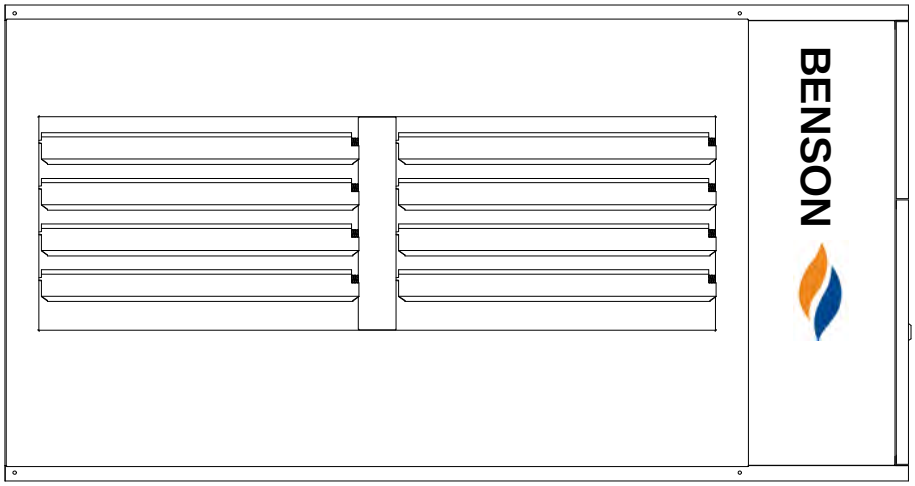
BENSON
OIL UNIT HEATER^2
RANGE

INSTALLATION COMMISSIONING
SERVICING
USER INSTRUCTIONS



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THIS MANUAL SHOULD BE LEFT WITH THE END USER .
TO ENSURE SERVICE AND MAINTENANCE INFORMATION IS AVAILABLE ON SITE

BENSON OIL UNIT HEATER

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1.0 Compliance notices

The following information is relevant to the Benson Oil Fired Unit Heater range (OUHA) and (OUHC) manufactured by Benson These heaters are manufactured within a strictly controlled quality environment within the parameters of ISO 9001:2000.

The Benson OUHA (C) Heater range has been tested and assessed for compliance with the following European Directives.

Machinery Directive (89/392/EEC)
Low Voltage Directive (73/23/EEC & 93/68/EEC)
Electromagnetic Compatibility Directive (89/336/EEC & 91/31/EEC)
Product Liability Directive (65/374/EEC)

The manufacturer has taken reasonable and practical steps to ensure that Benson Unit Heaters are safe and without risk when properly used. These heaters should therefore only be used in the manner and purpose for which they were intended, and in accordance with the recommendations detailed herewith.

The heaters have been designed, manufactured, assembled, inspected, and tested, with safety and quality in mind, there are certain basic precautions which the installer and user should be aware of, and they are strongly advised to read the appropriate sections of the information pack accompanying the heater, prior to installation or use.

Benson Heating supports all new products being supplied to their customers with a comprehensive information pack; this clearly defines mandatory instructions for the safe installation, use, and maintenance, of the appliance (s).

Where proprietary items are incorporated into Benson Heating products, detailed information and instructions are also provided as part of the information pack.

It is the responsibility of the installer, owner, user, or hirer, of such products supplied by Benson Heating, to ensure that they are familiar with the appropriate information manuals, supplied by the manufacturer, and that they are suitably aware of the purpose of the manuals and the safety instructions. In addition, operators must be suitably trained in the use of the appliance so as to ensure its continued safe and efficient use.

Benson Heating has a commitment to continuous improvement, and therefore reserves the right to amend or change the specification of the Unit Heater range subject to compliance with the appropriate European, National, and Local Regulations.

Contained within the text of the manual, the words '**Caution'** and '**Warning'** are used to highlight certain points.

Caution is used when failure to follow or implement the instruction (s) can lead to premature failure or damage to the heater or its component parts.

Warning is used when failure to heed or implement the instruction (s) can lead to not only component damage, but also to a hazardous situation being created where there is a risk of personal injury.
The Benson OUHA (C) Range conform to the following harmonized standards;

BS EN ISO 12100-1: 2003 &
BS EN ISO 12100-2: 2003
Safety of Machinery - Basic Concepts, General Principles for Design
Technical principles and specifications
Part 1 & Part 2

BS EN 60204 - Part 1 : 1993
Safety of Machinery - Electrical Equipment for Machines
Specification for General Requirements

BS EN 60335 - Part 1 : 1988
Safety of Household and Similar Electrical Appliances General Requirements

BS EN 55014 - 1993
Limits and methods of measurement of radio disturbance characteristics of electrical motor-operated and thermal appliances for household and

similar purposes, electrical tools and similar electric apparatus

BS EN 50165 - 1997 Electrical Equipment of non-electric heating appliances for household and similar purposes, safety requirements

1.1 Certificates of conformity

Certificates are available from the Quality Control Department at Benson Heating

1.2 General product information

The unit heater models have an output range from 100,000 Btu to 350,000 Btu.

Each heater must be connected to its own individual open flue.

Each heater is fitted with a forced draught burner which has been test fired and pre-set prior to despatch. The safety functions of the burner are by way of a fully sequential control box fitted to the burner.

Note
Neither asbestos nor soft soldered joints are used in the construction or manufacture of the Benson range of Unit Heaters. The materials selected for use can withstand the mechanical, chemical, and thermal stresses which they will be subject to during foreseen normal use when installed in accordance with the manufacturers recommendations.

1.3 General requirements

Caution
Ensure that the fuel supply is in accordance with the manufacturer's recommendations and is as stated on the appliance data plate. Installation, commissioning, and servicing must only be carried out by appropriately qualified and competent persons.

Warning
Unauthorised modifications to the appliance, or departure from the manufacturers guidance on intended use, or, installation contrary to the manufacturers recommendations may constitute a hazard.

Note
To ignore the warning and caution notices, and to ignore the advice from the manufacturer on installation, commissioning, servicing, or use, will jeopardise any applicable warranty, moreover, such a situation could also compromise the safe and efficient running of the appliance itself, and thereby constitute a hazard. The installation of the appliance must meet all the relevant European, National, and Local Regulation criteria.

Prior to installation the following points should be considered;

a) The position of the heater for the efficient distribution and circulation of warm air

b) The position of the heater relative to the route of the flue

c) The position of the heater relative to the supply of fuel

d) The position of the heater relative to the electrical services, and if appropriate, any additional controls.

e) The position of the heater relative to the supply of fresh air

f) The position of the heater relative to service and maintenance requirements

Caution
The heater must not be installed within an area where the conditions are unsuitable, e.g. where the atmosphere is highly corrosive, has a high degree of salinity, or where high wind velocities may affect burner operation. Suitable protection should be provided for the appliance when it is located in a position where it may be susceptible to external mechanical damage from; for example, fork lift trucks, overhead cranes etc.

1.4 Delivery and pre-installation checks

The heater is supplied wrapped in heavy duty protective polythene. On receipt of the heater, the following checks should be carried out;

(a Model is as per order

(b That it is undamaged

(c That it is suitable for the fuel supply

(d That it is suitable for the electrical supply

If any of the points are not satisfied then contact should be made with the sales office at Benson Heating as soon as possible by telephoning 01547 528534. in the case of claims for damage, this must be reported in writing within 24 hours of delivery, in order to comply with insurance criteria.

THE WARRANTY REGISTRATION CARD SUPPLIED WITH THE HEATER MUST BE COMPLETED AND RETURNED IN THE PRE PAID ENVELOPE TO BENSON HEATING ON COMPLETION OF COMMISSIONING

Warranty claims made without this condition being fulfilled will not be processed

1.5 Warranty

The heater is supplied with a 2 year warranty comprising of the following :-

1 year parts and labour
1 year parts only.

In addition to this there is also a 10 year time related warranty on the combustion chamber. The warranty commences from the date of dispatch from the manufacturer, and is subject to the terms detailed within the Benson Heating 'conditions of business'. The warranty may be invalidated if -

a) The warranty registration and commissioning card has not been completed and returned to Benson Heating

b) The installation is not in accordance with the general requirements of this manual

c) The flue arrangement and air supply for the heater are not in accordance with the manufacturers recommendations, codes of practice, or similar standards

d) Air flow through the heater is not in accordance with the manufacturers technical specifications

e) Internal wiring on the heater has been tampered with or Unauthorised service/ repairs undertaken

f) The main electrical supply input to the heater has been interrupted during the heating mode

g) The heater has been subject to and affected by the ingress of water in any form

h) The heater is not operated at the rating's laid down in the manufacturers technical specifications

i) The heater has not been operated or used within the normal scope of its intended application

j) The manufacturer's recommended minimum service requirements have not been complied with

All warranty claims must contain the following information to enable processing to take place;

(1) Heater model
(2) Heater serial number
(3) Order reference/date of order, together with full installation details (name and address)
(4) Details or symptoms of fault
(5) Installers name and address.

Faulty parts must be returned to the Benson Heating Spares Department, the address of which is provided at the back of this manual. Any such parts will undergo inspection to verify the claim. Replacement parts supplied prior to this may be charged, and a credit supplied upon subsequent validation of the warranty claim.
Consumable items are specifically not included within the scope of the warranty.

Notification is required immediately a fault is suspected.
The manufacturer will not accept responsibility for any additional damage that has been caused, expense incurred, or consequential loss resulting from any failure of the heater (s)

2.0 Installation

Note
It is a requirement that only qualified and competent personnel may undertake installation commissioning and servicing of OUHA (C) Range Heaters.

Warning
All of the basic criteria must be satisfied prior to commencing installation and commissioning, additionally, the Unit Heater must be positioned and installed so as to comply with all the relevant standards and guide lines as well as meeting national and local fire regulations and insurance criteria, especially if it is proposed that the heater is to be installed within a special risk area (e.g. proximity to where petrol engined vehicles are stored or parked, where cellulose spraying takes place, where woodworking machinery is operated, etc,).

Indirect fired heaters must not be located in hazardous areas, however, it is permissible for the heater to supply air to such areas.

The heater must not be installed within an environment where there is a high concentration of chlorides, fluorides, salts, or other aggressive or volatile chemicals / compounds.
Nor should the heater be positioned where the burner could be adversely affected by high winds or draughts.

The heater must be installed so that it is level. Supports for the heater must be sufficiently robust to withstand the weight of the heater and any ancillary equipment. Any combustible material adjacent to the heater or flue system must be so placed or shielded so that its surface temperature does not exceed 65C

The location chosen for the heater must allow for the fitting of an effective flue system.
The location must also allow for adequate clearance for the air supply, return air circulation, oil supply, electrical supply, whilst also providing good and safe working access.

Suspended free blowing Unit Heaters are at their most effective when located as close to the working area as possible. However care should be exercised to avoid directing the discharged air directly onto the occupants of the area to be heated.

Where the passage of cold air causes problems (e.g by entrances, loading bays etc) it is considered favourable if the heater is positioned so as to discharge towards or across the cold air source from a distance from 1.5m - 6m dependent upon the size of the entrance and the air throw characteristics of the heater. On exposed walls heaters should be positioned so as to discharge towards, or along the length of the exposed wall. In areas where it is proposed that more than one heater is to be installed, a general scheme of circulation should be drawn up and maintained, thereby offering the best heat distribution.

Air pressure within the area heated and the outside air pressure must remain the same, factors influencing this would be the presence of extraction systems, ventilation systems, and various types of process plant. OUHA 200-350 models can be installed to allow the fans to work in opposite directions . This enables the heater to be installed centrally in the area to be heated and allows warm air to be discharged to both the front and rear of the heater

2.1 Installation Mounting Heights OUHA models

The Heater must be installed within the mounting heights indicated below in metres

Model OUHA	**100**	**140**	**200**
Min	2.0	2.0	2.4
Max	2.7	2.7	3.0
Model OUHA	**250**	**300**	**350**
Min	2.4	2.4	2.4
Max	3.5	3.5	3.5

The following clearances in mms must be observed
*****when suspended

Model	**100**	**140**	**200**	**250**	**300**	**350**
Above	300	300	300	300	300	300
Below *	300	300	300	300	300	300
R Hand	680	680	680	680	810	810
L Hand	250	250	250	250	250	250
Rear Axial	400	500	560	560	560	560
Rear Cent	200	200	200	200	200	200

2.2 Heater Mounting

The heater and flue must be adequately supported by one of the following methods ;

a) Suspension by steel drop rods or straps from the **M10** fixing points located on top of the heater
These must be of sufficient strength to safely carry the weight of the unit and ancillary equipment. The straps may only drop vertically to eyebolts, if used; **I.E**. They must not be joined to the eyebolt at an angle to the vertical, and eyebolts if used should be of an approved type.

b) OUH heaters can be mounted on specifically designed cantilever wall or vertical stanchion brackets which locate directly to the four **M10** fixings on the heater casing.
Alternatively OUHA or OUHC units can be mounted on cantilever type wall brackets however consideration must be given to ensure that the bracket is large enough to support the heater whilst providing the necessary clearances
In either case the installer should ensure that the wall wall fixings or other support medium is capable of supporting the weight

c) On a level non-combustible surface capable of adequately supporting the weight of the unit and ancillary equipment .

2.3 Warm Air Circulation

The air heater should be positioned to enable maximum circulation of discharged warm air within the area to be heated, whilst taking account of personnel within the area, sources of cold air ingress , and obstructions.

Ensure louvres are adjusted outwards and ensure blades are not resonating

The air temperature rise on passing the heat exchanger is typically around 34^0 C
A full and unobstructed return air path to the air heater must be provided
(see 2.4 Air Supply).

Where the heater is positioned to deliver blown air through an opening in a wall, return air intakes should be located so that they cannot become blocked. Similarly these intakes must be positioned so as not to draw in odours, fumes, hazardous vapours or particles.

2.4 Air Supply

Provision must be made for the existence of an air supply in order to satisfy both combustion and ventilation criteria.

