HOT AIR SPOT HEATER
APPAREIL DE CHAUFFAGE Á JET D'AIR

HOT AIR SPOT HEATER HOT GUN 125NA

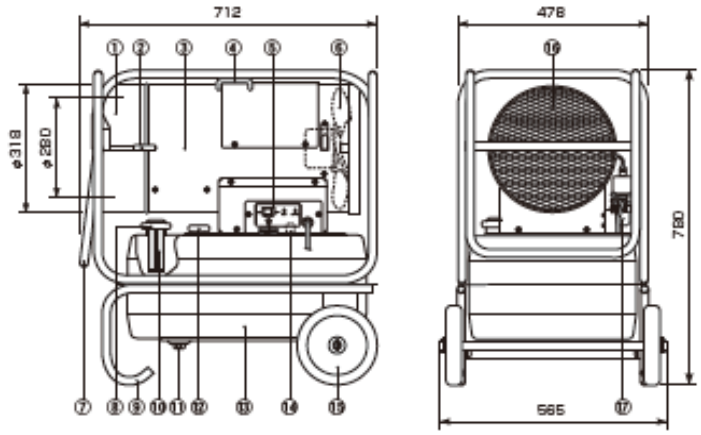
Service Manual

Contents

Shizuoka Seiki Co.,Ltd.

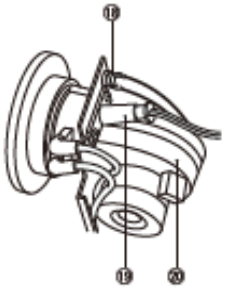
2019.11

1 Names of components

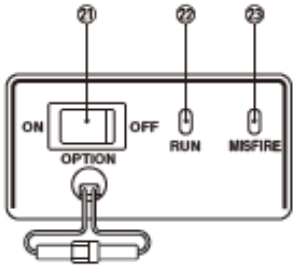


① Hot Air Outlet
② Vent Angle Lever
③ Outer Shell
④ Band Hook
⑤ Switch
⑥ Blower Fan
⑦ Handle
⑧ Fuel tank cap
⑨ Tank leg
⑩ Tank inlet filter
⑪ Drain Bolt
⑫ Fuel Gauge
⑬ Fuel Tank
⑭ Fuse
⑮ Wheel
⑯ Air Intake
⑰ Fuel Filter
⑱ Overheat Prevention System
⑲ Flame Monitor
⑳ Fan Motor

◆ Burner Section



◆ Switch Section



Switch Section

㉑ Operating Switch
This ignites or extinguishes the flame.
(Refer to page 9, 10, 11.)

㉒ Operation Lamp
This is lit while the heater is operating and cooling down.
(Refer to page 9, 10, 11.)

㉓ Misfire Lamp
This lamp lights when the heater is out of fuel or when air is mixed in the fuel.

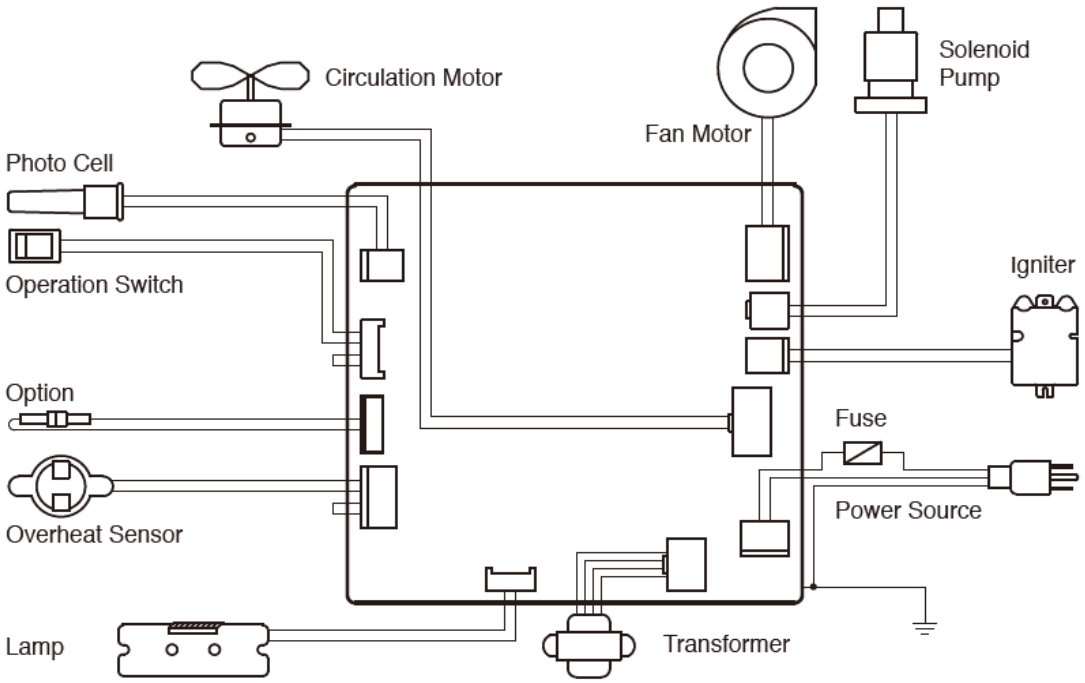
2 Wiring Diagram

Description of Safety Devices	
⑭ Electric Overload System (Fuse)	This shuts off the power supply when excessive electric current passes through, due to irregular trouble of the devices. **Operating condition**: The whole operation stops.
⑲ Flame Monitor	This automatically extinguishes the flame when ignition fails or flame goes out during the operation. This monitor, when it detects any irregularity before ignition, automatically extinguishes the flame. **Operating condition**: Misfire lamp is lit and Post-Purge continues for three (3) minutes.
Anomaly detection system for ⑳ fan motor	This automatically extinguishes the flame when some errors are detected in fan motor such as cable disconnection.

