Timberline

Hydronic Heating System by Elwell Corporation



Technical Description
Installation Supplement

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Timberline Hydronic Heating System

Technical Description
Installation Supplement

Introduction

Please read the following instructions carefully; they have been compiled to assist you with every aspect of installing your heater. Special attention is required to the Safety and Caution areas, which are found at the end of each section.

To ensure maximum performance from your heater and for your own safety, please adhere to the following instructions closely. Be aware that in the unlikely event of a heater failure during the warranty period, that warranty my be rejected if the heater is not installed in accordance with these instructions.

When installing the heater, for your own safety, please use all necessary personal protection/safety equipment when required.

Special Notes

Note: Highlighted areas require special attention or clarification.

Caution:

Indicates that personal injury or damage to equipment may occur if specific guidelines are not followed.

⚠ Warning:

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

Binar 5 Heater Specifications

Characteristic	Model	
	BINAR 5B Compact 12 GP Gasoline	BINAR 5D Compact 12 GP Diesel
Heat productivity, kW	5±0.5	
Nominal supply voltage, V	12	
Acceptable deviation, V	10...16	
Fuel	Gasoline	Diesel
Fuel consumption, L/h	0.7	0.6
Heat transfer agent	Antifreeze agent	
Power consumption with the pump, max, W	45	
Power consumption on start mode (100 sec),W	65	
Maximum liquid heating temperature, °F	+185	
Cabin heater fan switching at liquid temperature °F	+104	

Heater Warnings

⚠ Warning to Installer:

Correct installation of this heater is necessary to ensure safe and proper operation.

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 Hazard:

- Heater must be turned off while re-fueling.
- Do not install heater in enclosed areas where combustible fumes may be present.
- Do not install heaters in engine compartments of gasoline-powered boats.

⚠ Warning – Fire Hazard:

- Install the exhaust system so it will maintain a minimum distance of 50mm (2") from any flammable or heat-sensitive material.
- Ensure that fuel system is intact and there are no leaks.

⚠ Warning – Asphyxiation Hazard:

- Route the heater exhaust so that exhaust fumes cannot enter any passenger compartments.
- If running exhaust components through an enclosed compartment, ensure that it is vented to the outside.

⚠ Warning – Hazard on Coolant Heaters Used With Improper Antifreeze Mixtures:

- The use of Timberline coolant heaters requires that the coolant in the system be heated contain a proper mixture of water and antifreeze to prevent coolant from freezing or slushing.
- If the coolant becomes slushy or frozen, the heater's coolant pump cannot move the coolant, causing a blockage of the circulating system. Once this occurs, pressure will build up rapidly in the heater and the coolant hose will either burst or blow off at the connection point to the heater.

  This situation could cause engine damage and/or personal injury. Extreme care should be taken to ensure a proper mixture of water and antifreeze is used in the coolant system.
- Refer to the engine manufacturer's or coolant manufacturer's recommendations for your specific requirements.

⚠ DANGER: Risk of Injuries and Burns!

The cooling water and components of the cooling water circuit can get very hot.

- Parts conveying water must be routed and fastened in such a way that they pose no temperature risk to man, animal, or material sensitive to temperature from radiation/ direct contact.
- Before working on the cooling water circuit, switch the heater off and wait until all the components have cooled down completely. If necessary, wear gloves.

⚠ Warning – Asphyxiation Hazard:

- All RV installations must comply with the requirements of the Recreational Vehicle Industry Association.
  References: NFPA 1192, CSA B139.
- Field wiring should be done in accordance with the Canadian Electrical Code, Part 1.

Caution:

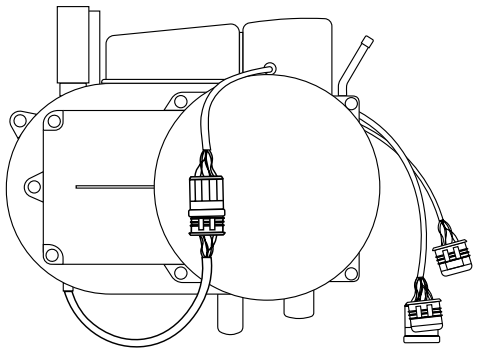
During electrical welding work on the vehicle, disconnect the power to the heater in order to protect the control unit.

Note: All measurements contained in this manual contain metric and approximate SAE equivalents in brackets–eg. 25mm (1").

Contact Elwell Corp for further information.

Tel: **360-608-0916**
Email: **info@elwellcorp.com**

Binar 5 Heater Unit



Follow instructions in the heater manual for installation.

- The heater unit can be mounted on a chassis rail.
- Enclosures are available for the heater if needed

Caution:

The place chosen needs to adhere to the following:

- Installed into a compartment completely closed off from the living space of the vehicle.
- Combustion air must be drawn from the outside of the vehicle.

Caution:

It may be necessary to cut holes into the floor of this space for exhaust and combustion air intake. Make sure the hole placement will not interfere with the coach structure, mechanical devices, wiring, or hoses/lines.

Note: Make sure the place chosen for installation will allow for adequate service clearances.

Exhaust

⚠ Warning to Installer:

- The exhaust is hot and should be routed away from any heat-sensitive parts and materials.
- The exhaust should not terminate underneath the vehicle or be positioned below vents, openings, slide-outs, and awnings.
- The exhaust should not be pointed downward.

Caution:

Exhaust systems that do not follow the recommended specifications must be approved by Elwell Corp.

Note: - Refer to the heater manual for exhaust specifications.
- A muffler may be used if necessary.

Installation

1. Attach the exhaust pipe/elbow to the furnace.
2. Route exhaust pipe (proper size for heater) to the desired location.
3. Secure into place with proper exhaust hangers and support hardware.

Fuel Connections

Note: Refer to the fuel supply section in the heater manual for further information.

Note: A direct connection to the fuel source with a dedicated fuel pick up is most ideal. An auxiliary tank (day tank) can also be used.

Locating a fuel source

- Most manufacturers have additional ports available on the fuel tank. If there is not one available, it may be necessary to drill the tank and install a fuel pick up pipe.
- It may be possible to tee into a generator supply line. A check valve should be installed after the tee to the generator.

Routing the fuel line

- The fuel line must be properly sized for the furnace in use.
- Avoid sharp objects or edges, and route away from high heat sources.
- Secure the fuel line in place.

Fuel Connections Contd.
Hose Connections

- Fuel lines should be cleanly cut and butted together to prevent the possibility of trapping air.
- Fuel line clamps need to be properly placed and tightened to prevent fuel leakage and air from entering.

Timberline 1.0 Modular Plumbing

(For Timberline 2.0 Combined Plumbing see Page 8)

Caution:

The system coolant flow is essential for optimum heating and for proper operation of the heater. A minimum flow rate is listed with the heater model specifications.

Caution:

Plumbing systems that do not follow the recommended specifications need to be approved by Elwell.

Note: An air bleed valve can be added at the high point in the coolant circuit to purge air.

Note: Refer to the cooling water circuit section in the heater manual for more information.

Series System

This is a common, simple system where the system coolant flows from one component to the next and returns to the heater. A robust system pump can push air through the system, essentially purging it without the use of air bleeds.

Routing Hoses

Coolant lines should be as short as possible and routed to prevent any kinking. Coolant lines expand when heated, and a hard line should not be mounted rigidly. Use a clamp with a rubber insert.

Avoid sharp objects or edges, and route away from high heat sources.

System Priming

Caution:

Air must be bled from the system to promote proper coolant circulation.

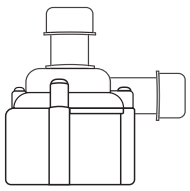
Caution:

The coolant solution must have anti-freeze. The recommended mixture is 60% water and 40% anti-freeze.

