

NXC100 INSTRUCTIONS

CLEAN ROBOT FOR SEMICONDUCTOR MANUFACTURING EQUIPMENT

Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.

INSTRUCTIONS

- INSTRUCTION MANUAL FOR MANIPULATOR
- MAINTENANCE MANUAL FOR MANIPULATOR
- INSTRUCTION MANUAL FOR TRACK
- MAINTENANCE MANUAL FOR TRACK
- INSTRUCTION MANUAL FOR PRE-ALIGNER
- MAINTENANCE MANUAL FOR PRE-ALIGNER
- NXC100 INSTRUCTIONS
- NXC100 EXPANSION BOX INSTRUCTIONS
- NXC100 STANDARD COMMUNICATION SPECIFICATION
- NXC100 STANDARD TEACHING PENDANT INSTRUCTION
- NXC100 STANDARD ERROR CODE TABLE
- NXC100 STANDARD PARAMETER TABLE
- NX100/NXC100 PARAMETER REFERENCE MANUAL

The manuals above correspond to specific usage.
Be sure to use the appropriate manual.



YASKAWA

MANUAL NO.

HW0484164





MANDATORY

- This instruction manual is intended to explain setting up and operating the robotic system. Read this manual thoroughly to understand all precautions and safety information before setting up and operating this system.
- General items related to safety are listed in Section 1. To ensure correct and safe operation, carefully read the section.



CAUTION

- Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure all covers and shields are replaced before operating this product.
- The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.
- YASKAWA may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications. If such modifications are made, the manual number will also be revised.
- If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.
- YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product's warranty.

Notes for Safe Operation

Read this instruction manual and related documents thoroughly before installation, operation, maintenance, or inspection of the NXC100 controller. Make sure you understand the product information, all precautions and safety information before using this product.

In this manual, the Notes for Safe Operation are classified as "WARNING", "CAUTION", "MANDATORY", or "PROHIBITED".



WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.



CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices.



MANDATORY

Always be sure to follow explicitly the items listed under this heading.



PROHIBITED

Must never be performed.

Even items described as "CAUTION" may result in a serious accident in some situations. At any rate, be sure to follow these important items.



To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as "CAUTION" and "WARNING".

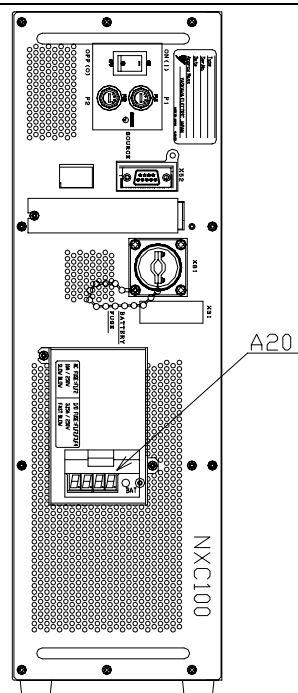


WARNING

- Before operating the manipulator, check that servo power is turned OFF when the emergency stop button on the teaching pendant is pressed. When the servo power is turned OFF, the 7-segment LED on the front panel of the NXC100 controller indicates "A20".

Injury or damage to machinery may result if the emergency stop circuit cannot stop the manipulator during an emergency. The manipulator should not be used if the emergency stop buttons do not function.

Emergency Stop Button



FRONT VIEW

- Once the emergency button is released, clear the cell of all items which could interfere with the operation of the robotic system.

Injury may result from unintentional or unexpected Manipulator motion.

Release of Emergency Stop Button



- Confirm that the mode selector switch on the teaching pendant is set to "TEACH" mode. The "TEACH" mode indicates that the robotic system is in Teaching Pendant Operation mode.

Operators may get injured if the robotic system is not in Teaching Pendant Operation mode and the manipulator is started from the host system.



WARNING



- Observe the following precautions when performing teaching operations:
 - Always follow the predetermined operating procedure.
 - Ensure that you have a safe place to retreat in case of emergency.

Improper or unintended manipulator operation may result in injury.

Confirm that no persons are present in the motion range of the manipulator and that you are in a safe location before:

- Turning ON the robotic system power.
- Moving the manipulator with the teaching pendant.
- Running check operations.
- Performing automatic operations.

Injury may result if anyone enters the motion range of the manipulator during operation. Always press an emergency stop button immediately if there are problems. The emergency stop button is located on the left side of the teaching pendant.



CAUTION

- Perform the following inspection procedures prior to conducting manipulator teaching. If problems are found, repair them immediately, and be sure that all other necessary processing has been performed.
 - Check for problems in manipulator motion.
 - Check for damage to insulation and sheathing of external cables.
- Read and understand the Explanation of Warning Labels before operating the manipulator.
- For safety, operate under the proper lighting.

Definition of Terms Used Often in This Manual

In this manual, the equipment is designated as follows.

Equipment		Manual
The manipulator	XU-RC series M101E, M101V: Single Arm Link Type/ XU-RC350S-C03 M201E, M201V: Dual Arm Link Type / XU-RC350D-C03 M201+: Dual Arm Link Type / XU-RC350D-J03 M112E, M112V: Single yaw / XU-RC400M-C03 M122E, M122V: Dual yaw / XU-RC400M-D03 M114E, M114V: Single yaw / XU-RC820M-A03 M124E, M124V: Dual yaw / XU-RC820M-B03	Manipulator
The track	XU-ACT series TL0505S: For 2 FOUPs / XU-ACT051L-C10 TL0505H: For 2 FOUPs / XU-ACT051L-D10 TL1010S: For 3 FOUPs / XU-ACT101L-C10 TL1010H: For 3 FOUPs / XU-ACT101L-D10 TL1515S: For 4 FOUPs / XU-ACT152L-D10 TL1515H: For 4 FOUPs / XU-ACT152L-C10	Track
The pre-aligner	XU-ACP series PV11a: 1 axis, 200 mm, Suction Type/ XU-ACP130-A13 PV11b: 1 axis, 300 mm, Suction Type/ XU-ACP130-A13 PV12M: 1axis, 200/300mm / XU-ACP130-B11 PV32: 3axes, 200/300mm / XU-ACP330-A22 PE11: Edge grip type 300mm / XU-ACP330-C10	Pre-Aligner
The controller	ERCR-NS01-B004 or ERCR-NS01-B004-E1 (RoHS Directive Model)	NXC100 controller
The expansion box	ERCR-ND10-C000	Expansion box
The manipulator, pre-aligner and controller altogether		Robotic system
The system designed and produced by the customer (The semiconductor manufacturing equipment in which the robotic system is to be installed)		Host system

Explanation of Warning Labels

The following warning labels are attached to the manipulator and the NXC100 controller.

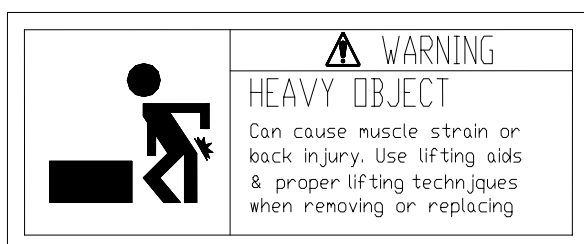


WARNING

- **Fully comply with the precautions on the warning labels.**

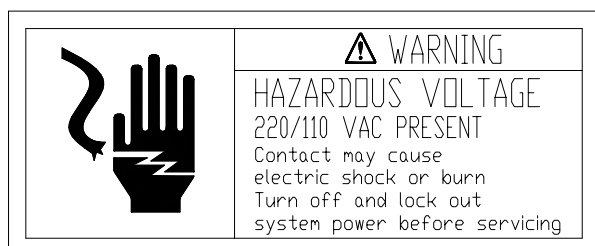
Failure to observe this caution may result in personal injury or damage to equipment.

Common:



“HEAVY OBJECT”

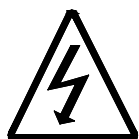
Can cause muscle strain or back injury.
Use lifting aids & proper lifting techniques
when removing or replacing.



“HAZARDOUS VOLTAGE”

Contact may cause electric shock or burn.
Turn off and lock out system power before servicing.

NXC100 controller only:



This label also indicates the connector which includes “HAZARDOUS VOLTAGE”.

110VAC/220VAC PRESENT

Contact may cause electric shock or burn.

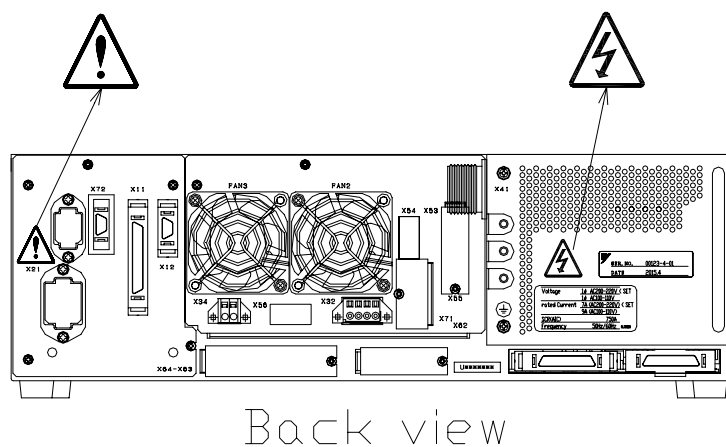
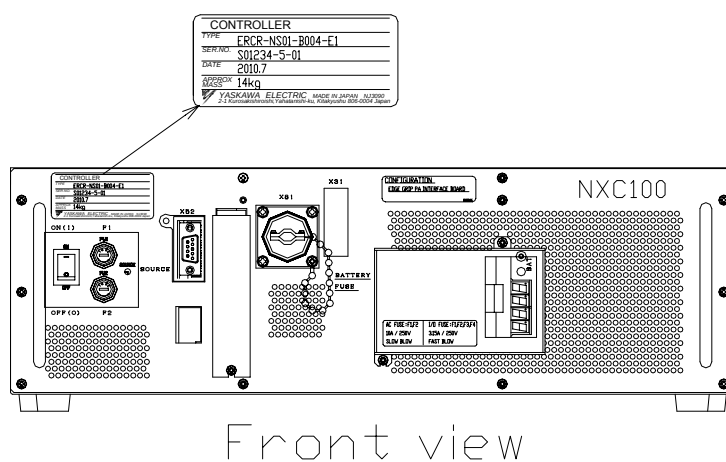
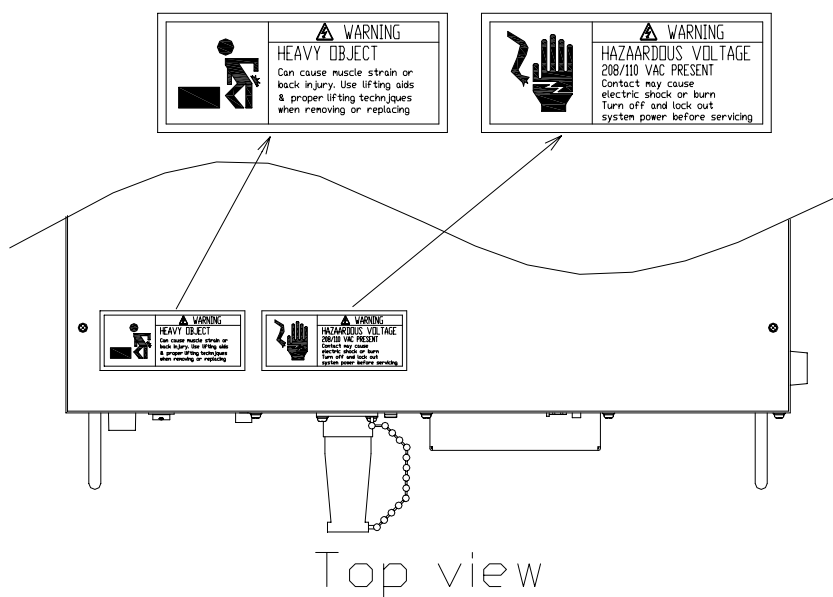
Turn off and lock out system power before connecting or disconnecting.



This label shows that rated output is referred to in the manual.

Location of Warning Labels (NXC100 Controller)

Refer to “2-2 Nameplate Confirmation” for the content of the nameplates.



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1 Safety



1.1 For Your Safety

Robots generally have requirements which are different from other manufacturing equipment, such as larger working areas, high-speed operation, rapid arm movements, and so forth, which can pose safety hazards. Read and understand the instruction manuals and related documents, and observe all precautions in order to avoid the risk of injury to personnel and damage to equipment.

It is the user's responsibility to ensure that all local, state, and national codes, regulations rules, or laws relating to safety and safe operating conditions are met and followed.



MANDATORY

- **Teaching and Maintenance of the robot shall conform to:**
 - **Industrial Safety and Health Law**
 - **Enforcement Order of Industrial Safety and Health Law**
 - **Ordinance of Industrial Safety and Health Law**
- **Prepare**
 - **SAFETY WORK REGULATIONS**based on concrete policies for safety management complying with related laws.
- **Observe the**
 - **MANIPULATING INDUSTRIAL ROBOTS-SAFETY (ISO 10218)**for safe operation of the robot.
- **Reinforce the**
 - **SAFETY MANAGEMENT SYSTEM**by designating authorized workers and safety managers, as well as giving continuing safety education.
- **Teaching and maintaining the robot are specified as**
"Hazardous Operations" in the Industrial Safety and Health Law
Workers employed in these above operations are requested to attend special training offered by YASKAWA.

1.2 Special Training



MANDATORY

- **Personnel who teaches or inspects the manipulator must undergo required training before using the manipulator.**

For more information on training, inquire at the nearest YASKAWA branch office.

The telephone numbers are listed on the back cover of this instruction manual.

1.3 Manual List



MANDATORY

- **It is important to have and be familiar with all manuals concerning the robotic system.**

You should obtain the following manuals:

- INSTRUCTION MANUAL FOR MANIPULATOR
- MAINTENANCE MANUAL FOR MANIPULATOR
- INSTRUCTION MANUAL FOR TRACK
- MAINTENANCE MANUAL FOR TRACK
- INSTRUCTION MANUAL FOR PRE-ALIGNER
- MAINTENANCE MANUAL FOR PRE-ALIGNER
- NXC100 INSTRUCTIONS
- NXC100 EXPANSION BOX INSTRUCTIONS
- NXC100 STANDARD COMMUNICATION SPECIFICATION
- NXC100 STANDARD TEACHING PENDANT INSTRUCTION
- NXC100 STANDARD ERROR CODE TABLE
- NXC100 STANDARD PARAMETER TABLE
- NX100/NXC100 PARAMETER REFERENCE MANUAL

- **Confirm that you have all these manuals on hand.**

If any manuals are missing, contact your salesperson from YASKAWA's local branch office.
The relevant telephone numbers are listed on the back cover.

1.4 Personnel Safety

The entire manipulator motion range is potentially dangerous.

All personnel working with the manipulator (safety administration, installation, operation, and maintenance personnel) must always be prepared and "Safety First" minded, to ensure the safety of all personnel.



CAUTION

- **Avoid any dangerous actions in the area where the manipulator is installed.**

Failure to observe this caution may result in injury due to a contact with the manipulator or peripheral equipment.

- **Please take strict safety precautions by placing signs such as "Flammable", "High Voltage", "Waiting", and "Off-limits to Unauthorized Personnel" in necessary areas in the factory.**

Failure to observe these cautions may result in fire, electric shock, or injury due to contact with the manipulator and other equipment.

- **Strictly observe the following items:**

- Always wear approved work clothes (no loose-fitting clothes).
- Do not wear gloves when operating the manipulator.
- Do not allow underwear, shirts, or neckties to hang out from the work clothes.
- Do not wear large jewelry, such as earrings, rings, or pendants.

Always wear protective safety equipment such as helmets, safety shoes (with slip-proof soles), face shields, safety glasses, and gloves as necessary.

Improper clothing may result in injury.



CAUTION

- **Unauthorized persons should not approach the manipulator or associated peripheral equipment.**

Failure to observe this caution may result in injury due to contact with the NXC100 controller, endeffectors, workpiece, positioner, etc.

- **Never forcibly move the manipulator axes.**

Failure to observe this caution may result in injury or equipment damage.

- **Never lean on the NXC100 controller or other controllers, and avoid inadvertently pushing buttons.**

Failure to observe this caution may result in injury or damage by unexpected movement of the manipulator.

- **Never allow unauthorized personnel to touch the NXC100 controller during operation.**

Failure to observe this caution may result in injury or damage resulting from unexpected movement of the manipulator.

1.5 Robot Safety

The robotic system is not intended to be a stand-alone unit. YASKAWA recommends that the robotic system be installed in a host system. Take safety into consideration when planning the system.

1.5.1 Installation and Wiring Safety

Refer to " INSTRUCTION MANUAL FOR MANIPULATOR " and this instruction manual for details on installation and wiring.

In planning installation, adapt an easy to observe arrangement to ensure safety. Take safety into consideration when planning the installation. Observe the following instructions when installing the manipulator.



WARNING

- **Build an enclosure for the manipulator, track, and pre-aligner so that no one can access them during automatic operation, and locate all controllers outside this enclosure.**
- **The door of the enclosure must be equipped with a safety interlock. Be sure the interlock operates correctly before use.**

Failure to observe these instructions may result in injury or damage.

- **Perform grounding in accordance with applicable electrical codes.**

Failure to observe this instruction may result in fire or electric shock.



WARNING

- **When the robotic system is used as independent system, connect ground lines for the manipulator, track, and pre-aligner to PE terminal on the back panel of the NXC100 controller. A ground line shall be:**
 - shorter than three meters
 - smaller than 16 AWG
 - colored by Green/Yellow

Failure to observe this instruction may result in fire or electric shock.

- **Check the connection of the ground lines when motor power cables for the manipulator, track, and pre-aligner are to be disconnected for maintenance and inspections.**



CAUTION

- Moving and installing the NXC100 controller may require two personnel or more.
- Before connecting the incoming AC power source to the NXC100 controller, verify that the NXC100 controller is configured to that AC power source rating.

Failure to observe this caution may result in injury or equipment damage.



MANDATORY

- Connect the robotic system to the host system's Emergency OFF (EMO) which is a SEMI-S2 requirement, and no operation or regularly scheduled maintenance location should require more than 3 m travel to an EMO button.
- Install the robotic system in the host system with LockOut/TagOut provisions. That is, each installation requires a device to shut OFF power to the manipulator, track, pre-aligner, and the NXC100 controller which is located outside the enclosure where the manipulator, track and pre-aligner are installed and has a LockOut/TagOut capability.

1.5.2 Operation Safety



WARNING

- Teach jobs from outside the enclosure where the manipulator is installed whenever possible.
- When teaching within the enclosure, observe the following instructions:
 - Follow the predetermined operating procedure.
 - Always have an escape plan in mind in case the manipulator comes toward you unexpectedly.

Failure to observe this warning may result in injury due to unexpected manipulator motion.

- Before operating the manipulator, make sure that the emergency stop circuit functions by pressing the emergency stop button on the teaching pendant and in the host system.

Malfunction of the emergency stop may result in injury or damage.

- Prior to operation, be sure there are no personnel in the enclosure.

Failure to observe this warning may result in injury due to contact with the manipulator.

- Press the emergency stop button immediately in the event any problems occur.



CAUTION

- **Inspect all equipment before turning ON the power to the NXC100 controller. Correct problems before operation by:**
 - Checking for problems in the manipulator motion.
 - Checking for damage to insulation and sheathing of cables.

- **Always return the teaching pendant to its hook on the NXC100 controller cabinet after use.**

If the teaching pendant is inadvertently left on the manipulator, a fixture, or on the floor, the manipulator or a tool could collide with it during manipulator movement, possibly causing injury or equipment damage.



MANDATORY

- **Personnel operating or inspecting the robotic system shall be trained as required by applicable laws and company policies. Refer to " 1.2 Special Training ".**



PROHIBITED

- **Never modify the manipulator, track, NXC100 controller, or pre-aligner.**

Failure to observe this instruction could result in injury or damage due to fire, power failure, or operation error.

1.6 Notes for Relocating and Transferring the Robotic System

When relocating or transferring the robotic system, observe the following safety precautions:



CAUTION

- **Attach the instruction manuals to the NXC100 controller cabinet so that all users have access to necessary manuals. See " 1.3 Manual List ".**

If any manuals are missing, contact your YASKAWA representative.

- **If the warning labels on the manipulator and the NXC100 controller are illegible, clean the labels so that they can be read clearly. Note that some local laws may prohibit equipment operation if safety labels are not in place.**

Contact your YASKAWA representative if you require new warning labels.

- **When the robotic system is transferred, an inspection by Yaskawa Engineering Co. (listed on back cover of this manual) is recommended.**

Incorrect installation or wiring may result in personal injury and property damage.

- **Do not subject the robotic system to halogen gases, such as fluorine, chlorine, bromine, and iodine, at any time even during transport or installation.**

Failure to observe this caution may result in fire or damage.

1.7 Notes on Disposal



CAUTION

- **When disposing of the manipulator, track, pre-aligner, and the NXC100 controller, follow the applicable national/local laws and regulations.**
- **Securely anchor the manipulator even when temporarily storing it before disposal.**

Failure to observe this caution may result in injury due to fall of the manipulator.

1.8 Applicable Standards

The robotic system intends to be mounted by the process tool supplier in their host system. So that the process tool supplier can mount this product into their host system easily, these products are designed in accordance with the related standards.

When planning the host system,

- perform risk assessment for their host system, and
- perform final checks to confirm their host system conform to related standards.
- read this manual thoroughly to understand all precautions and safety information and other technical information (e.g. specification, operation, maintenance procedures).

Semistar-M series conform to some standards. However, the model which specifications were changed to at the request from the process tool supplier may not conform to the following standard. Contact your salesperson from YASKAWA's local branch office and confirm it. The relevant telephone numbers are listed on the back cover.

- SEMI Standard

Semistar-M series conform to SEMI S2-0706, SEMI S8-0705. Refer to SEMI certificate.

Confirm whether the host system is conformable to SEMI S2, SEMI S8 standards, because the robotic system is partly completed machinery.

Semistar-M series are functional design in accordance with the SEMI F47-0200 standard.

Verify whether the host system is conformable to SEMI F47 standards. Because the voltage sag immunity performance of the robotic system will vary depending on the conditions (e.g. location, maximum speed, acceleration/ deceleration time, end-effector type, payload). Consider varying each condition when that product does not conform to SEMI F47 standard.

- Machinery Directive

We declare on our own responsibility that the Semistar-M series conforms to Machinery Directive (2006/42/EC). Refer to DoC.

The robotic system is partly completed machinery (Machinery Directive, 2006/42/EC, Annex II B)

Confirm whether the host system is conformable to Machinery Directive, because the robotic system is partly completed machinery. The robotic system must not be put into service until the host system has been declared in conformity with the provision of applicable Directives.

- EMC Directive

Semistar-M series conform to related EMC standards.

Confirm whether the host system is conformable to EMC standards. Because EMC performance of the robotic system will vary depending on the conditions (e.g. location, wiring) of the host system in which the robotic system is installed.

- EMS (Electromagnetic Susceptibility): EN61000-6-2
- EMI (Electromagnetic Interface): EN61000-6-4

- North American Safety Standards

Semistar-M series are designed in accordance with the UL standard.