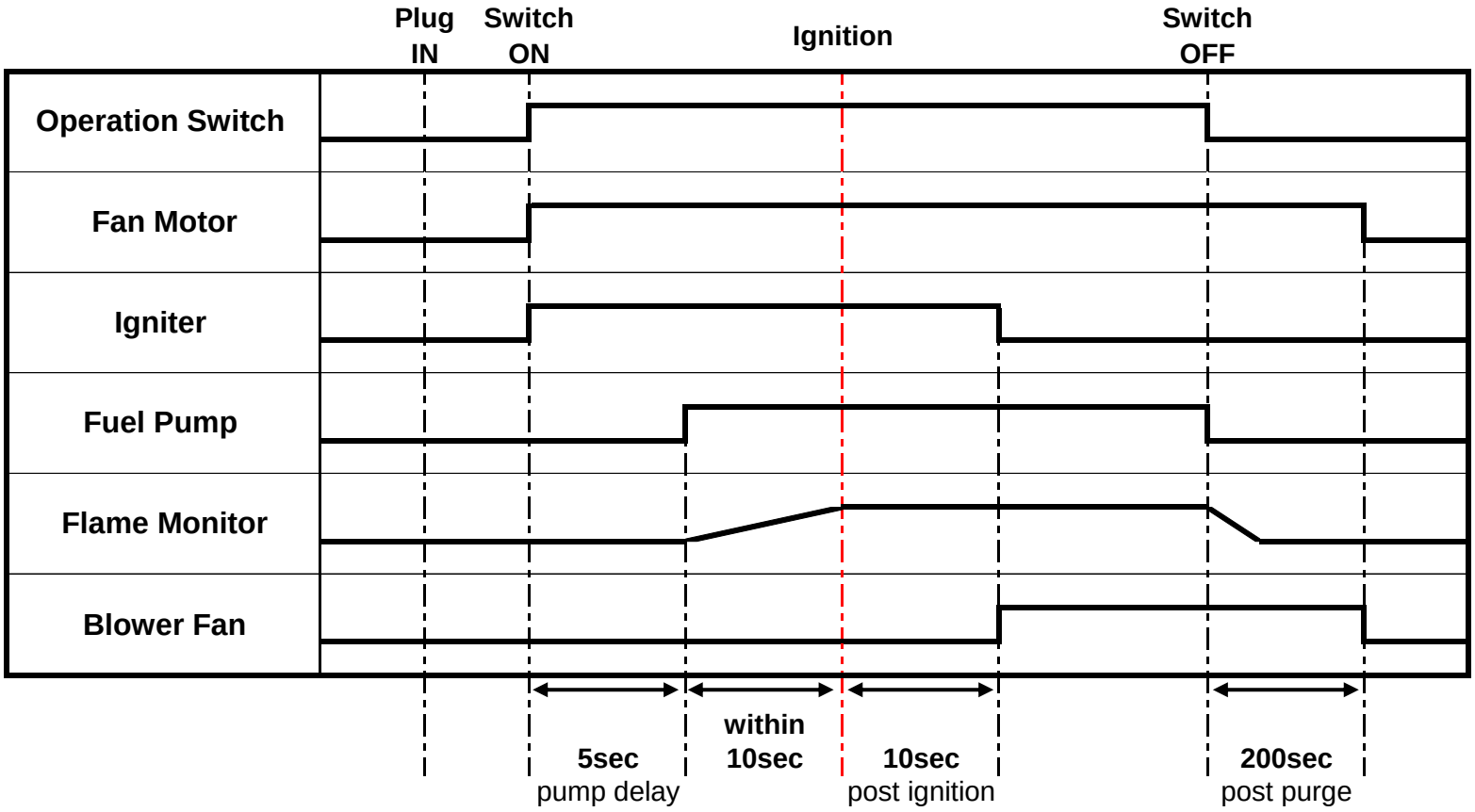
3 Specifications

Model Type	HG 125NA
Type	Forced Air/Direct-fired
Ignition System	High Intensity Discharge
Fuel	Kerosene or Fuel-Oil no heavier than No.2 (Diesel)
Fuel Consumption	2.9 kg/h (0.9 gal/h)
Heat Output Rating	34 kW (116000BTU/hr)
Tank Capacity	54 ℓ (14 gallon)
Continuous Operating Time	15 hours
Dimensions (mm)	780 (H) x 565 (W) x 712 (D) Outlet Diameter Ø318
Weight (w/empty tank)	37 kg, 81.6 lbs
Power Voltage and Frequency	AC 110–120V 50/60Hz
Power Consumption	• When igniting: 176W • When burning: 150W
Electric Fuse	3 A
Operating Noise Level	69dB (A)
Safety Systems	• Flame Monitor • Overheat Prevention System • Anomaly detection system for fan motor
Standard Parts	• Fuse (3A) x 1 • Element x 2 • Nozzle x 1 • Nozzle Wrench x 1 (Put in a plastic bag)

