



SPARTAN TOOL

FOR TOUGH CUSTOMERS. SINCE 1943.



PRODUCT MANUAL

Defender

Spartan Tool LLC | 1618 Terminal Road | Niles, MI 49120
order by phone **800.435.3866** | order online **SpartanTool.com**



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Warnings

- Read the safety and operating instructions before using any Spartan Tool product. Drain and sewer cleaning can be dangerous if proper procedures are not followed and appropriate safety gear is not utilized. Read the engine owners' manual for instructions and safety precautions on engine operation.
- Diesel is extremely flammable and is explosive under certain conditions.
 - Refuel in a well ventilated area with the engine stopped. Do not smoke or allow flames or sparks in the area where the engine is refueled or where diesel is stored.
 - Do not overfill the fuel tank (there should be no fuel in the filler neck). After refueling, make sure the tank cap is closed properly and securely.
- Before starting unit, be sure to wear personal protective equipment such as safety goggles or face shield and protective clothing such as gloves, coveralls or raincoat, rubber boots with metatarsal guards, and hearing protection.
- Carbon monoxide exhaust and/or diesel fumes from this equipment can create a hazardous atmosphere in confined spaces (which may include, but are not limited to, manholes and septic tanks), closed garages or other areas which may not be properly ventilated. In particular, excess diesel fumes can create an explosion hazard. Such hazardous atmospheres can cause death or severe injury. Do not operate this equipment located in any confined space or area with inadequate ventilation. Operate this equipment only is located outdoors or in an open, well-ventilated area.
- Ensure the jet hose has been placed in the pipe a minimum of 6 feet before engaging the water pressure to prevent the hose from coming out of the pipe prematurely and causing injury.
- Always shut off the water pressure before pulling the hose out of the pipe. Mark the hose a minimum of 6 feet from the end to help ensure the hose is not accidentally pulled out of the pipe while still under pressure. Shut off the water pressure when the hose mark is encountered.
- Never point the wash gun at anyone while operating the unit. Injury may result.
- Drains and sewer can carry bacteria and other infectious micro-organisms or materials which can cause death or severe illness. Avoid exposing eyes, nose, mouth, ears, hands, and cuts and abrasions to waste water or other potentially infectious materials during drain and sewer cleaning operations. To further help protect against exposure to infectious materials, wash hands, arms and other areas of the body, as needed, with hot, soapy water and, if necessary, flush mucous membranes with water. Also, disinfect potentially contaminated equipment by washing such surfaces with a hot soapy wash using a strong detergent.
- Only for outside use by authorized personnel. If you want to work inside a building, ensure enough ventilation. For use in cleaning drains, walls, floors and terraces with cold or hot water and to drain liquid with or without pollution like sand, stones etc.
- Fill the clean water tank only with water. It is strongly forbidden to drain flammable materials, chemicals, and elements with special regulations.
- For any questions, contact Spartan Tool at the address shown below.



CAUTION: Portions of the system can still be under pressure even if the unit is not operating.

CONTACT US

Spartan Tool LLC
1618 Terminal Rod
Niles, MI 49120
800.435.3866
SpartanTool.com

CALIFORNIA PROP. 65

This product may contain an extremely small amount of lead in the coating. Lead is a material known to the State of California to cause cancer or reproductive toxicity.



GENERAL

- Pipe Sizes: up to 13" diameter
- Max Water Pressure: 3,000 psi
- Max Water Flow: 10 GPM
- Jetting Applications: grease trap, surface water drain, storm drains

TRAILER

- Gross Vehicle Weight Rating (GVWR): 9460
- Gross Axle Weight Rating (GAWR): 4480
- L x W x H: 180 x 101 x 1
- Hitch: 2 5/16"
- Tires: ST 225-75-R15(D)
- Cold Inflation Pressure: 65 PSI
- Maximum Recommended Towing Speed: 55 mph

ENGINE

- Model: Kubota D1105 24 HP Diesel Engine
- Cylinders: 3
- Bore & Stroke: 3.07" x 3.09"
- Displacement: 68.5 cu. in.
- Fuel: Diesel
- Fuel Tank Capacity: about 8 gal
- Cooling: Water-cooling
- Oil Capacity: 4.2 Quarts
- Electric: 12V

CHASSIS

- See manufacturer for chassis info.

PRESSURE PUMP

- Max Temperature: 158° F
- Oil: GX 80W90 or equivalent

VACUUM PUMP

- Suction: -0.8 bar (relative)
- Oil: Vacumax 100 (71.002.000.100) or equivalent

FEATURES

- 1/2" x 262' high pressure jetting hose
- 115' filling hose
- 82' suction hose
- Riomote 9 channel radio remote control
- Engine and pump compartments
- Side mounted storage boxes
- Pivoting high pressure hose reel
- Suction hose reel connected to the waste tank
- High capacity tanks totaling 396 gallons with 264 gallons for waste and 132 gallons for clean jetting water

SAFETY

- E-stop for emergency shut down
- Pressure regulator / unloader valve
- Tank overflow protection on both waste and clean water tanks



Safety Instructions

This manual contains instructions for fundamental conditions that must be followed by use and maintenance of this machine. It is necessary for all authorized and qualified personnel to read the user's manual.

SAFETY MEASURES

Emergency Stop

This machine is equipped with an emergency stop. By operating this stop, the machine will stop immediately. Do not use the button for normal stopping. Only use when dangerous situations occur. After use, turn the emergency stop in order to be able to start up again.

Over-Pressure Valve

This protects the pipe system and reservoir.

Pressure Regulator

The pressure regulator looks to it that the working pressure never gets too high. It functions like a security valve.

Safety Covers

This machine is equipped with several safety covers over parts that are rotating. It is forbidden to remove these safety covers during operation of this machine. You can only remove them if there is maintenance on the machine. Stop the machine.

PERSONAL PROTECTION EQUIPMENT

- Safety glasses or face shield
- Ear protectors
- Gloves
- Waterproof clothing

POTENTIAL DANGERS

If safety precautions are not followed, it can be dangerous for personnel and for the environment.

If the procedures are not observed, this can result in:

- Failure of important functions of the machine.
- Failure of prescribed methods for maintenance.
- Exposure of persons to dangers of electrical or mechanical failures.



Fuel Shut Off must be turned "OFF" when towing jet. Failure to shut off fuel can cause fuel to flow through the carburetor and fill the engine cylinders.



Before hitching and towing on public roads, check that the tow vehicle uses a 2" ball on a hitch rated class II minimum, make sure keeper engages ball to secure hitch. Adjust if necessary.



The following two rules may limit your vehicle's towing capacity and the tank fill when towed. Determine the towing capacity as described below and follow guidelines in using the lowest value from the two rules.

TRAILER HITCH

Check rating of vehicle's trailer hitch

- **Warning:** Class 3 or 4 hitch with 2 5/16" ball with 7000 lbs towing capacity is required.

VEHICLE GCWR (GROSS COMBINED WEIGHT RATING)

Towing capacity = GCWR minus vehicle weight minus cargo weight minus passenger weight.

- **Note:** GCWR is provided on your vehicle or in vehicle manual.

VEHICLE TOWING CAPACITY

- Refer to the Vehicle Owners Manual for listed trailer towing capacity.
- Trailer towing capacity should equal GCWR minus vehicle weight, cargo weight, people weight, and (vehicle) fluids weight.
- Check axle load rotatings.

Wire the plug receptacle to your vehicle as show below.

- **Note:** The wire colors used on the jet running lights are also indicated in Fig. 7-1 for re-wiring to a different plug design.



- Always use safety chains.
- Always use trailer lights.

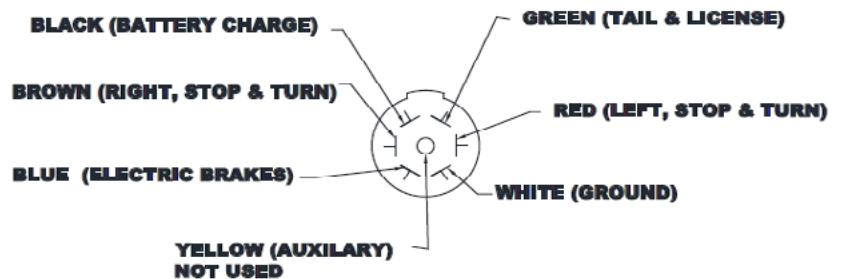
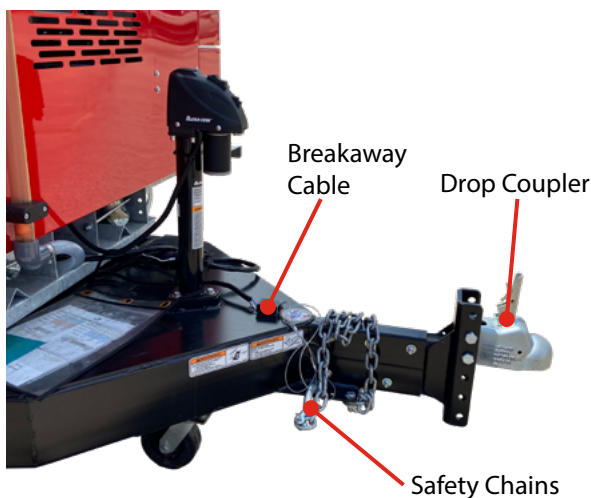


FIG. 7-1

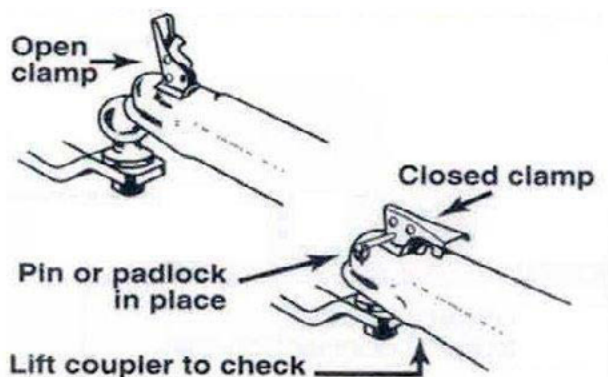
Towing Instructions



Adjust the coupler up or down depending on vehicle hitch height to ensure the jetter is towed level.

TOWING

1. Check that ball size is same as coupler.
2. Check that Ball Load Rating is the same or greater than Coupler Load Rating
3. Open clamp on hitch coupler.
4. Position hitch coupler above trailer hitch ball.
5. Lower trailer tongue until ball rests in ball socket.
6. Close hitch coupler clamp and secure with a pin or padlock.
7. Connect breakaway cable solidly to bumper or frame of tow vehicle as near to center as possible. The cable must hang clear of trailer tongue and be long enough to permit short radius without pulling breakaway cable forward.
8. Make sure breakaway cable is in the released position.



CAUTION: Do not use breakaway cable as a parking brake.



NOTE: Check location of breakaway cable periodically during each trip. Accidental application will cause brakes to drag and heat up, causing failure.

9. Cross safety chains underneath coupler. Allow slack for trailer to turn. Attach chain hooks securely to tow vehicle frame.



CAUTION: Avoid sharp turns. This could bend, create extreme stress or fracture either the actuator or trailer tongue.

10. Fully retract hitch jack and remove caster wheel. This will provide adequate ground clearance for transport.
11. Return high pressure reel to towing position, engage the transit lock, and confirm reel lock is engaged.
12. You are now ready to tow your trailer. The maximum recommended towing speed is 55 mph.



CAUTION: Always use safety chains. Chains hold trailer if connection fails.

Pump and Pressure System



The pump and relief valve are the heart of your jet. They have been specially designed for use with water temperatures up to 140°F for pipe jetting, but can provide useful water flow for many other cleaning jobs using the optional wash down gun and special attachments. The positive displacement pump (each crankshaft revolution has to move a certain amount of water) uses 3 plungers (similar to pistons in an engine) to create water flow. Pressure is not created until the pump outlet is restricted with a valve or nozzle. The pump, valving, and hoses can support pressures up to 3000 psi.

