TECHNICAL MANUAL

UAS 200-Gallon Cart

Spokane Industries

SPOKANE INDUSTRIES, INC.

MNUL-006 REV D

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SECTION

SECTION

Drawing No.

SECTION 1.0 INTRODUCTION

IMPORTANT

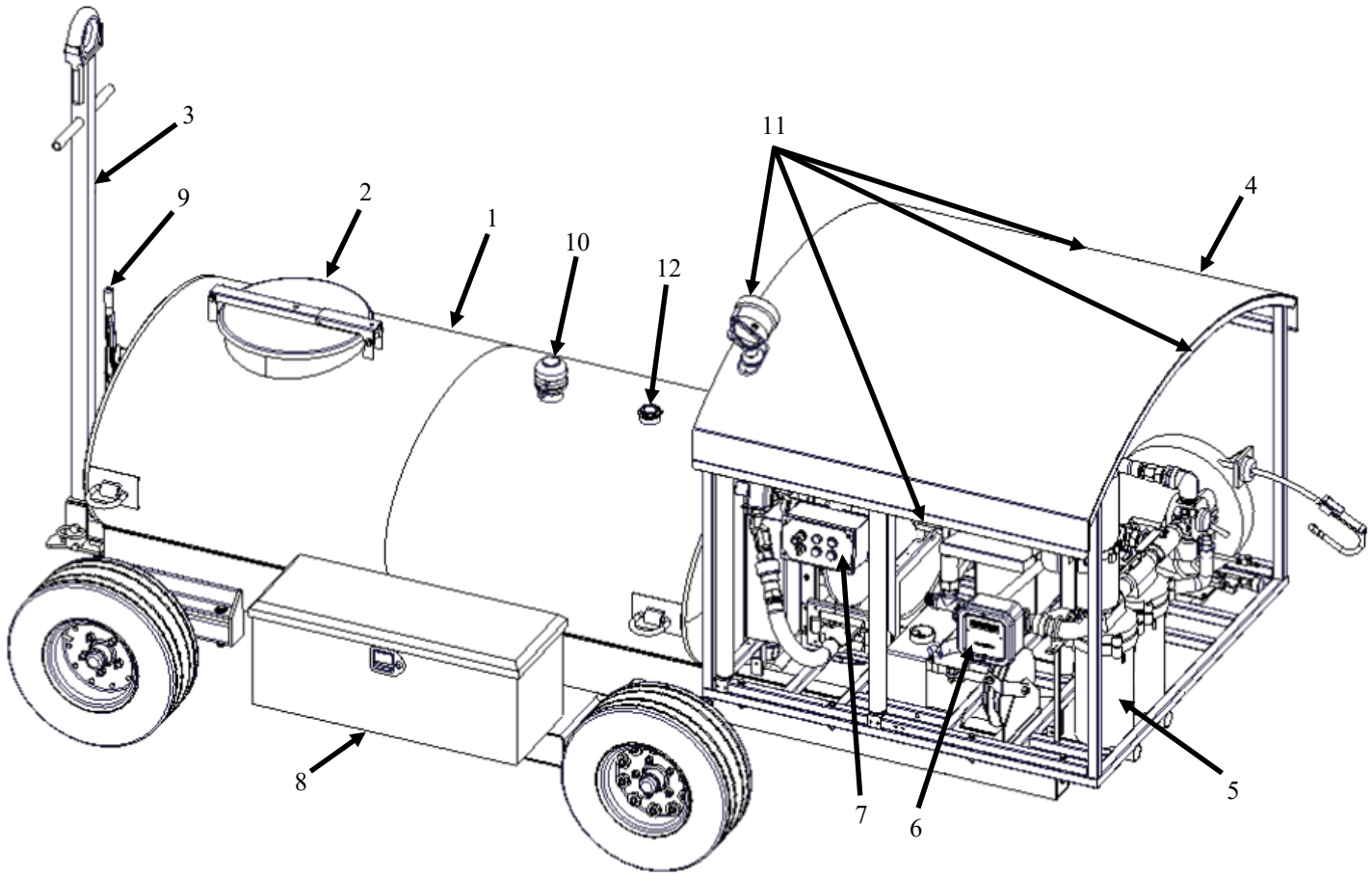
YOU MUST READ THIS MANUAL IN ITS ENTIRETY BEFORE OPERATING, SHIPPING OR PERFORMING MAINTENANCE PROCEDURES. FLAMMABLE AND COMBUSTIBLE VAPORS CAN CAUSE FIRE, AND/OR EXPLOSION AND CAN LEAD TO SERIOUS INJURY OR DEATH.

The instructions in this manual cover the operation, specifications and maintenance of the UAS Cart manufactured by Spokane Industries, Inc. of Spokane Valley, Washington.

The UAS Cart is designed to provide a portable, self-contained defueling/fueling system for the UAS program. The UAS Cart 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.

DESCRIPTION

Refer to the specifications chart in Section 1.2 for location and identification of major components and particulars for the 200-gallon UAS Cart. A daily inspection chart is available in Section 1.3 and a Preventative Maintenance Chart is available in Section 1.4.



1. Tank
2. Manway
3. Towbar
4. Pump Module
5. Fuel Filter Housings
6. Fuel Meter
7. Operator's Console
8. Utility Box
9. Parking Brake
10. Vent / Fill Port
11. LED Work Lights
12. Fuel Level Gauge

Section 1.1 **Figure 1-1 Component Identification**

1.2 Specifications for the UAS Cart 200 Gallon

Tank Volume:
- Nominal Capacity 200-gallons
- Max Capacity 220-gallons

Equipment Dimensions:
- Length (Tow bar down) 182-inches
  - (Tow bar up) 122-inches
- Width (Tire to tire) 59-inches
- Height (Tow bar down) 60-inches
  - (Tow bar up) 72-inches
- Weight (Empty) 2,557-pounds
  - (Full, at nominal capacity with fuel) 3,917-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 24VDC
- On-board Batteries ..... Dual Optima Blue tops wired in series
- On-board Charging ..... 120/230 VAC input / 28 Volt DC dual 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 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?				

1.4 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 4.5, 4.6 and 4.14 For maintenance.

SECTION 2.0 SAFETY GUIDELINES

Within this manual are guidelines and safety recommendations for use of the UAS Cart. 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 fueling and defueling the UAS.** Spokane Industries 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 UAS Cart 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. Make sure that the duplex hose assemblies and the depuddling hose assembly are coiled and place them in the manway. Place any loose items in the storage box and check to make sure the manway assembly is securely attached.

Loading the UAS Cart for Truck Shipment

⚠CAUTION

Fork extensions must be in contact with axle tubes only. 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 UAS Cart on a truck. Set the parking brake. Approach the unit from the front only. Once the UAS Cart is loaded on the truck, secure to the truck bed using attachment points on tank weldment.

Loading the UAS Cart 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 UAS Cart in the aircraft, lock tow bar upright, make sure the parking brake is set and that the parking brake, funnel cover, manway assembly and storage boxes are latched.

3.2 Controls and Indicators

Description	Functions
Battery Switch	Located at rear of unit, on the right side, this disconnects onboard batteries from the electrical system. The batteries can also be charged by the onboard battery charger or the seven-pin tow vehicle connector.
E-Stop Switch	Emergency shut down switch
Fuel Filter Petcocks	Maintains the two fuel filters
Fuel Meter	Located on the left hand side rear of the UAS Cart, this shows fuel level during defueling and fueling operations
Liquid Level Gauge	Located on the top centerline of the tank, this gauge shows how much fuel is in the tank.
Low-Point Drain	Located on the left side of the rear of the UAS Cart, this is used to drain water from the low-point tank sump.
Operator Console	Located on the left hand side on the rear of the unit, this turns the defuel / Fuel pumps ON and OFF
Parking Brake Handle	Located at the front of the tank on the left hand side, this is used to set the Parking Brake.
Sample Port Valve	Located at the bottom back of the UAS Cart, this is used to take fuel samples from the tank.
Selection Valve	Located at the rear of the UAS Cart, this selects the defueling or fueling action.

3.3 Defueling the Aircraft

⚠WARNING

Never operate the UAS Cart 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 UAS Cart.

⚠CAUTION

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. Open pump module covers (left and right) and uncoil 35-foot Hose assembly from hose cradle.
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 clockwise and allowing them to spring outward.
k. Place the Pump Selector Switch in the "DEFUEL" position.
l. Start the fuel pump by pushing the "Pump ON" button.

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

m. Monitor fuel meter to remove desired quantity of fuel.
n. Turn off fuel pump by depressing the "PUMP OFF".
o. Retract the fuel hose from aircraft
p. Turn off main battery switch.
q. 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 manway open for visual inspecting during this operation.

3.4 Fueling the Aircraft

⚠WARNING

Never operate the UAS Cart 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 UAS Cart.

Do not attempt to charge batteries while using the UAS Cart 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 battery 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 battery 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.

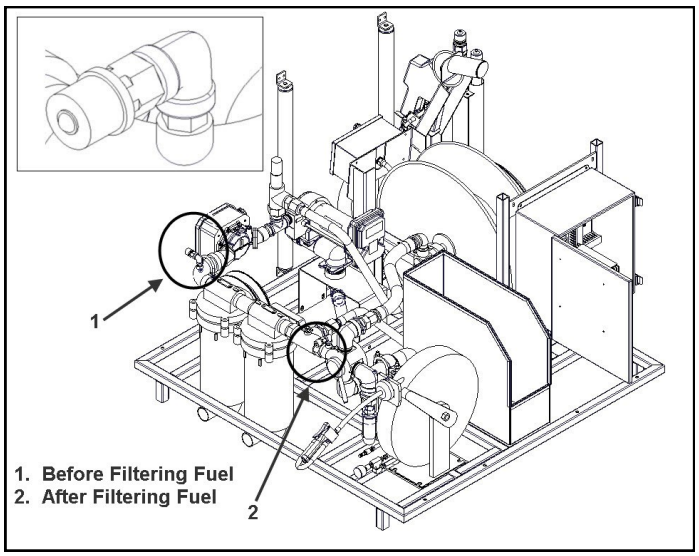


Figure 3-1 Sample Ports

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 UAS Cart 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 continuing with step C.
c. Inspect threads for damage. 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. Hand start the threaded component (s) and tighten until hand-tight. Do not cross thread components.
f. Tighten parts until there is a leak-free connection.

