MV Hydro 9

Diesel Powered
Water Heater
Instruction Manual
Ed 2.04

MV Heating UK Ltd
Unit 6
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9kW Water Heater

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Preface

Thank you for purchasing the MV Hydro 9 Water heater. This instruction book describes the structures, working principles, installation and operation of the MV Hydro 9. For correct use of the heater, please read this instruction book carefully before installation and operation. The instruction book should be saved in a convenient place for later reference.

Attention

- This instruction book is subject to revision without notice, but will conform to the purchased product.
- This manual aims to answer all questions the user may have about the product, however; if you have any doubts or find anything incorrect in this manual, please contact us directly.
- Check the heater for any damage when unpacking and contact the dealer immediately if any damage is found.
- If any troubles arise during application, please contact MV Heating or the company who sold it to you. We shall do our best to provide service to you.

Contents

Introduction

The MV Hydro 9 is a multi-functioning, intelligent, remote controlled water heater (hereinafter referred to as ‘the heater’). The main heater is a small furnace controlled by a single chip microprocessor. Its circulation system is connected to the cooling system of the vehicle. It can be operated without the need for the vehicle engine to be on.

The heater can not only be used to heat compartments but can also be used as an engine pre-heater to prevent cold starts and increase the life of the vehicle’s engine.

The heater can also help to avoid engine idling and can reduce CO_2 emissions and fuel consumption.

Technical Data

MV Hydro 9 TECHNICAL DATA	
Fuel	Diesel
Power supply	DC12/24v
Heating Medium	Coolant
Output	9.1kw (Max) 1.8 - 7.6kw (Regulating)
Fuel Consumption	1.1 l/h (Max) 0.19 - 0.9 l/h (Regulating)
Power Consumption	90W (Max) 37 - 83W (Regulating)
Working Pressure	2.0bar
Control Unit Temperature Range	-40 - 75°C (Operation) -40 - 85°C (Storage)
Fuel Pump Temperature Range	-40 - 20°C (Operation) -40 - 85°C (Storage)
Water pump circulation (0.15bar)	1650 l/h
Net Weight (Heater only)	4.8kg
Mobile phone control	No Limitation
Remote control (Optional)	Without obstacles ≤800m
Temperature of coolant when warm blower is started	45°

Structure and Working Principle

The heater is installed in series with the engines coolant system. The heater's control switch gives the ECU a start signal, then the fuel from the fuel tank is pumped into the combustion chamber by the supplied fuel pump. The glow pin ignites the fuel producing a flame in the combustion chamber. The coolant is then heated and sent around the vehicle when it has reached the correct temperature. The heater can then be turned off manually or set to by an automatic timer.

Coolant Circulation System

The coolant fluid from the engine flows through the water inlet pipe and pump and into the furnace cavity (between the furnace inner and outer casing). Once heated it exits from the water outlet pipe forming a complete loop. The water pump forces the circulation enabling the temperature to make a gradual rise.

The overheat sensor is used to measure the temperature of the furnace inner casing. The heater will automatically shut down if the sensor detects overheating due to a lack of water or other problems.

The water temperature sensor is used to measure the temperature and working conditions of the coolant and whether the matrix heater, or radiator in the vehicle needs to be started.

Exploded Heater Parts Diagram

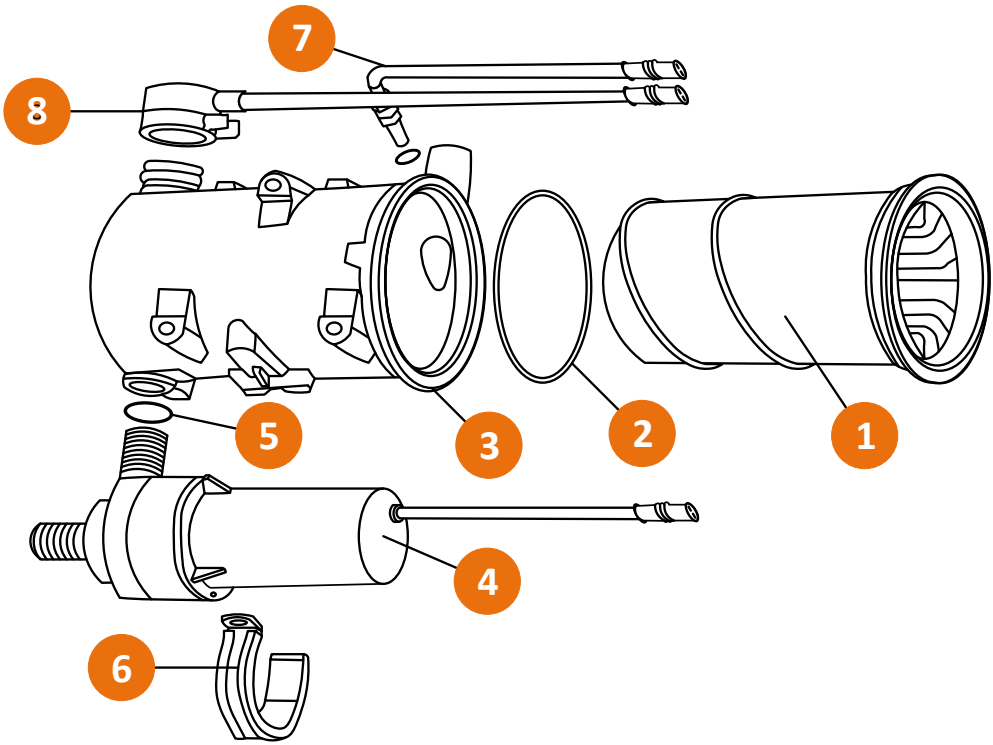


Figure I

1. Heat Exchanger (Inner)
2. 'O' Ring
3. Heat Exchanger (Outer)
4. Water Pump
5. 'O' ring
6. Water Pump Bracket
7. Water Temperature Sensor
8. Overheat Protector

The heat exchanger consists of the heat exchanger outer casing, the inner casing, and the combustion chamber (figure I).

Exploded Heater Parts Diagram Cont'd

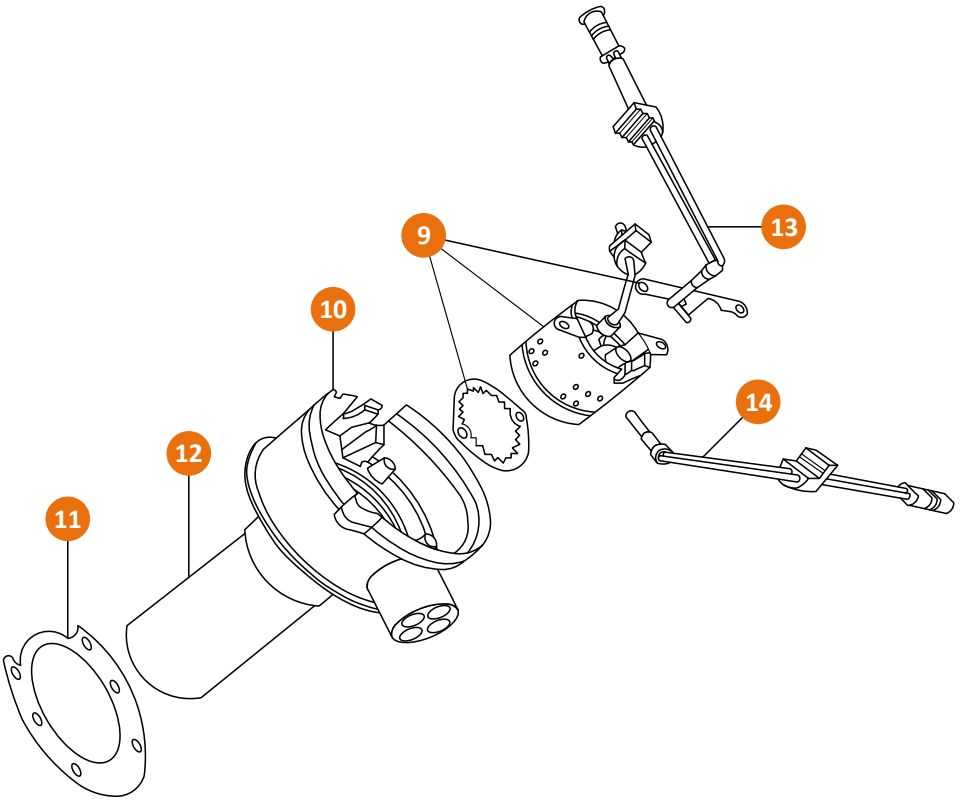
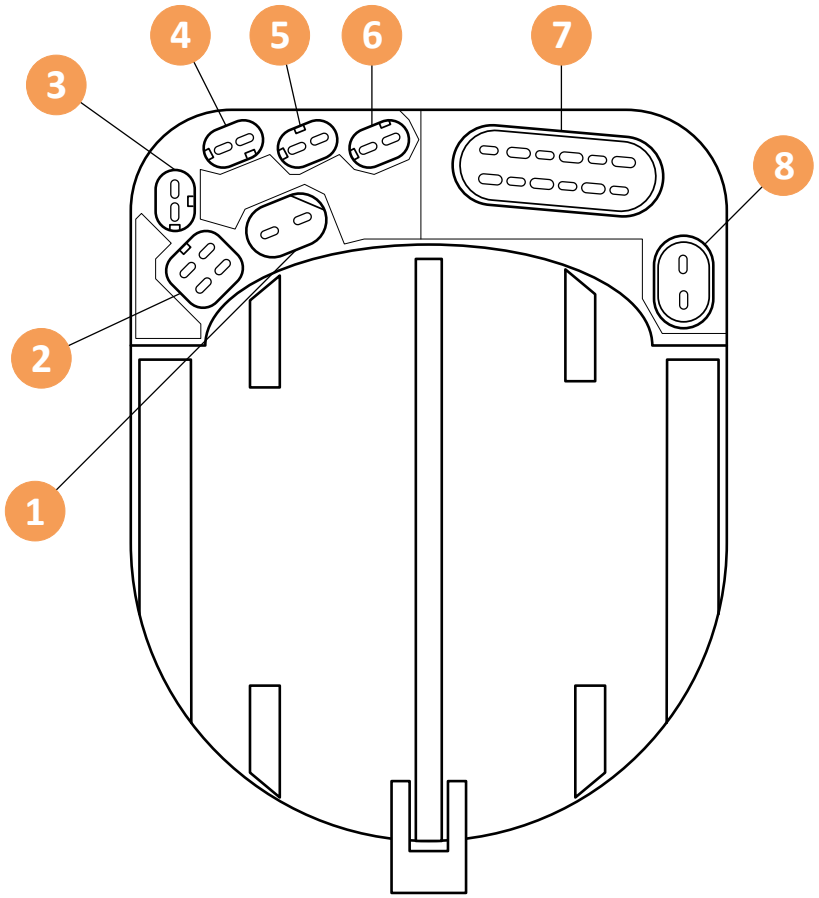


