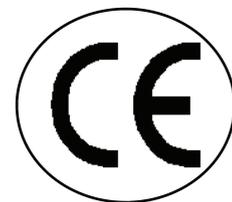
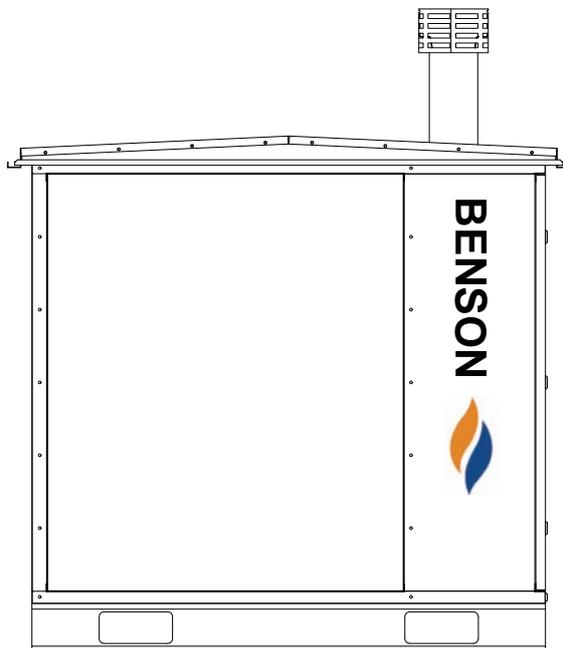


BENSON EVRD RANGE

NATURAL GAS (G20 I_{2H})
PROPANE GAS (G31 I_{3P})
EXTERNAL
TUBULAR HEATER

INSTALLATION COMMISSIONING
SERVICING
USER INSTRUCTIONS



Issue 1
Feb 2011

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

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IMPORTANT NOTICE TO INSTALLERS

Installers should satisfy themselves that the gas pipework installation is carried out in accordance with all current legislation, Codes of Practice and recommendations .

Additionally it may be necessary to protect the gas valves which form part of the heater or burner assembly from potential pipe contamination particularly, but not exclusively , where copper gas pipework is used.

In instances where copper pipework is to be used for all or part of a gas pipework installation, including short length final connections then we advise that installers consult with gas supplier or provider and satisfy themselves what additional precautions may be necessary

Any reference made to Laws, Standards, Directives , Codes of Practice or other recommendations governing the application and installation of heating appliances and which may be referred to in Brochures, Specifications, Quotations, and Installation, Operation and Maintenance manuals is done so for information and guidance purposes only and should only be considered valid at the time of the publication. Benson Heating cannot be held responsible from any matters arising from the revision to or introduction of new Laws, Standards, Directives, Codes of Practice or other recommendations.

1.0 Compliance notices

The Benson Variante range of warm air heaters detailed herewith are manufactured by Benson Heating within a strictly controlled environment within the parameters of ISO9001: 2000

These instructions are only valid if the following country code is on the appliance

GB. IE. If this code is not present on the appliance, it is necessary to refer to the technical instructions which will provide the necessary information concerning the modification of then appliance to the conditions of use for the country.

The Benson Variante Range has been independently tested and assessed, and has been found to meet the Essential Requirements of the following European Directives.

Gas Appliance Directive (90 / 396 / EEC)

Machinery Directive (89 / 392 EEC)

Low Voltage Directive (73 / 23 / EEC & 93 / 68 / EEC)

Electromagnetic Compatibility Directive (98 / 336 / EEC & 91 / 31 / EEC)

Product Liability Directive 65 / 374 / EEC)

The manufacturer has taken reasonable and practical steps to ensure that Benson Variante Range of 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 Variante Heater range subject to agreement from The Notified Body.

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 Variante range of heaters conform to the following European Harmonised Standards.

BS EN 1020 Requirements for non domestic gas fired forced convection air heaters for space heating incorporating a fan to assist transportation of combustion air and/ or combustion products.

BS EN - ISO 12100-1:2003 &
BS EN - ISO12100-2:2003
Safety of Machinery - Basic Concepts,
General Principles for Design
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

The Benson Variante range of gas unit
 heaters meet with the governments criteria in
 respect of the Enhanced Capital Allowance
 Scheme

1.1 Certificates of conformity

Declarations and Certificates are available
 upon request from the Quality Control
 Department at Benson Heating .

**Notified Body PIN Reference is
 063BQ5461**

1.2 General product information

The Benson Variante range includes for 10
 model sizes with outputs from **12.0 kW** to
144.0 kW,

Variante heaters are suitable for operation on
 natural gas (G20) or LPG (Propane G31)

The Model Range is made up as follows

Model No	12	20	30	42	50
Output kW	12	19.6	29.4	39.2	49.0
Model No	60	72	95	120	145
Output kW	58.8	72.0	96.0	120.0	144.0

Cabinet

Manufactured from electro-zinc coated steel,
 finished in a durable stove enamelled
 polyester powder paint.

Heat Exchanger

Manufactured from aluminised dimpled steel
 tube formed into a W shape to give
 enhanced efficiency .

Flue / Combustion Air Spigot

Each heater is fitted with two spigots both of
 which are located to the rear of the appliance
 One of the pair is for connection for the flue
 whilst the other is a screened combustion air
 intake

Burner

The induced draught multi in-shot burner
 assembly is manufactured from aluzinc
 coated steel and mounted to a common steel
 manifold which can be easily withdrawn
 through the burner access compartment.

Burner Control

The heaters are fitted with automatic
 ignition for all models within the range.

Exhaust Fan

Combustion gases are evacuated to
 atmosphere via an in built power flue venter
 fan which is safety interlocked to the gas
 valve via an air pressure proving device

Note

Neither asbestos nor soft soldered joints are
 used in the construction or manufacture of
 the Benson range of 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

Before installation, check that the local distribution conditions, nature of gas and pressure, and the current state adjustment of the appliance are compatible.

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.

This appliance must be installed by a competent person and in accordance with European, National, and Local criteria, including any relevant standards, codes of practice the requirements of the current building Regulations (and in particular parts J & L), Health and safety regulations IEE regulations and any requirements of the local Authority, Fire Officer or insurers Relevant standards may include BS6230, BS6891 and BS5588 parts 2 and 3

Prior to installation the following points should be considered;

- a) The position of the heater for the optimum 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 gas
- d) The position of the heater relative to the electrical services, wiring routes, 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 potential stratification / circulation problems, which generally occur at higher levels and which may be overcome through the provision of a suitable de-stratification unit.

g) 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 etc.

1.4 Delivery and pre-installation checks

The heater is supplied wrapped in heavy duty protective polythene, mounted on a pallet.

On receipt of the heater, the following checks should be carried out;

- a) The model is as per order
- b) That it is undamaged
- c) That it is suitable for the gas supply and pressure
- d) That it is suitable for the electrical supply

If any of these 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

1.5 Warranty

The heater is supplied with a 1 year parts and labour warranty and a further year on all parts excluding consumable's.

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'.

Note (i)

The warranty may be invalidated if -

a) The warranty registration/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

Note (ii)

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 on the cover 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.

Note (iii)

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

The location must also allow for adequate clearance for the air supply, return air circulation, gas supply, electrical supply, whilst also providing good and safe working access.

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 65°C.

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.

2.1 Installation Mounting and Clearances

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

2.2 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.

The air temperature rise on passing the heat exchanger is typically around 34^o C
A full and unobstructed return air path to the air heater must be provided

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.

Caution

It is necessary that the system is balanced in order to optimise 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.

2.3 Ventilation Openings and Grilles

Air Inlet 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.

2.4 Flue Installation.

An integral flue spigot is fitted to all Variante Air Heaters thereby allowing the flue to connect directly to the heater.

The design of the flue must ensure that it can be disconnected to allow for cleaning and servicing.

All joints should be sealed between the sections.

Warning

Each heater must have its own separate flue, with a flue diameter of not less than is detailed in **section 7.2** within this manual. The flue assembly must comply with all the relevant regulations regarding height and materials, and must terminate with an approved flue terminal.

Clearances EVRD in mm when viewed from the front

Model	12	20	30	42	50	60	72	95	120	145
Above	300	300	300	300	300	300	300	300	300	300
Below	n/a									
Right side	800	800	800	800	800	800	950	950	950	950
Left side	250	250	250	250	250	250	250	250	250	250
Rear	300	350	400	500	500	560	560	560	560	600

Right hand side = burner compartment side

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.

All Variante Heaters are equipped with a built in flue venter fan which prevents the re circulation of combustion products, consequently an external draught diverter, barometric damper, or anti spillage system must not be installed. Such devices are unnecessary on the Benson EVRD range of heaters.

The temperature of the combustion products can be as high as **170⁰ C** and therefore tend to rise naturally within the flue. Unnecessary bends and restrictions should therefore be avoided.

Provision for the disconnection of the flue for servicing and inspection purposes must also be made.

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 free escape of flue gases without risk of their re-entering the building through windows, ventilation ports etc.

The heaters must be connected to the flue system supplied by Benson Heating 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.

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 25mm internal diameter.

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.

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.

2.5 Electrical Installation

All electrical wiring and connections must be in accordance with the relevant European, National, and Local regulations as well as to IEE Standards.

Ensure that the Electric and Gas supplies are turned off before any electrical work is carried out on the heater.

Also ensure that wiring cannot make contact with any metal surfaces liable to be subject to high temperatures, and where insulation of the wiring could be impaired as a result of such contact.

All Variante models must be earthed.

Warning

Ensure that the electrical supply is compatible to the heater.

ALL HEATERS ARE NEUTRALLY RESET

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 the event of an emergency, or when the heater has been allowed to cool sufficiently to prevent any damage from being sustained to the heater or its controls (ie: during servicing).

Claims for damage will not be considered if they have resulted from incorrect wiring or the incorrect use of the heater

Each heater requires a permanent 230V 50Hz 1ph or 415V 50Hz 3ph electrical supply, depending on the heater size which must be wired through a fused isolator fitted with a fuse of the correct rating (see section 7.1).

The correct supply connection points for the live (s), neutral, and earth.

Wiring diagrams are also detailed within this manual, (section 6.0)

The electrical supply isolator should be

mounted adjacent to the air heater in an easily accessible position to allow for servicing isolation, or emergency shut off.