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.

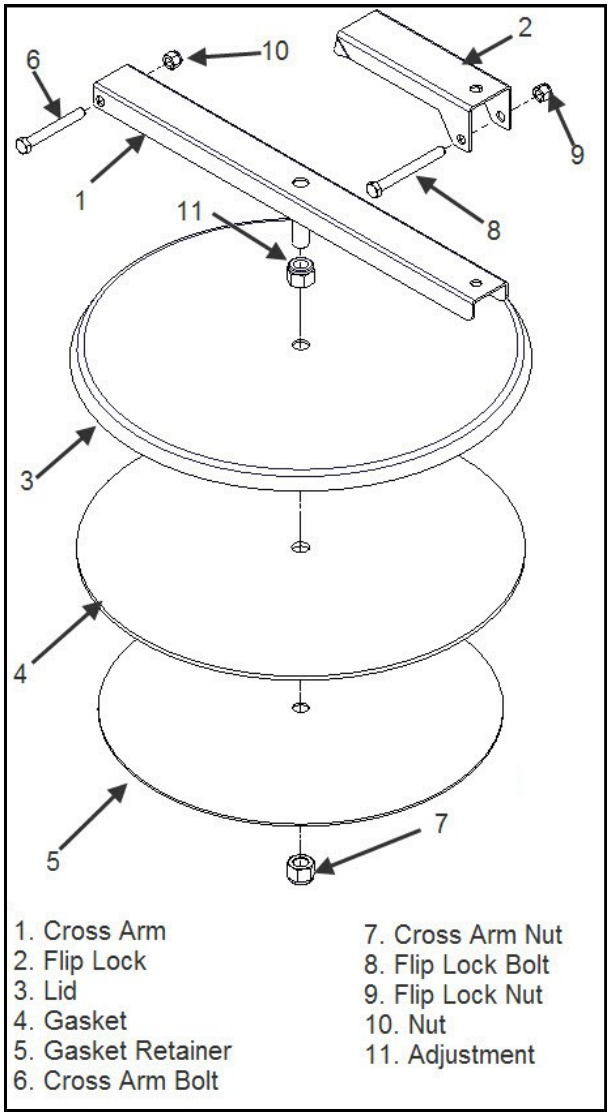


Figure 4-1 Manway Assembly

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.

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

4.6 Front Hub Assembly

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 separate from the hub and strike the ground.
d. 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).
f. Replace components and grease bearings before reassembly.
g. When reassembling, Castle nut (3 should be tightened until the hub assembly rotates past free.

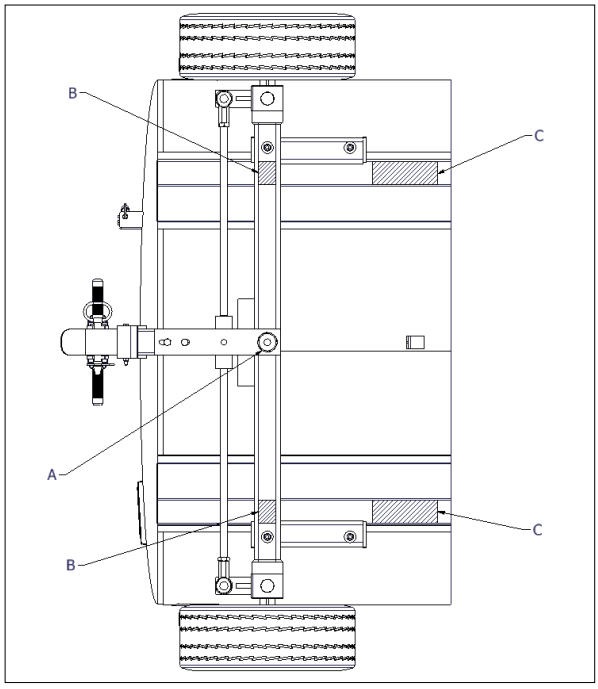


Figure 4-2 Lift Points

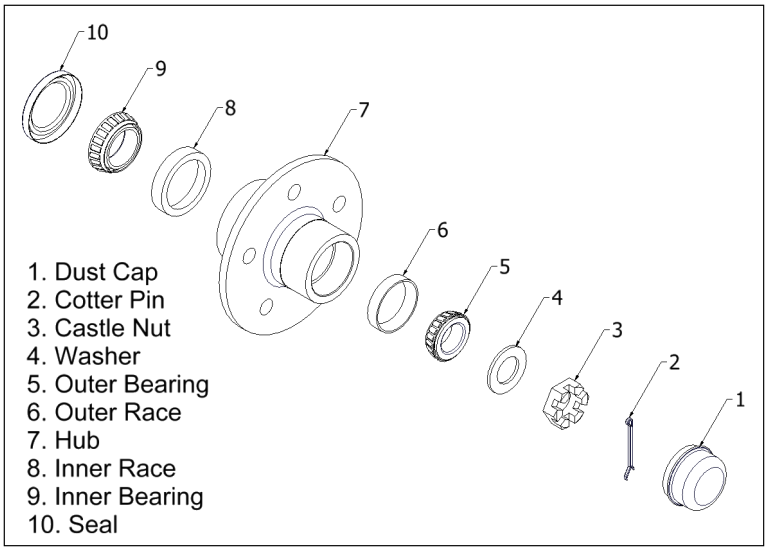


Figure 4-3 Front Hub Assembly

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. Remove cotter pin (3). While holding onto the tow bar, place foot on toe latch assembly (See arrow A) and depress.
b. Pull hitch pin (2) from steering 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).

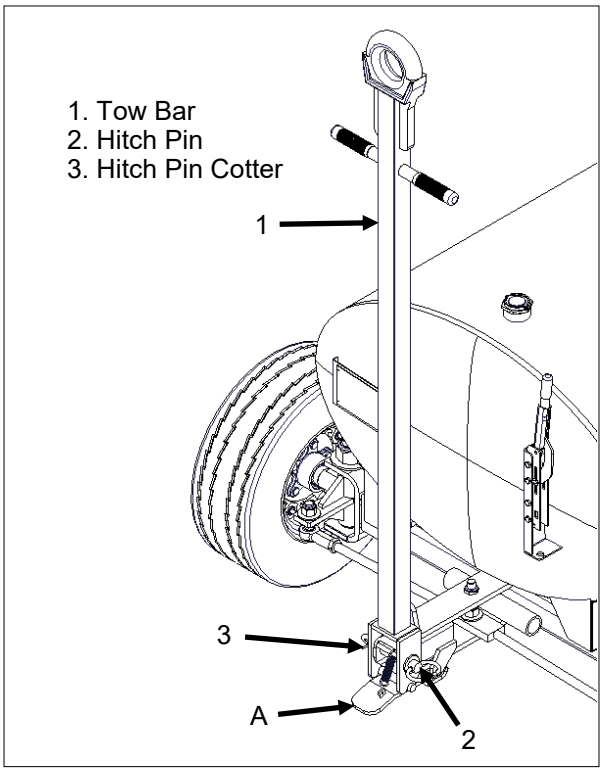


Figure 4-4 Tow Bar Removal

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.

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 parts.

4.9 Steering Arm Assembly

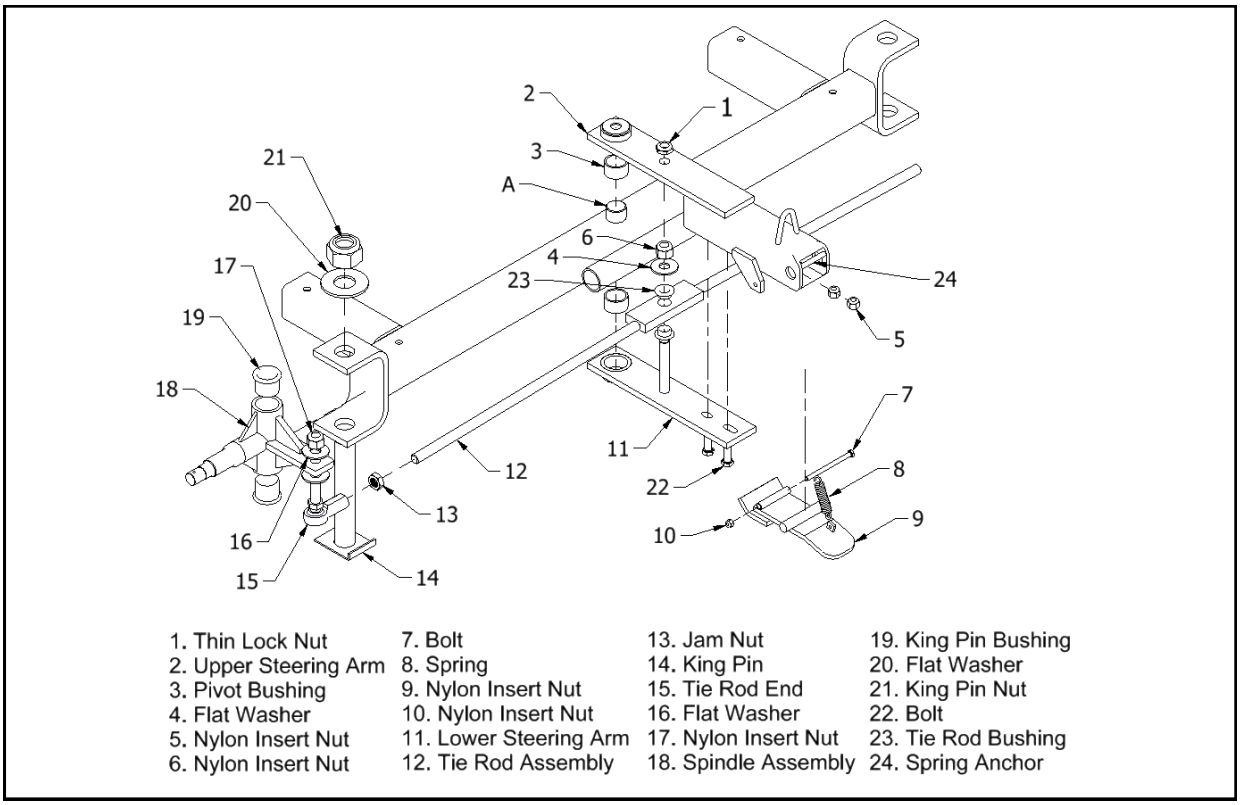
a. Remove the thin lock nut (1).
b. Remove nuts (17) and flat washers (16).
c. Remove bolts (22) and nuts (5). Allow lower steering arm subassembly (11), bushing (3), and tie rod assembly (12) to drop down; place to the side.
d. Lift upper steering arm subassembly vertically to clear pivot pin arrow (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 parts.

