Rinnai

SERVICE MANUAL

RCE-318H

FAN CONVECTOR

Proudly a member of The Australian Gas Association.
All of our products are AGA tested and approved.

The Australian
Gas Association

Quality System
Quality
Endorsed
Company
ISO 9002 Lic 4983
Standards Australia

Distributed and serviced in Australia under a Quality System certified as complying with ISO 9002 by Quality Assurance Services.

Rinnai New Zealand has been certified to ISO 9001 Quality Assurance by Telarc.

TELARC
REGISTERED
SUPPLIER
Quality
Endorsed
Company
ISO 9001 Reg 415

GAS
ENERGY RATING

Comparative Energy Consumption tested to The Australian Gas Association requirements of Australian Gas Code AG 103. An energy rating of 5 stars refers to an efficiency of approximately 80%, that is, 80% of gas consumed is converted to useful heat.

The Regulatory Compliance Mark (RCM) indicates compliance with electrical safety regulations in Australia and New Zealand
Rinnai Australia Supplier Code 5109

ISO 9001	*Model for Quality Assurance in design/development, production, installation and servicing, aimed primarily at achieving customer satisfaction by preventing nonconformity at all stages from design through to servicing.*
ISO 9002	*Same as ISO 9001 but excluding design.*
AG 103	*Approval requirements for gas heaters as set by The Australian Gas Association and Australian Liquefied Petroleum Gas Association Ltd, to ensure proper safety performance and quality levels are achieved.*

Produced by Customer Technical Services

March 1999

WARNING

Failure to comply with these instructions may result in serious personal injury or damage to the appliance.

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 Product Support 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.

SRV318
Issue Nº1

Table of Contents

Glossary of Terms

This glossary of terms and symbols 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_2)
OHS	-	overheat switch
PCB	-	printed circuit board
CPU	-	central processing unit
POT	-	potentiometer
rpm	-	revolutions per minute
SV	-	solenoid valve
ø	-	diameter
$\Delta^\circ C$	-	temperature rise above ambient
POV	-	modulating valve
TE	-	thermal efficiency
TH	-	thermistor

1. Introduction

Development Background

The 318 Convector is a compact fan room heater which allows digital control of room temperature, and features a function lock and economy function for consumer convenience as well as various safety functions.

Features

- "Soft-touch" keys and digital display. Room temperature is indicated by a flashing LED; selected temperature is indicated by a stable LED.
- Combustion and fan each offer 7 levels of control.
- Lock ensures simple operation and safety by not allowing settings to be changed.
- The Economy Function is used to conserve energy
- The selections made for "Preset Temperature" and "Economy Function" are stored in memory.
- Air Filter indicator shows when the air filter needs cleaning.
- LED indicators flash to alert of safety devices being used, incorrect positioning etc.
- When a problem occurs, the LED indicators flash to direct the service technician to the cause of the problem. See "Error Codes Messages" on pag e26.

2. Specification

Model No.		RCE - 318 H			
Name of appliance		Unflued Fan Convector			
Output		13 MJ/h (3.6 kW)			
Dimensions (mm)	Width	460			
	Depth	175 (215 with base)			
	Height	458			
Weight (Kg)		8.7			
Connections	Electrical	AC240V (NZ: AC230V)			
	Gas	Approved gas hose			
Electrical Consumption (W)		High: 41 Low : 30			
Heating Capacity		33~51 m^2			
Gas Input (MJ/h)		NG		LPG	
		Hi	13	Hi	13
		Lo	4	Lo	4
Burner	Form	Slit type			
	Method	Bunsen type			
Operation	Operation	One-touch button control			
	Ignition method	Continuous spark, direct ignition			
Control	Room temperature	Low (10° C) 16~26° C High - Continuously High			
	Gas flow control	High~Low, 7-stage modulating			
Position of Louvres		Bottom of appliance			
Air Volume (m^3/min)		2.1~1.3 (High~Low)			
Fan Control		High ~ Low 7-stage automatic control			
Convection Fan		Line flow type ø 90x L230			
Convection Fan Motor		Shading coil type 4 electrode motor			
Filter Indicator		Themistor 50° C ON			
Flame Failure		Thermocouple method			
Overheat Prevention		Thermistor 65° C OFF; Thermal fuse 157° C OFF			
Over-current Protection		3-amp fuse			
Power Failure		Power failure circuit			
Incomplete Combustion Prevention		Thermocouple			
Fan Delay		Overheat Thermistor (82~255 secs)			
Flashback		Bi-metal switch 80° C± 5° C (OFF) 65° C±5° C (ON)			
Tilt switch		Included PCB			
Noise Level (dB(A))		High~Low = 38~32			

3. Combustion Specification

Basic Combustion Specification

Rinnai model reference		RCE-318H		
Gas type		Natural	Propane	LPG (NZ)
Gas consumption (MJ/h)	High	13	13	13
	Low	4	4	4
Main injector size		1.70	1.15	1.15
Thermocouple spacer		A & B	B	A & B
Restrictor		17	19	22
Regulator pressure (kPa)	High	0.82	1.57	1.57
	Low	0.09	0.19	0.19
Burner marking		W2N	W20	W2N
Combustion method		Surface combustion		
Burner type		Stainless steel slit style		
Solenoid valve		Direct single seated valve type		
Modulating solenoid valve		Rinnai electronic control		

Warm Air Discharge Temperature Distribution

Conditions: <High Combustion>

Test gas: Natural
Measured Input: 12.93 MJ/h 3,090 kcal/h
Nominal Input: 12.55 MJ/h 3,000

(Unit Δ°C)

80	73	66	73	81	77	73	57
87	63	66	87	95	72	71	61
82	57	65	90	90	65	70	51
63	54	63	82	75	60	61	44

(Average 70.4)

(Room temperature 27.0°C)

Conditions: <Low Combustions>

Test gas: Natural
Measured Input: 3.77 MJ/h 900 kcal/h
Nominal Input: 3.77 MJ/h 900

(Unit Δ°C)

27	32	28	31	34	34	32	28
38	36	32	43	52	41	35	29
38	34	31	47	52	39	34	27
31	31	31	43	47	36	31	31

(Average 35.2)

(Room temperature 27.0°C)

Air Discharge Velocity

<High Operation>

(Unit m/sec)

2.45	3.06	3.08	2.73	2.48	2.77	2.59	1.18
1.85	3.42	3.49	3.13	3.96	3.23	2.96	1.95
2.60	3.58	3.48	3.72	3.84	3.57	3.29	2.66
2.97	3.48	3.64	4.24	3.84	3.63	3.31	2.62

(Average 3.09)

<Low Operation>

(Unit m/sec)

1.22	1.72	2.00	1.85	1.76	1.55	1.11	0.69
0.86	1.97	2.15	2.14	1.90	1.92	1.76	1.42
1.30	2.20	2.18	2.38	2.21	2.45	2.14	1.94
1.53	2.01	1.94	2.52	2.65	2.51	2.20	1.47

(Average 1.86)

Conditions

- Convection Fan Rpm. High: 850 rpm
  Low: 540 rpm

  Measured with gas on

- Average air velocity on High:3.09 m/sec
- Average air velocity on Low:1.86 m/sec
- Area of louvre:0.0115 m^2
- Air flow rate on High:2.13 m^3/min
- Air flow rate on Low:1.28 m^3/min

