HARBEN
HIGH PRESSURE WATER TECHNOLOGY

Operation & Maintenance Manual

Original Instructions

ET-180 HW Trailer Jetter Manual
905-303/905-304

Read the Health and Safety Manual before operating any equipment. Failure to do so could cause serious injury or death.

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Operation & Maintenance Manual for:

UNIT: DTK 375 ET-180 HW Trailer Unit

ISSUE DATE: 2/26

ISSUE No: 4

AMENDMENTS

Change	Changes	Date	Signature
1	NEW ADDITION	7/25	TW
2	ADDED WIRELESS UNIT	11/25	TW
3	UPDATED WIRING DIAGRAM/TEMP SENSOR	12/25	TW
4	UPDATED WIRING DIAGRAM	2/26	TW
	ADDED INCLUDED HANBOOK INFO.		
	UPDATED HOSE REEL SPECIFICATION		

Section 1 – Introduction & Contents

1.1. Contents

1.2. Introduction

Please ensure that you read this Operation & Maintenance Manual in conjunction with the Health & Safety Manual before operation.

Within this manual, the health and safety risks are highlighted with specific symbols. These will be referenced to sections within the Health and Safety Manual which you are required to read. The sections to refer to in the manual will be labelled at the end of the highlighted statement (Ex. H&S Section 2). There are three symbols that will be used to differentiate the levels of severity. They are as follows:

-  : This is the symbol for **CAUTION**. This means that if an accident were to happen, it would cause minor to moderate injury.
-  : This is the symbol for **WARNING.** This means that if an accident were to happen, it could result in a serious injury or possible death.
-  : This is the symbol for **DANGER**. This means that if an accident were to happen, it will result in death or serious injury. This will only be shown for the most extreme cases.

It is imperative that these symbols are paid attention to as to avoid any sort of injury.

Notices

Carefully read the notices of this manual because they give important information concerning safe installation, use and maintenance; familiarize yourself with the workings of the machine to rapidly switch it off and eliminate pressure.

This manual is an integral and essential part of the product; it will be consigned to the user to ensure the training/information for personnel.

The manufacturer does not assume responsibility for damage caused to persons, things or to the machine, in the case of improper use. Carefully preserve this manual for any further consultation.

Identify the model of your machine by reading the details on the identification plate. Upon delivery, inspect the machine / accessories for any damage, which may occur during transport.

CAUTION! Always follow the recommended operating procedures. Do not misuse the equipment as this could result in injury or mechanical breakdown!

1.3. Scope of this Manual

This manual provides operation, maintenance, and safety instructions for the Jetter. Where the Jetter has been fitted with proprietary components, details of these are also included in this manual.

This manual is compiled to match the Scope of Supply detailed in Section 2. All specifications, descriptions and parts lists refer only to the components in the version of the unit detailed in this scope of supply.

Maintenance instructions included in this manual include:

- Routine maintenance to be carried out at specific times.
- Maintenance of the high-pressure pump.

Repairs to the pump crankcase are not considered maintenance operations as these should be undertaken only by HARBEN INC**,** their approved dealers, or at least competent automotive technician.

1.4. The Trailer Jetter

Harben drain Jetters have been designed to the highest standards so that they will work safely and reliably for many years. It is important that you take time to read the information provided in this operation and maintenance manual so that you understand how to make the most of the Jetter and how to use it safely. **Harben Jetters are powerful pieces of industrial equipment and should only be operated by competent users who understand that serious injury or death can occur through misuse.**

The Jetters described in this operation and maintenance manual are intended to be used for high-pressure water jetting in drain and sewer systems from 2” up to 18” diameter.

They will remove soft blockages, tree roots and hard scale, liquefying fats and restoring drain flow by blasting high-pressure water through a drain nozzle connected to the end of a high-pressure hose. Some models can be fitted with jump jets kits to increase the effective cleaning distance.

Harben trailer Jetters use a diesel or a gas engine to power a high-pressure water pump up to 4,000 psi and 18 gpm.

Additional accessories can be purchased from Harben Inc., such as jetting guns and jet pumps which extend the range of work that can be carried out with the Jetter. Separate details are available on request.

1.5. Composition of this Manual

This manual comprises the following further sections:

Section 2 Scope of Supply

Defines the scope of supply of the equipment in compliance with the sales order.

Section 3 Technical Data

Contains technical information about the Jetter.

Section 4 Operation

Describes the recommended operating procedures for the Jetter.

Section 5 Routine Maintenance

This section details recommended routine maintenance requirements for the pump and Jetter.

Section 6 Fault Finding

Fault diagnosis tables for the pump, engine and ancillaries.

Section 7 Harben P-Type Pump

Details of the pump and gearbox assembly.

Section 8 Water Heater

Specification of water heater

Section 9 Unloader Valve

Specification and details of unloader valve

Section 10 Circuit diagrams/Electrical Details

This section includes the Hydraulic and water circuits of the Jetter.

Section 11 Diesel Engine

Provides part details of the diesel engine.

Section 12 Parts list / Spares / Auxiliary Components

How to identify and order spares / auxiliary components.

Section 13 Service Documents

Service logbook and checklist.

Section 14 Warranty & Certification

This section explains the warranty information for the trailer.

Section 15 Tire Safety

This section provides information on maintenance and safety of the tires on the trailer.

Section 16 Health & Safety

This manual details health and safety considerations in general and specific to water jetting equipment.

2. Scope of Supply

2.1. Scope of Supply

Unit:	ET180 HW Trailer Jetter

2.2. Unit Assembly

Figure 2.1 defines the components of the Jetter assembly as follows:

The pump is driven by an industrial diesel engine.

The engine drives the pump via a 2:1 reduction gearbox which reduces the pump rpm down to the correct shaft speed.

The 'P' Type 8 22 radial piston high-pressure diaphragm pump is driven by the industrial diesel engine through the 2:1 reduction gearbox.

Water is fed from a mains supply into a plastic water storage tank. The tank supplies the pump with a positive head of pressure via an inline hypro strainer that filters the water to approximately 80 microns.

The water is passed through a water heater, which is activated on the control panel. The water heater will only fire while jetting with a pressure above 650 PSI. (The water heater does not need to be activated if hot water is not required)

The water is directed by a divert valve, to a hydraulically driven hose reel with up to 500 feet of ½" hose, or at low pressure 'dumped' back to tank.

The system is protected from over pressurization by an unloader valve.

The engine and system pressure can be monitored at the control panel situated at the rear of the Jetter.

2.3. Detailed Drawings

Detailed drawings and parts lists for the above components are provided as follows:

The pump is detailed in Section 7.

Details of other parts and assemblies are included at Section 10.

