



Instruction manual



Electrostatic Controller E-SC24L



This instruction manual contains **IMPORTANT WARNINGS, CAUTIONS** and instructions for safe operation. Before operation, be sure to read this instruction manual thoroughly and understand the equipment so that you can use it safely and effectively for a long time.

Keep this booklet in an appropriate place for immediate reference.

■ Important information - Safety Precautions

This electrostatic air hand spray gun is exclusively used for electrostatic painting (we call it electrostatic spray gun from now on). Be sure to read and understand this instruction manual.

Both the supervisor and operator shall be fully knowledgeable about the requirements stated within this instruction manual, including important warnings, cautions and proper method of operation.

Wrong operation (mishandling) can cause serious bodily injury, death, fire or explosion.





Keep this booklet in an appropriate place for immediate reference.




1. About safety

Pay special attention to items which are shown by below marks and symbols. Symbols and marks have the following meanings.

Indication of warnings and cautions

	WARNING	Indicates a potentially hazardous situation which, if not avoided, will result in serious injury or loss of life.
	CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or property damage.

Examples of warnings and cautions

	Indicates [You must be careful]. We will explain briefly in or near the symbol. (The example on the left is [Be careful about electric shock]).
	Indicates [You must not do]. We will explain briefly in or near the symbol. (The example on the left is [Do not touch]).
	Indicates [You must do]. We will explain briefly in or near the symbol. (The example on the left is [Be sure to ground it]).

- ✓ **We shall not be responsible for any injury or damage caused by disregard of warnings, cautions or instructions.**

Important	Indicates notes which we ask you to observe. They are helpful to fully achieve performance and functions of the equipment.
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■ Warnings and cautions for safe operation



WARNING

Fire and Explosion



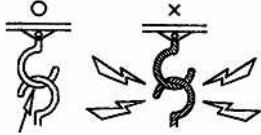
Avoidance of fire and explosion at painting site

- ❶ Never install it at a site with flammable goods or bring flammable goods like lighters. Paints and organic solvents are flammable, able to cause fire.
(Never use the following Halogenated Hydrocarbon solvents which can chemically react with spray gun parts (aluminum parts) etc., crack and melt them.)
 - Improper solvents: methyl chloride, dichloromethane, 1,2-dichloroethane, carbon tetrachloride, trichloroethylene, 1.1.1.-trichloroethane
(Be sure that all fluids and solvents are compatible with gun parts. We are ready to supply a material list used in the gun on request.)



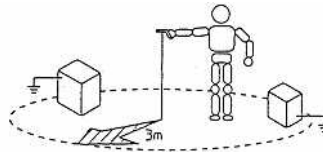
Avoidance of fire caused by grounding failure

(Be sure to keep hanger or conveyor clean without paint stuck on it and keep them conductive. Incomplete grounding, dirty hanger or conveyor cannot conduct electricity, and static electricity accumulates, resulting in fire accident by spark discharge.

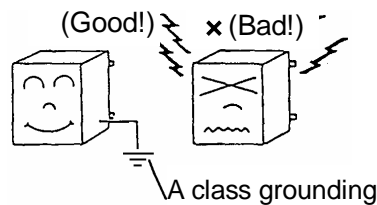


Be sure to contact metallic points by making contact points knife-edged or sharp-pointed.

(Store paint and solvent in a metallic container which is grounded. Poorly grounded conductor can accumulate static electricity, causing fire accident by spark discharge. If you are forced to place conductive goods such as fluid container and fluid supply pump within 3m from the gun, be sure to ground them without fail.



(Securely ground electrostatic controller (A class grounding : less than 10Ω). As you ground the electrostatic spray gun by contacting electrostatic controller through low voltage cable, incomplete grounding can accumulate static electricity on spray gun, causing fire accident by spark discharge or bodily injury by electric shock.





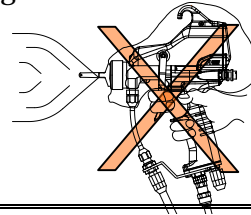
Avoidance of fire by ignition of paints and solvents

(Be sure to turn off electric source of electrostatic controller (E-SC24L) series: option) before cleaning inside of fluid passages. As paints and solvents are flammable and have low flash points, they can catch fire if there is spark discharge in and around painting site.

(Spray distance between work-piece and painting equipment must be over 10cm. If the distance is less than 10cm, spark discharge can occur and paint can catch fire.

(Never use lacquer paints. Lacquer paints have low flash points and can catch fire.

(Do not cover electrostatic spray gun with anti-dust sheet. Static electricity accumulated on sheet can discharge and solvent gas can catch fire.



Wrong operation



Avoidance of wrong use

- ❶ Never point toward human or animal during spraying. If done, it can cause inflammation of eye or skin and bodily injury.
- ❷ Never use gas other than compressed air. If done, it can cause fire or poisoning accident.
- ❸ Never use at higher than max. operating pressure (refer to specifications on page 2).
- ❹ Tip of fluid needle has a sharp point. Do not touch the tip of fluid needle during maintenance for the protection of the human body.



Avoidance of wrong operation

- ❶ Before inspecting, cleaning, disassembling or assembling electrostatic spray gun, be sure to turn off electric source of electrostatic controller (E-SC24L) series: option), interlocked equipment and equipment and fully release air and fluid pressure in the following procedure. If not, it can cause bodily injury by wrong operation.

Job 1) Turn off electric source of electrostatic controller (E-SC24L) series: option) .



Job 2) Stop supply of compressed air, paint and solvent to spray equipment.



Job 3) Turn electrostatic spray gun downwards, pull trigger, operate fluid needle and fully release air pressure and fluid pressure.

Bodily protection



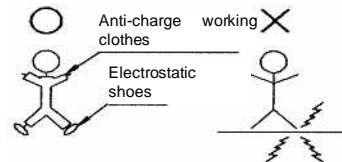
Protection from solvents, air and fluid pressure

- 1 Use spray booth and do the painting job in a well-ventilated place. Painting and cleaning jobs in a poorly ventilated site can cause organic solvent poisoning and ignition.
 - 2 Always wear protective tool such as protective goggles and mask. If not, cleaning liquid can touch eyes and skin, causing inflammation. If you feel something wrong with eyes or skin, immediately consult with a doctor.
- (We recommend you to wear earplugs for your safety. Noise level can reach over 85dB(A) depending on operating and working conditions.)
- (Be sure to turn off electric source of electrostatic controller or multi-gun control system and release fluid and air pressure before cleaning, disassembling or doing maintenance job or during stoppage of job. If not, remaining pressure can cause bodily injury through wrong operation and spattering of cleaning liquid. Be sure to follow [Avoidance of wrong operation] on page □ in order to turn off electric source, and release air and fluid pressure.



Protection from static electricity

(Be sure to wear electrostatic shoes (resistance figure $10^5 \sim 10^8$, JIS T 8103) and anti-charge working clothes (JIS T 8118). If not, static electricity can accumulate on human body and cause bodily accidents by electric shock.



- 2 Operators must not wear metallic things such as watch or key holders during operation. If done, static electricity can accumulate on them and you will get an electric shock. If you wear glasses with metallic frame and approach the gun, you can get an electric shock. Before approaching spray equipment, turn off electric source of electrostatic controller or multi-gun control system.



- 3 Operator must always hold electrostatic spray gun with bare hand or glove having a large hole at palm position. As human body is grounded through the handle of electrostatic spray gun, static electricity can accumulate on human body and cause bodily harm by electric shock if operator holds the gun handle with normal glove.

(When you turn off main electric source switch in order to stop the gun operation in an emergency, it takes about 5 seconds till the electric potential of electrostatic spray gun goes down to a safe level. Don't try to touch the pin electrode at tip of gun during that period.



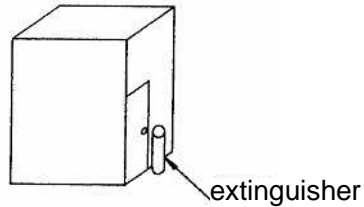
Protection of human body

(If operators pull the trigger many times during operation, it may cause repetitive strain injury. Be sure to take a rest if you feel tired.

Others

❶ Never use altered parts or other than genuine parts when parts are damaged or worn out. If done, it can cause failure of the gun, accidents or bodily injury.

❷ Be sure to install a fire extinguisher at painting site.



❸ Make sure that the equipment has stopped before you enter the working range of other painting equipment (robot, reciprocator, etc.). If not, moving robot or reciprocator can injure you.

❹ Never use for food or chemicals. If done, erosion in paint passages can cause accidents, and foreign matter can enter.

❺ When paint becomes dry, do not use conductive paints. If done, static electricity can leak. Contact paint manufacturer for details.

❻ Be sure to use air hose and fluid hose we have designated.
General fluid hose and rubber hose can leak static electricity and damage isolation.

