



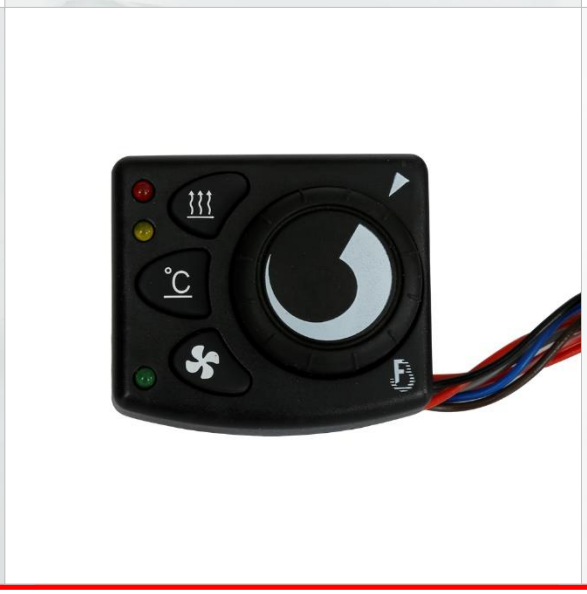


General COMPONENTS

BISON/WALRUS

HEATER INSTALLATION AND SERVICE MANUAL

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FOR REFERENCE ONLY

PREFACE

This manual is designed for use only by GC dealers and their trained and certified technical personnel. This manual expands and/or overrides all OEM heater manuals that come with GC products. This manual applies only to products distributed by GC. In case of conflict of information between this manual and heater OEM, please contact GC tech support.

TABLE OF CONTENTS

1. INSTALLATION

This section describes working principles, internal structure and installation requirements for hydronic and air heaters and their components. It is technician's sole responsibility to familiarize themselves and adhere to all sections of this manual.

1.0 Required tools

Only metric tools should be used to install and service GC line of heater products. All mounting hardware provided in the kit is also metric. The tools you'll need the most are #1 & #2 Phillips screwdrivers, 4mm Allen wrench, a 10mm socket wrench and Molex pin extraction tool. A 30 thou filling gauge is required to set the combustion impeller clearance when servicing the heater. A multimeter may be necessary to test resistance, continuity and operating voltage of various components. We also recommend using service laptop with diagnostics software to properly commission the heater and make sure all sensors work fine and all faults are cleared.

1. 1 WIRING

This section describes general requirements for installation of wiring harness and its components. Please consult your local electrical code and your equipment manual for requirements specific to your case. Consult vehicle's OEM in all cases where GC-provided equipment is being integrated into vehicle's (or vellsel's) HVAC/R or control system.

1.1.1 SPLICING AND EXTENSIONS

When extending or shortening the harness, all connections should be made with heat shrinkable butt connectors (Fig.1) of appropriate gauge, suitable for automotive applications. Crimping of butt connectors should be done with crimping tool rated for insulated connectors (Fig.2) to avoid insulation damage. Conductor gauge and insulation material should remain the same throughout the entire length of the wire (FLRY-B). Use of aluminum or solid copper conductors is not permitted.

Fig.1: Heat shrinkable butt connector

Fig.2: Crimping tool for insulated connectors

1.1.2 HARNESS INSTALLATION

Wiring harness should be installed in such way that no part of it is subjected to heat (over 60C), direct sunlight, moisture, road salt, flying debris or vibration. In cases where harness is run outside of the vehicle or inside of the engine compartment, it should be protected by liquid-tite or corrugated conduit, or other suitable type of protection. Wiring harness should be secured throughout its entire length at an interval not exceeding 50cm. Do not install wiring harness in close proximity to moving parts, exhaust pipes or ignition cables.

Where harness is run through walls of the vehicle, rubber grommets should be used to protect conductor insulation from damage.

In cases with heavy-duty equipment where more than one battery is present in the circuit, it is recommended to install additional fuse into the ground supply line of the heater harness, of the same rating as the fuse on the positive line.

1.1.3 WALRUS 5000C INTERNAL WIRING

During installation of 5000C coolant heater, special attention should be paid to position of a rubber sleeve around supply and return temperature sensors. That sleeve should be pushed in slightly under the fan cover, through a small cavity of the heater block. When the sensor cover is installed, that sleeve should sit snug in the cavity between the heater block and the cover, protecting sensor conductors from heat and vibration.

Failure to correctly position the sleeve will cause wires to fray, and, consequently, will cause heater to fail.

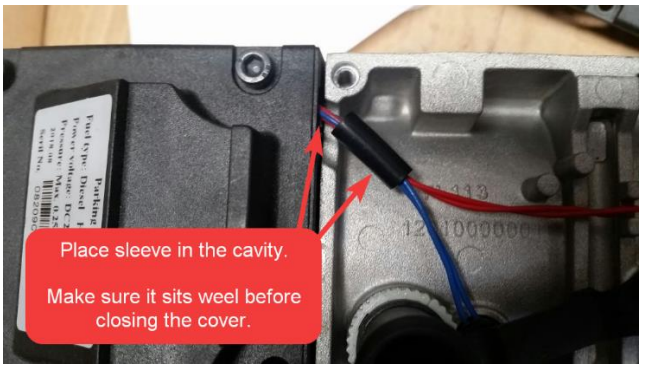


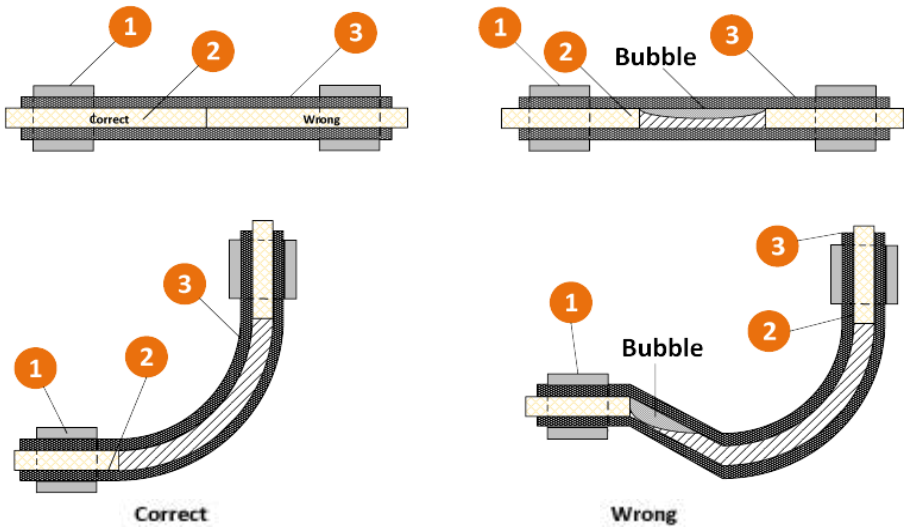
Fig. 1: Sensor wire sleeve

1.2 FUEL DELIVERY

1.2.1 FUEL LINES AND LINE CONNECTIONS

Maximum length of the fuel line between the pickup tube and the fuel pump should not exceed 1.2m!
Maximum length between the pump and the heating unit should not exceed 6.8m.

Every heater kit provided by GC comes with 2mm (internal ø) nylon fuel lines suitable for most installation cases. However, in special situations (i.e. marine applications, heavy-duty etc) those fuel lines may not be your best choice. Consult your local regulations to identify what type of hose or tubing should be used.



1. Fuel Connector Clamp 2. Fuel Pipe 3. Rubber Fuel Connector

Fig. 1: Fuel line connections

Figure 1 shows the correct way to connect fuel lines to prevent the build-up of air bubbles: Ensuring they are flush and minimizing bends.

Fuel line should be run through locations where no flying debris, excessive heat, sunlight, vibration or moisture could affect its integrity, otherwise fuel lines should be sleeved with appropriate material.

Fuel line from the fuel pump to the main heater should be installed in any directions other than downwards (avoid sagging), and affixed to the body of the vehicle with appropriate clamps and zip-ties at an interval of 30cm or less.

Only sharp knife could be used to make cuts. The cuts should be clean and straight to ensure good coupling and prevent bubbles. Do not use saw or scissors.

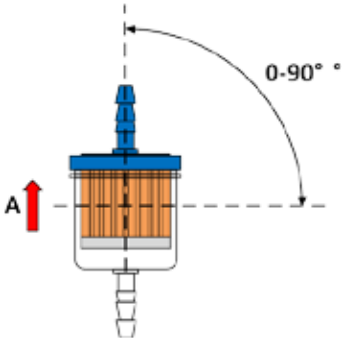


Fig. 2: Fuel filter

Figure 2 shows the allowable installation angle of the fuel filter, as well as the direction of fuel flow (arrow A). The filter should be fitted between the vehicles tank and the fuel pump.

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

1.2.2 FUEL STANDPIPE

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

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

Fig. 3: Marine standpipe

Usually supplied with marine kits and supplied bent, this standpipe is installed like so:

- Drill a hole in the top of the vehicle's fuel tank of appropriate diameter. Avoid shavings from falling in by using grease and strong magnet when drilling. Ensure it is smooth and clean of burrs;
- Remove the top nut and washers and bend the standpipe straight;
- Straighten the standpipe and cut it down to size if necessary, at 45-degree angle. Make sure that the end of the pipe is about 2-3cm away from the bottom of the tank;
- Fit the standpipe by tilting it into position into the newly drilled hole.

Fig. 4: Vehicle standpipe

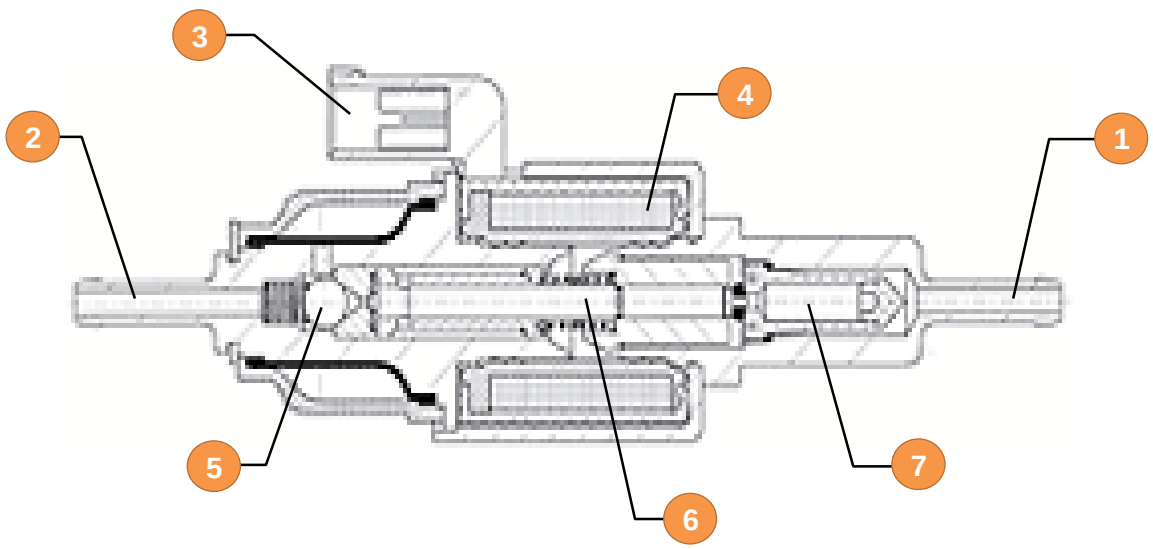
Supplied mainly with vehicle kits, this standpipe is installed like so:

- If possible, remove the sender unit from the vehicles fuel tank, this will make it easier to attach the nut securely back onto the standpipe;
- Drill a hole in the top of the vehicle's fuel tank of appropriate diameter. Avoid shavings from falling in by using grease and strong magnet when drilling. Ensure it is smooth and clean of burrs;
- Cut back the pipe at a 45-degree angle so it's about 2-3cm away from the bottom of the tank;
- Remove the nut from the standpipe and feed it through the hole ensuring the rubber 'o' ring remains on the standpipe 'head' side;
- Replace the nut on the standpipe to secure it safely to the sender unit;
- Replace the sender unit into the fuel tank.