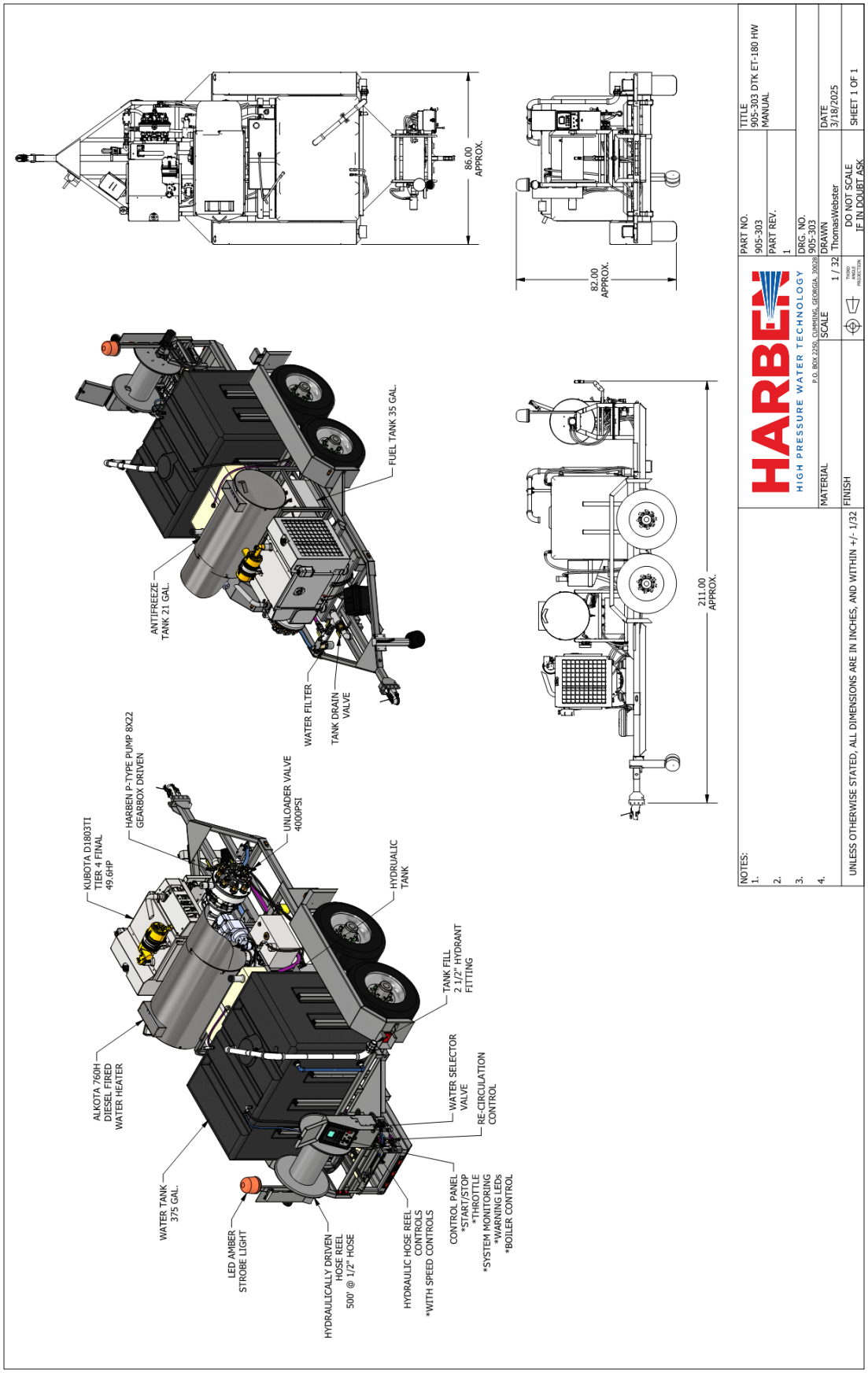


Fig. 2.1 – ET180 HW Manual Primary Components

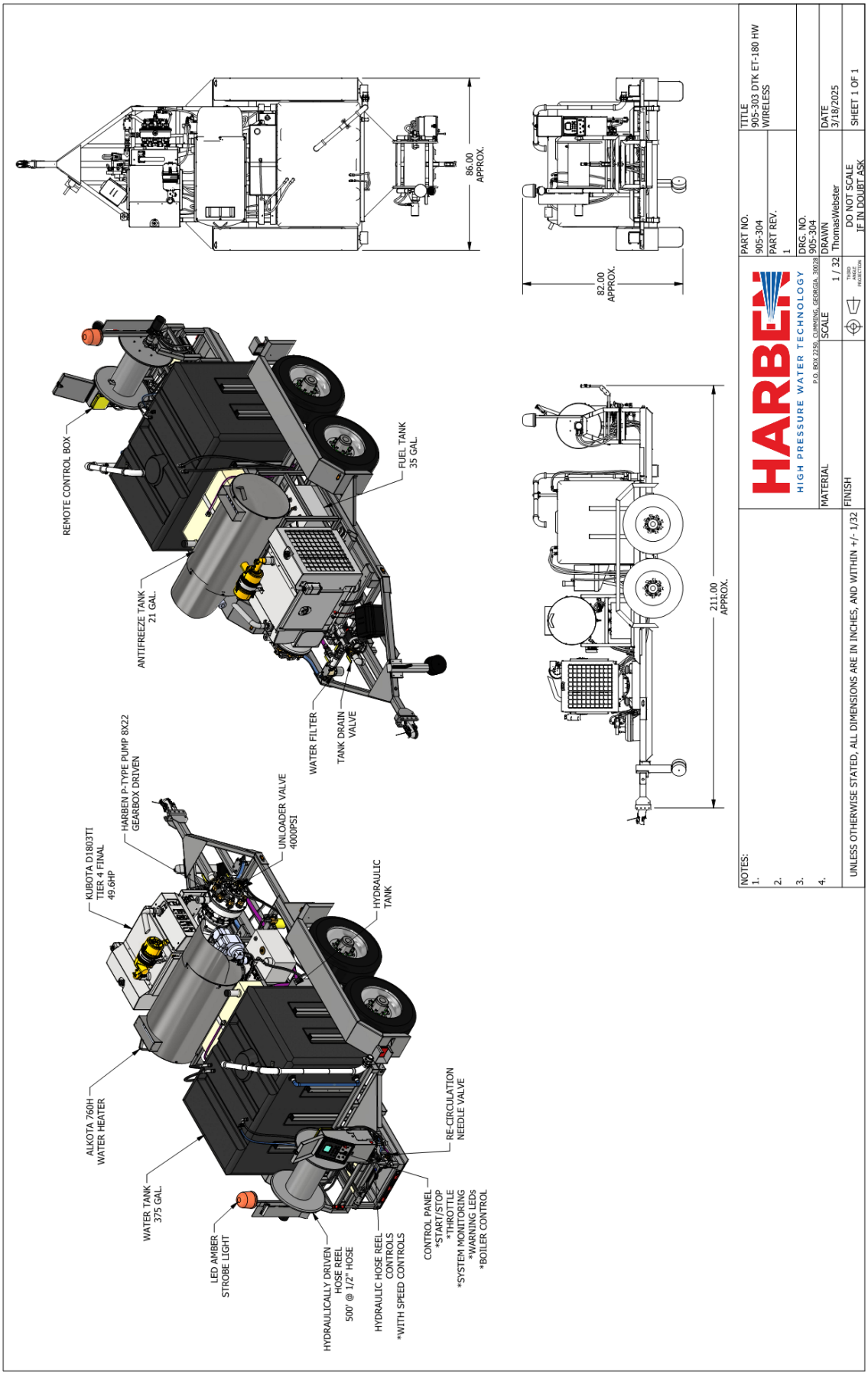


Fig. 2.2 – ET-180 HW Wireless Primary Components

3. Technical Data

3.1. Technical Data

3.1.1. Pump Data

Pump Type	Harben 'P' Type 8 22 (See Section 8)
Pump diameter	16" approx.
Pump length	15" approx.
Inlet	1 ¼" dia.
Outlet	G1/2" (1/2" BSP)
Shaft dia	30 mm
Shaft length	65 mm
Cylinder options	8
Power rating (nominal)	45 hp
Plunger diameter	22 mm
Shaft speed	1250 rpm
Maximum pressure	Up to 4000 psi (280 bar)
Max flow rate	Up to 18 USG/min (70 lpm)
Crankcase lubrication	Fully immersed
Oil capacity	1.3 USG
Weight	176 lb
Recommended crankcase oil	Shell Morlina 150 or Tellus 150 (see section 6)
Max inlet temperature	77°F

3.1.2. Main Components

Engine	ENGINE KUBOTA D1803TI TIER 4 FINAL ENCLOSED
Pump	011086-001 Harben P Type 8 22
Gearbox	020143-005 Harben P Type 2:1
	012242-005 Harben P Type 2.21:1 (High Altitude Jetter)

3.1.3. Ancillaries

Water tank	375 gal capacity
Supply filter	042134-020 Hypro line strainer / 170 micron mesh
Monitoring & control	Standard engine controller and throttle
Pressure control and safety	903625-021 Unloader valve 4060PSI

3.1.4. Services Required

Mains water supply	Positive head capable of delivering greater than 16 USG/min *Note: Water pH value of 5 to 9 is recommended.*

3.2. Technical Description

3.2.1. Primary Components

The primary components of the Jetters are illustrated in Figures 2.1-2.6 which are as follows:

- A prime mover in the form of an industrial diesel engine which drives a Harben P Type high-pressure pump.
- The pump can produce high-pressure water up to 4000 psi.
- *Note: See above or section 7 for performance options*.
- A hydraulic driven hose reel with up to 650 feet of single synthetic fiber braid high-pressure hot water hose (0.81" O.D.) with either a nozzle or gun attachment to deliver the high-pressure water to the work application. The ET180 HW utilizes a pivoting hose reel.

  Harben will not be responsible for any damages caused by exceeding stated capacity
- Plastic water tank(s), acting as a reservoir, also ensuring the water is settled and non-turbulent, discharging a smooth uninterrupted supply, with a positive head of pressure to the inlet, maximising the full potential of the pump.
- A diesel fired, externally controlled water heater which enables water heating up to 140 Fahrenheit and above with a flow rate of 10gpm.
- A diverter valve which directs high-pressure water to the main jetting hose or diverts it back to the tank.
- An unloader valve to prevent over pressurization and protect vulnerable components.
- The control panel which includes the engine controller, pressure gauge, throttle, high-pressure selector, water temperature, jump jet valve & hydraulic hose reel controls.
- A Hypro 80 micron mesh inline strainer is fitted to the suction line between the tanks and the pump inlet.

  Note: This is a critical component which ensures that no contaminants are drawn into the pump inlet. This filter must be inspected and cleaned daily, if it becomes blocked it will cause the pump to cavitate.

3.2.2. Engine Monitoring

Engine oil pressure and hours run are monitored on the engine control panel.

4. Operation

4.1. Operating Conditions

Operators of water jetting equipment should be fully conversant with the 'WJA Code of Practice for the use of high-pressure water jetting equipment', hereafter referred to as 'The Code of Practice'. A copy of The Code of Practice is available upon request.

Please ensure that you read this Operation & Maintenance Manual in conjunction with the Health & Safety Manual before operation.

4.2. Daily Checks

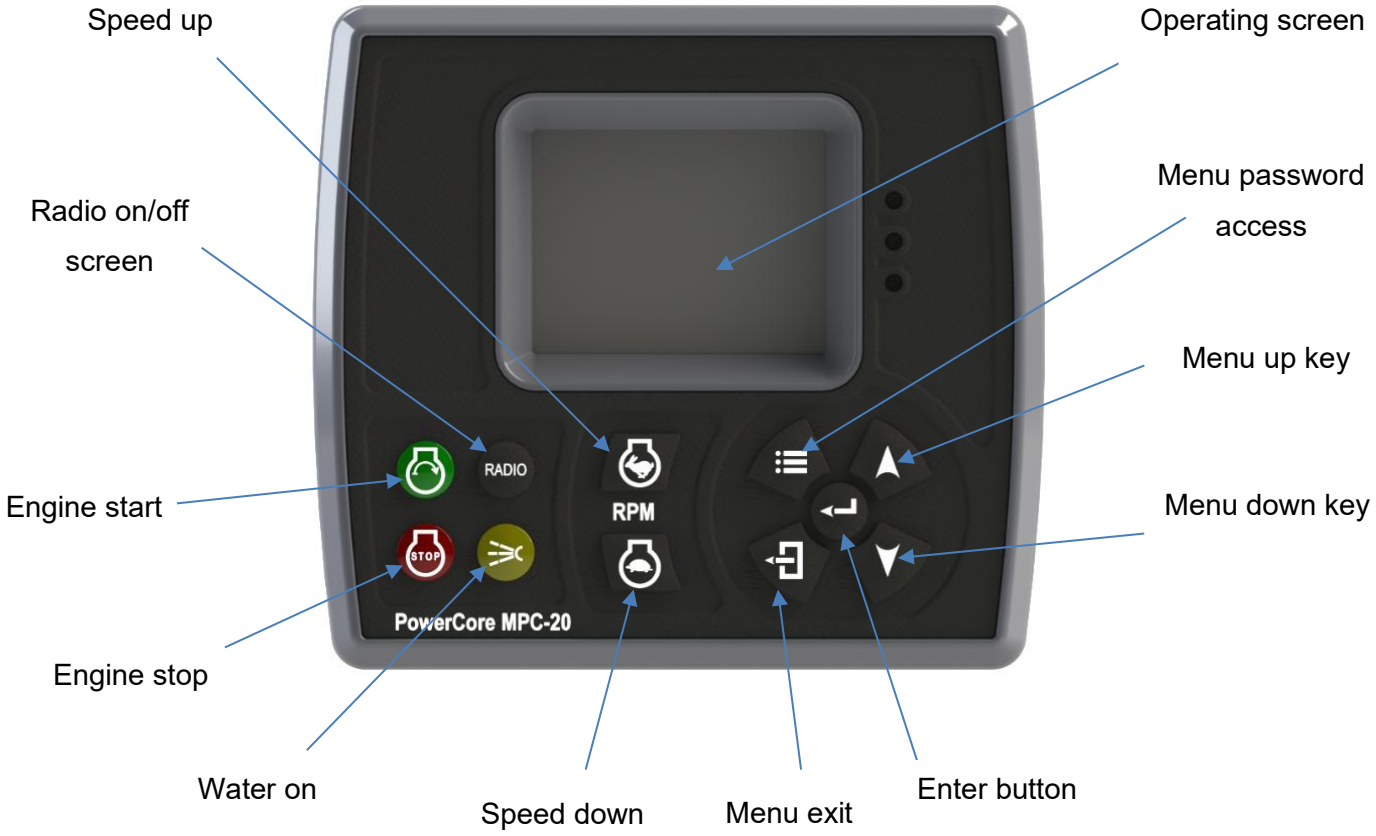
- pump oil level
- gearbox oil level
- water filter cleanliness
- engine oil level
- tank water level

