VAL6 Infrared Heater

KBE5S & KBE5L

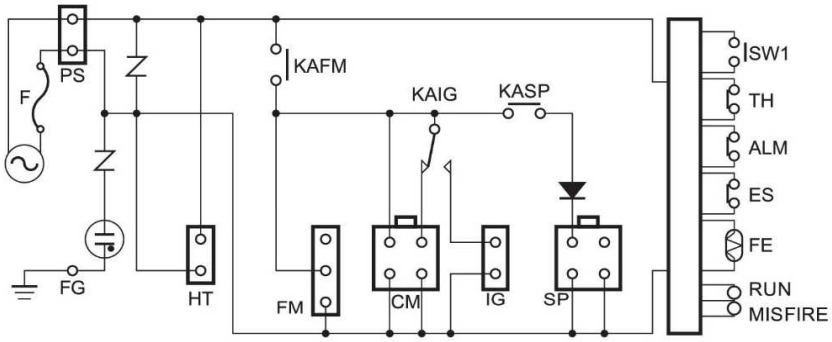
(2-step)

Maintenance Manual

Shizuoka Seiki Co.,Ltd.

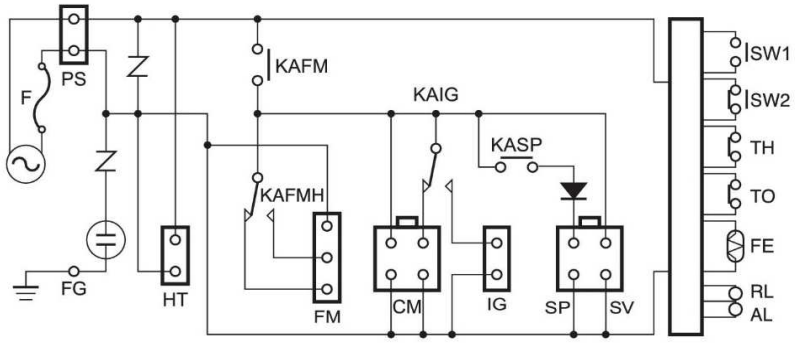
■ Wiring Diagram of Burner Control

●KBE5S



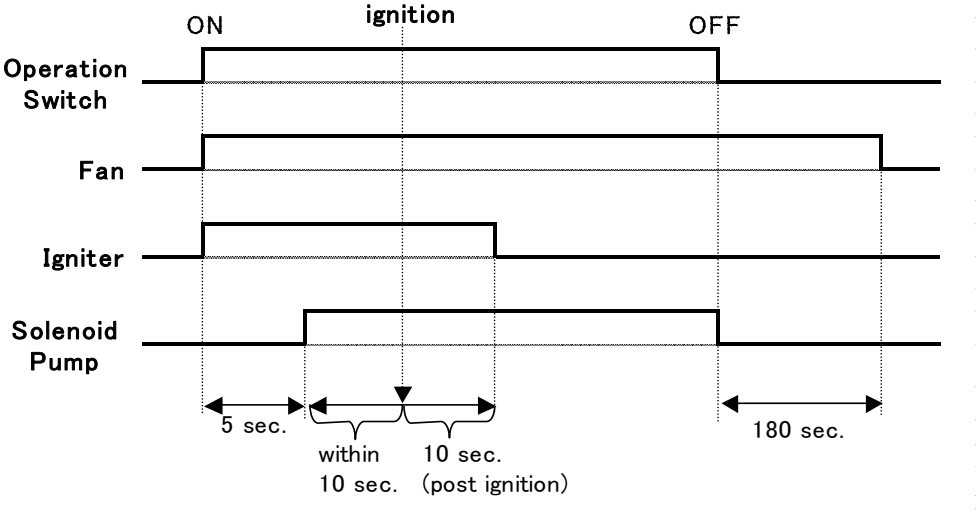
PS	: Power Source	HT	: Open (Fuel Preheater)	RUN	: Running Lamp
SW1	: Operation Switch	FM	: Air Intake Motor	MISFIRE	: Misfire Lamp
ALM	: Short	CM	: Open	KA*	: Contorol Relay
TH	: Thermostat	IG	: Igniter	F	: Line Fuse
FE	: Photo Cell	SP	: Solenoid Pump	ES	: Earthquake Sensor (Short)
FG	: Flame Grand				

●KBE5L 2-step



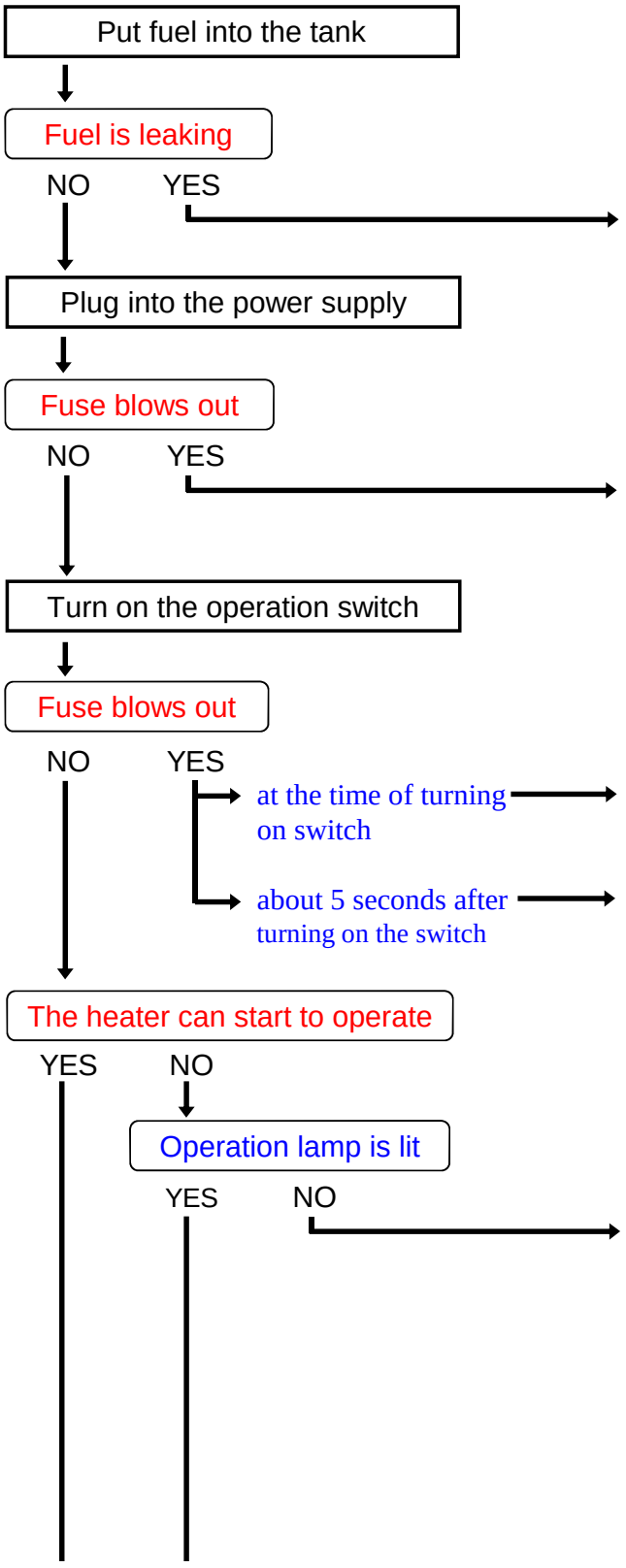
PS	: Power Source	RL	: Running Lamp	HT	: Fuel Preheater
SW1	: Operation Switch	AL	: Misfire Lamp	FM	: Air Intake Motor
SW2	: Change Over Switch	KA*	: Control Relay	CM	: (Open)
TH	: Thermostat (Short)	F	: Line Fuse	IG	: Igniter
TO	: Tip Over	Z	: Surge Absorber	SP	: Solenoid Pump
FE	: Photo Cell	FG	: Frame Grand	SV	: Solenoid Valve