■ Contents

Note:

- The operator and the supervisor of this electrostatic controller must fully read and understand from P.2 to P.9 (for a Operator).
- Only the supervisor and / or other equally qualified personnel, having fully read and understood the contents of this instruction manual, can take care of matters related to P.10 to P.26

for a Operator

- 1. Specifications P. 2**
- 2. Names and functions of each section P. 3**
- 3. Operation..... P. 4**
- 4. Safeguards P. 6**
- 5. Daily maintenance and inspection P. 8**
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for a Supervisor

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Electrostatic Controller
E-SC24L series

Instruction manual

< for a operator >

1 Specifications

1.1 Specifications

Items	Contents
Input voltage	AC200 ~ 240V 50/60Hz single-phase
Output voltage (Electrostatic Controller)	MAX AC24Vpp
Output current (discharge current of electrostatic spray gun)	MAX 150 μ A (C.P 200 μ A)
Electric consumption	75W
Ambient temperature range	5 ~ 40
Ambient humidity range	Less than 70%RH
Safeguards	Detection of over-current, LV cable failure, spray set time failure
Dimensions L x W x H	200mmX150mmX130mm
Mass	3.4kg
Charge ON/OFF mechanism	Air flow switch (air joint IN/OUT size: G1/4 male)
Max. operating air pressure (when air flow switch is used)	MAX 0.68MPa
Applicable electrostatic spray gun	Only for E-spray series electrostatic spray gun Model : E-MW50 series only

< Outline of electrostatic controller >

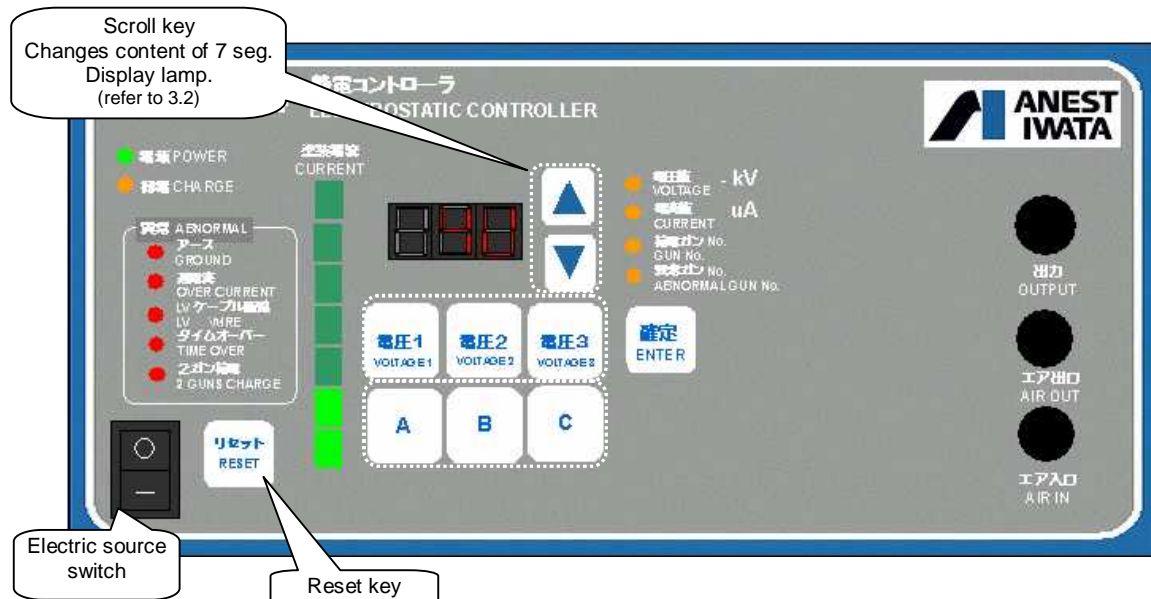
This electrostatic controller is for supplying electricity to the booster circuit built into the electrostatic spray gun. It converts AC200-240V electricity to AC24V and supplies it to the electrostatic spray gun via a low voltage cable. (LV cable)

It has a built-in safeguard (detection of over current, disconnection of LV cable failure and self-diagnostic function to detect failure)

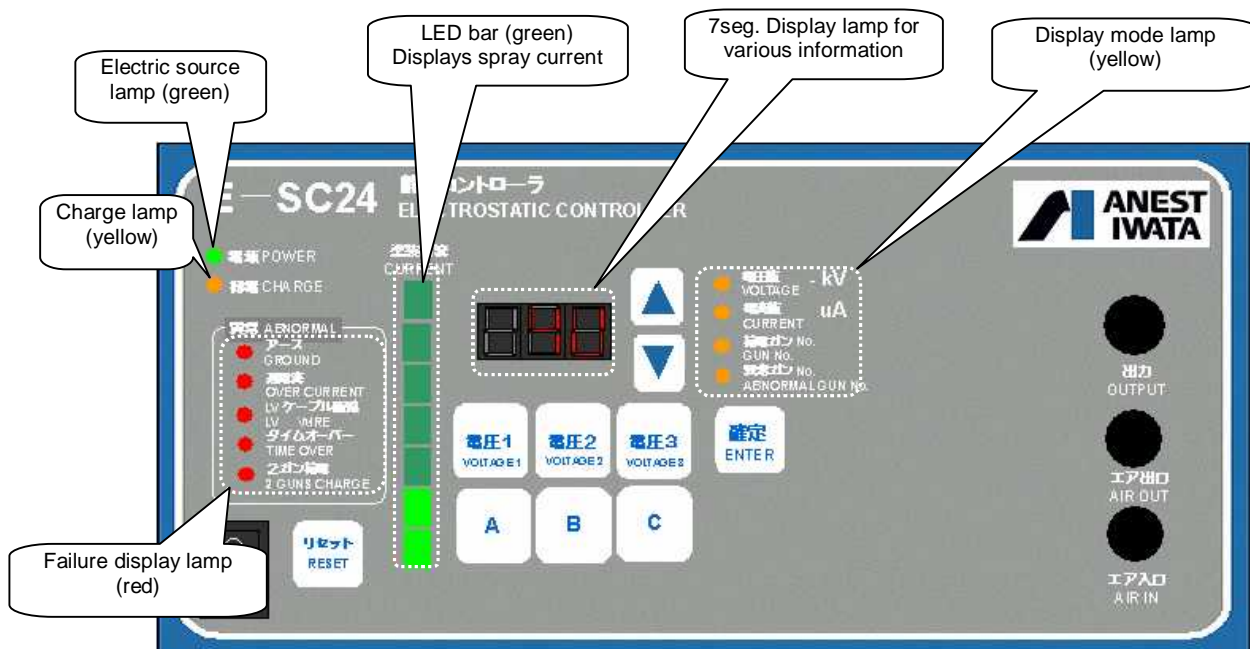
2 Names and functions of each section

2.1 Front panel of Electrostatic Controller

1) Operation section







2) Display section



3 Operation

3.1 Normal operation

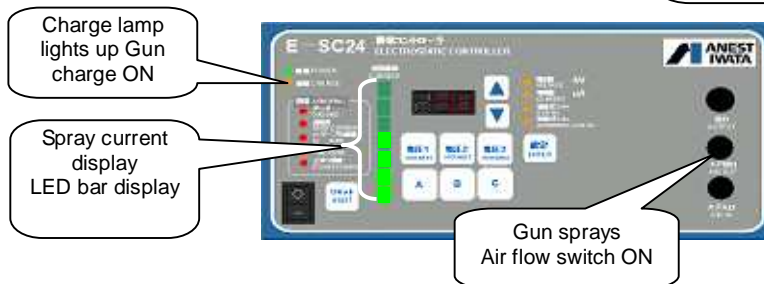
 WARNING	
	(1) When charging electrically, be sure to ground all surrounding metallic things. If not it can cause fire or injury of electric shock.
 CAUTION	
	(1) During charging (when high voltage is generated), do not put electrostatic spray gun within about 50cm of Electrostatic Controller. If done, Electrostatic Controller can fail if it sparks, as Electrostatic Controller is electrical equipment.

After setup is finished, start painting according to the following procedure.

Job-1 Turn on electric source switch. Electric source lamp lights up and the gun is ready to charge (voltage key lamp, display mode lamp, 7 seg. Display lamp lights up and displays.)



Job-2 In case of hand spray gun: if the spray gun starts to spray, air flow switch operates and gun is charged^{*1)}
When high voltage is charged, charge lamp lights up and spray current is displayed in spray current^{*2)}



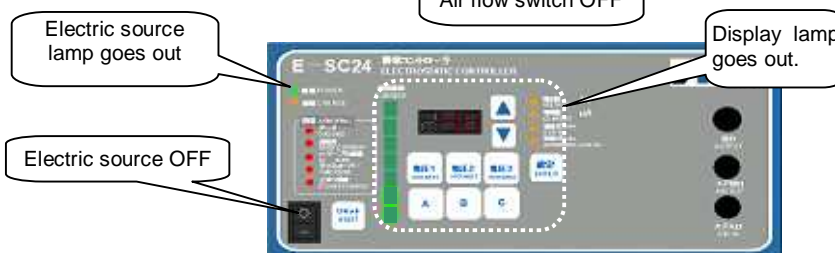
*1) Max. Voltage -60kV is set when shipped form factory (set in voltage 1)

*2) It normally lights up about in the range of 80 ~ 130 μA. But display differs according to other conditions

Job-3 In the case of spray hand gun: if the connected spray gun ends air spray, air flow switch stops, charge stops and returns to Job-1 condition.

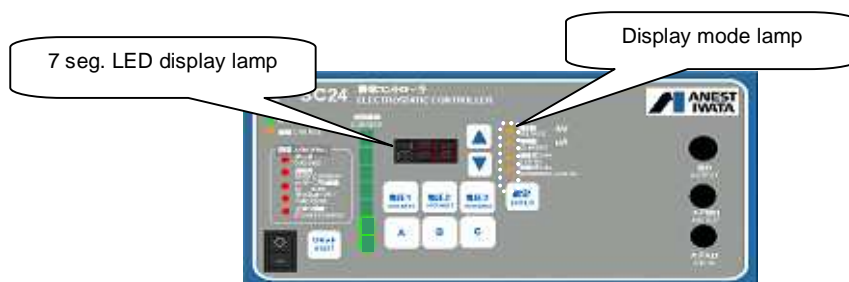


Job-4 If spray job is finished, turn off electric source of Electrostatic Controller.



