# AMBIRAD TORNADO 600

MOBILE RADIANT
HEATERS

## Operation, maintenance and servicing manual

Wolfe Design Ltd

## Index



## 1 Health & safety details

### Important

Read these instructions before use.

This appliance must be installed in accordance with such regulations as are in force.

This appliance is for indoor use only.

Subject to compliance to clearance distances ventilation and flue requirements detailed in these instructions the heater can be used inside marquees.

Only use in a well ventilated area. See technical details Section 2.

The heater is not for domestic use.

The heater is designed for space heating only.

Do not use the heater in basements or below ground level.

This appliance is fitted with a hose and regulator.

These instructions must be given to the user.

Suitable gloves should be worn when handling this equipment.

Observe the cool down period and never handle the heater when hot.

Never place any objects, particularly combustible materials on top of the heater and always ensure that flues are not obstructed.

Bend knees when lifting the product via the handles for wheeling.

### Gas leaks

Propane gas is highly flammable and heavier than air. Consequently in the event of a gas leak there is a risk of explosion.

Prior to use, check gas supply connections with leak detection solution. Never use a naked flame when checking for a gas leak. In the event that bubbles are noted either rectify if considered competent or consult your supplier.

Do not use the heater until the fault is rectified.

In the event of a gas leak evacuate people from the immediate area and open doors and windows.

Do not operate electrical switches.

If a lot of gas has escaped call the Fire Service.

After ventilating the room turn off the gas valve, and disconnect the electrical connector to the heater.

If the appliance is hot leave to cool then with the aid of a competent person identify and rectify the source of the leak.

### Gas cylinders

This heater is designed to be used with 47kg propane bottles.

Gas cylinders are heavy, never attempt to lift a cylinder, full or empty, by yourself. Always get help.

Keep cylinders upright at all times during use, transporting and when stored.

Liquid gas can cause severe freeze burns so avoid skin contact by wearing gloves when making connections or handling the cylinder. If ice is noted on the cylinder ensure that cylinder is not leaking. If leaking is suspected do not use the cylinder.

Do not drop or knock a gas cylinder in that damaged cylinders can be dangerous.

Do not store full or empty bottles in the operating area of the heater and never apply heat to the cylinder.

### Electrical supply

The heater is suitable for use with either a 230V/50Hz or 110V/50Hz supply. A selector switch enables the user to choose the desired voltage. See section 3 step 4.

Only female electrical connectors compatible to the male connectors on the rear of the unit must be used.

Always switch off and unplug the equipment when not in use.

## 2 Technical details

| Model | | | |
|---|---|---|---|
| Heat input gas | kW | 51 | 45 |
| Gas type | | Propane G31 | |
| Gas category | | $I_{3p(37)}$ | $I_{3p(30)}$ |
| Supply press | mbar | 37 | 30 |
| Injector size | | 4.6 | 4.6 |
| Electrical supply | | 110V | |
| Electrical input | | 400W | |
| Weight | | 85kg | |
| Hose | | 1.5m lg, 8mm ID approved to EN 1763-1 BS3212 (UK Only) | |
| Regulator | | 4kg/h 37mbar | 4kg/h 30mbar |
| Min Room size | | 510m$^3$ | |
| Required ventilation | | 1275cm$^2$ | |

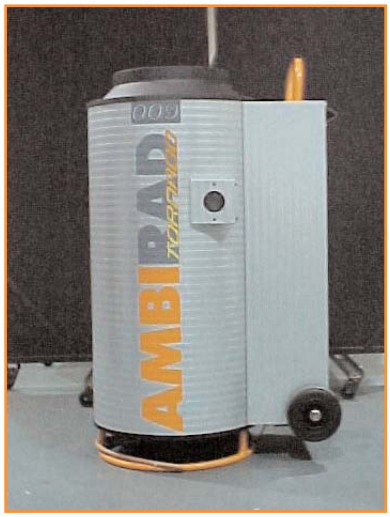
### Countries of destination

GB, IE, BE, CH, FR, NL, ES & PT.

## 3 Moving the product

Figure 1 Wheeling

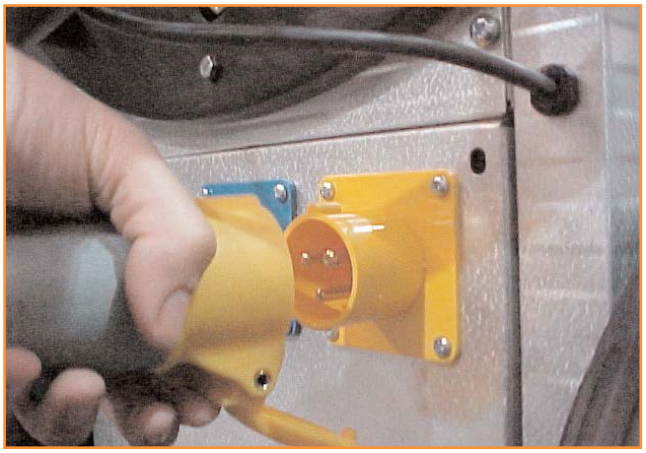

Figure 2 Standing for storage




## 4 Operating instructions

Ensure that you have read all other detail included in these instructions prior to following the operating instructions detailed.

