PARKING HEATER PRODUCTS®

# PH52W ENGINE HEATER

- Technical Description
- Installation Instructions
- Operating Instructions
- Troubleshooting and Parts

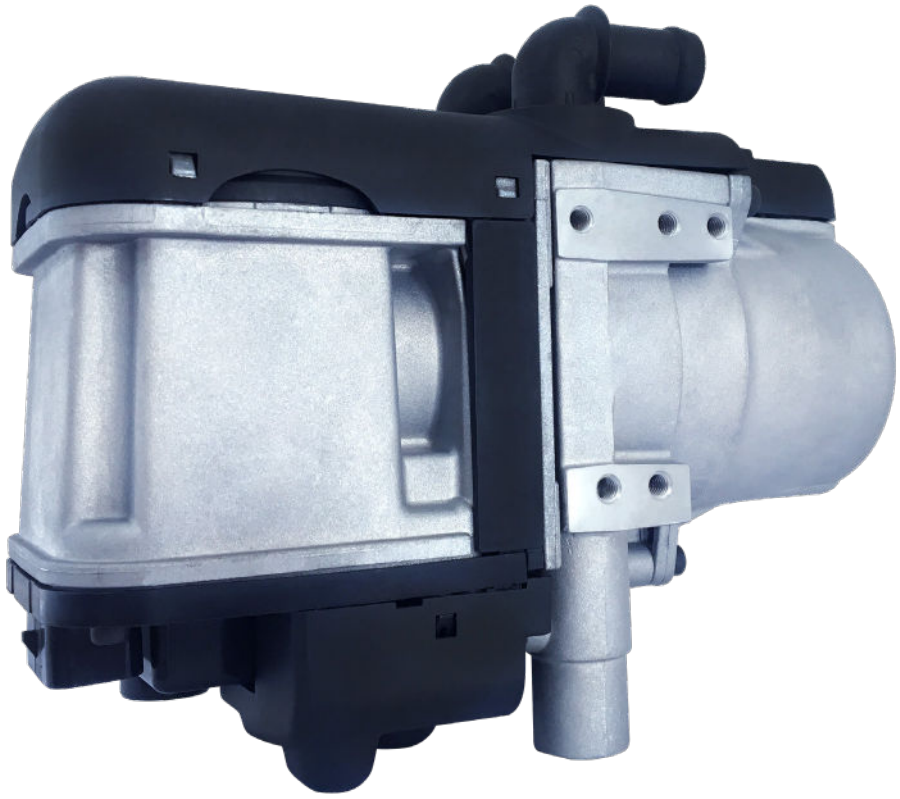
# Table of Contents

# Introduction

Thank you for purchasing our PH52W heater kit.

The PH52W heater is designed to preheat your engine by using on-board diesel fuel and battery systems. Operation is simple and the heater provides a safe and reliable alternative to cold engine starting or need for electrical plug ins.

Please take a moment to familiarize yourself with this manual, safety warnings and heater requirements before installing or operating your heater.



# Heater Warnings

## Special Notes

**Note:** Highlight areas requiring special attention or clarification.

### Caution

Indicates that personal injury or damage to equipment may occur unless specific guidelines are followed.

### Warning

Indicates that serious or fatal injury may result if specific guidelines are not followed.

### ⚠ Warning - Installation Hazards

- The installation of this kit requires trained decision-making concerning locating and integrating components, tying components together, rerouting, or relocating OEM components, etc.
- It is impossible to describe all of the safety and operational considerations in the installation instructions. Therefore, the technician must exercise professional judgment to achieve a safe and quality installation.
- Read and understand this manual before attempting to install the heater.
- Failure to follow all these instructions could cause serious or fatal injury.

### ⚠ Warning - Explosion Hazards

- Heater must be turned off while re-fueling.
- Do not install heater in enclosed areas where combustible fumes may be present.

### ⚠ Warning - Fire Hazards

- Exhaust pipe must maintain a minimum a distance of 50mm (2") from any flammable or heat sensitive material.
- Ensure there are no leaks in the fuel system.

### ⚠ Warning - Asphyxiation Hazards

- Ensure that exhaust fumes cannot enter passenger compartments.

### ⚠ Warning - Burn Hazards

- Ensure a proper mixture of water and antifreeze to prevent coolant from Freezing.
- Ensure that the coolant flow can never be blocked while heater is in operation.
- Blocking coolant flow can result in extreme pressure, bursting hoses and release of scalding coolant.

### Caution - Operational Considerations

**Bio-Diesel**

This heater is not designed for use with straight bio-diesel (Blends of bio-diesel up to 10% are acceptable)
Operating outside of these conditions may plug the heater with soot and result in combustion failure.

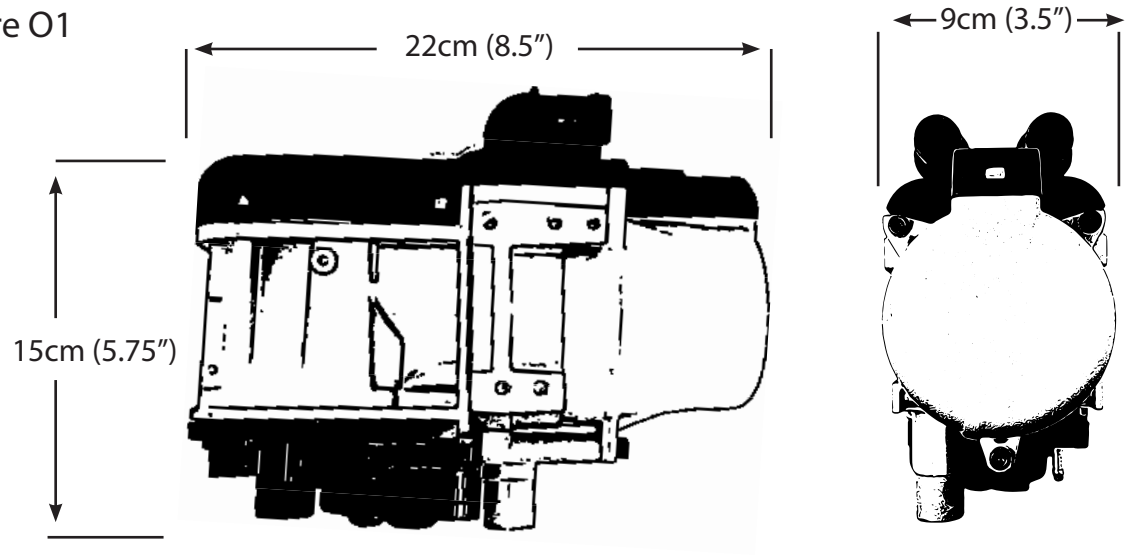
**High Altitudes**

This heater is not designed to operate continuously at altitudes above 1500 meters (4920').
Operating in these conditions may plug the heater with soot and result in combustion failure.

