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TECHNICAL MANUAL

M600-RFOS 600 Gallon Defueler / Fueler Cart

Spokane Stainless Technologies™ Inc.

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SECTION 1.0

INTRODUCTION



IMPORTANT

YOU MUST READ THIS MANUAL IN ITS ENTIRETY BEFORE OPERATING, SHIPPING OR PERFORMING MAINTENANCE PROCEDURES. FLAMMABLE AND COMBUSTIBLE VAPORS CAN CAUSE FIRE, AND/OR EXPLOSION AND CAN LEAD TO SERIOUS INJURY OR DEATH.

The instructions in this manual cover the operation and maintenance of the M600-RFOS Defueler/ Fueler cart manufactured by Spokane Stainless Technologies, Inc. of Spokane Valley, Washington.

Additional features of the M600-RFOS include a spill containment kit, and cabinet lighting, which makes it easier and safer to fuel up at night.

Refer to the specifications chart (Section 1.2) for more information regarding dimensions, fuel capacity and other information on the 600-gallon DFC. Refer to Section 1.4 for the Daily Inspection Checklist and Section 1.5 for The Preventive Maintenance Chart

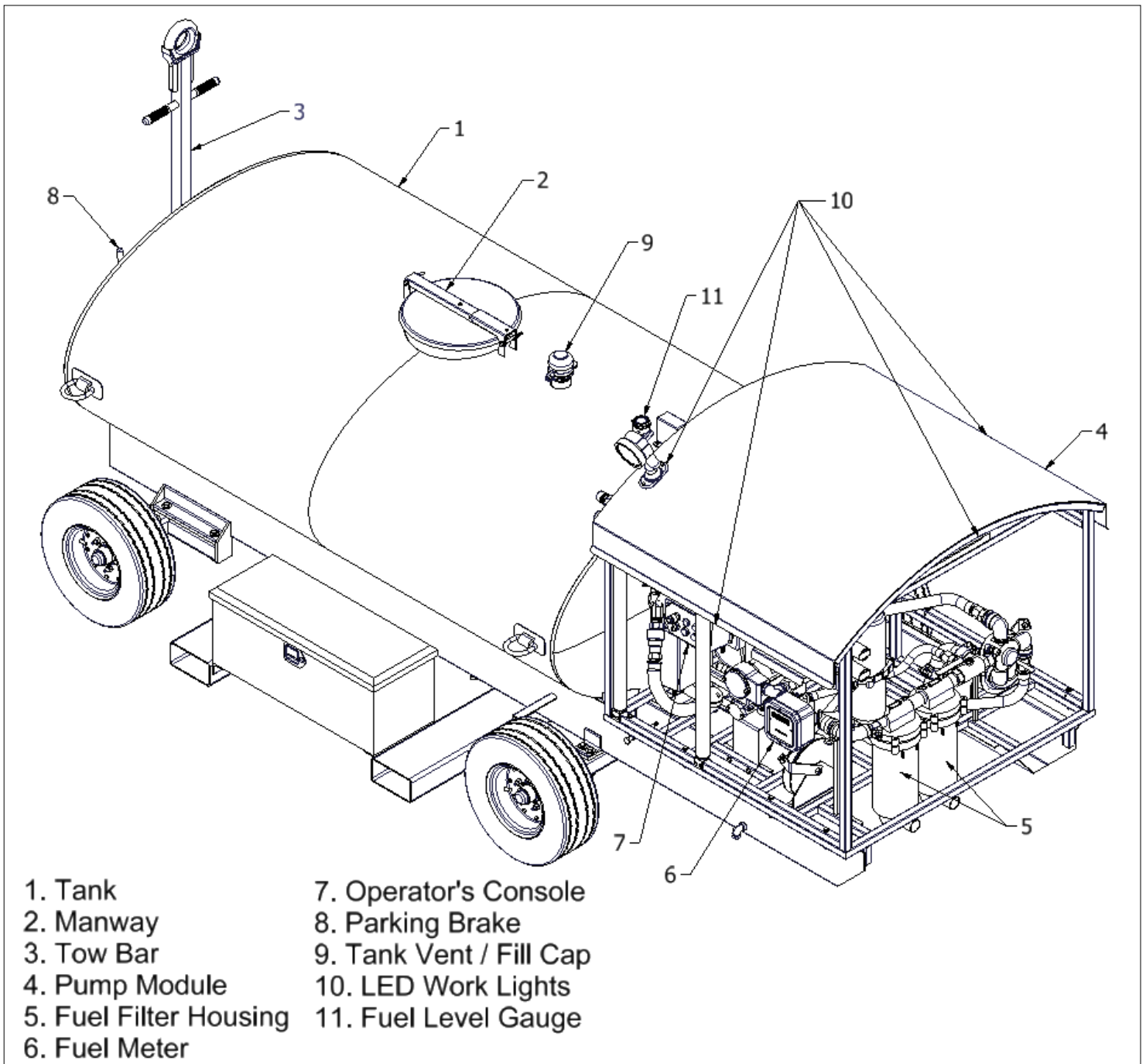
DESCRIPTION

Throughout this manual the unit will be referred to as the DFC. The M600-RFOS is a 600-gallon defueler / fueler cart designed to provide a portable, self-contained defueling/ fueling system for refueling helicopters. The DFC is easy to use and maintain.

The DFC M600-RFOS consists of an inner tank assembly and an outer tank, otherwise known as tight wrap construction. This easy to use fueler /defueler consists of a pump, fuel meter, fuel filter and a plumbing system that allows for fuel to recirculate through the system, as well as go in and out of the tank for either defueling or fueling purposes of helicopters.

When fuel is extracted, it is filtered through the plumbing system and placed back into the tank with a 50-foot fuel hose. There is a rigid and a soft extraction wand so that the user can fuel and defuel different size tanks.

Fueling and defueling is made simple with fittings that are designed for specific fueling and defueling purposes for CH-47 Chinook, AH-64 Apache and UH-60 Blackhawk helicopters. Please see section 1.3 for the hose fitting hookups for select airframes.



Section 1.1

Figure 1-1 Component Identification

1.2 Specifications for the M600-RFOS 600 Gallon

Tank Volume:

| | |
|------------------------|-------------|
| Nominal Capacity | 600-gallons |
| Max Capacity | 660-gallons |

Equipment Dimensions:

| | |
|---|--------------|
| Length (Tow bar down) | 222-inches |
| (Tow bar up) | 162-inches |
| Width (Tire to tire) | 77-inches |
| Height (Tow bar down) | 70-inches |
| (Tow bar up) | 75-inches |
| Weight (Empty) | 2,780-pounds |
| (Full, at nominal capacity with fuel) | 6,980-pounds |
| 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 |

Flow and Pressure:

| | |
|---|---------|
| Fueling Flow Rate (nominal) | 11-GPM |
| Fueling Pressure | <10-PSI |
| Fuel Extraction Flow Rate (nominal) | 10-GPM |
| Fuel Extraction Suction (lift) | 10-FEET |

Electrical Characteristics:

| | |
|--------------------------|---|
| Voltage | 12VDC |
| On-board Batteries | Dual Optima Blue tops |
| On-board Charging | 120/230 VAC Input / 12VDC x 30-amp output |
| Cabinet Lighting | LED |
| Circuit Protection | Yes, circuit breakers |

Duty Cycle:

| | |
|------------------------------------|-------------------------------|
| Pump (Fueling and Extraction) | 30-minutes ON, 30-minutes OFF |
|------------------------------------|-------------------------------|

Towing Characteristics:

| | |
|-------------------------------------|-----------------------|
| Speed, Forward Direction | 15-MPH |
| Speed, Backward Direction | (hand push/pull only) |
| Turning Radius (Curb to curb) | 372-inches |

Wheels and Tires:

| | |
|---|---------------|
| Tire Size | 20.5 x 8.0-10 |
| E Range Tire Pressure (Cold) (See Sidewall) | 90-PSIG |
| Lug Nuts Torque | 100 ft.-lbs. |
| Split Rim Nuts Torque | 75 ft.-lbs. |

Other Characteristics:

| | |
|--------------------------------|--------------------|
| Double Wall Construction | Yes |
| Tie-down Points | Yes, x 4 D-rings |
| Fork-lift Ready | Yes, 4 x 8 pockets |

1.3 Hose Fitting Hookups and Usage for Select Airframes

| Helicopter Type | Defuel Fittings | Fuel Fittings |
|-----------------|---|---|
| UH-60 Blackhawk | 25-5038 Custom Plug Fitting | Single Point (Whittaker F116) Whittaker Valve |
| AH-64 Apache | 25-5039 Single Point (Whittaker F116) | Single Point (Whittaker F116) Whittaker Valve |
| CH-47 Chinook | 25-5040 Threaded Swivel Connection | Single Point (Whittaker F116) Whittaker Valve |



Part Number Reference

UH-60 Black Hawk Fitting Asm. - 25-5038

AH-64 Apache Whittaker Nozzle Asm. –AV.COM Part Number F116VX7D - 25-5039

CH-47 Chinook Threaded Swivel Asm. - 25-5040

Whittaker Valve - 04-1042

1.4

Daily Inspection Checklist

| Part to be inspected | What to Look For | | | | Check Off Once Inspected |
|-----------------------------|--|--------------------------------------|---|-------------------------------|--------------------------|
| Wheels | Are tires damaged? | Are there loose or missing lug nuts? | | | |
| Brakes | Inspect for proper function | Are brakes properly adjusted? | | | |
| Towbar | Are there cracks in welds? | Are there missing attachment pins? | Are there missing retaining clips? | | |
| Tank | Are there leaks or any obvious damage? | Does Manway close properly? | Are there loose or missing components in the undercarriage mounting hardware? | | |
| Fueling Nozzle | Are there any leaks? | | | | |
| Ground Reel | Is cable end securely fastened to cable? | | | | |
| Valves | Are valves functioning properly? | | | | |
| Fuel Filter Housings | Are there any cracks? | Are there any leaks? | | | |
| Fuel Hose | Are there any cracks? | Are there any leaks? | Are there any rub spots? | Are fitting ends operational? | |
| Low-Point Drain | Is water drained from tank low-point sump? | | | | |

1.5

Preventative Maintenance Chart

| Item | Interval | Action |
|--------------------------|------------------|--|
| Manway Seal | Monthly | Inspect for tears, cracks and compression damage. Refer to Section 4.3 for maintenance instructions. |
| Brakes | Quarterly | Check for proper adjustment and make any adjustments using sections 4.15, 4.16 and 4.17. |
| 12 Volt batteries | 6 Months | Check battery cell fluid level. If the batteries need to be serviced, remove the battery box before servicing the batteries. |
| Tank Weldment | Yearly | Inspect both inner and outer tank welds for cracks. Remove plug from outer tank test fitting and inspect for fuel evidence. |
| Wheel Bearings | Yearly | Inspect for damage and replace components when needed. Pack wheel bearings with grease. Use sections 4.8 and 4.17 For maintenance. |

SECTION 2.0

SAFETY GUIDELINES

Within this manual are guidelines and safety recommendations for use of the DFC. It is the responsibility of the end user to completely read this manual and comply with all local, state and federal laws and **regulations applicable for defueling and fueling aircraft**. Spokane Stainless Technologies, Inc. is not responsible for industry specific information on safety management, employment safety, health standards, safety codes, etc. Contact your local safety manager or industrial safety representative. It is the responsibility of the end user to ensure persons operating this equipment:

- **Are trained, authorized and permitted to use the equipment.**
- **Have physical and the mental ability to operate this equipment safely.**
- **Are aware of the potential hazards associated with this equipment, i.e static electricity, electrical shock, fuel spills and pinch points.**

2.1 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 that must be understood and applied during operation and maintenance to ensure safety and protection of equipment.

2.2 Protective Clothing

When fuels are being handled, approved equipment such as gloves, eye protection, face shields, etc. shall be used.

2.3 Static Bonding and Grounding and Other Fire Hazard Precautions

Improper static bonding and grounding can lead to a fire, and as with any other equipment dealing with fuel, there is always a risk of fire if all safety precautions are not followed or the equipment is not used correctly. Make sure to read and understand all instructions before operating this equipment.

2.4 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 sources.

2.5 Area of Use

This equipment has been designed to operate outdoors only. Flammable and/or combustible vapors in ignitable quantities could be produced under certain circumstances. Additionally, local protocols must be consulted to determine if fuel draining equipment can be used in the location being considered.

SECTION 3.0

OPERATION INSTRUCTIONS

3.1 Shipment Preparation

⚠ WARNING

Flammable and combustible vapors must be removed from tank before shipping to prevent a fire and/or explosion. If this step is not taken, serious injury or death could occur

Before transporting the DFC by truck or cargo aircraft, make sure to drain the tank of all liquid products by opening the drain valve. Remove all flammable and/or combustible vapors from the tank using an approved ventilation method. Secure any loose items and check to make sure the manway assembly is securely attached.

Loading the DFC for Truck Shipment

⚠ CAUTION

Inserting fork extensions into fork pockets should be the only means of lifting the DFC for shipment. Damage to the

equipment will occur if the equipment is lifted from any other location.