### Step 1



The heater can be operated on either a 110 or 230 volt electrical supply by inserting a suitable connector/lead into either the 110 or 230 volt appliance connectors.

Plug the supply lead into the connector on the rear of the product and put the rocker switch next to the connector inlet to the 'ON' position.

### Step 2

Uncoil the hose from around the rear ring.

### Step 3

Attach the regulator to the gas bottle using the spanner provided. *Note Left hand thread.*

Ensure the hose is not twisted or damaged and that the gas bottle is positioned at the side of the unit to avoid heating at the outlet.

*Note When positioning the heater please ensure that all inlets and outlets are unrestricted there are no combustible materials in the vicinity. Please ensure the heated air is not directed towards the gas bottle.*

## Thermostat Control

The temperature of the building can be controlled using either the local or optional remote thermostat.

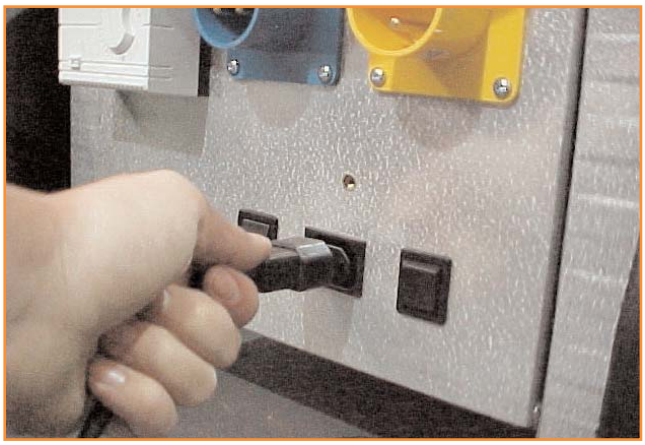
### Step 4


Local thermostat - set the rocker switch to the local stat position.

### Step 5

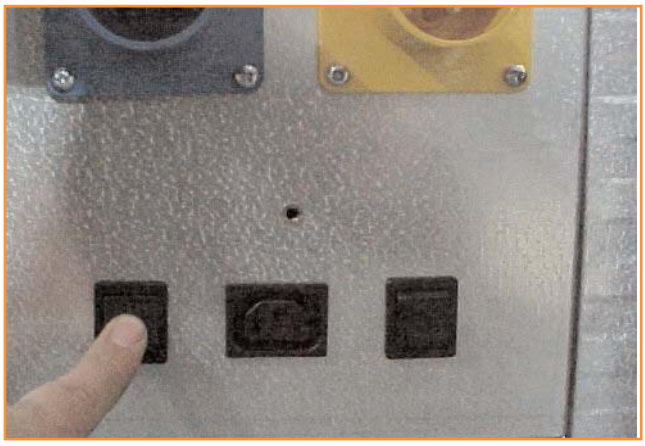
Adjust the thermostat control to the desired temperature.

### Step 6



Remote thermostat - set the rocker switch to the remote stat position. (See Step 4). Plug the remote stat lead into the remote stat socket. A remote thermostat kit is available from Ambi-Rad by quoting part number 200587.

### Step 7



Set the 3 position rocker switch to either the 110 or 230 volt position

After switching on the mains supply, ignition is controlled by the automatic ignition unit incorporated on the burner assembly. Firstly, the combustion and convection fans will be heard running then after a delay of 15-20 seconds the igniter will be heard to spark. On ignition the amber light will illuminate. If ignition does not occur then there is probably air in the gas line.
Re-ignition can be attempted by switching the switch on the rear of the product from either ON-STAT or ON-NO STAT to OFF then ON again. If ignition still does not occur consult section 7 Fault Finding.

### Step 8 Disconnection

*Note Connecting and disconnecting cylinders MUST take place in a flame free atmosphere. When the appliance is not going to be used for a period of time the unit MUST be disconnected from the electrical mains and gas cylinder.*

When heating is complete, turn OFF the gas supply. Leave the electric supply turned ON to enable the combustion fan to operate for 10 minutes to cool the product prior to moving.

