SERVICE MANUAL

WICKLESS TYPE KEROSENE HEATER
(2000 Models)

MODEL: Zibro Kamin SRE 156 (Type B)
Zibro Kamin SRE 166 (Type B)
Zibro Kamin SRE 176 (Type B)
Zibro Kamin SRE 250 (Type A)
Zibro Kamin SRE 260 (Type B)
Eurostove Oslo injection (Type B)
Webber SRE 701 injection (Type B)
Stover SRE 702 injection (Type B)
Tectro SRE 703 injection (Type B)

NOTE 1: All the model names in this SERVICE MANUAL are abridged.
(ex. SRE 156 (Type B) → SRE 156)

NOTE 2: All the functions and specifications of Model Oslo, SRE 701, SRE 702 and SRE 703 are same as SRE 156 except the design. Please refer to the items of SRE 156 if you would like to know the contents of Model Oslo, SRE 701, SRE 702 and SRE 703.

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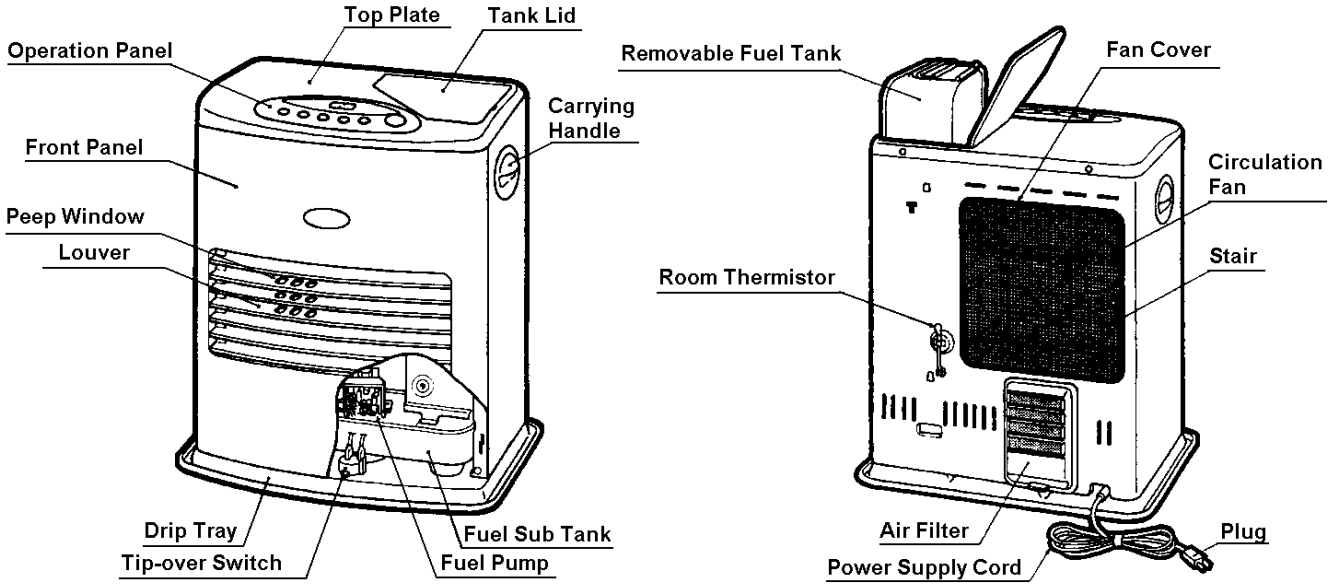
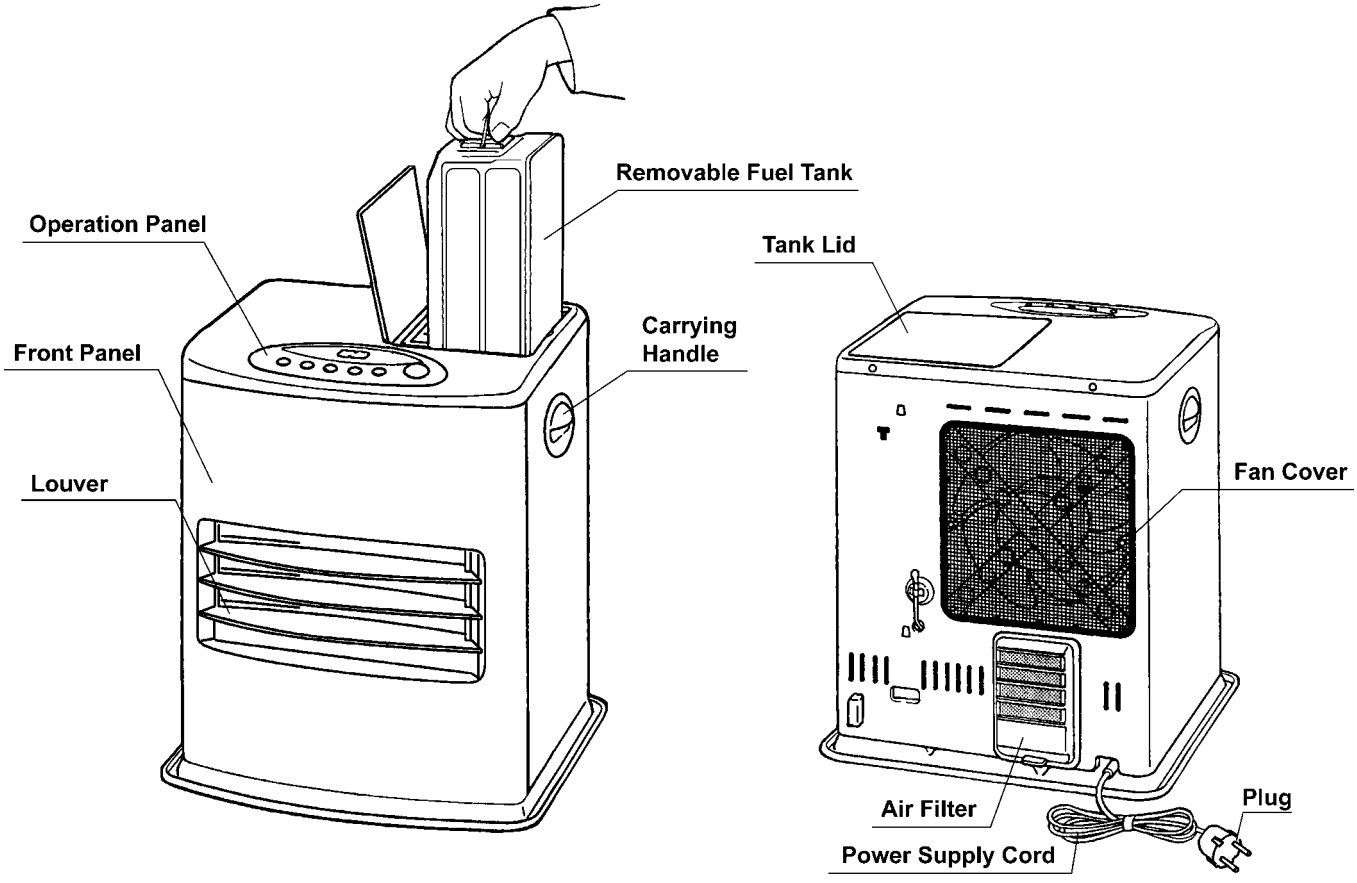
1. OUTVIEW AND SPECIFICATIONS

OUTVIEW

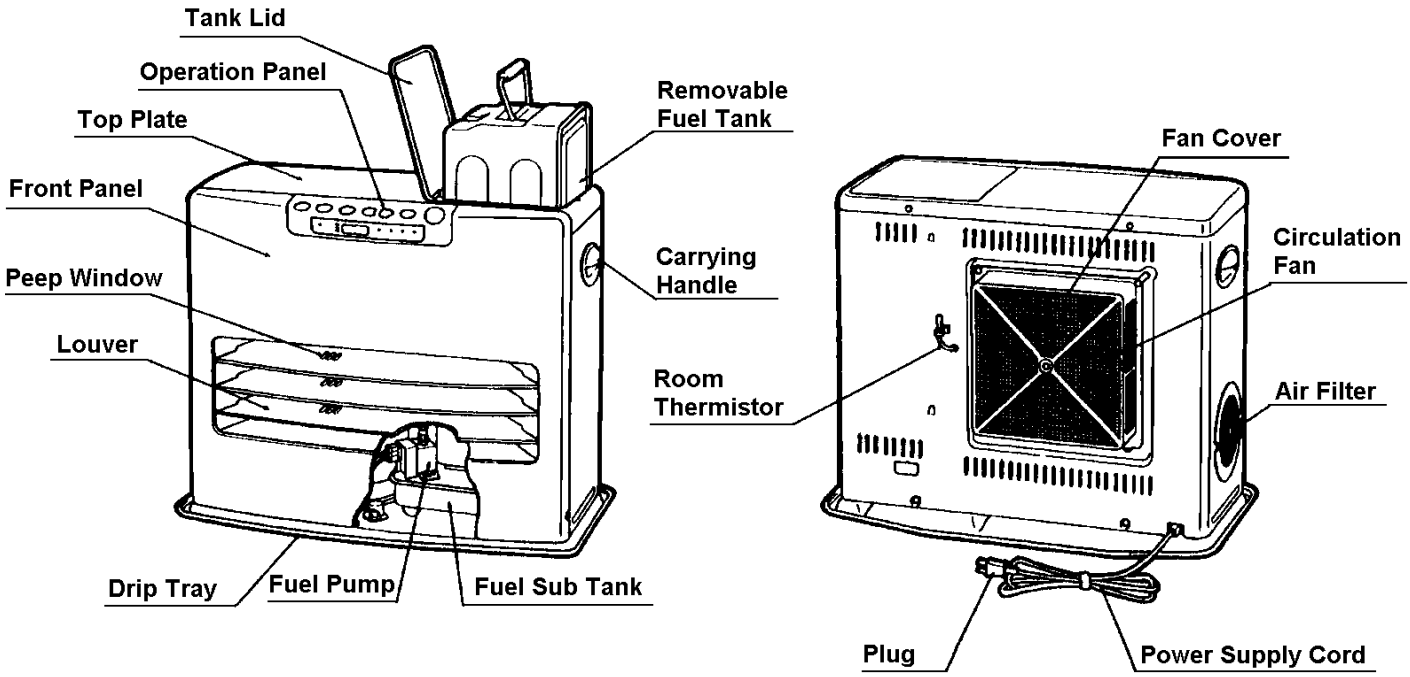
SRE 156



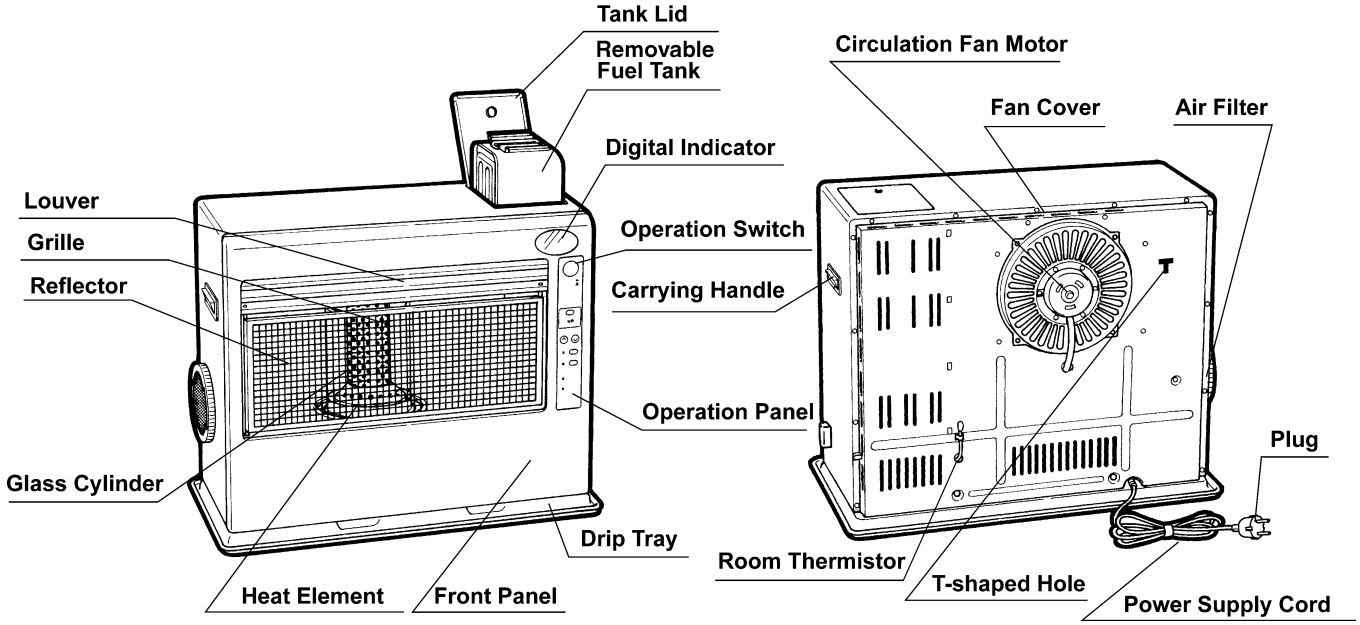
SRE 166



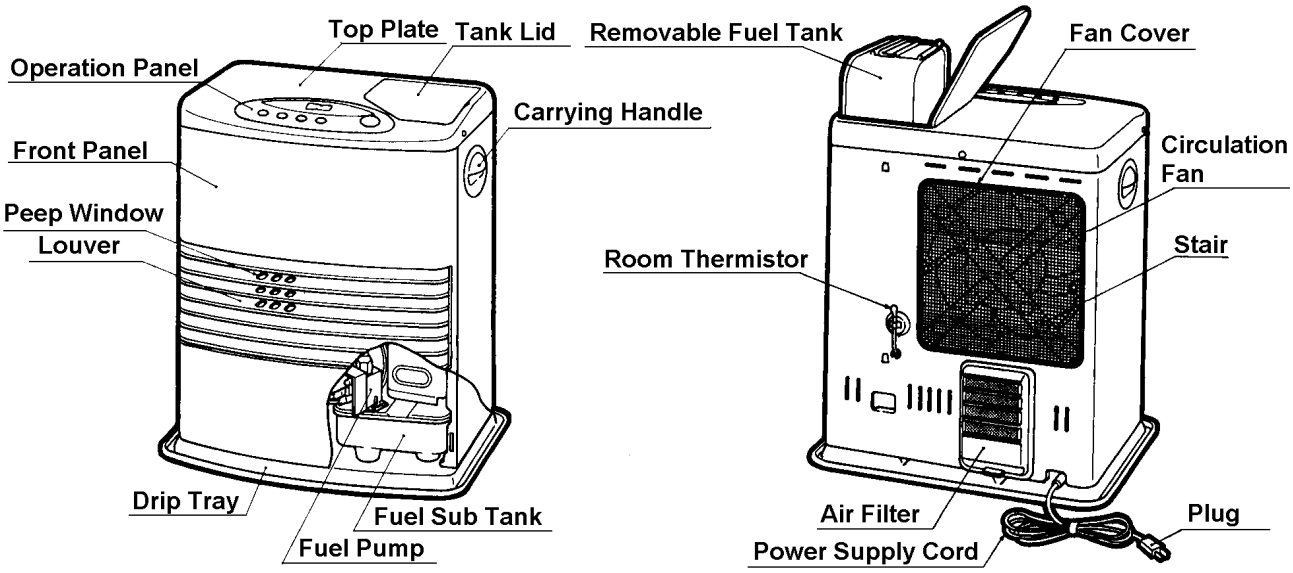
SRE 176



SRE 250, SRE 260

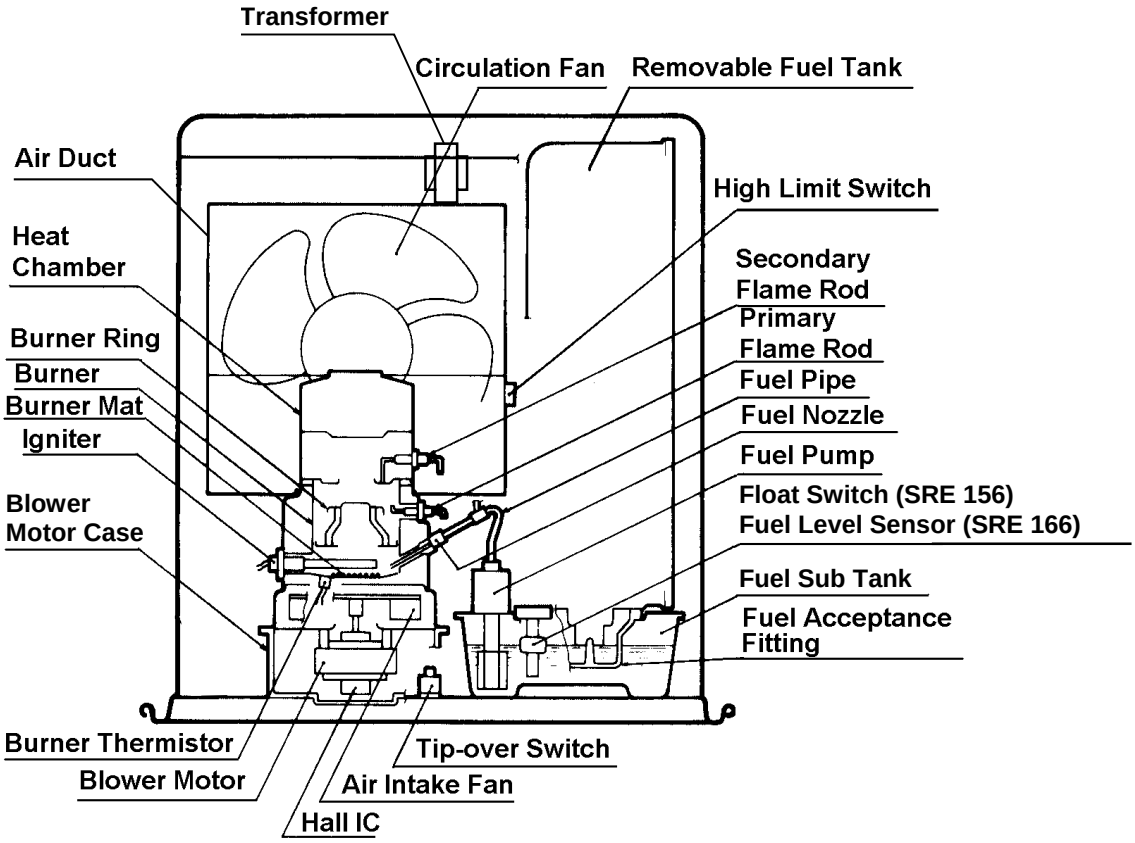


Oslo, SRE 701, SRE 702, SRE 703

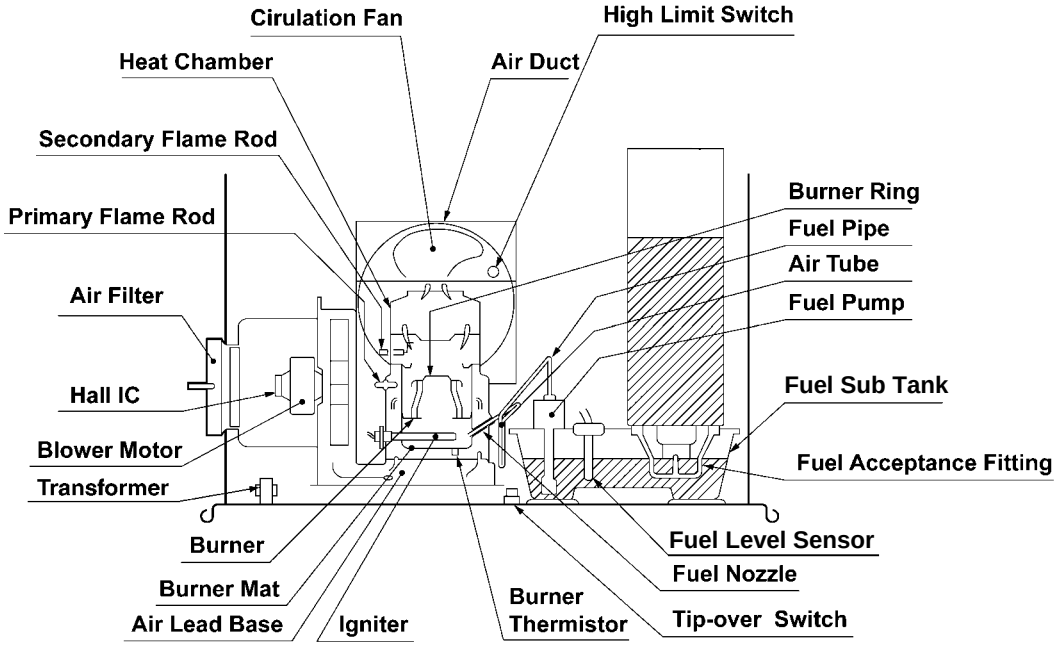


STRUCTUAL ILLUSTRATION

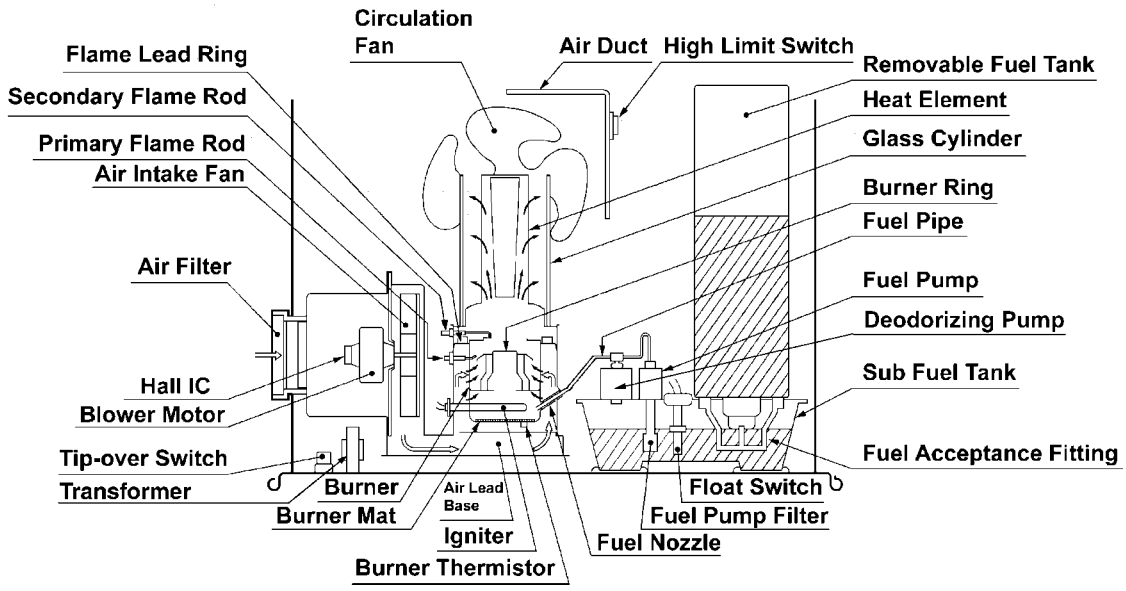
SRE 156, SRE 166



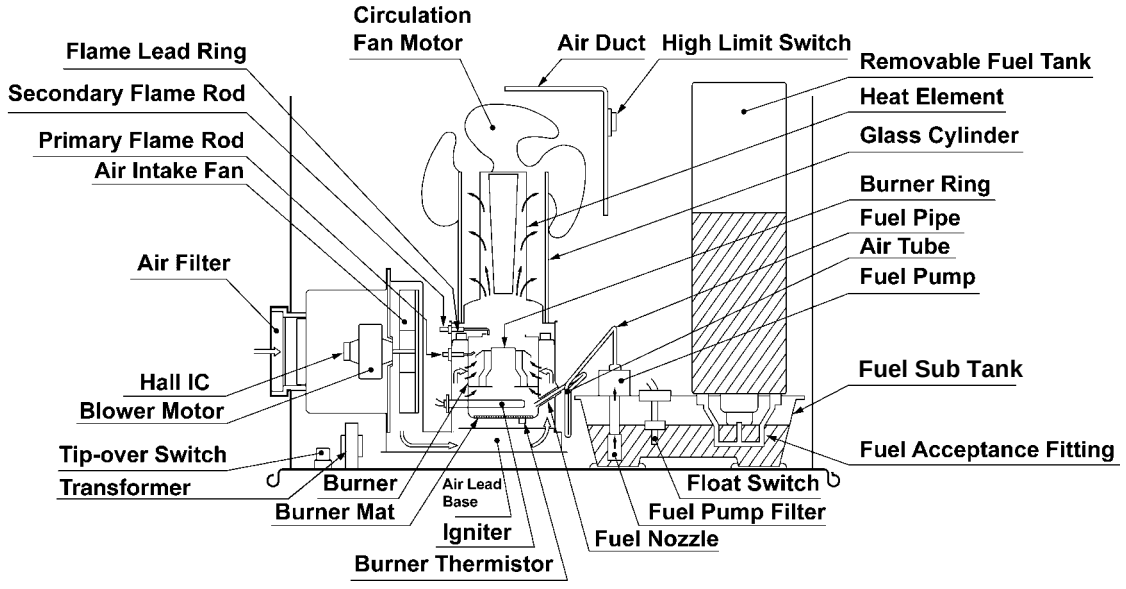
SRE 176



SRE 250



SRE 260



BURNING SYSTEM

(1) When the Power Switch is pressed, the Igniter is electrically generated to preheat the Burner Bottom. The completion time of preheating is detected by electric timer, of which standard time is approximately 90 sec. at a room temperature of 15 °C, provided that it is approximately 180 sec. if the room temperature is lower than 6 °C. In the case of the shortest time (for instance, when re-igniting shortly after extinguishing burning), a shorter time of approximately 40 sec. is obtainable.

(2) Upon the completion of preheating, the combustion air is sent into the Burner, while the fuel is sent from the Fuel Nozzle, at the same time. The fuel is instantaneously evaporated and immediately ignited with the Igniter which has been red-heated at a temperature of higher than 900 °C.

(3) After ignition, “Med-High” burning continues for approximately 40 sec., to raise the temperature of the Burner, after which burning is automatically controlled for the burning sequence of “High ↔ Med-High ↔ Med. ↔ Med.-Low ↔ Low. The Igniter becomes off while the heater is in burning operation. The Burner bottom maintains a high temperature burning of higher than 300 °C by receiving a high radiation heat from the Burner Ring.

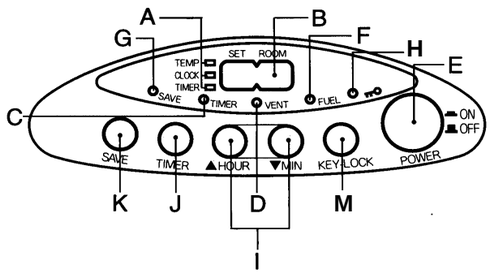
(4) When the Power Switch is pressed again, the burning will cease in around 5 sec. The Circulation Fan will run for approximately 90 sec. and then stop automatically.

SPECIFICATIONS

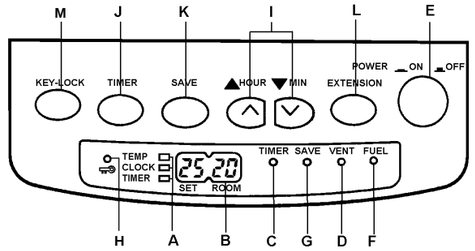
Model		SRE 156	SRE 166	SRE 176	SRE 250	SRE 260	Oslo, SRE 701, SRE 702, SRE 703
Type		Forced draft, unvented, pot type kerosene heater (forced convection type)					
Ignition		Electric					
Fuel		Kerosene					
Heating Power	High	3000 W	3100 W	3700 W	4850 W	6000 W	3000 W
	Low	800 W	800 W	1050 W	1450 W	2450 W	800 W
Fuel Consumption	Max. (High)	0.313 l/h	0.323 l/h	0.385 l/h	0.505 l/h	0.625 l/h	0.313 l/h
	Min. (Low)	0.083 l/h	0.083 l/h	0.109 l/h	0.151 l/h	0.235 l/h	0.083 l/h
Fuel Tank Capacity		Max. 5.4 lit.	Max. 7.6 lit.	Max. 7.6 lit.	Max. 5.1 lit.	Max. 7.1 lit.	Max. 4.0 lit.
Burning Time		17-65 hrs.	23.5-91 hrs.	20-70 hrs.	10.5–35hrs.	11-28 hrs.	13-47 hrs.
Exterior Dimensions (including drip tray)	W (mm)	405	435	550	588	704	374
	D (mm)	295	315	322	320	355	280
	H (mm)	435	437	445	485	560	430
Weight		10 kg	11 kg	12 kg	15 kg	21 kg	9.5 kg
Voltage and Frequency		230V (50Hz)					
Power Consumption	Max.	980 W (A short time in the initial period of ignition)					
	Burning	32 W	32 W	28 W	38 W	44 W	32 W
Current Fuse		4 A					
Safety Device		Tip-over Switch Ignition Safety Device Burning Control Device Safety Device for Power Outage High Limit Switch (Overheat Protector) Incomplete Combustion Preventive Device (Flame Rod, Burner Thermistor)					

2. HOW TO USE

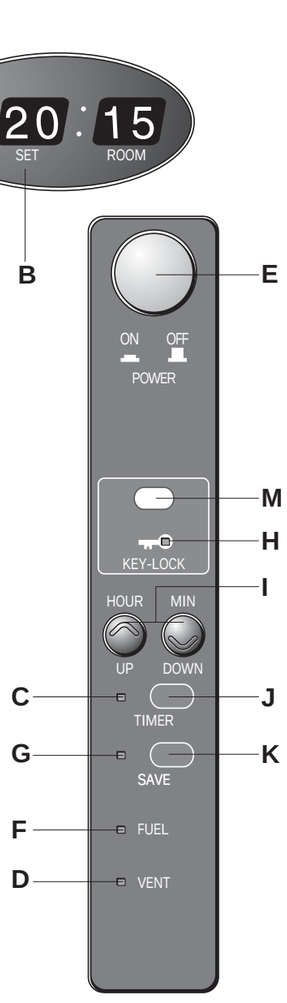
SRE 156, SRE166



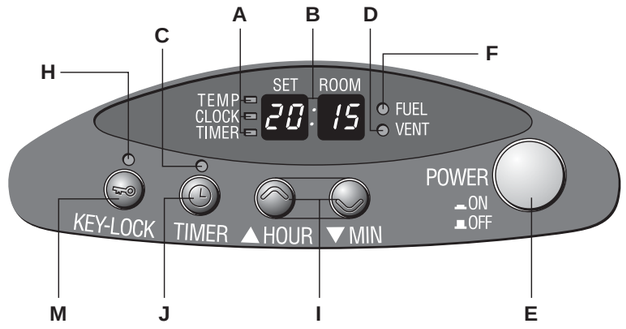
SRE 176



SRE 250, SRE 260



Oslo, SRE 701, SRE 702, SRE 703



A. TEMP., CLOCK, AND TIMER INDICATION LAMPS BY DIGITAL INDICATOR

B. DIGITAL INDICATOR

a. Set Temp. : A set temperature is selective between 6 °C - 28 °C.
b. Room Temp. : Displays a room temperature of 0 °C to 32 °C.
c. Current Time
d. Start Time
e. Remaining Burning Time for Fuel Empty: Displays the remaining burning time 10 to 1 min. Displays "-- --" when heater shut off.
f. Automatic Extinguishment: Displays error code E-0 to E-9, F-0 and F-1 of malfunctions, by self-diagnosis function.

C. TIMER LAMP

Lit: Waiting for timer operation

D. VENT LAMP (ventilation lamp)

Flashes (Stop operation): The indoor air is short of oxygen.
- DO NOT always rely on the VENT lamp, but open the window or the door once or twice an hour for natural ventilation.

E. POWER BUTTON

- Press to "ON" position
- One more press to "OFF" position.

Flashes: Preheating, Lit: Operating

F. FUEL LAMP

Lit: The FUEL Lamp lights up 10 minutes before the removable fuel tank runs out of the fuel, when the buzzer starts buzzing and the remaining burning time is displayed on the digital indicator.
Flashes (Stop operation): The fuel runs out and heater shuts off automatically.

G. SAVE LAMP (except models OSLO, SRE 701, SRE 702 and SRE 703)

Lit: Save mode operation is in use.

H. KEY-LOCK LAMP

Lit: The Key-Lock is in operation.

I. ROOM TEMP/TIME SETTING BUTTON

Set the desired room temperature and the current time.
- Set Room Temperature.: The desired room temperature can be set by pressing the "▲ HOUR " or "▼ MIN" buttons.
- Set Clock: Set the current time by pressing the "▲ HOUR " or "▼ MIN" buttons.

J. TIMER BUTTON

The timer operation starts.

K. SAVE BUTTON (except models Oslo, SRE 701, SRE 702 and SRE 703)

Set or release the save mode operation.

L. EXTENSION BUTTON (SRE 176)

By pressing this button, the remaining heating time will be extended for 60 min.

M. KEY-LOCK BUTTON

When the KEY-LOCK button is pressed more than 3 sec., the childproof lock has been activated.

