

# EPSON

RC520

## *Safety and Installation*

*Read this manual first*

Rev.2

EM089B1742F

RC520 Safety and Installation

Rev.2

RC520 Safety and Installation

Rev.2

## **FOREWORD**

Thank you for purchasing our robot products.

This manual contains the information necessary for the correct use of the Operator Panel.

Please carefully read this manual and other related manuals before installing the robot system.

Keep this manual handy for easy access at all times.

## **WARRANTY**

The robot system and its optional parts are shipped to our customers only after being subjected to the strictest quality controls, tests, and inspections to certify its compliance with our high performance standards.

Product malfunctions resulting from normal handling or operation will be repaired free of charge during the normal warranty period. (Please ask your Regional Sales Office for warranty period information.)

However, customers will be charged for repairs in the following cases (even if they occur during the warranty period):

1. Damage or malfunction caused by improper use which is not described in the manual, or careless use.
2. Malfunctions caused by customers' unauthorized disassembly.
3. Damage due to improper adjustments or unauthorized repair attempts.
4. Damage caused by natural disasters such as earthquake, flood, etc.

Warnings, Cautions, Usage:

1. If the robot system associated equipment is used outside of the usage conditions and product specifications described in the manuals, this warranty is void.
2. If you do not follow the **WARNINGS** and **CAUTIONS** in this manual, we cannot be responsible for any malfunction or accident, even if the result is injury or death.
3. We cannot foresee all possible dangers and consequences. Therefore, this manual cannot warn the user of all possible hazards.

## TRADEMARKS

Microsoft, Windows, and Windows logo are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries. Other brand and product names are trademarks or registered trademarks of the respective holders.

## TRADEMARK NOTATION IN THIS MANUAL

Microsoft® Windows® XP Operating system

Microsoft® Windows® 2000 Operating system

Throughout this manual, Windows XP, and Windows 2000 refer to above respective operating systems. In some cases, Windows refers generically to Windows XP, and Windows 2000.

## NOTICE

No part of this manual may be copied or reproduced without authorization.

The contents of this manual are subject to change without notice.

Please notify us if you should find any errors in this manual or if you have any comments regarding its contents.

## INQUIRIES

Contact the following service center for robot repairs, inspections or adjustments.

If service center information is not indicated below, please contact the supplier office for your region.

Please prepare the following items before you contact us.

- Your controller model and its serial number
- Your manipulator model and its serial number
- Software and its version in your robot system
- A description of the problem

## SERVICE CENTER

## MANUFACTURER & SUPPLIER

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## Before Reading This Manual

**NOTE**



Do not connect the followings to OPTIONAL DEVICE Connector of RC520.  
Connecting to the followings may result in malfunction of the device since the pin assignments are different.

Operator Panel OP1

Teach Pendant TP1

Teaching Pendant TP-3\*\*

Operating Unit OPU-320

RC+ Software Key

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## 1. Safety

Installation and transportation of robots and robotic equipment shall be performed by qualified personnel and should conform to all national and local codes.

Please read this manual and other related manuals before installing the robot system or before connecting cables.

Keep this manual handy for easy access at all times.

### 1.1 Conventions

Important safety considerations are indicated throughout the manual by the following symbols. Be sure to read the descriptions shown with each symbol.

 WARNING	This symbol indicates that a danger of possible serious injury or death exists if the associated instructions are not followed properly.
 WARNING	This symbol indicates that a danger of possible harm to people caused by electric shock exists if the associated instructions are not followed properly.
 CAUTION	This symbol indicates that a danger of possible harm to people or physical damage to equipment and facilities exists if the associated instructions are not followed properly.

### 1.2 Design and Installation Safety

Only trained personnel should design and install the robot system. Trained personnel are defined as those who have taken robot system training held by the manufacturer, dealer, or local representative company, or those who understand the manuals thoroughly and have the same knowledge and skill level as those who have completed the training courses.

To ensure safety, a safeguard must be installed for the robot system. For details on the safeguard, refer to the Installation and Design Precautions in the Safety chapter of the EPSON RC+ User's Guide.

The following items are safety precautions for design personnel:



WARNING

- Personnel who design and/or construct the robot system with this product must read the *Safety* chapter in the *EPSON RC+ User's Guide* to understand the safety requirements before designing and/or constructing the robot system. Designing and/or constructing the robot system without understanding the safety requirements is extremely hazardous, and may result in serious bodily injury and/or severe equipment damage to the robot system.
- The Manipulator and the Controller must be used within the environmental conditions described in their respective manuals. This product has been designed and manufactured strictly for use in a normal indoor environment. Using the product in an environment that exceeds the specified environmental conditions may not only shorten the life cycle of the product but may also cause serious safety problems.
- The robot system must be used within the installation requirements described in the manuals. Using the robot system outside of the installation requirements may not only shorten the life cycle of the product but also cause serious safety problems.

Further precautions for installation are mentioned in the following manuals. Please read this chapter carefully to understand safe installation procedures before installing the robots and robotic equipment.

#### Relevant Manuals

Refer



This manual : 2. Installation

Manipulator manual : Setup & Operation 3. Environment and Installation

### 1.3 Operation Safety

The following items are safety precautions for qualified Operator personnel:

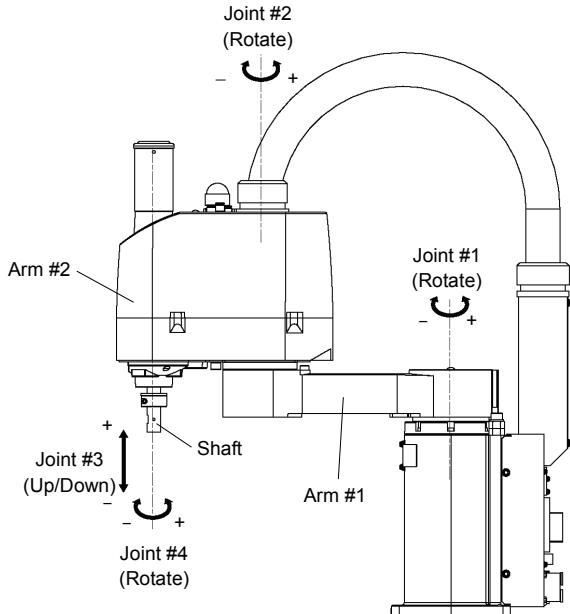
 WARNING	<ul style="list-style-type: none"><li>■ Please carefully read the <i>Safety-related Requirements</i> in the <i>Safety</i> chapter of the <i>EPSON RC+ User's Guide</i> before operating the robot system. Operating the robot system without understanding the safety requirements is extremely hazardous and may result in serious bodily injury and/or severe equipment damage to the robot system.</li><li>■ Do not enter the operating area of the Manipulator while the power to the robot system is turned ON. Entering the operating area with the power ON is extremely hazardous and may cause serious safety problems as the Manipulator may move even if it seems to be stopped.</li><li>■ Before operating the robot system, make sure that no one is inside the safeguarded area. The robot system can be operated in the mode for teaching even when someone is inside the safeguarded area. The motion of the Manipulator is always in restricted status (low speeds and low power) to secure the safety of an operator. However, operating the robot system while someone is inside the safeguarded area is extremely hazardous and may result in serious safety problems in case that the Manipulator moves unexpectedly.</li><li>■ Immediately press the Emergency Stop switch whenever the Manipulator moves abnormally while the robot system is operated. Continuing the operating the robot system while the Manipulator moves abnormally is extremely hazardous and may result in serious bodily injury and/or severe equipment change to the robot system.</li></ul>
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 WARNING	<ul style="list-style-type: none"><li>■ Be sure to connect the AC power cable to a power receptacle. DO NOT connect it directly to a factory power source. To shut off power to the robot system, pull out the power plug from the power source. Performing any work while connecting the AC power cable to a factory power source is extremely hazardous and may result in electric shock and/or malfunction of the robot system.</li></ul>
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### Part Names and Arm Motion

#### E2 series

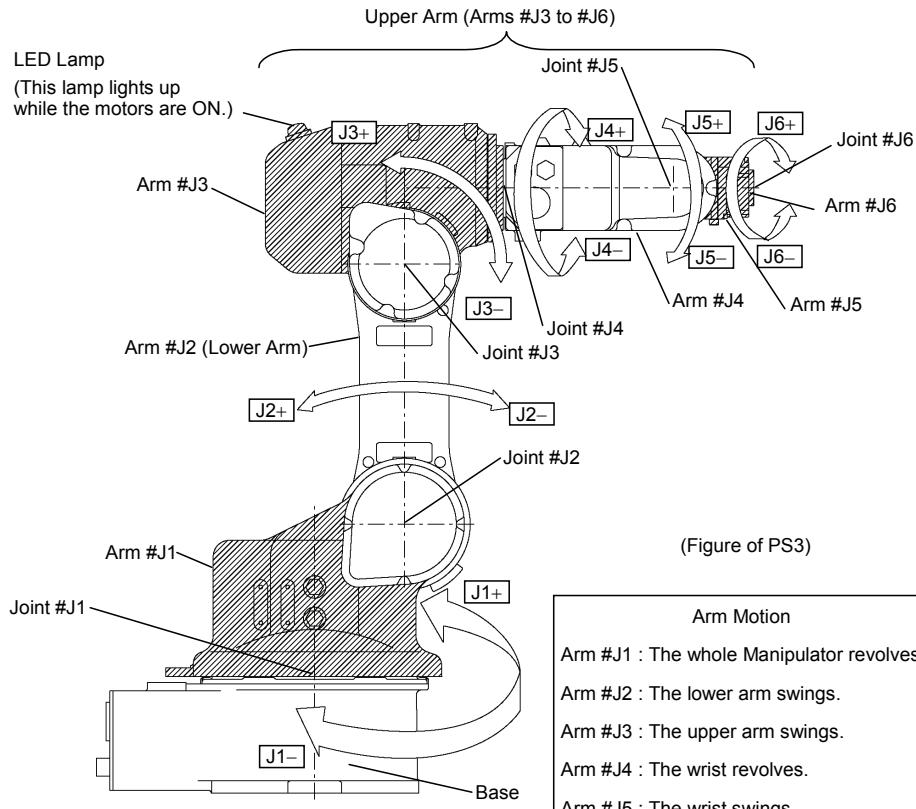
The motion range of each arm is shown in the figure below. Take all necessary safety precautions.



(Figure of E2C)

## PS series

The motion range of each arm is shown in the figure below. Take all necessary safety precautions.



## Arm Motion

- Arm #J1 : The whole Manipulator revolves.
- Arm #J2 : The lower arm swings.
- Arm #J3 : The upper arm swings.
- Arm #J4 : The wrist revolves.
- Arm #J5 : The wrist swings.
- Arm #J6 : The wrist rotates.