The regular valve acts to direct the water flow to the water tank when the hose reel and gun valves are off, or if nozzles provide too much restriction for total flow. Always use clean water to keep the regulator valve operating property. The hose and nozzle are designed to allow full flow at 3000 psi (at 3200 engine rpm) and the wash down gun operates at 1600 psi max pressure. If leaks develop in the system between the relief valve and hose reel valve (or gun valve) you will hear intermittent engine surges as the bypass pressure gradually drops and is built up again by the pump. Tighten or otherwise repair the leaks for smooth running. Always stop engine and release pressure before any plumbing changes or repairs.

Because of the inherent hazards with high pressure, use only Spartan high pressure hoses and components when repairing your machine.

If the nozzles become worn or if the gun is used with the jet hose, the regulator valve allows the same total flow but at lower pressure because the restriction is lower. To maintain desired pressure - replace nozzles.

If nozzles become plugged, the regulator valve will direct some of the flow back to the water tank while providing pressures over 3000 psi. If these pressures are seen with normal engine speed (3400 RPM), check and clean the nozzles. When using optional lengths of 1/4" hose the operating pressures can also be over 3000 psi at full gpm. Reducing engines rpm will produce lower pressures to prevent regulator valve from bypassing off and on. Continued operation at pressures over 3000 psi can cause engine overheat and reduce engine life.

Clean inlet filter daily (Fig. 10-1). A clogged filter will cause the pump to run dry and can cause expensive damage to the pump.

Positive Inlet Filter
Displacement Pump

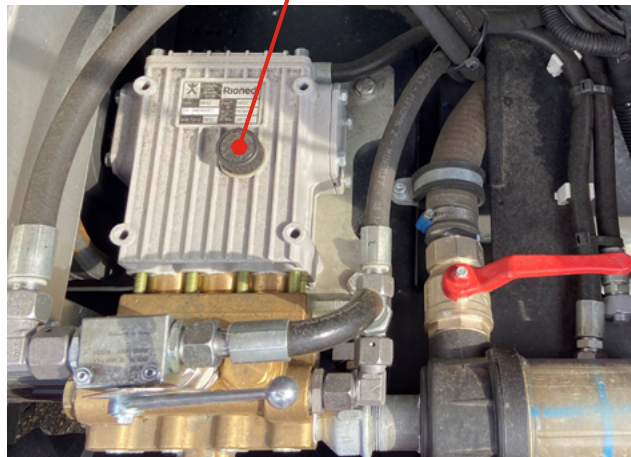


FIG. 10-1



High Pressure Water Jetting

High pressure water jetting is the utilization of high pressure water combined with sufficient water flow to remove debris in drain/sewer pipes. High pressure water jetting can also be used to remove debris on surfaces.

A high pressure water jet consists of a pump, a motor or engine, a hose reel, a given length of hose, and a various assortment of nozzles.

A pipe is cleaned with a high pressure water jet by directing water pressure and flow through a nozzle. Controlled water pressure and flow propels a water jet through the sewer pipe allowing it to remove and wash away the obstruction (See Fig. 11-1).

Ideally, a sewer pipe is cleaned from the lower end of the pipe and the hose propels itself to the higher end of the pipe. By slowly withdrawing the jet hose, the water pressure and flow cleans the line most effectively. When it is impossible to clean from the lower end of the pipe, the pipe must be water jetted several times to remove all the debris. A skilled operator can effectively clean a drain/sewer regardless of the obstacles in his or her way.

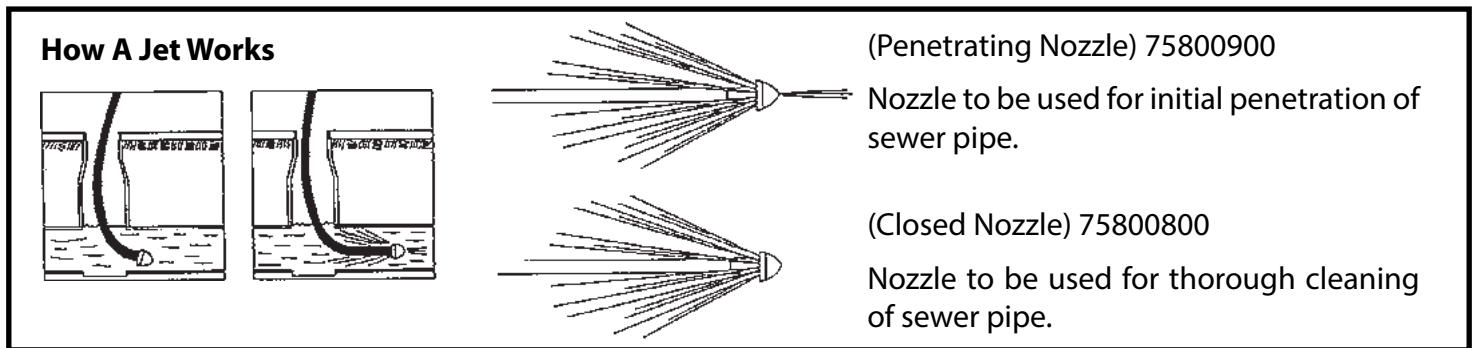


Fig. 11-1



Water Tank Filling

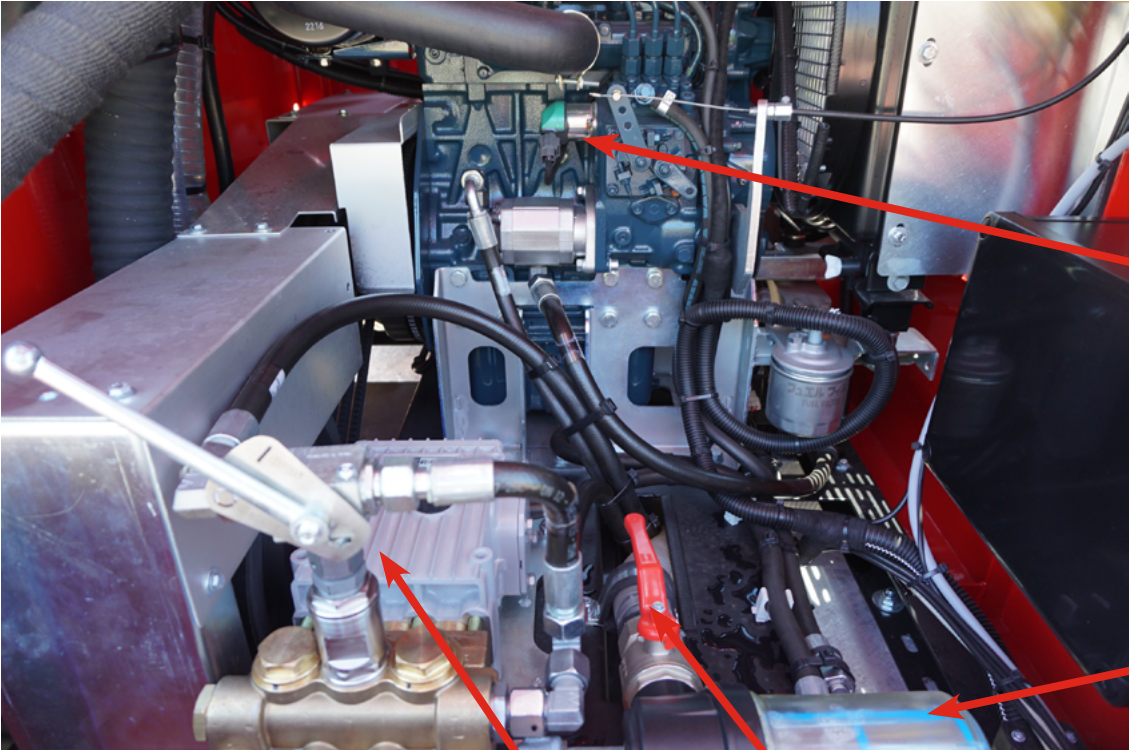
Fill the water tank from a clean water source. Always flush rust out of hydrants before connecting fill hose. The jet unit can be filled using 5/8" garden hose on fill reel or using fire hydrant fill. Fire hydrant fill requires fire hose with 2" cam lock female quick coupler.



NOTE: If the next 4 items are not followed, cavitation of the pump could occur and reduce operating efficiency and severely damage the pump.

- Use water temperatures under 131°F.
- Ensure that water strainer is clean (check daily as needed).
- Make sure the strainer valve (between the tank and the pump) is fully open during operations. This valve stops tank flow to allow strainer service.
- The pump drain valve must be closed. It must not drip when engine is off and strainer valve is open.

Operator Controls

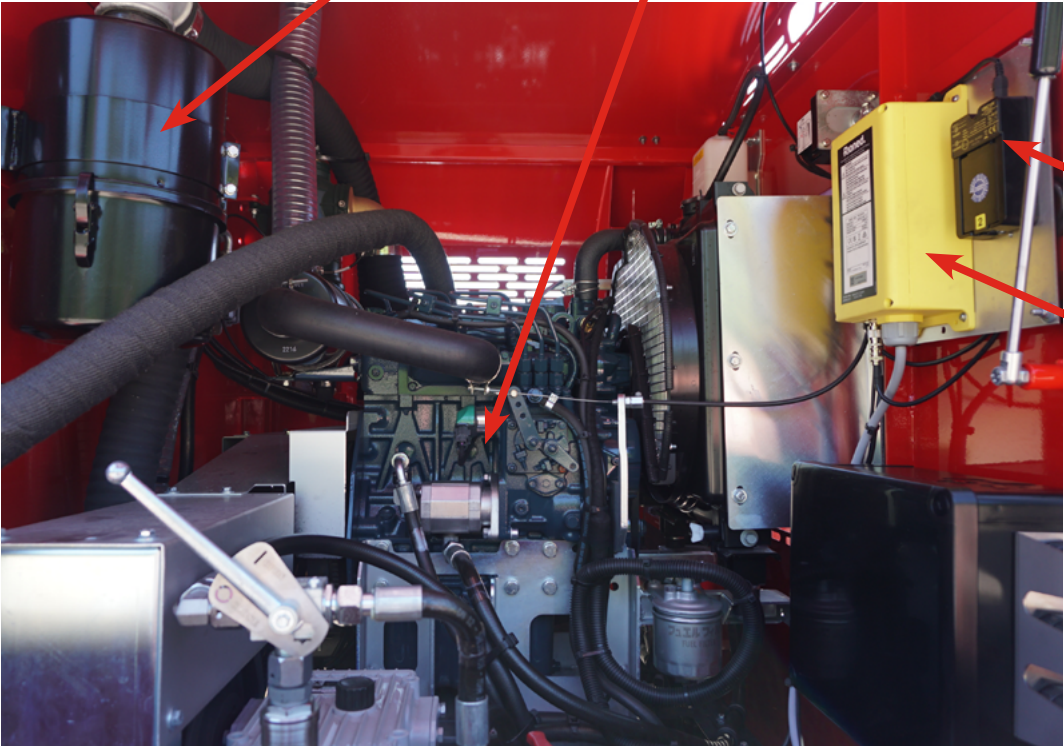


Engine

Water Filter

HP Pump

Supply Valve Water Filter



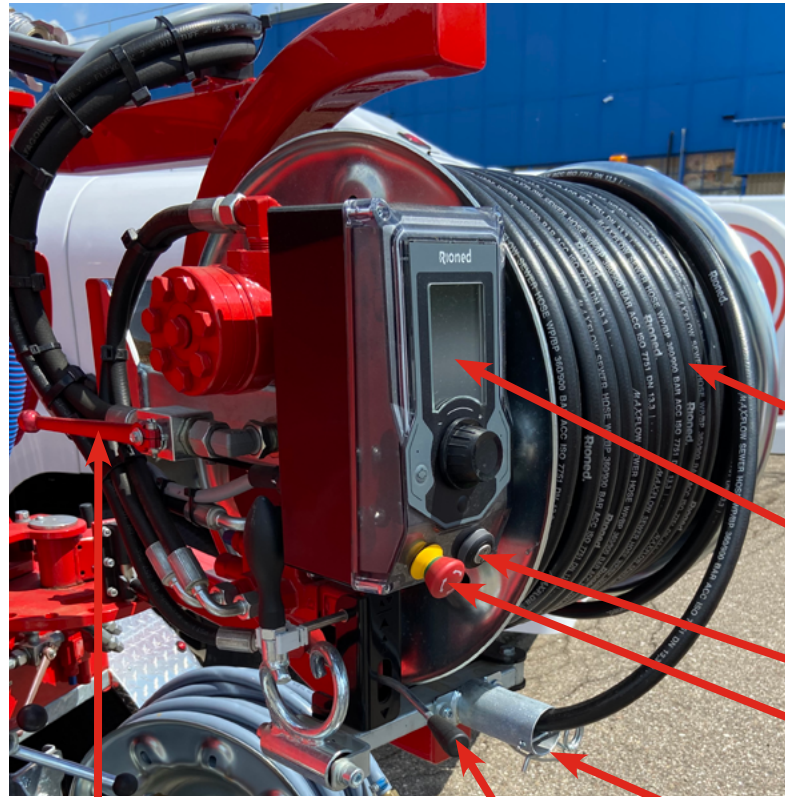
Vacuum Filter

Engine

Charger (radio remote control)

