

ZR 20

SERVICE MANUAL

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INTRODUCTION

As with all JEM products, the ZR20 is built to the highest standards, and is designed with quality, extreme reliability and simplicity of use in mind. Once familiar with this machine, servicing can be carried out in the minimum of time. This manual should be read and fully understood by anyone intending to service these machines. A full understanding of the internal parts of the ZR20's main components will aid quick and efficient repair of the machine and will avoid potential problems.

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SAFETY FIRST! ALWAYS UNPLUG THE MACHINE BEFORE ATTEMPTING TO REMOVE THE COVER! LIVE CONNECTIONS WILL BE EXPOSED. THERE ARE NO USER-SERVICEABLE COMPONENTS INSIDE.

SECTION 1 - INITIAL INTERNAL INSPECTION

The cover is held on by 13 self tapping screws. When removed, lift the cover from the machine, hinging it backwards carefully. Note that the cover is still attached to the machine by a 4mm nylon tube held at the inlet end of the pump by a nut and olive, and by a compression bulkhead at the cover end. The tube is removed by pressing the brass rim around the tube inwards with your thumbnails and pulling gently (re-assembly is simply by pushing the tube back in as far as it will go). With a little practice, this operation will come with ease. With the cover out of the way, the whole machine is easily accessible. At this point it should be noted that any brass fittings that are dismantled for any reason must be cleaned before re-assembly and re-sealed with a joint sealant to avoid subsequent air leakage problems. This procedure does not apply to nut and olive joints, which are self-sealing. Cleanliness is essential as foreign matter in the lines can damage the machine or cause blockages at a later date.

SECTION 2 - FLUID PUMP

The pumping system is an extremely powerful oscillating piston type, which combines a high flow rate with powerful scavenging capabilities. This new pump has replaced the earlier all-brass type pump. Both pumps are extremely reliable and trouble-free. Pre 1986 machines were fitted with a manual trip situated on the coil winding to prevent damage to the pump. Later models have an auto-reset trip fitted on the pump mounting bracket and if the pump is run continuously for an extended period of time, or if the pump accidentally runs dry, it will cut out. (Factory tests have revealed that running the pump dry for appx 5 minutes will cause the cut-out to come into effect, and that a further 4 minutes is required before it will reset - a point to watch out for if pump problems are being experienced). See the Trouble-shooting Chart at the end of this manual for a complete list of possible pump-related faults.

SECTION 3 - NON RETURN VALVE (EARLIER MODELS)

On older models, tracing the route of the fluid from the pump to the aluminium chamber, the next fitting in line is the brass non-return valve (later models have this incorporated into the pump). On pre-1986 machines a stainless steel micron-mesh filter screen is fitted under the inlet push-in compression (PART # 69) - more recent models have a filter in the bottle end of the fluid line. No problems have been experienced with filters. On earlier models, if the push-in connector has to be removed for filter cleaning or replacement, remember to clean the threads and re-seal on assembly using a hydraulic sealant. Also, on earlier models, non-return valves may be dismantled for cleaning or inspection, but care must be taken on re-assembly not to overtighten otherwise internal movement could be impeded. The non-return valve, as its name suggest, prevents fluid from syphoning back through the pump. it also serves to dramatically reduce smoke emission from the nozzle at the end of a cycle.

SECTION 4 - THE ALUMINIUM CHAMBER

The block is mounted in an insulated steel barrel fixed to the base of the machine and a precise procedure must be followed to remove it. First of all remove the cable ties retaining the wires leading to the platinum heat sensor which is located under a plate on the top of the barrel. The platinum sensor must be removed by removing the four pan-head screws retaining the aluminium plate, removing the amber mica, and carefully lifting out the sensor.

