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# BENSON

# INSTALLATION & SERVICING MANUAL FOR BENSON EVRC EXTERNAL TUBULAR HEATER NATURAL GAS (G20 I<sub>2</sub>H), PROPANE GAS (G31 I<sub>3</sub>P)



## WARNINGS

Benson equipment must be installed and maintained in accordance with the relevant provisions of the Gas Safety (Installations and Use) Regulations 1998 for gas fired products. Due account should also be taken of any obligations arising from the Health and Safety at Works Act 1974 or relevant codes of practice. In addition the installation must be carried out in accordance with the current IEE wiring regulations (BS 7671), BS 6896 (Industrial & Commercial) and any other relevant British Standards and Codes of Practice by a qualified installer. All external wiring MUST comply with the current IEE wiring regulations.

<b>Section</b>	<b>Contents</b>	<b>Page No</b>
<b>1.0</b>	<b>Compliance Notices</b>	4
1.1	Certificates of Conformity	5
1.2	General product Information	5
1.3	General Requirements	6
1.4	Delivery & Pre-installation Checks	6
1.5	Warranty	7
<b>2.0</b>	<b>Installation</b>	7
2.1	Installation Clearances and Mounting Heights	7
2.2	Warm Air Circulation	8
2.3	Vent Openings and Grilles	8
2.4	Flue Installation	8
2.5	Electrical Installation	9
2.6	Gas Installation	11
<b>3.0</b>	<b>Commissioning</b>	12
3.1	Electrical Pre tests	12
3.2	Gas pre tests	13
3.3	Ignition Sequence	13
3.4	Hand Over	18
<b>4.0</b>	<b>Servicing</b>	19
4.1	Servicing Procedure	19
<b>5.0</b>	<b>Fault Diagnosis</b>	21
<b>6.0</b>	<b>Wiring Diagrams</b>	23
<b>7.0</b>	<b>Technical Data</b>	40
7.1	Technical Data Common Information	40
7.2	Technical Data Heater Specifications	41
<b>8.0</b>	<b>Parts Listing</b>	43
<b>9.0</b>	<b>Dimensions</b>	47

### **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

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 (2006/42/EC)  
Low Voltage Directive (2006/95/EC)  
Electromagnetic Compatibility Directive (2004/108/EC)  
Product Liability Directive 85/374/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 & 12100-2  
Safety of Machinery - Basic Concepts,  
General Principles for Design Part 1 & 2

BS EN 60204 - Part 1  
Safety of Machinery - Electrical Equipment

for Machines Specification for General Requirements

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

BS EN 55014  
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  
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.

### 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 - On/Off ONLY)

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

Variante heaters have been approved for alternative flue discharge arrangements These are detailed in following page's

### 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 or top\* of the appliance. One of the pair is for connection for the flue whilst the other is a screened combustion air intake.

\* specified at time of ordering.

**WARNING**  
**(SEE FLUE INSTALLATION 2.5)**

### Burner

The induced draught multi 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

### Air Movement Fan

Variante can be supplied with Three Centrifugal fan options suitable for ducted applications.

Note:  
Neither asbestos nor soft soldered joints are used in the construction or manufacture of the Benson EVR 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 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, 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 01384 489200. 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 consumables.

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 installation is not in accordance with the general requirements of this manual.
- b) The flue arrangement and air supply for the heater are not in accordance with the manufacturers recommendations, codes of practice, or similar standards
- c) Air flow through the heater is not in accordance with the manufacturers technical specifications.
- d) Internal wiring on the heater has been tampered with or unauthorised service repairs undertaken.
- e) The main electrical supply input to the heater has been interrupted during the heating mode.
- f) The heater has been subject to and affected by the ingress of water in any form
- g) The heater is not operated at the rating(s) laid down in the manufacturers technical specifications.
- h) The heater has not been operated or used within the normal scope of its intended application.
- i) 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 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 Heights and Clearances**

On a level non-combustible surface capable of adequately supporting the weight of the unit and ancillary equipment . See table on next page

## Clearances EVRC in mm (when viewed from the front)

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

### 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° 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.

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 ERVC range of heaters.

The temperature of the combustion products can be as high as **170 °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 following distances in mm should be observed**

**200** below guttering or eaves.

**300** from corners or openings (windows

doors etc) and from other horizontal terminals on same wall.

**1200** from a facing surface.

**1500** from another terminal vertically on the same wall.

**2000** from ground level.

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.

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, which must be wired through a fused isolator fitted with a fuse of the correct rating.

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.

**Caution**

**When using the SmartCom or 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 Control Relay**

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 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. On

## Limit Control

A high temperature manual reset limit control.

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.

If these controls require resetting the cause should be determined and rectified immediately.

## 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.

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 outlet louvres (Axial heaters) 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 1.0) 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 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 **30 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 **30 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.

*For Hi/Low and Modulation adjustment, refer to the following procedures.*

## Adjustment of Optional Hi-Low regulator

### **IMPORTANT**

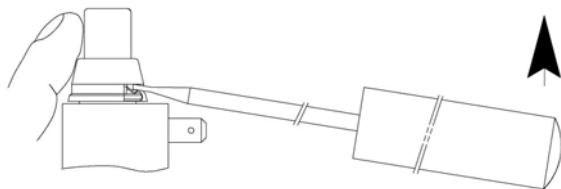
*Adjustments should be made by qualified persons only.*

*If the appliance manufacturer supplies checkout and/or service and maintenance instructions, carefully follow them. If such instructions are not provided, then follow the procedure as outlined below.*

*Allow time for pressure to stabilize before making adjustments.*

*It is recommended that the High-Low regulator is operated a few times to ensure correct setting. It should be prevented, that High-Low regulator is exposed to unnecessary forces because of wiring.*

Cap has to be removed by putting a small screw driver in one of the slots and lifting the cap carefully while at the same time supporting the cap opposite to the screw driver.



**Maximum pressure setting must first be adjusted then minimum pressure setting can be adjusted.**

**Any adjustment of maximum pressure setting influences minimum pressure setting.**

**Never adjust the maximum setting above the range specified.**

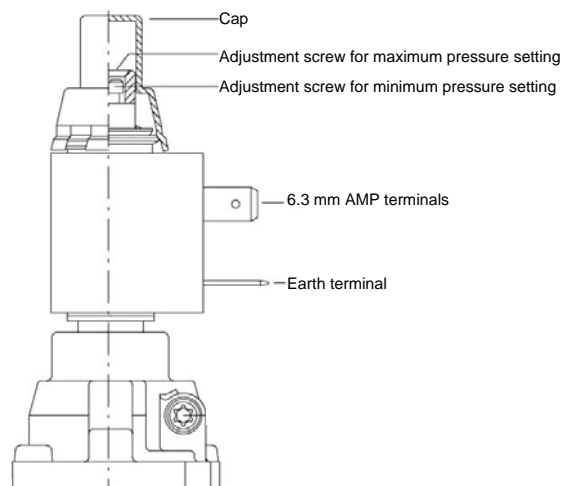
### **Adjusting maximum pressure setting**

- Connect a suitable pressure gauge to pipe line or to outlet pressure tap of gas control concerned, to measure burner



pressure (measuring point must be as near to burner as possible).

- Energize High-Low regulator, set gas control in operation and wait until an outlet pressure is recorded on pressure gauge.
- Use a 8 mm wrench to turn adjustment screw for maximum pressure setting clockwise to increase or counter-clockwise to decrease pressure, until desired maximum burner pressure is obtained.
- Check maximum pressure setting after several times.



### **Adjusting minimum pressure setting**

- Connect a suitable pressure gauge to pipe line or to outlet pressure tap of gas control concerned, to measure burner pressure (measuring point must be as near to burner as possible).
- Disconnect electrical connection of High-Low regulator.
- Set gas control in operation and wait until an outlet pressure is recorded on the pressure gauge.
- When minimum pressure setting needs adjustment, then use a 3.5 mm screw driver to turn adjustment screw for minimum pressure setting clockwise to increase or counter-clockwise to decrease pressure, until desired minimum burner pressure is obtained.
- Wire High-Low regulator coil in circuit.
- Check **maximum** pressure setting and re-adjust if necessary. Check minimum pressure setting again.

When High and Low pressure settings are correct, replace cap and connect pressure feedback connection (if applicable).

**Checkout**

After any adjustment, set appliance in operation and observe through several complete cycles to ensure that burner system components function correctly.

**Adjustment of Optional modulation regulator**

**IMPORTANT**

*Adjustments should be made by qualified persons only.*

*If the appliance manufacturer supplies checkout and/or service and maintenance instructions, carefully follow them. If such instructions are not provided, then follow the procedure as outlined below.*



Allow time for pressure to stabilize before making adjustments.

It is recommended that the Modureg is operated a few times to ensure correct setting.

Cap must be removed before any adjustment can be made. Cap can be removed by firstly removing the small retaining screw and lifting the cap carefully.

Take care that after any adjustment cap and O- ring are mounted (if applicable).

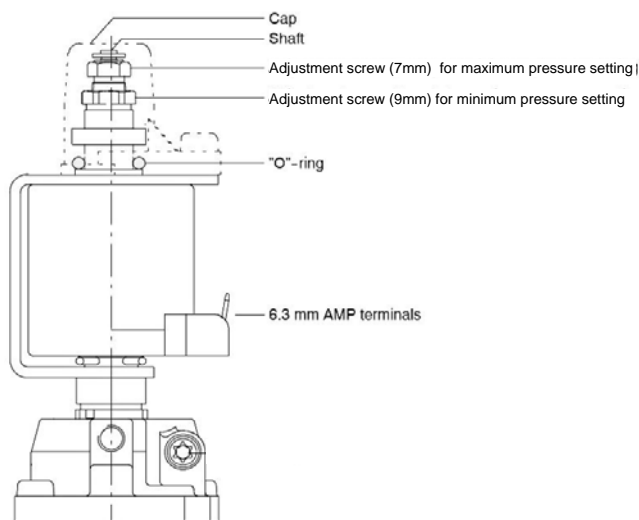
**The minimum pressure setting must first be adjusted to ensure that burner will safely light up, then maximum pressure setting can be adjusted.**

**Any adjustment of minimum pressure setting influences the maximum pressure setting.**

**Adjusting minimum pressure setting**

- Disconnect pressure feedback connection (if applicable).

- Connect a suitable pressure gauge to pipe line or to outlet pressure tap of gas control concerned, to measure burner pressure (measuring point must be as near to burner as possible).
- Disconnect electrical connection to Modureg.
- Energize operator, set control in operation and wait until an outlet pressure is recorded on pressure gauge.
- If minimum pressure setting needs adjustment turn the adjustment for minimum pressure setting clockwise for increasing or counter-clockwise for decreasing pressure until the desired minimum outlet pressure is obtained.
- Check that main burner lights easily and reliably at minimum pressure.
- Check maximum pressure setting and readjust if necessary.
- Mount cap and "O" ring and reconnect pressure feedback connection (if applicable).



**Adjusting maximum pressure setting**

- Disconnect pressure feedback connection (if applicable).
- Connect a suitable pressure gauge to pipe line or to outlet pressure tap of gas control concerned, to measure burner pressure (measuring point must be as near to burner as possible).
- Disconnect electrical connection of Modureg.
- Energize operator, set control in operation and wait until an outlet pressure is recorded on pressure gauge.
- Push the shaft gently downwards to the

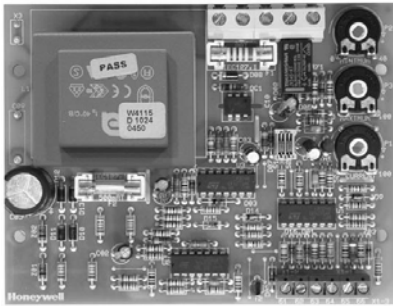
maximum adjustment screw and hold it on.

- If maximum pressure setting needs adjustment turn the maximum rate adjustment screw clockwise for increasing or counter-clockwise for decreasing the maximum pressure, until the desired maximum outlet pressure is obtained. Release shaft.
- Mount cap and "O"-ring and reconnect pressure feedback connection (if applicable).

When maximum and minimum pressure are set, wire Modureg in circuit.

### Adjustment of modulation Interface board

**IMPORTANT**  
Adjustments should be made by qualified persons only.



The interface board is a signal conditioner designed for the use in association with a Honeywell modulation coil V7335A (Modureg). The purpose is to provide a linear conversion of a low DC voltage or current (produced by measure or control equipment) to a requested control current or voltage for the modulation coil (0-22 V-DC or 30-165 mA-DC).

### Characteristics

#### Input signal

The interface board requires to be powered by a 230 VAC supply voltage.

Following control signals are available:

- 4 - 20 mA-DC with input protection for a continuous 200 mA signal (terminals 64-63).
- 0 - 5 V-DC with input protection for a continuous 35 V-DC signal signal (terminals 64-64).
- 0 - 10 V-DC with input protection for a continuous 35 V-DC signal (terminals 64-66).

*Remark : Please ensure that the polarisation '+' and '-' of the control signal is done correctly, otherwise the PCB will in case of a 0-5 V DC control signal not modulate and will even in case of a 0-10 V DC control signal refuse to operate.*

#### Output signal.

The required output signal *can* be obtained by adjusting the selector switches on the printed circuit board.

- For output control signal of one modulation coil V733SA (165mA)  
Switch 1: "OFF"  
Switch 2: "OFF"

### OPERATION

#### Adjustment & Control signals.

##### General

A relay with potential free contacts (terminals 5 & 6) incorporated within the interface board, controls the burner relay in the heater. This relay (burner on relay) is triggered each time there is an increase of the control current or voltage (room thermostat function).

#### Adjustment of the minimum drop-out voltage of burner relay. Potentiometer P2.

The minimum drop-out voltage is controlled by a potentiometer P2, varying between 0 % and 40 % of the input control signal.

##### Example

- an input control signal of 0 to 10V DC and potentiometer P2 set at 0 % results into a drop-out voltage of 0.3V DC.
- an input control signal of 0 to 10V DC and potentiometer P2 set at 40 % results into a drop-out voltage of 4V DC.

#### Adjustment of the maximum hold-in voltage of burner relay. Potentiometer P3.

The maximum hold-in voltage is controlled by a potentiometer P3. Its proportional value is added to the P2 setting value.



