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April 2015

A Service Engineers

Fault Finder

for Warm Air Heating

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Johnson & Starley

CONTENTS

Johnson & Starley Warm Air Heaters are

FULLY COMPLIANT WITH PART L BUILDING REGULATIONS

GENERAL VENTILATION INFORMATION

If having undersized grilles was not a major crisis as it was deemed to be NCS (not to current standards). However, since June 2008 the classification for undersized existing ventilation had changed from NCS to AR (at risk).

From the 1st June 2008, all installations providing less than 90% of the ventilation requirements will be regarded as AR.

90% to 100% of the requirement is accepted under standards.

Where a defect(s) is identified with the ventilation and it is not possible to rectify it, reference should be made to the requirements of the current Gas Industry Unsafe Situations Procedure.

For Balanced Compartments and Fan Assisted Provision of Combustion Air see Publication No. ZZ1348 A guide to Size & Free Areas for Pressed Steel Grilles, Aluminium Grilles and Registers

Models

J15-22 Mk 1, 2 & 3

J25-32 Mk 1, 2 & 3

JA33-43

J54-64

JT19-25

JTRS22-25

JWD38-50

Care must be taken during replacement and handling of electronic assemblies, i.e. Electronic Panel, Fan Speed Regulator, Airflow Sensor, Thermista-stat. It is not practical to rectify any defects within these assemblies except in the factory, and any attempt to do so may render any guarantee void.

MAIN BURNER NOT OPERATING

Check Pilot Burner is lit, Time Control is ON, Thermista-stat turned UP

Check mains electrical supply

Check 1.5A fuse on Electronic Panel

Check 24V at Multifunctional Control

No 24V
Check for 24V across yellow and black leads at Electronic Panel

24V Present
Multifunctional Control faulty

No 24V
Check all connections at Electronic Panel are tightened for securely
Replace Electronic Panel

24V Present
Check limit switch and connections

Check Time Control and connections

FAN ON BUT MAIN BURNER CYCLES BEFORE REQUIRED TEMPERATURE IS REACHED

Bridge out Thermista-stat

Burner continues to cycle
Check Limit Switch is operating

Burner remains on
Thermista-stat faulty

Limit Switch operating
Check temperature rise, if less than 60˚C, replace Limit Switch

Check return air path and air filter for restriction

Check burner bar pressure is not excessive

Fan speed too low
Check balancing knob on Electronic Panel is not set too low

Check connections, especially at 6-way fan plug

Put Fan Override Switch on Electronic Panel to continuous position

Limit Switch not open circuit
Replace Electronic Panel

Fan speeds up
Replace Electronic Panel
Replace Airflow Sensor

Fan remains at slow speed
Replace Electronic Panel

MAINS BURNER NOT CYCLING (ROOM TEMPERATURE TOO HIGH)

Disconnect Thermista-stat

Burner goes out
Replace Thermista-stat

Burner remains on
Disconnect yellow wire at Multifunctional Control

Burner goes out
Replace Electrical Panel

Burner remains lit
Replace Multifunctional Control

MAIN FAN CONTINUES TO RUN OR CYCLE AFTER HEATING IS TURNED OFF

Check heater type. If it is a ventilation model fan will run continuously at low speed

Check that the Fan Override Switch on the Electrical Panel is set to **AUTO**

Disconnect Airflow Sensor

Fan stops
Check the Pilot Flame is not too large

Replace Airflow Sensor

Fan continues to run
Remove 6-way plug from the Electronic Panel (Figure 2) or remove the 6 wires 1 to 6 (figure 1)

Fan stops
Replace Electronic Panel

Fan continues to run
Replace Fan Speed Regulator

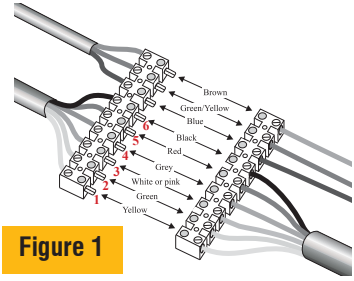


Figure 1

PLEASE NOTE: The unit will have either a 6 way and a 3 way plug (see figure 2) or it will have a 9 way terminal strip (see figure 1) going to the fan speed regulator.

MAIN BURNER ON FOR BRIEF PERIOD ONLY

Check Thermista-stat control knob is on maximum setting

Bridge out Thermista-stat socket or connection at heater

Burner lights and remains on
Reconnect Thermista-stat at heater

Check polarity by interchanging the external Thermista-stat leads

Bridge out Thermista-stat leads at Thermista-stat

Burner remains on
Thermista-stat faulty

Burner not remaining on
Open circuit in external wiring to Thermista-stat

Burner not remaining on
Replace Electronic Panel

MAIN BURNER ON BUT FAN NOT RUNNING

Set Fan Override switch on control panel to ***continuous position***

Fan operates
Check connections at the Electrical Panel

Check Airflow Sensor & connections

Replace Electronic Panel

Fan not operating
Check fan connections, especially at 6 and 3 way plug

Check voltage at fan plug

No voltage
Remove 6-way plug from electronic panel, check for +30V dc across contacts as shown in figure 2 **OR** terminal 3 to 6 on figure 1

