

MV Hydro 5-S



DIESEL POWERED

WATER HEATER

INSTRUCTION MANUAL

Ed 2.10

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5kW Water Heater

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Preface

Thank you for purchasing the MV Hydro 5 Water heater. This instruction book describes the structures, working principles, installation and operation of the MV Hydro 5. 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.



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Introduction

The MV Hydro 5 is a 5kW modulating diesel fired water heater, which is suitable for providing hot water for heating purposes via radiators or matrix heaters and also domestic hot water via a calorifier. The MV Hydro 5 is fully automatic in operation featuring low energy glow pin ignition and microprocessor control for full temperature regulation.

It has low servicing costs due to modular construction and its simple pre-made connections means easy installation. Simple 2 wire system thermostats can also be added into the installation if desired.

It can be applied to various heating purposes, whether its hot water heating for easier living or engine pre-heating and demisting.

For both vehicle and marine markets, the Hydro 5 is a great way to efficiently meet your heating needs.

This kit includes everything necessary for installation excluding plumbing to the radiators and calorifiers.

Technical Data

MV Hydro 5 TECHNICAL DATA	
Fuel	Diesel
Power Supply	DC12/24V
Heating Medium	Coolant
Thermal Power (W)	High power operation: 5000W Low power operation: 2400W
Fuel consumption (L/h)	High power operation: 0.62 Low power operation: 0.27
Power consumption (W)	<100 at starting 37 (High Power) - 10 (Low Power)
Working pressure (MPa)	0.25
Lowest working temperature	-40°C
Net weight (heater only)	4.8Kg
Mobile phone control (optional)	No limitation
Remote control (optional)	Without obstacles ≤800m
Starting temperature of matrix heater	45°C
Water pump flow rate (L/h)	25

Structure

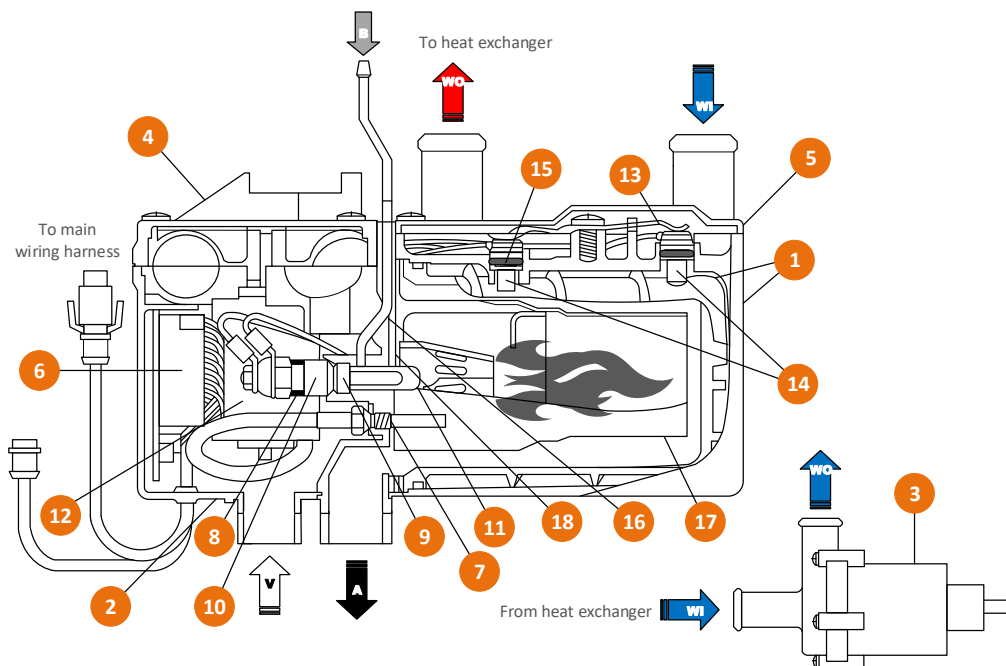


Figure 1

- | | |
|---|-------------------------------------|
| 1. Heat Exchanger Assembly | 2. Base Cover |
| 3. External Water Pump | 4. Fan Cover |
| 5. Top Cover | 6. E.C.U. |
| 7. Flame Sensor | 8. Holder |
| 9. Glow Pin | 10. Glow Pin Housing |
| 11. Glow Pin Screen and Seals | 12. Combustion Air Motor |
| 13. Leaf Spring | 14. Temperature and Overheat Sensor |
| 15. Temperature and Overheat Sensor O-Rings | 16. Combustion Chamber Gasket |
| 17. Combustion Chamber | 18. Combustion Chamber Seal |

V: Combustion Air Inlet

B: Fuel Inlet

WI: Water inlet

A: Exhaust outlet

WG: Water outlet

Working Principle

The main heater body consists of the heat exchanger assembly, the combustion chamber, glow pin and flame sensor etc., air motor and E.C.U.

The coolant flows through the water inlet pipe, around the furnace cavity between the heat exchanger inner casing and outer casing (or water jacket) and then exits out the outlet pipe, making a full loop of the circulation system.

The water pump constantly circulates the coolant around the system and is thus heated repeatedly in the furnace, ensuring a gentle rise in temperature.

The flame sensor is used to judge if the combustion chamber has been ignited and if it keeps burning after ignition.

The fuel pump draws fuel from the fuel tank and sends it to the combustion chamber where it mixes with combustion supporting air. The mixture then gets ignited by the glow pin. Fresh air is taken from outside the vehicle by the air inlet pipe, and is blown into the combustion chamber by the air motor. The exhaust then releases fumes safely outside of the vehicle.

The overheat sensor is used to measure the temperature of the heater's inner casing. The heater will shut down automatically if a fault is sensed, to prevent overheating. The most common causes are insufficient coolant in the furnace cavity, or the water pump has stopped circulating.

The controller (or E.C.U.) is powered by a single-chip microprocessor and monitors the workings of the heater. It constantly examines:

- The supplied power voltage and whether it meets the correct margins
- Any open or short circuit trouble with the glow pin, flame sensor, overheating sensor, etc.
- The glow pin conduction and duration times
- Measures the rotation speed of the combustion fan in different stages of operation
- The adjustment and feeding rate of fuel during different stages of operation
- The working conditions of the heater based on the flame sensor, overheat sensor, etc.
- Working conditions of the water and fuel pump
- When troubles arise; the heater will switch automatically and send out the relevant fault code to the timer control

After initial installation; the vehicle should be started to ensure a complete circulation.