1. Fill the system with water/anti-freeze solution (60% to 40%).
2. Operate the pump from time to time to push the coolant through the system. An average system holds between five and seven gallons of coolant.
3. After filling the system, operate the pump continuously for at least one minute and watch for coolant circulation in the fill neck of the expansion tank.

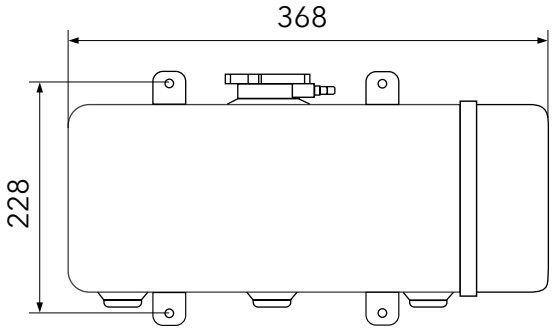
System Circulation Pump

Provides circulation of the system coolant throughout the unit and the interior heating loop.



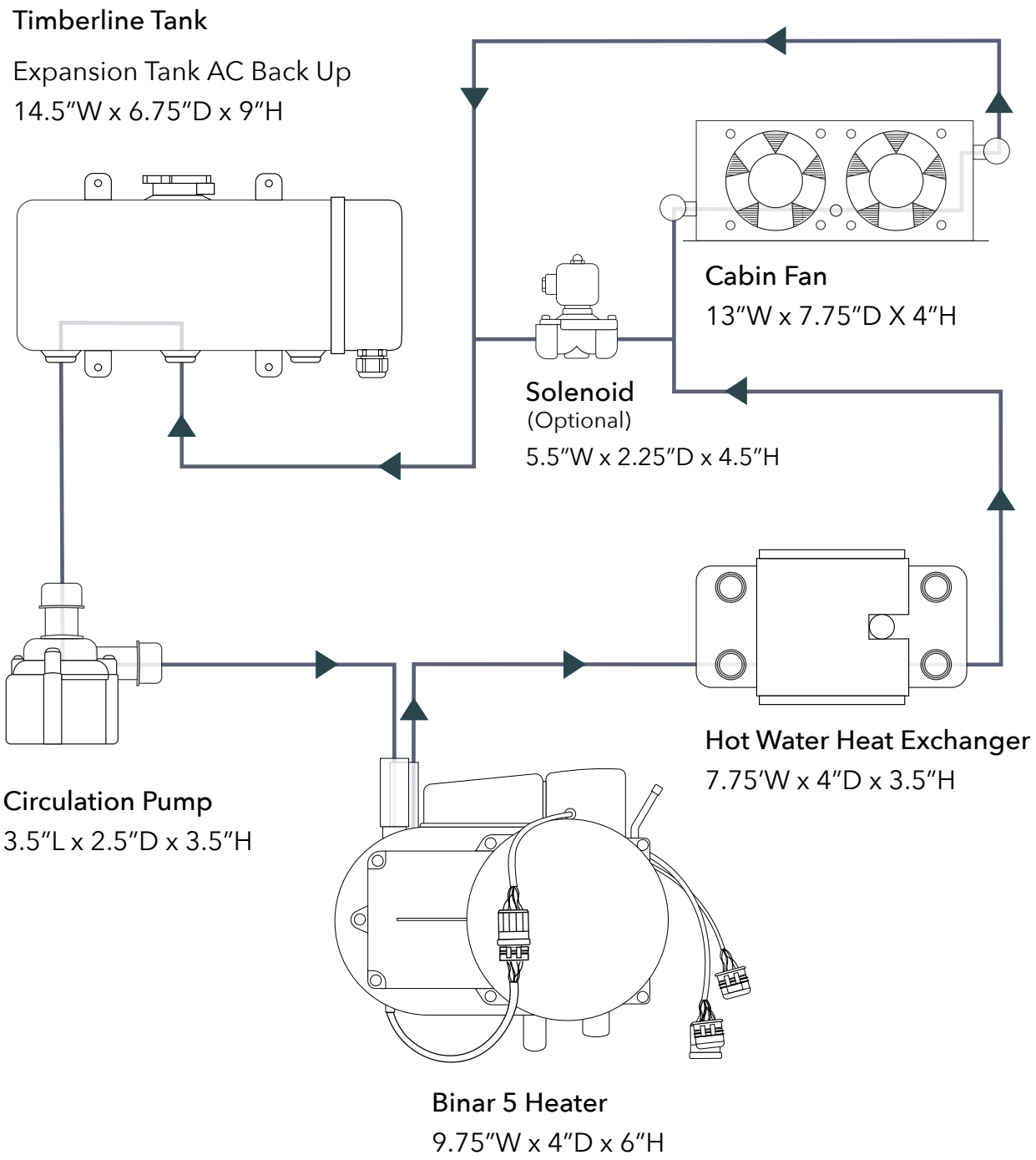
AC Electric 120VAC Unit

This unit serves as the system fill-point, expansion tank, and provides coolant heating with shore power.



Timberline 1.0 System Plumbing Diagram

Timberline Furnace Heating Loop



Timberline 1.0 Wiring

Caution:

All RV installations must comply with the requirements of the Recreational Vehicle Industry Association. References: NFPA 1192, CSA B139

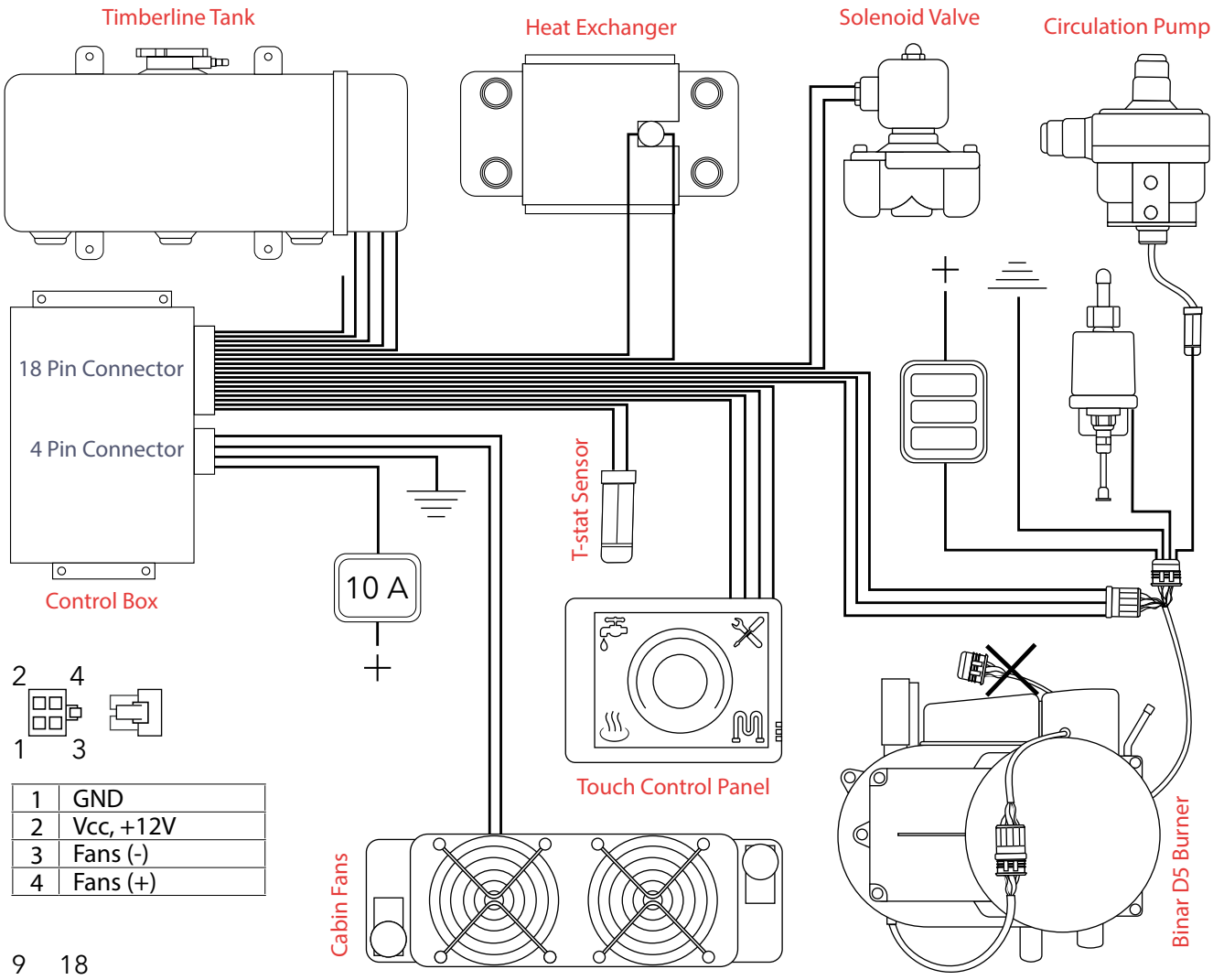
Caution:

Field wiring should be done in accordance with the Canadian Electrical Code, Part 1.

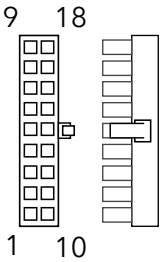
Caution:

All wiring should be properly sized according to wire type, amperage draw, and length of circuit.

Note: Wiring should be routed away and protected from sharp edges, moving objects, and high heat sources.

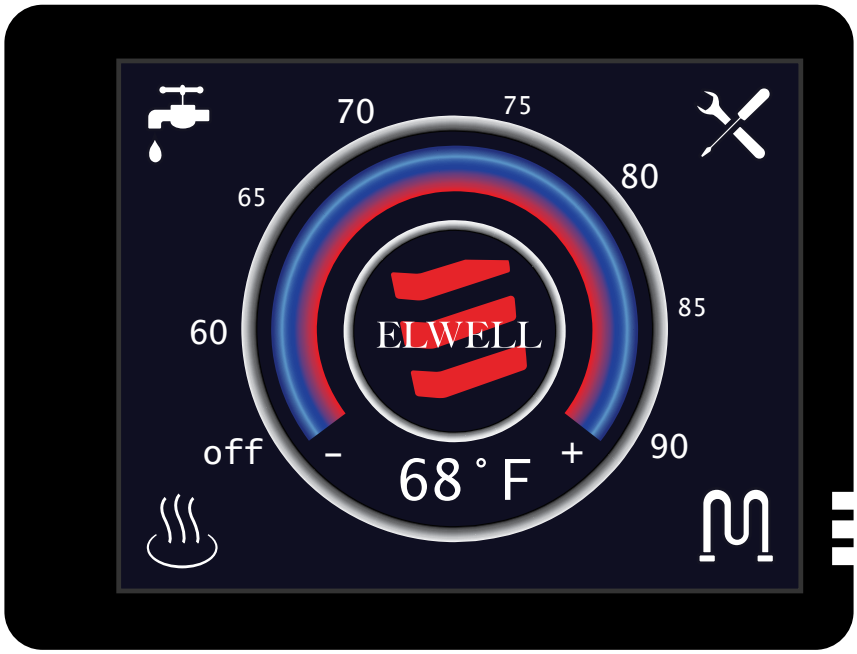


1	GND
2	Vcc, +12V
3	Fans (-)
4	Fans (+)



1	Not Used	7	Heater Wire (Rx)	13	Heat Exchanger Sensor (+)
2	Heater Wire (GND)	8	Element Relay (-)	14	Tank Sensor (+)
3	Touch Screen (GND)	9	Solenoid Valve (-)	15	Air Sensor (+)
4	Heat Exchanger Sensor (-)	10	Touch Screen (Tx)	16	Touch Screen (+)
5	Tank Sensor (-)	11	Heater Wire (Tx)	17	Element Relay (+)
6	Air Sensor (-)	12	Touch Screen (Rx)	18	Solenoid Valve (+)

Timberline 1.0 Touchscreen Panel



Burner

When the burner icon is selected the diesel heater will run and keep the coolant hot and ready for hot water and heat. The heater will cycle on and off, maintaining the temperature of the coolant.

Electrical Element

When the 110V Electric Element icon is selected the 1500 watt 110V element will activate and provide supplemental heat to the coolant.

When both the Burner and Element icons are selected the system automatically prioritizes using heat from the electric element. If there is greater heating demand on the system then the burner will automatically engage and heat the coolant.

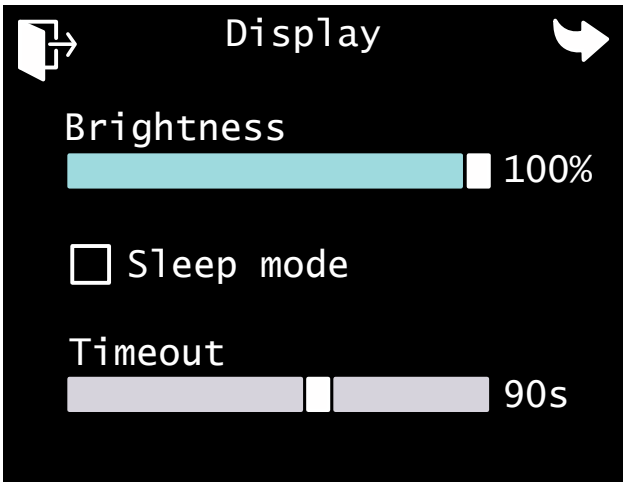
Interior Temperature

When the interior temperature set-point is set warmer than the interior ambient emperature, the fans will begin to heat the interior until the set point is satisfied. The interior temperature set point can be set by either sliding the temperature bar to the desired temperature or by pressing the **+** and **-** icons under the temperature bar. Note: In order for the system to heat the interior, either the burner or electric element or both must selected.

Hot Water

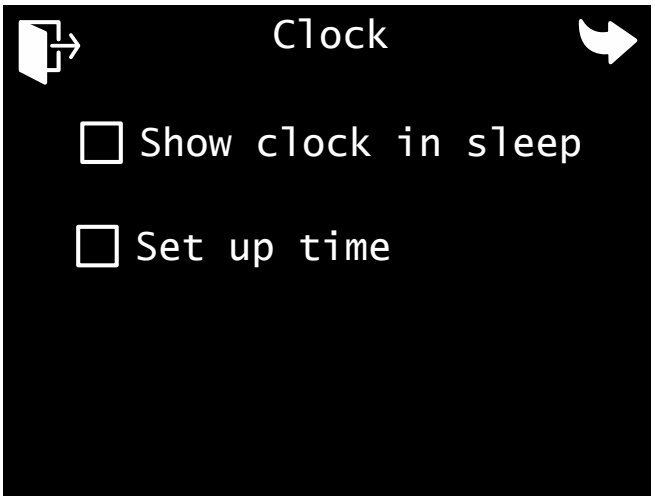
When the Hot Water icon is selected the system will cycle and maintain the hot water heat exchanger so hot water is available on demand. Note: In order for hot water to be maintained, either the the burner or the electric element icons or both must be selected.