4 Specifications



5 Sequence Time Chart



6 Troubleshooting

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		Operation lamp is lit	
		Misfire lamp is lit	
2	The heater does not ignite (though the heater is working)	Fuel pump does not operate at all	7
		No fuel or a little fuel is pumped up	
		Igniter does not spark. [Igniter does not operate]	
		Sequence of operation is normal, but it doesn't ignite	
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5	Odor comes out		
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8	Fuel leaks		
9	Fuse blows out	When the plug is put into the socket	11
		When the switch is turned on	
		About 5 seconds after turning on	

HG 125NA Troubleshooting

Phenomenon		Possible Cause	How to check	Result	Remedy
1. The heater does not start.	**The lamp does not light on.**	No power source supplied	Measure voltage of AC outlet. Standard: HG 125NA - AC120V	If circuit tester indicates 0V, power source is disconnected	Connect power source
		Fuse blowout	Take fuse out from fuse box, and then check each lead with circuit tester	If multimeter reads ∞Ω, fuse blows out	Find a cause of blown fuse and replace with a new one
		Disconnection of power cable	Take power source connector (CN 1) out from burner controller, and then check each lead with multimeter	If either of the lead is broken, power cable is broken	Make sure the power cable is connected, or replace it
		Loose connection of power source connector	Plug in power source connector (CN 1) again, and then turn on	If it works normally, power source connector fails in contact	Plug in connector (CN 1) firmly
		Loose connection of transformer connector	Plug in transformer connector (CN 7) again, and then turn on	If it works normally, transformer connector fails in contact	Plug in connector (CN 7) firmly
		Failure of transformer	Measure voltage at output side of transformer connector (CN 7) Standard (purple-purple): about AC15V	If multimeter reads normal voltage at input side, and reads 0V at output side, transformer fails	Replace transformer
		Loose connection of operating switch connector	Plug in operation switch connector (CN 8) again, and then turn on	If it works normally, operation switch connector fails in contact	Plug in connector (CN 8) firmly
		Failure of operating switch	Take operating switch connector (CN 8) out, and then check lead with Standard: Conducting (0Ω) when	If it doesn't conduct when turned on, operating switch fails	Replace operating switch
		Failure of burner controller	Measure voltage at input side of transformer connector (CN 7) Standard (white-red): HG 125NA - AC120V	If power source is normal and multimeter reads 0V at input side, burner controller fails	Replace burner controller
	Run lamp is lit	Terminals of thermostat are uncoupled.	Check whether the terminals of thermostat are connected fiemly.		Firmly connect terminals on theermostat
	Misfire lamp is lit.	Flame monitor lens is perplexed by direct sunlight	Unplug flame monitor connector (CN 11), and then start operation	It starts to operate	Avoid direct sunlight on radiation disk
		Failure of burner controller		It doesn't start to operate	Replace burner controller

HG 125NA Troubleshooting

Phenomenon		Possible Cause	How to check	Result	Remedy
2. The heater does not ignite.	**Fuel pump does not operate at all.**	Loose connection of fuel pump connector	Plug in fuel pump connector (CN 6) again, and then turn on	If it works normally, fuel pump connector fails in contact	Plug in connector (CN 6) firmly
		Failure of fuel pump	Measure voltage at output side of fuel pump connector on burner controller Standard (blue-blue) HG 125NA - AC60～96V	If voltage is normal, fuel pump fails	Replace fuel pump
		Failure of burner controller		If multimeter reads 0V, burner controller fails	Replace burner controller
	No fuel or a little fuel is pumped up.	Fuel line is clogged	Disconnect each fuel line, and then clean up each of them	If it ignites after cleaning, fuel flow decreases because of clogged in fuel lines	·Clean fuel lines ·Clean and rinse the fuel tank with kerosene, alcohol or acetone
		Filter element is clogged	Check clarity of filter element	If filter is dirty, fuel flow decreases because of clogged filter element	·Replace filter element ·Clean and rinse the tank with kerosene, alcohol or acetone
		Nozzle is clogged	Replace nozzle	If it ignites, nozzle is clogged	·Replace nozzle ·Clean and rinse the fuel tank with kerosene, alcohol or acetone
		Loose joint in fuel lines	Check looseness of each joint	If heater ignites by joints fastened more tightly, air is absorbed into fuel lines at loosed joints	Fasten joints more tightly
		Fuel pump is clogged, or failure	Remove burner cover and fuel outlet line, and then turn on the switch	No fuel is pumped up, fuel pump is clogged or failure	Replace fuel pump
		Failure of burner controller	Measure voltage at fuel pump connector on burner controller standard (blue-blue) HG 125NA - AC60~96V	If multimeter reads power supply voltage , burner controller fails	Replace burner controller
	Igniter does not spark. [Igniter does not operate.]	Loose connection of igniter connector	Plug in igniter connector (CN 4) again, and then turn on the operating switch	If it works normally, loose connection of igniter connector	Plug in connector (CN 4) firmly
		Failure of igniter	Measure voltage at igniter connector (CN4) on burner controller Standard (black-black): HG 125NA - AC120V	If voltage is normal, igniter fails	Replace igniter
		Failure of burner controller		If multimeter reads 0V, burner control fails	Replace burner controller
	Sequence of operation is normal, but it doesn't ignite	Alignment of electrode is out of standard	Measure the alignment of electrode	If any part is out of standard position, out of alignment is cause	Replace electrode (adjust the position)
		Improper quantity of combustion air	Check gate opening of fan motor	If gate opening is unusual, quantity of combustion air is improper	Adjust gate opening. Normal scale: HG 125NA 120V 60Hz - 2 HG 125NA 110V 50Hz - 8