Installation

Exploded Parts Diagram

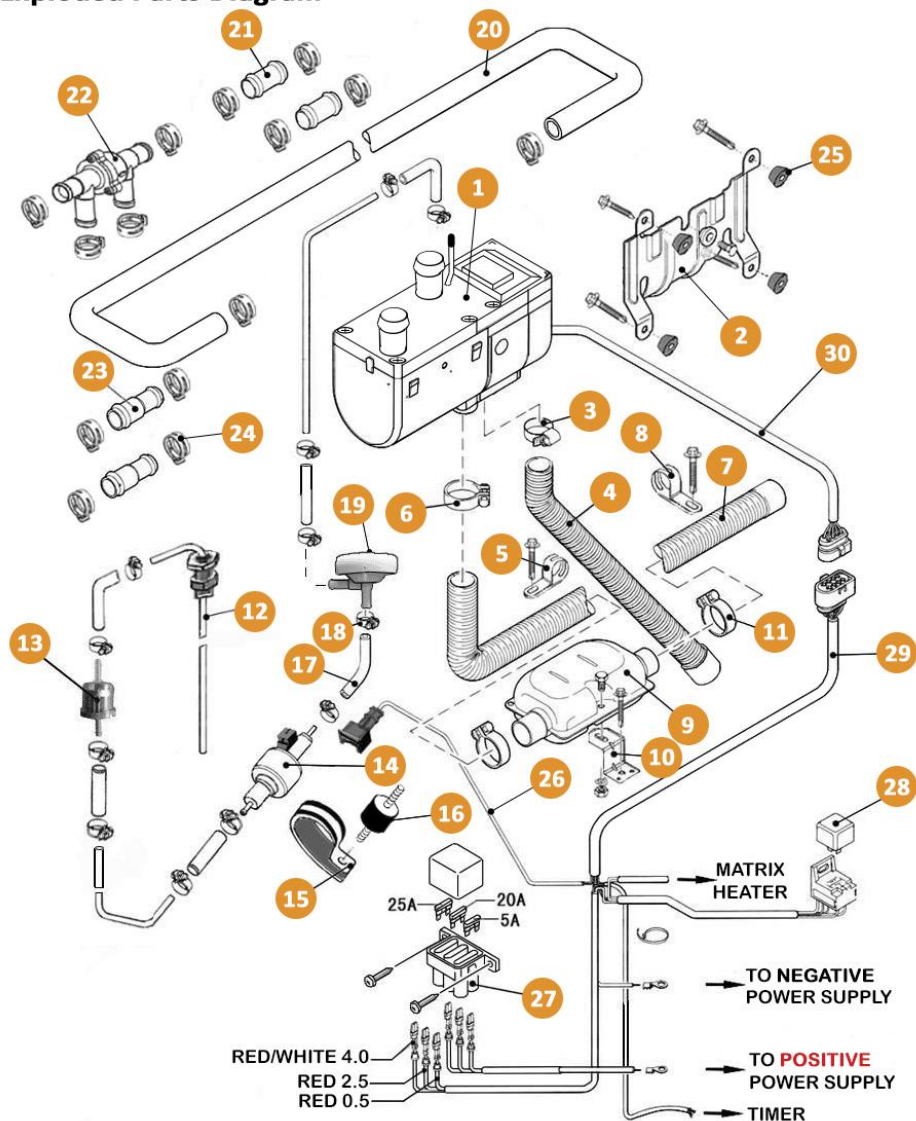


Figure II



- | | |
|--|--------------------------------------|
| 1. Hydro 5 Heater | 16. Anti-Vibration Mount |
| 2. Heater Mounting Bracket | 17. Rubber Fuel Connector |
| 3. Combustion Air Intake Clamp | 18. Fuel Line Connector Clamp |
| 4. 22mm Combustion Air Intake | 19. Fuel Damper (Optional) |
| 5. Combustion Air Fixing 'P' Clip | 20. Rubber Coolant Pipe |
| 6. Exhaust Clamp | 21. Coolant Pipe Connectors |
| 7. 24mm Exhaust - 1M* | 22. Bypass Valve** |
| 8. Exhaust 'P' Clip | 23. Reducing Pipe Connectors |
| 9. 24mm Exhaust Silencer* | 24. Coolant Pipe Clamps |
| 10. Exhaust Silencer Mounting Bracket | 25. Rubber Damper Mounts |
| 11. Exhaust Silencer Clamp* | 26. Fuel Pump Power Loom |
| 12. Fuel Standpipe | 27. Fuse Holder |
| 13. Inline Fuel Filter | 28. Matrix Heater Relay |
| 14. Fuel Pump | 29. Main Wiring Harness |
| 15. Fuel Pump Bracket | 30. Heater body Loom and Plug |

*Combined 2.3m stainless steel exhaust and silencer for marine applications

**Only supplied in vehicle applications

Do not install the heater anywhere near flammable sources, including the fuel tank, in closed spaces without ventilation or exposed in the proximity of people without a proper heat shield.

Dimensions

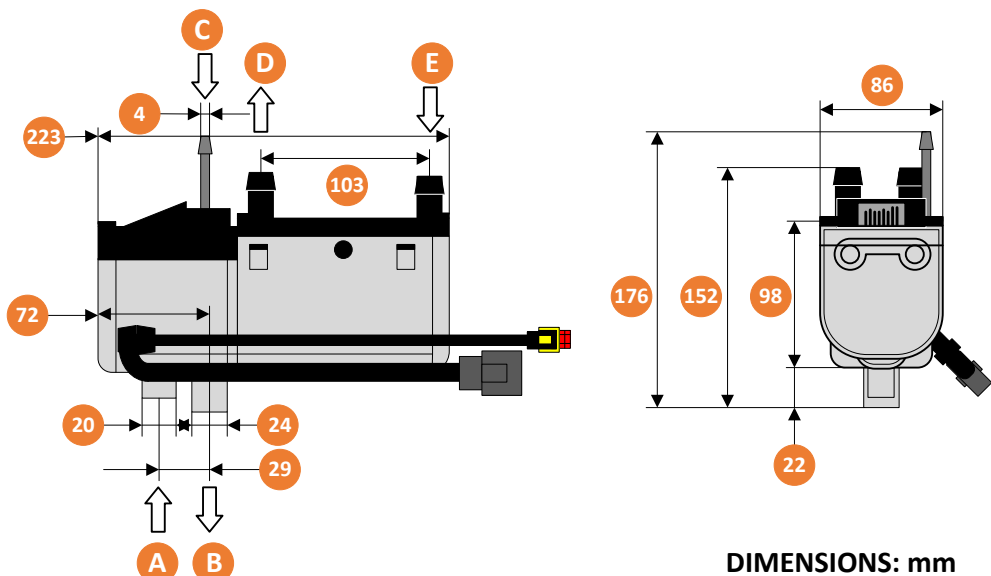


Figure III

The heater should ideally be installed in the engine room, but with ease of access for removal and servicing of the unit.

The main heater body is mounted onto a suitable surface with a bracket. Ensure it is lined up with all relevant holes in the correct position. Once it is in place the unit can be mounted to the bracket with the M6X10 bolt supplied in the kit.

Figure IV shows the maximum degree the heater can be installed at if an incline is required.

