HARBEN

HIGH PRESSURE WATER TECHNOLOGY

Operation & Maintenance Manual

Original Instructions

E-SERIES Trailer Jetter Manual

903-1311

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Operation & Maintenance Manual for:

UNIT: E-Series Trailer Jetter

ISSUE DATE: 5/23

ISSUE No: 2

AMENDMENTS

Change	Changes	Date	Signature
1	NEW ADDITION	05/20	GT
2	UPDATED LOGOS	5/23	JB

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 ⚠ and you are required to read the relevant section in the Health & Safety Manual.

Notices

Carefully read the notices of this manual because they give important information concerning safe installation, use and maintenance; familiarise 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.

IMPORTANT, Follow the recommended operating procedures at all times; 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 agents, or at least competent automotive engineers.

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 5,000 psi and 18 gpm.

Additional accessories can be purchased from Harben Inc., such as floor cleaners, 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

This section defines the scope of supply of the equipment in compliance with the sales order.

Section 3 Technical Data

This section contains technical information about the jetter.

Section 4 Operation

This section 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 Circuit diagrams/Electrical Details

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

Section 9 Diesel Engine

This section provides part details of the diesel engine.

Section 10 Parts list / Spares / Auxiliary Components

How to identify and order spares / auxiliary components.

Section 11 Service Documents

Service logbook and checklist.

Section 12 Warranty & Certification

Section 13 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:	E-Series Trailer Jetter

2.2. Pump 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.

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

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 a safety relief bursting disc.

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.

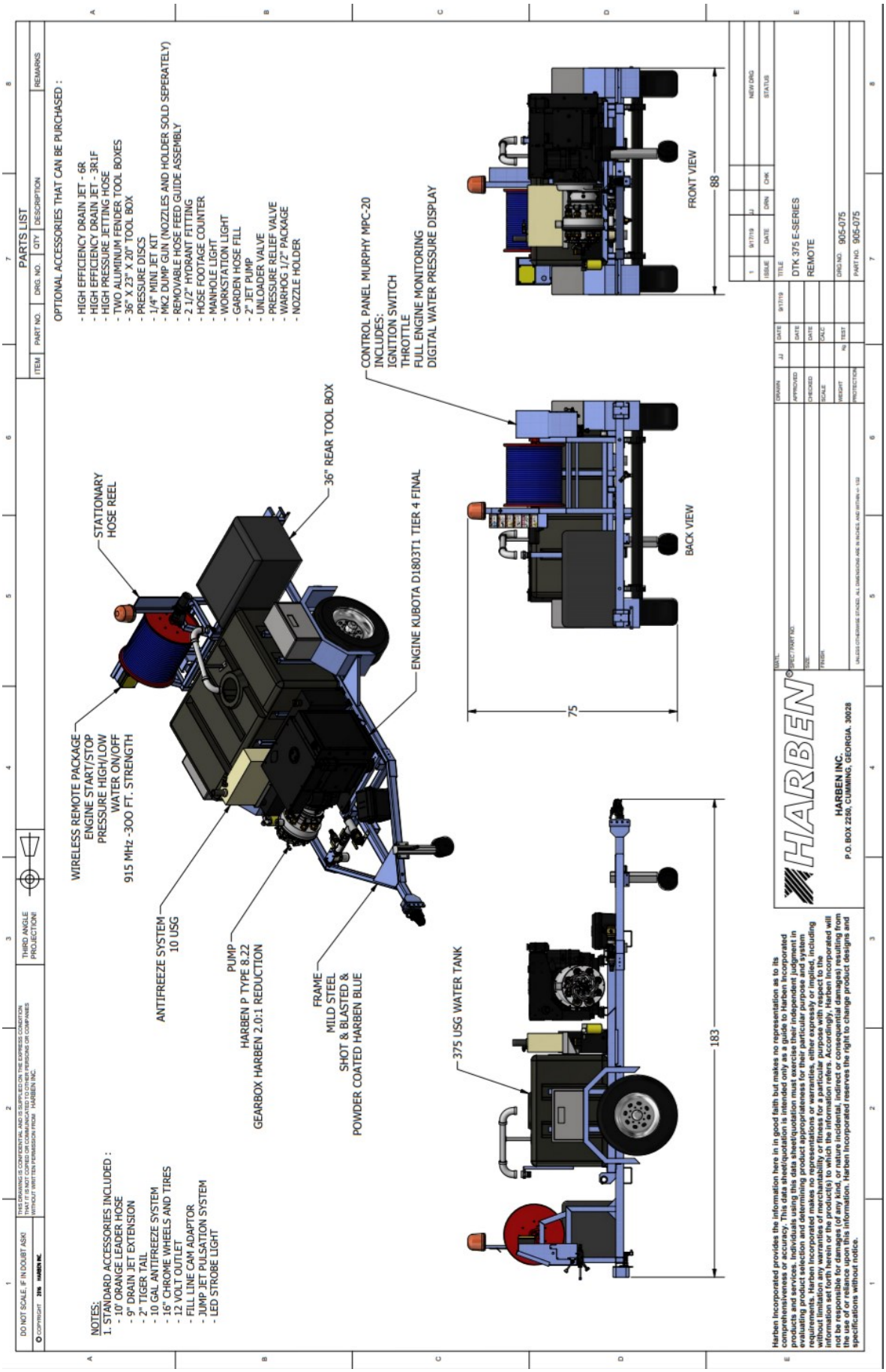


Fig. 2.1 – E-Series Primary Components

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	020041AAB Harben P Type 8 22
Gearbox	020143 Harben P Type 2:1

3.1.3. Ancillaries

Water tank	375 gal capacity
Supply filter	042134 Hypro line strainer / 170 micron mesh
Monitoring & control	Standard engine controller and throttle
Pressure control and safety	011046 Pressure disc white 4000 psi 011047 Pressure disc black 5000 psi (Hot ambient temperature)

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 jetter are illustrated in Figure 2.1 which are as follows:

