FOR TOUGH CUSTOMERS.
SINCE 1943

Ultimate Warrior
Skid Mount Sewer Jetter

Spartan Tool LLC
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www.spartantool.com

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• Read the safety and operating instructions before using any Spartan Tool products. 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 instruction and safety precautions on engine operation.

• Gasoline 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 gasoline 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 gasoline 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 gasoline fumes can create an explosion hazard. Such hazardous atmospheres can cause death or severe injury. Do not operate this equipment in any confined space or area with inadequate ventilation. Operate this equipment only when located outdoors or in an open, well ventilated area.

• Insure the jet hose has been placed in the pipe (minimum of 6 feet suggested) before engaging the water pressure to prevent the hose from coming out of the pipe prematurely and causing injury.

• Always shut the water pressure off before pulling the hose out of the pipe. Mark the hose a minimum of 6 feet from the end to help insure 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.

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

• 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.

• For any questions contact the company at the address shown below.

  **“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.”**

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Ultimate Warrior Features

USE

- The integrated engine drives the high-pressure pump via a V-belt drive.
- This 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 through the high-pressure hose on the reel.

180° PIVOTING HOSE REEL

- The extending hose reel arm and pivoting hose reel allow 180° of hose access from the front of the jetter.

eCONTROL+ CONTROL PANEL

- The eControl panel with LCD screen allows intuitive operation of the machine.
- An easy-to-use jog-wheel guides you quickly through a clear menu system with all machine functions available with a single click.
- The integrated LED warning lights indicate machine status at a glance.
- Functions displayed include control lights for the Engine, Run Dry Protection, ECO Function and Service Interval.
- The compact design and low weight maximizes the payload capacity of the vehicle and is commonly installed into standard vans.

LARGE CAPACITY HOSE REEL ~450 FT HP HOSE

- The high-pressure hose reel pivots through 180 degrees for optimum working conditions in all circumstances.
- The freewheel system ensures that the hose reel can be coiled off without any friction of the hydraulics reducing the effort required to operate the hose reel.
- The high-pressure jetting hose fitted to the Ultimate Warrior is the lightest hose in its class.
- The smooth inner surface and widened inner core results in an increase of 12% effective working pressure at the nozzle.
**USER FRIENDLY**

- With an easy fill fuel tank and special forklift lifting provision the Ultimate Warrior is extremely user friendly.

**MANUAL HOSE REEL LOCKING MECHANISM**

- The manual hose reel locking device consists of three manually operated latches that release the hose reel arm and allows the hose reel position to swivel allowing the hose reel to be positioned in a 180° radius.

**ECO PACKAGE OPTION**

- The ECO package helps you to save water and fuel.

- The start/stop system shuts off the engine automatically when the pump is on with no high pressure flow.

- The built up pulsator significantly reduces the consumption of water by sending pulses through the hose.
1. High-pressure hose on reel
2. eController
3. Hose holder
4. Hose guide
5. Supply pipe
6. Water filter
7. Drain valve
8. Water filter valve
9. Pressure regulator
10. Pressure gauge
11. Swivel Locking Device (3x)
12. Water tank level indication
13. Fuel tank
14. ECM (Engine Control Module)
15. Hydraulic Hose Reel Speed Control
1. High-pressure hose on reel
2. Supply hose on reel
3. Supply hose valve
4. eController
5. Hose holder
6. Hose guide
7. High-pressure (HP) valve
8. Swivel Locking Device (3x)
9. Reel locking device
10. Water filter valve
11. HP Pump
12. Oil reservoir
13. Connection supply hose
14. Water tank level indication
15. Water tank
16. Fuel tank
18. Oil reservoir  
21. Water Tank  
22. Fuel tank  
23. Engine  
26. Hydraulic Oil Reservoir
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40. Key Switch (Off-Manual-Riomote)
eController Functions

Spartan Tool Company provides several options on the Ultimate Warrior Skid Mount Sewer Jetter. As a result there are multiple eControl configurations to accommodate the features available on any particular unit.

This section of the manual will cover available functions of the Two Function eController and the Four Function eController.

The two figures below identify the two function and four function eController.

---

**2 Function eController**

The Two Function remote is identified by the two “Blue Function Indicators“ at the top of the LCD display.

The Two Functions Include:

- Home Function
- Maintenance Function

---

**4 Functions eController**

The Four Function remote is identified by the four “Blue Function Indicators“ at the top of the LCD display.

The Four Functions Include:

- Home Function
- HP Hose Reel Control
- ECO Mode
- Management Function
Description - Controls

Corona Display

The Corona on the eController is normally OFF (Gray)

Blue Corona indicates-
Set to Riomote Control

Red Corona indicates-
eController Error

Green Corona indicates-
Switched OFF by ECO Start/Stop System

Orange Corona indicates-
Pre-start functions or one of two error conditions.
  • Run Dry (no water in tank)
  • Error Oil level

Reference page 31 “eControl Errors” for alarm functions.
Push Buttons/Indicating Lights

<table>
<thead>
<tr>
<th>Description</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>The “Engine ON” light/button indicates the status and controls the starting</td>
<td>(see page 21, “Starting the Engine” for more information)</td>
</tr>
<tr>
<td>of the engine.</td>
<td></td>
</tr>
<tr>
<td>The “High Pressure Spray” light/button indicates the status and controls</td>
<td>(see page 28, “Cleaning a Draineline” for more information)</td>
</tr>
<tr>
<td>the operation of the high pressure spray valve.</td>
<td></td>
</tr>
<tr>
<td>The “BLUE LED” above each button will blink when the corresponding function</td>
<td>(The engine is ready to start OR high pressure spray is available.)</td>
</tr>
<tr>
<td>is available.</td>
<td></td>
</tr>
<tr>
<td>The “Blue LED” above each button will light solid when the corresponding</td>
<td>(The engine is running OR the high pressure spray valve is open.)</td>
</tr>
<tr>
<td>function is active.</td>
<td></td>
</tr>
</tbody>
</table>
Description - Controls

Navigation Bullets

The navigation bullets have two general states:

- Passive (Gray)
- Active (Blue)

Depending on the user’s location in the menu, one bullet is on display, or in the case of a pop-up eController Error, all navigation bullets disappear. (See page 31 “eController Errors” for list of pop-up displays)

Features in navigation bullets are in specified order, if applicable:

Error
Home
HP Hose Reel
ECO Mode
Management

The “Error” navigation icon is only visible and can be navigated when an error is applicable.