### 1.4 Maintenance Safety

Please read this section, *Maintenance* of the Manipulator manual, and other related manuals carefully to understand safe maintenance procedures before performing any maintenance.

Only authorized personnel who have taken the safety training should be allowed to maintain the robot system. The safety training is the program for the industrial robot operator that follows the laws and regulations of each nation.

The personnel who have taken the safety training acquire knowledge of industrial robots (operations, teaching, etc.), knowledge of inspections, and knowledge of related rules/regulations. Only personnel who have completed the robot system-training and maintenance-training classes held by the manufacturer, dealer, or locally-incorporated company should be allowed to maintain the robot system.

- |                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br>WARNING | <ul style="list-style-type: none"><li>■ Do not remove any parts that are not covered in this manual. Follow the maintenance procedure strictly as described in this manual and the <i>Maintenance</i> of the Manipulator manual. Improper removal of parts or improper maintenance may not only cause improper function of the robot system but also serious safety problems.</li><li>■ Keep away from the Manipulator while the power is ON if you have not taken the training courses. Do not enter the operating area while the power is ON. Entering the operating area with the power ON is extremely hazardous and may cause serious safety problems as the Manipulator may move even though it seems to be stopped.</li><li>■ When you check the operation of the Manipulator after replacing parts, be sure to check it while you are outside of the safeguarded area. Checking the operation of the Manipulator while you are inside of the safeguarded area may cause serious safety problems as the Manipulator may move unexpectedly.</li><li>■ Before operating the robot system, make sure that both the Emergency Stop switches and safeguard switches function properly. Operating the robot system when the switches do not function properly is extremely hazardous and may result in serious bodily injury and/or serious damage to the robot system as the switches cannot fulfill their intended functions in an emergency.</li></ul> |
|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

 WARNING	<ul style="list-style-type: none"><li>■ Be sure to connect the AC power cable to a power receptacle. DO NOT connect it directly to a factory power source. To shut off power to the robot system, pull out the power plug from the power source. Performing any work while connecting the AC power cable to a factory power source is extremely hazardous and may result in electric shock and/or malfunction of the robot system.</li><li>■ Before performing any replacement procedure, turn OFF the Controller and related equipment, and then pull out the power plug from the power source. Performing any replacement procedure with the power ON is extremely hazardous and may result in electric shock and/or malfunction of the robot system.</li><li>■ Be sure to connect the cables properly. Do not allow unnecessary strain on the cables. (Do not put heavy objects on the cables. Do not bend or pull the cables forcibly.) The unnecessary strain on the cables may result in damage to the cables, disconnection, and/or contact failure. Damaged cables, disconnection, or contact failure is extremely hazardous and may result in electric shock and/or improper function of the robot system.</li></ul>
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 CAUTION	<ul style="list-style-type: none"><li>■ Carefully use alcohol, liquid gasket, and adhesive following respective instructions and also instructions below. Careless use of alcohol, liquid gasket, or adhesive may cause a fire and/or safety problems.<ul style="list-style-type: none"><li>- Never put alcohol, liquid gasket, or adhesive close to fire.</li><li>- Use alcohol, liquid gasket, or adhesive while ventilating the room.</li><li>- Wear protective gear including a mask, protective goggles, and oil-resistant gloves.</li><li>- If alcohol, liquid gasket, or adhesive gets on your skin, wash the area thoroughly with soap and water.</li><li>- If alcohol, liquid gasket, or adhesive gets into your eyes or mouth, flush your eyes or wash out your mouth with clean water thoroughly, and then see a doctor immediately.</li></ul></li></ul>
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## 1. Safety

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 <b>CAUTION</b>	<ul style="list-style-type: none"><li>■ Wear protective gear including a mask, protective goggles, and oil-resistant gloves during grease up. If grease gets into your eyes, mouth, or on your skin, follow the instructions below.</li></ul> <p>If grease gets into your eyes :</p> <p style="margin-left: 20px;">Flush them thoroughly with clean water, and then see a doctor immediately.</p> <p>If grease gets into your mouth:</p> <p style="margin-left: 20px;">If swallowed, do not induce vomiting. See a doctor immediately. If grease just gets into your mouth, wash out your mouth with water thoroughly.</p> <p>If grease gets on your skin:</p> <p style="margin-left: 20px;">Wash the area thoroughly with soap and water.</p>
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## 1.5 Emergency Stop

If the Manipulator moves abnormally during operation, immediately press the Emergency Stop switch. The motor power will be turned OFF, and the arm motion by inertia will be stopped with the electromagnetic brake and dynamic brake.

However, avoid pressing the Emergency Stop switch unnecessarily while the Manipulator is running normally. Otherwise, the Manipulator may hit the peripheral equipment since the operating trajectory while the robot system stops is different from that in normal operation.

To place the robot system in emergency mode during normal operation, press the Emergency Stop switch when the Manipulator is not moving.

Refer to the Controller manual for instructions on how to wire the Emergency Stop switch circuit.

### Free running distance in emergency

The operating Manipulator cannot stop immediately after the Emergency Stop switch is pressed.

Remember that the values vary depending on conditions such as the weight of the end effector and work piece, Weight/Speed/Accel settings, operating pose, etc.

### 1.6 Manipulator Labels

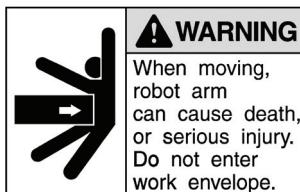
Labels are attached around the locations of the Manipulator where specific dangers exist.

Be sure to comply with descriptions and warnings on the labels to operate and maintain the Manipulator safely.

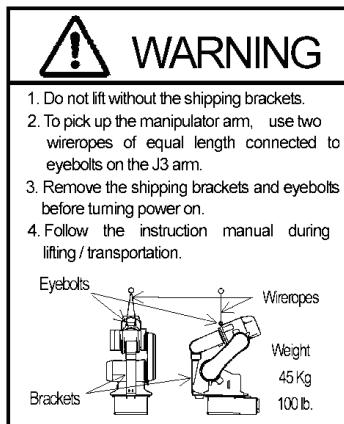
Do not tear, damage, or remove the labels. Use meticulous care when handling those parts or units to which the following labels are attached as well as the nearby areas:

#### Examples of Manipulator Labels

E2 series



PS3 series



All  
Manipulators



#### NOTE:

Hazardous voltage exists while the Manipulator is ON. To avoid electric shock, do not touch any internal electric parts.

## 1.7 Safety Features

The robot control system supports safety features described below. However, the user is recommended to strictly follow the proper usage of the robot system by thoroughly reading the attached manuals before using the system. Failure to read and understand the proper usage of the safety functions is highly dangerous.

Among the following safety features, the Emergency Stop Switch and Safety Door Input are particularly important. Make sure that these and other features function properly before operating the robot system.

For details, refer to the *2.5 Controller Installation - Safety Door Switch and Latch Release Switch*.

### ATTEND (TEACH) Control Device

To operate the Manipulator at a short distance without any operation unit (option), you must create an ATTEND (TEACH) control device and connect it to the OPTIONAL DEVICE connector on the front of the Control Unit in order to operate the Manipulator at a short distance. The ATTEND (TEACH) control device should consist of the Emergency Stop switch, 3-position enable switch (dead-man switch), and ATTEND (TEACH) control device enable/disable switch.

The name of the control device depends on the software used in your Control Unit as shown below:

EPSON RC+ : TEACH control device

SPEL CT : ATTEND control device

### Emergency Stop Switch

The ATTEND (TEACH) control device must be equipped with the Emergency Stop switch. The EMERGENCY connector on the Drive Unit has extension Emergency Stop input terminals used for connecting the Emergency Stop switches. These Emergency Stop inputs are internally connected to the relays for the dynamic brake. Therefore, pressing any Emergency Stop switch can shut off the motor power immediately and the robot system will enter the Emergency Stop condition.

### Safety Door Input

In order to activate this feature, make sure that the Safety Door Input switch is connected to the EMERGENCY connector on the Drive Unit.

When the safety door is opened, normally the Manipulator immediately stops the current operation, and the status of Manipulator power is operation-prohibited until the safety door is closed and the latched condition is released. In order to execute the Manipulator operation while the safety door is open, you must change the ATTEND (TEACH) control device enable/disable switch to “enable” or change the mode selector switch on the operation unit to the mode for teaching and then engage the 3-position enable switch. In this case, the Manipulator is operated in low power status.

### Lockout

Turn OFF the power supply and use a lockout procedure to prevent anyone from turning ON the power supply by mistake while someone else is in the safeguarded area for maintenance or repairs.

The procedure for lockout is described in the *Maintenance 1. Safety Precautions for Maintenance*.

### Low Power Mode

The motor power is reduced in this mode. A shift into restricted status (low power status) can be done through the execution of a power status change instruction, regardless of the safety door or operation mode. This ensures the safety of the operator and reduces the possibility of peripheral equipment being destroyed or damaged as a result of careless operation.

### Dynamic Brake

The dynamic brake circuit includes relays that short the motor armatures. When the motor armatures are shorted, the power to the Motor Driver modules is cut off and the reverse EMF caused by the short stops the motors. The dynamic brake circuit is activated when there is an Emergency Stop input or when any of the following errors is detected: encoder cable disconnection, motor overload, irregular motor torque, motor speed error, servo error (positioning or speed overflow), irregular CPU, memory check-sum error and overheat condition inside the Motor Driver Module.

## Encoder Cable Disconnection Error Detection

The dynamic brake circuit is activated when the Motor Encoder Signal cable (connecting to the Drive Unit) is disconnected.

## Motor Overload Detection

The dynamic brake circuit is activated when the system detects that the load on the motor has exceeded its capacity.

## Irregular Motor Torque (out-of-control manipulator) Detection

The dynamic brake circuit is activated when irregularity with motor torque (motor output) is detected (in which case the Manipulator is out of control).

## Motor Speed Error Detection

The dynamic brake circuit is activated when the system detects that the motor is running at incorrect speed.

## Positioning Overflow - Servo Error - Detection

The dynamic brake circuit is activated when the system detects that the difference between the Manipulator's actual position and commanded position exceeds the margin of error allowed.

## Speed Overflow - Servo Error - Detection

The dynamic brake circuit is activated when the system detects that motor speed has overflowed.

## CPU Irregularity Detection

Irregularity in the motor controlling CPU is monitored by a watch-dog timer. Also, the system CPU inside the Control Unit and the motor controlling CPU inside the Drive Unit are designed to constantly check each other for any discrepancies between the units. If a discrepancy is detected, the dynamic brake circuit is activated.

## Memory Check-sum Error Detection

The dynamic brake circuit is activated when a memory check-sum error is detected.

### **Overheat Detection at the Motor Driver Module**

The dynamic brake circuit is activated when the temperature of the power device inside the Motor Driver module is above the nominal limit.