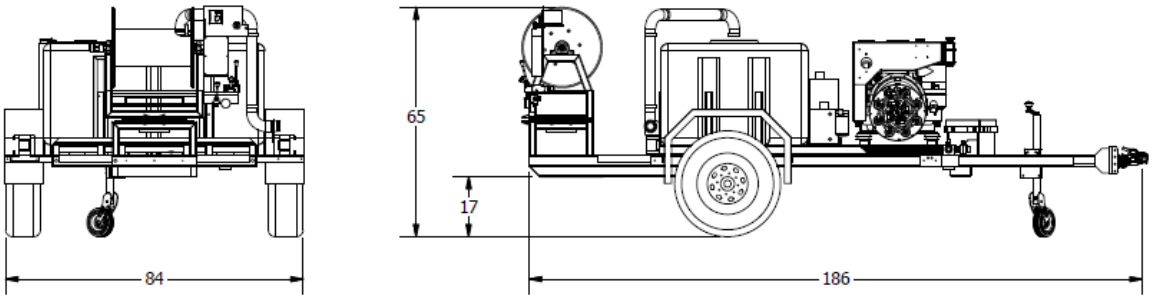
- A prime mover in the form of an industrial diesel engine which drives a Harben P Type high pressure pump.
- The pump is capable of producing high pressure water up to 4000 psi.
- *Note: See above or section 8 for performance options*.
- A hydraulic driven hose reel with up to 500 feet of single wire braid high pressure hose with either a nozzle or gun attachment to deliver the high pressure water to the work application.
- Plastic water tank, 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.
- The pressure valve directs high pressure water to the main jetting hose, or diverts it back to the tank.
- The control panel which includes the engine controller, pressure gauge, throttle, high pressure selector, 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.

3.3. Installation Details



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.

Within this manual the health and safety risks are highlighted with ⚠ and you are required to read the relevant section in the Health & Safety Manual.

4.2. Daily Checks

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

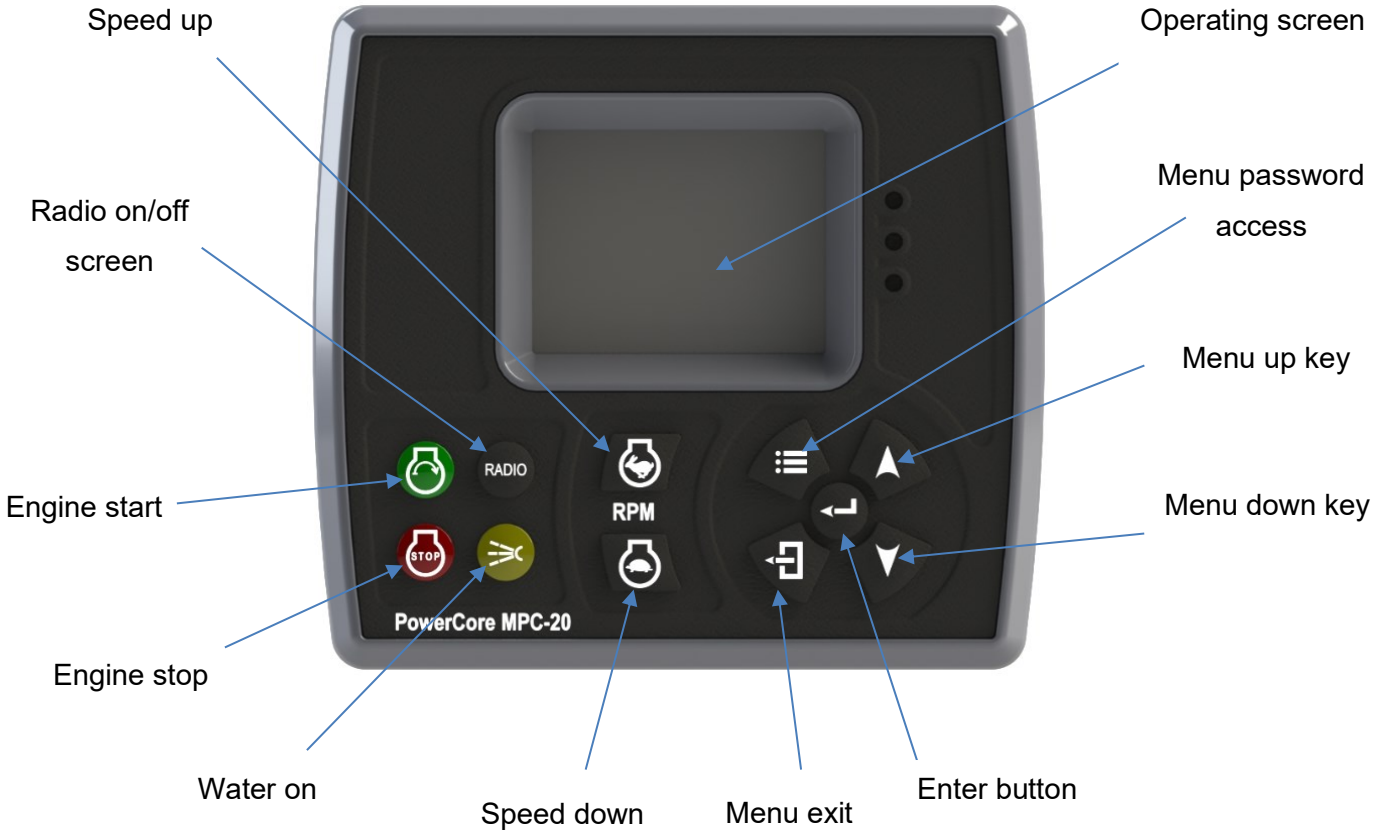
4.3. Pre-start Checks & Procedures

⚠ 1. In cold weather check that machine is not frozen before starting (see Antifreeze section). Only operate the machine in a well-ventilated area.
2. Ensure the towing vehicle and trailer hand brakes are applied.
3. Connect the water supply to the inlet hose reel (NOTE: In order to comply with water authority byelaws 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 axles and could make it dangerous.