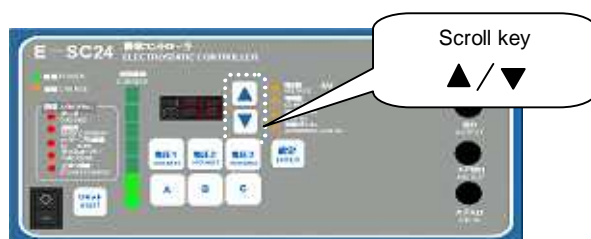
3.2 How to change 7 seg. LED display items

Information of “set voltage”, “spray current”, “charge gun No.” *1) and “failure gun No.” *1) is displayed on 7 seg. display lamp. We explain how to change display items hereunder.



*1) E-SC24 series does not display “charge gun No.” or “failure gun No.”

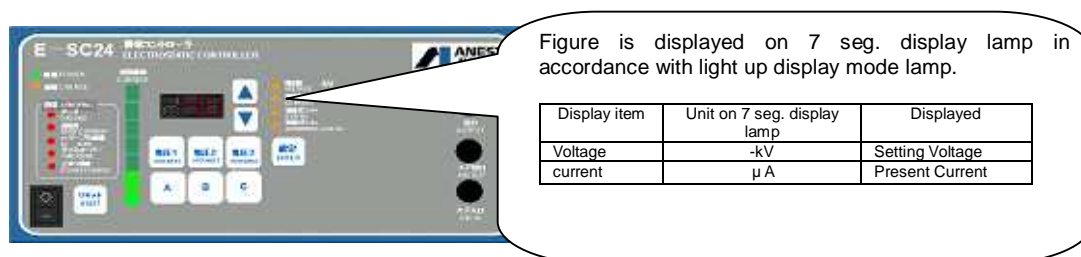
Job-1 push scroll key on (▲/▼) the right side of 7seg. display lamp and change to the item you want to display.



▲ : changes to upward mode.
▼ : changes to downward mode

But if you select ▲ at top mode (voltage mode), bottom mode (current mode) is selected.
If ▼ is selected at bottom mode, top mode is selected.

Job-2 Lamp lights up in selected display mode and present current of selected mode is displayed on 7 seg. display lamp.



4 Safeguards

Safeguards (failure detection functions) to monitor safety about electrostatic coating system of electrostatic controller are explained below.

4.1 Safeguards to be monitored

■ Contents of safeguards

Detection items	Contents to be detected	Safeguards
over current failure 1	When over 150 μ A coating current occurs and continues for over 30sec.	Immediately shutting off HV charging and sounding failure buzzer. Warning mode is kept until reset key is pushed.
over current failure 2	In case the current flows over 200 μ A. (Hard wear circuit protection: CP)	Immediately shutting off HV charging and sounding failure buzzer. The warning mode is kept until turning off the power switch.
LV cable failure	When LV cable is damaged.	Immediately shutting off charge and sounding failure buzzer. Warning mode is kept till reset key is pushed.
spray set time over	When detecting continuous charge signal for over 2 minutes.	Immediately shutting off charge and sounding failure buzzer. Warning mode is kept till reset key is pushed.
high voltage generator failure	When the current supplied to high voltage generator, is in abnormal condition	Immediately shutting off charge and sounding failure buzzer. Warning mode is kept till reset key is pushed.

Detection name	Indication lamp									Alarm
	7seg. display	Power	Charge	Ground	Overcurrent	LV cable	Time over	2guns charge		
Power on while charging signal on										Periodical beep sound
Over current failure1										Beep sound
Over current failure2										Beep sound
LV cable failure										
Current detecting line										Beep sound
Primary line of transformer										Beep sound
Shielding wire										Beep sound
Spray set time over										Beep sound
High voltage generator failure	E01									Beep sound

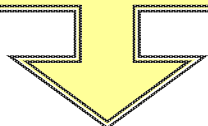
: lighting, : flickering (normal interval: 1sec), : flickering (slow interval 2sec), : flickering (fast interval 0.5sec)

4.2 Measures when warning mode appears by safeguards

When electrostatic controller detects failure, buzzer sounds and warning mode appears. Follow the following procedure, check the contents of failure and remedy.

Before taking any measures, be sure to read the following warning items.

Suppose that electrostatic controller detects failure, warning buzzer sounds and charge is stopped (=warning mode)



Job-1 Suspend coating job and check failure item by lit-up position of failure display lamp.

First check failure item by failure display lamp although warning buzzer continues sounding.



Job-2 If you have checked failure item, push reset key and cancel warning mode.



But if failure condition is continuously detected (for example, disconnection of shield wire), warning mode cannot be cancelled since failure is detected again and warning mode appears. In that case, turn electric source switch OFF.

If failure item is checked, push reset key and reset warning mode.

But as for disconnection of shield wire, warning mode continues even if reset till grounding is reconnected. Turn electric source OFF.





Job-3 After canceling warning mode, proceed confirmation about checked failure items according to below chart. When failure is still detected, equipment may have failed. Check again "6. Problems and remedies"

 WARNING	
	(1) Before checking failure of electrostatic spray gun, be sure to turn off electric source of electrostatic controller and fully release air pressure and fluid pressure (refer to P. "avoidance of wrong operation") in order to avoid bodily injury by wrong operation.

Failure items	Check and remedy
Over current failure	Charge again and check if over current failure is detected. When over current failure is detected even if charged, check the following item. ✓ Check if spray distance is continuously short or other grounded thing comes nearer tip of gun. When spray distance is continuously short (grounded thing is near tip of electrostatic spray gun) this detection can work. If so, make spray distance longer.
LV cable failure	Note the lighting mode of LV cable lamp (see Sec.4) and check connector connection on electrostatic spray gun side and electrostatic controller side of low voltage cable. If connection of low voltage cable has no problem, LV cable was snapped. Replace low voltage cable.
Spray set time	Charge again and check if charge is turned ON/OFF normally. If it is detected again, refer to 6 "Problems and remedies", chart 7.



5 Daily inspection and maintenance

Refer to the below chart and periodically inspect Electrostatic Controller (weekly).

 WARNING	
	(1) Before inspection, be sure to turn off electric source of Electrostatic Controller and fully release air pressure (refer to P. “avoidance of wrong operation”).

Where to inspect	
1. Grounding connection of Electrostatic Controller	Is grounding wire off or worn out?
2. Remove dirt from Electrostatic Controller body	Is dust accumulated?
3. Low voltage cable 1) Remove dirt. 2) Check outer damage. 3) Check for loose connector.	Is dust accumulated? Is outer cover (sheath) damaged or disconnected? Is connector out of place?
4. Air hose 1) Remove dirtiness. 2) Check for outer damage. 3) Check for looseness of joint (air leak).	Is dust accumulated? Is air hose damaged or scratched? Is air leaking from loose joint?

6 Problems and remedies (troubleshooting)

 WARNING	
	Before inspection, be sure to turn off electric source of electrostatic controller and fully release air pressure. (refer to P. "avoidance of wrong operation")
Important	If you refer to below chart and cannot solve problem, be sure to contact the shop which sold it to you.

	Problems	Causes	Remedies
1	Electric source lamp does not light up even if electric source is turned on.	Main electric source is not turned on. Receptacle comes off.	Turn on main electric source. Insert receptacle.
		Fuse is disconnected.	Replace with fuse (5.2X20mm 250V2.5A). refer to 7.2.
2	Soon after electric source is ON, buzzer sounds and charge lamp flashes.	Electric source is ON when electrostatic gun is sprayed or external charge signal is ON.	Turn on electric source after you stop spraying electrostatic air gun or turn off external charge signal.
3	Electric source lamp and charge lamp light up. High voltage is not impressed.	Low voltage cable is not connected.	Check for connection of low voltage cable.
		Electrostatic spray gun failure.	Contact the shop which sold it to you.
		Electrostatic Controller failure.	Contact the shop which sold it to you.
4	Electric source lamp lights up but charge lamp does not light up even if air spray of electrostatic spray gun is turned on.	Flow switch failure by dust mixture.	Contact the shop which sold it to you.
		Flow switch failure by dust attached.	Remove air joint from air outlet and air inlet and blow from air inlet and remove dust.
		Electrostatic Controller failure.	Contact the shop which sold it to you.
5	Over-current is detected.	Spray distance is continuously short.	Secure proper spray distance.
		Low voltage cable is disconnected.	Replace low voltage cable.
		Electrostatic spray gun failure.	Contact the shop which sold it to you.
6	Shielded wire disconnection is detected.	Low voltage cable connector is disconnected.	Reconnect low voltage cable.
		Shielded wire of low voltage cable is disconnected.	Replace low voltage cable (refer to gun instruction manual)
7	Spray set time is detected even if electrostatic spray gun is not sprayed over 2 minutes.	Air leaks from air hose joint.	Tighten air hose joint (stop leak).
		Air leaks from spray gun.	Replace air valve seat set (refer to gun instruction manual)
		Wrong operation of flow switch.	Remove air joint from air outlet and air inlet, and blow air from air inlet to remove dust.
8	After charging, charge lamp flashes and buzzer sounds intermittently.	Controller output is improper.	Turn off electric source and turn on electric source with reset key being pushed (keep pushing reset key for 4 seconds). After buzzer sounds 4 times, spray the gun over 5 seconds and charge gun. Check that buzzer sounds again, push "ENTER" key and return to normal mode.

