling points (nozzles). In the defuel mode, fuel is removed from the aircraft and stored in the 500 gallon collapsible drums.

b 500 Gallon Collapsible Drum Operation. For procedures required to operate the 500 gallon collapsible drums, refer to TM 10-8110-203-12&P.

c. 200 GPM Pump Operation. For procedures required to operate the 200 GPM pump, refer to TM 10-4320-342-10.

d 200 GPM Filter Separator Operation. For procedures required to operate the 20OGPM filter separator, refer to TM 10-4330-236-13.

e Single Point Refueling Nozzle (D1) Operation. For procedures required to operate the single point refueling nozzle and gravity fill adapter, refer to TM 10-4930-242-13&P.

f CCR Nozzle and Gravity Fill Adapter. For procedures required to operate the CCR nozzle and gravity fill adapter, refer to TM 10-4930-243-13&P.

2-17. OPERATING PROCEDURES - cont.

g. Fuel System Startup.

WARNINGS

Fueling operations are potentially dangerous. Make sure you identify and eliminate all safety hazards before operating the fuel system. If a fuel spill occurs during refueling, Immediately shut down the system, isolate the defective component(s) and clean up spilled fuel in accordance with local regulations. Observe the following safety precautions and warnings to prevent injury to personnel and damage to the equipment.

- Do not allow smoking within 100 feet of the AFARE. Fuel vapors are extremely flammable. Post NO SMOKING signs around refueling area. Do not operate system or components near open flame or excessive heat. Death or Injury could result from exploding or burning fuel. Suitable and properly charged fire extinguishers must be available at all times.

- Wear protective goggles and gloves. Use fuel resistant gloves when handling system components due to toxic effects of some fuel additives. Avoid contact with skin, eyes, and clothes. If fuel contacts eyes, immediately flush eyes with clean fresh water and get medical attention.

- Avoid getting fuel on your body or clothing. Fuel can cause chemical burns on unprotected skin. If clothing becomes saturated with fuel, remove clothing immediately and wash your body with hot soapy water.

- Do not breathe fuel vapors. Refuel only in well-ventilated area. Vapors are toxic and can cause serious illness or death. If dizziness occurs, leave area and get fresh air. Get medical attention.

- Static discharge could ignite the fuel or cause an explosion of the fuel vapor. Do not operate the system until properly grounded or bonded.

- Be certain that nozzles are properly bonded to the aircraft or vehicle being refueled. Make sure the 200 GPM pump and 200 GPM filter separator ground rods are installed and connected.

- Radio transmitters can cause an arc at antennas. Do Not ground equipment to a radio antenna. Do not transmit during refueling operations.

- Before operation, be certain all system components are securely connected to avoid fuel spills. If fuel spill occurs, cover the area with dry soil to reduce rate of vaporization. During operation avoid fuel spills as much as possible. Make sure fire extinguishers are charged and readily available in case of fire.

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

2-17. OPERATING PROCEDURES - cont.

Refuel Mode. Refer to figure 2-20.

NOTE

Couplers may be opened to allow fuel flow from one, two or three fuel drums. Open couplers as needed to support your mission requirements.

(1) Set couplers (1, 2, and 3) to open.

(2) Open both gate valves (4 and 5) on fueling manifold assembly (6).

(3) Close gate valve (7) on pressure reducing assembly (8).

(4) Close 3-inch manifold (9).

(5) Open valve section (10).

(6) Open valve section (11).

(7) For operation of 200 GPM pump (12), refer to TM 10-4320-342-10.

(8) For operation of filter separator, refer to TM 10-4330-236-13.

(9) Connect fuel nozzle (15) to aircraft refueling adapter. Refer to TM 10-4930-243-13&P to connect CCR nozzle or gravity fill adapter. Refer to TM 10-4930-242-13&P to connect D1 nozzle.

(10) When aircraft fuel tank is full, disconnect fuel nozzle (15) from aircraft adapter. Refer to TM 10-4930-243-13&P to disconnect CCR nozzle or gravity fill adapter. Refer to TM 10-4930-242-13&P to disconnect D1 nozzle.

Defuel Mode. Refer to figure 2-20.

NOTE

Couplers may be opened to allow fuel to fill one, two or three fuel drums. Open couplers as needed to support your mission requirements.

(11) Set couplers (1, 2 and 3) to open.

(12) Open gate valve (4) and close gate valve (5) on fueling manifold assembly (6).

(13) Open gate valve (7) on pressure reducing assembly (8).

2-17. OPERATING PROCEDURES - cont.

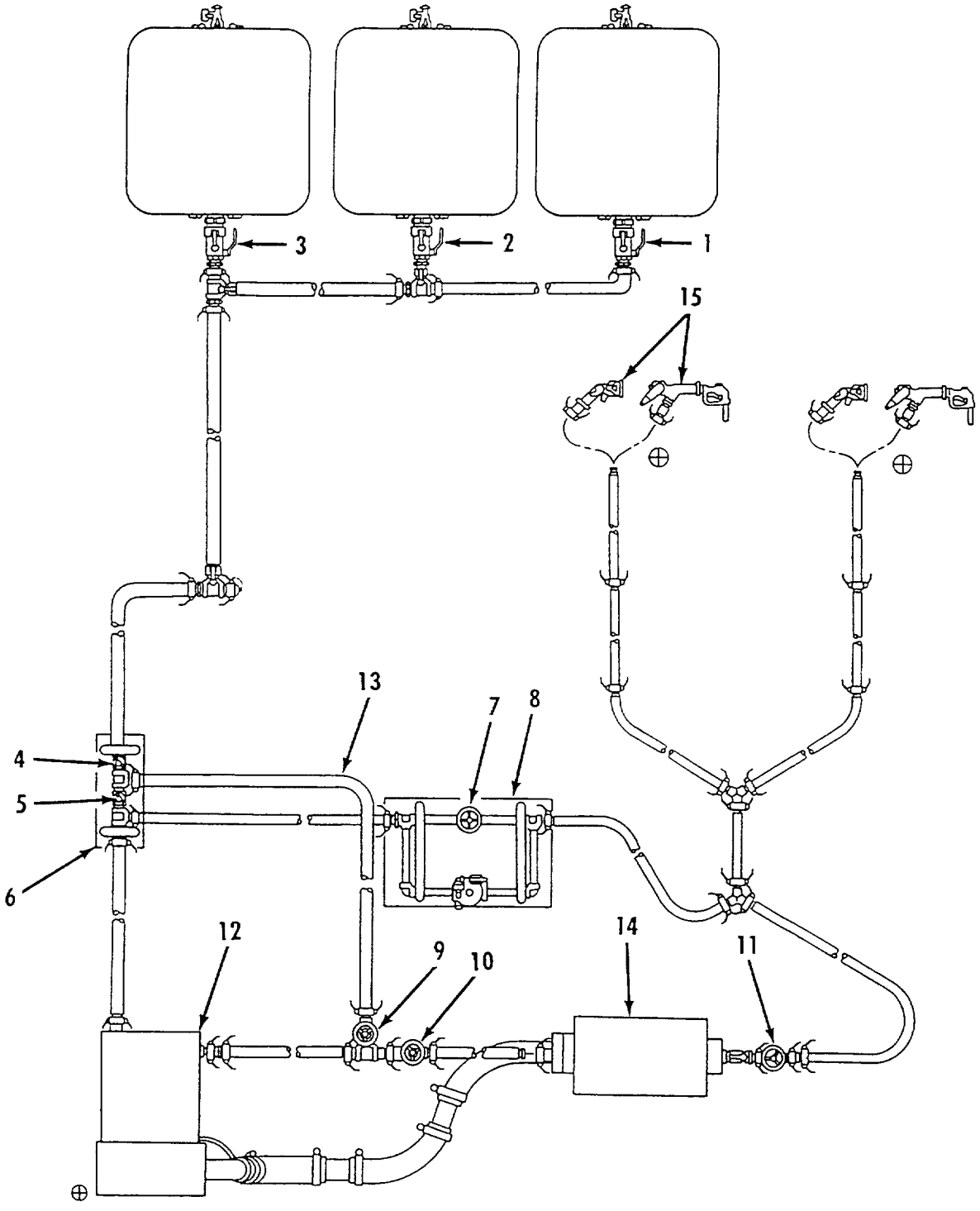


Figure 2-20. Fuel System Control Valves.

2-17. OPERATING PROCEDURES - cont.

(14) Open 3-inch manifold (9).

(15) Close valve section (10).

(16) Close valve section (11).

(17) Connect D1 nozzle (15) to aircraft refueling adapter. Refer to TM 10-4930-242-13&P.

WARNING

To prevent injury to personnel and damage to the equipment, use extreme care when defueling. Fuel capacity of 500 gallon drums must not be exceeded. Drums could leak or rupture if over-pressurized.

(18) For operation of the 200 GPM pump (12), refer to TM 10-4320-342-10.

(19) When aircraft is defueled, shut down 200 GPM pump. Refer to TM 10-4320-342-10.

(20) Disconnect D1 nozzle (15) from aircraft adapter. Refer to TM 10-4930-242-13&P.

h. Fuel System Shutdown.

(1) Shut down filter separator (14) Refer to TM 10-4330-236-13.

(2) Shut down 200 GPM pump (12). Refer to TM 10-4320-342-10.

2-18. DECALS AND INSTRUCTION PLATES.

For location and description of data plates used on the AFARE system, refer to figure 2-21.

Refer to the applicable technical manual for decals and instruction plates on the following equipment:

200 GPM Pump Assembly	TM 10-4320-342-10
Closed Circuit Refueling (CCR) Nozzle and Gravity Fill Adapter	TM 10-4930-243-13&P
Single Point Refueling Nozzle(D-1 Type)	TM 10-4930-242-13&P
500 Gallon Collapsible Drum	TM 10-8110-203-12&P
200 GPM Fuel Filter Separator	TM 10-4330-236-13

2-18. DECALS AND INSTRUCTION PLATES - cont.

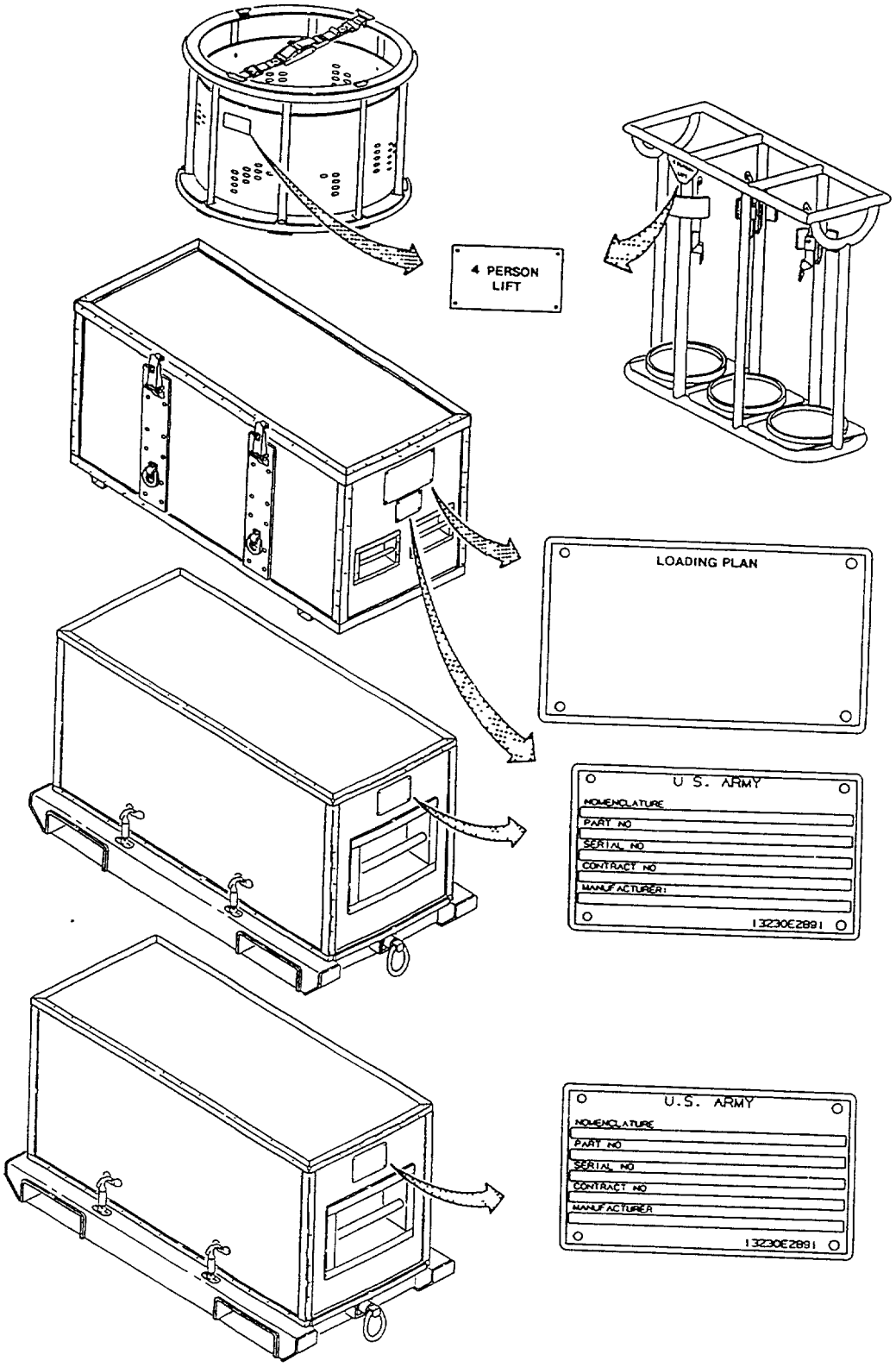


Figure 2-21. Decals and Instruction Plates.

2-19. OPERATING AUXILIARY EQUIPMENT.

Refer to the applicable technical manual for operating the following equipment:

200 GPM Pump Assembly	TM 10-4320-342-10
Closed Circuit Refueling (CCR) Nozzle and Gravity Fill Adapter	TM 10-4930-243-13&P
Single Point Refueling Nozzle(D-1 Type)	TM 10-4930-242-13&P
500 Gallon Collapsible Drum	TM 10-8110-203-12&P
200 GPM Fuel Filter Separator	TM 10-4330-236-13

2-20. PREPARATION FOR MOVEMENT.

a. Defuel. Refer to para 2-17g.

b. 200 GPM Pump Ground Rod Removal. Refer to figure 2-22.

WARNINGS

Use care to prevent injury when removing ground rods. Wear gloves to protect your hands Do not hold ground rod below upper stop collar.

(1) Loosen nut (9) and disconnect ground wire (7) from ground lug (10).

(2) If required, loosen screw (8) and disconnect ground wire (7) from front plate (5).

(3) Loosen two screws (4) and rotate front plate (5) from back plate (6).

(4) Lift slide (2) forcefully against upper stop. Repeat until ground rod (1) is pulled from soil.

2-20. PREPARATION FOR MOVEMENT - cont.

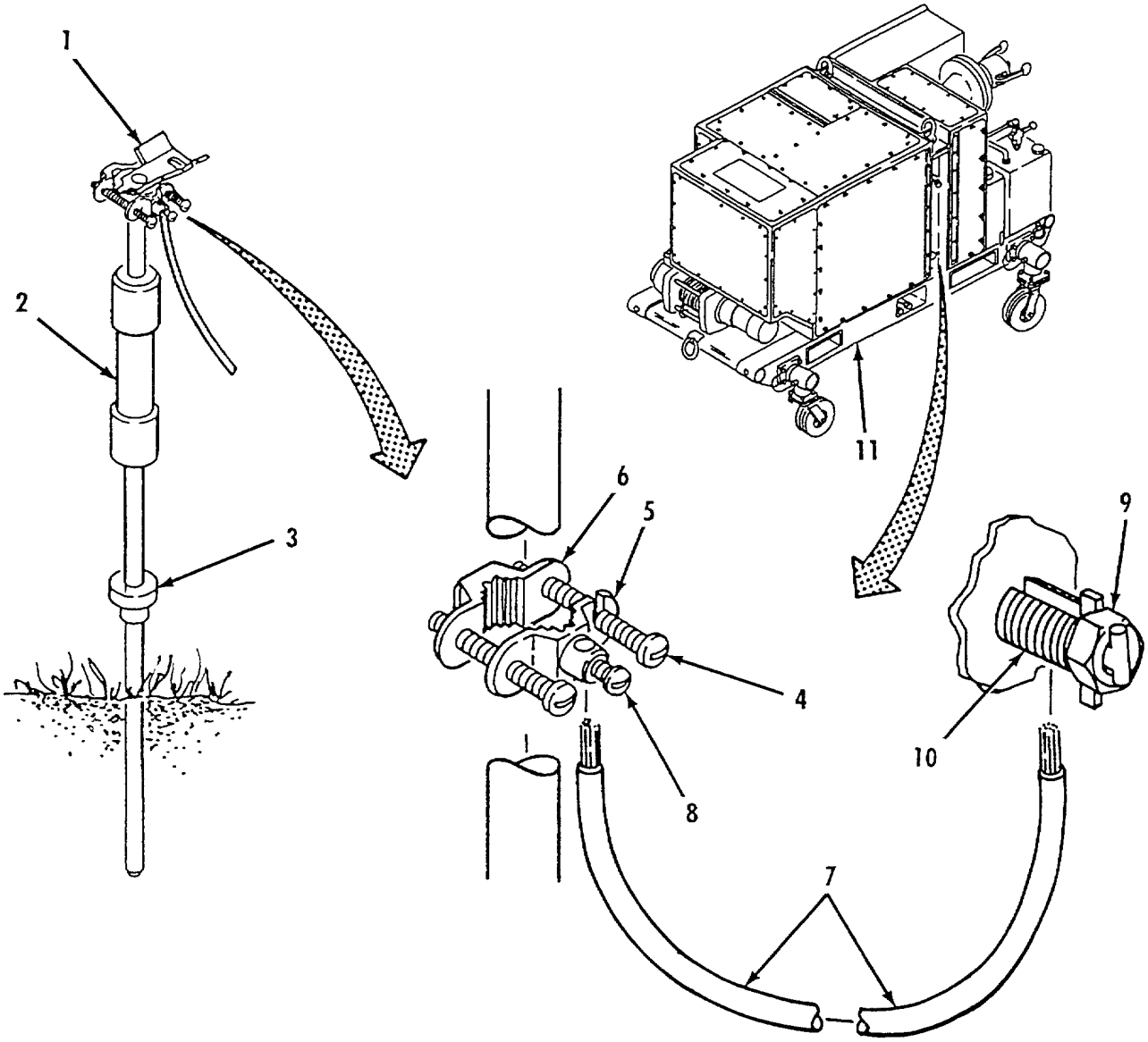


Figure 2-22. 200 GPM Pump Ground Rod Removal.

2-20. PREPARATION FOR MOVEMENT - cont.

c. Refueling Point Ground Rod Removal. Refer to figure 2-23.

WARNING

Use care to prevent injury when removing ground rods. Wear gloves to protect your hands. Do not hold ground rod below upper stop collar.

(1) Disconnect ground clamp (4) from ground rod (1).

(2) If used, disconnect aircraft ground cable from ground rod (1).

(3) Lift slide (2) forcefully against upper stop Repeat until ground rod (1) is pulled from soil.

(4) Repeat steps (1 through 3) for ground rod at other refueling point.

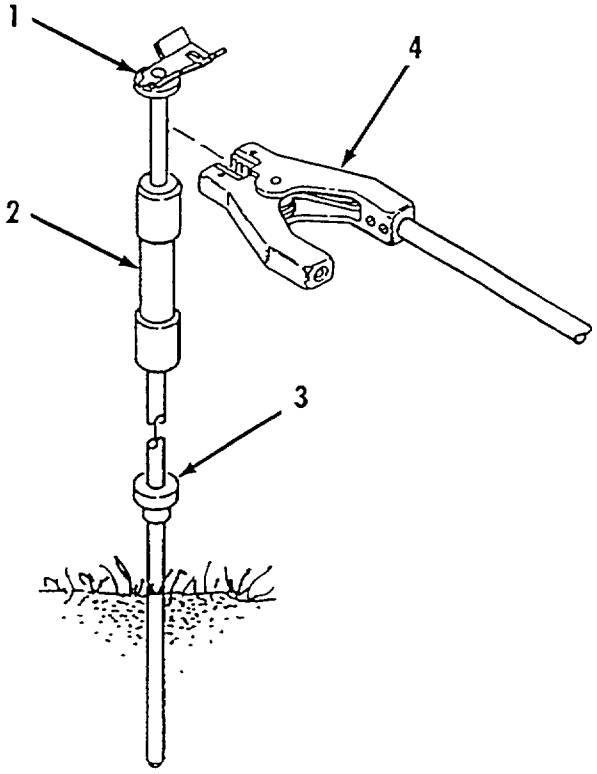


Figure 2-23. Refueling Point Ground Rod Installation.

2-20. PREPARATION FOR MOVEMENT -cont.

d. Fuel System Disassembly. Refer to figure 2-24.

CAUTION

To prevent contamination of fuel system components, keep dirt mud, sand, ice and snow from entering open couplings during assembly.

NOTE

Refer to para 2-15h for connection of quick disconnect couplings.

(1) Close all fuel valves.

WARNING

Whenever hoses are disconnected, spills may occur and the potential for fires exists.

(2) Drain residual fuel from hoses.

(3) Disconnect D1 nozzle (40) or CCR nozzle (41) from 2 in. x 50 ft. discharge hose (36).

(4) Disconnect D1 nozzle (40) or CCR nozzle (41) from 2 in. x 50 ft. discharge hose (39).

(5) Disconnect three 2 in. x 50 ft. discharge hoses (37, 38, and 39) from wye (33).

(6) Disconnect three 2 in. x 50 ft. discharge hoses (34, 35, and 36) from wye (33).

(7) Disconnect 2 in. x 10 ft. discharge hose (32) and wye (33) from wye (27).

(8) Disconnect 2 in. x 10 ft. discharge hose (31) from reducer (30) and wye (27).

(9) Disconnect 3 in. female x 2 in. male reducer (30) from valve section (29).

(10) Disconnect valve section (29) from water detection kit adapter assembly (28).

(11) Disconnect water detection kit adapter assembly (28) from filter separator (22).

(12) Disconnect wye (27) from 2 in. x 10 ft. suction hose (26).

(13) Disconnect 2 in. x 10 ft. suction hose (26) from pressure reducing skid assembly (25).

(14) Disconnect 2 in. x 10 ft. discharge hose (24) from fueling manifold assembly (14) and pressure reducing skid assembly (25).

(15) Disconnect 3 in. x 10 ft. discharge hose (23) from fueling manifold assembly (14) and 3 inch manifold (19).

(16) Disconnect 3 in. x 10 ft. discharge hose (21) from valve section (20) and filter separator (22).

(17) Disconnect 3-inch manifold (19) and valve section (20) from 3 in. x 10 ft. discharge hose (18).

2-20. PREPARATION FOR MOVEMENT - cont.

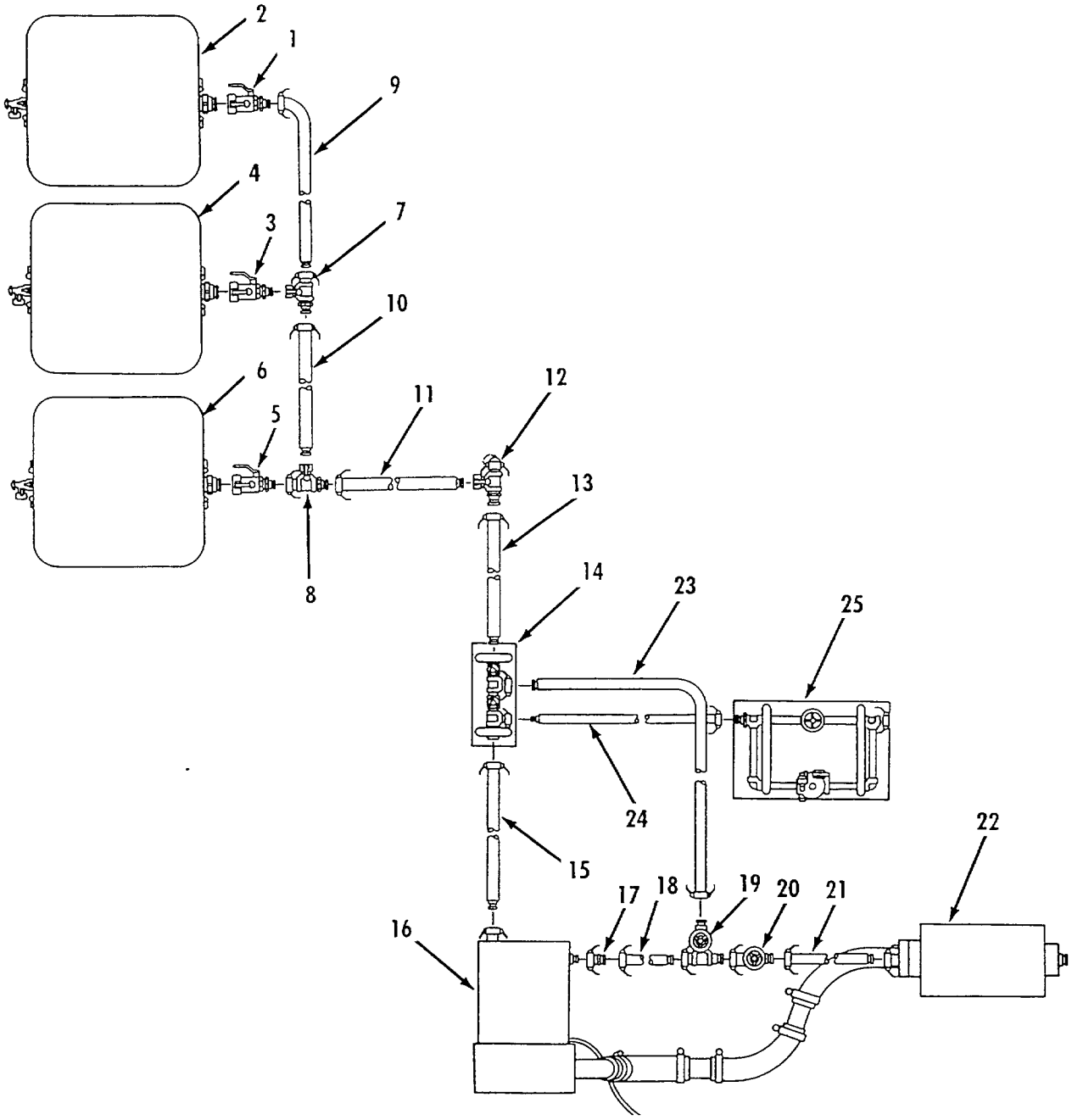


Figure 2-24. Fuel System Disassembly (Sheet 1 of 2)

2-20. PREPARATION FOR MOVEMENT - cont.

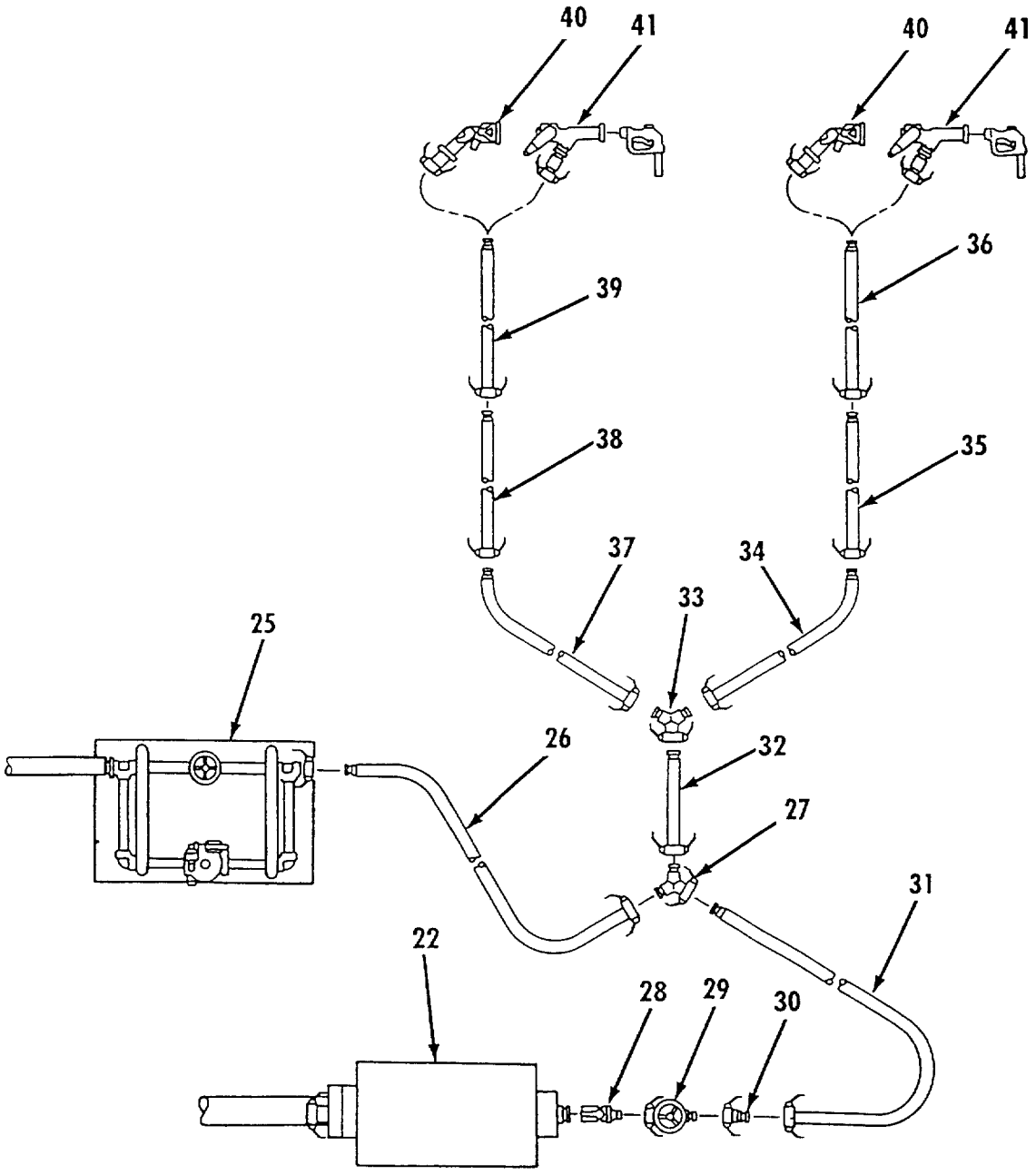


Figure 2-24. Fuel System Disassembly (Sheet 2 of 2)

2-20. PREPARATION FOR MOVEMENT-cont.

(18) Disconnect 3 in x 10 ft discharge hose (18) from reducer (17).

(19) Disconnect 3 In male x 2 in female reducer (17) from discharge coupling on 200 GPM pump (16).

(20) Disconnect 3 in x 10 ft suction hose (15) from fueling manifold assembly (14) and suction coupling on 200 GPM pump (16).

(21) Disconnect 3 in x 10 ft suction hose (13) between tee (12) and fueling manifold assembly (14).

(22) Disconnect tee (12) from 3 in x 10 ft suction hose (11).

(23) Disconnect 3 in x 10 ft suction hose (11) from tee (8).

(24) Disconnect 3 in x 10 ft suction hose (10) from tee (7) and tee (8).

(25) Disconnect 3 in x 10 ft suction hose (9) from coupler (1) and tee (7).

(26) Disconnect tee (8) from coupler (5).

(27) Disconnect tee (7) from coupler (3).

(28) Disconnect coupler (5) from 500 gallon drum (6).

(29) Disconnect coupler (3) from 500 gallon drum (4).

(30) Disconnect coupler (1) from 500 gallon drum (2).

2-20. PREPARATION FOR MOVEMENT-cont.

e. Remove 200 GPM Pump External Fuel Tank. Refer to figure 2-25.

(1) Disconnect fuel hose (8) from coupling (9) on adapter (4).

(2) Disconnect other end of fuel hose (8) from external fuel connector (6) on 200 GPM pump (7).

(3) Install cap (5) on external fuel connector (6).

(4) Move handle (3) to release position on adapter (4).

(5) Remove adapter (4) from fuel can (2).

(6) Install cap (1) on fuel can (2).

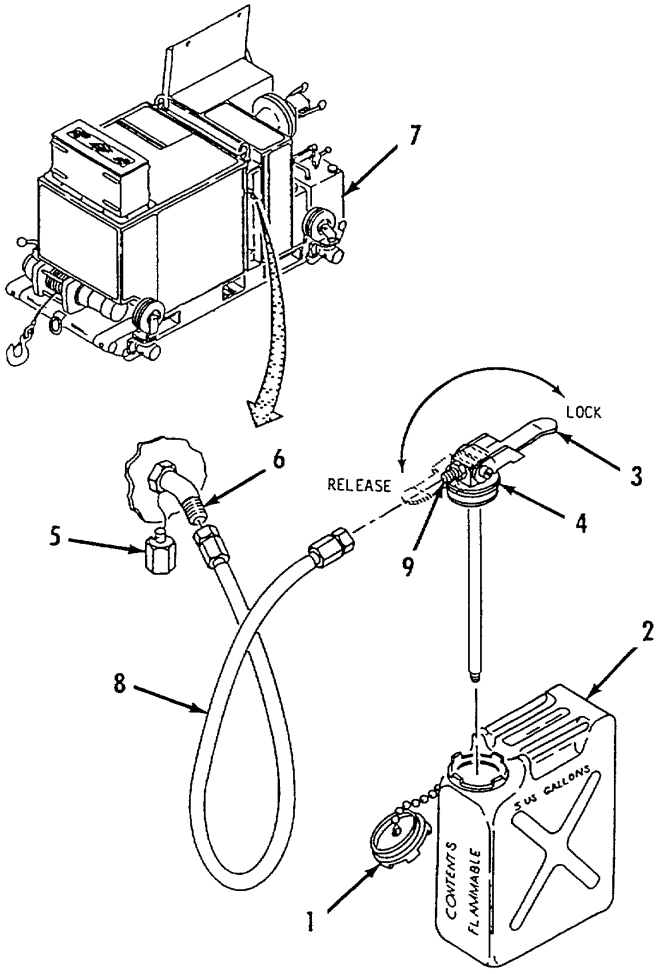


Figure 2-25. External Fuel Tank Removal.

2-20. PREPARATION FOR MOVEMENT-cont.

f. Remove Air Ducts. Refer to figure 2-26.

(1) Loosen clamp (12).

(2) Slide end of air duct (11) off defrost shroud of filter separator (13).

(3) Remove clamp (12) from air duct (11).

(4) Loosen clamps (8 and 10).

(5) Slide ends of air ducts (7 and 11) off of coupler (9).

(6) Remove clamp (10) from air duct (11).

(7) Remove clamp (8) from air duct (7).

(8) Loosen clamps (4 and 6).

(9) Slide ends of air ducts (3 and 7) off of coupler (5).

(10) Remove clamp (6) from air duct (7).

(11) Remove clamp (4) from air duct (3).

(12) Loosen clamp (2) and slide air duct (3) off of deflector (1).

(13) Remove clamp (2) from air duct (3).

g. Remove Deflector. Refer to figure 2-27.

(1) Remove four pins (11) and lift upper frame (9) and attached deflector (10) from lower frame (2).

(2) Remove pins (7) from mount (6) on 200 GPM pump.

(3) Remove pins (5) and brace (4) Repeat for other brace (8).

(4) Repeat steps (2) and (3) for other brace (8).

(5) Lower locator arms (1) on lower frame (2) to unlock position.

(6) Remove lower frame (2) from exhaust extension (3) on 200 GPM pump.

(7) Stow deflector components in storage box as shown on loading plan.

2-20. PREPARATION FOR MOVEMENT-cont.

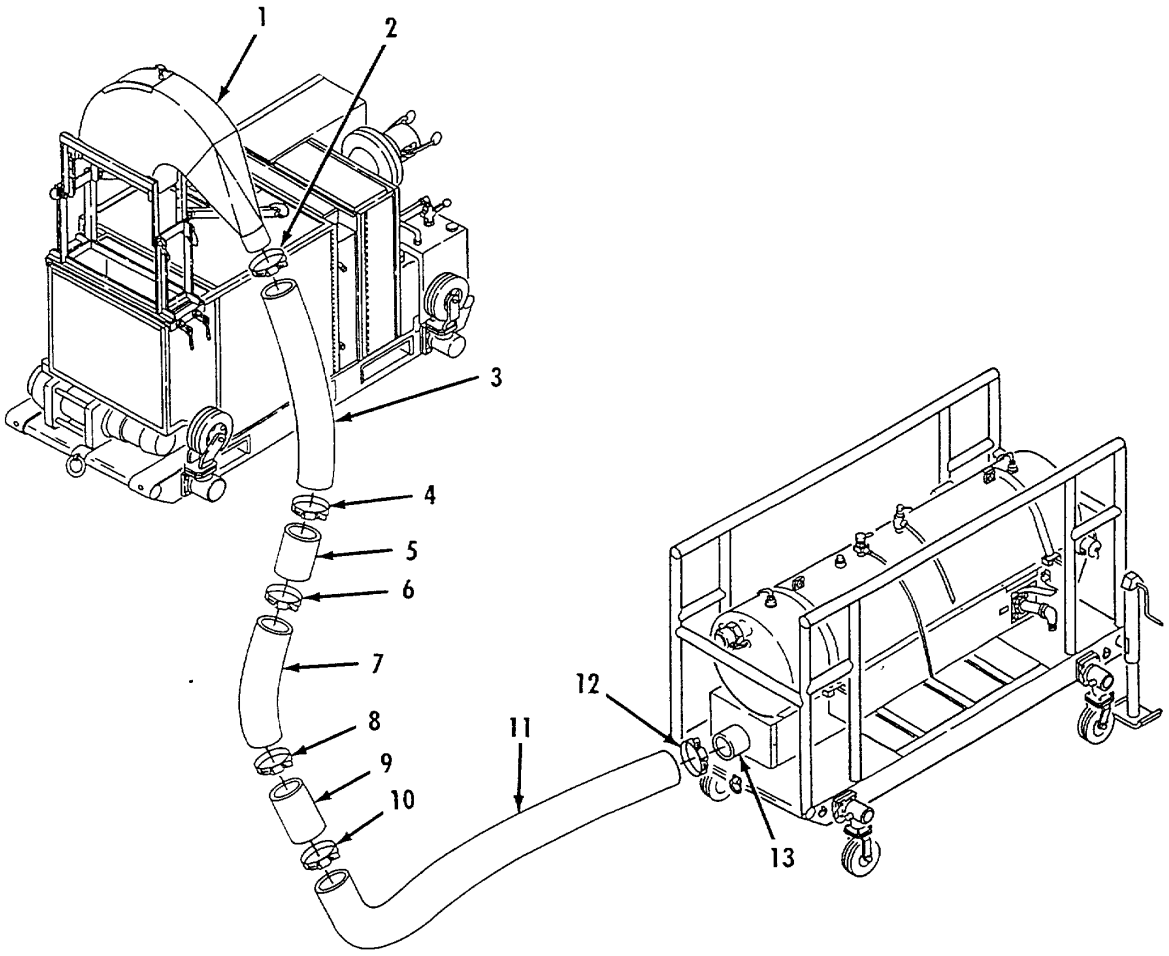


Figure 2-26. Air Duct Removal.

2-20. PREPARATION FOR MOVEMENT-cont.

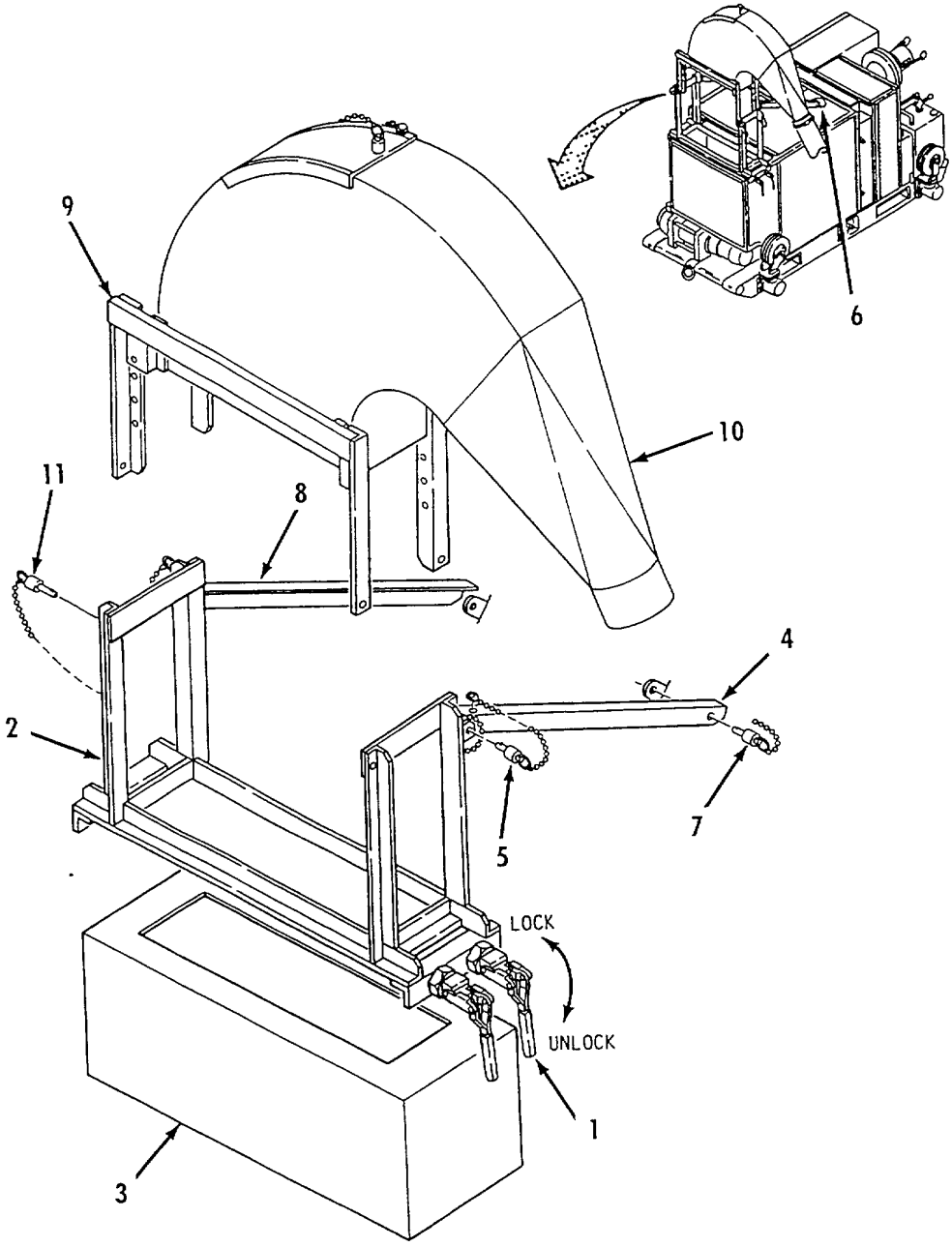


Figure 2-27. Deflector Removal.

2-20. PREPARATION FOR MOVEMENT-cont.

h. Install Covers. Refer to figure 2-28.

NOTE

The following procedure is applicable to the pressure reducing and fueling manifold assemblies

(1) Lower cover (1) onto skid (2).

(2) Align position of catches (3) with fasteners (4).

(3) Lift and hook four fasteners (4) onto catches (3).

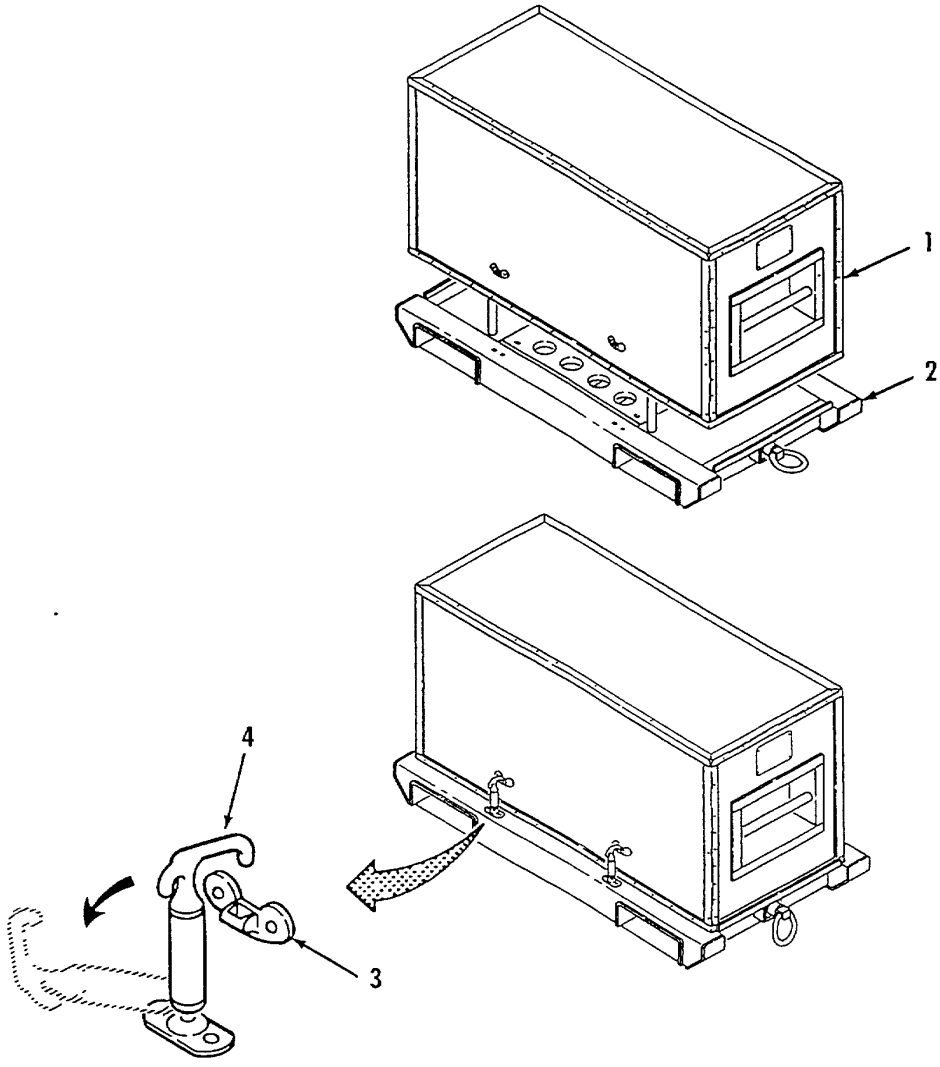


Figure 2-28. Cover Installation.

2-20. PREPARATION FOR MOVEMENT-cont.

i. Fire Extinguisher Removal. Refer to figure 2-29.

(1) Position fire extinguisher (3) in frame (4).

(2) Push down on handle (1) and latch hook (2) onto handle of fire extinguisher (3).

(3) Repeat steps (1) and (2) for two remaining fire extinguishers.

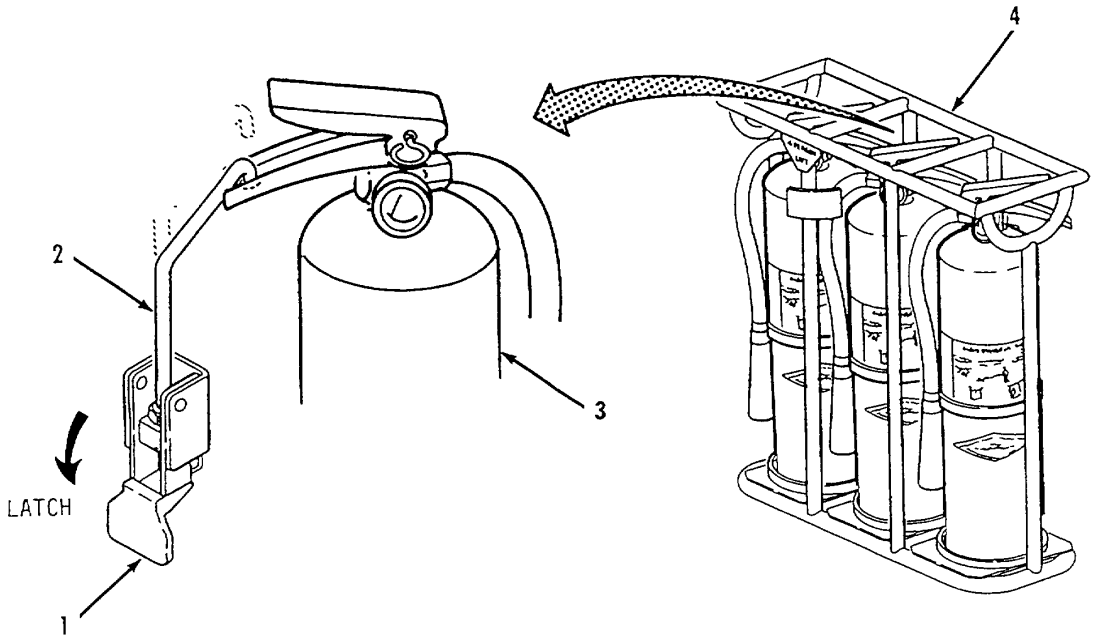


Figure 2-29. Fire Extinguisher Removal.