■ Sequence Time Chart



Operation Flowchart

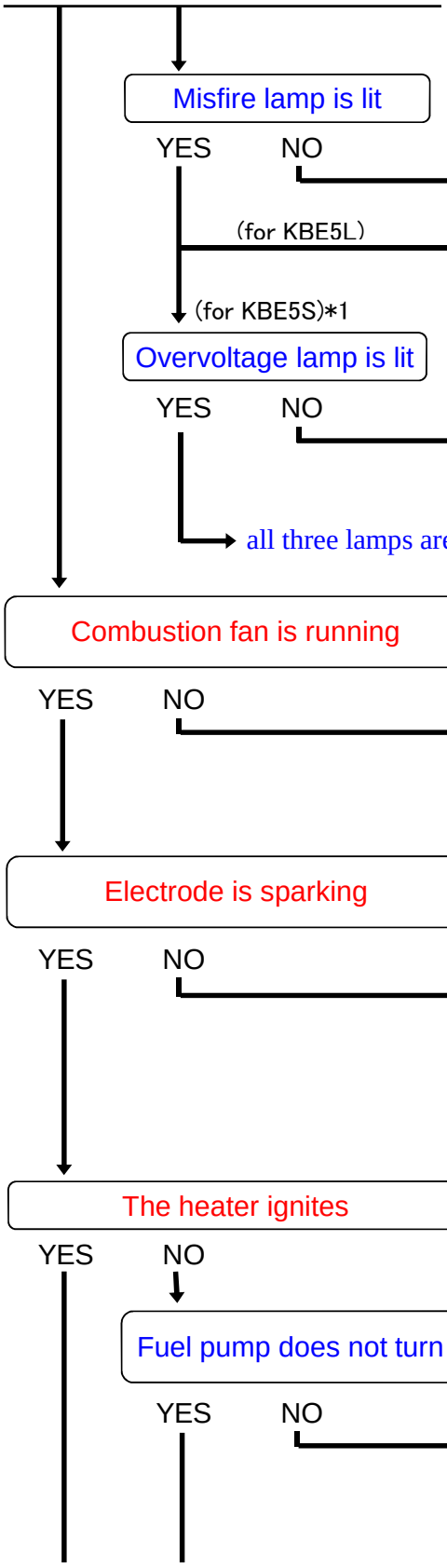
MODEL: KBE5S, KBE5L(2-step)



Possible Cause	Remedy No.
● Drain packing and/or bolt is damaged	1
● There is too much fuel in the tank	2
● Transformer coil is short-circuited	3
● Surge absorber(SA1) on control board is short-circuited	4
● Fan motor is short-circuited	5
● Ignition transformer is short-circuited	6
● Fuel pump is short-circuited	7
● Power source is not supplied	8
● Fuse blows out	9
● Power cord is disconnected	10
● Power sorce connector is loose connection	11
● Transformer connector is loose connection	12
● Transformer is defective	13
● Operation switch connector is loose connection	14
● Operation switch is defective	15
● Circuit board (burner control) is defective	16

Operation Flowchart

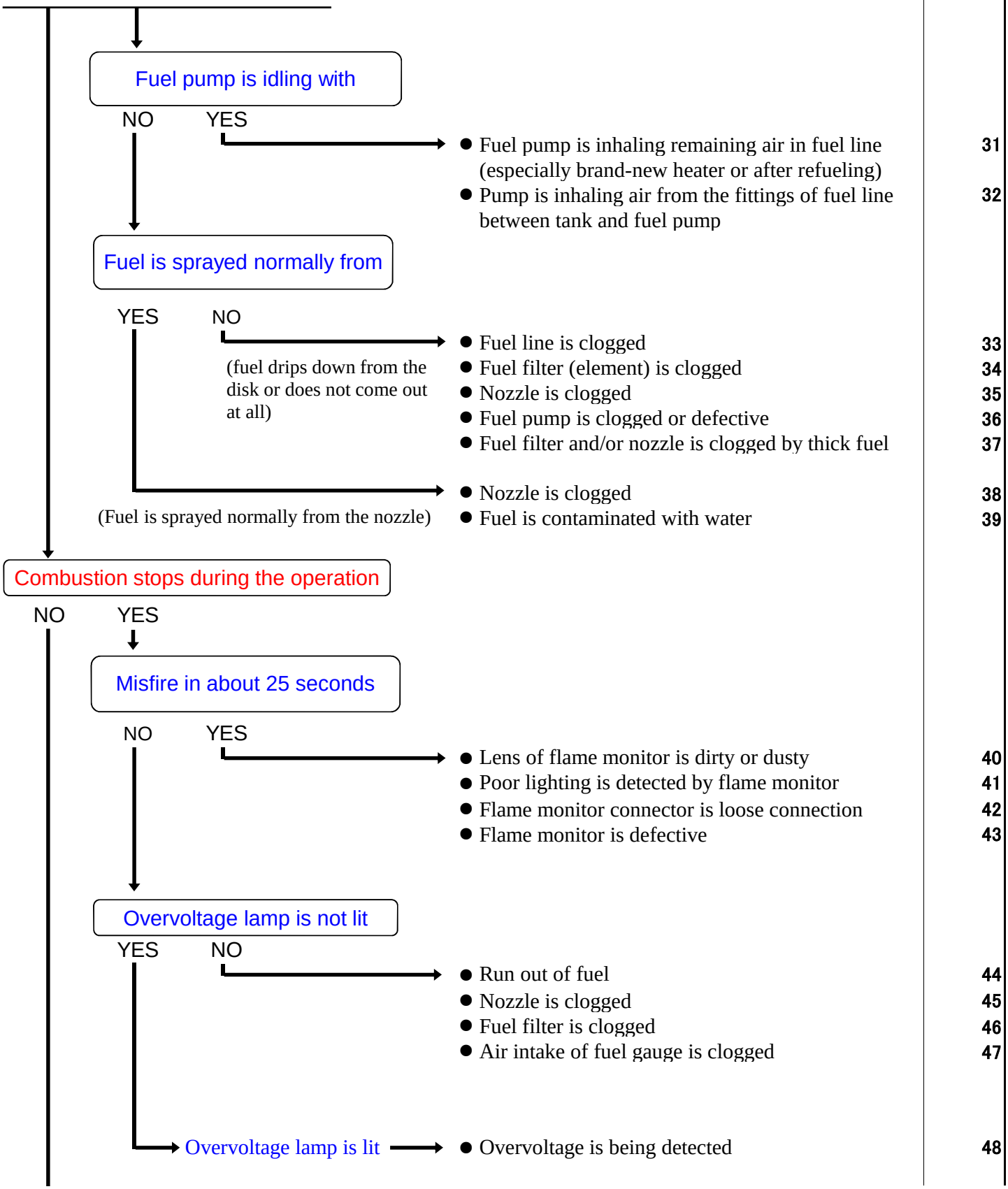
MODEL: KBE5S, KBE5L(2-step)



Possible Cause	Remedy No.
● Terminals of control device is uncoupled	17
*1 KBE5S manufacturered from 2006 to 2013(Serial# J-04 to D-05)	
● Direct sunlight hits flame monitor	18
● Circuit board (burner control) is defective	19
● Overvoltage is being detected	20
● Combustion fan connector is loose connection	21
● Combustion fan motor is clogged	22
● Combustion fan and/or circuit board (burner control) is defective	23
● Ignition transformer connector or high-voltage cord is loose connection	24
● Electrode is defective	25
● Ignition transformer is defective (crack in high-voltage cord)	26
● Circuit board (Burner control) is defective	27
● Fuel pump connector is loose connection	28
● Fuel pump is defective	29
● Circuit board (Burner control) is defective	30

