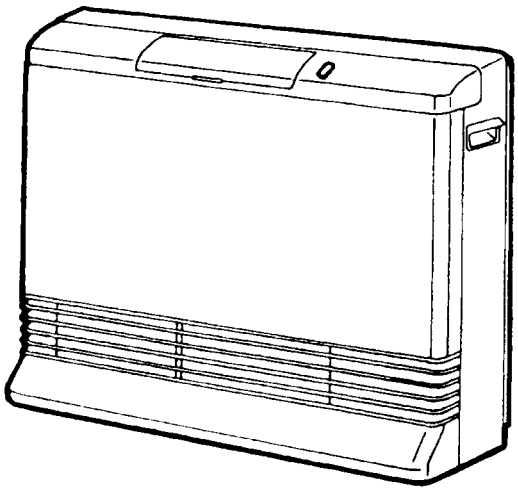
Rinnai

SERVICE MANUAL

RCE - 417H

CONVECTOR



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The Australian Gas Association

Proudly a member of the AGA
All of our gas products are AGA tested and approved

WARNING

ALL WIRING INSIDE THIS APPLIANCE MAY BE AT 240 VOLTS POTENTIAL.

ALL SERVICE WORK MUST BE CARRIED OUT BY AN AUTHORISED PERSON.

DO NOT TEST FOR GAS ESCAPES WITH AN OPEN FLAME.

This manual has been compiled by Rinnai Australia Customer Technical Services. While many individuals have contributed to this publication, it will be successful only if you - the reader and customer - find it useful. We would like to extend an invitation to users of this manual to make contact with us, as your feedback and suggestions are valuable resources for us to include as improvements. Rinnai are constantly working toward supplying improved appliances as well as information, and specifications may be subject to alteration at any time.

Table of Contents

Glossary of Terms

This glossary of terms is provided to assist you in understanding some of the language used throughout this manual.

dB(A)		sound pressure level in decibels, "A" range
DC	-	direct current
AC		alternating current
Hz		Hertz
IC		integrated circuit
kcal/h	-	kilocalorie per hour
kPa	-	kilopascals
LED	-	light emitting diode
mA	-	milliamps
MJ/h	-	megajoule per hour
mm	-	millimetres
NO_x		oxides of nitrogen (NO & NO,)
OHS	-	over heat switch
PCB		printed circuit board
CPU	-	central processing unit
POT	-	potentiometer
rpm	-	revolutions per minute
SV	-	solenoid valve
Ø	-	diameter
$\Delta°C$	-	temperature rise above ambiant
POV	-	modulating valve
TH	-	thermistor

§ 1 Introduction

1. Development Background

1.1 The Rinnai Fan Convector heater model RCE417 has been designed to provide comfortable and efficient heating for areas of up to 6.3 sq. (65 m^2) or volume of 150 m^3.

2. Characteristics

2.1 Very low NO, emissions.

2.2 Combustion control in 3 stages.

2.3 Control by finger touch control switches. When the appliance is operated a short “beep” indicates that it is working.

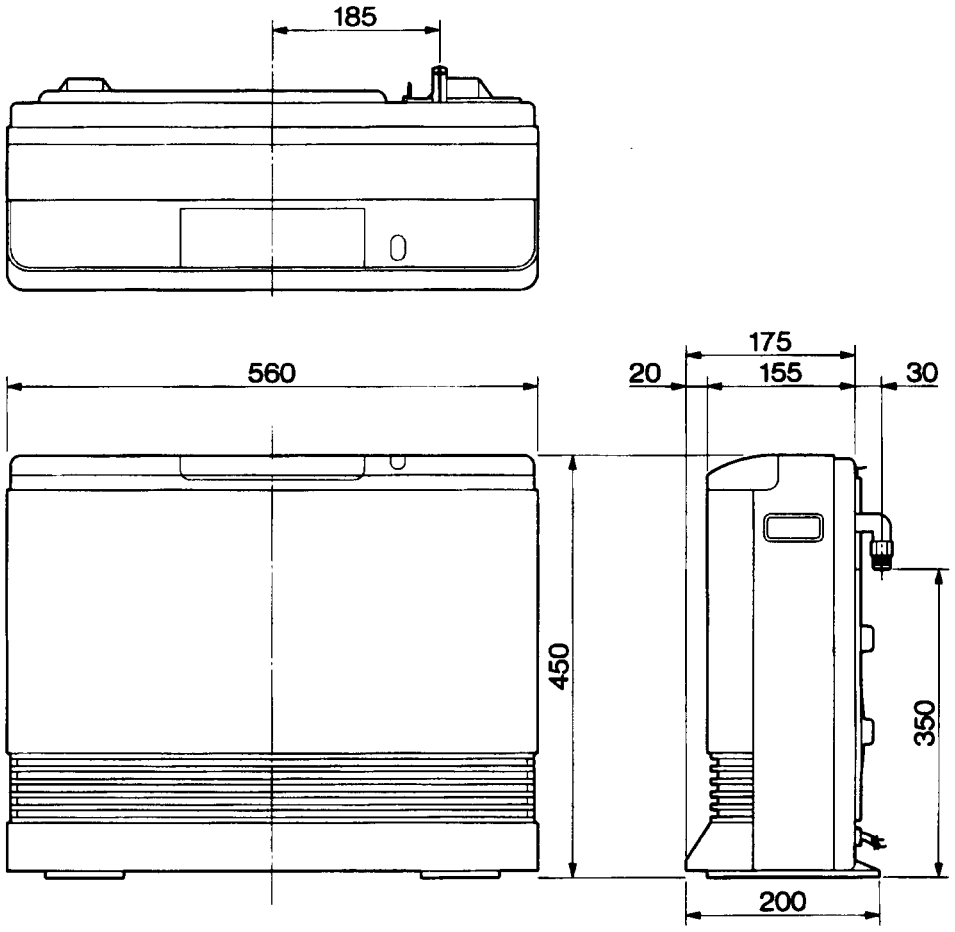
2.4 Room temperature is indicated by a flashing LED; selected temperature is indicated by a stable LED.

2.5 Air Filter indicator indicates when the air filter needs cleaning.

2.6 When a problem occurs, the LED indicators flash in various combinations to direct the service technician to the cause of the problem. Information about the previous fault is stored in the PCB and can be recalled by the service technician.

§ 2 Dimensions

Note: All dimensions are in millimetres.



§ 3 Specification

Type of appliance	Gas Fan Convector Heater
Model	RCE-417H
Heating capacity (MJ/h)	17 (15*)
Dimensions (mm)	Width - 560 Height - 450 Depth - 155
Weight	13.5 kg
Power supply	AC 230/240 V 50 Hz
Noise level (dB(A))	Hi 38 / Med 33 / Lo 28
Method of operation	Push button
Ignition method	Continuous spark ignition
Gas flow (volume) control method	3 stage modulating valve
Convection fan	Line flow fan ⌀ 110 mm x 360 mm
Heated air outlet location	Louvre at lower front
Air flow direction adjustment	Fixed
Air output volume (m^3 / min)	Hi 3.77 Lo 2.30
Air fan speed control	Power transistor
Room temperature adjustment	L ~ 16, 18, 20, 22, 24, 26 ~ H (L setting 10°C, H setting continuous Hi/40°C OFF)
Safety device	Overheat - Bi-metal switch: 120°C OFF, (105°C return)
	Overheat - Thermal fuse: melting temperature 157°C
	Fan rotation detection - PCB
	Tipover - Tilt Switch
	Flame failure device - Thermocouple
	ODS - Thermocouple
	Flash back protection - Thermocouple
	Power failure safety device - PCB
	Excess current protection - 3A Fuse (on PCB)
	Overheat protection - OHS
	Pre-purge - PCB

* In Victoria only on LPG

§ 4 Combustion Specification

1. Basic Combustion Specification

Rinnai model reference		RCE-417H		
Gas type		Natural	Propane	LPG
Gas consumption MJ/h	HI	17	17	15 *
	MED	11	11	11
	LO	7	7	7
Main injector size (ø mm)		1.9	1.2	1.2
Length (mm)		13	11.5	11.5
Pilot injector size		0.25	0.2	0.2
Regulator pressure (kPa)	HI	0.88	2.11	2.11
	LO	0.18	0.45	0.45
PCB switch positions	ON	1, 2	2, 3, 4	2, 3, 4
	OFF	3, 4	1	1
Combustion method		Surface combustion		
Burner type		Ceramic plaque		
Flame hole size and quantity		1.3 mm x 4700		
Restrictor		Not required		

* 15 MJ/h in Victoria only.

2. Warm Air Discharge Temperature Distribution

Conditions: <High Combustion>

Test gas: Natural
Measured Input: 20.2 MJ/h
Nominal Input: 21 MJ/h

(Unit Δ°C)

89	78	59	58	72	93	96	53
87	80	56	55	67	80	95	62
92	75	53	52	60	84	99	92
89	68	50	45	51	78	101	101
89	57	45	45	42	73	97	97

(Average 72.9)

(Room temperature 24°C)

Conditions: <Low Combustion>

Test gas: Natural
Measured Input: 4.4 MJ/h
Nominal Input 4.1 MJ/h

(Unit Δ°C)

61	52	38	41	51	64	57	32
57	51	37	39	47	61	58	43
66	49	36	38	45	61	66	55
56	45	32	36	40	54	60	60
60	40	34	33	25	55	59	56

(Average 48.75)

(Room temperature 22°C)

3. Warm Air Discharge Velocity

<High Operation>

(Unit m/sec)

2.0	2.7	2.7	2.7	2.6	2.5	2.2	0.7
1.5	2.6	2.8	2.8	2.5	2.6	2.2	0.8
2.6	3.0	3.1	3.1	2.75	2.8	2.5	1.8
3.1	3.3	3.4	3.4	3.2	3.1	2.9	2.7
3.3	3.2	3.3	3.4	3.0	3.2	2.8	3.1

<Low Operation>

(Unit m/sec)

1.1	1.6	1.7	1.7	1.6	1.5	1.2	0.4
0.8	1.6	1.8	1.6	1.6	1.7	1.2	0.4
1.7	1.8	2.0	1.8	1.8	1.8	1.5	1.0
1.9	2.2	2.2	2.2	2.1	2.1	1.8	1.7
2.1	2.1	2.2	2.2	1.9	2.0	1.5	1.8

Conditions

Convection Fan Rpm. High: 1000 rpm
Low: 600 rpm

Measured with gas on
Average air velocity on High: 4.03 m/sec
Average air velocity on Low: 2.62 m/sec
Area of louvre: 0.0187 m^2
Air flow rate on High: 3.77 m^3/min
Air flow rate on Low: 2.30 m^3/min

4. Noise Level

Operation Noise (dB(A))
High: 38 Low: 28

Measuring method: According to Japanese Industry Standards During Combustion

1. Combustion Control by Convection Fan System

This system controls the volume of combustion air (primary air) based on the ability of the convection fan to provide air for combustion as well as heated convection air. This provides for more stable combustion.

Changes in the volume of gas for combustion, or the flame characteristics are measured by the thermocouple as the burner flame changes in temperature The convection fan is controlled by the PCB and set at an appropriate speed (rpm) related to the temperature as measured by the TC.

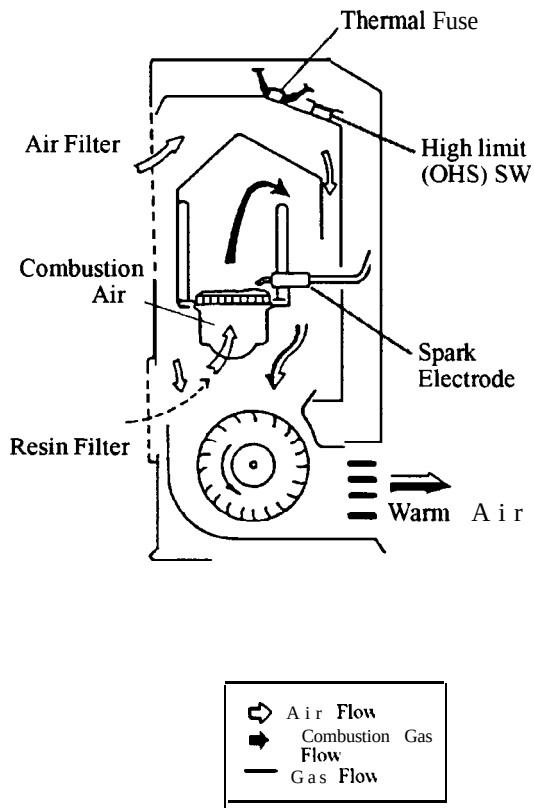
In summary: Gas Plow Increases → Thermocouple temperature rises →**PCB** instructs increase in speed → Speed increase is checked by the PCB.

During normal "high" combustion, the output of the thermocouple is 26 m V which gives a speed for the convection fan of 1000 rpm.

If the air filter becomes blocked with dust, reducing the amount of air available for combustion, the temperature of the combustion side of the burner tile begins to increase, which in turn increases the voltage output of the TC. This then increases the speed of the fan.

If left in this state (and dust continues to collect and block the appliance) the speed increases to its limit. The output voltage continues to increase (the fan can go no faster) and the flashback point would be reached. (Before this point is reached, combustion is automatically stopped by the hi-cut function when the output from the TC rises to 34 mV).

Before automatically shutting down, when the TC output reaches 33 mV, the filter sign begins to flash, reminding the customer of the need to clean the filter.

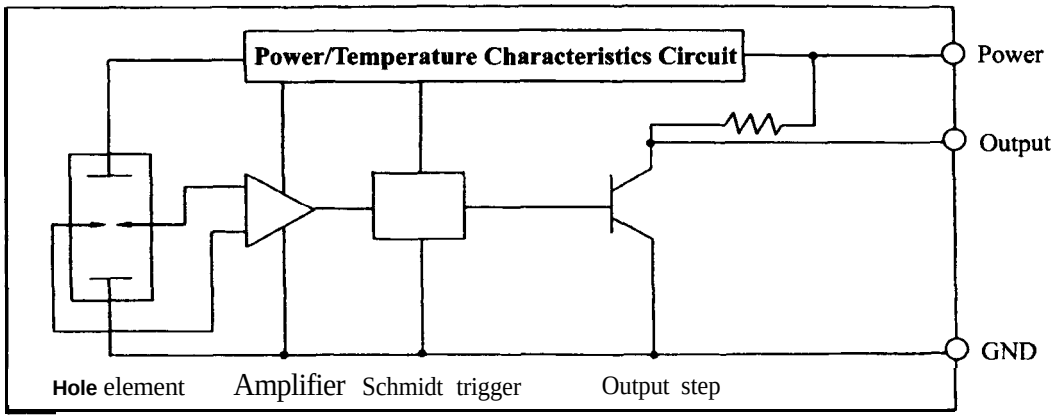


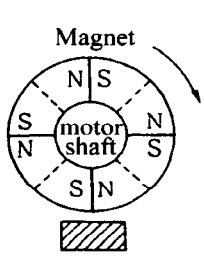
2. Convection Fan Rotation Sensor

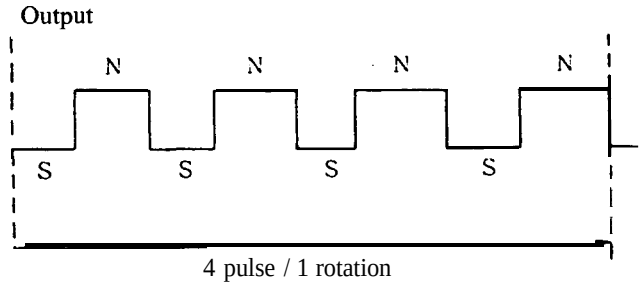
The rotations are measured by the pulse signal's cycle and the PCB input of the hole IC output which produces the motor rotation signal. The Pulse Wide Modulation **(PWM)** output is adjusted so the **correct** rpm is achieved. This is achieved by comparison of the target value and sensed rotation.

The rotation sensor outputs 4 pulses for every 1 rotation.

(a) Circuit diagram of Hole IC

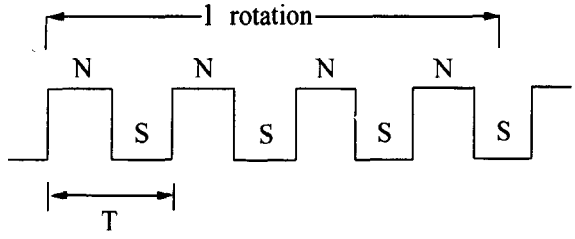






(b) Action

① Hole output is amplified by the amplifiation circuit (Hole IC internal action)
② The amplified signal passes through the Schmidt trigger circuit producing a waveform. (Hole IC internal action).
③ The oscillating signal is output as a digital signal (Hole IC internal action).
④ The Hole IC output signal is input into the PCB.
⑤ Within 1 rotation of the fan, the magnetic field changes from N, S, N, S, N, S, N, S, outputting a pulse as shown in the diagram below from the hole IC. This pulse is recorded by the PCB.



⑥ The T secs cycle of the pulse taken is measured by the **PCB .**
⑦ Using the T **secs** cycle result, the rotations per minute of the fan is calculated.

< Calculation Method **>**

When the T sec cycle is converted to pulse electrical frequency it becomes:

Electrical Frequency $= \frac{1}{T}$ Hz

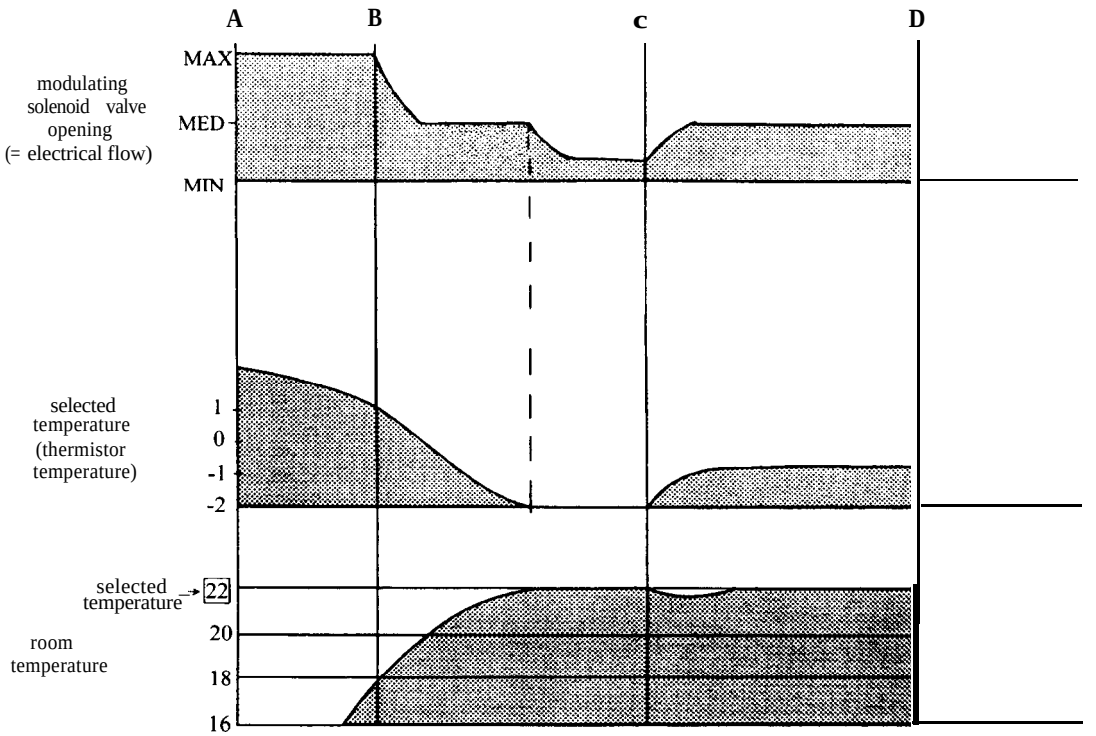
This means that, **in one second,** $\frac{1}{T}$ pulse is output.

With 1 fan rotation 4 pulses are output from the Hole IC, therefore, in 1 second $\frac{1}{4T}$ rotations are made.

Converting this to rotations per minute, brings us to the number of fan rotations.

Following: $\frac{1}{4T} \times 60 = \frac{15}{T}$ 'pm = fan rotaions.