- Electrical Equipment, Control, and Laboratory Use; Part 1: General Requirements, UL 61010-1

- American National Standard

Semistar-M series are designed in accordance with the ANSI/RIA 10218-1-2007.

- Robots for industrial Environment - Safety Requirements Part 1 – Robot, ANSI/RIA 10218-1-2007

• SEMI Certificate



• DoC for Machinery Directive

	
DECLARATION OF CONFORMITY	
(according to Annex II B of the Machinery Directive, for machinery which can not function independently or machinery parts)	
We, YASKAWA ELECTRIC CORPORATION 2-1 KUROSAKI SHIROSIROISHI YAHATA-NISHI-KU, KITAKYUSHU-CITY, 803-8530 JAPAN	
herewith declare, on our own responsibility that the following product conforms to the relevant provisions.	
Product	: <u>INDUSTRIAL ROBOT</u> (Wafer Handling System to use for Semiconductor Manufacturing Equipment)
System Name : NXC100	
Type designations: ERCR-NS Series / NXC100 / Controller ERCR-ND Series / Expansion box XU-RC Series / Manipulator XU-ACT Series / Track XU-ACP Series / Prealigner (see appendix 1)	
To which this declaration relates is in conformity with the following standards	
EN ISO 10218-1:2006	EN 60204-1:2006
EN ISO 12100-1:2003	EN ISO 12100-2:2003
EN 954-1:1997	EN ISO 13849-1:2008
EN 61000-6-2:2005	EN 61000-6-4:2007
Following the provisions of Machinery Directive 2006/42/EC EMC Directive 2004/108/EC	
The product covered by this declaration is intended to be installed or assembled with the other machinery to constitute machinery covered by the Machinery Directive (2006/42/EC), and shall not be put into service until the machinery into which it is to be installed or assembled has been declared in conformity with the provision of the applicable Directive.	
Signature:	Ref. No. _____ XXXXXX MM.DD.YYYY, Japan Place and Date of Issue (Name) XXXXXXXXXXXXXX XXXXXXXXXXXXXX General Manager Clean Robotics Business Division YASKAWA ELECTRIC CORPORATION
Page 1 of 2	

Appendix 1 of DoCReference No. **XXXXX****Typedesignations**

Product	Type	Remark
Controller	ERCR-NS01-B004	NXC100
	ERCR-NS01-B004-E1	NXC100 RoHS version
Expansion box	ERCR-ND10-C000	NXC100
Manipulator	XU-RC350S-C03	M101
	XU-RC350D-C03	M201
	XU-RC350D-J03	M201+
	XU-RC400M-C03	M112
	XU-RC400M-D03	M122
	XU-RC820M-A03	M114
	XU-RC820M-B03	M124
Track	XU-ACT051L-C10	TL0505S
	XU-ACT051L-D10	TL0505H
	XU-ACT101L-C10	TL1010S
	XU-ACT101L-D10	TL1010H
	XU-ACT152L-D10	TL1515S
	XU-ACT152L-C10	TL1515H
Pre-aligner	XU-ACP130-A13	PV11
	XU-ACP130-B11	PV12
	XU-ACP330-A22	PV32
	XU-ACP330-C10	PE11
Teaching pendant	JZRCR-NPP02-01	
	JZRCR-NPP02-01-E1	RoHS version

Setup

2 Product Confirmation



CAUTION

- **Confirm the contents of the delivery that there is no damage or lack of parts caused by transporting.**

Failure to observe this instruction may affect the manipulator performance or the manipulator may not perform as expected.

- **Confirm that the serial numbers (S/N) of the manipulator and the NXC100 (Head 6 digits and last 2 digits) are same.**

*** Serial No. of the nameplate should match as below.**

E.g. S/N of Manipulator

S2K783 - 1 - 01

Head 6 digits Last 2 digits

S/N of the NXC100

S2K783 - 3A - 01

Head 6 digits Last 2 digits

Failure to observe this instruction may result in injury or damage.



When using spare parts, the serial numbers of the manipulator and the NXC100 (Head 6 digits and last 2 digits) are not same.

In this case, confirm that the combination of the manipulator and the NXC100 is right, then set up the manipulator and the NXC100 following the appropriate instruction manuals.

When using NXC100 spare parts, refer to " 12 Replacing Parts " of this instruction manual.

When using manipulator spare parts refer to the instruction manual of the manipulator corresponding to the manipulator spare parts.



The NXC100 controller's memory stores the standard position data and the teaching data of respective manipulators, and the parameters corresponding to the manipulator type. If the combination of the manipulator and the NXC100 controller is changed, these data have to be reconfigured.

2.1 Contents Confirmation

Check the contents of the delivery when the product arrives.

Standard delivery includes following of the NXC100 controller and the NXC100 accessories. (Check the contents of the delivery with the packing list delivered with the product.)

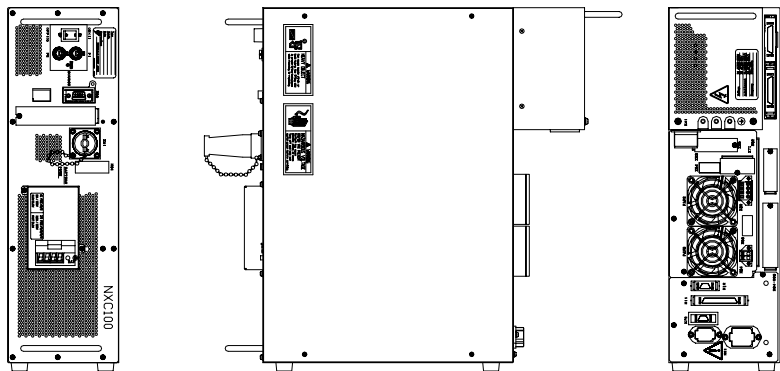
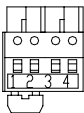
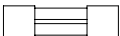
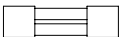
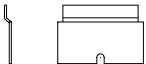
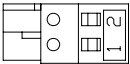
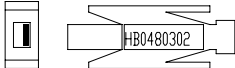
Contents		Qty
NXC100 controller 		1
NXC100 Accessories	 X32 Reset Connector (Type: HB0480097 or Type: HB0480717(For RoHS))	1
	 Power fuse for spare	2
	 I/O fuse for spare	2
	 Wiring tool for WAGO connector (X32,X34)	2
	 Dust Cove for X31	1
	 Connector cover for X71(with a screw)	1
	 X34 Brake Release Connector (Type: HB0480098 or Type: HB0480718(For RoHS))	1
	 X54/X56 Mechatrolink terminator (Type: HB0480302 or Type: HB0480689(For RoHS))	2

Fig. 1 Contents of the Delivery

2.2 Nameplate Confirmation

Confirm the nameplate of the NXC100 controller.

The place of the nameplate and nameplate description are indicated below.

S/N: serial No. (head 6 digits and last digits) of the nameplate should match as below.

E.g. S/N of Manipulator

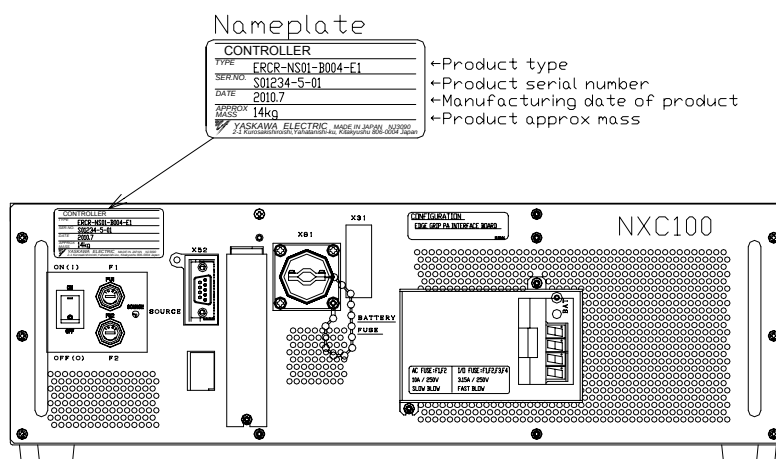
S01234 - 5 - 01

Head 6 digits Last 2 digits

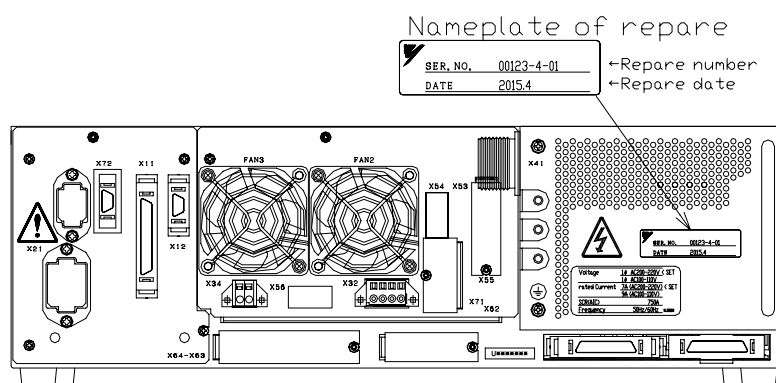
S/N of the NXC100

S01234 - 5 - 01

Head 6 digits Last 2 digits



Front view



Back view

Fig. 2 Location of the Nameplate

2.3 Configuration Confirmation

There are three types of NXC100 hardware configurations depending on the specification of pre-aligner.

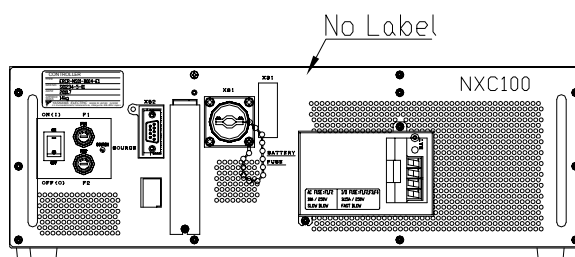
Hardware Configuration	Pre-aligner Specification/Type
NXC100 Specification A	No pre-aligner PV11a: 200 mm, 1 axis, suction type / XU-ACP120-A13 PV11b: 300 mm, 1 axis, suction type / XU-ACP130-A13 PV12M: 200/300 mm switching, 1axis, suction type / XU-ACP130-B11
NXC100 Specification B	PE11: edge grip type / XU-ACP330-C10
NXC100 Specification C	PV32: 3 axes, suction type / XU-ACP330-A22

Check the configuration of the NXC100 controller.

The place of the nameplate and configuration are indicated below.

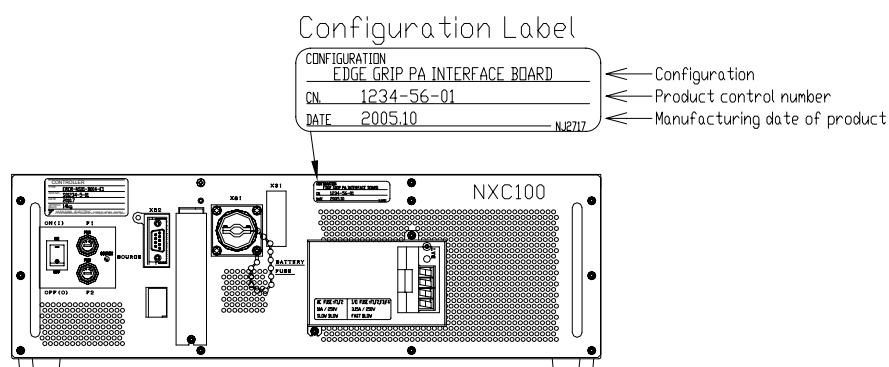
2.3.1 NXC100 Specification A

The NXC100 controller does not require any optional parts if no pre-aligner or PV11, PV12 (single-axis pre-aligner) is used in the system. In this case, use the NXC100 specification A.



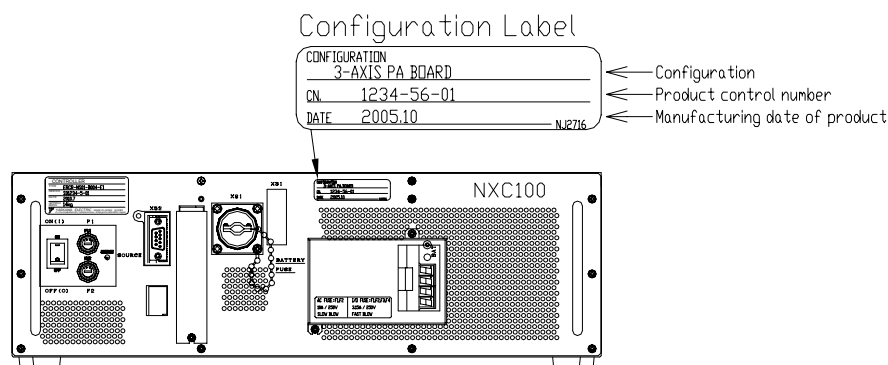
2.3.2 NXC100 Specification B

The NXC100 controller requires optional parts if PE11 (edge-grip pre-aligner) is used in the system. In this case, use the NXC100 specification B.



2.3.3 NXC100 Specification C

The NXC100 controller requires optional parts if PV32 (3-axes pre-aligner) is used in the system. In this case, use the NXC100 specification C.



The NXC100 software configuration varies by the specifications of controlled manipulator/track/pre-aligner, types of end effectors, configuration of various functions. The NXC100 will be provided in Yaskawa's standard software configuration if there is no particular designation from user.

3 Transport/Installation



WARNING

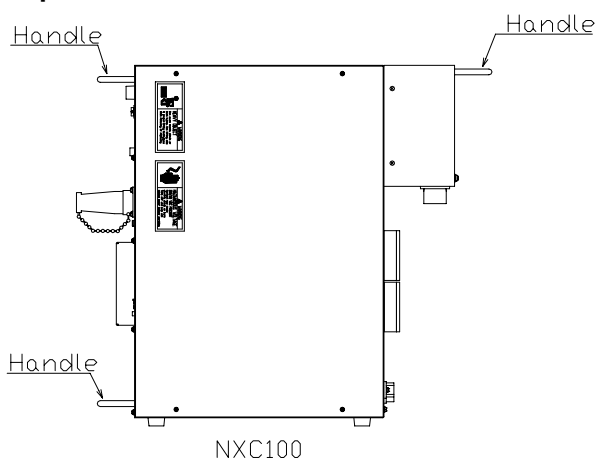
- Build an enclosure for the manipulator, track, and pre-aligner so that no one can access them during automatic operation, and locate all controllers outside the enclosure.
- The door of the enclosure should be equipped with a safety interlock. Be sure the interlock functions correctly before use.

Failure to observe these warnings may result in injury or damage to the equipment.



CAUTION

- Each approx mass is shown below. Moving and installing the NXC100 controller require two or more personnel.



The approx mass of the NXC100

Model description	Approx mass (kg)
NXC100 The representative type ERCR-NS01-B004 ERCR-NS01-B004-E1	14

Failure to observe this caution may result in damage or injury.

- Avoid excessive shock in transporting the manipulator, track, pre-aligner, NXC100 controller, and expansion box.

Failure to observe this caution may adversely affect their performance.



MANDATORY

- The equipment of the robotic system (manipulator, track, pre-aligner, and NXC100 controller) shall be built into the host system.
Each equipment shall be mounted on a location that enables safe maintenance by one or two personnel, allowing an area for transportation jigs if required.
The customer should observe instruction manuals for the robotic system, and install the assemblies of the robotic system conforming to the requirements of SEMI-S8.
- Install the robotic system in the host system with LockOut/TagOut provisions. That is, each installation requires a device to shut OFF power to the manipulator, track, pre-aligner, and NXC100 controller that is located outside the enclosure where the manipulator, track, and pre-aligner are installed and has a LockOut/TagOut capability.
- All equipment should be mounted to meet the requirements of SEMI S8.

3.1 Transporting NXC100 Controller

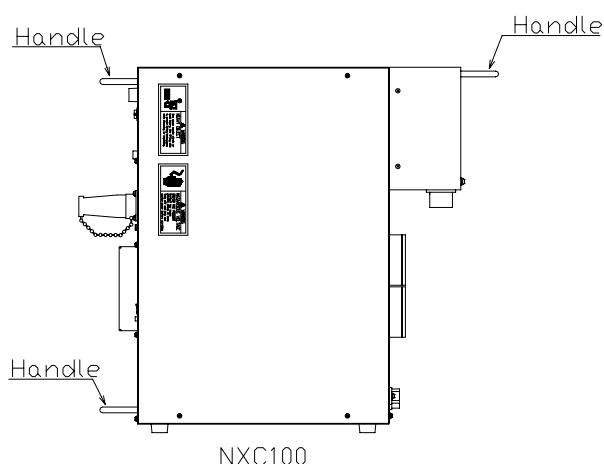
The transport method of the NXC100 controller should be determined according to "Manual Material Handling Analysis (SEMI-S8)" by the customer.

The mass of the NXC100 controller is indicated in the nameplate. For the nameplate and its location, refer to "2.2 Nameplate Confirmation".

Uncrating and moving the NXC100 controller require two personnel.

The handles of the NXC100 controller are used to pull/push the NXC100 controller out of/into the rack.

When loading or unloading the NXC100 controller onto/from the rack, use a lifter; when transporting the NXC100 controller, use a cart. However, if such operations should be performed without the transportation equipment out of necessity, the NXC100 controller shall be lifted by two personnel securely holding the controller base.



The approx mass of the NXC100 controller

Model description	Approx mass (kg)
NXC100 The representative type ERCR-NS01-B004 ERCR-NS01-B004-E1	14

3.2 Place of the Installation



CAUTION

- The NXC100 controller is not resistant to dust, water, or explosion. Operation must be performed in an environment with NO explosiveness, inflammability, corrodible gas, humidity, or dust.

Failure to observe this caution may result in injury, damage to equipment, or malfunction.

When the NXC100 controller is installed, satisfy the environmental conditions as below:

1. Ambient temperature:

	Operating	Storage
NXC100 controller	0 to 40° C	–10 to 60° C

2. Ambient humidity:

	Operating	Storage
NXC100 controller	90 % RH max (non condensing)	90 % RH max (non condensing)

3. Free from corrosive gases or liquid, or explosive gases.
4. Free from excessive vibration or shock.
5. Free from large electrical noise.
6. Free from moisture or chemical liquid.

3.3 Location

Place of installation: the host system.



CAUTION

- Any obstruction must be avoided around 200 mm of air intake vent on the front panel and air exhaust vent on the back panel of the NXC100 controller.

Failure to observe this caution may result in injury, damage to equipment, or malfunction.

- The NXC100 controller must be located where the NXC100 controller power switch (SW1) is located no higher than 64.5 inches (1640 mm) from the floor.

- Install the NXC100 controller outside the range of motion of the manipulator (outside the safeguarding).
- Install the NXC100 controller in a location where the operator can easily look at the manipulator to enable secure operation.

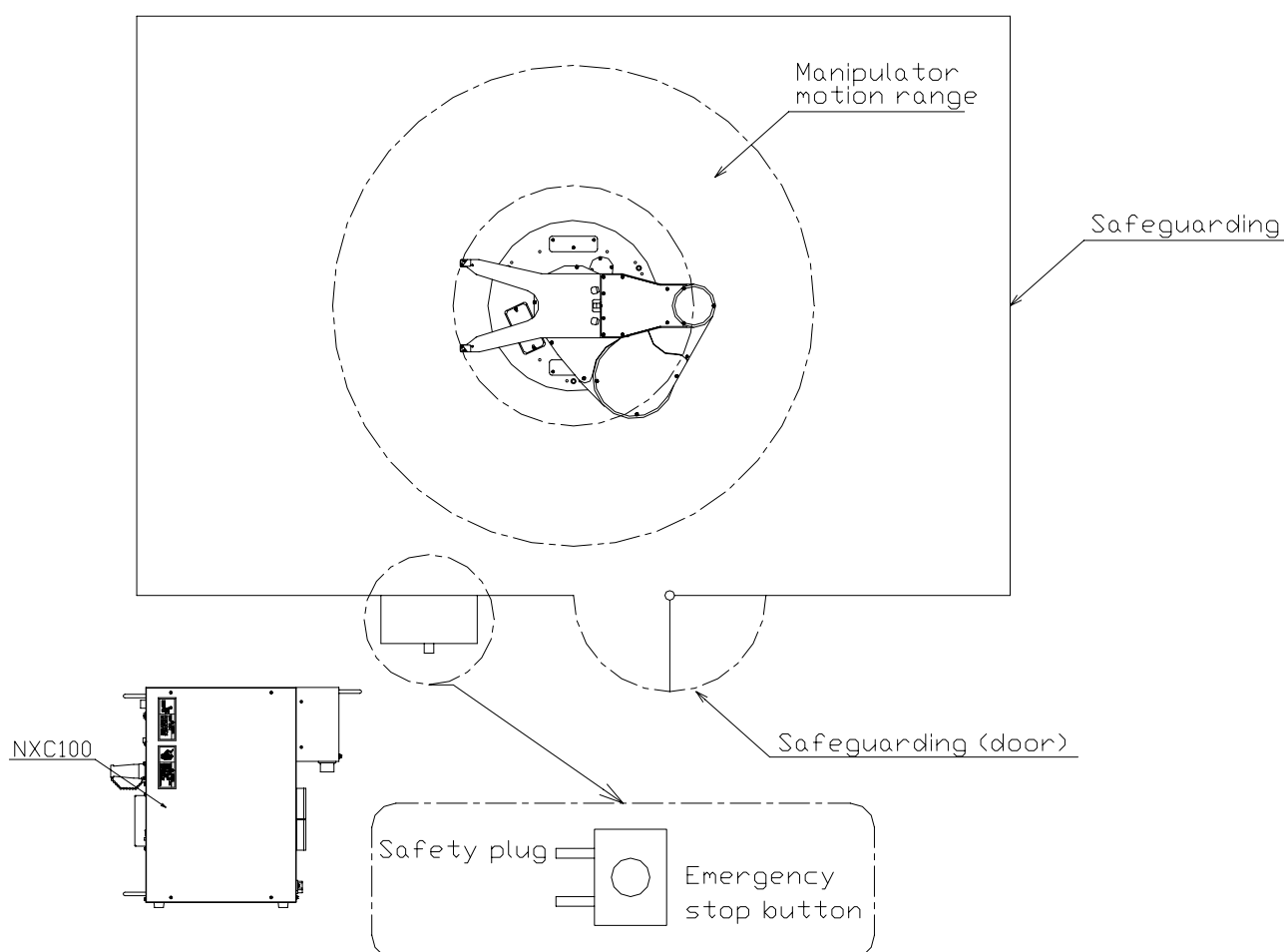
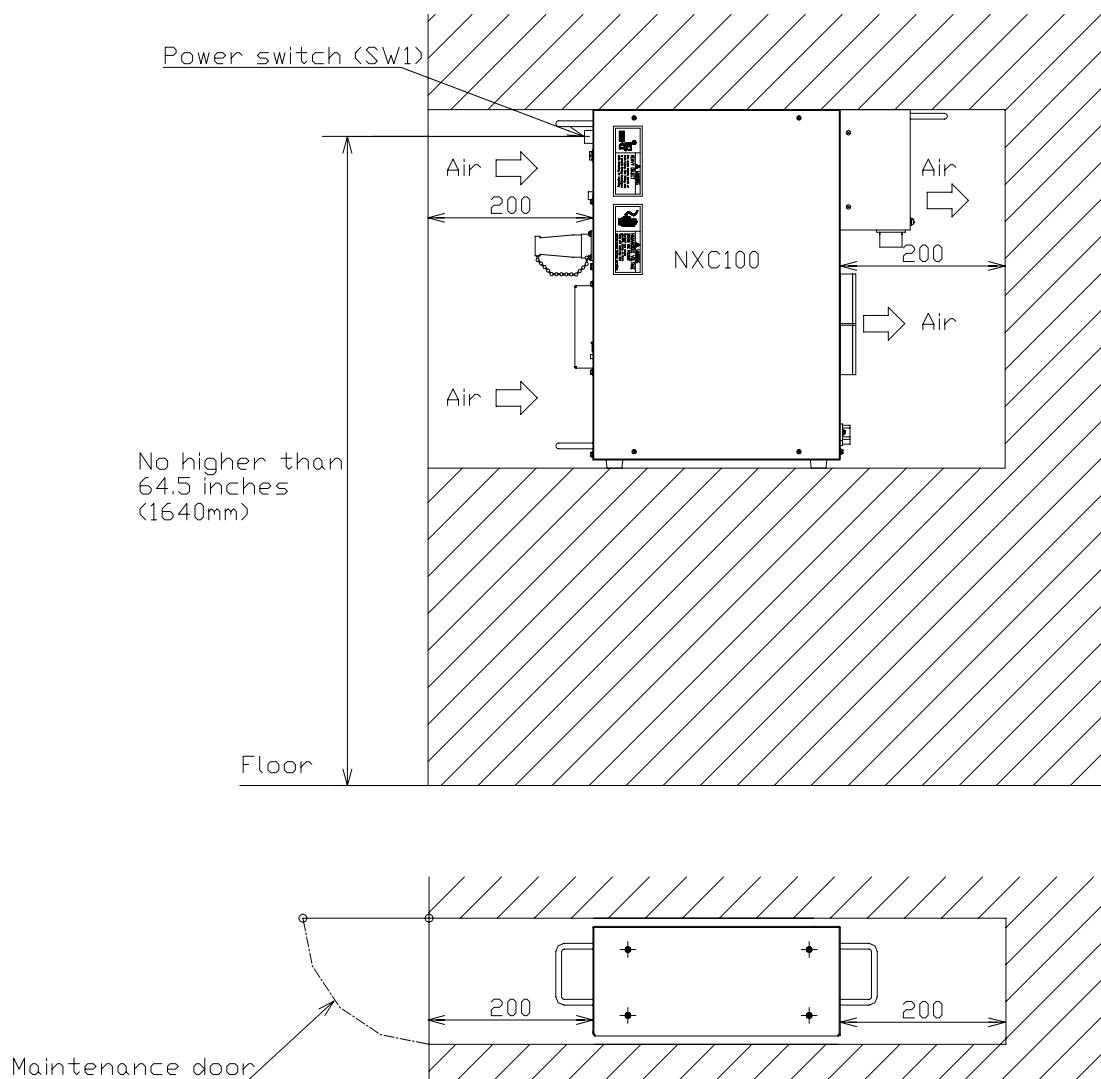