Electrical panel

Warning

Ensure that the mains isolator is turned **OFF** before undertaking any electrical work on the heater. Access to the electrical panel is gained by opening the right hand heater side panel.

Warning

Ensure that all connections are secure and that there are no loose strands which could bridge across the terminals.

A minimum conductor size of 1.0 mm (diameter) is required.

Remote Control Panels Warning

Isolate panel before working on heater

Caution

When using CP4 Optimised Controller

Consideration should be made when routing the cable between the control and heater. Avoiding where possible any existing cables and switch gear as any induced voltage may affect the operation of the sequential control box within the heater.

It is recommended that screened cable is used when the control is to be sited more than 10 metres away from the heater

One electrical panel per heater is required, unless heaters are specified for multiple heater control applications. On no account should more than one heater be connected to a single time switch or thermostat.

The only exception to this is when a control panel suitable for multiple heater applications is supplied by the manufacturer.

Any ancillary electrical items e.g. room thermostats , time switches, remote panels etc, must be wired into the heater electrical circuit in accordance with the diagrams provided

Note

When external controls operate to switch the heater **OFF**, power to the heater should remain to allow the fan to continue to operate to sufficiently cool the heater thereby preventing damage to the heat exchanger.

Fan limit control

(Situated inside the right hand side panel)

FAN ON 50° **FAN OFF 30°**

These settings may require slight adjustment on commissioning

Fan control (white button)

The fan control switch features normally open 230V contacts, and is wired to control the live supply to the fan motor . When the circuit is made, the fan will switch on when the heat anticipator has closed the fan switch contacts. When the thermostat or time switch shuts down the burner, the fan will continue to run until the thermal switch has cooled sufficiently to prevent the residual heat from damaging the heater or its controls.

On start up the fan delay prevents air being circulated until the desired temperature is achieved

Limit control (red button) **SET at 100°**

An adjustable high temperature manual reset limit control. If this control needs resetting the cause should be determined and rectified immediately.

On models with two fans a second limit control is situated inside the right side panel and is wired in series. Operation of either switch will shut down the heater. On larger models there will be additional limit stats fitted

Caution

The power supply to the fan must not be interrupted, the only time when power supply can be disconnected or interrupted is during servicing or in emergencies

If there is a requirement for the heater to be switched off over night then the gas valve circuit should be opened via a time switch, etc, as per the wiring instructions and diagrams supplied within section 6.0 of this manual.

2.6 Gas installation

Warning

Please read notice on page 3 of this manual

As there have been recorded instances of the deposition of copper sulphide dust within the valves and orifices of gas appliances as a

direct result of a reaction between the hydrogen sulphide contained in some natural gasses and copper pipe we recommend that the heater(s) should not be connected to any natural gas pipe distribution system which utilizes copper pipework, including final connections. Instead steel pipework should be used throughout.

In the event that it is impractical to use steel pipework or where installers are obliged or insist on using elements of copper pipework within the installation then we strongly recommend that the gas supplier be consulted as specific conditions and requirements may be necessary.

The Variante range of heaters are all manufactured and pre set for use with Natural Gas, and all feature 1/2" or 3/4" BSP connection points. Prior to installation the supply characteristics (gas type and pressure) must be checked to ensure that they are in accordance with the data plate on the heater. The gas supplier should check that the meter and service connection to the heater are capable of delivering the required volume of gas, thereby ensuring that the minimum burner pressure can be achieved.

Consideration should be given to the pressure drop on single and multi heater installations and the effect they may have on other plant sharing the supply. If it is necessary to fit a gas pressure booster, the controls must include a low pressure cut off switch which must be fitted on the supply / inlet side of the booster. It is also a requirement that the gas supplier is advised prior to the installation or fitting of the booster. Each heater supply must be fitted with a separate isolating cock positioned adjacent to and upstream of the union which must be sited outside the heater.

The isolating cock should be of the 90° turn type and should be clearly marked **OPEN / CLOSED** it should also be installed so as to fall to the closed position

An approved gas jointing compound must be used on all joints and unions and the system purged and tested for soundness prior to final connection

The connection to the heater can be made by way of either an approved flexible coupling or rigid connection . Threaded connections must comply to ISO 288/1 or ISO 7/1 further

information concerning accepted European practice is detailed in BS EN1020 1998. The diameter of the pipework from the isolating cock to the burner must not be less than the diameter of the connection into the multiblock.

Note

Reference to The Institute of Gas Engineers publications Utilisation Procedures IGE/UP1 and IGE/UP2 together with reference to BS6891 is strongly advised.

3.0 Commissioning

Note

It is a requirement that only suitably qualified and competent personnel are allowed to undertake the commissioning of the heater.

It is also strongly recommended that prior to commissioning the engineers familiarises themselves with the heater. the specific requirements of the installation / application, and the information contained within the manual.

Warning

All heaters are subject to a rigorous test programme prior to despatch, whilst such a programme does involve pre-commissioning and the setting of the heater to operate efficiently and within its designed operational limits this does not mean that the function of thorough on site commissioning is less important

It is strongly recommended that the equipment used for the sampling and analysis of the flue gases is accurate to within +/- 0.1% and maintained so that it is regularly calibrated.

The following pre-commissioning checks should be undertaken, having first ensured that the gas and electrical supplies are turned off.

- (a) Check that all panels and fasteners are secure and in place.
- (b) Check that the heater is mounted safely.
- (c) Check that the flue is sealed, secured, and adequately supported.

(d) Check that the fan is free to rotate, that the fan is secured to its shaft, and that the guards and fan assembly are all in place and properly secured.

(e) Check that the heater is installed so that it is not tilted and remains square.

(f) Check that the louvres are set to offer minimum resistance to air flow.

3.1 Electrical pre-tests

The electrical safety checks must include the following

- a) Test for earth continuity
- b) Test for resistance to earth
- c) Check live and neutral connections are correct.
- d) Check to ensure that when the external controls operate to switch the heater off, power remains to the fan

3.2 Gas supply pre-test

Ensure that the service pipework has been installed purged and tested in accordance with the relevant regulations, and that the installation is served by an adjacent isolating cock.

Connection from the supply to the heater must also comply with the relevant regulations (see section 8.0) and must have been purged and soundness tested by an authorised engineer

3.3 Ignition sequence

PRE START DRY RUN

In order to test that all controls are in good working order, the control sequence should first be tested with the gas supply turned **Off**. Ensure gas isolating cock is in the **Off** position

Warning

If during the following sequence of operations the heater fails to operate correctly the fault should be traced and rectified before proceeding, if necessary referring to section 5.0 fault diagnosis.

- a) Switch off the main electrical supply to the heater

- b) Turn off gas supply to the heater
- c) Open side panel, and connect manometers to the gas supply test point and to the main burner test point
- d) Ensure outlet duct louvres are correctly set
- e) Ensure fan rotation is not impaired or obstructed
- f) Set room thermostat to its lowest setting
- g) If a time switch is fitted ensure it is set to an on period
- h) Switch on electrical supply
- i) Use leak tester to test for soundness on the unions and pipework
- j) Operate the heater through the installed control system.
On start the signal will activate the flue venter for a pre purge period and in turn will make the air proving switch, once made, the air proving switch will complete the circuit to the control box and after a **40 second Delay** the automatic control should attempt light the burner, because the gas is turned off and flame cannot be established , the control box will go to **LOCKOUT**.
- k) Reset the control on completion of dry run.
- l) Open gas cock
- m) Operate heater through installed control
The flue venter will pre purge the heater and in turn operate an air proving switch which completes the electrical circuit to the control box after a **40 second Delay** the control will open the gas solenoid valve and the main burner will light.
The flame can be observed at the burner manifold, check that the burner is providing a good flame i.e. even and stable.
- n) Check pressure readings on the manometers, and continue to let the heater fire for ten minutes
- o) When the fan starts ensure that the direction of rotation is correct , and that the fan start is within 2 minutes of burner ignition

Caution

If the fan fails to operate within approximately 2 minutes and the heater goes to overheat it will shut down through breaking the circuit to the gas valve, the cause must be ascertained and rectified before re-ignition.

Once the limit thermostat has tripped out it must be manually reset to allow re-ignition to take place.

p) After ten minutes check burner head pressure is as specification - adjust as necessary by removal of the gas pressure adjustment cover, and using a screwdriver turn the adjustment screw on the governor as follows: Clockwise to increase. Anti clockwise to decrease.

q) Check that the gas pressure remains satisfactory for all appliances on the same circuit

r) Undertake combustion tests checking CO CO² and efficiency (see section 7.0)
CO should not exceed (20PPM)

s) Check that the burners are extinguished when the thermostat is set to its lowest setting, and then remove the manometers.

t) Turn the thermostat to its highest setting to re light the burner and replace the adjustment screw cover

On completion mark the gas valve adjustment screw with paint/sealant to prevent tampering with valve

u) Turn the thermostat to its lowest setting and shut off the gas supply at the gas control valve, allow the fan to continue to run until the heater is cooled sufficiently for the fan to shut down

v) Turn off the electrical supply

w) Close the side panel

x) Set thermostat to desired setting

y) Ensure that the user is familiar with the heater and its controls and that the user is satisfied with the commissioning and testing, and that he is aware of the instructions within

the manual

It is strongly advised that the commissioning engineer runs through the lighting, shutdown, and general safe and efficient running of the heater before hand over.

3.4 Hand over

Upon satisfactory completion of commissioning and testing, a record of commissioning information (contact name date etc) should be made in the log book left with the heater by the commissioning engineer together with the user instructions. At the same time the user should be made aware of the most efficient and economical methods of operation.

The user must be familiar and satisfied with the safety, ignition, shutdown, and general operational procedures.

4.0 Servicing

Warning

It is a requirement that only qualified personnel are allowed to carry out installation commissioning or servicing.

In addition only spare parts recommended by the manufacturer may be fitted, and the installer should provide a list of recommended spare parts that are available through the manufacturer or his agent (see section 8)

Before commencing any maintenance or servicing work the heater must be shut down and allowed to cool, and have the gas and electric supplies to it turned off at the supply cock and isolator respectively.

Always test for gas soundness after completing any service work particularly if this has necessitated the removal and / or replacement of gas carrying components

It is advisable that routine inspections are carried out on a frequent basis, servicing must also be carried out regularly, and in accordance with the manufacturers recommendations i.e. at a maximum interval of one year. In certain applications the frequency of servicing will have to be increased, this to a large extent is governed by the working environment, and both the manufacturer and the installer will be able to offer further advice.