3. Room Temperature Control by the Modulating Solenoid Valve



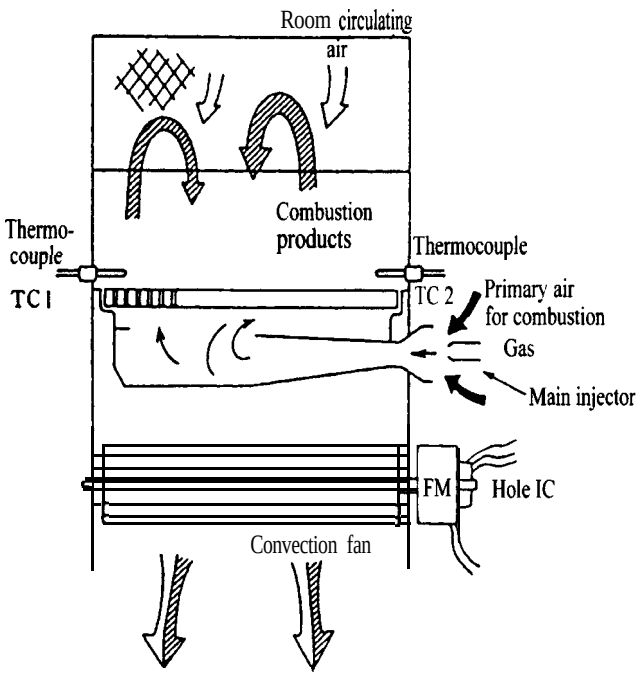
① When the difference between the selected temperature and the thermistor temperature is great (initial ignition A – B), the modulating valve opens fully.

② When room temperature minus thermistor temperature becomes approximately 1 degree, the modulating valve moves to the medium position; when it is minus 2 degrees, it moves to the low position (B – C).

③ The gas flow is controlled in 3 stages by the modulating valve from 17 to 11 to 7 MJ / h, making room temperature control very even.
When the heating load changes, the modulating valve quickly opens and gas flow increases until it matches the load, thus controlling the room temperature accurately to the selected temperature (C – D).

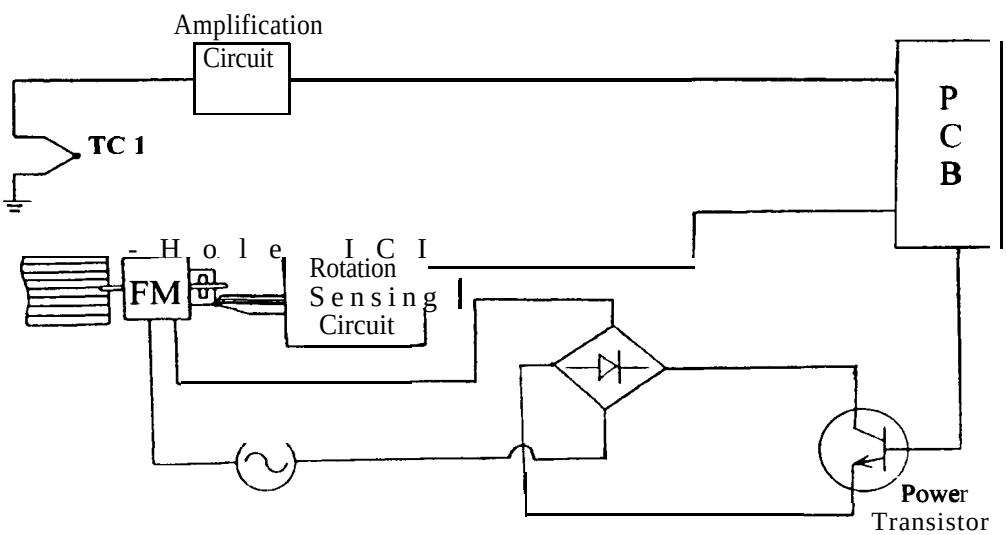
4. Explanation of Combustion Operating Principles

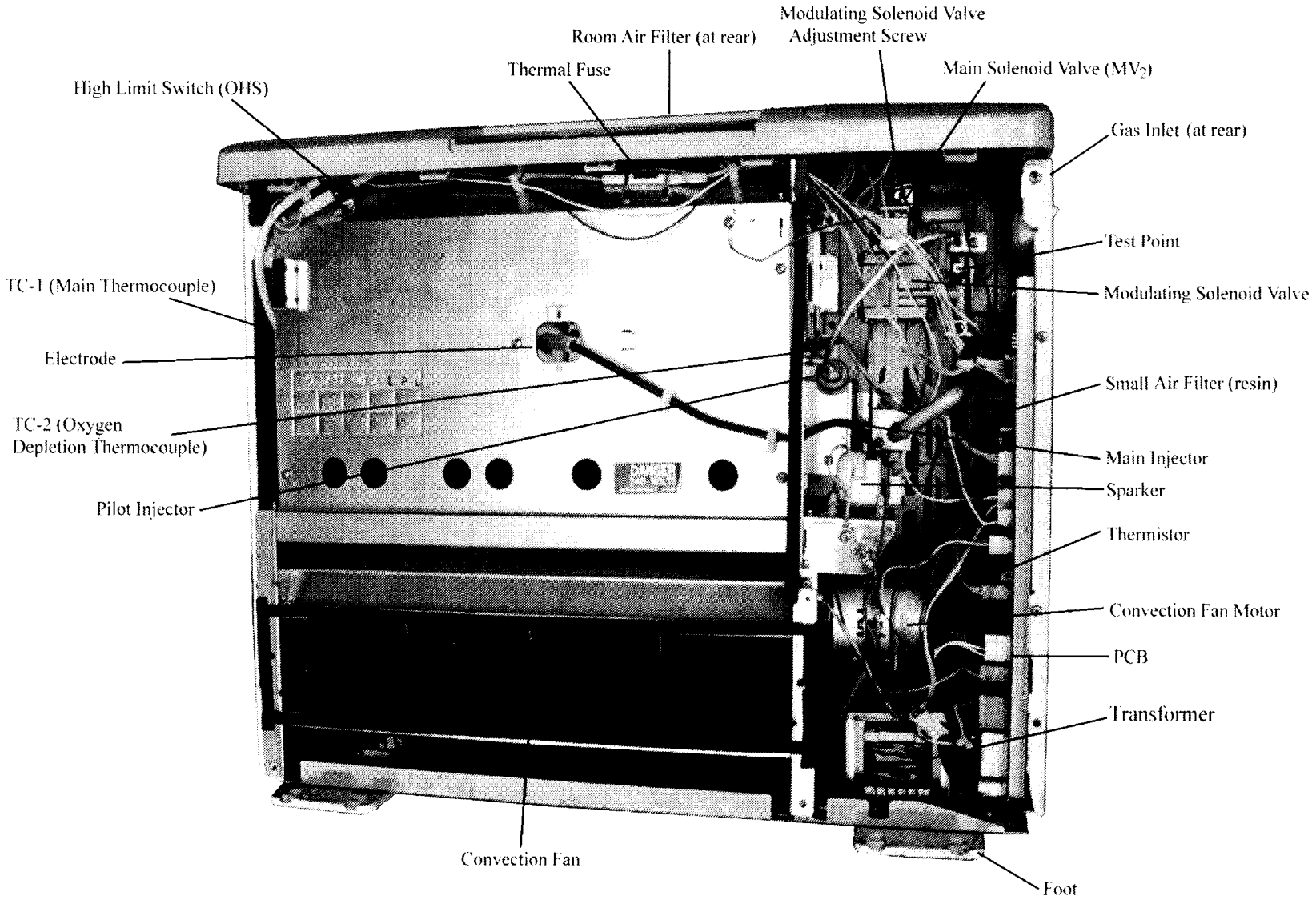
(a) Optimum Combustion Control Principles



1. The main burner is complete primary air surface combustion.
2. All air needed for combustion is taken in through the ventruri.
3. The appliance is constructed so that the amount of air for combustion is increased or decreased according to the combustion fan's rotation speed.
4. The thermocouple **TC1,** placed just above the main burner ,monitors combustion and, according to the rise and fall of the thermocouple output, the combustion fan's rotation speed is controlled, maintaining optimum combustion conditions.
   The oxygen level in the room is monitored by TC2. This thermocouple is placed in a 'gas rich' area of the main burner. (The gas for the flame in this area is supplied by both the main injector and a smaller secondary injector). The output from TC2 is monitored by the PCB, which in turn closes the solenoids if pre-set limit conditions are reached.
5. The PCB records the output signal of the Hole IC attached to the convection fan motor. If there is a difference in actua dompared with indicated motor rotation, the power to the moto willrbe increased or decreased until it reaches the indicated rotation speed.

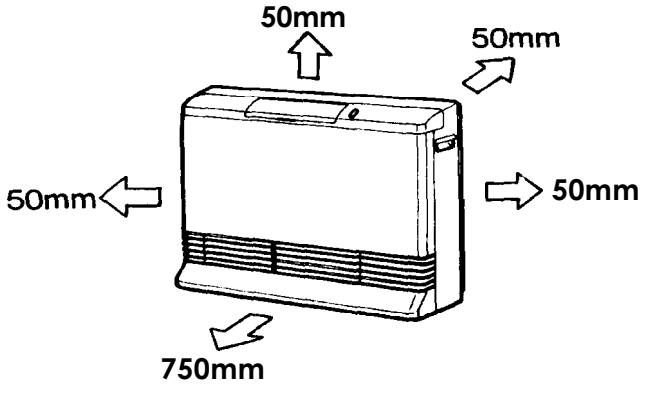
(b) Optimum Combustion Control Operation. Block Diagram

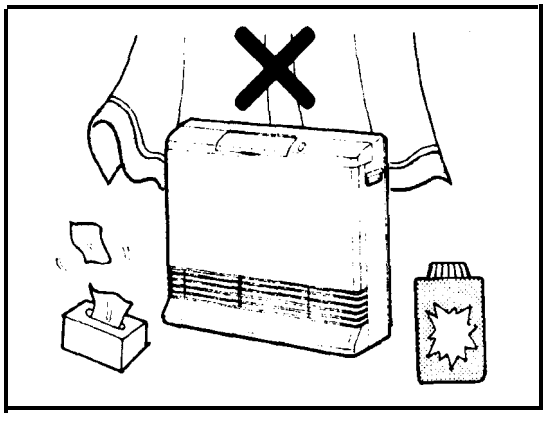



Modulating Solenoid Valve Adjustment Screw
Room Air Filter (at rear)
Thermal Fuse
Main Solenoid Valve (MV_2)
High Limit Switch (OHS)
Gas Inlet (at rear)
Test Point
TC-1 (Main Thermocouple)
Modulating Solenoid Valve
Electrode
Small Air Filter (resin)
TC-2 (Oxygen Depletion Thermocouple)
Main Injector
Sparker
Pilot Injector
Thermistor
Convection Fan Motor
PCB
Transformer
Convection Fan
Foot

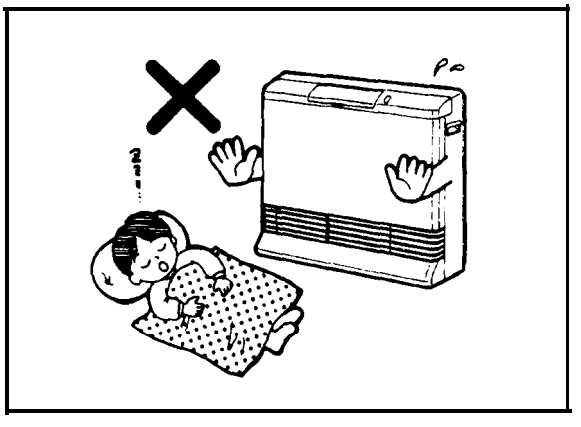
§ 7 Installation

The following clearances are recommended for installation.

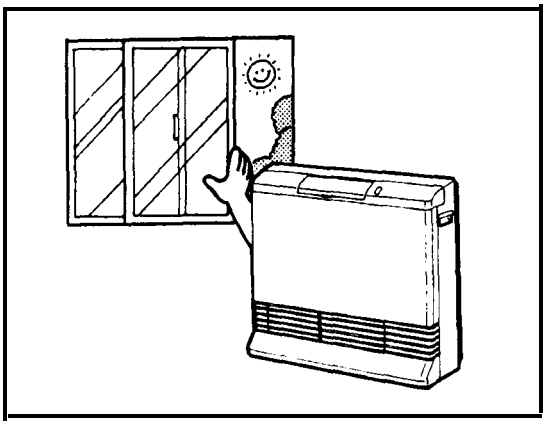




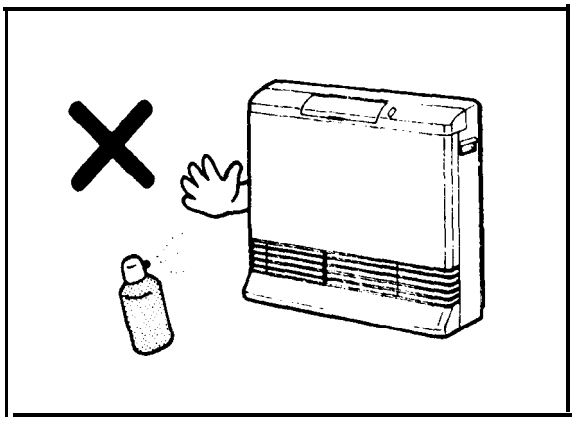
Keep away from flammable materials or curtains.



Do not allow children or elderly persons to sleep in the warm air discharge from the heater.



Ventilate the room when the heater is in use. Correct, fixed ventilation is usually sufficient; consult your gas authority for local regulations.

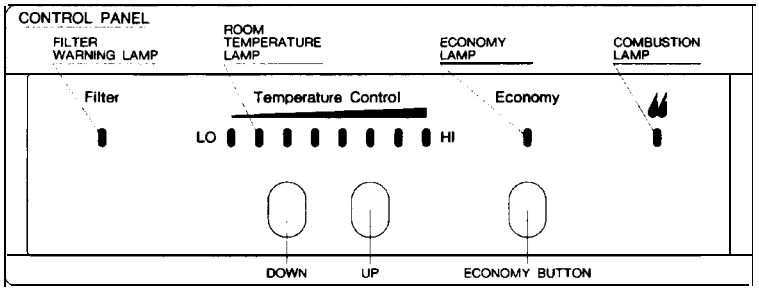


Do not spray aerosols near the heater while it is in use. Use of aerosols, paint, polishes etc. whilst the heater is in use may cause unpleasant smells. Butane filled aerosols may cause an explosion.

1. Normal Operation

Press operation switch. Room temperature indicator flashes and operation indicator glows, convection fan operates, and pre-purge occurs. Approximately 3 seconds later, the spark generator begins to discharge a spark from the electrode across the spark gap. At the same time, the solenoid valves and the modulating solenoid valve open.

After the flame ignites at the burner it operates on “High”, the thermocouple senses the flame, and the combustion indicator glows red. The spark stops. “Forced high” combustion continues for 60 seconds. This is to allow combustion to stabilise. The PCB continually monitors the room temperature and combustion conditions.



2. Temperature Control

Select the desired room temperature using the temperature control switches. The pm-set temperature indicator is continuous, the room temperature indicator flashes.

3. Turning OFF

Press operation switch. Solenoid valves and the modulating solenoid valve close, and combustion ceases. All indicators will go out. Convection fan stops after post-purge (approximately 200 – 255 seconds).

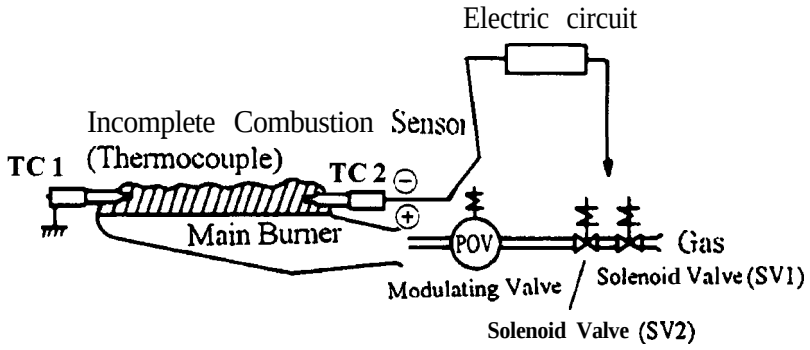
4. Economy Mode

Press economy mode button. The economy mode indicator illuminates. Thirty minutes after the room temperature reaches the preset temperature (set with the thermostat), the ‘Economy Mode’, if set, reduces the temperature by 1 “C. After another 30 minutes the temperature will be reduced by a further 1 “C. This is an energy saving feature. When the heater is running only on low, the ‘Economy Mode’ does not operate. It doesn ‘t operate if the heater is under capacity for the room size.

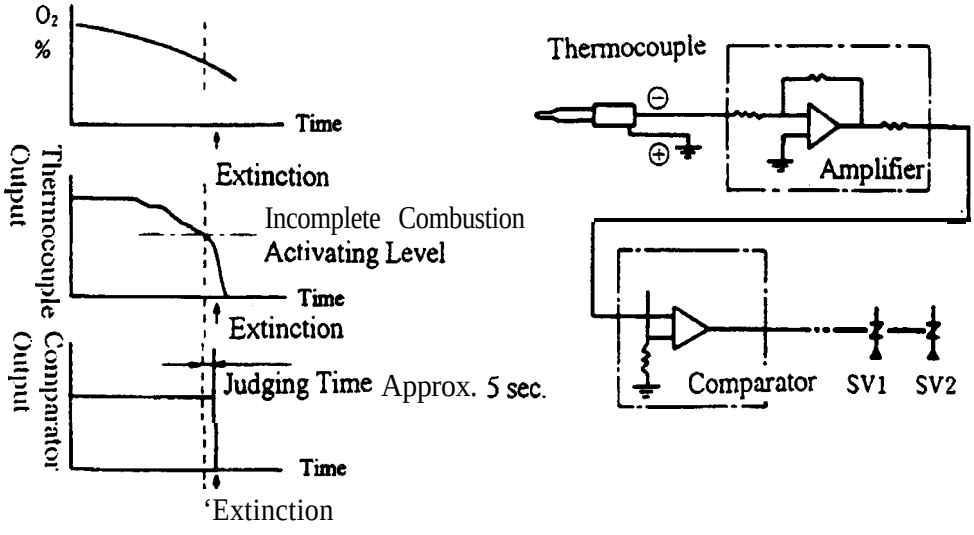
If the economy mode switch is pressed at any time while it is in operation then the economy mode indicator will go out.

(A) Safety Devices

1. Incomplete Combustion, ODS, and Flame Failure Safety Device

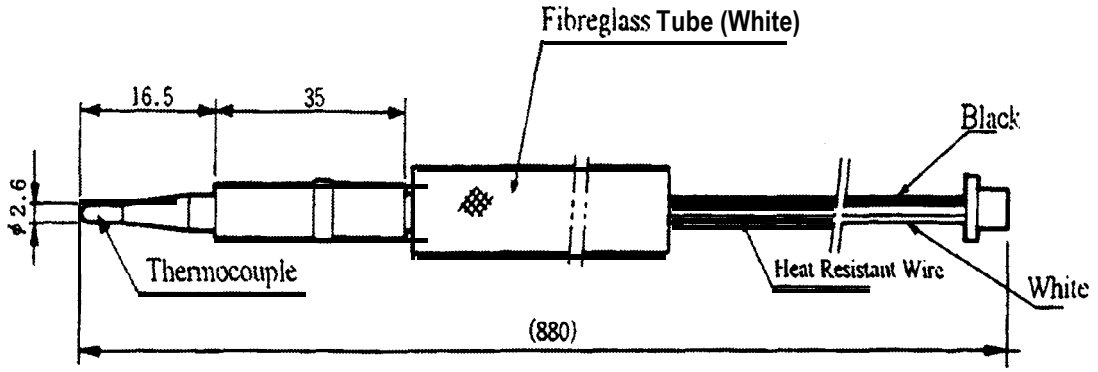


The **Incomplete Combustion Safety Device** is a flame temperature sensing type, using a sensor with a thermocouple. Thermocouples are used widely as burner safety devices. The Incomplete Combustion Safety Device is incorporated in a special burner structure and is connected to an electronic sensor. Combustion and flame failure are monitored by this system.



The amplifier amplifies the thermocouple output (20-30 mV) and any changes are checked against the comparator. If the output is lower than the standard voltage of the comparator, the PCB closes the gas valve.