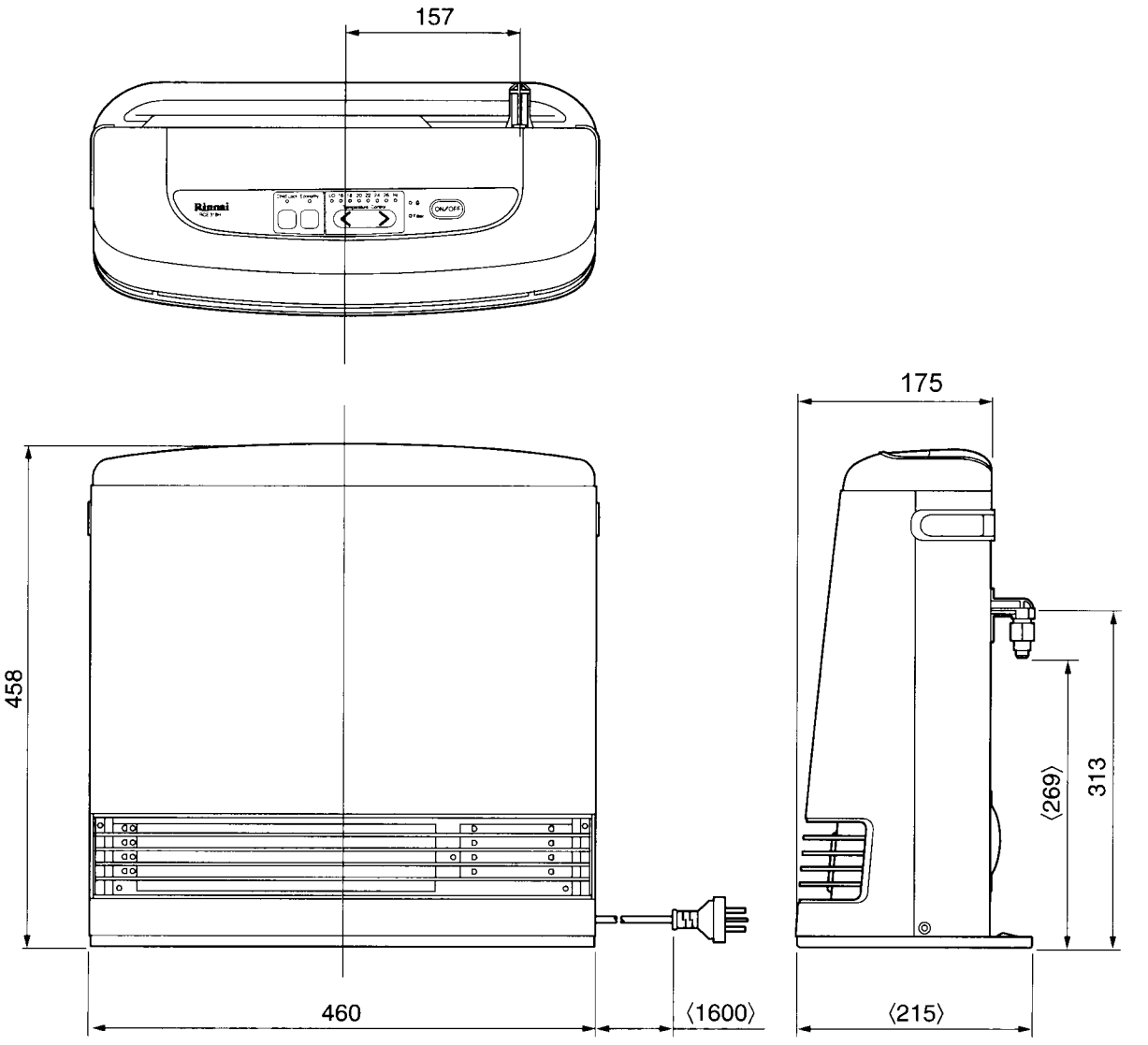
Noise Level

Operation Noise (dB (A))
High: 40 Low: 28

-Measuring method: According to Japanese Industry Standards
-During Combustion

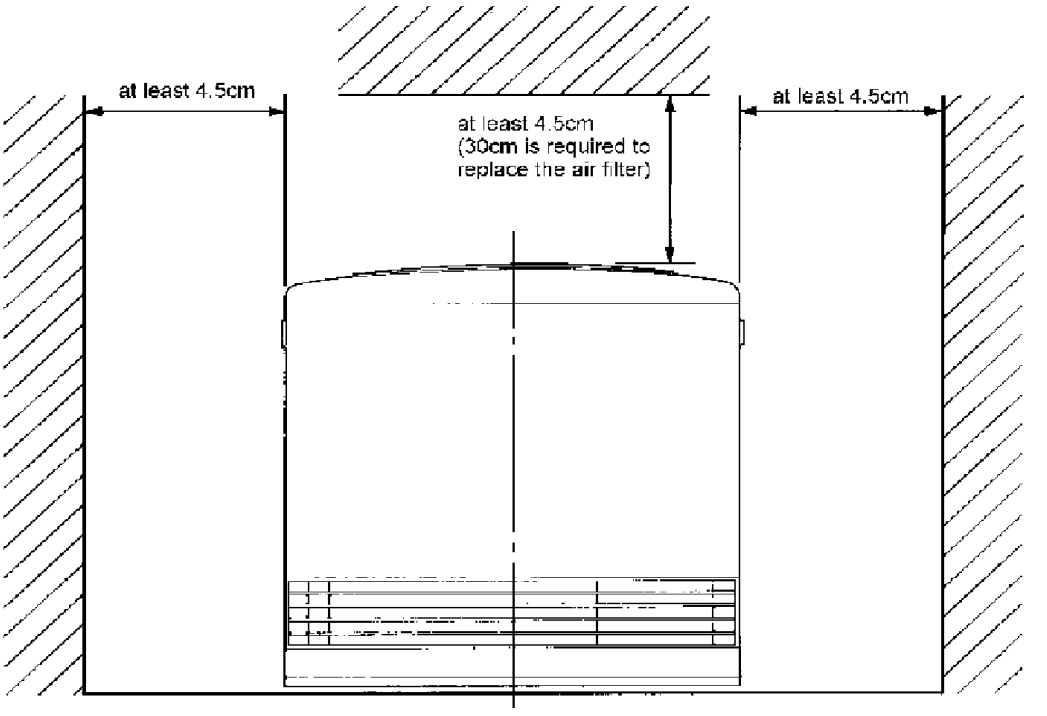
4. Dimensions

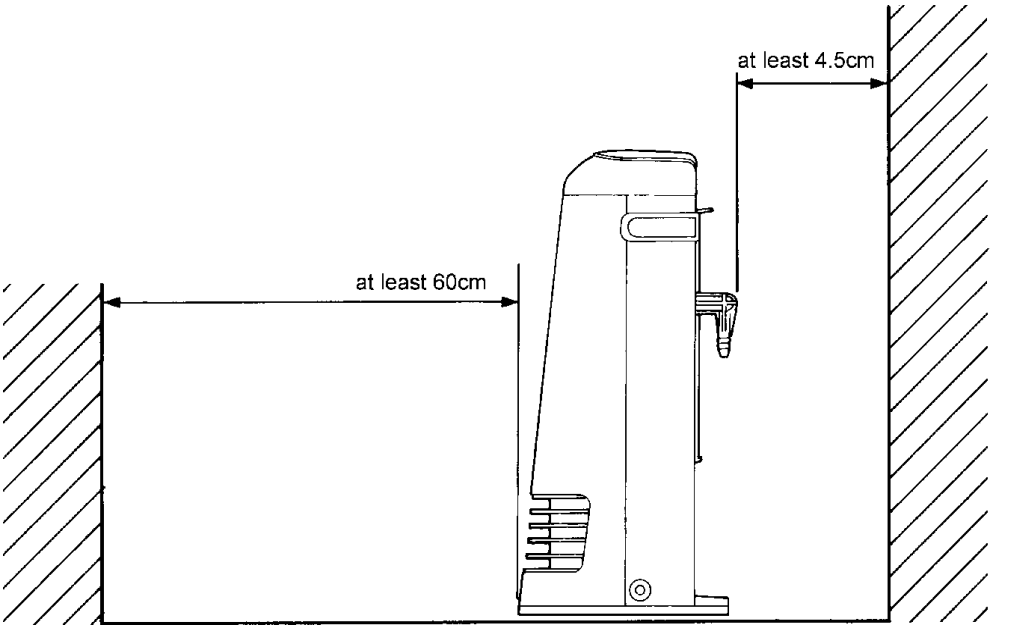
Note: All dimensions are in millimetres



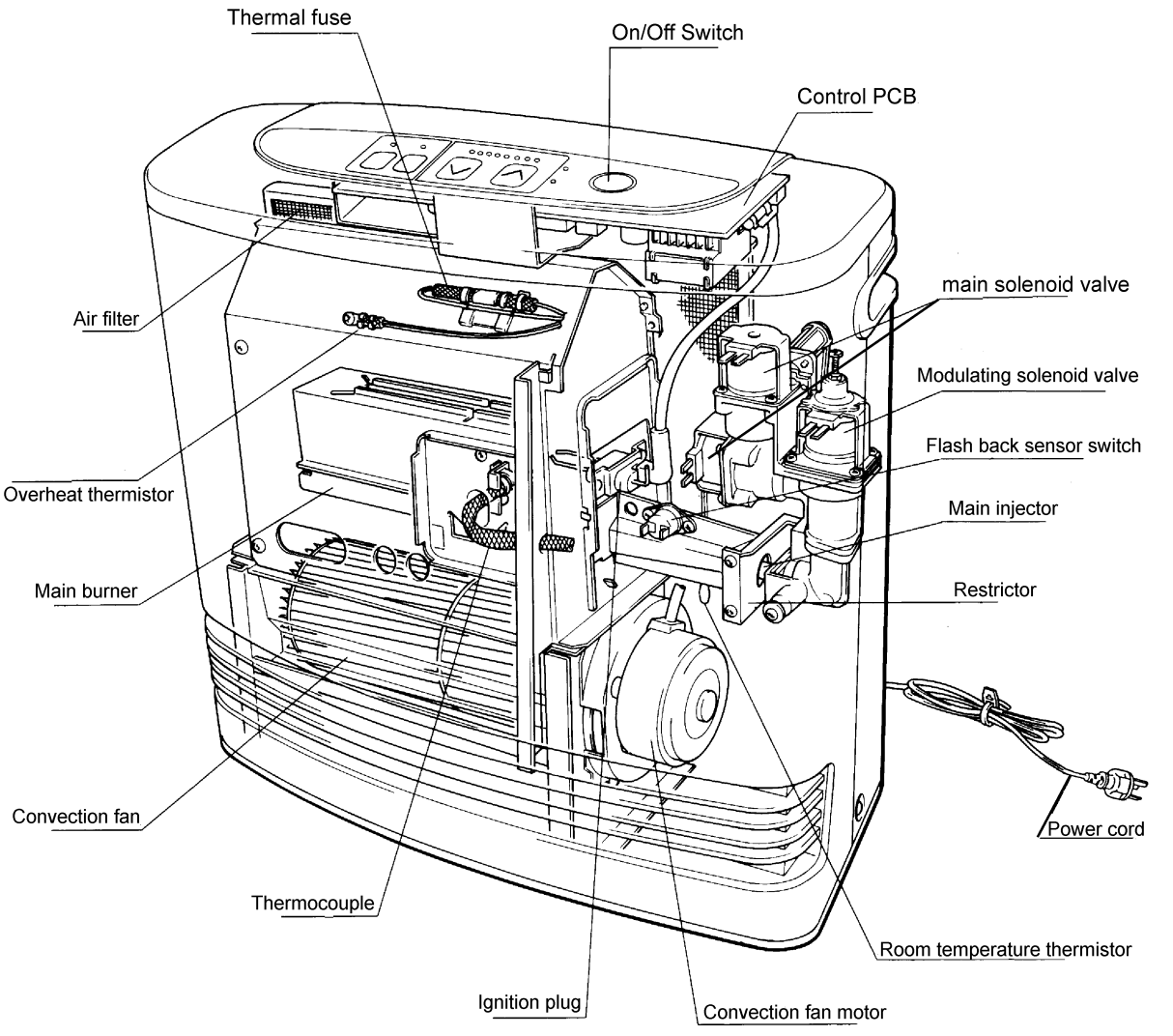
5. Installation

The following clearances are recommended for installation.

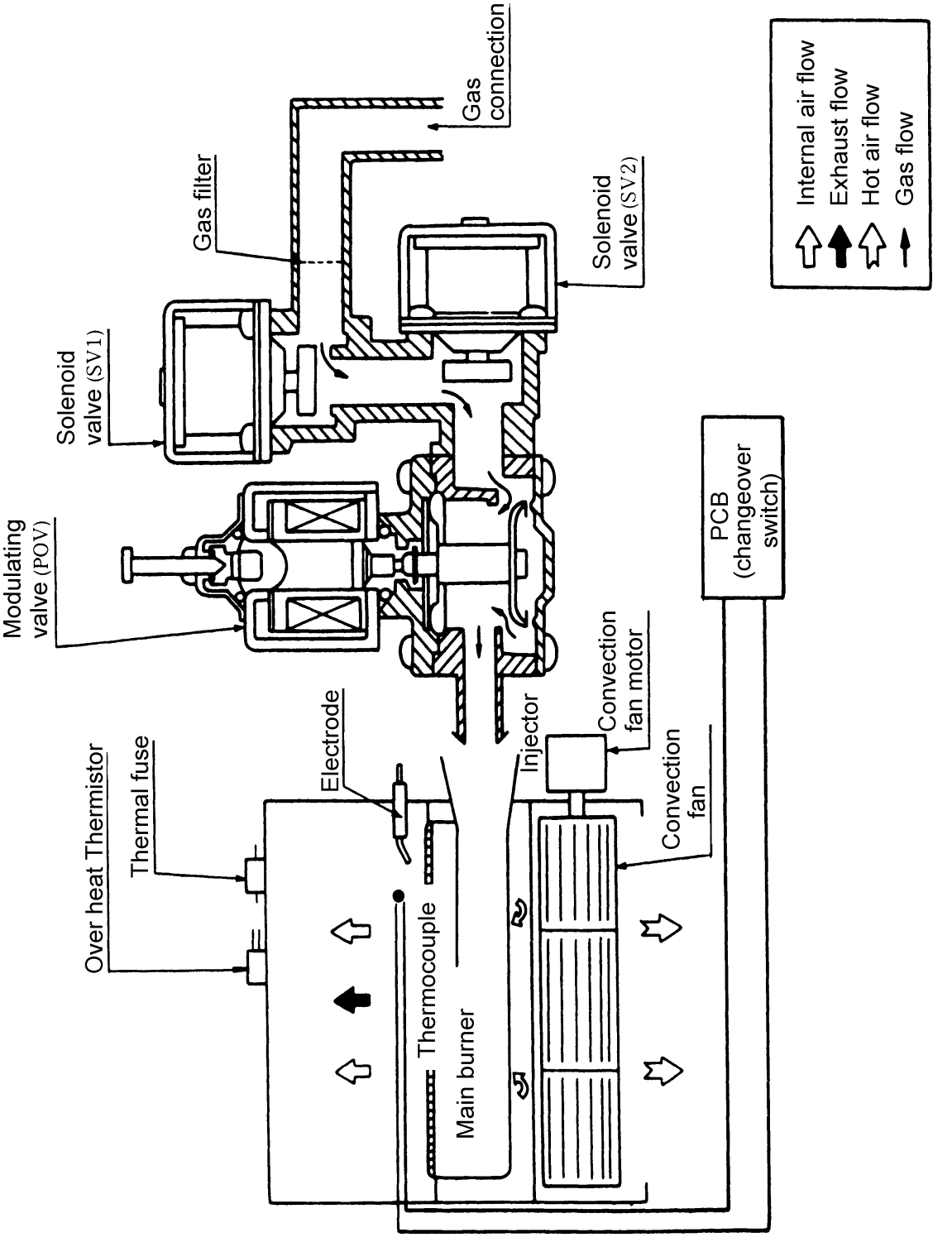




6. Cut - Away Diagram

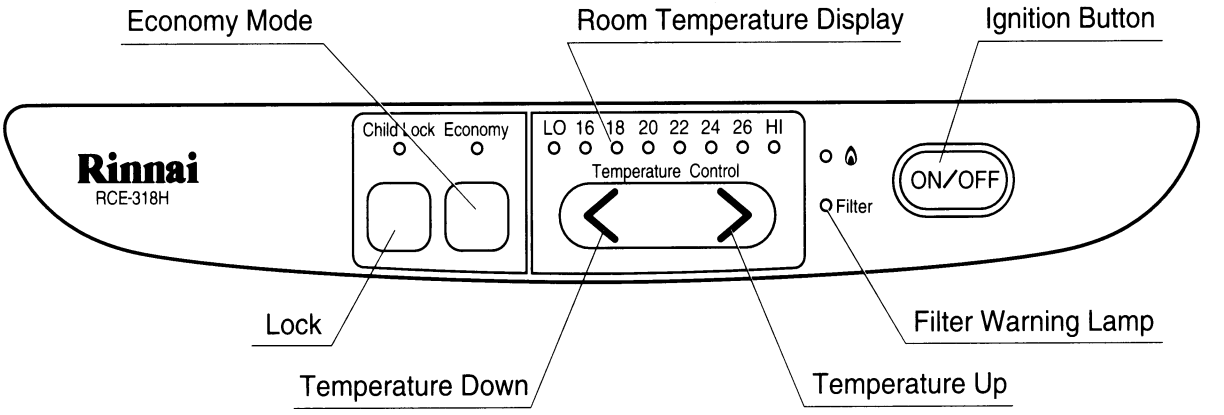


7. Schematic Diagram



8. Operation Principles

Control Panel Layout



Normal Operation

- Press the ON / OFF button.
- The RoomTemperature indicator flashes illuminated, and the convection motor starts pre-purging.
- After approximately 3 seconds, the electrode starts discharging electricity, and at the same time the solenoid valves and the modulating valve turn ON.
- After ignition, while the main burner is on “High”, the Combustion indicator illuminates red as the thermocouple detects the flame and the electrical discharge ceases. (Compulsory combustion is carried out for approx. 60 sec on High).

Temperature Control

- Room temperature can be adjusted (refer to customers operating information) to the desired temperature with the room temperature control button. Preset Room Temperature illuminates, whereas Present RoomTemperature flashes.

Turning OFF

- Press the ON / OFF button.
- The solenoids and modulating valve turn OFF and combustion ceases.
- The indicators will turn off.
- The convection motor ceases operation after post-purging (82 ~ 255 seconds).

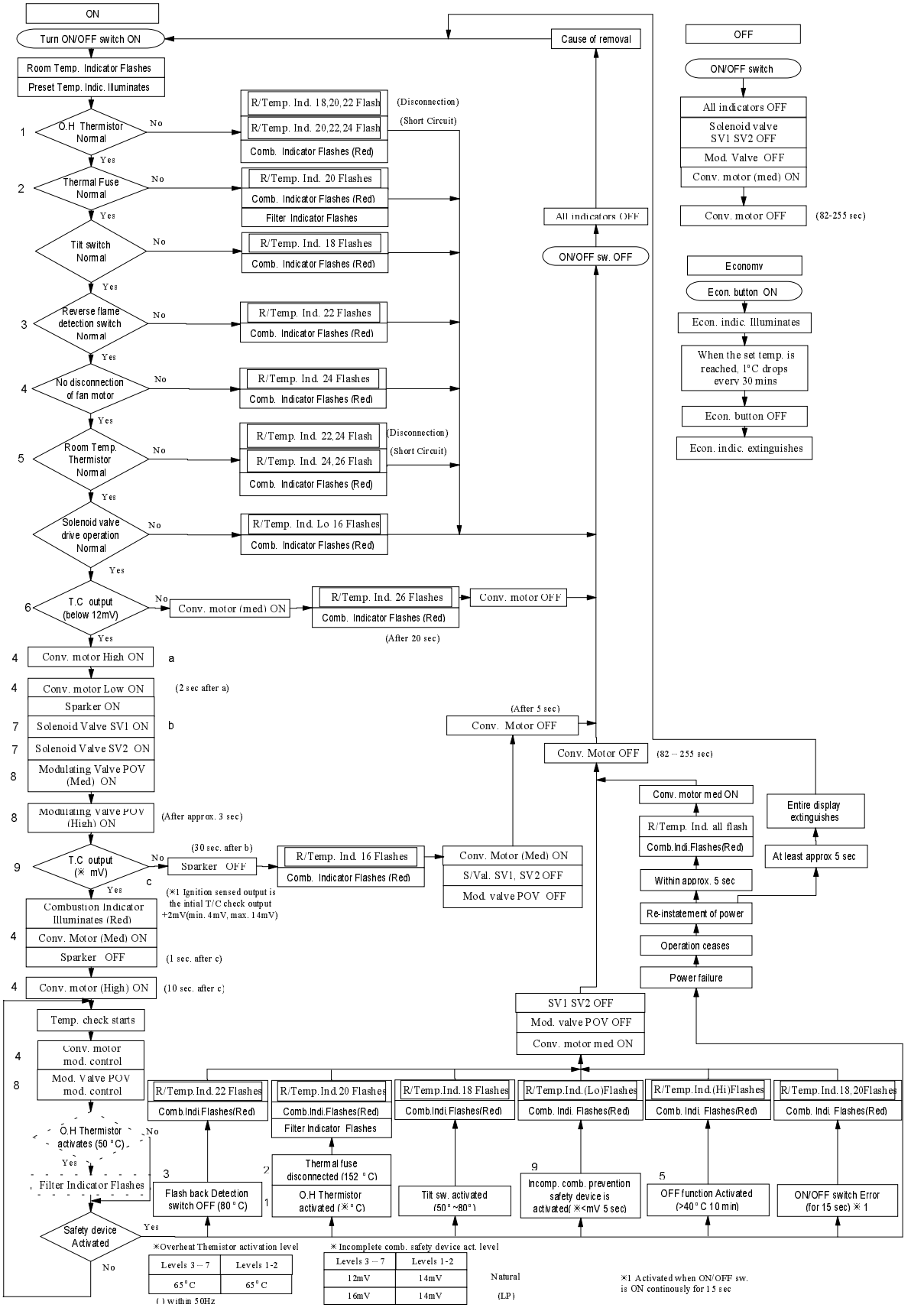
Economy Mode

- Press the Economy button. The Economy indicator illuminates and the appliance enters economy operation.
- It automatically decreases the preset room temperature once every 30 minutes by a maximum of 1 degree after the auto economy operation reaches the preset room temperature.
- Economy indicator turns off when the Economy button is pressed.

Lock

- Press the lock button. The lock indicator illuminates.
- When setting the lock during combustion, only the ON / OFF switch responds. When ceasing operation, the off button does not respond.
- The lock button should be pressed for approximately 1second when cancelling.

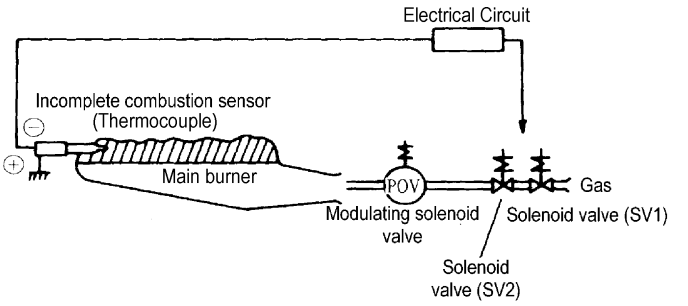
9. Operational Flow Chart



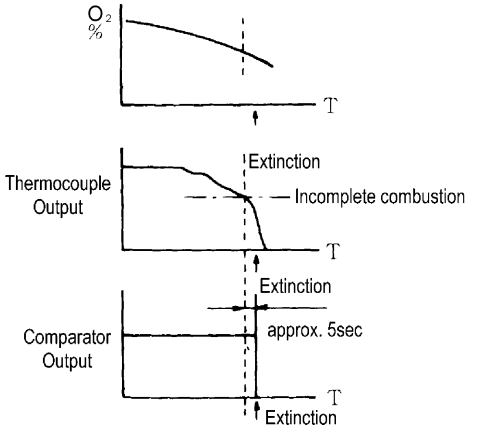
10. Main Componentry

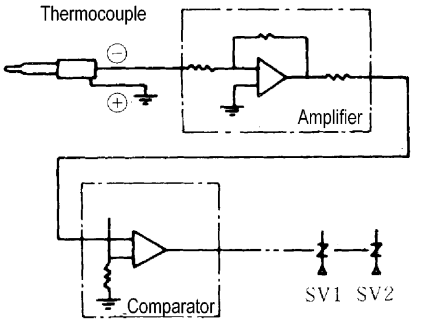
1. Safety Devices

Incomplete Combustion, ODS and Flame Failure Safety Device



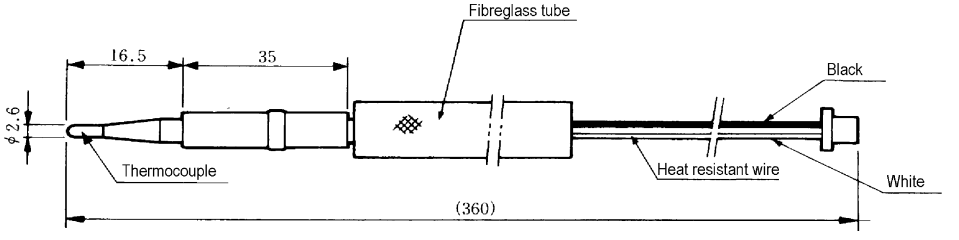
The Incomplete Combustion Safety Device senses flame temperature using a thermocouple. Thermocouples are used widely as burner safety devices. The Incomplete Combustion Safety Device is incorporated in a special burner structure with an electronic sensor. Ignition, combustion and flame failure are monitored by this system. If abnormal combustion occurs, the temperature and electrical changes will be sensed before incomplete combustion occurs and pollutes the air inside the room, and the gas is cut off by closing the solenoid valves.





