

SERVICE UNITS

OPERATOR MANUAL



Introduction

Dear Customer,

Congratulations on purchasing your Satellite Service Unit.

Our service units are built and assembled in Europe, using the best components available in our industry to deliver trouble-free usage and operation.

Service Units from Satellite

The Satellite Service Unit is a machine specifically designed to empty and service mobile sanitation devices. The machines are available in a wide range of volumes and materials. They can be adapted to your specific needs with a variety of options and accessories. The Satellite Service Units are market-tested, effective and professional. Designed for practicality, this user-friendly machine is highly reliable and exceedingly easy to operate and maintain.

Easy installation

Most of our modules are equipped with an Easy-Fix kit as standard. This kit allows for quick and easy installation on any flatbed or chassis without the need for extensive engineering or construction.

Maintenance

All components that need to be covered by daily and weekly maintenance can be reached or worked on without the need for (special) tools. Within reach and easy to maintain.

Optimal use of your Satellite Service Unit

To ensure optimal performance of your Satellite Service Unit, please carefully read this manual before operating the machine. Failure to do so may result in personal injury and damage to the machine.

Safety:

The Service Unit is equipped with various options and accessories to ensure optimal operational safety for both user and surroundings. We specifically ask you to pay attention to Section 1.1, Safety.

The machine should only be serviced by professionals.

The Satellite Service Unit is designed for use by professionals only. On delivery, the user will receive thorough training to become a skilled operator.

Do not lend the machine to anyone who has not been thoroughly trained and has not carefully read this manual.

The operator's manual should be considered as an integral part of the machine and must remain with the machine if it is sold.

Warnings:

Some items in this operator's manual are marked with this warning symbol.

The warning indicates areas where extra care must be taken to avoid personal injury or damage to the machine and its accessories. The warning also shows what requires special attention.



Reservations:

As it is Satellite's policy to make continuous improvements, we reserve the right to alter the specifications and equipment at any time without prior notice. Satellite Industries accepts no liability for errors or omissions in the operator's manual.

Contact us:

Do not hesitate to contact Satellite Industries should you have questions of any nature regarding your new Satellite product.

Best regards

Satellite Industries SRL – 67 Avenue de la Toison D'Or – BE-1060 BRUSSELS

e-mail: info@satelliteindustries.com – www.satelliteindustries.co.uk

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1. General information

1.1 Safety



Make sure you know how to operate the machine

By making sure you know how to operate the machine, you will also be aware of how to react in the event of an emergency. Read this manual carefully.



Make sure no one is standing close to the machine while it is in use

Avoid people standing by, tripping over hoses or accidentally hurting themselves on the machine while it is in use.



Do not aim the high-pressure or low-pressure spray lance at people or animals

Pressurised water can cause serious injuries



Perform regular checks on the machine and the installation

Ensure the machine is still properly attached to the chassis and all components are performing as they should.



Coded signal

In this manual we have used different signals to indicate various levels of danger and attention needed.

DANGER
<p>This signal indicates an immediate threat to the operator and/or machine. If this warning is ignored it will lead to serious or fatal injury.</p>

ATTENTION
<p>This signal indicates handling or operational guidelines to prevent collateral damage. Following these guidelines will prevent damage to or breakdown of the machine.</p>

CAUTION
<p>This signal indicates a possible dangerous situation for the operator and/or machine. Ignoring this dangerous situation may lead to minor or intermediate injuries.</p>

WARNING
<p>This signal indicates a possible threat to the operator and/or machine. If this potential threat is not avoided, it may lead to serious or fatal injuries.</p>



IMPORTANT

Indicates important information





This machine complies with Directive 2006/42/EC

and has been constructed, assembled and tested in accordance with the rules and regulations described in this Directive. The machine has been delivered in perfect technical condition. Danger to people and machine may occur if

- this machine is operated by unqualified personnel;
- this machine is used whilst not in a good technical condition;
- this machine is used for tasks it has not been designed to perform.

1.2 EC Declaration of Conformity

	<p>Original EC Declaration of Conformity for a machine in accordance with Directive 2006/42/EC, Annex II, 1A</p>	
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~~We~~ Satellite Industries SPRL
~~europäischer Hauptsitz~~
67 Avenue de la Toison d'Or
BE-1060 Brussels

Hereby declare that the machine

Trade ~~name~~: MAL
Serial ~~number~~: C-XXXXX
Model: 250 / 300 / 450 / 650
Type: Service Unit
~~Function~~: The machine is used to empty and service portable toilets and showers.

is a ready-to-use machine that complies with all the relevant requirements of Machinery Directive 2006/42/EC.

