Operation & Maintenance Manual

Original Instructions

Unit 4018 US Van Pack

903-1314

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: Unit 4018 US Van Pack

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AMENDMENTS

Change	Changes	Date	Signature
1	NEW ADDITION	09/19	JJ
2	UPDATE WARRANTY POLICY	10/19	JJ
3	Minor Changes. Added part number	5/20	GT
4	Added multiple sections. Minor changes	6/20	GT
5	Added Pictures to Anti-Freeze Section	6/20	GT
6	Updated manual to code	6/20	GT

Section 1 – Introduction & Contents

1.1. Contents

1.2. Introduction

Read this manual along with the Health and Safety Manual before you operate or carry out any maintenance on the high-pressure vanpack.

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 vanpack. Where the vanpack 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 Vanpack

Harben® drain vanpacks 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 vanpack in accordance with the instructions. Harben® vanpacks 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 vanpacks described in this operation and maintenance manual are intended to be used for high-pressure water jetting in drain and pumping applications.

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 Vanpacks use diesel engines to power a high-pressure water pump up to 5,000 psi and 18 GPM.

Additional accessories can be purchased from Harben®, such as: floor cleaners, jetting guns and jet pumps which extend the range of work that can be carried out with the jetter. Safety information relating to individual accessories is provided later in this section.

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 vanpack.

Section 4 Operation

This section describes the recommended operating procedures for the vanpack.

Section 5 Routine Maintenance

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

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 vanpack.

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 Manual

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:	U.S. Vanpack

2.2. Pump Assembly

Figures 2.1-2.2 defines the components of the vanpack assembly as follows:

The pump is driven by an industrial diesel engine.

The engine drives the pump via a 2.21:1 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 2.21:1 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 vanpack.

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.