The amplifier amplifies the thermocouple output (20 ~ 30 m V) 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.

Sensor Specification



Sensor Characteristics (when room temperature is < 3 °C)

Ignition Sensing Voltage (mV)	ODS Sensing Voltage (mV)	Normal Output Voltage (mV) Standard Performance NG*	Drop Out Time (secs)
Output at initial check + 2 mV	level 3~7 16(LPG) 12(NG)±1.5 level 1 ~ 2 14±1.5	level 3 ~ 7 20 ~ 3 level 1 ~ 2 18 ~ 3	Below 60

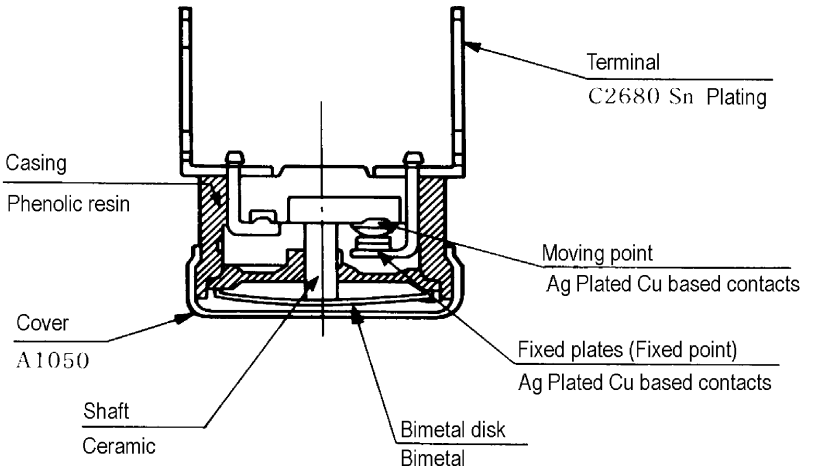
Drop Out = Time until the gas is cut off after flame failure.

* Sensing voltage varies depending on gas type. (Refer to combustion specifications)

Overheat Switches

OHS Type	Performance	
Thermistor	Level 3 ~ 7 Level 1 ~ 2	Activates at 65°C Activates at 65°C
Thermal Fuse	Cut Off Temp	157 $^{+0/-10}$ °C

Flash Back Sensor Device

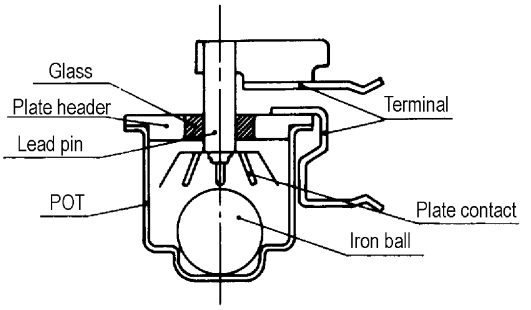


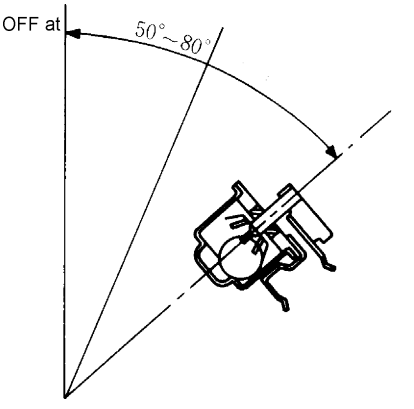
Activation Temp.	80 ± 5°C OFF
Reset Temp.	65 ± 5°C ON

Tilt Switch Safety Device

The circuit closes when the unit is tilted activating the switch safety circuit on the PCB and shutting the solenoids.

Activating Angle	50° ~ 80°

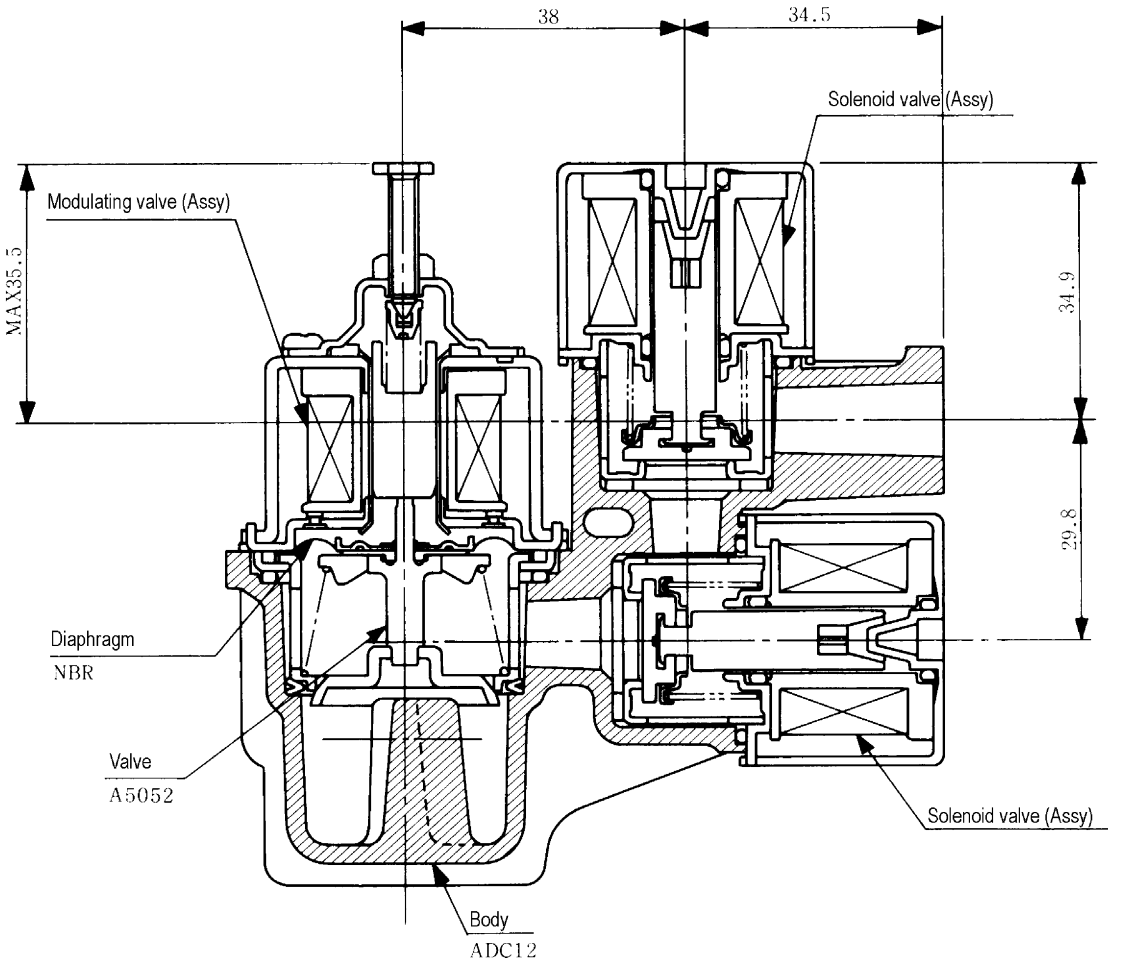




Surge Protection

Glass Fuse	3 Amp

2. Solenoid Valves



		Solenoid Valve 1	Solenoid Valve 2
Single Seated Valve	Voltage	DC 90 V	DC 90 V
	Electrical Consumption	Below 6W	Below 6W

Modulating Valve	
Current	Below 180 mA
Electrical Consumption	Below 6W

3. Electrical

Convection Fan

Convection Fan				
Type	**Diameter (mm)**	**Width (mm)**	**Air flow Rate m^3/min**	**Fan (rpm)**
Line Flow Fan	90	230	High: 2.13 Low: 1.28 (Gas off)	High: 850± 100 Low: 540± 100

Note: Air flow rate is measured using a duct.
Fan speed is measured with gas ON, and appliance completely assembled.

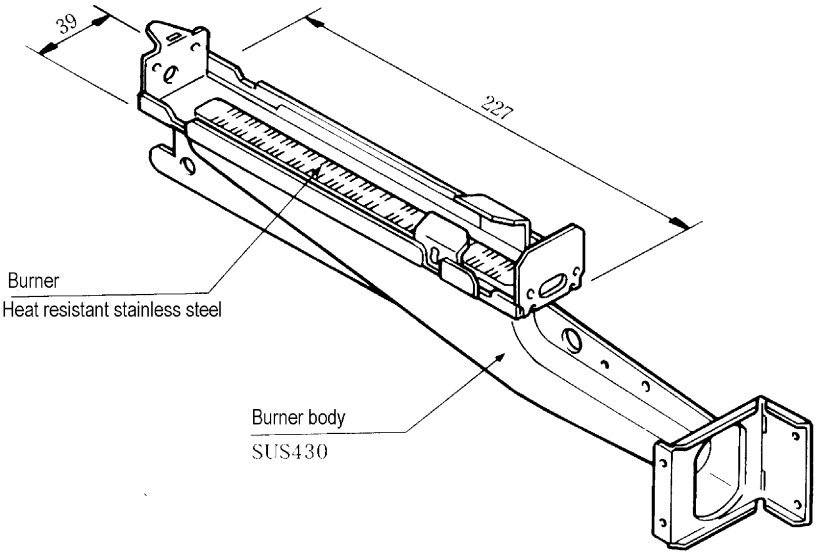
Room Temperature Control Device

	Set Temp Range	Differential
Thermistor	16 ~ 26°C	Approx. 0.5°C

4. Combustion

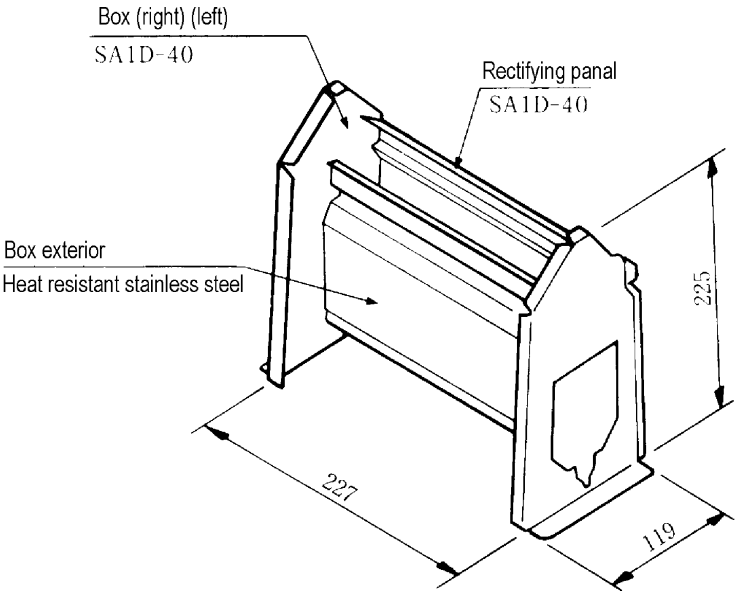
Burner

Type	Combustion Type	Burner Port Shape	Qty	Material
Main burner	Bunsen	Slit	1	Heat Resistant Stainless Steel

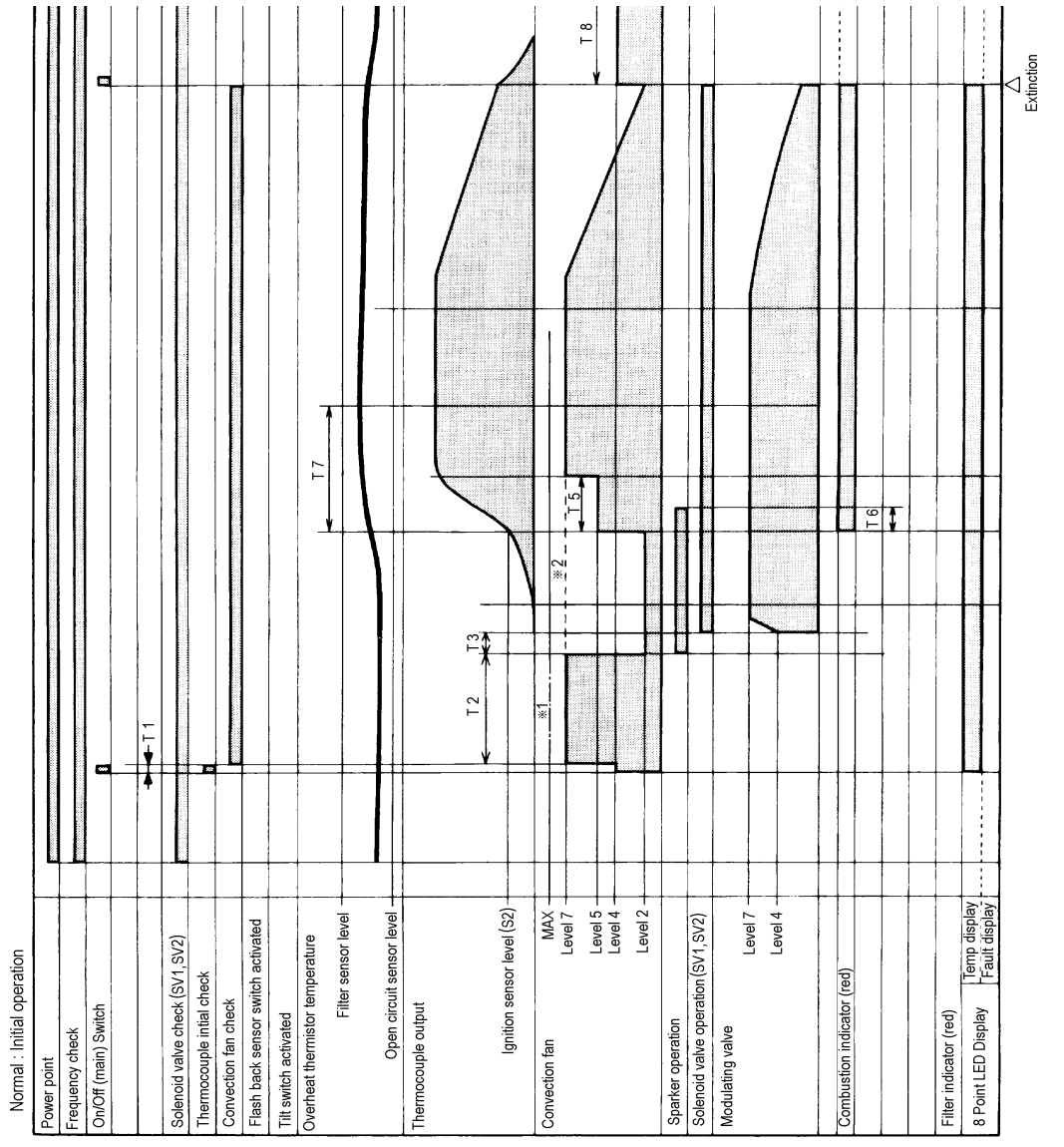


Combustion Chamber

Material	Thickness (mm)	Dimensions
SA1D-40	0.6	As below
Heat Resistant Stainless Steel	0.5	