Phenomenon		Possible Cause	How to check	Result	Remedy
3. Misfire within 10 seconds after ignition.	**Misfire lamp is lit.**	Loose flame monitor	Open burner cover, and check if the flame monitor is in	If flame monitor comes off, it doesn't work	Put in flame monitor firmly
		Shortage of light sensed from flame	Take flame monitor out, and then check clarity of its lens	If lens of flame monitor is dirty less sensitive.	Wipe lens of flame monitor with soft cloth
			Remove burner, and then check clarity of burner cone and vane	If burner cone or fan is dirty, it senses little light	Clean burner cone and whirl vane
			Check extent of combustion air inlet opening	If opening is too extensive, flame is short because combustion air is too much	Decrease opening to reduce combustion air. Normal scale: HG 125NA 120V 60Hz - 2 HG 125NA 110V 50Hz - 8
		Loose connection of flame monitor	Plug flame monitor connector (CN 11) again, and then turn on	If it works normally, flame monitor connector fails on contact	Plug connector (CN 11) firmly
		Failure of flame monitor	Measure voltage at flame monitor connector on burner controller standard dark - about DC5V light - DC1.2V and under	If voltage doesn't change, flame monitor fails	Replace flame monitor
		Nozzle clogged	Replace nozzle	If it ignited, nozzle is clogged	Replace nozzle
		Filter element clogged	Check clarity of filter element	If filter is dirty, fuel flow decreases because of filter element clogged	Clean or replace the filter element
4. Combustion stops during operation.	**Misfire lamp is lit.**	Absorbing air into fuel lines from joints	Check looseness of each joint	If any joint is loose, air is absorbed into fuel lines from loose joint	Fasten joints more tightly
		Insufficient pumping of fuel because vacuum forms in fuel tank	Check if air intake of tank cap is clogged with dust	If air intake of tank cap is clogged, fuel flow is insufficient by vacuum forming in fuel tank	Clean air intake of tank cap
		Shortage of light detected by flame monitor	Take flame monitor out, and then check clarity of its lens	If lens of flame monitor is dirty, it detects a little light	Wipe lens of flame monitor with soft cloth
			Remove burner, and then check clarity of burner cone and vane	If burner cone or whirl vane is dirty, flame monitor detects a little of light	Clean burner cone and whirl vane
		Flame monitor connector is loose connection	Plug flame monitor connector (CN 11) again, and then turn on	If it works normally, flame monitor connector fails on contact	Plug connector (CN 11) firmly
		Failure of flame monitor	Unplug flame monitor connector (CN 11), and then check transition of resistance by changing quantity of light into flame monitor	If resistance doesn't change, flame monitor fails	Replace flame monitor
		Nozzle clogged	Replace nozzle	If it works normally, nozzle was	Replace nozzle
		Filter element clogged	Check clarity of filter element	If filter is dirty, fuel flow decreases because of clogged filter element	Clean or replace the filter element

HG 125NA Troubleshooting

Phenomenon		Possible Cause	How to check	Result	Remedy
5. Smell of fuel comes out.		Quantity of combustion air is too much	Check gate opening of combustion air inlet	If opening is too extensive, it burns imperfectly	Decrease opening to reduce combustion air. Normal scale: HG 125NA 120V 60Hz - 2 HG 125NA 110V 50Hz - 8
		Nozzle clogged	Replace nozzle	If it works normally, nozzle is	Replace nozzle
		Filter element clogged	Check clarity of filter element	If filter is dirty, fuel flow decreases because of clogged filter element	Clean or replace the filter element
		Incorrect nozzle	Check makers imprint of the nozzle if it is correct. Mark: 0.85USgal/h 60° H	If makers imprint is incorrect, the nozzle is incorrect	Replace incorrect nozzle for correct one
6. Smoke comes out.		Shortage of combustion air	Check extent of combustion air inlet opening	If combustion air inlet is too small, it burns in short of Oxygen	Extend combustion air inlet opening. Normal scale: HG 125NA 120V 60Hz - 2 HG 125NA 110V 50Hz - 8
		Decrease of airflow from fan motor	Check if fan is dusty	If fan is dusty, it is short of air	Clean fan
		Decrease revolutions of the fan motor (Power source voltage is insufficient)	Measure voltage at power source connector Standard: HG 125NA - AC120V	If voltage at power source is lower than standard, combustion air is decreased because of low voltage	Check voltage
		Nozzle clogged	Replace nozzle	If it works normally, nozzle was	Replace nozzle
		Using at high altitude area (Low oxygen concentration)	Know the altitude if using at lower than the altitude of 1000m(3000ft)	If using at higher than the altitude of 1000m(3000ft), heater burns imperfectly because of shortage of oxygen	Extend combustion air inlet opening. Normal scale: HG 125NA 120V 60Hz - 2 HG 125NA 110V 50Hz - 8
		Incorrect nozzle	Check makers imprint of the nozzle if it is correct. Mark: 0.85USgal/h 60° H(danfoss)	If makers imprint is incorrect, the nozzle is incorrect	Replace incorrect nozzle for correct one
7. Combustion is not stable.		Loose joints in fuel line	Check looseness of each joint	If any joints are loose, air is absorbed into fuel lines from loose joint	Fasten joints more tightly