Other directives and/or relevant provisions with which the machine complies:

- ~~Directive 2000/14/EC~~

|

Applied ~~standards~~:

EN ISO 12100:2011	Safety of machinery – General principles for design – Risk assessment and risk reduction
EN 953:1997+A1:2009	Safety of machinery – Guards – General requirements for the design and construction of fixed and movable guards

Authorised representative for the compilation of the technical documentation:

Satellite Industries SPRL, ~~europäischer Hauptsitz~~, 67 Avenue de la Toison d'Or, 1060 ~~Brussels, Belgium~~

Declaration signed by:

Mr Georges Köller, Managing Director, Satellite Industries SPRL, 67 Avenue de la ~~Toison d'Or~~, 1060 Brussels, Belgium

BE-1060 Brussels,

.....

~~Signature~~ (Mr. Georges Köller, Managing Director)

2. Machine Identification

2.1 Components

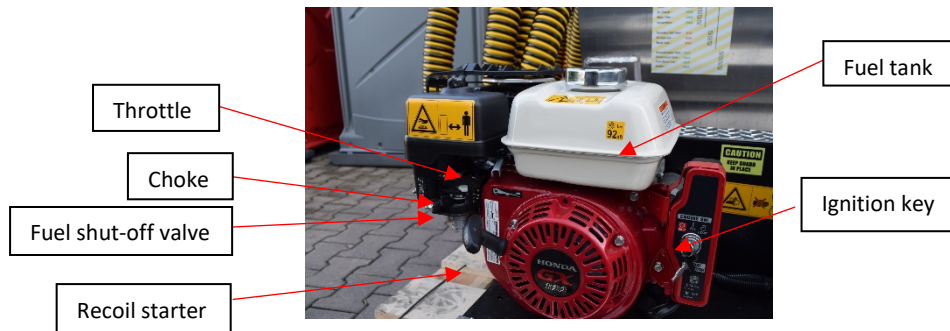


1	Suction hose	4	Primary ball valve	7	Engine
2	Suction wand	5	Secondary ball valve	8	Vacuum pump
3	Fresh water fill point	6	Oil separator	9	Manometer

2.2 Engine

Introduction

Your machine is fitted with a Honda petrol engine. The exact version will depend on the size of the vacuum pump. In general, all Honda GX engines are to be started in the same way and therefore these steps will be the same. Should your module be equipped with a custom engine (e.g., Hatz diesel or other), please refer to the additional information on said engine.



IMPORTANT

Before starting the engine, make sure there is sufficient petrol in the tank and oil in the crankcase. The engines on our machines are equipped with both low-fuel and low-oil security sensors. They will not start if there is not enough fuel and/or oil.



IMPORTANT

The engine is equipped with a generator to recharge the 12V battery on the machine. Running the engine for longer periods will help the charging process. Repeated cold starts and short periods of runtime can drain the battery. It is possible to connect the machine to your vehicle's electrical system, provided it is a 12V system.



IMPORTANT

Additional and more specific information on the Honda engine can be found in the engine's original operator manual as supplied with your machine.



WARNING

With the engine running, the exhaust will heat up. Do not touch, burn hazard.



WARNING

Engine exhaust gas is hazardous to your health and may be fatal. If the machine is run in a confined space, the exhaust gas must be adequately removed from the room or space, using an exhaust hose, for example. Otherwise doors and windows must be opened, to allow for proper ventilation.

Starting/Stopping the engine

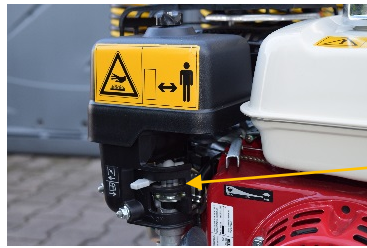
1



Move the fuel valve lever to the ON position



2



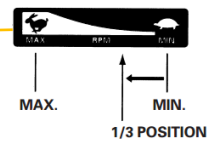
To start a cold engine, move the choke lever to CLOSE



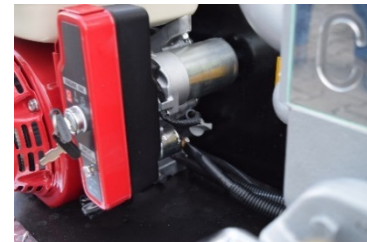
3



Move the throttle lever away from the MIN. position, about 1/3 of the way towards the MAX. position



4



Turn the key to the START position and hold it there until the engine starts. Once the engine starts, release the key, allowing it to return to the ON position.

