powrmatic

OIL FIRED WARM AIR HEATERS

Commisioning and Maintenance Instructions

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Contents

Powrmatic Range of Warm Air Heaters

1 Introduction

The Powrmatic Range of Oil-Fired Warm Air Heaters covers every possible application, with outputs from 100,000 1,500,000 Btu/h.

The standard unit is the freestanding Commercial Aire unit incorporating swivel type distribution heads but these units are also available with inlet and outlet spigots suitable for connection to ductwork.

All units are also available as horizontal or counterflow units.

The External Aire fully weatherproof range enables the unit to be mounted externally either on the ground or as a roof-top unit.

The range is complimented by the Compacto Series, which is a lower cost alternative to the Commercial Aire with sizes of 100, 150, 200, 300, 400, 500, 600, 700, 800, 1000 and 1,250,000 Btu/h.

2 Construction

Frame

All Powrmatic heaters are based on the exclusive Formex method of construction, providing a framework of exceptional strength and pleasing design.

Exterior Panels

The exterior panels are manufactured from 1.2mm (18 swg) steel, epoxy powder coated and baked. The lower louvred panels are removable for servicing and maintenance purposes.

Insulation

All panel framework surfaces are fully insulated with aluminium foil-backed fibreglass sheeting marked with the Powrmatic logo.

Distribution

The air heaters are available with a choice of discharge head plans. The heads can be rotated through 360° to achieve the desired overall air distribution pattern. Alternatively the units can be supplied fitted with a spigot suitable for connection to ductwork.

Controls

The air heaters are fitted with fan on/off controls; safety overheat limit controls; flame failure controls; motor overload controls; affording completely automatic operation of the equipment.

Powrtrol

As a standard feature, each air heater is supplied with a Powrtrol centralised control station, incorporating time clock, room and frost thermostat. This control panel ensures the correct operation of the heater both by day and by night.

Heat Source - Oil Burners

The heat source is a well proven pressure jet oil burner comprising burner fan housing, blast tube with turbolator, combustion head assembly, electrode leads, transformer, burner fan impellor, oil pump and burner motor. The flame of the oil burner is matched to the heat exchanger design, ensuring maximum efficiency.

3 Installation Instructions

Weight

Before installing the heater, the mounting arrangement should be checked to ensure it will support the weight of the heater.

Clearance

Provided the heater is not installed in a confined space, no special precautions are necessary other than to ensure that sufficient clearance is allowed all round for ease of maintenance, dependendent upon size of heater.

Air Heater

When the heater is installed in a confined space, an adequate air supply both for combustion and main fans correspond to the area of one long side inlet panel. When the heater is in a confined space or in an area of negative pressure, the burner must be fitted with a combustion air intake adaptor and ducted to an outside source of air. This can be supplied by Powrmatic on request.

It is important that the burner fan never competes for air with the main fans (see Fault Finding).

Supports

It is most important that the unit be mounted in such a manner that it is both level and evenly supported. Failure to ensure this will result in forces being transmitted through the frame causing distortion of the frame members. Should this be excessive extra loads will be transmitted to the sub-components and in particular the main fan bearings causing premature failure.

Flue

Ideally the flue should terminate 1m higher than the highest point of the roof, or at least 1m higher than the section of roof through which it projects. It should provide a negative pressure at the base of the flue between -0.75 mm w.g. (-0.03" w.g.) and -1.5 mm w.g. (-0.06" w.g.). A draught stabiliser should be fitted where a negative pressure of -1.5mm w.g. is exceeded. The flue itself should be as vertical as possible, avoiding sharp bends and horizontal runs. Each heater must be fitted with its own individual flue and must on no account be connected to a flue serving another heater or appliance.

Where a long or tortuous flue is unavoidable, an Induced Draught Fan is strongly recommended.

Powrmatic strongly recommend that a condensation trap should be incorporated to prevent damage to the heaters. The Powrmatic range of stainless steel flues are suitable for

application to the heaters and includes the following items: Straight Flue Pipe, Bends, Draught Stabilisers, Adjustable Roof Flashing, Two types of weathering cowls - the Standard Weather Cowl, and a Storm Cowl.

Oil Supply

Powrmatic oil fired air heaters are designed to burn 35 sec. gas oil. This should normally be stored in a tank as close to the heater as possible, outside the building. Reference should be made to B.S. 799 Part 2 and to any local Bye-Laws and Regulations. The size of the oil tank will depend on the quantity of oil used per day, and the delivery terms offered by the oil company. The tank must not be galvanised or painted inside, but must be painted outside with a base coat of red oxide, and normally finished with bitumastic paint.

Tanks should not be mounted directly on to the earth surface but should either be raise clear of the ground on suitable saddles or similarly mounted over concrete catch pits. In the latter case the catch pit should be so constructed as to have a net volume of at least 10 per cent greater than the volume of the tank. The catch pit should have a sump and floors sloped to it.

N.B.1. Galvanised tanks and pipes must not be used.

N.B.2. Flow and return oil connections on the oil pump are ¼" B.S.P. and the final connections should be made in flexible pipe.

N.B.3. Mains pressure to inlet side of pump must not exceed 2 Bar .

Pipe Systems (Refer to Appendix for details of Pump and Pump Sizing) Single Pipe or Gravity Feed System

Several units may be fed from a common pipe in this way, but the common pipe must be proportionally bigger in diameter. The distance to the furthest unit, together with its oil consumption, will determine the height of the tank. The height of the tank above the burner should not in any case exceed 10 feet.

The illustration below shows the recommended arrangement of tank piping and fittings for a single pipe system. The outlets of the oil tank must be above the level of the burner.

1. Oil Tank
2. Tank Gauge
4. Vent Cap
5. Fill Cap
6. Tank Valve
7. Gate Valve
8. Oil Filter
9. Fire Valve
10. Sludge Valve
11. Return to flow

N.B. An oil filter is essential and must always be fitted.

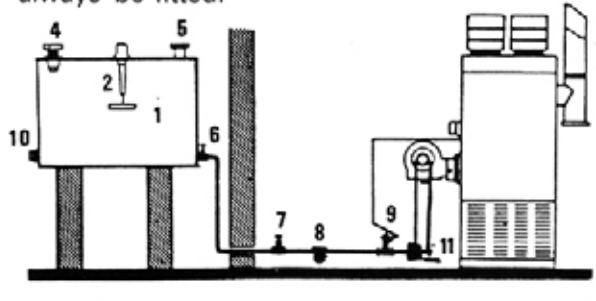


Fig 1. Tank Piping for Single Pipe System

Two Pipe System

Burner above Tank: for any installation in which the tank is below the pump, the single pipe system, is not suitable. On all these applications, the two pipe systems illustrated below may be used.

1. Oil Tank
2. Tank Gauge
4. Vent Cap
5. Fill Cap
6. Tank Valve
7. Gate Valve
8. Oil Filter
9. Fire Valve
10. Return Line
11. Non-return Valve

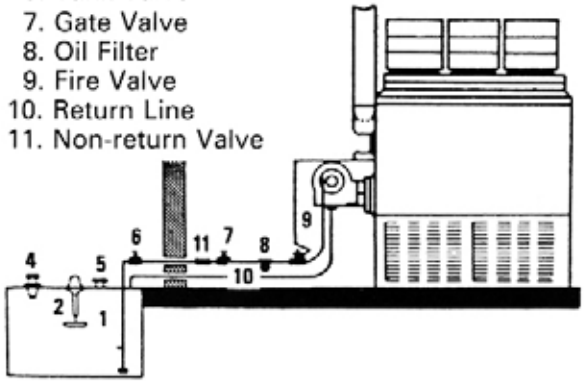


Fig 2. Tank piping for Double Pipe System

Daily Service Tank System

This is a system, frequently used where several units are involved and especially where long pipe runs or high lifts are necessary.