Phenomenon		Possible Cause	How to check	Result	Remedy
8. Fuel leaks.		Loose joints in fuel line	Check looseness of each joint	If any joint is loose, fuel is leaking	Fasten joints more tightly
		Failure of drain packing	Remove drain bolt after removing fuel from fuel tank, and then check whether packing isn't corrupted	Fuel leaks because of breach of packing	Replace drain packing
		Quantity of fuel in the fuel tank is too much	Check the fuel level	Fuel overflows because quantity of fuel in the fuel tank is too much	Decrease quantity of fuel in fuel tank
9. Fuse blows out	**When the plug is put into the outlet.**	Short circuit of transformer coil	Unplug transformer connector (CN 7) from burner controller, then measure coil resistance values of two leads Standard: HG 125NA (white-red) - about 350Ω (purple-purple) - about 9.0Ω ・Without tester Unplug transformer connector (CN 7) from burner controller, then put plug into AC outlet	If either of the values is 0Ω, transformer is short-circuited If fuse doesn't blow out, transformer is short-circuited	Replace a transformer
		Short circuit of surge absorber (SA1)	Gauge resistance at surge absorber (SA1)	If resistance value is 0Ω, surge absorber is short-circuited	Replace burner controller
	When the switch is turned on.	Short circuit of fan motor coil	Unplug fan connector (CN 3) from burner controller, then measure resistance between terminals	If resistance value is 0Ω, fan coil is short-circuited	Replace fan motor
		Short circuit of igniter	Unplug igniter connector(CN 4) from burner controller, then measure resistance between terminals ・Without tester Unplug igniter connector (CN 4), and then start operation	If resistance value is 0Ω, primary side of igniter is short-circuited If fuse doesn't blow out, igniter is short-circuited	Replace igniter
	About 5 seconds after turning on	Short circuit of fuel pump coil	Unplug fuel pump connector (CN 6) from burner controller, then measure resistance between terminals ・Without tester Unplug fuel pump connector (CN 6), then turn on	If resistance value is 0Ω, fuel pump coil is short-circuited If fuse doesn't blow out, pump coil is short-circuited	Replace fuel pump

Phenomenon		Possible Cause	How to check	Result	Remedy
	About 20~30 seconds after turning on	Short circuit of Blower motor	Unplug blower motor connector (CN 5) from burner controller, then measure resistance between terminals(4-5PIN)	If resistance value is 0Ω, blower motor is short-circuited	Replace blower motor

7 Standard resistance & Standard Voltage

★Standard resistance of functional parts

Parts	Connector No		Lead	Condition	Resistance HG 125NA	Memo
Operating Switch	CN8	1-2PIN	Yellow-Yellow	On	0Ω	
				Off	∞Ω	
Overheat Protection	CN13	3-4PIN	Red-Red	not in working	0Ω	
				in working	∞Ω	
Flame Monitor	CN11		White-White (Red Line)	dark	about DC5V	
				light	DC1.2V and under	
Transformer	CN7		Red-White	input	about 350Ω	
			Purple-Purple	output	about 9Ω	
Igniter	CN4		Black-Black (thin)	input	-	
			Black-Black (bold)	output	about 4kΩ	
Fuel Pump (Pump coil)	CN6	2-4PIN	Blue-Red	-	about 90Ω	
Fan Motor	CN3	1-2PIN	White-Black	-	about 120Ω	Normal scale 2（60Hz） Normal scale 8（50Hz)
Blower Motor	CN5	4-8PIN	Blue-Yellow	-	about 50Ω	

★Input &Output of Burner Control

Parts	Connector No		Lead	Condition	Voltage HG 125NA	Memo
Power Cable	CN1		Black - White	-	AC 110-120V 50/60Hz (±10%)	
Transformer	CN7		Red - White	input	AC 110-120V (±10%)	
			Purple - Purple	output	about AC 15V	
Igniter	CN4		Black - Black (thin)	input	AC 110-120V (±10%)	
Fuel Pump (Pump coil)	CN6	2-4PIN	Blue-Red	-	AC 60-96V	*1
Fan Motor	CN3	1-2PIN	White-Black	-	AC 110-120V (±10%)	
Blower Motor	CN5	4-8PIN	Yellow-Yekllow	-	AC 110-120V (±10%)	

*1 Output voltages vary according to mesuring instrument because they are half-wave/full-wave rectification

8 Check & Repair

Figure 1 Removing a burner cover (Outer Shell Cover)

Unscrew four screws and take burner cover off

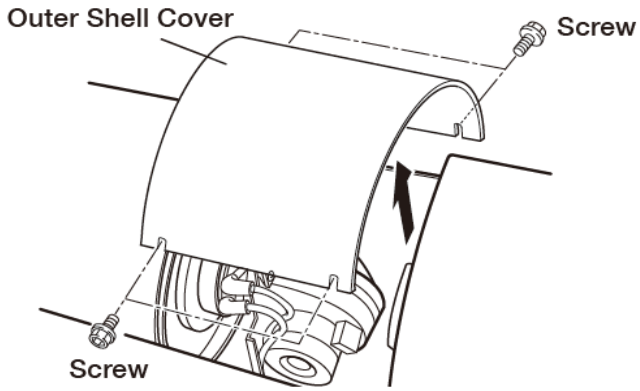


Figure 2 Removing a burner unit

Unscrew three nuts as below and take the burner unit off

Unscrew the nut and remove the pump nozzle line.