1.2.3 FUEL PUMP INSTALLATION, OPERATION AND WORKING PRINCIPLES

Fuel pump provided with the kits is a piston- (or plunger-) type metering pump. It comes with 12V or 24V coil and is the same for all heater models. The internal composition of the fuel pump is shown on Fig. 5. DC current applied to the coil creates magnetic field that actuates the piston, causing fuel to be sucked into the pump through the intake. When the electric current is removed, piston spring moves the plunger back into home position, pushing fuel out of the supply side. Outlet check valve prevents fuel from flowing back into the pump. The amount of fuel pumped into the heater depends on frequency of pump cycles and fuel displacement of the pump per pulse.

Fuel damper provided with the kit should be installed immediately after the pump to ensure smooth supply of fuel to the heater.



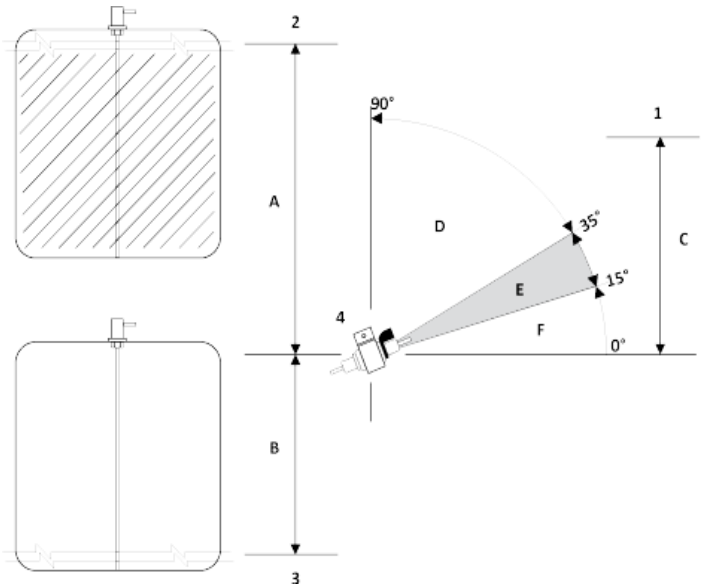
1. Fuel inlet; 2. Fuel outlet; 3. Electrical connector;
4. Magnetic coil; 5. Outlet check valve; 6. Plunger; 7. Pre-plunger

Fig.5: Piston metering fuel pump

It is advised to install the fuel pump in clean, dry and easily accessible location, where it would not be subject to rust due to road salt, splashes, dust, stones and other flying debris.

Rubber holder provided with the kit should be used when mounting the pump onto the body of the vehicle. If metal holder is provided, it is suggested to install a layer of rubber insulation between the pump and the holder. This will help to protect the pump from high frequency vibration and lower the “clicking” noise of the plunger.

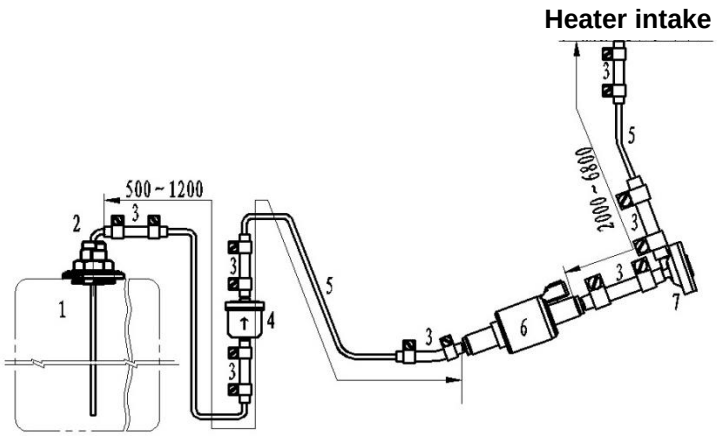
It is recommended that the pump is mounted in such way that it is always above the maximum level of fuel in the fuel tank. In cases where this is not possible, refer to Fig. 6,7 for maximum allowable elevation difference. The pump should also be mounted at 15- to 35-degree angle to the ground to prevent unwanted plunger strokes due to vibration.



1. Heater Body
2. Max. Fuel Level
3. Min. Fuel Level
4. Fuel Pump

A. 3000mm
B. 500mm
C. 2000m
D. Not acceptable
E. Acceptable (between 15-35°)
F. Not acceptable

Fig. 6: Fuel pump tilt angle



1 - Fuel tank
2 - Fuel pickup tube
3 - Fuel line coupling
4 - Filter
5 - Fuel line
6 - Fuel pump
7 - Damper

Fig. 7: Fuel pump allowable elevation

1. 3 MAIN UNIT PLACEMENT

NOTE: Units should not be placed where subject to strong vibration and mechanical shock!

1.3.1 INSTALLATION OF AIR HEATERS

Air heaters could be installed on the floor or on the wall of the vehicle. Maximum allowable tilt of the heater with respect to ground is 30 degrees. When installing heater onto the wall, glow pin should be on the lower side of the heater, pointing upwards. This will reduce heat stress to the insulation of the wires. It is advised that the clearance around the heater will be sufficient enough to be able to remove the covers without taking out the entire unit (around 100cm or 3").

Air heaters must be installed onto a flat surface with no gaps left between the heater plate and the vehicle surface. Heater gasket and plate gasket must be installed. Installer must ensure that no exhaust fumes could enter inside the vehicle.

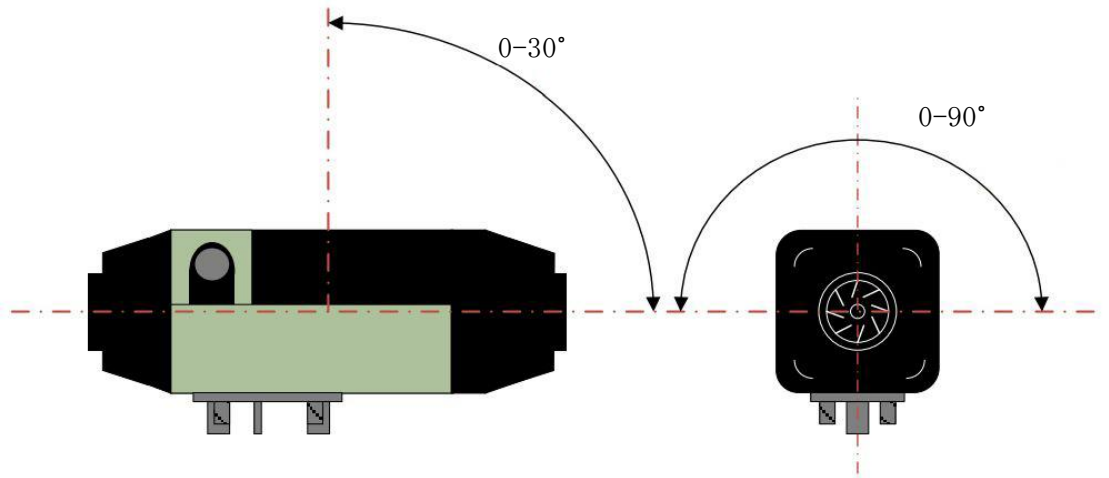


Fig.1: Allowable tilt of the heating unit

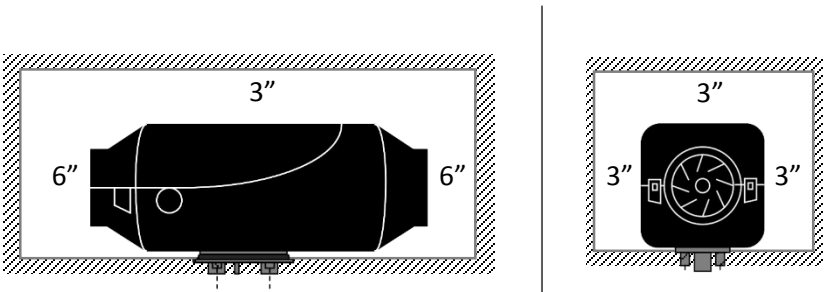
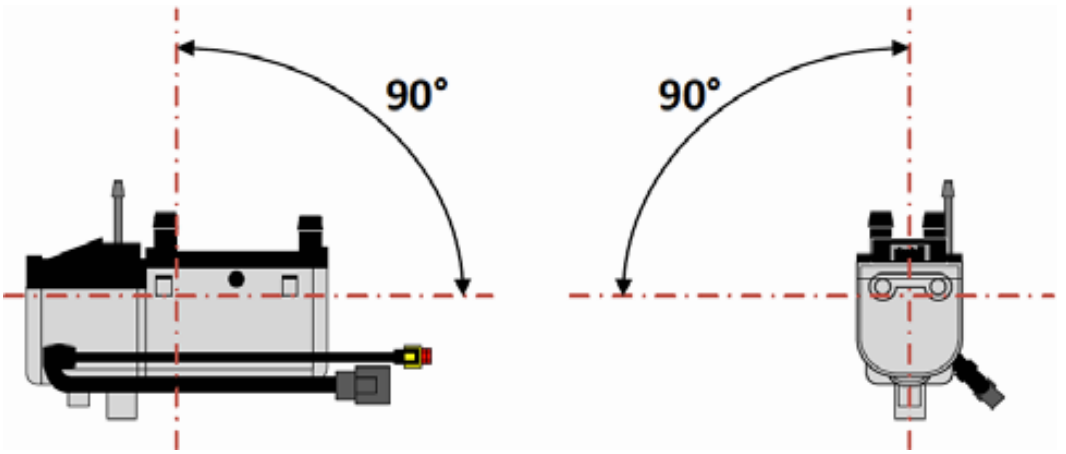


