4-8 Heating Systems

There are three different heating systems in your coach. The Webasto hydronic heating system circulates a glycol-water mixture throughout the coach. The Operator can control four heating zones which direct the heat where it is needed. Further explanations of its operation and its advantages are discussed later in this section. The second heat source is a set of four heat pumps that are part of the Dometic roof top air conditioning units. These heat pumps provide heat at temperatures above 42°F. The third source of heat is four 120VAC electric heaters - two 1000 watt heaters are installed in the bathroom and kitchen, two 500 watt heaters are installed in Bay 2 and Bay 4.

4-8.1 Webasto Hydronic Heating System

Hydronic heating is comprised of a 50/50 water, antifreeze mixture that is ran through piping in the coach and continuously heated. There are zones placed throughout the coach that have fans attached to them. Using the two thermostats that are installed in the coach a user can control the heat zones for the coach. One thermostat controls the front of the coach and the other controls the back. The dividing line is the first pocket door at back of galley. The thermostats are located in the bedroom area and the front main galley area. This system is run off of the diesel and it may be preferred to use the 110 electric heating system when parked in a campground to save diesel provided the weather isn't too inclement. Some advantages of the hydronic system are:

- Continuous hot water
- Fuel efficient burner which burns all grades of diesel fuel, stove oil, furnace oil, and kerosene without any burner adjustments (not for use with gasoline.)
- Zero smoke, no carbon built-up, no fouling or smell.
- Copper and brass water jacket transfers more heat to the water and reduces the fuel consumption (three year warranty).
- High temperatures 310 stainless steel burner and marine stainless steel jacket.
- Quiet operation and low power consumption.
- All heaters are designed to operate on 10.5 to 15.0 V.D.C.
- All heaters are electric ignition, which draws 2 amps for 30 seconds on startup.
- Insulated enclosure for retaining heat and minimizing noise.
- Sealed combustion – 100% outside air is fan assisted to the combustion chamber and then exhausted outside, avoiding backpressure.
- Optional bottom exhaust – mostly used in motor homes.
- Includes four zone heating control for up to four thermostats.
- Completely modular and field serviceable (user friendly).
- Hookups and connections are easily accessible.
- Electronically controlled. Safety features include four-second shutdown in case of failure, LED digital readout on the electronic control panel for indicating faults, aquastats for monitoring water temperatures and a photodiode to monitor the flame.
- Complete with remote control panel with ON/OFF reset button, LED digital readout, and signal horn.
- Jumper for constant pump circulation (Automatic cycling when off).
- All heaters cycle at an operating temperature of 180°F (82°C) with overheat cutout set at 195°F (90.5°C).
- Air accumulator installed in the fuel line to collect air bubbles and prevent them from reaching the burner and causing nuisance shutdowns.

The Webasto heater utilizes a low pressure fuel system. The built in fuel pump draws fuel from the fuel tank up to a zero pressure regulator where it stops. An air accumulator is installed inline between the fuel pump and the regulator to trap any air bubbles from passing through the nozzle valve. For continuous bleeding, a return line can be run back to the fuel tank. A small compressor delivers air to an air aspirating nozzle. This nozzle draws fuel from the zero pressure regulator, mixing it with air through a venturi. This process produces a very fine mist of fuel into the burner providing complete combustion and very low emissions. This low pressure system allows the use of a larger fuel orifice, less clogging, less wear and less maintenance. Ignition is accomplished by a low draw ignitor, approximately 2 amps, for thirty seconds. Combustion air is drawn from outside so the heater can be installed in an air tight compartment or in the engine room without the fear of starving the heater of air or back venting the heater with the engine running.

4-8.2 Operation

4-8.2.1 Starting the Heater

The major steps in starting the heater are as follows:

1. Turn on the ON/OFF control switch, located on the remote indicator panel.
2. Turn up the zone thermostat to a setting higher than room temperature.
3. Start the heater by switching the service switch to ON. This switch is located on the side of the electronic control box located next to the unit in the bay.