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 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.



1. Thin Lock Nut
2. Upper Steering Arm
3. Pivot Bushing
4. Flat Washer
5. Nylon Insert Nut
6. Nylon Insert Nut
7. Bolt
8. Spring
9. Nylon Insert Nut
10. Nylon Insert Nut
11. Lower Steering Arm
12. Tie Rod Assembly
13. Jam Nut
14. King Pin
15. Tie Rod End
16. Flat Washer
17. Nylon Insert Nut
18. Spindle Assembly
19. King Pin Bushing
20. Flat Washer
21. King Pin Nut
22. Bolt
23. Tie Rod Bushing
24. Spring Anchor

Figure 4-5 Exploded View of Undercarriage

4.11 Front Undercarriage Removal

To remove the entire Front Undercarriage assembly see figure 4-6, the equipment must have the front end raised. See Figure 4-2 for lift points.

a. 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.
b. Place cribbing under tank skids (see Figure 4-2, reference arrows C) to safely support the equipment.
c. Lower onto cribbing. Leave jack in place.
d. Raise jack to apply slight pressure on assembly. **(Tow bar must be in upright position.)**
e. Remove bolts (2) and nuts (3).
f. Carefully lower jack and assembly until wheels are on the ground and front axle tube clears tank mounts.
g. 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.

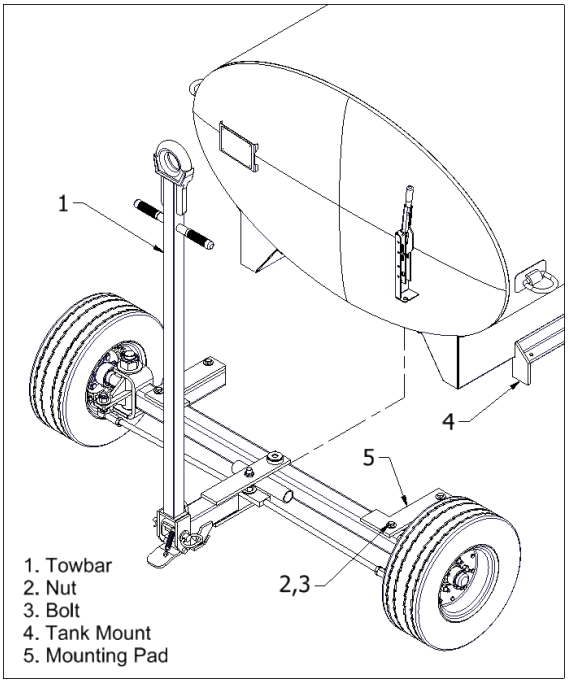


Figure 4-6 Front Undercarriage Removal

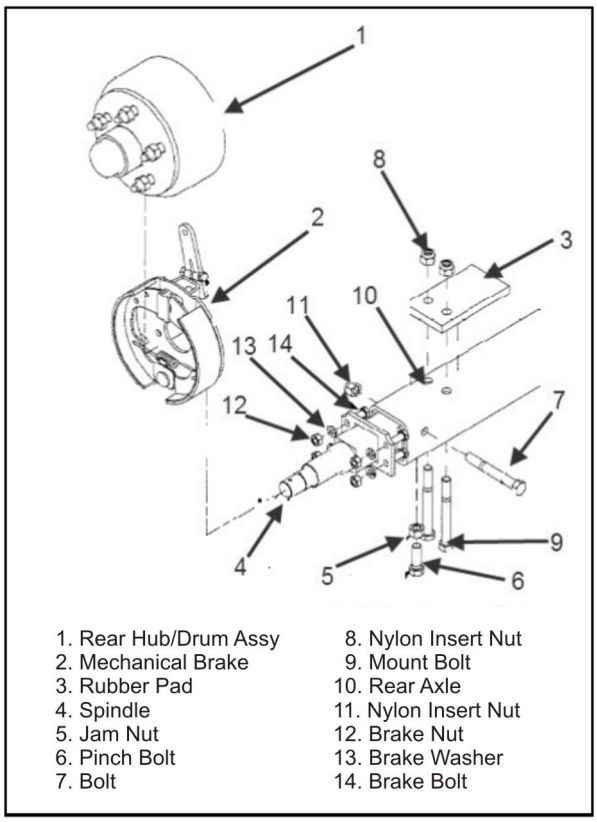


Figure 4-7 Rear Undercarriage Removal

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.

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

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) and 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.
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.

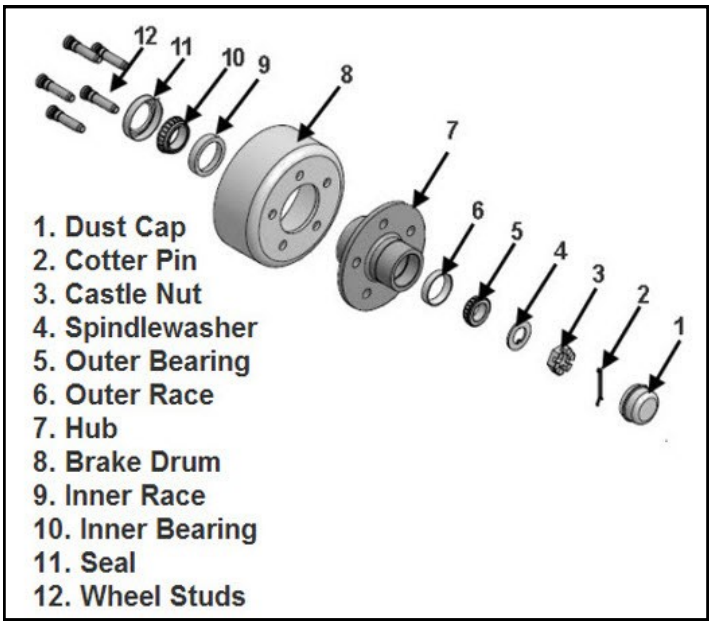


Figure 4-8 Rear Hub and Brake Drum

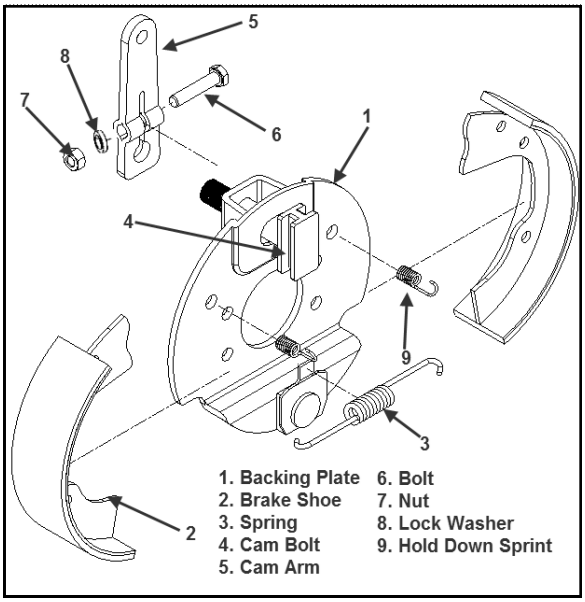


Figure 4-9 Mechanical Brake

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.

a. Remove Rear Wheel Assembly as described in section 4.13
b. Remove Rear Hub and Brake Drum Assembly as described in section 4.14.
c. Remove brake cable end from arm (5) as described in section Section 4.17, step (a).
d. Remove nuts (12), washers (13), and bolts (14) shown in Figure 4-7
e. Remove Mechanical Brake Assembly and place on flat surface.
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.

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

4.16 Parking Brake Assembly and Adjustment

The parking brake assembly consists of a brake handle and cable assembly and a mechanical brake assembly. 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 counterclockwise to loosen the brakes (see reference arrow D in Figure 4-10.) 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 of Figure 4-10 (each side).

4.17 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.

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).