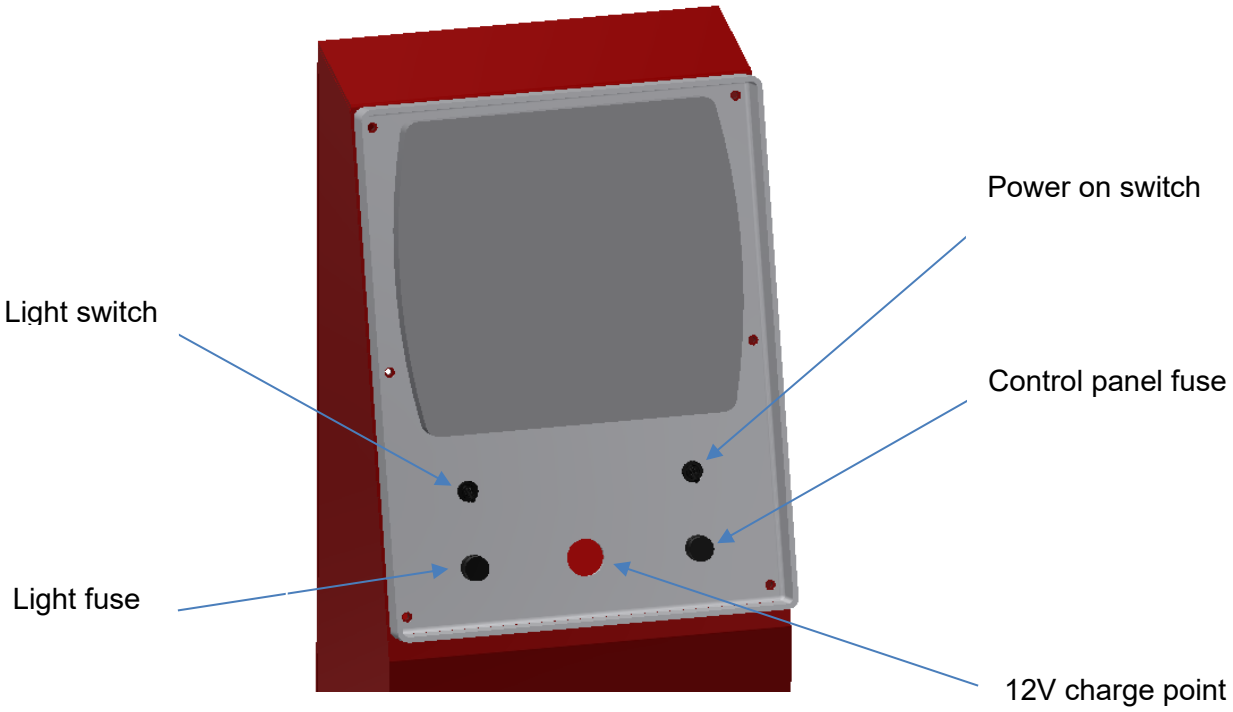
⚠ 4. Feed off the hose reel approximately 100 metres of high-pressure hose. **Do not fit the nozzle or gun at this point!**

4.4. Control panel layout and function

4.4.1. Control keys



4.4.2. Toggle switch operation



4.4.3. Screen layouts

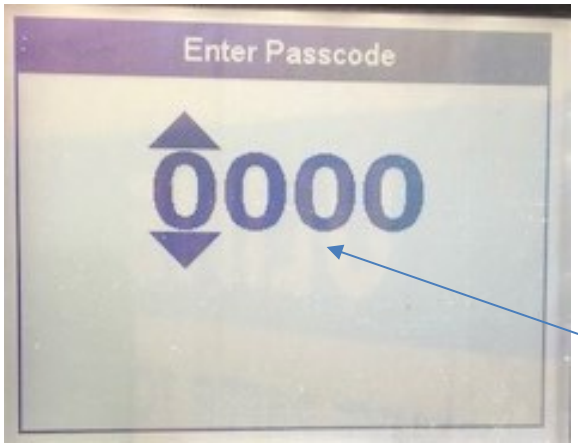
Starting splash screen

Software version

Password screen

Run screen entry – 2010

Minor programme updates - 1111



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

Main run screen (access by pressing menu exit key)

Harben contact number

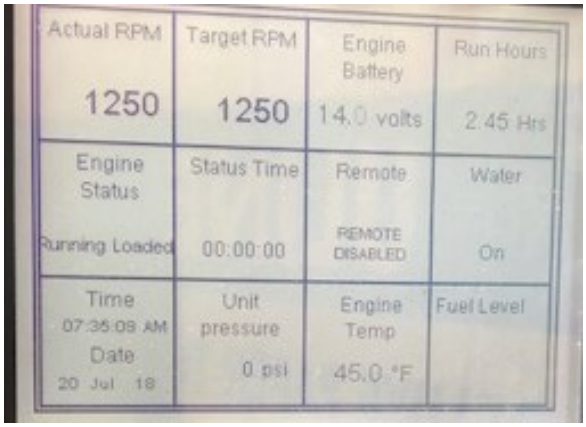
Engine speed

Unit pressure

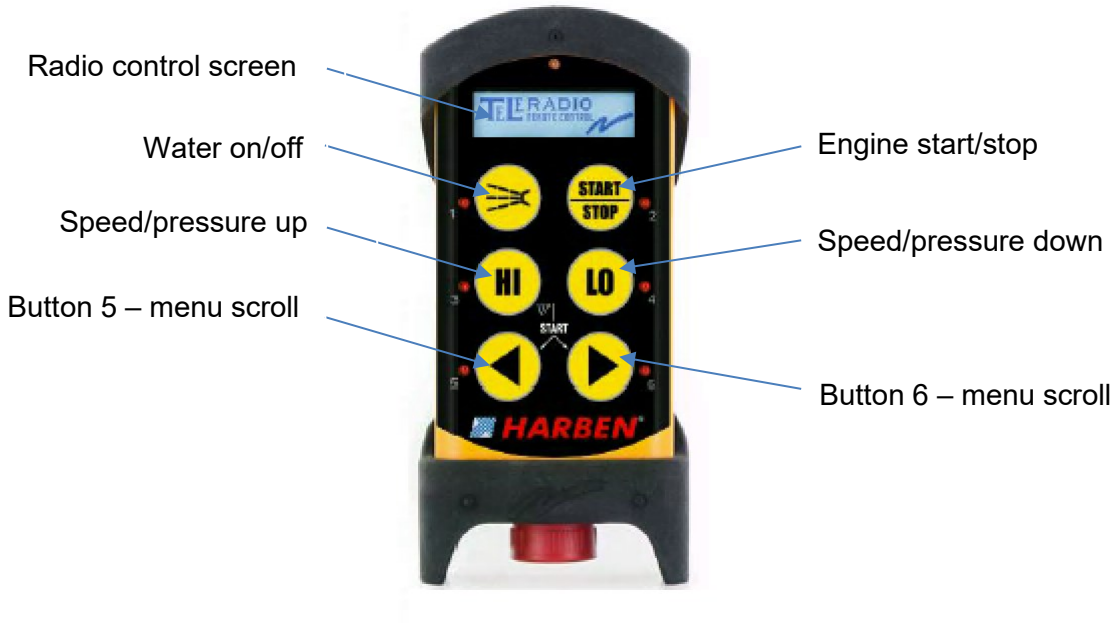
Water on indication

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

Run detail screen (access via the up and down keys)



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.