2-20. PREPARATION FOR MOVEMENT-cont.

j. Packing.

(1) Prepare the filter separator for movement. Refer to TM 10-4330-236-13.

(2) Prepare the 200 GPM pump for movement. Refer to TM 104320-342-10.

(3) Prepare the 500 gallon collapsible drums for movement. Refer to TM 10-8110-203-12&P.

(4) Pack nozzles, wyes and couplings in component carriers.

(5) Roll 2-inch discharge hoses and pack in hose carriers.

(6) Bundle remaining suction hoses. Secure hoses together with straps.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

2-21 OPERATION IN EXTREME HEAT.

Observe the following precautions when operating the fuel system m extreme heat:

WARNNG

- Do not operate fuel system in area of tents or shelters. Inhalation of petroleum fumes and vapors will result in serious illness or death.
- To prevent injury to personnel and damage to the equipment, do not operate the AFARE in ambient temperatures over 95°F.

(1) Shade fuel system components from direct sunlight. Direct sunlight on fuel hoses and drums may increase system fuel pressure resulting in fuel leaks or fuel hose ruptures.

(2) Slide deflector door to open position.

(3) Refer to TM 104320-342-10 for additional precautions to follow when operating the 200 GPM pump in extreme heat.

(4) Refer to TM 10-4330-23613 for additional precautions to follow when operating the 200 GPM filter separator in extreme heat.

2-22. OPERATIONS IN DUSTY OR SANDY AREAS.

Observe the following precautions when operating the AFARE in dusty or sandy areas:

WARNING

Do not operate fuel system in area of tents or shelters. Inhalation of petroleum fumes and vapors will result in serious illness or death.

(1) Make sure dust caps are installed on all open couplings and nozzles.
(2) Do not lay fuel nozzles in dust or sand. Fuel nozzles may pick up dirt and contaminate aircraft fuel system.
(3) Carefully inspect fuel nozzles for accumulations of dust, dirt and sand before connecting to aircraft refueling adapters. Remove contaminants before refueling.

WARNING

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

(4) Following operation in dusty or sandy areas, rinse all system components with cleaning solvent to remove dust, dirt and grit from nozzles and quick disconnect couplings.

2-22. OPERATION IN SANDY OR DUSTY AREAS-cont.

(5) Do not operate 200 GPM pump during dust storms or in blowing sand.

(6) Refer to TM 10-4320-342-10 for additional precautions to follow when operating the 200 GPM pump in dusty or sandy conditions.

(7) Refer to TM 10-4330-236-13 for additional precautions to follow when operating the 200 GPM filter separator in dusty or sandy conditions.

2-23. OPERATION IN SALT WATER AREAS.

Observe the following precautions when operating the AFARE in saltwater areas.

WARNINGS

- Do not operate fuel system in area of tents or shelters. Inhalation of petroleum fumes and vapors will result in serious illness or death.

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

(1) Operation in salt water areas accelerates corrosion on bare metal surfaces. Following operation in salt water areas, rinse components with cleaning solvent to remove salt spray and/or deposits. Do not allow salt water to remain on aluminum components.

(2) Refer to applicable TM 10-4320-342-10 for additional precautions to follow when operating the 200 GPM pump in saltwater areas.

(3) Refer to applicable TM 10-4330-236-13 for additional precautions to follow when operating the 200 GPM filter separator in saltwater areas.

2-24. EMERGENCYPROCEDURES.

WARNINGS

If a fuel spill occurs during refueling, immediately shut down the system, isolate the defective component(s) and clean up spilled fuel m accordance with local procedures. Observe the following safety precautions and warnings to prevent injury to personnel and damage to the equipment:

- Do not allow smoking within 500 feet of fuel spill.
- Wear protective goggles and gloves. Use fuel resistant gloves when handling system components due to toxic effects of some fuel additives. Avoid contact with skin, eyes, and clothes. If fuel contacts eyes, immediately flush eyes with clean fresh water and get medical attention.
- Avoid getting fuel on your body or clothing. Fuel can cause chemical burns on unprotected skin. If clothing becomes saturated with fuel, remove clothing immediately and wash your body with hot soapy water.
- Do not breathe fuel vapors. Refuel only in well-ventilated area. Vapors are toxic and can cause serious illness or death. If dizziness occurs, leave area and get fresh air. Get medical attention.
- Static discharge could ignite the fuel or cause an explosion of the fuel vapor. Cover fuel spill with dry soil to reduce rate of vaporization. Make sure a suitable fire extinguisher is charged and readily available in case of fire.

(1) In the event of a fuel hose rupture or component failure, immediately shut down the AFARE system para (2-17h).
(2) Isolate defective component by closing the nearest upline and downline valves.
(3) Absorb or disperse spilled fuel. Refer to AR 200-1 and local standard operating procedures.
(4) Refer to TM 10-4320-342-10 for additional emergency procedures when operating the 200 GPM pump.
(5) Refer to TM 10-4330-236-13 for additional emergency procedures when operating the 200 GPM filter separator.
(6) Do not operate the AFARE until defective components or fuel leak has been corrected.

2-25. DECONTAMINATION PROCEDURES.

As required, assist the supporting NBC unit m decontaminating the AFARE. Refer to FM 3-3, FM 3-4, and FM 3-5 for detailed decontamination procedures.

CHAPTER 3

OPERATOR MAINTENANCE INSTRUCTIONS

Section I. LUBRICATION INSTRUCTIONS

Lubrication of the AFARE is limited to the 200 GPM pump. Lubricate the pump in accordance with LO 10-4320-342-12.

Section II. OPERATOR TROUBLESHOOTING PROCEDURES

3-1. INTRODUCTION

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

b. This table cannot list all the malfunctions that may occur, all the tests or 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.

c. Refer to the applicable technical manuals for operator troubleshooting procedures on the following equipment.

200 GPM Pump Assembly	TM 10-4320-342-10
Closed Circuit Refueling (CCR) Nozzle and Gravity Fill Adapter	TM 104930-243-13&P
Single Point Refueling Nozzle(D-1 Type)	TM 10-4930-242-13&P
500 Gallon Collapsible Drum	TM 10-8110-203-12&P
200 GPM Fuel Filter Separator	TM 10-4330-236-13

3-2. MALFUNCTION INDEX

3-3. TROUBLESHOOTING PROCEDURES.

Refer to table 3-1 for Operator Troubleshooting instructions.

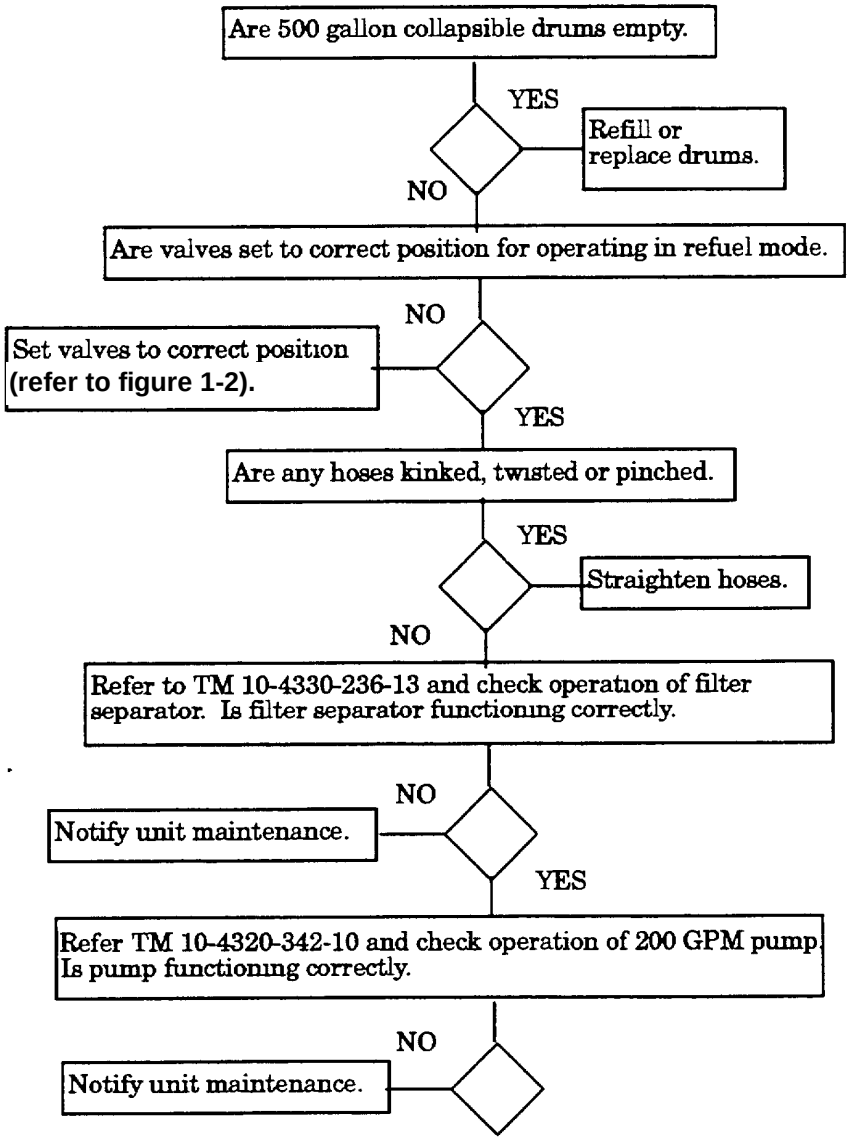
3-3. TROUBLESHOOTING PROCEDURES-cont.

Table 3-1. Operator Troubleshooting.

WARNING

Be sure to read ALL Warnings in front of tins manual before troubleshooting.

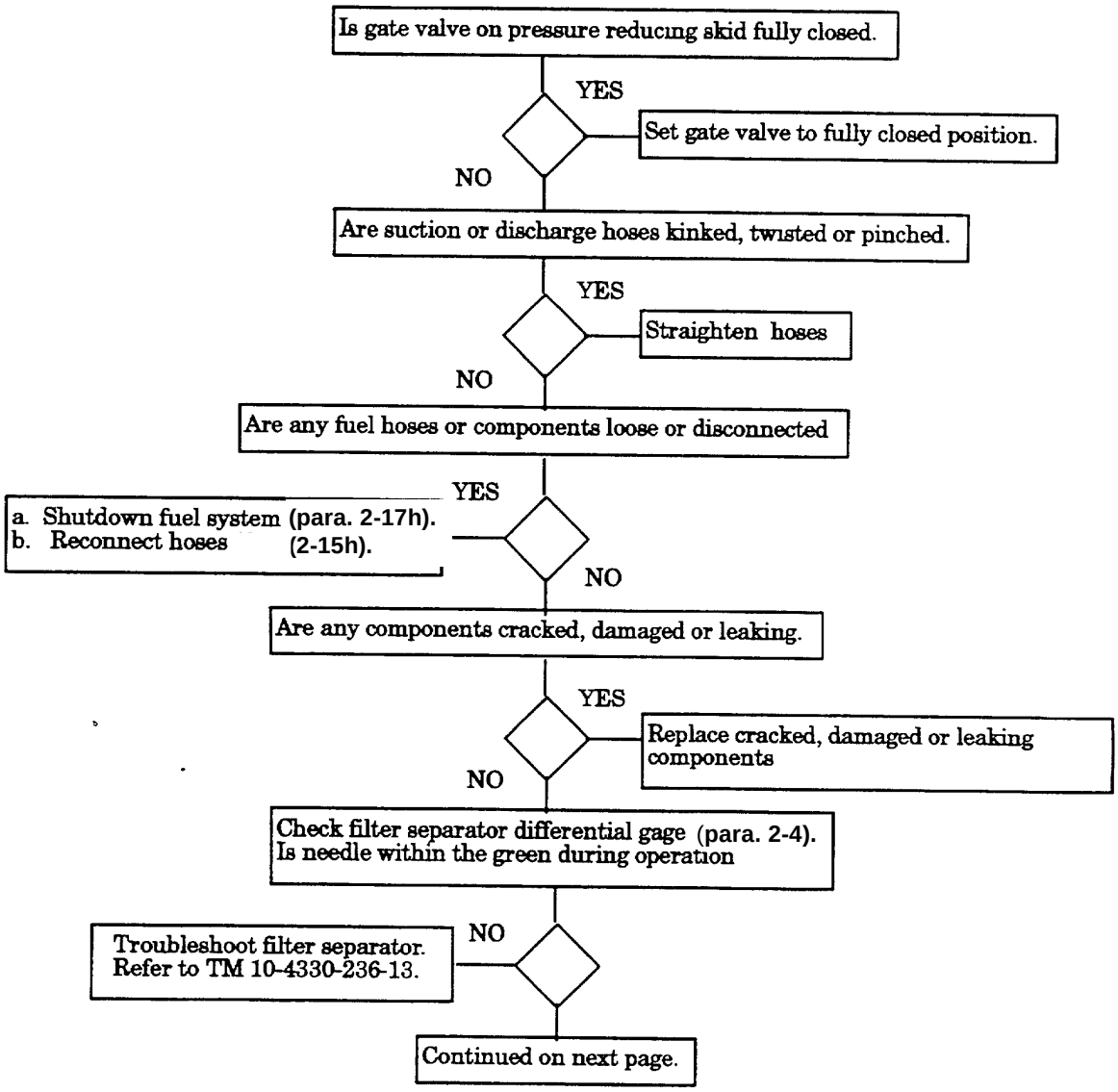
MALFUNCTION 1. NO FUEL FLOW TO REFUELING POINT(S) (DEFUEL MODE).



3-3. TROUBLESHOOTING PROCEDURES-cont.

Table 3-1. Operator Troubleshooting-cont.

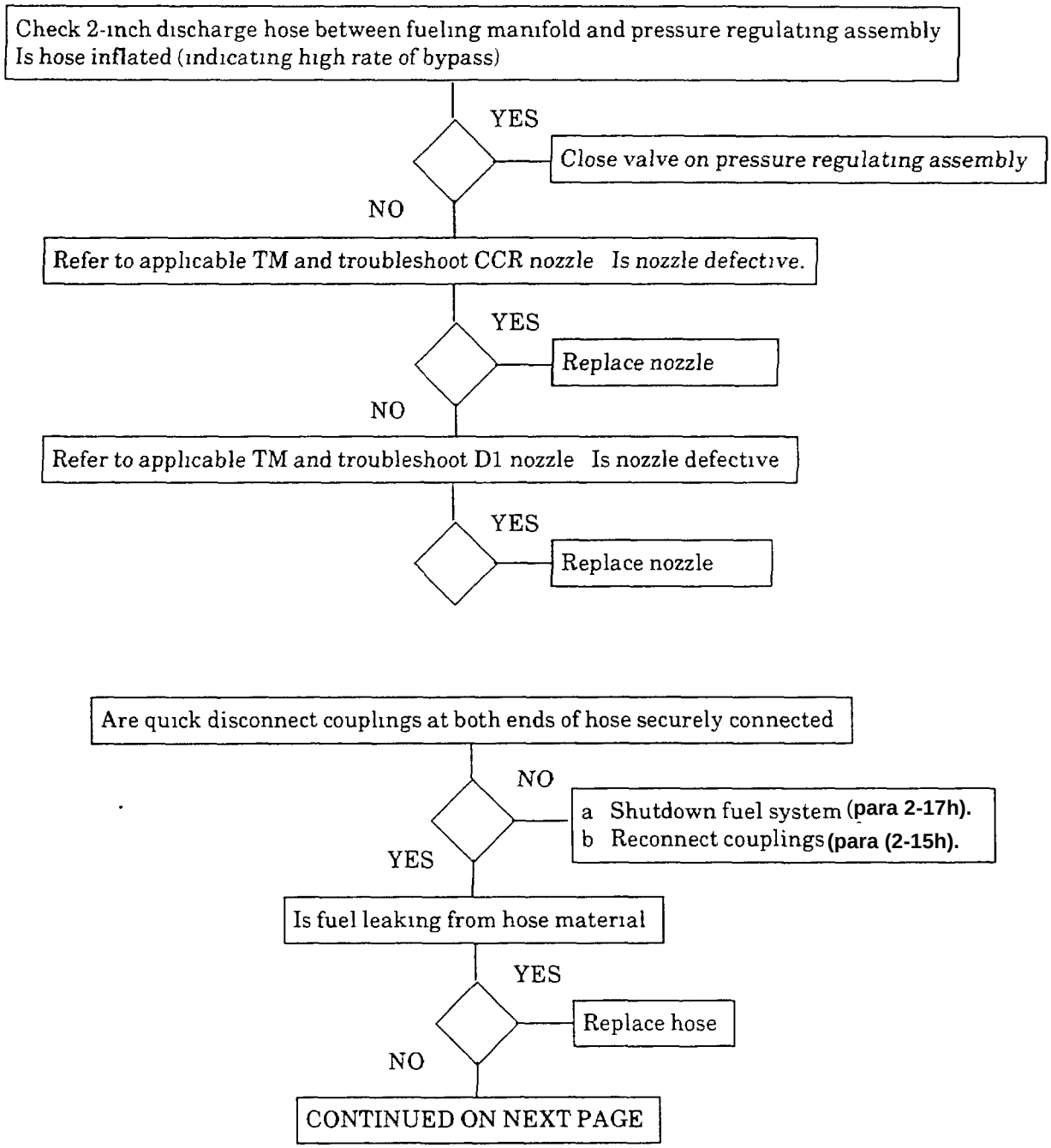
MALFUNCTION 2. LOW FUEL PRESSURE AT REFUELING POINT.



3-3. TROUBLESHOOTING PROCEDURES-cont

Table 3-1 Operator Troubleshooting-cont.

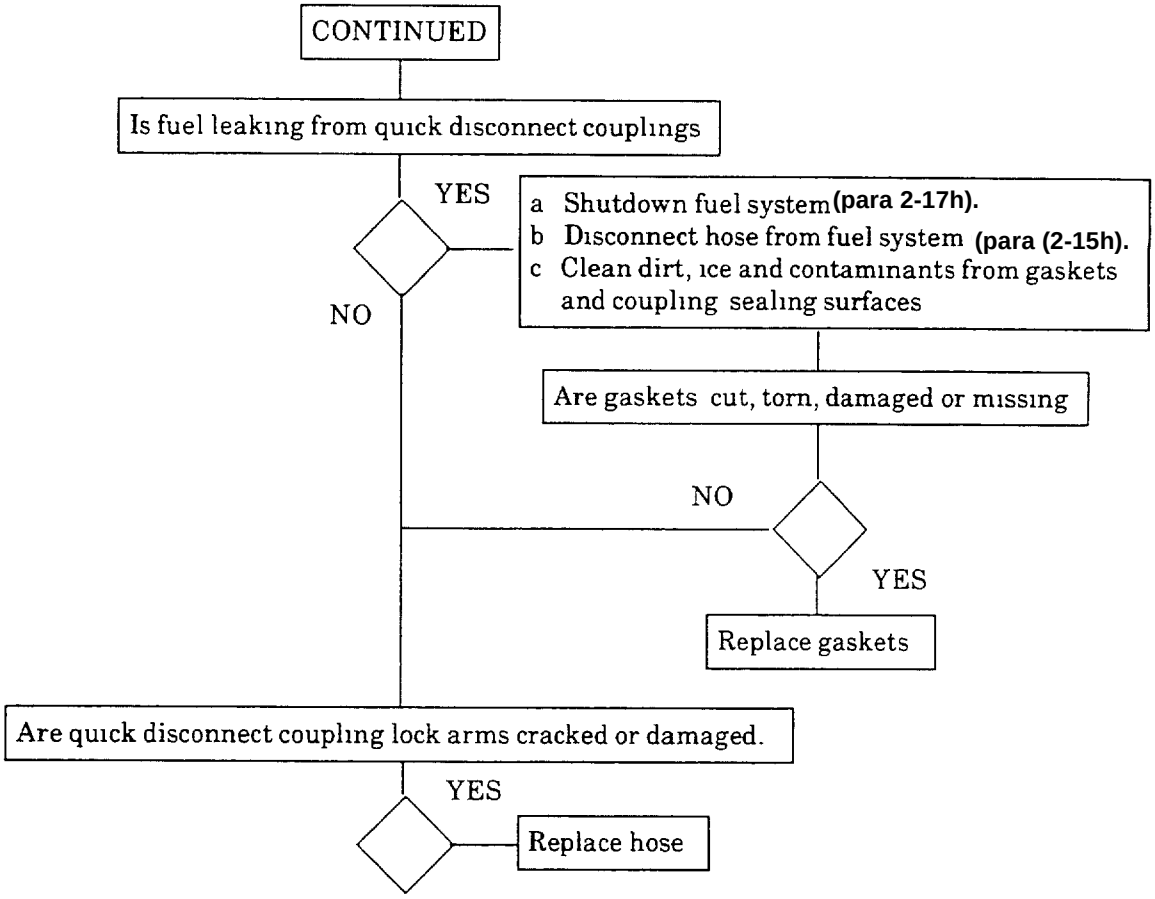
MALFUNCTION 2. LOW FUEL PRESSURE AT REFUELING POINT-cont.



3-3. TROUBLESHOOTING PROCEDURES-cont.

Table 3-1. Operator Troubleshooting-cont

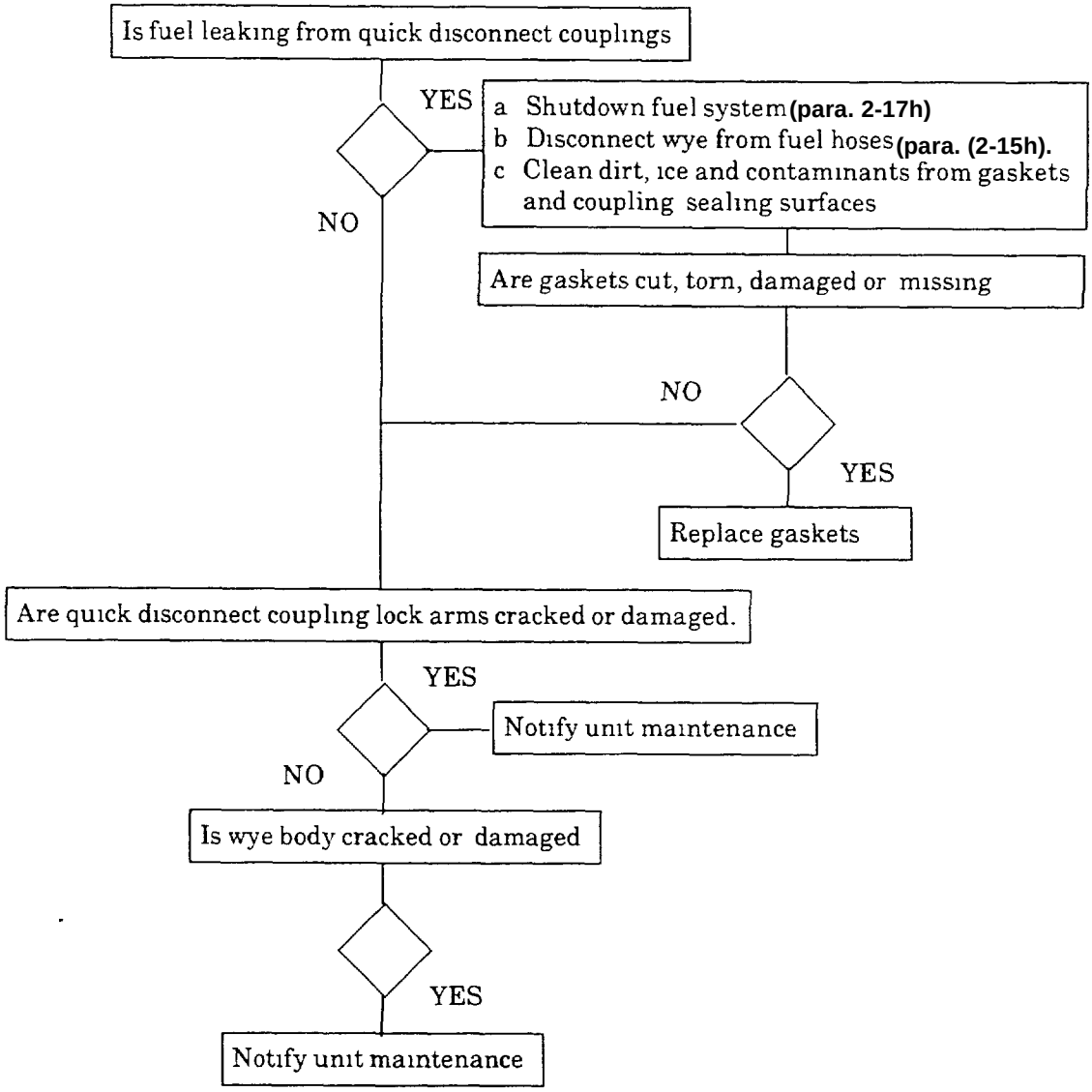
MALFUNCTION 3. FUEL HOSE ASSEMBLIES LEAK-cont .



3-3. TROUBLESHOOTING PROCEDURES-cont.

Table 3-1. Operator Troubleshooting-cont

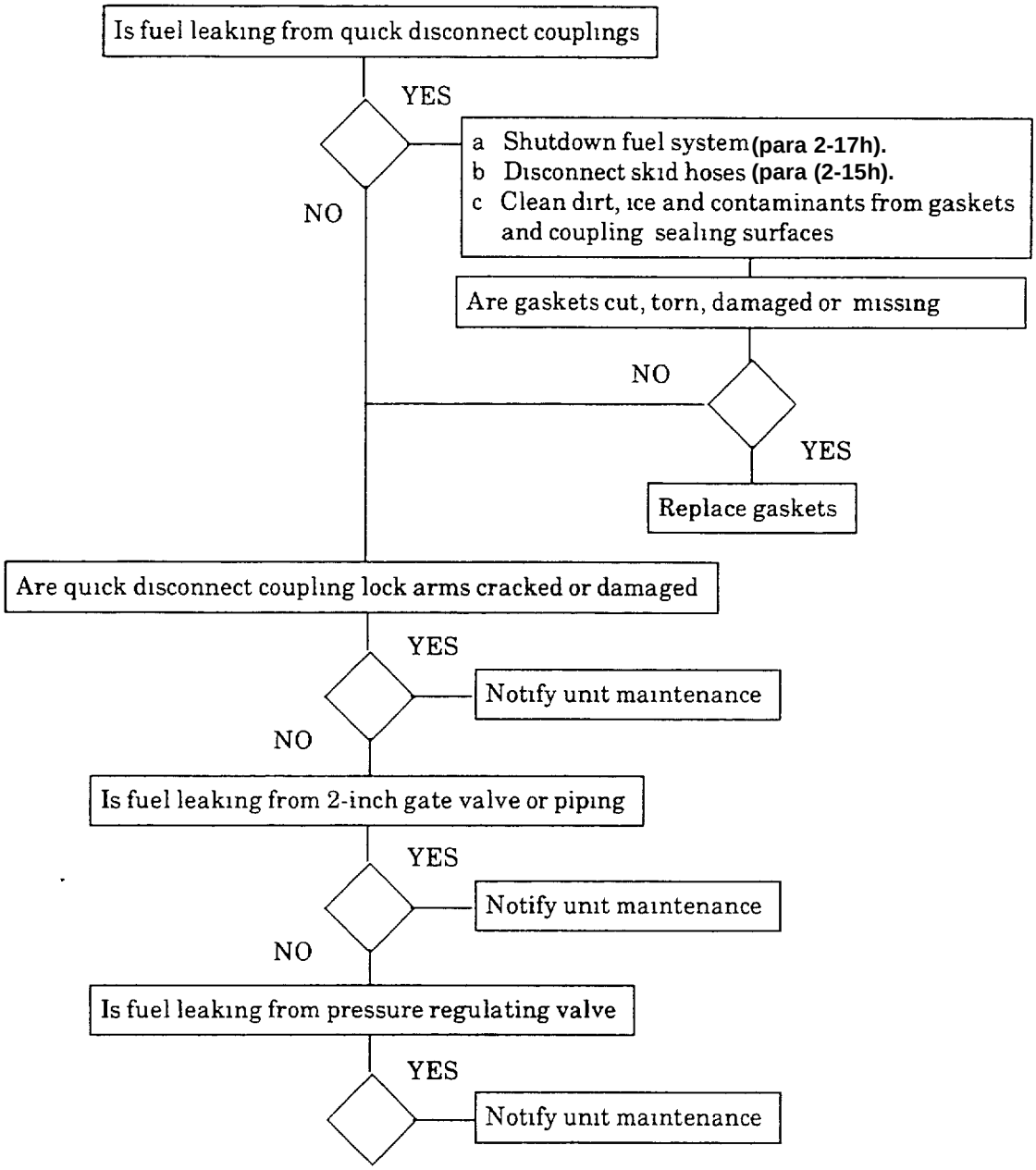
MALFUNCTION 4. WYE ASSEMBLY LEAKS.



3-3. TROUBLESHOOTING PROCEDURES-cont.

Table 3-1. Operator Troubleshooting-cont.

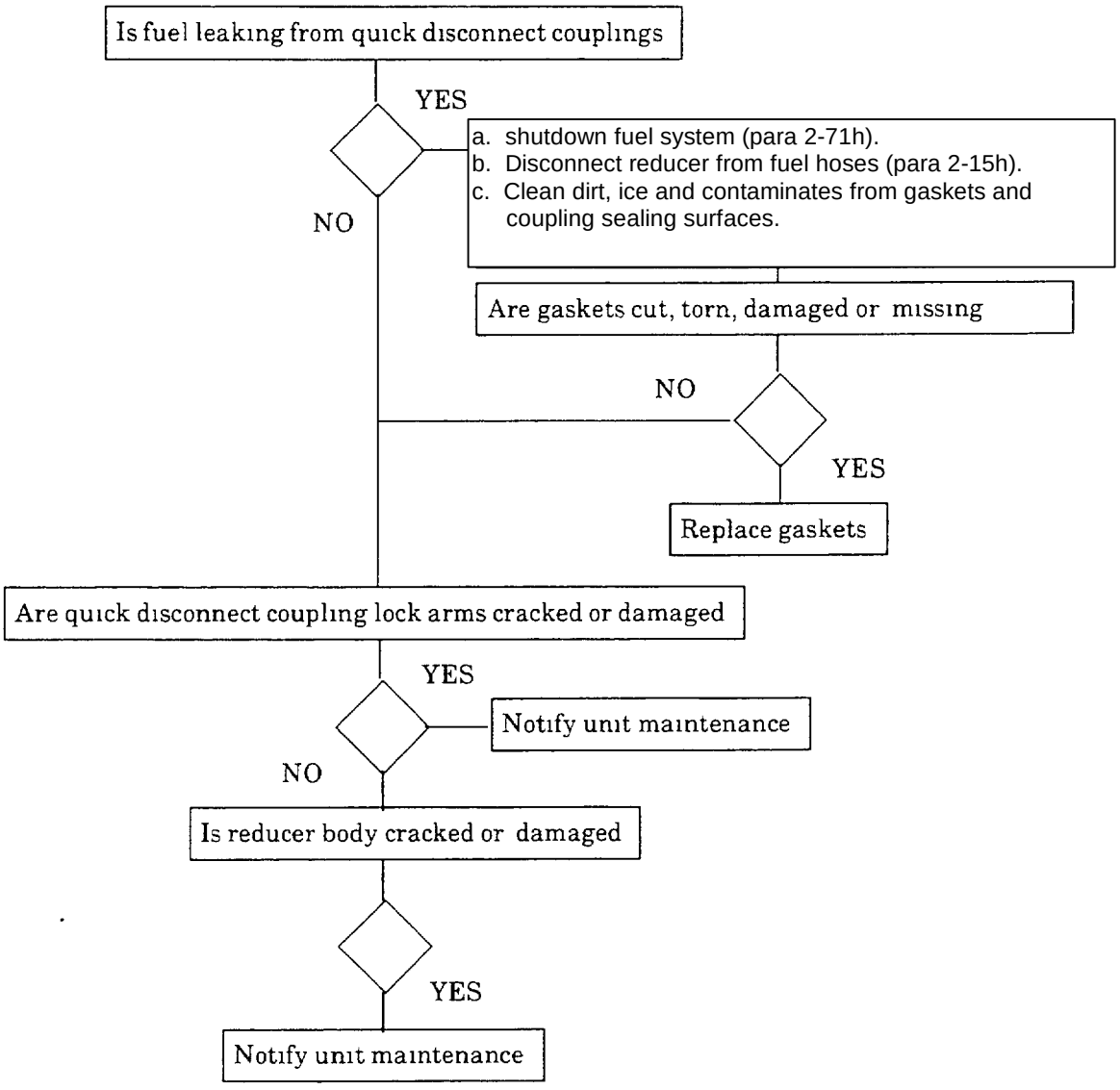
MALFUNCTION 5. WYE ASSEMBLY LEAKS.



3-3. TROUBLESHOOTING PROCEDURES-cont.

Table 3-1 Operator Troubleshooting-cont

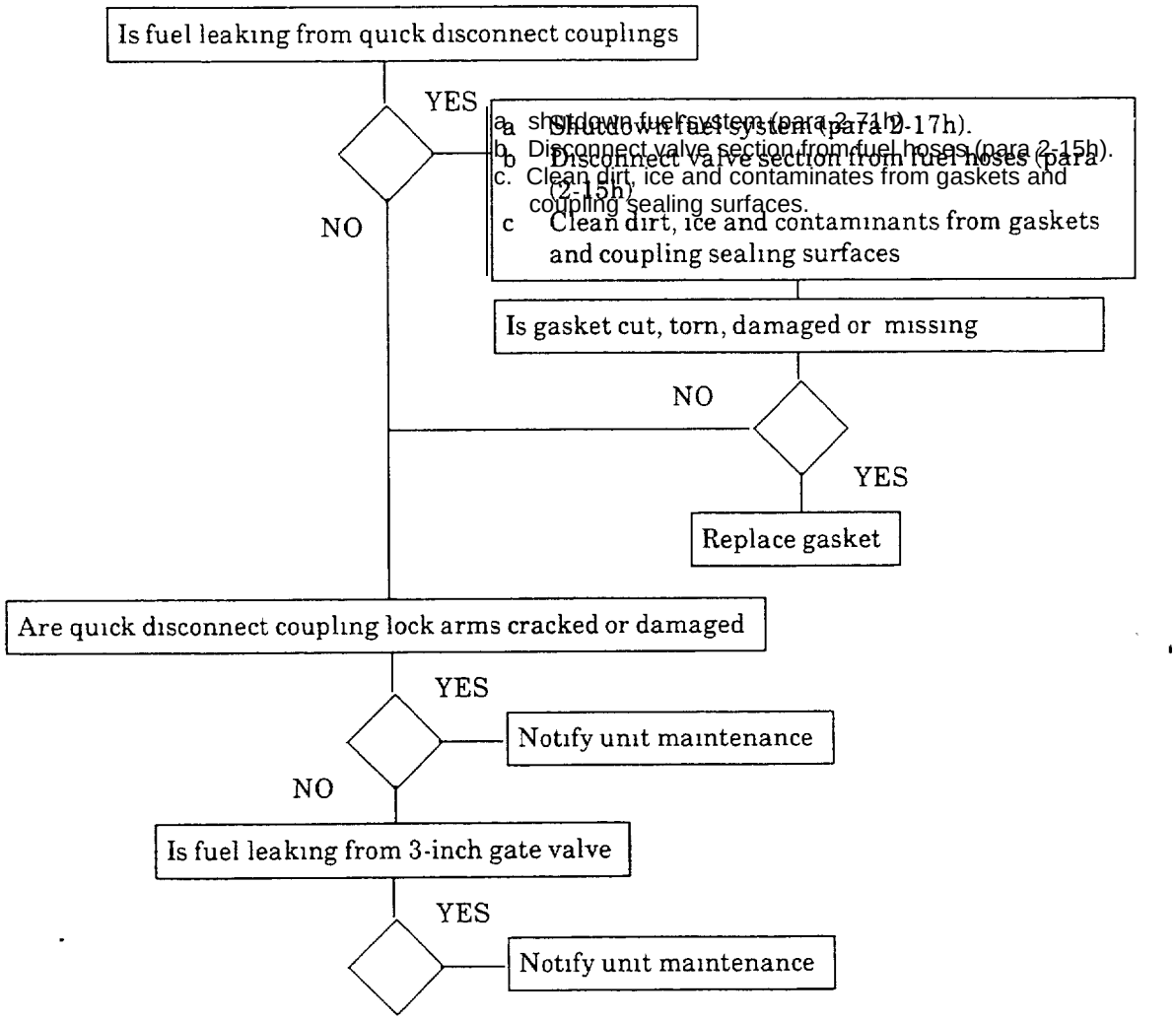
MALFUNCTION 6. REDUCER ASSEMBLY LEAKS.



3-3. TROUBLESHOOTING PROCEDURES-cont.

Table 3-1 Operator Troubleshooting-cont

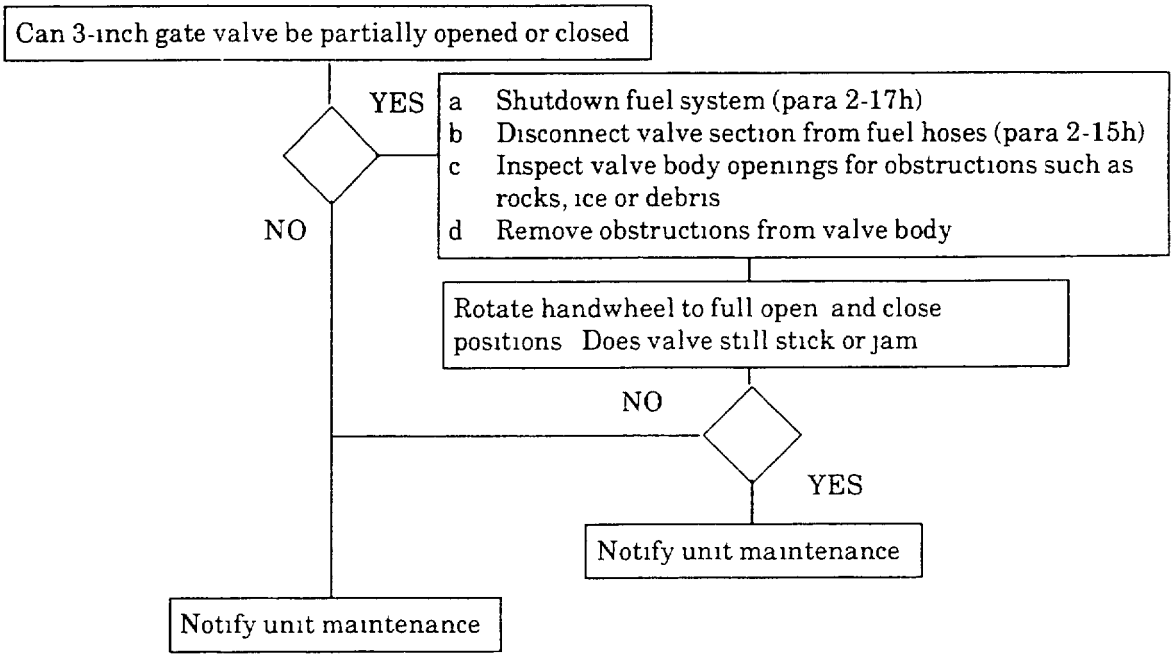
MALFUNCTION 7. VALVE SECTION LEAKS.



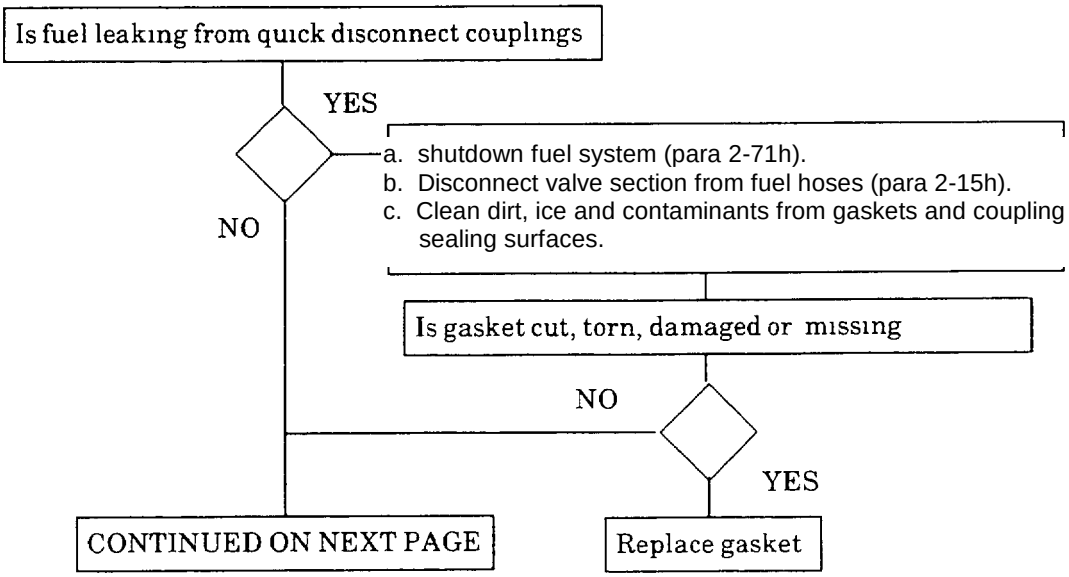
3-3. TROUBLESHOOTING PROCEDURES-cont.

Table 3-1. Operator Troubleshooting-cont

MALFUNCTION 8. VALVE SECTION STUCK OR JAMMED.



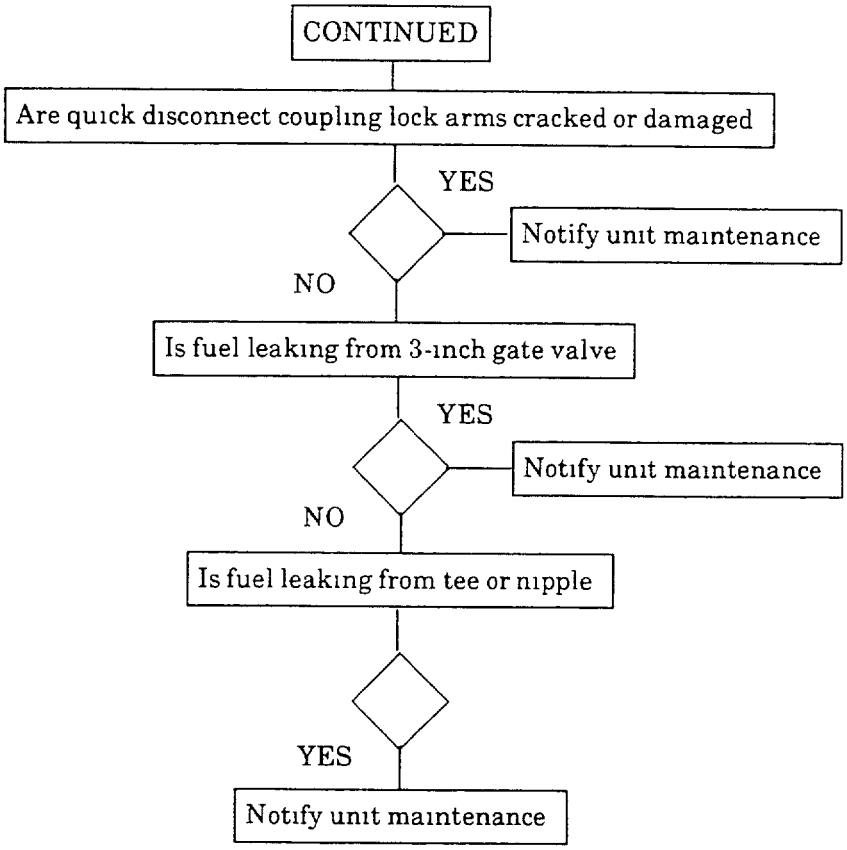
MALFUNCTION 9. 3-INCH MANIFOLD LEAKS.



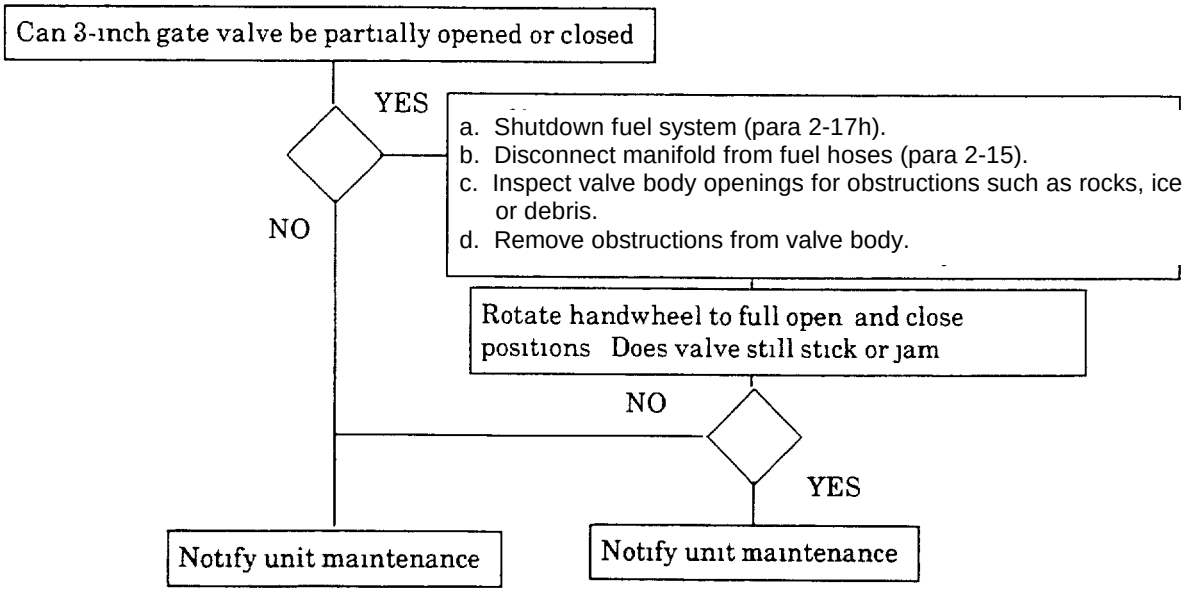
3-3. TROUBLESHOOTING PROCEDURES-cont.

Table 3-1 Operator Troubleshooting-cont

MALFUNCTION 9. 3-INCH MANIFOLD LEAKS-cont.



