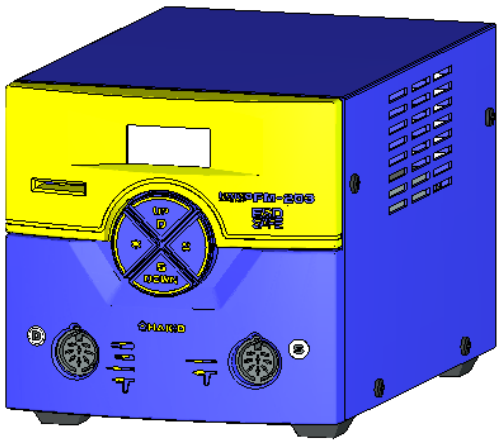
HAKKO FM-203 ESD SAFE

SOLDERING STATION

Repair Manual



First edition

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Chapter 1　Introduction

In this manual, technical procedures for replacing genuine parts are described, targeting individual technicians with the knowledge, experience, and tools necessary for electronic equipment repair. Before performing any tasks, please peruse this manual thoroughly to understand the contents, and proceed with the work. In this manual, matters to be attended are classified and indicated as follows. Please fully understand the content before reading the main text.

▲Warning　Failure to use genuine parts or appropriate tools, and ignoring this warning to engage in incorrect handling, may result in the user facing the possibility of death or serious injury.

△Caution　Failure to use genuine parts or appropriate tools, and ignoring this warning to engage in incorrect handling, may result in the user facing the potential for impairment or the occurrence of only physical damage.

Note　Indicates content that requires special attention, such as easily making mistakes during operation.

▲Warning

- When repairing, be sure to unplug the power first.
- After disassembly and assembly, perform insulation withstand testing before applying power for safety.
- In case of a blown fuse, replace the damaged part, conduct insulation withstand testing, and then apply power.
- This product is equipped with measures against static electricity, such as imparting conductivity to plastic, grounding of the soldering iron and station. During repairs, pay sufficient attention, and when replacing parts or making repairs, ensure there is no exposure of live parts or damage to insulation materials.
- Using non-genuine parts may affect the performance and safety of the product, leading to product damage or serious accidents. Always use genuine parts for proper compatibility.
- If you feel any issues during repair work or product use, stop the operation. Continuing repair work or product use without resolving the problem may lead to serious accidents or injuries.

△Caution

When using tools and equipment with this product, strictly adhere to the following points:

- When performing soldering or solder removal, be cautious of burns and melting of components.
- When removing or installing screws, be careful not to over-tighten or loosen them, as this may cause damage to the parts.

Chapter 2　Parts list

The table below shows the parts needed for repair. Refer to the following part numbers for ordering.

Reference page	Category	Part No.	Part name	Specifications
5-2-③	sale	B2852	Switch	
	sale	B2384	Inlet	
	sale	B2419	Power cord/3 core & American plug	
5-2-②	sale	B2743	Transformer /120V	
-	sale	B2972	Card	
5-2-③	sale	B2761	Fuse/250V-3A	100 to 120V
5-1	sale	B3397	Cover	
	sale	B3398	Chassis/rubber foot	
5-2-①	sale	B3399	Front panel/A	
	sale	B3400	Front panel B/LED レンズ D.S 付	With LED lens, D.S.
	sale	B3401	Display	
	sale	B3402	Button set	4 pcs.
	sale	B3403	P.W.B.	For power and operation
	sale	B3404	Heat sink	
	sale	B3405	Clip (large size)	
	sale	B3406	Clip (small size)	
-	sale	B3253	Connecting cable	

Chapter 3　Equipment, tools, and screws

The following equipment, tools, and screws are needed for repair. You can order us the items which bear the part numbers. Please use articles on the market for the rest.

Reference page	Category	Part No.	Part name	Remarks / applicable tool
2-1			Dielectric voltage-withstand tester	Photo No.1
			Power consumption meter (or am-meter)	Photo No.2
			DMM	Photo No.3
	sale	FG101B-03	Thermometer w/thermocouples	Photo No.4
5			Phillips-head screwdriver # 2	Photo No.5
5			Cutting pliers	Photo No.6
5			Spanner, 7mm	Photo No.7
5	sale	FR301-03	Desoldering tool (or WICK)	Photo No.9
5	sale	FX951-66	Soldering iron	Photo No.10
5			Flat-head screwdriver	Photo No.8
5-1			Binding head screw M3×6 BZn	Phillips-head S/driver #2 Photo No.5
5-1			External tooth washer M3	
5-2			Cable tie 100L	Cutting pliers Photo No.6
5-2-1			Tapping screw P　M3×8 Ni	Phillips-head S/driver #2 Photo No.5
5-2-1			SEMS screw M3×6 P2 MC	Phillips-head S/driver #2 Photo No.5
5-2-1 5-2-2 5-2-3 5-2-4			SEMS screw M4×6 P2 Ni	Phillips-head S/driver #2 Photo No.5
5-2-1 5-2-2 5-2-3 5-2-4			External tooth washer M4	Phillips-head S/driver #2 Photo No.5
5-2-1			Silicone grease	
5-2-2			SEMS screw M4×8 P3 MC	Cross point S/driver #2 Photo No.5
5-2-2			Nut M4	Spanner 7mm Photo No.7
5-2-2			S washer M4	
5-2-2			Pan head screw M4×55 Ni	Cross point S/driver #2 Photo No.5
5-2-2			Resin plain washer M4	

※ All items with a category column opened are to be ordered in the market.

<Photos of the equipment and tools for repair>

Please prepare the tools necessary, referring to the photos below.

No.1 Dielectric voltage-withstand tester

No.2 Power consumption meter

No.3 DMM

No.4 FG-101B

No.5 Cross-point S/D

No.6 cutting pliers

No.7 M7 spanner

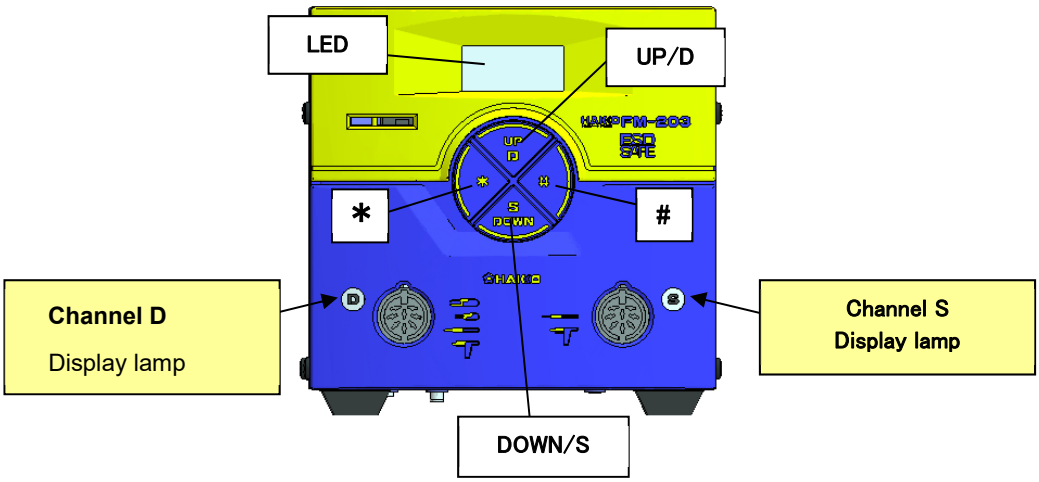
No.8 Regular point S/D

No.9 FR-301 or Wick

No.10 FX-951

Chapter 4　Checking the performance

Check the performance before repair work starts.