Fig. 3 Installation Place

- Any obstruction must be avoided around 200 mm of the air intake vent on the front panel and air exhaust vent in the back panel of the NXC100 controller.
- The NXC100 controller must be located where the NXC100 controller power switch (SW1) is located no higher than 64.5 inches (1640 mm) from the floor.
- Install the NXC100 controller in a location where operators have access to the NXC100 controller front panel for its operation.
- For maintenance purposes, install the NXC100 controller in a location where it is easy to remove the NXC100 controller from the host system rack.



Units: mm

Fig. 4 The NXC100 Controller Layout

3.4 Installing the NXC100 Controller



CAUTION

- To fix the NXC100 controller in place, prepare screws which do not go beyond 5 mm of tapped holes on the outer panel of NXC100, considering the thickness of mounting plates/brackets. Using the screws which go over 5 mm deep in the NXC100 outer panels may cause damage to the inner parts of controller.

Recommended size of screws: UNF#10-32
5 mm length + thickness of mounting plates/brackets
Recommended material for screws: annealed copper or more stronger materials

- The NXC100 controller shall be installed fixing all of the eight fixing points.
- Installation type of the NXC100 controller is freestanding; settle the NXC100 in the frames with seismic protection.

Failure to observe this instruction may cause injury, damage to the equipment or malfunction.

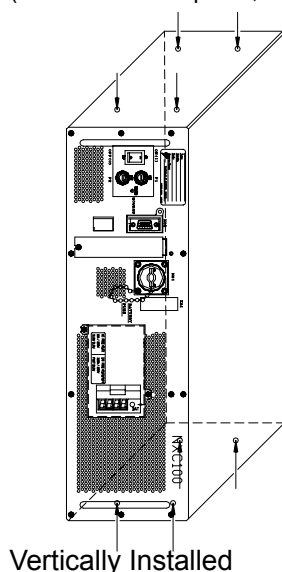
Installation Method:

- For vertically installed NXC100 controller, fix the NXC100 controller in the host system by using holes on the top and bottom panels of the NXC100 controller as shown " Fig. 5 Location of Tapped Holes ".
- For horizontally installed NXC100 controller, fix the NXC100 controller in the host system by using holes on both side panels of the NXC100 controller as shown " Fig. 5 Location of Tapped Holes ".

Refer to " 8.4 Center Gravity " and " 8.5 Seismic Load ".

Tapped holes UNF #10-32

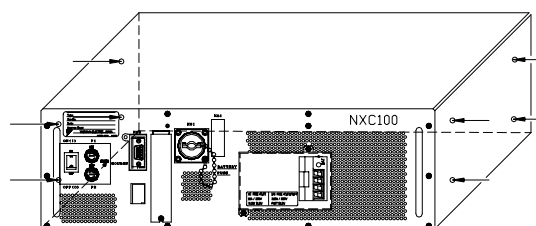
(4 holes on each panel, 8 holes in total)



Vertically Installed

Tapped holes UNF #10-32

(4 holes on each panel, 8 holes in total)



Horizontally Installed

Fig. 5 Location of Tapped Holes

Install the NXC100 controller in the correct orientation.

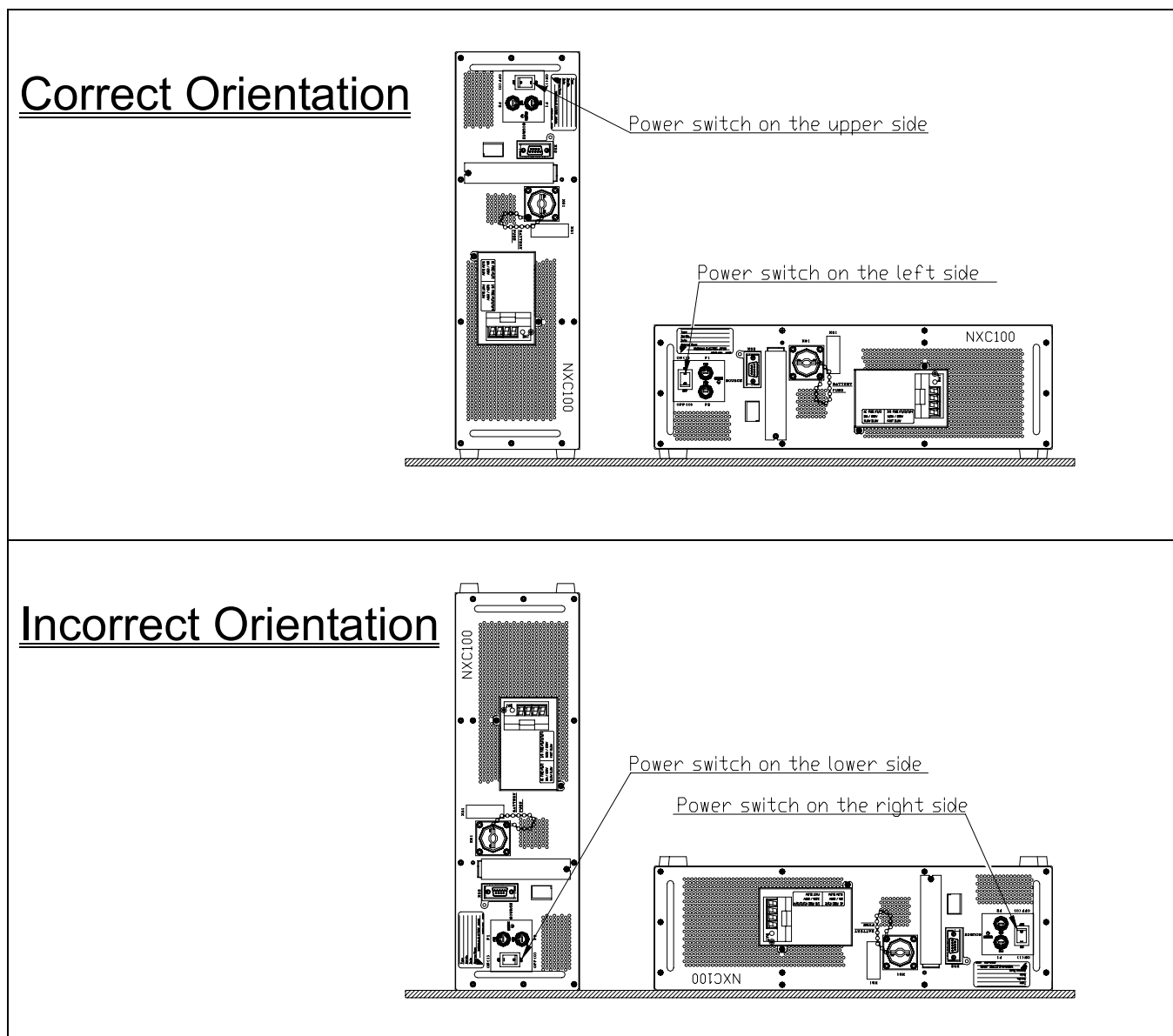


Fig. 6 Correct Orientation for NXC100 Controller Installation



Case legs are attached to the NXC100 controller bottom panel.
For removing the case legs, turn the center of the case legs with a flathead screwdriver.
Install the case legs according to the installation orientation (horizontally installed or vertically installed) of the NXC100 controller.

4 Connecting Cables



WARNING

- **Make sure to turn OFF the main power supply, lock the switch and put up a warning sign (such as "DO NOT TURN ON THE POWER") when connecting cables.**
The robotic system does not have the switches to turn OFF the power; turn OFF the switches in the host system to which the robotic system is connected.

Failure to observe this warning may result in electric shock or injury.

- **Perform grounding in accordance with applicable electrical codes.**

Failure to observe this warning may result in fire or electric shock.



CAUTION

- **Handle cables with care so that the cables will not be broken, bent, crimped, etc.**
- **Do not give any excessive force to connectors when connecting cables.**

Failure to observe this caution may result in connection failure.

- **Make sure to insert connectors firmly until the end and securely tighten them with fixing screws.**

Failure to observe this caution may result in electric shock or malfunction of the manipulator.

- **Ensure that cables do not interfere with any other parts.**

Failure to observe this caution may cause cable breakage or disconnection.

- **Fix cables.**

Failure to observe this caution may cause cable breakage or disconnection.

- **Securely execute the noise prevention process.**

Vibration and performance error will occur if the noise effects the signal.

- Separate and keep a distance between the power line and signal line.
- Shorten the connecting cables as much as possible.
- For the grounding method of the NXC100 controller, apply a single-point ground system with the ground resistance of 100 Ω or less.

- **Make sure to insert the air tubes firmly until the end.**

Failure to observe this caution may cause wafer damage due to wafer gripping or chucking error.



MANDATORY

- **Connect the robotic system to the host system's Emergency OFF (EMO) which is required in SEMI-S2.**

4.1 Cable Connection Diagram

(1) System configuration when manipulator is individually operated (without track)

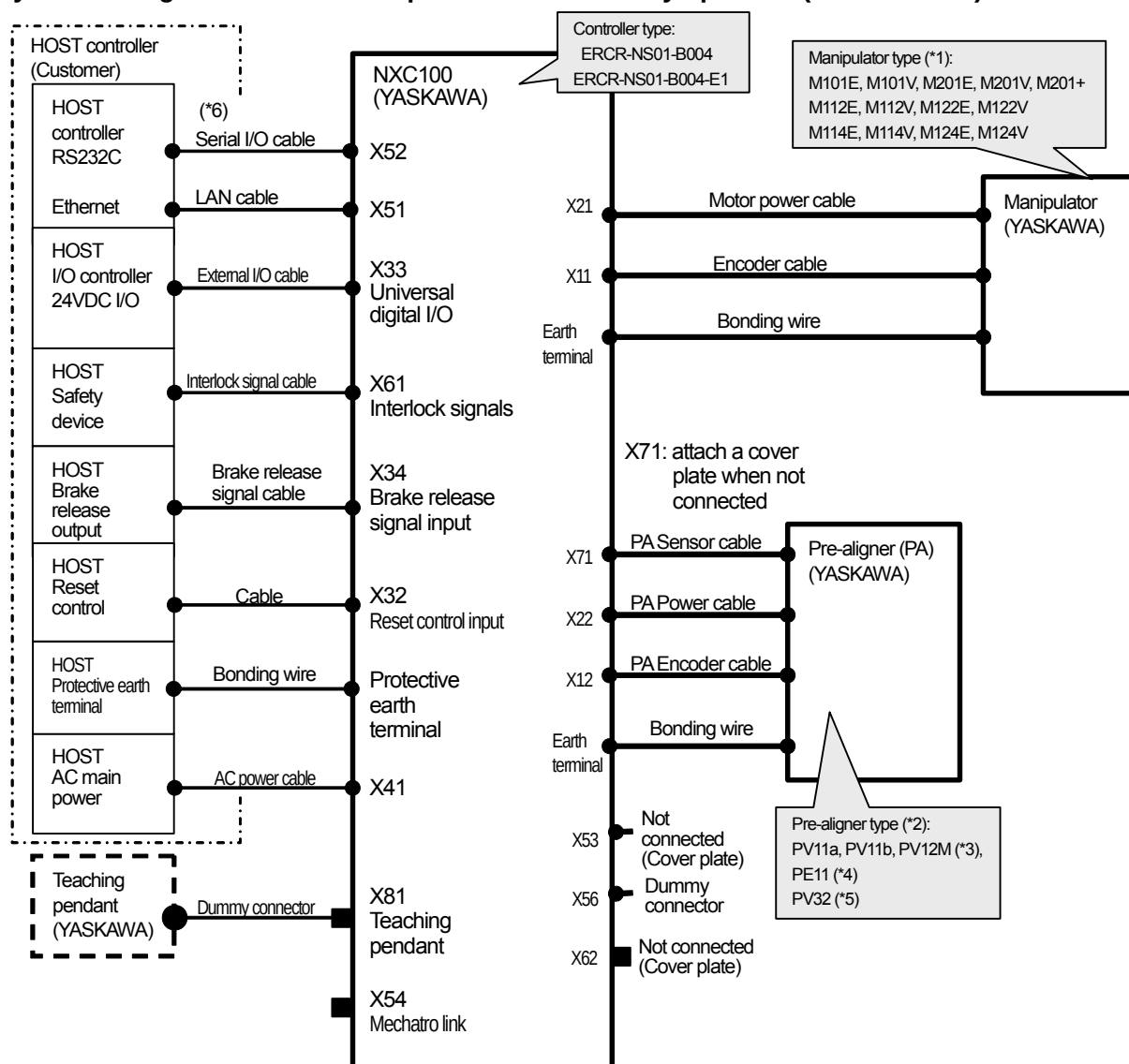


Fig. 7-1 Connection Diagram (without Track)

- *1 No expansion box is required when using manipulator without track. Attach a cover plate to the X62 connector.
- *2 When not using pre-aligner, use the standard configuration controller NXC100 Specification A. Attach a cover plate to the X71 connector.
- *3 When using the single-axis pre-aligner (PV11a, PV11b, or PV12M), use the standard configuration controller NXC100 Specification A. Remove the cover plate attached to the X71 connector, then connect the pre-aligner sensor cable.
- *4 When using the edge-grip pre-aligner (PE11), use the controller configured for PE11, NXC100 Specification B. Remove the cover plate attached to the X71 connector, then connect the pre-aligner sensor cable.
- *5 When using the 3-axes pre-aligner (PV32), use the controller configured for PV32, NXC100 Specification C. Remove the cover plate attached to the X71 connector, then connect the pre-aligner sensor cable.
- *6 Specify the communication method when placing order.

(2) System configuration for the EFEM (With TLxxxxS series)

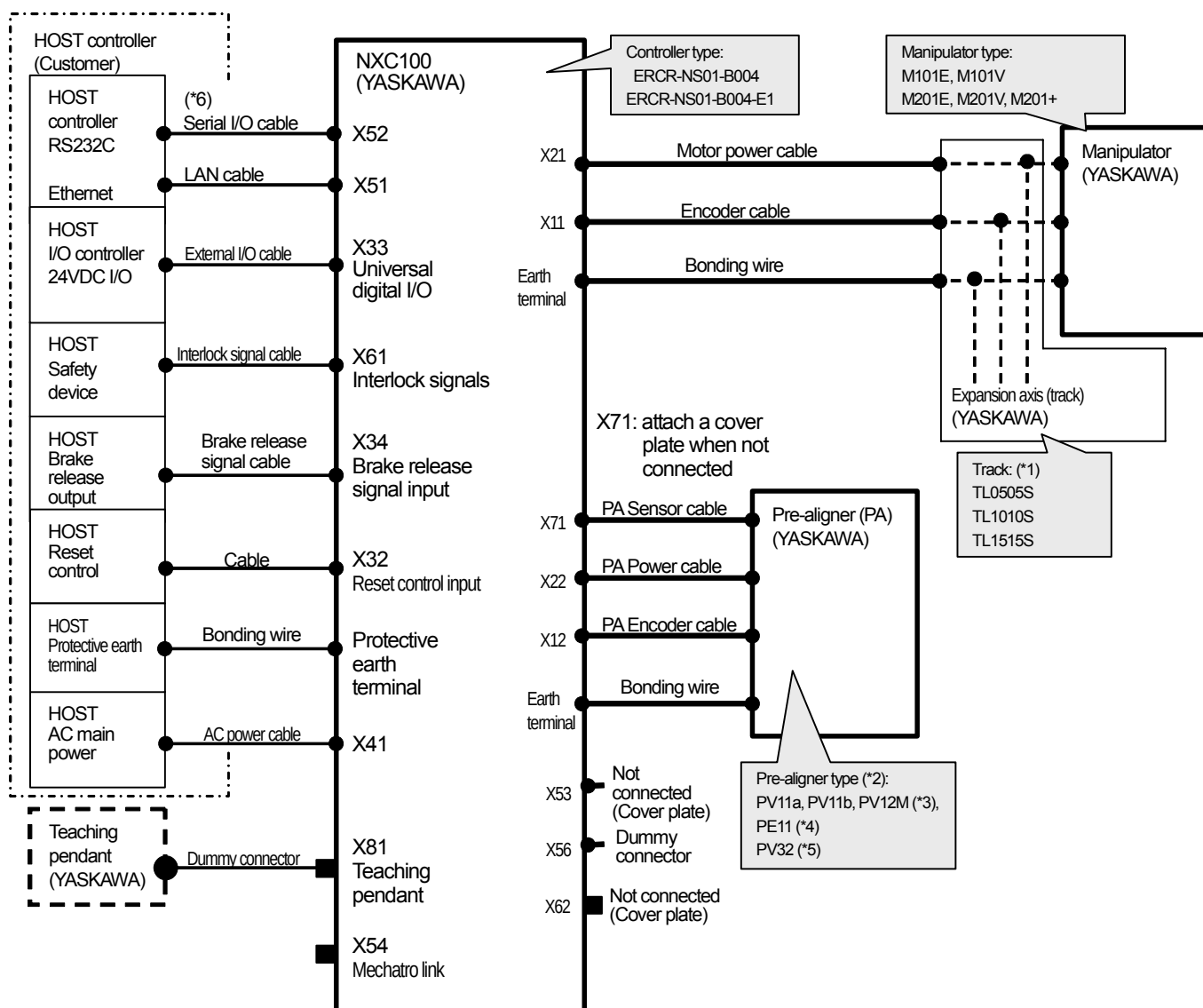


Fig. 7-2 Connection Diagram (with Track)

- *1 No expansion box is required when using the TLxxxxS series track. Attach a cover plate on the X62 connector.
- *2 When not using pre-aligner, use the standard configuration controller NXC100 Specification A. Attach a cover plate to the X71 connector.
- *3 When using the single-axis pre-aligner (PV11a, PV11b, or PV12M), use the standard configuration controller NXC100 Specification A. Remove the cover plate attached to the X71 connector, then connect the pre-aligner sensor cable.
- *4 When using the edge-grip pre-aligner (PE11), use the controller configured for PE11, NXC100 Specification B. Remove the cover plate attached to the X71 connector, then connect the pre-aligner sensor cable.
- *5 When using the 3-axes pre-aligner (PV32), use the controller configured for PV32, NXC100 Specification C. Remove the cover plate attached to the X71 connector, then connect the pre-aligner sensor cable.
- *6 Specify the communication method when placing order.