Forklift with fork extensions will be required to load the DFC on a truck. Set the parking brake. Approach the unit from the front only. Once the DFC is loaded on the truck, secure to the truck bed using attachment points on tank weldment.

Loading the DFC for Air Shipment

⚠ CAUTION

Do not back equipment by any means other than hand pushing/pulling, or it will cause damage to the equipment.

After placing the DFC in the aircraft, lock tow bar upright, make sure the parking brake is set and that the manway assembly and storage boxes are latched.

3.2

Controls and Indicators

| Description | Functions |
|--------------------------------|--|
| Battery Switch | Main power disconnect |
| E-Stop Switch | Emergency shut down switch |
| Fuel Filter petcocks (several) | Maintains the two fuel filters |
| Fuel Meter | Gauge that shows fuel level during defueling and fueling operations |
| Operator Console | Turns Defuel / Fuel pumps both ON and OFF |
| Parking Brake Handle | Sets Parking Brake |
| Liquid Level Gauge | Located on the top centerline of the tank, this shows how much fuel is in the tank. |
| Sample Port Valves | There are two of these. One is located on the left side of the fuel meter and the other valve is located on the right side of the recirc valve. These are used to take fuel samples from the tank. |
| LED Worklights | Located on top of the M600-RFOS and underneath the top hood, these are used to light the working area. |

3.3 Defueling the Aircraft

▲WARNING

Never operate the DFC in a closed area or in an area with little or no ventilation.

All fuels are flammable, do not allow sources of ignition within 50 feet of the DFC.

Make sure there is enough room in the tank to store the fuel being removed from the aircraft.

- a. Set brakes by moving the handle so it points upward.
 - b. Chock tires if chocks are available.
 - c. Attach static bonding/grounding cables by locating reel with clamp end, and pulling cable outward until desired length has been taken out.
 - d. Allow cable to retract until it stops. Attach at ramp to an approved bonding/grounding site.
 - e. Uncoil 50-foot Hose assembly from hose reel.
 - f. Attach the DEFUEL adapter.
 - g. Position the Selection Valve to the DEFUEL position."
 - h. Ensure that the recirc valve is properly positioned.
 - i. Turn on the Battery Switch. The "POWER ON" indicator lamp will light up.
 - j. Make sure E-stop switches are in the non-stopped condition by twisting them counterclockwise and allowing them to spring outward.
 - k. Start the fuel pump by pushing the "Pump ON" button.
 - l. Monitor fuel meter to remove desired quantity of fuel.
 - m. If too much fuel is received into the tank, the Fuel Limit switch will activate and cut power to the system. Defueling operation must cease. Pump will turn off and pump run light will not illuminate
 - n. Disconnect the suction side of the pump
 - o. Turn the valving to go into fueling mode.
 - p. Find an appropriate receptacle, and connect the M600-RFOS into the receptacle.
 - q. On the side of the electrical box, turn the reset switch. This will allow you to bypass the level switch.
 - r. On the control panel, hold down the pump button for several seconds
 - s. The pump will activate again and defueling can continue.
 - t. Turn off re-set switch.
 - u. Turn off fuel pump by depressing the "PUMP OFF".
 - v. Retract the fuel hose from aircraft
 - w. Turn off main battery switch.
 - x. Recoil hose and store.
- Normal safety procedures must be followed during this process.
 - Filling of the tanks should be done through the fuel fill service port.
 - Filling personnel must check fuel gauge when conducting this operation.
 - Filling personnel must also have the man-way open for visual inspecting during this operation.

NOTE: Repeat steps I through L if defueling any other fuel cells on the aircraft

3.4 Fueling the Aircraft

⚠ WARNING

Never operate the DFC in an enclosed area. Proper ventilation must be maintained at all times. All fuels are flammable, do not allow sources of ignition within 50 feet of the DFC.

Do not attempt to charge batteries while using the DFC 12 Volt electric fuel pump, damage to charger will occur.

- a. Set brakes by moving Brake lever upright.
- b. Chock tires if chocks are available.
- c. Locate reel with clamp end, and pull cable outward until desired length has been taken out. Allow cable to retract until it stops. Attach at ramp to an approved bonding /grounding location.
- d. Position the selection valve to the FUEL Position.
- e. Uncoil and fully extend hose.
- f. Remove Nozzle from stowed position and attach to hose end.
- g. Start the fuel pump by depressing the "PUMP ON" button.
- h. On electrical box turn main power switch ON by turning clockwise
- i. Ensure battery charge indicator indicates enough charge for operation.
- j. Open aircraft fuel tank and insert nozzle.
- k. Fill tank to desired capacity.
- l. Remove nozzle, close fuel tank and turn off pump.
- m. Turn main power switch OFF at electrical box.
- n. Remove nozzle and stow in nozzle holder.
- o. Retract fuel hose by pulling on retracted hose and allow the hose reel to start retrieving hose, control the rate of retraction by providing a small amount of resistance against the hose reel.

⚠ CAUTION

Improper grounding may result in an ignition source.

NOTE: Periodically monitor differential pressure gauges during fueling operations. This allows real time reading of filter contamination level. Red scale begins at 15 PSI differential pressure.

3.5 Taking Samples Using the Sample Ports

There are two ports used solely for taking for taking fuel samples. The sample port located on the right side of the fuel meter and the sample port located on the left side of the recirc valve.

- a. Make sure parking brake is set
- b. Attach bonding/grounding cables
- c. To take fuel before filtering, unscrew the cap to the sample port located on the right side of the fuel meter (1).
- d. After filtering fuel samples can be taken by unscrewing cap to the fuel sample port located on the left side of the recirc valve.

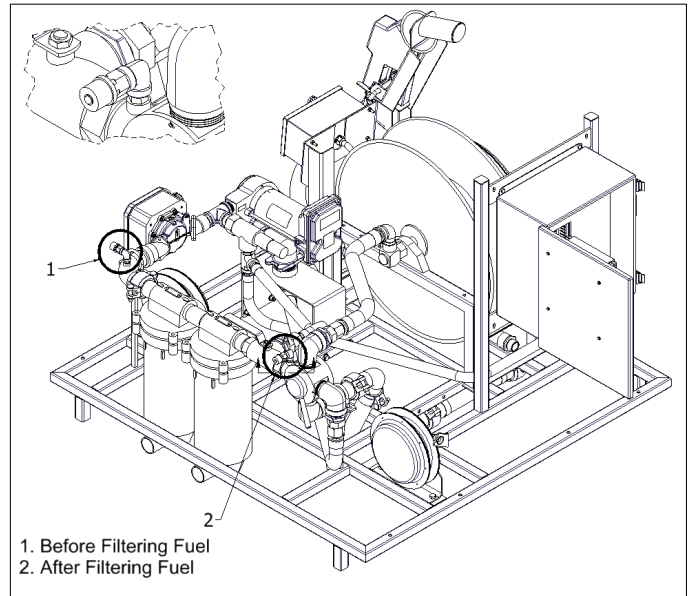


Figure 3-1 Sample Ports

3.6 Fuel Moisture Removal Low Point Drain/ Fuel Filter Housings.

The low point drain is located at the rear of the tank assembly.

- a. Make sure that the parking brake is set.
- b. Attach bonding/grounding reels.
- c. Use the fuel pump to empty tank contents into a safe container.
- d. Open low point sump valve and allow remainder of fuel to drain.
- e. Open petcock drain on filter to drain fuel from filter housing.
- f. Remove pipe plugs to drain fuel from plumbing system.

SECTION 4.0

MAINTENANCE, ASSEMBLY AND REPAIR

The DFC should always be inspected prior to use to make sure it is in working order.

4.1 Repair and Replace Instructions

Remember to set the parking brake 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 used for the disassembly and reassembly for equipment components.

4.2 General Tank Instructions

⚠ WARNING

Make sure 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.

This procedure covers all components attached to the tank by means of threaded pipe connections and describes how to properly apply pipe joint sealing compounds. Pipe joint sealing compounds should be approved for fuel service.

- a. Remove parts 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 parts to dry before moving on to step c.
- c. Inspect threads, and replace any damaged parts.
- d. Apply an even coat of pipe joint sealing compound across and all around the first four threads. The coat thickness should fill the thread “valleys”, and no more.
- e. Tighten until hand-tight. Do not cross thread components.
- f. Tighten parts until the connection does not have leaks.

4.3 Manway Assembly and Maintenance

The manway assembly is located on the top of the tank. The manway assembly has one adjustment point. Use Figure 4-1 for the following maintenance steps.

Manway Disassembly/Reassembly

- 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).

Manway Adjustment

- 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.

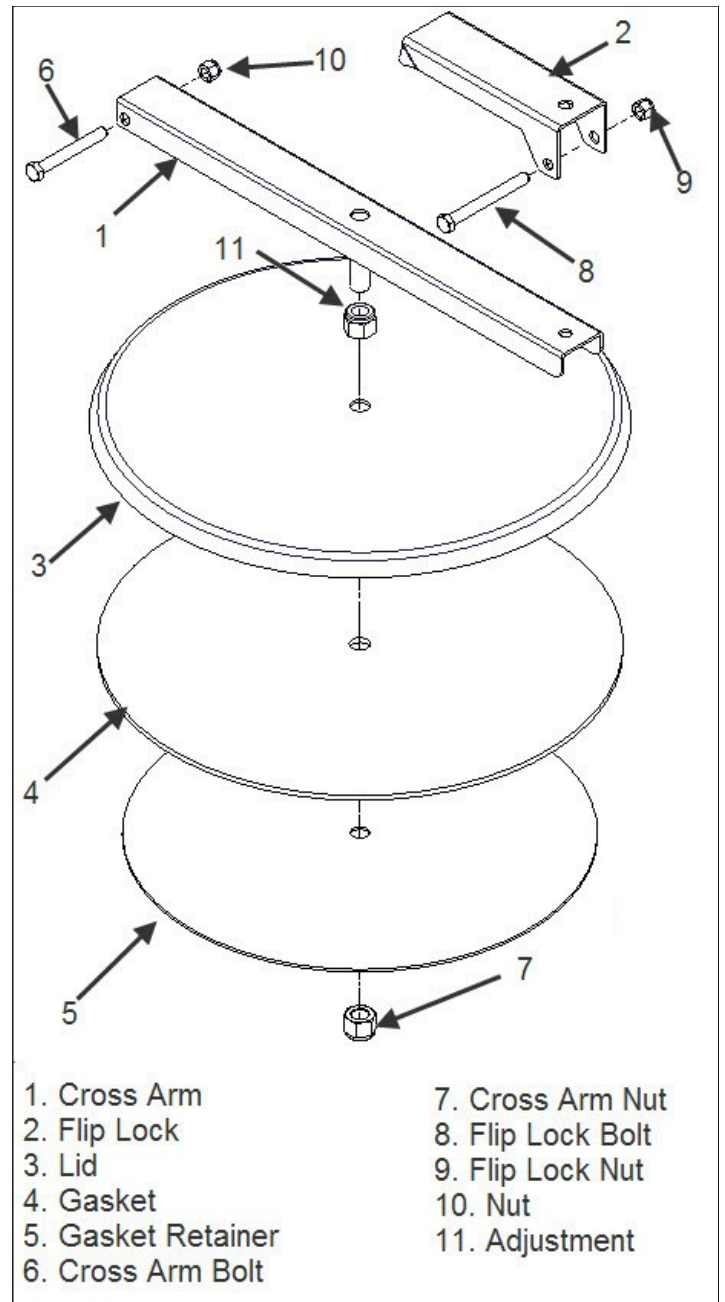


Figure 4-1 Manway Assembly

4.4 Front Undercarriage Assembly

The Front Undercarriage assembly consists of a wheel assembly, a hub assembly a spindle assembly a tow latch assembly, a steering arm assembly and an adjustable tie rod assembly.

4.5 Front Wheel Assembly Removal

To remove the wheel assembly, the equipment must have the front end raised and placed on approved jack stands.

- Loosen lug nuts on wheel assembly requiring maintenance one turn while equipment is still on the ground.
- Raise equipment with suitable maintenance jack (see Figure 4-2, arrow A for jack placement) high enough to remove wheel assembly.
- Place approved jack stands under front axle (see Figure 4-2, arrow B for stand placement).
- Remove lug nuts of wheel assembly needing maintenance, and remove.

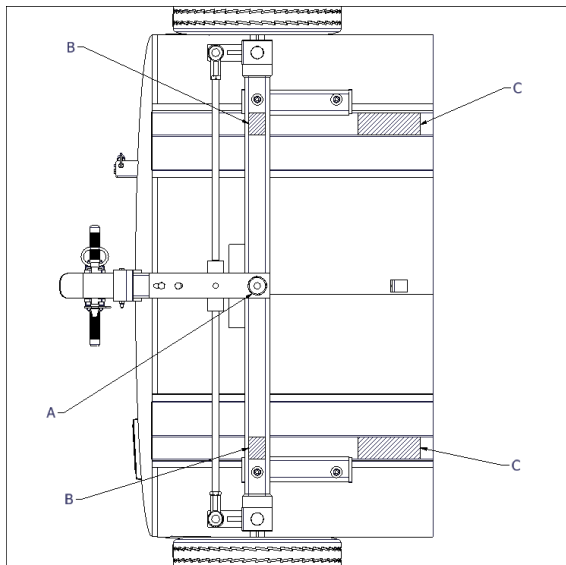


Figure 4-2 Lift Points

4.6 Front Hub Assembly

To remove the front hub assembly, follow these maintenance steps:

- Remove dust cap (1) by lightly taping with a rubber hammer.
- Remove cotter pin (2), castle nut (3), and washer (4).
- Grasp front hub (7) and pull outward firmly. Ensure that bearing (5) doesn't fall from hub and strike the ground.
- Remove bearing (5), seal (10), and bearing (9) from the front hub (7). Using a suitable H-frame press, remove bearing races (6) and (8).
- Replace components and grease bearings before reassembly.
- When reassembling, Castle nut (3) should be tightened until the hub assembly rotates past free.