Operation Flowchart

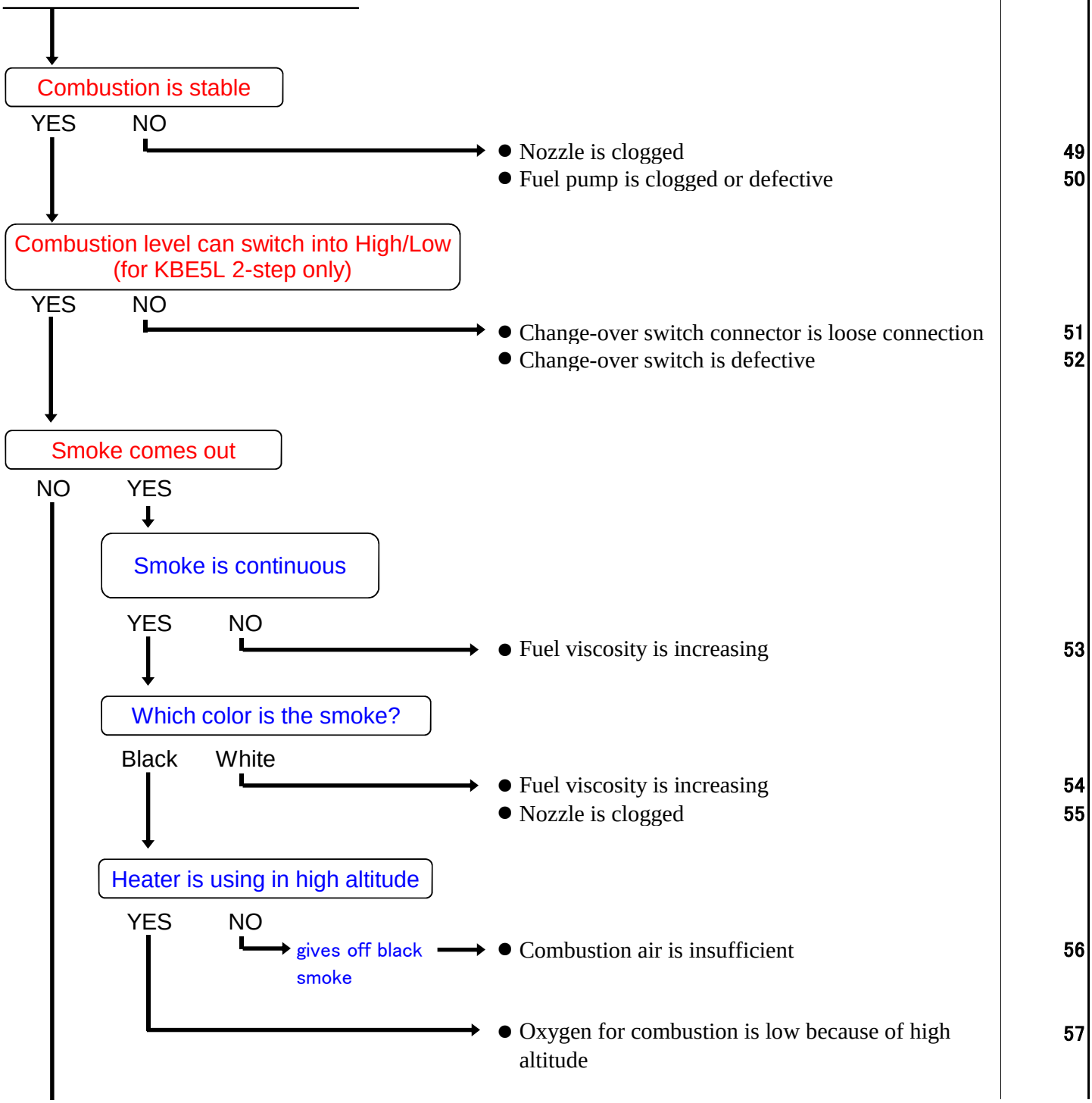
MODEL: KBE5S, KBE5L(2-step)



Possible Cause	Remedy No.
● Fuel pump is inhaling remaining air in fuel line (especially brand-new heater or after refueling)	31
● Pump is inhaling air from the fittings of fuel line between tank and fuel pump	32
● Fuel line is clogged	33
● Fuel filter (element) is clogged	34
● Nozzle is clogged	35
● Fuel pump is clogged or defective	36
● Fuel filter and/or nozzle is clogged by thick fuel	37
● Nozzle is clogged	38
● Fuel is contaminated with water	39
● Lens of flame monitor is dirty or dusty	40
● Poor lighting is detected by flame monitor	41
● Flame monitor connector is loose connection	42
● Flame monitor is defective	43
● Run out of fuel	44
● Nozzle is clogged	45
● Fuel filter is clogged	46
● Air intake of fuel gauge is clogged	47
● Overvoltage is being detected	48

Operation Flowchart

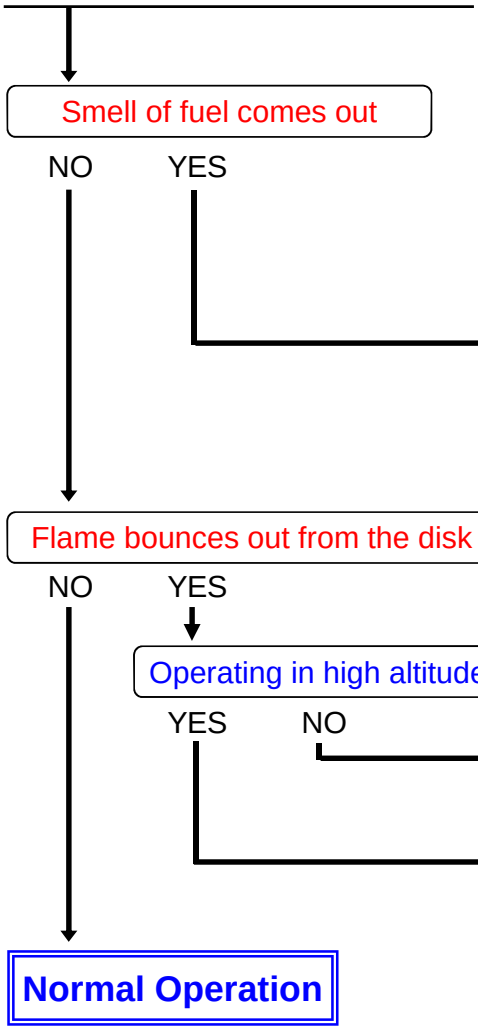
MODEL: KBE5S, KBE5L(2-step)



Possible Cause	Remedy No.
● Nozzle is clogged	49
● Fuel pump is clogged or defective	50
● Change-over switch connector is loose connection	51
● Change-over switch is defective	52
● Fuel viscosity is increasing	53
● Fuel viscosity is increasing	54
● Nozzle is clogged	55
● Combustion air is insufficient	56
● Oxygen for combustion is low because of high altitude	57

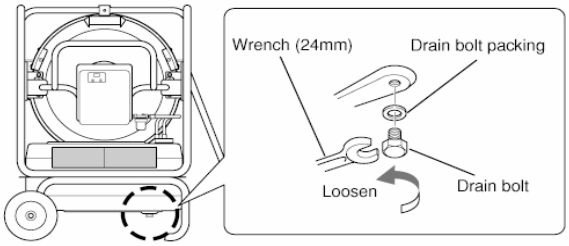
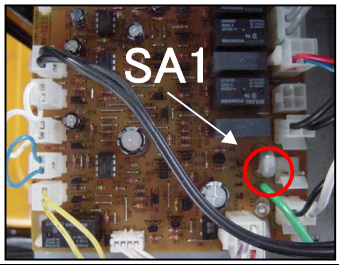
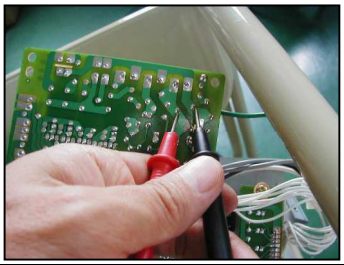
Operation Flowchart

MODEL: KBE5S, KBE5L(2-step)