Figure II

9. Burner Assembly
10. Exhaust Housing
11. Combustion Chamber Gasket
12. Combustion Chamber
13. Flame Sensor
14. Glow Pin

Figure II shows the burner, and combustion chamber assembly which sits inside the heat exchanger. The glow pin sits inside the burner assembly and ignites the diesel coming into the unit. Once ignited, the flame sensor switches off the glow pin.

E.C.U. Connections



1. Glow Pin
2. Air Motor
3. Temperature Sensor
4. Flame Sensor
5. Water Pump
6. Overheat Sensor
7. Main Wiring Harness
8. Fuel Pump

Figure III

Note: Pay attention to the 'tab' orientation of some plugs.

E.C.U. Functions:

- It monitors the voltage of the heater and whether it is too high or low
- Checks for broken and short circuits of many of the internal parts like, the air fan, glow pin, flame sensor, overheat sensor etc.
- Controls the speed of the air motor during different phases of operation
- Adjusts the fuel pulsing rate of the fuel pump automatically according to the different phases of operation
- Determines the working conditions of the heater based on data collected from the flame sensor, overheat temperature and temperature sensors
- Controls the working conditions of the water pump
- Automatically switches off the heater if faults are detected. (The heater can be turned on again if necessary)
- Sends the relevant fault code to the timer control

The heater itself is powered by the vehicle's own battery. Ensure that the heater does not drain the battery of power if the vehicle's engine is switched off. Charging will be necessary if this happens.

The heater's fuel comes directly from the vehicle's fuel tank via the standpipe and fuel line supplied in the kit.

Installation

Do not install the heater:

- Near any flammable or explosive sources, like the vehicle fuel tank
- In a closed space without proper ventilation
- In a house or vehicle cabin close to people

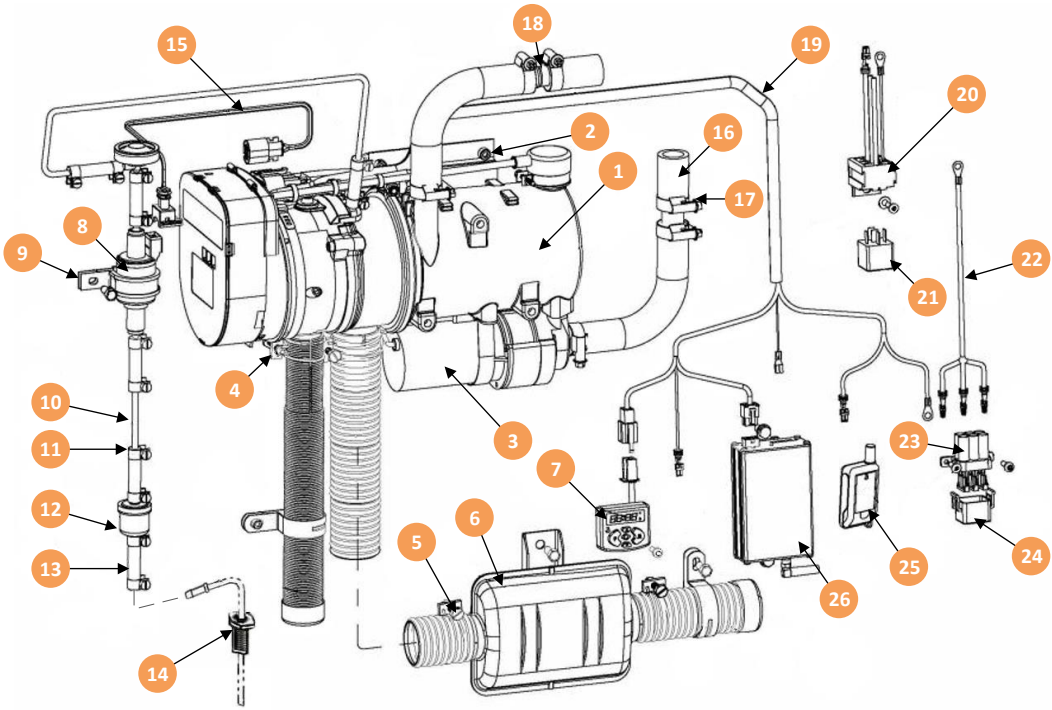


Figure IV

Figure IV shows the basic layout of the MV Hydro 9.

1. Heater body
2. Heater mounting bracket
3. Water pump
4. Combustion air pipe
5. Exhaust pipe
6. Silencer*
7. Control unit
8. Fuel pump with damper
9. Fuel pump clamp
10. Fuel pipe
11. Fuel connector clamp
12. Fuel filter
13. Rubber connector
14. Fuel standpipe
15. Fuel pump connection lead
16. Rubber water pipe
17. Water pipe clamp
18. Water pipe joiner
19. Main wiring harness
20. Fan relay wire
21. Fan Relay
22. Positive power supply cable
23. Fuse box
24. Fuse box cover
25. Remote control module (optional)
26. Remote receiver (optional)

*Inbuilt as a complete exhaust system when purchased as part of a marine installation kit

