Panasonic

Operating Instructions

Arc Welding Robot Controller

Model No. **YA-2K Series**

Model No.
YA-2KAR61YH* YA-2KAR61EH* (TM-1400/TM-1100/ TM-1600)
YA-2KAR81YH* YA-2KAR81EH* (TM-1800/TM-2000)
YA-2KAL81YH* YA-2KAL81EH* (TL-1800/TL-2000)
YA-2KAS81YH* YA-2KAS81EH* (TS-800/TS-950)
YA-2KA261YH* YA-2KA261EH* (LA-1800)

TAWERS

- Arc Welding Robot Systems -

♦ Before operating this product, please read the instructions carefully and save this manual for future use.
Please also read the operating instructions of peripheral equipment.
♦ First, please read the “Safety precautions”.

English version is the original instructions.

WMA438TE0PAB00

2401

♦Introduction

Thank you for purchasing our Panasonic arc welding robots “YAWERS”. This manual explains TAWERS system configuration and operations of the robot controllers such as specifications, installation and maintenance.

For handling of the manipulator, please refer to the operating instruction of the applied manipulator. For operation of the controller, please refer to the operating instructions of “Teach Pendant for Arc Welding Industrial Robots”.

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- Take appropriate action to prevent security risks such as outflow of personal information via this product.
- Change your login password periodically to prevent unauthorized operation of the equipment.
- Easy-to-guess passwords may be figured out by third parties. Set a hard-to-guess password and keep it strictly confidential to prevent leaks to third parties.
- If you forgot the password, information may not be able to restored. Make sure to manage the password properly.
- Do not use the same password that you use on other systems or services.
- When entering your password, take care so that third parties may not steal glances at it.
- Take appropriate measures to avoid safety risks and to prevent third parties from illegally using the product, interfering or stopping the use of it.
- Secure the equipment and devices of this product firmly so that they may not be moved or relocated easily.
- Use keys, locks or other means to restrict physical access to the location of the equipment.
- Handle personal information in accordance with national laws and regulations.

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- This operating instructions manual is based on the information as of January, 2024.
- The information in this operating instructions manual is subject to change without notice.

♦Table of Contents

1. Safety Precautions

Please read the “Safety manual” (separate volume) for detail safe handling.
In case of using the product in a system, please also read the operating instructions of peripheral equipment.

♦Signal Words and Safety Symbols

Signal Words		Safety Symbols	
⚠ WARNING	Indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury.		Indicates a prohibited action.
⚠ CAUTION	Indicates a potentially hazardous situation, which, if not avoided, could result in minor injury or property damage.		Indicates a mandatory action.
			Indicates a hazard alert.

1.1 Observe the following for safe welding operation

⚠ WARNING

Welding Power Unit

Observe the following cautions to prevent accidents that can cause serious injuries.

(1) Never use the welding power unit for other than welding purpose, such as for pipe thawing.
(2) It is very important to comply with all instructions, safety warnings, cautions and notes mentioned. Failure to do so can result in serious injury or even death.
(3) Work of driving source at the input side, selecting work site, handling, storage and piping of high pressure gas, storage of welded products and also disposal of waste should be performed according to the operating instructions and national, state and local codes and regulations.
(4) Prevent any unauthorized personnel to enter in and around the welding work area.
(5) Only educated and/or skilled persons who well understand this welding power unit should install, operate, maintain and repair the unit.
(6) Only educated and/or skilled persons who well understand the operating instructions of the unit and who are capable of safe handling should perform operation of the unit.

Against Electric Shock

Observe the following instructions to prevent the hazard.

(1) Only educated and/or skilled persons should perform grounding of the case of the welding power unit, the base metal and jigs electrically connected to the base metal.
(2) Before installation or maintenance work, turn off all input power including power at the power distribution box and wait for at least five minutes to discharge electrical current from the capacitors. Check to make sure that no charged voltage present at capacitors before touching any parts.
(3) Do not use undersized, worn, damaged or bare wired cables.
(4) Connect cables firm and insulate the connected parts.
(5) Do not use the product with a case and panel removed or not in place.
(6) Do not handle the welding power unit with torn or wet gloves.
(7) Wear safety harness in case of working above floor level.
(8) Perform periodic checks without fail. Repair or replace any damaged parts as needed prior to use.
(9) Turn off all equipment when not in use.
(10) Do not touch any live parts.
(11) The welding power unit must be grounded and the work must be grounded in accordance with ANSI Z49.1 (For North America).

Electromagnetic Wave

Observe the following cautions to prevent radio interference due to welding current and high frequency for arc start.

(1) This product is classified as Class A, Group 2 ISM (industrial, scientific and medical) equipment and is intended for use in an industrial environment because it contains arc welding equipment.
This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.
Class A equipment : equipment suitable for use in all locations other than those allocated in residential environments and those directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.
Group 2 equipment : equipment in which radio-frequency energy in the frequency range 9 kHz to 400 GHz is intentionally generated and used or only used locally, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of

material, for inspection/analysis purposes, or for transfer of electromagnetic energy.

(2) Electromagnetic wave generated during welding operation may have adverse affects on medical equipment in the periphery of the equipment in operation and the welding work site. If you wear a pacemaker, consult your physician before going near the welding work site.

(3) Provide proper grounding work of all equipment including electronic devices and safety devices near the welding work site. Conduct an additional electromagnetic shielding work if needed.

(4) Lay the welding cable as short as and as close to the floor or ground as possible. Lay the base metal cable and the torch cable along to each other to reduce generation of electromagnetic wave.

(5) Never share the ground work of the base metal and welding power unit with other equipment.

⚠ WARNING

(6) Provide measures against noise to the external equipment, such as sequencer of the jig, proximity switch and area sensor, if such equipment is affected by the inverter noise from the robot or welding power unit. For details of the measures, please refer to the operating instructions of the external equipment.

Ventilation and Protective Equipment

Oxygen deficit, fume and gas generated during welding can be hazardous.

(1) Provide sufficient ventilation or wear breathing equipment specified by the applicable law (occupational safety and health regulation, ordinance on the prevention of oxygen deficiency and the like).

(2) Use a local exhauster specified by the applicable law (occupational safety and health regulation, rules on preventing injury by inhaled dust or etc.) or wear a protective breathing gear. If a protective breathing gear is used, it is recommended to use one with an electric fan with high protection performance.

(3) When conducting welding in the bottom, such as tank, boiler and the hold of a ship, use a local exhauster or wear breathing equipment specified by the applicable laws and regulations.

(4) When conducting welding in a confined area, make sure to provide sufficient ventilation or wear breathing equipment and have a trained supervisor observe the workers.

(5) Do not conduct welding at a site where degreasing, cleaning or spraying is performed. Conducting welding near the area where any of these types of work is performed can generate toxic gases.

(6) When welding a coated steel plate, provide sufficient ventilation or wear protective breathing gear. (Welding of coated steel plates generates toxic fume and gas.)

(7) Never ventilates with oxygen. Refer to ANSI Z49.1(For North America).

Against Fire, Explosion or Blowout

Observe the following cautions to prevent fires explosion or blowout.

(1) Remove any flammable materials at and near the work site to prevent exposure of such flammable materials to the spatter. If they cannot be relocated, cover them with a fireproofing cover.

(2) Do not conduct welding near flammable gases. Do not place the electric equipment near flammable gases, otherwise, such gases may catch fire from a spark of electricity inside the electric equipment.

(3) Do not bring the hot base metal near flammable materials immediately after welding.

(4) When welding a ceiling, floor or wall, remove all flammable including ones located in hidden places.

(5) Connect cables firm and insulate the connected parts. Improper cable connections or touching of cables to any electric current passage of the base metal, such as steel beam, can cause fire.

(6) Connect the base metal cable as close as possible to the welding section.

(7) Do not weld a sealed tank or a pipe that contains gas.

(8) Keep a fire extinguisher near the welding site for an emergency.

No Disassembling/Modification

Unauthorized disassembling or modification can cause fire, electric shock or breakdown.

(1) Contact Panasonic sales representatives for repair work.

(2) As for inspection of the inside the product if needed, follow the instructions in the operating instructions.

⚠ CAUTION

Installing Shielding (Curtain etc.)

Arc flash, flying spatter and slugs generated during welding can damage your eyes, skin and hearing.

(1) When welding or monitoring welding operation, wear safety glasses with sufficient light blocking structure or use a protective mask designed for welding operation.

(2) When welding or monitoring welding operation, wear protective clothing designed for welding operation, such as leather gloves, leg cover and leather apron, and also wear long-sleeve shirts.

(3) Install a protective curtain around the welding operation site to prevent exposure of eyes of people in the surrounding area to the arc flash.

(4) Be sure to wear noise-proof protective equipment, such as ear muffs and ear plugs, if the noise level is high.

Gas Cylinder and Gas Flow Regulator

Overturn of gas cylinder and blowout of gas flow regulator can cause injury.

(1) The gas cylinder must be handled properly according to the applicable law and in-house standards.
(2) Use the gas flow regulator that is supplied or recommended by our company.
(3) Read the operating instructions of the gas regulator prior to use, and observe the cautions described in it.
(4) Secure the gas cylinder to a dedicated gas cylinder stand.
(5) Do not expose the gas cylinder to high temperature.
(6) When opening the valve of the gas cylinder, do not bring your face close to the discharge outlet.
(7) When the gas cylinder is not in use, be sure to put the protective cap back on.
(8) Do not hang the welding torch on the gas cylinder. Do not allow the electrode to touch to the gas cylinder.
(9) Only the specified contractor should perform disassembly or repair work on the gas flow regulator. Such works require some expertise.

⚠ CAUTION

Rotating Parts

Rotating parts can cause injury.

(1) Keep away from rotating parts, such as cooling fans and feed rollers of the wire feeder, or hand, finger(s), hair or part of your clothes may be caught by the rotating parts resulting in injury.
(2) Do not use the product with a case and panel removed or not in place.
(3) Only educated and/or skilled persons who well understand welding machines should perform maintenance and repair work. During maintenance or repair work, provide fence or the like around the welding machine so that any unauthorized person can not come close to the working area carelessly.

Welding Wire

Welding wire, especially wire tip part can cause injury.

(1) Do not perform inching operation or pull the torch switch with your eyes, face or body close to the end of the welding torch. Wire extends out from the end of the welding torch and may stick into the eye, face or body.
(2) In case of using a torch cable with the resin liner, straighten the torch cable and reduce the preset feed amount (current) to half or less before applying the wire inching.
(3) If the high speed wire inching is executed with the torch cable extremely-bended, the welding wire may pass through the resin liner and the cable.
Replace any damaged liner/cable with a new one without fail. Never use a damaged liner/cable, or it can cause gas leak or insulation deterioration.

Against Insulation Deterioration

Insulation deterioration can cause fire of welding power unit.

(1) Keep enough distance from welding power unit when performing welding or grinding operation so as to prevent such spatters or iron particles from getting into the power unit.
(2) Perform inspection and maintenance work periodically so as to prevent insulation deterioration due to accumulated dust or dirt.
(3) When spatters or iron particles get into the welding power unit, turn off the power switches of the welding power unit and power distribution box, and then use dry air to blow them off.

2. Specifications

2.1 About Model No.

Model number	Code number: Manipulator	Code number: Controller	Specifications
YA-2KAR61*H*	YA-2KMR61*H*	YA-2KCR61*H*	TAWERS (WGH4 type controller)
YA-2KAR81*H*	YA-2KMR81*H*	YA-2KCR81*H*	
YA-2KAL81*H*	YA-2KML81*H*	YA-2KCL81*H*	
YA-2KAS81*H*	YA-2KMS81*H*	YA-2KCS81*H*	
YA-2KA261*H*	YA-2KM261*H*	YA-2KC261*H*	

Of the model number, "***" consists of one-letter "Model group" code followed by a "Manipulator type" code of two alphanumeric characters.

- **Model group**

Model group code	Basic design policy
Y	The robot is designed as a standard specification for use in markets outside of Japan. **< Note >** If you are intended to use the robot in US, Canada or EU member states (including countries signed the EEA accord), please purchase the robot designed for those countries. (See the following models.)
E	The robot is designed in accordance with the following European directives, UK regulations and EN standards. EU directives : 2006/42/EC and 2014/30/EU. UK regulations : S.I. 2008/1597 and S.I. 2016/1091 EN standards : EN ISO 10218-1:2011, EN 60204-1:2018, EN IEC 60974-1:2018 +A1:2019, EN IEC 60974-5:2019, and EN 60974-10:2014+A1:2015. Before put into service the Robot in the European market the Robot system shall be designed in accordance with the manufacturers specification described in this manual and instruction manual. Remodeling and/or modifying this product not in accordance with the manufacturers specification then this declaration will loose its validity. Authorised Representative: Panasonic Connect Europe GmbH Panasonic Testing Centre Winsbergring 15, 22525 Hamburg, Germany

- **Attention to the export of the product to EU member states**

Products other than E model group code do not meet the requirements specified in the EC Directives which are the EU safety ordinance. Please bear in mind that those products may not be brought as is into the EU member state or any other country which has signed the EEA accord

- **Two-digit alphanumeric digits**

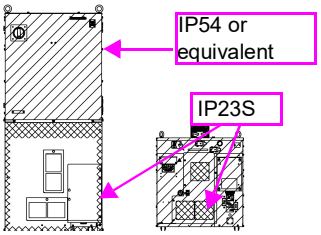
The digits relate to manipulator type. Please refer to the operating instructions of the manipulator.

- **Example: Model number "YA-2KAR61YH0"**

The model number "YA-2KAR61YH0" is a floor installation type manipulator for welding operation with standard arm (TM-1400 WGH4) for use in markets outside of Japan in general.

2.2 Technical data

2.2.1 Structure and control method

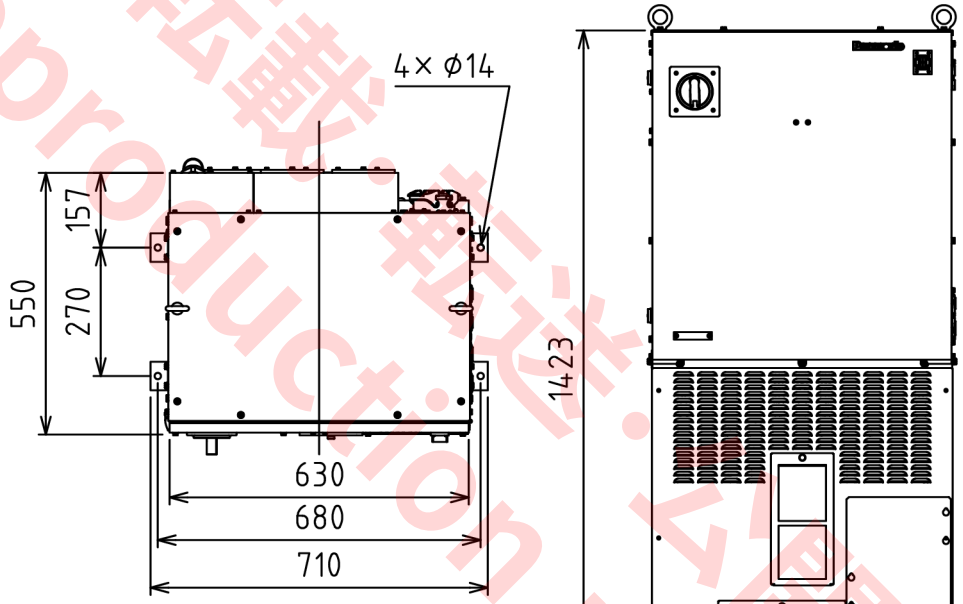
Item		Specifications
Structure and IP class		Closed box type, IP54 or equivalent, IP68 (Fan part) Teach pendant, IP40 or equivalent. 
Cooling method		Indirect air cooling (Circulating internal air).
Input power source (Mean power)		3-phase, 342 VAC to 484 VAC (37 kVA) (26 kW), (380 VAC to 440 VAC (± 10 %)) 50 Hz / 60 Hz (±2 %) (neutral earthing) (Y/E spec.)
Full load current		55.0 A
Short circuit current rating (E spec.)		5 kA
Grounding		Protective Earth (PE) grounding is required. Functional Earth (FE) is required depending on applied system.
Body color		Black
Teaching method		Teaching playback
The number of control axes		6 axes simultaneously (Max. 27 axes)
The number of external axes		Motor capacity: 20 kW Standard unit: 3 built-in external axes (2 kW motor or less) + external axis controller with 6 exterior type axes (Total motor capacity: 20 kW or less)
Path control		PTP and CP (Linear and circular interpolation)
Position detection method		Electronic type absolute pulse encoder
Position control method		Software servo control
Speed control method		Constant linear velocity control (during CP control)
Speed range	at teaching operation	Max. speed can be controlled within the safety speed range from 0.01 m/min to 15 m/min (Default setting: 15 m/min)
	at playback operation	0.01 m/min to 999.99 m/min (Direct input method)
	Set rang	Select from m/min, inch/min, m/s and cm/min
Memory system		IC memory (Battery back-up system)
Memory capacity and software		Memory
Connecting cable to manipulator		30 m
Dimensions (W x D x H)		630 mm x 550 mm x 1 423 mm (Projection parts are not included.)
Operating ambient temperature, humidity		0 to 40 °C, 20 to 90 %RH (50 % RH or less at 40 °C, and 90 % RH or less at 20 °C.) No due condensation
Transportation / Storage temperature		-25 °C to 60 °C
Mass (Weight)	Y spec	193 kg (425 lbs.), (Excluding the Teach pendant and connecting cable.)
	E spec	198 kg (437 lbs.), (Excluding the Teach pendant and connecting cable.)
Altitude		2 000 m or less
Motor overload protection		No thermal memory function

Note

For details of software and operation of the controller, please refer to the operating instruction [Operation].

⚠ WARNING
For the power supply of 380 to 480 VAC, make sure to ground the neutral point of the power supply. Otherwise, there is a risk of fire and damage to equipment.