4.3. Pre-start Checks & Procedures

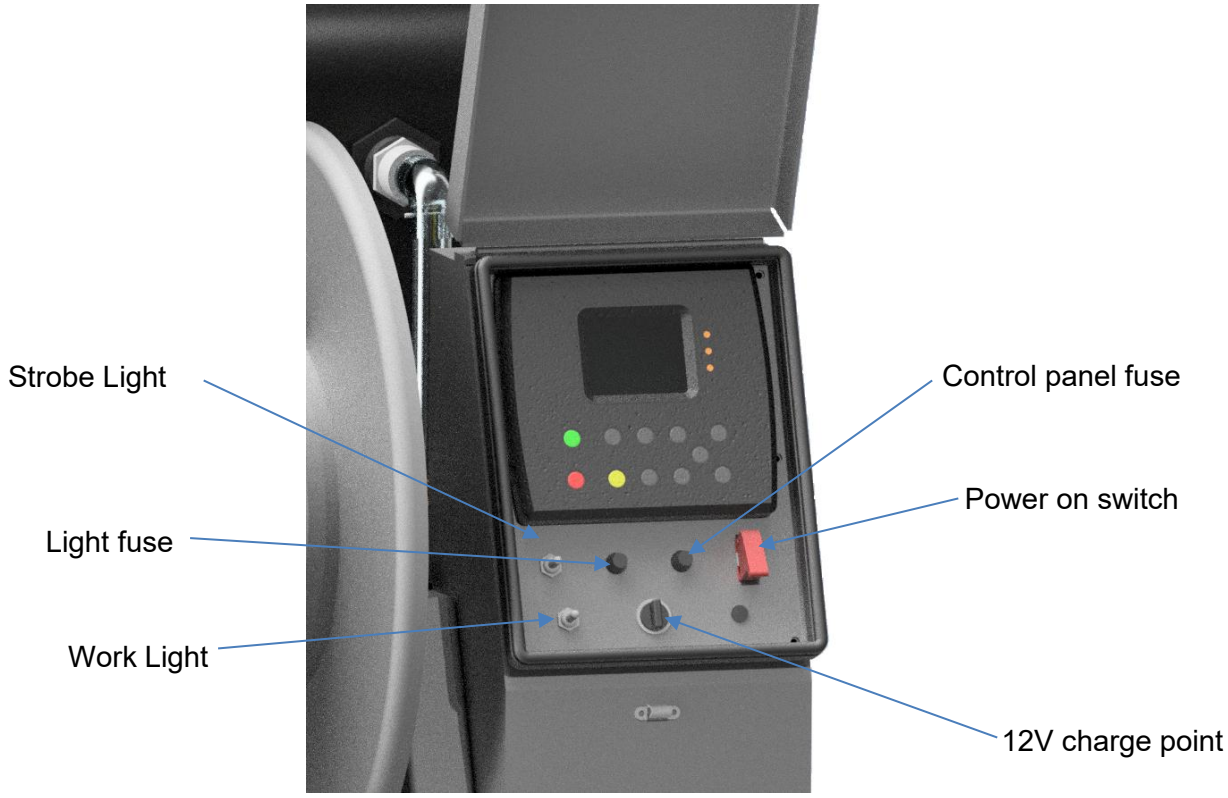
1. ⚠ In cold weather check that machine is not frozen before starting (see Antifreeze section 4.11). Only operate the machine in a well-ventilated area. **(H&S Sections 8,9, and 12)**
2. Ensure the towing vehicle and trailer hand brakes are applied. **(H&S Sections 11 and 13)**
3. Connect the water supply to the water tank fill point (NOTE: To comply with water authority bylaws never fill the tank by putting a hose directly inside). The water will fill the tank via an appropriate filling point.
   Overfilling the tanks will overload the trailer axle(s) and could make it dangerous.
4. ⚠ Feed off approximately 10 feet of high-pressure hose. **Do not fit the nozzle or gun at this point! (H&S Section 16)**

4.4. Control Panel Layout and Function

4.4.1. Control Keys



4.4.2. Toggle Switch Operation



4.4.3. Screen Layouts

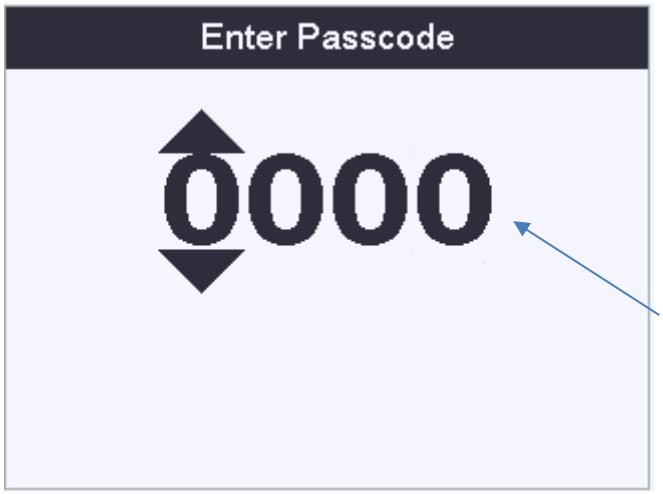
Starting splash screen

Software version Displays here

Password screen

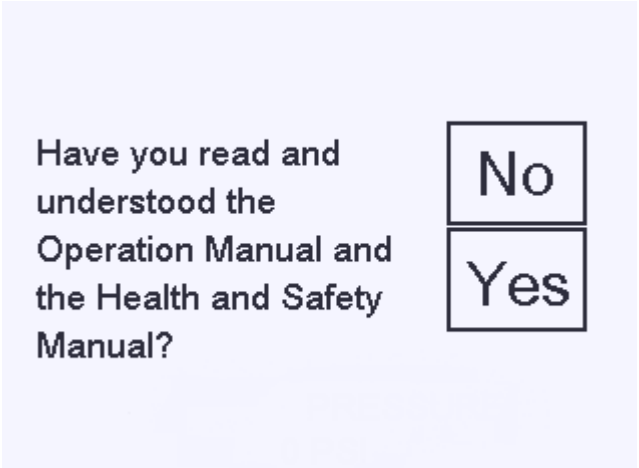
Run screen entry – 2010

Minor programme updates - 1111

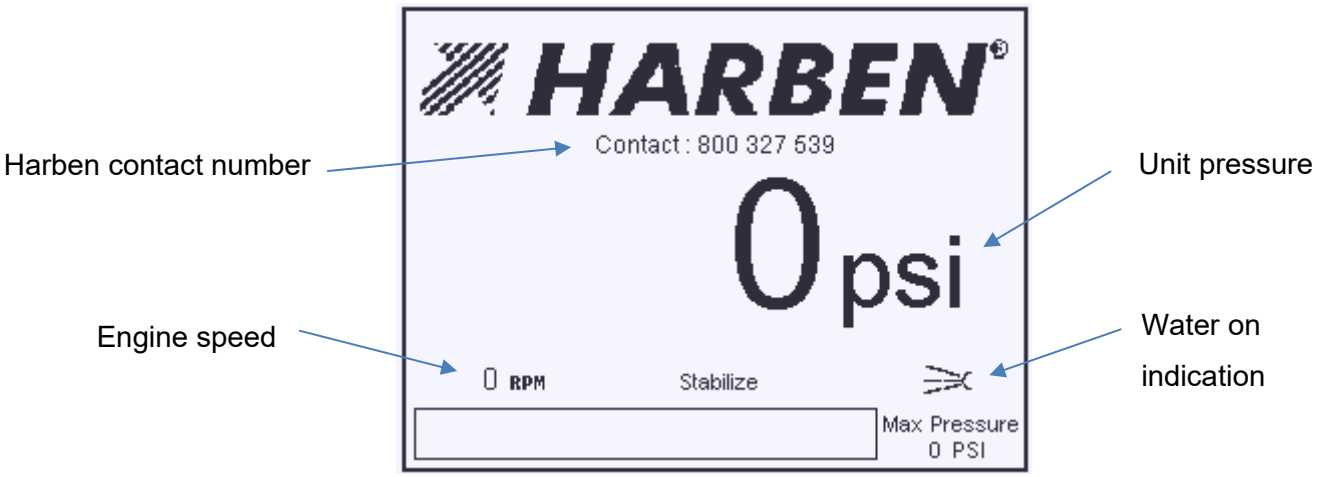


Password screen – Use enter, up and down buttons to enter password

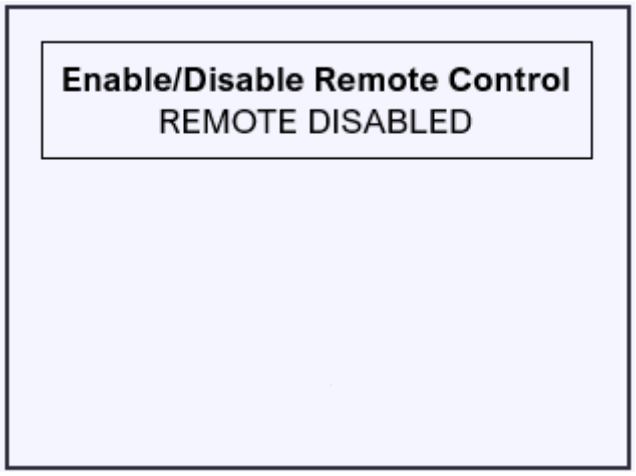
Manual Confirmation Screen



Main run screen (access by pressing menu exit key)



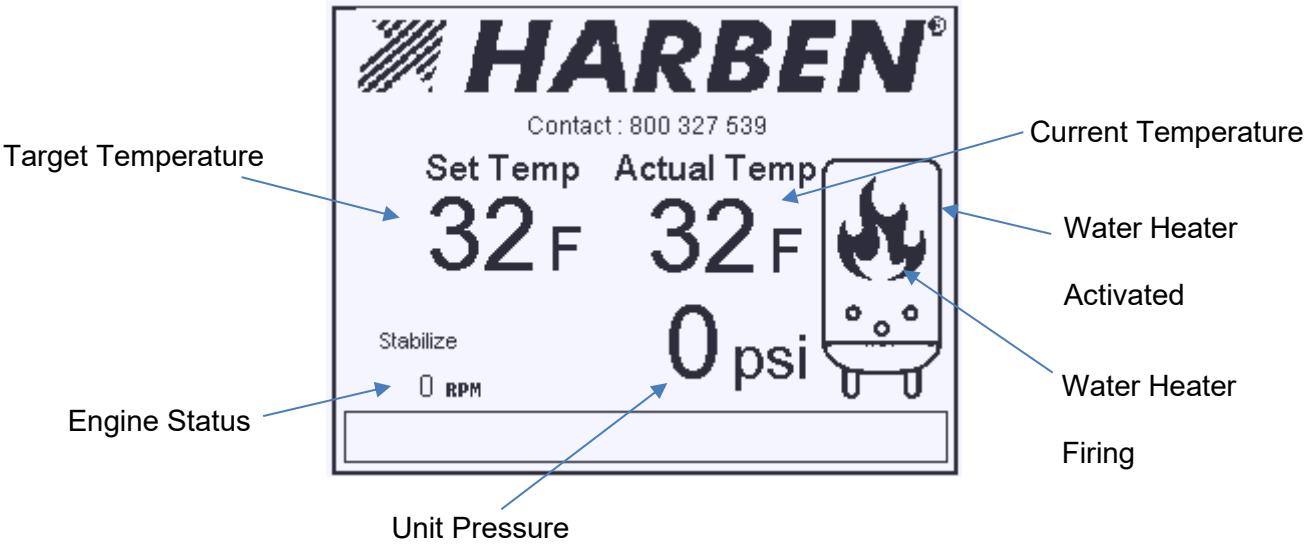
Remote enable/control screen (Enter button will toggle between function)



Run detail screen (access via the down key)

Actual RPM	Target RPM	Engine Battery	Run Hours
0	0	0.0 volts	0.00 Hrs
Engine Status	Status Time	Remote	Water
Stabilize	00:00:00	REMOTE DISABLED	Off
Time 12:00:00 AM Date 00 Jan 00	Unit pressure	Engine Temp	Fuel Level
	0 psi	32.0 °F	0 %

Boiler control screen (access via the up key)



Radio control layout

4.5. Running the Engine (Manual Mode)

With two people, one at the pump set and one in charge of the nozzle or gun. **(H&S Section 8, 16)**

Tank water level

Ensure you have an adequate water supply and that the water tank is filled to the ball valve shut off level.