Example:

- Potentiometer P2 is set at 0 %, and P3 at 5%, the hold-in voltage of the burner relay is adjustable between 5 % and 100 % of the input control signal. So, if input control signal is set at 0 to 10V DC, the hold-in voltage of the relay amounts to 0.5V DC.
- Potentiometer P2 is set at 40 % and P3 at 5%, the hold-in voltage of the burner relay is adjustable between 45 % and 100 % of the input control signal. So, if the input control signal is set at 0 to 10 VDC: the hold-in voltage of the relay amounts to 4.5V DC.

Example:

- Maximum power (165 **mADC** at 22V DC) is provided to the modulation coil with a 10V DC input control signal and P1 set at 100 %
- Maximum power (165mA-DC at 22V DC) is provided to the modulation coil with a 5V DC input control signal and potentiometer P1 set at 50 %.

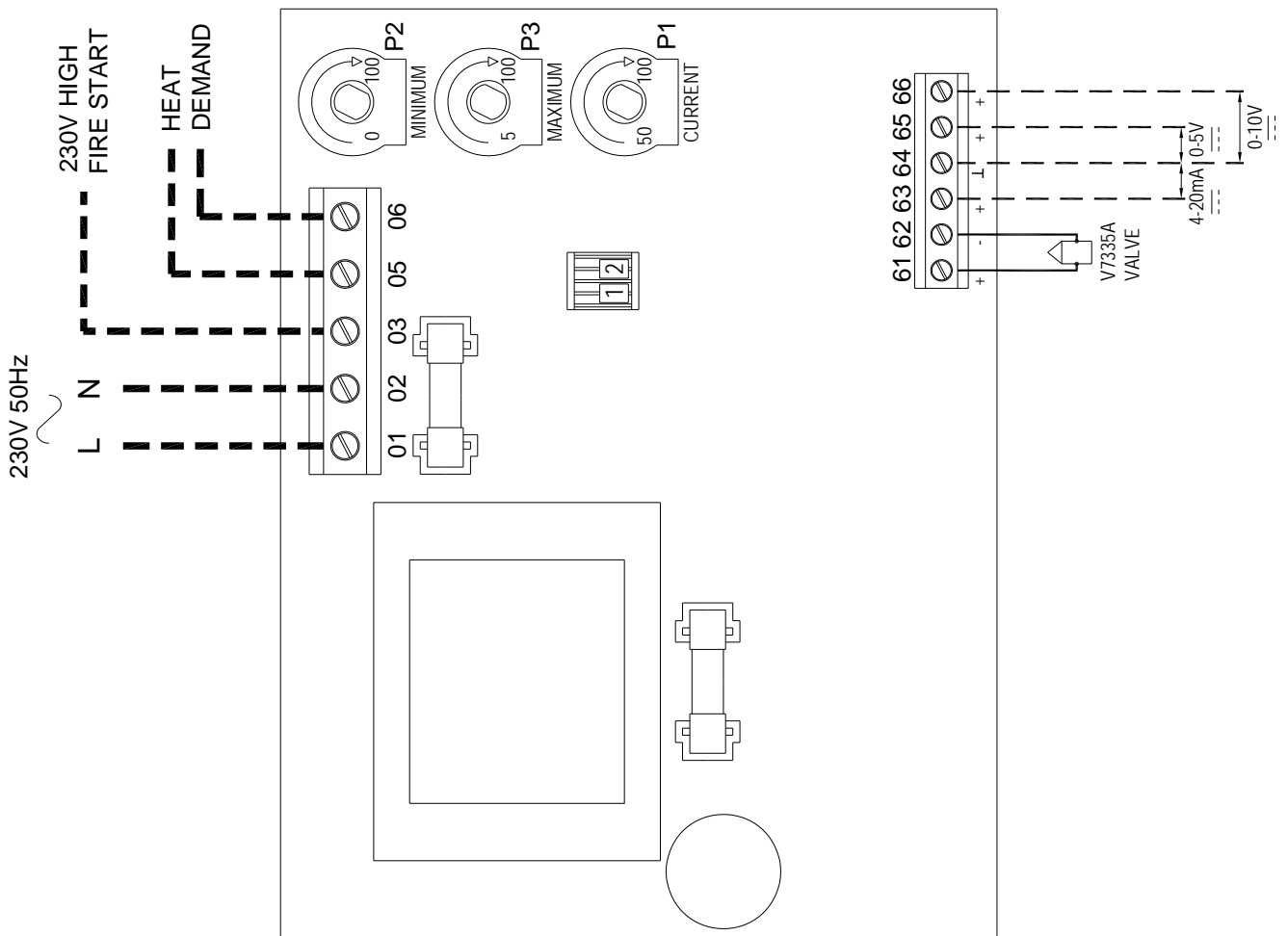
High fire start signal

A maximum control current or voltage is sent to the modulation coil for 10s when a 230V AC line input voltage appears on terminal 3. This 230V AC line input voltage is generated by a contact in the burner relay incorporated within the appliance.

**Adjustment of the current control. Potentiometer P1**

The control current or voltage of one or two Honeywell modulation coils V7335A Modureg is controlled by the potentiometer P1, varying between 50 % and 100 % of the input control signal.

When opening the main gas valve and when ionisation current is sufficient, the 230V AC line input voltage is directed towards terminal 3 of the interface board.



- q) Check that the gas pressure remains satisfactory for all appliances on the same circuit.
- r) Undertake combustion tests checking CO, CO<sub>2</sub> and efficiency. 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

### Warnings

**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 and the louvres. 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

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.

### **Limit stats**

If the heater has gone into an overheat condition, remove the black dust cover and depress the green button.

On models with two fans a second limit control is situated inside the right side panel and is wired in series. If the heater has gone into an overheat condition, depress the red button.

### **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.

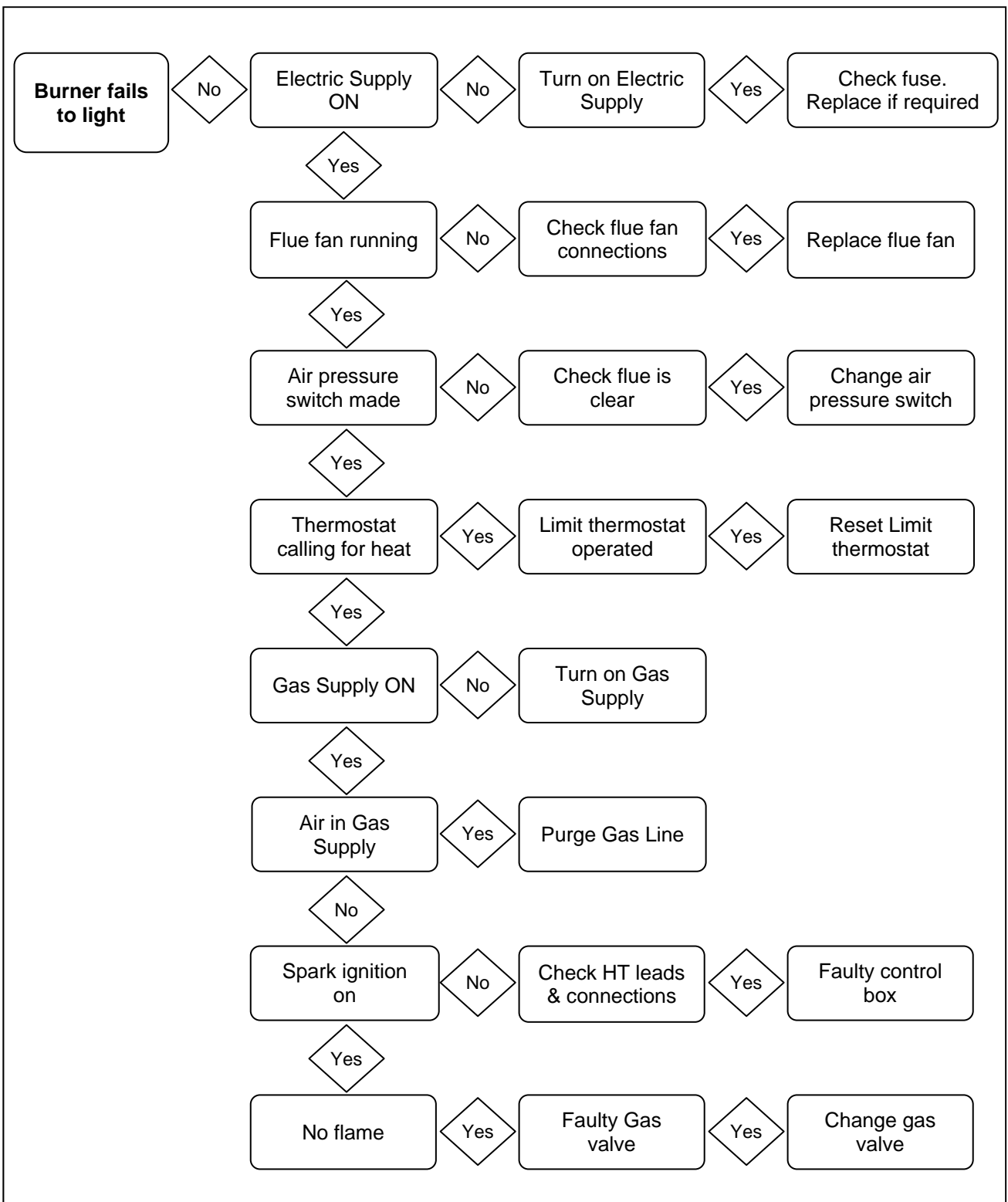
Check the flame sensor rod for signs of pitting or corrosion, ensure that the ceramic insulation material is not damaged or cracked. Check connections are secure.

### **Main Governor**

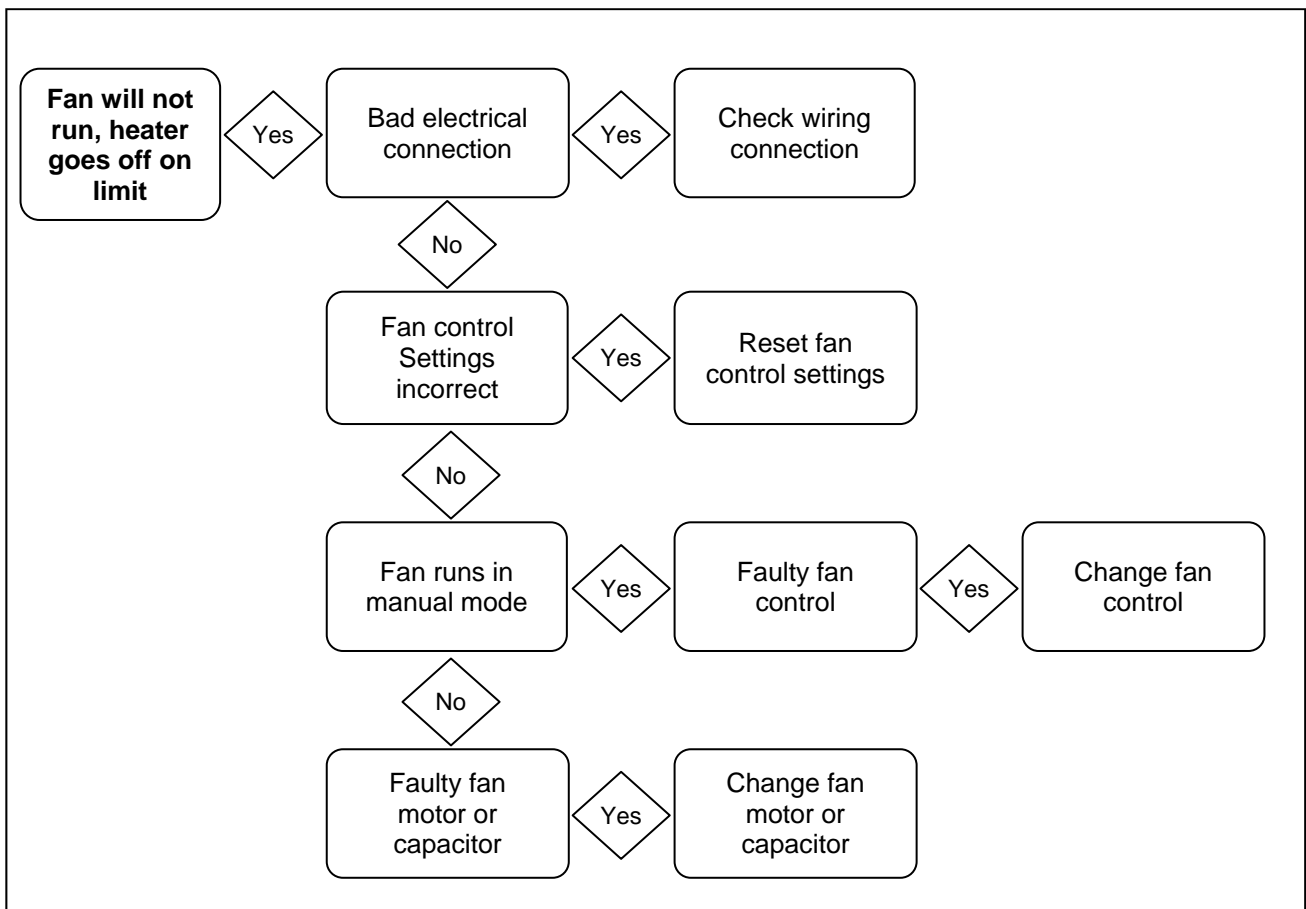
To adjust the main governor, using a screwdriver remove the metal cover to reveal the adjustment screw, and turn as follows :

Clockwise to increase pressure.  
Anticlockwise to decrease pressure.