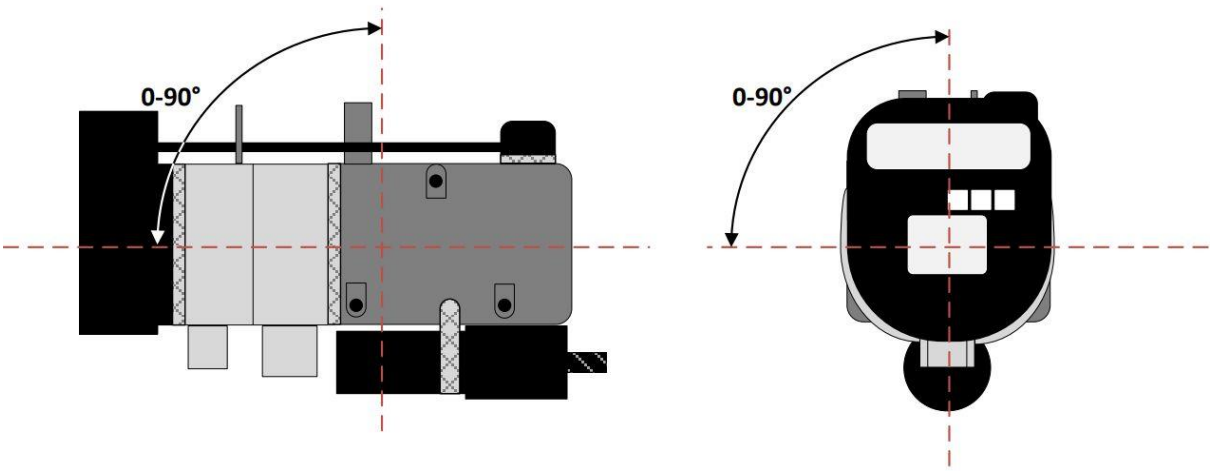
Fig.2: Suggested clearance around the unit

1.3.2 INSTALLATION OF COOLANT HEATERS

Figures 3 and 4 show allowable deviations form “ideal” installation position of 5kW and 9kW coolant heaters. The heater bodies are usually installed on their brackets within the engine compartment to keep the coolant hose lengths to a minimum.



Fi.3: Allowable installation tilt for 5kW coolant heater



1.4 INTAKE AND EXHAUST OF COMBUSTION AIR

1.4.1 GENERAL RULES

Ends of the exhaust and intake pipes cannot face front of the vehicle, installed upwards, against the wall, or otherwise where the airflow could be restricted, affected by the wind, or would allow dust and water to get into the heater. Ideally, ends of both pipes should face down (Fig.1).

Both pipes should be run straight down, or on inclined plane to the ground to allow condensate collecting in the pipes to escape freely. In cases where this is not possible, it is advised to make a small (1/32") hole at the lowest point of the pipe to allow condensate to escape without blocking the airflow.

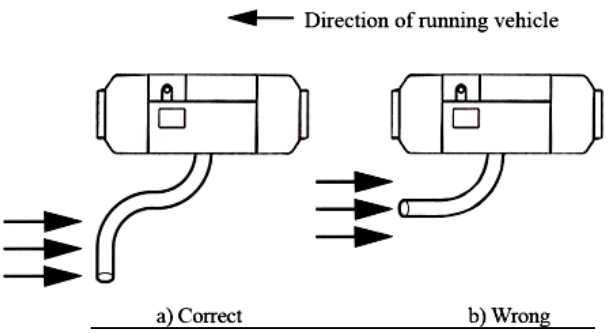


Fig.1: Installation of combustion air pipes

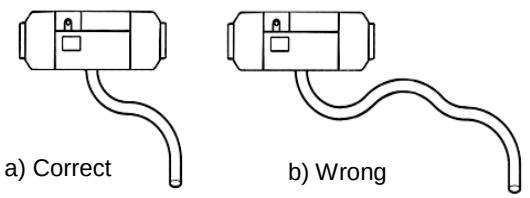


Fig.2: Installation of combustion air pipes

For optimal airflow suggested radii of bends of the pipes should be not less than six times the diameter if the pipe. That means that with 1" pipe the tightest radius of bend should be around 6". It is recommended that each bend along the way will not exceed 90 degrees, with a maximum of four bends in total.

Separation between air intake and air exhaust should be sufficient to prevent exhaust fumes re-entering the heater.

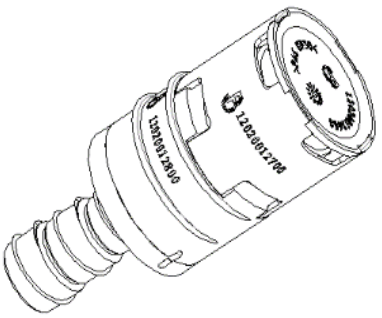
1.4.2 INSTALLATION OF INTAKE AIR PIPE

Intake combustion air pipe should be installed without kinks or sharp bends, facing down and away from the front of the vehicle. In cases where dust of debris could be present, optional air filter should be purchased and installed.

It is not allowed to tap the air intake of the heater into the air intake of the main engine of the vehicle.

Intake air pipe should be secured to the body of the vehicle with appropriate straps and should be kept away from heat-dissipating parts of the vehicle.

In units, where fuel pump wires exit through intake air inlet, they should be fully straightened and fed through the slot on the side of the stud. Intake air pipe should go over those wires tight enough not to pinch them. Feeding wires through the air intake pipe is forbidden.



Fi.3: Optional intake air filter

1.4.3 INSTALLATION OF EXHAUST AIR PIPE

Aside from points made in section 1.4.1 of this manual, special considerations should be taken when installing exhaust pipe and muffler onto the body of the vehicle. Working temperature of the exhaust pipe could exceed 200 degrees centigrade. When strapping the pipe to the surface, make sure no other objects or heat-sensitive materials are present on the other side. Maintain sufficient (about 6") separation between exhaust pipe and adjacent parts of the vehicle. In cases where shorter separation is inevitable, exhaust pipe should be sleeved with optional fiberglass shield.

In no cases should exhaust pipe be secured with, or provide support for other plastic parts, wiring, ducting or fuel lines.

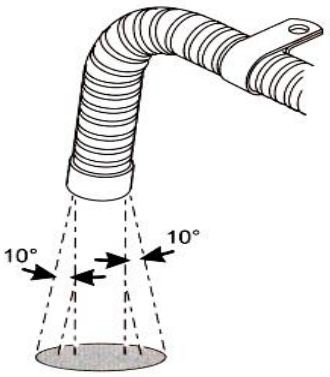


Fig.4: Exhaust pipe end orientation

1.5 AIR DUCTING

1.5.1 GENERAL RULES

Air ducting, if required, should be installed of appropriate type for the application, without sharp bends, kinks or reduction in cross-sectional area. Return air duct and supply air duct should have sufficient separation to prevent hot supply air from re-entering and short-cycling the heater. Ideally, supply air outlet and return air inlet should be located in the opposite ends of the room.

Protective screens should be installed to prevent objects from entering the ducts. Air inlet and air outlet should be located in such way so there could be no obstruction of airflow by cargo or other objects.

Installation of optional room temperature sensor is required in cases where the air supply for the heater is taken from the outside of the vehicle. Air intake louvre should be located as far as possible from heater exhaust pipe and exhaust pipe of the vehicle.

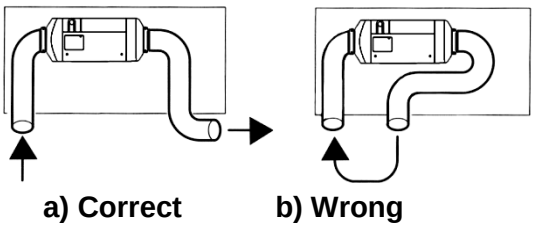


Fig: 1: Air ducting right and wrong

When attaching the duct to the heating unit, clamp tension should be sufficient to hold the duct firmly in place, without obstructing the fan impeller and allowing it to turn freely.

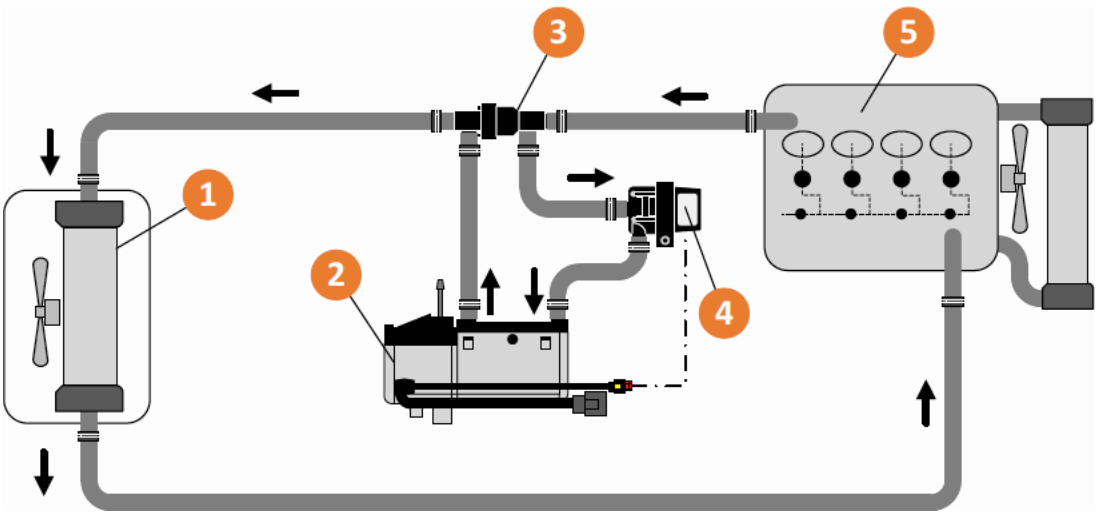
Ducting of the heater should be designed in a way that the differential pressure between intake and discharge of the heater does not exceed 0.15kPa.

1.6 COOLANT PLUMBING

Both 9Kw and 5Kw coolant heaters could be installed in one of the two ways, as shown on Fig.1 and 2.

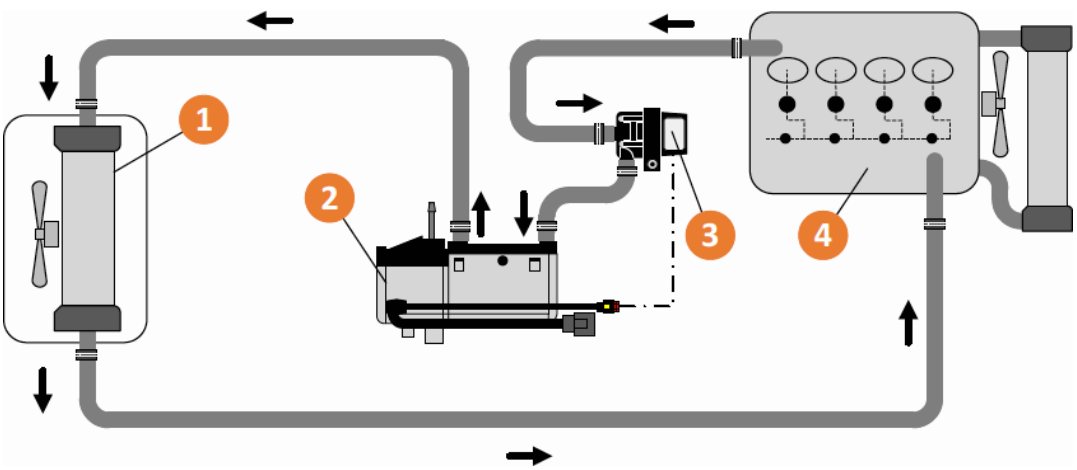
Figure 1 (factory preferred) shows typical installation with the check valve (Fig.1 #3) installed into the coolant loop. When the heater pump is engaged, check valve closes, allowing coolant being pumped through the heater. When coolant pump is turned off, check valve opens and the coolant flows in bypass of the heater.