(a) Sensor Specification



(b) Sensor Performance

Ignition Sensing Voltage (mV)	ODS Sensing Voltage (mV)	Normal Output Voltage (mV) (Ref) Standard Performance NG		Drop Out Time (sec)
Output at initial check + 2 mV	level *3-7 12±1.5 level 1-2 14±1.5	Level 3 ~ 7 Level 1 ~ 2	> 16 < 35 (High) > 18 < 35 (Low)	Below 60
		(Ref) HI: above 16 LO: above 18		

Drop Out = Time until the gas is cut off after flame failure.
Sensing voltage varies depending on gas type. (Refer to individual gas specifications)

* Modulating valve step.

2. Overheat Switches

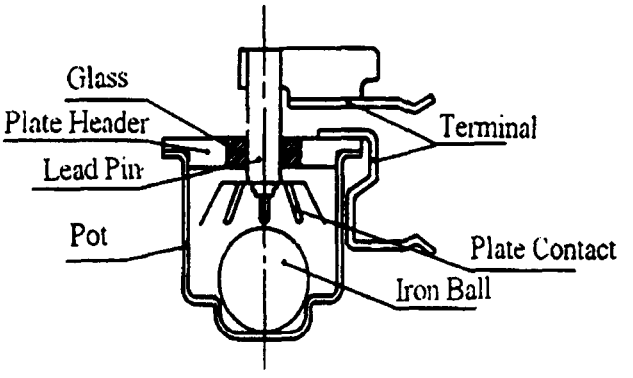
If either the air filter or the air oulet becomes blocked, the solenoid valve closes and operation stops. The appliance can be re-lit when it has cooled. If either the air filter or the air outlet becomes blocked, and the OHS fails, the solenoid valve closes and operation stops. This is a “one-shot” fuse; the appliance cannot be restarted until the fuse has been replaced.

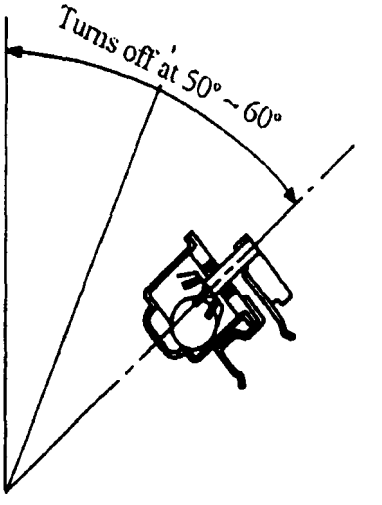
Type	Performance	
Thermistor	Level 3 ~ 7 Level 1 ~ 2	Activates at 100°C Activates at 90°C
Thermal Fuse	Cut Off Temp	157°C

3. Tilt Switch Safety Device

Normally, the circuit is open. However, the circuit is closed when unit is tilted, this activates the switch safety circuit on the PCB and shuts the solenoids.

Type	Performance	
Steel Ball Tilt Switch	Activating Angle	50° ~ 80"

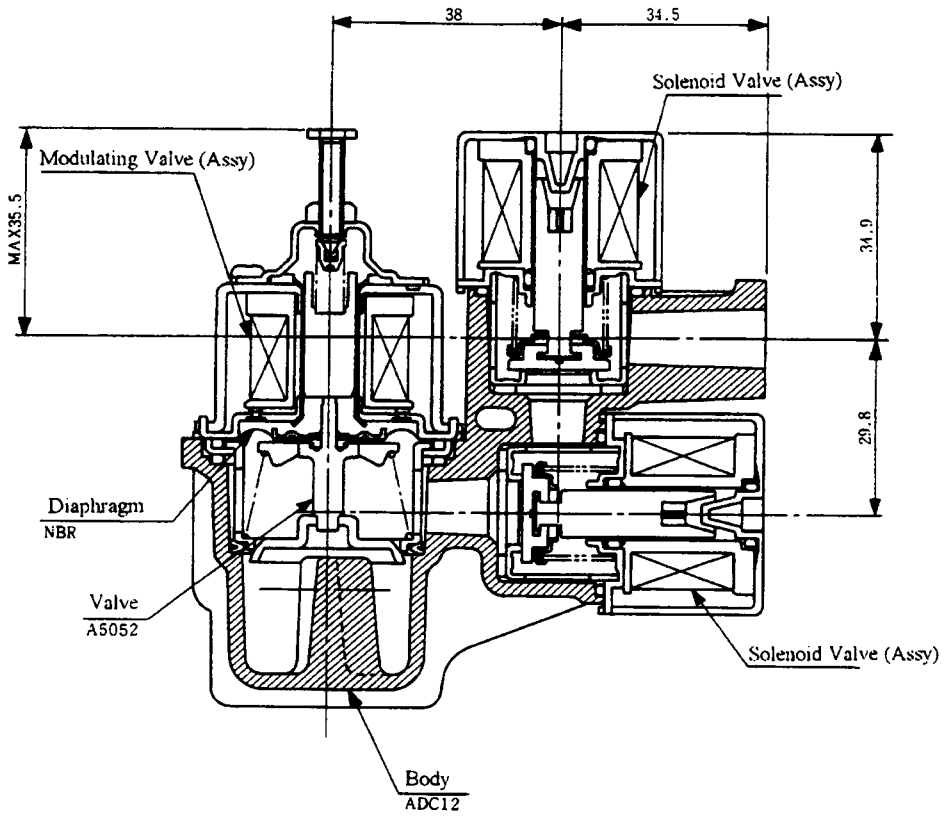




4. Surge Protection

Type	Value
Glass Fuse	3 Amp

(B) Valves



1. Solenoid Valve

Type	Specification	Solenoid Valve 1	Solenoid Valve 2
Single Seated Valve	Voltage	DC 90 V	DC 90 V
	Power Consumption	Below 6 W	Below 6 W

2. Modulating Valve

Specification	
Current	Below 180 mA
Power Consumption	Below 6 W

(C) Electrical

1. Convection Fan

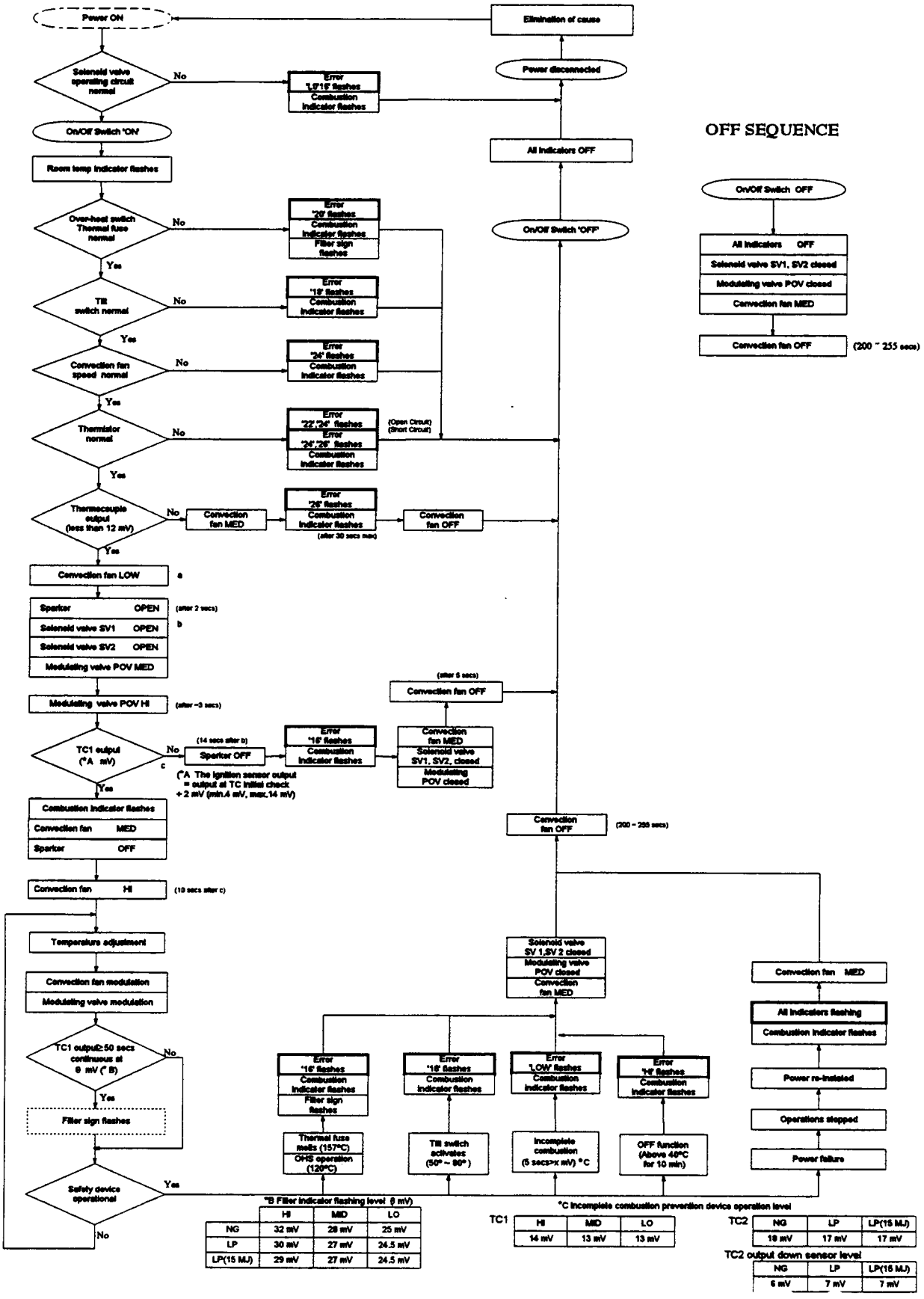
Convection Fan				
Type	**Diameter (mm)**	**Width (mm)**	**Air Flow Rate m^3/min**	**Fan (rpm)**
Line Flow Fan	110	360	(Gas Off) HI: 3.77 LO: 2.30	HIGH: 1000 ± 100 LOW: 600 ± 100

NOTE: (1) Air flow rate is measured using a duct
(2) Fan speed is measured with gas ON, and appliance completely assembled

2. Thermistor Resistances

Temperature (°C)	**Resistance (kΩ)**
	Room TH
16	90
18	85
20	81
22	77
24	74
26	71

§ 10 Operation Flow Chart



*B Filter indicator flashing level (mV)

	HI	MID	LO
NG	32 mV	28 mV	25 mV
LP	30 mV	27 mV	24.5 mV
LP(15 MJ)	29 mV	27 mV	24.5 mV

*C Incomplete combustion prevention device operation level

TC1

HI	MID	LO
14 mV	13 mV	13 mV

TC2

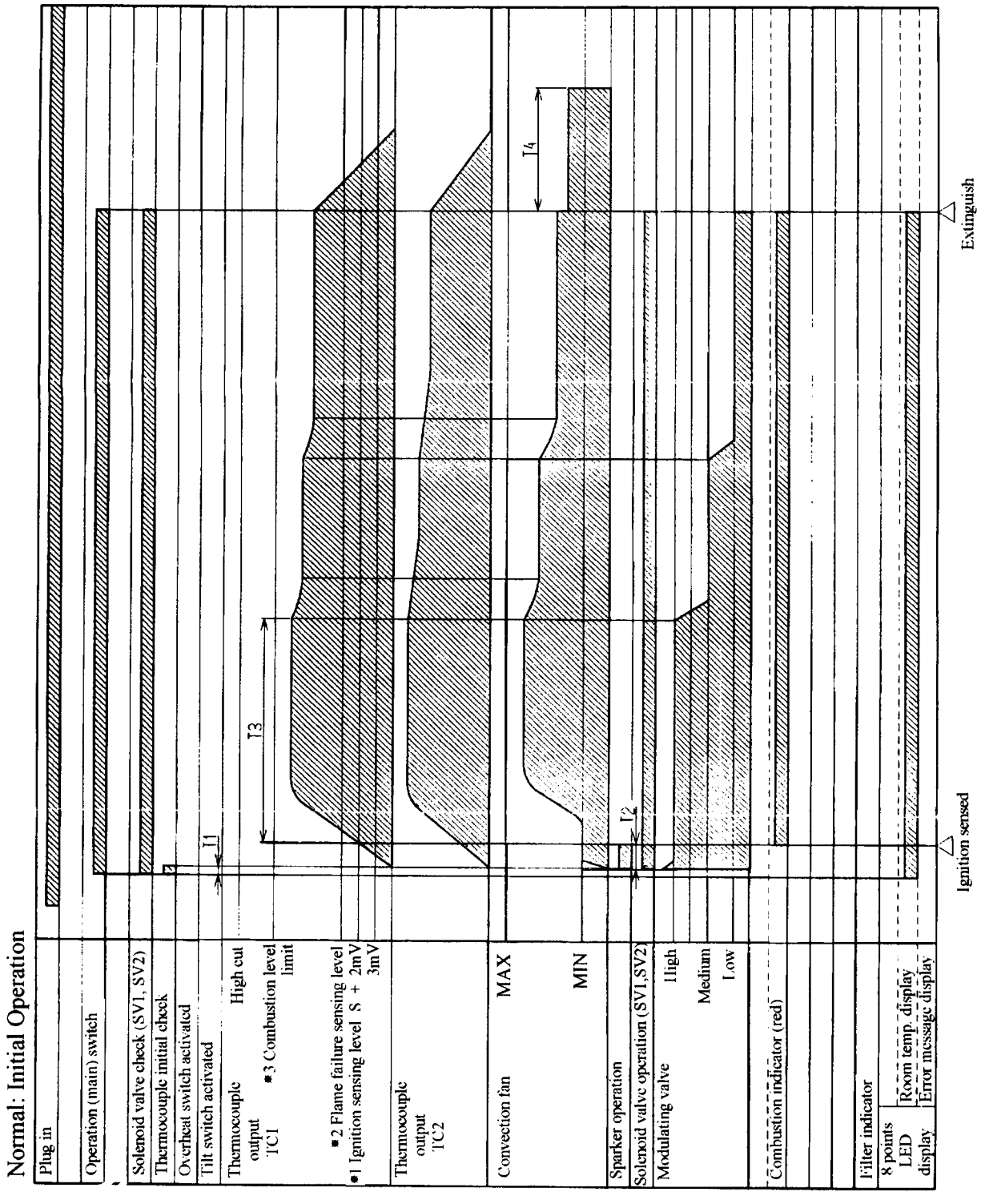
NG	LP	LP(15 MJ)
19 mV	17 mV	17 mV

TC2 output down sensor level

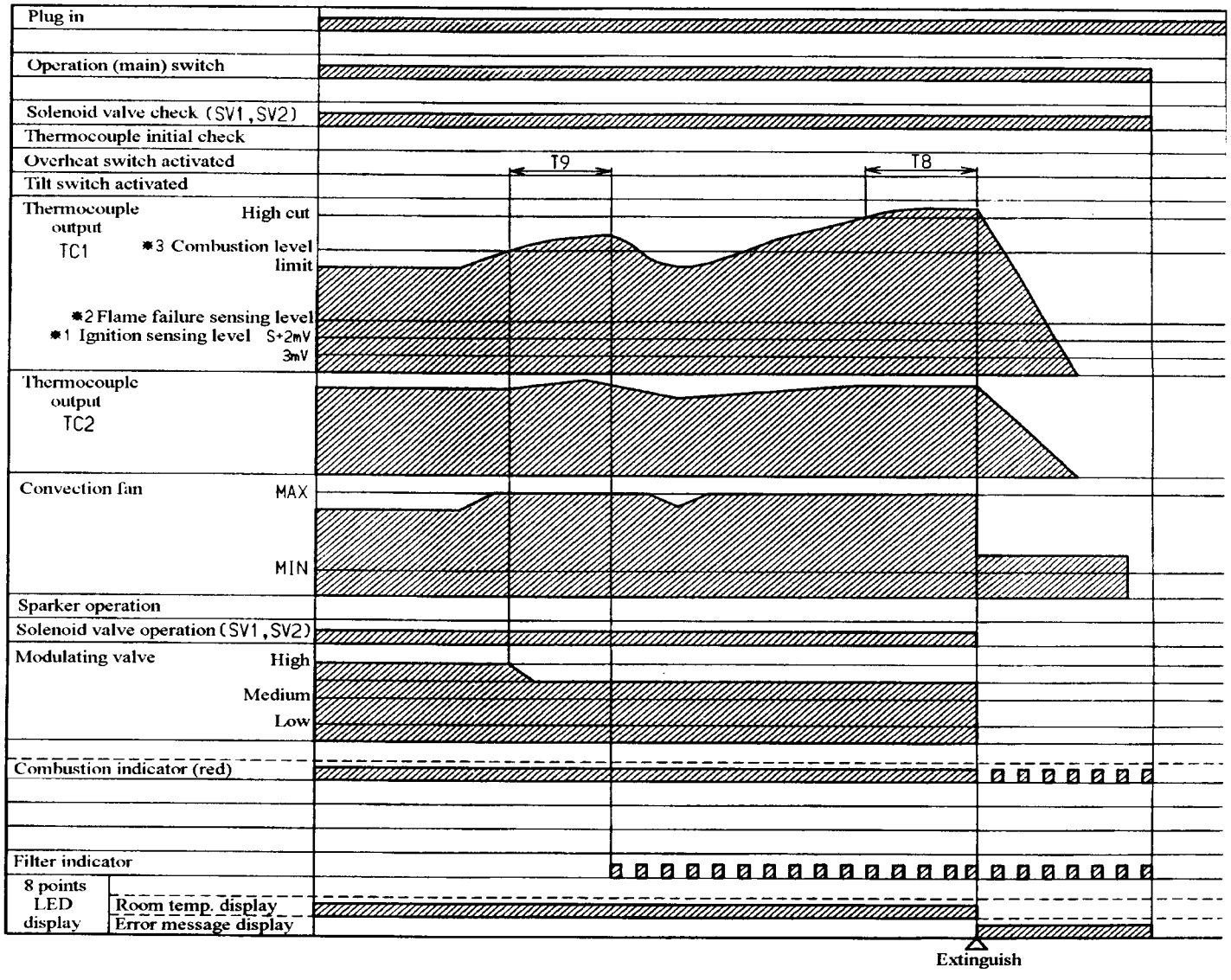
NG	LP	LP(15 MJ)
6 mV	7 mV	7 mV

§ 11 Time Charts

T1: Thermocouple initial check continuous time — max 30 secs
T2: Sparker operation time — max 3 secs
(Compulsory holding time) — max 14 secs
T3: Compulsory "high" time — 100 secs
T4: Post purge timer - when filter indicator flashes & OHS operates — 255 secs
- other than above — 200 secs
T5: Compulsory post purge time — 20 secs
T6: Flame failure sensing determining time — 5 secs
T7: Tilt switch operation determining time — 0.2 secs
T8: TC high cut operation determining time — 60 secs
T9: Filter indicator flashing determining time — 50 secs



