General Purpose Robot Arm for Industry Use

ZERO

Delta Robot Installation Guide

Document Number : M-0102-211018

October 2021

Introduction

Thank you for your purchase of the general-purpose industrial robot "ZERO"

- Using this product requires "the special education on industrial robots", "qualifications for electrical work", knowledge and skills for robots and a programming language "Python".
- For safe and proper use of the product, please read the product manuals carefully.
- Product specifications are subject to change without notice (due to potential future product improvement initiatives).

- We recommend keeping the product manuals handy at all times for easy access.
- The contents of this document are subject to change without notice.
- Reproducing or coping the information contained herein, in whole or in part, without prior approval of ZEUS CO., LTD is strictly prohibited.

Purpose of this Guide

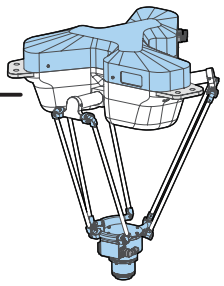
The installation guide is a quick guide to help you with installation procedures from mounting the robot "ZERO" through ABS Homing operation.
The next step of ABS Homing is teaching the robot.
For safe use of the product "ZERO", please read the manuals as well as this manual carefully.

Product Overview

This product comprises a manipulator and a controller as shown below.

"ZERO" (= Robot)

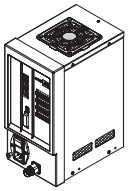
"ZERO" consists with a manipulator and a controller



Manipulator

The manipulator is an 3-axis (optional 4-axis) parallel robot actuated by servo motors.

Attaching different end-effectors to the manipulator-tip allows the robot to be adapted for various tasks.



Controller

The controller is a control board that includes control circuitry and a power supply board.

The controller handles communications with the host controller through I/O interfaces, and comprehensively controls motions of the manipulator.

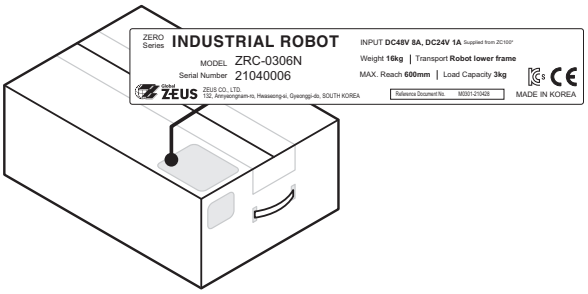
Introduction

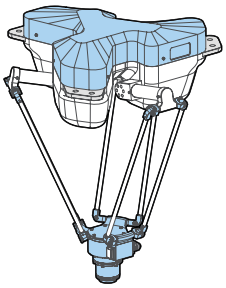
Checking Items Upon Unpacking

Please compare the actual items received with your product purchase order.

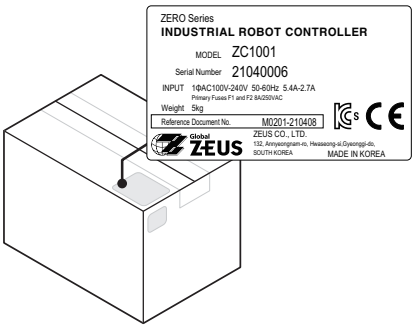
Should you have any problems, please contact the customer service.

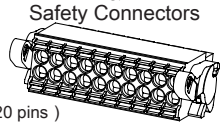
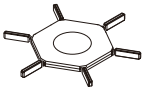
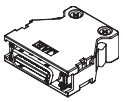
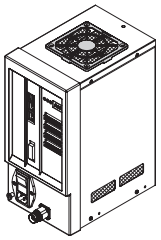
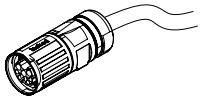
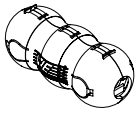
Manipulator



Manipulator 	1 ☐

Controller



User's Guide & Safety Guide 	1 Copy ☐	I/O Connectors & Safety Connectors  (20 pins)	4 ☐
		Coding profile keys 	1 set (6 keys) ☐
		Jumper Connector  For automatic operation, this needs to be connected to CN2.	1 ☐
Controller 	1 ☐		
Installation Guide (this document) 	1Copy ☐	Manipulator Cable 	1 ☐
		Ferrite Core  For Power cable	2 ☐

The C. CODE is unique to each robot. Connect the controller with its C. CODE matching manipulator.

Connect only a C. CODE matching pair of the manipulator and the controller to each other.

Safety Precautions

Safety Signs

This manual uses the signs below to indicate serious but avoidable problems caused by misuse of the product. One is for death or serious bodily harm. The other is for bodily injury or product or equipment damage.

Danger	Identifies information about imminent hazards that will result in death or serious injury.
Caution	Identifies information about hazards that could result in injury or equipment damage.

Throughout this document, the safety precautions that users must follow are marked as follows.

	Safety Precaution - "Prohibited Action"
	Safety Precaution - "Mandatory Action"

The following symbols used in this manual identify information about anticipated hazards.

	Cautions and Dangers Causes unexpected, unstable, or uncontrolled motions. Compromises the performance or reliability of the product. Shortens the product life.
	Electric shock hazard
	Burn hazard
	Fire hazard
	Injury hazard
	Failure and damage hazard
	Collision hazard
	Trip and fall hazard

Safety Precautions

Releasing the Brake in an Emergency

In case of emergency, you can manually release the brake of any manipulator joint and move the manipulator.

	Do not enter the area under the arm when releasing the brake. Ensure that there are no people in the robot's range of operation. The arm may drop under its own weight when you release the brake manually	
	If there is potential hazard such as interference with surroundings, take a non-hazardous position and release the brake.	

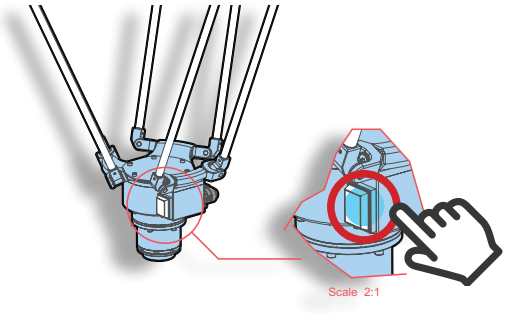
How to release the brake

Connect the controller and the manipulator using the manipulator cable, and turn on the power to the controller. Power to the robot becomes present. Note that the brakes cannot be released unless the robot is powered on. To release a brake, press the brake release button located at each joint.

Brake Release Button

The robot brakes could not be turned off when it has no power.

All joints



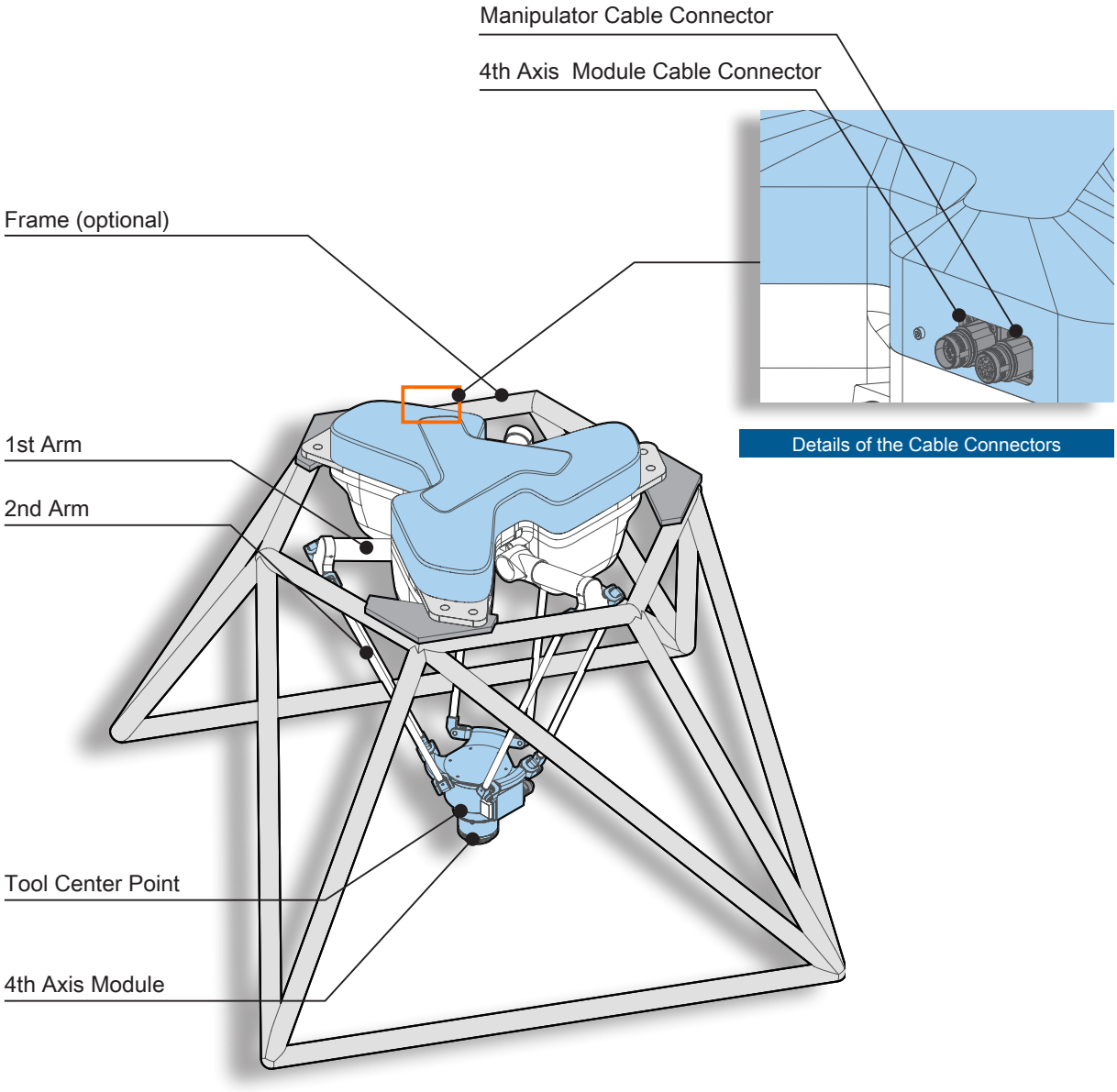
The brake releases while pressing the brake release button.

