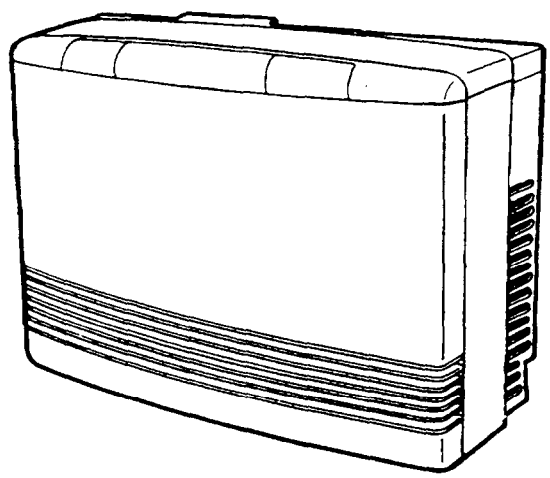
Rinnai

SERVICE MANUAL

RHFE-556 FTR
RHFE-556 FM/FDT
RHFE-431 FT

ENERGYSAVER



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Rinnai Australia Pty Ltd
(Head Office)
10-11 Walker Street
Braeside Victoria 3195

The Australian Gas Association

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

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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 the Rinnai Australia Technical Customer 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.

8/97 SRV556/431

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
OHS	-	over heat switch
PCB	-	printed circuit board
CPU	-	central processing unit
POT	-	potentiometer
rpm	-	revolutions per minute
SV	-	solenoid valve
Ø	-	diameter
Δ°C	-	temperature rise above ambient
POV	-	modulating valve
TH	-	thermistor

§ 1 Introduction

1. Background

The RHFE-556FTR/431FT/556FM incorporate an improved modulating control system to provide comfortable heating. Other features of these appliances are improved safety, operation (including remote control - FTR version only) installation, and maintenance features.

The 556FM version has been specifically introduced for installation in education or similar institutions, where the dual timer features may not be required.

2. Characteristics

i) Built into the main PCB is the software to adapt all versions for connection to a central ON-OFF control.
ii) Gas flow modulates in 8 steps between HI ~ LOW/and OFF, achieving comfortable and efficient heating.
iii) The 556FTR and 431FT versions include a 24 hour digital clock and dual timer, and an economy mode function to reduce gas consumption without affecting comfort.
iv) Temperature control is monitored by fuzzy-neuro technology.
v) The 556FTR incorporates remote control ON-OFF and temperature selection.
vi) All operation and temperature control is with easy-to-use push buttons.
vii) If a problem occurs and service is required, an error coded message appears on the digital or LED display to direct the service technician to the cause of the problem.
viii) Information about any previous faults is stored in the PCB and can be recalled during servicing.

3. About the 556FTR/431FT/556FM

The bodywork is formed from 0.6 mm galvanised steel sheet, which forms a box to which the components, heat exchangers and blowers are attached. The whole assembly is covered by an outer case which is constructed from 0.6 mm galvanised steel sheet, and plastic mouldings.

The combustion chamber is constructed from 1.0 mm hot dip aluminium coated steel sheet, located in the lower centre of the appliance.

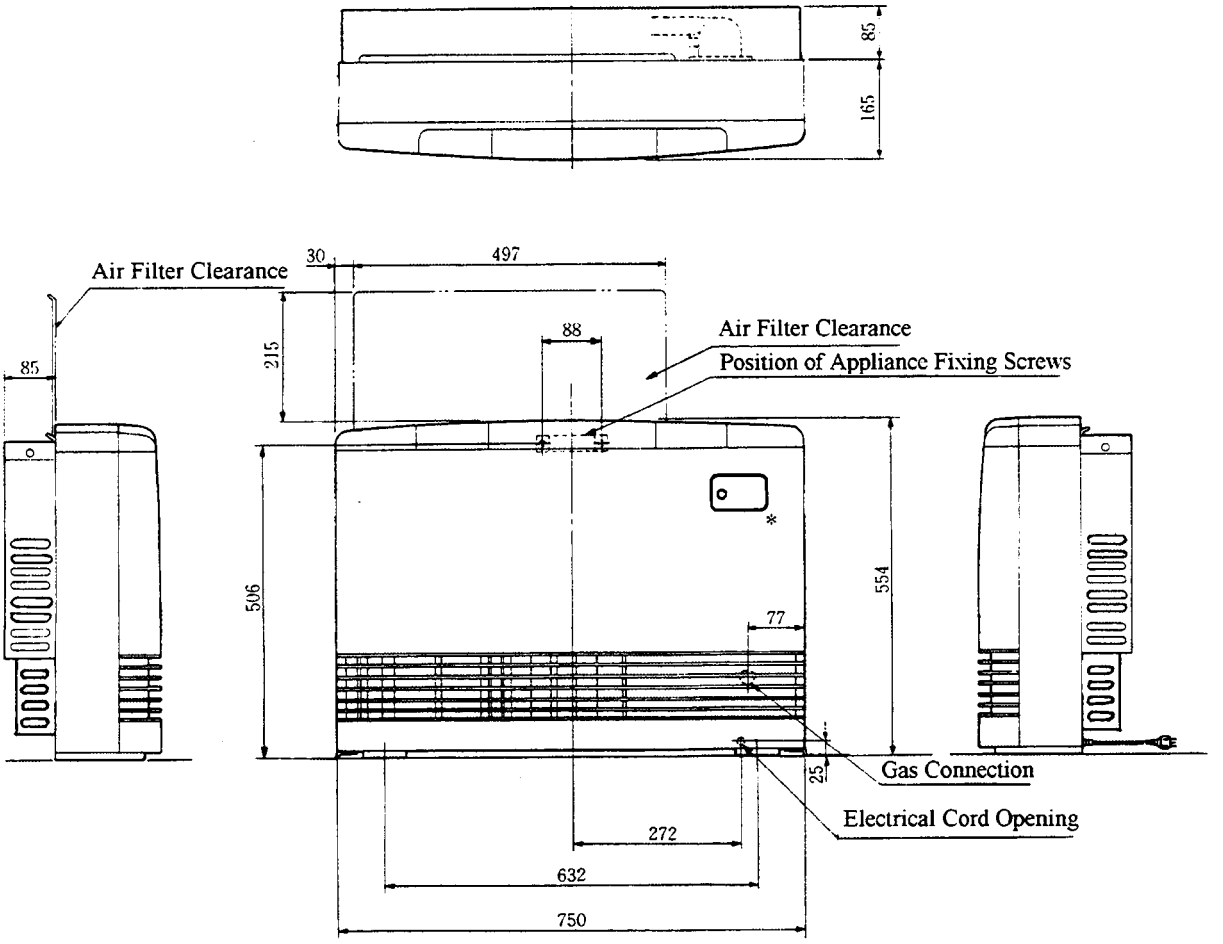
The heat exchanger is composed of two sub-heat exchanger sets. The left hand set, Nº.1 is constructed of 1.0 mm aluminised steel. The right hand set, Nº.2 is constructed of 0.8 mm stainless steel. The inlet of sub-heat exchanger Nº.1 is connected to the outlet of the combustion chamber, the outlet is connected to sub-heat exchanger Nº.2. Sub-heat exchanger Nº.2 consists of 5 "sub" sections. Constructed from 0.8 mm stainless steel. The outlet of sub-heat exchanger Nº.2 is constructed from 0.5 mm stainless steel and connected to the flue by a concertina stainless steel tube.

The combustion air fan draws combustion air from the outside atmosphere through the flue manifold pipe. Air is then blown into the combustion chamber via a rubber tube. Combustion products in the combustion chamber are pushed out into sub-heat exchanger Nº.1, to sub-heat exchanger Nº.2, and then into the 34 mm flue pipe which is connected through the flue manifold to the outside atmosphere.

The flue system is connected with stainless steel concentric pipe. The inner pipe (34 mm diameter.) is the combustion gas outlet, and is connected to the outlet of sub-heat exchanger Nº.2. The outer pipe (70 mm diameter) is the combustion air inlet and is connected to the inlet of the combustion fan air pipe. Various flue lengths are available.

Ignition is continuous spark in conjunction with an electrically operated solenoid and control is monitored by the PCB. Gas passes through the 15 mm BSP inlet fitting, then via a flange connection to the solenoid valves Nº.1, Nº.2, a regulator modulating valve, aluminium injector manifold, before entering the burner.

Note: All dimensions are in mm.



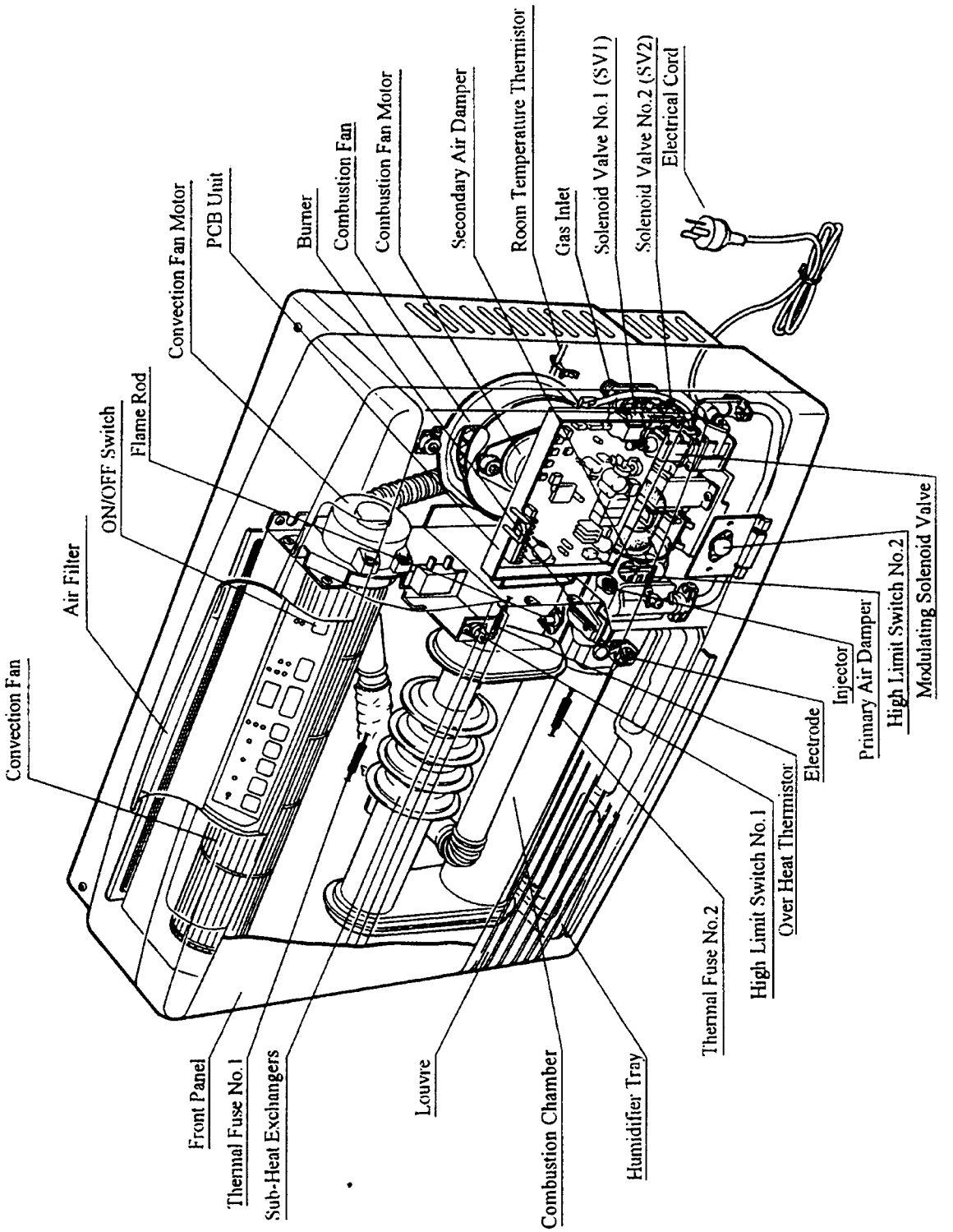
*** FM version only**

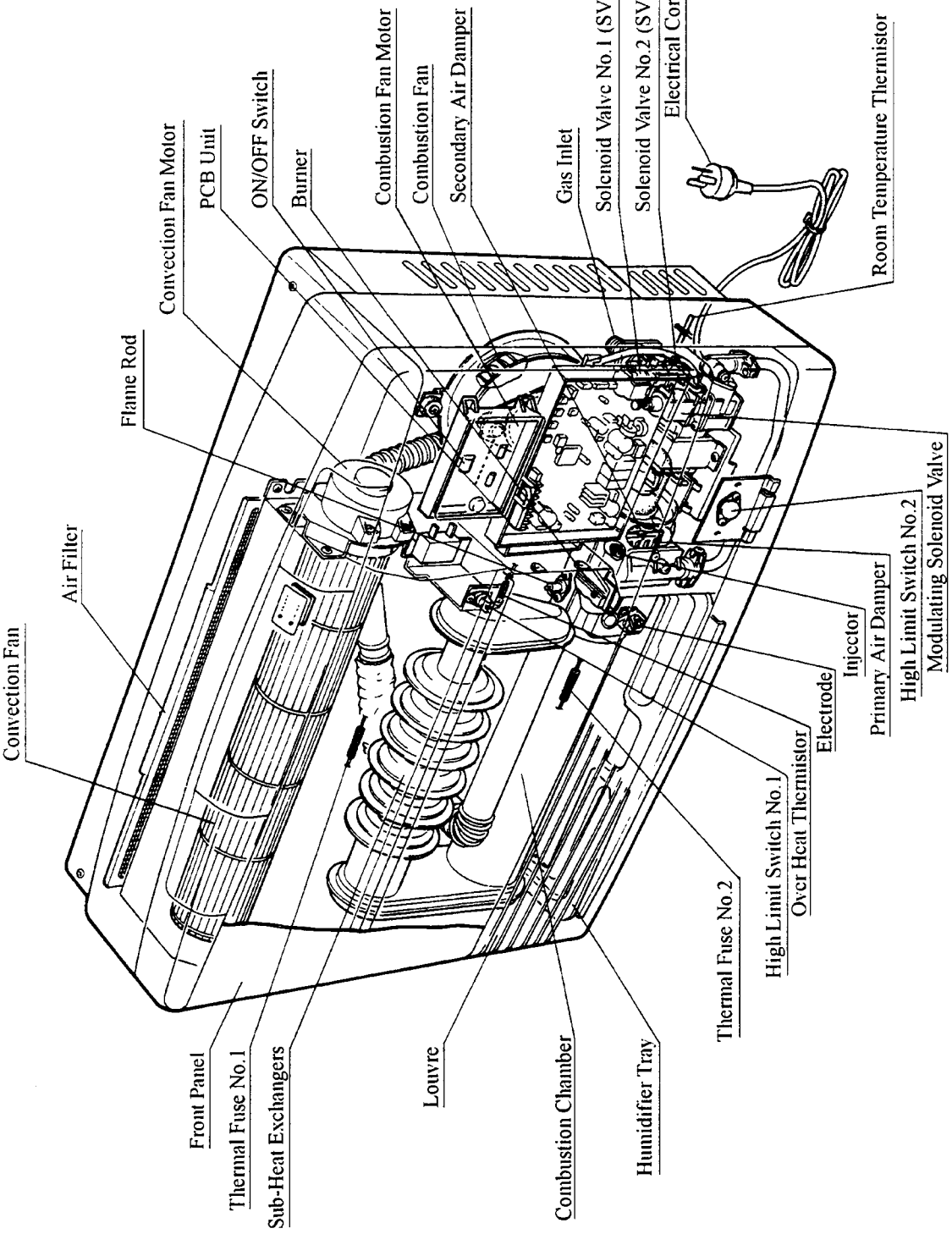
3. SPECIFICATIONS:

Model:	**RHFE-556FTR / 556FM**	**RHFE-431FT**
Type of Appliance:	Fan Forced Flued Gas Space Heater	
Dimensions:	Width: 750 mm Depth: 165 mm (with back spacer 250 mm) Height: 554 mm	
Weight:	22	
Connections:	Electrical AC 230/240V 50 Hz Gas R ½ BSP Male Thread	
Gas Consumption (kW): (Max. / Min).	23 / 9	18 / 8
Output (MJ/h) (Max. / Min).	5.4 / 2.1	4.0 / 1.8
Combustion system:	Stainless Steel Bunsen Burner	
Ignition system:	Continuous spark	
Operation:	Finger touch control buttons (non-lock)	
Temperature control:	Electronic thermostat modulating HI-LOW/OFF	
Temperature range:	LOW (10°C) – 16 ~ 26°C - HI	
Warm air outlet	Bottom of appliance	
Air volume control:	Hi – LOW (proportional)/OFF	
Timer operation: **(556FTR / 431FT only)**	Timer – 24 hour, 2-way programmable, intelligent Operation – 24 hour Clock – 24 hour digital display Temperature Control - 26°C limit when using timer program	
Indicators:	Burner ON, child lock, filter, economy, digital display, over-ride, Clock setting, timer setting, timer, temperature display	
Operating buttons:	ON-OFF, up-down, child lock, economy, timer, clock setting, over-ride, timer set	
Remote control: **(556FTR only)**	ON-OFF, temperature adjustment	
Economy mode:	Energy saving feature	
Child lock:	Locks all controls except OFF	
Humidifier Tray:	Capacity – 1300 cc	
Safety devices:	Flame failure – Flame rod Overheat – Bi-metal switch, thermal fuse, thermistor Power failure – PCB Power surge – 3 Amp fuse Fan delay – Micro computer timer	
Noise level range:	HI – LOW = 41 ~ 33 dB(A)	HI – LOW = 38 ~ 31 dB(A)

Cut - Away Diagram

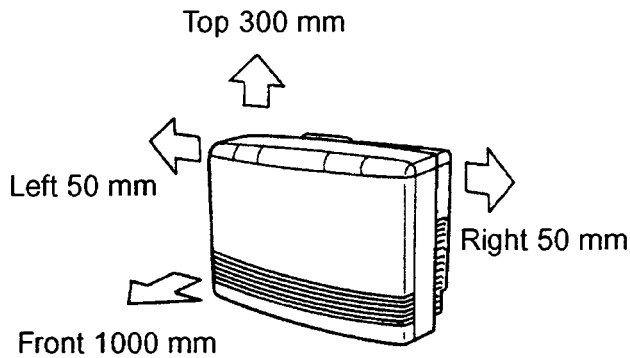
RHFE-556 FTR
RHFE-431 FT

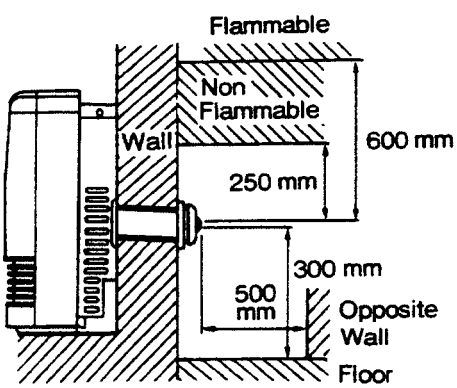


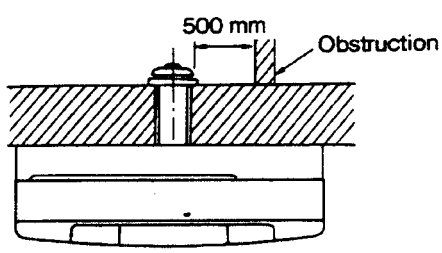

Convection Fan
Air Filter
Front Panel
Thermal Fuse No.1
Sub-Heat Exchangers
Flame Rod
Convection Fan Motor
PCB Unit
ON/OFF Switch
Burner
Louvre
Combustion Chamber
Humidifier Tray
Thermal Fuse No.2
High Limit Switch No.1
Over Heat Thermistor
Electrode
Injector
Primary Air Damper
High Limit Switch No.2
Modulating Solenoid Valve
Combustion Fan Motor
Combustion Fan
Secondary Air Damper
Gas Inlet
Solenoid Valve No.1 (SV1)
Solenoid Valve No.2 (SV2)
Electrical Cord
Room Temperature Thermistor

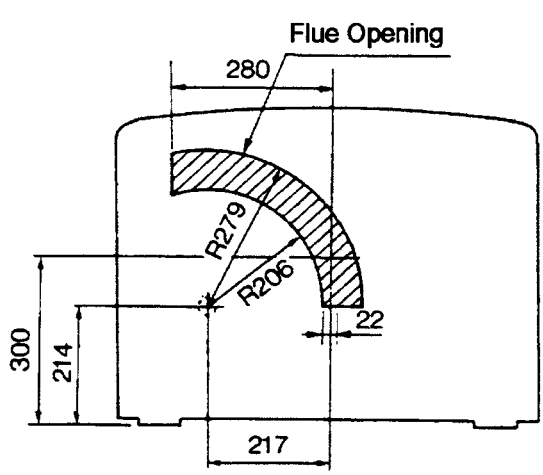
NOTE

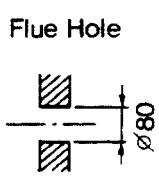
The information provided here is only a guide. For full details on installation procedures you are advised to contact Rinnai directly, or consult the Customers Operating and Installation booklet.