Possible Cause	Remedy No.
The unburnt component may come out under the temperature of combustion chamber is low right after ignition. This unburnt component causes odor. However this may stop within 3 minutes because the temperature of combustion chamber will increase.	
● Quantity of combustion air is too much	58
● Nozzle is clogged	59
● Fuel filter is clogged	60
● The nozzle is incorrect	61
● Combustion air is insufficient	62
● Oxygen for combustion is low because of high	63

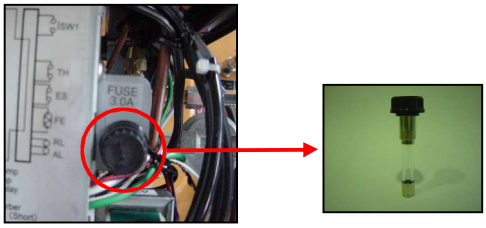
VAL6 KBE5S & KBE5L Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
Fuel is leaking				
1	Drain packing and/or bolt is defective	Remove fuel from tank and take out a drain bolt. Then check whether the packing and bolt are damaged	Fuel leaks because of broken packing and/or bolt	Replace a drain packing and/or bolt
				
2	Too much fuel in the tank	Check the fuel level		Drain excess fuel
Fuse blows out				
At the time of pluging into the power supply				
3	Transformer coil is short-circuited	Disconnect transformer connector (CN 7) from circuit board, then measure coil resistance values of two leads Standard: about 350Ω (white-red) Standard: about 9Ω (purple-purple)	If either lead shows ∞Ω, the transformer is short-circuited	Replace a transformer
		・Without circuit tester Disconnect transformer connector (CN 7) from circuit board, then put plug into AC outlet	If the fuse is intact, the transformer is short-circuited	Replace a transformer
4	Surge absorber(SA1) on control board is short-circuited	Measure resistance at surge absorber (SA1)	If resistance value is ∞ Ω, surge absorber is short-circuited	Replace a circuit board (burner control)
		 		

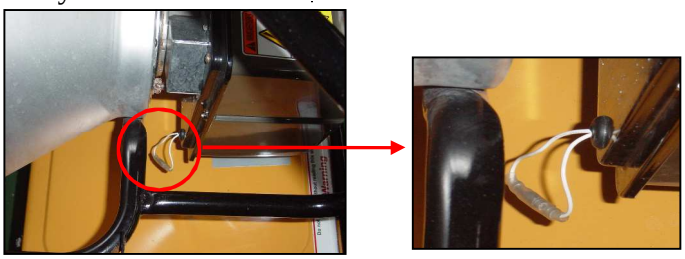
VAL6 KBE5S & KBE5L Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
At the time of turning on operation switch				
5	Fan motor is short-circuited	Disconnect fan connector (CN 3) from circuit board, then measure resistance between terminals	If value leads ∞Ω, the fan coil is short-circuited	Replace a fan motor
		·Without circuit tester Unplug fan connector (CN 3), and then start operation	If the fuse is intact, the fan coil is short-circuited	Replace a fan motor
6	Ignition transformer is short-circuited	Disconnect ignition connector(CN 4) from circuit board, then measure resistance between terminals	If the value shows ∞Ω, the ignition coils is short-circuited	Replace an ignition transformer
		·Without circuit tester Disconnect ignition connector (CN 4), and then start operation	If the fuse is intact, the ignition coils is short-circuited	Replace an ignition transformer
About 5 seconds after turning on operation switch				
7	Fuel pump is short-circuited	Disconnect fuel pump connector (CN 6) from circuit board, then measure resistance between terminals	If the value shows ∞Ω, the fuel pump coil is short-circuited	Replace a fuel pump
		·Without circuit tester Disconnect fuel pump connector (CN 6), then turn on	If fuse is intact, the fuel pump coil is short-circuited	Replace a fuel pump

VAL6 KBE5S & KBE5L Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
Heater cannot start up（heater does not operate at all with switching on)				
Operation lamp is not lit (No lamp is lit)				
8	Power source is not supplied	Measure voltage of AC outlet. Standard: AC120V (or plug in another power tool and see if it works)	If the value shows ∞V, power cable is not receiving electricity. (or if under 100V, could be power shortage)	Plug into a working outlet
9	Fuse blows out	Take fuse out from fuse box, and then check each conduction with circuit tester	If circuit tester reads ∞ Ω, fuse blows out	Find a cause(s) of blown fuse and solve it,(refer to #3-7), then replace with a new one
				
10	Power cord is disconnected	Take power source connector (CN 1) out from circuit board, then check each conduction with circuit tester	If either of the lead is broken, power cord is defective	Make sure the power cord is connected, or replace it
11	Power sorce connector is loose connection	Plug in power source connector (CN 1) again, then turn on	If it works normally, power source connector fails on contact	Plug in connector (CN 1) firmly
12	Transformer connector is loose connection	Plug in transformer connector (CN 7) again, and then turn on	If it works normally, transformer connector fails on contact	Plug in connector (CN 7) firmly
13	Transformer is defective	Measure voltage at output side of transformer connector (CN 7) Standard: input - AC120V (white-red) output - AC15V (purple-purple)	If tester reads normal voltage at input side, and reads 0V at output side, transformer is defective	Replace a transformer
14	Operation switch connector is loose connection	Plug in operation switch connector (CN 8) again, then turn on switch	If it works normally, operation switch connector fails in contact	Plug in connector (CN 8) firmly
15	Operation switch is defective	Take operation switch connector (CN 8) out, then check conduction with circuit tester Standard: Conducting (0Ω) when turned on switch	If it does't conduct when turned on switch, operation switch is defective	Replace an operation switch

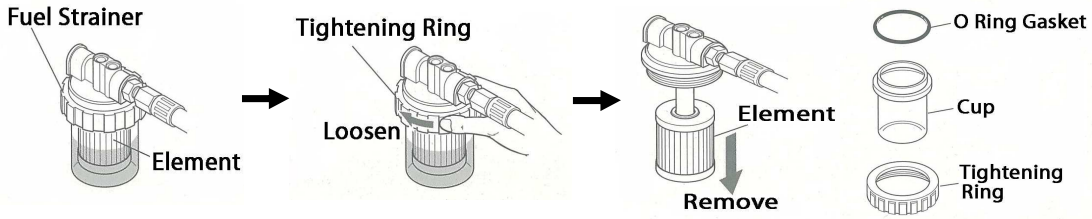
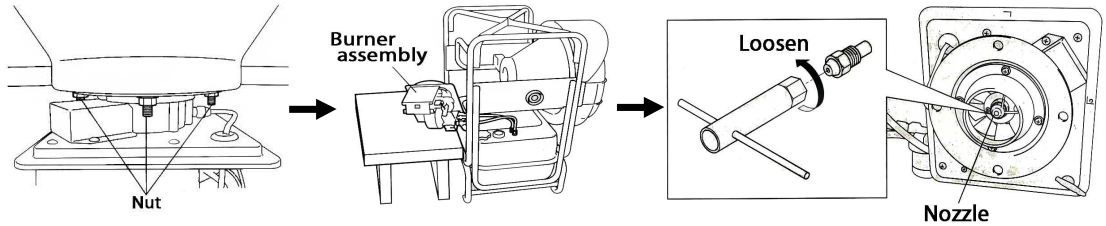
VAL6 KBE5S & KBE5L Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
16	Circuit board (Burner control) is defective	Measure voltage at input side of transformer connector (CN 7) Standard: AC120V (white-red)	If power source is normal and tester reads 0V at input side, circuit board is defective	Replace circuit board (burner control)
Misfire lamp is not lit (Only operation lamp is lit)				
17	Terminals of control device is uncoupled	Check whether the terminals for control device are connected firmly 		Firmly connect terminals on control device
Overvoltage lamp is not lit (Operation lamp and misfire lamp are lit)				
18	Direct sunlight hits flame monitor	Unplug flame monitor connector (CN11), then turn on switch	If it starts, sunlight is detected by flame monitor	Move disk away from direct sunlight or bright light source
19	Circuit board (Burner control) is defective		If it doesn't start, circuit board is defective	Replace a circuit board
All three(operation, misfire, over voltage) lamps are lit				
20	Over voltage is being detected	Change the power source or confirm whether the voltage of power source or generator is correct		Find a cause of over voltage and take away them
Combustion fan does not run				
21	Combustion fan connector is loose connection	Plug combustion fan connector (CN 13) again, and then turn on	If it works normally, combustion fan connector fails on contact	Plug connector (CN13) firmly
22	Combustion fan motor is clogged	Try to rotate a vane by hand (*Be sure to plug off beforehand)	If a vane isn't rotated smoothly or completely, the combustion fan is clogged	Replace a combustion fan
23	Combustion fan and/or circuit board (Burner control) is defective	Refer to above #21 & 22	There is no cause in #21 & 22, combustion fan and/or circuit board are defective	Replace a combustion fan and/or circuit board