# Specifications

## Principal Dimensions

*Figure O1




| Performance Specifications | |
|---|---|
| Heating Mode | High |
| Heating Capacity kW/hr (BTUs/hr) | 5.0 (17,060) |
| Fuel Consumption L/hr (US Gal/hr) | 0.6 (0.16) |
| Power Consumption - WATT | 56 |
| Power Consumption In Standby - WATT | 27 |
| Start-up Power Consumption - WATT | < 135 |
| Min. Coolant Through-put L/hr (US Gal/hr) | 250 (66) |
| Fuel Type | Diesel |
| Nominal Voltage | 12 Volt |
| Lower Voltage Limit | 10.5 / 21.0 Volts over 20 seconds |
| Upper Voltage Limit | 16.0 / 32.0 Volt over 20 seconds |
| Overheat Protection | 115° C (239° F) |
| Allowed Ambient Temperature | -40° C to 80° C (-40° F to 176° F) |
| Weight | 2.5 kg (5.5 lbs) |

Above Specifications (± 10%)

# Heater Kit List

**Description**

5 kW Engine Heater Boxed Version

**Note:** Contents of the kit will vary for Boxed Version. Kit list is based on Universal Kit Version.

| QTY | Description | Part Number |
|---|---|---|
| 1 | 5 kW Engine Heater | P52W-T802 |

| QTY | Description | Part Number |
|---|---|---|
| 1 | Operating Switch | P52W-X303 |
| 1 | 2 Sided Mounting Tape | NPN |

| QTY | Description | Part Number |
|---|---|---|
| 1 | Mounting Bracket | P52W-X701 |

| QTY | Description | Part Number |
|---|---|---|
| 1 | Wiring Harness<br>5M (16') Power Harness, 20A Fuse<br>5M (16') Fuel Pump Harness<br>7.5M (25') Switch Harness, 5A Fuse<br>0.3M (12") Coolant Pump Harness | P52W-T301 |

| QTY | Description | Part Number |
|---|---|---|
| 1 | Flexible Stainless Steel Exhaust, 0.6M x 22mm | U65D-X519 |
| 1 | Combustion Air Intake Tube, 0.6M x 22mm | U65D-X522 |
| 2 | "P" Clamp | NPN |
| 1 | 24 – 26 mm Exhaust Clamp | U65D-X502 |
| 1 | 24 – 26 mm Combustion Air Hose Clamp | NPN |

| QTY | Description | Part Number |
|---|---|---|
| 1 | Coolant Pump | P52W-T601 |

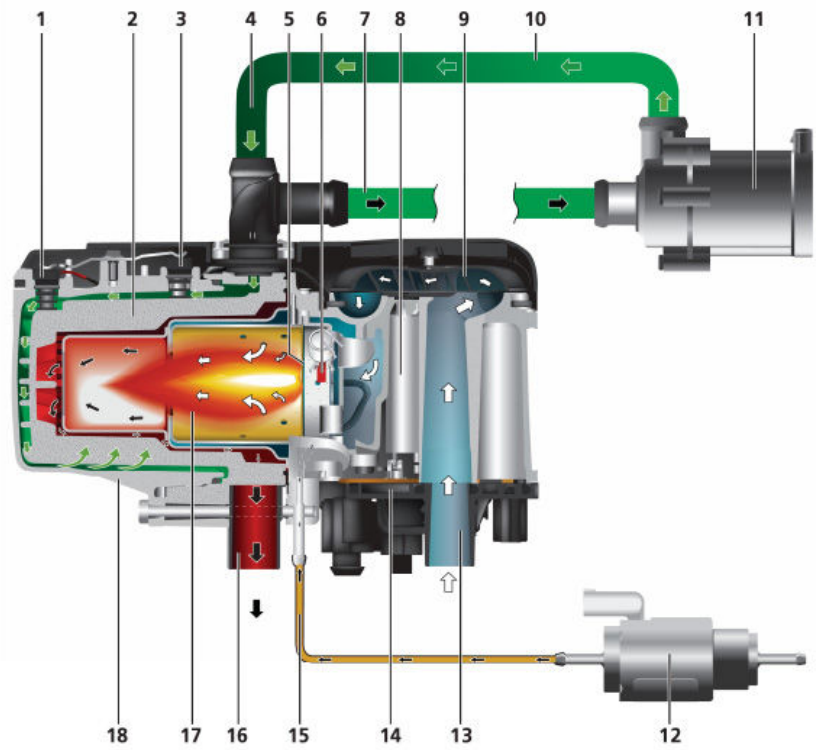
# Heater Kit List

| QTY | Description | Part Number |
|---|---|---|
| 1 | Fuel Pickup Tube & Fuel Tube Hardware Kit<br>- Compression Fitting<br>- Large Flat Washer<br>- Small Flat Washer<br>- Large Rubber Gasket<br>- Large Hex Nut<br>- Brass Hex Nut<br>- Brass Securing Body | U65D-X405 |
| 1 | Fuel Metering Pump | P52W-T401 |
| 1 | Fuel Pump Holder | U65D-X407 |
| 1 | Black Rubber Fuel Line, 0.3M (12") 7mm ID | U65D-X414 |
| 4 | 5mm x 50mm Fuel Line Connectors | U65D-X409 |
| 1 | "Z" Mounting Bracket | U65D-X704 |
| 1 | Clear Plastic Fuel Line, 5M (16') 1.5 mm ID | U65D-X403 |
| 12 | Small Fuel Line Clamps, 9-11 mm | U65D-X401 |

| QTY | Description | Part Number |
|---|---|---|
| 1 | "Z" Mounting Bracket | U65D-X704 |
| 2 | "L" Brackets | U65D-X706 |
| 4 | M6 x 15 Screws | NPN |
| 6 | M6 x 25 Screws | NPN |
| 6 | M6 Hex Nuts | NPN |
| 4 | M6 Flat Washers | NPN |
| 2 | #8 Self Drilling Screws | NPN |
| 11 | 6mm Lock Washers | NPN |

# Main Components and Operating Concept

*Figure O2




1. Overheat Sensor
2. Heat Exchanger
3. Temperature Sensor
4. Coolant Inlet
5. Atomizer
6. Glow Pin / Flame Sensor
7. Coolant Outlet
8. Blower Motor
9. Combustion Air Blower
10. Return Coolant
11. Coolant Pump
12. Fuel Metering Pump
13. Combustion Air Inlet
14. ECU
15. Fuel Inlet
16. Exhaust Outlet
17. Flame Tube
18. Heat Exchanger

**Main parts of PH52W Engine Heaters**

Here is a basic overview of the operation of the heater.

- Fuel is delivered to the heater via the heater's fuel pump.
- Combustion air is delivered to the heater via the heaters 12v combustion air blower.
- Fuel is atomized and the fuel / air mixture is ignited using a glow pin.
- The flame is contained in a flame tube and exhaust gases expelled.
- The heater's coolant pump takes cold coolant from the engine, circulates it through the heater's water jacket, then it pumps hot coolant back to the engine.

# Heater Mounting

**Mounting Considerations**:
- Protect from road spray
- Mount below engine coolant level to avoid air blockage.
- Keep coolant hoses short to maximize flow and minimize heat loss.
- Keep power wiring short to minimize voltage drop.
- Keep fuel lines short to ensure good combustion.

**Suggested Locations**:
- Step box
- External storage compartments (Not inside cab)
- Inside frame rail
- Inside engine compartment

**Note**: PHP boxed version can be used to simplify your installation and protect your investment.


# Heater Mounting

## Warning - Asphyxiation Hazard

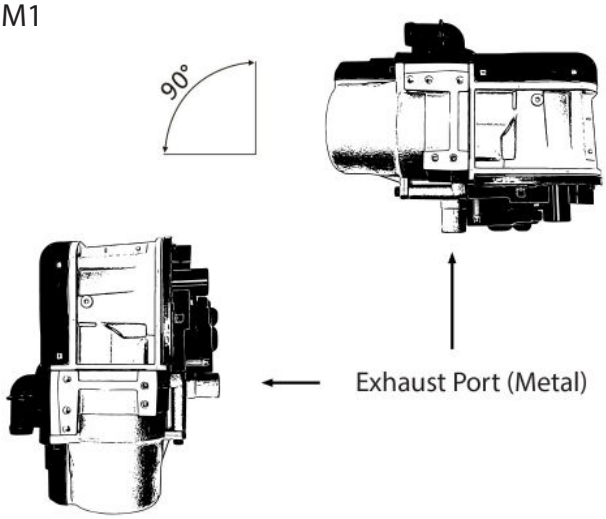
Do not mount the heater inside passenger compartments where poisonous exhaust fumes may be inhaled.