Installation Angle

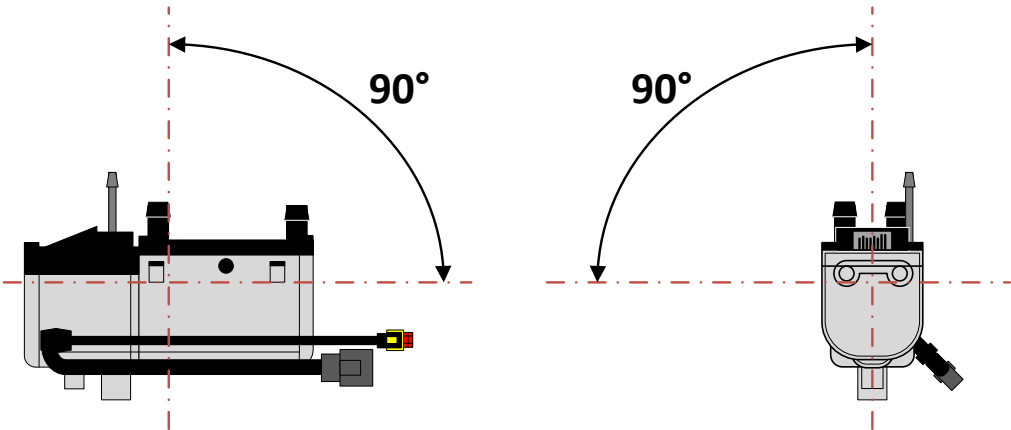
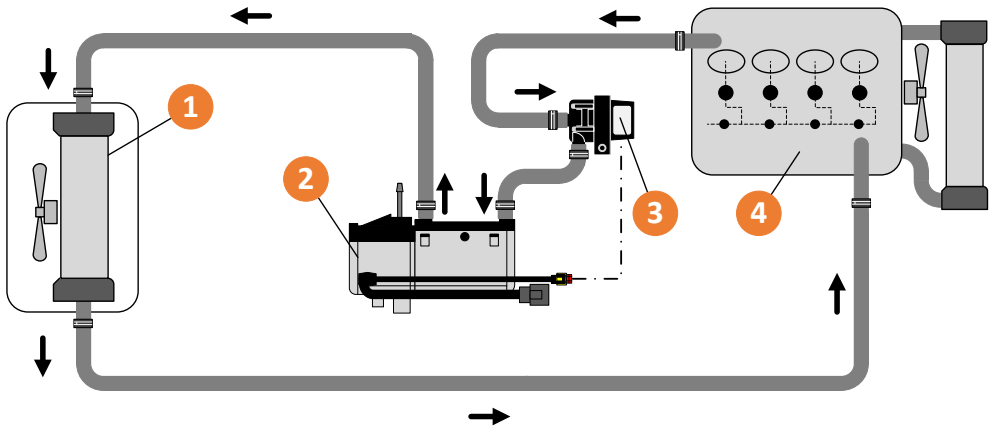


Figure IV

Coolant Circulation Diagrams



- | | |
|------------------------|---------------|
| 1. Matrix Heater | 2. The Heater |
| 3. External Water Pump | 4. Engine |

Figure V

Figure V shows the installation of the coolant circulation system in a marine or vehicle application, not using a bypass valve that plumbs into the engine. Figure VI shows the way to install the system in a vehicle, using the bypass valve.

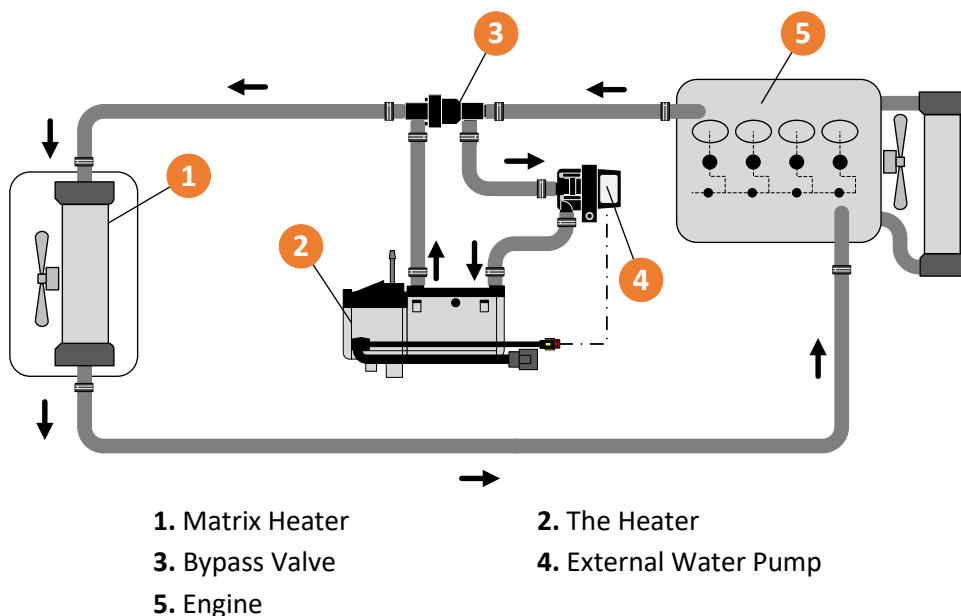


Figure VI

To bleed the system, simply loosen the outlet hose from the heater and begin the system. Any excess air should immediately circulate out of the system and the hose can be re-tightened.

During installation, any existing coolant in the system should be flushed out with clean water and then re-filled with new coolant.

Ensure you use the right coolant specified for your vehicle.