- Dimensions



[Unit: mm]

2.3 Inputs, output and communications

Items	Input and output		Specifications	
Status I/O	Input		1. Start 3. Error release 5. Operating mode	2. Hold 4. Teaching mode 6. Servo ON
	Output		1. Running 3. Error 5. Teaching mode 7. Ready	2. Hold status 4. Operating mode 6. Servo ON 8. Alarm
Common I/O	Input		40 points	
	Output		40 points	
	I/O allocation		Allocate program start method input and other status I/O	
Other I/O	Input		Safety Holder input	
	Input specs.		Photo-coupler (ON/OFF of 24 VDC, 5 mA)	
	Output specs.	Y spec.	NPN transistor, Open collector	
		E spec.	PNP transistor, Open collector	
Safety I/O(*1)	Dual circuit input		• TP emergency stop • Enabling switch • Mode select switch • Use safety inputs (8 points)	
	Output		4 points, Relay contact output 4 points, FET output, source type	
	Safety input allocation		Allocation of safety I/O through safety settings is available, for example, external emergency stop, external enabling switch, door stop and protective stop.	
External memory, Communication Interface	Controller		Optional RS-232C, RS-422 and Ethernet(*2)	
	Teach Pendant		SD memory, SDHC memory USB2.0 port: 2 ports(*3)	

(*1): For details of safety I/O, see “Functional safety manual”.

(*2): Connect only with LAN in the plant.

(*3): Do not turn off the power switch while connecting with SD memory or USB memory.

2.4 Specification of built-in welding power source

Item	Specifications
Built-in welding power source	YA-2KD501 □ **(*1)
Applicable welding method	CO2, MAG, Stainless steel MIG, Pulsed MAG, Stanless steel pulsed MIG
Control method	Inverter type
Maximum no-load voltage	105 VDC (Y type, E type),
Standard load voltage output display	40 A, 16 V to 500 A, 39 V
Output current adjustable range	40 ADC to 500 ADC
Output voltage adjustable range	16 VDC to 50 VDC
Rated duty cycle (10-minute cycle)	80 % (for CO2, MAG, Stainless steel MIG welding) 60 % (for Pulsed MAG, Stainless steel pulsed MIG)
Output terminal connection	M8 bolt connection
Insulation class	Main transformer: F, Reactor: E, Power factor improvement reactor: H
Standards to be complied with	IEC60974-1 (Y type, E type),
Mass	83 kg (183 lbs.)
EMC classification	Class A
Power efficiency	86 % (500 A / 39 V : E type only)
Standby power consumption	42 W (Welding power source only)
Equivalent models	None
Shield gas index at MAG welding	350 A: 20 L/min
Wire use rate	350 A: 134 g/min

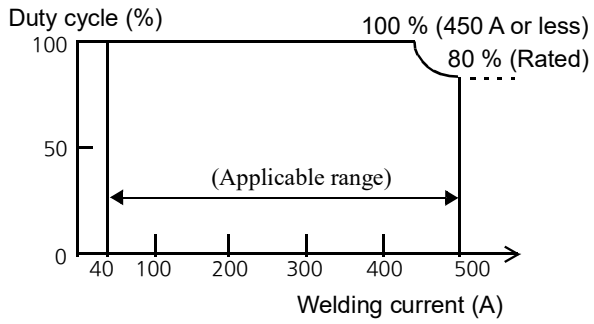
(*1): □ shows Model group (Y/E).

• About “Duty cycle”

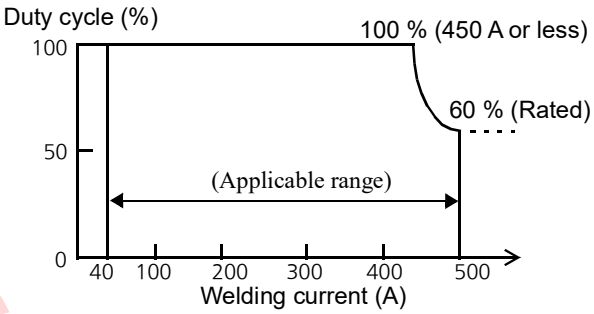
“Rated duty cycle 80 %” means that the machine can weld for a total of 8 minutes out of any 10 minutes at the rated current, and then must cool down during the remaining 2 minutes to prevent overheating.
(8 min./10 min.) x 100 % = 80 %

- Use of the machine exceeding the rated duty cycle can cause the machine temperature to exceeds its allowable value, and deterioration or burning of the machine may be the result.
- If the machine is used in combination with other products, such as welding torch, please apply the lowest rated duty cycle among the applied products.
- The indicated duty cycles at 40 °C or above are simulation value.

(GMAW)



(Pulsed GMAW)



• About “Maximum no-load voltage”

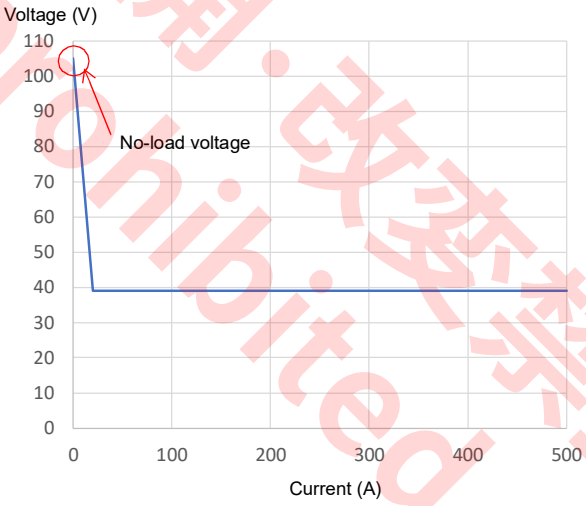
The teach pendant can display the welding voltage up to 62.5 V. Any voltage that is beyond 62.5 V such as the maximum no-load voltage is displayed “62.5” on the teach pendant.

2.5 About static characteristic

The static characteristic of this welding power source is the following constant voltage characteristic.

• Thermistor protection

The welding power source is equipped with the thermistor at the radiator fin of the semiconductor to monitor the temperature.When the welding power source is in an abnormal temperature state due to over-duty cycle, over-rated output current, or decrease in cooling efficiency, the control circuit is activated to stop the output and indicate the error state.



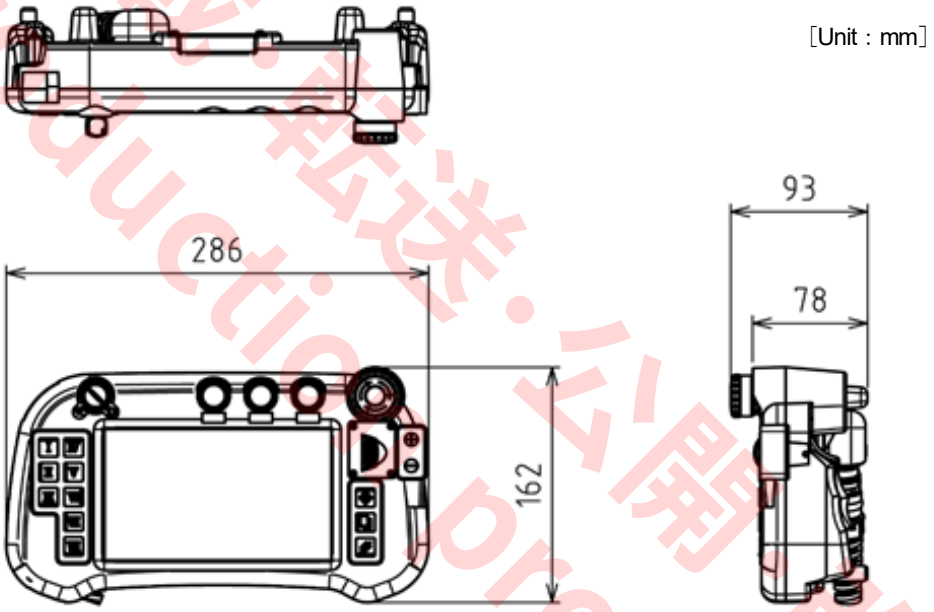
< Note >

Static characteristics no-load voltage varies by model.

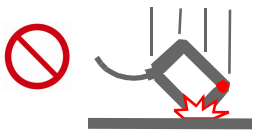
2.6 Teach Pendant

Item	Specifications
Model number	Y spec: WSAUR00001ZZ E spec: WSAUR00005ZZ
Environmental protection class	IP40 or equivalent
Display	7 inches width TFT color graphic LCD
Memory in TP	IC memory
SD memory card slot	SD memory, SDHC memory
USB 2.0 port	2
Enabling switch	3 points action
Emergency stop switch	1 point
Connecting cable	10 m (Dedicated cable, connector connection)
Mass (Weight)	Y spec: 980 g (Cables not included) E spec: 998 g (Cables not included)

［Unit : mm］

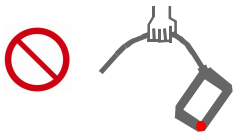


NOTIFY



Careful not to drop the teach pendant.
Or it may result in teach pendant damage and/or injury.

Do not place anything on the teach pendant.
Do not apply any strong force or impact especially on the LCD part.
Or it may result in damage of teach pendant and LCD.



Do not pick up or handle the teach pendant by the cable or the connector part.
Hold the teach pendant by the body at any time.
Or excess load will be applied to the connection, which can damage the teach pendant.

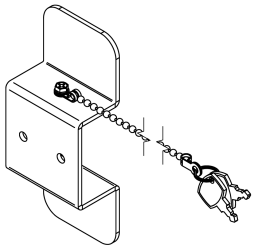
2. 7 Accessories for teach pendant

Description	Part number	Repair parts order number	Q'ty	Note	Safety part
Label for Key switch (Sheet type)	ANS31017	ANS31017	1		
Saddle	SP15N	SP15N	1		
Upset bolt	XVGZ3+F8FJ	YZA384	2		

2.8 Accessories for controller

Description	Part number	Repair parts order number	Q'ty	Note	Safety part
TP hook (*)	WSAKC047PX	WSAKC047PX	1		
Bolt (*)	XVGZ3+F6FJ	YWW14	1		
Ball chain (*)	TM14-1L500	YAB47	1		
Mode select switch key (*)	AS6-SK-132	YAB178	1 set	2 pcs/set	
Name plate (For origin mark)	ANU51519	ANU51519	1		
Fastener key (For the front door lock)	Fastener attachment	-	2		
Clamp filter	J0KG00000014	J0KG00000014	1	Noise suppression component	
Nylon tie	AB150	YAW87	1	Noise suppression component	
Nylon tie fixture	TMS20	YWW39	1	Noise suppression component	
Rubber sheet	AFQ41158	AFQ41158	2		
Bolt	XVGZ8+F25FJ	YZA239	2		
Washer	XWE8FJ	YZA225	2		
Nut	XNG8GFJ	YZA198	2		

(*) : They are factory assembled.



2.9 Connecting cable (Sold separately)

The cable connecting the manipulator and the controller is available separately. Prepare a cable of length suitable to the installation environment (position of the devices). The following shows details of our standard cable model.

Note

It requires 1 m for the height of the controller.
Prepare a cable that is 1 m longer than the layout length between the controller and the manipulator.

Cable length	Part number	Specifications	Outside diameter	Bend radius at the time of installation
5 m	AWU03837L5M	For fixed wiring	23.6 mm	185 mm or more

Two pieces of ground cable; AWC42164LM (5 m in length, 14 mm^2 in sectional area (AWG6)) are included in the connecting able unit.

- Flexing cable (Made-to-order)

Lay the cable on a place free from tension or twist to the cable.

Cable length	Part number	Specifications	Outside diameter	Bend radius in motion
5 m	AWU03866L5M	For mobile	24.6 mm	246 mm or more

Two pieces of ground cable; AWC42164LM (5 m in length, 14 mm^2 in sectional area (AWG6)) are included in the connecting able unit.

Note

- For other cable lengths, please consult Panasonic representatives.
- Install manipulator and controller so that the distance between two is 30 m or shorter.

3. Transportation

3.1 Transportation methods

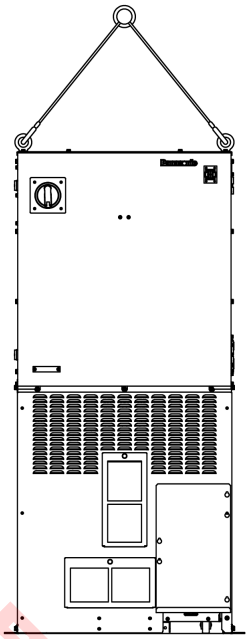
⚠ CAUTION

In case of using a crane, be sure not to stand under or near the lifted controller.
In case of using forklift, be sure no personnel shall hold the controller. Otherwise, there is a risk of injury.

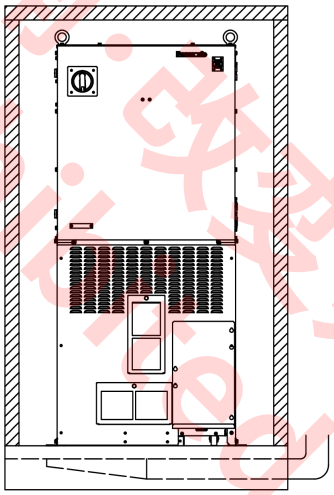
Any transportation method that may apply any shock to the controller shall be avoided.

(1) Crane or forklift should be handled by qualified personnel.

(2) In principle, use a crane to transport a controller for installation or re-installation. When a crane is used, hang the controller with double-wire through the attached two eyebolts as illustrated in the figure on the right.
- Double-wire hanging method.
  Hook the wires to the provided eyebolts.



(3) In case it is necessary to use folk lift for transportation, pack and fix the controller in the transportation package before moving it.



About eyebolts

Eyebolts are important safety parts. When they are lost or broken, purchase Panasonic genuine eyebolts for your safety.

4. Installation

> **⚠ CAUTION**
>
> The installation shall be made by qualified installation personnel and should conform to all national and local codes.

4.1 Choosing an installation site

- Locate indoors with ambient temperature 0 °C to 45 °C.
- Avoid exposure to direct sun light.
- Locate the controller outside the work envelope of the manipulator and also as close to the manipulator as possible.
- Locate in a place with low humid, less dusty and less oily smoke.
- Free from flammable or corrosive gas.
- No obstacle within the work envelope of the manipulator.
- A place where inspection and disassembling work can be conducted easily.
- A place large impact or vibration is not transmitted.
- A place no large electrical noise source exists.
- Avoid exposure to the rain, water spray or snow.
- Humidity relative to temperature:
  - Up to 50 % at 45 °C
  - Up to 90 % at 20 °C
- Altitude above sea level: Up to 2 000 m.
- Inclination to installation surface: Max. 10 degrees.

  < Note >

  When installing the product on a inclined surface, make sure to fix the product to the floor.
- Avoid wind to the arc (Provide windshields.)
- Free from abnormal amount of dust, acid, corrosive gases or substances etc. other than those generated by welding process.
- Avoid places where metallic substances or combustible foreign materials can get into the welder through the air inlets.
- IP code

Part	IP code
Controller body	IP54 or equivalent
Teach pendant	IP40 or equivalent

Note

- If a significant noise source (plasma or high frequency etc.) exists at or around the installation site, please consult us in advance.
- Refer to the environmental protection class (IP class) of each machine. (See “Specifications”)

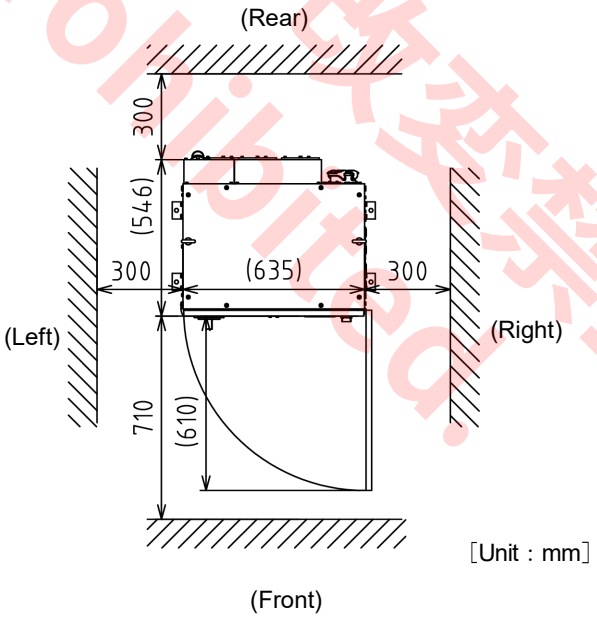
4.2 Installation site

(1) Locate the controller outside of the work envelope of the manipulator and also outside the safety fenced area. Make sure to maintain space from any wall or peripheral equipment (see the figure on the right) from any wall or peripheral equipment for maintenance and inspection work and to control temperature inside of the controller.

(2) Do not place anything above and lower part of the controller. Temperature inside the controller rises which may cause temperature anomaly.

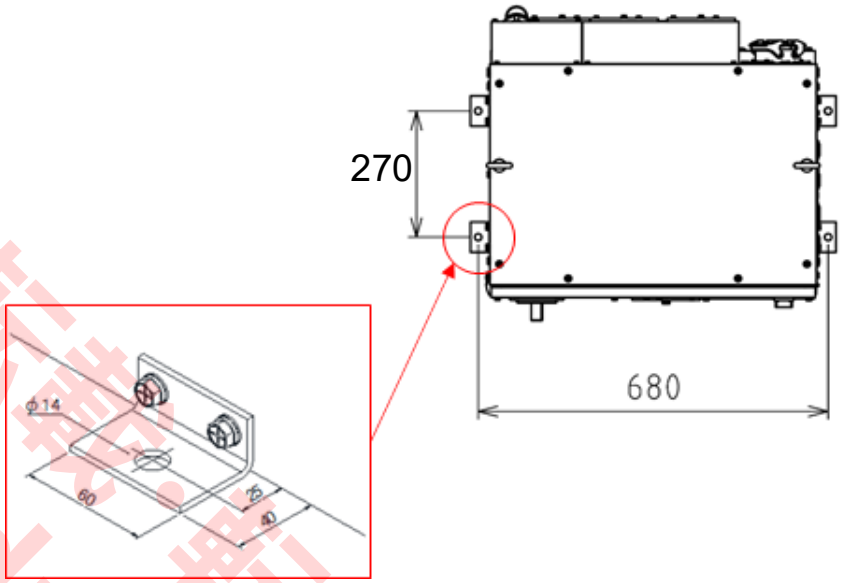
< Note >

The case of the controller works as heat radiator. Do not interrupt the cooling effect.