After cooling is complete, switch the 3 position rocker switch (Step 7) on the rear of the product to the OFF position and disconnect from the electric supply and remove the electrical connector.

Disconnect the gas supply and recoil the hose around the rear ring assembly and position the regulator in the clip provided.

*Note If the appliance is not to be used for a period of time, ensure that the appliance is stored in a dry environment.*

## 5 Cleaning & maintenance

The hose should be checked regularly for its integrity, if any damage is found the hose must be replaced. See Technical details for hose details.

Ensure that the air intakes and flue outlet on the sides of the product are clean and free from any blockage.

The casing can be cleaned with a soft cloth and a mild detergent as required

## 6 Servicing instructions

### Health and safety

This heater should be serviced annually.

These instructions are intended to be used only by competent service engineers, and details all the service operations that are authorised by the manufacturer.

Isolate gas and electrical supplies before carrying out any repair work. Always test for gas soundness with a suitable leak detection fluid. Use gloves and safety glasses.

If it is not possible to leave the appliance in a safe condition, disconnect the plug on the electronic sequence controller.

### Required tools

4mm Allen keys.
Phillips screwdriver.
6" Adjustable spanner.

### Combustion fan maintenance

### Step 1

Ensure electricity supply is isolated. Open the controls cover and remove the live, neutral and earth leads from the terminal block.

Place the product on the rear ring in the vertical position to gain access to the fan cover.

### Step 2

Remove the fan access cover.

Remove the four bolts that attach the fan to the base of the product.

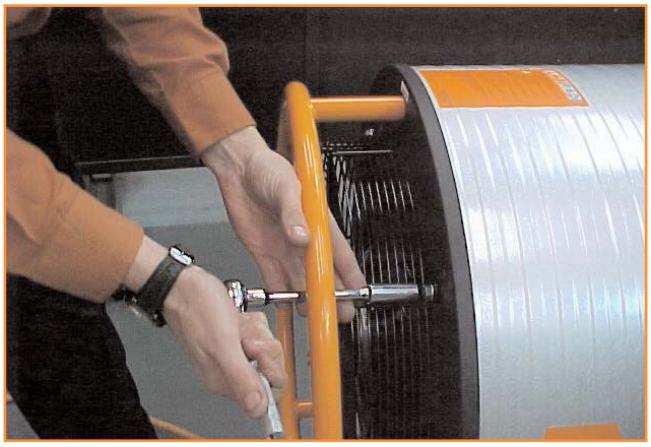
Inspect the main fan impeller and remove any dust by brushing with a soft brush. Similarly remove any dust from the finger guard covering the secondary (cooling) impeller and the mesh aperture in the motor cover.

Ensure that the impeller turns freely and that there is not excessive play in the bearings.

Following any servicing the correct operation of the appliance should be verified by following the operating instructions.

## Axial fan & heat exchanger

### Step 1 Axial fan



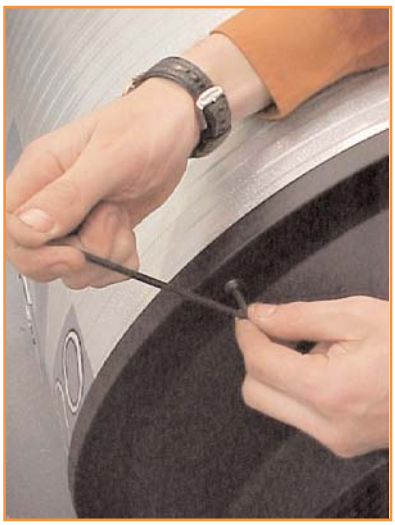
Remove the 4 nuts securing the axial fan to the rear spinning assembly.

Check that the fan spins freely without any sign of being out of balance or bearing noise. If so replace the fan.

If fan operation appears fine, then with a soft brush remove dust from the impellars and motor.

Replace the fan after checking the heat exchanger assembly.

### Step 2 Heat exchanger assembly maintenance



Remove the screws fastening the front spinning to case assembly.

Using a soft brush remove any dust and dirt from the rigid tubes, flexible coil and reflector gaining access front and rear of the product. Inspect the tube assembly and if holes or internal blockages are suspected either replace the at risk component by removal of the heat exchanger assembly through the front of the product or clear any blockage.

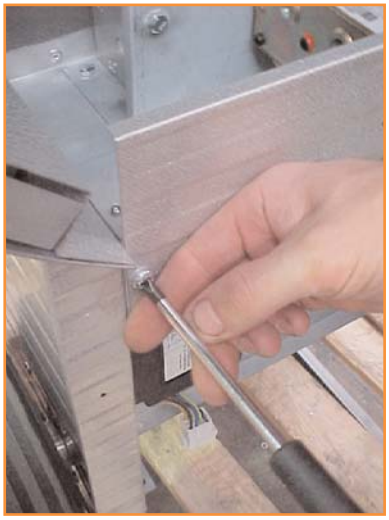
Refit the front spinning assembly.