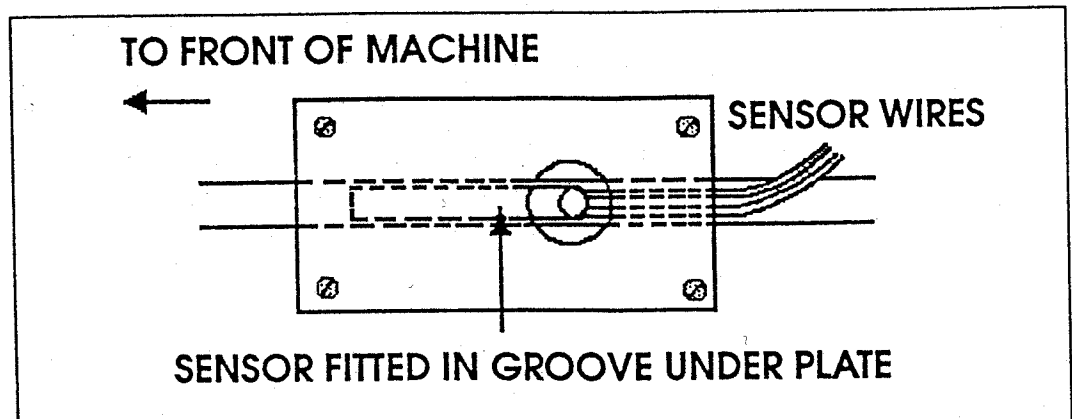


REMEMBER THE SENSOR IS CERAMIC-BASED, AND CAN EASILY BE BROKEN. A BROKEN SENSOR IS IRREPARABLE AND MUST BE REPLACED.

Barrel removal can now commence. Remove the wires from the thermal trip; disconnect the heater neutral wire from the terminal block near the pcb; remove the four screws, nuts and washers holding the barrel case to the base of the machine and finally lift the barrel clear, allowing the outlet nozzle to clear the front cowling. On older models fitted with a replaceable cartridge heater, no further dismantling is necessary if only heater replacement is required. On these models, the heater can be removed by inserting a thin rod or screwdriver through the hole located under the outlet nozzle, and by gently tapping, the heater can be removed through the end-caps. On later models, the heater element is sealed within the block and cannot be removed separately. On all machines over one year old, it is wise to inspect the insulation for any deterioration or compaction and replace it if necessary. If block replacement is required, the four centralising bolts on the barrel case will have to be slackened off as required before the block can be removed. Reassembly is a reversal of the above procedure apart from the re-fitting of the platinum heat sensor.

SECTION 5 - RE-FITTING THE PLATINUM SENSOR

When the block is back in the barrel and the barrel has been re-mounted in the machine, first of all check the groove on the top of the block for any foreign materials or possible obstruction. The groove must be perfectly clean before assembly. Locate the sensor carefully in the channel so that when the amber mica and the cover plate are in position the sensor is not trapped otherwise irreparable damage may occur when the plate is tightened down. The insulating sleeve covering the wires must not leave any exposed area and if the amber mica is damaged, replace it.



SECTION 5 - REFITTING THE PLATINUM SENSOR (Cont.)

The position of the sensor looking through the aperture in the plate should be as overleaf, with the wires clearing through the slot to the rear of the block. The sensor should be hidden from view except through the aperture, where it is just visible through the mica. Once the plate has been tightened down, carry out the sensor test as described in Section 8.

SECTION 6 - THERMAL TRIP

This, as already explained, is a temperature limiter and when the barrel temperature exceeds 90° Centigrade, the power is cut to the heater. This protects the aluminium block and therefore the rest of the machine from overheating.



UNDER NO CIRCUMSTANCES SHOULD THE TRIP BE BY-PASSED.

If constant tripping is experienced a fault condition must exist, and the problem must be located and rectified. A common cause of tripping is due to the machine being incorrectly sited in a hot area, breakdown of the barrel insulation, and/or obstruction of the air vents.

