Contents of this manual may depict or describe features that may be available optionally.

OPERATION AND SERVICE MANUAL

SEALVAC™ VACUUM BOTTOM DRAIN UNIT

200, 400, 600 Gallon Capacity

(757, 1514, 2271 Liters)

MANUAL SV/SVU 200/400/600 REVISION 3.0 APRIL 2008

THIS PAGE INTENTIONALLY BLANK

TABLE OF CONTENTS

TABLE OF CONTENTS - CONTINUED

LIST OF ILLUSTRATIONS

LIST OF TABLES

FOREWORD

1. GENERAL.

2. PURPOSE AND SCOPE.

This manual provides operation and maintenance instructions for the Tank, Trailer Mounted, Recoverable Aviation Turbine Fuel: 200, 400, and 600 Gallon.

3. ARRANGEMENT.

This manual consists of five chapters. Chapter 1 contains introductory material for the manual and general description information. Chapter 2 contains a list of special tools and test equipment. Chapter 3 provides instructions and references for preparation for use, reshipment, air transportability, and storage. Chapter 4 provides operating instructions. Chapter 5 provides maintenance instructions with schematics.

4. ABBREVIATIONS AND SYMBOLS.

FOD	Foreign Object Damage/Debris
ID	Inner Diameter
inch Hg	Inches of Mercury (vacuum pressure)
NPT	National Pipe Thread
OD	Outer Diameter
PSIG	Pounds Per Square Inch - Gauge
SCFM	Standard Cubic Feet per Minute

SAFETY SUMMARY

1. GENERAL SAFETY INSTRUCTIONS.

This manual describes physical and chemical processes which may cause injury or death to personnel, or damage to equipment if not properly followed. This safety summary includes general safety precautions and instructions that must be understood and applied during operation and maintenance to ensure personnel safety and protection of equipment. Prior to performing any task, the WARNINGs, CAUTIONs and NOTEs included in that task shall be reviewed and understood.

2. WARNINGS, CAUTIONS AND NOTES.

WARNINGs and CAUTIONs are used in this manual to highlight operating or maintenance procedures, practices, conditions or statements which are considered essential to protection of personnel (WARNING) or equipment (CAUTION). WARNINGs and CAUTIONs immediately precede the step or procedure to which they apply. WARNINGs and CAUTIONs consist of four parts: heading (WARNING or CAUTION), a statement of the hazard, minimum precautions, and possible result if disregarded. NOTEs are used in this manual to highlight operating or maintenance procedures, practices, conditions or statements which are not essential to protection of personnel or equipment. NOTEs may precede or follow the step or procedure, depending upon the information to be highlighted. The headings used and their definitions are as follows:

WARNING

Highlights an essential operating or maintenance procedure, practice, condition, statement, etc, which if not strictly observed, could result in injury to, or death of, personnel or long term health hazards.

CAUTION

Highlights an essential operating or maintenance procedure, practice, condition, statement, etc, which if not strictly observed, could result in damage to, or destruction of, equipment or loss of mission effectiveness.

NOTE

Highlights an essential operating or maintenance procedure, condition, or statement.

3. PROTECTIVE CLOTHING.

When fuels are being handled, approved equipment such as gloves, eye protection, face shields, etc. shall be used. Local standard operating procedures and OSHA standards will always take precedence over this publication.

4. STATIC BONDING AND GROUNDING.

Improper static bonding and grounding can lead to a fire. Always follow local policy to bond and ground this equipment.

5. FIRE HAZARD.

This equipment is designed to safely handle fuel. However, fuel is inherently dangerous and no amount of engineering can assure that a fire will not occur. Always assume a fire can occur. Read and understand this publication.

6. RECOVERABLE PRODUCTS.

Recoverable products resulting from ground handling and servicing of aircraft will be handled in accordance with federal, state, and local pollution control laws. Fuel or oil spills will be reported to the facility fire department as required by local directives.

7. CONFINED SPACE.

Personnel that work within an aircraft space(s) that: by design has limited openings for entry and exit; has unfavorable natural ventilation, not intended primarily for human occupancy, or contains other recognized safety hazards shall comply with the requirements of all local safety procedures for confined space. The equipment described in this manual is considered to be a confined space.

8. LOCKOUT / TAGOUT.

Personnel shall be aware of the hazards associated with unguarded machinery parts, capacitors, gaseous and wet pipe systems, spring loaded devices, etc. Lockout/tagout the energy source prior to performing maintenance, adjustment, or other procedures that would bypass safety guards, barriers, or otherwise expose personnel to hazardous energy sources. Any equipment, machine, or process that could unexpectedly energize, start-up, or release energy will be equipped with a means to lockout/ tagout the energy source(s).

9. AREA OF USE.

This equipment has been designed to operate outdoors. Flammable and/or combustible vapors in ignitable quantities could be produced under certain circumstances. Indoor operation requires an optional vent adaptor that allows typical ventilation equipment to be used to ventilate the equipment's exhaust air. Additionally, local protocols must be consulted to determine if fuel draining equipment can be used in the location being considered.

10. EQUIPMENT SECURITY.

This equipment has lockable features to prevent unauthorized use. The manway assembly, telescoping funnel assembly (when equipped) and ball valves accept a standard padlock. The storage boxes are keyed.

CHAPTER 1

INTRODUCTION AND GENERAL INFORMATION

1.1 INTRODUCTION.

The instructions in this manual cover the operation and maintenance of the Tank, Trailer Mounted, Recoverable Aviation Turbine Fuel: 200, 400, and 600 Gallon, part numbers SV/SVU200(S), SV/SVU416(S), and SV/SVU616(S) respectively, manufactured by Spokane Industries, Inc. of Spokane Valley, Washington.

1.2 PURPOSE.

Tank, Trailer Mounted, Recoverable Aviation Turbine Fuel: 200, 400, and 600 Gallon; herein referred to as the SealVac™, provides a convenient, safe, and efficient means to recover and store aviation fuels. SealVac™ is a trademark of Spokane Industries, Inc. The SealVac™ Vacuum Fuel Drain System is protected by the following U.S. Patents: US 5,117,876, US 6,860,300 B1, US 6,896,013 B2, and 7,171,990 B2.

1.3 DESCRIPTION.

Refer to Figure 1-1 for location and identification of major components and Tables 1.1 through 1.3 for leading particulars of each size. The SealVac consists of a full vacuum inner tank assembly and an outer tank, (known as double wall construction.) Defueling is accomplished by several specialized aircraft interface drain tools, a fifty (50-foot) depuddling hose, and a sixteen foot (16-foot) telescoping funnel assembly (400 & 600 gallon sizes only.)

WARNING

Read the manual in its entirety before operating, shipping, or performing maintenance procedures. Flammable and combustible vapors can cause fire and/or explosion and lead to serious injury or death.

CAUTION

Read the manual in its entirety before operating, shipping, or performing maintenance procedures. Flammable and combustible vapors can cause fire and/or explosion and lead to serious equipment and aircraft damage.

1.4 THEORY OF OPERATION.

The SealVac is comprised of six primary functional areas. The theory of operation for each area is described in the following paragraphs.

1.4.1 Full Vacuum Tank Assembly. The Full Vacuum Tank Assembly collects and stores the fluid that is being handled. The tank weldment has an integrated sediment chamber to collect foreign object damage/debris (FOD). The tank is baffled laterally for transport stability and structural soundness. The tank weldment has an outer wrap that serves as secondary containment in the event of a primary tank leak. See Figure 1-1, 1.

1.4.2 Vacuum System Assembly. The Vacuum System Assembly uses compressed air to create vacuum inside the tank weldment, provides vacuum to the Drain Tools, and controls the tank operation. See Figure 1-1, 3.

1.4.3 Vacuum Governor. The Vacuum Governor maintains a maximum vacuum level of 8 inches Hg inside the tank weldment. This vacuum limit protects the airframe fuel cell from damage.

Table 1-1. Leading Particulars for Part Number SV/SVU200(S)

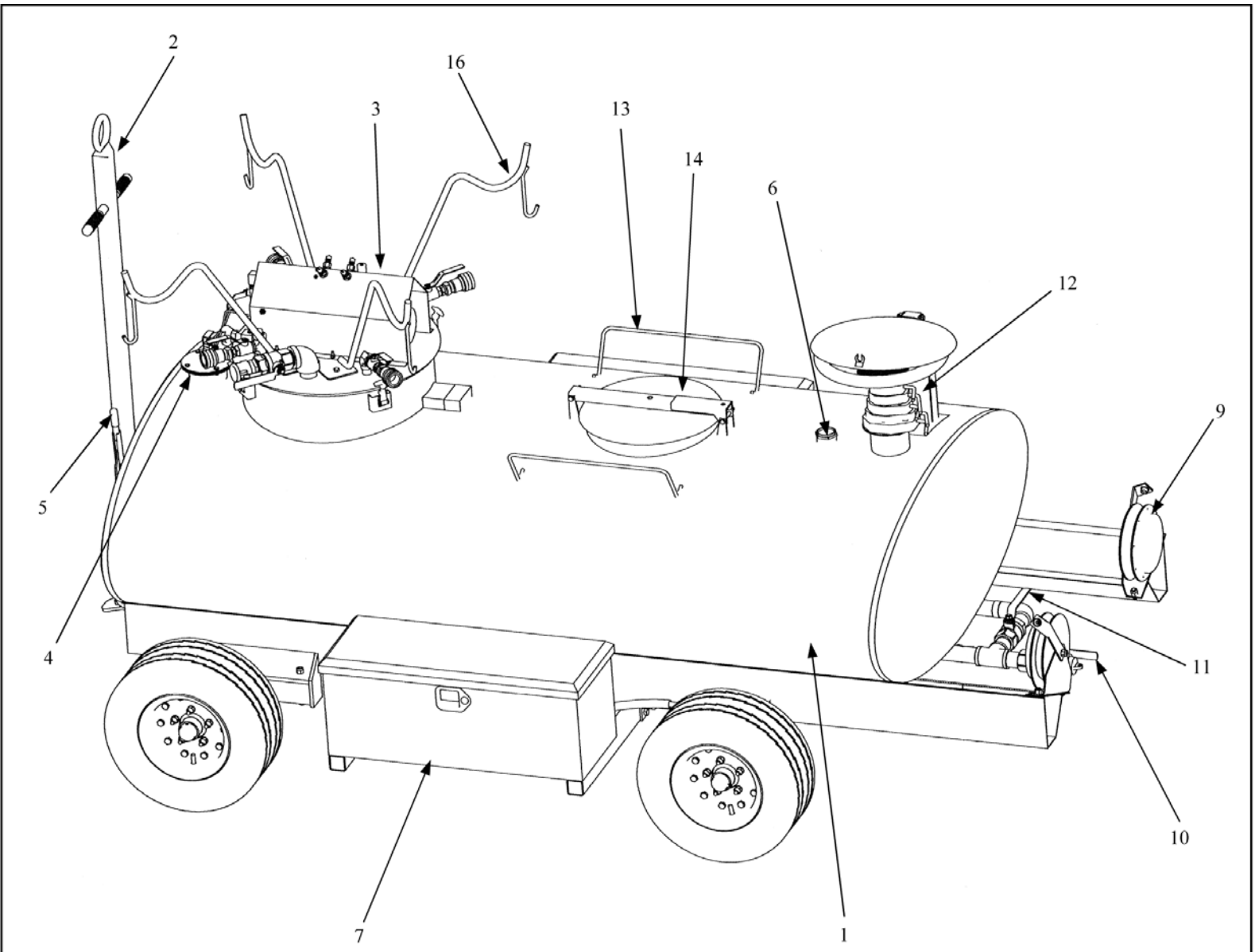
Tank Volume:	
Nominal Capacity	200-gallons
Max Capacity	220-gallons
Equipment Dimensions:	
Length (Tow bar down)	153-inches
(Tow bar up)	93-inches
Width (Tire to tire)	59-inches
(Box to box)	59-inches
Height (Tow bar down)	60-inches
(Tow bar up)	72-inches
Weight (Empty)	1,400-pounds
(Full, at nominal capacity with fuel)	2,920-pounds
Telescoping Funnel Height (Fully collapsed)	N/A
(Fully extended)	N/A
Ground Clearance (At tow bar)	6-inches
(At axle)	8-inches
Environmental Conditions:	
Operating Temperature Range	-25°F to 110°F
Storage Temperature Range	-40°F to 150°F
Supply Air Requirements:	
Supply Air Pressure (Maximum)	100-PSIG
(Minimum)	45-PSIG
Supply Air Flow Rate (Maximum)	Not established
(Minimum)	68-SCFM
Operational Characteristics:	
Tank Vacuum Pressure	8-inches Hg
Tank Vacuum Flow	89-SCFM
Drain Tool (Adherence Vacuum pressure)	17-inches Hg
(Adherence Vacuum flow)	2.1-SCFM
(Length)	35-feet
(Diameter, inner)	3/4-inch
Depuddling Hose (Length)	35 or 50-feet
(Diameter, inner)	1-inch
Towing Characteristics:	
Speed, Forward Direction	15-MPH
Speed, Backward Direction	(hand push/pull only)
Turning Radius (Curb to curb)	336-inches
Tire Size and Pressure:	
Tire Size.....	20.5 x 8.0-10
B Range Tire Pressure (Cold) (See Sidewall)	35-PSIG
E Range Tire Pressure (Cold) (See Sidewall)	90-PSIG
Other Characteristics:	
Double Wall Construction	S models only
Number of Defueling Ports	Four (4) Drain Tool Ports / One (1) Depuddle/Utility Port

Table 1-2. Leading Particulars for Part Number SV/SVU416(S)

Tank Volume:	
Nominal Capacity	400-gallons
Max Capacity	440-gallons
Equipment Dimensions:	
Length (Tow bar down)	187-inches
(Tow bar up)	128-inches
Width (Tire to tire)	76-inches
(Box to box)	76-inches
Height (Tow bar down)	42-inches
(Tow bar up)	72-inches
Weight (Empty)	1,650-pounds
(Full, at nominal capacity with fuel)	4,690-pounds
Telescoping Funnel Height (Fully collapsed)	42-inches
(Fully extended)	234-inches
Ground Clearance (At tow bar)	6-inches
(At axle)	8-inches
Environmental Conditions:	
Operating Temperature Range	-25°F to 110°F
Storage Temperature Range	-40°F to 150°F
Supply Air Requirements:	
Supply Air Pressure (Maximum)	100-PSIG
(Minimum)	45-PSIG
Supply Air Flow Rate (Maximum)	Not established
(Minimum)	68-SCFM
Operational Characteristics:	
Tank Vacuum Pressure	8-inches Hg
Tank Vacuum Flow	89-SCFM
Drain Tool (Adherence Vacuum pressure)	17-inches Hg
(Adherence Vacuum flow)	2.1-SCFM
(Length)	35-feet
(Diameter, inner)	3/4-inch
Depuddling Hose (Length)	35 or 50-feet
(Diameter, inner)	1-inch
Towing Characteristics:	
Speed, Forward Direction	15-MPH
Speed, Backward Direction	(hand push/pull only)
Turning Radius (Curb to curb)	372-inches
Tire Size and Pressure:	
Tire Size	20.5 x 8.0-10
B Range Tire Pressure (Cold) (See Sidewall)	35-PSIG
E Range Tire Pressure (Cold) (See Sidewall)	90-PSIG
Other Characteristics:	
Double Wall Construction	S models only
Number of Defueling Ports	Four (4) Drain Tool Ports / One (1) Depuddle/Utility Port

Table 1-3. Leading Particulars for Part Number SV/SVU616(S)

Tank Volume:	
Nominal Capacity	600-gallons
Max Capacity	660-gallons
Equipment Dimensions:	
Length (Tow bar down)	187-inches
(Tow bar up)	128-inches
Width (Tire to tire)	76-inches
(Box to box)	89-inches
Height (Tow bar down)	62-inches
(Tow bar up)	72-inches
Weight (Empty)	2,135-pounds
(Full, at nominal capacity with fuel)	6,695-pounds
Telescoping Funnel Height (Fully collapsed)	62-inches
(Fully extended)	254-inches
Ground Clearance (At tow bar)	6-inches
(At axle)	8-inches
Environmental Conditions:	
Operating Temperature Range	-25°F to 110°F
Storage Temperature Range	-40°F to 150°F
Supply Air Requirements:	
Supply Air Pressure (Maximum)	100-PSIG
(Minimum)	45-PSIG
Supply Air Flow Rate (Maximum)	Not established
(Minimum)	68-SCFM
Operational Characteristics:	
Tank Vacuum Pressure	8-inches Hg
Tank Vacuum Flow	89-SCFM
Drain Tool (Adherence Vacuum pressure)	17-inches Hg
(Adherence Vacuum flow)	2.1-SCFM
(Length)	35-feet
(Diameter, inner)	3/4-inch
Depuddling Hose (Length)	35 or 50-feet
(Diameter, inner)	1-inch
Towing Characteristics:	
Speed, Forward Direction	15-MPH
Speed, Backward Direction	(hand push/pull only)
Turning Radius (Curb to curb)	372-inches
Tire Size and Pressure:	
Tire Size	20.5 x 8.0-10
B Range Tire Pressure (Cold) (See Sidewall)	35-PSIG
E Range Tire Pressure (Cold) (See Sidewall)	90-PSIG
Other Characteristics:	
Double Wall Construction	S models only
Number of Defueling Ports	Four (4) Drain Tool Ports / One (1) Depuddle/Utility Port



1. FULL VACUUM TANK ASSEMBLY
2. TOW BAR
3. VACUUM SYSTEM ASSEMBLY
4. AUTO SHUT-OFF ASSEMBLY
5. PARKING BRAKE
6. LIQUID LEVEL GAUGE
7. STORAGE BOX (1 OF 2)
9. GROUNDING REEL (1 OF 2)
10. TANK DRAIN VALVE
11. FUNNEL ISOLATION VALVE (400/600 ONLY)
12. TELESCOPING FUNNEL ASSEMBLY (IF EQUIPPED)
13. HOSE CRADLE
14. MANWAY ASSEMBLY

Figure 1-1. Equipment Component Identification

1.4.4 Auto Shut-off Assembly. The Auto Shut-off Assembly prevents the tank from being over-filled by shutting off the tank vacuum on a "tank full" condition. The "tank full" condition is equal to the nominal tank size. A 10-percent vapor/liquid expansion space is provided to ensure spill-free operation. See Figure 1-1,4.