Receiver (radio remote control)

Operator Controls



HP Valve

Hydraulic Reel Control

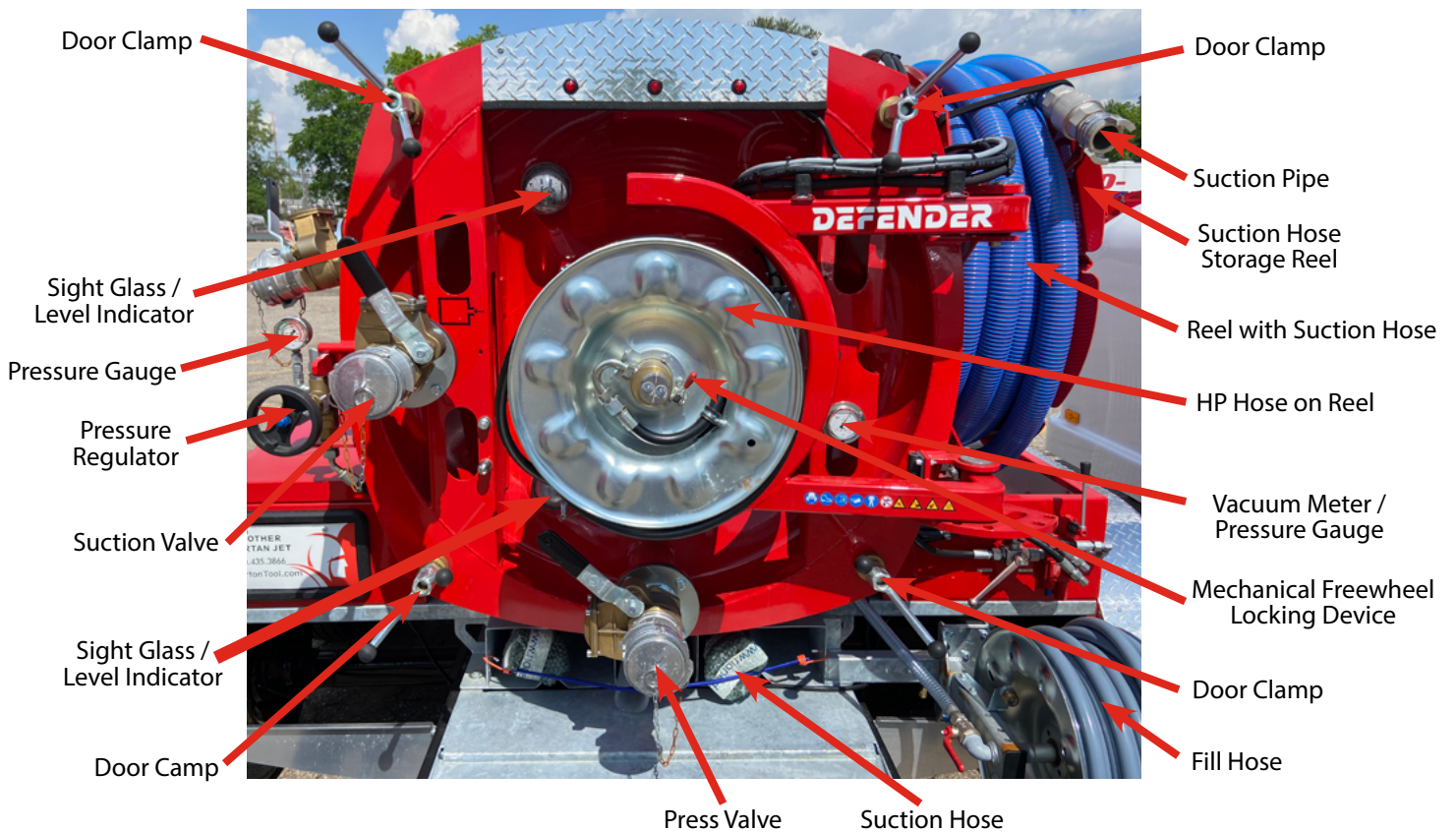
Hose Guide

HP Hose

Control Box

Engine Start (Keyhole)

Emergency Stop



Door Clamp

Door Clamp

Sight Glass /
Level Indicator

Suction Pipe

Pressure Gauge

Suction Hose
Storage Reel

Pressure
Regulator

Reel with Suction Hose

Suction Valve

HP Hose on Reel

Vacuum Meter /
Pressure Gauge

Sight Glass /
Level Indicator

Mechanical Freewheel
Locking Device

Door Camp

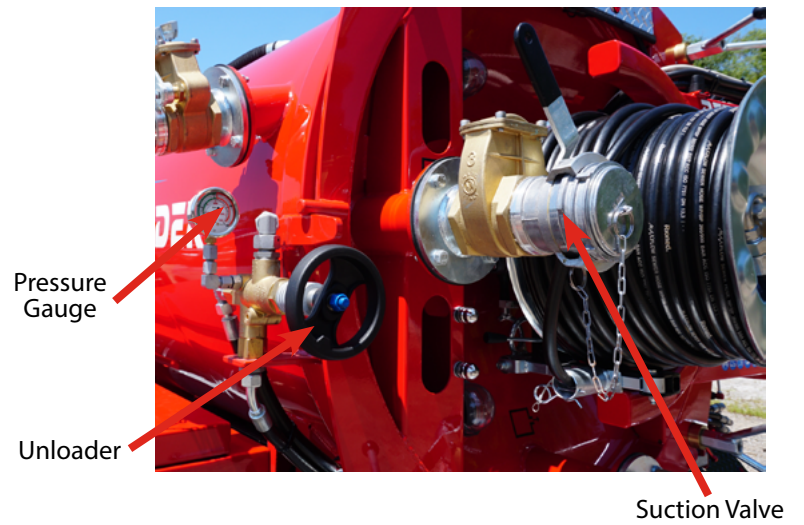
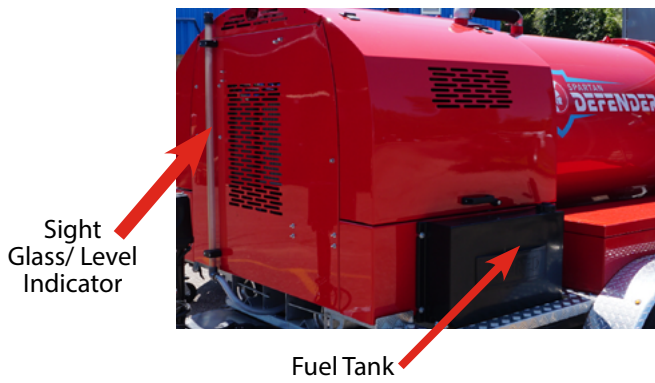
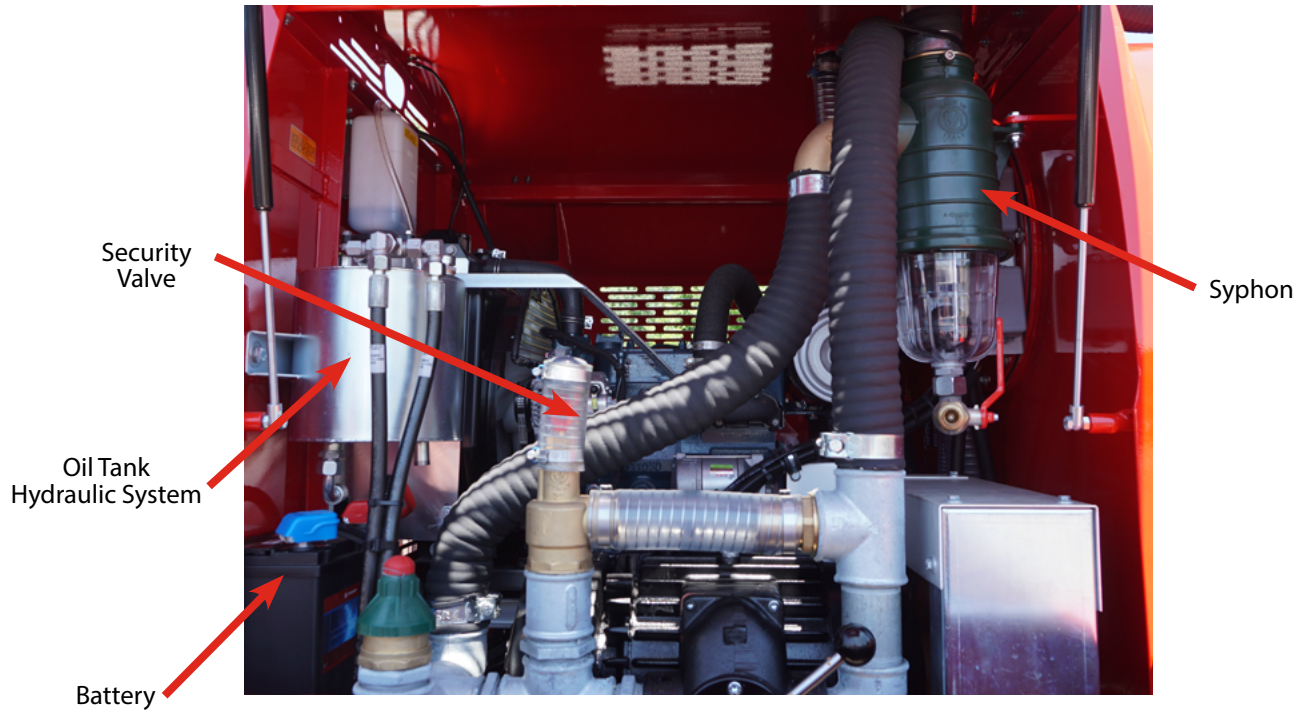
Door Clamp

Fill Hose

Press Valve

Suction Hose

Operator Controls





Engine Operation



NOTE: If you control, maintain or inspect the machine, you must have the right qualifications for this job. If you do not have the necessary knowledge, you may not use the machine. Further, you must convince yourself that you understand this manual thoroughly.



WARNING: It is forbidden to drive with the unit when over the maximum allowed load.



CAUTION: By simultaneously switching on the high pressure pump and vacuum pump, the unloader should be decreased.

START UP

- Check the oil level in the engine, high-pressure pump, oil tank hydraulic system, and vacuum pump using the dipsticks. Add oil if necessary.
- Check fuel level.
- Check whether the water filter is clean. Clean the filter if necessary.
- Turn the supply valve to the water filter to the open position.
- Close the high-pressure valve at the reel.



NOTE: The maximum water temperature is 131° F.

- Fill the water tank via the supply reel and/or the supply pipe.
- Loosen the control wheel of the pressure regulator.
- Screw the appropriate attachment onto the high-pressure hose.

HYDRAULIC REEL

- By means of pushing the control lever upwards or downwards, the high-pressure hose can be unrolled or rolled up. Due to the proportional functioning of this valve you can also control the speed of the reel. By putting the lever into position D (Fig. 14.1), you can unroll the hose manually.



ATTENTION: Never block the lever and always control it with one hand while guiding the high-pressure hose by means of the hose guide with the other hand.