1. Oil Tank
2. Tank Gauge
3. Transfer Pump
4. Vent Cap
5. Fill Cap
6. Tank Valve
7. Gate Valve
8. Oil Filter
9. Fire Valve
10. Sludge Valve
11. Daily Service Tank
12. Float Switch
13. Return to flow

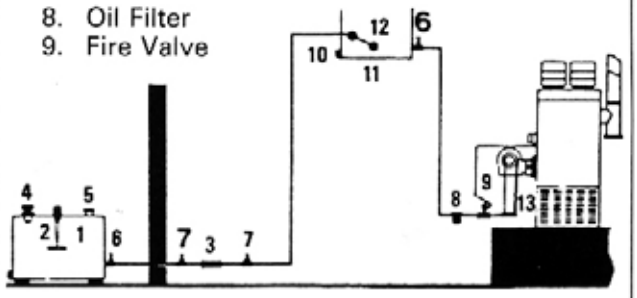


Fig 3. Daily Service Tank System

4 Starting Instructions

1. Check that the oil tank is full, and that all oil connections in the line are secure with no open ends.
2. Check that all valves between the oil tank and the oil burner are open and that the correct grade of oil (35 sec.) is in the tank.
3. Check electrode, combustion air and head settings are correct.
4. Check that the fire valve is in the open position, is of the spring loaded type, and that the cable is taut.
5. Vent systems by removing quarter flexible oil connection adjacent to the pump until oil flows freely and no air globules can be seen in the oil flow. Reconnect.
6. Turn the room thermostat to maximum. This must be above ambient in order for the heater to operate. If for any reason the ambient temperature is excessive when commissioning the unit, then the thermostat terminals in the control box must be bridged. Remove bridge between connections on panel, before leaving the unit.
7. On Models utilizing Honeywell L4064 thermostat, set the fan "on" pointer on the combination fan and limit to approximately 50°C and set the fan "off" pointer to approximately 30°C.
   If fitting replacement L4064 check tag has been removed between bottom terminals.
8. On Models utilising White Rogers, set the fan "on" point of the fan and limit control to approximately 50° C and the "off" to 30°C.
9. Ensure that the limit pointer on the fan and limit control is set to 90°C. Heater only guaranteed to maximum setting of 93°C on limit control.
10. Check that the fan belts are of the correct tension and correctly aligned (this is factory set but, as there is a possibility of movement in transit, the correct tension should allow ½" of movement when the belts are pressed together between thumb and forefinger).
11. Ensure that the time clock is set at the customer's appropriate time and in the "on" position.
12. If the unit is being commissioned during a time normally in the "off" cycle on the time clock, then the clock by-pass button should be advanced.
13. On a one pipe system, where the tank is above the oil burner pump, be sure to bleed air out of the system.

NOTE: Where a Riello oil pump is fitted on a Riello burner there is no internal circulation and therefore on a one pipe system the return must be connected into the flow to the pump.

14. On a two pipe system, air bleeding is automatic.
15. In order to check the pressure, remove the small gauge port on the face of the pump and fit a pressure gauge for test reading.
16. Turn on the power supply from the main isolator and press the reset button on the control box if the red light appears. The heater should now start. Check main fan rotation on three-phase supply. If rotation is incorrect, change two- phase wires over.
17. The oil pressure should be checked and adjusted if necessary to the appropriate pressure.

NOTE:

°C	°F
29	84
55	130
60	140
82	180
90	194
93	200

5 Commissioning Instructions

1. Follow the starting instructions (see section 4)
2. Allow the heater to run for approximately ten minutes to settle down.
3. If fitted adjust the draught stabiliser to give a negative pressure of between -0.75mm w.g. (-0.03" w.g.) and -1.5mm w.g. (-0.06"w.g.). The measurement should be taken at the flue offtake of the heater prior to the draught diverter.
4. Make a check to ensure there is no heavy flame impingement on the heat exchanger.
   NOTE: Take care when opening pressure relief door as the combustion chamber may be slightly pressurised.
5. Measure the smoke number. If the figure is greater than one, increase the burner air supply until this number is achieved. Take a CO^2 measurement and a flue temperature (subtracting ambient temperature to give a nett flue temperature). Compare this with the data plate figures to achieve the best perform ance of the heater.
6. Complete the commissioning by checking the con trols operation viz:- time clock, room thermostat and frost thermostat as well as fan and limit thermostat.
7. Complete and return the warranty registration card to Powrmatic Ltd.

NOTES: On ducted heating systems -

1. Check that the main fan motor is not being overloaded. This will occur when insufficient resistance is imposed by the duct system, giving a higher than standard operating volume.
2. Check the temperature rise through the unit -that is, the difference between the average leaving temperature and the average inlet temperature is approximately 29°C. The average air leaving temperature should not exceed 82°C. Leaving air temperature approaching or exceeding 93°C will cause the heater to shut down on limit protection.
3. On three-phase units, the direction of rotation should be checked and, if necessary, reversed by changing over two of the phases. All heaters fitted with three-phase motors are provided with overload protection, fitted to the motor contactor and this should be set by the pointer on the side of the overload adjacent to the contactor against the pointer scale to the nameplate amps +15%. Should the unit operate without the main fans coming on, press the red overload reset button on the motor contactor.
   If this does not cause the fans to run, check the wiring. All heaters fitted with single-phase main fan motors incorporate built-in overload protection on the motors.

Control Sequence

The control sequence through which the unit will go during the start-up operation is as follows:

1. The room thermostat calls for heat (i.e., ambient temperature is below that which is set on the room thermostat).
2. The burner motor, fan and oil pump are started and go through a pre-purge cycle purging the heat exchanger.
3. At the same time as the pre-purge cycle starts, the ignition transformer is energised and a spark at the electrode tips can be both seen and heard (a small buzzing sound).
4. The oil solenoid is energised after 15 seconds, allowing oil to the burner nozzle.
5. Flame is established and ignition continues for a short period (see details on control boxes).
6. The photocell, illuminated by the flame and therefore acknowledging flame establishment, switches off the ignition spark and the starting sequence is completed.
7. After flame establishment, the heat exchanger temperature is raised to the pre-determined point set on the fan and limit control (fan on setting). On reaching this temperature the main fan will commence to operate delivering warm air.
   If the room thermostat is satisfied, the oil burner will shut down, leaving the mains fans running until the heat in the heat exchanger is dissipated. When the heat exchanger is cooled (fan off setting), the main fan will cease to operate.
   If a fault occurs during the start up sequence, the control box will go to lock-out and the warning lamp on the control box will light up to indicate this. To re-start the unit, press the lock-out button on the control box.
   If, for any reason the flame goes out during operation, the control sequence is designed in such a way as to permit the unit to attempt one automatic re-start. If, during this attempt, the unit fails to re-start, it will automatically go on to lock-out and the light will appear on the control box.
   If, for any reason, insufficient air is passed over the heat exchanger due to the air inlets being restricted in any way, the unit will switch off on the limit safety control. Once the heat exchanger has cooled the limit thermostat must be reset to restart the burner. (Red button on Honeywell fan/limit 'stat. White Rogers is self resetting). Ensure any blockage is removed from the heater airways before attempting to refire the burner.

When Stopping the Heater

It is important that this is done through the room thermostat or time clock circuit in order that the main fan may continue running until the fan off temperature is reached. This procedure ensures that the hot heat exchanger is always cooled by the main fan prior to shut down and is never allowed to "bake" which results in strain and deterioration.
Do not switch the unit off directly from the mains unless it is an emergency.