## Caution

Guard the heater against excessive road spray to minimize corrosion and avoid ingestion of debris.

**Mounting**:
Mount the heater using the mounting bracket provided with the installation kit.
Provide shielding as required to protect the heater from environmental conditions.
Orientate the heater within permissible mounting configurations shown in Figure M1.

*Figure M1



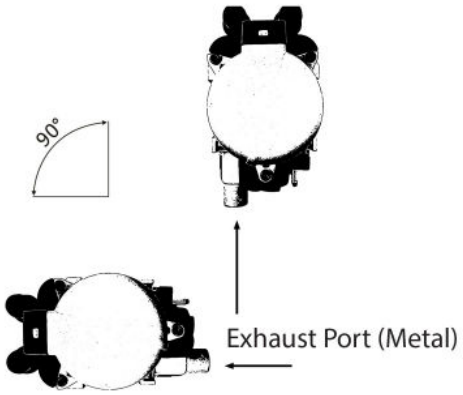




*Figure M2

Heater Mounting Bracket

*Figure M3

PHP Boxed Version

# Exhaust & Combustion Air Intake Connections

The combustion air intake channels clean air into the heater. It can be eliminated if not required to ensure clean air intake.

The exhaust tube channels exhaust safely away from the heater and vehicle. It also assists in providing a required amount of back pressure required to balance the combustion process.

**Exhaust Considerations:**

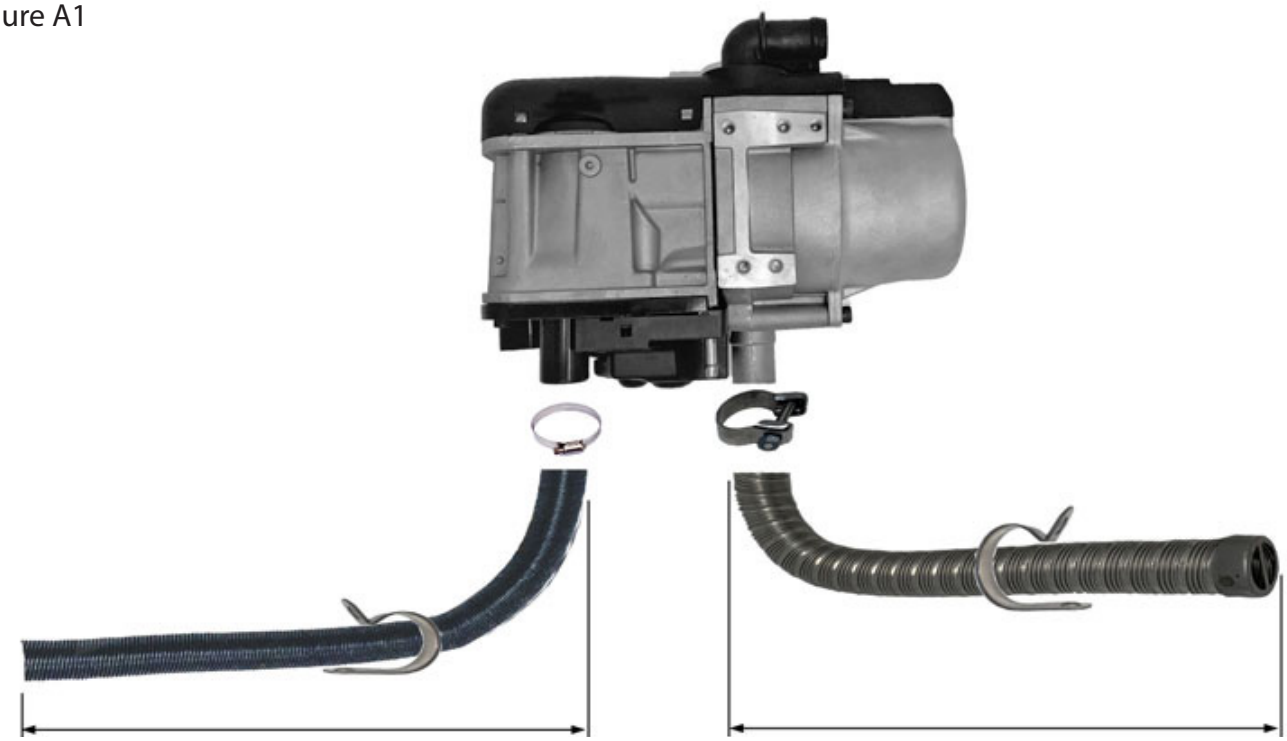
- The exhaust is made using a heat resistant, 22mm flexible, stainless steel tube.
- Secure the exhaust tube to the heater using the exhaust clamp provided.
- Discharge exhaust away from passenger compartment.
- Ensure exhaust fumes cannot be sucked into combustion air intake.
- Install exhaust pipe with incline for moisture run off.
- Drill a small drain hole at low point if proper incline cannot be maintained.
- Route the exhaust pipe from the heater using "p" clamps provided.
- Route away from the vehicle slip stream.

**Combustion Air Intake Considerations:**

- The combustion air intake is made from a flexible, water resistant, paper / aluminum compound.
- Secure the combustion air intake tube to the heater using the clamp provided.
- Draw air from a clean air source away from water, dust and exhaust.
- The combustion air opening must be kept free at all times.
- Install combustion air intake tube with an incline for moisture run off.
- Route the combustion air intake using "p" clamps provided.
- Route away from the vehicle slip stream.

# Exhaust & Combustion Air Intake Connections

*Figure A1



**Combustion Air Intake**
**Max. 1M (3')**

**Exhaust**
**Min. 0.2M (8")** **Max. 2M (6')**

## Warning - Fire Hazard

The exhaust is hot, keep a minimum of 5 cm (2") clearance from any heat sensitive material.

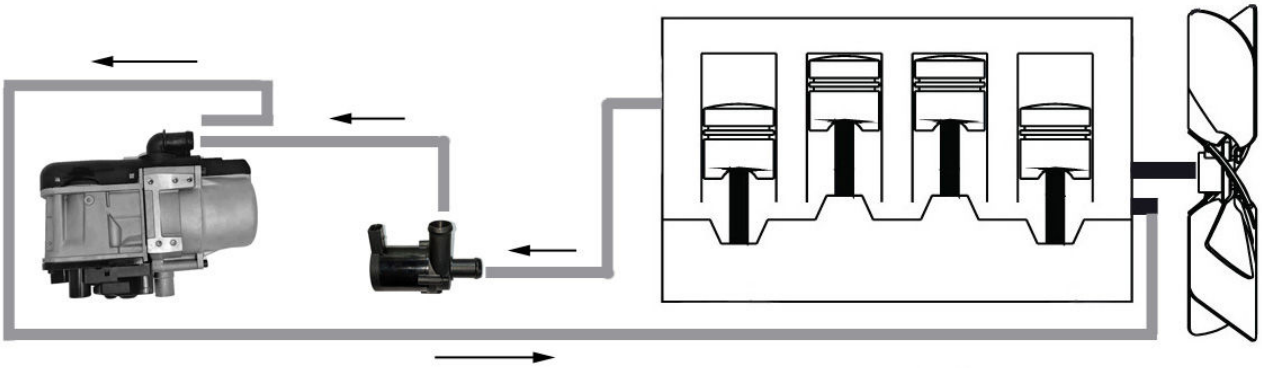
## Warning - Asphyxiation Hazard

Route exhaust beyond the skirt of the cab and outside of the frame area.
Failure to comply with this warning could result in Carbon Monoxide Poisoning.