(1) Check of the soldering iron error display

1. Turn on the power switch **without connecting any soldering iron or connecting cable.**
2. Indications are shown on the LED display in the following order while one display lamp is lit and the other one flashes.

＊ When “OFF” is shown on the LED display, power conduction has been stopped by pressing the “UP/D” or “DOWN/S” button for 1 sec. or more. Hold one or the other button pressed for 1 sec. or more again to cancel.

＊ To switch which display lamp is lit and which one is flashing, use the “UP/D” or “DOWN/S” button.

Set temperature

8. 8. 8.	→	3 5 0	→	C - E

3. Turn off the power switch.

(2) Check of sensor error display

1. **Connect 2 soldering irons (without tips)** and turn on the power switch.
2. Indications are shown on the LED display in the following order while one display lamp is lit and the other one flashes.

＊In the case of connecting FM-2022 or FM-2023 to the station, one display lamp is lit, and the other one is not lit.

＊To switch which display lamp is lit and which one is flashing, use the “UP/D” or “DOWN/S” button.

Set temperature

8. 8. 8.	→	3 5 0	→	S - E

3. Turn off the power switch.

(3) Performance test

1. **Insert the card and connect 2 soldering irons (with tips)**, and then turn on the power switch while holding the "DOWN/S", "＊" and "#" buttons pressed at the same time. The version number of the P.W.B. (ex.: 1.01) will be shown on the LED display.
2. **Press the "UP/D" button.** The type number of the soldering iron connected to Channel D (the channel for which the display lamp is lit) will be displayed on the LED display. (Refer to the table at right.)
3. **Press the "DOWN/S" button.** The type number of the soldering iron connected to Channel S (the channel for which the display lamp is lit) will be displayed on the LED display. (Refer to the table at right.)

Soldering iron connected	Number shown on LED display
FM-2021	27
FM-2022	22
FM-2023	
FM-2024	24
FM-2025	28
FM-2026	27
FM-2027	
FM-2028	28
None	C-E

4. **Press the "＊" button.** The presence of the iron holder on Channel D will be displayed on the LED display. (Refer to the following table.)

	Without iron holder	With iron holder	
		With switch turned on	With switch turned off
Indication on LED display	d o	d O	d 1
Indication lamp on Channel D	Lit	Not lit	Lit

5. **Press the "#" button.** The presence of the iron holder on Channel S will be displayed on the LED display. (Refer to the following table.)

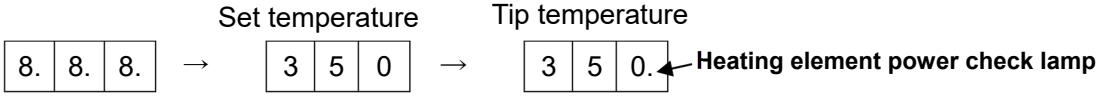
	Without iron holder	With iron holder	
		With switch turned on	With switch turned off
Indication on LED display	S o	S O	S 1
Indication lamp on Channel S	Lit	Not lit	Lit

6. **Pull out the card.** Performance inspection will be ended and the unit will return to normal operation.

(4) Temperature setting check

Temperature setting range	
Centigrade (ºC)	200˚C to 450˚C
Fahrenheit (ºF)	400˚F to 840˚F

1. **Turn on the power switch with the card pulled out.** Indications are shown in the display in the following order and the temperature of the tip will increase to the set temperature.



2. Insert the card and check whether or not temperature can be changed.

(5) Offset value check

Offset value input range	
Centigrade (ºC)	−50℃～+50℃
Fahrenheit (ºF)	−90℉～+90℉

1. **Insert the card and turn on the power switch.** Indications are shown in the display in the following order and the tip temperature will increase to the set temperature.

		Set temperature		Tip temperature	
8. 8. 8.	→	3 5 0	→	3 5 0.	← **Heating element power check lamp**

2. **Press the "#" button pressed for 1 sec. or more** and check that the offset value can be changed.

(6) Parameter check

1. **Insert the card and turn on the power switch while holding the "UP/D" button pressed.** The mode will be changed to the parameter input mode.
2. **Press the "＊", "UP/D" and "DOWN/S" buttons** and check that the parameter setting can be changed.
3. **Press the "＊" button pressed for 1 sec. or more** so that "y" is displayed. If there is no problem in the setting, press the "＊" button.

Note To change the setting again, press the "UP/D" button to cause "n" to be displayed, and then press the "＊" button.

Prameter

0 1 ●Temperature setting (℃ or ℉)

LED display	Setting	Initial setting
C or F	C: Centigrade F: Fahrenheit	℃ display

0 2 ●Auto sleep setting

❒ To set the auto sleep function to off, refer to parameter 07.

LED display	Setting	Initial setting	Sleep mode indication	Sleep mode temperature	Method for canceling auto sleep
Two - digit	Sleep time	Dch: 6min Sch: 6min	S L P	200℃ 400℉	- Press "UP/D" or "DOWN/S" button. - Remove soldering iron from iron holder.

Note The auto sleep setting is a function to set the time from when the soldering iron is placed on the iron holder until the time the auto sleep function starts.

- The auto sleep time can be set in units by minutes (up to 29min).
- The auto sleep time can be set separately for channel D and S individually.

0	3	

●Lower limit temperature error setting

LED display	Setting	Initial setting	Lower temperature error indication	Lower temperature setting range
Three - digit	Lower limit temperature	150℃	H - E	30 to 150℃ 50 to 300℉

Note The lower limit temperature error is a function to warn by an error indication and a warning buzzer when the tip temperature has become lower than the set temperature by the amount of the set lower limit temperature.

Example: If the set temperature is 350ºC and the lower limit error temperature is 100ºC, an error indication is displayed and a warning buzzer sounds if the tip temperature decreases to below 250ºC.

・The buzzer sound for lower limit temperature error cannot be canceled.

0	4	

●Offset-free mode

LED display	Setting	Initial setting
0 or 1	0: Disabled. Offset cannot be changed unless the card is inserted. 1: Enabled. Offset can be changed even if the card is not inserted.	0

0	5	

●Buzzer sound setting mode for S-E, C-E error

LED display	Setting	Initial setting
0 or 1	0: Buzzer does not sound when error occurs. 1: Buzzer sounds when error occurs.	0

0	6	

●Buzzer sound setting mode when reaching set temperature

LED display	Setting	Initial setting
0 or 1	0: The buzzer does not sound when the soldering iron reaches the set temperature. 1: The buzzer sounds when the soldering iron reaches the set temperature.	1

0 7 ●Auto sleep function setting mode

LED display	Setting	Initial setting	Auto sleep canceling method
0 or 1	0: Auto sleep function is OFF. 1: Auto sleep function is ON and time set by parameter 02 is used.	1	- Press “UP/D” or “DOWN/S” button. - Remove soldering iron from iron holder.