(3) System configuration for the EFEM (With TLxxxxH series)

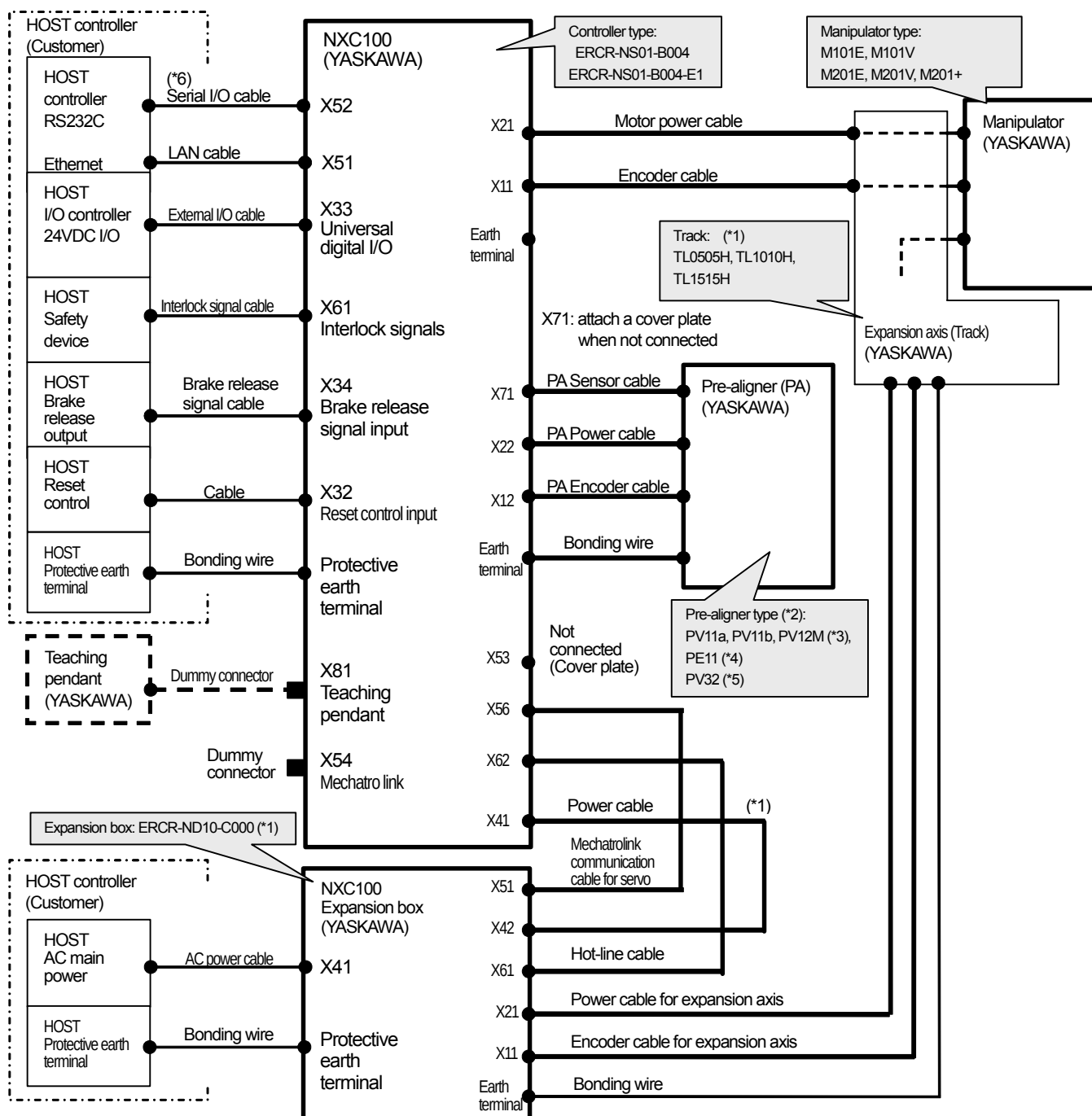


Fig. 7-3 Connection Diagram (with Expansion Box)

- *1 Expansion box is required when using the TLxxxxH series track. Refer to the instruction manual for the expansion box. Remove the cover plate attached to the X62 connector, then connect the hot-line cable. Remove the dummy connector on the X56 connector, then connect the mechatrolink communication cable for servo. The controller power is supplied via the expansion box.
- *2 When not using pre-aligner, use the standard configuration controller NXC100 Specification A. Attach a cover plate to the X71 connector.
- *3 When using the single-axis pre-aligner (PV11a, PV11b, or PV12M), use the standard configuration controller NXC100 Specification A. Remove the cover plate attached to the X71 connector, then connect the pre-aligner sensor cable.
- *4 When using the edge-grip pre-aligner (PE11), use the controller configured for PE11, NXC100 Specification B. Remove the cover plate attached to the X71 connector, then connect the pre-aligner sensor cable.
- *5 When using the 3-axes pre-aligner (PV32), use the controller configured for PV32, NXC100 Specification C. Remove the cover plate attached to the X71 connector, then connect the pre-aligner sensor cable.
- *6 Specify the communication method when placing order.

4.2 Connector Location

Connectors are located at the places indicated below.

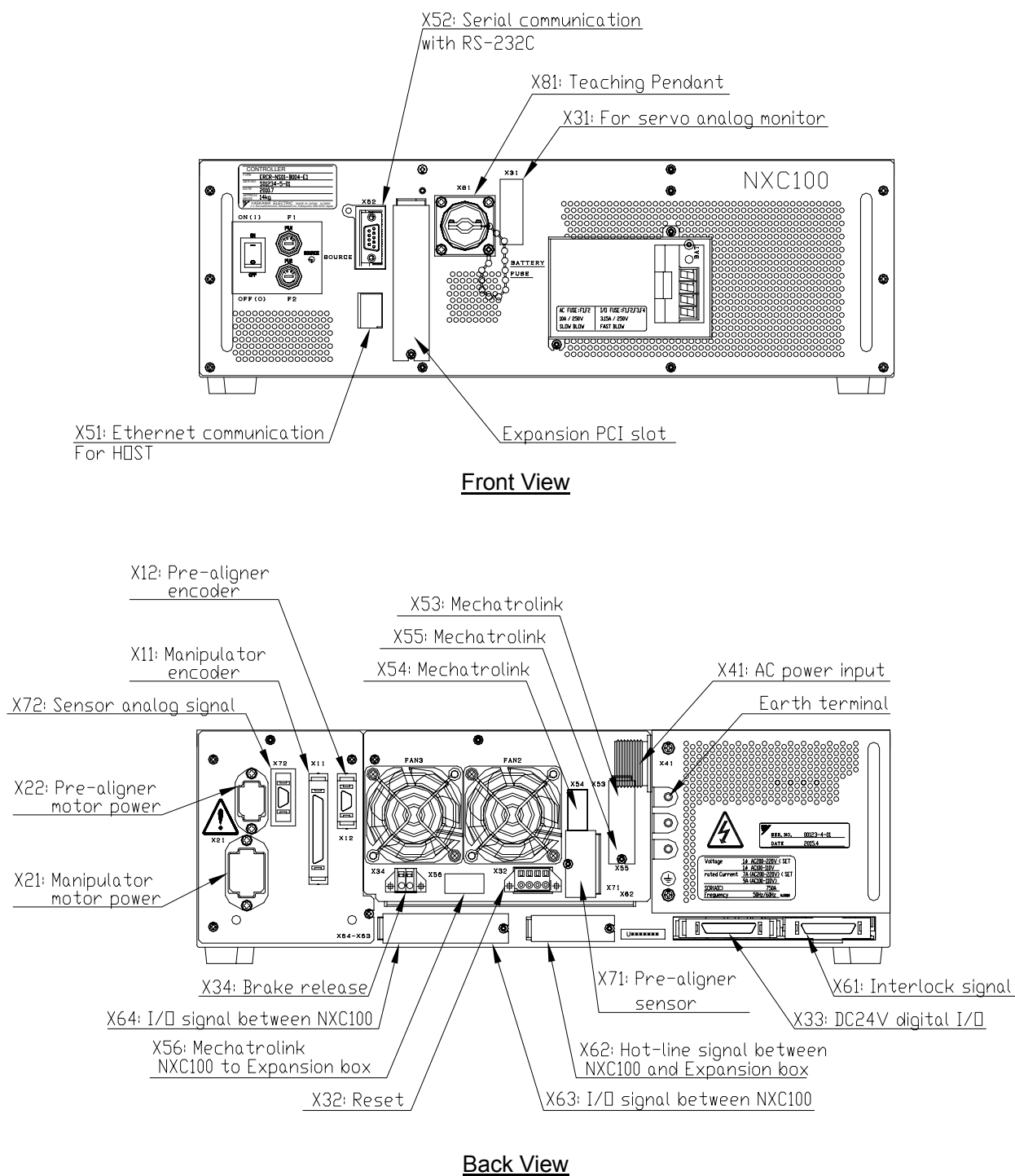


Fig. 8 Connector Location

4.3 Connection for Robotic System

Cables between the manipulator and the NXC100 controller are provided by YASKAWA.

Connect the cables to the locations specified in the following table. (For example, the NXC100 controller connector X21 to cable connector X21)

Do not use cables provided by companies other than YASKAWA.

The specified cables are different according to the product specifications. Verify the cable part number and quantity indicated in the packing list delivered with the product.

Table 1 Provided Cable List (*3)

	Connector name (NXC100 controller)	Cable Name	Qty
1	X21	Manipulator motor power cable *1	1
2	X11	Manipulator encoder cable *1	1
3	X22	Pre-Aligner motor power cable *1	1
4	X12	Pre-Aligner encoder cable *1	1
5	X71	Pre-Aligner sensor cable *1	1
6	X81	Dummy connector (with the NXC100 controller)	1
		or Teaching Pendant (Optional)	1
7	X32	Reset Connector (Type: HB0480097) *2 or Reset Connector (Type: HB0480717, For RoHS) *2	1
8	X34	Brake Release Connector (Type: HB040098) *2 or Brake Release Connector (Type: HB0480718, For RoHS) *2	1
9	X54/X56	Mechatrolink terminator (Type: HB0480302) *2 or Mechatrolink terminator (Type: HB0480689, For RoHS) *2	2

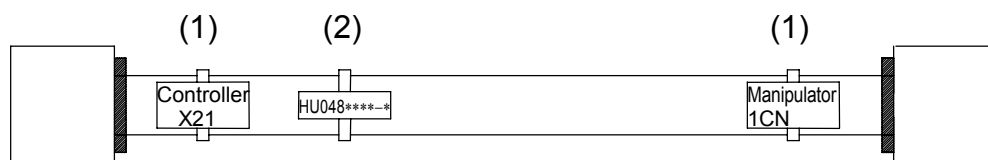
*1 Refer to instruction manuals:

- INSTRUCTION MANUAL FOR MANIPULATOR
- INSTRUCTION MANUAL FOR TRACK
- INSTRUCTION MANUAL FOR PRE-ALIGNER

*2 NXC100 accessories.

*3 In case of robot system with TLxxxxS series.

Provided cable has a part number tag and connector number tag at each end.
Confirm the part number and connector location. (Example: the NXC100 controller connector)



- (1) **Controller X21** ← Connected to
← Connector Number
- (2) **HU048****-*** ← Part Number

Fig. 9 Cable Tags



Connect either the dummy connector or teaching pendant (optional) to X81 on the front panel of the NXC100 controller.
If no connector is connected to X81, the robotic system will be in emergency stop.

4.4 Connection for Communication or Optional Function

Cables between the robotic system (NXC100 controller) and the host system are not delivered with the product; they shall be prepared by customer.

Cables to be prepared by customer:

- Communication cables such as RS232C and Ethernet cables.
- Signal cables such as I/O, safety, sensor and brake release cables.



- YASKAWA provides reset connectors with jumper.
- The Ethernet communication cable is used for maintenance and/or host communication.

Table 2 List of Cables Prepared by Customer

	Connector Name (NXC100 controller)	Cable Name	Qty	Remarks
1	X51	Ethernet communication cable	1	
2	X52	Serial communication cable RS232C	1	
3	X33	24 VDC universal digital I/O cable	1	
4	X61	Interlock signal cable	1	
5	X32	Reset signal cable	1	
6	X41	Power cable	1	
7		Bounding wire	3	
8	X72	Sensor analog signal cable	1	
9	X34	Brake release signal cable	1	
10	CN1	5 VDC universal digital I/O cable	1	On the PCI board (Optional)

4.4.1 Power Supply (LockOut/TagOut and Emergency OFF)

The robotic system cannot be used as a stand-alone unit; it is designed to be built into the host system. In planning the system, take appropriate measures to ensure safety.

Since the robotic system does not have the ON/OFF switch for the power to the NXC100 controller, the host system shall have a device to control the NXC100 power. Customers shall also be required to prepare and install safeguarding including safety equipment such as LockOut/TagOut, Emergency OFF (EMO) provisions, and interlock for the robotic system.

Prepare the power supply for the NXC100 controller as follows:

- Supply voltage: single phase 200/220 VAC (+10 % to -10%); 50/60 Hz
Rated current: 1 A; full load current: 7 A (excluding inrush current)
- Supply voltage: single phase 100/110 VAC (+10% to -10%); 50/60 Hz
Rated current: 2 A; full load current: 9 A (excluding inrush current)

The input voltage is will be set before shipment since it is switched by the internal setting of the NXC100 controller.

The power supply voltage is indicated as "<SET" in the rating label in the following diagram.

The input power voltage of the standard specification is set to 200/220 VAC.

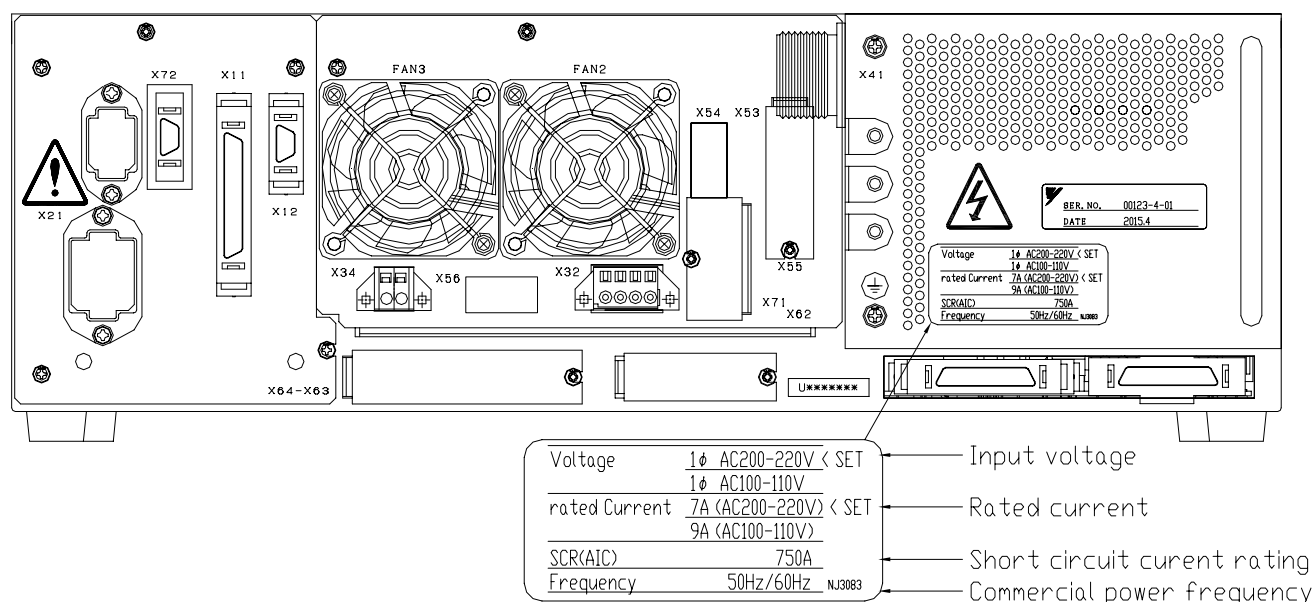


Fig. 10 Rating Label

1. The Switch for the Main Power

Prepare the switch with which the main power for the NXC100 controller is turned ON/OFF in the host system. It must have LockOut and TagOut functions, and it must be able to be locked out at "OFF" position.

The switch with LockOut/TagOut provisions must be located outside of the enclosure where the manipulator and track are installed. For SEMI S8, the switch must be installed at 1640 mm (64.5") or lower position from the floor.

2. Circuit Breaker

Although the NXC100 controller is equipped with the switch (SW1) and AC fuses (F1, F2), it does not have a circuit breaker that protects the robotic system. The customer shall install a circuit breaker for the robotic system in the host system. The current interrupting capacity of the circuit breaker shall be 10,000 AIC or more.

The servo drivers are connected to the NXC100 controller, and relatively large inrush current is generated compared with their capacity; therefore, the NXC100 controller has built-in fuses with electric characteristic corresponding to the inrush current. In selecting a circuit breaker, consider this fuse inertial delay.

If the switch for the main power supply is omitted by using the circuit breaker to turn ON/OFF the main power supply, the circuit breaker must have LockOut/TagOut.

<NXC100 Controller Built-in Fuse>

6.35 mm diameter; 31.8 mm long, fast-acting type; ceramic tube fuse

- 314 Series manufactured by Littelfuse Limited

Electrical Characteristics

Ratio Relative to Rated Current	Rated Current	Pre-arcing Time
110 %	1/8 to 30 A	4 hours or more
135 %	1/8 to 30 A	1 hour or more
200 %	1/8 to 30 A	15 seconds or more

For standard specification, the fuse with the following characteristics is used:

Rated Voltage	Rated Current
250 V	10 A

The melting I^2t for the 10 A fuse is 206 [A²Sec] (reference value).

3. Emergency OFF (EMO)

The robotic system does not have the EMO system; the electric power to the robotic system is supplied only through the NXC100 controller. Connect the NXC100 controller power to the power supply that is under EMO control. The EMO button shall be installed within 3 meters from the operator's position.

4. Connection to NXC100 controller

Connect the power supply through LockOut/TagOut and EMO provisions to X41 on the back panel of the NXC100 controller.

X41: INPUT AC Power

For details, refer to " 9.2 Pin Assignments ".

4.4.2 Communication Interface

The NXC100 controller has the LAN communication interface and RS-232C communication interface. The X51 and X52 are the communication interface connectors mounted on the NXC100 controller front panel.

The NXC100 controller controls the manipulator, track, and pre-aligner after receiving control commands from the host controller through RS-232 /or ETHERNET communication.

- (1) X51: ETHERNET (For maintenance PC connection; also used for host communication)
- (2) X52: RS232C (For host communication; also used for maintenance PC connection)

For details, refer to " 9.2 Pin Assignments ".

4.4.3 Digital I/O Interface

The NXC100 controller has digital I/O interface.

The X33 is the digital I/O interface connector on the NXC100 controller back panel.

X33: Universal digital I/O signals; 24 VDC

For details, refer to " 9.2 Pin Assignments ".

4.4.4 Interlock

The robotic system is designed to stop its operation by receiving interlock signals during automatic operation. Install the robotic system in the enclosure so that no one can access it during automatic operation.

For the enclosure, prepare safeguarding and safety interlock which fulfill the requirements prescribed by EN292-1, SEMI-S2, etc.

The X61 is the interlock interface connector on the NXC100 controller back panel.

X61: Interlock signals

For details, refer to " 9.2 Pin Assignments ".

4.4.5 Other Signals

- (1) X32: RESET (Reset Signal Input/Output Use)
- (2) X72: SENSOR (Sensor Analog Signal Use)
- (3) X34: BRAKE (Brake Release Signal Use)
- (4) CN1: DC5V universal digital I/O (Used when the optional DC5V PCI board is used)

For details, refer to " 9.2 Pin Assignments ".

5 Turning ON and OFF the Power Supply



WARNING

- **Confirm that nobody is present in the motion range of the manipulator and that you are in a safe location when turning ON the NXC100 controller power supply.**

Failure to observe this warning may result in injury caused by contact with manipulator.
Always press an emergency stop button immediately if there is a problem.



MANDATORY

- **Before turning ON the power supply, make sure that operator can press the emergency stop button described in " 5.3.1 Emergency Stop (Shutting OFF the Servo Power) ".**

Failure to observe this instruction may result in injury or damage to the equipment.

5.1 Before Applying the Power Supply

Before applying the power supply, verify that the followings have been installed as intended:

1. Mechanical mounting and stability:
Refer to "Transporting" and "Installation" in " INSTRUCTION MANUAL FOR MANIPULATOR ".
2. Electrical connections:
Refer to " 4 Connecting Cables " in this instruction manual.
3. Communications connections:
Refer to " 4 Connecting Cables " in this instruction manual.
4. Peripheral equipment and system:
The enclosure needs to include the safety interlock which fulfills the requirements prescribed by EN292-1, SEMI-S2, etc.
5. Limiting devices for restricting the maximum space:
The enclosure needs to include the safety barrier which fulfills the requirements prescribed by EN292-1, SEMI-S2, etc.

5.2 Turning ON the Power Supply

The NXC100 controller does not have the switch for power supply.

Turn ON the power switch (SW1) on the NXC100 controller, then turn ON the power supply with the switch prepared in the host system.

For the operation after turning ON the power supply, refer to " 6 Testing " in this instruction manual.

5.3 Turning OFF the Power Supply

As described below, there are several methods to turn OFF the power supply.

5.3.1 Emergency Stop (Shutting OFF the Servo Power)

At the emergency stop, the servo power is shut OFF and the manipulator stops its operation.

For the manipulator axes with motor, the mechanical brake is activated with the shutoff of the servo power and stops the manipulator. The servo power can be shut OFF by the emergency stop in either the "TEACH" mode or the "HOST" mode.

The NXC100 controller has two emergency stop systems; use the following two systems for emergency stop.

1. Emergency stop button at the upper left of the teaching pendant
The emergency stop button can be used when the teaching pendant is connected to X81 on the NXC100 controller.
 - (1) To activate: press the button.
 - (2) To release: twist the button to the right to rise it.
2. Interlock signal input from the X61 connector on the NXC100 controller
Prepare the connecting cable and the switch (double contact points) for the host system.
Connect them to the external emergency stop signal (EXESP 1, EXESP 2) of the NXC100 controller.
 - (1) To activate: release the contact.
 - (2) To release: shorten the contact.

For details, refer to " 9.2 Pin Assignments ".

5.3.2 Ordinary Turning OFF the Power Supply

Turn OFF the main power supply with the switch prepared in the host system.

5.3.3 Shutting OFF the Compressed Air

Shut the valve to supply air to the robotic system prepared in the host system.

6 Testing

Before a test run, observe the following instructions.



MANDATORY

- **No persons shall be in the motion range of the manipulator.**
Failure to observe this instruction may result in injury.
- **No persons shall enter the motion range of the manipulator.**
Failure to observe this instruction may result in injury.
- **The manipulator, the NXC100 controller and peripheral equipment are installed correctly.**
Failure to observe this instruction may result in injury or damage on equipment.
- **No looseness at the fixing/anchor point.**
Failure to observe this instruction may result in overturning of equipment or the manipulator may not perform as expected.
- **Connectors are inserted firmly until the end and firmly tightened with mounting screws.**
Failure to observe this instruction may result in electric shock or the manipulator may not perform as expected.
- **Emergency stop is always held when turning ON the power supply and can be pressed in emergency.**
Failure to observe this instruction may result in injury or damage on equipment.

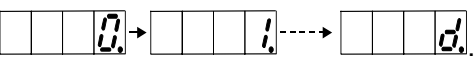


CAUTION

- **In case where alarm occurs during testing, retry testing after removing the alarm cause .**
Failure to observe this caution may result in injury or damage on equipment.
- **Never touch the moving part when operating automatically.**
Failure to observe this caution may result in injury or damage on equipment.
- **Do not remove or insert connector when equipment is in operation or power-on condition.**
Failure to observe this caution may result in electric shock or damage on the operation circuit.

6.1 Turning ON the NXC100 Controller

Turn ON the NXC100 controller power supply following " 5.1 Before Applying the Power Supply " and " 5.2 Turning ON the Power Supply " in this instruction manual.

The 7-segment LED on the NXC100 controller front panel indicates .

When the NXC100 controller is in the normal operation, it indicates , and the dot "." will start to flush at 1 second interval.



If the 7-segment LED indicates other than "1.000" the NXC100 controller is in the alarm status. Confirm the error contents referring to the error code table and remove the cause of the error. After removing the error cause, turn OFF the power supply and wait for over 5 minutes. Restore the power to the NXC100 controller, then check if the 7-segment LED indicates "1.000".



The highest order digit of 7-segment LED indicates the unit number. The last three digits of 7-segment LED indicate the detailed error code.