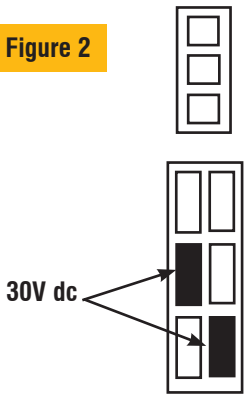
Voltage present
Fan Motor fault

No voltage
Replace Electronic Panel

Voltage present
Replace Fan Speed Regulator

SOCKET ON ELECTRONIC PANEL

Figure 2



MODAIRFLOW SERIES 2

Models

J70-90

J55-65

JB40-50

JU40-50

JB16-20

JB25-30

Q44

HI-SPEC J30

HI-SPEC J50

HI-SPEC J65

HI-SPEC J90

HI-SPEC JU55

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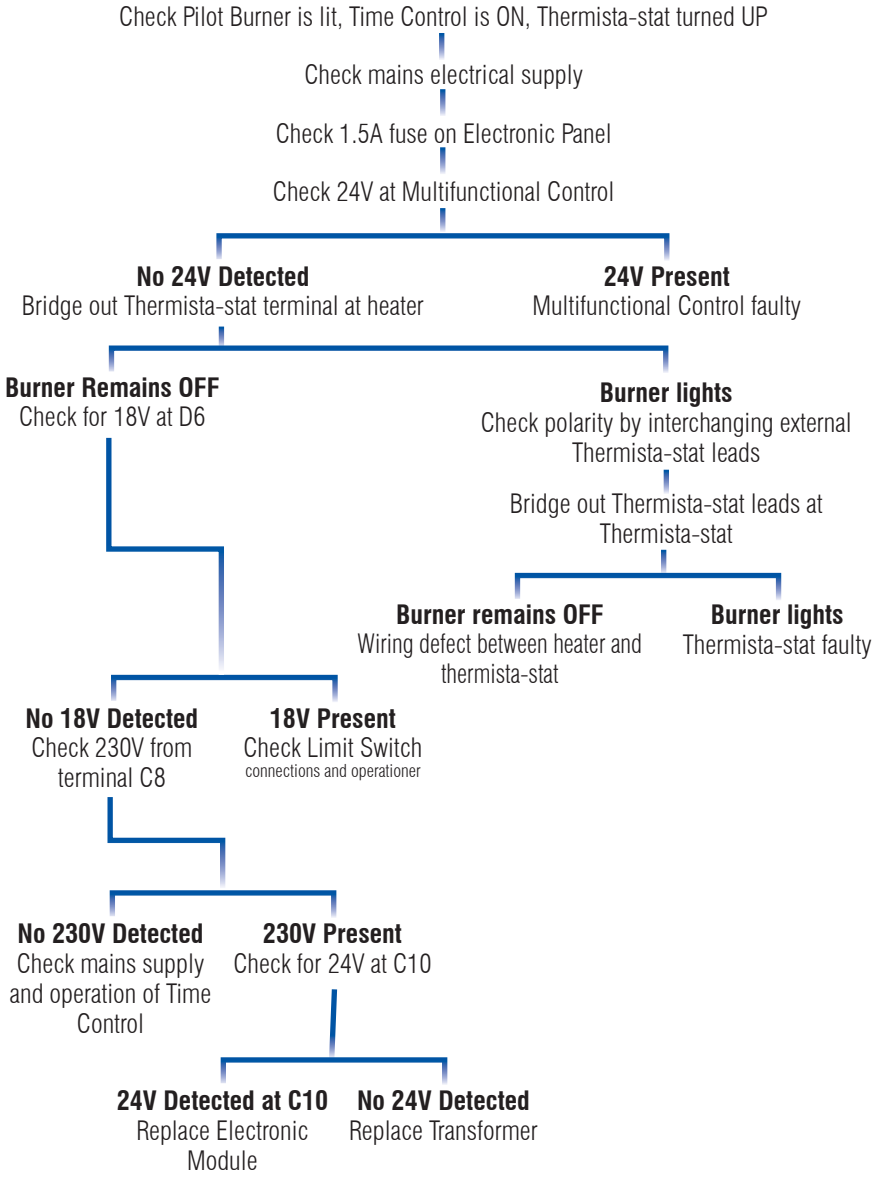
MAIN BURNER NOT OPERATING



MAINS BURNER NOT CYCLING (ROOM TEMPERATURE TOO HIGH)

Disconnect Thermista-stat

- **Burner goes out** — Replace Thermista-stat
- **Burner remains on** — Disconnect yellow wire at Multifunctional Control
  - **Burner goes out** — Replace Electrical Module
  - **Burner remains lit** — Replace Multifunctional Control

MAIN FAN CONTINUES TO RUN OR CYCLE AFTER HEATING IS TURNED OFF

Check Fan Selector Switch on Electronic Module

If set to VENTILATION , fan will run continuously at low speed

Check Fan Selector Switch is set to AUTO and SUMMER AIR CIRCULATION Switch is OFF

Disconnect Airflow Sensor

- **Fan stops** — Check the Pilot Flame is not too large
  - Replace Airflow Sensor
- **Fan continues to run** — Replace Electronic Module

MAIN BURNER ON BUT FAN NOT RUNNING

Check for voltage across black and pink leads at fan socket

- **No Voltage** — Bridge out Airflow Sensor
  - **Fan Starts** — Replace Airflow Sensor
  - **Fan fails to start** — Replace Electronic Module
- **Voltage Detected** — Fan motor faulty

MAIN BURNER ON FOR BRIEF PERIOD ONLY

Check Thermista-stat control knob is on maximum setting

Bridge out Thermista-stat connection at heater

Burner lights and remains on
Reconnect Thermista-stat at heater

Burner not remaining on
Replace Electronic Module

Check polarity by interchanging the external Thermista-stat leads

Bridge out Thermista-stat leads at Thermista-stat

Burner remains on
Thermista-stat faulty

Burner not remaining on
Open circuit in external wiring to Thermista-stat

FAN ON BUT MAIN BURNER CYCLES BEFORE REQUIRED TEMPERATURE IS REACHED

Bridge out Thermista-stat

Burner continues to cycle
Check Limit Switch is operating

Burner remains on
Thermista-stat faulty

Limit Switch operating
Check temperature rise, if less than 60˚C, replace Limit Switch