Tank water level

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

NOTE: 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 pre start (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. Increase the speed of the engine and when it is safe to turn the water on, press the water on button.
10. The engine speed and 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 pre start (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. Increase the speed of the engine and when it is safe to turn the water on, press the water on button on the handset.
13. The engine speed and 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 truck package

1. Fit the correctly sized nozzle to the high-pressure hose. Engine should not be running.
2. Insert the nozzle approximately 6 feet into the drain before diverting the water through the main jetting hose.
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.
6. Once you have completed your jetting work and area 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.
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”.

4.8. Harben® Jump Jet

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

The Harben Jump Jet system is a unique and exceptionally effective addition to the Harben high pressure pump which increases the effective duct cleaning distance up to and often beyond 1000ft. When required the operator can switch on the Jump Jet to create a cyclic vibration in the jetting hose. The vibration travels along the entire length of the hose reducing friction between itself and the duct wall and allowing the de-silting nozzle to continue moving into the duct, cleaning as it goes.

To operate the jump jet, open the jump jet valve on the control panel of the unit.

4.9. 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.

The motor is fitted to the hub of the hose reel. The motor speed and direction is 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 inwards towards the pump set 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.

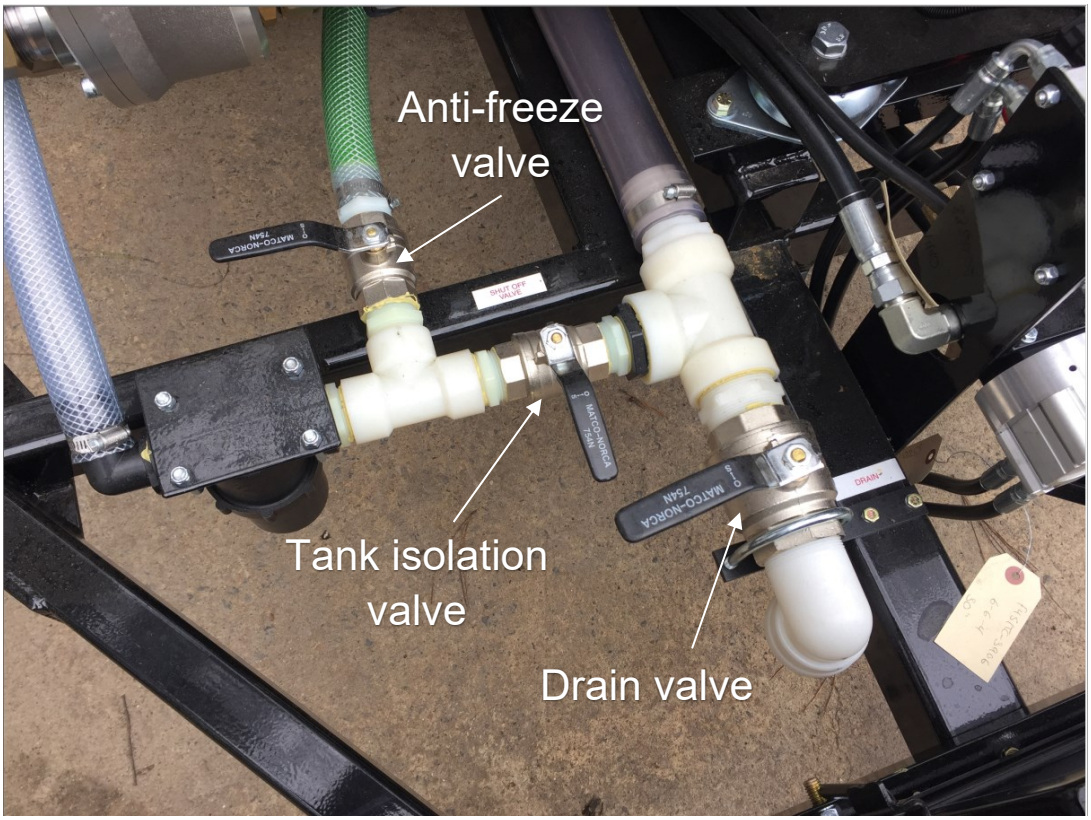
Hoses that have become stuck can sometimes be pulsed free using the Harben® Jump Jet™ kit or alternatively they should be pulled free by hand.

NOTE: 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.

4.10. 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. Take the following precautions to avoid frost damage:

4.10.1. To Anti-Freeze the machine with an antifreeze tank:



1. The valves to control the antifreeze procedure are located as shown
2. Shut the tank isolation valve
3. Open the tank drain valve
4. Put the jump jet valve into the “off” position
5. Open the antifreeze tank valve. This tank must be full of an antifreeze mixture with strength of no less than a 50/50 mix.
6. Remove the gun or any jetting nozzle from end of the hose and unreel 10ft of hose.
7. Ensure the unit starts in dump (radio – nothing to do, manual – put pressure selector to dump)
8. Hold the open-ended hose away from the body pointing it to the ground and away from any by-standers.
9. Start the engine and run at idle speed. As shown as engine runs, switch water to pressure. Water will come from the end of the high-pressure hose. (It may be necessary to bleed the pump if water flow is very slow)

10. After a minute or two the antifreeze mixture will start to come out of the high-pressure hose. *IMMEDIATELY SWITCH OFF THE ENGINE.*
11. Place the end of the high-pressure hose into the antifreeze tank. If the hose is clean you may remove the strainer in the tank lid to make it easier.
12. Restart the engine and allow the antifreeze to circulate. Briefly (about 2 seconds) move the selector valve from HIGH PRESSURE to DUMP and back to HIGH PRESSURE (use water on button for radio system). Briefly (about 4 seconds) put the 'jump jet' valve into the 'On' position and then return to the 'Off' position. See picture below.
13. Stop the engine.
14. Manually rewind the hose back on the reel and lock in position.