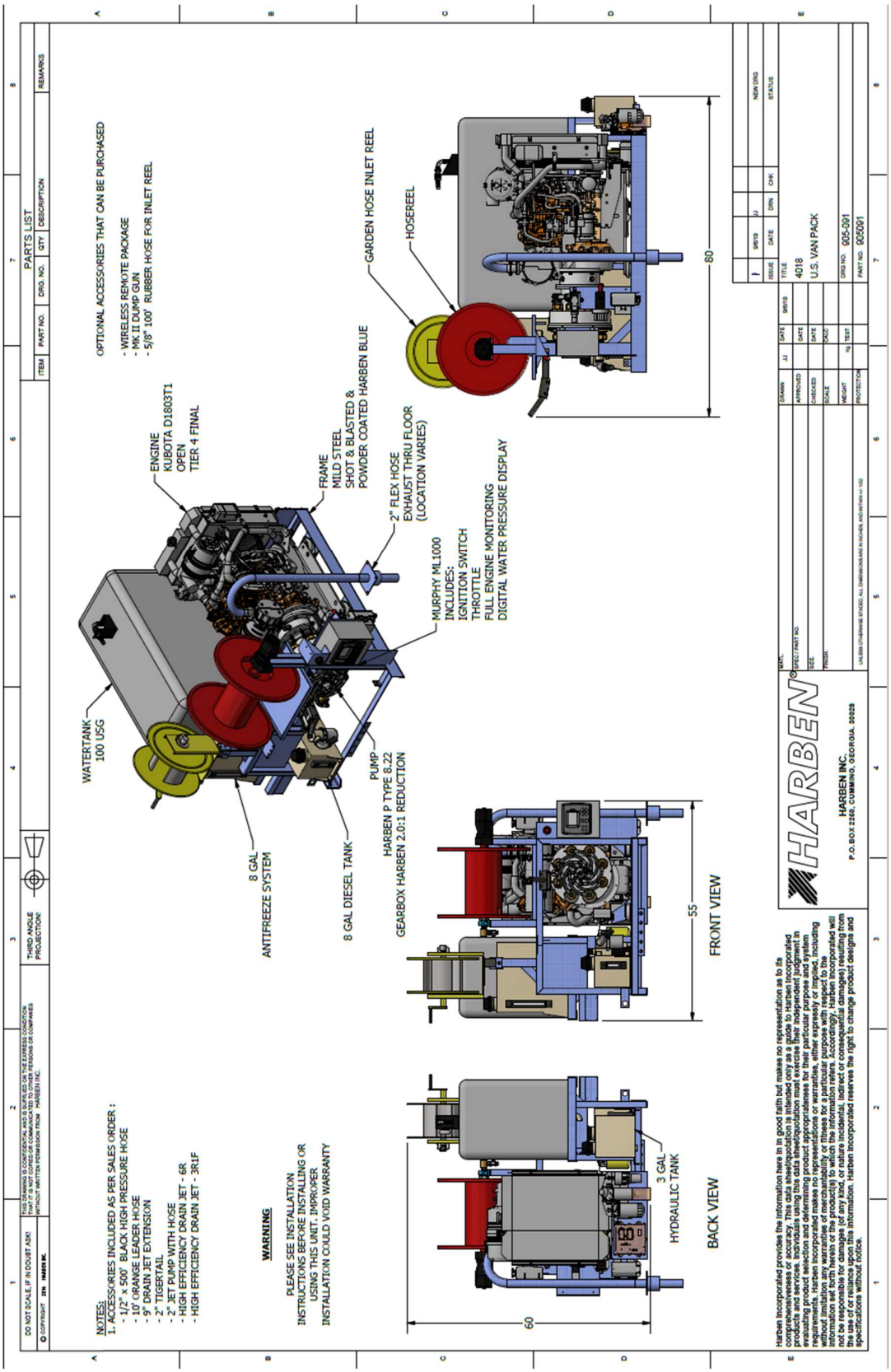


Fig. 2.1 – 4018 US Van Pack Remote

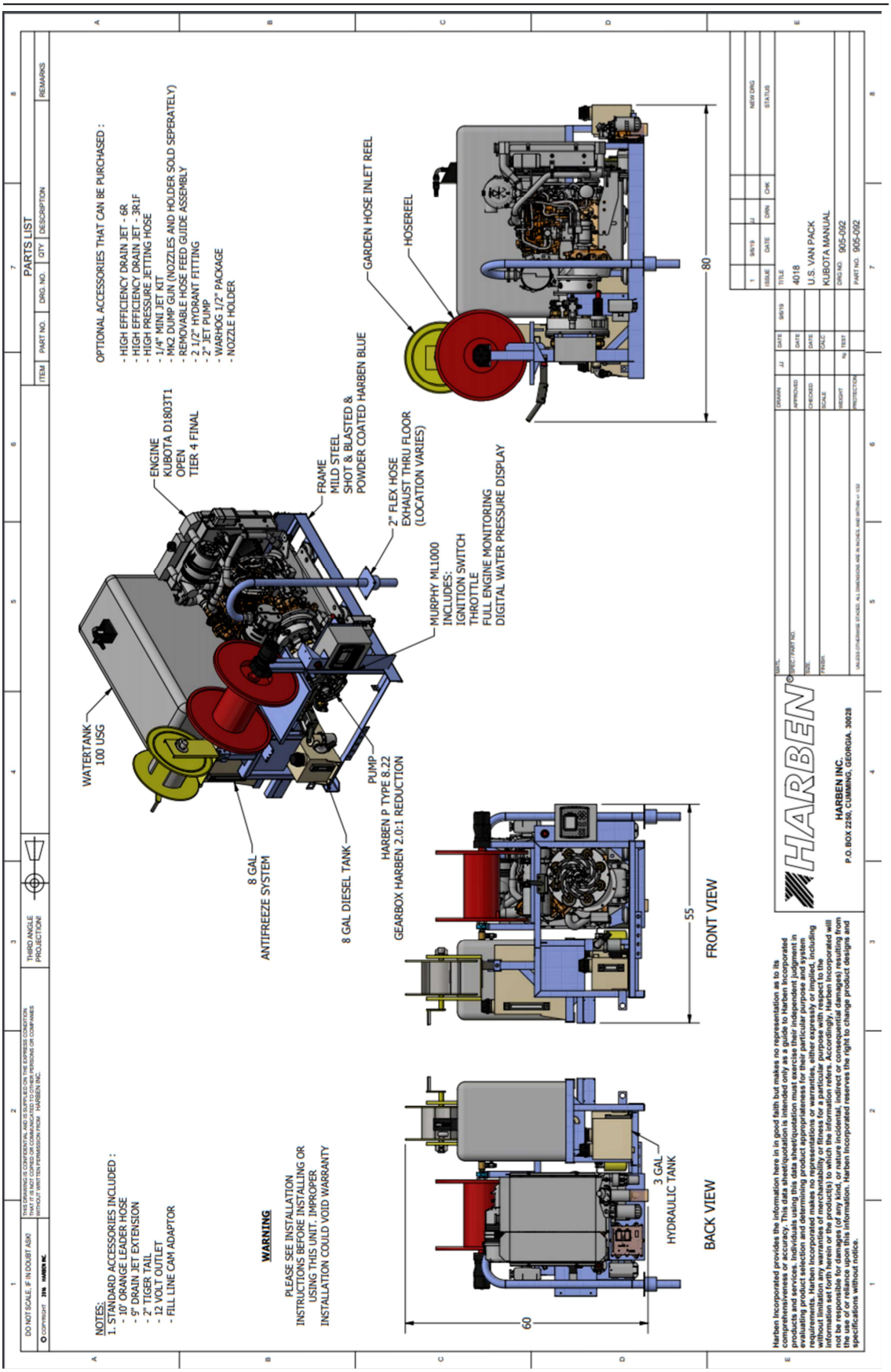


Fig. 2.2 – 4018 US Van Pack Manual

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

3.1.3. Ancillaries

Water tank	100 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

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 vanpack are illustrated in Figures 2.1-2.2 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 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, maximizing 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.

  NOTICE: 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 'Industry Best Practices 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

Carry out all daily checks. Full maintenance checks are detailed in Section 5 - Routine Maintenance.

They are:

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

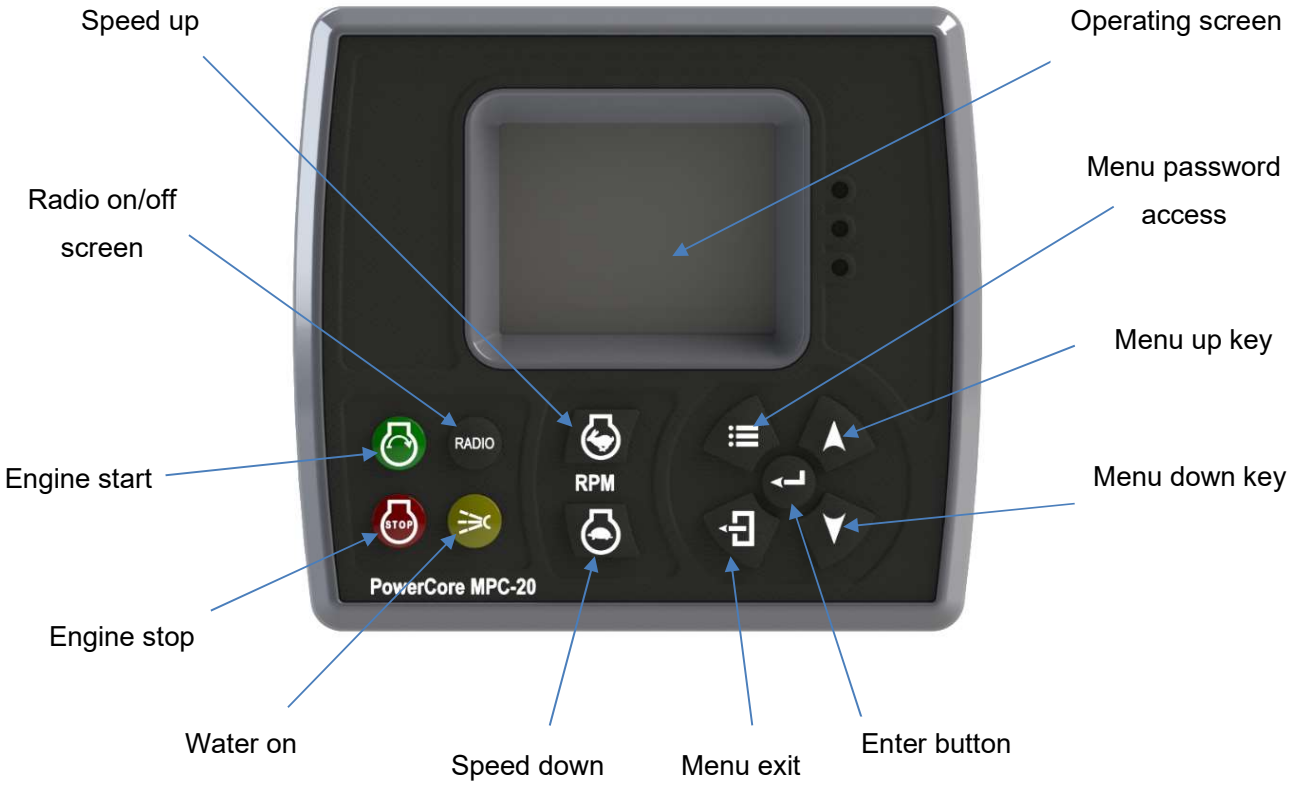
4.3. Pre-start Checks & Procedures

1. ⚠ **WARNING!** In cold weather check that machine is not frozen before starting (see Antifreeze section 4.11). Serious injury can occur from ice bullets. **(H&S Sections 3 and 7)**
2. Only operate the machine in a well-ventilated area. **(H&S Sections 3, 8, 9, and 12)**
3. Ensure the vehicle is parked on a level surface, and the hand brake is applied. **(H&S Sections 3, 11, and 13)**
4. To fill water tank, connect to water supply. The water will fill the tank via the inlet hose reel when the tank is full it will flow out the overflow. (NOTICE: To comply with water authority bylaws never fill the tank by putting a hose directly inside)
5. Feed off the hose reel approximately 10 feet of high-pressure hose. Do not fit the nozzle or gun at this point! **(H&S Section 3, 6, and 16)**
6. ⚠ **WARNING!** Inspect hose before using. Damaged hose can lead to serious injury if put under pressure. **(H&S Section 3, 6, and 16)**
7. In order to avoid an interruption to the jetting operation please ensure that the hand held 'radio control unit' is fully charged, this is to ensure the radio signal is at full strength and not compromised while the unit is being operated in 'remote' mode.

NOTICE: Do not drop the handheld "radio control unit" (RCU) down a manhole as this could cause it permanent damage. Please use the lanyard provided.

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

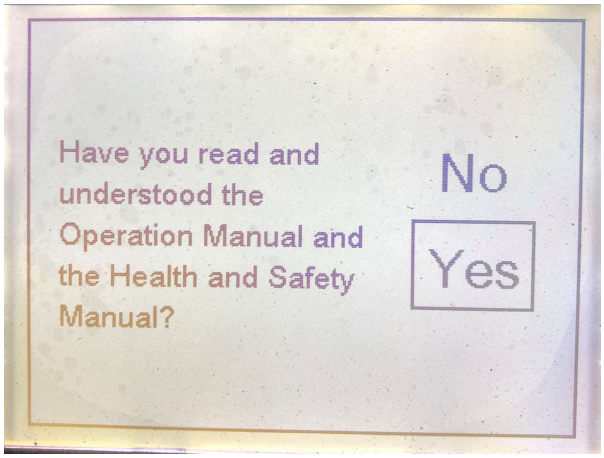
Password screen

Run screen entry – 2010

Minor programme updates - 1111

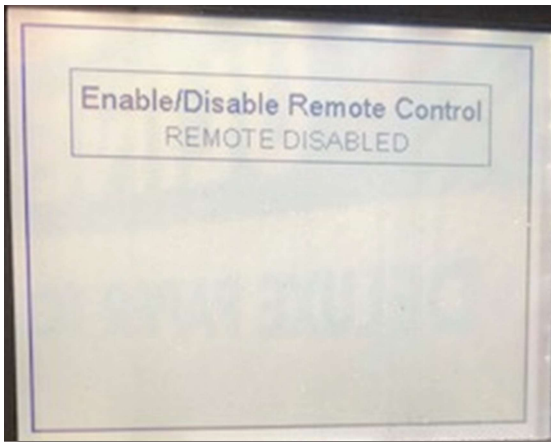
Password screen – Use enter, up and down buttons to enter password