1.4.5 Drain Tools. The Drain Tools allow for leak-free draining of bottom sumps. The Drain Tools use vacuum to adhere to the surface surrounding the sump. A fuel probe locks into the Drain Tool while simultaneously opening the sump's poppet drain valve. Tank vacuum pressure is then applied to the fuel cell to accomplish draining. See Figure 1-2, 1 through 3.

1.4.6 Drain Tool Vacuum Group. The Drain Tool Vacuum Group provides constant vacuum to the Drain Tools. These vacuum generators produce approximately 18 inches Hg. The Drain Tool Vacuum Group is separate from the Tank Vacuum Group to provide a higher vacuum condition that is not dependant on tank fluid level and not interrupted by the Auto Shut-off feature.

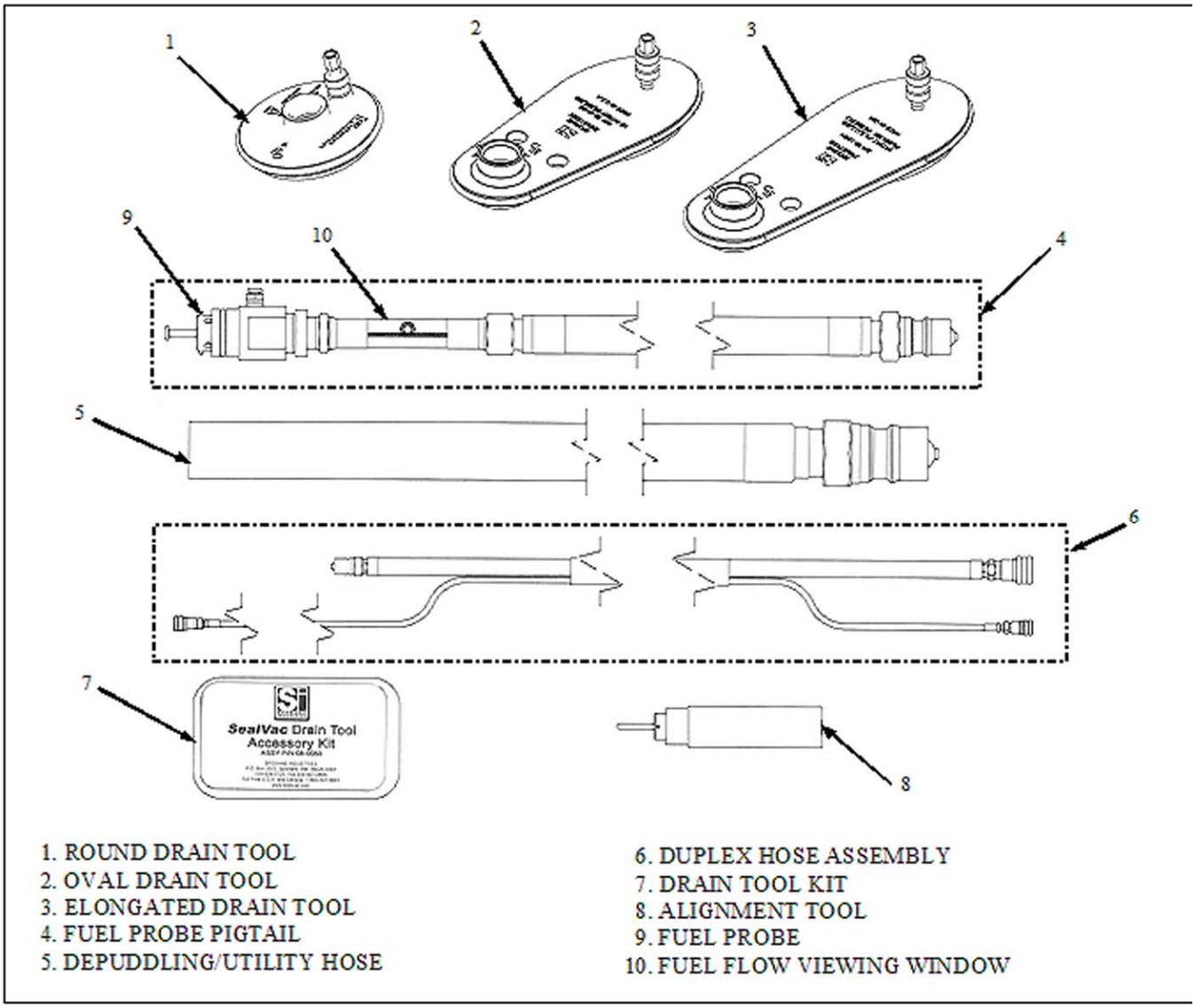


Figure 1-2. Drain Tools and Accessories

CHAPTER 2

SPECIAL TOOLS AND TEST EQUIPMENT

2.1 GENERAL.

The SealVac is easy to use and easy to maintain. No special tools or equipment are needed to service this equipment except some specific pressure, vacuum, and flow equipment.

2.2 PRESSURE TEST EQUIPMENT.

The following test equipment should be used with the trouble shooting tables contained in Chapter 5 and the Supply Air Requirements contained in Tables 1-1 through 1-3.

2.2.1 Supply Air Pressure. Supply air pressure readings can often be found at the source of the supply air. If not, an air pressure gauge will be needed to service the supply air system on the unit. These gauges are readily available in many sizes and configurations. An air pressure gauge capable of reading 0 to 125 PSI is required to trouble shoot the equipment.

2.2.2 Supply Air Flow. Supply air flow rate readings should be obtained at the air connection point of the equipment. An air flow gauge capable of reading 0 to 100 SCFM is required to troubleshoot the equipment.

2.2.3 Vacuum Pressure. Vacuum pressure readings should be obtained at the point of interest. A vacuum pressure gauge capable of reading 0 to 30 inch Hg is required to trouble shoot the equipment.

2.2.4 Vacuum Flow. Vacuum flow rate readings should be obtained at the point of interest. A vacuum flow gauge capable of reading 0 to 100 SCFM is required to troubleshoot the equipment.

2.3 ELECTRICAL TEST EQUIPMENT.

A digital multi-meter is needed to test electrical continuity of various static bonding/grounding components used in the SealVac. A meter capable of reading milliohms is required to troubleshoot the equipment.

CHAPTER 3

PREPARATION FOR USE AND SHIPMENT

3.1 PREPARATION FOR USE.

The following set of instructions should be followed prior to using the unit for the first time or preparing the SealVac for shipment.

3.2 FIRST TIME USE.

3.2.1 Un-packaging. Un-package the SealVac by:

a. Remove outer wrapping material.
b. Remove equipment from pallet if palletized.
c. Open manway cover.
d. Remove Duplex Hose assemblies and Depuddling Hose from interior of tank.
e. Remove Drain Tools and Fuel Probe Pigtail assembly from side storage boxes and unwrap.
f. Remove air transport bolts and nuts from Vacuum System Assembly and store in storage box.

3.2.2 Taking Inventory. After all the components are removed from the packaging, conduct an inventory to ensure all loose items are present. See Table 3-1 for components listing.

3.2.3 Storage of Components. Each component has a storage location in or on the tank weldment.

a. Coil Duplex Hose assemblies and hang on hose hangers.
b. Coil Depuddling Hose and place in Hose Cradle.
c. Place Drain Tools and Fuel Probe Pigtail assemblies in storage boxes.

3.3 SHIPMENT.

The SealVac has been designed to be transported by truck or cargo aircraft.

3.3.1 Preparation for Shipment. Begin the shipping preprocess by following these steps:

a. Drain the tank of all liquid products by opening the drain valve.

WARNING

Flammable and combustible vapors must be removed from the tank before shipping to prevent a fire and/or explosion. Serious injury or death could occur.

b. Evacuate all flammable and/or combustible vapors from the tank using an approved ventilation method.
c. Coil Duplex Hose assemblies and the Depuddling Hose assembly. Place inside the tank through the manway.
d. Place all other loose items inside the side storage boxes.
e. Ensure that Manway Assembly, Funnel Cover, and Vacuum System Assembly are securely latched.

3.3.2 Truck Shipment. To load the SealVac on a truck, a forklift with fork extensions will be required.

a. Ensure the steps in Paragraph 3.3.1 have been completed.
b. Set the parking brake.
c. Approach the unit from the front only.

CAUTION

Fork extensions must be in contact with axle tubes only. Damage to equipment will occur if the equipment is lifted from any other location.

d. Ensure fork extensions are contacting both the front and rear axle tubes.
e. Place on truck.
f. Secure to truck bed using attachment points on tank weldment.

3.3.3 Air Shipment. The SealVac has been designed to be air transported. Specific aircraft loading procedures take precedence over the steps described here.

a. Ensure the steps in Paragraph 3.3.1 have been completed.
b. Follow specific aircraft loading requirements.

CAUTION

Do not back equipment by any means other than hand pushing/pulling. Damage to the equipment will occur if self propelled tow methods are employed.

c. Load equipment by towing forward only by self propelled tow methods or by hand pushing/pulling.
d. After placement in aircraft, lock tow bar in upright position.
e. Ensure Parking Brake is set.
f. Ensure Funnel Cover is latched.
g. Ensure the Manway Assembly is latched.
h. Ensure storage boxes are latched.

CHAPTER 4

OPERATION INSTRUCTIONS

4.1 INTRODUCTION.

The instructions contained in this chapter provide step by step procedures for operating the SealVac. All three configurations are described in this chapter. All operational steps are identical except for the 200 gallon size which does not have a Telescoping Funnel Assembly.

4.2 GENERAL PRECAUTIONS.

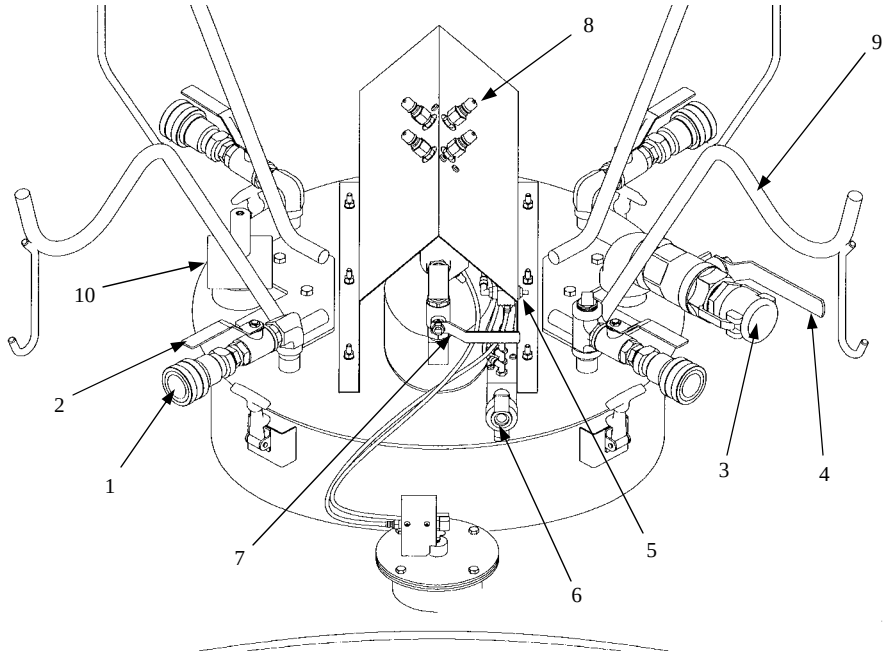
Observe all WARNING, CAUTION, and NOTE headings throughout these instructions. Fuel is inherently flammable and/or combustible under many conditions. Fully understanding the safety and operational characteristics of the SealVac is crucial for successful and safe fuel handling operations.

4.3 CONTROLS AND INDICATORS.

Refer to Table 4-1 and Figure 4-1 for descriptions and locations of all the controls and indicators.

4.4 OPERATION.

The SealVac is designed to perform three major modes of operation: Vacuum Draining, Depuddling, and Gravity Draining. Paragraph 4.5 describes supporting operations that are used in conjunction with these major modes of operation. Paragraph 4.6 describes the theory of operation and operational steps for the Vacuum Draining mode. Paragraph 4.7 describes the operational steps of the Depuddling mode. Paragraph 4.8 describes the operation steps of the Gravity Draining mode. Finally, Paragraph 4.9 describes supplemental operations.



1. FUEL EXTRACTION PORT, (1 OF 4)
2. FUEL EXTRACTION VALVE, (1 OF 4)
3. DEPUDDLING/UTILITY HOSE PORT
4. DEPUDDLING/UTILITY HOSE VALVE
5. AUTO SHUT-OFF BYPASS VALVE
6. SUPPLY AIR CONNECTOR
7. TANK VACUUM VALVE
8. DRAIN TOOL VACUUM PORT (1 OF 4)
9. DUPLEX HOSE HANGER (1 OF 4)
10. VACUUM GOVERNOR

Figure 4-1. Component Identification - Vacuum System Assembly

Table 4-1. Controls and Indicators

Description	Function
Parking Brake Handle	Used to set the parking brake during operation and storage.
Liquid Level Gauge	Indicates level of the fluid inside the tank. Located on the top centerline of the tank.
Fuel Extraction Valve; 4 each	Control valves for the vacuum draining mode using the Drain Tools. Located on top of the Vacuum System Assembly.
Depuddling/Utility Hose Valve	Control valve for the depuddling mode. Located on top of the sediment chamber lid.
Auto Shut-off Bypass Valve	Allows the user to bypass the air signal from the Auto Shutoff Assembly that controls whether or not vacuum is applied to the tank. Located top front of tank weldment.
Tank Drain Valve	Used to empty tank when at capacity. Located bottom rear of tank.
Funnel Isolation Valve	Isolates vacuum tank from funnel assembly. Valve must be open to use funnel and closed to use vacuum tank.
Tank Vacuum Valve	Control valve for operating tank vacuum.

4.5 SUPPORTING OPERATIONS.

Each major mode of operation uses one or more of these supporting operations. Instructions for each supporting operation is described below.

4.5.1 Parking Brake. The parking brake is applied by using the parking brake handle located at the front of the tank assembly. See Figure 4-2.

a. Ensure the SealVac is at rest.
b. To set parking brake, move handle so that it points upward.
c. Chock equipment if required by local operating procedures.
d. To release parking brake, move handle so that it points to the side.

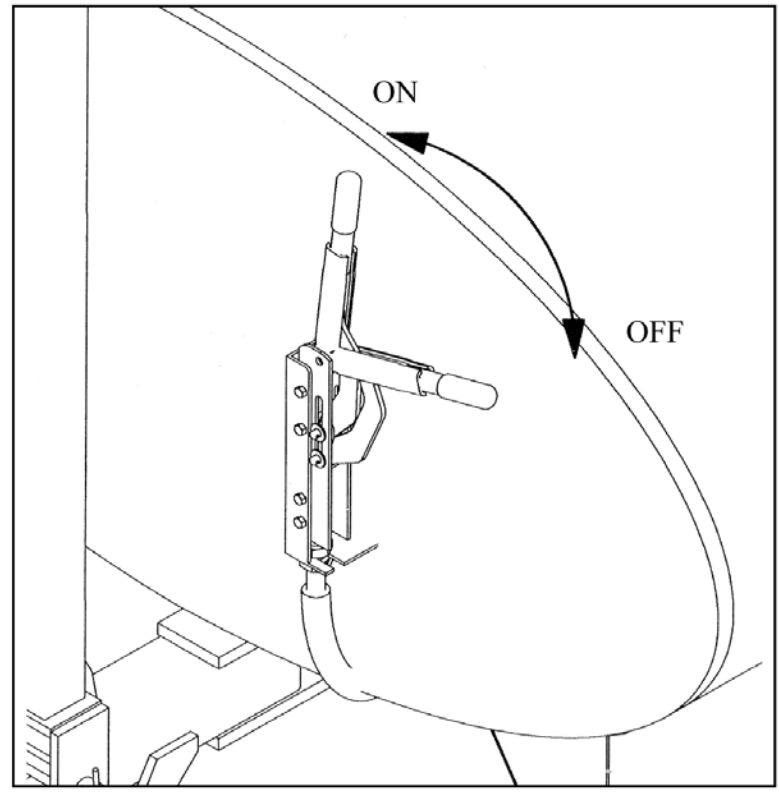


Figure 4-2. Parking Brake Handle

4.5.2 Static Bonding/Grounding. The static bonding/grounding reels are located at the rear of the tank assembly. Follow local protocol for static bonding/grounding procedures if different than described here.

a. Ensure parking brake is set. See Paragraph 4.5.1 for instructions.