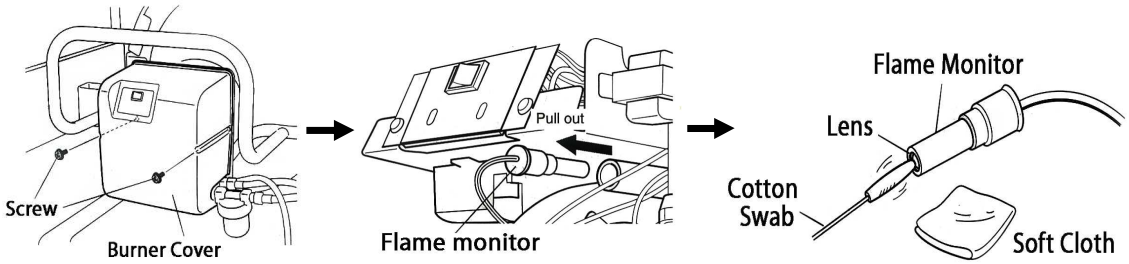
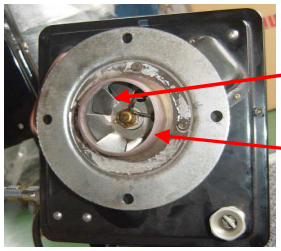
VAL6 KBE5S & KBE5L Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
Electrode is not sparking				
24	Ignition transformer connector (CN4) or high-voltage cord is loose connection			Connect connection of ignition transformer connector (CN4) or high-voltage cord
25	Electrode is defective （abnormal electrode） (clearance is out of alignment)	Confirm that an electrode or a high-voltage cord are not wet or dirty by Refer to drawing①		Replace an electrode Clean an electrode or a high-voltage cord
26	Ignition transformer is defective	Measure voltage at ignition transformer connector (CN4) on Standard: AC120V (black-black)	If it reads 120V, ignition transformer is defective	Replace an ignition transformer
27	Circuit board (Burner control) is defective		If it doesn't read 120V, circuit board is defective	Replace a circuit board
The heater does not ignite				
Fuel pump doesn't turn on (no vibration of fuel pump)				
28	Fuel pump connector (CN6) is loose connection	Plug fuel pump connector (CN6) again, and then turn on	If it works normally, fuel pump connector fails on contact	Plug connector (CN6) firmly
29	Fuel pump is defective	Measure voltage at output side of fuel pump connector on circuit board: Standard: AC60～96V (red-blue)	If the value shows standard voltage, the pump is defective	Replace a fuel pump
30	Circuit board (Burner control) is defective		If the value does NOT show standard voltage, the circuit board is defective	Replace a circuit board
Fuel pump is idling with clicking sound				
31	Fuel pump is inhaling air which is remaining in fuel line (especially brand-new heater or after refueling)			Repeat start-operation 2 or 3 times in order to pump air out of fuel line ＊NEVER repeat more than 4 times in a row as fire may result
32	Pump is inhaling air from the fittings of fuel line between tank and fuel pump	Confirm no loose fitting in fuel line	If any loose fittings, tighten it	Tighten all fittings and repeat start-operation

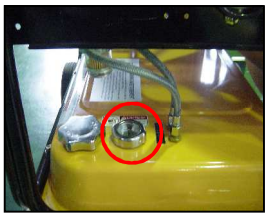
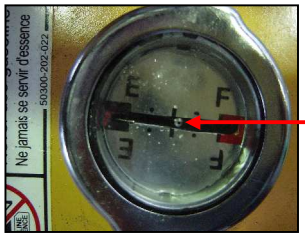
VAL6 KBE5S & KBE5L Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
Fuel is not sprayed normally from the nozzle				
33	Fuel line is clogged			Clear the clog in fuel line
34	Fuel filter (element) is clogged	Check with eyes whether or not the fuel filter is dirty or fouled		Replace a fuel filter
	Replacing a fuel filter 			
35	Nozzle is clogged			Replace a nozzle Clean and flush the tank with kerosene, alcohol or acetone
	Replacing a nozzle  unscrew three nuts and remove the burner			
36	Fuel pump is clogged or defective	Loose the brass nut, then switch on and check whether fuel comes out (place a pan under the pump)	If no fuel is pump up or fuel is not flowing at least 2" high, the fuel pump is clogged or defective (see exhibit "How to restore the fuel	Replace a fuel pump Clean and flush the tank with kerosene, alcohol or acetone
	 Loose the brass nut and switch on (make sure that pump turns on)			

VAL6 KBE5S & KBE5L Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
37	Fuel filter and/or nozzle is clogged by thick fuel		Because of low temperature, fuel viscosity increase and fuel filter and/or nozzle is clogged	Warm the fuel or mix kerosene with diesel. (Replace a filter and/or nozzle if
(Fuel is sprayed normally form the nozzle)				
38	Nozzle is clogged			Replace a nozzle Clean and flush the tank with kerosene, alcohol or acetone
39	Fuel is contaminated with water		Because of condensation, there is the dew condensation water in the tank	Replace a fuel thoroughly
Combustion stops during the operation				
Misfire in about 25 seconds after ignition				
40	Lens of flame monitor is dirty or dusty	Take a flame monitor out, and check whether its lens is clear or not	If it is dirty or dustiness, flame monitor cannot detect flame properly	Clean the lens of flame monitor with soft cloth
				
41	Poor lighting is detected by flame monitor	Remove a burner and check whether the whirl vane and inside of draft tube are clear or not	If they are dirty or dustiness, flame monitor cannot detect flame light properly *usually this will be happen with above #42 at once	Clean the whirl vane and inside of draft tube or replace a vane *clean the lens of flame monitor
	Cleaning the whirl vane and inside of			Clean the whirl vane and inside of draft tube (especially behind whirl vane) till they are shining
42	Flame monitor connector is loose connection	Plug flame monitor connector (CN11) again, and then turn on	If it works normally, flame monitor connector fails on contact	Plug connector (CN11) firmly

VAL6 KBE5S & KBE5L Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
43	Flame monitor is defective	Disconnect flame monitor connector (CN11) from circuit board, then check transition of resistance by changing quantity of light into flame monitor	If the valu of resistance is nonstandard, the flame monitor is defective Standard: balck-black dark: over 2MΩ light: under 10KΩ	Replace a flame monitor
Overvoltage lamp is NOT lit				
44	Run out of fuel	Check whether fuel is in tank		Refueling
45	Nozzle is clogged			Replace a nozzle Clean and flush the tank with kerosene, alcohol or acetone
46	Fuel filter (element) is clogged	Check with eyes whether or not the fuel filter is dirty or fouled		Replace a fuel filter
47	Air intake of fuel gauge is clogged	Check if air intake of fuel gauge is clogged with dust	If air intake of fuel gauge is clogged, fuel flow is insufficient by pressure drop in fuel tank	Clear an air intake of fuel gauge
				