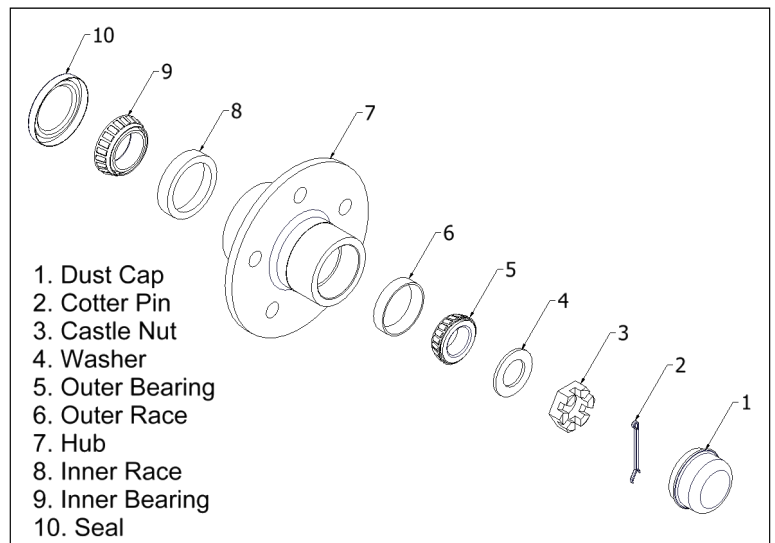


Figure 4-3 Front Hub Assembly

4.7 Tow Latch Assembly

The tow latch assembly is used to secure the tow bar in the upright position. see Figure (4-4).

- a. Remove tow bar (1) by placing the tow bar in upright, latched position. Pull the hitch pin clip (2). While holding onto towbar, 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.

(The remaining steps are illustrated in Figure 4-5) .

- c. 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).

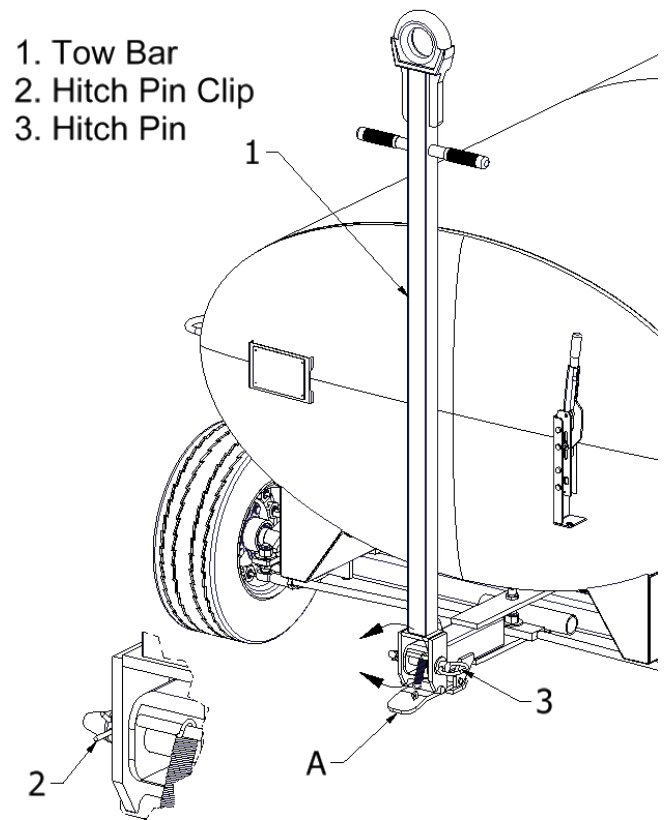


Figure 4-4 Tow Bar Removal

CAUTION

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

4.8 Spindle Assembly

To remove the spindle assembly, follow the maintenance steps for the front hub assembly before beginning the next steps. See Figure 4-5.

- 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 the yoke is free.
- e. Remove spindle assembly from tie rod (15).
- f. Remove bushings (19) with bronze punch and hammer.
- g. Repair / replace components.

4.9 Steering Arm Assembly

- a. Remove the 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 to clear tank and front axle tube.
- e. Remove tie rod assembly (12) by removing nut (6) and flat washer (4). Note the presence of the bushings (23).
- f. Repair / replace components.

4.10 Tie Rod Assembly

Refer to Figure 4-5 for the removal of the tie rod. Before beginning this process make sure that you have followed the steps for the steering arm assembly. **Note presence and location of bushings (23) when removing tie rod assembly from steering arm assembly.**

- a. Disassemble the tie rod assembly by the unthreaded components. Before disassembly mark rod length with masking tape. Note that tie rod ends angle downward when reassembling.
- b. Adjust tire toe in/toe out as needed.

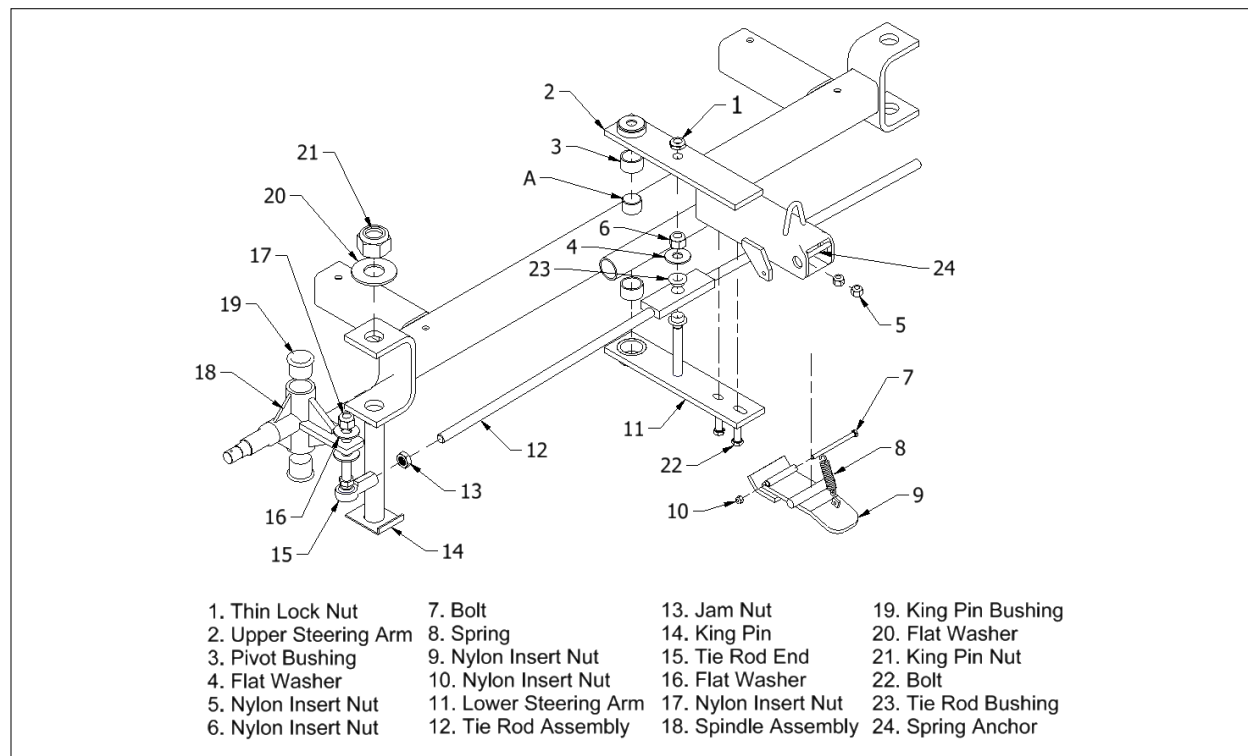


Figure 4-5 Exploded View of Undercarriage

4.11 Front Undercarriage Removal

To remove the entire Front Undercarriage assembly, the equipment must have the front end raised. See Figure 4-2 for lift points.

- Raise equipment with suitable maintenance jack (see Figure 4-2 arrow A for jack placement) to allow four inches of space between the wheels and ground.
- Place cribbing under tank skids (see Figure 4-2, reference arrows C) to safely support the equipment.
- Lower onto cribbing. Leave jack in place.
- Raise jack to apply slight pressure on assembly. (**Tow bar must be in upright position.**)
- Remove bolts (2) and nuts (3), (see Figure 4-6).
- Carefully lower jack and assembly until wheels are on the ground and front axle tube clears tank mounts.
- Pull Front Undercarriage forward. Note location of rubber mounting pads (5).

⚠ WARNING

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

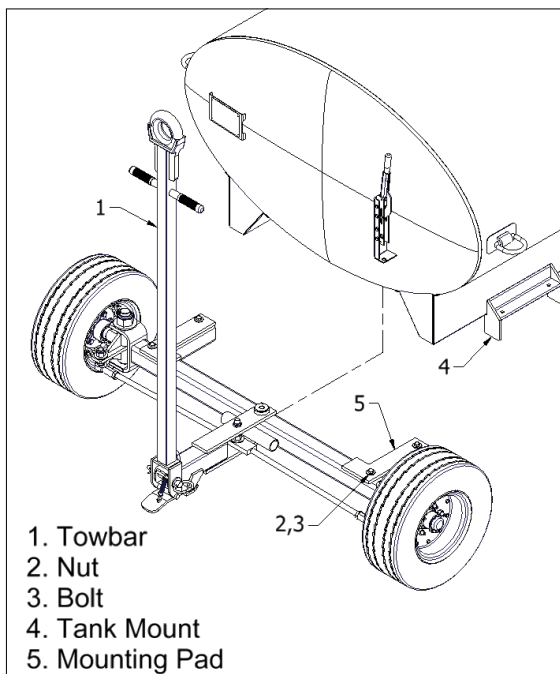


Figure 4-6 Front Undercarriage Removal

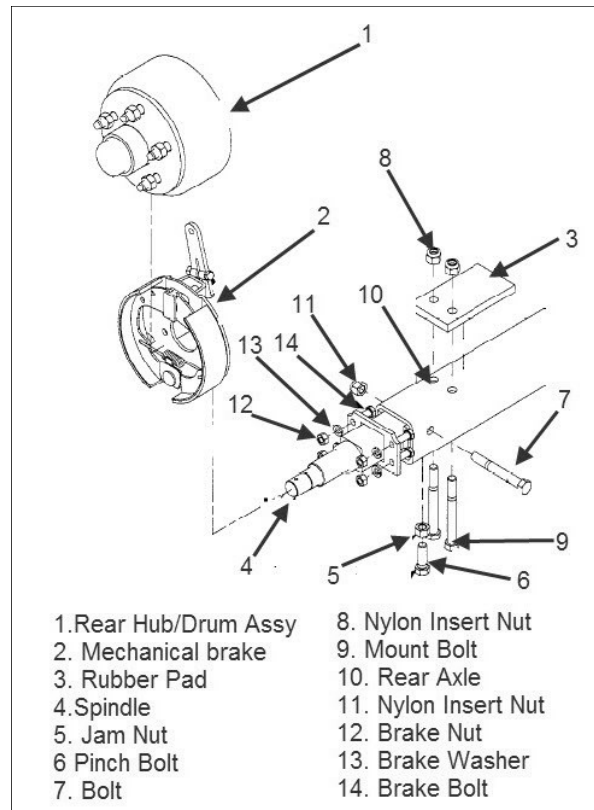


Figure 4-7 Rear Undercarriage Removal

4.12 Rear Undercarriage Assembly

See Figure 4-7 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).

4.13 Rear Wheel Assembly Removal

To remove wheel assembly, the equipment must have the back end raised and placed on approved jack stands. Points A and B are similar on both the rear and front axles. (See Figure 4-2)

- Raise equipment with suitable maintenance jack high enough to remove wheel assembly. (See Figure 4-2, arrow A for jack placement) .
- Place approved jack stands under rear axle (see Figure 4-2, arrow B for stand placement).
- Remove lug nuts of wheel assembly needing maintenance.

4.14 Rear Hub / Brake Drum Assembly

To remove the rear hub and brake drum assembly, follow the maintenance steps for the rear wheel assembly removal before beginning the next steps. Figure 4-8 illustrates the process for the rear hub/ brake drum assembly.