It is a requirement that the area where the air heater is located must have a permanent air vent of negligible resistance direct to the outside air.
Such air vents must be positioned so as not to become blocked or flooded, nor should they be placed so as to introduce undesirable matter (e.g. flammable, volatile, or aggressive chemicals/compounds or potentially hazardous or harmful substances) either direct from the outside, or through their proximity to an adjacent extraction system.

Note
It is strongly recommended that BS 6230 : 2005 is referred to for further information concerning ventilation requirements

Where mechanical ventilation is used it is a requirement that the inlet is of the mechanical type, and the outlet is either mechanical or natural.

2.4.1 Heaters installed within the heated space

Where heaters are installed within the space to be heated (e.g. not a plant room separate room, or compartment then Combustion and general ventilation **is not required if**
The combustion air intake is ducted to atmosphere (i.e. Room Sealed Appliance)
OR
The design air change rate of the building is more than 0.5 air changes per hour and the volume of the space is greater than 4.7m^3 per kilowatt of the total rated heat input

Combustion and general ventilation
is required if
The appliance is not provided with combustion ductwork e.g. the air for combustion is taken from the space being heated
And
The building design air change rate is less than 0.5 air changes per hour and the volume of the space is greater than 4.7m^3 per kilowatt then low level ventilation is required

Where combustion air ventilation is required as dictated by the previous criteria then that ventilation can be via permanent ventilation openings / grilles situated at low level (I.e. below the flue takeoff spigot) and with the free area of such grilles as :-
For heaters with a rated input of less than 60 kW — 4.5 cm^2 per kW of heat input
For heaters with a rated input of more than 60 kW — 270 cm^2 plus for each kW of rated input over the 60 kW threshold an additional 4.5 cm^2

Or by mechanical input (**not extract**) ventilation in association with either mechanical or natural extract and with a ventilation flow rate of 1.08m^3/h per kW of total rated input

Where mechanical extract is used to complement the above then the extract rate shall be 2.16m^3/h per kW of rated heat input
Mechanical ventilation systems where fitted must be provided with safety interlocks to prevent heater operation in the event of airflow failure.

2.4.2 Heaters installed Within a Plant Room

Where the heater is installed within a plant room ,separate room or compartment then combustion and general ventilation
is always required
Where the combustion air intake is ducted to atmosphere (i.e. Room Sealed Appliances) Then that ventilation can be via a permanent ventilation / grille situated at both low level (inlet) and high level (outlet) and with the free area of such grilles as :-

Low level (Inlet)

For heaters with a rated input of less than 60 kW — 4.5 cm^2 per kW of heat input
For heaters with a rated input of more than 60 kW — 270 cm^2 plus for each kW of rated input over the 60 kW threshold an additional 2.25 cm^2

High Level (Outlet)

For heaters with a rated input of less than 60 kW — 4.5 cm^2 per kW of heat input

For heaters with a rated input of more than 60 kW — 270 cm^2 plus for each kW of rated input over the 60 kW threshold an additional 2.25 cm^2

Alternatively mechanical input (not extract) ventilation may be used in association with either mechanical or natural extract and with a ventilation flow rate of 2.16m^3/h per kW of total rated input.

Mechanical ventilation systems where fitted must be provided with safety interlocks to prevent heater operation in case of air flow failure

Where the combustion air intake **is not ducted to atmosphere** heater installed in flue only configuration then ventilation can be via a permanent ventilation opening / grille situated at both Low level (Inlet) and high Level (Outlet) and with the free area of such grilles as :-
Low level (Inlet)

For heaters with a rated input of less than 60 kW — 9.0 cm^2 per kW of heat input

For heaters with a rated input of more than 60 kW — 540 cm^2 plus for each kW of rated input over the 60 kW threshold an additional 4.5 cm^2

High Level (Outlet)

For heaters with a rated input of less than 60 kW — 4.5 cm^2 per kW of heat input

For heaters with a rated input of more than 60 kW — 270 cm^2 plus for each kW of rated input over the 60 kW threshold an additional 2.25 cm^2

Alternatively mechanical input (not extract) ventilation may be used in association with either mechanical or natural extract , and with a ventilation flow rate of 3.24m^3/h per kW of total rated input

Where mechanical extract is used to complement the above then the extract rate shall be 2.06m^3/h per kW of rated heat input

Mechanical ventilation systems where fitted must be provided with safety interlocks to prevent heater operation in case of air flow failure

2.4.3 Ventilation Openings and Grilles

Ventilation openings and grilles must communicate directly with the outside air, be of negligible resistance and shall be sited so that they cannot easily be blocked of flooded

3.0 Fuel

The heaters are set for single pipe operation
The bypass plug is provided separate with the burner for conversion to two pipe see Riello manual
Three methods of fuel supply can be used to supply fuel to the heaters

(a) Two pipe system
(b) Gravity Feed
(c) Pressurised ring main

Two pipe system

This is used where the oil storage tank is lower than the pump.
Access for the fuel feed to the burner should be via a suitable tapping made in the top of the tank, and the fuel feed pipe should extend to not less than 100mm above the bottom of the tank. A non return valve with a metal to metal seat should be fitted, especially if the return pipe work is terminated at a level above the draw off tube. The non- return valve must be removable for service and maintenance purposes, and the return pipe from the pump must therefore be extended down into the tank to the same level as the suction pipe. The use of a Fuel Deaerator in this type of installation will reduce the need of a return pipe back to the tank

Caution
The Deareator must be fitted the burner side of the inlet fuel filter

Maximum lift should not exceed 3.5 metres, and the vacuum should not exceed 0.4 bar.

Each heater must have a separate fuel supply.
Note
It is strongly recommended that the separate manual concerning the operational details of the burner supplied with the heater as part of the information package is studied prior to installation

Gravity feed system

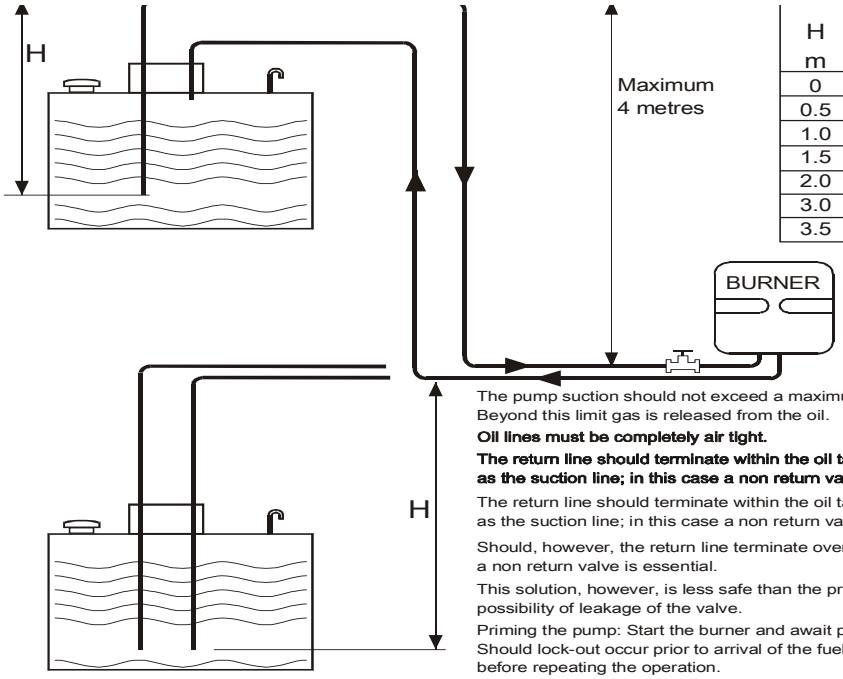
For installations where the oil tank is 200mm or more above the level of the fuel pump the principle of gravity feed may be used.
The draw off point for the supply to the burner must not be positioned any lower than 100mm above the bottom of the tank.
Where a return valve is fitted this must be tamper proof to prevent inadvertent operation.
Each heater must have a separate fuel supply

Pressurised ring main system

This system is used to supply a number of units from a common storage tank.
A booster pump is used to provide the pressure to push the oil around the ring main and back to the tank. Pressure reducing valves should be fitted on the delivery pipe to each heater to ensure that the delivery pressure at the heater is less than **6 psi**.

BENSON OIL UNIT HEATER

Typical Fuel layout



H	L metres	
m	I.D. 8mm	I.D. 10mm
0	35.0	100.0
0.5	30.0	100.0
1.0	25.0	100.0
1.5	20.0	90.0
2.0	15.0	70.0
3.0	8.0	30.0
3.5	6.0	20.0

The pump suction should not exceed a maximum of 4 metres.
Beyond this limit gas is released from the oil.

Oil lines must be completely air tight.

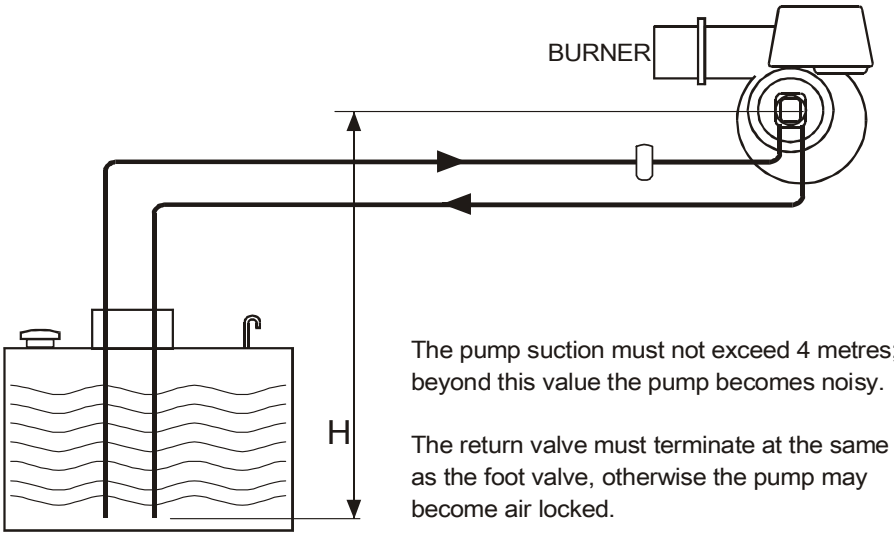
The return line should terminate within the oil tank at the same level as the suction line; in this case a non return valve is not required

The return line should terminate within the oil tank at the same level as the suction line; in this case a non return valve is not required.

Should, however, the return line terminate over the fuel level, a non return valve is essential.

This solution, however, is less safe than the previous one, due to possibility of leakage of the valve.

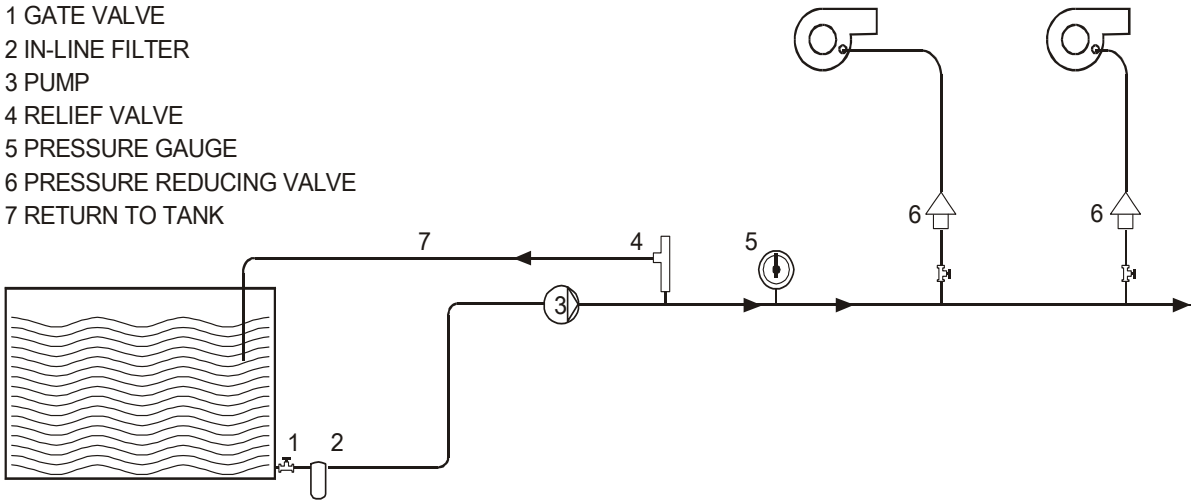
Priming the pump: Start the burner and await priming.
Should lock-out occur prior to arrival of the fuel, wait at least 20 seconds before repeating the operation.



The pump suction must not exceed 4 metres; beyond this value the pump becomes noisy.

The return valve must terminate at the same level as the foot valve, otherwise the pump may become air locked.

1 GATE VALVE
2 IN-LINE FILTER
3 PUMP
4 RELIEF VALVE
5 PRESSURE GAUGE
6 PRESSURE REDUCING VALVE
7 RETURN TO TANK



Caution
The internal by-pass plug must be removed from the burner pump when used in a pressurised ring main application .

3.1 Pipe work and fittings

Caution
Galvanised pipe work and fittings must not be used.
All joints must be sealed properly, if necessary using PTFE tape or other approved sealing media. The pipe work must be effectively sealed so as to prevent the ingress of air. It is advisable to check all pipe work prior to installation to ensure that there is no loose debris or scale present.
Black iron pipes can be hammered to assist in the removal of these contaminants

A Capillary type fire valve is supplied loose with the heater for installation by the fitter on site.
The capillary should be inserted through the grommet at the rear of the heater burner compartment and secured via the P clips mounted above the burner.
The fire valve can now be secured to the oil installation pipe work .

Note
Any waste oil or sludge must be disposed of correctly.
Never dispose of it by dumping or tipping it down drains or into watercourses where ground water can become polluted and environmental damage caused.