Figure 2 shows installation where the check valve is not employed, which means that the coolant circulates through the heater at all times. The drawbacks of this method are obstructed coolant flow and the risk of heater's coolant pump freewheeling and generating electricity, feeding it back to the ECU. This method is acceptable, but is not recommended by the factory.



1. Cabin Heater 2. The Heater 3. Bypass Valve 4. External Water Pump 5. Engine

Fig.1: Coolant heater installation with check valve



1. Cabin Heater 2. The Heater 3. External Water Pump 4. Engine

Fig.2: Coolant heater installation without check valve

Hoses connecting to the heaters should be properly fitted and secured to avoid strain tension on connecting pieces of the heater or excessive vibration. Additional elbows and bends should be installed if necessary.

5kW coolant heater comes with two types of hose connectors: straight and 90 degree, which gives some extra options for a better fit. Those pieces are secured to the heater using sprocket-like mating bushings that lock connector in place.

1.7 SENSORS AND CONTROLS

Operation of hydronic heaters and air heaters is controlled through one of the following methods:

- Analog Controller (air heaters only), or Digital Timer;
- Remote Control Unit (RF433);
- GSM Control Unit (requires SIM card to operate);
- Push-button;

Digital timer for water heaters and digital timer for the air heaters look exactly the same and have the same menu structure, however, digital timers for air heaters will not work on water heaters and vise-versa.

Fig.1: Analog controller

Analog controller on Fig.1 comes standard with all air heaters and allows operation of the heater on one of the three basic modes:

- Ventilation - blower fan circulates the air (lower button, green LED)
- Setpoint mode - heater maintains the temperature set by the dial, between 05 and 35 degrees centigrade (middle button, yellow LED);
- Variable heat mode - heater constantly produces heat. The amount of heat is set by the dial from minimal heat to maximum heat.

Digital timer(Fig.2) comes standard with all coolant heater models and as an option with all air heater models. It allows 7-day programming, reading and clearing faults and some other maintenance operations.

Please refer to section 1.7.1 for details on how to program and operate this controller.

Fig.2: Digital Timer

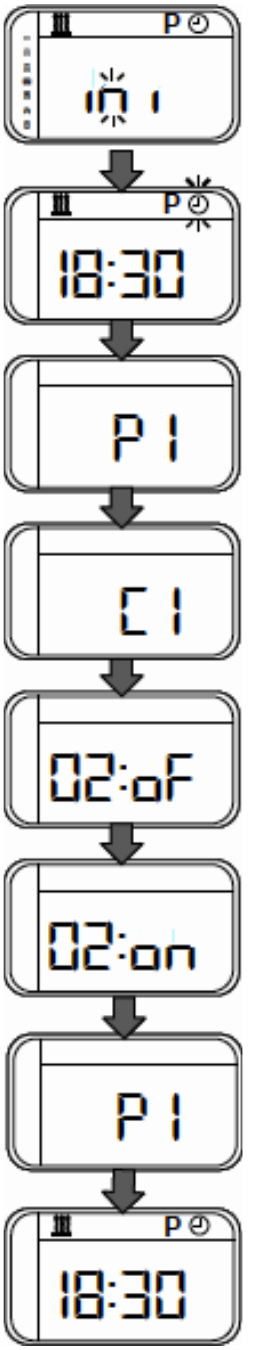
1.7.1 SETTING UP DIGITAL TIMER

Digital timer is the most commonly used control method which offers a number of functions for operation, maintenance and testing of the unit. Comfortable working knowledge of this device is vital for all service personnel.

CHANGING LANGUAGE

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

1. Turn on the control with the power button. Wait for the symbols to stop flashing, then press the power button again.
2. Navigate to the clock face symbol at the top of the control by using the arrow keys. When it is flashing press both arrow keys simultaneously.
3. P1 now appears.
4. Press ok and C1 will appear.
5. Keep pressing ok slowly until '02:oF' appears.
6. Press any of the arrow keys until the screen reads '02:on'
7. Keep pressing ok until back to the P1 menu screen
8. Press power button to return. The language will now be set to English.



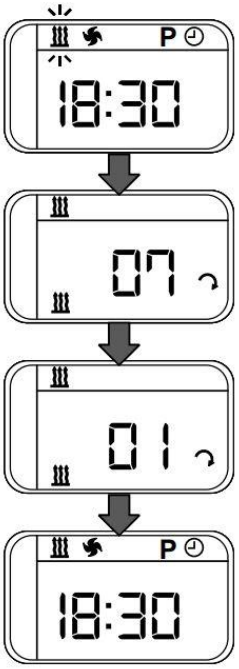
SETTING DATE AND TIME

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

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

MANUAL ON/OFF OPERATION

1. To switch the power on manually, navigate to the heating icon, and press ok
2. The heater will start automatically.
3. Use the arrow keys to adjust the output of the heater from high to low (07 to 01 respectively)
4. To switch the heater off, simply press the heater button to return to the home screen.



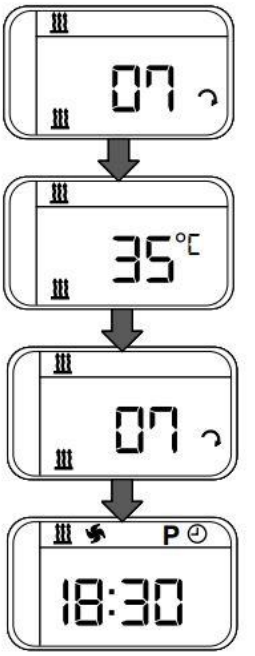
SWITCHING TO THERMOSTATIC MODE

To switch to thermostatic mode, turn the heater on manually, as stated in the previous step.

1. Once the heater is on, press and hold the ok button for three seconds and then release it.
2. The display should change to a temperature setting which can be adjusted from 05° C to 35° C using the arrow keys.
3. To adjust back to the variable output mode, simply press and hold the ok button again for 3 seconds and then release it.
4. To switch the heater off, press the power button to return to the home screen.

FAN MODE

The fan mode works in the same way as the manual on/off mode. Simply navigate across to the fan symbol and confirm with OK. The fan will then automatically switch on and its speed can be adjusted from high to low (07 to 01 respectively) using the arrow keys. To switch it off, press the power button.



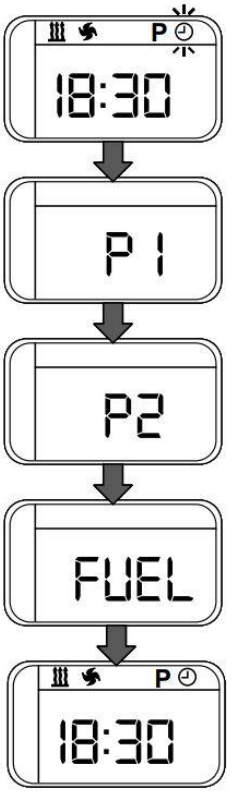
PRE-SETTING HEATING TIMES

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

1. Navigate to the 'P' symbol, and press OK.
2. Using the arrow keys select the number 1 (flashing) at the top of the screen, and press OK - Number 1 is the first heating time.
3. Using the arrow keys, select 'ON', as this will allow the heater to switch on after the presetting is finished. Press OK to confirm.
4. Select the length of time you want the heater to run for by using the arrow keys.
5. L800 represents 800 minutes. Run time can be selected from 50-990. Press OK to confirm.
6. Select the hour you wish the heater to start at by using the arrow keys and then pressing OK to confirm.

ENABLING FUEL PRIMING MODE

This option allows to override the fuel pump for test and service purposes only and should not to be used during normal heater operation!

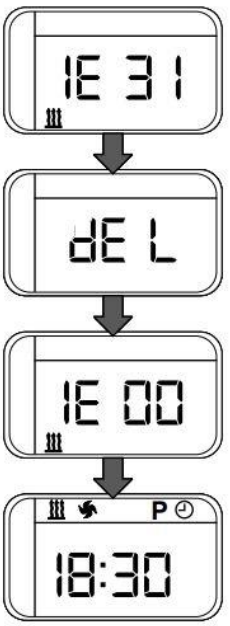


1. Disconnect the fuel line from the heater first, to prevent flooding of the heater and place in a suitable receptacle;
2. To enter the fuel priming mode, navigate to the clock face using the arrow keys and press both arrow keys simultaneously;
3. P1 should appear on the screen;
4. Select P2 by pressing any arrow key, and confirm with OK;
5. The fuel pump will begin to rapidly pump the fuel;
6. It will automatically shut down after three minutes, or press any key to stop the pumping at any time, and return to the home screen.

CHECKING AND CLEARING ERROR CODES

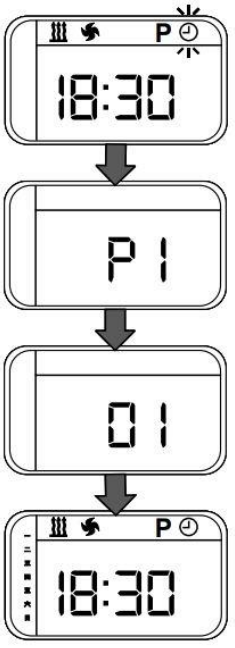
Once an error code has been displayed, and the problem has been amended, follow these steps to reset it.

1. Check the error using the arrow keys. Exit by pressing either OK or the power button.
2. Press both arrow keys to display message ‘dEL’.
3. Press OK to delete all errors or power to go back. Once the display reads ‘IE00’ then no errors have been found.
4. Press OK or power to return.



RESETTING DIGITAL CONTROLLER TO FACTORY SETTINGS

1. Navigate to the clock face on the menu and simultaneously press both arrow buttons.
2. P1 should appears on the screen.
3. Using the left arrow key select ‘-01’, confirm by clicking the ‘OK’ button.
4. The control should now be reset to its original factory settings.



1.7.2 INSTALLATION OF AUXILIARY ROOM TEMPERATURE SENSOR

Fig.5: Room temperature sensor

Auxiliary room temperature sensor (Fig.1) should be installed in all cases where heater intake air temperature cannot be trusted as reliable reading for the heater operation, i.e. when fresh air is taken for heating of the vehicle, or when location of the heater differs from the room it serves.

The type of sensor is the same for all air heater models and is a 10KOhm NTC thermistor.

Room temperature sensor consists of the sensor body with two-conductor cable permanently attached to it, harness or ECU connector and two harness wires that need to be installed into:

- **Pins 9 & 11 of main heater connector X6 on 2kW Air heater;**
- **Connector X5 of ECU on 5kW air heater;**
- **Pins 13 & 15 of connector X6 on 2.2kW and 4kW air heaters;**

Thermistor wiring is polarity-insensitive.