Limit Switch not open circuit
Replace Electronic Module

Check return air path and air filter for restriction

Check burner bar pressure is not excessive

Fan speed too low
Check balancing knob on Electronic Panel is not set too low

Put Fan Override Switch on Electronic Module to continuous position

Fan speeds up
Bridge out Airflow Sensor and set Fan Sensor Switch to AUTO

Fan remains at slow speed
Replace Electronic Panel

Fan reaches maximum speed
Replace Airflow Sensor

Fan remains at slow speed
Replace Electronic Module

NON MODAIRFLOW SERIES

2

Models

J70-90

J55-65

JB40-50

JU40-50

JB16-20

JB25-30

Q44

HI-SPEC J30

HI-SPEC J50

HI-SPEC J65

HI-SPEC J90

HI-SPEC JU55

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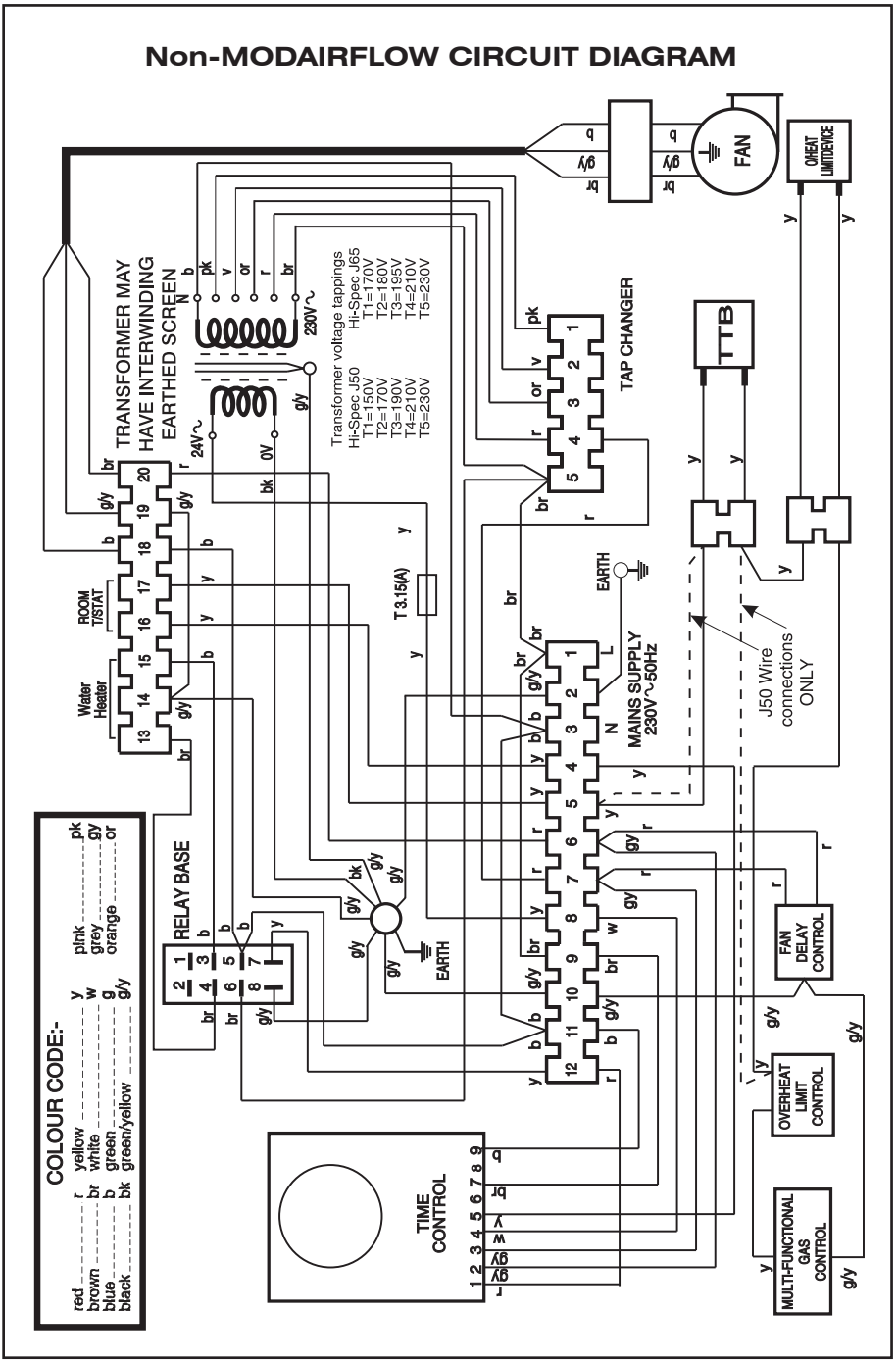
SYMPTOM	POSSIBLE CAUSE	REMEDY
Pilot will not light	No gas supply to heater	Check for gas at inlet pressure test point on Multifunctional Control
	Gas supply pipe not purged	Purge gas supply pipe in accordance with BS 6891
	Pilot orifice restricted	Clear pilot orifice or replace pilot injector
	Piezo system faulty	Check ignitor, lead and electrode
Pilot lights but goes out on releasing START button during initial light-up, or after normal operation	Connection between Thermocouple and Multifunctional Control not secured	Check connection is secure
	Faulty power unit on Multifunctional Control	Replace Multifunctional Control
	Faulty Thermocouple	Replace Thermocouple
	Pilot flame of insufficient length	Adjust
	Pilot orifice restricted	Replace pilot injector
Main burner lights but fan fails to run after approx 3 minutes	Loose electrical connection fan delay control	Check connections
	Fan control set incorrectly	Check for correct settings
	Faulty fan assembly	Replace, taking care not to damage impeller
	Faulty fan control	Replace fan control
	Burner setting pressure not correct	Adjust pressure as necessary
Main burner operating intermittently with fan running	Gas rate or burner pressure setting high	Check gas rate and burner pressure setting
	Temperature rise excessive	Adjust fan speed or gas rate accordingly
	Air filter or return air path restricted	Check filter is clean and air path is clear
	Excessive number of outlets closed	Open additional outlets
	Spillage of flue gases	Carry out spillage test and rectify
	Spillage monitoring device (TTB) faulty	Replace spillage device