4.0 Flue system

Warning
It is essential that the products of combustion are flued to the outside of the building.
Each heater must have its own separate flue, with a flue diameter of not less than is detailed in this manual. The minimum vertical length of flue must not be less than 1m. The number of bends should be kept to a minimum. It is strongly advised that BS 5854; 1980, and BS 5440; parts 1 and 2, are used as consultative documents when considering flue requirements.

Care should be taken to ensure that the flue terminal is not situated in a high-pressure area, the proximity of buildings and other obstacles which will influence this must be taken into account, preferably at the design stage.

Provision must be made for the disconnection of the flue for inspection and service requirements, and it is strongly advised that where bends are fitted inspection covers are included.
Flue should be supported at intervals not exceeding 1.8 mtrs

The materials from which the flue is constructed must be non-combustible, resistant to internal and external corrosion, and be capable of withstanding the stresses and loadings associated with normal use.

When designing the flue system the prevention of the formation and entrapment of condensation must be a key consideration. Twin wall or insulated systems are recommended, as they tend to inhibit the formation of condensates.
Where condensation is unavoidable traps should be included to encourage the condensates to flow freely to a point from which they may be released, preferably into a gully. The condensate pipe from the flue to the disposal point must be made from corrosion resistant pipe of not less than the internal diameter of the drain pipe.
If the flue passes through a wall, ceiling, or roof made from combustible material then it has to be sleeved so as to provide a minimum of a 25mm void between the exterior of the flue and the internal wall of the sleeve. The maximum permitted temperature of any adjacent combustible material is 65^{o} C.

The position of the flue and its terminal should be such that it does not impair the combustion process. It should terminate in an exposed position so as to allow the escape and dissipation of flue gases without risk of their re-entering the property through windows, ventilation ports, etc.

The flue should extend to at least 1m above the height of any object within 3.5m of the terminal.

Flue terminals should be fitted on all flues, the terminal must be of the approved type, and have outlet grilles on all sides giving a total free area of at least double that of the flue.

Caution
It is imperative that the flue should be properly sealed where it passes through the roof, this can best be achieved by using the approved method of roof flashing plate and cravat.
Note
It should be noted that claims made under warranty and attributed to the ingress of water may not be considered especially if an approved method of sealing has not been used, or if the design of the flue has not made provision for possible condensation problems.

5.0 Electrical supply

Wiring external to the unit heater must be installed in accordance with any Local, National, and European regulations, as well as meeting the appropriate requirements of IEE regulations.
The means of connection to the main electrical supply must allow for complete electrical isolation of the heater, the supply should only be used to serve the heater itself and no other plant or equipment. The position of the isolation switch must be such that it is adjacent to the heater and easily accessible at all times. In addition, the isolator itself must have a contact separation of not less than 3mm. (as per BS5991 clause 20.2).
All connections must be checked to ensure that they are secure, and free from corrosion.
Terminals and connections should also be checked to ensure that no stray strands are bridging terminals.
Electrical continuity should also be checked

Cables, conduit, and fittings that are used to make the connection between the isolator and the heater must conform to the appropriate IEE regulations.
All heaters are supplied fused and pre-wired, all must be earthed.
The Control fuse ratings are detailed on the appliance data plate.

Warning
Ensure that the electric and oil supplies are turned off before any electrical work is carried out on the heater. Ensure that wiring cannot make contact with any surfaces liable to be subject to high temperatures or where the insulation of the wiring could be impaired as a result of such contact.

Final connections for any additional external controls must be completed on site, and must be carried out according to IEE regulations. Separate user information is provided for the time control unit and the burner, and forms part of the product information pack which accompanies every heater when despatched.

Caution
The main electrical supply must not be switched off or disconnected as a method for stopping the heater ,the exception to this is in an emergency,
or during servicing when the controls must be completed on site and the heat exchanger has been allowed to cool sufficiently to prevent any damage from occurring , Claims will not be considered if they have resulted from incorrect wiring or the incorrect use of the heater

Always ensure that the appropriate personal protective equipment is used.

6.0 Commissioning – Pre test

Check to ensure electrical safety, and inspect and check the oil installation, testing for leaks.

(a) Ensure that the electrical supply is turned off.

(b) Ensure that the oil supply is turned off.

(c) Check that all panels and fasteners are secure and in place.

(d) Check that the heater is installed correctly and that the support is adequate.

(e) Ensure that warm air delivery outlets are open.

(f) Check that fan is free to rotate and the guards are in place.

(g) Ensure that the flue is secure, adequately supported, and that the various joints are properly sealed.

(h) Check that there is provision for flue gas sampling and that this sample point can be plugged and sealed after commissioning.

(i) Remove cover from fan limit stat check that fan limit stat settings have not been disturbed and are as follows

Fan Off 30º C
Fan On 50º C
Overheat Limit is preset at 100º C
check that overheat reset button is reset

(j) Ensure that the burner is securely attached to the heater.

(k) Test for electrical earth continuity between the heater, oil pipe work, and mains supply.
(l) Turn on main electrical supply, select the following switch settings on **CP2**

On/Standby - Standby
Heat/Ventilation - Ventilation

The fan will start enabling fan direction etc to be verified. Reset on/standby switch to off position.

If **CP4** supplied press Fan and enter to operate fan, Repeat operation to switch off fan

(m) Set **CP4** controller as per customer requirements

(n) Set override to on (1) and put in override time and enter

6.1 Commissioning - Ignition

It is strongly recommended that the separate manual concerning the operational details of the burner supplied with the heater as part of the information package is studied prior to commissioning.
Time intervals within the ignition sequence will vary slightly from one model to another.

Warning
Do not proceed with commissioning unless all the criteria detailed have been satisfied.

(a) Ensure that the electrical supply is turned off.

(b) Ensure that the oil supply is turned off.

(c) If **CP2** supplied Select the following switch settings on the control for the heater

On/Standby - Standby
Heat/Ventilation - Heat

(d) Turn on main electrical supply.

(e) Select 'on' position for heater on/standby switch.

(f) Check for the following burner sequence

Interval	Operation
5s	Combustion air damper actuated burner fan motor initiates purge cycle
15s	Solenoid valve opens ignition transformer provides spark for burner ignition

---------- EITHER----------

15s	Ignition failure caused by fuel starvation resulting in burner lockout/shutdown

(g) Set heater on/standby switch to standby position

(h) Attach oil manifold bleed screw and gauge)

(i) Open oil supply valves and bleed air from pipe work and adjust burner oil pressure as per detailed in burner manual

(j) Repeat steps c,e,f.

----------OR----------

15s	Burner ignition - flame detection
20s	Burner ignition cycle complete

Warning
If burner ignition is not satisfactorily accomplished, commissioning must not proceed until the reason or fault has been identified and rectified, if necessary by reference to the separate burner information supplied with heater.

(k) Repeat steps 4.2 c,a,

(l) Repeat steps 4.2 d,e,f, allowing the heater to reach thermal equilibrium.

(m) Adjust room thermostat to its highest setting, and allow the heater to continue to fire

(n) Gradually reduce the temperature setting on the room thermostat until the burner shuts down, (@ < ambient and then gradually increase the temperature setting on the . thermostat until heat is called for, (@ > ambient) and the burner automatically re-fires.

(o) Re-set time clock to a minimum off period, checking that the burner shuts down, and then automatically re-lights once the minimum off period has elapsed (Separate information on the time clock is contained within the information package supplied with the heater)

(p) Check limit stat by isolating fan control circuit
The time between the fan stopping and burner shut down should be noted,
If the time interval between fan stop and burner shut down is greater than 2 minutes Check settings on fan and limit stat are correct,

(q) Undertake flue gas analysis using approved and calibrated analysing equipment recording data on the commissioning card, ie, CO, CO_2, net and gross flue temperatures.

Record burner oil pump pressure, ambient temperature, barometric pressure, and smoke reading (0 - 1 Baccarach scale).
Note
The burner air and oil pressure settings should be only very finely adjusted to achieve a CO^2 reading of 12.5% (+/- 0.5%).

All Unit Heaters are test fired and pre-commissioned as part of the manufacturing process, if however, during on site commissioning the data are found to be not in accordance with the manufacturers data, then the following action is recommended.
* Re-check all readings and calculations.
* Adjust burner as per manufacturers instructions.
* Consult Benson Heating Technical Department.

(r) Complete commissioning card and provide operating instructions for the user, high-light the fact that the manufacturer recommends that in the interests of safety and efficiency the heater is serviced on a regular basis only by qualified and competent persons.

The completed commissioning card must be returned to Benson Heating Service Department immediately after the satisfactory completion of commissioning, failure to do so can invalidate any subsequent warranty claim.

(s) Set all controls to the requirements of the user.

(t) Set override on **CP4** to Off

Final adjustment for the direction of the air flow from the heater should be made,

Caution
On ducted applications it is necessary that the system is balanced in order to \the efficiency of the heater and the air distribution and delivery system Failure to balance the system can result in fan motor overloading and premature component failure, it can also result in an inefficient heating/ventilation system.

(a) Check that the amount of fan produced air volume is in accordance with the heater specification, if the volume is too great the fan can be overloaded.
Ensure that the running current is as per that stated on the heater data plate.
Alternatively, the static pressure should be measured at the start of the ductwork to confirm that it is within the permissible tolerance.

(b) If the current drawn is greater than the stated running current, in most probability this will be caused by insufficient static pressure within the ductwork, in which case system resistance should be increased through the introduction of a damper placed as close to the start of the ductwork as possible, thereby resulting in a reduction in drawn current.

The damper should be adjusted until the current is in accordance with that stated on the data plate.

(c) If the current drawn is too low the duct outlet grilles will require opening to reduce static pressure and increase air volume, if this is not the case overheat cut outs can be caused

7.0 Servicing

Warning
Servicing must be carried out on a regular basis, the maximum interval between services being 1 year.
In certain applications the frequency of servicing will have to be increased , this to a large extent is governed by the working environment.
It is a requirement that only suitably qualified and competent persons are allowed to undertake servicing.

Before any maintenance or servicing work is carried out the heater must be shut down and allowed to cool, and have the oil and electric supplies to it turned off at the supply valve and isolator respectively.

Caution
Certain component parts are factory sealed and are designed so as to be tamper proof. Usually such items do not require servicing, and therefore should not be tampered with. Failure to comply with this can invalidate any warranty, and can also lead to premature failure. The following parts fall within this category: room thermostat, time clock, frost thermostat, controller, and fan motor assembly .

Additionally, the fan and limit stat has been factory set, and must not be re-set without formal consent from the manufacturer.

Reference should be made to the separate information covering the operational details of the burner and remote controllers.
Only approved spare/replacement parts can be fitted, failure to comply with this can compromise the safe and efficient running of the heater, and can also invalidate any warranty claim

7.1 Planned Servicing

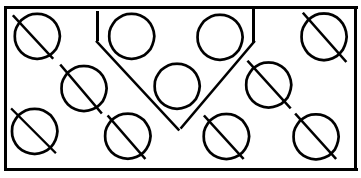
In order to maintain the efficient operation of the heater it is recommended that the following planned servicing and preventative maintenance programme is adopted by the user.

Quarterly Inspection
(a) Visual inspection of the burner
(b) Clean and check spark electrode
(c) Clean and check photocell
(d) Check overheat safety is operational

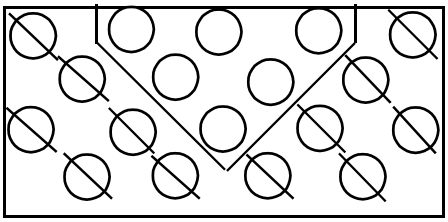
Bi-Annual Inspection
(a) As per quarterly inspection, plus...
(b) Combustion check
(c) Smoke test

Annual Inspection
(a) As per half year inspection, plus...
(b) Heat exchanger and cleaning
(c) Electrical connections
(d) Main fan motor assembly
(e) Oil supply including filter
(f) Burner
(g) Air delivery system
(h) Flue