Overvoltage lamp is lit				
48	Over voltage is being detected	Change the power source or confirm whether the voltage of power source or generator is correct		Find a cause of over voltage and take away them
Combustion is not stable				
49	Nozzle is clogged			Replace a nozzle Clean and flush the tank with kerosene, alcohol or acetone
50	Fuel pump is clogged or defective	Loose the brass nut, then switch on and check whether fuel comes out (place a pan under the pump)	If no fuel is pump up or fuel is not flowing at least 2" high, the fuel pump is clogged or defective (see Exhibit A "How to restore the fuel	Replace a fuel pump Clean and flush the tank with kerosene, alcohol or acetone

VAL6 KBE5S & KBE5L Trouble Shooting

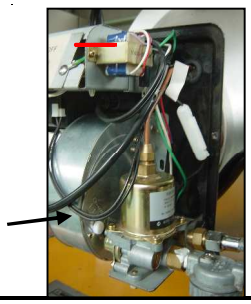
No.	Possible Cause	How to check	Result	Remedy
Combustion stage can switch (for KBE5L 2-step only)				
51	Change-over switch connector is loose connection	Plug change-over switch connector (CN8) again, and then turn on	If it works normally, change-over switch connector fails on contact	Plug in connector (CN8) firmly
52	Change-over switch is defective	Take change-over switch connector (CN 8) out, then check conduction with circuit tester Standard: Conducting (0Ω) when making the switch to "High"	If it does't conduct when turned on switch, change-over switch is defective	Replace a change-over switch
Smoke comes out				
Smoke is continuous for about 3 minutes				
53	Fuel viscosity is increased by low ambient temperature	Check whether ambient temperature is not under minus 4 dgree Fahrenheit (-20℃) and make sure winter fuel is used	If temperature is under minus 4 degree Fahrenheit or summer fuel is used, fuel is not sprayed normally from the nozzle because fuel viscosity is increased by low ambient temperature	Warming up fuel, refueling winter fuel or mixing kerosene with fuel in order to decrease fuel viscosity
Heater produces WHITE smoke				
54	Fuel viscosity is increased by low ambient temperature	Check whether ambient temperature is not under minus 4 dgree Fahrenheit (-20℃) and make sure winter fuel is used	If temperature is under minus 4 degree Fahrenheit or summer fuel is used, fuel is not sprayed normally from the nozzle because fuel viscosity is increased by low ambient temperature	Warming up fuel, refueling winter fuel or mixing kerosene with fuel in order to decrease fuel viscosity
55	Nozzle is clogged			Replace a nozzle Clean and flush the tank with kerosene, alcohol or acetone

VAL6 KBE5S & KBE5L Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
Heater produces BLACK smoke				
56	Combustion air is insufficient	Check whether a combustion fan is run (refer to #21, 22, 23)	If the combustion fan does not run, imperfect combustion occurs by low oxygen	Replace a combustion fan and/or circuit board
		Check whether vanes of combustion fan are dusty	If vanes are dusty, imperfect combustion is occurs by low oxygen	Clean a vanes of combustion fan
		Check whether air inlet opening for combustion is appropriate	If opening is small, imperfect combustion occurs by low oxygen	Adjust a air inlet opening Normal scale : 3
		Check whether applied voltage is normal Standard: 120V±10%	If applied voltage is lower than 108V, imperfect combustion by decreasing of combustion fan rotation speed occurs	Find a cause(s) of low voltage and solve it * or plug into another outlet
Heater is using in high altitude				
57	Oxygen for combustion is low because of high altitude	Check whether the heater is opearting in an altitude higher than 1000m	If its altitude is higher than 1000m, imperfect combustion occurs by low oxygen environment	Expand an air inlet opening gradually until smoke is clear away Normal scale: 3

Adjustment of air inlet

expand an air inlet opening for combustion fan gradually (scale should be 4 or more) until smoke is clear away or flame doesn't protrude from the radiation disk.

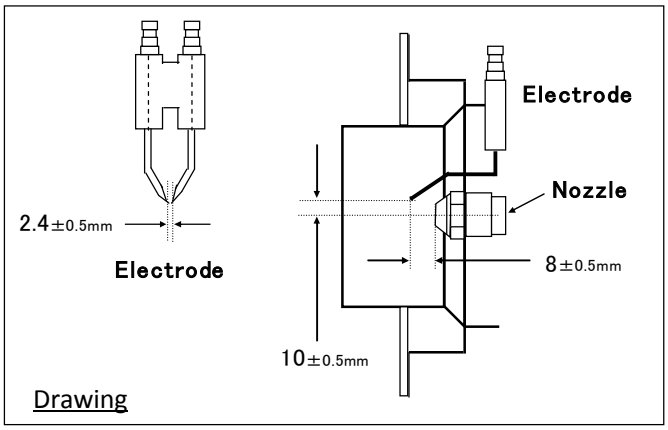


VAL6 KBE5S & KBE5L Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy
Smell of fuel comes out				
58	Combustion air is too much	Check whether air inlet opening for combustion is appropriate	If air inlet opening if too much, imperfect combustion occurs	Narrow an air inlet opening Normal scale: 3
59	Nozzle is clogged			Replace a nozzle Clean and flush the tank with kerosene, alcohol or acetone
60	Fuel filter (element) is clogged	Check with eyes whether or not the fuel filter is dirty or fouled		Replace a fuel filter
61	Nozzle is incorrect	Check whether correct nozzle is used Mark: 0.85USgal/h 60°H		Replace a correct nozzle
Flame bounces out from the disk				
62	Combustion air is insufficient	Check whether a combustion fan is run (refer to #21, 22, 23)	If the combustion fan does not run, imperfect combustion occurs by low oxygen	Replace a combustion fan and/or circuit board
		Check whether vanes of combustion fan are dusty	If vanes are dusty, imperfect combustion is occurs by low oxygen	Clean a vanes of combustion fan
		Check whether air inlet opening for combustion is appropriate	If opening is small, imperfect combustion occurs by low oxygen	Adjust a air inlet opening Normal scale: 3
		Check whether applied voltage is normal Standard: 120V±10%	If applied voltage is lower than 108V, imperfect combustion by decreasing of combustion fan rotation speed occurs	Find a cause(s) of low voltage and solve it * or plug into another outlet
Heater is using in high altitude				
63	Oxygen for combustion is low because of high altitude	Check whether the heater is opearting in an altitude higher than 1000m	If its altitude is higher than 1000m, imperfect combustion occurs by low oxygen environment	Expand an air inlet opening gradually until smoke is clear away Normal scale: 3

VAL6 KBE5S & KBE5L Trouble Shooting

No.	Possible Cause	How to check	Result	Remedy



Drawing

How to restore the fuel flow

If the heater produces a lot of black smoke, is difficult to fire or never ignites; please perform the following procedures before replacing the pump and/or nozzle.

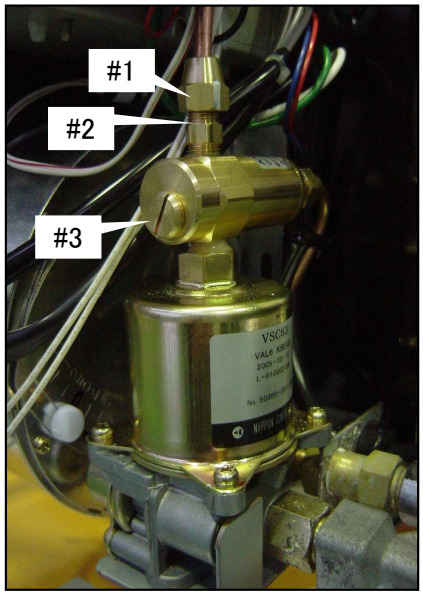
1. Make sure that the pump turns on (you can feel and hear the vibration). This will occur approximately 5 seconds after the switch has been turned on.

2. Make sure that the electrode is sparking. You will hear the sparking and can see it through the front disk right after turning on the heater. (Take the heater to a dimly lit area for this spark check).

If the above items all check out properly and the unit is still not firing, place a pan under the pump to collect fuel during the next procedure. (If either 1 or 2 is the problem, please refer to the troubleshooting).