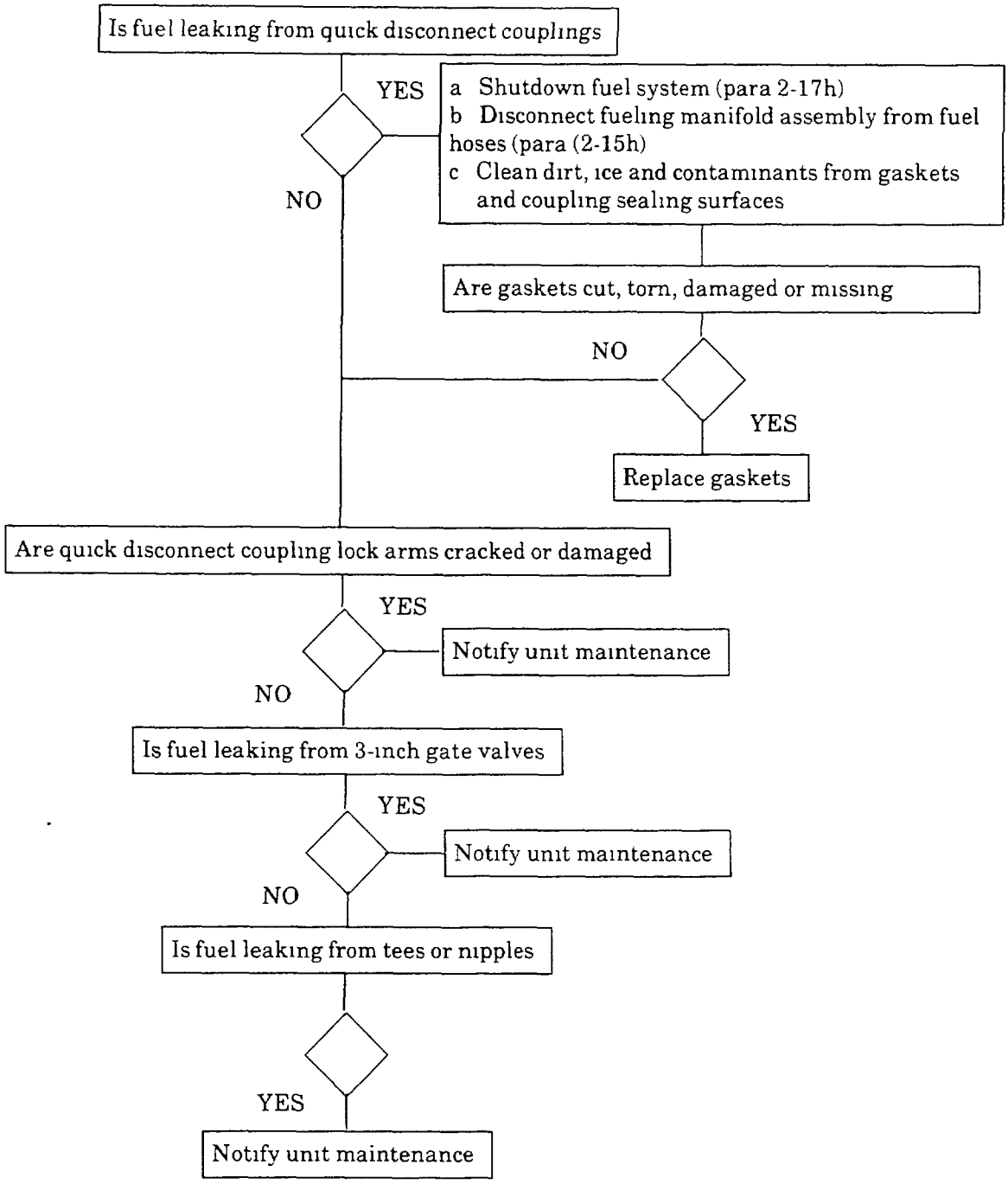
MALFUNCTION 10. 3-INCH MANIFOLD STUCK OR JAMMED.



3-3. TROUBLESHOOTING PROCEDURES-cont.

Table 3-1. Operator Troubleshooting-cont.

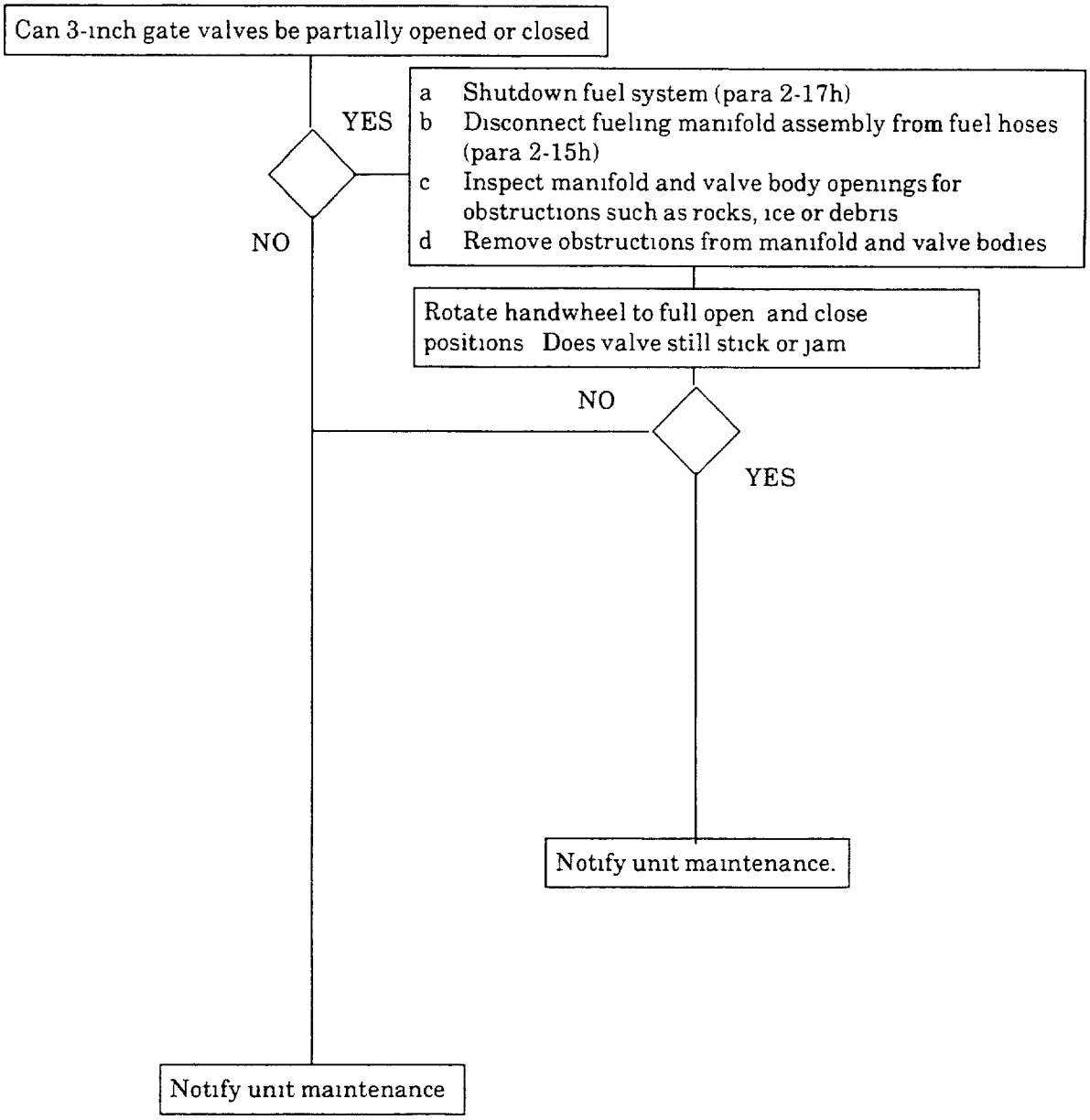
MALFUNCTION 11. FUELING MANIFOLD ASSEMBLY LEAKS.



3-3. TROUBLESHOOTING PROCEDURES-cont.

Table 3-1 Operator Troubleshooting-cont.

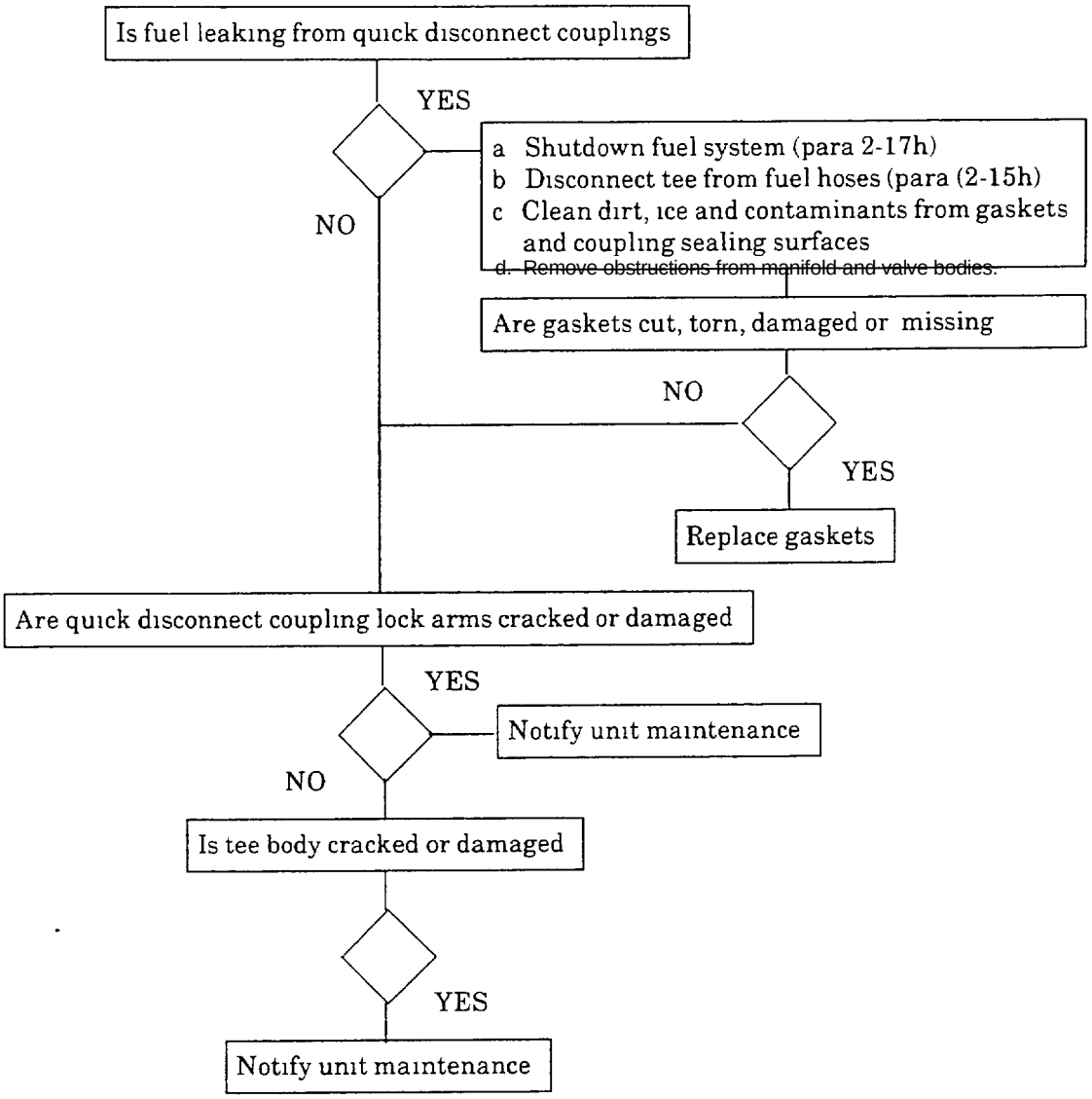
MALFUNCTION 12. FUELING MANIFOLD ASSEMBLY STUCK OR JAMMED.



3-3. TROUBLESHOOTING PROCEDURES-cont.

Table 3-1 Operator Troubleshooting-cont.

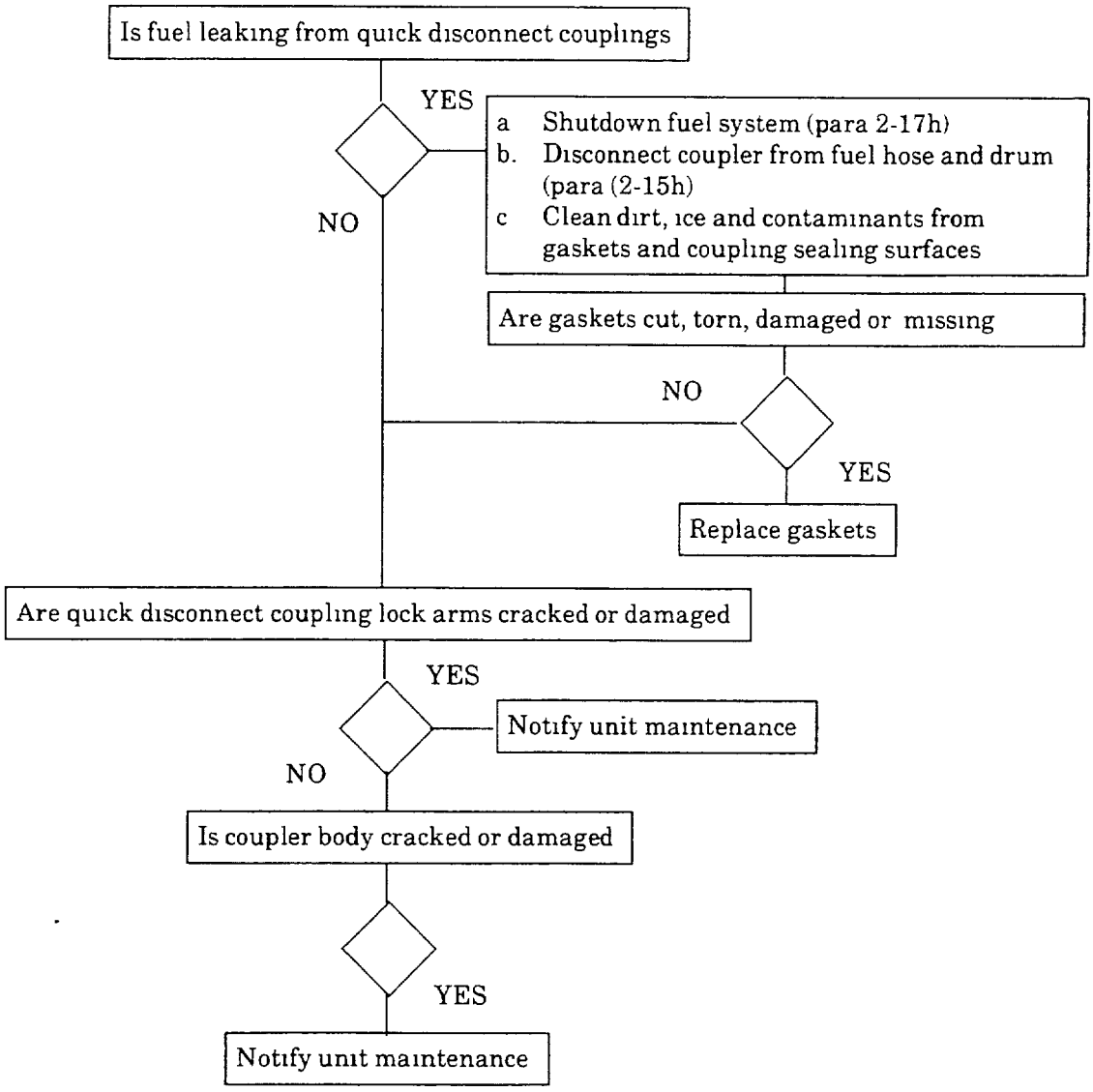
MALFUNCTION 13. TEE ASSEMBLY LEAKS.



3-3. TROUBLESHOOTING PROCEDURES-cont.

Table 3-1. Operator Troubleshooting-cont.

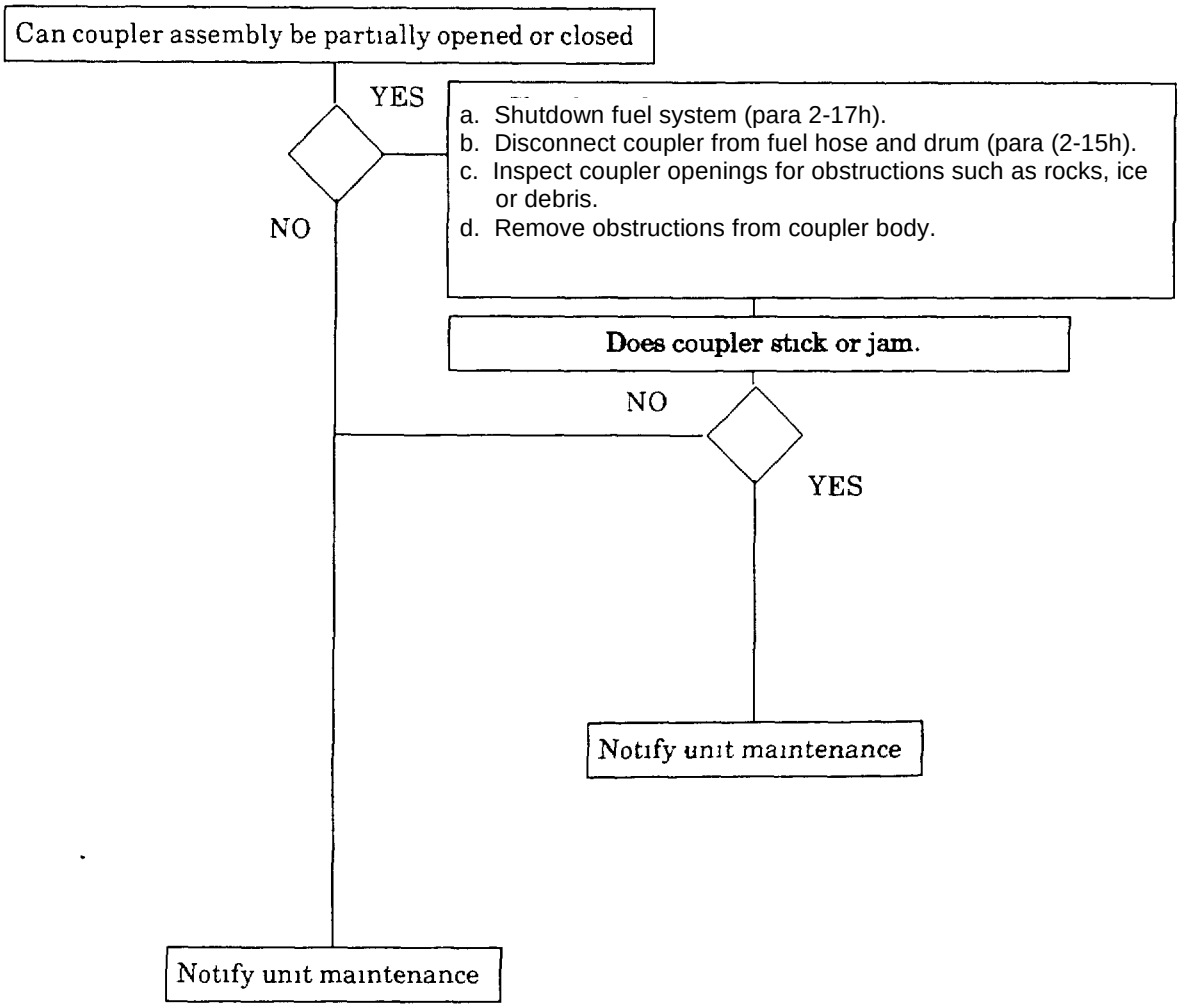
MALFUNCTION 14. COUPLER ASSEMBLY LEAKS.



3-3. TROUBLESHOOTING PROCEDURES-cont.

Table 3-1 Operator Troubleshooting-cont

MALFUNCTION 15. COUPLER ASSEMBLY STUCK OR JAMMED.



SECTION III. OPERATOR MAINTENANCE PROCEDURES

Operator maintenance on the AFARE consists of only those tasks and procedures identified In the Operator's Preventive Maintenance Checks and Services (PMCS) chart Refer to the operator's PMCS chart and perform all tasks at the intervals specified.

CHAPTER 4
UNIT MAINTENANCE INSTRUCTIONS

SECTION I REPAIR PARTS, SPECIAL TOOLS, TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE), AND SUPPORT EQUIPMENT

4-1. COMMON TOOLS AND EQUIPMENT.

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE), CTA 50-970 or CTA 8-100, applicable to your unit. The General Mechanics Tools Kit, SC5180-90-CL-N26, is authorized for your use.

4-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

Refer to the Maintenance Allocation Chart contained in Appendix B for maintenance tasks authorized at unit level maintenance and the TMDE and support equipment required to perform these tasks. Special tools required to maintain the AFARE components are listed in Appendix B, Section III.

4-3. REPAIR PARTS.

Repair parts are listed and illustrated in TM10-4930-240-23P, Repair Parts and Special Tools List for Unit and Direct Support Maintenance.

SECTION II. SERVICE UPON RECEIPT

4-4. SITING.

a. Transport. The AFARE is designed to be packaged and transported by truck or aircraft. Secure AFARE components to the transport vehicle before movement.

b. Site Selection. When selecting a site for installation of the fuel system, consider the overall operating area Siting must include access to the aircraft staging area and provide adequate space to set up the system and space for movement of tankers (minimum space required 100 x 300 feet). Site should be level, free of overhead obstructions and provide good drainage to prevent water damage. Avoid low areas where fuel vapors can collect. To prevent a hazard to personnel and equipment, site must be located downhill or downstream from other installations. For addition siting information, refer to FM 10-68 and FM10-69.

4-5. SHELTER REQUIREMENTS.

The fuel system does not require special sheltering during normal operation. Store unused fuel system components in a storage van or shelter to prevent damage and minimize routine maintenance.

4-6. CHECKING UNPACKED EQUIPMENT.

a. Unpacking Fuel System Equipment. Components of the AFARE are packaged and shipped in cardboard boxes or crates. Where possible, save packaging materials for reuse. Use care when unpacking to prevent damage to fragile components. This manual addresses installation and use of all components, but you may not need to unpack all of them to perform your mission.

Refer to the applicable technical manuals for unpacking instructions for the following equipment:

200 GPM Pump Assembly	TM 10-4320-342-24
Closed Circuit Refueling (CCR) Nozzle and Gravity Fill Adapter	TM 10-4930-243-13&P
Single Point Refueling Nozzle(D-1 Type)	TM 10-4930-242-13&P
500 Gallon Collapsible Drum	TM 10-8110-203-12&P
200 GPM Fuel Filter Separator	TM 10-4330-236-13

4-6. CHECKING UNPACKED EQUIPMENT-cont

b. Processing Unpacked Equipment

(1) Remove all tape, paper wrapping, plastic sheeting and packing materials from the AFARE-components

(2) Inspect stencils, markings and information plates. All items should be clear and readable.

(3) Inspect all components to make sure they are in serviceable condition

(4) Inspect the equipment for any damage incurred during shipment If the equipment has been damaged,
report the damage on SF 364, Report of Discrepancy.

(5) Check equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.

(6) Check to see if the equipment has been modified.

SECTION III. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4-7. GENERAL.

To ensure that the AFARE is ready for use at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or equipment failure.

4-8. PMCS PROCEDURES.

a. Your Preventive Maintenance Checks and Services, Table 4-1, lists inspections and care required to keep your equipment in good operating condition.

b. The "INTERVAL" column of Table 4-1 tells you when to do a certain check or service.

c. The "LOCATION, ITEM TO CHECK/SERVICE" column of Table 4-1 tells you the name of the item to be checked or serviced and where the item is located.

d. The "PROCEDURE" column of Table 4-1 tells you how perform the required checks and services. Follow these instructions carefully

4-9. PMCS TABLE.

The necessary preventive maintenance services to be performed are listed and described in Table 4-1. Defects discovered during operation of the system should be corrected as soon as possible. All deficiencies and shortcomings will be recorded, together with the corrective action taken, on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) as soon as possible.

Table 4-1. Unit Preventive Maintenance Checks and Services for Model AFARE100.

Item	Interval	Location Item to Check/Service	Procedure
1	Monthly	CCR Nozzle	Perform unit PMCS procedures at the intervals specified in TM 10-4930-243-13&P
2	Monthly	Filter Separator	Perform unit PMCS procedures at the intervals specified in TM 10-4330-236-13
3	Monthly	200 Gpm Pump	Perform unit PMCS procedures at the intervals specified in TM 10-4320-342-24.
4	Monthly	500 Gallon Collapsible Drums	Perform unit PMCS procedures at the intervals specified in TM 10-8110-203-12&P
5	Monthly	Single Point Refueling Nozzle (D1)	Perform unit PMCS procedures at the intervals specified in TM 10-4930-242-13&P

SECTION IV. UNIT TROUBLESHOOTING PROCEDURES

4-10. INTRODUCTION.

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

b. This table cannot list all the malfunctions that may occur, all the tests or 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.

c. Refer to the referenced technical manuals for operator troubleshooting procedures on the following equipment:

200 GPM Pump Assembly	TM 10-4320-342-24
Closed Circuit Refueling (CCR) Nozzle and Gravity Fill Adapter	TM 10-4930-243-13&P
Single Point Refueling Nozzle(D-1 Type)	TM 10-4930-242-13&P
500 Gallon Collapsible Drum	TM 10-8110-203-12&P
200 GPM Fuel Filter Separator	TM 10-4330-236-13

SECTION V. UNIT MAINTENANCE PROCEDURES

4-11. INTRODUCTION.

This section contains instructions for performing Unit level maintenance on the Arctic Forward Area Refueling Equipment. (AFARE).

4-12. DISCHARGE AND SUCTION HOSE REPAIR (TYPICAL).

NOTE

The following procedure applies to all sizes and lengths of discharge and suction hoses used in the fuel system.

This task consists of a. Disassembly b. Cleaning c. Repair d. Assembly

INITIAL SET-UP:

Tools:		Gasket (2)	(Item 1, App J)
General Mech Tool Kit (App B, Sect III, Item 1)		Strapping (A/R)	(Item 2, App J)
Clamping Tool (App B, Sect III, Item 3)		Seal (4)	(Item 3, App J)
Equipment Condition:		Gasket (2)	(Item 4, App J)
Hose assembly removed (para 2-20)		Strapping (A/R)	(Item 5, App J)
Material/Parts:		Seal (4)	(Item 6, App J)
Cleaning Solvent	(Item 1, App E)		
Wiping Rag	(Item 2, App E)		

NOTE

Ensure that all parts identified as mandatory replacement parts are discarded and replaced with new components Disassemble hoses only to the level required to make repairs

a. Disassembly. Refer to figure 4-1.

(1) Disconnect split ring (1), chain (2) and split ring (3) from dust plug (4).

(2) Remove dust plug (4) from female coupling (6).

(3) Remove gasket (5) from female coupling (6).

(4) Disconnect split ring (7), chain (8) and split ring (9) from dust cap (10).

(5) Remove dust cap (10) from male coupling (12).

(6) Remove gasket (11) from dust cap (10).

(7) Cut strapping (13 and 14) from hose (17) Pull female coupling (6) from hose.

(8) Cut strapping (15 and 16) from hose (17) Pull male coupling (12) from hose.

4-12. DISCHARGE AND SUCTION HOSE REPAIR (TYPICAL)-cont

b. Cleaning

WARNING

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

Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

c. Repair. Replace damaged components Do not reuse coupling gaskets (5 and 11).

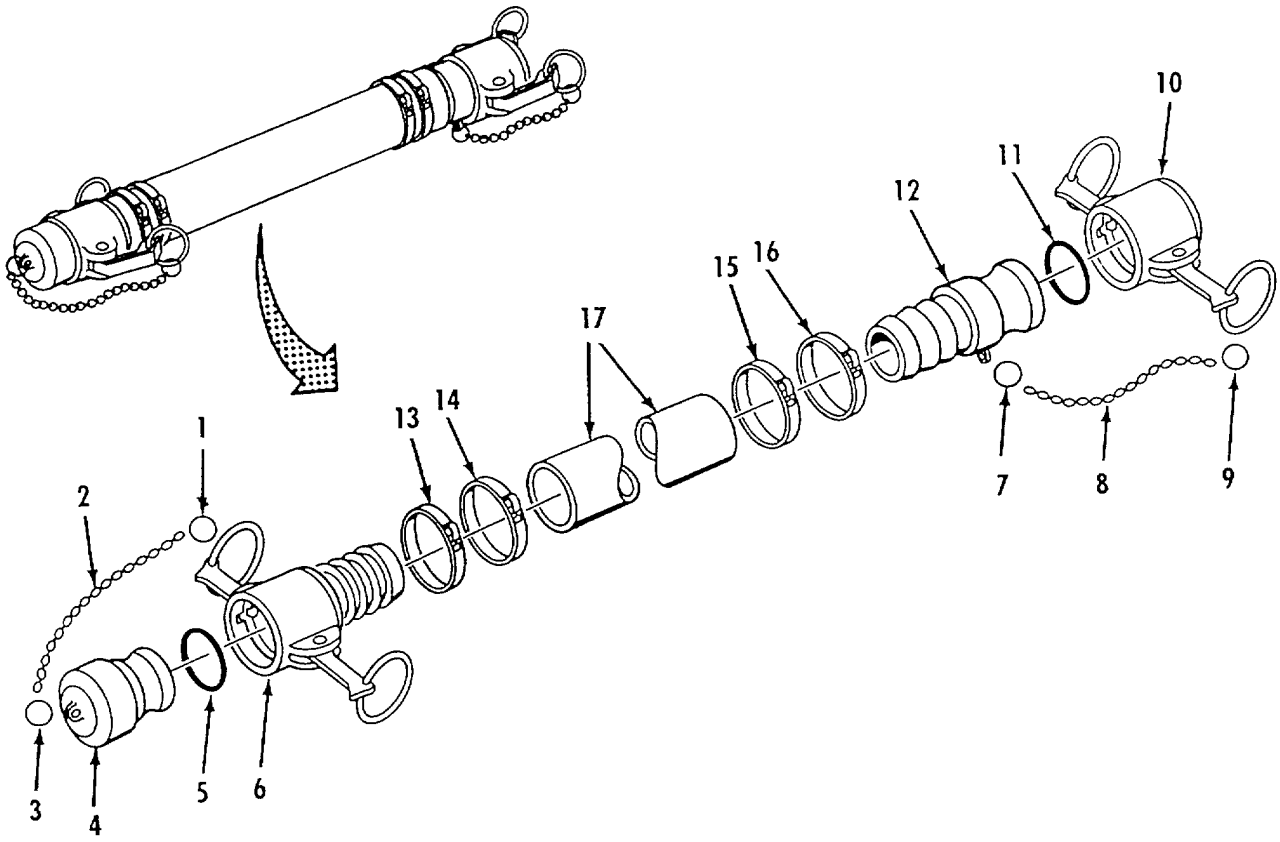


Figure 4-1. Discharge and Suction Hose Disassembly.

4-12. DISCHARGE AND SUCTION HOSE REPAIR (TYPICAL)-cont

d. Assembly

(1) Push male coupling (12, figure 4-1) and female coupling (6) into hose (17).

NOTE
Strapping and seals are supplied in the accessory kit.

(2) Cut a piece of strapping (1, figure 4-2) 36 inches long.

(3) Slide seal (2) onto strapping (1) as shown Bend end of strapping under seal.

(4) Wrap other end of strapping (1) around hose (3) and through seal (2) Position strapping on hose about 1 Inch from end of coupling.

(5) Wrap another loop of strapping (1) around hose (3) and through seal (2).

(6) Position strapping (1) In slots of clamping tool (4). Tool nose (5) should fit snug against seal (2).

(7) Apply pressure to gripper lever (6) and turn handle (7) until strapping (1) is snug. Tool will lock In place when correct tension Is applied Reposition tool as required.

CAUTION
Strapping can damage hose if over tightened.

(8) Turn handle (7) clockwise to tighten strapping (1) Continue turning handle until strapping stops moving through seal (2).

CAUTION
Strapping may break if operator does not release tension on handle when bending over seal.

(9) While reversing handle (7) 3/4 turn, roll tool (4) to opposite side of seal (2) (This will bend strapping and prevent it from slipping through seal when tool is removed).

(10) Pull cutting handle (8) on tool to cut strapping (1).

(11) Remove tool (4) while holding tag end of strapping down on seal (2) with thumb.

(12) Clinch tag end of strapping (1) by hammering down tabs of seal (2) over strapping.

(13) Repeat steps (2) through (12) for three remaining straps Straps should be spaced 1-inch from end of coupling and 1-inch apart.

4-12. DISCHARGE AND SUCTION HOSE REPAIR (TYPICAL)-cont

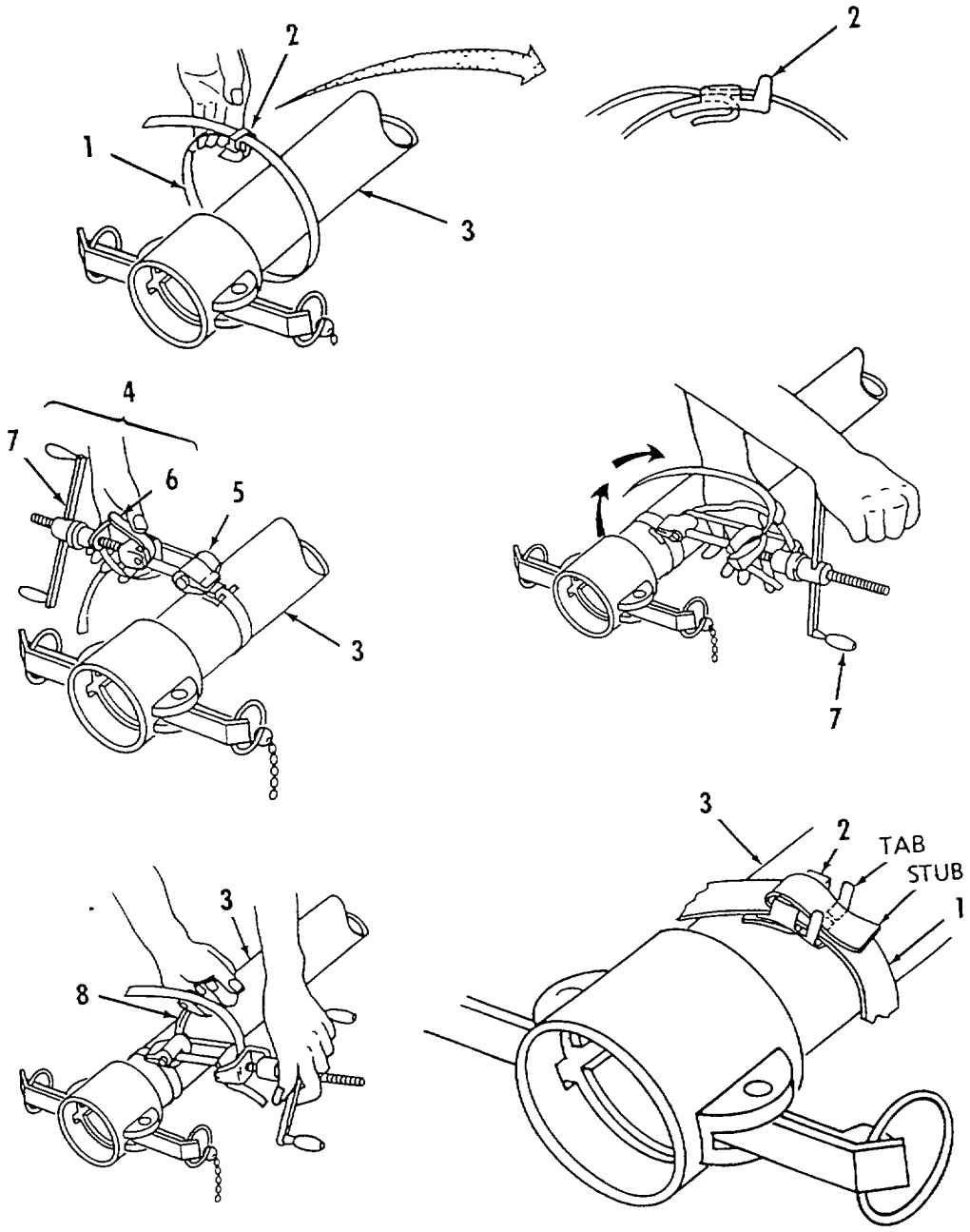


Figure 4-2. Strapping and Seal Installation.

4-12. DISCHARGE AND SUCTION HOSE REPAIR (TYPICAL)-cont

CAUTIONS

- To prevent premature failure of hose assembly, gaskets certified for arctic service must be installed If a new dust cap or female coupling has been installed, remove and discard black gaskets supplied with the new components and replace them with **arctic service gaskets**.
- Ensure gasket is fully seated in gasket seat of coupling/dust cap to prevent leaks In assembled components.

(14) Install gasket (5, figure 4-3) in female coupling (6).

(15) Install gasket (11) in dust cap (10).

(16) Connect split ring (9), chain (8) and split ring (7) to dust cap (10) and male coupling (12).

(17) Connect split ring (1), chain (2) and split ring (3) to dust plug (4) on female coupling (6).

(18) Install dust plug (4) in female coupling (6).

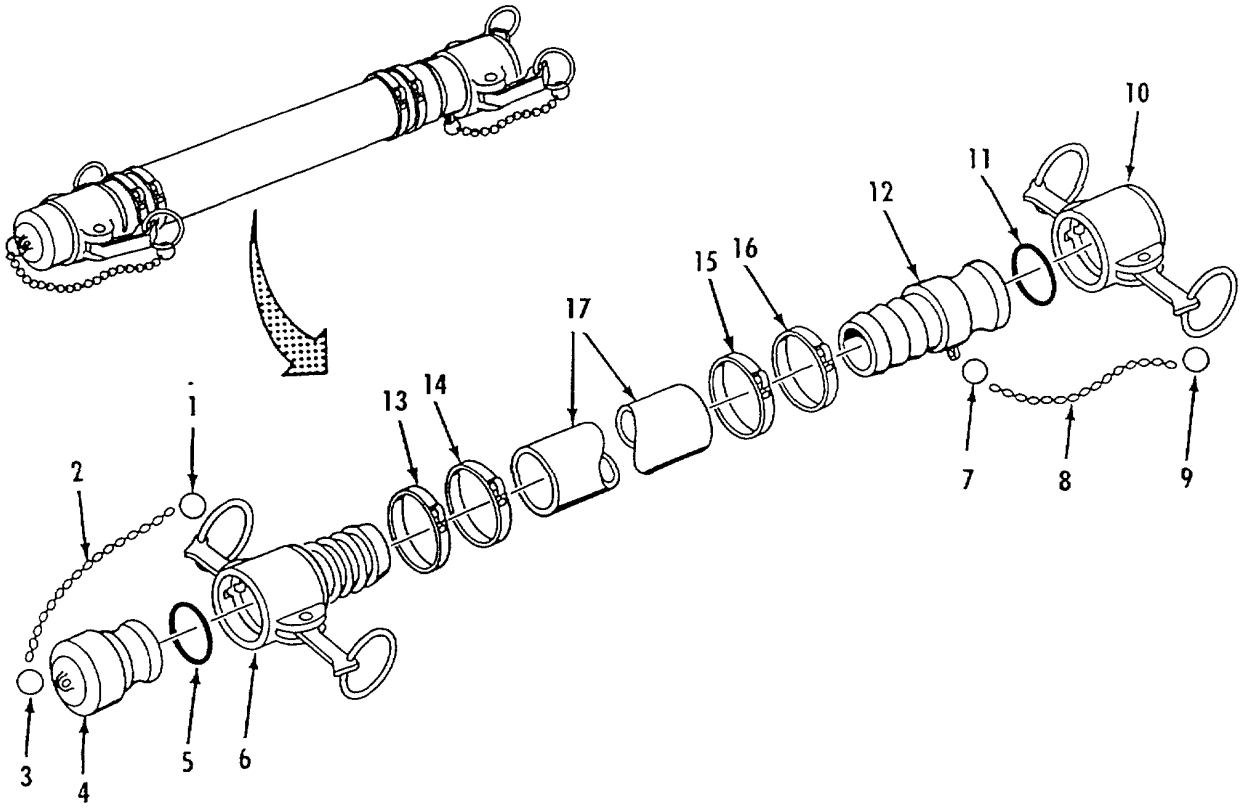


Figure 4-3. Discharge and Suction Hose Assembly.

4-13. WYE ASSEMBLY REPAIR.

This task covers:

a. Disassembly **b. Cleaning**

c. Repair **d. Assembly**

INITIAL SETUP:

Tools:	**Material/Parts:**
General Mech. Tool Kit (App B, Sect III, Item 1)	Cleaning Solvent (Item 1, App E)
Equipment Condition:	Wiping Rag (Item 2, App E)
Wye assembly removed (para 2-20)	Coupling Gasket (3) (Item 1, App J)

NOTE

Ensure that all parts Identified as mandatory replacement parts are discarded and replaced with new components Disassemble hoses only to the level required to make repairs.

a. Disassembly. Refer to figure 4-4.

(1) Disconnect chain (1) from split rings (2 and 5).

(2) Disconnect chain (3) from split rings (4 and 5).

(3) Disconnect chain (6) from split rings (7 and 8).

(4) Remove dust cap (9) from body (15).

(5) Remove gasket (10) from dust cap (9).

(6) Remove dust plug (11) from body (15).

(7) Remove gasket (12) from female coupling on body (15).

(8) Remove dust cap (14) from body (15).

(9) Remove gasket (13) from dust cap (14).

b. Cleaning

WARNING

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

Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

4-13. WYE ASSEMBLY REPAIR - cont.

c. Repair. Replace damaged or defective components. Do not reuse coupling gaskets (10, 12 and 13).

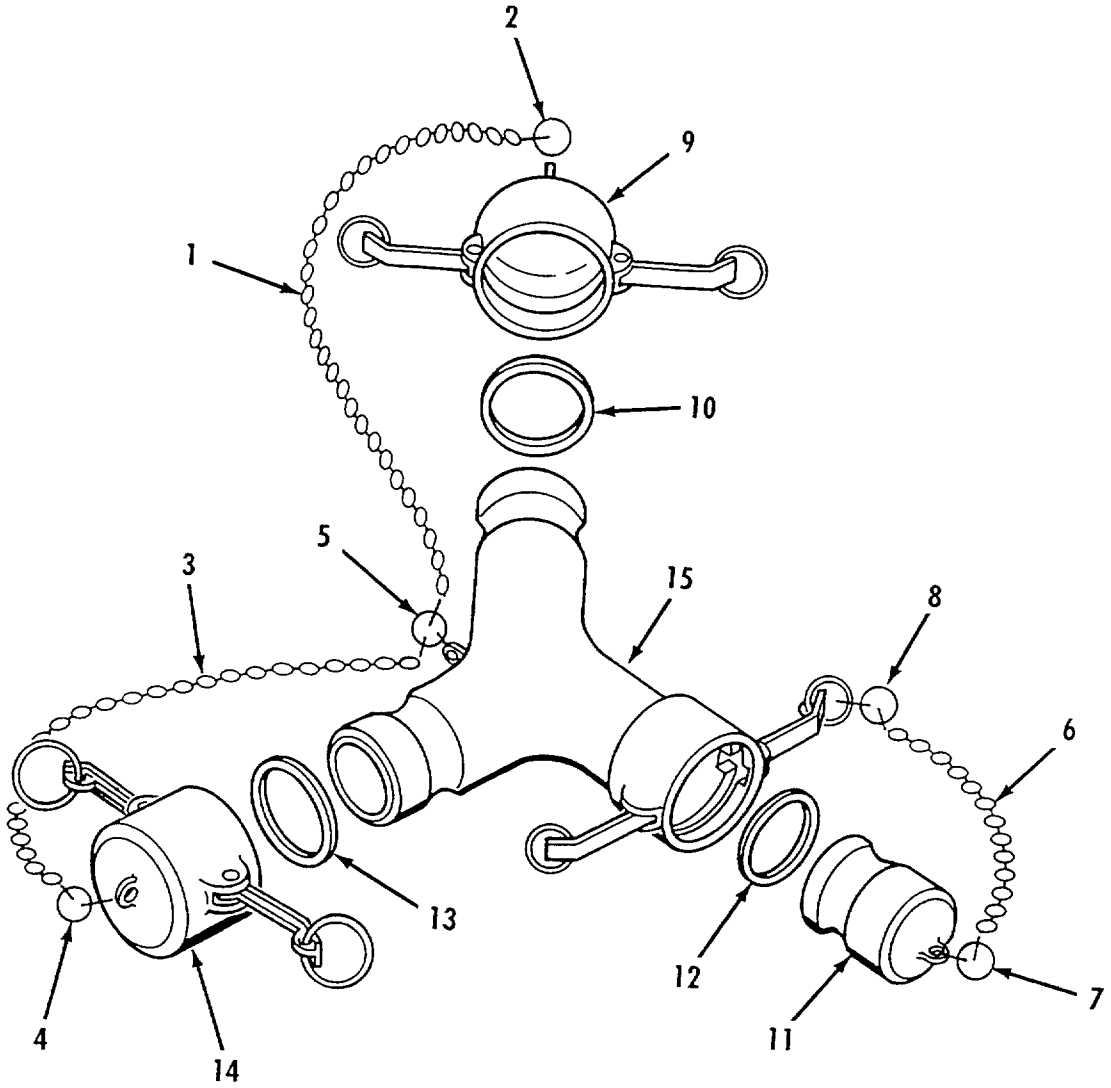


Figure 4-4 . Wye Assembly Repair .

4-13. WYE ASSEMBLY REPAIR - cont.

d. Assembly. Refer to figure 4-4.

CAUTIONS

- To prevent premature failure of wye assembly, gaskets certified for arctic service must be installed. If a new wye body or dust caps has been installed, remove and discard black gaskets supplied with the new components and replace them with blue colored arctic service gaskets.
- Ensure gaskets are fully seated in groove of coupling/dust caps to prevent leaks In assembled components.

(1) Install gasket (13) in dust cap (14).

(2) Install dust cap (14) on body (15).

(3) Install gasket (12) in female coupling on body (15).

(4) Install dust plug (11) on body (15).

(5) Install gasket (10) on dust cap (9).

(6) Install dust cap (9) on body (15).

(7) Connect split ring (8), chain (6) and split ring (7).

(8) Connect split ring (5), chain (3) and split ring (4).

(9) Connect split ring (5), chain (1) and split ring (2).

4-14. DISCHARGE HOSE ASSEMBLY (21N X 10 ET) REPAIR.

Refer to para 4-12 for repair of the 2in x 10 ft discharge hose assembly.

4-15. SUCTION HOSE ASSEMBLY (21N X 10 FT) REPAIR.

Refer to para 4-12 for repair of the 21n. x 10 ft. suction hose assembly.

4-16. PRESSURE REDUCING ASSEMBLY REPAIR.

Refer to the following paragraphs to repair components of the pressure reducing skid assembly.

4-17. COVER ASSEMBLY(PRESSURE REDUCING) REPAIR.

NOTE

The following procedure applies to both pressure reducing cover and fuel manifold cover

This task covers:

a. Removal **b. Disassembly** **c. Cleaning**

d. Repair **e. Assembly** **f. Installation**

INITIAL SET-UP:

Tools:
General Mech. Tool Kit (App B, Sect III, Item 1)
Drill and Bit Set (App B, Sect III, Item 2)
Hand Riveter (App B, Sect III, Item 2)

Personnel Required:
two

Material/Parts:
Cleaning Solvent (Item 1, App E)
Wiping Rag (Item 2, App E)
Adhesive (Item 3, App E)
Lockwasher (8) (Item 7, App J)
Lockwasher (8) (Item 8, App J)
Blind Rivet (4) (Item 9, App J)
Backup Plate (4) (Item 10, App J)
Backup Plate (224) (Item 11, App J)
Blind Rivet (172) (Item 12, App J)
Blind Rivet (52) (Item 13, App J)

NOTE

Ensure that all parts identified as mandatory replacement parts are discarded and replaced with new components.

a. Removal. Refer to figure 4-5.

(1) Lift four hood fasteners (1) and separate from catches (2).

(2) Lift cover assembly (3) from skid (4).

b. Disassembly. Refer to figure 4-5.

NOTE

Disassemble cover only the extent required to replace defective component.

(1) Remove two nuts (5), lockwashers (6) and screws (7).

(2) Separate hood fastener (8) from skid (4).

(3) Repeat steps (1) and (2) for three remaining hood fasteners (8).

(4) Remove two nuts (9), flat washers (10), lockwashers (11) and screws (12).

(5) Separate catch (13) from cover assembly (3).

(6) Repeat steps (4) and (5) for three remaining catches (13).

(7) Remove four rivets (14) and backup plates (15).

(8) Separate plate (16) from cover assembly (3).

4-17. COVER ASSEMBLY (PRESSURE REDUCING) REPAIR - cont.