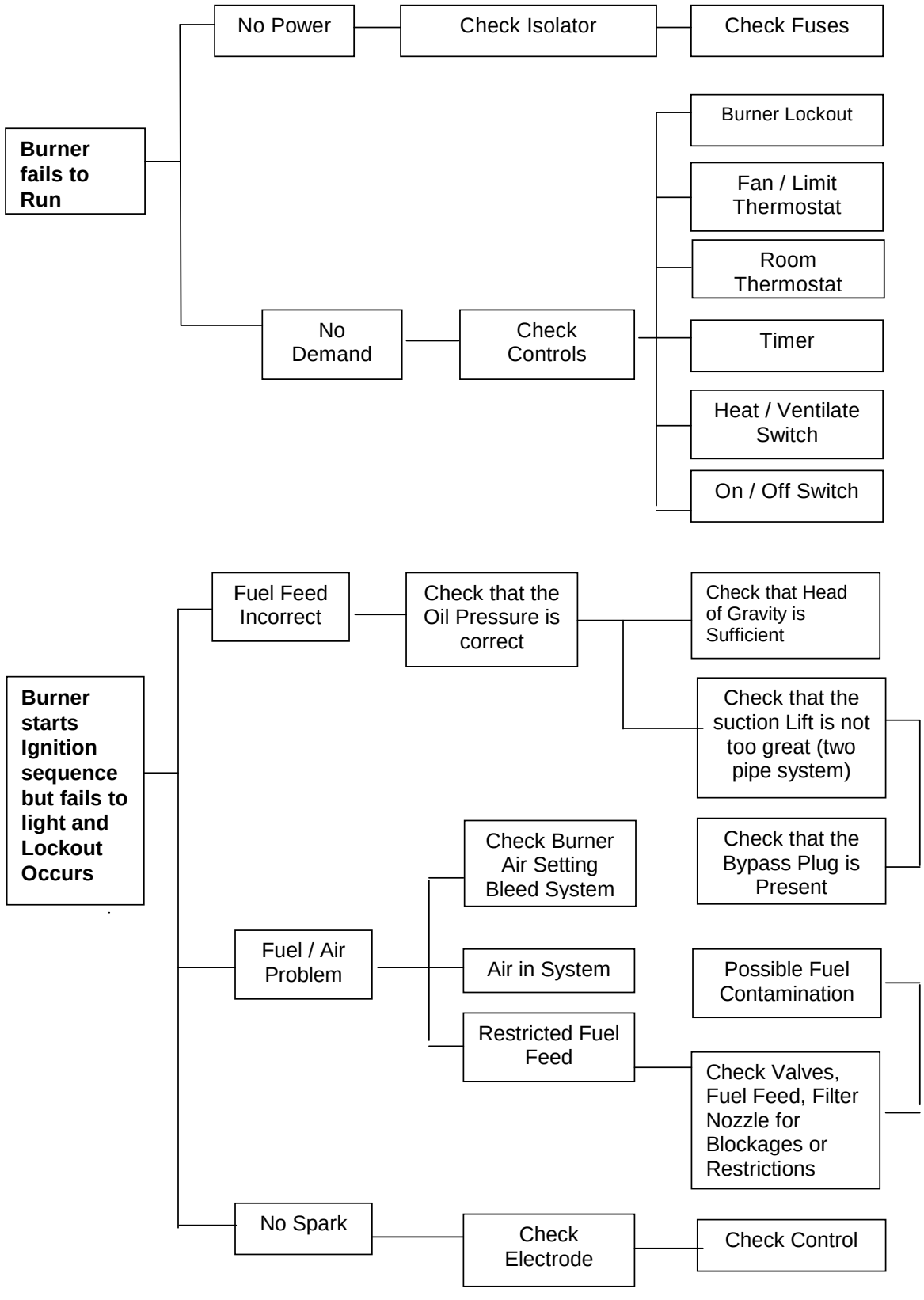
Turbulator positions 100-250



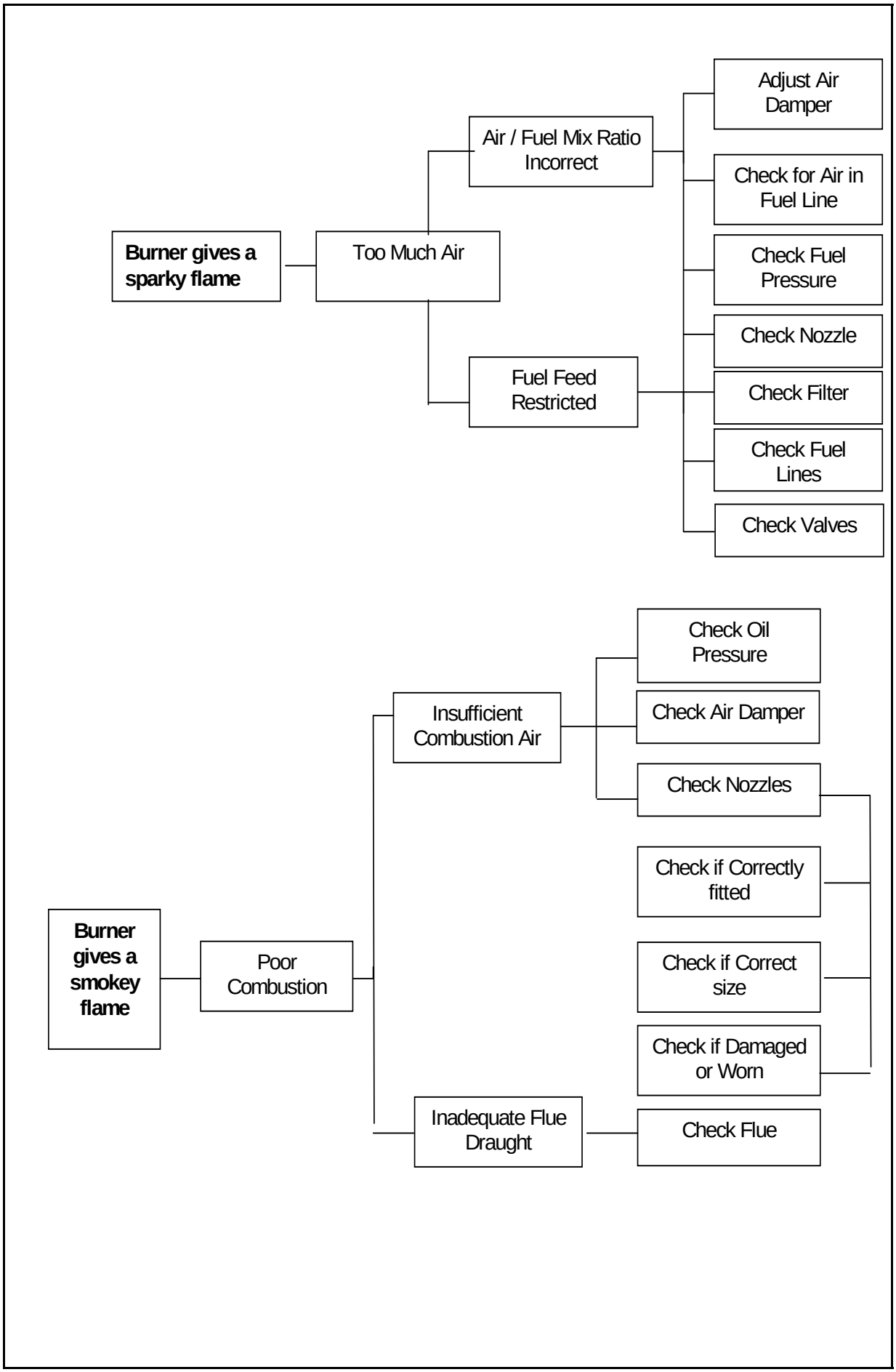
Turbulator positions 300-350



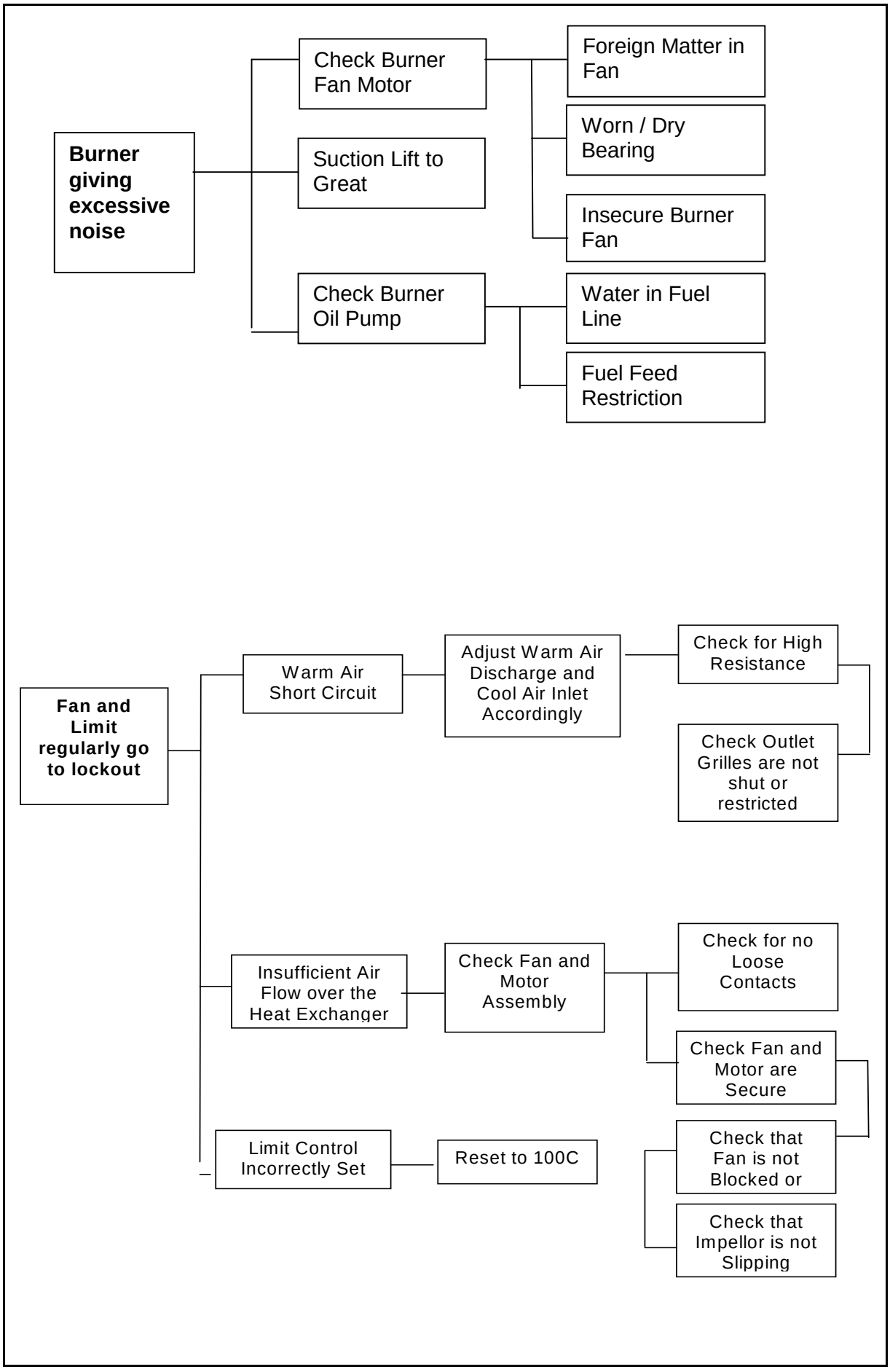
8.0 Fault Finding



BENSON OIL UNIT HEATER

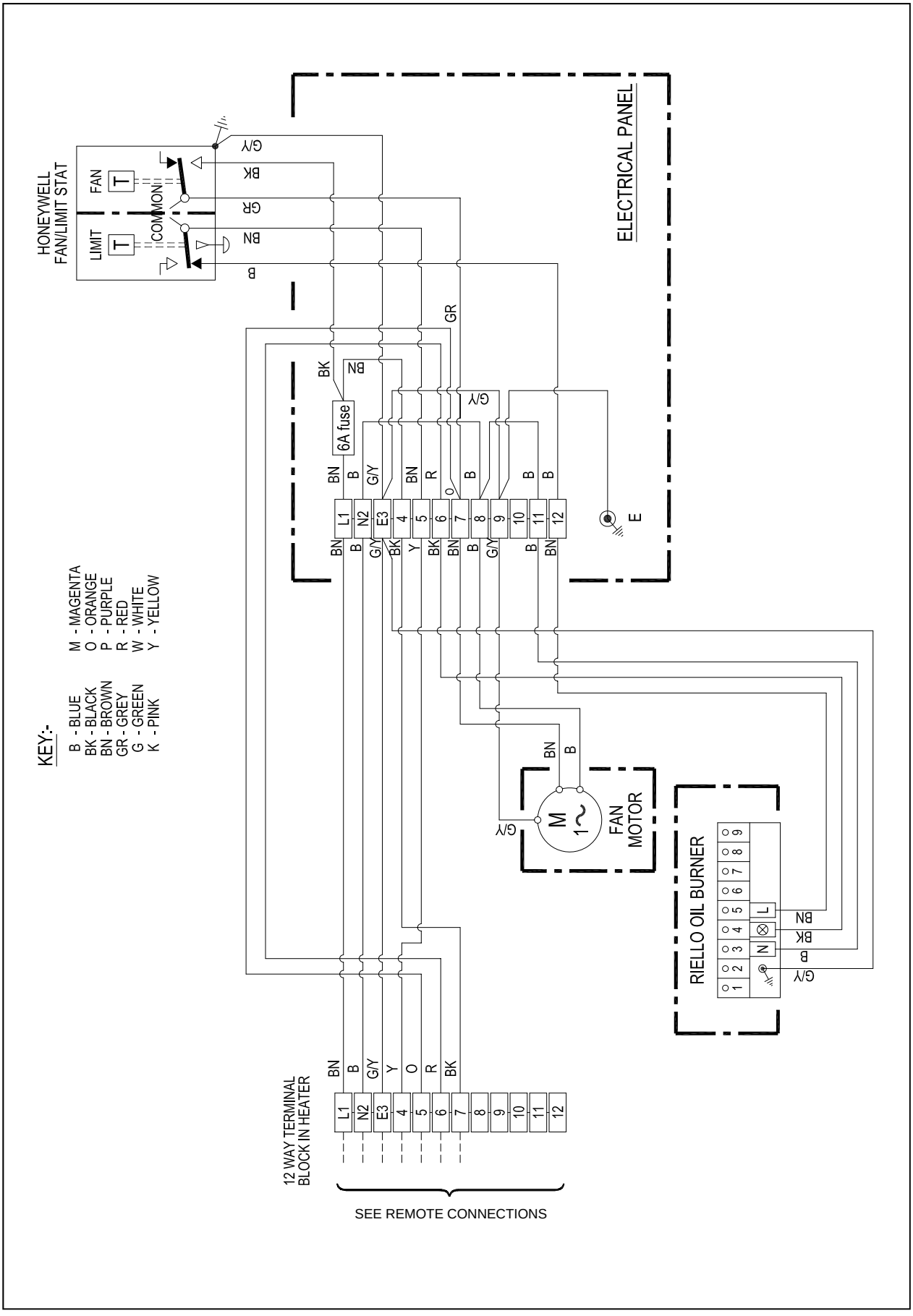


BENSON OIL UNIT HEATER



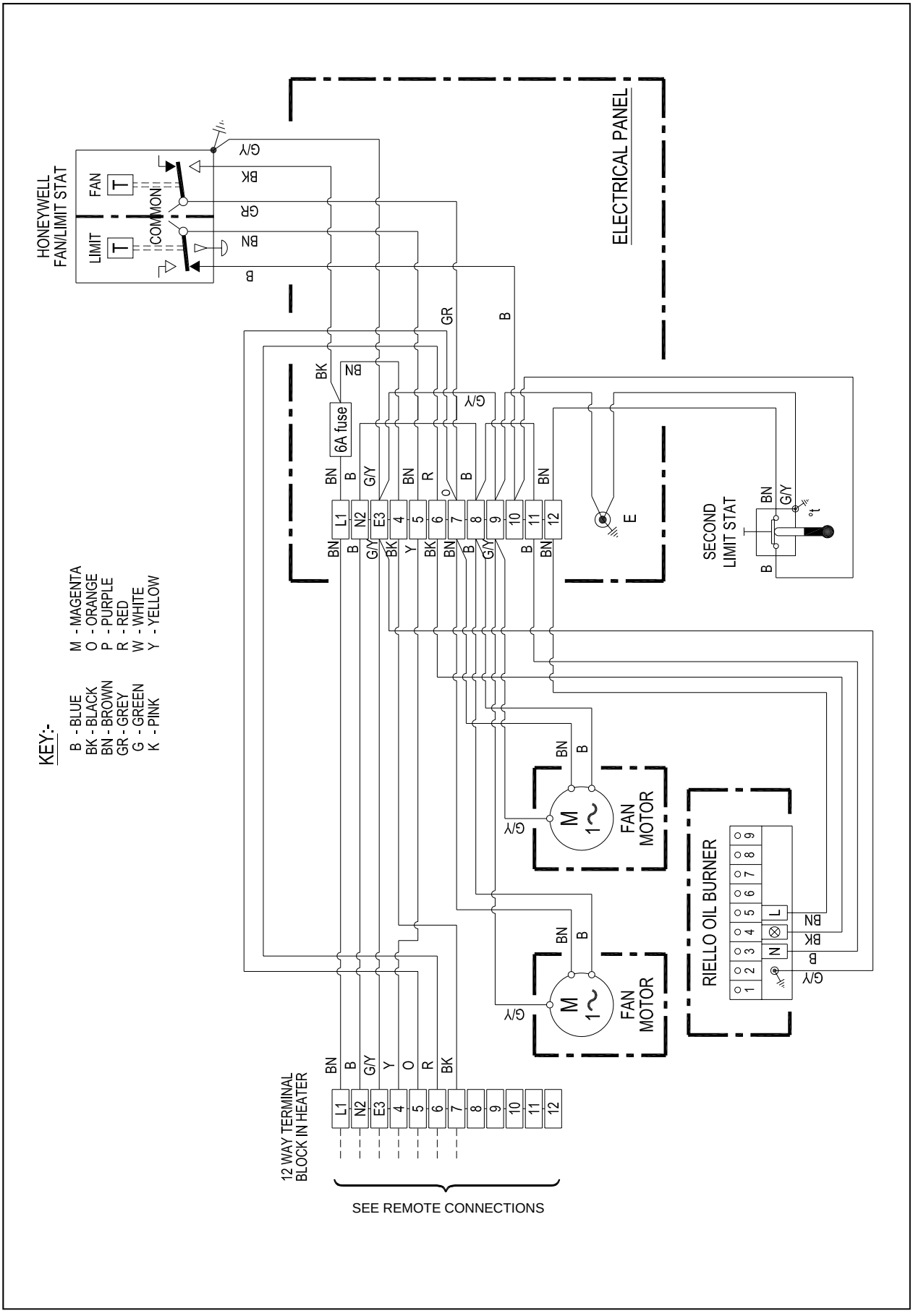
9.0 Internal Wiring Diagram 33-65-100

OUHA 100-140 ON/OFF Riello Oil Fired Burner



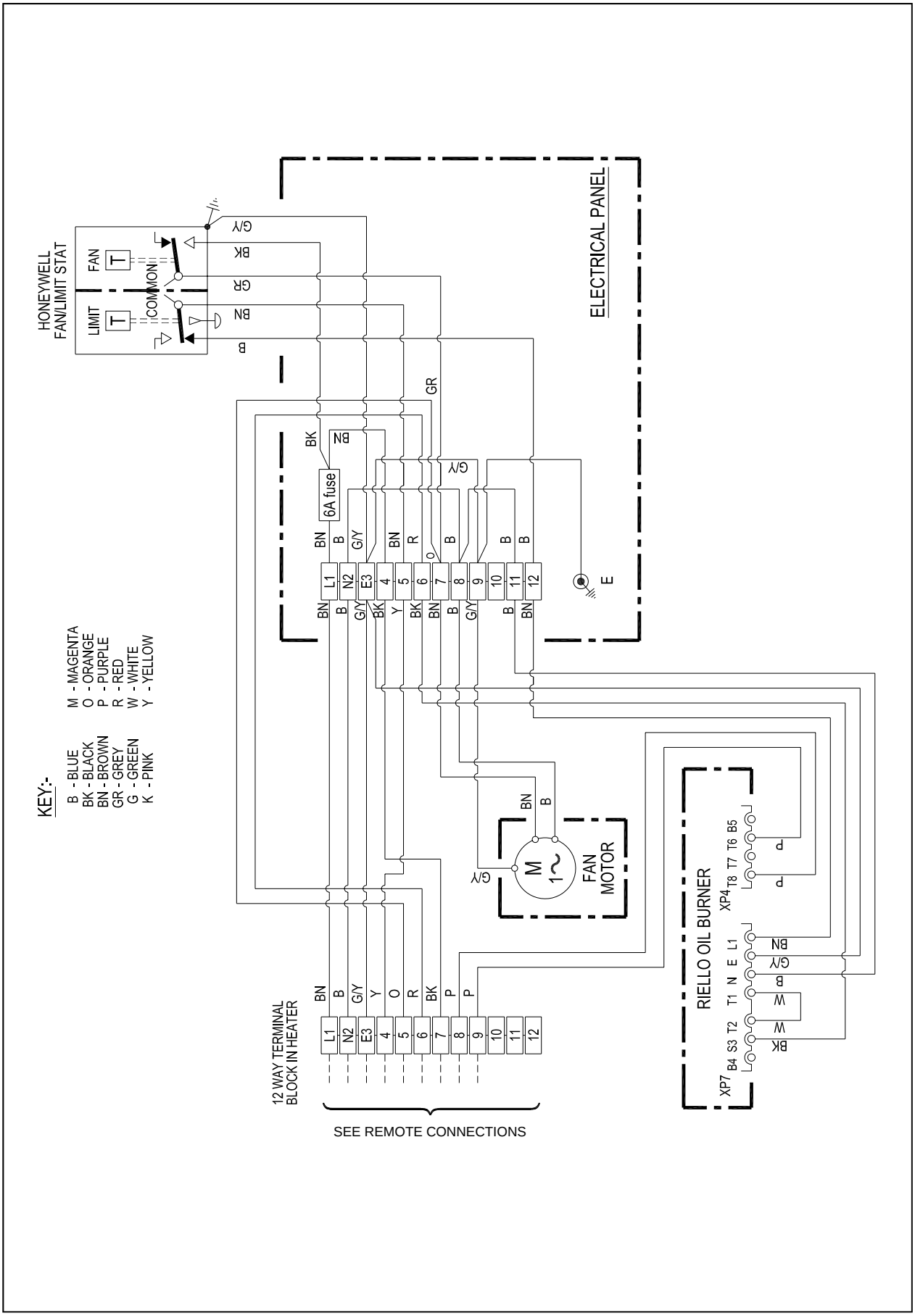
Internal Wiring Diagram 33-65-106

OUHA 200-350 ON/OFF Riello Oil Fired Burner



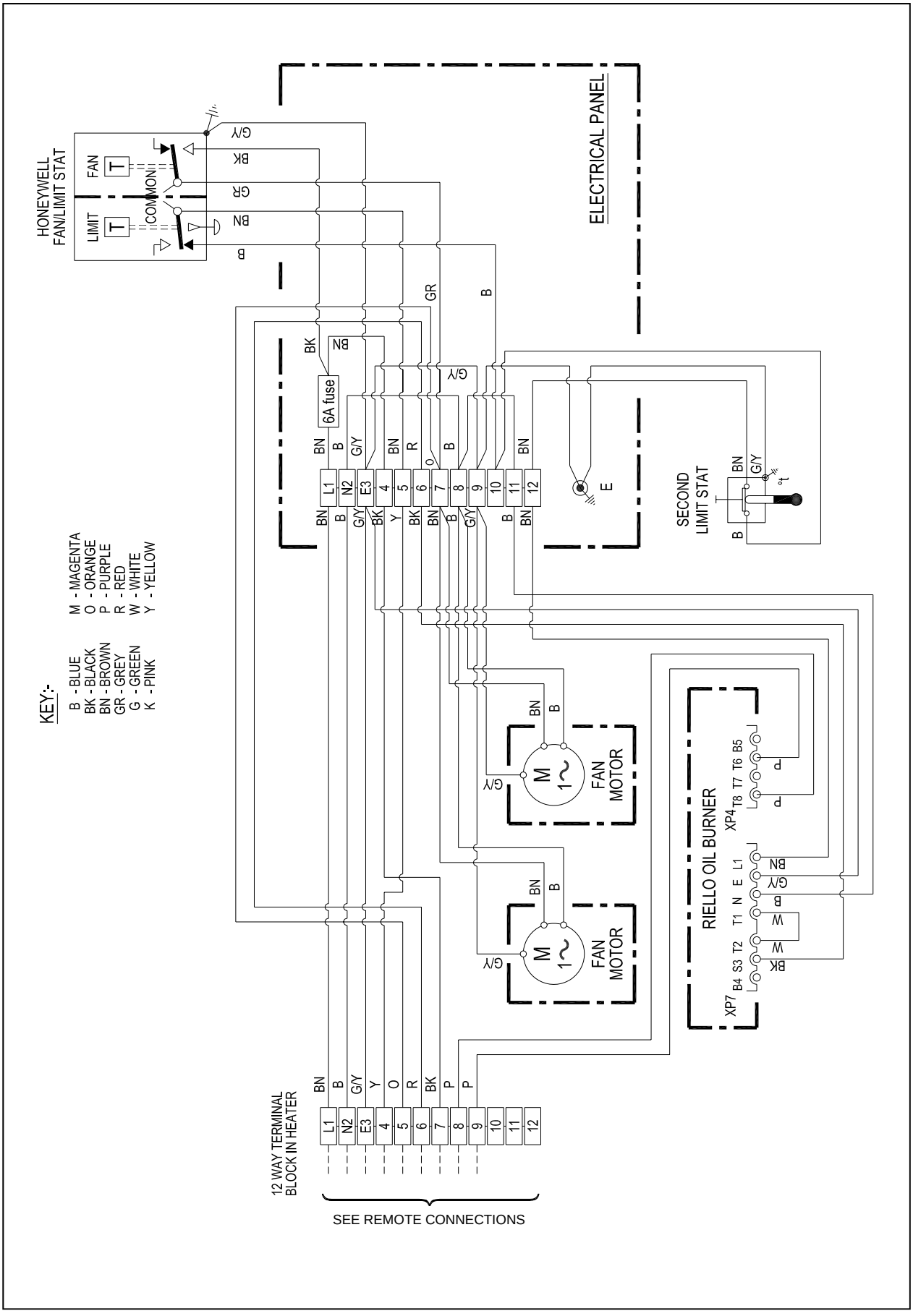
Internal Wiring Diagram 33-65-107

OUHA 100-140 HI/LOW Riello Oil Fired Burner



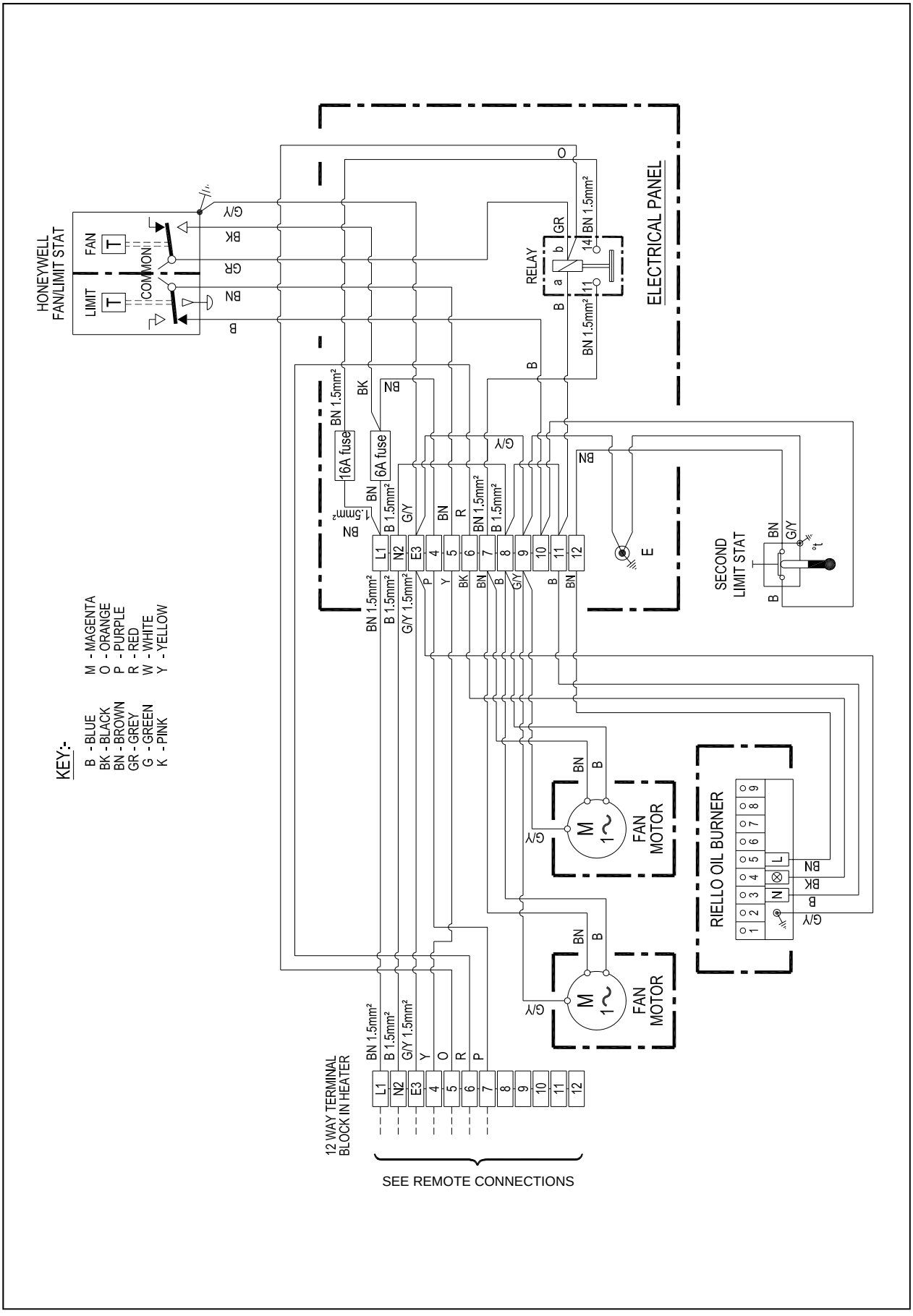
Internal Wiring Diagram 33-65-108

OUHA 200-350 HI/LOW Riello Oil Fired Burner



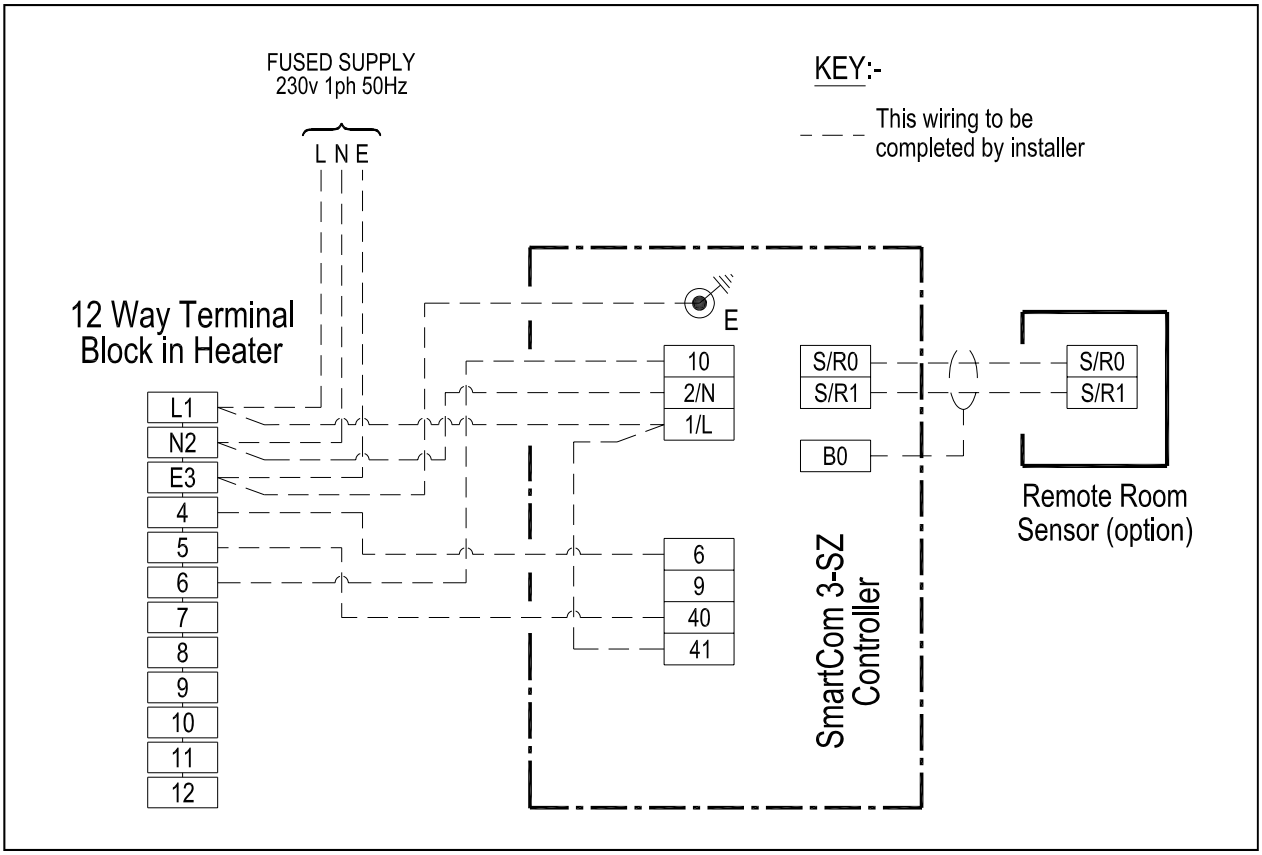
Internal Wiring Diagram 33-65-191