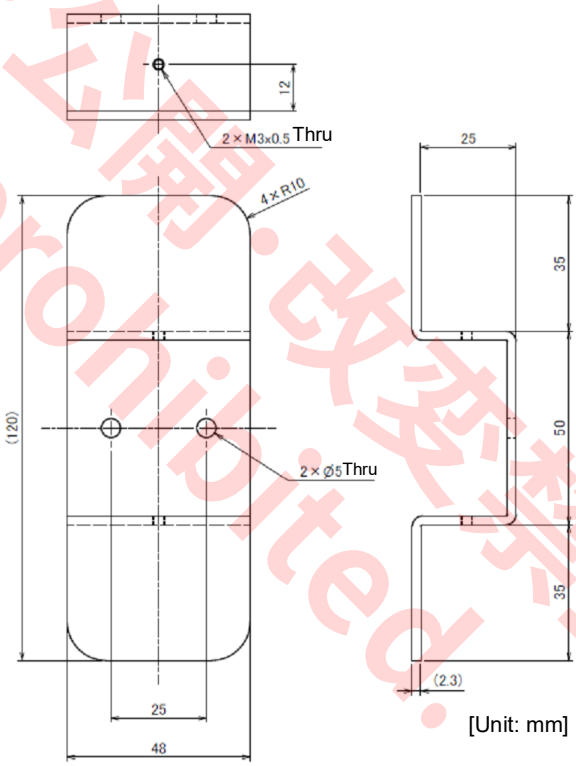
［Unit : mm］

(3) Installation method
Fix the fixing plates of the controller to the ground or bedplate with M12 anchor bolts.



(4) Teach pendant
Hook the teach pendant on the provided TP hook.
TP hook should be installed outside of both the safety fence and the work envelope of the manipulator so as to prevent possible danger due to mode change inside the safety fenced area. A mode switch key is chained with ball chain to the TP hook.

●TP hook



[Unit: mm]

5. Connection

⚠ CAUTION

The installation shall be made by qualified installation personnel and should conform to all national and local codes. Otherwise, there is a risk of fire and electric shock.

⚠ CAUTION

Carefully route the cables to the controller, such as cable between manipulator and controller and TP cable, so that a person won't step on or a forklift won't run over the cable. If not, a person can stumble over the cable or the cable can be damaged to generate unexpected operation of the manipulator, which can cause injury.

5.1 Connecting the controller to the manipulator

5.1.1 Connecting cable for the manipulator

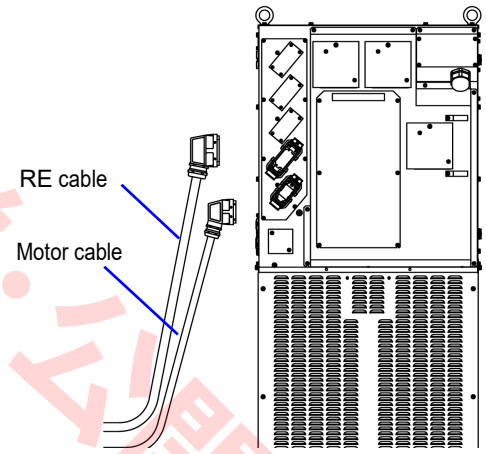
(1) Connect the motor cable and RE cable to the connectors3 for controller and manipulator respectively. Make sure to push the cables until the gap between the connector and cable connector case becomes 1 mm or smaller.

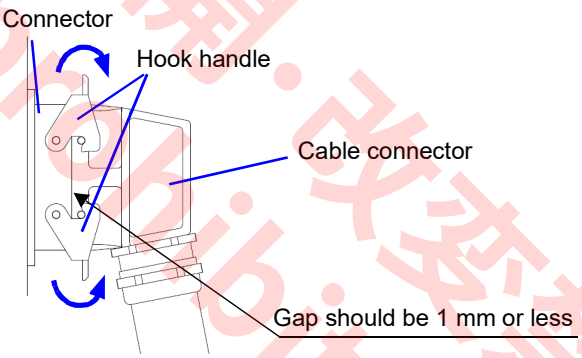
< Note >

Wide gap between the plug and the receptacle may cause bent pin of the connector.

(2) Push down the hook lever to the arrow direction and lock the plug.

(3) Reaffirm that the cable is locked completely.



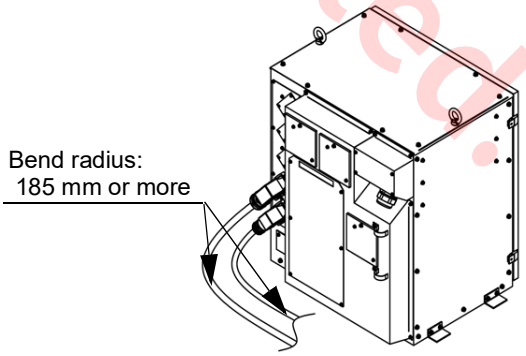


Note

- Make sure to connect the controller to the manipulator of the same production number as the controller. The origin data of the manipulator (robot position control origin), which forms a pair with the controller is saved in the controller.
- Connecting cable is sold separately. Prepare a cable of the length suitable to the installation environment (position of the devices). For details, please refer to section "2.9 Connecting cable (Sold separately)".

Note

- For RE cable and motor cable, secure at least 185 mm bend radius.
- At the time of laying those cables to the front side of the controller, do not bend them forcibly, or it can cause breaking of wire. Lay the cables naturally.
- Rout it so as to avoid load to be applied. As for the flexing cable, refer to section "2.9 Connecting cable (Sold separately)".



5.1.2 Connecting cables for the built-in welding power source

(1) Connect the output cable (customer preparation) from welding power source to the output terminal (-) for “BASE METAL” with attached M8 bolt. (Recommended tightening torque: 10.1 N•m-13.4 N•m)
(2) Connect the welding power cable to the output terminal (+) for “TORCH” with the attached M8 bolt. (Recommended tightening torque: 10.1 N•m-13.4 N•m)
(3) Connect the base metal voltage detection cable (-) to the voltage detection terminal on the left side of the output terminal (-) for “BASE METAL” terminal.
(4) Re-install the output terminal cover back in place.

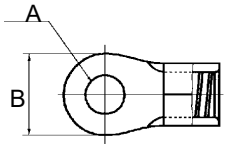
No.	Name	Remarks
a	Output (-)	For base metal Bore diameter: 10.5 mm Connect with the provided M8 bolt.
b	Output cable	*Customer preparation article (Cable size: 60 mm^2 or more in dia.)
c	Output (+)	For welding torch Bore diameter: 10.5 mm Connect with the provided M8 bolt.
d	Power cable *1	5 m (standard)
e	Base metal *1 detection cable	10 m Bore diameter: 6 mm
f	Terminal cover	

*1: Provided as incidental equipment.

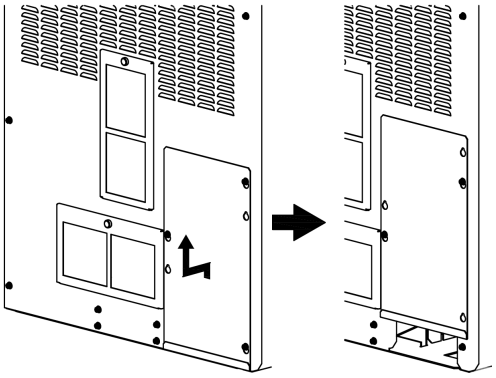
Note

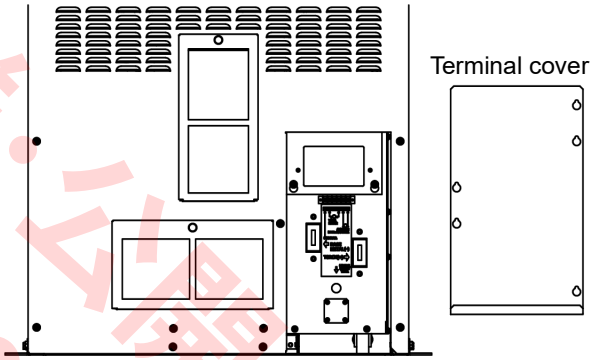
After connecting the base metal cable and the power cable, make sure to insulate the connecting part with insulating tape.
• Output cable should be a welding cable or a tough rubber sheathed cable (excluding one with vinyl). The cable length should not be unnecessarily long.
Treat the end of the cable with crimp terminal. Use the crimp terminal of the following size.

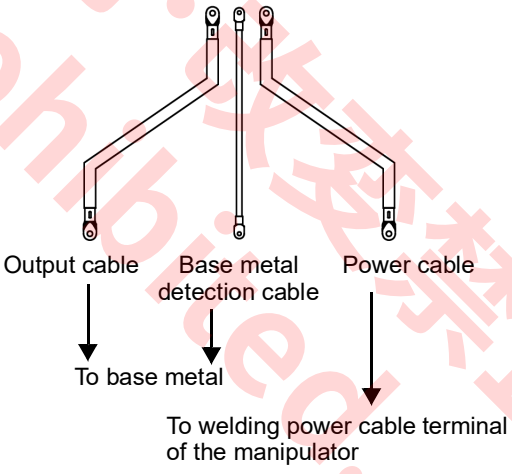
A	dia. 8.4 mm
B	29 mm or less



<Connection of Output cable/Power cable>
Terminal cover is factory installed at the lower left position at shipment. After completing connection of the output and power cables, fix the terminal cover at the lower right position.





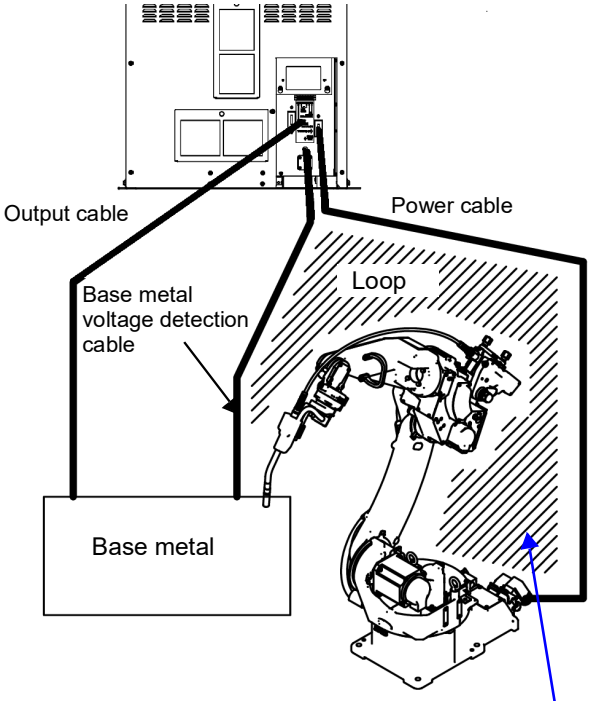


Note

To show maximum performance of the product, observe the following important points and connect cables properly. Improper connection can cause troubles such as unstable arc (increase in spatter).

<Important points>

- Route the base metal voltage detection cable and the torch side voltage detection cable that is incorporated into power cable and torch cable as close as possible to minimize the “Loop” area that is surrounded by those two cables. Minimizing the “Loop” area may reduce the influence of the induction noise.
- If it is necessary to extend the output cable, the longer the distance (or cable length) is, the more significant the influence caused by the size of “Loop” area becomes. Route the cables attentively to reduce the “Loop” area as much as possible.
- Route the base metal voltage detection cable with the minimum length. Cut off the excess

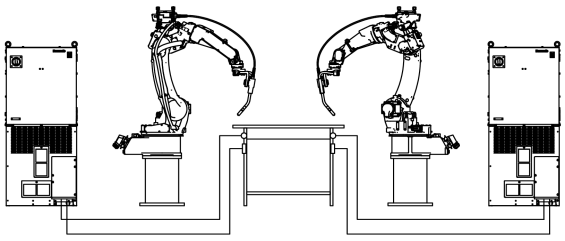


Route the base metal voltage detection cable along the robot power cable as much as possible to minimize the loop (the shaded area).

5.1.3 Remarks on using multiple robots

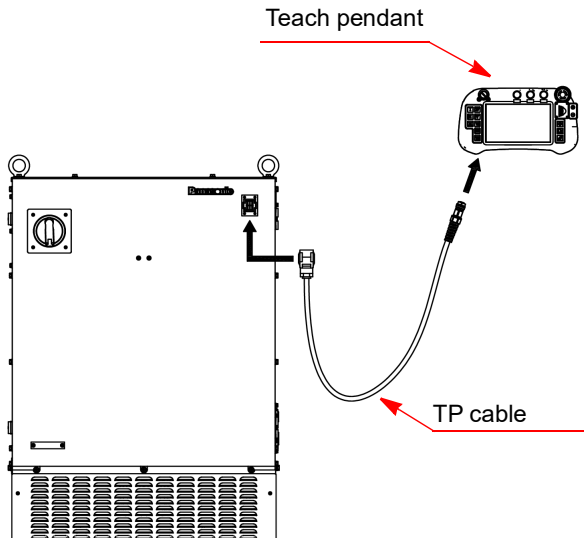
To weld one workpiece with multiple robots, observe the following:

- Connect the work cable and voltage detection line of each robot to the closest possible portion to each weld. Be sure the distance between each robot’s cable/line connection portions is 500 mm or more. (Weld output of other robots can make the weld unstable)
- Be sure the multiple robots do not share one work cable or voltage detection line.

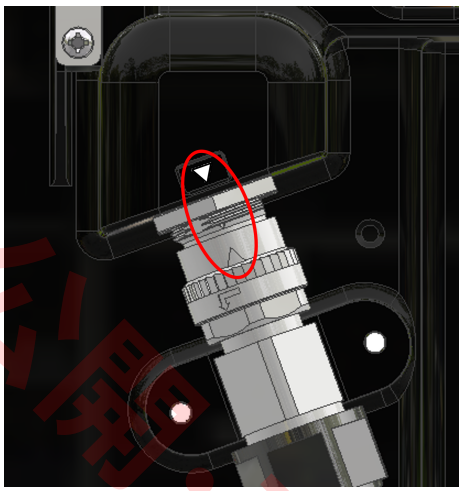


5.2 Connecting teach pendant

Connect the TP cable to the connector of the teach pendant.



Match the △ mark on the TP cable side connector and the △ mark on the TP case.
Then insert the connector straight so that it does not tilt until it makes a clicking sound.



Note

To disconnect the TP cable, turn the TP cable side coupling in the direction of the arrow shown on the figure, and then pull it out straight.

5.3 Grounding wire connection

⚠ WARNING

HIGH LEAKAGE CURRENT
Provide grounding work before connecting grounding wire to conductive parts to ground high leakage current to the ground. Otherwise, risk of fire and electric shock.

⚠ CAUTION

Provide grounding to the protective earth terminal (PE) of the controller exclusively.
Check the grounding work before operation. Otherwise, there is a risk of fire and electric shock.

<Grounding>

Use a cable with 14 mm^2 in diameter or more to provide protective grounding. The protective grounding guides leaked current to the ground to prevent electric shock caused by leaked current.

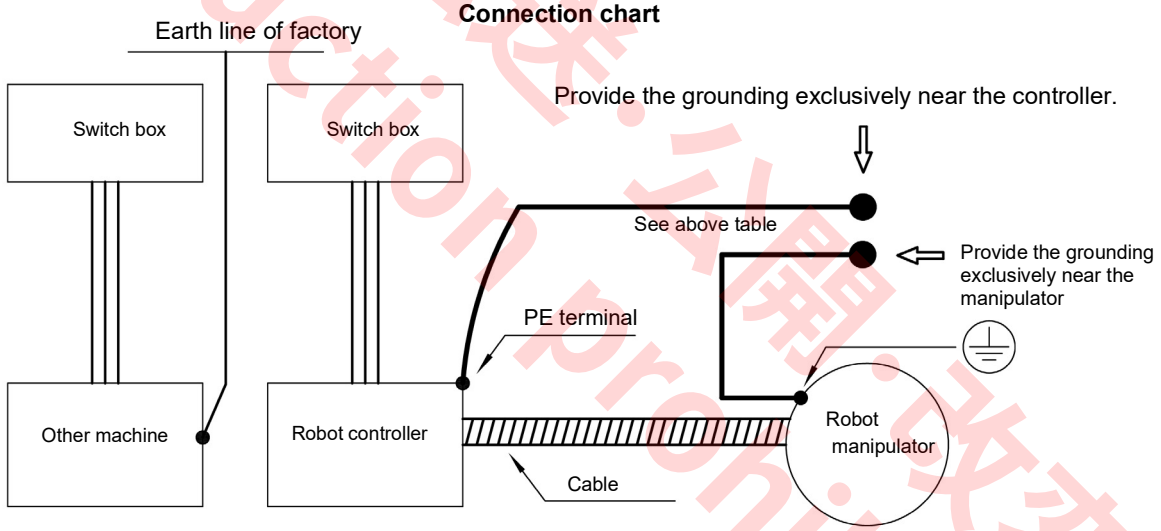
Two 14 mm^2 (AWG6) Green/yellow wires are supplied for grounding.

Note

Size of the protective grounding wires for other devices shall be according to the corresponding instruction.

Countries	Grounding resistance	Size of protective grounding wire
Japan	100 ohm or less	14 mm^2 or more.
EU	100 ohm or less	14 mm^2 or more.
USA	0.1 ohm or less	AWG6 or more
Others	Conform to all national and local codes	

Connection chart



5.3.1 Maximum allowable fault loop impedance

It meets the requirements of EN 60364-4-41 under the following conditions:

* Input cable and ground cable should be 10 m or less.