## Burner maintenance

### Step 1

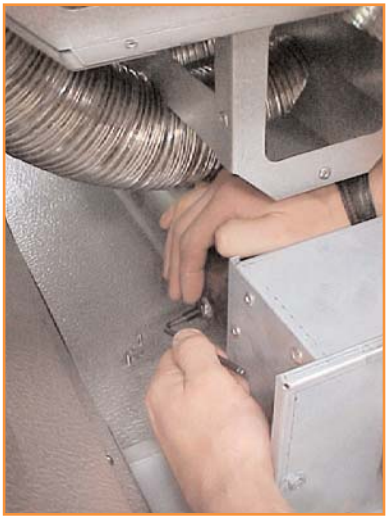
Remove the screws fixing the rear spinning to the case assembly and the gas hose.

### Step 2



Remove the bolts securing the rear support to the case assembly.

### Step 3



Slacken the grub screw securing the burner to the firing tube.

### Step 4

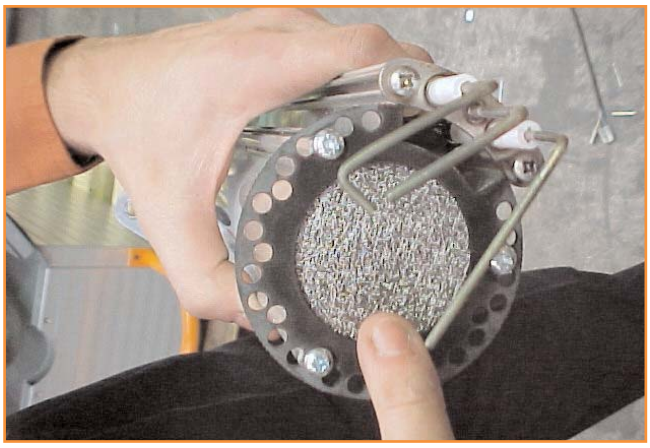
Remove the screws fixing the burner assembly to the case.

### Step 5

Slide the burner assembly away from the firing tube to reveal the burner assembly.

Inspect the burner electrode assembly condition taking care when reassembling to ensure that the leads to the assembly are fitted the same way as on removal. If the electrode assembly is in good order check the spark electrode gap. This should be 3.5mm $\pm$ 0.5mm. Adjust the gap if necessary by bending the earth rod.

### Step 6

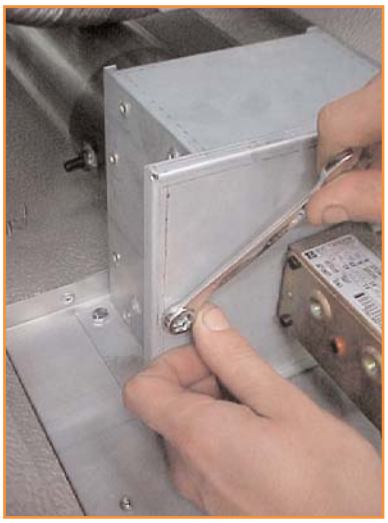


With a soft brush remove dust from the burner head filter.

If a blockage is suspected replace the filter by removing the ignitor assembly and with a small screwdriver prise the filter from its location.

Re-fit.

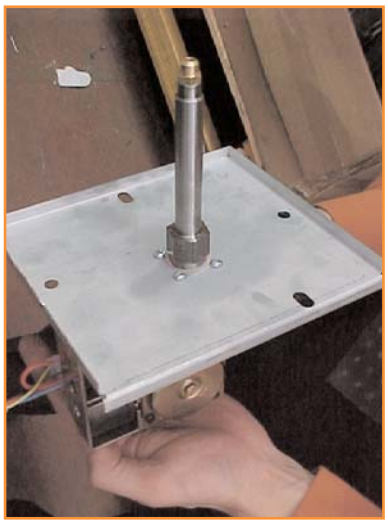
### Step 7



Access to the injector is by removal of the screws that attach the gas valve fixing plate to the burner assembly.

On removal of the screws and plate inspect the injector and clean as necessary. Do not broach out.

### Step 7



To remove the injector with the burner head removed, unscrew the injector from its carrier using a spanner on the hexagon portion of its body. When replacing the injector ensure that it is fully tightened in its carrier. Replace the sealing gasket if this is not in good condition.