Unit No. (1 to 4)
Detailed error code

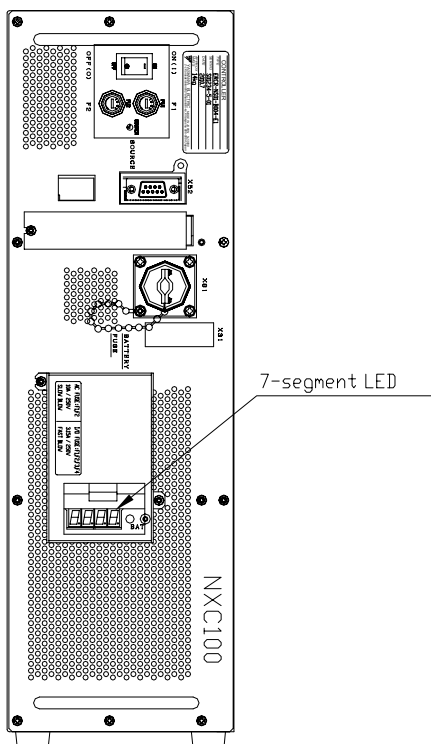


Fig. 11 Location of 7-Segment LED Indicator

Table 3 7-Segment LED Status

Indication Code	Details
0. ~ C.	CPU is in initialization.
*.000 (* indicates the unit No.)	CPU is operating correctly and in stand-by condition.
Other codes	Alarm or error indication

After applying the power supply, verify the following:

1. Emergency stop circuit/devices properly function.
Refer to " 6.3 Inspection for Safety " in this instruction manual.
2. Each axis moves and is controlled as intended.
Refer to " TEACHING PENDANT OPERATORS MANUAL ".
3. Manipulator responds to basic operation instructions as expected.
Refer to " 6.3 Inspection for Safety " in this instruction manual.
4. All safeguarding devices or interim safeguards properly function.
Refer to " 6.3 Inspection for Safety " in this instruction manual.
5. Slow speed control can be properly performed
Refer to " TEACHING PENDANT OPERATORS MANUAL ".

6.2 Turning ON the Servo Power

Depending on modes, the servo power is turned ON in two different methods as described below.

6.2.1 NXC100 Controller in the Host Mode

If the teaching pendant dummy connector is connected to the X81 connector on the NXC100 controller, or mode selector switch of the teaching pendant is set to the "HOST" mode, the NXC100 controller is in the command state from the host controller after turning ON the power supply.

If the automatic SERVO ON function is set, servo power automatically turns ON.

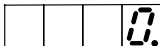
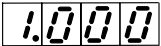
If the automatic SERVO ON function is not set, send the SERVO ON command from the host controller.

For details, refer to " TEACHING PENDANT OPERATORS MANUAL ".



Servo power cannot be turned ON if the emergency stop button is pressed or the safeguarding is open.
After checking the safety of the robotic system, release the emergency stop by rising the emergency stop button and close the safeguarding. Then turn ON the power supply to the NXC100 controller again.

6.2.2 NXC100 Controller in the Teach Mode

1. Turn OFF the power supply to the NXC100 controller.
2. Connect the teaching pendant to the X81 connector on the NXC100 controller.
3. Turn ON the power supply to the NXC100 controller. The 7-segment LED on the NXC100 controller front panel indicates  →  -----> . When the NXC100 controller is in the normal operation, it indicates , and the dot "." will start to flush at 1 second interval.
4. Set the mode selector switch of the teaching pendant to "TEACH".
5. The SERVO ON READY switch on teaching pendant turns the light OFF (SERVO OFF status).
6. Hold the Enable switch of the teaching pendant to the position of the middle. The SERVO ON READY switch of the teaching pendant lights up (SERVO ON status).



Servo Power ON/OFF -- Enable Switch

When holding the Enable switch of the teaching pendant, the servo power is turned ON and the SERVO ON READY switch lights up.

Holding the Enable switch until it clicks will shut OFF the servo power, and the light of the SERVO ON READY switch on the teaching pendant will be turned out.



The power-on operation with the Enable switch will be cancelled if an emergency stop operation is performed by teaching pendant or other external signal. To restore the servo power, perform the steps 5 and 6 in this section.

6.3 Inspection for Safety

Before operating the manipulator, be sure that the safety device functions properly for robot motion stop in the time of an emergency.



WARNING

- **Before operation, ensure that the safety device functions correctly.**

Failure to observe this warning may result in health hazard or injury due to malfunction caused by grounding failure, etc.

- **Do not remove or insert connector when equipment is in operation or power-on condition.**

Failure to observe this warning may result in electric shock, damage to operation circuit, or uncontrollable manipulator.



CAUTION

- **Leave an interval time of five minutes or more when performing emergency stop or on/off the power supply.**

Frequent ON/OFF of the emergency stop or power supply may result in deterioration in the main circuit elements of SERVOPACK.

6.3.1 Emergency Stop Button Inspections

1. Turn OFF the power supply to the NXC100 controller.
2. Connect the teaching pendant to the X81 connector on the NXC100 controller firmly.
3. Turn ON the power supply to the NXC100 controller. The 7-segment LED on the NXC100 controller

front panel indicates → -----> . When the NXC100 controller is

in normal operation, it indicates , and the dot " . " will start to flush at 1 second interval.

4. Set the mode selector switch of the teaching pendant to "TEACH".
5. The light of SERVO ON READY switch on the teaching pendant is turned OFF (SERVO OFF status).
6. Hold the Enable switch of the teaching pendant to the position of the middle.
7. The Enable switch of the teaching pendant lights up (SERVO ON status).
8. Press the emergency stop button on the teaching pendant.
When pressing the emergency stop button, the 7-segment LED indicates "A20". The light of SERVO ON READY switch on the teaching pendant is turned OFF.
9. Release the emergency stop button by twisting the button to the right to restore former state.
10. Turn OFF the power to the NXC100 controller, and remove the teaching pendant.
11. Connect the teaching pendant dummy connector to X81 on the NXC100 controller

6.3.2 Interlock Inspections

1. Turn ON the power supply to the NXC100 controller.
2. The 7-segment LED on the NXC100 controller front panel indicates

. When the NXC100 controller is in normal operation, it indicates , and the dot "." will start to flush at 1 second interval.

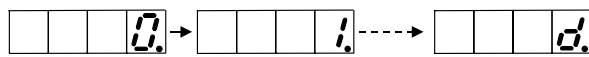
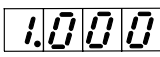
3. Set any interlock switch connected to X61 of the NXC100 controller to operate. When the switch works, the 7-segment LED indicates **"A10"**.

6.4 Teaching Pendant Inspections

6.4.1 Adjusting the LCD Screen Contrast of Teaching Pendant

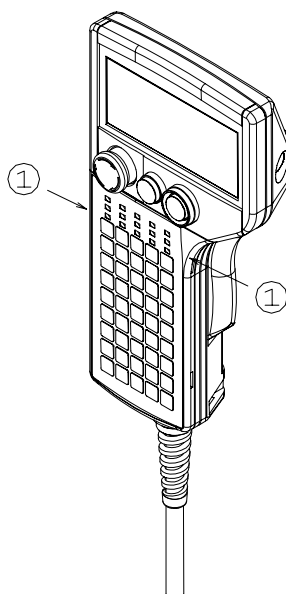
When the teaching pendant screen is not clearly visible, adjust its contrast with the LCD contrast control following the procedure below.

- (1) Turn OFF the power to the NXC100 controller.
- (2) Connect the teaching pendant to the connector X81 on the NXC100 controller.
- (3) Turn ON the power to the NXC100 controller. The 7-segment LED on the NXC100 controller front

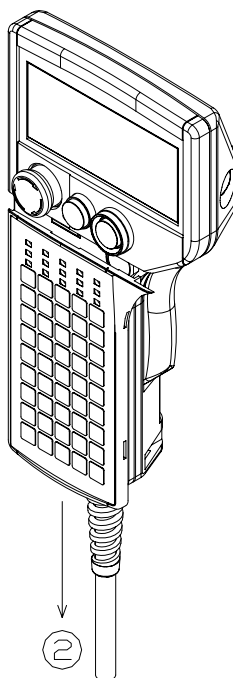
panel indicates . When the NXC100 controller is in normal operation, it indicates , and the dot "." will start to flush at 1 second interval.

- (4) Set the mode selector switch of the teaching pendant to "TEACH".
- (5) Press the emergency stop button on the teaching pendant.
- (6) Remove the key unit from the teaching pendant according to the following steps.

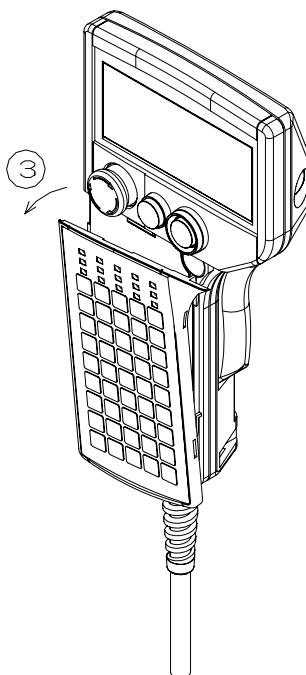
- 1) Hold the two positions ① indicated with arrows.



2) Slide the key unit in the direction of the arrow ② until it is caught on.



3) Pull out the key unit in the direction of the arrow ③ and remove it.



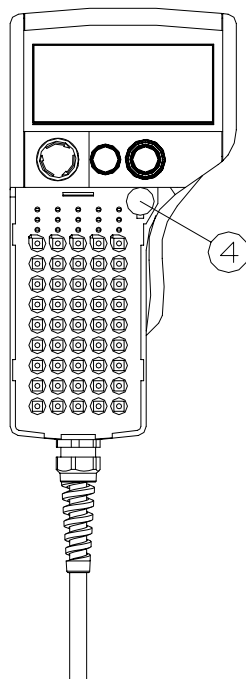
(7) Eliminate static electricity and apply antistatic protection.



If static electricity is generated during the succeeding operations, the teaching pendant may be damaged. Be sure to eliminate static electricity before operating the following steps.

(8) Prepare a plastic flat tip screwdriver.

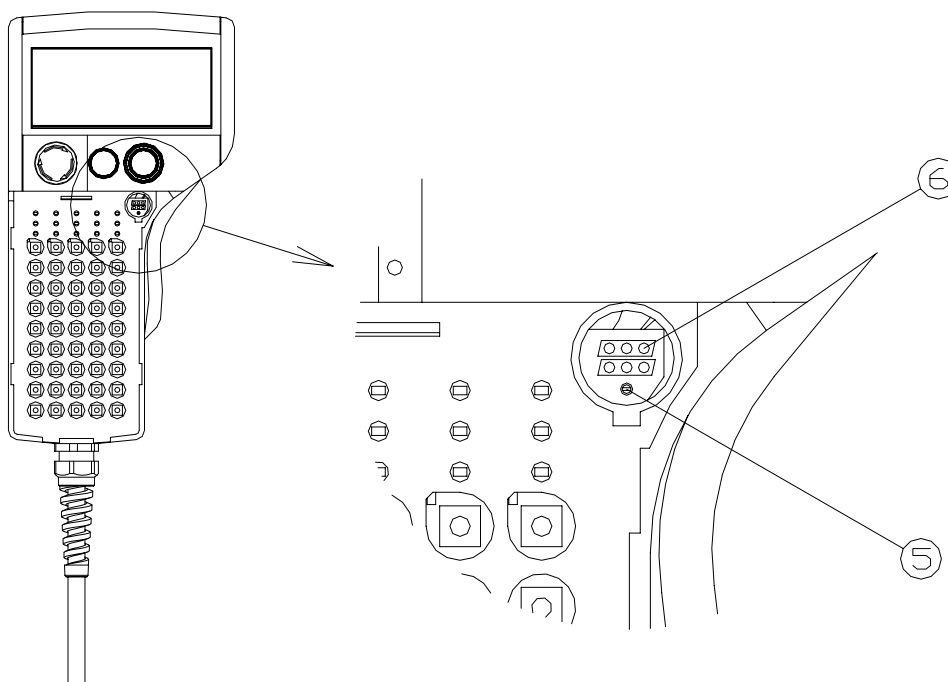
(9) Put the flat tip screwdriver into the lower groove of the protection cap ④, and remove the cap.



(10) Adjust the LCD contrast by turning the LCD contrast control ⑤ with the flat tip screwdriver.



⑥ is the end terminal for program data writing. Be sure not to touch the end terminal ⑥ with metal parts to avoid any damage to the teaching pendant.
Do not apply excessive force on the LCD contrast control to avoid any damage to the component.



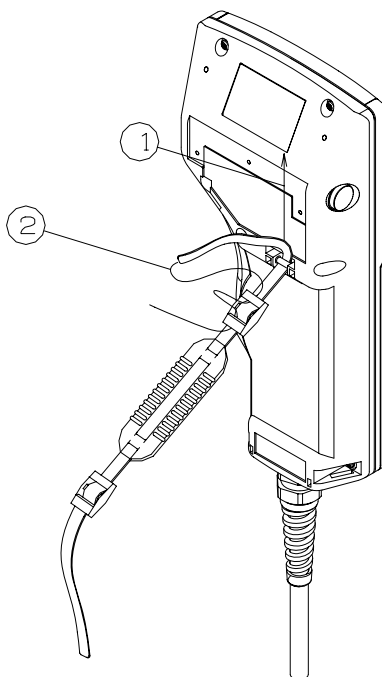
- (11) Reinstall the protection cap.
- (12) Reinstall the key unit.
- (13) Turn OFF the power to the NXC100 controller to disconnect the teaching pendant.
- (14) Connect the teaching pendant dummy connector to the connector X81 on the NXC100 controller.

6.4.2 Adjusting the Teaching Pendant Hand Strap

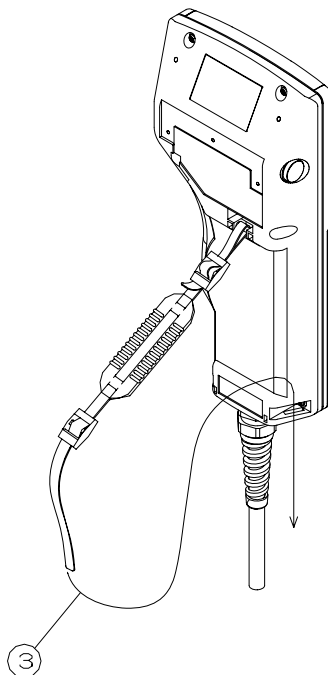
If the teaching pendant hand strap is too tight or loose, or if there is a need to change the hand to hold the teaching pendant, adjust the hand strap as follows.

For Operators Holding the Teaching Pendant with the Left Hand

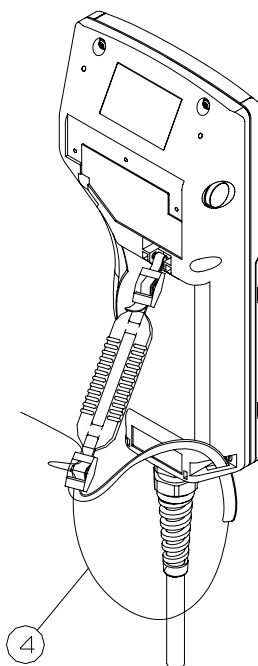
- (1) Turn OFF the power to the NXC100 controller; or prepare the teaching pendant which is not connected to the NXC100 controller.
- (2) Put the hand strap through the strap hole as shown with the arrow ①, and fasten the strap as shown with the arrow ②.



(3) Put the hand strap of the other end through the lower strap hole as shown with the arrow ③.



(4) Fasten the hand strap of the other end as shown with the arrow ④.



(5) Hand strap fixation is complete.

For Operators Holding the Teaching Pendant with the Right Hand

For those who hold the teaching pendant with the right hand, there is another strap hole on the other side of the strap hole for the left-hand holder. When performing the step (3) described with the arrow ③, use this strap hole and fix the hand strap according to the same steps as the left-hand holder.

Specifications & Signals

8 Specifications

8.1 NXC100 Controller Specifications

8.1.1 Basic Specifications of NXC100 Controller

Item	Specifications
Applicable manipulator model	XU-RC series M101E, M101V: Single arm / XU-RC350S-C03 M201E, M201V: Dual arm / XU-RC350D-C03 M201+: Dual Arm / XU-RC350D-J03 M112E, M112V: Single yaw / XU-RC400M-C03 M122E, M122V: Dual yaw / XU-RC400M-D03 M114E, M114V: Single yaw / XU-RC820M-A03 M124E, M124V: Dual yaw / XU-RC820M-B03
Applicable end effector model	HU0380651: Edge gripper type (with mapping sensor) HU0380652: Edge gripper type (no mapping sensor) HU0380653: Suction type (with mapping sensor) HU0380654: Suction type (no mapping sensor)
Applicable track model	XU-ACT series TL0505S: 2W Liner Motor Track / XU-ACT051L-C10 TL0505H: 2W Liner Motor Track / XU-ACT051L-D10 (*1) TL1010S: 3W Liner Motor Track / XU-ACT101L-C10 TL1010H: 3W Liner Motor Track / XU-ACT101L-D10 (*1) TL1515S: 4W Liner Motor Track / XU-ACT152L-D10 TL1515H: 4W Liner Motor Track / XU-ACT152L-C10 (*1)
Applicable pre-aligner model	XU-ACP series (*2) PV11a: 1axis, 200 mm, suction type / XU-ACP120-A13 (*3) PV11b: 1axis, 300 mm, suction type / XU-ACP130-A13 (*3) PV12M: 1axis, 200/300 mm, suction type / XU-ACP130-B11 (*3) PE11: Edge grip type / XU-ACP330-C10 (*4) PV32: 3 axes, suction type / XU-ACP330-A22 (*5)
Applicable expansion box	For TLxxxxH series / ERCR-ND10-C000 (*1)
Basic Specifications	
Input power supply	Single-phase 100/110 VAC (50/60 Hz) Rated current: 2A Full load current: 9 A (excluding inrush current) Single-Phase 200/220 VAC (50/60 Hz) Rated current: 1A Full load current: 7 A (excluding inrush current) Power fluctuation +/- 10 %; Frequency fluctuation +/- 2Hz; Power consumption 400 VA *Since the voltage is switched by the internal setting of the NXC100 controller, the input power voltage is set at 100 V or 200 V before shipment. Specify the power supply voltage when placing order.

Item		Specifications
Input power supply		<u>Tolerance for voltage interruption</u> - In case of no track is used: 20 msec - In case of TLxxxxS series track is used: 3 msec (100 V input power); 20 msec (200 V input power) - In case of TLxxxxH series track is used: 20 msec *Limitation of maximum velocity differs by presence of wafers. Without wafers: 1500 mm/sec.; with wafers: 1300 mm/sec.
Grounding		Ground resistance 100 Ω or less
Environmental conditions	Operating/Storage temperature	0 °C to +40 °C (*6)/-10 °C to +60 °C
	Operating/Storage humidity	90 % RH max (non-condensing)
	Vibration/Shock resistance	1 G/5 G (*7)
	Altitude	1000 m or below
	Ambient	-Free from explosive, inflammable, and corrosive gases -Free from dirt or dust -Pollution degree 1 (IEC664-1)
Structure		-Self-stand vertically or horizontally mounted type -Forced cooling (air inlet on the front panel and air outlet on the rear panel)
External dimensions (mm)		Width: 425; Height: 133; Depth: 300 (385) Volume: 18.4 liters (excluding protruded sections) Refer to "13. Drawings".
Approximate mass		14 kg
Case surface		Nickel plated
Control section		
CPU		CPU (667 MHz) for the main control CPU (300 MHz) for the servo control
Memory		Main memory 128 Mbyte Compact Flash memory 128 Mbyte
Communication (for host or maintenance) (*9)		RS-232C (One channel) 10 Base-T / 100 Base-TX (One channel)
PCI expansion slot		1 slot
Input/Output Signals		
Input	Photo-insulation external input for Host 24VDC, 5 mA max.	12 inputs
	Robot interlock signal Double contact inputs	Safeguarding (SAFF) Forced Release Input (FORCE) Full Speed Test (FST) Safe Speed Mode Selection (SS-P) External Servo ON (EXSVON) External Hold (EXHOLD) External Emergency Stop (EXESP) External Enable Switch (EXDSW) Servo On Enable (ONEN)
	CPU reset for Host Contact input	1 input
Output	Photo-insulation output for Host 24VDC, 50 mA max	14 outputs
	Mode signal contact output (HOST mode / TEACH mode)	External Mode Select Switch (EX-SEL SW)
Exclusive use Input / Output	Brake release input	1 input (24VDC, 1 A max)
	Sensor analog output	2 outputs (manipulator pressure switch output)

Item	Specifications
Indicator	Pilot lamp for power supply input (white) 7-segment LED, 4 digits (green) CPU memory backup battery condition indicator (red)
Power Supply	
Control power	+5 V, +24 V supplied by built-in switching regulator
Current protection	Double phase protected by fuses
AC Servo Driver	
Position control	Serial communications (absolute encoder)
Acceleration and deceleration control	Software servo control
Number of controlled axis	8 axes (*2)
Total motor capacity	650 W (load factor 35 %)
Applicable motor	Σ II, Σ III series AC servo motors (200 VAC specifications) manufactured by YASKAWA
Amplifier capacity	Refer to "Table 4 Applicable Amplifier Specifications". (*8)
Expansion box interface	Mechatrolink communication connector for servo (X56) Hot-line signal connector for servo (X62)
Standard Applicable	Refer to "1.8 Applicable standards".

- (*1) Expansion box is required when using the TLxxxH series track. Remove the cover plate attached to the X62 connector, then connect the hot-line cable. Remove the dummy connector on the X56 connector, then connect the mechatrolink communication cable for servo. The controller power is supplied via the expansion box. Refer to NXC100 EXPANSION BOX INSTRUCTIONS.
- (*2) When not using pre-aligner, use the standard configuration controller NXC100 Specification A. Attach a cover plate on the X71 connector.
- (*3) When using the single-axis pre-aligner (PV11a, PV11b, or PV12M), use the standard configuration controller NXC100 Specification A. Remove the cover plate attached to the X71 connector, then connect the pre-aligner sensor cable.
- (*4) When using the edge-grip pre-aligner (PE11), use the controller configured for PE11, NXC100 Specification B. Remove the cover plate attached to the X71 connector, then connect the pre-aligner sensor cable.
- (*5) When using the 3-axes pre-aligner (PV32), use the controller configured for PV32, NXC100 Specification C. Remove the cover plate attached to the X71 connector, then connect the pre-aligner sensor cable.
- (*6) Keep the ambient temperature within the indicated condition even when placing the controller in a box, etc., ensure that the temperature inside the box does not exceed the specified range.
- (*7) Observe the installation instructions described in this manual.
- (*8) For manipulator axis configuration, refer to "Table 4 Applicable Amplifier Specifications" in this section with the instruction manuals for manipulator, track, pre-aligner.
- (*9) Specify the communication method when placing order.