OUHC 200-350 ON/OFF Riello Oil Fired Burner



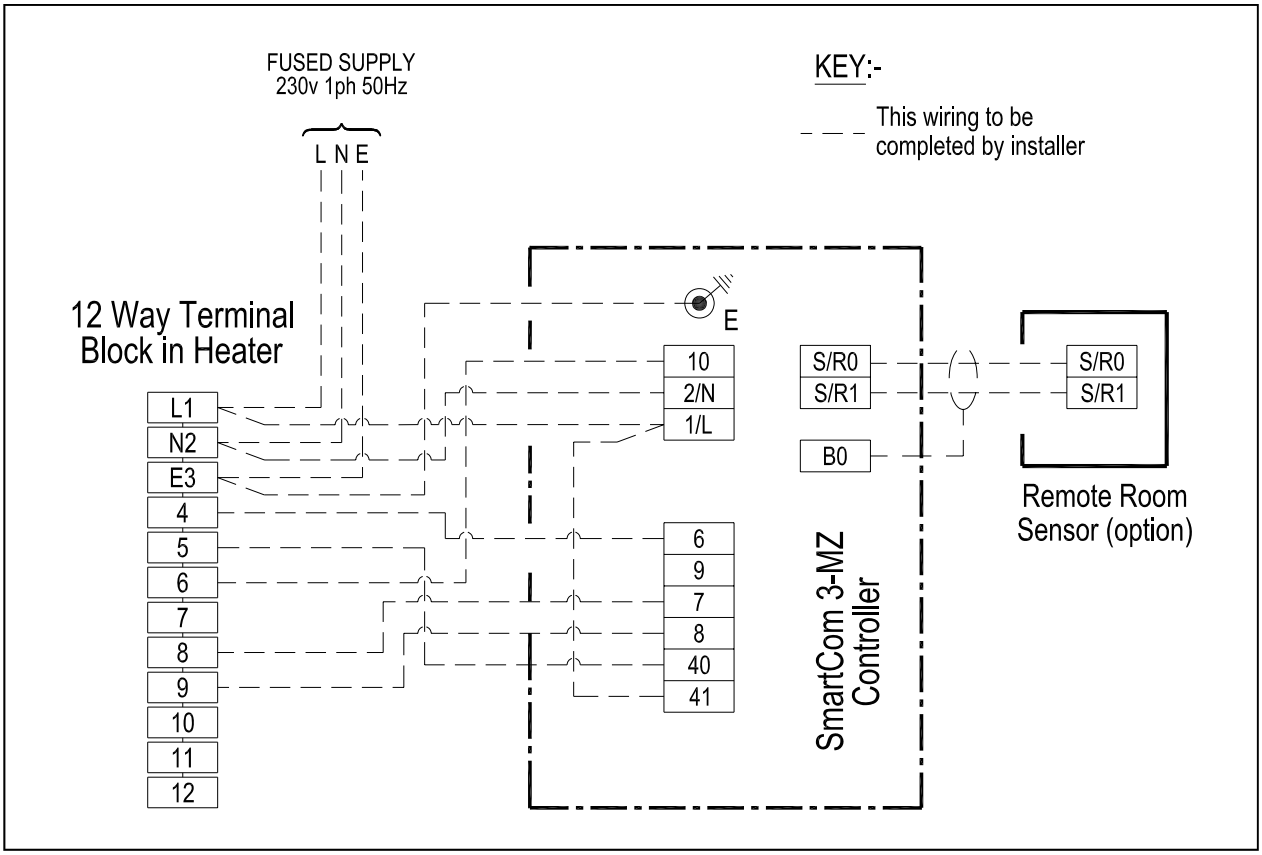
Remote Connections 33-65-228

ON/OFF to SmartCom SC3-SZ



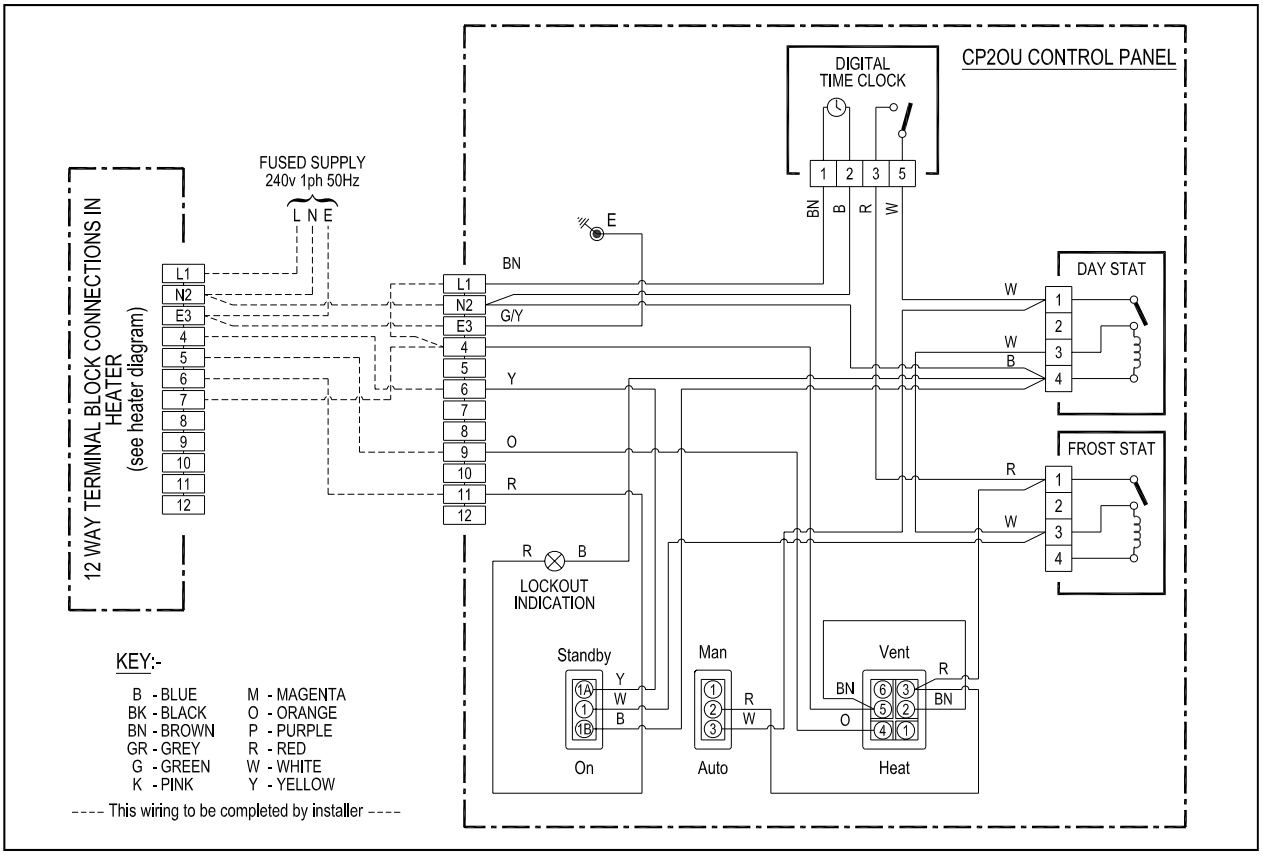
Remote Connections 33-65-229

HI/LOW to SmartCom SC3-MZ



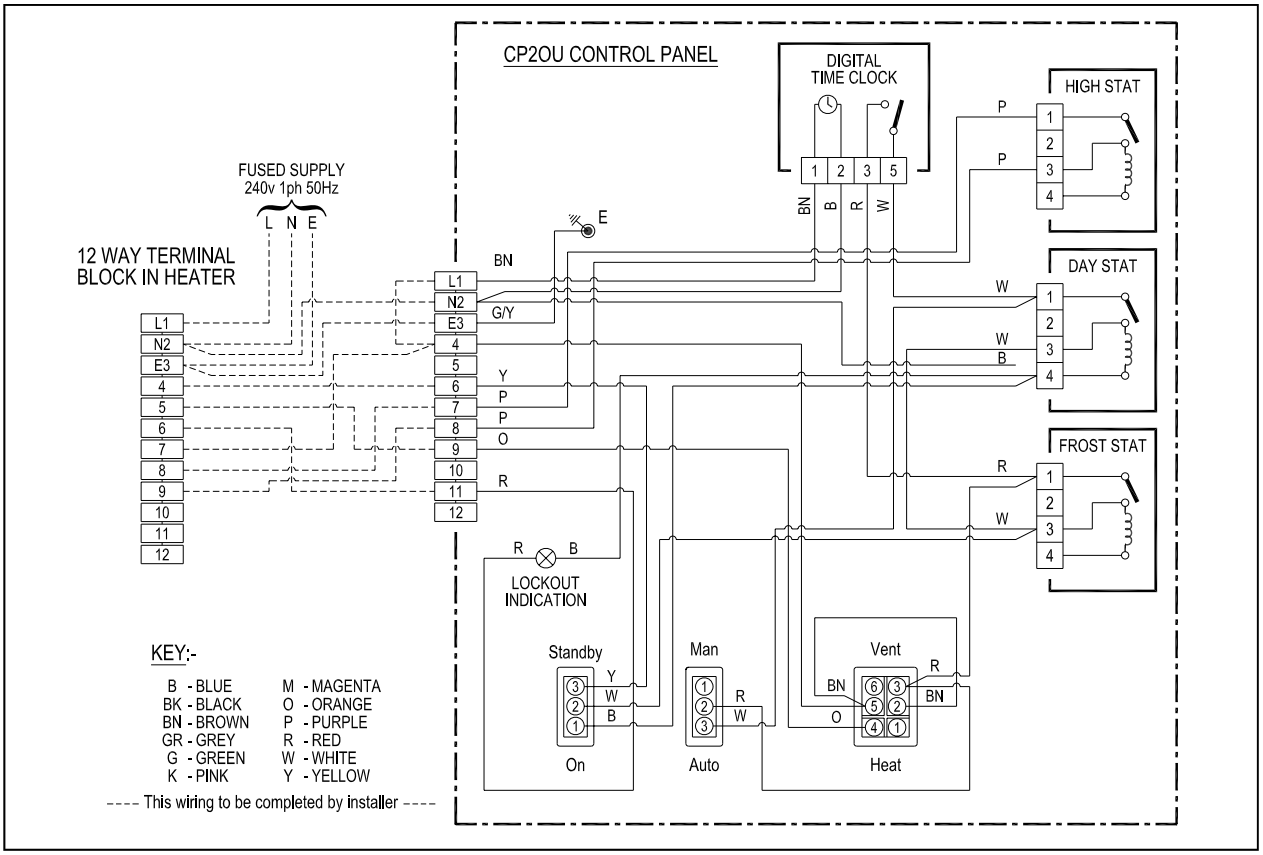
Remote Connections 33-65-102

ON/OFF to CP2OU



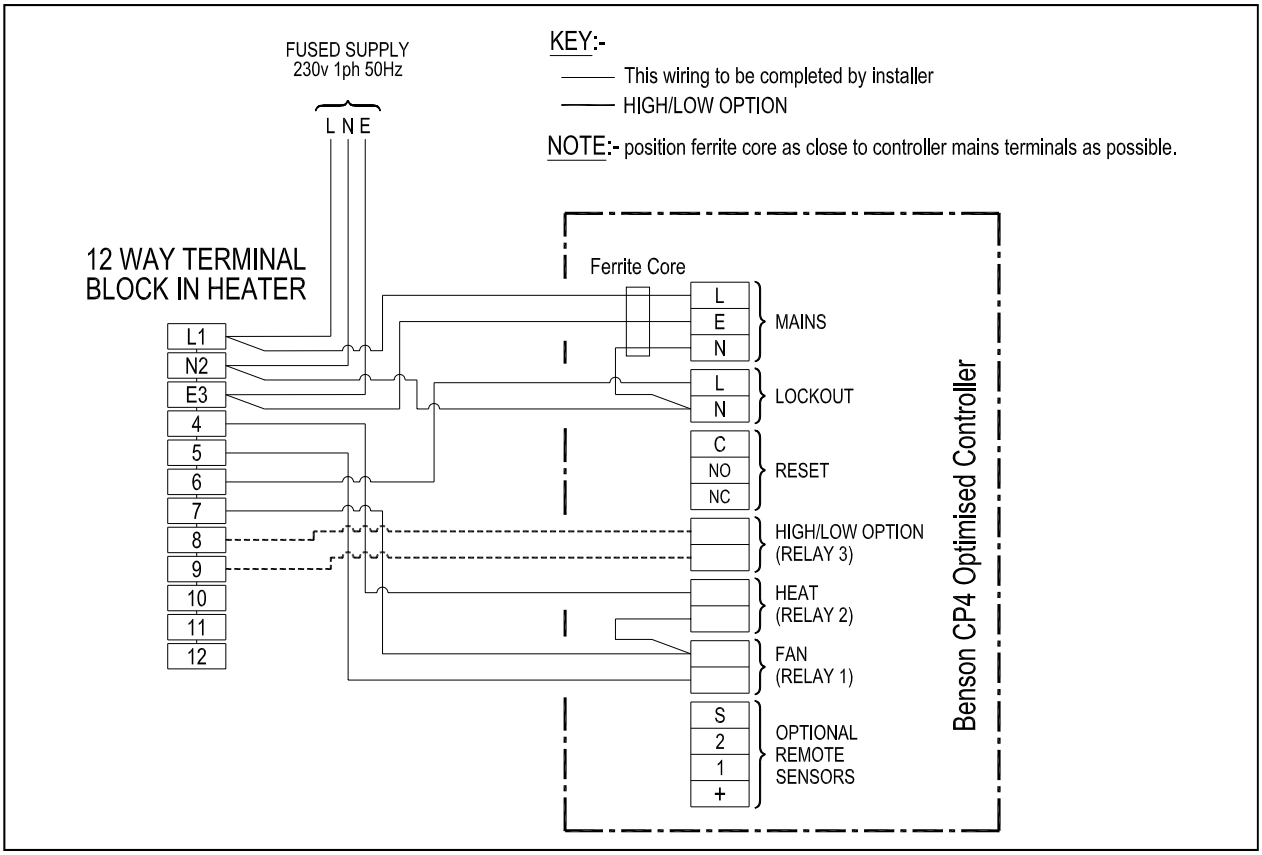
Remote Connections 33-65-130

HI/LOW to CP2OU



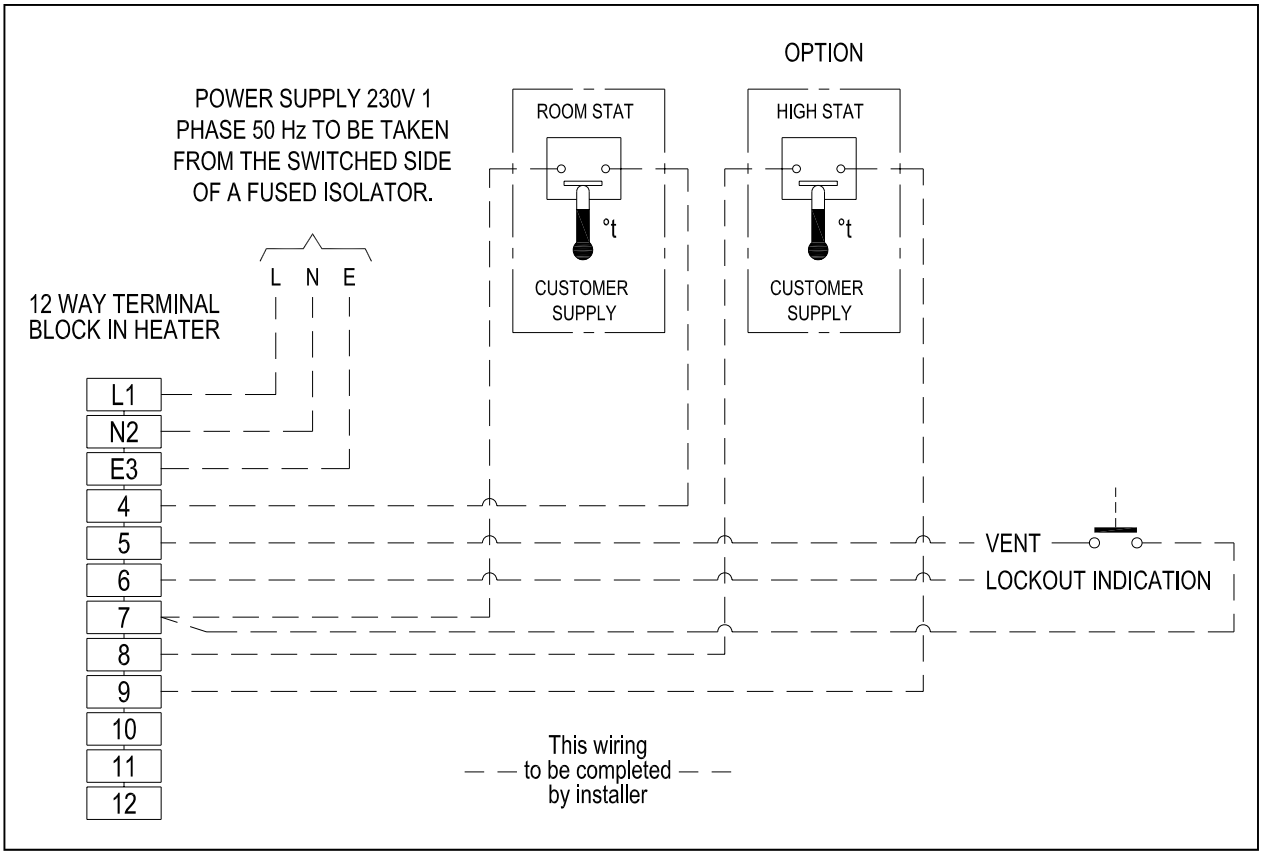
Remote Connections 33-65-131

ON/OFF (HI/LOW) to CP4



Remote Connections 33-65-228

ON/OFF (HI/LOW) Less Controls



10.0 Technical Data

MODEL		OUH 100	OUH 140	OUH 200	OUH 250	OUH 300	OUH 350
HEAT OUTPUT	kW/hr Btu/hr	31.26 106.660	39.78 135.725	58.61 200.000	71.88 245.240	87.92 300.000	102.5 350.000
HEAT INPUT (nett)	kW/hr Btu/hr	34.24 116.830	44.60 152.175	64.25 219.220	82.73 282.250	96.04 327.690	114.8 391.640