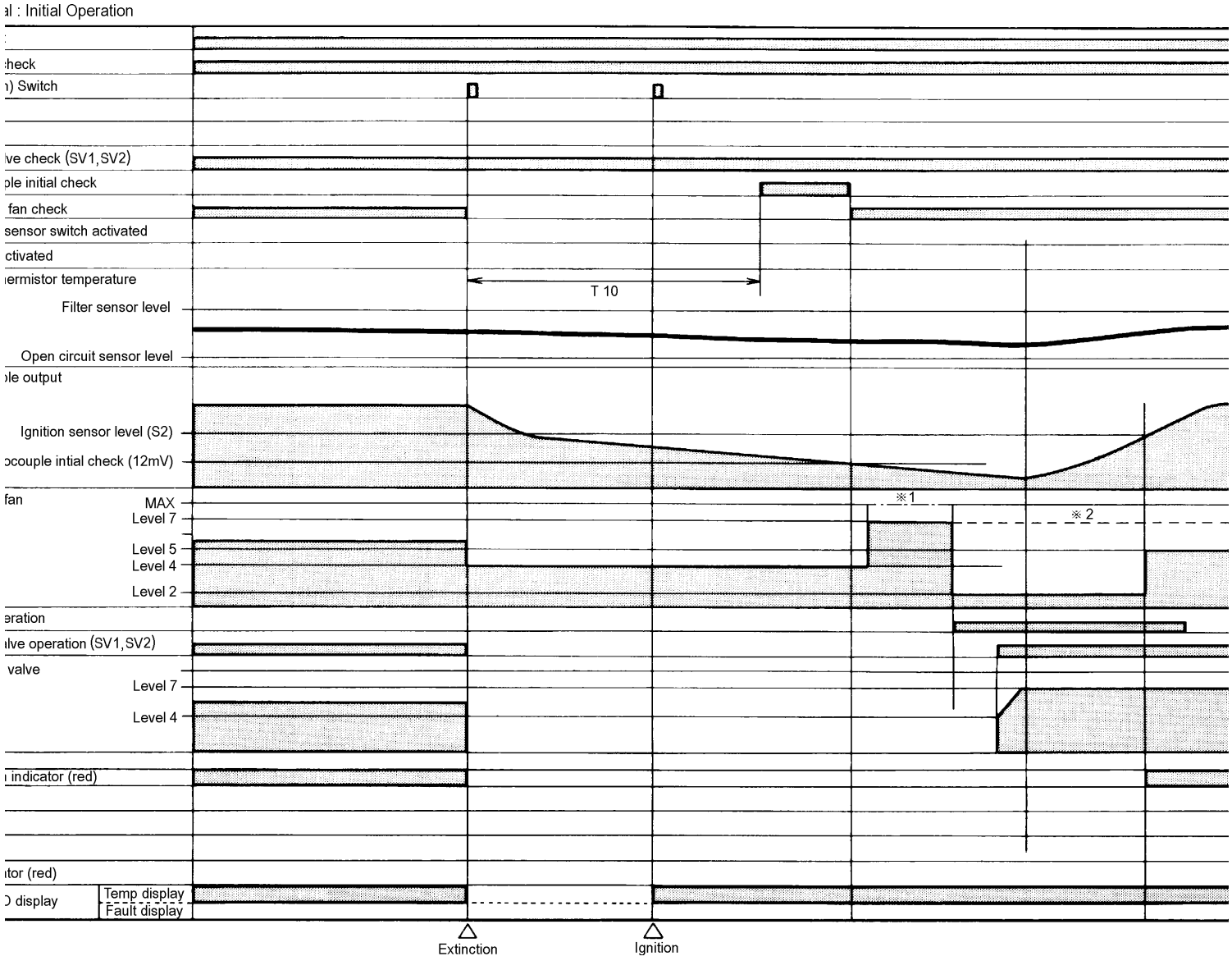
11. Time Charts



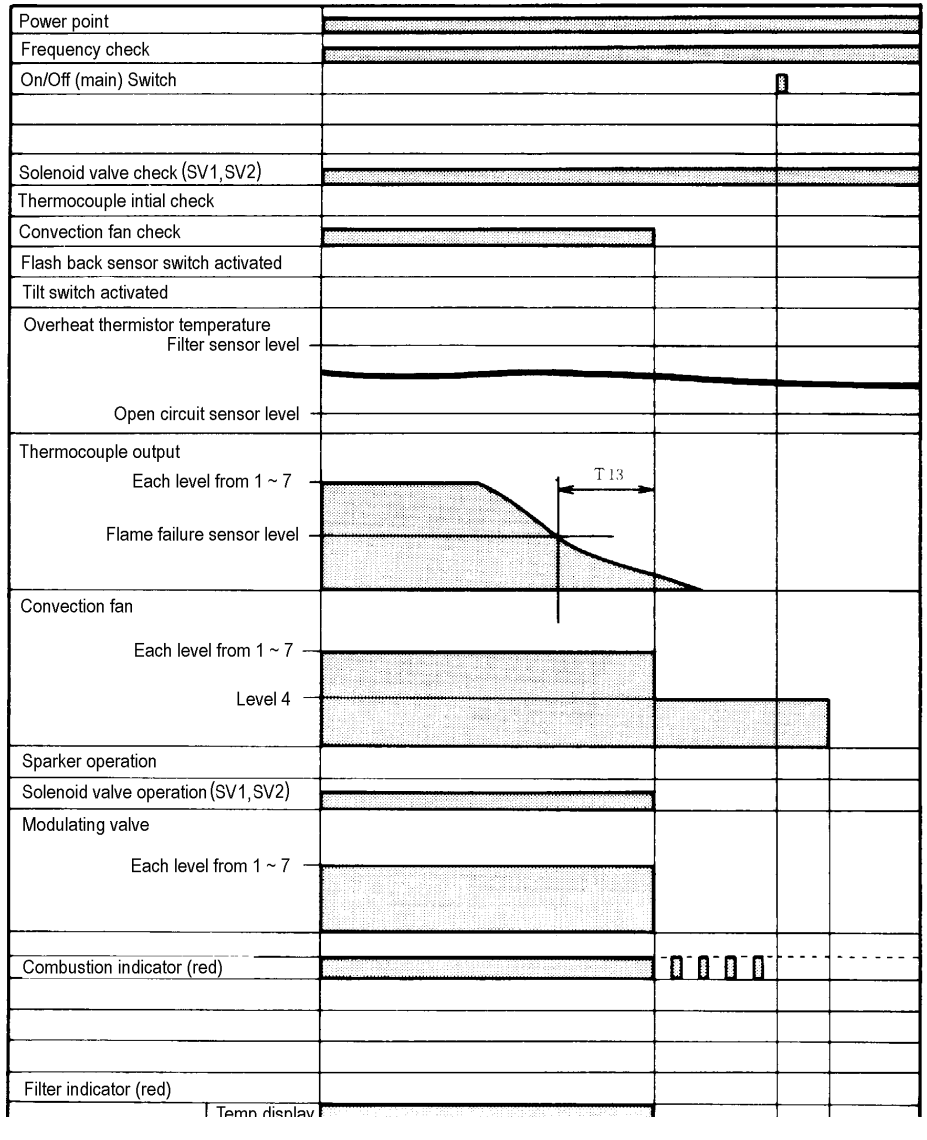
e initial check (continuous time) max 20 sec
ie 2 sec
e 0.2 sec
ustion time 1 10 sec
time 1 sec
ustion time 2 60 sec
ner
rature thermistor, 255 sec
tch, faulty thermistor,
rmistor activated 82~255 sec
82~150 sec
-purge time 20 sec
e detected 5 sec
time max 15 sec
: switch time 0.5 sec
ish back switch time 0.2 sec
:h error time 15 sec
ror time 0.2 sec

nperature < 10 degrees celcius
nperature < 5 degrees celcius

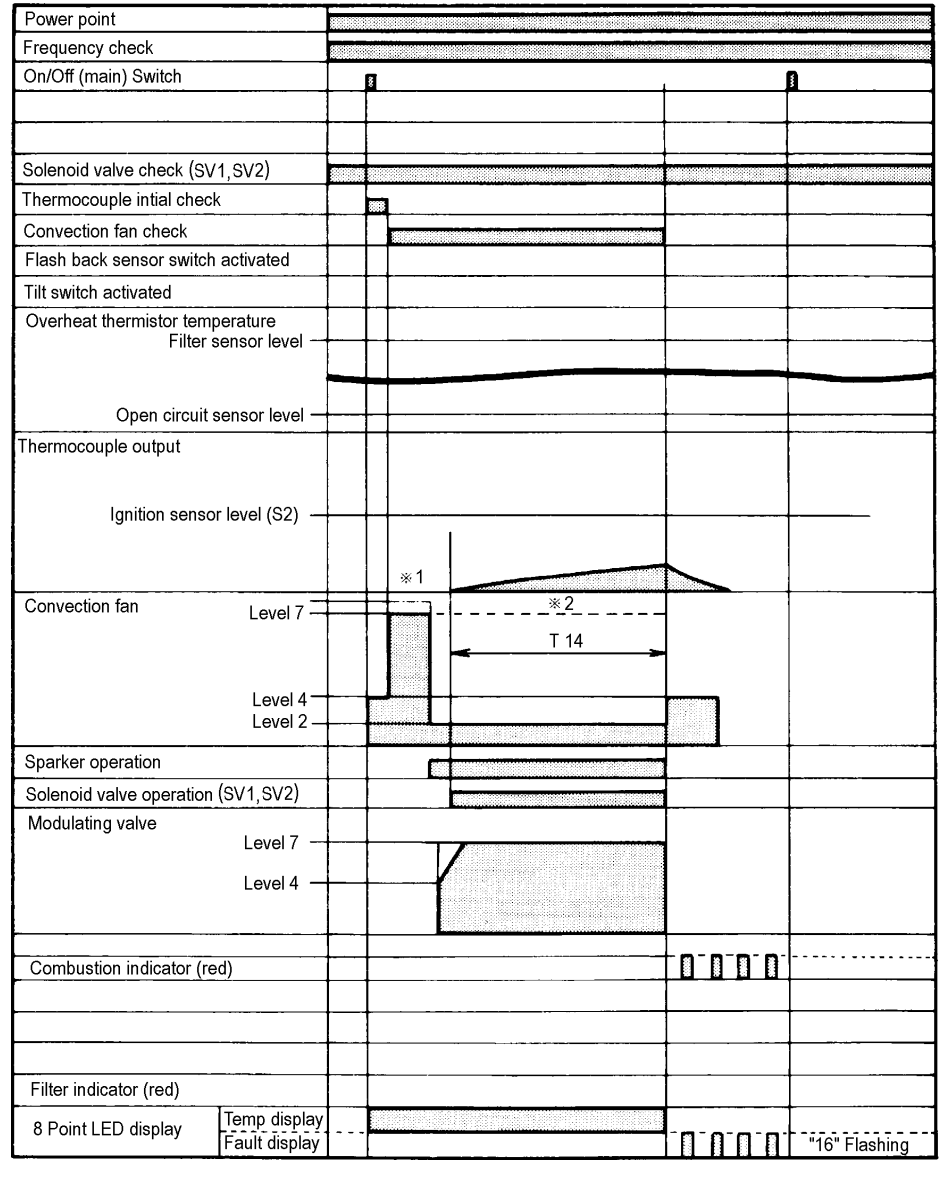
g valve start up
4 to level 7


al : Initial Operation
check
n) Switch
lve check (SV1,SV2)
ple initial check
fan check
sensor switch activated
ctivated
ermistor temperature
Filter sensor level
Open circuit sensor level
ple output
Ignition sensor level (S2)
ocouple intial check (12mV)
fan
MAX
Level 7
Level 5
Level 4
Level 2
eration
lve operation (SV1,SV2)
valve
Level 7
Level 4
indicator (red)
tor (red)
D display
Temp display
Fault display
T 10
※1
※2
Extinction
Ignition

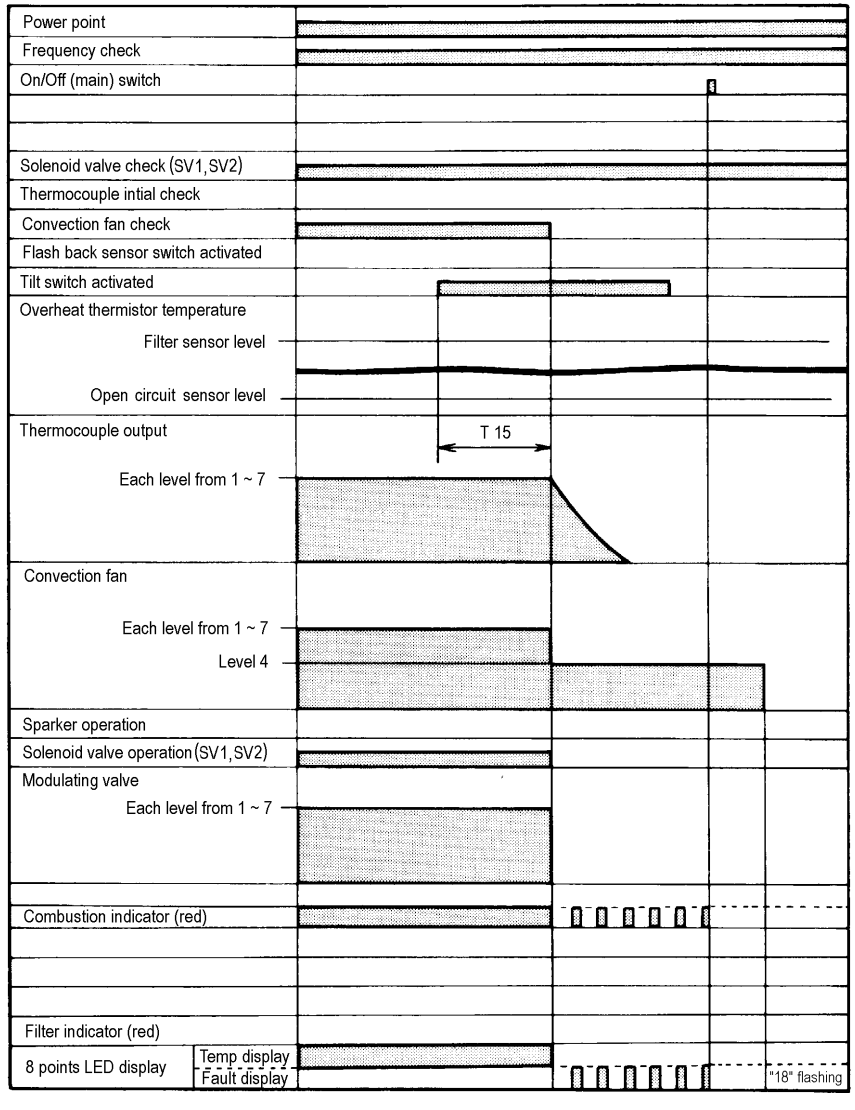
Error : Flame Failure / Oxygen Depletion