WARNING

Static bonding/grounding reels are spring loaded. Ensure that the cable stops before letting loose. Injury can occur if cable is allowed to retracted uncontrolled.

b. Locate reel with clamp end and pull cable outward until desired length has been taken out.
c. Allow cable to retract until it stops.
d. Attach to ramp at an approved bonding/ground location.
e. Locate reel with plug end and pull cable outward until desired length has been taken out.
f. Allow cable to retract unit it stops.
g. Attach to airframe at an approved bonding/grounding location.
h. To detach, reverse these steps.

4.5.3 Liquid Level Gauge. The liquid level gauge is located on top of the tank assembly, rear of the manway assembly. See Chapter 1, Figure 1-1, 6. The liquid level gauge should be checked prior to, and during any major mode of operation.

4.5.4 Supply Air Connection. The supply air connector is located at the front of the tank, near the vacuum system assembly. See Figure 4-3. The air supply should be within the parameters specified in Chapter 1, Tables 1-1 through 1-3

a. Ensure parking brake is set. See Paragraph 4.5.1 for instructions.
b. Ensure tank vacuum valve (arrow B) is "off".
c. Attach air supply hose to connector (arrow A) by pushing connectors together and turning counterclockwise a quarter turn.
d. Secure connection by inserting locking pin into connector safety holes.
e. Disconnect air supply by reversing steps.

NOTE

If supply air is flowing, air will flow to the drain tool vacuum group even when tank vacuum valve is closed. This is normal.

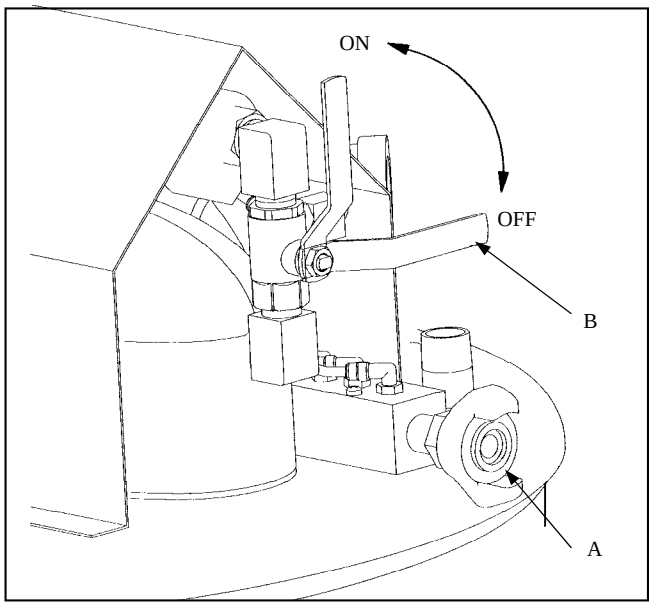


Figure 4-3. Supply Air Connector and Tank Vacuum Valve

4.5.5 Tank Vacuum Operation. The tank Vacuum Valve is used to turn the Tank Vacuum Group on and off. See Figure 4-3.

a. Ensure parking brake is set. See Paragraph 4.5.1 for instructions.
b. Ensure supply air connection is made. See Paragraph 4.5.4.
c. Turn valve handle to "on" position.
d. Turn off by reversing steps.

4.5.6 Auto Shut-off Bypass Valve Operation. The Auto Shut-off Bypass Valve; see Figure 4-1, 5, is intended to be used when tank vacuum is needed to clear fuel from hoses after the tank has reached capacity. The valve bypasses the Auto Shut-off feature and should be used with extreme caution. These operational step requires two people.

a. Close all Fuel Extraction Valves (2).

WARNING

The Auto Shut-off Bypass Valve allows vacuum operation to resume after the Auto Shut-off feature stops vacuum operation on tank-full conditions. Overfull conditions and spills are possible if care is not exercised. Injury and/or exposure to fuel can occur.

b. Perform steps (c), (d), and (e) simultaneously.

c. Operator number 1: detach Fuel Probe Pigtail assembly from Drain Tool. Hold Fuel Probe Pigtail assembly in the air to ensure fuel does not drain out.

d. Operator number 2: open Fuel Extraction Valve corresponding to Fuel Probe Pigtail assembly that operator number 1 is holding.

e. Operator number 2: hold Auto Shut-off Bypass Valve (5) open (by depressing button) until fuel has been extracted from Fuel Probe Pigtail assembly that operator number 1 is holding.

f. Repeat (b) through (e) for remaining Fuel Probe Pigtail assemblies that are still being used.

NOTE

This procedure can be used with Depuddling Mode also on tank-full conditions. Substitute valve and hose names in instruction to accomplish.

4.6 VACUUM DRAINING MODE.

Vacuum Draining refers to draining from under-wing airframe sumps using the Drain Tool, Fuel Probe Pigtail assembly, and the Duplex Hose assembly.

4.6.1 Description of Major Components. A description of the Vacuum Draining components are giving below to assist the user with understanding how the SealVac performs Vacuum Draining operations.

4.6.1.1 The Drain Tool Assemblies. The Drain Tools are used to interface with the aircraft. The Drain Tools have two parts. The first part is the Vacuum Area that is used to adhere the tool to the aircraft. The second part is the Fuel Hub. The Fuel Hub centers and locks the Fuel Probe that opens the sump poppet drain valve. See Chapter 1, Figure 1-2, 1 through 3.

4.6.1.2 The Fuel Probe Pigtail Assembly. The Fuel Probe Pigtail assembly is used to open the aircraft's sump poppet drain valve. The probe has an adjustable pin that depresses the poppet valve while locking into the Fuel Hub, and simultaneously creates a seal between the Fuel Probe and the Drain Tool. See Chapter 1, Figure 1-2, 4.

4.6.1.3 The Fuel Flow Viewing Window. The Fuel Flow Viewing Window allows the operator to observe whether of not fuel is flowing out of the sump drain. See Figure 1-2, 10.

4.6.1.4 The Duplex Hose Assembly. The Duplex Hose assembly consists of two individual hoses bundled together. The 3/4-inch drain hose provides vacuum to the Fuel Probe Pigtail assembly and drains fuel. The 1/4-inch vacuum hose provides vacuum to the Drain Tool vacuum area. See Chapter 1, Figure 1-2, 6.

4.6.2 Vacuum Draining Setup Steps. Before the vacuum draining operation can begin, the drain tools and the fuel probes need to be configured for the airframe to be drained. Once a setup is established for an airframe, the setup procedure does not have to be repeated. Refer to Table 4-2 for initial setup parameters.

4.6.2.1 Drain Tool Setup. The Drain Tools use two functional seals. The Hub Seal, see Figure 4-4, 2 creates a seal around the Fuel Probe. The Vacuum Area Seal (3), creates the vacuum area that allows the Drain Tool to adhere to the airframe. The Oval and Elongated Drain Tools use either the Flat Vacuum Area Seal or the Contoured Vacuum Area Seal, depending on the surface profile. Table 4-2 suggests which seal should be used for a specific airframe.

4.6.2.1.1 Selection of the Vacuum Seal. When working with a relatively flat surface, the Flat Vacuum Area Seal is used. When working with a curved surface, the Contoured Vacuum Area Seal is used. Round Drain Tools use the Short Hub Seals, while the Oval and Elongated Drain Tools use the Tall Hub Seals.

4.6.2.1.2 Changing the Vacuum and Hub Seals. To change either the Vacuum Seal or the Hub Seal, follow the steps described below. See Figure 4-4 for supporting diagrams.

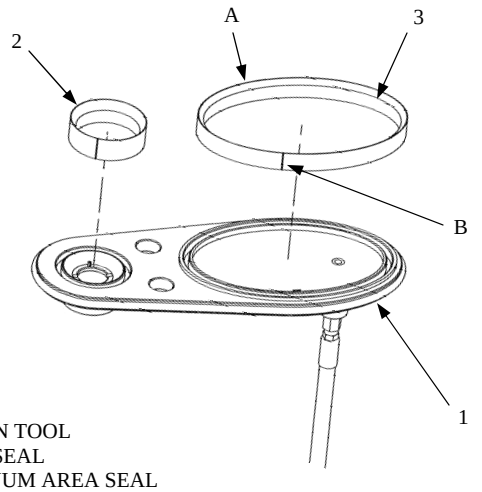


Figure 4-4. Changing Drain Tool Seals

a. Wipe drain tool (1) and seal surfaces free of any fuel and oil.

b. Grasp seal (2) or (3) and pull directly outward. If seal will not come loose, use a small screwdriver to carefully pry out the seal.

c. Remove any foreign material from seal groove.

d. Orient seal so that the knife edge (reference arrow A) is pointing away from the drain tool and the tallest side is along the outer edge.

e. Lubricate seal with petroleum jelly.

f. For Vacuum Area Seals, align seal seam (reference arrow B) along center of long side of oval groove. The Hub Seals do not have a seam alignment requirement.

g. Press firmly while working the seal into the groove. Start at the seam and work in around the perimeter of the seal.

h. After seals are installed, connect the vacuum supply line of the Duplex Hose assembly and verify that the seal installation is correct by adhering drain tool to side of tank.

4.6.2.2 Fuel Probe Pigtail Assembly. The Fuel Probe Pigtail assembly uses a number of different types and lengths of Fuel Probe Pins. Due to the variety of fuel drain sump designs, it will be necessary to adjust the length and type of the Probe Pin. Proper pin length is critical for efficient vacuum draining operations. Too short of a pin will not fully open the poppet drain. Too long of a pin will fully open the drain, but will not allow the Fuel Probe to lock into the Drain Tool.

4.6.2.2.1 Types of Probe Pins. There are two types of Fuel Probe Pins. The first type is a button head machine screw. The button head pins are typically used on larger poppet drain valves. The second type is an Allen head set screw . The set screw type pins are typically used on smaller poppet drain valves.

CAUTION

Do not over tighten the Probe Pins. Damage to the Fuel Probe will occur if Fuel Probe Pins are over tightened.

4.6.2.2.2 Determining Fuel Probe Pin Length. Use the following steps to determine proper Fuel Probe Pin length. See Figure 4-5 for supporting diagrams.

a. Determine which pin type (1) or (2) is most appropriate for the poppet drain valve being opened.

b. Select a medium length Fuel Probe Pin from the pin kit.

c. Thread pin (1) or (2) into Fuel Probe end (3) and tighten.

d. Perform steps in Paragraph 4.6.3 for Vacuum Draining, stopping at step (m).

WARNING

Poppet drain valves can get stuck open for a number of reasons. An open poppet drain valve will allow uncontrolled fuel flow. Exposure to fuel can occur.

e. Verify that Fuel Probe locks into Drain Tool. If no, go back to step (b) of these instructions and select a shorter pin. If yes, continue to step (f) of these instructions.

f. Turn on Tank Vacuum Valve.

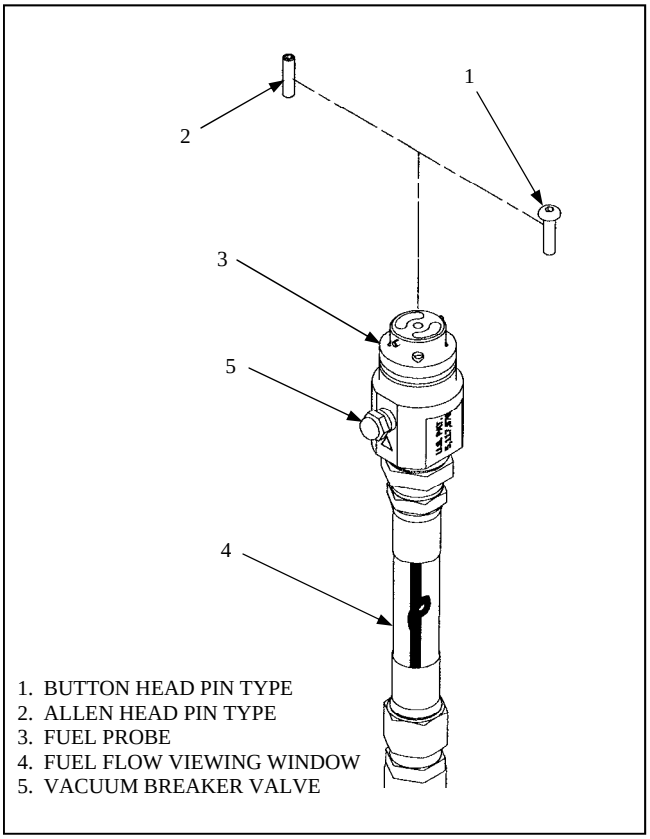


Figure 4-5. Fuel Probe and Pins

g. Observe Fuel Flow Viewing Window (4). If no, or small flow is present, turn off tank vacuum and go back to step (b) of these instructions, selecting the next longer sized pin. If good fuel flow is present, the correct pin length has been selected. You may wish to make a note of the pin length that operates best.

4.6.3 Vacuum Draining Procedure. The Vacuum Draining procedure can only be performed after the initial set up instructions in Paragraph 4.6.2 have been finished. Aircraft specific draining procedure take precedence over the steps described here. See Figure 4-6 for abridged pictorial description of these steps.

CAUTION

Ensure that aircraft fuel cell is properly vented before applying vacuum. Obstructed fuel cell vents can cause severe damage to aircraft fuel cell.

a. Ensure the setup procedure outlined in Paragraph 4.6.2 have been completed for the airframe being drained.

b. Position the SealVac within the reach distance of the 35-foot Duplex Hose assembly.

c. Set parking brake. See Paragraph 4.5.1 for instructions.

d. Attach static bonding/grounding cables. See Paragraph 4.5.2 for instructions.

e. Check Liquid Level Gauge for tank capacity. See Paragraph 4.5.3 for instructions.

f. Attach air supply hose to the Vacuum System Assembly. See Paragraph 4.5.4 for instructions.

g. Uncoil the Duplex Hose assembly and select a Drain Tool to be used.

h. Make Duplex Hose connections to Fuel Extraction Port and the Drain Tool Vacuum Port at the Vacuum System Assembly.

i. Connect Duplex Hose to Fuel Probe Pigtail assembly and Drain Tool assembly. Ensure vacuum slide valve at Drain Tool is closed.

j. Stretch Duplex Hose to point of use. If elevated, secure Duplex Hose to stand with safety lanyard.

NOTE

Use of petroleum jelly on drain tool seals can ease adherence of tools on some surface such as around rivets, screws, and over panel gaps. Apply liberally to seal before adhering.

NOTE

Ensure one is not attempting to seal drain tools over aircraft wing or fuselage weep holes, as this may result in vacuum leaks and poor drain tool sealing.

k. Insert Alignment tool into Drain Tool.

l. Align Drain Tool and Alignment tool to aircraft sump poppet drain valve.

m. While aligned, push up on slide valve (open valve) and adhere Drain Tool to surface.

n. Return to the SealVac and turn on the Tank Vacuum Valve.

o. Return to Drain Tool and insert the Fuel Probe Pigtail assembly into the Fuel Hub. Lock probe by turning a quarter turn until probe stops.