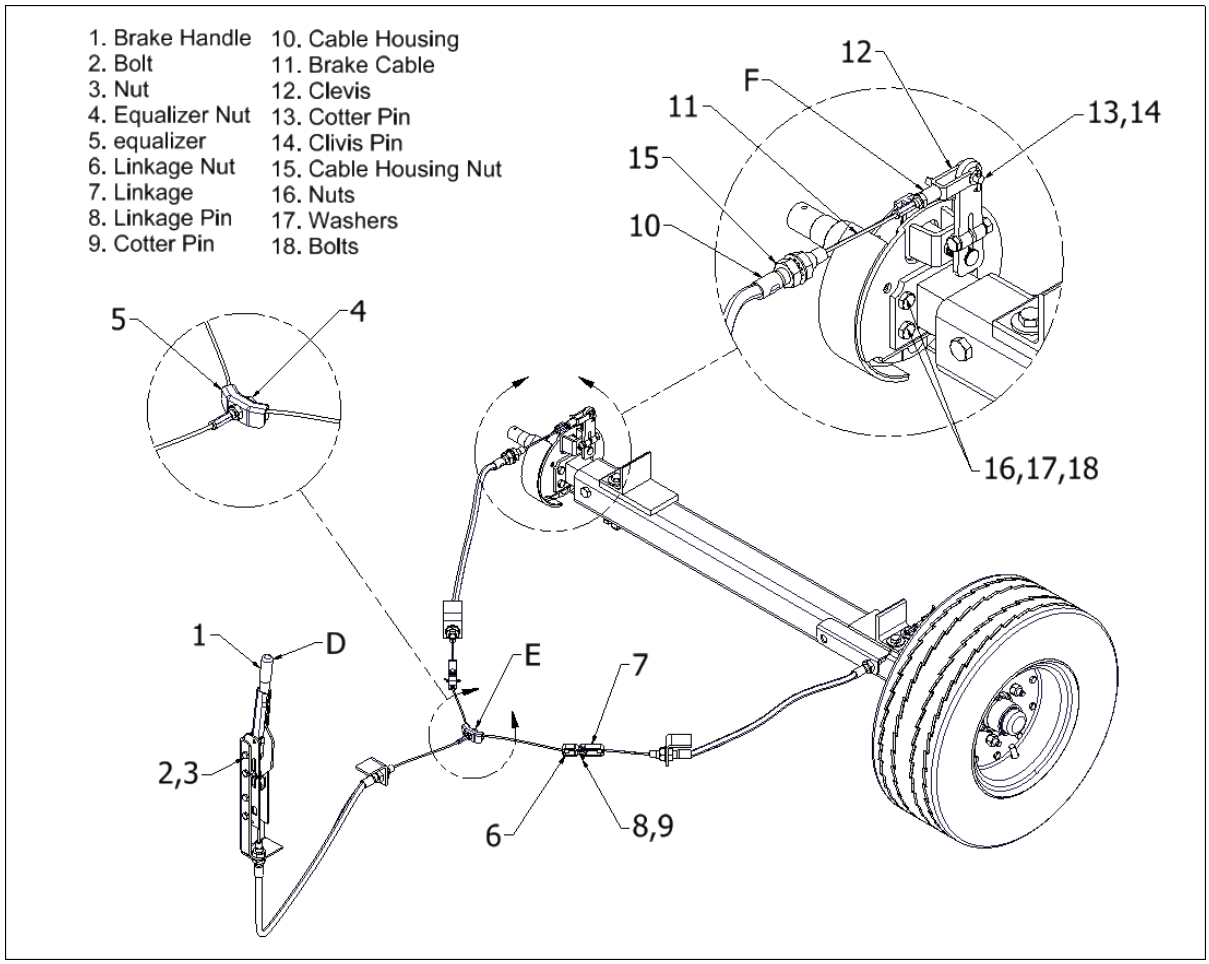


Figure 4-10 Brake and Cable Assembly

4.18 Rear Undercarriage Assembly

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

a. Raise equipment with suitable maintenance jack (see Figure 4-11 arrow A for jack placement) and allow for 2-inches of space between the wheels and the ground.
b. Place cribbing under tank skids to safely support the equipment. (see Figure 4-11, reference points labeled with a C).
c. Lower onto cribbing. Leave jack in place.
d. Disconnect parking brake cables at mechanical brake assembly in Section 4.17, 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 the front axle tube clears tank mounts.

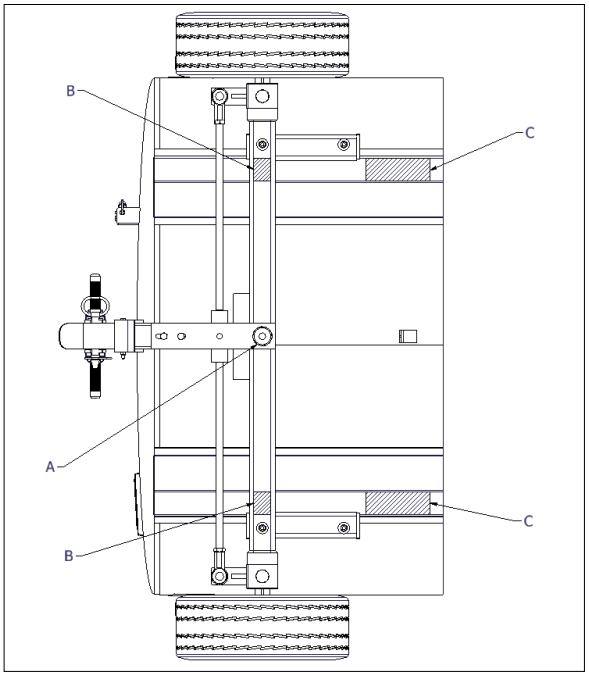


Figure 4-11 Lift Points

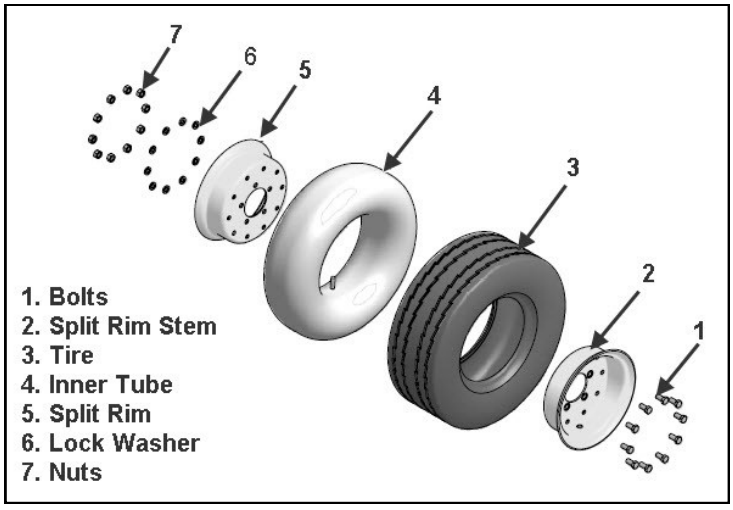


Figure 4-12 Wheel Assembly

4.19 Wheel Assembly

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

a. Remove wheel assembly as described in Section 4.13 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). When reassembling, make sure that the inner tube stem is positioned through access hole in split-rim.
f. Torque nuts (7) to 75-foot-pounds before applying air pressure to wheel.
g. 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.

⚠WARNING

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

a. 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.
b. Remove the two bolts connecting the fuel meter (6) to the pump-to-meter line (9).
c. Remove the pump to meter line (9).
d. Remove the four bolts at the bottom of the pump mounting plate.
e. Remove the threaded hose from the pump's inlet.

4.21 Removing the Fuel Meter

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

4.22 Removing the Filter Housings

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

4.23 Removing the 4-Way Selection Valve

a. Remove fuel meter (6) as described in Section 4.21.
b. Remove the valve-to pump line (2).
c. Remove the valve-to-pump line threaded Victaulic fitting at the elbow next to the 4-way selection valve. (10)
d. Remove the tank-to-valve line (5) Victaulic fitting at the elbow next to the selection valve.
e. Remove the U-bolt (not shown) that secures the remaining assembly to the frame.
f. Using a pipe wrench and a bench vise, remove remaining components.

4.24 Removing the Hose Reel

a. Remove all items connected to mounting bracket (12) and remove bracket.
b. Remove valve-to-reel line. (7)
c. Remove the quick disconnect from the fueling nozzle (13).

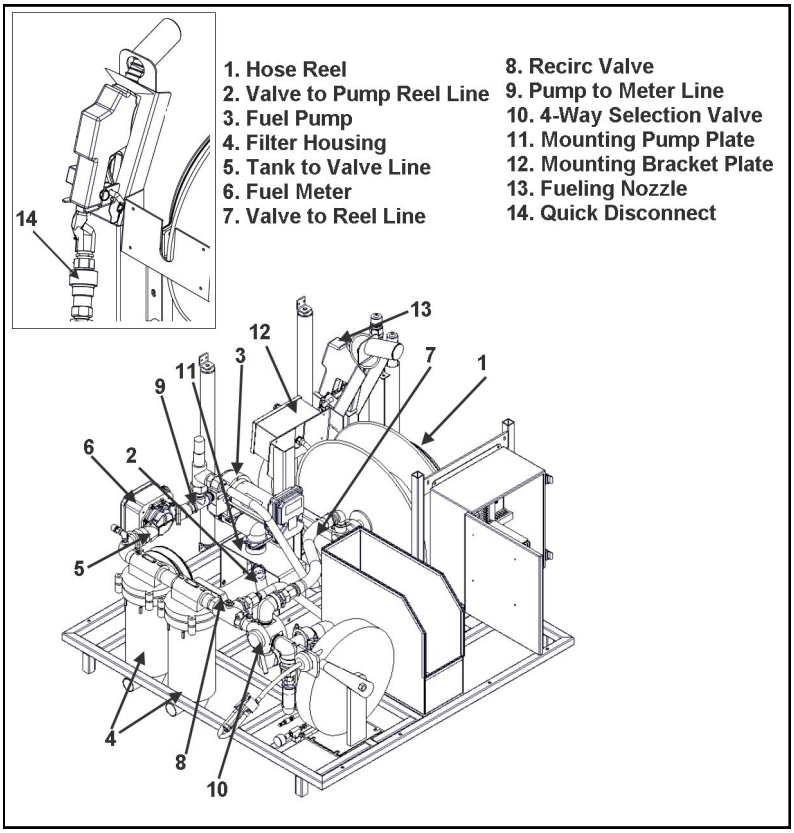


Figure 4-13 Pump Module

4.25 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.

4.26 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.

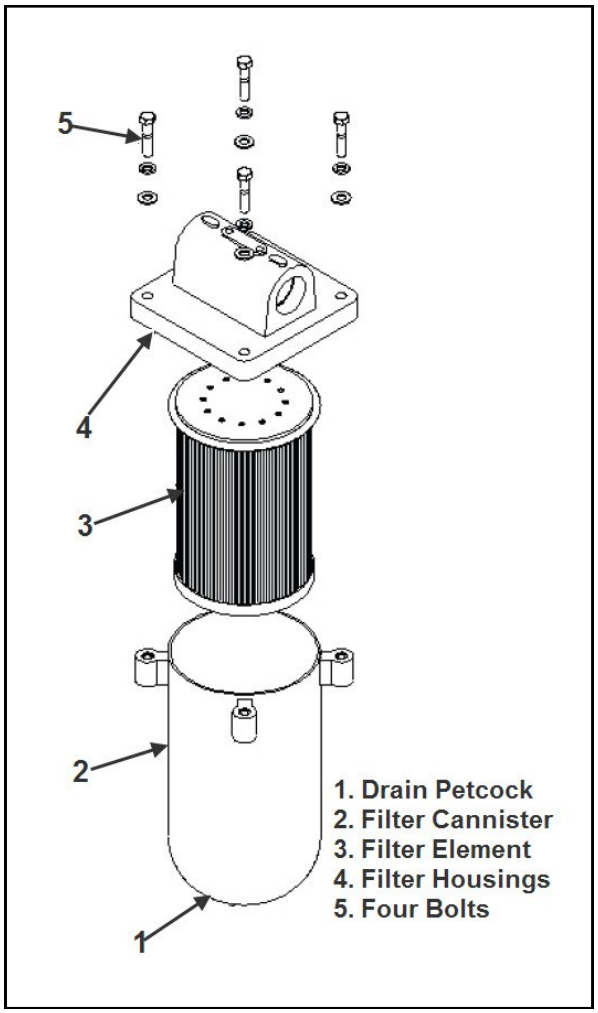


Figure 4-14 Fuel Filters

4.27 Troubleshooting the UAS Cart

Problem	Probable Cause	Corrective Action
Threaded Connection leaking or 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	Charge batteries
	Fuel filter(s) restricted	Inspect and replace if needed
	Tank-to-Pump valve partially open	Ensure valve is open (handle vertical)
	Fuel/Defuel T-handle not pushed in	Ensure T-handle is pushed in completely
Low/ No Defueling Capability	Low battery charge	Charge batteries
	Fuel filter(s) restricted	Inspect and replace if needed
	Tank-to-Pump valve partially open	Ensure valve is open (handle vertical)
	Fuel/Defuel T-handle not pulled out	Ensure T-handle is pulled out completely
12 Volt pump – weak or will not work	Low/ No battery charge	Fully charge batteries
	Battery terminals/ cables corroded	Inspect & clean, replace if necessary
	Battery Cell(s) fluid low	Service cell(s) with distilled water
	Main Power switch in OFF position	Turn Main Power switch ON
	Pump has internal damage	Replace pump
	Pump has reached duty cycle	Wait 30 minutes and retry
	Circuit breaker has tripped	Wait 30 minutes and retry
Fuel Meter has no indication of flow	Main pump not turned ON	Turn ON pump
	Main tank empty	Load fuel into tank
	Fuel Meter internally broken	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
Tow bar 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 or parking brake assembly is damaged or missing	Adjust brakes or adjust and repair using sections 4.15, 4.16 and 4.17.