Thermocouple Output High Cut



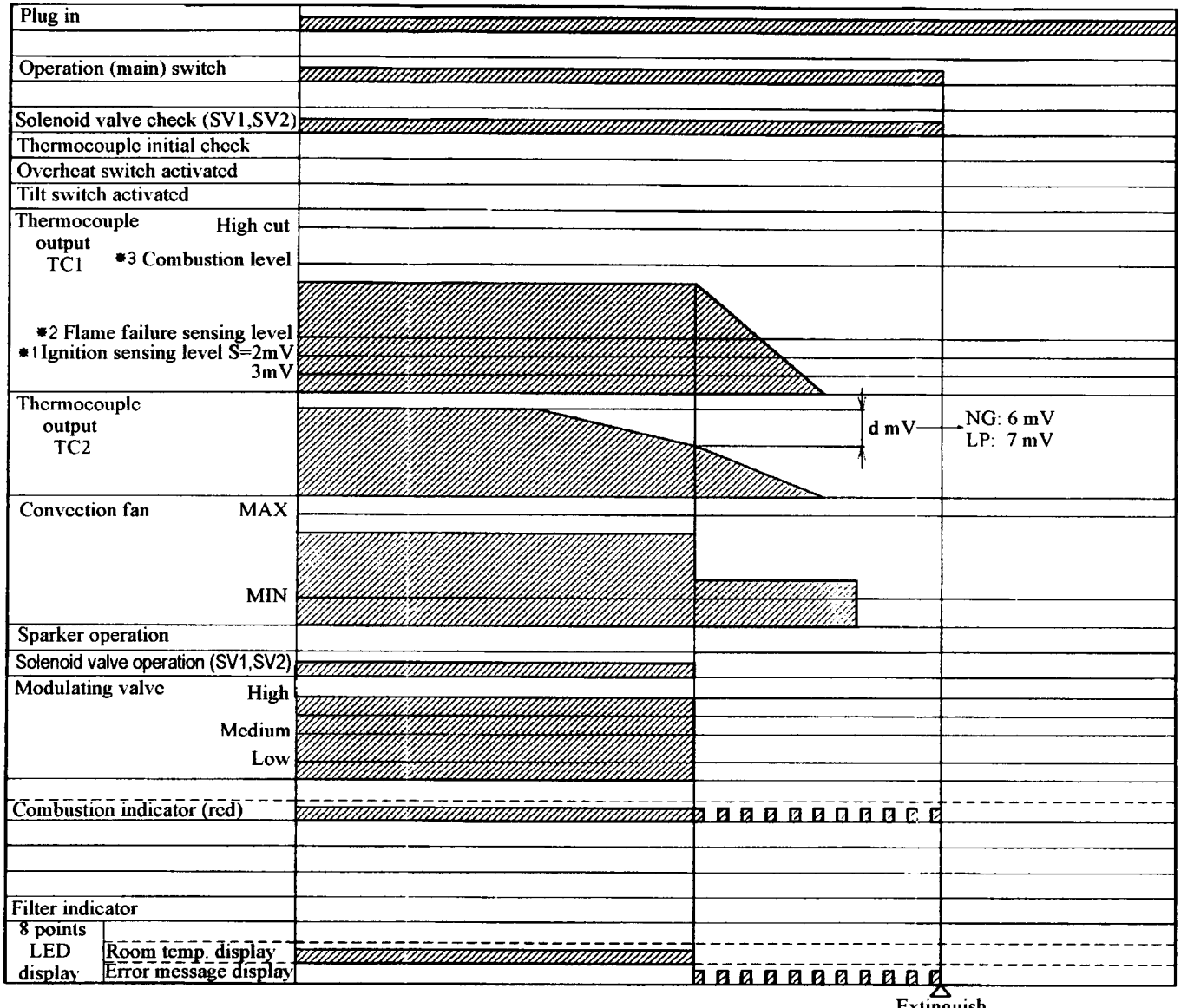
Filter sign flashing TC output (mV)

combustion	HI	MED	LO
NG	32	28	25
LP	30	27	24.5

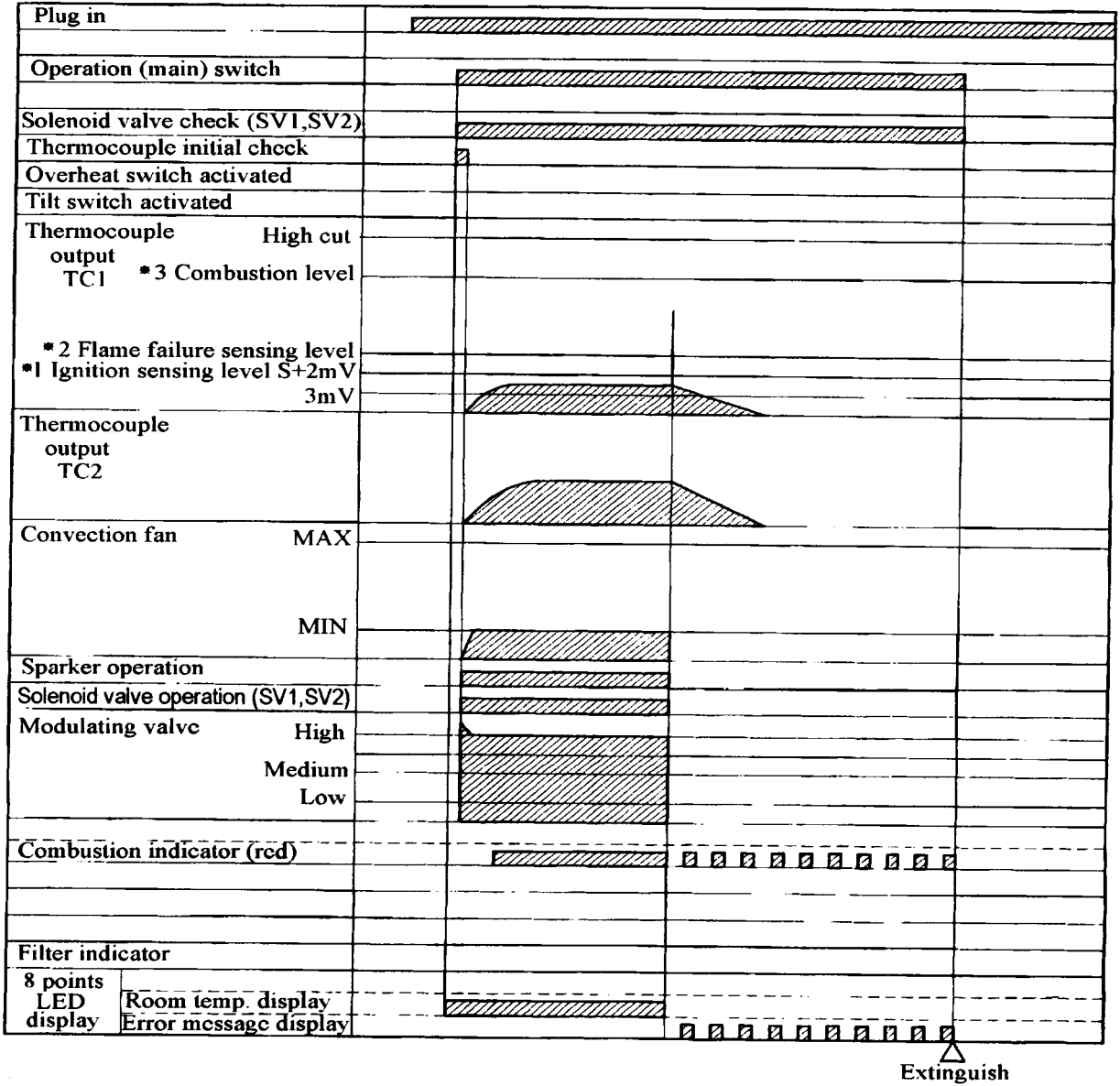
TC high cut output (mV)

combustion	HI	MED	LO
NG	34	29	26.5
LP	32.5	28.5	25.5

Oxygen Depletion Activated



Flame Failure



§ 12 Ignition and Operation Sequence

Ignition procedure		Reaction	
1	Connect electrical cord to power point.	⇛	Current to ON/OFF switch.
2	Plug in gas hose.	⇛	Gas flows to solenoid valve (SV,).
.	Turn the ON/OFF switch on.	⇛	Convection fan (CF) begins to rotate and sparker operates.
		⇛	Solenoid valves (SV, and SV,) and the modulating valve (POV) open after spark begins.
		3	Gas flows to the burner and ignition occurs.

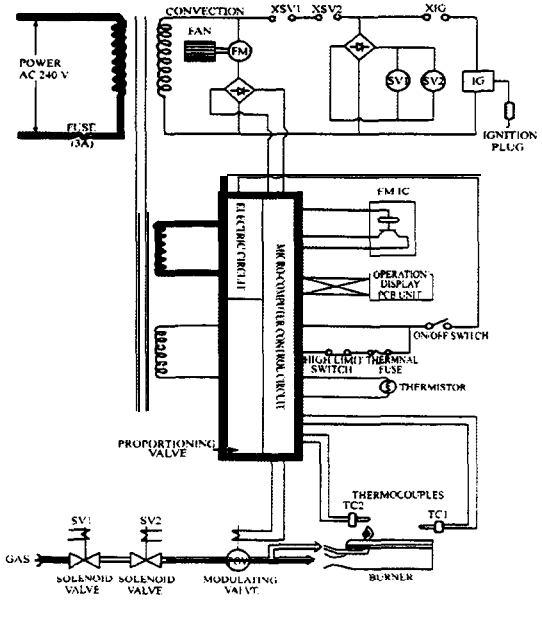
Diagram of gas flow & Electric circuit	Caution
	⇛ **Ensure** gas is **turned** on. ⇛ Check hose for bends or kinks. ⇛ Air in hose will delay ignition.

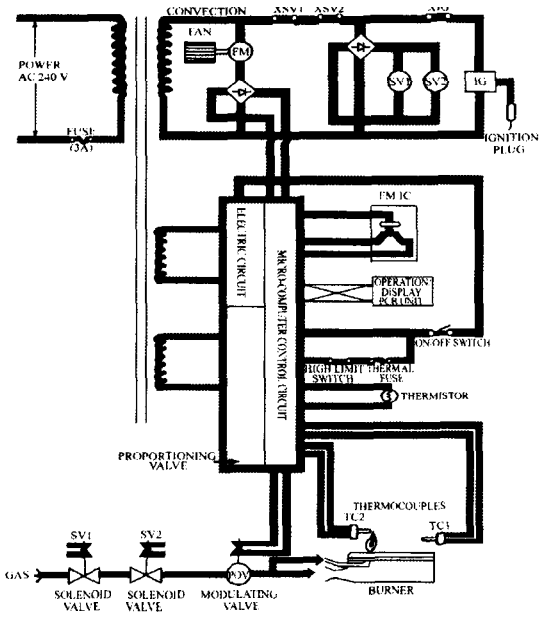
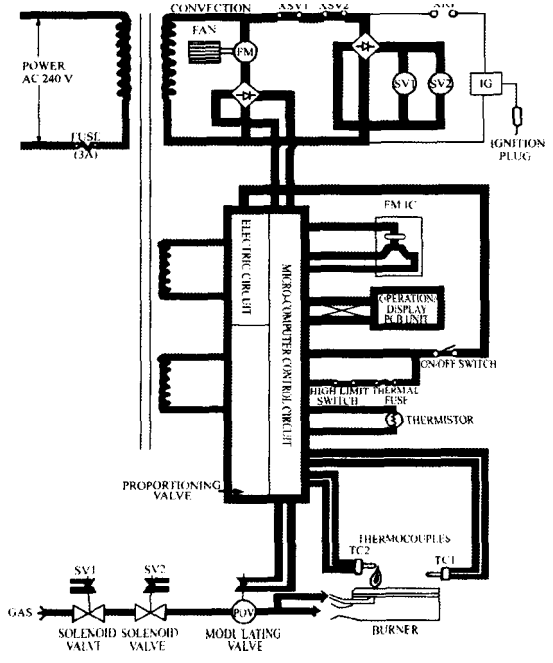
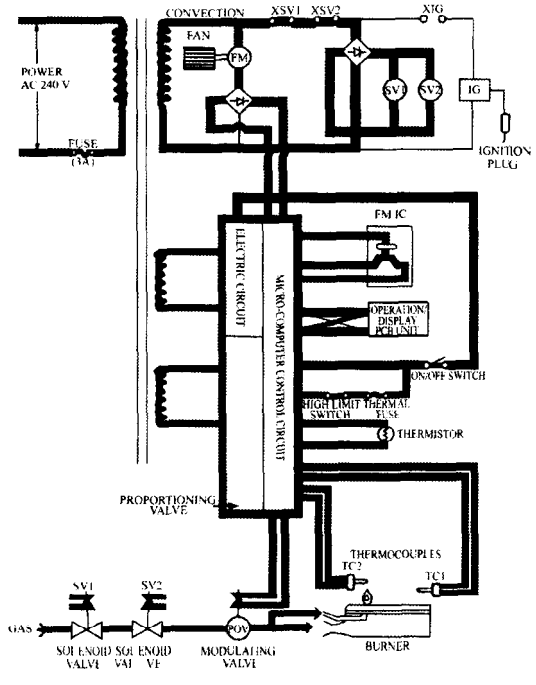
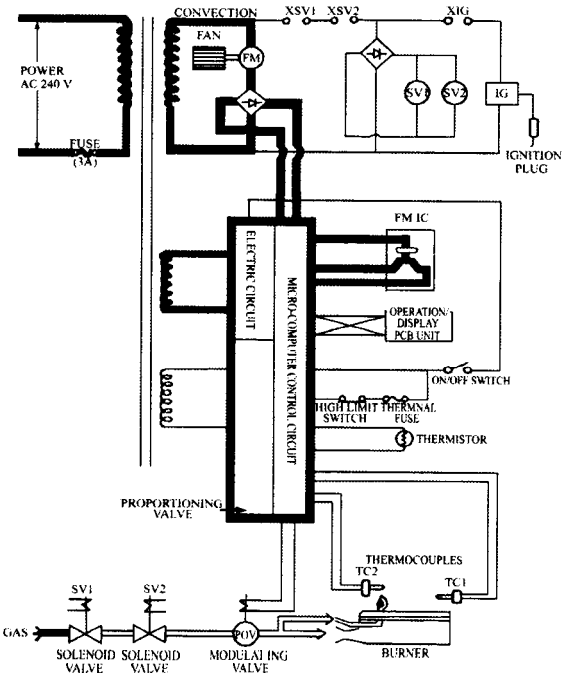
Diagram of gas flow & Electric circuit	Caution
	⇛ Air in hose will delay ignition. ⇛ The ignition sequence continues for 15 **secs;** if output from thermocouples does not reach the pre-determined level, the solenoid valves **(SV,** and **SV,)** and modulating valve will close. ⇛ Switch OFF and repeat ignition procedure.
Reaction	
High Combustion Operation	
* S = Output of **TC1** , just before solenoid valve (SV) opens.	⇛ Thermocouple **(TC1)** heats up and output exceeds S* + 2mV. 3 Combustion indicator (red, LED) glows. 3 Spark ceases. Thermocouple heats up and the output exceeds 14 mV (Combustion remains on **"high"** for approx. 100 **secs** after ignition).
"Low" Combustion Operation	
	⇛ Modulating valve operates to "low". ⇛ Convection fan rotates at "Low" speed.

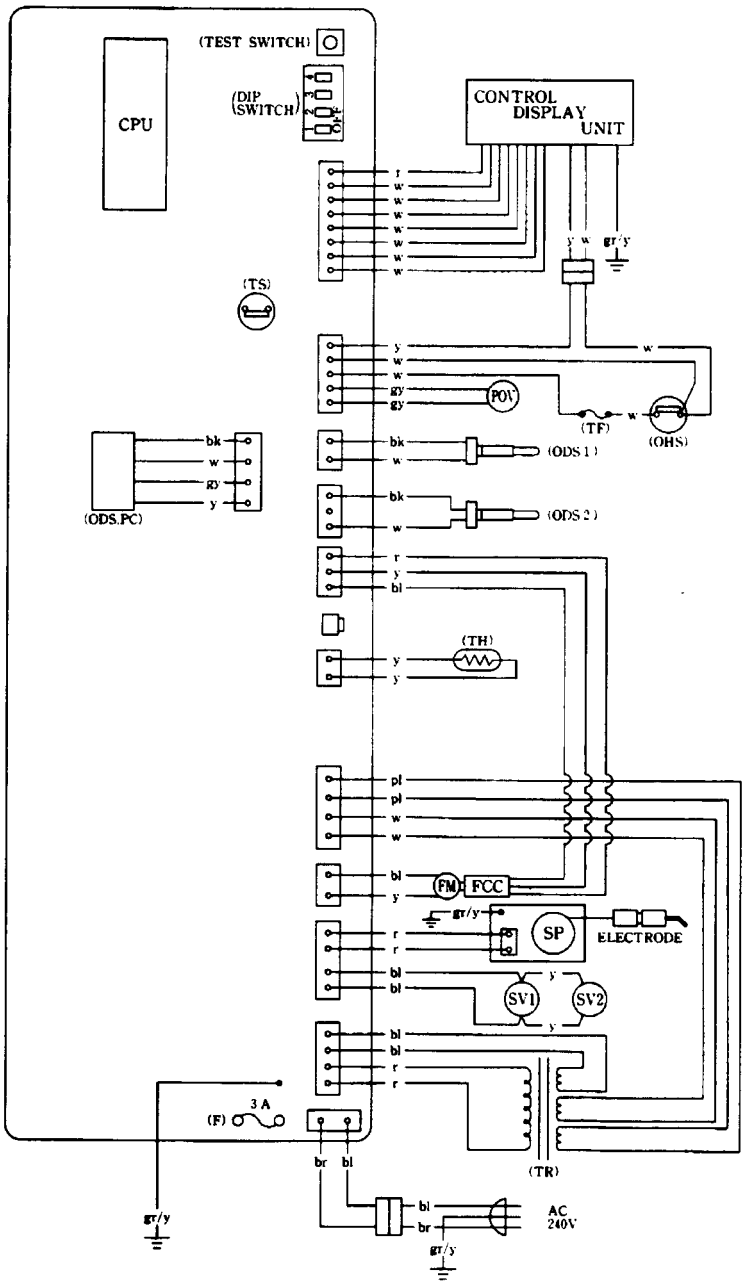
Diagram of gas flow & Electric circuit	Caution
	**3** Irrespective of the pre-set room temperature, initial combustion will remain on “High” for approx 100 seconds after ignition (this is to stabilise combustion). 3 After 100 seconds, operation is controlled by the thermistor and temperature modulating control operation system.
	⇛ Appliance operates on “Low” if room temperature is within 2 °**C**, of pre-set temperature, or higher than set temperature.

OFF Sequence	Reaction
1. Press ON/OFF switch, to return it to the OFF position.	⇛ Solenoid valves (SV, and SV,) and modulating valve close. ⇛ Combustion and room temperature display indicators go out. ⇛ Convection fan rotates for approx 200 seconds on medium speed before stopping completely. (Removes residual heat from interior of appliance). (255 seconds if appliance is overheated). ⇛ Do not disconnect the electric cord prior to convection fan stopping. (Appliance will overheat).

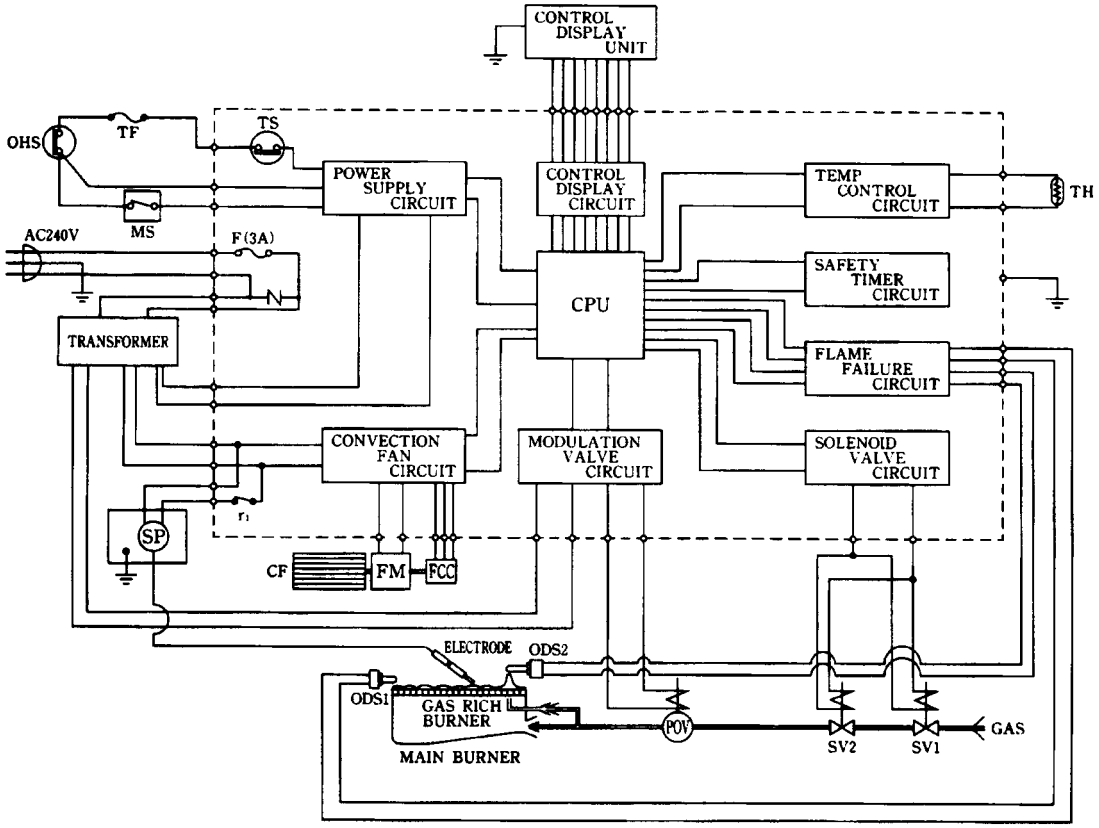
Diagram of gas flow & Electric circuit	Caution



§ 13 Wiring Diagram



§ 14 Block Diagram

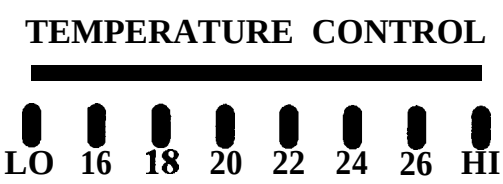


CODE	COLOUR
bk	black
bl	blue
br	brown
gy	grey
gr/y	green/yellow
pl	purple
r	red
w	white
y	yellow

MARK	PART NAME	MARK	PART NAME
TR	TRANSFORMER	FM	FAN MOTOR
SV1~2	MAIN SOLENOID VALVE 1~2	CF	CONVECTION FAN
POV	MODULATION SOLENOID VALVE	FCC	FAN CONTROL CIRCUIT
MS	MAIN SWITCH	F	FUSE
OHS	OVER HEAT SWITCH	ODS1~2	OXYGEN DEPLETION SENSOR
TF	THERMAL FUSE	ODS.PC	O.D.S. POWER CHECK
TS	TIP OVER SWITCH	TH	THERMISTOR
SP	SPARKER	CPU	CENTRAL PROCESSING UNIT

§ 15 Error Coded Messages

When the safety device is activated, the cause will be indicated by a flashing display.
The ***combustion lamp*** will go out. (If the OHS or Thermal Fuse operates, and the ***filter lamp*** was on, the ***filter lamp*** will go out).