SYMPTOM	POSSIBLE CAUSE	REMEDY
Main burner operating with intermittent fan operation	Gas rate or burner pressure setting too high	Check gas rate and burner setting
	Fan delay control set incorrectly	Check for correct setting
Fan runs for excessive period or operates intermittently after mains burner shuts down	Fan delay control not set correctly	Check for correct settings
Noisy operation	Gas pressure too high	Check burner pressure setting
	Noisy fan motor	Replace fan assembly
	Fan speed setting too high	Adjust fan speed
Pilot alight but main burner not igniting	Mains electrical supply not connected to heater	Check mains supply
	Controls not demanding heat. Room thermostat is operating correctly	Check the time control (if fitted) and room thermostat are operating correctly
	Loose connection to room thermostat, overheat (limit) control, gas control lead, time control or transformer	Check connections
	Transformer open circuit	Check with test meter and replace electrical panel if necessary
	Multifunctional control faulty	Replace multifunctional control
	Overheat (limit) control faulty	Short circuit control and replace if necessary
	Room thermostat or external wiring faulty	Fit temporary loop to heater thermostat socket. If heater ignites, external circuit or room thermostat is faulty
	TTB faulty	Check TTB and wiring for open circuit


Non-MODAIRFLOW CIRCUIT DIAGRAM
COLOUR CODE:-
red r
brown br
blue b
black bk
yellow y
white w
green g
green/yellow g/y
pink pk
grey gy
orange or
RELAY BASE
TRANSFORMER MAY HAVE INTERWINDING EARTHED SCREEN
24V~
0V
230V~
Transformer voltage tappings
Hi-Spec J50
T1=150V
T2=170V
T3=190V
T4=210V
T5=230V
Hi-Spec J65
T1=170V
T2=180V
T3=195V
T4=210V
T5=230V
ROOM T/STAT
Water Heater
T 3.15(A)
TAP CHANGER
EARTH
MAINS SUPPLY 230V~50Hz
TTB
J50 Wire connections ONLY
FAN
OVERHEAT LIMITDEVICE
FAN DELAY CONTROL
OVERHEAT LIMIT CONTROL
MULTI-FUNCTIONAL GAS CONTROL
TIME CONTROL

Models

HI-SPEC J25
HI-SPEC J25RS
HI-SPEC J25SC
HI-SPEC J32
HI-SPEC M31
HI-SPEC J40

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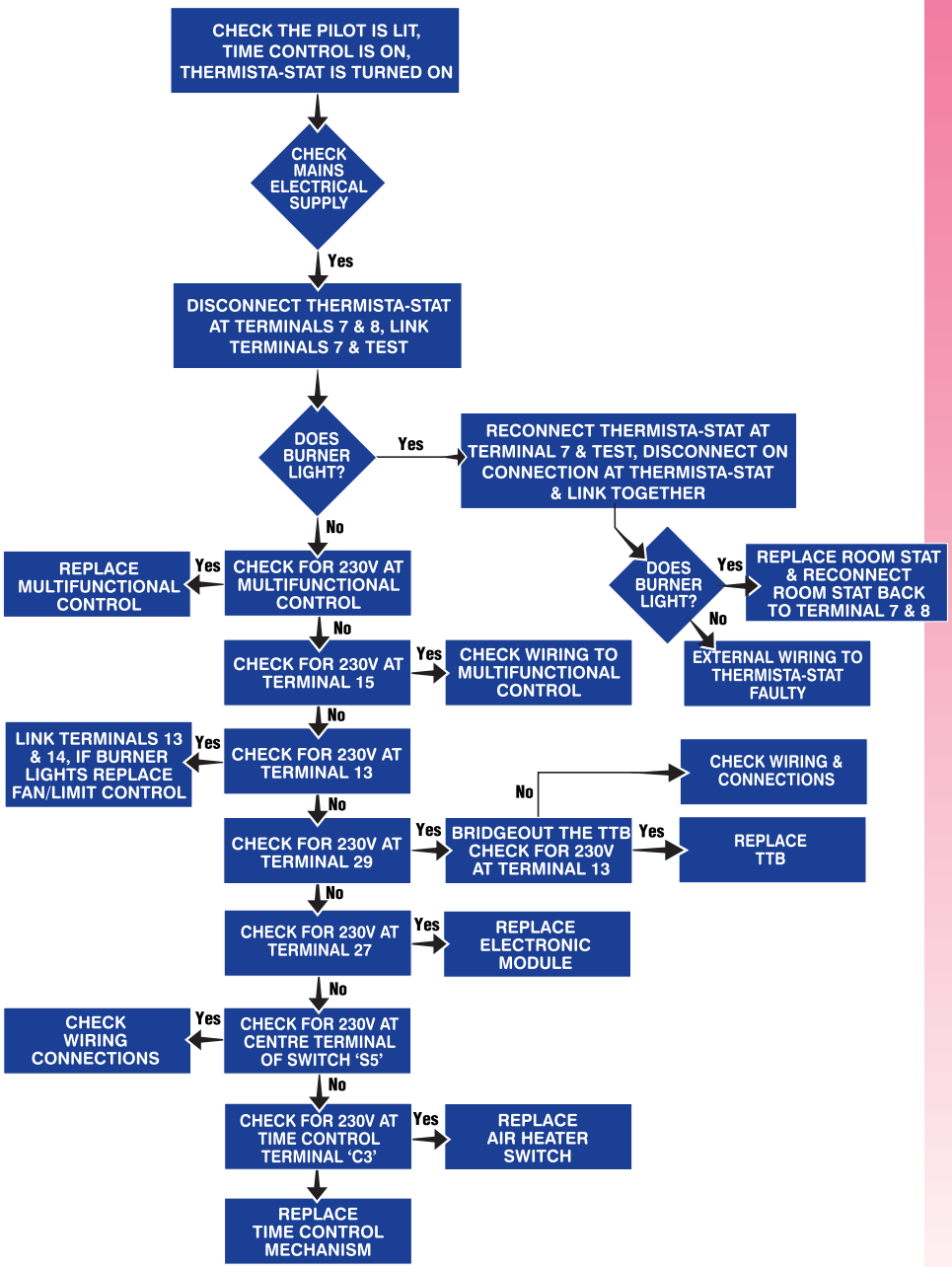
MAIN BURNER NOT OPERATING