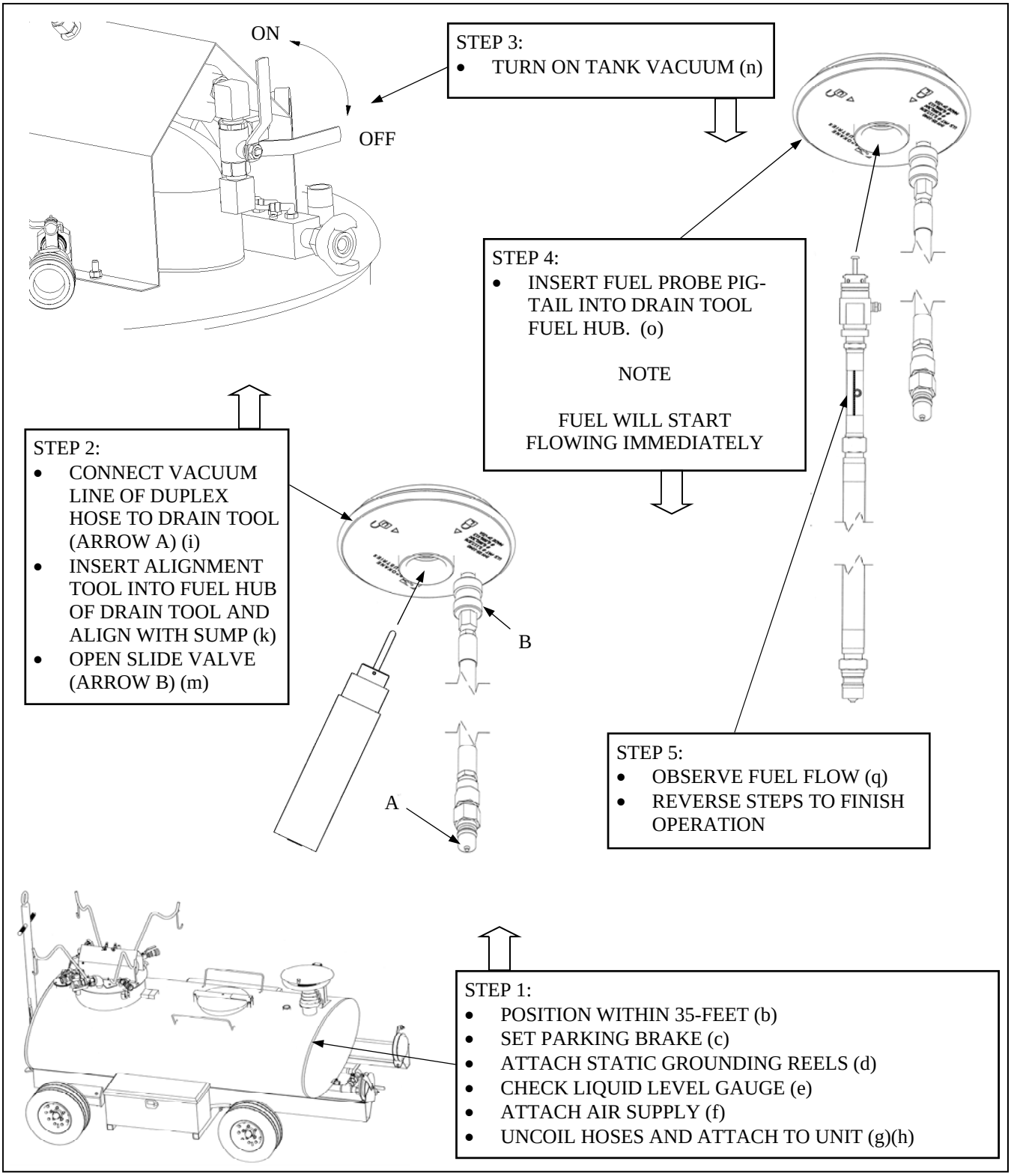


Figure 4-6. Vacuum Draining Steps

Table 4-2. Drain Tool Setup And Usage for Select Airframes

Airframe	Wing - Outer	Wing - Middle	Wing - Outer	Fuselage	Conformal Tank	Wing Drop Tank	Fuselage Drop Tank
A-10	NA	NA	NA	NA	NA	NA	NA
B-1B	Os	Os	Os	Es, Os, Oc (optional tank)	Es (fuselage center)	NA	NA
B-2	NA	NA	NA	NA	NA	NA	NA
B-52	Os	Os	Os	Os	NA	NA	NA
C-5	Os	Os	Os	Os	NA	NA	NA
C-17	Os	Os	Os	Os (extended range)	NA	NA	NA
CV-22	Es, Os	Es, Os	Es, Os	Es, Os	NA	NA	NA
C-130	Os	Os	Os	Os	NA	Oc	NA
F-15	Oc	Oc	Oc	NA	Es	Oc	Oc
F-16	NA	NA	NA	Rs, Os	NA	Oc	Oc
F-22	NA	NA	NA	NA	NA	Oc	NA
KC-135	Os	Os	Os	Os, R	NA	NA	NA
T-38	NA	NA	NA	Es	NA	NA	NA

E - Elongated Drain Tool
O - Oval Drain Tool
R - Round Drain Tool

s - flat seal (E and O Drain Tools)
c - contoured seal (E and O Drain Tools
NA - Not Applicable

p. Stop draining if hub seal leaks fuel.

q. Observe fuel flow in Fuel Flow Viewing Window; see Figure 4-5, 4.

r. To stop draining, push and hold Vacuum Breaker Valve; see Figure 4-5, 5, on probe, un-lock probe and pull out of drain tool.

s. Allow vacuum to clear fuel in Duplex Hose.

t. Turn off Tank Vacuum Valve.

u. Remove Drain Tool by pulling down on slide valve (close valve) and remove tool.

v. Coil Duplex Hose and store Drain Tools.

4.7 Depuddling Mode. Depuddling operations are performed by using the 1-inch by 35 or 50-foot Depuddling Hose assembly. Aircraft specific depuddling procedures take precedence over the steps described here.

a. Position the SealVac within the reach distance of the 35 or 50-foot Depuddling Hose assembly.

b. Set parking brake. See Paragraph 4.5.1 for instructions.

c. Attach static bonding/grounding cables. See Paragraph 4.5.2 for instructions.

d. Check Liquid Level Gauge for tank capacity. See Paragraph 4.5.3 for instructions.

WARNING

Ensure that the tank has enough capacity to receive the amount of fuel being drained. The Auto Shut-off feature of the SealVac is not available for gravity draining operations. Overfill and spill conditions can occur resulting in exposure to fuel.

e. Attach air supply hose to the Vacuum System Assembly. See Paragraph 4.5.4 for instructions.

f. Remove Depuddling Hose from Hose Cradle and uncoil.

g. Turn on tank vacuum by opening the Tank Vacuum Valve. See Paragraph 4.5.5 for instructions.

h. Open Depuddling Port Valve (See Figure 4-1,3).

i. Perform depuddling operation.

j. Stop operation by reversing steps.

4.8 Gravity Draining Mode. The Telescoping Funnel is designed for Gravity Draining operations. The following instructions describe how to use the Telescoping Funnel. Use Figure 4-7 for the following steps.

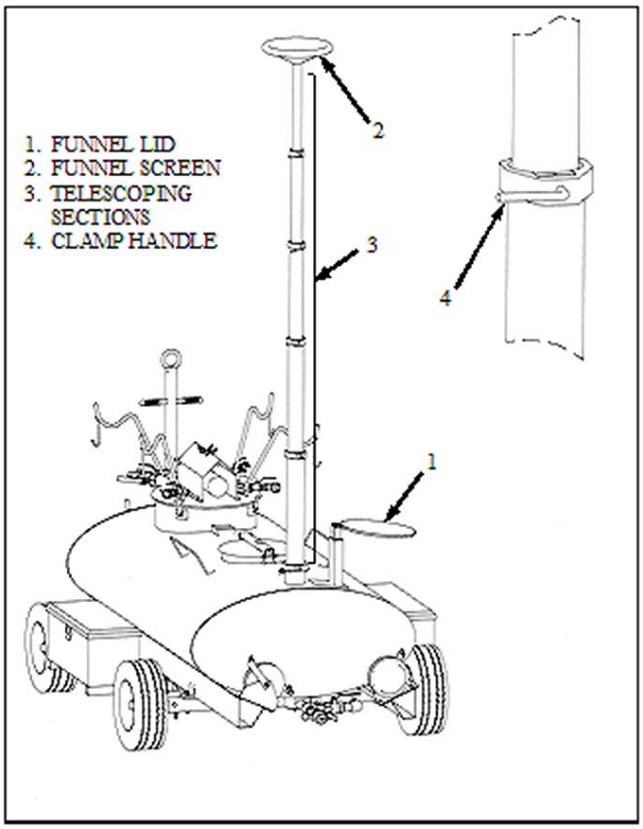


Figure 4-7. Telescoping Funnel Operation

WARNING

Operation of the Telescoping Funnel Assembly inherently involves pinch points. Use gloves and ensure clamps are secured before letting go of the sections being raised or lowered. Injury from falling funnel sections could occur.

a. Position SealVac so that the Telescoping Funnel is under the drain point.

b. Set parking brake. See Paragraph 4.5.1 for instructions.

c. Attach static bonding/grounding cables to approved location. See Paragraph 4.5.2 for instructions.

d. Open cover (1) to expose funnel.

e. Inspect funnel and screen (2) for obstructions.

f. Raise upper most section (3) of funnel assembly.

g. Secure clamp by handle (4) when either the section is

fully extended, or when the desired funnel height has been achieved.

h. Raise next section (3) of funnel assembly.

CAUTION

The Funnel Isolation Valve must be opened before starting the Gravity Draining operation. Failure is open valve will result in an overfill and spill condition, resulting in exposure to fuel.

i. Secure clamp (4) when either the section is fully extended, or when the desired funnel height is achieved.

j. Repeat steps f. through g. until the desired funnel height is achieved.

k. Open Funnel Isolation Valve, see Figure 4-8, 1. The valve handle will be pointed in-line with the plumbing in the open position.

l. Begin gravity draining operations.

m. Continually check tank capacity. Stop when full.

n. Lower assembly by reversing steps.

4.9 SUPPLEMENTAL OPERATIONS.

Supplemental operations are not specific to either a major mode of operation or a supporting operation. Supplemental operation instructions are described in the following paragraphs.

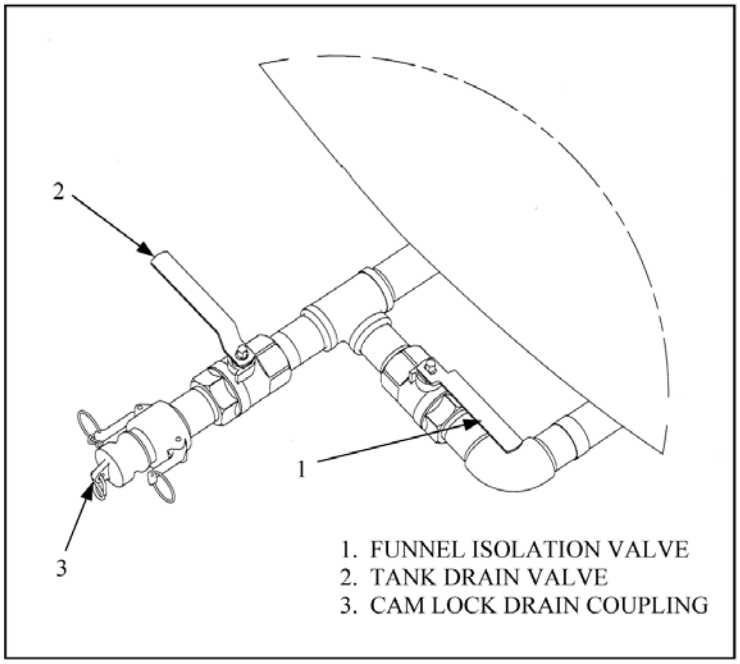


Figure 4-8. Funnel Isolation Valve, Open Position

4.9.1 Towing the SealVac. The SealVac can be towed by means of self propelled tow apparatus or by pushing/pulling by hand.

a. Ensure that all hoses, static bonding/grounding cables, and tools are properly stored and all valves are closed.

b. See Figure 4-9. Release Tow Bar from the up-right position by applying foot pressure to Toe Latch (reference arrow A) and swing Tow Bar downward (reference arrow B).

CAUTION

Do not back equipment by any means other than hand pushing/pulling. Damage to the equipment will occur if self propelled tow methods are employed.

c. Attach to tow apparatus if not being pushed/pulled by hand.

d. Release parking brake (reference arrow C). See Paragraph 4.5.1 for instructions.

e. While towing, observe towing speed and turning radius restrictions in Tables 1-1 through 1-3.

f. If towing with a self propelled apparatus, do not back unit.

4.9.2 Parking the SealVac. The SealVac can be used to store recoverable aviation fuels. Follow local protocol for storing recoverable aviation fuels if different than described here.

a. Place SealVac in approved area.

b. Set parking brake. See Paragraph 4.5.1 for instructions.

c. Attach static bonding/grounding cables. See Paragraph 4.5.2 for instructions.

d. Ensure that the Tank Drain Valve and the Sample Port Valve is closed.

e. Ensure Manway Assembly is closed and latched.

4.9.3 Draining the SealVac. The tank drain is located at the rear of the tank assembly. See Figure 4-8.

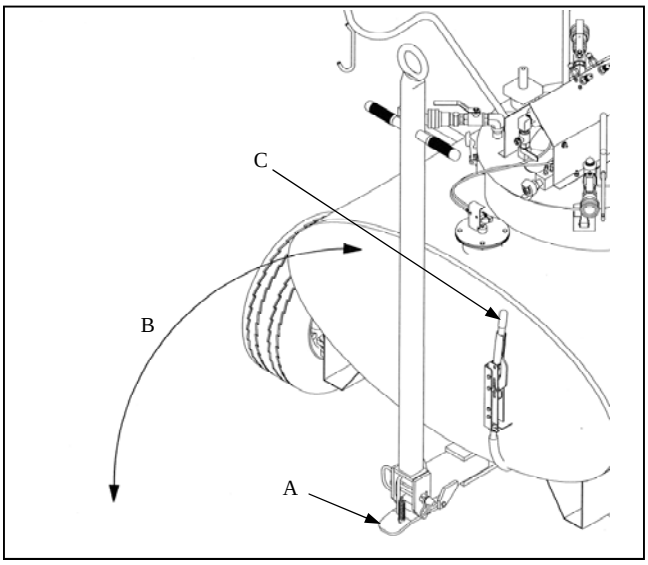


Figure 4-9. Releasing the Tow Bar

a. Ensure the parking brake is set. See Paragraph 4.5.1 for instructions.

b. Attach static bonding/grounding cables. See Paragraph 4.5.2 for instruction.

c. Ensure Tank Drain Valve (2) is closed.

d. Remove cam lock plug (3).

e. Attach drain hose if applicable.

f. Ensure drain hose is attached at opposite end to approved source.

g. Open Tank Drain Valve (2).

h. Open Funnel Isolation Valve (3).

i. Complete drain operation.

j. Reverse steps upon completion of drain operation.

4.9.4 Checking the Sediment Chamber. The Sediment Chamber collects foreign objects/debris (FOD) from the fuel being extracted by Vacuum Draining and Depuddling modes. To check for FOD, follow these steps. Use Figure 4-10 while performing this steps.

a. Ensure parking brake is set. See Paragraph 4.5.1 for instructions.

WARNING

The Vacuum System Assembly weighs approximately 90-pounds. The use of two people is recommended to remove the assembly. Injury could result from a one person lift.

b. Disconnect air supply. See Paragraph 4.5.4 for instructions.

c. Disconnect Auto Shut-off pneumatic lines (reference arrow A) and the bond strap (reference arrow B).

d. Unlatch rubber straps, four places (reference arrow C).

e. Lift vacuum system assembly/sediment chamber lid assembly vertically and place to the side. Two people should perform this step.

f. Remove FOD from chamber.

g. Reassemble in reverse order.

4.9.5 Taking Fuel Samples. The Sample Port valve located at the rear of the tank can be used to take fuel samples.

a. Ensure parking brake is set. See Paragraph 4.5.1 for

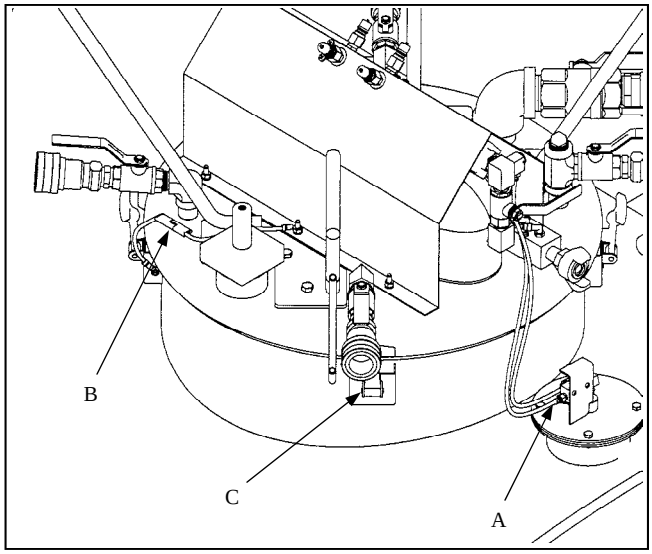


Figure 4-10. Accessing the Sediment Chamber

CHAPTER 5

MAINTENANCE INSTRUCTIONS

5.1 OPERATIONAL CHECKOUT.

Operational checkout is performed during the course of normal operation. While the SealVac is operating normally, it may be assumed that no repair is required. However, the preventive maintenance procedures may be preformed at regular intervals or in accordance with standard shop procedures; which ever is more suitable.

5.2 INSPECTION AND PREVENTIVE MAINTENANCE.

5.2.1 Inspection. Prior to each day's use, determine that the equipment is in serviceable condition by performing a daily inspection. A daily inspection check sheet is illustrated in Table 5-10.