0 8 ●Auto shutoff function setting mode

LED display	Setting	Initial setting	Indication when auto shutoff function is activated.	Auto shut-off canceling method
0 or 1	0: Auto shutoff function is OFF. 1: Auto shutoff function is ON. If no operation is performed for more than 30 min., power applied to soldering iron is shut off.	0	- - -	- Press “UP/D” or “DOWN/S” button. - Remove soldering iron from iron holder.

Note The auto shut-off function is a function which sounds a buzzer 3 times and then shuts off power to the soldering iron if the soldering iron is placed on the iron holder and 30 min. elapses without any operations.

・If the auto shut-off function is activated and no actions are taken, a buzzer sounds 3 times every 30 min.

・The buzzer sound while the auto shut-off function is activated cannot be canceled.

0 9 ●Auto channel switching setting mode

- Valid only when soldering holder is being used.

LED display	Setting	Initial setting
0 or 1	0: Auto channel switching is disabled. 1: Auto channel switching is enabled.	1

Note Auto channel switching is a function to automatically change the LED indication channel and control channel to that of the picked-up soldering iron when the soldering iron is picked up from the iron holder.

1	0	

●Dual channel control setting mode

LED display	Setting	Initial setting
0 or 1	U or A 0: Dual channel control is disabled. 1: Dual channel control is enabled.	1

・Dual channel control setting mode depends on the connected soldering irons and the setting as the following table.

Channel D	Channel S	Mode enabled	Mode disabled	How to select the channel when mode is disabled
FM-2022 FM-2023	FM-2024 FM-2026 FM-2027	Only one of the two is controlled regardless of whether the mode is enabled or disabled. The connector that is not controlled is set to sleep condition.		- Press “UP/D” or “DOWN/S” button. - Remove soldering iron from iron holder.
FM-2024 FM-2026 FM-2027	FM-2024 FM-2026 FM-2027	Power is applied simultaneously.	Only one of the two is controlled. The connector that is not controlled is set to sleep condition.	

(7) Initial reset

1. When the “✱” and “#” buttons are pressed while the power switch is turned on, indications will be shown on the LED display as follows.

   U or A （Refer to the following table.）

2. Select “U” or “A” and press “✱”. Settings will be reset to the initial setting and the unit will return to normal operation.

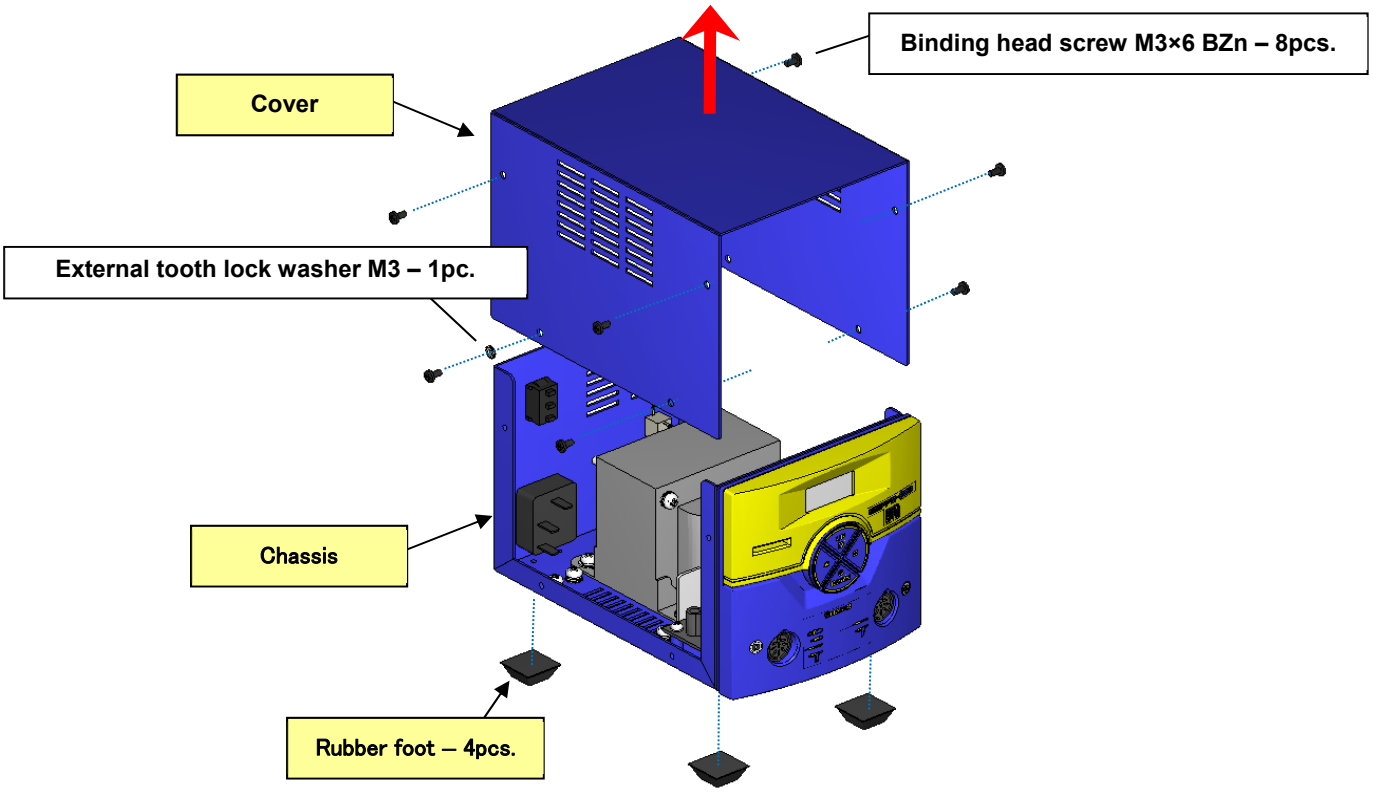
			Initial setting	
			U	A
Parameter	01	Temperature setting (℃ or ℉)	F (Fahrenheit)	C (Centigrade)
	02	Auto sleep setting	6	6
	03	Lower limit temperature error setting	270	150
	04	Offset-free mode	OFF（0）	
	05	Buzzer sound setting mode for S-E, C-E error	OFF（0）	
	06	Buzzer sound setting mode when reaching set temperature	ON（1）	
	07	Auto sleep function setting mode	ON（1）	
	08	Auto shutoff function setting mode	OFF（0）	
	09	Auto channel switching setting mode	ON（1）	
	10	Dual channel control setting mode	ON（1）	
Set temperature			750	350
Offset value			0	0

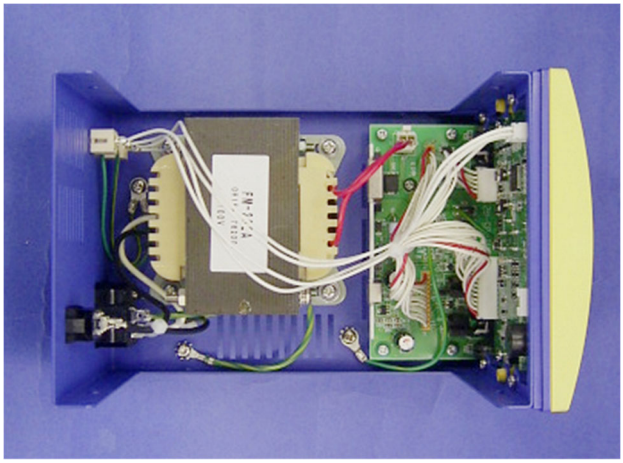
Chapter 5　Disassembly/assembly

Knowing the point to be repaired, disassembly to repair or replace, then reassembling.