4-8.2.2 Signs of Normal Operation

When the heater is operating normally:

- The ignitor will glow and the combustion air intake fan and the circulating pump begin to run. Whenever the pump is running, the green LED at the bottom of the LED display will be on.
- A few seconds later, the fuel pump starts delivering fuel to the regulator, the compressor turns ON, the fuel valve opens, and fuel is drawn to the air aspirating nozzle. The fuel is atomized and sprayed into the combustion chamber to start combustion.

After the ignition period (about 10 seconds), the ignitor shuts OFF, and the burner continues to operate. The heater will operate until all the zone thermostats are satisfied, or until the heater reaches its normal water operating temperature of 180°F. Once the normal operating temperature is reached, the burner itself will cycle off and the combustion fan will operate for an additional two minutes to purge the burner. If a zone thermostat, domestic water heater aquastat, or engine heat exchanger aquastat is not satisfied, the circulating pump will continue to operate. If a thermostat cannot be satisfied by the residual heat in the system, and the water temperature drops, the burner will restart and cycle until all thermostats are satisfied. Once all thermostats are satisfied, the heater will go through the two minute purge, and the circulating pump will ease. The circulating pump will operate if the remote switch and any zone thermostat or the domestic water aquastat are on. The circulating pump will be activated independently by the engine heat aquastat. After the heater has been running for a little while, the water outlet of the heater case should become warm. If the water hose leaving the outlet of the heater does not warm up immediately after the pump comes on, water is not circulating properly and air may be in the system. Turn the heater OFF immediately and check water circulation, refer to *Water Filling Procedure Section* later in this manual.

4-8.2.3 Main Control Board Operation

Once the heater is operating normally, you must check the operating safety functions of the main board. To make sure the safety functions work properly, place your hand over the air intake inlet to the compressor, this will snuff out the flame. If you continue to block the air intake inlet, the heater will try to restart two more times and failing to do so will shut it down, stopping the compressor and fuel pump. The board will display a code 7. Reset the fault and the heater will continue with normal operation.

4-8.2.4 Stopping the Heater (For Seasonal Purposes)

WARNING!!! NEVER shut off the power to the heater using the circuit breaker or a master switch, or disconnect the battery while the heater is running. Doing so will cause serious damage to the heater, which will not be covered under warranty.

To turn the Heater OFF, turn OFF the ON/OFF control switch, located on the remote indicator panel. The room thermostat or the remote indicator panel ON/OFF switch can be turned ON or OFF at any time, without harming the heater. The heater will automatically run through the purge cycle, which takes about two minutes.

4-8.2.5 Stopping the Heater (For Maintenance)

To shut down the heater totally, for maintenance purposes:

1. Turn OFF, the ON/OFF control switch, located on the remote indicator panel.
2. Turn OFF, the service switch on the electronic control box.
3. Wait until the heater has completed the purge cycle and turned itself OFF.
4. Disconnect the power supply.

4-8.2.6 Resetting the Fault

When a fault occurs and has been corrected, you can reset the fault by switching the service switch on the side of the main control box located next to the unit in the bay, or the remote control switch OFF, then ON again. This will reset the fault and the diagnostic code.

4-8.2.7 Stopping the Heaters (When coach is left for extended periods of time)

There are two heating systems supplied with the motor home. The Hydronic heat system has two thermostats located in the bathroom and the galley. The bay electric heater has a thermostat located in bay 2, right. If the Auto Gen-Start feature on the Inverter is Off and coach is unused for a period of time, (more than a day), be sure that all three thermostats are set to the full Off position (the thermostat Off state has a detent position at the end of the full counterclockwise rotation). If not turned to full Off position and motor home gets below 50°F, the hydronic heater pump turns On and the bay electric heaters turn On, thus draining the battery. To use the Auto Gen-Start function on the inverter, refer to *Inverter Section* section of this manual.

4-8.3 Heat Exchanger Operation

If your motor home is equipped with a heat exchanger to pre-heat your engine and recycle waste engine heat, follow these procedures.