Table 4 Applicable Amplifier Specifications

Amplifier Capacity Applicable Unit			Standard Axis									Expansion Axis
			1st axis (100/200 W)	2nd axis (200 W)	3rd axis (100W)	4th axis (50 W)	5th axis (50 W)	6th axis (50 W)	7th axis (50 W)	8th axis (50 W)	9th axis (50 W)	ERCRC-ND10-C000 (400 W)
Motor Driver	NXC100 controller	Spec A	✓	✓	✓	✓	✓	✓				
		Spec B	✓	✓	✓	✓	✓	✓				
		Spec C	✓	✓	✓	✓	✓	✓	✓	✓	✓	
		Spec F	✓	✓	✓	✓	✓	✓				
	Expansion Box ERCRC-ND10-C000											✓
Unit Motor	ManipUlator	M101E M101V		✓	✓	✓						
		M201E,M201V M201+		✓	✓	✓	✓					
		M112E,M112V M114E,M114V	✓	✓	✓	✓						
		M122E,M122V M124E,M124V	✓	✓	✓	✓	✓					
	Track	TL0505S TL1010S TL1515S	✓									
		TL0505H TL1010H TL1515H										✓
	Pre-aligner	PV11a PV11b						✓				
		PV12M PE11						✓				
		PV32						✓	✓	✓		

8.2 Teaching Pendant Specifications

Item	Specifications
Model	JZRCR-NPP02-01-E1 (RoHS Directive Model) (*2)
Basic Specifications	
External dimensions (mm)	Width: 133; Height: 255; Depth: 35 Refer to "13 Drawings".
Approximate mass	0.6 kg
Ambient temperature (*1)	0 to 40 °C (operating) (*1), -20 to 60 °C (storage)
Ambient humidity	30 to 85 % RH (non-condensing)
Display	
Screen (mm)	Width: 95.96; Height: 31.96 Monochromatic LCD with back light
Number of indication dots	192 x 64
Operation panel	
Key switch	Matrix arrangement of 5 x 9 pieces
Emergency stop	Red mushroom type 24.9 mm dia. (compliant with EN standard) Pushlock/Turn reset
Mode selector	Switch between HOST mode and TEACH mode 2-position select switch
Servo on ready	Illuminated Push Button Switch Indicate: Green
Enable switch	3-position switch, conforming to ANSI/RIA R15.06-1999
Communication	
Serial interface	RS-422
Others	Hand strap is delivered with the teaching pendant

(*1) Use the teaching pendant within the specified temperature range.

If the teaching pendant is enclosed in a box, the temperature inside of the box must not exceed the specified range.

(*2) Old model - JZRCR-NPP02-01 was discontinued. It did not conform to RoHS directive.

8.3 NXC100 controller Parts Names

See outline drawings for dimensions indicated in "13 Drawings" in this manual.
The following pictures show the front panel and back panel of the NXC100 controller.

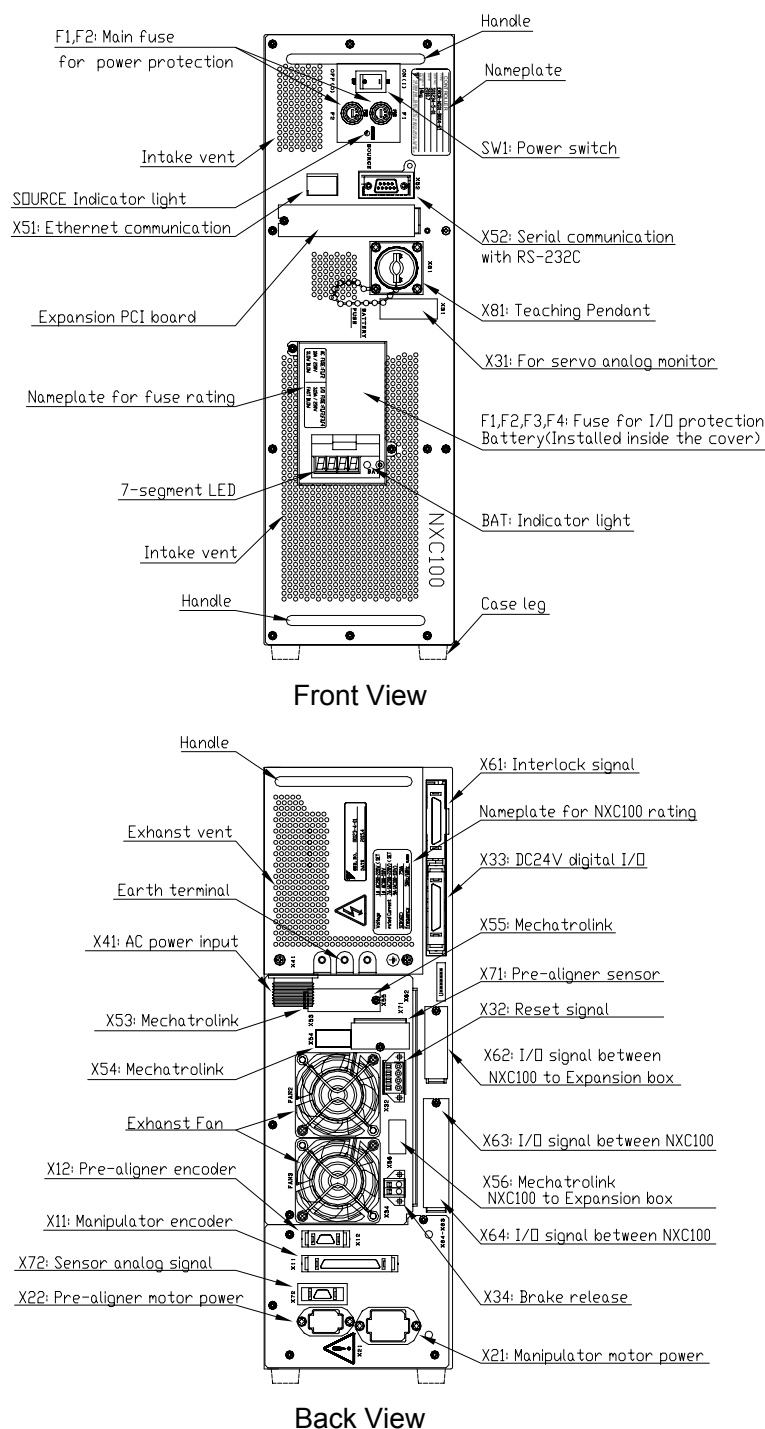


Fig. 12 Part Name of the NXC100 Controller

8.4 Center of Gravity

The center of gravity is fundamental in evaluating seismic protection. Securely install the NXC100 controller in accordance with the mass and center of gravity as shown below.

For installation, refer to " 3 Transport/Installation ".

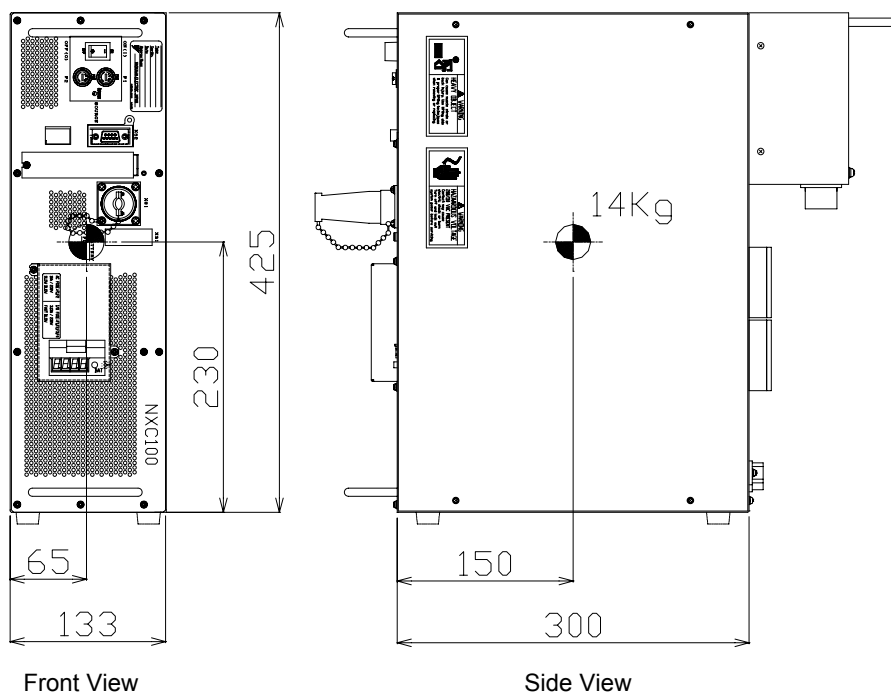


Fig. 13 Vertically-Installed NXC100 Controller

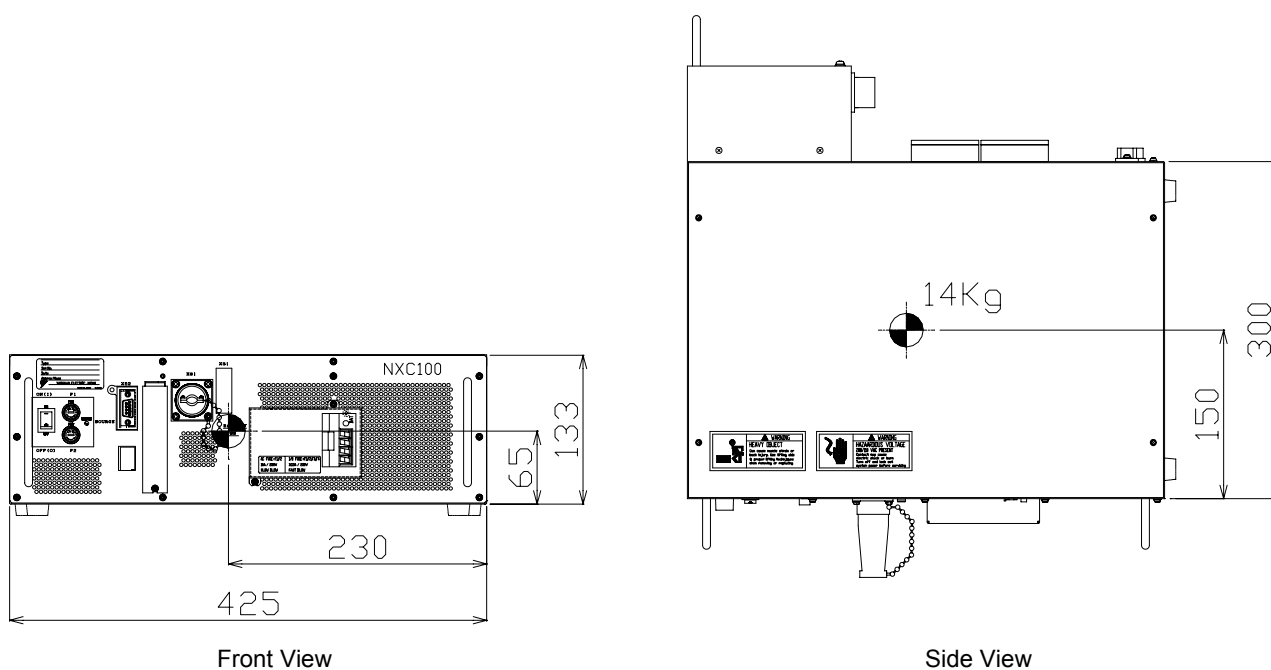


Fig. 14 Horizontally-Installed NXC100 Controller

8.5 Seismic Load

This section explains the case when the seismic load, which is equivalent to 63% of the NXC100 controller weight, is added in a horizontal direction to the NXC100 controller.

<Vertically-Installed NXC100 Controller>

Because the NXC100 controller is fixed both on the top and bottom, it is not overturned by a horizontal load. Therefore, consideration on the NXC100 controller is not necessary in this case.

$$F = 0.63 \times W = 0.63 \times 14 = 8.82 \text{ kgf}$$

When material of screws is annealed copper

Mounting screws: UNF#10-32, eight screws (four on the top, four on the bottom)

Shearing force applied to each mounting screw: $8.82 / 8 = 1.1 \text{ kgf}$

Sectional surface of screw UNF#10-32: 12.4 mm^2

Shearing stress: $1.1 / 12.4 = 0.088 \text{ kgf/mm}^2 < 6 \text{ kgf/mm}^2$ (Allowable shearing stress of the screw)

The mounting screws have enough strength to withstand the horizontal load.

<Horizontally-Installed NXC100 Controller>

For a horizontally-installed the NXC100 controller, the weight of the NXC100 controller must be taken into consideration:

$$F = 1.63 \times W = 1.63 \times 14 = 22.8 \text{ kgf}$$

When material of screws is annealed copper

19-inch rack mounting screws: screw UNF#10-32, four screws (two on the left, two on the right)

Shearing force applied to each mounting screw: $22.8 / 4 = 5.7 \text{ kgf}$

Sectional surface of screw UNF#10-32: 12.4 mm^2

Shearing stress: $5.7 / 12.4 = 0.46 \text{ kgf/mm}^2 < 6 \text{ kgf/mm}^2$ (Allowable shearing stress of the screw)

The mounting screws have enough strength to withstand the vertical load.

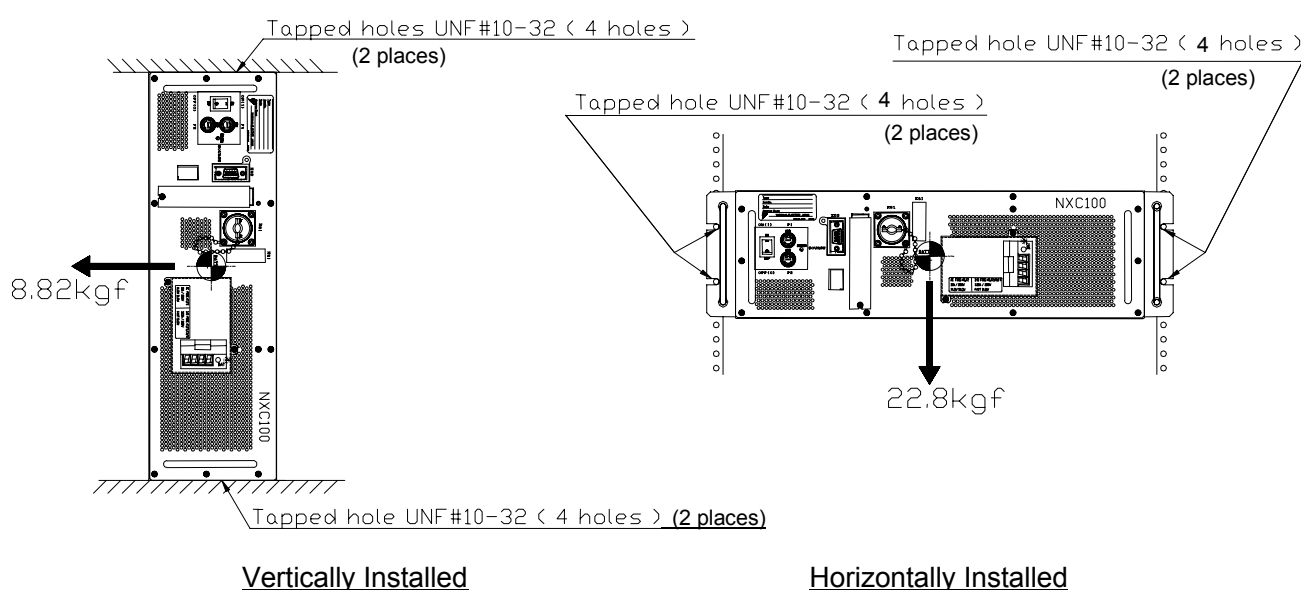


Fig. 15 Seismic Load to the NXC100 controller

8.6 LED Indicator, Operation Switch, etc.

1. 7-segment LED Indicator

Indicates the NXC100 controller's internal status in 4 digits (green).

Mainly indicates an error code.

	0	1	2	3	4	5	6	7	8	9
Display	0	1	2	3	4	5	6	7	8	9
	A	B	C	D	E	F				
Display	A	b	c	d	E	F				

2. Power Switch

Device code: SW1

Turns ON/OFF the input power supply.

3. Fuse

Device codes: F1, F2; F1 to F4

F1, F2: main fuse for power supply protection

Location: side of Power ON/OFF Switch

Part No. 314010 or 314010P (For RoHS), 250 V, 10 A, 6.35 mm diameter x 31.8 mm long,

Fast-acting type, ceramic body fuse

Manufactured by Littelfuse Ltd.

F1, F2: fuse for robot IO protection

F3, F4: fuse for host IO protection

Location: inside the fuse box

Parts No. 2173.15 or 2173.15MXP (For RoHS), 250 V, 3.15 A, 5 mm diameter x 20 mm long,

Fast-acting type, glass body cartridge fuse

Manufactured by Littelfuse Ltd.

Fuse for brake protection

Location: inside the fuse box

Parts No. SMP50 or SDP50 (For RoHS), 5 A, time-lag type

Manufactured by Daito Communication Apparatus Co., Ltd

(*1) Old models were discontinued. These did not conform to RoHS directive.

4. LED Indicator

Device code: SOURCE

LED indicator (SOURCE) indicates the ON/OFF condition of the NXC100 controller power supply.

Device code: BAT

LED indicator (BAT) indicates decreased backup battery voltage of the memory.

5. Battery

Used for the CPU memory backup.

Location: inside the fuse box

Type: Lithium battery

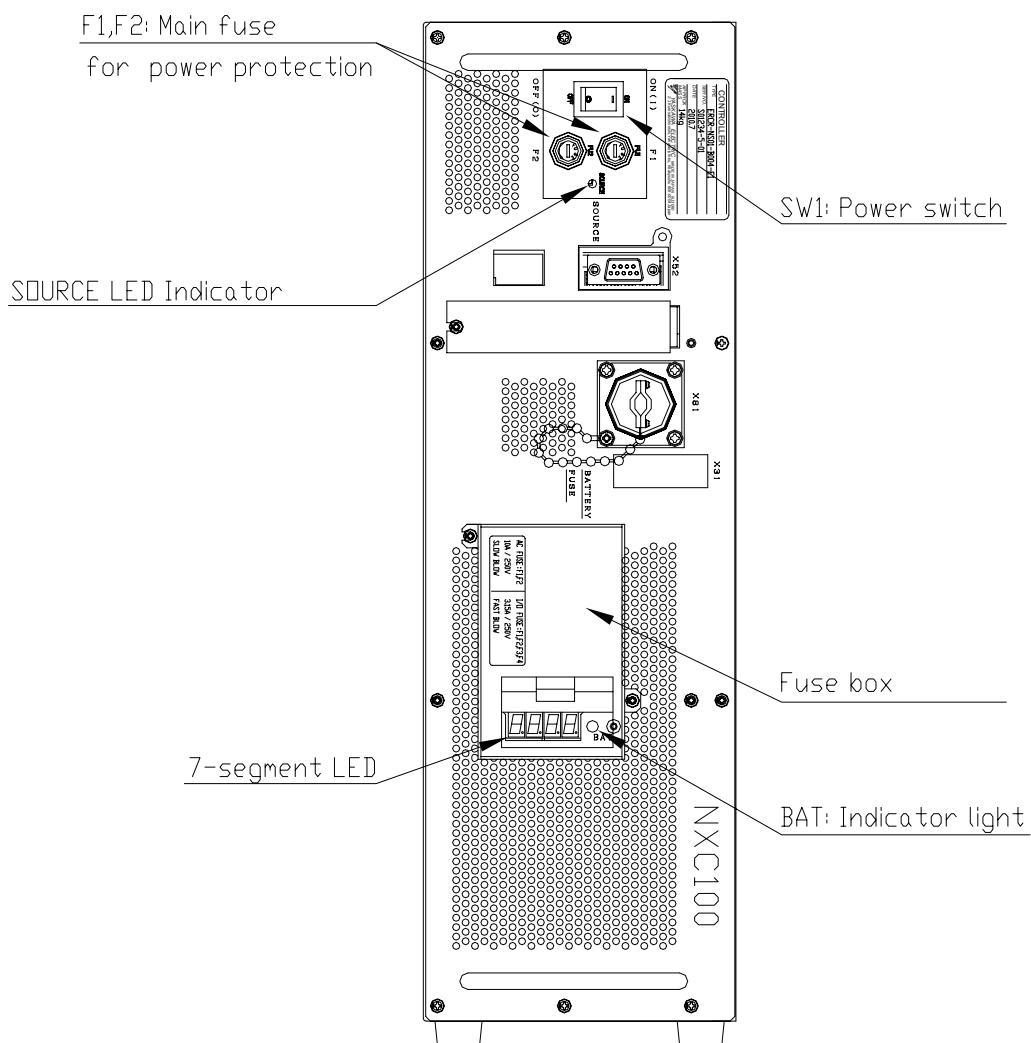


Fig. 16 Front View of NXC100 Controller

9 Signals

9.1 NXC100 Controller Connector Names

For connector names and connector locations, refer to " 4.2 Connector Location ".

9.2 Pin Assignments



CAUTION

- Do not remove/insert connectors when operating the equipment or turning ON the power supply.

Failure to observe this caution may result in electric shock, damage on the operation circuit, or the manipulator may become uncontrollable.

The following shows the connector pin assignments between the NXC100 controller and the host system.

NXC100 Controller Front Panel

(1) X51: ETHERNET for maintenance PC connection /or host communication.

Connector on the NXC100 controller: RJ45 (socket)

Connector on cable: RJ45 (plug)

Pin No.	Signal Name	Contents
1	TX+	Data
2	TX-	Data
3	RX+	Data
4	(NC)	Not Connected
5	(NC)	Not Connected
6	RX-	Data
7	(NC)	Not Connected
8	(NC)	Not Connected

(2) X52: RS232C for host communication and maintenance PC connection

Connector on the NXC100 controller: DSUB 9 pin (pin)

Connector on cable: DSUB 9 pin (socket)

Pin No.	Signal Name	Contents
1	DCD	Not Connected
2	RXD	Data Receiving
3	TXD	Data Transmission
4	DTR	Not Connected
5	GND	Signal Ground
6	DSR	Not Connected
7	RTS	Request Transmission
8	CTS	Clear to Send
9	RI	Not Connected

Screw-type fastening; applicable screw size: M 2.6

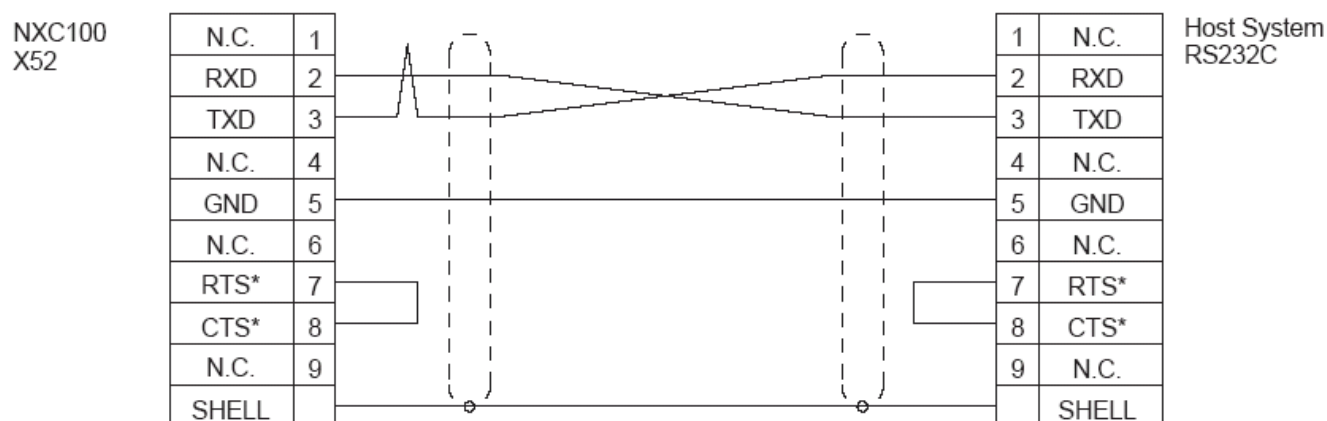


Fig. 17 Wire Connection Example

(3) CN1: DC5V universal digital I/O signal

Optional Specification

Digital I/O board is optional. The board can be connected to the PCI slot on the NXC100 controller.