▲Warning	When repairing, be sure to unplug the power first. After disassembly and assembly, perform insulation withstand testing before applying power for safety.

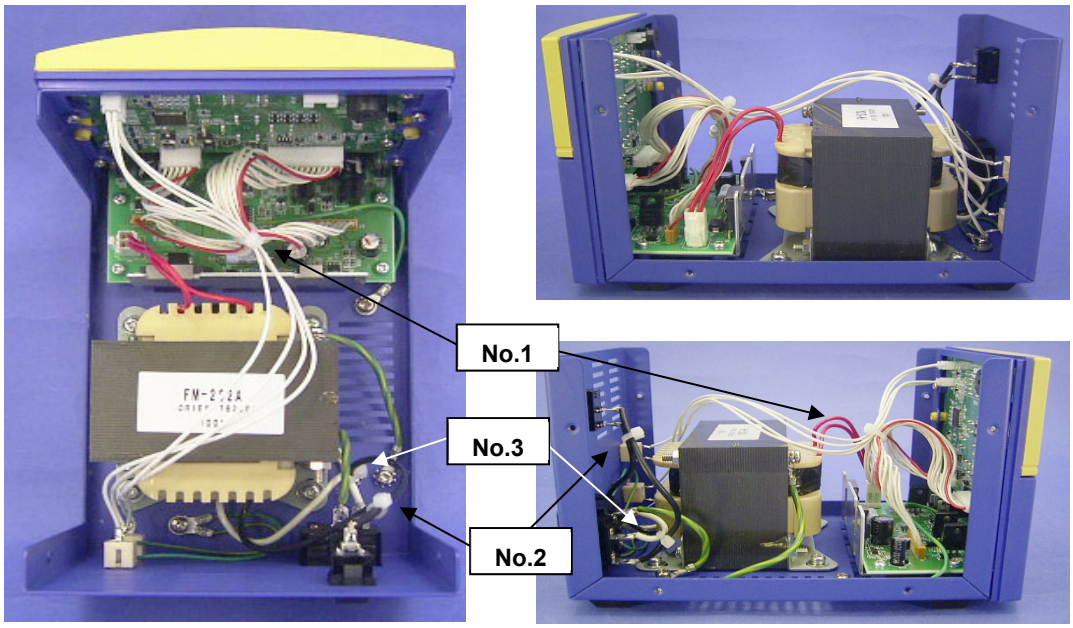
5-1　Open





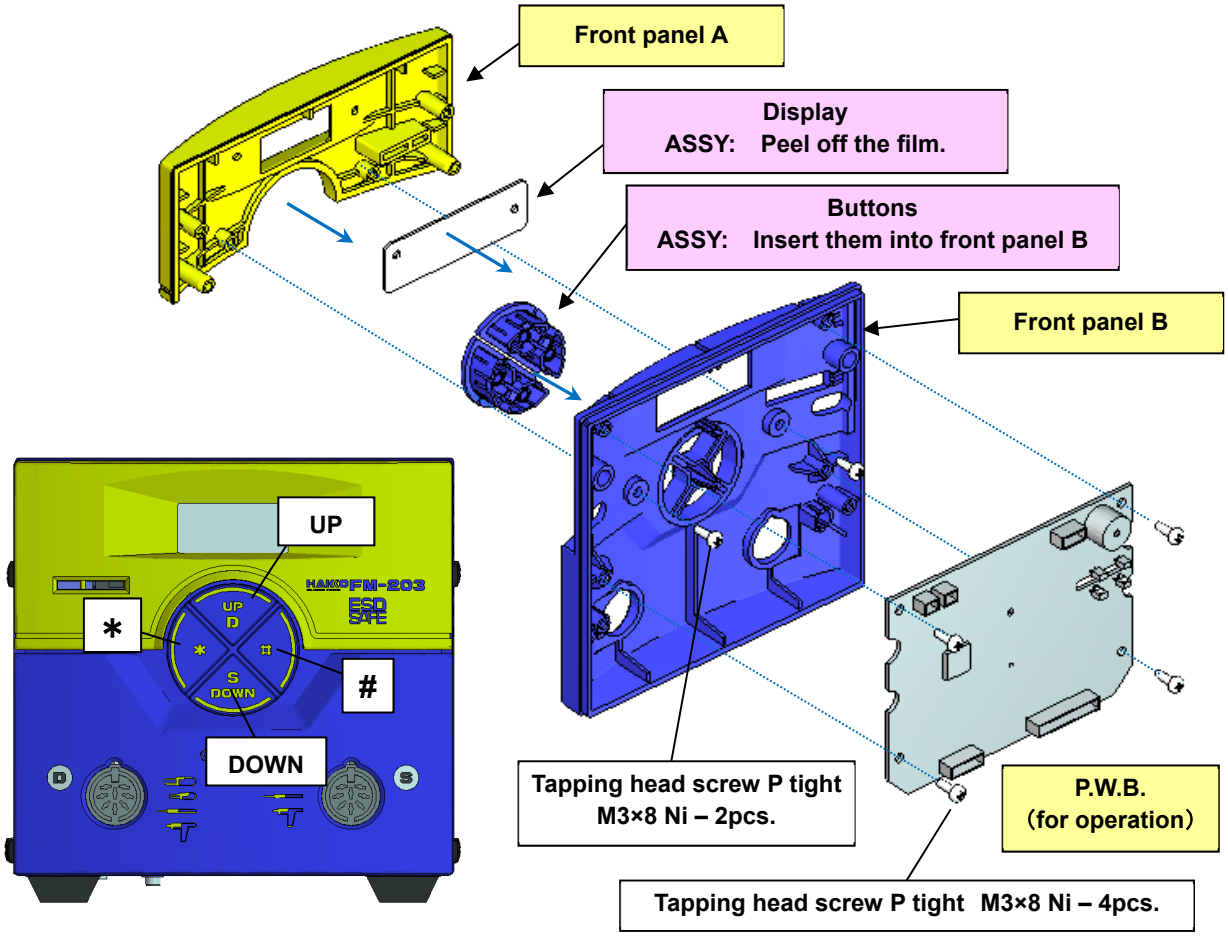
△Caution	Before installing the cover, check that the lead wires are not pinched.