Emergency Stop:

The machine is equipped with an emergency stop. By operating this stop, the machine will stop immediately. Do not use the button for normal stopping. Only use when dangerous situations occur. After use, turn the emergency stop in order to be able to start up again. Make sure the emergency stop can always be reached.



Position	Description
A	Wind hose
B	Reel locked
C	Unwind hose
D	Reel "out of gear"

Fig. 14.1






Emergency Stop

Make sure to use personal protective equipment while using the machine.

Open the side doors while operating (see Fig. 15.1).

STARTING THE ENGINE

To start the engine at the back of the unit. Position key control box:

- Insert key: 
- Position 1 (manual control): 
- Position 2 (remote control): 

To start the engine manually.

- Insert key and turn to position 1 "Manual Control ON".
- "Work safe" will display for 2 seconds.
- The "Manual control ON" icon will display for 2 seconds.
- The main menu will appear.
- Check the error icon. If the error icon is visible, it must be addressed before operation. Continue on if the error icon is not visible.
- Push the engine button to start the engine. When the engine runs the "Engine LED" lights up blue.
"Engine ON" will display for 2 seconds, followed by the main menu.
- Increase (+ clockwise) or decrease (- counterclockwise) RPM by turning the Navigator.

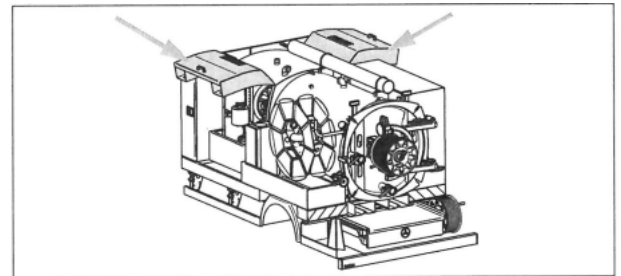
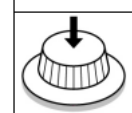
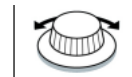
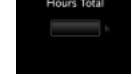
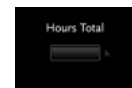
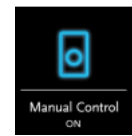


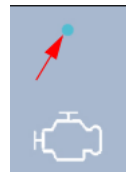
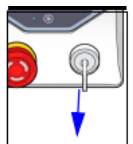
Fig. 15.1



Engine Operation

To start the engine via Riomote:

- Insert key and turn to position 2 "Radio Control ON".
- "Work safe" is displayed for 2 seconds.
- The "Riomote control ON" icon will display continuously. The corona is colored blue and will blink.
- Switch on the Riomote control. Corona will be continuously blue when Riomote remote control has contact with the receiver.
 - » If the Riomote Remote Control is not switched on in 10 seconds or has no contact, the corona will be red and the emergency stop activates.
 - » It is still possible to connect after 10 seconds if the Riomote remote control is switched on. The corona will turn from red to blue.
- Check the error icon for problems. If the error icon is visible, go to "Errors eControl". Continue if the error icon is not visible.
- For safety, remove the key from the control box.
- Push the "Engine start" button on the Riomote. This will start the engine. When the engine runs the "Engine LED" lights up.
- Increase RP by pushing "RPM+" button.



ENGINE SHUT-DOWN

- Turn high pressure water control valve "Off".
- Allow engine to idle for 1 to 2 minutes.
- Turn the engine key switch OFF. (The engine key switch must be OFF when the engine is not running to avoid battery draining.)



- Always locate the jet in the driest and safest place possible. Avoid high traffic areas and use flashers and safety cones.
- Position the jet so that the hose can be pulled directly off of the reel for use. Remember that jetting is most effective when you jet against the water flow.
- Open the side doors while operating the machine.
- When working with the machine, keep grate inside the tool box free from obstacles.
- The driver should take care of not exceeding the maximum loading capacity of the vehicle by filling the tanks. It is prohibited to drive with the water tank and vacuum tank full at the same time if the maximum load weight of the vehicle is exceeded.



WARNING: Trailer must be level for low water shutdown to operate correctly. When trailer is on an incline with the hitch end at the down hill side and an empty tank, enough water can be held in the lower front corner of tank to keep float switch in the operating position.

- It is strongly forbidden to spray on: humans, animals, and/or electrical components. Never let the high-pressure hose spray outside a sewer, drain or pipe.
- Do not let the machine operate without supervision

UNLEVEL GROUND

- Position the trailer with the hitch (tank suction) end at the downhill side.



WARNING: Do not unhitch or operate trailer jet unhitched upon unlevel ground.

UNHITCHING

- Place wheel chocks around trailer jet wheels.
- Disconnect ball hitch by raising lever and jacking hitch up.
- Disconnect safety chains and light cord before driving away.

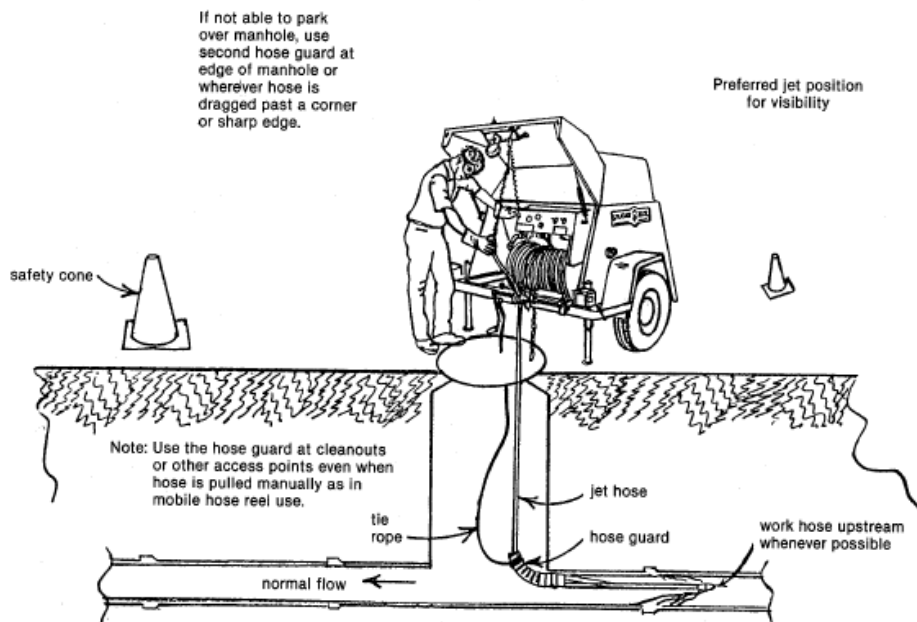


Fig. 17.1



Operating Instructions

OPERATION

- Release the reel lock (see previous instructions) and install nozzle and hose guard(s).
- Always insert sewer hose several feet into pipe opening before actuating hose reel valve. Never stand in front of pipe opening when nozzle is near pipe opening. As described in "Setup Section," work upstream whenever possible.



NOTE: At this time, put on safety goggles to prevent eye injury from flying water and debris.

- Follow engine starting procedures to begin pipe cleaning operations. Advance engine throttle to full speed.
- To start spraying:
 - eControl: Press "High Pressure ON" to spray water. The display will show "High Pressure" then change to the main menu. Increase or decrease RPM by turning the Navigator.
 - Riomote Control: Press button 4 (start spraying). Followed by button 2 (throttle up) to allow the hose to unwind into the drain.
- Move the H.P. water control valve to ON (up) and let out hose as nozzle pulls into pipe, untwisting hose kinks as necessary. Proceed slowly and cautiously.
- Pull back 1-2 feet for every 4-5 feet of progress to make sure the hose is not burying itself or tying itself up in an open cavity or larger pipe.
- Continue working up the line while watching and feeling for speed changes as the nozzle makes its way into a blockage.
- When working over a manhole, you often will see dirty water, chunks of grease or debris flow past as the nozzle penetrates a blockage. When backed up water flows, the line is probably open.
- Now, pull the "working" nozzle back slowly to re-clean and scour the pipe walls. When working through heavy and long blockages you may have to flush debris back to machine every 5-10 ft. Repeat until water runs clear from the pipe.



WARNING: Do not let the engine run at full throttle without load (hose reel valve OFF) for longer than 1-2 minutes.

- The Defender Water Jet will pull out past 260' but you will find the going slower because of the pressure loss from extra hose length. Unless longer operation is common, we recommend the hose extensions be added only when needed. If moving the jet before the job is done, the hose can be disconnected from the jet to avoid pulling hose completely out of pipe and restarting.
- Check that the water drains away. When the blockage has been cleared, continue to flush for awhile. At the same time, wind the hose up slowly.



ATTENTION: Rewind hose onto reel under pressure to avoid crushing. If machine has run out of water, ensure hose is unwound before pressurizing.

- To stop spraying:
 - eControl: Press "High Pressure OFF" to the spray of water and decrease engine RPM.
 - Riomote Control: Press button 3 (stop spraying) to stop the spray of water and decrease engine RPM.
- Remove hose guard and install hose end and nozzle in holder. Place high pressure hose in hose holster. Lock reel. Store all parts in tool box compartment.



REMINDER: Engine key switch must be off to prevent battery drain when not using.

- Follow engine shut down procedure.

- Reverse setup instructions, drain tank and disconnect fill hose. Replace manhole cover or pipe caps and clean up machine before leaving job site.

OPERATING HINTS

- Wind white tape around hose (a minimum of 6 ft. from end recommended) to warn of nozzle being too close to pipe opening.
- Grab the hose into an "S" shape and twist the hose to help it get around corners and off of pipe edges (See Fig. 19.1).
- Turn water valve off and pull hose back out of line. Look for traces of clay or other material to determine if nozzle is burying itself outside of pipe.
- Try different nozzle or different pipe openings.
- Walk to nearby buildings and manholes and listen for water sound to determine if hose is going where it should. The hose may tie itself up in a manhole and need help going into the next pipe. Use a pole or pipe to guide hose so entering the manhole can be avoided.

PIPE JETTING PROCEDURE

- Although the Defender is capable of various high pressure cleaning operations, jetting pipes of 4" - 15" is typically the major work required of the jet. The hose reel is designed for outdoor applications. See sections on the mobile hose reel and ¼" drain hose for indoor or remote applications and for lines smaller than 6".
- For **safety** reasons, always operate with 2 people when the pipe entrance is away from the jet location; one person should stay near the jet to control the machine operation while the other person works the hose and nozzle. The mobile hose reel should be used for remote control whenever the second person cannot be seen or heard by the machine operator.
- The sewer hose should always be replaced when reinforcement sleeve can be seen because of a worn cover.
- The Defender **nozzles** are designed to match the pressure and flow performance of your jet. They are key to efficient operation because they convert all of the engine and pump power to water speed for hose pull and for cleaning impact.
- Nozzles "**Closed**" (75800850) and "**Open**" (75800950) are standard equipment. See parts section for part numbers to order additional nozzles or root cutters. Nozzle holes will wear after several months of continuous use. If the system operating pressure gradually drops, try a new nozzle to check for wear. Check for nozzle plugging occasionally by removing the nozzle from the hose and holding up to the light. Clean by inserting small diameter wire if necessary. Plugged nozzles will cause poor hose pull even though the gauge pressure will show higher.



Fig. 19.1



Fig. 19.2

Operating Instructions

ENCOUNTERING OBSTRUCTIONS

- When obstruction or corners are encountered it may be necessary to manually rotate the hose (See Fig. 19-1) to enable feed through that area. The rotation will cause the jetting nozzle to jump over or around those areas. Any rotations in one direction must be followed by an equal number in the opposite direction to prevent kinks from building in the hose.
- At times, it will be necessary to move the hose slightly in and out of the drain line to assist the jetting nozzle in clearing stubborn clogs, obstructions, or tight corners (See Fig. 19-2).

Treat the high-pressure hose carefully:

Always clean after use.

Ensure that hose does not encounter sharp objects.

Ensure that no traffic crosses the hose.

If the hose has to be repaired, use only the correct pressure rated repair couplings.



CAUTION: Ensure the spraying nozzle does not leave the drain! Water under high-pressure may cause severe injuries!