The ‘Home” navigation button is the default position and normally displays Engine Run time and HP Hose Counter.

eController Functions

HP Hose Reel Mode.

When the eController is selected to “HP Hose Reel” the LCD displays the hose position and the “UP” / “DOWN” control positions. The hose reel is actuated by rotating the navigation knob clockwise to select “Down” and counter clockwise to select “Up”.

The speed of the hydraulic drive using the eController is controlled by adjusting the speed control unit which throttles the hydraulic flow to the reel drive hydraulic motor. (see page 29, “Rewind Hose Using Hydraulic Reel”)

Hydraulic Speed Control
**ECO Mode**

When the eController is selected to ECO Mode the LCD displays the status of ECO Mode, either ON or OFF. The default is ECO Mode “ON” whenever the engine is started. The green leaf icon on the tachometer display is lit when the ECO Mode is active.

In ECO Mode the eController controls the High Pressure Valve and the Speed of the Engine during periods when flow is not being used. If there is no operator action being taken, the engine will eventually shutdown.

*(See page 24 in the “Operation Section” for a more detail description of ECO Mode operation.)*

**Management Mode**

When the eController is selected to Management Mode, the LCD displays a menu of three functions that can be selected by rotating the navigation knob and activated by depressing the navigation knob.

- Selecting “Software Version” displays the current version of the controller software.
- Selecting “Service Interval” displays the days and run hours until maintenance is required.
- Selecting “Hose Counter” displays the length of hose off the HP hose reel.

**Pulsator Mode (If Available)**

When the eController is selected to Pulsator Mode, the LCD displays the Pulsator status indicator and the ON/OFF icon.

The Pulsator function is controlled with the Navigator knob to turn the Pulsator function ON and OFF.

When the Pulsator icon is illuminated the Pulsator function is active.

**Tachometer**

The pointer which indicates the engine’s RPM should always display the current RPM.
The Riomote® radio remote control consists of a large waterproof and shock-proof hand held sender and a unit mounted receiver. The system is provided with separate batteries (lifetime of 8 hours) and is supplied with a battery charger. The Riomote® radio remote control is available in 7 channel and 9 channel models dependent on the functions available on the eController.

Unit Mounted Receiver
Safety Instructions

WARNING: READ THE “OPERATOR'S MANUAL” THOROUGHLY BEFORE USING ANY SPARTAN TOOL PRODUCT. DRAIN/SEWER CLEANING CAN BE DANGEROUS IF PROPER PROCEDURES ARE NOT FOLLOWED. KNOW THE PROPER OPERATION, CORRECT APPLICATIONS AND THE LIMITATIONS OF ALL SPARTAN TOOL PRODUCTS BEFORE USE.

Emergency Stop

This machine is equipped with an Emergency Stop. By operating the Emergency Stop, the machine will shut down. Do not use this button for normal stopping. Only use it when dangerous situations occur. After use, remove the danger and then rotate the Emergency Stop button clockwise to be able to start up again. Ensure the Emergency Stop can always be reached.

Pressure Regulator

The Pressure Regulator functions to ensure that the working pressure never gets too high. It functions like a safety valve relieving water to the storage tank to reduce pressure in the HP hose line.

Personnel Protection Equipment

The following personal protection equipment should be worn by personnel operating or working with the Ultimate Warrior:

- Ear protection
- Protective safety glasses
- Gloves (Recommended)
- Waterproof work clothing (Recommended)
- Spray boots for use with the spray gun (Recommended)

Work Area

The following precautions must be observed when establishing a work area for use of the Ultimate Warrior:

- Clearly mark the work area.
- Maintain a minimum distance of 20 feet from the work area.
- Remove all lose materials from inside the work area.
- Never spray from an unstable surface (ladder, boat, scaffold, ...).
- Never use in a Confined Space (Closed Room)
- Ensure there are no combustible materials in the area.
- The area must be adequately ventilated to prevent accumulation of carbon monoxide.
- DO NOT use corrosive chemicals in conjunction with the Spartan sewer jetters. Only environmentally approved chemicals should be introduced into drain lines.
Safety Instructions

General Precautions
• Do not let the machine operate without supervision.
• Keep children and animals away from the machine.
• DO NOT spray on humans or animals. IF the skin is penetrated immediately seek medical attention.
• Prevent damage by spattered or flying parts.
• Avoid spraying near electrical connections and other electric components if you are cleaning with a spray gun!
• Never block the controls in any way.
• Put personal protection equipment on BEFORE you start the machine.
• Ensure that the spraying nozzle does not leave the drain.

Safety Stickers
1. Safety Glasses, Hard Hats, and Hearing Protection are Required.
2. Safety Shoes are Required.
4. Hand protection is required.
5. Wear protective clothing against caustic material.
6. No eating or drinking.
7. Slipping Hazard.
8. Pinching Hazard (Hand Injury).
9. Rotating Machinery.
10. Warning, Machine Auto Start.
This machine is designed to run on Diesel Fuel with ultra low sulfur content (15ppm)

Excess idling or low RPM operation will build up soot and ash in the engine causing a lose of power and may cause the engine to stall.

An indicator lamp on the Engine Safety Protection Panel will illuminate to indicate when manual engine regeneration is required by placing the unit in the Neutral Parking mode.