Procedure

Unscrew the brass fitting #1 completely and push it aside, so that the fuel outlet nipple #2 is visible. Turn on switch and look for fuel coming out of #2. The fuel flow must be at least 2" high. If the required fuel height is met, only the nozzle should be replaced and clean and flush the tank with kerosene, alcohol or acetone.



If no fuel is coming out or there is only a trickle, remove the #3 flat head screw, and turn on the switch.
After a few tries, fuel should squirt out of #3. It should shoot out about 12". If you only get a trickle, or no fuel, there may be several factors contributing to the clogging. Please replace a fuel

If you have a good flow at #3, reconnect the flat head screw and turn on the switch. The fuel will flow at #2 and if it is a constant flow with a minimum of 2" in height, turn off the switch and reconnect the fitting #1.

Note: Insufficient amounts of fuel at the nozzle may cause the unit not to ignite and the raw fuel that drips on the insulator will cause the black smoke when the heater does ignite.

Chart 1 Standard resistance of functional parts

Parts	Connector No	Lead	Condition	Resistance	Remarks
Operation Switch	CN8	Yellow－Yellow	on off	0Ω ∞Ω	
Change-over Switch (KBE5L 2-step only)		Blue－Blue	High Low	0Ω ∞Ω	
Photo Cell	CN11	Black－Black	dark light	over 2MΩ under 10KΩ	
Transformer	CN7	Red-White Purple-Purple	input output	about 350Ω about 9Ω	
Igniter	CN4	Black－Black	input output	- about 4.5KΩ	
Solenoid Pump	CN6	Red-Blue	-	about 130Ω	
Fan motor	CN3	Gray-Gray	－	about 10Ω	gate：Normal scale 3 (60Hz)*

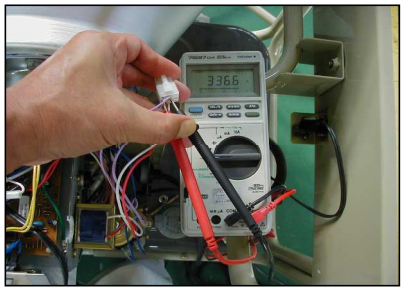
*When heater is used above 3,000ft sea level, adjust air inlet on fan motor for better combustion

Chart 2 Input & Output of Burner Control

Parts	Connector No	Lead	Condition	Voltage
Power code	CN1	Black-White	－	AC 120V (±10%)
Transformer	CN7	Red-White Purple-Purple	input output	AC 120V (±10%) about AC 15V
Igniter	CN4	Black-Black	input	AC 120V (±10%)
Solenoid Pump	CN6	Red-Blue	－	AC 60～96V
Fan motor	CN3	Gray-Gray	60Hz 50Hz	AC 120V (±10%) -

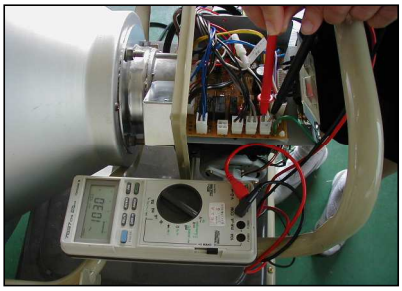
Picture 1 How to measure resistance

① Pull out a connector which you will measure from burner control
② Turn on the circuit tester and set resistor range
③ Insert the lead head of resistor to connector [lead wire side] and measure resistance

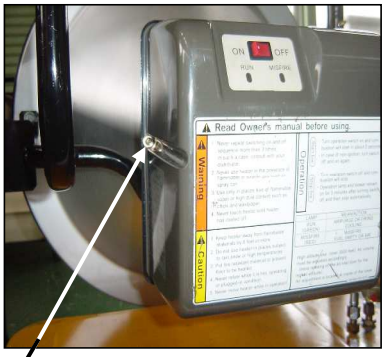


Picture 2 How to measure voltage

① Operate the heater
② Turn on the circuit tester and set AC voltage range
③ Insert the lead head of resistor to connector and measure voltage

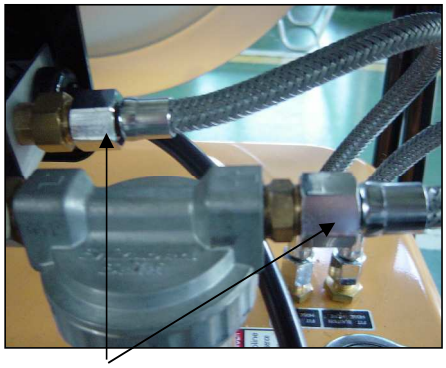


Picture 3 Removing a burner

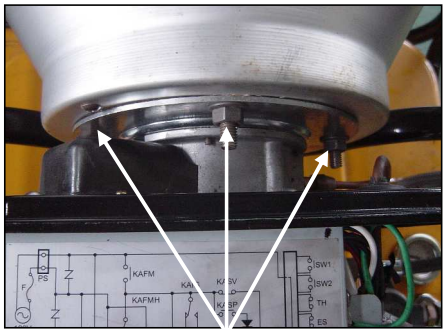


screw

Unscrew two screws and take burner



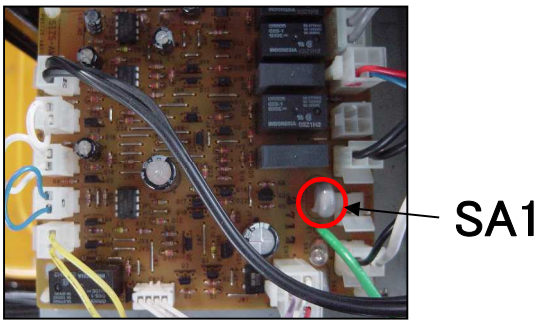
Unscrew two silver nuts with holding gold nuts and remove two fuel hoses

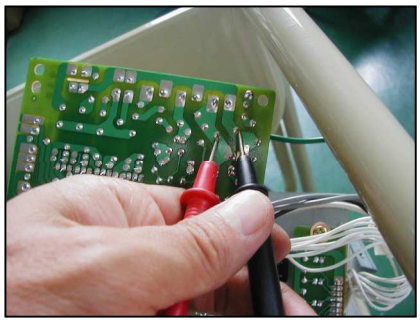


nut

Unscrew three nuts and take the burner off

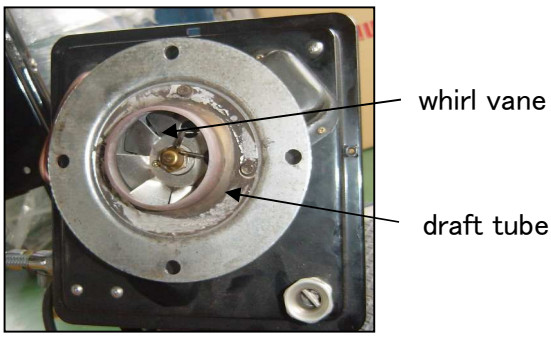
Picture 4 Inspection surge absorber (SA1)





Take out the burner control, and point the lead head at solder part of SA1

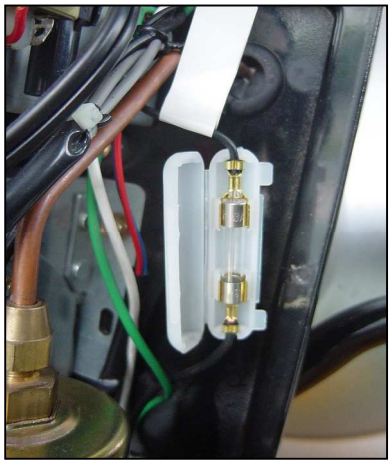
Picture 5 Inspection draft tube and fan



In case of draft tube and fan are dusty, please clean them up

Picture 6 Inspection fuse①

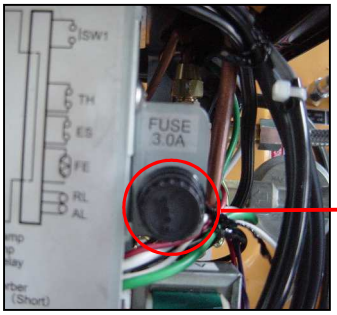
Object Serial Number : till 01Q-020000 (2003/2004 model)