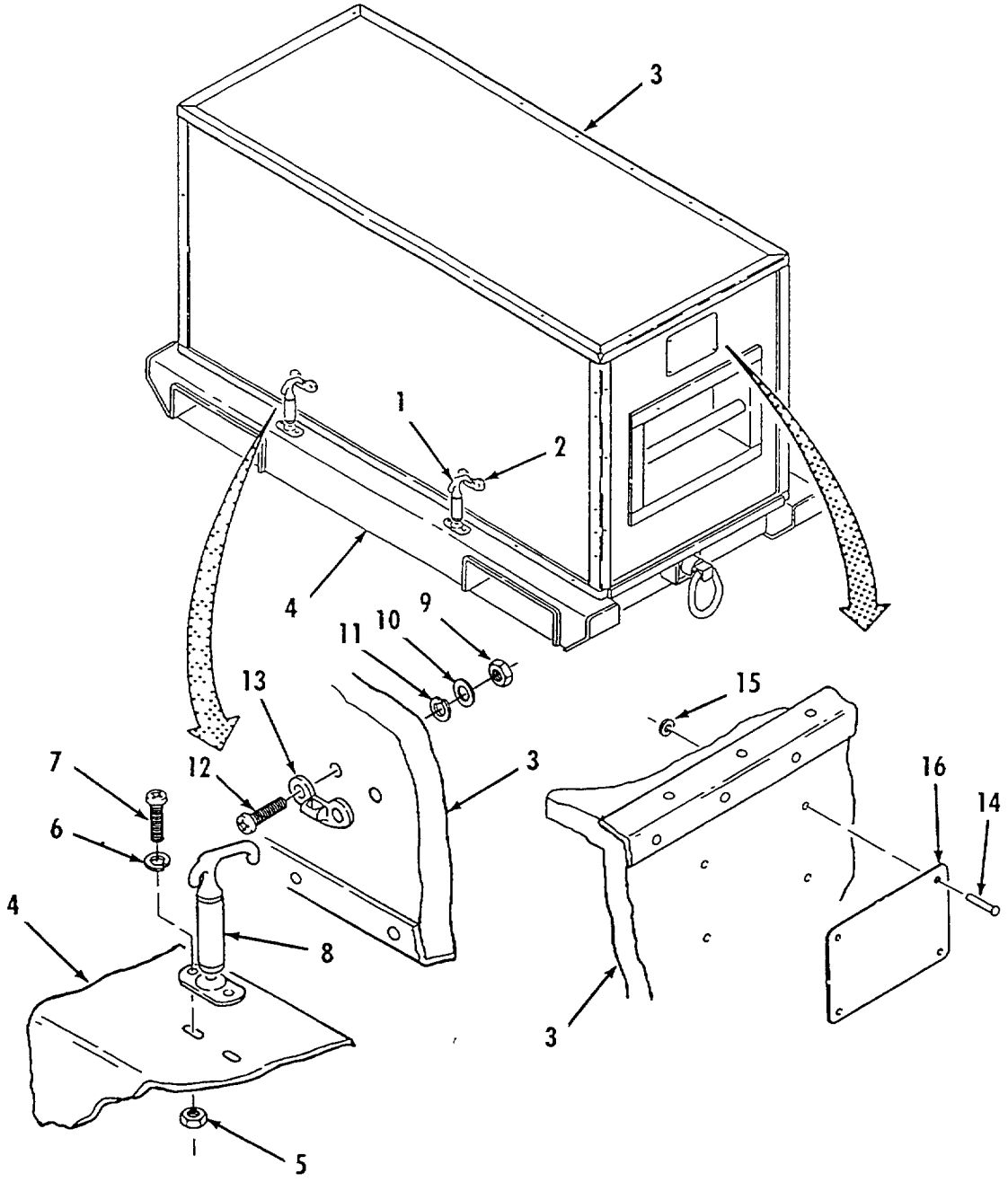


Figure 4-5. Cover Assembly (Pressure Reducing) Repair (Sheet 1 of 2).

4-17. COVER ASSEMBLY (PRESSURE REDUCING) REPAIR - cont.

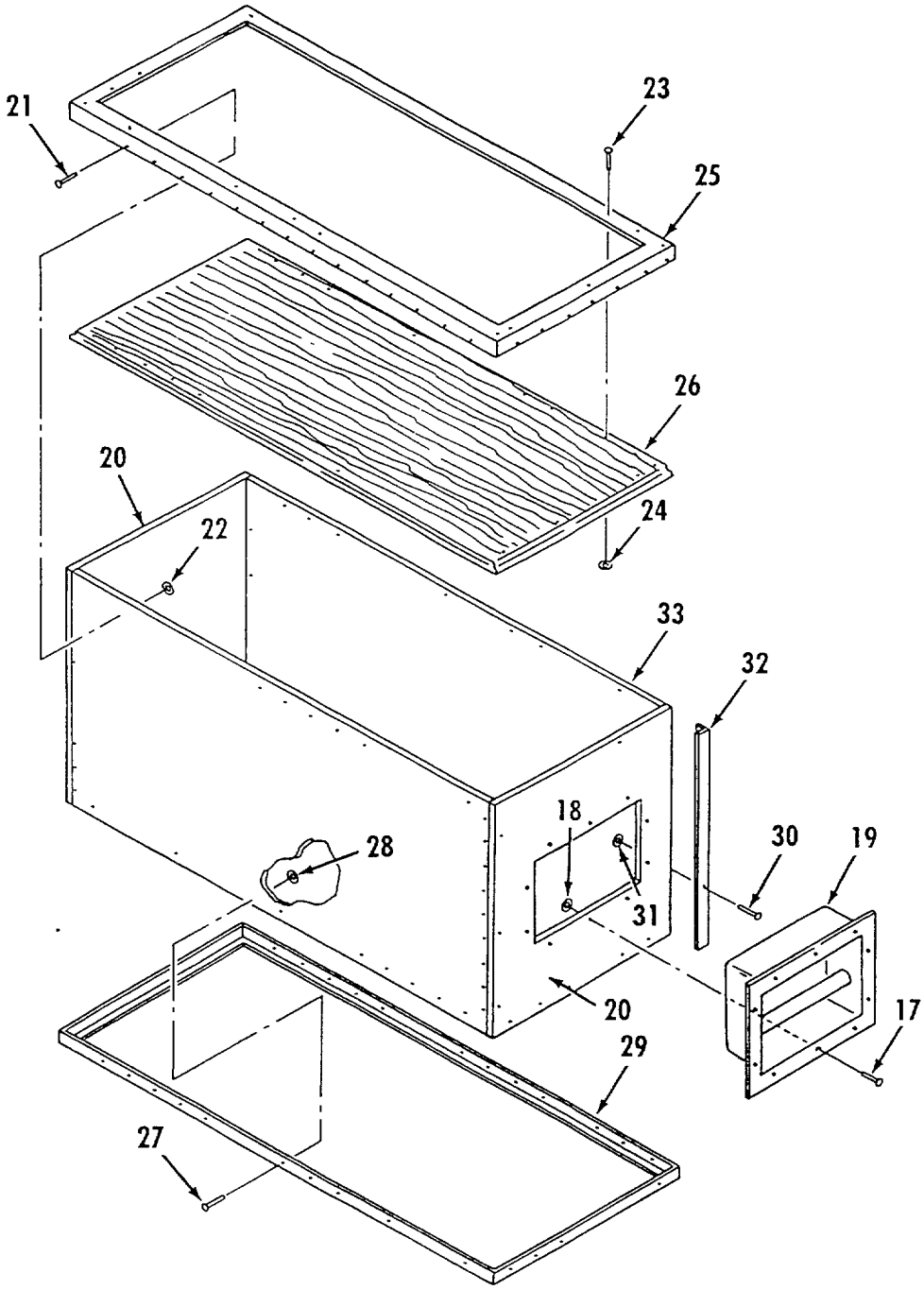


Figure 4-5. Cover Assembly (Pressure Reducing) Repair (Sheet 2 of 2).

4-17. COVER ASSEMBLY (PRESSURE REDUCING) REPAIR - cont.

(9) Remove ten rivets (17), backup plates (18) and lift handle (19) from end panel (20) Repeat for other end panel.

(10) Remove 52 rivets (21) and backup plates (22) securing upper frame (25) to end panels (20) and side panels (33).

(11) Remove upper frame (25) and attached top panel (26).

(12) Remove 48 rivets (23) and backup plates (24).

(13) Separate upper frame (25) from top panel (26).

(14) Remove 52 rivets (27) and backup plates (28) from lower frame (29) Separate lower frame from end panel (20) and side panels (33).

(15) Remove 15 rivets (30) and backup plates (31) from corner post (32).

(16) Separate corner post (32) from end panel (20) and side panel (33).

(17) Repeat steps (15) and (16) for three remaining corner posts (32).

c. Cleaning

WARNING

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

Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

d. Repair. Replace damaged or defective components.

e. Assembly. Refer to figure 4-5.

(1) Apply adhesive along mating surfaces of side panels (33), end panels (20) and lower frame (29) Position side and end panels in lower frame.

4-17. COVER ASSEMBLY (PRESSURE REDUCING) REPAIR - cont.

(2) Using lower frame (29) as a template, drill 1/8-inch diameter holes through side panels (33) and end panels (20) for rivets (27).

(3) While holding side panels (33) and end panels (20) in position, Install 52 rivets (27) and v backup plates (28) through lower frame (29).

(4) Apply adhesive along mating surfaces of upper frame (25) and top panel (26).

(5) Position upper frame (25) on top panel (26) Using holes In top frame as a template, drill 1/8-inch diameter holes through top panel for rivets (23).

(6) While holding top panel (26) in position, install 48 rivets (23) and backup plates (24) through upper frame (25).

(7) Apply adhesive to mating surfaces of upper frame (25), side panels (33) and ends panels (20).

(8) Position upper frame (25) and attached top panel (26) over side panels (33) and end panels (20).

(9) Using holes In upper frame (25) as a template, drill 1/8-inch diameter holes through side and end panels (20 and 33) for rivets (21).

(10) While holding side and end panels (20 and 33) in position, Install e 52 rivets (21) and backup plates (22) through upper frame (25).

(11) Apply adhesive to mating surfaces of corner post (32), end panel (20) and side panel (33).

(12) Position corner post (32) on end panel (20) and side panel (33).

(13) Using holes in corner post as a template, drill 1/8-inch diameter holes through side and end panels for rivets (30).

(14) While holding corner post (32) in place, Install (15) backup plates (31) and rivets (30).

(15) Repeat steps (11) through (14) for three remaining corner posts (32).

(16) Apply adhesive to mating surfaces of lift handle (19) and end panel (20).

(17) Position lift handle (19) on end panel (20).

(18) Using holes in lift handle (19) as a template, drill 1/8-inch diameter holes through end panel (20) for rivets (17).

(19) While holding lift handle (19) in place, Install 10 backup plates (18) and rivets (17).

(20) Repeat steps (16) through (19) for other lift handle (19) .

14-17. COVER ASSEMBLY (PRESSURE REDUCING) REPAIR- cont.

(21) Position plate (16) on cover assembly (3).

(22) Install four rivets (14) and backup plates (15).

(23) Position catch (13) on cover assembly (3).

(24) Install two screws (12), lockwashers (11), flat washers (10) and nuts (9).

(23) Repeat steps (23) and (24) for three remaining catches (13).

(24) Position hood fastener (8) on skid (4).

(25) Install two lockwashers (6), screws (7) and nuts (5).

(26) Repeat steps (24) and (25) for three remaining hood fasteners (8).

f. Installation. Refer to figure 4-5.

(1) Position cover assembly (3) on top of skid (4).

(2) Lift four hood fasteners (1) and latch onto catches (2).

4-18. PRESSURE REDUCING ASSEMBLY REPAIR.

This task covers:

a. Removal **b. Disassembly** **c. Cleaning**

d. Repair **e. Assembly** **f. Installation**

INITIAL SET-UP:

Tools:
General Mech Tool Kit (App B, Sect III, Item 1)
Pipe Wrench (2 ea) (App B, Sect III, Item 5)

Equipment Condition:
Pressure reducing assembly removed from system (para 2-20)
Cover assembly (pressure reducing) removed (para 4-17)

Personnel Required:
Two

Material/Parts:
Cleaning Solvent (Item 1, App E)
Wiping Rag (Item 2, App E)
Thread Sealant (Item 4, App E)
Foam (A/R) (Item 14, App J)
Foam (A/R) (Item 15, App J)
Lockwasher (16) (Item 16, App J)
Coupling Gasket (2) (Item 1, App J)

NOTE

Ensure that all parts identified as mandatory replacement parts are discarded and replaced with new components.

a. Removal. Refer to figure 4-6.

(1) Remove two nuts (1), lockwashers (2), cap screws (3) and flat washers (4).

(2) Remove strap (5) from pressure reducing assembly (7).

(3) Remove foam (6) from strap (5).

(4) Repeat steps (1) through (3) for three remaining straps.

(5) Using two personnel, remove pressure reducing assembly (7) from skid (14).

(6) Remove two nuts (9), lockwashers (10), cap screws (12) and flat washers (11).

(7) Separate bracket (13) from skid (14).

(8) Remove foam (8) from bracket (13).

(9) Repeat steps (6) through (8) for three remaining brackets.

4-18. PRESSURE REDUCING ASSEMBLY REPAIR.

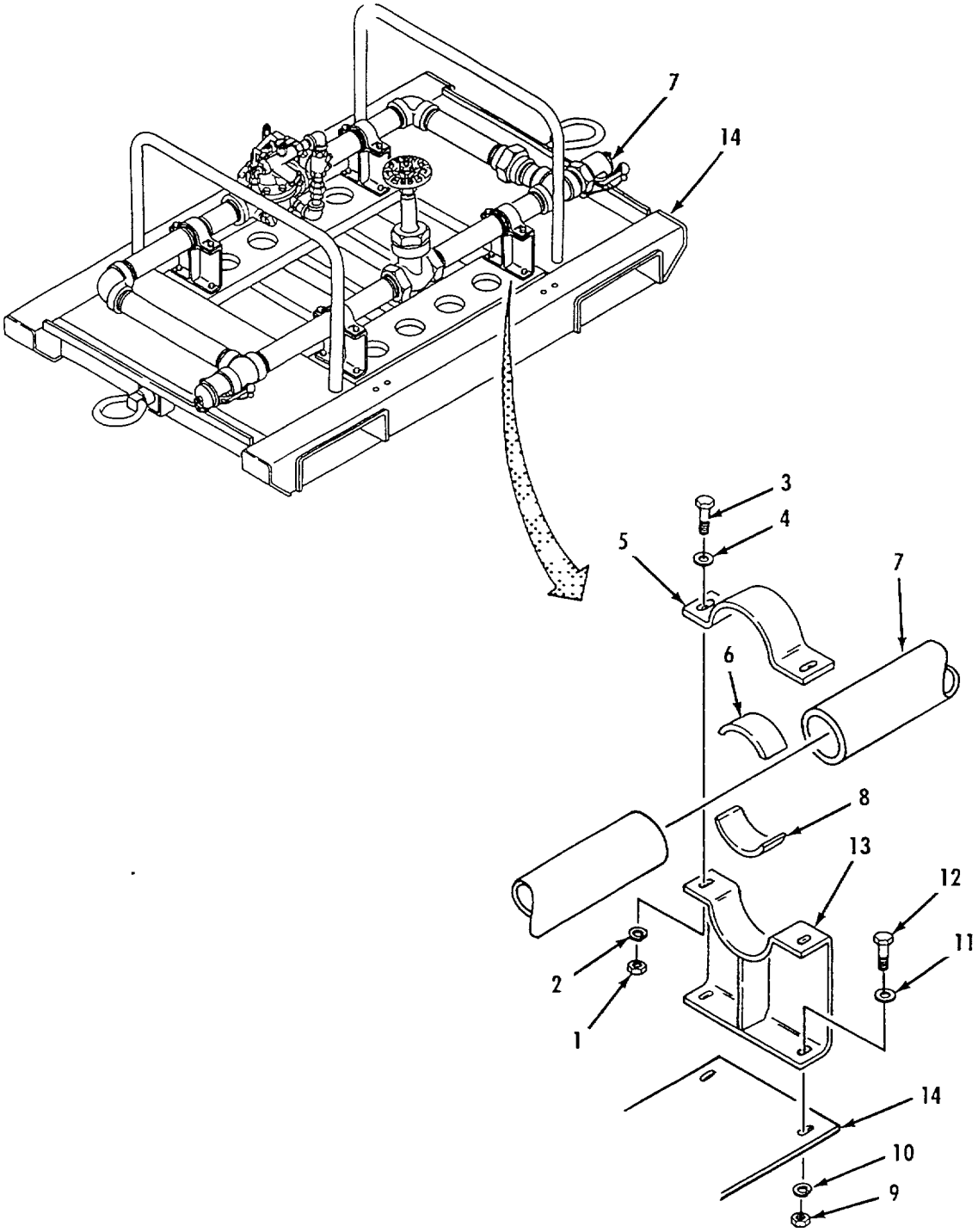


Figure 4-6. Pressure Reducing Assembly Removal.

4-18. PRESSURE REDUCING ASSEMBLY REPAIR- cont.

b. Disassembly. Refer to figure 4-7

NOTE

Disassemble pressure reducing assembly only the extent required to replace defective component.

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

(2) Disconnect and remove spilt ring (3), chain (4) and split ring (5) from dust cap (2) and male coupling half (17).

(3) Disconnect and remove slit ring (7), chain (8) and split ring (9) from dust plug (6) and female coupling half(11).

(4) Remove gasket (10) from female coupling half (11).

(5) Remove female coupling half(11) from tee fitting (22).

(6) Loosen piping at union (12).

(7) Remove tube (13) and union half (12) from elbow fitting (14).

(8) Remove union half (12) from tube (13).

(9) Remove elbow fitting (14) and tube (15) from pressure reducing valve (26).

(10) Remove elbow fitting (14) from tube (15).

(11) Remove nipple (16) and male coupling half(17) from tee fitting (18).

(12) Remove tee fitting (18) from tube (19).

(13) Remove tube (19) from gate valve (20).

(14) Remove gate valve (20) and tube (21) from tee fitting (22).

(15) Remove tube (21) from gate valve (20).

(16) Remove tee fitting (22) and tube (23) from elbow fitting (24).

(17) Remove tee fitting (22) from tube (23).

(18) Remove elbow fitting (24) from tube (25).

(19) Remove tube (25) from pressure regulating valve (26).

4-18. PRESSURE REDUCING ASSEMBLY REPAIR - cont.

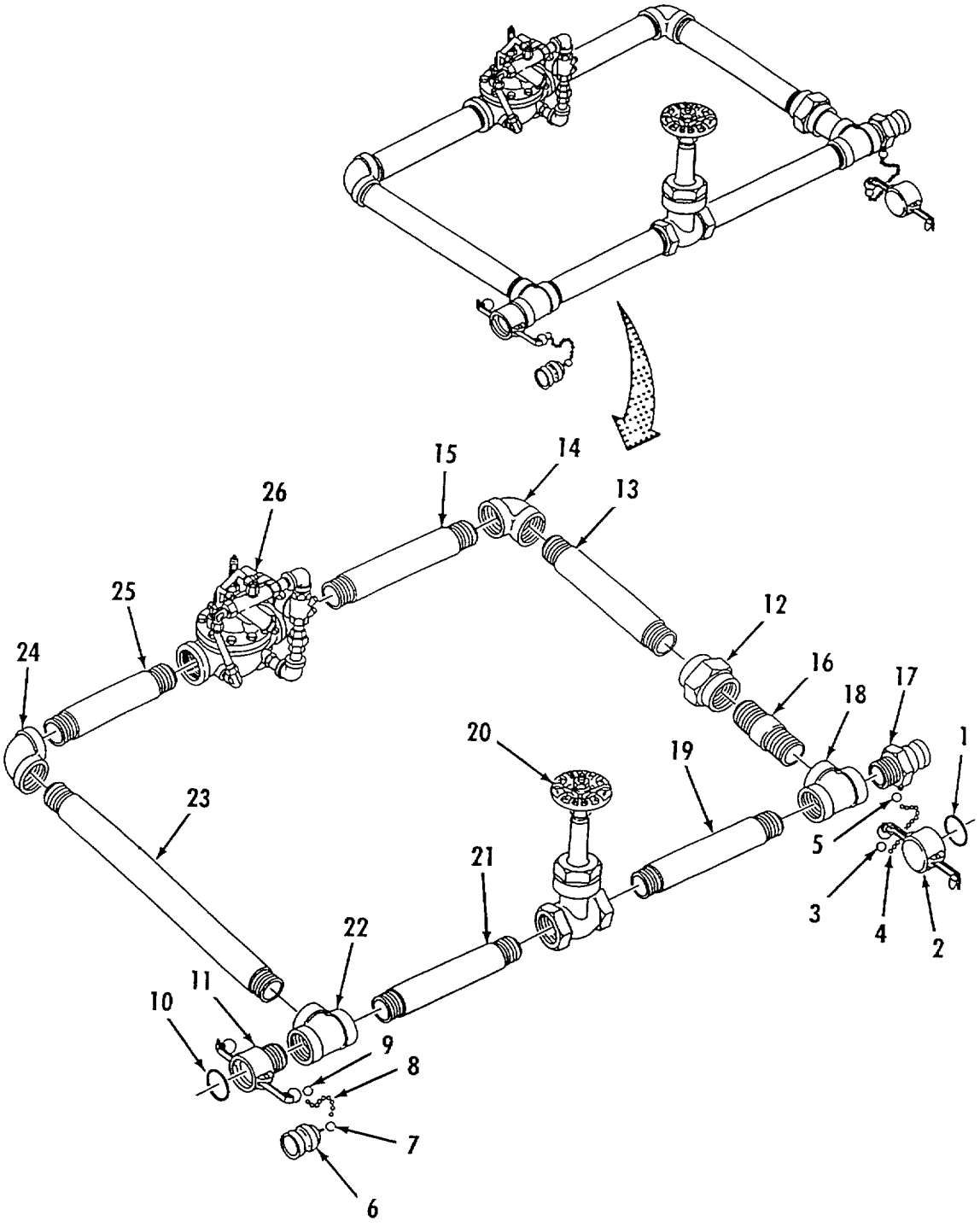


Figure 4-7. Pressure Reducing Assembly Repair.

4-18. PRESSURE REDUCING ASSEMBLY REPAIR - cont.

c. Cleaning.

WARNING

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

Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

d. Repair Replace damaged or defective components.

e. Assembly Refer to figure 4-7.

(1) Apply thread sealant to male threads of all pipe components.

(2) Install tube (25) on pressure regulating valve (26).

(3) Install elbow (24) on tube (25).

(4) Install tube (23) on elbow fitting (24).

(5) Install tee (22) on tube (23).

(6) Install tube (21) on tee fitting (22).

(7) Install gate valve (20) on tube (21).

(8) Install tube (19) on gate valve (20).

(9) Install tee fitting (18) on tube (19).

(10) Install male coupling half (17) and nipple (16) on tee fitting (18).

(11) Install tube (15) on pressure reducing valve (26).

(12) Install elbow (14) on tube (15).

(13) Install tube (13) on elbow fitting (14).

(14) Install union half (12) on tube (13).

(15) Connect piping at union (12).

(16) Install female coupling half(11) on tee fitting (22).

4-18. PRESSURE REDUCING ASSEMBLY REPAIR - cont.

CAUTIONS

- To prevent premature failure of hose assembly, gaskets certified for arctic service must be installed. If a new dust cap or female coupling has been installed, remove and discard black gaskets supplied with the new components and replace them with blue colored arctic service gaskets.
- Ensure gasket is fully seated in gasket seat of coupling/dust cap to prevent leaks In assembled components.

(17) Install gasket (10) in female coupling half(11)

(18) Install gasket (1) In dust cap (2)

(19) Connect split ring (9), chain (8) and split ring (7) on female coupling half (11) and dust plug (6)

(20) Connect split ring (5), chain (4) and split ring (3) to male coupling half (17) and dust cap (2)

f. Installation. Refer to figure 4-6

(1) Position bracket (13) on skid (14).

(2) Allne mounting holes In bracket (13) with skid (14), then install two flat washers (11), cap screws (12), lockwashers (10) and nuts (9).

(3) Apply foam tape (8) to saddle on bracket (13).

(4) Repeat steps (1), (2) and (3) for three remaining brackets.

(5) Using two personnel, position pressure reducing assembly (7) on skid (14).

(6) Apply foam tape (6) to saddle of strap (5).

(7) Position strap (5) over pressure reducing assembly (7) and allne mounting holes with bracket (13).

(8) Install two flat washers (4), cap screws (3), lockwashers (2) and nuts (1).

(9) Repeat steps (6), (7) and (8) for three remaining straps.

4-19. PRESSURE REGULATING VALVE ASSEMBLY REPAIR.

This task covers:

a. Disassembly **b. Cleaning**

c. Repair **d. Assembly**

INITIAL SET-UP:

Tools:
General Mech Tool Kit (App B, Sect III, Item 1)
Pipe Wrench (2 ea) (App B, Sect III, Item 5)

Equipment Condition:
Pressure regulating valve removed (para 4-18)

Material/Parts:
Cleaning Solvent (Item 1, App E)
Wiping Rag (Item 2, App E)
Packing (Item 17, App J)
Packing (Item 18, App J)
Diaphragm (Item 19, App J)
Disc (Item 20, App J)
Packing (Item 21, App J)
Tape, Anti-seize (Item 5, App E)

NOTE

Ensure that all parts identified as mandatory replacement parts are discarded and replaced with new components.

a. Disassembly.

NOTE

Disassemble pressure regulating valve only the extent required to replace defective component.

Disassemble Piping Refer to figure 4-8.

(1) Disconnect three lines (1, 2 and 3) from valve (23).

(2) Disconnect union (4) and remove assembled piping (5).

(3) Remove union (half) (4) and nipple (6) from pressure control valve (7).

(4) Remove pressure control valve (7), bushing (8) and nipple (9) from elbow (10).

(5) Remove elbow (10) and nipple (11) from strainer (12).

(6) Remove two connectors (13 and 14) and elbow (15) from strainer (12).

(7) Remove elbow (16) and connector (17) from valve (23).

(8) Remove elbow (18) from pressure control valve (7).

(9) Remove union (half) (4), nipple (19), elbow (20), nipple (21) and bushing (22) from valve (23).

4-19. PRESSURE REGULATING VALVE ASSEMBLY REPAIR - cont

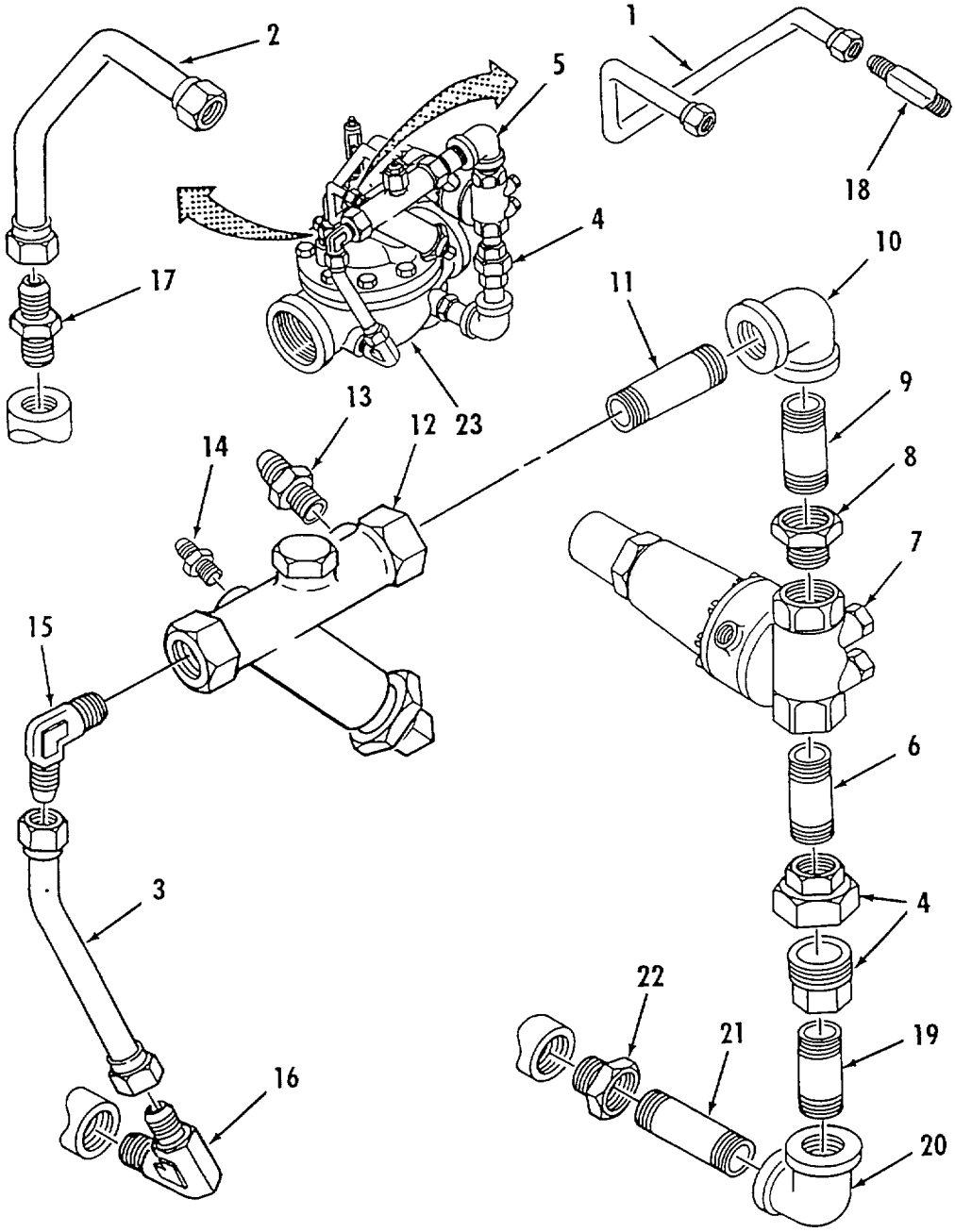


Figure 4-8. Piping Disassembly.

4-19. PRESSURE REGULATING VALVE ASSEMBLY REPAIR - cont.

Disassemble Strainer Refer to figure 4-9.

(10) Remove plug (1) and packing (2) from body (8).

(11) If required, remove plug (3) from body (8).

(12) Remove reducer (4) and packing (5) from body (8).

(13) Carefully pull strainer (6) from body (8).

(14) If required, remove plug (7) from reducer (4).

Disassemble Pressure Regulating Valve Refer to figure 4-10.

(15) Remove Indicator (1) from cover (3).

(16) Mark and record alinement of valve cover (3) with body (17).

WARNING

To prevent injury to personnel, remove cover slowly to release spring tension.

(17) Remove eight bolts(2).

CAUTION

To prevent damage to bearing cover or valve stem, pull cover straight up from body.

(18) Remove valve cover (3) from body (17) If cover Is stuck, use a hammer and blunt chisel to drive cover up off body by tapping upward around edge of cover.

NOTE

Spring cover may be stuck inside valve cover. Make sure spring cover is not lost or missing.

(19) If required, remove spring cover (5) from valve cover (3).

(20) Remove spring (6) from top of stem (14).

CAUTION

To prevent damage to stem or seat, pull stem straight up from body.

(21) Remove assembled diaphragm (4) from body (17).

CAUTION

To prevent damage to stem, use vice that has soft brass jaws.

(22) Secure end of stem (14) (opposite end of nut (7)) in vise.

(23) Remove nut (7), diaphragm washer (8) and diaphragm (9) from stem (14).

4-19. PRESSURE REGULATING VALVE ASSEMBLY REPAIR - cont.

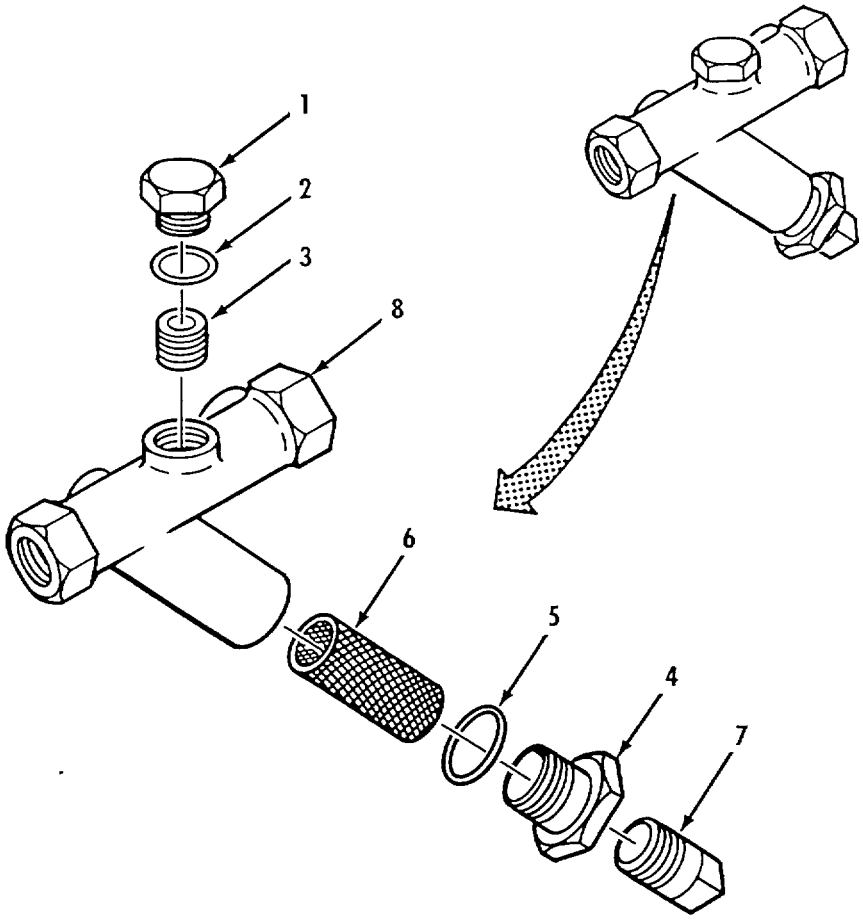


Figure 4-9. Strainer Disassembly.

4-19. PRESSURE REGULATING VALVE ASSEMBLY REPAIR - cont.

(24) Remove disc retainer (10) and disc (11) from stem (14) Separate disc retainer from disc.

(25) Remove spacer washer (12) and disc guide (13) from stem (14).

(26) If required, remove seat (15) and packing (16) from body (17).

b. Cleaning.

WARNING

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

Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

c. Repair. Replace damaged or defective parts and all sealing components.

d. Assembly.

Assemble Pressure Regulating Valve. Refer to figure 4-10.

(1) If removed, install packing (16) and seat (15) in body (17).

(2) Install disc guide (13) and spacer washer (12) on stem (14).

NOTE

Number of spacer washers must be adjusted during assembly to prevent over compression of disc.

(3) Position disc (11) on disc retainer (10), then slide both parts onto stem (14).

4-19. PRESSURE REGULATING VALVE ASSEMBLY REPAIR - cont.

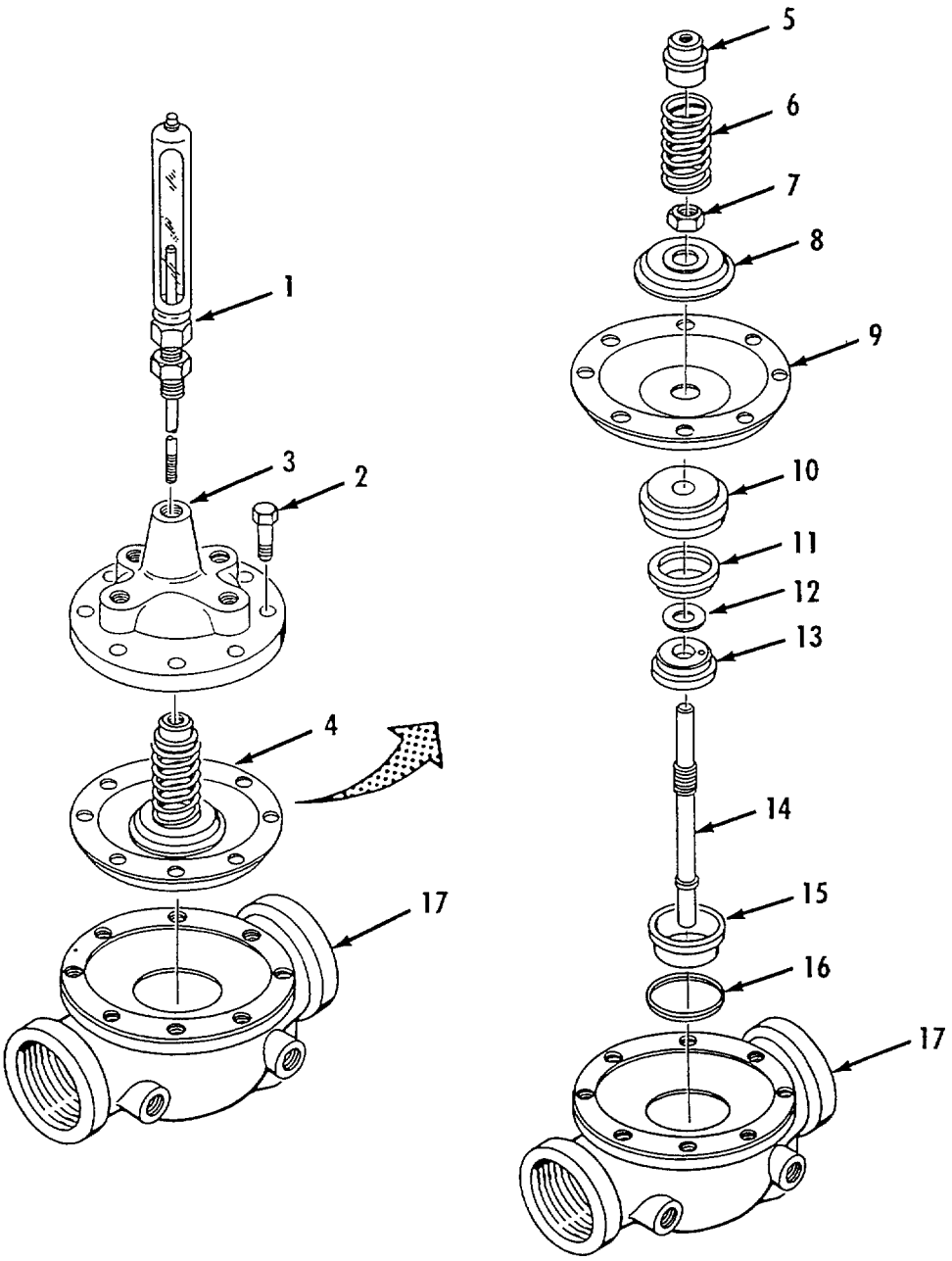


Figure 4-10. Pressure regulating Valve Repair.

4-19. PRESSURE REGULATING VALVE ASSEMBLY REPAIR - cont.

CAUTION

To prevent premature failure of diaphragm, nut must be tight. If nut is loose on stem, diaphragm could pull loose and tear under pressure.

(4) Install diaphragm (9), diaphragm washer (8) and nut (7) on stem (14). Tighten nut until diaphragm cannot be twisted on stem.

(5) Check compression of disc (11) between disc guide (13) and disc retainer (10). Disc should be compressed very lightly. If disc Is deformed, install additional spacer washers (12) between disc guide and disc retainer as required.

CAUTION

To prevent damage to stem or seat, lower stem straight into seat.

(6) Lower assembled diaphragm (4) into body (17) Make sure end of stem (14) mates correctly with seat (15).

(7) Aline holes In diaphragm (9) with holes on body (17). If required, diaphragm may be stretched to fit over holes.

(8) If removed, install spring cover (5) In valve cover (3).

(9) Install spring (6) on stem (14).

CAUTION

To prevent damage to spring cover or valve stem, valve cover must be lowered straight onto stem without twisting or binding.

(10) While matching alinement marks made during disassembly, lower valve cover (3) over stem (14) and onto body (17).

(11) Install eight bolts (2). Tighten bolts evenly in a cross pattern.

Assemble Strainer. Refer to figure 4-11.

(12) Apply anti-seize tape to male threads of plugs (1 and 7) and reducer (4).

(13) If removed, install plug (7) in reducer (4).

(14) Push strainer (6) up into body (8).

(15) Install packing (5) on reducer (4).

(16) Install reducer (4) on body (8).

(15) If removed, install plug (3) In body (8).

(17) Install packing (2) on plug (1).

(18) Install plug (1) on body (8).

4-19. PRESSURE REGULATING VALVE ASSEMBLY REPAIR - cont.

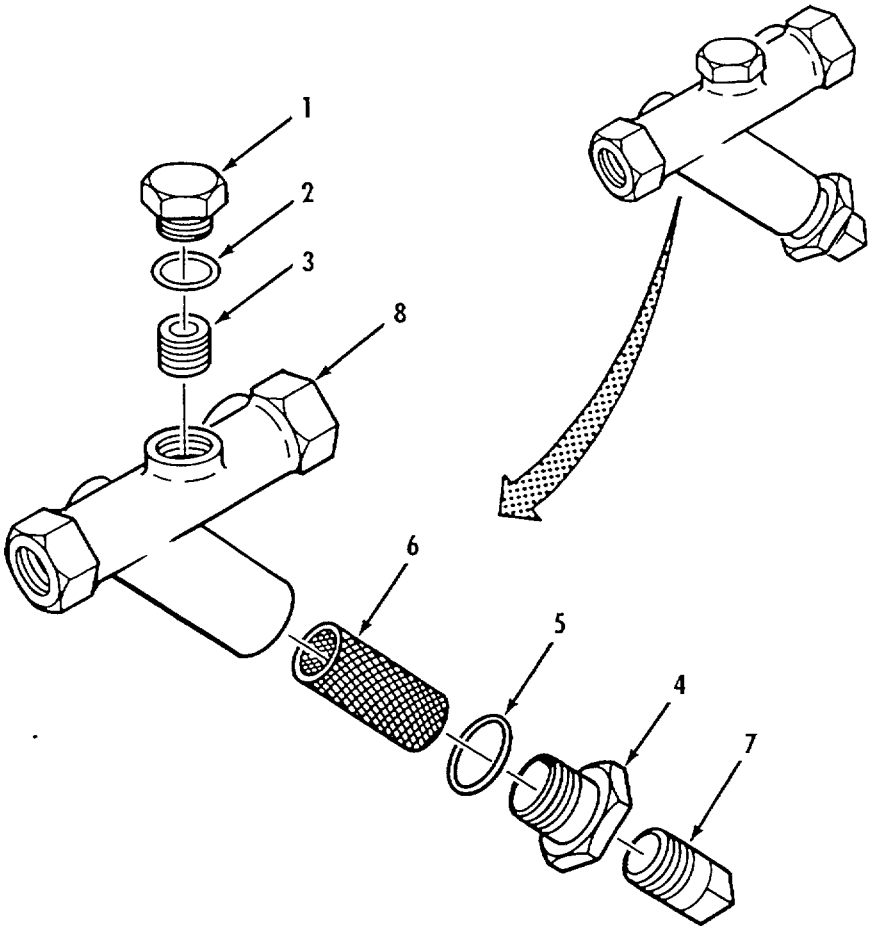


Figure 4-11. Strainer Assembly.

4-19. PRESSURE REGULATING VALVE ASSEMBLY REPAIR - cont.

Assemble Piping Refer to figure 4-12.

(19) Apply anti-seize tape to male threads of all piping components.

(20) Install bushing (22), nipple (21), elbow (20), nipple e (19) and union (half) (4) on valve (23).

(21) Install elbow (18) on pressure control valve (7).

(22) Install connector (17) and elbow (16) on valve (23).

(23) Install elbow (15) and two connectors (13 and 14) on strainer (12).

(24) Install nipple (11) and elbow (10) on strainer (12).

(25) Install nipple (9) on elbow (10).

(26) Install bushing (8), nipple (6) and union (half) (4) on pressure control valve (7).

(27) Install pressure control valve (7) and attached parts on nipple (9).

(28) Position assembled piping on valve (23) and connect both halves of union (4).

(29) Connect three lines (1, 2 and 3) to valve (23).

4-19. PRESSURE REGULATING VALVE ASSEMBLY REPAIR - cont.

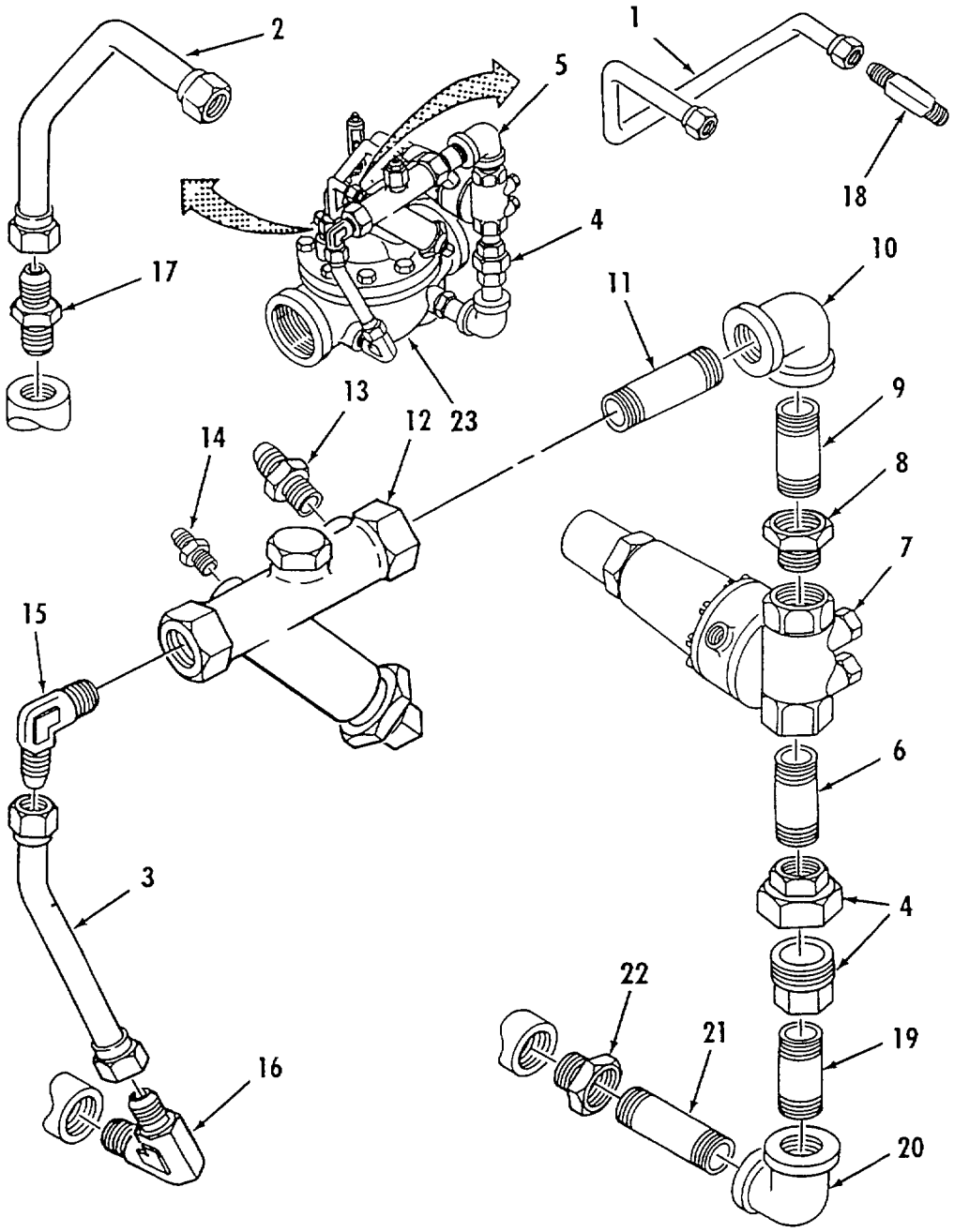


Figure 4-12. Piping Assembly.

4-20. SKID ASSEMBLY (TYPICAL) REPAIR.

NOTE

The following procedure applies to both fuel manifold and pressure reducing skids.

This task consists of
a. Disassembly
b. Cleaning
c. Repair
d. Assembly

INITIAL SET-UP:		
Tools:	Material/Parts:	
General Mech Tool Kit (App B, Sect III, Item 1)	Cleaning Solvent	(Item 1, App E)
Pipe Wrench (2 ea) (App B, Sect III, Item 5)	Wiping Rag	(Item 2, App E)
Equipment Condition:		
Pressure reducing assembly removed (para 4-18)		

NOTE

Ensure that all parts identified as mandatory replacement parts are discarded and replaced with new components.

a. Disassembly. Refer to figure 4-13.

(1) Remove ring (1) from insert (2).

(2) Remove insert (2) from skid (3).

(3) Repeat steps (1) and (2) for other end of skid (3).

b. Cleaning.

WARNING

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

Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

c. Repair. Replace damaged or defective components.

4-20. SKID ASSEMBLY (TYPICAL) REPAIR.

d. Assembly. Refer to figure 4-13.

(1) Install insert (2) In skid (3).

(2) Install ring (1) on insert (2).

(3) Repeat steps (1) and (2) for other end of skid (3).