Note: If the engine fails to start within 5 seconds, release the key, and wait for at least 10 seconds before operating the starter again. *Using the starter for more than 5 seconds at a time will overheat the starter motor and may damage it.*

5

If the choke lever was moved to the CLOSED position to start the engine, gradually move it to the OPEN position as the engine warms up.

For longevity it is recommended to allow the engine to warm up before adjusting the throttle lever to operating (engine) speed.

Operating RPM will be achieved at approximately $\frac{3}{4}$ of full throttle.

6

STOPPING THE ENGINE

- a. Move the throttle lever to the MIN. position.
- b. Turn the engine switch (key) to the OFF position.
- c. Turn the fuel valve lever to the OFF position.

Note: failing to close the fuel valve will cause the carburettor to overflow

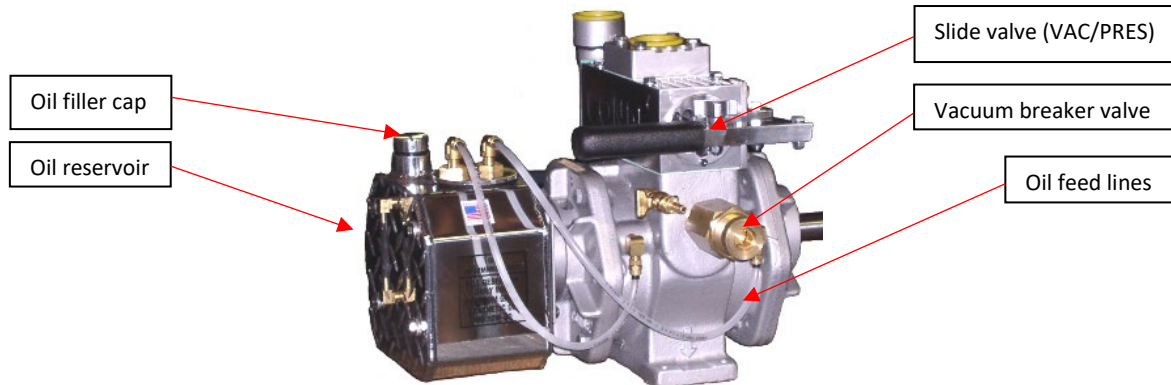
Recommended engine oil 10W30 Synthetic, for more information on maintenance, please see [“4. Service and Maintenance”](#).

2.3 Vacuum pump

Introduction

Your machine is fitted with a Conde vacuum pump. The exact model vacuum pump may be different from the Conde 6SS described here. In general, all Conde vacuum pumps are operated in the same way and therefore these steps will be the same. Should your module be equipped with a custom pump (e.g., Masport or other), please refer to the additional information on said pump.

The pump is driven by the auxiliary engine by means of a V-belt, or by hydraulic motor in case of a PTO. The set-up is made to spin the pump at its optimal operating speed.



IMPORTANT

Before operating the pump, make sure the oil reservoir is filled with 10W-30 synthetic oil.



IMPORTANT

The slide valve should only be operated with the engine/PTO switched off. In addition, there should be no vacuum or pressure in the tank. Operating the slide valve with a running pump may cause the vanes to break.



IMPORTANT

Additional and more specific information on the Conde vacuum pump can be found in the operator manual from the original manufacturer as supplied with your machine.

WARNING

Never run the pump without oil in the oil reservoir. Running the pump without oil will result in pump failure.

WARNING

During (extended) operation the pump will heat up. Do not touch the pump during or after operation, as it might cause burns.

Recommended oil 10W30 Synthetic, for more information on maintenance, please see [“4. Service and Maintenance”](#).