> *NOTICE*: Do NOT allow unfiltered water into the pump

If your machine is fitted with a radio remote control go to section 4.6.

1. Switch on unit using toggle switch.
2. Enter password '2010' to enter.
3. You will now enter the run screen.
4. Ensure the open ended, high-pressure hose is in a safe position, preferable within sight of the operator at the control panel.
5. Press the engine start button.
6. The control system will now go through a prestart (glow plugs).
7. The engine will now start and run in idle.
8. The user can now increase and decrease the speed of the engine using the engine up and down speed.
9. When it is safe to turn the water on, press the water on button.
10. The engine speed and water pressure can now be increased and decreased using speed up and speed down button.
11. Radio mode will not operate when manual mode is selected.

4.6. Running the Engine (Radio Mode)

1. Switch on unit using toggle switch.
2. Enter password '2010' to enter.
3. You will now enter the run screen.
4. Press the radio screen button.
5. Press the enter button to turn the radio function on.
6. Switch on the radio handset by releasing the E-stop button
7. Hold down button 5 and 6 on the radio handset until the buzzer sounds and the top green LED on the handset lights.
8. Press the engine start button.

9. The control system will now go through a prestart (glow plugs).
10. The engine will now start and run in idle.
11. The user can now increase and decrease the speed of the engine using the engine up and down speed on the handset.
12. When it is safe to turn the water on, press the water on button on the handset.
13. The engine speed and water pressure can now be increased and decreased using speed up and speed down button.
14. Manual mode will not operate when radio mode is selected.

4.7. Running the Nozzle/Jet

1. ⚠ Fit the correctly sized nozzle to the high-pressure hose. **Engine should not be running**. **(H&S Section 6)**
2. Insert the nozzle approximately 6 feet into the drain before diverting the water through the main jetting hose. **(H&S Section 15)**
3. Once inserted, press the water on button. Water will now be diverted to the main jetting hose.
4. To increase engine speed, use the speed up and speed down buttons.
5. Adjust the engine speed until the desired pressure is reached. **(H&S Section 5)**
   NOTICE: DO NOT EXCEED THE MAXIMUM OPERATING PRESSURE OF 4000 PSI. IF YOU DO SO YOU RUN THE RISK OF INJURY, AND DAMAGE TO EQUIPMENT.
6. Once you have completed your jetting work and are ready to retrieve the nozzle decrease the engine speed to idle. The unit will be running at around 700 psi. It is recommended that you rewind your hose while under some sort of pressure. A tightly wound hose that is re-energized could crush the drum of the reel. **(H&S Section 6)**
7. Rewind hose. Once the orange leader hose becomes visible from the pipe, divert the water back to the tank, and continue to fully rewind the hose. Remove nozzle and secure hose to adapter for “travel mode”.

NOTICE: Do not exceed the 4000PSI by fitting a smaller nozzle than is recommended. This will cause the unloader to open. The maximum engine speed is 2375 rpm

4.8. Water Heater

At any time, you can access the menu that allows you to activate the boiler, see ambient temperature, and set desired water temperature.

The water heater is controlled by both a pressure and flow switch, both must be activated for the boiler to fire. The pressure switch is set to a pressure of 650PSI, this will allow the water heater to fire while jetting but prevent it from firing while recirculating water to the tank. This is to stop the recirculation of hot water which could damage the pump and vital components.

When in use, to enable water to be heated to **140 Fahrenheit and above**, the unit should be restricted to a flow rate of below **10gpm**. This can be achieved by attaching the appropriate jetting nozzle **NOT** through use of the needle valve.

After jetting with hot water, deactive the boiler and run the water for a further minute, to cool the water heater and extend its longevity.

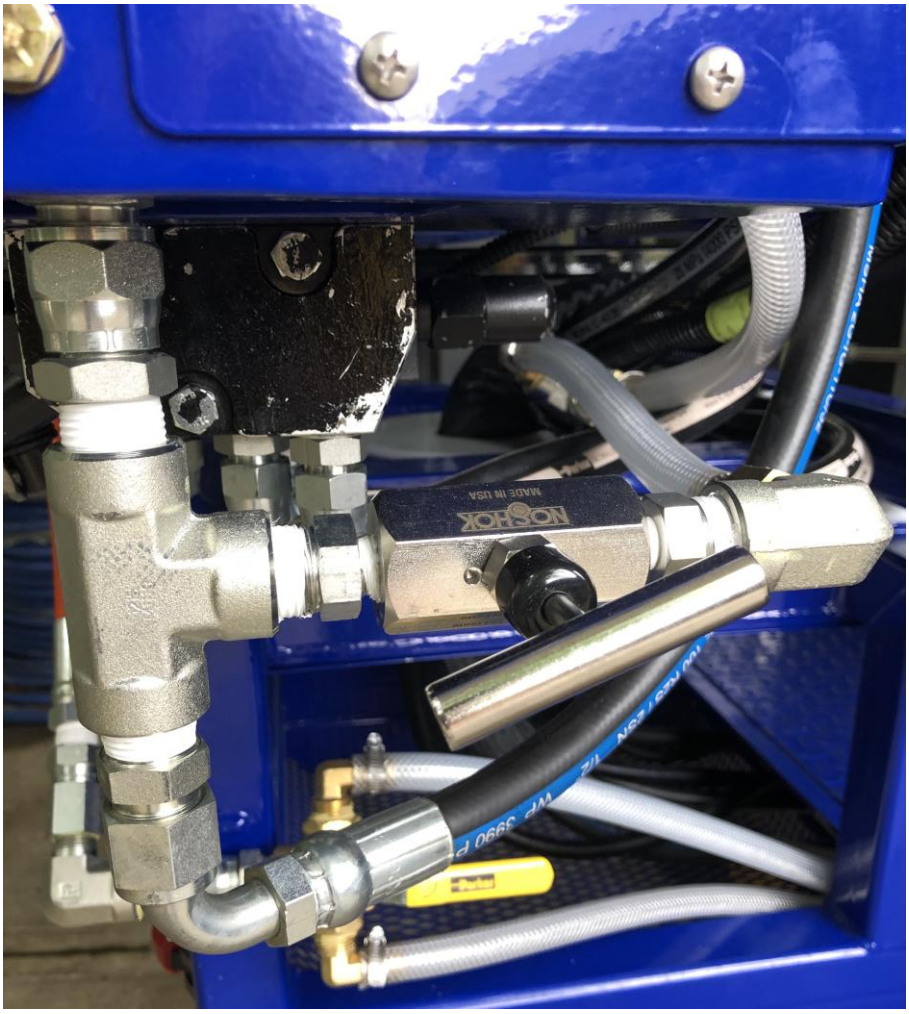
4.9. Water Heater Operation

1. Locate the water heater control page using the  on the control panel.
2. Temperature can be adjusted by using button and the  &  Arrows buttons on the controller.
3. The water heater can be turned on/off using the  Button.
4. Once activated the water heater  symbol will display. The flame  symbol will display while the water heater is firing.

The following logic is followed for the water heater to ignite:

- Flow switch on (water passing through the heater)
- Pressure switch activated (system pressure exceeds 650psi)
- Water heater turned on (symbol is displayed)
- Target temperature exceeds current water temperature

4.10. Bypass Valve Operation



During cold water applications the bypass valve is used to control the amount of water that is sent through the jetting hose and ultimately to the nozzle. The use of this valve will “fine tune” the amount of water you send to the nozzle.

In normal operations, the valve will be shut by being turned clockwise until it seats. This will give the operator full pressure and flow. For example, on a Harben Jetter that is a 4018 model with ½” X 500’ of jetting hose, this will allow you to achieve a performance of 4,000 PSI and up to 18 GPM.

Anytime there is a need to reduce the amount of water flow to the nozzle, especially in applications that require the use of Mini Jet Kits that use ¼”, 3/16” and even 1/8” mini hoses, use of the bypass valve helps divert some of the water back to the tank which lessens the load on the engine and pump.

To use the valve:

1. Turn the handle on the valve counterclockwise until it stops. This opens the valve completely. **This needs to be done before turning on the Jetter or before connecting to the Mini Jet Kit.**

2. Start the Jetter. The amount of flow will be at the very minimum.
3. To increase the amount of water to the nozzle, turn the handle clockwise to start closing the valve. The pressure will increase as you start to close the valve.
4. Once the ideal pressure is reached, the valve can be left at that position until the job is finished.

NOTICE: The bypass valve is a "fine tuning" instrument! Close it in small increments until the desired performance is reached. A simple quarter turn of the valve can result in several hundred PSI increases.

NOTICE: Please note the working pressure for the unit must never be exceeded.

NOTICE: Nozzle selection must be used to restrict flow to 10gpm or below for hot water jetting NOT the needle valve.

4.11. Hose Reel Winding and Unwinding

The high-pressure hose is manually unwound and hydraulically wound by a hydraulic motor, which is driven by a gear pump from the engine P.T.O. **(H&S Section 6)**

The motor is fitted to the hub of the hose reel. The motor speed and direction are controlled via a manually actuated spool valve.

The hose reel motor speed can be adjusted up and down by a flow control knob.

Pushing the lever upwards will wind the hose reel in.

The normal practice is to unwind the hose by hand, only drawing off the required length of hose to reach the work site and then to wind the hose back in using the hydraulic motor.

It should be remembered that the hose cannot be wound using the hydraulic motor unless the engine is running.

Therefore, when a jetting operation is finished, wind in the hose before shutting down the engine. Wind in the hose before you intend to empty the tank.