3. ERROR MESSAGE (E-X or F-X)

Error Code	Main Failure Causes	Related Part	Main Checking Items	Other Checking Items
E-0	The internal temperature of the heater has been overheated.	High Limit Switch	To be continuity at room temperature.	Circulation Fan Cover, Circulation Fan, plugged Air Duct, stained Louvers, Circulation Fan Motor with lack of rotation, Fuel Pump with an excessive fuel flow.
F-0	Electrical power has been restored after an extinguishment by electrical power failure.	Main Circuit Board	Appropriate electric conductance must be provided when the heater “ON” and “OFF”.	Power failure recovered, or cracked solder on the Main Circuit Board.
E-1	Room Thermistor malfunction.	Room Thermistor	Resistance should exist (8 – 35 kΩ)	
F-1	Burner Thermistor malfunction. Burner has been lack of preheating.	Burner Thermistor	Resistance should exist (several MΩ to 5 kΩ)	Igniter (black coated: 40 – 49 Ω at normal temperature)
E-2	Re-ignition has been given immediately after extinguishment. Primary Flame Rod current was low at ignition.	Primary Flame Rod (Ignition safety device)	Electric current to be more than 0.3 µA within 40 sec. after ignition.	Fuel Pump with small fuel flow rate, plugged Fuel Pump Strainer, Transformer voltage is low, Flame Rod and/or Burner Ring whitened, leak, plugged Air Filter.
E-5	Tip-over Switch has been actuated.	Tip-over Switch	Electric conductance to exist at ordinary operation.	Check on the installed conditions (inclination and/or vibration)
E-6	Primary Flame Rod current has been low in combustion.	Primary Flame Rod (Incomplete combustion preventive device)	Current to be more than 2 µA in 2 min. and 30 sec. after ignition.	Plugged Fuel Pump Strainer, plugged Air Filter, Flame Rod and/or Burner Ring whitened, removed / deformed burner mat.
E-7	Room temperature exceeds 32 °C.	Room Thermistor	Resistance should exist (8 – 35 kΩ)	Installing place of the heater (direct sunbeams, distance between the rear side of the heater and the wall)
E-8	Blower Motor malfunction.	Hall IC	Output voltage to be approx. DC 2.5 V in operation.	Blower Motor
E-9	Secondary Flame Rod current with an excessive airflow has been low.	Secondary Flame Rod (Ignition safety device)	Current to be more than 0.3 µA within 2 minutes and 30 sec. after ignition.	Fuel Pump with small fuel flow rate, plugged Fuel Pump Strainer, Flame Rod and/or Burner Ring whitened, Blower Motor with abnormal rotation, plugged Air Filter
-- --	*Care must be taken, since there is also be a normal condition.			
Ventilation (VENT) Lamp	The bottom of the burner has been cooled off.	Burner Thermistor	3 – 20 kΩ in 20 min. after ignition.	Installing place of the heater (abnormal pass of cold air)
Fuel Lamp	Out of fuel.	Float Switch or Fuel Level Sensor	Switch changes over by fuel level.	Plugged Fuel Tank Cap and/or Fuel Acceptance Fitting (fuel condition, configuration)
All Lamps Off	Fuse open.	Fuse for electric current	Receptor to be of AC 230 V.	Blower Motor, Circulation Fan Motor, Surge Absorber on the Main Circuit Board
All Lamps Off (This is normal)	Stand-by position	-	If display returns back after press of any buttons (except Operation Switch)	-

4. OVERHAULING PROCEDURE

CAUTION **Be sure to unplug the heater and allow the heater cool completely before overhauling. Before removing the screws from the components which are subjected to burning, use penetrating oil and allow at least 10 min. for it to work.**

SRE 156, SRE 166, Oslo, SRE 701, SRE 702, SRE 703

● **FRONT PANEL:**

(1) Remove four (4) screws (SRE 156, 166) or three (3) screws (Oslo, SRE 701, SRE 702, SRE 703) from the Top Plate and disconnect the three (3) lead wires from the Main Circuit Board.

CAUTION **This work must be given by firmly holding the Circuit Board Base.**

(2) Shift the Front Panel from lower to upper and disengage its claws from the Cabinet.

CAUTION **When reassembling these parts, insert the left claw of the Front Panel first and then assemble the right side.**

● **HEAT CHAMBER:**

(3) Remove one (1) screw from the Heat Chamber.

(4) Draw the Heat Chamber assembly to front side.

(5) Disconnect the lead wire from the Secondary Flame Rod on the Heat Chamber.

● **MAIN CIRCUIT BOARD:**

(6) Disconnect the lead wires from the Main Circuit Board.

(7) Pinching the six (6) heads of PCB support with the radio pliers and remove the Main Circuit Board.

● **CABINET:**

(8) Unclamp the lead wires from the Heat Shield Plate for the Removable Fuel Tank.

(9) Remove the Air Filter from the rear side of the Cabinet.

(10) Remove three (3) screws from both front side and rear side and then remove the Cabinet by pulling straight upward.

● **BURNER RING:**

(11) Remove the Burner Ring by carefully pulling its assembly upward and turning counterclockwise.

● **BURNER MAT:**

(12) The Burner Mat is adhered to the burner bottom with adhesive. When replacing the Burner Mat, closely adhere it to the burner bottom with Burner Mat Adhesive in the same way.

● **IGNITER:**

(13) Remove two (2) screws from the Igniter Cover.

(14) Remove the Igniter by securely holding and turning its ceramic part with large size pliers.

● **FUEL PIPE:**

(15) Remove the Fuel Pipes by releasing the flare nuts from the Fuel Nozzle and the Fuel Pump with double wrenches.

CAUTION **Remove the Fuel Pipe from the Fuel Nozzle side first in order to prevent fuel spillage into the Burner.**

● **FUEL NOZZLE:**

(16) Remove two (2) screws from the Fuel Nozzle.

CAUTION **Do not lose the Fuel Nozzle Gasket.**

● **PRIMARY FLAME ROD:**

(17) Remove two (2) screws from the Primary Flame Rod.

CAUTION **Do not break the Gasket for the Primary Flame Rod.**

CAUTION **Do not change the direction of the Primary Flame Rod, when reassemble it. Refer to "The Position of Primary Flame Rod" on page 28.**

● **FUEL PUMP:**

(18) Remove two (2) screws from the Fuel Pump.

● **BURNER THERMISTOR:**

(19) Remove the Thermistor bushing from the Air Duct.

(20) Remove one (1) screw from the Burner and one (1) screw of earth lead wire to raise Burner.

(21) Remove the Burner Thermistor with wrenches.

CAUTION **Do not twist the lead wires when disconnecting the Burner Thermistor.**

● **BLOWER MOTOR:**

(22) Disassemble the Blower Motor Case by removing five (5) screws.

CAUTION **Do not mix these screws with other screws, since they are especially used for the plastic parts.**

(23) Remove the Blower Motor Base and the Blower Motor assembly.

CAUTION **When reassembling the Blower Motor Case and the Blower Motor Base, be sure to pass the lead wires of the Blower Motor through the recessed portion of the Blower Motor Base, which may otherwise cause the Blower Motor lead wires to be shorted or burner pressure to rise excessively.**

● **FLOAT SWITCH (SRE 156, Oslo, SRE 701, SRE 702, SRE 703):**

(24) Remove the Float Switch by turning counterclockwise with large size pliers.

CAUTION **When reassembling the Float Switch, securely position the Switch so that it is not caught with the Removable Fuel Tank.**

● **FUEL LEVEL SENSOR (SRE 166):**

(25) Pull out Fuel Level Sensor upward.

● **TIP-OVER SWITCH:**

(26) Remove one (1) screw from the Tip-over Switch.

● **AIR DUCT:**

(27) Remove two (2) screws from the Circulation Fan Cover, and remove to pull the filter at the center portion in such a manner that it is not deformed.

CAUTION **For reassembling the parts, engage the upper and lower ends of the Circulation Fan Cover with the upper and lower claws of the Cabinet and secure the parts with the screws at two places.**

(28) Remove four (4) screws from the Circulation Fan Motor Bracket and the Cabinet, to disassemble the Air Duct.

● **HIGH LIMIT SWITCH (Overheat Protector):**

(29) Take the Air Duct out and remove two (2) screws from the High Limit Switch, which is attached to the Air Duct.

● **CIRCULATION FAN:**

(30) Remove four (4) screws from the Circulation Fan Motor bracket, to dismount the Circulation Fan Motor assembly.

(31) Release one (1) nut (counterclockwise) from the Motor Shaft.

● **POWER SWITCH:**

(32) Remove the two (2) screws from the Power Switch Circuit Board.

● **OPERATION PANEL BASE:**

(33) Disassemble the Operation Panel Base, by disengaging the two claws.

CAUTION **Care is to be taken not to damage the lead wires.**

SRE 176

● **FRONT PANEL:**

(1) Remove the two (2) screws from the Louver and shift the Front Panel from lower to upper and disengage its claws from the Cabinet.

● **HEAT CHAMBER:**

(2) Remove one (1) screw from the Heat Chamber

(3) Draw the Heat Chamber to front side.

(4) Disconnect the lead wire of the Secondary Flame Rod from the Heat Chamber.

● **TOP PANEL:**

(5) Remove four (4) screws from Top Plate and disconnect three (3) lead wires from the Main Circuit Board.

● **MAIN CIRCUIT BOARD:**

(6) Disconnect the lead wires from the Main Circuit Board.

(7) Pinching the head of the PCB Support with the radio pliers and remove the Main Circuit Board.

● **CABINET:**

(8) Remove the Air Filter.

(9) Remove the four (4) screws from the both sides of the front and the rear side of the Cabinet and next pull the Cabinet straight upward.

● **BURNER RING:**
(10) Disassemble the Burner Ring by carefully raising and next turning left.

● **BURNER MAT:**
(11) The Burner Mat is adhered to the burner bottom with adhesive. When replacing the Burner Mat, closely adhere it to the burner bottom with Burner Mat Adhesive in the same way.

● **IGNITER:**
(12) Remove the two (2) screws from the Igniter.
(13) Remove the Igniter by pinching and turning its ceramic part with the large size pliers.

● **PRIMARY FLAME ROD:**
(14) Pull off the terminal for Primary Flame Rod and remove the two (2) screws.
CAUTION Do not break the Gasket for the Primary Flame Rod.

CAUTION Do not change the direction of the Primary Flame Rod when reassemble it. Refer to "The Position of Primary Flame Rod" on page 28.

● **FUEL PIPE:**
(15) Remove the Fuel Pipes by releasing the Flare Nuts from the Fuel Nozzle and the Fuel Pump with double wrenches.

● **FUEL NOZZLE:**
(16) Remove the two (2) screws from the Fuel Nozzle.
CAUTION Care is to be taken not to lose the Gasket.

● **BURNER THERMISTOR:**
(17) Disengage the Thermistor bushing from the Air Duct or lower part of Heat Chamber.

(18) Remove three (3) screws and raise the Heat Chamber.

(19) Remove the Thermistor with the wrenches.
CAUTION Care is to be taken not to twist the lead wire of the Thermistor, when removed.

● **FUEL PUMP:**
(20) Remove the two (2) screws from the Fuel Pump.

● **FUEL LEVEL SENSOR:**
(21) Pull out Fuel Level Sensor upward.

● **TIP-OVER SWITCH:**
(22) Remove one (1) screw from the Tip-over Switch.

● **TRANSFORMER:**
(23) Remove one (1) screw from the Transformer.

● **BLOWER MOTOR:**
(24) Remove the two (2) screws from the Blower Motor and two (2) screws from the Blower Motor Base.

(25) Remove the five (5) screws from the Air Intake Fan Case.

(26) Remove one (1) nut (counterclockwise) from Air Intake Fan.

(27) Remove three (3) screws from Blower Motor Case.

(28) Remove the two (2) screws from Blower Motor.

CAUTION **When assembling the Blower Motor Base, be sure to pass the lead wire of the Blower Motor through the recess of the Blower Motor Case, which may otherwise cause the Motor lead wire to be shorted or the Burner pressure to rise.**

● **HIGH LIMIT SWITCH:**

(29) Remove two (2) screws from the High Limit Switch of Air Duct.

● **AIR DUCT:**

(30) Remove the Air Duct from the Cabinet, by disengaging the claws from the Rear Panel.
NOTE: Correct the claws for Cabinet, if deformed.

● **CIRCULATION FAN:**

(31) Remove the two (2) screws from Fan Cover.

(32) Remove two (2) screws from Circulation Fan Motor Bracket.

(33) Remove three (3) screws from Circulation Fan Motor.

● **OPERATION PANEL BASE:**

(34) Remove two (2) screws from Operation Panel Base.

● **POWER SWITCH:**

(35) Remove two (2) screws from the Power Switch Circuit Board.

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● **GRILLE:**

(1) Remove one (1) screw from lower center of the Grille. Lift the pillars of Grille from the Reflector. Take the Guard toward you then let down to disassemble the Guard.

● **FRONT PANEL:**

(2) Remove two (2) screws of the lower part sides of Front Panel. Shift the Front Panel from lower to upper and disassemble it from the cabinet.

(3) Disconnect three (3) lead wires from Main Circuit Board wiring from Operation Panel Circuit Board on the Front Panel.

● **CABINET:**

(4) Disconnect three (3) lead wires of Circulation Fan, Room Thermistor and High Limit Switch from upper part of Cabinet wiring from Main Circuit Board.

CAUTION **Hold Main Circuit Board when disconnect wire.**

(5) Remove the Removable Fuel Tank. Remove Air Filter from the side of the Cabinet.

(6) Remove two (2) screws from side and one (1) screw from rear side of the Cabinet.

(7) Remove the Cabinet by pulling straight upward.

● **HEAT ELEMENT ASSEMBLY:**

(8) Remove two (2) screws from Heat Element Assembly and remove Heat Element Assembly.

● **GLASS CYLINDER:**
(9) Remove one (1) screw of Belt on the Glass Cylinder

● **SECONDARY FLAME ROD:**
(10) Disconnect red lead wire of Secondary Flame Rod

(11) Remove two (2) screws from Secondary Flame Rod. Disassemble Secondary Flame Rod pulling toward you.

● **BURNER ASSEMBLY:**
(12) Disassemble the Flame Lead Ring.
CAUTION **Do not put upside-down the Flame Lead Ring when reassemble.**

(13) Lift the Burner Ring Assembly then disassemble it by turning left.

● **BURNER MAT:**
(14) The Burner Mat is adhered to the burner bottom with adhesive. When replacing the Burner Mat, securely put it to the burner bottom with Burner Mat Adhesive in the same way.

● **MAIN CIRCUIT BOARD:**
(15) Disconnect the lead wires from the Main Circuit Board. Remove two (2) screws and remove Controller Base from the Drip Tray.
CAUTION **Hold Main Circuit Board when disconnect wire.**

(16) Pinching the head of PCB support with pliers and remove the Main Circuit Board.

● **TRANSFORMER:**
(17) Remove one (1) screw of the Transformer and remove it.

● **TIP-OVER SWITCH:**
(18) Disconnect the connector of Tip-over Switch, remove one (1) screw and disassemble it.

● **IGNITER:**
(19) Remove two (2) screws from the Igniter Cover.

(20) Remove the Igniter by securely holding its ceramic part with large size pliers and turning it.

● **PRIMARY FLAME ROD:**
(21) Disconnect blue lead wire and remove two (2) screws from the Primary Flame Rod.
CAUTION **Do not break the Gasket for the Primary Flame Rod.**

CAUTION **Do not change the direction of the Primary Flame Rod when reassemble it. Refer to "The Position of Primary Flame Rod" on page 28.**

● **FUEL PIPE:**
(22) Remove the Fuel Pipes by releasing the flare nuts from Fuel Nozzle side and Fuel Pump side with double wrenches.
CAUTION **Remove the Fuel Pipe first from the Fuel Nozzle side to prevent fuel spillage into the Burner.**

● **FUEL NOZZLE:**
(23) Remove two (2) screws from the Fuel Nozzle.
CAUTION **Do not lose the Fuel Nozzle Gasket.**

● **BURNER THERMISTOR:**
(24) Remove three (3) screws and lift the Heat Chamber Assembly.
CAUTION **Do not break the Burner Thermistor under the Heat Chamber Assembly.**

(25) Disengage the Thermistor bushing from the Heat Chamber Assembly.

(26) Pull out the lead wire from the Heat Chamber Assembly. Remove the Burner Thermistor with the wrenches.
CAUTION **Do not twist the lead wire of the Burner Thermistor when remove it.**

● **BLOWER MOTOR:**
(27) Remove four (4) screws from Blower Motor Assembly and remove the Blower Motor assembly.

(28) Remove five (5) screws from Blower Motor Case.

(29) Remove Air Intake Fan and nut (left-screwed)

(30) Remove five (5) screws from Blower Motor Case and remove the Blower Motor Case.
CAUTION **When reassembling the Blower Motor Case and the Blower Motor Base, be sure that the taped-part of the lead wires of the Blower Motor and Hall IC passes through the recessed portion of the Blower Motor Case.**

(31) Remove two (2) screws of Blower Motor.

● **FUEL PUMP:**
(32) Disassemble the Fuel Pipe with double wrenches. Remove two (2) screws, then pull up the Fuel Pump slowly.
CAUTION **Do not mix these screws with other screws since these screws are special.**

● **DEODORIZING PUMP:**
(33) Remove the two (2) screws from Deodorizing Pump.

● **FLOAT SWITCH:**
(34) Remove the Float Switch by turning counterclockwise with large size pliers.
CAUTION **When reassembling the Float Switch, securely position the Switch so that it is not caught with the Removable Fuel Tank.**

● **CIRCULATION FAN MOTOR:**
(35) Remove four (4) screws of the Circulation Fan Cover to dismount it.

(36) Remove four (4) screws of the Circulation Fan Motor.

● **REFLECTOR ASSEMBLY:**
(37) Remove six (6) screws of front side and four (4) screws of rear side and pull up the Reflector assembly.

● **HIGH LIMIT SWITCH:**
(38) Disconnect two (2) terminals on the side of Air Duct assembly.

(39) Remove two (2) screws from the High Limit Switch.

● **POWER SWITCH:**
(40) Remove two (2) screws of the Power Switch.

● **OPERATION PANEL CIRCUIT BOARD:**
(41) Remove three (3) screws from the Operation Panel Circuit Board.
(42) Lift the Claws holding the Operation Panel Circuit Board then take the Operation Panel Circuit Board.

SRE 260

● **GRILLE:**
(1) Remove one (1) screw from lower center of the Grille. Lift the pillars of Grille from the Reflector. Take the Guard toward you then let down to disassemble the Guard.

● **FRONT PANEL:**
(2) Remove two (2) screws of the lower part sides of Front Panel. Shift the Front Panel from lower to upper and disassemble it from the cabinet.

(3) Disconnect three (3) lead wires from Main Circuit Board wiring from Operation Panel Circuit Board on the Front Panel.

● **CABINET:**
(4) Disconnect three (3) lead wires of Circulation Fan, Room Thermistor and High Limit Switch from upper part of Cabinet wiring from Main Circuit Board.
CAUTION **Hold Main Circuit Board when disconnect wire.**

(5) Remove the Removable Fuel Tank. Remove Air Filter from the side of the Cabinet.

(6) Remove two (2) screws from side and three (3) screws from rear side of the Cabinet.

(7) Remove the Cabinet by pulling straight upward.

● **HEAT ELEMENT ASSEMBLY:**
(8) Remove two (2) screws from Heat Element Assembly and remove Heat Element Assembly.

● **GLASS CYLINDER:**
(9) Remove one (1) screw of Belt on the Glass Cylinder

● **SECONDARY FLAME ROD:**
(10) Disconnect red lead wire of Secondary Flame Rod

(11) Remove two (2) screws from Secondary Flame Rod. Disassemble Secondary Flame Rod pulling toward you.

● **BURNER ASSEMBLY:**
(12) Disassemble the Flame Lead Ring.
CAUTION **Do not put upside-down the Flame Lead Ring when reassemble.**

(13) Lift the Burner Ring Assembly then disassemble it by turning left.

● **BURNER MAT:**

(14) The Burner Mat is adhered to the burner bottom with adhesive. When replacing the Burner Mat, securely put it to the burner bottom with Burner Mat Adhesive in the same way.

● **MAIN CIRCUIT BOARD:**

(15) Disconnect the lead wires from the Main Circuit Board. Remove two (2) screws and remove Controller Base from the Drip Tray.

CAUTION **Hold Main Circuit Board when disconnect wire.**

(16) Pinching the head of PCB support with pliers and remove the Main Circuit Board.

● **TRANSFORMER:**

(17) Remove one (1) screw of the Transformer and remove it.

● **TIP-OVER SWITCH:**

(18) Disconnect the connector of Tip-over Switch, remove one (1) screw and disassemble it.

● **IGNITER:**

(19) Remove two (2) screws from the Igniter Cover.

(20) Remove the Igniter by securely holding its ceramic part with large size pliers and turning it.

● **PRIMARY FLAME ROD:**

(21) Disconnect blue lead wire and remove two (2) screws from the Primary Flame Rod.

CAUTION **Do not break the Gasket for the Primary Flame Rod.**

CAUTION **Do not change the direction of the Primary Flame Rod when reassemble it. Refer to "The Position of Primary Flame Rod" on Page 28.**

● **FUEL PIPE:**

(22) Remove the Fuel Pipes by releasing the flare nuts from Fuel Nozzle side and Fuel Pump side with double wrenches.

CAUTION **Remove the Fuel Pipe first from the Fuel Nozzle side to prevent fuel spillage into the Burner.**

● **FUEL NOZZLE:**

(23) Remove two (2) screws from the Fuel Nozzle.

CAUTION **Do not lose the Fuel Nozzle Gasket.**

● **BURNER THERMISTOR:**

(24) Remove three (3) screws and lift the Heat Chamber Assembly.

CAUTION **Do not break the Burner Thermistor under the Heat Chamber Assembly.**

(25) Disengage the Thermistor bushing from the Heat Chamber Assembly.

(26) Pull out the lead wire from the Heat Chamber Assembly. Remove the Burner Thermistor with the wrenches.

CAUTION **Do not twist the lead wire of the Burner Thermistor when remove it.**

● **BLOWER MOTOR:**

(27) Remove two (2) nuts from Blower Motor Assembly and remove the Blower Motor assembly.

(28) Remove four (4) screws, Joint Pipe and Joint Pipe Gasket.

(29) Remove five (5) screws from Blower Motor Case.

(30) Remove Air Intake Fan and nut (left-screwed)

(31) Remove seven (7) screws from Blower Motor Case and remove the Blower Motor Case.

CAUTION **When reassembling the Blower Motor Case and the Blower Motor Base, be sure that the taped-part of the lead wires of the Blower Motor and Hall IC passes through the recessed portion of the Blower Motor Case.**

(32) Remove two (2) screws of Blower Motor.

● **FUEL PUMP:**

(33) Disassemble the Fuel Pipe with double wrenches. Remove two (2) screws, then pull up the Fuel Pump slowly.

CAUTION **Do not mix these screws with other screws since these screws are special.**

● **FLOAT SWITCH:**

(34) Remove two (2) screws of the Float Switch and pull it up.

CAUTION **When reassembling the Float Switch, securely position the Switch so that it is not caught with the Removable Fuel Tank.**

● **REFLECTOR ASSEMBLY:**

(35) Remove seven (7) screws of front side and six (6) screws of rear side and pull up the Reflector assembly.

● **HIGH LIMIT SWITCH:**

(36) Disconnect two (2) terminals on the side of Air Duct assembly.

(37) Remove two (2) screws from the High Limit Switch.

● **CIRCULATION FAN MOTOR:**

(38) Remove four (4) screws of the Circulation Fan Cover to dismount it.

(39) Remove four (4) screws of the Circulation Fan Motor.

● **POWER SWITCH:**

(40) Remove two (2) screws of the Power Switch.

● **OPERATION PANEL CIRCUIT BOARD:**

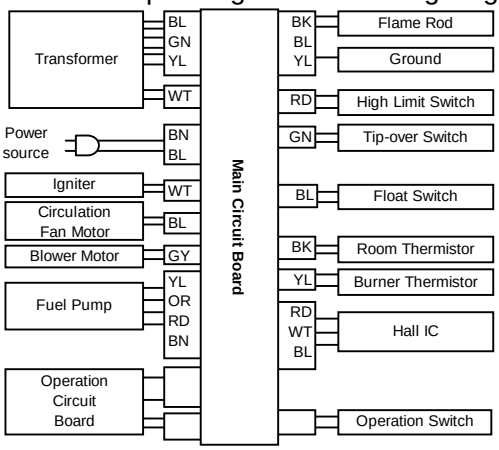
(41) Remove three (3) screws from the Operation Panel Circuit Board.

(42) Lift the Claws holding the Operation Panel Circuit Board then take the Operation Panel Circuit Board.

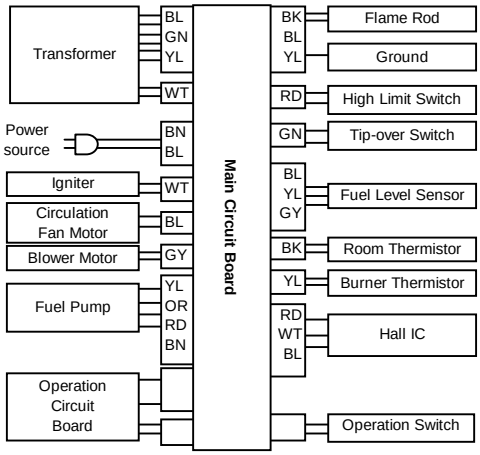
5. ADJUSTING AND MAINTENANCE

1. MAIN CIRCUIT BOARD

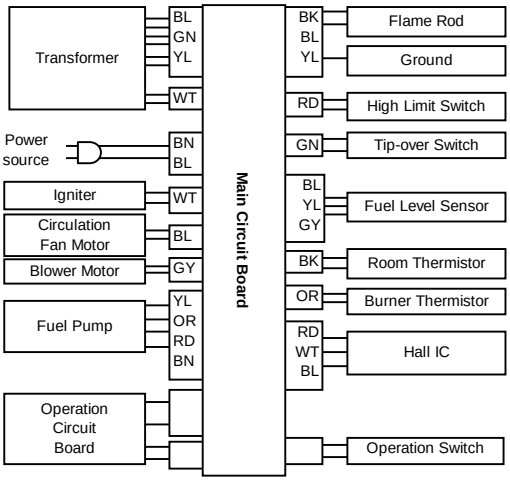
- Before judging the condition of the Main Circuit Board, check to see if the terminals are secured in position. If the terminals have any trouble of which cause is unknown, check on the points first.
- If the terminals are reconnected, make sure that their lead wires are connected to their corresponding colors before giving the ignition test.



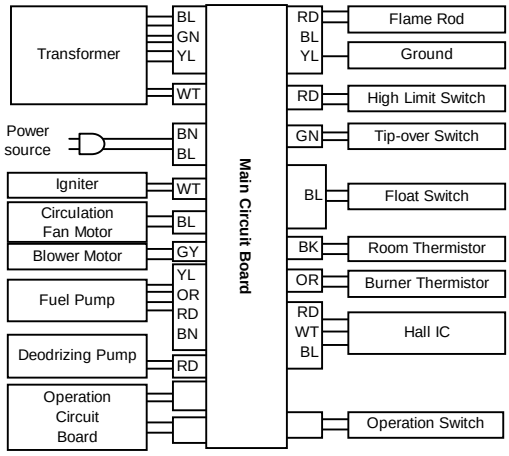
SRE 156



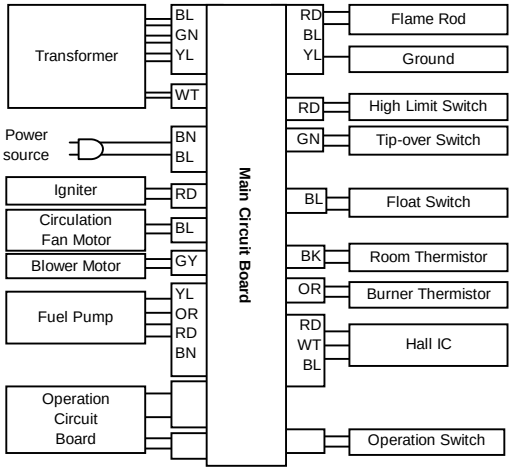
SRE 166



SRE 176

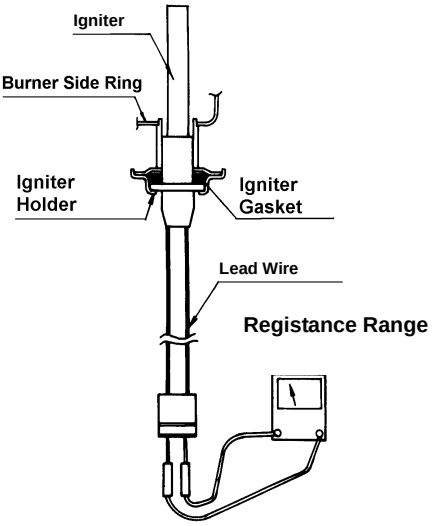


SRE 250



SRE 260

2. IGNITER



- The Igniter plays two roles of preheating and ignition heaters.

- The Heater is print-incorporated into the ceramics; therefore, it is capable of obtaining a short time of red heating of approximately 30 sec. The electric current is turned on only for preheating, while it is turned off during combustion.

- The initial resistance at a room temperature of 23 °C stays at 40 to 49 Ω.

- In case of a failure of the Igniter or a gas leak, disassemble the Igniter as per the **4. OVERHAULING PROCEDURE**. The Igniter Gasket is deteriorated by heat, which loses its Gasket effect if once taken off. Be sure, therefore, to use the new Igniter Gasket when the Igniter is reassembled.

CAUTION **The Heater is colored in gray (white at SRE 260), while the lead wire is colored in white (red at SRE 260).**

3. BURNER THERMISTOR

- **The Burner Thermistor is an important part to detect the burner bottom temperature.** Be sure to connect the Burner Thermistor to the Main Circuit Board before starting the Heater. For replacing the Burner Thermistor, **coat the screw part of the Thermistor with adhesive** and tightly screw them in. **Since the lead wire is thin and easy breakable, sufficient care is to be given not to twist it when reassembling the Burner Thermistor.**

CAUTION **High temperature Thermistors, which vary their standard resistance, are used for the Burner Thermistor depending on the application. Be sure when replacing the Thermistor which suits the model of the Burner or the Heater.**

- Standard resistance's of Burner Thermistors:

Color of Lead Wire	20 °C	250 °C	300 °C	B constant
Orange	Approx. 120 MΩ	58 kΩ	25 kΩ	5100
Blue	Approx. 120 MΩ	70 kΩ	31.5 kΩ	5100
Yellow and White	Approx. 20 MΩ	8 kΩ	3.34 kΩ	5250

4. FUEL PUMP

- Minute care is to be taken in the cleaning of the Fuel Pump not to cause dust or dirties to the Pump. Such a dust that is not visible may have influence on the flow rate of fuel.

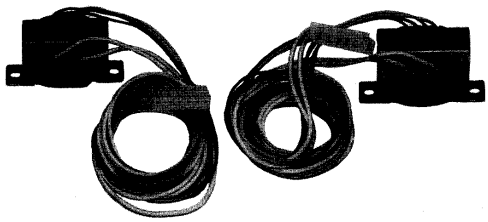
- Clean the Suction Filter and the Discharge Outlet with kerosene.

- The Pump itself is not capable of checking the flow rate, since the frequency which determines the flow rate is incorporated in the CPU of the Main Circuit Board from which the signal for each flow rate is emitted.

CAUTION **For reassembling the Fuel Pump, sufficiently remove kerosene from the Pump to prevent any dust from adhering to the Pump.**

5. TRANSFORMER

- The Transformer supplies electric voltage necessary for each part, by lowering the power supply of 230 V. Any broken wire in the Transformer disorders the operation of the Heater.

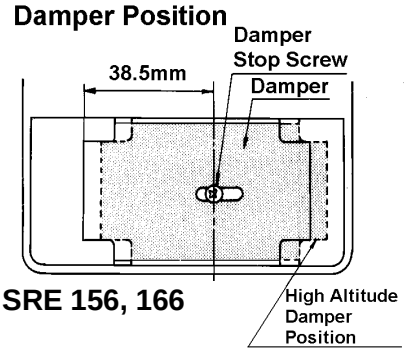


Output Voltage without Overload	
Green ↔ Green	Approx. AC 12 V
Yellow ↔ Yellow	Approx. AC 140 V
Blue ↔ Blue	Approx. AC 30 V
White ↔ White	Approx. AC 230 V

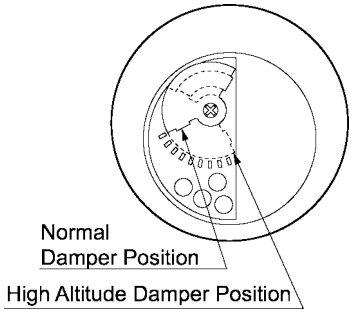
6. AIR FLOW REGULATING DAMPER

- Air flow has been adjusted at the factory before the Heater is shipped. The Air Flow Regulating Damper has been screw-locked, which adjustment is made for a level of lower than 800 meters. If the Heater is used at a higher level than 800 meters, the Damper needs to be adjusted.

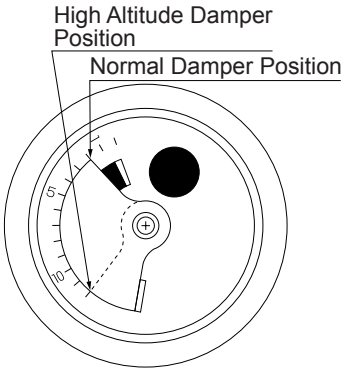
- Insufficient air flow may cause combustion vibrations or soot, while an excessive air flow may cause to fail combustion.



SRE 156, 166

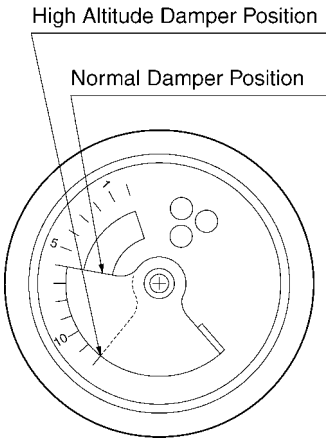


SRE 176



SRE 250

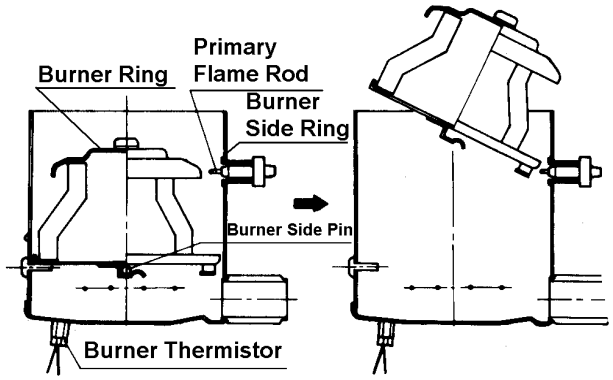
	Model	Level lower than 800m	Higher level
Damper position	SRE 156 SRE 166	38.5mm (Fully closed)	Fully open
	SRE 176	Scale 0 (Fully closed)	Fully open
	SRE 250	Scale 2	Fully open
	SRE 260	Scale 6	Fully open



SRE 260

7. ASSEMBLY OF BURNER RING AND BURNER

- Make sure that the Burner Ring is set in position, as shown in the figure. It is especially important that the three burner side pins are all in secured position. Care is to be given for the Primary Flame Rod, when removing the Burner Ring.