Dimensions

Dimensions: mm

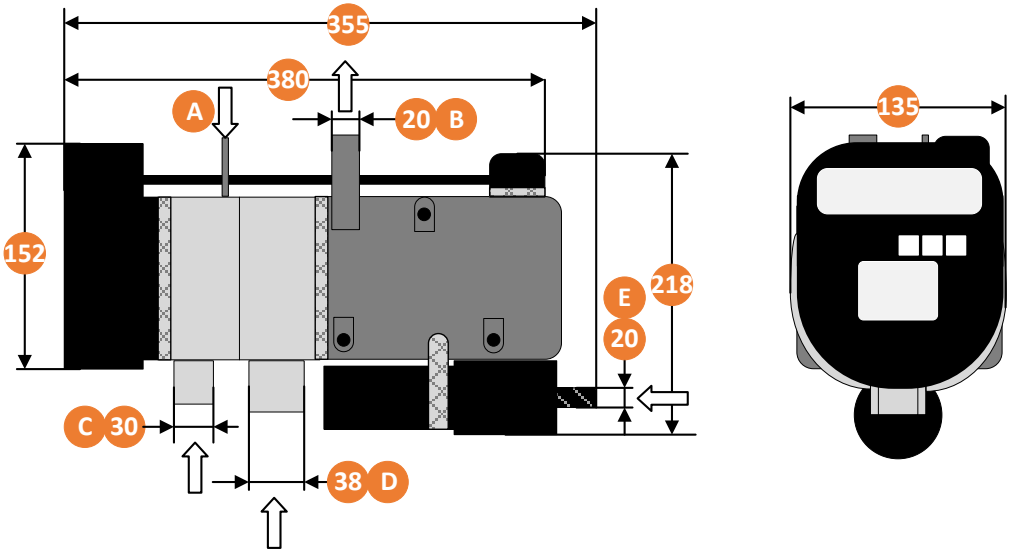


Figure V

A. Fuel Inlet pipe
B. Hot Water outlet
C. Combustion air intake
D. Exhaust outlet
E. Water inlet

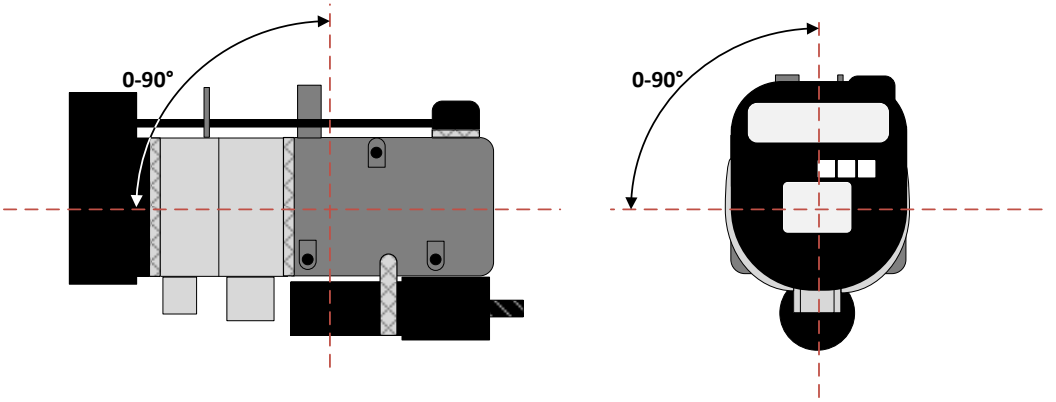


Figure VI

The heater is ideally mounted on its bracket, secured deeply in the engine to facilitate heat conduction and enabling the water pump to evacuate air automatically.

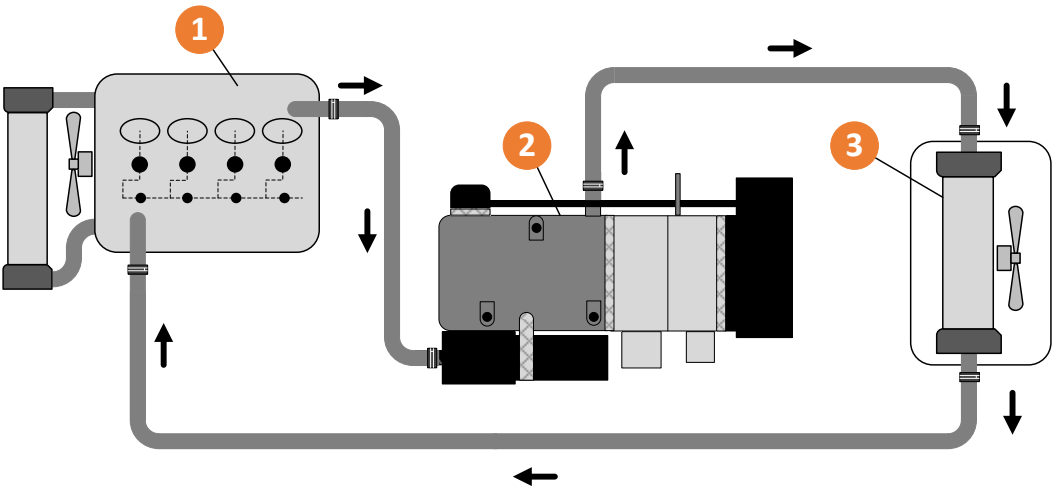
The Installation position can incline to suit different needs, however it should not exceed 90° from the 'normal' installation position, as shown in figure VII.

Installation of Coolant Circulation System

During installation, the existing cooling liquid in the vehicle should be emptied and the system cleaned with fresh water. Once installed, new liquid should be used.

Connect the heater between the engine and the heat exchanger of the warm blower by the supplied hose and clamps (Figure VII).

Note: Make sure the correct coolant is used for your vehicle's specifications



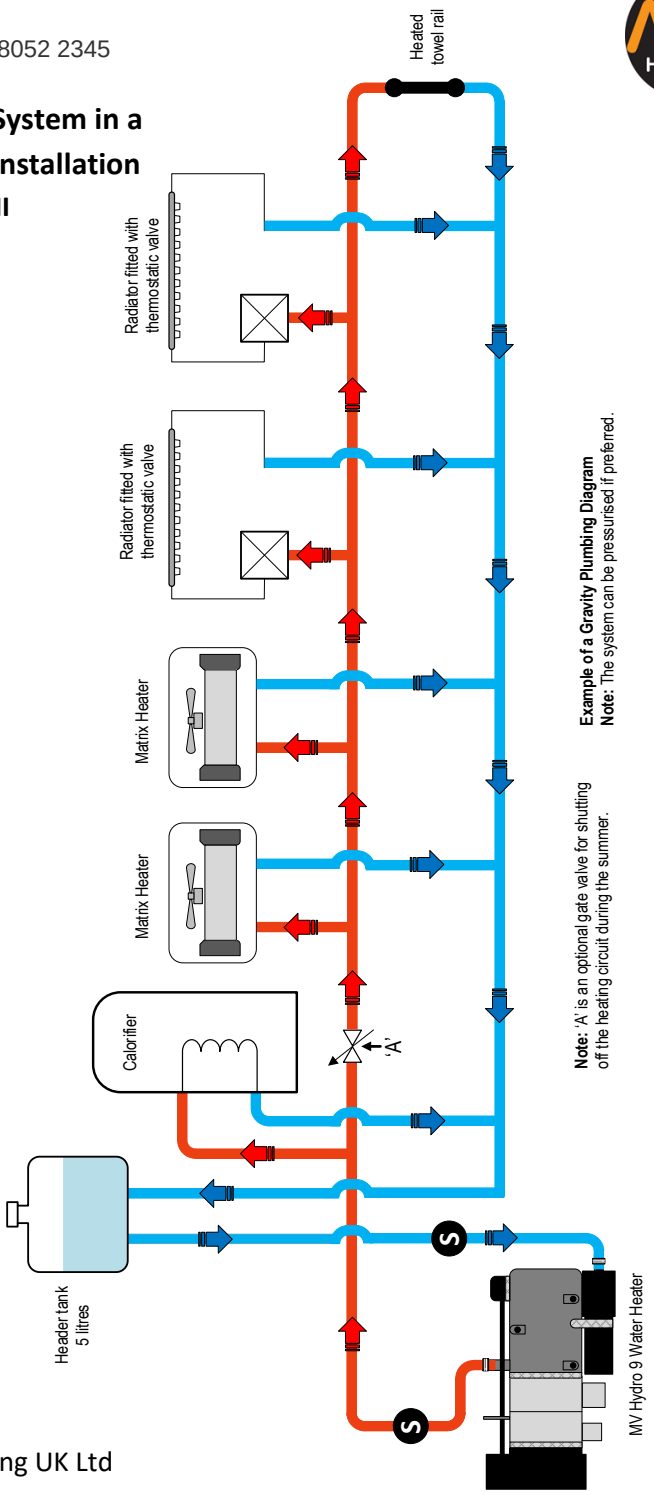
1. Vehicle's Engine **2.** Heater
3. Matrix Heater

Figure VII (Arrows show direction of flow)

If a used heater is being installed (or re-installed), the coolant liquid should again be emptied and the system cleaned with clean water and re-filled with fluid. After installation of the heater, you should start the engine once to circulate the coolant and eliminate any air bubbles that may have occurred.

Gravity System in a Marine Installation

Figure VIII



Example of a Gravity Plumbing Diagram
Note: The system can be pressurised if preferred.

Note: 'A' is an optional gate valve for shutting off the heating circuit during the summer.