Type of TN system

CB, CP, NFB		System Voltage	Maximum
Model	Rated Current		
BW100EAG-3P075	75 A	197 V	0.17 ohm

(1) In the case of TT system, the rated sensitivity current and maximum allowable fault loop impedance may be specified by EN standards, so follow the instructions of EN standards.

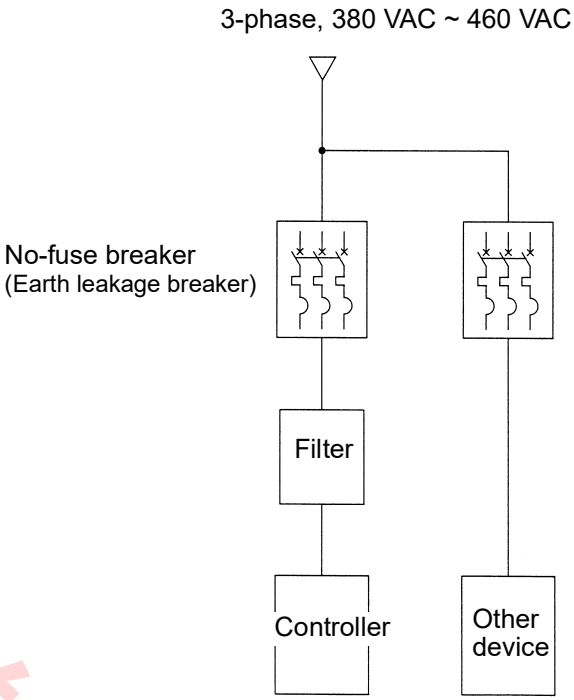
5.4 Connecting primary power source

5.4.1 Wiring of primary power cable

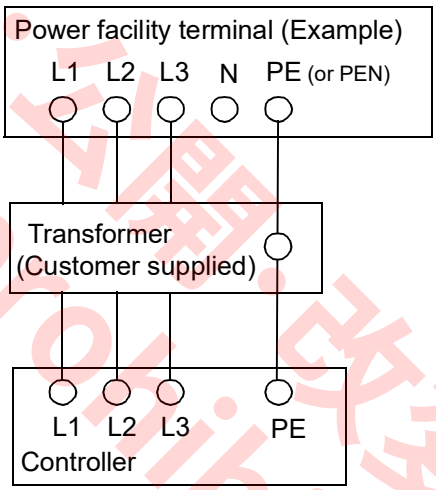
Input power capacity	Power cable
37 kVA (26 kW)	14 mm^2 or more AWG6 or more

- Be sure to provide no-fuse breaker (earth leakage breaker) or switch with fuse of specified capacity for each controller separately.
  YA-2K series: 75 A

- If an earth leakage breaker is used, make sure to provide specified grounding work. It is recommended to use an earth leakage breaker of medium sensitivity and high speed type. The recommended rated sensitivity currents that can prevent malfunction of the earth leakage breaker are as follows.
  - a robot used alone: 100 mA,
  - a robot with external axes: 200 mA
  For details and about grounding work, please consult your local electrical engineers.
- To prevent noise from entering from the power cable, if it is the case, install a filter before the primary input.



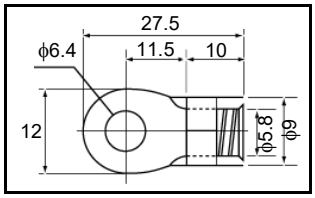
To connect to a power facility other than 380 V ~ 460 V:
- You can use PEN for the ground terminal PE of power facility.
- Do not use the terminal “N” of the power facility, if any.
- Please prepare a transformer to convert voltage to 380 VAC ~ 460 VAC at your end.

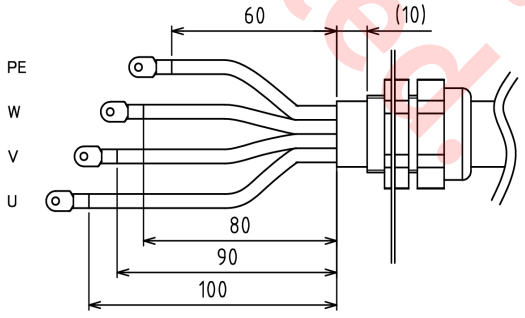


Note

Here shows the specifications of the terminal part of the input power cable for this product. Please prepare at your end.

Recommended clamp terminal: 14 mm^2, M6





5.4.2 Connecting primary cable

⚠ CAUTION

To prevent electric shock, turn off the power switch of the power distribution box before connecting input cable, and confirm safe before operation. Otherwise there is a risk of electric shock and injury.

NOTIFY

Do not connect a primary power cable of peripheral equipment to the breaker or terminal block inside the controller, or it will cause malfunction or breakdown. Otherwise there is a risk of breakdown and malfunction.

Refer to the following specifications and prepare the main unit connection end part of the input power cable.

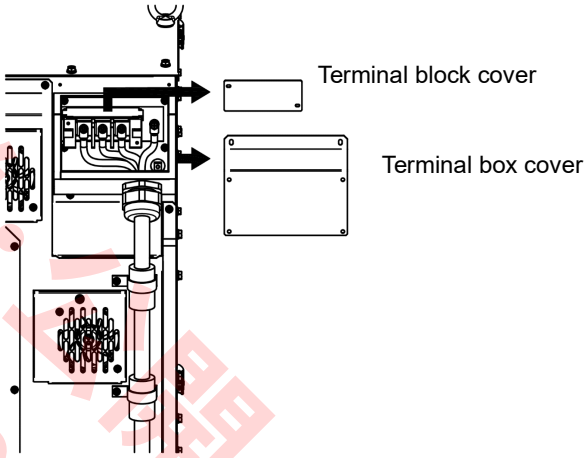
* Recommended crimp terminal: 3.5 mm^2 or more, M6

(1) Remove the terminal box cover, terminal block cover, and two saddles.
- Terminal box cover: M4 screw
- Terminal block cover: M3 screw

(2) From the bottom of the terminal box, pass the input power cable through the cord lock, and then connect the cable to the input power terminal.
- Outside diameter of the cord lock adaptive cable: 32 mm to 34 mm

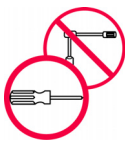
(3) Install the terminal block cover and terminal box cover.

(4) Protect the cable coating with the attached rubber sheet, then fix the input power cable to the bottom of the terminal box with the attached saddle.



Note

Connecting screw
- Do not use a wrench
- Tightening torque: 2.5 N•m to 3.0 N•m



5.4.3 Door handle

Normally the door handle is in the ON state during operation. The door handle is used to turn ON/OFF the switch.

Note

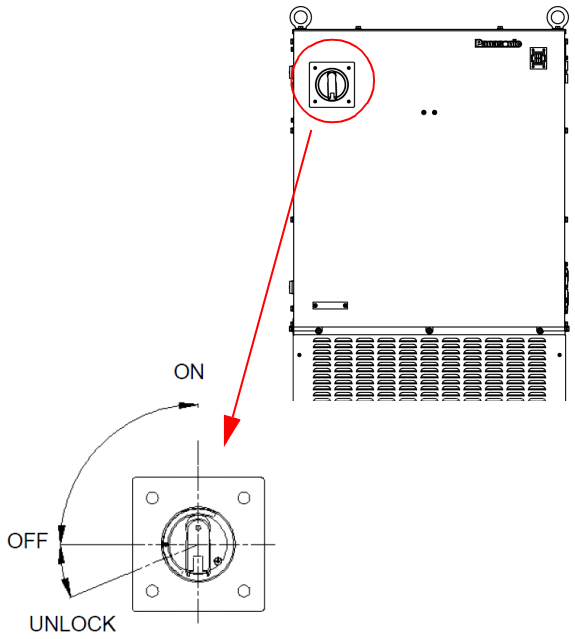
- Allow 3 seconds interval after turning off the door handle and before back ON again.
  If the interval is not long enough, the alarm “Accidental power failure is detected.” can occur. In such a case, turn power on again.
- Please allow 3 to 5 minutes of cooling down of the inside of the built-in welding power source after completing welding operation before turning off the door handle.

< Operation >

(1) Turn the door handle clockwise to turn ON the switch, and counter-clockwise to turn it OFF. Turn the door handle counter-clockwise further to UNLOCK the door.

(2) Before closing the door, set the handle to the OFF position.

* When the door switch is turned on, power to the robot controller part and built-in welding power source are turned on.



5.4.4 Lock switches with padlock

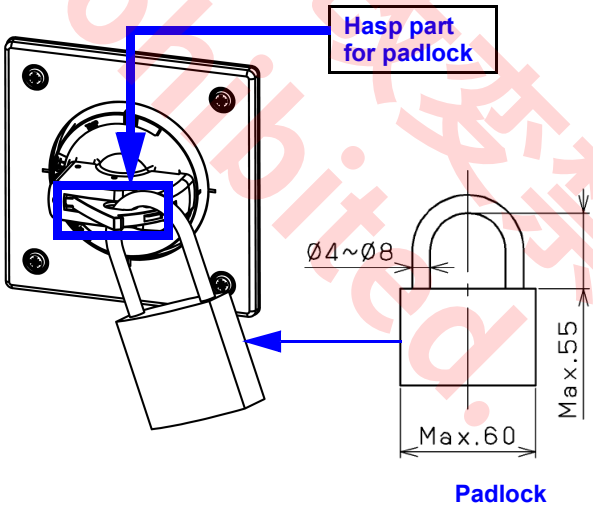
1) Lock the door handle switch

Use a padlock (customer preparation) to lock the door handle at the OFF position regardless of the door opened/closed state.

(a) Set the door handle to the OFF position.

(b) Push the end of the handle, then the hasp for a padlock comes out.

(c) Put a padlock on the door handle to lock.



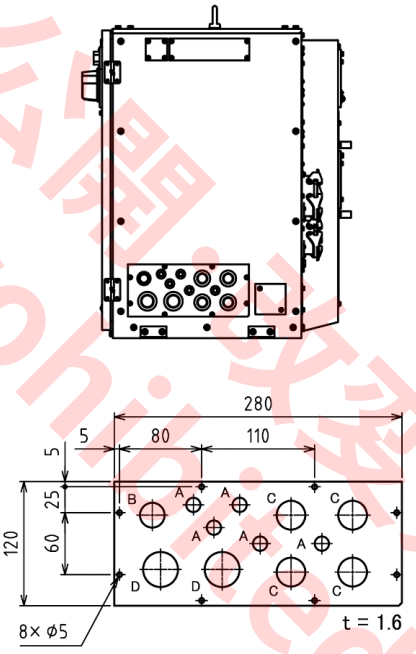
5.5 Connecting and control method of external device

NOTIFY

Observe the following instructions in case of connecting external equipment.

- Apply a radio shield wire as I/O connecting cable between an external device and robot I/O circuit in order to protect the controller from noise.
- Connect the shield wire to the FE terminal (⏚) on the rear side of the controller.
- The FE terminal is provided to prevent noise.
- If a system comprises a machine which generates high frequency (such as TIG, plasma), the robot I/O circuit may be damaged by the high frequency noise. Be sure to design so that any external input to the system should use a no-voltage contact signal and any output to an external device should be converted into relay contact output.
- Do not place anything other than optional units specified by us inside the controller. Failure to follow the instruction can cause an abnormal temperature error or to fail in securing safety.
- At the time of wiring to the inside of the controller, make sure to apply measures against noise by running the lead-in cables along the side panel or base panel to keep the lead-in cables away from the boards and cables inside the controller.
- If a trouble, such as an error stop, whose probable cause is noise from external equipment occurs, use a noise filter unit. The noise filter unit prevent introduction of external noise into the unit. For details, please refer to section “5.6 Using noise filter unit“.
- Do not connect the ground cable to the COM of the sequencer card. Otherwise, it will cause the controller to malfunction or break down.

• For cables to be connected with an external device or robot I/O circuit, draw cables through the wire ports of the IO panel at the right bottom of the controller. At that time, remove the grommet with membrane from the wire port to be used.
Use cord lock or the like to fix the cable.



As for each of the following connections, please refer to the specified section.

Safety I/O circuit	Functional safety manula
External device	6. External Control Signal Connection

I/O panel hole diameter (Unit: mm)	
Hole A (5 pcs.)	14
Hole B (1 pcs.)	24
Hole A (4 pcs.)	28
Hole A (2 pcs.)	34

5. 6 Using noise filter unit

● Part list

No	Description	Q'ty	Note
1	Clamp filter	1	Accessories
2	Fixing band	1	
3	Fixing plate	1	

● Installation

(1) Connecting procedure varies with COM the signal wire is connected to. (See the figure on the right.)

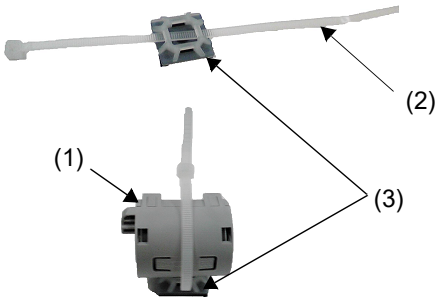
(a) Disconnect the signal wire from COM , wind it around the clamp filter four turns, and then connect it to COM (A).

(2) Bind the clamp filter and the fixing plate and fix them on the bottom plate of the controller.

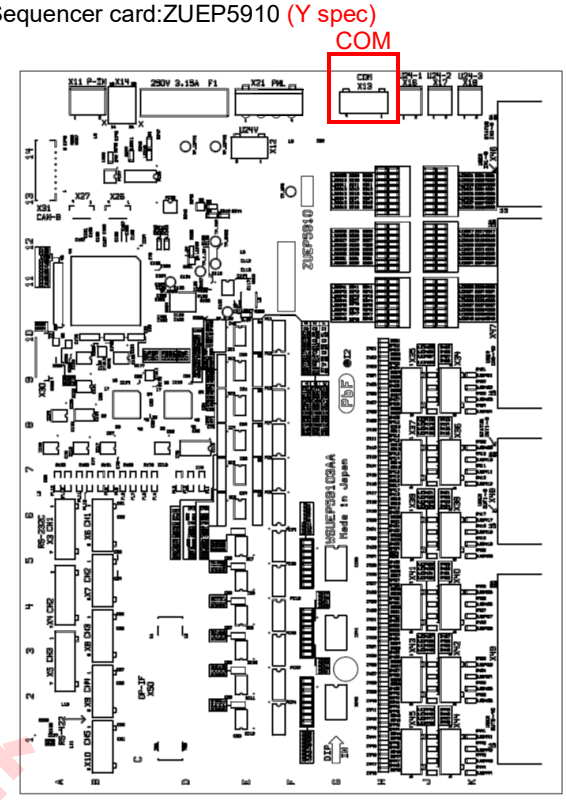
Note

Check the following of the following phenomena occur.
The detector activates without a collision.
The servo turns off on its own during the welding operation in program test mode.
A file closes on its own during the welding operation in program test mode.

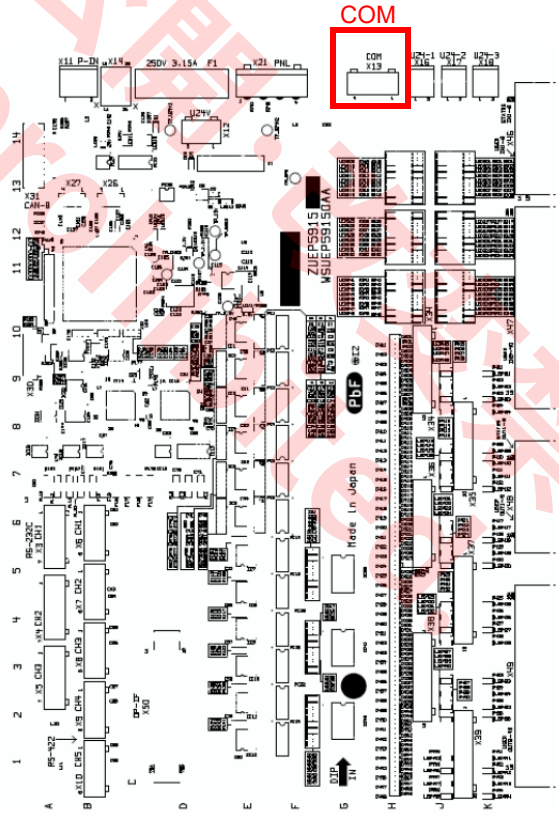
- Check if shielded cables are used.
- Check if the clamp filter is attached to the input/output signal cable.
- Disconnect all input/output signal wires and then check if the above phenomena still occur. If the same error occurs, please consult your local Panasonic distributor.



Sequencer card:ZUEP5910 (Y spec)



Sequencer card:ZUEP5915 (E spec)



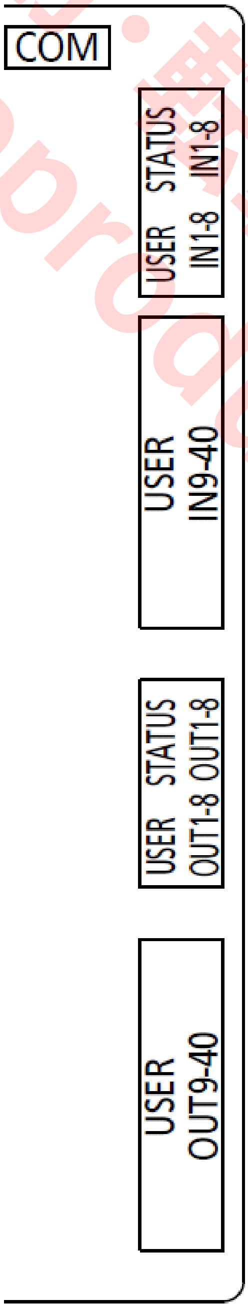
6. External Control Signal Connection

6.1 Terminal location of the sequencer card

Specifications	Part number	Output type
E	ZUEP5915	Open collector (PNP)
Y	ZUEP5910	Open collector (NPN)

Note

- Allocation of User I/O terminals vary with start method.
- Terminals marked with
  *: An additional setting is needed to enable the signal.
  **: Functions vary with the circuit board (see left table).