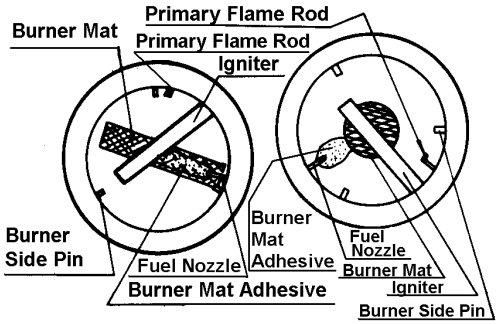


8. BURNER MAT

- After the Burner Ring is removed, the Burner Bottom is seen as illustrated in the below figure. **(See 7. Assembling of the Burner Ring and Burner)** This Burner Mat is adhered to the bottom of the Burner with a heat resistive inorganic adhesive, which plays an important role of preventing oscillated combustion.

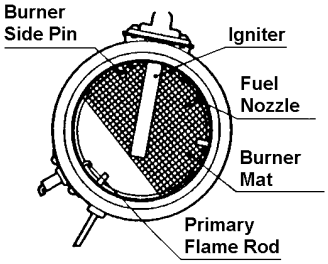
- The Burner Mat is normally made of a silica cloth (having a thermal resistance of 1000°C), which is not breakable under normal using condition. If replacing the Burner Mat, first completely remove the Mat itself and adhesive by using a sand paper and apply adhesive between the base and the new Burner Mat. (See page 27 for the details by model.)

- Also remove the carbon from the bottom of the Burner by using a vacuum cleaner.



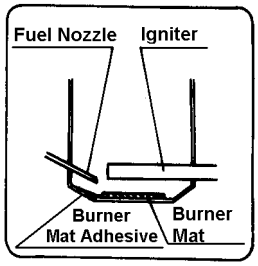
SRE 156
SRE 166

SRE 176



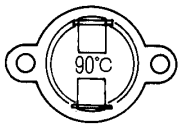
SRE 250
SRE 260

Side view

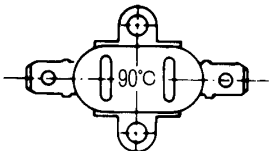


9. HIGH LIMIT SWITCH (Overheat Protector)

CAUTION: Two types of the Overheat Protector Device, which differ in configuration, are used.



SRE 156
SRE 166



SRE 176
SRE 250
SRE 260

10. BLOWER MOTOR AND AIR INTAKE FAN

- The revolution of the Blower Motor is changed depending on the burning mode of “High ↔ Med.-High ↔ Med. ↔ Med.-Low ↔ Low” by phase control means, by which an appropriate blowing rate is made to the Burner to suit the combustion condition.

- The Blower Motor may cause an abnormal noise or be disordered, if it becomes defective or loose. If so, first check to see if the Air Intake Fan is loose or adversely vibrates.

- If the Air Intake Fan vibrates, change the Air Intake Fan. If neither of the above two problems is found, replace the Blower Motor. If an abnormal noise is still generated, check to see if there is any other cause than above.

CAUTION **The Air Flow Regulating Damper is provided at the Air Filter Base, in order that the Heater can be used in a level of above 800 to 1300 m.**

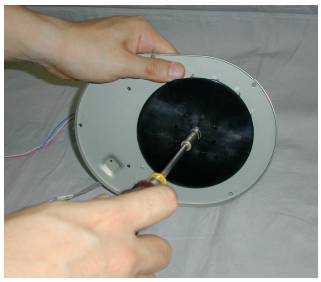
- Disassembling of the Blower Motor is to be done in the following procedure.

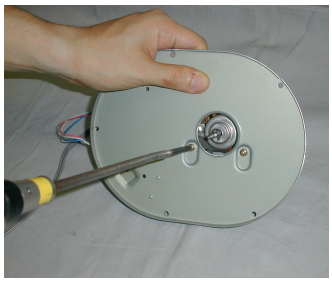
SRE 156, SRE 166

(1) Remove the nuts from the Air Intake Fan,

CAUTION **The nuts are of the counterclockwise screw.**

(2) Remove the two (2) screws from the Blower Motor.





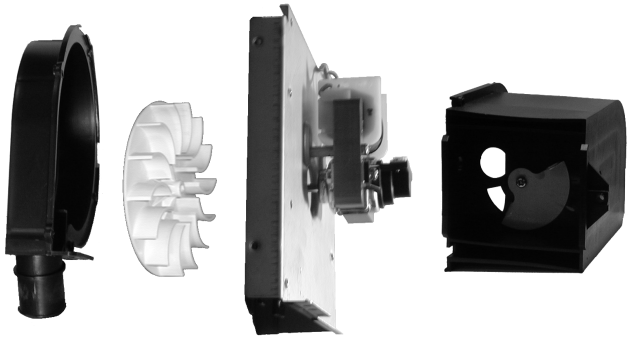
SRE 176, SRE 250

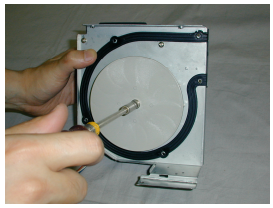
(1) Remove the nut from the Air Intake Fan.

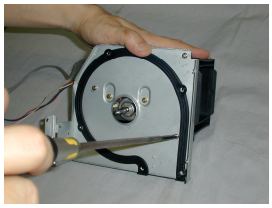
CAUTION **The nut is of the counterclockwise screw.**

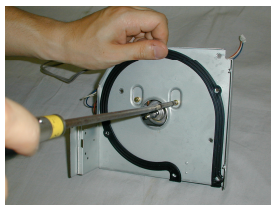
(2) Remove the three (3) screws from the Blower Motor Case.

(3) Remove the two (2) screws from the Blower Motor.







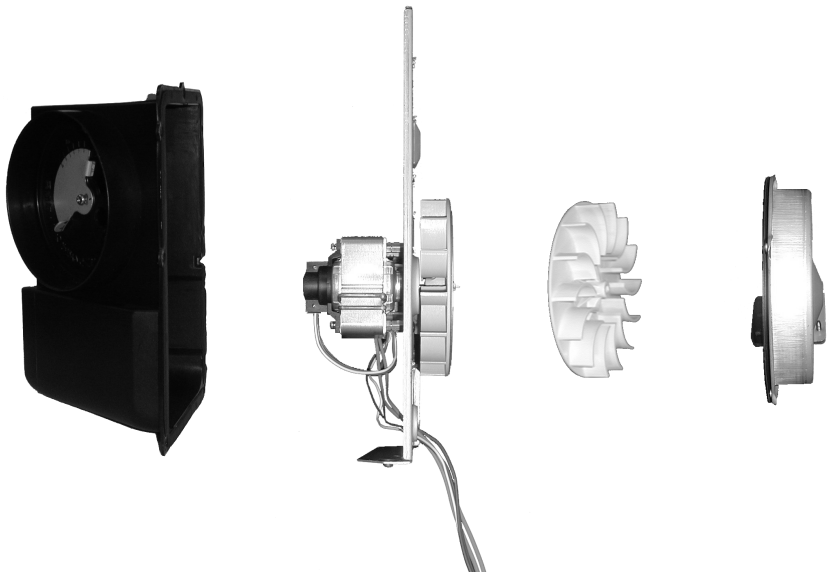


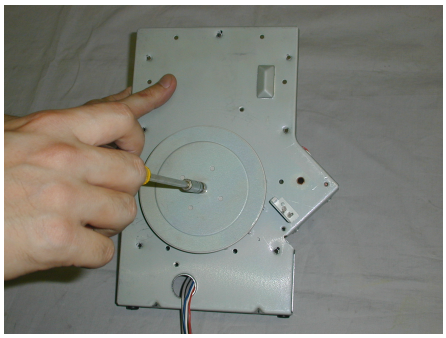
SRE 260

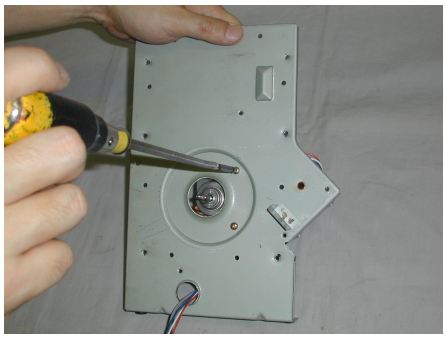
(1) Remove the nut from the Air Intake Fan,

CAUTION **The nut is of the counterclockwise screw.**

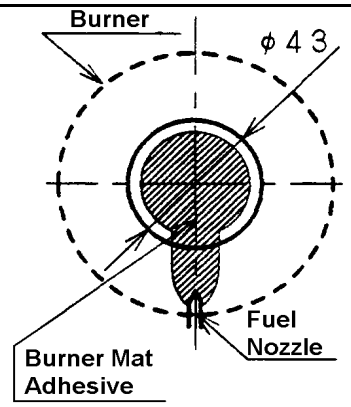
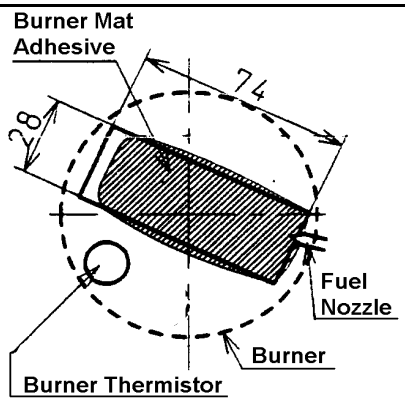
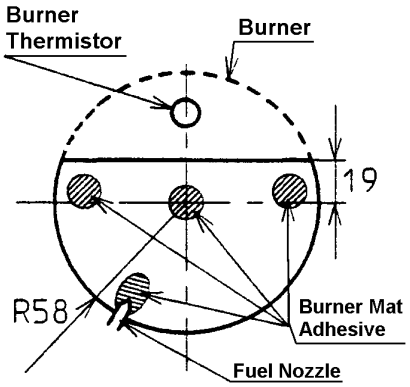
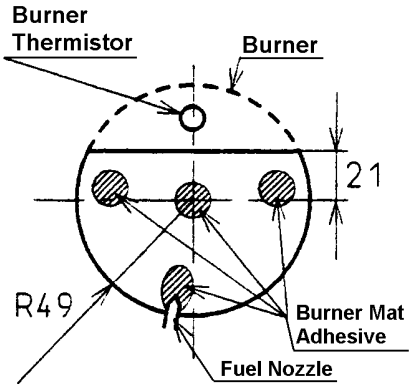
(2) Remove the two (2) screws from the Blower Motor.



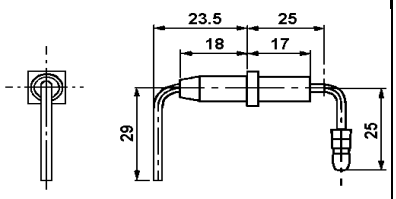
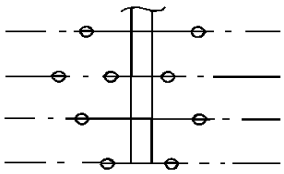
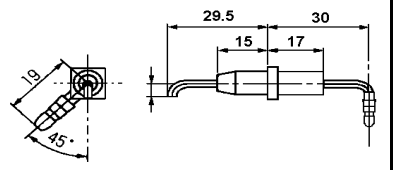
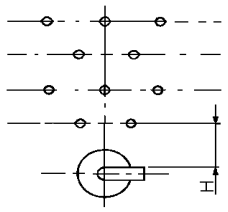
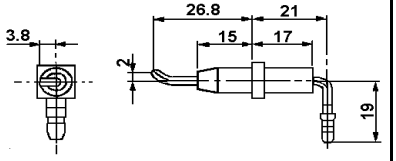
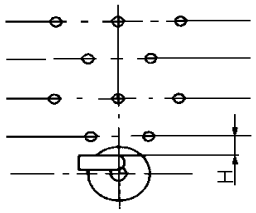
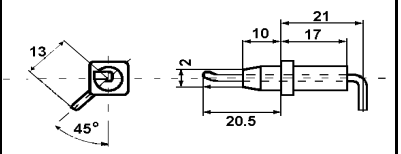
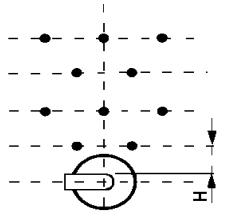
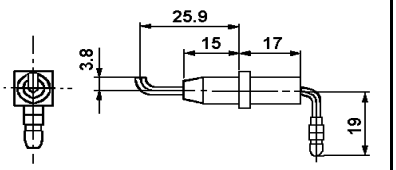
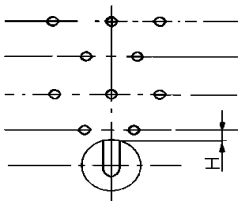
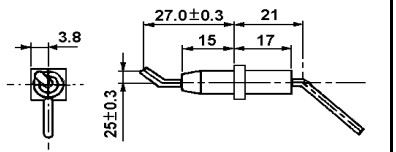
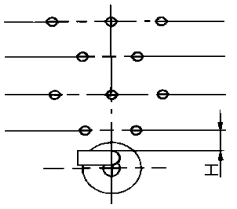
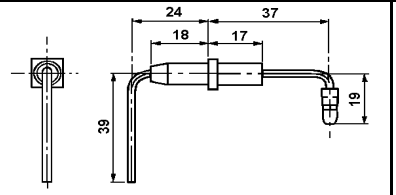
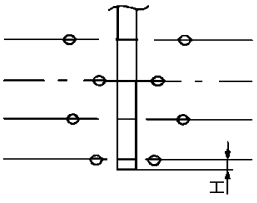
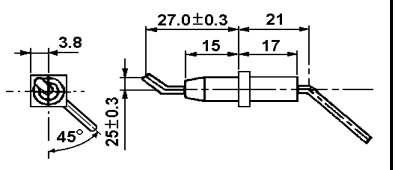
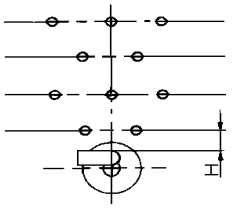


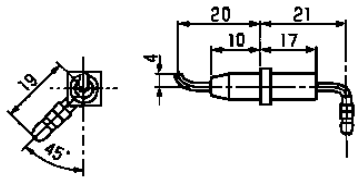
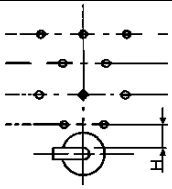


The Position of Burner Mat and Burner Mat Adhesive

Part No.	Position	Models
17158214		LCB-230, LCB-330, SRE 150, SRE 151, SRE 810 (Type A, B), SRE 175, SRE 176 (Type A, B)
17188214		SRE 147, SRE 710 (Type A, B), SRE 165, SRE 166 (Type A, B), SRE 156 (Type A, B), Oslo (Type A, B) SRE 701 (Type A, B), SRE 702 (Type A, B), SRE 703 (Type A, B)
17186624		LCR-660 SRE 260 (Type A, B) (Black coating on Burner Bottom)
17188914		SRE 185 (Black coating on Burner Bottom) SRE 186 (Type A, B) (Black coating on Burner Bottom) SRE 250 (Type A) (Black coating on Burner Bottom)

The Position of Primary Flame Rod

Part No.	Primary Flame Rod	Position		Models
17153020				LCR-3A, Laser 32
17156520			H=6.5mm W=2.5mm	LCR-6C, LCR-660, SRE 260 (Type A)
17158320			H=0.2mm W=1.0mm	LCB-330, SRE 150
17188920			H=3.0mm W=1.5mm	SRE 185, SRE 186 (B)/(S) (Type A)
17158220			H=1.4mm W=1.2mm	LCB-230
17188220			H=0.5mm W=0mm	SRE 147, SRE 165, SRE 710 (B)/(S) (Type A, B), SRE 166 (B)/(S) (Type A, B), SRE 156 (B)/(G) (Type A, B), Oslo(Type A, B), SRE 701(Type A, B), SRE 702 (Type A, B), SRE 703 (Type A, B)
17154220			H=0.7mm	LCR-6B
17188120			H=0.5mm W=0mm	SRE 151, SRE 810 (Type A, B), SRE 175, SRE 176 (B)/(G) (Type A, B)

Part No.	Primary Flame Rod	Position	Models
17190920		 H=3.0mm W=1.5mm	SRE 250 (Type A)

* "W" is a distance to Burner Ring

6. MAIN CIRCUIT BOARD SPECIFICATION

1. SCOPE

PRODUCT MODEL NAME	MODEL NUMBER OF MAIN CIRCUIT BOARD
SRE 156	MA-084-01-230
SRE 166	MA-084-04-230
SRE 176	MA-084-02-230
SRE 250	MA-075-01-230
SRE 260	MA-084-03-230
SRE 701, SRE 702, SRE 703 ,Oslo	MA-084-05-230

*MA-084-05-230 (for Model SRE701, SRE702, SRE703 and Oslo) is same as MA-084-01-230 (for Model SRE156) except Back up device.

2. CONDITIONS

2.1 Voltage range: AC195.5 V to 253 V (rated voltage shall be AC 230 V)
However, for pump, rated voltage shall be AC 207 V to 253 V.

2.2 Frequency: 50 Hz

2.3 Operating temperature range: - 20 to + 55 ˚C (relative humidity: 60 % or less)*1

2.4 Range of temperature for preservation: - 25 to + 65 ˚C (relative humidity: 60 % or less)*1

2.5 Ambient relative humidity: 95% or less (temperature: 35 to 40 ˚C)

*1 : No Main Circuit Board shall be subject to dew condensation (it shall not be frozen at less than 0 ˚C)

3. PERFORMANCE

3.1 Rated output

3.1.1 Igniter: Before ignition: 7 A, After ignition: 2 A

3.1.2 Fuel Pump: 0.5 A

3.1.3 Blower Motor: 0.3 A

3.1.4 Circulation Fan Motor: 0.3 A

3.1.5 Deodorizing Pump (SRE 250): 0.4 A

3.2 Time Chart (See page 31 - 49)

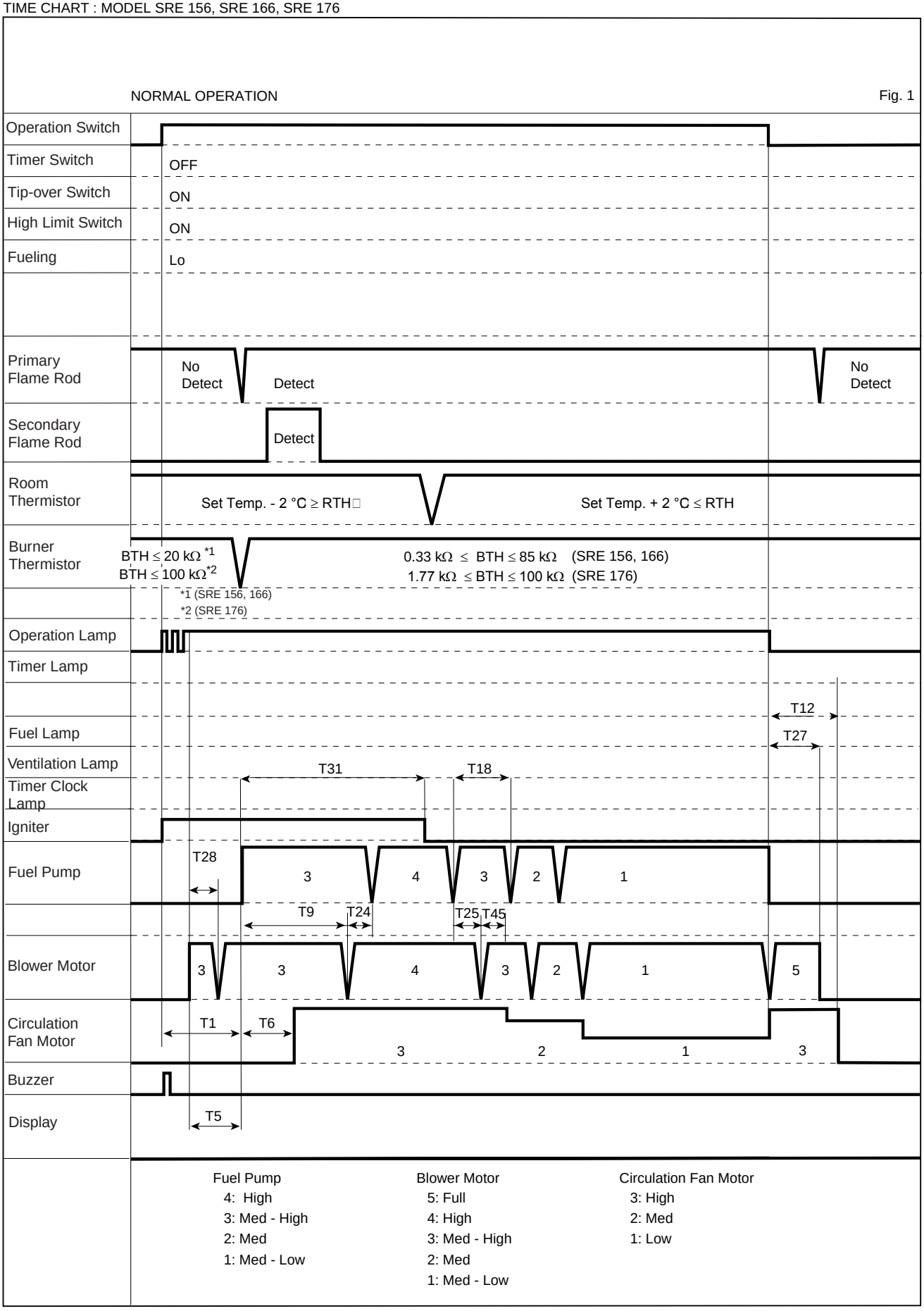
3.3 Specification. (See page 50 - 72)

3.2 TIME CHART

Sequential Time		SRE 156 SRE 166 SRE 176	SRE 250	SRE 260
T1	Pre-heat timing 1	40s	50s	60s
T2	Pre-heat timing 2	90s	150s	150s
T3	Pre-heat timing 3	150s	210s	180s
T5	Pre-purge timing	10s	10s	10s
T6	Fan motor delay timing	13s	13s	13s
T7	Flame check at start (Safety timing) Ignition failure	40s	40s	50s
T8	Flame check at initial burning (Initial condition)	150s	150s	150s
T9	Forced Med.-High burning	40s	200s*	150s*
T10	Forced High burning	110s	-	-
T11	Blower motor post-purge	15s	30s	15s
T12	Fan motor post-purge	90s	150s	150s
T13	Burner thermistor read time	20m	20m	20m
T14	Waiting time for timer set	10s	10s	10s
T15	Refueling (Refilling - Out of fuel)	10m	10m	10m
T16	Refueling warning interval	120s	120s	120s
T18	Combustion change	30s	60s	60s
T23	Blower motor lock or low rotation	5s	5s	5s
T24	Fuel pump delay timing	3s	5s	5s
T25	Blower motor delay timing	3s	5s	5s
T26	5 seconds buzzer	5s	5s	5s
T27	Blower motor post-purge 2	90s (max.) or 4s (min.)	150s (max.) or 10s (min.)	150s (max.) or 10s (min.)
T28	Blower motor pre-purge activation timing	5s	5s	5s
T30	Lost flame response timing	less than 3s	less than 3s	less than 3s
T31	Post-heat timing 1	40s	40s (min.)	50s (min.)
T32	Post-heat timing 2	80s	80s (max.)	660s (max.)
T35	Lost flame detection timing	30s	30s	30s
T37	Blower motor post-purge 4	30s	60s	60s
T40	Fuel alarm timing	3s	3s	3s
T41	Forced Med.-High burning	-	20s	-
T44	Pre-heating extension timing	30s	30s	30s
T45	Flame current detection timing	10s	15s	15s
		s: second, m: minute		

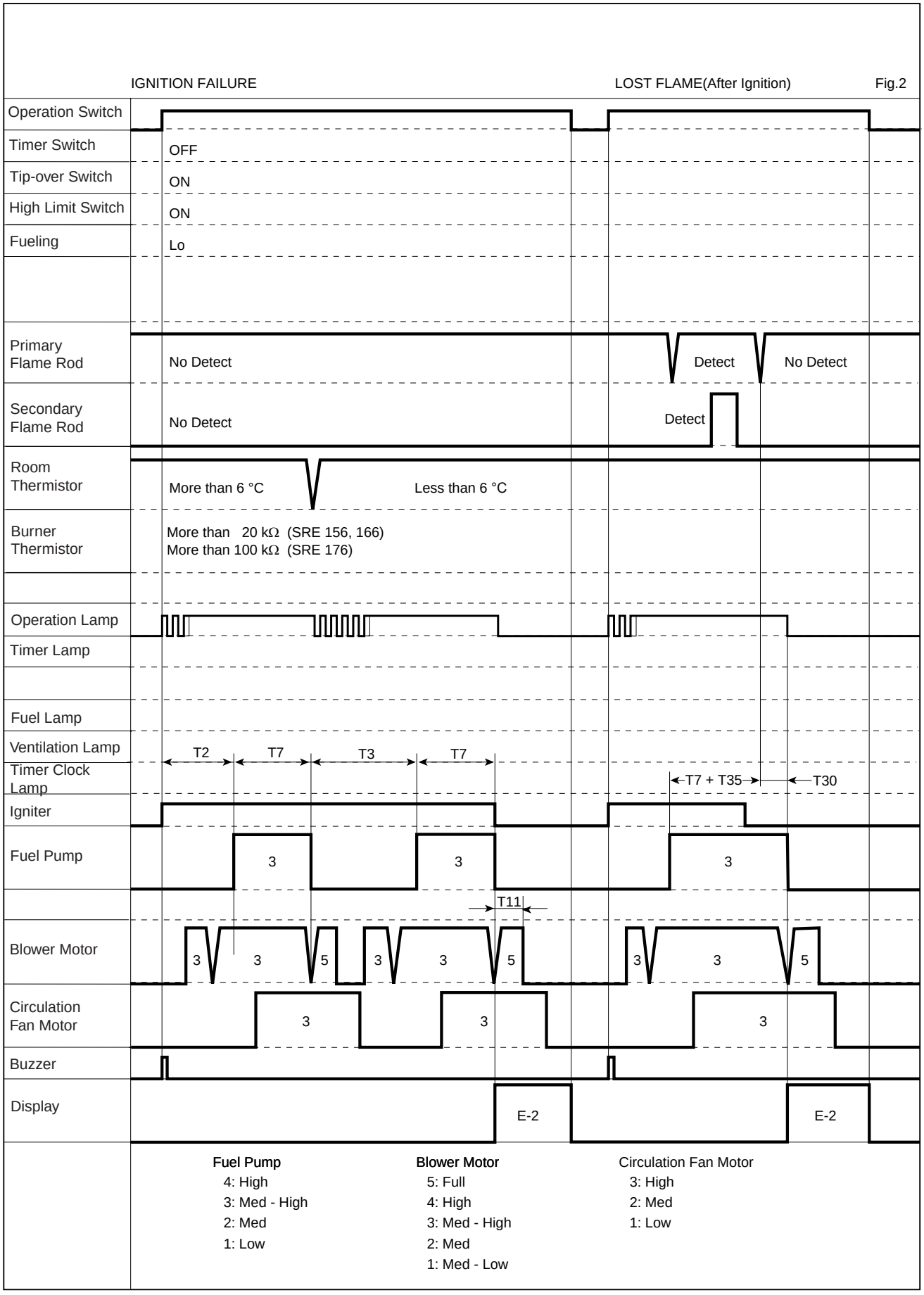
* Forced Med. burning

TIME CHART : MODEL SRE 156, SRE 166, SRE 176



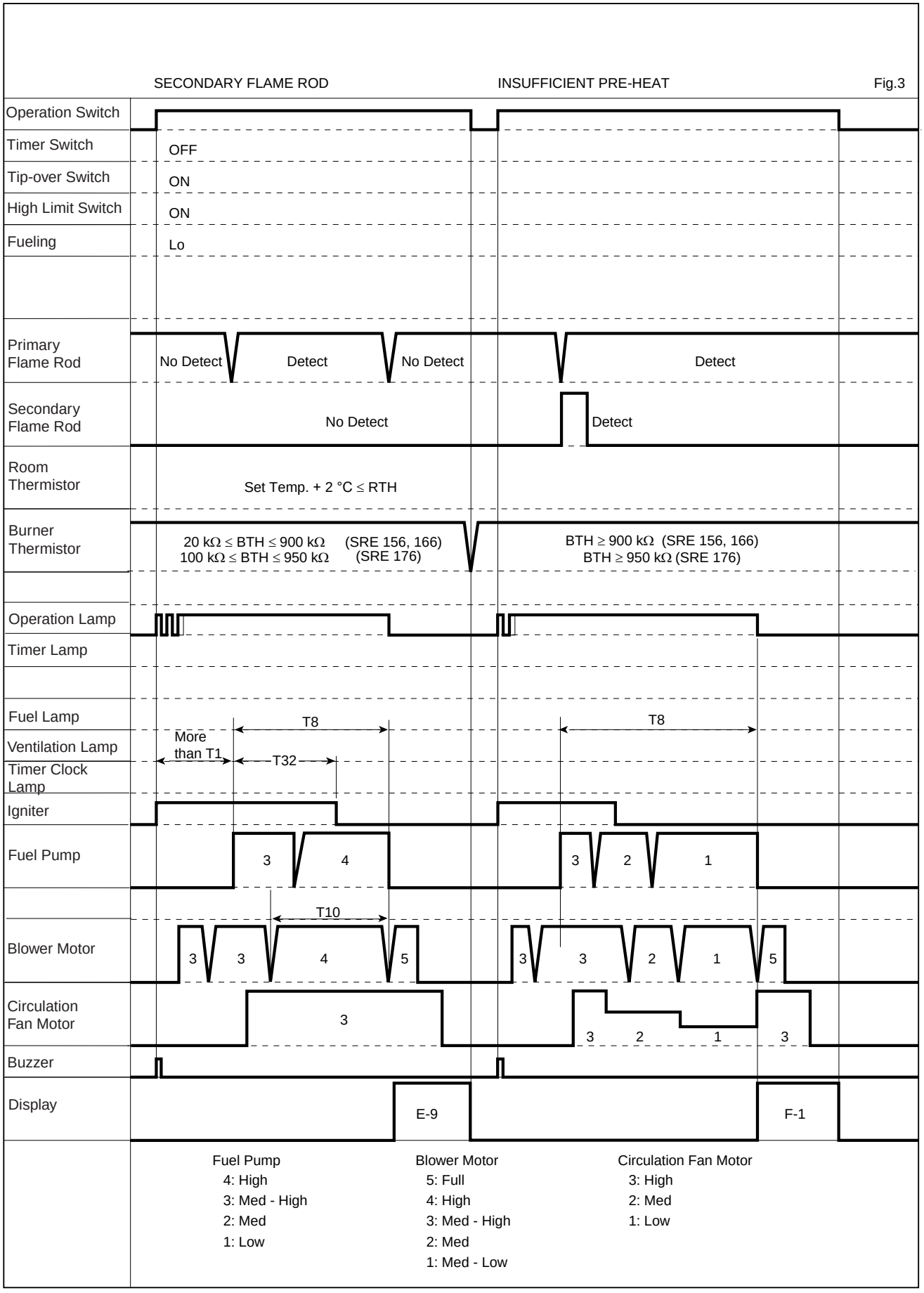
NOTE : This time chart will vary according to set condition.

TIME CHART : MODEL SRE 156, SRE 166, SRE 176



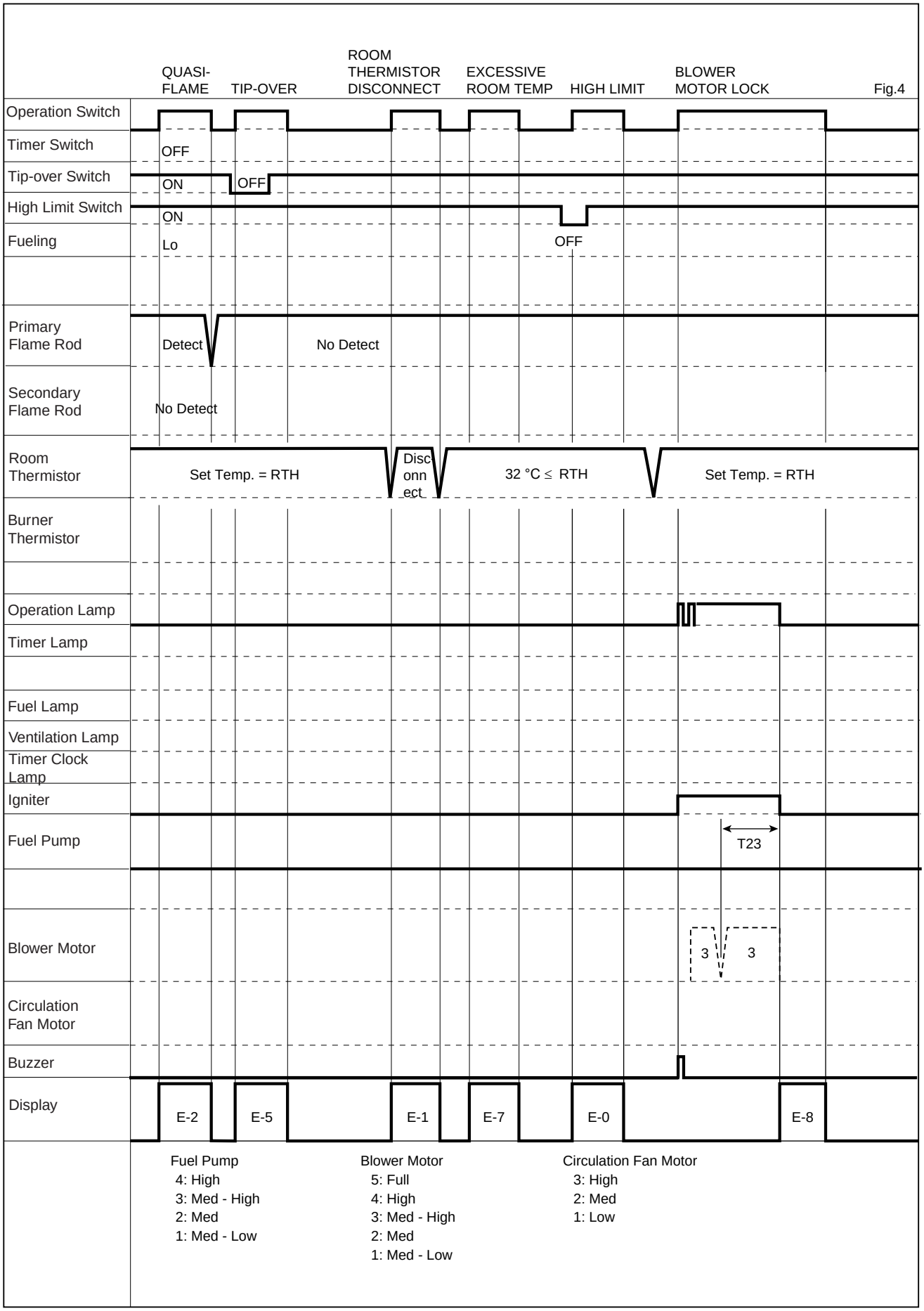
NOTE : This time chart will vary according to set condition.