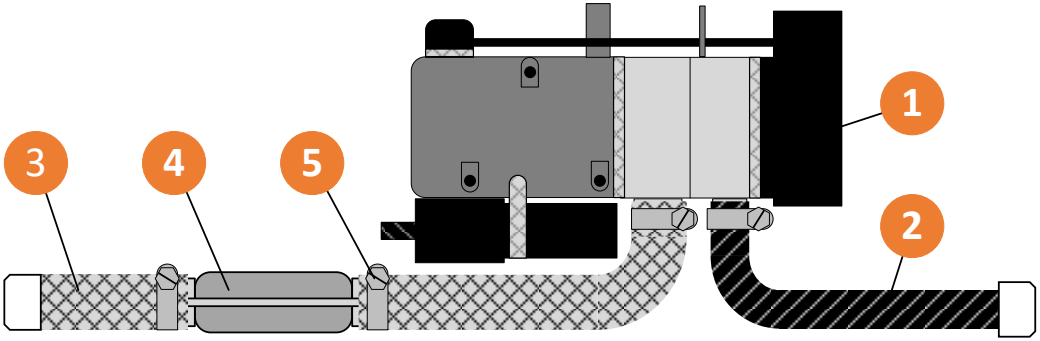
Figure VIII shows a simple layout of how to install a Hydro water heater into a marine application using a gravity fed system.

As shown by the diagram, a twin pipe header tank with the return flow passing through it, will act as a permanent auto bleed in the system, any air returning to the heater will come out in the header tank. Antifreeze should be added up to 30% to prevent the coolant from freezing.

Optional service valves can be fitted at point ‘S’. This will enable faster and easier removal of the heater without introducing air into the system.

Pipework: All pipework should be in 22mm. 15mm should only be used on the return from the matrix heaters, radiators and/or towel rail.

Installation of the Air Intake and Exhaust



1. Heater **2.** Combustion Air Pipe **3.** Exhaust Pipe
4. Silencer **5.** Exhaust Pipe Clamp

Figure IX

Only use the combustion air pipe and exhaust pipe supplied in the kit. They should not be cut short and middle sections should be secured with clamps in various locations to prevent sagging.

The function of the air inlet pipe is to draw in combustion supporting air into the main furnace of the heater. The inlet should face outside of the vehicle but away from the direction of travel, so it doesn't get clogged with dirt and debris.

Note: These parts get hot when in use and should therefore be installed away from anything damaged by high heat. If they cannot be installed sufficiently enough away, then a heat shield is required.

The Exhaust pipe should not be installed in such a way that its fumes are re-entered by the air inlet. Like the combustion pipe, it should also be opposite to the air flow, so again it doesn't get clogged. A small hole (ϕ2 – 5) can be drilled at the low end of the exhaust pipe to allow condensation to drain.

Fuel Lines

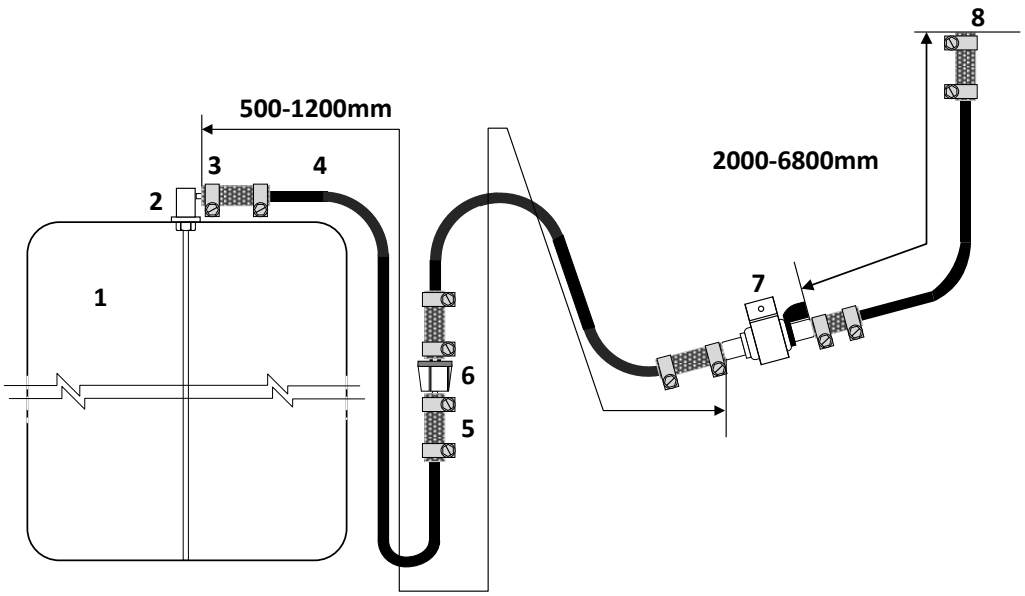


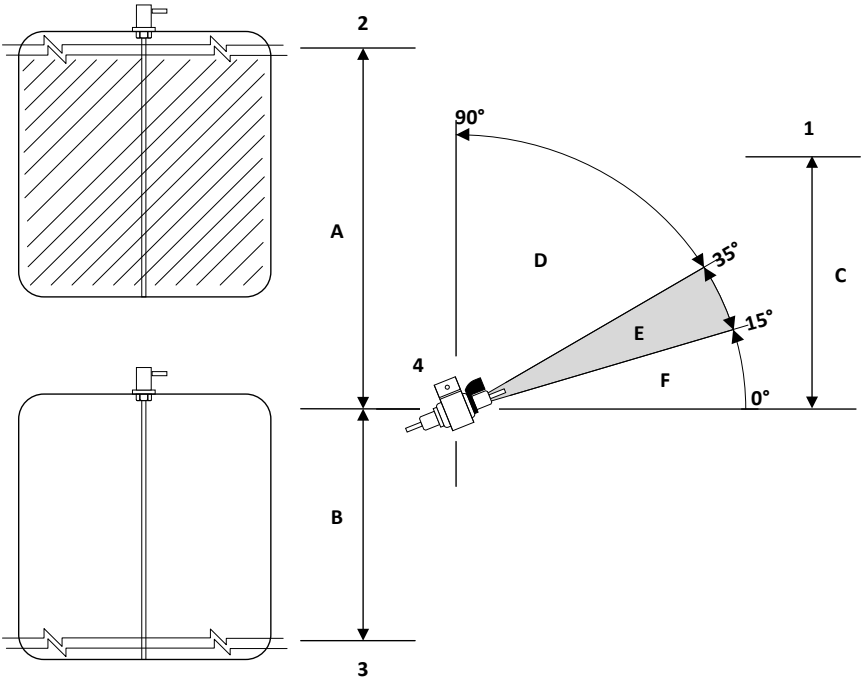
Figure X

1. Fuel Tank	**2.** Fuel Standpipe	**3.** Fuel line Hose Clamp
4. Fuel Line	**5.** Rubber Fuel connector	**6.** Fuel Filter
7. Fuel Pump		**8.** To Heater

Always fit the fuel pump on the anti-vibration mount securely onto the vehicle. Ensure the outlet of the fuel pump tilts upward. The correct angle is shown in Figure XI.

Where possible the fuel line is ideally placed uphill to the fuel pump to ensure ideal bleeding of the fuel line.

Fuel Pump Angle & Suction Height



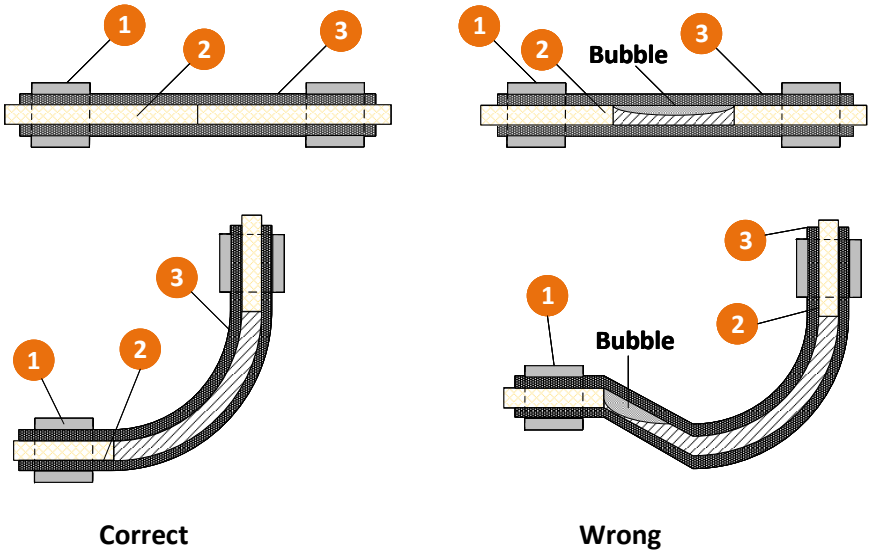
1. Heater Body
2. Max. Fuel Level
3. Min. Fuel Level
4. Fuel Pump
A. 3000mm
B. 500mm
C. 2000m
D. Not acceptable
E. Acceptable (between 15-90°)
F. Not acceptable

Figure XI

Figure XI shows the ideal way to mount the fuel pump

The fuel pump's outlet should tilt upward at an angle between 15˚-35˚ (as shown above).