USER IN 1-8 / STATUS IN 1-8	1A	User-IN007	1B	User-IN008
	2A	User-IN005	2B	User-IN006
	3A	User-IN003	3B	User-IN004
	4A	User-IN001	4B	User-IN002
	5A	Start	5B	Hold
	6A	(Reserved)	6B	Error release
	7A	Operating mode	7B	Teaching mode
	8A	Servo ON	8B	OPR confirm

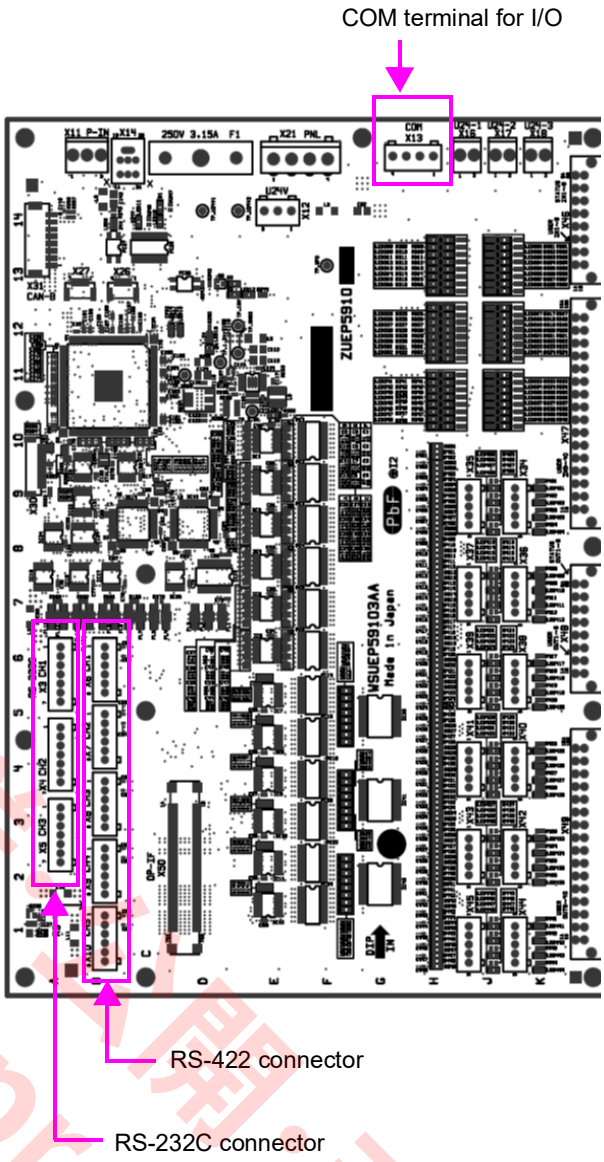
USER IN 9-40	1A	User-IN039	1B	User-IN040
	2A	User-IN037	2B	User-IN038
	3A	User-IN035	3B	User-IN036
	4A	User-IN033	4B	User-IN034
	5A	User-IN031	5B	User-IN032
	6A	User-IN029	6B	User-IN030
	7A	User-IN027	7B	User-IN028
	8A	User-IN025	8B	User-IN026
	9A	User-IN023	9B	User-IN024
	10A	User-IN021	10B	User-IN022
	11A	User-IN019	11B	User-IN020
	12A	User-IN017	12B	User-IN018
	13A	User-IN015	13B	User-IN016
	14A	User-IN013	14B	User-IN014
	15A	User-IN011	15B	User-IN012
	16A	User-IN009	16B	User-IN010

USER OUT 1-8 / STATUS OUT 1-8	1A	User-OUT007	1B	User-OUT008
	2A	User-OUT005	2B	User-OUT006
	3A	User-OUT003	3B	User-OUT004
	4A	User-OUT001	4B	User-OUT002
	5A	Running	5B	Hold status
	6A	Ready	6B	Servo ON
	7A	Operating mode	7B	Teaching mode
	8A	Alarm	8B	Error

USER OUT 9-40	1A	User-OUT039	1B	User-OUT040
	2A	User-OUT037	2B	User-OUT038
	3A	User-OUT035	3B	User-OUT036
	4A	User-OUT033	4B	User-OUT034
	5A	User-OUT031	5B	User-OUT032
	6A	User-OUT029	6B	User-OUT030
	7A	User-OUT027	7B	User-OUT028
	8A	User-OUT025	8B	User-OUT026
	9A	User-OUT023	9B	User-OUT024
	10A	User-OUT021	10B	User-OUT022
	11A	User-OUT019	11B	User-OUT020
	12A	User-OUT017	12B	User-OUT018
	13A	User-OUT015	13B	User-OUT016
	14A	User-OUT013	14B	User-OUT014
	15A	User-OUT011	15B	User-OUT012
	16A	User-OUT009	16B	User-OUT010

- **Sequencer card**

Terminal or connector	Application
COM	Common.



6.2 Serial interface

The sequencer card is provided with serial connectors to connect optional units and/or welding power source.

Connector	Application
RS-232C RS-422	For an optional units or digital communication of welding power source.

Refer to the following correspondence table of port numbers and connectors.

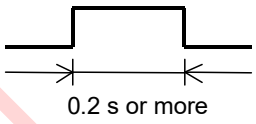
Connector	Port number	Connector symbol
RS-232C	Port 1	232C-1(X3)
	Port 2	232C-2(X4)
	Port 3	232C-3(X5)
RS-422	Port 1	422-1(X6)
	Port 2	422-2(X7)
	Port 3	422-3(X8)
	Port 4	422-4(X9)
	Port 5	422-5(X10)

6.3 I/O terminal equivalent circuit

<table>
<tr><td>Spec.</td><td colspan="2"></td></tr>
<tr><td>Y</td><td>

● **Input terminal equivalent circuit**

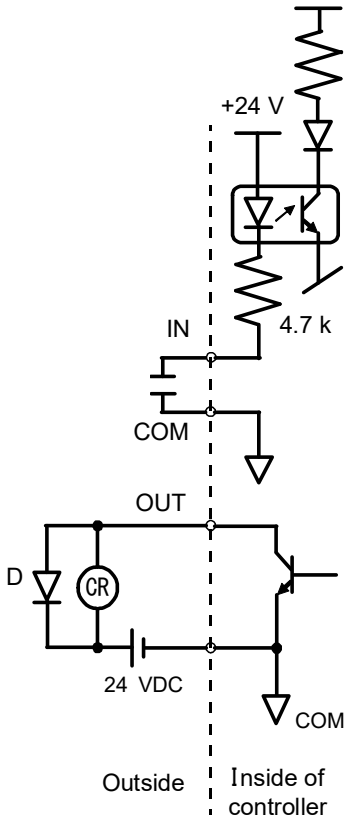
• To receive no-voltage ON/OFF contact signal from an external equipment.
• External relay contact to be connected... 1 ohm or less, Chattering .....10 ms or less
• Pulse amplitude of an input signal should be 0.2 s or more.



● **Output terminal equivalent circuit**

• Rated output is 24 VDC, 75 mA, NPN transistor open collector output.
• Use a relay whose coil voltage is 24 VDC and coil current is 75 mA DC or less, and attach a noise adsorbing diode: D (100 V, 1 A).

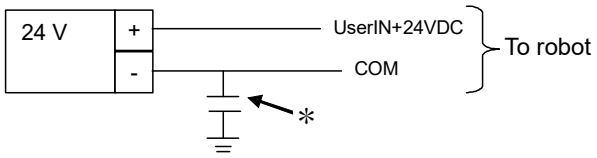
</td><td>



</td></tr>
<tr><td>E</td><td>

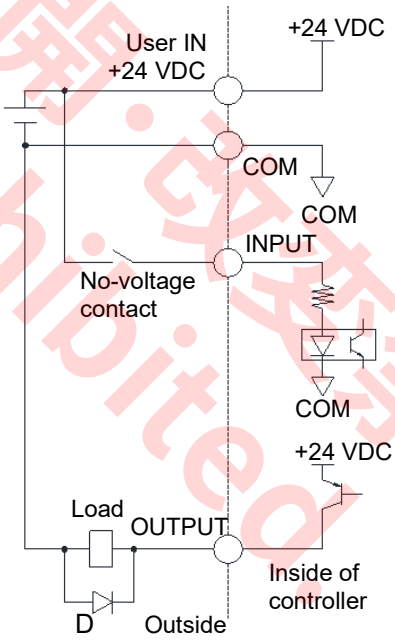
● **Power to activate input/output**

• It is necessary to apply 24 VDC of supply voltage between 24 VDC input and COM. Turn ON/OFF the power synchronous to the control power of the controller.
• The power to be provided by customer:
  • Voltage: 24 VDC +10 %/-0 %
  • Capacity: 75 W or more
• Apply noiseless stable power is applied.
To remove the common-mode noise, refer to the following figure and input the capacitor.
* Recommended capacitor: Film capacitor 0.1 μF, 50 VDC.



To the ground of the base panel of the robot controller

</td><td>



</td></tr>
</table>

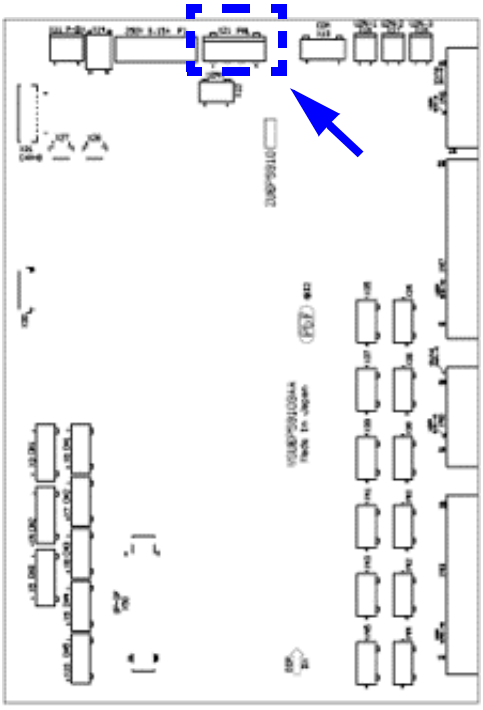
	● **Input terminal equivalent circuit:** • To receive no-voltage ON/OFF contact signal from an external equipment. • External relay contact to be connected 1 ohm or less • Chattering 10 ms or less • Pulse amplitude of an input signal should be 0.2 s or more. ● **Output terminal equivalent circuit** • Open collector (PNP) output. • Rated output is 24 VDC, 75 mA • Use a relay whose coil voltage is 24 VDC and coil current is 75 mA DC or less, and attach a noise adsorbing diode: D (100 VDC, 1 A). • Rated load of the emergency stop output: 5 A, 30 VDC.	

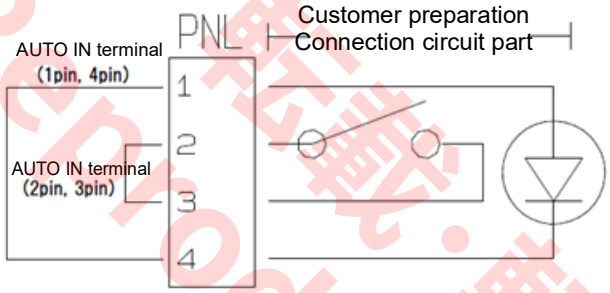
6.4 Auto start settings

For details of settings and usage of the auto start, please refer to the operating instructions (Teach pendant for arc welding industrial robots.)

6. 5 External interlock release input

PNL connector is provided as the input part to release the interlock of the sequencer card from outside. To use this function either connect the separately sold operation box to the connector or provide a connection circuit at user's end by refering to the following specification. To use it, software settings for this function is also needed.
For details, refer to the operating instructions (Operation).



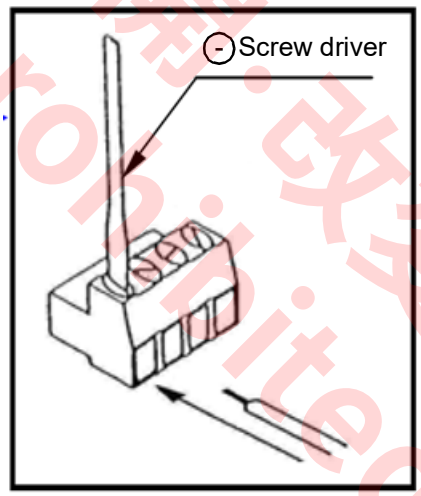


【Recommended rated specifications
Switch: 24 VDC, 3 A
LED: 24 VDC, Rated current: 10 mA
(Limited resistor insid LED: 2.4 k-ohm)

Procedure to release the interlock

(1) After switch the mode select switch on the teach pendant to AUTO side,
Turn on the "AUTO MODE" on the operation box, or turn on the switch that is connected to the "AUTO IN" of the customer prepared part.

(2) In AUTO mode, after restarting from "Door stop input", turn on the "AUTO MODE" on the operation box, or turn on the switch that is connected to the "AUTO IN" of the customer prepared part.



- **PNL connector part**
The plug part (see the figure on the right) of this PNL connector part is removable.
To connect a lead wire, remove the coating of the ellad wire about 7 mm from the tip, and then tighten it with a precision driver.
(Tightening torque: 0.5 N・m to 0.6 N・m)

Applicable electric wire: 0.2 mm^2 to 2.5 mm^2
(AWG24 to AWG12)

6.6 Status IN/OUT

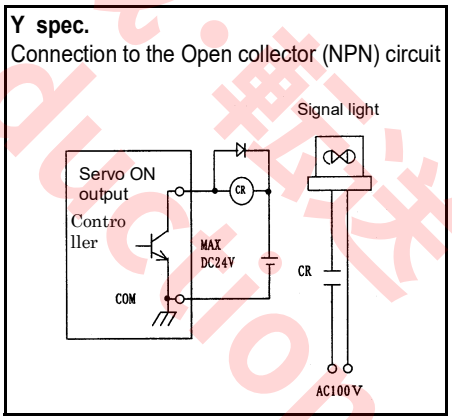
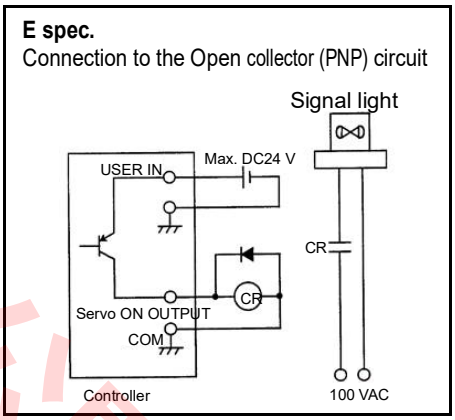
Dedicated input/output terminals to send signals when the robot is in specified state or to change robot status according to the signal received.

6.6.1 Status INPUT

● Dedicated input terminals

Status INPUT	Description
External servo ON input	Turn ON to enable servo power ON if the following conditions are all satisfied. Condition 1: Status output signal 'Ready' output signal is ON. Condition 2: Mode select switch is set to operation mode ('AUTO' position) and not in Mode error state. Condition 3: Mode select is set to auto-operation (in operation mode) Condition 4: Mode select switch is not switched to 'TEACH' position due to override in operation. Condition 5: The 'Emergency stop' input is not ON. The input signal must satisfy the following conditions. The input signal must be ON in 0.2 second after the 'Ready' output signal goes ON. The input signal must be kept ON for 0.2 second or more. If you try to turn on servo within 1.5 seconds after turning it off, "Retry to turn on servo" is displayed and servo doesn't turn on .
Error release input	When the robot is in an error state and the error dialog box is displayed, turn ON this input to close the dialog box. At that time, the error output goes off if it is in ON state. Input signal is effective when the signal state is switched and kept for 0.2 second or more.
Start input	Turn ON this input signal to run a program. In a hold state, turn on to restart. The input signal is ignored under the following conditions. • The servo power is OFF. • Auto-operation is not set. • In error condition. • Stop input is ON. • In override state.
Stop input	• Turn ON this input signal to bring the operating robot into a hold state. • While the signal is ON, re-start, manual operation and trace operation are not operable. • The robot remains in a hold state even if this signal is turned OFF. • To restart operation, turn ON the start input signal.
Operating mode input	• It is to switch the mode from teaching mode to operation mode. • Use this input when the robot is in teaching mode and operation mode is desired. • When the input signal is turned ON, a message to switch the mode select switch to operation mode appears. • Switch the mode select switch to 'AUTO' or turn OFF the operating mode input to close the message box. Please be advised that while the message box is displayed, the robot is in the error state.
Teaching mode input	• It is to switch the mode from operation mode to teaching mode. • Use this input when the robot is in operation mode and teaching mode is desired. • When the input signal is turned ON, a message to switch the mode select switch to teaching mode appears. • Switch the mode select switch to 'TEACH' or turn OFF the teaching mode input to close the message box. Please be advised that while the message box is displayed, the robot is in the error state.
OPR confirm input	In case of using the operation box, turn ON this input signal to release the interlock occurred at the time of switching to AUTO mode. (You can also use the AUTO mode switch on the operation box to release the interlock.) **< Note >** • The interlock at the time of switching to AUTO mode occurs if the controller is equipped with the operation box either as standard (for UL or CE specification) or as optional. • It is necessary to complete the management settings for the operation box to enable this input. Please refer to the operating instructions (Operation) for details.