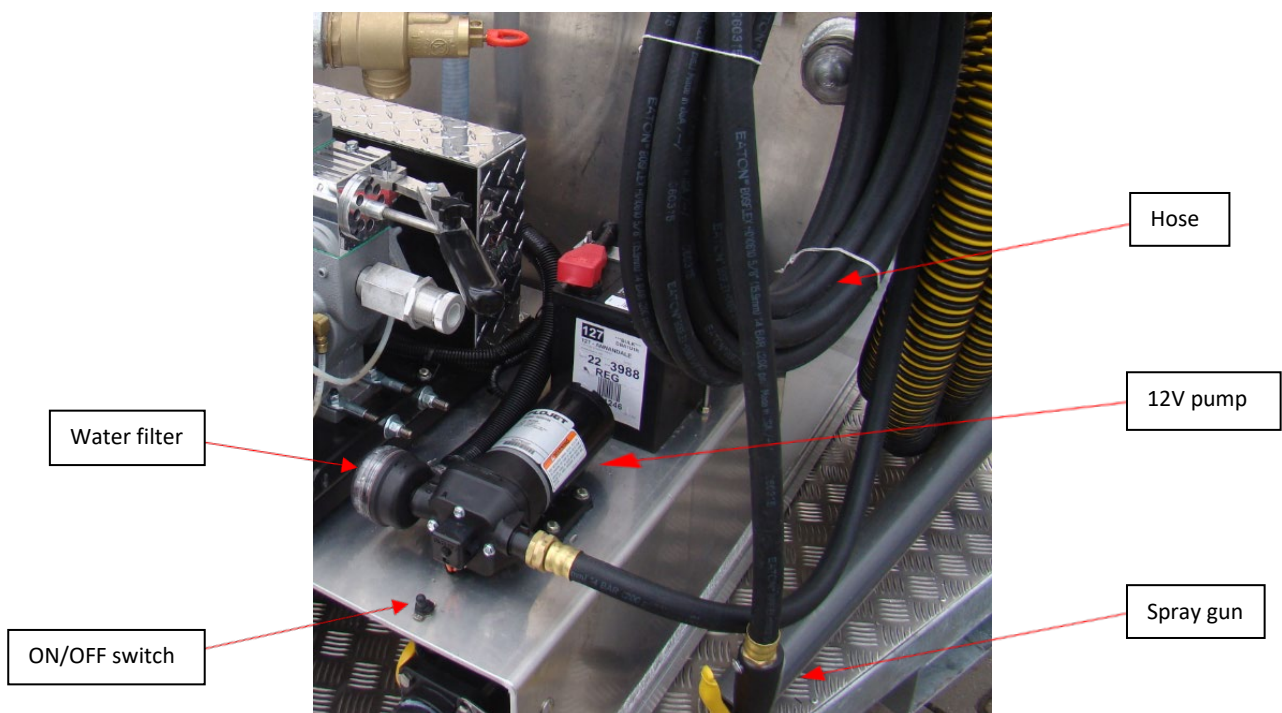
2.4 Low-pressure wash (optional)

Introduction

Optionally your machine can be fitted with an electric low-pressure pump.

The complete option consists of a water pump with filter, a toggle switch, plumbing, 9-m hose and adjustable spray gun. The pump has a maximum capacity of 18.5 l @ 3 bar.

The 12V pump is powered by the standard battery. It can be turned ON/OFF by means of a switch. When switched on, the operator can start spraying water by activating the trigger handle on the spray gun. By twisting the tip of the nozzle, the jet pattern can be adjusted.



IMPORTANT

Extensive use of the electric pump can drain the battery. If the service module is mounted on a vehicle (with 12V electrical system) it is recommended to connect the electric pump to the vehicle's battery.



IMPORTANT

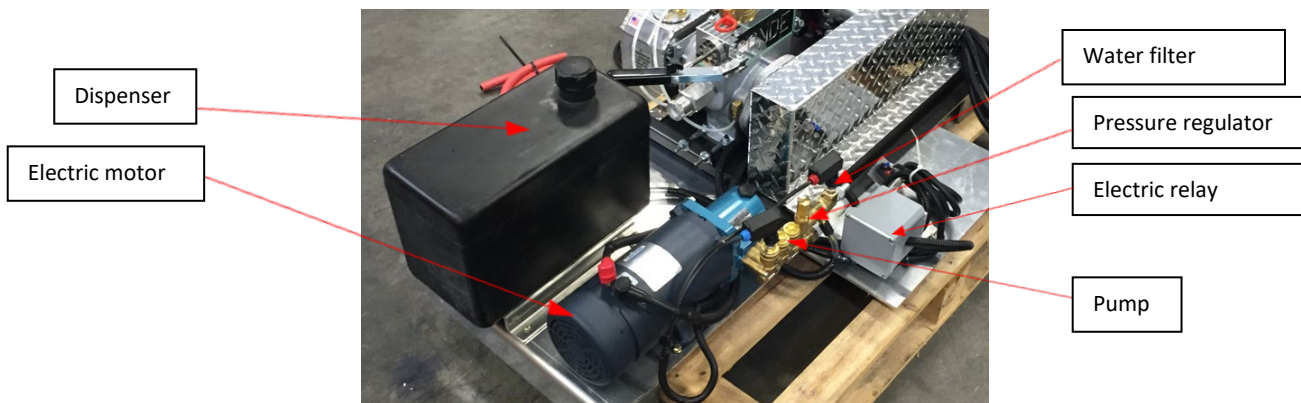
Additional and more specific information on the electric pump can be found in the operator manual from the original manufacturer as supplied with your machine.