Fuel Line Connections



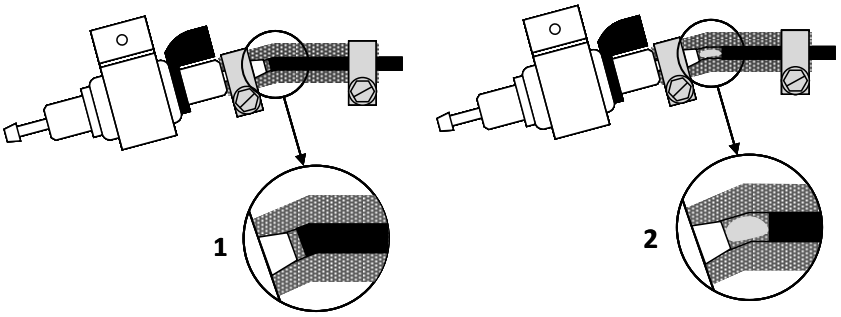
1. Fuel connector clamp **2.** Fuel Pipe **3.** Rubber fuel connector

Figure XII

Figure XII and XIII show the correct way to connect fuel lines to prevent the build-up of air bubbles: Ensuring they are flush and minimising bends.

When the fuel is being sucked from the vehicle tank, or an independent tank, a fuel standpipe is required. Make sure all the openings are appropriate for the installation and a tight seal is maintained for the base of the standpipe (see pages 22-23).

The bottom of the suction pipe should be about 30-40mm from the bottom of the fuel tank, to avoid sucking impurities or sediment from the bottom.



1. Flush – No Air Bubble **2.** Gap – Air Bubble Formed

Figure XIII

Only use the fuel line provided, ensure the pipe is placed away from any possible debris and avoid any sagging in the line. Make sure the fuel line does not flow downward toward the fuel pump. This will prevent correct fuel flow and produce air bubbles in the line.

The fuel filter, fuel pipe and clamps should all be replaced after approximately 2 years of use.

Angle of Fuel Filter

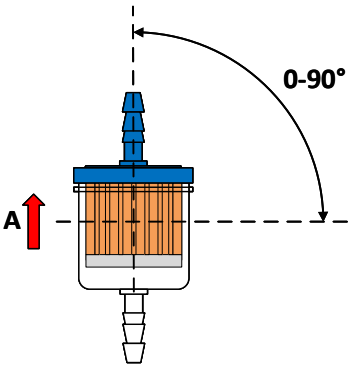


Figure XIV shows the allowable, installations angle of the fuel filter, as well as the direction of fuel flow (arrow A). The filter should be fitted between the vehicles tank and the fuel pump.

Figure XIV

Fuel Standpipe

A fuel standpipe (or suction pipe) will need to be installed in the vehicle's fuel tank or an independent fuel tank depending on what the installation calls for. Sealant is not required to fit the standpipes.

Depending on the standpipe provide in the kit you will need to install the standpipe in one of two ways.

Standpipe 1: (**Part No:** AHZ-034) **Figure XV**

Usually supplied in Marine kits and supplied bent, this standpipe is installed like so:

- Drill a hole in the top of the vehicle's fuel tank Φ22 ± 0.2mm in size. Ensure it is smooth and clean of burrs
- Remove the top nut and washers and bend the standpipe straight
- Straighten the standpipe and cut it down to size if necessary
- Fit the standpipe by tilting it into position into the newly drilled hole
- Place the rubber and metal washers back on top followed by the nut and tighten it securely on top

Stand pipe 2 (Sender Unit Pipe): (**Part No:** AHZ-035)

Figure XVI

Supplied mainly in vehicle kits, this standpipe (or sender unit pipe) is installed like so:

- If possible; remove the sender unit from the vehicle's fuel tank, this will make it easier to attach the nut securely back onto the standpipe
- Drill a Φ6 ± 0.2mm hole into the sender unit
- Remove the nut from the standpipe and feed it through the hole ensuring the rubber 'o' ring remains on the standpipe 'head' side
- Replace the nut on the standpipe to secure it safely to the sender unit.
- Replace the sender unit into the fuel tank.

The bottom of the fuel standpipe should be 30-40mm from the bottom of the fuel tank to allow enough suction of fuel and at the same time not allow impurities and sediment to be drawn up the standpipe.

Installation of Electrics

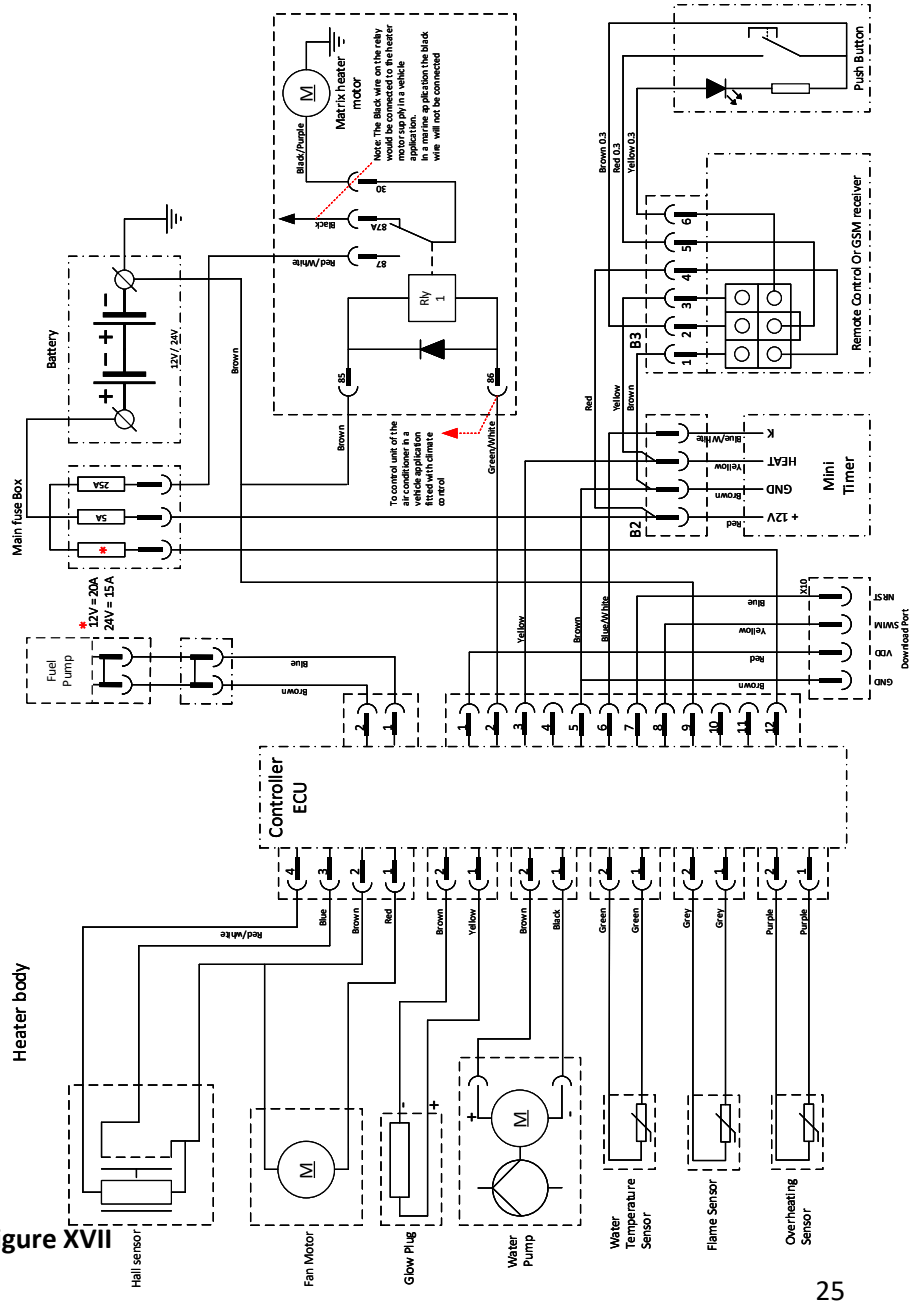


Figure XVII

The wiring diagram is shown in Figure XVII.

The circuits outside the heater have been made into bundles and can be laid out according to the positions of various components. The distance between two fixing points should not exceed 30cm.

Note: Any exposed wiring outside the vehicle should be well protected from damage to prevent short circuiting.

The positive, power supply wire for the heater (2.5mm² red) will connect to the positive terminal of the vehicle's battery and the negative wire (2.5mm² brown) will connect to the negative terminal.