CLEANING A WALL, TERRACE, OR FLOOR



CAUTION: Before using a spray gun, you must always set the pressure below the maximum (\pm the half of the maximum pressure). You must do this before you start the machine. If the machine is running, the pressure can be increased by turning the control wheel towards its maximum working pressure. Never exceed the maximum pressure that is marked on the manometer when using the spray gun.

1. Screw the spray gun onto the high-pressure hose. Fasten it by using the two wrenches provided.
2. COMPLETELY unroll the high-pressure hose.
3. Open the HP valve near the HP reel.

Start spraying by eControl:

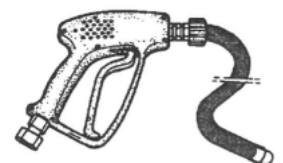
1. Press "High Pressure ON" button.
2. Turn the throttle up by turning the Navigator clockwise.
3. Screw the high-pressure regulator wheel upward on the high-pressure regulator until the required working pressure is reached. The adjusted pressure can be read from the pressure gauge (12) on the machine when the spray gun is open.
4. Pull the trigger of the spray gun.

Stop working:

1. Turn the HP pump off and throttle down. Press "Stop spraying" button.
2. Close the HP valve near the HP reel.
3. Stop the engine. Push "Engine ON" button for more than 1 second.
4. Check that the water drains away. When the blockage has been cleared, continue to flush for awhile. At the same time, wind the hose up slowly.

Spray gun with NW 5 Hose:

Instead of the spray lance gun, you can also mount a NW5 hose with small nozzle onto the spray gun. This set can be used for unclogging small pipes. The water supply can be used for unclogging via the gun. In this way you can prevent the system from flooding the surroundings.





Turn the pressure regulator under 150 bar (2175 psi). The pressure may never exceed 150 bar (2175 psi).

Using the device during periods of frost:

Your machine may freeze up during a period of frost. A number of safety precautions must be taken.

Additional preparations before storage:

1. Drain the water tank and the water filter.
2. Close the drain valve and mount the filter again.
3. Put enough antifreeze into the water tank.
4. Open the high-pressure valve.
5. Start the machine and let it run.



NOTE: It is not necessary to attach either a nozzle or a gun to the high-pressure hose.

6. Let the high-pressure pump remove all the water, which is still in the high-pressure hose.
7. Close the high-pressure valve when antifreeze comes out of the hose.
8. Leave the engine running for some time: to allow all pipes to fill up with antifreeze.
9. Switch off the machine. Now the machine is ready for storage.

Additional preparations:

1. Turn on the machine and let the high-pressure pump drain all antifreeze into a jerry can. The antifreeze can be reused. Ensure that no water is mixed with the antifreeze. If water gets into the antifreeze it is not suitable for re-use. Dispose of the used antifreeze properly, hand it into a local depot for disposal of industrial waste.
2. Stop the machine and prepare it for use.



WARNING: Ensure that no water is mixed with the antifreeze. If too much water gets into the antifreeze it is not suitable for re-use. Dispose the used antifreeze properly, hand it into a local depot for disposal of industrial waste.

BASIC OPERATION

- The integrated engine drives the high-pressure pump, the hydraulic pump, and the vacuum pump.
- The high-pressure pump receives water from the water tank via the water filter and pressurizes it. The pressure can be continuously adjusted. The pressurized water leaves the machine via the high-pressure hose on the reel.
- The vacuum pump is connected to the vacuum tank. When this pump creates a vacuum, the tank gets filled.
- The hydraulic pump drives via a hydraulic system the hose reel.

TWO TANK OPERATION

- Both tanks may be linked by opening the valve between to use the full capacity for jetting operations. Both tanks could also be used for vacuuming. Keep in mind the clean tank may not be easy to get clean again or remove all debris, which could cause other issues on future jobs.

Lever to Link Clean and Dirty Tanks





Using the Vacuum Device

The vacuum system is only for use in cleaning sewers and tanks.

BEFORE USE

1. Clean the suction valve, press valve, and syphon.
2. Clean the float ball protection in the vacuum tank (dirt and functioning) always before use.
3. Empty the vacuum blow off container.
4. Check the oil level of the vacuum pump and engine. Fill if necessary.
5. Check the liquid in the cooling tank.
6. Couple the Suction hose at the suction valve or use the suction pipe.
7. Set the handle of the vacuum pump to "suck".

FILL THE DIRTY WATER TANK

1. Put the end of the suction hose/pipe into the dirty water.
2. Start the engine (see page 15).
3. Press vacuum button on the control box.
4. Push throttle button open on the control box.



NOTE: Check the oil dropper on the vacuum pump. The dropper must give 7-10 drops/min.

5. Check the vacuum/pressure gauge (max. -0.8 bar or -11.6 psi).



NOTE: The vacuum pump is protected against overheating and will, in case of overheating, be shut off automatically

6. Open the suction valve or "Valve open" on the remote control.
7. Close the suction valve when the vacuum tank is full (see sight glass or level indicator).
8. Press throttle button down or RPM-.
9. Press vacuum button on.
10. Stop the engine with the start/stop switch.

EMPTY THE DIRTY WATER TANK

1. Fasten a hose onto the tank valve.
2. Place the end of the hose where the contents are to be released.
3. Open the tank valve.
4. Start the engine.
5. Set the handle of the vacuum pump to "Press" position.
6. Press button on the control box or "VAC On" button on the transmitter.

Let the vacuum pump press all the dirty water out of the tank (max. 0.5 bar or 7.3 psi). At 0.5 (7.3 psi) bar the overpressure security has to open. In case the tank is not pressed empty, the connection in the vacuum tank in front of the valve is blocked with sand or stones.

7. Press "Throttle Close" button, use the throttle control or "RPM-" on the radio remote control.

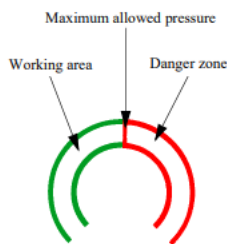
8. Press button on the control box or "VAC off" button on the transmitter.
9. Stop the engine, press button or "Stop" on the transmitter.
10. Open the suction valve for remaining pressure.
11. Check the float ball protection in the vacuum tank (dirt and functioning).

Symbols To Know

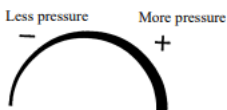


7.20 Security sticker

7.17 Pressure gauge

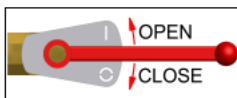


7.18 Pressure regulator



7.19 Valve control

Open and close valve:



1. Gehör- Kopf- und Augen Schutz tragen verpflichtet.
2. Sicherheitsschuhe mit extra Schutz verpflichtet.
3. Betriebsanleitung studieren verpflichtet.
4. Sicherheitshandschuhe mit Pulsschutz verpflichtet.
5. Schutzkleidung verpflichtet.
6. Kein Trinkwasser.
7. Gefahr für rutschen.
8. Pas auf für Handverletzung.
9. Drehende Maschine.
10. Achtung für automatische anlassende Maschine.

1. You must wear ear- head- and eye protection.
2. You must wear security shoes with extra protection.
3. Read the user's manual.
4. You must wear safety gloves with wrist protection.
5. You must wear protection cloth.
6. No drinking water.
7. Slip danger.
8. Look out for hand damage.
9. Turning machine.
10. Warning for automatically starting machine.

1. Gehoor- hoofd- en oogbescherming dragen verplicht.
2. Veiligheidsschoenen met extra bescherming verplicht.
3. Handleiding lezen verplicht.
4. Veiligheidshandschoenen met polsbescherming verplicht.
5. Beschermende werkkleding verplicht.
6. Geen drinkwater.
7. Gevaar voor uitglijden.
8. Pas op voor handletsel.
9. Draaiende machine.
10. Waarschuwing voor automatisch startende machine.

1. Protection obligatoire des yeux, de l'ouïe et de la tête.
2. Protection obligatoire des pieds.
3. Obligation de lire le manuel d'utilisation.
4. Protection obligatoire des mains.
5. Protection obligatoire du corps.
6. Eau non potable.
7. Attention Risque de sol glissant.
8. Attention Risque d'écrasement.
9. Attention Risque de dangers divers.
10. Attention Risque de démarrage automatique a tous moments.





Options

HOUR COUNTER

This machine is equipped with an hour counter.

The hour counter indicates the number of working hours that the machine has worked.

PULSATOR SYSTEM

Purpose: With less water use, quicker to the stoppage.

The high-pressure pump has three cylinders. By normal use the three cylinders follow each other continuously. This gives a continuous volume stream. By stopping one stroke, you get a pulsating water stream.

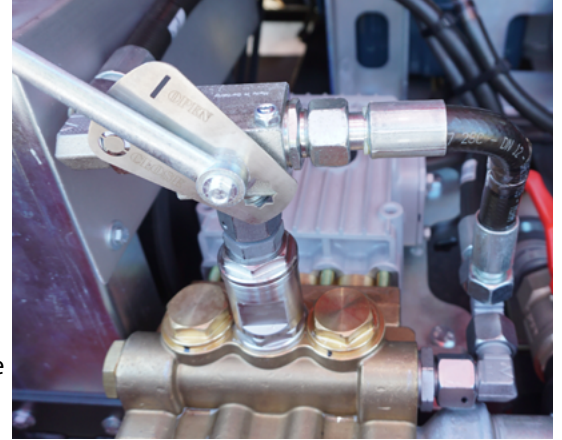
Control: To close or open the 3-way valve, you start or stop the pulsator.

- Handle to the left = Pulsator on
- Handle to the right = Pulsator off

Use the pulsator system only to get quicker to the blockage. Stop the pulsator when you are to the blockage.

Reel out with the hydraulic control. Do not touch the HP hose while the Riopulse is on.

Follow instructions from the previous sections.



NOTE: Operating pressure will decrease and fluctuate when pulsation is activated.

UNWINDING BY HAND

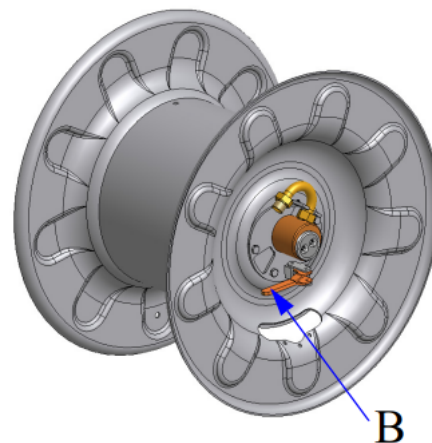
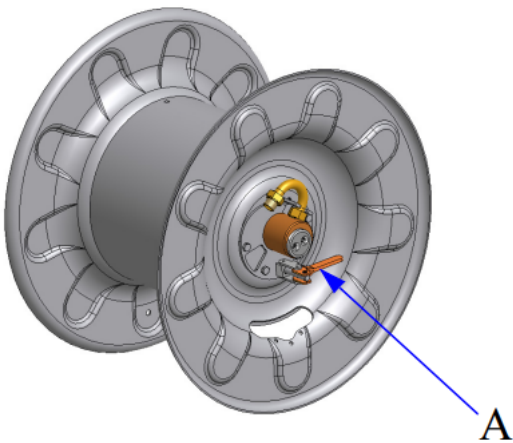
Your machine is fitted with a mechanical freewheel locking device. With this device you can put the HP hose reel in "complete freewheel position" or in "hydraulic".

If you want to unwind by hand you put the device in position "A".

The locking pin is released and the HP reel can turn freely without resistance.

To get the HP reel in hydraulics you put the device in position "B".

The pin goes back in locking position and you can use the hydraulics again.