The error message will be displayed by the temperature indicator LEDS located under the control panel cover.

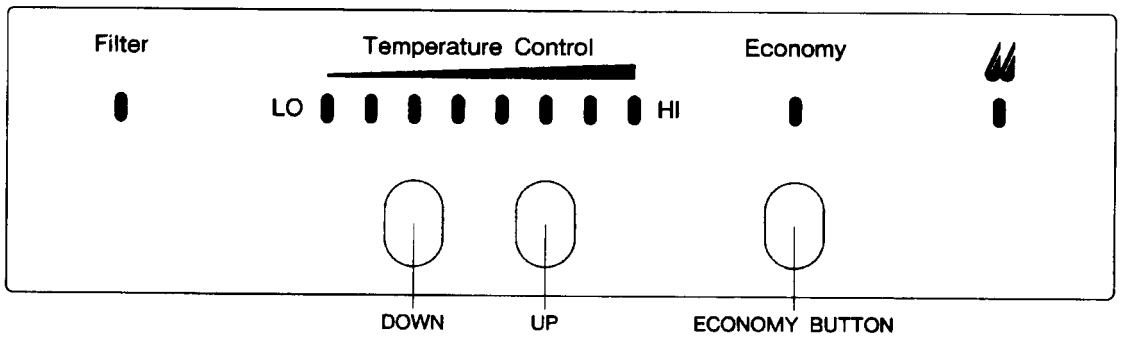
Depending on the type of malfunction, either one or a combination of the indicators will flash. The flashing will continue until the ON-OFF button is pressed to turn the appliance off. An explanation of the various combinations of error messages which can be displayed is explained below.

Indicator	Error	Explanation
LO	Flame Failure	During combustion the TC output falls below the flame check level for more than 5 seconds
16	Ignition Failure	14 seconds after the initial spark, the TC output does not reach the ignition level
18	Tilt switch activated	The tilt switch has been activated for more than 0.2 seconds continuously.
20	OHS or thermal fuse activated	The OHS or thermal fuse has been activated continuously for more than 0.2 seconds.
24	Abnormal fan rpm.	1) During combustion and after activation of the modulating valve (controlled depending on the output of TC1) the rpm varies from the designated rpm for more than 10 seconds. 2) Less than 10 Hz (150 rpm) is sensed for 1 second. 3) During pre-purge: (Ml) is above 18 Hz (270 rpm) and below 38 Hz (570 rpm) (M2) is above 19 Hz (285 rpm) and below 39 Hz (585 rpm)
26	Initial thermocouple check	After prepurge, the output from the TC is greater than the initial check continuously for 30 seconds.
HI	10 min 40°C	The room temperature exceeds 40 °C for more than 10 minutes continuously.
LO-16	MV check	MV1, MV2, answer back signals, are continuously separated by more than one second.

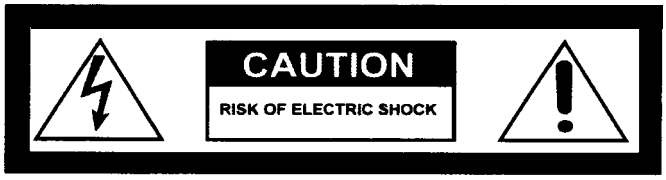
16-18	Thermocouple hi-cut	The output of TC, exceeds the hi-cut level for more than 5 seconds continuously.
22-24	Thermistor open circuit	The thermistor is open circuited or faulty for more than 2 seconds.
24-26	Thermistor short circuit	The thermistor is short circuited or faulty for more than 2 seconds.
18:20: 22	Abnormal combustion	TC1 output less than 21 mV for more than 120 seconds during "HI" or "HI down" combustion. During "Med" less than 19 mV; during "Low" less than 14 mV.
ALL	Power Failure	During operation or non-operation the power goes off for more than 0.15 seconds.

Error history recall

The latest errors can be retrieved by pushing the temperature UP/DOWN buttons together with the economy button, even after the appliance has been tuned off. This can be useful when diagnosing faults.



§ 16 Fault Finding Procedure



1. Initial checks

Service Call Symptom	Check Points (See information in following sections)
Appliance does not operate after having pressed ON/OFF Switch.	• Check electrical cord is connected to the power point. • Confirm power supply. • Check Child Proof Lock. • Check gas hose is plugged in.
Ignition does not occur. ***(Red Combustion Indicator does not illuminate).*** (Indicator '16' & Combustion Indicator flash)	· Check gas type matches that supplied to appliance ..... 1 • Check inlet pressure. ..... 1 · Air in gas supply. 1
Room does not warm up.	· Check pre-set temperature. ..... 2 · Blocked air-filter. ..... 3 · Warm air outlet obstruction. ..... 4 · Inadequate gas supply. 1
Flame failure. (Indicator '20' & Combustion Indicator flash) (Indicator 'LO' & Combustion Indicator flash) (Indicator '22' & Combustion Indicator flash) (All indicators 'LO' – 'HI' flash*) * When power is restored within 0.5 seconds after power failure.	· Insufficient ventilation ..... 5 · Blocked air filter. ..... 3 · Power failure. • Warm air outlet obstruction. ..... 4 • Check gas type. · Inadequate gas supply. ..... 1 · Flash back. 7
There is a smell of gas.	· Leaking gas supply ..... 1 · Safety device operating. • Smell of combustion by-product. 6

2. Failure conditions - causes and remedy

1. Gas Supply

dgnition does not occur>, <Room does not warm up>, <Smell of gas>

· Is the gas supply fully open?
· Is the gas hose bent?
· Is the gas supply squashed?
· Is the gas supply incorrect size?
· Is the gas supply connected correctly?

⇛ Ensure gas supply is fully open.

⇛ Ignition problems can be caused by poor gas supply, or air in the supply line.

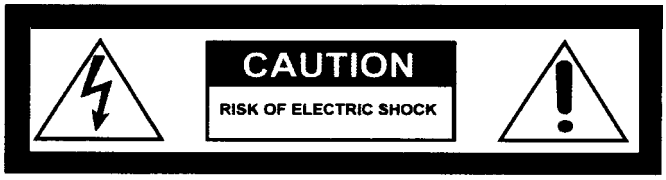
2. Pre-set Temperature

<Room does not warm up>

· Is the pre-set temperature lower than the current room temperature?
(Appliance switches to 'LO' approximately 1 minute after ignition.)

⇛ Reset the pre-set temperature to a higher temperature than the current room temperature.

§ 16 Fault Finding Procedure



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2. Failure conditions - causes and remedy

1. Gas Supply

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· Is the gas supply fully open?
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· Is the gas supply squashed?
· Is the gas supply incorrect size?
· Is the gas supply connected correctly?

⇛ Ensure gas supply is fully open.

⇛ Ignition problems can be caused by poor gas supply, or air in the supply line.

2. Pre-set Temperature

<Room does not warm up>

· Is the pre-set temperature lower than the current room temperature?
(Appliance switches to 'LO' approximately 1 minute after ignition.)

⇛ Reset the pre-set temperature to a higher temperature than the current room temperature.

3. Blocked Air Filter

<Room does not warm up>, <Flame failure>

- Is the air filter blocked with dust?
- Is the OHS operating due to a blocked air filter? (Indicator '20' and Combustion Indicator flash)

⇛ Air filter should be cleaned approximately once a month.

4. **Warm Air Outlet Obstruction**

<Room does not warm up>, @lame failure>

- Is there any object placed in front of the louvre? (Indicator '20' and Combustion Indicator flash)

⇛ Ensure the louvre is not blocked, or any large object placed in front (within 1 m) of the appliance.

5. Insufficient Ventilation

<Flame failure>

- Is the ventilation in the room sufficient? (Indicator 'ID and Combustion Indicator flash)

⇛ Ensure that ventilation complies with AGA requirements.

6. **Smell of Combustion Product**

<There is a smell of gas>

⇛ There may be a slight smell of gas at ignition and/or extinction.

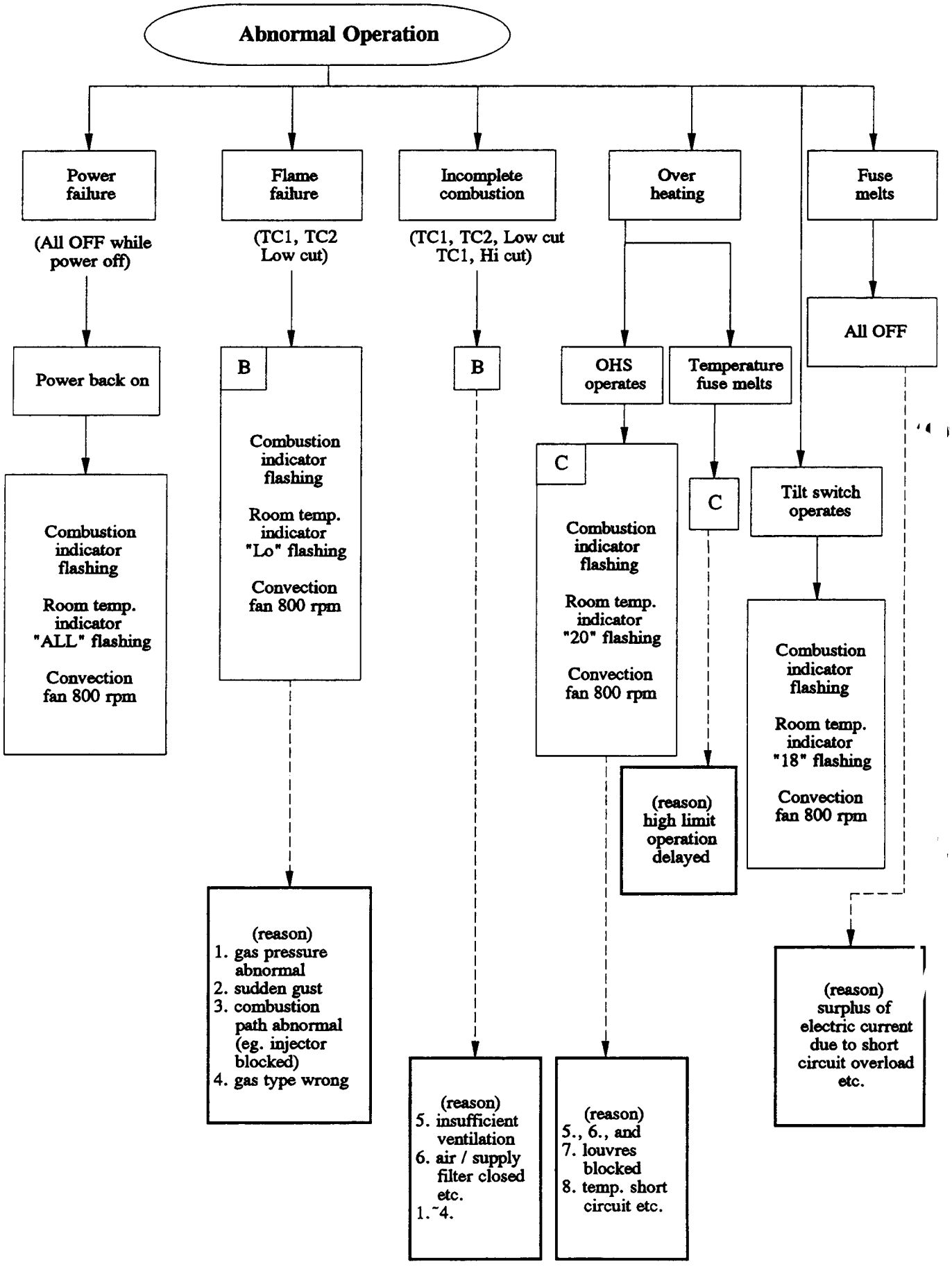
⇛ Possibly caused by aerosol spray or polish.

7. **Flame Failure**

- **Is the** air filter blocked with dust?
- Is the burner or restrictor blocked?
- Is the combustion chamber blocked, or foreign matter inside?
- Are combustion specifications and gas pressure settings correct? (Indicator '22' and Combustion Indicator flash)

3. Conditions that are not faults

Condition	***Cause*** *and Explantion*
Ignition is slow and cold air is blown from appliance.	When the ON/OFF switch is pressed, ignition occurs however, ignition could be delayed due to air in the gas supply line. Combustion Indicator (red) will not illuminate until the thermocouple has heated up, there will be few seconds delay after ignition.
Warm air continues to blow after switching appliance OFF.	The fan stops after releasing all heat residual from within the appliance. (approx. 200 - 255 if appliance has overheated)
A clicking sound when the burner ignites.	Normal ignition sound. The extent of the sound will depend on gas pressure and burner temperature; the sound may be fairly loud.
Resonant sound after ignition.	Movement of the flame as it travels across the burner.
After ignition there is a ticking or clicking noise.	This is the expansion of the combustion chamber metal.
The heater does not ignite upon initial use.	There may be air in the gas supply, preventing the appliance igniting immediately. After 15 seconds the spark will stop and the heater will lockout. The ON/OFF switch must be reset to re-attempt ignition.
There is smoke or an unusual smell upon initial use.	This is caused by grease, oil or dust in or on the combustion chamber. This will stop after a short period. Increase the ventilation when using the appliance.


Abnormal Operation
Power failure
(All OFF while power off)
Power back on
Combustion indicator flashing
Room temp. indicator "ALL" flashing
Convection fan 800 rpm
Flame failure
(TC1, TC2 Low cut)
B
Combustion indicator flashing
Room temp. indicator "Lo" flashing
Convection fan 800 rpm
(reason)
1. gas pressure abnormal
2. sudden gust
3. combustion path abnormal (eg. injector blocked)
4. gas type wrong
Incomplete combustion
(TC1, TC2, Low cut TC1, Hi cut)
B
(reason)
5. insufficient ventilation
6. air / supply filter closed
etc.
1.~4.
Over heating
OHS operates
C
Combustion indicator flashing
Room temp. indicator "20" flashing
Convection fan 800 rpm
(reason)
5., 6., and
7. louvres blocked
8. temp. short circuit etc.
Temperature fuse melts
C
(reason)
high limit operation delayed
Fuse melts
All OFF
Tilt switch operates
Combustion indicator flashing
Room temp. indicator "18" flashing
Convection fan 800 rpm
(reason)
surplus of electric current due to short circuit overload etc.

Fault Analysis

Note: Before carrying out resistance checks, disconnect power.

A: After pressing the ON/OFF switch:

a. the room temperature and pre-set temperature indicators do not illuminate.
b. the convection fan does not begin to rotate.
c. the solenoid valves do not open.
d there is no spark.

NO→

Is there electrical supply?

YES

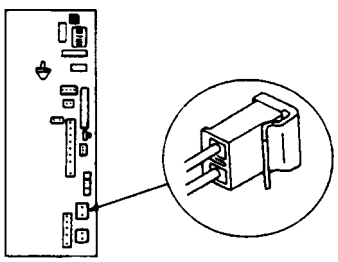
↓

(See next page)

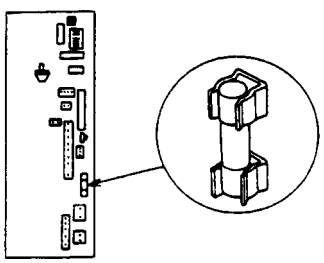
1. Check the connection at the wall socket.

Normal Value
AC 240 V

2. Check the incoming power supply connection at the PCB.



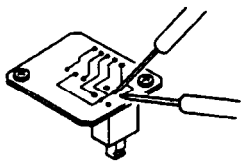
2. Is the 3 amp fuse blown?

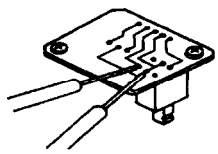


Normal Value
0Ω

a. The room temperature and pre-set temperature indicators do not illuminate.

(1) Broken wiring or loose pin connectors. (Open circuit)
(2) Faulty indicator PCB (ON/OFF switch)

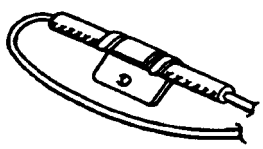


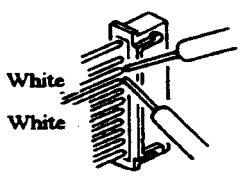


Switch PCB

Normal Value 0Ω (when ON/OFF Switch is ON)

(3) Faulty PCB
(4) Thermal fuse has melted. (Room temperature indicator '20' and combustion indicator flash)



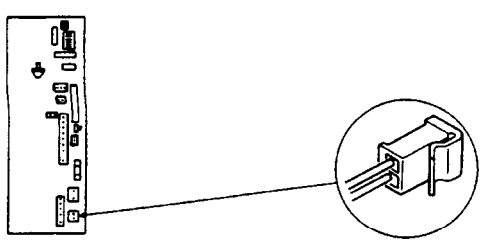


Normal Value 0Ω (Melts at 152°C)

b. The convection fan does not begin to rotate.

(1) Convection fan shaft grub screw loose.
(2) An obstruction in the convection fan is preventing the fan from rotating.
(3) Open circuit or bad connection in motor circuit.

Motor Coil	Normal Value 110~180Ω

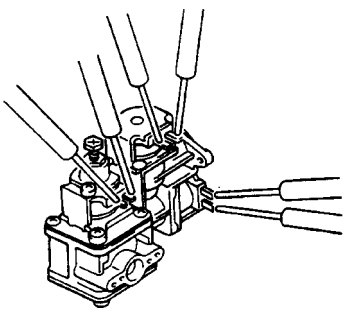


(4) Faulty P.C.B.

c. The solenoid valves do not open.

(1) Broken wiring or loose pin connectors.
(2) Solenoid coil wiring is broken or shorted.

SV_1 SV_2	Normal Value 1.5~2.2 KΩ
Modulating Valve	Normal Value 80~100Ω



(3) Faulty P.C.B.

d. There is no spark.

(1) High tension cord disconnected or broken.
(2) Insulation leak from high tension cord etc.
(3) Incorrect spark gap (Normal spark gap is 3.5 - 4.5 mm)
(4) Faulty P.C.B.

B: After repeated efforts to operate the appliance, it will not ignite. (Room temperature indicator '16' and combustion indicator flash) (No warm air.)

(1) Air in the gas supply.
(2) Incorrect (inlet) gas pressure.
(3) Incorrect gas type, or a kink in the gas supply hose.
(4) Faulty sparker.
(5) Blocked injector.
(6) Incorrect combustion specification. (Injector, restrictor, regulator pressure etc.)

C: There is warm air, however the combustion indicator does not illuminate.

After one cycle of 15 seconds the spark stops and miss-ignition occurs.