TIME CHART : MODEL SRE 156, SRE 166, SRE 176



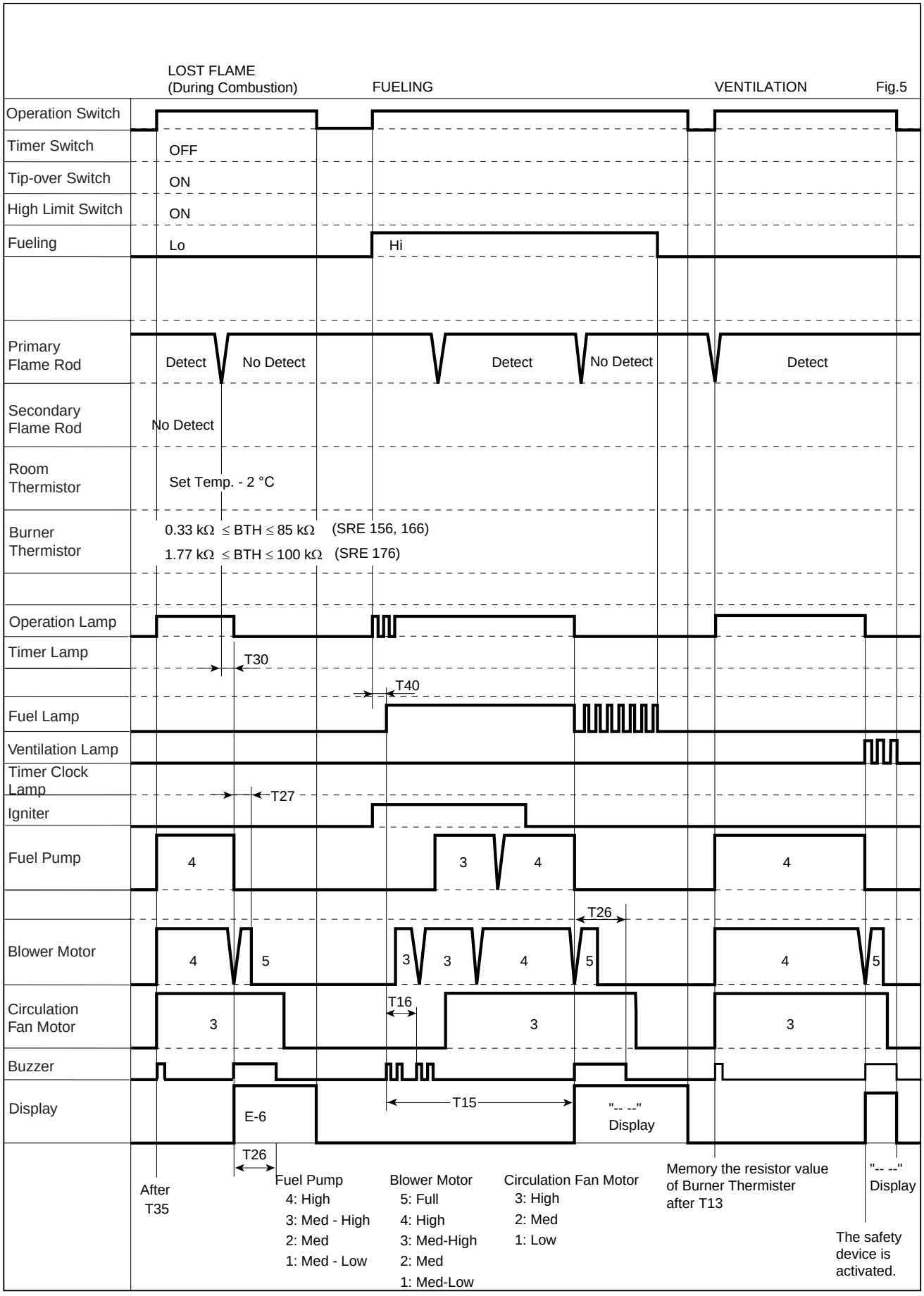
NOTE : This time chart will vary according to set condition.

TIME CHART : MODEL SRE 156, SRE 166, SRE 176



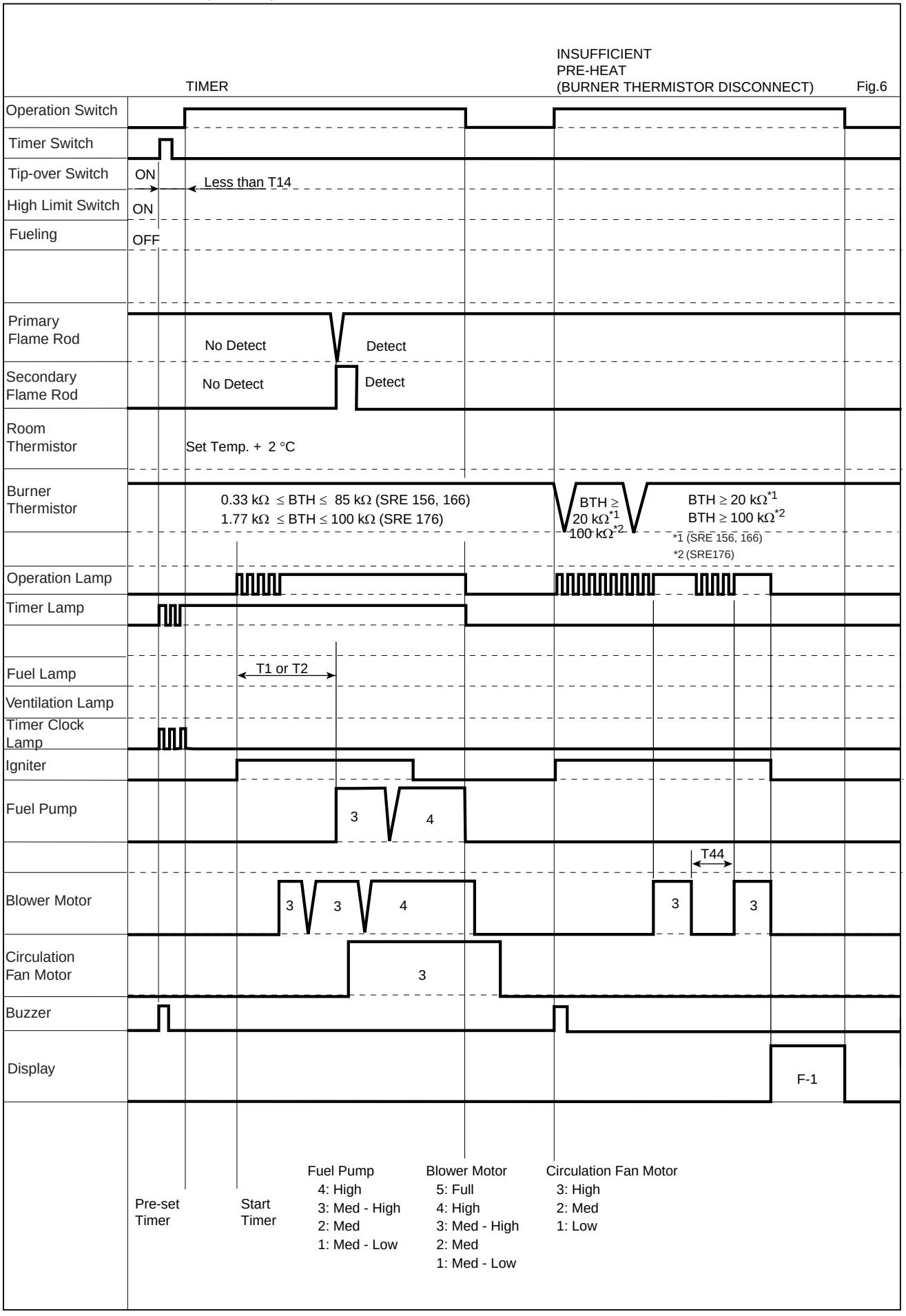
NOTE : This time chart will vary according to set condition.

TIME CHART : MODEL SRE 156, SRE 166, SRE 176



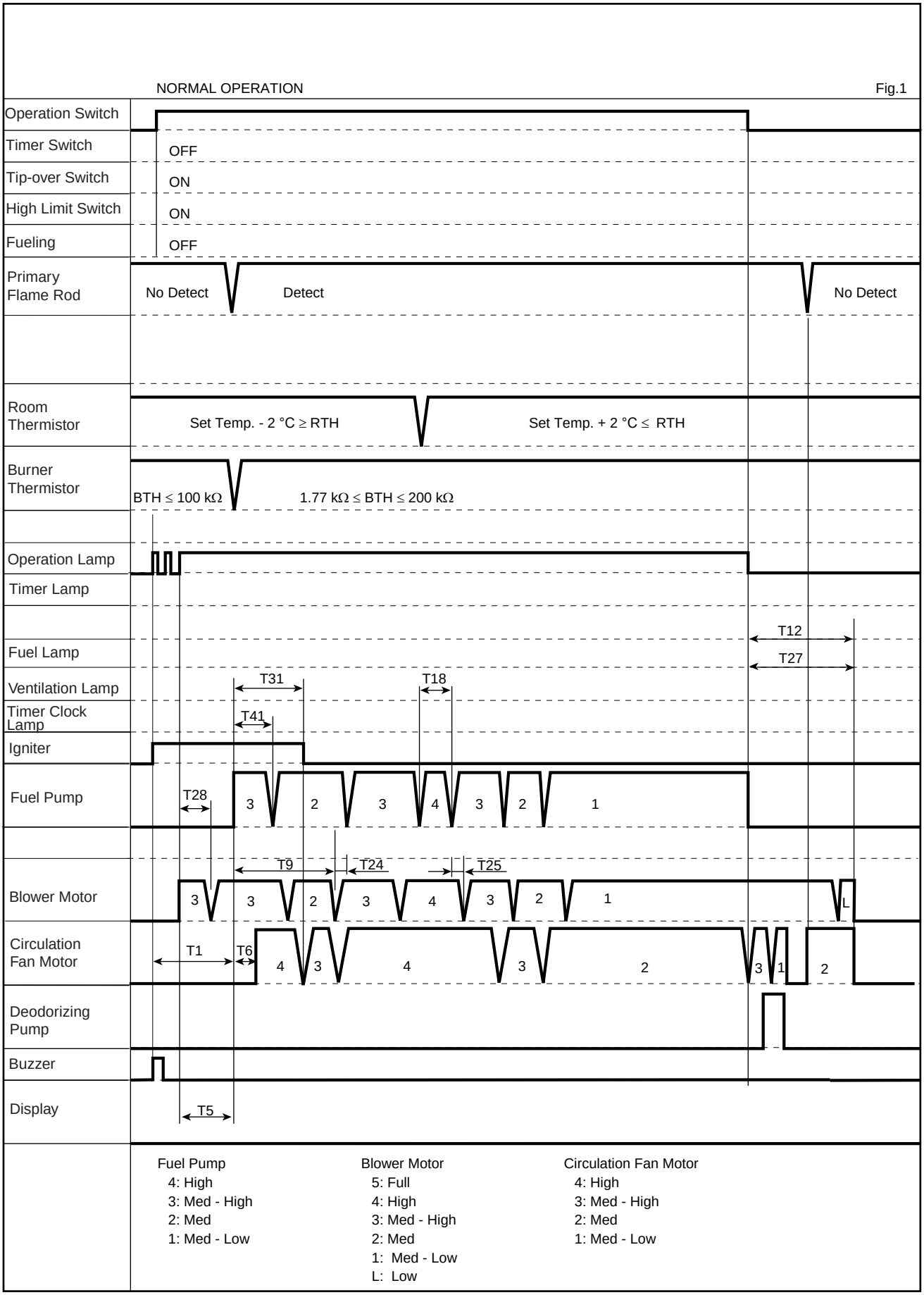
NOTE : This time chart will vary according to set condition.

TIME CHART : MODEL SRE 156, SRE 166, SRE 176



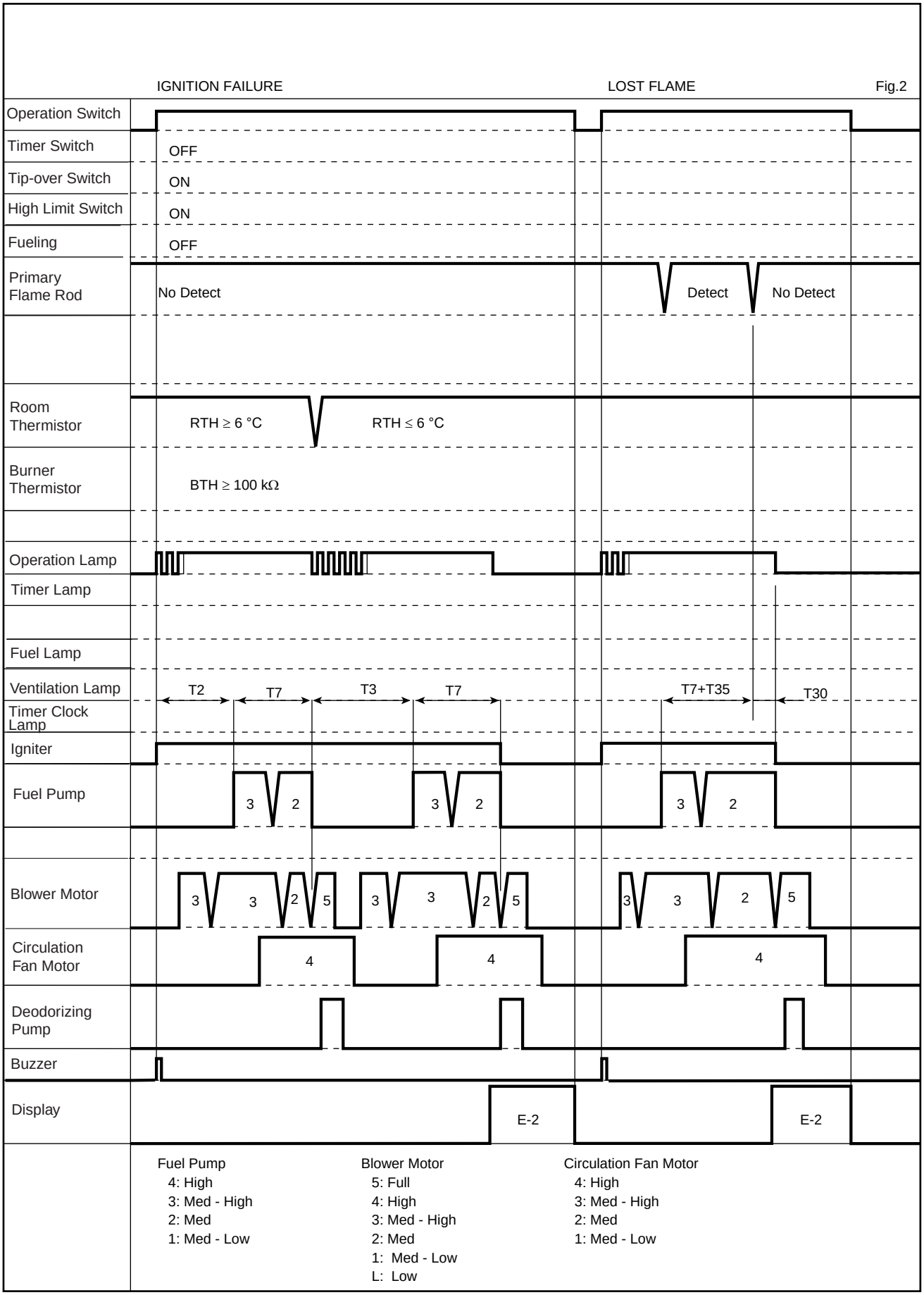
NOTE : This time chart will vary according to set condition.

TIME CHART : MODEL SRE 250



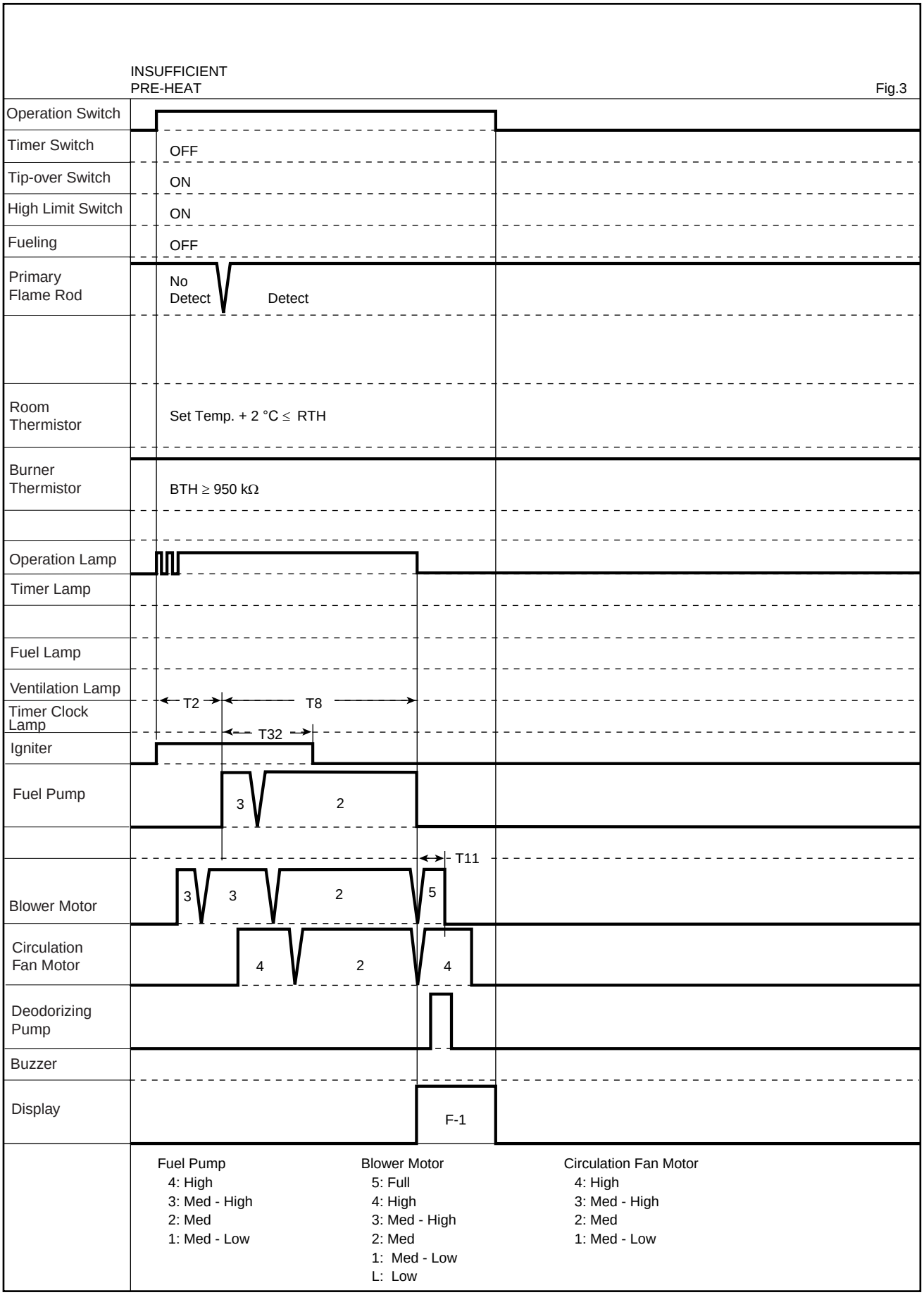
Note : This time chart will vary according to set condition.

TIME CHART : MODEL SRE 250



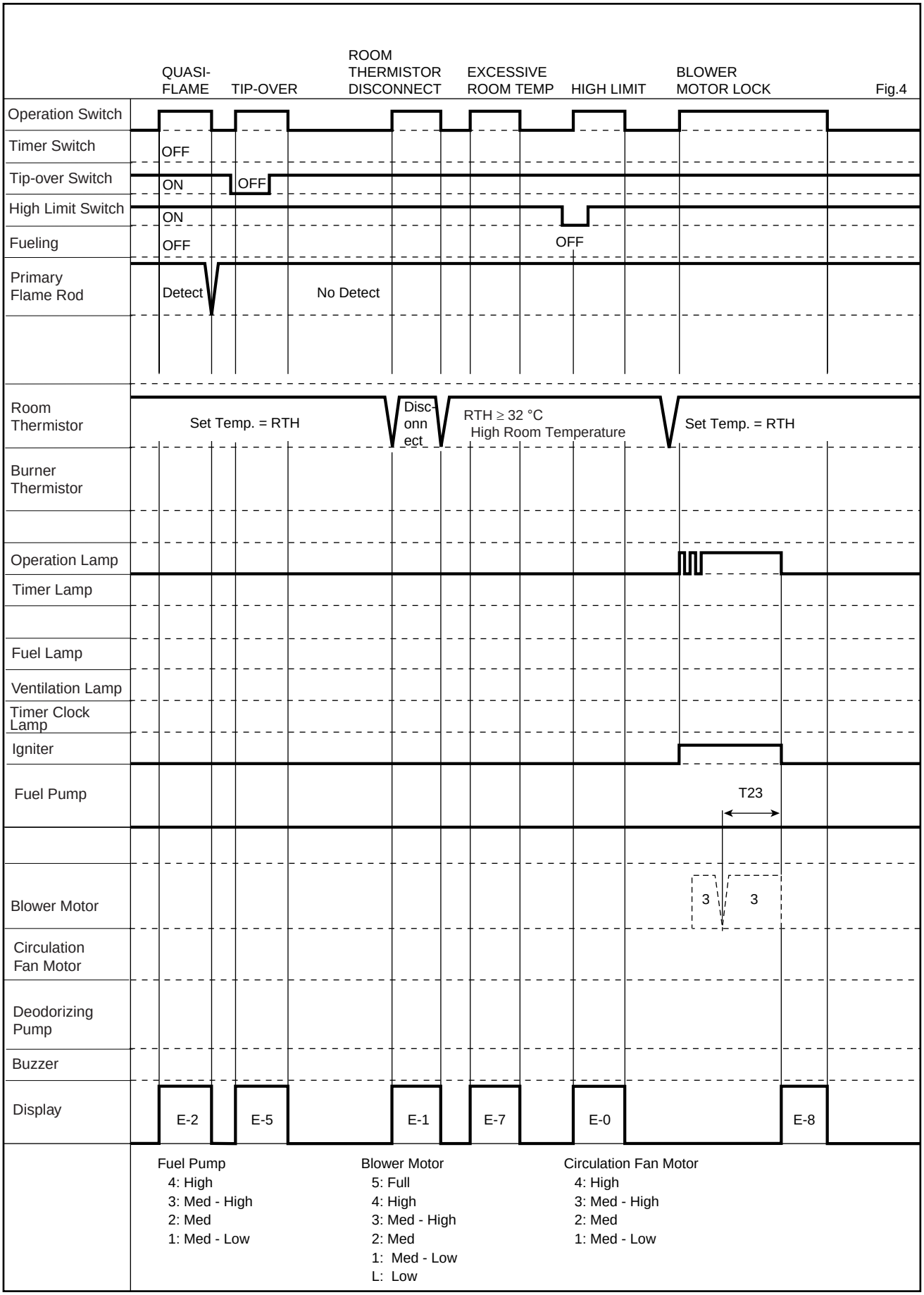
Note : This time chart will vary according to set condition.

TIME CHART : MODEL SRE 250



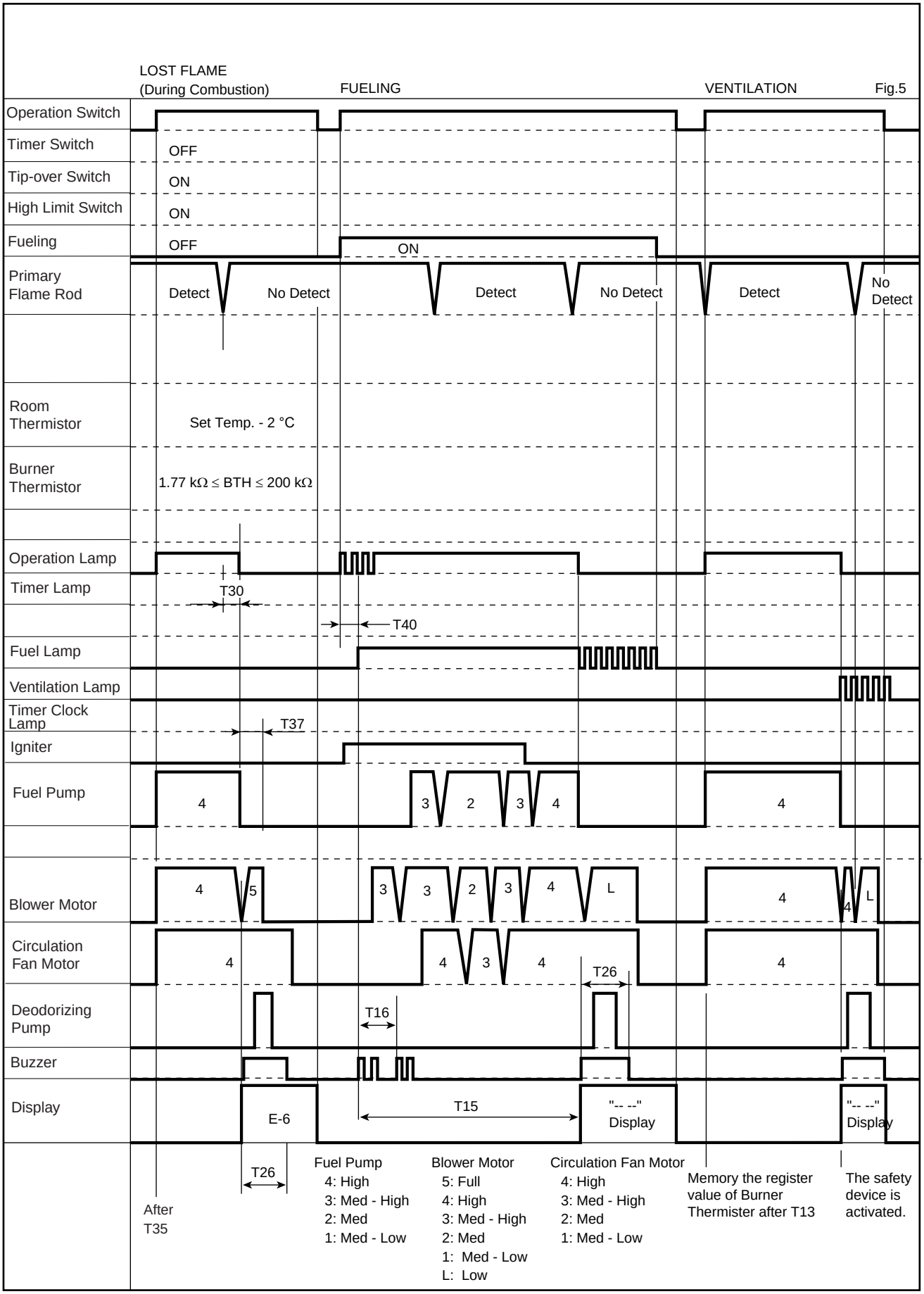
Note : This time chart will vary according to set condition.

TIME CHART : MODEL SRE 250



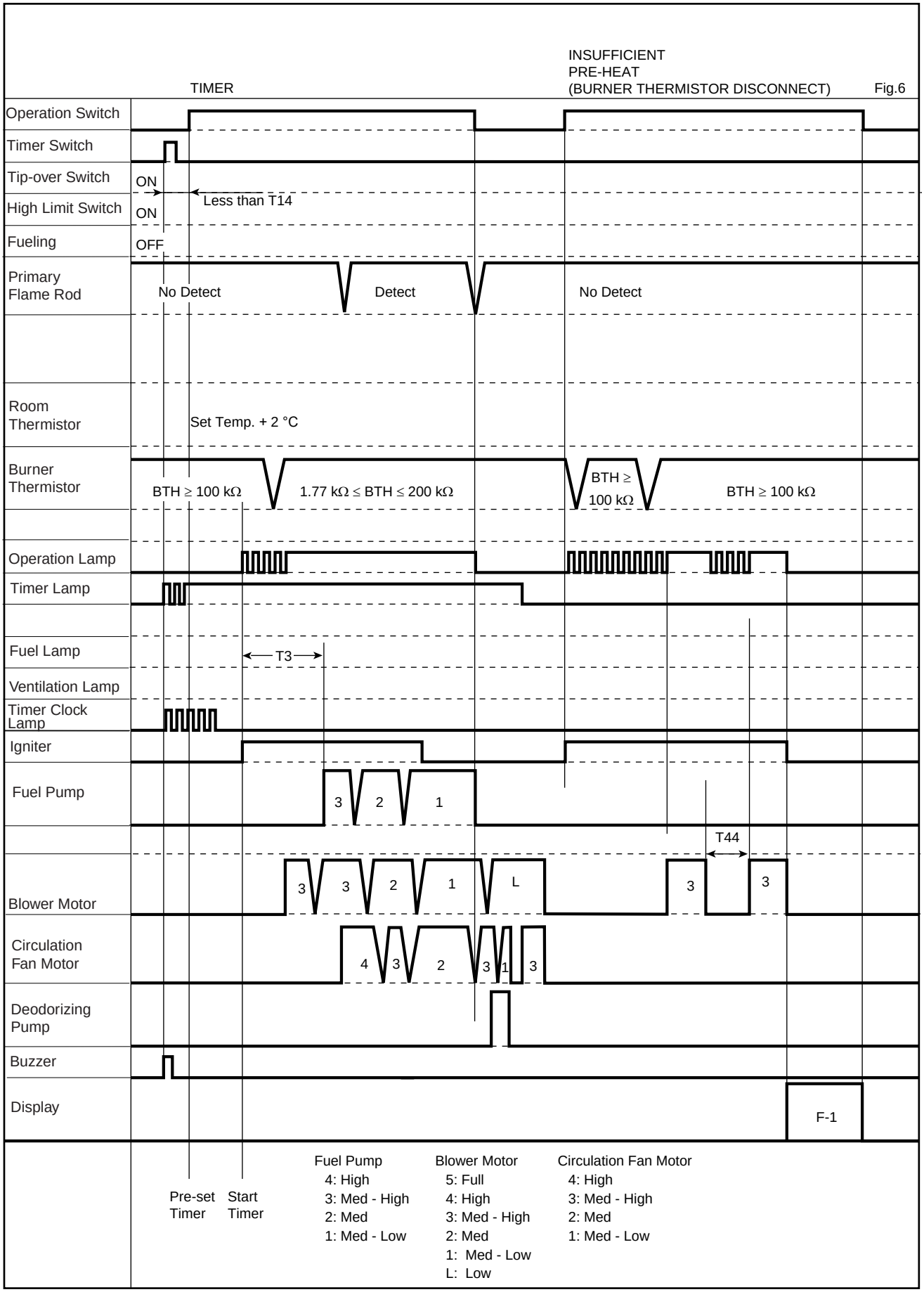
Note : This time chart will vary according to set condition.