### **Over-Voltage Detection**

The dynamic brake circuit is activated when the voltage of the Controller is above the normal limit. (When mounting a regeneration module toDU4, or using DU6)

## 2. Installation

This chapter contains precautions for safe and accurate installation of the robot system.

The outline to install the robot system is indicated on 2.1 Outline from Unpacking to Operation of Robot System. Refer to each section and/or the Manipulator manual and the Controller manual for unpacking, transportation, and installation.

The numbers of controllable motor axes per Drive Unit are as shown below:

Each four-axis Drive Unit (RC520DU) : Up to four axes

Each six-axis Drive Unit (RC520DU6) : Up to six axes

Up to three Drive Units are connected to one Control Unit. The following table shows available connections of the Drive Units per Control Unit.

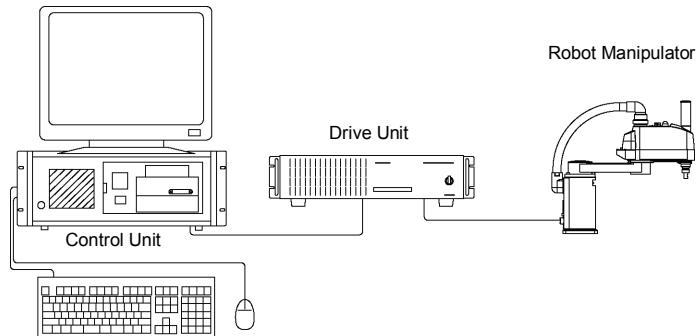
	Four-axis Drive Units	Six-axis Drive Units
Case 1	3 Drive Units	-
Case 2	2 Drive Units	1 Drive Unit
Case 3	-	2 Drive Units

For details on the Control Unit, refer to the *Setup & Operation 2.4 Control Unit (RC520DU)*.

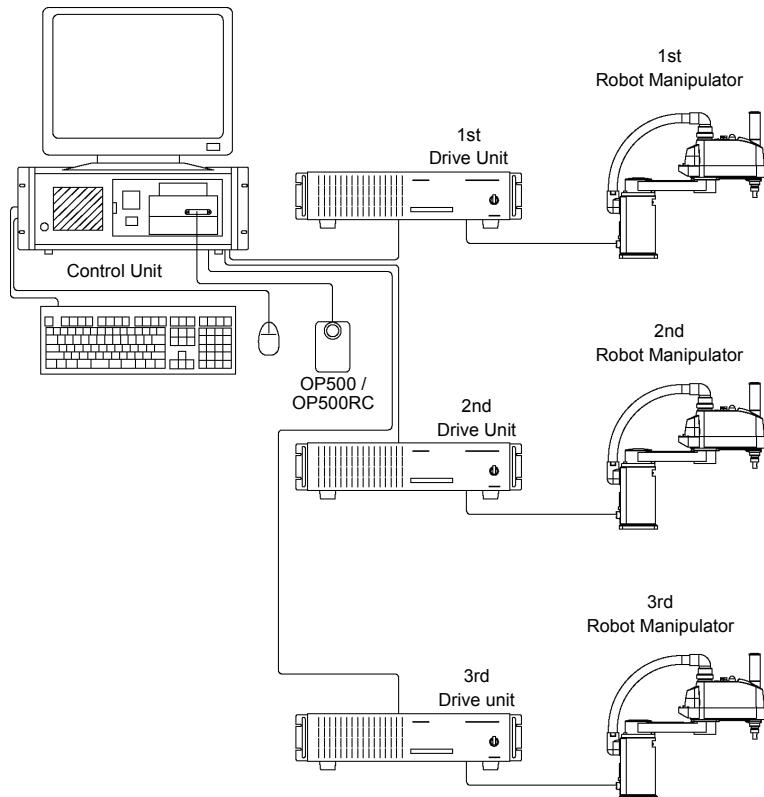
For details on the Drive Unit, refer to the *Setup & Operation 2.5 Four-axis Drive Unit and the Setup & Operation 2.6 Six-axis Drive Unit (RC520DU6)*.

## 2. Installation

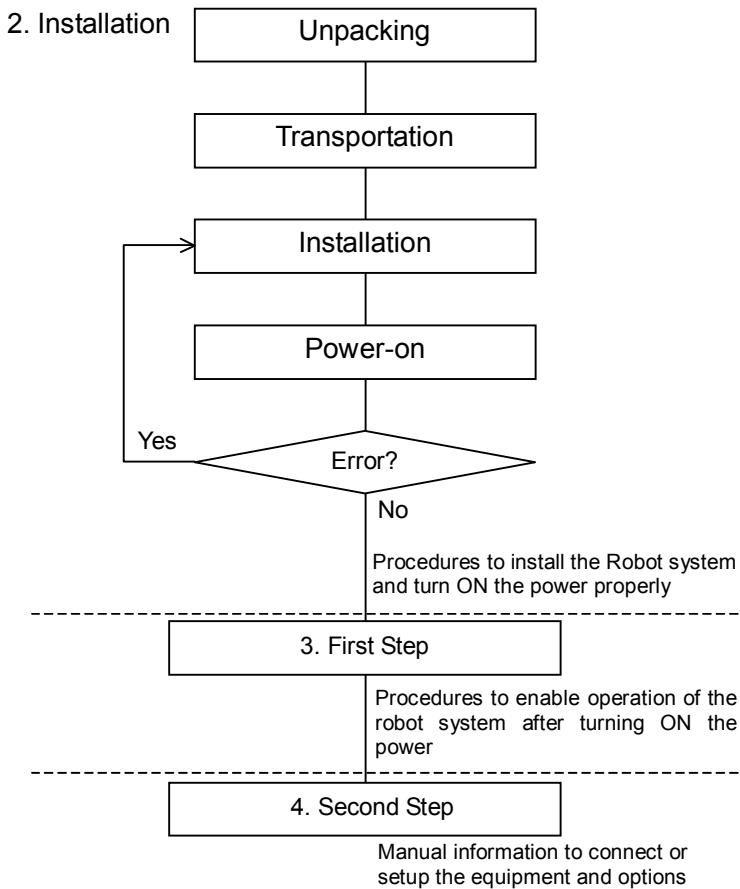
### Example 1 : One Drive Unit and One Manipulator



### Example 2 : Three Drive Units and Three Manipulators



## 2.1 Outline from Unpacking to Operation of Robot System



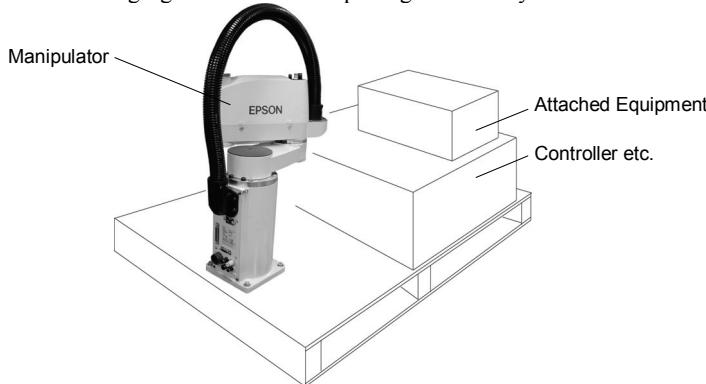
### 2.2 Unpacking

Installation and transportation of robots and robotic equipment shall be performed by qualified personnel and should conform to all national and local codes.

Using a cart or similar equipment, transport the Manipulator in the same conditions as it was delivered. Observe the following when unpacking the Manipulator.

#### Package Components Example

The following figure illustrates the package at delivery.



#### Unpacking Precautions

##### Transportation procedure

- : Only authorized personnel should perform sling work and operate a crane or forklift. When these operations are performed by unauthorized personnel, it is extremely hazardous and may result in serious bodily injury and/or severe equipment damage to the robot system.

##### Vibration at transportation

- : Avoid excessive vibration or shock during Manipulator transporting. Excessive vibration or shock may cause equipment damage to and/or malfunction of the Manipulator.

##### Anchor bolt

- : When removing the anchor bolts, support the Manipulator to prevent falling. Removing the anchor bolts without supporting the Manipulator may get hands, fingers, or feet caught as the Manipulator will fall.

##### Wire tie

- : Do not remove the wire tie securing the arm until you finish the installation. You may get your hands caught in the Manipulator when the wire tie is removed before completing the installation.

## 2.3 Transportation

Installation and transportation of robots and robotic equipment shall be performed by qualified personnel and should conform to all national and local codes.

### Transportation Precautions

#### Transportation procedure

: Using a cart or similar equipment, transport the Manipulator in the same conditions as it was delivered. Observe the following when unpacking the Manipulator.

Only authorized personnel should perform sling work and operate a crane or forklift. When these operations are performed by unauthorized personnel, it is extremely hazardous and may result in serious bodily injury and/or severe equipment damage to the robot system.

#### Vibration at transportation

: Avoid excessive vibration or shock during Manipulator transporting. Excessive vibration or shock may cause equipment damage to and/or malfunction of the Manipulator.

#### Anchor bolt

: When removing the anchor bolts, support the Manipulator to prevent falling.

Removing the anchor bolts without supporting the Manipulator may get hands, fingers, or feet caught as the Manipulator will fall.

#### Wire tie

: Do not remove the wire tie securing the arm until you finish the installation.

You may get your hands caught in the Manipulator when the wire tie is removed before completing the installation.

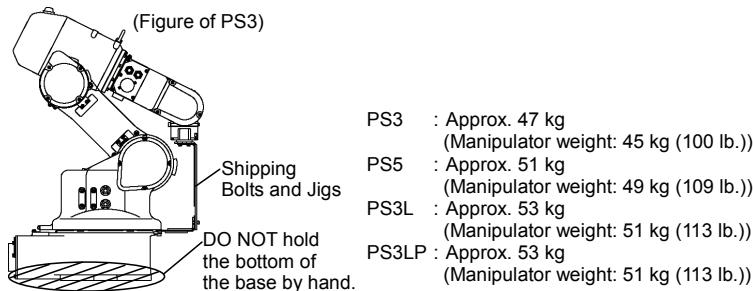
#### Hoisting procedure

: Stabilize the Manipulator with your hands when hoisting it. Unstable hoisting is extremely hazardous and may result in serious bodily injury and/or severe equipment damage to the robot system as the fall of the Manipulator.

### Manipulator Transportation

#### PS series

To carry the Manipulator, have at least 3 people to work on it and secure the Manipulator to the delivery equipment or hold it by hand. Do not hold the bottom of the base (the screened parts in the figure). Holding these parts by hand is extremely hazardous and may cause your hands and fingers to be caught.