SECTION 7 - THE PRINTED CIRCUIT BOARD

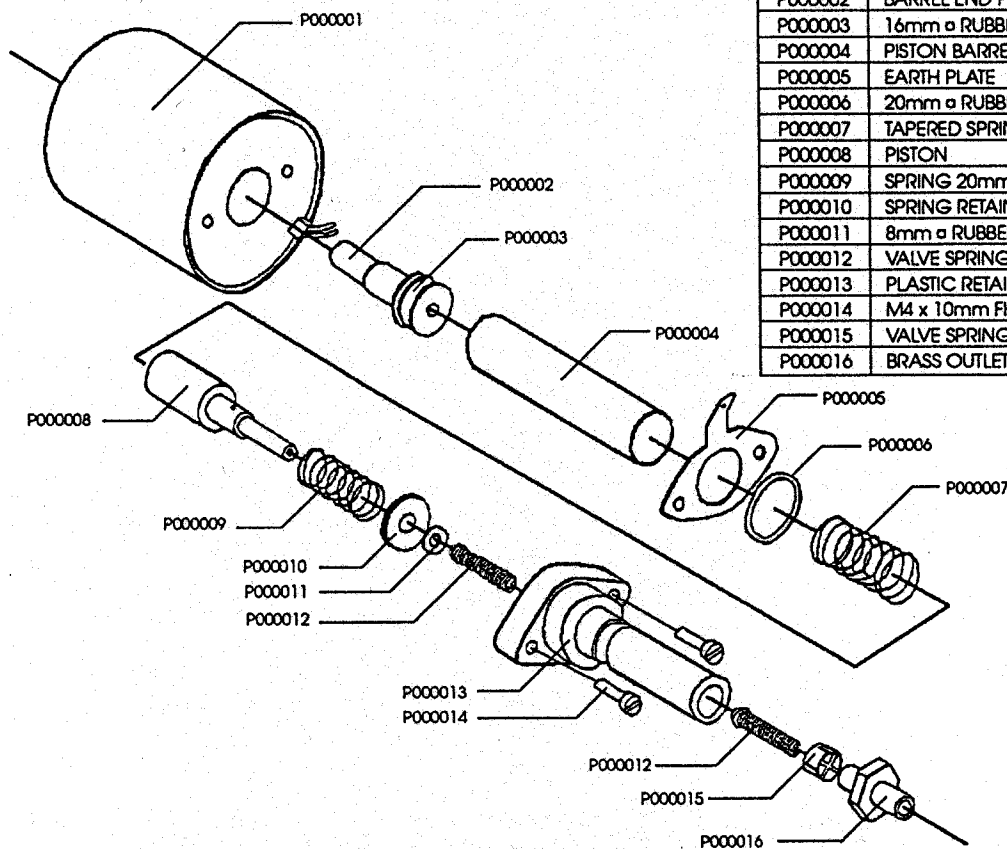
The pcb is generally trouble-free and is sealed against any damp problems that may occur. It should be left alone if functioning correctly. If pcb problems are suspected, refer to the Trouble-shooting Chart in this manual. Schematic diagrams for the board are supplied in this manual.

SECTION 8 - SENSOR TEST

Disconnect the sensor wires or remove the plug at the pcb. Set a test meter to the OHMS position on a scale that will allow at least 50% full scale deflection for accuracy and, with a test probe on each wire, a reading of 100+ ohms should be seen. (Note that holding the probes on the wires with your fingers may give an erroneous result - use clips). If the reading is satisfactory, place one probe on the block and check to see that there is no reading. **NO READING SHOULD BE SEEN.** If there is a reading, then there is a leakage to earth which must be rectified. This leakage can arise from the wires being trapped under the sensor plate or the insulating sleeves needing re-positioning. Check also the pcb end to see if a short is there. No reading on the sensor test means the sensor has been irretrievably damaged.