(See page 47, Emission Monitoring-Regeneration for more information)

Warning:
If the unit fails to control pressure within the operating zone, contact Spartan Tool Customer Service at 800-435-3866 or by email at
Check Before Departure

Before you drive away with the vehicle, check the following:

1. The high-pressure hose has been inserted into the hose holder (23) and secured with the locking pin.

2. The high pressure hose reel is locked with the clutch engaged (3) and the manual hydraulic hose reel control level in the neutral position or the eController not in Hose Reel mode. (see page 23, “Hydraulic Hose Reel Control” for more information)

3. The supply hose is connected to the GK coupling (17).

4. The supply hose reel is locked by means of the reel locking device).

5. IF temperatures are below freezing, the water tank has been emptied and the piping system drained and flushed with antifreeze. (see page 35, “Cold Weather Operation” for more information.) The vehicle is now ready for departure.

6. The vehicle is now ready for departure.

Placement of Ultimate Warrior

1. Put the vehicle at the desired location and set the parking brake.

2. Block the tires if using on an incline or uneven surface.

3. Mark the working area by establishing barriers to prevent inadvertent access to the work area.

Prior to Starting the Ultimate Warrior

1. Ensure there is adequate fuel in the fuel tank (22) for the intended task.

2. Ensure the water filter (9) is clean. Clean the filter, if necessary.

3. Check the supply valve (15) to the water filter is open.

4. Check the high-pressure valve (7) at the HP hose reel is closed.

5. Fill the water tank via the supply pipe (8) or the supply hose. (The maximum water temperature is 55°C)

6. Loosen the control wheel of the pressure regulator (11). (rotate counter clockwise)

7. Attach the nozzle onto the high pressure hose.
Starting the Engine

**Important!**
The machine is equipped with an emergency stop. By operating this stop, the machine will shut down. Do not use this button for normal stopping. Only use when dangerous situations occur. After use, rotate the emergency stop clockwise to be able to start up again. Make sure the emergency stop can always be reached.

**Caution!**
Put on protective safety glasses and ear protection before starting the machine.

1. Put the key in the eController key switch.

2. Turn the key clockwise to position 1 “Manual Control ON”.
   - “Work Safe” is displayed for 2 seconds.
   - Icon “Manual Control ON” is displayed for 2 seconds.
   - Then the main menu is displayed.
   - ECO mode is always active “ECO Start/Stop” or “ECO Stop” if the unit is supplied with the ECO Function.

3. Check the error icon.
   - IF the error icon is visible, then check the eController Error Icon. (See “31 for a description of eController errors.”)
4. IF the error icon is not visible, depress the “Engine ON” button) for 2 sec..
   - “Pre-heat” (A) and “Engine ON” lights energize for 5 seconds.
   - After 5 sec. the engine starts.
   - With the engine running the blue “Engine LED” light (38) and the “Engine ON” light (39) is displayed for 2 seconds.
   - THEN the main menu on the eController is displayed after 5 seconds.

5. Increase (clockwise) or decrease (counter clock-wise) RPM by turning the Navigator dial (44).

6. Depress the Navigator Dial to display the “Navigation Bullet” menu.
   - Let the engine warm up. After 3 minutes the machine is ready for use.

**Manual Hose Reel Swivel Locking Device**

There are three locking mechanisms associated with the high pressure hose reel arm.

1. Mechanism “A” should normally be disengaged when the hose reel arm is in the stored position. Mechanism “A” is for locking the arm in a place when in an extended position.

2. Mechanism “B” is a spring returned latching devise that must be pushed down to unlock the arm and allow extending the hose reel arm. Once positioned the arm must be locked in place by engaging mechanism “A”.

3. Mechanism “C” is disengaged by pushing down on the mechanism to allow the hose reel to be positioned with the hose reel arm. Once positioned releasing mechanism “C” will lock the reel in place within the hose reel arm.
Hydraulic Reel Control

The hydraulic control lever is spring loaded to default to the neutral position "A" where the hose reel is locked by the hydraulic actuator.

- Pushing the control lever upwards (position B) will actuate the hydraulic motor to wind the hose onto the reel.
- Pushing the control lever downwards (position C) will actuate the hydraulic motor to unwind the hose off the reel.
- Due to the proportional functioning of this valve you can control the speed of the reel by movement of the lever away from the center position (A).
- Pushing the control lever into position “D”, (a maintaining position) will allow the hose reel to move without the aid of the hydraulic motor. This allows the hose to unwind as the high pressure hose nozzle works its way through a drain line.

A clutch assembly (30) on the HP hose reel drive unit can be disengaged to allow the hose reel to free wheel for pulling the hose off the reel manually.

Warning!

⚠️ Never block the Hydraulic Hose Reel lever and always control it with one hand while guiding the high pressure hose by means of the hose guide.

High Pressure Hose Guide

Purpose is to guide the HP hose onto and off of the hose reel.

- Put the end of the HP hose through the opening of the hose guide (24).
- Moving the hose guide right and left guides the hose evenly on the hose reel.
**ECO Mode**

The ECO Mode is available if the unit is supplied with a four function eController. ECO mode functions to close the HP valve and reduce engine RPM during periods of inactivity sensed by low spray flow.

To change/discharge ECO mode, the engine must be running.

ECO mode defaults to “ON” when the engine is started.

When the ECO Mode is “ON”, the ECO Mode icon (Green Leaf) is illuminated and the ECO function is active.

To turn the ECO Mode OFF, select the ECO Mode function using Navigator dial (44) and depress the Navigator dial to activate the ECO Mode function.

- Once activated, turn the Navigation dial counter clockwise to select “OFF” and depress the Navigation dial to activate “ECO Mode “OFF”.
- ECO Mode icon (Green Leaf) extinguishes.

To turn the ECO Mode ON, turn the Navigator dial clockwise and depress the Navigator dial to activate.

- ECO Mode is “ON”.
- ECO Mode icon (Green Leaf) illuminates.