⚠ If the hose becomes stuck in the drain the hydraulic hose reel should NOT be used as a winch to try and free it and the towing vehicle should NEVER be driven away in an attempt to drag the hose clear. This will put severe strain on the reel framework which could lead to serious damage. **(H&S Section 6)**

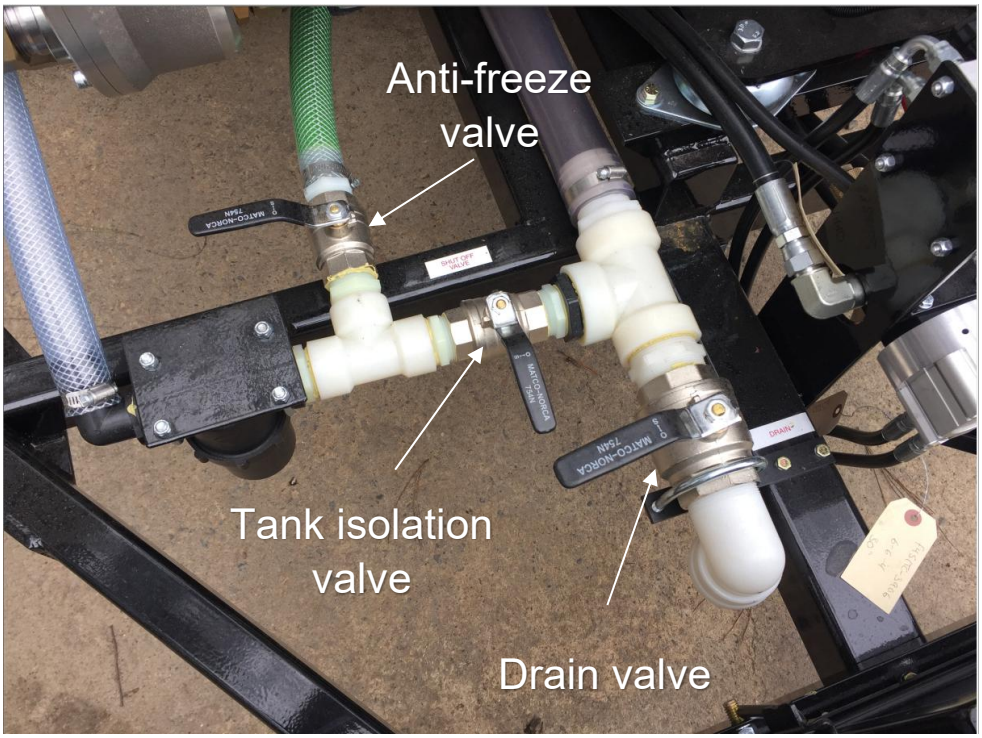
Hoses that have become stuck can sometimes be pulsed free using the Harben® Jump Jet™ kit or alternatively they should be pulled free by hand.

NOTICE: The hose should NEVER be tightly wound onto the hose reel drum when the hose is not pressurised, as might occur when the hose has become trapped. A tightly wound hose can easily crush the hose reel when it is next pressurised. If you have reason to believe that the hose may have been tightly wound onto the reel when unpressurised it should be completely unwound and then rewound loosely before pressurising.

4.12. Frost Precautions

During cold periods there is a risk of freezing overnight or when travelling on the road. Damage caused by freezing is expensive to repair and IS NOT COVERED UNDER WARRANTY. **(H&S Section 7)** Take the following precautions to avoid frost damage:

4.12.1. To Anti-Freeze the Machine with an Antifreeze Tank:



1. Close the Water Shut Off Valve located on the inlet line from the water tank.
2. Open drain valve and drain water tank, leave valve open
3. Open antifreeze tank ball valve
4. Connect jetting hose to recirculation line fitting located below the hose reel
5. Ensure the recirculation ball valve has its handle in the vertical position

6. Ensure the jump jet valve is off.
7. Ensure the flow diverter valve is closed. (turn knob fully clockwise)
8. Turn on jetter and engage the water.
9. After approximately 4 seconds turn the jump jet valve to “on” position.
10. Watch the clear braded jump jet hose running up the back of the tank. Once it fills with antifreeze immediately turn the jump jet valve to “off” position this should take approximately 4 seconds.
11. Turn the handle to the recirculation ball valve to the horizontal position and watch for the second of the clear braided hoses running up the back of the tank to turn the color of the antifreeze. Once it has quickly turn the recirculation ball valve back to the vertical position.
12. Turn off the jetter
13. After all the water has been drained from the tank close the drain valve.
14. With antifreeze valve still open, quickly open and close the water shut off valve allowing some antifreeze to enter suction inlet line.
15. Manually rewind the hose back on the reel and lock in position.

4.12.2. To De-Antifreeze the Machine:

1. Shut the anti-freeze valve.
2. Shut the drain valve.
3. The handle for the 2-way ball valve should be in the horizontal position.
4. Open the tank isolation valve.
5. Re-fill the water storage tank.
6. Put jump jet valve into the ‘off’ position.
7. Place the high-pressure hose (NO NOZZLE ATTACHED!) into the antifreeze tank.
8. Start the engine with the selector on ‘HIGH-PRESSURE’. (If on radio put water on as soon as the engine starts.)
9. Pump out the antifreeze solution from the high-pressure hose back into the antifreeze tank.
10. As the antifreeze mix reaches the top of the tank turn engine off. (Regularly check the strength of the antifreeze mixture ensuring it is at least a 50/50 mix)
11. The machine can now be used in the normal manner.

DO NOT ATTEMPT TO JET ANY REMAINING ANTIFREEZE SOLUTION INTO A CONTAINER

NOTICE: If the pump is frozen up, on no account should the unit be started until it has been thoroughly thawed.

NOTICE: When the engine starts, the pump will be pumping fluid and may be under pressure.

5. Routine Maintenance

Table 1 provides a basic guide to routine maintenance requirements for the various components of the Jetter.

Warning: Maintenance should only be carried out with the engine turned off and when cold.

5.1. Maintenance Procedures

Prior to use / Daily / After 8 hours running	• Check inlet water filter element (Ref Para 5.2) • Check engine oil level on dip stick (Ref section 9) • Check engine coolant level (Ref section 9) • Visual check for hose damage/water leaks & for any cracks in frame/chassis etc. • Check ignition and warning lamp operation • Check all lugnuts on bolts tires and torque to 90 lbs/ft
Weekly / every 24 hours running	• Visually inspect Jetter for security checking for any loose, damaged, or missing parts. • Check air filter cleanliness (Ref section 9) • Check engine fuel water trap for contamination (Ref section 9)
3 months / 50 hours	• First service contact Harben Inc.
6 months / 150 hours	• Inspect tanks and fittings for leaks, thoroughly clean & flush through (with hot water in excess of 158°F) • Tighten any loose joints • Grease the hydraulic hose reel bearing blocks • Check condition of 12volt start battery • Grease battery terminals for protection • Check alternator belt
Yearly / 300 hours	• Intermediate service of engine, gearbox and pump required (Contact Harben Inc.) • Closely inspect the structural integrity of the framework for signs of stress and cracking • Check hydraulic filter gauge. If it reads in the red replace the filter and oil (Shell Tellus 22) • Carry out detailed inspection of pipes, hoses and fittings. • Dismantle, clean & lube the hydraulic diverter valve
2 yearly / 600 hours	• Major service of engine, gearbox and pump required (Contact Harben Inc.) • Replace the pump inlet/delivery valves and diaphragms • Check wiring terminals/connections and continuity of electrical earth.

Table 1 Recommended Routine Maintenance

For a detailed guide to pump maintenance and overhaul procedures refer to Section 7.

For routine engine and water heater maintenance please refer to the engine and water heater handbook supplied with the unit.

5.2. Daily Maintenance

The following must be completed daily with the Jetter switched **OFF**.

1. Check condition of inlet water filter & element. Clean or replace. (Harben part no. 042-134)

Unscrew the bowl to remove the mesh (Harben part no. 903-245). Take precautions so as not to lose the sealing ring (Harben part no. 903-300).

2. Visually inspect all hoses for signs of chaffing or leaks. Report any damage immediately to supervisor or manager.
3. ⚠ Water at high-pressure jetting from a damaged hose or hose connector can cause serious injury. Do not attempt to repair or secure any hose while the high-pressure pump is running. **(H&S Section 6)**

With the Jetter **running:**

4. Make further inspection for leaks. If a leak is observed, shut down immediately and report the leak to a supervisor or manager.
5. Check all lugnuts on both tires and torque to approximately 90 lbs / ft.

6. The green wheel lug indicators should be pointing in the right direction.

5.3. Pump Lubricating Chart

Manufacturer	Type
ESSO	Nuto H150
GULF	LP 150
MOBIL	DTE Extra Heavy
ROC	Kiron 150
TEXACO	Rando HD 150
BP	Energol HLP 150
AGIP	OSO 105
SHELL	Tellus/Morlina 150
CENTURY OIL	PWLM
PETROFINA	Hydran 51
CASTROL	Hyspin AWS 150

Oil Capacity (litres)			
Number of Cylinders			
3-cyl	4-cyl	6-cyl	8-cyl
6.5	6.0	5.75	5.0

6. Fault Finding

Most of the problems experienced during jetting operations are likely to be caused by the pump or the associated hoses.

These types of problems are covered in the pump fault finding chart, which is repeated at 6.3 overleaf for convenience.

Also covered at 6.3 overleaf is a diagnosis of selector valve problems

6.1. Fault Finding – Electrical

As part of the control system, there is a detailed log of all electrical alarms and shutdowns. These will range from oil pressure to CanBus failure. To access this menu, use the following instructions.

1. Enter 1111 into the low password screen
    a. Main menu
    b. Systems settings
    c. Event history
2. The event history will now give time, date, and alarm/event history

6.2. Fault Finding - Hydraulic

Problem	Possible Cause	Recommended Action
Low system pressure	• Worn or incorrect size of cutting nozzle • Engine speed slow • Leaks from hose, pipes and connections • Blocked inlet filter • Inlet hose to long • Loss of water through dump line of selector valve or gun when high-pressure selected • Loss of water through dump line of remote-control kit, if fitted	• Replace the old jetting Nozzle with a new one • Adjust to correct speed • Check the connections for tightness, replace if needed • Clean or replace element • Shorten hose length • Check seats and seals • Check seats and seals
High system pressure	• Blocked nozzle, selector valve or gun • Incorrect nozzle size • Incorrect bore size • Engine speed high • Crushed delivery hose • Two-gun choke left in gun when operating as single gun unit	• Clean the items and flush out the delivery line • Replace the nozzle • Replace the hose • Adjust to correct speed • Replace if necessary • Replace with standard choke
Low water level	• Blocked or dirty pre-filters • Faulty ball valve assembly • Wrong seat in ball valve assembly • Low inlet pressure	• Clean or replace elements • Replace if necessary • Replace the seat if necessary • Increase pressure
Pump not running evenly (also refer to pump faults)	• Air in water • Air in crankcase oil • Worn drive coupling • Faulty inlet or delivery valve • Valve nut over tightened	• Water bleed pump • Oil bleed pump • Replace flexible elements and examine coupling • Check valve condition • Check tightness of inlet & delivery nut
Burst disc failure or safety relief valve operating (also refer to high system pressure problem)	• Incorrect burst disc • Incorrect valve setting • Faulty valve • Faulty or fatigued burst disc	• Replace with correct disc • Check certificate/setting • Repair or replace if required • Replace with new disc

6.3. Pump Fault Finding

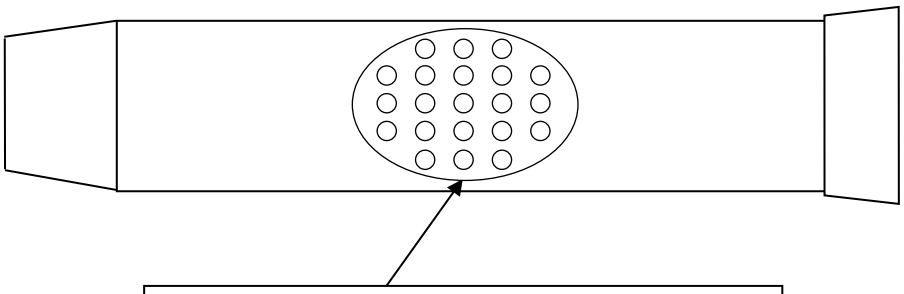
Problem	Possible Cause	Recommended Action
• Mixing of oil and water in crankcase • Loss of pressure • Pump not running evenly	• Worn or damaged delivery valves. • Damaged filter element allowing debris to jam delivery valve	• Check all delivery valves – replace as necessary • Check all diaphragms – replace as necessary • Replace oil • Check filters – replace as necessary