To pre-heat your engine: Turn on the heater by a manual switch or timer wired to the jumper W-W terminal, located in the control box. If the heat exchanger is mounted upright, close to and near the bottom of the engine, it will transfer heat to the engine's cooling system through gravity circulation. A more positive solution is to install a pump on the engine side of the heat exchanger wired to the A-A pump terminals located in the control box, on the main board in series with a master switch.

To use waste engine heat for space and domestic water heating:

1. Install a switch, and/or an aquastat (part #1027), on the engine supply line to the heat exchanger, and wire to the A-A terminals on the main control board.
2. Turn OFF, the ON/OFF control switch, located on the remote indicator panel. This will stop the burner from operating, but all other heater functions will operate normally.
3. Start your engine.
4. When the engine aquastat heats up to its preset temperatures, it will automatically switch on the circulating pump of the heating system. All other functions of the system will operate normally.
5. The circulating pump will continue to operate until the engine aquastat has cooled down. A manual switch can be wired in series with this aquastat to shut down the pump sooner if required.

4-8.4 Domestic Water Operation

If your water heater is connected to the hydronic heating system and its controlling aquastat (part #1024) is wired to the W-W terminals on the main board, it will cycle the heater and the water pump. A manual switch can be wired in series with this aquastat to shut down the operation if desired. A bypass loop can be plumbed in for summer operation.

CAUTION!! Where there is a chance of contamination of your domestic water when using a heating system, use antifreeze specifically intended for hydronic heating systems. Inhibited propylene glycol is recommended. Do not use automotive, ethylene glycol, or any undiluted or petroleum based antifreeze as they can cause severe personal injury should antifreeze leak into your potable water supply. Double wall heat exchangers are available for potable water which will prevent contamination in the event of an internal leak.

4-8.5 Troubleshooting

4-8.5.5 Overview

The electronic board consists of a flash micro controller programmed to monitor the timing and safety function of the heater. Each time the board is energized by a call for heat, it will check its own circuits for any problems. Should a problem exist, the board will shut down.

You can easily monitor your Webasto heater's operation by checking the electronic control box. Any fault or problem will be immediately picked up by the control board and an LED diagnostic code indicator will light up to pinpoint the fault. Once the fault has been corrected, it can be reset by switching the service or remote switch OFF, then ON again. The diagnostic codes are described below.

4-8.5.6 Power On (Green)

The POWER ON indicator is lit whenever the service switch on the control box is ON and if the remote panel is switched ON, a small red LED near the lower right hand side of the digit on the remote panel will also glow. If this light does not come on, check to see if the service switch is ON.

If the power on light does NOT come on:

Check for a blown fuse.

4-8.5.7 Burner On

No diagnostic code will be displayed on the main board or the remote panel when the burner is ON and operating normally. A small red LED will glow near the right hand side of the digital readout on the main board located on the unit in the upper left hand corner, indicating it is ON.

4-8.5.8  - Service Switch Off

The service switch is switched OFF.

- The burner will shut down if it has been running.
- The diagnostic code,  will be displayed.
- The control board will purge the system with the combustion fan and circulating pump for two minutes. At the end of the purge period, the system will power down and will go into a low power consumption mode (10mA max.). There will not be any display or LED's lit.

4-8.5.9  – Remote Switch Off

The remote panel is switched OFF.

- The burner will shut down.
- The diagnostic code,  will be displayed.
- The control board will purge the system with the combustion fan and the circulating pump for two minutes.

If the remote switch is put in the ON position, the control board resumes operation and a small red LED glows near the lower right hand corner of the digit. If there is no diagnostic code displayed or small LED glowing:

1. Make sure the service switch is ON.
2. Make sure the remote switch cable is plugged into the control box and remote switch.
3. Make sure the remote rocker switch is working.
4. Check the cable continuity.

4-8.5.10 C – Heater Cycling (Normal Operation)

The operating aquastat installed on the water jacket has been satisfied.