- Remove dust cap (1) by lightly tapping with a rubber hammer.
- Remove cotter pin (2), castle nut (3) and washer (4).
- Grasp front hub (7) and drum (8) and pull outward firmly. Ensure that bearing (5) doesn't fall from hub and strike the ground.
- Remove bearing (5), seal (11), and bearing (10) from the rear hub (7).
- Using a suitable H-frame press, remove bearing races (6) and (9).
- Remove drum (8) by pressing out wheel studs (12) in suitable H-frame press.
- Replace components and grease bearings before reassembly.
- Reassemble in reverse order. Castle nut (3) should be tightened until the hub assembly rotates barely past free.

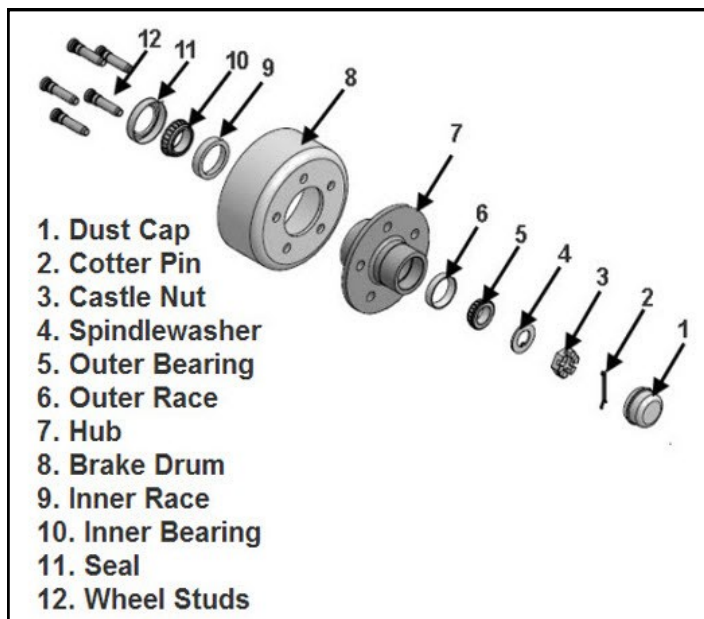


Figure 4-8 Rear Hub and Brake Drum

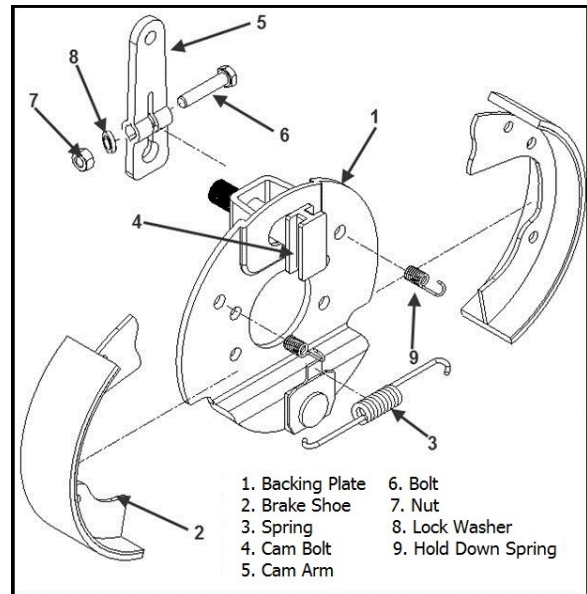


Figure 4-9 Mechanical Brake

4.15 Mechanical Brake Assembly

The assembly can be disassembled while attached to the rear spindle or removed from the unit. See Figure 4-9.

- Remove Rear Wheel Assembly as described in section 4.13.
- Remove Rear Hub and Brake Drum Assembly as described in section 4.14.
- Remove brake cable end from arm (5) as described in section Section 4.17, step (a).
- Remove nuts (12), washers (13), and bolts (14) shown in Figure 4-9
- Remove Mechanical Brake Assembly and place on flat surface.
- Remove spring (3).
- Release brake shoes (2) by removing springs (9) from the backing plate (1).
- Remove nut (7), lock washer (8), and bolt (6) to release arm (5).
- Remove brake cam (4) by pulling directly outward.

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

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



4.18 Rear Undercarriage Assembly

To remove the entire Rear Undercarriage assembly, the equipment must have the back end raised. See Sections 4.12, and 4.13 with Figure 4-11.

- Raise equipment with suitable maintenance jack (see Figure 4-11 reference arrow A for jack placement) and allow for 2-inches of space between the wheels and the ground.
- Place cribbing under tank skids to safely support the equipment. (see Figure 4-11, reference points labeled with a C).
- Lower onto cribbing. Leave jack in place.
- Disconnect parking brake cables at mechanical brake assembly in Section 4.15, step (a).
- Raise jack to apply slight pressure on assembly.
- Remove mounting nuts and bolts from both sides of axle assembly.
- Carefully lower jack and assembly until wheels are on the ground and the front axle tube clears tank mounts.

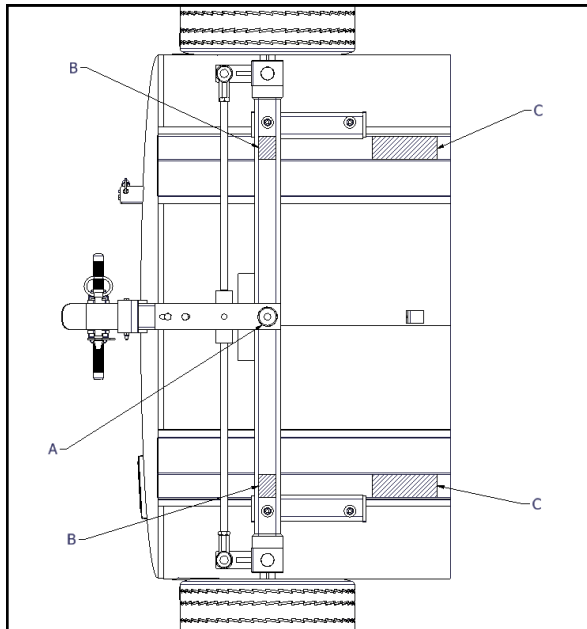


Figure 4-11 Lift Points

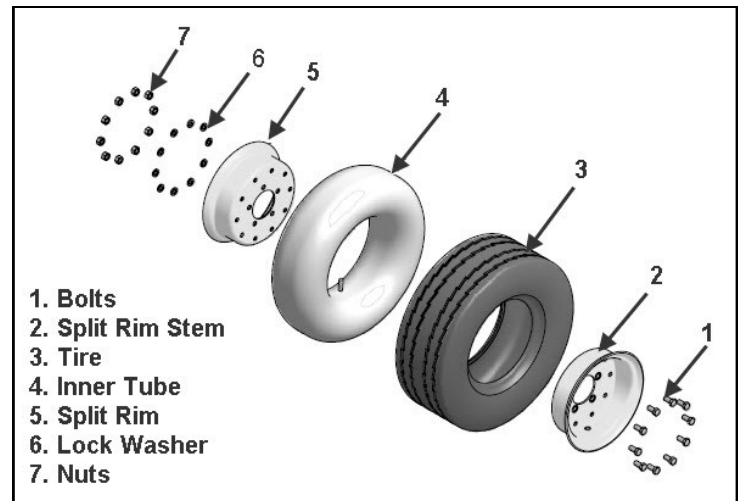


Figure 4-12 Wheel Assembly

4.19 Wheel Assembly

The Wheel assembly is a two-piece, split rim design. Use Figure 4-12 and sections 4.12 and 4.13 for the following maintenance steps.

- Remove wheel assembly as described in Section 4.5 for the side needing repair.
- Release air pressure from the inner tube by depressing stem valve or by removing the stem valve.
- Remove nuts (7), lock washers (6), and bolts (1).
- Separate split-rims (2) and (5) from tire (3).
- Remove inner tube (4) from tire (3). When reassembling, make sure that the inner tube stem is positioned through access hole in split rim.
- Torque split rim nuts (7) to 75-foot-pounds before applying air pressure to tire.
- Torque lug nuts to 100-foot-pounds.

⚠ WARNING

Disconnect all electrical connections to the unit (batteries, battery charger, tow vehicle) before performing any of the steps described here. Flammable liquids and vapors can be ignited by accidental electrical arcs. Serious injury or death could result.

Drain all flammable liquids from the tank and plumbing system before performing any of the steps described here. Flammable liquids and vapors pose a fire danger that could result in serious injury or death.

4.20 Removing the Fuel Pump

- Remove electrical leads from pump motor. The cover plate is located in back of the pump motor and the conduit is located in front of the pump motor.
- Remove the two bolts connecting the fuel meter (6) to the pump-to-meter line (9).
- Remove the pump to meter line (9).
- Remove the four bolts at the bottom of the pump mounting plate.
- Remove the threaded hose from the pump's inlet.

4.21 Removing the Fuel Meter

- Remove the two bolts connecting the fuel meter (6) to the pump-to-meter line (9).
- Remove the four bolts connecting the fuel meter (7) to the back of the pump.

4.22 Removing the Filter Housings

- Remove the Victaulic fitting on the left side of the housing filter.
- Unthread the recirc valve (8).

4.23 Removing the 4-Way Selection Valve

- Remove fuel meter (6) as described in Section 4.20.
- Remove the valve-to pump line (2).
- Remove the valve-to-pump line threaded Victaulic fitting at the elbow next to the 4-way selection valve. (10)
- Remove the tank-to-valve line (5) Victaulic fitting at the elbow next to the selection valve.

- Remove the U-bolt (not shown) that secures the remaining assembly to the frame.
- Using a pipe wrench and a bench vise, Remove remaining components.

4.24 Removing the Hose Reel

- Remove all items connected to mounting bracket (12) and remove bracket.
- Remove valve-to-reel line. (7)
- Remove the quick disconnect from the fueling nozzle (14).

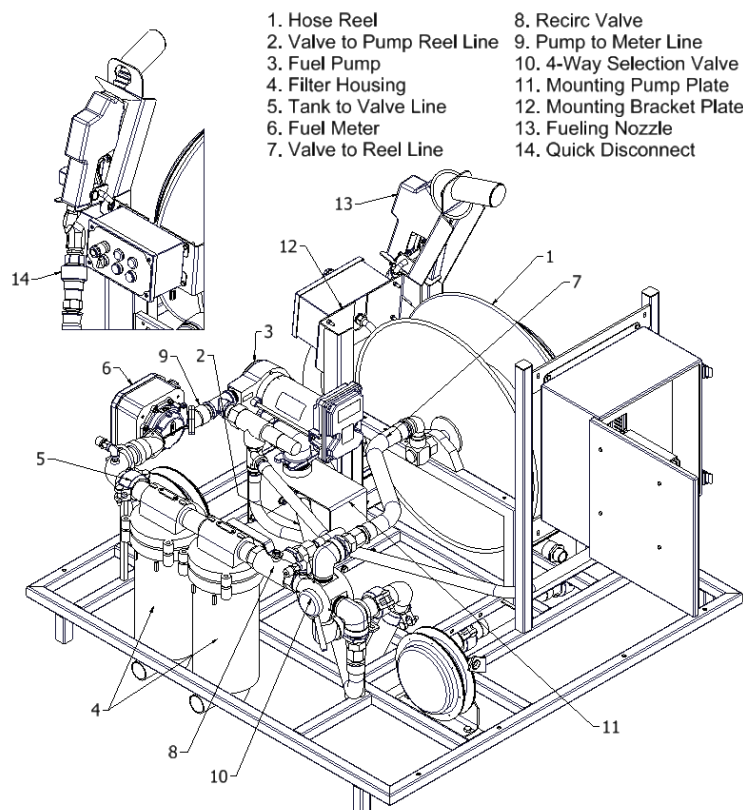


Figure 4-13 Pump Module

4.25 Pump Strainer Removal and Cleaning

This pump is designed for minimum maintenance. Motor bearings are sealed and require no lubrication. Inspect the pump and components regularly for fuel leaks and make sure the hose and power cord are in good condition. Keep the pump exterior clean to help identify leaks.

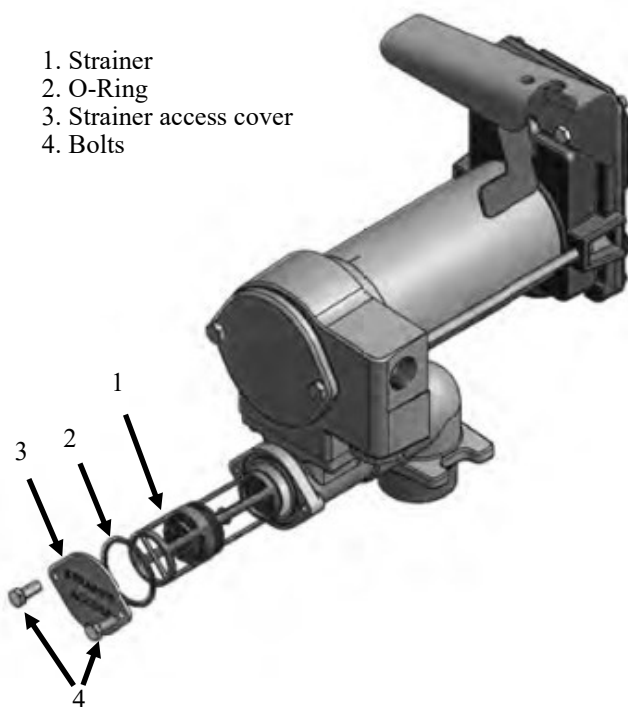
Do not use this pump for water, chemicals or herbicides. Dispensing any fluid other than those listed in this manual will damage the pump. Use of the pump with unauthorized fluids will void the warranty.