Manual Confirmation Screen

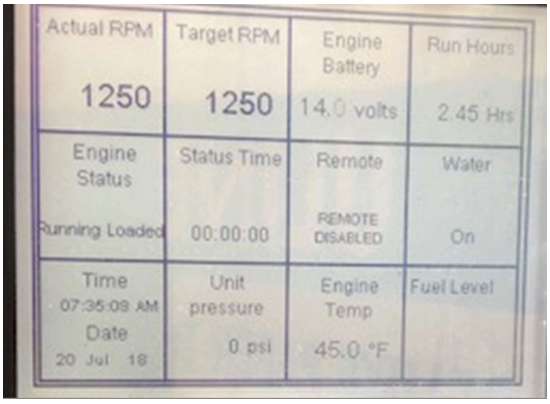


Main run screen (access by pressing menu exit key)

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



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



4.4.4. 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 Sections 3, 4, 8, 9, 11, 15, and 16)**

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

1. Switch on unit using toggle switch.
2. The control system will now go through a pre-start (glow plugs).
3. Enter password ‘2010’ to enter.
4. You will now enter the run screen.
5. Press the engine start button.
6. The engine will now start and run in idle.
7. The user can now increase and decrease the speed of the engine using the engine up and down speed.
8. Increase the speed of the engine and when it is safe to turn the water on, press the water on button.
9. The engine speed and pressure can now be increased and decreased using speed up and speed down button.
10. 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. The control system will now go through a pre-start (glow plugs).
3. Enter password '2010' to enter.
4. You will now enter the run screen.
5. Press the radio screen button.
6. Press the enter button to turn the radio function on.
7. Switch on the radio handset by releasing the E-stop button.
8. Hold down button 5 and 6 on the radio handset until the buzzer sounds and the top green LED on the handset lights.
9. Press the engine start button.
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 Vanpack

1. ⚠ **CAUTION!** Fit the correctly sized nozzle to the high-pressure hose. **Engine should not be running**. Potential injury can occur if a nozle is being put on the end of a hose. **(H&S Sections 3 and 6)**
2. Insert the nozzle approximately 6 feet into the drain before diverting the water through the main jetting hose. **(H&S Section 3, 6, 14, and 16)**
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)**
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 3 and 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 MAXIMUM OPERATING PRESSURE OF 4000 PSI. IF YOU DO SO YOU RUN THE RISK OF INJURY, AND DAMAGE TO EQUIPMENT

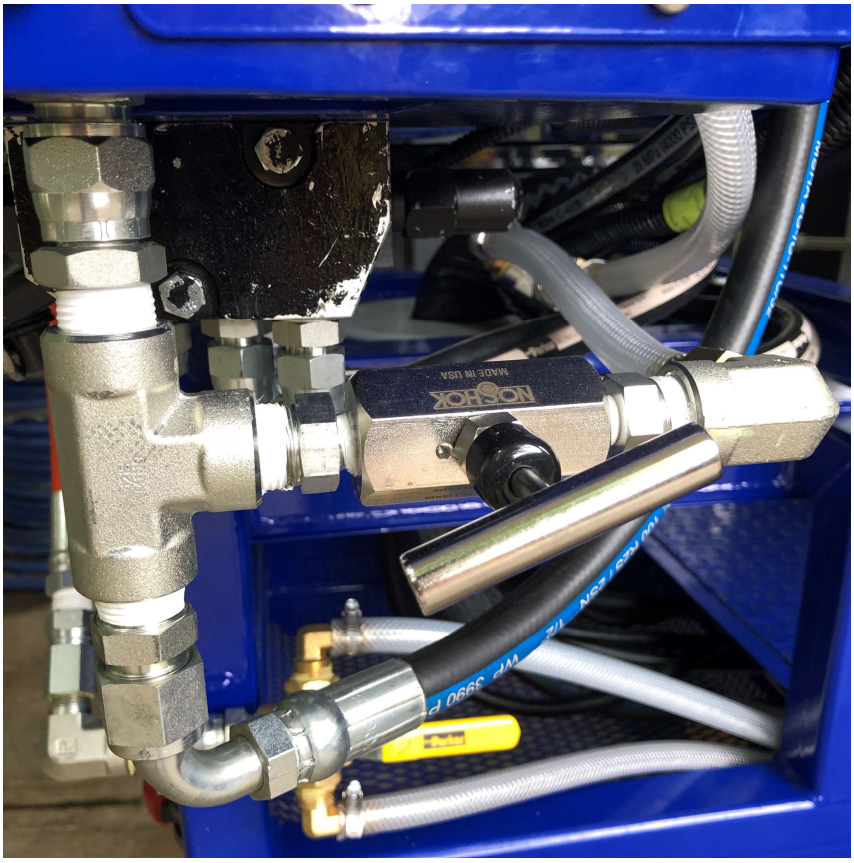
NOTICE: Do not exceed the 4000PSI by fitting a smaller nozzle than is recommended. This will cause the burst disc to open. The maximum engine speed is 2375 rpm

4.8. Harben® Jump Jet

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 500ft. The Jump Jet operation will help the jet to travel further up the duct. 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. Bypass Valve Operation



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.

4.10. 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 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.