Timberline 1.0 Touchscreen Panel Contd.



Display

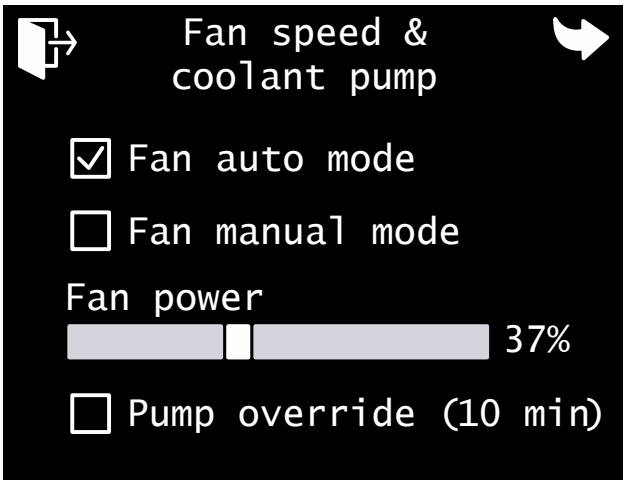
For adjusting the brightness you can check the *Sleep mode* and the display will "go to sleep" for the set time. You can wake the panel up by touching the screen.



Clock

Selecting *Show clock in sleep* will display a clock when the screen goes into sleep mode.

Use Set up Time to set the clock.



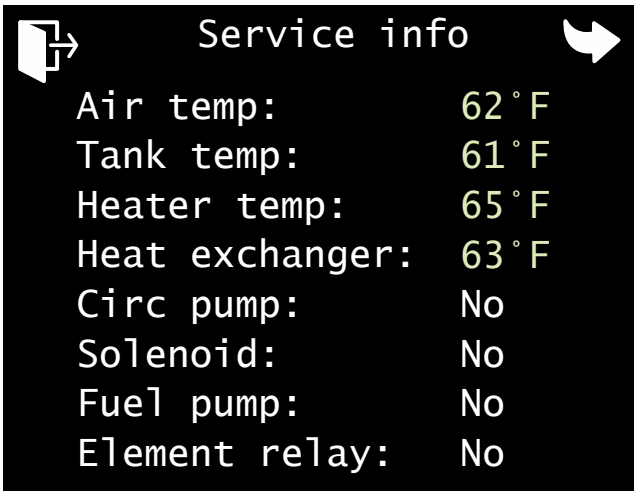
Fan speed and Coolant Pump

When *Fan auto mode* is selected the fans will regulate air flow based on the needs inside the living space. The fans will blow harder when more heat is needed and softer when maintaining the selected set point.

Selecting *Fan manual mode* will make the fans always run at the set percentage selected anytime there is a call for heat.

By selecting the *Pump override* the coolant pump will run for 10 minutes. This mode is used for purging the air from the coolant system.

Timberline 1.0 Touchscreen Panel Contd.



Service Info

Air Temp: The current temp inside the living space

Tank Temp: The temperature of the coolant inside the Timberline tank.

Heater Temp: The coolant temp inside the Timberline heater.

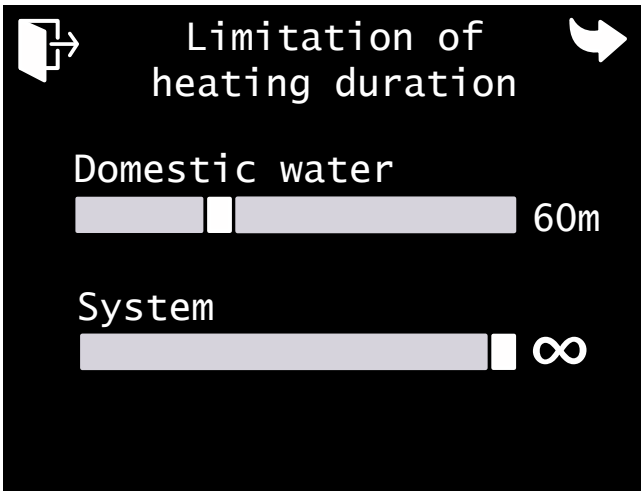
Heat Exchange: The temp of the domestic water heat exchanger.

Circ Pump: Indicates if the circulation pump is activated or not.

Solenoid: Indicates if the heating loop solenoid is activated.

Fuel Pump: Indicates if the Fuel pump for the Timberline heater is activated.

Element Relay: Indicates if the 110V element is activated in the Timberline Tank.



Limitation of Heating duration

Domestic water bar allows you to choose a length of time the domestic hot water is activated; from 30 minutes to infinity. Infinity is the default selection. These functions are used when you plan to leave the coach for some time and want to limit the heaters operation.

System bar allows you to choose a length of time the system will be activated; from 1 hour to infinity. Infinity is the default selection. These functions are used when you plan to leave the coach for some time and want to limit the heaters operation.

Timberline 2.0 All-in-one Plumbing

Technical data and characteristics

Performance specifications are quoted in table 2.1.

1. Hot water outlet.
2. Cold water inlet.
3. Connection of the Binar-5/10-Compact heater (input of the coolant into the tank). Supply of heated coolant from the Binar-5/10-Compact heater to the tank.
4. Connection of the Binar-5/10-Compact heater (output of the coolant from the tank). Supply, for heating, of the coolant from the tank to the Binar-5/10-Compact heater using a pump.
5. Heating zone №1. Connecting a dependent heater.
6. Heating zone №2. Connecting a dependent heater.

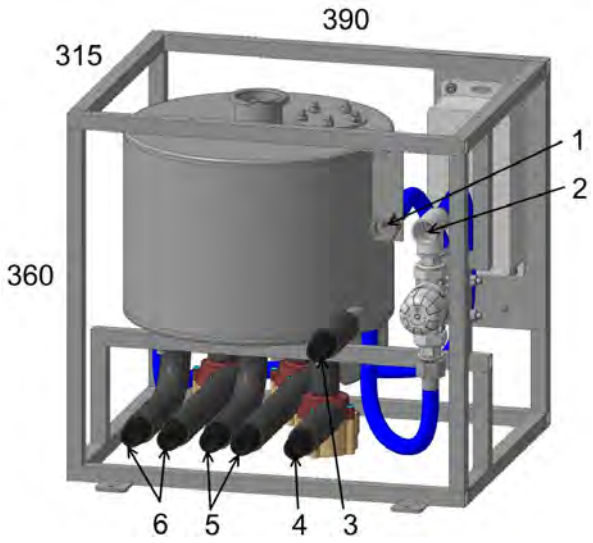


Fig. 1

Table 2.1

Characteristic	
Burner Rating, BTU	17000-40000
Burner Model	Binar-5-Compact - Binar 10
Burner Fuel	Diesel or Petrol
Tank Capacity, gal	2.0
Supply voltage, V	12
Electric Element: Power Consumption, W Voltage, V AC	 1500W 120V
Zone Heat Circulation (pumps)	2
Dimensions	15.5″ x 13.75″ x 14.25″

Thermal Module System Description

Introduction

The thermal module is designed for use in inhabited residential premises in vehicles (mobile homes, water transport, kungi, etc.). It is used for heating the coolant for heating with the help of dependent heaters, as well as heating running water for domestic needs. A liquid heater running on liquid fuel and a heating element are used as a heat source. Both heat sources can operate independently of each other.