4.10.2. To De-Antifreeze the machine:

1. Shut the anti-freeze valve
2. Shut the drain valve
3. Open the tank isolation valve
4. Re-fill the water storage tank.
5. Put jump jet valve into the 'off' position,
6. Place the high-pressure hose (NO NOZZLE ATTACHED!) into the antifreeze tank.
7. Start the engine with the selector on 'HIGH PRESSURE'. (If on radio put water on as soon as the engine starts.)
8. Pump out the antifreeze solution from the high-pressure hose back into the antifreeze tank.
9. 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)
10. Place the jump jet valve in the on position.
11. The machine can now be used in the normal manner.

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

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

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 routing engine maintenance please refer to the engine 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.

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

5.4. Burst Discs

When carrying out any maintenance/overhaul of the pump, always ensure the correct burst disc for its working pressure is fitted. The available burst discs are as follows:

Colour Code	Part Number	For Maximum Working Pressure
Yellow	011019	125 bar (1800 psi)
Blue	011020	140 bar (2000 psi)
Red	011021	175 bar (2500 psi)
Purple	011022	210 bar (3000 psi)
Green	011045	240 bar (3500 psi)
White	011046	275 bar (4000 psi)
Black	011047	345 bar (5000 psi)
Orange	011107	415 bar (6000 psi)

(Burst disc holder showing “White” burst disc)

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

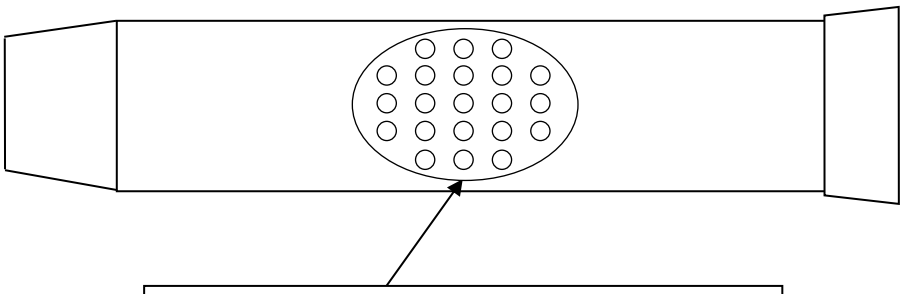
Problem	Possible Cause	Recommended Action
• Mixing of oil and water in crankcase • Loss of pressure • Pump not running evenly	• Worn or damaged delivery valves. • Damaged filter element allowing debris to jam delivery valve	• Check all delivery valves – replace as necessary • Check all diaphragms – replace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

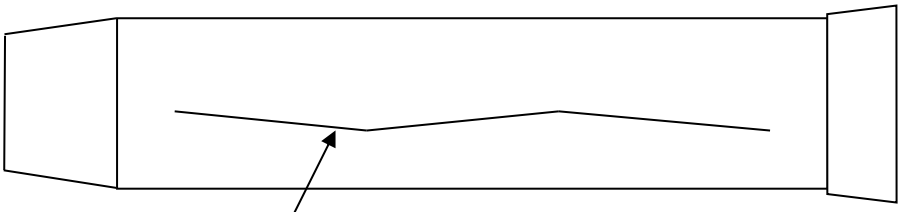
Reason: It has been inflated

B

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

Reason: the diaphragm has pumped through mandrel delivery holes.