A safe working platform giving good access to the heater is required,

Clean all accessible surfaces including the outside of the tubular heat exchanger by removal of the fan assembly. Check for panel damage and that all fasteners are present and secure.

Visually check all electrical wiring for signs of damage, possibly through contact with hot surfaces, check conduit for signs of chaffing and for security. Check all terminals are secure and free from escaped / stray conductor strands.

4.1 Servicing procedure - major component parts

Heat exchanger

Remove fan assembly and carry out visual inspection of the tubular heat exchanger using an inspection lamp and mirror. Check seams and joints for perforations. Check for severe corrosion and splits in the heat exchanger.

Check that there are no blockages and that there is not an excessive build up of soot within the heat exchanger.

If required remove the burner manifold allowing access for cleaning, with a flexible flue brush and vacuum cleaner.

Warning If the heat exchanger is found to be perforated the heater must not be fired until a replacement heat exchanger has been fitted

Injectors and Manifold

Undo the gas pipe connection

Remove the 6 manifold fixing screws.

Remove the manifold and injector assembly from the right hand side of the heater.

Check that the manifold is straight, the injectors are correctly aligned, and that they are clean, and that there are no contaminants restricting the orifices, if necessary clean carefully with compressed air and or lint free cloth and acetone.

Caution

The injector orifice is precision machined to fine tolerances, do not clean with hard sharp or abrasive instruments. If the injectors have been removed from the manifold, when they are replaced, and care should be taken not to over tighten.

Ensure all joints are gas tight.

Fan and Motor

Check that the fan is secure and rotates freely without excessive play in the shaft. The fan blades and motor should be cleaned using a soft brush. The fan and motor assembly can be removed from the heater by first disconnecting the leads from the terminal block and by removing the strain relief bush. The four screws securing the fan and motor assembly to the rear of the plenum can be removed, and the assembly complete with guard can then be removed from the heater.

Fan and Limit Thermostats

Open the right hand door, so as to gain access. Remove securing screw from cover, remove cover plate and disconnect the cables. Remove the screws which secure the unit to the side of the heater and withdraw the thermostat complete from the heater. Check that the bi metal coil and its housing are secure clean as necessary with a soft brush .

Flue System

Check that the flue is in good condition, that it is adequately supported, that there are no blockages or restrictions. Check that any joints are properly sealed preventing an escape of products of combustion. Check condensate drain if fitted . Check for signs of water ingress and any resultant damage.

Flue Venter

Check that the flue fan is clean and free from any dust deposits

Differential Air Pressure Switch

Check that the tubes are connected and clear and free from dust, Check that they are not kinked or damaged Check electrical connections are intact

Test

Test and re-commission as per sections 3.0 to 3.4 inclusive.

Automatic Controls

Automatic control is by way of a Honeywell controller
Spark Ignition is via an ignition electrode ensure that the ceramic insulation material is not damaged or cracked.

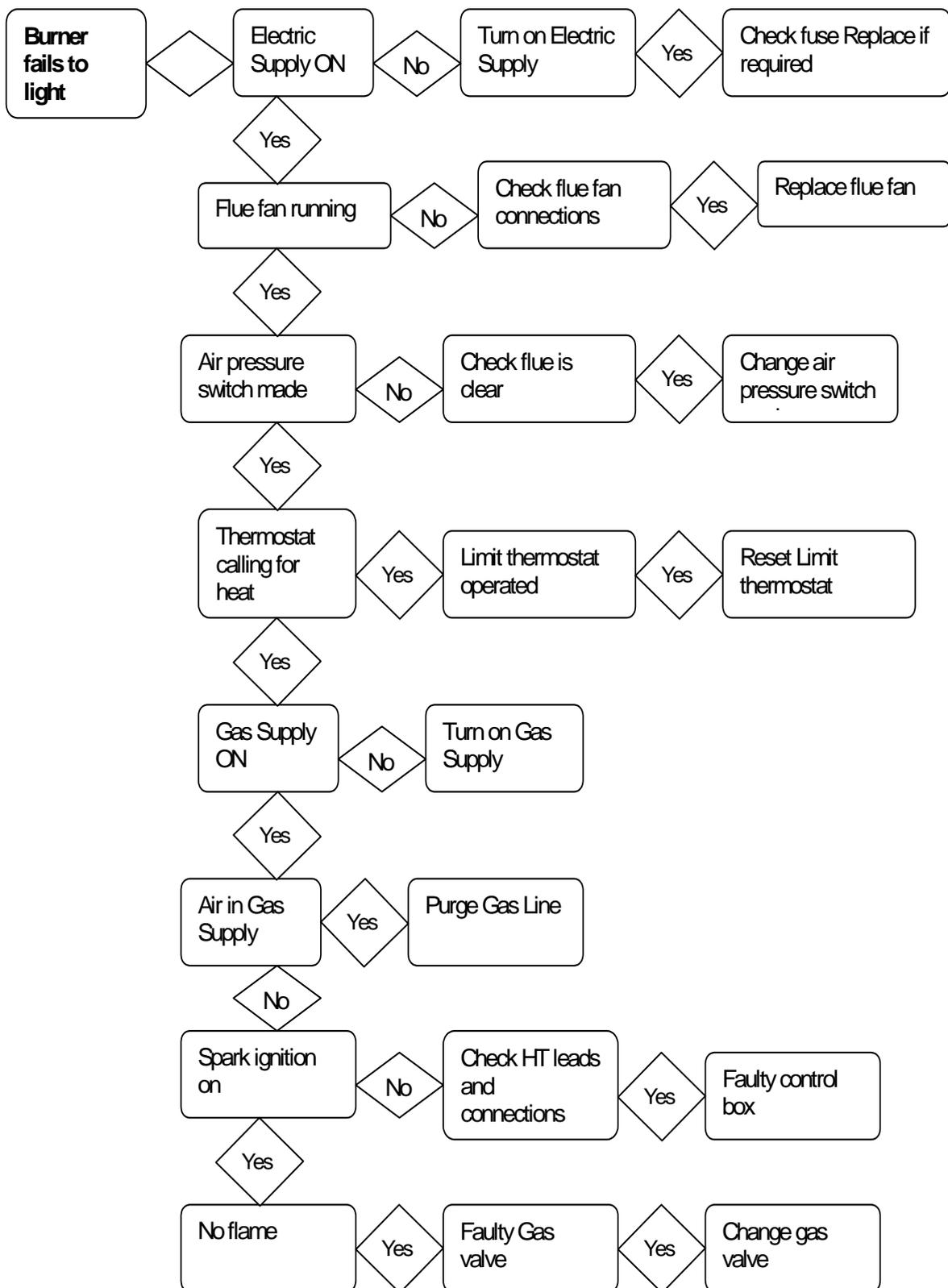
Flame supervision is via a flame sensor rod . Check the flame sensor rod for signs of pitting or corrosion, ensure that the ceramic insulation material is not damaged or cracked. Check connections are secure.

Multibloc Valve

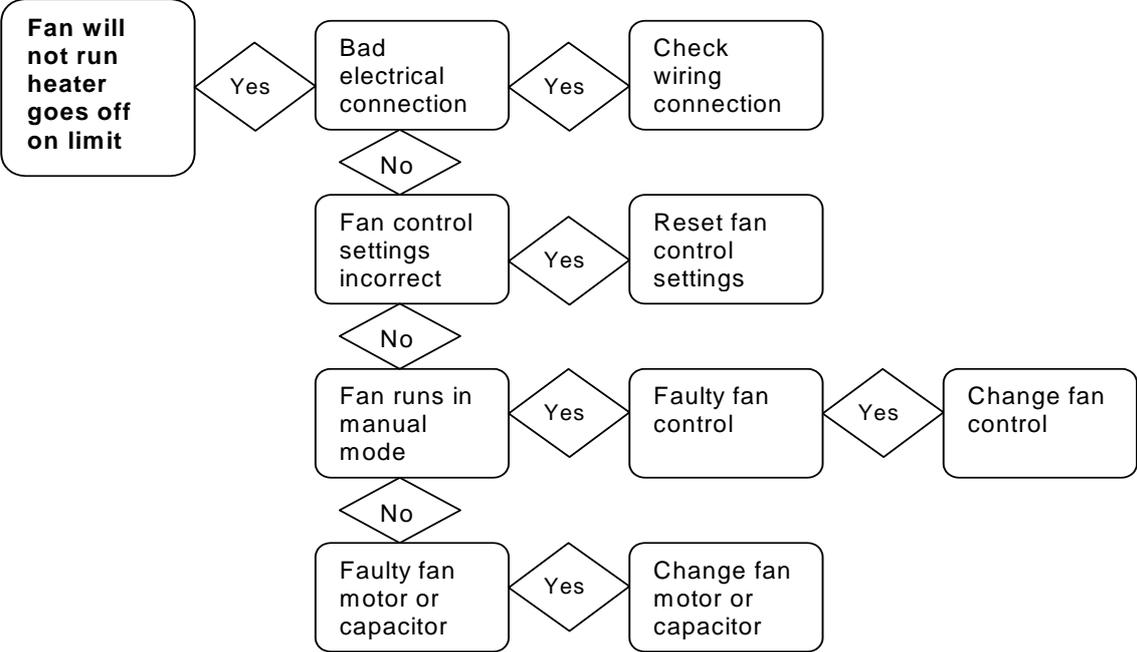
Main Governor

To adjust the main governor, using a screwdriver remove the metal cover to reveal the adjustment screw, and turn as follows :
Clockwise to increase pressure.
Anticlockwise to decrease pressure.
It should be noted that full clockwise adjustment will result in the valve being closed permanently.