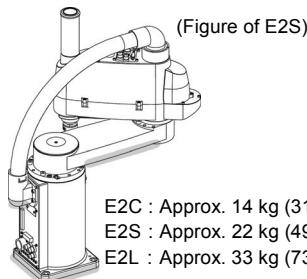
#### Reference:

Pulse values at Manipulator transport (PS series) : 0, 2621440, -3140167, 0, -1847207, 0

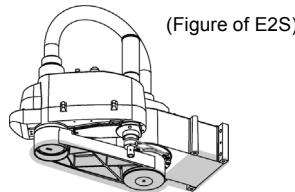
#### E2C, E2S, E2L

To carry the Manipulator, have two or more people to work on it and secure the Manipulator to the delivery equipment or hold the areas indicated in gray in the figure (bottom of Arm #1 / main cable elbow fitting / bottom of the base) by hand. When holding the bottom of the base by hand, be very careful not to get hands or fingers caught.

#### Table Top

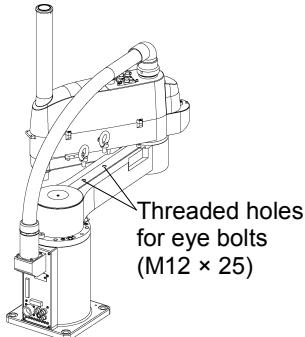


#### Multiple Mountings



## E2H

To carry the Manipulator, secure the Manipulator to the delivery equipment, or pass belts through the eyebolts (as shown in the figure) and hoist it with your hands. Do not hold the duct joint on the back of the base. When holding the bottom of the base by hand, be very careful not to get hands or fingers caught.

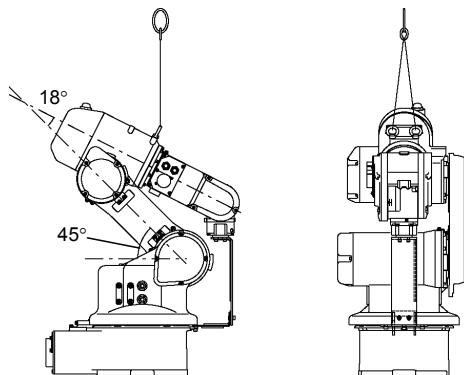


E2H : Approx. 37 kg (83 lb.)

#### Using a Crane

To hoist the Manipulator with a crane, secure the Manipulator with shipping bolts and jigs and posture the Manipulator as shown in the figures below (the posture at shipment from the manufacturer).

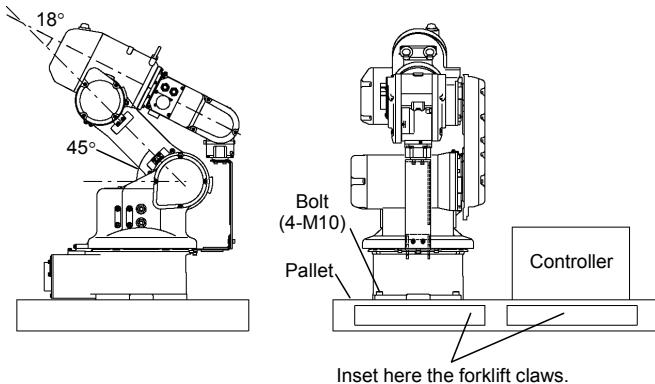
Use a cable threaded through the eyebolts attached to the Manipulator as shown. (Make sure that they are not loose.)



(Figures of PS3)

### Using a Forklift

Position the Manipulator as shown in the figures below (the posture at shipment from the manufacturer) and secure it onto a pallet with shipping bolts and jigs. Insert the forklift claws under the pallet and transport the Manipulator together with the pallet. The pallet must have enough strength to bear the weight of the Manipulator. Transporting of the Manipulator must be performed slowly in order to avoid overturning or slippage.



(Figures of PS3)

## 2.4. Manipulator Installation

Installation and transportation of robots and robotic equipment shall be performed by qualified personnel and should conform to all national and local codes.

For details, refer to the Manipulator manual.

- (1) When the Manipulator is Clean-model, unpack it outside of the clean room.

**NOTE**



Secure the Manipulator not to fall, and then wipe off the dust on the Manipulator with a little alcohol or distilled water on a lint-free cloth. After that, carry the Manipulator in the clean room. Connect an exhaust tube to the exhaust port after installation.

- (2) Remove the shipping bolt and jigs.

**PS series**

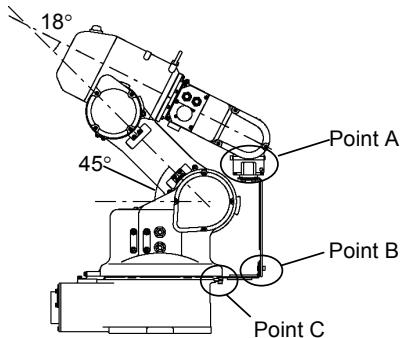
The shipping bolts and jigs are attached to the Manipulator as shown the figure below (points A, B, and C) for protecting the Manipulator from various external forces during transportation. Remove the shipping bolts B, A, and C in this order. The jigs are painted yellow.

Point A : 4-M5×12 hexagon socket head cap bolts with plain washers and disc spring washers

Point B : 2-M5×12 hexagon socket head cap bolts with plain washers and disc spring washers

Point C : 2-M6×15 hexagon socket head cap bolts with disc spring washers

(° = deg.)



The figure is PS3

**NOTE**



Before turning on the power, be sure that the shipping bolts and jigs have been removed. The shipping bolts and jigs must then be stored for future use, in the event that the Manipulator must be moved again.

## 2. Installation

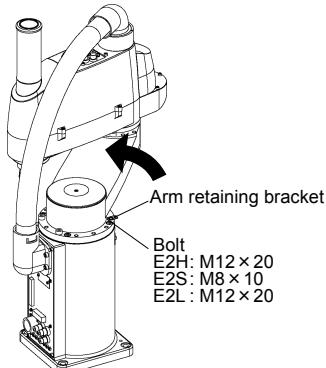
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### E2H, E2S, E2L

- (1) Using nippers, cut off the wire tie securing Arm #2.
- (2) Unscrew the cable clamp (E2H), or remove the M4 screw (E2S, E2L) on the end of Arm #2.
- (3) Push Arm #1 slowly in the direction shown with an arrow in the figure below.  
Remove the arm retaining bracket and bolt form the base.

NOTE  


If the bolt is not removed, the motion range of Joint #1 will be limited.  
Be sure to remove the bolt.



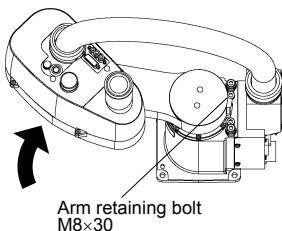
The figure is E2S

### E2C

- (1) Using nippers, cut off the wire tie securing Arm #2.
- (2) Unscrew the M4 screw on the end of Arm #2.
- (3) Push Arm #1 slowly in the direction shown with an arrow in the figure on the right. Fasten the arm retaining bolt on the base.

NOTE  


The arm retaining bolt must be fastened. Otherwise, the motion range of Joint #1 is limited.



## Installation Precautions

### Safeguard installation

- : To ensure safety, a safeguard must be installed for the robot system. For details on the safeguard, refer to the *Installation and Design Precautions* in the *Safety* chapter of the *EPSON RC+ User's Guide*.

### Space between safeguard and Manipulator

- : Install the Manipulator at a location with sufficient space so that a tool or a work piece on the end effector does not reach a wall or a safeguard when the Manipulator extends its arm fully while holding a work piece. Installing the Manipulator at a location with insufficient space is extremely hazardous and may result in serious bodily injury and/or severe equipment damage to the robot system as a tool or a work piece may collide with a wall and a safeguard.

### Manipulator check before installation

- : Before installing and operating the Manipulator, make sure that all parts of the Manipulator are in place and have no external defects. Missing or defective parts may cause improper operation of the Manipulator. Improper operation of the Manipulator is extremely hazardous and may result in serious bodily injury and/or severe equipment damage to the robot system.

### Base table

- : A base table for anchoring the Manipulator is not supplied. Please make or obtain the base table for your Manipulator. The shape and size of the base table will differ depending on the use of the robot system.  
For details, refer to the manual of each Manipulator.

### Side mounting and ceiling mounting

- : When mounting the Manipulator on a wall or ceiling, secure the Manipulator to the wall or ceiling that has enough strength and rigidity. Mounting the Manipulator on a wall or ceiling that has insufficient strength and rigidity is extremely hazardous and may result in serious bodily injury and/or severe equipment damage to the robot system as the Manipulator may fall or vibrate.

### Side mounting and ceiling mounting

: When mounting the Manipulator on a wall or ceiling, for safety purposes, attach the support to the Manipulator base to prevent the Manipulator from falling. If the Manipulator falls, it is extremely hazardous and may result in serious bodily injury and/or severe equipment damage to the robot system.

### For Protected-model

: Connect the power cable connection and the signal cable connector to the Manipulator immediately after the Manipulator installation. The Manipulator without connecting them may result in electric shock and/or malfunction of the robot system as it cannot ensure IP65.

## 2.5 Controller Installation

### Installation Precautions

#### Environment conditions

- : The Controller must be used within the environmental conditions described in their manuals. This product has been designed and manufactured strictly for use in a normal indoor environment. Using the product in the environment that exceeds the conditions may not only shorten the life cycle of the product but also cause serious safety problems.

#### For Clean-room installation

- : The Controller is not designed for clean-room specification. If it must be installed in a clean room, make sure to install it in the proper enclosure with adequate ventilation and cooling.

#### Installation procedure

- : Before performing any installation procedure, turn OFF the Controller and related equipment, and then pull out the power plug from the power source.  
Performing any replacement procedure with the power ON is extremely hazardous and may result in electric shock and/or malfunction of the robot system.

#### Cable

- : Be sure to connect the cables properly. Do not allow unnecessary strain on the cables. (Do not put heavy objects on the cables. Do not bend or pull the cables forcibly.) The unnecessary strain on the cables may result in damage to the cables, disconnection, and/or contact failure.  
Damaged cables, disconnection, or a contact failure is extremely hazardous and may result in electric shock and/or improper function of the system.

#### Installing direction

- : The Controller must be normally placed horizontally.

#### Rubber feet

- : Do not remove any feet of the Controller.

### Connecting Drive Unit and Control Unit

The configuration data for the Drive Unit is stored in the Control Unit. When connecting these units, it is crucial that the Drive Unit must be connected to the specified Control Unit. The Connection Check label on the front door of the Control Unit indicates the serial number of the Drive Unit to be connected and the DU (Drive Unit) number. (See the picture in the next page.) Connect the appropriate Drive Unit.

Connect the Drive Unit and the Control Unit by using Motion cable. The Motion Interface cable has a rectangular, 100-pin connector on both ends, which must go into the MOTION connectors on both the Control Unit and the Drive Unit.