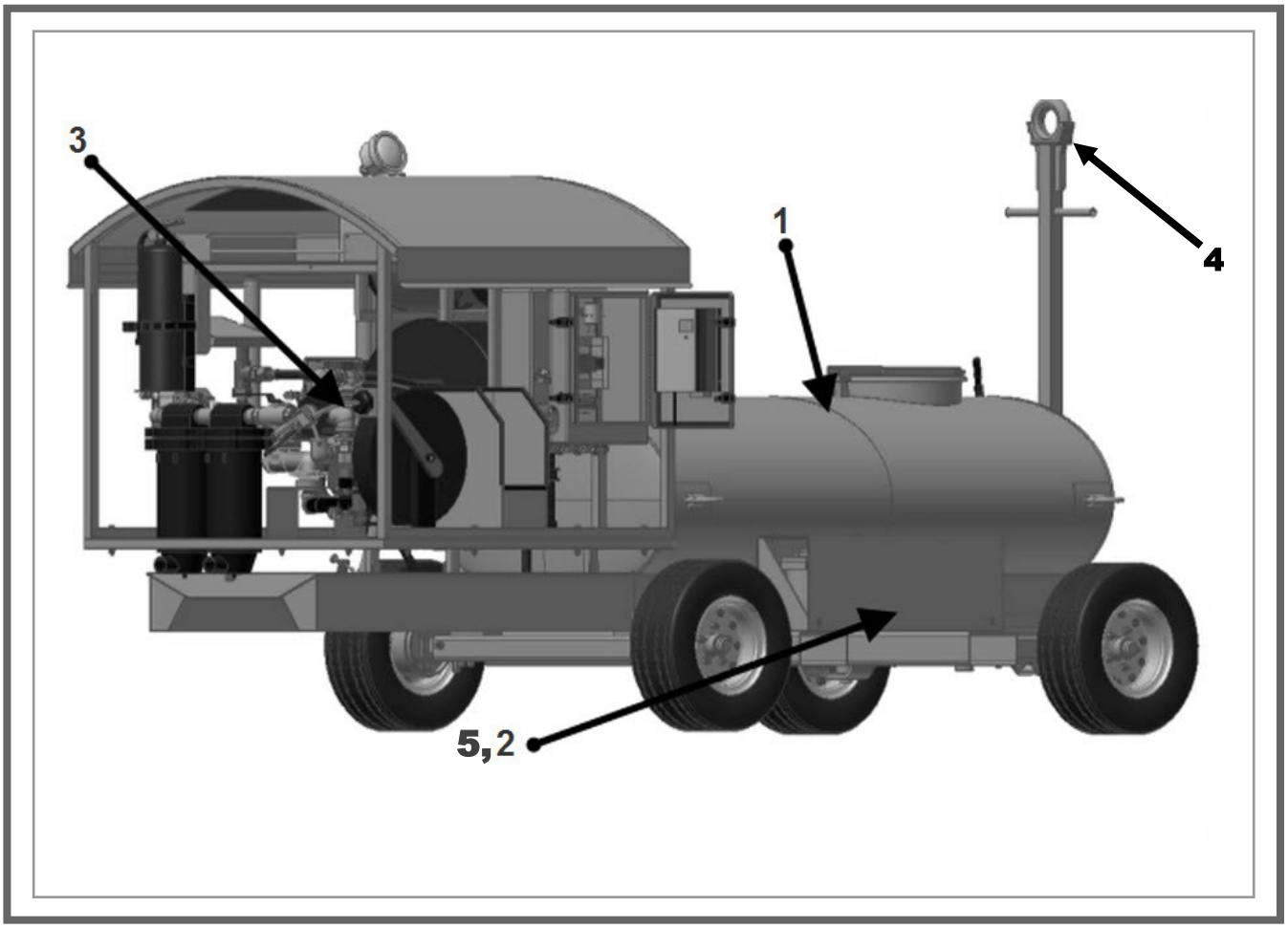
SECTION 5.0

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.

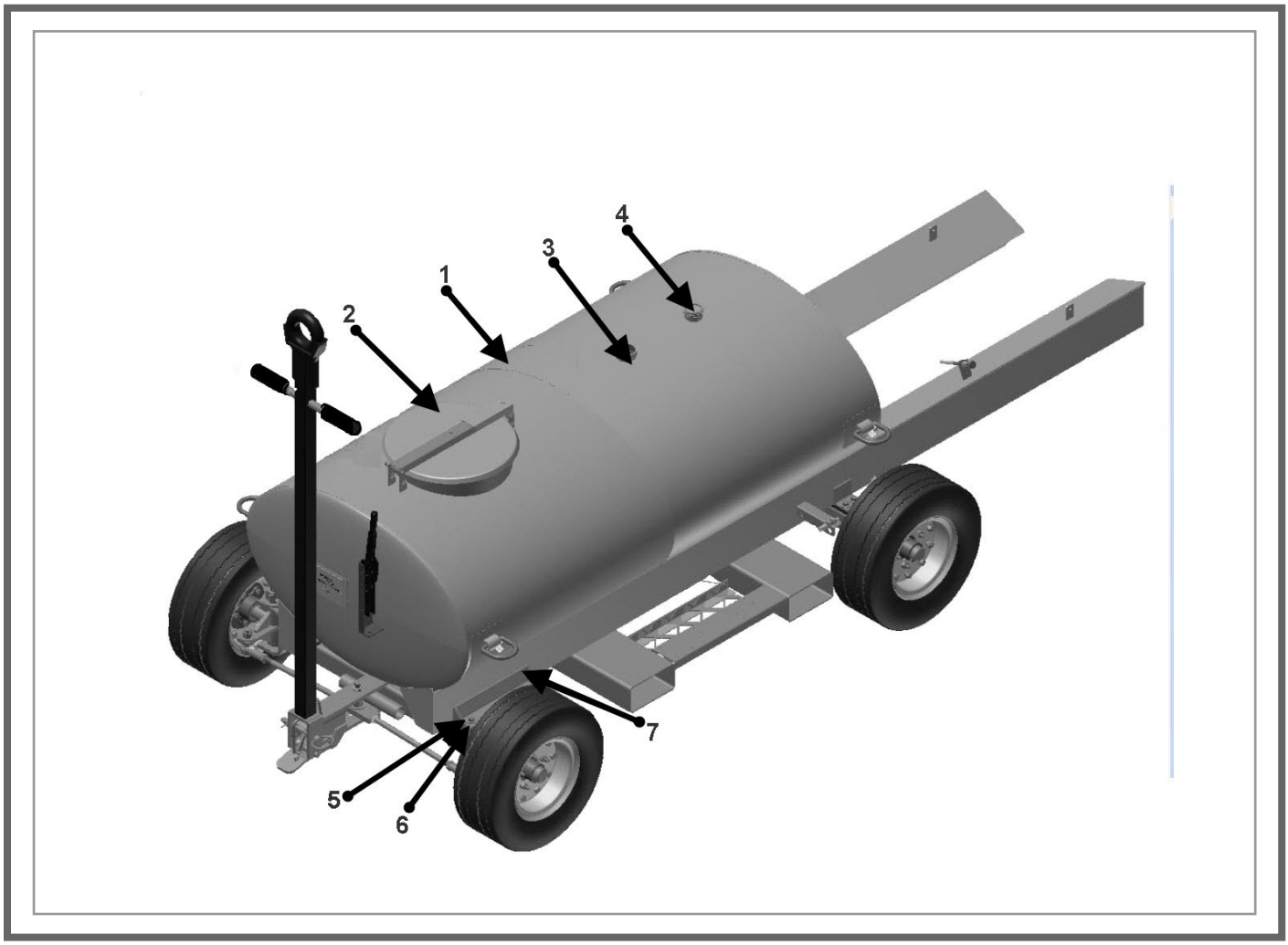
You may access customer service by contacting the Metal products Division at 800-541-3601, or 509-928-0720. (The toll free number does not work internationally). If you would like more information about the Spokane metal products division of Spokane Industries you may visit the website at www.spokaneindustries.com