Loosen three nuts fixing burner assembly. (Be careful not to remove the nuts.)Rotate a burner assembly to the direction of bigger screw hole and take it off.

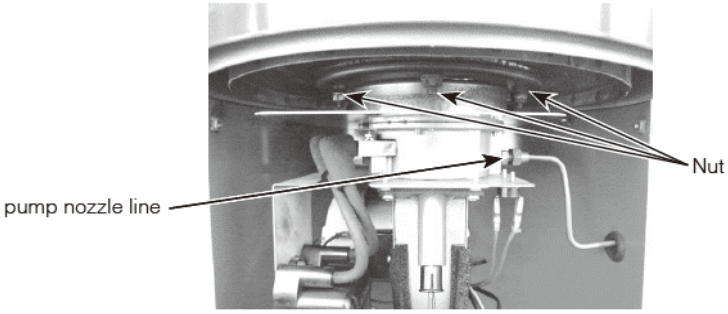


Figure 3 Mesuring resistance

① Unplug an intended connector from burner controller
② Turn on the multimeter and set multimeter range

③ Insert the lead head of multimeter to connector [lead wire side] and measure resistance

Figure 4 Mesuring voltage

① Operate the heater

② Turn on the multimeter and set AC voltage range (partially direct current range)

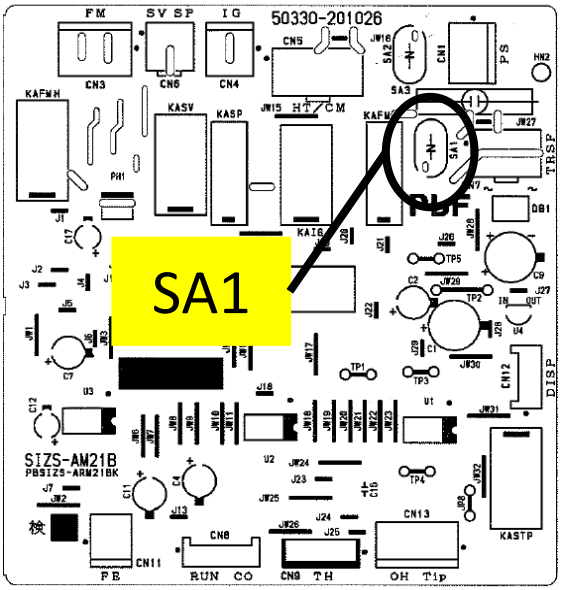
③ Insert the lead head of multimeter to connector and measure voltage

Observation

※ Be sure to set resistor at proper range
※ Be careful not to insert the lead head of resistor strongly since damage in connector may occur

Figure 5 Checking a surge absorber (SA1)

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



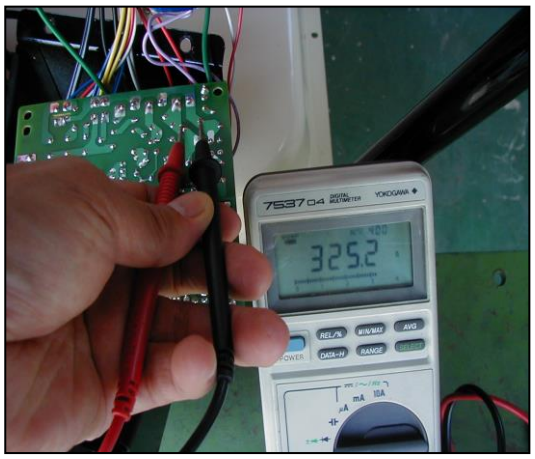


Figure 6 Replacing a fuse

Be sure to unplug the power plug then open the fuse cap and Check whether fuse is blown out

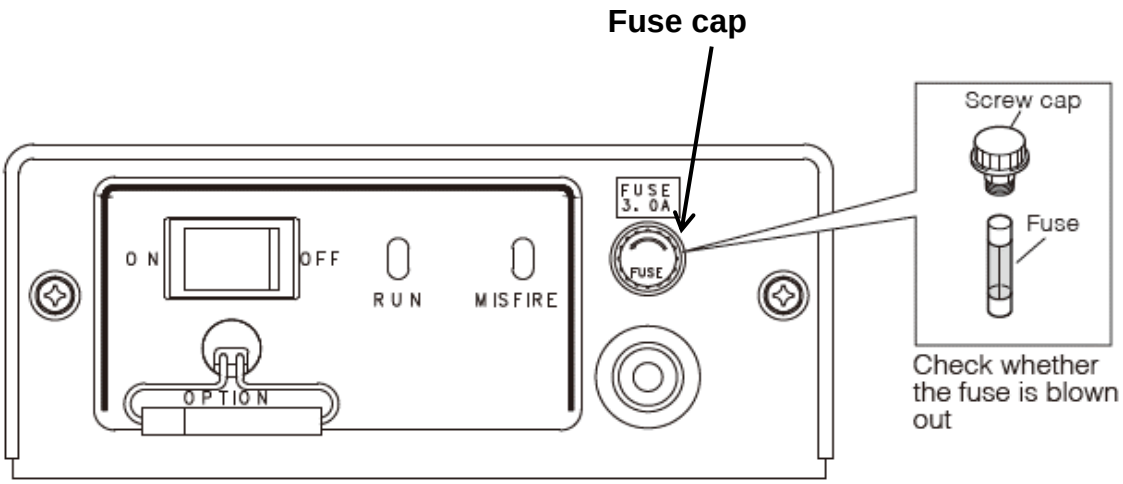


Figure 7 Checking a filter element

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.