It is imperative to test the sensor operation using diagnostics software and control thermometer to make sure that the sensor operates as it should.

LOCATION CONSIDERATIONS

Room temperature sensor should not be located in direct sunlight, near windows, too high or too low on the wall, or near hot air outlet of the heater. Ideal location of the sensor is at the shoulder height on the back wall of the room, where it will not be affected by cross-breeze or sunlight.

1.7.3 INSTALLATION OF RF433 REMOTE CONTROL UNIT

Remote control unit works with advanced versions of digital controllers and allows remote start of heaters using key fob. Typical operating distance of key fob is 50 meters. Contact GC sales team if you have compatibility questions.

Remote control key fob requires single AAA battery to operate. Battery is not included in the kit.

When installing remote control unit following considerations should be taken:

- Antenna should be mounted is a way to prevent radio waves being trapped, i.e. as close as possible to the windows;
- Pushbutton should be mounted in easily accessible location;
- Remote control unit should be located close to the timer/controller connectors.
- Estimate cable lengths before placing the unit to make good judgement on location of all components.

Unit comes prewired and is easy to install: simply follow the instructions attached to the unit.

1.7.4 INSTALLATION OF GSM UNIT

Fig.1: GSM kit

GSM control unit is an optional device that allows control of the heater through text messages or a voice call. A SIM card should be purchased and installed into the unit to make it work. This unit does not require data to be added to the plan.

GSM kit includes GSM unit itself and a button that should be installed near the analog or digital controller of the heating unit. The button is used to stop the heating cycle and to reset the password to default (hold button for 3 seconds to reset).

GSM unit should be installed as close as possible to the windows of the vehicle, and as far as possible from metal objects such as frame or chassis of the vehicle and wiring.

Heating duration set by voice or text can be set between 15 and 45 minutes.

LOADING YOUR SIM CARD

SIM card should be loaded with GSM unit powered down, preferably before installing the unit into the vehicle.

Fig.2: SIM holder eject button

1. Eject SIM card holder by gently pressing on eject button with a thin, blunt metal object, such as paper clip (Fig.2). Do not use pencil - graphite may break and fall into the unit.

2. Break the SIM chip out of the card and place it into the SIM holder of GSM unit. SIM holder of supports only standard size SIM.

3. Insert SIM holder back into the unit *facing down (Fig.3)*, towards the circuit board. Push it in until it is about 1/16" in.

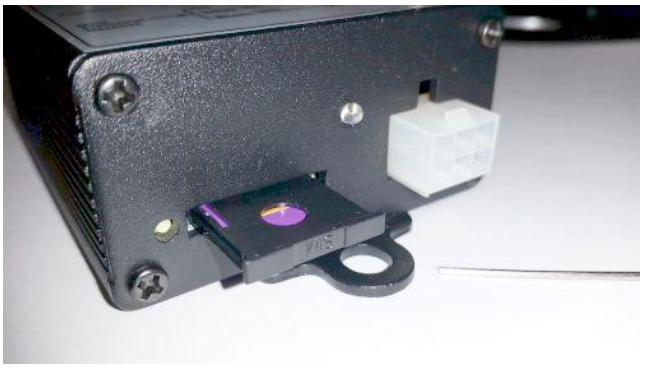


Fig.3: Correct orientation of SIM card

After SIM card is in place, reinstall the unit and power it up. Steady green light should turn on, indicating that the unit is running Ok. You can call the number given to you by your wireless provider to setup the password and bind your cellphone.

VOICE OPERATION

To operate the heater using voice, dial the number of the SIM card and follow the prompt. If you phone is not bound to the GSM unit, you will be asked to enter the password followed by the pound key (#). **Default password is 2530666.** Once the password is accepted, you will be offered following options:

[1] - heat ON for 15 minutes;
[2] - heat ON for 30 minutes;
[3] - heat ON for 45 minutes;
[8] - change language;
[1] - Chinese;
[2] - English;
[3] - Russian;
[0] - return;
[9] - change password;

Out of the box, GSM unit may be set to Chinese, in which case you will have to convert it to English by selecting option #8, and then #2.

If you are willing to change your password, it should be done before you start heating cycle.

TEXT MESSAGE OPERATION

As an example, we will assume the GSM unit password is 2530666 and the operator phone number is +15552321111.

*Bind cellphone: *pwd**phonenumber#*

You can bind up to two cellphones to one GSM controller by sending following text message:

*2530666**15552321111#

The GSM unit should reply with confirmation or an error message. Once bound, you no longer have to enter the password to send commands to the controller.

*Unbind one cellphone: *pwd*#phonenumber#*

2530666#15552321111#

*Unbind all cellphones: *pwd##*

2530666##

*One-time instant start: (*pwd)*01*mm#*

This command will start the heater instantly, after command is accepted, for the duration of *mm* minutes.

*01*30# (bound start now for 30 min)
*2530666*01*30# (unbound start)

*Heater shutoff: (*pwd)*02#*

This command will shut the heater off, if it started its heating cycle.

*One-time (non-repeating) delayed start: (*pwd)*hhmm*duration#*

*0215*30# (bound)
*2530666*0215*30# (unbound)

This command allows you to program GSM controller to start the heating cycle once, in *hh* hours *mm* minutes from now and heat for *duration* minutes. After command is accepted, the heater will start countdown.

Duration can be set anywhere between 15 and 45 minutes. If you omit the duration (*(*pwd)*hhmm#*), heater will heat for the preset default duration of 45 minutes:

*0215# (bound)
*2530666*0215# (unbound)

In the example above the heater will engage in 2 hours and 15 minutes from now and will operate for 45 minutes.

*Cancel delayed start: (*pwd)*0000#*

The command above will cancel scheduled start of the heater.

SERVICE AND MAINTENANCE

All GC heaters should be subjected to regular maintenance, preferably on a yearly basis. Every maintenance should start with inspection of the heater and all of its external components (refer to the "Technician's Checklist" of the GC Warranty Manual). Using Ignite Advanced Diagnostics, identify the hours of the heater and compare them against maintenance schedule and records. Wearable components that are past their hours should be replaced to ensure best efficiency and avoid equipment failure. For the expected lifetime of various components of the heaters, please refer to the following Maintenance Schedule chart.

MAINTENANCE SCHEDULE

#	Part description	Expected lifetime	
		Hours	Seasons
1.	Burner (air heaters)	800	2
2.	Glow pin	-	5
3.	Temperature sensors	-	-
4.	Water pump	-	-
5.	Fuel filter	-	2
6.	Flame sensor	-	-
7.	Flame tube	-	-
8.	Heat exchanger	-	10
9.	Overheat sensor	-	10
10.	Exhaust pipe	-	10
11.	Air ducting	-	-
12.	Intake, supply, room sensors, controllers	-	-
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			

TROUBLESHOOTING

AIR HEATER ERROR CODES (ANALOG CONTROLLER ONLY)

Following codes are indicated by red LED on analog controller:

Times of flashes of LED	Troubleshooting methods
1	a Check whether the fuel pipe is blocked or whether the fuel in the tank is sufficient. b Check whether the exhaust pipe is blocked. c Check whether fuel mass is appropriate.
2	a Ditto b Ditto c Ditto d Replace the fuel pump
3	a Abnormal voltage, if the voltage is very low, then battery should be charged.
4	a Use ventilation mode cooling if temperature over high. b Or replace controller.
6	a Replace controller
7	a Check whether fuel pump lead connection is reliable. b Replace fuel pump; Replace controller.
8	a Check whether the fan wheel have any scrape. b Replace fan motor assembly. c Replace controller.
9	a Clean the carbon deposition of glow plug. b Replace glow plug. c Replace controller.
10	a Whether air inlet and outlet are blocked. b Whether junction box cover tightly. c Whether inlet air and exhaust air short circuit.
11	a Check overheat sensor (normal temperature resistance is about 1kΩ). b Replace overheat sensor.
12	a Check control switch connection. b Replace control switch.
13	a Need to clean up the carbon deposition and maintenance work.

WATER HEATER ERROR CODES

Following codes could be retrieved and cleared through diagnostics software or digital timer.

Fault code	Fault cause	Troubleshooting methods
10	Voltage too high	A Check power supply
11	Voltage too low	A Check power supply B Charge the battery if voltage is low
12	Software overheat	A Check coolant level, refill coolant after temperature drop if lack of coolant and then start again B Check whether water pump is working properly
14	Water temperature or overheating temperature difference too high	
15	Overheat lock 10 times	
17	Hardware overheat	
13	Second failure	A Check whether the fuel pipe is blocked or the fuel in the fuel tank is enough B Check whether air inlet pipe or exhaust pipe is blocked. C Check whether fuel mass is appropriate
20	Glow plug open circuit	A Clean up the carbon deposition B Change glow plug C Change controller
21	Glow plug short circuit	
30	The rotate speed of the fan is too high	A Change controller
31	The fan has a broken circuit	A Check whether fan wheel is binding B Change fan motor assembly C Change controller
33	The rotate speed of the fan is too low	A Check whether power voltage is too low B Check whether fan wheel is binding C Change controller
39	Short circuit of warm air blower	A Check motor of warm blower
41	Broken circuit of the water pump	A Check water pump line B Change water pump
42	Short circuit of the water pump	
47	The fuel pump is short circuited	A Check fuel pump leads connection is reliable B Change fuel pump C Change controller
48	The fuel pump is broken circuited	

50	Start failure lock over 10 times	Same as 13
51	Self -checking over high temperature of flame sensor	A Wait for flame sensor cooling B Change flame sensor (normal temperature resistance>about 1Ω)
52	Flameout 3 times	Same as 13
60	Temperature sensor is broken circu	A Check temperature sensor (normal temperature resistance is about 10Ω) B Change temperature sensor
61	Temperature sensor is short circui	
64	A broken circuit of the flame sensor	A Check flame sensor (normal temperature resistance is about 0.8Ω) B Change flame sensor
65	Flame sensor is short-circuited	
71	A broken circuit of the overheating sensor	A Check overheat sensor B Change overheat sensor C Change controller
72	Overheat sensor short circuit	
99	Fault information invalid	A Change controller
E1	Fault of controller	A Replace controller

TIMER MALFUNCTIONS

All connections should be prepared for you in your kit. However, if changes need to be made, or terminals have become disconnected, use the following diagrams to ensure the timer plugs are wired correctly. Use multimeter to check for appropriate voltage and continuity of the wires.