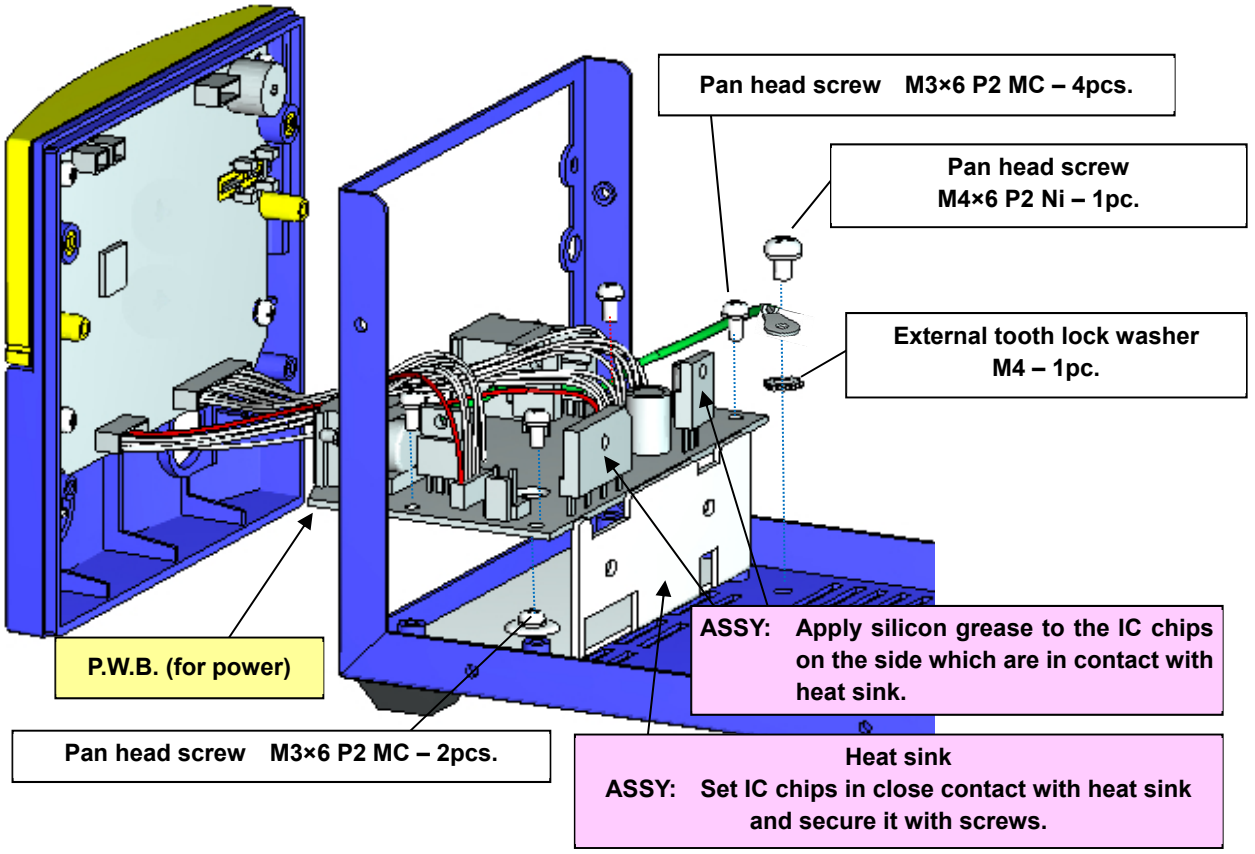
5-2 Inside, wiring and screws

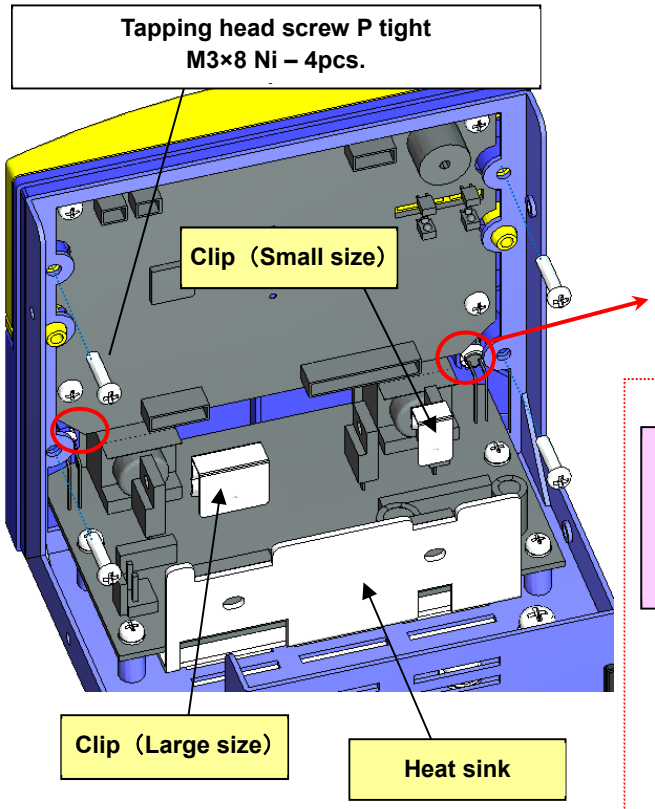


Cable ties which tie lead wires at 3 points are 100mm long.
No.1 the lead wires of P.W.B. and jack
No.2 the lead wires of power switch
No.3 the lead wires of power receptacle except grounding wire

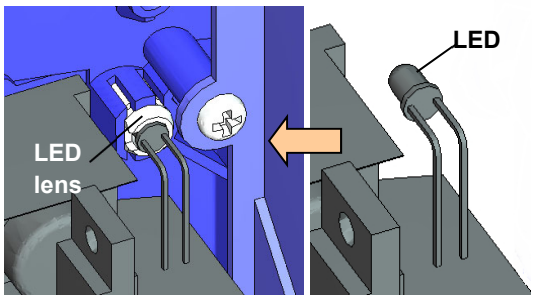
(1) Front panel and P.W.B.







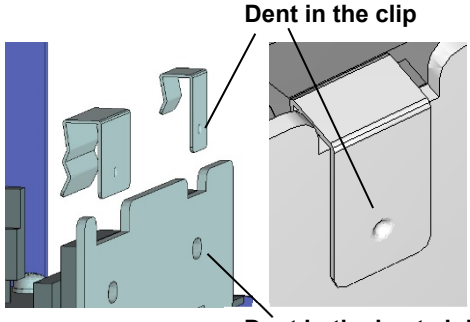
ASSY:Install each LED on P.W.B. in each channel LED lens. If not, the light of LED lens will turn down.