Electrostatic Controller E-SC24L series

Instruction manual

< for a supervisor >

1 Specifications

1.1 Specifications

Items	Contents
Input voltage	AC200 ~ 240V 50/60Hz single-phase
Output voltage (Electrostatic Controller)	MAX AC24Vpp
Output current (discharge current of electrostatic spray gun)	MAX 150 μ A (C.P 200 μ A)
Electric consumption	75W
Ambient temperature range	5 ~ 40
Ambient humidity range	Less than 70%RH
Safeguards	Detection of over-current, LV cable failure, spray set time failure
Dimensions L x W x H	200mmX150mmX130mm
Mass	3.4kg
Charge ON/OFF mechanism	Air flow switch (air joint IN/OUT size: G1/4 male)
Max. operating air pressure (when air flow switch is used)	MAX 0.68MPa
Applicable electrostatic spray gun	Only for E-spray series electrostatic spray gun Model : E-MW100 series only




< Outline of electrostatic controller >

This electrostatic controller is for supplying electricity to the booster circuit built into the electrostatic spray gun. It converts AC200-240V electricity to AC24V and supplies it to the electrostatic spray gun via a low voltage cable. (LV cable)

It has a built-in safeguard (detection of over current, disconnection of LV cable failure and self-diagnostic function to detect failure)

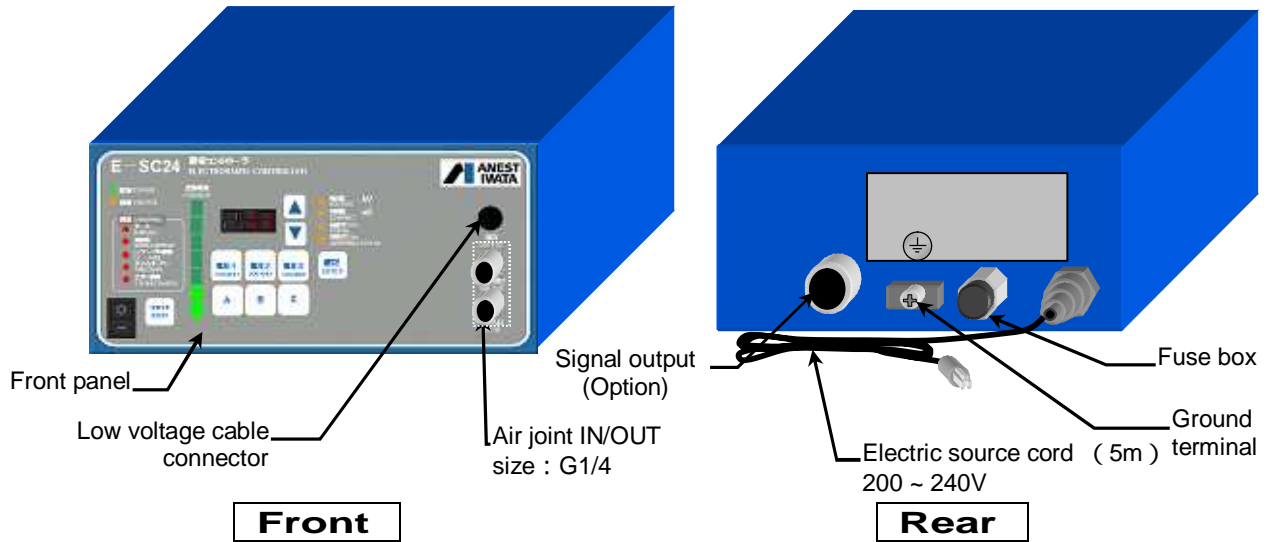
2 Check the products

This unit consists of the following accessories including electrostatic controller. Before use, be sure to check that all the products are included without any damage. If you find some products are missing or damaged, contact the shop which sold it to you.

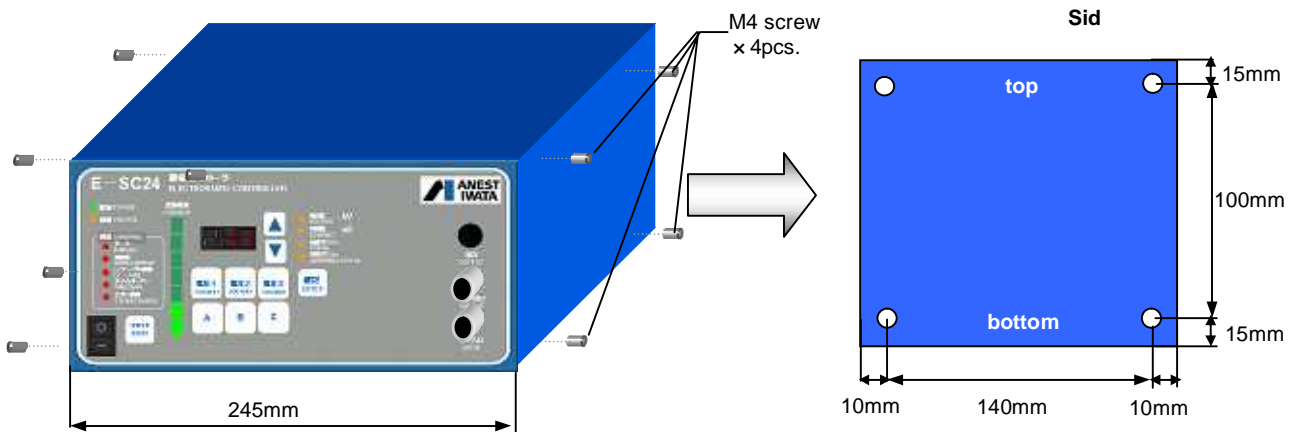
Name of products	Contents
Electrostatic Controller	
Accessories	(1) Grounding wire (5m) 
	(2) Instruction manual (this one) 