**The “ECO Mode” Operation**

- High Pressure valve closes.
- Engine RPM decreases.
- Engine stops after 30 seconds with no operator action.
- To restart press the “Engine Start” button.
- Press the “High Pressure ON” button.
- Water comes out of the high pressure hose.
- Increase engine RPM to adjust pressure and water flow.
Management Mode

The Management Mode functions to display the current software version, required service intervals, and the hose reel counter,

1. Rotate the “Navigator” dial (44) to set the navigation bullet to position 4 “Management”

2. Depress the “Navigator” dial to activate the “Management” function.
   - The Navigation bullet extinguishes.
   - The Management Underline illuminates.

3. Once the Management function is activated the three menu options are displayed which include: Software Version, Service Interval and Hose Counter.

4. Each menu item can be displayed by selecting the item with the navigation dial and depressing the dial to activate the selection.
Riomote Control

The Remote control provides the ability to operate the high pressure machine jettter from a distance. There are multiple versions of the remote control based on the available functions of the machine.

7 Channel Riomote Control Functions:

1. Engine RPM Decrease
2. Engine RPM Increase
3. HP Spray Stop
4. HP Spray Start
5. Engine Stop
6. Engine Start
7. Emergency stop
Remote Control Operation

Emergency Stop Test

Check that the emergency stop works before working with the Rio-mote Control. Proceed as follows:

1. Insert the key into the eController key switch (46).

2. Turn the key to position 2 “Radio Control ON”.
   - “Work Safe” is displayed for 2 seconds.
   - “Rio-mote Control ON” is displayed continuously.
   - Corona illuminates blue and is blinking.

3. Switch the Riomote Control ON
   - Press and Hold the START button on the Riomote to link the Riomote with the Ultimate Warrior.
   - Release the START button when the blue corona stops blinking.
   - Corona is continuous “Blue” when the Riomote control is contacted with the receiver.


5. Depress button (7) the “Stop” button to exercise the Emergency Stop function.

Battery Indication

If the “Battery Indicator” on the Riomote controller lights continuously the battery must be recharged.

Note!
If the engine does NOT stop using the Riomote controller, contact your supplier.
Cleaning a Drain-line

1. Attach a suitable nozzle onto the high-pressure hose.

2. With the hose reel out of gear (Position “D”), pull the hose through the hose guide (24) to facilitate guiding the hose.

3. The hose can be unwound short distances with the hydraulic hose reel out of gear.

4. Put the nozzle into the drain to be cleaned.

5. Rotate the pressure regulator (11) clockwise to increase pressure to the desired value on the pressure gauge (12).

6. Open the high-pressure valve.

6. Depress the “High Pressure ON” button (41).
   - Water begins spraying out of the nozzle at the end of the hose.
   - “High Pressure LED” (40) lights blue.
   - “High Pressure ON” is displayed on the eController screen for 2 seconds.
   - Then the main menu is displayed on the eController screen after 5 seconds.

7. Increase or decrease engine RPM by turning the Navigator Knob (44).

8. The hose will now unwind and work its way into the drain line.

9. When possible, jet the drain line from the low end to the high end of the pipe.
10. Check for water draining away as an indication that the blockage has been cleared in the drain line.

11. When the blockage has been cleared, continue to flush while rewinding the high pressure hose.

---

**Attention!**

Ensure that the spraying nozzle does not leave the drain while spraying! Water under high-pressure may cause severe injury!

---

**Stop Spraying**

1. Depress the “High Pressure” button (41) to shut the high pressure valve.
   - “High Pressure LED” (40) extinguishes.
   - “High Pressure OFF” appears on the eController display for 2 seconds.
   - Water spray at hose nozzle stops.
   - Engine RPM decreases.

2. Care of the HP hose.
   - Always clean the hose after use.
   - Ensure there are no sharp objects near the hose.
   - Ensure vehicles do not cross over the hose.

---

**Important!**

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

---

**Rewind Hose Using Hydraulic Reel**

1. Move the hydraulic reel control lever from the “Out of Gear” (D) position to the “Reel Locked” (B) position.

2. Push the hydraulic reel control lever upward to rewind the HP hose.
   - Upward motion of the lever increases the speed of the reel proportionally.
   - Use the hose guide to align the hose so it re winds on the reel evenly.

3. Once the hose has been stored on the reel, ensure the lever is in the reel locked position (B) and the hose reel clutch is engaged.

4. The hydraulic speed control unit (F) can be adjusted to control the range of speed when using the hydraulic reel control lever.
Operating Instructions

Cleaning a Wall, Terrace or Floor

Caution!
Before using a spray gun, set the jettet pressure below the maximum spray gun pressure. (+/- half the maximum spray gun pressure). Do this prior to starting the engine. Once the engine is running, jettet pressure can be increased by turning the HP regulator handwheel to the working pressure. DO NOT exceed the green band pressure on the pressure gauge.

1. Attach the spray gun (B) onto the high-pressure hose.
2. Disengage the clutch assembly and completely unroll the high pressure hose.
3. Attach the spray lance gun (C) securing the quick coupling tightly.
4. Open the manual HP valve (7).
5. Depress the “High Pressure ON’ button.
6. Throttle up the engine speed by rotating the Navigator dial clockwise.
7. Rotate the HP regulator handwheel (11) clockwise until the desired operating pressure is reached when the spray gun is open.

Secure from High Pressure Cleaning
1. Depress the “High Pressure” button (41) to shut the high pressure valve and throttle down the engine.
2. Close the manual HP valve lever (7).
3. Depress the “Engine ON” button (39) for more than 1 second to stop the engine.
4. Rewind the hose.
eController Errors

**Emergency Stop**

1. The Emergency Stop icon illuminates on the eController when the Emergency Stop button is depressed.
   - Engine stops
   - High Pressure Valve closes
   - Pulsator Valve closes (if equipped)
   - Hose Reel switches OFF
   - ECO Mode switches ON
2. Operation can only be restarted after rotating the Emergency Stop button to release it.

**Engine Temperature**

1. The Engine Temperature icon illuminates when high engine temperature is detected. (240° F)
   - Engine stops
   - High Pressure Valve closes
   - Pulsator Valve closes (if equipped)
   - Hose Reel switches OFF
   - ECO Mode switches ON
2. The operator can acknowledge the alarm by depressing the Navigator dial in Manual Mode.
3. Operation can only resume after engine temperature has cooled to clear the alarm.