This connector is on the digital I/O board with the 5V-I/O function.

Part number of the digital I/O board: HB0480093

Type of the digital I/O board: PIO-16/16TB (PCI)

Connector on the NXC100 controller: DSUB 37 pin (socket)

Connector on cable: DSUB 37 pin (pin)

DIN

Item	Specification
Circuit Architecture	Isolated TTL level input
Input Points	16
Input Voltage	5 V

DOUT

Item	Specification
Circuit Architecture	Isolated TTL level output
Output Points	16
Output Voltage	5 V
Output Current	Average 6.4 mA (4 TTL loads) per channel

Extensible distance for connection : approx. 5 m (depends on wiring environment)

Pin Assignment

Pin No.	Signal Name	Contents	Pin No.	Signal Name	Contents
1	GND	(-)Common	20	GND	(-)Common
2	DI20	Input port	21	DO20	Output port
3	DI21		22	DO21	
4	DI22		23	DO22	
5	DI23		24	DO23	
6	DI24		25	DO24	
7	DI25		26	DO25	
8	DI26		27	DO26	
9	DI27		28	DO27	
10	DI28		29	DO28	
11	DI29		30	DO29	
12	DI30		31	DO30	
13	DI31		32	DO31	
14	DI32		33	DO32	
15	DI33		34	DO33	
16	DI34		35	DO34	
17	DI35		36	DO35	
18	Vcc	+5 V output	37	Vcc	+5 V output
19	(NC)	Not Connected			

Screw-type fastening; applicable screw size: UNC #4-40

• Circuit Example

When DI20 input and DO20 output are used, connection method is as shown in the following diagram.

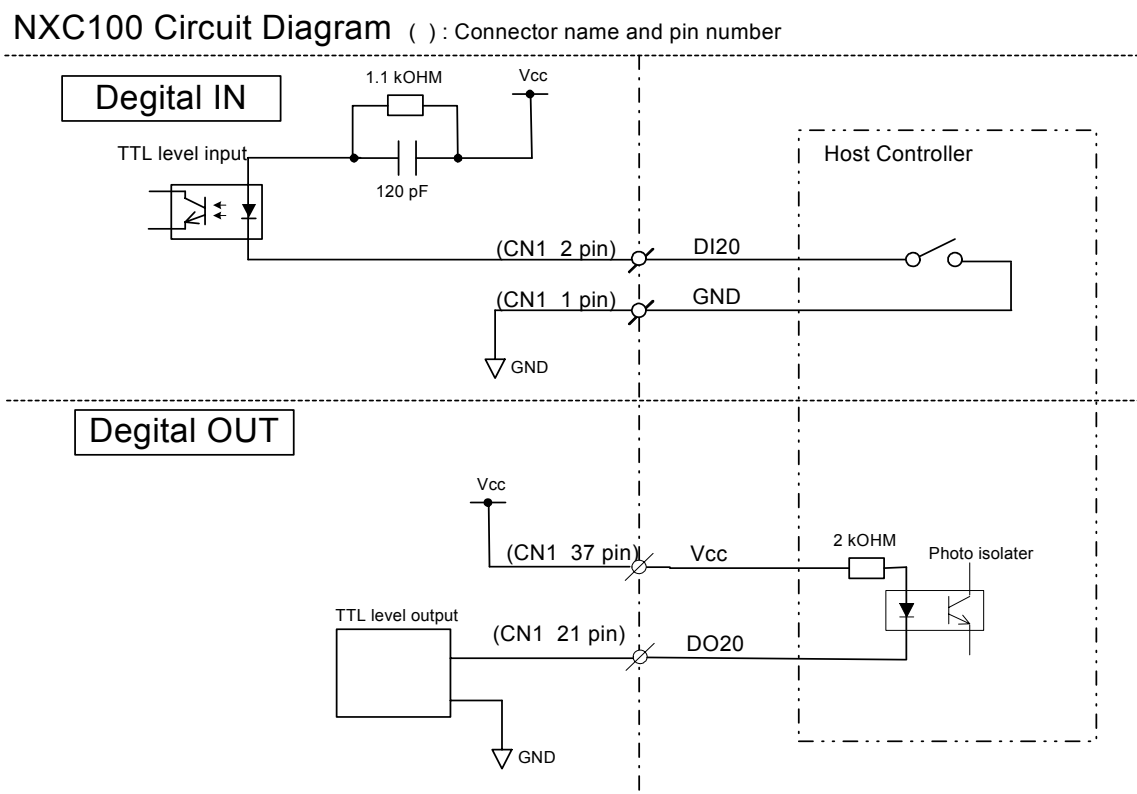


Fig. 18 Circuit Diagram (when Using DI20 Input and DO20 Output)

NXC100 Controller Back Panel

(4) X41: INPUT power connector

Connector on the NXC100 controller: CE05-2A18-10PD-D (DDK)

Connector on cable: CE05-6A18-10SD-D-BSS (DDK)

Pin No.	Signal Name	Contents
A	R	AC Input
B	T	AC Input
C	N.C.	Not Connected
D	PE	Protective Earth



Customer must properly ground the PE line (pin D) in the host system. The ground resistance must be 100 Ω or less.

The NXC100 controller must be located less than 1640 mm (64.5") from the floor so that operators can access the X41 connector easily.

Prepare the following AC power cable whose parts comply with UL498.

Connector to the NXC100 controller: CE05-6A18-10SD-D-BSS

Connector to the host system: Select the parts in accordance with UL498; and the ground pin of the connector shall be a make-first/ break-last configuration.

Power cable size: 16 AWG wire or larger

Power cable specification: UL1015

Connect the PE line to the PE terminal (earth terminal) on the NXC100 controller back panel.

Size of PE terminal: UNF#10-32, 8 mm long

Bonding wire: 16 AWG wire or larger size, colored green/yellow, 3 m long or less

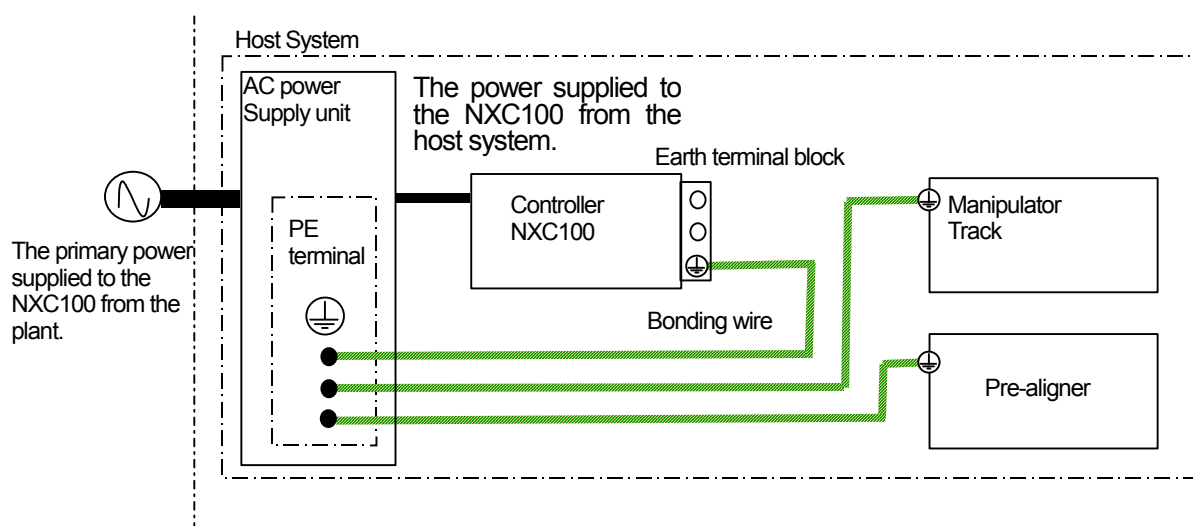


Fig. 19 The Robotic System Used in the Host System (Normal Operation)

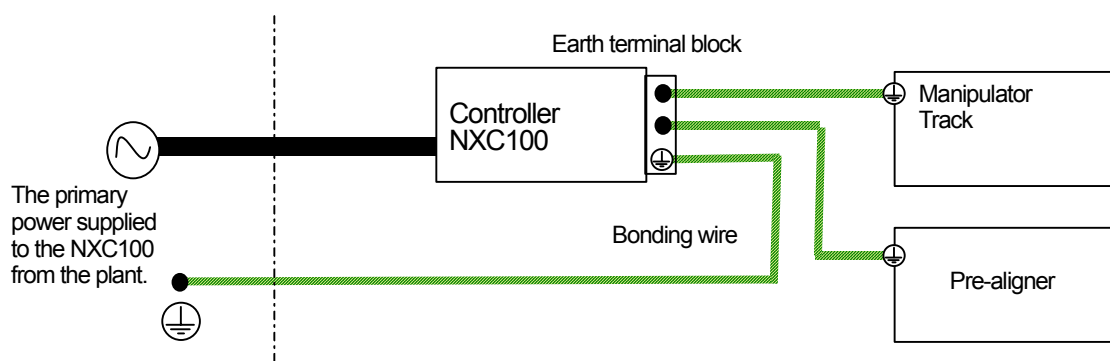


Fig. 20 The Robotic System Used as Independent System (Troubleshooting, etc.)



The NXC100 controller is classified in the Overvoltage Category II. Supply power through the appropriate electric equipment such as isolation transformer, surge protective device, circuit breaker, breaker for excessive electricity, etc. of the host system or plant facility.

(5) X33: DC24V universal digital I/O signal

Connector on the NXC100 controller: 10268-52A2PL (3M)

Connector on cable: 10168-6000EL (3M)

Shell on cable: 10368-3210-000 (3M)

Dummy Connector: HB0480081 (optional part for the NXC100 controller)

Dummy Connector: HB0480697 (optional part for the NXC100 controller, for RoHS Directive)

DIN

Item	Specification
Circuit Architecture	Input circuit based on AC input type photo-coupler isolation
Input Points	12
Input Voltage	24 V +/-20 %
Input Current	5 mA (max)
Common	DI0 to DI11: Common

DOUT

Item	Specification
Circuit Architecture	Open collector transistor output
Output Points	14
Output Voltage	24 V +/-20 %
Output Current	DO0 to DO13: 50 mA per contact Current source output
24V Common	DO0 to DO4: 5 Points Common DO5 to DO9: 5 Points Common DO10 to DO13: 4 Points Common



- The 24 VDC universal digital I/O signal (hereinafter called I/O) for the NXC100 controller is supplied by either an internal power supply or an external power supply.
The internal power supply for the I/O is 24 VDC, 1 A.
- In order to isolate the NXC100 controller I/O circuit, or if the I/O current required is greater than 1 A, utilize an external power supply.
- Power supply circuit for I/O (+24 VU, 024 VU) has 3 A fuses.
- The external power supply should be of high quality which shall not introduce noise to the system.
- Do not connect the external power line to the terminal (+24 VU, 024 VU) when selecting the internal power supply; connecting the external power line may cause a failure in the NXC100 controller.

- **When External DC24V Power Supply is Not Used**

Connect +24V2 to EX+24VIN.

Connect 024V2 to EX024VIN.

- **When I/O is Not Used**

Connect the dummy connector.

An error "external 24V power OFF error (error code: A09)" will occur if dummy connector is not connected.

NXC100 controller Circuit Diagram

(): Connector Assignment

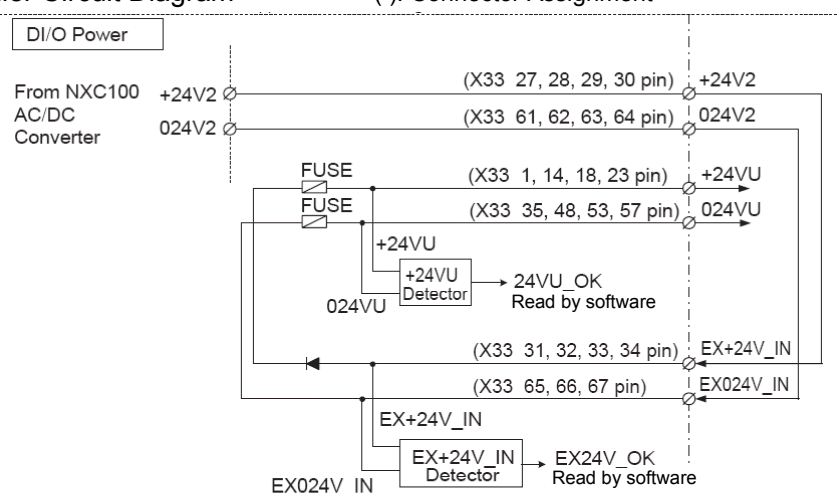


Fig. 21 NXC100 Controller Circuit Diagram (when I/O is Not Used)

- **When External DC24V Power Supply is Used**

Connect 24 VDC power supply input from the host system to EX+24VIN and EX024VIN. In this case, do not connect the internal power supply simultaneously: connecting the internal power supply when using the external power supply may cause a failure in the NXC100 controller.

NXC100 controller Circuit Diagram

(): Connector Assignment

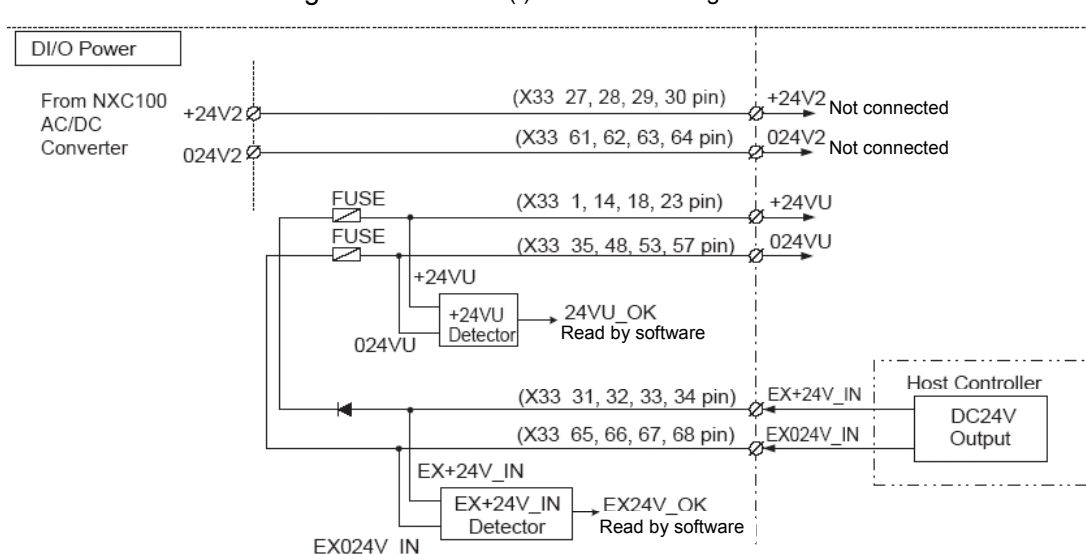


Fig. 22 NXC100 Controller Circuit Diagram (when External Power Supply is Used)

• **When I/O Protection Fuse is Blown Out due to Faulty Wiring, etc.**

The error "24V power OFF error for DI/DO (error code: A08)" will occur. After removing the error cause, replace the fuse referring to " 12.6 Replacing I/O Fuse (F1, F2, F3, F4) ".

Pin Assignment for Connector X33

Pin No.	Signal Name	Contents	Pin No.	Signal Name	Contents
1	+24VU	+24 V output	35	024VU	0 V output
2	DI00A	Input port	36	DI00B	Input port
3	DI01A		37	DI01B	
4	DI02A		38	DI02B	
5	DI03A		39	DI03B	
6	DI04A		40	DI04B	
7	DI05A		41	DI05B	
8	DI06A		42	DI06B	
9	DI07A		43	DI07B	
10	DI08A		44	DI08B	
11	DI09A		45	DI09B	
12	DI10A		46	DI10B	
13	DI11A		47	DI11B	
14	+24VU	+24 V output	48	024VU	0 V output
15	DOPCOM0	(+)common DO00 to DO04	49	DONCOM0	(-)common DO00 to DO04
16	DO00	Output port	50	DO01	Output port
17	DO02		51	DO03	
18	+24VU	+24 V output	52	DO04	
19	DOPCOM1	(+)common DO05 to DO09	53	024VU	0 V output
20	DO05	Output port	54	DONCOM1	(-)common DO05 to DO09
21	DO07		55	DO06	Output port
22	DO09		56	DO08	
23	+24VU	+24 V output	57	024VU	0 V output
24	DOPCOM2	(+)common DO10 to DO13	58	DONCOM2	(-)common DO10 to DO13
25	DO10	Output port	59	DO11	Output port
26	DO12		60	DO13	
27	+24V2	Internal power supply output port +24 V	61	024V2	Internal power supply output port 0 V
28	+24V2		62	024V2	
29	+24V2		63	024V2	
30	+24V2		64	024V2	
31	EX+24IN	External power supply input port. +24 V	65	EX024IN	External power supply input port 0 V
32	EX+24IN		66	EX024IN	
33	EX+24IN		67	EX024IN	
34	EX+24IN		68	EX024IN	

Specifications for X33 DC24V Universal Digital Input /Output Signal

	Signal name	Contents	Logic
Digital input signals (*1)	DI00	Gate interlock 1	1: ON (access permitted) *6
	DI01	Gate interlock 2	0: OFF (access prohibited)
	DI02	Gate interlock 3	
	DI03	Gate interlock 4	
	DI04	Gate interlock 5	
	DI05	Gate interlock 6	
	DI06	Gate interlock 7	
	DI07	Gate interlock 8	
	DI08	OPEN	
	DI09	OPEN	
	DI10	OPEN	
	DI11	OPEN	
Digital output signals (*2)	DO00	Mode signal	0: HOST; 1: TEACH
	DO01	NXC100 controller watchdog output	Repeats ON and OFF every 1 second
	DO02	During the alarm occurrence (UNIT1)*4	0: Alarm; 1: Normal *3
	DO03	During the warning occurrence (UNIT1)*4	0: Warning; 1: Normal *3
	DO04	Run signal (UNIT1)*4	0: Busy; 1: Ready
	DO05	During the alarm occurrence (UNIT2)*5	0: Alarm; 1: Normal *3
	DO06	During the warning occurrence (UNIT2)*5	0: Warning; 1: Normal *3
	DO07	Run signal (UNIT2)*5	0: Busy; 1: Ready
	DO08	OPEN	
	DO09	OPEN	
	DO10	OPEN	
	DO11	OPEN	
	DO12	OPEN	
	DO13	OPEN	

*1 "1": Photocoupler ON (LED lights up); "0": Photocoupler OFF

*2 "1": Photocoupler ON (LED lights up); "0": Photocoupler OFF

*3 Refer to ERROR CODE TABLE.

*4 UNIT1: Manipulator and Track (in standard specification)

*5 UNIT2: Pre aligner (in standard specification)

*6 The station access interlock signals of the manipulator. Refer to communication specification.

• Circuit Example

The following figure shows the circuit example when external 24 VDC power supply is used.

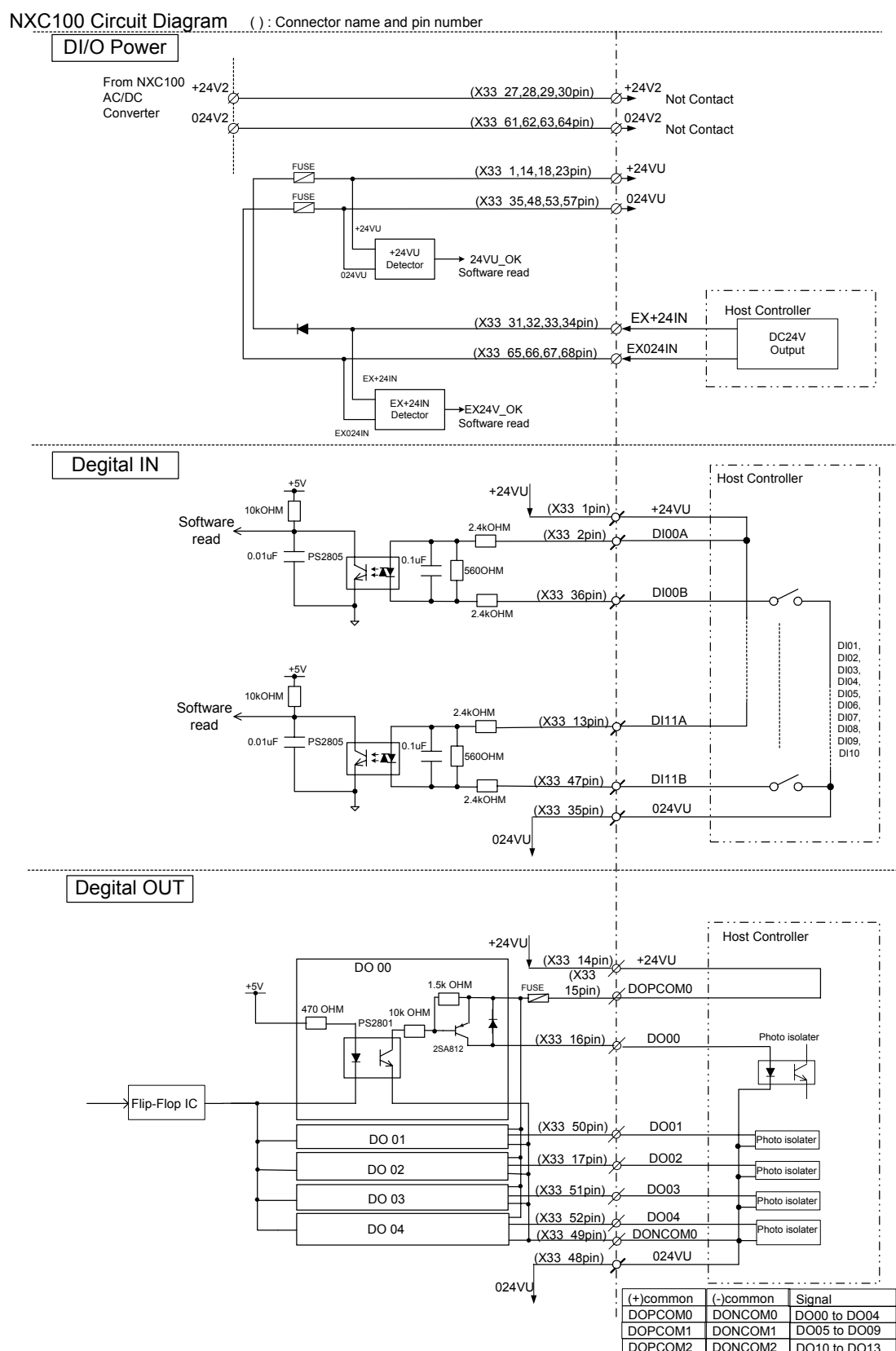


Fig. 23 Circuit Example (when External Power Supply is Used)

• Dummy Connector (Optional)



When I/O is not used, make sure to connect a dummy connector to the connector X33 on the NXC100 controller.