# Heater Plumbing

Understand that connecting your heater to the engine makes it an integral part of the engine's cooling system. It is impossible to describe all of the safety and operational considerations in these installation instructions. Therefore, the technician must exercise professional judgment to achieve a safe and quality installation. It is important to try to optimize the coolant flow to get the best heat distribution and heater operation.

*Figure P1

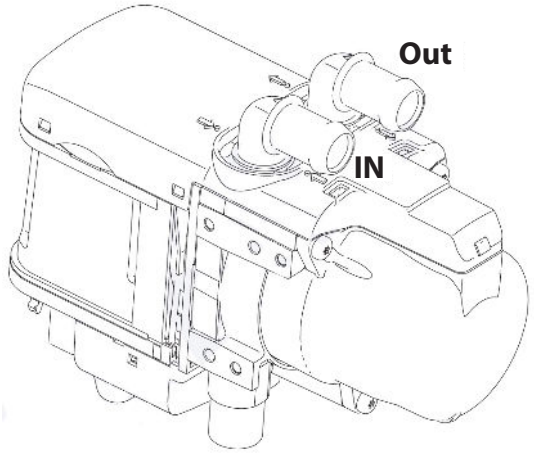


**Installation Procedure:**

- Plan the heater plumbing circuit.
- Install the coolant pump in a protected location close to the heater (Note: Pump is pre-installed in the boxed version)
- Install fittings, valves and run hoses as required.
- Bleed the air out of the system (Run engine to help circulate coolant).
- Top up coolant as required.
- Test the heater to ensure proper flow.

# Heater Plumbing

*Figure P2




**Follow these guidelines and considerations:**

- There are a few plumbing accessories included with the kit (Connectors and molded hoses)
- Use 3/4" hoses to optimize coolant flow.
- Keep the pick up and return points as far apart as possible.
- Take coolant from a high pressure point of the engine (ie. back of block)
- Return coolant to a low pressure point of the engine (ie. engine's coolant pump).
- Use ball valves to isolated the system when not in use.
- Take the coolant from a low point on the engine to minimize aeration.
- Mount heater and coolant pump low to allow the purging of air.
- Consider using insulation around the hoses.
- A heat exchange can be incorporated into the system. However, ensure that the heater flow can never be completely blocked by a flow control valve.

## Warning - Burn & Explosion Hazards

- Do not work on the plumbing system when it is hot or under pressure.
- Do not work on the heater or plumbing system when the heater or engine are in operation.
- Always wear safety gloves and appropriate eye protection.
- Ensure system has pressure relief protection limiting maximum system pressure to 15 PSI (1 bar).
- Coolant flow must never be blocked during heater operation (ie. flow control valves).

## Caution

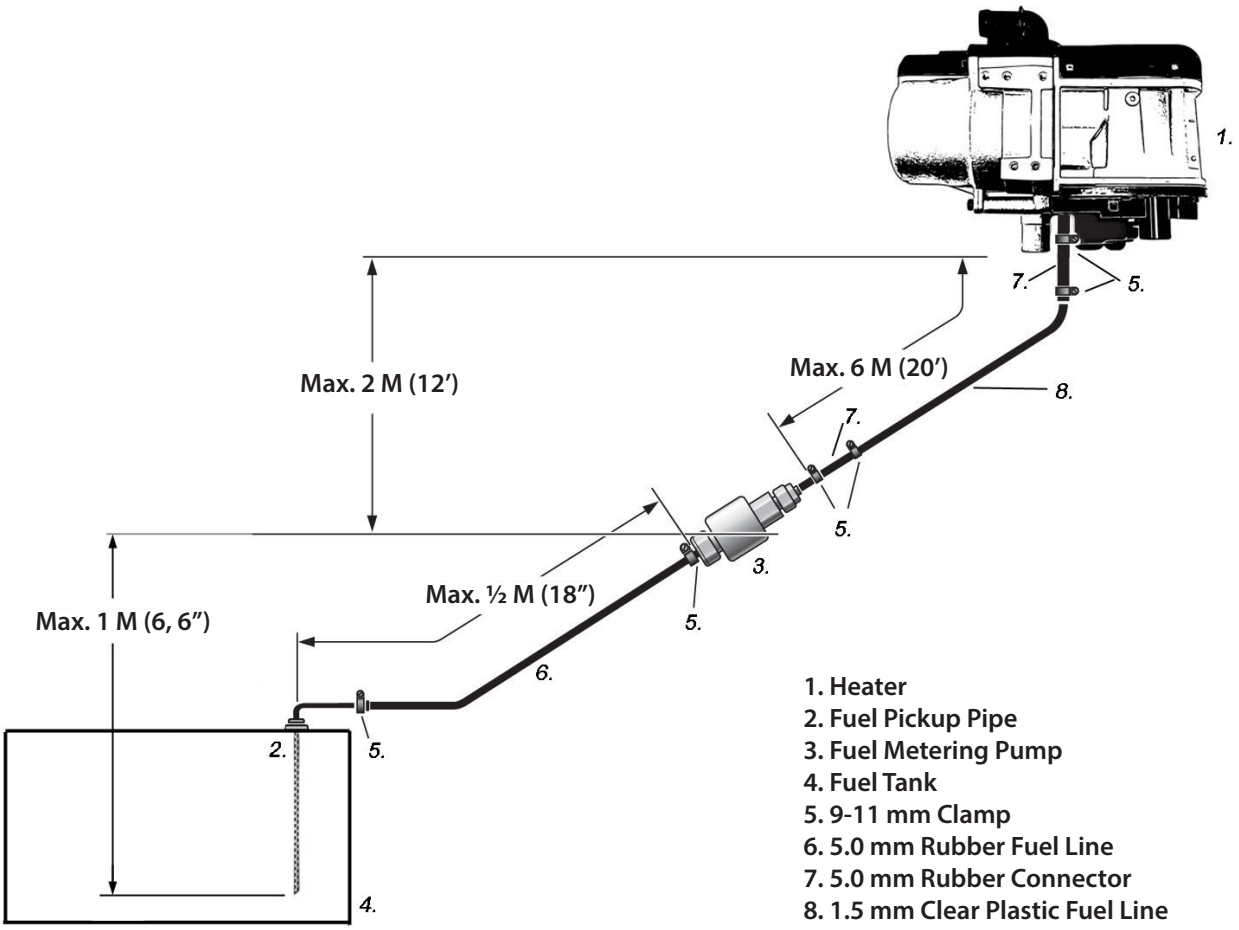
The coolant liquid must contain at least 10% antifreeze all year round as a corrosion protection.

**Tech Tip:**
Test the flow by feeling the incoming and outgoing hoses. In a system with proper coolant flow, the output temperature will not exceed the input temperature by more than 10°C (18°F).