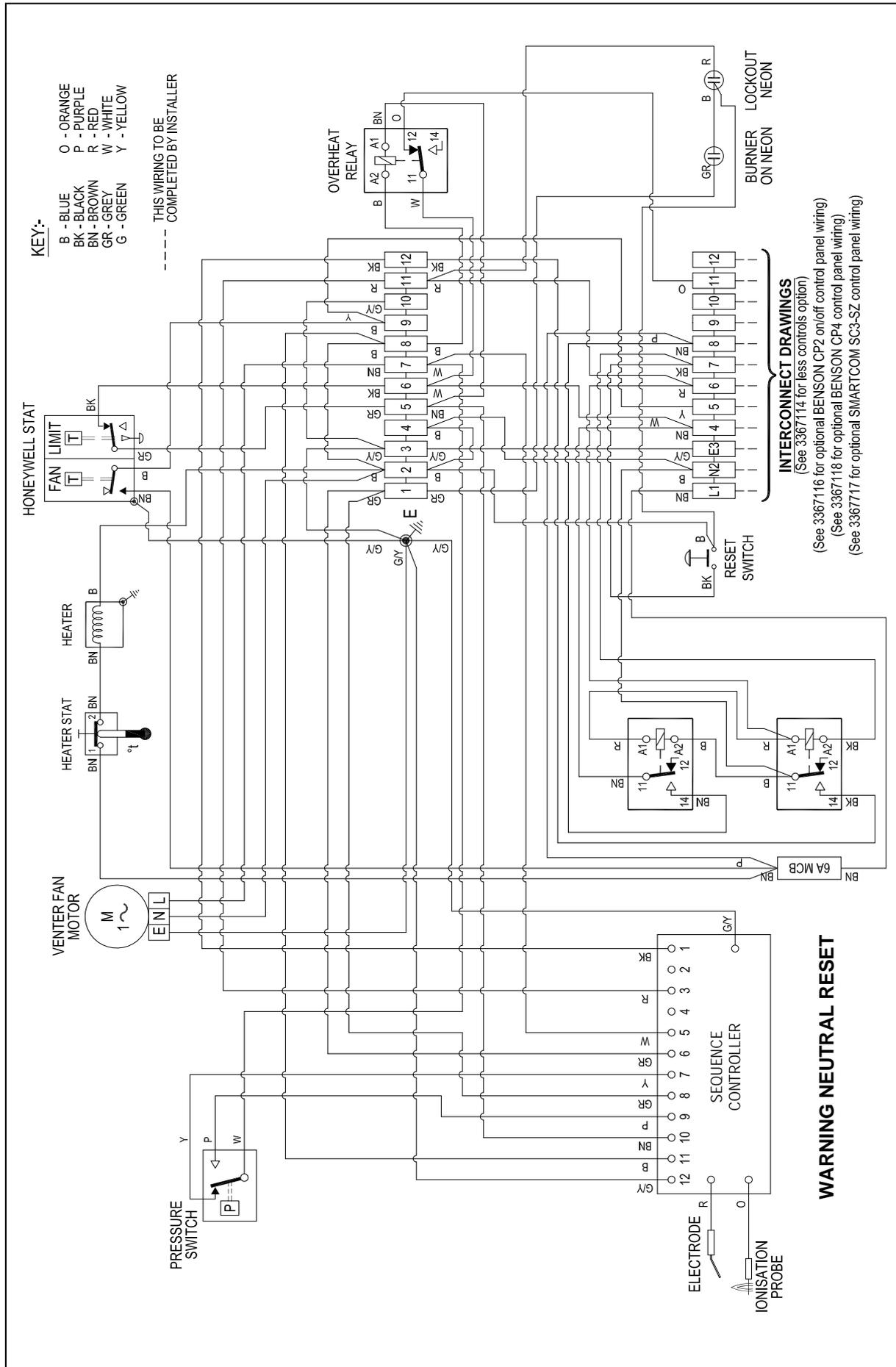
Fault Finding



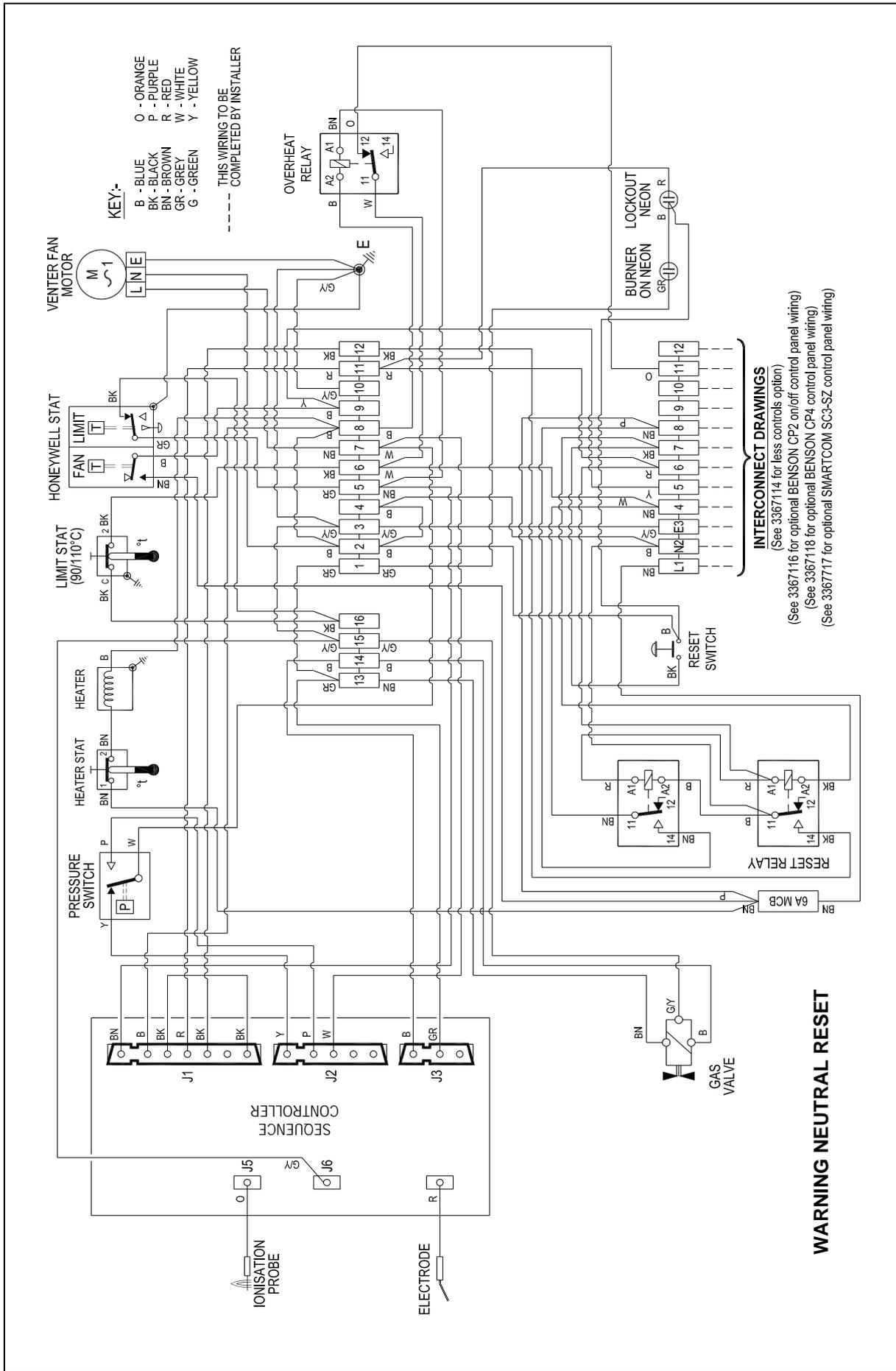
Fault finding cont'd



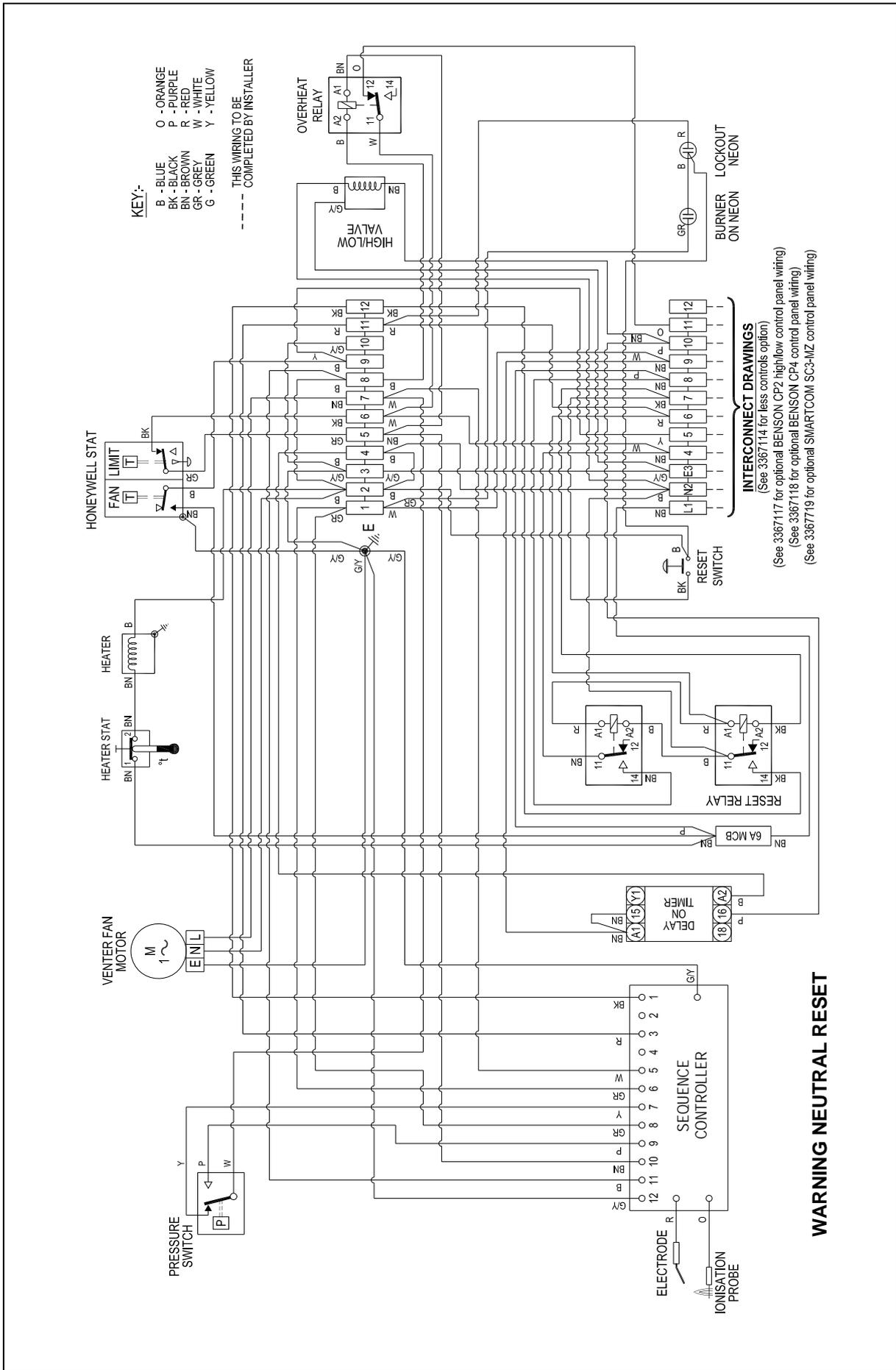
6. Wiring Diagram 33-67-112 EVRD 12-60 Auto ignition On/Off