TIME CHART : MODEL SRE 250



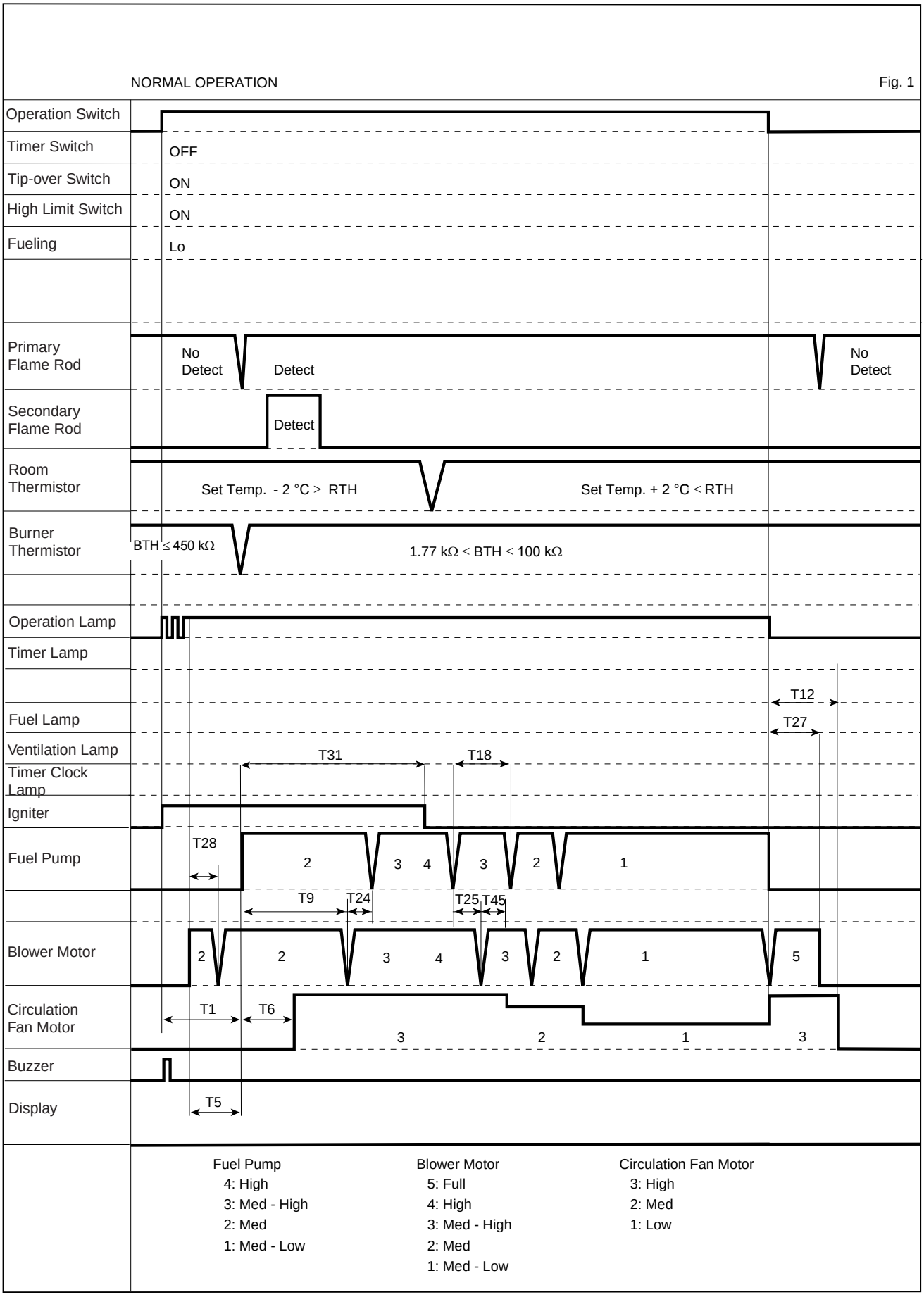
Note : This time chart will vary according to set condition.

TIME CHART : MODEL SRE 250



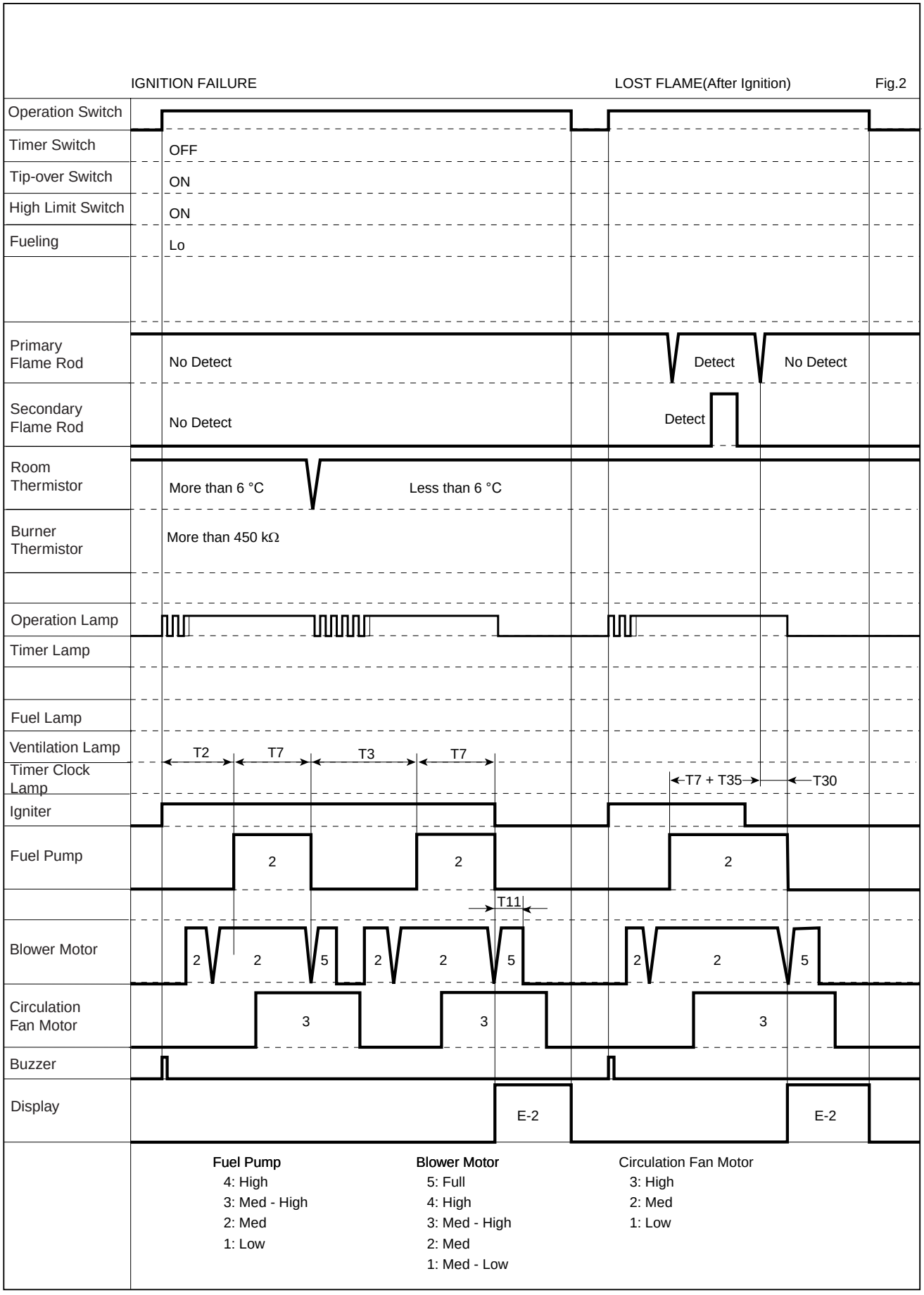
Note : This time chart will vary according to set condition.

TIME CHART : MODEL SRE 260



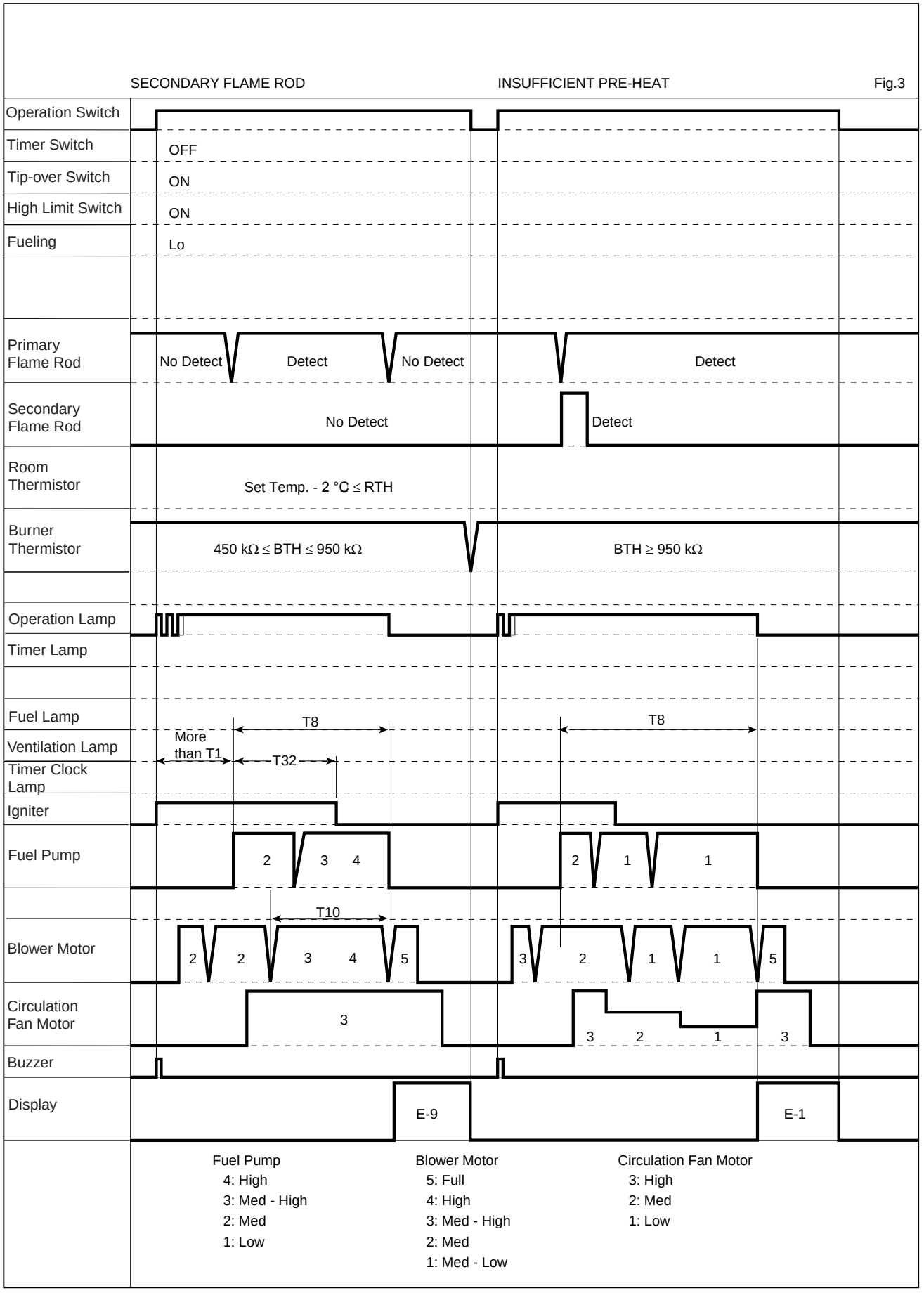
NOTE : This time chart will vary according to set condition.

TIME CHART : MODEL SRE 260



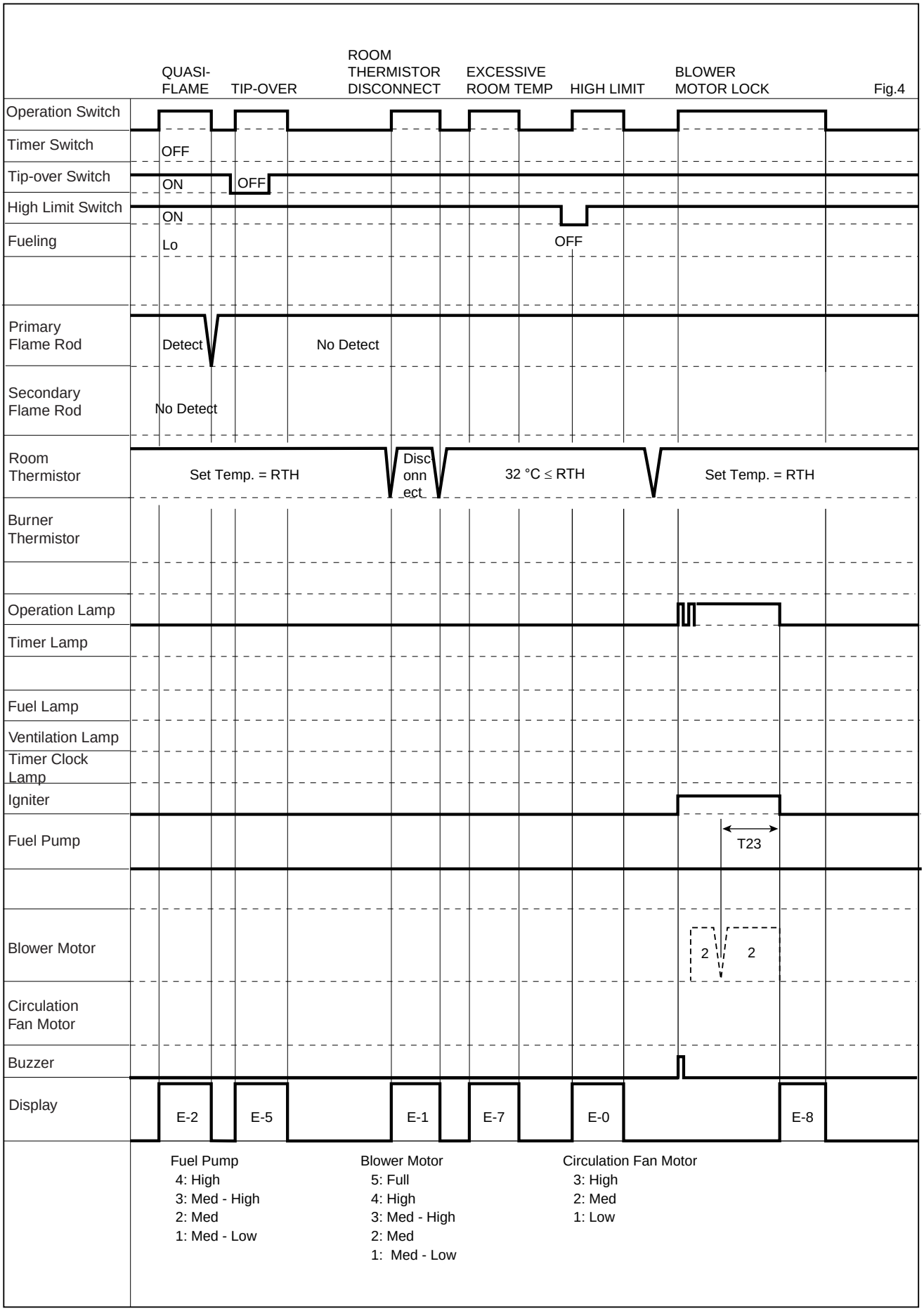
NOTE : This time chart will vary according to set condition.

TIME CHART : MODEL SRE 260



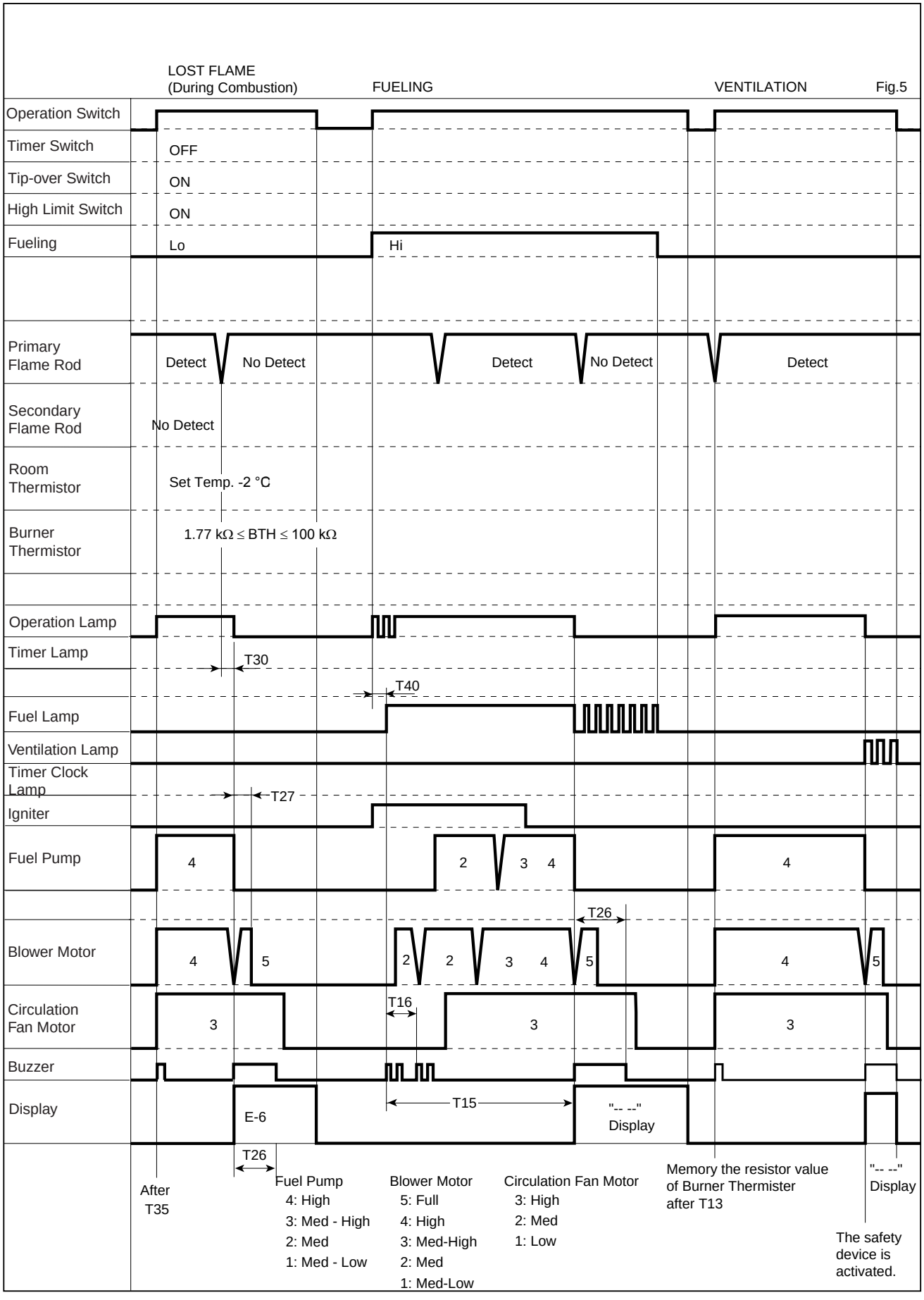
NOTE : This time chart will vary according to set condition.

TIME CHART : MODEL SRE 260



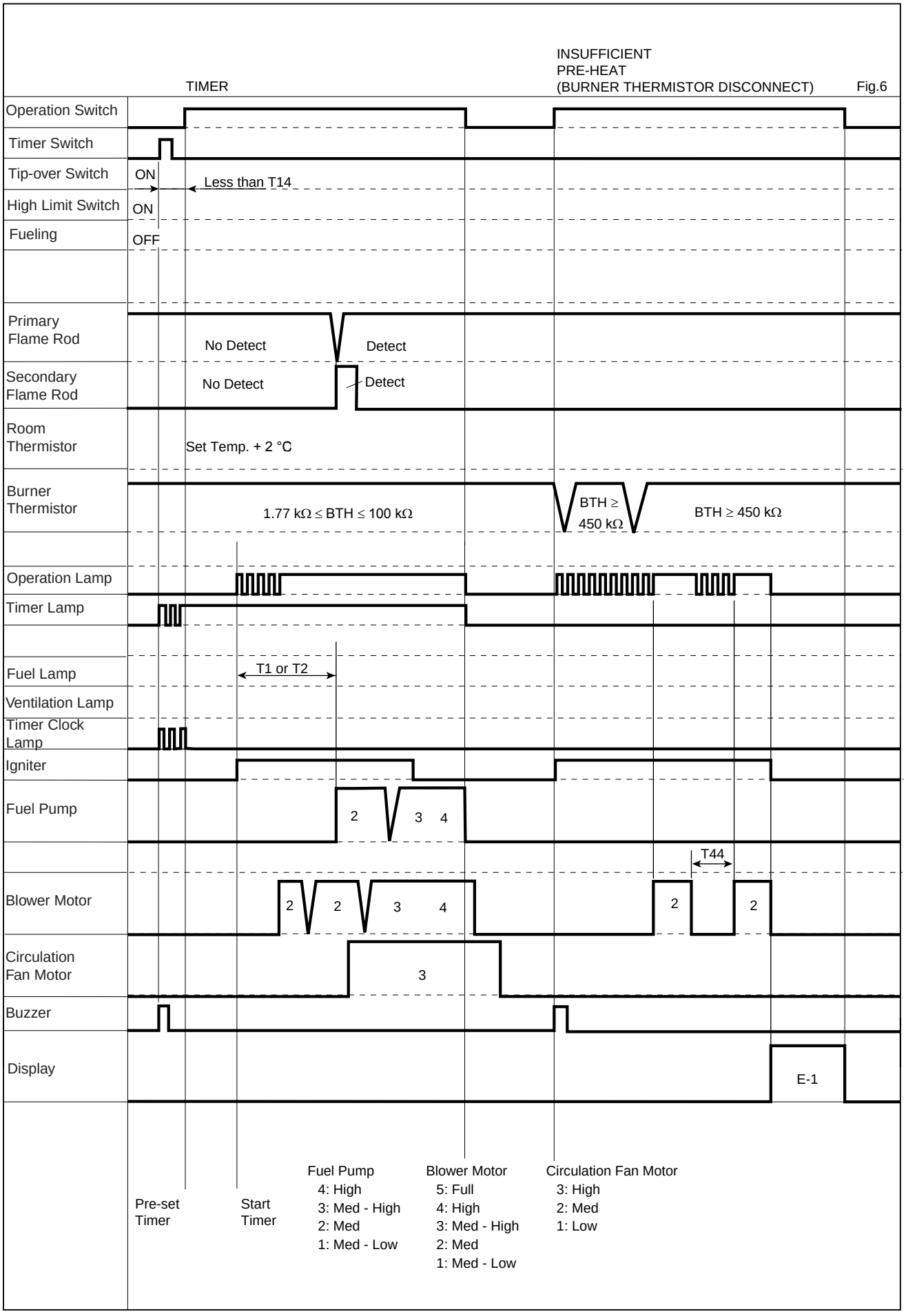
NOTE : This time chart will vary according to set condition.

TIME CHART : MODEL SRE 260



NOTE : This time chart will vary according to set condition.

TIME CHART : MODEL SRE 260



NOTE : This time chart will vary according to set condition.

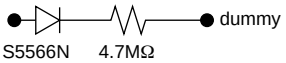
3.3 SPECIFICATIONS.

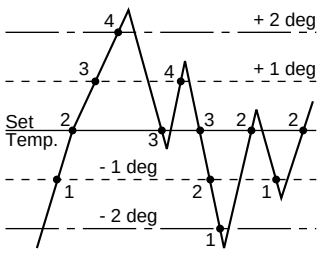
Item	Test Item	Specifications				Remarks.
		SRE 156 SRE 166	SRE 176	SRE 250	SRE 260	
3.3.1	**TIMING**					
3.3.1-1	Pre-heat timing 1 (T1)	40 ± 3 sec.	40 ± 3 sec.	50 ± 4 sec.	60 ± 5 sec.	Burner Thermistor < Pre-heat shorted resistance (See 3.3.4-1)
3.3.1-2	Pre-heat timing 2 (T2)	90 ± 8 sec.	90 ± 8 sec.	150 ± 10 sec.	150 ± 10 sec.	Room Thermistor ≥ 6 ˚C (See 3.3.3-6), Burner Thermistor ≥ Pre-heat shorted resistance (See 3.3.4-1)
3.3.1-3	Pre-heat timing 3 (T3)	150 ± 10 sec.	150 ± 10 sec.	210 ± 15 sec.	180 ± 10 sec.	Room Thermistor < 6˚C (See 3.3.3-6) At ignition of timer operation. However, at pre-heat timing 2 and 3, when Burner Thermistor after pre-heat timing 1 does not exceed pre-heat shortened resistance, ignition starts.
3.3.1-4	Pre-purge timing (T5)	10 ± 2 sec.	10 ± 2 sec.	10 ± 2 sec.	10 ± 2 sec.	
3.3.1-5	Fan Motor delay timing (T6)	13 ± 2 sec.	13 ± 2 sec.	13 ± 2 sec.	13 ± 2 sec.	
3.3.1-6	Safety timing when started (T7)	40 ± 3 sec.	40 ± 3 sec.	40 ± 3 sec.	50 ± 4 sec.	
3.3.1-7	Initial state timing (T8)	150 ± 10 sec.	150 ± 10 sec.	150 ± 10 sec.	150 ± 10 sec.	Burner Thermistor detects pre-heat shortened resistance.
3.3.1-8	Forced Med.-High burning timing (T9)	40 ± 3 sec.	40 ± 3 sec.	200 ± 15 sec. (forced Med. burning timing)	150 ± 10 sec. (forced Med. burning timing)	
3.3.1-9	Forced High burning timing (T10)	110 ± 10 sec. 20 ± 3 sec.	110 ± 10 sec. 20 ± 3 sec.	- - - - - -	- - - - - -	Max. Min. Unless Main Circuit Board detects Secondary Flame Rod at forced Med.-High burning timing, it performs High burning until it detects the secondary flame. However, it takes at least 20 sec. to change burning mode after Secondary flame is detected. Unless the flame is detected within 110 sec., Main Circuit Board displays E-9 and stops because of an error.

Item	Test Item	Specifications				Remarks.
		SRE 156 SRE 166	SRE 176	SRE 250	SRE 260	
3.3.1-10	Blower Motor post-purge timing 1 (T11)	15 ± 2 sec.	15 ± 2 sec.	30 ± 3 sec.	30 ± 3 sec.	No Blower Motor post-purge is available before Fuel Pump is turned on. The Blower Motor is at full rotation until initial timing.
3.3.1-11	Fan Motor post-purge timing (T12)	90 ± 7 sec.	90 ± 7 sec.	150 ± 10 sec.	150 ± 10 sec.	
3.3.1-12	Burner Thermistor detection timing (T13)	20 min. ± 80 sec.	20 min. ± 80 sec.	20 min. ± 80 sec.	20 min. ± 80 sec.	When Power Button is turned on and after T13 timing, Burner Thermistor starts to detect. However, when it is in continuous operation, timing starts from the beginning of the second pre-heat. Therefore, Additional High burning and Low burning can be performed.
3.3.1-13	Setting Possible timing (T14)	10 ± 2 sec.	10 ± 2 sec.	10 ± 2 sec.	10 ± 2 sec.	
3.3.1-14	Refueling timing (T15)	10min. ± 60sec.	10min. ± 60sec.	10min. ± 60sec.	10min. ± 60sec.	After displaying the remainder of burning time, Information Display flashes (countdown from 10). A fuel lamp turns on and flashes after countdown.
3.3.1-15	Refueling warning timing (T16)	120 ± 9 sec.	120 ± 9 sec.	120 ± 9 sec.	120 ± 9 sec.	Timing at which buzzer B sounds as a Refueling warning.
3.3.1-16	Burning change timing (T18)	30 ± 3 sec.	30 ± 3 sec.	60 ± 5 sec.	60 ± 5 sec.	
3.3.1-17	Motor lock timing (T23)	5 ± 2 sec.	5 ± 2 sec.	5 ± 2 sec.	5 ± 2 sec.	After Non-detection of motor timing (T28).
3.3.1-18	Pump delay timing (T24)	3 ± 2 sec.	3 ± 2 sec.	5 ± 2 sec.	5 ± 2 sec.	
3.3.1-19	Blower Motor delay timing (T25)	3 ± 2 sec.	3 ± 2 sec.	5 ± 2 sec.	5 ± 2 sec.	
3.3.1-20	Buzzer 5 sec. (T26)	5 ± 2 sec.	5 ± 2 sec.	5 ± 2 sec.	5 ± 2 sec.	Buzzer C sounds (E-6, ventilation), or buzzer B sounds repeatedly 5 sec. (flame extinguish for refueling).
3.3.1-21	Blower Motor post-purge timing 2 (T27)	90 ± 7 sec. 4 ± 2 sec.	90 ± 7 sec. 4 ± 2 sec.	150 ± 10 sec. 10 ± 2 sec.	150 ± 10 sec. 10 ± 2 sec.	Max. Min. However, unless Main Circuit Board detects (less than detected current) Primary flame within 4 sec., it immediately stops (Insufficient current was detected) (when BMP (blower motor post-purge) is set to 0).

Item	Test Item	Specifications				Remarks.
		SRE 156 SRE 166	SRE 176	SRE 250	SRE 260	
3.3.1-22	Non-detection of motor lock timing (T28)	5 ± 2 sec.	5 ± 2 sec.	5 ± 2 sec.	5 ± 2 sec.	
3.3.1-23	Response to lost flame timing (T30)	3 sec. or less	3 sec. or less	3 sec. or less	3 sec. or less	
3.3.1-24	Post-heat timing 1 (T31)	40 ± 5 sec.	40 ± 5 sec.	40 ± 3 sec.(Min.)	50±5 sec.(Min.)	When pre-heat timing ends at T1, and when Main Circuit Board is started by Burner Thermistor.
3.3.1-25	Post-heat timing 2 (T32)	80 ± 9 sec.	80 ± 9 sec.	80 ± 9sec.(Max.)	660 ± 60sec. (Max.)	When pre-heat timing ends at T2 and T3(however, when timing is P3 after forced Med.-High Burning (forced Med. burning - SRE 250) (T9) or is changed to P2, it is T31).
3.3.1-26	Burning changing safety timing (T33)	300 ± 20 sec.	300 ± 20 sec.	300 ± 20 sec.	300 ± 20 sec.	Timing at which no ventilation is performed if timing is changed by High and Low burning after T13 ends. However, upper and lower limits of BTH (Burner Thermistor) are detected at this timing.
3.3.1-27	Fixed burning timing (T34)	5 min. ± 20 sec.	5 min. ± 20 sec.	5 min. ± 20 sec.	5 min. ± 20 sec.	From 15 min. after Power Button is turned on.
3.3.1-28	Lost flame detection timing (T35)	30 ± 3 sec.	30 ± 3 sec.	30 ± 3 sec.	30 ± 3 sec.	Timing at which primary flame detection level is changed after T7 timing ends.
3.3.1-29	Blower Motor post-purge timing 4 (T37)	30 ± 3 sec.	30 ± 3 sec.	60 ± 5 sec.	30 ± 3 sec.	If selected by changing Main Circuit Board, T37 will be performed whether primary flame is detected or not (when BMP is set to 1).
3.3.1-30	Additional High burning timing (T39) (except SRE250, 260)	2 hrs. ± 6 min.	2 hrs. ± 6 min.	- - -	- - -	Min. time from the time at which it restarts Additional High burning after the end of Additional High burning.
3.3.1-31	Refueling recognition timing (T40)	3 ± 2 sec.	3 ± 2 sec.	3 ± 2 sec.	3 ± 2 sec.	Time from detection of Refueling to time when Fuel Lamp is turned on, or time from non-detection of low fuel to when Fuel Lamp is turned off.

Item	Test Item	Specifications				Remarks.
		SRE 156 SRE 166	SRE 176	SRE 250	SRE 260	
3.3.1-32	Forced Med.-High burning timing (SRE 250) (T41)	- - -	- - -	20 ± 3 sec.	- - -	Med.- High burning timing after Fuel Pump is on. Blower Motor delay (T25)
3.3.1-33	Deodorizing Pump OFF timing (SRE 250) (T42)	- - -	- - -	2 ± 1 sec.	- - -	Time from when Main Circuit Board starts to extinguish the flame to the time when Deodorizing Pump is turned on.
3.3.1-34	Deodorizing Pump ON timing (SRE 250) (T43)	- - -	- - -	3 ± 2 sec.	- - -	
3.3.1-35	Pre-heat extension timing (T44)	30 ± 3 sec.	30 ± 3 sec.	30 ± 3 sec.	30 ± 3 sec.	
3.3.1-36	Flame current undetected timing (T45)	10 ± 2 sec.	10 ± 2 sec.	15 ± 2 sec.	15 ± 2 sec.	Time from when Main Circuit Board passes T25 to the time when flame current is not detected, when Main Circuit Board stops burning after T35.
3.3.1-37	Relay stuck detection timing (T46)	20 min.± 80sec.	20 min.± 80sec.	20 ± 80 sec.	20 min.± 80sec.	Time from when operation stops to the time when relay stuck is judged.
3.3.1-38	Cleaning operation timing (T48)	- - -	- - -	2 hrs. ± 6 min.	2 hrs. ± 6 min.	Time from when High burning starts to the time when cleaning operation is started.
3.3.1-39	Heater post-purge timing (T50)	30 ± 3 sec.	30 ± 3 sec.	30 ± 3 sec.	30 ± 3 sec.	Timing at which heater pre-purge is performed when the operation is stopped.
3.3.1-40	Stand-by timing (T51)	5 min. ± 20 sec.	5 min. ± 20 sec.	5 min. ± 20 sec.	5 min. ± 20 sec.	Time taken to change to Stand-by saving mode when Power Button is turned off.
3.3.1-41	Initial refueling timing (T52)	2 ± 1 sec.	2 ± 1 sec.	2 ± 1 sec.	2 ± 1 sec.	T52 is started when pump is turned on.