Section 8 - Pump Schematic & Parts List

PUMP



PART	DESCRIPTION
P000001	PUMP COIL
P000002	BARREL END PLATE
P000003	16mm \varnothing RUBBER O RING
P000004	PISTON BARREL
P000005	EARTH PLATE
P000006	20mm \varnothing RUBBER O RING
P000007	TAPERED SPRING 25mm
P000008	PISTON
P000009	SPRING 20mm
P000010	SPRING RETAINING WASHER
P000011	8mm \varnothing RUBBER O RING
P000012	VALVE SPRING
P000013	PLASTIC RETAINING PLATE
P000014	M4 x 10mm FH BOLT
P000015	VALVE SPRING RETAINER
P000016	BRASS OUTLET

DIAGRAM 3 - INTERNAL VIEW

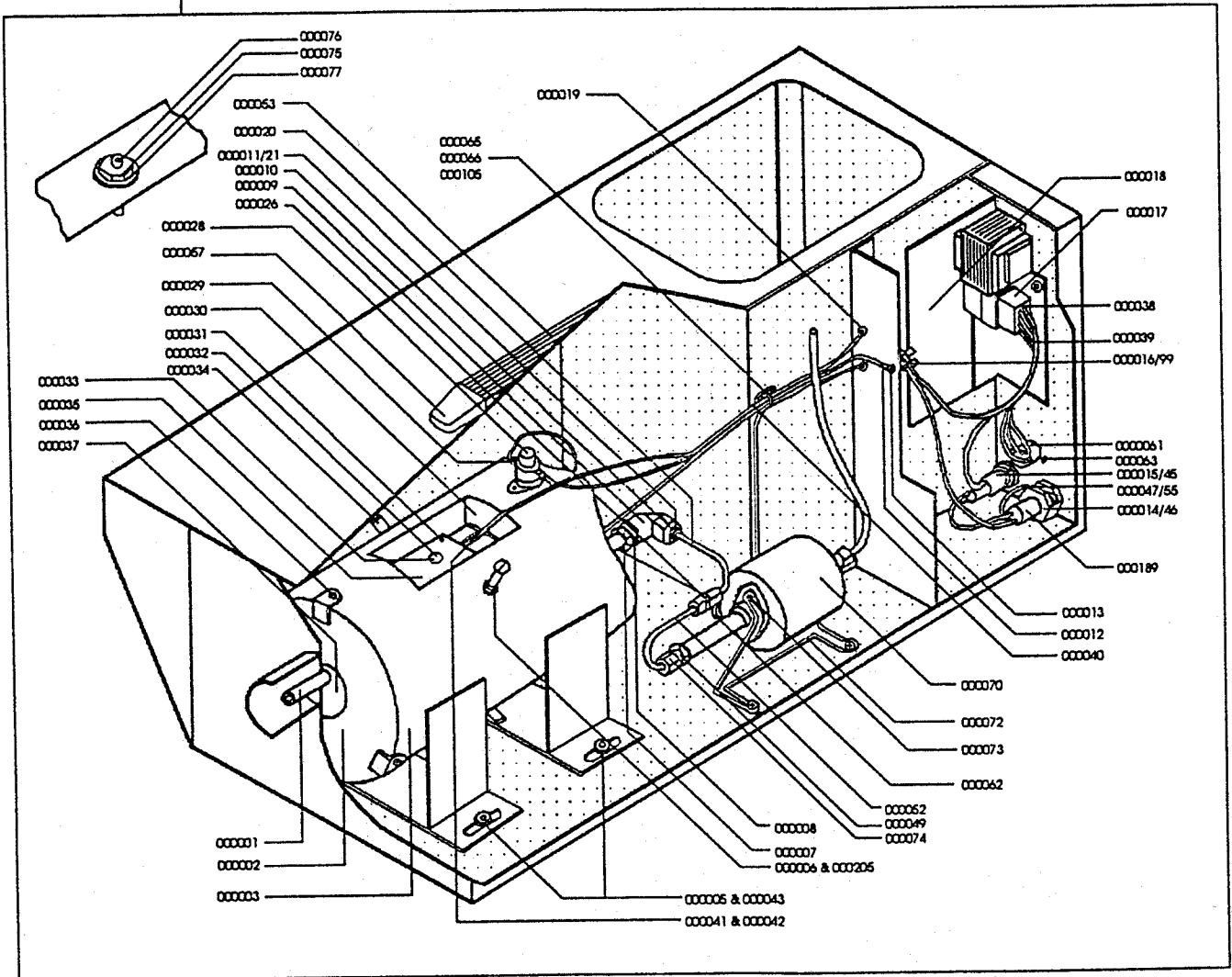
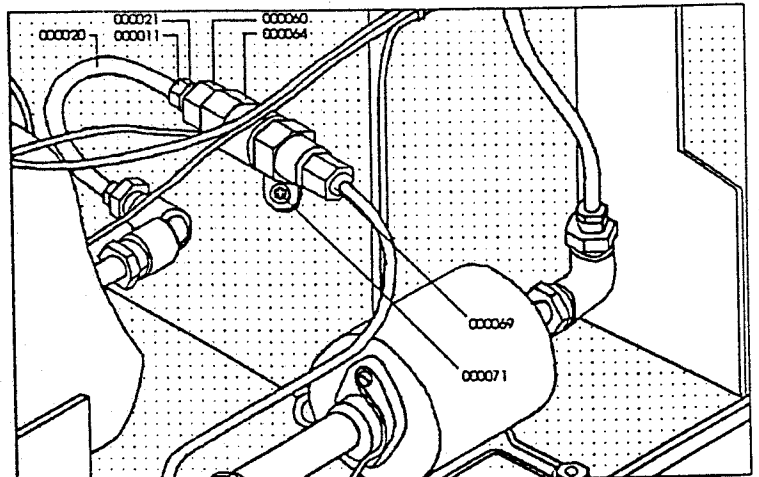