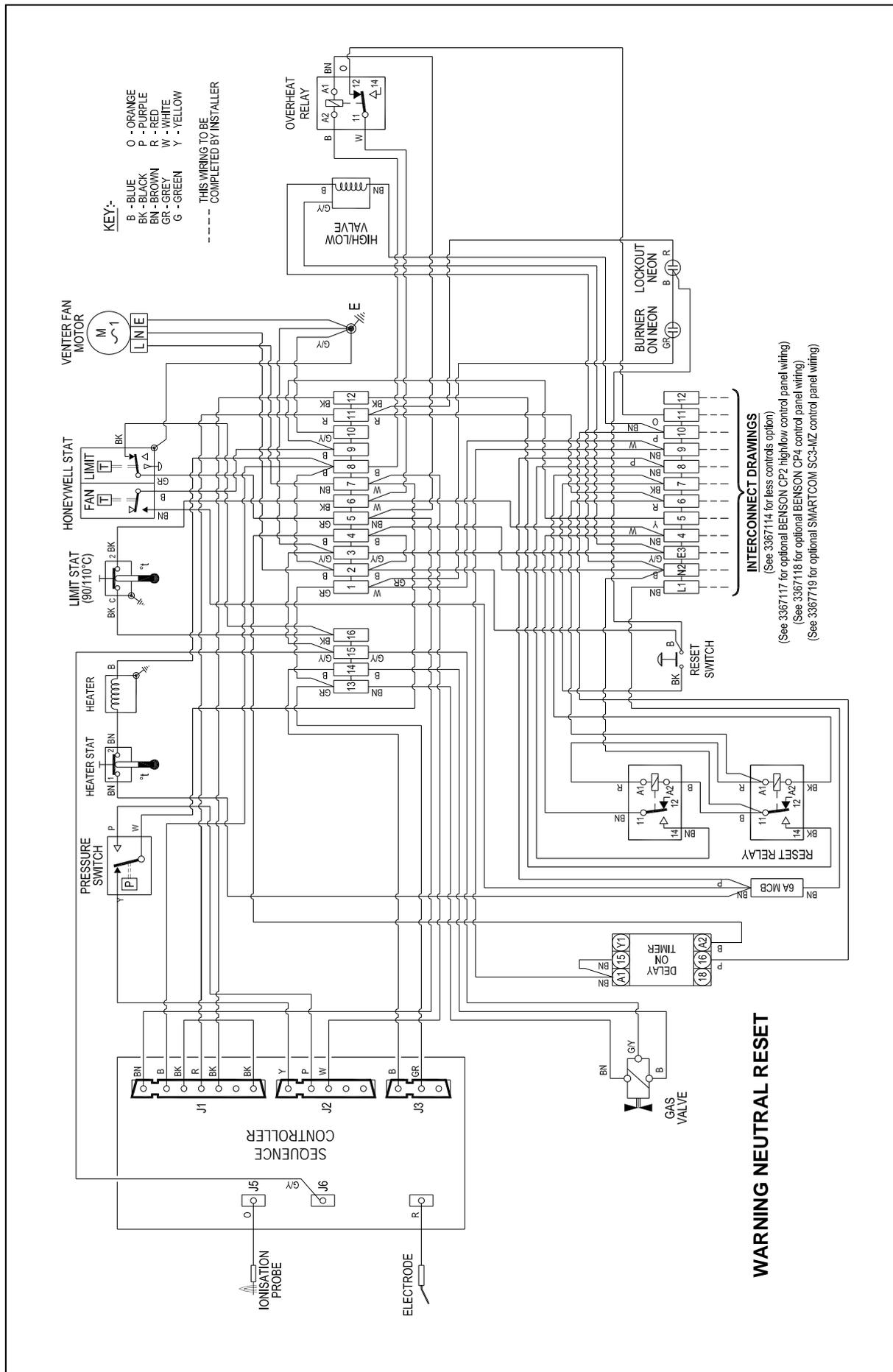
Wiring Diagram 33-67-113 EVRD 72-145 Auto ignition On/Off



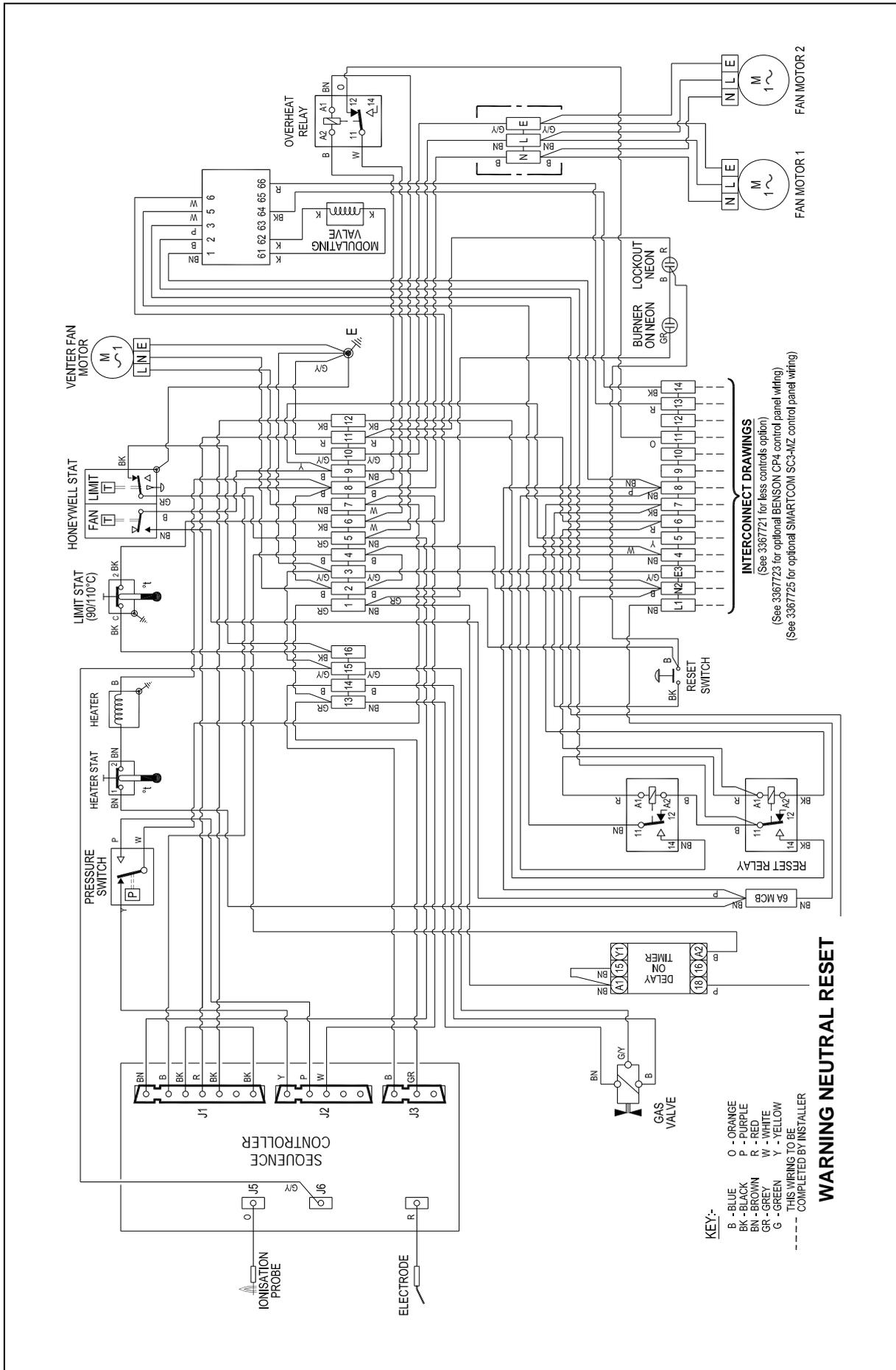
Wiring Diagram 33-67-713 EVRD 12-60 Auto ignition Hi/Low