MAIN BURNER ON BUT FAN NOT RUNNING

Check for voltage at fan terminals 30 & 31

No voltage
Link terminals 21 & 22 (FDC)

Fan runs
Replace replace FDC/ limit control

Fan does not run
Replace electronic module

Voltage detected
Disconnect black leads from capacitor & connect mains to fan

Fan runs
Replace capacitor

Fan does not run
Replace fan

MAIN BURNER CONTINUOUSLY ON (ROOM TEMPERATURE TO HIGH)

Set Thermista-Stat to 'SUMMER AIRFLOW'

Burner goes out
Replace Thermista-stat

Burner remains lit
Disconnect supply to Multifunctional Control at terminal 15

Burner goes out
Replace Thermista-stat

Burner remains lit
Replace Multifunctional Control

FAN ON BUT MAIN BURNER CYCLES BEFORE REQUIRED TEMPERATURE IS REACHED

Disconnect Thermista-stat at terminals 7 & 8

Link terminals 7 and 'TEST'. **DO NOT LINK 7 & 8**

Burner continues to cycle
Check Air Filter and Return Air path for restrictions

Burner remains on
Thermista-stat faulty

Burner continues to cycle
Check temperature rise, if less than 60˚C, link terminals 13 & 14 to bypass Limit Control

Limit Switch not operating
Replace Electronic Module

Burner continues to cycle
Replace electronic module

Burner runs and room temperature rises
Replace FDC/Limit Control

MAINS BURNER NOT CYCLING (ROOM TEMPERATURE TOO HIGH)