DIAGRAM 4 - SERIES 1 FILTER

The diagram opposite illustrates the separate filter system fitted to earlier models. Other parts were as per current models.



TROUBLE-SHOOTING/DIAGNOSTICS CHART

SYMPTOM

CURE

Green light on machine when machine plugged in. Machine cold.

1. Sensor broken.
2. Wire broken off sensor or pcb.
3. Earth wire off pcb or bad earth connection.

Machine emits fluid when cold. LED red

1. Opto-isolator or pump triac faulty. Replace.
2. Bad earth or earth broken on DIN socket.

Red LED on. Machine not heating.

1. Machine tripped. Reset.
2. Heater open circuit. Replace.
3. Heater wire broken. Re-connect.
4. Bad neutral connection at terminal block.
5. Bad crimp on terminal strip.
6. Thermal trip faulty. Replace.

Red LED on all the time. Machine overheating.

1. Sensor shorting to earth. Carry out sensor test.
2. Faulty triac. Replace.
3. Check if thermal trip by-passed.

Machine operates continuously when Yellow mode reached (remote versions only).

1. Pump triac faulty. Replace.
2. Wires shorting on DIN socket or faulty remote button.
3. Fault in remote lead or plug. Rectify.

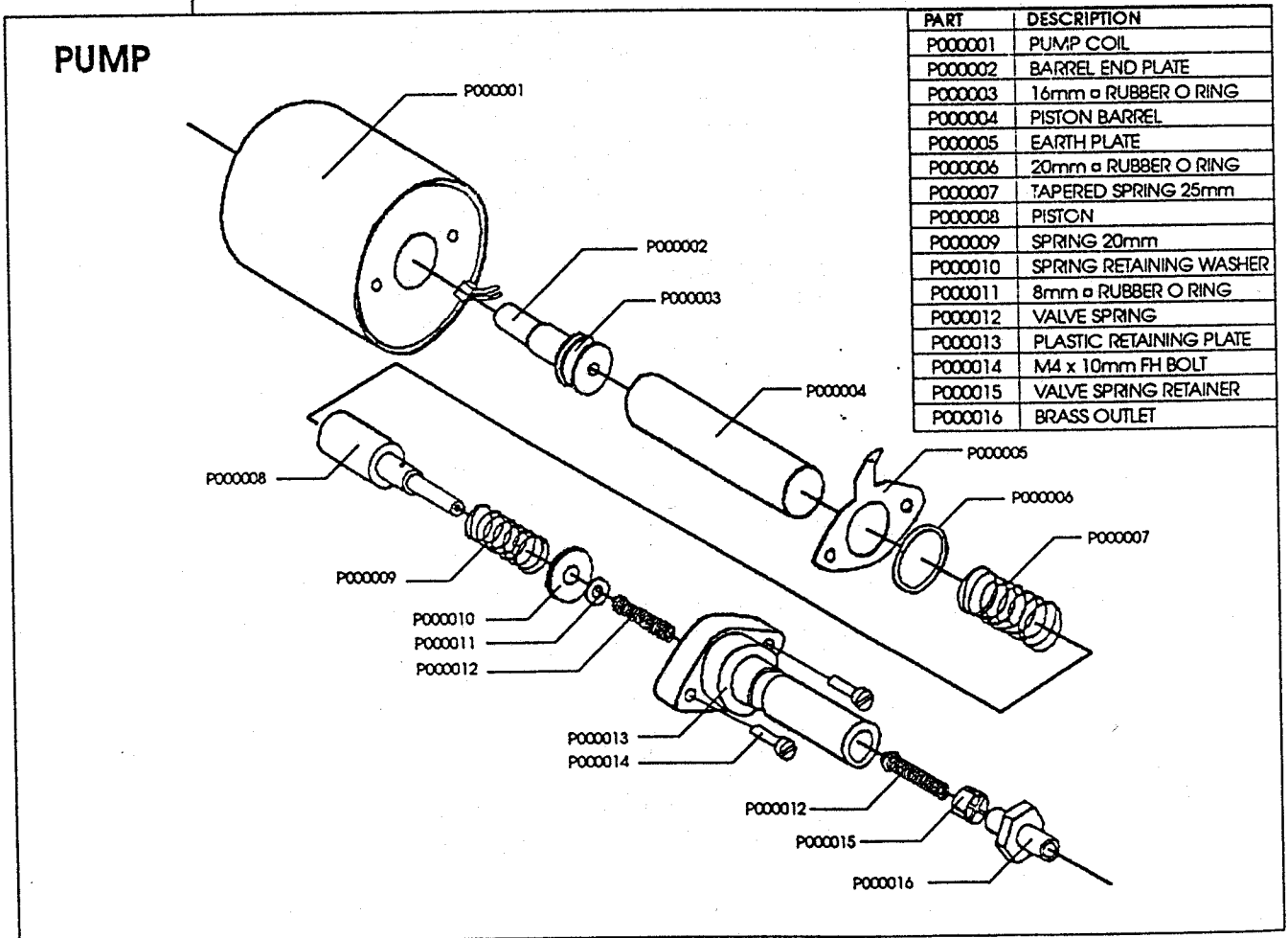
Machine stays in Yellow mode and continues heating until trip functions.