# Fuel System

The PH52W fuel pump and fuel system are the heart of the heater. The fuel pump not only delivers fuel to the heater but also controls the amount of fuel delivered. The pump is designed to operate like an electric solenoid and works using electric pulses. Each time it is energized, it provides a measured dose of fuel. It is critical to the heater's operation to stay within parameters outlined below and only use the components provided. (Figure F1)

*Figure F1




1. Heater
2. Fuel Pickup Pipe
3. Fuel Metering Pump
4. Fuel Tank
5. 9-11 mm Clamp
6. 5.0 mm Rubber Fuel Line
7. 5.0 mm Rubber Connector
8. 1.5 mm Clear Plastic Fuel Line

**System Layout & Considerations**

- Keep the length of the fuel system short as possible.
- Mount the fuel pump as close to the fuel pickup as possible (pump pushes better than it sucks).
- Minimize vertical rise.
- Mount the fuel pump in a protected location away from road spray.
- Choose a mounting location for the fuel pickup pipe that is close to the heater and offers installation access.
- Design your fuel system so that Figure F1 fuel line limits are not exceeded.

# Fuel System

*Figure F2

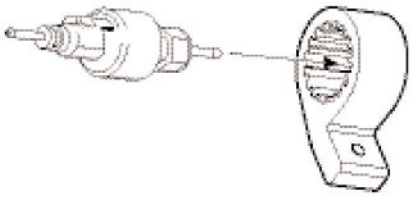
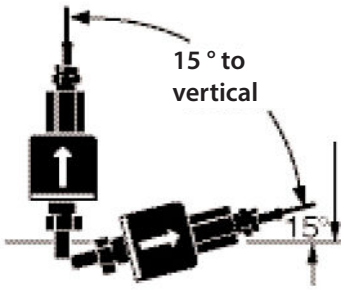


*Figure F3

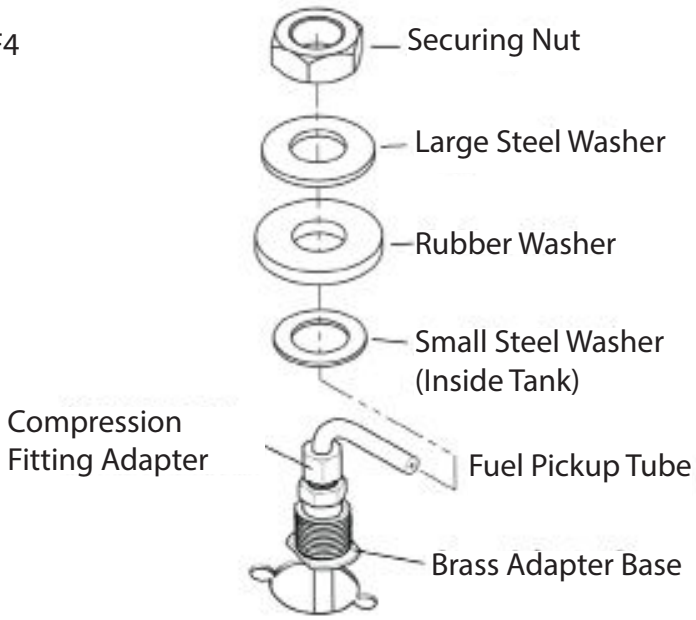



**Fuel Pump Mounting**

- Using the bracket and rubber mount provided, install fuel pump as shown. (Figure F2)
- Isolating the pump with the rubber holder helps to minimize noise created during operation.
- Ensure that the proper mounting angle is observed to avoid cavitation. (Figure F3)

**Fuel Pickup Pipe**

*Figure F4




**Fuel Source**

- Connect directly into the fuel tank using our dedicated fuel pickup tube.
- Teeing into the existing vehicle fuel lines is not recommended.
- There are three common methods to install a fuel pickup tube.
- Use NPT / compression fittings if available
- Use spare fuel gauge plate if available
- Drill dedicated holes into the tank.

# Fuel System

*Figure F5

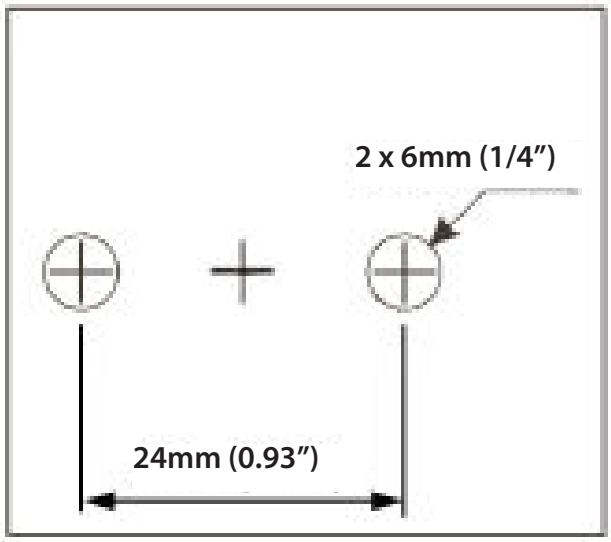
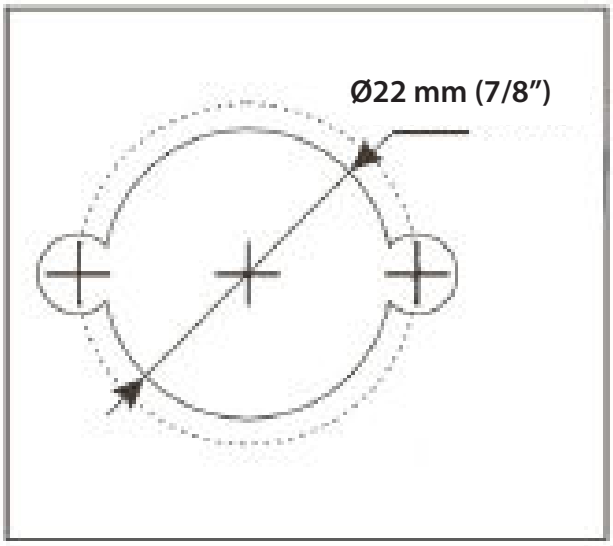



*Figure F6




**Fuel Pick-Up Pipe Installation (Drill Option)**

- Drill mounting holes in tank to accommodate pick-up pipe as shown in Figure F4
- Drill the two (1/4") holes first. (Figure F5)
- Drill a 7/8" hole. (Figure F6)
- Mount the fuel pick-up assembly pipe as shown.
- Position pick-up pipe 4" from bottom of tank (1" for flat tanks)

**Fuel Line Connections**

- Route fuel lines from the fuel pick-up pipe to the heater.
- Use only fuel lines provided (Other sizes or types of fuel lines may inhibit proper fuel flow)
- Make proper butt joints using clamps and connector pieces as shown.
- Use a sharp utility knife to cut plastic fuel lines to avoid fuel line pinching.