- The burner will shut down.
- The diagnostic code, C will be displayed.
- The control board will purge the burner with the combustion fan for two minutes and then stop. The circulating pump will run until the last thermostat is satisfied, then will purge for two minutes and stop.
- To maintain the system temperature the operating aquastat will cycle the burner off at 185°F (85°C) and on again at 150°F (65°C).
- If the heater cools and fails to resume operation and the diagnostic code continues to be displayed, the aquastat is faulty or has an open connection.

4-8.5.11 F – Thermostats Off (Normal Operation)

All thermostats and aquastats are satisfied.

- The burner will shut down.
- The diagnostic code, F will be displayed.
- The control board will purge the system with the combustion fan and the circulating pump for two minutes. When any thermostat or aquastat calls for heat, the heater will resume normal operation.
- If the heater fails to resume operations, check the thermostat and their connections.

4-8.5.12 0 – Voltage Low or High

The battery or power supply voltage is below 10.5Vdc or above 15.5Vdc.

- The burner will shut down.
- The diagnostic code, 0 will be displayed.
- The buzzer will sound for 10 seconds.
- The control board will purge the system with the combustion fan and circulating pump for two minutes while it is checking if the voltage fault is still present.

If the voltage fault has cleared, the control board resets the alarm and restarts the burner. If the condition has not cleared by the end of the purge period, the diagnostic code remains displayed. The control board continues to check the voltage every half hour until the voltage fault clears and then restarts the burner. To manually reset the fault, switch the service switch or the remote panel switch OFF then ON again.

4-8.5.13 1 – Overheat

The high temperature limit has been reached.

- The burner will shut down.
- The diagnostic code, 1 will be displayed.
- The buzzer will sound for 10 seconds.
- The control board will purge the system with the combustion fan and the circulating pump for two minutes while it is checking if the overheat condition exists. If the condition exists, the diagnostic code will continue to be displayed.
- In order to restart the burner, first check the circulating pump, the level of the coolant, and the movement of the coolant while the circulating pump is running. Then reset the fault after the water has cooled down by switching the service switch or the remote panel switch OFF then ON again. If it does not reset, check for faulty aquastat and proper ground.

If a number diagnostic code lights up and the heater is not in an overheat condition, check the ground from the heater to the battery. The ground should be a minimum 10 AWG and connected directly to the battery.

4-8.5.14 2 – Fuse Blown

One of the fuses on the control board has blown.

- The burner will shut down.
- The diagnostic code, 2 will be displayed.
- The buzzer will sound for 10 seconds.
- The control board will purge the system with the combustion fan and the circulating pump for two minutes while it is checking for a blown fuse.

If a blown fuse exists, the diagnostic code will continue to be displayed.

- In order to restart the burner, replace any blown fuses with one of the proper size. Then reset the fault by switching the service switch or the remote panel switch OFF then ON again.

4-8.5.15 3 – Fuel Pump/Solenoid

The fuel pump or fuel solenoid has shorted.

- The burner will shut down.
- The diagnostic code, 3 will be displayed.
- The buzzer will sound for 10 seconds.
- The control board will purge the system with the combustion fan and the circulating pump for two minutes.
- In order to restart the burner, check the fuel pump and solenoid for a short circuit. Then reset the fault by switching the service switch OFF and ON again.

The remote panel switch does not reset short circuit faults.

4-8.5.16 4 – Ignitor

The ignitor is open or shorted.

- The burner will shut down.
- The diagnostic code, 4 will be displayed.
- The buzzer will sound for 10 seconds.
- The control board will purge the system with the combustion fan and the circulating pump for two minutes.
- In order to restart the burner, check the ignitor and connections. Then reset the fault by switching the service switch or the remote panel switch OFF then ON again if the ignitor is open or by the service switch only if the ignitor is shorted.

The remote panel switch does not reset a short circuit fault.

4-8.5.17 5 – Combustion Fan

The combustion fan is open or shorted.