DRAWING NUMBER



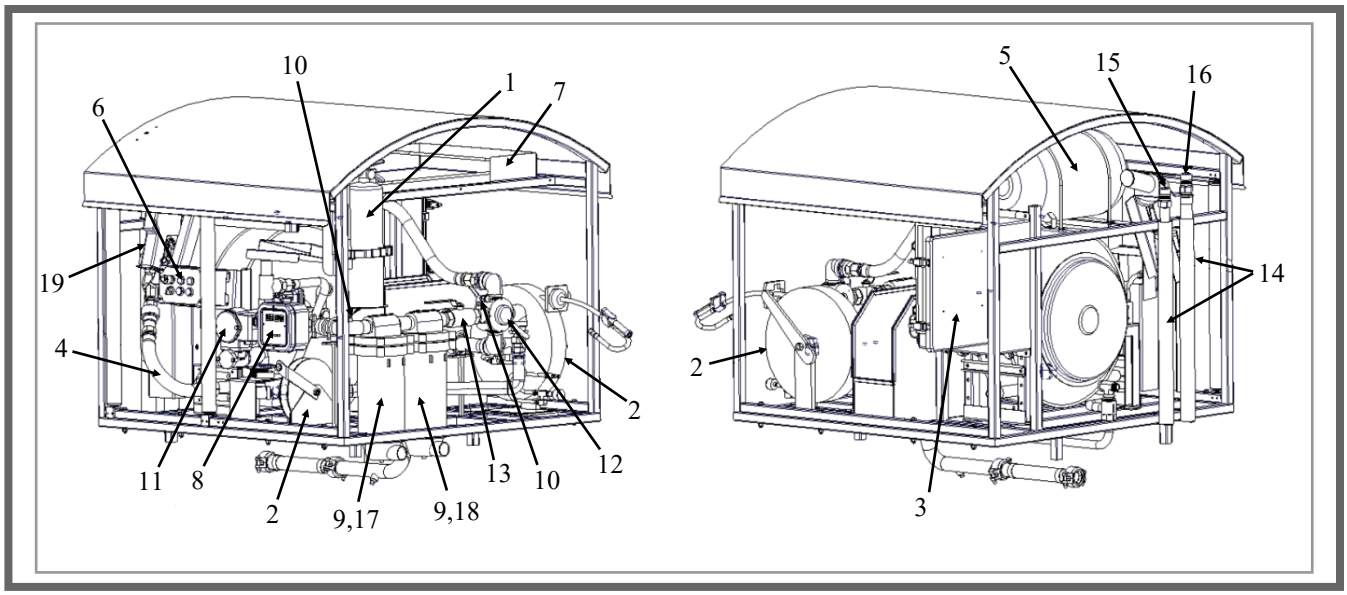
DRAWING 1.0 **Overview Component Identification**

ITEM	QTY	P.N.	DESCRIPTION	MATERIAL	WEIGHT
1	1	RD-040-01	Tank, Sub-Asm., UAS Cart 200	Stainless Steel	2035.5lbmass
2	1	07-5510	Dual Battery Enclosure	Various	48 lbmass
3	1	RD-040-02	Pump Module Asm.	Various	966.7 lbmass
4	1	07-1103-1	Weldment, Tow Bar	Mild Steel	33.8 lbmass
5	2	04-8050	Battery	Various	60 lbmass



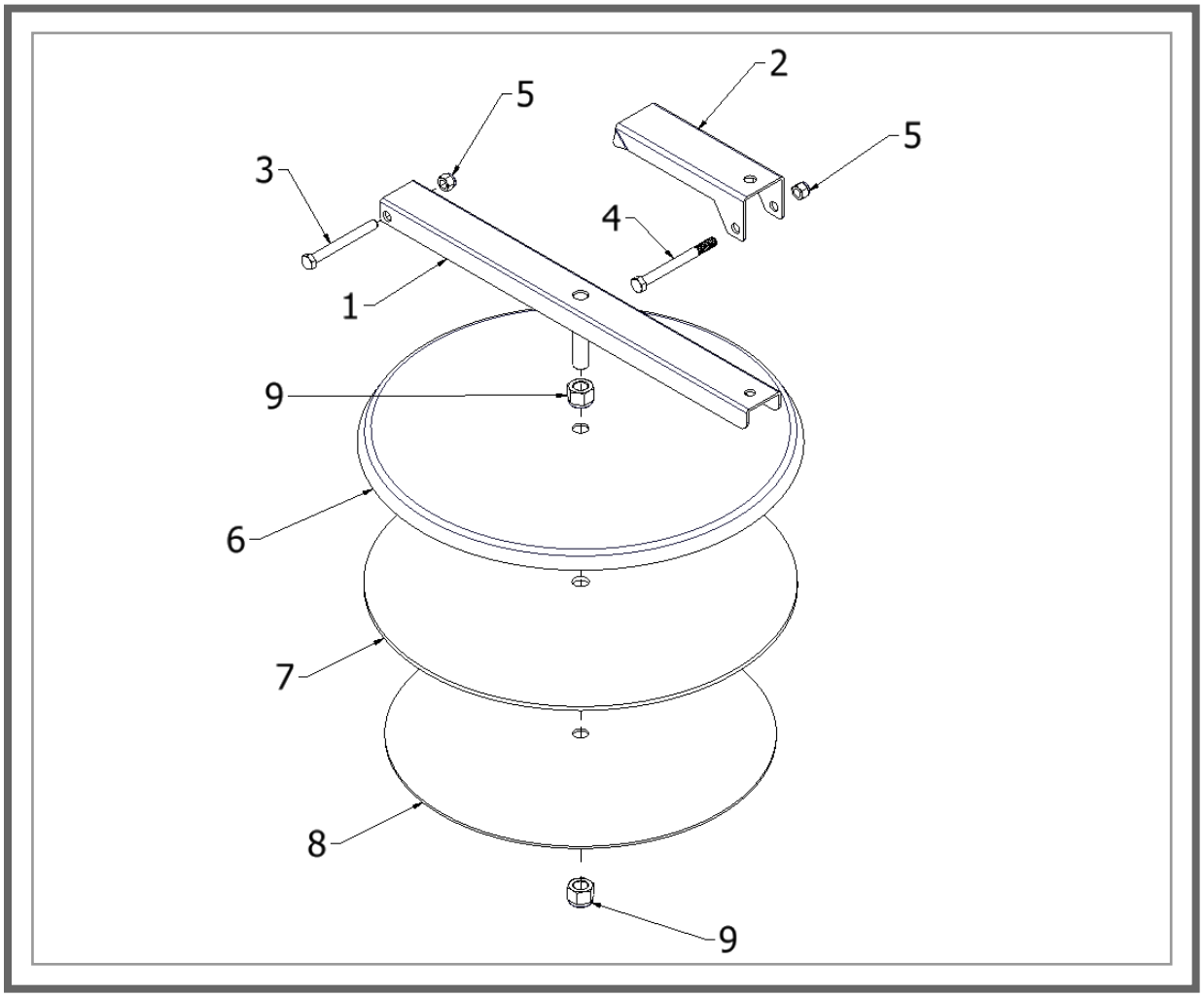
DRAWING 2.0 **Overview, Component Identification (Tank)**

ITEM	QTY	P.N.	DESCRIPTION	MATERIAL	WEIGHT
	1	RD-040-01	Tank Sub-Asm., UAS Cart 200	Various	1460 lb.mass
1	1	RD-040-100	UAS Cart Tank Weldment	Stainless Steel	1036 lb.mass
2	1	08-10251	Cross Arm and Lid Assembly	Stainless Steel	15.75 lb.mass
3	1	04-01545	Cap, Tank Vent , 2” MPT	Iron	1.99 lb.mass
4	1	04-01540	Liquid Level Gauge	Various	.08 lb.mass
5	8	02-3087	Nut, Nylon Insert, 1/2” - 13	Stainless Steel	.06 lb.mass
6	8	02-3025	Hex Bolt, 1/2” x 4 1/2” LG	Stainless Steel	.30 lb.mass
7	2	06-1023	Pad, Mounting	Rubber	.75 lb.mass