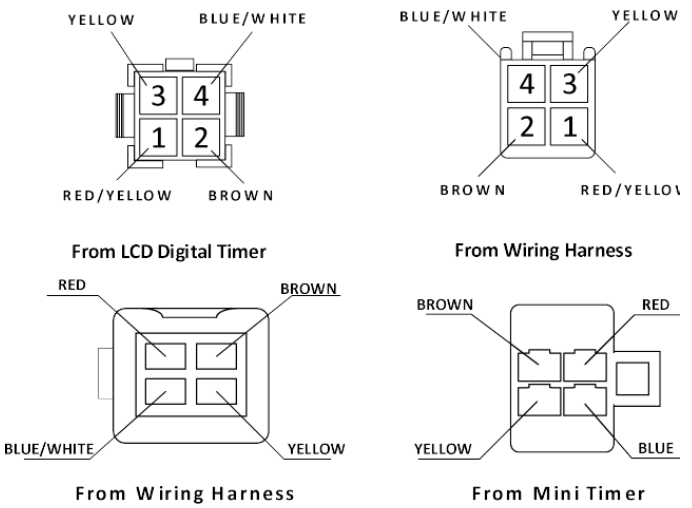


Fig.1: Controller connection

1. (red/yellow) positive supply, +12 or +24V;
2. (brown) 0V or chassis ground;
3. (yellow) heater enable - starts heater if connected to red;
4. (blue/white) LIN network conductor.

HEATER DRAWINGS

2000A - 2kW Air Heater

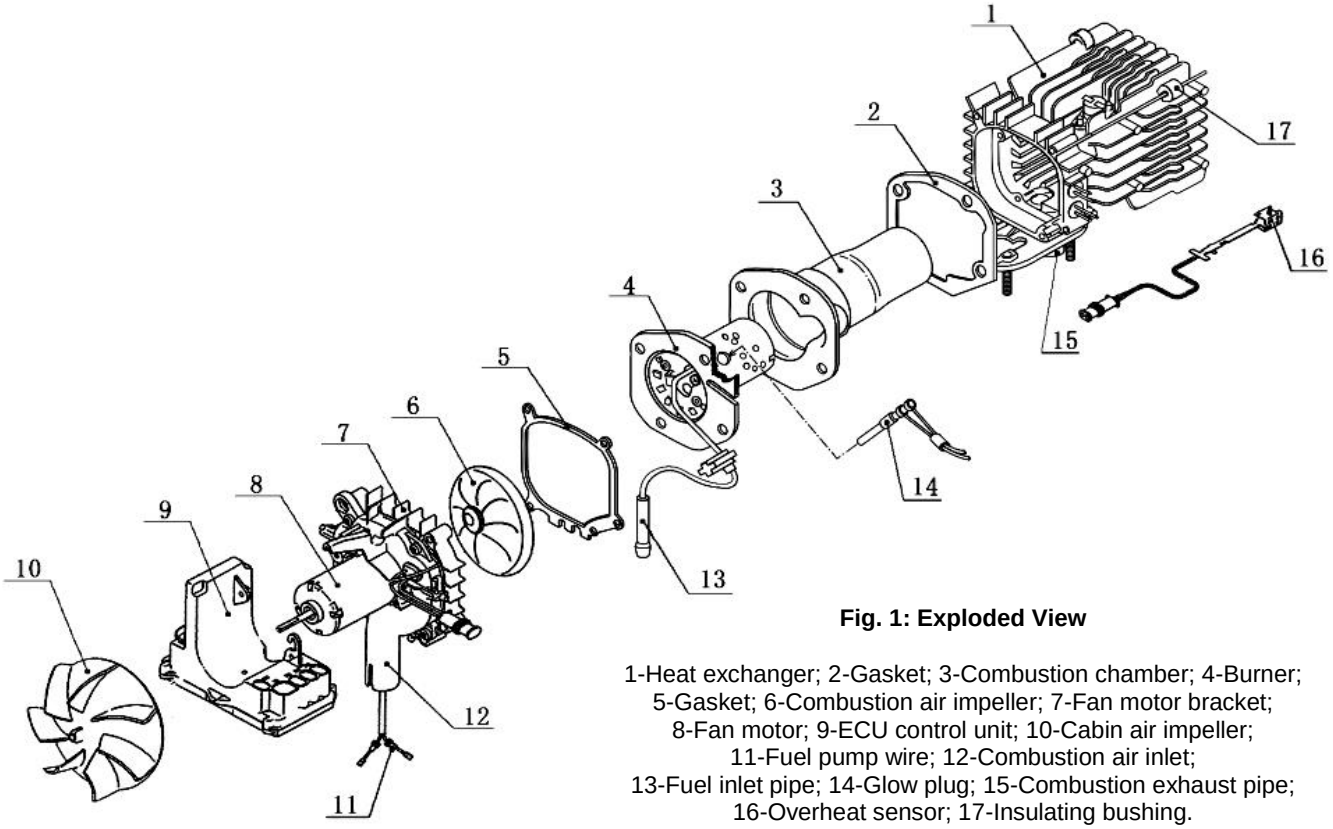


Fig. 1: Exploded View

1-Heat exchanger; 2-Gasket; 3-Combustion chamber; 4-Burner;
5-Gasket; 6-Combustion air impeller; 7-Fan motor bracket;
8-Fan motor; 9-ECU control unit; 10-Cabin air impeller;
11-Fuel pump wire; 12-Combustion air inlet;
13-Fuel inlet pipe; 14-Glow plug; 15-Combustion exhaust pipe;
16-Overheat sensor; 17-Insulating bushing.

- Socket X1 - fan motor,
- Socket X2 - glow plug,
- Socket X3 - overheating sensor,
- Socket X4 - fuel pump,
- Socket X5 – not used,
- Socket X6 - main wire harness.

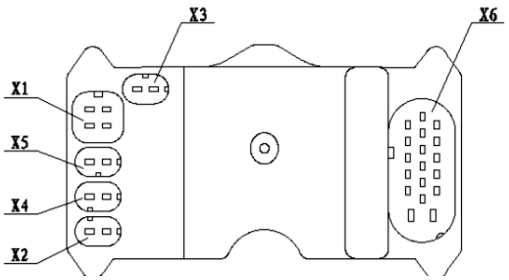
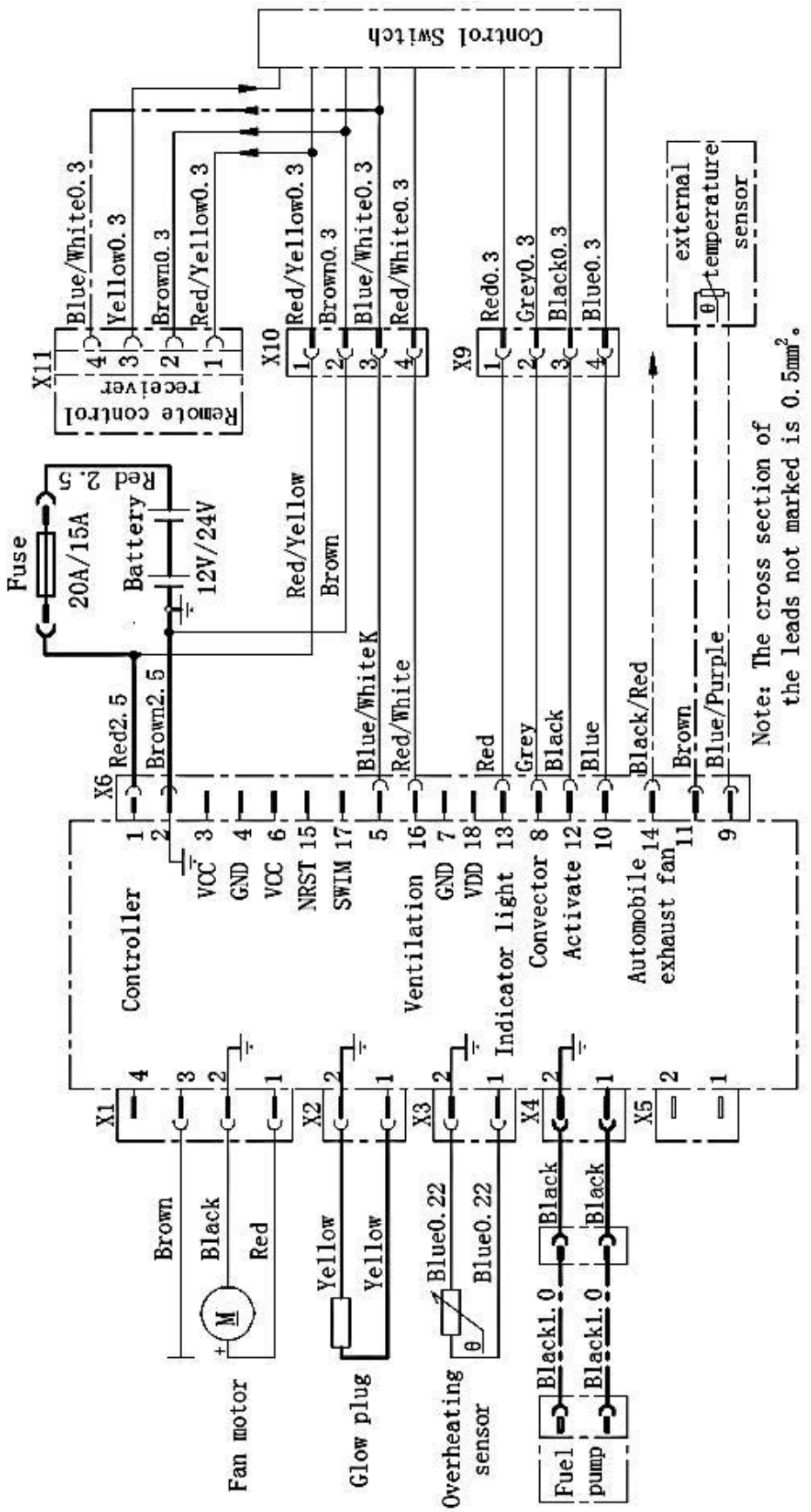