All electrical components of the heater connect to the wire harnesses connectors. The plugs will connect to each other with the relevant connections.

Wire Connections off the Relay of the Warm blower

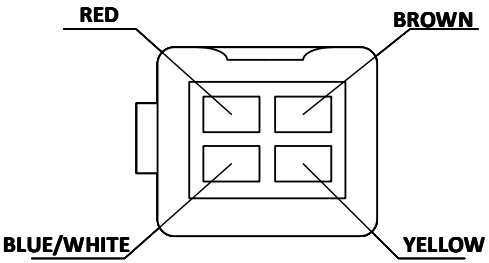
The black wire 4mm² connects to the vehicle's fuse box. The purple and black wire (4mm²) connects to the positive terminal of the warm blower motor.

Note: All terminals should be plugged in, even those not in use, to avoid short circuiting.

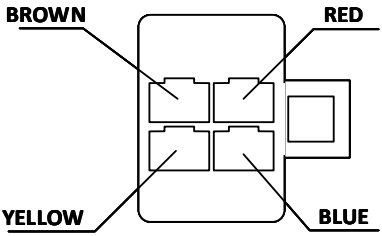
Timer Connections

All connections should be prepared for you in your kit. However, if changes need to be made, or terminals have become disconnected, use the following diagrams to ensure the timer plugs are wired correctly.

Mini Timer



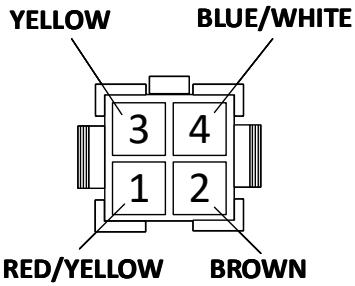
From Wiring Harness



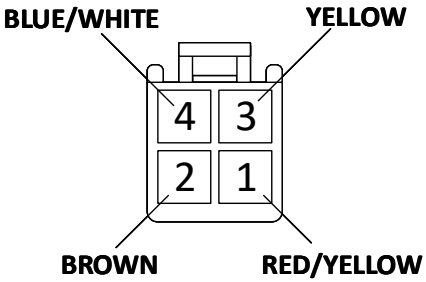
From Mini Timer

Figure XVIII

LCD Digital Timer



From LCD Digital Timer

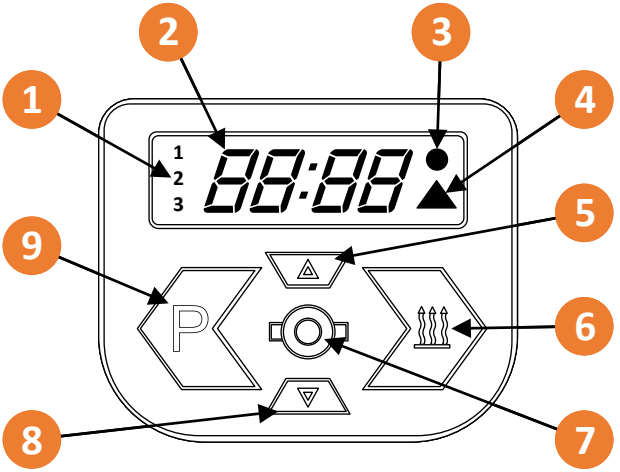


From Wiring Harness

Figure XIX

Operating Instructions

Mini Digital Timer Instructions



1. Heating time confirmation icons
2. Main Clock
3. Confirmation Icon
4. Power on Icon
5. Up Arrow Button
6. Heating Button
7. Fixing Screw Hole
8. Down Arrow Button
9. 'P' (Program) Button

Figure XX

Note: When the power to the heater is switched on for the first time, the timer will display:

This will remain unchanged if no other operation is given. During this time, the arrow keys can be used to adjust the brightness on the display.

Setting Up Stages

1. Setting the Clock

Press the ‘P’ button once the timer is powered, and the screen will display 12:00. You can then use the arrow keys to again adjust the brightness of the display. By pressing ‘P’ again, the hour time will start to flash. This can now be adjusted using the arrow keys. Once set to the correct hour, press the ‘P’ button again. The minute section will now begin to flash, allowing you to adjust it with the arrow keys. Press the ‘P’ button again to move onto the second stage – Presetting the automatic power on times.

2. Presetting the Automatic Power-On Times

Once the clock has been set, you can set the automatic power on times. You can set up to three different times a day for the heater to power on, as indicated by number 1 in Figure XIV.

Having pressed the ‘P’ button after the minutes on the clock have been set, the display will read:

This is the first automatic power on time, as indicated by the small number ‘1’ that has appeared in the upper left-hand corner of the display. The hour can then be adjusted in the same way as the clock was adjusted, pressing the ‘P’ button to move onto and adjust the minutes. However, after the minutes have been set, press the ‘Heating Button’ to confirm your selection. The display will then read:

A solid, black circle will appear on the top right of the display. This confirms the 1st automatic power-on time has been set.

To move onto the 2nd and 3rd power-on times, simply press the 'P' button after the confirmation dot has appeared and repeat the process for the 2nd power-on time and again for the third. Making sure to press the heating button to confirm the selection every time. Once the 3rd time has been confirmed, press the 'P' button again, to move to the third and final stage – Presetting the heating duration time.

3. Presetting Heating Duration Time

Heating times can be set between 1 minute and 2 hours 59 minutes.

Once the 'P' button has been pressed after the third automatic heating time, the screen will display 00:30, and the hours will be blinking. The hours can be adjusted using the arrow keys. Then the minutes can be adjusted by pressing the 'P' button again and using the arrow keys to adjust.

Pressing the 'P' button for the final time will complete the set-up and the screen will display:

The clock face will differ depending on what time it has been set to, but will display the three small 1, 2, and 3 digits, indicating that the three automatic start-up times and the heating duration time have been set.

Immediate Power-On and Off

To start the heater immediately, simply press the heating button. The screen will display 0:30 with a small black triangle:

This indicates that the heater has started. The operation time can be adjusted to run between 1 minute and 2 hours 59 minutes by using the arrow keys. The timer will then visibly run down on the display until it reaches zero and switches itself off. More minutes can be added, or subtracted at any time during operation of the heater, by pressing the arrow keys.

If you wish to turn the heater off manually, simply press the heating button again and the heater will go into a cool down mode, returning the display to the clock face.

Note: If left for longer than 10 seconds the timer will automatically shut off. If it has done this during set-up, you will have to repeat the steps from the beginning.

LCD Digital 7-Day Timer

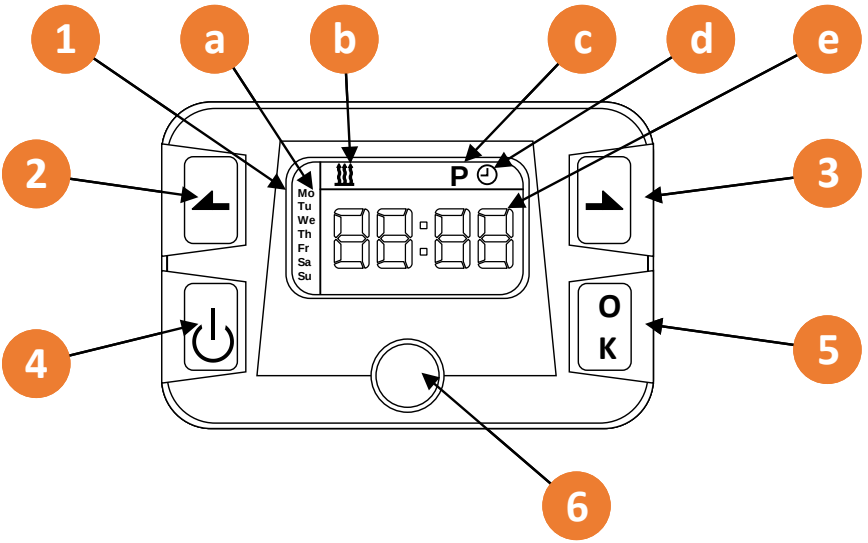


Figure XXI

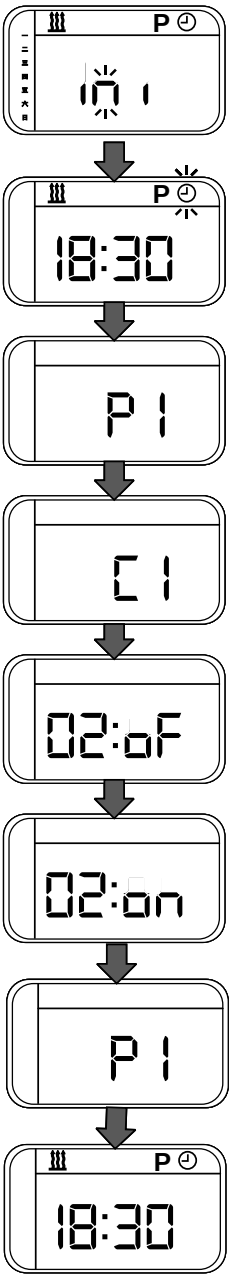
1. LCD Screen
2. Left Arrow Button
3. Right Arrow Button
4. Power/Back Button
5. OK Button
6. Fixing Screw Hole

a. Days of the week
b. Heating Symbol
c. 'P' (Timer) Symbol
d. Clock Symbol
e. Clock Face

Functions:

- 7 day timer, programmable up to 3 times daily
- 7 step variable output mode
- Thermostatic mode from 05°C to 35°C

Changing Language



The language should be set to English. However, if it isn't or the control has been reset to default settings it will revert to Chinese. Please follow these steps to convert the language to English.