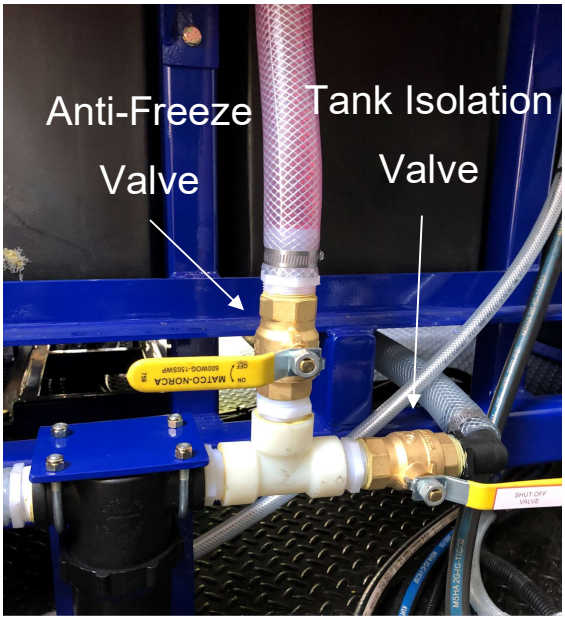
⚠ **CAUTION!** If the hose becomes stuck in the drain the hydraulic hose reel should NOT be used as a winch to try and free it and the towing vehicle should NEVER be driven away to drag the hose clear. This will put severe strain on the reel framework which could lead to serious damage. **(H&S Section 3, 6, and 13)**

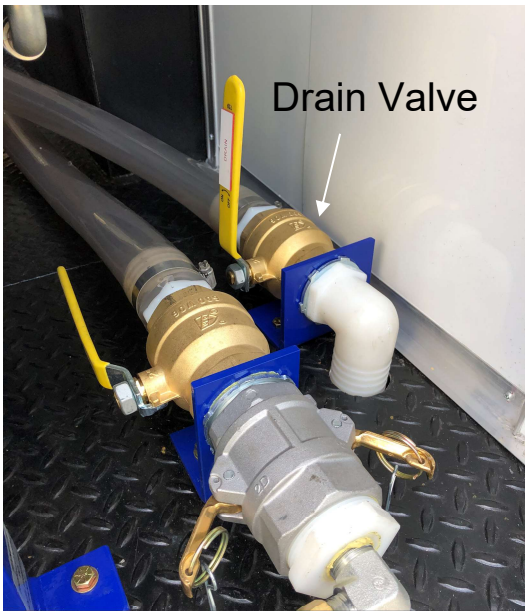
Hoses that have become stuck can sometimes be pulsed free using the Harben® Jump Jet™ kit or alternatively they should be pulled free by hand.

NOTICE: The hose should NEVER be tightly wound onto the hose reel drum when the hose is not pressurized, as might occur when the hose has become trapped. A tightly wound hose can easily crush the hose reel when it is next pressurized. 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 pressurizing.

4.11. 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:





4.11.1. To Anti-Freeze the Machine with an Anti-Freeze 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. The handle for the 3-way ball valve should be in the vertical position.
5. Put the jump jet valve into the “off” position

6. Open the antifreeze tank valve. This tank must be full of an antifreeze mixture with strength of no less than a 50/50 mix.
7. Remove the gun or any jetting nozzle from end of the hose and unreel 10 feet of hose.
8. Ensure the unit starts in dump (radio – nothing to do, manual – put pressure selector to dump)
9. Hold the open-ended hose away from the body pointing it to the ground and away from any by-standers.
10. 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)
11. After a minute or two the antifreeze mixture will start to come out of the high-pressure hose. *IMMEDIATELY SWITCH OFF THE ENGINE.*
12. 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.
13. 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.
14. Stop the engine.
15. Manually rewind the hose back on the reel and lock in position.

4.11.2. To De-Antifreeze the Machine

1. Shut the anti-freeze valve.
2. Shut the drain valve.
3. Open the tank isolation valve.
4. The handle for the 3-way ball valve should be in the horizontal position (as shown).
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. Place the jump jet valve in the on position.

12. The machine can now be used in the normal manner.

NOTICE: If the pump is frozen up – it should on no account be started. Operating the machine frozen will damage the pump and damages caused by misuse will not be covered under warranty.

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

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

5. Routine Maintenance

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

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 6.3) • Check engine oil level on dip stick (Ref section 10) • Check engine coolant level (Ref section 10) • 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 vanpack for security checking for any loose, damaged, or missing parts. • Check air filter cleanliness (Ref section 10) • 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 more than 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 (H&S Section 11)

The following must be completed daily with the vanpack 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. ⚠ **WARNING!** 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 Sections 3 and 6)**

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. **(H&S Section 5)** The available burst discs are as follows:

Color 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

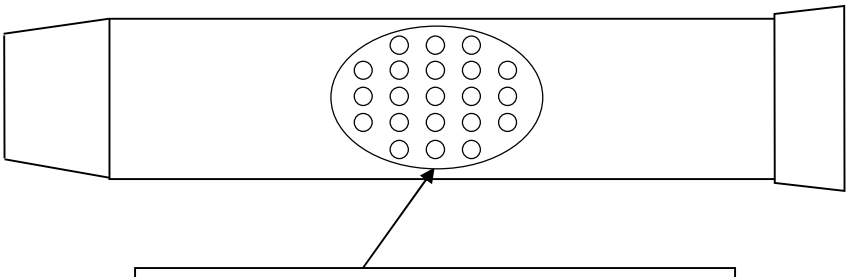
Problem	Possible Cause	Recommended Action
Low system pressure	• Worn or incorrect size of cutting nozzle • Engine speed slow • Leaks from hose, pipes, and connections • Blocked inlet filter • Inlet hose to long • Loss of water through dump line of selector valve or gun when high-pressure selected • Loss 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

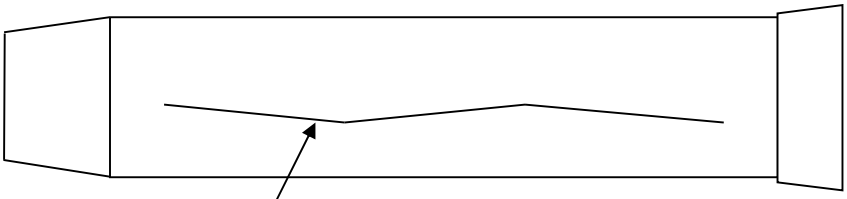
Reason: It has been inflated

B

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

Reason: the diaphragm has pumped through mandrel delivery holes.