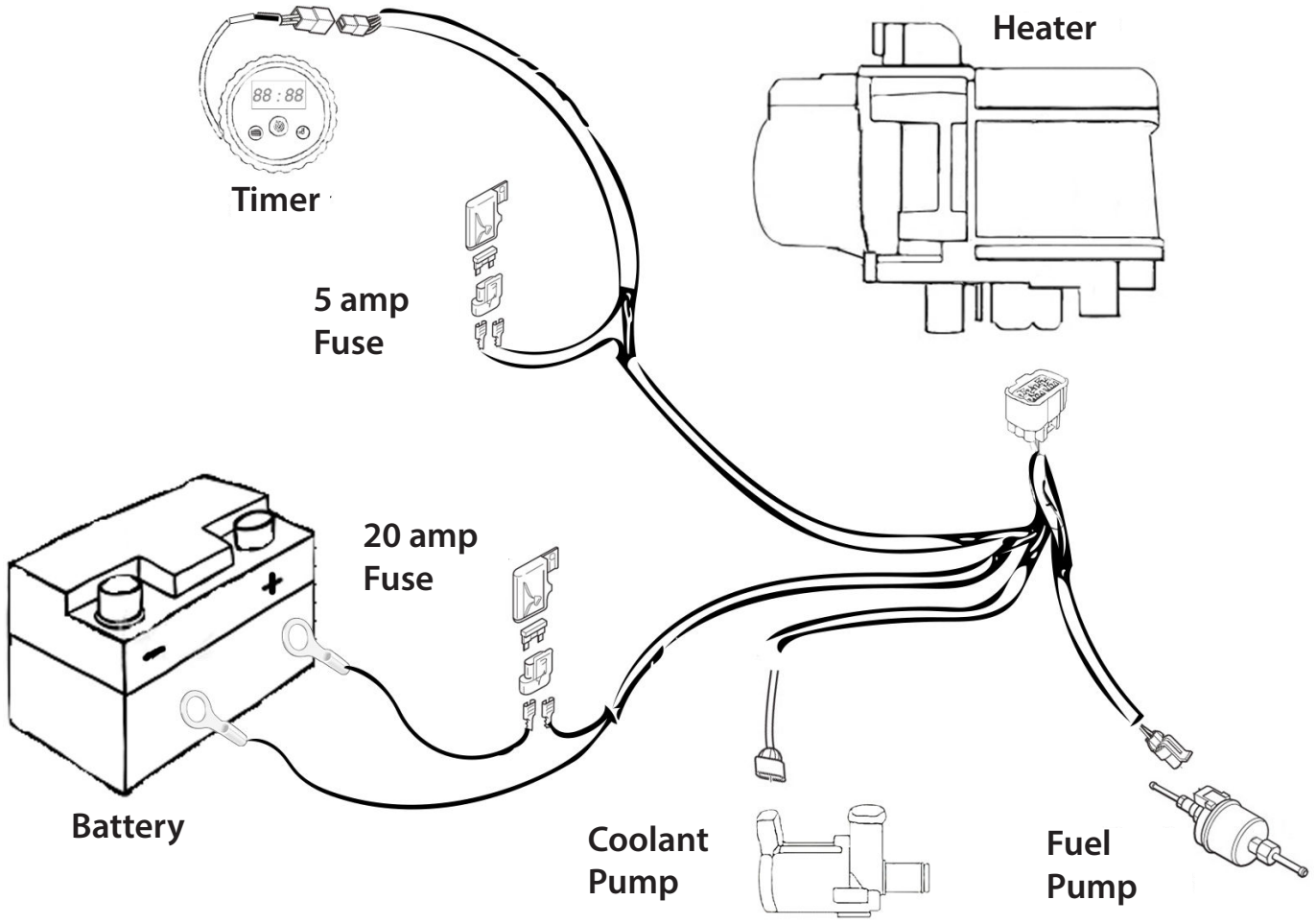
# Electrical Connections

**Electrical System Installation**

Connect the heater harness as follows:

- Route cables using either an existing cable passage or drill holes as required.
- Seal the hole around the cables and make sure they are protected from chaffing and pinching.
- Cut each harness section to length and install terminals and connectors as required.
- Below is a summary of the wiring connections required.

*Figure E1



# Electrical Connections

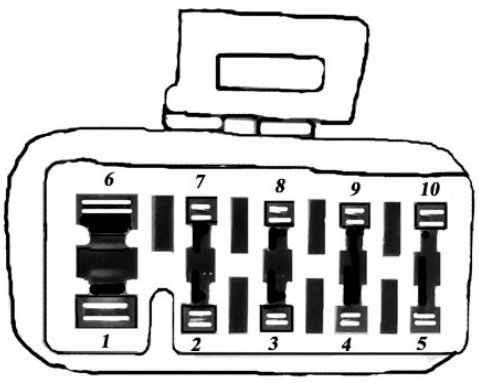
| | |
|---|---|
| A. Main Heater Harness | Connects switch and power harness to the heater harness.<br>Refer to Main Harness Connections Legend for details. |
| B. Power Harness | 2 Core, 5M (16') Long – Red & Black<br>• Route power harness section from heater to vehicle batteries.<br>• Cut to required length.<br>• Connect red wire to fuse link and install terminal.<br>• Attach ring terminal to battery (+).<br>• Connect brown wire to battery (-) using ring terminal provided.<br>• Install 20 amp main fuse (Last step of installation) |
| C. Switch Harness | 5 Core, 8M (25') Long – Red, Brown, Yellow, Blue, Green<br>• Route switch harness section from heater to switch location.<br>• Cut harness to length and attach wiring terminals<br>• Install terminals into connector so they match the wire colours from the operating switch. Yellow is a spare wire.<br>• Attached connector to operating switch<br>• This circuit is protected by a 5 amp fuse located near the main harness connection. |
| D. Fuel Metering Pump Harness | 2 Core, 5M (16') Long – Purple & White<br>• Route fuel metering pump harness to fuel pump.<br>• Cut to required length.<br>• Install wiring terminals, protective seals and connector block (No polarity required – Connect either wire to either terminal). |
| E. Coolant Pump Harness | 2 Core, 0.3M (1') Long – Black & Orange<br>• Connector is pre-installed.<br>• Route coolant pump harness to coolant pump and connect. |

## Main Harness Wiring Legend

**Note:** There are no corresponding numbers on the connector. Numbers are for reference only.

| Terminal | Wire Color | Function |
|---|---|---|
| 1. | Red | Main "+" Positive Feed |
| 2. | Yellow | Spare |
| 3. | Green | Switch |
| 4. | Orange | Coolant Pump "+" |
| 5. | White | Fuel Pump |
| 6. | Black | Main "-" Negative Feed |
| 7. | Brown | Switch |
| 8. | Blue | Switch |
| 9. | Black | Coolant Pump "-" |
| 10. | Purple | Fuel Pump |

**Open end view of main heater harness connector**



# Operating Switch

**Operating Switch**

*Figure E2


The PH52W is provided with a multifunctional controller. It is capable of manual and timer controlled switching of the heater and conveys heater operational parameters and diagnostics.

**Refer to the Operating Switch Instructions for operational details.**

*Figure E3

Mount Operating Switch in a suitable location using the keyed mounting holes or two sided tape provided.
Route the switch harness from the heater to the Operating Switch.
Cut the harness to length, attached terminals and connector.
Connect harness to Operating Switch.

# Operating Switch

**Overview:**
The PHP Control Switch allows you to turn the heater on and off, regulate temerature, set operating mode, timed shutdown and timed startup functions. It also facilitates troubleshooting by providing diagnostic codes.


**Operation Buttons and Display Icons:**

| Programming Keys: | | Display Icons: | | |
|---|---|---|---|---|
| 1. |  On / Off & Select | 1. |  | Heating Mode (Flashes in standby mode) |
| 2. |  Operation Status | 2. | On | Heater On |
| 3. |  Switch Modes | 3. | Off | Heater Off |
| | | 4. | 65°C | Degrees Celsius |
| | | 5. | WaterTemp | Water Temp Mode |
| | | 6. | A/C | Automatic Climate Mode |
| | | 7. | TIM | Indicates Run Time |
| | | 8. | Error | Indicates Error |

# Operating Switch

**On / Off Control:**

| | |
|---|---|
| Press  and hold 3 sec. to start heater | On Displayed for 3 seconds<br>  Max. / actual coolant temp. |
| Press  and hold 3 sec. to stop heater<br>**NOTE: Heater will initiate a 3 minute cool down** | Off Displayed for 3 seconds<br>  Disappears |

**Operating Modes:**
The heater is designed to function in two different operating modes.

**"Water Temp"** mode allows you to control the maximum engine coolant temperature that the heater will maintain. This is the most common operating mode. This mode allows you to set the desired maximum operating temperature from 30ºC to 75 ºC. While operating in this mode, the heater will switch on and off according to the requirements to maintain the desired maximum temperature.