1. Sensor wires touching or sleeve pierced by opto-isolator pins on rear of pcb. Rectify.

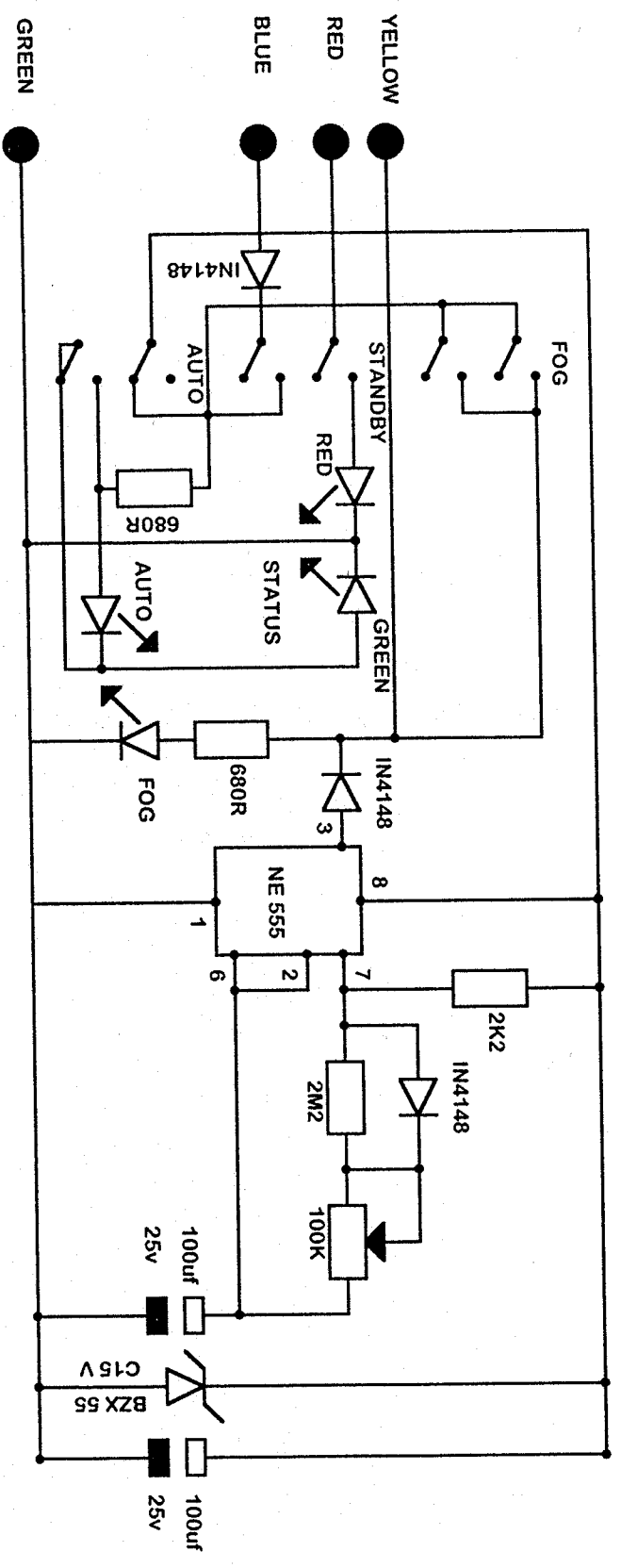
Poor or no smoke emission.

1. Check for air bubbles in fluid lines. Identify air leak and repair.
2. In-line filters blocked. Clean.
3. Block restricted. Replace.

ITEM	PART NUMBER	DESCRIPTION
75	000016	TERMINAL BLOCK
76	000053	6" BLACK/NICKEL 2 STEELS (HANDLE)
77	000189	MAINS (A.C.) CABLE
78	000018	P.C.B. 240 v (#000208 120v U.S. VERSION)
79	000061	DIN SOCKET 180° 5 PIN
80	000065	CABLE TIE BASE
81	000191	5 LITRE CONTAINER
82	000200	BOTTLE CAP
83	000186	WIRE MESH FILTER 4mm
84	000206	FILTER RETAINER 4mm
85	000020	4mm BUNDY TUBE
86	000060	1/8" BSP - 4mm MALE STRAIGHT ADAPTOR
87	000064	NON RETURN VALVE
88	000069	PUSH-IN CONNECTOR
89	000071	COPPER CLIP