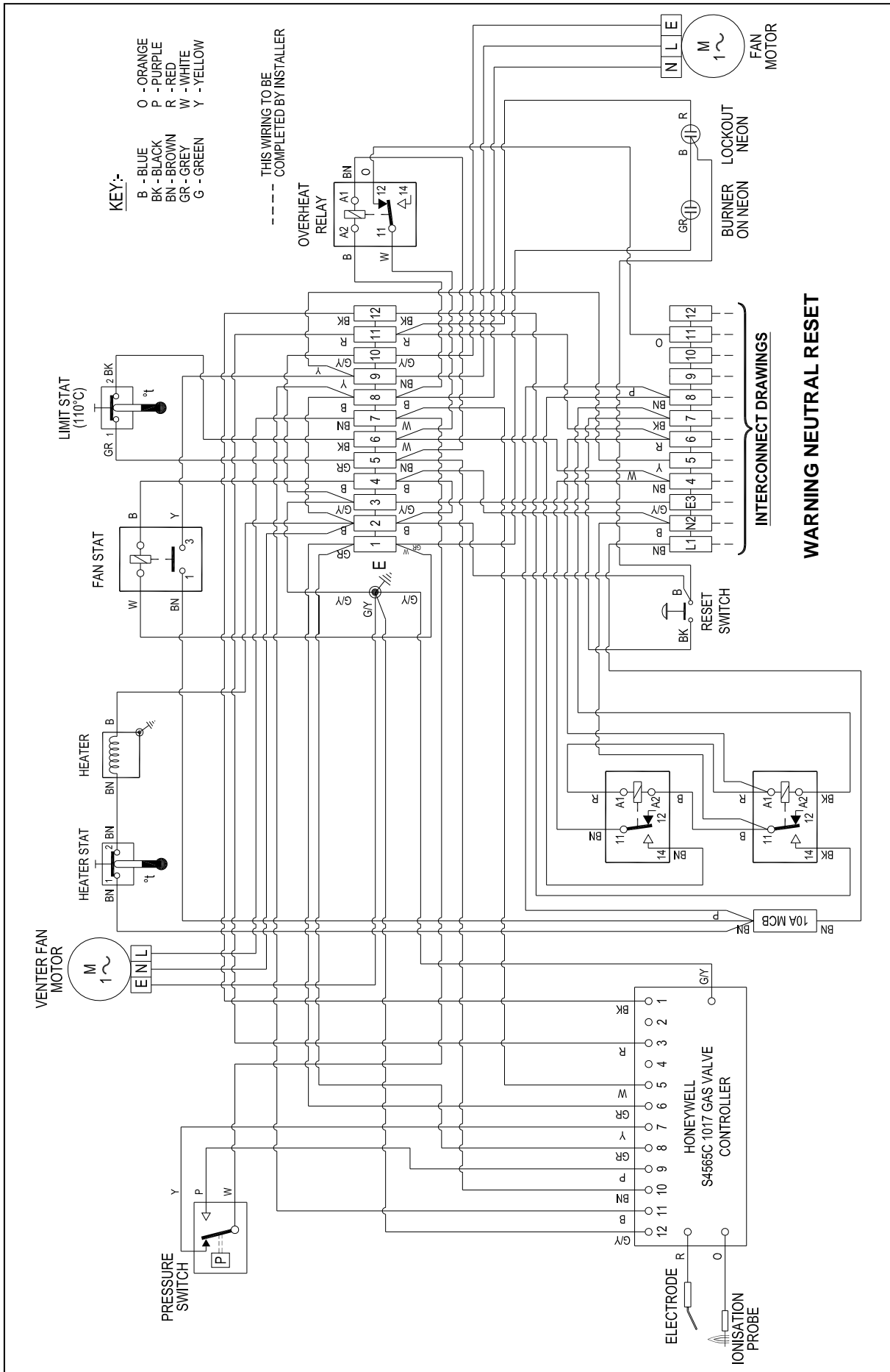
## 5.0 Fault finding



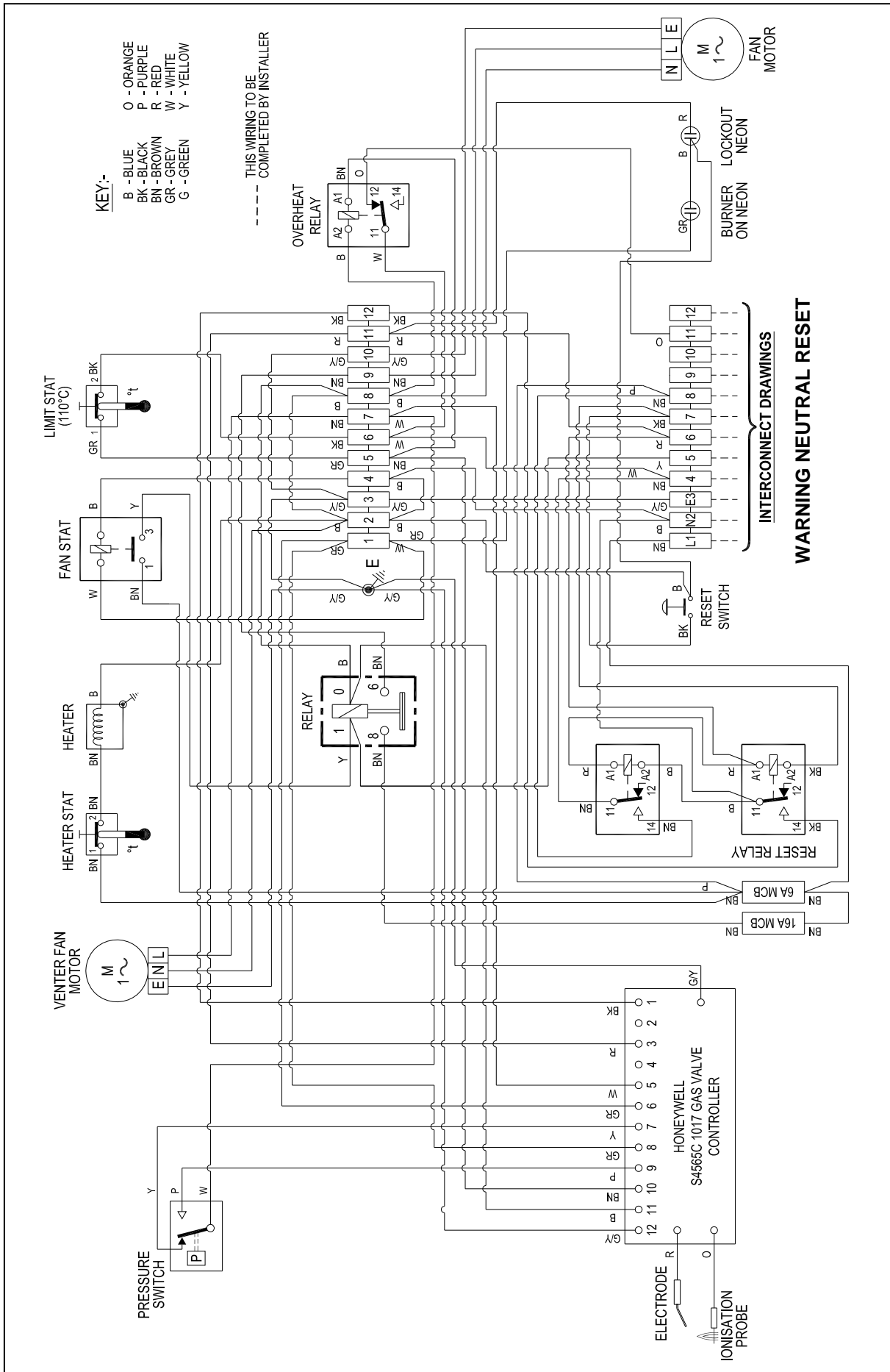
### Fault finding cont'd



6. Wiring Diagram 33-68-019 EV<sup>2</sup>RC 12-42 EV<sup>2</sup>RC1 12-30 EV<sup>2</sup>RC2 12-20 On/Off

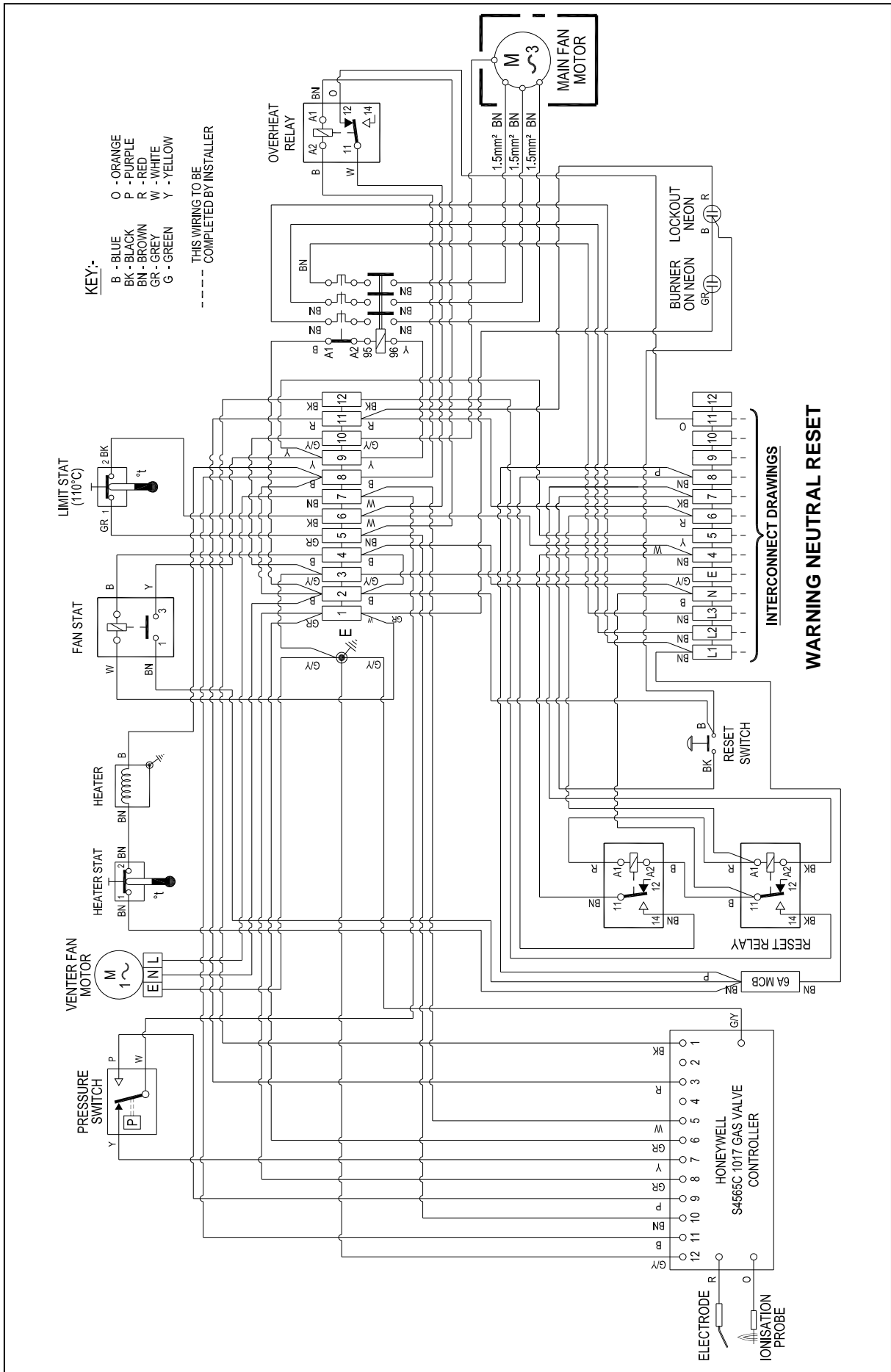


# Wiring Diagram 33-68-022 EV<sup>2</sup>RC 50-60 EV<sup>2</sup>RC1 42-60 EV<sup>2</sup>RC2 30-42 On/Off

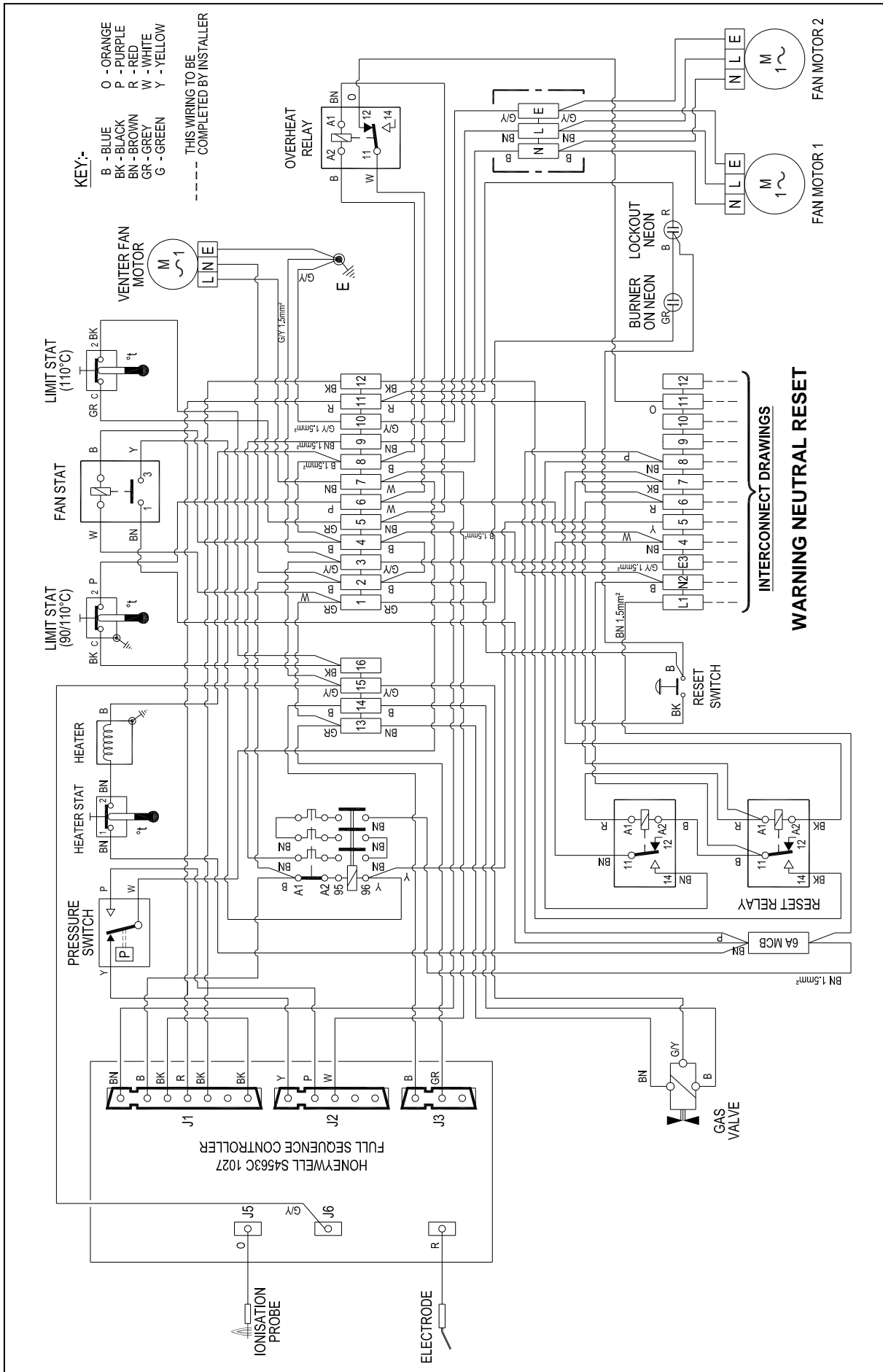