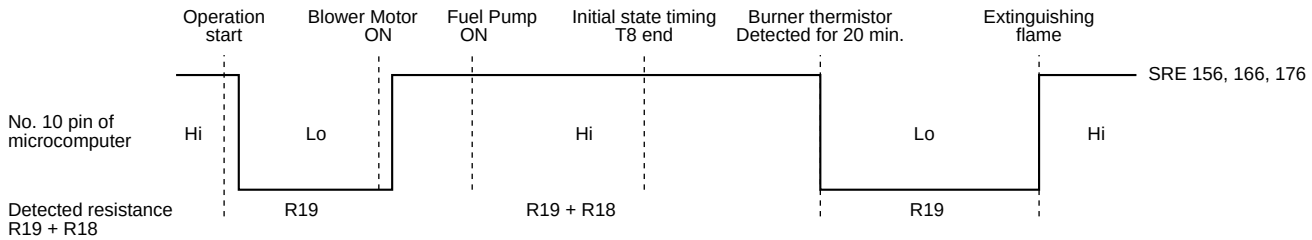
Item	Test Item	Specifications	Remarks.
3.3.2	**FLAME DETECTOR**		Meter:Yokogawa 2011-SB2 (class1, range 3 μA) used
3.3.2-1	Detected current (Primary Flame Rod)	0.6 μA or more (recommended value: 0.3 μA or more)	until T35 (3.3.1-28). Quasi flame is detected only when flame detector starts. Unless current is detected until T7 (3.3.1-6) repeat it (return to pre-heat). If it is still not detected at T7, E-2 is displayed. If detected current is less than 0.3 μA at T7 to T35, E-2 is also displayed.
		SRE 156 / SRE 166 / SRE 176 / SRE 250 / SRE 260	After T35
		1.0 ± 0.3 μA / 0.7 ± 0.3 μA / 1.2 ± 0.3 μA / 0.7 ± 0.3 μA	Additional High burning
		1.0 ± 0.3 μA / 0.7 ± 0.3 μA / 1.2 ± 0.3 μA / 0.7 ± 0.3 μA	High burning
		1.0 ± 0.3 μA / 0.7 ± 0.3 μA / 1.0 ± 0.3 μA / 0.7 ± 0.3 μA	Med.-High burning
		0.7 ± 0.3 μA / 0.7 ± 0.3 μA / 1.0 ± 0.3 μA / 0.7 ± 0.3 μA	Med. burning
		0.7 ± 0.3 μA / 0.7 ± 0.3 μA / 1.0 ± 0.3 μA / 0.7 ± 0.3 μA	Med.-Low burning
		1.0 ± 0.3 μA / 0.7 ± 0.3 μA / 1.1 ± 0.3μA / 0.4 ± 0.4 μA	Low burning
			* Unless flame current detection of the following items meets condition, E-6 is displayed.
3.3.2-2	Allowable rod leak resistance (Primary Flame Rod)	1.5 MΩ or more	 * At the condition of detected current 0.6 μA or more
3.3.2-3	Detected current (Secondary Flame Rod)	0.6 μA or more (recommended value: 0.3 μA or more)	If it is detected more than 2 sec. at timing of T9 (3.3.1-8), T10 (3.3.1-9) will not be performed. If it cannot be detected more than 2 sec., E-9 error is displayed. (SRE 156, SRE 166, SRE 176)
3.3.3	**ROOM THERMISTOR**		Use Thermistor B constant 4100. The Resistance at 28 ˚C is 10kΩ.
3.3.3-1	Max. set temperature	28.4 ± 3.2 ˚C (8.56, + 1.25 kΩ, - 1.14 kΩ) (SRE 156, SRE 166)	Indicator should be 28 ˚C.
		29.6 ± 2.8 ˚C (8.12, + 0.90 kΩ, - 0.94 kΩ) (SRE 176)	
		29.6 ± 2.8 ˚C (8.12, + 0.90 kΩ, - 0.94 kΩ) (SRE 250)	
		27.7 ± 3.2 ˚C (8.84, + 1.31 kΩ, - 1.17 kΩ) (SRE 260)	
3.3.3-2	Min. set temperature	5.7 ± 2.2 ˚C (25.88, + 3.14 kΩ, - 2.78 kΩ) (SRE 156, SRE 166)	Indicator should be 6 ˚C.
		6.7 ± 1.8 ˚C (24.54, + 2.43 kΩ, - 2.20 kΩ) (SRE 176)	
		6.7 ± 1.8 ˚C (24.54, + 2.43 kΩ, - 2.20 kΩ) (SRE 250)	
		5.1 ± 2.2 ˚C (26.74, + 3.28 kΩ, - 2.85 kΩ) (SRE 260)	

Item	Test Item	Specifications	Remarks.
3.3.3-3	Differential	1 ± 0.5 deg.	
	Max. temperature setting	(0.50 + 0.34 kΩ, - 0.33 kΩ) (SRE 156, SRE 166)	Set temperature 28 ˚C
		(0.46 + 0.18 kΩ, - 0.14 kΩ) (SRE 176)	
		(0.46 + 0.18 kΩ, - 0.14 kΩ) (SRE 250)	
		(0.52 + 0.34 kΩ, - 0.34 kΩ) (SRE 260)	
	Min. temperature setting	(1.18 + 0.90 kΩ, - 0.87 kΩ) (SRE 156, SRE 166)	Set temperature 6 ˚C
		(1.24 + 0.78 kΩ, - 0.66 kΩ) (SRE 176)	
		(1.24 + 0.78 kΩ, - 0.66 kΩ) (SRE 250)	
		(1.23 + 0.93 kΩ, - 0.90 kΩ) (SRE 260)	
3.3.3-4	High room temperature / Operating temperature		E - 7 is on.
	Set temperature: other than 6 ˚C	27, +2.3 ˚C, -2.8 ˚C (9.12, +1.25 kΩ, -0.90 kΩ) (SRE 156, SRE 166)	
		28, +2.5 ˚C, -2.7 ˚C (8.72 +0.96 kΩ, -0.92 kΩ) (SRE 176)	
		28, +2.5 ˚C, -2.7 ˚C (8.72, +0.96 kΩ, -0.92 kΩ) (SRE 250)	
		25, +2.7 ˚C, -2.3 ˚C (10.0, +1.13 kΩ, -1.15 kΩ) (SRE 260)	
	Set temperature:other 6 ˚C	21, +2.2 ˚C, -2.4 ˚C (12.06,+1.45 kΩ, -1.16 kΩ) (SRE 156, SRE 166)	
		25, +2.5 ˚C, -2.4 ˚C (10.0, +1.18 kΩ, -1.08 kΩ) (SRE 176)	
		22, +2.3 ˚C, -2.8 ˚C (11.5, +1.64 kΩ, -1.17 kΩ) (SRE 250)	
		22, +2.4 ˚C, -2.3 ˚C (11.51, +1.32 kΩ, -1.21 kΩ) (SRE 260)	
3.3.3-5	Broken wire detected	570, + 640 kΩ, - 220 kΩ(SRE 156, SRE 166)	E-1 is on.
		540, + 350 kΩ, - 250 kΩ(SRE 176)	
		540, + 350 kΩ, - 250 kΩ(SRE 250)	
		590, + 620 kΩ, - 210 kΩ(SRE 260)	
3.3.3-6	Preheat shortened resistance	6.0 ± 2.2 ˚C (25.50, + 3.06 kΩ, - 2.77 kΩ) (SRE 156, SRE 166)	
		6.7 ± 1.8 ˚C (24.54, + 2.43 kΩ, - 2.20 kΩ) (SRE 176)	
		6.7 ± 1.8 ˚C (24.54, + 2.43 kΩ, - 2.20 kΩ) (SRE 250)	
		5.4 ± 2.2 ˚C (26.32, + 3.23 kΩ, - 2.80 kΩ) (SRE 260)	
3.3.3-7	Room Thermistor burning control	Refer to figure on the right 1 High 2 Med. - High 3 Med. 4 Med. - Low	
		Low burning control	Note 2: If room temperature is less than 16 ˚C, Med.-Low burning is not performed (for tolerance, see 3.3.3-3) If Main Circuit Board is changed to set room temperature: 1) After T13 (3.3.1-12) 2) Room temperature is 18 ˚C or higher. 3) When room temperature increases by 4 ˚C or higher than set temperature. If three conditions mentioned above are met, Low burning will be performed. However, Low burning is not performed during Save Mode operation. 4) Room temperature is 17 ˚C or less. 5) When room temperature is set temperature plus 3 ˚C. When either of the two conditions is met, Low burning is changed to Med.-Low burning.

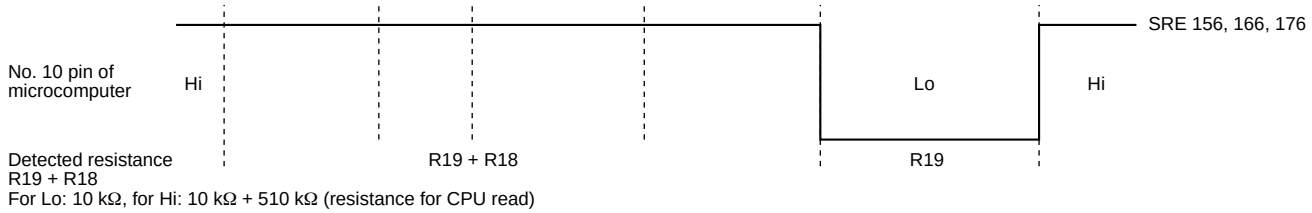
Item	Test Item	Specifications	Remarks.
3.3.3-8	Initial control for Room Thermistor burning	High burning Med.-High burning Med.-Low burning	Regarding set temperature 1 ˚C or less Less than 1 ˚C to 0 ˚C or less More than 0 ˚C However, if room temperature is less than 16˚C, Med.-Low burning will not be performed.
3.3.3-9	Save mode operation	4 ± 1.5 deg.	When room temperature increases by 4 ˚C higher than set temperature, Save Mode flame extinguish is performed. When room temperature decreases to less than set temperature during Save Mode flame extinguish, Main Circuit Board resumes operation.
3.3.3-10	Additional High burning operation (PH operation) (except SRE 250, SRE 260)		If Main Circuit Board is changed to set temperature (3.3.9-4), when the following conditions are met after Burner Thermistor Detection Timing (T 13) (SRE 250:Additional High burning timing (T39)), Main Circuit Board enters Additional High burning operation. 1) Room temperature is less than 10 ˚C. 2) Set temperature is 5 ˚C higher than room temperature. 3) Main Circuit Board does not perform Additional High burning after starting operation (including Save Mode ignition) operation (including safety ignition) or it passes Additional High burning timing (T39) after Additional High burning operation is finished (however, it does not count Additional High burning timing (T39) during cleaning operation, burning lock, and refueling extension). * When the condition mentioned above is exited within 5 min., it is subject to normal temperature control. * If there is any forced burning condition (burning lock, refueling extension), forced burning has priority. Also, if there is forced burning during PH operation, Main Circuit Board must pass Additional High burning timing (T39) for PH operation. * Main Circuit Board does not perform Additional high burning during refueling extension. * Burning lock in Additional High burning mode shall be P4 lock.

Item	Test Item	Specifications				Remarks.
		SRE 156 SRE 166	SRE 176	SRE 250	SRE 260	
3.3.4	**BURNER THERMISTOR**					
3.3.4-1	Pre-heat shortened resistance	20 ± 3.0 kΩ	100 ± 14 kΩ	100 ± 14 kΩ	450 ± 78 kΩ	
3.3.4-2	Lower-limit resistance after 20 min.	0.33 ± 0.16 kΩ	1.77 ± 0.43 kΩ	1.77 ± 0.43 kΩ	1.77 ± 0.43 kΩ	
3.3.4-3	Upper-limit resistance after 20 min.	85 ± 12 kΩ	100 ± 14 kΩ	200 ± 30 kΩ	100 ± 14 kΩ	
3.3.4-4	Resistance at insufficient pre-heat	900 ± 125 kΩ	950 ± 126 kΩ	950 ± 126 kΩ	950 ± 126 kΩ	
3.3.4-5	Resistance at insufficient initial pre-heat	20 ± 3.0 kΩ	100 ± 14 kΩ	100 ± 14 kΩ	450 ± 78 kΩ	If value of Burner Thermistor is insufficient initial resistance at insufficient initial pre-heat or less in the beginning of pre-purge timing T5, Main Circuit Board will not detect F-1 broken wire.
3.3.4-6	Post-heat shortened resistance	- - -	- - -	- - -	15 ± 1.7 kΩ	
3.3.4-7	F-1 broken wire detection	When Power Button is on, value of BTH (Burner Thermistor) is converted to that of LSB: A When pump is on, value of BTH is converteted to that of LSB: B After pre-heat extension(30 sec.), when pump is on, value of BTH is converted to that of LSB: B' . If A≤ B + 2(LSB) is met when pump is on, Main Circuit Board performs pre-heat extension. If A ≤ B' + 2(LSB) is met , it displays F-1. However, there is no detection for re-ignition (repeat). In addition, it does not perform hot start during pre-heat extension. Extended time for pre-heat shall be 30 sec.				

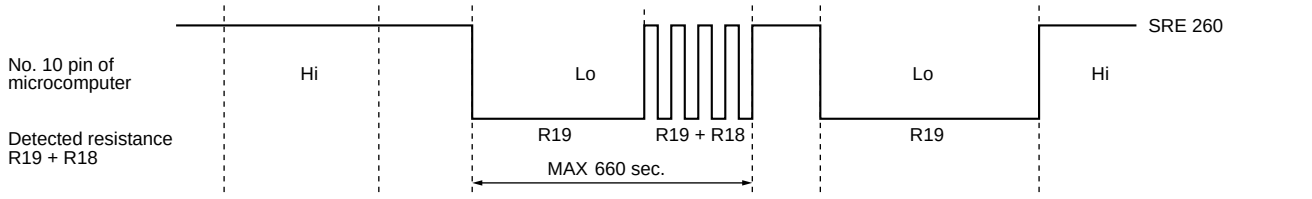
Burner thermistor detection circuit (No. 10 pin of microcomputer)
Sequence is as follows:



For Lo: 10 kΩ, for Hi: 10 kΩ + 510 kΩ (resistance for CPU read)



For Lo: 10 kΩ, for Hi: 10 kΩ + 510 kΩ (resistance for CPU read)



For Lo: 15 kΩ, for Hi: 15 kΩ + 910 kΩ (resistance for CPU read)

Item	Test Item	Specifications	Remarks.
3.3.5	**VENTILATION**	After T13(3.3.1-12), Main Circuit Board ventilates Burner Thermistor as it changes. However, when it is in repeat operation, it counts timing from the beginning of the second pre-heat. Z : Value of safety operation (LSB) BTH20 : Value of Burner Thermistor after 20 min. (LSB) RTH20 : Value of Room Thermistor after 20 min. (LSB) RTH : Value of present Room Thermistor (LSB) BTH : Value of present Burner Thermistor (LSB) Formula of calculating the value of LSB BTH = Bth / (R + Bth) x 256 BTH20 = Bth20 / (R + Bth20) x 256 RTH = Rth / (Rrth + Rth) x 256 RTH20 = Rth20 / (Rrth + Rth20) x 256 R: Partial-pressure resistance for CPU read (Burner Thermistor) Bth20: Resistance(kΩ) of Burner Thermistor after 20 min. (at T13) Bth: Resistance (kΩ) of present Burner Thermistor Rth20: Resistance (kΩ) of Room Thermistor after 20 min. (at T13) Rth: Resistance (kΩ) of present Room Thermistor Rrth : Partial-pressure resistance for CPU read (Room Thermistor)	

	SRE 156 SRE 166	SRE 176 SRE 250	SRE 260
R	10 kΩ	15 kΩ	15 kΩ
Rrth	23.2 kΩ	22 kΩ	24 kΩ

Formula

SRE 156, SRE 166, SRE 176, SRE 250.

Z = BTH20 + (RTH - RTH20 - B) / 4 + C + D (LSB)

For SRE 156, 166

B : B = 0 (LSB)

C: Correction values (LSB) during 20-minute burning

Burning	High	Med.-High	Med.	Med.-Low
C	0	5	15	15

D: Correction values (LSB) during present burning according to the following table

Burning	High	Med.-High	Med.	Med.-Low	Low
D	75	60	30	10	15

For SRE 176

When B is 20 min. (at T13) and burning condition is high burning, formula shall be BTH20-50. However, when BTH20 ≤ 50, it shall be B = 0. In other burning types, it shall be B = 0. (LSB)

C: Correction values (LSB) by state of 20 min. burning (T13)

Burning	High	Med.-High	Med.	Med.-Low
C	35	35	35	25

D: Correction values (LSB) by present burning according to the following table

Burning	High	Med.-High	Med.	Med.-Low	Low
D	50	25	15	10	10

<table>
<tr><th>Item</th><th>Test Item</th><th>Specifications</th><th>Remarks.</th></tr>
<tr><td></td><td></td><td>SRE 250
Z = BTH20 + (RTH - RTH20) / 4 + C + D (LSB)

C: Correction values (LSB) during 20 min. burning (T13)
<table><tr><td>Burning</td><td>High</td><td>Med.-High</td><td>Med.</td><td>Med.-Low</td></tr><tr><td>C</td><td>5</td><td>20</td><td>35</td><td>40</td></tr></table>
D: Correction values (LSB) during present burning according to the following table
<table><tr><td>Burning</td><td>High</td><td>Med.-High</td><td>Med.</td><td>Med.-Low</td><td>Low</td></tr><tr><td>D</td><td>85</td><td>40</td><td>0</td><td>0</td><td>0</td></tr></table>
SRE 260
Z = BTH20 + (RTH - RTH20 - B) / 4 + 60 + RTH / D (LSB)

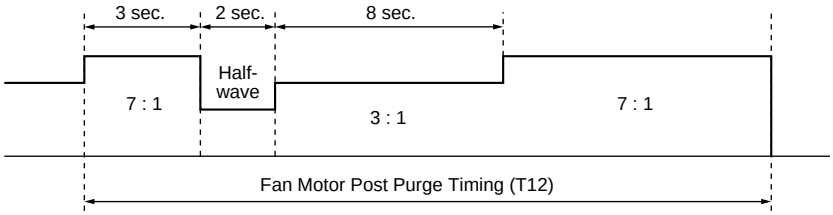
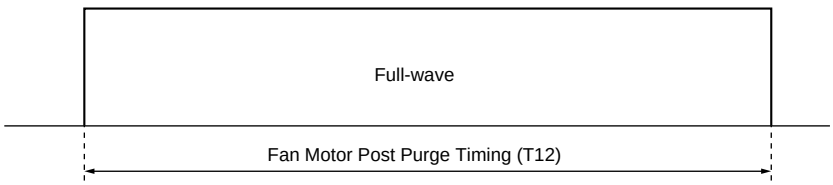
B: Correction values (LSB) during 20 min. burning (T13)
High Burning = BTH20 - 20
Med. burning = BTH20 - 40
Low and Med.-Low burning = 0
D: Correction values (LSB) during present burning according to the following table
<table><tr><td>Burning</td><td>High</td><td>Med.-High</td><td>Med.</td><td>Med.-Low</td><td>Low</td></tr><tr><td>D</td><td>4</td><td>8</td><td>16</td><td>256</td><td>16</td></tr></table></td><td>For SRE 156,</td></tr>
<tr><td>3.3.5-1</td><td>For safety operation</td><td>(Universal regardless of models)
BTH = Z± 5(LSB)
Ventilation lamp turns on and buzzer C sounds (T26).</td><td></td></tr>
</table>

Item	Test Item	Specifications	Remarks.
3.3.6	**INDICATION**		
3.3.6-1	Operation Lamp	Flashing: Under pre-heat, Lighting: Under operation and Save Mode flame extinguish. *Operation lamp is in static drive.	
3.3.6-2	Timer Lamp	Lighting: During timer standby, during timer burning, after timer burning. Flashing: During time setting by timer	
3.3.6-3	Fuel Lamp	Flashing: Low fuel safety operation, during refueling extension. Lighting: Warning for low fuel.	
3.3.6-4	Ventilation Lamp	Flashing: Function for displaying ventilation in ventilation safety mode (currently displayed are BTH and value calculated for ventilation). Lighting: Function for displaying ventilation (20 min. burning displayed, 20 min. BTH displayed)	
3.3.6-5	Clock Indication Lamp	Flashing: Time setting enabled Lighting: Current time displayed	
3.3.6-6	Temperature Indication Lamp	Flashing: Set temperature adjustable (during operation) Lighting: Set temperature displayed (during operation)	
3.3.6-7	Timer Indication Lamp	Flashing: During time setting by timer	
3.3.6-8	Key-Lock (Childproof lock) Lamp	Flashing: Burning locking (3.3.9-14) Lighting: During Key-Lock (childproof lock) operation	
3.3.6-9	Colon Lamp	Flashing: Current time displayed, Lighting: Time is displayed on timer, and current time is not set.	
3.3.6-10	Information Display Indication	Stop: Flashing: Current time and timer' s time setting enabled, Lighting: Current time, timer' s time, error code displayed (3.3.6-11) Operation: Flashing: – Lighting: Displays set temperature and room temperature, and displays remaining burning time during low fuel.	
3.3.6-11	Error Code	E-0: Overheat protection device activates. F-0: Recovery from power failure, RAM check, backup power is dead. E-1: Broken wire of Room Thermistor F-1: Broken wire of Burner Thermistor, Burner Thermistor running short of Preheat, Burner Thermistor running short of initial preheat E-2: Initial lost flame, quasi flame detection E-5: Anti-earthquake unit operation (is one second slower than safety operation) E-6: Lost flame E-7: High room temperature E-8: When motor lock, Blower Motor high rotation and Upper / Lower limit frequency are detected E-9: Secondary Flame Rod not detected (except Model SRE 250, SRE 260) Bar (— —)indication: When extinguish flame with Power Button turned on, other than Flashing mentioned above(except during timer standby, during burning by timer). Refer to 3.3.9-12 on page 68.	
3.3.6-12	Burning Mode Indication	PH: Additional High burning P4: High burning P3: Med.-High burning P2: Med. burning P1: Med.-Low burning PL: Low burning P0: Stop (Only Power Button ON is displayed) See 3.3.9-10 on page 67.	
3.3.6-13	Save Mode Lamp	lighting under Save Mode operation	

Item	Test Item	Specifications				Remarks.
3.3.6-14	Room temperature Indicating specificity	SRE 156, SRE 166		SRE 176		
	0	0.7 +2.1˚C or less	- 30.17 kΩ	1.4 ± 1.8˚C or less	- 29.67 kΩ	
	1	1.6 +2.1˚C or less	36.32 - 28.77 kΩ	2.3 ± 1.8 ˚C	34.32 - 28.29 kΩ	
	2	2.5 ± 2.2˚C	34.59 - 27.44 kΩ	3.2 ± 1.8 ˚C	32.68 - 26.97 kΩ	
	3	3.3 ± 2.2˚C	32.96 - 26.17 kΩ	4.0 ± 1.8 ˚C	31.13 - 25.73 kΩ	
	4	4.2 ± 2.2˚C	31.41 - 24.97 kΩ	4.9 ± 1.8 ˚C	29.67 - 24.55 kΩ	
	5	5.1 ± 2.2˚C	29.95 - 23.82 kΩ	5.8 ± 1.8 ˚C	28.29 - 23.42 kΩ	
	6	6.0 ± 2.2˚C	28.56 - 22.73 kΩ	6.7 ± 1.8 ˚C	26.97 - 22.35 kΩ	
	7	6.9 ± 2.2˚C	27.25 - 21.69 kΩ	7.6 ± 1.8 ˚C	25.73 - 21.32 kΩ	
	8	7.8 ± 2.2˚C	26.00 - 20.70 kΩ	8.5 ± 1.8 ˚C	24.55 - 20.35 kΩ	
	9	8.7 ± 2.2˚C	24.80 - 19.74 kΩ	9.4 ± 1.8 ˚C	23.42 - 19.41 kΩ	
	10	$9.6 \pm \frac{2.3}{2.2}$ ˚C	23.67 - 18.83 kΩ	$10.4 \pm \frac{1.8}{1.9}$ ˚C	22.35 - 18.52 kΩ	
	11	$10.5 \pm \frac{2.3}{2.2}$ ˚C	22.58 - 17.96 kΩ	11.3 ± 1.9 ˚C	21.32 - 17.66 kΩ	
	12	11.5 ± 2.3 ˚C	21.55 - 17.13 kΩ	12.2 ± 1.9 ˚C	20.35 - 16.84 kΩ	
	13	$12.4 \pm \frac{2.3}{2.2}$ ˚C	20.56 - 16.32 kΩ	13.2 ± 1.9 ˚C	19.41 - 16.05 kΩ	
	14	13.4 ± 2.3˚C	19.61 - 15.55 kΩ	$14.1 \pm \frac{2.0}{1.9}$ ˚C	18.52 - 15.30 kΩ	
	15	$14.3 \pm \frac{2.4}{2.3}$ ˚C	18.70 - 14.81 kΩ	$15.1 \pm \frac{2.0}{1.9}$ ˚C	17.66 - 14.57 kΩ	
	16	$15.3 \pm \frac{2.4}{2.3}$ ˚C	17.83 - 14.10 kΩ	16.1 ± 2.0 ˚C	16.84 - 13.87 kΩ	
	17	$16.3 \pm \frac{2.5}{2.4}$ ˚C	17.00 - 13.41 kΩ	17.1 ± 2.0 ˚C	16.05 - 13.20 kΩ	
	18	$17.3 \pm \frac{2.5}{2.4}$ ˚C	16.20 - 12.75 kΩ	$18.1 \pm \frac{2.1}{2.0}$ ˚C	15.30 - 12.55 kΩ	
	19	$18.3 \pm \frac{2.6}{2.4}$ ˚C	15.42 - 12.11 kΩ	$19.1 \pm \frac{2.1}{2.0}$ ˚C	14.75 - 11.93 kΩ	
	20	$19.4 + \frac{2.6}{2.5}$ ˚C	14.68 - 11.50 kΩ	20.2 ± 2.1 ˚C	13.87 - 11.33 kΩ	
	21	20.5 ± 2.6˚C	13.97 - 10.90 kΩ	$21.2 \pm \frac{2.2}{2.1}$ ˚C	13.20 - 10.74 kΩ	
	22	$21.6 \pm \frac{2.7}{2.6}$ ˚C	13.28 - 10.33 kΩ	$22.3 \pm \frac{2.3}{2.1}$ ˚C	12.55 - 10.18 kΩ	
	23	$22.7 \pm \frac{2.8}{2.6}$ ˚C	12.62 - 9.78 kΩ	$23.4 \pm \frac{2.4}{2.2}$ ˚C	11.93 - 9.64 kΩ	
	24	23.9 ± 2.8˚C	11.98 - 9.24 kΩ	$24.6 \pm \frac{2.4}{2.3}$ ˚C	11.33 - 9.12 kΩ	
	25	$25.0 \pm \frac{3.0}{2.7}$ ˚C	11.36 - 8.72 kΩ	$25.8 \pm \frac{2.5}{2.4}$ ˚C	10.74 - 8.61 kΩ	
	26	$26.3 \pm \frac{3.0}{2.9}$ ˚C	10.76 - 8.22 kΩ	$27.0 \pm \frac{2.6}{2.4}$ ˚C	10.18 - 8.12 kΩ	
	27	$27.5 \pm \frac{3.2}{2.9}$ ˚C	10.18 - 7.73 kΩ	$28.3 \pm \frac{2.7}{2.5}$ ˚C	9.64 - 7.64 kΩ	
	28	$28.9 \pm \frac{3.2}{3.1}$ ˚C	9.63 - 7.26 kΩ	$29.6 \pm \frac{2.8}{2.6}$ ˚C	9.12 - 7.18 kΩ	
	29	$30.2 \pm \frac{3.4}{3.1}$ ˚C	9.09 - 6.80 kΩ	$31.0 \pm \frac{2.8}{2.7}$ ˚C	8.61 - 6.73 kΩ	
	30	$31.6 \pm \frac{3.5}{3.2}$ ˚C	8.56 - 6.36 kΩ	$32.4 \pm \frac{3.0}{2.8}$ ˚C	8.12 - 6.30 kΩ	
	31	$33.1 \pm \frac{3.7}{3.3}$ ˚C	8.06 - 5.93 kΩ	$33.8 \pm \frac{3.1}{2.8}$ ˚C	7.64 - 5.88 kΩ	
	32	$34.7 \pm \frac{3.8}{3.5}$ ˚C	7.57 - 5.51 kΩ	$35.4 \pm \frac{3.2}{3.0}$ ˚C	7.18 - 5.47 kΩ	

Item	Test Item	Specifications				Remarks.
3.3.6-14	Room temperature Indicating specificity	SRE 250		SRE 260		
	0	0.1+2.2˚C or less	-31.21 kΩ	0.1+ 2.2˚C or less	-31.21 kΩ	
	1	0.9 ± 2.2˚C	37.57 - 29.76 kΩ	0.9 + 2.2˚C	37.57 - 29.76 kΩ	
	2	1.8 ± 2.2˚C	35.78 - 28.38 kΩ	1.8 + 2.2˚C	35.78 - 28.38 kΩ	
	3	2.7 ± 2.2˚C	34.09 - 27.07 kΩ	2.7 ± 2.2˚C	34.09 - 27.07 kΩ	
	4	3.6 ± 2.2˚C	32.50 - 25.83 kΩ	3.6 ± 2.2˚C	32.50 - 25.83 kΩ	
	5	4.5 ± 2.2˚C	30.98 - 24.64 kΩ	4.5 ± 2.2˚C	30.98 - 24.64 kΩ	
	6	5.4 ± 2.2˚C	29.55 - 23.52 kΩ	5.4 ± 2.2˚C	29.55 - 23.52 kΩ	
	7	6.3 ± 2.2˚C	28.19 - 22.44 kΩ	6.3 ± 2.2˚C	28.19 - 22.44 kΩ	
	8	7.2 ± 2.2˚C	26.89 - 21.41 kΩ	7.2 ± 2.2˚C	26.89 - 21.41 kΩ	
	9	8.1 ± 2.2˚C	25.66 - 20.43 kΩ	8.1 ± 2.2˚C	25.66 - 20.43 kΩ	
	10	9.0 ± 2.2˚C	24.48 - 19.48 kΩ	9.0 ± 2.2˚C	24.48 - 19.48 kΩ	
	11	9.9 ± 2.2˚C	23.36 - 18.58 kΩ	9.9 ± 2.2˚C	23.36 - 18.58 kΩ	
	12	$10.8 \pm \frac{2.3}{2.2}$ ˚C	22.29 - 17.72 kΩ	$10.8 \pm \frac{2.3}{2.2}$ ˚C	22.29 - 17.72 kΩ	
	13	$11.7 \pm \frac{2.4}{2.2}$ ˚C	21.27 - 16.89 kΩ	$11.7 \pm \frac{2.4}{2.2}$ ˚C	21.27 - 16.89 kΩ	
	14	12.7 ± 2.3 ˚C	20.29 - 16.09 kΩ	12.7 ± 2.3 ˚C	20.29 - 16.09 kΩ	
	15	$13.6 \pm \frac{2.4}{2.3}$ ˚C	19.35 - 15.32 kΩ	$13.6 \pm \frac{2.4}{2.3}$ ˚C	19.35 - 15.32 kΩ	
	16	$14.6 \pm \frac{2.4}{2.3}$ ˚C	18.45 - 14.58 kΩ	$14.6 \pm \frac{2.4}{2.3}$ ˚C	18.45 - 14.58 kΩ	
	17	$15.6 \pm \frac{2.5}{2.3}$ ˚C	17.58 - 13.87 kΩ	$15.6 \pm \frac{2.5}{2.3}$ ˚C	17.58 - 13.87 kΩ	
	18	$16.6 \pm \frac{2.5}{2.4}$ ˚C	16.75 - 13.19 kΩ	$16.6 \pm \frac{2.5}{2.4}$ ˚C	16.75 - 13.19 kΩ	
	19	$17.6 \pm \frac{2.6}{2.4}$ ˚C	15.96 - 12.53 kΩ	$17.6 \pm \frac{2.6}{2.4}$ ˚C	15.96 - 12.53 kΩ	
	20	$18.7 \pm \frac{2.6}{2.5}$ ˚C	15.19 - 11.89 kΩ	$18.7 \pm \frac{2.6}{2.5}$ ˚C	15.19 - 11.89 kΩ	
	21	19.8 ± 2.6˚C	14.45 - 11.28 kΩ	19.8 ± 2.6˚C	14.45 - 11.28 kΩ	
	22	$20.9 \pm \frac{2.7}{2.6}$ ˚C	13.74 - 10.69 kΩ	$20.9 \pm \frac{2.7}{2.6}$ ˚C	13.74 - 10.69 kΩ	
	23	22.0 ± 2.7˚C	13.05 - 10.11 kΩ	22.0 ± 2.7˚C	13.05 - 10.11 kΩ	
	24	$23.1 \pm \frac{3.3}{3.1}$˚C	12.39 - 9.56 kΩ	$23.1 \pm \frac{2.9}{2.7}$˚C	12.39 - 9.56 kΩ	
	25	$24.3 \pm \frac{2.9}{2.7}$ ˚C	11.75 - 9.02 kΩ	$24.3 \pm \frac{2.9}{2.7}$ ˚C	11.75 - 9.02 kΩ	
	26	$25.5 \pm \frac{3.0}{2.8}$ ˚C	11.13 - 8.50 kΩ	$25.5 \pm \frac{3.0}{2.8}$ ˚C	11.13 - 8.50 kΩ	
	27	$26.8 \pm \frac{3.1}{2.9}$ ˚C	10.54 - 8.00 kΩ	$26.8 \pm \frac{3.1}{2.9}$ ˚C	10.54 - 8.00 kΩ	
	28	$28.1 \pm \frac{3.2}{3.0}$ ˚C	9.96 - 7.51 kΩ	$28.1 \pm \frac{3.2}{3.0}$ ˚C	9.96 - 7.51 kΩ	
	29	$29.5 \pm \frac{2.8}{2.7}$ ˚C	9.40 - 7.04 kΩ	$29.5 \pm \frac{3.3}{3.1}$ ˚C	9.40 - 7.04 kΩ	
	30	$30.9 \pm \frac{3.4}{3.2}$ ˚C	8.86 - 6.58 kΩ	$30.9 \pm \frac{3.4}{3.2}$ ˚C	8.86 - 6.58 kΩ	
	31	$32.3 \pm \frac{3.7}{3.3}$ ˚C	8.34 - 6.14 kΩ	$32.3 \pm \frac{3.7}{3.3}$ ˚C	8.34 - 6.14 kΩ	
	32	$33.9 \pm \frac{3.8}{3.5}$ ˚C	7.83 - 5.70 kΩ	$33.9 \pm \frac{3.8}{3.5}$ ˚C	7.83 - 5.70 kΩ	

Item	Test Item	Specifications	Remarks.
3.3.7	**OPERATION PANEL**		
3.3.7-1	Power Button	Once Power Button is pressed, buzzer A sounds and operation starts. When pressed again, it extinguishes the flame (lock type).	
3.3.7-2	Tact SW (any buttons except Power Button)	When Tact button is pressed, buzzer A sounds.	
3.3.7-3	Timer Button	In operation 1) If current time and timer are not set: Timer Button will not operate. 2) If current time is already set and timer is not set: Operation stops, Information Display bar indication is on, colon lamp turns on, and Timer Lamp flashes. If UP or DOWN Button is not pressed within 10 sec., a timer error will occur. If UP or DOWN is pressed while Timer Lamp is flashing (within 10 sec.), the lamp flashes, setting is 0:00, and setting can be changed. After 10 sec., Clock Lamp and Timer Lamp will turn on, and timer will be in standby. 3) If current time and timer are already set: Operation stops, timer indication flashes, and Timer Lamp flashes. While Timer Lamp is flashing (10 sec.), timer setting can be changed. After 10 sec., Clock Lamp and Timer Lamp go on, and timer will be in standby. During stop 4) If current time and timer are not set: Timer Button will not operate. 5) If current time is already set and timer is not set: Information Display bar indication is on, colon lamp turns on, and Timer Lamp flashes. If UP or DOWN Button is not pressed within 10 sec., setting returns to current time. If UP or DOWN Button is pressed while Timer Lamp is flashing (10 sec.), Information Display is indicated as 0:00 and setting can be changed. After 10 sec., setting returns to current time. Also, when Power Button is turned on while Timer Lamp is flashing, setting returns to 3) above and timer will be in standby. 6) If current time and timer are set: Timer setting flashes, and Timer Lamp flashes. While Timer Lamp is flashing (10 sec.), timer setting can be changed. After 10 sec., setting returns to current time. When Power Button is turned on while Timer Lamp is flashing(10 sec.), setting returns to 3) above and timer will be in standby.	