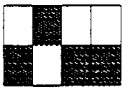




1. Basic combustion specification

Item		Specification			
Rinnai model number		RHFE-556FTR/556FM		RHFE-431FT	
Gas type		NG	Propane	NG	Propane
Gas consumption MJ/h	HI	23	23	18	18
	LO	9	9	8	8
Injector size (ø mm)		1.30	0.85	1.10	0.70
Injector quantity		4	4	4	4
Secondary damper (ø mm) and quantity		33x47 (1)	2.5 (15)	33x47 (1)	2.5 (15)
Regulator pressure (kPa)	HI	0.51	1.06	0.65	1.10
	LO	0.09	0.18	0.15	0.32
Burner marking		P	P	P	P
Combustion method		Bunsen burner			
Burner type		Stainless slit style			
Solenoid valve		Direct single seated valve type			
Modulating solenoid valve		Rinnai electronic control			

556/431 PCB Dip Switch positions

Gas	Model		1 2 3 4	
N.G.	556	2, ON		ON OFF
	431	2,3,4, ON		ON OFF
Propane	556	1, ON		ON OFF
	431	1,3,4, ON		ON OFF

2 Combustion fan speeds

	RHFE-556FTR/556FM		RHFE-431FT	
	Propane	Natural	Propane	Natural
Ignition	1500	1530	1260	1320
Re-ignition	1980	1830	1530	1560
Normal - High	3180	3180	2430	2430
Normal - Low	1290	1290	1140	1170

3.1 Warm air discharge temperature distribution

RHFE-556FTR/556FM

Condition: < High Combuston >

Test gas: Natural
Measured input: 22.8 MJ/h
Nominal input: 23 MJ/h
Room temperature: 22 °C

(Unit △ °C)

67	67	18	18	33	7
59	61	18	27	34	20
81	37	39	42	40	69
65	78	69	73	65	83
37	95	74	95	88	83
44	86	98	98	92	81

Condition: < Low Combustion >

Test gas: Natural
Measured input: 8.9 MJ/h
Nominal input: 9 MJ/h
Room temperature: 22 °C

(Unit △ °C)

33	38	10	11	17	8
27	34	12	16	19	17
36	20	33	26	23	42
28	53	41	41	43	57
17	60	48	56	55	60
22	45	61	56	57	50

3.2 Warm air discharge temperature distribution

RHFE-431FT

Condition: < High Combuston >

Test gas: Natural
Measured input: 17.5 MJ/h
Nominal input: 18 MJ/h
Room temperature: 22 °C

(Unit △ °C)

34	53	13	13	33	18
47	66	31	22	38	24
74	53	39	25	35	42
46	72	63	48	55	47
47	75	65	61	92	68
66	76	72	66	88	77

Condition: < Low Combustion >

Test gas: Natural
Measured input: 7.8 MJ/h
Nominal 8 MJ/h
Room temperature: 22 °C

(Unit △ °C)

24	31	8	6	9	9
30	38	21	14	19	15
49	32	32	20	20	23
25	43	40	30	36	30
29	46	43	38	54	41
29	44	45	39	53	48

4.1 Warm air discharge velocity

RHFE-556FTR/556FM

< High Operation >

(Unit: m/sec)

1.71	2.49	3.31	2.73	2.83	0.59
3.04	1.92	0.99	0.80	0.97	1.76
3.43	2.50	2.30	2.94	1.47	2.58
3.50	3.06	2.94	3.42	2.06	3.21
3.56	3.40	3.16	3.15	2.86	2.74
3.51	3.42	3.06	3.32	3.42	2.81

< Low Operation >

(Unit: m/sec)

1.14	1.68	2.38	2.05	1.79	0.49
1.98	1.32	0.83	0.66	0.70	1.18
2.36	1.82	1.50	2.07	1.14	1.86
2.33	2.22	1.88	2.27	1.39	2.26
2.25	2.37	2.12	2.40	2.05	2.02
2.30	2.20	2.27	2.23	2.51	1.96

Conditions:

- Convection fan revolutions High: 1080 rpm
  Low: 770 rpm
- Measured with burner off
- Average air velocity on High: 2.65 m/sec
- Average air velocity on Low: 1.83 m/sec
- Area of louvre: 0.0285 m^2
- Air flow rate on High: 4.53 m^3/min
- Air flow rate on Low: 3.13 m^3/min

4.2 Warm air discharge velocity

RHFE-431FT

< High Operation >

(Unit: m/sec)

0.55	2.16	2.92	1.40	2.04	0.48
2.87	2.09	1.71	0.71	1.22	1.82
2.78	2.39	2.01	1.51	1.42	2.78
2.85	2.98	2.51	2.41	2.46	3.12
2.87	3.20	2.94	3.04	2.58	3.10
2.88	2.78	3.35	3.04	2.83	2.41

< Low Operation >

(Unit: m/sec)

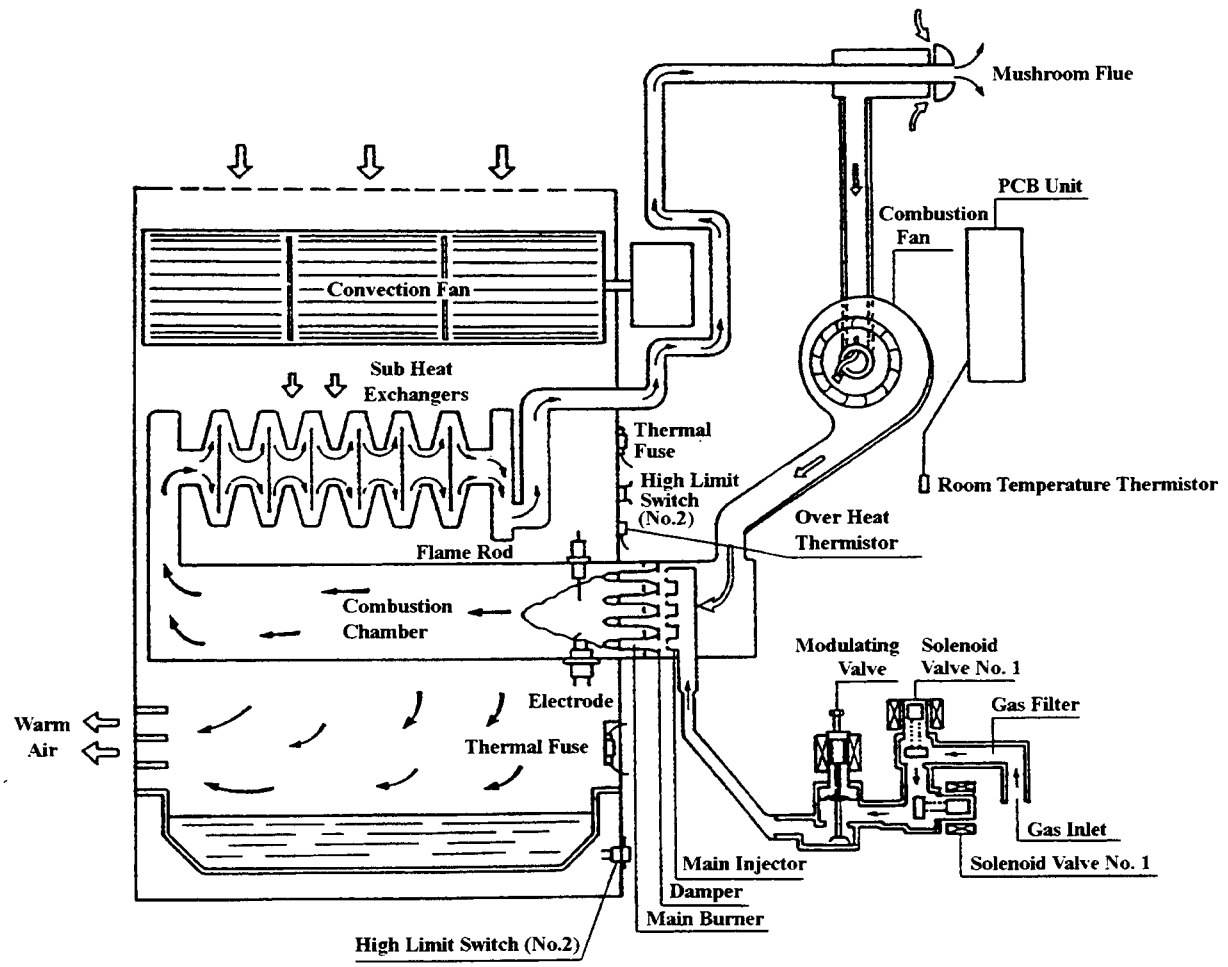
0.44	1.34	2.33	1.25	1.55	0.43
2.34	1.32	1.14	0.54	0.99	1.27
2.15	1.77	1.52	1.3	1.01	2.00
2.15	2.23	1.91	1.95	1.85	2.19
2.14	2.51	2.25	2.33	2.15	2.41
2.36	2.11	2.56	2.38	2.17	1.71

Conditions:
- Convection fan revolution. High: 890 rpm Low: 680 rpm
- Measured with burner off
- Average air velocity on High: 2.34 m/sec
- Average air velocity on Low: 1.78 m/sec
- Area of louvre: 0.0285 m^2
- Air flow rate on High: 4.00 m^3/min
- Air flow rate on Low: 3.04 m^3/min

5. Noise Level

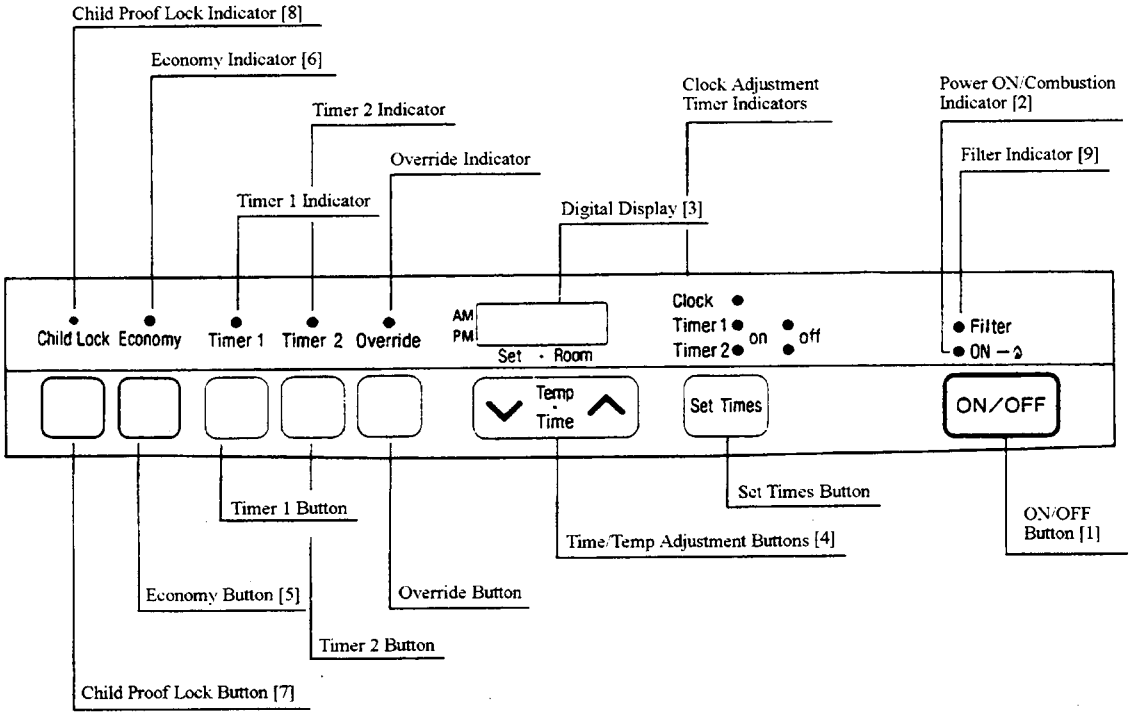
- Measurment taken during normal combustion.
- Unit: dB(A).

	556FTR/556FM	431FT
High	41	38
Low	33	31

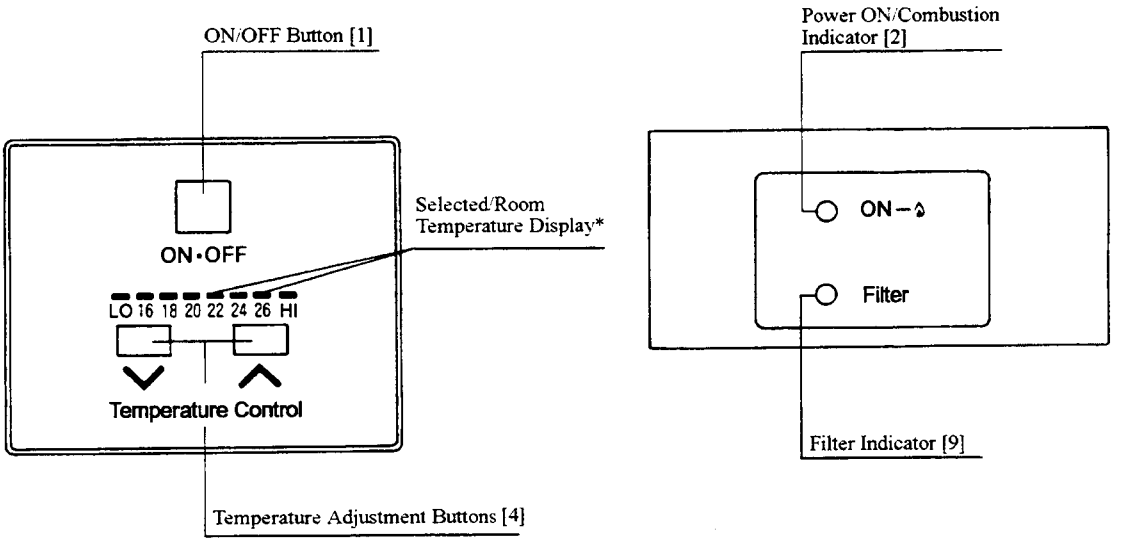

Mushroom Flue
PCB Unit
Combustion Fan
Convection Fan
Sub Heat Exchangers
Thermal Fuse
High Limit Switch (No.2)
Room Temperature Thermistor
Over Heat Thermistor
Flame Rod
Combustion Chamber
Modulating Valve
Solenoid Valve No. 1
Gas Filter
Warm Air
Electrode
Thermal Fuse
Gas Inlet
Main Injector
Solenoid Valve No. 1
Damper
Main Burner
High Limit Switch (No.2)

✻ Refer to Appendix 1 at rear of manual for explanation on setting clock, timers, and operating timers for 556FTR/431FT.

RHFE-556FTR
RHFE-431FT



RHFE-556FM



* **Flashing LED is room temperature.**
Steady LED is selected temperature.

✳ **Numbers in brackets refer to location of functions on control panel, page 13.**

1. Normal Operation

Push the ON/OFF button [1] to operate the appliance. The power ON/combustion indicator [2] will glow green. The combustion fan will run on high until pre-purge is completed.

Pre-purge is completed after approximately 15 seconds, following which, the combustion fan will decrease revolutions to enable ignition to occur. After the combustion fan reaches a pre-determined speed, (depending on gas type) the electrode produces the spark to begin the ignition cycle.

After the spark is sensed as having crossed the spark gap by the PCB, the solenoids (SV_1 & SV_2) as well as the modulating valve will open and allow gas to flow to the burner.

The flame rod senses the flame on the main burner. After the flame is sensed, the power ON/combustion indicator [2] changes to red and the spark stops. After an additional 15 seconds the convection fan begins to operate.

The room temperature is sensed by the temperature thermistor located at the rear of the appliance. The printed circuit board controls the air/gas ratio to the optimum level according to the selected temperature. The combustion fan is adjusted in conjunction with the opening degree of the modulating valve. The convection fan is adjusted in the same manner.

2. Thermostat Control

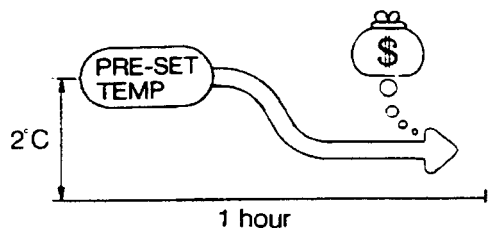
The selected and room temperatures are displayed on the digital or LED display [3]. Time and temperature are displayed alternately depending whether the heater is running or not (556FTR/431FT only). The selected temperature is altered by pressing the time/temperature adjustment buttons [4].

3. Turning Off

Simply press the ON/OFF button [1]. The solenoids, together with the modulating valve will close. The combustion fan will also stop, and all indicators will go out. After the burner extinguishes, the convection fan will continue to run for up to 210 seconds, ensuring the appliance is cool.

4. Economy Mode (556FTR/431FT only)

To engage the economy function press the economy button [5] while the heater is operational. The economy indicator [6] will glow. The economy function is designed to drop the selected temperature by a total of 2°C over a period of one hour, once the selected temperature has been reached. After 30 minutes the temperature will be reduced by 1°C. After a further 30 minutes the temperature will be reduced by another 1°C.



This does not result in a loss to the heating effectiveness, rather it is an energy saving feature.

You may press the economy button [5] at any time again, to cancel the economy function.

5. Child Proof Lock (556FTR/431FT only)

To activate the child proof lock press the child lock button [7]. The child proof lock indicator [8] will glow.

If the child proof lock is activated during normal operation, then no functions other than the ON/OFF switch will be operable until the lock is released.

If the child proof lock is activated whilst the appliance is OFF, then the complete range of functions will be locked.

6. Filter Indicator

When the air filter becomes covered in dust and the temperature inside the appliance rises, the filter indicator [9] will glow.

7. Fuzzy Logic

The main aim of this function is to heat a room counfortably, without cold draughts from the appliance, by controlling the flow of air coming from the heater as the heat exchanger temperature rises. This also increases heating efficiency.

In order to achieve comfortable heating, it is preferable to avoid cold draughts from the appliance. Also for increased efficiency it is important to reduce overheating the room and concentrate heating the area where people are most often situated.

Fuzzy logic has been adopted in order to achieve the above improved heating pattern.

The information which becomes the basis for "fuzzy" control is 'room temperature' and 'the time elapsed since the start of combustion'. The means of control is the speed of the convection fan.

In the case of a conventional fan heater, the convection fan operates normally from the time of ignition and a cold draught may accompany the flow of air from the appliance. To tone down this unsuitable or uncomfortable situation, fuzzy logic controls the speed of the convection fan after taking into consideration the room temperature at the time of ignition. For example: in the case of the room temperature being low, then the fan is made to rotate at a low speed. As the room temperature rises, the speed of the convection fan is gradually increased. In this way it is possible to ensure a comfortable volume of warmed air whilst decreasing the possibility of cold draughts immediately after ignition.

The fan speed increases proportionally as time passes, and the room gradually heats up. This improves the warm air distribution, assisting in a reduction of stratification throughout the room and resulting in more effective heating conditions. The PCB continually monitors the room temperature and adjusts the fan speed depending on the conditions at the time.

8. Clock and Timer Setting and Operation (556FTR/431FT only)

Refer to ***appendix 1*** at back of this manual.

Flame rod sensor

Senses main burner ignition and shuts off the solenoid valves when the flame current drops below 0.1 μA.
* Ignition sensing current: under 0.8 μA.
* Extinction sensing current: above 0.1 μA.

Spark sensing circuit

Senses the location of spark and opens the solenoid valves only when the spark location is confirmed as correct.

Pre-purge circuit

Purges heat exchanger and flue prior to spark commencing.

Combustion fan rpm sensing circuit

Senses the operation of the combustion fan and maintains a pre-determined rotation speed.

Overheat protection switches

Shut off the solenoid valves and cut off gas supply in the case of over heating.

i) Bimetal OHS1
Operates at 130 ± 5°C
Recovery at 115 ± 7°C

ii) Bimetal OHS2
Operates at 90 ± 5°C
Recovery at 75 ± 7°C

iii) Thermal Fuses

Cut out at	152 ± 2°C
	152 ± 2°C
	130 ± 2°C
	(one shot)

iv) Thermistor
Operates at different temperatures depending on gas input, see page 17.

Fan delay

The convection fan starts after a short delay to avoid cold draughts, and keeps running after burner extinction to allow the unit to cool down.

ON AT	15 sec
OFF AT	210 sec

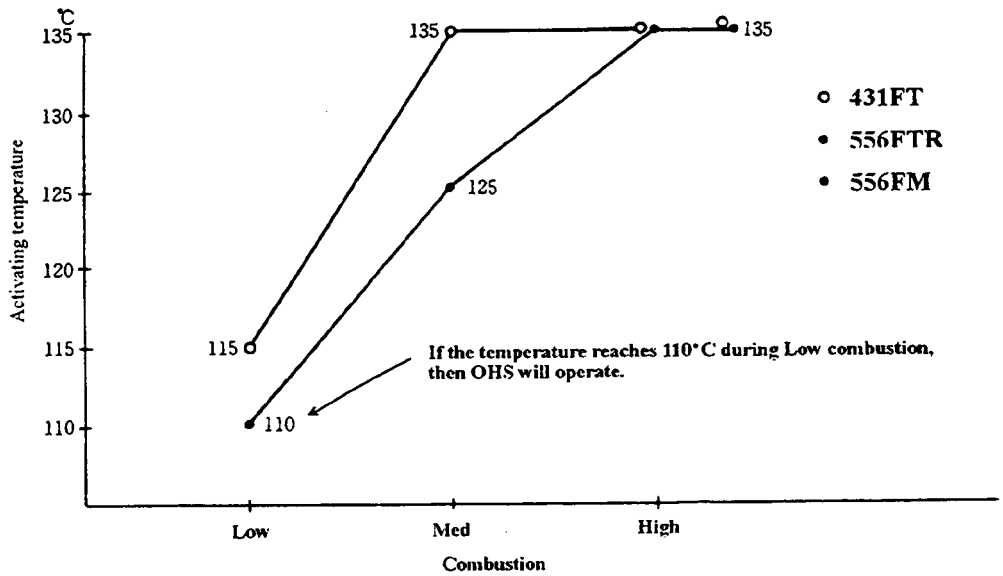
Power failure circuit

Shuts off the solenoid valves if a power power failure occurs. The unit will relight after the power is restored, and the clock time will be slow by the amount of time the power was off.