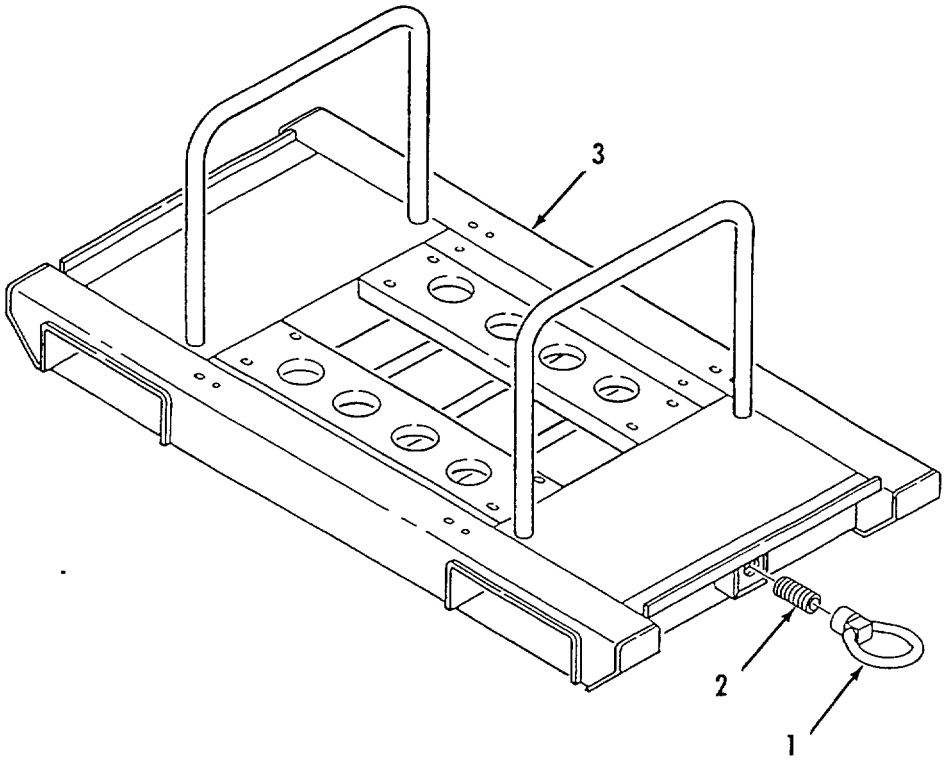


Figure 4-13. Skid Assembly repair.

4-21. REDUCER ASSEMBLY (2 IN. M X 3 IN. FEM) REPAIR.

NOTE

The following procedure applies to all sizes of reducer assemblies.

This task consists of a. Disassembly b. Cleaning c. Repair d. Assembly

INITIAL SET-UP:		
Tools:	**Material/Parts:**	
General Mech Tool Kit (App B, Sect III, Item 1)	Cleaning Solvent	(Item 1, App E)
Equipment Condition:	Wiping Rag	(Item 2, App E)
Reducer assembly removed (para 2-20)	Coupling Gasket, 2-in	(Item 1, App J)
	Coupling Gasket, 3-in	(Item 4, App J)

NOTES

- Ensure that all parts identified as mandatory replacement parts are discarded and replaced with new components.
- The following instructions are typical for all reducers supplied with the AFARE. A 2-in Male X 3-in Female reducer assembly is shown. Repair of other reducers is similar.

a. Disassembly. Refer to figure 4-14.

(1) Disconnect split ring (1) from dust plug (8).

(2) Disconnect split ring (2) from reducer (10).

(3) Disconnect split ring (3) from dust cap (7).

(4) Disconnect chain (4) from split rings (1 and 2).

(5) Disconnect chain (5) from split rings (2 and 3).

(6) Remove dust cap (7) and dust plug (8) from reducer (10).

(7) Remove gasket (6) from dust cap (7).

(8) Remove gasket (9) from reducer (10).

b. Cleaning.

WARNING

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

Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

4-21. REDUCER ASSEMBLY (2 IN. M X 3 IN. FEM) REPAIR - cont.

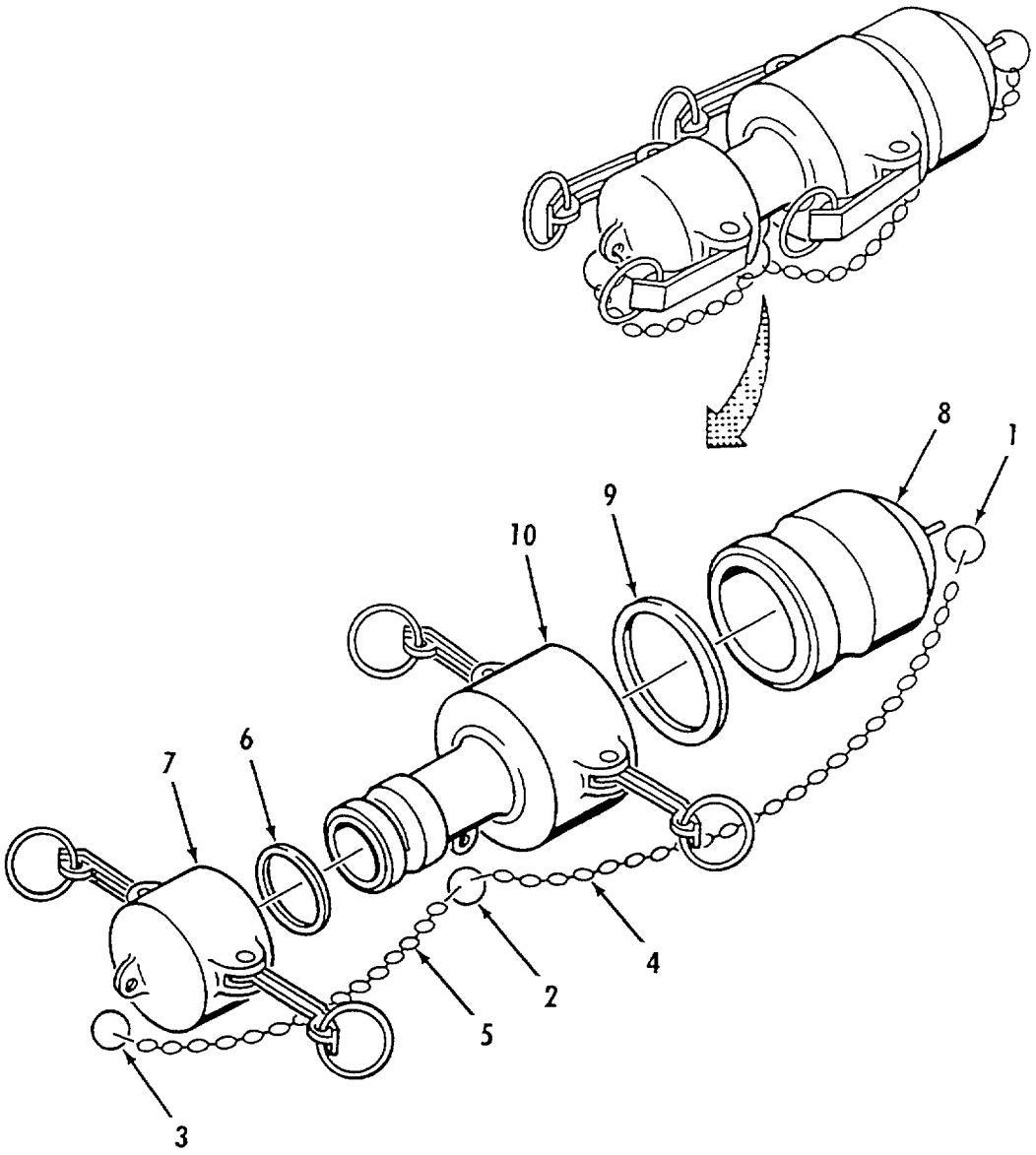


Figure 4-14. Reducer repair.

4-21. REDUCER ASSEMBLY (2 IN. M X 3 IN. FEM) REPAIR - cont.

c. Repair. Replace damaged or defective components.

d. Assembly. Refer to figure 4-14.

CAUTIONS

- To prevent premature failure of reducer assembly, gaskets certified for arctic service must be installed. If a new dust cap or reducer has been. Installed, remove and discard black gaskets supplied with the new components and replace them with blue colored arctic service gaskets.
- Ensure gasket is fully seated in gasket seat of coupling/dust cap to prevent leaks In assembled components.

(1) Install gasket (9) In reducer (10).

(2) Install gasket (6) in dust cap (7).

(3) Install dust plug (8) and dust cap (7) to reducer (10).

(4) Connect chain (5) to spilt rings (2 and 3).

(5) Connect chain (4) to spilt rings (1 and 2).

(6) Connect split ring (3) to dust cap (7).

(7) Connect split ring (2) to reducer (10).

(8) Connect split ring (1) to dust plug (8).

4-22. VALVE SECTION ASSEMBLY REPAIR.

This task consists of a. Disassembly b. Cleaning c. Repair d. Assembly

INITIAL SET-UP:	
Tools:	**Material/Parts:**
General Mech Tool Kit (App B, Sect III, Item 1)	Cleaning Solvent (Item 1, App E)
Pipe Wrench (2 ea) (App B, Sect III, Item 5)	Wiping Rag (Item 2, App E)
Vise (App B, Sect III, Item 2)	Thread Sealant (Item 4, App E)
Equipment Condition:	Coupling Gasket (2) (Item 22, App J)
Valve section assembly removed (para 2-20)	

NOTE

Ensure that all parts identified as mandatory replacement parts are discarded and replaced with new components.

a. Disassembly. Refer to figure 4-15.

(1) Disconnect split rings (1 and 2) and remove chain (3).

(2) Disconnect dust cap (5) from male coupling half (6).

(3) Remove gasket (4) from dust cap (5).

(4) Disconnect split rings (7 and 8) and remove chain (9).

(5) Disconnect dust plug (10) from female coupling half (12).

(6) Remove gasket (11) from female coupling half(12).

(7) Place gate valve (13) in vise.

(8) Remove male coupling half (6) and female coupling half (12) from gate valve (13).

b. Cleaning.

WARNING

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

Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

4-22. VALVE SECTION ASSEMBLY REPAIR - cont.

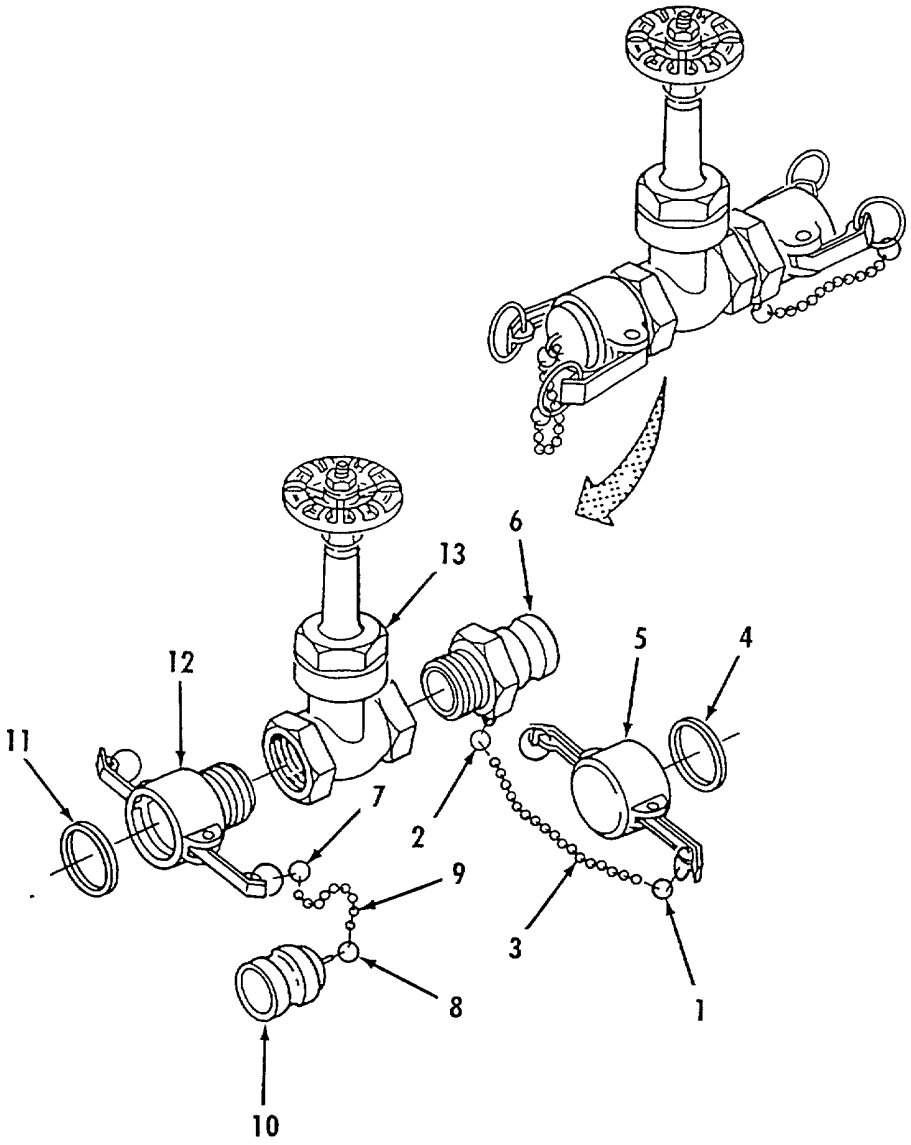


Figure 4-15. Valve Section Repair.

4-22. VALVE SECTION ASSEMBLY REPAIR - cont.

c. Repair. Replace damaged or defective components.

d. Assembly. Refer to figure 4-15.

(1) Apply thread sealant to male threads of male coupling half (6) and female coupling half (12).

CAUTIONS

- To prevent premature failure of valve section assembly, gaskets certified for arctic service must be installed. If a new dust cap or female coupling half has been installed, remove and discard black gaskets supplied with the new components and replace them with blue colored arctic service gaskets.
- Ensure gasket is fully seated. In gasket seat of coupling/dust cap to prevent leaks in assembled components.

(2) Install female coupling half (12) and male coupling half (6) on gate valve (13).

(3) Remove gate valve (13) from vise.

(4) Install gasket (11) in female coupling half (12).

(5) Connect dust plug (10) to female coupling half (12).

(6) Connect chain (9) and split rings (7 and 8).

(7) Install gasket (4) In dust cap (5).

(8) Connect dust cap (5) to male coupling half (6).

(9) Connect chain (3) and split rings (1 and 2).

4-23. DISCHARGE HOSE ASSEMBLY (3 IN.) REPAIR.

Refer to para 4-12 for repair of the 3-inch discharge hose assembly.

4-24. 3-INCH FUELING MANIFOLD ASSEMBLY REPAIR.

This task consists of a. Disassembly b. Cleaning c. Repair d. Assembly

INITIAL SET-UP:	
Tools:	**Material/Parts:**
General Mech. Tool Kit (App B, Sect III, Item 1)	Cleaning Solvent (Item 1, App E)
Pipe Wrench (2 ea) (App B, Sect III, Item 5)	Wiping Rag (Item 2, App E)
Vise (App B, Sect III, Item 2)	Thread Sealant (Item 4, App E)
Equipment Condition:	Coupling Gasket (3) (Item 4, App J)
3-inch manifold assembly removed (para 2-20)	

NOTE

Ensure that all parts identified as mandatory replacement parts are discarded and replaced with new components.

a. Disassembly. Refer to figure 4-16.

NOTE

Disassemble 3-inch fueling manifold only the extent required to replace defective component.

(1) Disconnect split rings (1 and 2) and remove chain (3).

(2) Disconnect dust cap (5) from male coupling half (15).

(3) Remove gasket (4) from dust cap (5).

(4) Disconnect split rings (6 and 7) and remove chain (8).

(5) Remove dust plug (9) from female coupling half (17).

(6) Disconnect split rings (10 and 11) and remove chain (12).

(7) Disconnect dust cap (14) from male coupling half (20).

(8) Remove gasket (13) from dust cap (14).

(9) Place gate valve (21) in vise.

(10) Remove male coupling half (15) from tee (18).

(11) Remove gasket (16) and female coupling half(17) from tee (18).

(12) Remove tee (18)from nipple (19).

4-24. 3-INCH FUELING MANIFOLD ASSEMBLY REPAIR - cont.

(13) Remove nipple (19) and male coupling half(20) from gate valve (21).

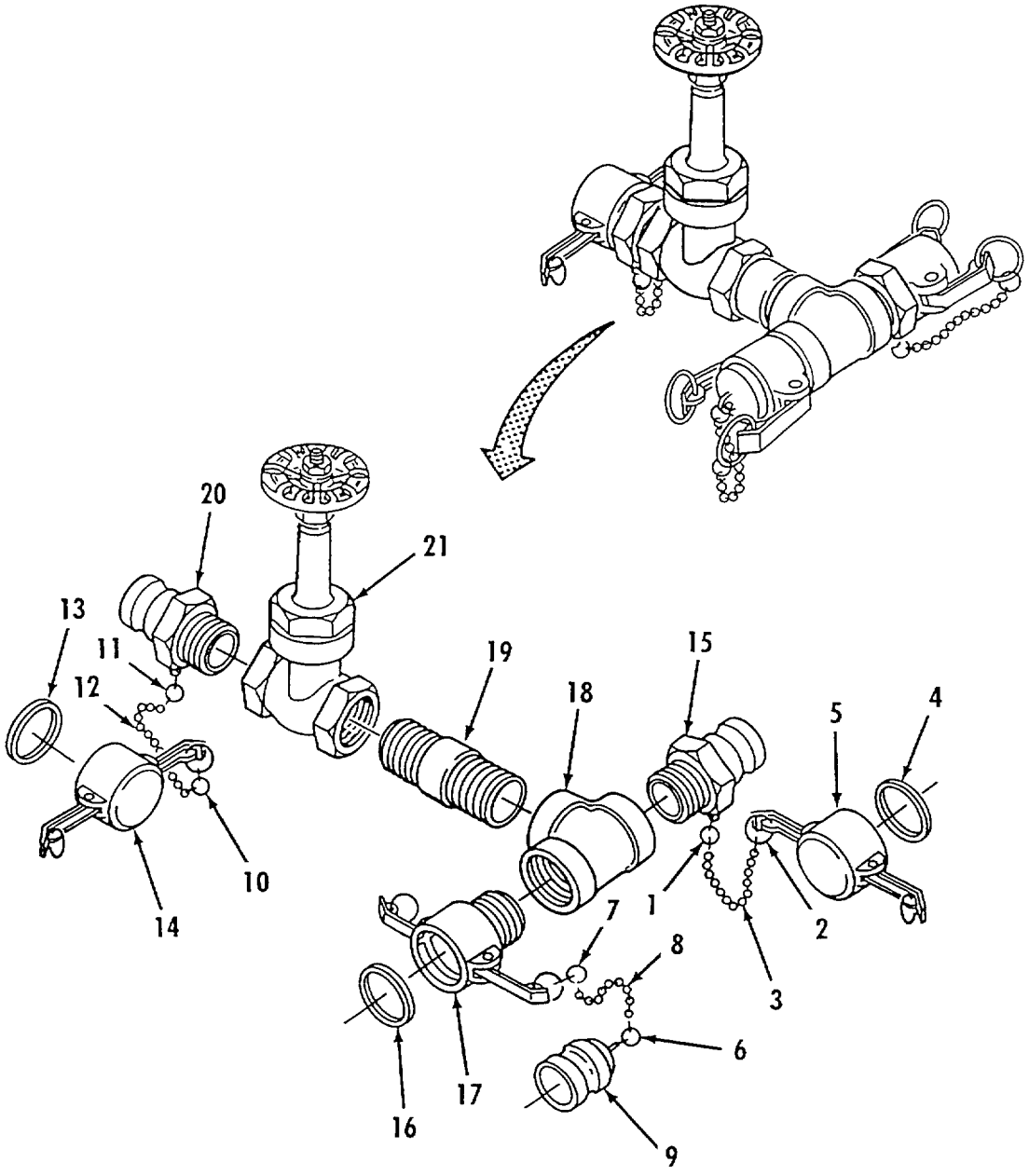


Figure 4-16. 3-inch Fueling Manifold Assembly Repair.

4-24. 3-INCH FUELING MANIFOLD ASSEMBLY REPAIR - cont.

b. Cleaning.

WARNING

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

Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

c. Repair. Replace damaged or defective parts and all sealing components.

d. Assembly. Refer to figure 4-16.

(1) Apply thread sealant to male threads of all components.

CAUTIONS

- To prevent premature failure of 3-inch manifold assembly, gaskets certified for arctic service must be installed. If a new dust caps or female coupling half has been installed, remove and discard black gaskets supplied with the new components and replace them with blue colored arctic service gaskets.
- Ensure gasket is fully seated In gasket seat of coupling/dust cap to prevent leaks in assembled components.

(2) Install male coupling half (20) and nipple (19) on gate valve (21).

(3) Install tee (18) on nipple (19).

(3) Install gasket (16) in female coupling half (17).

(4) Install female coupling half (17) and male coupling half(15) on tee (18).

4-24. 3-INCH FUELING MANIFOLD ASSEMBLY REPAIR - cont.

(5) Remove gate valve (21) from vise.

(6) Install gasket (13) in dust cap (14).

(7) Connect dust cap (14) to male coupling half (20).

(8) Connect chain (12) and split rings (11 and 10).

(9) Install dust plug (9) In female coupling half (17).

(10) Connect chain (8) and split rings (7 and 6).

(11) Install gasket (4) In dust cap (5).

(12) Connect dust cap (5) to male coupling half (15).

(13) Connect chain (3) and split rings (2 and 1).

4-25. REDUCER ASSEMBLY REPAIR.

Refer to para 4-21 for repair of the 3 in. Male x 2 In Female reducer assembly.

4-26. EXHAUST DEFLECTOR ASSEMBLY REPAIR - cont.

This task consists of. a. Disassembly b. Cleaning c. Repair d. Assembly

INITIAL SET-UP:	
Tools:	**Material/Parts:**
General Mech Tool Kit (App B, Sect III, Item 1)	Cleaning Solvent (Item 1, App E)
Drill and Bit Set (App B, Sect III, Item 2)	Wiping Rag (Item 2, App E)
Hand Riveter (App B, Sect III, Item 2)	Blind Rivet (Item 23, App J)
Equipment Condition:	Blind Rivet (8) (Item 24, App J)
Exhaust deflector assembly removed from pump (para 2-20)	Lockwasher (8) (Item 25, App J)

NOTE

Ensure that all parts identified as mandatory replacement parts are discarded and replaced with new components.

a. Disassembly. Refer to figure 4-17.

NOTE

Disassemble exhaust deflector assembly only the extent required to replace defective component.

(1) Remove rivet (1) and pin (2) from deflector (3).

(2) Slide vent (4) from deflector (3).

(3) Remove eight nuts (5), lockwashers (6) and screws (7) from frame (8) and separate deflector (3) from upper frame (8).

(4) -Remove four rivets (9) and pins (10) from lower frame (21).

(5) Remove two rivets (11) and pins (12) from two angle braces (13).

(6) Remove two nuts (14), screws (15) and nuts (16) from lower frame (21).

(7) Remove two nuts (17) and locators (18) from lower frame (21).

(8) Remove two bolts (19) and nuts (20) from locators (18).

4-26. EXHAUST DEFLECTOR ASSEMBLY REPAIR - cont.

b. Cleaning.

WARNING

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

Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

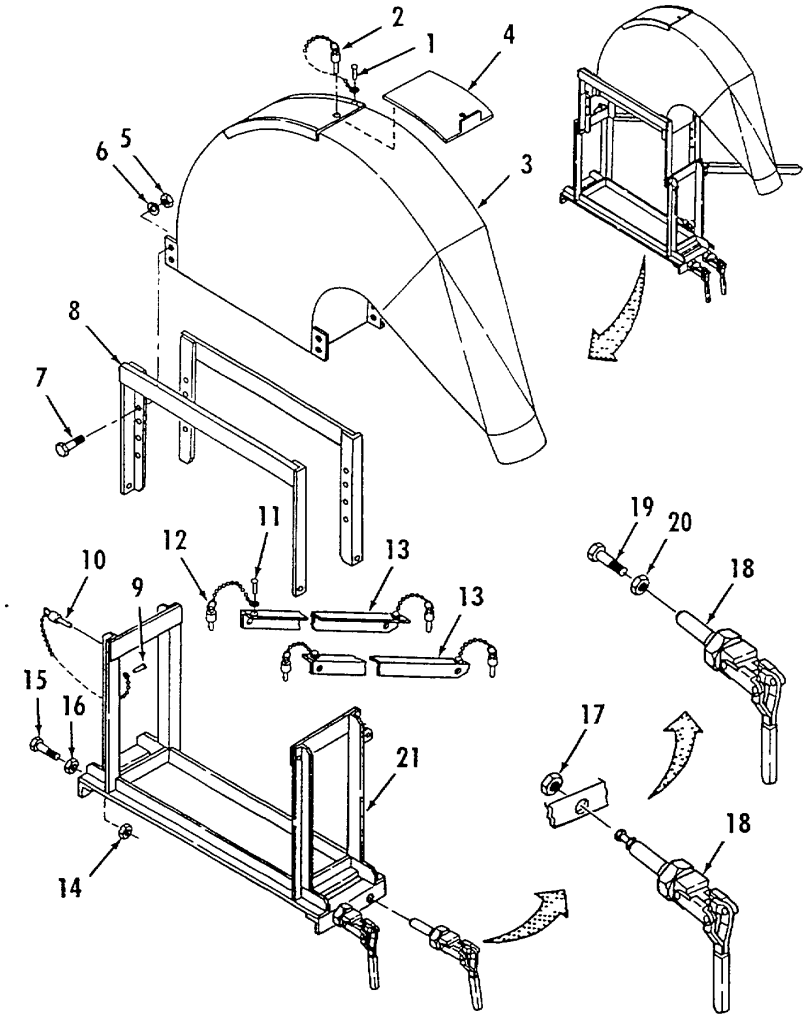


Figure 4-17. Exhaust Deflector repair.

4-26. EXHAUST DEFLECTOR ASSEMBLY REPAIR- cont.

c. Repair. Replace damaged or defective components.

d. Assembly. Refer to figure 4-17.

(1) Install two nuts (20) and bolts (19) on locators (18).

(2) Position two locators (18) in lower frame (21) and install nuts (17).

(3) Install two nuts (16), screws (15) and nuts (14) in lower frame (21).

(4) Install two rivets (11) and pins (12) in two angle braces (13).

(5) Install four pins (10) and rivets (9) in lower frame (21).

(6) Position deflector (3) on upper frame (8) and install eight screws (7), lockwashers (6) and nuts (5).

(7) Slide vent (4) onto deflector (3).

(8) Install pin (21 on deflector (3) with rivet (1).

4-27. SUCTION HOSE ASSEMBLY (3 IN. X 10 FT) REPAIR.

Refer to para 4-12 for repair of the 31n x 10 ft suction hose assembly.

4-28. FUELING MANIFOLD ASSEMBLY REPAIR.

Repair of the fueling manifold skid assembly is accomplished by replacing and/or repairing components that make up the assembly. Refer to the following paragraphs to repair components of the fueling manifold skid assembly.

4-29. COVER ASSEMBLY (FUEL MANIFOLD) REPAIR.

Refer to para 4-17 for repair of cover assembly.

4-30. FUELING MANIFOLD ASSEMBLY REPAIR.

This task covers:

a. Removal **b. Disassembly** **c. Cleaning**
d. Repair **e. Assembly** **f. Installation**

INITIAL SETUP:

Tools:		**Material/Parts:**	
General Mech Tool Kit	(App B, Sect III, Item 1)	Cleaning Solvent	(Item 1, App E)
Vise	(App B, Sect III, Item 2)	Wiping Rag	(Item 2, App E)
Pipe Wrench (2 ea)	(App B, Sect III, Item 5)	Thread Sealant	(Item 4, App E)
Equipment Condition:		Foam (A/R)	(Item 14, App J)
Cover removed (para 2-20)		Foam (A/R)	(Item 15, App J)
Personnel Required:		Lockwasher (16)	(Item 16, App J)
two		Coupling Gasket	(Item 1, App J)
		Coupling Gasket	(Item 4, App J)

NOTE

Ensure that all parts identified as mandatory replacement parts are discarded and replaced with new components.

a. Removal. Refer to figure 4-18.

(1) Remove two nuts (1), lockwashers (2), flat washers (3) cap screws (4) and flat washers (5).

(2) Remove strap (6) from fueling manifold assembly (8).

(3) Remove foam (7) from strap (6).

(4) Repeat steps (1) through (3) for other strap (6).

(5) Using two personnel, remove fueling manifold assembly (8) from skid (16).

(6) Remove two nuts (10), lockwashers (11), flat washers (12), cap screws (13) and flat washer (14).

(7) Separate bracket (15) from skid (16).

(8) Remove foam (9) from bracket (15).

(9) Repeat steps (6), (7) and (8) for remaining bracket (15).

4-30. FUELING MANIFOLD ASSEMBLY REPAIR - cont.

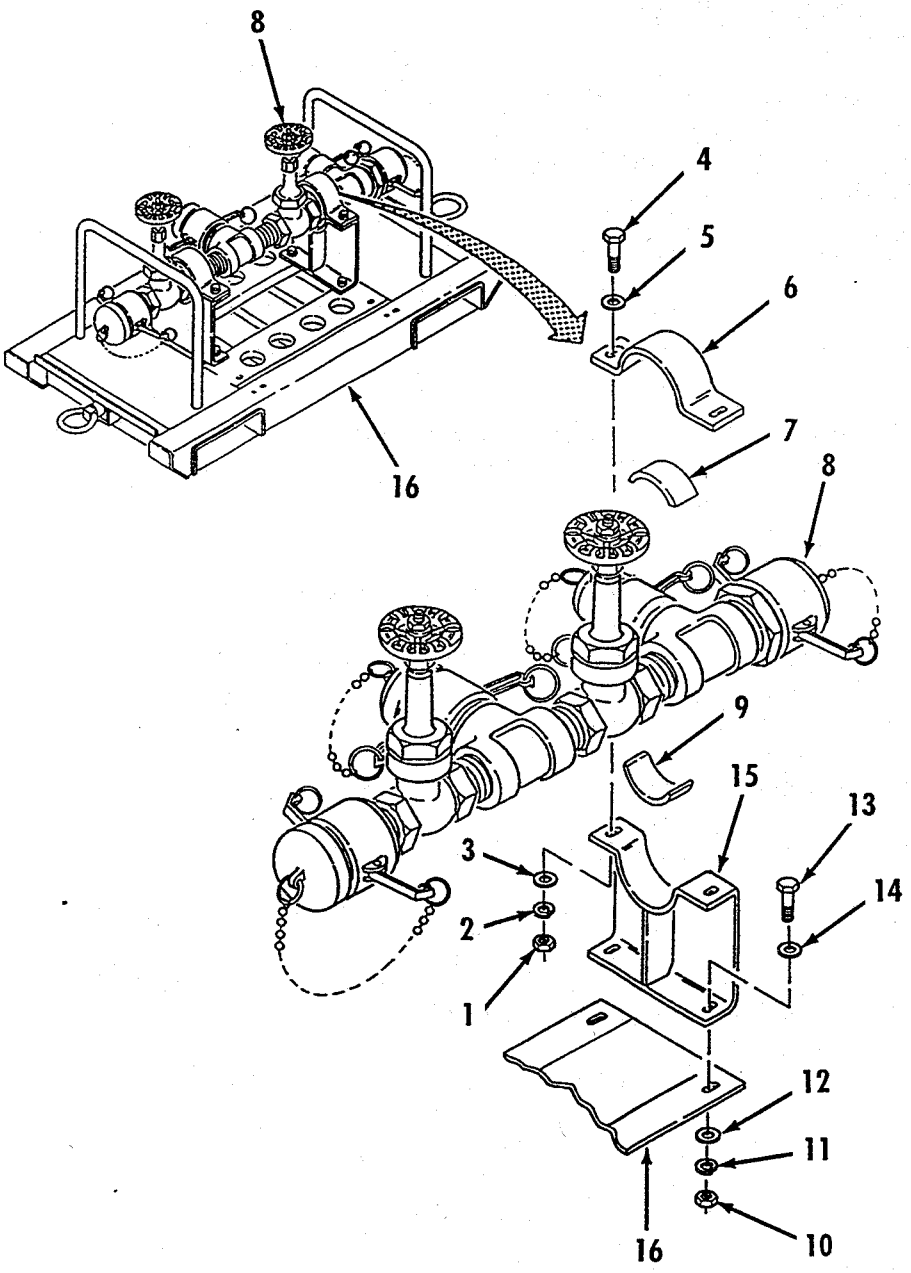


Figure 4-18. Fueling Manifold Replacement.

4-30. FUELING MANIFOLD ASSEMBLY REPAIR - cont.

b. Disassembly. Refer to figure 4-19.

NOTE

Disassemble fueling manifold assembly only to the extent required to replace defective component.

(1) Place manifold assembly (1) in vise.

(2) Remove split rings (2 and 3) and chain (4).

(3) Remove dust cap (6) from male coupling half (13).

(4) Remove gasket (5) from dust cap (6).

(5) Remove split rings (7 and 8) and chain (9).

(6) Remove dust plug (10) from female coupling half (12).

(7) Remove gasket (11) from female coupling half (12).

(8) Remove female coupling half(12) from tee (14).

(9) Remove male coupling half (13) from tee (14).

(10) Remove tee (14) from nipple (15).

(11) Remove nipple (15) from gate valve (16).

(12) Remove gate valve (16) from nipple (17).

(13) Remove nipple (17) from tee (24).

(14) Remove split rings (18 and 19) and chain (20).

(15) Remove dust plug (21) from female coupling half (23).

(16) Remove gasket (22) from female coupling half (23).

(17) Remove female coupling half (23) from tee (24).

(18) Remove tee (24) from nipple (25).

(19) Remove split rings (26 and 27) and chain (28).

(20) Remove dust plug (29) from female coupling half (31).

(21) Remove gasket (30) from female coupling half (31).

(22) Remove female coupling half (31) from gate valve (32).

(23) Remove nipple (25) from gate valve (32).

4-30. FUELING MANIFOLD ASSEMBLY REPAIR - cont.

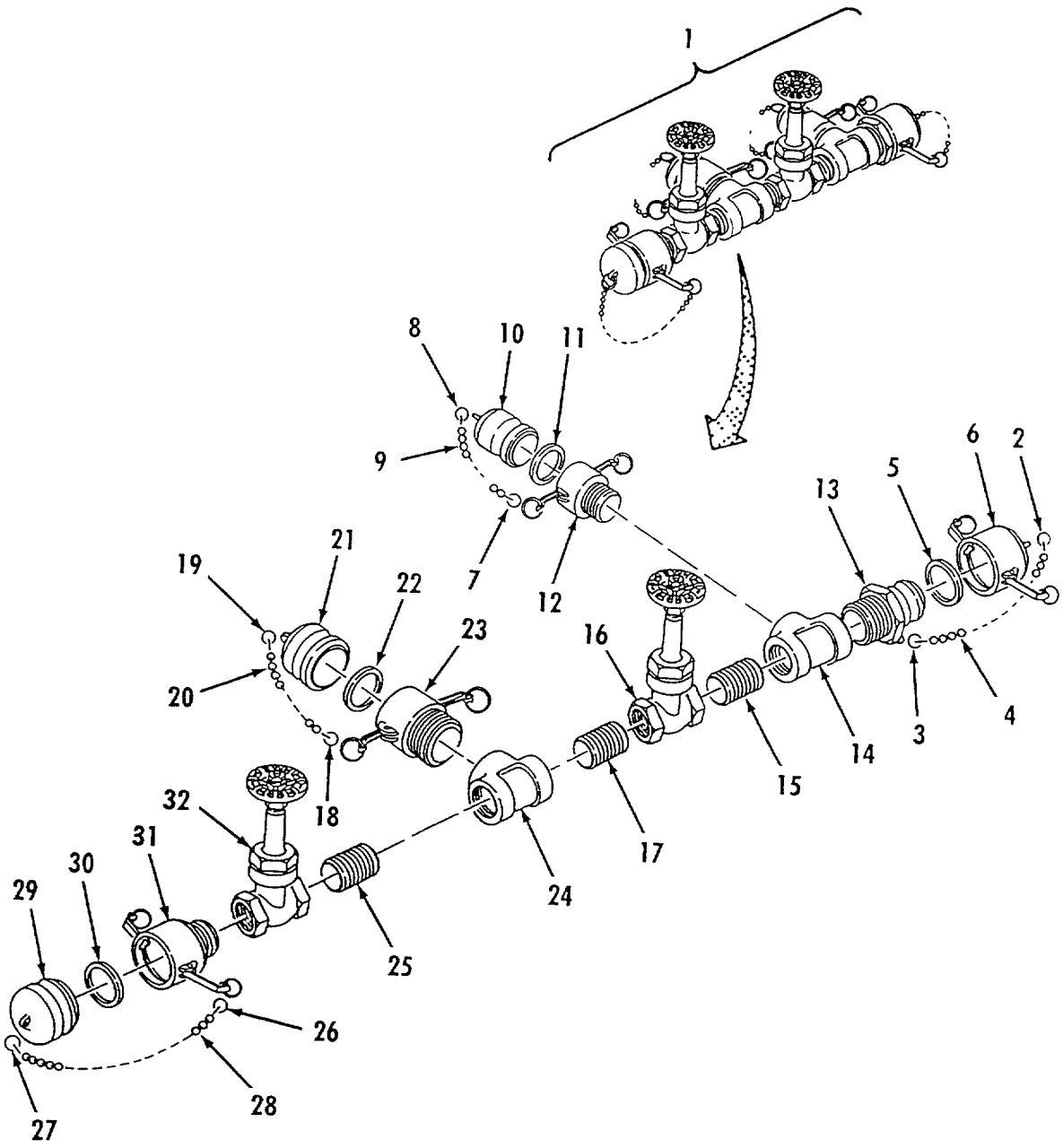


Figure 4-19. Fueling Manifold Repair.

4-30. FUELING MANIFOLD ASSEMBLY REPAIR - cont.

c. Cleaning.

WARNING

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

Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

d. Repair. Replace damaged or defective parts and all sealing components.

e. Assembly. Refer to figure 4-19.

CAUTIONS

- To prevent premature failure of fueling manifold assembly, gaskets certified for arctic service must be installed. If a new dust cap or female coupling half has been installed, remove and discard black gaskets supplied with the new components and replace them with arctic service gaskets.
- Ensure gasket is fully seated in gasket seat of coupling/dust cap to prevent leaks in assembled components.

(1) Apply thread sealant to male threads of all threaded threaded components.

(2) Install female coupling half (31) on gate valve (32).

(3) Install gasket (30) in female coupling half (31).

(4) Install dust plug (29) in female coupling half (31).

(5) Install split rings (26 and 27) and chain (28).

(6) Install nipple (25) and tee (24) on gate valve (32).

(7) Install tee (24) on nipple (25).

(8) Install female coupling half (23) on tee (24).

(9) Install gasket (22) in female coupling half (23).

4-30. FUELING MANIFOLD ASSEMBLY REPAIR - cont.

(10) Install dust plug (21) in female coupling half (23).

(11) Install split rings (18 and 19) and chain (20).

(12) Install nipple (17) on tee (24).

(13) Install gate valve (16) on nipple (17).

(14) Install nipple (15) on gate valve (16).

(15) Install tee (14) on nipple (15).

(16) Install female coupling half (12) on tee (14).

(17) Install gasket (11) in female coupling half (12).

(18) Install dust plug (10) in female coupling half (12).

(19) Install split rings (7 and 8) and chain (9).

(20) Install male coupling half (13) on tee (14).

(21) Install gasket (5) in dust cap (6).

(22) Connect dust cap (6) to male coupling half (13).

(23) Install split rings (2 and 3) and chain (4).

(24) Remove manifold assembly (1) from vise.

f. Installation. Refer to figure 4-18.

(1) Apply foam (9) to saddle of bracket (15).

(2) Position bracket (15) on skid (16).

(3) Install two flat washers (14) cap screws (13), flat washers (12), lockwashers (11) and nuts (10).

(4) Repeat steps (1), (2), and (3) for other bracket (15).

(5) Using two personnel, position fueling manifold assembly (8) on skid (16).

(6) Apply foam (7) to saddle of strap (6)

(7) Aline mounting holes in strap (6) with bracket (15).

(8) Install two flat washers (5), cap screws (4), flat washers (3), lockwashers (2) and nuts (1).

(9) Repeat steps (6), (7), and (8) for remaining strap (6).

4-31. FUELING MANIFOLD SKID REPAIR.

Refer to para 4-20 for fuel manifold skid repair

4-32. TEE ASSEMBLY REPAIR.

This task covers:

a. Disassembly **b. Cleaning**
c. Repair **d. Assembly**

INITIAL SETUP:

Tools:	**Material/Parts:**	
General Mech Tool Kit (App B, Sect III, Item 1)	Cleaning Solvent	(Item 1, App E)
Pipe Wrench (2 ea) (App B, Sect III, Item 5)	Wiping Rag	(Item 2, App E)
Vise (App B, Sect III, Item 2)	Thread Sealant	(Item 4, App E)
Equipment Condition:	Coupling Gasket	(Item 4, App J)
Tee assembly removed (para 2-20)		

NOTE

Ensure that all parts identified as mandatory replacement parts are discarded and replaced with new components.

a. Disassembly. Refer to figure 4-20.

NOTE

Disassemble tee assembly only the extent required to replace defective component.

(1) Place tee assembly (1) in vise.

(2) Remove split rings (2 and 3) and chain (4).

(3) Remove dust plug (5) from female coupling half (7).

(4) Remove gasket (6) from female coupling half (7).

(5) Remove female coupling half (7) from tee (20).

(6) Remove split rings (8 and 9) and chain (10).

(7) Remove dust cap (12) from male coupling half (13).

(8) Remove gasket (11) from dust cap (12).

(9) Remove male coupling half (13) from tee (20).

(10) Remove split rings (14 and 15) and chain (16).

(11) Remove dust plug (17) from female coupling half (19).

4-32. TEE ASSEMBLY REPAIR - cont.

(12) Remove gasket (18) from female coupling half (19).

(13) Remove female coupling half (19) from tee (20).

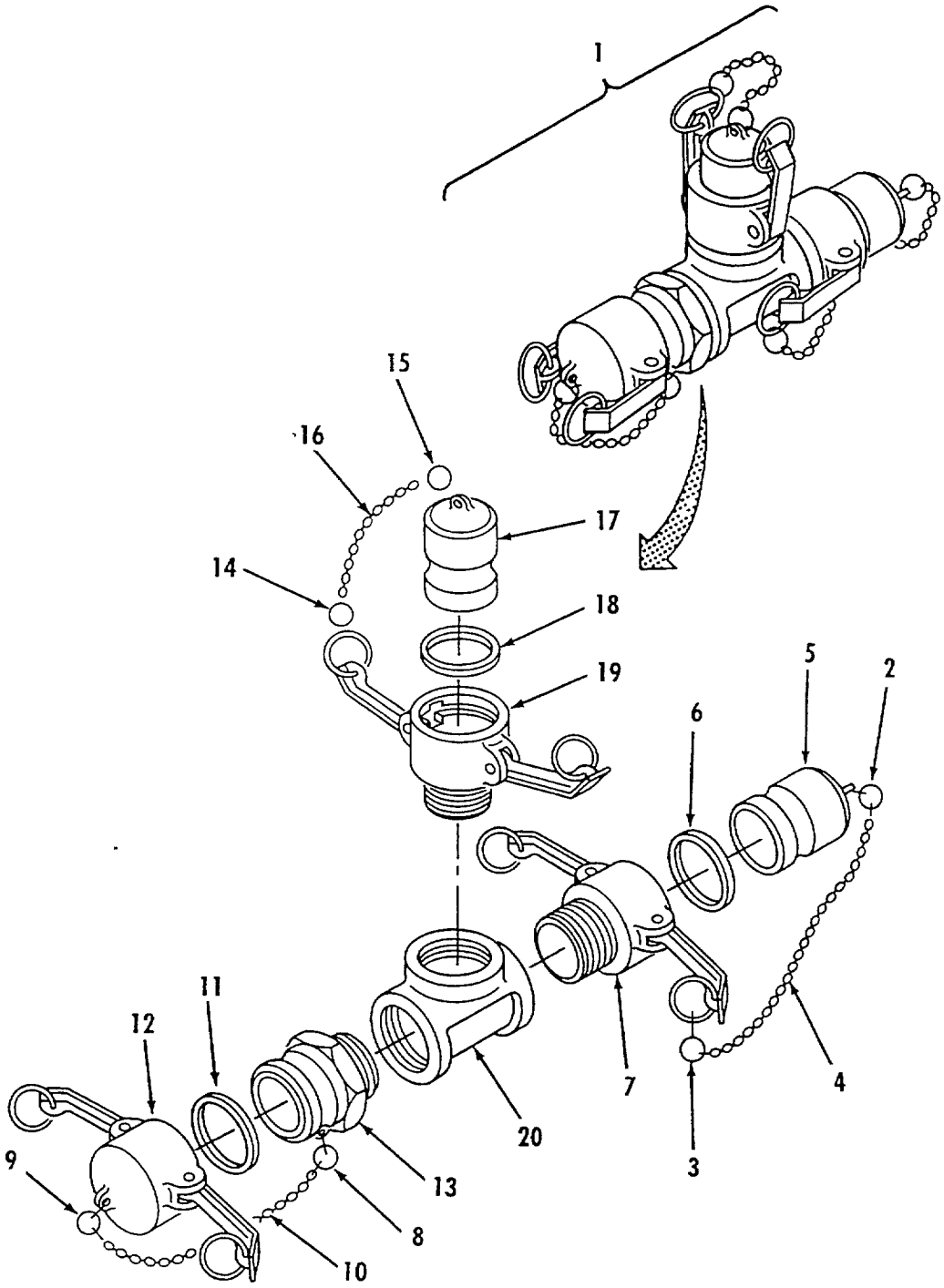


Figure 4-20. Tee Assembly Repair.

4-32. TEE ASSEMBLY REPAIR - cont.

b. Cleaning.

WARNING

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

Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

c. Repair. Replace damaged or defective parts and all sealing components.

d. Assembly. Refer to figure 4-20.

CAUTIONS

- To prevent premature failure of tee assembly, gaskets certified for arctic service must be installed. If a new dust cap or female coupling half has been installed, remove and discard black gaskets supplied with the new components and replace them with arctic service gaskets.
- Ensure gaskets are fully seated in gasket seat of coupling/dust cap to prevent leaks in assembled components.

(1) Apply thread sealant to male threads of all components.

(2) Install female coupling half (19) on tee (20).

(3) Install gasket (18) in female coupling half (19).

(4) Install dust plug (17) in female coupling half (19).

(5) Install split rings (14 and 15) and chain (16).

(6) Install male coupling half (13) on tee (20).

(7) Install gasket (11) in dust cap (12).

(8) Install dust cap (12) on male coupling half (13).

(9) Install split rings (8 and 9) and chain (10).

(10) Install female coupling half (7) on tee (20).

(11) Install gasket (6) in female coupling half (7).

(12) Install dust plug (5) in female coupling half (7).

(13) Install split rings (2 and 3) and chain (4).

4-33. COUPLER ASSEMBLY REPAIR.

This task covers:

a. Disassembly **b. Cleaning**
c. Repair **d. Assembly**

INITIAL SETUP:

Tools:		**Material/Parts:**	
General Mech Tool Kit	(App B, Sect III, Item 1)	Thread Sealant	(Item 4, App E
Vise	(App B, Sect III, Item 2)	Silicone Lubricant	(Item 6, App E)
Pipe Wrench (2 ea)	(App B, Sect III, Item 5)	Coupling Gasket (2)	(Item 3, App J)
Adjustable Wrench	(App B. Sect III, Item 2)	Seal (2)	(Item 30, App J)
Equipment Condition:		Cotter Pin	(Item 31, App J)
Coupler removed (para 2-20)		Cotter Pin(4)	(Item 32, App J)
Material/Parts:		Seal	(Item 33, App J)
Cleaning Solvent	(Item 1, App E)	Cylinder	(Item 34, App J)
Wiping Rag	(Item 2, App E)		

NOTE

Ensure that all parts identified as mandatory replacement parts are discarded and replaced with new components.

a. Disassembly.

Remove Couplings Refer to figure 4-21.

(1) Place coupler in vise.

(2) Remove split rings (1 and 2) and chain (3).

(3) Remove dust cap (4), then remove gasket (5) from dust cap (4).

(4) Remove male coupling half (6) from coupler body (7).

(5) Remove gasket (8) from coupler body (7).

Disassemble Coupler. Refer to figure 4-22.

(6) Turn handle (1) to open position.

(7) Remove cotter pin (2) from end of shaft (3).

(8) Drive out groove pin (4) from handle (1). Pin must be driven out in the opposite direction of the flow arrow on handle (1).

4-33. COUPLER ASSEMBLY REPAIR - cont.