Gravity System in a Marine Installation

Figure VII

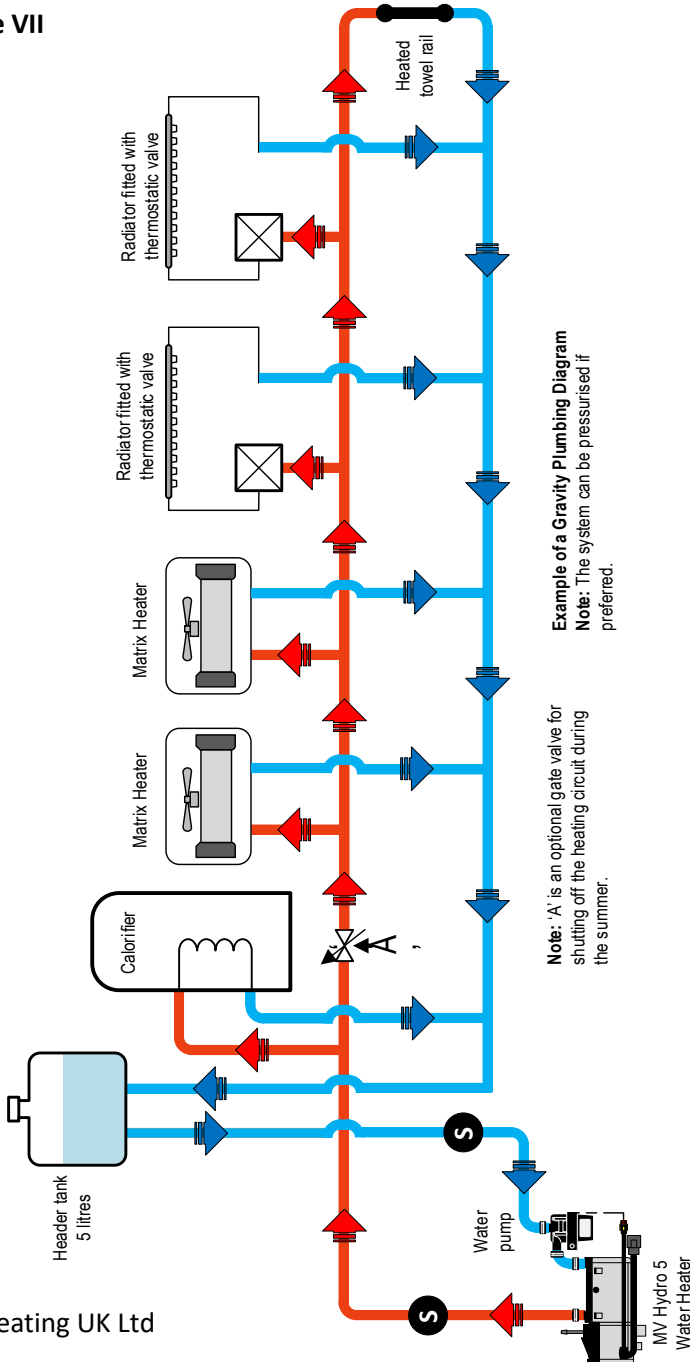


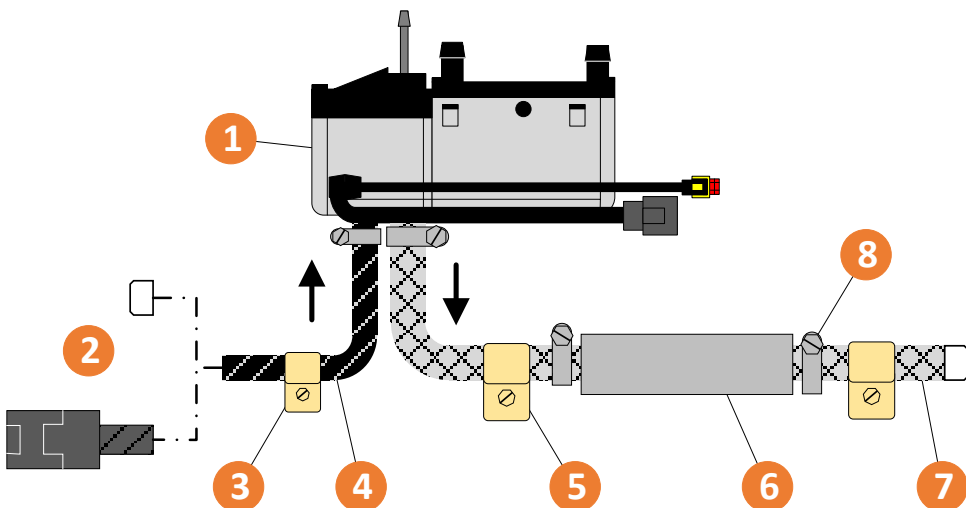
Figure VII shows a simple layout of how to install the Hydro 5 into a marine application using a gravity fed system.

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.

Air Intake and Exhaust Installation



- | | |
|------------------------------|-------------------------------|
| 1. Heater | 2. Air Silencer or End Cap |
| 3. P-Clip | 4. 20mm Combustion Air Intake |
| 5. Exhaust P-Clip | 6. Exhaust Silencer |
| 7. 24mm Exhaust with End Cap | 8. Exhaust Clamps* |

Figure VIII

Figure VIII shows the installation of the air intake and exhaust. Make sure you only use the appropriate pipes provided and use the clamps to secure them in position.

The air inlet pipe is used to bring in combustion supporting air into the furnace of the heater from outside of the vehicle and in the opposite direction of travel to ensure that the air is clean and doesn't clog up the pipe with dirt and dust.

*Not necessary when the silencer is built into the exhaust as part of a marine application for example.

Make sure that the exhaust and any other parts that become hot during the operation of the heater are away from anything damaged by a high heat like wires or plastics.

Also, please ensure that the exhaust **does not** exit in such a way that the fumes are re-circulated by the air inlet pipe or can be inhaled by anyone.

Mounting Bracket Dimensions

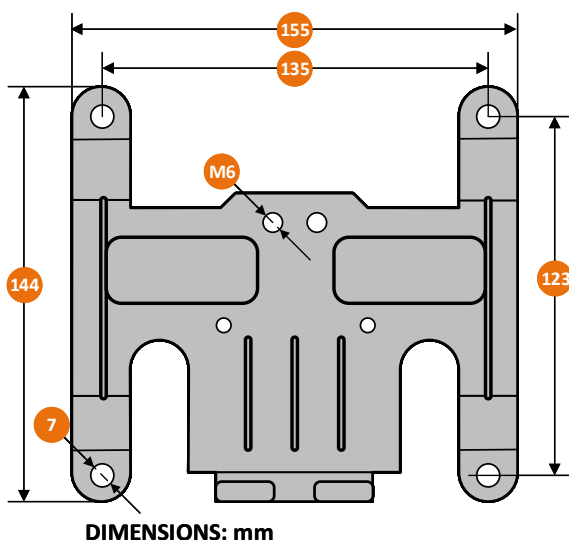


Figure IV

The mounting bracket is supplied in the installation kit, along with a 100mm M6 hex bolt, used to secure the heater in place to the bracket using one of the two M6 taps, located near the center of the bracket.