C



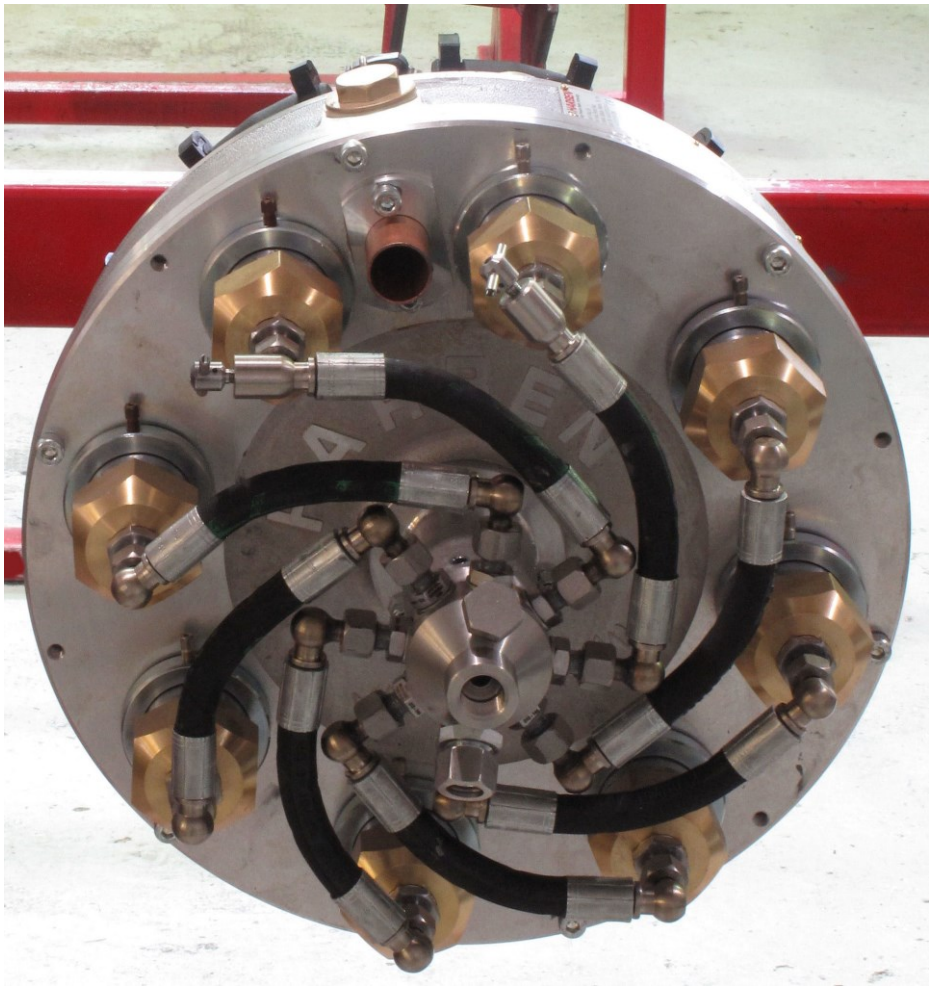
Shear through wall of diaphragm

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

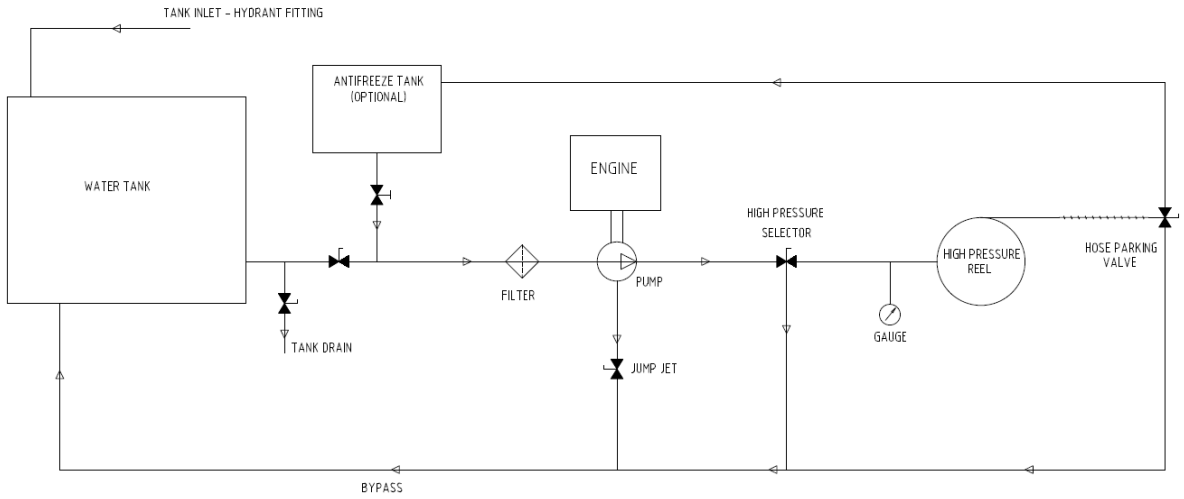
Refer to the **P Type Service Manual** Part No. 061-352 included with your jetter.



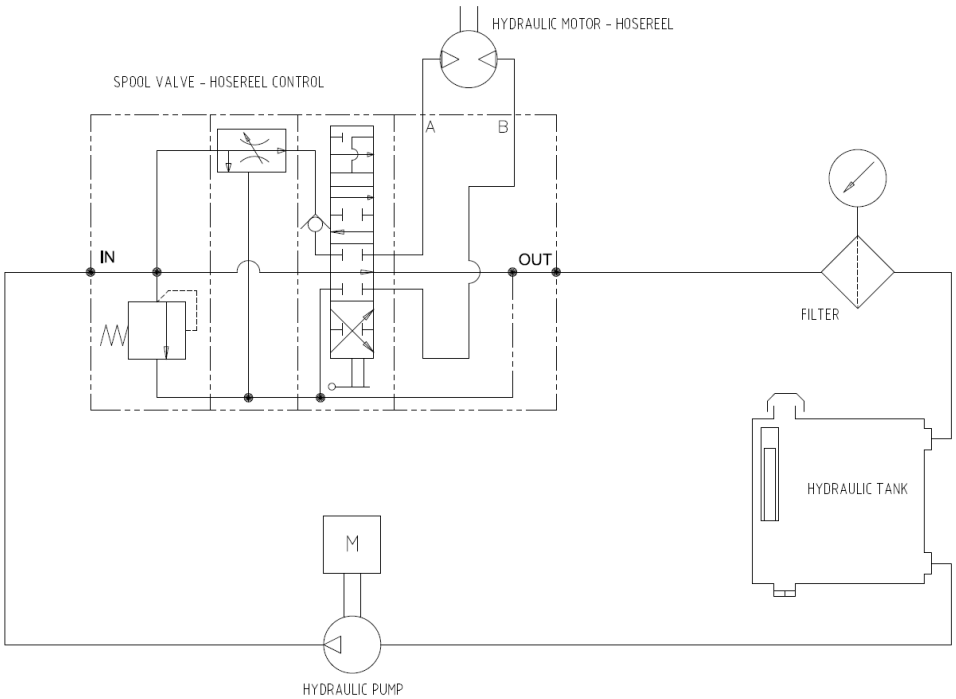
8. Circuit Diagrams

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

8.1. Water Circuit for E-Series



8.2. Hydraulic Circuit for E-Series



9. Engine

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

10. Parts List / Spares

10.1. 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.

10.2. 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

10.3. Routing Maintenance / Consumable Items

See **Section 5**

10.4. Consumable components

See **Section 5**

10.5. Parts List

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

10.5.1. Manual

Component	Description	Qty.
011086	PUMP P TYPE 8-22 BRASS NUTS/MANIFOLD S/S BARRELS	1
011156	ELBOW RUBBER 1 1/4" INLET	1
011157	TUBE SUPPORT 1 1/4" INLET	1
013041	EXPANSION CHAMBER	1
013767	SCREW CAP M6 x 50MM	4
016398	COUPLING KUBOTA TIER 4 FINAL	1
018005	VALVE SPOOL HYD FLOW CONTROL CV1185 (SEE NOTES)	1
020143	GEARBOX HARBEN 2.0:1 SAE5 FLANGE (TIER 4 FINAL)	1
021020	BELL HOUSING LISTER	1
023004	NUT NYLOC M6	4
023011S	PARKER H.P. SWIVEL JOINT WITH 1 X 903 058 ADAPTOR	1
023088	PART 1 NEUPEX B140 PERQUOTE 144.704.068/REV B / Gearbox Coupling (FEMALE)	1
023093	PART 4 NEUPEX B140SAME AS 480.009.327 Gearbox Coupling (MALE)	2
023097	ADAPTOR 1/4" NPTM x #6 JICM	3
033010	SEAL DOWTY 1/2"	2
033013	SEAL DOWTY 3/8"	6
033015	SEAL DOWTY 1"	1
041021	PLUG SQUARE HEAD 1/4"	1
041044	PLUG SQUARE HEAD 1/2"	1
042134	POLYPROPYLENE 1 1/4"FPTSTRAINER	1
043057	DUMP DIFFUSER	2
043057	DUMP DIFFUSER	1
043140	BLACK 2" SQUARE 11GA ABS INSERT CAPS	6
043177	MALE PIPE x HOSE BARB2 x 2 NYLON ONLY	3
043201	MALE PIPExHOSE BARB1 1/4" NYLON ONLY	1
055024	HOSE 1/2" ID NYLOBRAID	20
055024	HOSE 1/2" ID NYLOBRAID	20
057021C	JUMP JET KIT 6-8 CYLINDER - DT200-DT300S-300 E-SERIES WITH 2 X 903 691	1
061027	LABEL "HARBEN"	3
061093	VINYL CUSTOM DECAL	1
061880	PEEL AWAY SAFETY STICKER	1
069581	KIT HYDRAULIC DIVERT VALVE INSTALLATION - Mk2	1
900139	ADAPTOR 1/2" NPTM x 1/2" FEMALE SWIVEL	1
900145	ELBOW 1/2"Fx7/8"JICM	2
900151	REDUCER 1/2"Mx1/4"F	1
900186	TEE 1/2" MALE/FMALE/FMALE	1
900200	ADAPTOR 3/8" NPTM x #6 JICM	6
900223	ADAPTOR 1/2" NPTM x 3/8" NPTM	1