## Component replacement

### To replace gas safety control valve

4mm Allen keys.
Phillips screwdriver.
6" Adjustable spanner.

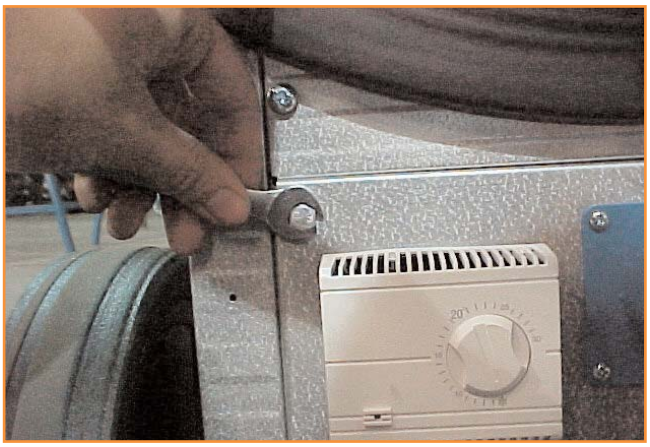
Follow instructions for burner maintenance steps missing out step 6.

At step 7 do not remove the injector, but unscrew the injector carrier and fulham hose nozzle from the gas valve. The valve can be replaced and the injector carrier and fulham hose nozzle re-fitted using an approved pipe joining compound on the threads of both components.

Carry out commissioning. The governor should be fully screwed in, i.e put out of action.

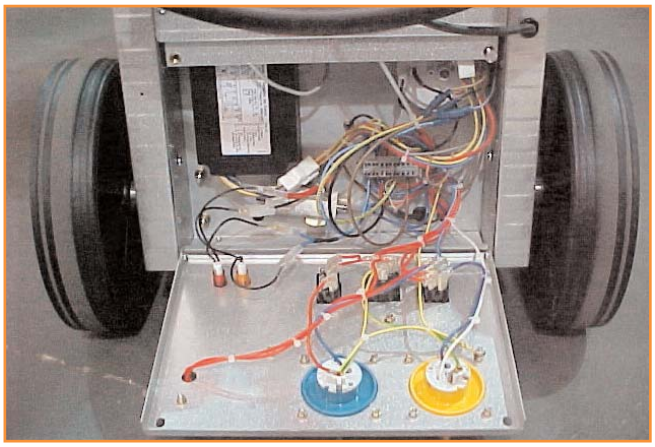
### To replace the electronic sequence controller, transformer, thermostat and pressure switch

### Step 1



Access to these components is via the hinged lid. Remove the lid securing screws.

### Step 2



Components can be seen behind the hinged lid. Replace as required ensuring connections are made in the same order as on removal.