Fig.2: ECU Connections



2000A Electrical Diagram

5000A - 5kW Air Heater

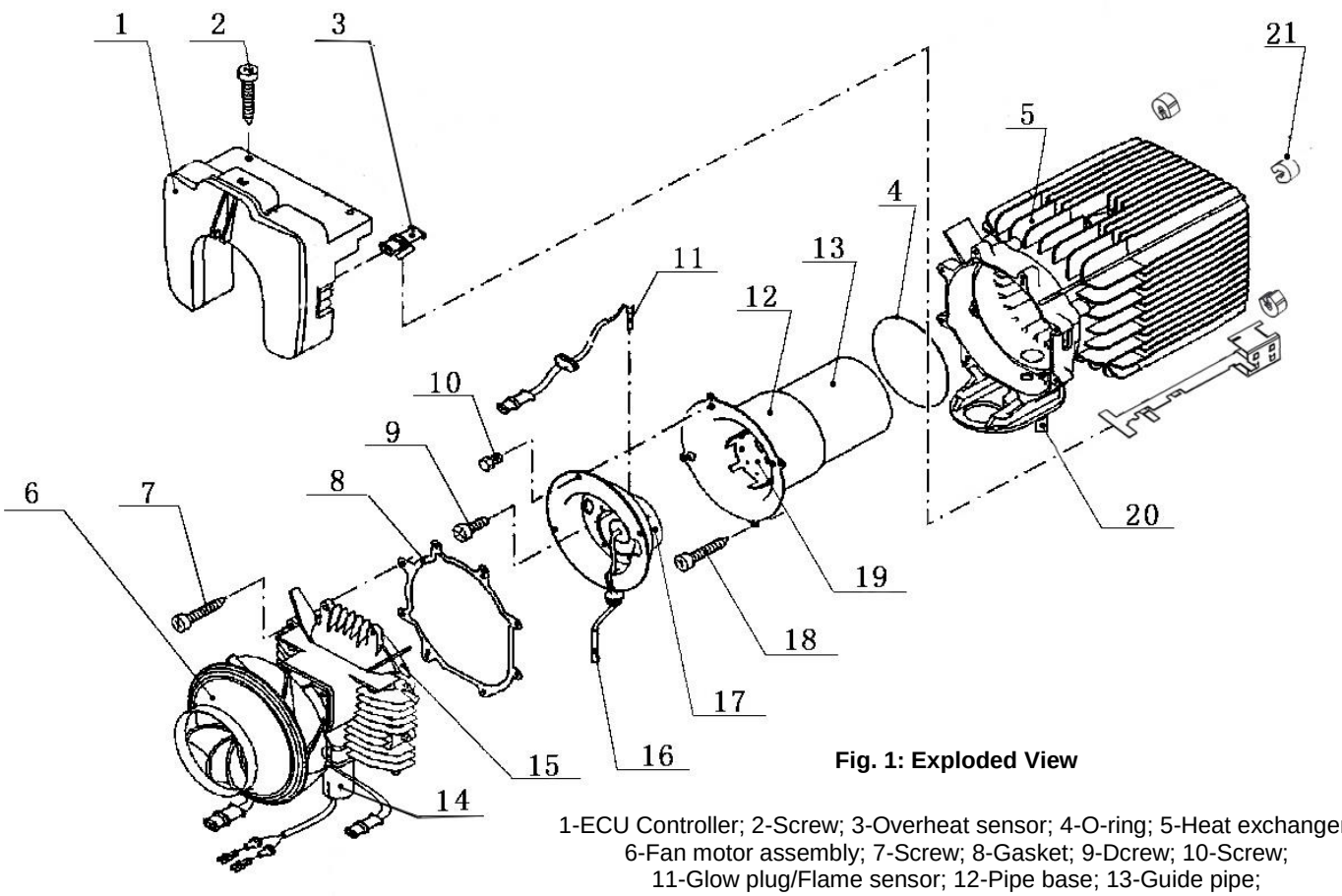


Fig. 1: Exploded View

1-ECU Controller; 2-Screw; 3-Overheat sensor; 4-O-ring; 5-Heat exchanger;
6-Fan motor assembly; 7-Screw; 8-Gasket; 9-Dcrew; 10-Screw;
11-Glow plug/Flame sensor; 12-Pipe base; 13-Guide pipe;
14-Combustion air inlet; 15-Combustion air impeller; 16-Fuel inlet pipe;
17-Combustor; 18 – Screw; 19 – Combustion chamber; 20 – Exhaust outlet

- Socket X1 - Fan motor,
- Socket X2 - Glow plug,
- Socket X3 - Overheating sensor,
- Socket X4 - Fuel pump
- Socket X5 – External temperature sensor
- Socket X6 – Compartment fan (option).
- Socket X7 – Main wire harness connector

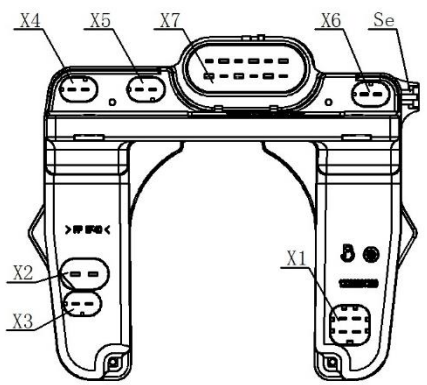
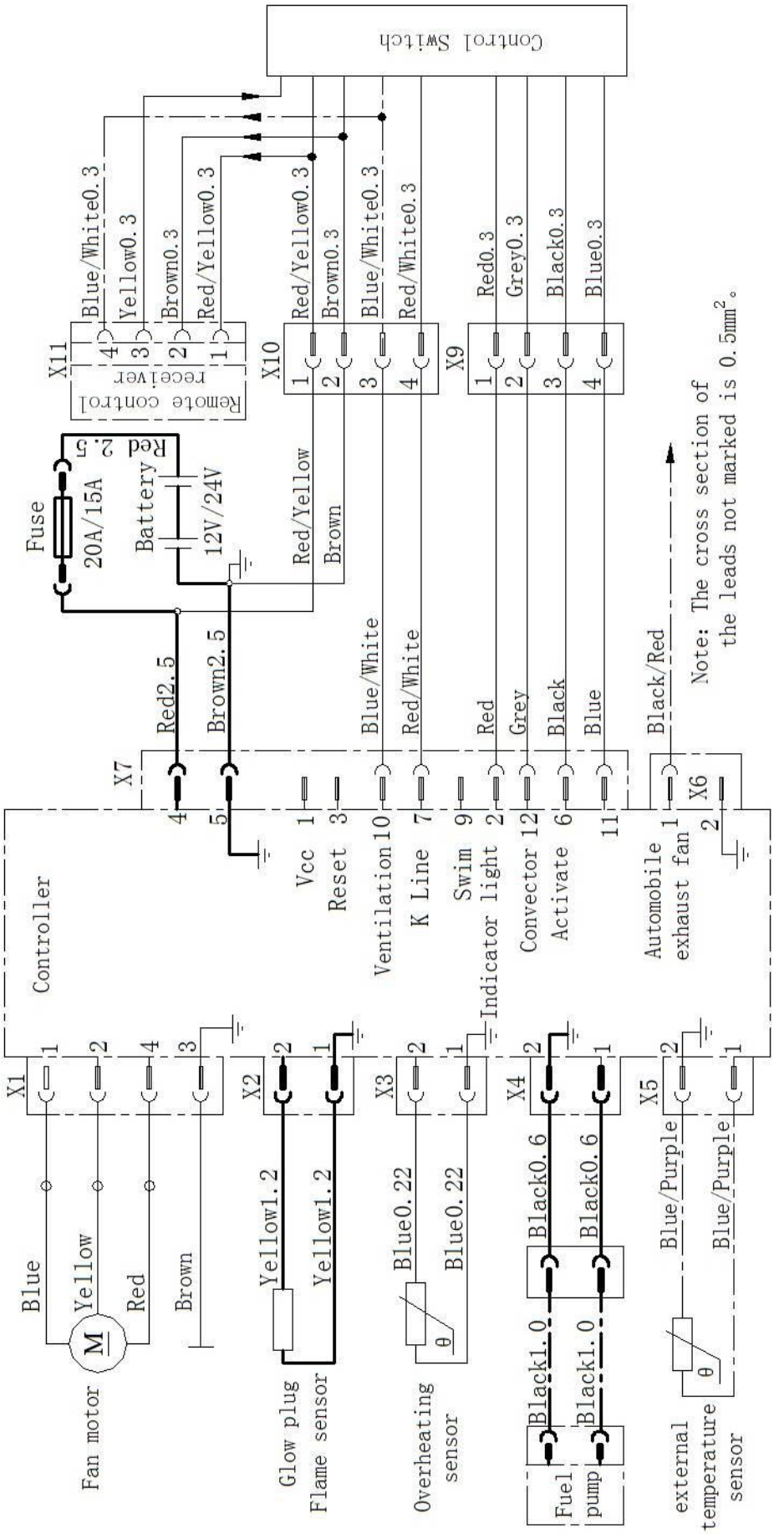
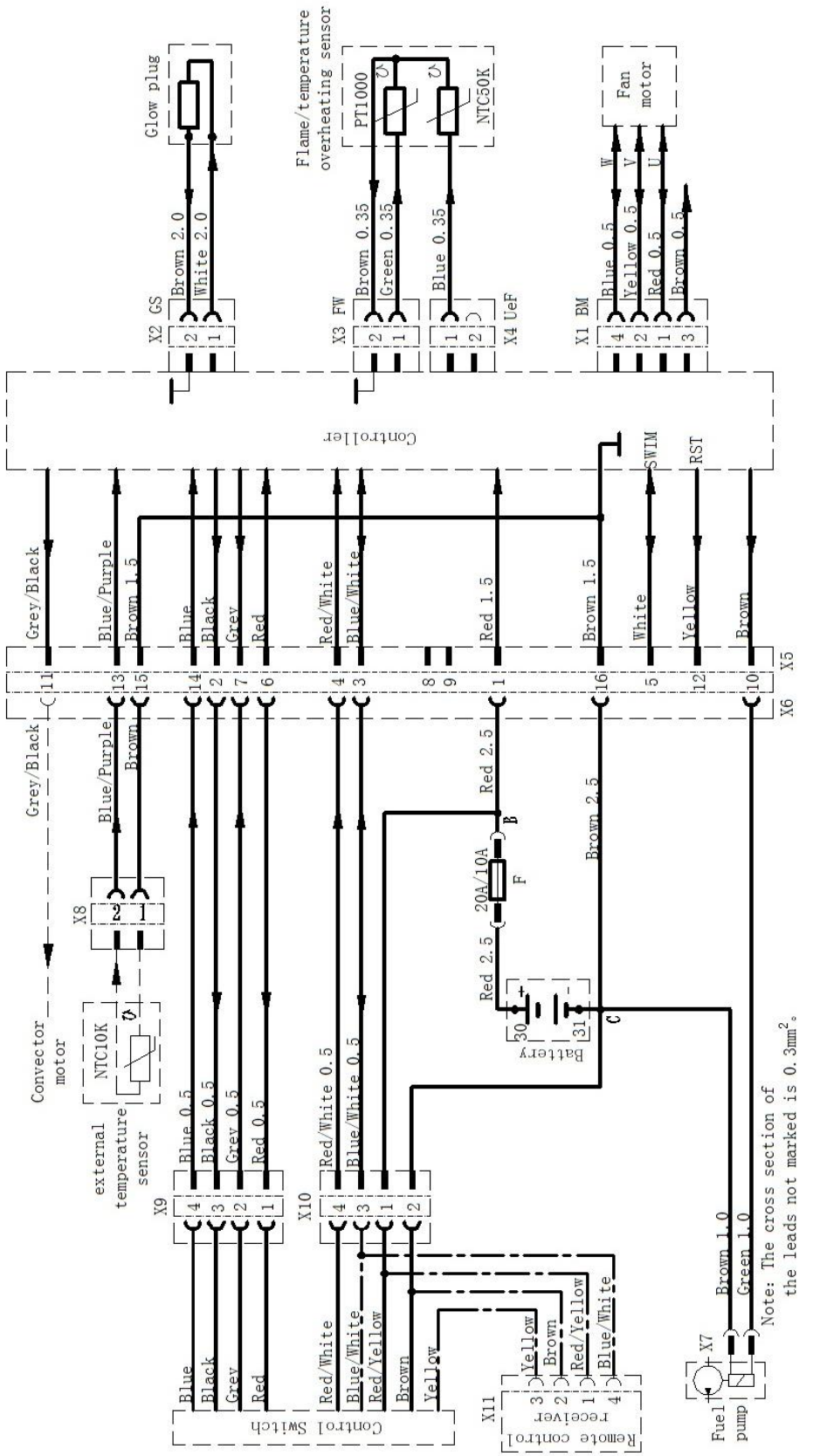