RADIO RIOMOTE CONTROL

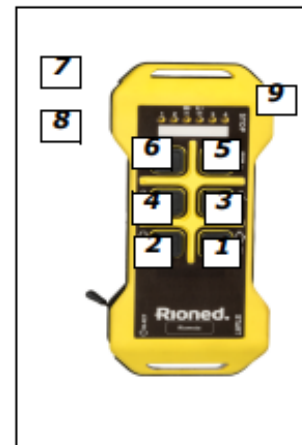
Start the vehicle engine with the Riomote control by following the instructions listed:

1. Insert the key into the key switch. Turn key half a turn clockwise to position 2.
2. Switch on the Riomote control. The Riomote symbol will stop flashing and stay blue when the Riomote control has established a connection with the receiver.
3. For safety reasons, remove the key from the eControl.
4. Press button 6 "Start motor" (7- and 9-channel) or button 2 "Start" (11-channel) on the Riomote control. The engine is now started. When the engine is running, the engine LED is blue.
5. Increase the speed by pressing button 2 "Increase speed" (7- and 9-channel) or button 6 "Throttle up" (11-channel).
6. Let the engine warm up. After three minutes of warming up, the machine is ready for use.

TO OPERATE THE TRANSMITTER

Functions:

1. Start the engine
2. Stop the engine
3. High-pressure pump on (start spraying)
4. High-pressure pump off (stop spraying)
5. Throttle up the engine
6. Throttle down the engine
7. Vacuum pump on
8. Vacuum pump off
9. Emergency stop



HOSE GUIDE

Purpose: To guide the HP hose safely into the sewer and wind the HP hose safely onto the reel drum.

Use:

- Put the end of the hose through the opening of the hose guide.
- By moving the hose guide to the right and left, you can wind the HP hose fluently on the reel drum.
- After use, lock the support.

Advantage:

- Maintain cleaner hands
- Hose longevity
- More freedom of movement
- Security
- Hose stays cleaner

RUN DRY PROTECTION

The run-dry protection is to protect the high-pressure pump.

If the water level in the tank is too low, the run-dry protection activates.

To prevent running dry, refill the water tank (supply hose, fill opening, supply pipe, etc.).



Hydraulic Oil

Hydraulic oil is an environmental friendly oil based on vegetable oil. By use of natural vegetable oil, the hydraulic oil is neutral for the environment and is biologically decomposable. When an oil spill occurs, the ground, as well as the nearby water, will be less damaged by contamination. Renew the oil once a year.

Characteristics:

It is possible to use the oil for a wide temperature range by handing a good viscosity from different temperatures.

The good lubrication characteristic takes care of protection against friction.

When using this oil remember that the standing time of this oil is shorter than the standing time of a premium mineral hydraulic oil.

It's recommended to clean up the spilled oil as soon as possible.

The oil meets the requirements for required lubrication, as stated in DIN 51 524, part two for HPL hydraulic oils.

This oil is compatible with elastomers, which is made of nitrubber, polyacrylate, silicone and epihydrogen chloride.

Use:

This oil is universal as hydraulic oil and is very suitable for use in hydraulic installations, which are being used often in environmental areas such as: close to rivers and lakes in water catchments areas.

Precautionary measures:

The mixing with motor oils will decrease the quality of this oil. Consequences: formation of foam and obstruction of filters.

Hygiene and health: this oil is a safe product, but extended contact with the skin could cause issues. Take the proper precautions when dealing with this liquid.



Power Rewind Instructions

TO REWIND HOSE ON REEL

- Release reel lock.
- Turn Speed Selector Dial counterclockwise to begin rewind in "Slow" position.
- Use panel mounted push button to initiate rewind.
- Adjust Selector Dial to desired rewind speed.



Cold Weather Protection: To avoid damage to the pump and water jet hose, keep the Defender from freezing temperatures. If the Defender must be stored in freezing temperatures, you must use one of the following methods:

FREEZE PROTECTION & WINTERIZATION PROCEDURE

1. Drain all water or let pump run until it sucks air.
2. Stop the HP-pump quickly.
3. Change the valves in the suction line. You should see the anti-freeze in the suction line and filter.
4. Run the pump on anti-freeze. The anti-freeze should get through the pump head and the pressure regulator to get the anti-freeze through the HP-hose.
5. Drain the filling line. A filling hose should not easily break when it freezes.
6. To be certain, blow the filling hose with pressured air, or make a connection from HP-hose to filling hose and run the anti-freeze through the filling hose until it flows into the clean water tank.

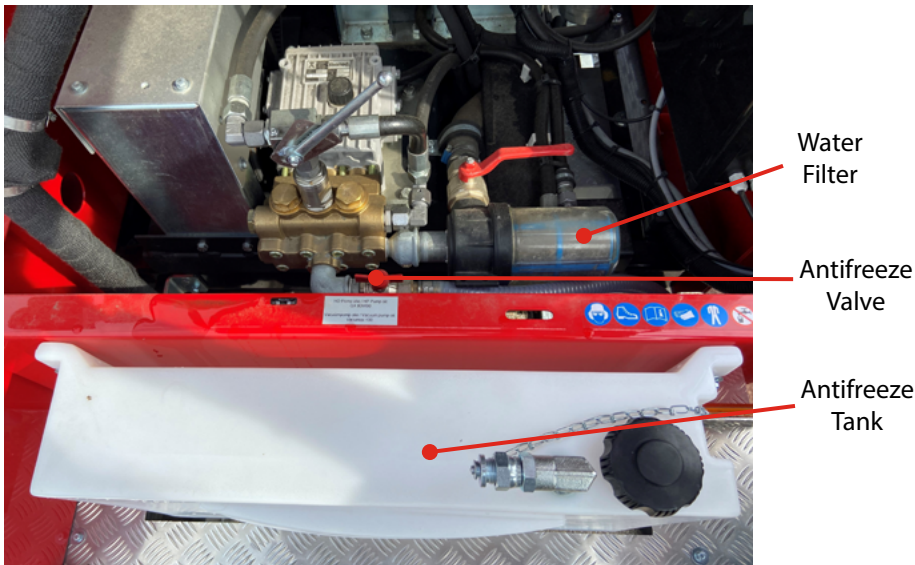


Fig. 20.1

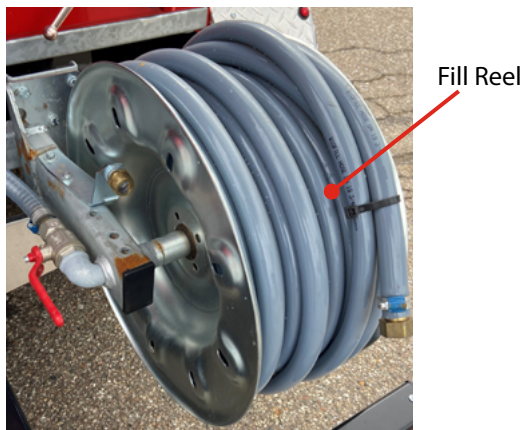


Fig. 20.2



Fig. 20.3



Maintenance

GENERAL MAINTENANCE

- Check entire unit daily for water, fuel, and oil leaks.
- Inspect machine daily for loose or lost nuts, bolts, etc. Clean inlet filter daily.
- Battery is maintenance free.



ATTENTION: Always stop the engine first and depressurize the system before servicing or repairing the machine.

To depressurize the system, open the HP valve. If the spray lance gun is attached you must also pull the trigger.

To depressurize the vacuum tank, open the suction valve.

DAILY MAINTENANCE

Oil Level: Check all oil levels every time before use. Add oil if necessary.

If an oil level has dropped, this implies a leak in the system. In which case, check all gaskets, couplings, and (hydraulic) pipes in the system. Immediately repair damage and fill the system with the correct oil.



NOTE: During the break-in period, the oil consumption of the engine can be more than usual.

Cleaning Water Filter: Clean before every use and after especially dirty jobs.

- a. Close the supply valve in the suction pipe.
- b. Open the drain valve.
- c. Unscrew cap from the filter piece.
- d. Clean the filter and concerning parts
- e. After cleaning, assemble the parts in opposite order.
- f. Open the supply valve.
- g. Check for leakage.

WEEKLY MAINTENANCE

Cleaning: Clean the frame and underneath weekly. Use car shampoo and plenty of water. Especially when roads are being salted, it is strongly advised to clean the machine often and more thoroughly.

MINOR SERVICING

Minor servicing must be carried out EVERY 250 WORKING HOURS (or at least once every 6 months) and includes the following parts of the machine:

1. Drive - Servicing the engine. Refer to Fig. 30.1 and 30.2 on page 30. See Engine Owner's Manual for additional information.
 - a. Change the oil in the engine.
 - b. Replace the oil filter, if equipped.
 - c. Clean the air filter.
 - d. Replace the fuel filter.
 - e. Check the condition of the battery.
 - f. Check the torque of the mounting bolts for the engine; tighten them if necessary.
 - g. Replace the HP valve actuator.
 - h. Clean the pressure regulator.

2. Carriage - Lubricate all mechanical moving parts in the system every 250 working hours or at least once every six months. Check that all nuts and bolts have been correctly tightened.
3. Pump System
 - Cleaning the high-pressure control: When the high-pressure valve has been closed, the pressure gauge should not indicate any pressure. Similarly, if the spray gun is connected and closed, the pressure gauge should not indicate any pressure. If the pressure gauge does indicate a pressure, this implies a leakage in the system or that the one-way valve may be dirty or damaged. In which case, stop the machine, un-screw the hose coupling and clean or replace the one-way valve. Also, check the condition of the O-ring and gasket. Regularly clean the high-pressure control. Carefully remove all dirt. Proper maintenance will increase the service life of this part.
 - Changing the pump oil: Change the pump oil in the high-pressure pump after every 1000 working hours (or at least once a year).

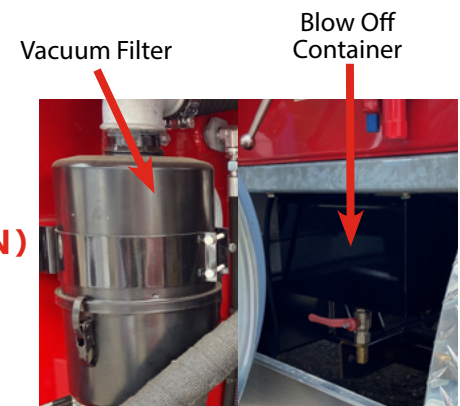
CLEANING FLOAT BALL (SIPHON)

1. Unscrew the cover, drain the water.
2. Clean the float ball.
3. Close the cover.

VACUUM FILTER & BLOW OFF CONTAINER (OPTION)

Drain the liquid regularly.

Catch it in a bucket and dispose of it in a proper way.



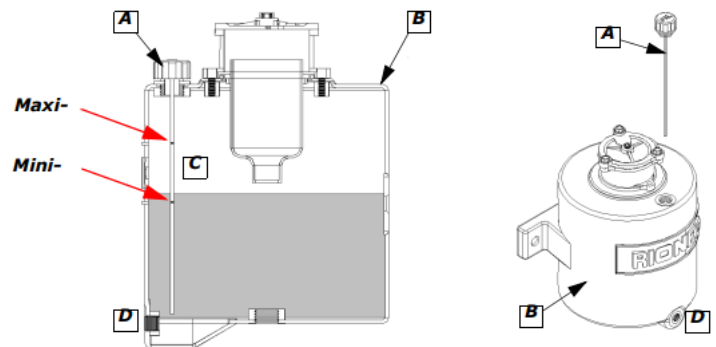
HYDRAULIC SYSTEM



IMPORTANT: You have to renew the hydraulic oil at least once a year.

Only use oil HESTIA 46. Check the oil level every time before use.

1. Stop the machine. Be aware that the machine is standing horizontal.
2. Take the dipstick (A) out of the oil tank (B).
3. Clean the dipstick with a cloth.
4. Put the dipstick into the oil tank.
5. Take the dipstick back out and check if the oil is between maximum and minimum (C).
6. Fill oil, if necessary.
7. Fasten the dipstick onto the oil tank.
8. Start the engine and let it turn for about five minutes.
9. Stop the machine and repeat point 2 until 8.



LONG-TERM PERIODIC MAINTENANCE

Have the high-pressure machine checked and maintained from time to time by the field service of Spartan Tool. This will boost the longevity of the machine. Periodic maintenance includes:

- a. Decalcifying both the suction valves and pressure valves at least once a year.
- b. Puncture nozzle holes when blocked.