Fuel Lines

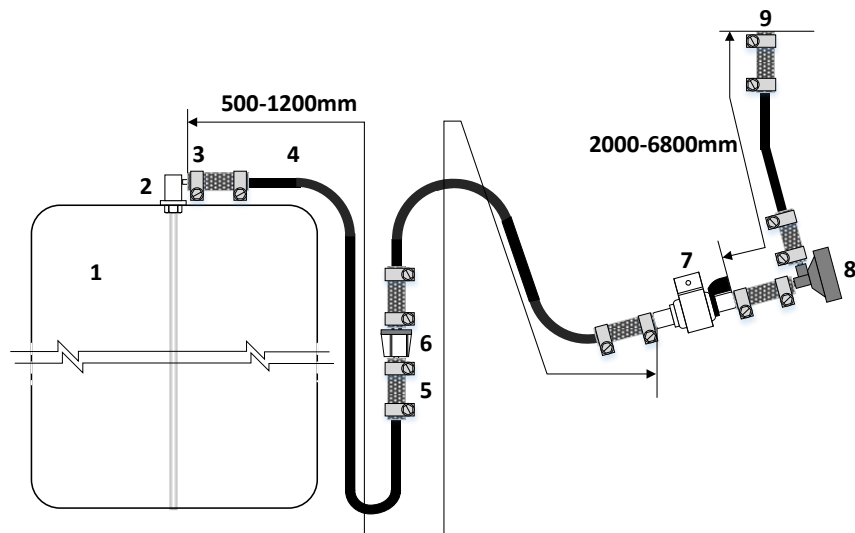


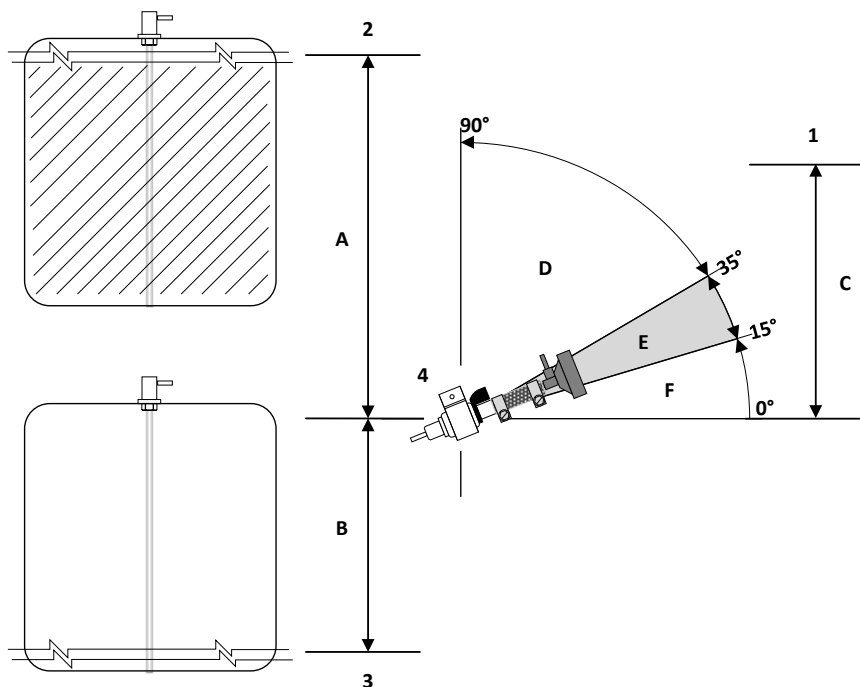
Figure X

- | | | |
|--------------|--------------------------|-------------------------|
| 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. Fuel Pump Damper | 9. 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
3. Min. Fuel Level

A. 3000mm

C. 2000m

E. Acceptable (between 15-90°)

2. Max. Fuel Level

4. Fuel Pump and damper

B. 500mm

D. Not acceptable

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

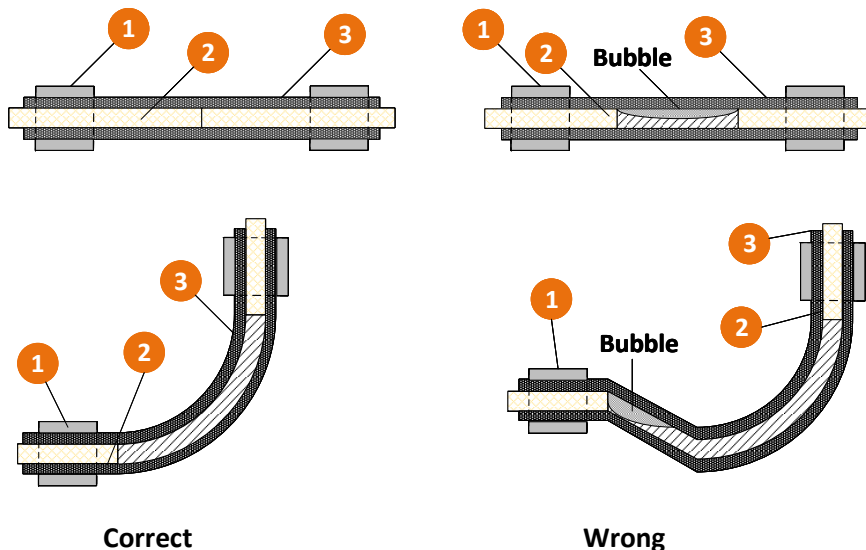
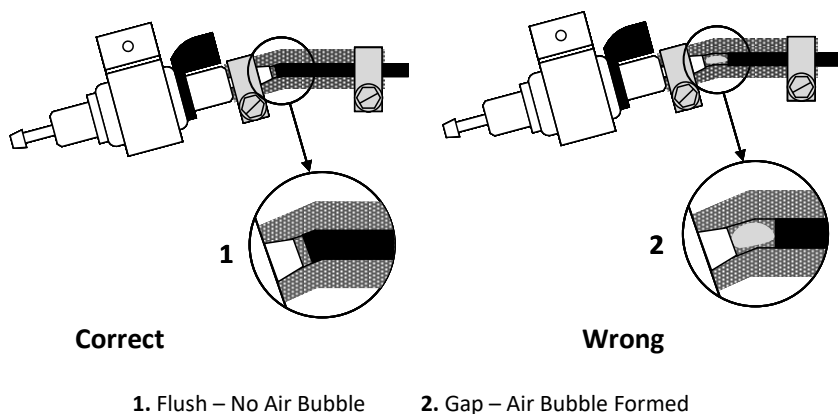


Figure XII

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.

**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

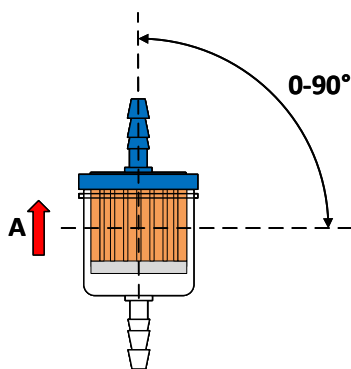


Figure XIV shows the allowable, installations angle of the fuel filter, as well as the direction of fuel flow (arrow A). The filter should be fitted between the vehicles tank and the fuel pump.

Figure XIV

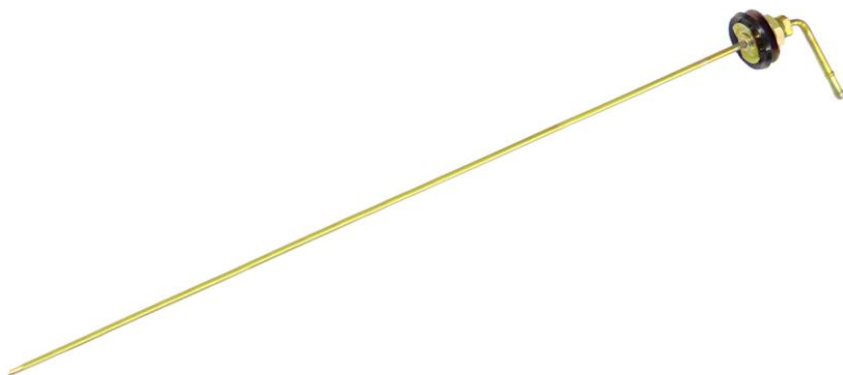
Fuel Standpipe

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 $\Phi 22 \pm 0.2\text{mm}$ 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

Standpipe 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 $\Phi 6 \pm 0.2\text{mm}$ 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.