- The burner will shut down.
- The diagnostic code, 5 will be displayed.
- The buzzer will sound for 10 seconds.
- The control board will purge, with the circulating pump for two minutes.
- In order to restart the burner, check the combustion fan. Then reset the fault by switching the service switch or the remote panel switch OFF then ON again if the combustion fan is open or by the service switch only if the combustion fan has shorted.

The remote panel switch does not reset a short circuit fault.

4-8.5.18 6 – Water Pump

The water pump is shorted.

- The burner will shut down.
- The diagnostic code, 6 will be displayed.
- The buzzer will sound for 10 seconds.
- The control board will purge with the combustion fan for two minutes.
- In order to restart the burner, check the water pump. Then reset the fault by switching the service switch OFF then ON again.

The remote panel switch does not reset a short circuit fault.

4-8.5.19 7 – Flame Out

The flame went out or did not ignite.

- The burner will shut down.
- The diagnostic code, 7 will be displayed.
- The control board will try to restart the burner two more times. After three unsuccessful ignition attempts, the buzzer will sound for 10 seconds.
- The control board will purge with the combustion fan and circulating pump for two minutes. The diagnostic code 7 will continue to be displayed.

The single most common reason for flame out faults is when air gets into the fuel system. This is normally caused by loose fittings or when your fuel supply is teed off a fuel line used by your engine or generator. As air accumulates and passes through the nozzle, it interrupts the fuel and shuts down the burner. When this happens, it may be necessary to reset the fault a few times to ensure all air has passed through the system. If the burner resumes normal operation, you must find the source of the air leak, otherwise, this fault will continue to occur. An Air Accumulator has been installed to collect the air before it reaches the nozzle. Check regularly and bleed if necessary. Air which is collected is an indication of a leak somewhere in the fuel system.

1. Check the fuel supply. The fuel pump will chatter if there is no fuel or when air is passing through the pump. Check the Air Accumulator for air and bleed if necessary. Check connections between the fuel tank and fuel pump and the regulator and nozzle for air leaks. Find source of air entry and repair. Make sure the nozzle or fuel filter is not clogged.
2. Check the air line hoses for any restriction of air flow through the compressor. Restrictions may be caused by a crimped hose, clogged air filter, or a loose or leaking air hose from the compressor outlet to the nozzle. Check the air filter inlet for any obstructions.
3. Make sure the air pressure of the compressor with the nozzle installed, is at 8 to 90 psig for CO-20/32 models and 10 to 12 psig for CO-45/65, and 14 to 16 psig for CO-85/105 models.
4. Check for negative pressure in the area around the heater. When the engine is running, it can draw air back through the heater's exhaust pipe. All intake air and exhaust connections must be tight.
5. Check for restrictions or leaks in the combustion air intake hose or exhaust pipe.
6. Check for open circuit on fuel pump/solenoid and compressor.

- To restart the burner, check the fuel supply, check for air in the fuel line, and clean the nozzle. Then reset the fault by switching the service switch or the remote switch OFF then ON again.

7. If when reset, the board shuts down without trying to restart the burner the board is defective.

4-8.5.20 8 – Compressor

The air compressor has shorted.

- The burner will shut down
- The diagnostic code, 8 will be displayed.
- The buzzer will sound for 10 seconds.
- The control board will purge the system with the combustion fan and the circulating pump for two minutes.
- In order to restart the burner, check the air compressor. Then reset the fault by switching the service switch OFF then ON again.

The remote panel switch does not reset a short circuit fault.

4-8.5.17 ⊐ – Bypass Mode

The bypass mode is a service feature to be used by authorized service personnel only. The bypass mode overrides the remote switch, voltage fault, fuse blown fault, flame out fault, open ignitor fault, open fan fault, and thermostats. All these safety devices will be bypassed for five minutes.

- While in the bypass mode, the diagnostic code, ⊐ will be displayed and the Power ON LED will flash rapidly.
- If the heater cycling aquastat is satisfied or the overheat limit is reached, the burner stops and purges for two minutes while displaying the diagnostic codes: C-heater cycling or 1-overheat, and the Power ON LED flashes slowly. You must wait for the heater to cool before continuing in the bypass mode. The bypass mode times out in five minutes. After the first three minutes running, it automatically purges for the last two minutes.