Connect the AC OUTLET connector of the Drive Unit to the AC IN connector of the Control Unit with the Power cable to supply AC200V power to the Control Unit from via the Drive Unit.

#### Power

- : Make sure that the power to the Controller is turned OFF and locked out before connecting or disconnecting any cables. Connecting or disconnecting any cables with the power ON is extremely hazardous and may result in electric shock and/or malfunction of the Controller.

#### Cable

- : Be sure to connect the cables properly. Do not allow unnecessary strain on the cables. (Do not put heavy objects on the cables. Do not bend or pull the cables forcibly.) The unnecessary strain on the cables may result in damage to the cables, disconnection, and/or contact failure. Damaged cables, disconnection, or a contact failure is extremely hazardous and may result in electric shock and/or improper function of the system.

#### Connection of Control Unit, Drive Unit, and Manipulator

- : The serial numbers of the Drive Unit and Manipulator that should be connected are indicated on the Connection Check Label on the Control Unit. Connect the Control Unit, the Drive Unit and the Manipulator correctly. Improper connections between the Drive Unit and the Manipulator and between the Control Unit and the Drive Unit may cause improper function of the robot system and also serious safety problems.

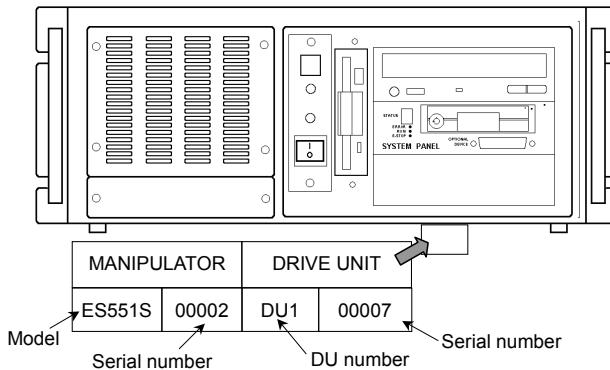
#### Connection of Drive Unit and MIB

If there is more than one Drive Unit connected to the Control Unit in the robot system, make sure that the DU numbers (DU1 - DU3) indicated above the MIB connector on the Control Unit and the Drive Unit (above the MOTION connector) match. Improper connection between the Control Unit and the Drive Unit may cause malfunction of the robot system and/or serious safety problems as it may make the Manipulator move abnormally.

Connection Check label(s) at the front of Control Unit:

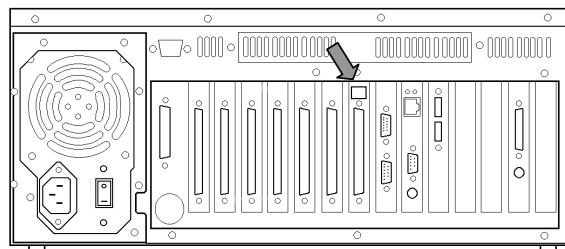


There is a Connection Check label for each Drive Unit. The same number of labels as Drive Units used in the robot system is attached on the bottom of the inside of the front door.



DU number label(s) at the back of Control Unit:

Drive Unit's No. is indicated on the label as shown below



## 2. Installation

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### Drive Unit serial number - Identifying proper unit:

Drive Unit's serial number is indicated on the label as shown below.

(The following photo is the six-axis Drive Unit.)



## 2.6 Connection to EMERGENCY Connector (Controller)

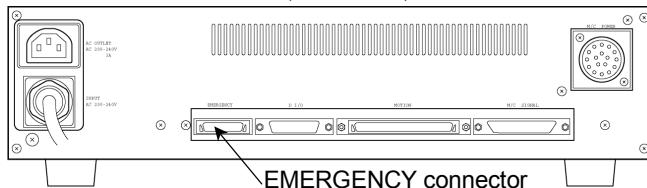
Connect a safeguard switch or Emergency Stop switch to the RC520 EMERGENCY connector for safety.

When nothing is connected to the EMERGENCY connector, RC520 does not operate normally.

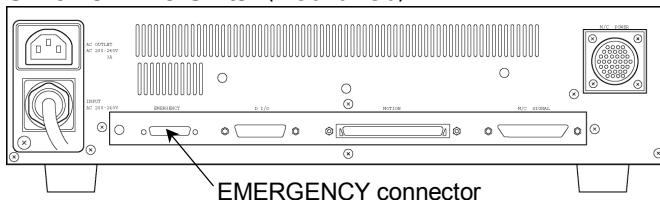
### Connector Pin

: Before connecting the connector, make sure that the pins are not bent. Connecting with the pins bent may damage the connector and result in malfunction of the robot system.

### Four-axis Drive Units (RC520DU)



### Six-axis Drive Units (RC520DU6)



### Safety Door Switch and Latch Release Switch

The EMERGENCY connector has input terminals for the Safety Door switch and the Emergency Stop switch. Be sure to use these input terminals to keep the system safe.

Connector	Standard
EMERGENCY connector	Rectangular half-pitch 20-pin M2.6 screw

### Safety Door Switch

The interlock of the Safety Door

- : The interlock of the Safety Door must be functioning when the robot system is operated. Do not operate the system under the condition that the switch cannot be turned ON/OFF (e.g. The tape is put around the switch.). Operating the robot system when the switch is not functioning properly is extremely hazardous and may cause serious safety problems as the Safety Door input cannot fulfill its intended function.

In order to maintain a safe working zone, a safeguard must be erected around the Manipulator. The safeguard must have an interlock switch at the entrance to the working zoon. The Safety Door that is described in this manual is one of the safeguards and an interlock of the Safety Door is called a Safety Door switch. Connect the Safety Door switch to the Safety Door input terminal on the EMERGENCY connector.

The Safety Door switch has safety features such as temporary hold-up of the s program or the operation-prohibited status that are activated whenever the Safety Door is opened.

Observe the following in designing the Safety Door switch and the Safety Door.

- For the Safety Door switch, select a switch that opens as the Safety Door opens, and not by the spring of the switch itself.
- The signal from the Safety Door (Safety Door input) is designed to input to two redundant signals. If the signals at the two inputs differ by two seconds or more, the system recognizes it to be a critical error. Therefore, make sure that the Safety Door switch has two separate redundant circuits and that each connects to the specified pins at the EMERGENCY connector on the Controller.
- The Safety Door must be designed and installed so that it does not close accidentally.

### Latch Release Switch

The controller software latches the following conditions:

- The safety door is open.
- The operation mode is for teaching.

The EMERGENCY connector has an input terminal for a latch release switch that cancels the latched conditions.

Open : The latch release switch latches conditions that the safety door is open or the operation mode is for teaching.

Closed : The latch release switch releases the latched conditions.

**NOTE** When the latched operation mode for teaching is released while the safety door is open, the status of Manipulator power is operation-prohibited because the safety door is open at that time.

To execute a Manipulator operation, close the safety door again, and then close the latch release input.

#### Checking Latch Release Switch Operation

After connecting the safety door switch and latch release switch to the EMERGENCY connector, be sure to check the switch operation for safety by following the procedures described below before operating the Manipulator.

- (1) Turn ON the Controller while the safety door is open in order to boot the controller software.
- (2) Make sure that “Safety” is displayed on the main window status bar.
- (3) Close the safety door, and turn ON the switch connecting to the latch release input. Make sure that the “Safety” is dimmed on the status bar.

The information that the safety door is open can be latched by software based on the latch release input condition.

Open : The latch release switch latches condition that the safety door is open. To cancel the condition, close the safety door, and then close the safety door latch release input.

Closed : The latch release switch does not latch the condition that the safety door is open.

**NOTE** The latch release input also functions to acknowledge the change of operation mode for teaching.

In order to change the latched condition of the operation mode for teaching, turn the mode selector switch on the operation unit to the mode for normal or turn the ATTEND (TEACH) control device enable/disable switch to “disable”. Then, close the latch release input.

### Emergency Stop Switch

If it is desired to create an external Emergency Stop switch(es) in addition to the Emergency Stop on the Teach Pendant and Operator Panel, make sure to connect such Emergency Stop switch(es) to the Emergency Stop input terminal on the EMERGENCY connector.

The Emergency Stop switch connected must comply with the following:

- It must be a push button switch that is “normally closed”.
- A button that does not automatically return or resume.
- The button must be mushroom-shaped and red.
- The button must have a double contact that is “normally closed”.



The signal from the Emergency Stop switch is designed to use two redundant circuits.

If the signals at the two circuits differ by two seconds or more, the system recognizes it as a critical error. Therefore, make sure that the Emergency Stop switch has double contacts and that each circuit connects to the specified pins on the EMERGENCY connector at the Controller. Refer to *Circuit Diagrams* indicated later in this section.

### Checking Emergency Stop Switch Operation

Once the Emergency Stop switch is connected to the EMERGENCY connector, continue the following procedure to make sure that the switch functions properly. For the safety of the operator, the Manipulator must not be powered ON until the following test is completed.

- (1) Turn ON the Controller to boot the controller software while pressing the Emergency Stop switch.
- (2) Make sure that both the “E-STOP” LEDs on the Control Unit’s system panel and the Drive Unit’s front panel are ON.
- (3) Make sure that “E.Stop” is displayed on the status bar on the main window.
- (4) Release the Emergency Stop Switch.
- (5) Execute the RESET command.
- (6) Make sure that “E-STOP” LEDs are turned OFF and the “Emergency Stop” is no longer visible (or dimmed) from the status bar.



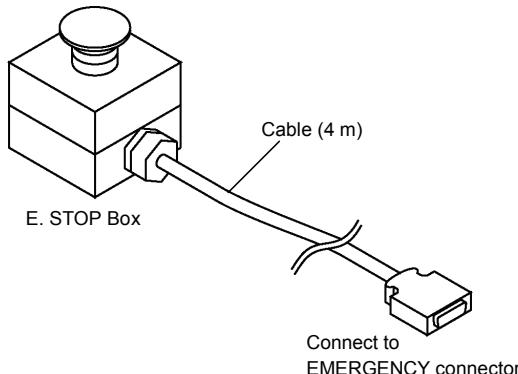
For the Emergency Stop condition to work with the peripheral equipment at the input of the Emergency Stop at the Drive Unit via the EMERGENCY connector, make sure that the desired equipment is connected to the Emergency Stop output terminals. The relay contacts at the EMERGENCY connector (#5 & #6) (normally closed) will open at the input of Emergency Stop state.

### E. STOP Box

The E. STOP box is a unit for performing an emergency stop. When using the E. STOP box, connect it to the EMERGENCY connector.

The E. STOP box is provided with the Controller as a standard accessory when the Controller you purchased is UL specifications.