Item	Test Item	Specifications	Remarks.
3.3.7-4	Min., DOWN Button	When temperature displays: Press this button once to change temperature setting. If pressed within 10 sec., temperature decreases by one degree. When current time and timer displayed: Press this button once to change current time and timer. If pressed within 10 sec., clock increases one min. Press this button more than one sec. to fast-forward the clock. If time is not set when this button is pressed, the setting will become 0:00 (buzzer sounds only once when this button is held down).	
3.3.7-5	Hour, UP Button	When temperature displays: Press this button once to change temperature setting. If pressed within 10sec temperature increases by one degree. When current time and timer displayed: Press this button once to change current time and timer. If pressed within 10 sec., clock increases one hour. Press this button more than one sec. to fast-forward the clock. If time is not set when this button is pressed, the setting will become 0:00 (buzzer sounds only once when this button is held down).	
3.3.7-6	Extension Button (SRE 176)	When Refueling Remaining time displayed: Starts Fuelling Extension Operation (Refuel Extension Operation. Please refer to 3.3.9-5) When Error message displayed: Displays the time when the unit stopped by error.	
3.3.7-7	Key-Lock (Childproof Lock) Button	Press this button more than 3 sec. starts the Key-Lock (Childproof Lock) operation. During Key-Lock (Childproof Lock) operation, any buttons except Power Button (OFF) and Key-Lock (Childproof Lock) Button does not work even if they are pressed. If the operation is in Key-Lock (Childproof Lock) operation, press this button more than 3 sec. releases Key-Lock (Childproof Lock) operation.	
3.3.7-8	Save Mode Button (except Oslo, SRE 701, SRE 702 and SRE 703)	Press this button once changes to Save mode operation and press this button again releases Save mode operation.	
3.3.8	**CIRCULATION FAN MOTOR CONTROL**	<table><tr><td>Additional High burning, High, and Med.-High burning:</td><td>Full rotation</td></tr><tr><td>Med. burning:</td><td>7:1 control</td></tr><tr><td>Med.-Low and Low burning:</td><td>3:1 control</td></tr></table>	
	Fan motor half-wave control setting	When Circulation Fan Motor half-wave control setting is enabled (3.3.9-3), fan motor post-purge operates as follows:  However, if the Circulation Fan Motor stops due to an abnormality (except for stop for refueling) and until initial state timing T8 ends, fan motor post-purge half-wave control mentioned above will not be performed.  	

Item	Test Item	Specifications	Remarks.
3.3.9	**ADDITIONAL FUNCTIONS**		
3.3.9-1	Ventilation safe mode setting	Ventilation safe mode setting can or cannot be used by TJ 10.	

Safe mode value	Z + 20	Z
TJ 10	X	O

O: With element, X: Without element

3.3.9-2	Low burning setting	Low burning setting can or cannot be used by TJ 4.	

Low burning setting	Existence	Not existence
TJ 4	X	O

O: With element, X: Without element

3.3.9-3	Circulation Fan Motor half-wave control setting	Circulation Fan Motor half-wave control setting can or cannot be used by RX2 resistance. The following BMP1 and BMP2 settings can also be set by RX2.	

RX2	BMP setting	FM half-wave control setting
1 kΩ	BMP1	O
8.2 kΩ	BMP1	X
13 kΩ	BMP2	O
22 kΩ	BMP2	X
43 kΩ	BMP0	O
Release	BMP0	X

O: Existence, X: Not-existence

3.3.9-4	Additional High burning setting (except SRE 250 and SRE 260)	Additional High burning setting can or cannot be used by TJ 3.	

Additional High burning setting	Not Existence	Existence
TJ 3	O	X

O: With element, X: Without element

Item	Test Item	Specifications	Remarks.
3.3.9-5	Refueling extension setting	Refueling extension setting can or cannot be used by TJ 9.	

Refueling extension setting	Not Existence	Existence
TJ 9	O	X

O: With element, X: Without element

When refueling extension setting is enabled, the Main Circuit Board operates as follows:
- When extension button is pressed while a warning for refueling is given (during a countdown in refueling), the Main Circuit Board stops controlling burning with the room thermistor, forcibly changes to Med.-Low burning (P1), and extends time for refueling. In addition, if Low burning setting is enabled, meeting the condition for Low burning (3.3.3-7) allows Low burning (PL). If the condition for Save Mode flame extinguish is met, the Main Circuit Board performs Save Mode flame extinguish.
- When refueling is extended, the Fuel Lamp will flash.
- To calculate extension time, multiply the number during refueling countdown by (X). The value in parentheses depends on refueling extension time (the unit in sec. is rounded off).
  For example: When the setting of refueling extension time is 6 times:
  If the refueling countdown is indicated as 10, extension time is 6 x 10=[60] .
  If the refueling countdown is indicated as 5, extension time is 6 x 5=[30] .
- The warning buzzer for refueling turns on every two min. after the countdown reaches to 10 min.
- The countdown during refueling extension is also counted during pre-heat.
- If refueling extension setting is enabled while burning is fixed, when extension button is pressed, extension time for refueling is 6 times. However, burning remains at T13 timing, then changes to Med.-Low (or Low.) burning.
- During Save Mode flame extinguish, refueling countdown is not counted.
- To return to normal burning mode from refueling extension, either supply the heater with kerosene so that the refueling sensor can be activated, or reset the Main Circuit Board.
- Even while refueling is extended, the Main Circuit Board performs forced High burning.
- While refueling is extended, the Main Circuit Board cannot be set in burning lock mode.
- Refueling extension is disabled in the following cases:
  During burning lock, during child lock, while a Fuel Lamp is off or flashing, during Save Mode flame extinguish.
- Additional High burning timing (T39) is not counted while refueling is extended.

Item	Test Item	Specifications	Remarks.
3.3.9-6	Refueling extension time setting	Refueling extension time setting can be done by TJ 8. 6 times: Multiply 6 by refueling extension time. 5 times: Multiply 5 by refueling extension time	

Refueling extension time setting	6 times	5 times
TJ 8	X	O

O: With element, X: Without element

3.3.9-7	Model setting	Model setting can or cannot be used by TJ 14, TJ 15, and TJ 16.	

Model	SRE 156	SRE 166	SRE 176	SRE 250	SRE 260
TJ 14	X	X	O	X	O
TJ 5	X	O	O	X	O
TJ 6	X	X	X	X	O

O: With element, X: Without element

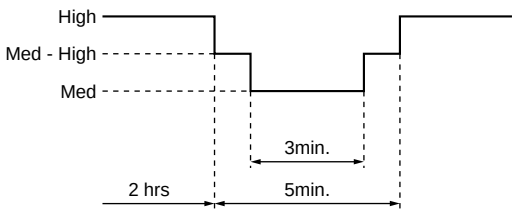
3.3.9-8	Each model setting		

Model	SRE 156	SRE 166	SRE 176	SRE 250	SRE 260
Three-hour OFF function	X	X	X	X	X
Smell Reduce Extinguish System	X	X	X	X	X
BM2 setting	X	X	X	X	X
Ventilation safety operation value	Z	Z	Z	Z	Z
Low burning setting	O	O	O	O	O
FM half-wave control setting	O	O	O	X	X
BMP setting	BMP 0	BMP 0	BMP 0	BMP 0	BMP 0
BMP2 setting	X	X	X	O	X
Additional High burning setting	O	O	O	X	X
Refueling extension setting	X	X	O	O	X
Refueling extension time setting	6 times	6 times	6 times	5 times	5 times
Setting non-compliant with backup	Compliant	Compliant	Compliant	Compliant	Compliant
Save Mode switch circuit	O	O	O	O	O
RX1	Open	Open	Open	Open	Open
RX2	43 k	43k	43 k	13 k	13 k

O: Set, X: Not set

3.3.9-9	Primary Flame indication function	When DOWN Button is pressed more than 3 sec. while the heater is in operation, Primary Flame is indicated. However, the upper two digits indicate burning mode and the lower two digits indicate the current of Primary Flame.	
3.3.9-10	Burning mode indication function	When UP Button is pressed more than 3 sec. while the heater is in operation, burning mode is displayed. See 3.3.6-12 on page 60.	

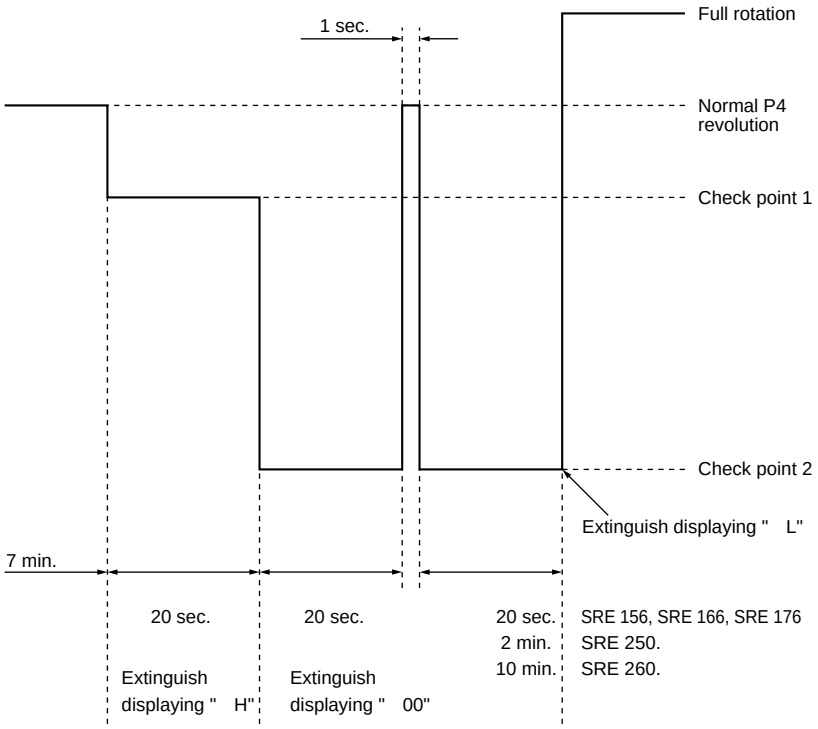
Item	Test Item	Specifications	Remarks.
3.3.9-11	Failure time indication function	In safety stop (safety and ventilation safety indicated with error code: E-X, F-X), when Extension Button is pressed more than 3 sec., (time from when Power Button is turned on to occurrence of failure) is displayed. Failure indication time is calculated with the following formula: Formula t: Failure indication time A, B, C, D Four-digit LED data values A B C D Four-digit LED t = (A x 1 hour + B x 10 min. + C x 1 min. + D x 10 sec.) However, 0 to 9 sec. are an error. Data is displayed in hexadecimal and the pattern is as follows: Data: 0 1 2 3 4 5 6 7 8 9 A b C d E F Hexadecimal: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	
3.3.9-12	Error message back-up	If UP Button and DOWN Button are pressed together more than 5 sec. when Power Button is off, up to nine previous error codes will be flashed in order. The Clock Indication Lamp and Colon lamp are off. [XE□] or[XF□ (X = 1-9) [XE - -] (ventilation is in bar indication) When no error previously occurred: [E] (Example: 1E- 0, 2F- 1) Stop for refueling is not indicated.	
3.3.9-13	Ventilation indication	When UP and DOWN Buttons are pressed together for 10 sec. while the heater is in operation, the indication is changed. SEG 1, 2 / SEG 3, 4 Set temperature / Room temperature — Normal temperature indication (1) 20 min.burning state / BTH20 — Ventilation Lamp turns on. (2) BTH / Value calculated for ventilation — Ventilation Lamp flashes. (3) For BTH, BTH20, and the value calculated for ventilation (Z), see 3.3.5. For 20 min. burning state, see Burning mode indication function (3.3.9-10). Item (1) to (3) are displayed when UP and DOWN are pressed together for 10 sec. In this mode, the following items are enabled. Flame display is possible. Set temperature change, burning lock, timer setting, Key-Lock (Childproof Lock), and Save mode are enabled. (the ventilation lamp indicates the states) Displays the total value when Z +20. This function is canceled when the flame is extinguished, and when operation is resumed, the temperature indication will return to normal. When the heater does not pass T13, (1) [P-00] (2)[**00] are displayed (** indicate the present BTH). During safety timing (T33) after passing T13, the value calculated for ventilation is [00] .	

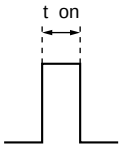
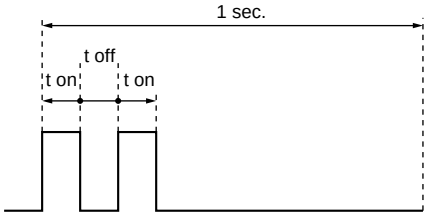
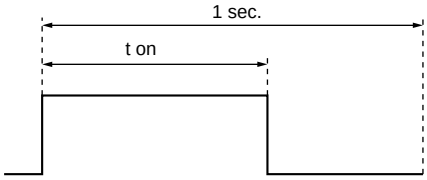
<table>
<tr><th>Item</th><th>Test Item</th><th>Specifications</th><th>Remarks.</th></tr>
<tr><td>-14</td><td>Burning lock</td><td>Maintains the present burning regardless of changed room temperature when Key-Lock (Childproof Lock) Button and Extension Button are pressed together more than 5 sec. This function is canceled when Key-Lock (Childproof Lock) Button is pressed more than 3 sec. or Power Button is turned off.</td><td></td></tr>
<tr><td>-15</td><td>Circulation Fan Motor post-purge after recovery from a power failure</td><td>When the power supply is turned on when F-0 is displayed, if the resistance of the Burner Thermistor is less than the following values, then a Circulation Fan Motor post-purge (T12) full-wave is performed.
<table><tr><th>Model</th><th>Resistance of a Burner Thermistor</th></tr><tr><td>SRE 156, SRE 166</td><td>85 kΩ (3.3.4-3) or less</td></tr><tr><td>SRE 176, SRE 250, SRE 260</td><td>100 kΩ (3.3.4-3) or less</td></tr></table></td><td></td></tr>
<tr><td>-16</td><td>Prevention of relay stuck</td><td>When a flame is extinguished (Power Button OFF, safety flame extinguish, timer waiting, power-saving flame extinguish) and 20 min. pass by, if the resistance of a Burner Thermistor is less than the following values, this function is enabled by Blower Motor P4 rotation and fan motor full-rotation. In addition, when the resistance is the following values or more, it is disabled.
This applies to the following cases:
If the heater is plugged in but does not operate after 20 min. and an error code is displayed on the indicator.
<table><tr><th>Model</th><th>Resistance of a Burner Thermistor</th></tr><tr><td>SRE 156, SRE 166</td><td>85 kΩ (3.3.4-3) or less</td></tr><tr><td>SRE 176, SRE 250, SRE 260</td><td>100 kΩ (3.3.4-3) or less</td></tr></table></td><td></td></tr>
<tr><td>-17</td><td>Fixed burning</td><td>Maintains time and burning for T34 15 min. after the Power Button is turned on. When burning mode is high and fixed, if the mode is changed, after 20 min., if the state of burning changes, then burning switch safety will not have any influence.</td><td></td></tr>
<tr><td>-18</td><td>Stand-by mode</td><td>If the Power Button is turned off for 5 min., Information Display, colon, and time indication LEDs will turn off. While the LEDs are off, pressing any key will return the display to the current time. If left for an additional 5 min., the display will be turned off by the Stand-by Mode.</td><td></td></tr>
<tr><td>-19</td><td>Cleaning function (SRE 250, SRE 260)</td><td>Forcibly changes burning to Med. burning if High burning (including Additional High burning operation) is performed continuously more than two hours.
 
</td><td></td></tr>
</table>

Item	Test Item	Specifications	Remarks.
		• Indication 7SEG turns on " CL:05" (colon lamp flashes), and performs a countdown every minute. It uses the right two digits to perform a countdown and displays it as " 04, 03, 02, 01" . The temperature lamp will turn off. Relation between countdown for refueling When a countdown for refueling is displayed in advance, it has priority. If a countdown for refueling countdown is inserted while a cleaning function is indicated, it also has priority. If a cleaning function is executed when countdown indication is terminated by refueling, the remaining cleaning time is displayed. • Cancelling a cleaning function If burning changes to Med.-High burning or less while a cleaning function is displayed, the cleaning function will be cancelled. In addition, when burning is locked, a 2 hour count is cleared. If the cleaning function is executed, burning will be locked, and the cleaning function will be cancelled. • Ventilation start If the cleaning function is started, it will be performed in accordance with burning change safety.	
3.3.9-20	Check mode	Connecting Power plug while pushing Timer Switch to " ON" position, Check mode starts. Procedure 1. Connecting Power plug pushing Timer Button to " ON" position. 2. Buzzer, All the lamps light on for 5 sec. 3. It checks Switch contact during 5 sec., it starts Check mode after item 4, if more than one pulse are entered from all the tact switches. If contact switch will be entered buzzer will be on for 100ms. If the contact of Tact switch is not entered for 5 sec., it changes to Normal mode displaying " -- : --" (Bar Display). If any tact switch is pressed, it counts 5 sec. again. Lamp will be lit until all the switch are confirmed (except Save button and Extension button). 4. It displays the following value at the first of 4 figures of 7 seg. " 30 : -7" : SRE 156 " 32 : -7" : SRE 166 " 40 : -7" : SRE 176 " 50 : 13" : SRE 250 " 72 : 13" : SRE 260 It displays time (min.) of starting Check point 1 at second figure. (It displays " --" (Bar display) at second figure in case of first figure. It displays " 7" (13 for SRE 250, SRE 260) of 7 min. as initial value and it can be selected " 7" to " 5" , " 6" , " 8" , " 9" , " 22" (" 9" , " 11" , " 15" , " 17" , " 22" for SRE 250, SRE 260) by Up and Down Buttons. It does not display time during Check mode.	

Item	Test Item	Specifications	Remarks.
		5. Check mode operation (Disconnect power plug to stop Check mode) The difference of Normal operation and Check mode operation is as follows. All the safety device activates at Check mode operation. - No Additional High burning and Low burning - It operates at Forced High burnig - BM rpm (P4) is changed to Check point 1 for 20 sec. after 7 min. (13 min. for SRE 250, SRE 260). Power button on. (Time can be set by the above procedure. At this moment, It extinguishes displaying " - H" as defect if the value of FL (A) A/ D is more than Lost flame detection of P4. - Next it operates setting BM rpm to Check mode 2 as below illustration. - " 00" displays if " E-6" displays before Check point 1 to extinguish" (PASSED) - It extinguishes " L" as a defect if it does not extinguish at the following extinguish point. - The buzzer C keeps on buzzing " H" and " L" extinguish. The buzzer stops at Power button OFF and stands by Check mode. - It does not Save extinghuish although Save lamp is lit. - It does P4 burning after forced P3 burning for 30 min. Burning lock is possible. It burning locks at P3 if it is P3 burning. - It displays room temperature up to 7 min. (13 min for SRE 250, SRE 260). at 20 ˚C setting. Setting change is possible. - 7 seg. Displays flame current after 7 min. - Fuel extension does not activate. But it does refueling countdown. - It activates Error display time. - It will be BMP1 setting at extinguishments during Check mode. - The high temperature activation temperature is 36 ˚C during Check mode.	

Models	Check point 1	Check point 2
SRE 156, SRE 166	2120 rpm	1650 rpm
SRE 176	2200 rpm	1730 rpm
SRE 250	2220 rpm	1850 rpm
SRE 260	2180 rpm	1900 rpm



Item	Test Item	Specifications	Remarks.
3.3.10	**BUZZER SOUND**	The following explains the buzzers. Buzzer A, ton = 100 ms  Buzzer B, ton = 100 ms, toff = 100 ms  Buzzer C, ton = 600 ms 	
3.3.11	**BACKUP IN CASE OF A POWER FAILURE (EXCEPT OSLO, SRE 701, SRE 702, SRE 703)**	This function stores the current time, timer setting, temperature setting, backup in case of an error, and refueling count time. In the other situations, the function is cancelled.	
3.3.11-1	Backup time	Ensured backup time should be 10 min.	
3.3.11-2	Backup life	1. Average temperature of Main Circuit Board substrate used for one decade: 40 ˚C (temperature near the backup capacitor). 2. Availability of Main Circuit Board' s substrate for one decade: 25 % 3. Temperature range when using Main Circuit Board substrate: 25 to 55 ˚C (temperature near the Backup Capacitor) If the conditions mentioned above are met, the life of the backup capacitor will be ensured as follows: Backup time: More than 10 min. Life: More than one decade	

7. INSPECTION AND REPAIR

♦ **This Heater is provided with the self-diagnosis circuit by which if the Heater operation becomes inoperable (unburnable) for some reason, inspection and repair can given according to "Error (E)" Display.**

E-0 DISPLAY

E-0 is displayed and the heater is extinguished.

High Limit Switch actuated.

- Provide a spacing of more than 2m around the heater.
- Circulation Fan Cover is covered with such as a curtain.
- Circulation Fan Cover is caused with an excessive amount of dust.
- Louver is plugged.

  → Give ignition after removing the cause.
- Air Duct is stained or corroded.

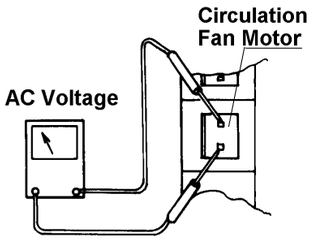
  → Clean the Air Duct and polish the assembling part of the High Limit Switch.
- Failure of the Circulation Fan Motor. Explanation 1
- Failure of the High Limit Switch. Explanation 2

  → Defective wiring → Repair and part replacement.
- Internal temperature rose due to an excessive flow rate.

  → See the E-6 display.

Explanation 1.

The failure of the Circulation Fan Motor may sometimes be caused by the broken wire of the Circulation Fan Motor or by the defectively assembled Fan which touches the neighboring part. The latter case can be corrected by refastening the screws. The output voltage failure with the Main Circuit Board may also cause the Circulation Fan Motor trouble. Use the tester to check to see if the **terminal of Circulation Fan Motor has an output of AC 230 V** (for High and Med-High combustion).(The above test is to be given with the Circulation Fan Motor terminal as being connected.)

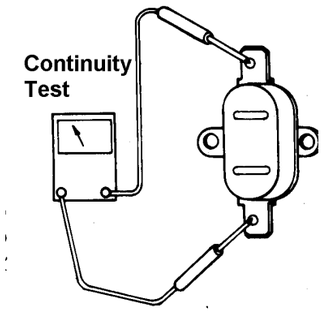


Explanation 2.

Specifications for the High Limit Switch

Model	Actuation	Resume
SRE 156, SRE 166, SRE 176, SRE 250, SRE 260	Open at 90 °C±5 °C	Close at 70 °C±10 °C

If the High Limit Switch is caused with trouble, check to see if the contact point has the proper electric conductance. **The contact point is normally ON-contact.** If the curtain plugs the Air Filter, the High Limit Switch is actuated to stop the operation of the Heater. This stop operation is not a miss-operation, but a normal operation. If this happens, carefully check the installing place of the Heater. (Check the place where the trouble occurred.) The trouble of an erroneous operation may be caused by the direct sunbeams to which the Heater is subjected from the rear side of the Heater or by the portional heat rise in the High Limit Switch due to the exterior air blow which is caused near its outgoing and incoming place. If a trouble that corresponds to this case occurs, change the installing position of the Heater.



F-0 DISPLAY

F-0 is displayed and the Heater is extinguished.	Soldered are in the transfer part of the Main Circuit Board is broken.	Soldering is to be sufficiently given to the Main Circuit Board.	
		Re-press the Power Switch for ignition.	

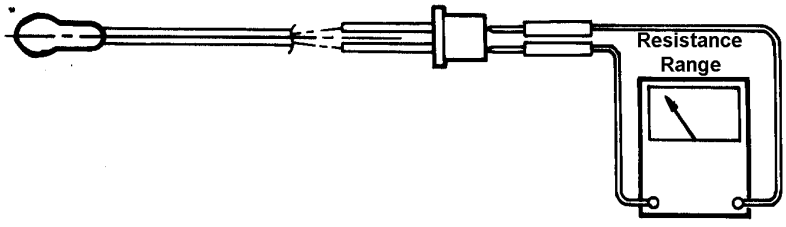
E-1 DISPLAY

E-1 is displayed and the Heater is extinguished.	Displayed at the same time of ignition.	Room thermistor or the terminal is disconnected. Explanation 1	Part replacement or correction.

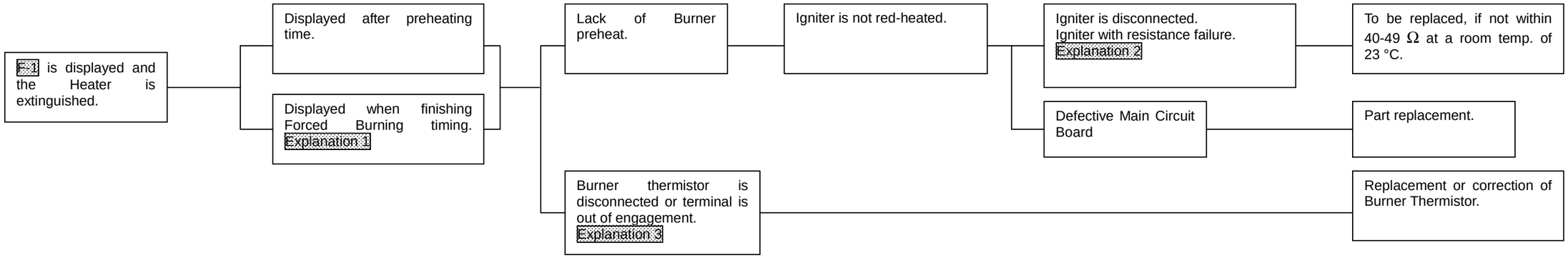
Explanation 1

Resistance of the Room Thermistor.

Room temp.: approx. 25 °C	Approx. 10 kΩ
Room temp.: approx. 0 °C	Approx. 35 kΩ

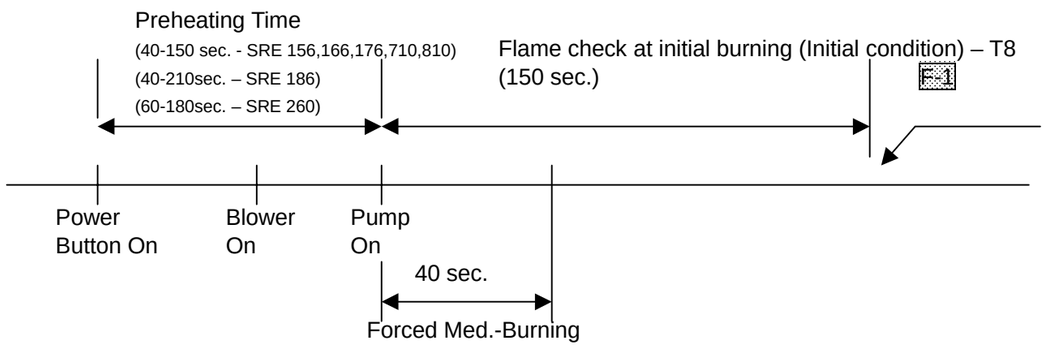


F-1 DISPLAY



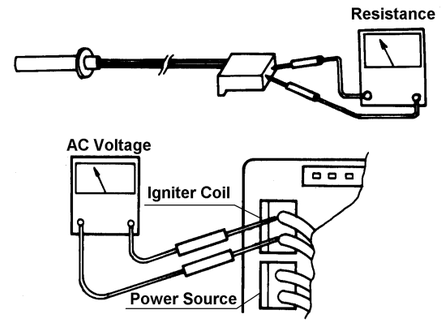
Explanation 1

The Flame check at initial burning (Initial condition) – T8 implies a time span of 2 minutes and thirty seconds from the end of preheating (approximately 40 to 150 sec. – SRE 156, 166, 176, 710, 810; approximately 40 to 180 sec. – SRE 186; approximately 60 to 80 sec. – SRE 260). After ignition is made, **a forced Med.-burning of 40 seconds** will be followed.



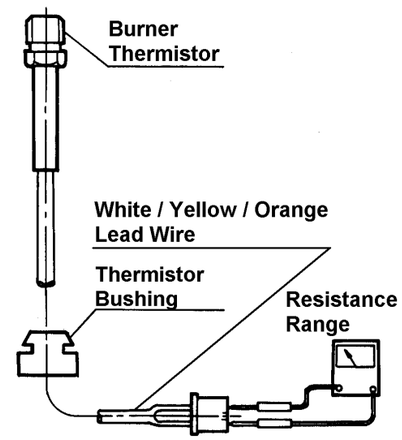
Explanation 2

The Igniter is red-heated in approximately 30 seconds after pressing the Power Button. If this does not occur, check by tester to see if the resistance of the Igniter is proper. If the Igniter does not show a resistance of 40 to 49 Ω, change it with the new Igniter. If the Igniter is not abnormal, the Main Circuit Board is assumed to be defective. Check by measuring the output voltage on the side of Main Circuit Board, which voltage must be AC 230V.



Explanation 3

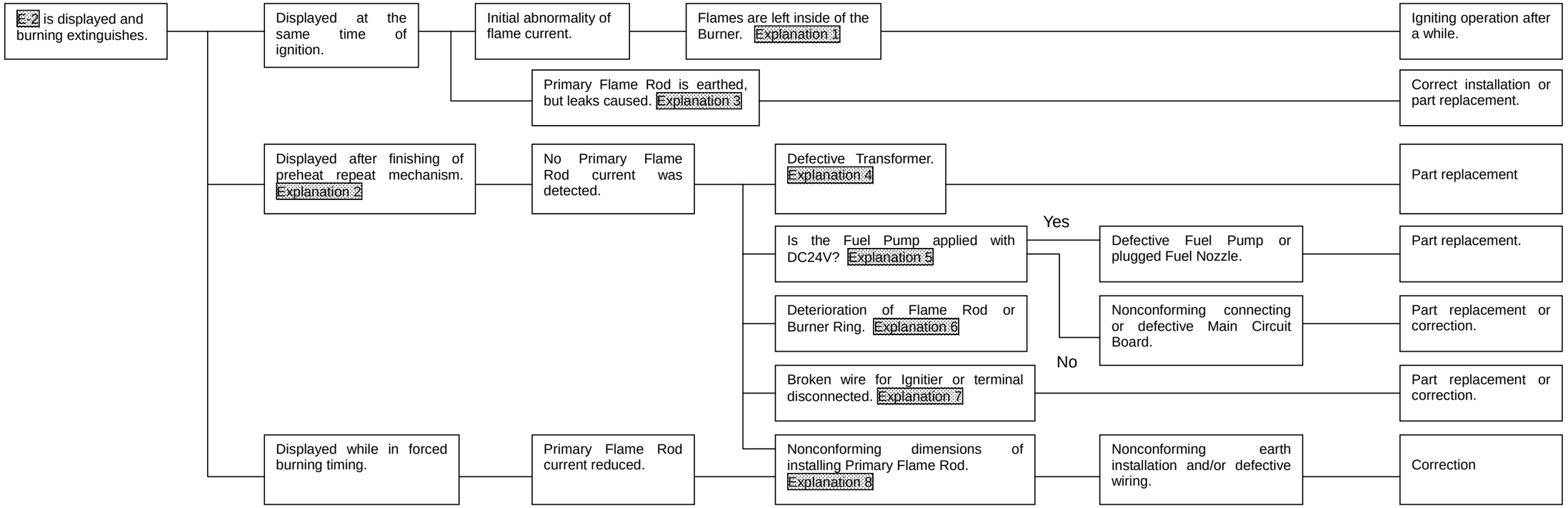
If the resistance of the Burner Thermistor is more than **950 kΩ** after Forced Burning timing and yellow or white colored flames are at more than 900 kΩ (or if the Burner Thermistor temperature is lower than approximately 160 °C), **"F-1"** will be displayed to stop the operation. If the Burner Thermistor is broken or the terminal is not connected, this safety device is actuated.



Resistances of the Burner Thermistor:

Thermistor Temperature	SRE 156 SRE 166 (Yellow)	SRE 176 SRE 250 SRE 260 (Orange)
Approx. 20 °C	Approx. 20 MΩ	Approx. 120 MΩ
Approx. 250 °C	Approx. 8 kΩ	Approx. 58 kΩ
Approx. 300 °C	Approx. 3.34 kΩ	Approx. 25 kΩ

E-2 DISPLAY



Explanation 1

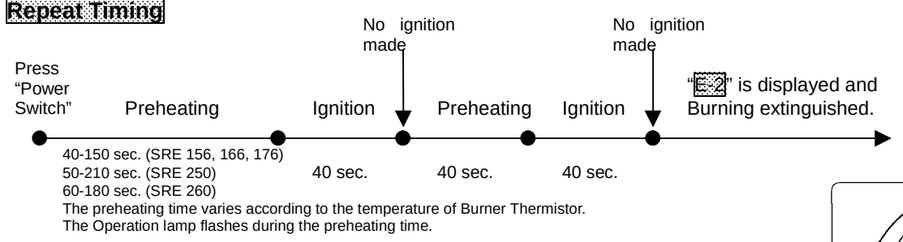
If pressing the Power Button immediately after burning extinguishes, the Flame Detector is actuated to display "E-2", by which no ignition can be made.