**Heat Exchanger High Temperature**

1. The Heat Exchanger High Temperature icon illuminates when high temperature is detected.
   - Engine stops
   - High Pressure Valve closes
   - Pulsator Valve Closes (if equipped)
   - Hose Reel switches OFF
   - ECO Mode switches ON
2. The operator can acknowledge the alarm display by depressing the Navigator in Manual Mode.
3. Operation can only resume after heat exchanger temperature has cooled.
Hydraulic Oil High Temperature
1. The Hydraulic Oil Temperature icon illuminates when high hydraulic oil temperature is detected.
   - Engine stops
   - High Pressure Valve closes
   - Pulsator Valve Closes (if equipped)
   - Hose Reel switches OFF
   - ECO Mode is unchanged
2. The operator can acknowledge the alarm display by depressing the Navigator in Manual Mode.
3. Operation can only resume after the hydraulic oil temperature has cooled.

Oil Level
1. The Oil Level icon illuminates when low engine oil level is detected.
   - Engine stops
   - High Pressure Valve closes
   - Pulsator Valve Closes (if equipped)
   - Hose Reel switches OFF
   - ECO Mode is unchanged
2. The operator can override the alarm by depressing the Navigator in Manual Mode and continue operation.

Coolant Level
1. The Coolant Level icon illuminates when low engine coolant level is detected.
   - Engine stops
   - High Pressure Valve closes
   - Pulsator Valve Closes (if equipped)
   - Hose Reel switches OFF
   - ECO Mode is unchanged
2. The operator can acknowledge the alarm display by depressing the Navigator in Manual Mode.
3. The operator must refill the coolant level in order to restart the engine.
Battery Charge

1. The Battery Charge icon illuminates when low battery voltage is detected.
   - Engine stops
   - High Pressure Valve closes
   - Pulsator Valve Closes (if equipped)
   - Hose Reel switches OFF
   - ECO Mode is unchanged
2. The operator can override the alarm by depressing the Navigator in Manual Mode and continue operation.

Run Dry

1. The Run Dry icon illuminates when low level is detected in the water tanks.
   - Engine stops
   - High Pressure Valve closes
   - Pulsator Valve Closes (if equipped)
   - Hose Reel switches OFF
   - ECO Mode is unchanged
2. The operator can override the alarm by depressing the Navigator dial in manual mode and continue operation.
3. The High Pressure LED starts blinking when the run dry is active, the override remains active as long as the Navigator dial is depressed.

Service Interval

1. The Service Interval icon illuminates when any of the maintenance intervals have been exceeded. The error is also listed under the Management function on the eController
   - Engine stops
   - High Pressure Valve closes
   - Pulsator Valve Closes (if equipped)
   - Hose Reel switches OFF
   - ECO Mode is unchanged
2. After running 360 days or 250 hours (whichever comes first) the error message is displayed.
3. The operator can override the message by depressing the navigation dial in manual mode.
4. The message will reappear the next time the machine is started.
Suction Venturi

Purpose:
The suction venturi is used to pump liquid out of sumps.

Preparations:
Check there is adequate water in the Ultimate Warrior water tank to support venturi operation.

Use:
1. Connect the HP hose onto the coupling of the suction venturi (A).
2. Place the suction venturi in the sump to be pumped (B).
3. Secure the transparent hose where water will be drained from the sump (C).
4. Verify that the manual HP valve is closed.
5. Start the machine.
6. Switch ON the high-pressure pump.
7. Open the manual HP valve to initiate flow through the venturi.
8. To stop suction:
   • Close the manual HP valve.
   • Stop the engine.
9. Uncouple the HP hose from the venturi.
Cold Weather Option (Anti-Freeze Tank)

Using the Anti-Freeze Tank

Your high-pressure device may freeze up during cold weather conditions. A number of safety precautions must be taken.

Additional preparations before departure:

1. Drain the water tank on the Ultimate Warrior by opening the drain valve.

2. When all water has been removed/drained, remove the water filter.

3. Clean the filter then reinstall it in the by reversing the steps.

4. Close the drain valve.

5. Remove the hand cap on the antifreeze tank and fill with ~7 gal. of antifreeze.

6. Remove the nozzle attachment from the HP hose and attach the HP hose to the Anti-Freeze tank connection (A).

7. Open the antifreeze valve (B).

8. Override the “Dry Tank” warning by depressing the Navigation Dial then depress the “Engine Run” button to start the engine.

9. Ensure the HP valve lever on the machine is open.

10. Depress the “High Pressure” ON push button on the eController.

11. Let the high-pressure pump remove all the water, which is still in the high-pressure hose and pump. (In Run Dry Override, the Navigation button must remain depressed to keep the HP valve OPEN.)

12. Close the high-pressure valve or push button HP OFF, when antifreeze flows out of the HP hose. (Watch the color of the water to determine when antifreeze flows out of the HP hose.)

13. Connect the HP-hose (with the special connection) to the supply hose.

14. Open the supply valve.

15. Close the HP valve, when anti-freeze flows out of the supply hose (watch the color of the water).

16. Next you connect the hose onto the anti-freeze tank (top).
17. Open the HP-valve again and let the pump send all anti-freeze to the anti-freeze tank.
18. Close the high-pressure valve.
19. Switch off the machine.
20. Disconnect the hose and the special coupling and clean up.

Make sure that the HP and the supply hose are locked and tightened. Now the machine is ready for departure.

Dispose the used antifreeze properly by delivering to a local disposal facility for industrial waste.