When connecting the Safety Door switch or Emergency Stop switch to the EMERGENCY connector, remove the E. STOP box from the connector.



Once the E. STOP box is connected to the EMERGENCY connector, continue the following procedure to make sure that the E. STOP box functions properly. For the safety of the operator, the Manipulator must not be powered ON until the following test is completed.

- (1) Turn ON the Control Unit and the Drive Unit to boot the Controller while pressing the E. STOP box switch.
- (2) Make sure that the “E-STOP” LEDs on the Control Unit’s system panel and the Drive Unit’s front panel are ON.
- (3) Make sure that “Emergency Stop” is displayed on the status bar on the monitor window.
- (4) Release the E. STOP box switch.
- (5) Execute the RESET command.
- (6) Make sure that “E-STOP” LEDs are turned OFF and the “Emergency Stop” is no longer visible (or dimmed) from the status bar.

### Pin Assignments

The EMERGENCY connector pin assignments are as follows:

Pin No.	Signal	Function
1	E_SW11	Emergency Stop switch output (1) <sup>*3</sup>
2	E_SW12	
3	E.STOP1+	Emergency Stop input 1 (+)
4	E.STOP1-	Emergency Stop input 1 (-)
5	E.STOP OUT	Emergency Stop condition output (Relay contact) <sup>*1</sup>
6	E.STOP OUT	
7	GUARD11	Safety Door input (1) <sup>*2</sup>
8	GUARD12	
9	+24V	+24V output
10	+24VGND	+24V GND output
11	E_SW21	Emergency Stop switch output (2) <sup>*3</sup>
12	E_SW22	
13	E.STOP2+	Emergency Stop input 2 (+)
14	E.STOP2-	Emergency Stop input 2 (-)
15	RELEASE	Latch Release input
16	RELEASE	
17	GUARD21	Safety Door input (2) <sup>*2</sup>
18	GUARD22	
19	+24V	+24V output
20	+24VGND	+24V GND output

\*1 The Emergency Stop condition is output via relay contact when it is open (it is normally closed).

\*2 A critical error occurs if the input values from Safety Door 1 and Safety Door 2 are different for two or more seconds. They must be connected to the same switch with two sets of contacts.

\*3 The signal from the Emergency Stop switch is designed to use two redundant circuits. An error occurs if the statuses of the two redundant circuits are different for two or more seconds. They must be connected to the same switch with two sets of contacts.

Emergency Stop switch output rated load	+30V 1A or under	1-2, 11-12 pin
Emergency Stop rated input voltage range Emergency Stop rated input current	+24V $\pm 10\%$ 10mA/24V input	3-4, 13-14 pin
Safety Door rated input voltage range Safety Door rated input current	+12V to +24V $\pm 10\%$ 10mA/24V input	7-8, 17-18 pin
Latch Release rated input voltage range Latch Release rated input current	+12V to +24V $\pm 10\%$ 10mA/24V input	15-16 pin
Emergency Stop output relay contact rated load	+30V 0.5A or under	5-6 pin

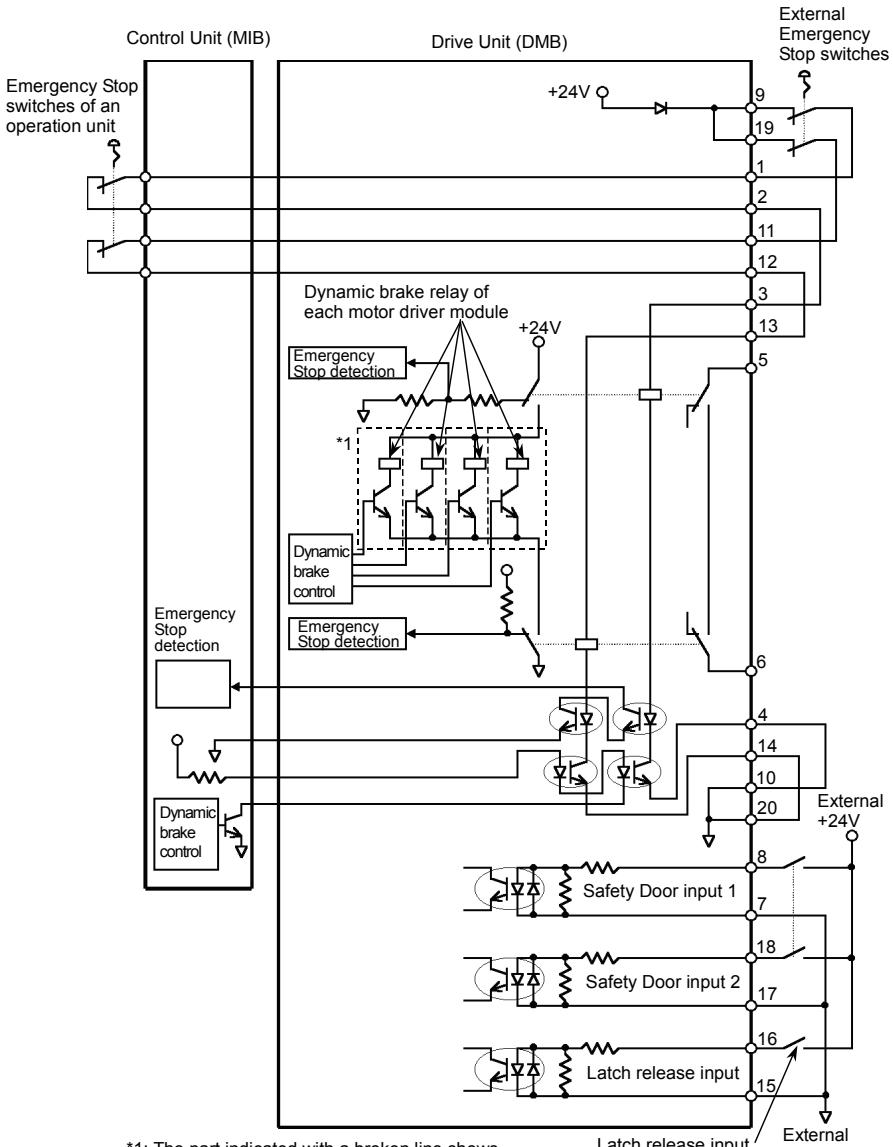
NOTE



The total electrical resistance of the Emergency Stop switches and their circuit should be  $1 \Omega$  or less.

## Circuit Diagrams

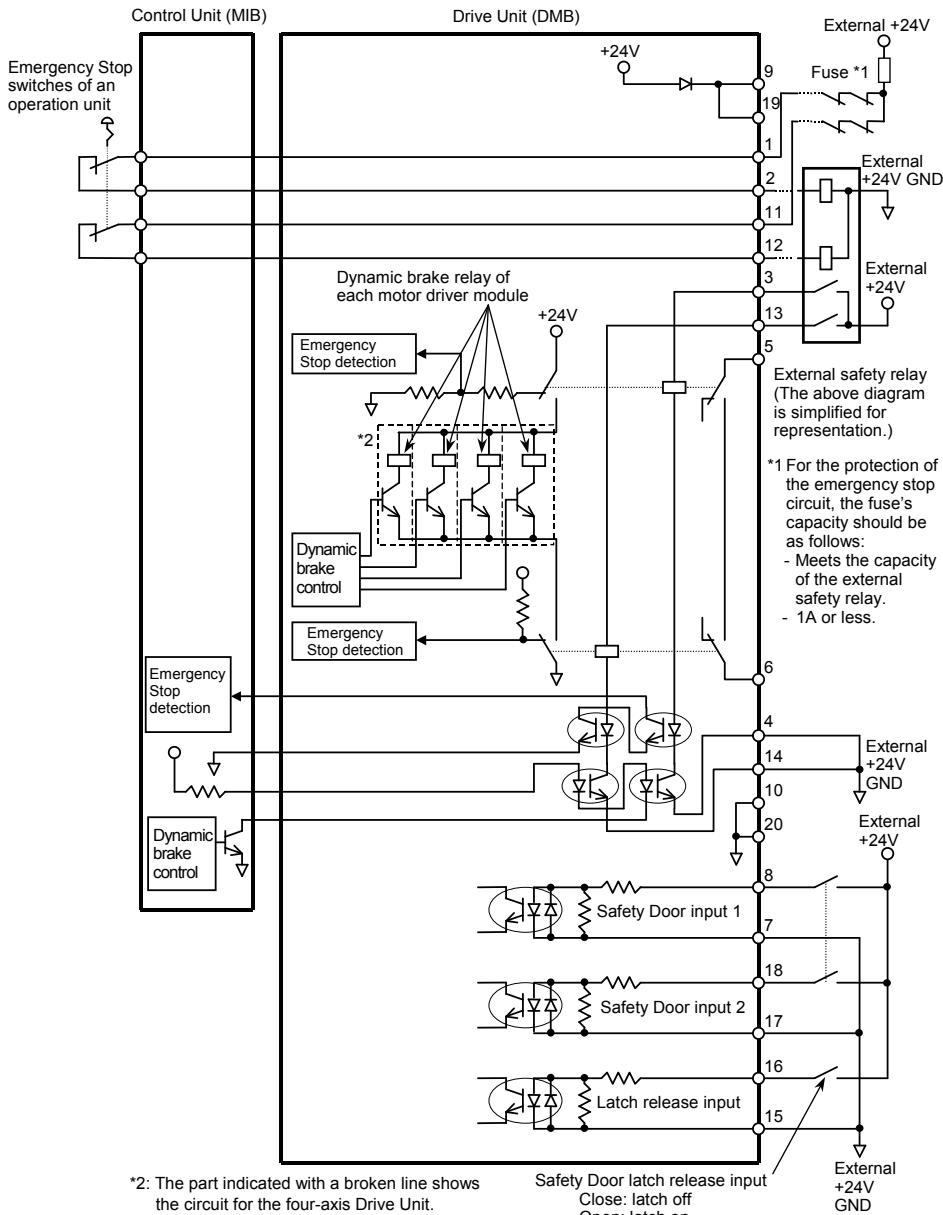
## Example 1: External emergency stop switch typical application



\*1: The part indicated with a broken line shows the circuit for the four-axis Drive Unit. For the six-axis Drive Unit, there are six motor driver modules in the circuit.