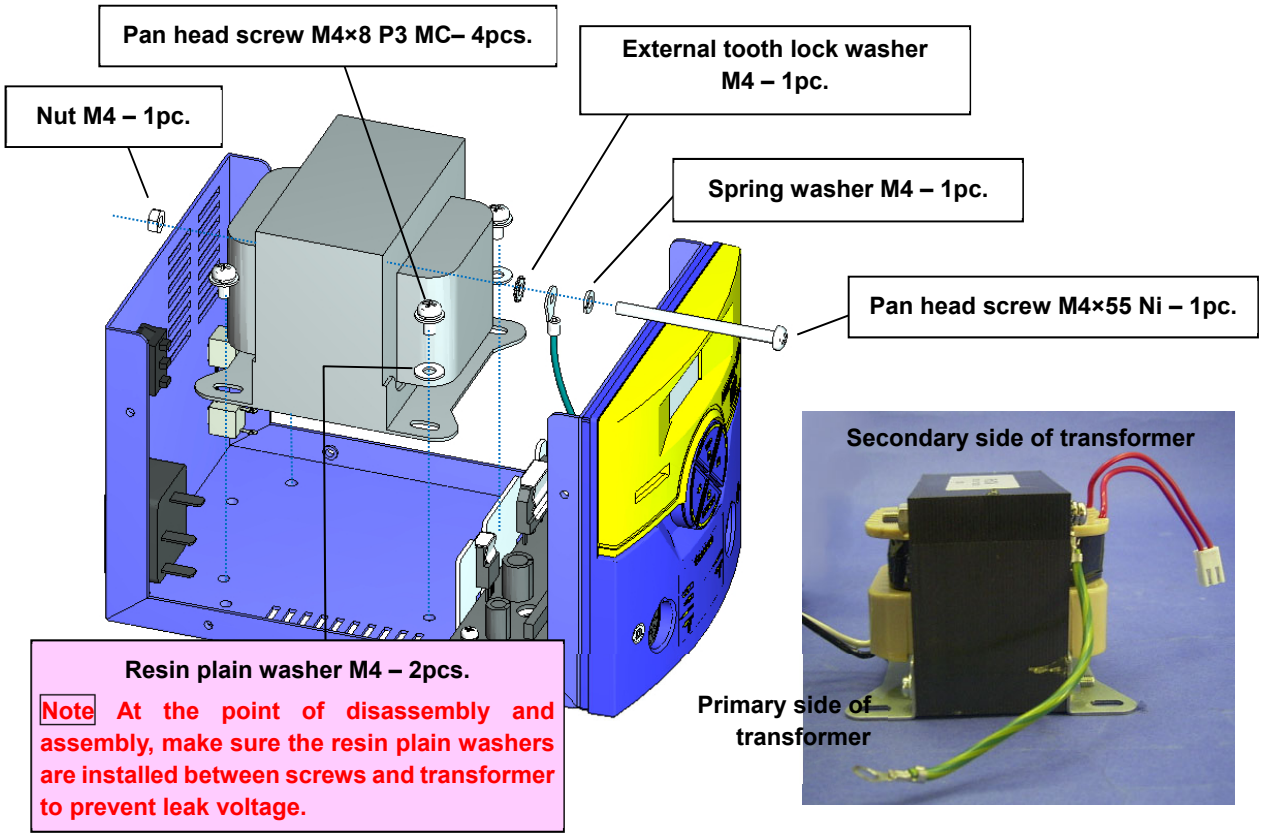
Disassembly/Assembly for clips

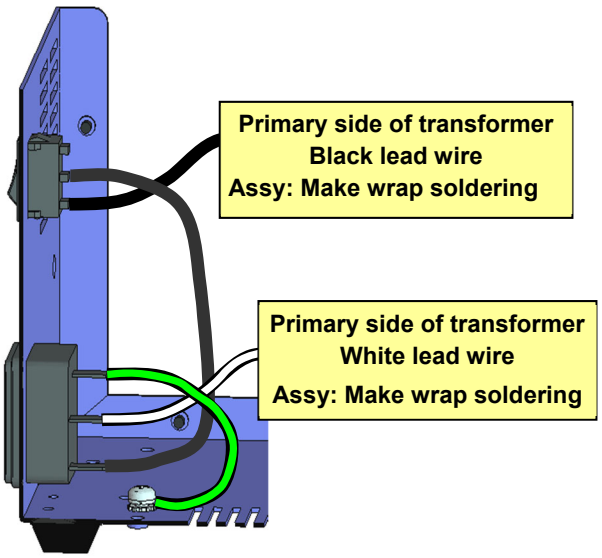
DIS-ASSY: Pull the clips up while widening the back side which has the dents.

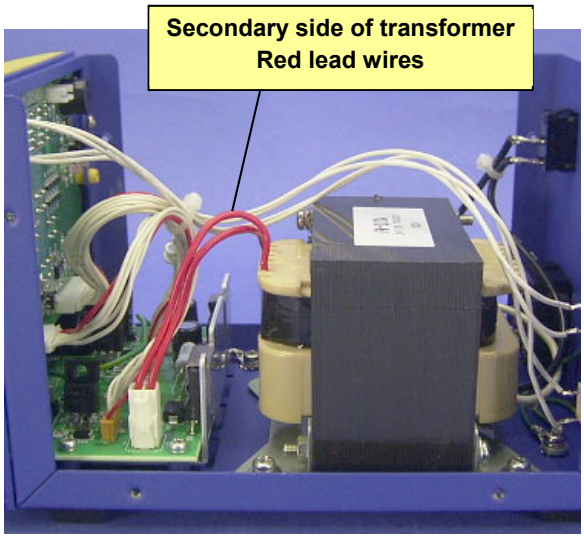
ASSY: Insert the clips to heat sink so as to set the dents on the clips in the dents in the heat sink.