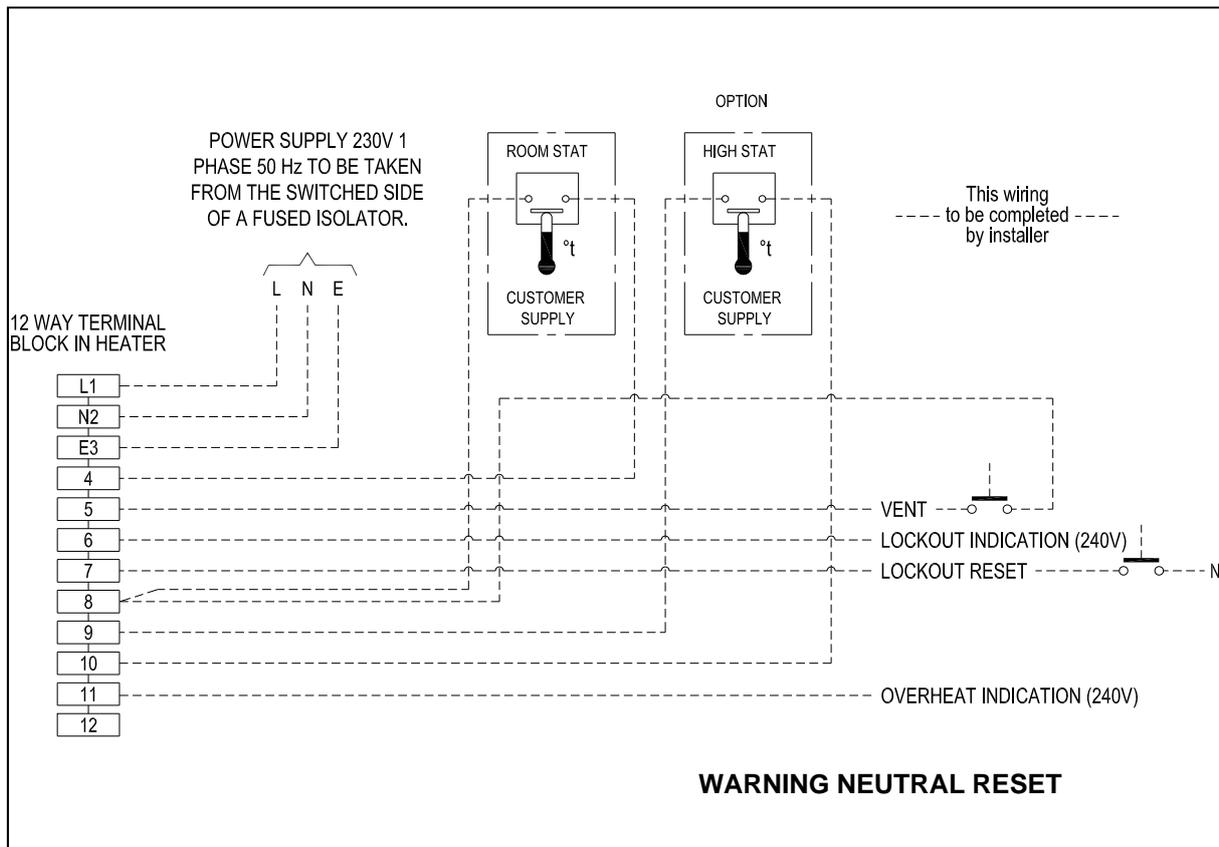
Wiring Diagram 33-67-715 EVRD 72-145 Auto ignition Hi/Low



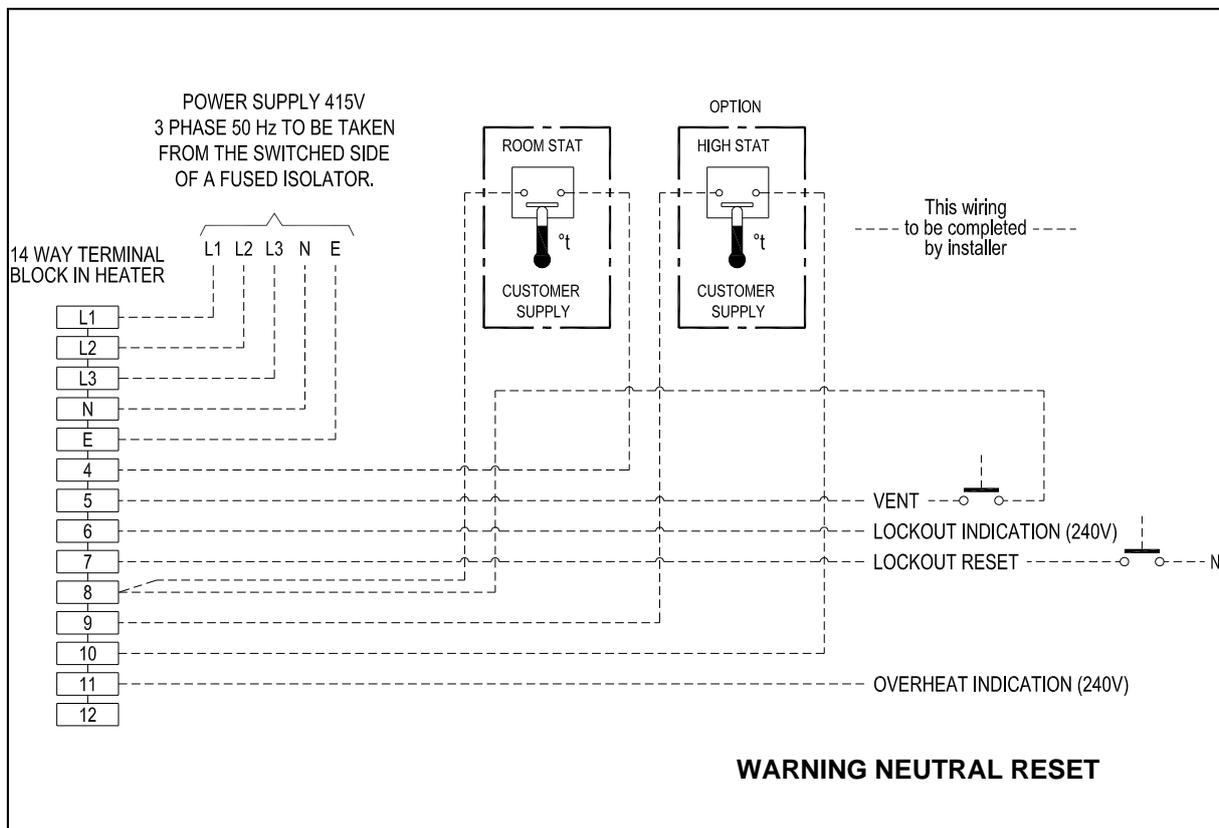
Wiring Diagram 33-67-716 EVRD 72-145 Auto ignition Modulation



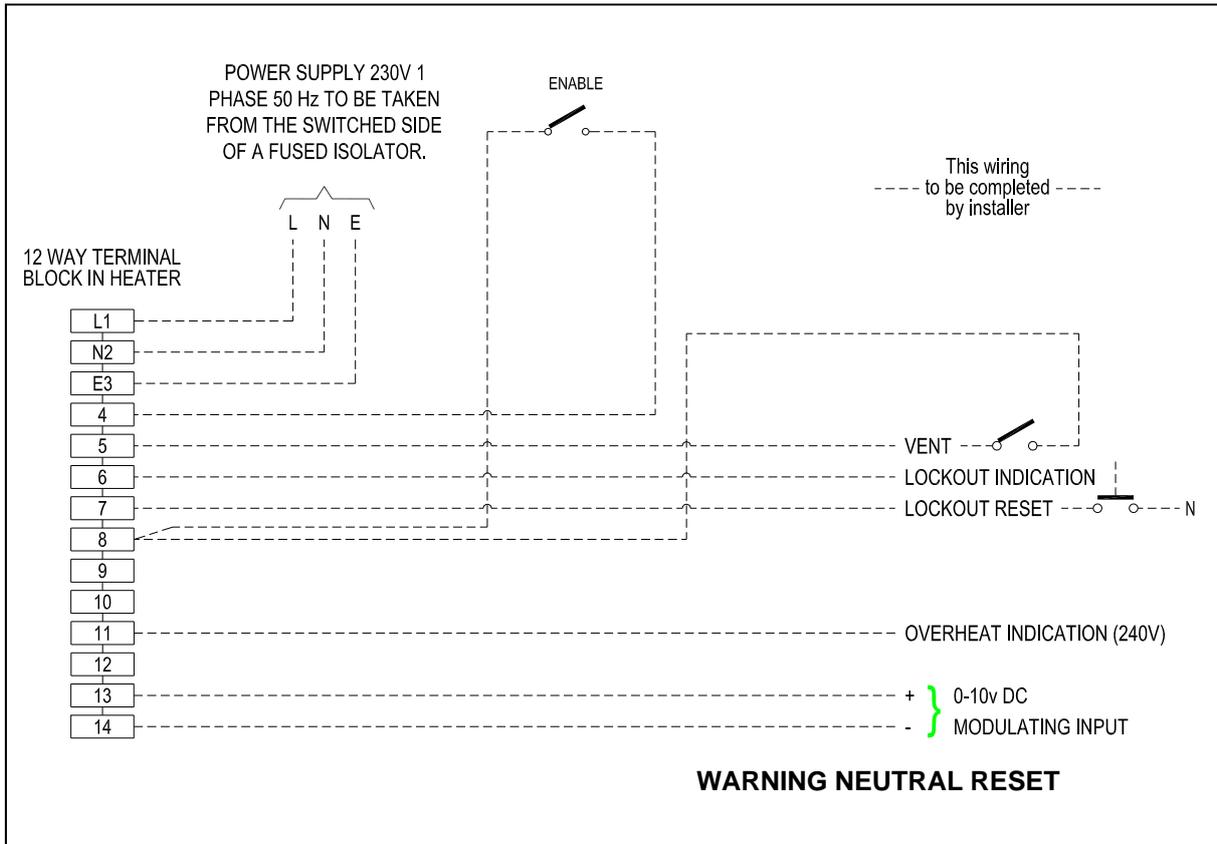
Wiring Diagram Less Controls Connections On/Off (Hi/Low) 1 Phase 33-67-114