Bolts/Screws and Torque Tightening

Size	Torque Tightening (N•m) (1.8T, vehicle/engine use)
M3	1.14
M4	2.7
M5	5.4
M8	22.0

1. Mounting the Manipulator

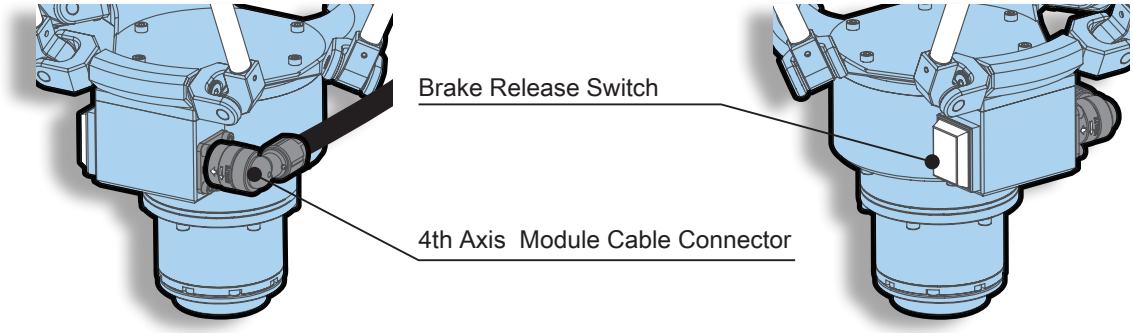
Component Features



Details of the Cable Connectors

The shape of the frame is an example. The shape and dimension can be changed due to product improvement or circumstances.

Details of the tool center point



Precautions for Installation

Observe the mounting styles specified below and mount the manipulator properly.

To mount on the frame, using all 6 bolts is recommended.

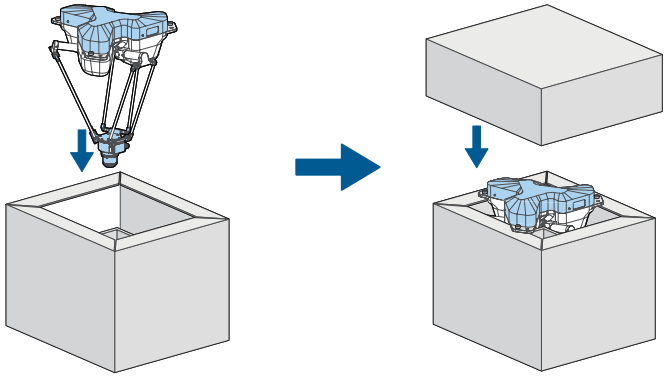
Packing and Shipping

·Controller

Lift the lower part to avoid any impact on the front and intake vent.

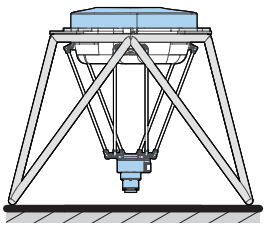
·Manipulator

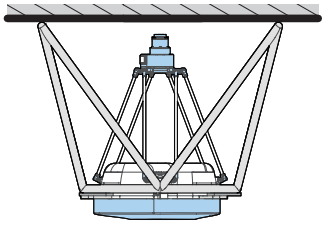
Don't hold the joint part and the end effector.



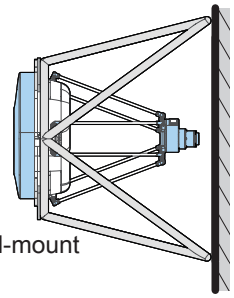
Mounting Configurations

OK Floor-mount



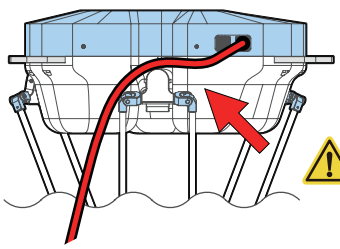


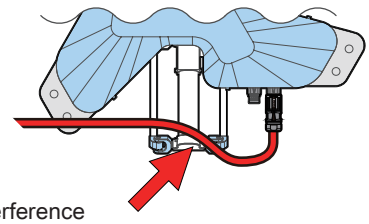
Ceiling-mount
NG



Wall-mount
NG

Precautions for Installation



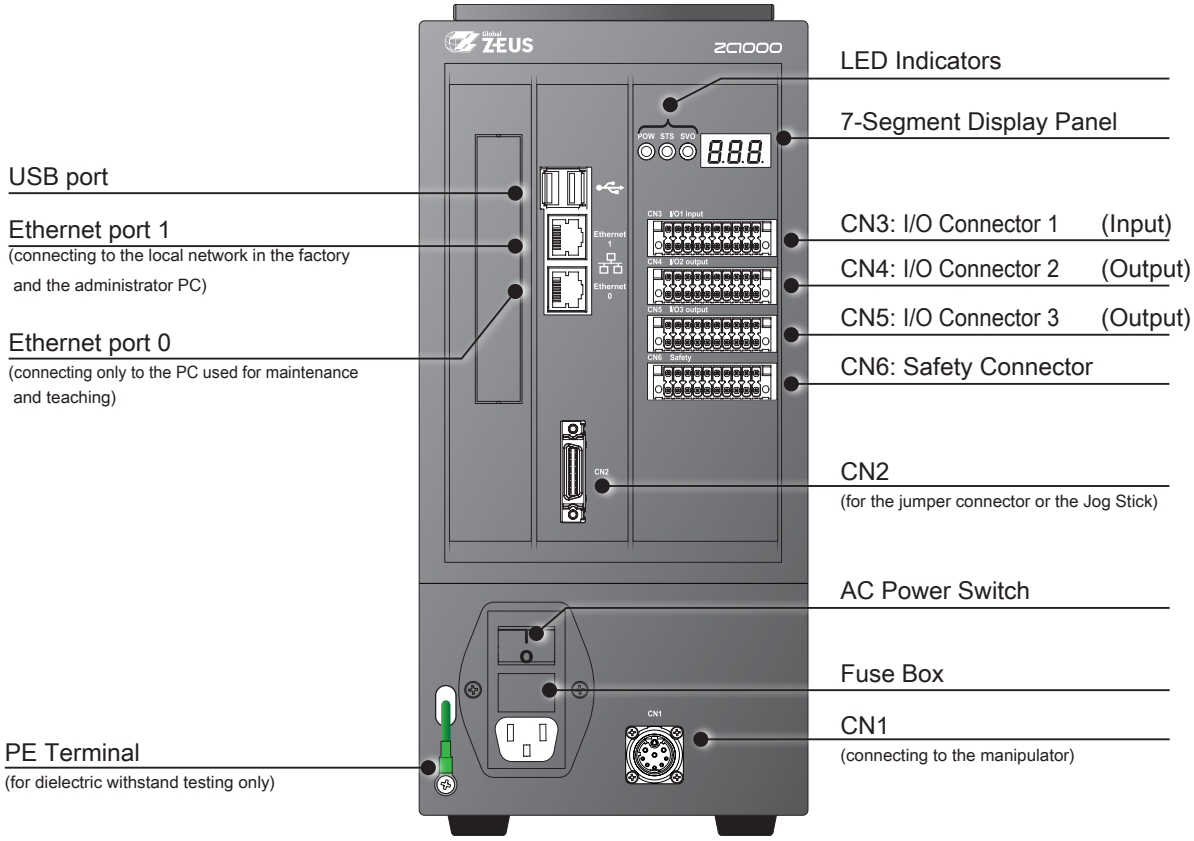


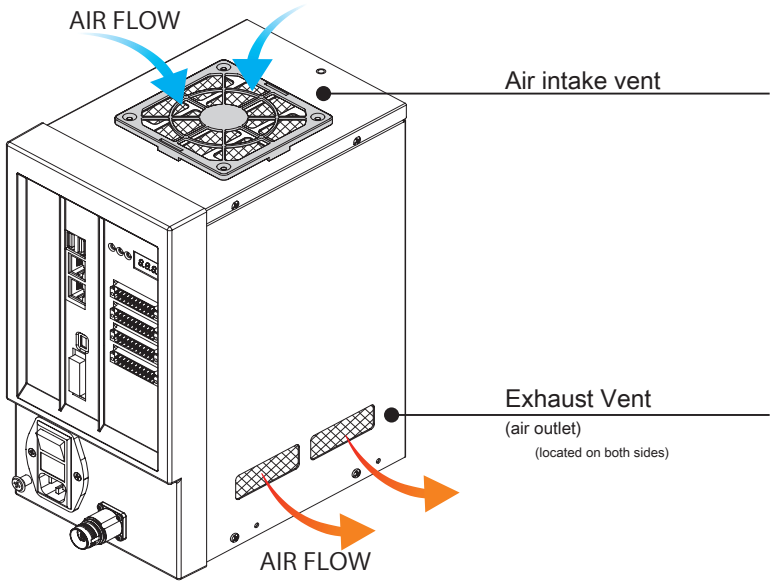
Watch out for interference of the manipulator and the cable.

Carefully read details and precautions for the dimensions of installation space, the work envelope, arm postures, the end-effector design, and arm I/O.

2. Controller Installation

Component Features





7-Segment Display Panel and LED Indicators

The 7-segment display panel and three LED indicators display states of the robot.
The period blinking in the bottom right corner of the 7-segment display panel indicates that the controller system is in operation.

Display		Description
---	---	Starting the controller
ini	ini	Initializing the controller
rdy	rdy	READY state (stand-by)
inc	inc	ABS Lost state (*1)
tch	tch	Teach Mode
JoG	JoG	JOG Operation Mode
run	run	Executing User program
PAu	PAu	Pausing User Program
PoF	PoF	Processing Power OFF
E**	E**	System-Defined Error (*2, *4)
c**	c**	System-Defined Error Fatal (*2, *5)
u**	u**	User-Defined Error (*3, *4)
r**	r**	User-Defined Error Fatal (*3, *5)

*1) When started for the first time, the manipulator is in a state of the absolute position being lost.