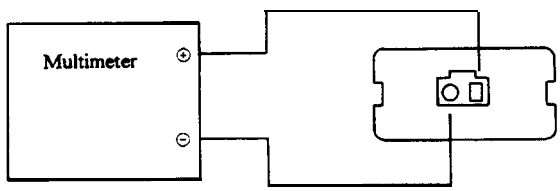
↓ ↓

Ignition is OK

Miss-ignition → 1. Faulty indicator / Incorrect wiring
2. Faulty PCB

Confirm thermocouple output

■ ***Thermocouple Output Checking Method***
(Connect the multimeter to the output checking terminal at the back of the appliance.)



Output Checking Terminal (LHS ⊖, RI-IS ⊕)

	HI Combustion	LO Combustion
NG	≥ 16 mV	≥ 18 mV
LP	≥ 18 mV	≥ 16 mV

Is the output 14 mV or above?

NO →

(1) Check combustion specification, gas type, and gas pressure.
(2) Check the combustion condition.
(3) Check thermocouple is firmly positioned.
(4) Check the thermocouple lead.
*(5) Check the thermocouple, spacer and bracket.

*specification varies depending on the gas type (Refer combustion specification page 4)

YES

Faulty PCB

D: The flame fails during normal operation.

(1) Power failure. All indicators turned off.
(2) Tilt Switch has activated. (Room temperature indicator '18' and combustion indicator flash.)
(3) A safety device has activated.
- Air filter is blocked and OHS is activated (Room temp. indicator '20' and combustion indicator flash]
- Incomplete Combustion Prevention Device (ODS) is activated due to insufficient ventilation.
- Rink in the gas supply hose. (Room temperature indicator 'Lo' and combustion indicator flash)
- Gas pressure is abnormally low.
- Clearances around the appliance are insufficient (refer to the Customer Operation Manual).
- Obstruction in front of the heater.

(4) Safety devices are activated — Check wiring is not broken or pin connectors loose.

↓

Flame failure occurs between 30 minutes to 1 hour after the ignition.
(Room temperature indicator 'LO' and combustion indicator flash.)

↓

Incomplete combustion prevention device (ODS) possibly early cut-off.

↓

Check thermocouple output.

Confirm thermocouple output (mV) is stable and as shown in the table below.

Measure the output at HI and LO combustion

↓

↓

	HI Combustion	LO Combustion
NG	≥ 16 mV	≥ 18 mV
LP	≥ 18 mV	≥ 16 mV

YES

↓

Faulty PCB

NO ↓

1. Check the test point pressure, restrictor and injector all conform to the specification.
2. Faulty thermocouple and/or burner.
3. Check specification of thermocouple bracket, TC spacer etc.

Flash back (with large noise) and flame fails. Room temperature indicator '22' and combustion indicator flash.

(1)Blocked air filter.
(2)Blocked burner or restrictor.
(3)Dust or foreign matter in the combustion chamber.
(4)Incorrect combustion specification or pressure setting.

§ 18 Electrical Componentry Analysis

- **Before starting inspection, check to ensure all wiring harnesess and corrections are secure.**
- **Before carrying out checks marked ✳, remove power cord from wall socket.**

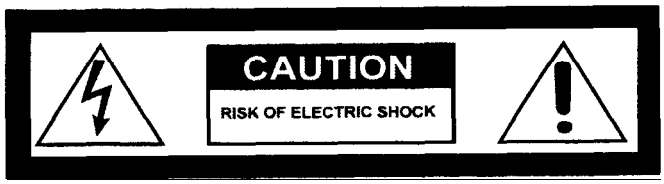
Nature of fault	Examination Point	Diagnostic Point	values	Action
The room temperature indicators do not glow after switching the appliance ON.	1. Is the electrical plug in the power point firmly?	Confirm electrical connection. Check voltage.	216 - 264 V	Yes *Go to2 No → Rectify supply
	2. Is the electrical fuse blown?	1) ✳ Check resistance of fuse	0Ω	Yes → Go to 3 No → Change fuse
		2) ✳ Release the convection fan motor 2 pm connector and measure the coil resistance.	98 - 125 a Blue - Yellow	Yes → Go to 2 - 4 No • Replace convection fan motor.
		3) ✳ Release the 240 → 100 V transformer 7P and 4P connectors, measure the coil resistance.	35 - 45 Ω Red - Red 1.5 - 4 Ω White - White 3 ~ 7 Ω Purple - Purple 13 - 22n Blue - Blue	Yes → Go to 2 4 No → Replace transformer
		4) ✳ Release the pin connectors from SV_1 and SV, and measure the resistance between both solenoid terminals on each solenoid.	SV, 1.6 - 2.2k Ω SV, 1.6 - 2.2k Ω	Yes → Go to3 No → replace solenoid
		5) ✳ Release tbe pin connectors from tbe Modulating valve, measure the resistance between both terminals.	80 ~ 100 Ω	Yes • Replace PCB No → 4 mV
	3. Is the operation of the ON/Off button normal?	✳ Release the LED PCB 2P connector, check the continuity of the connection with the switch ON then OFF.	ON → 0Ω OFF → ∞Ω	Yes → Go to 4 No → Replace indicator PCB
	4. Is the power supply transformer OK?	Confirm the transformer voltages.	White - White 9- 12V Purple - Purple 18 _ 24V Blue - Blue 95 - 115v	Yes → Replace PCB No • Replace power supply transformer
The PCB LED indicators display a coded error message when the appliance is switched ON.	5. Is the high-limit switch in the OFF position? When over heating has occurred, the switch will return to the ON position after the appliance has cooled. LED [20] flashing.	✳ With the ON-OFF button in tbe OFF position, check the continuity of the OHS between the switch.	0 Ω	Yes → Go to 7 No → Replace High-Limit switch.

Nature of fault	Examination Point	Diagnostic Point	values	Action
	6. Has the thermal fuse melted? LED [20] flashing.	✳ **As above. Check thermal** fuse	**0 Ω**	Yes → **Go to 7** No ▸ Replace harness
	7. Is the tilt switch OK? LED [20] flashing	✳ Check the continuity of the PCB tilt switch, with the appliance in the upright position.	Body of switch, connection from PCB → **0 Ω**	Yes ▸ **Go to 7** No ▸ Replace PCB
	8. Is the convection fan motor faulty or disconnected? LED [24] flashing.	✳ Release the convection fan motor 2 pin connector, measure the coil resistance.	98 - **125Ω** Blue - Yellow	Yes ▸ Replace **PCB** No ▸ Replace fan motor
There is no spark generated.	9. Is the high tension lead connected firmly, is there any spark-leak?	✳ Disconnect power supply and confirm connections by hand.	Tight with no insulation leaks.	Yes ▸ **Go to 10** No ▸ Rectify
	10. Is the voltage to sparker OK?	Confirm voltage at 2 pin sparker **connector.**	Red - Red AC90- 115V	Yes ▸ Replace sparker No • Replace PCB
sparker activates, however the burner will not ignite. (After approx. 14 **sec** the spark stops). LED **[16]** flashing.	11. **Are SV_1 and SV_2** opening?	1) ✳ Release tbe pin connectors from SV, and **SV_2,** measure the resistance between both terminals on each solenoid.	SV, and **SV_2** 1.6 - 2.2 k **Ω**	Yes bGotoll-2 No → Replace solenoid
		2) Measure the solenoid terminal voltage.	Yellow - Yellow DC80 - 100V Blue - Blue DC80 - 100V	Yes • Go to 12 No ▸ Replace PCB
	12. Is the modulating valve operating correctly?	1) Measure test point pressure	Is set pressure reached?	Yes → Confirm injector, damper spec. No → **Go to 12-2**
		2) ✳ Confirm gas type selection switches are in correct position.	Check inside front panel for details.	Yes → Go to 12-3 No → Rectify
		3) ✳ Check tbe Modulating valve coil resistance.	80- **100Ω**	Yes • Adjust pressure, if not suitable then replace PCB No • Replace Modulating valve.
The burner ignites however the [combustion] **indicator** does not glow.	13. Is the Modulating valve operating correctly?	Measure test point pressure.	Is set pressure reached?	Yes → After checking the injectors, damper and thermocouple, go to 14
	14. Is the output at TC, > 4mV?	Using the PCB TC output check connector, check TC output.	>4mV	Yes → Replace PCB No ▸ Replace **thermocouple**
The flame goes out during normal **operation**	16. Is the TC output OK?	1) Measure TC output, while appliance is operating.	NG: **TC1** 18-32 mV or **TC > 18 mV** Propane: **TC1** 18-**32 mV or > 17 mV**	Yes ▸ Replace **PCB** No ▸ Replace thermistor

Nature of fault	Examination Point	Diagnostic Point	values	Action
		2) Has the appliance operated for a long period without the room being ventilated?	ODS condition	Yes • Confirm correct use with customer No ‣ Replace PCB
	17. Dusty conditions	Check the state of the air filter, convection fan, and **louvre** outlet.	Dirty	Yes *Clean No-'Check18
	18. Are the combustion chamber specifications OK?	Check specifications of combustion chamber, refer front of manual.	Normal	Yes ‣ Check 19 No ‣ Readjust specification
	19. Is the convection fan operating correctly?	1) Follow examination point 2-2	see 2-2	Yes ‣ Go to 19-2 No • Replace motor
		2) Confirm voltage at PCB 2 pin connector	Blue - Yellow **HI AC75 - 90 V** LO AC50 - 68V	Yes ‣ Check for fan obstruction No ‣ Replace PCB

NB: If the condition does not improve after replacing parts, harness may be defective. Check for shorts and broken vires. To check connections, gently shake them and then re-check appliance operation.

§ 19 Gas Conversion



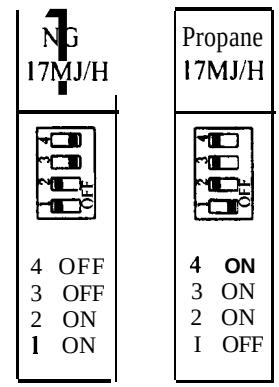
1. Remove 4 screws inside bottom louvre, pull complete front panel forward at bottom, unclip from escucheon panel and remove from heater
2. Replace small gas label on gas inlet
3. Replace large gas label on back of appliance
4. Place correct small gas label over existing gas type label on data plate
5. Complete details on conversion sticker, place sticker inside left hand side panel
6. Undo main gas tube connection at solenoid, 1 screw
7. Remove "0" ring from solenoid connection and refit to main gas tube (to avoid trapping "0" ring when re-assembling)
8. Remove injector holder, 3 screws
9. Release injector, 1 screw and clip
10. Fit main injector for appropriate gas type, secure with clip and screw
11. Undo pilot supply tube at pilot burner
12. Remove pilot injector from pilot burner
13. Fit pilot injector for appropriate gas type
14. Refit main and pilot gas supply tubes, take care with "0" ring
15. Connect appliance to gas and electricity
16. Follow gas pressure setting procedure (see next page)
17. Test for gas escapes
18. Disconnect appliance from services
19. Replace front cover

§ 20 Gas Pressure Setting Procedure

✳ See page 4 for combustion specification.

1. Set dip switch to correct position. See diagram opposite.

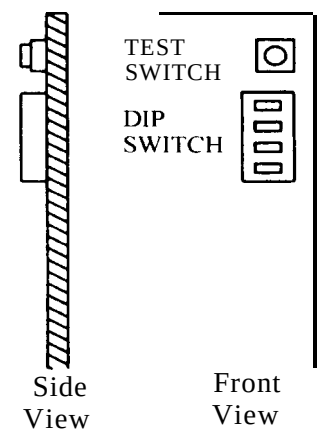
2. Remove test point screw, connect pressure gauge.



3. Turn appliance ON.

4. When the combustion lamp comes on, push the TEST **SWITCH** (see diagram opposite), set the temperature control to LOW.

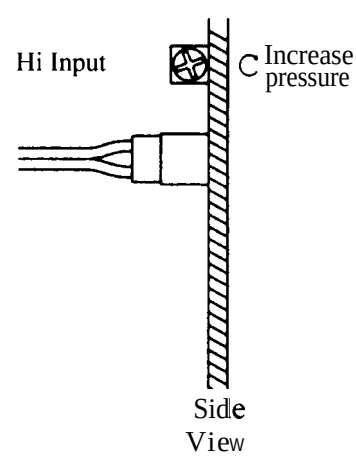
5. Adjust the LOW pressure with the regulator screw (on top of modulating valve) to: 0.45 kPa (Propane) / 0.18 kPa (Natural Gas).



6. Re-set the temperature control to HIGH.

7. Adjust the HIGH pressure with the POT on the PCB to: 2.07 kPa (Propane 17 MJ/h), 1.71 kPa (Propane 15 MJ/h) / 0.86 kPa (Natural Gas).

8. Turn the appliance off, disconnect the pressure gauge and replace the test point screw.



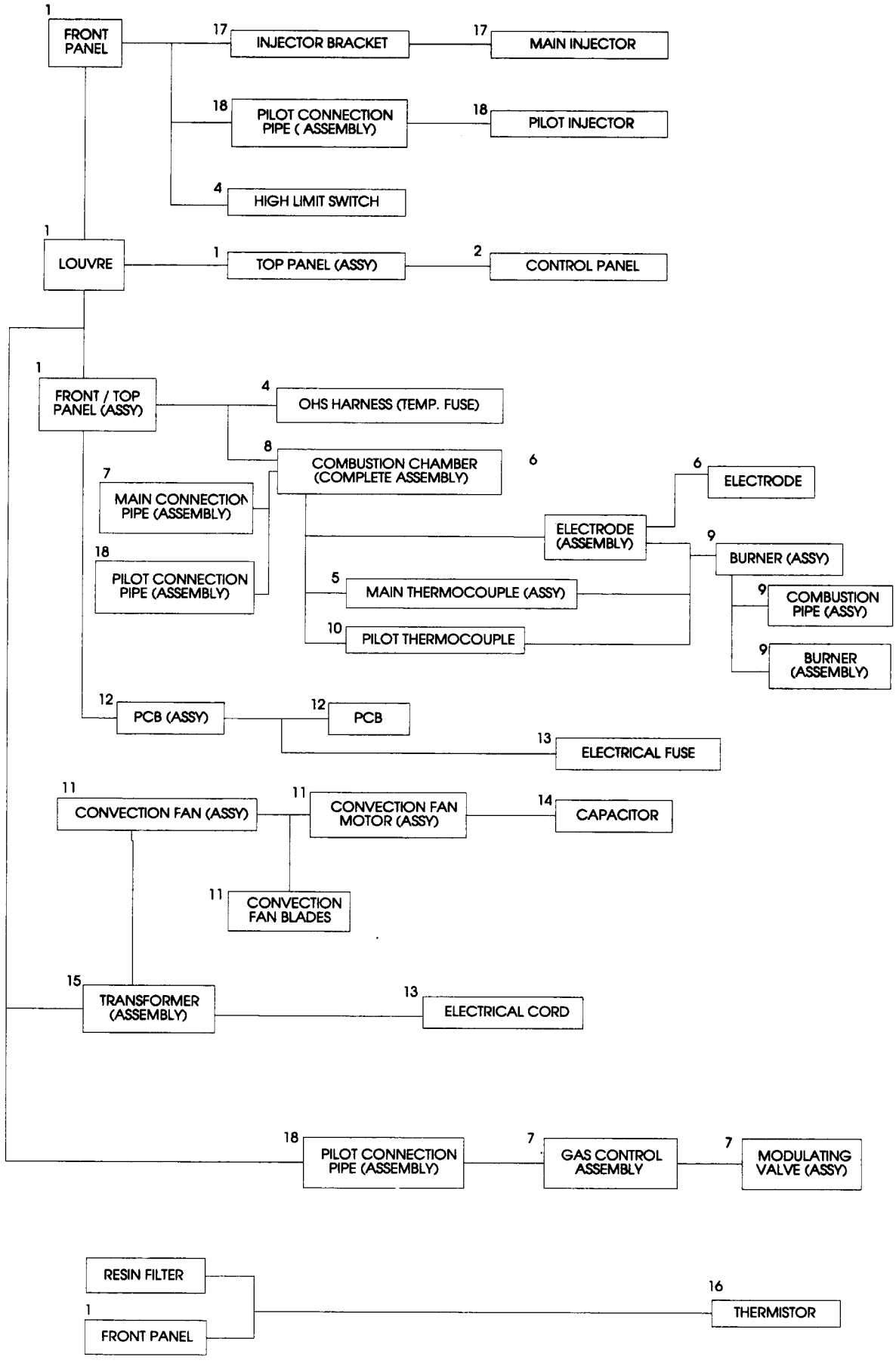
§ 21 Dismantling for Service

NOTE: Before proceeding with dismantling, be sure to follow the **CAUTION** instructions before each explanation.

e.g. - Isolate gas supply
- Disconnect electrical supply from wall socket

Unless otherwise stated, re-assembly is the reverse of dismantling.

Dis-assembly trail (Numbers refer to item number previous page)

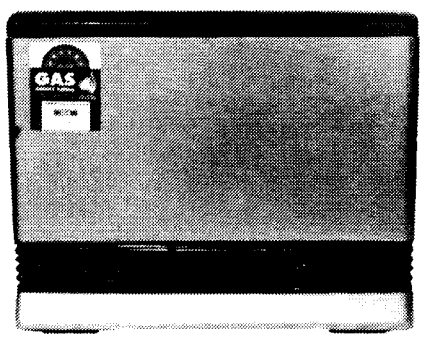


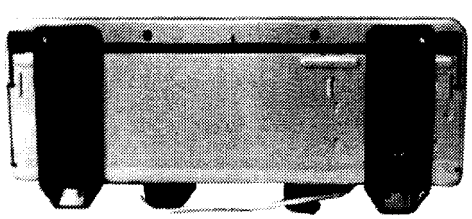
1. Removal of the Front Panel, Louvre and Skirt

CAUTION

240 ***Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.***

a) Lay unit on its rear panel, remove two (2) screws securing the feet to the underside of the skirt.





b) Remove two (2) screws securing louvre to convection fan casing, and two (2) screws securing louvre to side casing.

c) Lift up near base and then manoeuvre forward until tabs of the top of the front panel release from control panel moulding.

**** be careful not to break lugs.***

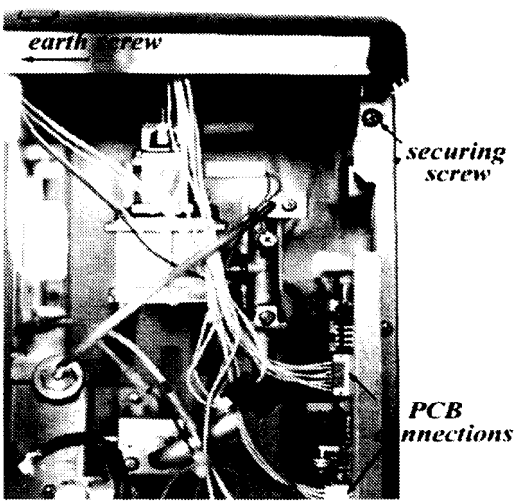
2. Removal of the Control Panel

CAUTION

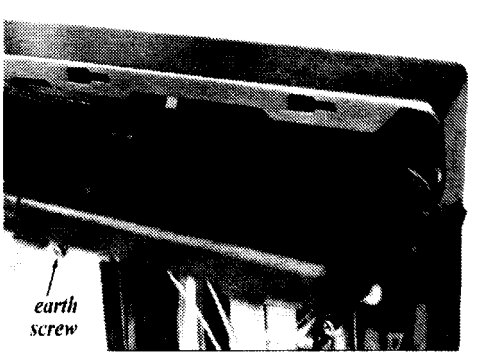
240 ***Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.***

a) Follow section 1 first.

b) Remove two (2) securing screws (either side of control panel), two (2) PCB connections, and one (1) earth screw in the centre.



c) Firmly tap control panel on right hand side to manoeuvre it out of slots of the top casing and off the unit.



3. Removal of the Indicator PCB

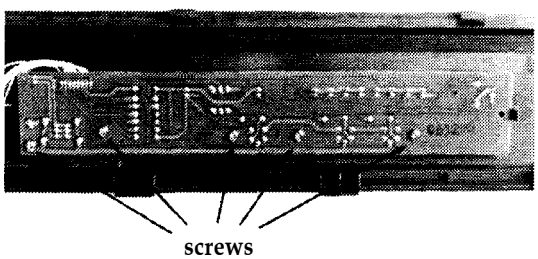
CAUTION

240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.

a) Follow section 1 first.

b) Follow section **2.**

c) Remove five (5) securing screws to release.