**"Automatic Climate - A/C"** mode allows you to control the maximum cabin temperature that the heater will maintain. This is a less common operating mode and is only practical for use with cargo and cabin heating applications. This mode allows you to set the maximum cabin temperature from 14 ºC to 40 ºC (As measured at the Control Switch). In this mode the heater will maintain a coolant temperature between 60 ºC and 75 ºC. However, once the maximum cabin temperature is reached, the heater will go into standby mode.

When heater is initially started for the first time it will start in "WaterTemp" Mode. Subsequent starts will be in the last used mode "WaterTemp" or " A/C"

**Switching Between Operating Modes (Heater Must Be Running):**

| | |
|---|---|
| To switch heater between "WaterTemp" Mode and "A/C" Mode:<br>Press  **three times** . | "WaterTemp" or "A/C" mode will be indicated by the corresponding icon.<br>WaterTemp Or A/C<br>The corresponding, current Engine Coolant Temperature or Cabin Temperature will also be displayed.<br>40ºC |

# Operating Switch

**Adjusting Maximum Temperature (Heater Must Be Running):**

| | |
|---|---|
| To adjust max temperature (Either Operating Mode):<br>Rotate  Clockwise or Counterclockwise in a snapping motion to the desired setting.<br>"WaterTemp" Mode Range: 30 °C to 75 °C<br>"A/C" Mode Range: 14 °C to 40 °C | While adjusting, the set point temperature will flash.<br>  <br>After 3 seconds, the actual engine coolant or cabin temperature will be displayed.<br>  |

**Operating Status**

To access the heater operating status information

Press  to toggle through parameters

After all 7 operating parameters have been viewed, the controller will return to the home screen.

| | |
|---|---|
| **Voltage** | ie. 12 U |
| **Glow Pin Status** | 83UA On or OUA off |
| **Fan Speed** | 0 to 9,915 RPM |
| **Fuel Pump Pulse** | 0.0 to 2.0 Per Second |
| **Timed Shut Down** | 15 min to 7 hours |
| **Temperature** | ie. 40 °C<br>Coolant Temperature WaterTemp mode or Cabin Temperature A/C Mode |
| **Flame Sensor Temperature** | ie. 086 |

**Timed Shutdown (Controls How Long Heater Will Run When Turned On Manually)**

| | |
|---|---|
| To set the timed shutdown, first select the Timed Shut Down Status mode (**See Operating Status**). Default is 2:00 hours.<br>Adjust the time by rotating Clockwise or Counterclockwise in a snapping motion.  <br>The time span is 15 minutes to 7 hours.<br>**Note: Once changed, new setting will be retained.** | Count down time will be displayed.<br>  |

# Operating Switch

**Timer Functions:**
The control switch can be used as a timer to automatically turn the heater on and off at desired times.

**First – Set current clock time (24 hour clock)**
**Second – Set the desired start time.**
**Third – Set the desired stop time.**

**Set Clock Time:**

| | |
|---|---|
| Press and hold  for 3 seconds.<br><br>**Set the clock time.**<br>When the double colon flashes you can set the clock time.<br>1) Rotate  to set the minutes<br>2) Press  to move to setting hours<br>3) Rotate  to set the hours<br>Press  to move to setting Automatic Start Time. |  <br>Clock with Flashing Minutes (two digits on right) and Colon sppears Flashing<br><br>  <br>Clock with Flashing Hours (two digits on left) and Colon appears Flashing |

**Set Automatic Start Time**

| | |
|---|---|
| **When the upper colon flashes** you can set the start time.<br>1) Rotate  to set the minutes<br>2) Press  to move to setting hours<br>3) Rotate  to set the hours<br>Press  to move to setting Automatic Stop Time. |  <br>Clock with Flashing Minutes (two digitis on right) and **Upper Dot in Colon ONLY appears Flashing**<br><br>  <br>Clock with Flashing Hours (two digits on left) and **Upper Dot in Colon ONLY appears Flashing** |

# Operating Switch

### Set Automatic Stop Time

**When the Lower colon flashes** you can set the start time.

1) Rotate  to set the minutes

2) Press  to move to setting hours

3) Rotate  to set the hours

Press  to move back to Clock Settings.

To Exit Time Setting menu simply wait 5 seconds.

Clock with Flashing Minutes (two digits on right) and Lower Dot **in Colon ONLY appears Flashing**

Clock with Flashing Hours (two digits on left) and Lower Dot **in Colon ONLY appears Flashing**

### Additional Features - Heater in Off Mode

**Fuel Pump Priming**

Upon initial installation and before heater has be run it is possible to fill the fuel line / bleed air out of the system using the controller.

Press  5 Times to activate fuel pump.

Run fuel pump until fuel reaches the heater

Press  to switch Fuel Pump Off

**Running Water Pump Only**

Upon initial installation or after service it is possible to run the water pump only to bleed air out of the system using the controller.

Press and Hold  3 seconds

To activate Water Pump

Press  to switch Water Pump off.

**Self Diagnostics:**
If the heater's ECU detects a fault during operation, the display will flash and an error code. Refer to the diagnostic fault code legend in manual for further direction.

# Heater Operation

## Pre-Start

- Check all fuel, electrical and plumbing connections.
- Refill the engine coolant.
- Bleed air from the coolant system & top up coolant.

## Start Up

Upon signal from the operating switch, the heater conducts a sequenced start procedure.

- ECU executes electrical systems check
- Coolant pump and combustion air blower activate.
- Glow pin begins preheat (20-50 seconds)
- Fuel Metering pump starts to pulse.
- Gradual acceleration of blower and increased pulse frequency of fuel metering pump.
- Combustion is established.
- ECU recognizes temperature change via the flame sensor.
- Once acceptable level of combustion is established, the glow pin is switched off
- Typical start up is 1 ½ to 2 minutes.

**Note:** If the heater fails to start the first time it will automatically attempt a second start. If unsuccessful, the heater will shut down completely.

**Note:** On initial start up the heater may require several start attempts to self prime the fuel system. Tech Tip: Heater has a Priming function. (See Operating Switch Instructions).

## Running

Upon ignition, the heater will continue to operate as follows:

- Temperature is monitored at the heat exchanger.
- Once coolant reaches 75°C (167°F) or set maximum, heater will automatically switch off (Activates Cool Down)
- Coolant pump continues circulation and ECU monitors temperature.
- Heater re-starts once coolant temperature reaches 65°C (149°F).
- Heater continues to operate until switched off, either manually, automatically by timer or heater malfunction shutdown.

**Note:** If flame out occurs, heater will automatically attempt one restart. If successful, it will continue to operate. Otherwise, it will shut down completely with a cool-down cycle.

**Note:** If voltage drops to 10.5 volts or rises above 16 volts, heater will shut down.

# Heater Operation

## Switch Off / Cool Down

Upon switch off;

- Heater commences a controlled cool down cycle.
- Fuel delivering stops and flame is extinguished.
- Combustion air blower and coolant pump continue to run for 3 minute cool down.
- Heater shuts off.