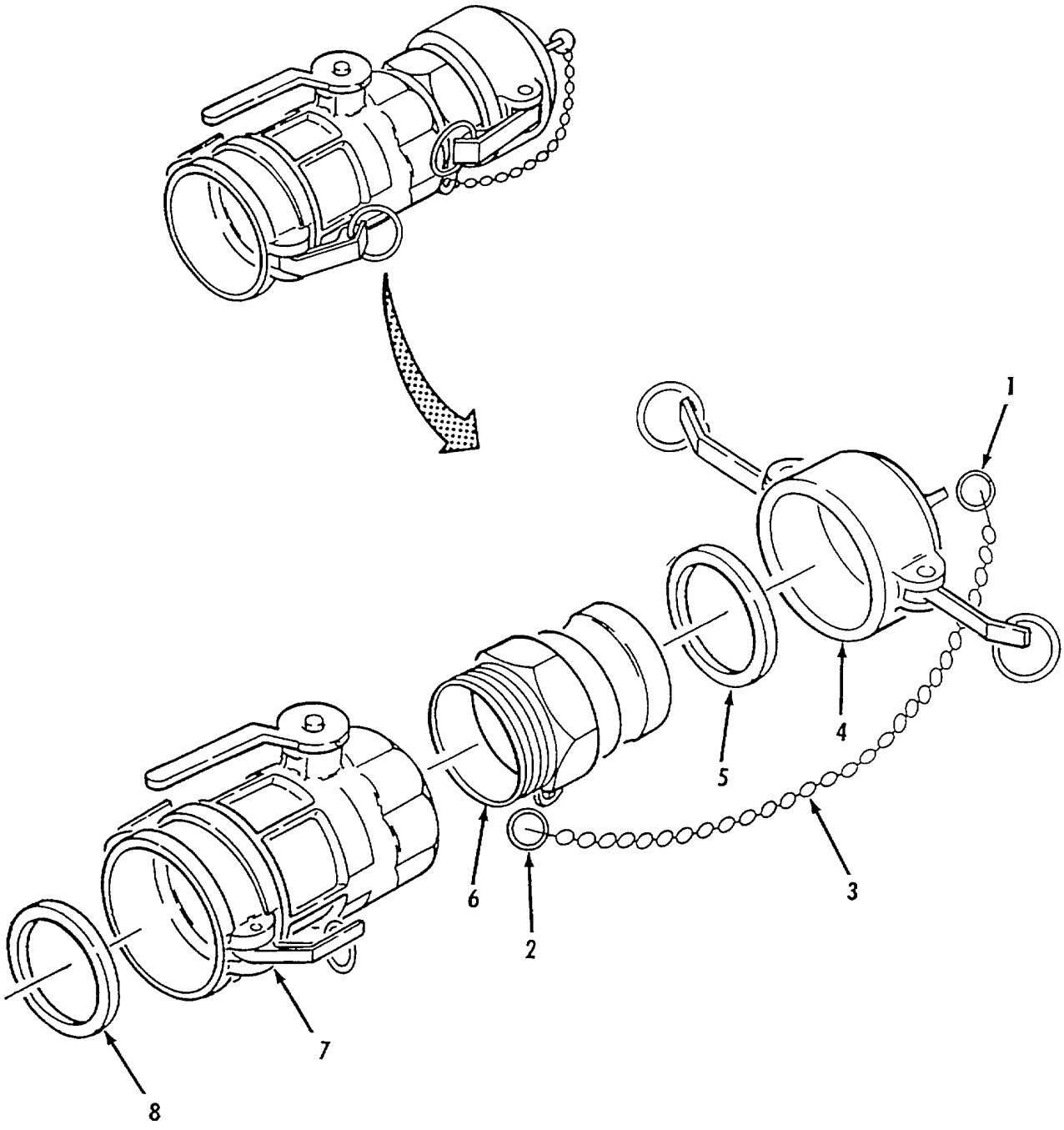


Figure 4-21. Coupling Replacement.

4-33. COUPLER ASSEMBLY REPAIR - cont.

(9) Remove handle (1) from top of shaft (3).

(10) Remove stuffing box (5) and seal (6).

(11) Note position of drive pin hole before remove shaft (3).

(12) Pull shaft (3) bushing (7), seal (8) and retainer (9) from body (10).

(13) Note position of yoke (11) in body (10).

WARNING

Assembled components are under spring tension. Use care when removing components to prevent injury from flying parts. Slowly release spring tension as components are removed.

(14) While pushing poppet (12) against spring (13), turn and aline yoke (11) with cutouts in washer (14). Slowly release spring tension and remove poppet and yoke components as an assembly.

(15) Slide spring (13) off over yoke (11).

(16) Remove screw (15) and seal (16) from end of poppet (12).

NOTE

To aid assembly, count and record the number of turns required to remove setscrew from poppet.

(17) Remove setscrew (17) from poppet (12).

(18) Unscrew poppet (12) and remove poppet (12), poppet guide (18) and cylinder (19) from stem (20).

(19) Remove cotter pins (21 and 22) from pin (23).

(20) Remove pin (23) and stem (20) from link (24).

(21) Note position of yoke (11) and link (24) before separating.

(22) Remove cotter pins (25 and 26) from pin (27).

(23) Remove pin (27) from yoke (11).

(24) Remove packing (28), washer (14) and bushing (29) from body (10).

4-33. COUPLER ASSEMBLY REPAIR REPAIR - cont.

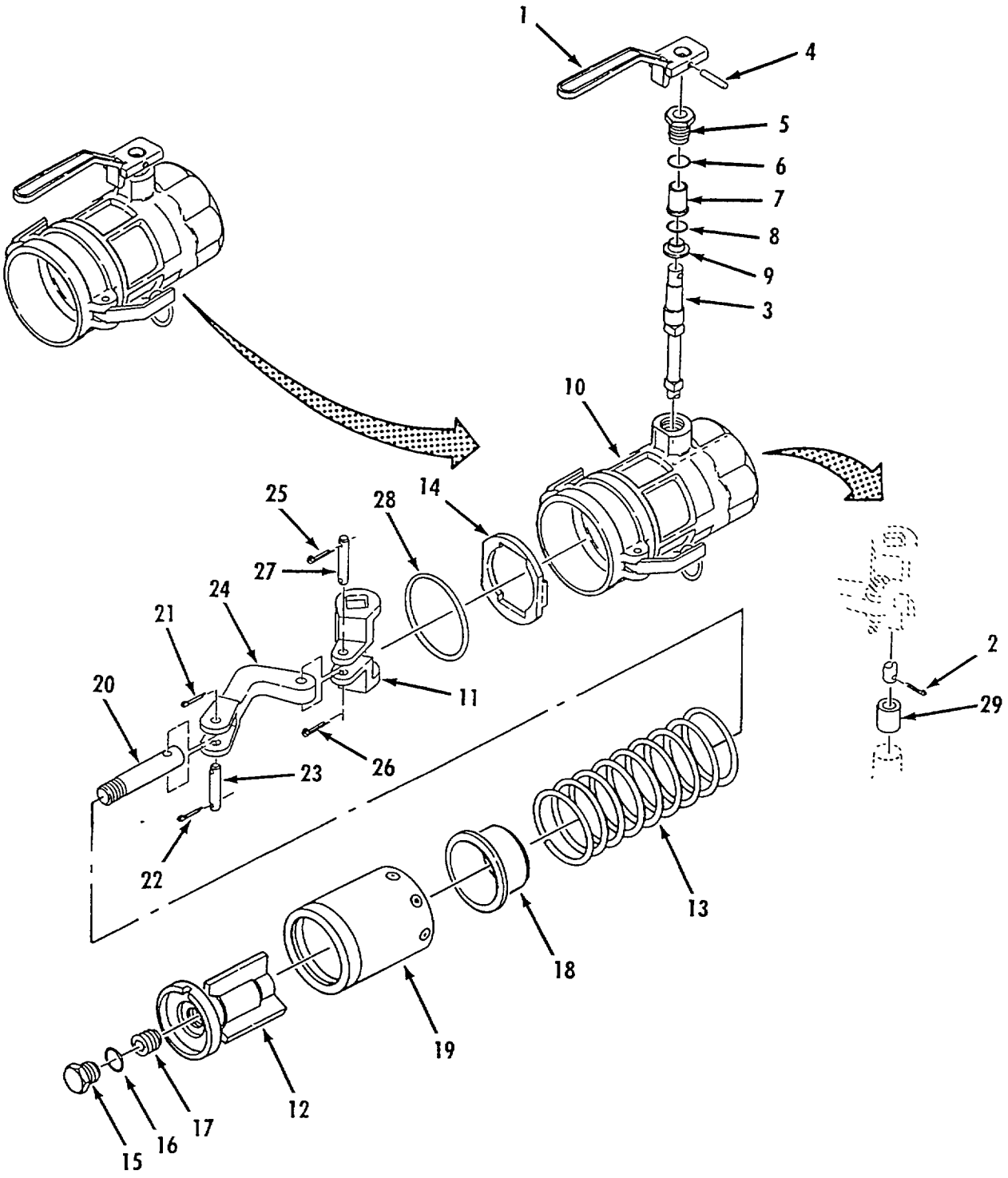


Figure 4-22. Coupler Repair.

4-33. COUPLER ASSEMBLY REPAIR - cont.

b. Cleaning.

WARNING

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

Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

c. Repair. Replace damaged or defective parts and all sealing components.

d. Assembly.

Assemble Coupler. Refer to figure 4-22.

(1) Install bushing (29) in body (10).

(2) Install washer (14) with tabs facing inward in body (10).

(3) Apply lubricant to packing and install in body (10).

(4) Alone link (24) with yoke (11) as noted during disassembly and install pin (27).

(5) Install cotter pins (25 and 26) in pin (27).

(6) Aline stem (20) in link (24) and install pin (23).

(7) Install cotter pins (21 and 22) in pin (23).

(8) Install setscrew (17) in poppet (12). Setscrew must be turned in the same amount as recorded during disassembly.

(9) Position poppet guide (18) and cylinder (19) over stem (20).

(10) Insert poppet (12) into cylinder (19) and screw poppet (12) onto stem (20) until it stops, then tighten.

(11) Install seal (16) on screw (15), then install screw (15) into poppet (12).

WARNING

Assembled components are under spring tension. Use care when installing body to prevent Injury from flying parts. Slowly compress spring when Installing.

(12) Slide spring (13) on over yoke (11).

4-33. COUPLER ASSEMBLY REPAIR- cont.

(13) Apply lubricant to cylinder (19) and push assembled yoke and poppet components into body (10).

NOTE

Ensure yoke is locked in the same position as noted during disassembly.

(14) Aline and push yoke (11) through cutouts in washer (14). When yoke (11) is through washer (14), turn poppet (12) and lock yoke (11) against washer (14).

(15) Install retainer (9), seal (8) and bushing (7) on shaft (3).

NOTE

Shaft must be installed in the same position as noted during disassembly.

(16) Install shaft (3) in body (10) and push through yoke (11) and bushing (29) until fully seated.

(17) Install stuffing box (5) and seal (6) in body (10).

(18) Position handle (1) on top of shaft (3). Aline handle with the drive pin hole on shaft (3).

(19) With smooth end of groove pin (4) pointing with flow of arrow, drive groove pin (4) through handle (1) and shaft (3).

(20) Turn handle (1) and Install cotter pin (2) in bottom hole on shaft (3).

Refer to figure 4-21.

(21) Install gasket (8) in coupler body (7).

(22) Apply sealant to male threads of male coupling half (6).

(23) Install male coupling half half (6) on coupling body (7).

(24) Install gasket (5) in dust cap (4) and install dust cap (4) on coupling half (6).

(25) Connect split rings (1 and 2) to chain (3).

(26) Connect split rings (1 and 2) to coupling half (6) and dust cap (4).

4-34. REDUCER REPAIR.

Refer to para 4-23 for repair of all reducers.

4-35. ADAPTER ASSEMBLY REPAIR.

This task covers:

a. Disassembly **b. Cleaning**
c. Repair **d. Assembly**

INITIAL SETUP:

Tools:		**Material/Parts:**	
General Mech Tool Kit	(App B, Sect III, Item 1)	Cleaning Solvent	(Item 1, App E)
Vise	(App B, Sect III, Item 2)	Wiping Rag	(Item 2, App E)
Pipe Wrench (2 ea)	(App B, Sect III, Item 5)	Thread Sealant	(Item 4, App E)
Equipment Condition:		Coupling Gasket	(Item 4, App J)
Adapter assembly removed (para 4-13a)			

CAUTIONS

- To prevent premature failure of adapter assembly, gaskets certified for arctic service must be installed. If a new dust cap or female coupling has been Installed, remove and discard black gaskets supplied with the new components and replace them with arctic service gaskets.
- Ensure gasket is fully seated in gasket seat of coupling/dust cap to prevent leaks in assembled components.

NOTES

- Ensure that all parts identified as mandatory replacement parts are discarded and replaced with new components.
- The following instructions are typical for all adapters supplied with the AFARE. A Male X Male adapter is shown. Repair of other adapters is similar.

a. Disassembly. Refer to figure 4-23.

(1) Place adapter assembly (1) in vise.

(2) Remove three split rings (2, 3, and 4) and chains (5 and 6).

(3) Remove dust cap (7) from male coupling half (8).

(4) Remove gasket (9) from dust cap (7).

(5) Remove dust cap (10) from male coupling half (11).

(6) Remove gasket (12) from dust cap (10).

(7) Remove male coupling half (11) from male coupling half (8).

4-35. ADAPTER ASSEMBLY REPAIR-cont.

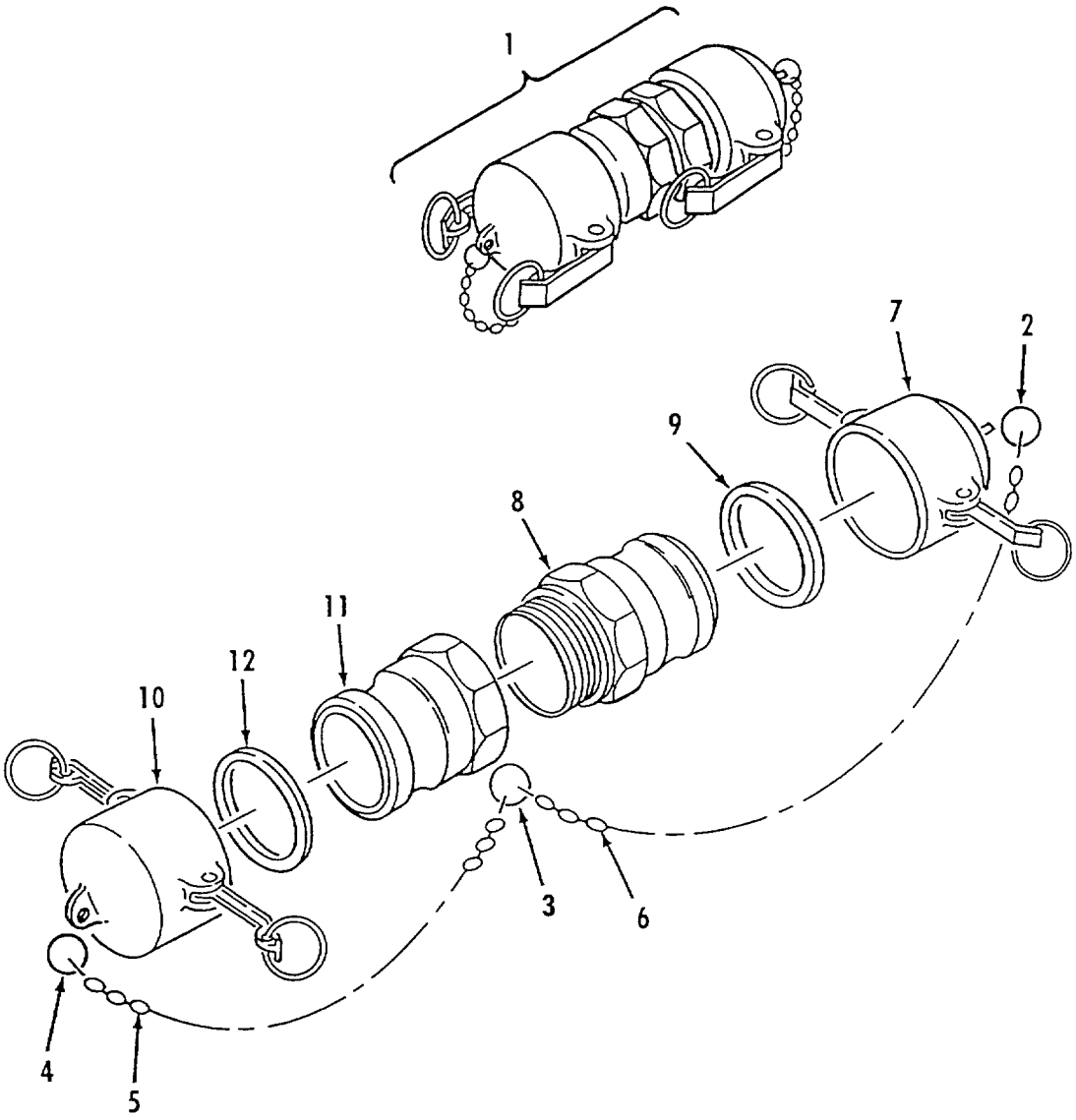


Figure 4-23. Adapter Repair.

4-35. ADAPTER ASSEMBLY REPAIR-cont.

b. Cleaning.

WARNING

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

Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

c. Repair. Replace damaged or defective parts and all sealing components.

d. Assembly. Refer to figure 4-23.

(1) Apply thread sealant to male threads of male coupling half (8).

(2) Connect male coupling half (11) on male coupling half (8).

(3) Install gasket (12) in dust cap (10).

(4) Install dust cap (10) on male coupling half (11).

(5) Install gasket (9) in dust cap (7).

(6) Install dust cap (7) on male coupling half (8).

(7) Install chains (5 and 6) and three split rings (2, 3, and 4).

4-36. ELBOW ASSEMBLY REPAIR.

This task covers:

a. Disassembly **b. Cleaning**
c. Repair **d. Assembly**

INITIAL SETUP:	
Tools:	**Material/Parts:**
General Mech Tool Kit (App B, Sect III, Item 1)	Cleaning Solvent (Item 1, App E)
Equipment Condition:	Wiping Rag (Item 2, App E)
Adapter assembly removed (para 4-13a)	Coupling Gasket (Item 1, App J)
	Coupling Gasket (Item 4, App J)

NOTES

- Ensure that all parts identified as mandatory replacement parts are discarded and replaced with new components.
- The following instructions are typical for all elbows supplied with the AFARE.

a. Disassembly. Refer to figure 4-24.

(1) Remove three spilt rings (1, 2, and 3) and chains (4 and 5).

(2) Remove dust cap (6) from male end of elbow (7).

(3) Remove gasket (8) from dust cap (6).

(4) Remove dust plug (9) from female end of elbow (7).

(5) Remove gasket (10) from female end of elbow (7).

b. Cleaning.

WARNING

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

Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

c. Repair. Replace damaged or defective parts and all sealing components.

4-36. ELBOW ASSEMBLY REPAIR - cont.

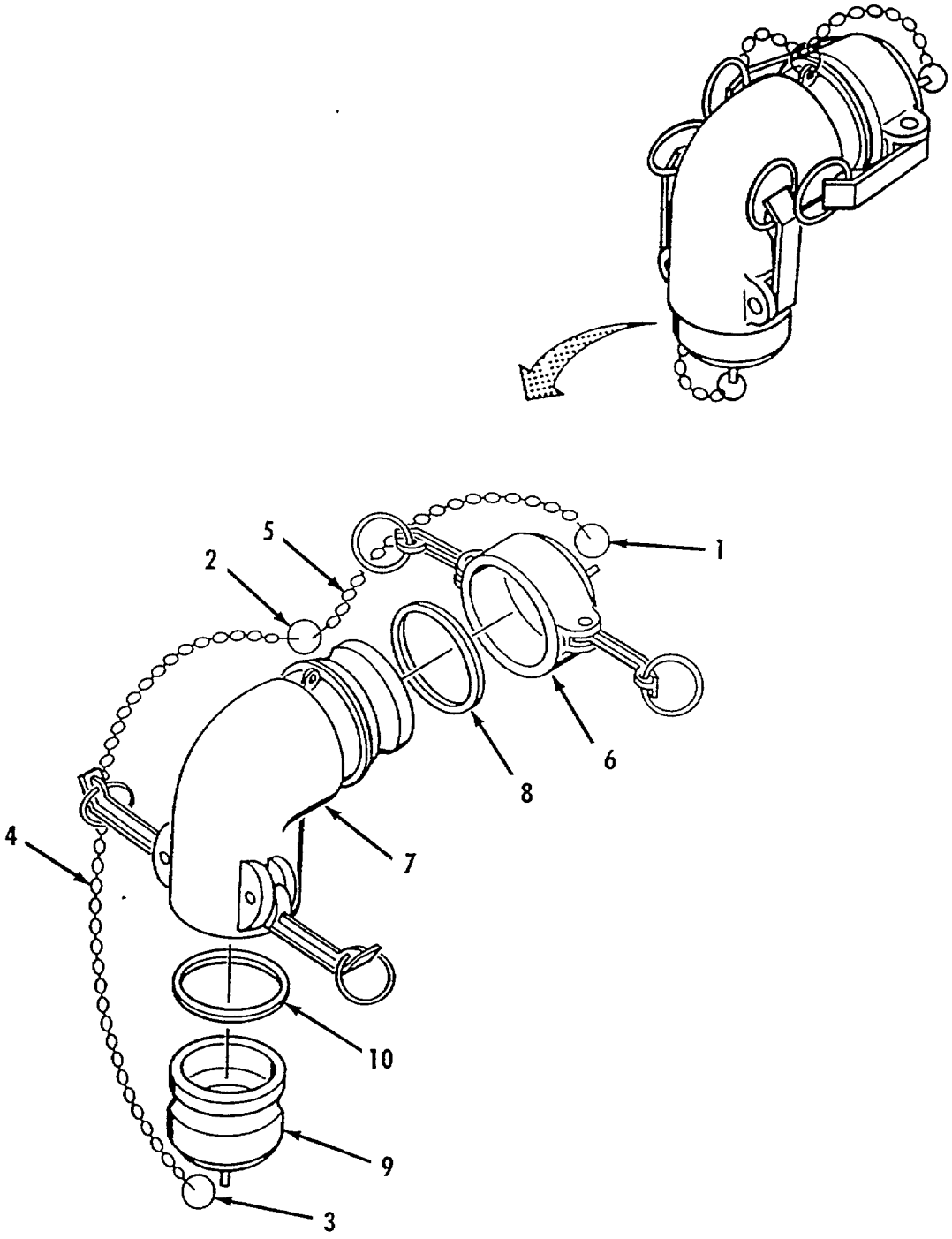


Figure 4-24. Elbow Repair.

4-36. ELBOW ASSEMBLY REPAIR-cont.

d. Assembly. Refer to figure 4-24.

CAUTIONS

- To prevent premature failure of elbow assembly, gaskets certified for arctic service must be installed. If a new elbow or dust cap has been installed, remove and discard black gaskets supplied with the new components and replace them with arctic service gaskets.
- Ensure gasket is fully seated in gasket seat of coupling/dust cap to prevent leaks in assembled components.

(1) Install gasket (10) in female end of elbow (7).

(2) Install dust plug (9) in female end of elbow (7).

(3) Install gasket (8) In dust cap (6).

(4) Install dust cap (6) on male end of elbow (7).

(5) Install chains (4 and 5) and three split rings (1, 2, and 3).

4-37. FUEL HOSE (NON-COLLAPSIBLE) REPAIR

Refer to para 4-12 for repair of non-collapsible fuel hose.

4-38. FUEL HOSE (COLLAPSIBLE) REPAIR

Refer to para 4-12 for repair of collapsible fuel hose.

4-39. FIRE EXTINGUISHER FRAME REPAIR.

This task covers:

a. Disassembly **b. Cleaning**

c. Repair **d. Assembly**

INITIAL SET-UP:

Tools:	**Material/Parts:**	
General Mech Tool Kit (App B, Sect III, Item 1)	Cleaning Solvent	(Item 1, App E)
Equipment Condition:	Wiping Rag	(Item 2, App E)
Fire extinguishers removed	Lockwasher	(Item 25, App J)

NOTE

Ensure that all parts identified as mandatory replacement parts are discarded and replaced with new components.

a. Disassembly. Refer to figure 4-25.

(1) Remove two screws (1), lockwashers (2), flat washers (3), latch (4) and nut plate (5) from frame (6).

(2) . Repeat step (1) for two remaining latches (4).

b. Cleaning.

WARNING

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

Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

c. Repair. Replace damaged or defective components.

d. Assembly. Refer to figure 4-25.

(1) Position nut plate (5) and latch (4) on frame (6).

(2) Install two flat washers (3), lockwashers (2) and screws (1) and attach latch (4) and nut plates (5).

(3) . Repeat steps (1) and (2) for two remaining latches (4).

4-39. FIRE EXTINGUISHER FRAME REPAIR-cont.

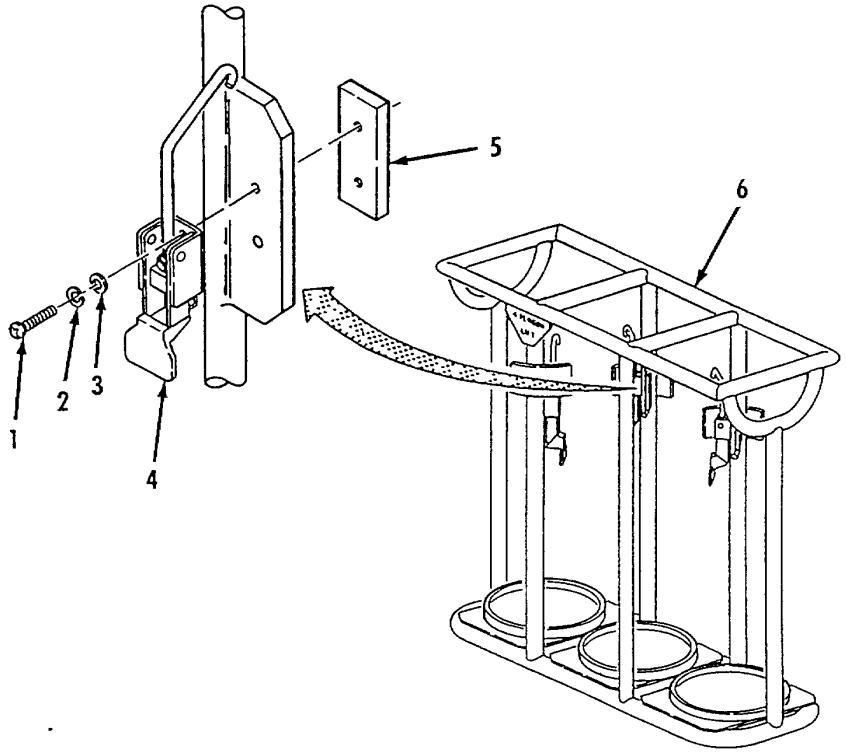


Figure 4-25. Fire Extinguisher Frame Repair.

4-40. FUEL HOSE CARRIER REPAIR.

Unit level repair of the fuel hose carrier is limited to replacement of the web strap

4-41. NOZZLE AND COMPONENT CARRIER ASSEMBLY REPAIR.

This task covers:

a. Disassembly **b. Cleaning**

c. Repair **d. Assembly**

INITIAL SET-UP:

Tools:
General Mech Tool Kit (App B, Sect III, Item 1)
Hand Riveter (App B, Sect III, Item 1)
Drill and Bit Set (App B, Sect III, Item 1)

Equipment Condition:
Components removed from carrier

Material/Parts:

Cleaning Solvent	(Item 1, App E)
Wiping Rag	(Item 2, App E)
Blind Rivet (16)	(Item 28, App J)
Self Locking Nut (8)	(Item 29, App J)

NOTE

Ensure that all parts identified as mandatory replacement parts are discarded and replaced with new components.

a. Disassembly. Refer to figure 4-26.

NOTE

Disassemble nozzle and component carrier only the extent required to replace defective component.

(1) Disconnect eight straps (1) and remove cover (2) from carrier (3).

(2) Remove eight self locking nuts (4), flat washers (5), screws (6) and flat washers (7).

(3) Remove four nozzle bags (8) from carrier (3).

(4) Remove two rivets (9) and strap (1) from carrier (3). Repeat for seven remaining straps.

b. Cleaning.

WARNING

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

Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

4-41. NOZZLE AND COMPONENT CARRIER ASSEMBLY REPAIR-cont.

c. Repair. Replace damaged or defective components.

d. Assembly. Refer to figure 4-26.

(1) Install strap (1) on carrier (3) with two rivets (9). Repeat for seven remaining straps.

(2) Position four nozzle bags (8) Into carrier (3).

(3) Install eight flat washers (7), screws (6), flat washers (5) and self locking nuts (4).

(4) Position cover (2) on carrier (3) and connect eight straps (1).

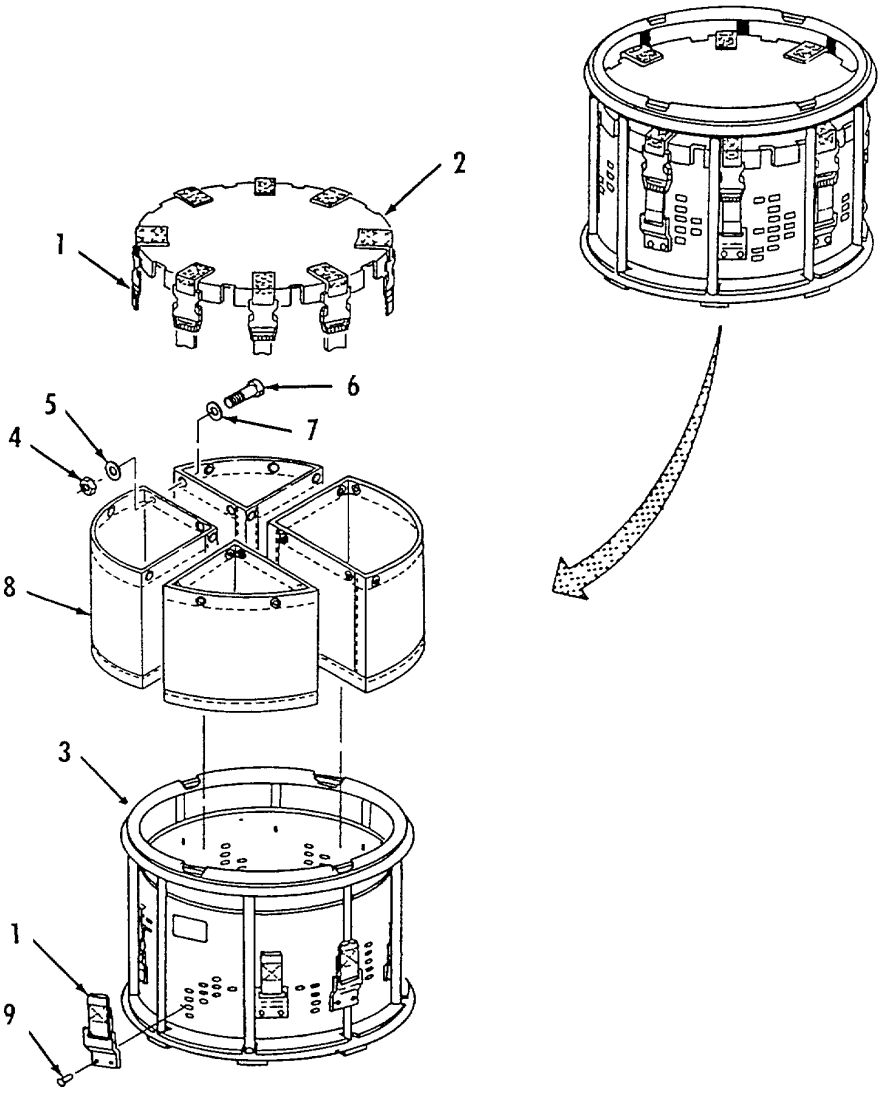


Figure 4-26. Nozzle and component Carrier Repair.

4-42. STORAGE BOX ASSEMBLY REPAIR.

This task covers:

a. Disassembly **b. Cleaning**

c. Repair **d. Assembly**

INITIAL SET-UP:

Tools:
- General Mech Tool Kit (App B, Sect III, Item 1)
- Drill and Bit Set (App B, Sect III, Item 2)
- Hand Riveter (App B, Sect III, Item 2)

Equipment Condition:
- Components removed from storage box

Material/Parts:
- Cleaning Solvent (Item 1, App E)
- Wiping Rag (Item 2, App E)
- Adhesive Sealant (Item 4, App E)
- Lockwasher (32) (Item 7, App J)
- Blind Rivet (48) (Item 9, App J)
- Blind Rivet (8) (Item 13, App J)

NOTE

Ensure that all parts identified as mandatory replacement parts are discarded and replaced with new components.

a. Disassembly. Refer to figure 4-27.

NOTE

Disassemble storage box only the extent required to replace defective component.

(1) Remove two nuts (1), lockwashers (2), screws (3), and strike (4) from cover. . Repeat for three remaining strikes.

(2) Remove fifty four rivets (5) and backup plates (6), then separate top panel (7) from upper frame (8).

(3) Remove upper shelf (9) from storage container (10).

(4) Remove lower shelf (11) from storage container (10).

(5) Remove eight rivets (12) and backup plates (13), then separate divider (14) from lower shelf (11).

(6) Slide adapter (15) on webbing and remove strap webbing (16) from container (10). Repeat step for remaining five strap webbings.

(7) Remove four rivets (17), backup plates (18) and identification plate (19) from container (10).

(8) Remove four rivets (20), backup plates (21) and identification plate (22) from container (10).

(9) Remove two nuts (23), lockwashers (24), screws (25), ring (26) and clip (27) from storage container (10). . Repeat step for remaining three rings

4-42. STORAGE BOX ASSEMBLY REPAIR-cont.

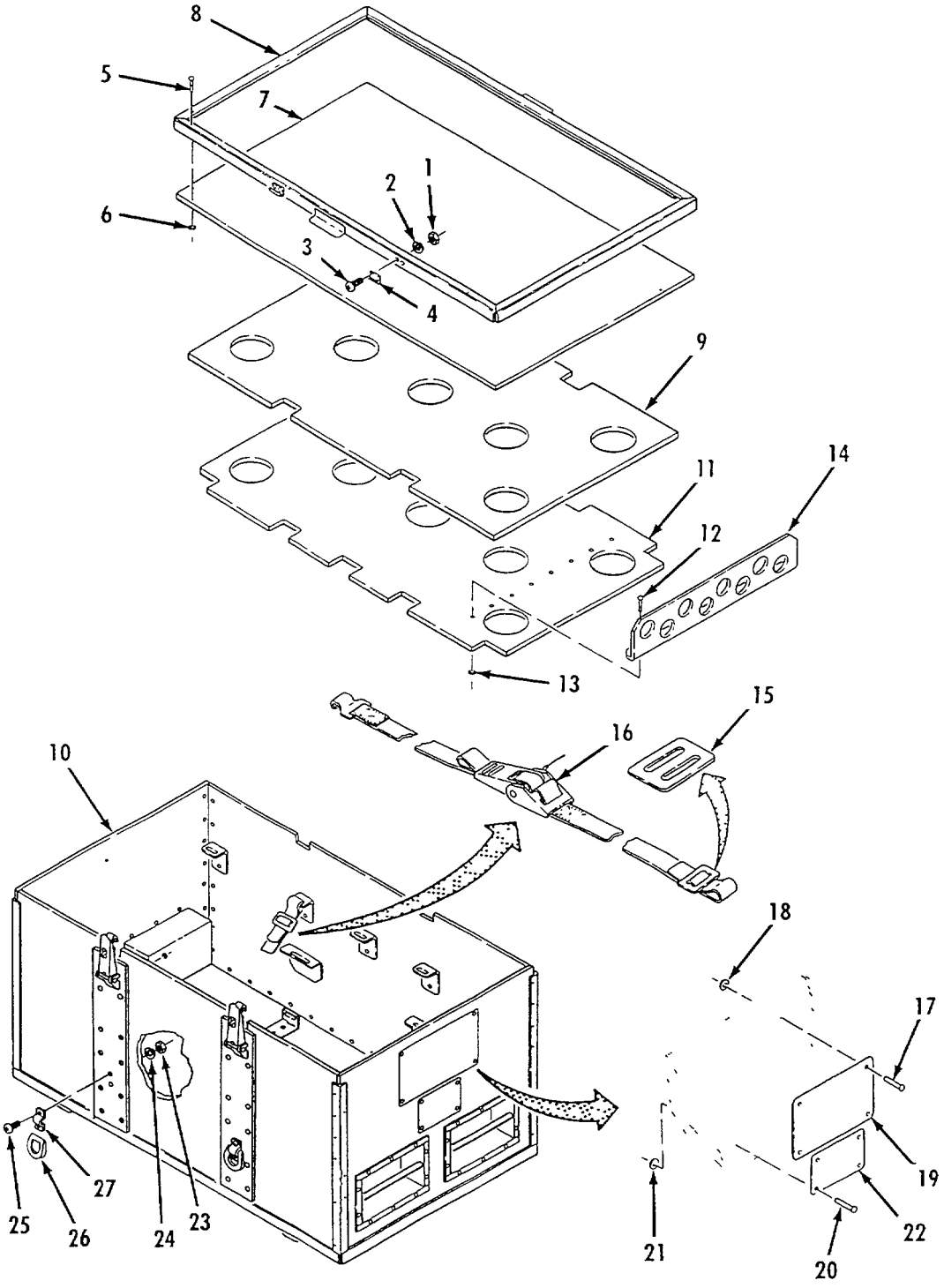


Figure 4-27. Storage Box (Cover and Shelves) Repair.

4-42. STORAGE BOX ASSEMBLY REPAIR-cont.

Refer to figure 4-28.

(10) Remove ten rivets (1), backup plates (2) and pull out lift handles (3) from container (4). . Repeat step for remaining three lift handles.

(11) Remove two rivets (5), backup plates (6) and latch (7) from container (4). . Repeat step for remaining three latches.

(12) Remove two rivets (8) and top angle bracket (9) from container (4). . Repeat step for remaining nine top angle brackets.

(13) Remove two rivets (10) and bottom angle bracket (11) from container (4). Repeat step for remaining three bottom angle brackets.

(14) Remove twelve rivets (12), backup plates (13) and channels (14) from container (4). Repeat step for remaining three channels.

(15) Remove twenty rivets (15), backup plates (16) and skid (17) from bottom of container (4). Repeat step for remaining skid.

Refer to figure 4-29.

(16) Remove sixteen rivets (1), backup plates (2) and corner angle (3) from panels (4 and 5). Repeat step for remaining three corner angles.

(17) Remove seventeen rivets (9), backup plates (10) and lift out side panel (11) from lower frame (8). Repeat step for other side panel (4).

(18) Remove fifty four rivets (12), backup plates (13) and lift out bottom panel (14) from lower frame (8).

b. Cleaning.

WARNING

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

Using wiping rags and cleaning solvent, remove dirt and contaminants from all components.

4-42. STORAGE BOX ASSEMBLY REPAIR-cont.

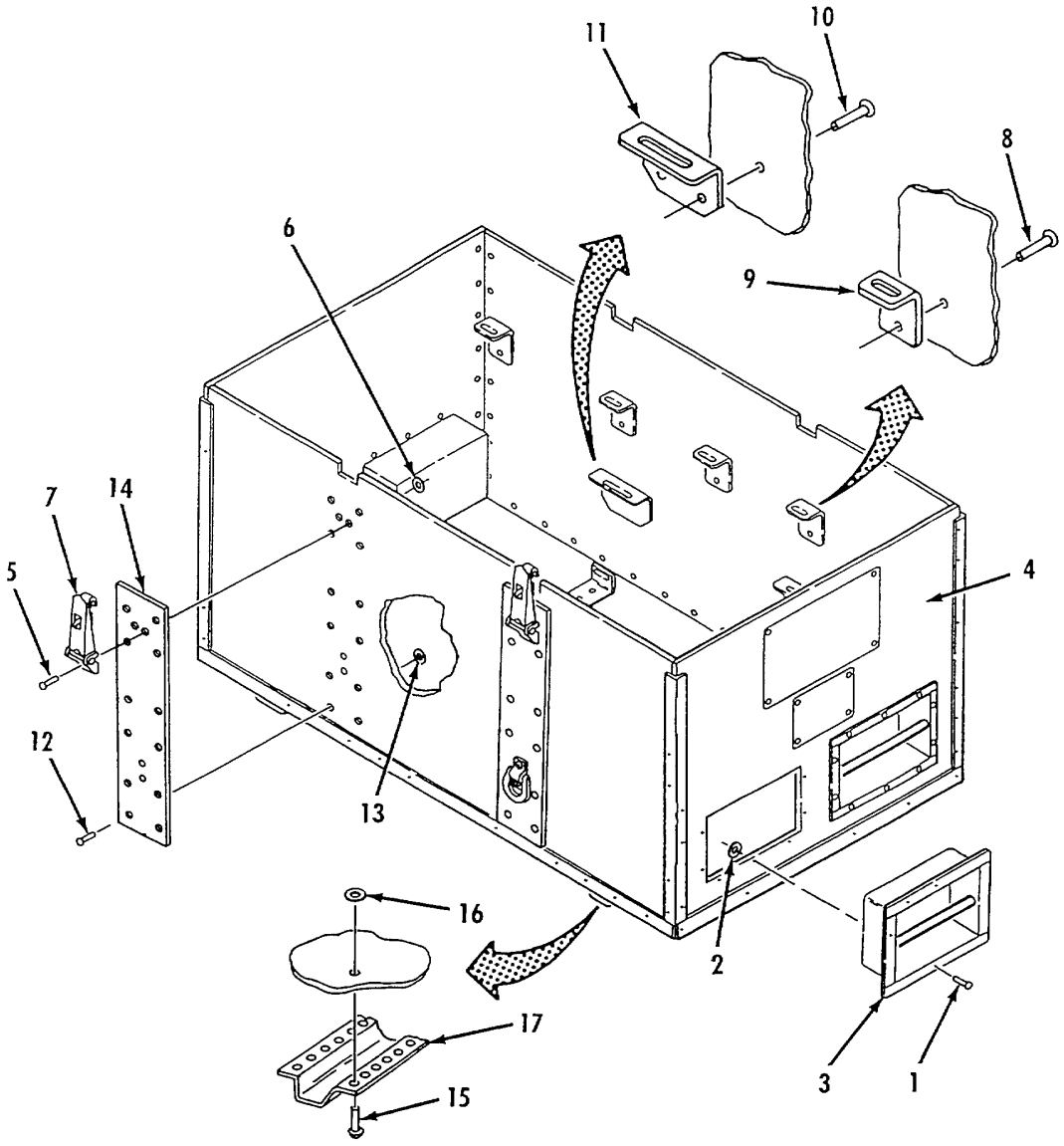


Figure 4-28. Storage Box (Brackets, Handles and Skids) Repair.

4-42. STORAGE BOX ASSEMBLY REPAIR-cont.

c. Repair. Replace damaged or defective components.

d. Assembly. Refer to figure 4-29.

NOTE

Drill holes in panels by using angle brackets, channels, corner angles, skids, lift handles, identification plates, latches, upper frame and lower frame as templates.

(1) Apply adhesive sealant on bottom panel (14) and install In lower frame (8), then secure with fifty four rivets (12) and backup plates (13).

(2) Apply adhesive sealant on side panel (11) and install lower frame (8), then secure with sixteen rivets (9) and backup plates 10. Repeat step for other end panel.

(3) Apply adhesive sealant on end panel (5) and install in lower frame (8), then secure with ten rivets (6) and backup plates (7).

(4) Install corner angle (3) on panels (4 and 5) and secure with sixteen rivets (1) and backup plates (2). Repeat step for remaining three corner angles.

Refer to figure 4-28.

(5) Install skid (17) on container (4) and secure with twenty rivets (15) and backup plates (16)-. Repeat step for other skid.

(6) Install channel (14) on container (4) and secure with twelve rivets (12) and backup plates (13). Repeat step for remaining three channels.

(7) Install bottom bracket (11) on container (4) and secure with two rivets (10). Repeat step for remaining three angle brackets.

(8) Install top angle bracket (9) on container (4) and secure with two rivets (8). Repeat step for remaining nine angle brackets.

(9) Install latch (7) on container (4) and secure with two rivets (5) and backup plates (6). Repeat step for remaining three latches.

(10) Install lift handle (3) on container (4) and secure with ten rivets (1) and backup plates (2). Repeat step for remaining three rings.

Refer to figure 4-27.

(11) Install ring (26) and clip (27) on container (10) with two screws (25), lockwasher (24) and nut (23). Repeat step for remaining three rings.

(12) Install identification plate (22) on container (10) with four rivets (20) and backup plates (21).

4-42. STORAGE BOX ASSEMBLY REPAIR.

(13) Install identification plate (19) on container (10) with four rivets (17) and backup plates (18).

(14) Install strap webbing (16) on container (10) and secure with slide adapter (15). Repeat step for remaining five strap webbings.

(15) Install separator divider (13) on lower panel (14) and secure with eight rivets (11) and backup plates (12) and place in storage container (10).

(16) Install top panel (7) in upper frame (8) and secure with fifty four rivets (5) and backup plates (6).

(17) Install strike (4) on upper frame (8) and secure with two screws (3), lockwashers (2) and nuts (1). Repeat step for remaining three strikes .

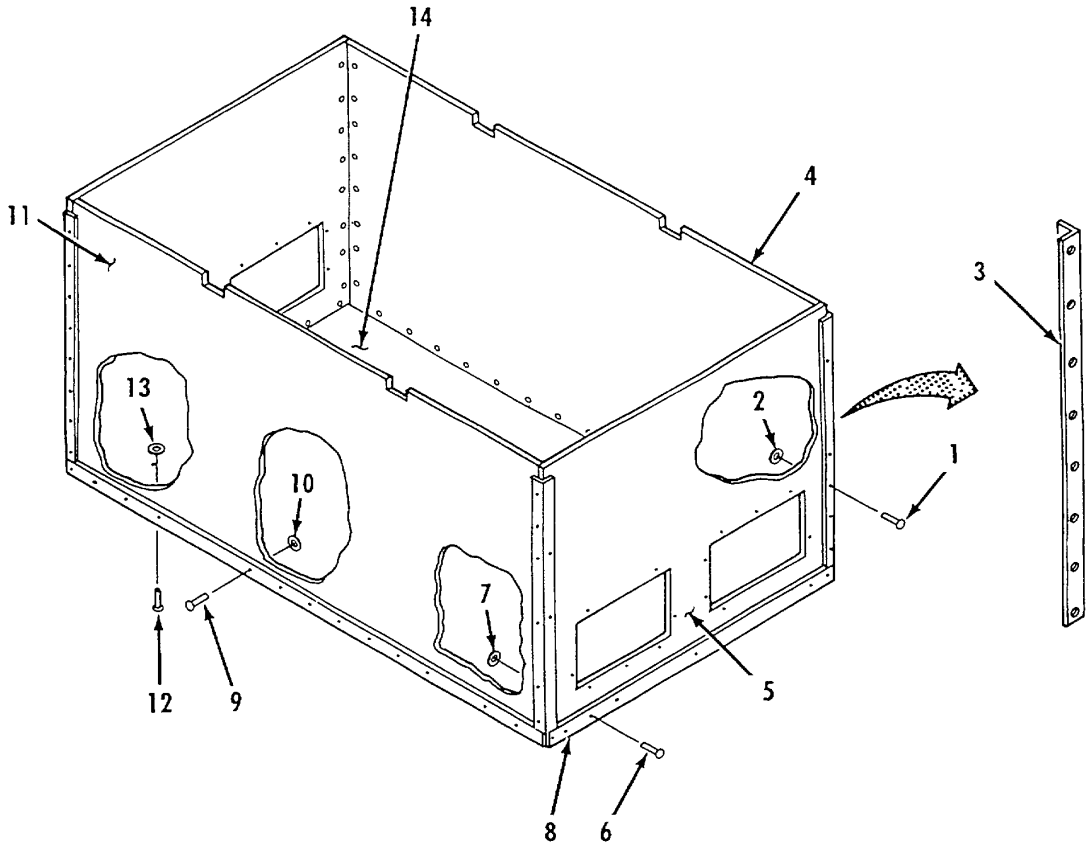


Figure 4-29. Storage Box (Panels and Frame) Repair.

Section VI. PREPARATION FOR STORAGE OR SHIPMENT

4-43. SECURITY PROCEDURES.

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

4-44. ADMINISTRATIVE STORAGE.

WARNING

To prevent injury to personnel and damage to equipment, all fuel system components must be cleaned and purged before administrative storage.

a. Placement of equipment in administrative storage should be for short periods of time when a shortage of maintenance effort exists. Items should be mission ready within 24 hours or within the time factors as determined by the directing authority. During the shortage period, appropriate maintenance records will be kept.

b. Before placing equipment in administrative storage, Preventive Maintenance Checks and Services should be completed, shortcomings and deficiencies should be corrected, and all modification work orders (MWOs) should be applied.

c. Storage Site Selection. Inside storage is preferred for items selected for administrative storage. If inside storage is not available, keep fuel system components away from corrosive materials, such as saltwater spray.