Explanation 2

The REPEAT mechanism is provided to correct a miss ignition. If ignition cannot be made, the operation will automatically go over again. If this second ignition cannot be made, "E-2" will be displayed to stop operation.

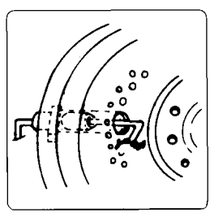
CAUTION **The expression of "no ignition" above implies that <u>the Primary Flame Rod current is lower than 0.3 µA.</u>**

Repeat Timing



Explanation 3

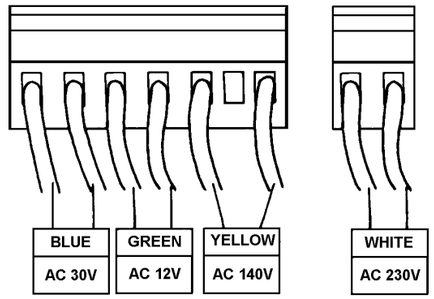
No operation can be made if only the Flame Rod is stained with carbon. If, however, the Primary Flame Rod and the Burner wall, or the Burner Ring are connected with carbon, the Flame Detector is actuated. The easier tendency of carbon adhesion (as shown in the right figure) is caused by the Burner Ring which is out of position, or by nonconforming air flow rate.



Explanation 4

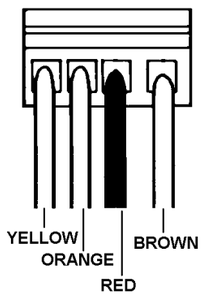
The malfunction due to the broken wire of the Transformer is to be checked by Tester as follows:

(1) Disconnect the Transformer.
(2) Apply the test pin of the Tester to the terminal of each lead wire as shown in the following figure, to check to see if the lead wire and related terminal are electrically conductive.
(3) The connection of the lead wire and terminal must be defective, if the above check shows non- or unstable conductance.
(4) If there is any electrical conductance found between each of any of the two of the blue, green, yellow and white lead wires, their connection must be wrong.



Explanation 5

Measure the output of the output terminal for Fuel Pump. DC 24V is outputted between the yellow and the orange lead wires after preheating has been completed.



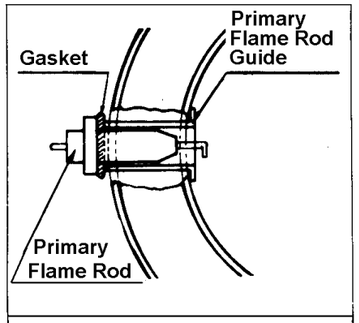
Explanation 6

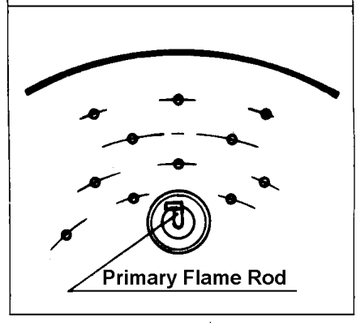
If a silicon compound split hair coating liquid or a hair treatment solution is used in the room while being heated by kerosene fan heater, the Primary Flame Rod and the Burner Ring are deposited with white products on the surface of the Flame Rods, which makes it unable to detect the flame current and thereby causing a miss ignition, or to cease the combustion. If this occurs, remove the white products from the Primary Flame Rod and the Burner Ring with the use of sand paper. Give this cleaning work by leaving the Primary Flame Rod being mounted to the Burner.

Explanation 7

If the Igniter is broken or if the terminal is disconnected, the fuel is fed into the Burner even without having the source of flames. Do not, therefore, repeat ignition operation for many times, which otherwise causes kerosene at the bottom of the Burner. It is, therefore, necessary to completely remove kerosene as well as to removing the cause of the trouble.

Also refer to **Explanation 3** of E-1 Display.



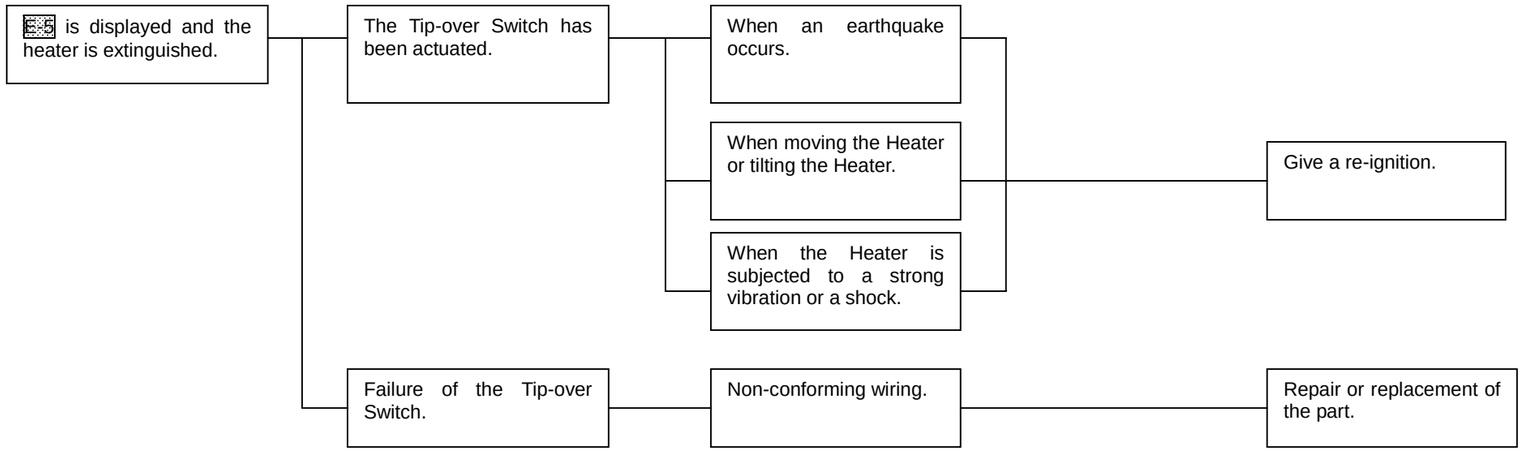


Explanation 8

- The Heater operation may be stopped in a similar way to that without flames, if the connector of the Flame Rod is not connected securely.

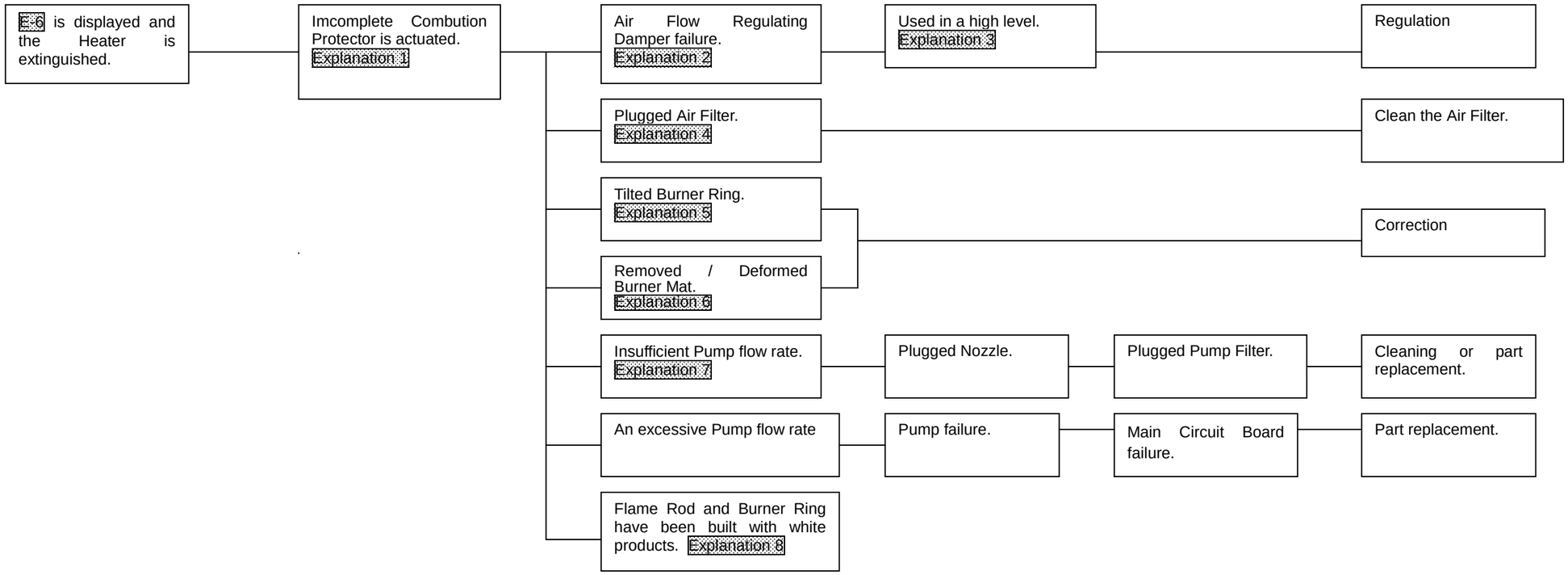
- The Flame Rod is securely fixed to the Burner, after making sure that the Flame Rod is provided with the Gasket properly. (See page 28 for the details by model.)

E-5 DISPLAY



CAUTION No overhauling of the Tip-over Switch is permitted.

E-6 DISPLAY



Explanation 1

The Incomplete Combustion Protector always checks the condition of combustion, by monitoring the current of Primary Flame Rod after a time of 70 seconds elapses from Pump ON operation.
The following table shows the operating currents of the Primary Flame Rod in process of combustion.

Combustion State	Flame A Current	Digital Display
High burning	Less than 1.0 µA	A2
Med. High burning	Less than 1.0 µA	"
Med. Low burning	Less than 0.7 µA	BC
Low burning	Less than 0.7 µA	"

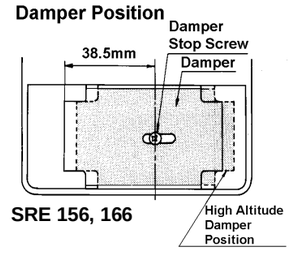
(See 7. Flame Current Display Function)

Explanation 2

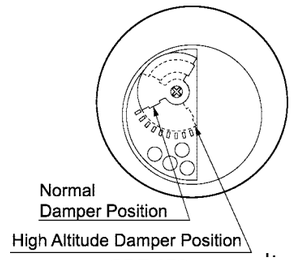
If a whistle sound is heard, it is assumed that the heating atmosphere has a considerably insufficient amount of air for proper combustion. Check to see if in the adjustment of the Damper.

The right drawing shows the standard adjustment of air rate, of which procedure is simple. The proper way of air adjustment is performed with the use of the by adjusting the draft pressure at the lower part of the Combustion Chamber 8.4 to 9.4 mmH_2O for SRE 156, SRE 166 and 9.6 to 10.8 mmH_2O for SRE 176 250 and 4.0 to 4.6 mmH_2O for SRE 260. When using the simple procedure, adjust the draft pressure within the range shown in the left drawing which allows

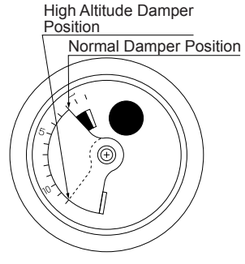
Model	Lower than 800m level	High altitude
SRE 156,166	38.5mm (Totally enclosed)	Totally opened
SRE 176	Totally enclosed	Totally opened
SRE 250	Scale 2	Totally opened
SRE 260	Scale 6	Totally opened



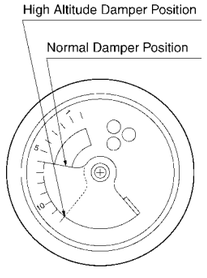
SRE 156, 166



SRE 176



SRE 250



SRE 260

Explanation 3

This Heater is so designed that it can be used at a ground level of up to 1300 meters; however, if it is used at a level of higher than 800 meters, the draft adjustment needs to be given. If the Heater is used above 800 meters, sufficient care is to be given for ventilation, since such level is in short of oxygen supply. See the section of 5-6. Air Flow Regulating Damper.

Explanation 4

Ask the consumers to clean the filter from time to time. The filter structure is so designed it may not be affected by cotton dust to a certain extent, while powder or dust easily plugs the filter, which results insufficient supply of air.

Explanation 5

The Burner Ring is inclined on the three pins, unless being installed in position. Emissions are caused if the Ring is not in position.

Explanation 6

If the Burner Mat is removed or deformed, an oil stagnation may be caused which may instantaneously generates an excessive fuel flow with a whistle sound, as seen with a new Burner. If this occurs, adjust the position of the Burner Mat in such a manner that it closely touch the burner bottom. See the section of 5-8. Burner Mat and page 27.

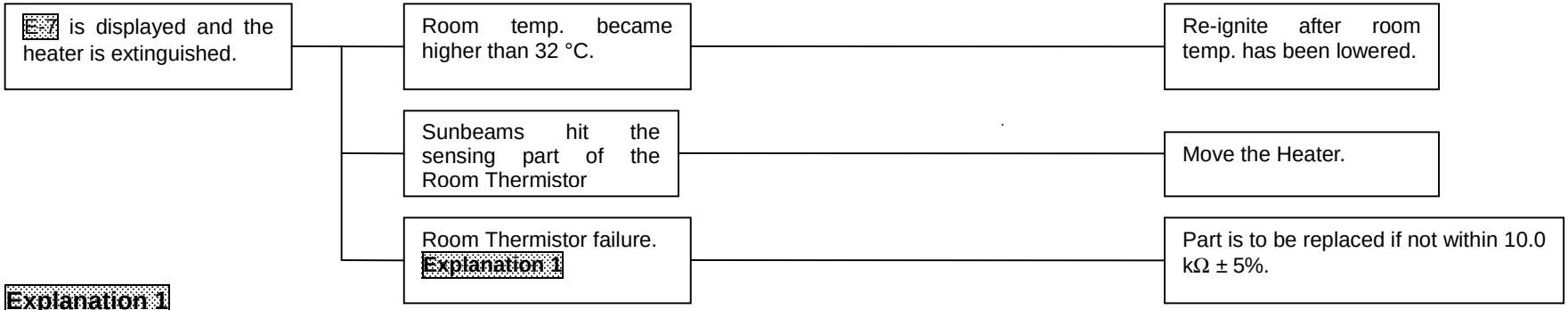
Explanation 7

For cleaning the Fuel Pump, minute care is to be given not to cause the Pump with dust. Clean the filter at the suction mouth and the discharge outlet with kerosene. The frequency to determine the flow rate is controlled by the Main Circuit Board which is incorporated inside of the CPU. Therefore, no flow check can be made by Pump itself.

Explanation 8

See **Explanation 6** of E-2 Display.

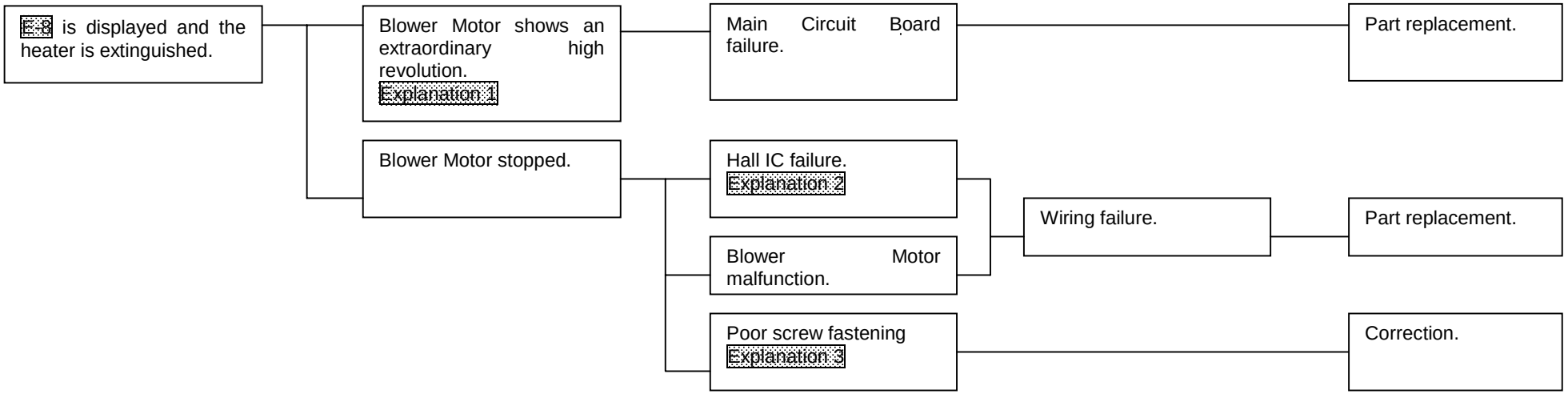
E-7 DISPLAY



Explanation 1

Also see **Explanation 1** of **Explanation 1** E-1 Display.

E-8 DISPLAY



Explanation 1

If the Blower Motor shows an abnormally high revolution (which is not controlled) in the Med, Med-Low or Low, the Main Circuit Board is defective.

Explanation 2

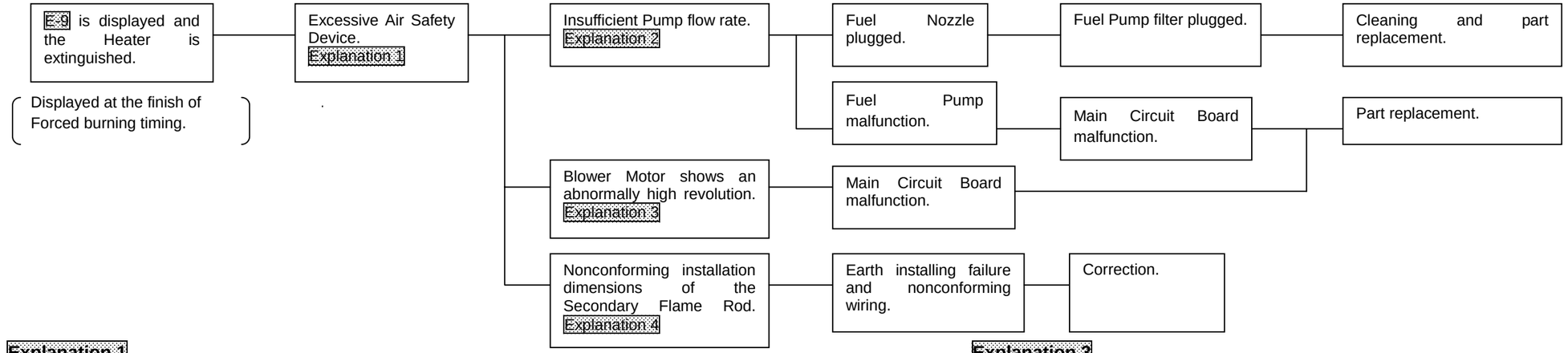
In most of the failure cases of the Blower Motor, the Heater stops its operation with "E-8" as displayed, after the finish of preheating.

The failure of the Motor is caused by electric disconnection, defective voltage of the Main Circuit Board, or output failure of the Hall IC. If this occurs, measure the current or the voltage with the Tester. See the Explanation 4 of E-2 Display

Explanation 3

Even if the Circulation Fan Motor is slightly inclined, it touches the blower case and, therefore, becomes unable to rotate. This inclination is caused by loose screw.

E-9 DISPLAY



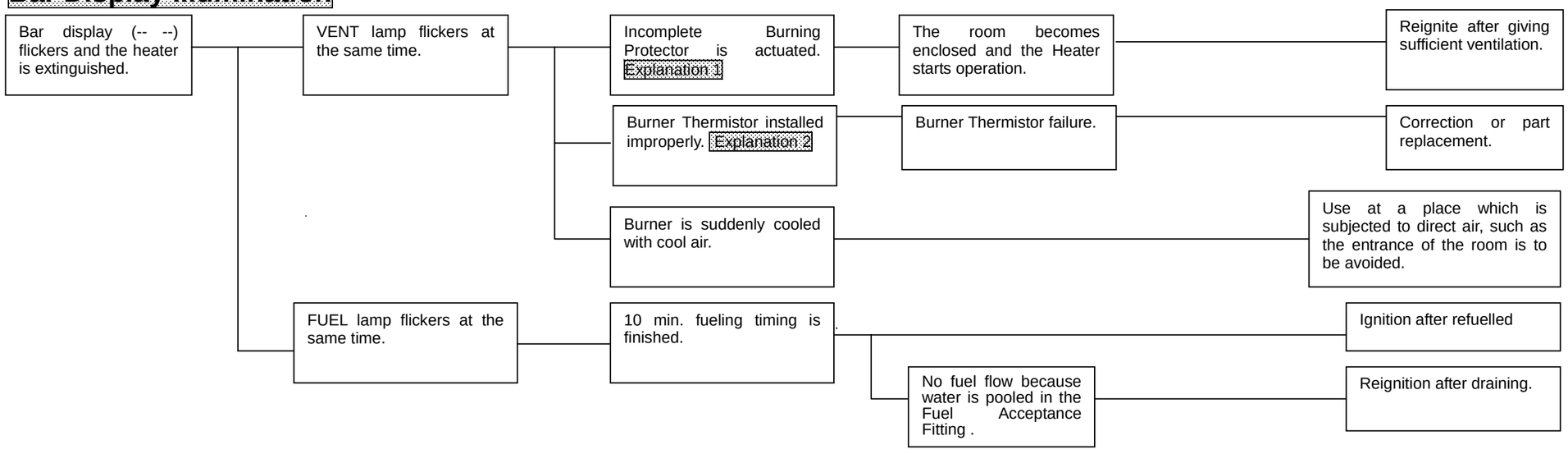
Explanation 1
In the timing (150 seconds) of the forced burning, the Heater compulsorily gives High burning after the finish of the forced Med.-High burning until an electric current of the Secondary Flame Rod of higher than 0.3 µA is detected for longer than 2 sec.

Explanation 2
See Explantion 7 of E-6 Display.

Explanation 3
See **Explanation 1** of E-8 Display.

Explanation 4
Make sure that the Secondary Flame Rod is in proper position and free of touching the outer tube on the earthing side.

Bar Display Illumination



Explanation 1
If the Incomplete Combustion Preventive Device is used in an enclosed room for a long time of period, the oxygen in the room will be short of oxygen in a level of O_2 vol. % = approx. 18%, to stop the operation.
This Heater reads the temperature (by resistance) of the Burner Thermistor at twenty minutes after the starting operation and determines operation setting level, at the same time. The temperature (by resistance), room temperature change, and the coefficient for combustion condition are calculated and monitored by micro-computer.

Explanation 2
Check to see if there is any loose screw for the Burner Thermistor. Apply the end of the Burner Thermistor with an adhesive and securely fasten the Thermistor.

Since the lead wire is thin and, therefore, easily breakable, sufficient care is to be taken not to twist it.
The reference resistances of the Burner Thermistor are shown in the following table.
Since this thermistor is different by a model, use that which suits the model.

Color of Lead Wire	Temperature	
	250 °C	300 °C
Orange	58 kΩ	25 kΩ
Blue	70 kΩ	31.5 kΩ
White or Yellow	8 kΩ	3.34 kΩ

Other Phenomena

Pressing of the Operation Switch does not light any lamp.

- Wire failure. **Explanation 1**
- Transformer failure. **Explanation 2**
- The Main Circuit Board malfunction.

→ Reignition after checking or part replacement.

Explanation 1
Inspect the switch lead wire and the lamp lead wires mainly.

Explanation 2
Nonconforming due to broken wire. (See **Explanation 4** of E-2 Display.)

CAUTION
The failure of the Transformer may be caused by the cause of Main Circuit Board failure; therefore, the Main Circuit Board also needs to be checked. Check to see if the Main Circuit Board is discolored. Even if no color change is found, make sure that the Main Circuit Board works properly.
* Care is to be given to connect the Connector in position. It is also noted that the wrong connection of the Main Circuit Board may ruin the function of the Heater itself.

An odor is caused in operation.

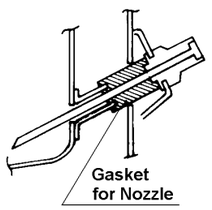
- Oil smear in the Fuel Sub Tank. **Explanation 1**
- Loose screw with the Fuel Pipe. **Explanation 2**
- Defective Nozzle Gasket. **Explanation 3**

→ Correction or part replacement.

Explanation 1
Oil smears in the Fuel Sub Tank is caused when refueling kerosene. Sufficient explanation should be given to the consumers. Kerosene evaporates automatically, which is, however, not easy to remove the odor.

Explanation 2
A slightly loosened screw could cause an oil leak with an odor. Make sure that all the screws of the fuel piping are fastened securely. Refasten the screws, if necessary.

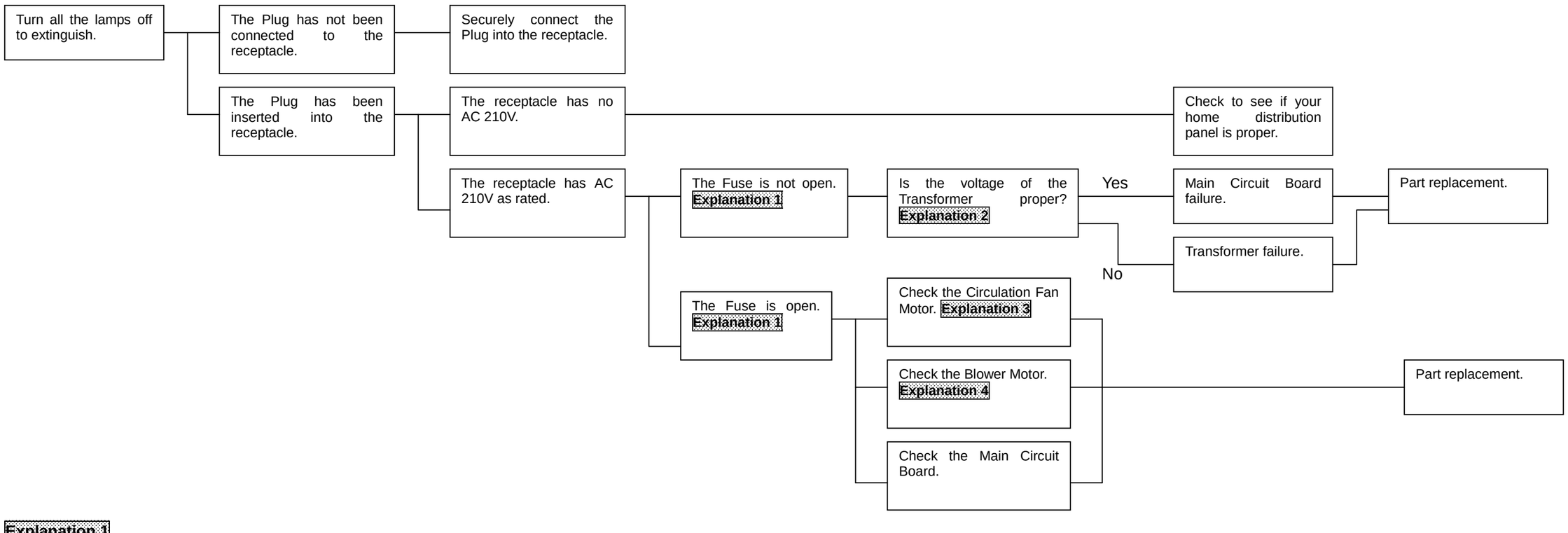
Explanation 3
The defective Gasket for Fuel Nozzle, which is shown as the shaded part in the left figure, may cause an odor with oil smears. If so, replace the Nozzle and the Gasket together, which have been installed as a set.



Time disordered

Time disordered. → Reconnect the Power Supply Cord.

If this happens, once disconnect and reconnect the Power Supply Cord. Should this correct the problem, replace the Main Circuit Board.



Explanation 1

There is one (1) Fuse (4A) on the Main Circuit Board and one (1) Fuse (5A) between the Power Supply Cord.

Explanation 2

One (1) Fuse is provided on the Main Circuit Board and one (1) Fuse is provided between the Power Supply Cord.

Explanation 3

Disengage the Connector for the Circulation Fan Motor from the Main Circuit Board and check to see if the resistance is proper, by using the Tester. Replace the Convection Motor, if the resistance is not 70-180 Ω at a room temperature of 23 °C. Unless the Motor has any problem. The Main Circuit Board is considered to be defective. Measure the output voltage on the side of the Main Circuit Board for this check.

Explanation 4

Disengage the Connector for the Blower Motor from the Main Circuit Board and check the resistance by Tester. Replace the Blower Motor, if the resistance is not 15-30 Ω at a room temperature of 23 °C. If the Motor is not defective, the Main Circuit Board is considered to be defective. Measure the output voltage on the side of the Main Circuit Board for this check.

8. FLAME CURRENT DISPLAY

♦ **This Heater is provided with the self-diagnosis circuit by which if the Heater operation becomes inoperable (unburnable) for some reason, inspection and repair can be given according to the "Error(E) Display".**

♦ This Heater is provided with the Flame Current Display Function,
A digital display which shows the electric current so that the consumer can check to see if the combustion is normal.

How to Display

The above Function display the flame current only while the button "▼ Min." of "Room Temperature / Time Setting" is pressed for 3 sec.
The display function shows the flame current with sixteen decimal numbers in the display, as shown in Graph 1. The relationships between flame current and decimal display are shown in Table 1 for flame currents in the forced burning timing (approximately 2 min. and 30 sec.) and in Table 2 for those after the forced burning timing.

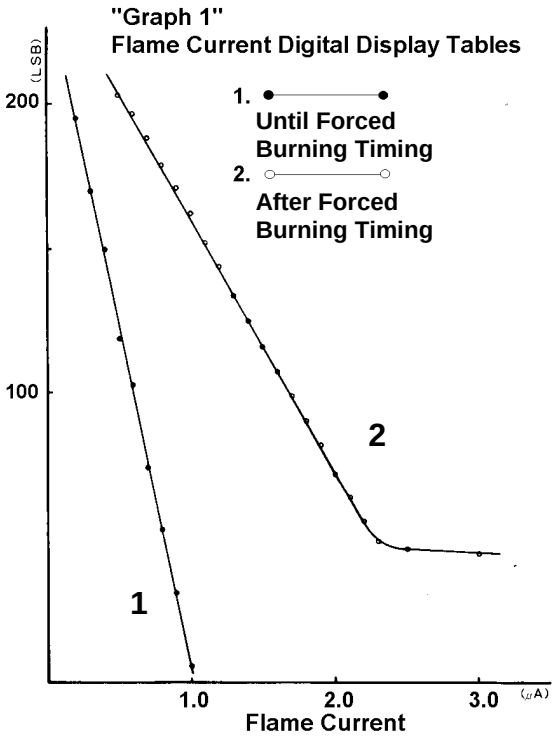
What is LSB Least-Significance-Bit

How to calculate
Digital display*

Flame Current (LSB values) = (2^{nd}. row) x 16 + (1^{st}. row)

Example
Digital Display 4A → 4 x 16 + 10 = 74 LSB
Digital Display CB → 12 x 16 + 11 = 203 LSB
Graph 1, from [Table 1] on next page
74LSB = approx. 0.7 μA (forced burning timing)
203LSB = approx. 0.15 μA (forced burning timing)

♦ The combustion is normal, if the display shows a number less than the forties by direct reading.



SYSTEM	DIGITAL DISPLAY															
16 decimal	0	1	2	3	4	5	6	7	8	9	A	b	C	d	E	F
10 decimal	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

[TABLE 1] Digital Indicator 1st digit → until forced burning

Digital Indicator 2nd digit ↓

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	1	2	3	4	5	6 1.0	7	8	9	10	11	12	13	14	15
1	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31 0.9
2	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
3	48	49	50	51	52	53 0.8	54	55	56	57	58	59	60	61	62	63
4	64	65	66	67	68	69	70	71	72	73	74 0.7	75	76	77	78	79
5	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
6	96	97	98	99	100	101	102	103 0.6	104	105	106	107	108	109	110	111
7	112	113	114	115	116	117	118	119 0.5	120	121	122	123	124	125	126	127
8	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143
9	144	145	146	147	148	149	150 0.4	151	152	153	154	155	156	157	158	159
A	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
B	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191
C	192	193	194	195 0.2	196	197	198	199	200	201	202	203 0.15	204	205	206	207
D	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223
E	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
F	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255

Upper: LSB
Lower: µA

µA	Digit	
	2nd	1st
0.2	C	3
0.3	A	A
0.4	9	6
0.5	7	7
0.6	6	7
0.7	4	A
0.8	3	5
0.9	1	F
1.0	0	6

[TABLE 2] Digital Indicator 1st digit → after forced burning

Digital Indicator 2nd digit ↓

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31 1.9
2	32	33	34	35	36	37	38	39	40	41	42	43	44	45 3.0	46 2.5	47
3	48	49 2.3	50	51	52	53	54	55	56 2.2	57	58	59	60	61	62	63
4	64 2.1	65	66	67	68	69	70	71	72 2.0	73	74	75	76	77	78	79
5	80	81	82 1.9	83	84	85	86	87	88	89	90 1.8	91	92	93	94	95
6	96	97	98	99 1.7	100	101	102	103	104	105	106	107 1.6	108	109	110	111
7	112	113	114	115	116 1.5	117	118	119	120	121	122	123	124	125 1.4	126	127
8	128	129	130	131	132	133	134 1.3	135	136	137	138	139	140	141	142	143
9	144 1.2	145	146	147	148	149	150	151	152 1.1	153	154	155	156	157	158	159
A	160	161	162 1.0	163	164	165	166	167	168	169	170	171 0.9	172	173	174	175
B	176	177	178	179 0.8	180	181	182	183	184	185	186	187	188 0.7	189	190	191
C	192	193	194	195	196 0.6	197	198	199	200	201	202	203 0.5	204	205	206	207
D	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223
E	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
F	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255

Upper: LSB
Lower: µA

µA	Digit	
	2nd	1st
0.5	C	B
0.6	C	4
0.7	B	C
0.8	B	3
0.9	A	B
1.0	A	2
1.1	9	8
1.2	9	0
1.3	8	6
1.4	7	D
1.5	7	4
1.6	6	B
1.7	6	3
1.8	5	A
1.9	5	2
2.0	4	8
2.1	4	0
2.2	3	8
2.3	3	1
2.5	2	E
3.0	2	D