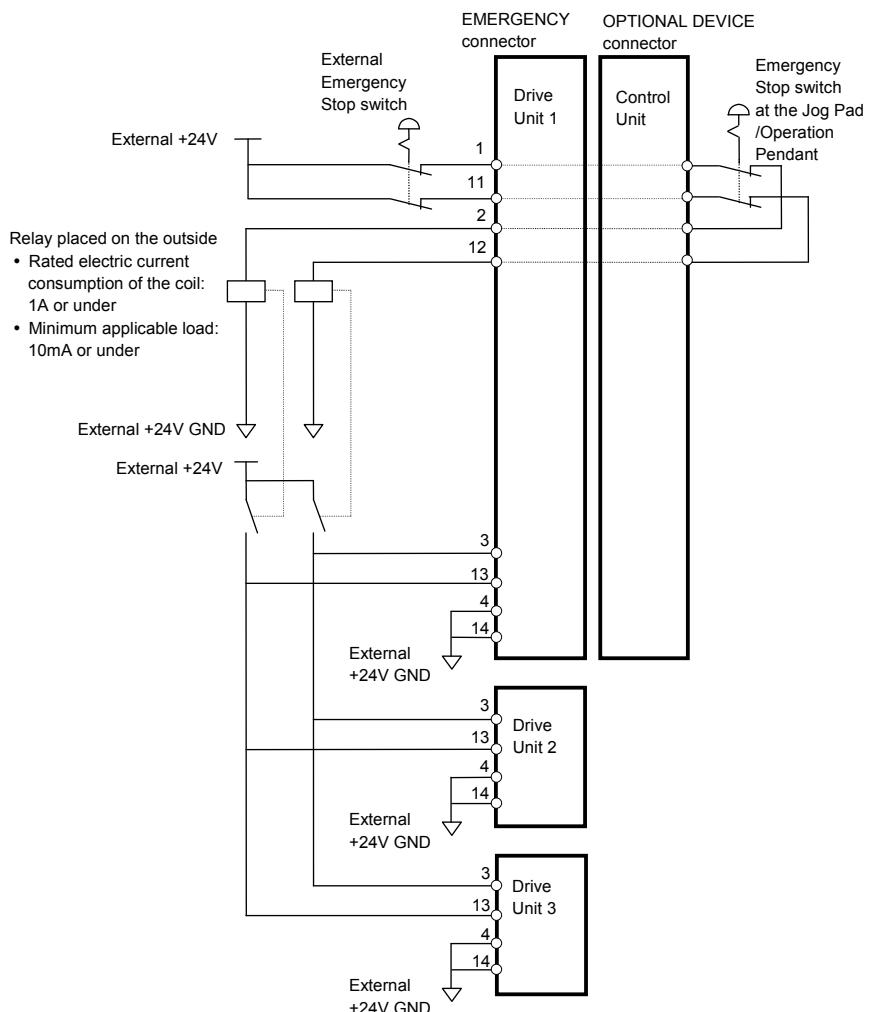
Latch release input  
Close: latch off  
Open: latch on

## Example 2: External safety relay typical application



### Example 3: Emergency Stop input circuit for Multi-Manipulator

RC520



## 2.7 Connecting Manipulator and Controller

### Connecting Precautions

#### Before Connection

- : Before connecting the connector, make sure that the pins are not bent. Connecting with the pins bent may damage the connector and result in malfunction of the robot system.

#### AC power cable

- : Be sure to connect the AC power cable to a power receptacle. DO NOT connect it directly to a factory power source. To shut off power to the robot system, pull out the power plug from the power source. Performing any work while connecting the AC power cable to a factory power source is extremely hazardous and may result in electric shock and/or malfunction of the robot system.

#### Connecting procedure

- : Before performing any connecting procedure, turn OFF the Controller and related equipment, and then pull out the power plug from the power source. Performing any replacement procedure with the power ON is extremely hazardous and may result in electric shock and/or malfunction of the robot system.

#### Cable

- : Be sure to connect the cables properly. Do not allow unnecessary strain on the cables. (Do not put heavy objects on the cables. Do not bend or pull the cables forcibly.) The unnecessary strain on the cables may result in damage to the cables, disconnection, and/or contact failure. Damaged cables, disconnection, or contact failure is extremely hazardous and may result in electric shock and/or improper function of the robot system.

#### Controller power

- : Make sure that the power to the Controller is turned OFF and locked out before connecting or disconnecting any cables. Connecting or disconnecting any cables with the power ON is extremely hazardous and may result in electric shock and/or malfunction of the Controller.

#### Connection

- : The serial numbers of the Drive Unit and Manipulator that should be connected are indicated on the Connection Check Label on the Control Unit. Connect the Control Unit, the Drive Unit and the Manipulator correctly. Improper connections between the Drive Unit and the Manipulator and between the Control Unit and the Drive Unit may cause improper function of the robot system and also safety problems.

### Wiring

- : Only authorized or certified personnel should be allowed to perform wiring.  
Wiring by unauthorized or uncertified personnel may result in bodily injury and/or malfunction of the robot system.

### Connector lock (PS series)

- : Be careful not to get hands or fingers caught while pushing down the connector lock lever because you should apply strong force to it.

### For Clean-model

- : When the Manipulator is a Clean-model, use it with an exhaust system.  
For details, refer to the Manipulator manual.

### For Protected-model

- : Connect the power cable connection and the signal cable connector to the Manipulator immediately after the Manipulator installation. The Manipulator without connecting them may result in electric shock and/or malfunction of the robot system as it cannot ensure IP65.

Connect a Drive Unit to the Manipulator by using M/C Power cable and M/C Signal cable.

#### M/C power cable

For the four-axis Drive Unit

- : The M/C power cable has round connectors with 17 pins on both ends. Connect the female connector to the POWER connector on the Manipulator and the male connector to the M/C POWER connector on the Drive Unit. Insert the connectors and rotate clockwise until you hear a “click” to secure the connection.

For the six-axis Drive Unit

- : This cable has a round connector with 37 pins on the controller-side and a rectangular connector with 36 pins on the Manipulator-side. Connect the round connector to the M/C POWER connector on the Drive Unit and the rectangular connector to the POWER connector on the Manipulator.

#### M/C Signal cable

For the four-axis Drive Unit

- : the M/C Signal cable has rectangular connectors with 68 pins on both ends.

For the six-axis Drive Unit

- : the cable has a D-Sub connector with 37 pins on the Controller-side end and a rectangular connector with 40 pins on the Manipulator-side end.

Connect the signal cable to the SIGNAL connector on the Manipulator and the M/C SIGNAL connector on the Drive Unit.

#### Serial Number of Connectable Manipulator

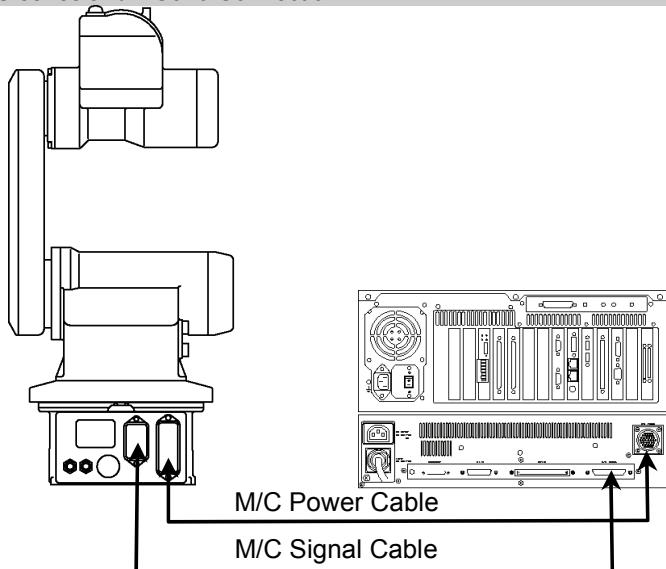
You can find the serial number of the Manipulator that should be connected to the Drive Unit on your left hand side facing the Drive Unit. The Manipulator’s serial number is indicated on the signature label of the Manipulator. (The following photo is the six-axis Drive Unit.)



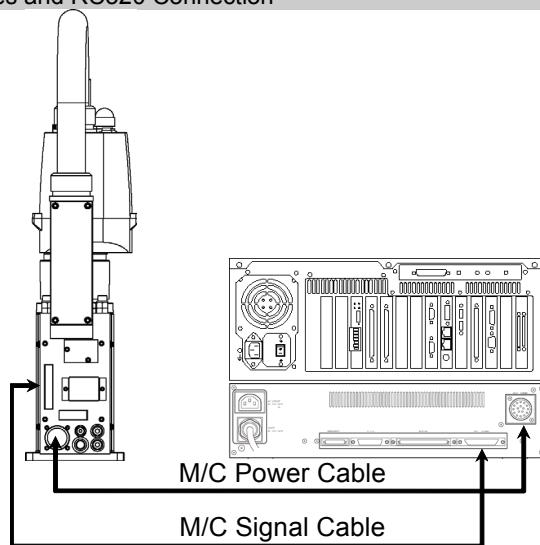
## 2. Installation

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PS series and RC520 Connection



E2 series and RC520 Connection



## 2.8. Power-on

### Power-on Precautions

#### Plug change

: If it is necessary to change the plug to fit the outlet in your factory, make sure that it is done by qualified personnel. When changing the plug, be sure to connect the earth wire of the AC power cable colored green/yellow on the Controller to the earth terminal of the factory power supply. The equipment must be grounded properly at all times to avoid the risk of electric shock. Always use a power plug and receptacle. Never connect the Controller directly to the factory power supply. (Field wiring)

#### Power activation

: Anchor the Manipulator before turning ON the power to or operating the Manipulator. Turning ON the power to or operating the Manipulator that is not anchored is extremely hazardous and may result in serious bodily injury and/or severe equipment damage to the robot system as the Manipulator may fall down

#### Manipulator check before installation

: Before installing and operating the Manipulator, make sure that all parts of the Manipulator are in place and have no external defects. Missing or defective parts may cause improper operation of the Manipulator. Improper operation of the Manipulator is extremely hazardous and may result in serious bodily injury and/or severe equipment damage to the robot system.

#### Shipping bolts and jigs check before turning ON

: Before first turning ON the power, be sure to remove the shipping bolts and jigs from the Manipulator. Turning ON the power while the shipping bolts and jigs are attached may result in equipment damage to the Manipulator.

### Power ON Procedure

- (1) Check the M/C power cable connection.
- (2) Check the M/C signal cable connection.
- (3) Check the EMERGENCY connector connection.
- (4) Connect the Dummy Plug or OP500RC to the OPTIONAL DEVICE connector.
- (5) Connect the AC power cable to the power supply socket.
- (6) Turn ON both the Drive Unit and Control Unit.

- (7) Boot the Controller. During this process, watch and monitor the Drive Unit LED status as described in the following list:

POWER LED	: The LED will be ON if the system is operating properly. When the LED is OFF, suspect that either there is an input/output failure in the Switching Power Supply module or a wiring failure in the Control Power Supply circuit.
MOTOR POWER	: The LED must be OFF.
E-STOP	: The LED must be ON when the system is in E-STOP condition. This LED turns ON when there is an EMERGENCY STOP input to the Control Unit's OPTIONAL DEVICE connector and the Drive Unit's EMERGENCY connector.
RUN	: The LED must be blinking.
ERROR	: The LED must be blinking.
1	: The LED must be OFF.
2	: The LED must be OFF.