CHAPTER 5

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

DIRECT SUPPORT MAINTENANCE PROCEDURES

5-1. INTRODUCTION.

This chapter contains Instructions for performing Direct Support level maintenance on components of the Arctic Forward Area Refueling Equipment (AFARE).

5-2. PRESSURE REDUCING ASSEMBLY REPAIR.

This task consists of: **Repair**

INITIAL SET-UP:

Tools:
Shop Equip, Welding (App B, Sec III, Item 5)
Equipment Condition
Pressure reducing assembly removed (para 2-20).

References:
TM 9-237 Welding Theory and Application
TM 43-0139 Painting Instructions for Army Materiel.

Repair.

a. Straighten and weld skid as required Refer to TM 9-237 for welding procedures.

b. Paint skid in accordance with TM 43-0139.

c. If skid is damaged beyond repair, replace skid.

5-3. EXHAUST DEFLECTOR ASSEMBLY REPAIR.

This task consists of: **Repair**

INITIAL SET-UP:

Tools:
Shop Equip, Welding (App B, Sec III, Item 5)

Equipment Condition:
Pressure reducing assembly removed (para 2-20).

References:
TM 9-237 Welding Theory and Application
TM 43-0139 Painting Instructions for Army Materiel.

Repair.

a. Straighten and weld exhaust deflector components as required. Refer to TM 9-237 for welding procedures.

b. Paint exhaust deflector components in accordance with TM 43-0139.

c. If any exhaust component is damaged beyond repair, replace component.

5-4. FUELING MANIFOLD SKID ASSEMBLY REPAIR.

This task consists of: **Repair**

INITIAL SET-UP:

Tools:
Shop Equip, Welding (App B, Sec III, Item 5)

Equipment Condition:
Fueling manifold removed (para 4-32)

References:
TM 9-237 Welding Theory and Application
TM 43-0139 Painting Instructions for Army Materiel.

Repair.

a. Straighten and weld skid as required. Refer to TM 9-237 for welding procedures.

b. Paint skid in accordance with TM 43-0139.

c. If skid is damaged beyond repair, replace skid.

5-5. FIRE EXTINGUISHER FRAME REPAIR.

This task consists of: **Repair**

INITIAL SET-UP:

Tools:
Shop Equip, Welding (App B, Sec III, Item 5)

Equipment Condition:
Fire extinguishers removed (para 2-20)

References:
TM 9-237 Welding Theory and Application
TM 43-0139 Painting Instructions for Army Materiel.

Repair.

a. Straighten and weld frame as required. Refer to TM 9-237 for welding procedures.

b. Paint frame in accordance with TM 43-0139.

c. If frame is damaged beyond repair, replace frame.

5-6. FUEL HOSE CARRIER ASSEMBLY REPAIR.

This task consists of: **Repair**

INITIAL SET-UP:

Tools:
Shop Equip, Welding (App B, Sec III, Item 5)

Equipment Condition:
Fuel hoses removed

References:
TM 9-237 Welding Theory and Application
TM 43-0139 Painting Instructions for Army Materiel.

Repair.

a. Straighten and weld carrier as required. Refer to TM 9-237 for welding procedures.

b. Paint carrier in accordance with TM 43-0139.

c. If carrier is damaged beyond repair, replace carrier.

5-7. NOZZLE AND COMPONENT CARRIER ASSEMBLY REPAIR.

This task consists of: **Repair**

INITIAL SET-UP:

Tools:
Shop Equip, Welding (App B, Sec III, Item 5)

Equipment Condition:
Nozzle bags removed (para 2-20)

References:
TM 9-237 Welding Theory and Application
TM 43-0139 Painting Instructions for Army Materiel.

Repair.

a. Straighten and weld carrier as required Refer to TM 9-237 for welding procedures.

b. Paint carrier in accordance with TM 43-0139.

c. If carrier is damaged beyond repair, replace carrier.

APPENDIX A

REFERENCES

A-1. SCOPE.

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

A-2. FORMS.

Recommended Changes to Publications and Blank Forms	DA Form 2028
Recommended Changes to Equipment Technical Publications	DA Form 2028-2
Equipment Inspection and Maintenance Worksheet	DA Form 2404
Maintenance Request	DA Form 5504
Equipment Log (Records)	DA Form 2408-9
Quality Deficiency Report	SF 368
Report of Discrepancy	SF 364

A-3. FIELD MANUALS.

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

A-4. TECHNICAL MANUALS.

Destruction of Army Materiel to Prevent Enemy Use	TM 750-244-3
Operator's, Unit, Direct Support and General Support Maintenance Manual for 200/600 Gpm Pump Assembly	TM 10-4320-342-10
Operator's, Unit, Direct Support and General Support Maintenance Manual for 200/600 Gpm Pump Assembly	TM 10-4320-342-24
Unit, Direct Support and General Support Maintenance Repair Parts and Special Tools List for 200/600 Gpm Pump Assembly	TM 10-4320-342-24P
Operator's, Unit, and Direct Support Maintenance Manual for 200 Gpm Filter-Separator	TM 10-4330-236-13
Unit and Direct Support Support Maintenance Repair Parts and Special Tools List for 200 Gpm Filter-Separator	TM 10-4330-236-23P

A-4. TECHNICAL MANUALS-cont.

Operator's, Unit and Direct Support Maintenance Manual for Single Point Refueling Nozzle (1)1) Including Repair Parts and Special Tools List	TM 10-4930-242-13&
Operator's, Unit and Direct Support Maintenance Manual Including Repair Parts and Special Tools List for Closed-Circuit Refueling Nozzle Assembly,	TM 10-4930-243-13&P
Operator's, Unit and Direct Support Maintenance Manual for 500 Gallon Collapsble Fuel Drum Including Repair Parts and Special Tools List	TM 10-8110-203-12&P

A-5. MISCELLANEOUS.

The Army Maintenance Management System	DA PAM 738-750
Security Procedures	AR 190-11, AR 190-13
Packing of Army Material for Shipment and Storage	AR 746-1
Environmental Protection and Enhancement	AR 200-1

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. GENERAL..

a. This section provides a general explanation of all maintenance and repair function authorized at various maintenance categories.

b. The Maintenance Allocation Chart (MAC) In Section II designates overall authority and responsibility for performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance categories.

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

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

B-2. MAINTENANCE FUNCTIONS.

Maintenance functions will be limited to and are defined as follows

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

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

c. Service. Operations required periodically to keep an item in proper operating condition, i. E. , to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

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

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

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared

B-2. MAINTENANCE FUNCTIONS-cont

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

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and is shown as the 3rd position code of the SMR code.

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

j. Overhaul. That maintenance effort (service/action) prescribed to restore an Item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (1 e, DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

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

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

a. Column 1, Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly End item group numbers are "00".

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

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

d. Column 4, Maintenance Level. Column 4 specifies, by the listing of a work time figure (expressed as man-hours shown as whole hours or decimals) in the appropriate subcolumn(s), the level of maintenance authorized to perform the function listed m Column (3). This figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or the complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate work time figures will be shown for each level. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation item including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance/quality control time in addition to the time required to perform the specific tasks

identified for the maintenance functions authorized m the maintenance allocation chart. The symbol designations for the various maintenance levels are shown on the following page.

C ..... Operator or crew
O ..... Unit Maintenance
F..... Direct Support Maintenance
H ..... General Support Maintenance
D ..... Depot Maintenance

e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) common TMDE, and special tools, special TMDE, and support equipment required to perform the designated function.

f. Column 6, Remarks. This column, when applicable, contains a letter code, in alphabetic order, which is keyed to the remarks contained in Section IV.

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

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

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

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

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

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

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

a. Column 1, Reference Code. The code recorded in column 6, Section II.

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

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS & EQPT	(6) REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
00	ARCTIC FORWARD AREA REFUELING EQUIPMENT (AFARE)	INSPECT REPLACE	1.0	 4.0					
01	CLOSED CIRCUIT REFUELING NOZZLE(CCR) WITH GRAVITY FEED ADAPTER								B
02	D-1 NOZZLE ASSY								B
03	HOSE ASSY, DISCHARGE 2 IN X50 FT	INSPECT REPLACE REPAIR	0.2	 0.2 1.0				 1,2,3	
04	WYE ASSY	INSPECT REPLACE REPAIR	0.2	 0.2 1.0				 1, 2	
05	HOSE ASSY, DISCHARGE, 2 IN X10 FT.	INSPECT REPLACE REPAIR	0.2	 0.2 1.0				 1,2,3	
06	HOSE ASSY, SUCTION, 2 IN X 10 FT	INSPECT REPLACE REPAIR	0.2	 0.2 1.0				 1,2,3	
07	PRESSURE REDUCING ASSY	INSPECT REPLACE	0.2	 0.5					
0701	COVER ASSY, PRESSURE REDUCING	INSPECT REPLACE REPAIR	0.2	 0.2 1.0				 1,2 4	
0702	PRESSURE REDUCING ASSY	INSPECT REPLACE REPAIR	0.2	 0.5 2.0				 1, 2	
070201	PRESSURE REGULATING VALVE ASSY	INSPECT REPLACE REPAIR	0.2	 1.0 2.0				 1, 2 1,2, 5	

Section II. MAINTENANCE ALLOCATION CHART - cont

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS & EQPT	(6) REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
0703	SKID ASSY	INSPECT	0.5						
		REPLACE		1.0					
		REPAIR		0.5	2.0			1, 2, 7	A
08	REDUCER ASSY (3-IN M X 2-IN. F)	INSPECT	0.2						
		REPLACE		0.2					
		REPAIR		0.5				1	
09	VALVE SECTION PIPELINE, 3 IN	INSPECT	0.2						
		REPLACE		0.2					
		REPAIR		1.0				1, 2, 5	
10	200 GALLON FILTER SEPARATOR								B
11	DISCHARGE HOSE ASSY, 3 IN.	INSPECT	0.2						
		REPLACE		0.2					
		REPAIR		1.0				1, 2, 3	
12	FUELING MANIFOLD, 3 IN.	INSPECT	0.2						
		REPLACE		0.2					
		REPAIR		1.0				1, 2, 5	
13	REDUCER ASSY (3-IN. M X 2-IN. F)	INSPECT	0.2						
		REPLACE		0.2					
		REPAIR		0.5				1	
14	200 GALLON PUMP ASSY								B
15	EXHAUST DEFLECTOR ASSY	INSPECT	0.2						
		REPLACE		0.3					
		REPAIR		1.0	2.0			1, 2, 7	A
16	SUCTION HOSE ASSY, 3 IN. 10 FT.	INSPECT	0.2						
		REPLACE		0.2					
		REPAIR		1.0				1, 2, 3	
17	FUELING MANIFOLD ASSY	INSPECT	0.2						
		REPLACE		1.0					
1701	COVER ASSY, FUELING MANIFOLD	INSPECT	0.2						
		REPLACE		0.5					
		REPAIR		1.0				1, 2,4	
1702	FUEL MANIFOLD ASSEMLY	INSPECT	0.5						
		REPLACE		0.5					
		REPAIR		1.0				1, 2, 5	

Section II. MAINTENANCE ALLOCATION CHART - cont

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS & EQPT	(6) REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
1703	SKID ASSY	INSPECT	0.2						
		REPLACE		1.0					
		REPAIR		0.5	1.0			1, 2, 7	A
18	TEE ASSY, 3 IN.	INSPECT	0.2						
		REPLACE		0.2					
		REPAIR		0.5				1, 2, 5	
19	COUPLER ASSY, 3 IN.	INSPECT	0.2						
		REPLACE		0.2					
		REPAIR		1.5				1, 2, 5	
20	500 GALLON COLLAPSIBLE DRUM								B
21	ACCESSSORY ITEMS								
2101	REDUCERS	INSPECT	0.2						
		REPLACE		0.2					
		REPAIR		0.5				1	
2102	ADAPTERS	INSPECT	0.2						
		REPLACE		0.2					
		REPAIR		0.5				1, 5	
2103	ELBOW	INSPECT	0.2						
		REPLACE		0.2					
		REPAIR		0.5				1	
2104	FUEL HOSE, COLLAPSIBLE 2 IN. X 10 FT.	INSPECT	0.2						
		REPLACE		0.2					
		REPAIR		1.0				1, 2, 3	
2105	FUEL HOSE NON-COLLAPSIBLE SUCTION 2 IN. X 10 FT.	INSPECT	0.2						
		REPLACE		0.2					
		REPAIR		1.0				1, 2, 3	
2106	FRAME, FIRE EXTINGUISHER	INSPECT	0.2						
		REPLACE		0.3					
		REPAIR		0.2	1.0			1, 2, 7	A
2107	FUEL HOSE CARRIER ASSY	INSPECT	0.2						
		REPLACE		0.3					
		REPAIR		0.2	1.0			1, 2, 7	A

Section II. MAINTENANCE ALLOCATION CHART -

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS & EQPT	(6) REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
2108	NOZZLE AND	INSPECT	0.2						
	COMPONENT	REPLACE		0.3					
	CARRIER ASSY	REPAIR		0.5	1.0			1, 2, 4, 7	A
2109	STORAGE BOX	INSPECT	0.2						
	ASSY	REPLACE		0.3					
		REPAIR		1.0				1, 2, 4	

Section III. TOOLS AND TEST EQUIPMENT REQUIREMENTS

(1) REFERENCE CODE	(2) MAINTENANCE CATEGORY	(3) NATIONAL STOCK NOMENCLATURE	(4) TOOL NUMBER(NSN)	(5) NUMBER
1	O	Tool Kit, General Mechanics	5180-00-177-7033	SC 5180-90-CL-N26
2	O	Shop Equipment, Automotive Maintenance and Repair Organizational Maintenance, Common No. 1, Less Power	4910-00-754-0654	SC-4910-95-CL-A74
3	O	Clamping Tool	5120-00-278-9925	GGG-C-00413
4	O	Riveter, Blind, Hand	5120-01-289-4310	CTA 50-970
5	O	Wrench, Pipe, 36-inches	5120-01-3351035	PW36C
6	F	Shop Equipment, Automotive Maintenance and Repair Field Maintenance, Basic, Less Power	4910-00-754-0705	SC-4910-95-A31
7	F	Shop Equipment, Welding Field Maintenance	4940-00-357-7268	SC-4910-95-CL-B19-HR

Section IV. REMARKS

REFERENCE CODE	REMARKS
A	Weld and straighten at Direct Support.
B	Refer to applicable technical manual.

APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

C-1. SCOPE.

This appendix lists components of end item and basic issue items for the Arctic Forward Area Refueling Equipment (AFARE) to help you inventory items required for safe and efficient operation.

C-2. GENERAL.

The Components of End Item and Basic Issue Items List are divided into the following sections.

a. Section II. Components of End Item. This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end Item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the Arctic Forward Area Refueling Equipment (AFARE) in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the system during operation and whenever it is transferred between property accounts. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of the end item.

C-3. EXPLANATION OF COLUMNS.

The following provides an explanation of columns found in the tabular listing.

a. Column (1) - Illustration Number (Illus Number). This column indicates the number of the illustration In which the item is shown.

b. Column (2) - National Stock Number. Indicates the national stock number assigned to the item and will be used for requisitioning purposes.

c. Column (3) - Description. Indicates the Federal Item and name and, if required, a minimum description to identify and locate the item The last line for each item indicates the CAGE (In parentheses) followed by the part number.

d. Column (4) - Unit of Measure (U/M). Indicates the measure used in performing the actual operational/maintenance function This measure is expressed by a two-character alphabetical abbreviation (e g, ea, in, pr).

e. Column (5) - Quantity required (Qty rqd). Indicates the quantity of the Item authorized to be used with/on the equipment.

Section II. COMPONENTS OF END ITEM

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION Usable CAGE and Part Number On Code	(4) U/M	(5) QTY. RQD
1		ADAPTER ASSEMBLY, WATER DETECTION KIT (97403) 13228E1817	EA	1
2	4930-01-376-7725	ADAPTER, CCR (81349) MIL-N-53093	EA	2
3	5340-00-066-1235	ADAPTER, CONTAINER (97403) 13211E7541	EA	1
4		ADAPTER, QUICK DISCONNECT (2-IN M X 2-IN M) (97403) 13228E1803	EA	1
5		ADAPTER, QUICK DISCONNECT(2-IN F X 2-IN F) (97403) 13228E1813	EA	1
6	6150-00-483-3918	CABLE ASSEMBLY, POWER (97403) 13219E3930	EA	1
7		CABLE, GROUND (97403) 13220E1127-3	EA	1
8		CABLE GROUND (97403) 13220E1127-1	EA	1
9	7240-00-025-3377	CAN, GASOLINE, 5 GALLON (81349) MIL-C-1283	EA	8
10	4730-00-929-0791	CAP, QUICK DISCONNECT (90906) MS27028-5	EA	1
11	4730-00-649-9100	CAP, QUICK DISCONNECT (96906) MS27028-11	EA	1
12		CARRIER ASSEMBLY, FUEL HOSE (97403) 13230E2896	EA	3
13		CARRIER ASSEMBLY, NOZZLE AND COMPONENT (97403) 13230E2924	EA	3
14	4730-00-010-2419	CLAMP, HOSE (81348) WW-C-440,TYPE-F-6.50-ID	EA	6
15		COUPLER, TANK TO HOSE 3 INCH (97403) 13228E1793	EA	3

Section II. COMPONENTS OF END ITEM - CONTINUED

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number Usable On Code	(4) U/M	(5) QTY. RQD
16	5120-00-357-8431	COUPLING WRENCH.TANK CAR 1 3/4 WIDTH (09310) E0610-001	EA	1
17		COUPLING, AIR DUCT (97403) 13229E4129	EA	2
18		DEFLECTOR ASSEMBLY, EXHAUST (90598) 13228E1790	EA	1
19	8110-01-327-1981	DRUM, FABRIC COLLAPSIBLE (81349) MIL-D-53092	EA	3
20		DUCT, AIR (97403) 13228E1788	EA	3
21		ELBOW, QUICK DISCONNECT (2 IN M X 2-IN F) (97403) 13228E1857	EA	1
22		ELBOW, QUICK DISCONNECT (3-IN M X 3-IN F) (97403) 13228E1858	EA	1
23	4330-01-262-9496	FILTER/SEPARATOR, FUEL, 200 GPM ARCTIC SERVICE (97403) 13228E1770	EA	1
24	42100-00-165-4703	FIRE EXTINGUISHER, DRY CHEMICAL(HAND PORTABLE) (97403) A-A-393	EA	3
25		FRAME, EXTINGUISHER (97403) 13229E2400	EA	1
26		FUELING MANIFOLD, 3 INCH (81349) 13228E1799	EA	1
27		GASKET, QUICK DISCONNECT (97403) 13288E1768-3	EA	2
28		GASKET, QUICK DISCONNECT, COUPLING (97403) 13228E1768-6	EA	2
29	4720-00-702-5214	HOSE ASSEMBLY (96906) MS28741-6-1200	EA	1
30		HOSE ASSEMBLY, DISCHARGE 90598) M53095-03D500	EA	6

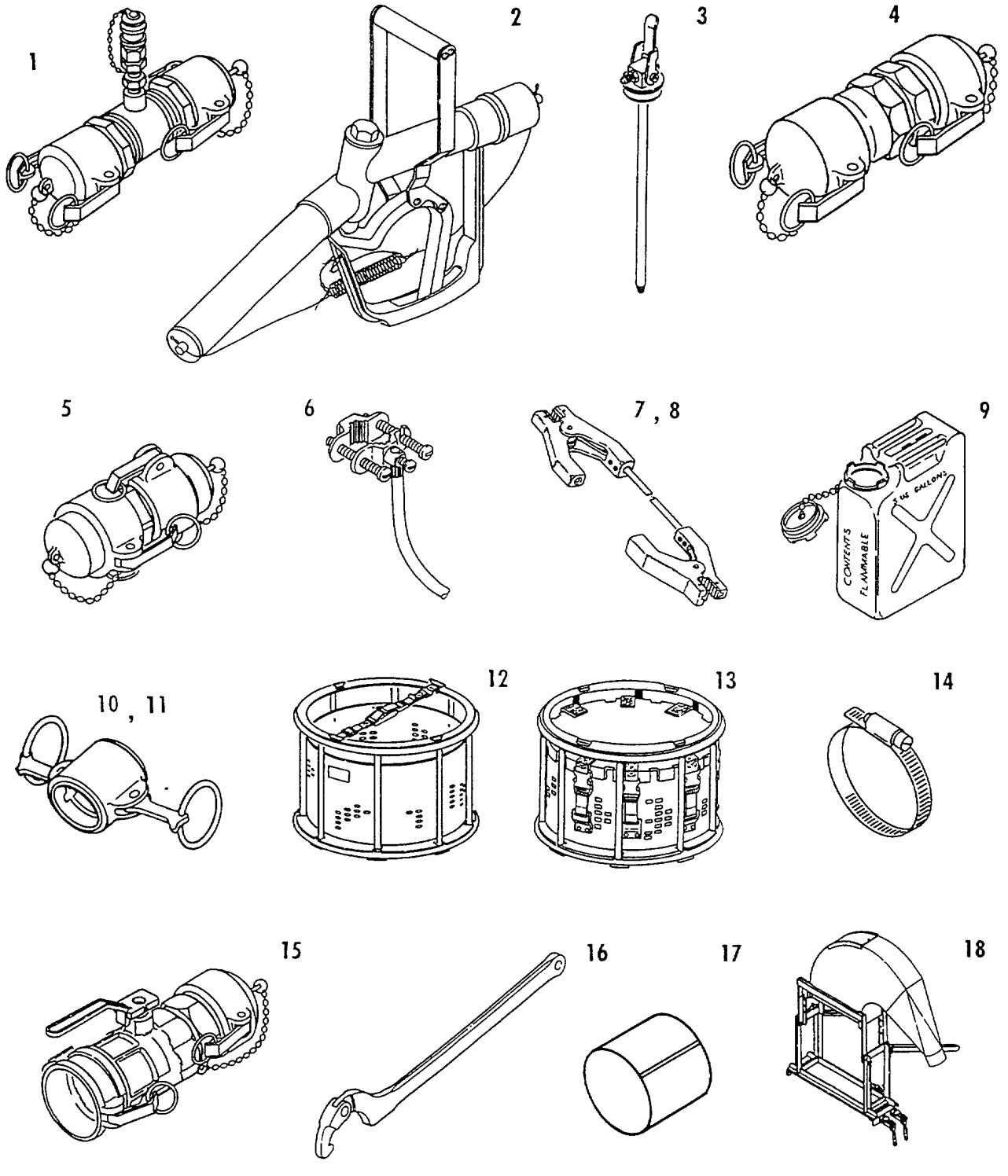
Section II. COMPONENTS OF END ITEM - CONTINUED

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number Usable On Code	(4) U/M	(5) QTY. RQD
31		HOSE ASSEMBLY, DISCHARGE, 2INCH X 10 FOOT (90598) M53095-03D100	EA	4
32		HOSE ASSEMBLY, SUCTION (90598) M53095-08B2A100	EA	5
33		HOSE ASSEMBLY, SUCTION 2 INCH BY 10 FOOT (90598) M53096-06B2A100	EA	11
34		HOSE ASSEMBLY,DISCHARGE (90598) M53095-03F100	EA	3
35		MANIFOLD, FUELING, ASSEMBLY (97403) 13230E2860	EA	1
36		NATO COUPLER. RAIL TANKER (97403) 13222E8219	EA	2
37		NOZZLE, CLOSED CIRCUIT REFUELING (81349) MIL-N-53094	EA	2
38		NOZZLE, SINGLE POINT REFUELING, TYPE D-1 (97403) 13228E1821	EA	2
39	4730-00-360-0715	PLUG, QUICK DISCONNECT (90906) MS27029-5	EA	1
40	4730-00-915-5127	PLUG, QUICK DISCONNECT (96906) MS27029-11	EA	1
41		PUMP ASSEMBLY, 200 GPM (97403) 13229E3900	EA	1
42		REDUCER, QUICK DISCONNECT (3-IN M X 2-IN F) (97403) 13228E1807	EA	2
43		REDUCER, QUICK DISCONNECT (4-IN M X 2-IN F) (94703) 13228E1808	EA	1
44		REDUCER, QUICK DISCONNECT (2-IN M X 1 5-IN F) (97403) 13228E1806	EA	1
45		REDUCER, QUICK DISCONNECT (2-IN M X 3-IN F) (97403) 13228E1809	EA	2

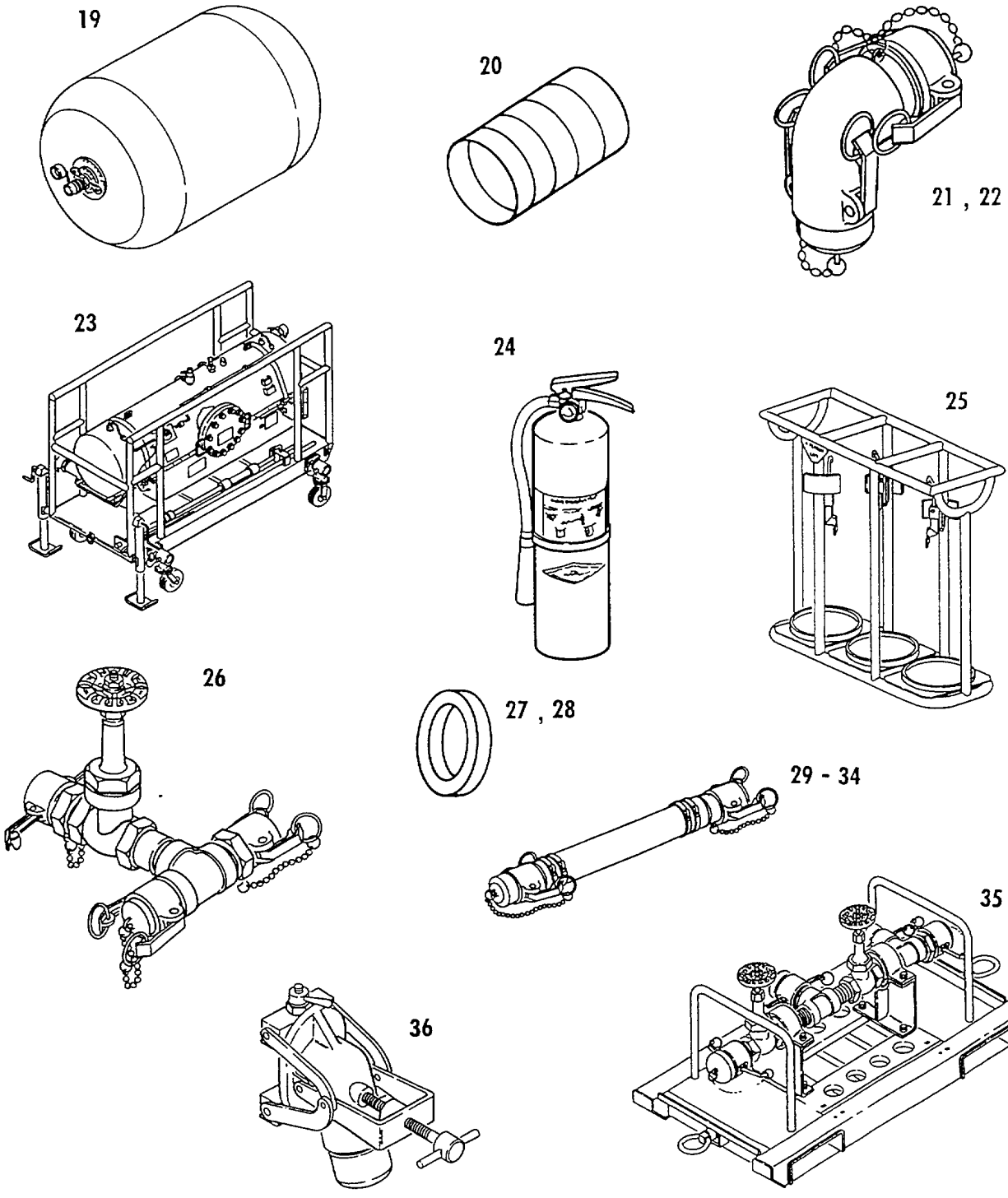
Section II. COMPONENTS OF END ITEM - CONTINUED

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number Usable On Code	(4) U/M	(5) QTY. RQD
46		REDUCER, QUICK DISCONNECT (3-IN M X 6-IN F) (97403) 13228E1810	EA	1
47		REDUCER, QUICK DISCONNECT (6-IN M X 2-IN F) (97403) 13228E1811	EA	1
48		REDUCER, QUICK DISCONNECT (3-IN M X 4-IN F) (97403) 13228E1833	EA	1
49		REDUCER, QUICK DISCONNECT (1.5-IN M X 2-IN F) (97403) 13228E1836	EA	1
50		REDUCER, QUICK DISCONNECT (4-IN M X 3 -IN F) (97403) 13228E1842	EA	1
51	5975-01-050-5707	ROD, GROUND (97403) 13219E0462	EA	3
52		SEAL, STRAPPING TYPE 201, 1/2 WIDTH (96906) WW-C-440,TYPE 201	BX	1
53		SEAL, STRAPPING TYPE 201, 3/4 WIDTH (96906) WW-C-440,TYPE 201	BX	1
54		SKID ASSEMBLY, PRESSURE REDUCING (97403) 13230E2900	EA	1
55		STORAGE BOX, DEFLECTOR, EXHAUST, AND HOSE (97403) 13230E2930	EA	1
56		STRAPPING, TYPE 201, 1/2 WIDTH (96906) QQ-S-766, TYPE 201, 1/2 WIDTH	RL	1
57		STRAPPING, TYPE 201, 3/4 WIDTH (96906) QQ-S-766.TYPE 201, 3/4 WIDTH	RL	1
58		TEE QUICK DISCONNECT 3 INCH (97403) 13228E1801	EA	3
59		VALVE SECTION, 3 INCH (97403) 13226E1804	EA	2
60		WYE ASSEMBLY, QUICK DISCONNECT 2 INCH X 3 INCH (97493) 13228E1825	EA	2

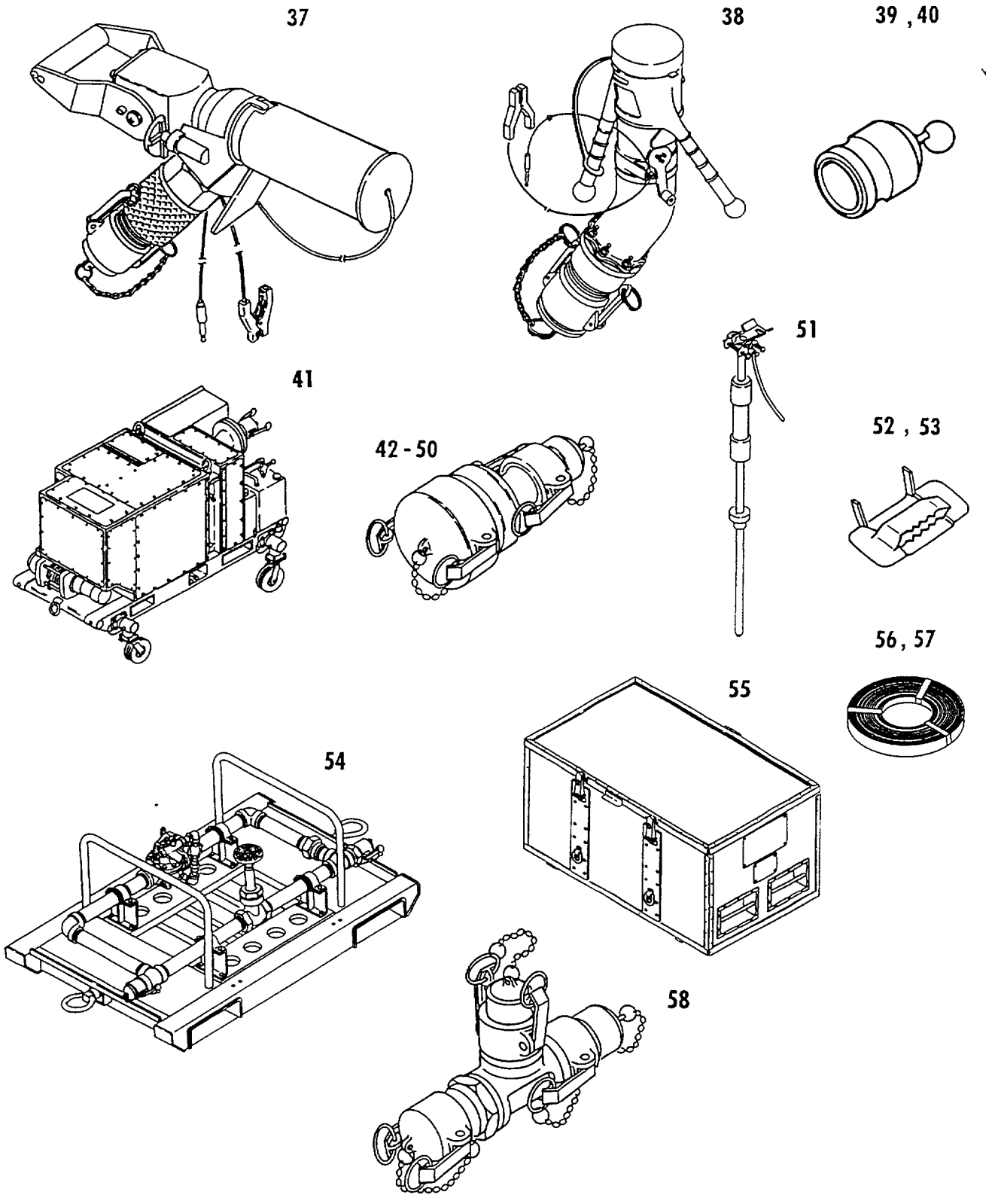
Section II. COMPONENTS OF END ITEM - cont.



Section II. COMPONENTS OF END ITEM - cont.



Section II. COMPONENTS OF END ITEM - cont.



Section II. COMPONENTS OF END ITEM - cont.

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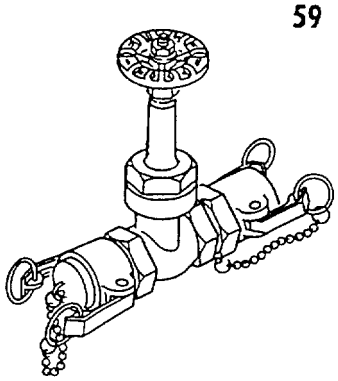

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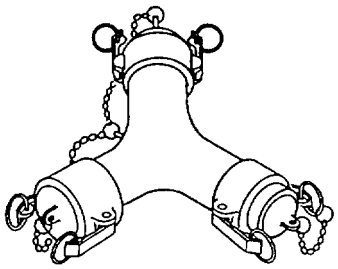
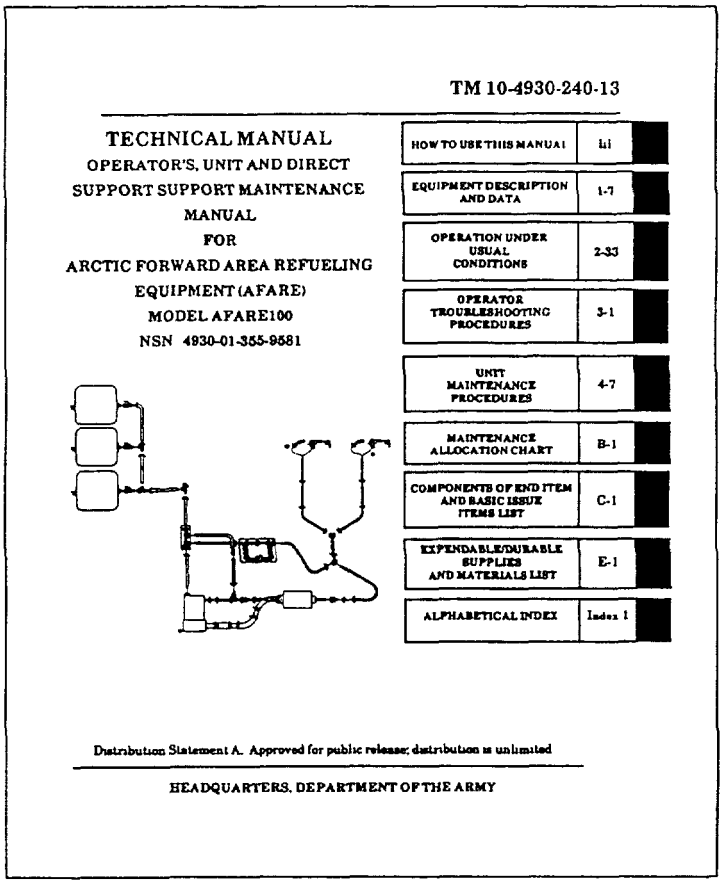


Section III. BASIC ISSUE ITEMS

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number Usable On Code	(4) U/M	(5) QTY. RQD
1		TECHNICAL MANUAL, OPERATOR'S, UNIT AND DIRECT SUPPORT MAINTENANCE MANUAL FOR ARCTIC FORWARD AREA REFUELING EQUIPMENT (AFARE) MODEL AFARE100, TM10-4930-240-13	EA	1



TM 10-4930-240-13

TECHNICAL MANUAL
OPERATOR'S, UNIT AND DIRECT SUPPORT SUPPORT MAINTENANCE MANUAL
FOR
ARCTIC FORWARD AREA REFUELING EQUIPMENT (AFARE)
MODEL AFARE100
NSN 4930-01-355-9581

Distribution Statement A. Approved for public release; distribution is unlimited

HEADQUARTERS, DEPARTMENT OF THE ARMY

APPENDIX D

ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

D-1. SCOPE.

This appendix lists additional items that you are authorized for the support of the AFARE.

D-2. GENERAL.

This list identifies items that do not have to accompany the AFARE and that do not have to be turned In with it. These items are all authorized to you by CFTA, MTOE, TDA, or JTA

D-3. EXPLANATION OF LISTING

National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name. If the item you require differs between serial numbers of the same model, effective serial numbers are shown in the last line of the description. If the item required differs for different models of the equipment, the model Is shown under the "Usable On" heading In the description column.

Section II. ADDITIONAL AUTHORIZED ITEMS LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION CAGEC AND PART NUMBER USABLE ON CODE	(3) U/I	(4) QTY RECM
5120-00-449-8083	Wrench, Adjustable, 10-Inch (58536) A-A-2344	EA	1
5120-00-237-6985	Screwdriver, Flat Tip, (81348) GGG-S-121	EA	1

APPENDIX E

EXPENDABLE AND DURABLE ITEMS LIST

Section I. INTRODUCTION

E-1. SCOPE.

This appendix lists expendable/durable supplies and materials you will need to operate and maintain the AFARE. This listing is for informational purpose only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable and Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

E-2. EXPLANATION OF COLUMNS.

a. Column 1 - Item Number. This number is assigned to the entry in the listing and is referenced in the task Initial Setup instructions to identify the material, e g, "Cleaning solvent (App E)".

b. Column 2 - Category. This column identified the lowest category of maintenance that requires the listed item.

C - Operator/Crew
O - Unit Maintenance
F - Direct Support Maintenance
G - General Support Maintenance

c. Column 3 - National Stock Number. This is the national stock number assigned to the item; use it to request or requisition the items.

d. Column 4 - Description. Indicates the federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the Commercial and Government Entity (CAGE) Code for Manufacturer in parentheses, if applicable.

e. Column 5 - Unit of Measure (U/M). Indicates the measure used In performing the actual maintenance function. This measure is expressed by a two character alphabetical abbreviation (e g, ea, In, pr). If the unit of measure differs from the rest of the issue, requisition the lowest unit of issue that will satisfy your requirements .

Section II. EXPENDABLE AND DURABLE ITEMS LIST

Item Number	Category	National Stock Number	Description	U/M
1	O	6850-00-331-3349	Cleaning Solvent, Federal Specification P-D-680, Type III	GL
2	O	7920-00-295-1711	Rags, Wiping (58536) A-A-531	LB
3	O	8040-00-142-9823	Adhesive (81349) MIL-A-46106	TU
4	O		Sealant, Thread, with Teflon (97403) 13228E1791	TU
5	O	8030-00-889-3535	Tape, Anti-seize (80244) MIL-T-27730 SZ2	RL
6	O	6850-00-177-5094	Silicone Compound (81349) MIL-S-8660	CN

APPENDIX F

LUBRICATION INSTRUCTIONS

Lubrication of the AFARE is limited to the 200 GPM pump. Lubricate the pump m accordance with LO 10-4320-342-12.

APPENDIX G

ILLUSTRATED LIST OF MANUFACTURED ITEMS

G-1. INTRODUCTION.

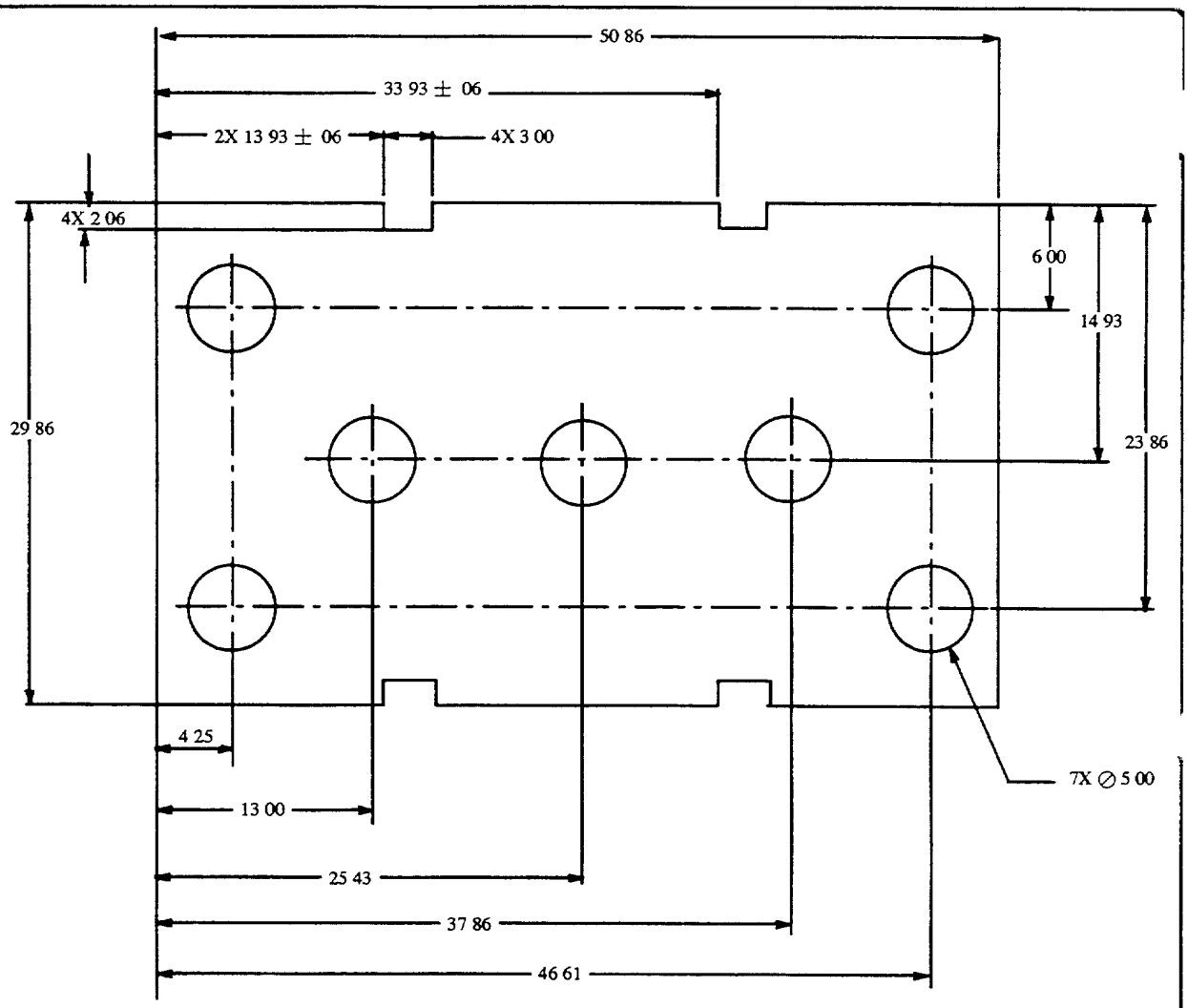
This appendix includes complete instructions for making items authorized to be manufactured or fabricated at organizational maintenance.

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

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

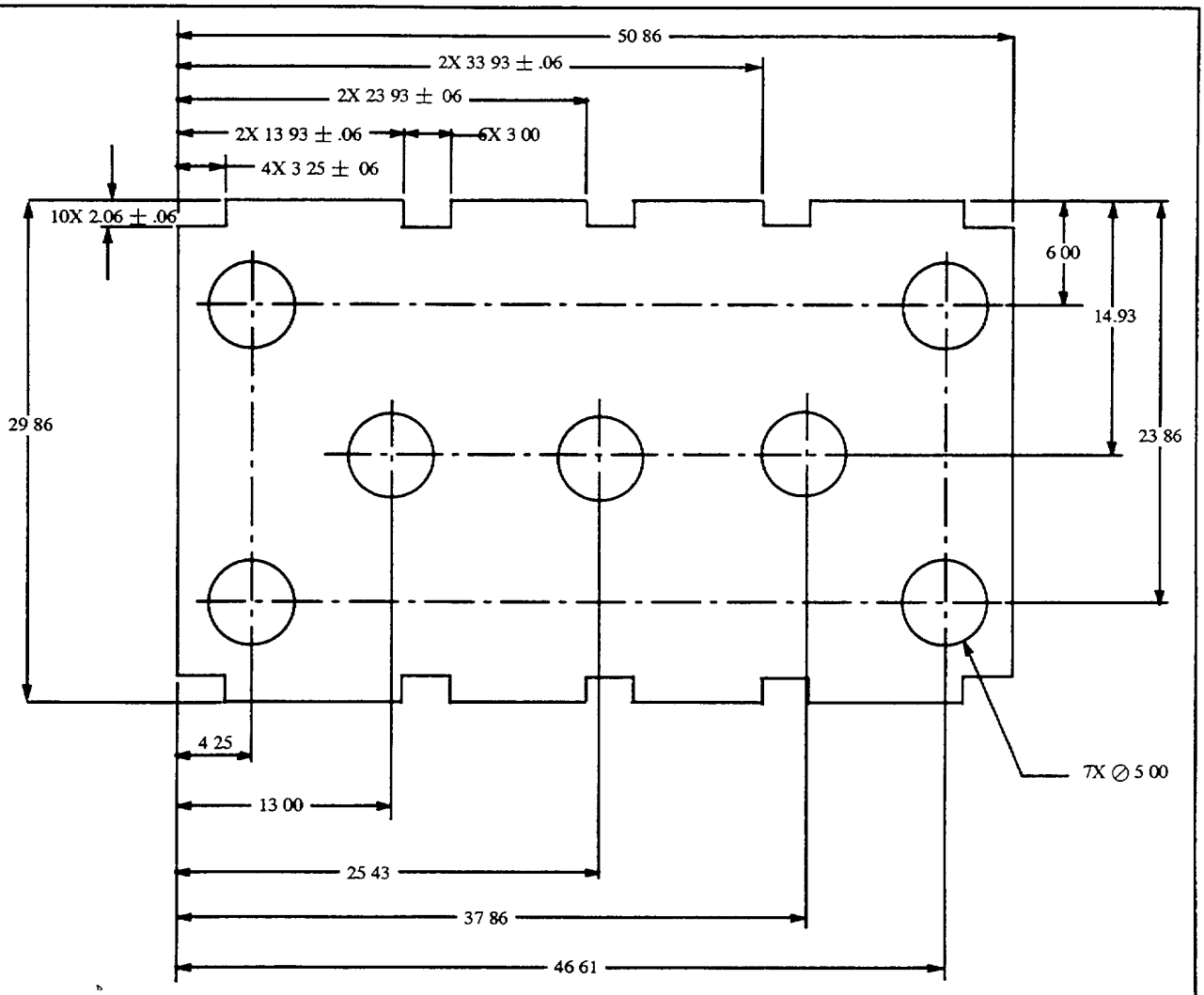
G-2. FABRICATION INSTRUCTIONS.