5.2.2 Preventive Maintenance. Paragraph 5.5 contains preventive maintenance items and intervals.

5.3 REPAIR AND REPLACE INSTRUCTIONS.

WARNING

The parking brakes must be set while performing maintenance procedures. Approved jack stands and wheel chocks must also be used. Serious injury or death may occur from rolling, or falling equipment.

The following procedures are for the disassembly, repair, replacement, and reassembly of the various component groups of the equipment. Perform only those steps necessary to effect the desired repairs.

5.3.1 General Tank Equipment. This procedure covers all components attached to the tank by means of threaded pipe connections. No specific maintenance instructions for disassembly or reassembly are needed for components attached to the tank by pipe threads. The following maintenance steps describe how to properly apply pipe joint sealing compounds. Pipe joint sealing compounds should be approved for fuel service.

WARNING

Ensure that the tank is free of fuel and flammable and/or combustible vapors before performing any maintenance operation involving the tank. Serious injury or death could occur.

a. Remove component(s) that need to be repaired or replaced.
b. Remove old pipe sealing compound from component (s) by wire brush or approved solvent. If solvent is used, allow component(s) to dry before proceeding.
c. Inspect threads for damage. Replace component(s) that have damage.
d. Apply an even coat of pipe joint sealing compound across and all the around the first four threads. The coat thickness should fill the thread "valleys", and no more.
e. Hand start the threaded component(s) and tighten until hand-tight. Do not cross thread components.
f. Tighten component(s) until a leak-free connection is achieved.

5.3.2 Vacuum System Assembly. The Vacuum System Assembly consists of three main groups that are accessed by removing the Vacuum System Assembly cover. The Drain Tool Vacuum Group is detailed in Paragraph 5.3.2.1. The Control Valving Group is detailed in Paragraph 5.3.2.2. The Tank Vacuum Group is detailed in Paragraph 5.3.2.3. The following maintenance steps allow access to all three groups.

a. Remove all hose assemblies from connection points and hangers.
b. Disconnect Auto Shut-off Assembly control lines (Figure 5-1, reference arrow A)
c. Disconnect static bond wire (Figure 5-1, reference arrow B).
d. Unlatch rubber hold downs (Figure 5-1, reference arrow C).

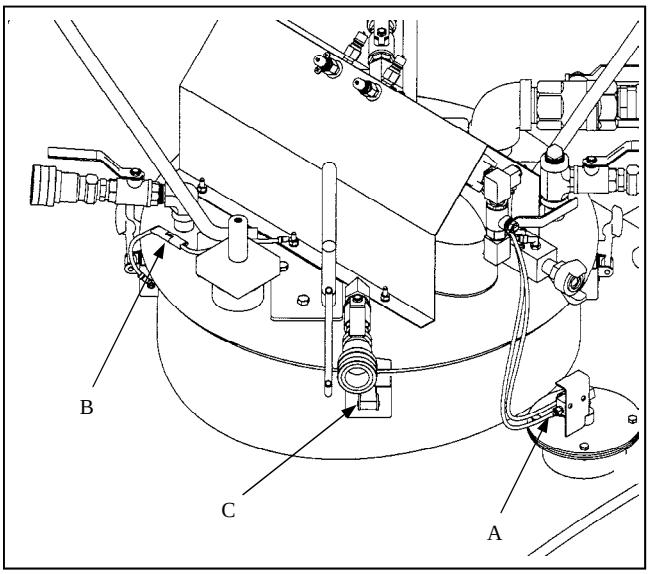


Figure 5-1. Vacuum System Removal

WARNING

The Vacuum System Assembly weighs approximately 90-pounds. The use of two people is recommended to remove the assembly. Injury could result from a one person lift.

e. Lift Vacuum System Assembly vertically and place on work bench. This should be done by two people.

g. Detach pneumatic tube from Drain Tool Vacuum Group at connection points on manifold (Figure 5-2, reference arrow A).

h. Remove nuts (1), six places; and bypass valve nut (2) to remove cover and Drain Tool Vacuum Group. Ensure that Auto Shut-off Bypass Valve is free from cover before removing. See Figure 5-2.

i. Reassemble in reverse order. Ensure Sediment Chamber Gasket is installed and is in good condition.

5.3.2.1 Drain Tool Vacuum Group. The Drain Tool Vacuum Group is contained inside of the Vacuum System Assembly cover. Follow the maintenance step in Paragraph 5.3.2 before beginning the next maintenance steps. See Figure 5-3 for the following steps.

a. Remove quick disconnect fittings (5) and close nipples (6).

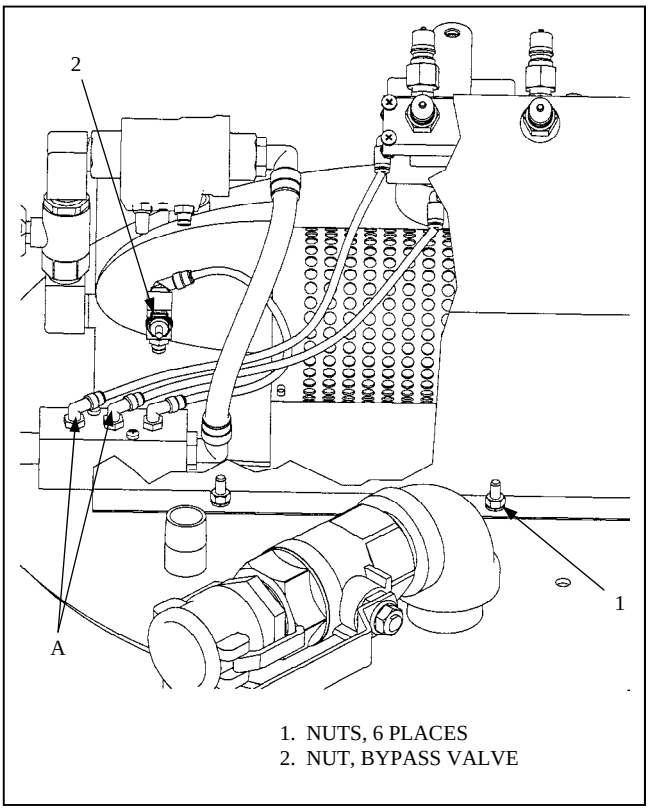


Figure 5-2. Vacuum System Assembly Cover Removal

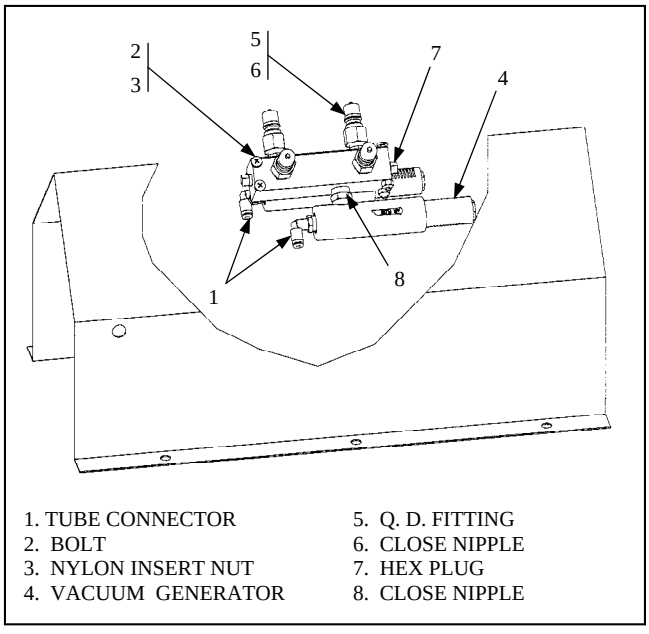


Figure 5-3. Drain Tool Vacuum Group

b. Remove bolts (2) and nuts (3). Separate manifold from cover.

c. Remove vacuum generators (4).

d. Remove close nipples (8) and hex plugs (7).

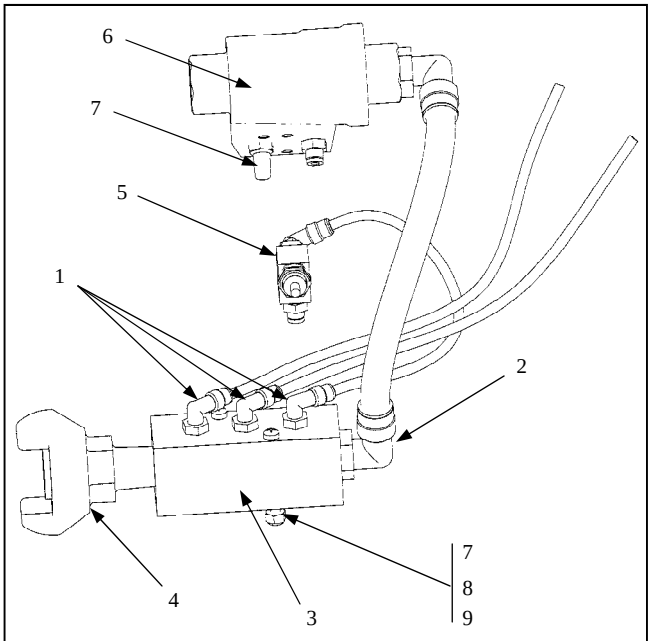
e. Remove tube fittings (1) from vacuum generators (4).

f. Repair / replace components.

g. Reassembly in reverse order.

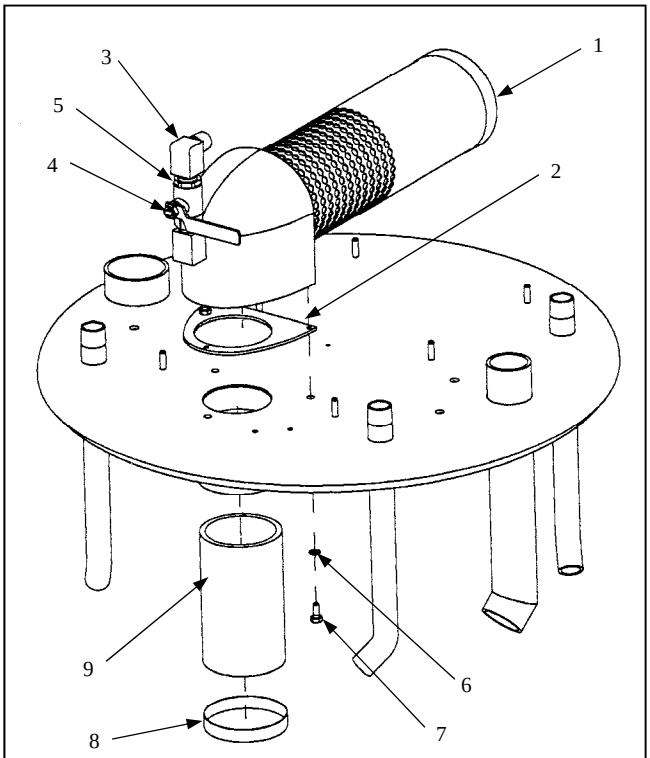
5.3.2.2 Control Valving Group. The Control Valving Group is located under the Vacuum System Assembly cover. Follow the maintenance steps in Paragraph 5.3.2 before beginning the next maintenance steps. See Figure 5-4 for the following steps.

a. Remove pneumatic lines coming from the Auto Shut-off Assembly (not shown) from the Control Valve (6) and Auto Shut-off Bypass Valve (5) by releasing tube connectors. This will free the Auto Shut-off Bypass Valve from the group.



1. TUBE CONNECTOR
2. TUBE CONNECTOR
3. MANIFOLD
4. AIR CONNECTOR
5. BYPASS VALVE
6. CONTROL VALVE
7. NYLON INSERT NUT
8. WASHER
9. BOLTS

Figure 5-4. Control Valving Group



1. VACUUM GENERATOR
2. GASKET
3. STREET ELBOW
4. BALL VALVE
5. CLOSE NIPPLE
6. LOCK WASHER
7. BOLT
8. HOSE CLAMP
9. HOSE

Figure 5-5. Tank Vacuum Group

b. Remove remaining pneumatic tubes from tube connectors (1) and (2), at the manifold (3), and Control Valve (6).

c. Remove manifold (3) from Sediment Chamber Lid by removing nuts (7), washers (8), and bolts (9).

d. Replace / repair components.

e. Reassemble in reverse order.

5.3.2.3 Tank Vacuum Group. The Tank Vacuum Group is mounted to the Sediment Chamber Lid. Follow the maintenance steps in Paragraph 5.3.2 before beginning the next maintenance steps. See Figure 5-5 for the following steps.

a. Detach pneumatic lines to Control Valve as describes in Paragraph 5.3.2.2.

b. Remove bolts (7) and lock washers (6).

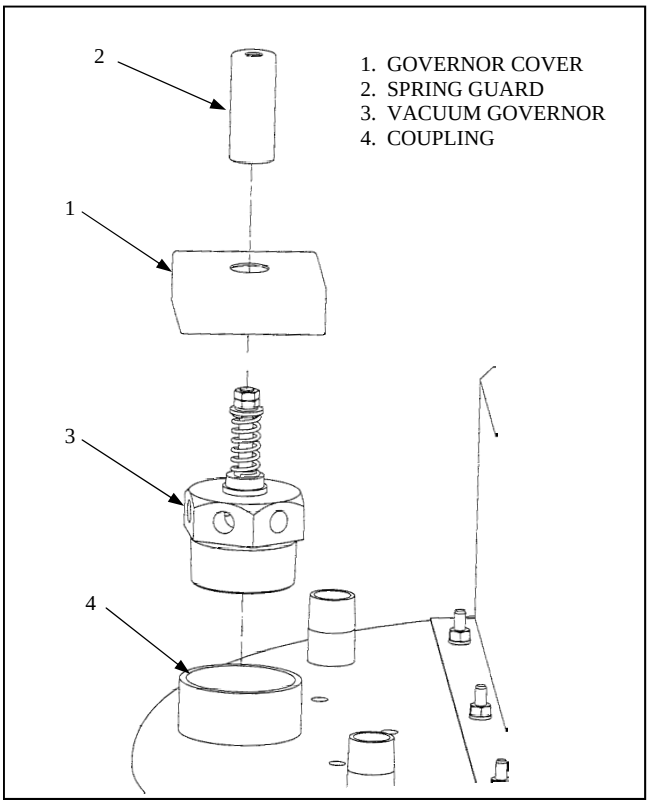


Figure 5-6. Vacuum Governor

c. Lift vacuum generator vertically to remove. Note presence of gasket (2).

d. Disassembly Tank Vacuum Valve (4), street elbows (3), and nipples (5), as needed.

e. Reassemble in reverse order. Refer to Paragraph 5.3.1 for pipe joint sealing compound instructions.

5.3.3 Vacuum Governor. Use Figure 5-6 for the following maintenance steps. The Vacuum Governor is located on the right side of the Vacuum System Assembly.

a. Remove vacuum governor cover (1), by unscrewing component (2) from the assembly.

b. Remove vacuum governor (3) from Sediment Chamber Lid fitting (4).

c. Replace components

d. Reassemble in reverse order. Refer to Paragraph 5.3.1 for pipe joint sealing compound instructions.

5.3.4 All Other Vacuum System Assembly Components. The remaining components of the Vacuum System Assembly (e.g. Fuel Extraction Ports and Duplex Hose Hangars) do not merit maintenance steps for disassemble and reassembly. When performing maintenance steps on pipe thread connection, follow the steps described in Paragraph 5.3.1

5.3.5 Auto Shut-off Assembly. The auto shut-off assembly is located in the front of the tank weldment. Use Figure 5-7 for the following maintenance steps.

a. Remove pneumatic tubes from the Vacuum System Assembly by releasing the quick disconnect fittings (see Figure 5-1, reference arrow A).

b. Remove bolts (11) and nuts (9); four places. Lift Auto Shut-off Assembly vertically to remove from tank, note presence of gasket (10).