Thermal Module System Description Contd.
Overview

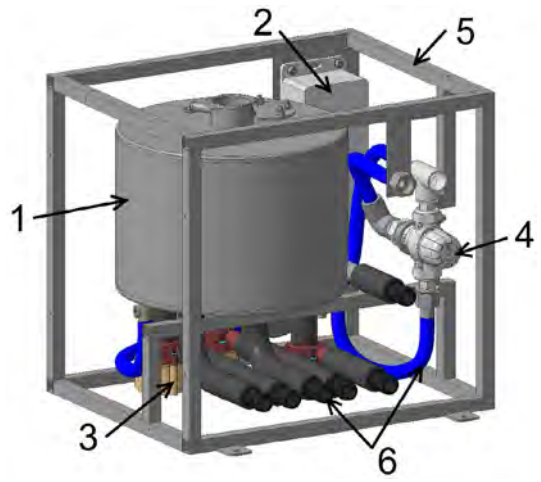


Fig. 2

1. Tank for a heat carrier (V=8.6 l) with electric heater (TEN) built into the tank, serves both for heating household water and for distributing heated heat carrier for heating the room
2. Central system control unit with harnesses for connecting system elements
3. Electric pump for coolant circulation in the system circuits 3 pcs
4. Tempering valve
5. Frame
6. Pipeline and fittings for connecting the hydraulic part of the system

The principle of operation of a liquid heater is based on the heating of a liquid (coolant), which is forcibly pumped through the heat exchange system of the heater. To heat up the liquid (coolant), the combustion products of the fuel-air mixture in the combustion chamber are used as a heat source. Heat is transferred through the walls of the heat exchanger to the heat carrier, which is pumped through the system. The heater operates both on the tank temperature sensor and on its own liquid temperature sensor to prevent overheating. The heater is powered by electricity from an external power source. The heated liquid (coolant) is fed into the first circuit of the tank, where it washes the tubular heat exchanger. Cold water flowing through the heat exchanger is heated and fed to the disassembly sites. As soon as the water is disassembled for household needs, the Binar-5/10-Compact heater switches to the maximum operating mode.

Dependent heaters are used for heating residential premises. They are included in the liquid circuit of the tank. The heat carrier is pumped by a pump through the heat exchanger of the heater. Dependent heaters are switched on using the control panel with the desired air temperature setting. The operation of dependent heaters for heaters is possible only when at least one source of liquid heating (heater or heating element) is turned on. After setting the air temperature, the heater and the circuit pump are switched on. There are two ways to control the fans: automatic and manual. The control method is set on the remote control. With automatic control, the fan speeds (stages) change depending on the difference in air temperatures in the heating zone and the temperature set on the control panel. With manual adjustment, the user himself sets the desired fan speeds on the control panel. Heating of premises and water analysis can be carried out simultaneously.

The electric pump (connected to the heater) is started when:

- the heater is turned on;
- electric heater is turned on;
- when distributing water for household needs;
- the electric pump is switched on in manual mode.

During parking, a heating element built into the tank can be connected to heat the coolant from an external power source (110V). The fuel tank works only on the tank temperature sensor. When the heating element is turned on, the heater pump starts.

Thermal Module System Description Contd.

Tank Design

The tank is a container (8.6 liters) with a heating element placed in it– a heating element and a heat exchanger. The heat exchanger is located in the "hot" first circuit of the tank. The hot coolant from the heater is fed into the tank and washes the heat exchanger, then enters the second circuit. The heat carrier from the second circuit is disassembled into dependent heaters.

The temperature (level) sensor is used to measure the temperature of the coolant, the float level sensor prevents overheating of the heating element at a low level of the coolant. The flow sensor determines the moment of the beginning of the analysis of water for household needs.

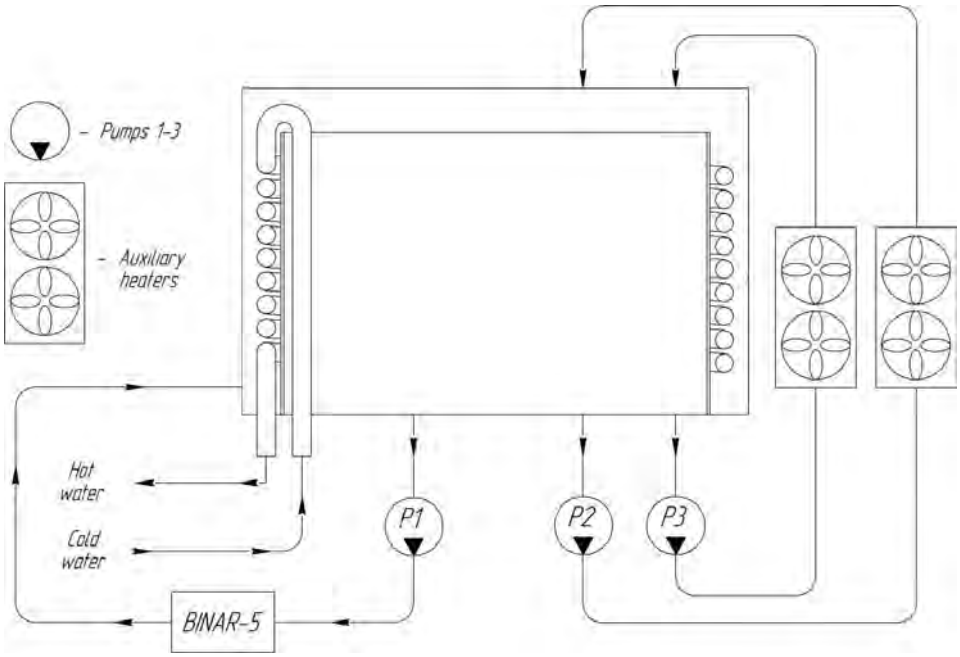


Fig. 3 Hydronic chart

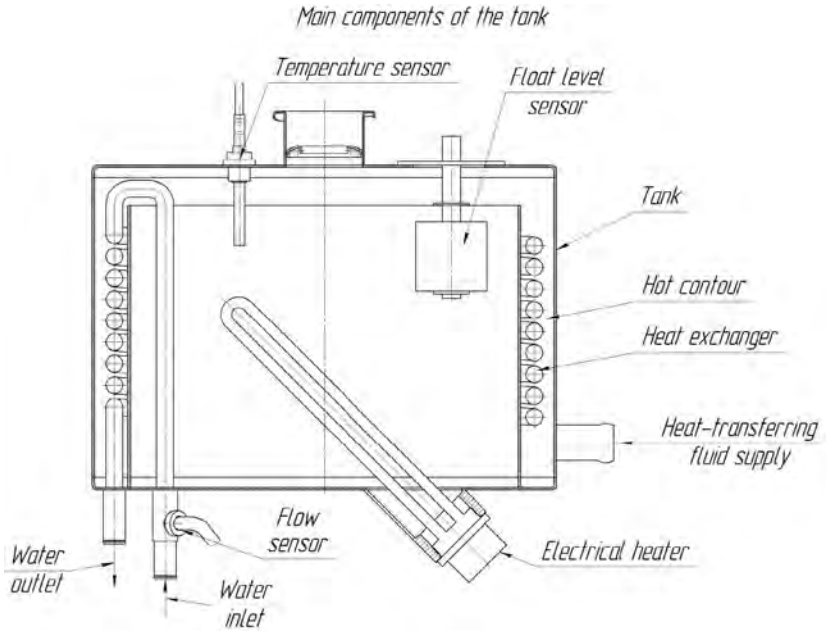


Fig. 4 Main components of the tank

Thermal Module System Description Contd.