Part Number	Description	Figure
Storage Box Deflector Assembly		
13230E2936	Shelf. Upper	G-1
13230E2944	Shelf. Lower	G-2
13230E2946	Panel, Top	G-3
13230E2953	Panel, Side	G-4
13230E2954	Panel, End	G-5
13230E2955	Panel, Bottom	G-6
Cover Assembly, Fueling Manifold		
13230E2883	Panel, Top	G-7
13230E2884	Panel, End	G-8
13230E2885	Panel. Side	G-9
Cover Assembly, Pressure Reducing		
13230E2916	Panel, End	G-10
13230E2917	Panel, Side	G-11
13230E2918	Panel, Top	G-12



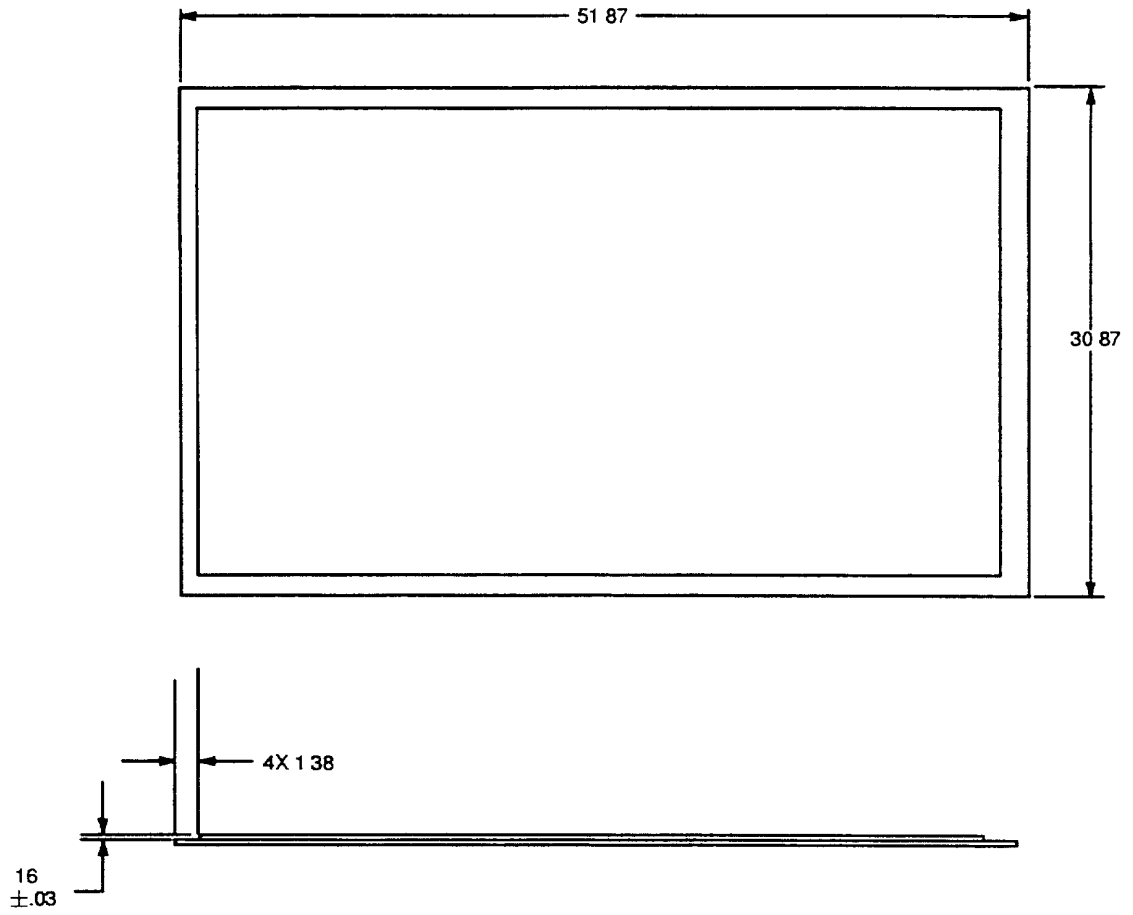
Fabricate from plywood, 3/8-inch thick, Grade AA, sanded both sides.
Cut to to dimensions shown.
Treat with wood preservative solution and water repellent solution per per TT-W-572B, Comp D.
Fire retardant treat per MIL-L-1914OC type II, category I
Prime per MIL-P-53030.
Finish per MIL-C-46168

Figure G-1. Deflector Assembly Storage Box Shelf, Upper



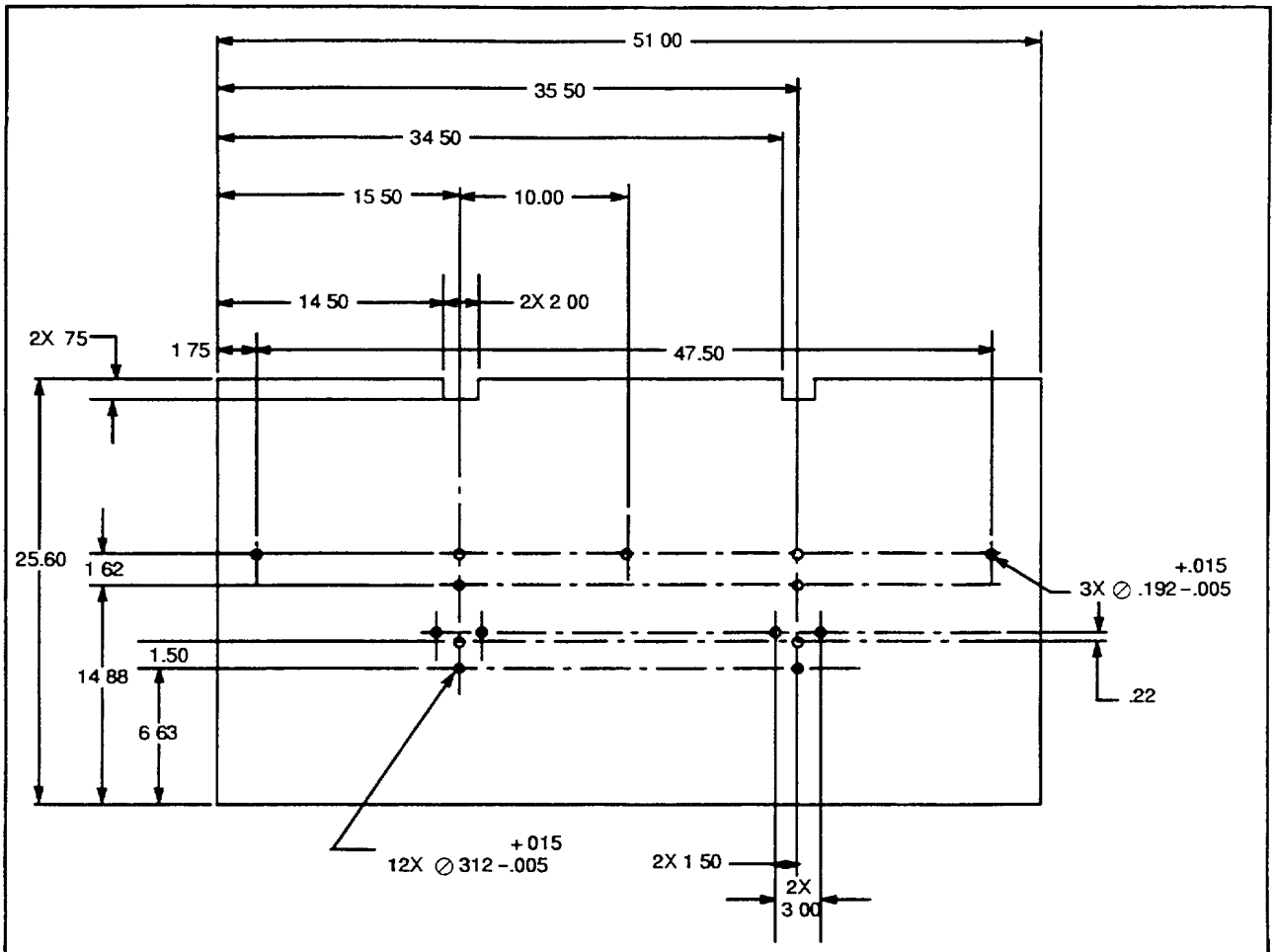
Fabricate from plywood, 3/8-inch thick, Grade AA, sanded both sides
Cut to to dimensions shown.
Treat with wood preservative solution and water repellent solution per per TT-W-572B, Comp D.
Fire retardant treat per MIL-L-1914OC type II, category I.
Prime per MIL-P-53030.
Finish per MIL-C-46168.

Figure G-2. Deflector Assembly Storage Box, Shelf, Lower



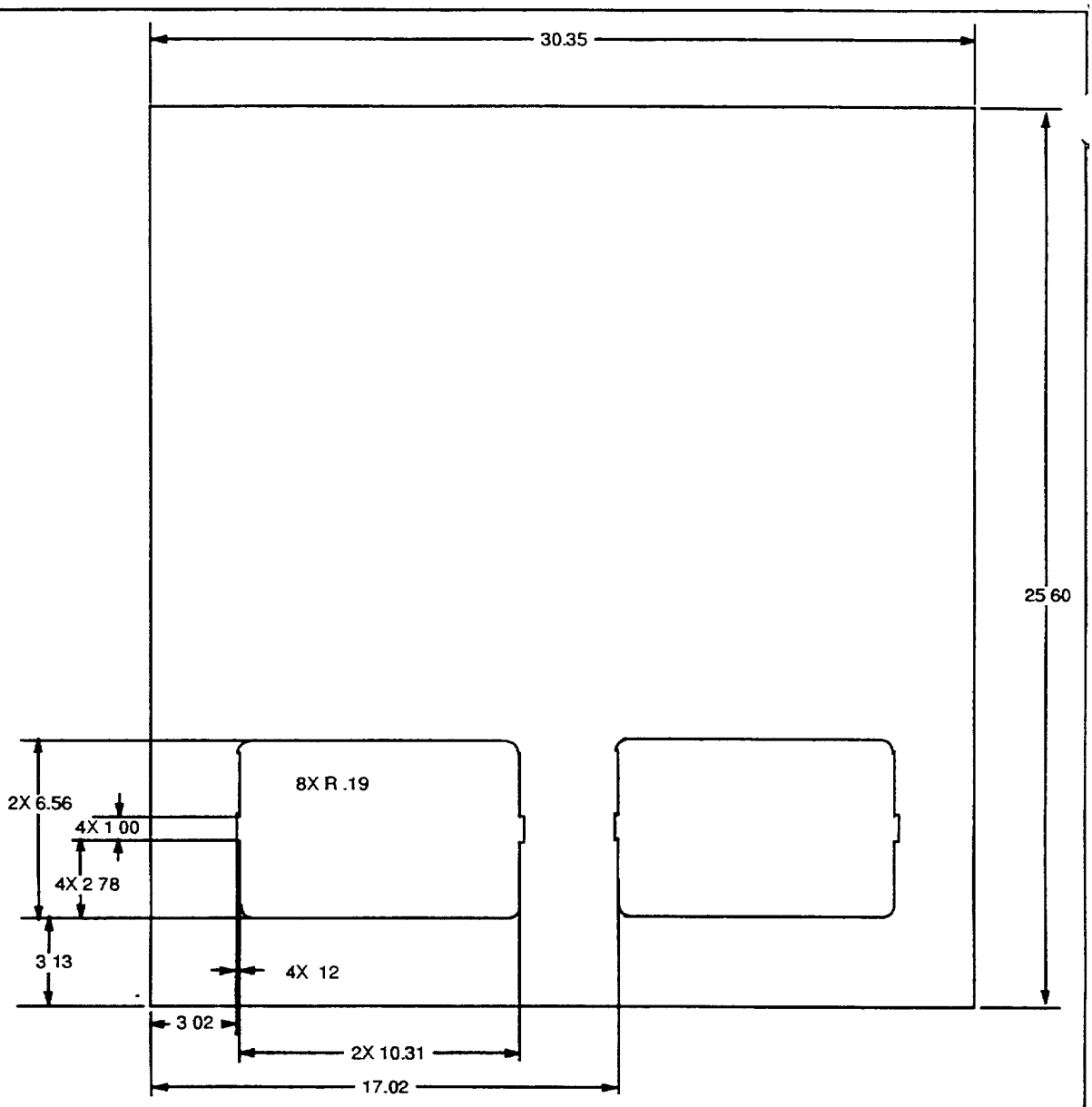
Fabricate from plywood, 3/8-inch thick, Grade AA, sanded both sides.
Cut to to dimensions shown.
Treat with wood preservative solution and water repellent solution per per TT-W-572B, Comp D
Fire retardant treat per MIL-L-1914OC type II, category I
Prime per MIL-P-53030
Finish per MIL-C-46168.

Figure G-3. Deflector Assembly Storage Box, Panel, Top.



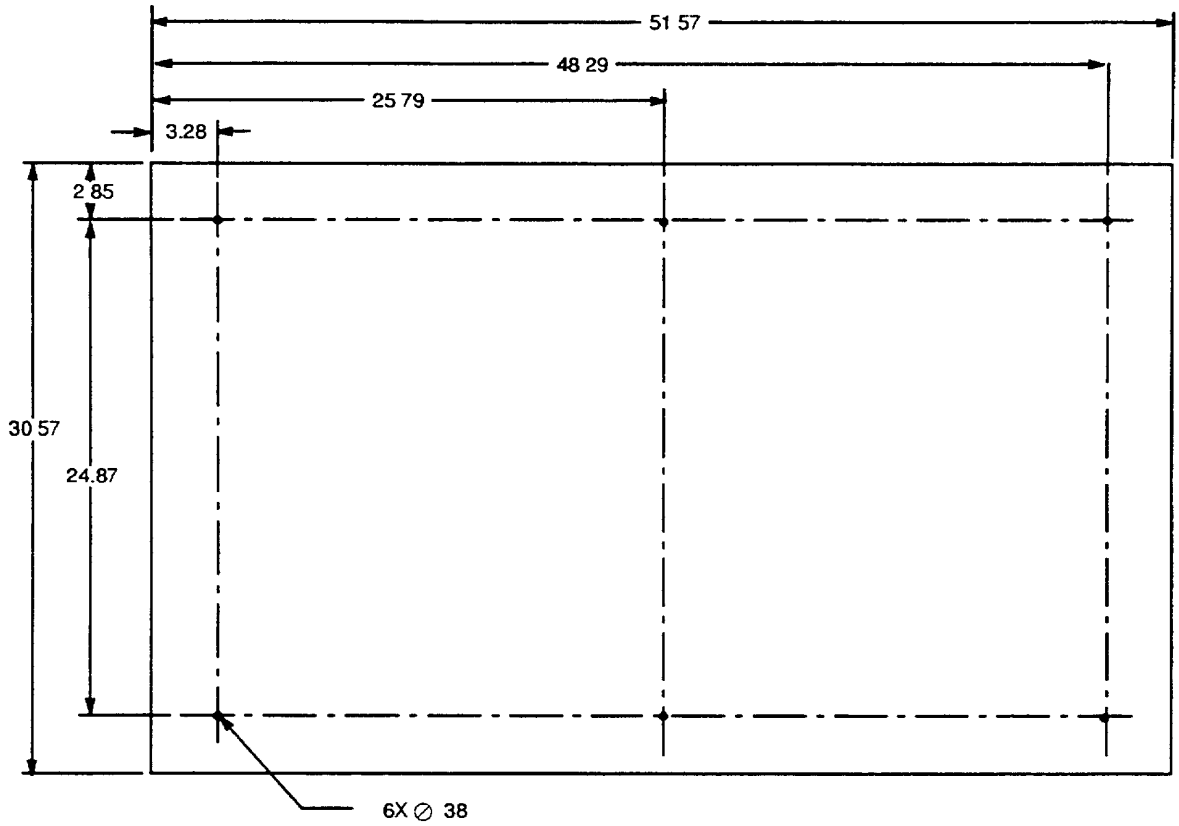
Fabricate from plywood, 3/8-inch thick, Grade AA, sanded both sides
Cut to to dimensions shown.
Treat with wood preservative solution and water repellent solution per per TT-W-572B, Comp D
Fire retardant treat per MIL-L-1914OC type II, category I.
Prime per MIL-P-53030.
Finish per MIL-C-46168

Figure G-4. Deflector Assembly Storage Box, Panel Side



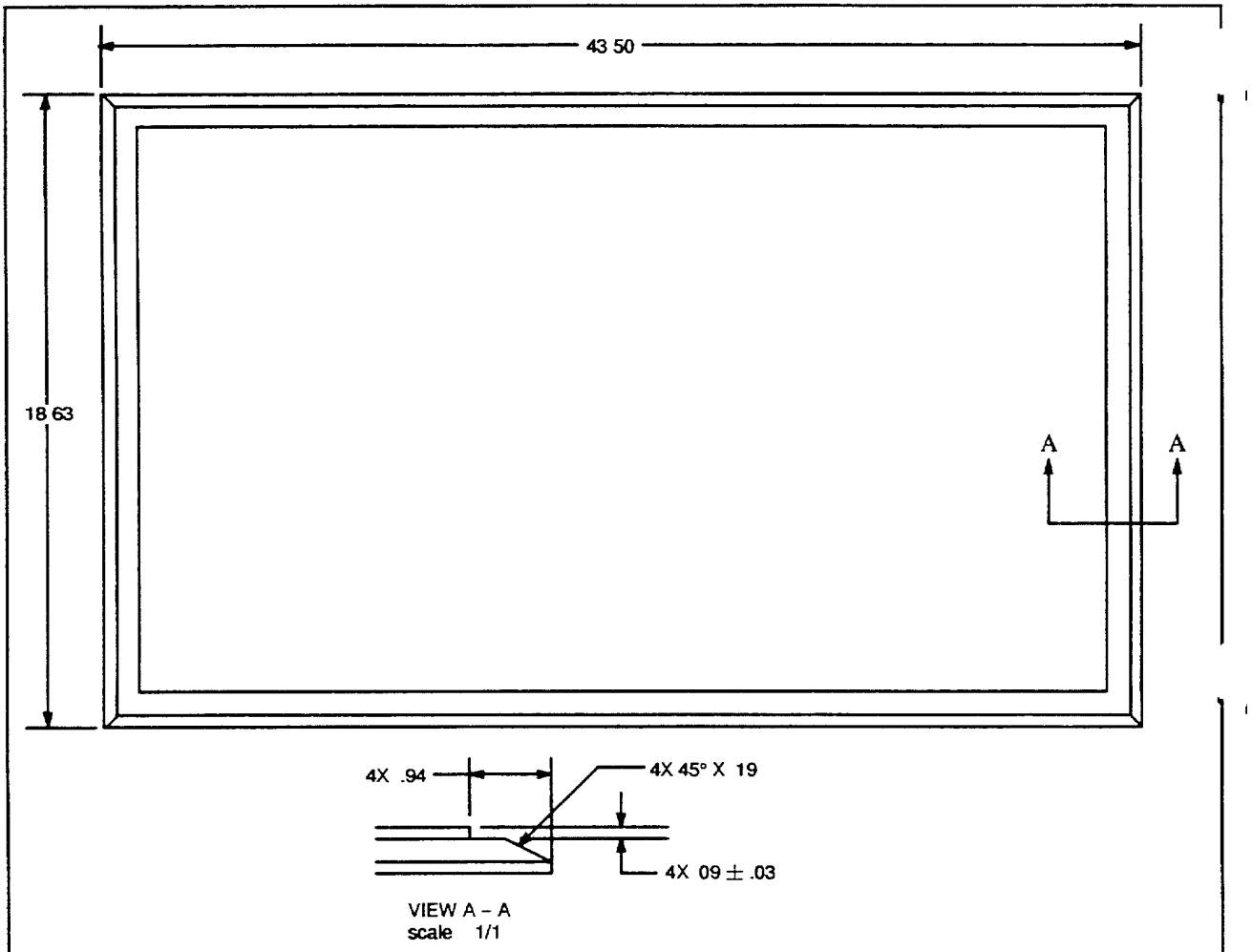
Fabricate from plywood, 3/8-inch thick, Grade AA, sanded both sides
Cut to to dimensions shown.
Treat with wood preservative solution and water repellent solution per per TT-W-572B, Comp D
Fire retardant treat per MIL-L-1914OC type II, category I.
Prime per MIL-P-53030.
Finish per MIL-C-46168.

Figure G-5. Deflector Assembly Storage box, Panel End.



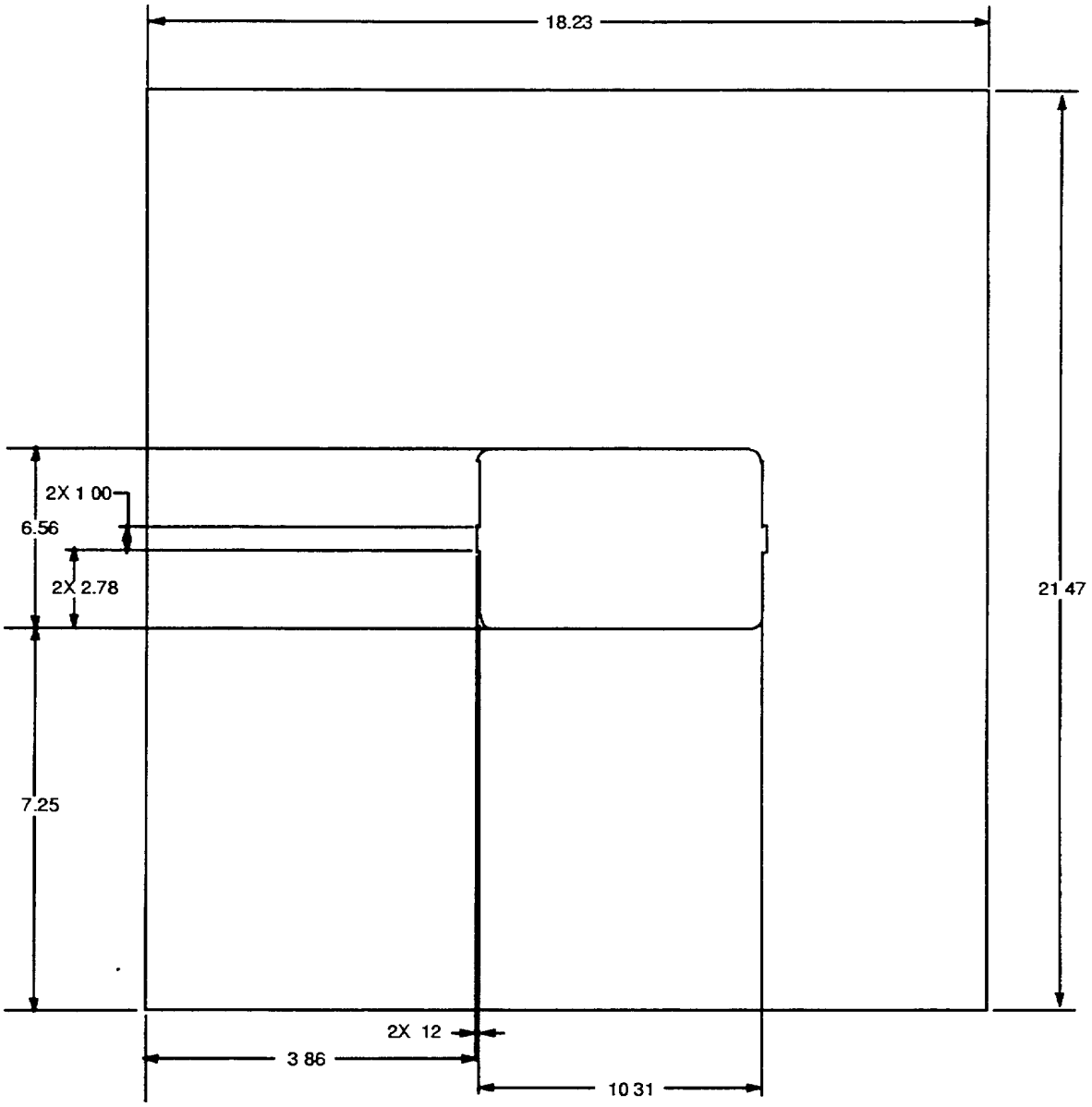
Fabricate from plywood, 3/8-inch thick, Grade AA, sanded both sides.
Cut to to dimensions shown.
Treat with wood preservative solution and water repellent solution per per TT-W-572B, Comp D
Fire retardant treat per MIL-L-19140C type II, category I
Prime per MIL-P-53030.
Finish per MIL-C-46168.

Figure G-6. Deflector Assembly Storage Box, Panel Bottom



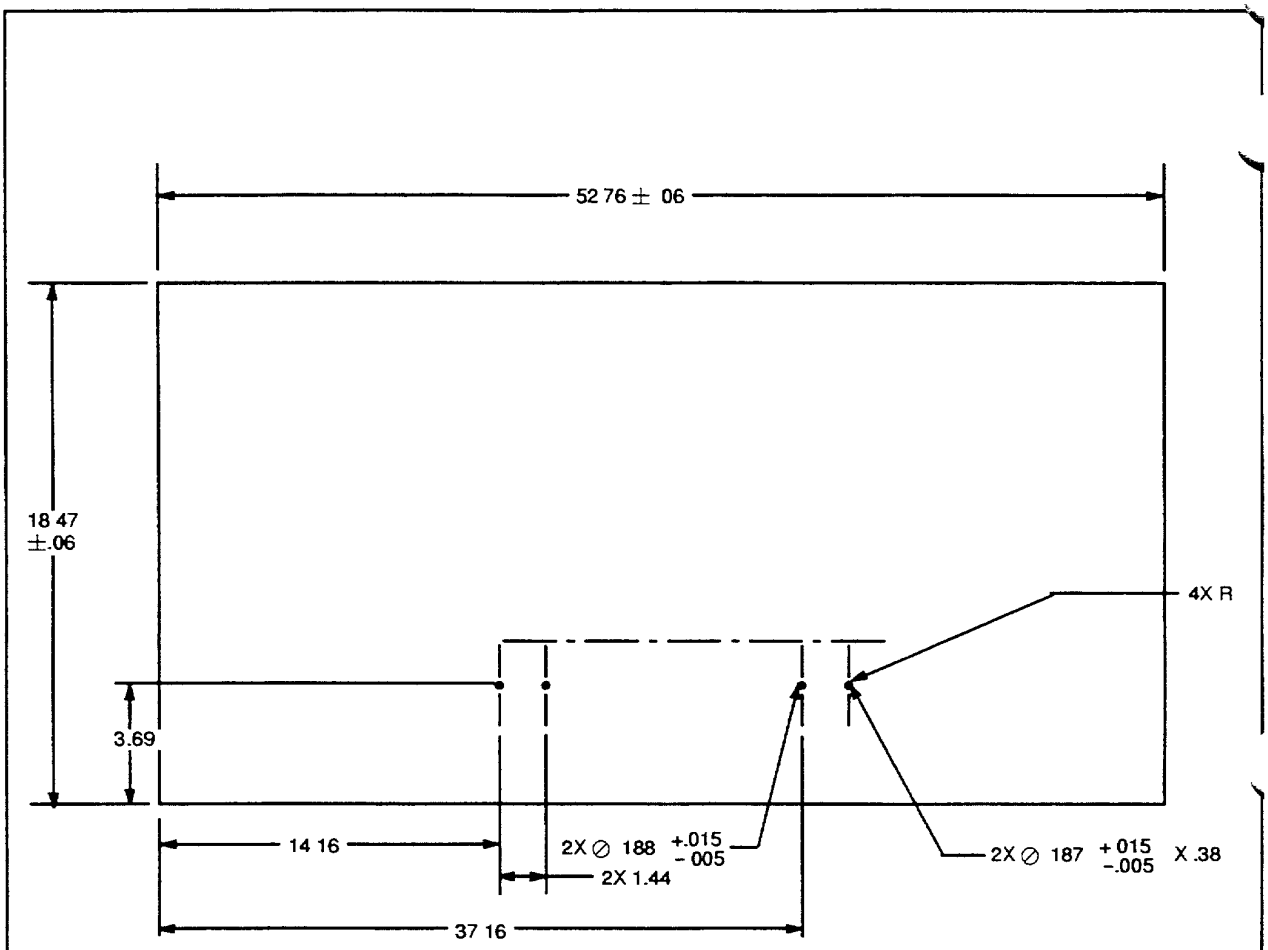
Fabricate from plywood, 3/8-inch thick, Grade AA, sanded both sides.
Cut to to dimensions shown.
Treat with wood preservative solution and water repellent solution per per TT-W-572B, Comp D
Fire retardant treat per MIL-L-19140C type II, category I
Prime per MIL-P-53030
Finish per MIL-C-46168

Figure G-7. Cover Assembly Fueling Manifold, Panel Top



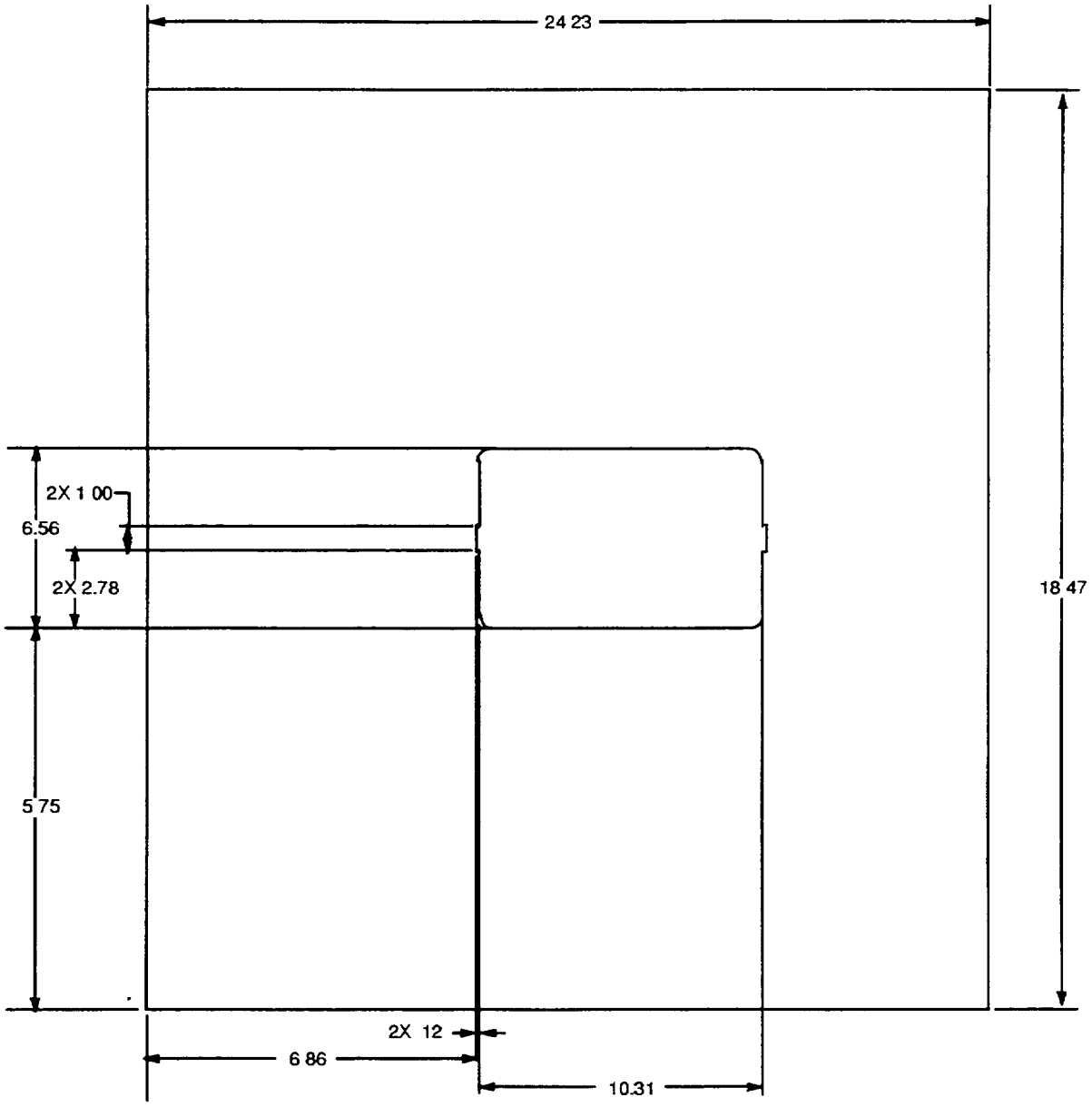
Fabricate from plywood, 3/8-inch thick, Grade AA, sanded both sides.
Cut to to dimensions shown.
Treat with wood preservative solution and water repellent solution per per TT-W-572B, Comp D.
Fire retardant treat per MIL-L-1914OC type II, category L
Prime per MIL-P-53030.
Finish per MIL-C-46168.

Figure G-8. Cover assembly Fueling Manifold, Panel End



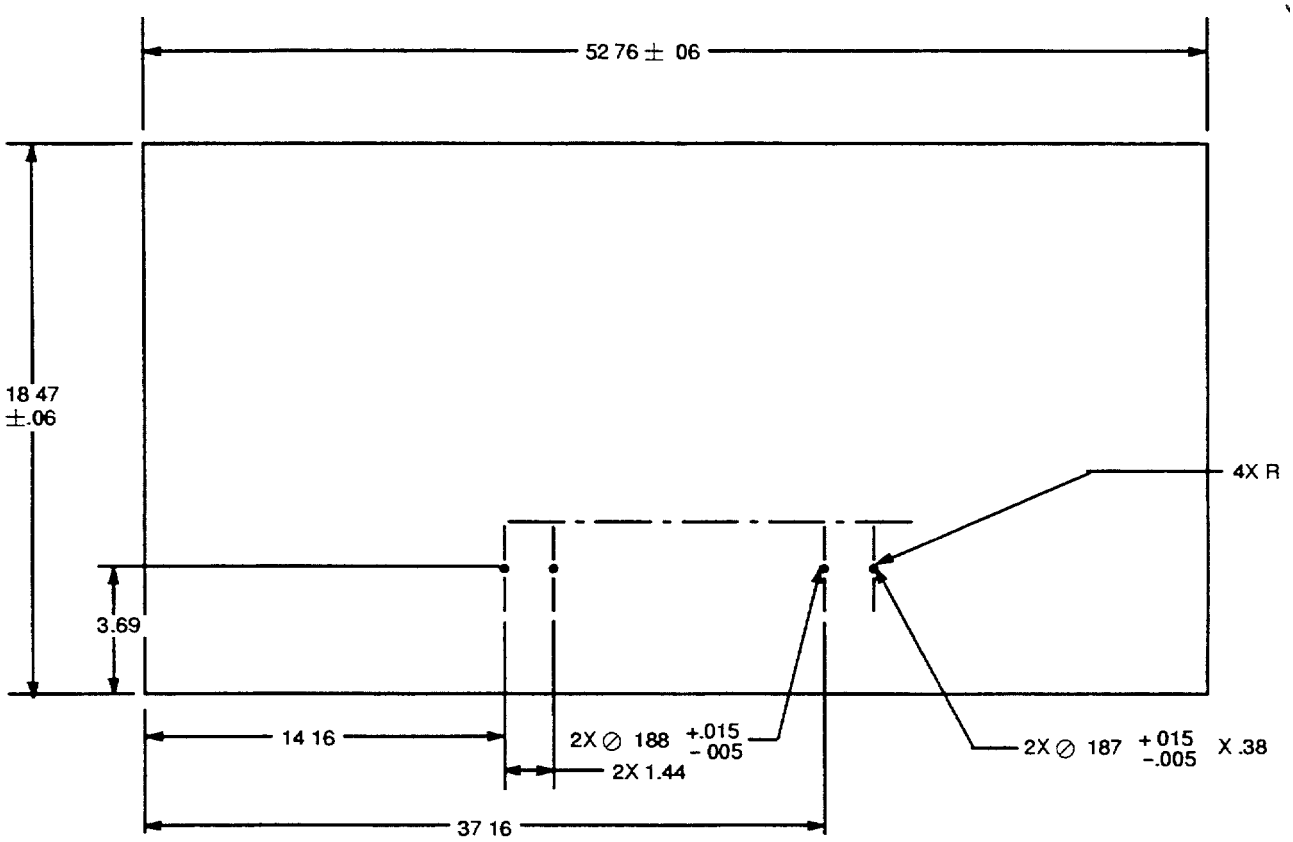
Fabricate from plywood, 3/8-inch thick, Grade AA, sanded both sides.
Cut to to dimensions shown.
Treat with wood preservative solution and water repellent solution per per TT-W-572B, Comp D.
Fire retardant treat per MIL-L-1914OC type II, category I.
Prime per MIL-P-53030
Finish per MIL-C-46168

Figure G-9. Cover Assembly Fueling Manifold, Panel Side



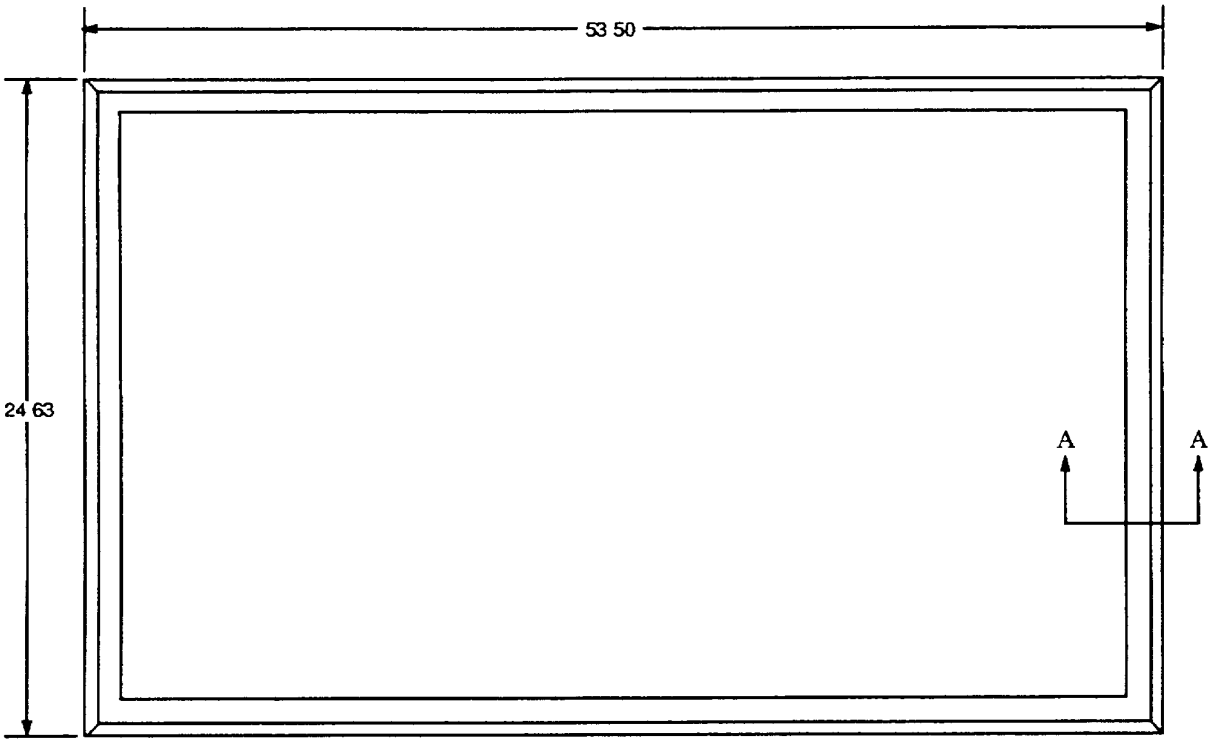
Fabricate from plywood, 3/8-inch thick, Grade AA, sanded both sides.
Cut to to dimensions shown.
Treat with wood preservative solution and water repellent solution per per TT-W-572B, Comp D.
Fire retardant treat per MIL-L-1914OC type II, category I.
Prime per MIL-P-53030.
Finish per MIL-C-46168.

Figure G-10. Cover Assembly Pressure Reducing, Panel End



Fabricate from plywood, 3/8-inch thick, Grade AA, sanded both sides.
Cut to to dimensions shown.
Treat with wood preservative solution and water repellent solution per per TT-W-572B, Comp D.
Fire retardant treat per MIL-L-1914OC type II, category I.
Prime per MIL-P-53030
Finish per MIL-C-46168

Figure G-11. Cover Assembly Pressure Reducing, Panel Side



Fabricate from plywood, 3/8-inch thick, Grade AA, sanded both sides.
Cut to to dimensions shown.
Treat with wood preservative solution and water repellent solution per per TT-W-572B, Comp D.
Fire retardant treat per MIL-L-1914OC type II, category I.
Prime per MIL-P-53030
Finish per MIL-C-46168

Figure G-12. Cover Assembly Pressure Reducing, Panel Top

APPENDIX H

TORQUE LIMITS

H-1. SCOPE.

This appendix provides torque limits for general use type fasteners. The torque values given in this appendix shall be used when specific torque values are not identified in the maintenance instructions.

H-2. TORQUE LIMITS.

Torque limits for fine threaded fasteners as compared to coarse threaded fasteners of the same diameter are slightly higher, but are not significant to general use. The following table identifies the torque limits for various sizes and types of fasteners.

APPENDIX H

TORQUE LIMITS - cont.

TYPE	MINIMUM TENSILE STRENGTH	MATERIAL	BODY SIZE OR OUTSIDE DIAMETER OF FASTENER												
			#2	#3	#4	#5	#6	#8	#10	1/4	5/16	3/8	7/16	1/2	9/16
SAE 0-1-2	74,000 PSI	LOW CARBON STEEL								6 (8)	12 (16)	20 (27)	32 (44)	47 (64)	69 (94)
SAE 3	100,000 PSI	MEDIUM CARBON STEEL								9 (12)	17 (23)	30 (41)	47 (64)	69 (94)	103 (140)
SAE 5	120,000 PSI	MEDIUM CARBON HEAT TREAT STEEL								10 (14)	19 (26)	33 (45)	54 (73)	78 (106)	114 (155)
SAE 6	133,000 PSI	MEDIUM CARBON STEEL QUENCHED TEMPERED								12 (16)	24 (33)	43 (58)	69 (94)	106 (144)	150 (203)
SAE7	133,000 PSI	MEDIUM CARBON ALLOY STEEL								13 (18)	25 (34)	44 (60)	71 (96)	110 (141)	154 (209)
SAE 8	150,000 PSI	MEDIUM CARBON ALLOY STEEL								14 (19)	29 (39)	47 (64)	78 (106)	119 (161)	169 (229)
SOCKET HEAD CAP SCREW	160,000 PSI	HIGH CARBON CASE HARDENED STEEL								16 (22)	33 (45)	54 (73)	84 (114)	125 (170)	180 (244)
SOCKET SET SCREW	212,000 PSI	HIGH CARBON CASE HARDENED STEEL					9 (1.0)	16 (1.8)	30 (3.4)	70 (7.9))	140 (15.8)	18 (2.0)	29 (3.3)	43 (4.9)	63 (7.1)

APPENDIX H

TORQUE LIMITS - cont.

	BODY SIZE OR OUTSIDE DIAMETER OF FASTENER															
TYPE	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8	2	2 1/4	2 1/2	2 3/4	3
SAE 0-1-2	96 (130)	155 (210)	206 (279)	310 (420)	480 (651)	675 (915)	900 (1220)	1100 (1492)	1470 (1993)	1900 (2576)	2360 (3200)	2750 (3729)	3450 (4678)	4400 (5966)	7350 (9967)	9500 (12882)
SAE 3	145 (197)	234 (317)	372 (504)	551 (747)	872 (1182)	1211 (1642)	1624 (2202)	1943 (2635)	2660 (3607)	3463 (4696)	4695 (6366)	5427 (7359)	7226 (9798)	8049 (10914)	13450 (18238)	17548 (23795)
SAE 5	154 (209)	257 (349)	382 (518)	587 (796)	794 (1077	1105 (1498)	1500 (2034)	1775 (2407)	2425 (3288)	3150 (4271)	4200 (5695)	4550 (6170)	6550 (8882)	7175 (9729)	13000 (17628)	16000 (21696)
SAE 6	209 (283)	350 (475)	550 (746)	825 (1119)	1304 (1768)	1815 (2461)	2434 (3301)	2913 (3950)	3985 (5404)	5189 (7036)	6980 (9465)	7491 (10158)	10825 (14679)	14983 (20317)	20151 (27325)	26286 (35644)
SAE 7	215 (292)	360 (488)	570 (773)	840 (1139)	1325 (1797)	1825 (2475)	2500 (3390)	3000 (4068)	4000 (5424)	5300 (7187)	7000 (9492)	7500 (10170)	11000 (14916)	15500 (21018)	21000 (28476)	27000 (36612)
SAE 8	230 (312)	380 (515)	600 (814)	900 (1220)	1430 (1940)	1975 (2678)	2650 (3593)	3200 (4339)	4400 (5966)	5650 (7661)	7600 (10306)	8200 (11119)	12000 (16272)	17000 (23052)	23000 (31188)	29000 (39324)
SOCKET HEAD CAP SCREW	250 (339)	400 (542)	640 (868)	970 (1315)	1520 (2061)	2130 (2888)	2850 (3865)	3450 (4678)	4700 (6373)	6100 (8272)	8200 (11119)	8800 (11933)	13000 (17628)	18000 (24408)	24000 (32544)	31000 (42036)
SOCKET SET SCREW	100 (136)	146 (198)														

APPENDIX H

TORQUE LIMITS - cont.

TYPE	MINIMUM TENSILE STRENGTH	BODY SIZE OR OUTSIDE DIAMETER OF FASTENER														
		MATERIAL	#2	#3	#4	#5	#6	#8	#10	1/4	5/16	3/8	7/16	1/2	9/16	
MACHINE SCREW YELLOW BRASS	60,000 PSI	COPPER (CU) 63% ZINC (ZN) 37%	2 (2)	3.3 (3)	4.4 (5)	6.4 (7)	8 (9)	16 (1.8)	20 (2.3)	65 (7.3)	110 (12.4)	17 (23)	27 (37)	37 (50)	49 (66)	
COPPER SILICONE BRONZE TYPE "B"	70,000 PSI	(CU) 96% ZINC (ZN) 2% SILICON (SI) 2%	2.3 (2)	3.7 (3)	4.9 (5)	7.2 (8)	10 (1.1)	19 (2.1)	22 (2.5)	70 (7.9)	125 (14.1)	20 (27)	30 (41)	41 (56)	53 (72)	

TYPE	BODY SIZE OR OUTSIDE DIAMETER OF FASTENER															
	3/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8	2	2 1/4	2 1/2	2 3/4	3
MACHINE SCREW YELLOW BRASS	78 (106)	104 (141)	160 (217)	215 (292)	325 (441)	400 (542)		595 (807)								
SILICONE BRONZE TYPE "B"	88 (119)	117 (159) (244)	180 (339)	250 (495)	365 (610)	450		655 (888)								

LEGEND

1. TORQUE VALUES All numbers are In foot-pounds except those that are underlined, which are inch-pounds

2. Numbers in parentheses are Newton-Meters

APPENDIX J

MANDATORY REPLACEMENT PARTS

ITEM NO	NOMENCLATURE	PART NUMBER
1	Coupling Gasket, 2-in	13228E1768-6
2	Strapping (2-in)	J210-4
3	Seal (2-in)	C254
4	Coupling Gasket, (3-in)	13228E1768-8
5	Strapping (3-inch)	J213-3
6	Seal (3-in)	C256
7	Lock, washer	MS35338-43
8	Lockwasher	MS35338-42
9	Blind Rivet	M242431/1B408
10	Backup Plate	13230E2892
11	Backup Plate	13230E2892-1
12	Blind Rivet	M24243/1B408
13	Blind Rivet	M24243/1B610
14	Foam	13230E2932-2
15	Foam	13230E2903-4
16	Lockwasher	MS35338-44
17	Packing	00713J
18	Packing	00751J
19	Diaphragm	V1493A
20	Disc	V5564K
21	Packing	00777D
22	Coupling Gasket, 1 1/2-in.	13228E1768-5
23	Blind Rivet	MS20600B4W2
24	Blind Rivet	MS20600B4W5
25	Lockwasher	MS35338-139
26	Coupling Gasket, 1 5-in	13228E1768-5
27	Coupling Gasket, 4-in	13228E1768-9
28	Blind Rivet	MS20600AD6W5
29	Self Locking Nut	MS51922-6

MANDATORY REPLACEMENT PARTS - cont

ITEM NO	NOMENCLATURE	PART NUMBER
30	Stuffing Box Seal	H-10459M
31	Cotter Pin	H-4881-N
32	Cotter Pin	1711D-3-29
33	Seal	1711D-3-3
34	Cylinder	1711D-3-9

ALPHABETICAL INDEX

ALPHABETICAL INDEX - cont

ALPHABETICAL INDEX - cont

ALPHABETICAL INDEX- cont

By Order of the Secretary of the Army:

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

Official:

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

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C