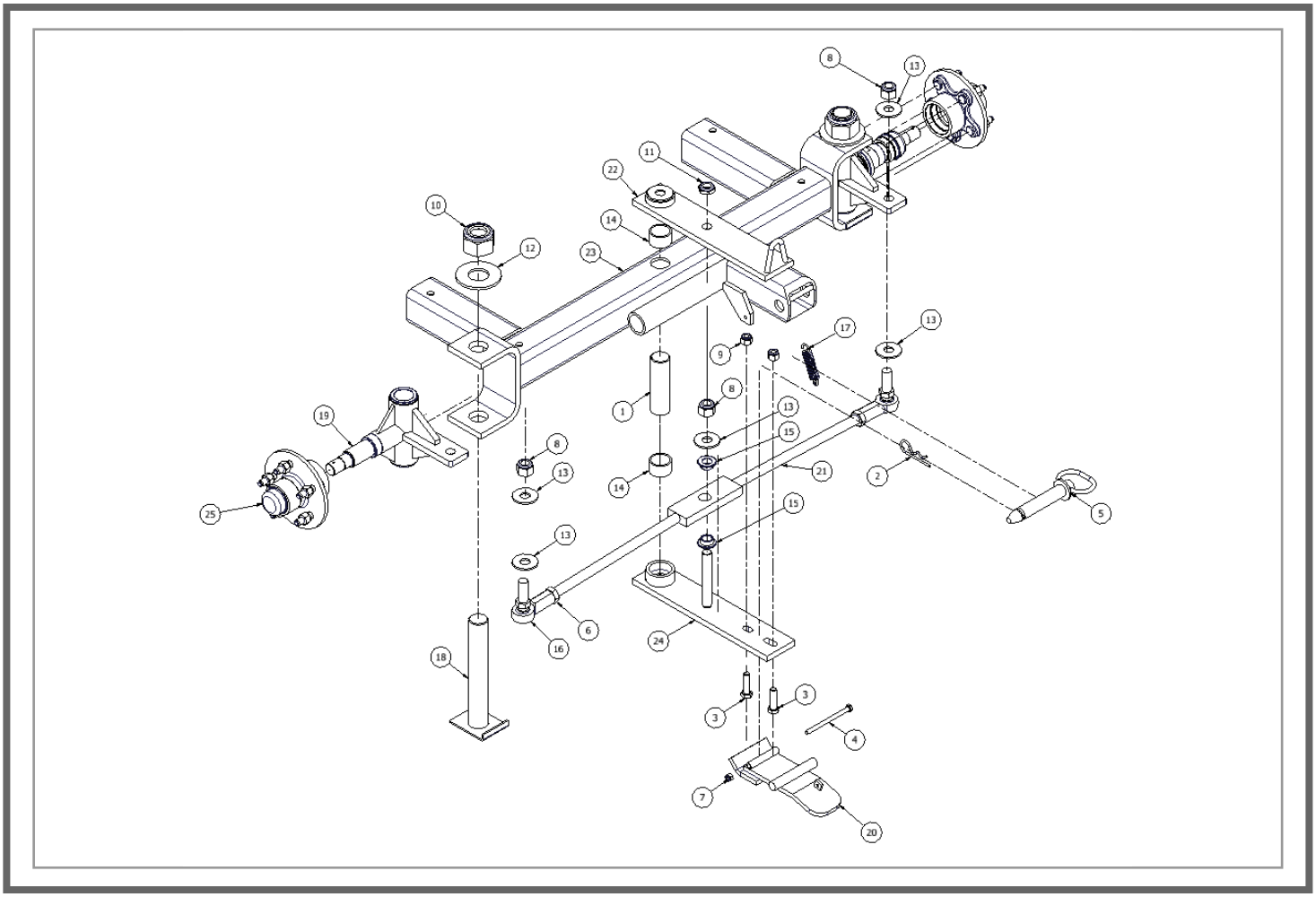
Drawing 3.0 **Pump Components**

ITEM	QTY	P.N.	DESCRIPTION
1	1	04-0702	Fire Ext. 5# Purple K
2	1	04-10362	Grounding Reel, Red, With Clamp & Plug
3	1	105-00004-A024	Electrical Box Assembly
4	1	25-5006	Fuel Hose Assembly, 1-IN x 35-FT
5	1	25-5020	Plumbing Kit, Air Tank X Hose Reel
6	1	15-00110	3x2 Operators Console
7	1	04-8025	Spill Response Kit #420
8	1	04-0143	Meter, MR 5-30N 1 1/2 IN FNPT, GPI # 126300-05
9	2	04-8043	Filter Housing, Facet VF-225B-PGS
10	2	04-8040	Fuel Sampling Port
11	1	04-0175	Pump, Fuel, 24VDC, 25GPM, Great Planes M#M-3425CS-PO
12	1	04-10310	Valve, 4-Way Lever Operated, 1– 1/2 IN. Ports
13	1	04-10350	Valve, Ball, 3-Way, 1 1/2 IN NPT
14	2	25-2510	Weldment Storage Tube
15	1	25-5009	Suction Wand, 1” x 30”
16	1	25-5008	Suction Hose Asm., 1” x 30”
17	1	04-80212	Filter Element, Facet #CC-22-7, Coalescer CRT, Fits VF-22SB
18	1	04-80213	Filter Element, Facet #FG-0-612-2, FG Monitor CRT, Fits VF-22SB
19	1	04-8162	Nozzle, Automatic Shut-off .83-inch, 1-IN FNPT



Drawing 4.0 **Manway Assembly**

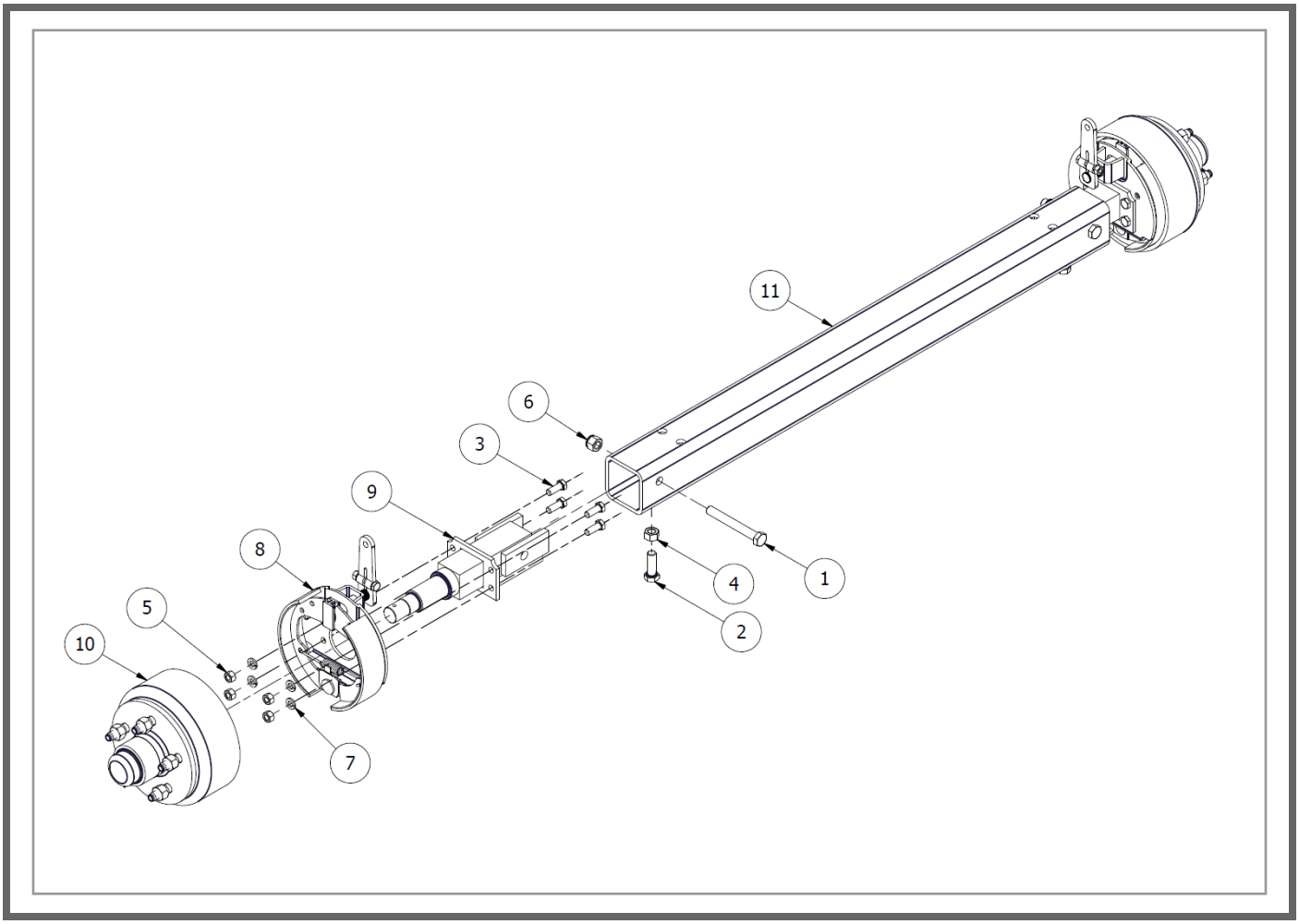
ITEM	QTY	P.N.	DESCRIPTION
1	1	07-1039S	Cross Arm
2	1	01-8222S	Flip Lock
3	1	02-3044	Hex Hd. Capscrew, NC, 3/8” by 3-1/2” LG
4	1	02-3045	Hex Hd. Capscrew, NC, 3/8” by 4” LG
5	2	02-3089	Nut, Nylon Insert, 3/8-16 (AP)
6	1	01-86001	Manway Lid, 16” Diameter w/ Thru Hole
7	1	06-25025	Manway Gasket, 16” Standard, 3/16” Thk, Buna
8	1	01-8710	Retainer Gasket, SV
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

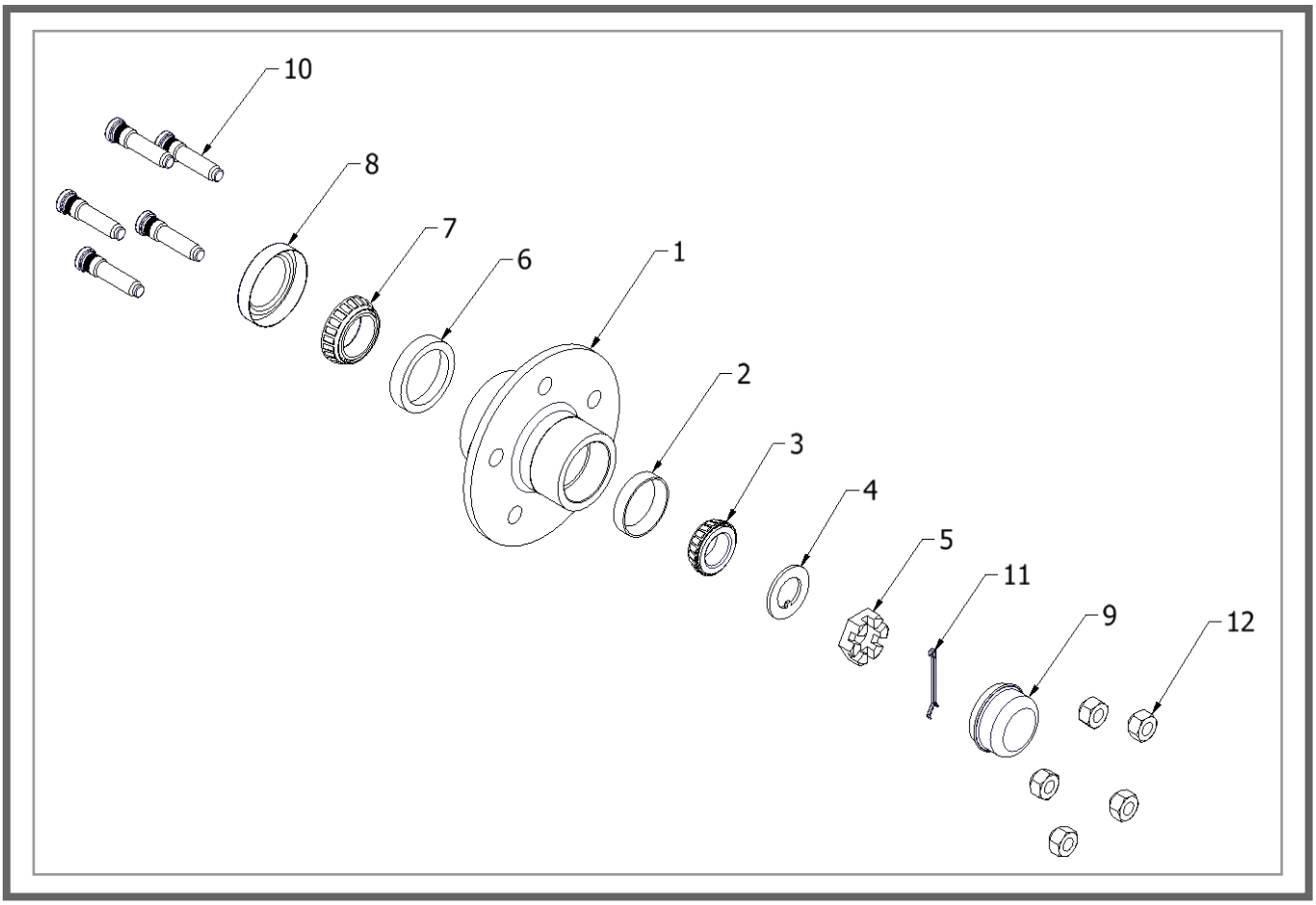
ITEM	QTY	P.N.	DESCRIPTION
13	5	02-3131	WASHER, FLAT, 3/4-IN, PLATED
14	2	03-1014	BUSHING, STEERING ARM
15	2	03-1015	BUSHING, TIE ROD, PIVOT POINT
16	2	03-1016	ROD END, BALL JOINT LINKAGE
17	1	04-1054	SPRING, TOW LATCH
18	2	07-10105	KING PIN
19	2	07-1015	ASM., KING PIN
20	1	07-1020	TOE LATCH WMT, ALL SIZES
21	1	07-10371	TIE ROD ASSEMBLY, 200 GALLON
22	1	07-1052	STEERING ARM, UPPER, 200 GALLON
23	1	07-1053	FRONT AXLE WELDMENT, 200 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