To Clean or Replace Strainer

All pump models have an inlet strainer. If flowrate is reduced, clean or replace strainer (see below)

Turn the pump off and disconnect from power. Depending on the model, remove and clean the strainer with a soft-bristled brush and solvent. If the strainer is very dirty, compressed air may be used. If damaged, replace the strainer. Replace components making sure that they are seated and fasteners are tightened securely.

1. Strainer
2. O-Ring
3. Strainer access cover
4. Bolts



**Figure 4-14. Manufacturer's Pump Strainer Removal
(Great Plains MODEL M-3025CB-AV Fuel Pump)**



Figure 4-15. Clogged Pump Strainer

4.26 Changing Fuel Filter Elements

The fuel filter elements should be replaced whenever fuel flow is restricted or at least once per year. The following steps describe how to replace the fuel filter. See Figure 4-14.

- a. Drain filter housing by opening the top and bottom petcock valves.
- b. Remove the four bolts that secure the filter canister to the filter housing.
- c. Pull downward on the filter element.
- d. Replace O-ring (not shown.)
- e. Install new filter element in reverse order.
- f. Close bottom petcock valve.
- g. Jog pump to purge air.
- h. Close top petcock valve.

4.27 Changing Operator Console Indicator Lights

The only maintenance activity for the operator console is to change out indicator lights.

- a. Identify the indicator light that needs to be removed.
- b. Rotate lens counterclockwise and remove.
- c. Remove circular diffuser disk (plastic) from housing.
- d. Remove and replace light bulb.

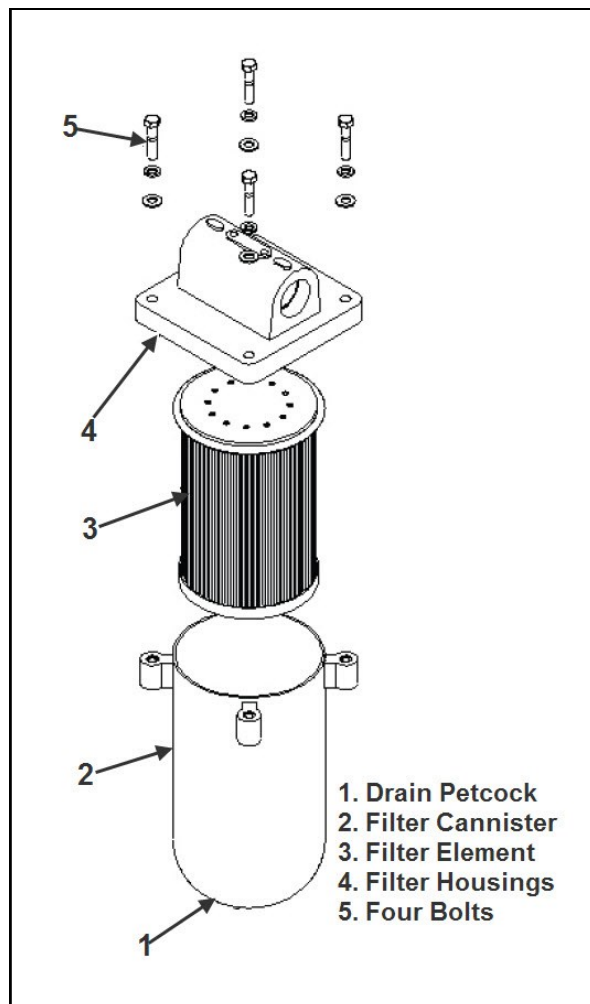


Figure 4-16 Fuel Filters

4.28

Troubleshooting the M600-RFOS

| Problem | Probable Cause | Corrective Action |
|---|--|--|
| Threaded Connection leaking weeping | Loose fitting, bad seal, damaged fitting | Use Section 4.2 To fix condition |
| Valve Leaking, weeping, or doesn't operate | Internal damage to valve's ball, stem, or seat | Replace valve using section 4.2 |
| Manway won't seal | Manway Assembly is out of adjustment or seal is damaged | Adjust manway assembly using section 4.3 |
| Low/ No discharge pressure at fuel nozzle | Low battery charge Fuel filter(s) restricted Tank-to-Pump valve partially open Pump strainer is blocked | Charge batteries Inspect and replace if needed Ensure valve is open (handle vertical) See section 4.25 |
| Low/ No Defueling Capability | Low battery charge Fuel filter(s) restricted Tank-to-Pump valve partially open Pump strainer is blocked | Charge batteries Inspect and replace if needed Ensure valve is open (handle vertical) See section 4.25 |
| 12 Volt pump – weak or will not work | Low/ No battery charge Battery terminals/ cables corroded Battery Cell(s) fluid low Main Power switch in OFF position Pump has internal damage Pump has reached duty cycle Circuit breaker has tripped | Fully charge batteries Inspect & clean, replace if necessary Service cell(s) with distilled water Turn Main Power switch ON Replace pump Wait 30 minutes and retry Wait 30 minutes and retry |
| Fuel Meter has no indication of flow | Main pump not turned ON Main tank empty Fuel Meter internally broken | Turn ON pump Load fuel into tank Replace fuel meter |
| Wheels won't steer properly | Steering arm assembly is damaged or tie rod assembly is damaged or misadjusted. | Inspect and repair when needed using Sections 4.9 and 4.10. |
| Wheels wobble or drag while rolling | Wheel bearings are damaged or loose | Inspect and Repair if needed |
| Towbar won't lock in upright position | Tow latch spring, damaged or missing | Inspect and replace when necessary |
| Brakes don't secure unit while engaged. | Brakes are out of adjustment parking brake assembly is damaged or missing | Adjust brakes or adjust and repair using sections 4.15, 4.16 and 4.17. |

SECTION 5.0

PART BREAKDOWN DRAWINGS AND PART NUMBERS

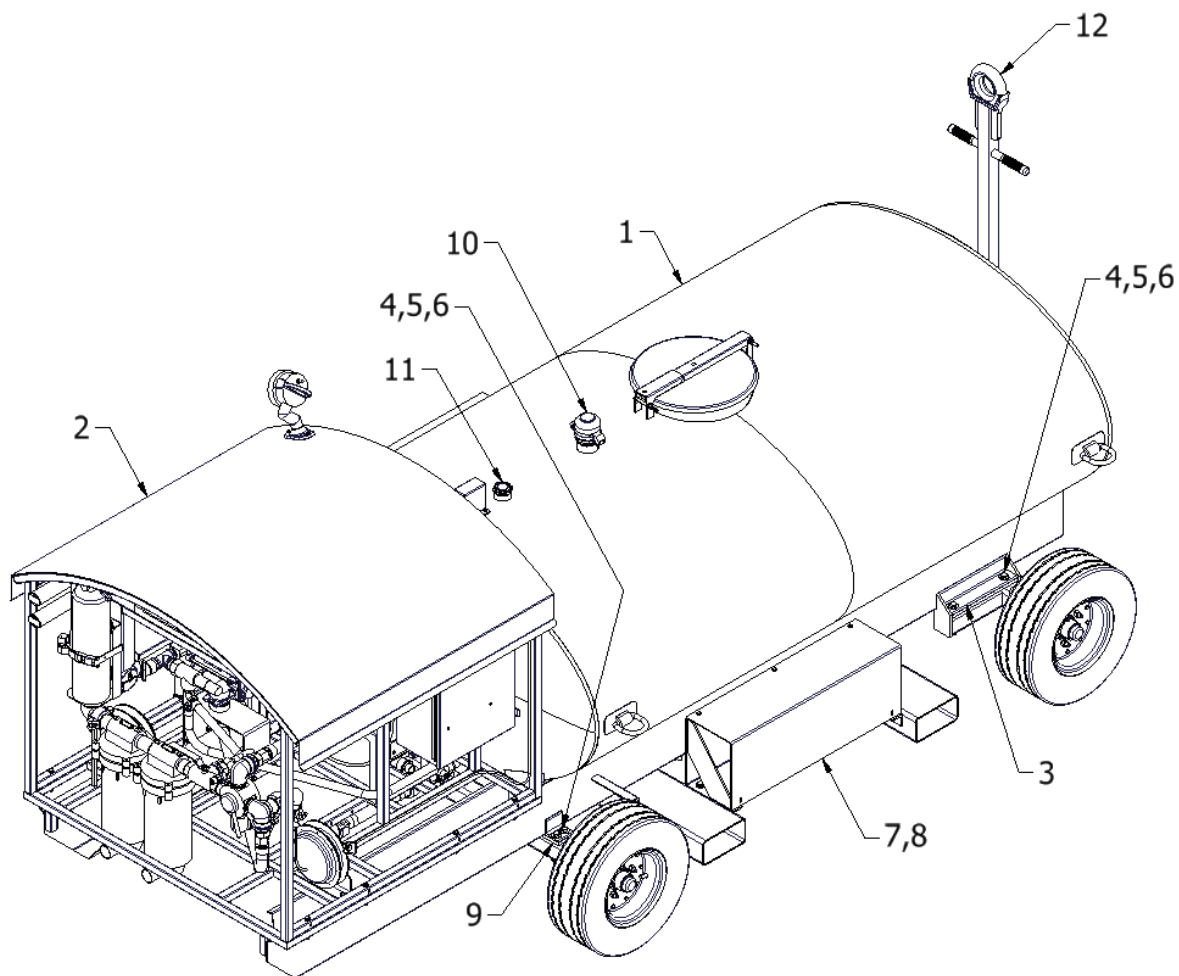
The following figures are supplied to assist in component identification and parts reordering. When reordering, ensure the complete model number and serial number are provided to the sales representative.

You may access customer service by contacting Spokane Stainless Technologies at 509-921-8850. If you would like more information about Spokane Stainless Technologies you may visit the website at:

www.spokanestainless.com.

DRAWING NUMBER

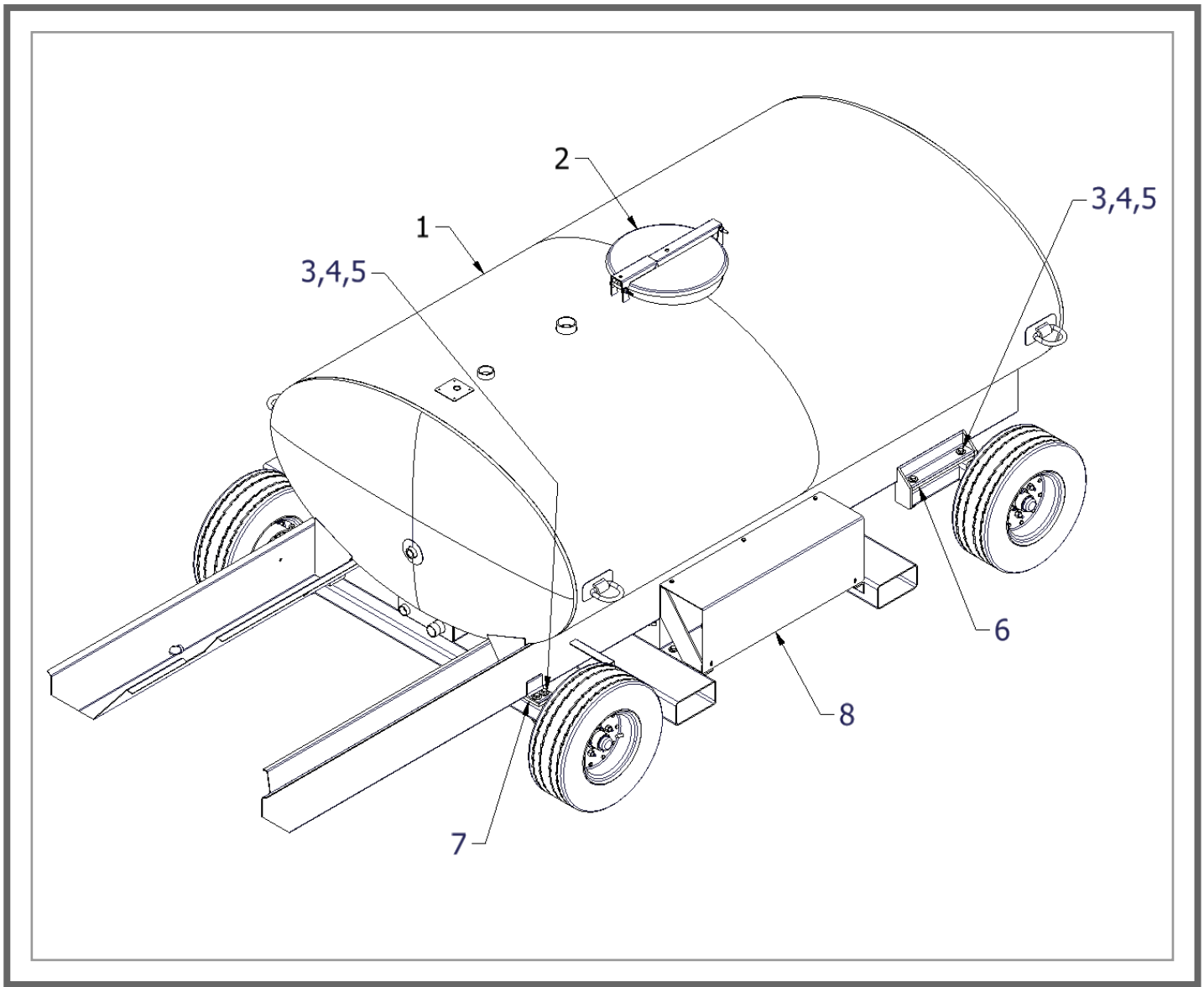
- 1.0 Overview, Component Identification**
- 2.0 Overview, Component Identification (Tank)**
- 3.0 Pump Components**
- 4.0 Manway Assembly**
- 5.0 Front Undercarriage**
- 6.0 Rear Undercarriage and Axle**
- 7.0 Front Hub Assembly**
- 8.0 Rear Hub & Drum Assembly**
- 9.0 Wheel & Tire Assembly**