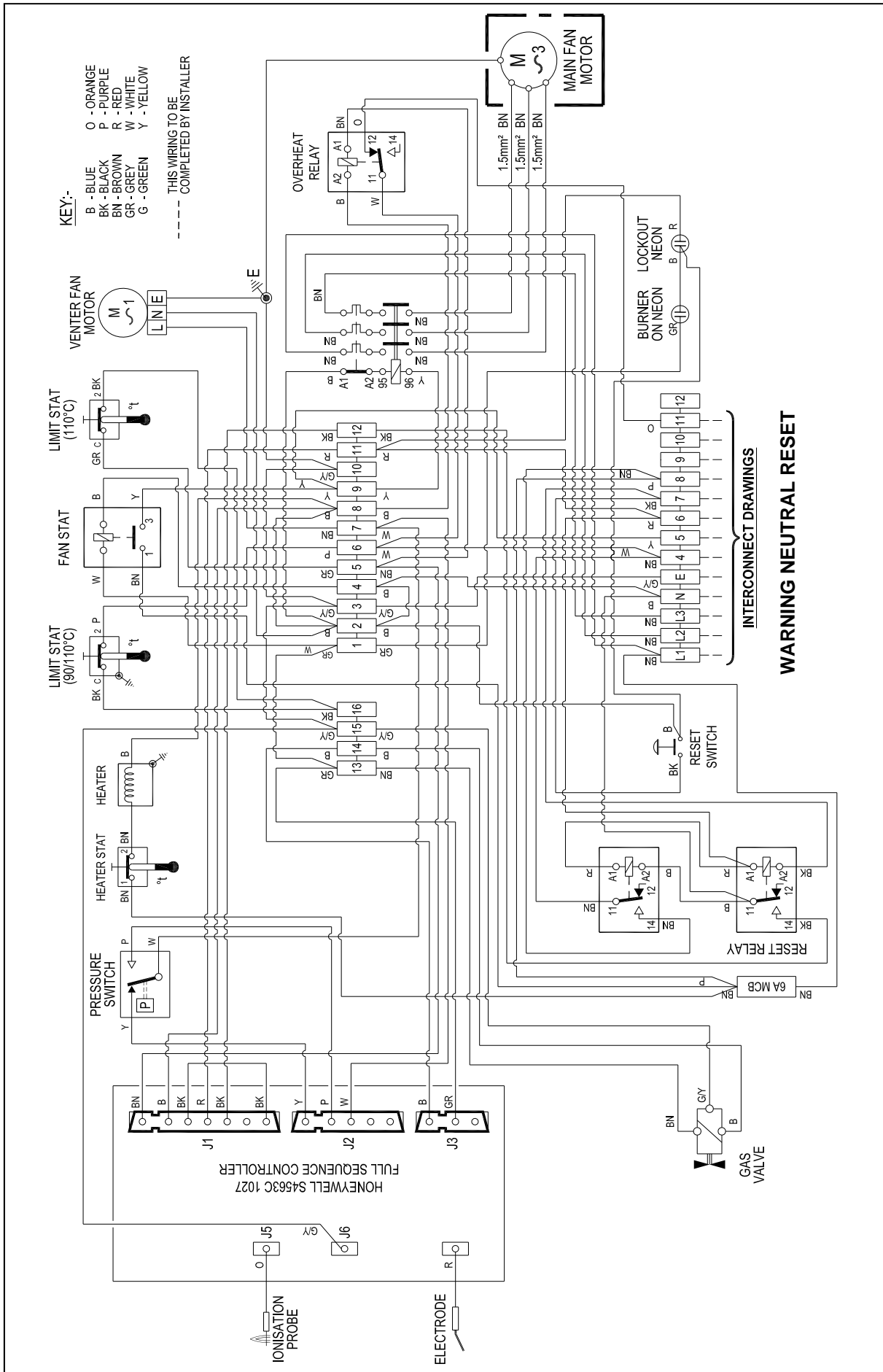
# Wiring Diagram 33-68-025 EV<sup>2</sup>RC 50-60 3 Phase On/Off



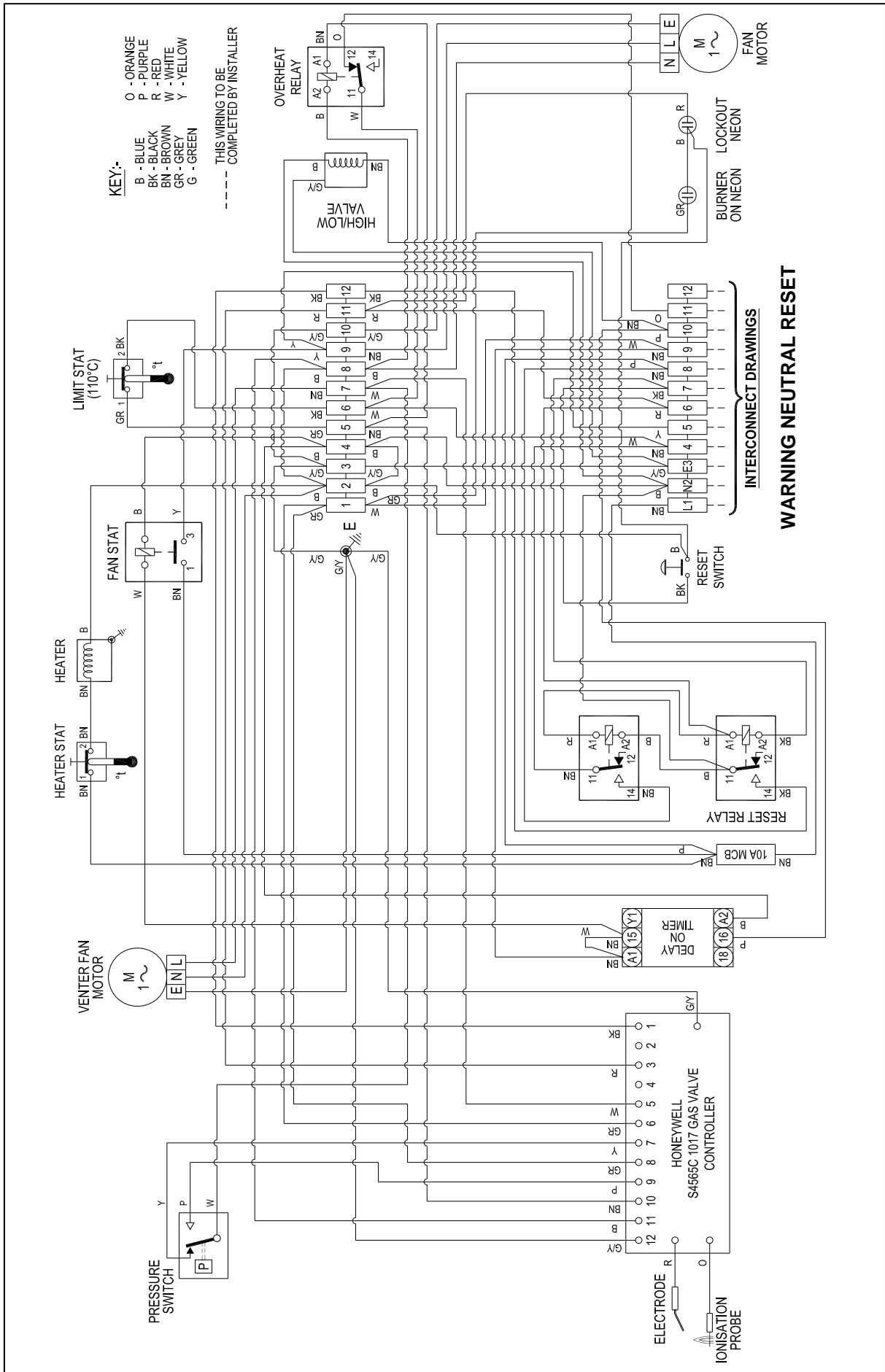
# Wiring Diagram 33-68-028 EV<sup>2</sup>RC 72-95 EV<sup>2</sup>RC1 72-95 On/Off



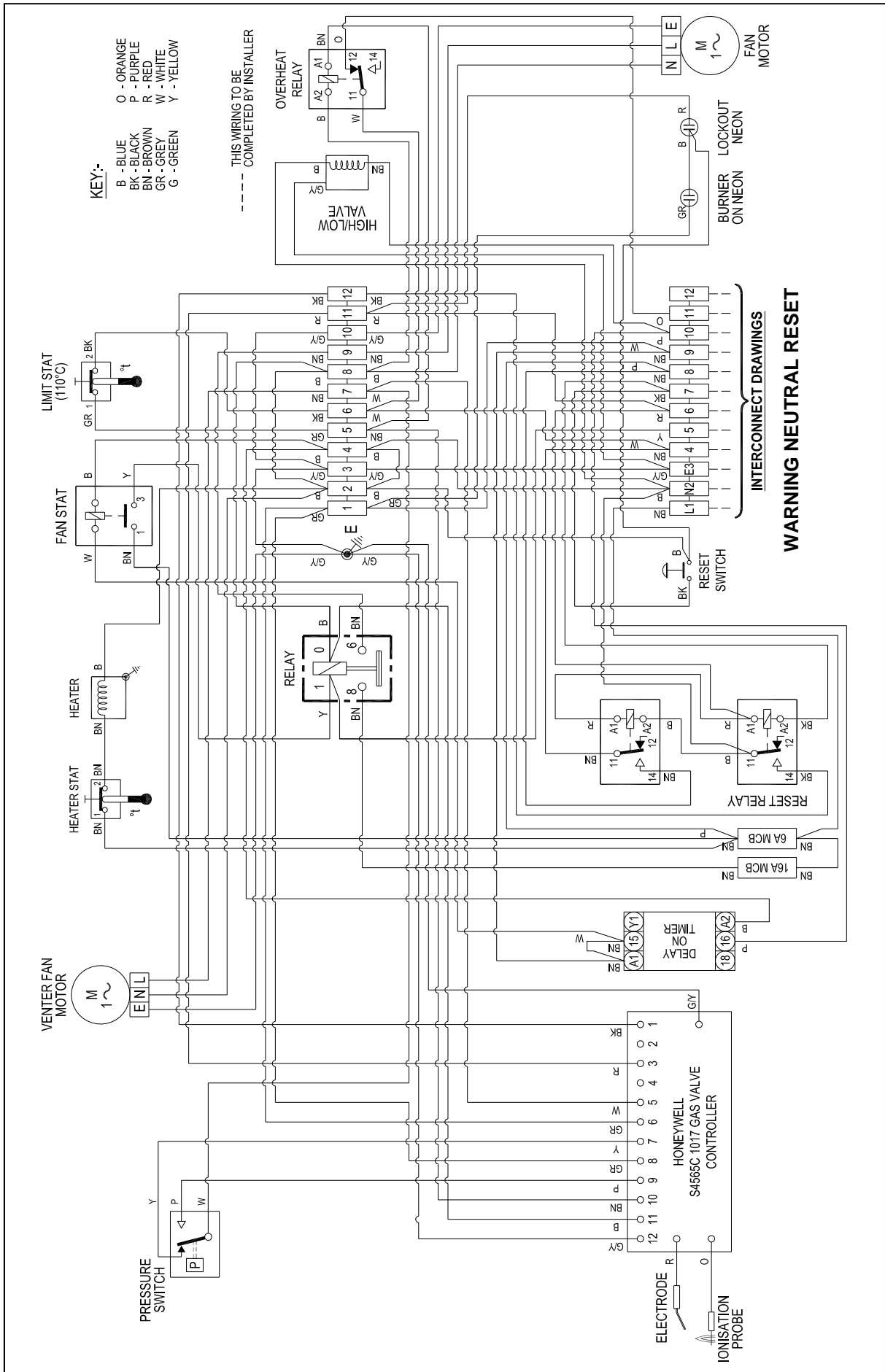
# Wiring Diagram 33-68-031 EV<sup>2</sup>RC 120-145 EV<sup>2</sup>RC2 72-145 3 Phase On/Off