• 1 Loss of crankcase oil through high-pressure hose
• Loss of pump pressure
• Pump not running evenly
	• Inlet restriction may have been caused through:
	  ○ Blocked filters
	  ○ Kinked inlet hose
	  ○ Worn or damaged inlet valves
	  ○ Excessive inlet hose length
	• Pump has been frozen
		• Clear restriction
		• Check inlet valves – replace as necessary
		• Check diaphragms – replace as necessary
		• Replenish oil

• Mixing of oil and water in crankcase	• Diaphragm failure (may have been through fatigue from excessive running hours)	• Check all diaphragms – replace as necessary

Distinguishing features of failure on diaphragm

A



Impression of the baffle on diaphragm

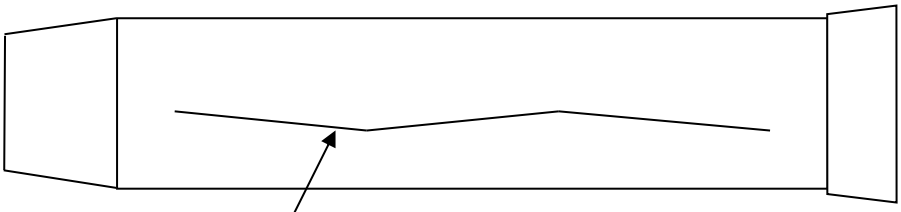
Reason: It has been inflated

B

4 small impressions cause more damage on the inside, than on the outside.

Reason: the diaphragm has pumped through mandrel delivery holes.

C



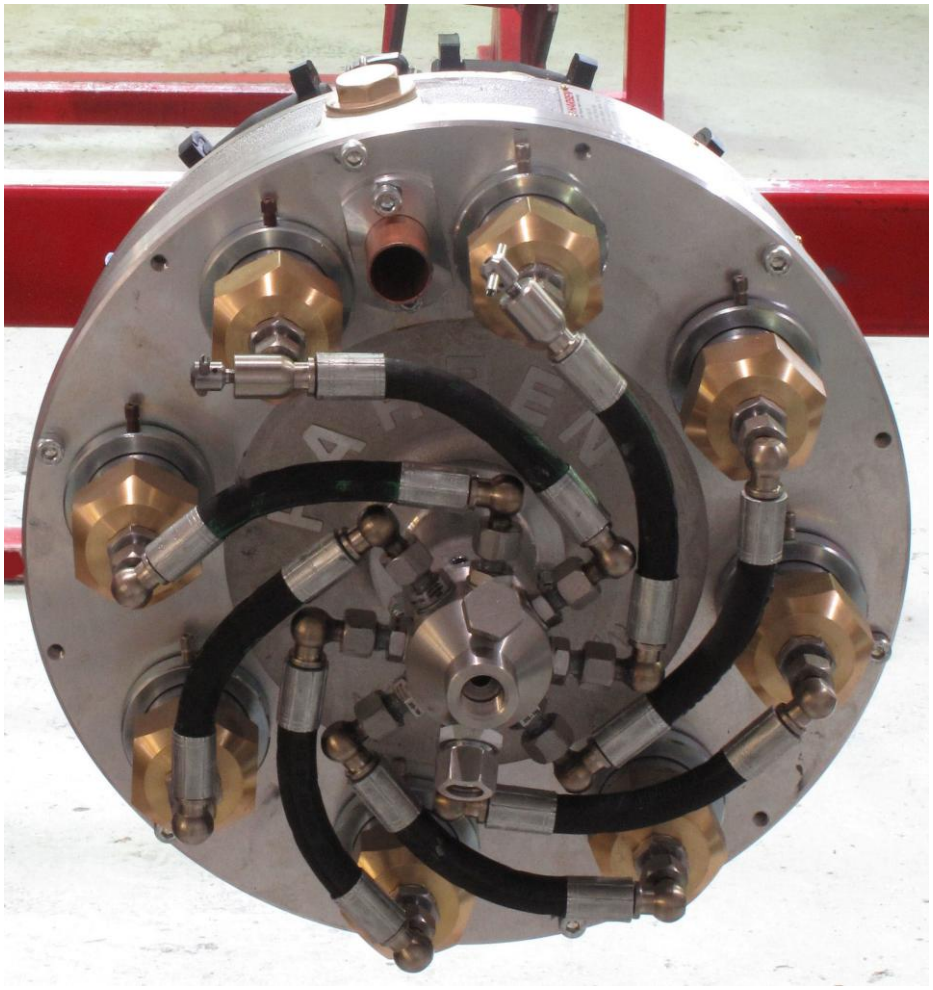
Shear through wall of diaphragm

6.4. Selector Fault Finding

Selector problem	Cause	Action
Loss of pressure and flow is down	Water leaking through the worn seat back to tank	Replace the seats and the plug if also damaged
If water leaks along spindle and past lever	O-ring and back up ring failure along shaft	Replace O-ring and back up ring 013-021 & 023-001.
Water leaking along the gland nut thread	Leaking selector seal	Replace seal 012-095.

7. Pump

Refer to the **P Type Service Manual** Part No. 061-352 included with your Jetter.



8. Water Heater

Harben offer a detailed manual of the Alkota 760H Water Heater, and this will accompany the unit, along with component warranty information.

Model 760H

Diesel 760,000 BTU

Fuel consumption – 7.6 gph

Weight – 1150 lbs

9. Unloader Valve

PA VB85/260

VB85/160 – 280 Rv Pressure regulating valve (Unloader)

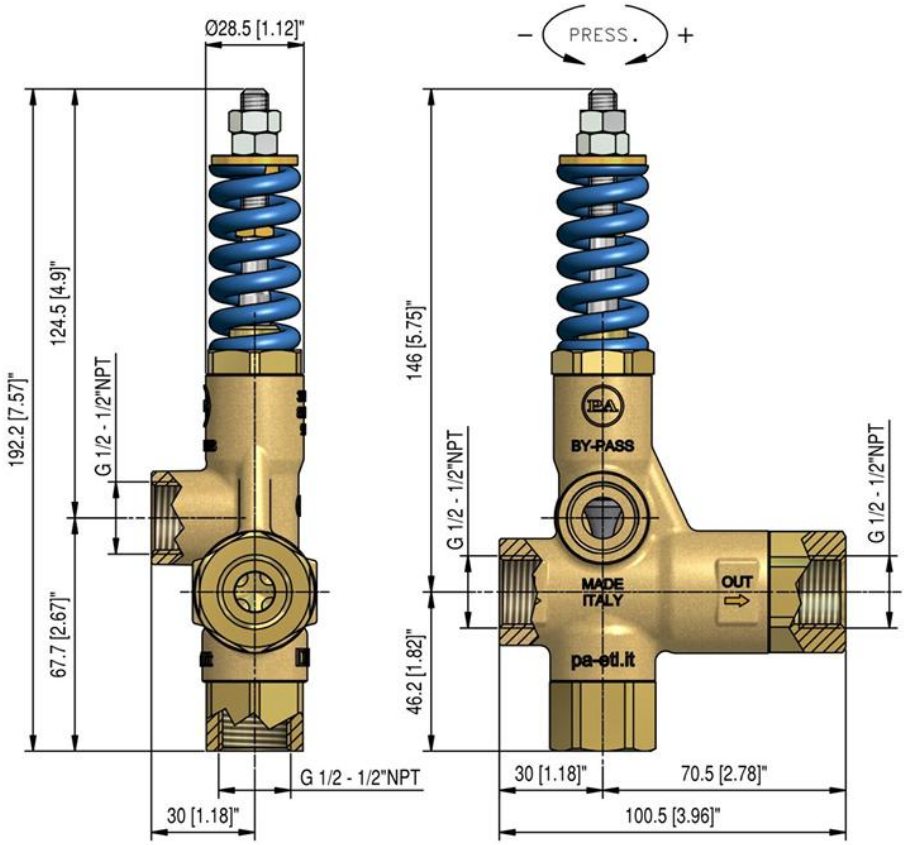
Recycled water version **Technical manual: E 282**

At gun closure, the waterflow is discharged in bypass reducing the pressure in the system upstream of the valve.

DN 15

- **60.0423.00** G 1/2" F White spring
- **60.0423.05** 1/2" NPT F White spring
- **60.0423.60** G 1/2" F Blue spring
- **60.0423.65** 1/2" NPT F Blue spring

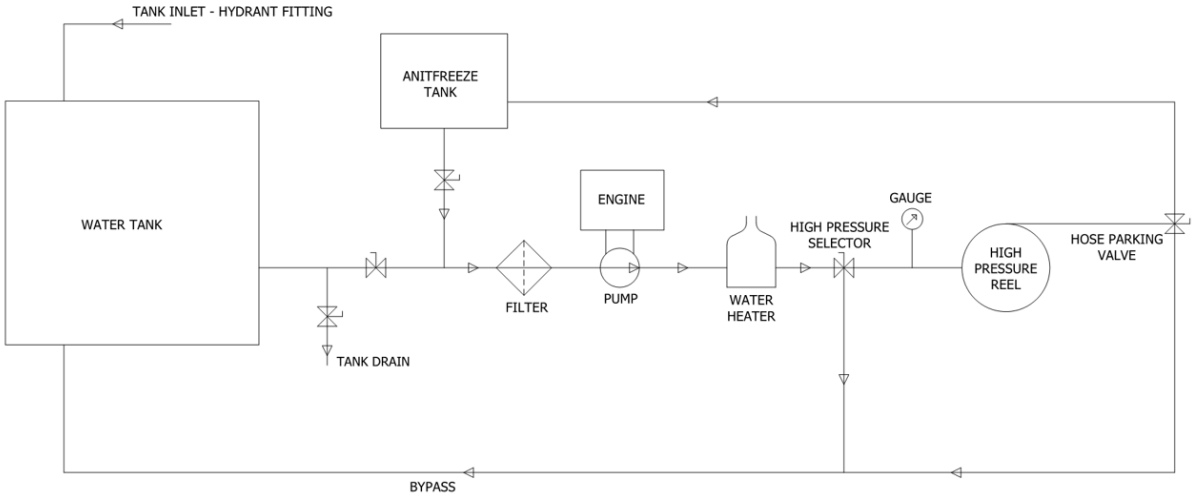
- Dynamic seals made up of O-ring and Back-up ring.
- Optimized internal passages that guarantee reduced pressure loss.
- Antirotation device of the piston positioned inside the valve and obtained by an hexagonal sector of the piston itself.
- O-rings of the fittings positioned upstream to the thread : no risk of fittings ejected in case of overpressure.
- Double feed connection.
- Version with knob fitted with locknut for minimum working pressure adjustment.