*2) For more information on system-defined errors, refer to “Troubleshooting.” P.28

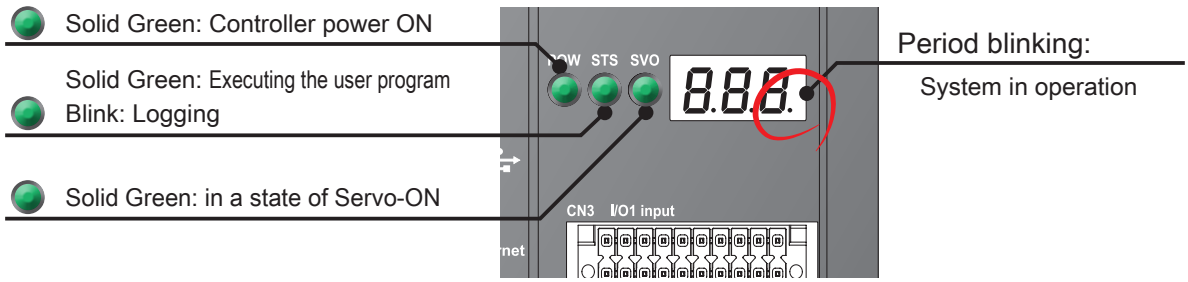
*3) Any user-defined errors can be created using Python programming.

*4) For a non-fatal error, eliminate the cause, and then recover with “Error reset signal.”

*5) For a fatal error, eliminate the cause, then power cycle.

LED Indicators

LED



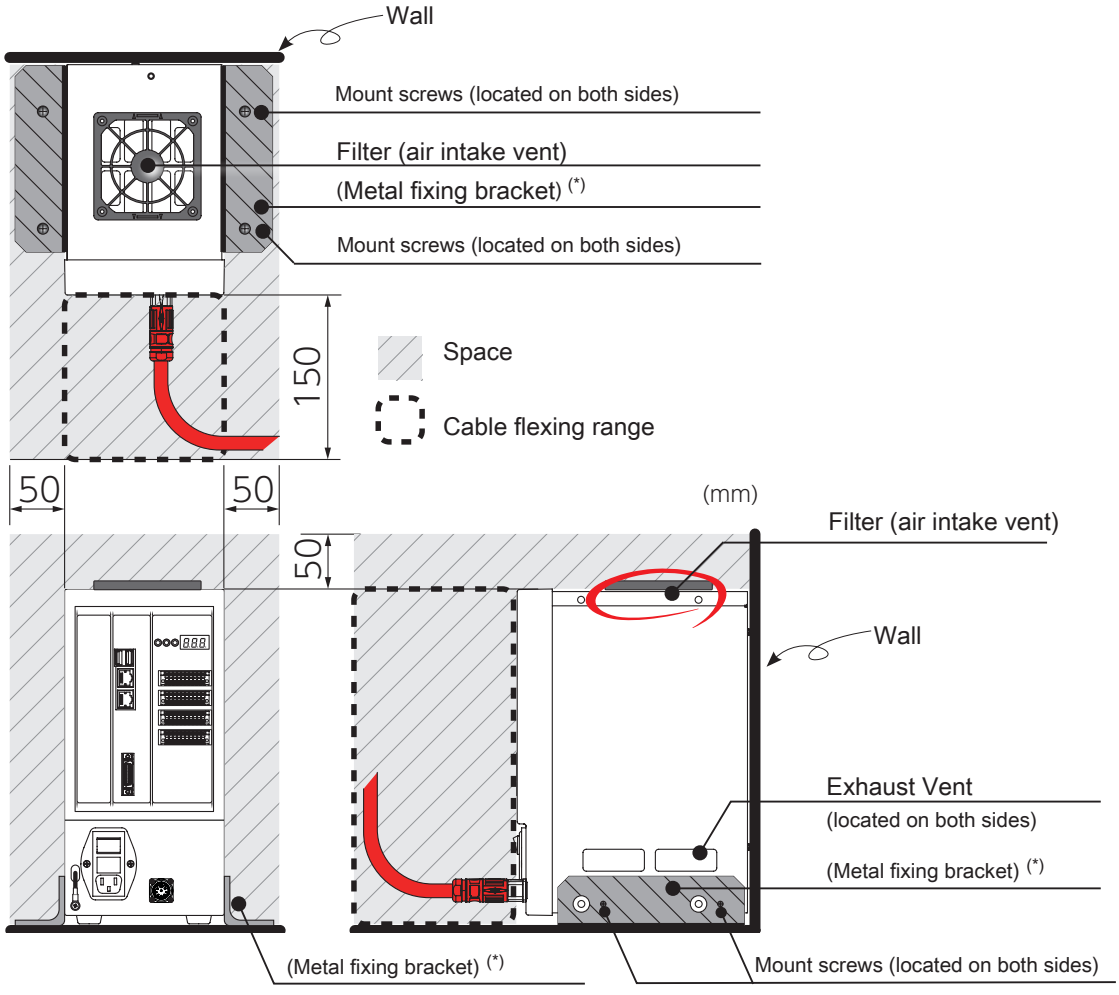
Controller Installation

Mounting

Provide sufficient space for installation.
Refer to the clearance around the controller illustrated below.

We recommend using mount screws (M3 at 4 spots) to the side of the controller as a fall prevention measure.
Do not install a manipulator in an enclosed space. Do not block the exhaust (or intake) vent(s).

When designing metal fittings, take it into consideration that the cover fixing screws are 20 mm away from the controller mount holes. In addition, do not let metal fittings block the air intake vents.



*) user-supplied

Safety Connector

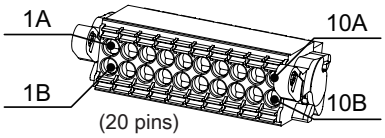
Connect the safety connector correctly.

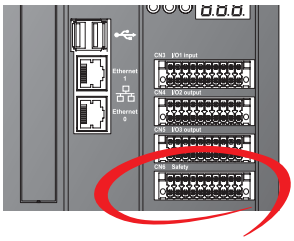
If not, the manipulator cannot be operated.

CN6: Safety Connector Pinout

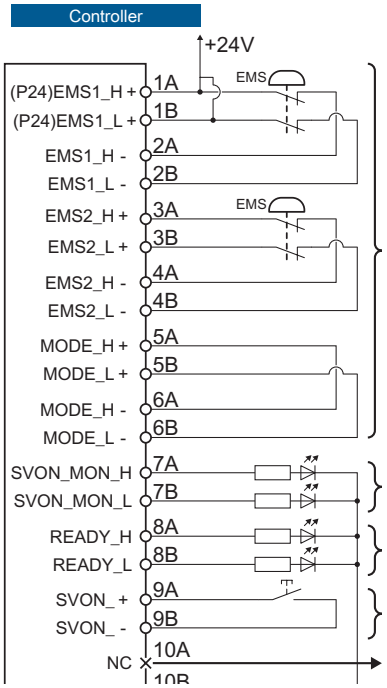
Terminal	Signal Name	Description	Terminal	Signal Name	Description
1A	EMS1_H+ (P24)	Emergency stop switch 1a, Controller 24V	1B	E MS1_L+ (P24)	Emergency stop switch 1a, Controller 24V
2A	EMS1_H–	Emergency stop switch 1a	2B	EMS1_L–	Emergency stop switch 1a
3A	EMS2_H+	Emergency stop switch 2a	3B	EMS2_L+	Emergency stop switch 2a
4A	EMS2_H–	Emergency stop switch 2a	4B	EMS2_L–	Emergency stop switch 2a
5A	MODE_H+	Mode switch	5B	MODE_L+	Mode switch
6A	MODE_H–	Mode switch	6B	MODE_L–	Mode switch
7A	SVON_MON+	Servo-ON monitor output	7B	SVON_MON_–	Servo-ON monitor output
8A	READY_H	READY contact output	8B	READY_L	READY contact output
9A	SVON_H+	Servo-ON input	9B	SVON_H–	Servo-ON input
10A	NC	Not use	10B	G24	Controller 24 V GND

Safety Connector (*)
Product Number:DFMC 1,5/10-ST-3,5-LR
1790564
(from PHOENIX CONTACT)
*) same as I/O connectors 1, 2, and 3





Wiring Example of Safety Connector



Install more than one emergency stop switch.
Attach jumper wires to the EMS input terminals which will not be used.

required — Emergency Stop Switch/Mode Switch

If only one end of these redundant circuits is connected, an error will be detected.
Please also short circuit the MODE terminals.

optional — Servo-ON monitor

optional — READY monitor

required — Servo-ON input

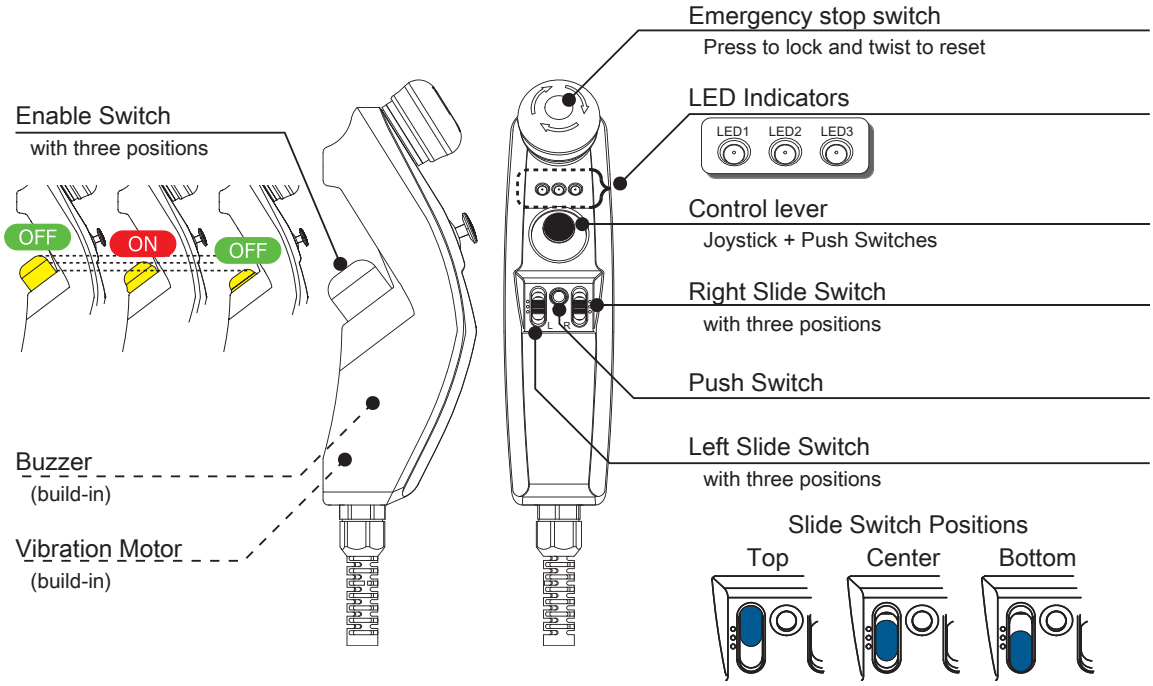
Do not connect any connector

*) Use EMS2 terminals for interlocks and light curtains which will prevent workers from entering the robot work area.
For the equipment to be connected, use a product that conforms to the applicable standards such as IEC61496. Use the product correctly according to its user guide and be sure that it can make an emergency stop.
If more than one piece of equipment are to be connected, wire them in series.