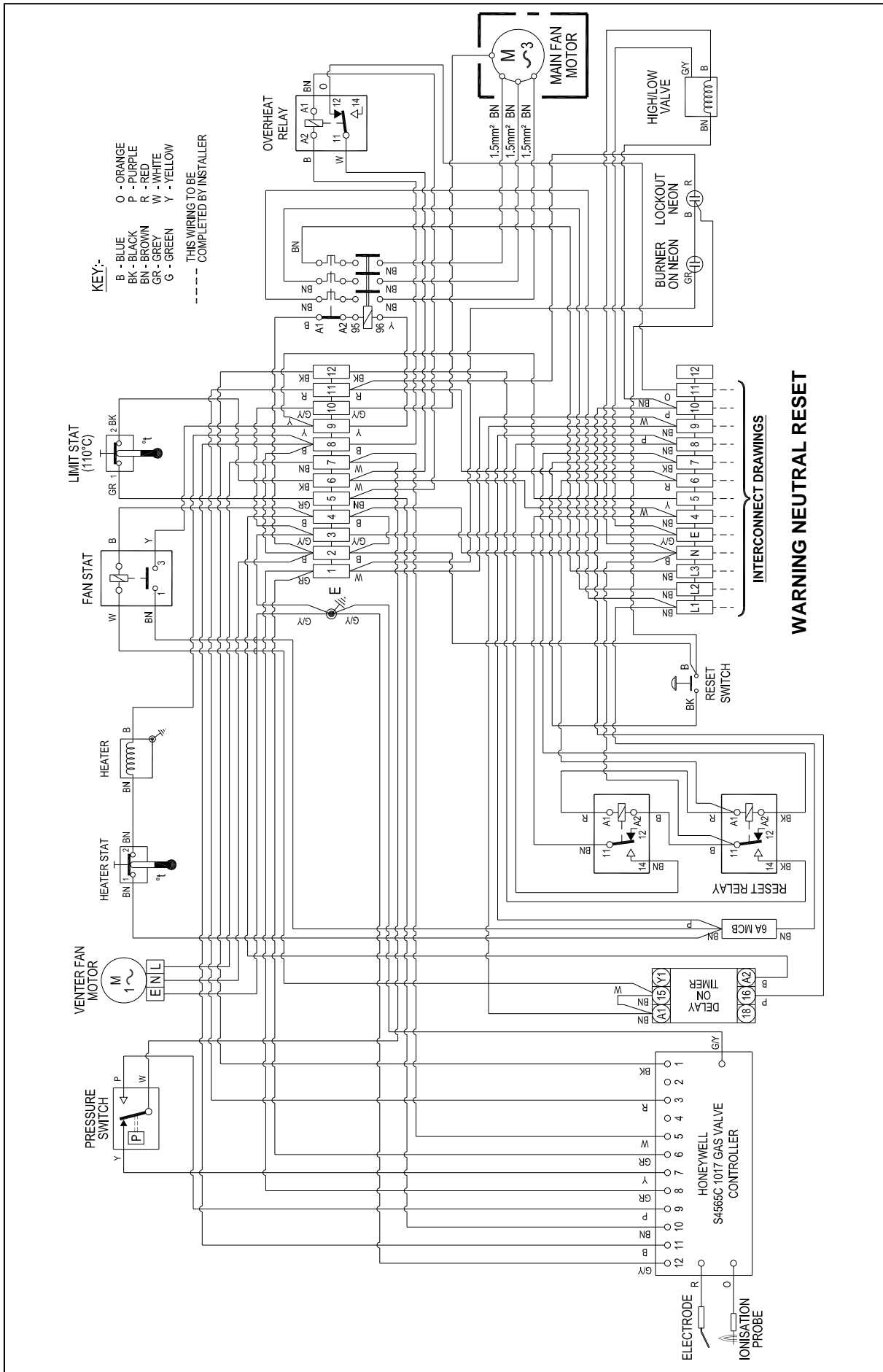
Wiring Diagram 33-68-020 EV<sup>2</sup>RC 12-42 EV<sup>2</sup>RC1 12-30 EV<sup>2</sup>RC2 12-20 Hi/Low



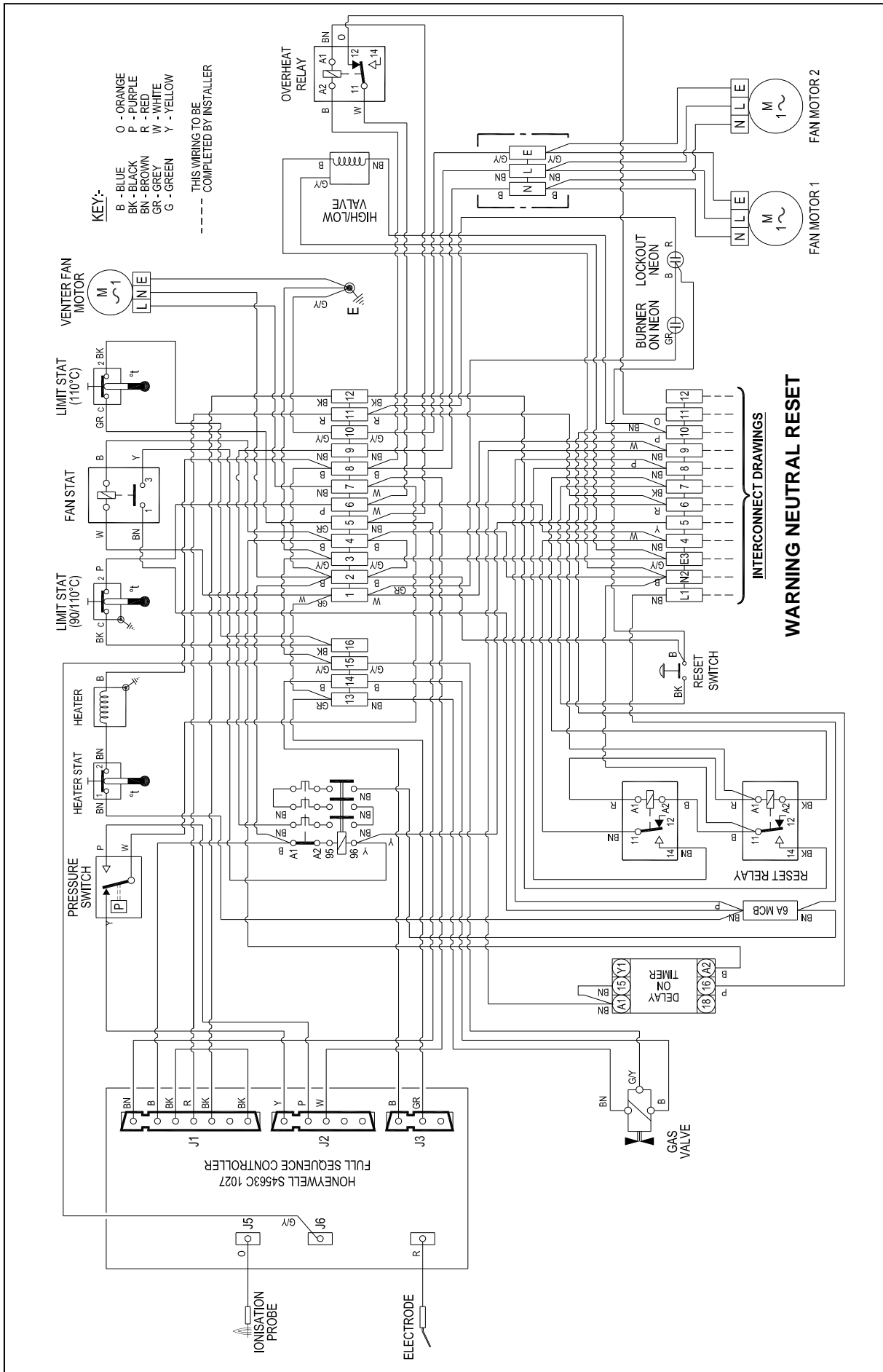
# Wiring Diagram 33-68-023 EV<sup>2</sup>RC 50-60 EV<sup>2</sup>RC1 42-60 EV<sup>2</sup>RC2 30-42 Hi/Low



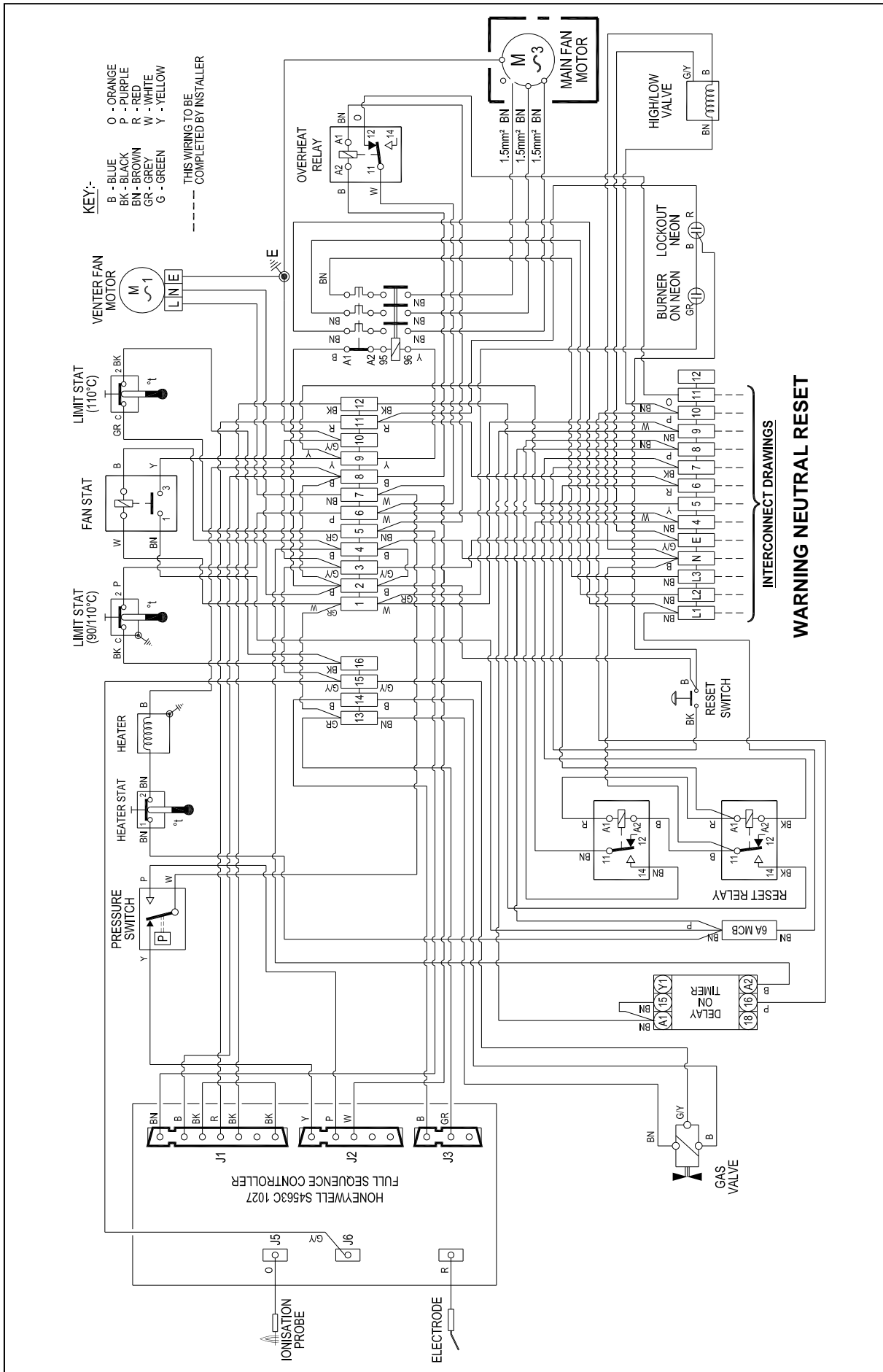
# Wiring Diagram 33-68-026 EV<sup>2</sup>RC 50-60 3 Phase Hi/Low