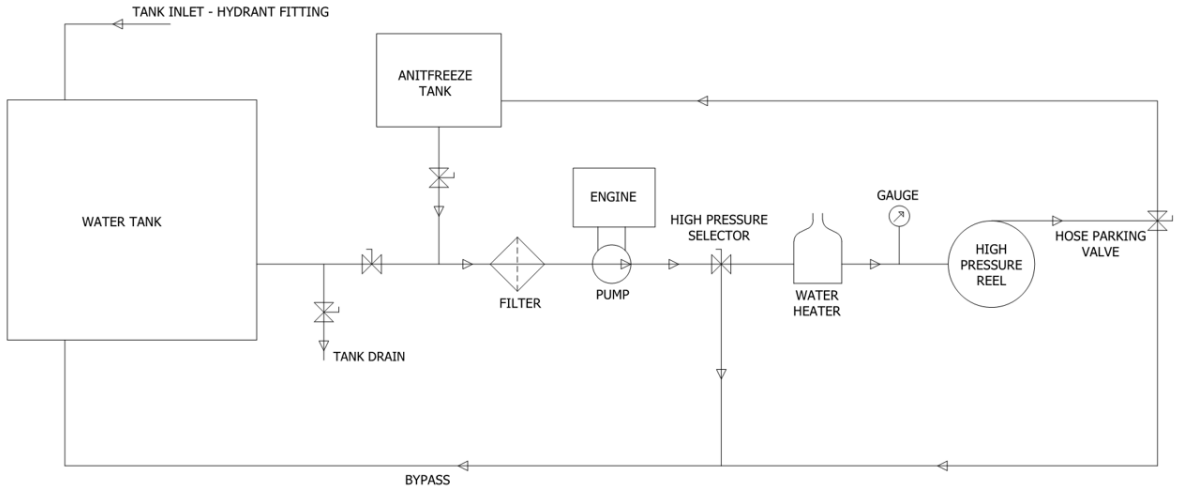
10. Circuit Diagrams

For wiring diagrams relating to the engine, refer to your engine handbook supplied with your Jetter.

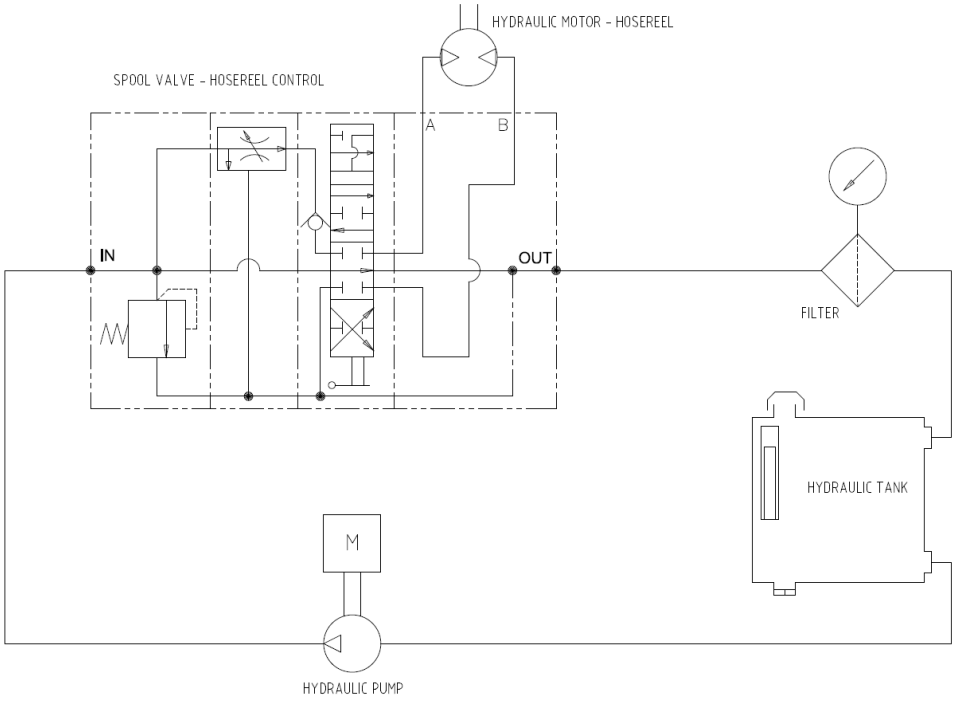
10.1. Water Circuit for ET-180 HW Manual



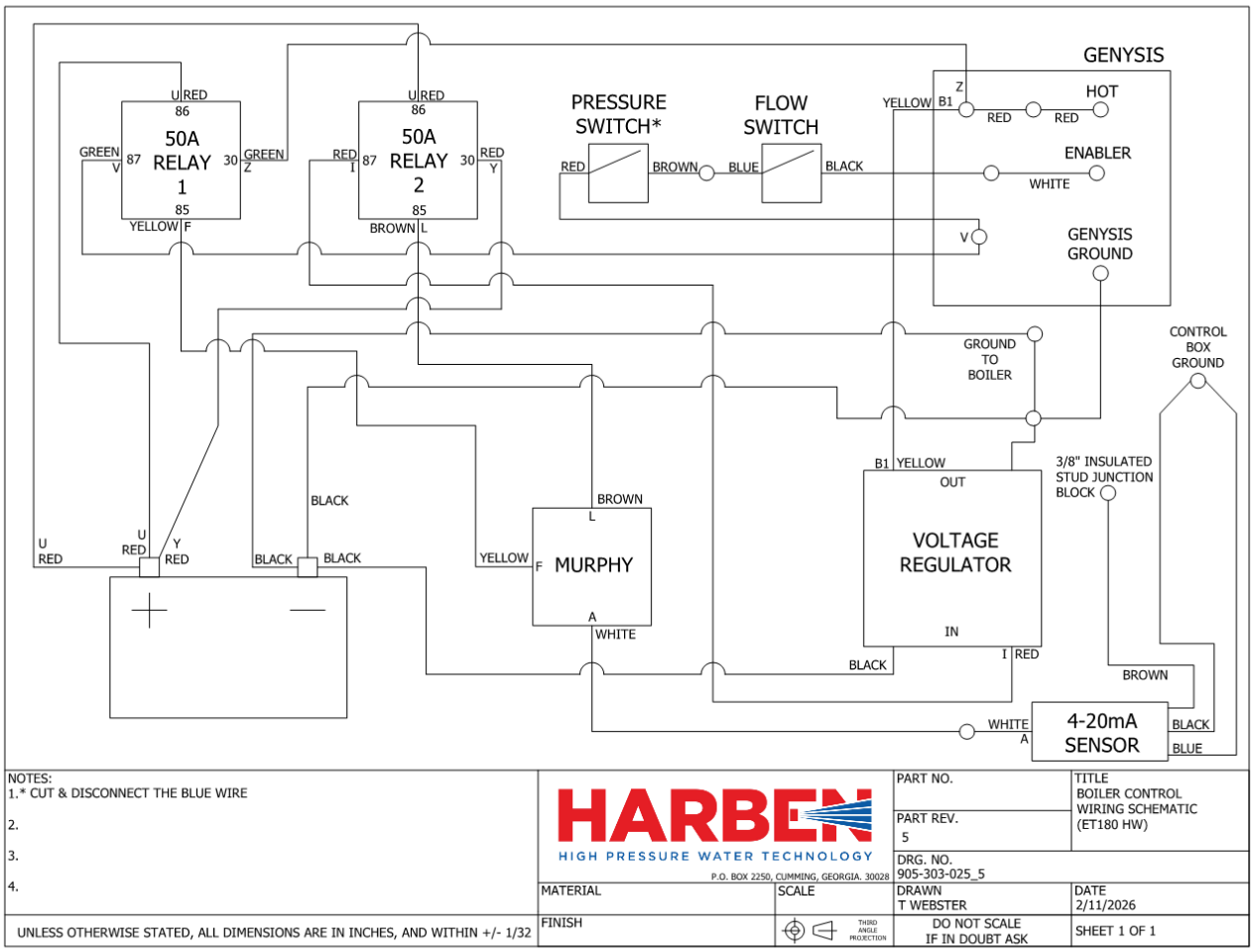
10.2. Water Circuit for ET-180 HW Wireless



10.3. Hydraulic Circuit for E180



10.4. Water Heater Wiring Diagram



11. Engine

A copy of the Engine Manufacturer’s Operators Handbook is supplied with this equipment

12. Parts List / Spares

12.1. Introduction

This section includes advice on obtaining spare parts.

To identify consumable items and service kits you require you should use the information in this section. To identify components for the pump or engine etc, refer to the relevant parts in this manual.

12.2. Ordering Spare Parts

Order spare parts from:

HARBEN
HIGH PRESSURE WATER TECHNOLOGY

Harben Inc.

2010 Ronald Reagan Blvd.

Cumming GA 30041

Tel. (770) 889-9535 - Fax. (770) 887-9411

email: sales@harben.com

www.harben.com

12.3. Routine Maintenance / Consumable Items

See **Section 5**

12.4. Consumable Components

See **Section 5**

12.5. Parts List

The parts list below details the common parts for your E180 and E-Series Jetters. For parts relating to the engine, or for details of optional extras fitted to your unit, contact either your distributer, or Harben Inc.

12.5.1. ET-180 HW Manual/Wireless

ITEM	HARBEN PART NO	DESCRIPTION	QTY
1	021017-021	Water Selector Valve (Manual Unit)	1
2	069581-017	Kit Hydraulic Water Divert Valve - Mk2 (Wireless Unit)	1
3	042134-020	Water Filter	1
4	903208-020	Hydraulic Filter	1
5	903358-015	Battery 634MF	1
6	9032141-015	50A Relay	2
7	9032123-015	Voltage Regulator	1
8	903722-015	Amber Marker Light	4
9	903720-015	Taillight Curb Side	1
10	903719-015	Taillight Offside	1
11	903721-015	Light Bar	1
12	9031322-021	6000psi Needle Valve	1
13	9036125-021	Unloader Valve 4060psi	1
14	903686-021	Ball Valve 3-Way Brass	1
15	903238-021	1 ¼” Ball Valve	2
16	903286-021	2” Ball Valve	1

13. Service Documents

13.1. Service Checklist

SERVICE CHECK LIST

HARBEN HIGH PRESSURE WATER TECHNOLOGY

Serial Number -

Unit Number -

Sht 1 of 2

Date -

Engineer -

Hours Run -

ESR -

I - Intermediate service **Y - Yearly service** **R - Customer request**

	Engine	I	Y	R
1	Check oil level			
2	Change oil			
3	Change oil filter			
4	Clean air filter			
5	Change air filter			
6	Change fuel filter			
7	Clean water trap			
8	Check coolant level & A/F mix			
9	Inspect radiator			
10	Inspect hoses			
11	Check fan belt			
12	Check engine mounts			
13	Check exhaust			
14	Check throttle cable			
15	Check for leaks			