Maintenance

Periodic Maintenance - Engine

MAINTENANCE	INTERVAL							
	Daily	First 8 hr.	Every 25 hr.	Every 50 hr.	Every 100 hr.	Every 200 hr.	Every 300 hr.	Every 400 hr.
Check and add engine oil	•							
Check for loose or lost nuts and screws	•							
Check for fuel and oil leakage	•							
Check battery electrolyte level	•							
Check and clean radiator screen	•							
Tighten nuts and screws			•					
* Clean air cleaner foam element			•					
* Clean air cleaner paper element					•			
Change engine oil		•			•			
Clean and regap spark plug					•			
Change oil filter						•		
* Replace air cleaner paper element							•	
K Clean combustion chamber							•	
K Check and adjust valve clearance							•	
K Clean and lap valve seating surface							•	
K Inspect radiator and hoses						•		
K Check fan belt conditions and tension						•		
K Change coolant								•

Note: The service intervals indicated are to be used as a guide. Service should be performed more frequently as necessary by operating condition.

* Service more frequently under dusty conditions.

K: Have an authorized Kawasaki engine dealer perform these services.

Fig. 30.1

Maintenance	Interval
Replace HP valve actuator	Every 250 hours
Check oil levels	Every time before use
Cleaning water filter	Every time before use and with strong pollution
Cleaning carriage	Weekly or with strong pollution
Service engine	Every 250 working hours or at least once every six months
Lubricate moving parts	Every 250 working hours or at least once every six months
Cleaning pressure regulator	Every 250 working hours or at least once every six months
Renew HP pump oil	Every 1000 working hours or once a year
Renew oil hydraulic system	Once a year
Decalcify suction valves	Once a year
Decalcify pressure valves	Once a year
Puncture nozzle holes	When blocked
Replace all parts immediately if there is a defect.	

Fig. 30.2



ENGINE

- **Oil**—SAE 10W30 (2,2 L or 2.32 qt capacity)
 - Check engine oil with every usage. Make the first engine oil change after (1) month or 20 hours of operation and every (6) months or 100 hours of operation thereafter.
- **Hydraulic Oil**—HESTIA 46
 - Change once a year.

PUMP

- **Oil**—GX 80W90
 - Change oil after the first 50 hours of operation, then at regular intervals of 500 hours or less, depending on operating conditions.
- **Inlet strainer**
 - Check inlet strainer before every usage to ensure that it is not blocked. Take care to ensure that no dirt or particles are allowed to enter the pump system.



WARNING: Do not exceed 3,000 PSI. Injury or machine damage may result.

BATTERY

- **12V**, 45 Amp
 - Maintenance-free battery. See battery for warnings.



WARNING: The battery contains sulfuric acid (electrolyte). Contact with skin or eyes may cause severe burns. Wear protective clothing and a face shield.

FREEZE PROTECTION

See page 27 for Cold Weather Protection instructions.

FUEL RECOMMENDATIONS

Use only clean, fresh, unleaded regular grade diesel.

Lubrication

PUMP

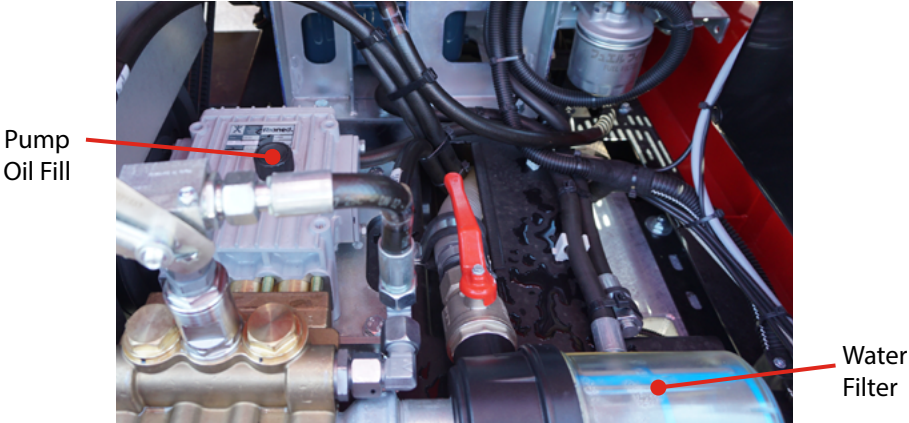


Fig. 25.1

- **Note:** Use a #2 lithium base grease formulated from a high quality mineral oil with rust and oxidation inhibitors.

HIGH PRESSURE REEL ASSEMBLY

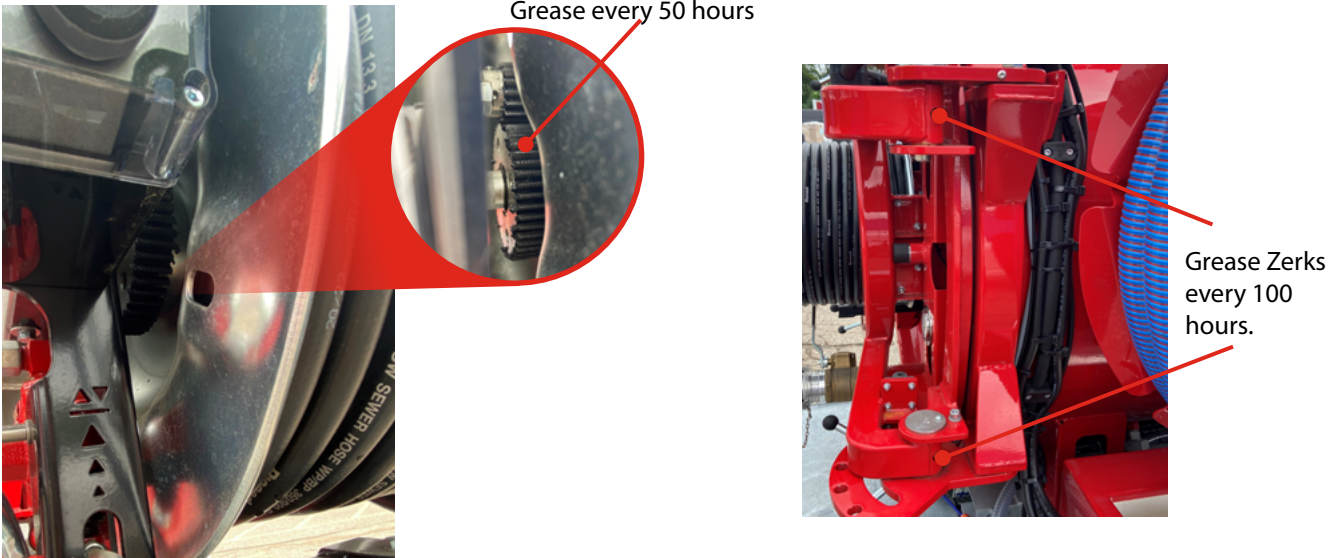


Fig. 26.1

BRAKE AND AXLE ASSEMBLY

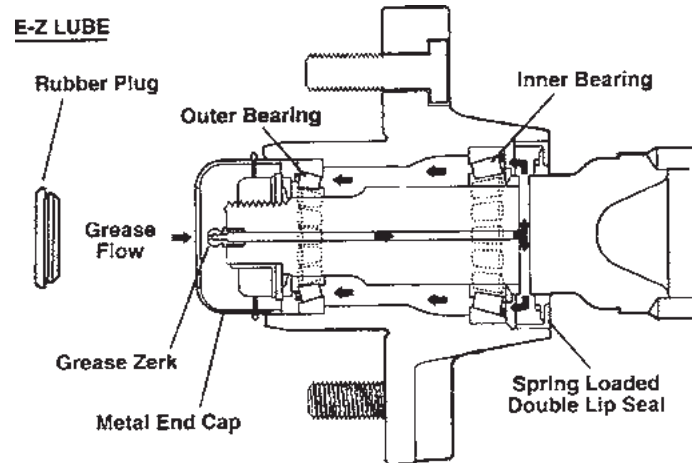


Fig. 26.2

Adjust brakes after the first 200 miles and at 3000 miles intervals thereafter, or as use and performance requires. For brake adjustment procedure refer to the Dexter Axle service manual

For additional maintenance information review the following sections in the Dexter Axle Service Manual:

- Braking System - Electric
- Hubs/Drums/Bearings
- Wheels and Tires



Grease wheel bearings every 12000 miles or 12 months. Follow greasing procedure in the Dexter Axle Service Manual.



Venturi Pump Attachment - 77763700 (Optional)

HOW THE VENTURI EFFECT WORKS

The Venturi Effect uses the venturi pumping attachment and your Spartan Jetter to create a vacuum effect to drain standing water. In Fig. 27.1, the black circles represent water from the jetter and the white circles represent the water to be pumped. The venturi has two parts: the Venturi Throat, which is a restricted section of the suction tube; above that is the venturi itself which is the part where the tube widens and connects to the discharge hose. The water from your Spartan Jetter is accelerated through a venturi restriction which causes it to increase speed causing a pressure drop and creates the vacuum that sucks in more water at the base of the attachment.

VENTURI PUMPING ATTACHMENT OPERATING INSTRUCTIONS

1. Attach the high pressure hose directly to the suction head of the venturi attachment.
2. Lower suction head into water or liquid to be pumped. The discharge hose is 15 ft. long and this determines the maximum depth or distance liquids can be pumped.
3. At a depth of 15 ft., the venturi attachment will pump 35-40 gpm. If additional lengths of discharge hose are added, the pumped volume will decrease accordingly.
4. Be sure to keep the pumping head submerged at all times to ensure steady continuous operation.
5. Start the engine and bring jet to full pressure. Use the ball valve on high pressure hose reel to control venturi operation.

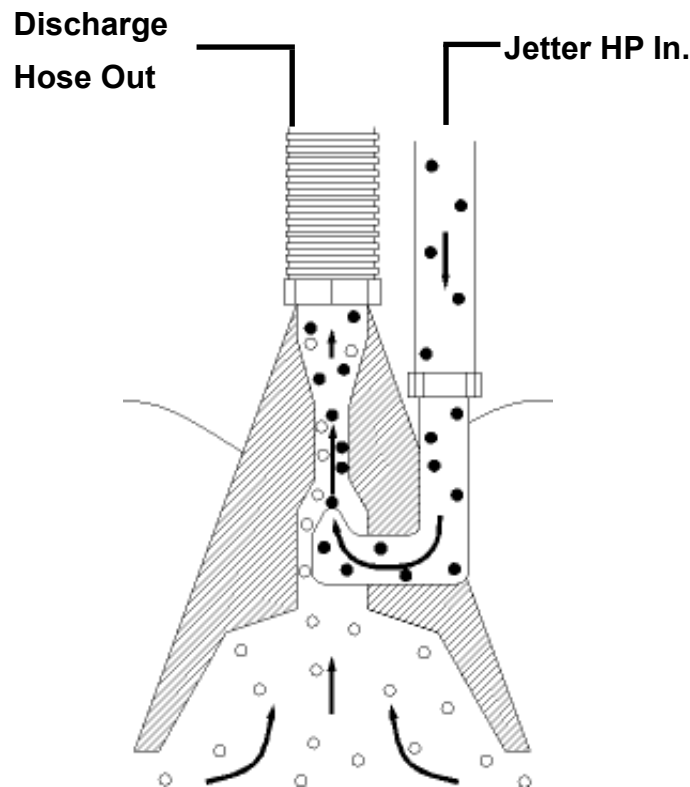


Fig. 27.1



PROBLEM	POSSIBLE CAUSES	CORRECTIVE ACTION
Engine does not start or stops abruptly.	Machine has run out of fuel.	Add fuel.
	Main or secondary fuse blown.	Replace the defective fuse and restart engine. If problem repeats, contact your dealer.
	Battery voltage too low.	Load or replace.
	Emergency stop activated.	Turn the emergency stop in order to be able to start up again.
The high-pressure pump does not produce the required pressure.	Water tank empty.	Fill the water tank.
	Supply valve to water filter closed.	Open the supply valve.
	Water filter clogged.	Stop the machine and clean the water filter.
	Air in high-pressure pump.	Allow the machine to run a few minutes. The failure will normally disappear. If not, contact the service department of your dealer.
	Suction valves blocked.	Carefully loosen the valves and descale them, if necessary.
	Suction valves worn out.	Contact the service department of your dealer.
Pressure varies.	Water level in tank too low.	Stop the engine, refill the tank and restart engine.
	Water supply valve not sufficiently opened.	Open the supply valve completely.
	Water filter clogged.	Stop the machine and clean the filter.
	Pump sucks air.	Stop the machine and check all hoses and couplings for leakage.
	Nozzle clogged.	Stop the machine and clean the nozzle (clean the nozzle holes).
	Pressure valves dirty or worn.	Stop the machine. Check the condition of the pressure valves. Clean or replace them.
	Pump gasket worn out.	Stop the machine and replace gasket.
	Ceramic plungers in the pump damaged.	Contact your dealer.
	Pressure control clogged or internally damaged.	Contact your dealer.