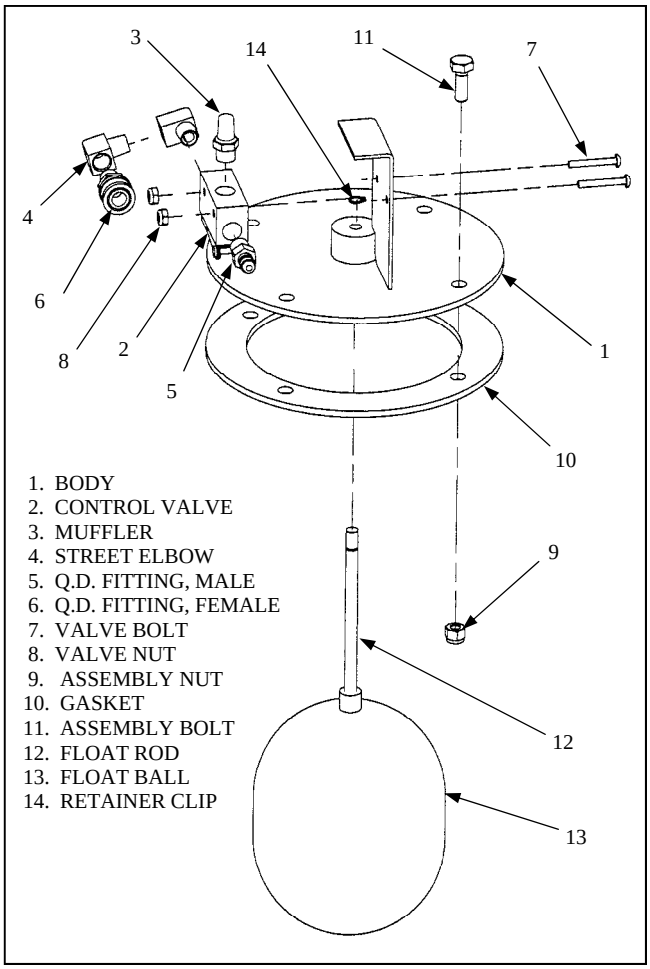


Figure 5-7. Auto Shut-off Assembly

c. Remove bolts (7) and nuts (8) to detach control valve (2) from body (1).

d. Remove fittings (5), (6), and (4) and pneumatic muffler (3) as needed.

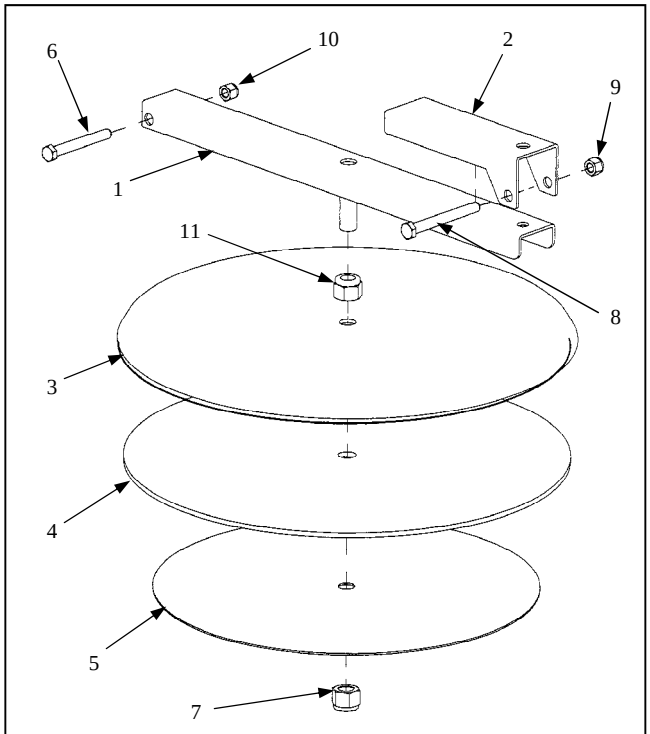
e. Remove retainer clip (14) to remove float rod (12) from body (1).

f. Un-thread float rod (12) from float (13). Use caution not to damage float by puncturing it during maintenance activities.

g. Repair / replace components.

h. Reassemble in reverse order.

5.3.6 Manway Assembly. The manway assembly is located on the top of the tank. The manway assembly has one adjustment point, see Paragraph 5.3.6.2 for adjustment steps. Use Figure 5-8 for the following maintenance steps.



1. CROSS ARM
2. FLIP LOCK
3. LID
4. GASKET
5. GASKET RETAINER
6. CROSS ARM BOLT
7. CROSS ARM NUT
8. FLIP LOCK BOLT
9. FLIP LOCK NUT
10. NUT
11. ADJUSTMENT NUT

Figure 5-8. Manway Assembly

5.3.6.1 Disassembly / Reassembly Steps.

a. Open handle (2).

b. Open Manway Assembly.

c. Remove nut (7).

d. Remove gasket retainer (5), gasket (4), and lid (3).

e. Remove bolt (6) and nut (10) to remove cross-arm (1).

f. Repair / replace components

g. Reassemble in reverse order, leaving nut (7) only partially threaded onto cross arm (1).

h. Adjust manway as indicated in Paragraph 5.3.6.2, starting at step (b).

5.3.6.2 Adjustment. Perform the following procedures to adjust the manway assembly.

a. Open handle (2).

b. Open Manway Assembly.

c. Rotate nut (11) to adjust lid position. Turn clockwise to move lid closer to the tank. Turn counter clockwise to move the lid away from the tank.

d. Tighten nut (7) until snug.

5.3.7 Telescoping Funnel Assembly. The Telescoping Funnel Assembly is located at the top, rear of the tank. The assembly consists of (starting at the top), a cover assembly (See Paragraph 5.3.7.1), a gasket (Paragraph 5.3.7.2), a funnel screen (See Paragraph 5.3.7.3), a funnel section and four telescoping sections (See Paragraph 5.3.7.4), and a base clamp (See Paragraph 5.3.7.5).

5.3.7.1 Funnel Cover Assembly. See Figure 5-9. The funnel cover (1) is removed by removing nut (6) and bolt (5).

5.3.7.2 Funnel Gasket. See Figure 5-9. The funnel gasket (3) is replaced by opening funnel cover (1). Remove damaged gasket and install new one.

5.3.7.3 Funnel Screen. The funnel screen (2), prevents FOD from entering the tank. The screen is replaced by opening the funnel cover and removing nut (7). Replace screen and reinstall nut. See Figure 5-9.

5.3.7.4 Funnel and Telescoping Sections. The funnel section (4) and telescoping sections are removed independently; starting at the uppermost sub-assembly, until the section needing repair/replacement is reached.

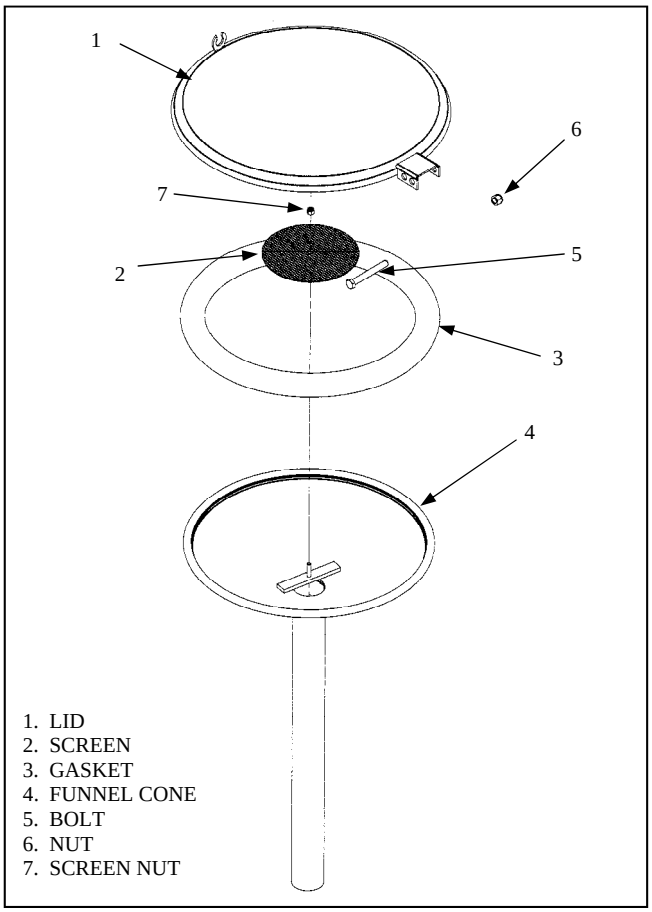


Figure 5-9. Funnel Section Assembly

a. Rotate each subassembly, starting with the upper most section, 180-degrees so that the clamp handle points toward the front of the tank (toward the tow bar.)

b. Lift each section vertically until almost free from clamp below.

c. When bottom edge of tube reaches clamp, lift firmly and rotate assembly slightly clockwise and counter-clockwise to guide alignment detent past alignment notch in clamp. See Figure 5-10, reference arrow A.

d. Remove set screw (1), then remove clamp handle (2) to release clamp wedge (3). See Figure 5-10.

e. Repair/replace damaged components.

f. Reassembly in reverse order.

5.3.7.5 Base Clamp. The base clamp (4), is attached directly to the tank. See Figure 5-10.

a. Rotate entire funnel assembly (all telescoping section and funnel section) 180 degrees until clamp handles are facing the front of the tank (toward the tow bar).

b. Lift entire funnel assembly by the largest telescoping section. When bottom edge of bottom telescoping section tube reaches the base clamp (4), lift firmly and rotate assembly slightly clockwise and counter-clockwise to guide alignment detent past alignment notch in base clamp (see reference arrow A).

c. Remove bolts (5) and lock washers (6).

d. Repair / replace components.

e. Reassembly in reverse order.

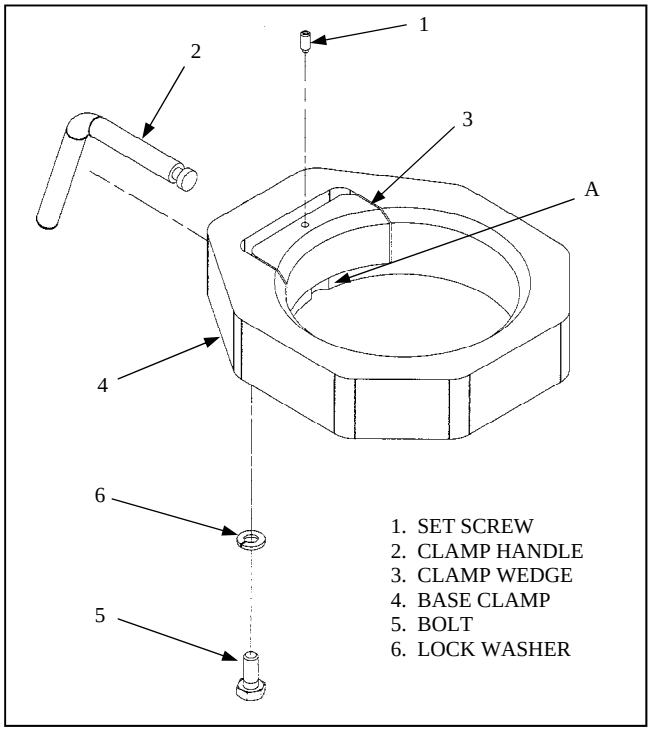


Figure 5-10. General Clamp Diagram

5.3.8 Front Undercarriage Assembly. The Front Undercarriage assembly consists of a wheel assembly (See Paragraph 5.3.8.1), a hub assembly (See Paragraph 5.3.8.2), a spindle assembly (See Paragraph 5.3.8.3), a tow latch assembly (See Paragraph 5.3.8.4), a steering arm assembly (See Paragraph 5.3.8.5), and an adjustable tie rod assembly (See Paragraph 5.3.8.6). The Wheel Assembly is discussed in Paragraph 5.3.10.

5.3.8.1 Front Wheel Assembly Removal. To remove the wheel assembly, the equipment must have the front end raised and placed on approved jack stands.

WARNING

Use suitable lifting and support equipment when performing these steps. Serious injury or death could occur from rolling or falling equipment.

a. Loosen lug nuts on wheel assembly requiring maintenance 1 turn while equipment is still on the ground.

b. Raise equipment with suitable maintenance jack (see Figure 5-11, reference arrow A for jack placement) high enough to remove wheel assembly.

c. Place approved jack stands under front axle (see Figure 5-11, reference arrow B for stand placement).

d. Remove lug nuts of wheel assembly needing maintenance, and remove.

5.3.8.2 Front Hub Assembly. To remove the front hub assembly, follow the maintenance steps in Paragraph 5.3.8.1 before beginning the next steps. See Figure 5-12.

a. Remove dust cap (1) by lightly tapping with a rubber hammer.

b. Remove cotter pin (2), castle nut (3), and washer (4).

c. Grasp front hub (7) and pull outward firmly. Ensure that bearing (5) doesn't fall from hub and strike the ground.

d. Remove bearing (5), seal (10), and bearing (9) from the front hub (7).

e. Using a suitable H-frame press, remove bearing races (6) and (8).

f. Replace components and grease bearings before reassembly.

g. Reassemble in reverse order. Castle nut (3) should be tightened until the hub assembly rotates barely past free.

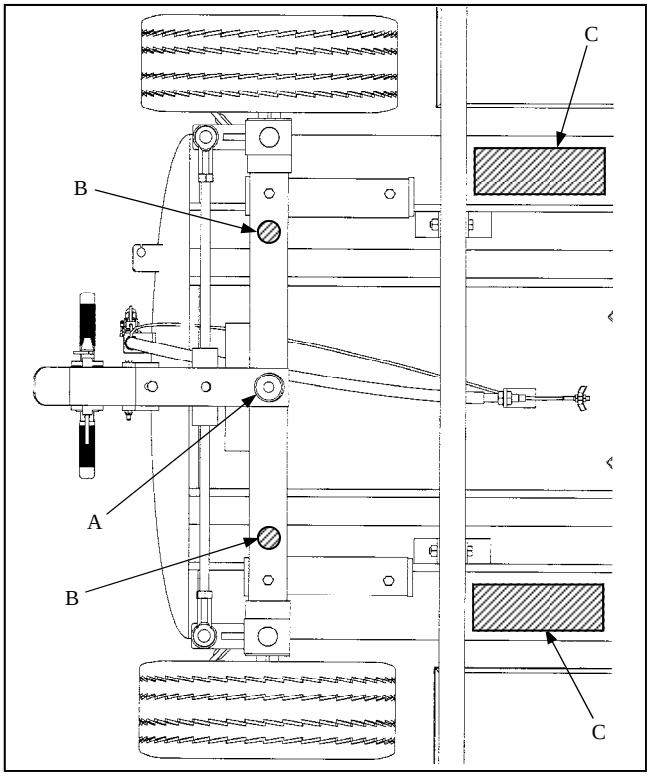


Figure 5-11. Generic Undercarriage Lift Points

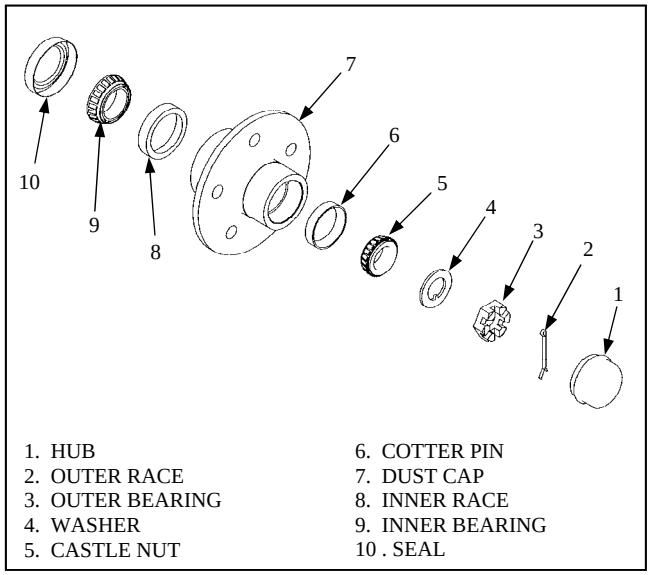


Figure 5-12. Front Hub Assembly

5.3.8.3 Spindle Assembly. To remove the spindle assembly, follow the maintenance steps in Paragraph 5.3.8.2 before beginning the next steps. See Figure 5-14.

a. Remove nut (17) and washer (16).
b. Remove nut (21) and washer (20).
c. Remove king pin (14) from yoke by using a rubber hammer.
d. Grasp spindle assembly (18) and rotate toward front of tank until free of yoke.
e. Remove spindle assembly from tie rod (15).
f. Remove bushings (19) with bronze punch and hammer.
g. Repair / replace components.
h. Reassembly in reverse order. Nut (21) should not be tighten past snug.

5.3.8.4 Tow Latch Assembly. The tow latch assembly is used to secure the tow bar in the upright position. see Figure 5-14.

a. Remove tow bar (1) by placing the tow bar in upright, latched position. Remove hair pin (2). While holding onto tow bar, place foot on toe latch assembly (see reference arrow A) and depress.
b. Pull hitch pin (3) from steering arm assembly and place tow bar to the side.

NOTE

Removing hitch pin from steering arm assembly will free tow bar. Prevent tow bar from falling by holding it firmly until free. Set aside.

c. See Figure 5-14 for the remaining steps. Remove bolt (7) and nut (10).
d. Rotate toe latch plate (9) downward to free from assembly.
e. Detach spring (8) from toe latch plate (9) and spring anchor (24).

5.3.8.5 Steering Arm Assembly. To remove the steering arm assembly, follow the maintenance steps in Paragraph 5.3.8.4 before beginning the next steps. See Figure 5-14.