Electric
Wiring Diagram

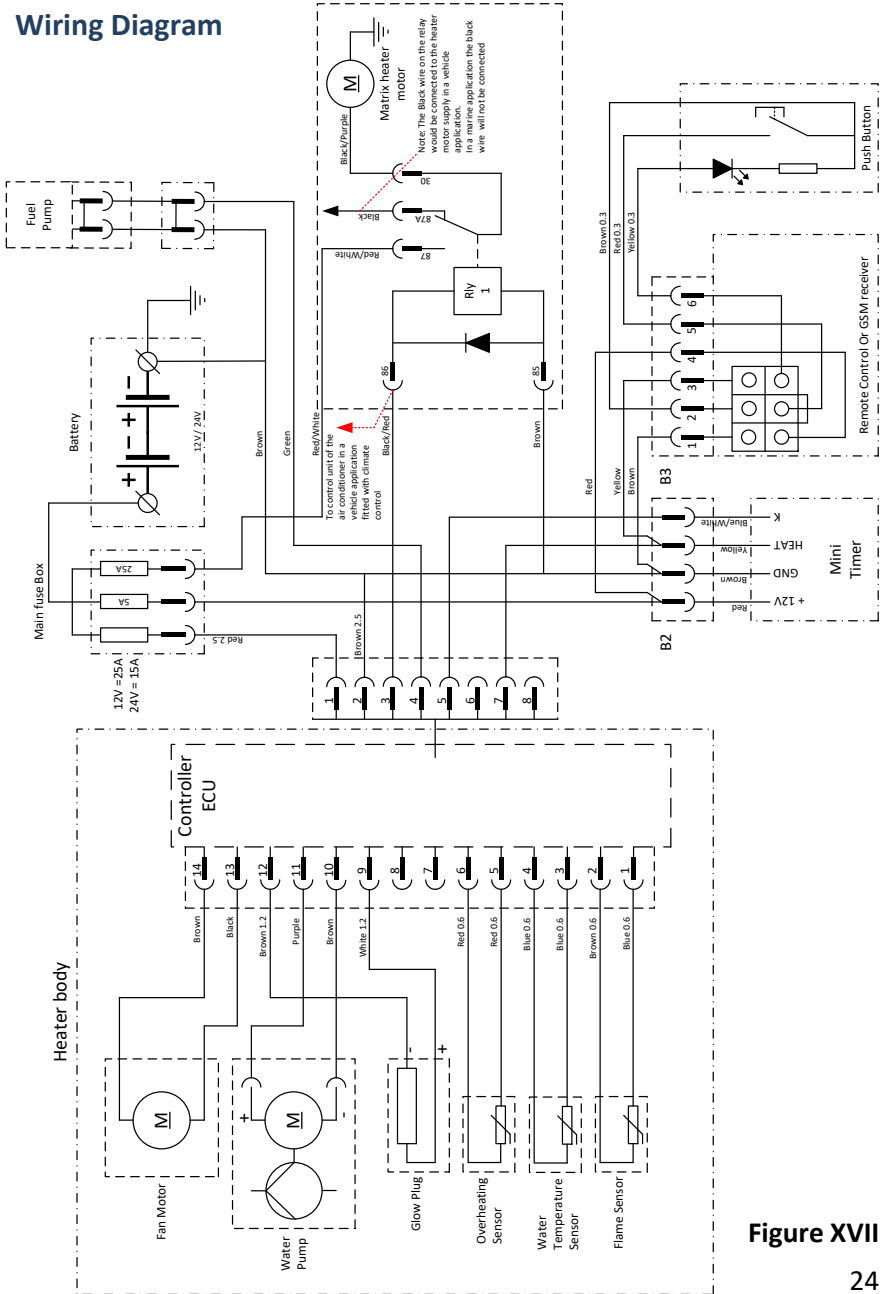


Figure XVII

Connections

The connections on the main wiring harness have all been pre-fitted so that only simple connections to the corresponding plugs need to be made.

The main connections on the heater are to the main wiring harness, and to the water pump. The connections on the wiring harness are for the timer control, to the fuel pump, and to the remote control (if one is installed, otherwise it can be left unplugged), and to the main heater itself. The remaining wires are installed as follows:

Attach the positive line (4mm² red) to the positive terminal of the vehicle's battery and the negative (2.5mm² brown) to the negative terminal.

The black wire (4mm²) of the matrix heater's relay should be connected to the vehicle's fuse box, and the black/purple wire (4mm²) should be connected to the positive terminal of the matrix heater.

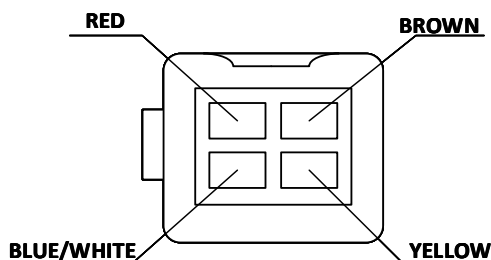
All electrical components of the heater should join to the main wiring harness according to the corresponding connections. The only plug that can be left unattached is the remote control port (red, brown, and yellow) as it is an optional extra.

Note: All terminals should be connected, even if not in use to prevent short circuiting. And when fitting the electrics, make sure any exposed wiring outside of the vehicle are well protected from damage or heat.

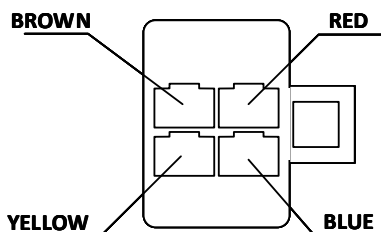
Timer Connections

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



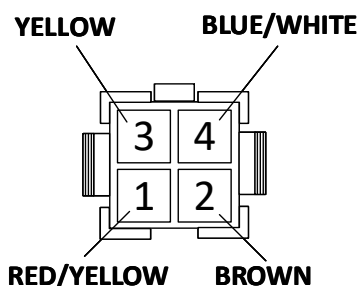
From Wiring Harness



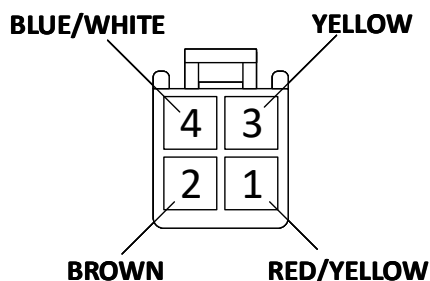
From Mini Timer

Figure XVIII

LCD Digital Timer



From LCD Digital Timer

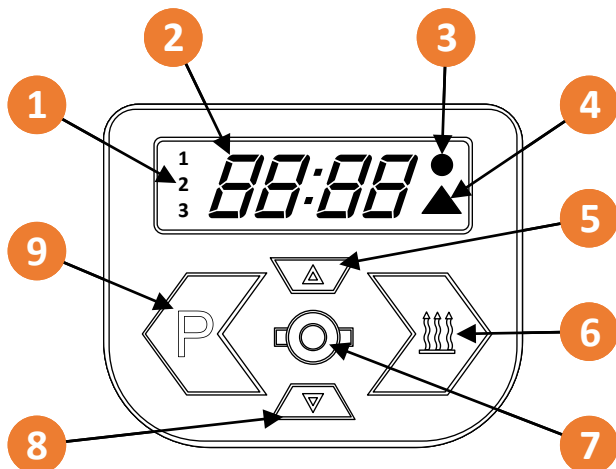


From Wiring Harness

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 XIX

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.