Figure 1 **Vacuum switch connections**

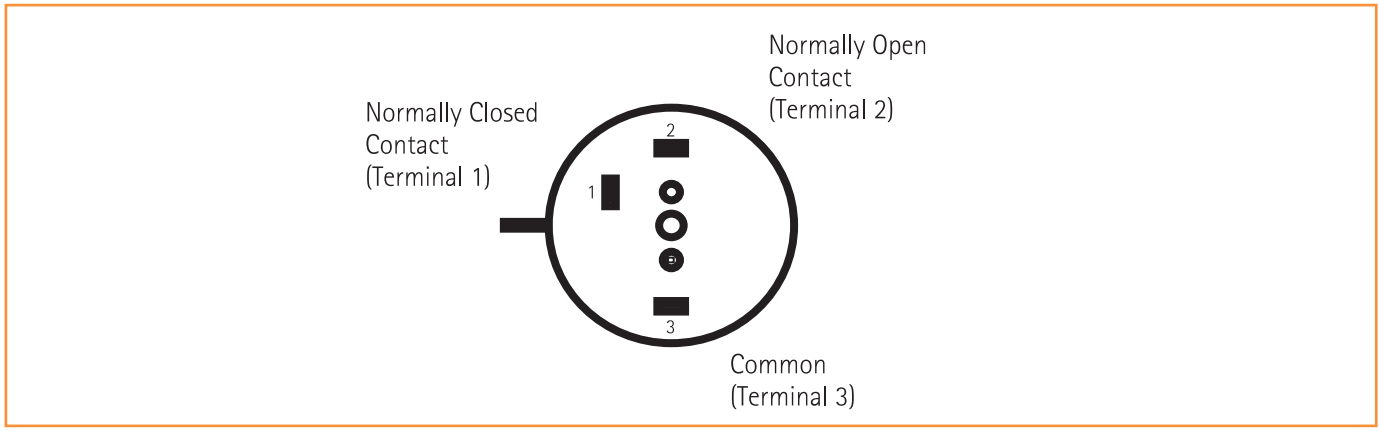
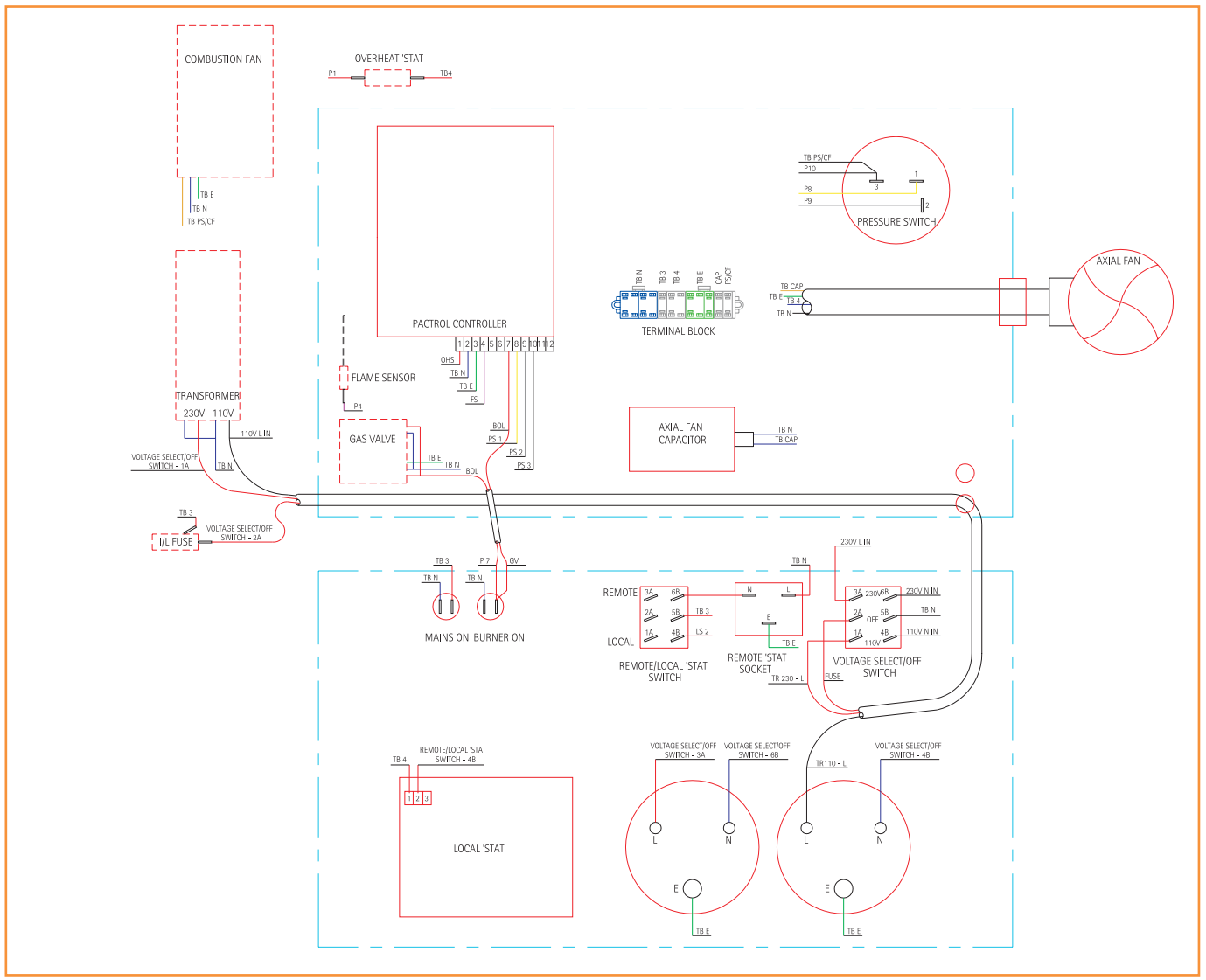