Tank Design

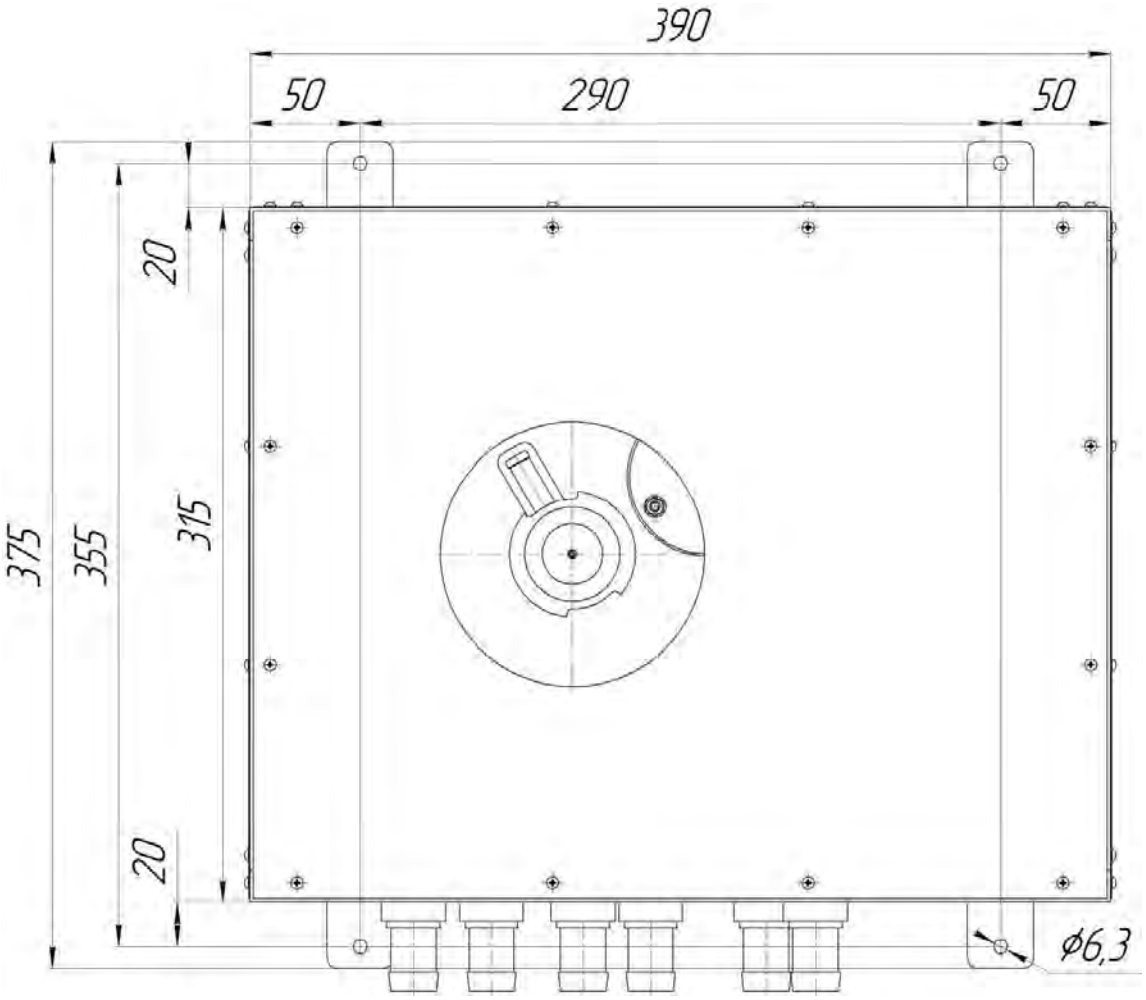


Fig. 6 Mounting dimensions

Thermal Module System Description Contd.

Tank Design

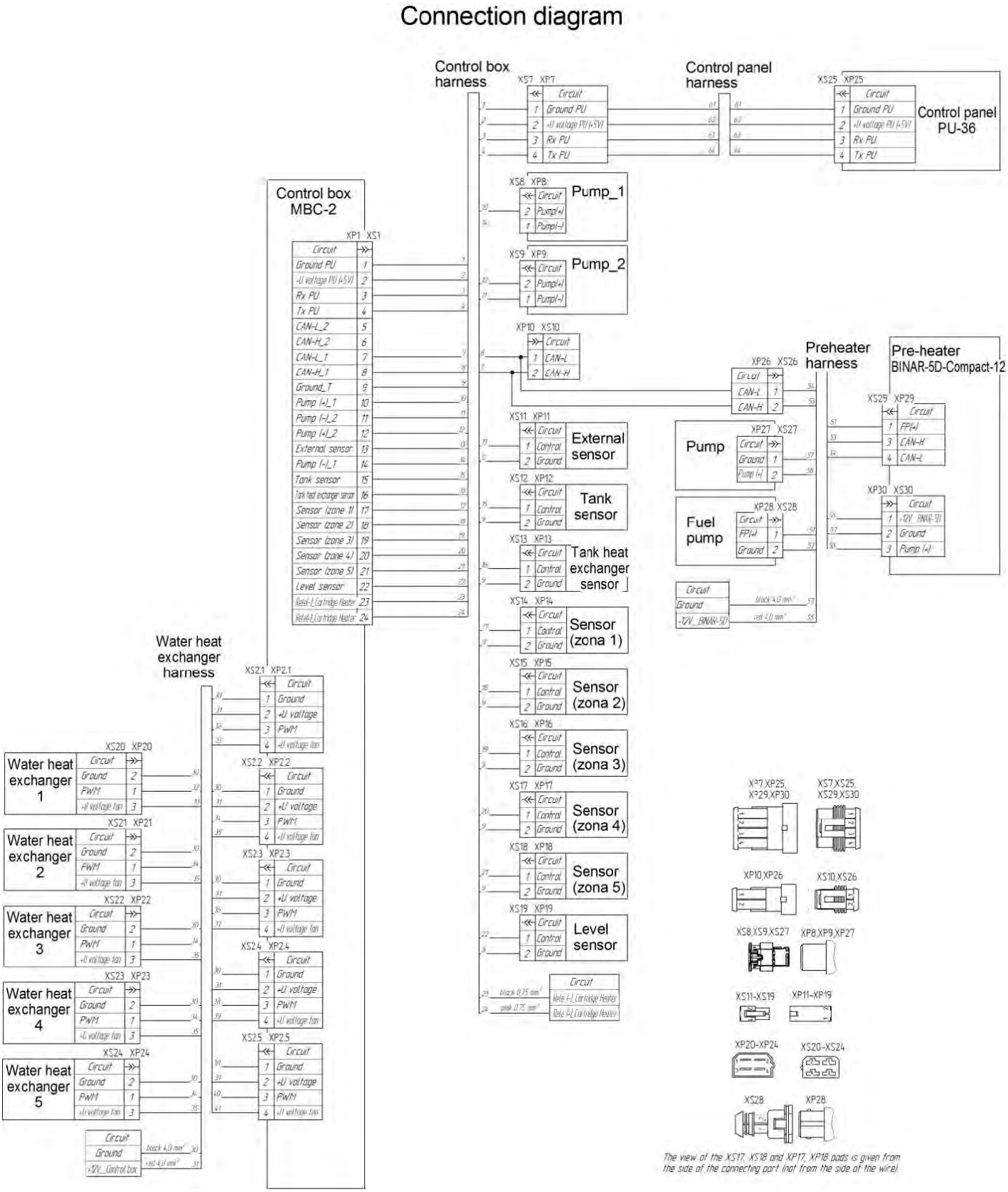
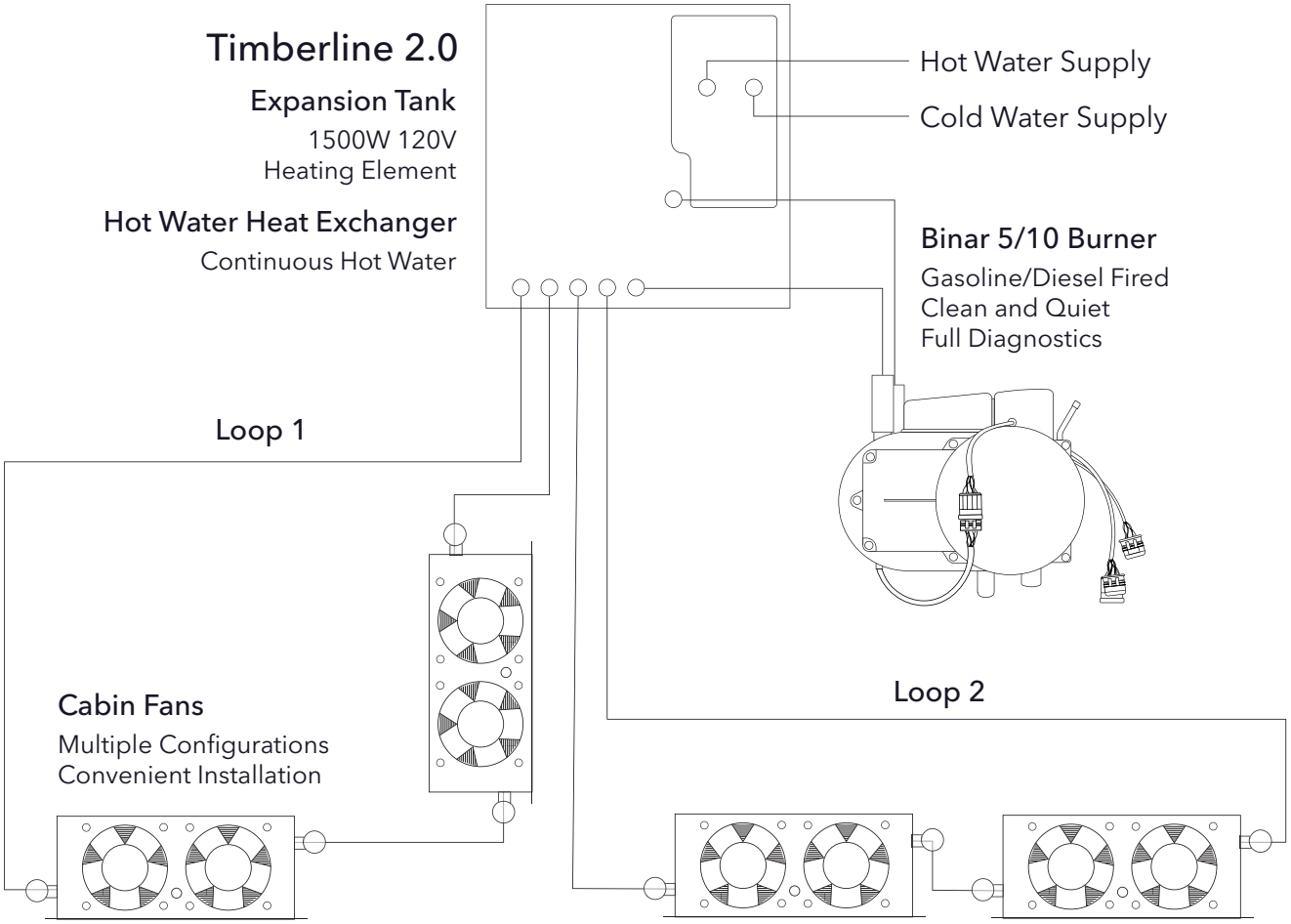