6.6.2 Status OUTPUT

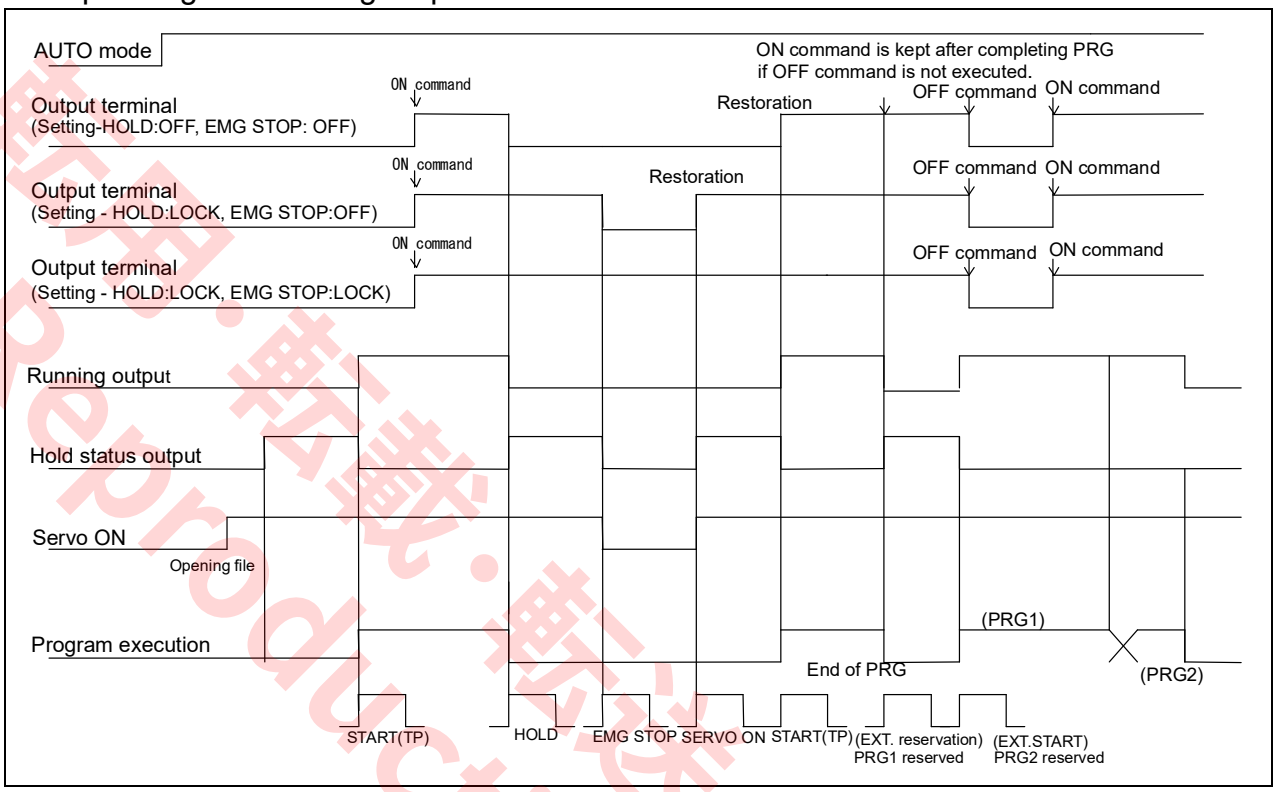
Status OUTPUT	Description
Alarm output	• The signal is output when the robot goes into an alarm condition. (At that time servo power is turned OFF) • Unless power is turned OFF, the output signal remains in ON state.
Error output	• The signal is output while the robot is in an error condition. • The signal is turned OFF when the error is released.
Operating mode output	• The signal is output in operation mode (including override.) • While the message box to switch to teaching mode is displayed (by turning on the 'Teaching mode' input), if the operation mode is selected, this signal remains ON.
Teaching mode output	• The signal is output in teaching mode (excluding override.) • While the message box to switch to operation mode is displayed (by turning on the 'Operating mode' input), if the teaching mode is selected, this signal remains ON.
Ready output	• The signal is output when the robot is ready to receive a status input signal. • It goes OFF when the robot is in an alarm condition or when the 'Emergency stop' input is ON.
Servo ON output	• The signal is output when the servo power is ON. <Examples of installing a signal light> **Y spec.** Connection to the Open collector (NPN) circuit  **E spec.** Connection to the Open collector (PNP) circuit 
Running output	• The signal is output while running a program (including override.) • It is turned OFF when the robot goes in hold or emergency stop state, and turned ON again when the robot is re-started.
Hold status output	• The signal is output when the running program is stopped in operation mode. • The signal is output while the robot is in a hold state due to an error or emergency stop input, and is turned OFF when re-started. • The signal is turned OFF when the mode select switch is placed in 'TEACH' position. When the mode select switch is placed in operation mode and the robot is ready to restart after turning on servo power, the signal is turned ON.

6.6.3 Status I/O to be allocated to user terminals

For details of setting procedure and functions of status I/Os allocated to the user terminals, please refer to the operating instructions (Teach pendant for arc welding industrial robots.)

6.7 Flowchart of Status Outputs

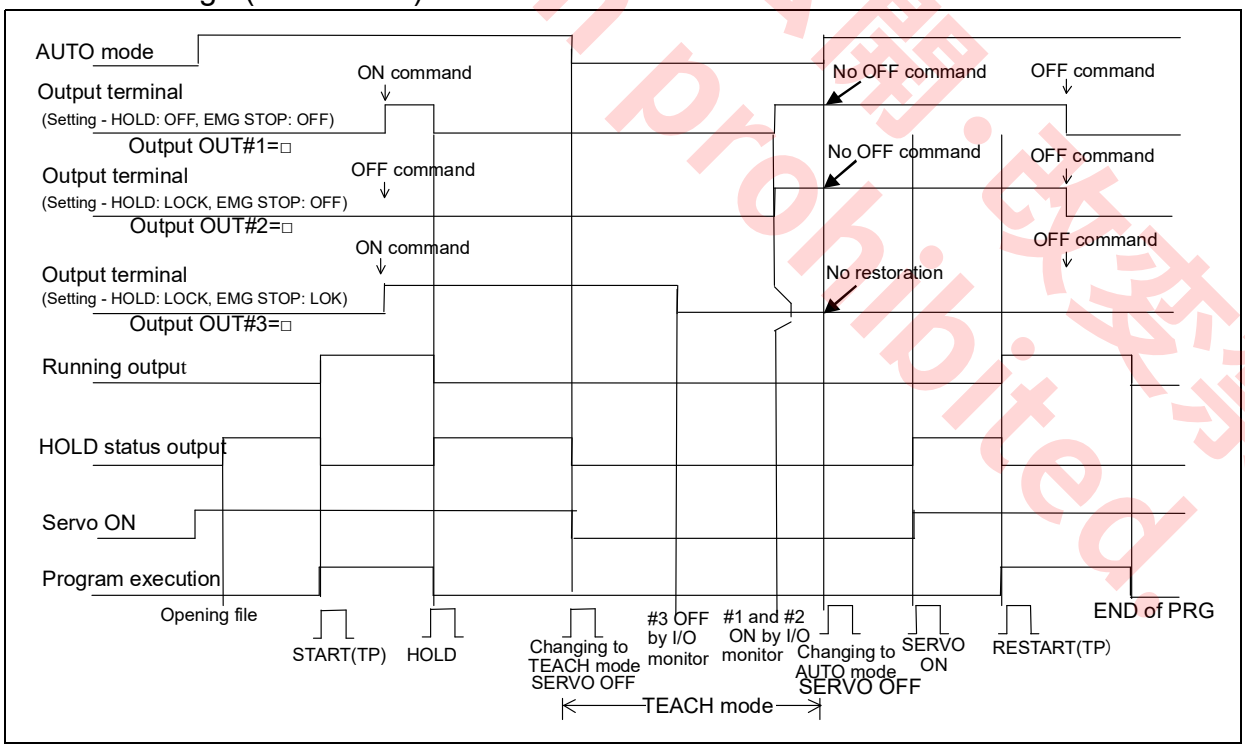
6.7.1 Operating and Holding output



Note

The chart is drawn as positive logical setting case.

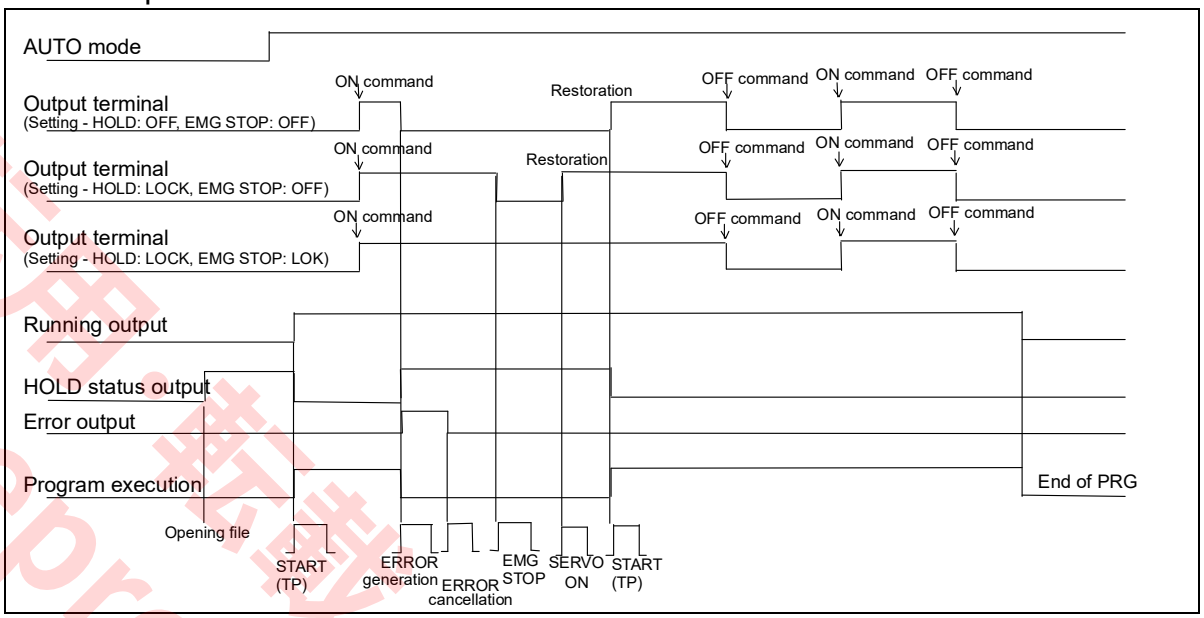
6.7.2 Mode change (I/O monitor)



Note

The chart is drawn as positive logical setting case.

6.7.3 Error output



Note

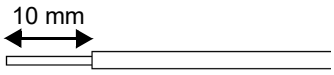
The chart is drawn as positive logical setting case.

6.8 Connecting to the sequencer card

- This part employs a connector. It is possible to remove it from the P.C. Board.
- It is a push-in type connector.

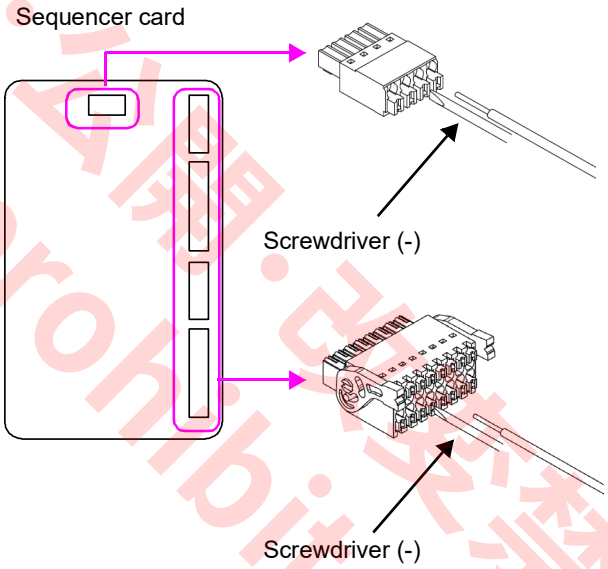
<Procedure>

(1) Peal off the insulation coating at the end part of the lead wire (about 10 mm from the end).



(2) With a flathead 2.5 mm screwdriver or so, insert the wire while holding down the button next to each terminal hole.

(3) Once inserted the wire properly, release the button next to the terminal to lock the wire.

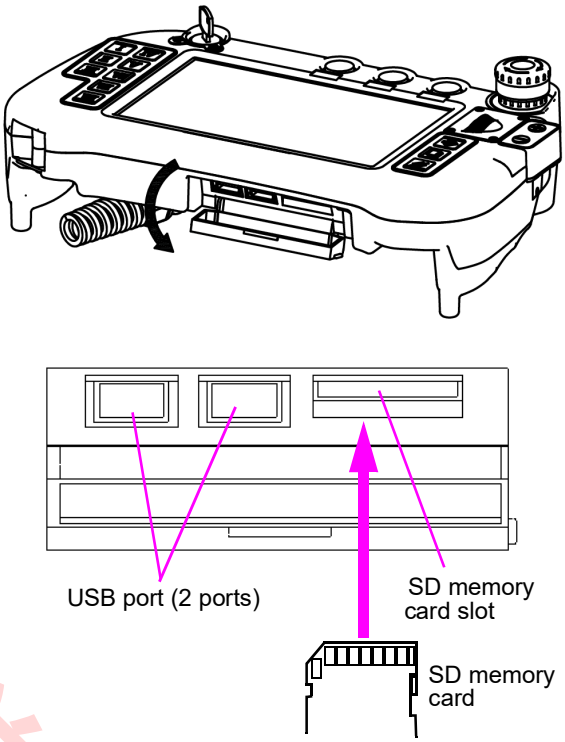


Applicable wire: 0.2 mm^2 to 0.75 mm^2 (AWG24 - AWG18)

Applicable wire size				About Ferrule terminal			
Single wire (mm^2)	Stranded wire (mm^2)	AWG	Bare wire length (mm)	Applicability	Tip diameter (mm)	Conductive part size (mm)	Recommended Ferrule terminal model number
0.2	0.2	24	10 or more	Applicable	1.5 or less	10 or more	AI 0.25-10 YE
0.3	0.3	22					AI 0.34-10 TQ
0.5	0.5	20					AI 0.5-10 WH
0.75	0.75	18					AI 0.75-10 GY

6.8.1 SD Memory Card slot (Teach Pendant)

The teach pendant is equipped with a SD memory card slot. Open the cover at the bottom of the teach pendant to access the SD memory card slot.
Open the cove and attach the memory card to it to use.



- SD MEMORY CARD

[SD]
Maximum capacity_2GB, Maximum speed_Class 10
[SDHC]
Maximum capacity_32GB, Maximum speed_Class 10
[Corresponding format]
FAT, FAT32, exTAT,
* Prohibition of use of NTFS

6.8.2 USB port

The teach pendant is provided with two USB ports on the left side of the SD memory card slot. You can connect a USB-compatible keyboard or memory when you use Windows.

- USB port

[USB]
2.0 High-Speed (480 Mbps) responding type
(Theoretical value)
[Type-A connector]
[Corresponding format]
FAT, FAT32, exTAT
* Prohibition of use of NTFS

<Usage note for USB port>

- The port supports USB 2.0 but does not support Hi-Speed USB.
- Applicable devices for the port are keyboard and memory.
- Depending on the type of keyboard, some functions, such as multimedia, are not available.

6.9 Built-in welding voltage/current monitor terminal

If it is necessary to use welding voltage/currentor monitor function of built-in power source, use the welding voltage/current monitor terminal.

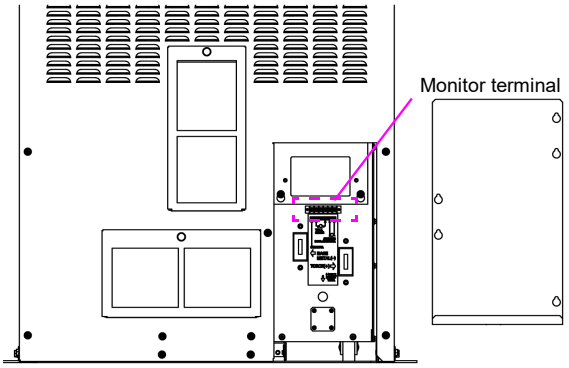
♦Connecting to welding voltage/ current monitor terminal

(1) Remove the terminal cover at the lower part of the controller front panel.

(2) The monitor terminals are located on the output terminal.

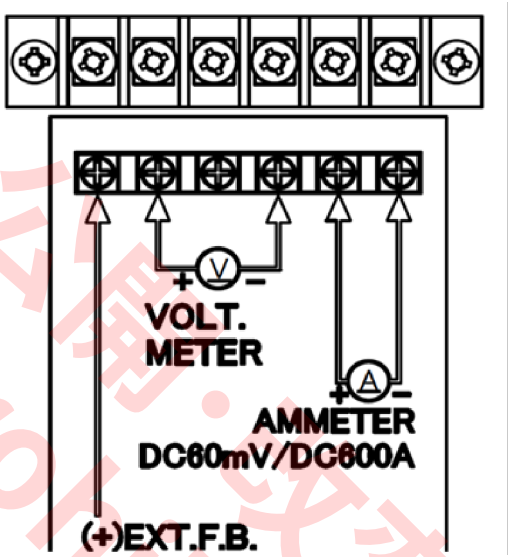
(3) In the same manner as the output cable, draw the cable from the underside of the power to connect the external device and the monitor terminal.

(4) Re-install the output terminal cover



♦Layout and functions of the monitor terminals

Terminal name	Function
+ Ⓐ – Ammeter	Connect a DC ammeter between those terminals to monitor welding current value. (Output terminals from the shunt resistor 600 A, 60 mV)
+ Ⓥ – Volt meter	Connect a DC voltmeter between those terminals to monitor welding voltage value.
(+) EXT.F.B.	It is an external (+) voltage feedback terminal. Connect an incidental device such as high voltage touch sensor between this terminal and the base metal voltage detection terminal to detect welding voltage to the device.



Note

Independently wire the DC ammeter and the DC voltageter.

7. Maintenance and Inspection

⚠ CAUTION

Maintenance and inspection work must be performed by qualified personnel who have completed the appropriate training programs and also well understand the contents.
Prior to conducting maintenance and inspection work, turn off the power switch and leave it for the inner capacitor discharge and sufficient cooling of the heat generation parts.