4. Removal of the Over Heat Switch

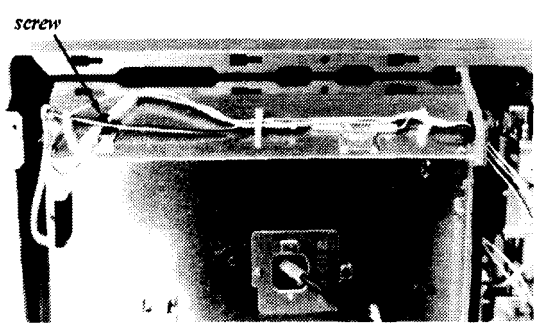
CAUTION

240 ***Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdn'ver or multimeter.***

a) Follow section 1 first.

b) Follow section 2.

c) To replace OHS, remove push-on connectors, remove one (1) securing screw.



5. Removal of the Thermocouple LHS

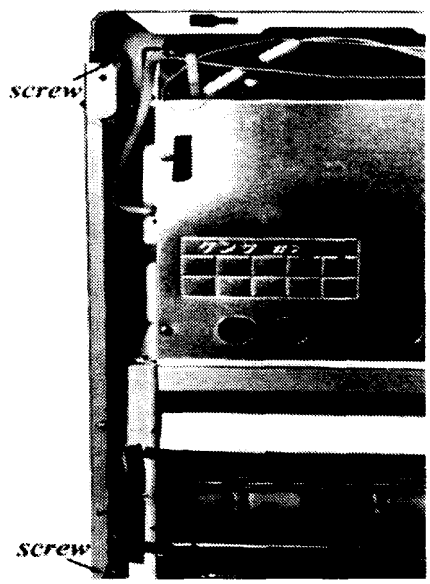
CAUTION

240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.

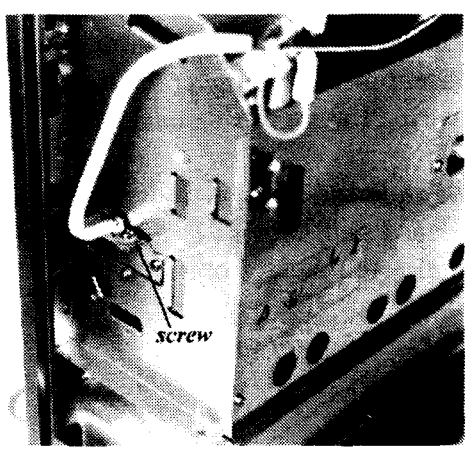
a) Follow section 1 first.

b) Follow section 2.

c) Remove the five (5) screws securing outer casing. Manoeuvre out at base, slide to the left, and up and over to remove completely.



d) Remove the single screw holding the thermocouple clip to the bracket.



5. Removal of the Electrode

CAUTION

240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.

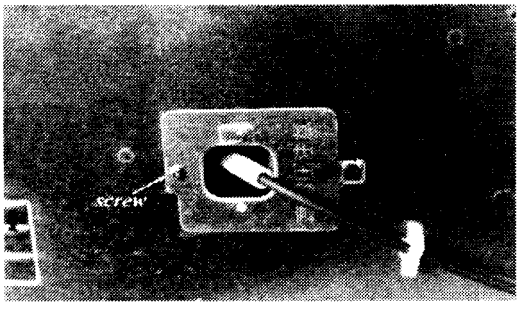
a) Follow section 1 first.

b) Follow section 2.

c) Follow step 5-c.

d) Unclip thermocouple (left and right), OHS, thermal fuse harness from PCB connections.

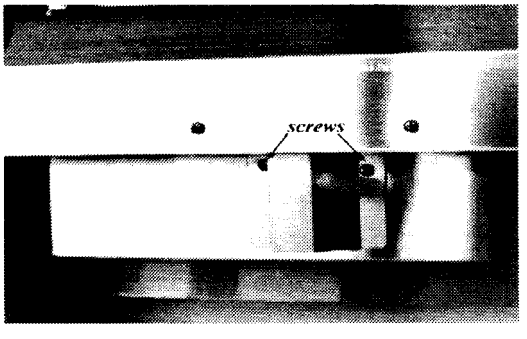
e) Remove electrode cover, one (1) screw.



f) Remove high tension lead from electrode, and spark generator.

g) Remove eight (8) combustion chamber heat shield securing screws, manoeuvre it off from the base.

h) Remove two (2) electrode clip securing screws to remove electrode completely.



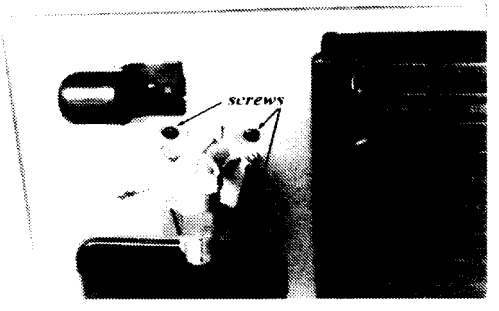
7. Removal of the Gas Control Assembly

CAUTION

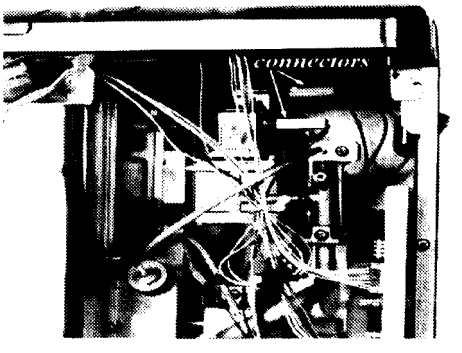
240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.

a) Follow section 1 first.

b) Undo the gas supply hose connection at rear of appliance.



c) Remove push-on connectors from the modulating valve and solenoid terminals. **Don t pull on the wires.**



d) Remove pilot gas supply connection tube clip, one (1) screw.

e) Remove gas supply connection tube clip at the bottom of gas control, one (1) screw.

f) Remove gas control securing screws (3) at rear of appliance.

g) Gas control assembly can be manoeuvred from app1iance.s

Note: Don't loose the gas filter from inside flange and the assembly 0 ring.

8. Removal of the Combustion Chamber

CAUTION

240 ***Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or mu&meter.***

a) Follow section 1 first.

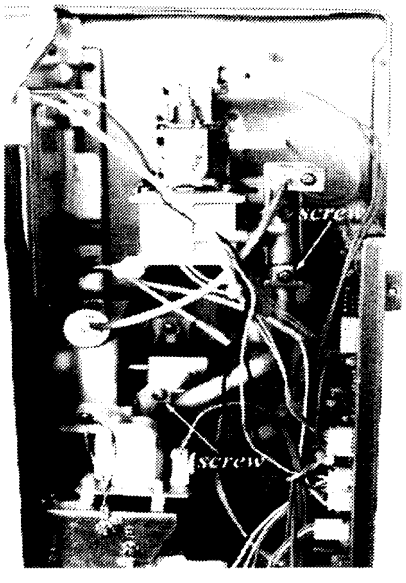
b) Follow section **2.**

c) Follow step 5-c.

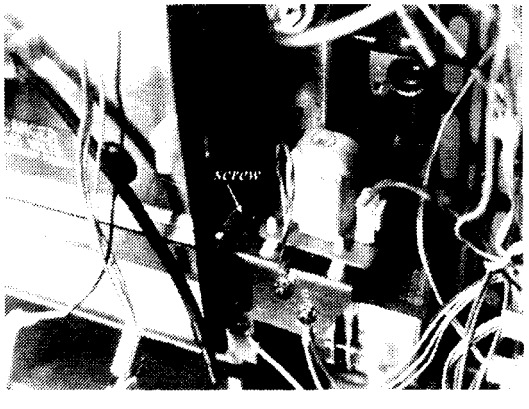
d) Follow step 7-d.

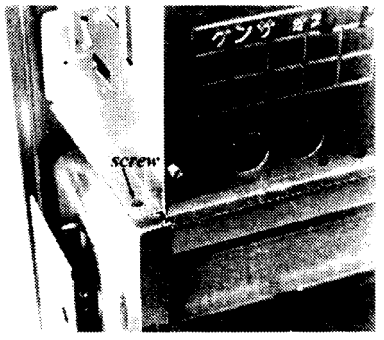
e) Follow step 7-e.

f) Remove two (2) gas supply tube securing clip screws. Remove gas supply tube completely.

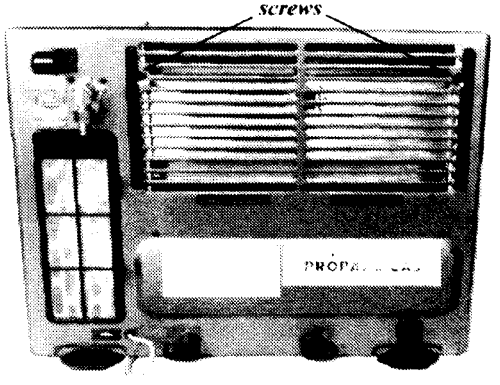


g) Remove one (1) combustion chamber base securing screw on right and left hand side.





h) Remove filter, then the two (2) screws securing the combustion chamber to rear panel.



i) Follow step 6-e.

j) Unclip thermocouple connection in harness and manoeuvre combustion chamber out of appliance completely.

9. Removal of the Main Burner

CAUTION

240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.

a) Follow section 1 first.

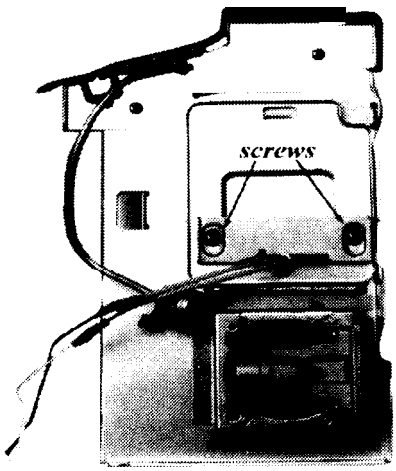
b) Follow section 2.

c) Follow section 5.

d) Follow section 6.

e) Follow section 8.

f) With combustion chamber out of the appliance, remove injector side thermocouple bracket and burner blanking plate and gasket. Two (2) screws.



g) Remove two (2) burner securing screws.

h) Remove venturi blanking plate. One (1) screw.

i) Remove left hand side thermocouple bracket. Three (3) screws.

j) Manoeuvre burner out of the chamber by lifting up and pulling on it gently.

LO. Removal of the Thermocouple RHS

CAUTION

240 ***Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.***

a) Follow section 1.

b) Follow section 2.

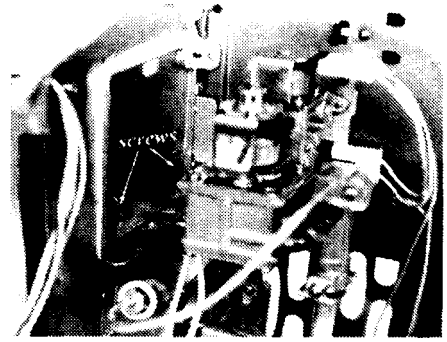
c) Follow step 5-c.

d) Follow section 15-b.

e) Remove PCB as per section 12.

f) Remove two (2) screws.

g) Release connector.



11. Removal of Convection Fan Assembly

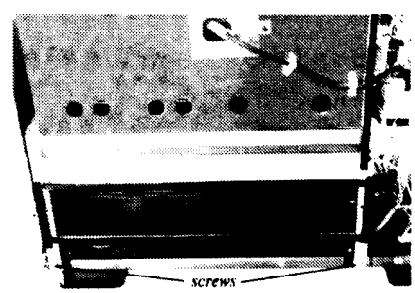
CAUTION

240 ***Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.***

a) Follow section 1 first.

b) Follow step 8-g.

c) Remove two (2) fan assembly securing screws at bottom front of appliance.



d) Remove one (1) sparker support screw, and PCB earth lead.

e) Dislodge sparker assembly.

f) Remove two (2) fan assembly securing screws at rear of appliance.

g) Remove fan motor connectors from PCB.

h) Remove RHS divider panel. Two (2) screws.

i) Remove transformer. See section 15.

j) Remove fan casing assembly by sliding forward and out.

12. Removal of the PCB Unit

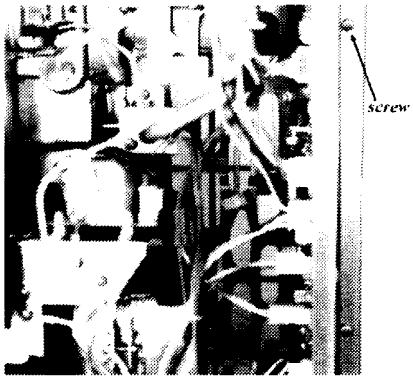
CAUTION

240 ***Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.***

a) Follow section 1 first,

b) Remove one earthing connector and all pin connectors from PCB.

c) Remove two (1) PCB unit support securing screw from side casing.



d) PCB and the support lifts forward and out of the appliance.

13. Removal of the Electrical Fuse

CAUTION

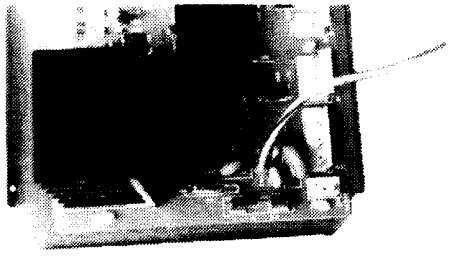
240 ***Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.***

a) Follow section 1 first.

b) Follow section 15.

c) Follow section 12.

d) Electrical fuse is connected to the PCB.



14. Removal of the Fan Capacitor

CAUTION

240 ***Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.***

a) Follow section 1 first.

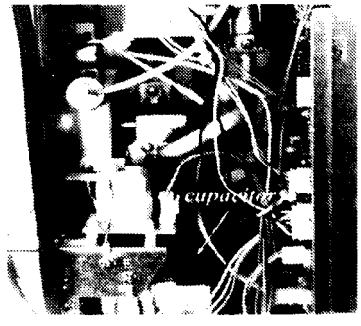
b) Follow section 2.

c) Follow section 5c.

d) Follow section 15.

e) Follow section 12.

f) The capacitor is situated on the fan motor, RHS of combustion chamber assembly.



g) Remove one (1) screw to remove capacitor.

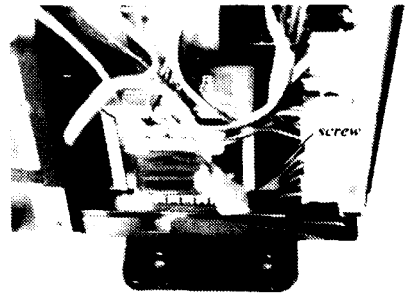
15. Removal of the Transformer

CAUTION

240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.

a) Follow section 1 first.

b) Remove one (1) transformer support securing screw.



c) Slide transformer forward to manoeuvre it out completely.

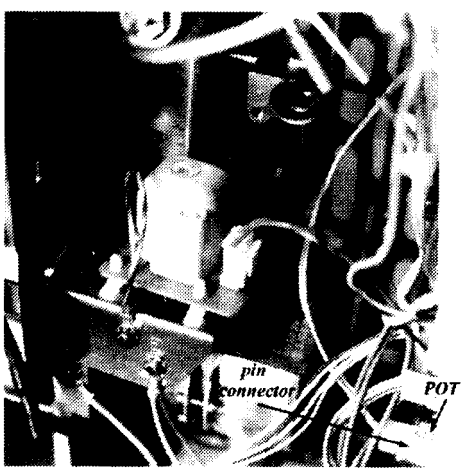
16. Removal of the Thermistor

CAUTION

240 ***Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.***

a) Follow section 1 first.

b) Release thermistor pin connector from PCB.



c) Unclip thermistor from the holder on the rear panel.

17. Removal of the Injector

CAUTION

240 ***Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.***

a) Follow section 1 first.

b) Loosen gas connection supply tube securing screw to gas valve.

c) Remove two (2) injector block securing screws.

d) Remove one (1) screw from venturi housing.

e) Manoeuvre gas supply connection tube to the right.

f) Disconnect injector holder with injector attached.

g) Injector is visible and can be removed from the holder using fingers, after removing securing clip. One (1) screw.

18. Removal of the Pilot Injector

CAUTION

240 ***Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.***

a) Follow section 1.

b) Remove pilot injector gas supply tube securing fitting with a spanner.

c) Remove two (2) pilot injector filters.

d) Pilot injector will be visible.

****flange** faces outwards*

19. Removal of the Burner Cover Shield

CAUTION

240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.

a) Follow section 1.

b) Follow section 2.

c) Follow section Sc.

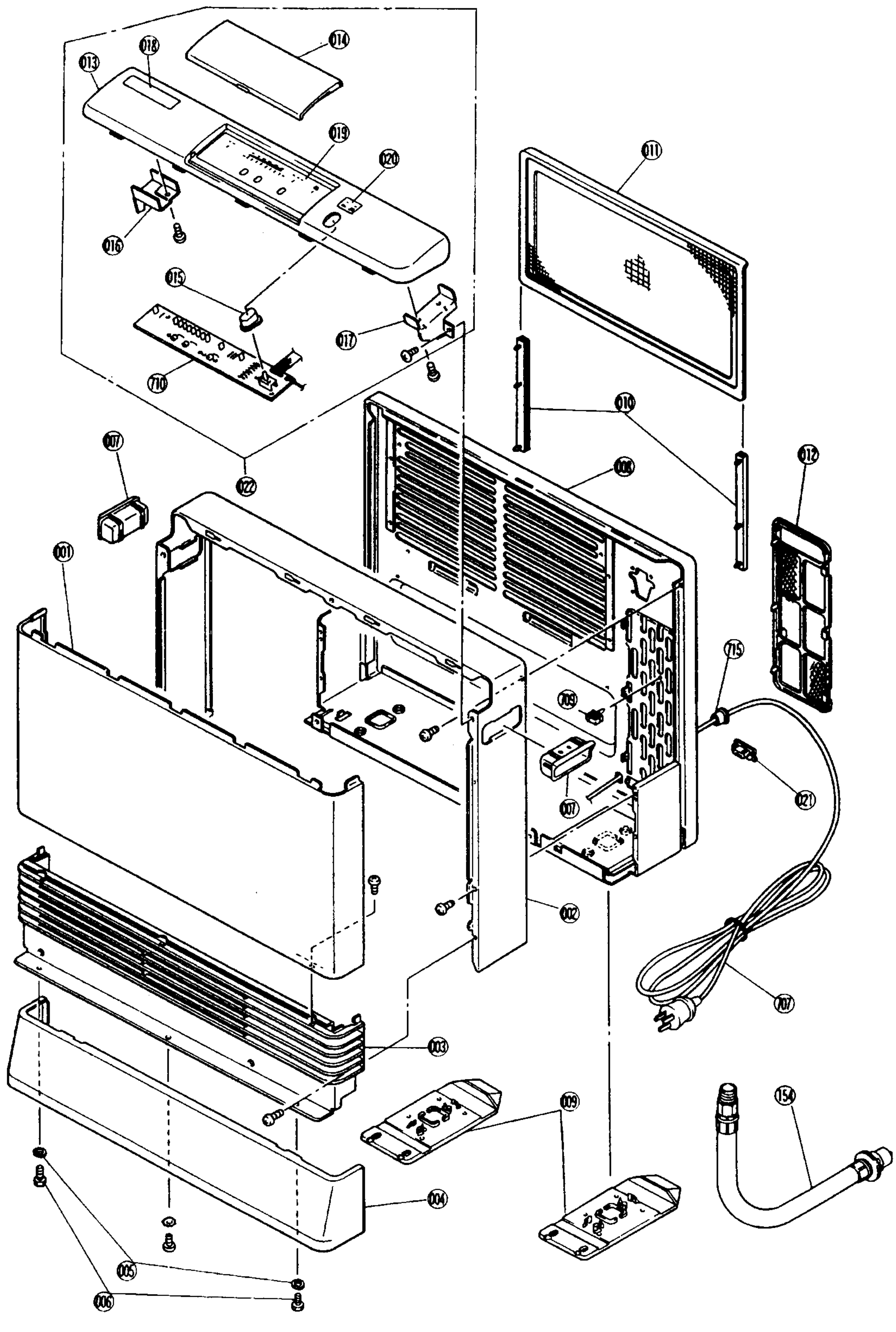
d) Follow section 6-e, 6-g, 6-h.