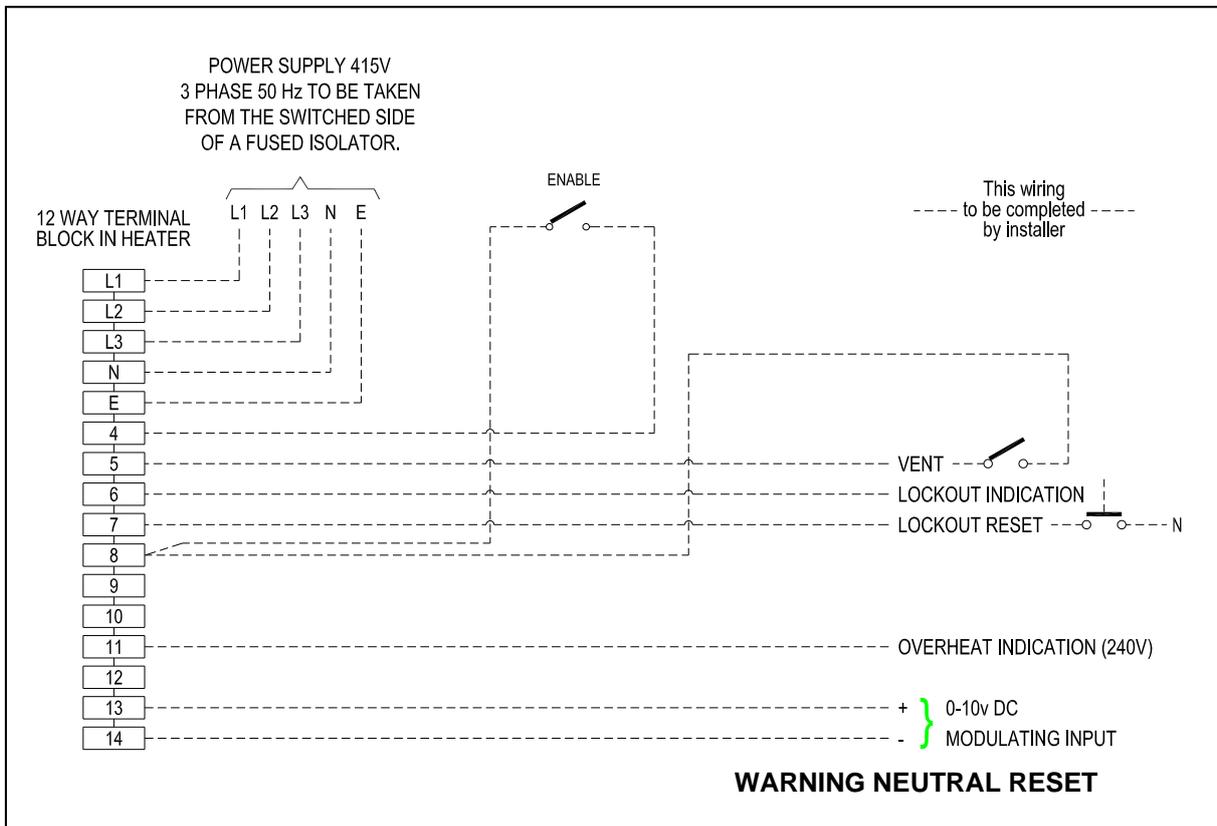
Wiring Diagram Less Controls Connections On/Off (Hi/Low) 3 Phase 33-67-115



Wiring Diagram Less Controls Connections Modulation 1 Phase 33-67-721



Wiring Diagram Less Controls Connections Modulation 3 Phase 33-67-722



7.1 Technical Data Common Information

Appliance Type	B ₂₂ C ₃₂ C ₁₂
PIN / report no	0063BQ5461
Electrical Supply	230V 50Hz 1ph 415V 50Hz 3 ph
Fuse Rating	6 Amp -16 Amp
IP Rating	IP44
Fan Limit Settings	Fan On 50°C Fan Off 30°C Limit 100°C

Country	Approved Gas Category
AT,CH,CZ,DK,EE,ES,FI,GB,GR,HU,IE,IT IS,LT,LV,NO,PT,RO,SE,SI,SK,TR	I _{2H}
BE,CZ,NL,FR,DE,IE,IT,ES,CH,PT,GB,SE, SK,SL,PT,PL,TR	I _{3P}
PL,LU,DE,RO	I _{2E}
PL	I _{2LS}
PL	I _{2LW}

Natural Gas (G20 I_{2H}) Tubular Heater

The minimum allowable pre-purge time requires calculating [BS EN1020:1998 clause 6.38]. To do this only the Carbon Dioxide CO₂ figure needs to be measured.

E.G. on a model 170 the calculated minimum time is = $354.8 / ((100 / \text{CO}_2) + 1)$

If the measured CO₂ is 6.7%

Then $100 / 6.7 = 14.9$

$14.9 + 1 = 15.9$

Therefore minimum pre-purge time is = $354.8 / 15.9 = \mathbf{22.3 \text{ seconds}}$

The calculation to be conducted is given below for all models:

Model 12 Minimum pre-purge time = $628.8 / ((100 / \text{CO}_2) + 1)$

Model 20 Minimum pre-purge time = $475.4 / ((100 / \text{CO}_2) + 1)$

Model 30 Minimum pre-purge time = $398.0 / ((100 / \text{CO}_2) + 1)$

Model 42 Minimum pre-purge time = $366.8 / ((100 / \text{CO}_2) + 1)$

Model 50 Minimum pre-purge time = $354.8 / ((100 / \text{CO}_2) + 1)$

Model 60 Minimum pre-purge time = $347.4 / ((100 / \text{CO}_2) + 1)$

Model 72 Minimum pre-purge time = $286.2 / ((100 / \text{CO}_2) + 1)$

Model 95 Minimum pre-purge time = $269.7 / ((100 / \text{CO}_2) + 1)$

Model 120 Minimum pre-purge time = $261.4 / ((100 / \text{CO}_2) + 1)$

Model 145 Minimum pre-purge time = $269.2 / ((100 / \text{CO}_2) + 1)$

The pre-purge time must then be measured. If the measured pre-purge time is lower than the calculated time STOP and contact Benson Heating.

Propane (G31 I_{3P}) Tubular Heater

The minimum allowable pre-purge time requires calculating [BS EN1020:1998 clause 6.38]. To do this only the Carbon Dioxide CO₂ figure needs to be measured.

E.G. on a model 170 the calculated minimum time is = $898.4 / ((300 / \text{CO}_2) + 2.01)$

If the measured CO₂ is 8.0%

Then $300 / 8.0 = 37.5$

$37.5 + 2.01 = 39.51$

Therefore minimum pre-purge time is = $898.4 / 39.51 = \mathbf{22.7 \text{ seconds}}$

The calculation to be conducted is given below for all models:

Model 12 Minimum pre-purge time = $1597.5 / ((300 / \text{CO}_2) + 2.01)$

Model 20 Minimum pre-purge time = $1203.6 / ((300 / \text{CO}_2) + 2.01)$

Model 30 Minimum pre-purge time = $1007.7 / ((300 / \text{CO}_2) + 2.01)$

Model 42 Minimum pre-purge time = $928.7 / ((300 / \text{CO}_2) + 2.01)$

Model 50 Minimum pre-purge time = $898.4 / ((300 / \text{CO}_2) + 2.01)$

Model 60 Minimum pre-purge time = $879.4 / ((300 / \text{CO}_2) + 2.01)$

Model 72 Minimum pre-purge time = $724.7 / ((300 / \text{CO}_2) + 2.01)$

Model 95 Minimum pre-purge time = $682.8 / ((300 / \text{CO}_2) + 2.01)$

Model 120 Minimum pre-purge time = $661.7 / ((300 / \text{CO}_2) + 2.01)$

Model 145 Minimum pre-purge time = $681.6 / ((300 / \text{CO}_2) + 2.01)$

The pre-purge time must then be measured. If the measured pre-purge time is lower than the calculated time STOP and contact Benson Heating.

7.2 Technical Data

NAT GAS / LPG	MODEL	12	20	30	42	50
HEAT OUTPUT	kW Btu	12.0 40,950	19.6 67,000	29.4 100,000	39.2 134,000	49.0 167,000
HEAT INPUT (Nett)	kW Btu	12.9 44,000	21.1 72,000	32.0 109,180	42.6 145,350	53.3 181,700
EFFICIENCY	% Nett	92.8	92.7	92.0	92.1	92.0
EFFICIENCY	% Gross	83.6	83.5	82.8	82.9	82.8
GAS CONNECTION	BSP/Rc	1/2"	1/2"	1/2"	1/2"	1/2"
MIN INLET PRESS NAT GAS	mbar Ins WG	17.5 7	17.5 7	17.5 7	17.5 7	17.5 7
BURNER PRESSURE NAT GAS	mbar Ins WG	12.6 5	8.3 3.3	8.3 3.3	8.3 3.3	8.3 3.3
BURNER PRESSURE NAT GAS Hi Lo	Hi mbar Lo mbar	12.6	8.3 3.3	8.3 3.3	8.3 3.3	8.3 3.3
MAIN INJECTOR NATURAL GAS	mm No Off	1.8 3	2.2 4	2.2 6	2.2 8	2.2 10
NAT GAS CONSUMPTION	ft ³ /hr m ³ /hr	48 1.37	79 2.23	119 3.38	159 4.50	199 5.63
MIN INLET PRESS LPG	mbar Ins WG	37.0 14.8	37.0 14.8	37.0 14.8	37.0 14.8	37.0 14.8
BURNER PRESSURE LPG	mbar Ins WG	21.3 8.52	29.2 11.68	29.2 11.68	29.2 11.68	29.2 11.68
LPG PROPANE CONSUMPTION	m ³ /hr Kg/h	0.52 0.96	0.86 1.59	1.30 2.41	1.73 3.20	2.16 4.00
MAIN INJECTOR PROPANE	mm No Off	1.2 3	1.3 4	1.3 6	1.3 8	1.3 10
TEMPERATURE RISE	°C °F	32 58	30 54	31 56	34 61	33 60
AIR FLOW	m ³ /sec	0.31	0.55	0.79	0.96	1.21
CENTRIFUGAL FAN STATIC PRESSURE (STD)	Pa	100	125	100	150	150
CENTRIFUGAL FAN STATIC PRESSURE (OPT 250)	Pa	250	250	250	250	250
CENTRIFUGAL FAN STATIC PRESSURE (OPT 500)	Pa	500	500	500	500	500
SOUND LEVEL @ 3m	DbA	53	55	57	58	61
FLUE DIAMETER	mm	80	80	100	100	100
COMBUSTION AIR DIA	mm	80	80	100	100	100
SUPPLY VOLTAGE (STD)	STD	230/1/50	230/1/50	230/1/50	230/1/50	230/1/50
SUPPLY VOLTAGE (OPT 1)	250 Pa	230/1/50	230/1/50	230/1/50	230/1/50	230/1/50
SUPPLY VOLTAGE (OPT 2)	500 Pa	230/1/50	230/1/50	230/1/50	230/1/50	415/3/50
ELECTRICAL POWER (AMPS)	STD	1.1	1.7	1.7	2.4	3.2
ELECTRICAL POWER (AMPS)	250 Pa	1.7	1.7	2.4	2.4	4.8
ELECTRICAL POWER (AMPS)	500 Pa	3.3	3.3	4.8	4.8	3.5
INTERNAL FAN FUSE RATING AMPERES	STD 250 Pa 500 Pa	6 6 10	6 6 10	6 6 10	6 6 10	6 10 10
GROSS FLUE TEMP	°C	130	135	145	140	150
WEIGHT Kgs	Cent	102	107	133	141	167
AIR PRESS SWITCH	mbar	1.5	1.03	1.03	1.03	1.03
FLUE RESISTANCE	min mbar max mbar	-0.05 +0.1	-0.1 +0.2	-0.1 +0.2	-0.1 +0.2	-0.1 +0.2