# Wiring Diagram 33-68-029 EV<sup>2</sup>RC 72-95 EV<sup>2</sup>RC1 72-95 Hi/Low

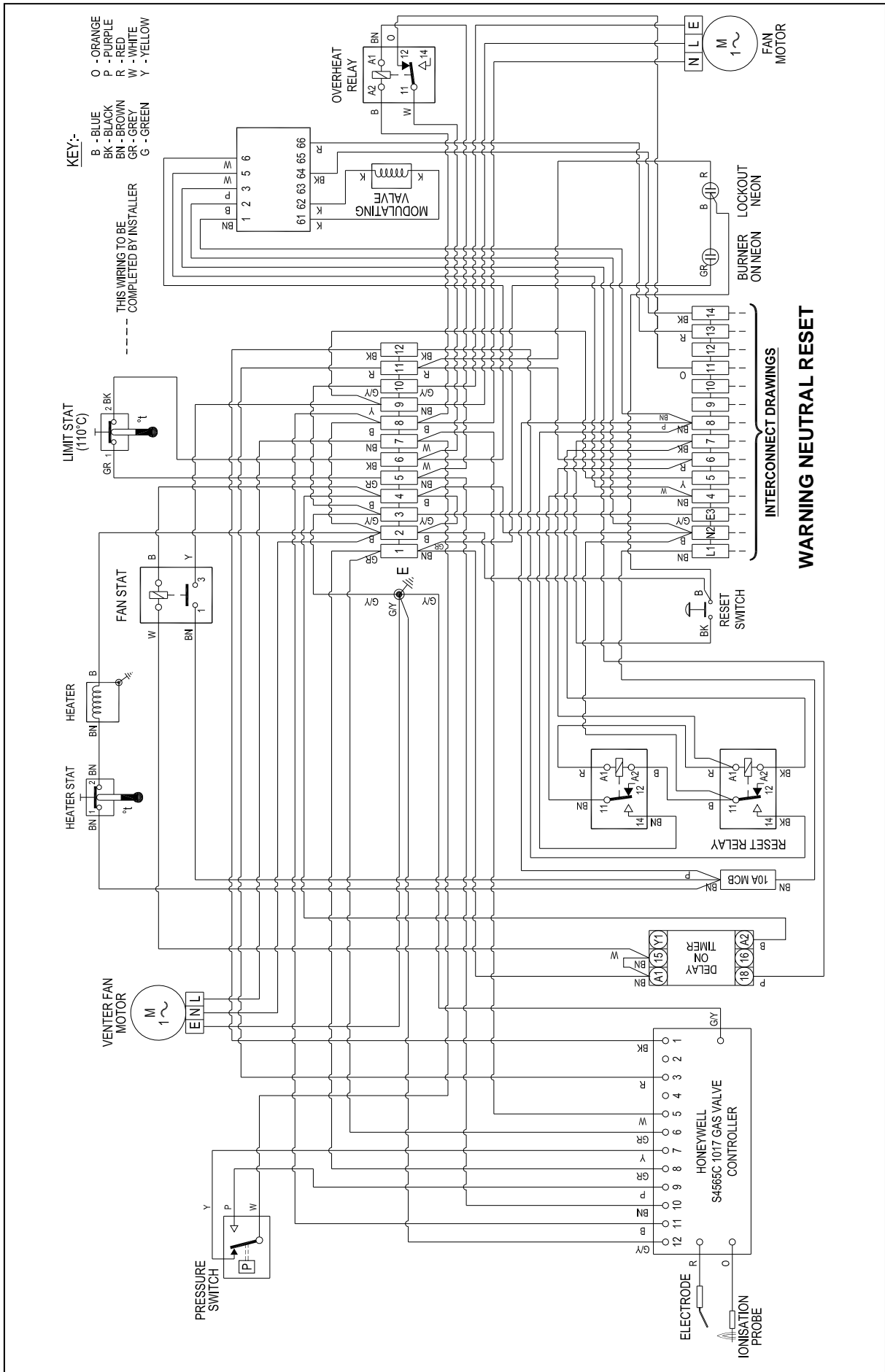


# Wiring Diagram 33-68-032 EV<sup>2</sup>RC 120-145 EV<sup>2</sup>RC2 72-145 3 Phase Hi/Low

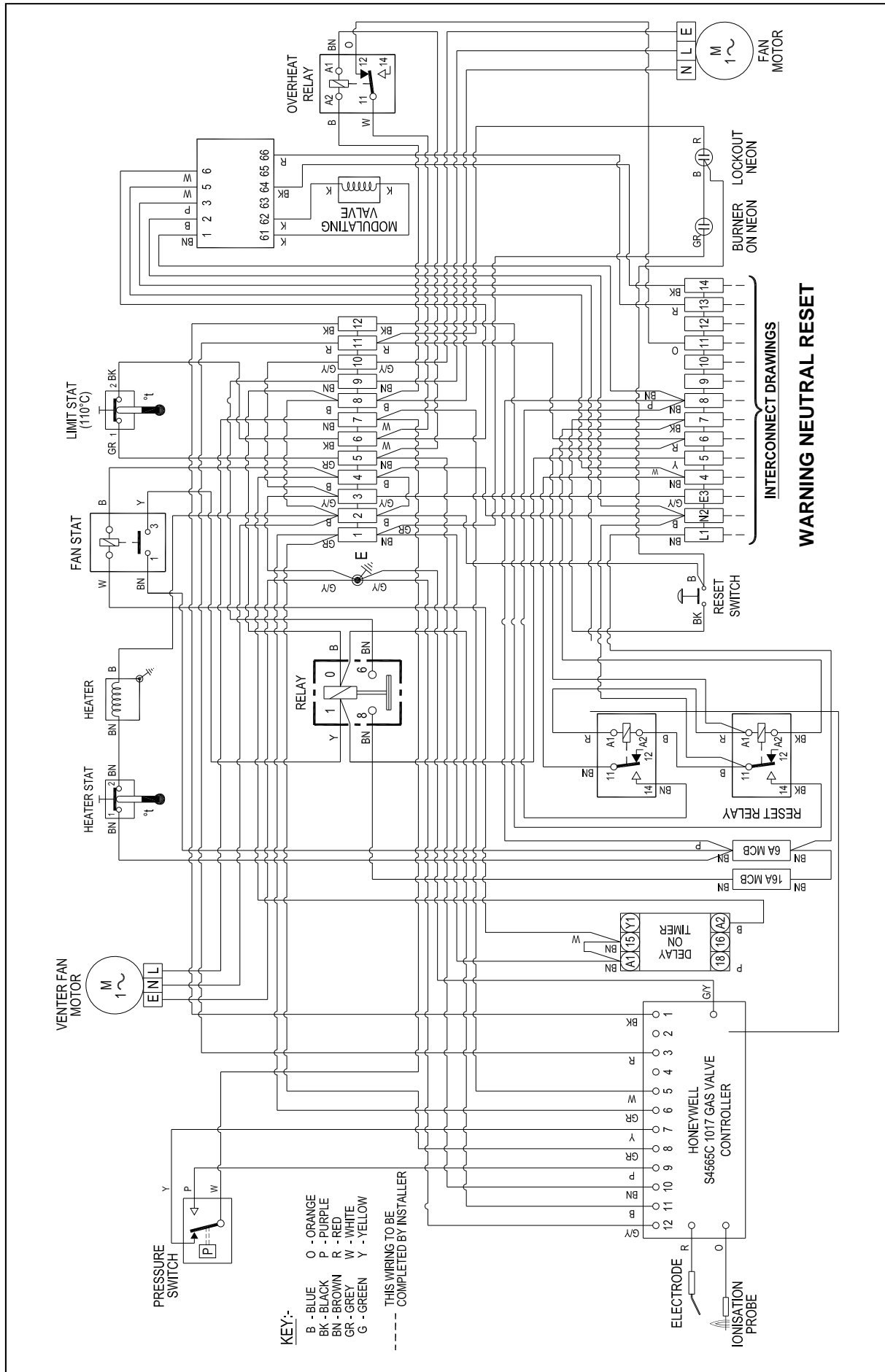




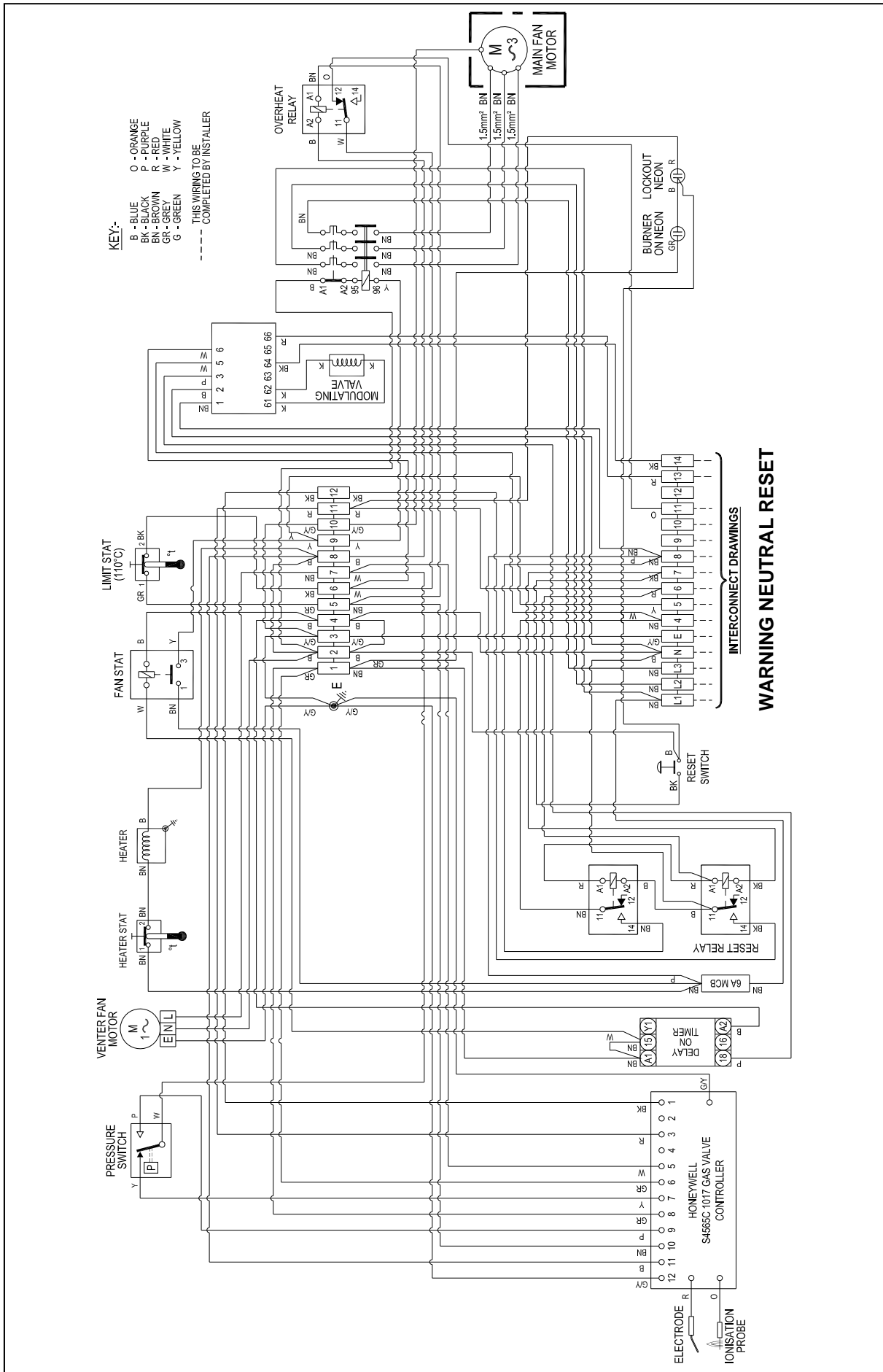
Wiring Diagram 33-68-021 EV<sup>2</sup>RC 12-42 EV<sup>2</sup>RC1 12-30 EV<sup>2</sup>RC2 12-20 Modulation



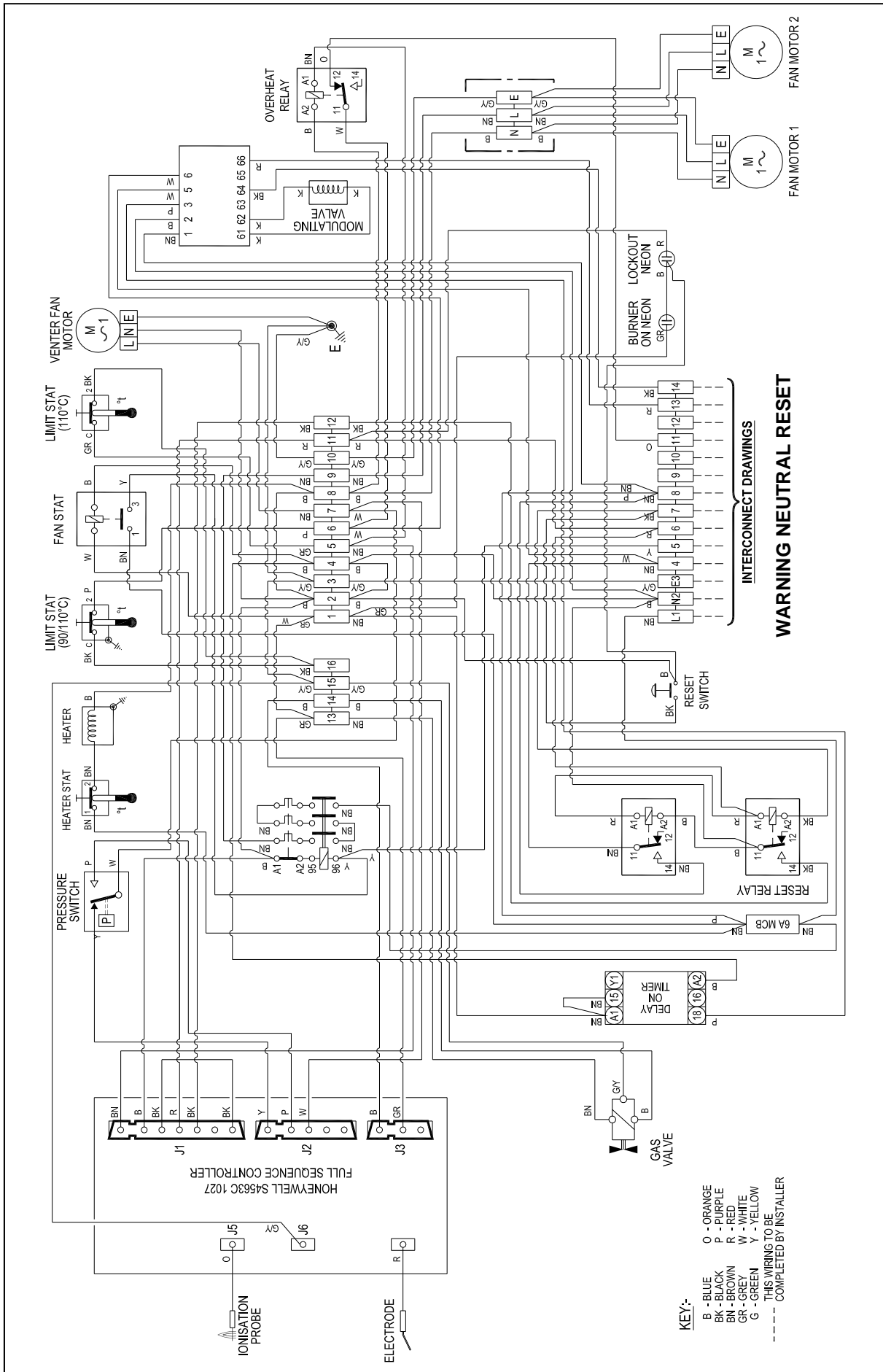
# Wiring Diagram 33-68-024 EV<sup>2</sup>RC 50-60 Modulation