3 Names and functions of each section

3.1 Outer appearance of electrostatic controller

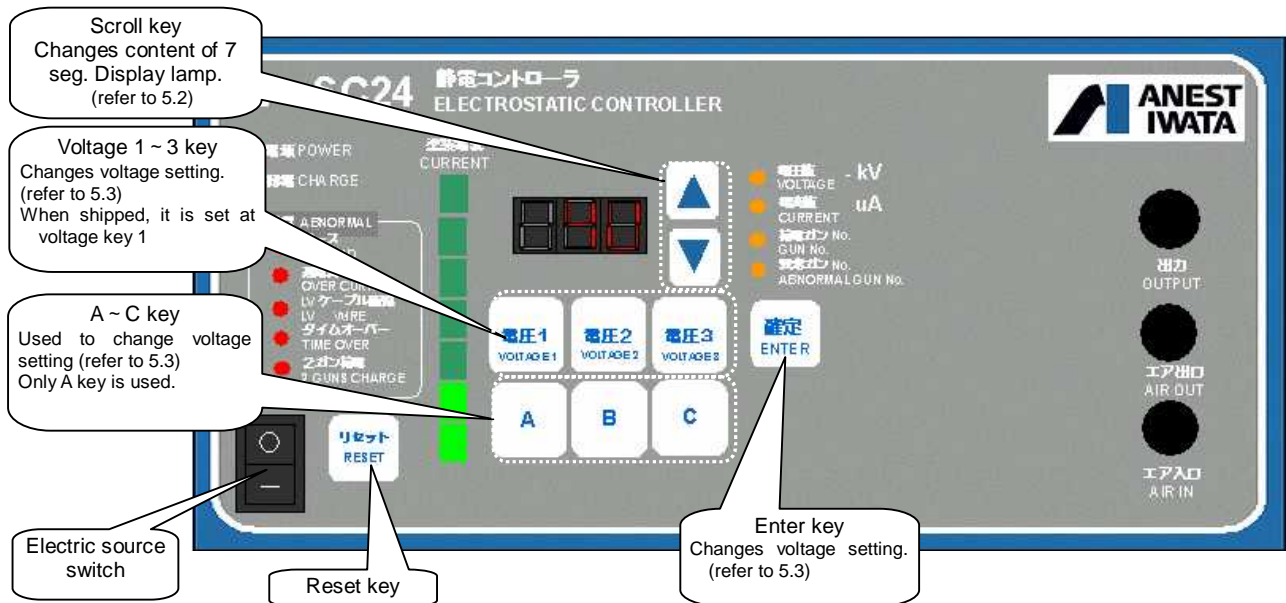


3.2 Position of screw (M4) to fix electrostatic controller

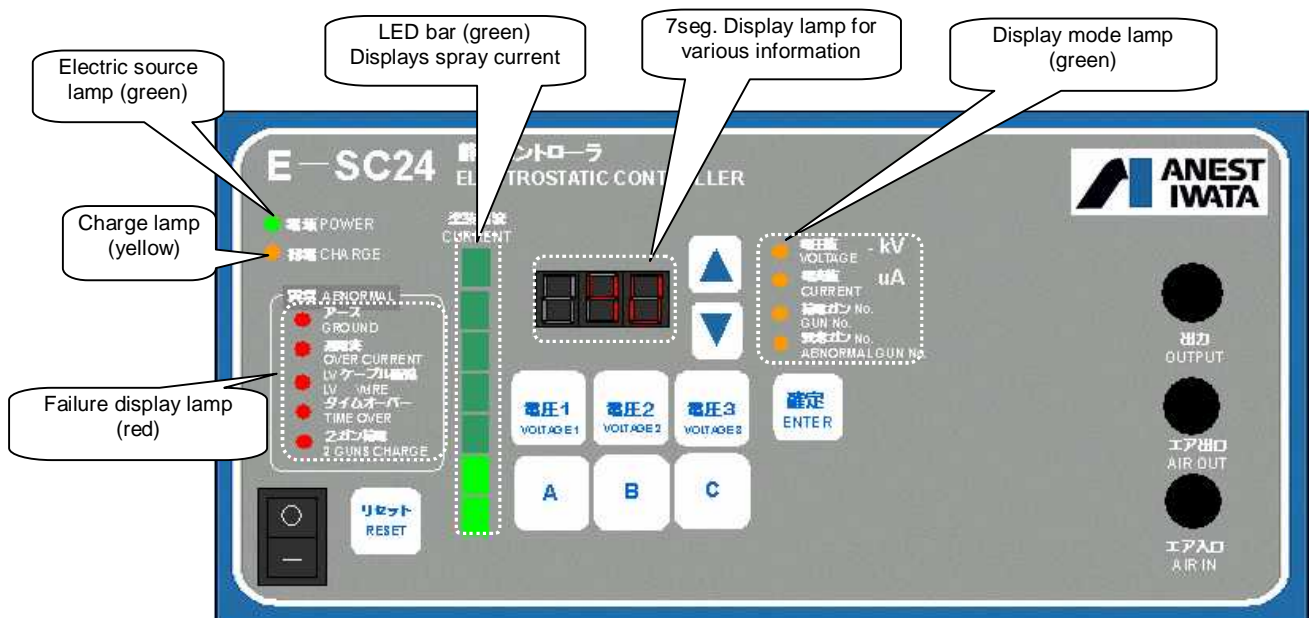


3.3 Front panel of Electrostatic Controller

1) Operation section



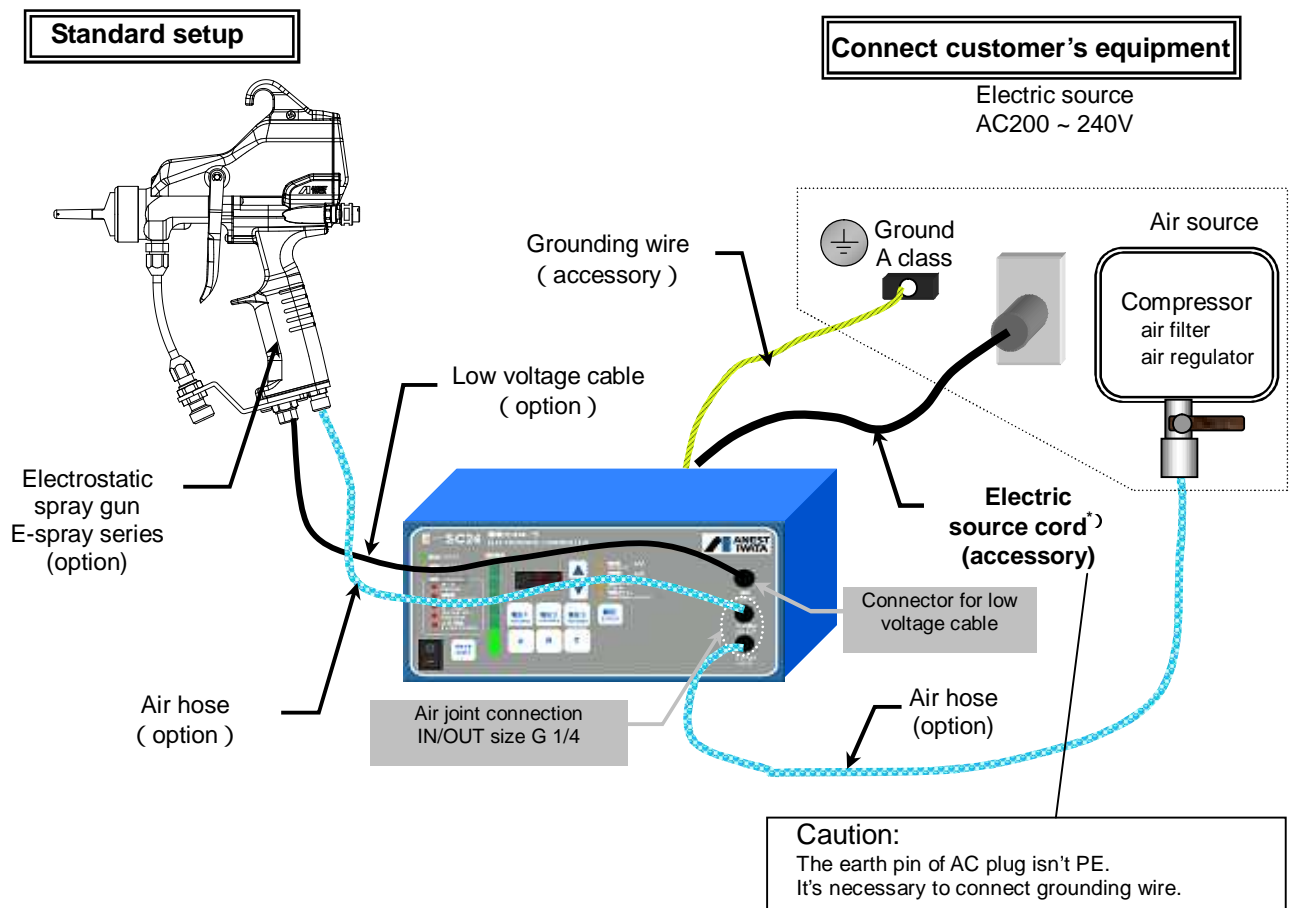
2) Display section



4 Setup of Electrostatic Controller

This section explains how to set up electrostatic controller about standard connection as shown below. Before setup, be sure to observe the below warning.

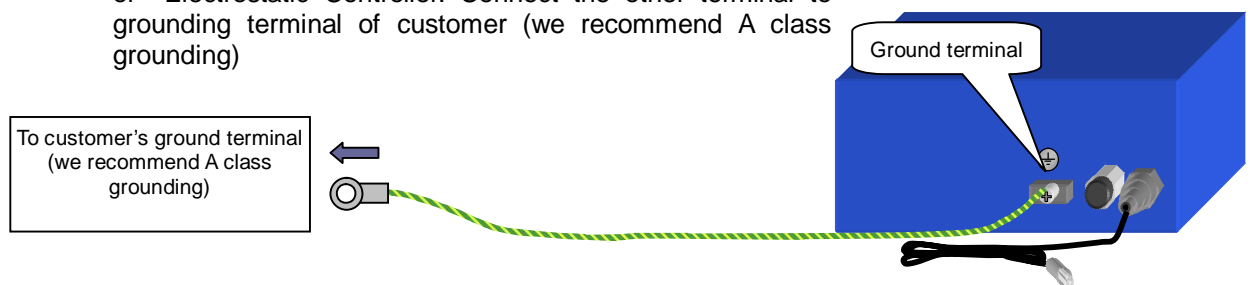
⚠ WARNING	
⚡	A) Before connection, be sure to turn off electric source switch, release pressure of primary side air source and turn off all electric source switches of related equipment.
⏚	A) Securely connect grounding. Insufficient grounding can cause failure by charging of electrostatic controller, fire by spark discharge through leak, charge, or injury by electric shock. B) Be sure to connect surrounding metallic things to ground before charging electrically. If not, it can cause fire or injury by electric shock.
!	A) Never use primary side electric source other than designated AC 200 ~ 240V. B) Input of different voltage than set specifications can cause damage to equipment or fire.



4.1 Connection of electric cable

⚠ WARNING	
⚡	A) Before connection, be sure to turn off electric source switch, release pressure of primary side air source and turn off all electric source switches of related equipment.
⏚	A) Securely connect grounding. Insufficient grounding can cause failure by charging of Electrostatic Controller, fire by spark discharge through leak, charge, or injury by electric shock. B) When charging electrically, be sure to ground all surrounding metallic things. If not, it can cause fire or injury of electric shock.
!	A) Never use primary side electric source other than designated AC 200 ~ 240V). B) Input of different voltage then set specifications can cause damage to equipment or fire.

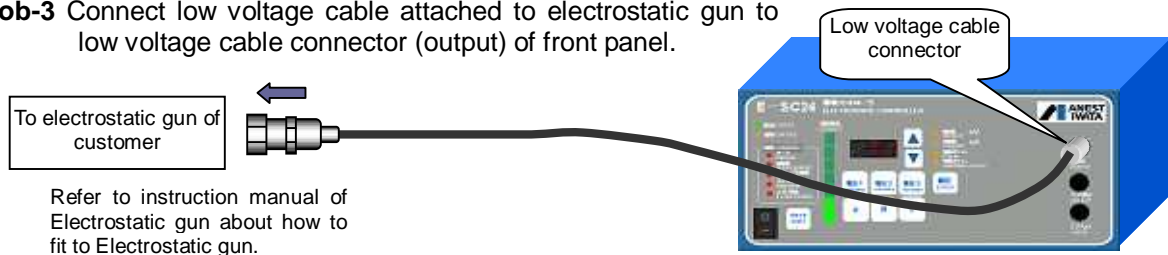
Job-1 Fit attached grounding wire to grounding terminal block at back of Electrostatic Controller. Connect the other terminal to grounding terminal of customer (we recommend A class grounding)



Job-2 Insert electric source cord into AC 200 ~ 240V electric source receptacle of customer.



Caution: The earth pin of AC plug isn't PE(Protection Earth). It's necessary to connect grounding wire.

Job-3 Connect low voltage cable attached to electrostatic gun to low voltage cable connector (output) of front panel.