DRAWING 1.0

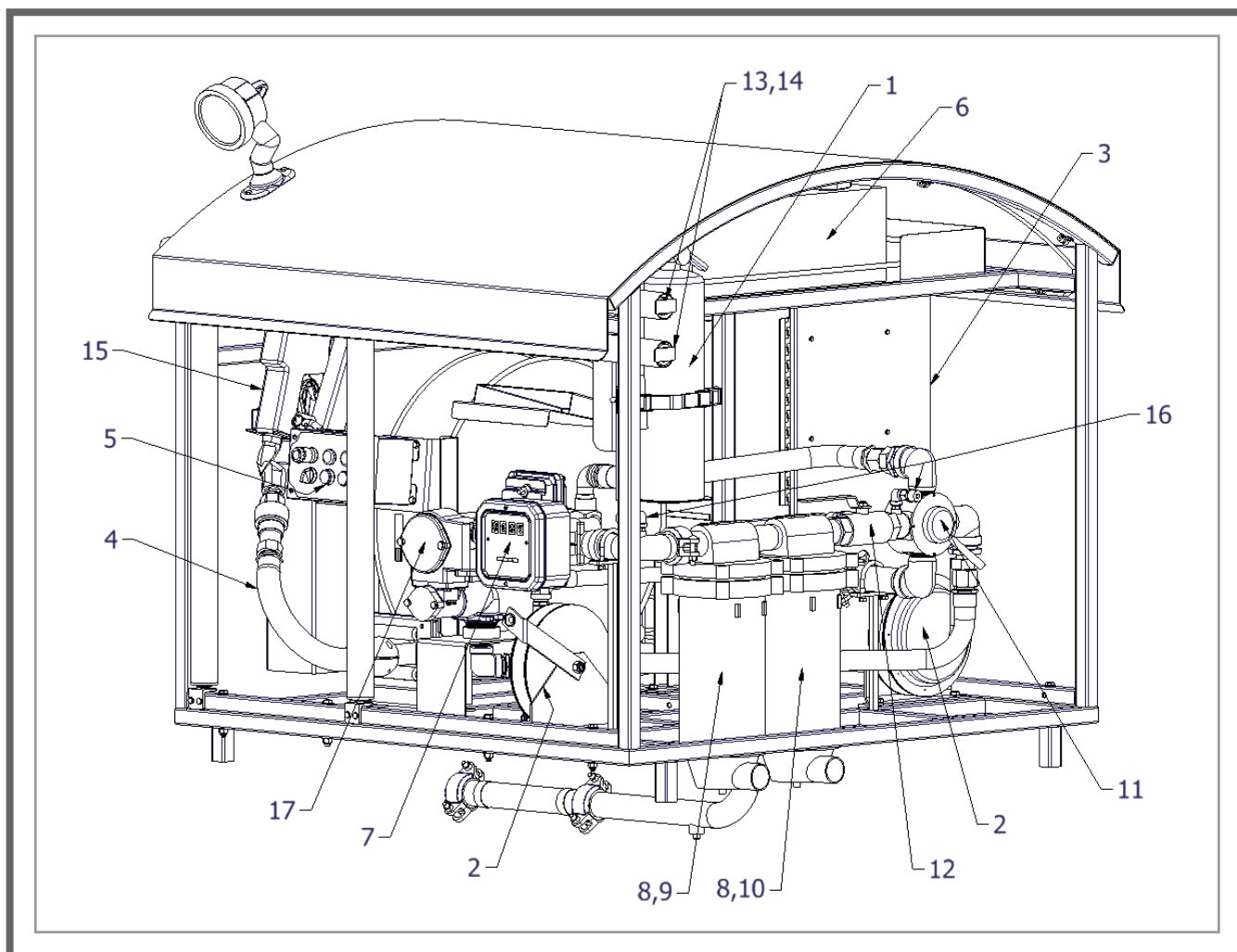
Overview Component Identification

| ITEM | QTY | P.N. | DESCRIPTION | MATERIAL | WEIGHT |
|------|-----|-----------|------------------------------|-----------------|----------|
| 1 | 1 | 07-9029 | Tank Weldment 600 Gallon | Various | 1852 lb. |
| 2 | 1 | 25-0003 | Pump Module Assembly | Various | 788 lb. |
| 3 | 2 | 06-1023 | Mounting Pad | Rubber | 1 lb. |
| 4 | 8 | 02-3025 | Bolt, 1/2-IN x 4-1/2-IN LG | Stainless Steel | 0 lb. |
| 5 | 16 | 02-3125 | Washer, 1/2-IN | Stainless Steel | 0 lb. |
| 6 | 8 | 02-3087 | Nut, Nylon Insert, 1/2-IN-13 | Stainless Steel | 0 lb. |
| 7 | 1 | 07-5510 | Dual Battery Enclosure | Various | 48 lb. |
| 8 | 2 | 04-8050 | Battery | Various | 60 lb. |
| 9 | 2 | 06-1012 | Rear Mount Pad | Rubber | 0 lb. |
| 10 | 1 | 04-01545 | Tank Vent / Fill Cap, 2-IN | | 0 lb. |
| 11 | 1 | 04-8007 | Liquid Level Gauge | Various | 0 lb. |
| 12 | 1 | 07-1103-1 | Weldment, Tow Bar | | 34 lb. |



DRAWING 2.0 **Overview, Component Identification (Tank)**

| ITEM | QTY | P.N. | DESCRIPTION | MATERIAL | WEIGHT |
|------|-----|----------|------------------------------|-----------------|----------|
| 1 | 1 | 07-9029 | Tank Weldment 600 Gallon | Various | 1852 lb. |
| 2 | 1 | 08-10251 | Cross Arm and Lid Assembly | Various | 12 lb. |
| 3 | 8 | 02-3025 | Bolt, 1/2-IN x 4-1/2-IN LG | Stainless Steel | 0 lb. |
| 4 | 16 | 02-3125 | Washer, 1/2-IN | Stainless Steel | 0 lb. |
| 5 | 8 | 02-3087 | Nut, Nylon Insert, 1/2-IN-13 | Stainless Steel | 0 lb. |
| 6 | 2 | 06-1023 | Mounting Pad | Rubber | 1 lb. |
| 7 | 2 | 06-1012 | Rear Mount Pad | Rubber | 0 lb. |
| 8 | 1 | 07-5510 | Dual Battery Enclosure | Various | 48 lb. |