4-8.5.18 Water Pump On (Green)

The green light located directly under the LED digit on the main board turns on whenever the circulating water pump is energized.

4-8.5.19 Remote Panel

The remote panel consists of an ON/OFF reset switch, an LED diagnostic digit, and fault buzzer. The diagnostic digit matches the main control board which refers to the diagnostic codes as explained previously in this section. A small red LED glows when the switch is on, which also indicates that the service switch is ON. The small buzzer sounds for 10 seconds to alert you of a fault.

4-8.5.20 LCD Readout Remote Panel (Optional)

This panel displays the diagnostic explanation which matches up to the diagnostic code on the main board. A small buzzer sounds for 10 seconds to alert you of a fault.

4-8.5.21 Flame Sensor Module

The Flame Sensor consists of a sealed module with a photodiode aimed at the flame, a red LED indicator light and 3 wires, white (+), black (-), and green (signal) connected to the main board. Under normal operating conditions whenever the burner ignition begins, the red LED flashes once indicating the white and black wires are connected and the module is receiving power and working properly. Once the burner is ignited, the LED begins to flicker like a flame. If for any reason the flame is extinguished, the flickering stops and the board shuts down the heater. If the green (signal) wire is disconnected, the board shuts down. If all wires are properly connected with module flashing and the board still shuts down, diagnostic code 7 Flame Out, the board may be defective.

4-8.5.22 Reduced Output

The heater may run without faulting, but at a reduced output. If this is noticed, it could be caused by the following:

1. High altitude
2. Dirty nozzle
3. Defective regulator
4. Too small a nozzle
5. Poor water circulation
6. Ash deposit in combustion chamber

4-8.5.23 Smokey, Smelly Exhaust

The heater may run without faulting, but you may experience signs of soot, exhaust smoke and/or a pungent smell. This is usually caused by the wrong fuel to air mixture. This can be affected by the following:

1. Low voltage
2. High altitude
3. Dirty compressor air filter
4. Low compressor air output
5. Restricted combustion air flow (intake hose/exhaust hose/combustion chamber)
6. Low combustion fan output (defective motor/wrong rotation/dirty fan blade)
7. Partially clogged grooves in nozzle distributor.

4-8.5.24 Hot Water is Coming Out Cool

This may be a sign that the Mixing Valve is not set to the proper setting. Look through the 3/8" x 1" Inspection Slot on the front of the Webasto Heat case, if setting is not at 4, it will need to be adjusted.

To adjust setting, remove cover from case and manually turn knob to highest setting (4), replace cover.

NOTE: If there is no slot on the Webasto case then this is not the cause of the cool water. Unit may need to be serviced.

4-8.6 Maintenance

4-8.6.1 The First Few Weeks

About two weeks after your Webasto heater has been running, you should conduct a general inspection of the entire system.

Check for any leaks in the exhaust, fuel, or water systems. Tighten all clamps.

4-8.6.2 Adding Antifreeze

Once the system has been filled with water and purged of all air during the installation procedure, you need to operate the heater at normal temperatures and then check for water leaks. If you do not find any, add antifreeze to lubricate the pump and prevent the water system from corroding or freezing in cold weather. To do this see *Water Filling Section Procedures* later in this manual.

CAUTION!! Where there is a chance of contamination of your domestic water when using a heating system, use antifreeze specifically intended for hydronic heating systems. Inhibited propylene glycol is recommended. Do not use automotive, ethylene glycol, or any undiluted or petroleum based antifreeze as they can cause severe personal injury.

IT IS VERY IMPORTANT THAT YOU NEVER USE WATER ONLY AS A COOLANT.

We recommend that you add a mixture of 50% water and 50% antifreeze. NEVER use more than a 50/50 mixture, since the added viscosity of the antifreeze solution will cause circulation problems. Your antifreeze/water mixture should be changed every three years. Antifreeze does wear out and can become very acidic.