2.5 12V Electric high-pressure wash (optional)

Introduction

Optionally your machine can be fitted with an electric 12V high pressure cleaner. This unique system needs to be connected to the vehicle's battery and can be run independently of the auxiliary engine. This will allow it to work more quietly, simultaneously with the vacuum pump. The complete system consists of a 12V electric motor (80A), CAT 4DX water pump with pressure regulator, 10 m of ¼" HP hose, adjustable spray gun and 15-l dispenser for soap or detergents.

The 12V pump is powered by the standard battery. It can be turned ON/OFF by means of a switch. When switched on, the operator can start spraying water by activating the trigger-handle on the spray gun. By twisting the tip of the nozzle, the jet pattern can be adjusted. If the dispenser is in use (valve open), the detergent can be added to the water by simply bringing the pressure down by moving the nozzle backwards on the gun.



IMPORTANT

If your module is equipped with an electric HP system (or HPe), the starter for the auxiliary engine will use the same connection. Your module will not have its own battery. The 12V motor (when switched on) uses approximately 80A. Make sure to check if your vehicle's battery is able to supply it. Lower amps will limit the power of the high-pressure pump.



IMPORTANT

The used 4DX27ER high-pressure pump is rated at 138 bar & 10 l/min. In this set-up its actual working pressure is 85 bar & 9.5 l/min.



IMPORTANT

Recommended oil for the high-pressure pump is CAT ISO68, more information on maintenance on the CAT4DX can be found in the original manufacturer's operator manual.



WARNING

It is highly recommended to have the 12V motor connected to the vehicle's battery by a trained mechanic. Satellite cannot be held liable for installation errors or damage (material and personnel) resulting from faulty installation.

2.6 Belt drive high-pressure wash (optional)

Introduction

Optionally your machine can be fitted with a belt-driven high-pressure washer. This system is designed to deliver optimal cleaning performance. The system consists of a CAT 3CP high-pressure pump (max. 16 l/min @ 150 bar), 10 m high-pressure hose, adjustable spray gun, pressure regulator and electric clutch.

The electric clutch is designed to allow the vacuum pump to be operated without simultaneously running the belt-driven HP pump. It will reduce wear on your HP pump and prevent costly damage in winter. The clutch is operated by turning the switch to the ON position. When in operation, the switch will be illuminated. Next to this there are two pressure-sensitive switches (blue and red), which monitor if pressure is needed (i.e., the operator is pressing the gun) and if there is enough water going to the pump. When either of these is defective, the clutch will not engage. This is a basic dry-run protection.



IMPORTANT

If your module is equipped with a belt-driven HP system and e-clutch, it is important to make sure the e-clutch is switched OFF after use. This will prevent draining the battery and higher resistance when (re-)starting the engine.



IMPORTANT

The used 3CP high-pressure pump is rated at 140 bar & 10 l/min. In this set-up its actual working pressure is 110 bar & 9.5 l/min.



IMPORTANT

The oil for the high-pressure pump is CAT ISO68, more information on maintenance on the CAT3CP and the e-clutch can be found in the original manufacturer's operator manual.

3. How to clean a toilet

3.1 Step by step

Introduction

This section will explain in broad terms the steps to follow when cleaning/servicing a toilet. It is intended to be a step-by-step guide to help you to get the most out of your Satellite service unit.