Figure 2 **Wiring diagram**



## 7 Fault finding

| Symptoms | Possible causes | Remedy |
|---|---|---|
| **Burner will not start**<br>Red 'mains on' does not illuminate. | **Incorrect voltage selected**<br>Overheat thermostat tripped. | Check outlet and inlets are not obstructed. Check fan speed. If problem persists replace thermostat. |
| Red light illuminates. | External controls, thermostats, time switch etc. not calling for heat. | Adjust controls. |
| | Loose electrical connection. | Check all connections. |
| | Fan seized or faulty motor. | Replace fan, recommission heater, checking gas pressure settings. |
| | Sequence controller relay failing to pull in and/ or hold in. | Check vacuum switch is satisfactory, replace sequence controller. |
| | Vacuum switch not returning to normal (switch off) position. | Replace vacuum switch. |
| Fan starts but burner does not attempt ignition. | Insufficient vacuum generated by fan. | Clean fan blades with soft bristle. |
| | Combustion chamber cover permitting air leakage. | Examine condition of sealing gasket, tighten down lid securely. |
| | Vacuum impulse line between combustion chamber and vacuum switch insecure or defective. | Fix securely in place. |
| | Vacuum switch 'pulls in' but electronic sequence controller does not proceed to programme ignition sequence. | Replace burner sequence controller unit but first check that the cause of failure is not a short on output circuit, by measuring resistance between pins 2 and 7 of burner control unit plug. A reading of 10,000 ohms indicates short circuit on gas valve burner indicator light or associated wiring. |
| Burner proceeds to ignition stage (normally indicated by audible spark valve energised and 'burner on' light illuminated) but burner does not light. | No spark. | Check electrode for cracks – replace if necessary. Check high tension connections are secure. Check spark gap is 3.5 ± 0.5mm. If no high tension output from electronic controller, replace controller. |
| | Gas safety valve faulty or defective. | Replace solenoid operator section of gas valve. |
| | Insufficient gas pressure. | Set burner pressure to that indicated on data badge (see commissioning). |
| Burner lights but shuts down after a few seconds. | Inadequate flame signal. This can be verified by connecting a sensitive micrometer in series with the violet wire which passes through the combustion chamber bulkhead. The correct reading should be 5µA ± 1µA. | Replace electrode. Check connections to electrodes and terminal 4 of electric sequence controller plug Replace the electronic sequence controller. |
| | Flame unstable. | Check cleanliness of burner and set burner pressure as indicated on data badge. |
| | Inadequate gas supply. Observe burner gas pressure with all heaters operating. | If gas pressure drops below that indicated on the data badge, examine gas supply pipework for excessive pressure loss. |
| | Insufficient vacuum at combustion chamber causing vacuum switch to cut off. | Clean fan blades with soft bristle brush. Inspect tube internally and clean if necessary (see servicing instructions). |
| Heater shuts down after operating for a period of time. | Refer to above. | If problem persists, replace vacuum switch. |

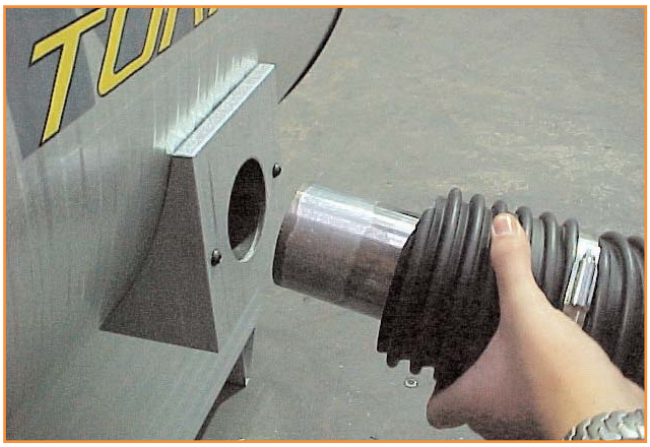
## 8 Ducted options

### Flue

The products of combustion can be taken away from the room where the product is being used by the use of a flue duct.

A flue pipe capable of withstanding 175˚C, 108mm diameter, and maximum length of 10m shall be used.

To keep touch and floor temperatures to an acceptable level, Ambi-Rad supply a twin wall flue pipe and it is recommended that such a flue pipe is used. Care must also be also taken by the user to ensure that any potentially combustible materials do not come into contact with the flue pipe. Ambi-Rad Flue Duct Kit can be ordered by quoting part number 200584 and 200601.

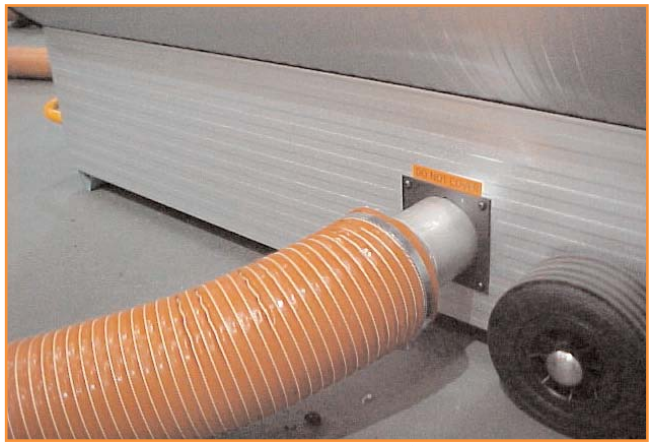


The flue pipe provided by Ambi-Rad is in two sections.