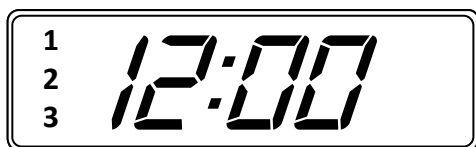
To move onto the 2nd and 3rd power-on times, simply press the 'P' button after the confirmation dot has appeared and repeat the process for the 2nd power-on time and again for the third. Making sure to press the heating button to confirm the selection every time. Once the 3rd time has been confirmed,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

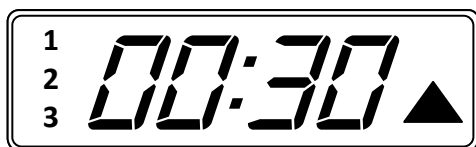
Pressing the 'P' button for the final time will complete the set-up and the screen will display:



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

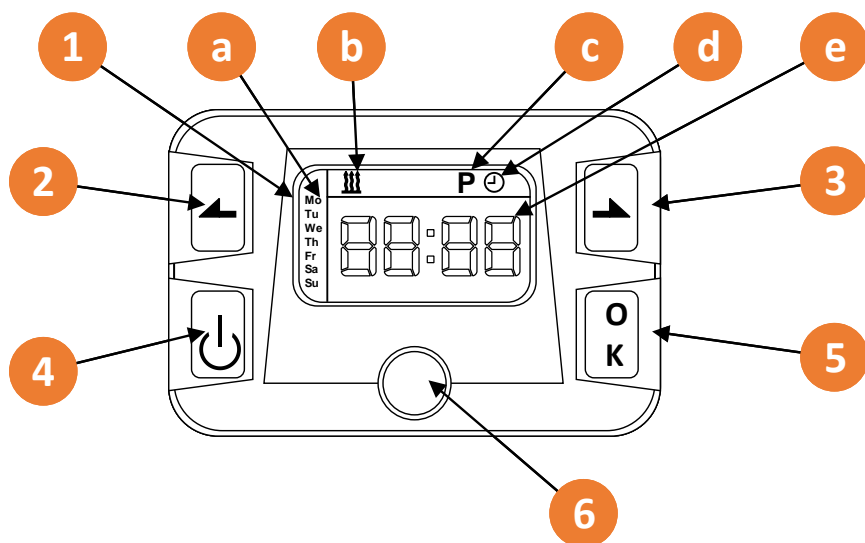


Figure XX

- | | |
|-----------------------|-----------------------|
| 1. LCD Screen | a. Days of the week |
| 2. Left Arrow Button | b. Heating Symbol |
| 3. Right Arrow Button | c. 'P' (Timer) Symbol |
| 4. Power/Back Button | d. Clock Symbol |
| 5. OK Button | e. Clock Face |
| 6. Fixing Screw Hole | |

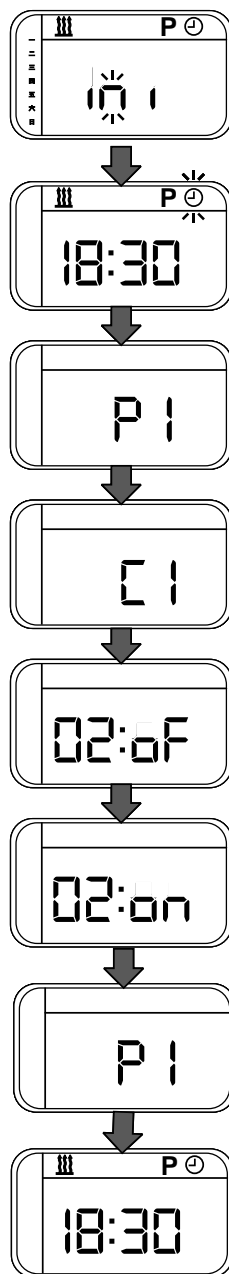
Functions:

- 7 day timer, programmable up to 3 times daily
- Simple on/off countdown timer
- Initial fuel priming feature

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.

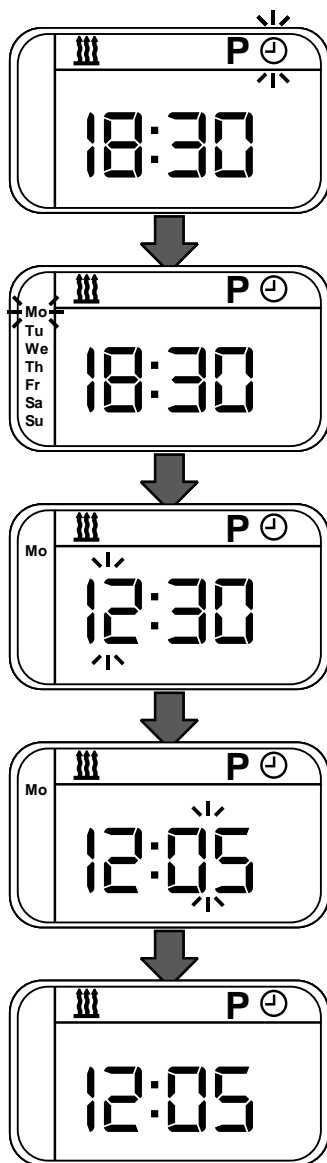
1. Turn on the control with the power button. Wait for the symbols to stop flashing, then press the power button again.
2. Navigate to the clock face symbol at the top of the control by using the arrow keys. When it is flashing press both arrow keys simultaneously.
3. P1 now appears.
4. Press ok and 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

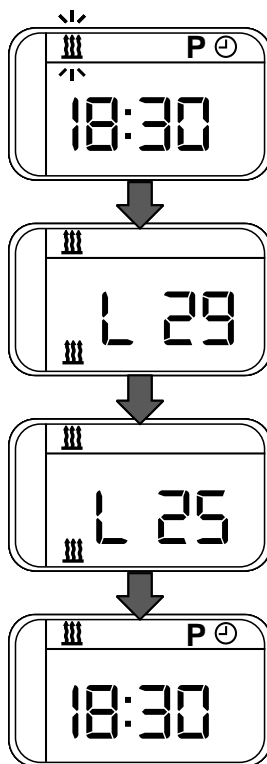
1. To change the date and time, navigate to the clock face symbol and press ok.
2. Select the day of the week it is first using the arrow keys, and pressing ok to confirm.
3. Select the hour using the arrow keys, and pressing ok to confirm.
4. Finally, select the minutes in the same way.
5. Once completed, 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