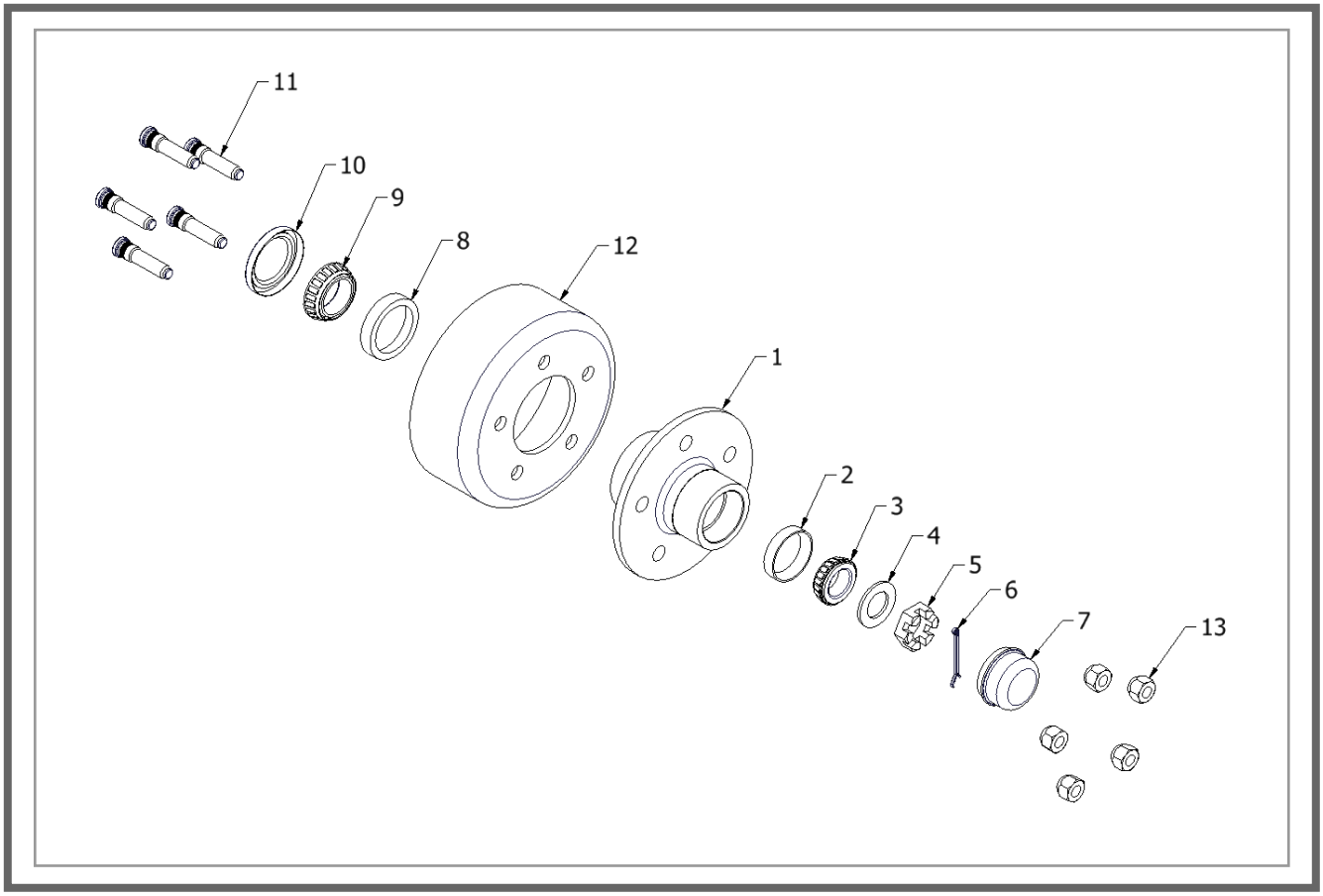
ITEM	QTY	P.N.	DESCRIPTION
1	2	02-3024	Hex HD Capscrew, NC 1/2-IN By 4-IN, GRD 5 Plated
2	2	02-3026	Hex HD Capscrew, NC, 1/2-in By 1-1/2-IN, GRD 5
3	8	02-3050	Hex HD Capscrew, NC, 3/8-IN By 1-IN, GRD 5, Plated
4	2	02-3067	Nut, Hex, NC, 1/2-IN - 13, FIN, Plated
5	8	02-3072	Nut, Hex, NC, 3/8-IN-16
6	2	02-3087	Nut, Nylock, NC, 1/2-IN-13, FIN, Plated
7	8	02-3143	Washer, MED, Lock, 3/8-IN, 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	08-1030ZR2	Rear Axle Weldment, 200 Gallon

- Not Illustrated



Drawing 7.0 **Front Hub Assembly**

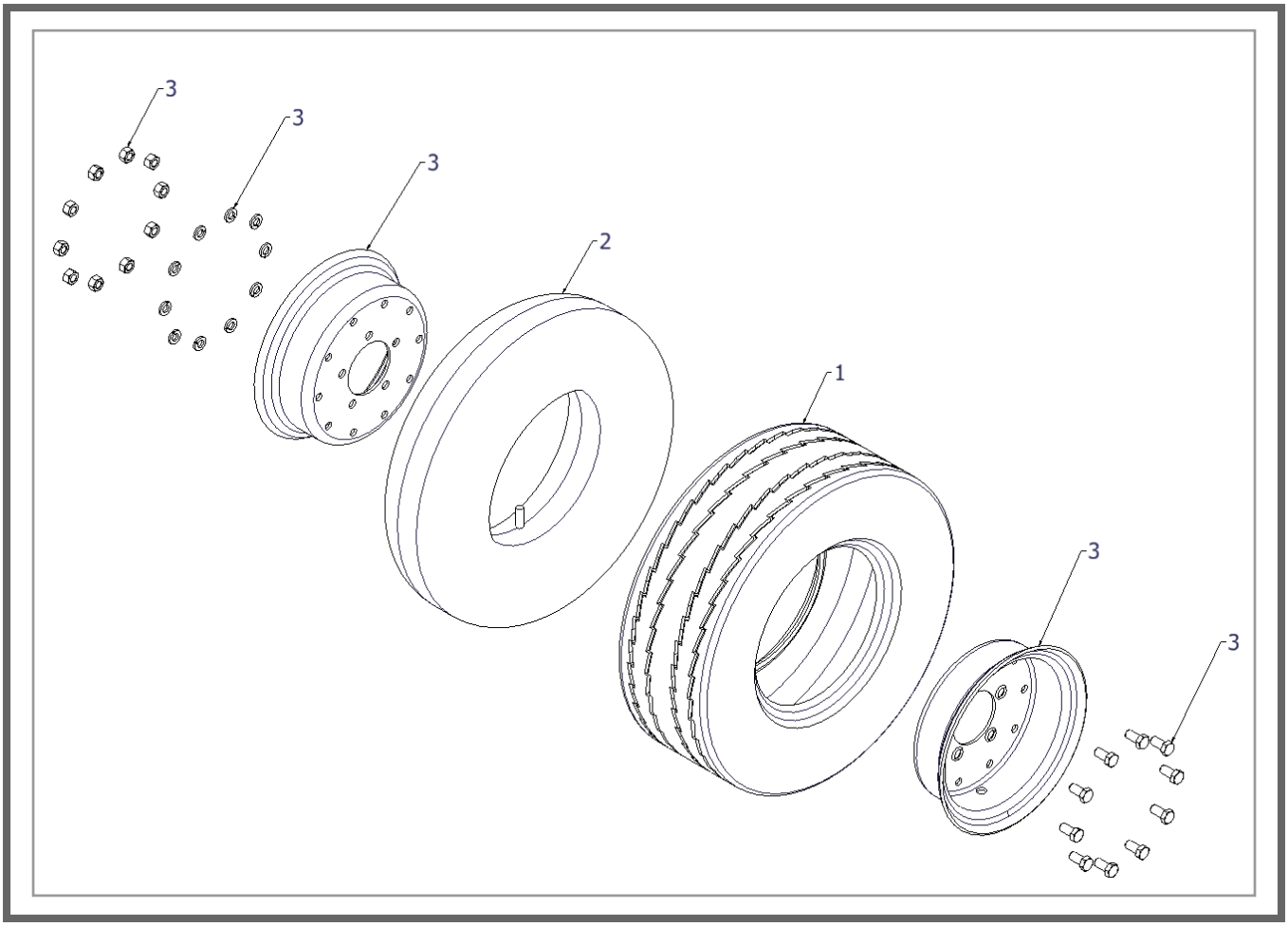
ITEM	QTY	P.N.	DESCRIPTION
1	1	04-1017	Hub, Front Axle
2	1	04-1016	Cup, Outer Bearing
3	1	04-1014	Cone, Outer Bearing
4	2	02-12055	Washer
5	1	02-1205	Nut, Castle
6	1	04-1015	Cup, Inner Bearing
7	2	04-1013	Cone, Inner bearing
8	2	04-1012	Seal bearing
9	1	04-1019	Cap, Hub
10	1	02-1017	Stud
11	1	02-1303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



Drawing 8.0 **Rear Hub and Drum Assembly**

ITEM	QTY	P.N.	DESCRIPTION
	1	08-10111	Rear Hub Assembly
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

*Replacement parts only available as whole assembly.



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	2	04-1020	Split Rim Wheel Assembly