Firstly, attach the front flue pipe section to the product by pushing the flue duct spigot into the flue outlet to ensure that the spring loaded flap moves through 90˚ to close off the flue outlet to the axial fan air stream.

Secondly, attach the rear flue pipe section at the end of the front section as shown above. The securing clip can now be tightened to keep both section together.

### Ducted air



In environments where dust, moisture or fumes are present a ducted air inlet is provided to allow fresh air to be drawn into the burner to aid combustion and prevent obstruction of the burner mesh with foreign objects. The tube feeding the ducted air inlet must be 150mm diameter and maximum length of 10 metres.

Ambi-Rad can supply the tube and ducted air spigot by quoting part no 200585.

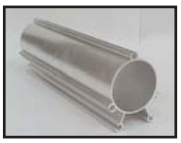
To fit the ducted air tube assembly push the spigot into the turbulator recess on the side of the product.

### Air delivery duct

A 450mm air delivery duct can be fitted to the outlet spinning as shown. A material capable of withstanding 120˚C must be used.

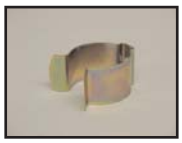
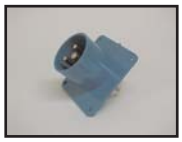
Ambi-Rad can supply the air delivery duct and attachment clip on request. If the Ambi-Rad outlet duct is used, ensure that the green end is fitted to the spinning. Ambi-Rad air delivery duct kit can be ordered by quoting part no 200586.

## 9 Spare parts

| Photograph | Description | Part Number |
|---|---|---|
|  | Ignition controller | S-TOR-600-450 |
|  | Valve twin sol. step reg 220/240V | S-TOR-600-430 |
|  | Amber neon (Burner ON) | S-TOR-600-500 |
|  | Red neon (Mains ON) | S-TOR-600-510 |
|  | Injector 4.6mm | S-TOR-600-410 |
|  | Thermostat | S-TOR-600-530 |
|  | Fulham hoze nozzle 1/2" BSPT x 10mm o/d | S-TOR-600-480 |
|  | 1" push on fix with domed cap | S-FAS-STA-125 |
|  | Gasket set | S-TOR-600-370 |
|  | Wheel spacer | S-TOR-WHE-011 |
|  | Extruded burner head | S-TOR-600-360 |

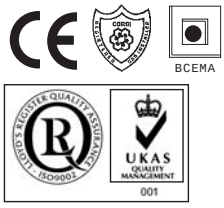
| Photograph | Description | Part Number |
|---|---|---|
|  | Igniter assembly | S-TOR-600-390 |
|  | Burner head mesh | S-TOR-600-380 |
|  | Jet carrier | S-TOR-600-400 |
|  | Combustion fan | S-TOR-600-420 |
|  | Transformer | S-ELE-TRA-010 |
|  | Axial fan c/w basket | S-TOR-600-570 |
|  | Inlet spinning assembly | S-TOR-600-550 |
|  | Outlet spinning assembly | S-TOR-600-540 |
|  | Propane regulator | S-GAS-REG-663 |
|  | Fulham hoze nozzle 3/8" BSPT x 10mm o/d | S-GAS-REG-664 |
|  | Gas hose | S-HOS-GAS-010 |

## 9 Spare parts (Cont)

| Photograph | Description | Part Number |
|---|---|---|
|  | O clip double ear | S-CLI-HOS-010 |
|  | Vacuum switch | S-TOR-600-440 |
|  | Remote thermostat socket | S-TOR-600-580 |
|  | Remote thermostat switch | S-TOR-600-590 |
|  | Mains appliance connector 110V | S-TOR-600-600 |
|  | Mains appliance connector 230V | S-TOR-600-610 |
|  | Three position 110/OFF/230volt switch | S-TOR-600-620 |
|  | Wheel | S-TOR-WHE-010 |
|  | Rear ring assembly | S-TOR-600-560 |
|  | Handle assembly black | S-TOR-600-300 |
|  | Controls hinge cover label | S-TOR-600-630 |

| Photograph | Description | Part Number |
|---|---|---|
|  | Harness - BCH mini | S-TOR-600-460 |
|  | Overheat thermostat | S-TOR-600-520 |
|  | Capacitor | S-TOR-600-640 |
|  | Spanner | S-TOR-600-670 |

UK Patent Applicaion No
0226006.5.




**Model Ref: HEA-TOR-PRO-600**

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AMBIRAD
ENERGY EFFICIENT HEATING SYSTEMS

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