900225	BARBED FITTING 90 DEGREE ELBOW 1/4"HOSE x 1/4NPT	2
900226	LOCK RING 2"	2
900247	INSERT FOR HOSE 7/8"-14JIC F SWVL x 1/2"OD 90DEG	3
900281	ADAPTOR 1/2"NPTM x #8JICM	1
900294	TEE 1/2"NPT FEMALE	1
900295	ADAPTOR 1/2"BSPM x #10JICM	1
900299	ADAPTOR 3/8"NPTM x #8JICM	1
900307	ADAPTOR 1/2"NPTM x #6JICM	1
900317	ADAPTOR 1/2"NPT MALE x #10 SAE MALE	1
900318	90 DEG ELBOW 1/2"NPTM x #6 JIC MALE	1
900319	BUSHING 1/2"NPT FEMALE x 3/4"NPT MALE	1
900340	ADAPTOR ELBOW BRASS 1/2" NPT MALE x 1/2" BARB	3
903001	9" DRAIN JET EXTENSION	1
903058	ADAPTOR 1/2" NPTM x #10 JICM	1
903058	ADAPTOR 1/2" NPTM x #10 JICM	2
903076	ELBOW 2"M x 2" BARB NYLON	1
903092	REDUCER 2" x 1 1/4" POLY	1
9031041	LABEL 'NOTICE - JETTER PERFORMANCE' 4000 PSI	1
9031042	LABEL 'WARNING - UNBLOCKING PIPES'	1
9031043	LABEL 'WARNING - NEVER PLACE YOUR HANDS NEAR LEAKS'	1
9031044	LABEL 'WARNING - ALWAYS WINTERIZE'	1
9031045	LABEL 'SAFETY FIRST'	1
9031046	LABEL 'CAUTION - HOT SURFACE'	1
9031047	LABEL 'NEVER ALLOW ANTIFREEEZE'	1
9031048	LABEL 'WARNING - DO NOT OPERATE WITH CANOPY OPEN'	1
9031049	LABEL 'DANGER - WATER JETS CAN CAUSE FATAL INJURIES'	1
9031050	LABEL 'WARNING - JETTER HOSES'	1
9031051	LABEL 'WARNING - PPE'	1
9031052	LABEL 'WARNING - DRAIN JET EXTENSION'	1
9031055	TELERADIO RADIO CONTROL SYSTEM CANOPEN - TRANSMITTER AND RECIEVER - 915 MHz	1
9031059	** BLACK ** 375 Horizontal Loaf Tank, HD, 62.5 in. x 41.5 in. x 38 in	1
9031084	EXTENSION HARNESS MURPHY MPC20 - KUBOTA D1803TI - SINGLE AXLE TRAILERS - RADIO - EPS9197X1-12 - 12'	1
9031088	MPC-20-R2 POWER CORE CONTROLLER	1
9031089	GASKET FOR MPC-20 CONTROLLER	1
9031090	ML2000 INTERNAL HARNESS FOR MPC-20 CONTROLLER	1
9031102	PRESSURE TRANSDUCER 0-5000PSI 4-20mA DIN CONNECTOR 1/4" NPT MALE	1
903113	NIPPLE 1 1/4" x 4"	1
9031195	SAFETY LABEL SET RED WHITE SQUARE DIESEL UNITS	1
9031201	GREEN LUG NUT WHEEL NUT INDICATOR 13/16	16
9031202	BATTERY CABLE E180 POSITIVE 24 IN	1
9031203	BATTERY CABLE E180 NEGATIVE 24 IN	1
9031234	1 1/4" CLEAR PVC WATER TANK SIGHT TUBE	2.3
9031235	1 1/4" CLEAR PVC WATER TANK SIGHT SOCKET ELBOW	2
9031236	FLOAT BALL WATER TANK SIGHT TUBE	1