A coolant conditioner should be added to the water system, to keep the coolant alkaline and not acidic, see section *Protecting Hydronic Heating Systems* later in this manual. These inhibitors also prevent the coolant from forming calcium scales. Conditioners are available from diesel engine manufacturers to maintain water stability and prolong heater life. If a conditioner is not installed in your system, check the pH level yearly. The components inside the heater should not normally require maintenance, except for periodic checks for obvious problems, such as leaks or overheating.

4-8.6.3 Nozzle

Nozzle problems such as clogging results in a poor flame, small and blue. Carefully disassemble. Hold nozzle and turn stem counter clockwise. Clean distributor orifice and air slots of any debris using solvent and high pressure air. Check O-rings for nicks and replace if in doubt. A leaking O-ring allows air into the fuel causing popping of the flame.

4-8.6.4 Fuel Lines and Filter

You should check your filter every season to determine if it needs replacement. The frequency depends largely on the quality of fuel you've been using.

4-8.6.5 Combustion Chamber

The quality of the fuel varies and some ash is left in the chamber after combustion. The burner and combustion tube must be removed and the combustion chamber vacuumed clean every 1000 hours. If this is neglected, the exhaust becomes restricted and causes the combustion chamber to burn out. The exhaust pipe should be checked and also be vacuumed, if required.

4-8.6.6 Checking Hoses and Tubes

Every so often, check all water hoses and tubes for leaks or weak points. Tighten all clamps and replace any sections of worn hose immediately.

CAUTION!! Never let the water pump run dry. This causes irreparable damage to the pump and voids the warranty.

4-8.6.7 Electrical System

The electronic control panel should not normally require servicing, except for the following:

- Make sure that all your connections are secure.
- Periodically, do a voltage test to ensure that you are getting 12 volts from the battery.
- Check for corrosion of wires.

4-8.6.8 Recommended Spare Parts

Like any piece of machinery, your Webasto heater will need servicing from time to time. A suggested maintenance schedule can be found in *Maintenance Schedule Section* below. The following is a list of parts recommended to have on hand.

Description	Part No.
Fuel filter cartridge	6021
Air filter	6018
Fuel nozzle (# for model CO 45)	14017
Fuel nozzle “O” ring	14025
Photocell (Board versions 5-10)	16002
Photodiode (Board version 11/12)	16003
Flame Sensor (Board version 2000 and 2001)	16004

Over a period of time, operational parts of the heater will wear out and need replacing:

- Air compressor
- Fan Motor
- Ignitor
- Operating and High Limit Aquastat

4-8.6.9 Maintenance Schedule

Maintenance Item	Maintenance Frequency	Service Required
Fuel/Water Hoses	Seasonally	Inspect for leaks and weak points
Hose Clamps	Seasonally	Inspect for corrosion
		Tighten if Loose
Combustion Chamber and Exhaust	1000 Hours	Vacuum Clean
Fuel Filter	Seasonally	Inspect for Cleaning or Replacement
Nozzles, Distributor Orifice, Air Slots and O-Rings	Seasonally or Every 2000 Hours	Cleaning and Inspection for Wear and Damage
Exhaust System	Seasonally	Inspect for Leaks and Corrosion
Coolant Mixture	36 Months	Replace
	12 Months	pH Level for Acidity
Electronic Control Panel	Seasonally	Voltage Test/Inspect for Corroded Wires
Air Compressor, Fuel Pump, Combustion Fan, Motor	Seasonally	Inspect for Leaks, Corrosion and Wear

4-8.6.10 Protecting Hydronic Heating Systems

The advantage of closed hydronic heating systems is that as long as there are no leaks, (i.e., no need for constant make-up water), the fill neutralizes (that is, it reaches equilibrium). The long term result is minimal scale build-up and insignificant corrosion since after operating for a period of time, most oxygen has been “starved” out of the boiler fill water. While boiler fill water treatments have their place, leak prevention is the single most important preventative maintenance item.