1. Overheat Control Method

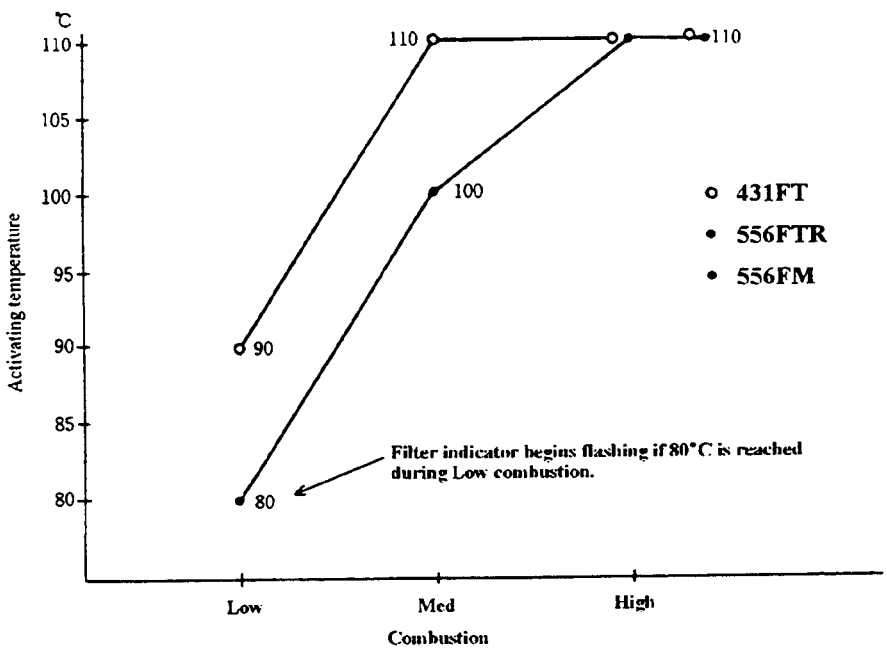
The overheat thermistor activates the overheat sensor and the filter indicator, as well as increasing the fan rpm.

(A) Overheat Sensor



* The overheat thermistor activates at different temperatures for different gas rates.

(B) Filter Indicator

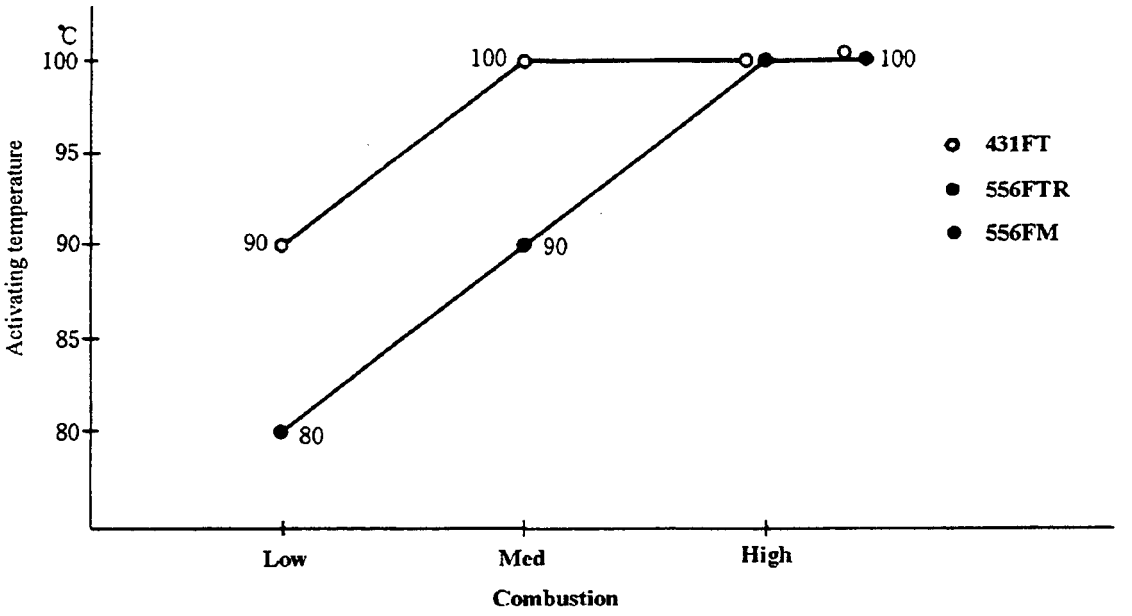


Note 1: Once the overheat limit temperature has been sensed and the filter indicator begins flashing, it will not go out, even if the temperature falls below the limit.

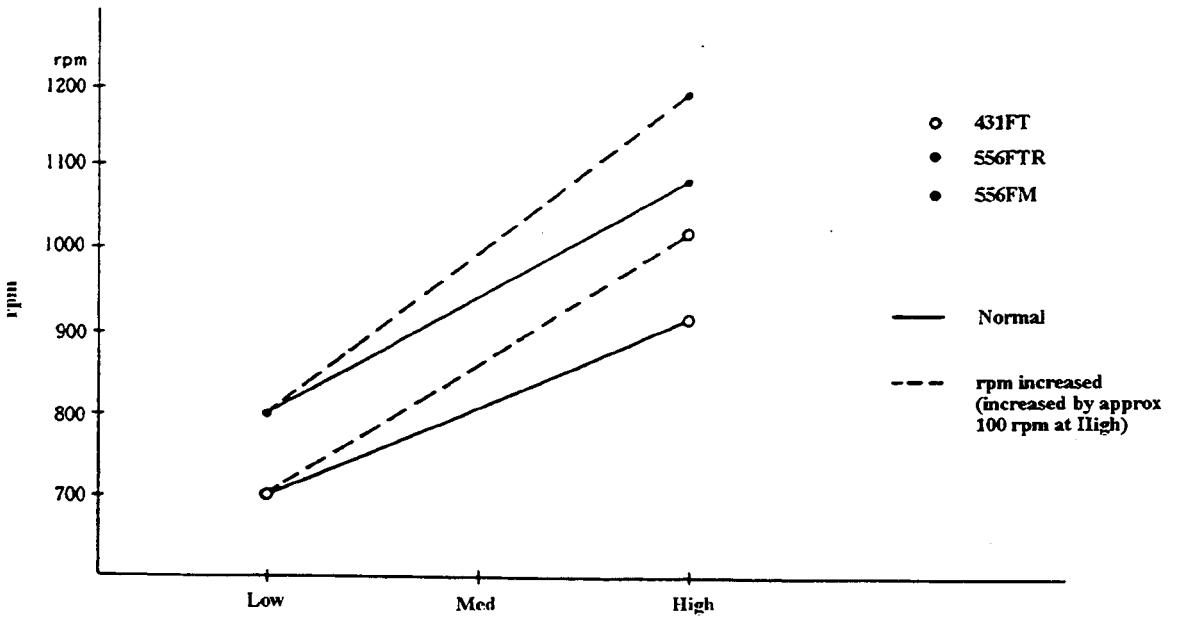
Note 2: Once the filter indicator begins flashing, gas input is limited to roughly 90% of high combustion.

(C) Convection Fan RPM Increase

The fan rpm increase to compensate for a reduction in air flow due to a clogged air filter or other causes. The convection fan rpm is normally determined by combustion level. The speed changes by aproximately 10 rp/sec while increasing, or decreasing.



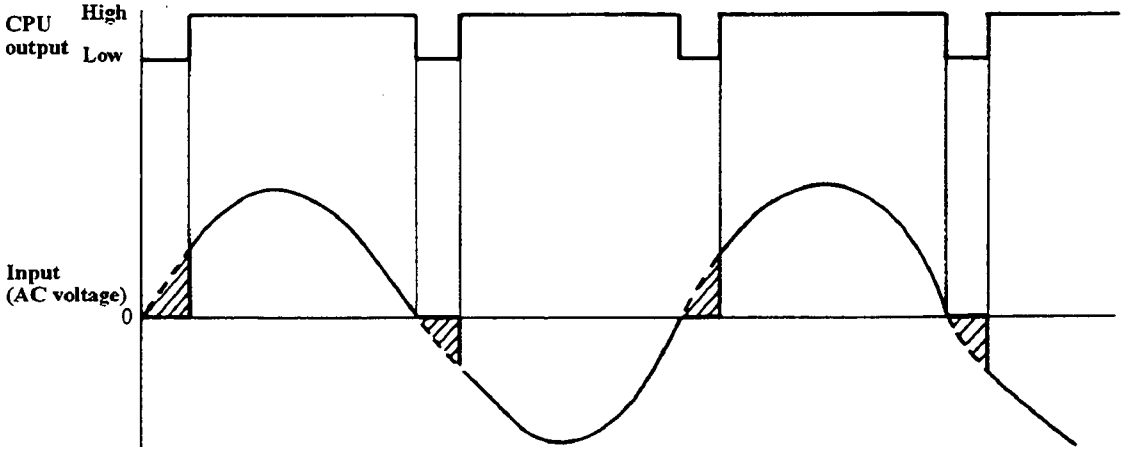
Once the temperature reaches the activating level and the convection fan speed increases, the fan speed remains at this increased level, even when the temperature at the thermistor falls lower than the activating temperature, during operation.



The solid line on the graph shows the fan speed during normal operation with a clean air filter. The fan speed with the air filter blocked (thermistor activated) is shown by the dotted line.

2. Convection Fan Control

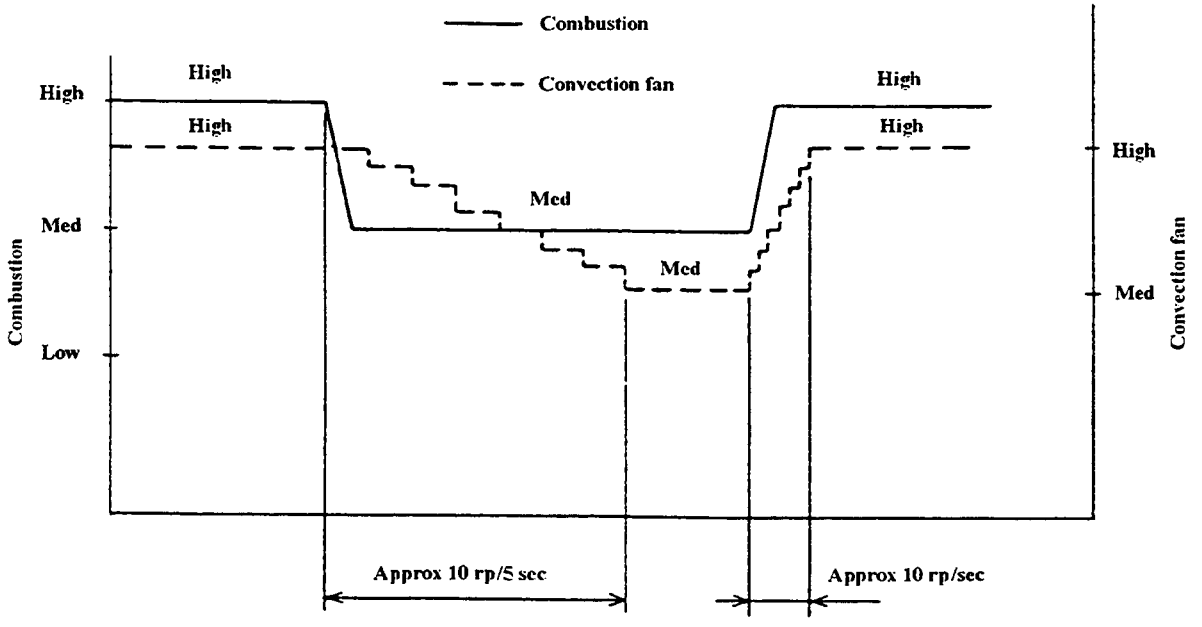
The phase control method regulates speed by turning off the fan activation signal for a specified interval after sensing that the AC wave form has crossed the zero point on the axis, and then applying input from which a portion of the output power wave form has been cut. Speed is controlled in proportion to the cut section.



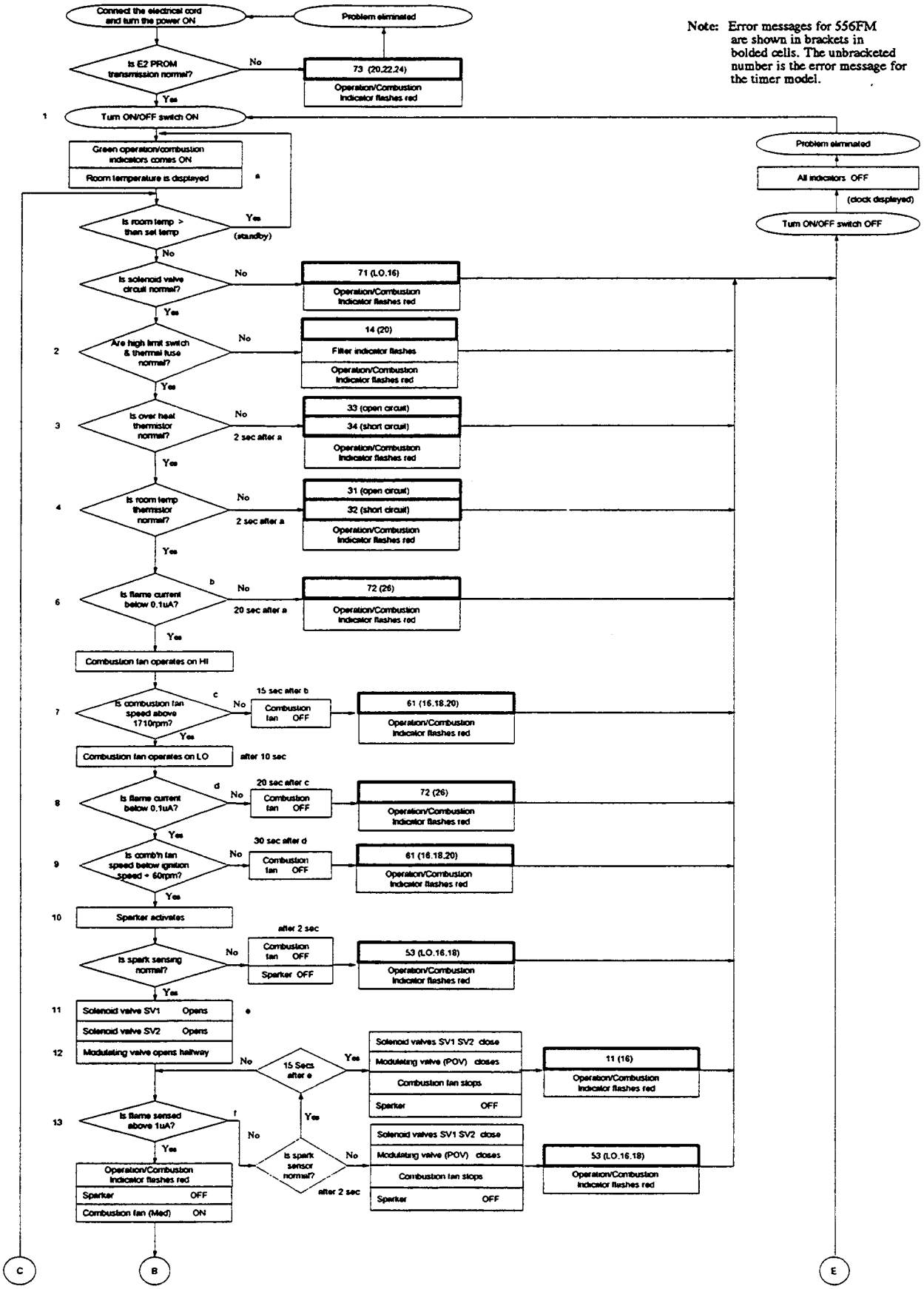
The shaded regions in the wave form are cut, and altering the size of these cut areas alters the fan input voltage, which controls the speed.

3. Fan Delay

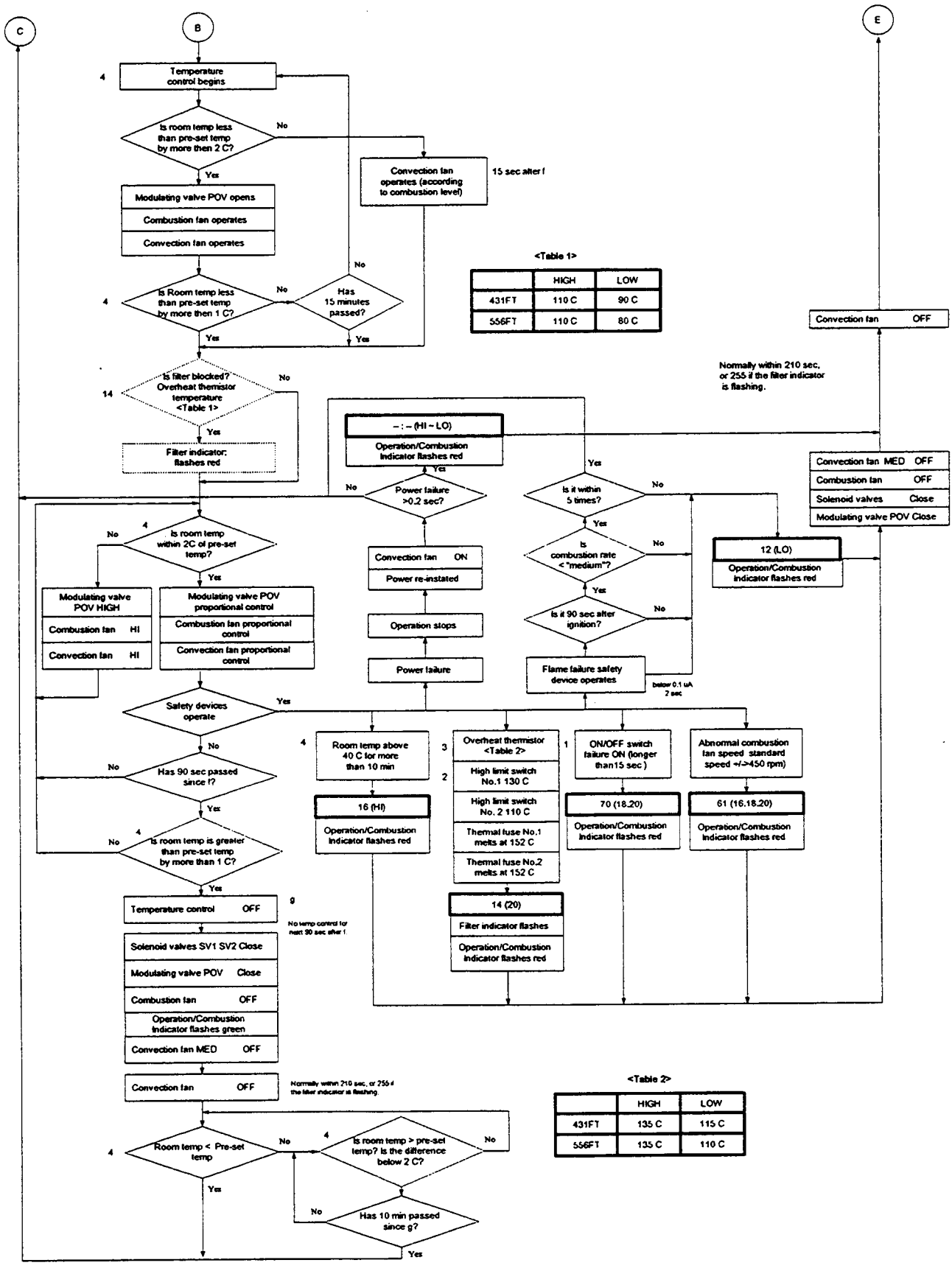
The fan delay keeps the convection fan running for a specified time after combustion has ceased in order to efficiently use the residual heat within the unit, while at the same time cooling the unit down.



Operation Flow Chart



Note: Error messages for 556FM are shown in brackets in bolded cells. The unbracketed number is the error message for the timer model.