Disconnect Thermista-stat

Burner goes out
Replace Thermista-stat

Burner remains on
Disconnect yellow wire at Multifunctional Control

Burner goes out
Replace Electrical Module

Burner remains lit
Replace Multifunctional control Control

FAN CONTINUES TO RUN OR CYCLES AFTER HEATING IS TURNED OFF

Disconnect FDC

Fan stops

Replace fan delay/limit control

Check pilot is not too large

Fan continues to run

Replace electronic module

ECONOMAIRE

Models

ECONOMAIRE 25
ECONOMAIRE 31
ECONOMAIRE 32
ECONOMAIRE 50
ECONOMAIRE 65
ECONOMAIRE 90

NOTE:
FAULTS 4, 5 & 6 RELATE TO THE AIR HEATER, WHILST FAULTS 7, 8 & 9 RELATE TO THE WATER CIRCULATOR

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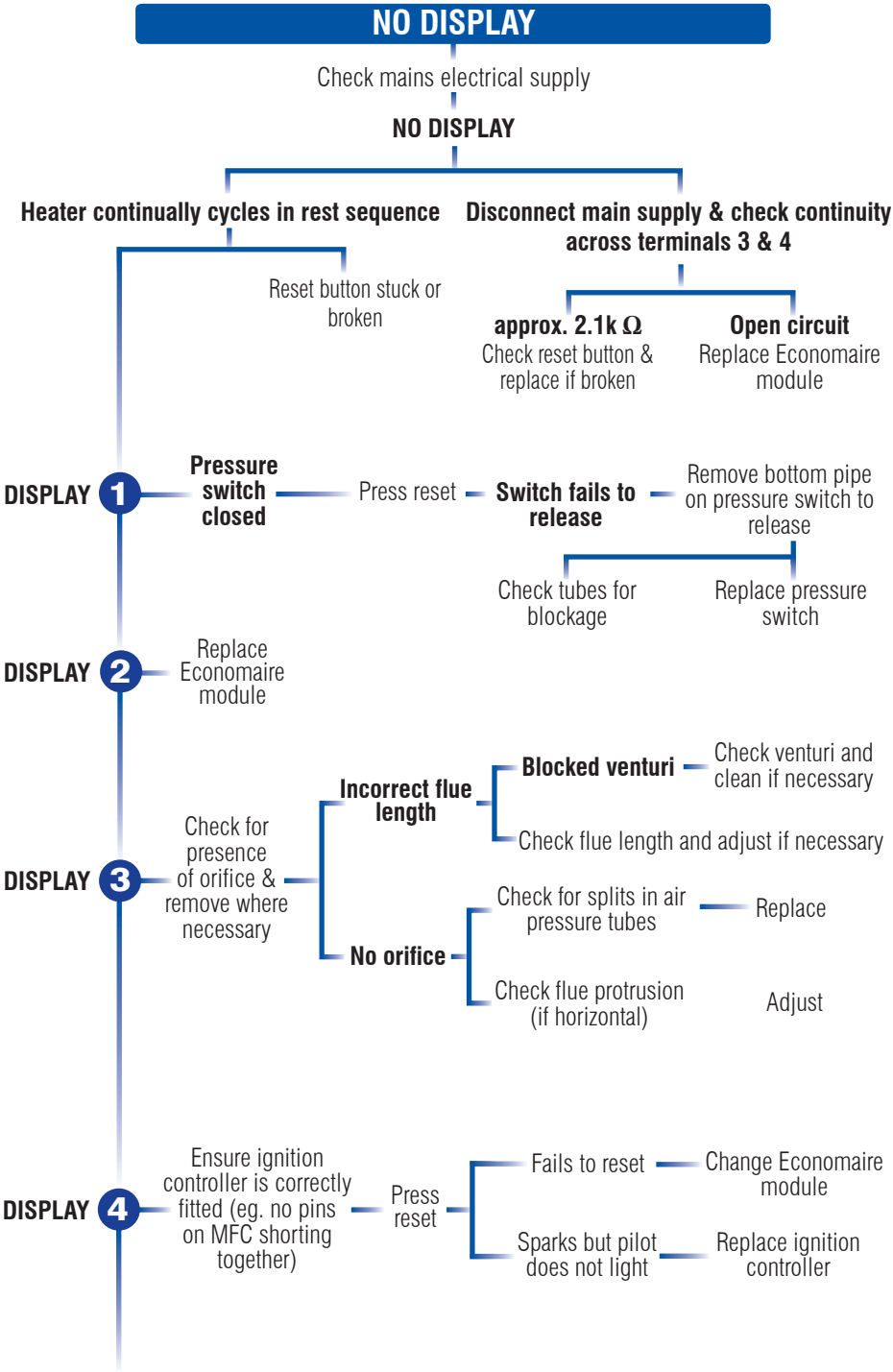
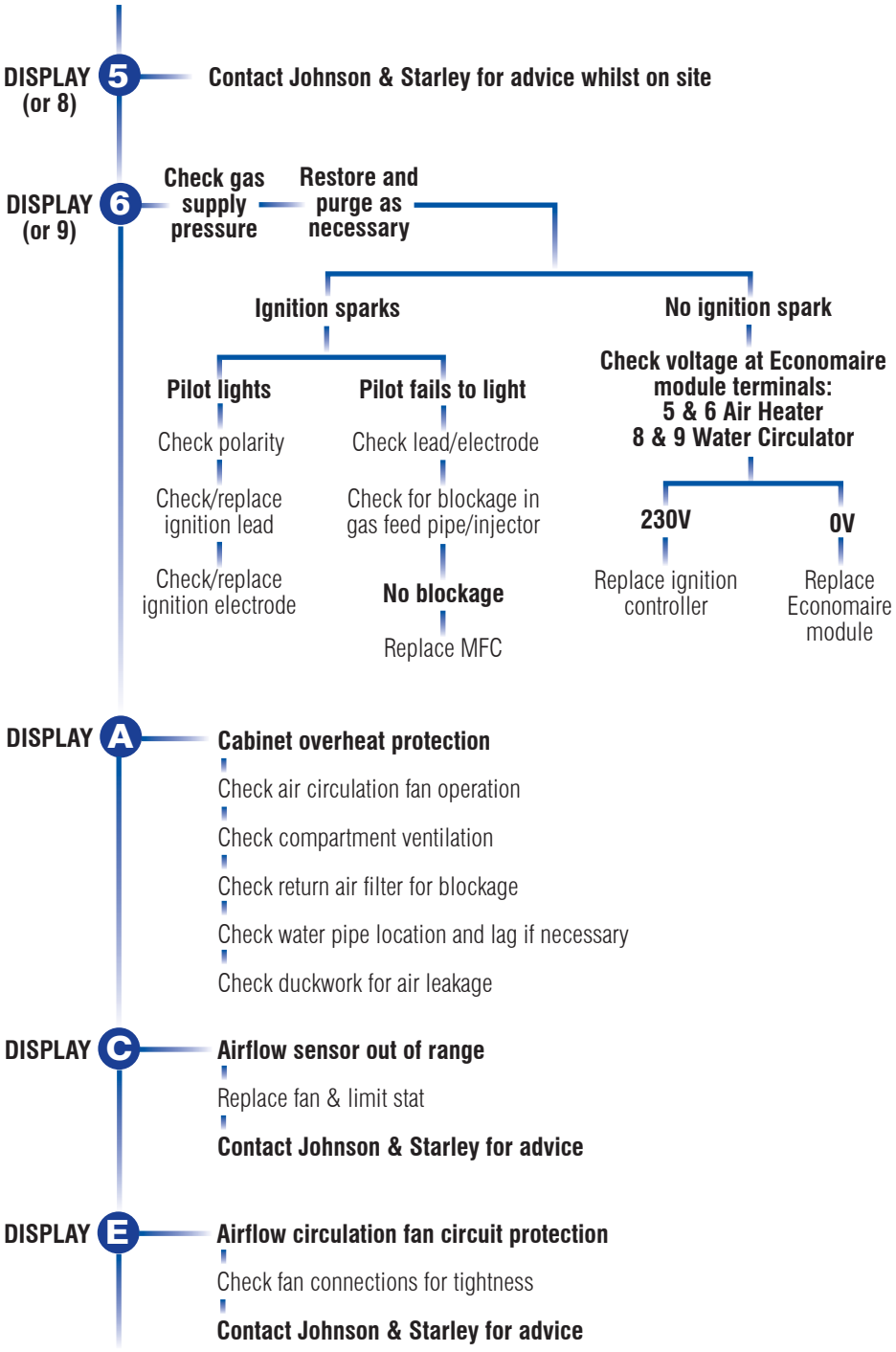
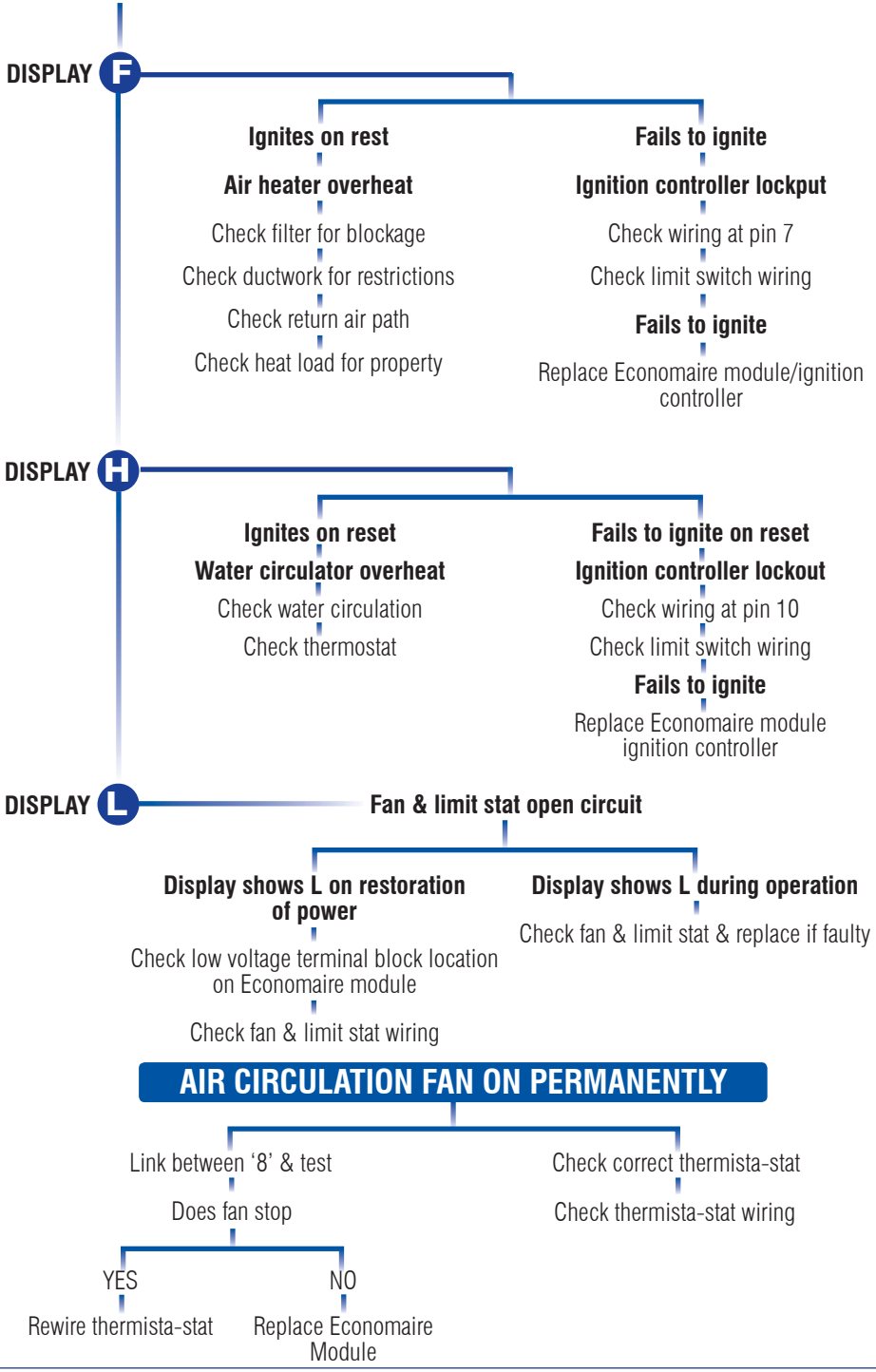