6 Fault Finding

Symptom	Fault	Solution
1. Thermostat and clock call for heat. Mains input is made but burner does not start, no ignition spark occurs. Control Box has not gone to "lock-out".	1. Faulty Control Box.	1. Replace Control Box.
	2. Open circuit on control line, i.e., faulty stat, clock or loose connection.	2. Check circuit from output of Control Box back to Control Box. Replace faulty wire or component.
	3. Limit thermostat operated.	3. Check for reason and reset.
2. Thermostat and clock call for heat. Mains input is made but burner does not start, no ignition spark occurs, Control Box has gone to "lock-out".	1. Faulty Control Box.	1. Change Control Box.
	2. Fault is ignition circuit.	2. Check output from Control Box to transformer, check for shorting to earth, cracked electrodes, loose transformer terminals. Check oil burner motor wiring is correct and motor is functioning correctly.
3a. Stat and clock call for heat, main input is made. Ignition sparking occurs, burner motor does not start, no flame. Control Box goes to "lock-out".	1. If supply arrives at motor, then faulty motor or neutral connection not made.	1. Replace motor or re-wire neutral. Check fan motor capacitor.
	2. If supply does not arrive at motor.	2. Check wiring back to Control Box.
	3. If signal is not leaving Control Box, then faulty box.	3. Replace Control Box.
3b. Stat and clock call for heat. Mains input is made. Ignition sparking occurs, burner motor starts but flame is not established at all. Control Box shows "lock-out".	1. Burner did not stabilise flame on start-up. Therefore box went to "lock-out".	1. Press reset button on Control Box.
	2. Lack of oil or air lock.	2. Check oil is available to pump. Bleed if necessary. Check pump is being driven through coupling. Check pump pressure. Replace pump if faulty. Check fuel line and nozzle for blockages.
4. As 3a, but flame is partly established and Control Box shows "lock-out".	This might be called a "STANDARD LOCK-OUT" CONDITION.	
	1. Flame is unstable. Photocell received too small a signal, therefore box goes to "lock-out".	1. Press "lock-out" button and check another start. If burner starts well this time, previous failure can be ignored. If, however another "lock-out" takes place, then refer to faults 2, 3 and 4.
	2. Either excessive draught is pulling the flame off the burner or insufficient draught is preventing stabilisation.	2. Measure the draught in flue. This should between -0.75mm w.g. - 1.5mm w.g. (-0.03"/-0.06" w.g.) A draught stabiliser should be fitted to obtain the correct draught where excessive chimney pull is experienced.
	3. Incorrect amount of combustion air.	3. Adjust on burner inlet, approximate settings given on pages 23 and 24.
	4. Position of Fuel Line. Assembly is correct.	4. Remove and check relative position of flame ring, nozzle and relative to end of blast tube, pages 23 and 24.
	5. Faulty Photocell or wiring.	5. Check circuit to Photocell and Control Box.

5. Burner starts up and runs satisfactorily, but then shuts off without going to "lock-out" with clock and room stat still calling for heat.	1. Heater has "Gone out on limit" due to over-firing.	1. Check that nozzles and nozzle pressures are in accordance with pages 23 and 24.
	2. Heater has "Gone out on limit" due to shortage of air.	2. Check that fan belts are tight and that inlet or outlet are not excessively restricted.
	3. Fault on fan and limit thermostat.	3. Check element is clear of heat exchanger or replace thermostat.
6. Burner starts up but pulsation takes place is the combustion chamber.	1. Pressurised combustion chamber.	1. Check flue system throughout is capable of giving sufficent draught and burner air is correctly set.
	2. Fault on burner.	2. Check burner throughout including nozzles, pressures and settings of components.
	3. Fault in oil supply.	3. Check sufficient oil is reaching the burner and it is of correct viscosity (35 sec.) and there is no air in the oil line.
7. Burner starts up. Main fan starts up and runs for a short period then stops.	1. Incorrect settings on fan control thermostat.	1. Reset fan on/off or set to larger differential between the two.
	2. Main fan motor over-load setting is incorrect. (three-phase only).	2. Check F.L.A. rating on motor nameplate and set overload on the contactor in the control panel to plus 15% of that value.
	3. Main fan motor is being overloaded.	3. Measure current (amps) to main fan motor. If this is greater than 15% of nameplate amps then air volume either inlet or outlet duct system must be reduced.

7 Servicing Instructions

Routine Service during Operating Period

The Powrmatic Air Heater has been specifically designed to operate with a minimum of servicing. However, to ensure that optimum operating efficiency is obtained, it is recommended that the following servicing procedure is undertaken.

First

1. Start unit, check condition of burner flame, etc., check operating efficiency.
2. Switch off unit, main isolator, remove main fuses.

Fuel Supply/Burner

3. Crack open sludge valve, draw off water/ condensate from main oil storage tank into container.
4. Close oil valve at tank and burner.
5. Remove main oil line filter. Fit new cartridge.
6. Remove burner from combustion chamber. Loosen screws holding blast tube and withdraw.
7. Remove the nozzle and filter from end of the fuel line. Wash the fuel line through with clean fuel and fit a new filter and nozzle if necessary, using the correct nozzle spanner.

   Note: Impingement after nozzle replacement will be checked as part of Starting (See Starting Instructions). Check oil line for leaks and rectify same. Remove and clean photo-electric cell.
8. Check and clean burner fan. Brush fan blades free of dust. heck that the fan impellor is running free in the casing.
9. Reassemble the complete combustion head assembly, and check relative positions of electrodes.
10. Check the motor.

Flue/Heater exchanger

11. Check and clean flues and examine combustion chamber for distortion, cracks, etc.

Main Fan Motor and Drive

12. Remove the inlet panel underneath the burner. Clean unit louvres.
13. Check fan impellor is not rubbing and there is no excessive vibration. Check blades and brush clean where necessary. Check the belts for wear. If there is any sign of fraying or splitting, the complete set of belts should be replaced; if one belt or more of a set are slack and it is found difficult to obtain even tensioning across the set, then the whole set should be replaced.
14. Check the pulley grooves for wear. This may only be slight and may appear on only pulley of the pair, usually the drive pulley. This pulley must be replaced or further wear will take place resulting in the failure of all belts and both pulleys. Pulleys should be withdrawn by use of a pulley extractor after first removing the fixing or grub screws in the hub of the pulley. The motor shaft should be cleaned with emery cloth before fitting the new pulley, which should be a push fit onto the shaft. The key should be lightly tapped in and the fixing screw tightened onto it.
15. Examine bearings for wear (remove belts), check for excessive play or tightness, check mountings and mounting arms for distortion. Replace where necessary.

Electrics

16. None of the electrics requires any maintenance as such, but the service engineer should examine the wiring for loose connections, any signs of cracked or weakened insulation, tracking or shorting to earth.

    This also includes the Powrmatic, Powrtrol, Thermatrol, and Eurotrol Unit. Any faulty component must be replaced.

General

17. Switch on power, replace main fuses, start plant.
18. When firing, check safety lock-out period by removing photocell.
19. Re-start plant, check operation of all thermostats in the circuit.
20. Check operating efficiency and compare with commissioning figures.
21. Ensure that all air intakes are free from combustion.

Overhaul during shutdown

The normal overhaul visit during shutdown period.

First

1. Start unit, check condition of burner flame, etc., check operating efficiency.
2. Check oil flow from pump.
3. Isolate the unit from the main electrical supply. Clean out flue ways.

Flue/Heat exchanger

4. Remove the panel from the heater. Check the insulation inside the panels is still intact. Then remove the clean-out door from the heat exchanger. Examine heat exchanger for faults, i.e., distortion, etc., and clean out.
5. Remove swirlers and clean. Clean out soot. Renew the gasket. Replace swirlers and renew where necessary.
6. Bolt clean-out door back on, making sure to tighten all nuts securely to elimiate any air gaps.