C
B
E
Temperature control begins
Is room temp less than pre-set temp by more then 2 C?
No
Yes
Convection fan operates (according to combustion level)
15 sec after f
Modulating valve POV opens
Combustion fan operates
Convection fan operates
Is Room temp less than pre-set temp by more then 1 C?
Has 15 minutes passed?
<Table 1>
HIGH
LOW
431FT
110 C
90 C
556FT
110 C
80 C
Convection fan OFF
Normally within 210 sec, or 255 if the filter indicator is flashing.
Is filter blocked? Overheat thermistor temperature <Table 1>
Filter indicator: flashes red
– : – (HI – LO)
Operation/Combustion Indicator flashes red
Power failure >0.2 sec?
Is it within 5 times?
Convection fan MED OFF
Combustion fan OFF
Solenoid valves Close
Modulating valve POV Close
Is room temp within 2C of pre-set temp?
Convection fan ON
Power re-instated
Operation stops
Power failure
Is combustion rate < "medium"?
Is it 90 sec after ignition?
Flame failure safety device operates
below 0.1 uA 2 sec
12 (LO)
Operation/Combustion Indicator flashes red
Modulating valve POV HIGH
Combustion fan HI
Convection fan HI
Modulating valve POV proportional control
Combustion fan proportional control
Convection fan proportional control
Safety devices operate
Has 90 sec passed since f?
Is room temp is greater than pre-set temp by more than 1 C?
Room temp above 40 C for more than 10 min
16 (HI)
Operation/Combustion Indicator flashes red
Overheat thermistor <Table 2>
High limit switch No.1 130 C
High limit switch No. 2 110 C
Thermal fuse No.1 melts at 152 C
Thermal fuse No.2 melts at 152 C
14 (20)
Filter indicator flashes
Operation/Combustion Indicator flashes red
ON/OFF switch failure ON (longer than15 sec)
70 (18.20)
Operation/Combustion Indicator flashes red
Abnormal combustion fan speed standard speed +/->450 rpm)
61 (16.18.20)
Operation/Combustion Indicator flashes red
Temperature control OFF
No temp control for next 30 sec after f.
Solenoid valves SV1 SV2 Close
Modulating valve POV Close
Combustion fan OFF
Operation/Combustion Indicator flashes green
Convection fan MED OFF
Convection fan OFF
Normally within 210 sec, or 255 if the filter indicator is flashing.
Room temp < Pre-set temp
Is room temp > pre-set temp? Is the difference below 2 C?
Has 10 min passed since g?
<Table 2>
HIGH
LOW
431FT
135 C
115 C
556FT
135 C
110 C

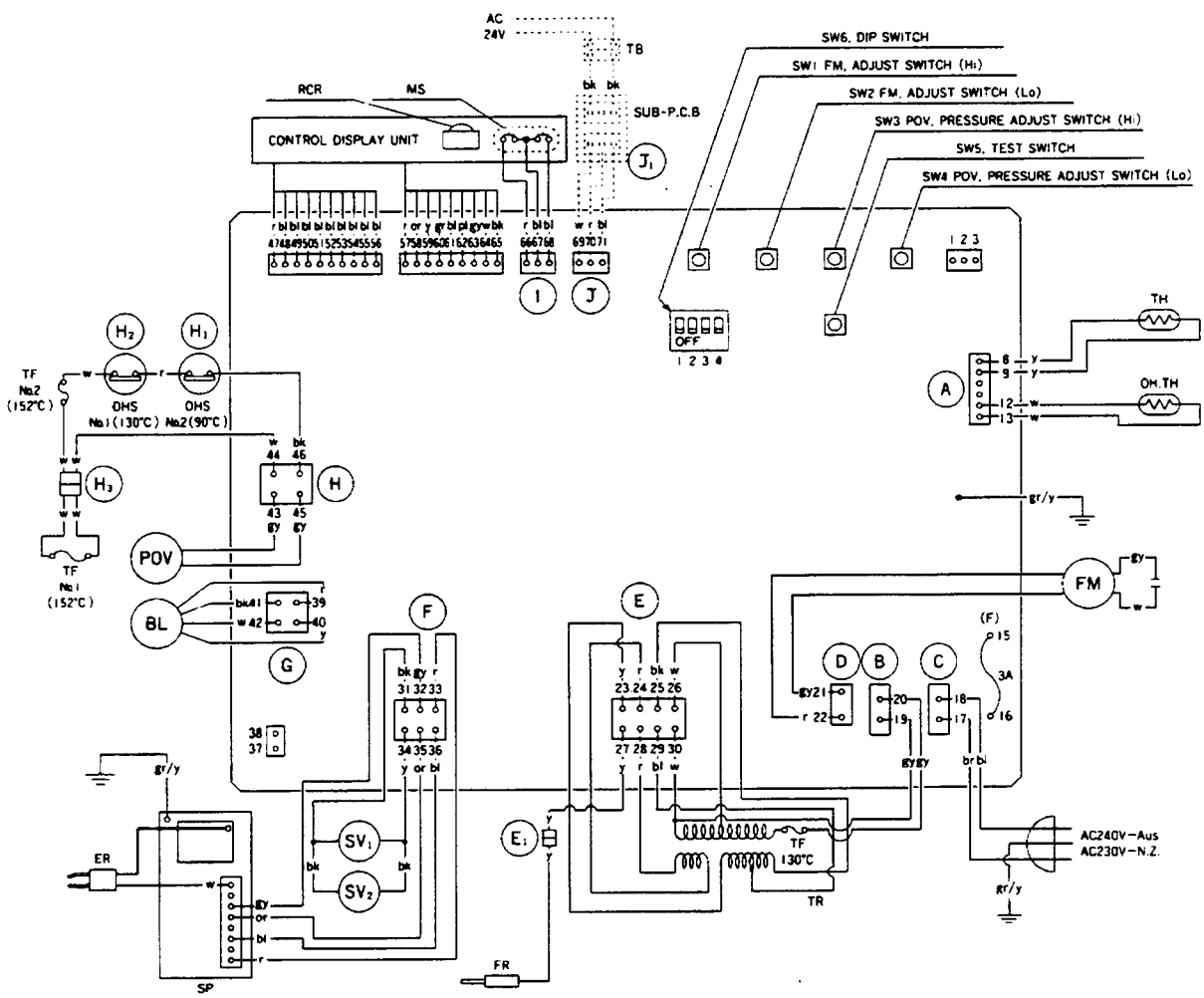
Flow ref.	CN	Wire colour		Value (Normal)	
				556FTR/556FM	431FT
1	I	red - blue		DC 3 ~ 10 V, ∞ resistance (current flows when switched on)	
		blue - blue			
2	H	white - black		below DC 1 V, below 4 Ω (current flows)	
	H1	black - red (Hi-limit switch No. 1)			
	H2	red -white (Hi-limit switch No. 2)			
	H3	white - white (Thermal fuse No. 1)			
	H2 H3	white - white (Thermal fuse No. 2)			
3	A	white - white		0.6 ~ 523 kΩ (< 0.6 kΩ: short, >523 kΩ: open)	
		temperature		0°C: 218 kΩ, 20°C: 78kΩ, 50°C: 21kΩ, 80°C: 7.3kΩ, 100°C: 3.6k, 135°C: 1.5kΩ	
4	A	yellow -yellow		1.8 ~ 844 kΩ (< 1.8 kΩ: short, >844 kΩ: open)	
		temperature		0°C: 123 kΩ, 20°C: 39kΩ, 30°C: 23kΩ, 40°C: 14kΩ	
5	A	grey - grey		1.8 ~ 844 kΩ (< 1.8 kΩ: short, >844 kΩ: open)	
		temperature		0°C: 123 kΩ, 20°C: 39kΩ, 30°C: 23kΩ, 40°C: 14kΩ	
6	E1	yellow - yellow		below DC 0.1 μA	
7	G	black - white		below 57 Hz	
8	E1	yellow - yellow		below DC 0.1 μA	
9	G	black - white		below ignition revolution + 2 Hz	
		ignition revolution	initial	LP: 50 Hz, NG: 51 Hz	LP: 42 Hz, NG: 44 Hz
			re-attempt	LP: 66 Hz NG: 61 Hz	LP: 51 Hz NG: 52 Hz
10	F	blue - red		AC 85 ~ 110 V	
11	F	black - yellow		DC 78 ~ 100 V, 1.3 ~ 2.2 kΩ	
12	H	grey - grey		DC 1 ~ 15 V (low ~ high) 80 ~ 100 Ω	
13	E1	yellow - yellow		above DC 1 μA	
14	A	white - white (filter sign)	high	flashes below 2.9 kΩ	flashes below 2.9 kΩ
			low	flashes below 7.3 kΩ	flashes below 5.3 kΩ
15	G	black - white (normal revolution)	high	LP: 106 Hz, NG: 106 Hz	LP: 81 Hz, NG: 81 Hz
			low	LP: 43 Hz, NG: 43 Hz	LP: 38 Hz, NG: 39 Hz
16	A	white - white (Hi-limit switch operates)	high	operates at below 1.5 kΩ	operates at below 1.5 kΩ
			low	operates below 2.9 kΩ	operates below 2.6 kΩ
17	D	grey - pink		AC 50 ~ 108 V (low ~ high), 90 ~ 180 Ω	

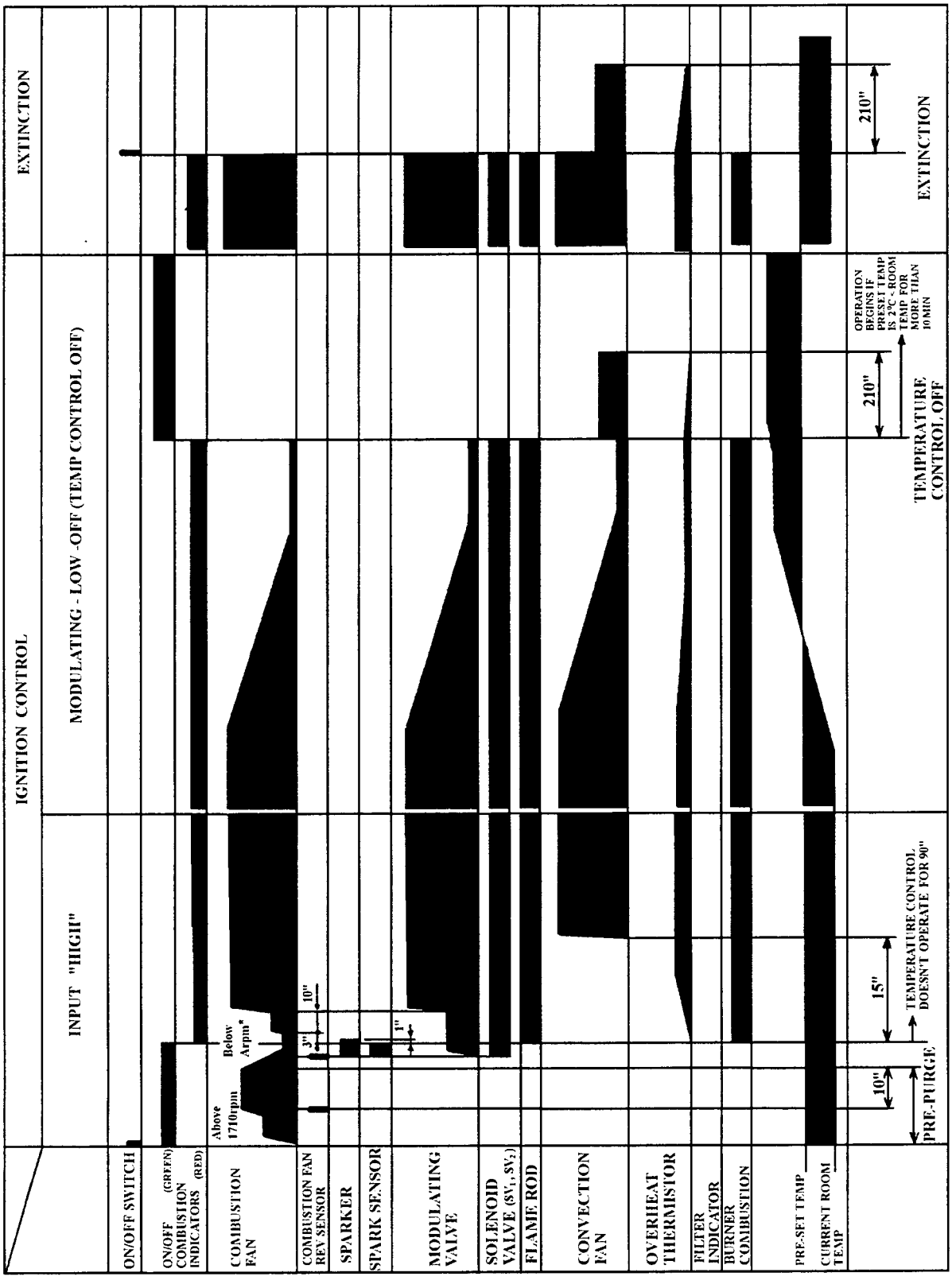
* Operational flow chart, see page 20.
* CN denotes connector number on wiring diagram, see page 23.

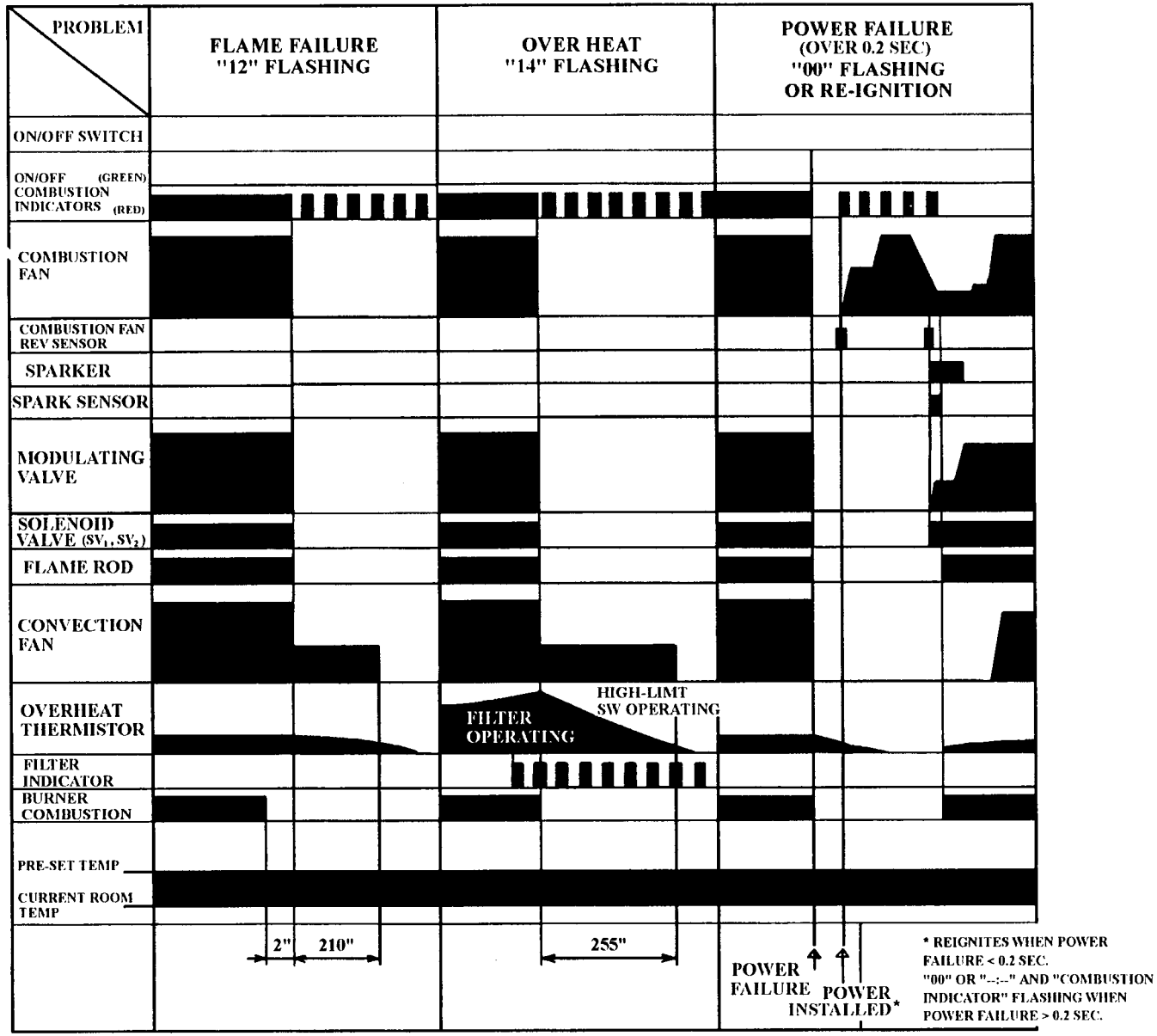
Transformer values

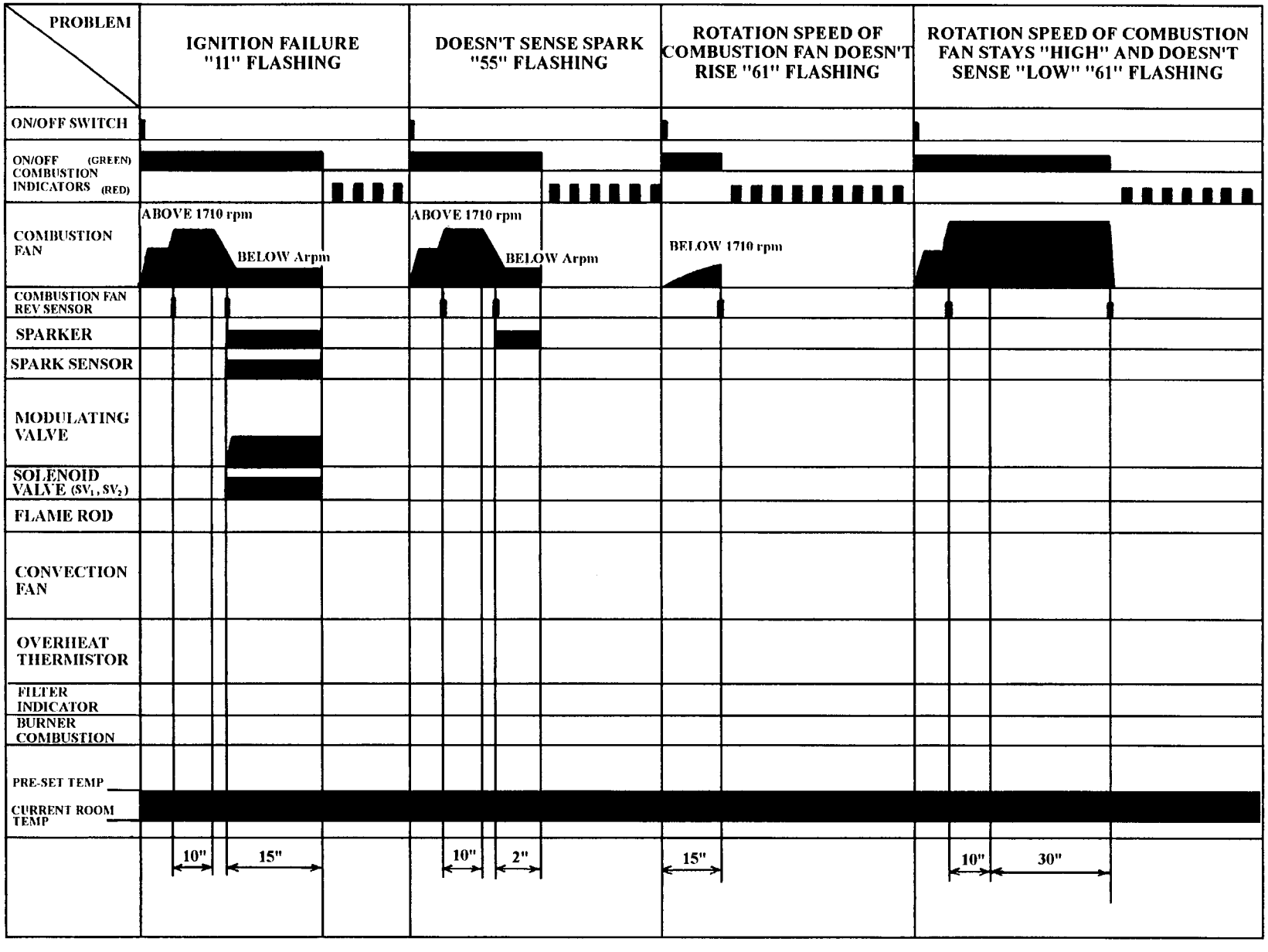
	Australia [240 V]	New Zealand [230 V]
Yellow - Blue	AC 130 ~ 180 V	AC 130 ~ 180 V
	200 ~ 400 Ω	200 ~ 400 Ω
Blue - Black	AC 10 ~ 16 V	AC 10 ~ 16 V
	1 ~ 3 Ω	1 ~ 3 Ω
Red - Red	AC 25 ~ 50 V	AC 25 ~ 50 V
	1 ~ 3 Ω	1 ~ 3 Ω
Grey - Grey	AC 216 ~ 264 V	AC 207 ~ 253 V

MARK	PART NAME
MS	MAIN SWITCH
RC	REMOTE CONTROL
TH	THERMISTOR
TF1~2	THERMAL FUSE 1~2
F	FUSE
CF	CONVECTION FAN
FCC	FAN CONTROL CIRCUIT
ER	ELECTRODE
POV	MODULATING SOLENOID VALVE
TR	TRANSFORMER
RCR	REMOTE CONTROL RECEIVER
TB	TERMINAL BLOCK
OH.TH	OVER HEAT THERMISTOR
OHS1~2	OVER HEAT SWITCH 1~2
FM	FAN MOTOR
BL	COMBUSTION FAN MOTOR
SP	SPARKER
FR	FLAME ROD
SV1~2	MAIN SOLENOID VALVE 1~2
CPU	CENTRAL PROCESSING UNIT



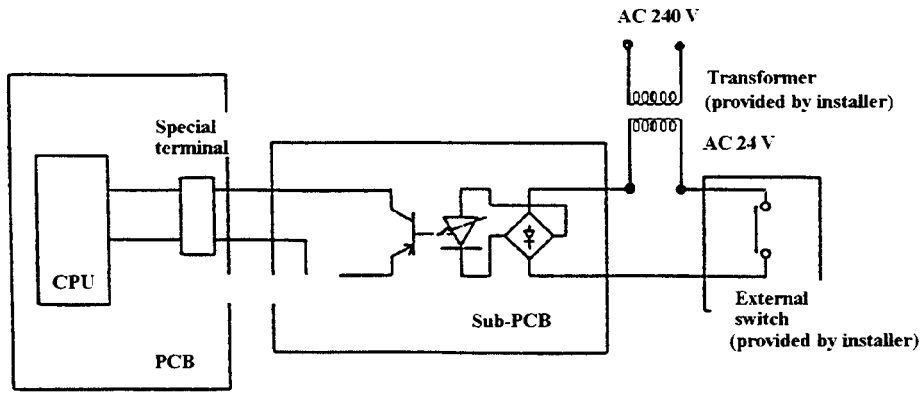

IGNITION CONTROL
INPUT "HIGH"
MODULATING - LOW -OFF (TEMP CONTROL OFF)
EXTINCTION
ON/OFF SWITCH
ON/OFF COMBUSTION INDICATORS (GREEN) (RED)
COMBUSTION FAN
Above 1710rpm
Below Arpm*
COMBUSTION FAN REV SENSOR
3"
10"
SPARKER
SPARK SENSOR
1"
MODULATING VALVE
SOLENOID VALVE (SV1, SV2)
FLAME ROD
CONVECTION FAN
OVERHEAT THERMISTOR
FILTER INDICATOR
BURNER COMBUSTION
PRE-SET TEMP
CURRENT ROOM TEMP
10"
PRE-PURGE
15"
TEMPERATURE CONTROL DOESN'T OPERATE FOR 90"
210"
TEMPERATURE CONTROL OFF
OPERATION BEGINS IF PRESET TEMP IS 2°C < ROOM TEMP FOR MORE THAN 10MIN
210"
EXTINCTION
* Ignition revolution (refer to Diagnostic Points)


PROBLEM
FLAME FAILURE "12" FLASHING
OVER HEAT "14" FLASHING
POWER FAILURE (OVER 0.2 SEC) "00" FLASHING OR RE-IGNITION
ON/OFF SWITCH
ON/OFF (GREEN)
COMBUSTION INDICATORS (RED)
COMBUSTION FAN
COMBUSTION FAN REV SENSOR
SPARKER
SPARK SENSOR
MODULATING VALVE
SOLENOID VALVE (SV1, SV2)
FLAME ROD
CONVECTION FAN
OVERHEAT THERMISTOR
HIGH-LIMT SW OPERATING
FILTER OPERATING
FILTER INDICATOR
BURNER COMBUSTION
PRE-SET TEMP
CURRENT ROOM TEMP
2"
210"
255"
POWER FAILURE
POWER INSTALLED*
* REIGNITES WHEN POWER FAILURE < 0.2 SEC.
"00" OR "--:--" AND "COMBUSTION INDICATOR" FLASHING WHEN POWER FAILURE > 0.2 SEC.