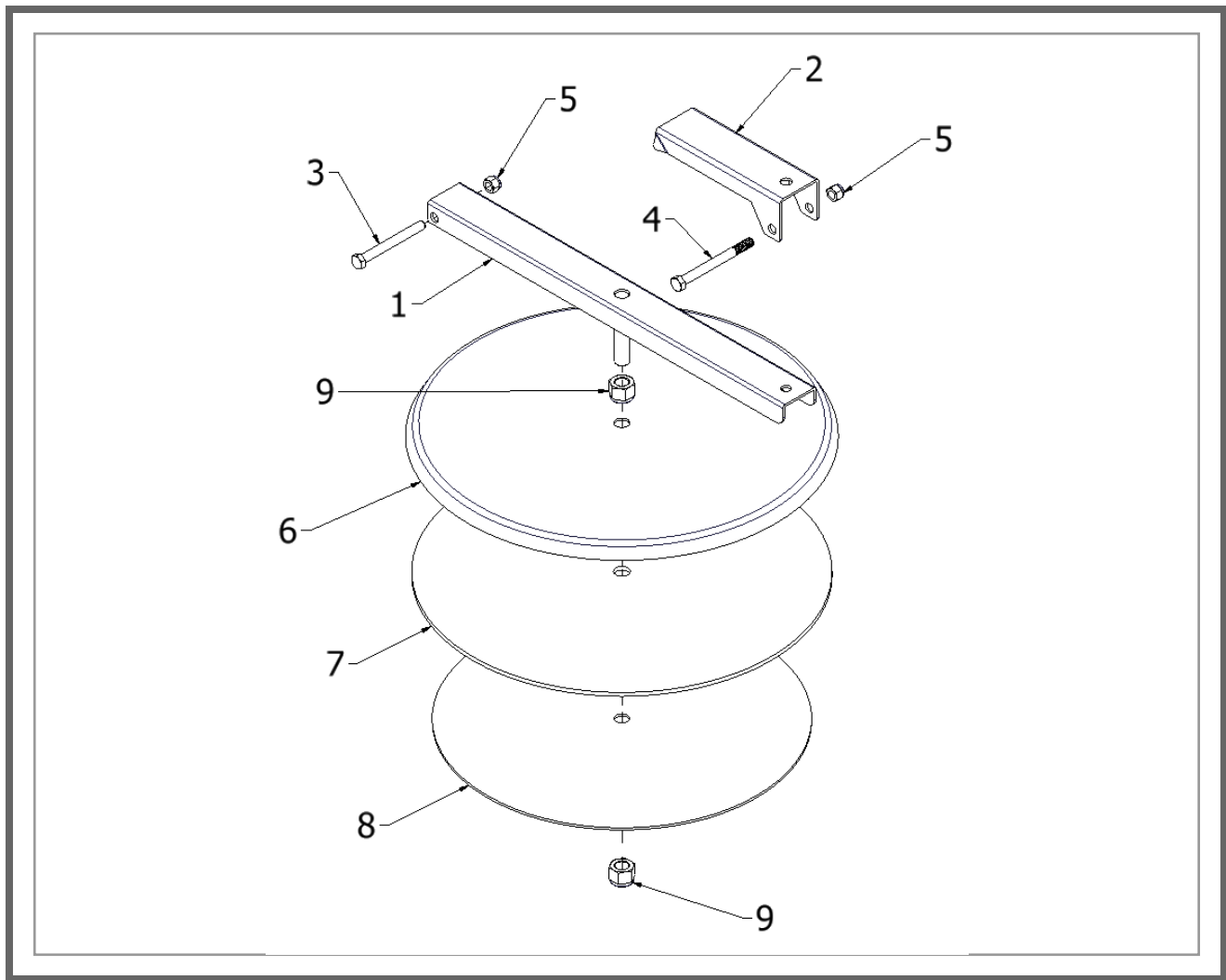


Drawing 3.0

Pump Components

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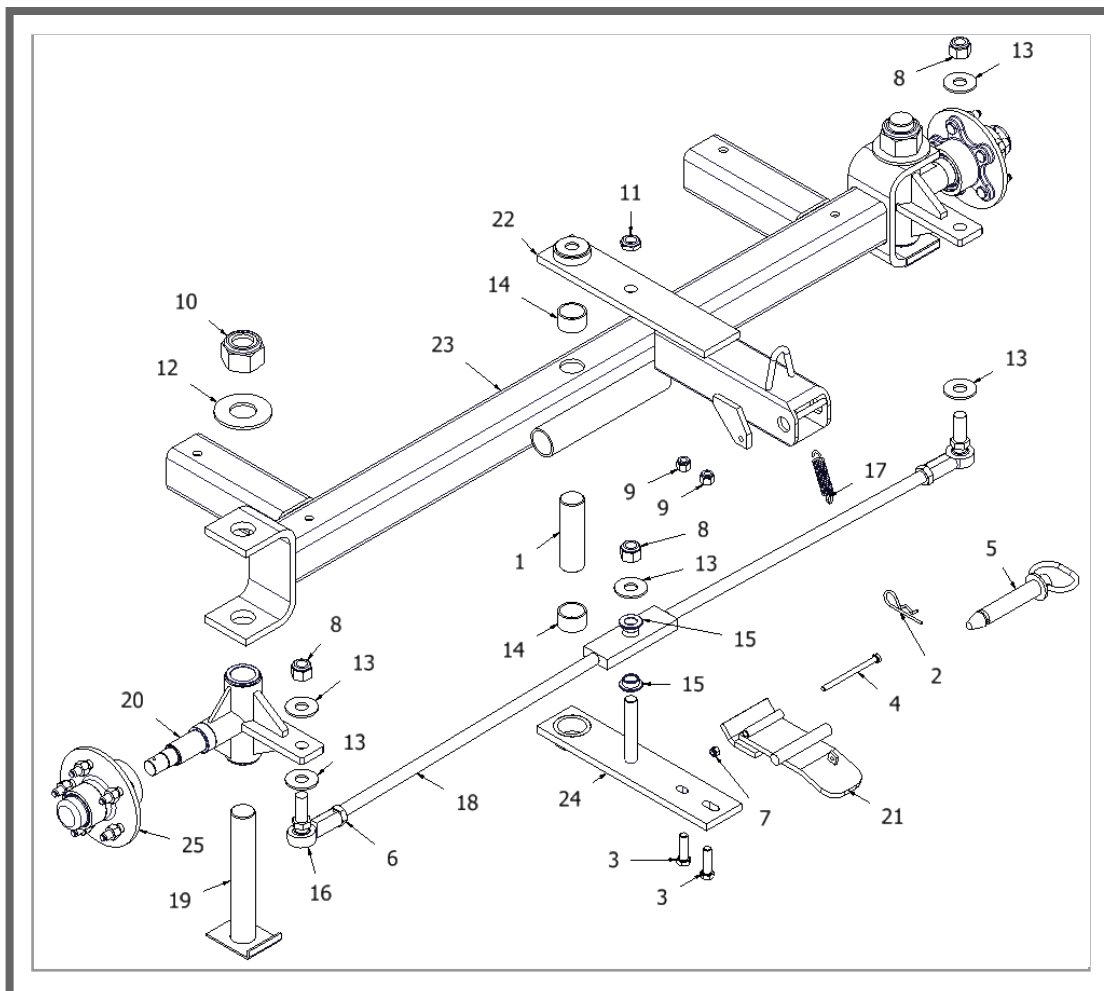
| ITEM | QTY | P.N. | DESCRIPTION |
|------|-----|-------------|---|
| 1 | 1 | 04-0702 | Fire Ext. 5# Purple K |
| 2 | 2 | 04-10362 | Grounding Reel, Red, Plug and Clamp |
| 3 | 1 | 15-00162 | Electrical Box Assembly |
| 4 | 1 | 25-5019 | Hose Asm., 1-IN x 50-FT |
| 5 | 1 | 15-00110 | Operator's Console |
| 6 | 1 | 04-8025 | Spill Response Kit |
| 7 | 1 | 04-8063 | Fuel Meter |
| 8 | 2 | 04-8043 | Filter Housing |
| 9 | 1 | 04-80212 | Filter Element, Facet #CC-22-7, Coalescer CRT, Fits VF-22SB |
| 10 | 1 | 04-80213 | Filter Element, Facet #FG-0-612-2, FG Monitor CRT, Fits VF-22SB |
| 11 | 1 | 04-10310 | Valve, 4-Way Lever Operated, 1- 1/2-IN. Ports |
| 12 | 1 | 04-10350 | Valve, Ball, 3-Way, 1 1/2-IN NPT |
| 13 | 1 | 25-0003-012 | Weldment, Lower Storage Tube, Suction Wand |
| 14 | 1 | 25-0003-013 | Weldment, Upper Storage Tube, Suction Wand |
| 15 | 1 | 04-8162 | Nozzle, Automatic Shut-off .83-inch, 1-IN FNPT |
| 16 | 2 | 04-8040 | Sample Port |
| 17 | 1 | 04-8061 | Pump, Fuel, 12VDC, 25GPM, 35 AMP |
| -18 | 2 | 04-0469 | ASM, CABLE, STATIC DRAIN |



Drawing 4.0

Manway Assembly

| ITEM | QTY | P.N. | DESCRIPTION |
|------|-----|----------|--|
| 1 | 1 | 07-1039S | Cross Arm |
| 2 | 1 | 01-8222S | Flip Lock |
| 3 | 1 | 02-3044 | Hex Hd. Capscrew, NC, 3/8" by 3-1/2" LG |
| 4 | 1 | 02-3045 | Hex Hd. Capscrew, NC, 3/8" by 4" LG |
| 5 | 2 | 02-3089 | Nut, Nylon Insert, 3/8-16 (AP) |
| 6 | 1 | 01-86001 | Manway Lid, 16" Diameter w/ Thru Hole |
| 7 | 1 | 06-25025 | Manway Gasket, 16" Standard, 3/16" Thk, Buna |
| 8 | 1 | 07-2303 | Retainer Gasket |
| 9 | 2 | 02-3091 | Nut, Nylock, NF, 5/8"-18 |

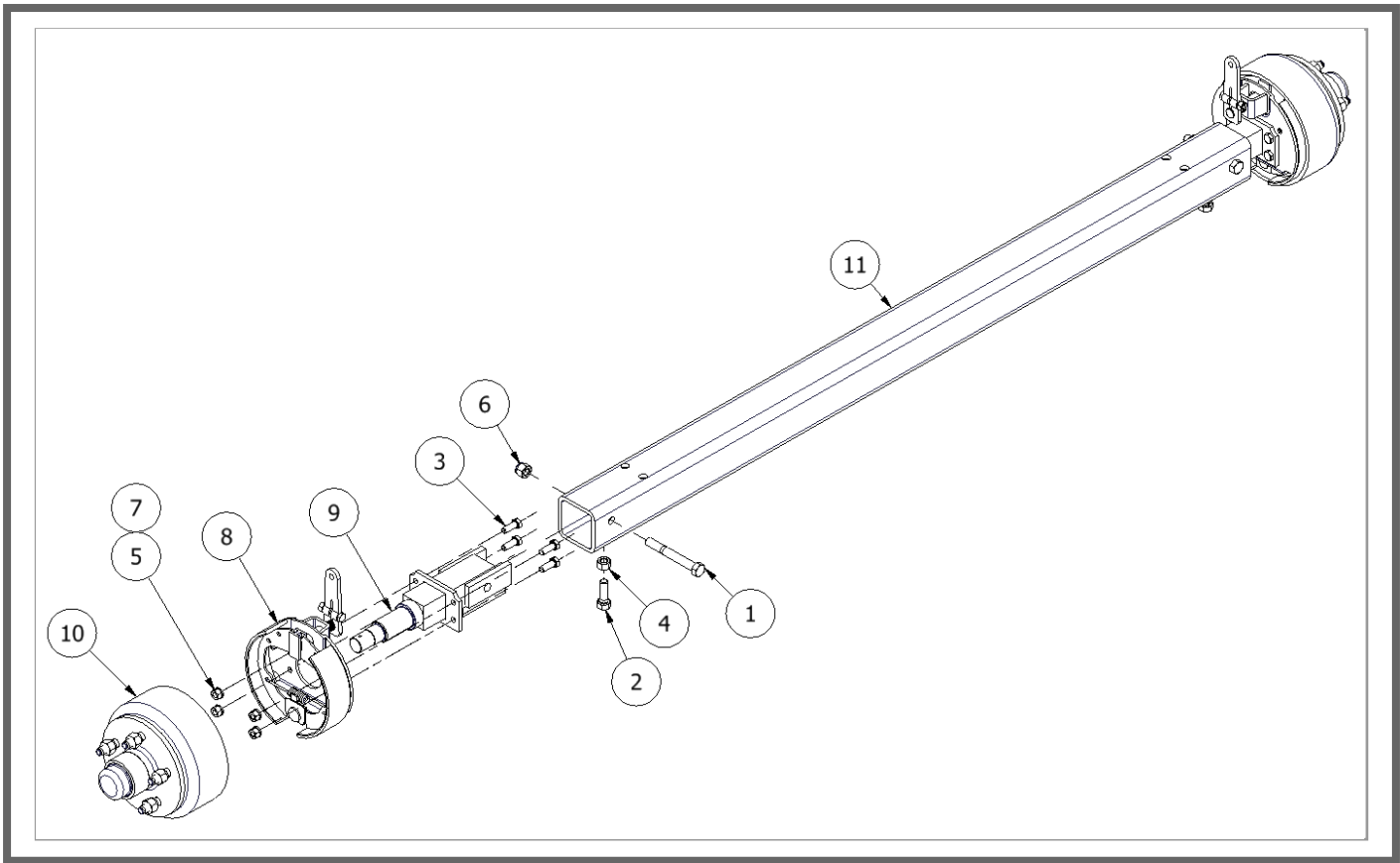


Drawing 5.0

Front Undercarriage

| ITEM | QTY | P.N. | DESCRIPTION |
|------|-----|---------|--|
| 1 | 1 | 01-8414 | PIVOT PIN, FRONT AXLE |
| 2 | 1 | 02-3016 | HITCH PIN CLIP |
| 3 | 2 | 02-3022 | HEX HD CAPSCREW, NC, 1/2-IN BY 1 3/4-IN, GRD 5, PLATED |
| 4 | 1 | 02-3055 | HEX HD CAPSCREW, NC, 5/16-IN BY 4 1/2-IN LG, PLATED |
| 5 | 1 | 02-3063 | HITCH PIN, 1-IN BY 4 1/2-IN LG, PLATED |
| 6 | 2 | 02-3081 | NUT, JAM, UNF, 3/4-IN-16, PLATED |
| 7 | 1 | 02-3082 | NUT, NYLOCK, NC, 5/16-IN-18 |
| 8 | 3 | 02-3083 | NUT, NYLOCK, NF, 3/4-IN-16 |
| 9 | 2 | 02-3087 | NUT, NYLOCK, NC, 1/2-IN-13, FIN, PLATED |
| 10 | 2 | 02-3093 | NUT, NYLOCK, UNF, 1 1/2-IN-12, FIN |
| 11 | 1 | 02-3094 | NUT, NYLOCK, NF, 3/4-IN-16, FIN, THIN |
| 12 | 2 | 02-3127 | WASHER, FLAT, 1 1/2-IN, PLATED |

| ITEM | QTY | P.N. | DESCRIPTION |
|------|-----|----------|---------------------------------------|
| 13 | 5 | 02-3131 | WASHER, FLAT, 3/4-IN, PLATED |
| 14 | 2 | 03-1014 | BUSHING, STEERING ARM |
| 15 | 2 | 03-1015 | BUSHING, TIE ROD, PIVOT POINT |
| 16 | 2 | 03-1016 | ROD END, BALL JOINT LINKAGE |
| 17 | 1 | 04-1054 | SPRING, TOW LATCH |
| 18 | 1 | 07-1005 | TIE ROD ASSEMBLY, 400/600 GALLON |
| 19 | 2 | 07-10105 | KING PIN |
| 20 | 2 | 07-1015 | ASM., KING PIN |
| 21 | 1 | 07-1020 | TOW LATCH WMT, ALL SIZES |
| 22 | 1 | 07-1104 | STEERING ARM, UPPER, 400 & 600 GALLON |
| 23 | 1 | 07-11071 | FRONT AXLE WELDMENT, 400 & 600 GALLON |
| 24 | 1 | 07-5002 | STEERING ARM, LOWER PLATE, ALL SIZES |
| 25 | 2 | 08-1011 | FRONT HUB ASSEMBLY |