7. Clean and check flues and combustion chamber for distortion, cracks, etc.
8. Replace nuts and studs as necessary. Drill and tap.
9. Renew gasket as necessary.
10. Replace service panel.

Fuel Supply/Burner

11. Cartridge filter. Remove cartridge from filter in oil line and insert new cartridge.
12. Servicing the oil burner. Crack open sludge valve, draw off water/condensate from main oil storage tank into container.
13. Close valve at tank and burner.
14. Remove main oil line filter and replace with a new cartridge.
15. Remove burner from combustion chamber, loosen screws holding blast tube and withdraw.
16. Remove the nozzle and filter from the end of the fuel line. Wash the fuel line through with clean fuel and fit a new filter and nozzle if necessary, using the correct nozzle spanner.

    (Note: Impingement after nozzle replacement will be checked as part of Starting (see Starting Instructions). Check oil line for leaks and rectify same. Remove and clean photo-electric cell.
17. Examine the electrodes for signs of tracking and for any form of cracking, however fine. Replace as necessary.
18. Reassemble the complete combustion head assembly, and check relative positions are correct and replace blast tube.

Main Fan Motor and Drive

19. Check the belts for wear. If there is any sign of fraying or splitting, the complete set of belts should be replaced; if one belt or more of a set are slack and it is found difficult to obtain even tensioning across the set, then the whole set should be replaced.
20. Check the pulley grooves for wear. This may only be slight and may appear on only one pulley.

    This pulley must be replaced or further wear will take place resulting in the failure of all belts and both pulleys. Pulleys should be withdrawn by use of a pulley extractor after first removing the fixing screw in the hub of the pulley. The motor shaft should be cleaned with emery cloth before fitting the new pulley which should be a push fit onto the shaft. The key should then be lightly tapped in and the fixing screw tightened down onto it.
21. Fitting and tensioning belts. When fitting new belts these should always be fitted loosely over the pulleys by first slackening off the motor adjustment nut. Then remove the old belts, slip the new belts over the pulleys and re-tension.
22. Electric motors for main fans. Provided these are not being over-loaded, these require very little servicing, but the running current of the motor in relation to the nameplate amperage should be checked. Oil lubricated motors require a few drops of Shell Voluta 27 or equivalent. Grease lubricated motors are fitted with grease nipples. These should receive at the most 1//4 stroke from a grease gun yearly. Remember over-lubrication causes more motor failures than under-lubrication.
23. Main fan bearings. Normally these should require no maintenance as they are lubricated for life; but they should be checked for cracks or any signs of failure. Remove belts, check end float longitudinal movement of shaft.
24. Main fans. Check security of the main shaft and no excessive vibration. Check blades and brush free of dust. Adjust if necessary.

Electrics

25. Electrics. None of the electrics require any maintenance as such, but the service engineer should examine the wiring for loose connections, any signs of cracked or weakened insulation, tracking or shorting to earth. This also includes the Powrtrol Unit. Any faulty components must be replaced.

General

26. The isolator should now be switched on and final setting up carried out as under Starting Instructions. If the heater does not operate satisfactorily, reference should be made to the Fault Finding Section.
27. Check operating efficiency.

8 Users Instructions

1. Your Powrmatic Air Heater is ready to give years of efficient service but, like any other complicated piece of machinery, it must be properly maintained and serviced. We suggest you arrange to have your heater serviced by a qualified service engineer. Your installer may prefer to carry out the servicing for you himself or suggest the name of a local engineer.

2. The majority of units are required to operate between certain hours of the day on certain days of the week, to thermostatically control the room at a pre-selected temperature. Central controls should include a Time Clock and Room Thermostat, as incorporated in the Powrmatic Powrtrol. Check with the installer that these controls have been programmed to your exact requirements.
3. The Powrtrol should be mounted in the room to be heated on a wall out of draughts, not in direct sunlight and not in the path of either the air from the outlets or the air returning to the inlets.

IMPORTANT

4. **Do not switch the unit off directly from the mains unless it is an emergency. If operation of the heater is required outside the normal programmed requirements, the unit should be started and stopped either by pressing the override button on the Time Clock, or by adjusting the setting on the thermostat.**

   Do not forget to set the Time Clock back to its original programme afterwards.

Users Starting Instructions

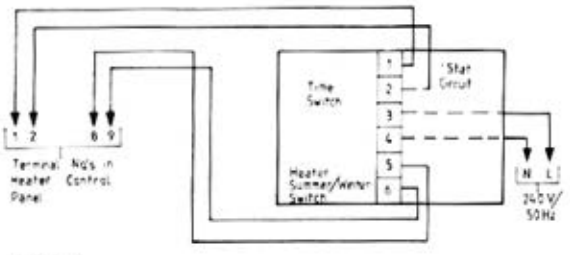
Before attempting to start the unit for the first time or after shutdown, carry out the following procedure:

1. Check there is oil in the tank (35 sec. fuel oil).
2. Check all valves are open between the oil tank and the heater.
3. Switch on the isolator connecting the heater to the main electrical supply.
4. Set the Time Clock to call for heat.
5. Set the Room Thermostat to the desired room temperature.

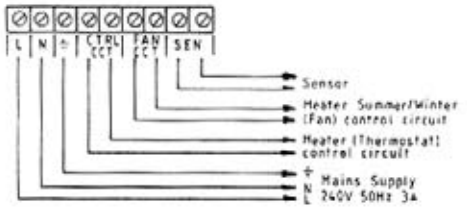
The heater should start within 30 seconds. If the heater does not start:

1. Check that the main electrical supply to the heater is switched on.
2. Check that the Time Clock in the Powrtrol is 'on'.
3. Set the Room Thermostat to a temperature higher than the room temperature.
4. Press the "lock-out" button on the burner. This is to be found inside the burner cover.
5. If the burner does not start within 90 seconds, turn the electrical supply off and call your service engineer.

9 Wiring Diagrams



POWTROL



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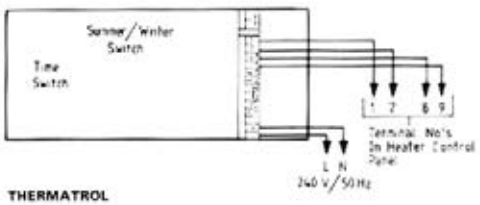
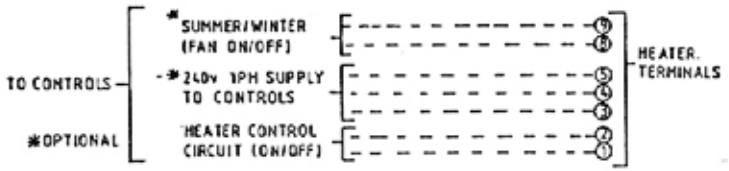
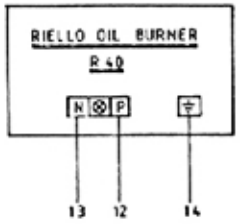
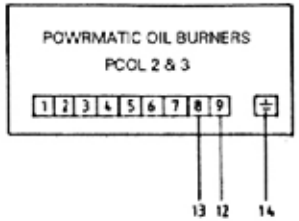