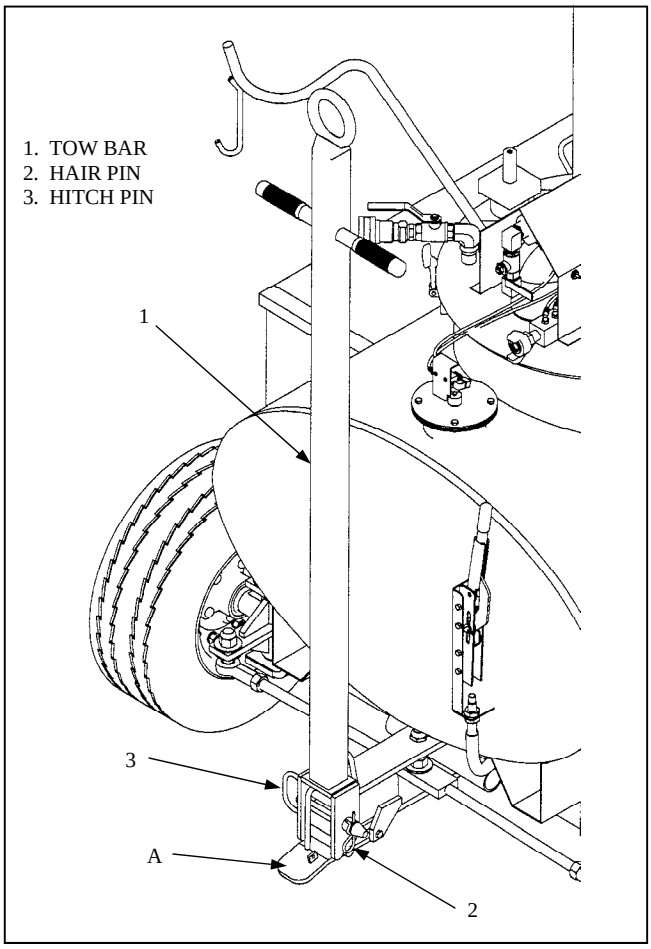


Figure 5-13. Tow Bar Removal

a. Remove thin lock nut (1).
b. Remove nuts (17) and flat washers (16).
c. Remove bolts (22) and nuts (5). Allow lower steering arm subassembly (11), bushing (3), and tie rod assembly (12) to drop down; place to the side.
d. Lift upper steering arm subassembly vertically to clear pivot pin (reference arrow A), then pull outward to clear tank and front axle tube.
e. Remove tie rod assembly (12) by removing nut (6) and flat washer (4). Note presence of bushings (23).
f. Repair / replace components.
g. Reassemble in reverse order.

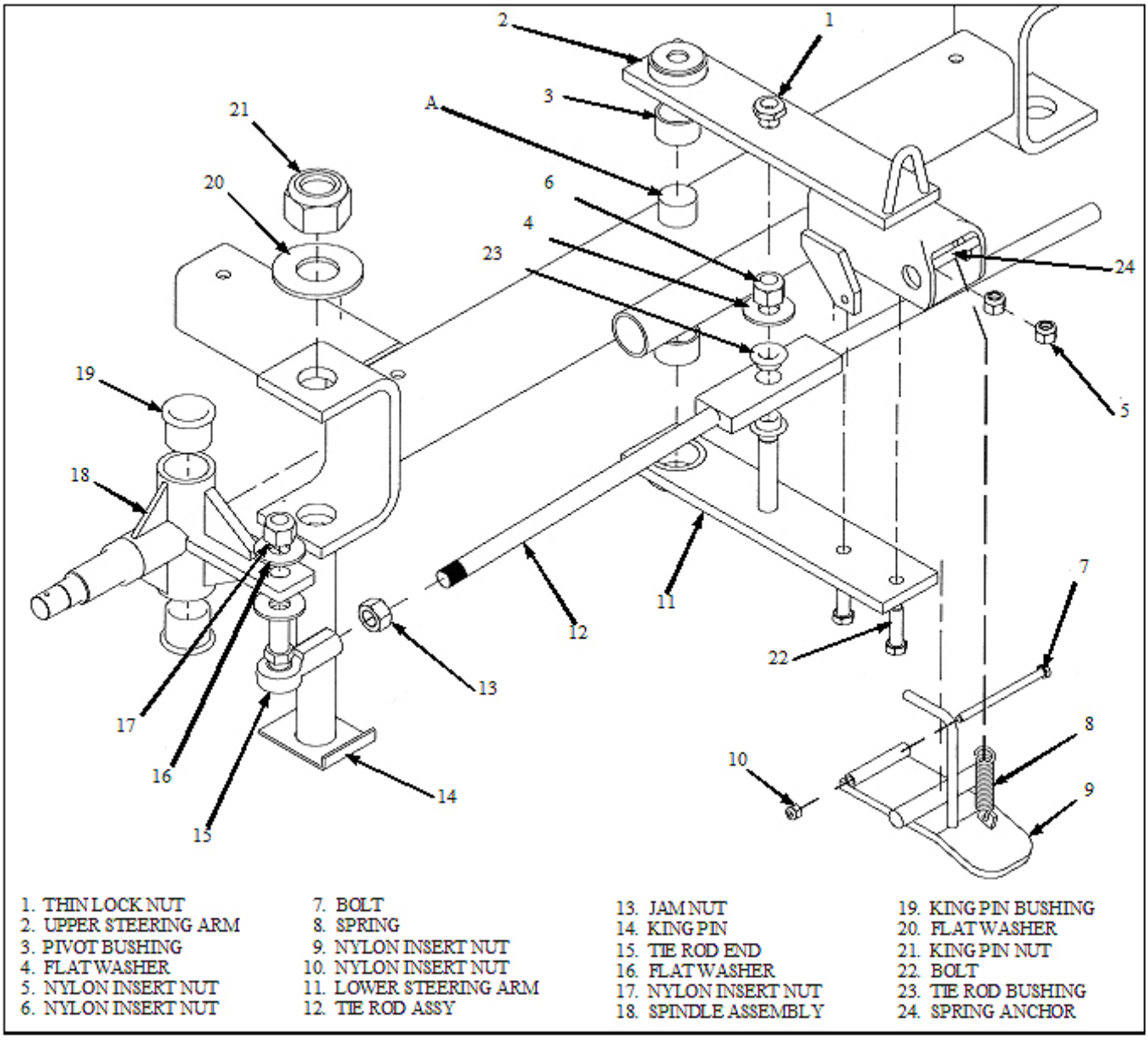


Figure 5-14. Front Undercarriage Exploded Assembly

5.3.8.6 Tie Rod Assembly. The tie rod assembly is removed by the following steps. See Figure 5-14.

a. Start by following the steps in Paragraph 5.3.8.5. Note presence and location of bushings (23) when removing tie rod assembly from steering arm assembly.

b. Disassembly tie rod assembly by unthreaded components. Before disassembly, mark tie rod length with masking tape.

c. Repair / replace components.

d. Reassemble in reverse order. Note that tie rod ends angle downward toward tie rod ends when reassembling.

e. Adjust tire toe in /toe out as needed.

5.3.8.7 Front Undercarriage Assembly Removal. To remove the entire Front Undercarriage assembly, the equipment must have the front end raised. See Figure 5-15 for these steps.

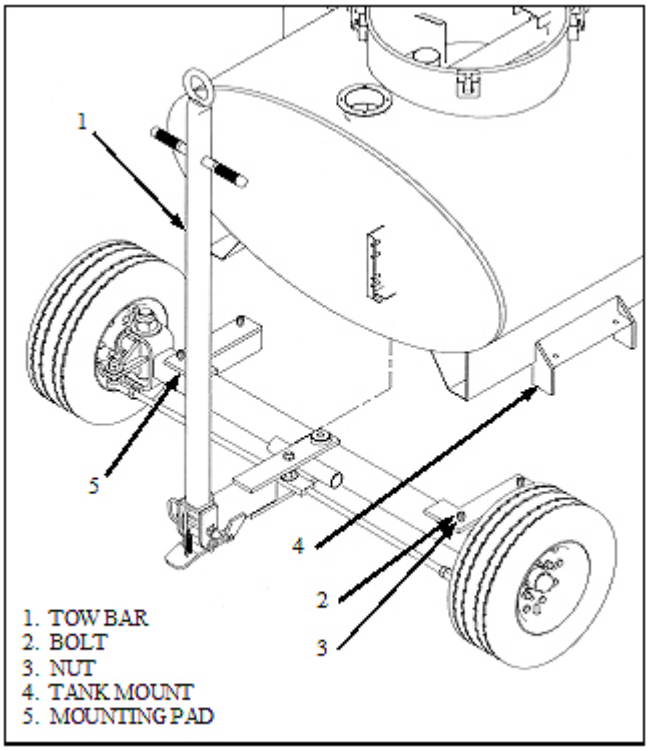


Figure 5-15. Removal of Front Undercarriage

WARNING

Use suitable lifting and support equipment when performing these steps. Serious injury or death could occur from rolling or falling equipment.

WARNING

The Front Undercarriage will become unstable when the wheels make contact with the ground. Serious injury could result from unexpected movement if proper attention is not being observed.

a. Raise equipment with suitable maintenance jack (see Figure 5-11, reference arrow A for jack placement) to allow for 4-inches of space between the wheels and the ground.

b. Place cribbing under tank skids (see Figure 5-11, reference points C) to safely support the equipment.

c. Lower onto cribbing. Leave jack in place.

d. Place tow bar (1) in the up position.

e. Raise jack to apply slight pressure on assembly.

f. Remove bolts (2) and nuts (3).

g. Carefully lower jack and assembly until wheels are on the ground and front axle tube clears tank mounts (4).

h. Pull Front Undercarriage forward. Note location of rubber mounting pads (5).

i. Reassembly in reverse order.

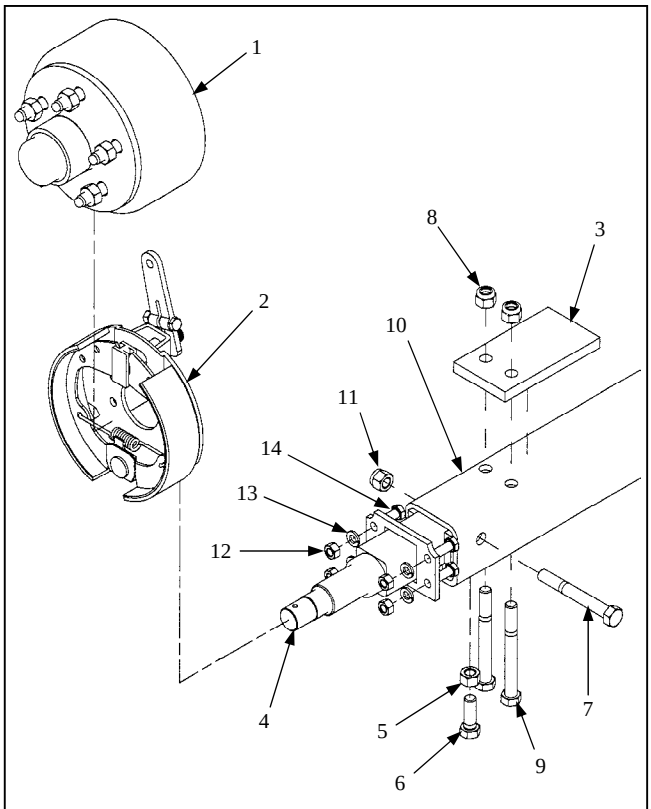


Figure 5-16. Rear Undercarriage

5.3.9 Rear Undercarriage Assembly. See Figure 5-16 for the following maintenance steps. The rear undercarriage assembly consists of: a wheel assembly, a hub and brake drum assembly (1), a mechanical parking brake assembly (2), a rear spindle (4), and the axle (10).

5.3.9.1 Rear Wheel Assembly Removal. To remove the wheel assembly, the equipment must have the back end raised and placed on approved jack stands.

WARNING

Use suitable lifting and support equipment when performing these steps. Serious injury or death could occur from rolling or falling equipment.

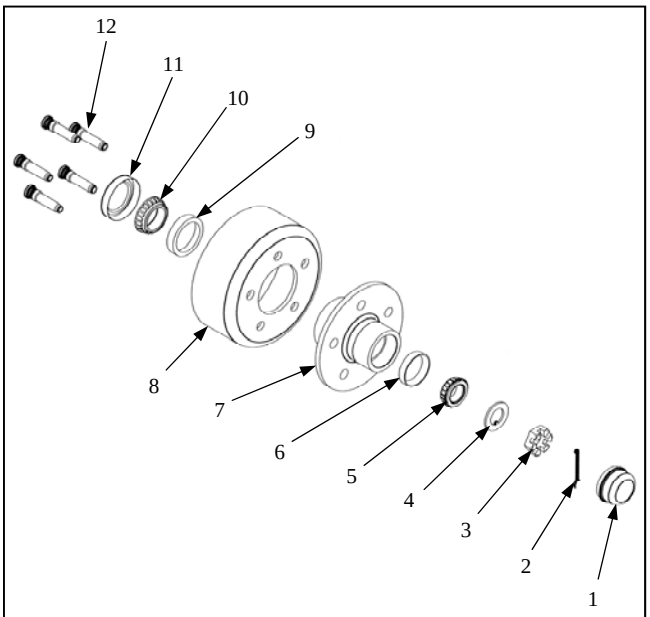
NOTE

Figure 5-11 is generic for both the Front Undercarriage and Rear Undercarriage. Points A and B are similar on both axles.

a. Raise equipment with suitable maintenance jack (see Figure 5-11, reference arrow A for jack placement) high enough to remove wheel assembly.
b. Place approved jack stands under rear axle (see Figure 5-11, reference arrow B for stand placement).
c. Remove lug nuts of wheel assembly needing maintenance, and remove.

5.3.9.2 Rear Hub / Brake Drum Assembly. To remove the rear hub and brake drum assembly, follow the maintenance steps in Paragraph 5.3.9.1 before beginning the next steps. See Figure 5-17.

a. Remove dust cap (1) by lightly tapping with a rubber hammer.
b. Remove cotter pin (2), castle nut (3), and washer (4).
c. Grasp front hub (7) and drum (8). Pull outward firmly. Ensure that bearing (5) doesn't fall from hub and strike the ground.
d. Remove bearing (5), seal (11), and bearing (10) from the rear hub (7).
e. Using a suitable H-frame press, remove bearing races (6) and (9).
f. Remove drum (8) by pressing out wheel studs (12) in suitable H-frame press.



1. DUST CAP
2. COTTER PIN
3. CASTLE NUT
4. SPINDLE WASHER
5. OUTER BEARING
6. OUTER RACE
7. HUB
8. BRAKE DRUM
9. INNER RACE
10. INNER BEARING
11. SEAL
12. WHEEL STUDS

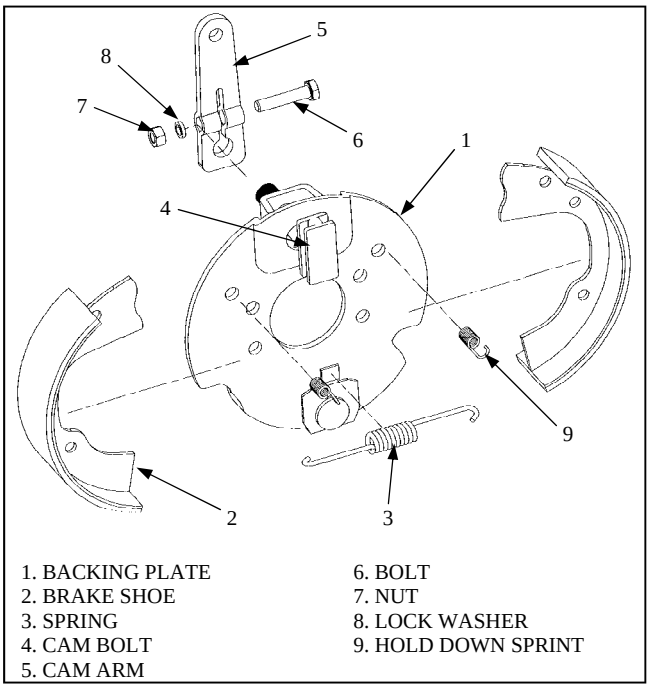
Figure 5-17. Rear Hub and Brake Drum

g. Replace components and grease bearings before reassembly.
h. Reassemble in reverse order. Castle nut (3) should be tightened until the hub assembly rotates barely past free.

5.3.9.3 Parking Brake Assembly. The parking brake assembly consists of a brake handle and cable assembly (See Paragraph 5.3.9.3.1), and a mechanical brake assembly (See Paragraph 5.3.9.3.2). The parking brake assembly is adjusted by following the instructions in Paragraph 5.3.9.3.3.

5.3.9.3.1 Brake Handle and Cable Assembly. The brake handle and cable assembly only need to be disassembled to the point that the repair is needed. These instructions start at the wheel assembly and progress toward the brake handle. See Figure 5-19.

a. Remove cotter pin (13) and clevis pin (14) to release clevis (12).
b. Unthread clevis (12) from cable (11).