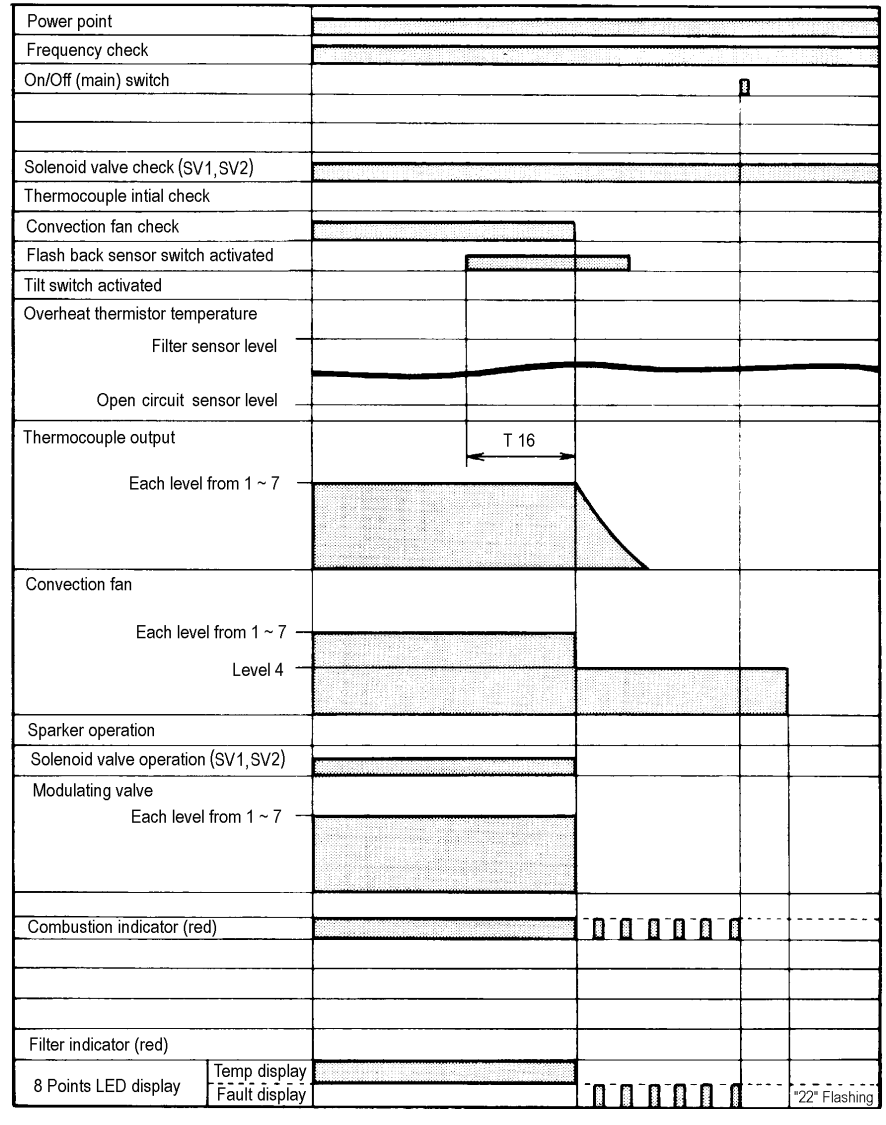
Error : Miss-Ignition

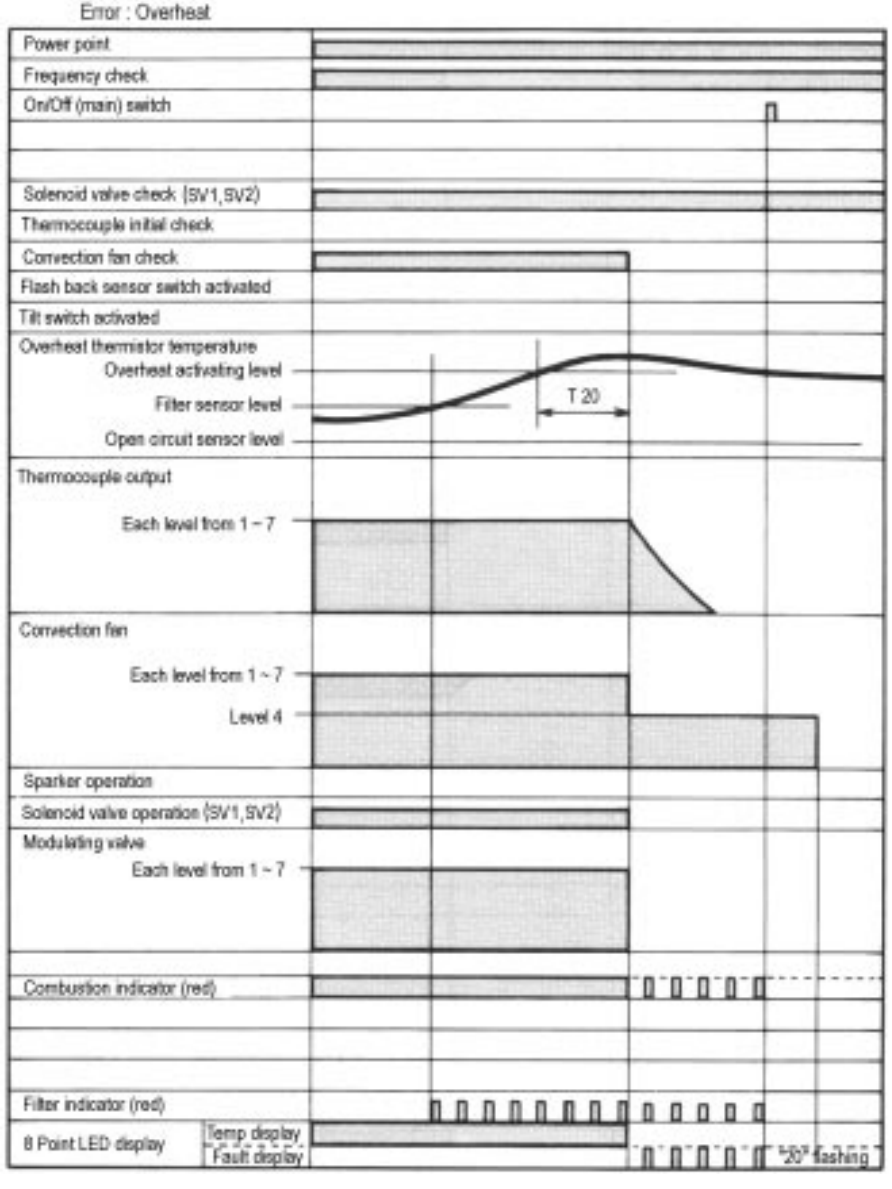


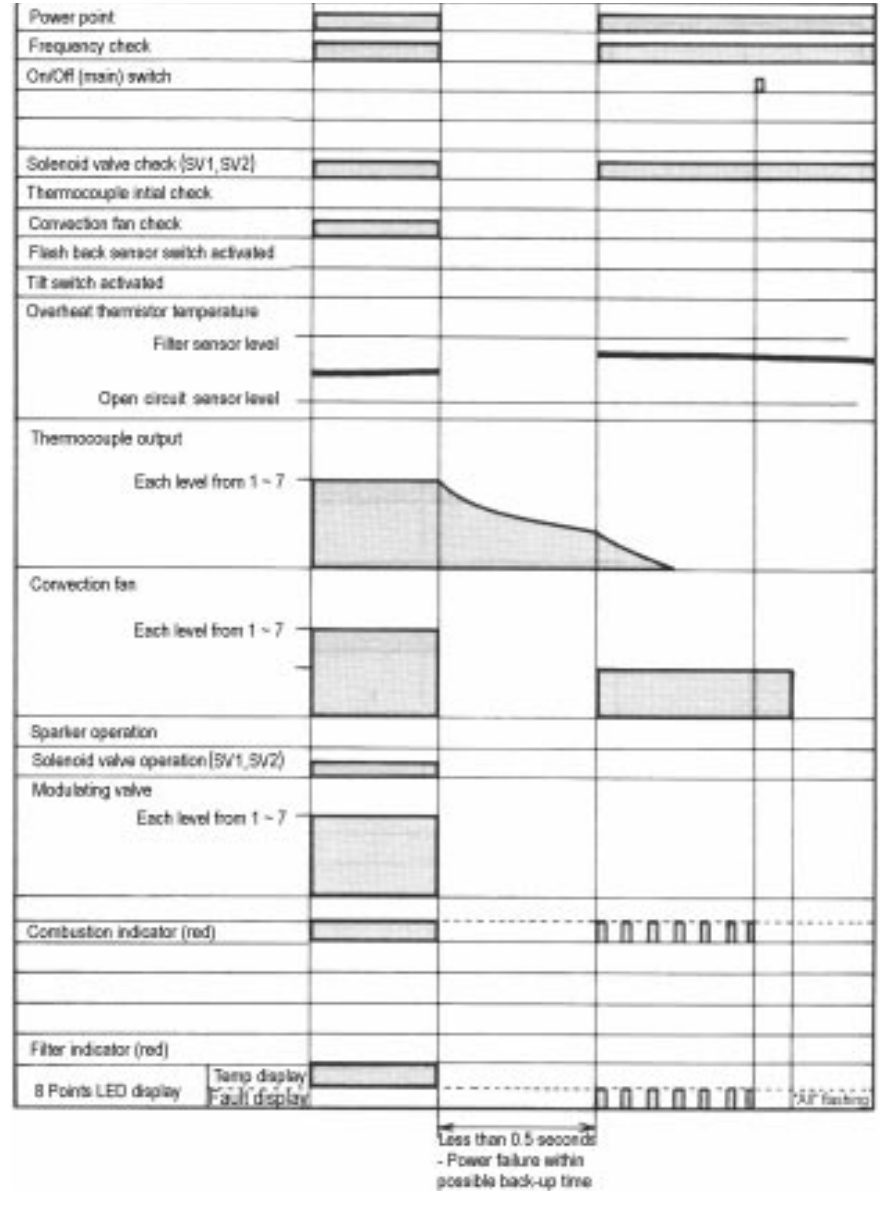
Error: Tilt Switch Activated

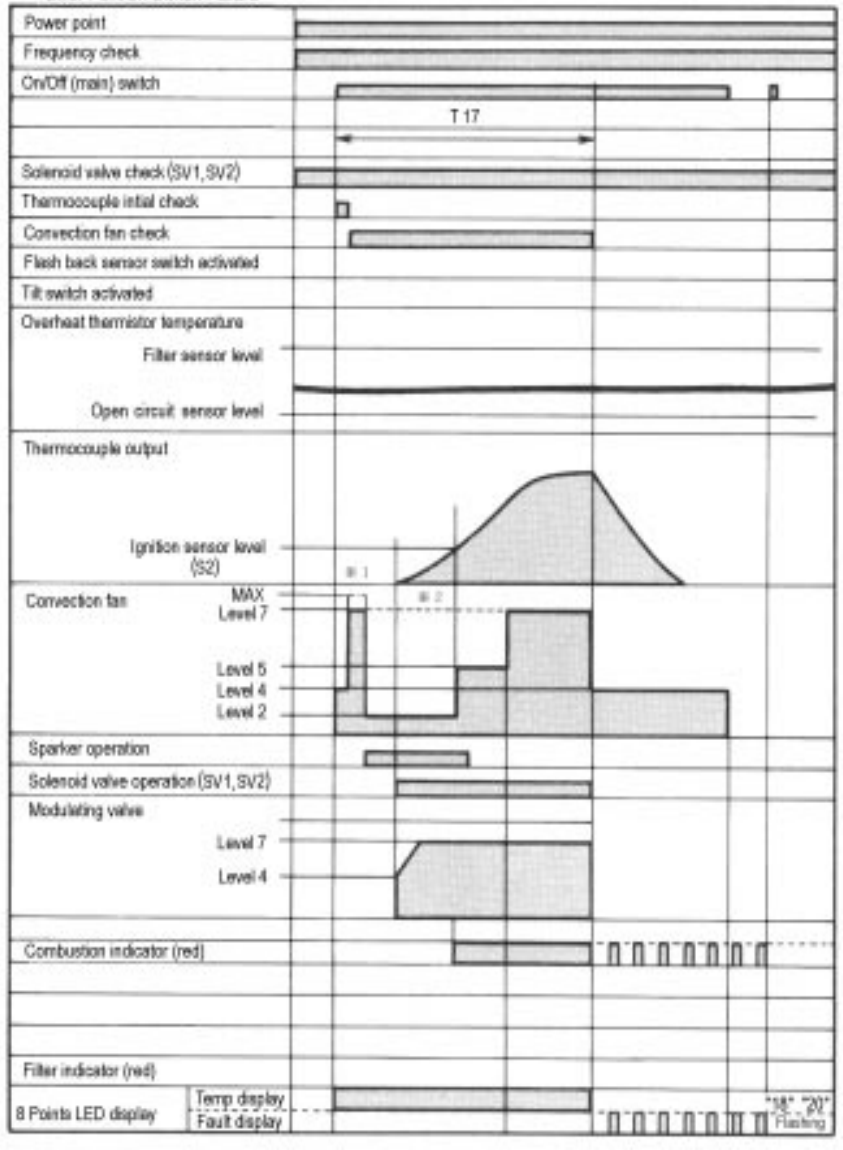


Error : Flash Back Switch Activated

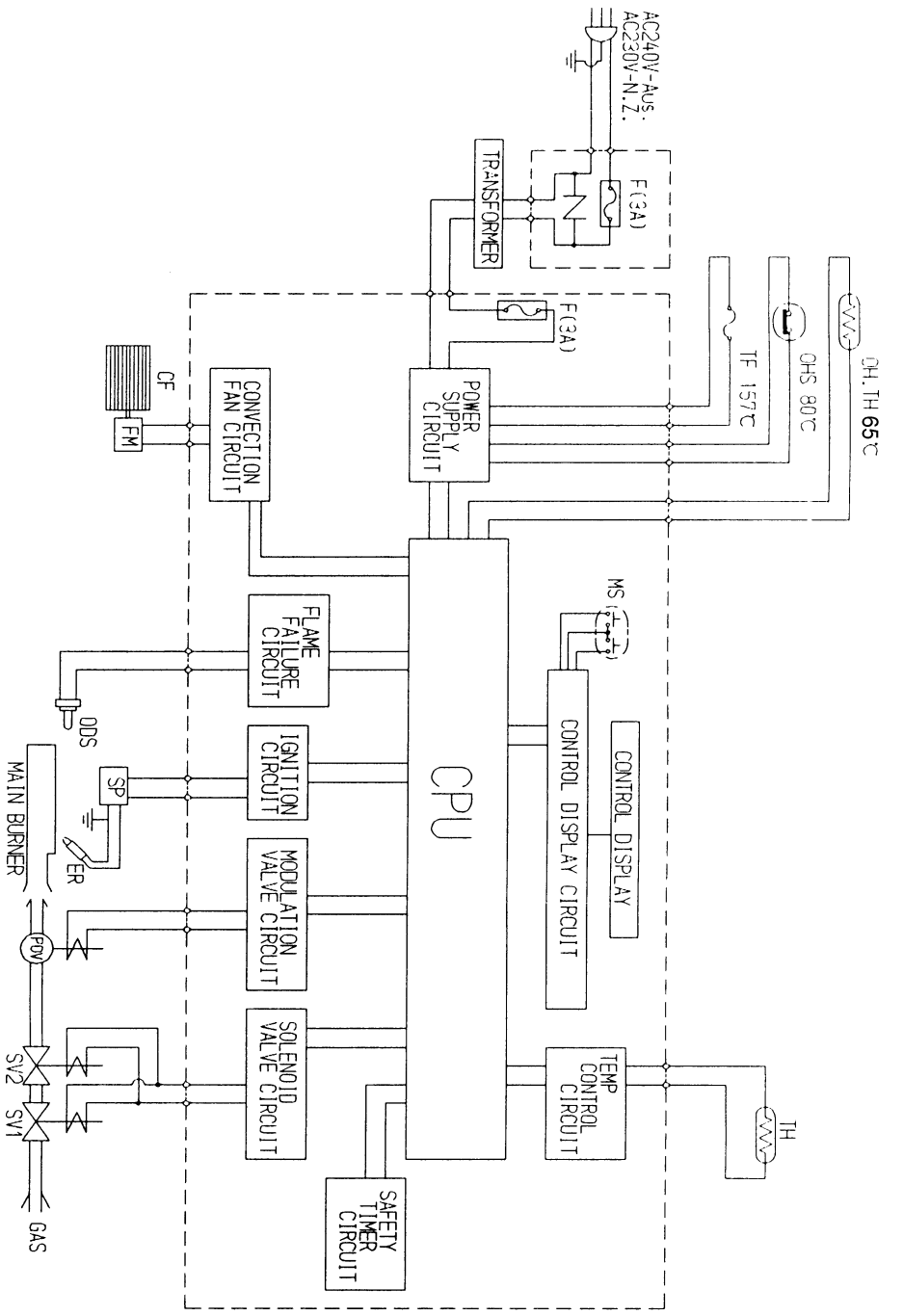



Error : Overheat
Power point
Frequency check
On/Off (main) switch
Solenoid valve check (SV1,SV2)
Thermocouple initial check
Convection fan check
Flash back sensor switch activated
Tilt switch activated
Overheat thermistor temperature
Overheat activating level
Filter sensor level
Open circuit sensor level
T 20
Thermocouple output
Each level from 1 ~ 7
Convection fan
Each level from 1 ~ 7
Level 4
Sparker operation
Solenoid valve operation (SV1,SV2)
Modulating valve
Each level from 1 ~ 7
Combustion indicator (red)
Filter indicator (red)
8 Point LED display
Temp display
Fault display
"20" flashing