Additional preparations before departure:

1. Open the Drain Valve (10) to empty the water tank.
2. Close the water filter valve (16) unscrew the water filter cap (9).
3. Close the Drain Valve and replace the filter cap again and open the water filter valve.
4. Put antifreeze into the water tank.
5. Open the supply valve to the water filter (16).
6. Start the machine and let it idle.
7. Leave the engine running for some time: to allow all pipes to fill up with antifreeze.
8. Switch off the machine.
9. The machine is ready for departure.
10. Turn on the machine and let the high-pressure pump drain all anti-freeze into an appropriate container.
11. Stop the machine and prepare it for use.
Caution!
Always stop the engine first and depressurize the system before servicing or repairing the machine.
To depressurize the system, open the manual HP valve. If the spray gun is attached you must also pull the trigger to release the pressure.

DAILY MAINTENANCE

Check Oil Levels

- Check all oil levels once a week. (Engine Oil, HP Water Pump Oil, Hydraulic Oil)
- Add oil if necessary (see page 41, Technical Specification, Motor).
- If oil level has dropped, this implies a leak in the system. In which case, check all gaskets, couplings, and hydraulic hoses in the system.
- Immediately repair damage and fill the system with the correct oil.

NOTE!
During the “Break-In” period, oil consumption may be more than usual.

Clean the Water Filter

1. Close the water filter valve (16).
2. Unscrew the cap from the filter piece (9).
3. Clean the filter and associated parts. After cleaning, assemble the parts in reverse order.
4. Open the water filter valve.
5. Check for leakage.
Minor Service

Minor service 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 and Engine
   - Change the oil in the engine. (*Super 15W40 SF CC or equivalent*)
   - Replace the oil filter.
   - Clean the air filter.
   - Replace the fuel filter.
   - Check tension of the V-belt and increase tension if necessary.
   - Check the condition of the battery.
   - Check the torque of attachment bolts for the engine and tighten as necessary.

2. Carriage:
   - Lubricate all mechanical moving parts in the system. Check that all nuts and bolts have been correctly tightened.

3. Pump system
   a. Cleaning the high-pressure hydraulic control system:
      - With the manual high-pressure valve closed, the pressure gauge should NOT indicate any pressure due to recirc through the unloader valve.
      - If the spray gun is connected and closed, the pressure gauge should NOT indicate any pressure due to recirc through the unloader valve.
      - If the pressure gauge DOES indicate a pressure, this implies a leakage in the system or the pop-off valve on the unloader valve may be dirty or damaged. (Contact customer care for service.)
      - If leakage is suspected, stop the machine, unscrew the hose coupling and clean or replace the pop-off valve on the unloader. Also, check the condition of the O-ring and gasket. (Contact customer care for service.)
   b. Regularly clean the high-pressure control.
      - Carefully remove all dirt!
      - Proper maintenance will increase the service life of this part.
   c. Changing the pump oil:
      - Change the pump oil in the high-pressure pump after every 1000 working hours (or at least once a year).
Hydraulic System

**Important!**

You have to renew the hydraulic oil at least once a year!

1. Replace the hydraulic fluid in the reel drive system.

2. Check hydraulic oil level each time before use. IF level is NOT sufficient proceed as follows:
   a. Stop the machine.
   b. Ensure the unit is on a level surface.
   c. Remove the dipstick (A) from the oil tank (B).
   d. Clean the dipstick with a lint free rag.
   e. Put the dipstick back into the oil tank.
   f. Remove the dipstick and check the oil on the dipstick is between maximum a minimum (C).
   g. Fill oil, if necessary.
   h. Return and tighten the dipstick to the oil tank.

To let oil out of the reservoir, unscrew the drain plug (D) and catch the oil in a bucket.
**Engine Control Module**

If the Engine Control Module (25) indicates “Regen Needed”, proceed as follows:

1. Turn the “Neutral Parking” switch to “Parking”.
2. Select “Y” on the Engine Control Unit.

*(See page 47, Attachment A, Engine Control Module for more information)*

**Extensive Periodic Maintenance**

Have the high pressure machine checked and maintained from time to time by the technical service of Spartan Tool.

**Maintenance Scheme**

- **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 pump oil**: Every 250 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**: Every 50 working hours

Replace all parts immediately if there is wear or defect.
Technical Specifications

General Specifications

<table>
<thead>
<tr>
<th>Description (symbol)</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>see page 50 Attachment A, Ultimate Warrior Dimensions</td>
</tr>
<tr>
<td>Water Tank Capacity</td>
<td>~80 gal. per tank</td>
</tr>
<tr>
<td>Fill medium</td>
<td>Water (H2O) Maximum</td>
</tr>
<tr>
<td>Temperature medium</td>
<td>132 °F</td>
</tr>
<tr>
<td>Total length high-pressure hose</td>
<td>~450 feet</td>
</tr>
<tr>
<td>Diameter high-pressure hose</td>
<td>½” (NW13)</td>
</tr>
<tr>
<td>Total length supply hose</td>
<td>~164 feet</td>
</tr>
<tr>
<td>Diameter supply hose</td>
<td>¾” (NW19)</td>
</tr>
<tr>
<td>Oil Tank Capacity</td>
<td>5 liters</td>
</tr>
<tr>
<td>Hydraulic Oil Tank Capacity</td>
<td>Hestia 46</td>
</tr>
<tr>
<td>Max. Hydraulic Temperature</td>
<td>80 °C</td>
</tr>
<tr>
<td>Pressure Regulator</td>
<td>ULH 262-2H</td>
</tr>
<tr>
<td>Year of Construction</td>
<td>See name plate on frame</td>
</tr>
</tbody>
</table>

Motor

<table>
<thead>
<tr>
<th>Description (symbol)</th>
<th>Technical Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Kubota WG1605</td>
</tr>
<tr>
<td>Number of Cylinders</td>
<td>4</td>
</tr>
<tr>
<td>Bore x stroke (d x l)</td>
<td>79 x 78.4 mm</td>
</tr>
<tr>
<td>Power (P)</td>
<td>37,0 kW at 3000 min-1 (gross) 33,5 kW (Net)</td>
</tr>
<tr>
<td></td>
<td>25,0 kW (Continuously)</td>
</tr>
<tr>
<td>Fuel</td>
<td>Gasoline</td>
</tr>
<tr>
<td>Fuel tank</td>
<td>~8 gallons</td>
</tr>
<tr>
<td>Cooling</td>
<td>Water Cooled</td>
</tr>
<tr>
<td>Weight (m)</td>
<td>~270 pounds</td>
</tr>
<tr>
<td>Battery (U,I)</td>
<td>12 V, 45 A</td>
</tr>
<tr>
<td>Oil</td>
<td>10W30 API/SF-CC or better</td>
</tr>
<tr>
<td>Quantity</td>
<td>6 quarts</td>
</tr>
</tbody>
</table>