7.2 Technical Data

NAT GAS / LPG	MODEL	60	72	95	120	145
HEAT OUTPUT	kW Btu	58.8 201,000	72.0 246,000	96.0 328,000	120.0 409,000	144.0 491,000
HEAT INPUT (Nett)	kW Btu	63.9 218,000	78.8 268,900	105.2 359,000	130.4 445,000	156.5 534,000
EFFICIENCY	% Nett	92.0	91.4	91.2	91.5	91.5
EFFICIENCY	% Gross	82.8	82.3	82.1	82.4	82.4
GAS CONNECTION	BSP/Rc	1/2"	3/4"	3/4"	3/4"	3/4"
MIN INLET PRESS NAT GAS	mbar Ins WG	17.5 7	17.5 7	17.5 7	17.5 7	17.5 7
BURNER PRESSURE NAT GAS	mbar Ins WG	8.6 3.4	8.7 3.5	8.7 3.5	9.2 3.7	9.2 3.7
BURNER PRESSURE NAT GAS Hi Lo	Hi mbar Lo mbar	8.6	8.7 5.3	8.7	9.2	9.2
MAIN INJECTOR NATURAL GAS	mm No Off	2.2 12	3.4 6	3.4 8	3.4 10	3.4 12
NAT GAS CONSUMPTION	ft ³ /hr m ³ /hr	239 6.76	294 8.33	393 11.12	490 13.87	587 16.63
MIN INLET PRESS LPG	Mbar Ins WG	37.0 14.8	37.0 14.8	37.0 14.8	37.0 14.8	37.0 14.8
BURNER PRESSURE LPG	Mbar Ins WG	36.5 14.6	25.5 10.2	25.5 10.2	25.5 10.2	25.5 10.2
LPG PROPANE CONSUMPTION	m ³ /hr Kg/h	29.2 11.68	3.21 5.94	4.28 7.92	5.34 9.88	6.41 11.86
MAIN INJECTOR PROPANE GAS	Mm No Off	1.3 12	2.0 6	2.0 8	2.0 10	2.0 12
TEMPERATURE RISE	°C °F	31 56	32 58	34 61	32 58	32 58
AIR FLOW	m ³ /sec	1.54	1.90	2.26	3.08	3.78
CENTRIFUGAL FAN STATIC PRESSURE (STD)	Pa	180	150	180	200	200
CENTRIFUGAL FAN STATIC PRESSURE (OPT 250)	Pa	250	250	250	250	250
CENTRIFUGAL FAN STATIC PRESSURE (OPT 500)	Pa	500	500	500	500	500
SOUND LEVEL @ 3m	DbA	65	61	63	66	66
FLUE DIAMETER	mm	100	130	130	130	130
COMBUSTION AIR DIA	mm	100	130	130	130	130
SUPPLY VOLTAGE (STD)	STD	230/1/50	230/1/50	230/1/50	415/3/50	415/3/50
SUPPLY VOLTAGE (OPT 1)	250 Pa	230/1/50	230/1/50	230/1/50	415/3/50	415/3/50
SUPPLY VOLTAGE (OPT 2)	500 Pa	415/3/50	415/3/50	415/3/50	415/3/50	415/3/50
ELECTRICAL POWER (AMPS)	STD	8	9	12	6	6
ELECTRICAL POWER (AMPS)	250 Pa	8	9	12	9.0	9.0
ELECTRICAL POWER (AMPS)	500 Pa	3.5	4.8	7.0	12.0	12.0
INTERNAL FAN FUSE RATING AMPERES	STD 250 Pa 500 Pa	16 16 N/A	16 16 N/A	16 16 N/A	N/A N/A N/A	N/A N/A N/A
GROSS FLUE TEMP	°C	150	150	150	160	160
WEIGHT Kgs	Cent	190	246	268	301	353
AIR PRESS SWITCH	mbar	1.03	1.65	1.65	1.65	1.65
FLUE RESISTANCE	min mbar max mbar	-0.1 +0.2	-0.2 +0.4	-0.2 +0.4	-0.2 +0.4	-0.2 +0.4

8.0 Parts List

Heater Size/ Description	12	20	30	42	50	60
 Gas Valve				28-30-180		
 Hi/Low Valve				28-30-187		
 Valve Gasket				28-64-226		
 Modulating Valve				28-30-201		
 Modulation Interface Board				28-30-198		
 Control Box				29-01-173		
 Pressure Switch		28-40-162			N/A	
 Pressure Switch		N/A		28-40-136		N/A
 Pressure Switch			N/A		33-62-119	N/A
 Pressure Switch				N/A		28-40-161
 Fan Limit Stat		28-60-021			28-60-023	
 Injector Natural Gas		33-64-263			33-64-144	

Parts list cont'd

	Heater Size/ Description	12	20	30	42	50	60
	Injector Propane Gas	33-64-146				33-67-322	
	Electrode			33-64-193			
	Ionisation Probe			33-64-194			
	Overheat Red Neon			28-50-030			
	Burner On Green Neon			28-50-038			
	Reset Relay 230V			28-25-039			
	Relay Base			28-25-035			
	Hire Fire Timer Relay			28-15-027			
	MCB			28-07-084			
	Lockout Reset Switch			20-40-118			
	Burner			33-64-158			
	Flue Fan	28-09-082		28-09-083		28-09-084	

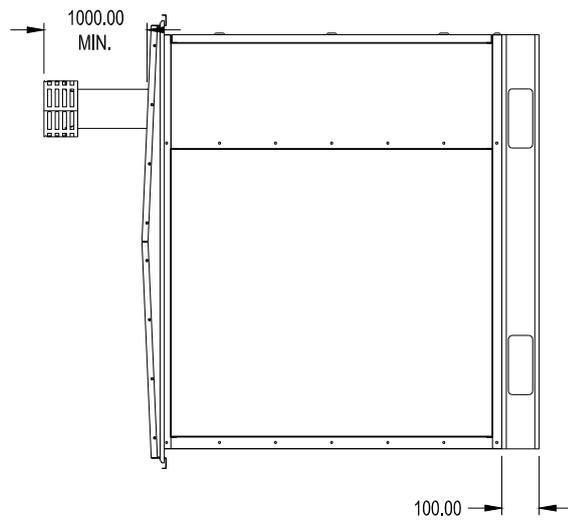
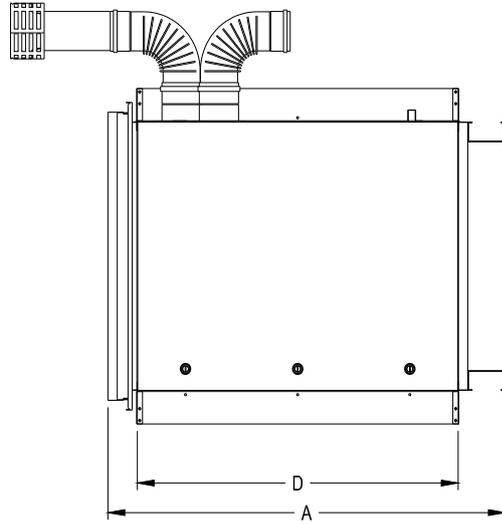
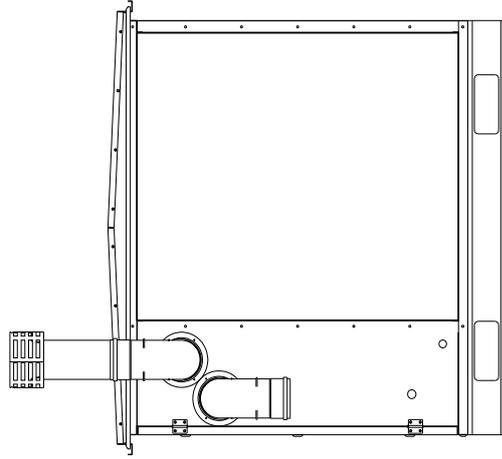
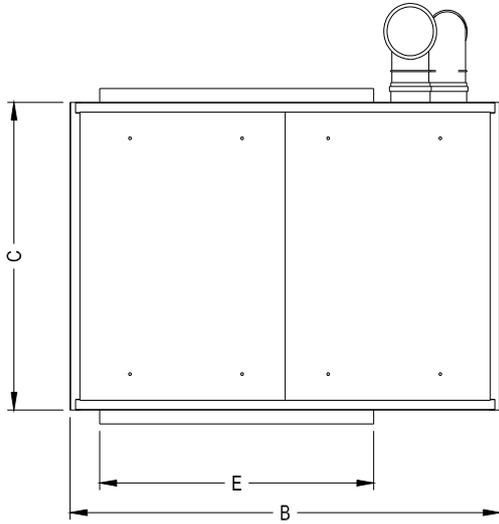
Parts list cont'd

	Heater Size/ Description	72	95	120	145
	Gas Valve	28-30-181		N/A	
	Gas Valve	N/A		28-30-184	
	Hi/Low Valve	28-30-188		N/A	
	Hi/Low Valve	N/A		28-30-189	
	Valve Gasket	33-64-227		N/A	
	Valve Flange c/w 'O' Ring	N/A		28-30-185	
	Modulating Valve	28-30-202		28-30-203	
	Modulation Interface Board	28-30-198			
	Control Box	29-01-183			
	Pressure Switch	28-40-163			
	Fan Limit Stat	28-60-021			
	Overheat Stat	28-60-039			

Parts list cont'd

	Heater Size/ Description	72	95	120	145
	Injector Natural Gas			33-64-145	
	Injector Propane Gas			33-64-147	
	Electrode			33-64-193	
	Ionisation Probe			33-64-194	
	Overheat Red Neon			28-50-030	
	Burner On Green Neon			28-50-038	
	Reset Relay 230V			28-25-039	
	Relay Base			28-25-035	
	Hire Fire Timer Relay			28-15-027	
	MCB			28-07-084	
	Lockout Reset Switch			20-40-118	
	Burner			33-64-160	
	Flue Fan		28-09-089		28-09-090

Model	A	B	C	D	E
12	595	1150	780	390	729
20	595	1150	780	390	729
30	700	1150	780	495	729
42	805	1150	780	600	729
50	935	1150	780	730	729
60	1065	1150	780	860	729
72	805	1850	910	600	1339
95	955	1850	910	750	1339
120	1135	1850	910	930	1339
145	1305	1850	910	1100	1339





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