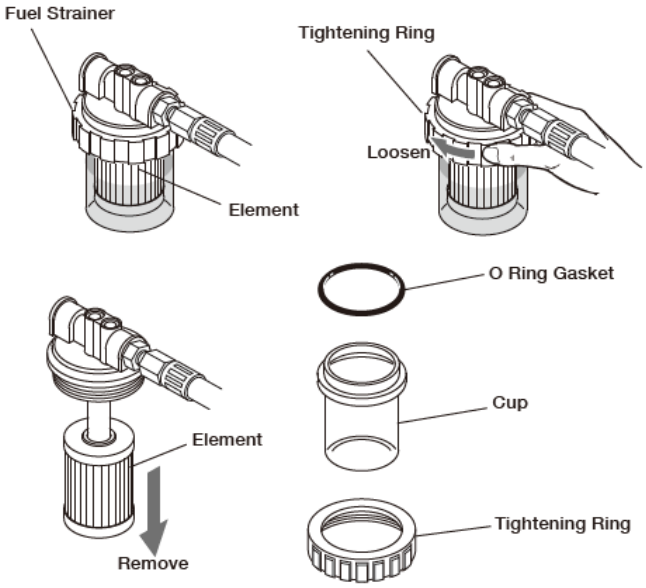


Figure 8 Checking a fuel tank

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 (0.7 gallons) capacity: to hold kerosene and water remained 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 so firmly that fuel can not leak out (of the fuel tank).
7. Wipe off kerosene or water spilt over the tank.

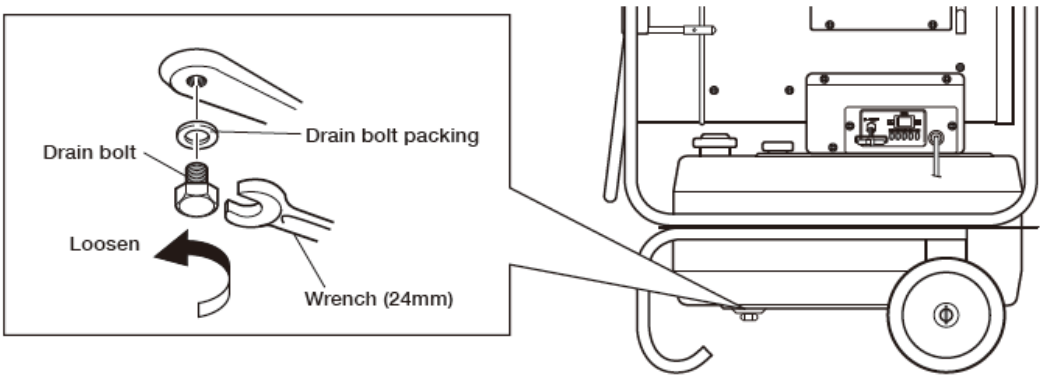
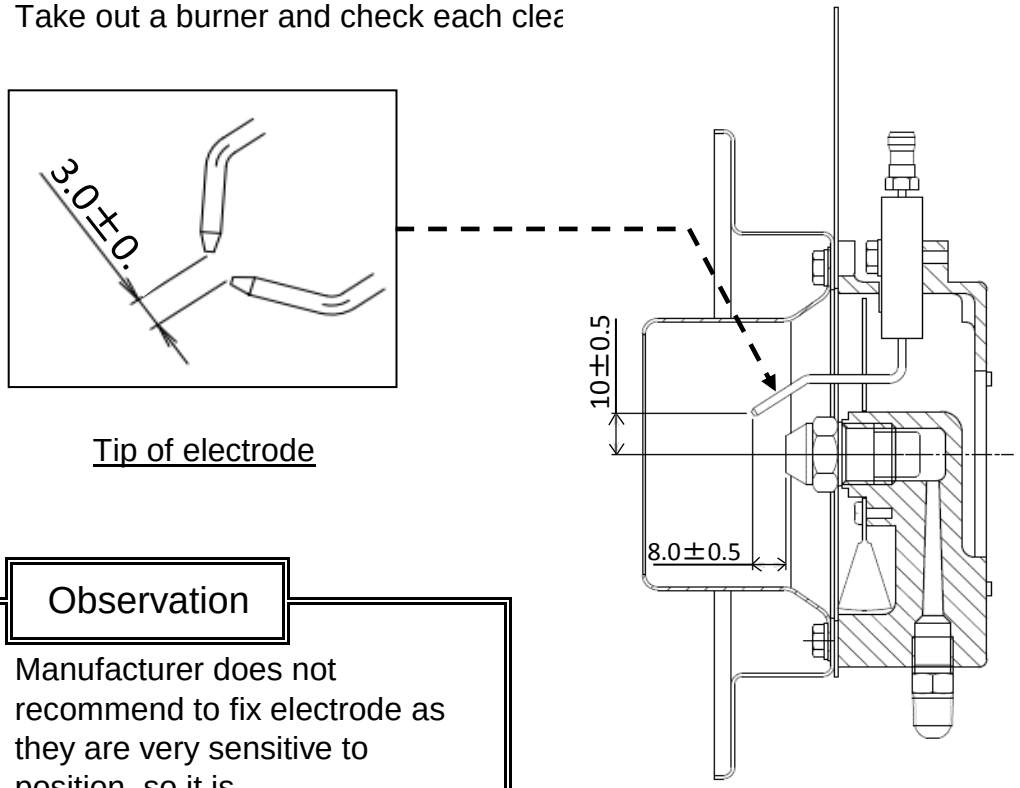