C



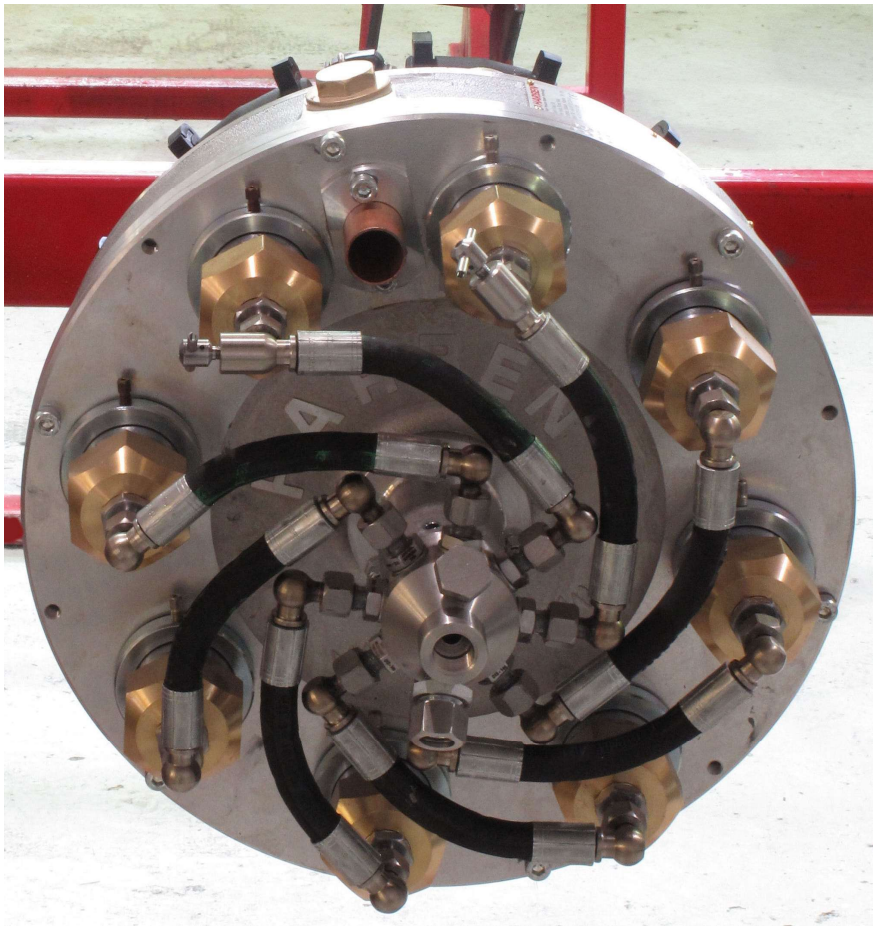
Shear through wall of diaphragm

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

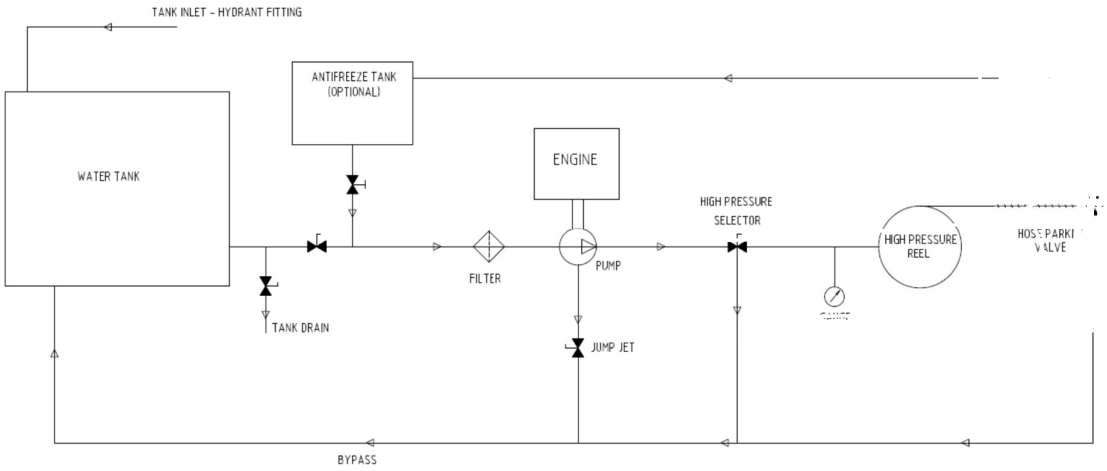
Refer to the **P Type Service Manual** Part No. 061-352 included with your vanpack.