PROBLEM
IGNITION FAILURE "11" FLASHING
DOESN'T SENSE SPARK "55" FLASHING
ROTATION SPEED OF COMBUSTION FAN DOESN'T RISE "61" FLASHING
ROTATION SPEED OF COMBUSTION FAN STAYS "HIGH" AND DOESN'T SENSE "LOW" "61" FLASHING
ON/OFF SWITCH
ON/OFF (GREEN)
COMBUSTION INDICATORS (RED)
COMBUSTION FAN
ABOVE 1710 rpm
BELOW Arpm
ABOVE 1710 rpm
BELOW Arpm
BELOW 1710 rpm
COMBUSTION FAN REV SENSOR
SPARKER
SPARK SENSOR
MODULATING VALVE
SOLENOID VALVE (SV1, SV2)
FLAME ROD
CONVECTION FAN
OVERHEAT THERMISTOR
FILTER INDICATOR
BURNER COMBUSTION
PRE-SET TEMP
CURRENT ROOM TEMP
10"
15"
10"
2"
15"
10"
30"

§ 15 Central Control

An optional sub-PCB driven by a 24 AC signal is available directly from Rinnai to enable the RHFE-556FTR/431FT/556FM to be controlled from a central location. This is particularly useful in schools and institutions. The connection operates when signals from the outside 24V control circuit are electrically isolated by a photo-transistor and the sub-PCB sends these signals to the CPU.



- When the central control is switched on, appliance can be operated normally at the unit.
- When the central control is switched off, appliance stops, goes into stand-by mode and no operation is possible from the unit.

« Summarising control actions »

Control	Operating sequence	Current state of appliance	Change in operation at appliance
Central Control (Outside)	ON → OFF	OFF	OFF
		ON	STAND-BY
	OFF → ON	OFF	OFF
		STAND-BY	ON

Control	Operating sequence	Current state of central control	Change in operation at appliance
Appliance side	OFF → ON	OFF	STAND-BY
		ON	ON
	STANDBY → OFF	OFF	OFF
	ON → OFF	ON	OFF

§ 16 Error Coded Messages

RHFE-556FTR: *Error is displayed as a number on clock flashing.*
RHFE-431FT: *Error is displayed as a number on clock flashing.*
RHFE-556FM: *Error is displayed as the room temperature LEDs flashing.*

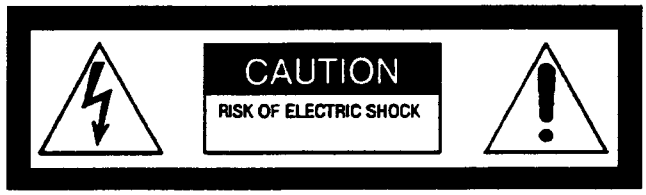
When a safety device is activated, the cause will be indicated by a flashing display. (Filter indicator will also flash in the case of overheat.)

556FTR/431FT	556FM	Probable Cause	Comments	Ref †
--:--	LO~HI	Power failure	When power failure is sensed operation stops.	-
11	16	Miss ignition	Flame current does not reach 1.0 μA within the given time, after solenoid valve opens.	14
12	LO	Flame failure	Flame rod current remains below 0.1 μA for 3 seconds during initial combustion.	14
14	20	Over heat safety device	High-limit temperature thermistor or thermal fuse has activated.	2, 6
16	HI	Over temperature cut off	Room temperature is sensed as being above 40°C for longer than 10 minutes.	5
31	22·24	Room temperature thermistor disconnection	Room temperature thermistor open circuit	5
32	24·26	Room temperature thermistor short circuit	Room temperature thermistor wire trapped, touching bare metal	5
33	18·20·22	High-limit thermistor disconnection	High limit thermistor open circuit	4

† Refers to the number on the left of the operational flow chart page 20, and diagnostic points page 22.

556FTR/431FT	556FM	Probable Cause	Comments	Ref †
34	**20·22·24**	High-limit thermistor short circuit	High limit thermistor wiretrapped, touching bare metal	4
53	**LO·16·18**	Abnormal spark sensed	Sparker not OFF within 20 seconds at time of ignition	11
			1st spark sense not within 2 seconds	
			2nd spark sense spark not continuous for 1 second after solenoid valve opens	
61	**16·18·20**	Abnormal combustion fan motor rpm	Speed is not achieved within time or goes over speed level	15
70	**18·20**	ON/OFF switch failure	ON/OFF switch connects continuously for more than 15 seconds	1
71	**LO·16**	Solenoid valve check	Solenoid valve(s) (SV_1, SV_2) signal and response signal are different.	12
72	**26**	Flame rod failure	Flame rod output does not cease within 20 seconds.	7
73	**22·24·26·HI**	Communication failure	Data transfer between CPU and E^2PROM fails.	-

† Refers to the number on the left of the operational flow chart page 20, and diagnostic points page 22.



1. The main faults and their remedies

✻ The numbers on the right hand side of this table refer to "Causes of faults and suggested remedies" on page 31 .

Fault symptom	556FTR 431FT	556FM †	Check points / remedy
The Economy indicator will not come ON.			* Confirm that Economy Mode has been selected * Confirm electrical cord is securely into the power point
After having pressed the ON - OFF switch the appliance will not operate.	**11**	**16**	* Check gas supply ..... 1 * Confirm no gas escapes ..... 1 * Check for air in the gas supply ..... 1 * Reconfirm gas type specified 1
Insufficient heating.			* Check selected room temperature setting ..... 2 * Check for blocked air filter ..... 3 * Check for an obstruction in the warm air flow ..... 4 * Reconfirm gas pressure at appliance 1
Burner goes out during operation.	**12** **14** **16**	**LO** **20** **HI**	* Ensure flue terminal is not blocked ..... 5 * Ensure air filter is not blocked ..... 3 * Check for an obstruction in the warm air flow ..... 4 * Reconfirm gas type specified * Confirm no gas escapes ..... 1 * Check for flash back ..... 6 * Check for high room temperature ..... 7 * Reconfirm electrical supply at power point 8
Gas odour.			* Confirm no gas escapes * Product of combustion leak 9
Heater stops.	**--:--**	**ALL**	* Power failure (> 0.2 seconds) 1

† Error is displayed as room temperature LEDs flashing

2. Causes of faults and suggested remedies

▲ 556FTR/431FT

Δ 556FM

1. Gas supply

In cases of miss ignition, insufficient heating and gas smell, check that:

* The gas supply pressure is correct.
* The specified gas type is correct for the area.
* There are no breaks/escapes in gas supply.
* There is no air in the gas supply.

→ Check the gas pressure at both the meter and the appliance.

→ Air in the gas line will prevent the appliance from igniting.

2. Thermostat setting

When the room does not reach the selected temperature, or the appliance will not remain alight, check that:

* The selected temperature is not set lower than the room temperature.

→ Select the required temperature setting with the UP/DOWN selection buttons.

3. Blocked air filter

If insufficient heating or lockout occurs, check that:

* The air filter is not blocked with dust.

→ If the air filter is blocked, the safety device will operate.

▲ ..... 14 flashing

Δ ..... 20 flashing

→ The filter must be cleaned at least once per month.

4. Air flow obstruction

If insufficient heating or lockout occurred, check that:

* There are no obstacles in front of the appliance or louvres.

▲ ..... 14 flashing

Δ ..... 20 flashing

→ There should be no articles within one (1) metre of the front of the appliance.

5. Flue terminal

If flame failure occurs during normal operation, check that:

* The flue terminal on the exterior wall is not obstructed in any way.

▲ ..... 12 flashing

Δ ..... LO flashing

→ Check in particular for shrubs growing over the flue terminal or a thick build up of spider webs.

6. Flash back protection

If flame failure occurs during normal operation, check:

* The flue terminal air intake is not blocked.
* For dust or foreign material on the burner.
* Combustion specification and gas type.

▲ ..... 12 flashing

Δ ..... LO flashing

7. Room temperature

* Is the room temperature unusually high?

→ 10 minutes after having sensed 40°C the appliance will automatically go out.

▲ ..... 16 flashing

Δ ..... HI flashing

8. Power failure

* If there has been a power failure for 0.2 seconds or longer .Current time will be displayed on display when "set times" button is pressed once. (Time will be slow by duration of power failure).

▲ ..... --:-- flashing

Δ ..... LO ~ HI flashing

9. Smell of products of combustion

If there is a smell of gas or products of combustion, check that:

* The flue manifold behind appliance has not come undone.

→ The products of combustion are leaving the appliance through the flue terminal.

Before contacting Rinnai please check the following points.
These points are part of the normal operation of the unit.

At Ignition

Heater does not operate.	→	Is the heater plugged in? Have the fuses or breaker blown at the switch board? Is there a power failure? Is the air filter blocked? Is anything blocking the outlet for the hot air? Is the flue blocked? Are Timers set? Clear Timers and operate again. Is central timer ON ? (where fitted)
Warm air does not flow when the burner lights.	→	The fan is started automatically after a short delay. This is to allow the heat exchanger to warm up, helping to avoid cold draughts.
Smoke or strange smells are produced on the first trial light up after installation.	→	This is caused by grease or oil and dust on the heat exchanger and will stop after a short time.
Sharp clicking noises at ignition, or when the unit cuts down on the thermostat, or goes out.	→	This is simply expansion noise from the heat exchanger.

During combustion

Clunking noise when the thermostat operates.	→	This is the sound of the solenoid gas valves opening and closing.
Unit is not heating room.	→	Is the air filter blocked? Is the set temperature high enough? Is the warm air outlet blocked by anything? Are the doors and windows of the room closed?
Air filter is blocked or the louvres are blocked or obstucted.	→	Allow heater to cool, clean air filter, operate again.
Heater will not re-ignite after overheating.	→	Even after unit has cooled down the heater does not ignite again. Repair is necessary. Contact your local agent or Rinnai for a Service call.

When the unit is turned off

Convection fan continues to run after turning OFF.	→	This is to remove the residual heat from the heat exchanger, the fan will stop when the heater cools down.

Other Points

Steam is discharged from the flue terminal.	→	High efficiency appliances tend to discharge water vapour on cold days, this is normal.
Unit cuts off without apparent reason.	→	Check if central timer is switched OFF (where fitted), or whether filters are blocked, (dirty filters will cause the heater to overheat).
Power Failure.	→	When power is restored, the appliance will begin to heat if it was ON at the time the power failed. Clock will be slow by the length of the power failure.
Remote control doesn't operate.	→	Check battery. Try moving closer to heater.

a. After having operated the appliance and:

i) The combustion fan doesn't begin to rotate, or it suddenly stops after having run for a short time.
ii) There is no spark (after 30 seconds).
iii) The solenoids do not open, preventing gas flow to the burners.
iv) The convection fan does not begin to rotate, approximately 15 seconds after ignition.

↓

Is there electrical supply → NO → 1. Confirm the connection at the wall socket
2. Is the 3 amp fuse blown?

↓

YES

↓

The appliance does not operate.

i) Open circuit or loose pin connector on PCB or wiring loom.
ii) ON/OFF button faulty. ▲ ... **70**, Δ ... **18·20 flashing**
iii) Faulty Printed Circuit Board.
iv) Control panel PCB faulty.
v) OHS is in the 'OPEN' position. (Closed → Normal) ▲ ... **14**, Δ ... **20 and filter flashing**
vi) Thermal fuse has melted.
vii) Solenoid circuit is faulty. ▲ ... **71**, Δ ... **LO·16 flashing**

↓

The combustion fan doesn't rotate, or the appliance fails after a short time.

i) Combustion fan shaft allen screw loose.
ii) An obstruction in the combustion fan is preventing it from rotating.
iii) Combustion fan does not reach pre-determined speed. ▲ ... **61**, Δ ... **16·18·20 flashing**
iv) The flame rod current is greater than 0.1 μA during pre-purge. ▲ ... **72**, Δ ... **26 flashing**
v) The combustion fan rpm does not match the ignition rpm check. ▲ ... **61**, Δ ... **16·18·20 flashing**
vi) Faulty spark generator. ▲ ... **53**, Δ ... **LO·16·18 flashing**
vii) Faulty PCB.

↓

There is no spark.

i) High tension cord disconnected or broken.
ii) Insulation leak from the high tension cord, (Spark sound is not regular).
iii) The spark gap is not correct (normal spark gap is 3.5 ± 0.5 mm).
iv) Weak or shorting spark.
v) Faulty PCB.

b. The solenoids do not open, preventing gas flow to the burners.

i) Open circuit or loose pin connectors on PCB or wiring loom.
ii) Faulty solenoid, or coil.
iii) Faulty sparker, (no spark is sensed).
iv) Faulty PCB

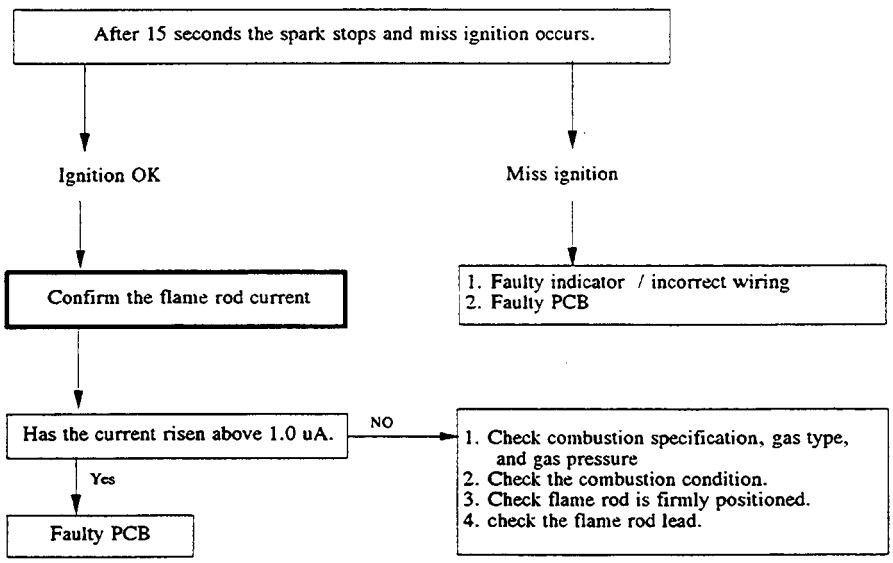
↓

c. The convection fan doesn't rotate.

i) Convection fan shaft allen screw loose.
ii) An obstruction in the convection fan is preventing it from rotating.
iii) Flame rod faulty.
iv) Faulty PCB.

↓

d. There is the sound of ignition, however the 'combustion' injector does not glow red.



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e. After repeated efforts to operate the appliance, it will not ignite. **▲ ... 11, △ ... 16 flashing**

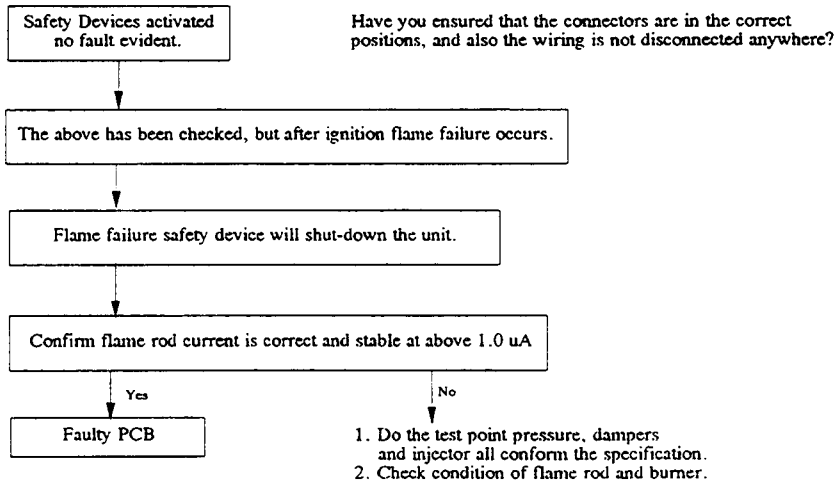
i) Air in the gas supply line.
ii) Incorrect gas pressure.
iii) Incorrect gas type, or a kink or break in the gas supply.
iv) Faulty or weak spark.
v) Blocked injector. Is the combustion specification correct?

f. The flame fails during normal operation.

1. Power failure for 0.2 seconds or longer. ▲ ... "_ _ : _ _", △ ... **LO ~ HI flashing**
2. Safety devices are activated.
   * Room temperature is sensed at above 40°C for 10 minutes. ▲ ... **16**, △ ... **HI flashing**
   * Air filter is blocked and the OHS is activated. ▲ ... **14**, △ ... **20 and filter flashing**
   * Obstruction in the flue terminal. ▲ ... **12**, △ ... **LO flashing**
   * Blockage or insufficient gas supply. ▲ ... **12**, △ ... **LO flashing**
   * Gas pressure is abnormally low.
   * The area surrounding the flue terminal may be restricted.
   * Obstruction in front of the heater. ▲ ... **14**, △ ... **20 and filter flashing**

↓

3.



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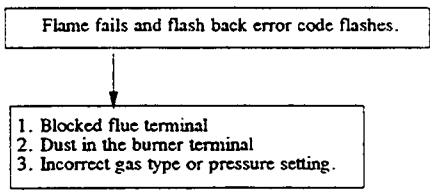
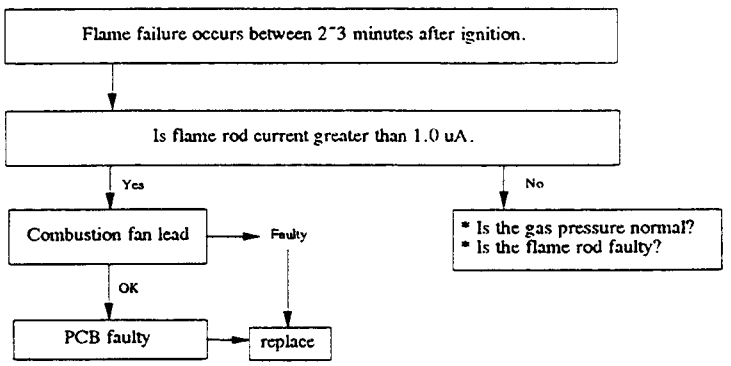


5.