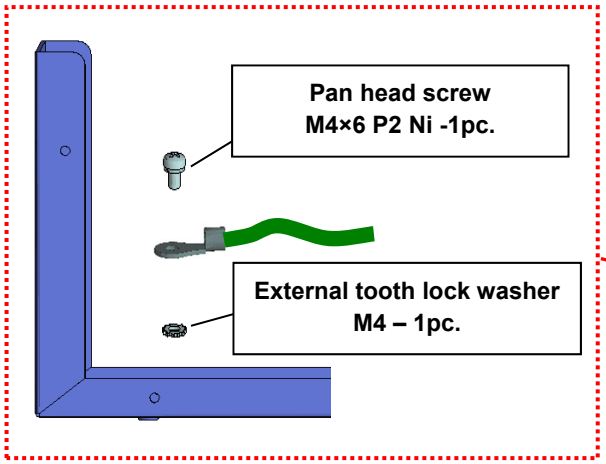


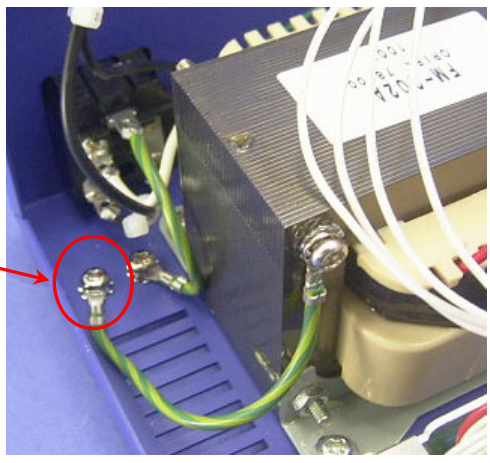
(2) Transformer



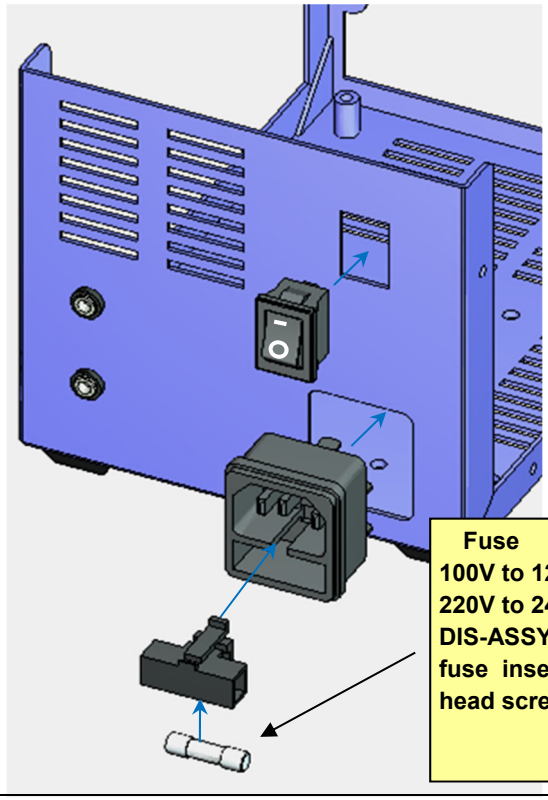


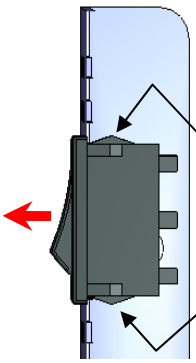






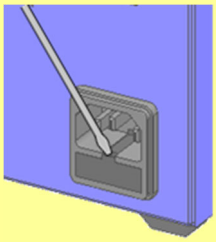
(3) Power switch and power receptacle

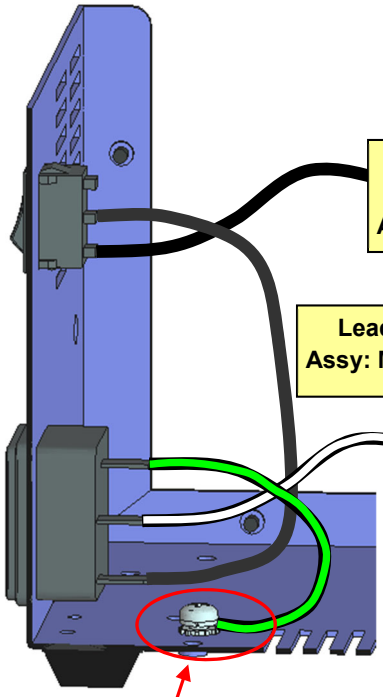




DIS-ASSY: Push the power switch and inlet while holding the claws at each upper and lower to disassemble.

Fuse
100V to 120V 250V-3A
220V to 240V 250V-1.6A
DIS-ASSY: Remove the fuse inserting the flat-head screwdriver, etc.

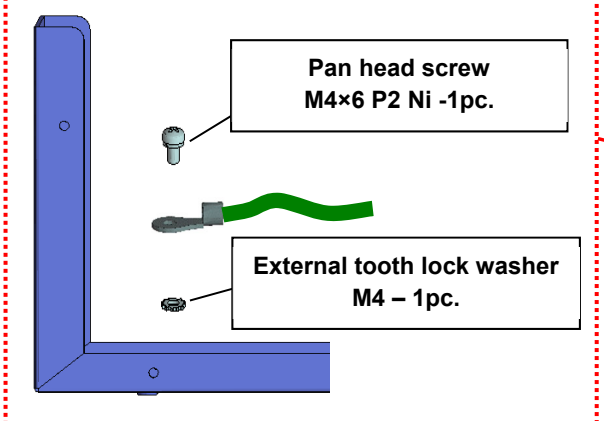




Primary side of transformer
Black lead wire
Assy: Make wrap soldering

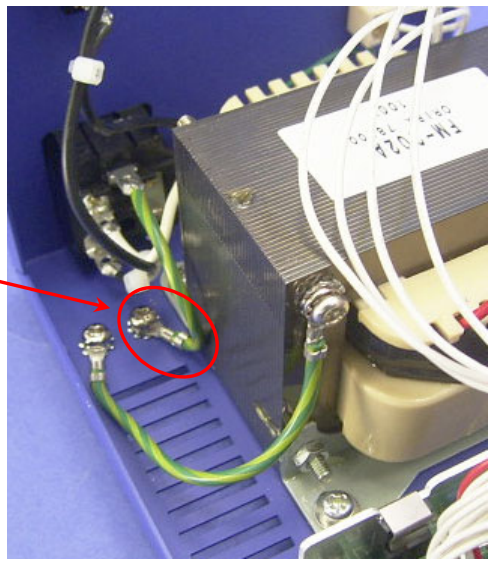
Lead wires between power receptacle and power switch
Assy: Make wrap soldering

Primary side of transformer
White lead wire
Assy: Make wrap soldering

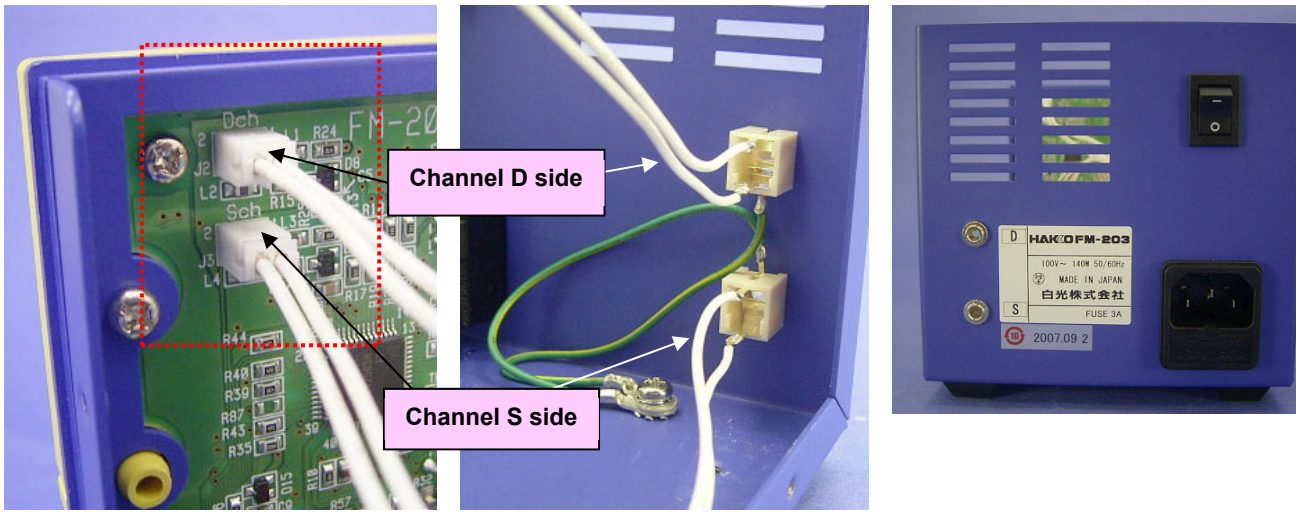


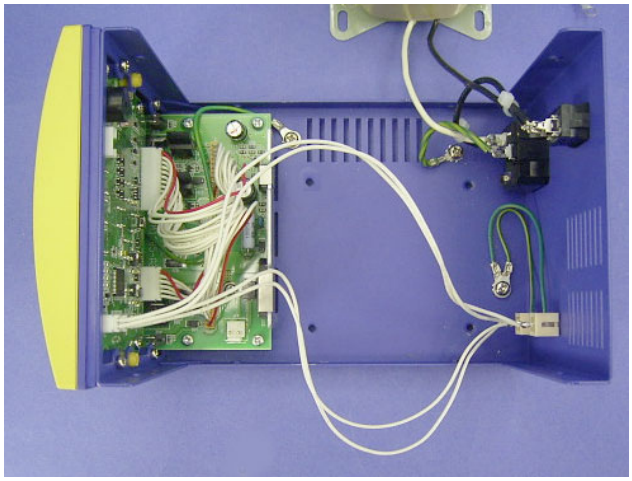
Pan head screw
M4×6 P2 Ni -1pc.