Fuel Consumption 35sec Gas Oil	Imp gall/hr Litres /hr	0.76 3.5	1.0 4.5	1.43 6.5	1.76 8.0	2.13 9.7	2.55 11.57
Burner Type	RIELLO	G5	G5	G10	G10	G20	G20
35 sec Oil Nozzle	US gall/hr Type	0.65 80S	0.85 60S	1.35 45S	1.75 60S	2.0 60S	2.25 45S
Oil Pump Pressure 35sec	Psi Bar	190 13.1	190 13.1	160 11.0	160 11.0	160 11.0	180 12.4
Head Setting Gas Oil	Number	3	6	4	5	2	1.5
Air Shutter Setting Gas Oil	Number	3	5.5	3	4.5	2	2.8
Oil Pump Pressure 28sec	Psi Bar	150 10.5	150 10.5	140 9.50	130 8.8	140 9.50	135 9.2
28 sec Oil Nozzle	US gall/hr Type	0.75 80S	1.0 60S	1.50 60S	2.0 60S	2.25 60S	2.75 60S
Fuel Consumption 28 sec Kerosene	Imp gall/hr Litres /hr	0.74 3.53	0.98 4.45	1.6 7.2	2.0 9.0	2.3 10.4	2.5 11.34
Oil Connection	BSP	3/8”	3/8”	3/8”	3/8”	3/8”	3/8”
Air Throw	mtrs	21	23	31	37	36	39
Air Flow Axial	m^3/s ft^3/m	0.9 1900	1.02 2120	1.6 3400	1.9 4050	2.44 5180	2.63 5573
Outlet Pressure Centrifugal	Pascals Ins WG	150 0.60	150 0.60	180 0.72	150 0.60	180 0.72	180 0.72