§ 19 Electrical Component Analysis

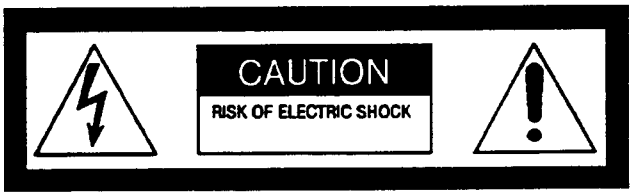
- Before starting inspection, check wiring harness and double check that all connectors are tight.
- Before carrying out checks marked ※, remove power cord from wall socket.

Nature of Fault	Examination Point	Diagnostic Point	Values	Y/N	Action
A. "–:–" fails to flash when power cord is pugged in, and temperature is not displayed when unit is turned on (normal sequence can not proceed).	(1) Is the voltage correct?	Check electric socket and voltage.	AC 220 - 260 V	Yes	Go to (2).
				No	Repair electric source.
	(2) Blown or defective fuse?	1. Measure fuse resistance.	>1 Ω	Yes	Go to (3).
				No	Replace fuse. Go to (2) - 2.
		※ 2. Measure resistance of convection motor coil after removing 2P connector.	(D) Grey - Pink 90 - 180 Ω	Yes	Go to (2) - 3.
				No	Replace convection motor.
		※ 3. Measure resistance of combustion motor coil after removing 4P connector.	(G) Red - Yellow <1 M Ω	Yes	Go to (2) - 4.
				No	Replace combustion motor.
		※ 4. Measure resistance of transformer after removing 8P connector.	(E) White - White 6-19 Ω. (E) Red - Red 1-3 Ω. (E) Black - Blue 0.5 - 2Ω. (E) Blue - Yellow 200 - 400 Ω.	Yes	Go to (2) - 5.
				No	Replace transformer.
		※ 5. Remove lead wires of solenoid valves (SV_1, SV_2) and measure coil resistance between terminals.	SV_1 1.3 - 2.2 k Ω. SV_2 1.3 - 2.2 k Ω.	Yes	Go to (2) - 6.
				No	Replace solenoid valve.
		※ 6. Remove lead wire(s) of modulating valve (POV) and measure coil resistance between terminals .	(H) Grey - Grey 80 - 100 Ω	Yes	Replace PCB.
				No Replace	Replace modulating valve.
	(3) Is the ON/OFF switch OK?	※ Check continuity of switch after removing 3P connector (turn switch ON and OFF) Red - Blue Blue - Blue.	(I) OFF: ∞ ON: 0 Ω	Yes	Go to (4).
				No	Replace switch.

Nature of Fault	Examination Point	Diagnostic Point	Values	Y/N	Action
	(4) Is the transformer OK?	Check transformer secondary voltage.	(E) Red - Red AC 28 - 50 V (E) Black - Black AC 10 -16 V (E) Blue - Yellow AC 130 - 180 V	Yes	Repalce PCB.
				No	Replace transformer.
B. Error code appears soon after turning heater on (normal sequence cannot proceed).	(5) Is overheat switch 1 or 2 OFF? (▵ ... 20 flashing ▲ ... 14 flashing) If unit was over heated, it will turn back ON once the unit cools down.	※ With ON/OFF switch OFF, check continuity between both terminals.	(H1) Black - Red <1 Ω (H2) White - Red <1 Ω	Yes	Go to (6).
				No	Replace overheat switch 1 and/or 2.
	(6) Has the temperature fuse melted? (▵ ... 20 flashing ▲ ... 14 flashing)	※ With ON/OFF switch OFF, check continuity between both terminals.	(H3) White - White 0 Ω (H2) (H3) White - White 0 Ω	Yes	Replace PCB.
				No	Replace temperature fuse.
	(7) Is the combustion motor wiring OK? (▵ ... 16, 18, 20 flashing ▲ ... 61 flashing)	※ Check combustion motor coil resistance using same procedure as (2)-3 above.	Red - Yellow <1 M Ω	Yes	Go to (8).
				No	Replace combustion motor.
C. No spark	(8) Is there any spark leakage due to loose or disconnected high tension lead	Check connection visually and by hand.	Good connection and no leakage.	Yes	Go to (10).
				No	Connect properly.
	(9) Is the spark unit voltage low?	Measure sparker input voltage.	(F) Blue - Red AC 85 - 110 V	Yes	Replace sparker.
				No	Replace PCB.
D. Spark fails to produce ignition (stops after approx. 15 sec.) (▵ ... 16 flashing ▲ ... 11 flashing)	(10) Are the solenoid valves (SV_1, SV_2) ON?	※ 1. Check solenoid valve coil resistance using same procedure as (2)-5 above.	SV_1 1.3 - 2.2 k Ω. SV_2 1.3 - 2.2 k Ω.	Yes	Go to (11) - 2.
				No	Replace solenoid valve.
		2. Check solenoid valves terminal voltage.	(F) Black - Yellow DC 78 - 100 V	Yes	Go to (12).
				No	Replace PCB.
	(11) Is the modulating valve (POV) OK?	1. Check test point pressure.	Is it at the specified pressure?	Yes	Check injector / damper.
				No	Go to (12) - 2.
		2. Check position of SW6 switches on PCB.	Refer to Section 13-1.	Yes	Go to (12) - 3.
				No	Set to proper position
		※ 3. Check modulating valve coil resistance.	(H) Grey - Grey 80 - 100 Ω	Yes	Adjust regulator pressure. If it does not match, replace PCB.
				No	Replace modulating valve.

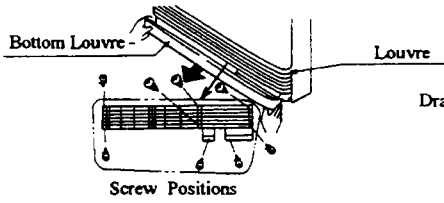
Nature of Fault	Examination Point	Diagnostic PoinT	Values	Y/N	Action
E. Ignition occurs, but combustion indicator does not operate. (Sparker stops after approx. 15 sec) (▵ ... 16 flashing ▲ ... 11 flashing)	(12) Is the modulating valve OK?	Measure test point pressure as in (11)-1 above.	Is it at the preset pressure?	Yes	Go to (14) after checking injector and damper.
				No	Adjust regulator pressure.
	(13) Is the current of the flame rod (FR) circuit >1.0 μA .	❋ Check flame rod circuit current. (Disconnect, measure between connector and lead.)	(E1) Yellow - Yellow flame rod >1.0 μA.	Yes	Replace PCB.
				No	Replace flame rod.
F. Heater does not reach preset room temperature.	(14) Is the thermistor OK?	❋ Disconnect thermistor from unit and measure resistance between terminals. As there may be some variance due to temperature setting, use the chart at the right as a guide.	(A) Yellow - Yellow 0°C : 123 kΩ 20°C : 39 kΩ	Yes	Replace PCB.
				No	Replace thermistor.
G. Heater stops during use (turns off prematurely).	(15) Shut off mechanism activated. (▵ ... LOW flashing ▲ ... 12 flashing)	Check flame rod circuit current (flow chart No. 7, No. 9).	(E1) Yellow - Yellow flame rod >0.1 μA. (Disconnect, measure between connector and lead.)	Yes	Check for dust clogging, FR wire and connector.
				No	Replace PCB
	(16) OFF function activated. (▵ ... HI flashing ▲ ... 16 flashing)	Was the heater used for a long period at a high temperature?	Over ten minutes at above 40°C.	Yes	Explain usage.
				No	Replace PCB.
	(17) Overheat switch activated. (▵ ... 20 flashing ▲ ... 14 flashing).	1. Check for dust on air filter, convection fan and air outlet.	Is the dust build up extreme?	Yes	Clean.
				No	Go to (18) - 2.
		2. Check combustion specifications	Correct?	Yes	Go to (18) - 3.
				No	Adjust accordingly
		❋ 3. Is the convection fan revolution speed correct? Measure motor coil resistance. See (2)-2.	(D) Grey - Pink 90 - 180 Ω	Yes	Go to (18) - 4.
				No	Replace motor.
		4. Check voltage at 2P terminal D on PCB (convection fan) .	HIGH - LOW AC 50 - 108 V	Yes	Check fan lock / obstruction, spin, etc.
				No	Replace PCB.
H. All other problems.	Are there any loose or defective connections? Is central timer operating (whtere fitted)?			Yes	Repair

(Note: If a problem is not remedied by replacing the appropriate part, the wiring harness is defective (short circuit, open circuit and/or defective connectors). Check for any short or open circuit. Lightly wiggle wires and harness to check for loose or faulty connectors.)

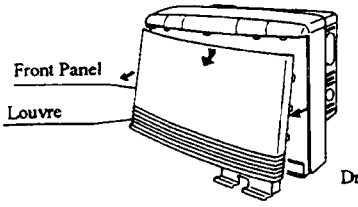


✻ Disconnect electrical supply

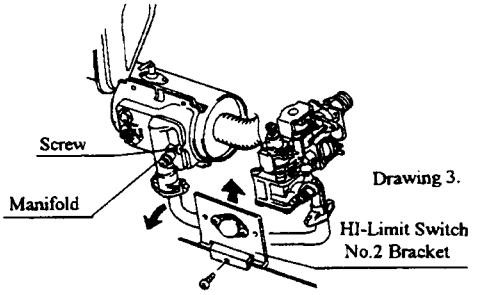
1. Remove bottom trim (pull)
2. Remove 8 screws inside bottom louvre, pull complete front panel forward at bottom, unclip from escucheon panel and remove from heater
3. Replace small gas label on gas inlet
4. Replace large gas label on back of appliance
5. Change very small gas label on Data Plate
6. Complete details on conversion sticker, place sticker inside left hand side panel
7. Undo main gas tube connection at manifold, 1 screw, push tube down
8. Remove "O" ring from manifold connection and refit to main gas tube (to avoid trapping "O" ring when re-assembling)
9. Remove manifold, (2 screws) take care with gasket
10. Remove burner cover, (6 screws) take care with gasket
11. Carefully remove front damper, (1 screw) see drawing 4.
12. Using pointed nose pliers, carefully pull the right hand damper forward, and out of the burner assembly
13. Gently fit new damper- tag faces to the right
14. Refit front damper
15. Remove injectors
16. Fit new main injectors
17. Refit manifold, (slide into pin locators) then secure with screws, take care with gasket
18. Connect main gas tube, take care with "O" ring
19. Connect appliance to electricity (and gas if disconnected).
20. Follow gas pressure setting procedure, see next page.
21. Test for gas escapes
22. Replace front cover



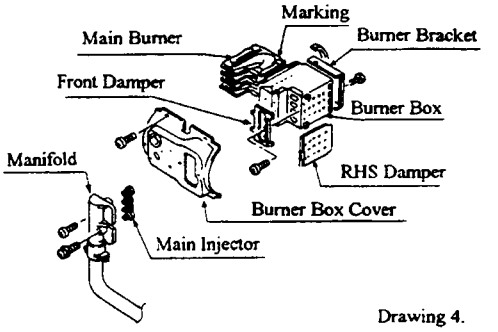
Drawing 1.



Drawing 2.



Drawing 3.



Drawing 4.

Gas Pressure Setting Procedure

1. Check SW6 Dip Switches are correct for the gas type for which the appliance is to be used. (Refer to page 7.)

2. There are two test points, one on the heat exchanger, one on the gas manifold. Connect pressure gauge to both test points. (Connect one side of the gauge to one point, the other side of the gauge to the other.) If you are using an electronic manometer, connect the ⊖ side to the heat exchanger test point. (Refer to data plate for pressures.)

3. Press the ON/OFF button to operate unit.

4. With appliance operating, press SW5 once.

5. Press SW4 to operate appliance on forced low. Adjust the setting to the correct pressure using "∧" and "∨" buttons on the control panel.

6. Press SW4 again to lock in selected setting.

7. Press SW3 to operate appliance on forced high. Adjust the setting to the correct pressure using "∧" and "∨" buttons on the control panel.

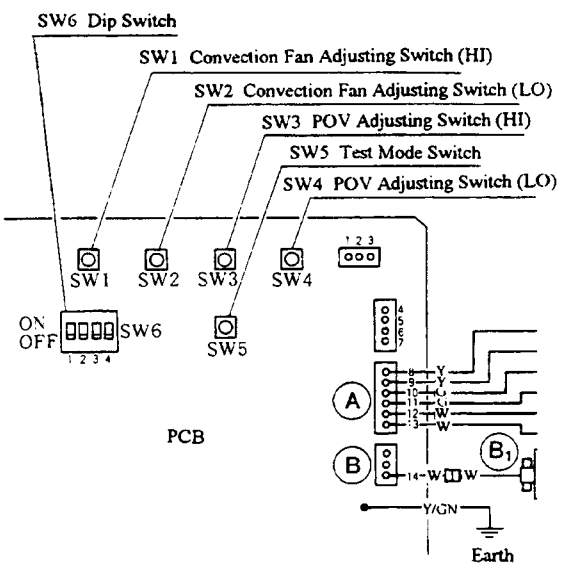
8. Press SW3 again to lock in the selected setting.

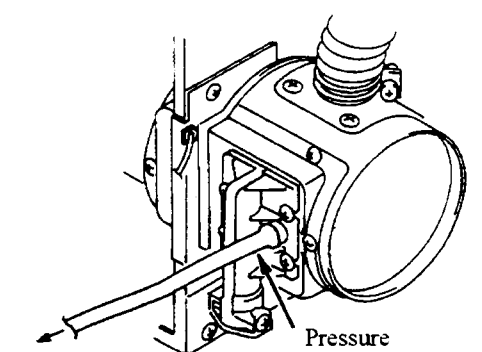
9. Press SW5 once to return heater to normal operation.

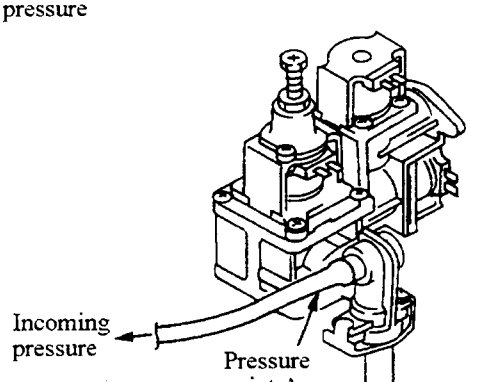
10. Press ON/OFF button to turn the unit off.

11. Remove the gauge from the test points and replace the test point screws.

12. Test for gas escapes.







§ 22 Dismantling for Service

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

eg. - Isolate gas supply.
- Disconnect electrical supply from wall socket.

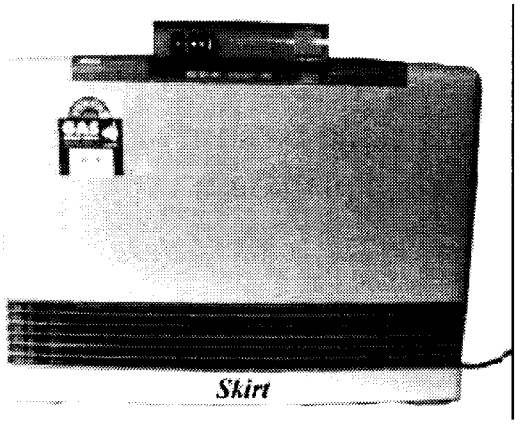
Unless otherwise stated, re-assembly is the reverse of dismantling.

1. Front Panel Removal

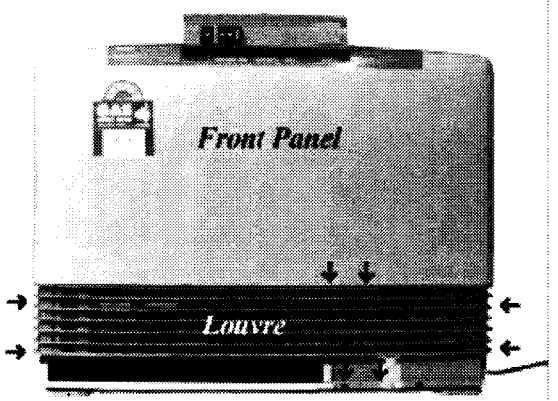
CAUTION

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

i) Grip sides of skirt and pull forward to remove.



ii) Remove eight (8) screws to release louvre and front panel.



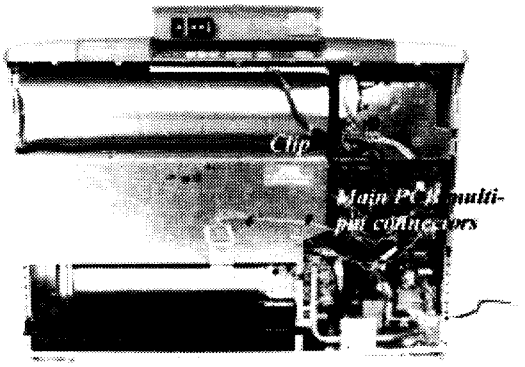
iii) Grip bottom left and right hand corners of louvre, pull forward to release together with front panel.

2. Top Panel, Control Panel, and Control Panel PCB Removal

CAUTION

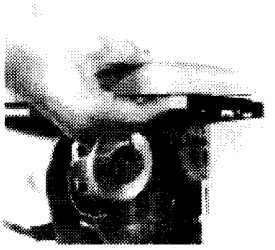
240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.

i) Remove front panel assembly, see section 1.
ii) Remove two (2) screws, one on each side of control panel.
iii) Release three (3) multi-pin connectors from main PCB.
iv) Release the control panel PCB harness from wire clip on convection fan, and clip on main PCB casing.



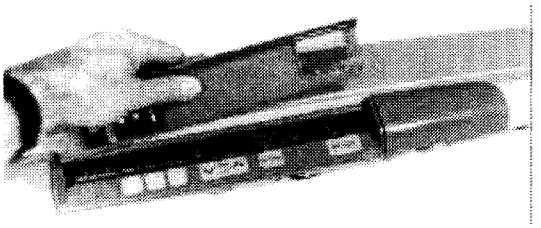
v) Place index finger against side casing nd pull control panel forward with middle finger to release from tab.
vi) Repeat on opposite side, lift panel on both sides to completely remove from appliance, together with top panel.

Pull with middle finger



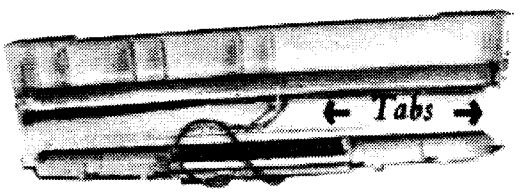
Lift to remove

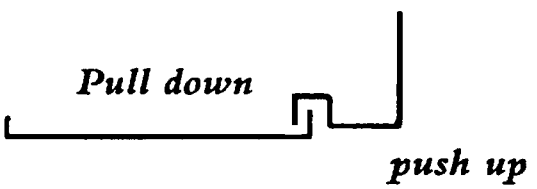
vii) Grip control panel cover and lift up, applying light strength on one side to disconnect the hinge pin from control assembly.



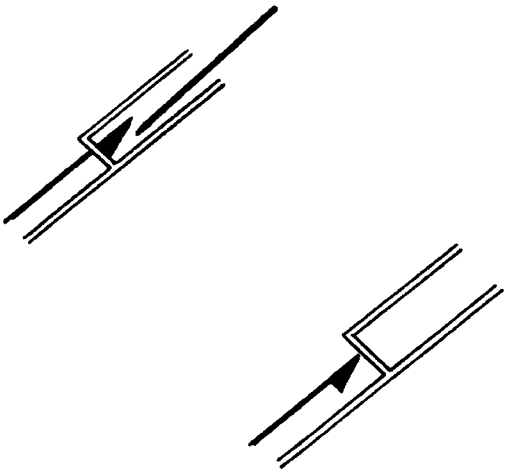
Lift, applying light strength

viii) Control panel and top panel are connected by a strip of tabs. (Tabs are moulded into control panel.) With panels turned over grip each end and push control panel upwards, using the index finger. At the same time push down on top panel support with thumb.





ix) Using a thin bladed screw driver, release the tab securing the control panel assembly.

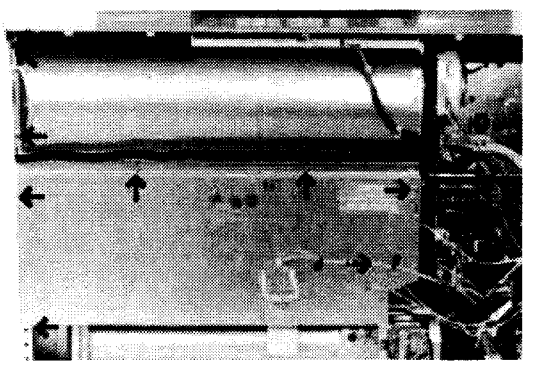


3. Convection Fan/Motor Removal

CAUTION

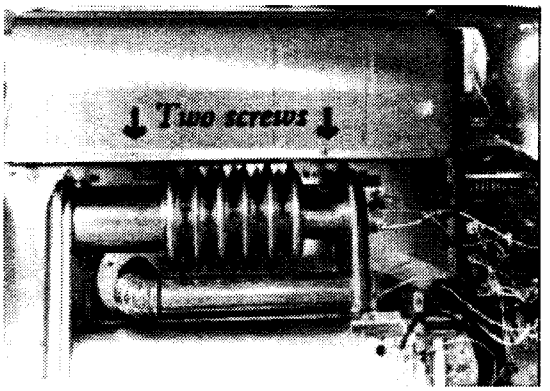
240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.

i) Remove front panel assembly, see section 1.
ii) Remove top panel and control panel assembly, see section 2 ii) ~ vi).
iii) Remove two (2) screws on left hand side which secure complete convection fan assembly to casing.