7.1 Inspection schedule

Maintenance and inspection works are inevitable to ensure full functions and performance of the robot and at the same time to ensure safety during operation.

(1) Refer to the table in the next page for the check items.
(2) Since the inspection intervals are set according to standard operation hours, apply either months or hours whichever is shorter as the standard. In case of operation on two shifts, the every 500-hour inspection shall normally be performed every 1.5 months. Hours correspond to time while the controller is in the ON state.
(3) It is recommended to have the overall inspection including overhauls specified by us at the time of every 2 000-hour inspection. If you enter into a periodical inspection contract with our company, our periodical inspections will start with a 2 000-hour (annual) inspection.

Inspection schedule
● Daily inspection
● Every 500 hours (or every third month)
● Every 2 000 hours (or every year)
● Every 4 000 hours (or every second year)
● Every 6 000 hours (or every third year)
● Every 8 000 hours (or every forth year)
● Every 10 000 hours (or every fifth year)

Note

- The above schedule is based on when the controller is used for arc welding operation.
- Inspection of the product is available as fare-paying service. For details, please contact Panasonic representatives.

7.2 Daily check

♦Inspections before turning on the power

	Parts	Item	Service	Remarks
1	Ground cable Cables	• Looseness • Breaking or damage of wire	• Re-tightening. • Replacement	
2	Safety fence	Damage	Repair	
3	Controller	Attachment of spatter/dust.	Removal of spatter/dust.	
		Clogged filter.	Clean/replace filter (*)	
4	Working area	Tidiness		

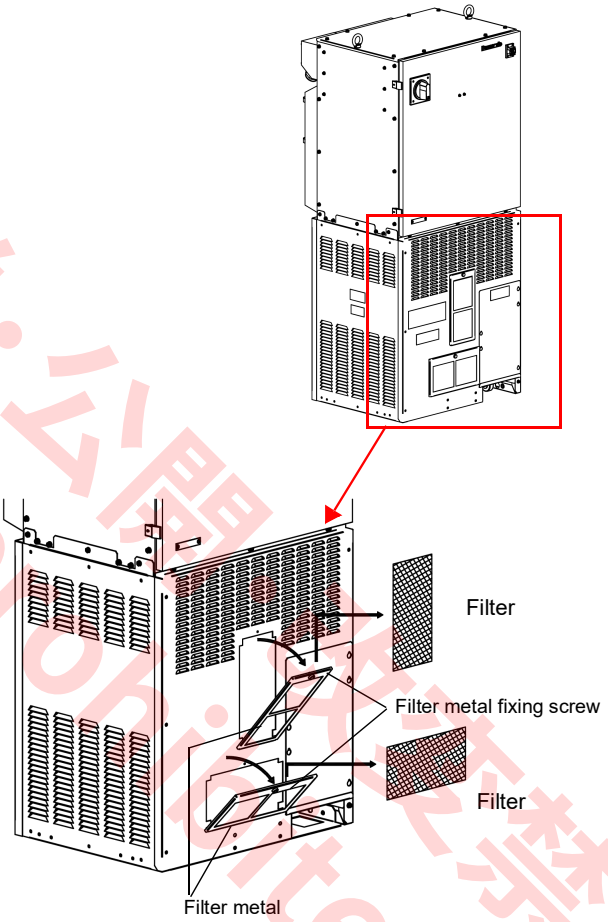
Note

For inspections about manipulator, welding torch, nozzle and tip, see the operating inspections of each item.

(*) : About filter at the air inlet fan

The air inlet fan at the side panels of the welding power source unit is covered with a filter.

- Clean the filter periodically. And remove dust and/or spatter attached to the filter. Using the controller with clogged filter may degrade its cooling performance of the fan, and performance of the robot will be deteriorated, as a result, the “Temperature error” may occurs.
- In case of “Temperature error”(W1210, W1220), check the filter and clean or replace it as necessary.
  Adhesion of dust to the cooling fan of the built-in welding power unit reduces cooling performance, which, as a result, can cause the “Temperature error”. In that case, clean the cooling fan.
  (If the error recurs after cleaning the cooling fan, please consult Panasonic representatives.)



● How to replace filter

(1) Loosen the fixing screw of the filter fitting. Then open the filter fitting and remove the filter.

(2) Insert a new filter into the filter fitting, and then close the filter fitting. Then tighten the filter fitting fixing screw.

♦ Inspections after turning on the power

CAUTION

Before turning on the power, check to confirm that no personnel are present within the robot work envelope.

	Parts	Item	Service	Remarks
1	Emergency stop switch	After turning on the servo power, the servo power goes off immediately after turning on the emergency stop switch.	If not, • Repair • Consult us if causes are not clear.	Do not use the robot unless the switch is repaired.
2	Fan	Cooling air inlet fan of the controller rotates. No attachment of dust on the fan.	If not, clean the fan.	Be sure to turn off the power to the controller before cleaning the fan.
3	Controller	No abnormal vibration, noise or odor from the built-in welding power source	If not, consult us if causes are not clear.	Do not use the robot unless the manipulator is repaired.

Note

For inspections about manipulator, see the operating inspections of each item.

Note

The fans for the built-in welding power source (3 pcs on the front panel side, 1 pc on the top panel, and 3 pcs inside) do not rotate immediately after power on. The fans rotate in 25 seconds after activating the controller. If the stand-by state lasts for seven minutes, the fans stop rotation to save electricity. If the stand-by state lasts 50 minutes, three fans which are one at the inner control part: FAN1, one at the upper part of the front panel: FAN2, and the fan on the top panel: FAN6, rotate for 10 minutes for cooling inside of the welding power source. During the stand-by state, the fans repeat this "50 minutes stop then 10 minutes rotation" operation. (Fan operation cycle in stand-by state)
The fans start rotating when welding operation starts, and then repeat the "Fan operation cycle in stand-by state" in seven minutes after welding operation ends.

7.3 Periodical check

Interval						Item	Inspection and service
3 mth	1 yr.	2 yr.	3 yr.	4 yr.	5 yr.		
O						Screws at covers	Check tightness and re-tighten if necessary.
O						Connecting cable connectors	Check tightness and re-tighten if necessary.
O						Other consumable components	Replace with new one if necessary

Note

- Electromagnetic contactors or cooling fans:
  Please treat them as consumable when performing periodical check and maintenance work. Those components have a certain life cycle electrically and mechanically.
- For details, please consult our service section. If you have a periodical inspection contract with our company, our periodical inspections will start with a 2 000-hour (annual) inspection.
- For inspection of the manipulator, please refer to the operating instructions of the manipulator.

7.4 Precautions in performing withstand voltage test and insulation resistance measurement

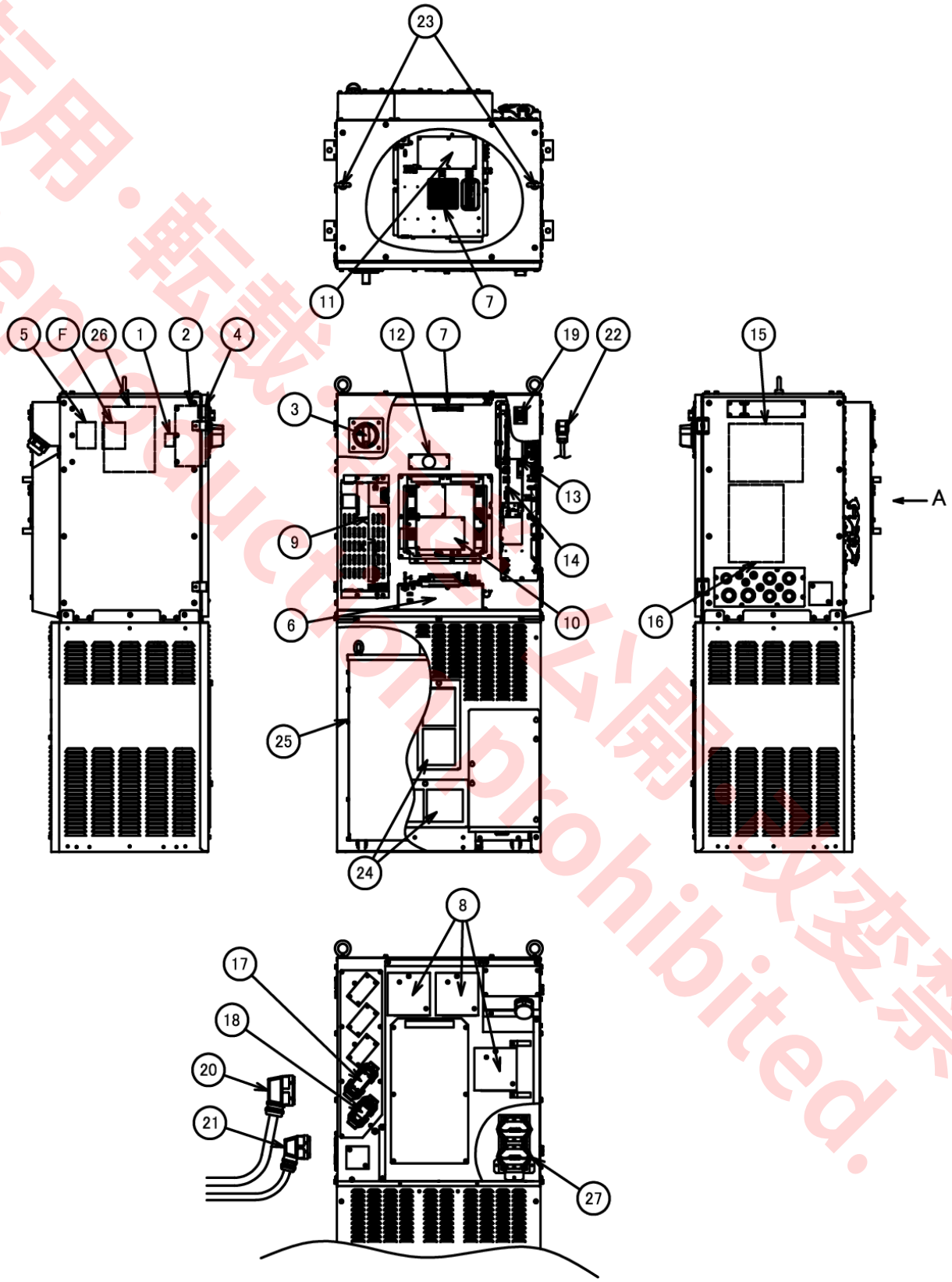
This product uses semiconductor components, such as transistor. Executing withstand voltage test or insulation resistance measurement casually may cause serious physical injury or mechanical failure. If necessary, contact Panasonic representatives.

8. Disposal of this product

After disposal of this product, data in the controller might go to third parties.
To prevent this, perform **All Clear** in **Memory clear** menu before disposal. For details, refer to “Operating Instructions [Operation]”.

9. Repair Parts List

9.1 Controller



No.	Description	Part number	Repair part order number	Q'ty	Note	Safety parts	Class
1	Anti-surge Parts	WSAEB00025	WSAEB00025	1			C
2	Breaker	MTNC000366AA	MTNC000366AA	1		O	C
3	Door handle	MTNK009282AA	MTNK009282AA	1			C
4	Terminal Cover	MTNE000993AA	MTNE000993AA	1			C
5	Magnetic Switch	MTNC000708AA	MTNC000708AA	1			C
6	DC Power Supply Unit	WSAEU00157ZZ	WSAEU00157ZZ	1			C
6-1	Power Card	ZUEP5957	ZUEP5957	(1)			C
6-2	DC Power Supply	MTNC001110AA	MTNC001110AA	(1)		O	C
6-3	DC Power Supply	MTNC001111AA	MTNC001111AA	(1)		O	C
6-4	DC Power Supply	MTNC001112AA	MTNC001112AA	(2)		O	C
6-5	Capacitor Unit	MTNE000874AA	MTNE000874AA	(3)		O	C
7	Cooling Fan	MTND000182AA	MTND000182AA	2		O	B
8	Cooling Fan Assy	WSAEB00022	WSAEB00022	3			C
8-1	Cooling Fan	MTND000183AA	MTND000183AA	(1)		O	C
9	Converter Unit: Y spec	WSAED00026ZZ	WSAED00026ZZ	1			C
	Converter Unit: E spec	WSAEU00294ZZ	WSAEU00294ZZ	1			C
9-1	Converter: Y spec	WSAED00025ZZ	WSAED00025ZZ	(1)			C
	Converter: E spec	WSAEU00300ZZ	WSAEU00300ZZ	(1)			C
9-2	Boot Ready Card	ZUEP5955_A1	ZUEP5955_A1	(1)			C
10	Servo Amplifier Unit: Y spec	WSAED00007ZZ	WSAED00007ZZ	1	TM-1100/ 1400/1600		C
		WSAED00008ZZ	WSAED00008ZZ	1	TM-1800/2000		C
		WSAED00013ZZ	WSAED00013ZZ	1	TL-1800/2000		C
		WSAED00014ZZ	WSAED00014ZZ	1	TS-800/950		C
		WSAED00009ZZ	WSAED00009ZZ	1	LA-1800		C
	Servo Amplifier Unit: E spec	WSAEU00295ZZ	WSAEU00295ZZ	1	TM-1100/ 1400/1600		C
		WSAEU00296ZZ	WSAEU00296ZZ	1	TM-1800/2000		C
		WSAEU00297ZZ	WSAEU00297ZZ	1	TL-1800/2000		C
		WSAEU00298ZZ	WSAEU00298ZZ	1	TS-800/950		C
		WSAEU00299ZZ	WSAEU00299ZZ	1	LA-1800		C
11	Power IF Card	ZUEP5958	ZUEP5958	1			C
12	Capacitor Card	ZUEP5974	ZUEP5974	1			C

No.	Description	Part number	Repair part order number	Q'ty	Note	Safety parts	Class
13	Backplane card	ZUEP5960	ZUEP5960	1			C
14	Main CPU Card	ZUEP5912	ZUEP5912	1			C
15	Robot Safety Card	ZUEP5919	ZUEP5919	1		O	C
16	Sequencer Card: Y spec	ZUEP5910	ZUEP5910	1	Open collector (NPN) output		C
	Sequencer Card: E spec	ZUEP5915	ZUEP5915	1	Open collector (PNP) output		C
17	Motor panel harness	WSAWC00378	WSAWC00378	1			C
18	RE panel harness	WSAWC00379	WSAWC00379	1			C
19	TP harness	WSAWC00377	WSAWC00377	1	Y spec		C
		WSAWC00565	WSAWC00565	1	E spec		C
20	Motor Cable	AWC32960LM	AWC32960LN	(1)	Sold separately Standard: 5 m Various lengths are available up to 30 m. For details, please contact Panasonic representatives.		C
21	RE Cable	AWC32961LM	AWC32961LN	(1)	Sold separately Standard: 5 m Various lengths are available up to 30 m. For details, please contact Panasonic representatives.		C
22	TP Cable: Y spec	WSAWC026LT	WSAWC026LT	1	Standard: 10 m Various lengths are available up to 30 m. For details, please contact Panasonic representatives.		B
	TP Cable: E spec	WSAWC029LT	WSAWC029LT	1			B
23	Eyebolts(*1)	XVN12FJ	XVN12FJ	1			C
24	Filter	AKC41124	AKC41124	1			C
25	Welding power source	WSAEU000282ZZ	WSAEU000282ZZ	1			C
26	Transformer	WSUTU53220	WSUTU53220	1			C
27	Reactor	WSAEL00003	WSAEL00003	2			C

No.	Description	Part number	Repair part order number	Q'ty	Note	Safety parts	Class
F	Fuse holder	K3GZ3YG00002	K3GZ3YG00002	1			C

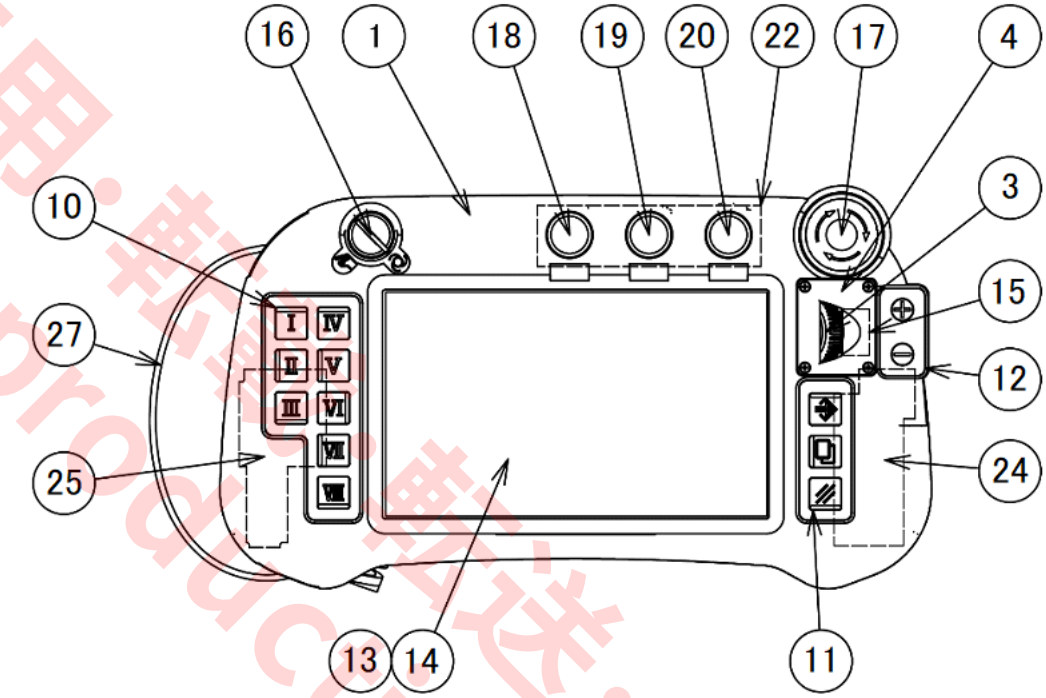
(*1) Eyebolts are important safety parts. When they are lost or broken, purchase Panasonic genuine eyebolts for your safety.