Regular maintenance and prompt repair of leaks, combined with a one time application of appropriate inhibitors, can help you enjoy problem-free heating. Since it is difficult to guarantee that a hydronic heating system will never leak, corrosion inhibitors and scale inhibitors added to “fresh” boiler fill water can act as low cost “insurance” for hydronic systems.

Causes of Scale

Tap water is the most typical source selected for boiler fill water. Water contains dissolved solids such as magnesium and calcium which when heated becomes much less soluble and forms scale. Scale comes out of solution in the largest amounts where the temperature is highest in the system (i.e., the boiler heat exchanger). As the scale builds up, noise and cold spots develop since scales plug up water channels and acts as an insulator that impedes proper heater transfer.

Acidity and Corrosion

Corrosion is the result of metal oxidizing (that is, metals reacting with oxygen-rich boiler fill water). The acidity of any liquid (including water) is a good indicator of how much corrosion will actually take place. As a rule of thumb, boiler fill water should have a pH greater than 7 and less than 10.5. The key to preventing corrosion is to make sure that the heating system is free of leaks and there is no need to replace it with fresh, oxygen rich boiler fill water. Corrosion inside a hydronic heating system stops quite quickly as the fill water stabilizes and becomes oxygen-starved. The pH should be measured at least annually.

Since most hydronic heating systems are comprised of different metals (e.g., iron, copper, etc.) and since boiler fill water is an electrolyte (that is, it will conduct electrical current), electro-chemical reactions (“galvanic” reactions) can take place. As the fill water stabilizes, however, it becomes a very weak electrolyte, so galvanic corrosion rarely becomes a problem – as long as the system remains leak-free.

Preventative Treatments

Corrosion and scale inhibitors are relatively inexpensive. Ideally, they should be applied, once only, at the time of a new installation or whenever a system has been completely drained. Boiler water treatment specialists almost unanimously agree that the prevention of leaks and the elimination of the need for frequent boiler water make-up are top priorities for hydronic systems.

4-8.6.11 Water Filling Procedure

After your system has been completely installed, filled with straight water, purged of all air, and operating for a period of time at normal operating temperatures, you should now double check all connections for leaks. If no leaks are found, the system can be drained and filled with a 50/50 mixture of antifreeze and water.

CAUTION!! Where there is a chance of contamination of your domestic water when using a heating system, use antifreeze specifically intended for hydronic heating systems. Inhibited propylene glycol is recommended. Do not use automotive, ethylene glycol, or any undiluted or petroleum based antifreeze as they can cause severe personal injury.

To fill the system use a separate self priming pressure pump with a hose on the suction side. Put the hose into a 5 gallon container. Remove the systems hose from the outlet of the expansion tank, which is feeding the systems circulating pump and attach it to the outlet of the self priming pressure pump. Remove the hose from the inlet of the expansion tank and hang it into the 5 gallon container.

Make a final check to ensure all of the air vents and drains are closed. Pour a mixture of antifreeze and water into the container and start the pump. As the mixture is pumped out, slowly add more mixture keeping the level above the inlet of the suction hose until all air has been expelled and the mixture starts coming out of the return hose hanging in the container. This flushes the system of any debris and purges the lines of air. Continue to run the pump for about 15 minutes.

When no more air is being expelled, stop the pump and reconnect the lines to the expansion tank. Top off the expansion tank with the mixture and turn on the system's circulating pump with the jumper, located on the main control board just right of the pump fuse, marked "Circ. Pump Override". When the jumper is on, the pump will run continuously and the bottom LED will be lit.

Check for a good flow through the expansion tank and double check all joints for leaks. Open and close all air vents to eliminate any remaining air bubbles. Recheck the mixture level and circulation in the expansion tank.

CAUTION!! Make sure you have a good, quiet circulation of water through the heater. Check the pump to make sure it does not run dry. If the heater has air pockets trapped in the water jacket when it is turned on, it could overheat and damage the unit. None of this is covered by warranty.