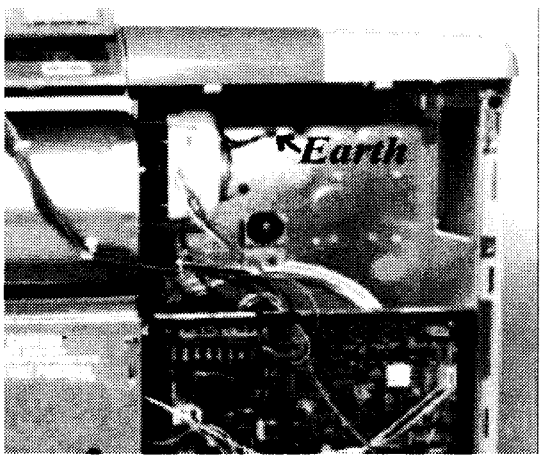


iv) Remove six (6) screws securing heat shield, and lift heat shield off.

v) Remove two screws securing bottom section of the complete convection fan assembly.



vi) Remove two (2) screws on right hand side securing convection fan assembly to casing.
vii) Remove one (1) earth screw.
viii) Release one (1) multi-pin connector from PCB, and remove wires from clip on main PCB casing.



ix) Grip convection fan complete assembly on both sides, pull forward and lift to remove from casing.

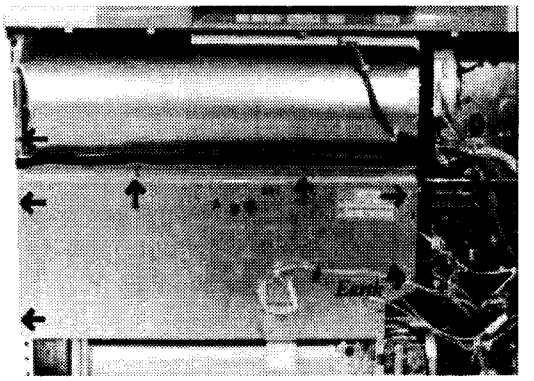
Note: Convection fan blade and/or motor may be replaced individually, however, to avoid problems associated with balancing, Rinnai recommends exchanging the complete assembly.

4. Heat Exchanger Removal

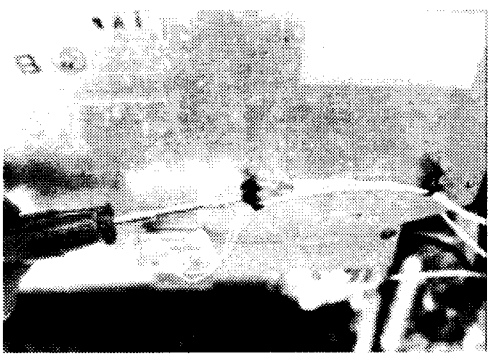
CAUTION

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

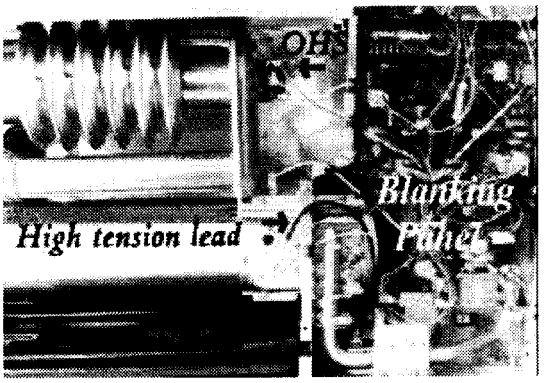
i) Remove front panel assembly, see section 1.
ii) Remove one (1) earth connection on front heat shield.
iii) Release fusible link (pull down) on front of heat shield.
iv) Release six (6) screws securing heat shield.



v) Release fusible link wires from black clamps using screwdriver, and lift off heat shield.

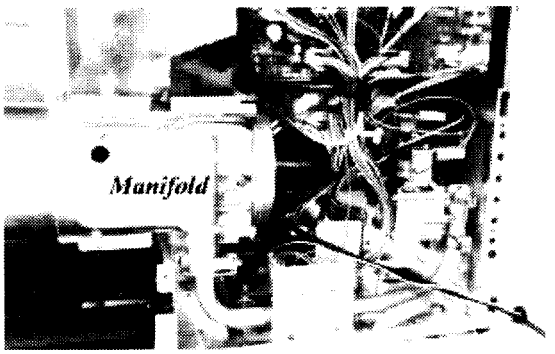


vi) Disconnect overheat switch and thermistor, two (2) screws.
vii) Disconnect flame sensing lead (pull hard).
viii) Remove spark sensing lead, and high tension lead (pull off gently).
ix) Remove blanking panel, one (1) screw.

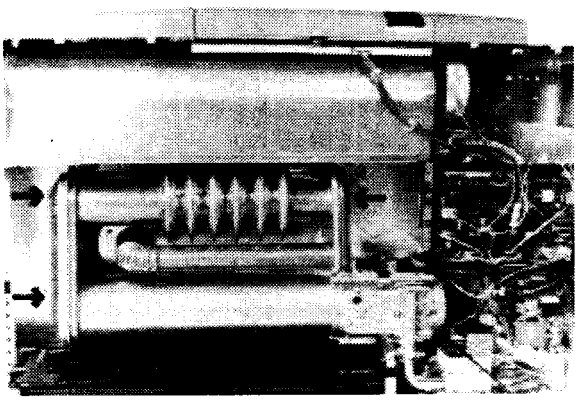


x) Remove one (1) air intake tube securing screw, one (1) gas supply tube securing screw and two (2) heat exchanger securing screws.

xi) Rotate clip at end of gas supply tube and push down on tube to release from manifold.



xii) Remove three (3) heat exchanger securing screws.



xiii) Grip heat exchanger on left hand side, then lift to release it from a tab and pull forward from the left hand side.

Note: Be careful not to damage O-ring on gas supply tube when removing right hand side of heat exchanger assembly.

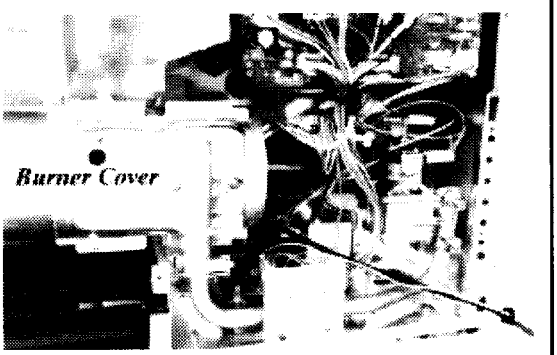
Note: Refer section 5 vi) to disconnect burner from heat exchanger complete assembly.

5. Burner Removal

CAUTION

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

i) Remove front panel assembly, see section 1.
ii) Remove front heat shield, see section 4 ii) ~ v).
iii) Remove blanking panel, one (1) screw.
iv) Remove spark sensing lead and high tension lead (pull off gently).
v) Remove one (1) gas supply tube securing screw.
vi) Remove six (6) burner cover screws; gently manoeuvre forward and out of burner chamber by pulling on manifold.

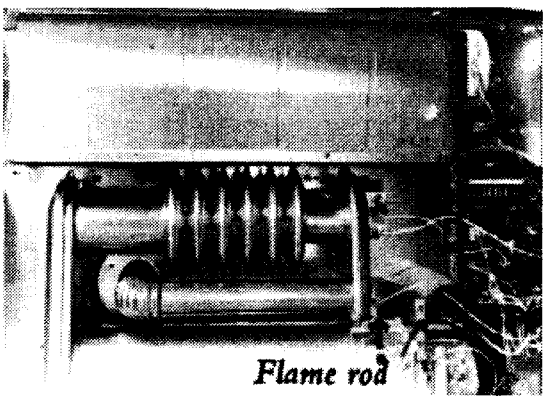


6. Flame Rod Removal

CAUTION

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

i) Remove front panel assembly, see section 1.
ii) Remove front heat shield, see section 4 ii) ~ v).
iii) Remove two (2) screws using a right angled screw driver.

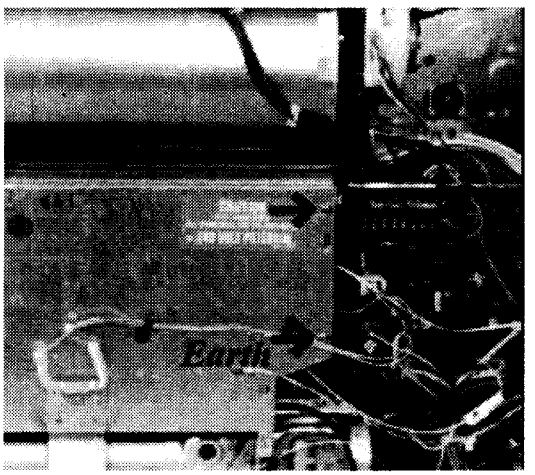


7. Main PCB Removal

CAUTION

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

i) Remove front panel assembly, see section 1.
ii) Release PCB by removing two (2) screws on left hand side.



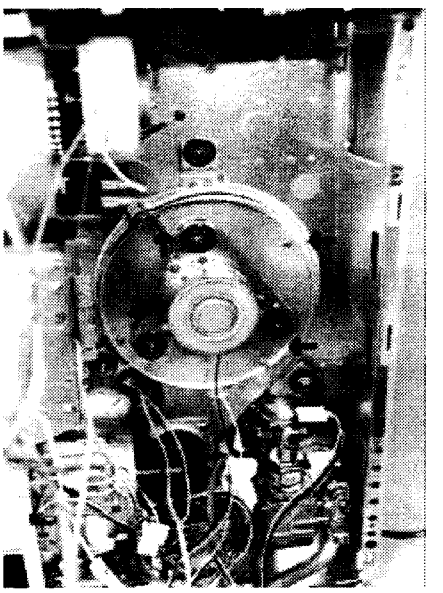
iii) Lift PCB on right hand side and gently manoeuvre it out.
iv) Disconnect all multi-pin connectors and wire harness from clips of PCB casing.
v) Remove one (1) earth connection on front shield.

8. Combustion Fan Removal

CAUTION

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

i) Remove front panel assembly, see section 1.
ii) Remove main PCB, see section 7 ii) ~ iv).
iii) Remove four (4) combustion fan securing screws and one (1) earth screw.



iv) Grip triangular fan motor plate and pull forward to remove fan from casing.

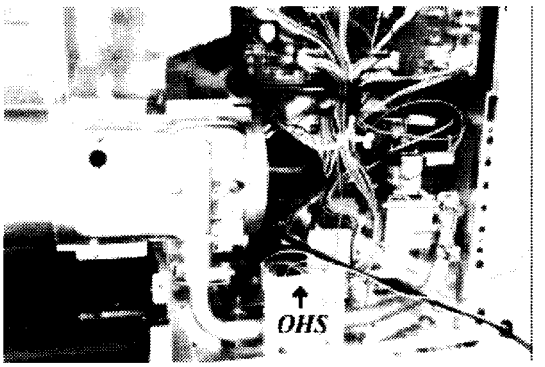
Note: Arrow should be aligned when fan assembly is replaced.

9. Spark Generator/Supply Transformer Removal

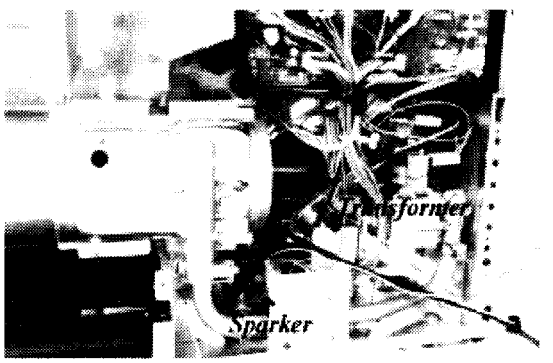
CAUTION

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

i) Remove front panel assembly, see section 1.
ii) Remove OHS bracket in lower right hand section of appliance.



iii) Remove two (2) screws securing the base bracket and lift to remove from unit.



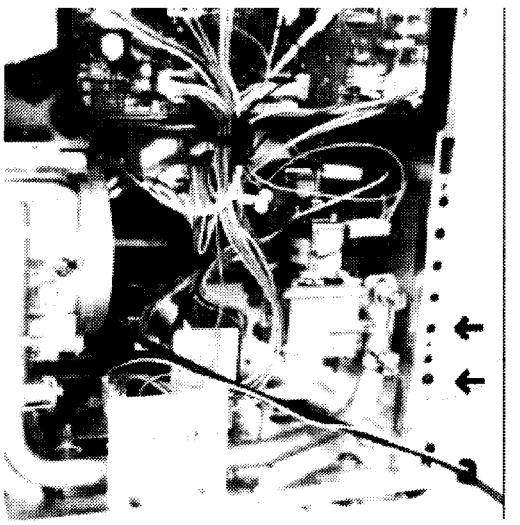
iv) Disconnect transformer at main PCB connector.
v) Disconnect spark generator at sparker board.

10. Gas Control Removal

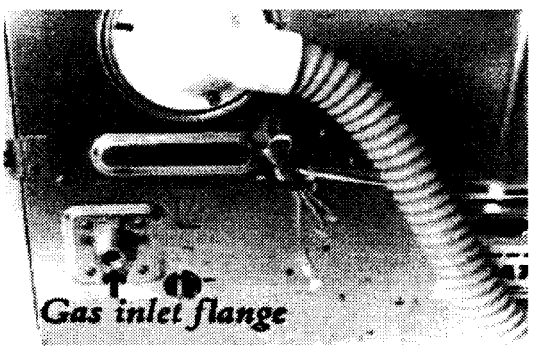
CAUTION

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

i) Turn off gas supply at meter and disconnect appliance from installation.
ii) Remove front panel assembly, see section 1.
iii) Release solenoid connectors and gas supply tube securing screw. Release aluminium tube. Take care with O ring.



iv) Remove four (4) screws surrounding the gas inlet flange.



v) Pull gas control assembly forward to remove from appliance.

Note: Ensure test point screw is fitted to gas controls, if fitting new control.

11. Room Thermistor Removal

Note: Room temperature thermistor and heat exchanger overheat thermistor are connected together as one harness.

CAUTION

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

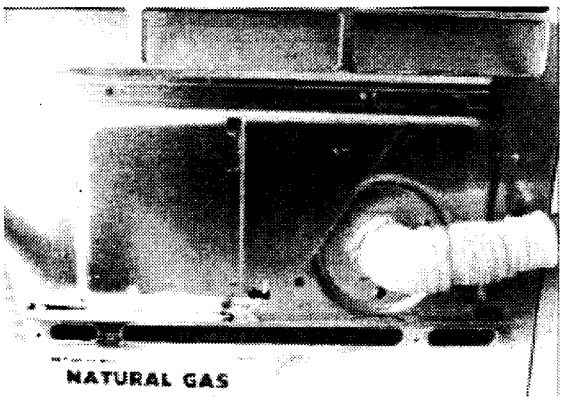
i) Remove front panel assembly, see section 1.
ii) Remove top and right hand side rear spacer panels.
iii) Reach in behind appliance and unclip thermistor from purse locks.
iv) Remove six (6) screws securing heat shield and lift heat shield off. See section 3 iii).
v) Remove overheat thermistor. See section 4 vi).

12. Thermal Fuse Removal

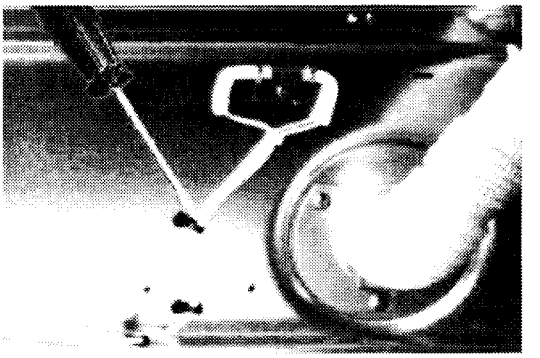
CAUTION

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

i) Turn off gas at meter and disconnect appliance from installation.
ii) Remove front panel assembly, see section 1.
iii) Remove two (2) screws securing thermal fuse cover plate at rear of unit.

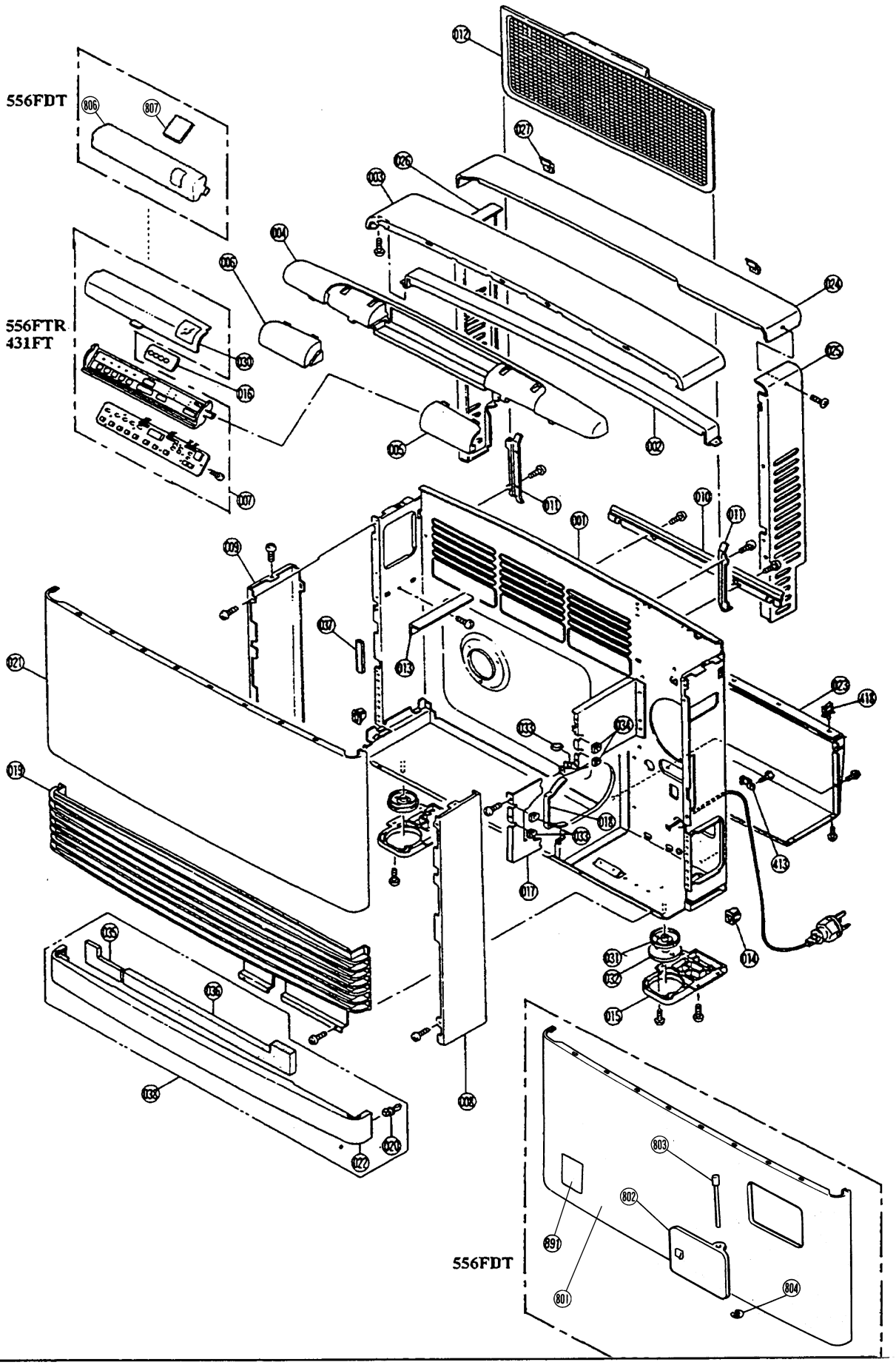


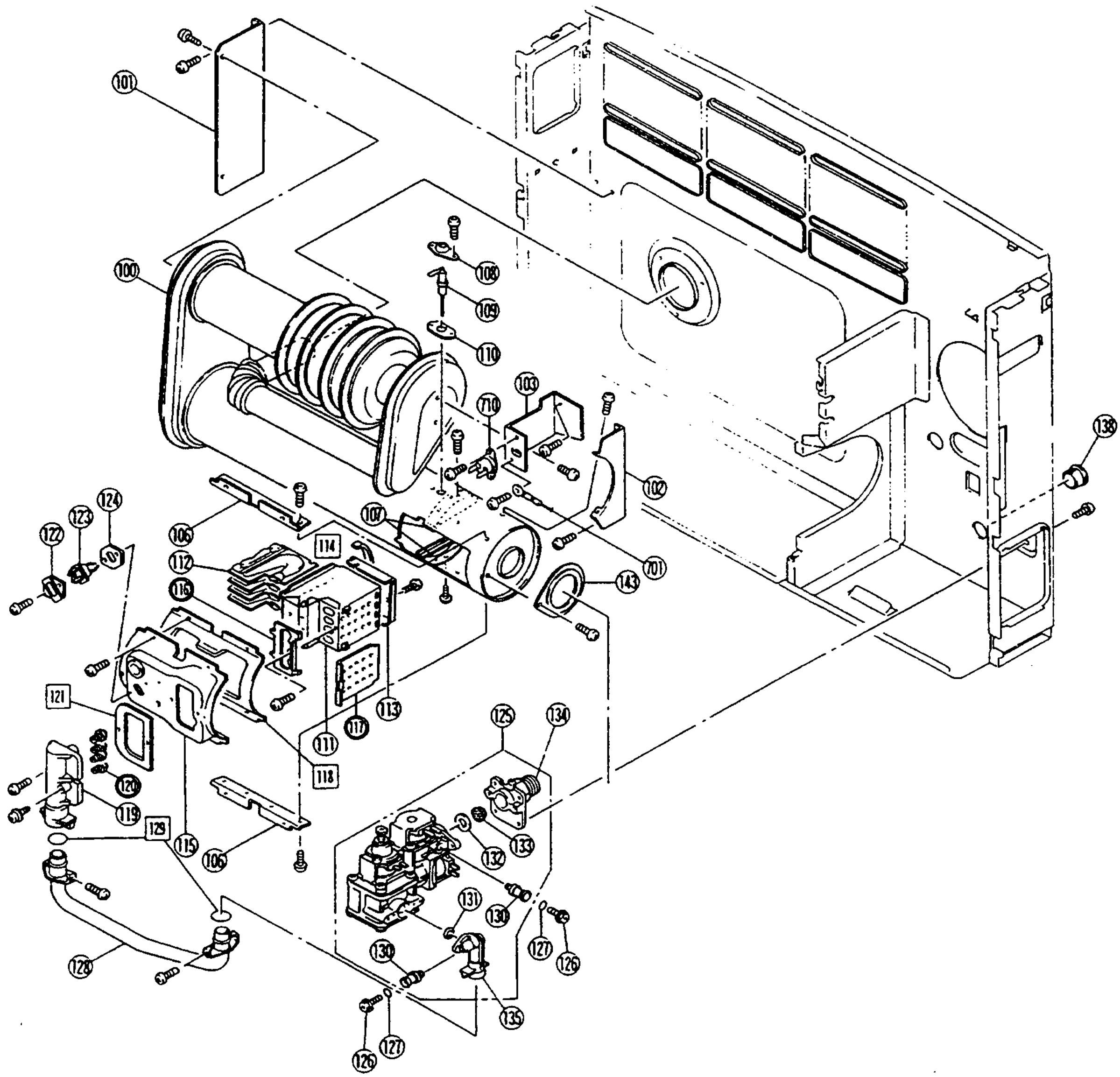
iv) Release thermal fuse (pull down).
v) Release thermal fuse wires from black clamps using screwdriver.



vi) Disconnect wire connector along harness to release completely from appliance.