NO DISPLAY
Check mains electrical supply
NO DISPLAY
Heater continually cycles in rest sequence
Reset button stuck or broken
Disconnect main supply & check continuity across terminals 3 & 4
approx. 2.1k Ω
Check reset button & replace if broken
Open circuit
Replace Economaire module
DISPLAY 1
Pressure switch closed
Press reset
Switch fails to release
Remove bottom pipe on pressure switch to release
Check tubes for blockage
Replace pressure switch
DISPLAY 2
Replace Economaire module
DISPLAY 3
Check for presence of orifice & remove where necessary
Incorrect flue length
Blocked venturi
Check venturi and clean if necessary
Check flue length and adjust if necessary
No orifice
Check for splits in air pressure tubes
Replace
Check flue protrusion (if horizontal)
Adjust
DISPLAY 4
Ensure ignition controller is correctly fitted (eg. no pins on MFC shorting together)
Press reset
Fails to reset
Change Economaire module
Sparks but pilot does not light
Replace ignition controller


DISPLAY 5 (or 8)
Contact Johnson & Starley for advice whilst on site
DISPLAY 6 (or 9)
Check gas supply pressure
Restore and purge as necessary
Ignition sparks
No ignition spark
Pilot lights
Pilot fails to light
Check polarity
Check/replace ignition lead
Check/replace ignition electrode
Check lead/electrode
Check for blockage in gas feed pipe/injector
No blockage
Replace MFC
Check voltage at Economaire module terminals: 5 & 6 Air Heater 8 & 9 Water Circulator
230V
0V
Replace ignition controller
Replace Economaire module
DISPLAY A
Cabinet overheat protection
Check air circulation fan operation
Check compartment ventilation
Check return air filter for blockage
Check water pipe location and lag if necessary
Check duckwork for air leakage
DISPLAY C
Airflow sensor out of range
Replace fan & limit stat
Contact Johnson & Starley for advice
DISPLAY E
Airflow circulation fan circuit protection
Check fan connections for tightness
Contact Johnson & Starley for advice