Normal coolant - engine is protected to -18 °F

Special coolant - engine is protected to -36 °F
## Technical Specifications

### Pump

<table>
<thead>
<tr>
<th>Description (symbol)</th>
<th>Technical unit Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Speck P52</td>
</tr>
<tr>
<td>Maximum pressure (p)</td>
<td>See name plate on frame</td>
</tr>
<tr>
<td>Maximum output</td>
<td>See name plate on frame</td>
</tr>
<tr>
<td>Weight</td>
<td>54 kg (~120 pounds)</td>
</tr>
<tr>
<td>Maximum water temperature</td>
<td>55 °C / 131 °F</td>
</tr>
<tr>
<td>Oil</td>
<td>GX 80W90</td>
</tr>
</tbody>
</table>
## Trouble Shooting

<table>
<thead>
<tr>
<th>Failure</th>
<th>Reason</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine does not start or stops abruptly.</td>
<td>Machine has run out of fuel</td>
<td>Add fuel</td>
</tr>
<tr>
<td></td>
<td>Main or secondary fuse blown</td>
<td>Replace the defective fuse and restart engine. If problem repeats, contact your dealer.</td>
</tr>
<tr>
<td></td>
<td>Battery voltage too low.</td>
<td>Charge or replace the battery.</td>
</tr>
<tr>
<td></td>
<td>Emergency stop activated</td>
<td>Rotate the emergency stop button in order to be able to start up again</td>
</tr>
<tr>
<td></td>
<td>Insufficient level in the water tank (for cooling system)</td>
<td>Fill the water tank and let the machine cool down. When cooled the machine can be started again.</td>
</tr>
<tr>
<td></td>
<td>Engine coolant level low</td>
<td>Fill the cooling system at the expansion tank.</td>
</tr>
<tr>
<td></td>
<td>Temperature of engine coolant too high</td>
<td>Let the machine cool down</td>
</tr>
<tr>
<td>The high-pressure pump does not produce the required pressure.</td>
<td>Water tank empty</td>
<td>Fill the water tank</td>
</tr>
<tr>
<td></td>
<td>Supply valve to water filter closed.</td>
<td>Open the supply valve</td>
</tr>
<tr>
<td></td>
<td>Water filter clogged.</td>
<td>Stop the machine and clean the water filter</td>
</tr>
<tr>
<td></td>
<td>Air in the high-pressure pump</td>
<td>Allow the machine to run a few minutes. The failure will normally disappear. If not, contact the service department of your dealer</td>
</tr>
<tr>
<td></td>
<td>Suction valves blocked</td>
<td>Carefully loosen the valves and descale them, if necessary</td>
</tr>
<tr>
<td></td>
<td>V-belt not sufficiently tightened</td>
<td>Tighten the V-belt; replace if necessary</td>
</tr>
<tr>
<td></td>
<td>Suction valves worn out.</td>
<td>Contact the service department of your dealer.</td>
</tr>
</tbody>
</table>
# Trouble Shooting

<table>
<thead>
<tr>
<th>Failure</th>
<th>Reason</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure varies.</td>
<td>Water level in tank too low</td>
<td>Stop the engine, refill the tank and restart engine</td>
</tr>
<tr>
<td></td>
<td>Water supply valve not sufficiently opened</td>
<td>Open the supply valve completely</td>
</tr>
<tr>
<td></td>
<td>Water filter clogged.</td>
<td>Stop the machine and clean the filter</td>
</tr>
<tr>
<td></td>
<td>Pump sucks air</td>
<td>Stop the machine and check all hoses and couplings for leakage</td>
</tr>
<tr>
<td></td>
<td>Nozzle clogged</td>
<td>Stop the machine and clean the nozzle (clean the nozzle holes)</td>
</tr>
<tr>
<td></td>
<td>Pressure valves dirty or worn</td>
<td>Stop the machine. Check the condition of the pressure valves. Clean or replace them</td>
</tr>
<tr>
<td></td>
<td>Pump gasket worn out</td>
<td>Stop the machine and replace gasket</td>
</tr>
<tr>
<td></td>
<td>V-belts for the pump slip</td>
<td>Stop the machine and tighten the belts</td>
</tr>
<tr>
<td></td>
<td>Ceramic plungers in the pump damaged</td>
<td>Contact your dealer</td>
</tr>
<tr>
<td></td>
<td>Pressure control clogged or internally</td>
<td>Contact your dealer</td>
</tr>
<tr>
<td></td>
<td>damaged.</td>
<td></td>
</tr>
<tr>
<td>Hydraulic reel does not wind the</td>
<td>Handle not on right position</td>
<td>Put the handle into the right position</td>
</tr>
<tr>
<td>hose</td>
<td>Hydraulic tank almost empty</td>
<td>Refill the tank. Check the system for leakage</td>
</tr>
<tr>
<td></td>
<td>Attachment bolt for control lever of hydraulic system loose</td>
<td>Fasten the bolt and put the lever into the correct position</td>
</tr>
<tr>
<td></td>
<td>Working pressure set too low</td>
<td>Increase the working pressure, if possible</td>
</tr>
<tr>
<td></td>
<td>Hydraulic tank return filter dirty</td>
<td>Switch off the machine and clean the return filter</td>
</tr>
<tr>
<td></td>
<td>Hydraulic system damaged</td>
<td>Contact your dealer</td>
</tr>
<tr>
<td>No reaction from the Riomote controller</td>
<td>No current</td>
<td>Recharge the battery</td>
</tr>
<tr>
<td></td>
<td>Use new battery</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Contact points are dirty</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check fuses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Contact with supplier for repeating occurrence</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transmitter is not on</td>
<td>Activate the transmitter (Link to the receiver)</td>
</tr>
<tr>
<td></td>
<td>Transmitter out of reach from receiver</td>
<td>Put the machines closer on. Put transmitter closer</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Trouble Shooting