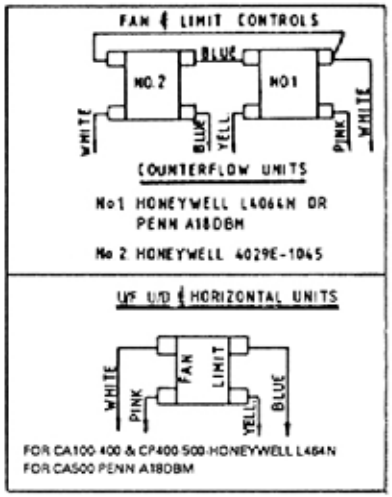
THERMATROL

CA AND CP HEATERS 1PH WITH VARIOUS OIL BURNERS



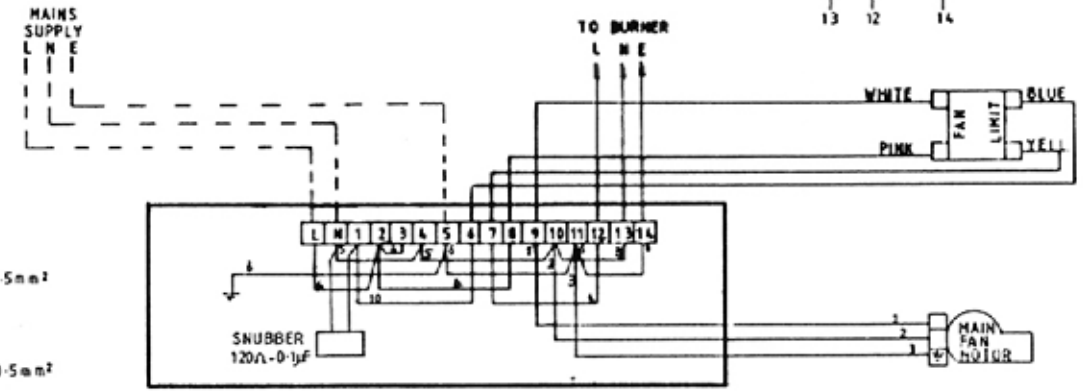




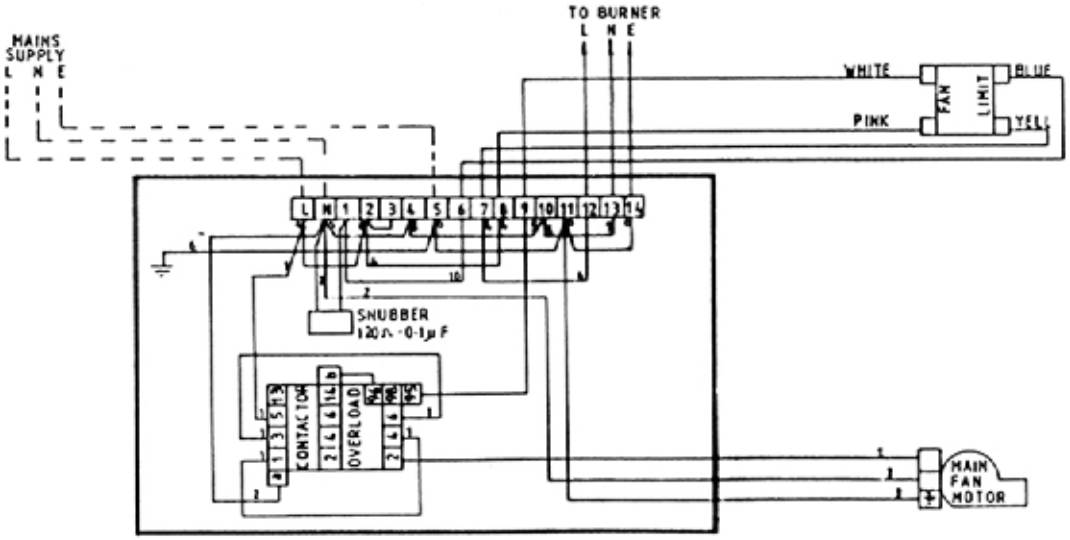


CABLES

1.	BROWN	1·5mm²
2	BLUE	
3	GRN/YELL	
4.	BROWN	0·5mm²
5.	BLUE	
6.	GRN/YELL	
7.	WHITE	
8.	ORANGE	
9.	YELLOW	
10.	MAUVE	

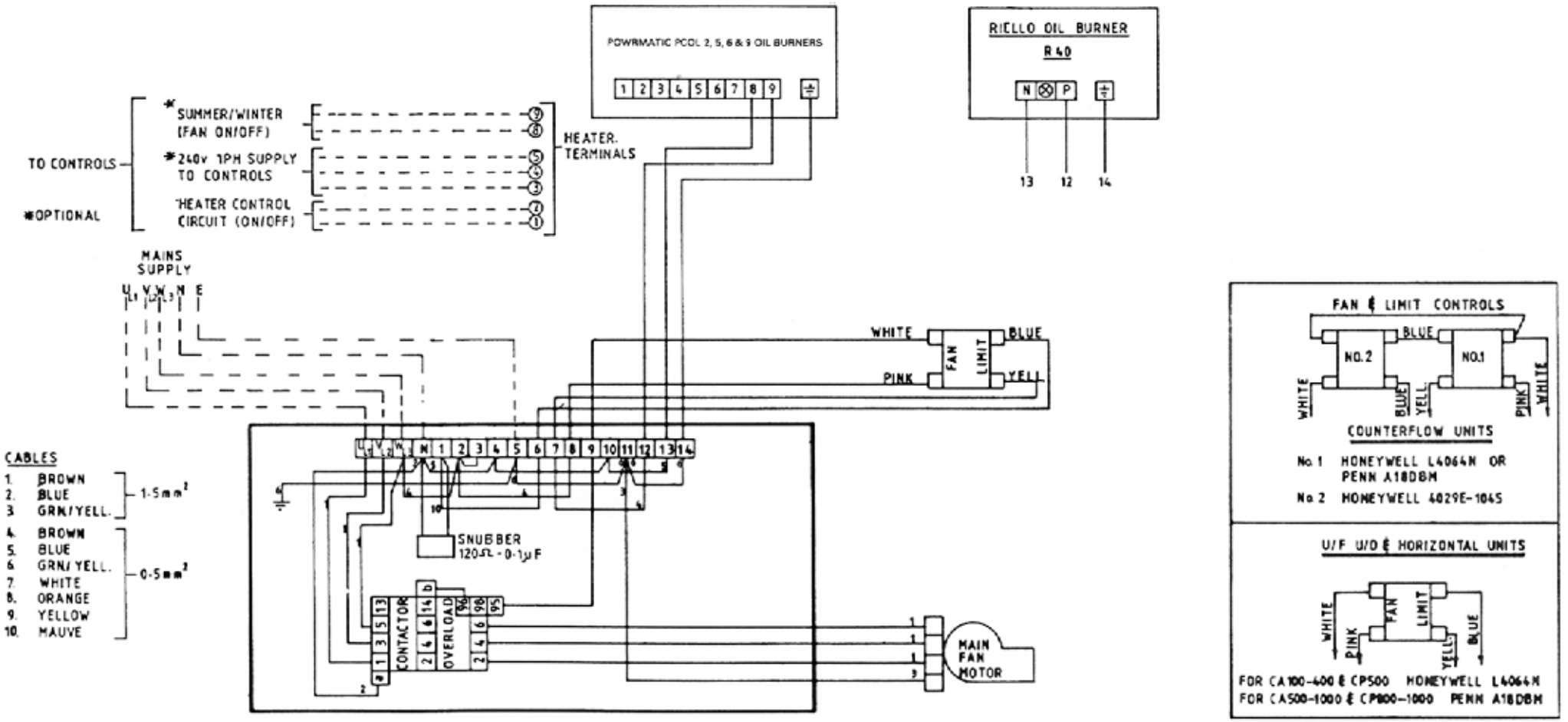


CONTROL BOX No1 - USED ON CA/CP100-300



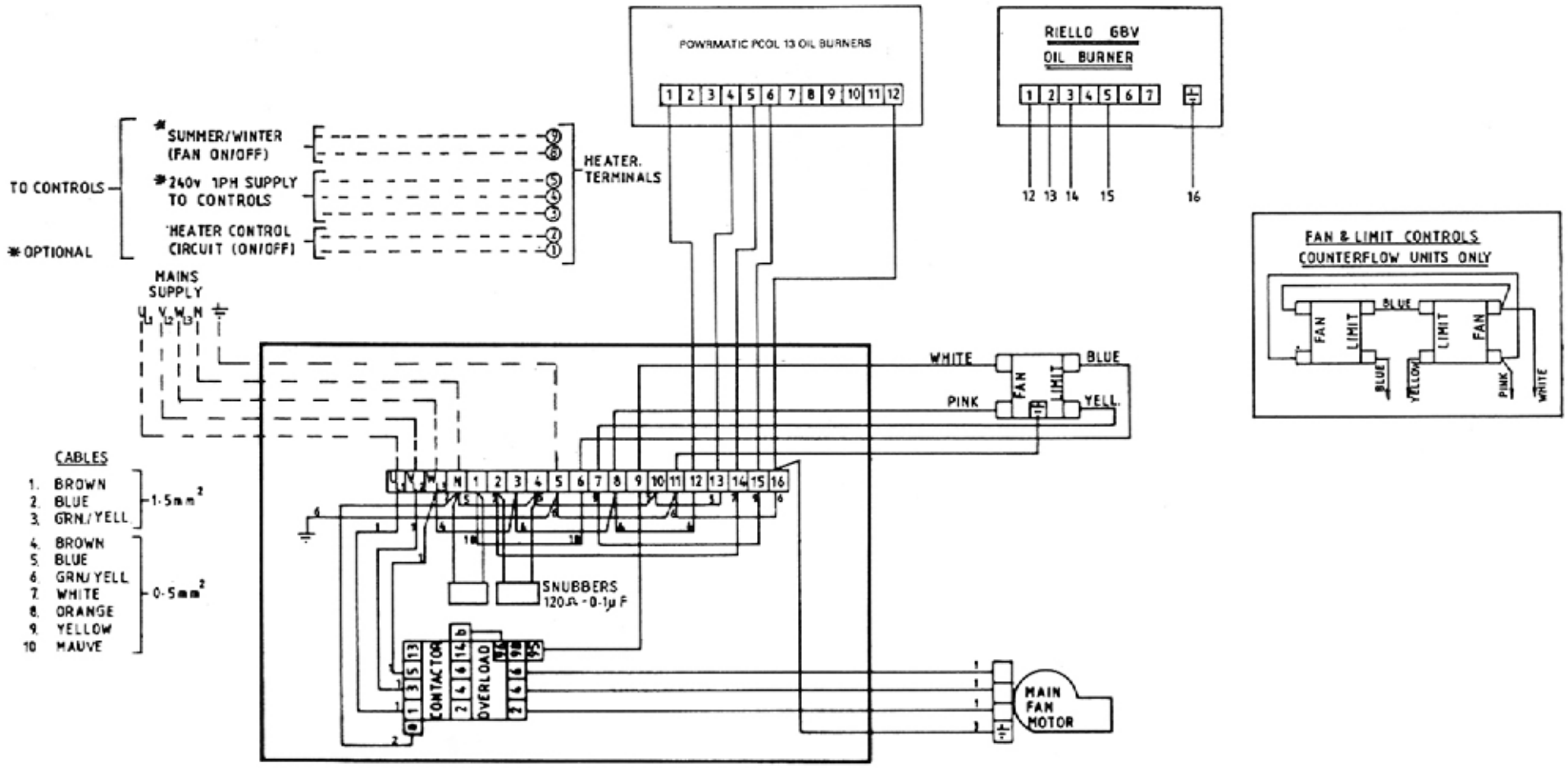
CONTROL BOX No2 USED ON CA/CP 400/500

CA AND CP 3PH HEATERS WITH VARIOUS OIL FIRED BURNERS



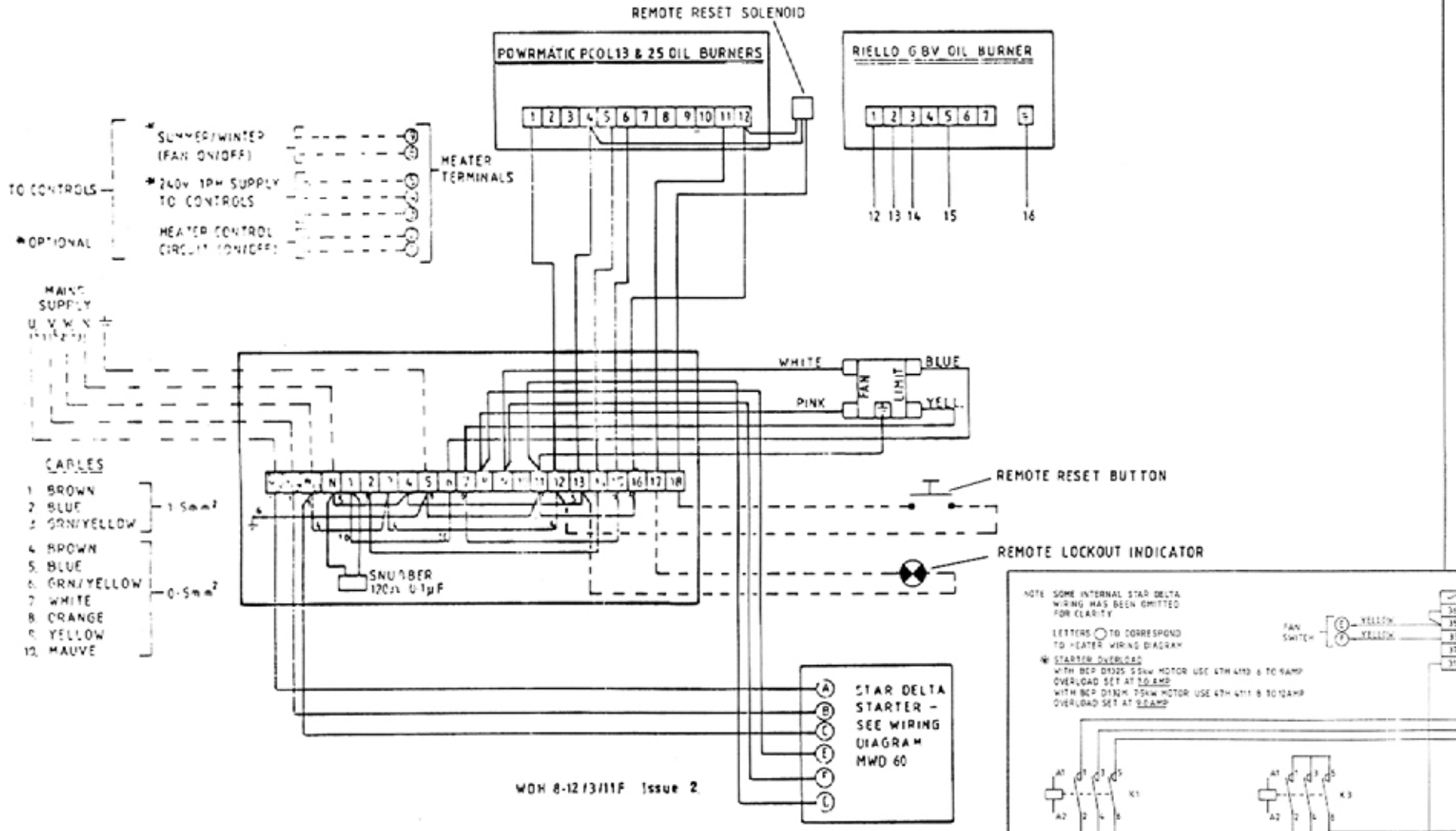
WOH 1-7/3/3F Iss.7

HEATER WITH RIELLO PRESS OIL BURNER CA AND CP 800 AND 1000

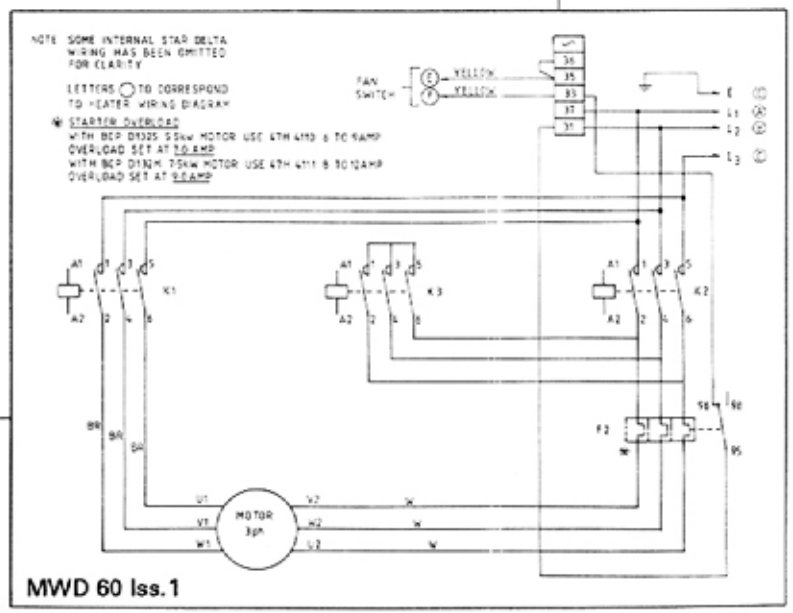


WOH 8·10/3/3F Iss.6

CA & CP HEATERS WITH VARIOUS OIL BURNERS, STAR DELTA STARTER & OPTIONAL REMOTE RESET, LOCK OUT INDICATOR.



WDH 8-12/3/11F Issue 2



MWD 60 Iss.1

RIELLO BURNERS WITH DANFOSS PRIMARY NOZZLES

Appliance	NCA-0 CP-0 100	NCA-0 CP-0 150	NCA-0 CP-0 200	NCA-0 CP-0 300	CA-0 CP-0 400	CA-0 CP-0 500	CA-0 CP-0 600	CA-0 CP-0 700	CA-0 CP-0 800	CA-0 CP-0 1000	CP-0 1250	CA-0 CP-0 1500
Nozzle US Gall	0.6	1.0	1.25	2.0	2.5	3.0	3.75	4.5	5.0	6.0	2 x 4.5	2 x 5.0