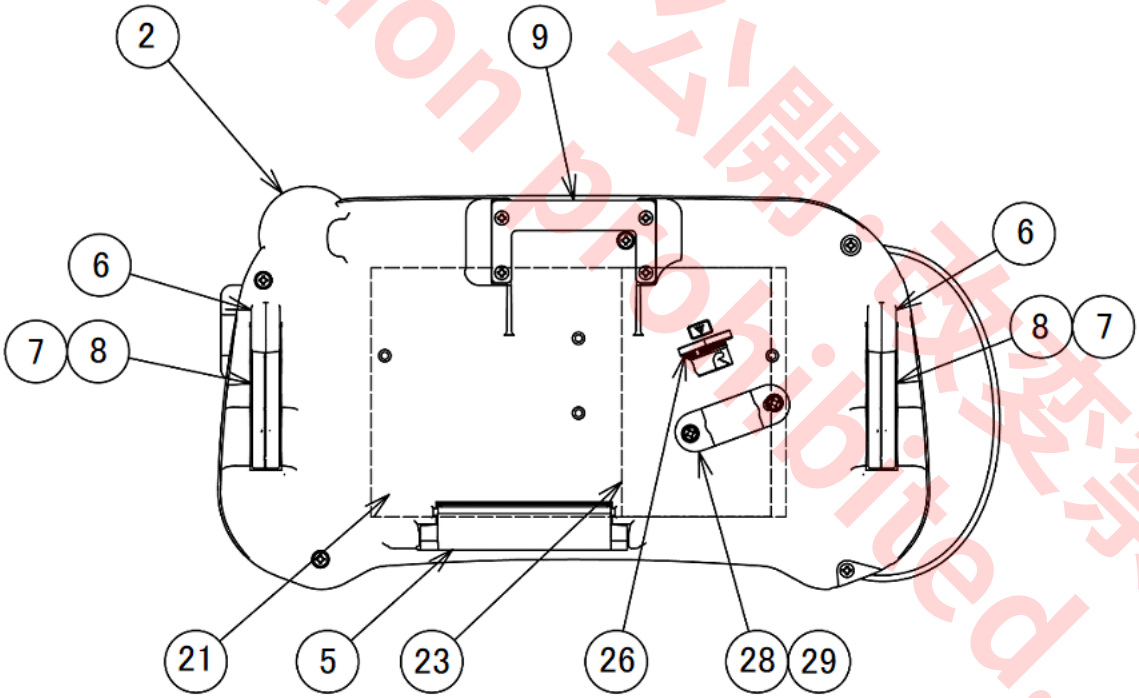
<Class> A: Consumable parts, rather short replacement cycle.
B: Assemblies and parts of high frequency in motion.
C: Important electric parts.
D: Parts rather long replacement cycle.

♦List of fuses

No.	Installation location	Part code	Part number	Repair part order number	Q'ty	Note	Safety parts
1	Fuse holder (See (F) in P.48)		K5D153YY0004	K5D153YY0004	3	15 A (Y/E spec)	O
2	ZUEP5910	F1	K5D312YY0012	K5D312YY0012	1	3.15 A (Y spec)	O
3	ZUEP5915	F1	K5D502YYA129	K5D502YYA129	1	5 A (E spec)	O
4	ZUEP5957	F1 F2	K5D802YY0007	K5D802YY0007	2	8 A	O

9.2 Teach pendant





No.	Description	Part number	Repair part order number	Q'ty	Note	Safety parts	Class
1	Upper case	WSAKC00082	WSAKC00082	1			D
2	Lower case	WSAKC00083	WSAKC00083	1			D
3	Dial	AKC31006	AKC31006	1			D
4	Jog cover	WSAKC00087	WSAKC00087	1			D
5	Cover	WSAKC00086	WSAKC00086	1			B
6	Trigger	AKC31009	AKC31009	2			B
7	Lever 1	WSAKC00175	WSAKC00175	2			B
8	Lever 2	WSAKC00176	WSAKC00176	2			D
9	TP hanger	WSAKC00089	WSAKC00089	1			B
10	Key Sheet Left	MTNS001075AA	MTNS001075AA	1			B
11	Key Sheet Right	MTNS001076AA	MTNS001076AA	1			B
12	Key Sheet UP	MTNS001077AA	MTNS001077AA	1			B
13	Touch Panel	MTNS001074AA	MTNS001074AA	1			B
14	LCD	MTNS001073AA	MTNS001073AA	1			B
15	Encoder	MTNS001071AA	MTNS001071AA	1			B
16	Key Switch harness	WSAWC00159	WSAWC00159	1			B
17	EMG Switch harness	WSAWC00158	WSAWC00158	1			B
18	Push button switch	A165TGYMNMA1	YABD40	1			B
19	Push button switch	A165TWMNMA2	YAW173	1			B
20	Push button switch	A165TGYMNMA3	YAB122	1			B
21	TP CPU Card	ZUEP5909	ZUEP5909	1			C
22	TP UP Card	ZUEP5941	ZUEP5941	1			C
23	TP Safety Card For WSAUR00001ZZ	ZUEP5920	ZUEP5920	1		○	C
	TP Safety Card For WSAUR00005ZZ	WSAEU00283ZZ	WSAEU00283ZZ	1		○	C
24	TP Right Safety Card	ZUEP5940	ZUEP5940	1			C
25	TP Left Safety Card	ZUEP5939	ZUEP5939	1			C
26	TP harness	WSAWC00393	WSAWC00393	1			B
27	TP band	WSAKC00146	WSAKC00146	1			B
28	Saddle	SP15N	SP15N	(1)			B
29	Upset bolt	XVGZ3+F8FJ	YZA384	(2)			B
-	TP system SC	WSAYF00041	WSAYF00041	-			B

<Class> A: Consumable parts, rather short replacement cycle.
B: Assemblies and parts of high frequency in motion.
C: Important electric parts.
D: Parts rather long replacement cycle.

10. Circuit diagram

10.1 Controller-1

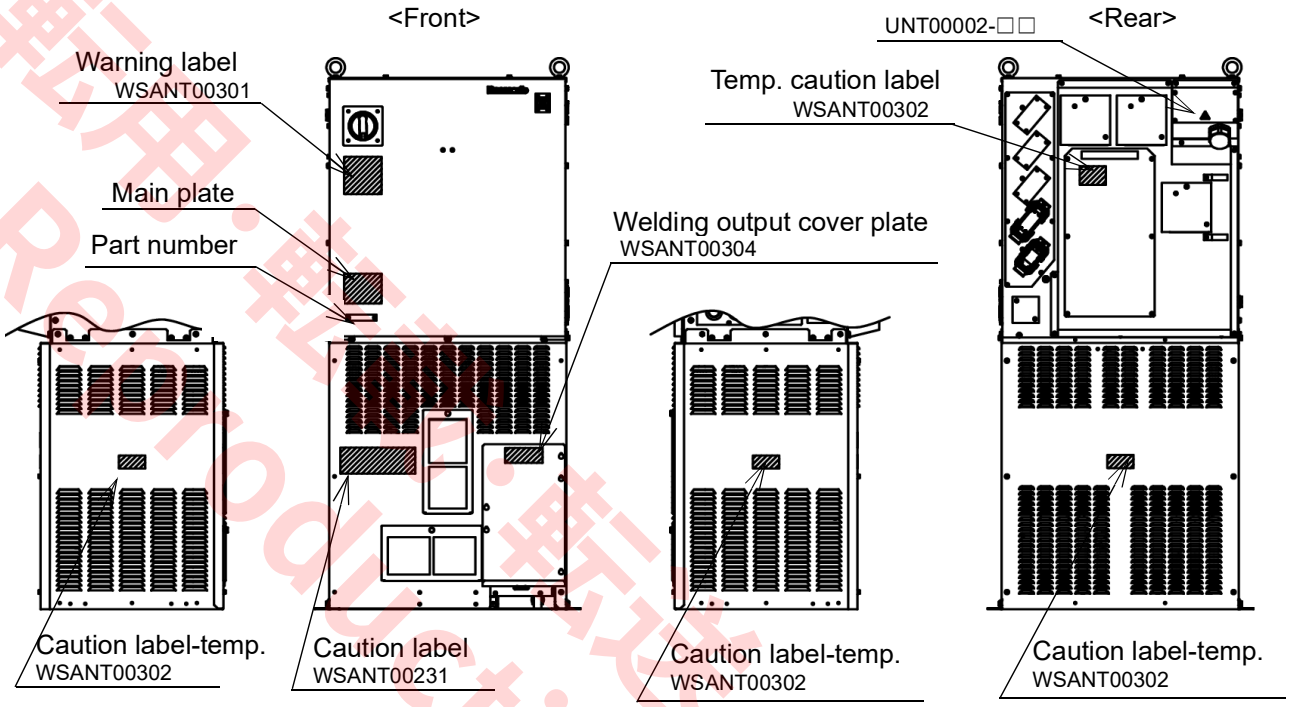
10.2 Controller-2

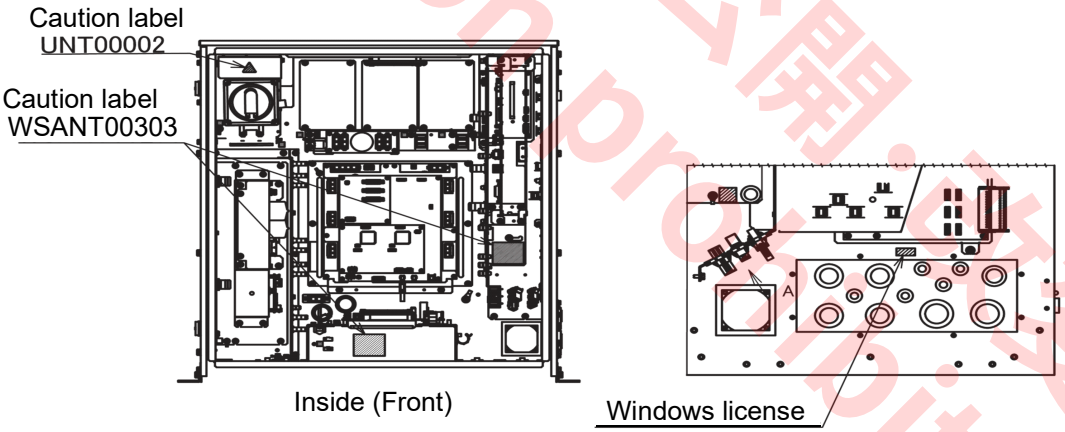
10. 3 Welding power source part

11. Location of Labels

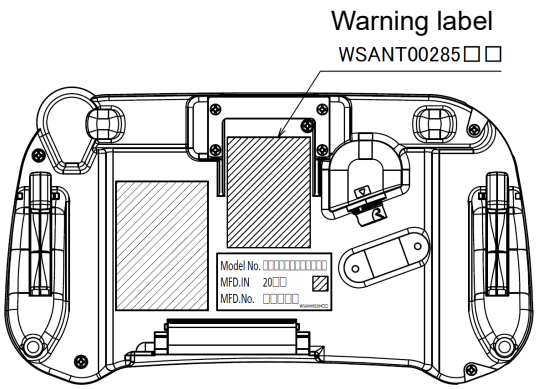
11.1 Location of labels

<Controller part>

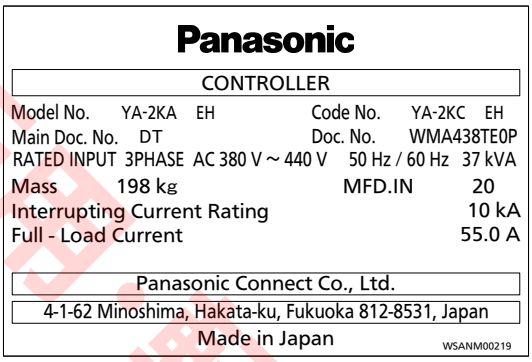




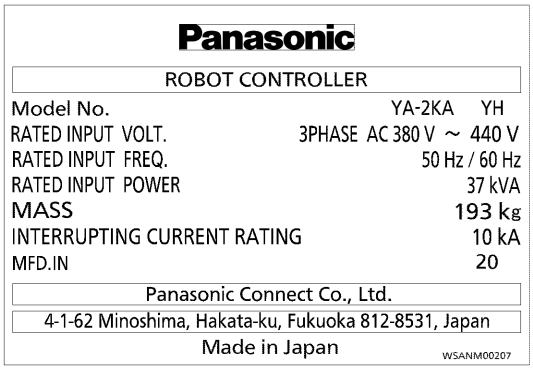
<Teach pendant part>



11.2 Labels



< Main name plate (E type) >



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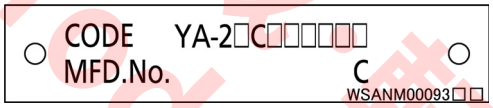
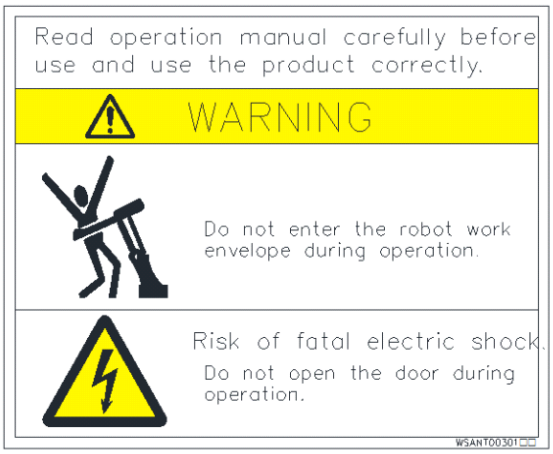


<Type label - Part number>

<Caution label – UNT00002>

<Caution label - WSANT00303>

<Temp. caution label - WSANT00302>



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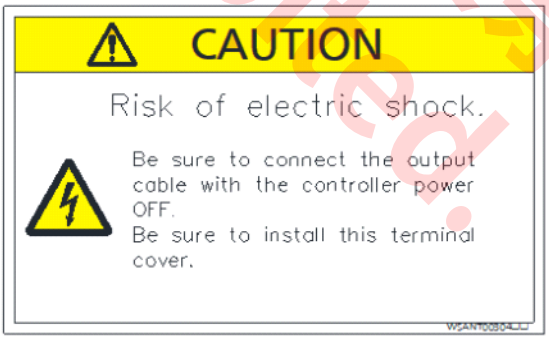
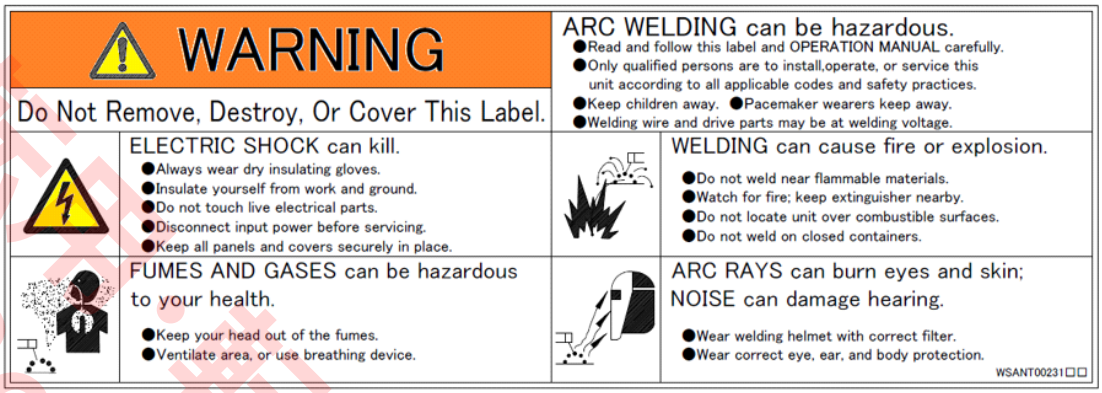


<Welding output cover label - WSANT00304>



< Warning label - WSANT00231 >

<Warning label - WSANT00285>

12. Appendix

12.1 License Information

This product incorporates the following five types of software:

(1) The software developed by Panasonic Connect Co., Ltd. (Hereinafter, our company) or developed for the sake of our company

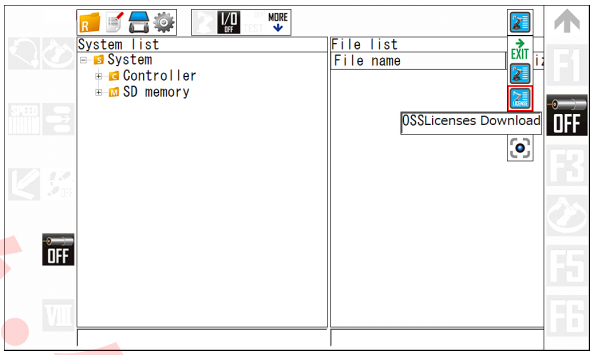
(2) The third party software licensed to our company

(3) The software licensed under the GNU General Public License Version 1.0/2.0/ 3.0 (“GPL”)

(4) The software licensed under the GNU Lesser General Public License Version 2.0/2.1/3.0 (“LGPL”)

(5) Open source software other than the software licensed under the GPL and LGPL

Each software categorized as (3) to (5) above is distributed in the hope that it will be useful, but without any warranty by itself, without even the implied warranty of merchantability or fitness for a particular purpose.
For details, please download “OSSLicenses.zip” file from this product and refer to the license items and conditions in it. To download it, click “Version” on the teach pendant and then select “OSSLcenses Download” in the “Version. You can download the “OSSLicenses.zip” to either SD memory card or USB memory.



For at least three (3) years from the delivery of this product, our company will give to any third party who contacts us at the below contact address, for a charge no more than our cost of physically performing source code distribution, a complete machine-readable copy of the corresponding source code for the software licensed under the GPL, LGPL, or other license requiring disclosure of open code.
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