<table>
<thead>
<tr>
<th>Failure</th>
<th>Reason</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warning Signal after short working time</td>
<td>Battery discharged / Defective</td>
<td>Charge or Replace the Riomote battery</td>
</tr>
<tr>
<td></td>
<td>Battery not charged or Defective</td>
<td>Replace the Riomote battery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check terminal connections</td>
</tr>
<tr>
<td>Transmitter indications are good but functions are not executed</td>
<td>Emergency stop pushed in</td>
<td>Unlock emergency stop</td>
</tr>
<tr>
<td></td>
<td>Receiver has no current</td>
<td>Check / replace fuses</td>
</tr>
<tr>
<td></td>
<td>No radio connection</td>
<td>Check functions of control lights</td>
</tr>
<tr>
<td>Certain functions are not executed</td>
<td>Receiver is faulty</td>
<td>Contact your supplier</td>
</tr>
<tr>
<td></td>
<td>Interruption in electric circuit</td>
<td>Check all plugs. Plug in and push. Check control lights if functions are indicated</td>
</tr>
</tbody>
</table>
The Engine Control Module consists of two major functions.

The first function is the controller setup function which allows the factory service technician to program the alarms settings and engine control functions of the Ultimate Warrior Skid Mount Sewer Jetter. Errors in programming can result in misoperation and severe damage to the jetter.

The second function of the Engine Safety Protection Panel is to monitor engine parameters to alert the operator to any abnormal conditions requiring attention as well as any operating limits that may be exceeded requiring the machine to be immediately shutdown. Once the engine is started the ECM has primary control of the engine providing prealarms, alarms and safety shutdowns.

This attachment provides the operator with information necessary to understand the operation of the Engine Safety Precautions Panel.

The diagram below identifies the indications available on the Engine Safety Protection Panel which will be explained on the subsequent pages.
EMISSIONS MONITORING AND REGENERATION

Part of the ECU continuously monitors the engine's emissions parameters. The build up of soot and ash in the engine can reduce power and may cause the engine to stall. To avoid this condition the ECU will alert the operator when regeneration is required to remove built up deposits in the engine.

Regeneration Levels

Level 0 (Passive) Normal engine operation. Removal of soot and ash is accomplished by current engine speed and load.

Level 1 (Auto) The ECU enables automatic regeneration. There is no effect on engine performance or operation during automatic regeneration. At this point “Disable Inhibit” can be activated followed by a Yes/No prompt. If inhibited “Regen Needed” will continue to scroll on the LCD display.

Level 2 (Auto/Parked) As soot and ash level increase, the ECU may continue as in level 1, or may send a Parked Regen request to the DPF Lamp.

Level 3 (Parked) The ECU will send prompts to the controller and light the DPF Lamp.

Level 4 (Service Regen) The “Regen Needed” prompt will appear. At this stage a service technician is required to perform regen.

Level 5 (Service Required) The engine requires service by an authorized dealer.

ECU Module Regen Buttons

When a regeneration is required, the ECU sends a signal to light the DPF Lamp. The lamp will remain lit until a regen has been completed.

Regen Inhibit

Pressing this button for at least 2 sec. will alternate the module between the Regen Inhibit and Regen Auto Modes. Any time the ECU indicate a regeneration is required a prompt will appear asking the operator if he wants to switch the auto mode.

Regen Request

This button will function when a required regen has been annunciated by the ECU and subsequently denied by the operator. If the operator wants to reinstitute the regeneration prompt he can push the button for at least 2 seconds.

Regeneration Process

Every two minutes when a regen is required the “Regen Needed” prompt will appear on the ECU display. To proceed with the regen the operator presses the “Enter” button for Yes.
If the operator selects “NO” then the “Parked Regen Needed” display will continue to flash on the ECU display.

If the operator selects “YES” the controller will alert the operator that engine RPM may increase. The operator should press “ENTER” to acknowledge.

The next prompt alerts the operator that the regeneration requires the engine be set to the minimum idle speed. The operator should press “ENTER” to acknowledge the process.

The next screen is the acknowledgment of the actual speed as set by the ECU. Use the down arrow to actually lower the speed. Once the speed is matched press the “ENTER” button.

To ensure the engine load is removed during regeneration the Parking Brake and Neutral Switch are applied. **It is not acceptable to initiate parked regeneration when engine load is applied.**

The operator places the switch to “PARKING” and acknowledges by pressing “ENTER” and the places the switch in “NEUTRAL” and acknowledges by pressing “ENTER”.

After the operator has acknowledge the prompt screens the regen request will be sent to the engine ECU and the full regeneration process will be activated.

During the regeneration process the progress can be monitored on the ECU display. The display will indicate a maximum of 10% until the engine achieves the desired temperature to remove ash and soot.

At the end of the process the controller will prompt the operator that the regeneration is complete. The operator must acknowledge by pressing the “ENTER” button prior to resuming normal operation.

The regen process will be aborted if the Neutral Parking switch is opened during the process. When this occurs a message will appear requiring the operator to acknowledge. There may be other causes for a regen to fail. If this occurs a message will be displayed indicating “REGEN FAILED” or “REGEN ABORTED”
ECU INDICATIONS

- Coolant Temp.
- Battery Volt.
- Fuel Rate
- Rated Speed
- Eng. Torque
- Total Hours
Machine Dimensions

- 57.4" x 45.5"
- 46.1" x 43.4"
- 68.4" x 19.8"
- 54.9" x 57.4"
- 53.9" x 50.0"
<table>
<thead>
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