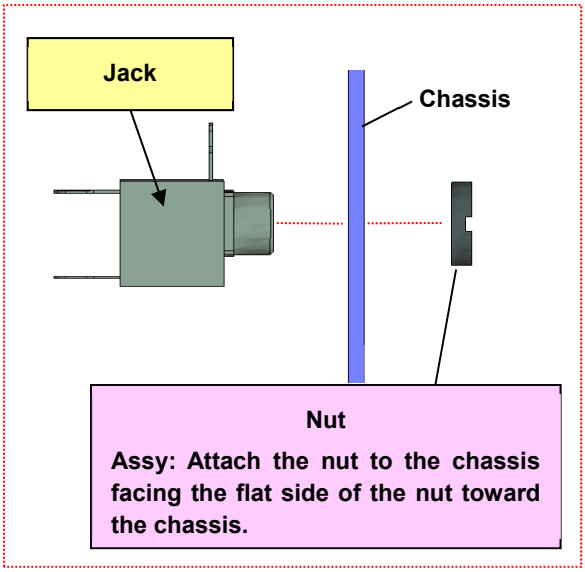
External tooth lock washer
M4 – 1pc.

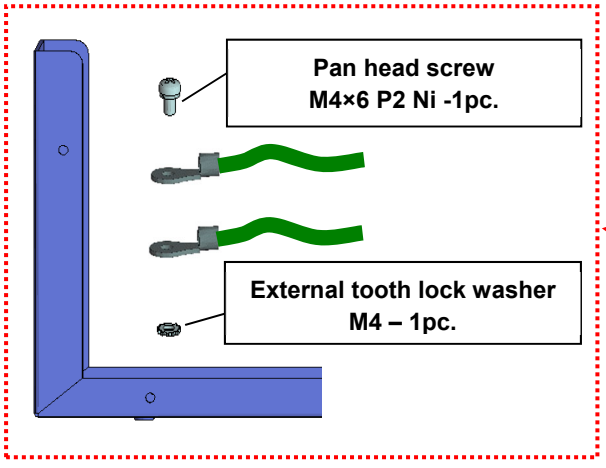


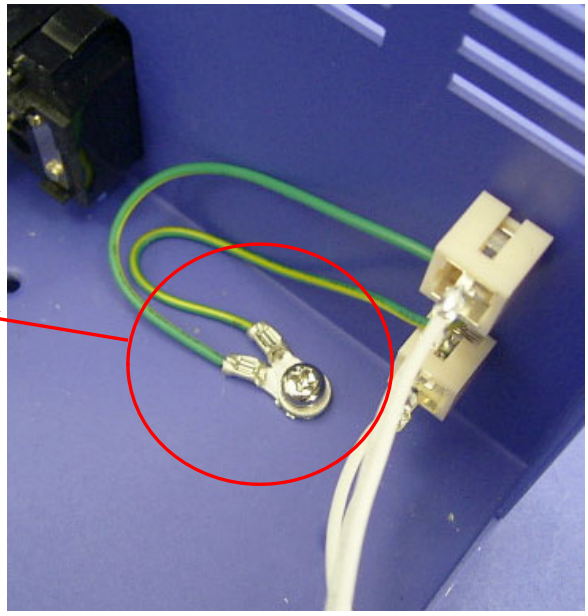
(4) Jack


Channel D side
Channel S side
HAKKO FM-203
MADE IN JAPAN
白光株式会社
FUSE 3A
2007.09 2




Jack
Chassis
Nut
Assy: Attach the nut to the chassis facing the flat side of the nut toward the chassis.


Pan head screw
M4×6 P2 Ni -1pc.
External tooth lock washer
M4 – 1pc.



Chapter 6　Inspection after repair work

<<Essential equipment for inspection>>

Dielectric voltage-withstand tester / Power consumption meter (or Ammeter) / DMM

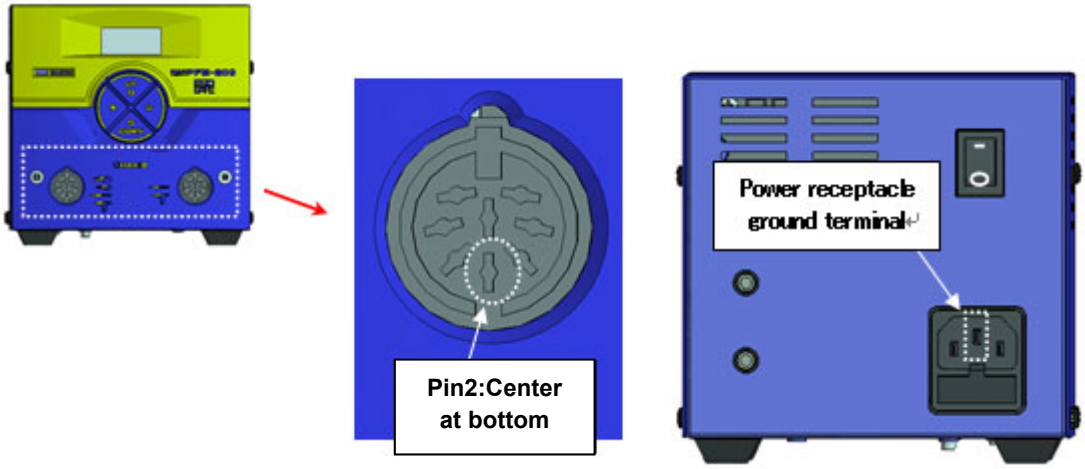
Thermocouple thermometer (HAKKO FG-101B)

Make sure to perform the inspection after the repair work is done.

(1)　Continuity test

Resistance between power receptacle ground terminal and receptacle pin 2 on D channel side must be 1Ω or lower.

Resistance between power receptacle ground terminal and receptacle pin 2 on S channel side must be 1Ω or lower.



(2)　Insulation test and withstanding voltage test

[Insulation test]

Apply 500VDC and check that the value must be 25MΩ or higher.

[Withstanding voltage test]

Apply 1250VAC (1mA) to check that it can resist for 1 second or longer.

Note Perform the following inspections with two proper soldering irons.

(3)　Check the power consumption (just after turning on power).

Power consumption must be 140W ±10%.

(4)　Measure the tip-to-ground potential and the tip-to-ground resistance.

Tip-to-ground potential must be less than 1.2mV.

Tip-to-ground resistance must be 1.0Ω or less.

(5)　Check the temperature.

Make sure that the temperature of the tip must be 350ºC ±15ºC when the setting temperature is 350ºC.

△Caution	**If soldering irons are included, return them to a customer putting solder on the tips. (To prevent oxidation)**

Chapter 7 Wiring Diagram