Troubleshooting

PROBLEM	POSSIBLE CAUSES	CORRECTIVE ACTION
Hydraulic reel does not wind the hose.	Handle not in correct position.	Put the handle into the correct position.
	Hydraulic tank almost empty.	Refill the tank. Check the system for leakage.
	Attachment bolt for control lever of hydraulic system loosened.	Fasten the bolt and put the lever into the correct position.
	Working pressure set too low.	Increase the working pressure if possible.
	Return filter hydraulic tank dirty.	Switch off the machine and clean the return filter.
	Hydraulic system damaged.	Contact your dealer.
No suction of the vacuum pump.	Switch doesn't supply current to magnet coupling.	Contact your dealer.
	Magnet coupling doesn't work.	Contact your dealer.
	Vacuum valve or press valve in open position.	Close the valve.
	Lever vacuum valve suction/pressure in wrong position.	Put the lever in the correct position.
	Clamp bolts not well-fastened.	Fasten the bolts.
	Float ball protection dirty or stacked.	Clean or loosen the ball.
	Still pressure in tank.	Open the vacuum valve.
	Oil separator not drained.	Drain the oil separator.
	Oil in the pump.	Press, at low speed of revolution, the oil out of the pump.
	Vacuum pump too hot or not greased sufficiently and blades of the pump stuck or burned.	Contact your dealer.
	Bad cleanness of float ball protection.	Clean again and press out the dirt, if necessary.
	Dirt reached the pump and blades stuck off.	Contact your dealer.
No reaction by switching in transmitter.	No current	Load battery.
		Use new battery.
		Control contact points on dirt and dust.
		Check fuses.
		Contact your supplier by repeating disturbances.
	Transmitter is not on.	Put button 0/1 to position I.
Transmitter is out of reach from receiver.	Move the machine and transmitter closer.	

PROBLEM	POSSIBLE CAUSES	CORRECTIVE ACTION
Warning signal after short working time.	Battery empty / defective.	Load or replace.
	Battery not loaded or defective.	Change battery completely.
		Check if the charging port works correctly.
		Check batter points / clean it.
		Use other battery.
Transmitter indications are good but functions are not executed.	Emergency stop pushed in.	Unlock emergency stop.
	Receiver has no current.	Check / replace fuses.
	No radio connection.	Check functions of control lights.
Certain functions are not executed.	Receiver is faulty.	Contact your supplier.
	Interruption in electric circuit.	Check all plugs. Plug in and push. Check control lights if functions are indicated.
Early failure.	Overheating.	Unit needs proper venting.
	No lubrication.	Lube per schedule.
	Dirt in the pump.	Only add clean oil.
	Working in the red danger zone (pressure gauge).	Not recommended.
	Rust.	Protect against/proper care.
	Running dry.	Monitor water level during use.
	Suction of sand or dust.	Recommended for liquids.



Tire Safety Information

This portion of the User's Manual contains tire safety information as required by 49 CFR 575.6.

The National Traffic Safety Administration (NHTSA) has published a brochure (DOT HS 809 361) that discusses all aspects of Tire Safety, as required by CFR 575.6. It can be obtained and downloaded, free of charge, from the NHTSA website.


Tire Safety Terminology Glossary

- **Cold tire inflation pressure** - the pressure in the tire before you drive
- **Gross Axle Weight Rating (GAWR)** - The maximum weight that any axle can support, as published on the Certification / VIN label on the front left side of the trailer. Actual weight determined by weighing each axle on a public scale, with the trailer attached to the towing vehicle.
- **Gross Vehicle Weight Rating (GVWR)** - The maximum weight of the fully loaded trailer, as published on the Certification / VIN label. Actual weight determined by weighing trailer on a public scale, without being attached to the towing vehicle.
- **Load rating** - The maximum load that a tire is rated to carry for a given inflation pressure.
- **Maximum load rating** - The load rating for a tire at the maximum permissible inflation pressure for that tire.
- **Maximum permissible inflation pressure** - The maximum cold inflation pressure to which a tire may be inflated.
- **Outer diameter** - The overall diameter of an inflated new tire.
- **Recommended inflation pressure** - The inflation pressure provided by the vehicle manufacturer on the Tire Information label and the Certification/VIN tag.
- **Rim** - a metal support for a tire or a tire and tube assembly upon which the tire beads are seated.
- **Vehicle maximum load on the tire** - The load on an individual tire that is determined by distributing to each axle its share of the maximum loaded vehicle weight and dividing by two.

Tire Information Placard

The Spartan Defender's Federal Certification/VIN label is located on the forward half of the left (road) side of the unit. The VIN label will identify the units GVWR and GAWR.

The Spartan Defender's Tire Information Placard can be located adjacent to the trailer's VIN (Certification) label at the left front of the trailer. The placard includes the Defender's tire size, cold tire inflation pressure, and load limitations. The load limitation statement will give an indication of the maximum cargo capacity. Any items (cargo) added to the Defender must not cause the total weight of the Defender to exceed the stated GVWR.



TIRE AND LOADING INFORMATION		
The weight of cargo should never exceed kg. or lbs.		
TIRE	SIZE	COLD TIRE PRESSURE
FRONT		
REAR		
SPARE		

SEE OWNER'S MANUAL FOR ADDITIONAL INFORMATION

Tire Safety Information

Steps for Determining Correct Load Limit

1. Locate the statement "The weight of cargo should never exceed 771 kg or 1700 lbs" on your tire information placard.
2. This figure equals the available amount of cargo and luggage load capacity.
3. Determine the combined weight of luggage and cargo being loaded on the vehicle. That weight may not safely exceed the available cargo and luggage load capacity.

General Tire Information

- Tire inflation pressure is the level of air in the tire that provides the load-carrying capacity and affects the overall performance of the vehicle. The tire inflation pressure is a number that indicates the amount of air pressure a tire requires to be properly inflated. Since tires are designed to be used on more than one type of vehicle, tire manufacturers list the "maximum permissible inflation pressure" on the tire sidewall. This number is the greatest amount of air pressure that should ever be put in the tire under normal driving conditions.
- Improper inflation is the main cause of tire failure. Excessive loads and/or under inflation cause tire overloading, which leads to abnormal tire flexing. Check the cold tire inflation pressures at least once a week for proper inflation levels.
- The proper air pressure may be found on the Certification/VIN label and/or the Tire Information placard.
High speed towing in hot conditions degrades the life of the Defender's tires. The internal heat generated from high speeds breaks down the tire's internal structure. It is recommended to drive at moderate speeds.
- If the trailer is stored for an extended period of time, the tires should be fully inflated to the maximum rated pressure. The Defender should be stored in a cool, dry place. Use tire covers to protect the trailer tires from the harsh effects of the sun.

Tire Maintenance

Checking Tire Pressure

- The recommended tire inflation pressure that vehicle manufacturers provide reflects the proper PSI when a tire is cold. A cold tire is one that has not been driven on for at least three hours. Since driving raises the tires temperature, the internal air pressure also increases. To prevent inflated tire readings, the tire must be measured when cold.

Maintaining Proper Tire Pressure

- a. Locate the recommended tire pressure on the vehicle's tire information placard, certification label, or in the Owner's Manual.
- b. Record the tire pressure of all tires.
- c. If the tire pressure is too high in any tires, slowly release air by gently pressing on the tire valve stem with the edge of your tire gauge until the correct pressure is reached.
- d. If the tire pressure is too low, note the difference between the measured tire pressure and the correct tire pressure. Add the missing pounds of air pressure to each tire that is under inflated.
- e. Check all the tires to make sure they have the same air pressure.



NOTE: If the tires are warm due to driving, but testing confirms under inflation, fill the tire to the recommended cold inflation pressure. While the tire may be slightly under inflated due to extra pressure in the warm tire, it is safer to drive a slightly under inflated tire than to drive a significantly under inflated tire. Since this is a temporary fix, the tire must be re-checked and adjusted once a cold reading can be obtained.

Tire Size and Tread

- Tires should be replaced when the tread is worn down 1/16 of an inch.
- Treadwear indicators on the bottom of the tire can be used as a guide. The indicators are raised sections spaced intermittently in the bottom of the tread grooves. If they appear even with the outside of the tread, the tire should be replaced.
- Replacement tires should be the same size as the Defender's original tires. To prevent error and maintain safety, it is recommended that all replacement parts be purchased through Spartan Tool LLC.

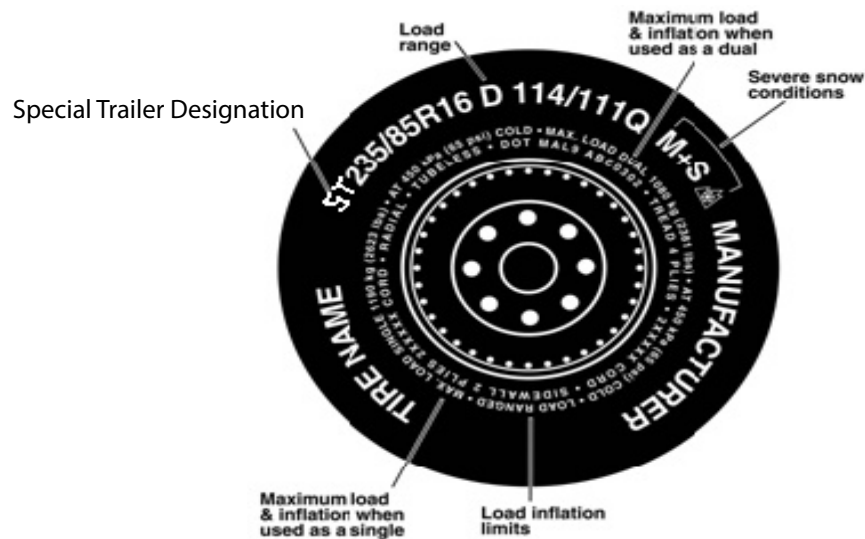
Tire Safety Information

Tire Balance and Wheel Alignment

- Tires must be properly balanced to avoid vibrations and shaking of the trailer. A wheel alignment adjusts the angles of the wheels to position them correctly relative to the trailer's frame. Such adjustments can maximize the life of the tires, but should be performed by a qualified technician.

Tire Repair

- A punctured tire can be repaired by plugging the hole and patching the area that surrounds the puncture hole. A small puncture in the tire tread can be repaired, but punctures to the sidewall should not. Tires should be removed from the rim to be properly inspected before plugging.



Tire Fundamentals

- Federal law requires tire manufacturers to place standardized information on the sidewall of all tires. This information identifies and describes the fundamental characteristics of the tire. It also provides a tire identification number for safety standard certification and in case of a recall.

Tire Safety Tips

Preventing Tire Damage

- Slow down before driving over a pothole or other object in the road.
- Do not run over curbs or other foreign objects in the roadway.

Tire Safety Checklist

- Check tire pressure regularly (at least once a month).
- Inspect tires for uneven wear patterns on the tread, cracks, foreign objects, or other signs of wear or trauma.
- Remove bits of glass and foreign objects wedged in the tread.
- Make sure tire valves have valve caps.
- Check tire pressure before any long trips.
- Do not overload trailer. Check the Tire Information Placard for the maximum recommended trailer load.



For our terms and conditions, including warranty, please visit <https://spartantool.com/pages/terms-and-conditions>. For warranty assistance, please contact us at (800) 435-3866 or customerservice@spartantool.com.

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