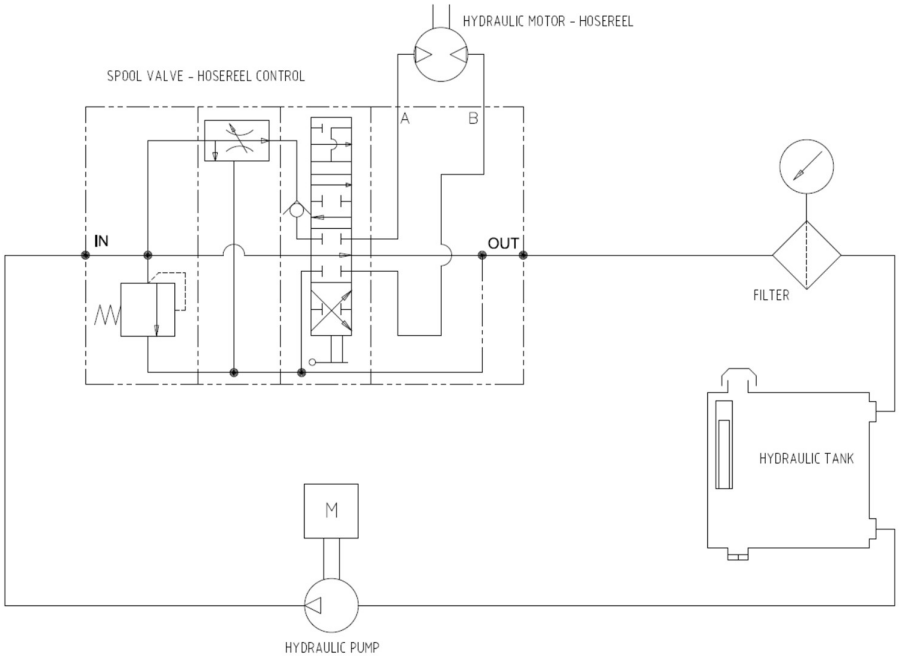
8. Circuit Diagrams

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

8.1. Water Circuit for VANPACK



8.2. Hydraulic Circuit for VANPACK



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®

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 vanpack. 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. Remote

Component	Description	Qty.
011060	VALVE DELIVERY MK4 P TYPE	2
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
013349	CLIP "R"	2
013490	PLUG DRAIN 3/8"BSP MAGNET	1
013767	SCREW CAP M6 x 50MM	4
014028	CIRCLIP SH-212-STPA	2
014041	CHAIN JACK PER METRE	0.5
015039	BACK UP RING BS135	4
015040	O RING 02-135	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
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
032459	SPACER SHAFT HYDRAULIC H/REEL MINI VANPACK	1
033010	SEAL DOWTY 1/2"	7
033013	SEAL DOWTY 3/8"	8
041044	PLUG SQUARE HEAD 1/2"	1
042134	POLYPROPYLENE 1 1/4"FPTSTRAINER	1
0422081	MOUNTING BRACKET INLET HOSE REEL MK4 LIGHT VP	1
0422319	SUPPORT TANK FILL POINT VANPACKS	1
0422737	HOSE REEL TRACE SWING ARM V/PACK	1
042510	PIN LOCKING SWIVEL KIT INLET HOSE REEL	1
043018	CAP HYD/FUEL TANK	1
043057	DUMP DIFFUSER	2
043201	MALE PIPExHOSE BARB1 1/4" NYLON ONLY	4
047004	STEM OUTLET (INLET HOSE REEL)	1
048010	SPACER HOSE GUIDE	1
048103	TUBE WATER OUTLET FOR HYDRAULIC HOSE REEL N15-142 AND 048-110	1