3. JOG Stick

Component Features

Use a Jog Stick (optional product) to jog each axis of the manipulator.
Jogging operation is used for Homing and Teaching.

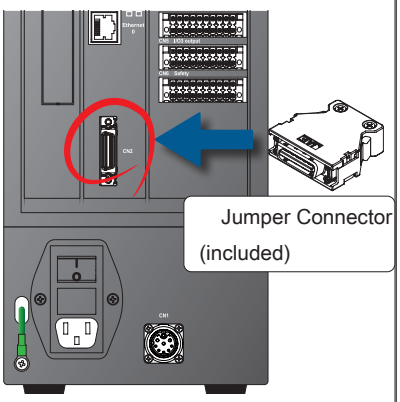


Jumper Connector (included accessory)

When you are not using a Jog Stick, connect the jumper connector (included accessory) to the controller.

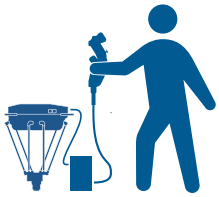
The robot operation mode depends on whether or not a Jog Stick is connected to the controller.

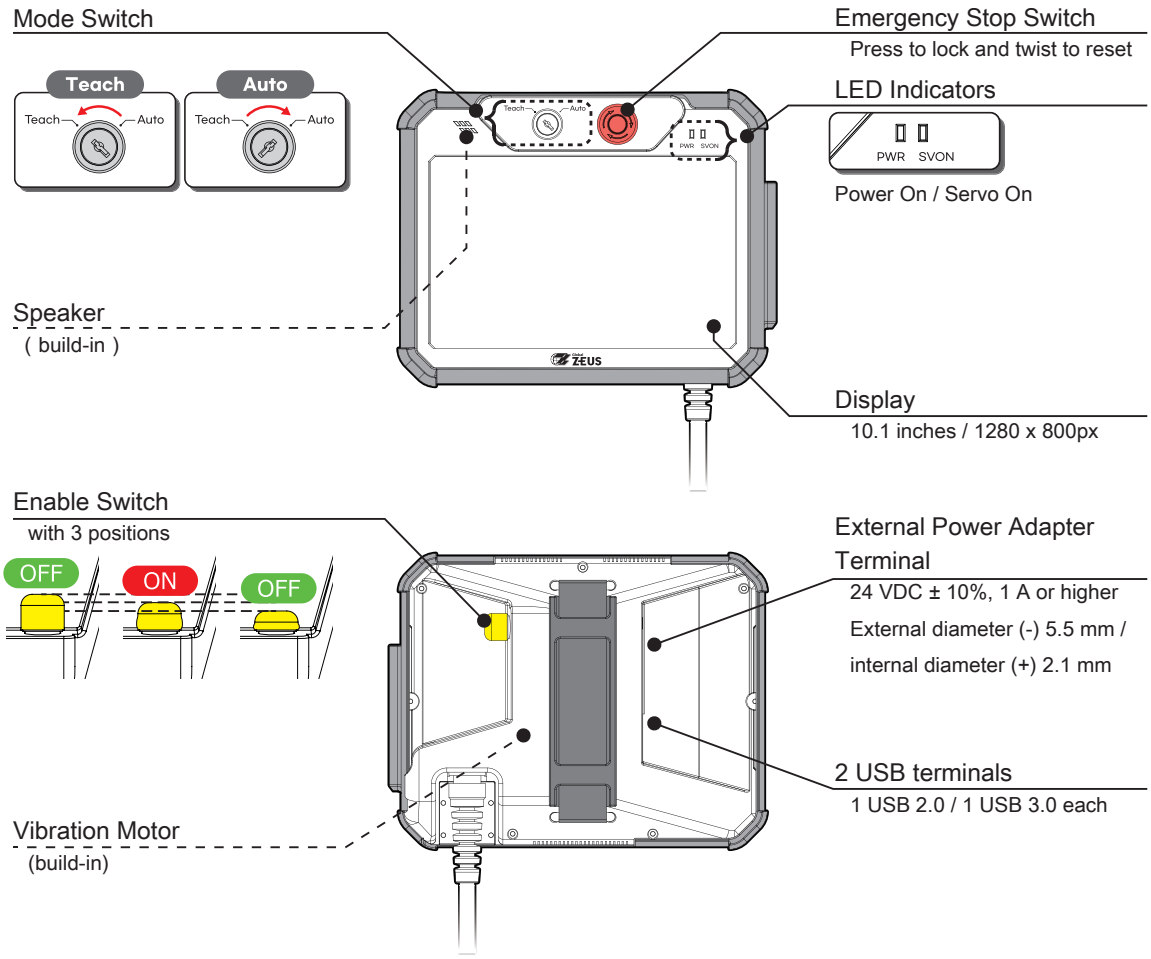
Do not power up the controller without the CN2 connector connected.



Operation Mode	Function
Remote	The jumper connector is connected to the controller. ⇒ Automatic operation mode
Teaching	The Jog Stick is connected to the controller. ⇒ JOG or TEACH operation using the Jog Stick

4. Teaching Pendant





	Do not use external power adapter terminals and UBS terminals when operating the manipulator using the teaching pendant.	

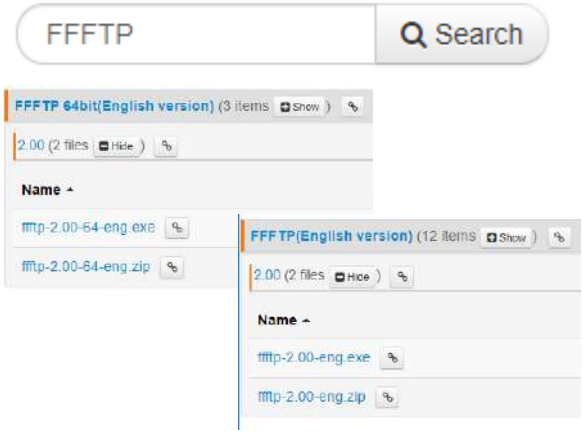
5. Connecting Controller and PC

Downloading the Software

This section describes the software required for the PC to be connected to the controller.

「FFFTP」: FTP Client Software

Use FTP (File Transfer Protocol) to transfer files between the PC and the controller.



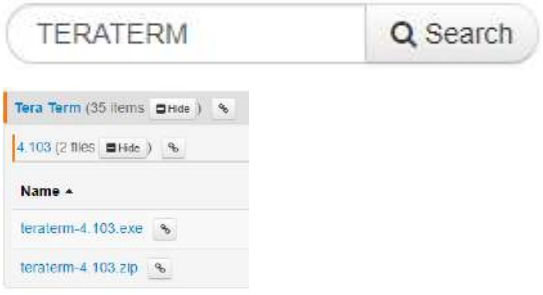
Depending upon your PC's OS, select either the 32-bit or 64-bit version.
Do not change the initial settings for installation.

(The BSD New License of FFFTP is owned by Jun Sota, FFFTP Project.)

URL https://osdn.net/projects/ffftp/

「TeraTerm」: Terminal Software

Tera Term is a remote access client which allows you to operate the controller by executing motion programs with telnet protocol.



Do not change the initial settings for installation.

(The BSD License of Tera Term is owned by T. Teranishi and Tera Term Project.)

URL https://osdn.net/projects/ttssh2/

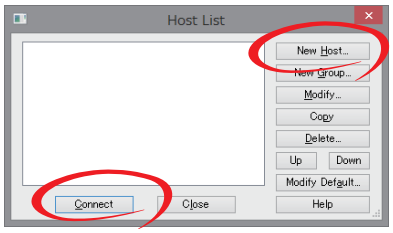
Setting Up the Software

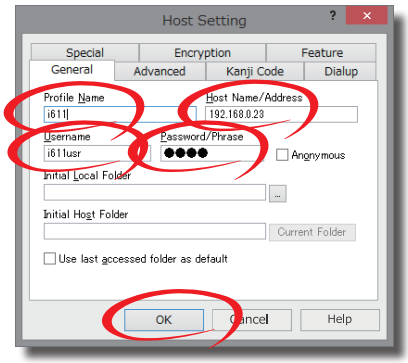
Set up the software for the controller connection.

FFFTP.exe

Start "FFFTP".

Click on [New Host ...] to configure host settings.





Host settings

Profile Name	i611 (or any name)
Host Name/Address	192.168.0.23
UserName	i611usr
Password/Phrase	i611

Click on [Connect]

(The screenshots are from Windows 10)

ttermpro.exe

Launch "Tera Term".

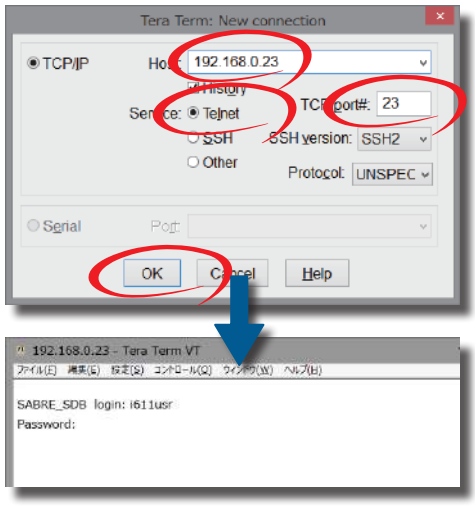
Host settings

Host :	192.168.0.23
Service :	Telnet
TCP port #:	23

(The controller must be powered on.)