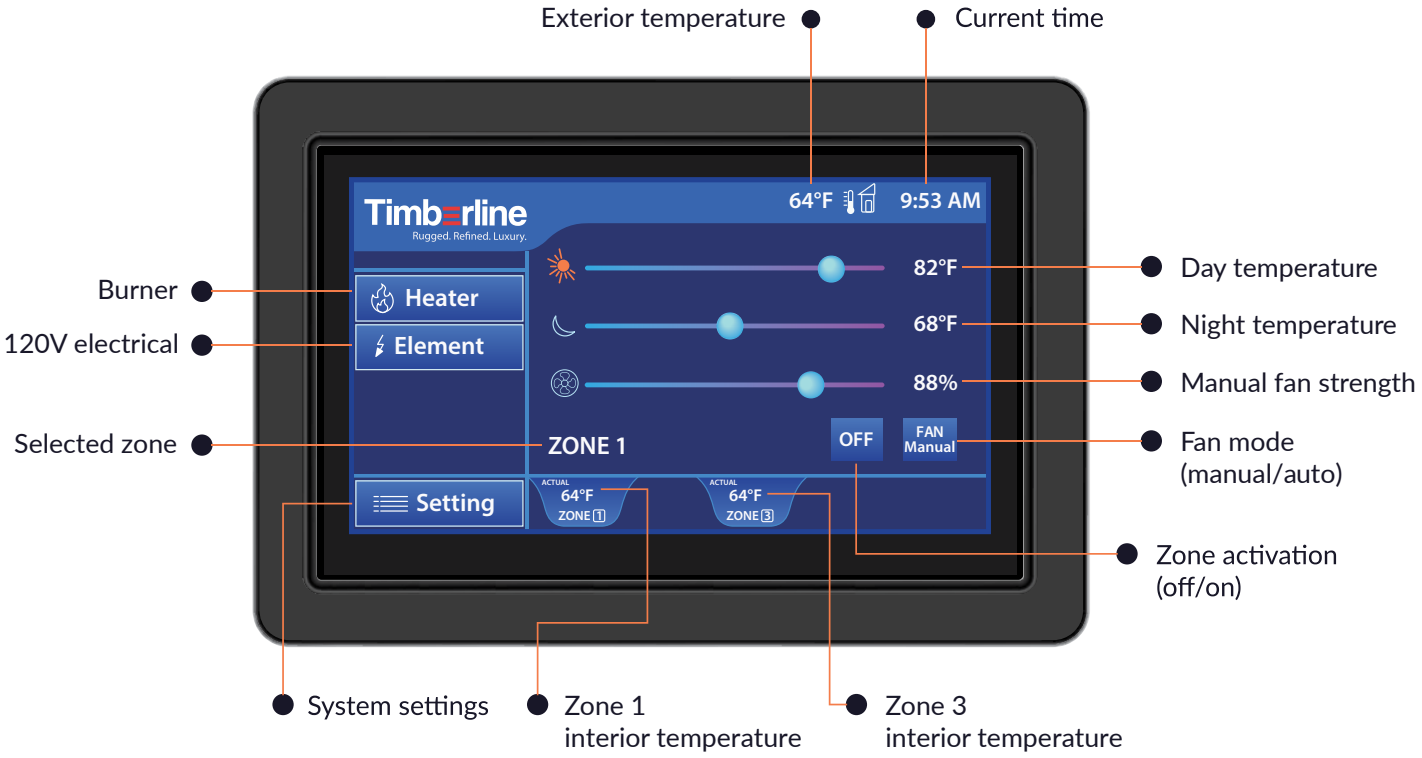
Fig. 5 Electrical diagram

Timberline 2.0 System Plumbing Diagram



Timberline 2.0 Touchscreen Panel

Homescreen Explained





1. Tap a **ZONE** tab to choose which heating zone to set.
2. Tap the **Heater** button to activate the burner.
3. Tap the zone **OFF/ON** button to activate that zone and turn the heat for your selected zone on and off.
4. Use the day and night time sliders to set the heat for each corresponding time.