1. BACKING PLATE
2. BRAKE SHOE
3. SPRING
4. CAM BOLT
5. CAM ARM
6. BOLT
7. NUT
8. LOCK WASHER
9. HOLD DOWN SPRINT

Figure 5-18. Mechanical Parking Brake

c. Remove nut (15) and remove cable housing (10) from bracket.

d. Remove nut at opposite end of cable and disassemble cable linkage parts (6), (7), (8), and (9).

e. Repeat steps a. through d. for opposite side.

f. Remove nut (4) to release cable equalizer (5).

g. Repeat step c. for cable housing leading to brake handle.

h. Remove nut at opposite end of cable and release cable by disassembling cable linkage from brake handle (1).

i. Remove bolts (2) and nuts (3) to free brake handle (1).

j. Reassembly in reverse order.

5.3.9.3.2 Mechanical Brake Assembly. The mechanical brake assembly is disassembled by following the steps described here. The assembly can be disassembled while attached to the rear spindle or removed from the unit. See Figure 5-18.

a. Remove Rear Wheel Assembly as described in paragraph 5.3.9.1.

b. Remove Rear Hub and Brake Drum Assembly as described in Paragraph 5.3.9.2

c. Remove brake cable end from arm (5) as described in Paragraph 5.3.9.3.1, step (a).

d. Remove nuts (12), washers (13), and bolts (14) shown in Figure 5-16.

e. Remove Mechanical Brake Assembly and place on flat surface.

NOTE

Steps (d) and (e) are needed only if Mechanical Brake Assembly is to be removed from the axle.

f. Remove spring (3).

g. Release brake shoes (2) by removing springs (9) from the backing plate (1).

h. Remove nut (7), lock washer (8), and bolt (6) to release arm (5).

i. Remove brake cam (4) by pulling directly outward.

j. Reassembly in reverse order.

5.3.9.3.3 Parking Brake Adjustment. The parking brake can be adjusted at three different locations. An in-field adjustment can be made at the brake handle by turning the handle cap clockwise to tighten brakes and counter-clockwise to loosen the brakes (see reference arrow D.) This adjustment must be made with the brake handle in the off position. Maintenance level adjustments can be made at reference arrow E and reference arrow F (each side).

5.3.9.4 Rear Spindle. To remove the rear spindle, follow the maintenance steps described in this paragraph. See Figure 5-16.

a. Remove Rear Wheel Assembly as described in Paragraph 5.3.9.1 for the side needing repair.

b. Remove Rear Hub and Brake Drum as described in Paragraph 5.3.9.2 for the side needing repair.

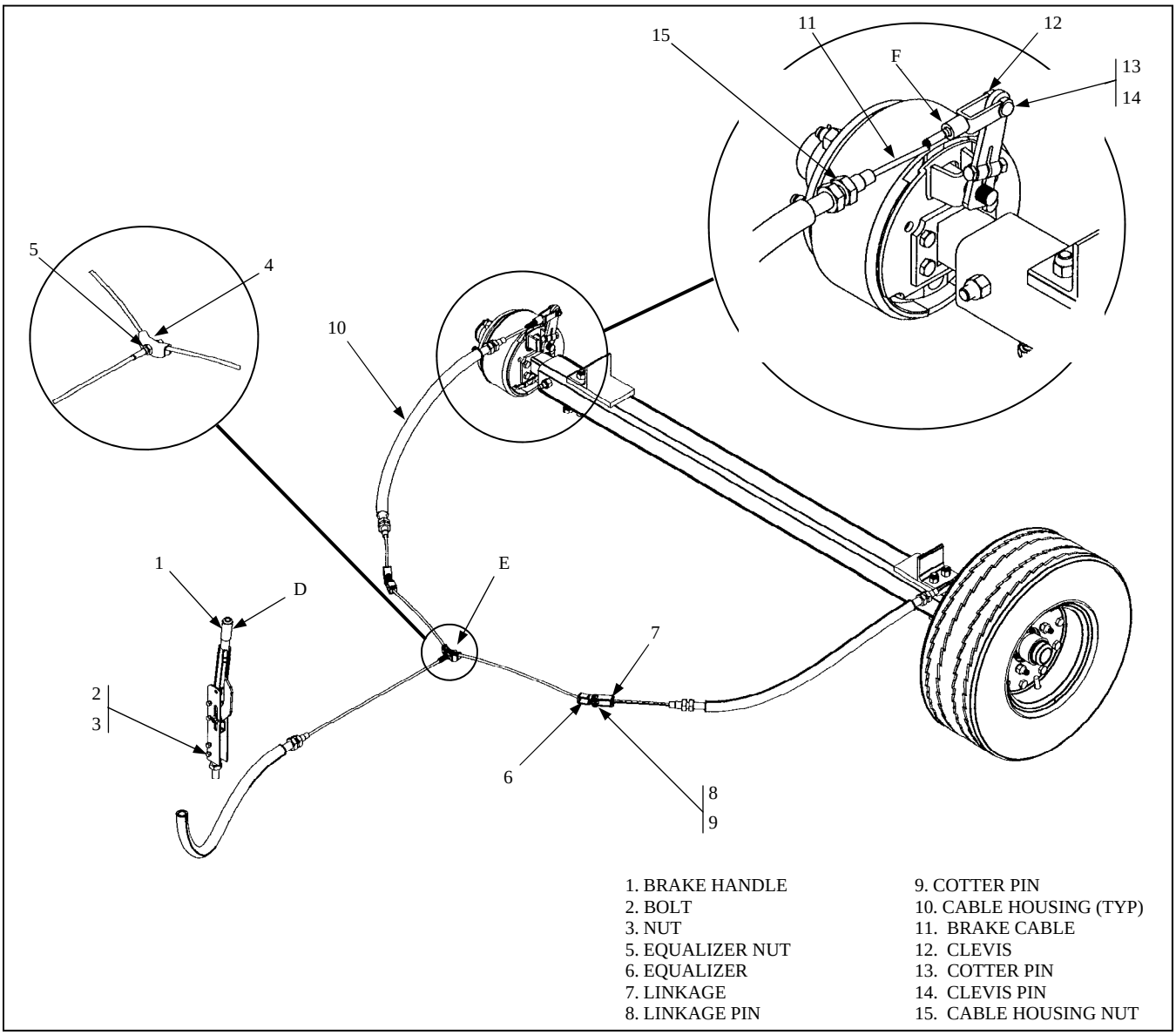
c. Remove Mechanical Brake Assembly as described in Paragraph 5.3.9.3 for the side needing repair.

d. Loosen jam nut (5) and remove bolt (6).

e. Remove nut (11) and bolt (7).

f. Pull rear spindle (4) directly outward to free from axle tube (10).

g. Reinstall in reverse order.



1. BRAKE HANDLE
2. BOLT
3. NUT
5. EQUALIZER NUT
6. EQUALIZER
7. LINKAGE
8. LINKAGE PIN
9. COTTER PIN
10. CABLE HOUSING (TYP)
11. BRAKE CABLE
12. CLEVIS
13. COTTER PIN
14. CLEVIS PIN
15. CABLE HOUSING NUT

Figure 5-19. Brake Handle and Cable Assembly

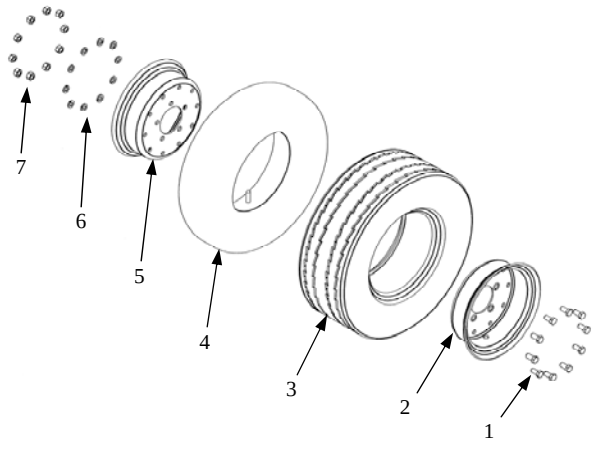
5.3.9.5 Rear Undercarriage Assembly Removal. To remove the entire Rear Undercarriage assembly, the equipment must have the back end raised. See Figure 5-16 for

WARNING

Use suitable lifting and support equipment when performing these steps. Serious injury or death could occur from rolling or falling equipment.

these instructions.

a. Raise equipment with suitable maintenance jack (see Figure 5-11, reference arrow A for jack placement) and allow for 2-inches of space between the wheels and the ground.
b. Place cribbing under tank skids (see Figure 5-11, reference points C) to safely support the equipment.
c. Lower onto cribbing. Leave jack in place.
d. Disconnect parking brake cables at mechanical brake assembly as described in Paragraph 5.3.9.1, step (a).
e. Raise jack to apply slight pressure on assembly.
f. Remove mounting nuts and bolts from both sides of axle assembly.
g. Carefully lower jack and assembly until wheels are on the ground and front axle tube clears tank mounts.



1. BOLTS
2. SPLIT RIM FOR STEM
3. TIRE
4. INNER TUBE
5. SPLIT RIM
6. LOCK WASHER
7. NUTS

Figure 5-20. Wheel Assembly

5.3.10 Wheel Assembly. The Wheel assembly is a two-piece, split rim design. Use Figure 5-20 for the following maintenance steps.

a. Remove wheel assembly as described in Paragraph 5.3.9.1 for the side needing repair.
b. Release air pressure from the inner tube by depressing stem valve or by removing the stem valve.
c. Remove nuts (7), lock washers (6), and bolts (1).
d. Separate split-rims (2) and (5) from tire (3).
e. Remove inner tube (4) from tire (3). Reassembly in reverse order. Ensure that inner tube stem is positioned through access hole in split-rim.
f. Torque nuts (6) to 150-foot-pounds before applying air pressure to wheel.

5.4 TROUBLE SHOOTING.

The trouble shooting paragraphs and tables outline probable causes to typical problems. Operational steps, such as "open valve," are not included in solutions. Verify that the operational steps outlined in Chapter 4 are being followed correctly before trouble shooting suspected problems. Tables 5-1 through 5-8 contain the trouble shooting guides.

5.5 PREVENTIVE MAINTENANCE.

The SealVac has been designed to require very little preventive maintenance. Materials such as stainless steel, 6061 aluminum, and oil-impregnated bronze bushings have been used in the design to minimize maintenance and repair requirements. Preventive Maintenance information can be found in Table 5-9.

Table 5-1. Trouble Shooting - General Tank

Problem	Probable Cause	Corrective Action
Threaded connection leaking or weeping	Loose fitting, bad seal, damaged fitting.	Fix condition. See Paragraph 5.3.1.
Valve leaking, weeping, or inoperable	Internal damage to valve's ball, stem, or seat.	Replace valve. See Paragraph 5.3.1.

Table 5-2. Trouble Shooting - Tank Vacuum

Problem	Probable Cause	Corrective Action
No vacuum	A) Supply air not within required specifications.	A) Check supply air pressure and flow rate. See Tables 1-1 through 1-3 and Chapter 2.
	B) Tank is full - Auto Shut-off has shut down tank vacuum.	B) Empty tank. See Paragraph 4.9.3.
Low vacuum	A) Supply air not within required specifications.	A) Check supply air pressure and flow rate. See Tables 1-1 through 1-3 and Chapter 2.
	B) Depuddling/Utility Valve open or Funnel Isolation Valve open.	B) Close valves if not being used in operation.
	C) Air leakage from tank.	C) Check Sediment Chamber Gasket, Manway Assembly, see Paragraph 5.3.6, and all other threaded connections, see Paragraph 5.3.1.

Table 5-3. Trouble Shooting - Drain Tools

Problem	Probable Cause	Corrective Action
Drain Tool won't adhere or has weak adherence	A) Supply air not within required specifications.	A) Check supply air pressure and flow rate. See Tables 1-1 through 1-3 and Chapter 2.
	B) Vacuum Area Seal damaged or installed in-correctly.	B) Inspect seal and correct. See Paragraph 4.6.2.1.2.
	C) Drain Tool vacuum generator muffler restricted.	C) Inspect and correct. See Paragraph 5.3.2.1.
	D) Drain Tool is being adhered over aircraft weep hole.	D) Reposition Drain Tool away from aircraft weep hole.
No or low flow through Fuel Probe	A) Fuel Probe Pin missing, or too short to fully open sump poppet valve.	A) Check Fuel Probe Pin. See Paragraph 4.6.2.2.2.
	B) Fuel Probe, fuel line, or quick disconnect clogged with FOD.	B) Inspect items for FOD. Remove FOD.

Table 5-4. Trouble Shooting - Auto Shut-off Assembly

Problem	Probable Cause	Corrective Action
Auto Shut-off doesn't shut off tank vacuum on full-tank conditions, or doesn't' allow tank vacuum to function on tank-empty conditions	A) Control lines not attached properly.	A) Ensure control lines are connected. See Paragraph 4.9.4, step c. and Figure 4-10.
	B) Float rod assembly sticking.	B) Disassemble as needed. Clean float rod. See Paragraph 5.3.5.
	C) Float is sunk.	C) Replace float. See Paragraph 5.3.5.

Table 5-5. Trouble Shooting - Manway Assembly

Problem	Probable Cause	Corrective Action
Manway Assembly won't seal	A) Manway Assembly is out of adjustment.	A) Adjust Manway Assembly. See Paragraph 5.3.6.2.
	B) Seal is damaged.	B) Replace Manway Seal. See Paragraph 5.3.6.1.

Table 5-6. Trouble Shooting - Telescoping Funnel Assembly

Problem	Probable Cause	Corrective Action
Funnel sections won't lock in place.	A) Clamps are not being tightened	A) Tighten Clamp Handles more.
	B) Clamp wedge or threads are damaged	B) Inspect and replace as needed. See Paragraph 5.3.7.4 and 5.3.7.5.

Table 5-7. Trouble Shooting - Front Undercarriage

Problem	Probable Cause	Corrective Action
Tow bar won't lock in the up-right position	Tow latch spring damaged or missing.	Inspect and replace as needed. See Paragraph 5.3.8.4.
Wheels won't steer properly	A) Steering Arm Assembly is damaged.	A) Inspect and repair as needed. See Paragraph 5.3.8.5.
	B) Tie Rod Assembly is damaged or misadjusted.	B) Inspect, repair, and adjust as needed. See Paragraph 5.3.8.6.
Wheels wobble or drag while rolling	Wheel bearings damaged or loose.	Inspect and repair as needed See Paragraph 5.3.8.3.

Table 5-8. Trouble Shooting - Rear Undercarriage / Brakes

Problem	Probable Cause	Corrective Action
Wheels wobble or drag while rolling	Wheel bearings damaged or loose.	Inspect and repair as needed. See Paragraph 5.3.9.2.
Brakes do not properly secure unit while engaged	A) Brakes are out of adjustment.	A) Adjust brakes. See Paragraph 5.3.9.3.3.
	B) Parking Brake Assembly is damaged or missing.	B) Inspect and repair as needed. See Paragraph 5.3.9.3.

Table 5-9. Preventive Maintenance

Item	Interval	Action
Sediment Chamber Screen	Weekly	Clean Sediment Chamber Screen by removing collected FOD. See Paragraph 4.9.5 for Sediment Chamber Lid removal instructions.
Sediment Chamber Seal	Monthly	Thoroughly inspect Sediment Chamber Seal for tears, cracks, and compression damage. Replace if needed.
Manway Seal	Monthly	Inspect Manway Seal for tears, cracks, and compression damage. Replace if needed. See Paragraph 5.3.6 for maintenance instructions.
Static Bonding/ Grounding	Monthly	Check Static Bonding/Grounding Reels and bond straps between the tank weldment and the Sediment Chamber Lid for electrical resistance. Maximum allowable resistance should be 10 Ohms. See paragraph 2.3.
Brakes	Quarterly	Check Brakes for proper adjustment. Adjust as needed. See Paragraph 5.3.9.3.3 for maintenance instructions.
Tank Weldment	Yearly	Inspect inner tank welds for cracks. Check baffles for cracks. Check outer tank welds for cracks. Remove plug from outer tank test fitting and inspect for evidence of fuel.
Wheel Bearings	Yearly	Disassemble and pack wheel bearings with grease. Inspect for damage and replace components as needs. See Paragraphs 5.3.8.2 and 5.3.9.2 for maintenance instructions.

Table 5-10. Daily Inspection Check Sheet

Item	What to Inspect
Wheels/Tires	Inspect for tire damage and proper tire pressure. Ensure that no lug nuts are missing or loose.
Brakes	Inspect for proper function and adjustment.
Tow Bar	Inspect for damage such as cracks in welds and missing attachment pin and retaining clip.
Tank	Inspect for leaks and obvious damage. Ensure Manway Assembly closes and latches properly. Check undercarriage mounting hardware for loose and/or missing components.
Hoses	Inspect for damage such as cracks and rub spots. Ensure fittings ends are operational.
Ground Reels	Inspect for function. Ensure cable ends are securely fastened to cable.
Valves	Inspect for function.
Drain Tools	Inspect for damage to Drain Tool body and seals.
Funnel	Inspect for function.