Figure 9 Positioning a electrode

Take out a burner and check each clea



Tip of electrode

Observation

Manufacturer does not recommend to fix electrode as they are very sensitive to position, so it is recommended to replace it.

Figure 10 Cleaning a frame monitor

Inspecting the Flame Monitor

1. Remove the four screws on the outside of the outer shell cover, and remove the cover. (Be careful not to lose the screws at this time.)

2. Slide the flame monitor out and check for any dirt on the lens. The lens should normally be clear.
Clean the lens if it is dirty.

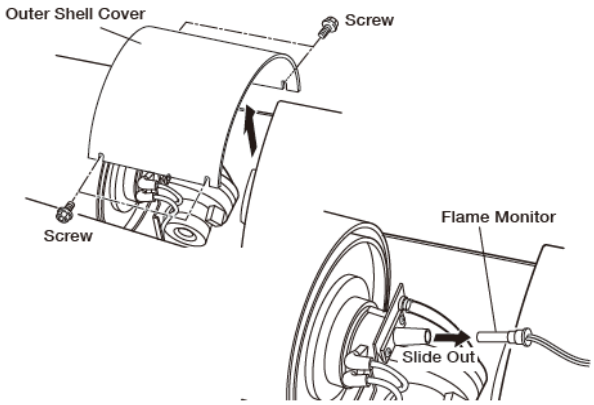


Figure 11 Checking a burner cone and whirl vane

Take out a burner and check whether or not burner cone and whirl vane are dirt or not. In case the burner cone and/or whirl vane is dirty, clean it(them) with cloth or brush. Infrequently abrasive cleanser may be required

CAUTION

When cleaning, be sure not to get soot or dust to adhere to the nozzle. It may cause nozzle clogged or abnormal spray

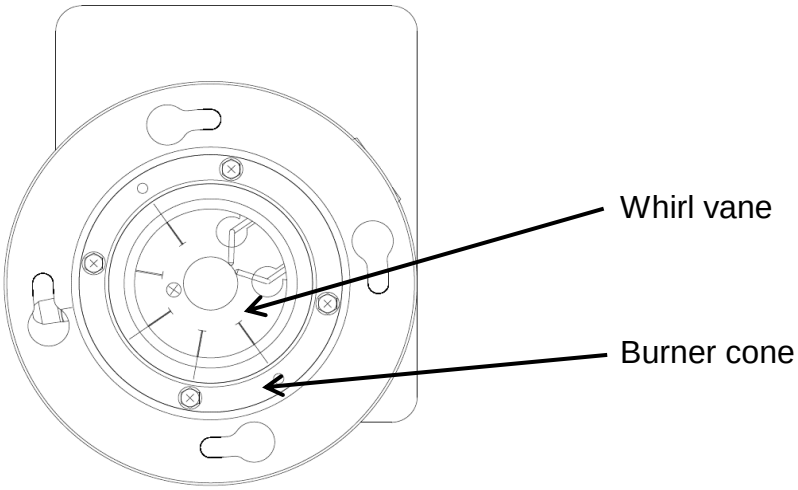
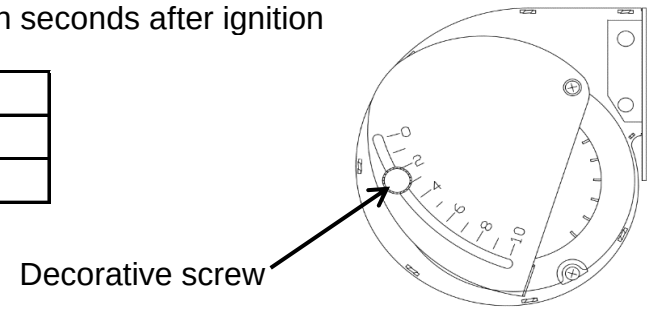


Figure 12 Adjusting an air inlet opening of fan motor

Unscrew a decorative screw and then extend/narrow an air inlet opening.
Also trial operation is required after each adjustment.
Be sure to repeat adjustment until following symptoms are identified.

- Heater ignites within one second after pump starts to operate
- There is no dark smoke
- White smoke extinguishes within two seconds after ignition
- Smell of fuel clear within ten seconds after ignition

	Scale
120V 60Hz	2
110V 50Hz	8



Observation

When heater is used above 1,000m(3,000ft) sea level, adjust air inlet on fan motor for better combustion