1	<p>Upon arrival at the location where a mobile toilet needs to be cleaned/serviced, start the petrol engine (Section 2.2) or engage the PTO (Section ...). This will start the vacuum pump. Make sure the slide valve on the vacuum pump is set to vacuum (lever pulled out), and the valve on the suction wand is closed.</p> <p><i>Note: keeping the valve on the suction wand closed will allow the module to build up vacuum pressure. By doing so, the actual time needed to empty the toilet will be shorter, and there will be fewer issues with blockage or waste build-up in the waste tank underneath the waste entry point.</i></p>
2	<p>Take sufficient hose off the storage hooks to be able to reach the toilet. In the time you need to take the hose and walk to the toilet, the vacuum pump will have managed to achieve maximum vacuuming power. This can be checked on the pressure gauge.</p>
3	<p>Insert the tip of the suction wand into the waste, making sure to stir the materials in the holding tank. With the suction wand skimming the bottom of the holding tank, open the valve on the suction wand. Make sure to vacuum in solid waste first. Fluid waste will then 'flush' the hose, and you will have less material build-up in your service unit tank. Once done, close the valve on the suction wand approximately halfway. This will cause the air being sucked in to accelerate, making sure that any material left in the hose will be vacuumed into the waste tank. Walk back to the truck and once the suction hose is stored back on the storage hooks the valve on the suction wand can be closed.</p>
	<p>The next steps will depend on how you operate, and which options are fitted on your Satellite service unit</p>
4	<p>Bucketfill: Satellite service units are equipped with a large diameter (2"/50 mm) outlet point for filling buckets with fresh water. Thanks to this large diameter, filling the bucket will only take seconds, and in addition it will help to dissolve detergents better and faster.</p>
5	<p>Low pressure: When fitted with low pressure, the low-pressure hose and gun can be used to wash down the toilet and/or refill the tank and hand wash station. With the engine running the low-pressure hose and spray gun need to be taken from the storage hook, and the toggle switch switched ON. Once the trigger on the gun is pulled back, water will flow. By twisting the nozzle tip the jet can be adjusted between straight and wide. Once finished, the hose needs to be recoiled on the storage hook. Do not forget to switch off the electric pump.</p>
6	<p>High pressure: A high-pressure system is an effective tool to clean a restroom on the road. However due to the nature of the installation and the fact that you have limited water capacity, the operator should always consider taking a very dirty toilet (e.g., cement or graffiti) back to base for proper cleaning and replacing it with a fresh unit to save time and resources. The nozzle on the gun can be adjusted. Twisting left/right will adjust the jet from pointed to flat. Pushing the nozzle forward or pulling it backward will adjust between high and low pressure.</p>

4. Service and maintenance

4.1 Daily maintenance and service before route

Introduction

To get the best performance out of your Satellite service unit, it is important to perform the following checks daily.

OIL LEVEL AUXILIARY ENGINE

1. Only perform oil level checks on a cold engine
2. Locate dipstick on engine (attention: can be left or right)
3. Remove and clean dipstick
4. Replace dipstick and take out again, read oil level
5. If needed, top up oil through the dipstick hole with a funnel
6. Repeat step 4 to check if oil level is correct
7. Insert and secure dipstick
8. Recommended oil: 10W30 Synthetic



FUEL LEVEL AUXILIARY ENGINE

1. Only perform fuel level check on a cold engine
2. For safety reasons engine must be switched off
3. Locate fuel tank
4. Open fuel cap and check fuel level visually
5. Pour in enough fuel to fill tank
6. Close fuel cap
7. Recommended fuel: only use clean canisters and premium-quality fuel, it will result in your engine running more smoothly.



OIL LEVEL VACUUM PUMP

1. Locate the vacuum pump, with the oil tank in front.
2. Check the oil level on the sight tube.
3. Oil should be visible, but not above $\pm \frac{3}{4}$ of the tube. Overfilling may result in oil spilling during operation of the vacuum pump.
4. If needed top up with oil, recommended: 10W30 Synthetic



OIL LEVEL HYDRAULIC OIL (if applicable)

1. Locate hydraulic oil tank
2. Check the oil level on the sight glass
3. Top up if needed, recommended oil: ISO

FILLING OF FRESH WATER

1. Locate the filler point on your tank
2. Undo cap and connect or insert hose
3. Make sure that the air from the tank can escape. In some cases, the hydrants used reach pressures over 5 bar. Your module is equipped with two inlet points to the fresh water tank.

WATER FILTER (low- & high-pressure systems)

1. Shut off water flow to the pump
2. Locate water filter
3. Unscrew cap, and remove mesh filter
4. Rinse mesh filter with clean tap water
5. Replace mesh filter
6. Open water flow to pump, and with water flowing out, replace cap*
7. Manually tighten the filter

*=by doing this, the air gap in the waterline to the pump will be minimised



ATTENTION

Failing to check the above-mentioned points may result in unscheduled downtime or an aborted route on the day.

4.2 What to observe on the route

Introduction

Although we grow accustomed to 'just doing the job' it is recommended to pay attention to a few items when the machine is in use, as these items can only be checked on a running machine. No need to check these constantly, but be aware of the following:

1. Manometer

The manometer is an important tool to check if your vacuum pump and module perform optimally. Check it the needle moves to -0.5 bar when using vacuum or does not exceed +0.5 bar when applying pressure to the tank. If the needle does not move, the manometer is faulty or the vacuum line to it might be loose. Fix or replace as soon as possible.