Angle Type	80s	60S	60S	60S	60S	60S	45B	45B	45B	45B	60B	45B
P.S.I.	210	180	190	200	200	210	210	190	210	200	210	190

BURNER SETTINGS (RIELLO)

RIELLO TYPE	R40	R40	R40	R40	R40	R40	R40	R40	GBV	GBV	tba	PRESS
Burner	G5	G10	G10	G10	G20	G20	G20	G20			tba	1
Air Head No.	2	1	2	4	1.5	3	4	6	4.5	5.5	tba	8
Combn Air No.(L)	3.8	3.5	3.5	6	2.5	2.2	3	3.0	3	4	tba	8mm
Combn Air No.(H)					3.5	5.9	5.5	7.0			tba	

MONARCH NOZZLES

Appliance	NCA-0 CP-0 100	NCA-0 CP-0 150	NCA-0 CP-0 200	NCA-0 CP-0 300	CP-0 400	CA-0 CP-0 500	C-0 600	C-0 700	CA-0 CP-0 800	CA-0 CP-0 1000	CP-0 1500
Nozzle US Gall	—	—	—	—	—	—	—	—	—	—	—
Angle Type	—	—	—	—	—	—	—	—	—	—	—
P.S.I.	—	—	—	—	—	—	—	—	—	—	—

—*To be advised

POWRMATIC BURNERS WITH DANFOSS PRIMARY NOZZLES

Appliance	NCA/CP	NCA/CP	NCA/CP	NCA/CP	CA/CP	CA/CP	CA	CP	CA	CP	CA	CP	CP	CA/CP	CP	CA
Model	100	150	200	300	400	500	600	600	700	700	800	800	800	1000	1250	1500
Nozzle US Gall	0.6	1.0	1.25	2.0	2.5	3.0	3.75	3.75	4.5	4.5	2 x 2.5	1 x 3.0 1 x 2.0	1 x 2.0 1 x 3.0	2 x 3.0	2 x 4.5	2 x 5.0
Angle Type	80s	60S	60S	60S	60S	60S	45B	60B	45B	60B	60S	60S	60S	60S	60B	60B
P.S.I.	210	200	190	200	230	210	210	220	190	190	210	210	210	200	210	200

POWRMATIC BURNER SETTINGS