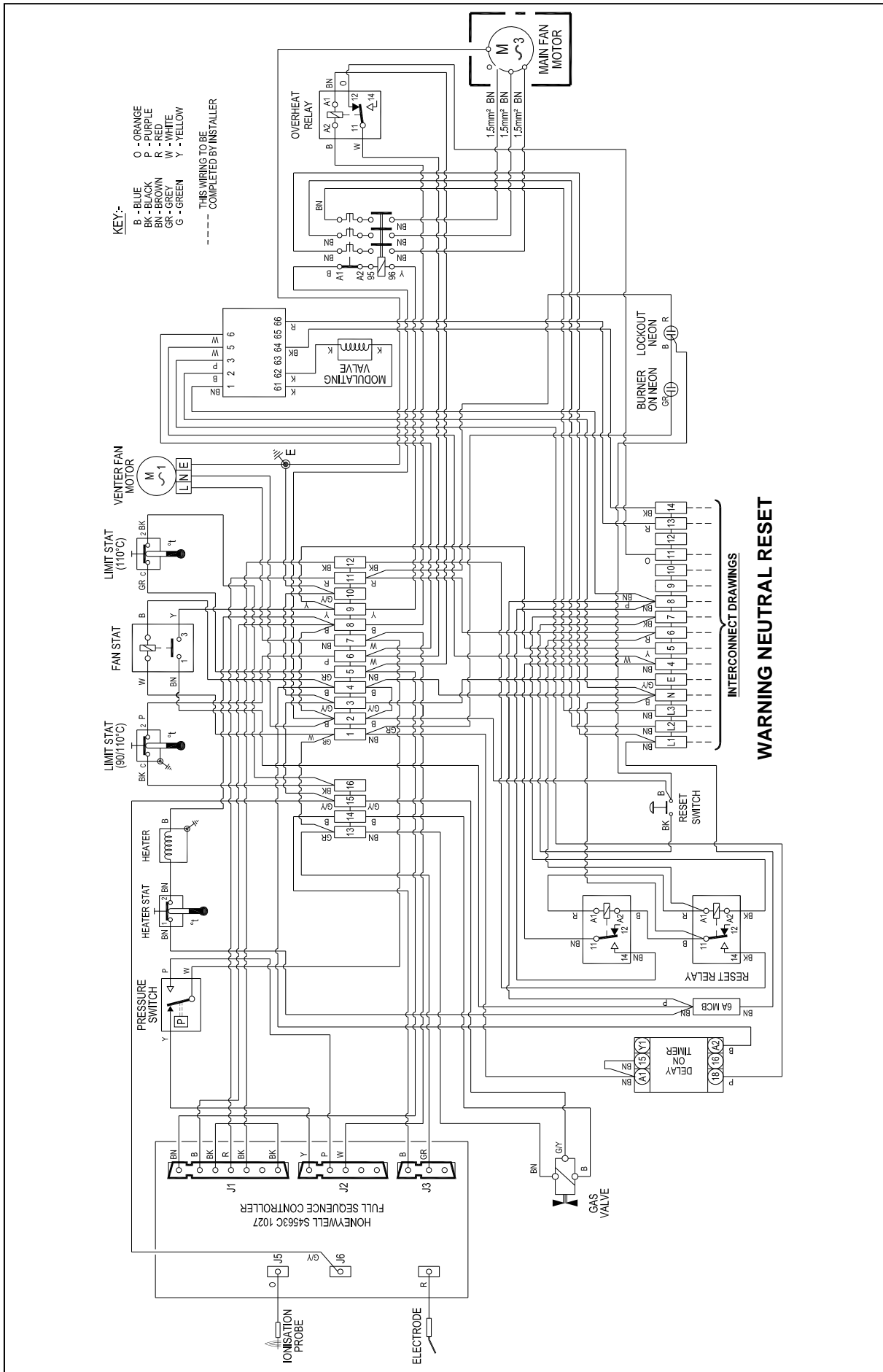
# Wiring Diagram 33-68-027 EVRC 50-60 3 Phase Modulation



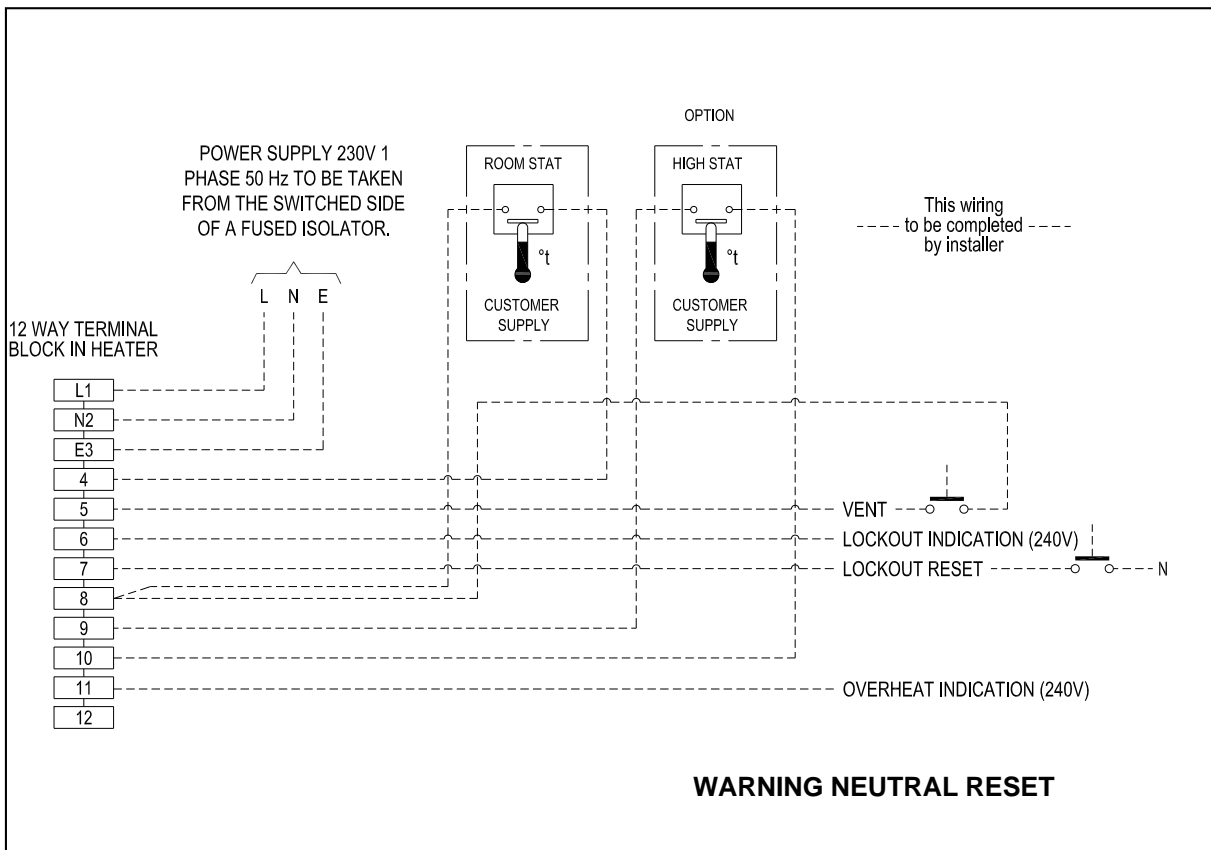
# Wiring Diagram 33-68-030 EV<sup>2</sup>RC 72-95 EV<sup>2</sup>RC1 72-95 Modulation



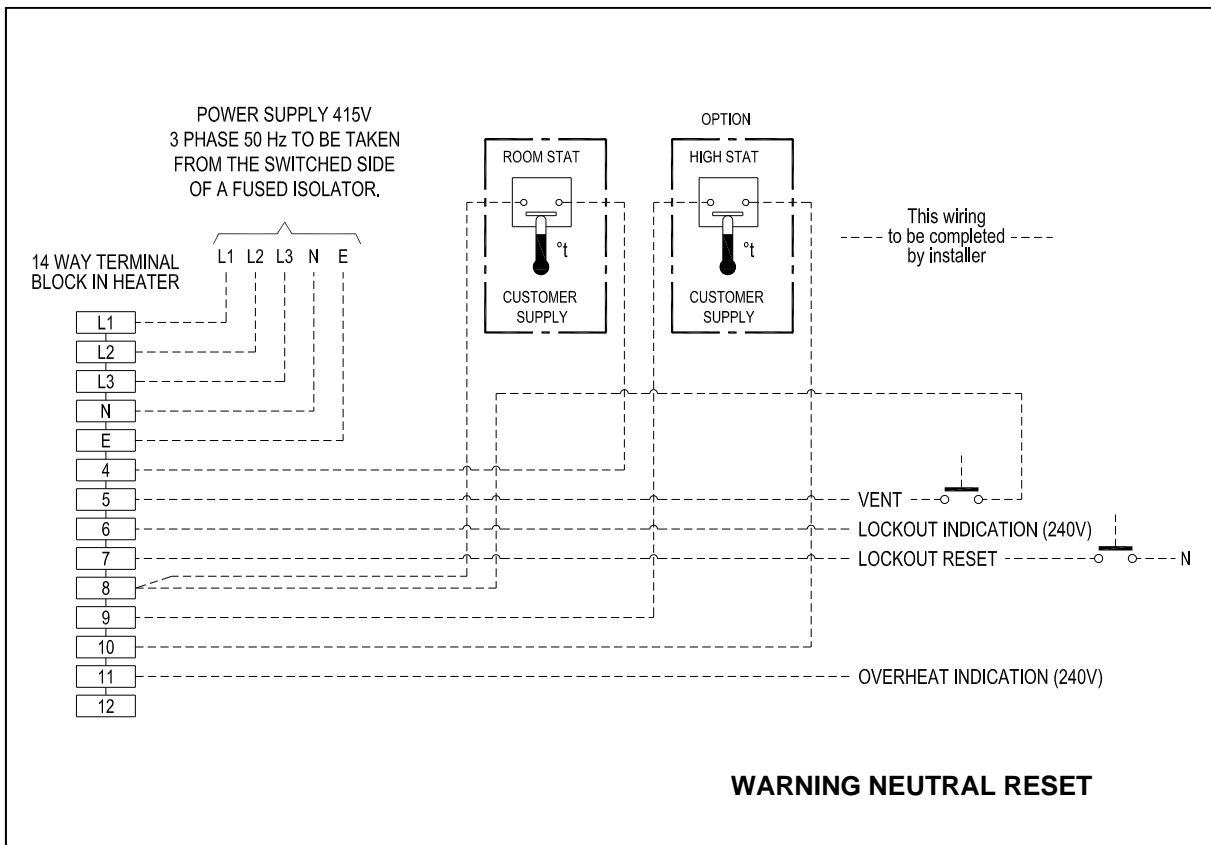
# Wiring Diagram 33-68-033 EV<sup>2</sup>RC 120-145 EV<sup>2</sup>RC2 72-145 3 Phase Modulation



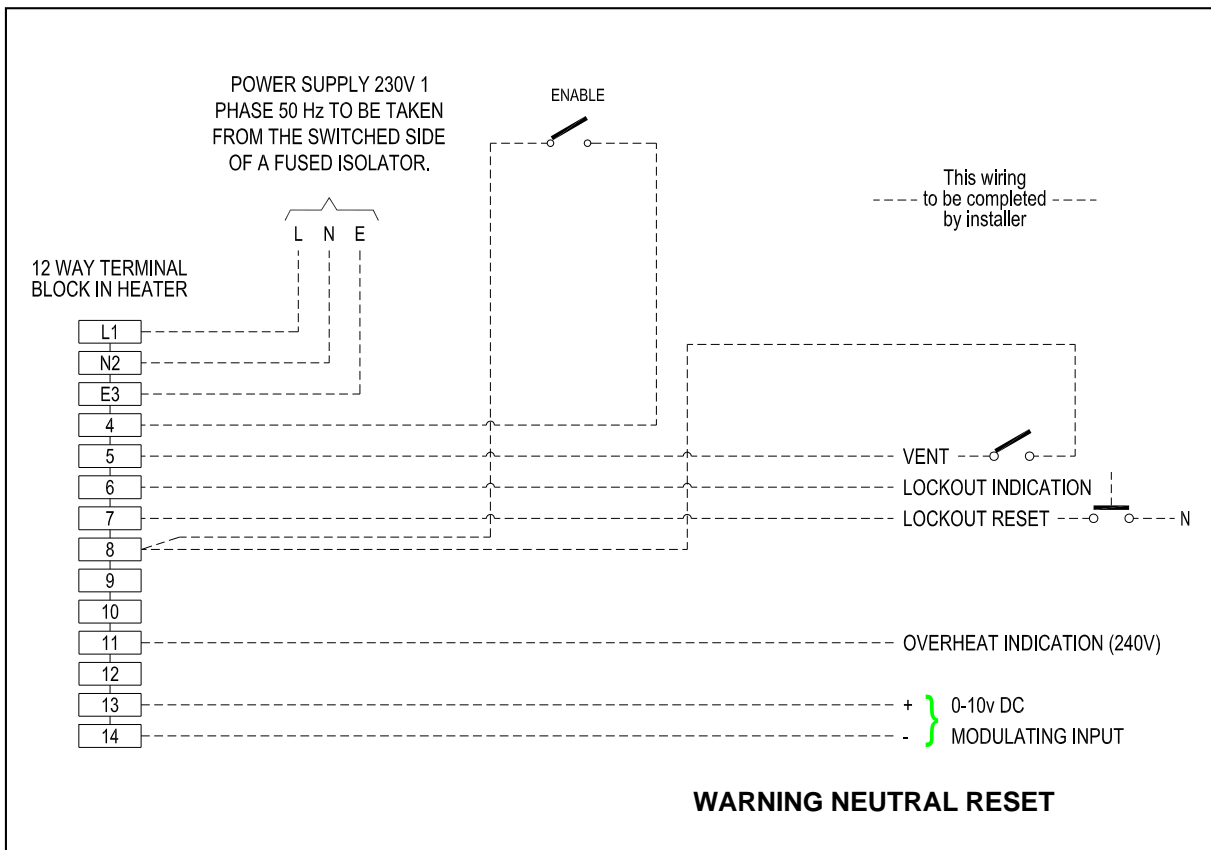
## Less Controls Connections On/Off (Hi/Low) 1 Phase 33-67-114