Controller Authentication

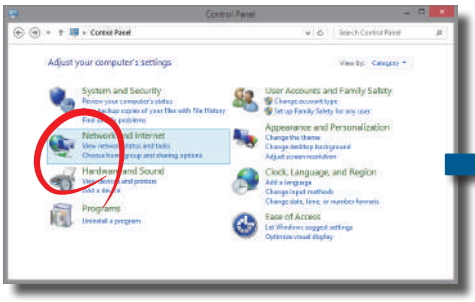
login:	i611usr
Password:	i611



Connecting Controller and PC

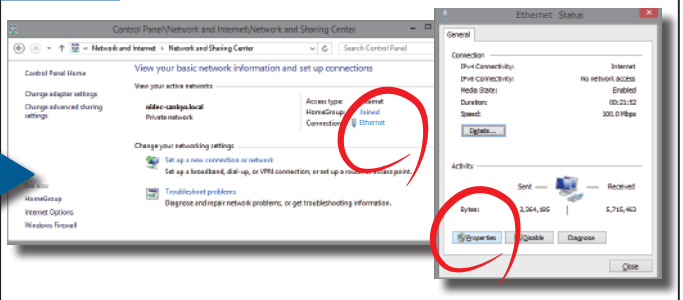
Setting up Connection to the Controller

Step 1



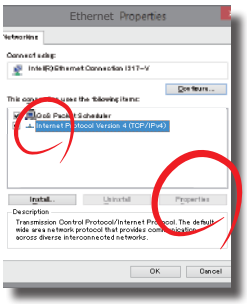
Go to Start > Control Panel > Network and Internet > Network and Sharing Center. Click Change Adapter Settings.

Step 2



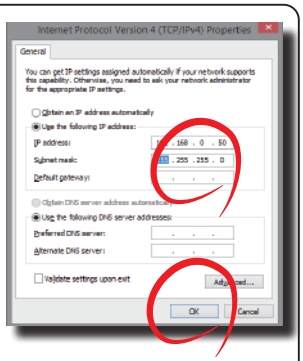
Right-click on Ethernet, and then select Properties.

Step 3



View the property of Internet Protocol Version 4 (TCP/IPv4).

Step 4



Enter the IP address and the subnet mask, then click OK.

IP address:	192. 168. 0. XX
Subnet mask:	255. 255. 255. 0

(Enter any two-digit umber other than 23 in XX.)

(The screenshots are from Windows 10)

Viewing the TEACH window using Google Chrome:

Start the web browser (Google Chrome) in privacy mode.
To open the TEACH window, enter the IP address.

MEMO

6. Wiring and Connections

System Configuration Diagram

Local network in the factory
(customer-supplied) System administrator

System administration of the whole equipment
Connecting to Ethernet 1 of the controller

Ethernet

Ethernet cable
(customer-supplied)

USB memory stick
(customer-supplied)

Data storage device to copy error logs from the controller

PC
(customer-supplied)

Ethernet

Device for maintenance and teaching operations
Device for robot motion programming
Connecting to Ethernet 0 of the controller

IP Address
192.168.1.23

IP Address
192.168.0.23

I/O Connectors
1, 2, 3
(included)

Safety Connector 1
(included)

Power Supply
(customer -supplied)

Earth-Leakage Circuit Breaker

Surge protector

PE

Single phase, 100 - 240 VAC, 50/60 Hz

Condition Requirements for Installation and Use
Pollution Degree 2
Overvoltage Category II

- Connect the robot to a power supply protected by an earth-leakage circuit breaker.
- Connect the robot to a power supply protected by a surge protector.
- Perform protective grounding. (Ground resistance of 100 Ω or less)

Controller

Teaching Pendant
(optional)

Jumper Connector
(included)

Jog Stick
(optional)

or Cable length 5m

or Cable length 3m

Do not power up the controller without the CN2 connector connected.

Power terminals
(customer-supplied)

Cable Specification
- Rated voltage 250 VAC
- Rated current 10 A or more
- IL13 Plug (No rock type is recommended)
- Applicable diameter: 4.5 - 8.5 mm

Power cable

Process the terminals in accordance with the specifications of the user-supplied power source.

Ferrite Core

If in the electrically noisy environment, use a ferrite core to reduce the electric noise.

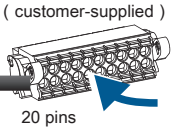
- Recommended product: (customer-supplied)
  E04SR401938 (SEIWA)
  Three or more turns
- included

PE Terminal
(for dielectric withstand testing only)
- Do not remove the screw.
- Do not connect anything.

Wiring and Connections

I/O Controller

(customer-supplied)



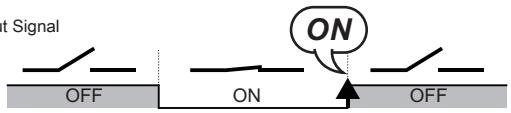
20 pins

Connect to I/O connectors 1, 2, and 3.
CN3 : I/O1 input
CN4 : I/O2 output
CN5 : I/O3 output

For wiring work, refer to the signal pinouts and the circuit diagram.

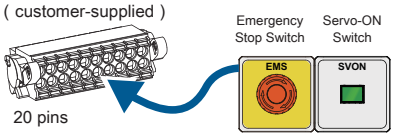
An input signal is detected at a rising edge of the input.
When an output becomes ON, its corresponding output port will be High.

Input Signal



Safety Circuit

(customer-supplied)



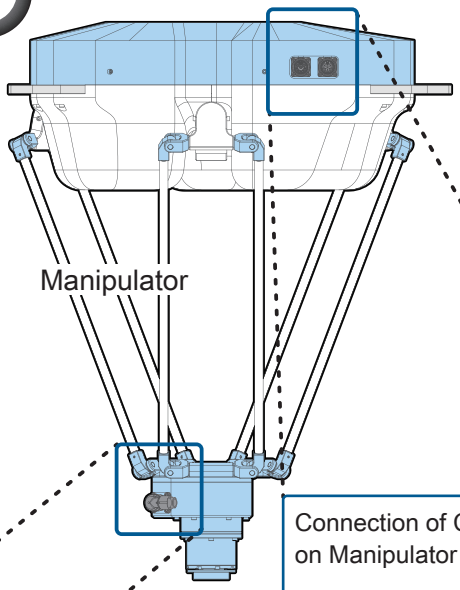
Connect to the safety connector.

Connect an emergency stop switch or a Servo-ON switch.
Improper connections disable Servo-ON.

I/O Cable

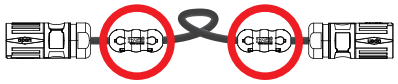
(customer-supplied)

- Provide sufficient separation from high voltage lines and motor power lines.
- AWG16-24
- Take noise into account and keep the wire length within 15 meters.

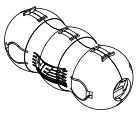


Manipulator Cable

(included)
Cable length 3m



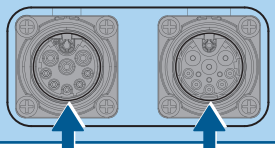
Ferrite Core (included)



Do not remove any of the included ferrite cores.

The C. CODE is unique to each robot. Connect the controller with its C. CODE matching manipulator.
Check the C. CODE labels on the manipulator and the controller. Only a C. CODE matching pair of them may be connected.

Connection of Cables on Manipulator



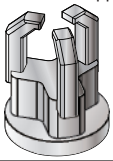
4th Axis Module (Optional)

4th Axis Module Cable (included)

End-Effector for tooling attachment

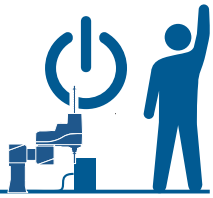
End-Effector

(customer-supplied)



Connect to the arm to I/O connector(optional).

7. Turning on the Power



Charging the Absolute Encoder

	Before turning on the power, verify that wiring is all complete.	
	Do not hot-swap any connectors.	

Upon shipment, the robot is in an "ABS LOST"

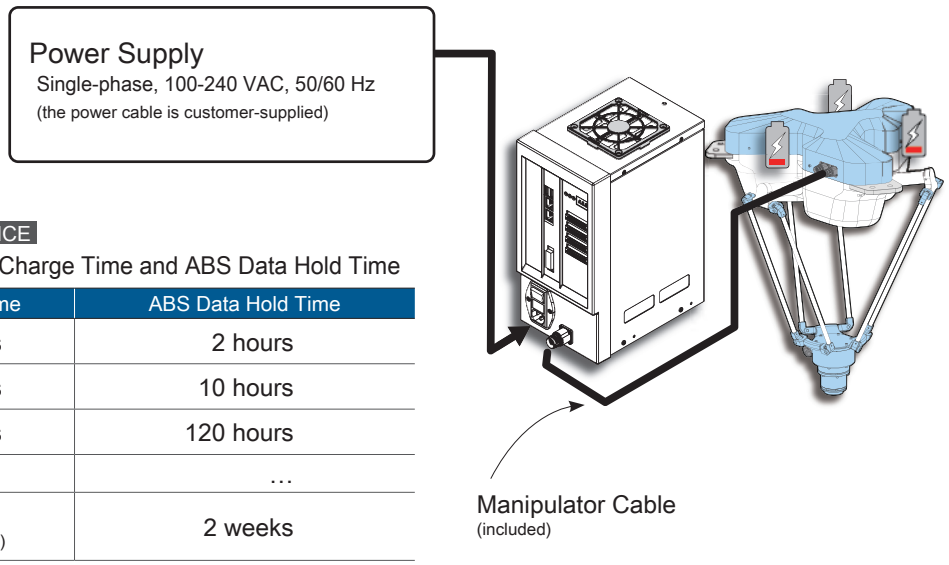
When starting up the robot for the first time, charge the backup battery for the absolute encoder.
Do not power up the controller without the CN2 connector connected.

Charging Method

1. Connect the controller and the manipulator.
2. Charging starts when the controller is powered up.

Connect the controller and the manipulator as shown in the wiring diagram below.
Wiring doesn't have to be complete like the System Configuration Diagram in 6. Wiring and Connections .