Temperature rise Through Heater	Deg C Deg F	29 52	32 57	30 54	31 56	30 54	32 57
Nett Efficiency	%	91.30	89.23	91.22	89.10	91.55	89.30
Sound Level @ 3m	Dba	61	65	68	69	71	72
Comb Chamber press	M/bar	0.14	0.14	0.14	0.14	0.14	0.14
Flue Size	mm	125	125	150	150	175	175
Flue Resistance	Min m/bar Max m/bar	-0.1 +0.2	-0.1 +0.2	-0.1 +0.2	-0.1 +0.2	-0.1 +0.2	-0.1 +0.2
Electrical Supply	Volts/ph/Hz	230/1/50	230/1/50	230/1/50	230/1/50	230/1/50	230/1/50
Rated Input Axial	kW	0.55	0.55	0.9	0.9	1.1	1.1
Rated Input Centrif	kW	1.1	1.1	1.1	1.1	2.2	2.2
Internal Fuse Axial	Amps	6	6	6	6	6	6
Fused Isolator Centrif	Amps	10	10	16	16	20	20
Run Current Axial	Amps	1.6	1.6	2.8	2.8	3.4	3.4
Run Current Centrif	Amps	8.0	8.0	11.0	11.0	15.0	15.0
Electrical Protection	IP	20	20	20	20	20	20
Weight Axial	Kg	116	116	177	177	240	240
Weight Centrifugal	Kg	138	138	212	212	280	280