- (8) Boot the Controller. During this process, watch and monitor the Control Unit LED status as described in the following list:

E-STOP	: When the main power is turned ON, the LED must turn ON momentarily and must go OFF unless there is an emergency stop input. If there is an emergency stop input at this time, the LED must stay ON. This LED turns ON when there is an EMERGENCY STOP input to the Control Unit's OPTIONAL DEVICE connector and the Drive Unit's EMERGENCY connector.
RUN	: The LED must be blinking.
ERROR	: The LED must be blinking.
7 segment	: When the main power is turned ON, "8" lights up momentarily and goes OFF. The displayed data must change from "0" in order to indicate the system condition that is checked at the beginning of the Controller.

When an error appears, check the connection in step (1) to (5) to turn ON the power again. If an error appears after checking the connection contact the supplier.

### 3. First Step

This section indicates the procedure to execute simple program after turning ON the power.

Make sure that the Robot system is installed safely by following the description in *1. Safety* and *2. Installation*. Then, operate the Robot system in the following procedures.

#### 3.1 Windows XP Setup

When using Windows XP, make sure to set up the system.

**NOTE** Do NOT stop the Windows XP Setup and turn OFF the Controller before completing this setup.

 Otherwise the Controller will NOT start up again and you must execute Windows recovery.

After a short time after turning ON the Controller, “Windows XP Setup” starts automatically.

Setup procedure is as follows. Follow the instruction in the dialog.

(1) Welcome to Microsoft Windows XP

Click the <Next> button to continue the setup.

(2) License Agreement

This dialog is for selecting agree or disagree to the displayed agreement.

When you agree to the agreement, select the option to agree and click the <Next> button. (If you select the option to disagree, the Windows setup will be canceled.)

After agreeing to the “License Agreement”, the setup starts automatically.

(3) Windows Startup

Windows reboot automatically after finishing the setup and will be able to use the Controller.

**NOTE      Settings at Shipment**

 The RC520 robot controller is configured at factory as shown below:

User name and the password for Auto Log In

Log In User Name : EPSON RC User (with Administrator authority)

Log In Password : epson

Windows Administrator Password

Administrator Password : epson

\* The password is case-sensitive.

For details of other settings at shipment, refer to *Appendix A Settings at Shipment* in the *EPSON RC+ User's Guide*.

## 3.2 Installing EPSON RC+ Software

EPSON RC+ is installed at the factory before shipment with the specified configuration. However, if you need to add an option, upgrade, or re-install, refer to the section *Installing EPSON RC+ Software* in Appendix A for instructions on installing EPSON RC+.

### Installing the software options key

Included with the EPSON RC+ Software is a software key device that enables options. Without this device, the options you have installed will not be enabled. All options are enabled on one key. Options can also be enabled in the field. See the chapter *Installing Options* for details.

The software options key is installed by simply plugging the male end of the key into the parallel port connector on the PC Control Unit.

Do not plug the options key into the Option Device connector or any other port other than the parallel port. Permanent damage can occur.



### PC Configuration

Refer to Appendix A and configure Date, Time, and screen resolution.

### 3.3 Writing your first program

Follow these instructions to create a simple application program so that you will become more familiar with the EPSON RC+ development environment.

#### 1. Start EPSON RC+

Double-click the EPSON RC+ icon on the desktop.

#### 2. Create a new project

- a. Select New from the Project menu.
- b. Type in a name for a project, for example, FirstApp.
- c. Choose **Ok** to create the new project.

When the new project is created, a program called Main.prg is created. You will see a window open with the title Main.prg with a cursor flashing in the upper left corner. Now you are ready to start entering your first program.

#### 3. Edit the program

Type in the following program lines in the Main.prg edit window. You can use upper or lower case characters.

Function main

```
Print "This is my first program."
```

Fend

#### 4. Run the program

Press **F5** to run the program. (F5 is the hot key for the Start selection of the Run menu). You will see the Status window showing the build operation.

Your program is compiled and loaded into memory. If there are no errors during build, the Run window will appear.

Press the **Start** button on the Run window to run the program.

You should see the following displayed on the Run window:

```
-> main started as Task 1
This is my first program.
-> All Tasks Stopped
```

Now let's teach some robot points and modify the program to move the robot.

#### 5. Teach robot points

Click on the Jog and Teach button  on the toolbar. You will see the Jog and Teach dialog box.

Look at the lower left hand corner of the screen. You will see a drop down list box called **Point File Name**. The current selection is robot1.pnt. This is the default robot point file for your application. Any points that you teach will be saved with this filename.

Click on the **Robot Control Panel** toolbar button . Click on the **Motor On** button to turn on the robot motors. You will be prompted to confirm the operation. Answer Yes to continue.

If the **MCal** button is enabled, press it now to calibrate the robot. You will be prompted to confirm the operation. Answer Yes to continue. Then you will see a status window appear and the robot should start calibrating. Type any key, or click the **Stop** button if you need to abort the MCal command. The MCal button is not enabled if you are using an absolute encoder robot.

Exit the Robot Control Panel by clicking on the **Close** button.

Press the **Teach P0** button.

Jog the robot by pressing the +Y jog button. Hold the button down to continue jogging. Let go when the robot is about half way out in the work envelope.

Jog the robot down by pressing the -Z button.

Now change the current point to P1 by clicking on the right arrow on the **Point #** slider until the point number is 1.

Press the **Teach P1** button. You will see a confirmation message to teach the point. Answer Yes.

Press the +X button to jog the robot in the +X direction.

Change the current point to P2 by clicking on the right arrow on the **Point #** slider until the point number is 2.

Press the **Teach P2** button. You will see a confirmation message to teach the point. Answer Yes.

Leave the jog screen by pressing the **Close** button located in the lower right corner of the screen. You will see a message saying that changes have been made. Click **Yes** to save the changes.

**6. Modify the program to include robot motion commands**

Insert three new Jump statements into the Main.prg program as shown below:

```
Function main
    Print "This is my first program."
    Jump P1
    Jump P2
    Jump P0
Fend
```

Run the program by pressing **F5** and then click on the **Start** button on the Run window. The robot should jump to each of the points you taught.

**7. Modify the program to change speed of robot motion commands**

Insert the Power, Speed, and Accel commands as shown in the program below:

```
Function main
    Print "This is my first program."
    Power High
    Speed 20
    Accel 20, 20
    Jump P1
    Jump P2
    Jump P0
Fend
```

Run the program by pressing **F5** and then click on the **Start** button on the Run window. The robot should jump to each of the points you taught at 20% speed, acceleration, and deceleration. The Power High statement enables your program to run the robot at high (normal) power, which in turn allows the robot speed and acceleration to be increased.

#### 8. Backup the project and system configuration

Even though this is only a sample project, we will backup the project and system configuration on floppy disk. This is easy to do with EPSON RC+. It is important that you keep regular backups of your applications on external media such as floppy disks.

Follow these steps to backup the project and system configuration:

1. Insert a blank floppy disk in the floppy drive.
2. From the Project menu, select Copy.
3. Change the Destination Drive to A:.
4. Click OK. The project will be copied to the floppy disk.
5. From the Tools menu, select Maintenance.
6. Click on the MKVER button.
7. Enter the MKVER name "sample".
8. Select the A: drive.
9. Click OK. The system configuration will be backed up on the floppy disk.

Now that you have written your first program.

## 4. Second Step

Setup other necessary functions after operating the robot system as indicated in 3. *First Step*.

Manuals that indicate necessary setups and procedures are guided in this section.  
(For descriptions of each manual, refer to 5. *Third Step*.)

### 4.1 Connection with External Equipment

#### Remote Control

EPSON RC+ User's Guide

    Remote Control

ROBOT CONTROLLER RC520 manual

    Setup & Operation 8. I/O Remote Set Up

#### I/O

EPSON RC+ User's Guide

    I/O Setup

ROBOT CONTROLLER RC520 manual

    Setup & Operation 6. I/O Connector

    Setup & Operation 7 Expansion I/O Board (Option)

#### Fieldbus I/O (Option)

EPSON RC+ Option Fieldbus I/O manual

#### Ethernet I/O (Option)

EPSON RC+ User's Guide

    Ethernet Communication

ROBOT CONTROLLER RC520 manual

    Setup & Operation 8. I/O Remote Set Up

#### RS-232C (Option)

EPSON RC+ User's Guide

    RS-232C Communication

ROBOT CONTROLLER RC520 manual

    Setup & Operation 9. RS-232C Board

## 4.2 Connection and Display Language of Option OP500RC

### Connection

ROBOT CONTROLLER RC520 manual

Setup & Operation 4. OPTIONAL DEVICE connector

EPSON RC+ Option OP500RC manual

1.6. Installation

### Changing Display Language

EPSON RC+ Option OP500RC manual

1.9 Setting Language

## 5. Third Step

Descriptions of manual contents are indicated in this section.

Manuals are supplied by Acrobat PDF to use the Robot system.

Select EPSON RC+-[Help]-[PDF Manual] to view the PDF manuals from a PC.

(Click <Start>-[Program]-[EPSON RC+] from the Windows desktop.)

### Software

#### EPSON RC+ User's Guide

This manual indicates descriptions of the Robot system and program development software.

- Safety
- Robot System Operation and Configuration
- Operation of Program Development Software EPSON RC+ GUI
- SPEL+ Language and Application
- Configuration of Robot, I/O, Communication etc.

#### EPSON RC+ SPEL+ Language Reference

This manual indicates descriptions of the SPEL+ language for robot program.

- Details of the commands
- Error Messages etc.

### Option

The manuals indicate descriptions of the Option(s) you purchased. There are manuals for each Option.

#### EPSON RC+ Option VB Guide 4.0

#### EPSON RC+ Option Vision Guide 4.0

#### EPSON RC+ Option Vision Guide 4.0 Properties and Results Reference

#### EPSON RC+ Option PG Motion System

#### EPSON RC+ Option Fieldbus I/O

#### EPSON RC+ Option Operator Pendant OP500RC

### Controller

#### ROBOT CONTROLLER RC520

This manual indicates descriptions of the Robot Controller RC520 and Robot system.

- Safety
- Specification, Installation, Operation, and Setup
- Backup and Restore
- Maintenance
- Verifying Robot System Operation
- Error Codes        etc.

### Robot

The manuals indicate descriptions of the Robot(s) you purchased. There are manuals for each Robot.

EPSON ProSix PS series (PS3, PS3L/PS3LP, PS5)

EPSON SCARA ROBOT E2 series (E2S/E2L, E2C, E2H)

#### EZ MODULES X4 series

- Safety
- Specification, Installation, Setting
- Maintenance
- Calibration        etc.