Example of Wiring for Charging



FOR REFERENCE

Guidelines for Charge Time and ABS Data Hold Time

Charge Time	ABS Data Hold Time
1 hours	2 hours
2 hours	10 hours
4 hours	120 hours
…	…
2 days (full charge)	2 weeks

Charging starts even while the controller is in an error state.
All of the manipulator joints have one backup battery each.

when finished…

Always perform ABS Homing after charging is complete.

Before Turning on the Power

There are different ways of preparation, depending on your target operation.

For ABS Homing

Using the alignment marks at the joints, align all axes manually or by jogging the robot.

Method 1

Manually release the brakes and move the manipulator arms. → Releasing the Brake in an Emergency P.5

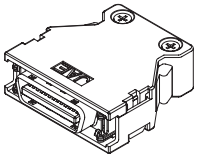
Method 2

Perform Jogging operation to move each joint of the manipulator. → Starting JOG Operation Mode P.21

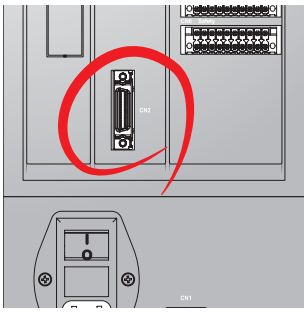
For Automatic Operation

AUTO mode where the robot is automatically controlled by the Python program

Connect the jumper connector to the controller.



Jumper Connector (included)

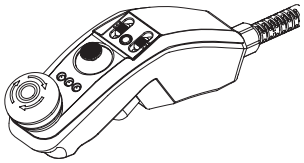


Controller

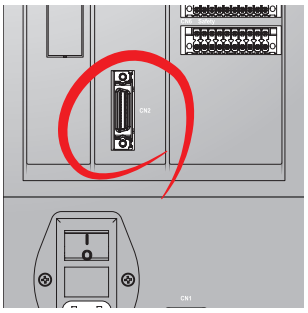
	Do not power up the controller without the CN2 connector connected.	

For teaching the robot (JOG Stick)

connect a Jog Stick to the controller.



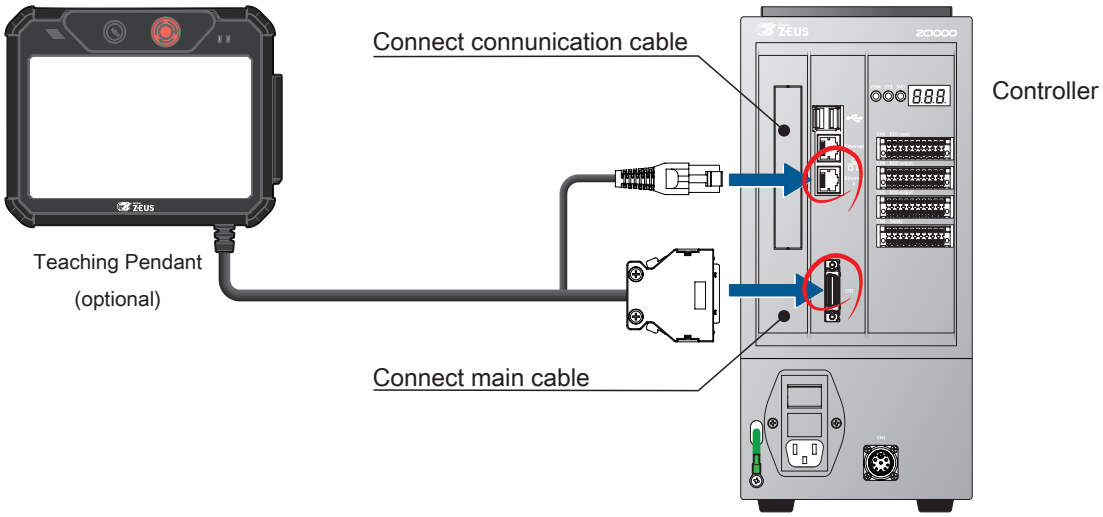
Jog Stick
(optional)



Controller

For teaching the robot (Teachig Pendant)

Teaching pendant cable consists of two strands of cable.
Connect communication cable to the controller's Ethernet 0(below).
Connect main cable to the controller's CN2.



Do not power up the controller without the CN2 connector connected.

Turning on the power

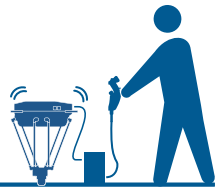
When the power is turned on, the following status codes will appear on the 7-segment display panel.

7-Segment Display Panel

	Starting the controller
	(approximately 10 seconds)
	Initializing the controller
	(approximately 10 seconds) When initialization is completed, one of the following will appear.
	The absolute home positional data is lost (ABS Lost). This will appear when the system is powered on for the first time or ABS Lost has occurred. Perform ABS Homing. (*)
	Ready (standby state) This code indicates that ABS Homing has been completed. The robot is in a standby state.
 	Error Check the error code and fix the error.

*) When the manipulator is powered on for the first time, it is missing the absolute positional data.

8. JOG Operation



Starting/Ending JOG Operation Mode

JOG operation mode enables you to operate the manipulator safely. Use this mode for aligning the joints via the aliment marks in order to recover the absolute position.

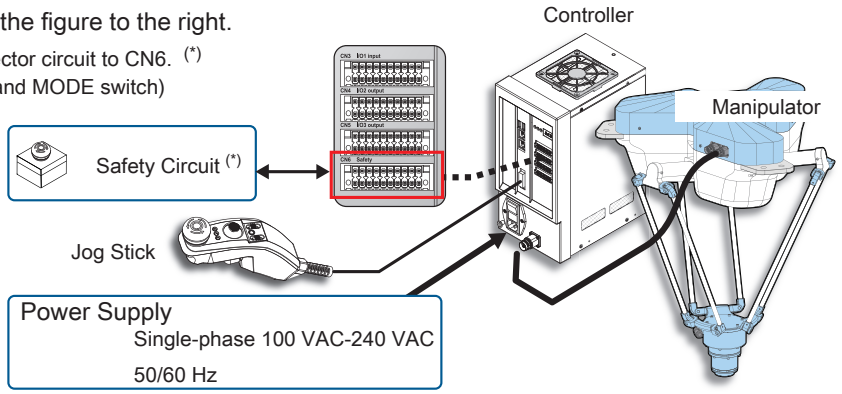
Start

Step 1 Connect

For connections, see the figure to the right.

Connect the safety connector circuit to CN6. (*)
(Emergency stop switch and MODE switch)

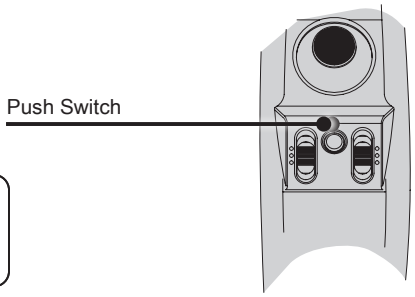
*) customer-supplied



Step 2 Start

Turn on the controller <u>while long pressing the push button</u> of the Jog Stick.

<u>Keep holding down</u> the push button until  appears on the 7-segment LED display on the controller.



Tip!

In the Event of an Error

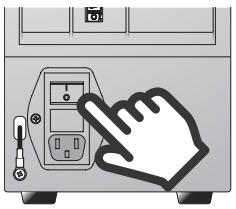
JOG operation error

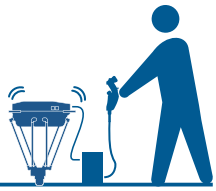
Recovery Method

Power cycle the controller.

End

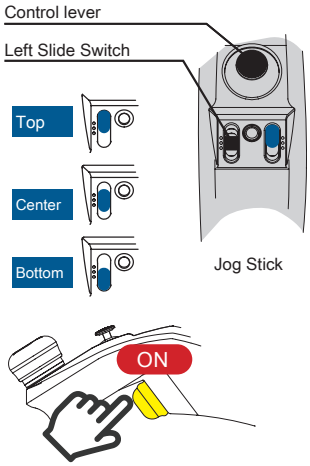
Turn off the controller power.





JOG Operation

Use a Jog Stick (optional product) to jog each joint of the manipulator. An operation of jogging a robot is used for Homing and Teaching.



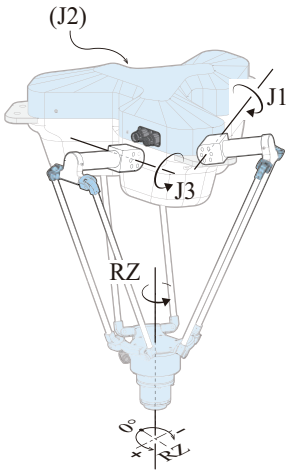
Step 1 Change the right slide switch position to the **Top** .

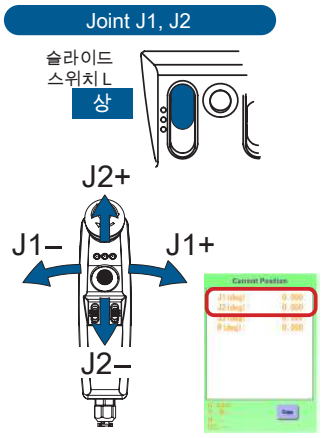
Step 2 Press the Enable switch to turn the servo on.

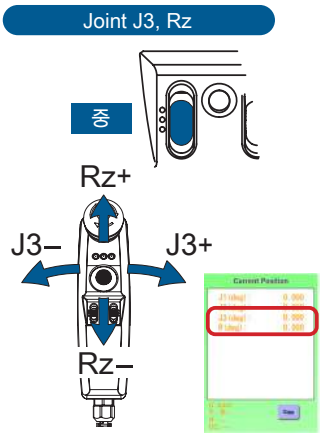
Step 3 Tilt the control lever to start jogging a robot.

Toggle the left slide switch between **Top** **Center** **Bottom** to select the target joint to operate.