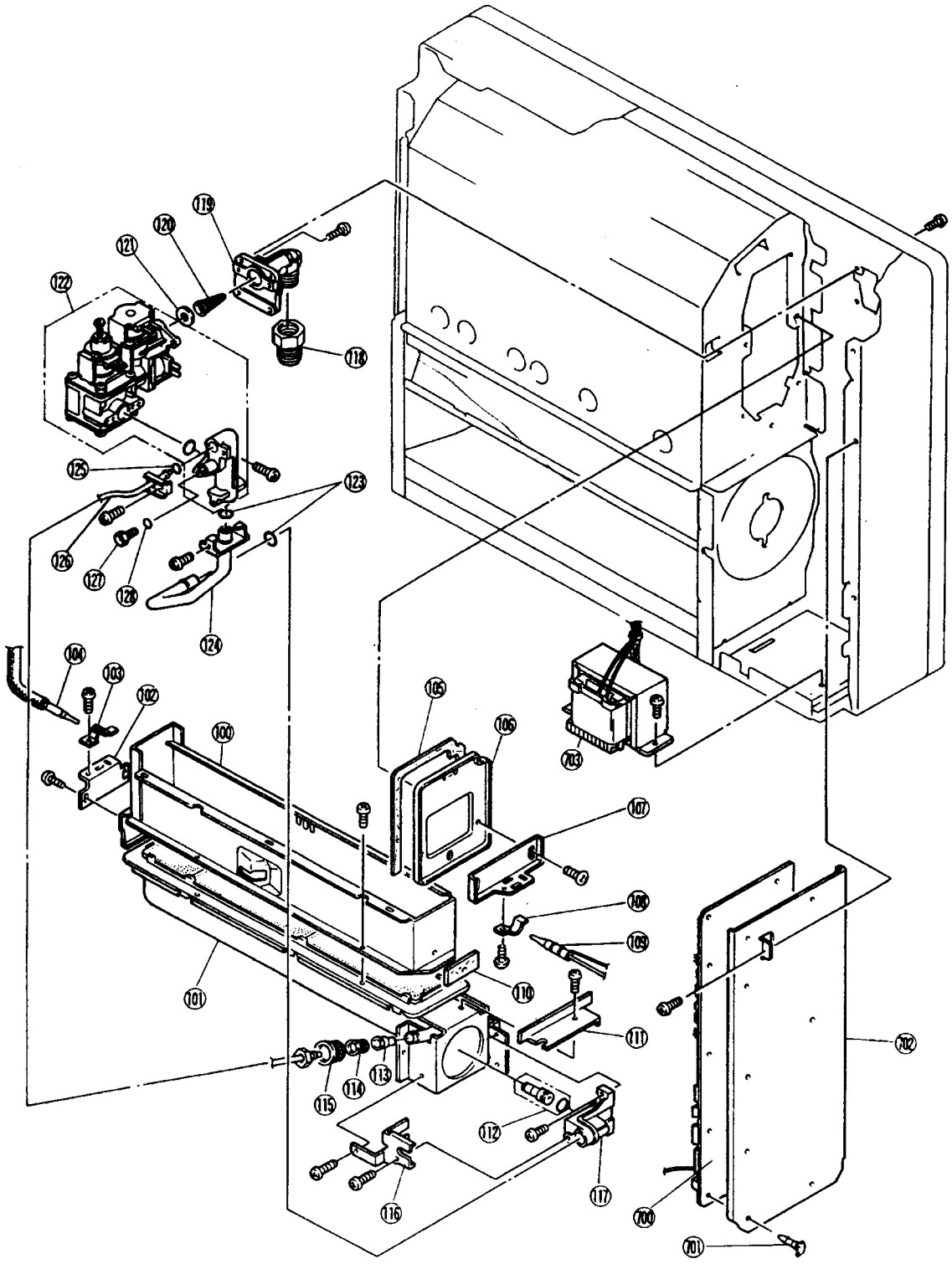
e) Remove top right hand divider panel. Two (2) screws.

f) Remove three (3) screws from rear edge and two (2) screws from front (See 6-i).

g) Lift shield and turn backwards to remove.

§ 22 Exploded Diagrams

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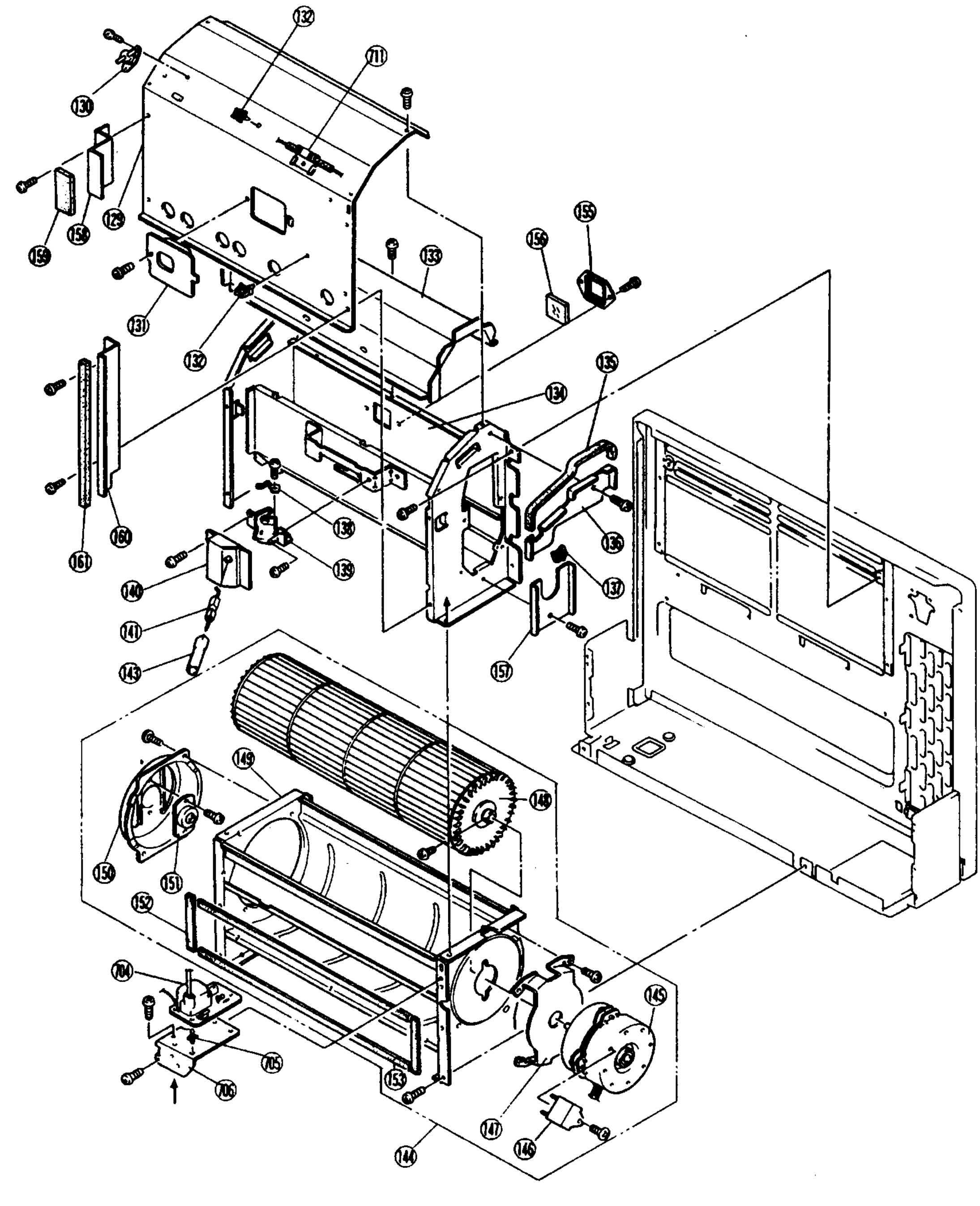

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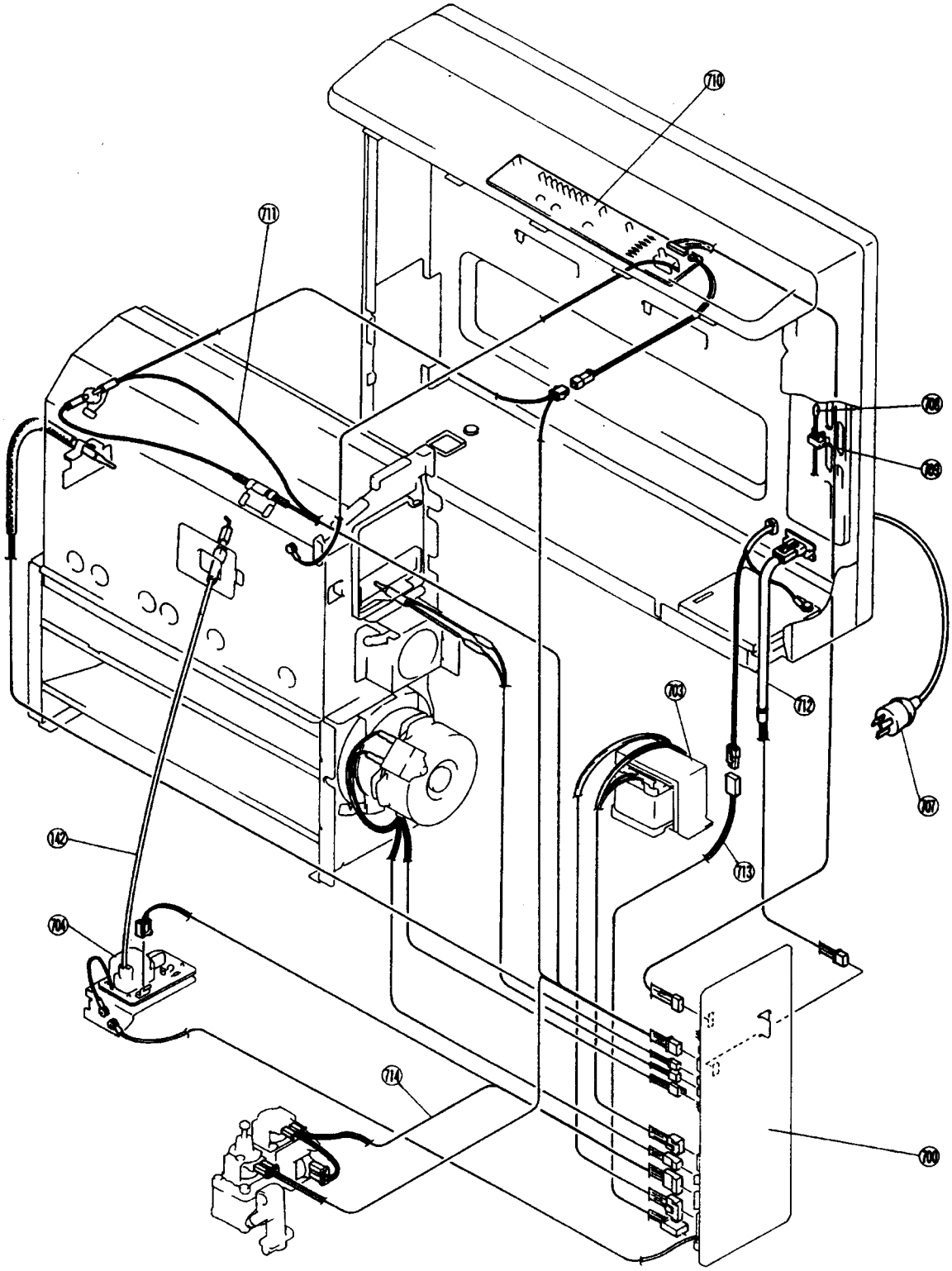
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PARTS LIST RCE- 417H

Valid from: 27/07/01

No.	RJ Part No.	Part Description	RA Part No.	RNZ Part No.	Qty
001	RC-407-25-1 x05	Front Panel A (Oyster White)	90168816	2102	1
001	RC-407-25-2 x01	Front Panel B (Gun Metal)	90170333		1
002	RC-407-16 x05	Side Panel (Oyster White)	90168675	9107	1
002	RC-407-16-2 x05	Side Panel (Gun Metal)			1
003	RC-417-66 x02	Louvre Assy (Oyster White)	90170242	9109	1
003	RC-417-66-2	Louvre Assy (Gun Metal)	90168683		1
004	RC-406-87-5 x04	Skirt E (Oyster White)	90170259	2113	1
004	RC-406-87-6	Skirt F (Gun Metal)			1
005	ZHAA04SZ	Spring Washer (M4 Use)			2
006	YEHA0408SC	Hexagonal/Tapping Screw			2
007	650P-69-3 X02	Handle (Oyster White)	90161951	2094	2
007	650P-69-18	Handle (Gun Metal)	90176199		2
008	RC-417-60 x04	Rear Panel Assy		2029	1
009	RC-406-55-2 x03	Base Support (Oyster White)	90161944	2167	2
009	RC-406-55-4 x03	Base Support (Gun Metal)			2
010	RC-209-15-1 x02	Air Filter Bracket A	90177049		2
011	RC-209-21-1 x03	Air Filter Assy A	90170267	2118	1
012	RC-406-90-3 x03	Resin Filter C	90161167	2095	1
013	RC-417-37 x01	Top Panel (Oyster White)	90170275	2121	1
013	RC-417-37-2	Top Panel (Gun Metal)			1
014	RC-417-47 x01	Control Panel Cover (Oyster White)	90169962	2126	1
014	RC-417-47-2	Control Panel Cover (Gun Metal)			1
015	RC-417-36 x01	ON/OFF Knob (Oyster White)	90170283	2131	1
015	RC-417-36-2	ON/OFF Knob (Gun Metal)			1
016	RC-407-20 x01	Control Panel Bracket L/H	90162462		1
017	RC-407-19 x01	Control Panel Bracket R/H			1
018	RC-417-40	Model Label (Oyster White)	90170291	2136	1
018	RC-417-85	Model label (Gun Metal)			1
019	RC-417-38	Control Panel (Oyster White)	90170309	2137	1
019	RC-417-84	Control Panel (Gun Metal)			1
020	RC-417-53	ON/OFF Label (Oyster White)	90170317	2144	1
020	RC-417-86	ON/OFF Label (Gun Metal)			1
021	RC-417-56 x01	Thermocouple Check Plug			1
022	RC-417-35 x04	Top Panel Compete Assy (Oyster White)	90168659		1
022	RC-417-35-2	Top Plate Complete Assy (Gun Metal)			1
100	RC-411-26	Burner Box (Assy)			1
101	RC-417-48 x03	Main Burner Assy	90168774	2149	1

PARTS LIST RCE- 417H

Valid from: 27/07/01

No.	RJ Part No.	Part Description	RA Part No.	RNZ Part No.	Qty
102	RC-410-94 x01	Main Thermocouple Bracket			1
103	RC-210-89 x01	Main Thermocouple Clip	90176439		1
104	RC-231-35-2	Main Thermocouple B (TC1)	90178758	2151	1
105	RC251B-93 x03	Burner Box Cover Packing		2178	1
106	RC-417-72	Burner Box Cover			1
107	RC-410-27 x05	Pilot Thermocouple Bracket			1
108	RC251B-95	Pilot Thermocouple Clip			1
109	RC-417-55 x03	Pilot Thermocouple Assembly	90168766	2179	1
110	RC410-29 x01	Pilot Thermocouple Packing		2180	1
111	RC-417-69	Burner Clip			1
112	RC-208-11-A-1.9	Main Injector with O Ring (NG)	90168790	2181	1
112	RC-208-11-A-1.2	Main Injector with O Ring (LPG)	90172438	2182	1
113	RC410-110-C-13-0.25	Pilot Injector (NG)	90168808	2183	1
113	RC410-110-C-11.5-0.2	Pilot Injector (LPG)	90172446	2184	1
114	RC-417-74 x01	Secondary Pilot Filter Assy	90170358	2185	1
115	RC-411-73 x02	Pilot Filter Assy	90170366	2187	1
116	RC-417-65 x01	Injector Fixing Plate			1
117	RC-208-22	Injector Holder	90176553		1
118	CP-30154 x01	Inlet Bush			1
119	RC-204-6 x02	Inlet Flange	90161662	2165	1
120	RHF250-212 x02	Gas Filter	90123225	2791	1
121	C3I1-7 x01	Inlet packing	90149873		1
122	RC-417-29-A	Gas Control(Sub Assembly)A LPG	90170382	2190	1
123	OR1AP10N	Gas Supply Tube O Ring (P10)	90170408	6341	2
124	RC-417-30	Gas Supply Tube (Assy)	90170416	2192	1
125	OR1AP4N	Pilot Tube O Ring (P4)		2193	1
126	RC-417-31 x02	Pilot Gas Supply Tube	90170432	2194	1
127	C10D-3	Pressure Test Point Screw	92068907	9994	1
128	CP-30094 x02	Pressure Test Point Packing		9995	1
129	RC-417-64 x01	Combustion Chamber Hood			1
130	ES-01140	Over Heat Switch (120C OFF)	90168741	2195	1
131	RC-406-37 x02	Hood Lid (Assy)			1
132	CP-90203-1	Saddle Clip	90176728	2156	5
133	RC-411-16 x01	Combustion Chamber Divider Panel			1
134	RC-411-10 x03	Combustion Chamber Assembly			1
135	RC-205-80-3 x01	Sealing Material C			1
136	RC-417-14	Partition Panel (Upper)			1

PARTS LIST RCE- 417H

Valid from: 27/07/01

No.	RJ Part No.	Part Description	RA Part No.	RNZ Part No.	Qty
137	CP-90207	Edge Holder	90176736		1
138	3120B-2213 x02	Electrode Bracket B			1
139	RC-406-29 x02	Electrode Holder			1
140	RC-411-80	Electrode Cover			1
141	RC-412-50	Electrode	90162066	2100	1
142	RC-412-51	High Tension Lead	90161936	2172	1
143	RC-223-84 x01	Silicon Tube			1
144	RC-417-19 x01	Conv. Fan Motor Complete Assy	90168782	2197	1
145	RC-417-20	Convection Fan Motor		2198	1
146	ES-19001-1	Capacitor (2.5μf)	90170457	2081	1
147	RC-332-34	Motor Base Plate			1
148	RC-417-21	Convection Fan Drum		2082	1
149	RC-417-22 x02	Convection Fan Casing Assembly			1
150	RC-504-32	Convection Fan Metal Housing			1
151	RC-223-74	Convection Fan Bearing	90156704	2101	1
152	RC-211-36-39	Conv. Fan Sealing Material W	90170465	2083	2
153	RC-211-36-16	Conv. Fan Sealing Material P	90161928	2169	2
154	CP-30405A	Hose			1
155	RHF400-26	Viewing Port Glass Bracket	90123365	4089	1
156	RHF400-27N	Viewing Port Glass	90123373	4090	1
157	RC-411-17	Comb. Chamber Blanking Plate			1
158	RC-406-45	Front Panel Support			1
159	RC-211-36-6	Sealing Material F		2168	1
160	RC-406-41 x03	Hood Partition Panel			1
161	RC-211-36-4	Sealing Material D			1
700	RC-417-41 x01	Main PCB Unit	90168717	2084	1
701	CP-90204-8	Circuit Board Spacer			8
702	RC-407-27-3 x05	Bracket			1
703	ET-130 x01	Transformer RA (240V)	90170473		1
703	ET-151	Transformer RNZ (230V)		2077	1
704	EI-29	Sparker	90161696	2199	1
705	CP-90205-3	Circuit Board Spacer	90177007		4
706	RC-412-20 x02	Sparker Bracket			1
707	CP-90303 x01	Electrical Cord	90161894		1
708	RC-205-70 x01	Thermistor	90168725	2078	1
709	CP-90190	Thermistor Clip			2
710	RC-417-39	Control PCB	90168691	2079	1

PARTS LIST RCE- 417H

Valid from: 27/07/01

No.	RJ Part No.	Part Description	RA Part No.	RNZ Part No.	Qty
711	RC-417-43	OHS Harness	90168824	2073	1
712	RC-417-34 x01	Thermocouple Check Lead		2071	1
713	RC-417-33	Relay Harness		2074	1
714	RC-417-42	MV/Sparker Harness		2075	1
715	CP-90137	Electrical Cord Bush	90177106	6653	1
	RC-417-91	Wind Protection Panel			
	RC-417-92	Electrode Holder (Assy)			
	CP-72061B-1	Barcode Label			
	RC-417-15x05	Combustion Chamber (Compli. Assy)			
	CP-80037-130	Ceramic Fibre			
	CP-80037-131	Ceramic Fibre			
	CP-80037-132	Ceramic Fibre			