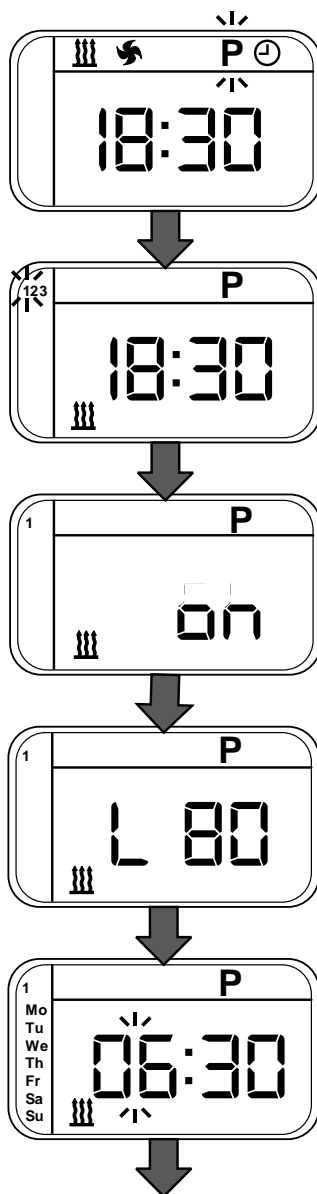
1. To switch the power on manually, navigate to the heating icon, and press ok
2. The heater will start automatically, with a countdown display.
3. The timer will then visibly run down on the display until it reaches zero and switches itself off. More minutes can be added, or subtracted at any time during operation of the heater, by pressing or holding the arrow keys. 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.

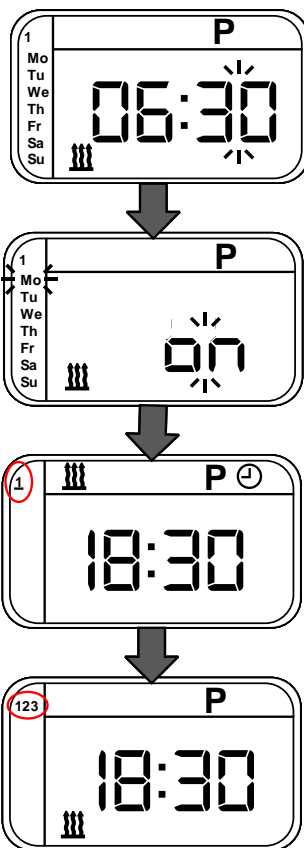


6. Select the minutes in the same way, and press OK to confirm.

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.



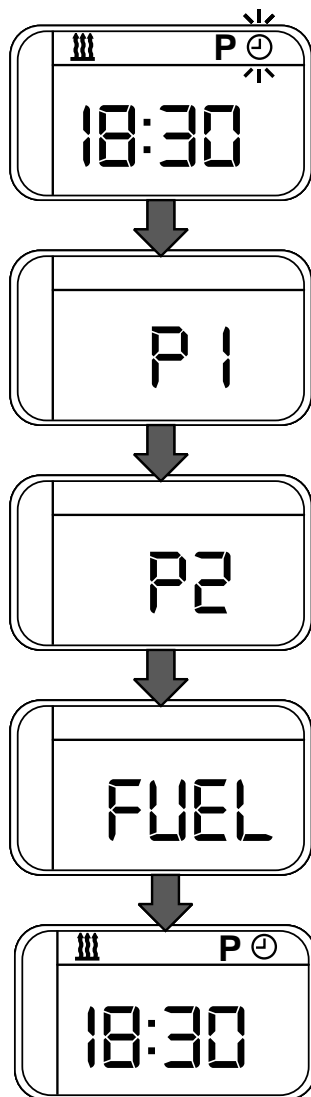
NOTE: To turn any of the preset times off without altering the set times, simply go through to step 3 and select 'OFF' using the arrow keys. Then repeatedly press OK until you have returned to the home screen.

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.

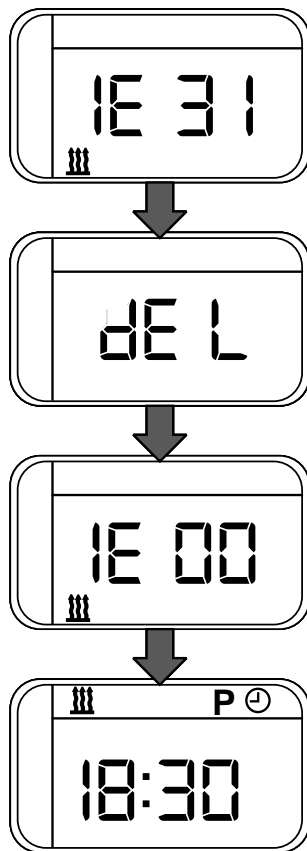
1. To enter the fuel priming mode, navigate to the clock face using the arrow keys and press both arrow keys simultaneously.
2. P1 should appear on the screen.
3. Select P2 by pressing any arrow key, and confirm with OK.
4. The fuel pump will begin to rapidly pump the fuel.
5. It will automatically shut down after three minutes, or press any key to stop the pumping at any time, and return to the home screen.



Checking Error Codes

If the heater has stopped running, you will need to follow these steps to view the fault information.

1. Check the error by pressing both the arrow keys together. 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 'IE 00' then no errors have been found.
4. Press OK or power to return.



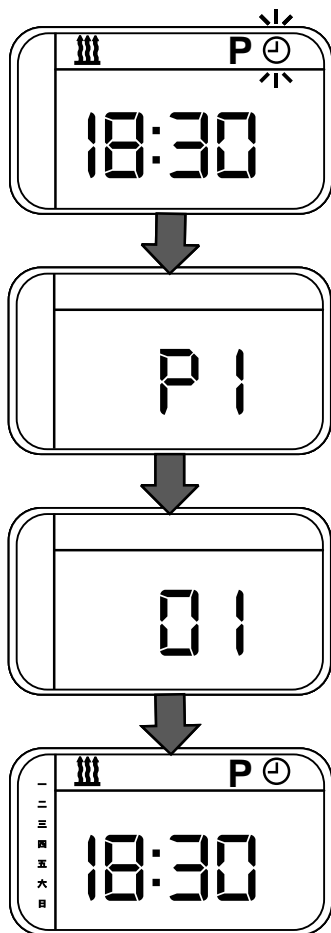
Resetting Digital Controller to Factory Settings

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

2. P1 should appear 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 circuit 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 too high <15 (12V) >29 (24V)	A) Check Voltage at the battery B) Check Voltage at the heater
11	Voltage too 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 whether the fuel pipe is blocked B) Check if the air inlet or exhaust outlet is blocked C) Check whether the fuel tank has enough fuel for the standpipe to pick up
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
48	Fuel Pump broken circuit	B) Change fuel pump C) Change controller
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)
61	Temperature sensor short circuit	B) Change temperature sensor
64	Flame sensor broken circuit	A) Check flame sensor (normal temperature resistance is about 0.8Ω)
65	Flame sensor short circuited	B) Change flame sensor
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



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