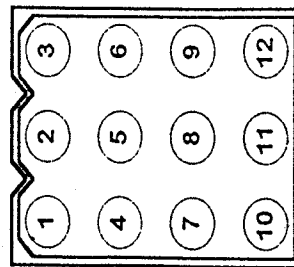
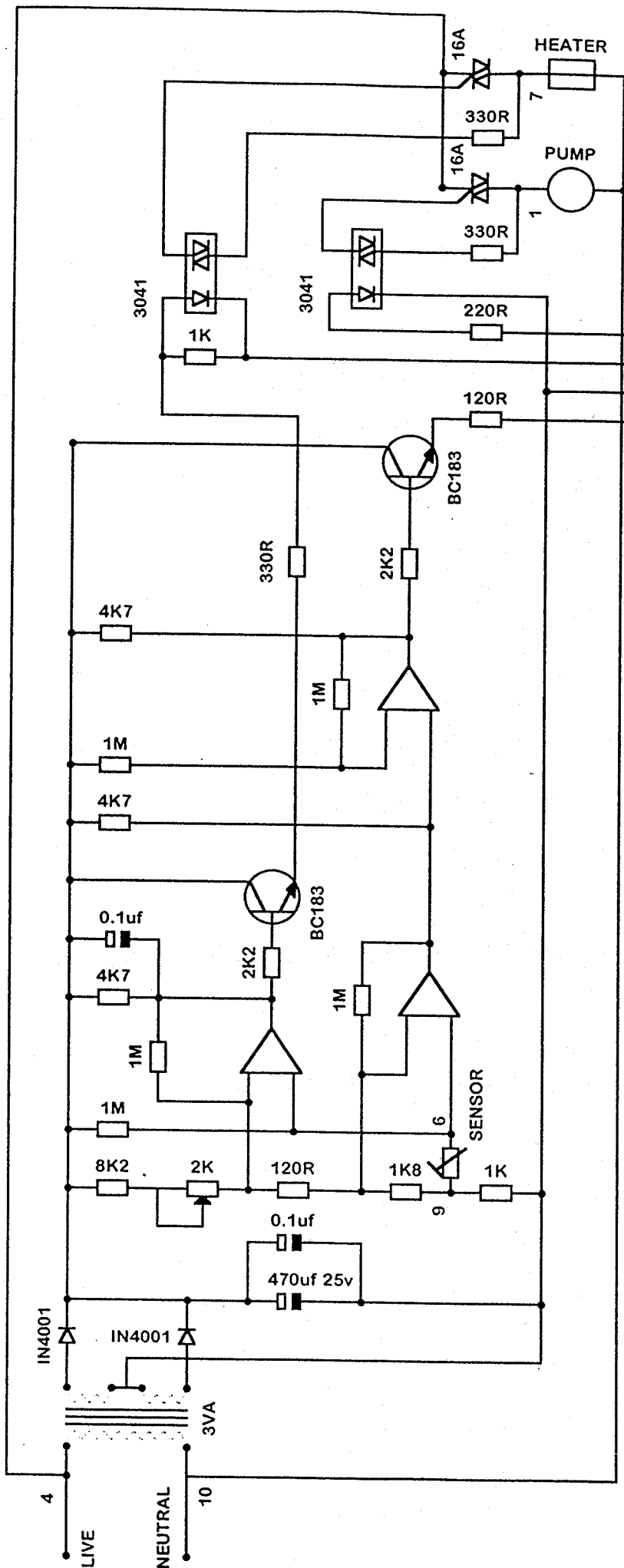
TIMER NON CE REMOTE DIAGRAM



BASIC REMOTE SCHEMATIC

ADY, SERVICE ENGINEER
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TIMER REMOTE DIAGRAM
NON CE USED ON
FOG3 / ZR20 MK1 ETC

LE FOG PCB NON CE DIAGRAM



- PIN 1 - THIN BROWN (PUMP LIVE).
- PIN 2 - YELLOW (DIN / XLR).
- PIN 3 - RED (DIN / XLR).
- PIN 4 - THICK BROWN (LIVE MAINS IN).
- PIN 5 - BLANK.
- PIN 6 - BLACK (SENSOR).
- PIN 7 - THICK BROWN (HEATER BLOCK LIVE THROUGH THERMAL TRIP).
- PIN 8 - BLANK.
- PIN 9 - BLACK (SENSOR).
- PIN 10 - THIN BLUE (NEUTRAL MAINS IN).
- PIN 11 - GREEN (DIN / XLR EARTH).
- PIN 12 - PINK (DIN / XLR).

VIEWED FROM COMPONENT SIDE

* ENSURE PIN 1 (PUMP LIVE) CONNECTS THROUGH DIODE SIDE OF PUMP.

ADY, SERVICE ENGINEER
 JEM SMOKE MACHINE CO. LTD.
 LE FOG PCB DIAGRAM
 AS USED IN ZR20 MK1
 FOGGER 3 NON CE