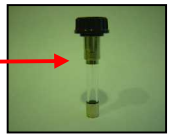
Open the fuse box and check whether the fuse blows out

Picture 7 Inspection fuse②

Object Serial Number : from 01Q-030000 (2003/2004 model)

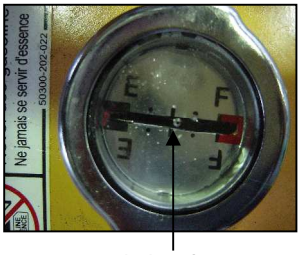


Open a screw cap and take out a fuse



Check whether fuse is blown out

Picture 8 Clean up fuel gauge

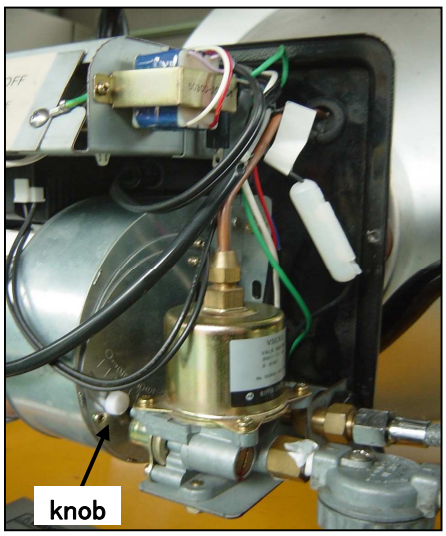


air intake

If air intake of fuel gauge is clogged, clean it up

Picture 9 Adjustment of air inlet for using the heater in high altitude

If dark smoke comes out or flame protrudes from the radiation disk in using the heater in an altitude higher than 3,000 ft, you need to expand combustion air inlet opening.



1. **Unfasten a knob and expand combustion air inlet opening.**

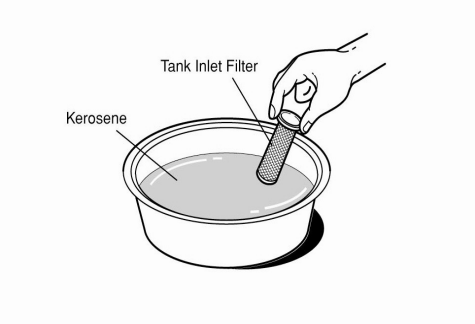
   Standard Scale: 3

   You need to expand combustion air inlet opening gradually until smoke is clear away or flame doesn't protrude from the radiation disk. (scale should be 4 or more)

2. **Fasten a knob of combustion fan and put a burner cover back.**

Daily Inspection

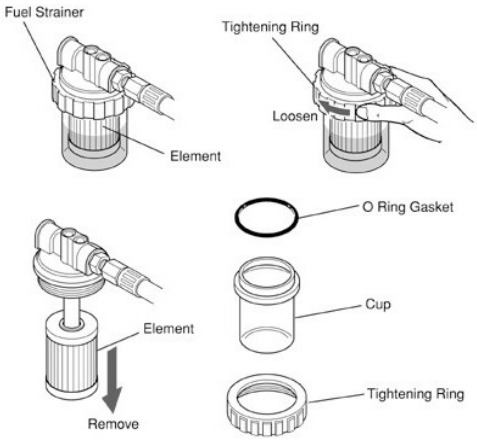
Inspection of the tank inlet filter



1. Please remove the fuel cap and check if dirt/ dust sticks to the inlet filter
2. If there are any dirt/dusts, remove the filter and wash it with fuel.
3. Please restore the tank inlet filter, and tighten firmly the fuel cap.

Inspection of the filter and drainage of water from the fuel tank

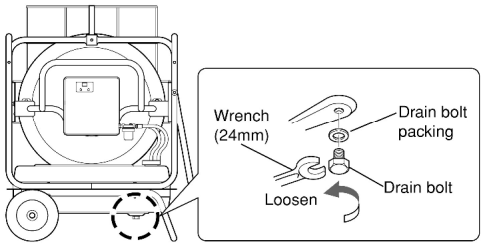
Checking the filter element



1. Check whether or not the filter element is dirt and foul.
2. In case the filter element is dirty or clogged, please replace it with a new one, and bind firmly the cup with the tightening ring.
3. If the dirt or water are found in the cup, eliminate them. Also, that means there are dirt or water in the tank as well. Follow the next instructions and eliminate the dirt or water from the fuel tank.

Drainage of water from the fuel tank

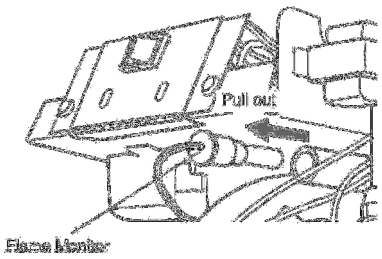
1. Remove the fuel cap, take out the tank inlet filter and insert a handy suction pump into the tank.
2. Remove as much fuel as possible (with the handy suction pump).
3. Restore the tank inlet filter and tighten firmly the fuel cap.
4. Prepare an empty container of about 3 liters (0.7gallons) capacity: to hold kerosene and water remaining in the fuel tank, place the container under the drain bolt (of the fuel tank).
5. Later on, please remove with wrench the drain bolt and tilt the fuel tank until the fuel is completely drained out of the tank. (At the same time, be careful not to lose the drain bolt packing)
6. Restore the drain bolt packing and tighten the drain bolt firmly so fuel cannot leak out (of the fuel tank).
7. Wipe off kerosene or water spilt over the tank.

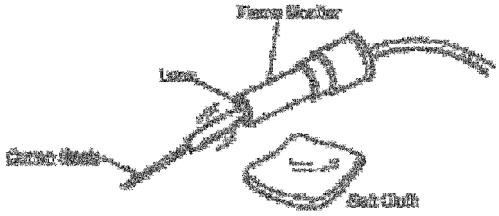


■ Inspection and cleaning of the flame monitor

Observations – When removing the flame monitor, hold it by its main assembly; do not pull out the cord.

1. Remove the burner cover and pull out the flame monitor, and check whether or not its lens is dirty/foul.
2. If the lens is dirty/foul, please wipe the surface of the lens with a soft cloth, etc. until it becomes clear.
3. Restore the flame monitor, fix burner cover with screws





Inspection of "dirt/dusts" on main unit

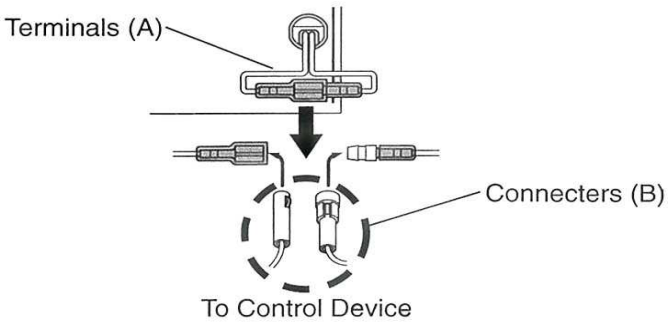
1. Check whether or not dirt/dusts is on or around the heater.
2. If dust is found, clean with a vacuum cleaner or wipe with a soft cloth, etc.

····· Periodic Inspection ·····

1. The heater must be checked, if used for a long time. Please ask your dealer to inspect the heater every two (2) seasons.

····· How to connect the Control device ·····

1. Uncouple the terminals (A) attached to the tip of white wires that come out of the burner base.
2. Connect both male and female terminals, which are uncoupled, to the connecters (B) of control device.



Observations

・When the heater is controlled by anotherdevice (such as a thermostat or a timer), the heater could turn itself on at any time.