2. Automated oil drip on vacuum pump.

The Conde vacuum pump is fitted with a unique, low-maintenance, system for feeding oil into the vacuum pump. This system uses a wicker system. When the vacuum pump is in operation you should see oil flowing through the clear plastic hoses. If not, check oil level and state of wickers in oil tank. If these are OK, remove the brass elbows on the pump housing and clean the venturi pumps. Not lubricating the pump will result in pump failure.

3. Vacuum Breaker Valve

The vacuum breaker valve is located on the side of the pump. Its purpose is to limit the amount of vacuum and allow fresh air to be pulled into the pump to cool it. Check if the vacuum breaker valve works properly during operation. Check the manometer to see if the vacuum does not exceed -0.5 bar, and you can feel if the valve opens by holding your hands in front of the opening, you should feel air being pulled in.

For adjustment of the vacuum breaker valve, please refer to

4. Pressure Relief Valve

The pressure relief valve is located above the vacuum pump. Its purpose is to limit the amount of pressure in the tank. Pressure should not exceed +0.5 bar. Check the manometer when applying pressure to the tank. Keep in mind that our tanks are not pressure vessels, which means that they are not designed or constructed to withstand pressure over 1 bar. If you should apply pressure to the tank, always make sure that it is done with at least the 3'' outlet valve open. We do not recommend using pressure to unblock the suction hose. You can check if the pressure relief valve is properly working by listening. It will start making a strong 'whooshing' noise when it relieves.



CAREFUL

Always perform checks with the engine switched off.

To be refuelled on a cold engine.

4.3 Daily maintenance and cleaning of the module after route

1. DRAIN TANK

The waste tank must be emptied every day.

Take the cap off the waste outlet, connect dump hose and open valve.

Caution: because of pressure the waste can be expelled with force, make sure to secure the dump hose before opening the outlet valve.

If pressure is needed to empty the waste tank, make sure to apply pressure only with the outlet valve open. Never pressurise the tank before opening the waste valve.

2. OIL SEPARATOR

To maintain airflow, the oil separator needs to be drained daily.

Place a bucket underneath the drain valve and allow the separator to drain.

The used oil from the oil separator cannot be re-used and must be disposed of in an environmentally friendly way.

3. SECONDARY BALL VALVE/MOISTURE TRAP

As an additional security measure to protect your vacuum pump a secondary ball valve (or moisture trap) is fitted. Its purpose is to take any moisture or fluids sucked past the primary ball valve out of the airflow. Air can flow through, but fluids/moisture will stay in the moisture trap. If not emptied on time, the collected moisture will limit the airflow and thus hamper your pump's performance. If the secondary ball valve is never emptied eventually the collected fluids will be pulled into the vacuum pump causing extensive damage.

Another point in favour of emptying the secondary ball valve, is that it will minimise that specific 'mobile-toilet-odour' as the air can flow freely without picking up scent from stained fluids/materials. Place a bucket underneath the drain valve and allow the secondary to drain. We recommend flushing the moisture trap (from the top) bi-weekly.

4. VISUAL CHECK

Take 5 minutes to properly check your machine. As with any technical equipment, it will need maintenance and will be subject to wear and tear. Be it from rubbing hoses, or vibrations through the chassis, there is always a chance of a minor adjustment or repair to be carried out. By allowing yourself a few minutes every day, you can prevent longer downtime in the future. Check the electric wiring, are all connectors still tight? Is wiring not exposed? Check all hoses, are they still tight? Check for leaks, etc.

Note: Aluminium tanks are equipped with a sacrificial (zinc-) anode, mounted on the side of the tank. These need to be removed and checked for wear/use every 6 months. When used up, they need to be replaced.

5. PREPARE FOR NEXT DAY/ROUTE

It is recommended to perform all daily checks at the end of the working day to have the module ready for the next day, thus preventing delays.

4.4 Maintenance schedule

		Each use	Weekly	Initial 20 hrs	Initial 50 hrs	Every 3 months or 50 hrs	Every 6 months or 100 hrs	Every year or 300 hrs
Engine oil	Check level	●						
	Change			●			●	
Air cleaner	Check	●						
	Clean		●			●		
	Replace							●
Sediment cup	Clean						●	
Spark plug	Check-adjust						●	
	Replace							●
Idle speed	Check-adjust							●
Valve clearance	Check-adjust							●
Cumbustion chamber	Clean	After every 500 hrs.						
Fuel tank and filter	Clean						●	
Fuel tube	Check	Every 2 years, replace if necessary						
Vacuum pump oil	Check level	●						
Belt (driving the pump)	Check-adjust			●		●		
Vanes	Check-replace							●
Vacuum break valve	Check-adjust		●					
Pressure relief valve	Check-adjust		●					
Anodes	Check-replace						●	
Water filter	Check-clean	●						
High-pressure pump oil	Check	●						
	Replace							●
Belts and pulleys	Check-adjust		●					
		= These items should be performed by an authorized Honda service partner.						