Fig.2: Exploded View



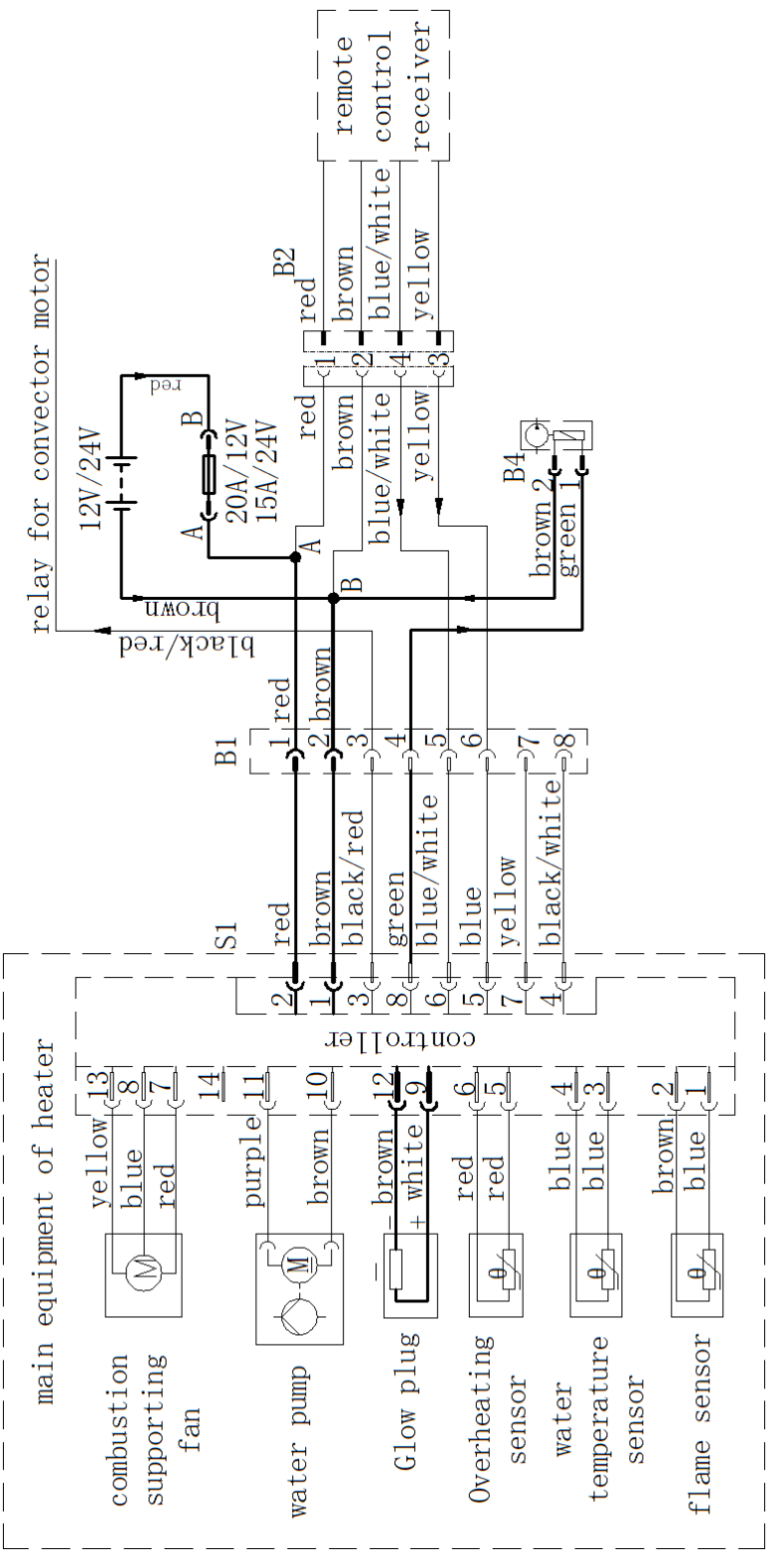
5000A Electrical Diagram

2200A & 4000A - 2.2kW/4kW Air Heaters



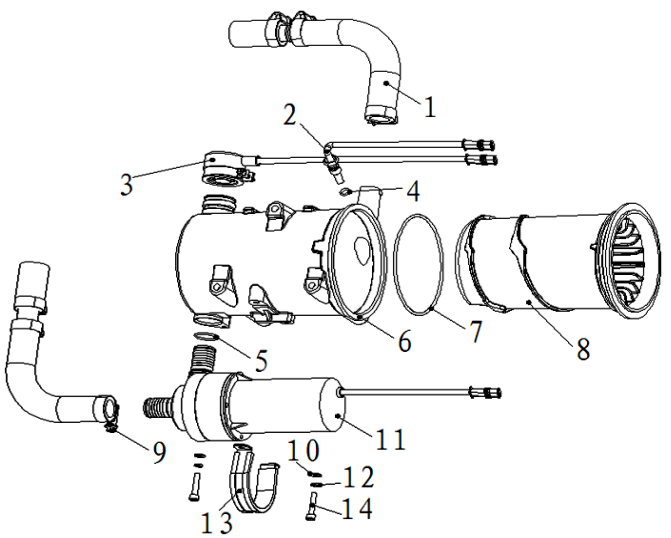
2200A/4000A Electrical Diagram

5000C Coolant Heater



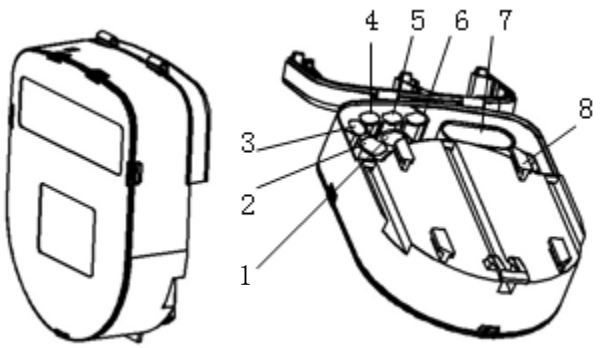
5000C Electrical Diagram

9000C Coolant Heater



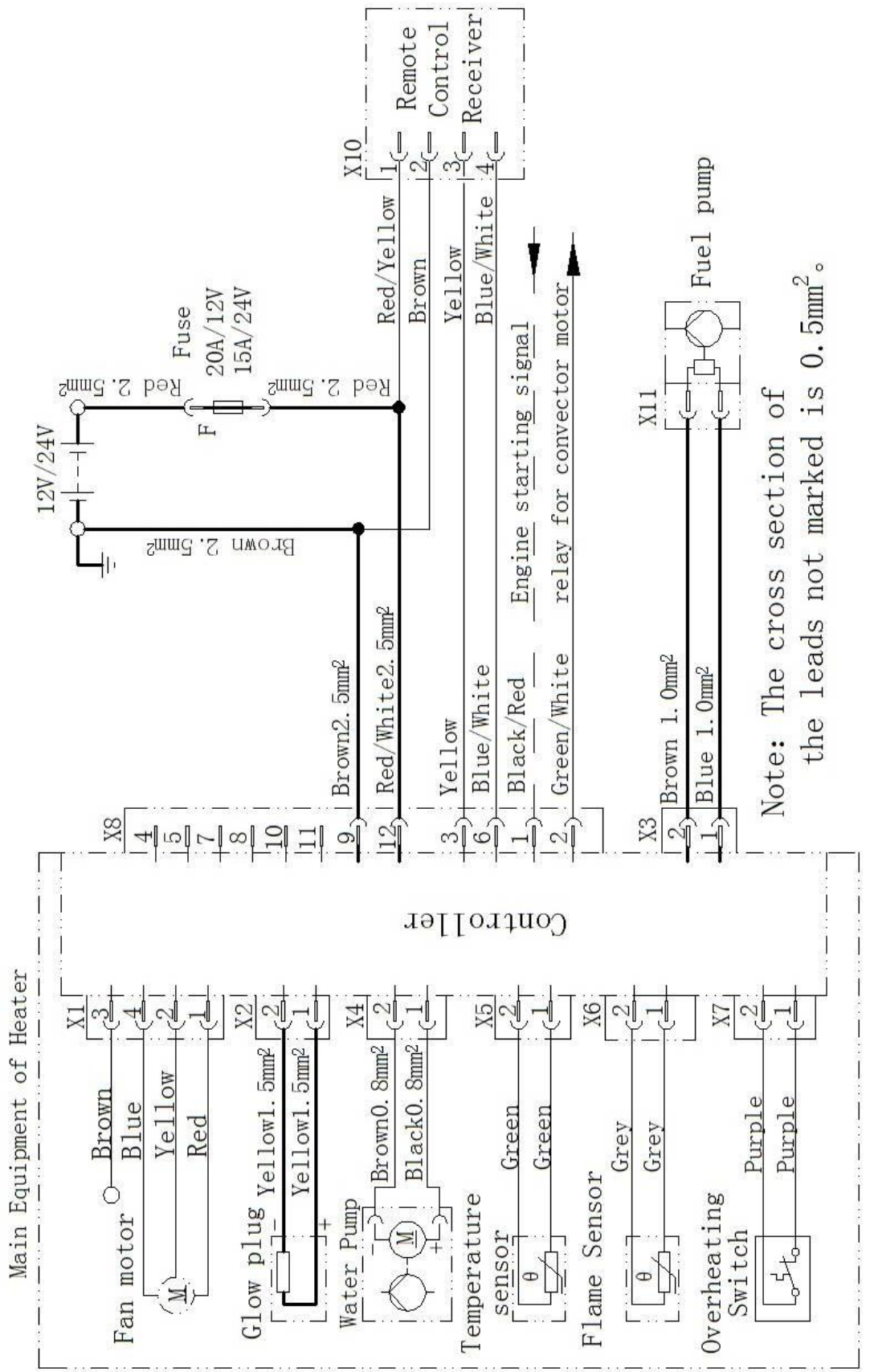
1 - Coolant outlet
2 - Water temperature sensor
3 - Overheat switch
4 - O-ring
5 - O-ring
6 - Heater outer casing
7 - O-ring
8 - Heater inner casing
9 - Coolant inlet
10 - Gasket
11 - Water pump
12 - Spring washer
13 - Water pump clamp
14 - Bolt

Fig. 1: Internal Composition



1 - Glow pin socket
2 - Fan motor socket
3 - Water temperature sensor socket
4 - Flame sensor socket
5 - Water pump socket
6 - Overheat switch
7 - Wire harness socket
8 - Fuel pump socket

Fig. 2: ECU Connections



9000C Electrical Diagram

DIAGNOSTICS SOFTWARE

Latest version of diagnostics software is available for download through GC Dealer Portal. GC authorized dealers are provided the software for free. Please refer to GC Warranty Manual on how to install, activate and use the software.