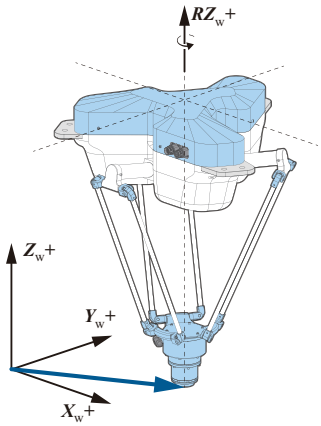
JOINT Coordinate System

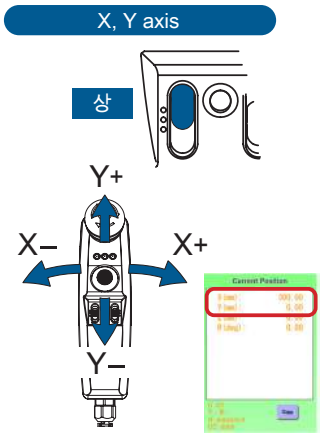


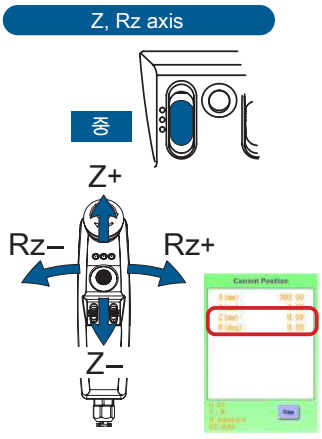




WORLD Coordinate System







When the WORLD coordinate system is used, unreachable points may exist even within the work envelope, due to the structure of manipulator. Use the JOINT coordinate system to avoid or recover from singularity points.

The JOINT Coordinate System enables the robot to move anywhere in the work envelope.

9. ABS Homing

HOME

ABS Homing

When turning on the robot for the first time, be sure to perform ABS Homing.

- ABS Homing must be done in a Servo-OFF state.
- "Manually" or "by JOG operation", align all axes via the alignment marks. (*)
- The servo needs to be turned on in the midst of ABS Homing. Prior to ABS Homing, connect the Jog Stick or a switch for turning on the servo.

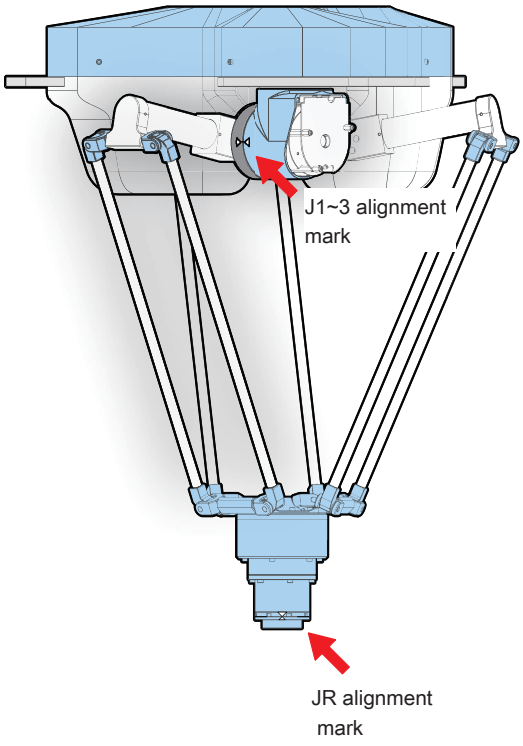
Homing is required if the robot is in an ABS LOST state (e.g., upon unpacking). Homing does not have to be performed regularly.

*) The home position varies depending on the model of manipulator. Check the alignment marks carefully.
*) When performing ABS Homing for each specific joint, be sure to align the alignment marks of the joint specified.
*) The alignment marks are enlarged in the drawings throughout this document. Use them as reference for the locations of actual alignment marks.

Step 1 Initial home positioning of the manipulator

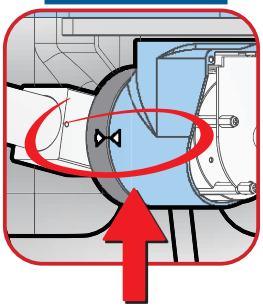
By "Manual" or "JOG Operation", align all axes via the alignment marks.

(Example of ZRC-0306R homing posture)

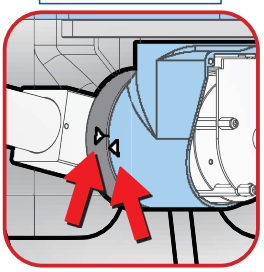


Joint J1~3

OK



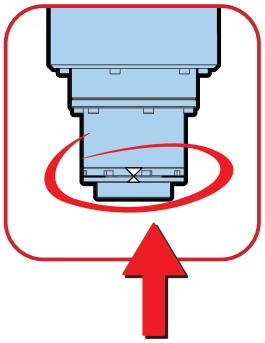
NG



The alignment marks are off.

Joint R

OK



(continue to the next page)

ABS Homing

Step 2 Executing the robot program "enc_reset.py"

Connect with the controller via Telnet.

Execute the ABS Homing program.

To specify all joints at once,

$enc_reset.py

To specify one or more joints,

Enter a space followed by a joint number(s).

$enc_reset.py 23 ← Specify Joint 2 and 3

The following confirmation message will appear.

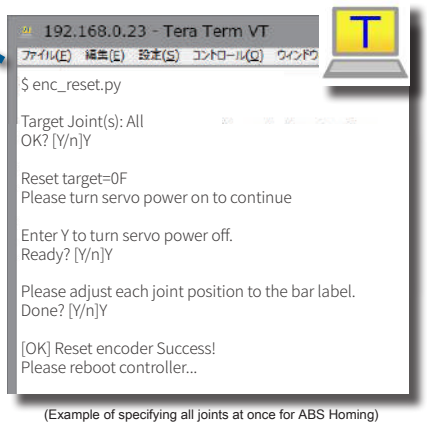
Target Joint(s) : All ← To specify all joints at once,

OK? [Y/n] Y__ ← Enter "Y" (in uppercase).

The following message will appear.

Reset target = 3F ← To specify all joints at once,

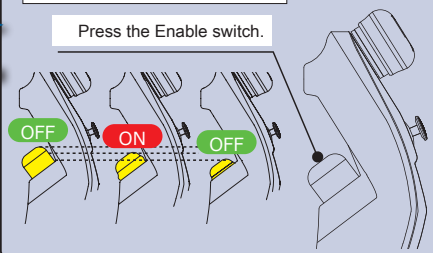
Please turn servo power on to continue



(Example of specifying all joints at once for ABS Homing)

Turn on the servo.

Press the Enable switch.



A confirmation message will appear when the SERVO-ON is completed.

Enter Y to turn servo power off

Ready? [Y/n] Y__ ← Enter "Y" (in uppercase).

The following message will appear.

Please adjust each joint position to the bar label.

Done? [Y/n] Y__ ← Enter "Y" (in uppercase).

The following message will appear.

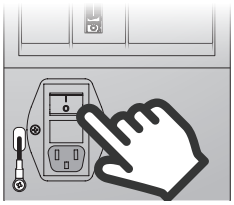
[OK] Reset encoder success!

Please reboot controller...

You are prompted to restart the controller.

Step 3 Restarting the Controller

When ABS Homing is completed, the 7-segment display panel on the controller will turn "rdy".



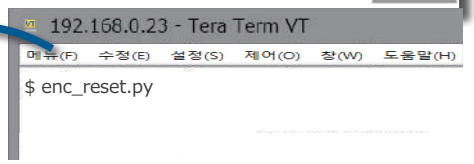
Checking ABS Homing Result

After ABS Homing, follow the procedure described below and confirm that the manipulator is indeed in the home position.

Step 1 Execute the confirmation program "confirm_home.py"

Connect with the controller via Telnet.

Execute the confirmation program.
$confirm_home.py

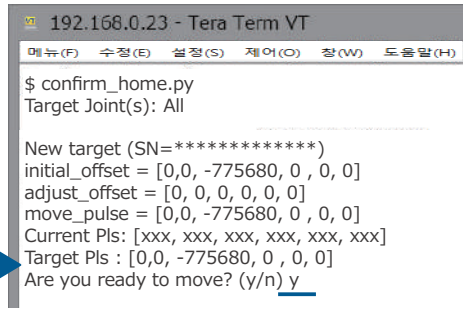


Keep on pushing on the Enable-switch of JOG stick then execute "confirm_home.py".

The following confirmation message will appear.
Are you ready to move? (y/n) y

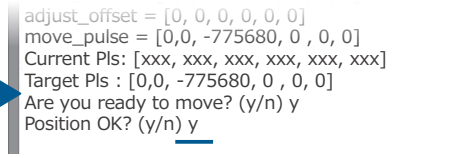
Enter "y" (lowercase).

Enter "y" and press Enter. All joints will return to the home position (i.e. the alignment marks will be aligned).
Note that As for the speed of the "confirm home.py", the speed of joint moving the longest distance is 1% of fastest.



The following confirmation message will appear when the homing motion is complete.
Position OK? (y/n) y

Enter "y" (lowercase).

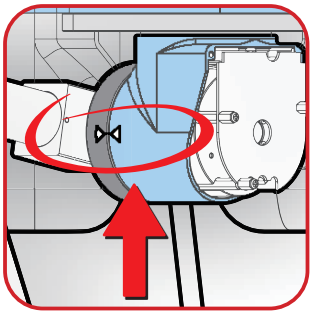


Step 2 Check the execution result of "confirm_home.py"

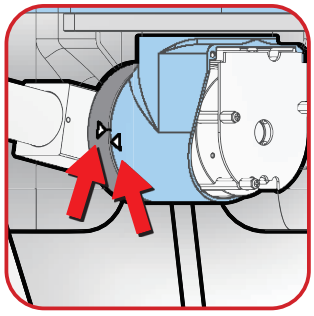
Check the pair of alignment marks at each joint are indeed aligned.

Example results of executing "confirm_home.py"

Success



Failure



The alignment marks are off.

Preparing for Teaching

Overview of Teaching Procedure

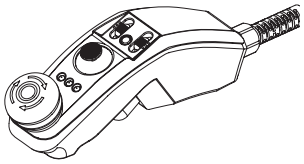
After ABS Homing is complete, proceed with teaching the robot.
During teaching operation, any target position that you move the robot to is recorded as a taught point. These taught points will be used in your robot motion program.

To teach the robot, you need to connect the controller and your PC using the LAN cable, and use our dedicated software named TEACHING PENDANT in the web browser.