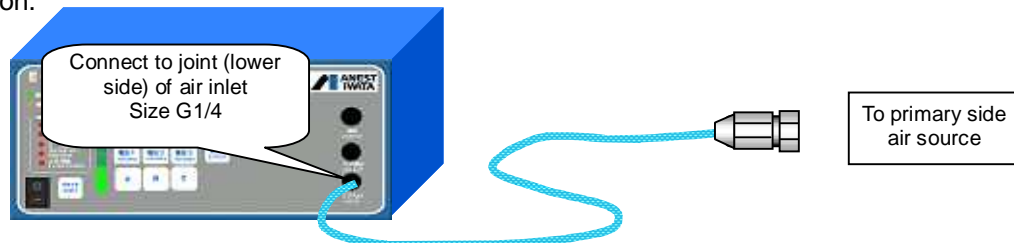


4.2 Connection of air hose

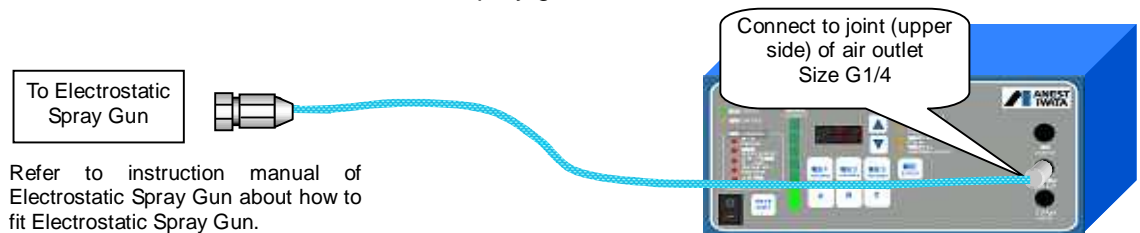
As hand spray gun type is charged ON/OFF by air flow switch (air flow sensor) in electrostatic controller, you must connect air hose to electrostatic controller.

 CAUTION	
	<p>A) When connecting air hose, pay attention so that dust does not enter air hose. If not, it can fail painting.</p> <p>B) Use clean and dry compressed air which is filtered near at inlet to controller through air filter (less than 5 μm) and dried through air dryer. Dirty air can fail painting.</p>

Job - 1 Connect air hose to joint (lower side) for G1/4 air inlet of front panel of electrostatic controller and the other side to air source of customer. As for customer's air source, be sure to read the above caution.



Job - 2 Connect air hose for electrostatic gun to air joint for G1/4 air outlet at front panel of electrostatic controller and the other side Electrostatic spray gun of customers.




4.3 Connection of external output signal (Model : E-SC24L)

It can output signal of “electric source”, “charge”, “reasonable spray distance signal “^{*1)}, and “failure” to the outside of the electrostatic controller. Refer to next page for an explanation of how to set up the connection of cable for output.

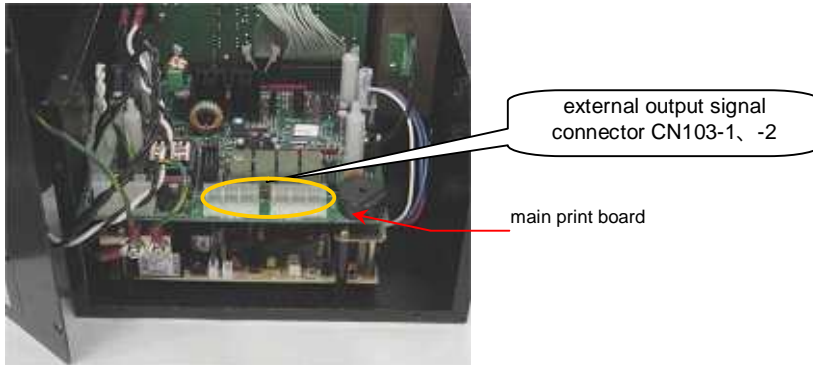
*1) When spray distance is improper, its signal is outputted.

< Construction >

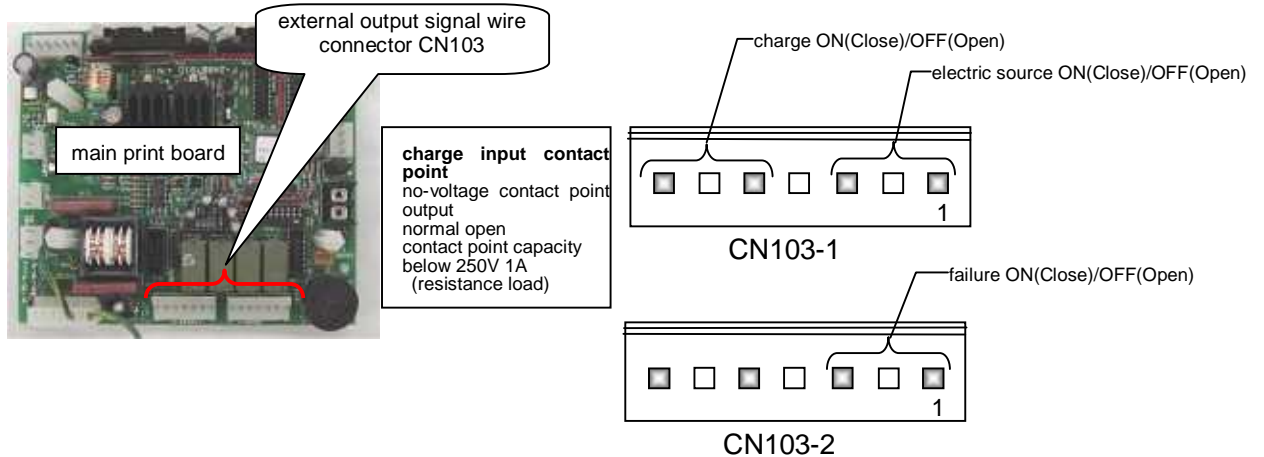
 <p>CAUTION</p>	<p>(1) As you must directly touch print board, only person conversant with this procedure must do this job.</p> <p>(2) Before connecting, be sure to pull out plug of primary side electric source cord and turn off electric source of all related units.</p> <p>(3) If you touch print board while static electricity accumulates on your body, it can damage print board. Before touching print board, be sure to touch metallic section such as screwdriver and release static electricity accumulated on your body.</p>
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Job - 1 Remove back lid according to 3 . 2 .

Job - 2 Look for external output signal connector on main print board.

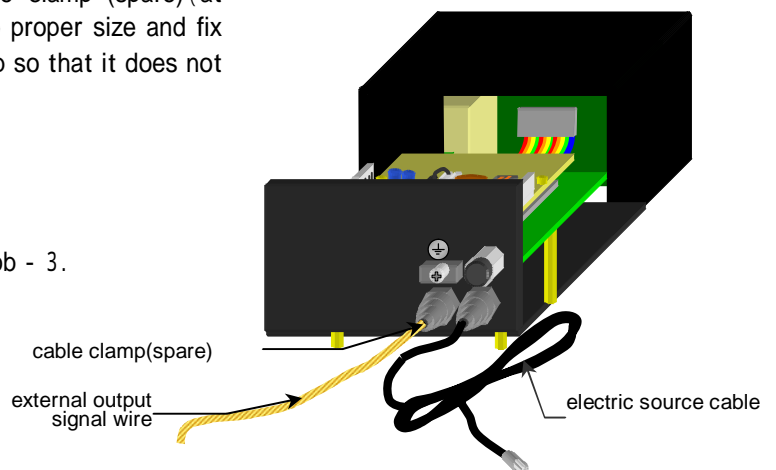


Job - 3 Connect external output signal wire to charge input signal wire terminal block on main print board.







Job - 4 Connect external charge ON/OFF signal wire to inside electrostatic controller through cable clamp (spare) (at that time, cut inlet of cable clamp to proper size and fix signal wire with screws of cable clamp so that it does not move).

Job - 5 After finishing setting, close back lid according to 9 . 1 job - 3.



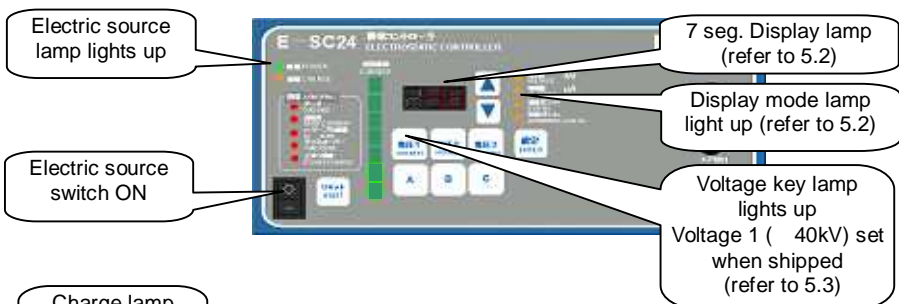
5 Operation

5.1 Normal operation

 WARNING	
	A) When charging electrically, be sure to ground all surrounding metallic things. If not it can cause fire or injury of electric shock.
 CAUTION	
	A) During charging (when high voltage is generated), do not put electrostatic spray gun within about 50cm of Electrostatic Controller. If done, Electrostatic Controller can fail if it sparks, as Electrostatic Controller is electrical equipment.

After setup of 4 is finished, start painting according to the following procedure.

Job-1 Turn on electric source switch. Electric source lamp lights up and the gun is ready to charge (voltage key lamp, display mode lamp, 7 seg. Display lamp lights up and displays.)