Power point
Frequency check
On/Off (main) switch
Solenoid valve check (SV1,SV2)
Thermocouple intial check
Convection fan check
Flash back sensor switch activated
Tilt switch activated
Overheat thermistor temperature
Filter sensor level
Open circuit sensor level
Thermocouple output
Each level from 1 ~ 7
Convection fan
Each level from 1 ~ 7
Sparker operation
Solenoid valve operation (SV1,SV2)
Modulating valve
Each level from 1 ~ 7
Combustion indicator (red)
Filter indicator (red)
8 Points LED display
Temp display
Fault display
All flashing
Less than 0.5 seconds
- Power failure within
possible back-up time


Power point
Frequency check
On/Off (main) switch
T 17
Solenoid valve check (SV1, SV2)
Thermocouple intial check
Convection fan check
Flash back sensor switch activated
Tilt switch activated
Overheat thermistor temperature
Filter sensor level
Open circuit sensor level
Thermocouple output
Ignition sensor level (S2)
Convection fan
MAX
Level 7
Level 5
Level 4
Level 2
Sparker operation
Solenoid valve operation (SV1, SV2)
Modulating valve
Level 7
Level 4
Combustion indicator (red)
Filter indicator (red)
8 Points LED display
Temp display
Fault display
"18", "20"
Flashing

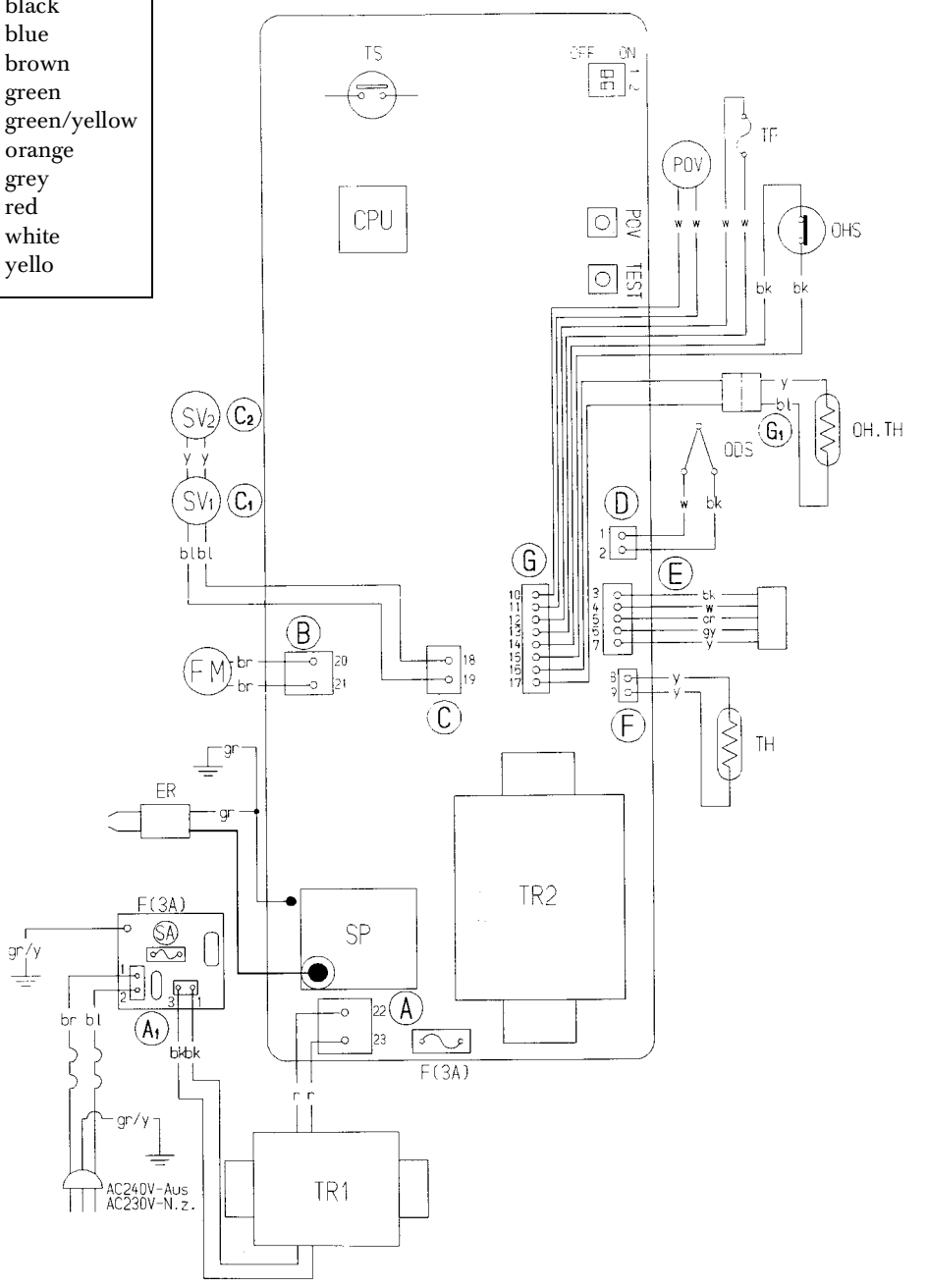
12. Block Diagram



13. Wiring Diagram

Legend

bk:	black
bl:	blue
br:	brown
gr:	green
gr/y:	green/yellow
or:	orange
gy:	grey
r:	red
w:	white
y:	yello

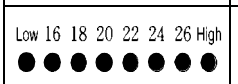
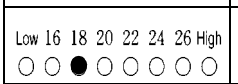
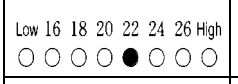
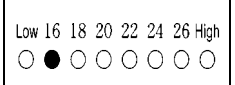
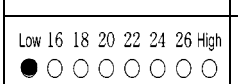
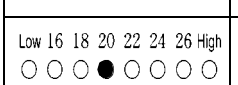
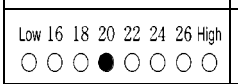
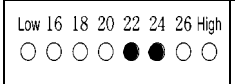
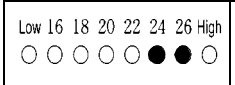
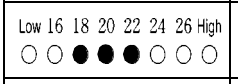
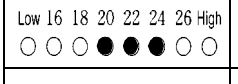
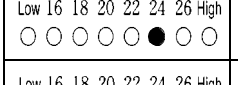
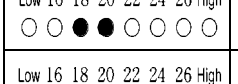
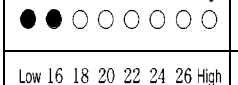
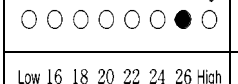
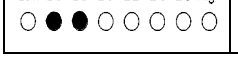


14. Diagnostic Points

Flow Chart Nº	CN	Wire Colour Nº	Measurement Value Voltage / Resistance	Component
1	G_1	white-white	10°C 120~135kΩ 20°C 70~85kΩ 40°C 25~40kΩ	Overheat Thermistor
2	G	white-white 12 13	DC <1V <1Ω	Thermal Fuse
3	G	black-black	DC <1V <1Ω	Flashback Sensor Switch
4	B	brown-brown	Hi~Lo AC 45~95V 75~140Ω	Convection Fan Motor
5	F	yellow-yello	10°C 58~73kΩ 20°C 33~44kΩ 40°C 9~19kΩ	RoomTemperature Thermistor
6	D	black-white	DC >12mV	Thermocouple
7	C	blue-blue	DC 80~100V	Solenoid Valve
	C_1	blue-blue yellow-yello	1.5~2.2kΩ	
	C_2	yellow-yello	1.5~2.2kΩ	
8	G	white-white 10 11	Hi~Lo DC 1~10V 80~100Ω	Modulating Solenoid Valve
9	D	black-white	DC >16mV	Thermocouple

The Operational Flow Chart is on pag e11, and the “Wiring Diagram” on pa ge24.

15. Error Codes Messages

Error Code	Content	Diagnostic Check Point
	Power Reinstatement While ON/OFF switch ON	-
	Gas interrupted due to Tilt switch	Check Tilt switch
	Flashback safety device	Check Flashback Sensor switch
	Ignition Failure Miss-ignition	Check Thermocouple Output
	Incomplete combustion Flame failure	Check Thermocouple Output
	Overheat thermistor activated	Check Overheat Thermistor
	Thermal fuse melted	Check Thermal Fuse
	Unit cuts OFF (10 mins at >40° C	Check Room Temperature Thermistor
	RoomTemperature Thermistor broken circuit	Check Room Temperature Thermistor
	RoomTemperature Thermistor short circuit	Check Room Temperature Thermistor
	Overheat Thermistor broken circuit	Check Overheat Thermistor
	Overheat Thermistor short circuit	Check Overheat Thermistor
	Fan Motor broken circuit	Check Convection Fan Motor
	ON/OFF switch abnormal	Check (ON/OFF sw.) PCB
	Solenoid circuit abnormal	Check Solenoid valve and modulating valve
	Thermocouple initial value abnormal	Check millivolts output on Thermocouple
	Thermocouple high cut	Check Thermocouple output >48mV for 5 secs

E^2 PROM

E^2 PROM (Electrically Erasable and Programmable Read Only Memory) is a ROM in which data is electronically programmed or erased. Programmed data will be stored semi-permanently even if the power fails or is disconnected.

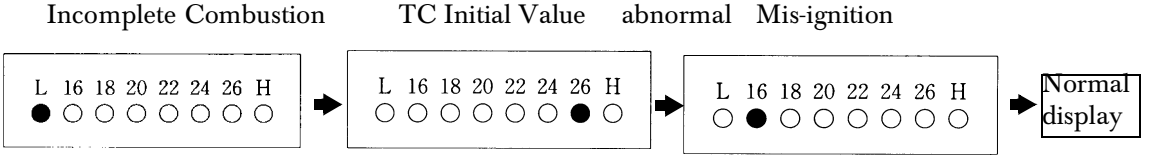
The most recent data on the past 3 errors is included in the information stored in E^2 PROM.

- How to Read the Data

  While the unit is off, press the "/\" "\/" and "Economy" buttons at the same time for at least 2.5 seconds. The error codes will be displayed in order on the LED display.
- Data Display

  The most recent error message (No.1) will be displayed first, then it will be followed up by the two previous errors (No. 2 and 3) displayed for 2.5 seconds each. (Nothing will be displayed if ther is no Error History.)

Eg.



- Resetting (deletable data)

  When turned OFF, press the "/\" "\/" "Economy" and "Lock" buttons at the same time for at least 2.5 seconds. The entire LED Display illuminates then reverts back to the normal display once the data setting has been completed.

- Permanent Data

  Data stored in the E^2 PROM will not be erased, even during a power failure. However, data will be divided into two groups, and of those, the data from one group can be deleted manually.

[Permanent Data]	[Deletable Data] *	(Initial setting)
• Modulating Valve Supplement CurrentValue	• Choice of Economy operation	(OFF)
• Convection Fan Supplement CurrentValue (High)	• Set Temperature	(22°C)
• Convection Fan Supplement CurrentValue (Low)	• Error History	(None)
• Estimated level set value		

* This data can be deleted as described in "Resetting" above.

16. Fault Finding Procedure

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 Lock.
Ignition does not occur. (Room Temperature indicates "16" and Combustion indicator flashes red)	• Check gas hose is plugged in. ..... 1 • Check gas type matches that supplied to appliance. • Check gas hose isn't bent/crimped. ..... 1 • Air in gas supply 1
Room does not warm up.	• Check pre-set temperature. ..... 2 • Blocked air filter ..... 3 • Warm air outlet short circuit (obstruction). ..... 4 • Inadequate gas supply. 1
Flame failure. (RoomTemp. "20", Combustion indicator flashes red) (RoomTemp."Low",Combustion indicator flashes red) (RoomTemp. "22", Combustion indicator flashes red) (RoomTemp. "Low"~"High" flash) when power is restored within 0.5 seconds	• Insufficient ventilation. ..... 5 • Blocked air filter ..... 3 • Power failure. • Warm air outlet short circuit (obstruction). ..... 4 • Check gas type • Strong draught in appliance. • Inadequate gas supply (pipe bent/crimped). ..... 1 • Flash back. 7
There is a smell of gas	• Leaking gas supply (faulty connection). ..... 1 • Safety device operating. • Smell of combustion by-product. 6

.... Numbers refer to the following items.

1. Gas Supply
   <Ignition 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 an incorrect length?
   - Is the gas supply connected correctly?

   -> Ensure the gas supply is fully open.

   -> Ignition problems can be caused by poor gas supply, or air in the supply line. (There maybe a gas smell until ignition)
2. Preset Temperature
   <Room does not warm up>
   - Is the set temperature lower than the current room temperature? (Appliance switches to "Low" approximately 1 minute after ignition)

   -> Set the room temperature higher than the present room temperature.

   -> Adjust to the desired room temperature with the room temperature control buttons.

3. Air Filter Blockage
   <Room does not warm up> <Extinguishes suddenly>
   - Is the air filter blocked by dust or is a curtain touching it?
   - Has the safety device been activated by the dust blockage? (Room Temperature indicates "20" and Combustion indicator flashes red)

   -> Clean the filter at least once a month.

4. Warm Air Short Circuit (Obstructions)
   <Room does not warm up> < Extinguishes suddenly>
   - Are there any obstructions in front of the warm air outlet? (Room Temperature indicates "20" and Combustion indicator flashes red)
     -> Do not cover or place any obstructing objects within 1 m of the warm air outlet.

5. Insufficient Ventilation
   <Extinguishes suddenly>
   - Is the room sufficiently ventilated? (Room Temperature indicates "Low" and Combustion indicator flashes red)
     -> During use, ventilate the room every hour by turning the ventilator on for 1 minute or by opening a window.

6. Exhaust Smell From Appliance
   <There is a gaseous smell>
   -> This appliance emits exhaust by-products into the room. When igniting / extinguishing, there may be a slight smell.

7. Flashback
   <Extinguishes suddenly>
   - Is the air filter blocked by dust or is a curtain touching it?
   - Is there any blockage in the burner or restrictor?
   - Is combustion, gas pressure etc, normal? (RoomTemperature indicates "22" and Combustion indicator flashes red)

Conditions that are not faults

Condition	Cause and Explanation
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. Fan does not stop.	The fan stops after releasing all heat residual from within the appliance. It will continue to run for 82 to 150 seconds (approx. 200 - 255 secs if appliance has overheated).
Hollow 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. This will soon go.
After ignition there is a ticking or clicking noise.	This is expansion of the combustion chamber metal, and is normal.
The heater does not ignite upon initial use.	There may be air in the gas supply, preventing the appliance from igniting immediately. After 15seconds the spark will stop and the heater will lockout. The ON/OFF button must be reset to re-ignite.
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.
There si an unusual ordour upon ignition/ extinction to burner	There may be a ordour sometimes upon ignition/extinction. (This should disappear once the flame is stable)

17. Fault Analysis

Note: Before carrying out resistance checks, disconnect power.