DISPLAY F
Ignites on rest
Air heater overheat
Check filter for blockage
Check ductwork for restrictions
Check return air path
Check heat load for property
Fails to ignite
Ignition controller lockput
Check wiring at pin 7
Check limit switch wiring
Fails to ignite
Replace Economaire module/ignition controller
DISPLAY H
Ignites on reset
Water circulator overheat
Check water circulation
Check thermostat
Fails to ignite on reset
Ignition controller lockout
Check wiring at pin 10
Check limit switch wiring
Fails to ignite
Replace Economaire module ignition controller
DISPLAY L
Fan & limit stat open circuit
Display shows L on restoration of power
Check low voltage terminal block location on Economaire module
Check fan & limit stat wiring
Display shows L during operation
Check fan & limit stat & replace if faulty
AIR CIRCULATION FAN ON PERMANENTLY
Link between '8' & test
Does fan stop
YES
Rewire thermista-stat
NO
Replace Economaire Module
Check correct thermista-stat
Check thermista-stat wiring

PROPORTIONAL BALANCING

(Use in conjunction with **Johnson & Starley**:- Balancing procedure sheet using an airflow meter and thermometer.)

1. Set Heaters to Summer Airflow mode.

2. Calculate guide balancing velocities

BALANCING PROCEDURE SHEET				
Room 1 Column 1	Heat Required (kW) Column 2	Register/ Diffuser Size Column 3	Air Velocity Factor Column 4	Guide Balancing Velocity **Column 2 x Column 4 =** Metres per second

3. Transfer the guide balancing velocities to column **A** on the following table.

		A	B	C	D
Warm air outlet number	Room	Guide balancing velocities	Measured Velocities	Column B / Column A	Balancing velocities Column A x Av Column C

4. Partly close the balancing dampers of the registers closest to the heater.

5. Measure the air velocity at each outlet and enter in column **B** .

6. Divide the figures in column **B** by the figure in column **A** and enter the result in column **C**.

7. Total the figures in column C and divide by the number of outlets to give an average.

8. Multiply each guide velocity (**A**) by the average (note 7) and enter the result in column **D**.

9. Balancing the system using the velocities in column D by adjusting the balancing dampers at the registers or the balancing screws/levers on the diffusers.

10. Set heater to heating mode and check temperature rise as opposite.

Temperature rise checking across the heater

The temperature rise between the nearest available point in the return air duct and the nearest available point on the supply air duct must be between 45˚C and 55˚C; check as follows.

Ignite the pilot and main burners and allow 15 minutes of operation.

Set the burner bar pressure to give the required heat output as per the installation instructions.

If necessary adjust the maximum fan speed to give the temperature rise as per installation instructions:-

On **Basic Controlled Heaters** select the correct tapping at the control panel.

On **Modairflow Heaters** adjust the balancing screw at the control Panel.

On **System E-T Heaters** set the rate switch at the control Panel.

On **Economaire Heaters** the control system will automatically adjust the fan speed.

AIR VELOCITY FACTORS					
REGISTER SIZE		Air Velocity Factor	DIFFUSER SIZE		Air Velocity Factor
in x in	mm x mm		in x in	mm x mm	
6 x 4	150 x 100	1.48	2.25 x 10	57 x 250	1.58
8 X 4	200 x 100	1.14	2.25 x 12	57 x 300	1.33
8 X 6	200 x 150	0.75	2.25 x 14	57 x 350	1.14
10 X 6	250 x 150	0.6	4 x 10	100 x 250	0.9
10 X 8	250 x 200	0.44	4 x 12	100 x 300	0.75
12 X 6	300 x 150	0.51	J&S Mini		3.4
12 X 8	300 x 200	0.37			

HEAT EXCHANGER CHECK

With air circulation fan assembly and burner/controls assembly, heat exchanger cover and inspection plates (if fitted), removed, clean the heat exchanger flueways by thoroughly brushing from above and below.

By viewing through the Fan Aperture, using a torch or similar, examine the heat exchanger externally for signs of cracks or holes, particularly around welded joints.

Using a torch or similar, introduce a light source into the heat exchanger burner aperture and upper access port, and again examine the heat exchanger for signs of cracks or holes, particularly around welded joints, whilst again viewing through the fan aperture. Refit the air circulation fan, burner and controls assembly, and air filter / air cleaner.

Light the appliance and note main burner flame profile. If the flame profile is affected when the Air Circulation fan switches on, check for any leaks between the air heater and the base plenum, paying particular attention to heaters with rear draught diverters. Rectify any air leaks before continuing with this procedure.

Allow the air heater to operate for approximately 15 minutes to ensure stability, and with the main burner lit, ensure that the operation of the Air Circulation Fan does not affect the main burner flame profile.

If no defaults are found and the appliance is working correctly, servicing / commissioning should proceed.

SPILLAGE TEST

Carry out a full test as follows, and ensure that the flue operates effectively with all doors and windows closed and any extractor fans in operation.

NOTE: If an extractor fan is situated in an adjoining or adjacent room, carry out the spillage test with the interconnecting doors open.

If the draught diverter is accessible:
(With the appliance operating fully)

a) Introduce smoke, into the draught diverter adjacent to an exit from the heat exchanger, by means of a smoke match or puffer.

b) Ensure that there is no spillage present (indicated by displacement of smoke downwards and out of the draught diverter).

If the draught diverter is not accessible:
(With appliance pre-heated)

a) introduce smoke by means of **part** of a smoke pellet on a non-combustible support, into the heat exchanger.

b) Extinguish both the Mains and Pilot burners.

c) Ensure that there is no spillage evident by visually observing the draught diverter location on the air heater.

d) If spillage is evident, further investigation and rectification is required before re-testing the appliance.

e) Repeat spillage tests but with the fan running, or summer airflow switch set to ON.

WARNING: The appliance shall not be left connected to the gas supply unless it has successfully passed the above spillage test.

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