Turning on the Heater

When the **Heater** button is selected and a zone is activated, the heater will run and keep the coolant hot and ready for hot water and heat.

The heater will cycle on and off, maintaining the temperature of the coolant.

When a button is activated it will turn orange.

Timberline 2.0 Touchscreen Panel Contd.

Turning on the only Hot Water



- Ensure that your zones are all toggled OFF and the **Heater** button is the only button activated.

To turn your hot water on without turning on the fans and heating your van, make sure only your **Heater** button is activated and all zones are turned off.

The system will cycle and maintain its temperature and hot water will be available on demand.

Fan Modes Explained



- Fan Manual mode

  Drag the fan slider to choose the percentage at which your fan speed will run

- Fan Auto mode

  Tap the **Fan** button to toggle it to **Fan Auto**. When Fan Auto mode is selected, the fan slider will disappear from the home screen.

When Fan manual mode is selected the fans consistently to run at the percentage you select, any time there is a call for heat.

When Fan auto mode is selected the fans will regulate air flow based on the needs inside the living space. The fans will blow harder when more heat is needed and softer when maintaining the selected set point.

Turning on the Electric



- Tap the **Element** button to activate your 1500 watt 120V electrical element.

When the **Element** button is selected and a zone is activated, the 1500 watt 120V electrical element will activate and provide supplemental heat to the coolant.

When both the **Heater** and **Element** buttons are selected the system automatically prioritizes using heat from the electric element. If there is greater heating demand on the system the burner will automatically engage and heat the glycol.

Electric will only be available when connected to shore power, unless otherwise specified.

Timberline 2.0 Touchscreen Panel Contd.

Time Setup



Home screen

1. From the home screen, tap the **Setting** button to visit the system settings.

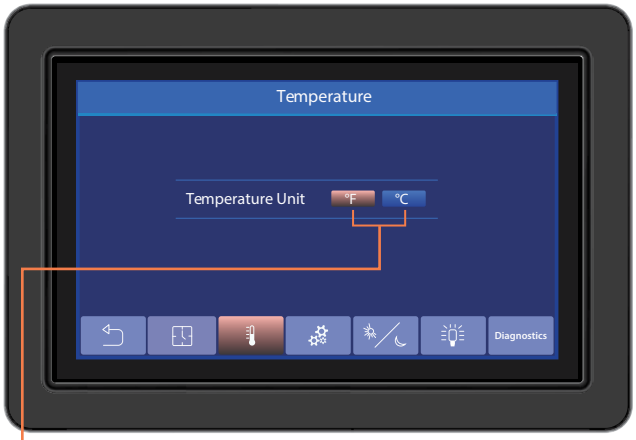


First screen of system settings

2. Set your current time and date by pushing the orange buttons. Tap the **SET** button to finalize.

3. Ensure your clock is set correctly. Day and Night temperatures on the home screen run based on the system clock.

Temperature Setup



Second screen of system settings

- Tap one of the temperature unit buttons to choose whether your temperature displays as Farenheit or Celsius.

Using System Settings



Third screen of system settings

- Drag the slider from 1 Hour to infinity to choose how long you want your system to run.

Limitation system heating time

Limitation system heating time allows you to choose a length of time the system will be activated; from one hour to infinity. This function can be used when you plan to leave your vehicle for some time and want to limit the heater operation.

One-time pump activation

One-time pump activation is used by technicians when replacing or installing parts within the plumbing loops of the Timberline system. As a system owner you don't set anything for this part of the system.

Timberline 2.0 Touchscreen Panel Contd.

Using Storage Mode



Third screen of system settings

- Tap the **Storage Mode** button to activate storage mode.

The storage mode feature keeps your van from freezing if temperatures get too low inside the van while your vehicle is parked and you are out adventuring for the day.

When the **Storage Mode** button is activated, the Timberline system will utilize the heater and electric to maintain the temperature inside your van. Heater and Electric will be “locked” in the on selection until Storage Mode is turned off.

⚠ CAUTION

Do not use the storage mode feature while your vehicle is parked inside a building as the heater will produce fumes.

Daytime Hours Setup



Fourth screen of system settings

- Drag the sliders to choose from when to when you want the system to run your day time temperatures.

On the home screen you select the temperatures you want your heater to run during the day and night.

Use the Daytime Setting screen to set the hours you want your system recognize as day time. The system will automatically run your set day time temperature during those hours, and night time temperature during the other hours.

Backlight Setup

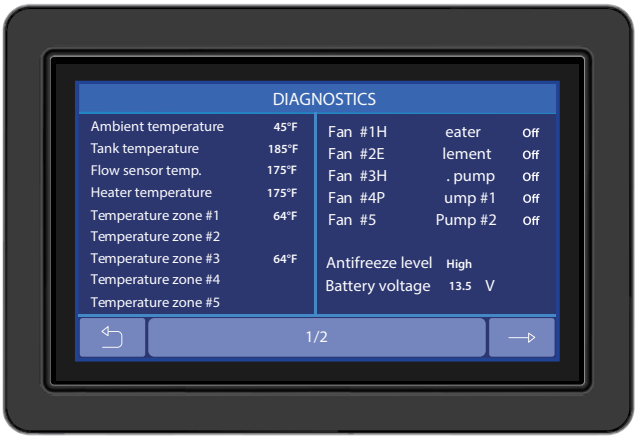


Fifth screen of system settings

- Drag the Timeout slider to choose how long the touch pad screen will stay on before going to sleep.
- Drag the Day and Night sliders to choose the brightness of your touch pad screen during day and night hours.

Timberline 2.0 Touchscreen Panel Contd.

Diagnostics Overview



Sixth screen of system settings



Sixth screen of system settings

Diagnostics gives you a snapshot of how your system is running.

Ambient Temperature:
Current temperature of air outside the vehicle

Tank Temperature:
Temperature of coolant inside the Timberline Tank

Flow Sensor Temperature:
Temperature of coolant at flow sensor

Heater Temperature:
Temperature of coolant inside Timberline Heater

Temp Zone 1, 2,3 etc:
Air temperature within zone x

Fan x:
Indicates if fans are activated withing zone x

Heater:
Indicates if Heater is activated and running.

Element:
Indicates if 110V element is activated

H. Pump, Pump1,2:
Indicates if Pump is activated

Total System Hours:
Shows number of hours the entire system has been run

Heater Hours:
Shows number of hours the Heater has been run

Element:
Shows number of hours the electric has been run

Heater SV: Panel SV:
Heater Version Panel Version

Control Box SV:
Control Box Version

Maintenance

Hydronic System

- The system does not require annual maintenance.
- It is recommended to test the alkalinity in the system coolant annually.

Domestic Water

- The domestic water loop does not require annual maintenance.
- Calcium build-up over time will act as an insulator. The exchanger unit can be back-flushed with a lime removal cleanser.

Fan Unit(s)

- The fan unit does not require annual maintenance.

Furnace

- Refer to the heater manual for more information.

Exhaust System

- The exhaust system should be inspected annually for damage.

Winterization

System Coolant

- The system coolant should be a winter/ anti-freeze mixture and does not require winterization.
- The system coolant can be tested for its freeze protection value.

Domestic Water System

- The domestic water circuit needs to be drained or protected using propylene glycol.
- Draining is accomplished by removing the braided stainless steel lines from the tempering valve. Light air pressure can be applied to ensure all the water is removed. Other water fixtures may also require draining.
- Propylene-glycol can be pumped through the system using the domestic water pump and opening both hot and cold valves at a plumbing fixture. Using this procedure does not require draining the Demand Hot Water exchanger.



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