4.5 TROUBLESHOOTING

Introduction

In case your module does not perform to the expected standard, it will probably be a relatively easy fix for the most part. See the troubleshooting tips below; for more detailed instructions please check the original manufacturers' operator manual supplied with your machine.

UNEXPECTED PROBLEM	POSSIBLE CAUSE	CORRECTION	
Loss of vacuum pump performance	4-Way valve not all the way pushed in or out.	Put slide valve all the way in appropriate position. Tighten handle nut if valve moves during operation.	
	Leak in system.	Check all connection (hose etc) for air leaks.	
	A ball trap is stopping air flow.	Drain ball trap and/or empty tank.	
	Outlet air filter or oil catch are plugged up.	Check the filter and/or oil catch. Clean, drain or replace if necessary.	
	A valve is open that should be closed.	Check all valves for correct position. Make sure flush valve is closed.	
	Plumbing and/or various other attachments are loose.	Tighten all plumbing and everything else connected to the system.	
	Pump is running too slow.	Adjust throttle (from engine) or PTO-rpm so that the pump is running \pm 1500rpm	
	Belt is slipping due to lack of tension on the belt.	Adjust motor base to allow for 1.5cm of free play of the belt.	
	Relief valves are faulty.	Check relief valves and reset of necessary.	
	One or more pumps vane is sticking or is worn.	Flush out pump and replace vanes if necessary.	
Vacuum pump making unusual noise	Piston cups inside of slide valve are worn out.	Install new piston cups.	
	Pulley is not secure to shaft.	Re-secure the pulley to shaft using set hole.	
	Blockage when pumping.	Locate and remove the substance causing blockage within plumbing.	
	Pulleys not in alignment.	Loosen pulleys and align using a straight edge.	
	Pulley is not properly secured.	Re-secure pulleys properly.	
	One or more pump vane is sticking.	Flush out pump and replace vanes if necessary.	
	Pump not receiving adequate oil.	Oil level in reservoir has dropped below wick. Fill reservoir. Vent hole on oil reservoir fill cap has plugged. Clean. Oil tube has come off or is leaking. Reattach or replace.	
	Pump operating too slow	Adjust throttle.	
	Inlet or outlet of pump is plugged or restricted.	Clear obstruction.	
	Engine - Engine will not start	Battery discharged.	Recharge battery.
Fuse burnt out.		Replace fuse (see engine specific operator manual)	
Fuel valve OFF.		Move lever to ON position.	
Choke OPEN.		Move lever to CLOSED position, unless the engine is warm.	
Engine switch OFF.		Turn engine switch to ON position.	
Engine oil level low.		Check and fill with the recommended oil to the proper level.	
Out of fuel.		Refuel	
Bad fuel; engine stored without treating or draining gasoline, or refueled with bad gasoline.		Drain fuel tank and carburator, refuel with fresh gasoline.	
Spark plug faulty, fouled or improperly gapped.		Replace or regap spark plug.	
Spark plug wet with fuel (flooded engine)		Dry and reinstall spark plug. Start engine with throttle lever in MAX position.	
Engine - Engine lacks power	Fuel filter restricted, carburator malfunction, ignition malfunction, valves stuck, etc.	Replace or repair faulty components as necessary.	
	Air filter restricted	Clean or replace air filter element.	
	Bad fuel; engine stored without treating or draining gasoline, or refueled with bad gasoline.	Drain fuel tank and carburator, refuel with fresh gasoline.	
	Fuel filter restricted, carburator malfunction, ignition malfunction, valves stuck, etc.	Replace or repair faulty components as necessary.	
	HP system	Electric HP pump not running.	Check all wires and connectors, they might have come loose, retighten if needed. Solenoid not working properly (in the grey plastic box), replace when needed.
		HP pump is running, but no or little water	Check water flow to pump, refill tank with water if needed. When run dry, there might be air trapped in the pump. Purge before operation.
			Water filter clogged, check and clean.
		E-clutch not engaging (when fitted)	HP not switched on, or fuse blown.