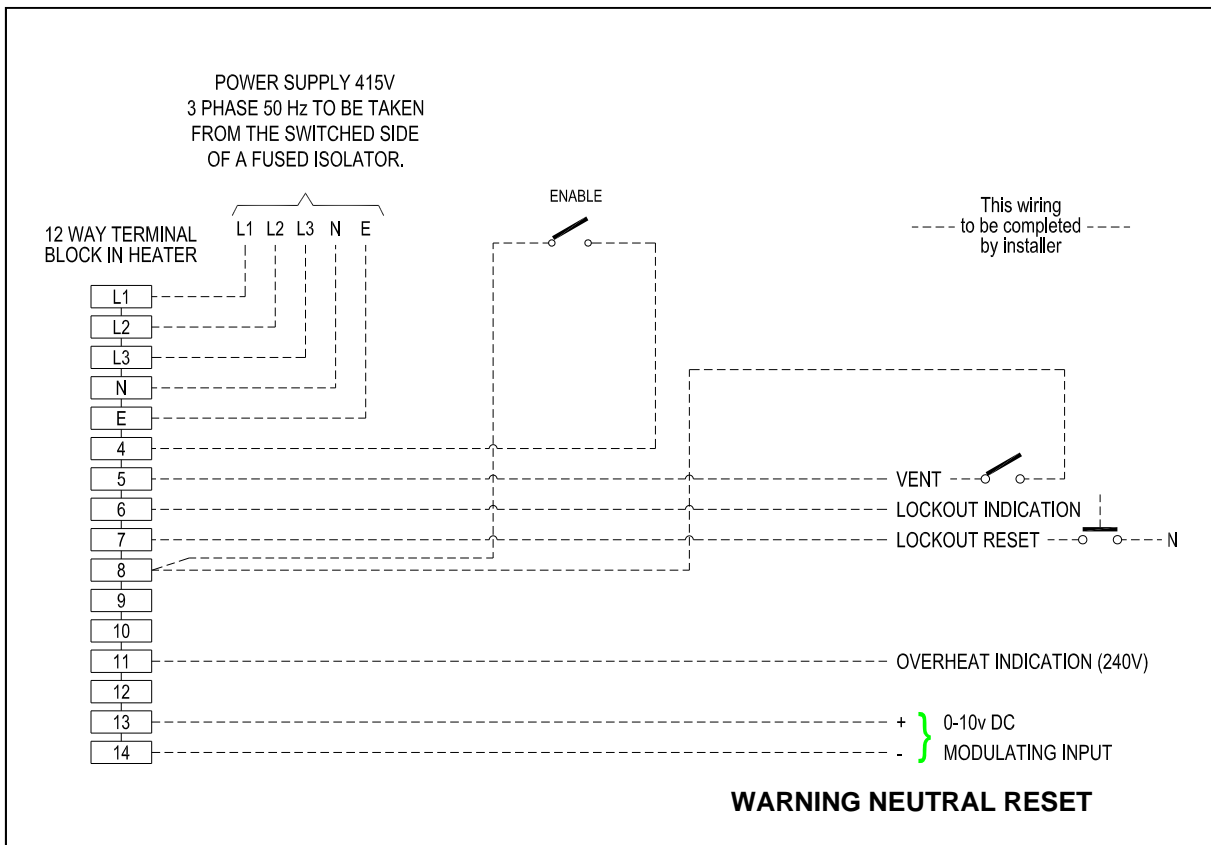
## Less Controls Connections On/Off (Hi/Low) 3 Phase 33-67-115



## Less Controls Connections Modulation 1 Phase 33-67-221



## Less Controls Connections Modulation 3 Phase 33-67-222



## 7.0 Technical Data

Appliance Type	B <sub>22</sub> C <sub>32</sub> C <sub>12</sub>
Electrical Protection	IP44

## 7.1 Technical Data Common Information

Country	Approved Gas Category
AT,BG,CH,CY,CZ,DK,EE,ES,FI,GB,GR,HR,IE,IT,IS,LT,LV,NO,PT,RO,SE,SI,SK,TR	I <sub>2H</sub>
BE,CZ,NL,FR,DE,IE,IT,ES,CH,PT,GB,SE,SK,SL,PT,PL,TR	I <sub>3P</sub>
PL,LU,DE,RO	I <sub>2E</sub>
PL	I <sub>2LS</sub>
PL	I <sub>2LW</sub>












## 7.2 Technical Data - models 12-50

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
HEAT OUTPUT Low Fire	kW Btu	5.8 19,700	9.4 32,100	14.2 48,400	18.9 64,400	23.6 80,800
HEAT INPUT (Nett ) Low Fire	kW Btu	6.5 22,200	10.6 36,200	16.0 54,600	21.3 72,700	26.7 91,200
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/Low/Modulation	Hi mbar Lo mbar	12.6 3.4	8.3 2.1	8.3 2.3	8.3 2.3	8.3 2.1
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 <sup>3</sup> /hr m <sup>3</sup> /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 <sup>3</sup> /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 59
AIR FLOW	ft <sup>3</sup> /min m <sup>3</sup> /sec	657 0.31	1165 0.55	1674 0.79	2034 0.96	2564 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 250 Pa 500 Pa	230/1/50 230/1/50 230/1/50	230/1/50 230/1/50 230/1/50	230/1/50 230/1/50 230/1/50	230/1/50 230/1/50 230/1/50	230/1/50 230/1/50 415/3/50
ELECTRICAL POWER (AMPS)	STD 250 Pa 500 Pa	1.1 1.7 3.3	1.7 1.7 3.3	1.7 2.4 4.8	2.4 2.4 4.8	3.2 4.8 3.5
INTERNAL MCB 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	102	107	133	141	167
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

## Technical Data - models 60-145

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
HEAT OUTPUT Low Fire	kW Btu	28.3 96,700	34.9 119,100	46.6 158,900	57.7 197,000	69.3 236,500
HEAT INPUT (Nett) Low Fire	kW Btu	32.0 109,200	39.4 134,500	52.6 179,500	65.2 222,500	78.3 267,200
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 3.8	9.2 3.8
BURNER PRESSURE NAT GAS Hi/Low/Modulation	Hi mbar Lo mbar	8.6 2.3	8.7 2.3	8.7 2.3	9.2 2.3	9.2 2.3
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 <sup>3</sup> /hr m <sup>3</sup> /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	29.2 11.68	25.5 10.2	25.5 10.2	25.5 10.2	25.5 10.2
LPG PROPANE CONSUMPTION	m <sup>3</sup> /hr Kg/h	2.59 4.79	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	ft <sup>3</sup> /min m <sup>3</sup> /sec	3263 1.54	4026 1.90	4789 2.26	6527 3.08	8010 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 250 Pa 500 Pa	230/1/50 230/1/50 415/3/50	230/1/50 230/1/50 415/3/50	230/1/50 230/1/50 415/3/50	415/3/50 415/3/50 415/3/50	415/3/50 415/3/50 415/3/50
ELECTRICAL POWER (AMPS)	STD 250 Pa 500 Pa	8 8 3.5	9 9 4.8	12 12 7	6 9 12	6 9 12
INTERNAL MCB 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	190	246	268	301	353
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						28-40-161
	Limit Stat						28-16-058
	Fan Control Thermostat						28-16-059
	Injector Natural Gas	33-64-263					33-64-144
	Injector Propane Gas	33-64-146					33-67-322

Parts list cont'd	Heater Size/ Description	12	20	30	42	50	60
	Electrode			33-64-193			
	Ionisation Probe			33-64-194			
	Overheat Red Neon			28-50-033			
	Burner On Amber Neon			28-50-034			
	Relay 230V			28-25-039			
	Relay Base			28-25-035			
	High Fire Timer Relay			28-15-027			
	Internal Control MCB			28-07-084 (6A) 28-07-085 (10A) 28-07-046 (16A)			
	Lockout Reset Switch			20-40-118			
	Burner			33-64-158			
	Flue Fan	28-09-082		28-09-083		28-09-084	
	Fan (STD) Centrifugal Motor	28-09-044 n/a		28-09-001 n/a	28-09-049 n/a	28-09-144 n/a	28-09-002 n/a
	Fan (OPT 1) Centrifugal Motor	28-09-143 n/a	28-09-001 n/a	28-09-049 n/a	28-09-049 n/a	28-09-002 n/a	28-09-050 n/a
	Fan (OPT 2) Centrifugal Motor	tba tba			28-09-146 21-10-009	28-09-140 28-10-127	28-09-003S 28-10-127

**Parts list cont'd**

<b>Heater Size/ Description</b>	<b>72</b>	<b>95</b>	<b>120</b>	<b>145</b>
 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 Control Thermostat			28-16-059	
 Limit Stat			28-16-058	
 Overheat Stat			28-60-039	
 Injector Natural Gas			33-64-145	
 Injector Propane Gas			33-64-147	

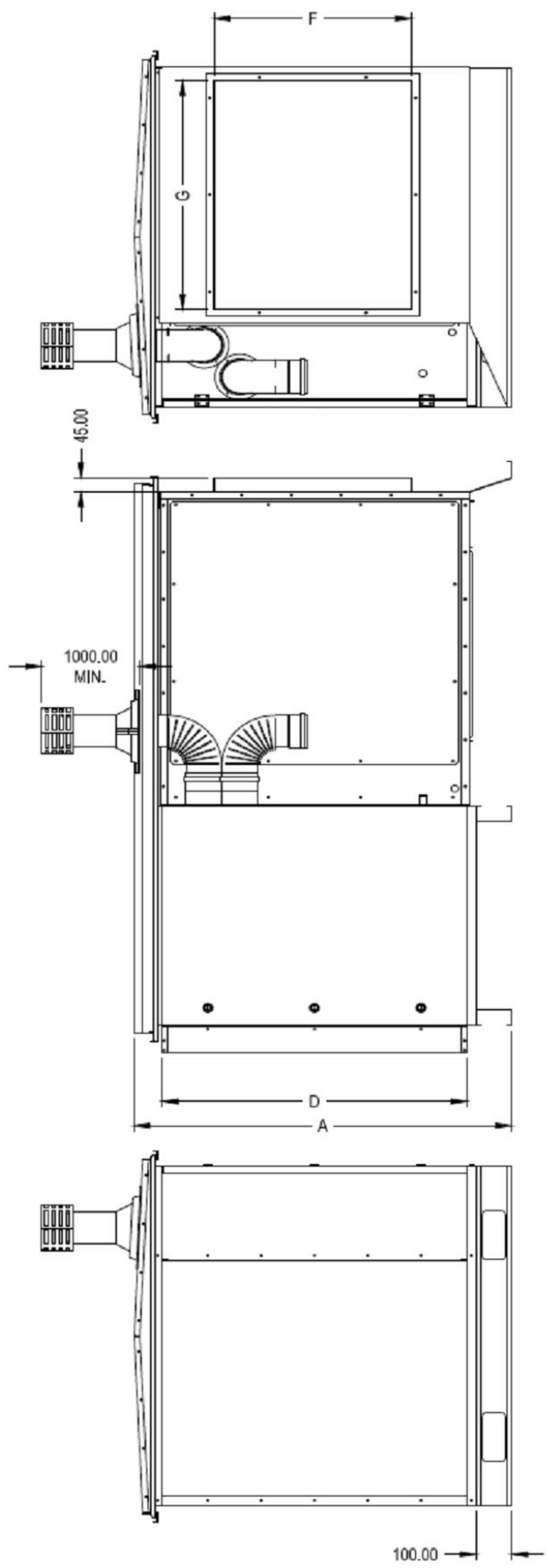
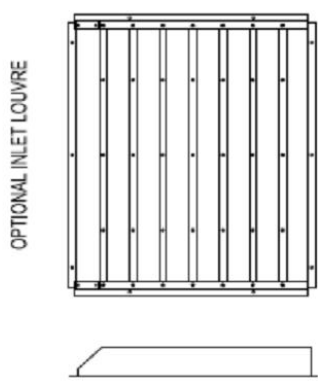
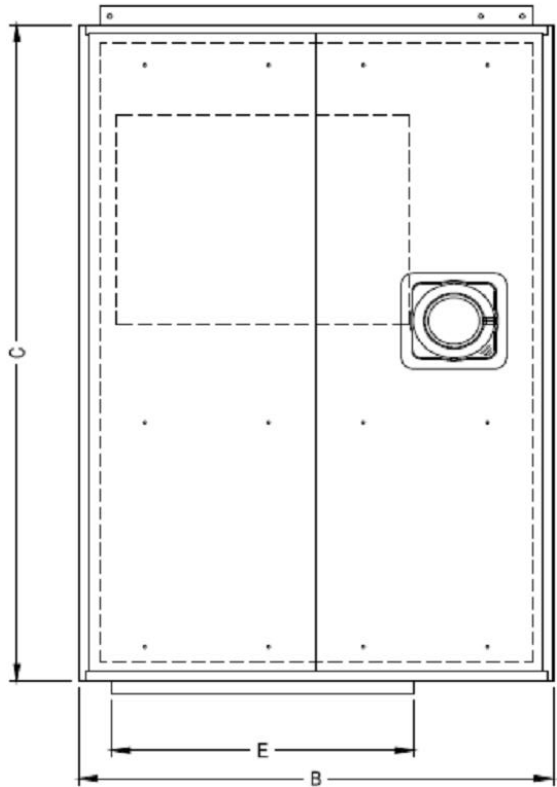
**Parts list  
cont'd**

<b>Heater Size/ Description</b>	<b>72</b>	<b>95</b>	<b>120</b>	<b>145</b>
 Electrode		33-64-193		
 Ionisation Probe		33-64-194		
 Overheat Red Neon		28-50-033		
 Burner On Amber Neon		28-50-034		
 Relay 230V		28-25-039		
 Relay Base		28-25-035		
 High Fire Timer Relay		28-15-027		
 Internal Control MCB		28-07-084 (6A) 28-07-085 (10A) 28-07-046 (16A)		
 Lockout Reset Switch		20-40-118		
 Burner		33-64-160		
 Flue Fan	28-09-089		28-09-090	
 Fan Centrifugal (STD) Motor	28-09-049* n/a	28-09-137* 28-10-117	28-09-043 28-10-015	28-09-043 28-10-120
 Fan Centrifugal (OPT 1) Motor	28-09-137* 28-10-117	28-09-137* 28-10-016	28-09-043 20-10-120	28-09-043 20-10-026
 Fan Centrifugal (OPT 2) Motor	28-09-137* 28-10-015	28-09-043 28-10-120	28-09-043 20-10-026	28-09-043 20-10-021

\* denotes 2 fans, \*\* denotes 3 fans, \*\*\* denotes 4 fans

# 9.0 Dimensions - EVRC

Mod	A	B	C	D	E	F	G
12	595	1150	1575	390	729	276	710
20	595	1150	1575	390	729	276	710
30	700	1150	1575	495	729	381	710
42	805	1150	1575	600	729	486	710
50	935	1150	1750	730	729	560	710
60	1065	1150	1750	860	729	560	710
72	805	1850	1805	600	1339	670	1320
95	955	1850	1875	750	1339	670	1320
120	1135	1850	1875	930	1339	748	1320
145	1305	1850	1875	1100	1339	828	1320



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**AMBIRAD AIRBLOC NORDAIRNICHE BENSON**

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