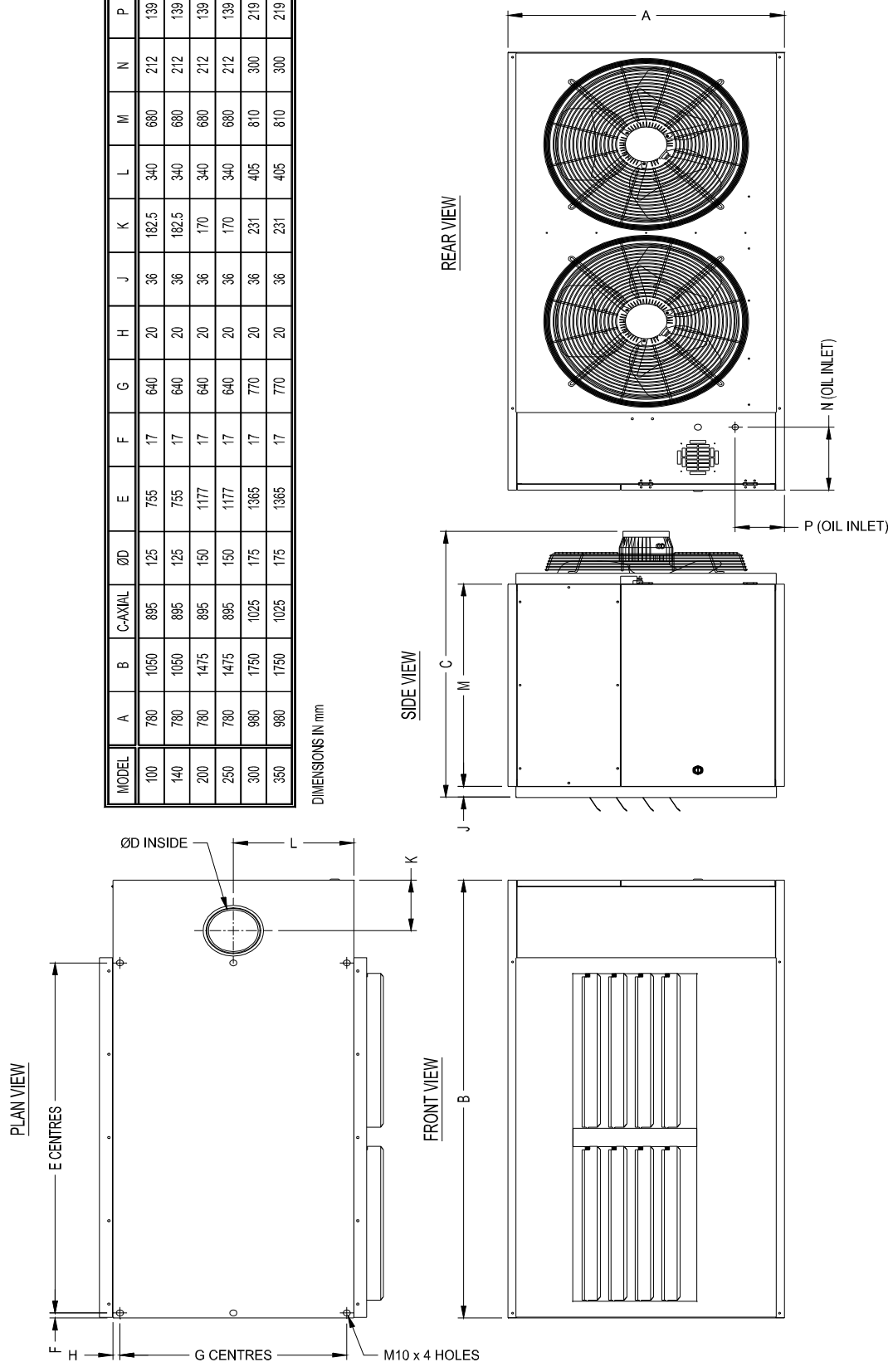
11.0 Parts List

DESCRIPTION	100	140	200	250	300	350
Fan/Limit Thermostat	28-60-021	28-60-021	28-60-021	28-60-021	28-60-021	28-60-021
Fan/Limit Stat Gasket	20-33-549	20-33-549	20-33-549	20-33-549	20-33-549	20-33-549
Burner Plate Gasket	31-28-080	31-28-080	31-28-080	30-40-156	30-40-156	30-40-156
O/heat Thermostat	N/A	N/A	28-40-059	28-40-059	28-40-059	28-40-059
Fire Valve	29-03-007	29-03-007	29-03-007	29-03-007	29-03-007	29-03-007
Sight Glass	20-30-151	20-30-151	20-30-151	20-30-151	20-30-151	20-30-151
Sight Glass Holder	20-30-061	20-30-061	20-30-061	20-30-061	20-30-061	20-30-061
Sight Glass Gasket	31-28-084	31-28-084	31-28-084	31-28-084	31-28-084	31-28-084
Fuse 1ph	28-07-049	28-07-049	28-07-049	28-07-049	28-07-049	28-07-049
Axial Fan	28-09-062	28-09-062	28-09-062	28-09-062	28-09-092	28-09-092
Centrifugal Motorised Fan 1ph	28-09-001	28-09-144	28-09-049	28-09-049	28-09-002	28-09-002
Fan Restrictor	N/A	33-30-518	31-30-017	31-30-017	TBA	TBA
Fuel Filter	29-15-017	29-15-017	29-15-017	29-15-017	29-15-017	29-15-017
Nozzle	27-00-410	27-00-418	27-00-426	27-00-436	27-00-032	28-00-036
Burner	29-99-452	29-99-452	29-99-453	29-99-453	29-99-454	29-99-454
CP2 CONTROLLER	B-CP2	B-CP2	B-CP2	B-CP2	B-CP2	B-CP2
CP4 CONTROLLER	B-CP4	B-CP4	B-CP4	B-CP4	B-CP4	B-CP4

12.0 Heater Dimensions Axial Fan

MODEL	A	B	C-AXIAL	ØD	E	F	G	H	J	K	L	M	N	P
100	780	1050	895	125	755	17	640	20	36	182.5	340	680	212	139
140	780	1050	895	125	755	17	640	20	36	182.5	340	680	212	139
200	780	1475	895	150	1177	17	640	20	36	170	340	680	212	139
250	780	1475	895	150	1177	17	640	20	36	170	340	680	212	139
300	980	1750	1025	175	1365	17	770	20	36	231	405	810	300	219
350	980	1750	1025	175	1365	17	770	20	36	231	405	810	300	219

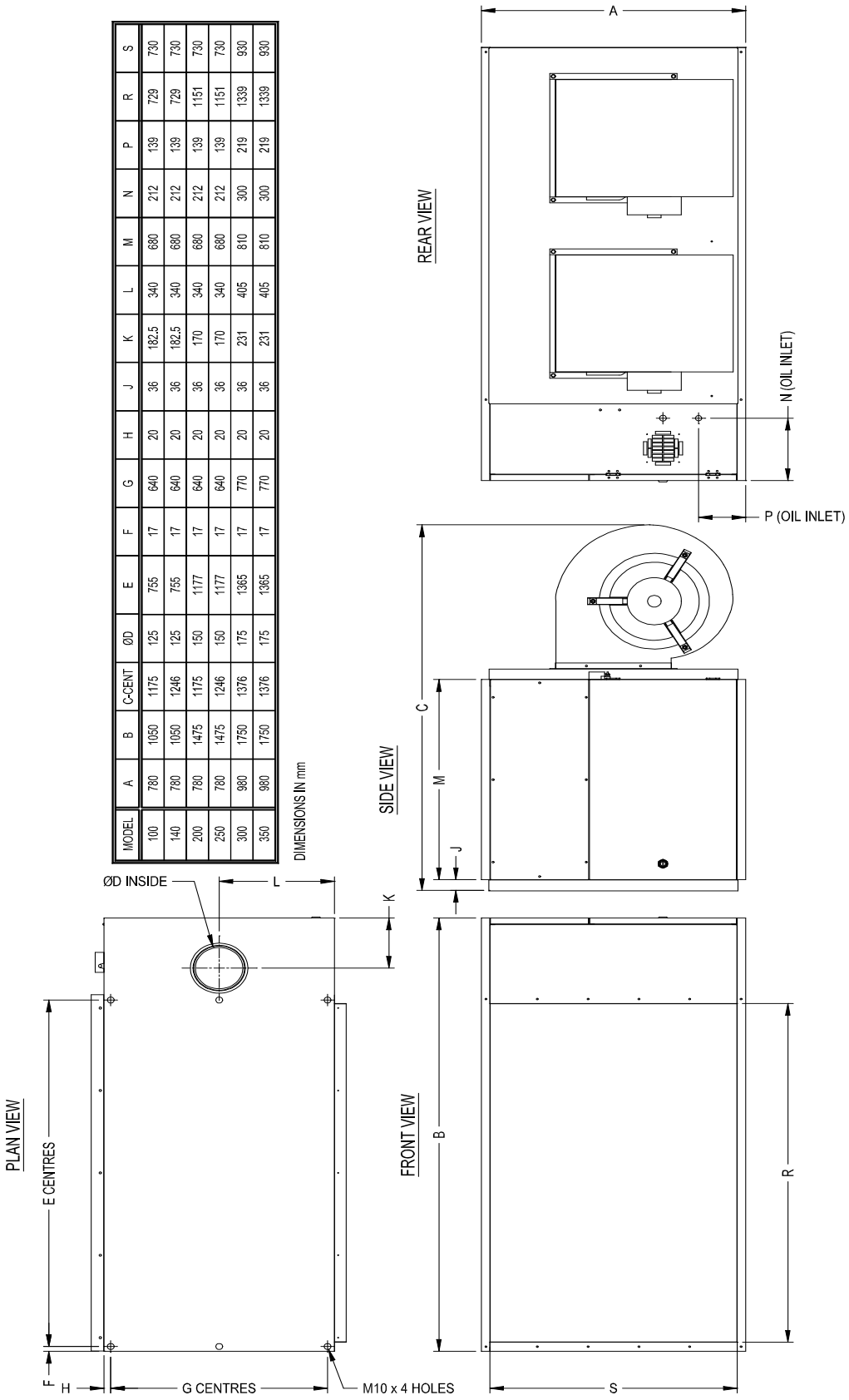
DIMENSIONS IN mm



12.1 Heater Dimensions Centrifugal Fan

MODEL	A	B	C-CENT	ØD	E	F	G	H	J	K	L	M	N	P	R	S
100	780	1050	1175	125	755	17	640	20	36	182.5	340	680	212	139	729	730
140	780	1050	1246	125	755	17	640	20	36	182.5	340	680	212	139	729	730
200	780	1475	1175	150	1177	17	640	20	36	170	340	680	212	139	1151	730
250	780	1475	1246	150	1177	17	640	20	36	170	340	680	212	139	1151	730
300	980	1750	1376	175	1365	17	770	20	36	231	405	810	300	219	1339	930
350	980	1750	1376	175	1365	17	770	20	36	231	405	810	300	219	1339	930

DIMENSIONS IN mm



S E C T I O N C

B A S I C U S E R I N S T R U C T I O N S

10.0 Introduction

The following information is relevant to the Oil fired Unit Heater range manufactured by Benson Heating. These heaters are manufactured within a strictly controlled quality system to ISO 9001: 2000.

All Benson Heating Oil Fired Heaters are CE marked, having been found to satisfy the essential requirements of the following European Directives.
Machinery Directive (89/392/EEC)
Low Voltage Directive (73/23/EEC & 93/68/EEC)
Electromagnetic Compatibility Directive (89/336/EEC & 91/31/EEC)
Product Liability Directive (65/374/EEC)

Benson Heating support all new products being supplied to their customers with a comprehensive information pack, and it is the responsibility of the owner, user, or hirer, of such products supplied by
Benson Heating to ensure that operators are provided with the operator manual, and that they are suitably instructed
regarding the purpose of the manual and safety instructions. In addition to this, operators must also be suitably and adequately trained in the use of the product.

Contained within the text of this manual, the words **'Caution'** and **'Warning'** are used to highlight certain points.

Caution is used when failure to follow or implement the instruction (s) can lead to a premature failure or damage being occasioned to the heater or its component parts.

Warning is used when failure to heed or implement the instruction(s) can lead not only to component damage, but can also lead to a hazardous situation being created where there is a risk of personal injury or death

10.1 Commissioning and hand over

Warning
As part of the commissioning programme, the commissioning engineer must go through the following with the operator.

(i) Lighting, shutdown, and operational information.
(ii) Safety features, data plate, and labelling.
(iii) The requirement for regular inspection - especially if the heater is within a more demanding environment - and the need for regular servicing, carried out by competent and qualified engineers.

Caution
After approximately 100 hours of running, the fan must be checked to ensure that it is correctly working,
It is strongly advised that this is undertaken by the commissioning engineer, and not the operator.

10.2 Servicing

Warning
Servicing must be carried out on a regular basis, the maximum interval between services being one year.
It is a requirement that only suitably qualified and competent persons are allowed to undertake the servicing.

10.3 Start up procedure

CP2 controller
(a) Ensure that the oil supply valves are open, and that the mains electrical supply is turned on

(b) Set time clock to an 'on' period

(c) Set room thermostat to demand heat

(d) Set heat/ventilation switch to 'heat'

(e) Set manual/automatic switch to 'automatic'

(f) Set on/standby switch to 'on'

(g) Check for the following burner sequence

interval	o p e r a n d
1	<5s Combustion air damper actuated fan motor initiates purge cycle...
2	<15s Solenoid valve opens ignition transformer provides spark for burner ignition and flame detection...
3	<20s Burner ignition start cycle complete.

Note
The time intervals within the ignition sequence may vary slightly between models.

(h) The burner will continue to fire until heat is no longer demanded.

10.4 Stop procedure

(a) Set on/standby switch to 'standby' position.

(b) The fan motor will continue to run until heat dissipation allows the fan and limit stat to shut down the fan.

Caution
Do not use the main electrical isolator to turn off the heater, to do so can cause damage to the heat exchanger and combustion chamber, and thereby invalidate the warranty.

10.5 Shut down procedure

(a) Follow steps 10.5 (a) and (b), when fan stops turn main electrical isolator off, and shut oil supply valves

10.6 Ventilation only

(a) Set heat/ventilate switch to 'ventilate'.

(b) Set on/standby switch to 'on'

10.7 Lockout situations

If either the burner or the fan and limit stat go to lockout, the lockout must be cleared manually before the ignition sequence can be re-initiated.

Caution
Repeated or frequent lockouts must be investigated and their cause determined by a qualified and competent engineer.

10.8 Contact information

Further information is available from :-

Benson Heating
Ludlow Road
Knighton
Powys
LD7 1LP

Telephone 01547 528534

Facsimile 01547 520399

BENSON HEATING
LUDLOW ROAD
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