Unit		NCA	NCA	NCA	NCA	CA	CA	CA	CA	CA	CA	CA
		100	150	200	300	400	500	600	700	800	1000	1500
Burner		PC/OL2	PC/OL2	PC/OL3	PC/OL3HR	PC/OL6	PC/OL6	PC/OL9	PC/OL9	PC/OL13	PC/OL13	PC/OL 25
No. HD Settings		1	2	Fully Back	Fully Forward	22	12	21	18	N/A	Fully Forward	Fully Back
Flame Ring/Blast Tube mm		33	25	34	12	18	10	20	15	34	N/A	N/A
Combustion Air	No.	1.0	3	2.5	5.5	4	5	4.75	5	5	7.5	N/A
	mm	N/A	20	13	32	N/A	N/A	N/A	N/A	N/A	20	32
Lowfire	No.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2	2.55	2.25	N/A
Combustion Air	mm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3	4	6

POWRMATIC BURNER SETTINGS

Unit		CP	CP	CP	CP	CP	CP	CP	CP	CP	CP	CP
		100	150	200	300	400	500	600	700	800	1000	1250
Burner		PC/OL2	PC/OL2	PC/OL3	PC/OL3HR	PC/OL6	PC/OL6	PC/OL9	PC/OL9	PC/OL13	PC/OL13	PC/OL25
No. HD Settings		1	2	Fully Back	Fully Forward	22	14	N/A	N/A	N/A	N/A	Fully Back
Flame Ring/Blast Tube mm		33	25	34	12	18	10	24	20	36	38	55
Combustion Air	No.	1.0	3	2.5	5.5	4	5	N/A	N/A	9.1	9.0	N/A
	mm	N/A	20	13	32	N/A	N/A	5	9	26	23	13
Lowfire	No.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3	3	N/A
Combustion Air	mm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8	8	4