Exploded Diagram

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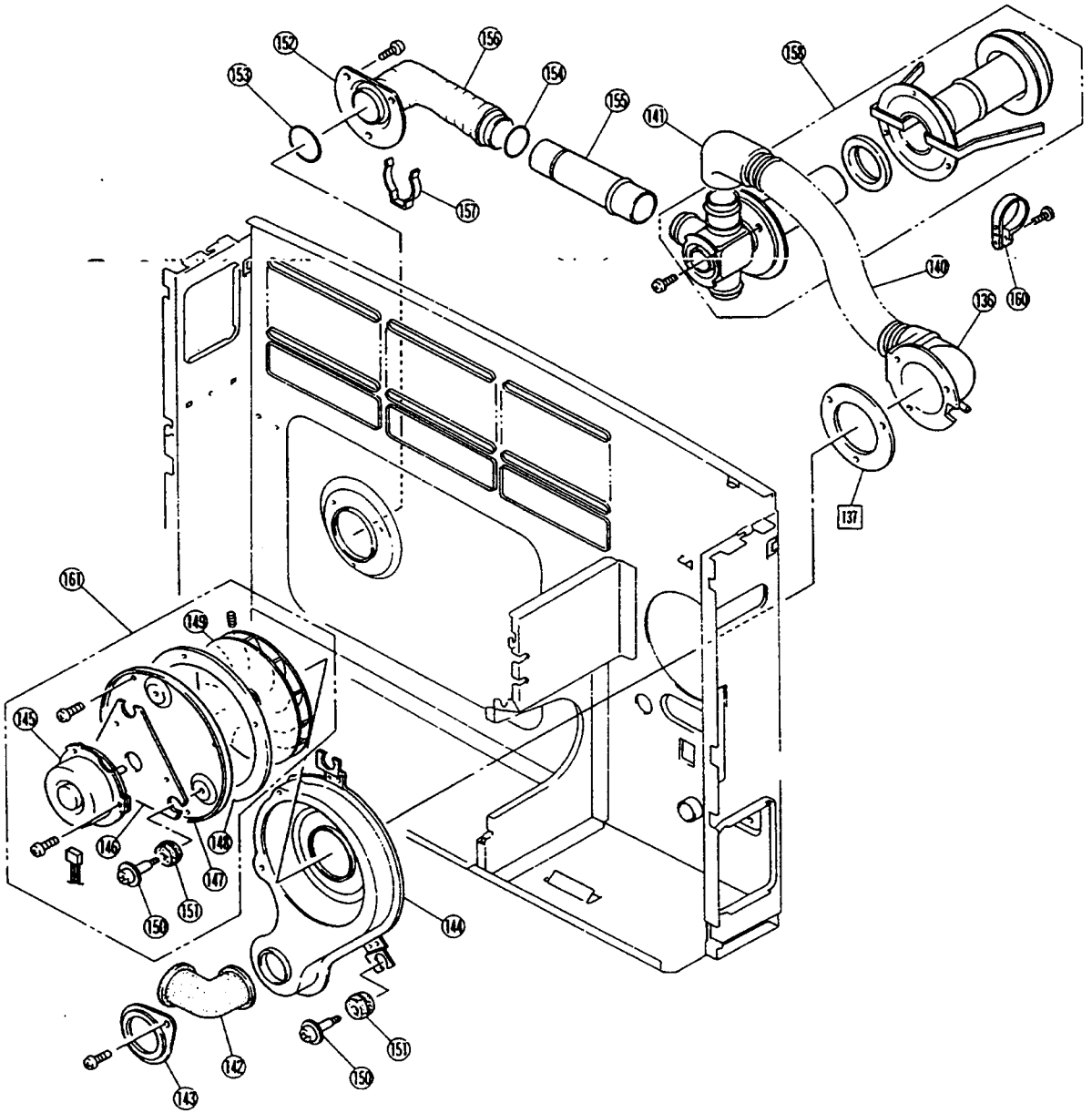
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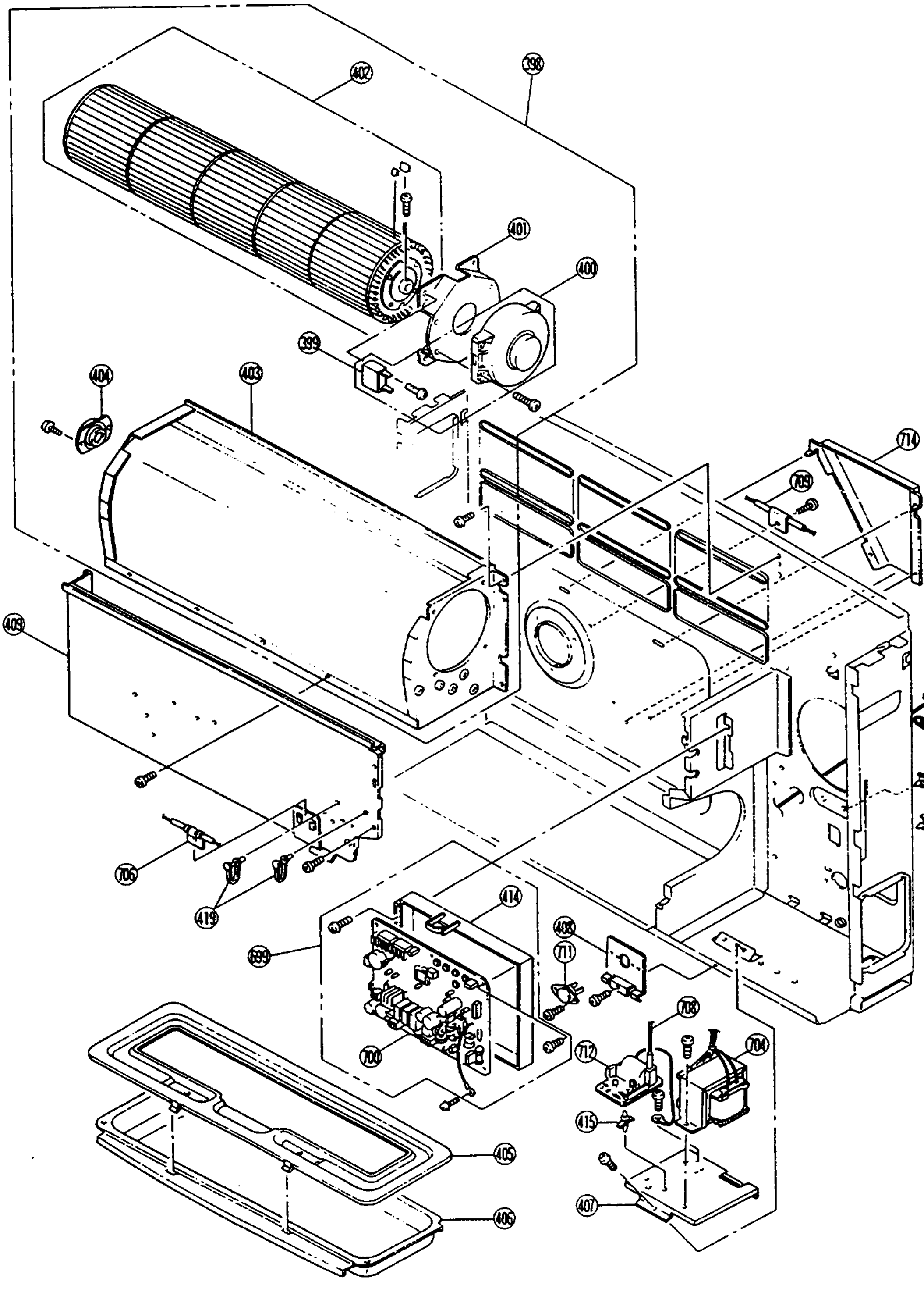
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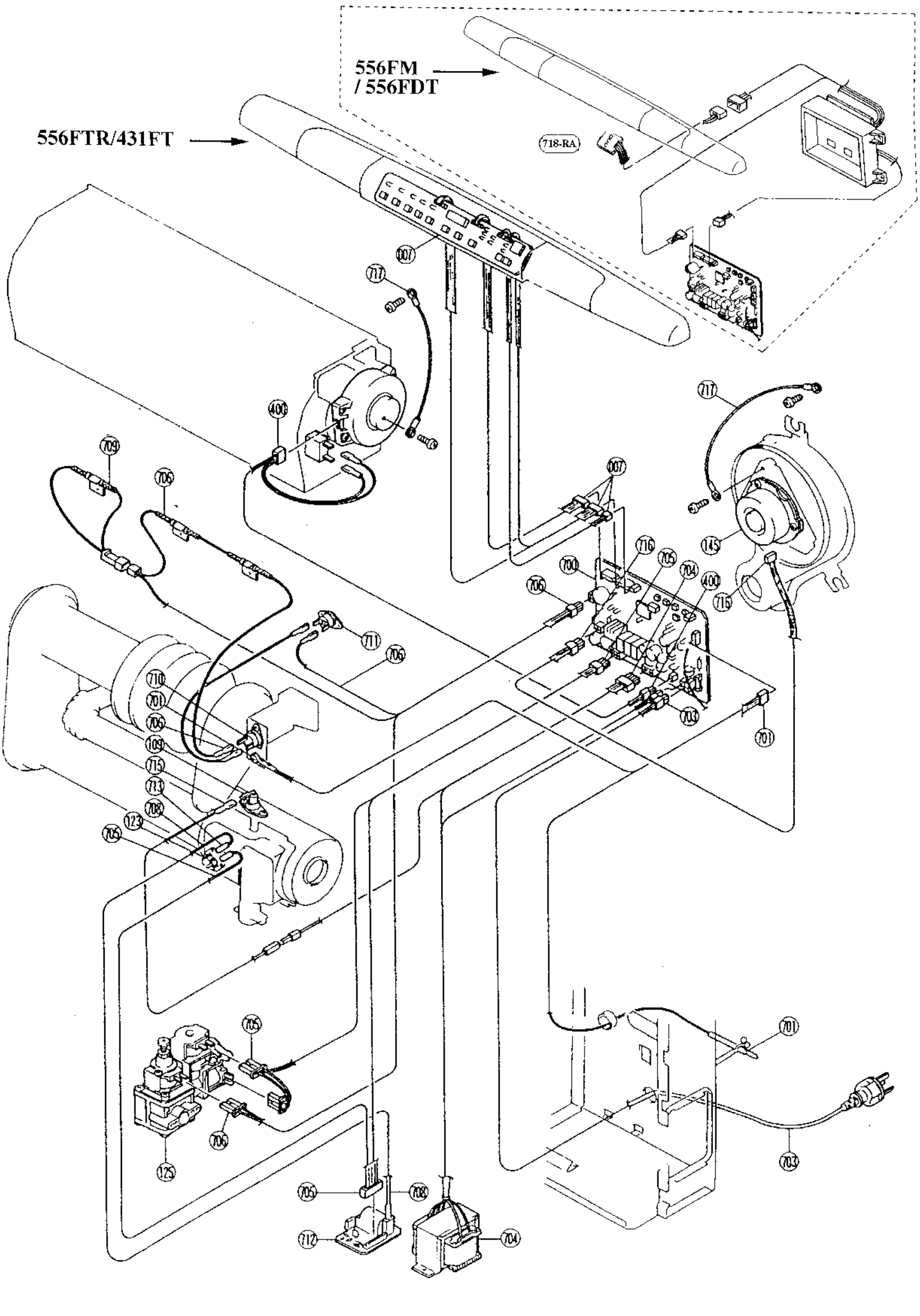
556FM
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No	Part Name	RA Part No	RNZ Part No	QTY
001	Rear Panel Assy C			1
002	Top Panel Support			1
003	Top Panel B	90175472	3000	1
004	Control Panel Plastic Body B	90175480	3006	1
005	Control Panel Moulding RHS B	90175498	3007	1
006	Control Panel Moulding LHS B-1 **(556)**	90175506	3008	1
006	Control PanelMoulding LHS B-3 **(431)**	90178625	3229	
007	Control Panel Complete Assy **(556)**	90175514	3009	1
007	Control Panel Complete Assy **(431)**	90178476		1
008	Side Panel RHS B	90175522	3011	1
009	Side Panel LHS B	90175530	3021	1
010	Filter Clip Bottom			1
011	Filter Clip Sides			2
012	Air Filter Assy B	90175548	3026	1
013	Convection Fan Bracket			1
014	Latch		3028	2
015	Foot		3030	2
016	Remote Control	90175555	3031	
017	Warm Air Sealing Bracket			1
018	Heat Exchanger Packing B	90175563		1
019	Louvre Assy B	90175571	3032	1
020	Strike	90175589	3038	2
021	Front Panel C	90175597	3024	1
022	Bottom Trim Assy B			1
023	Back Panel Heat Shield			1
024	Back Spacer Top B	90175605	3049	1
025	Back Spacer RHS B	90175613	3050	1
026	Back Spacer LHS B	90175621	3060	1
027	Wall Fixing Bracket	90147471	6684	2
030	Control Cover Assy	90178484	3063	1
031	Foot Base Assy	90168337	1610	2
032	Rubber Foot	90168329	4024	2
033	Cord Bush B			3

No	Part Name	RA Part No	RNZ Part No	QTY
34	Cord Bush A			2
35	Heat Insulating Material A		3064	1
36	Heat Insulating Material B		3065	1
37	Packing			1
38	Bottom Trim Complete Assy B	90175647		1
100	Heat Exchanger Complete Assy B **(556)**	90175654	3066	1
100	Heat Exchanger Complete Assy C **(431)**	90178492		1
101	Heat Exchanger Fixing Bracket			1
102	Combustion Chamber Fixing Bracket			1
103	OHS Bracket			1
106	Flange			2
107	Seal Bracket Assy			2
108	Flame Rod Bracket		3068	1
109	Flame Rod	90142803		1
110	Flame Rod Packing	90173113	3069	1
111	Burner Box			1
112	Burner LP/NG	90170630	3091	4
113	Burner Clip Assy			1
114	Burner Box Packing	90175662		1
115	Burner Box Fixing Bracket Assy			1
116	Primary Air Damper	90178559		1
117	Secondary Air Damper LP NG	90170754 90170911		1
118	Fixing Bracket Packing	90175670		1
119	Injector Manifold	90178542		1
120	Main Injector **(556)** LPG NG	90165168 90165036	3092 3093	4
120	Main Injector **(431)** LPG NG	90178526 90178534		4
121	Manifold Packing	90175688	3094	1
122	Electrode Clip		3096	1
123	Electrode	90175696	3097	1
124	Electrode Packing	90173105	3098	1
125	Gas Control Assy LP/NG	90175704	3099	1
126	Pressure Test point Screw			2
127	O-ring			2
128	Gas Supply Connection Tube		3100	1

No	Part Name	RA Part No	RNZ Part No	QTY
129	Gas supply Connection Tube Assy O-ring	90165523	3077	2
130	Pressure Point			2
131	Packing	90176611	3101	1
132	Packing			1
133	Gas Filter			1
134	Gas Inlet (1/2)	90165515		1
135	Elbow B	90165549		1
136	Air Supply Inlet C	90123043		1
137	Air Supply Packing	90123050		1
138	Bush			1
139	Bush			1
140	Flexible Intake Hose	90122961		1
141	Air Intake Elbow	90122953		1
142	Combustion Chamber Flexible Connection Tube	90175720	3102	1
143	Flexible Connection Tube Clip		3103	2
144	Combustion Fan Casing Assy A			1
145	Combustion Motor		3079	1
146	Combustion Motor Fixing Bracket	90165481		1
147	Combustion Fan Cover	90165473		1
148	Blanking Panel Packing	90165465		1
149	Combustion Fan	90165457		1
150	Motor Fixing S Tight Screw			6
151	Mounting Rubber Convection Fan	90122862		6
152	Flue Outlet Connection Assy	90158783		1
153	Sealing O-ring E	90122946		1
154	Sealing O-ring D	90122920		1
155	Flue Outlet Connection B	90158791		1
156	Flue Outlet Cover	90165382		1
157	Insulation Clip	90165374		1
158	Mushroom Flue AA Flue (75-115 mm) A Flue (115-240 mm) B Flue (240-400 mm) C Flue (400-600 mm) D Flue (600-800 mm) E Flue (800-1000 mm)	FM0302AA FM0302A FM0302B FM0302C FM0302D FM0302E		1

No	Part Name	RA Part No	RNZ Part No	QTY
160	Clip	90178146		2
161	Combustion Fan (Complete Assy)	90175738	3105	1
398	Convection Fan (Complete Assy)	90175746	3106	1
399	Capacitor		3107	1
400	Convection Fan Motor		3108	1
401	Convection Fan Motor Base			1
402	Line Flow Fan		3109	1
403	Convection Fan Casing Assy			1
404	Bearing	90156704		1
405	Humidifier Tray Cover		3110	1
406	Humidifier Tray	90175753	3111	1
407	Sparker Fixing Bracket			1
408	OHS Fixing Bracket			1
409	Heat Shield Assy			1
413	Electrical Cord Holder			1
414	PCB Unit Fixing Bracket			1
415	Circuit Board Spacer			4
416	Cable Clip			1
417	Cable Clip			1
418	Wire Clip			3
419	Speed Clip			3
699	PCB Unit Assembly			
700	PCB Unit	90175779	3113	1
701	Room temperature Thermistor	90176787	3144	1
703	Electrical Cord		3115	1
704	Transformer - Australia	90175795		1
705	Transformer - New Zealand		3116	1
706	Wiring harness A Assy		3117	1
708	High tension Lead Assy	90175803		1
709	Thermal Fuse Harness Assy	90175811	2957	1

No	Part Name	RA Part No	RNZ Part No	QTY
710	Overheat Switch (130°C OFF)	90178567		1
711	Overheat Switch (90°C OFF)	90178575		1
712	Sparker	90175829	2958	1
713	Electrode Sleeve			1
714	Thermal Fuse Cover			1
715	Flame Rod Lead Wire			1
716	Motor Harness A			1
717	Convection Motor Earth Wire			2
	Data Plate **(556)** LPG NG	90175977 90175985		1
	Data Plate **(431)** LPG NG			
	Warning Label	90175993		1
	Wiring Diagram **(556)**	90176009		1
	Wiring Diagram **(431)**			
	Warning Label (Electric)	90176017		1
	"Top" Indicator Label for flue & fan	90176025		1
	Gas Energy Rating Label **(556)**	90176033		1
	Gas Energy Rating Label **(431)**			
	Conversion Kit **to NG (556)**	90177445		1
	Conversion Kit **to LPG (556)**	90177452		1
	Conversion Kit **to NG (431)**			
	Conversion Kit **to LPG (431)**			
750	Central ON-OFF Adaption Kit Assy	90175712		1
751	Sub PCB			1
752	Terminal			1
753	Central Harness			1
754	Sub PCB Connector			1
755	Circuit board Spacer			1
756	Bush			1