	Gearbox	I	Y	R
16	Check oil level			
17	Change oil			
18	Check for leaks			

	Pump	I	Y	R
20	Check valves (Inlet/delivery)			
21	Replace valves (Inlet/delivery)			
22	Check diaphragms			
23	Replace diaphragms			
24	Change oil			
25	Check hoses/fittings			
26	Check working pressure			
27	Check working temp			
28	Check smooth running			
29	Change Burst Disc (Must be changed every 6 months)			
30	Set Safety Relief Valve (Must be set by manufacturer/authorised agent and reset/certificated every six months)			
30	Check main pressure gauge			
31	Check burst disc fitted			
32	Check jump jet operational			
33	Pressure gauge reading correctly			

	Hydraulics	I	Y	R
34	Check oil level			
35	Change oil			
36	Change filter			
37	Inspect hoses			
38	Inspect reel			
39	Grease reel bearings			
40	Check reel mountings			
41	Check operation			
42	Check for leaks			

	Electrics/Controls	I	Y	R
43	Check battery			
44	Check/grease terminals			
45	Check charge system			
46	Check wiring connections			
47	Test/check operations			
48	Test remote control unit			

	Vanpack frame	I	Y	R
49	Check for cracks/damage			
50	Check fixing bolts & brackets			
51	Check safety straps			

	Trailer	I	Y	R
52	Check for cracks/damage			
53	Check wheels/tyres/pressure			
54	Check brake operation			
55	Check lights/reflectors			
56	Check tow hitch/lubricate			
57	Check safety cable			
58	Check jockey wheel condition			

	Gun & Lance	I	Y	R
59	Check for leaks on pressure			
60	Check for damage			
61	Check operation			
62	Check jets are correct			

	Water tank	I	Y	R
63	Clean water filter			
64	Change water filter			
65	Check hoses & fittings			
66	Check tank security			
67	Check tank integrity			
68	Check A/Freeze			
69	Check inlet ball valve			

	OMO Foot pedal	I	Y	R
70	Check cable & plugs			
71	Test operation			
72	Check safety button			

	Pressure Hose	I	Y	R
73	Check for wear / damage			
74	cuts / tears			
75	Braiding showing			
76	Any joins in single length			
77	Fittings in good order			
78	Leader hose satisfactory			

	Hot Wash	I	Y	R
79	Check fuel pump pressure			
80	Clean fuel filter			
81	Check swirl plate adjustment			
82	Check electrode gap			
83	Check air flow			
84	Check thermostat operation			
85	Check low water level switch			
86	Check unloader valve			
87	Check burner is running clean			

	Remote Control	I	Y	R
88	Check handset operation			
89	Check Antenna			

	Other	I	Y	R
90	Test emergency stop button			
91	Check safety decals visible			
92	Check ID plate condition			
93	Clean & tidy appearance			

I	Intermediate Service
Y	Yearly Service
R	At Request of Customer

NA - Not applicable, A - Adjusted, √ - Satisfactory, R - Repair required, O - Observation

Note - If 'Adjusted' or 'Repair required' please describe issue on sht 2

13.2. Service Logbook

Unit Log Book	HARBEN HIGH PRESSURE WATER TECHNOLOGY
Serial Number -	
Unit Number -	
Date of Manufacture -	*Sht 2 of 2*

Date ..... Service Stamp

Technician .....

Type of Service ..... Service carried out by: .....

Date ..... Service Stamp

Technician .....

Type of Service ..... Service carried out by: .....

Date ..... Service Stamp

Technician .....

Type of Service ..... Service carried out by: .....

Date ..... Service Stamp

Technician .....

Type of Service ..... Service carried out by: .....

Date ..... Service Stamp

Technician .....

Type of Service ..... Service carried out by: .....

Date ..... Service Stamp

Technician .....

Type of Service ..... Service carried out by: .....

Date ..... Service Stamp

Technician .....

Type of Service ..... Service carried out by: .....

Type of service - Itermediate, Yearly	

14. Warranty

14.1. Warranty of New Products:

Equipment manufactured and supplied by Harben is warranted to be free from defects in materials and workmanship for a period one year or 2000 operating hours, whichever occurs soonest, from the date of shipping from our factory.

Our standard warranty covers both the parts and labor necessary to correct any such defects when repairs are carried out by us or by one of our authorised service centers.

To obtain warranty service, you should notify the Harben service department in writing within the warranty period, and they will direct you to your nearest service center. If the defect is covered by the warranty, we will repair or replace, at our option, the defective equipment, without charge for labor or materials.

Our warranty is limited to the original retail purchaser and is not transferable. We assume no responsibility for damage due to accident, neglect, abuse, tampering or misuse, or damage from repairs or alterations by others. This warranty does not cover damage to the equipment resulting from the use of non-genuine spare parts.

Warranty of Harben P Type Pump

The warranty for the Harben “P” Type pump when fitted to a trailer, truck or van pack unit manufactured by us and when used only in the sewer and drain cleaning industry is five years or 2000 hours, whichever occurs soonest, from the date of shipping from our factory.

For use in all other industries the warranty is two years or 2000 hours, whichever occurs soonest, from the date of shipping from our factory.

Parts considered as wearing parts within the “P” Pump are warranted for 90 days. These parts are:

• Inlet and Delivery valves

• Diaphragms

14.2. Warranty of Major Components:

Engines – Please see the engine manual that came with your machine.

Poly Tanks – All poly tanks are warranted for three years for material and workmanship.

Trailer Axles – Warranty is for two years. Please see axle manual that came with your machine for exact details.

Harben Trailer Frame – Warranty is for one year covering material and workmanship.

In Order to Make A Claim:

1. You must be the original purchaser of the machine in which the part(s) were originally installed.

2. You must notify us or our authorized service agent that you wish to make a warranty claim. When requested you must return the faulty part(s) clearly labelled and carriage paid along with the unit/pump serial number and any other information that we may reasonable request.

3. All components must have been installed and maintained in accordance with good industry practice and any specific recommendations we made, including those in our maintenance schedule that is supplied with your machine.

4. We will replace, at the customers cost, any part(s) returned for warranty inspection. When our inspection has been completed, we will advise if the parts(s) are covered by our warranty policy and if they are we will credit your account for the cost of the new part(s), minus taxes and shipping charges.

5. Our warranty does not cover travel charges, down time, or consequential losses.

6. No part(s) will be considered for replacement under warranty if it is subject to any of the following reasons for exclusion.

• Used for a purpose for which it is not designed

• Applied to a use which has not been approved by Harben

• Subject to misuse, negligence, lack of maintenance or accident

• Repaired or altered in any way which, in our judgement, may adversely affect its performance and reliability

• Considered as fair wear and tear

14.3. Limitations of Warranty:

The new product and spare parts warranty is limited to defects in material or workmanship of the product. It does not cover loss of time, inconvenience, property damage or any consequential damages. Repair or replacement of the product is your exclusive remedy.

Our liability under this clause shall be in lieu and to this exclusion of any warranty or conditions implied or expressed by law as to the quality or fitness for purpose of any goods supplied hereunder PROVIDED THAT nothing in this clause shall operate so as to exclude liability for death or personal injury arising from the negligence of the company or its employees.

Our obligations as aforesaid shall constitute the full extent of our liability in respect of any loss or damage sustained by the purchaser whether caused by any breach of this contract or by our negligence or otherwise and we shall not be liable to make good or pay for loss of use of the goods, loss of revenue, loss of profit or goodwill or any direct or consequential losses howsoever caused and the purchaser undertakes to indemnify us against any such claims against us by third parties.

All products manufactured, supplied, or installed for use at work are tested before they leave our factory and are supplied with adequate instructions for their proper use. Further copies of these instructions are available from us upon request.

15. Tire Safety

15.1. Tire Information

The tires installed on the E180 and E-Series trailers are made by Kendra. The specs and warranty information are in the manufacturer's manual supplied with this handbook. Information for this tire can be found on the placard placed on the side of the trailer. This placard includes the following:

- Front, Rear, and Spare Tire Size
- Cold Tire Pressure
- Max Cargo Weight
- Gross Axle Weight Rating (GAWR)
- Gross Vehicle Weight Rating (GVWR)
- VIN number
- Trailer Model number

The tire size, maximum tire pressure, and load limit for the tire are also displayed on the sidewall of each tire.

15.2. Tire Maintenance

Along with the components in the Jetter, the tires need regular maintenance. Listed below are a few measures that can be used to help maintain the tires. **(H&S Section 22)**

- **Tire Pressure** – Always keep the tire at the cold tire pressure listed by the tire manufacturer. Internal air pressure will increase as the tire temperature increases which can cause over inflation if the cold pressure is too high. If the pressure becomes too high, press the valve stem until the correct pressure is reached.
- **Tire Tread** - Tire tread is very essential to any tire. If the tread is below 1/16 of an inch, it needs to be replaced. Tread indicators on the bottom of the tire will show when it needs to be replaced. They are in the in the bottom of the tread grooves and if they are even with the outside of the tread, the tire needs to be replaced. Make sure that the spare is the same size as the tires on the trailer.
- **Tire Balance** – Tires need to be aligned and balanced to prevent any sort of shaking and vibrations that the trailer could experience. Having both done will help preserve the life of the tire.
- **Tire Repair** – Plugging a hole and patching the area around it is a simple option if there is a puncture in the tire. This can only be performed if the hole is in the tread and not in the sidewall. If it is beyond this repair option, the spare will need to be put on and the tire must be replaced.

15.3. Tire Safety

To help prevent any accidents, a few steps can be performed before moving the trailer.

- Check the pressure in each tire. Accurate cold tire pressure can only be measured if the trailer has sat for longer than three hours.
- Inspect the tire for any foreign objects that may be in the tire or around the tire.
- Make sure each valve has a cap and that they are on tight.
- Examine the tire for any uneven wear patterns on the tread and.
- Do not go over the maximum trailer capacity listed on the placard.

While driving, drive slowly over potholes and avoid curbs and foreign objects in the road.

15.4. Trailer Component and Safety

15.4.1. Breakaway Cable

Mounted on the trailer behind the hitch is a breakaway cable. If the cable is removed, the trailer brakes will immediately activate. Ensure that the breakaway cable is always intact and working. It needs to be checked daily.

15.4.2. Electronic Brakes

This trailer contains electronic brakes on the axle(s). They are linked to the towing vehicle once the whip is plugged in. The strength of the brakes can be adjusted if the towing vehicle has an electric trailer brake controller in the vehicle. See the axle manufacturer's manual in the documentation pack for further details and maintenance information.

15.4.3. Trailer Hitch

Before attaching the trailer, the towing vehicle's hitch must be inspected for defects, be capable to tow the weight of the trailer, and have the correct ball size. Make sure all connections are made before moving.

15.4.4. Trailer Lights

The trailer lights are linked to the towing vehicle once the whip is plugged in. This includes running lights down the sides and back, turn signals, and brake lights. These need to be inspected every time the trailer moves.

15.5. Reporting Safety Defects

If you believe that your vehicle has a defect which could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying Harben® Inc.

If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or Harben® Inc.

To contact NHTSA, you may call the Vehicle Safety Hotline toll-free at 1-888-327-4236 (TTY: 1-800-424-9153); go to http://www.safercar.gov; or write to:

Administrator
NHTSA
400 Seventh Street, SW.
Washington, DC 20590

You can also obtain other information about motor vehicle safety from http://www.safercar.gov.