9031237	ADAPTOR 1 1/4" MALE TO 1 1/4" SLIP FOR WATER TANK SIGHT TUBE	2
9031238	SLOTTED SPRING PINS FOR SIGHT TUBE	2
903124	I.D. PLATE FOR TRAILER	1
9031248	1 1/4" CLEAR PVC WATER TANK SIGHT SOCKET ADAPTOR 2"	2
9031249	HOSE ASSY 451TC-3906-6-6-4 x 22.5”	1
9031250	HOSE ASSY 451TC-3906-6-6-4 x 26”	1
9031287	2" X 2" ANTIFREEZE RECIRCULATION LABEL	1
9031307	LABEL "CAUTION" NOZZLES MAY OVER PRESSURE REV ENGINE SLOWLY	1
903134	HOLE PLUG	3
903139	U-BOLT 1 1/2" PIPE	2
903146	NIPPLE TN51212 3/4" NYLON	2
903148	HOSE CLAMP # 32	4
903149	CLAMP HOSE #28	1
903150	CLAMP HOSE #16	1
903151	CLAMP HOSE #04	5
903152	ADAPTOR ASSY 2" TO 3/4"GH	1
903153	ALUMINUM QUICK COUPLING 2" PART A	1
903167	U-BOLT 2" PIPE	1
903172	TEE 1 1/4" B1140	1
903175	CLAMP HOSE #20	1
903175	CLAMP HOSE #20	2
903178	CLAMP HOSE #08	4
903178	CLAMP HOSE #08	2
903190	R8NC08-HY0808MP-08BPF-10 10 LEADER HOSE MxF	1
903191	HYDRAULIC MOTOR PAINTED GLOSS BLACK	1
903224	BULKHEAD 1 1/4" TxT	2
903225	1 1/4 SCH 80PVC NIPPLE 2 INCH	1
903225	1 1/4 SCH 80PVC NIPPLE 2 INCH	2
903236	BULKHEAD FITTING 2" BF32	1
903238	VALVE BALL 1 1/4"	2
903239	2" TIGERTAIL WITH RING & ROPE	1
903241	WIRING HARNESS 25 FOOT	1
903249	HYDRAULIC MOTOR BRACKET POWDER COATED BLACK	1
903250	HOSE REEL SPACER	1
903284	NIPPLE SCH 80 PVC 2" x 3" LONG	1
903285	TEE PVC 2" B2000	1
903287	ELBOW 2"M x 2"F NYLON	1
903358	BATTERY 775DT	1
903389	ELBOW 1 1/4" MALE TO BARB	1
903389	ELBOW 1 1/4" MALE TO BARB	1
903491	SWITCH BREAKAWAY ELEC BRK	1
903520	12V OUTLET & CAP	1
903523	18GA GALVANIZED SHEET48"x96" CUT TO 2"x96"	0.5
903528	10 GAL ANTI FREEZE TANK ONLY	1
903597	PLUG 7 WAY	1
903599	AXLE ELEC BRAKE HGR-104-00 & K71-358-00	1
903647	BATTERY BOX 11" x 6 3/4" x 8"	1

903686	VALVE 1/2" 3 WAY BRASS	1
903688	VINYL GRIP RED	1
903705	NIPPLE 2" x 6"	1
903706	CAP RUBBER 2" A.F.TANK	1
903707	KIT PARTS FOR E-SERIES MANUAL	1
903719	LED TAIL LIGHT L/H	1
903720	LED TAIL LIGHT R/H	1
903721	LED LIGHT BAR	1
903722	LED AMBER MARKER LIGHT	4
903780	WHEEL CAP STAINLESS STEEL 8 LUG	2
903781	CHROME LUG NUT	16
903783	RUBBER SEAL PER FOOT	4
903784	ENCLOSED ADJUSTABLE DRAW LATCH	1
903786	HOSE ASSY 451TC 3906-6-6-4 x 56"	1
903787	HOSE ASSY 451TC 3906-6-6-4 x 60"	1
903789	HOSE ASSY 471TC 3906-10-10-8 x 62"	1
903790	HOSE ASSY 471TC 3906-10-10-8 x 80"	1
903791	HOSE ASSY 471TC 3906-10-10-8 x 93"	1
903802	HOSE 1 1/4" NYLOBRAID	4
903802	HOSE 1 1/4" NYLOBRAID	4
903806	TOGGLE SWITCH	1
903816	FULTON JACK F2 1600LBS	1
903818	LED MULTI MOUNT AMBER STROBE LIGHT	1
903824	FENDER FILM	2
903825	HOSE REEL HARBEN SPEC RXX60-0574	1
903826	CHROME WHEEL AND TiRE - E180 - E45 8 LUG	2
903837	HOSE ASSY F451TC-3906-8-8-6-64	1
903882	ENGINE KUBOTA D1803TI TIER 4 FINAL ENCLOSED	1
904008	HOSE FEED GUIDE ASSEMBLY STANDARD E180 (PAINTED BLACK)	1
904040	FRAME - E SERIES - TIER 4 FINAL MURPHY	1
Z093	PLUMBING BRACKET	1
Z094	ANTI-SIPHON BRACKET POWDER COATED BLACK	1
Z1113	SHIPPING STAND LONG TUBE	1
Z1115	SHIPPING STAND CIRCLE	1
Z594	BRACKET HYDRAULIC SELECTOR AND VALVE	1
Z710	TANK FUEL ALUMINUM -17 GAL	1
Z894	TANK HYDRAULIC ALUMINUM	1
Z954A	BRACKET REMOTE TEE (PAINTED BLACK)	1

11. Service Documents

11.1. Service Checklist

SERVICE CHECK LIST

HARBEN
HIGH PRESSURE WATER TECHNOLOGY

Serial Number -
Unit Number -
Date -
Hours Run -

Sht 1 of 2

Engineer -
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

11.2. Service Logbook

Harben Unit Log Book	HARBEN HIGH PRESSURE WATER TECHNOLOGY
Serial Number -	
Unit Number -	
Date of Manufacture -	*Sht 1 of 2*

Date …………………………………………	Official Harben Stamp and Signature	
Engineer ……………………………………		
Type of Service ……………………………	Please state if other Service provider used	……………………………………………………………
Date …………………………………………	Official Harben Stamp and Signature	
Engineer ……………………………………		
Type of Service ……………………………	Please state if other Service provider used	……………………………………………………………
Date …………………………………………	Official Harben Stamp and Signature	
Engineer ……………………………………		
Type of Service ……………………………	Please state if other Service provider used	……………………………………………………………
Date …………………………………………	Official Harben Stamp and Signature	
Engineer ……………………………………		
Type of Service ……………………………	Please state if other Service provider used	……………………………………………………………
Date …………………………………………	Official Harben Stamp and Signature	
Engineer ……………………………………		
Type of Service ……………………………	Please state if other Service provider used	……………………………………………………………
Date …………………………………………	Official Harben Stamp and Signature	
Engineer ……………………………………		
Type of Service ……………………………	Please state if other Service provider used	……………………………………………………………
Date …………………………………………	Official Harben Stamp and Signature	
Engineer ……………………………………		
Type of Service ……………………………	Please state if other Service provider used	……………………………………………………………

Type of service - Itermediate, Yearly	*FLOW 0322 Iss 1*

12. Warranty

12.1. 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

12.2. 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

Provision of this warranty shall not apply to any Harben product which has been:

- Used for a purpose for which it is not designed for; or
- Applied to a use which has not been approved by Harben Inc; or
- Subject to misuse, negligence, lack of maintenance or accident; or
- Repaired or altered in any way so as, in the judgement of Harben Inc, to adversely affect its performance and reliability; or
- Normal wear and tear

12.3. 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.