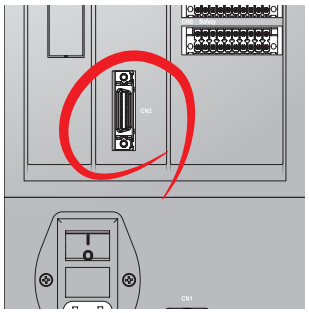
Before teaching the robot, connect a Jog Stick to the CN2 port on the controller.

For teaching the robot (JOG Stick)

Connect the JOG stick.



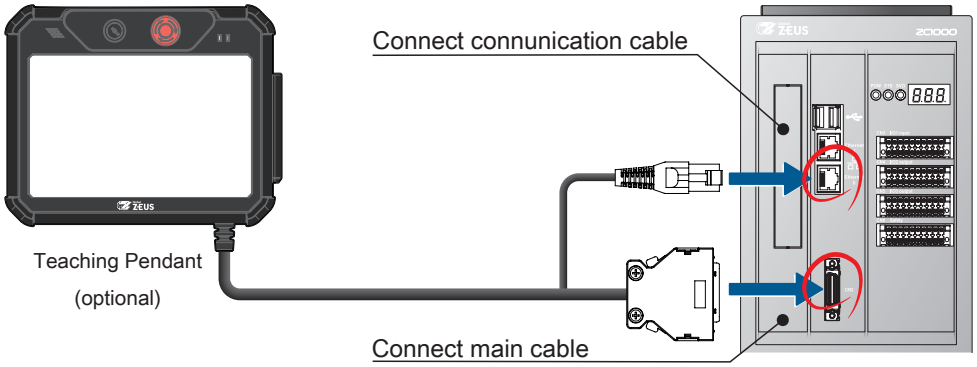
Jog Stick
(optional)



Controller

For teaching the robot (Teachig Pendant)

Connect the teaching pendant.



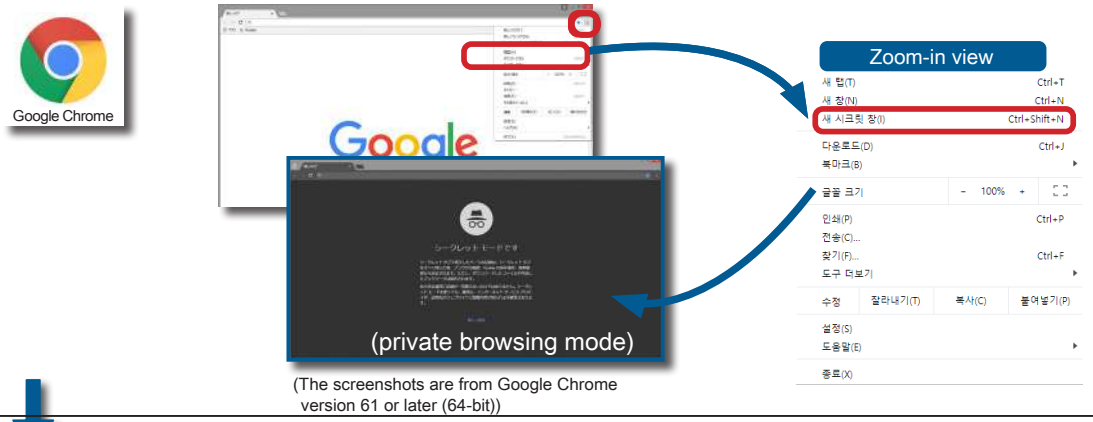
	When operating the manipulator for the first time, select the JOINT Coordinate System. Before teaching the robot, be sure that there are no obstacles in the work envelope of the robot. Keep an eye on the manipulator all times while teaching the robot. In the event of emergency, press the emergency stop switch on the Jog stick to stop the manipulator motion. Do not power up the controller without the CN2 connector connected.	
	Do not power off the controller while the manipulator is still in motion.	

Teaching Procedure

Open the web browser Google Chrome and enable private browsing.

Enter the controller IP address and start up the TEACH window.

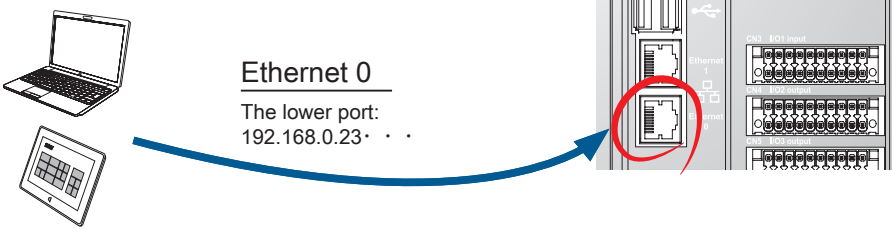
Step 1 Open Google Chrome and start a new Incognito window.



(The screenshots are from Google Chrome version 61 or later (64-bit))

Step 2 Connecting the controller and the PC

Connects the LAN cable to Ethernet 0.



Ethernet 0

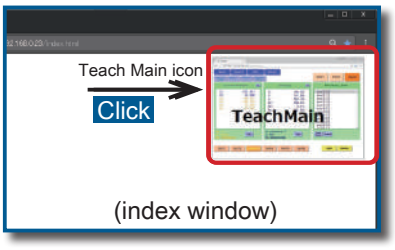
The lower port:
192.168.0.23・・・

Enter the controller IP address.

Controller IP address

http://192.168.0.23

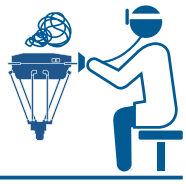
After connecting to the controller, the index window will appear.



(index window)

Click on the Teach main icon to bring up the operation window.

Troubleshooting



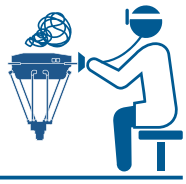
System-Defined Errors List

When a system-defined error is detected, its corresponding error code will appear on the 7-segment display panel. Check the detected error type and code in the following list.

E88 (Below)	System-Defined Error Eliminate possible causes, then recover with "Error Reset signal".	c88 (P29, 30)	Fatal System-Defined Error Eliminate possible causes, then "power cycle" the controller.

System-Defined Error

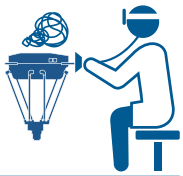
Error Code		Description
E01	E01	"init.py" not found
E02	E02	Error in "init.py"
E03	E03	Unable to execute the robot program
E04	E04	Robot program was not set-up
E05	E05	Unable to execute the robot program in the current mode
E06	E06	The robot motion API was used before executing i611 Robot class open( )
E07	E07	The robot program was executed during ABS Lost
E08	E08	Robot program aborted
E09	E09	The i611 Robot class open( ) was executed during E-stop
E10	E10	The i611 Robot class open( ) was executed during Servo-OFF
E11	E11	The robot program has no permission for operation
E12	E12	Robot program unable to communicate with System Manager
E13	E13	Exception for E-stop was not detected
E14	E14	The exit( ) method of the robot program ended abnormally
E15	E15	Robot program ended with exception
E16	E16	Exception for deceleration stop was not detected
E17	E17	System end processing was not completed correctly
E18	E18	Unable to access Memory I/O
E19	E19	Multiple instantiations of i611Robot Class in one process
E20	E20	open( ) i611Robot class was executed more than once in one process
E21	E21	An illegal call for API from another thread occurred
E40	E40	Teaching was aborted
E53	E53	The usage of the home directory (/home/i611usr) folder exceeded the upper limit
E99	E99	Unknown error



System-Defined Errors List

Fatal System-Defined Error

Error Code		Description
c01	c01	System Manager start failed
c02	c02	System Manager ended with fault
c03	c03	System Manager unable to communicate with Control Manger
c04	c04	An error occurred in JOG operation mode
c05	c05	Control Manager was aborted
c06	c06	Memory overflow in the controller
c10	c10	(Joint) Circuit Fault
c11	c11	(Joint) Over current error
c12	c12	(Joint) Brake Fault (Servo OFF → ON)
c13	c13	(Joint) Excessive torque
c14	c14	(Joint) An overload (thermal) error
c15	c15	(Joint) Actuation voltage drop
c16	c16	(Joint) AC power supply error
c17	c17	(Joint) Servo communication error
c18	c18	(Joint) Servo-ON check error 1 (normal operation is not possible)
c19	c19	(Joint) Servo-ON check error 2 (Z-phase cannot be detected)
c20	c20	(Joint) ABS Lost: Speed out of range upon power turning off
c21	c21	(Joint) ABS Lost: Encoder saving error
c22	c22	(Joint) Encoder signal detection abnormal error
c23	c23	(Joint) Encoder Pattern error
c24	c24	(Joint) ABS Lost: Battery of Multi-turn sensor voltage drop error
c25	c25	(Joint) State transition failed
c26	c26	Error at the Tip I/O
c28	c28	Error in internal monitor processing
c29	c29	The cooling fan stopped
c30	c30	Regenerative resistor 1 overheat
c31	c31	Main circuit relay fault
c32	c32	Wiring error of "E-stop circuit"
c33	c33	Wiring error at "Mode circuit"
c34	c34	Error in Control power



System-Defined Errors List

Error Code		Description
c35	c35	Inrush current limiting resistor overheat
c36	c36	Regenerative resistor 2 overheat
c37	c37	Regenerative resistor 3 overheat
c39	c39	Robot internal communication was lost
c40	c40	Redundant signal disagreement occurred in the "Door circuit"
c41	c41	Redundant signal disagreement occurred in the "Mode circuit"
c42	c42	Slave error due to a state transition timeout
c43	c43	Communication error due to an interrupt
c44	c44	Overspeed error at a slave
c58	c58	Error in SPI circuit
c59	c59	The robot definition file was faulty
c60	c60	Task error
c89	c89	(Joint) EtherCAT communication error
c91	c91	(Joint) Position deviation or speed error
c92	c92	(Joint) Joint parameter error
c93	c93	(Joint) ABS Lost: Encoder communication error
c94	c94	(Joint) The control board became overheated
c95	c95	(Joint) EtherCAT communication synchronization error
c96	c96	(Joint) Control synchronization error
c98	c98	Power supply failure
c99	c99	Unknown error

Error logs are saved in the controller. You can download the error logs to your PC for further investigation.

Customer service center
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