## Safety Systems

- ECU monitors operations through temperature sensor, overheat sensor and flame sensor.
- Heater will shut down the heater in case of a malfunction.
- ECU conducts circuit check on start up.
- Heater will shut down after two consecutive, unsuccessful, 90 second attempts.
- Heater automatically attempts to restart upon flame out.
- Heater will shut down in case of overheat.
- ECU monitors voltage and will shut down heater if outside 10.5V to 16.0V for 20 seconds.

## Warning - Fire Hazard

The heater must be switched off while any fuel tank on the vehicle is being filled.

## Warning - Asphyxiation Hazard

The heater must not be operated in garages or enclosed areas.

# Heater Operation

## Fault Code Chart

| Error Code | Description of Error | Diagnostic Instruction & Correct Action & Repair |
|---|---|---|
| 1 | High Voltage | Check supply voltage |
| 2 | Low Voltage | Check supply voltage |
| 3 | Fuel Pump<br>Open Circuit | Check fuel pump wiring connections<br>Check resistance across fuel pump terminal |
| 4 | Fuel Pump<br>Short Circuit | Check fuel pump wiring connections<br>Check resistance across fuel pump terminals |
| 5 | Glow Pin<br>Open Circuit | Check glow pin connectors<br>Check resistance across glow pin |
| 6 | Glow Pin<br>Short Circuit | Check glow pin connectors<br>Check resistance across glow pin |
| 7 | Blower Motor<br>Open Circuit | Check blower motor wiring<br>Check blower motor for free rotation |
| 8 | Blower Motor<br>Short Circuit | Check blower motor wiring<br>Check connection to blower<br>Check for damage inside blower |
| 9 | Flame<br>Extinguished | Check fuel flow<br>Check combustion air flow |
| 10 | Failed Ignition | Check Voltage Supply<br>Check fuel flow |
| 11 | Over Temperature | Check coolant flow<br>Check water pump operation |
| 12 | Inlet Sensor<br>Open Circuit | Check sensor connections<br>Check resistance across sensor |
| 13 | Inlet Sensor<br>Short Circuit | Check sensor connections<br>Check resistance across sensor |
| 14 | Not Applicable | |
| 15 | Water Pump<br>Open Circuit | Check water pump wiring<br>Check resistance of pump |
| 16 | Water Pump<br>Unload | Check water pump wiring<br>Check resistance of pump |
| 17 | Water Pump<br>Short Circuit | Check water pump wiring<br>Check resistance of pump |
| 18 | Outlet Sensor<br>Open Circuit | Check sensor wiring<br>Check resistance of sensor |
| 19 | Outlet Sensor<br>Short Circuit | Check sensor wiring<br>Check resistance of sensor |
| 20 | Flame Sensor<br>Open Circuit | Check sensor wiring<br>Check resistance of sensor |
| 21 | Flame Sensor<br>Short Circuit | Check sensor wiring<br>Check resistance of sensor |

# Troubleshooting & Parts

## Maintenance

- Switch heater ON at least once monthly for 10 minutes
- Clear combustion air supply and the exhaust system after longer standstill periods.
- Perform an annual preseason tune up:
- Remove and inspect glow pin for wear or deformation. Clean or replace as required.
- If the heater has excessive smoking or carbon build up, disassemble and clean the heater.
- Ensure that the vehicle batteries are maintained

**Note:** Batteries have significantly reduced capacity in cold weather

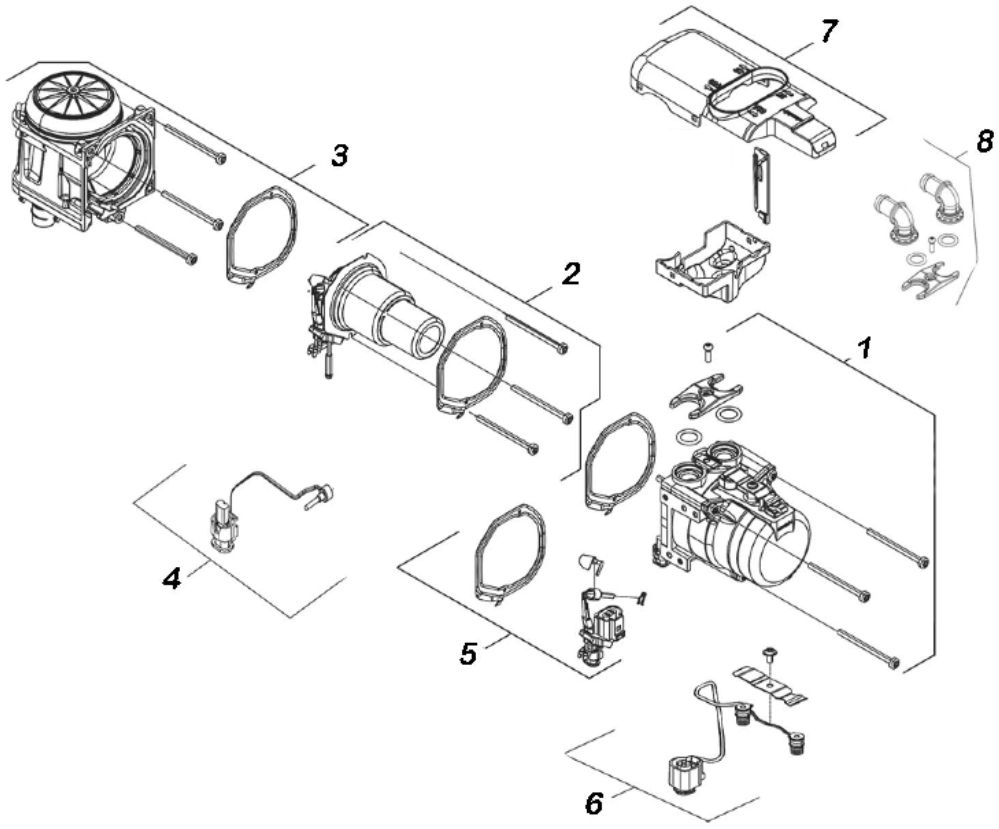
## Troubleshooting

The PH52W is equipped with self diagnostic capabilities. In the event of failure, an error code will be displayed on the operating switch. Refer to the Fault Code Diagnostic Chart for direction. In addition, consider our basic troubleshooting steps.

**Basic Troubleshooting:**

- Look for error code on timer and consult Fault Code Diagnostic Chart for direction.
- Ensure sufficient fuel.
- Check wiring & connections for breaks or corrosion
- Check to make sure the voltage going to the heater is not too low or high.
- Check the fuses to make sure they are not burned out.
- Remove power for 5 minutes or via main fuse at the battery, reinstall the fuse and restart.
- Install and test the heater with a new controller.
- Install a new ECU

# Heater Components




## PH52W Replacement Parts

**Note:** Refer to Kit List section for additional part listing.

| Item | Description | Part Number |
|---|---|---|
| 1 | Heat Exchanger | P52W-X101 |
| 2 | Burner (Flame Tube) | P52W-X102 |
| 3 | Combustion Blower & Integrated ECU | P52W-T101 |
| 4 | Flame Sensor | P52W-X103 |
| 5 | Glow Pin | P52W-T102 |
| 6 | Temperature and Overheat Sensors | P52W-X104 |
| 7 | Cover | P52W-X201 |
| 8 | Coolant Fittings | P52W-X602 |

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