CA RANGE: SINGLE PHASE

MAIN FAN SPECIFICATION

Description		NCA-0 100	NCA-0 150	NCA-0 200	CA-0 300	CA-0 400	CA-0 500
Main Fan Motor							
R.P.M.	S	915	1300	900	900	1500	1380
kW	S	0.335	0.55	0.56	0.99	1.5	45B
Start Amps	S	4.6	8.2	10.3	12.4	20.5	80
Running Amps	S	2.8	5.1	5.3	6.3	8.8	10.0
		WDBM	WDBM	WDBM	WDBM	WDBD	WDBK
Sifan Main Fan		10361-06	10341-05	12641-062	12461-062	155-105	155-161
Main Shaft Dia(mm)		↑	↑	↑	↑	25	25
Main Fan Bearings						2Ball	3 Ball
Pulley Dia (ins.) Fan		Direct	Direct	Direct	Direct	8.0	7.0
Motor		Drive	Drive	Drive	Drive	4.0	3.25
Vee Belts Type x No.		↓	↓	↓	↓	A6L x 2	A53 x 2
Min. Inlet Area							
Main Fan (S)	ft^2	2.6	2.6	3.5	4.4	5.5	8.25
	m^2	0.241	0.241	0.325	0.409	0.511	0.766
Std. Volume	c.f.m.	1100	1650	2200	3300	4400	6300
	m^3/s	0.519	0.779	1.038	1.557	2.076	2.973
Std. Pressure	ins.w.g.	0.6	0.4	0.7	0.4	0.4	0.5
	m.b.	1.5	1.0	1.75	1.0	1.0	1.25
Larger Motor kW		0.55	N/A	N/A	N/A	2.2	2.2
Pulley Dia. (ins.) Fan		6	N/A	N/A	N/A	8	9
Motor		3.25	N/A	N/A	N/A	5	5
Vee Belts Type x No.		A41 x 1	N/A	N/A	N/A	A56 x 3	A56 x 3
Max. Press. at Std. Vol.	ins.w.g.	0.8	N/A	N/A	N/A	0.75	0.75
	m.b.	2.0	N/A	N/A	N/A	1.875	1875

CA RANGE: THREE PHASE

MAIN FAN SPECIFICATION

APP.II

Description		CA-O 400	CA-O 500	CA-O 600	CA-O 700	CA-O 800	CA-O 1000	CA-O 1500
Main Fan Motor	R.P.M.	1425	1425	1420	1420	1420	1420	1415
	kW	1.5	1.5	2.2	2.2	2.2	3.3	2x4.0
Start Current Amps		7.0	16.0	14.5	14.5	12.4	15.6	2x15.6
Full Load Amps		3.2	3.2	5.1	5.1	5.1	7.8	2x7.8
	Sifan	WDBD 155 ←			WDBK 155-161 →			
		101				← WDBK 153-161 →		WDHD 186-001
Shaft Dia	mm	←		25			→	35
Bearings		2 Ball	3 Ball	3 Ball	3 Ball	4 Ball	1" Plummer 4 Ball	Plummer Block
Pulleys (Dia. ins.)								
	Fan	8.0	8.0	9.5	9.5	9.0	9.0	11.5
	Motor	4.0	4.0	5.0	5.0	4.0	5.0	5.5
Vee Belts	Type	A62	A58	A60	A60	A65	A67	B73
	No.	2	2	3	3	3	4	6
Min. Inlet Area Main Fan								
	ft^2	5.5	8.25	8.25	8.25	13.6	13.6	16.5
	m^2	0.511	0.766	0.766	0.766	1.26	1.26	1.53
Standard Volume								
	c.f.m.	4400	6300	7200	8400	9550	11000	16500
	m^3/s	2.076	2.973	3.398	3.964	4.507	5.191	7.787
Standard Pressure								
	ins. w.g.	0.4	0.4	0.5	0.3	0.4	0.625	0.625
	m.b.	1.0	1.0	1.25	0.75	1.0	1.6	1.6
Large Motor	kW	2.2	2.2	3.3.	3.3	3.3	5.5	2x5.6
Pulleys (Dia. ins.)								
	Fan	8.0	9.0	9.0	8.0	9.0	8.0	10.5
	Motor	5.0	5.0	5.0	5.0	5.0	5.0	6.0
Vee Belts	Type x No.	A62 x 3	A60 x 3	A60 x 4	A60 x 4	A67 x 4	A65 x 4	B73 x 6
Max. Press. at Std. Vol.								
	ins. w.g.	0.75	0.75	0.75	0.75	0.75	0.75	1.0
	m.b.	1.875	1.875	1.875	1.875	1.875	1.875	2.5

CA RANGE: SINGLE AND THREE PHASE MAIN FAN SPECIFICATION

Description		Single Phase					Three Phase						
		CP-0 100	**CP-0 150**	**CP-0 200**	**CP-0 300**	**CP-0 500**	**CP-0 400**	**CP-0 500**	**CP-0 600**	**CP-0 700**	**CP-0 800**	**CP-0 1000**	**CP-0 1250**
Main Fan Motor													
R.P.M.	S	915	1300	900	900	500	900	1420	1420	1420	1420	1445	1460
kW	S	0.335	0.55	0.56	0.99	2.0	1.5	2.2	3.3	3.3	3.3	5.5	11.0
Start Amps	S	4.5	7.0	tba	tba	80.0	14.0	18.5	14.5	16.0	62	87.2	32.5
Running Amps	S	2.9	5.7	5.9	6.1	12.0	3.8	5.7	7.4	7.4	7.8	10.9	19.0
		WDBM	WDBM	WDBM	WDBM	WDBD	WDBM	WDBM	WDBM	WDBM	WDBM	WDBD	WDBD
Sifan Main Fan		10361-06	10341-05	12641-062	12461-062	186-103	153-63-01	186-103	186-103	186-103	186-103	186-103	184-50764
Main Shaft Dia(mm)		↑	↑	↑	↑	25	↑	25	25	25	25	35	35
Main Fan Bearings		↑	↑	↑	↑	2 Ball	↑	2 Ball	2 Ball	2 Ball	2 Ball	2 Ball	3 Ball
Pulley Dia (ins.) Fan		Direct	Direct	Direct	Direct	9	Direct	8	9.5	9.5	8.375	8.0	11.5
Motor		Drive	Drive	Drive	Drive	4	Drive	4	5.0	5.0	4	5	7.5
Vee Belts Type x No.		↓	↓	↓	↓	A64 x 2	↓	A64 x 2	A72 x 2	A72 x 2	A70 x 4	A70 x 4	B76 x 4
Min. Inlet Area													
Main Fan (S)	ft²	2.6	2.6	3.5	4.4	6.6	5.5	6.6	6.6	9.25	9.25	9.25	11.5
	m²	0.241	0.241	0.325	0.409	0.63	0.52	0.63	0.63	0.859	0.859	0.859	1.1
Std. Volume	c.f.m.	1100	1650	2200	3300	6300	4400	6300	7200	8400	9550	11000	13360
	m³/s	0.519	0.779	1.038	1.557	2.973	2.08	2.973	3.4	3.96	4.507	5.191	6.49
Std. Pressure	ins.w.g.	0.6	0.25	0.6	0.4	0.6	0.3	0.6	0.3	0.5	0.5	0.625	1.2
	m.b.	1.5	0.625	1.5	1.0	1.5	0.7	1.5	0.75	1.25	1.25	1.6	3.0
Larger Motor kW		0.56	N/A	0.75	N/A	2.2	tba	3.3	5.5	5.5	5.5	7.5	N/A
Pulley Dia. (ins.) Fan		6.0	N/A	5.0	N/A	9.0	tba	9.5	tba	tba	8.375	11.5	N/A
Motor	3.25	N/A	3.25	3.25	5.0	5.0	tba	5.0	tba	tba	5.0	7.5	N/A
Vee Belts Type x No.		A41 x 1	N/A	NA42 x 2	A46 x 2	A67 x 3	tba	A67 x 3	tba	tba	A70 x 4	B82 x 3	N/A
Max. Press. at Std. Vol.	ins.w.g.	0.625	N/A	0.732	0.439	0.5	tba	1.0	tba	tba	0.75	0.75	N/A
	m.b.	1.6	N/A	1.875	1.125	1.25	tba	2.5	tba	tba	1.875	1.875	N/A