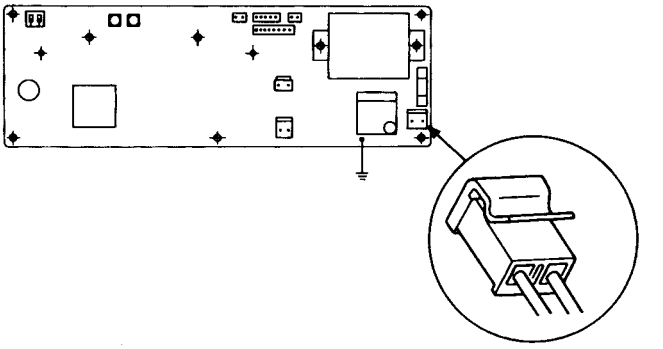
A: After pressing the ON/OFF Switch

a. the convection fan does not begin to rotate.
b. the solenoid valves do not open.
c. there is no spark.

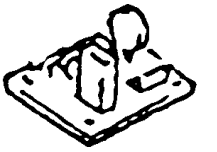
Is there electrical supply? NO →

YES ↓

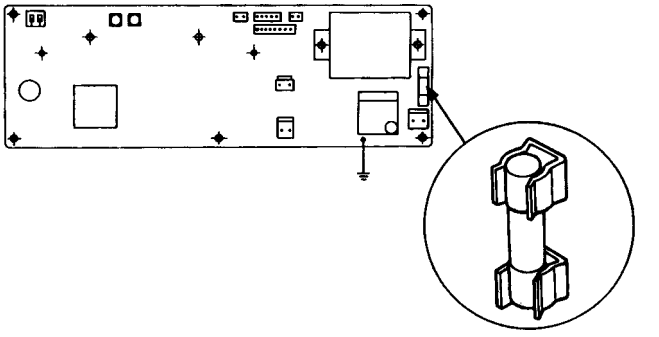
1. Check the connections at the wall socket



2. Check the surge absorber connection

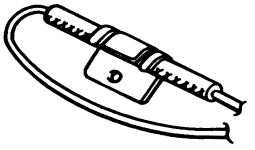


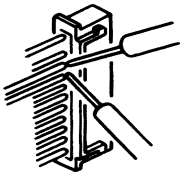
3. Is the 3 amp fuse blown?



a. The room temperature and preset temperature indicators do not illuminate.

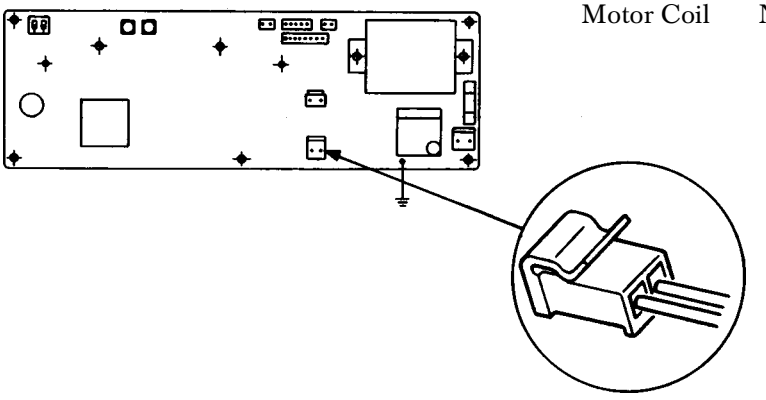
1. Broken wiring or loose pin connectors. (Open circuit)
2. Faulty PCB.
3. Thermal fuse has melted (Room Temperature indicates “20” and Combustion indicator flashes red).





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. Disconnection of motor wire or connector. (RoomTemperature indicates “24” and Combustion indicator flashes red.)

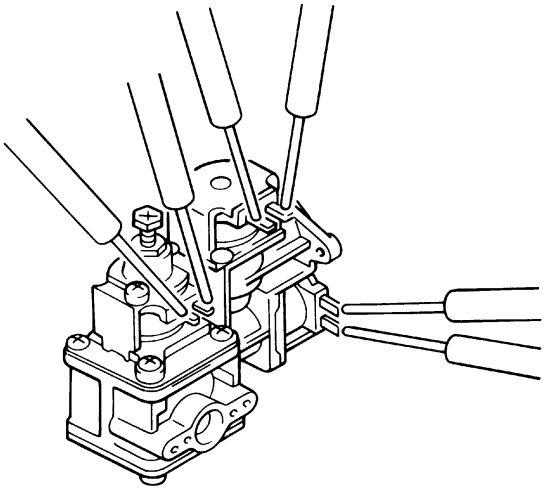


Motor Coil Normal Value
95Ω

4. Faulty PCB.

c. The solenoid valves do not open

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



3. Faulty PCB (SV current not DC 90V).

d. There is no spark

1 High tension cord disconnected or broken.
2. Insulation leak from electrode etc.
3. Incorrect spark gap (Normal spark gap is 3.0 ~ 4.0 mm).
4. Faulty PCB.

B: After repeated efforts to operate the appliance, it will not ignite. (Room Temperature indicates “16” and Combustion indicator flashes red.) (No warm air

1. Air has not been completely purged from pipes.
2. Incorrect gas pressure (primary).
3. Incorrect gas type, or kink in the gas supply hose, or the hose is too long.
4. Faulty sparker
5. Blocked injector
6. Incorrect combustion specification, blocked sparker. (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.

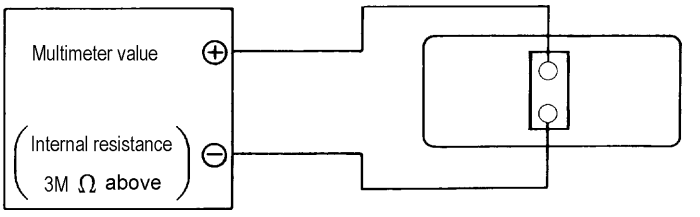
Miss-ignition

No 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 (Lower ⊖, Upper ⊕)

Is the output 16mV or above?

YES

NO

1. Check combustion specification, gas type, and gas pressure.
2. Check burner combustion.
3. Check thermocouple is firmly fixed.
4. Check thermocouple for short circuit or breakage.
5. Check thermocouple height.*
6. Check thermocouple spacer type for correct gas.

* Specification varies depending on the gas type (Refer to "Combustion Specification" on pag e3).

Faulty PCB

D: The flame fails during normal operation

1. Power failure. All indicators turned off.
2. Tilt switch has activated. (Gas cuts off when tilt switch activates.) (Room Temperature indicates "18" and Combustion indicator flashes red.)
3. A safety device has activated.
   - •Air filter is blocked and OHS is activated (Room Temperature indicates "20" and Combustion indicator flashes red.)
   - •Incomplete Combustion Prevention Device (ODS) is activated due to insufficient ventilation.
   - •Kink in the gas supply hose. Hose too long. (Room Temperature indicates "Low" and Combustion indicator flashes red.)
   - •Gas pressure is abnormally low.
   - •Clearances around the appliance are insufficient.
   - •Obstructions around the heater. (Refer to "Installation" on page 7 for clearances).
4. Safety devices are wrongly activated — First check wiring is not broken or pin connectors loose.

Flame failure occurs between 30 minutes to 1 hour after ignition.
RoomTemperature indicates "Low" and Combustion indicator flashes red.

↓

Incomplete combustion prevention device (ODS) may cut off early.

↓

Check thermocouple output.

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

Measure the output at High and Low combustion

	Hi Combustion	Lo Combustion
NG	≥ 12 mV	≥ 14 mV
LP	≥ 16 mV	≥ 14 mV

YES ↓

Faulty PCB

NO ↓

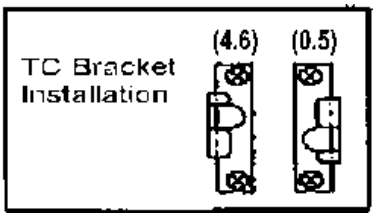
1. Check the regulator pressure, restrictor and injector all conform to the specification.
2. Faulty thermocouple and /or burner.
3. Check specification of thermocouple bracket, TC spacer etc.

Flash back (with large noise) and flame fails. Room Temperature indicates "22" and Combustion indicator flashes

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

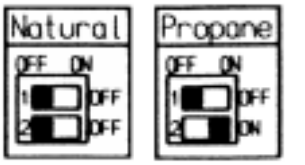
18. Gas Conversion

1. Remove front panel. (See "Removal of Front Panel & Louvre Assy" on page37.)
2. Remove the filter (See " Removal of the Filter" on page38.)
3. Replace small gas label on gas inlet, and large gas label on back of appliance.
4. Place very small gas label on Data Plate.
5. Complete details on conversion sticker, palce sticker inside front panel.
6. Remove Combustion Chamber. (See "Removal of the Combustion Chamber" on page38.) to gain access to burner.
7. Remove thermocouple and spacers (See " Removal of the Thermocouple" on page38.)
8. Remove the electrode (2 screws) (See " Removal of the Spark Electrode" on page39.) and burner blanking plate.
9. Remove the main burner. (See " Removal of the Main Burner " on page39.) and fit overheat switch.
10. Remove the secondary aeration cover
11. Fit restrictor to new burner.
12. Refit the new burner to the combustion chamber
13. Refit thermocouple with spacer (B & A) fold on braclet facing to the right (see diagram below).
14. Refit combustion chamber cover.
15. Remove injector from injector block (See "Removal of the Injector" on page41.)
16. Replace combustion chamber and screw into place.
17. Replace thermocouple and spacers, blanking plate, electrode assembly, overheat switch, gas supply connection, and connection tube clips.
18. Slide combustion chamber back and screw into place.
19. Replace and refit injector and filter.
20. Reconnect gas and electrical supplies.
21. Carry out gas pressure setting procedure on page35.
22. Replace the front panel

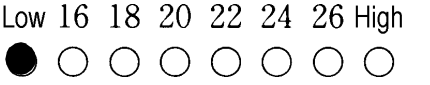


19. Gas Pressure Setting Procedure

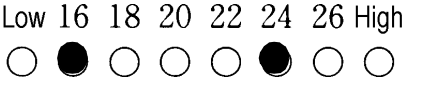
* See “Combustion Specification” on pa ge3.



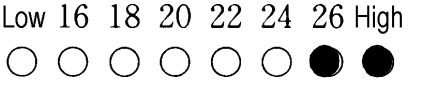
1. Turn appliance OFF.
2. Remove test point screw, and connect pressure gauge.
3. Check dip switches are in the correct position (see figure at right).
4. Press ON/OFF switch and begin operation of heater.
5. Press theTest Switch, situated on the PCB once, to switch to the testing mode.
6. Press the room temperature "" ∨ "" button on the control panel, adjusting so the indicator moves to "LO" (all the indicators illuminate except "LO"). [See figure at right]



7. Adjust low pressure using the regulator screw (See “Combustion Specification” on pag e3.). Lock regulator screw.
8. Press the POV switch once. The indicator will display "16" and "24". [See figure at right]



9. Adjust the high pressure using the “∨” (reduce gas flow) and “∧” (increase gas flow) switches on the control panel. (See “Combustion Specification” on page 3.).
10. Press the POV switch again. The indicators will clear and "26" and "High" is displayed, data is recorded. [See figure at right]



11. Pressing theTest switch once to return the heater to normal operation.
12. Press ON/OFF button to turn the appliance off.
13. Remove gauge, replace screw

20. Dismantling for Services

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

ITEM **PAGE**

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

1. Removal of Front Panel & Louvre Assy

a. Remove two (2) screws securing the louvre, and four (4) screws from the sides.

b. Pull bottom off front panel slightly forward and lift to remove.

2. Removal of Top Control Panel Assembly

a. Remove two (2) screws from the front of the unit.

b. Remove three (3) screws from the back of the unit.

c. Disconnect PCB connectors and pull out the earth from the spark electrode.

3. Removal of Control Panel & Main PCB Assy

CAUTION

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

a. Follow section 1 first.

b. Remove two (2) securing screws to remove PCB cover plate.

c. Remove seven (7) securing screws to release.

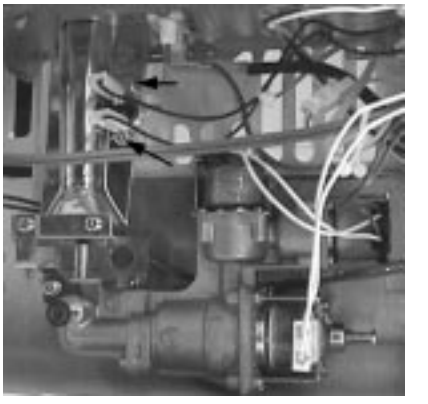
4. Removal of the Over Heat Switch

CAUTION

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

a. Follow section 1.

b. To replace OHS, remove two (2) securing screws.



5. Removal of the Thermocouple

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

a. Follow section 1.

b. Remove one (1) screw securing the cover plate.

c. Remove two (2) screws securing the bracket, and disengage from burner assy.

d. Remove one (1) screw to release the thermocouple from the bracket.

6. Removal of the Gas Control Assembly

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

a. Follow section 1.

b. Disconnect the gas supply hose at the rear of the appliance.

c. Remove two (2) gas control securing screw from the rear of the appliance. .

d. Remove three (3) screws from the front of the gas supply tube to remove.

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

7. Removal of the Filter

a. Pull filter in an upwards direction to remove.
.

8. Removal of the Combustion Chamber

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

a. Follow section 1.

b. Follow section 7 (removal of filter).

c. Remove two (2) securing screws from the rear of the appliance.

d. Remove two (2) securing screws on both sides of the combustion chamber base, and two (2) screws from the combustion bracket.

e. Remove five (5) gas supply tube securing screws.

f. Unclip connectors in harness and manoeuvre combustion chamber out of appliance.

9. Removal of the Spark Electrode

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

a. Follow section 1 first.

b. Follow section 8 (removal of combustion chamber).

c. Remove two (2) screws to remove electrode bracket.

10. Removal of the Main Burner

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

a. Follow section 1.

b. Follow section 5 (removal of thermocouple).

c. Follow section 7 (removal of filter).

d. Follow section 8 (removal of combustion chamber).

e. Follow section 9 (removal of spark electrode).

f. Remove one (1) screw (top) from spark electrode locating bracket.

g. Remove one (1) screw (centre) from the other end of the combustion chamber.

h. Lift top tab to release burner and pull out of combustion chamber in the direction of the gas supply tube.

i. Remove four (4) screws to remove burner cover shield.

11. Removal of Convection Fan Assembly

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

a. Follow section 1 first.

b. Follow section 7 (removal of filter).

c. Follow section 8 (removal of combustion chamber).

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

e. Remove two (2) screws from the back of the appliance.

12. Removal of the Transformer

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

a. Follow section 1.

b. Remove one (1) transformer securing screw and slide transformer forward.

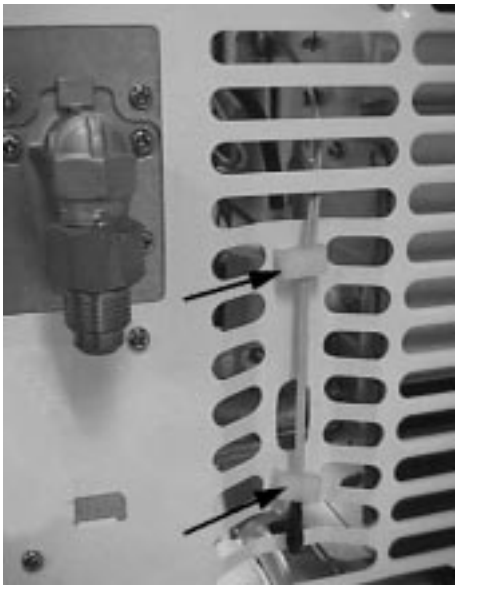
13. Removal of the Thermistor

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

a. Follow section 1.

b. Follow section 7 (removal of filter).

c. Pry open two (2) locating clips with a screwdriver and unplug from PCB.