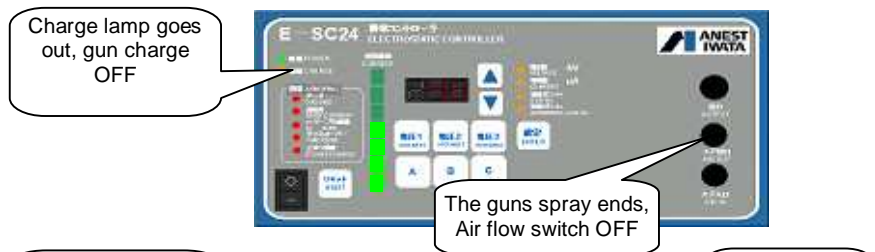
Job-2 In case of hand spray gun: if the spray gun starts to spray, air flow switch operates and gun is charged^{*1)}
When high voltage is charged, charge lamp lights up and spray current is displayed in spray current^{*2)}



*1) Max. voltage -40kV is set when shipped form factory (set in voltage 1)

*2) it normally lights up about in the range of 0 ~ 30 μA. But display differs according to other conditions

Job-3 In the case of spray hand gun: if the connected spray gun ends air spray, air flow switch stops, charge stops and returns to Job-1 condition.



Job-4 If spray job is finished, turn off electric source of Electrostatic Controller.



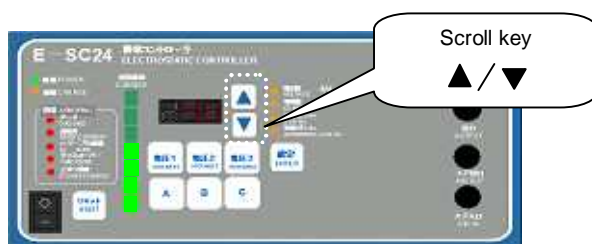
5.2 How to change 7 seg. LED display items

Information of “set voltage”, “spray current”, “charge gun No.” *1) and “failure gun No.” *1) is displayed on 7 seg. display lamp. We explain how to change display items hereunder.



*1) E-SC12 series does not display “charge gun No.” or “failure gun No.”

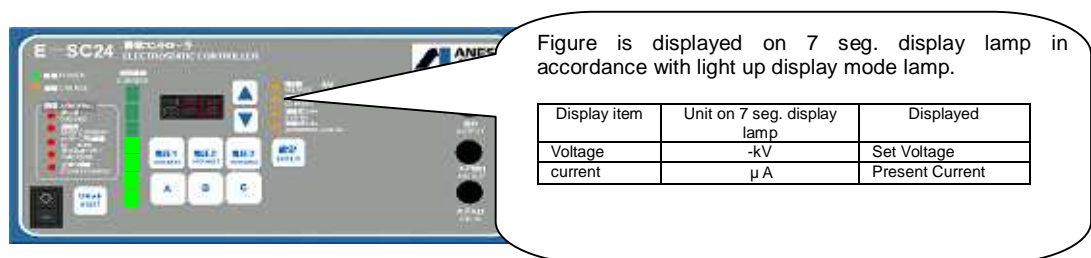
Job-1 push scroll key on (▲/▼) the right side of 7 seg. display lamp and change to the item you want to display.



▲ : changes to upward mode.
▼ : changes to downward mode

But if you select ▲ at top mode (voltage mode), bottom mode (current mode) is selected.
If ▼ is selected at bottom mode, top mode is selected.

Job-2 Lamp lights up in selected display mode and present current of selected mode is displayed on 7 seg. display lamp.



5.3 How to change set voltage

This page must be worked only by trained, qualified personnel who understand the requirements in this manual.

Max. voltage -40kV (voltage 1 key) is set when shipped from our plant. When you want to change charge voltage of electrostatic gun, you can choose from the following 3 kinds of voltage. We explain how to change it.

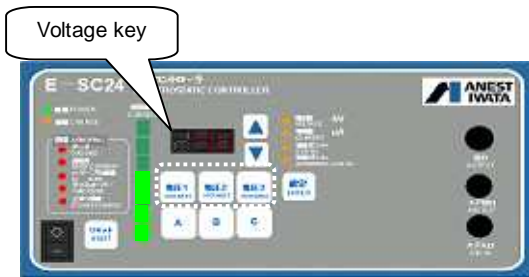
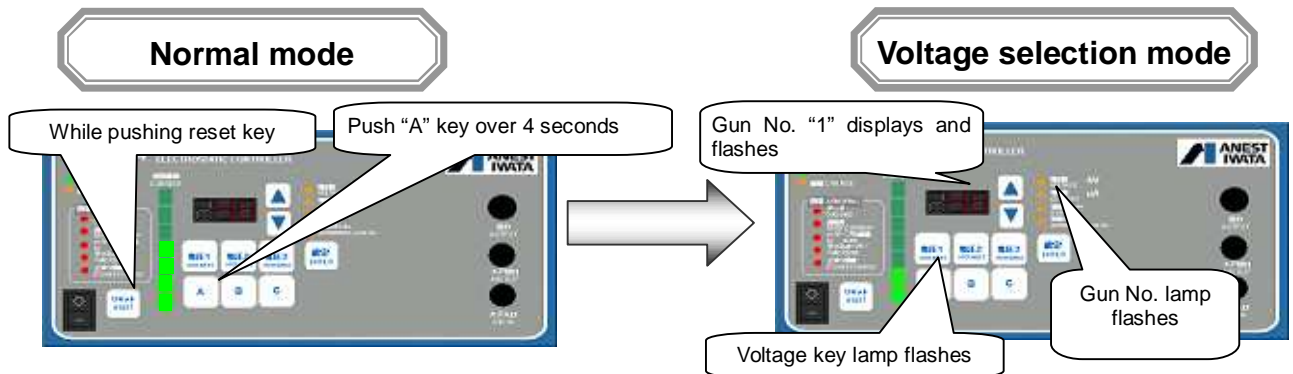


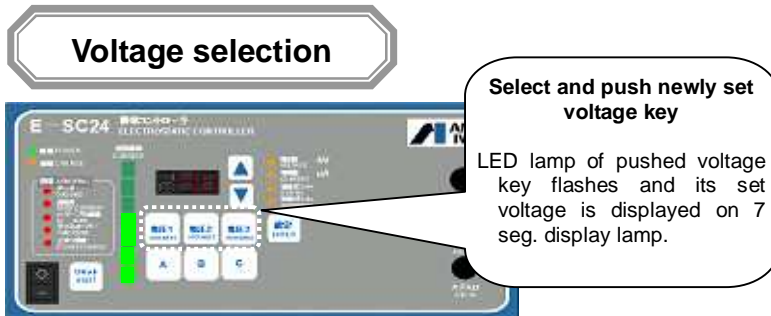
Chart1. set voltage key against each voltage key

Voltage	"voltage 1"(standard)	"voltage 2"	"voltage 3"
Set voltage	-30kV	-40kV	-50kV
Adjusts color of finishing surface, metallic paint or bounceback by voltage			

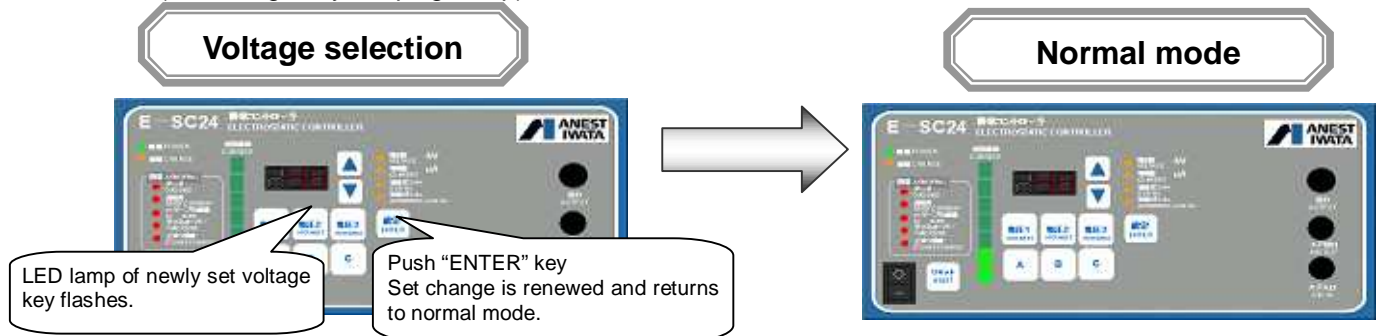
Job-1 If you continue pushing "A" key while pushing "reset key" under normal conditions (charge stand-by with only electric source ON for over 4 seconds), it becomes voltage selection mode. Voltage lamp of display mode lamp, gun No. lamp and voltage key lamp flash, and 7 seg. display lamp displays "1" and flashes.



Job-2 Chose newly set voltage key from "voltage 1 ~ 3 key" and push. (selected voltage key lamp flashes)



Job-3 If "ENTER key " is pushed, voltage set mode returns to normal mode. Charge from next time is set voltage by newly selected voltage key. (set voltage key lamp lights up)



6 Safeguards

Safeguards (failure detection functions) to monitor safety about electrostatic coating system of electrostatic controller are explained below.

1.1 Safeguards to be monitored

■ Contents of safeguards

Detection items	Contents to be detected	Safeguards
over current failure 1	When over 150 μ A coating current occurs and continues for over 30sec.	Immediately shutting off HV charging and sounding failure buzzer. Warning mode is kept until reset key is pushed.
over current failure 2	In case the current flows over 200 μ A. (Hard wear circuit protection: CP)	Immediately shutting off HV charging and sounding failure buzzer. The warning mode is kept until turning off the power switch.
LV cable failure	When LV cable is damaged.	Immediately shutting off charge and sounding failure buzzer. Warning mode is kept till reset key is pushed.
spray set time over	When detecting continuous charge signal for over 2 minutes.	Immediately shutting off charge and sounding failure buzzer. Warning mode is kept till reset key is pushed.
high voltage generator failure	When the current supplied to high voltage generator, is in abnormal condition	Immediately shutting off charge and sounding failure buzzer. Warning mode is kept till reset key is pushed.