1. Turn on the control with the power button. Wait for the symbols to stop flashing, then press the power button again.

2. Navigate to the clock face symbol at the top of the control by using the arrow keys. When it is flashing press both arrow keys simultaneously.

3. P1 now appears.

4. Press ok and C1 will appear.

5. Keep pressing ok slowly until '02:oF' appears.

6. Press any of the arrow keys until the screen reads '02:on'

7. Keep pressing ok until back to the P1 menu screen

8. Press power button to return. The language will now be set to English.

Changing the Date and Time

1. To change the date and time, navigate to the clock face symbol and press ok.

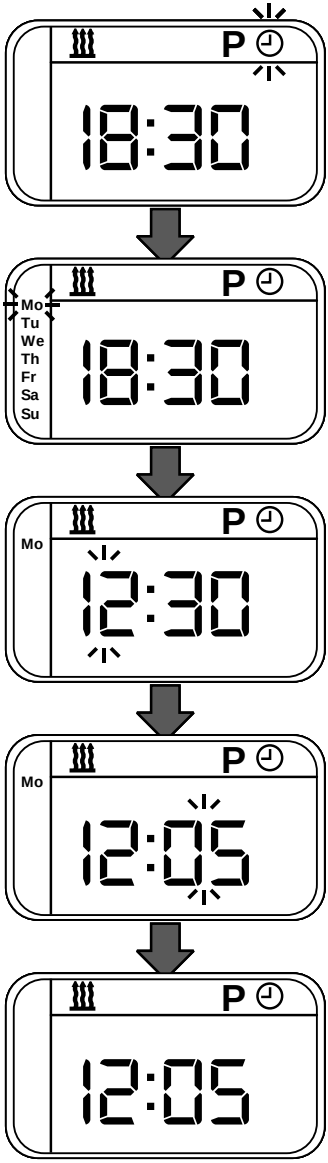
2. Select the day of the week it is first using the arrow keys, and pressing ok to confirm.

3. Select the hour using the arrow keys, and pressing ok to confirm.

4. Finally, select the minutes in the same way.

5. Once completed, the control will return to the home screen (displaying the correct time)

NOTE: If the LCD digital timer is disconnected from the loom, the date and time will need to be re-entered.



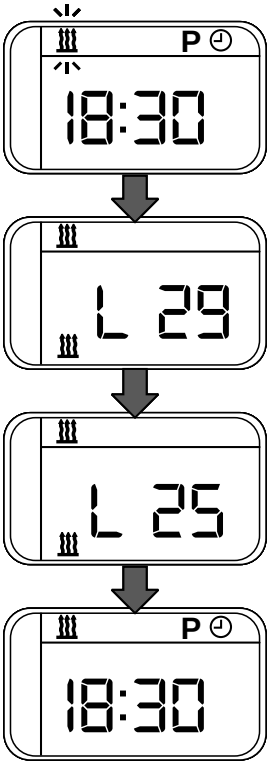
Manual On/Off

1. To switch the power on manually, navigate to the heating icon, and press ok

2. The heater will start automatically, with a countdown display.

3. The timer will then visibly run down on the display until it reaches zero and switches itself off. More minutes can be added, or subtracted at any time during operation of the heater, by pressing the arrow keys. The maximum heating time is 99 minutes.

4. To switch the heater off, simply press the power button to return to the home screen.



Pre-setting Heating Times

The digital control can be used as a 7-Day timer, and is able to be preset to switch on up to three times a day.

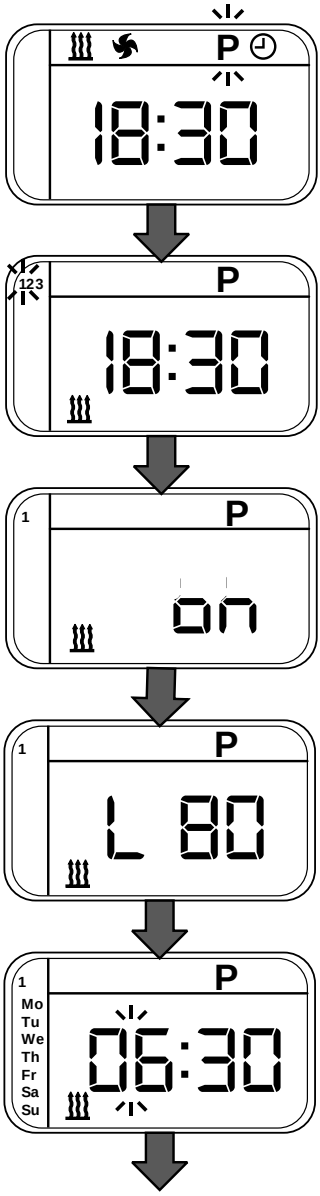
1. Navigate to the ‘P’ symbol, and press OK.

2. Using the arrow keys select the number 1 (flashing) at the top of the screen, and press OK – Number 1 is the first heating time.

3. Using the arrow keys, select ‘ON’, as this will allow the heater to switch on after the presetting is finished. Press OK to confirm.

4. Select the length of time you want the heater to run for by using the arrow keys. ‘L 80’ represents 80 minutes. Run time can be selected from 1-99 minutes by pressing or holding the arrow keys. Press OK to confirm.

5. Select the hour you wish the heater to start at by using the arrow keys and then pressing OK to confirm.

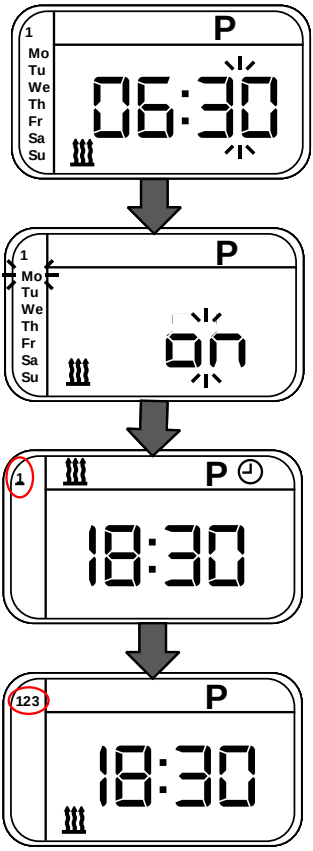


6. Select the minutes in the same way, and press OK to confirm.

7. The next step is choosing which day of the week you want the heater to run. Starting with Monday, use the arrow keys to change from ‘OFF’ to ‘ON’ and press OK to confirm. Continue this all the way through to Sunday.

8. The preset time should now be set. This will be indicated by the small, underlined number 1 at the top of the screen.

9. To set the second and third heating times, simply repeat all the steps but select 2 or 3 instead of 1 (see step 2.) to set those heating times.

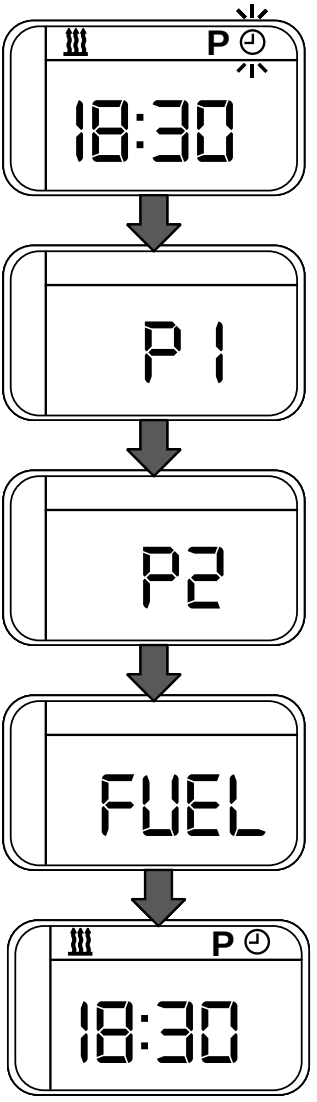


NOTE: To turn any of the preset times off without altering the set times, simply go through to step 3 and select ‘OFF’ using the arrow keys. Then repeatedly press OK until you have returned to the home screen.