14.Removal of the Injector

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

a. Follow section 1.

b. Remove three (3) gas supply pipe securing screws..

c. Pull out with pointy-nose pliers.

15.Removal of the Surge Absorber

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

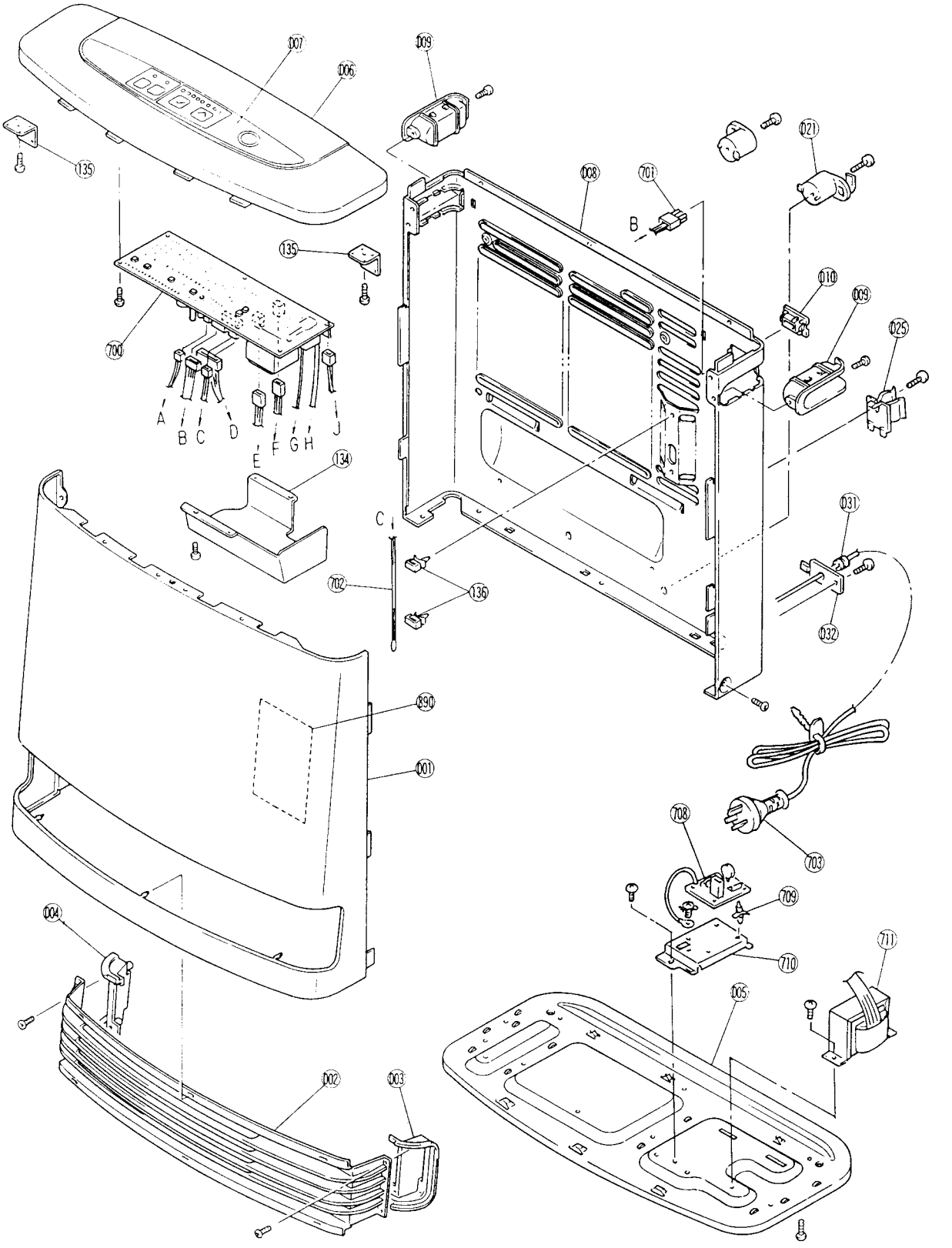
a. Follow section 1.

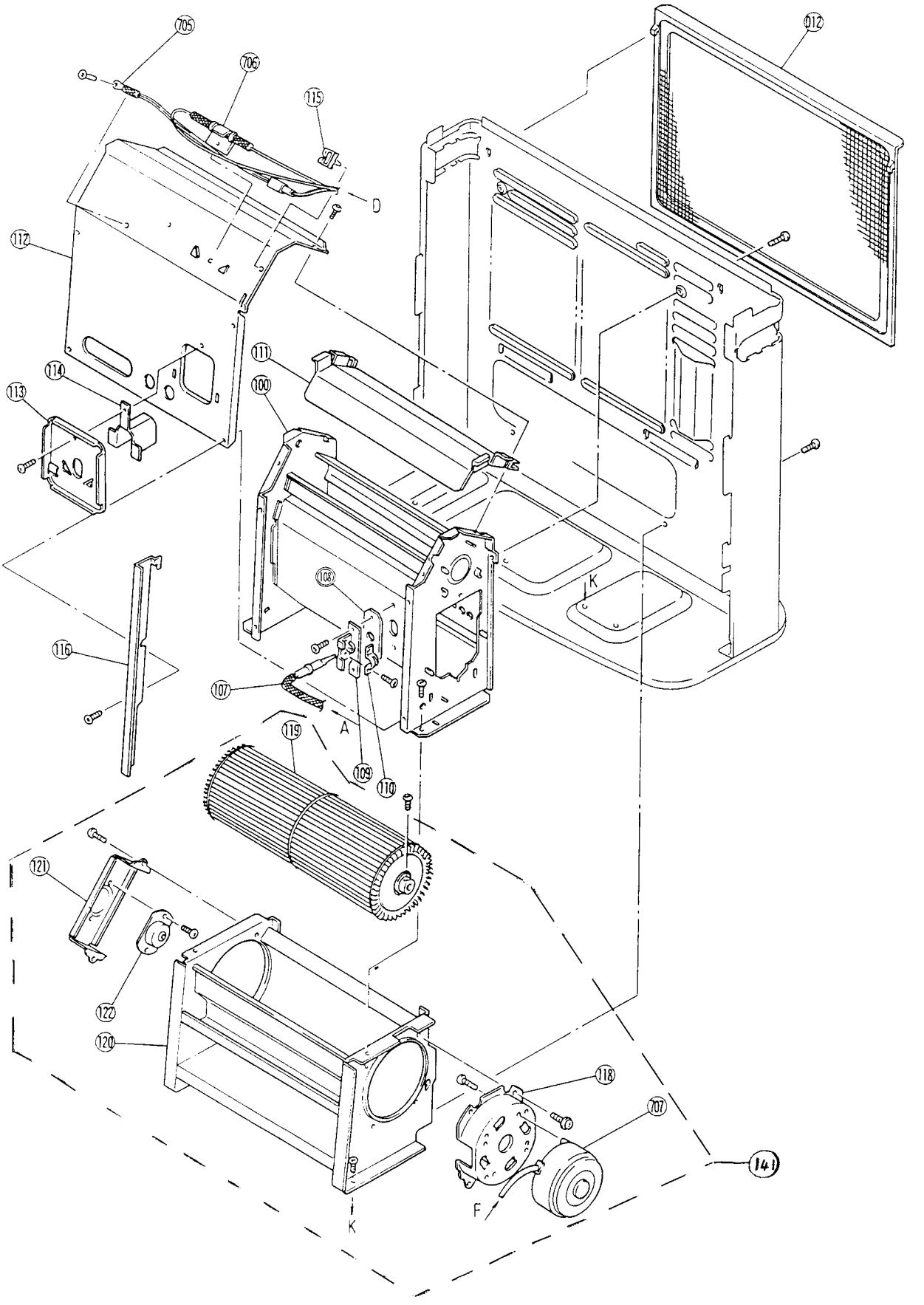
b. Remove one (1) screw (front) and slide forward.

c. Unplug connectors and unscrew earth securing screw (1).

d. Squeeze the ends of four (4) locating clips with pliers to remove surge absorber PCB.

21. Exploded Diagram

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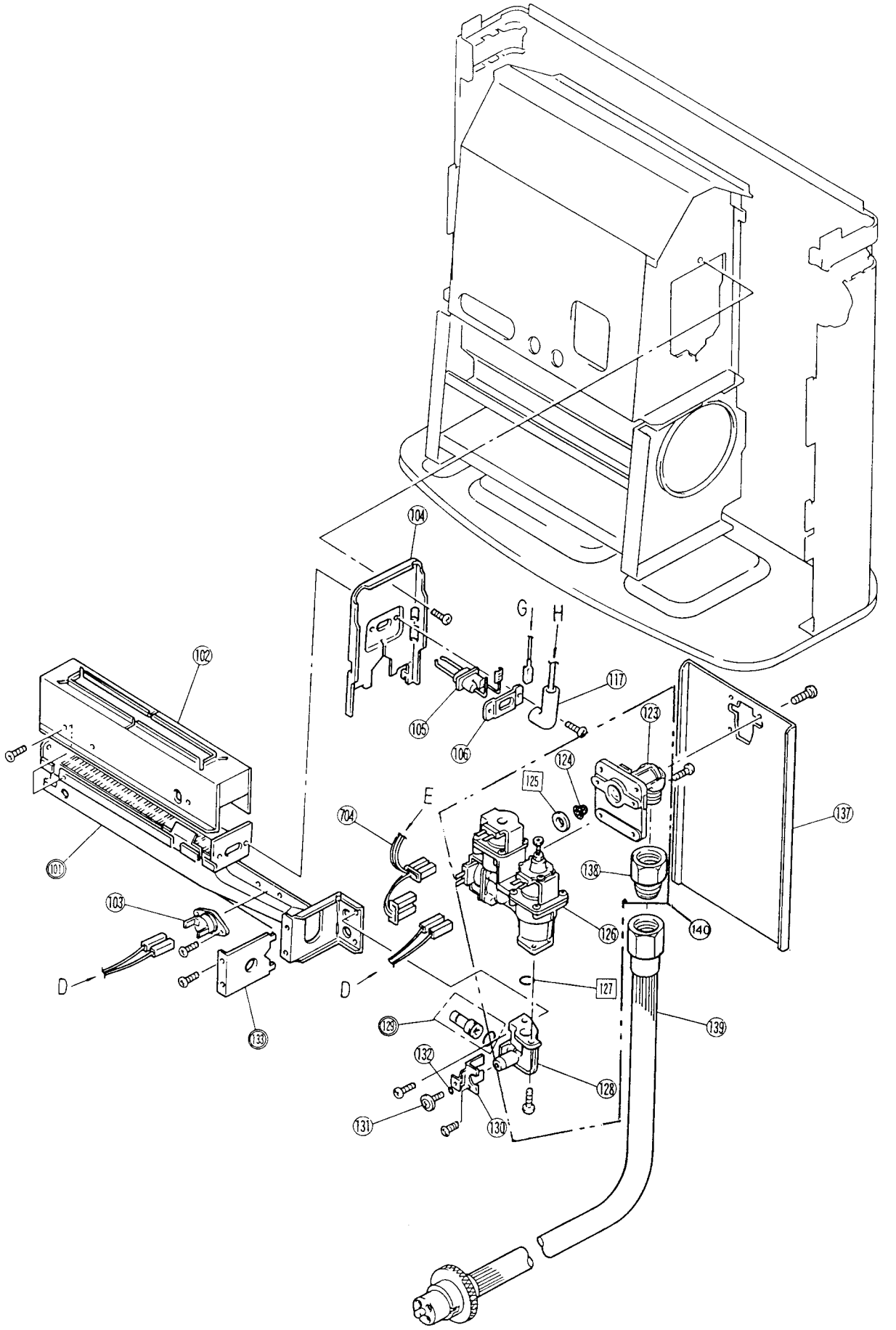
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22. Parts List

No.	Part Name	RA Part No.	RNZ Part No.	Qty
1	Front Panel 1C	90146028	2076	1
2	Louvre Assembly 3		2112	1
3	Louvre Positioning Bracket (Right) C	90146770	2148	1
4	Louvre Positioning Bracket (Left) C	90146788	2173	1
5	Base			1
6	Top Panel	90148446	2199	1
7	Control Panel Label		2240	1
8	Rear Panel B			1
9	Handle D		2247	2
10	Thermocouple Check Holder		2267	1
12	Air Filter	90149725	2415	1
21	Cord Holder		1773	2
25	Hose Holder A		1938	1
31	Cord Bush	90177106	6653	1
32	Electrical Cord Bracket	90177114		1
100	Combustion Chamber Assembly			1
101	Burner Assembly - NG		2250	1
101	Burner Assembly - LPG		2368	1
102	Secondary Air Cover			1
103	Over Heat Switc		2260	1
104	Burner Blanking Plate			1
105	Electrode	90162744	2273	1
106	Electrode Bracket			1
107	Thermocouple Complete Assembly D	90168758	2287	1
108	Spacer A (t1.0)		2412	1
108	Spacer B (t2.0)		2413	1
109	Thermocouple Fixing Bracket			1
110	Thermocouple Clip	90176439	2288	1
111	Divider panel B			1
112	Combustion Chamber Hood E			1
113	Combustion Chamber Cover			1
114	Heat Shield			1

No.	Part Name	RA Part No.	RNZ Part No.	Qty
115	Wire Clip			1
116	Hood Divider Panel			1
117	Electrode Sleeve			1
118	Convection Fan Motor Base			1
119	Convection Fan Drum		2279	1
120	Convection Fan Casing Assembly			1
121	Bearing Housing			1
122	Fan Bearing	90156704	4166	1
123	Gas Connection L Flange	90176652	1865	1
124	Gas Filter		4225	1
125	Packing	90149873		1
126	Modulating Solenoid Assembly	90162546	2238	1
127	Gas Use "O" Ring	90176611	1967	1
128	Injector Holder			1
129	Main Injector A - LPG	90162793	2234	1
129	Main Injector B - NG	90163130	2263	1
130	Injector Fixing Panel			1
131	Test Point Screw		2259	1
132	Test Point "O" Ring		2239	1
133	Restrictor Panel - Propane (Australia)	90169301	2396	1
133	Restrictor Panel - LPG (New Zealand)		1779	1
133	Restrictor Panel - NG (Australia & NZ)	90174772		1
134	Heat Shield			1
135	Top Panel Bracket			2
136	Wire Clip			2
137	Gas Control Fixing Panel			1
138	Gas Inlet Bush			1
139	Bayonet Hose			1
140	Gas Control Complete Assembly - Propane			1
140	Gas Control Complete Assembly - NG			1
141	Convection Fan Complete Assembly	90168709		1
700	Main PCB Unit		2236	1
701	Thermocouple Check Lead		2235	1
702	Thermistor Assembly	90176827	1795	1

No.	Part Name	RA Part No.	RNZ Part No.	Qty
703	Electrical Cord Assembly	90178161	3115	1
704	MV Harness		2218	1
705	High Limit Thermistor Assembly	90176934	1874	1
706	Thermal Fuse Harness		2369	1
707	Convection Fan Motor	90179029	2370	1
708	Surge Absorber	90150426	2299	1
709	Circuit Board Spacer		2366	4
710	Sparker PCB Fixing Bracket			1
711	Transformer (Australia)			1
711	Transformer (New Zealand)		2367	1
890	Wiring Diagram & Pressure Setting Label			1
	Operating & Installat'n Instructions (Aust.)			1
	Operating & Installation Instructions (NZ)			1

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	Sales	Tel: (03) 9271 6666 Fax: (03) 9271 6611
	Emergency Hot Water	Tel: (1800) 632 386
		10-11 Walker Street, Braeside, VIC 3195
		Tel: (03) 9271 6625 Fax: (03) 9271 6622
New South Wales:	**Service**	Tel: (02) 9609 2600 Fax: (02) 9729 0467
	Sales	Tel: (02) 9609 2888 Fax: (02) 9609 5260
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		1/6 Booran Drive, Logan Central, QLD 4114
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