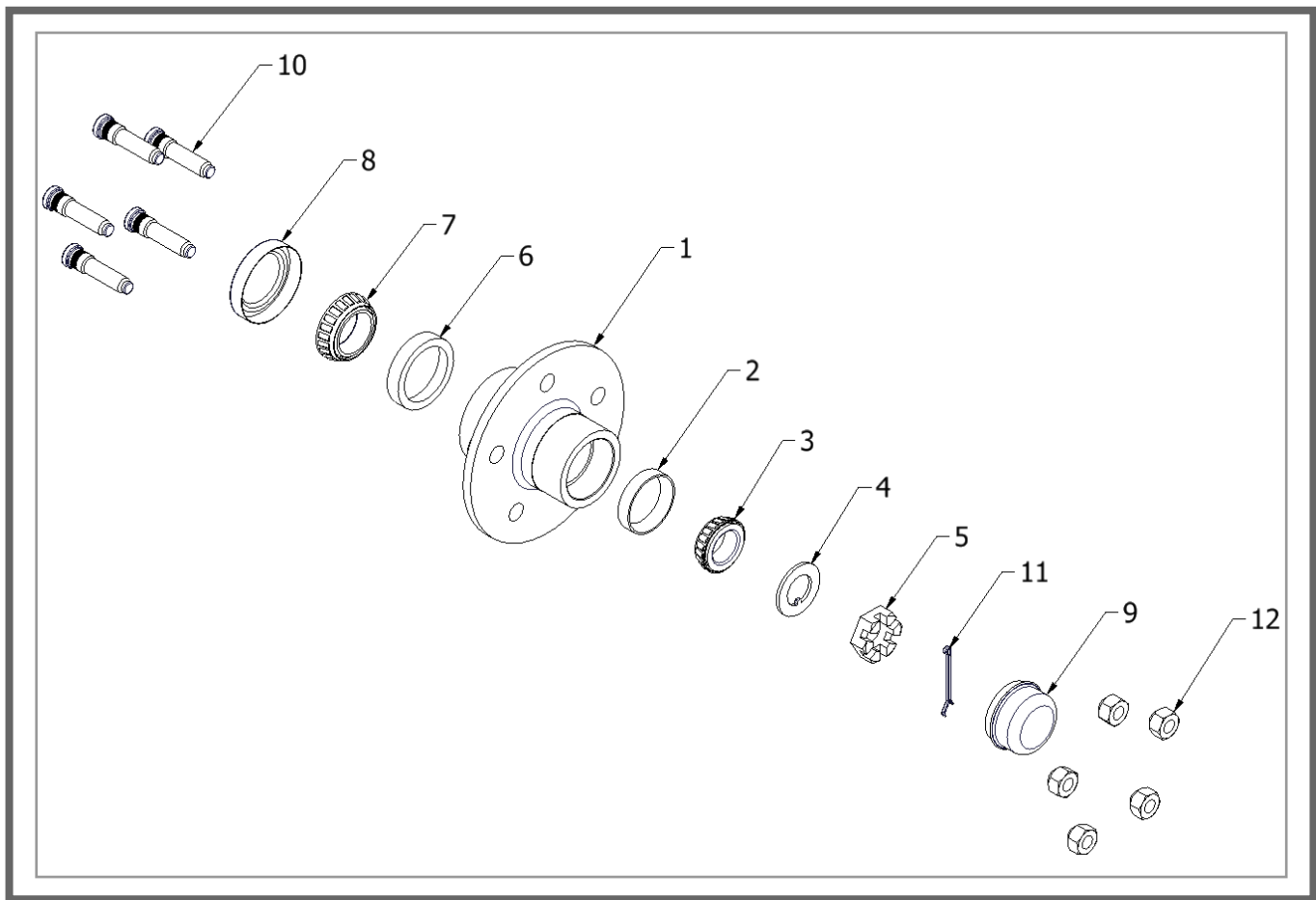


Drawing 6.0

Rear Undercarriage and Axle

| ITEM | QTY | P.N. | DESCRIPTION |
|------|-----|------------|--|
| 1 | 2 | 02-3024 | HEX HD CAPSCREW, NC, 1/2-INCH BY 4-INCH, GRD 5, PLATED |
| 2 | 2 | 02-3026 | HEX HD CAPSCREW, NC, 1/2-INCH BY 1 1/2-INCH, GRD 5, PLATED |
| 3 | 8 | 02-3050 | HEX HD CAPSCREW, NC, 3/8-INCH BY 1-INCH, GRD 5, PLATED |
| 4 | 2 | 02-3068 | NUT, HEX, 1/2"-13 UNC PLATED |
| 5 | 8 | 02-3072 | NUT, HEX, NC, 3/8-IN-16, FIN., PLATED |
| 6 | 2 | 02-3087 | NUT, NYLOCK, NC, 1/2-INCH-13, FIN., PLATED |
| 7 | 8 | 02-3143 | WASHER, MEDIUM LOCK, 3/8-INCH PLATED |
| 8 | 2 | 04-1063RBO | BRAKE ASSEMBLY |
| 9 | 2 | 07-1010 | REAR SPINDLE WELDMENT, REAR AXLE |
| 10 | 2 | 08-10111 | REAR HUB & DRUM ASSEMBLY |
| 11 | 1 | 08-103011 | REAR AXLE WELDMENT, 400 & 600 GALLON |

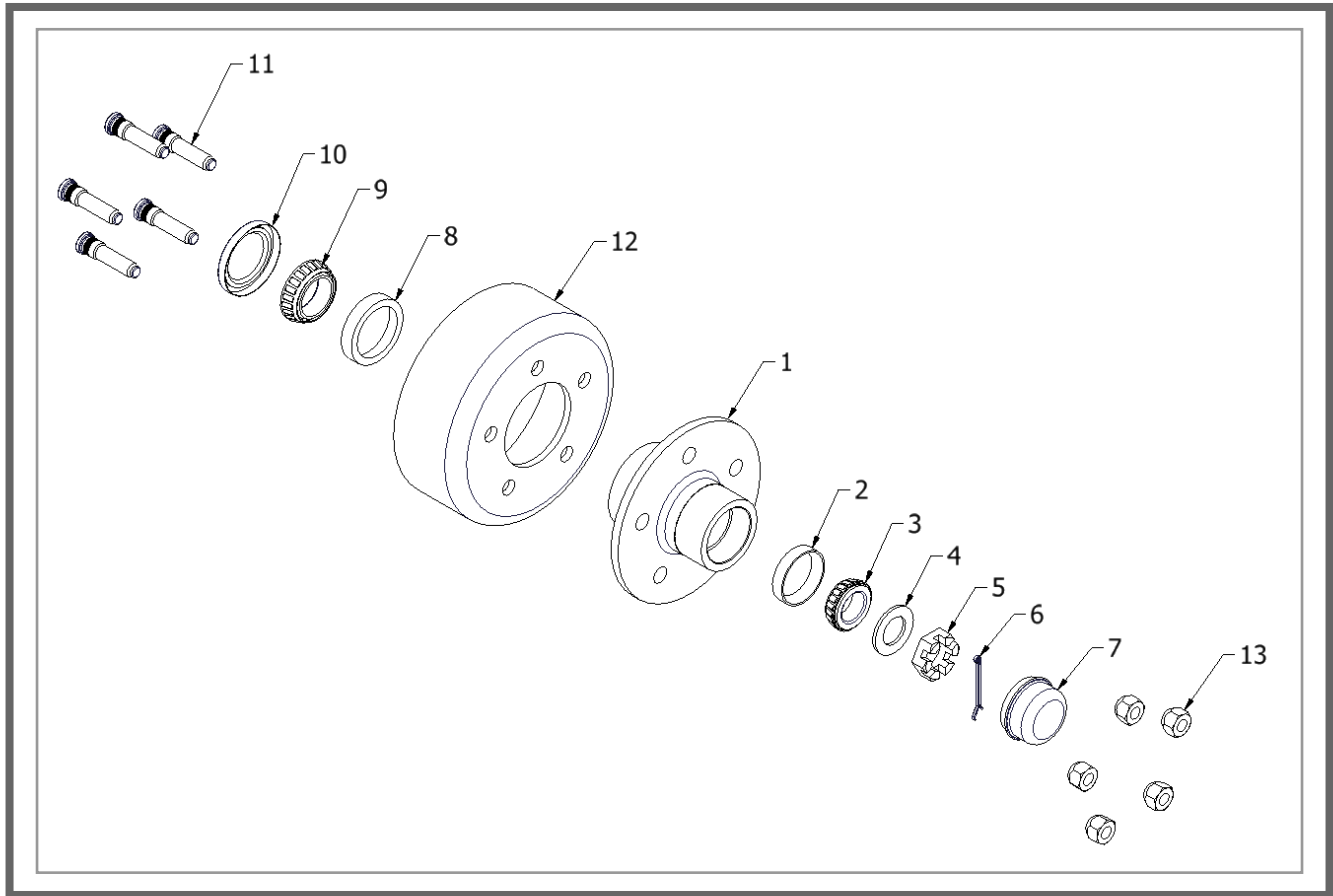
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Drawing 7.0

Front Hub Assembly

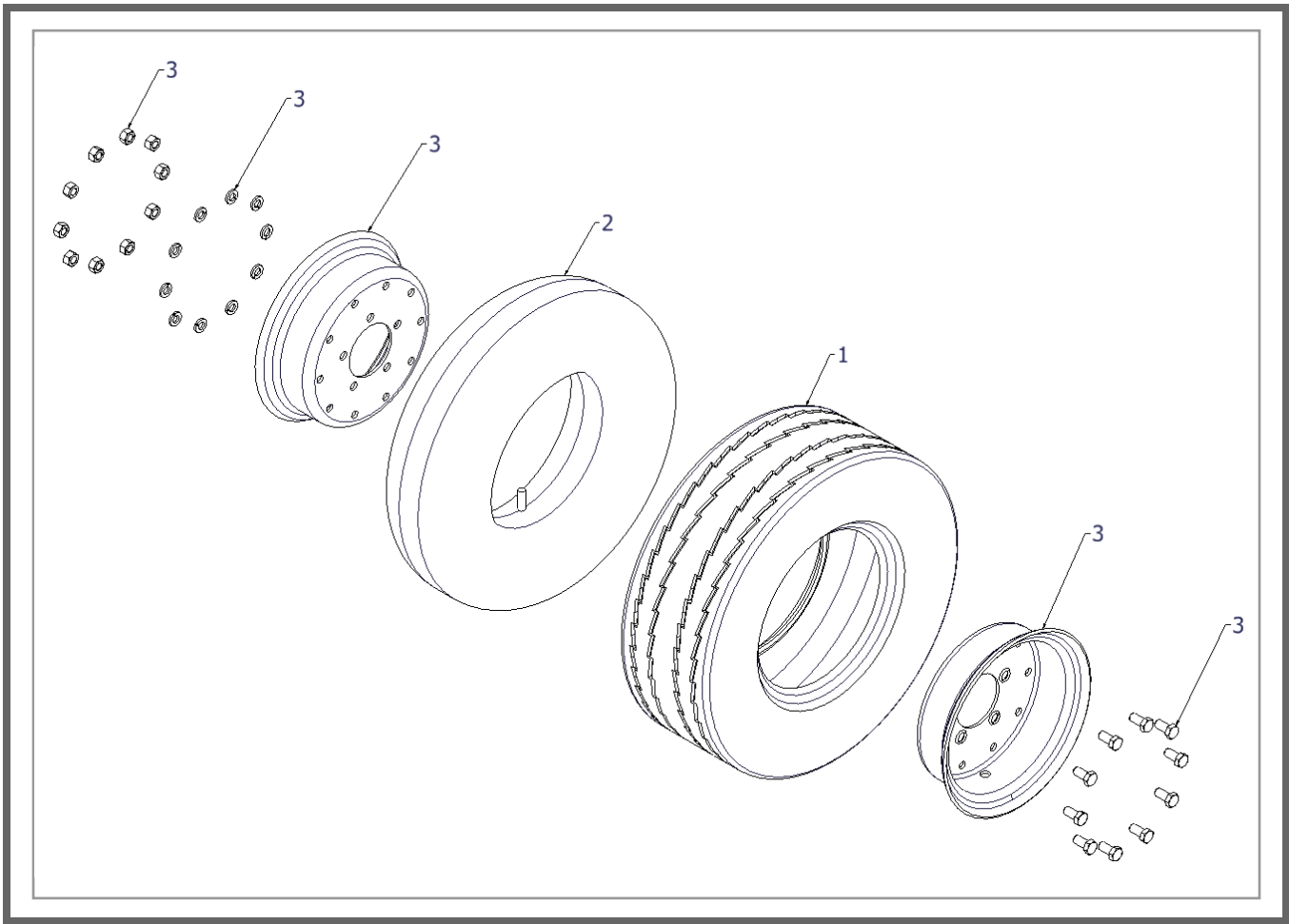
| ITEM | QTY | P.N. | DESCRIPTION |
|------|-----|----------|---------------------|
| 1 | 1 | 04-1017 | Hub, Front Axle |
| 2 | 1 | 04-1016 | Cup, Outer Bearing |
| 3 | 1 | 04-1014 | Cone, Outer Bearing |
| 4 | 1 | 02-12055 | Washer |
| 5 | 1 | 02-1205 | Nut, Castle |
| 6 | 1 | 04-1015 | Cup, Inner Bearing |
| 7 | 1 | 04-1013 | Cone, Inner bearing |
| 8 | 1 | 04-1012 | Seal bearing |
| 9 | 1 | 04-1019 | Cap, Hub |
| 10 | 5 | 02-1017 | Stud |
| 11 | 1 | 02-1303 | Pin, Cotter |
| 12 | 5 | 02-3065 | Nut, lug, 1/2" |



Drawing 8.0

Rear Hub and Drum Assembly

| ITEM | QTY | P.N. | DESCRIPTION |
|------|-----|----------|---------------------|
| 1 | 1 | 04-1017 | Hub, Rear Axle |
| 2 | 1 | 04-1016 | Cup, Outer Bearing |
| 3 | 1 | 04-1014 | Cone, Outer Bearing |
| 4 | 2 | 02-12055 | Washer |
| 5 | 1 | 02-1205 | Nut, Castle |
| 6 | 1 | 02-1303 | Pin, Cotter |
| 7 | 2 | 04-1019 | Cap, Hub |
| 8 | 2 | 04-1015 | Cup, Inner Bearing |
| 9 | 1 | 04-1013 | Cone, Inner bearing |
| 10 | 1 | 04-1012 | Seal, Bearing |
| 11 | 5 | 02-1303 | Stud |
| 12 | 1 | 08-10111 | Drum, Brake |
| 13 | 5 | 02-3065 | Nut Lug |



Drawing 9.0

Wheel and Tire Assembly

| ITEM | QTY | P.N. | DESCRIPTION |
|------|-----|----------|---------------------------------------|
| | 4 | 07-10201 | Complete Wheel Assembly (All Numbers) |
| 1 | 1 | 04-10221 | Tire, 20.5x 8.0-10, E-Range |
| 2 | 1 | 04-1045 | Inner Tube |
| 3 | 1 | 04-1020 | Split Rim Wheel Assembly |