048112	INLET HOSEREEL TYPE CRWM-1340	1
048117	DRUM HYD HOSEREEL 150M MK4 LIGHT VANPACK	1
055024	HOSE 1/2" ID NYLOBRAID	30
055148	TOP HOSE JUMP JET	2
057017	BODY JUMP JET	2
057018	COLLECTOR RING JUMP JET	2
061027	LABEL "HARBEN"	2
069581	KIT HYDRAULIC DIVERT VALVE INSTALLATION - Mk2	1
078321	PIN RESTRICTING SWING ARM H/REEL VANPACK	1
078857	HOSE REEL SHAFT TO SUIT 048117& 048112	1
085399	ANTI FREEZE TANK HARBEN VANPACK MK2	1
104482	WATER TRAY HOSE REEL KUBOTA VANPACK	1
900144	10GTX-S	1
900145	ELBOW 1/2"Fx7/8"JICM	1
900151	REDUCER 1/2"Mx1/4"F	1
900186	TEE 1/2" MALE/FMALE/FMALE	1
900200	ADAPTOR 3/8" NPTM x #6 JICM	3
900202	TEE 6-MMO-S 3/8" JUMP JET TEE	2
900223	ADAPTOR 1/2" NPTM x 3/8" NPTM	1
900225	BARBED FITTING 90 DEGREE ELBOW 1/4"HOSE x 1/4NPT	2
900227	ADAPTOR 3/8"BSPM x 9/16JICM	2
900231	LOCK RING 1 1/4"	1
900247	INSERT FOR HOSE 7/8"-14JIC F SWVL x 1/2"OD 90DEG	2
900256	ADAPTOR 1/4"M X 1/2"M	1
900281	ADAPTOR 1/2"NPTM x #8JICM	2
900294	TEE 1/2"NPT FEMALE	2
900303	LOCK WASHER M12 PACK 100 TAX EXEMPT	2
900307	ADAPTOR 1/2"NPTM x #6JICM	1
900317	ADAPTOR 1/2"NPT MALE x #10 SAE MALE	1
900319	BUSHING 1/2"NPT FEMALE x 3/4"NPT MALE	1
900322	BALL VALVE 1 1/4" T-PORT	1
900323	REDUCER BUSH 1 1/4" M x 1/2" F PTR-S	1
900339	ADAPTOR ELBOW #8 JIC MALE x SWIVEL FEMALE	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	2
903076	ELBOW 2"M x 2" BARB NYLON	2
9031015	BALL VALVE 1/2" NPT F/F LOW PRESSURE 600 PSI 2-WAY	1
9031029	HOSE ASSY 451TC-3906-8-8-6 X 59"	2
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
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
9031145	T4 OPEN ENGINE D1803TI-1006X00 W PUSHER FAN	1
9031148	2" EXHAUST HOSE FOR OPEN ENGINE	8
9031149	MUFFLER CLAMPS FOR 2" EXHAUST HOSE	2
9031195	SAFETY LABEL SET RED WHITE SQUARE DIESEL UNITS	1
9031202	BATTERY CABLE E180 POSITIVE 24 IN	1
9031203	BATTERY CABLE E180 NEGATIVE 24 IN	1
9031204	FUEL TANK US VAN PACK	1
9031205	HYDRAULIC TANK US VAN PACK	1
9031207	100 GAL WATER TANK US VAN PACK	1
9031214	ML2000-R2 MURPHY FRONT METAL ENCLOSURE KIT	1
9031215	EXTENSION HARNESS MURPHY ML2000 - KUBOTA D1803TI - US VAN PACK - REMOTE - EPS9197X2-5	1
9031216	KUBOTA T4F ADAPTOR FOR REMOTE OIL DRAIN	1
9031217	2" EXHAUST WRAP	5
9031218	KIT PARTS KUBOTA 1803 VANPACK - WIRELESS	1
9031227	HOSE ASSEMBLY 451TC-3906-8-8-6 x 46"	1
903124	I.D. PLATE FOR TRAILER	1
9031249	HOSE ASSY 451TC-3906-6-6-4 x 22.5”	1
9031250	HOSE ASSY 451TC-3906-6-6-4 x 26”	2
9031287	2" X 2" ANTIFREEZE RECIRCULATION LABEL	1
9031307	LABEL "CAUTION" NOZZLES MAY OVER PRESSURE REV ENGINE SLOWLY	1
903149	CLAMP HOSE #28	1
903150	CLAMP HOSE #16	1
903152	ADAPTOR ASSY 2" TO 3/4"GH	1
903172	TEE 1 1/4" B1140	2
903175	CLAMP HOSE #20	7
903178	CLAMP HOSE #08	6

903190	R8NC08-HY0808MP-08BPF-10 10 LEADER HOSE MxF	1
903197	BARBED FITTING 1/2" HOSE x 1/2 FEMALE PIPE	3
903208	FILTER HEAD & ELEMENT	1
903224	BULKHEAD 1 1/4" TxT	2
903225	1 1/4 SCH 80PVC NIPPLE 2 INCH	3
903238	VALVE BALL 1 1/4"	1
903239	2" TIGERTAIL WITH RING & ROPE	1
903313	HOSE ASSY JUMP JET TEE	2
903358	BATTERY 775DT	1
903361	HOSE ASSY DT200 JUMP JET	1
903389	ELBOW 1 1/4" MALE TO BARB	5
903408	PARKER 1/4" FNPT 2 WAYBALL VALVE S/S JUMP JET VALVE	1
903439	VELVAC VENTED GAS CAP2"F/M PIPE THREAD W/CHAIN (FUEL CAP)	1
903520	12V OUTLET & CAP	1
903681	1/2" STR FxF 5000 PSI SUPER SWIVEL JOINT	1
903738	E STOP TWIST TO RELEASE including NC ACTUATOR 78-3724 78-3732	1
903786	HOSE ASSY 451TC 3906-6-6-4 x 56"	1
903787	HOSE ASSY 451TC 3906-6-6-4 x 60"	1
903809	HOSE 2" CLEAR	1
903858	HOSE ASSY 451TC-0606-10-10-8 x 48"	1
903915	HYDRAULIC MOTOR FOR ELILMINATOR	1
904052	JUMP JET TEE ASSEMBLY	1
904060	Frame US Vanpack	1
A180430	ROD STRAP RETAINER WATER TANK	4
A190821	STRAP ASSEMBLY RATCHET TYPE. 25MM WIDE NYLON	4
N01794	BEARING PLUMMER BLOCK HOUSING 1" C/W GREASE NIPPLE	1
N05114	SIGHT GLASS 10"	1
N10001	BATTERY RETAINING BRACKET	1
N15190	ADJUSTING SPACER CONVEX	1
N20836A	BEARING HOUSING HYD HOSE REEL	1
N20838	HOSE REEL SHAFT (FLUID END)	1
N20843	TRACE ROLLER	4
Z1014	FILTER BRACKET HYDRAULIC	1
Z594	BRACKET HYDRAULIC SELECTOR AND VALVE POWDER COATED BLACK	1
Z947-A	EXHAUST THRU FLOOR ASSEMBLY	1

11. Service Documents

11.1. Service Checklist

SERVICE CHECK LIST

HARBEN®

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

11.2. Service Logbook

Unit Log Book	HARBEN®
Serial Number -	
Unit Number -	
Date of Manufacture -	*Sht 2 of 2*

Date .... Service Stamp

Engineer ....

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

Date .... Service Stamp

Engineer ....

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

Date .... Service Stamp

Engineer ....

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

Date .... Service Stamp

Engineer ....

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

Date .... Service Stamp

Engineer ....

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

Date .... Service Stamp

Engineer ....

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

Date .... Service Stamp

Engineer ....

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

Type of service - Itermediate, Yearly

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.

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.