Installation Fuel Priming Feature

ATTENTION:

- Not to be used in normal heater operation
- Disconnect the fuel line from the heater first, to prevent flooding of the heater and place in a suitable receptacle.



1. To enter the fuel priming mode, navigate to the clock face using the arrow keys and press both arrow keys simultaneously.

2. P1 should appear on the screen.

3. Select P2 by pressing any arrow key, and confirm with OK.

4. The fuel pump will begin to rapidly pump the fuel.

5. It will automatically shut down after three minutes, or press any key to stop the pumping at any time, and return to the home screen.

Checking Error Codes

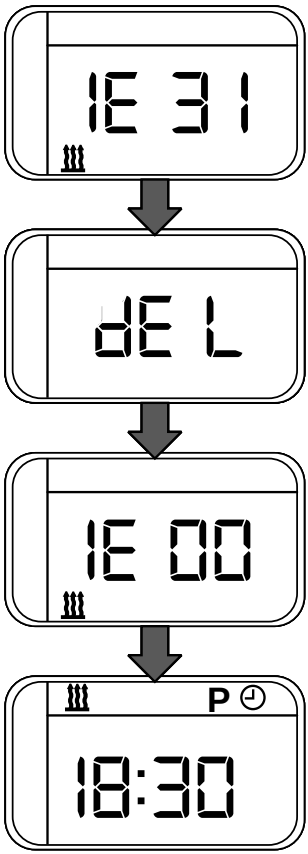
Once an error code has been displayed, and the problem has been amended, follow these steps to reset it.

1. Check the error using the arrow keys. Exit by pressing either OK or the power button.

2. Press both arrow keys to display message ‘dEL’.

3. Press OK to delete all errors or power to go back. Once the display reads ‘IE00’ then no errors have been found.

4. Press OK or power to return.



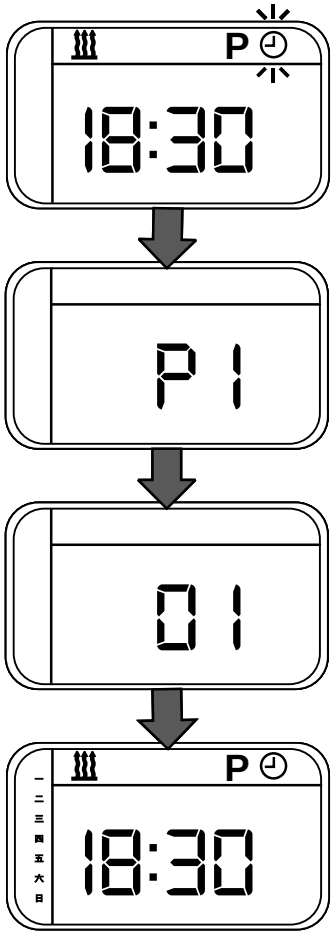
Resetting Digital Controller to Factory Settings

1. Navigate to the clock face on the menu and simultaneously press both arrow buttons.

2. P1 should appears on the screen.

3. Using the left arrow key select '—01', confirm by clicking the 'OK' button.

4. The control should now be reset to its original factory settings.



Maintenance

Once the heater is installed, it should ideally be turned on a few times to remove any air trapped in the fuel lines. Also ensure there is no leaking from the lines and that all electric terminals fit securely together.

You should also regularly:

- Check the air inlet and outlet for any pollution or foreign matters
- Clean the externals of the heater
- Check for corrosion or loose connections of the circuits
- Check the combustion air inlet and exhaust pipe for damage and clogs
- Check the fuel line for leaks

To ensure a long life of the heater it is advised that you run it for at least 10 minutes every month, to prevent malfunction of mechanical parts.

After 10 years the heat exchanger, overheat sensor and exhaust should be replaced by a professional.

If any welding is being attempted on the vehicle, please remove the positive power supply wire and earth it to protect the controller from any damage.

Additional Precautions

1. A trial run is useful before continual use of the heater to ensure all parts are working correctly. If lasting dense smoke occurs, irregular combustion noise, lingering fuel smell, or overheating happens, the heater should be switched off and allowed to cool. The fuse should also be removed, rendering the heater unusable. The installation should then be looked over, paying close attention to any loose connections of electrics, or pipework. A voltage check may be required, as well as checking fuel levels.

   If the heater has not been allowed to cool down before restarting, don't be alarmed when ignition does not occur straight away. The heater will go into a self-check mode, and will only start when the internal temperature has cooled to appropriate levels. If any problems persist, the heater and installation should be looked at by a trained professional.

Note: Once switched off, the water pump and air motor will continue to run. This is the cool down cycle, and is necessary to prevent damage to internal parts.

2. Be sure to turn the heater off before filling up the fuel tank.

3. The heater should ideally be run for 10 minutes every month to prevent the fuel pump, or any moving parts from blocking.

4. The manufacturer will not be held responsible for any damage to the heater caused by anything that violates these instructions.

Fault Finding

Fault codes will be displayed on the timer.

Press the **P** key in the heating mode. The fault code will be displayed as XEXX, where X is the breakdown number and XX is the fault code (see next page). Use the arrow keys to view the breakdown information.

To eliminate the failure information; hold down the **P** key and press the heating button. The information will now be cleared. Press the heating button again to display the current time.

Treatment of usual troubles

If the heater is switched on but does not work correctly, the following methods can be used for treatment.

- Turn off and then restart the heater. Do not restart the heater more than twice if the same problem persists.
- Ensure that the heater has cooled completely before attempting a restart, paying close attention if the coolant temperature has exceeded 70°C.
- Check that the fuses between the battery and the heater are correct (see below).

Protected Circuit	Rated current of fuse DC12V	Rated current of fuse DC24V
Warm air blower motor circuit	25A	25A
Main circuit of heater	20A	15A
Operation cicuit of heater	5A	5A

- Ensure that there is sufficient coolant in the system before starting-up, and never start the heater if the coolant has frozen.

Fault Codes and Troubleshooting

Fault Code	Description	Troubleshooting
10	Voltage to high <15 (12V) >29 (24V)	A) Check Voltage at the battery B) Check Voltage at the heater
11	Voltage to low <10.2 (12V) >20.5 (24V)	A) Check Voltage at the battery B) Check Voltage at the heater C) Charge Battery
13	Second Start Failure	A) Check coolant level - If necessary, refill once cooled and re-start heater B) Check whether the water pump is working
12	Software overheating	A) Check coolant level - If necessary, refill once cooled, and re-start heater B) Check whether the water pump is working
14	Overheating	
15	Overheat lock (10-time starting failure)	
17	Overheating hardware	
20	Glow pin broken circuit	A) Clean the glow plug of any carbon build-up B) Change glow pin C) Change controller
21	Glow pin short circuit	
30	Fan rotation speed is too high	A) Change controller
31	Broken circuit in the air motor	A) Check that the fan wheel is not rubbing B) Change the air motor C) Change controller
32	Short circuit in the air motor	
33	Fan rotation speed is too low	A) Check if the voltage of the heater is too low B) Check if the fan wheel is rubbing C) Change Controller
38	Matrix heater broken circuit	A) Check matrix heater motor
39	Matrix heater short circuit	
41	Water pump broken circuit	A) Check the water pipe for kinks and blockages B) Replace water pump
42	Water pump short circuit	
47	Fuel pump short circuit	A) Ensure the fuel pump lead is correctly installed B) Change fuel pump C) Change controller
48	Fuel Pump broken circuit	

Fault Code	Description	Troubleshooting
50	Starting Lock (see 13)	A) See 13
51	Temperature of the flame sensor is too high	A) Wait for flame sensor to cool and re-start B) Change flame sensor (normal temperature resistance >1Ω)
52	Flame out three times (See 13)	A) See 13
60	Temperature sensor broken circuit	A) Check temperature sensor (normal temperature resistance is about 10Ω) B) Change temperature sensor
61	Temperature sensor short circuit	
64	Flame sensor broken circuit	A) Check flame sensor (normal temperature resistance is about 0.8Ω) B) Change flame sensor
65	Flame sensor short circuited	
71	Overheat sensor broken circuit	A) Check overheat sensor
72	Overheat sensor short circuit	B) Change overheat sensor C) Change controller
99	Invalid fault information	A) Change controller
D3	Maintenance Reminder	A) Clean carbon build-up inside the heater