Detection name	Indication lamp	7seg. display	Power	Charge	Ground	Overcurrent	LV cable	Time over	2guns charge	Alarm
Power on while charging signal on										Periodical beep sound
Over current failure1										Beep sound
Over current failure2										Beep sound
LV cable failure										
Current detecting line										Beep sound
Primary line of transformer										Beep sound
Shielding wire										Beep sound
Spray set time over										Beep sound
High voltage generator failure		E01								Beep sound

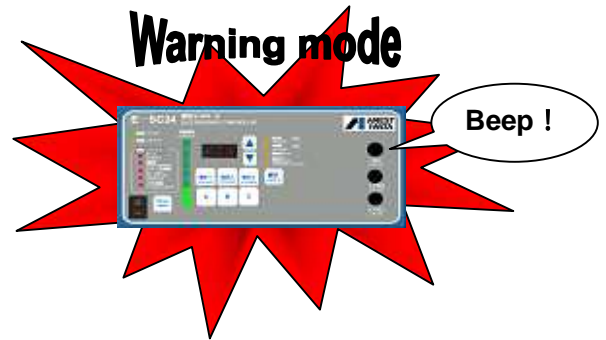
: lighting, : flickering (normal interval: 1sec), : flickering (slow interval 2sec), : flickering (fast interval 0.5sec)

6.1 Measures when warning mode appears by safeguards

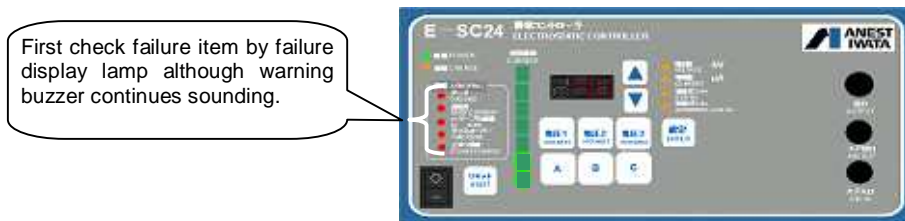
When electrostatic controller detects failure, buzzer sounds and warning mode appears. Follow the following procedure, check the contents of failure and remedy.

Before taking any measures, be sure to read the following warning items.

Suppose that electrostatic controller detects failure, warning buzzer sounds and charge is stopped (=warning mode)



Job-1 Suspend coating job and check failure item by lit-up position of failure display lamp.





Job-2 If you have checked failure item, push reset key and cancel warning mode.

But if failure condition is continuously detected (for example, disconnection of shield wire), warning mode cannot be cancelled since failure is detected again and warning mode appears. In that case, turn electric source switch OFF.



Job-3 After canceling warning mode, proceed confirmation about checked failure items according to below chart. When failure is still detected, equipment may have failed. Check again "8. Problems and remedies"



 WARNING	
	A) Before checking failure of electrostatic spray gun, be sure to turn off electric source of electrostatic controller and fully release air pressure and fluid pressure (refer to P. "avoidance of wrong operation") in order to avoid bodily injury by wrong operation.

Failure items	Check and remedy
Over current failure	Charge again and check if over current failure is detected. When over current failure is detected even if charged, check the following item. ✓ Check if spray distance is continuously short or other grounded thing comes nearer tip of gun. When spray distance is continuously short (grounded thing is near tip of electrostatic spray gun) this detection can work. If so, make spray distance longer.
LV cable failure	Note the lighting mode of LV cable lamp (see Sec.4) and check connector connection on electrostatic spray gun side and electrostatic controller side of low voltage cable. If connection of low voltage cable has no problem, LV cable was snapped. Replace low voltage cable.
Spray set time	Charge again and check if charge is turned ON/OFF normally. If it is detected again, refer to 6 "Problems and remedies", chart 7.

7 Daily inspection and maintenance

7.1 Daily inspection and maintenance

Refer to the below chart and periodically inspect Electrostatic Controller (weekly).

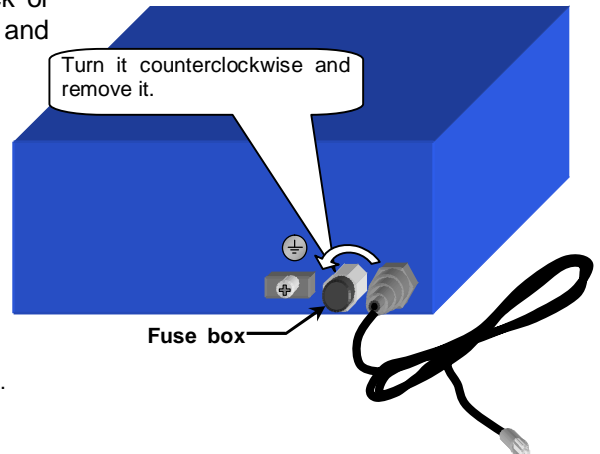
 WARNING	
	A) Before inspection, be sure to turn off electric source of Electrostatic Controller and fully release air pressure (refer to P. “avoidance of wrong operation”).

Where to inspect	
1. Grounding connection of Electrostatic Controller	Is grounding wire off or worn out?
2. Remove dirt from Electrostatic Controller body	Is dust accumulated?
3. Low voltage cable 1) Remove dirt. 2) Check outer damage. 3) Check for loose connector.	Is dust accumulated? Is outer cover (sheath) damaged or disconnected? Is connector out of place?
4. Air hose 1) Remove dirtiness. 2) Check for outer damage. 3) Check for looseness of joint (air leak).	Is dust accumulated? Is air hose damaged or scratched? Is air leaking from loose joint?

7.2 How to replace fuse

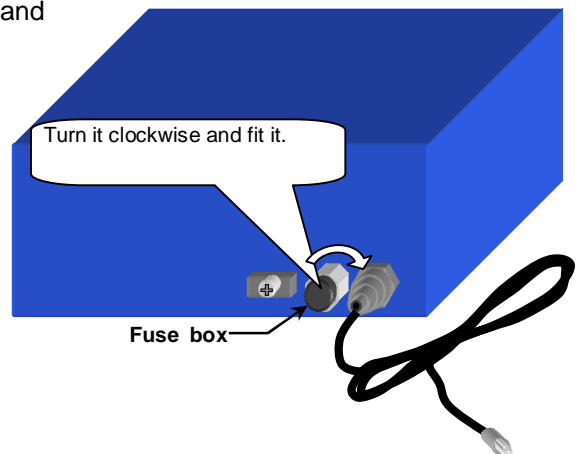
How to replace fuse when fuse is disconnected, is explained below.

Job-1 Turn cover of fuse box counterclockwise at back of Electrostatic Controller with minus screwdriver and remove cover.





Job-2 Replace fuse (5.2X20mm 250V2.5A) in fuse box.

Job-3 Turn cover of fuse box clockwise with minus drive and fit cover.



8 Problems and remedies (troubleshooting)

 WARNING	
	A) Before inspection, be sure to turn off electric source of electrostatic controller and fully release air pressure. (refer to P. "avoidance of wrong operation")
Important	A) If you refer to below chart and cannot solve problem, be sure to contact the shop which sold it to you.

	Problems	Causes	Remedies
1	Electric source lamp does not light up even if electric source is turned on.	Main electric source is not turned on. Receptacle comes off.	Turn on main electric source. Insert receptacle.
		Fuse is disconnected.	Replace with fuse (5.2X20mm 250V2.5A). refer to 7.2.
2	Soon after electric source is ON, buzzer sounds and charge lamp flashes.	Electric source is ON when electrostatic gun is sprayed or external charge signal is ON.	Turn on electric source after you stop spraying electrostatic air gun or turn off external charge signal.
3	Electric source lamp and charge lamp light up. High voltage is not impressed.	Low voltage cable is not connected.	Check for connection of low voltage cable.
		Electrostatic spray gun failure.	Contact the shop which sold it to you.
		Electrostatic Controller failure.	Contact the shop which sold it to you.
4	Electric source lamp lights up but charge lamp does not light up even if air spray of electrostatic spray gun is turned on.	Flow switch failure by dust mixture.	Contact the shop which sold it to you.
		Flow switch failure by dust attached.	Remove air joint from air outlet and air inlet and blow from air inlet and remove dust.
		Electrostatic Controller failure.	Contact the shop which sold it to you.
5	Over-current is detected.	Spray distance is continuously short.	Secure proper spray distance.
		Low voltage cable is disconnected.	Replace low voltage cable.
		Electrostatic spray gun failure.	Contact the shop which sold it to you.
6	Shielded wire disconnection is detected.	Low voltage cable connector is disconnected.	Reconnect low voltage cable.
		Shielded wire of low voltage cable is disconnected.	Replace low voltage cable (refer to gun instruction manual)
7	Spray set time is detected even if electrostatic spray gun is not sprayed over 2 minutes.	Air leaks from air hose joint.	Tighten air hose joint (stop leak).
		Air leaks from spray gun.	Replace air valve seat set (refer to gun instruction manual)
		Wrong operation of flow switch.	Remove air joint from air outlet and air inlet, and blow air from air inlet to remove dust.
8	After charging, charge lamp flashes and buzzer sounds intermittently.	Controller output is improper.	Turn off electric source and turn on electric source with reset key being pushed (keep pushing reset key for 4 seconds). After buzzer sounds 4 times, spray the gun over 5 seconds and charge gun. Check that buzzer sounds again, push "ENTER" key and return to normal mode.

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Instruction manual No.

Code No.