	X33
+24VU	1
DI00A	2
DI01A	3
DI02A	4
DI03A	5
DI04A	6
DI05A	7
DI06A	8
DI07A	9
DI08A	10
DI09A	11
DI10A	12
DI11A	13
+24VU	14
DOPCOM0	15
D000	16
D002	17
+24VU	18
DOPCOM1	19
D005	20
D007	21
D009	22
+24VU	23
DOPCOM2	24
D010	25
D012	26
+24V2	27
+24V2	28
+24V2	29
+24V2	30
EX+24IN	31
EX+24IN	32
EX+24IN	33
EX+24IN	34
024VU	35
DI00B	36
DI01B	37
DI02B	38
DI03B	39
DI04B	40
DI05B	41
DI06B	42
DI07B	43
DI08B	44
DI09B	45
DI10B	46
DI11B	47
024VU	48
DONCOM0	49
D001	50
D003	51
D004	52
024VU	53
DONCOM1	54
D006	55
D008	56
024VU	57
DONCOM2	58
D011	59
D013	60
024V2	61
024V2	62
024V2	63
024V2	64
EX024IN	65
EX024IN	66
EX024IN	67
EX024IN	68

(6) X61: interlock signal

Connector on the NXC100 controller: 10250-52A2PL (3M)

Connector on cable: 10150-6000EL (3M)

Shell on cable: 10350-3210-000 (3M)

Dummy Connector: HB0480230 (optional part for the NXC100 controller)

Dummy Connector: HB0480698 (optional part for the NXC100 controller, for RoHS Directive)

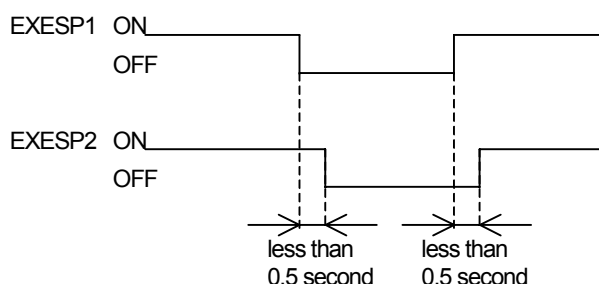


For dual input signals, wire the circuits so that both input signals are turned ON or OFF at the same time. If the single input signal is sent to the NXC100 controller, an error^{*1} will occur.

^{*1} Error code: AF4, Input Comparison Error

- 1) The time interval of each external dual signals sent to the NXC100 controller must be 0.5 second or less.

For example: EXESP1, EXESP2 signals



- 2) Signals relating to safety are configured with dual input signals in order to stop the robotic system when the single failure^{*2} of input circuit occurs. If either of the dual input signals are changed, the NXC100 controller detects single-failure and determines it as the serious error^{*3}. This error is cleared by turning ON the power to the NXC100 controller again after removing the cause of the alarm.

^{*2} Single failure such as welded contacts or disconnected wires of the external emergency-OFF switches.

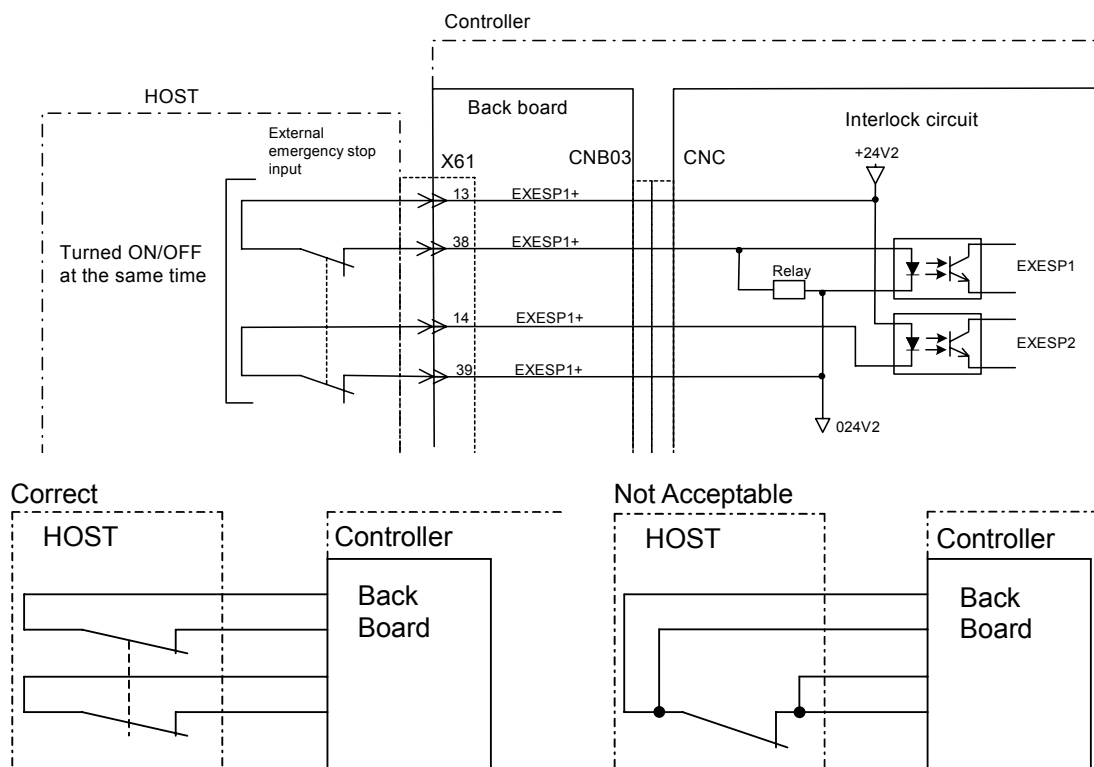
^{*3} Serious error: NXC100 controller is totally disabled. Refer to ERROR CODE TABLE.

(Continued on the next page)



(Continued from previous page)

- 3) Circuits of each dual input signals are different. Therefore, each signals need to be connected to separate switches. If both of the dual input signals are connected to the single, same switch, the NXC100 controller circuit may break down.



- 4) Make sure to perform the risk assessment in compliance with EN1050 and/or ISO 1412-1. Then choose safety category in compliance with EN954-1 and/or ISO 13849-1. Based on the result of risk assessment, connect signals to suitable switches (e.g. switches with positive opening contacts and recognized by notified body certification system).

EN1050: Safety of machinery - Principle for risk assessment

EN ISO 14121-1: Safety of machinery – Risk assessment, Part 1: Principles

EN954-1: Safety of machinery - Safety-related parts of control systems - General principles for design

EN ISO 13849-1: Safety of machinery – Safety-related parts of control systems, Part1: General principles for design

◆ External Emergency Stop: EXESP1, EXESP2

This signal is used to connect the emergency stop switch of an external device on EFEM. If the signal is input, the servo power is turned OFF. While this signal is being input, the servo power cannot be turned ON.

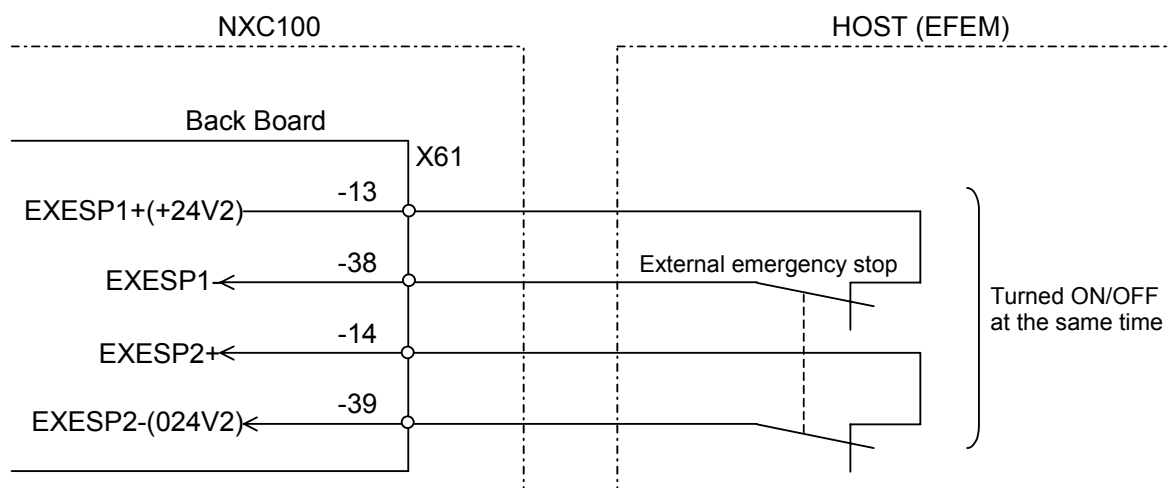


Fig. 24 Connection for External Emergency Stop

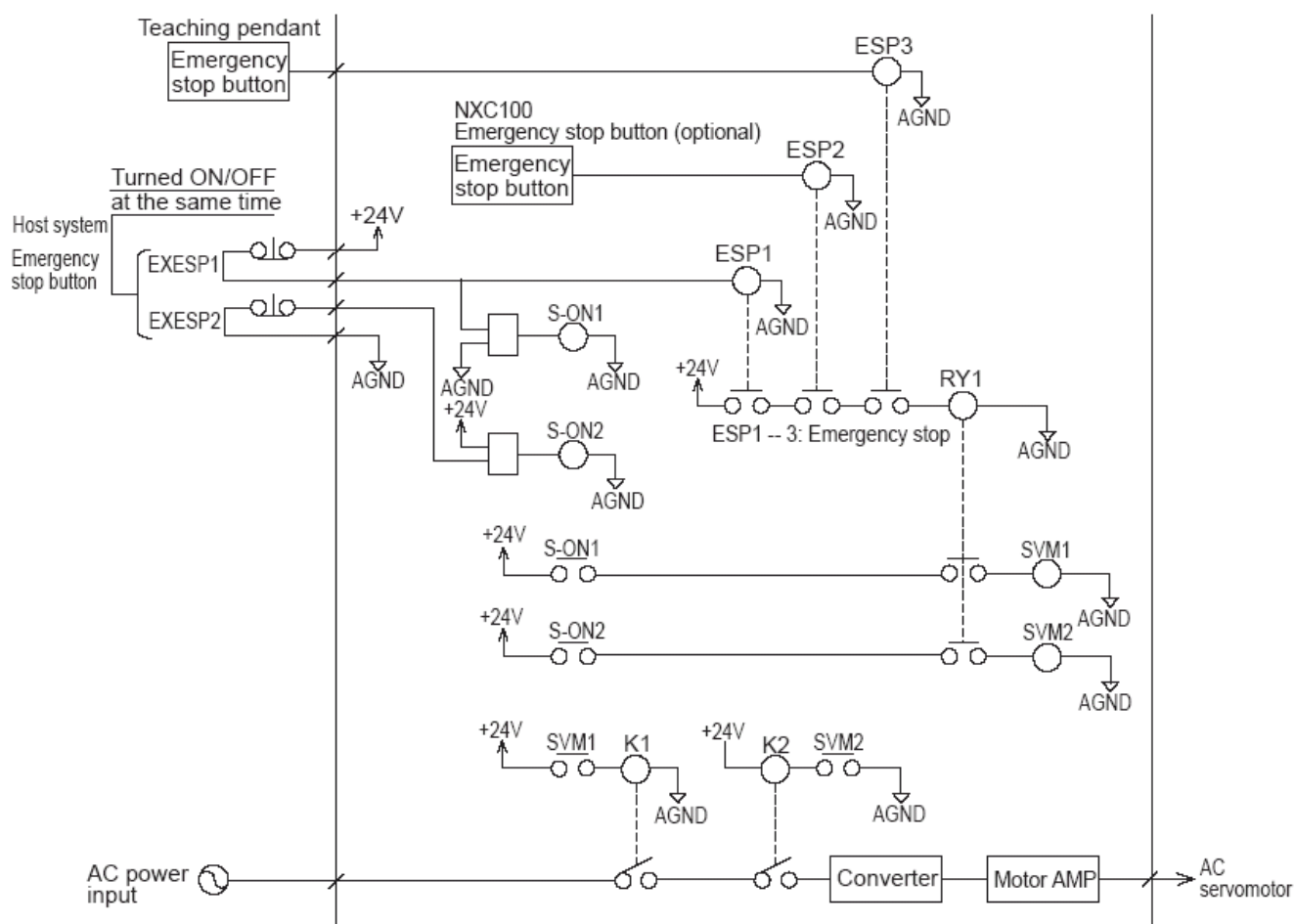


Fig. 25 Emergency Stop Circuit Diagram

◆ Safety Plug: SAFF1, SAFF2

This signal is used to turn OFF the servo power if the door on the safeguarding is open. Connect the interlock signal of the safety plug on the safeguarding door (EFEM door). If the interlock signal is input, the servo power is turned OFF. While this signal is being input, the servo power cannot be turned ON.



These signals are disabled in TEACH mode.

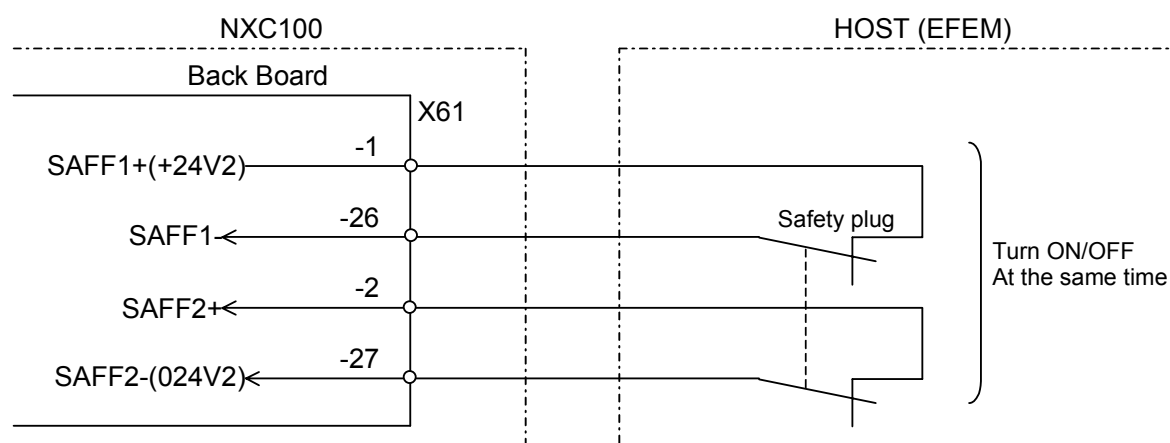
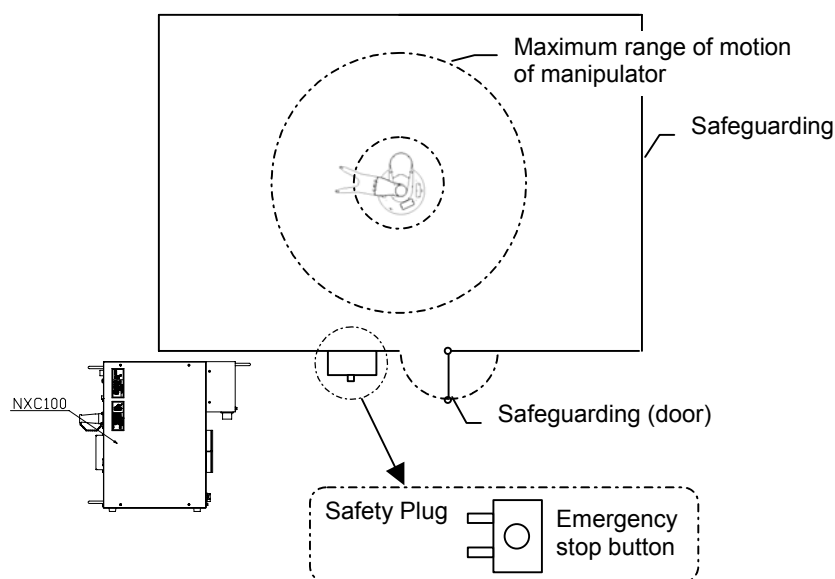


Fig. 26 Connection for Safety Plug

Installation of Safety Plug

A safety barrier and a door with an interlock function must be installed as shown in the following picture. The door must be opened by an operator to enter and the interlock function stops the manipulator operation when the door is open. The safety plug input signals (SAFF1, SAFF2) are connected to the interlock signal from the gate.



If the servo power is ON, the servo power can be turned OFF with the input of the interlock signal. The servo power cannot be turned ON while the interlock signal is input. However, the servo power cannot be turned OFF in the teach mode. Also, the servo power can be turned ON by the teaching pendant in the teach mode even if the interlock signal is input.

◆ Maintenance Input: FORCE1, FORCE2

If the signal input circuit is short-circuited, the Enable switch on the teaching pendant is disabled.

For routine use, use the system with this signal circuit open (nothing connected).

If the circuit for this signal must be used by necessity, be sure to use a **switch with a key** that is kept **under the care of the system manager** to ensure safety.

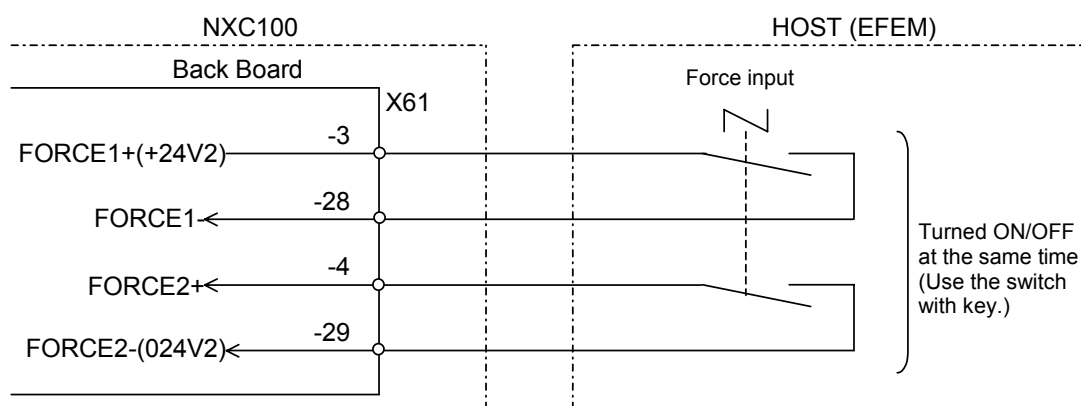


Fig. 27 Connection for Maintenance Input

◆ Full-Speed Test



WARNING

- No one is allowed to enter the safeguarding when the manipulator is in the Full-Speed Test (APV-FST) mode.
- The Full-Speed Test must be performed only by adequately trained personnel.
- For other safety precautions, follow safety requirements described in Section 10.8 of ANSI/RIA R15.06 if Full-Speed Test (APV-FST) mode is selected.

Failure to observe this warning may result in personal injury or damage to equipment.

This signal is used to reset the slow speed control limit for the test run in the teach mode.

If this signal input circuit is short-circuited, the speed of the test run can be selected up to 100 % in the teach mode.

If circuit of this signal is open, the status SS-P input signal determines the slow speed either of the first slow speed (16 %) or second slow speed (2 %).

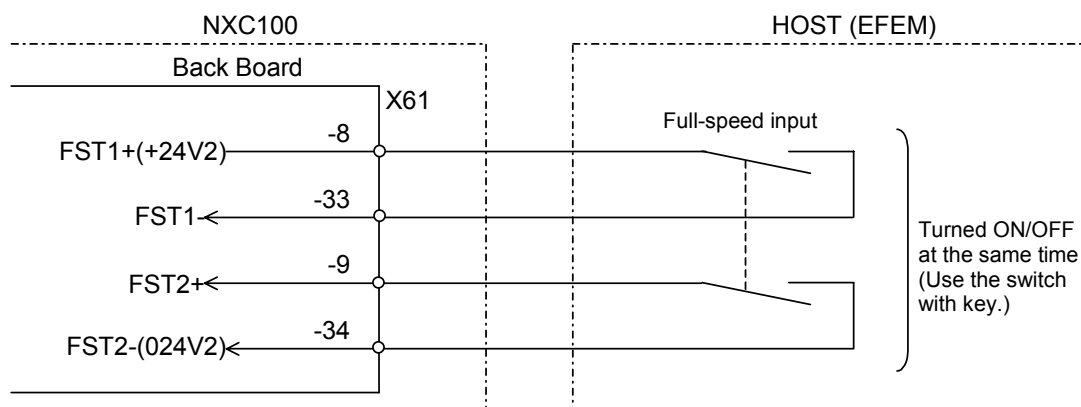


Fig. 28 Connection for Full-Speed Test

◆ Slow Speed Mode Selection: SS-P

This signal is used to determine the speed of the test run when the FST (full-speed test) signal input circuit is open.

Open: second slow speed (2 %)

Short-circuit: first slow speed (16 %)

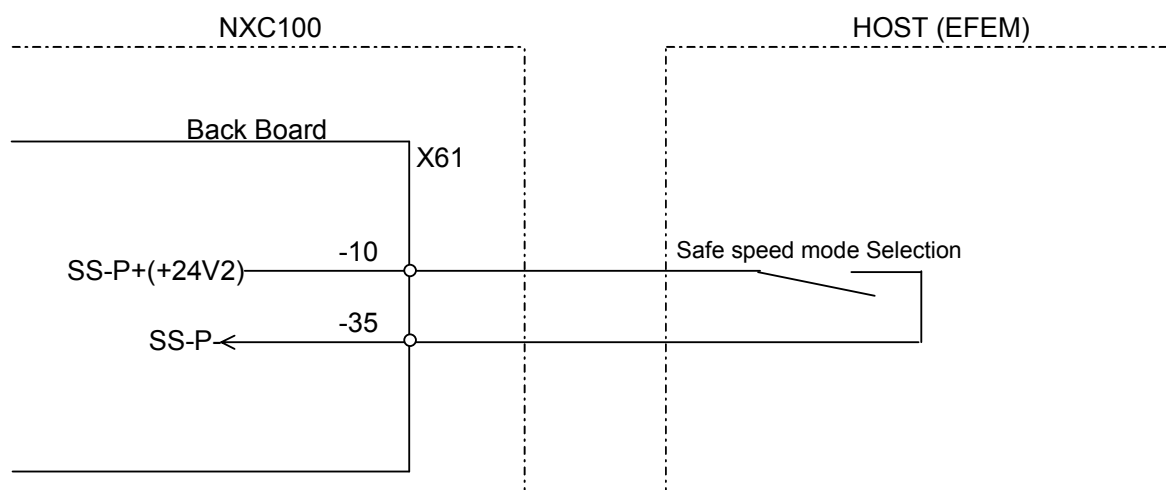


Fig. 29 Connection for Slow Speed Mode Selection

◆ External Hold: EXHOLD

This signal is used to connect the temporary stop switch of an external device on EFEM.

While the signal is input, the operations of the manipulator, track, and prealigner are stopped and operations by commands are disabled.

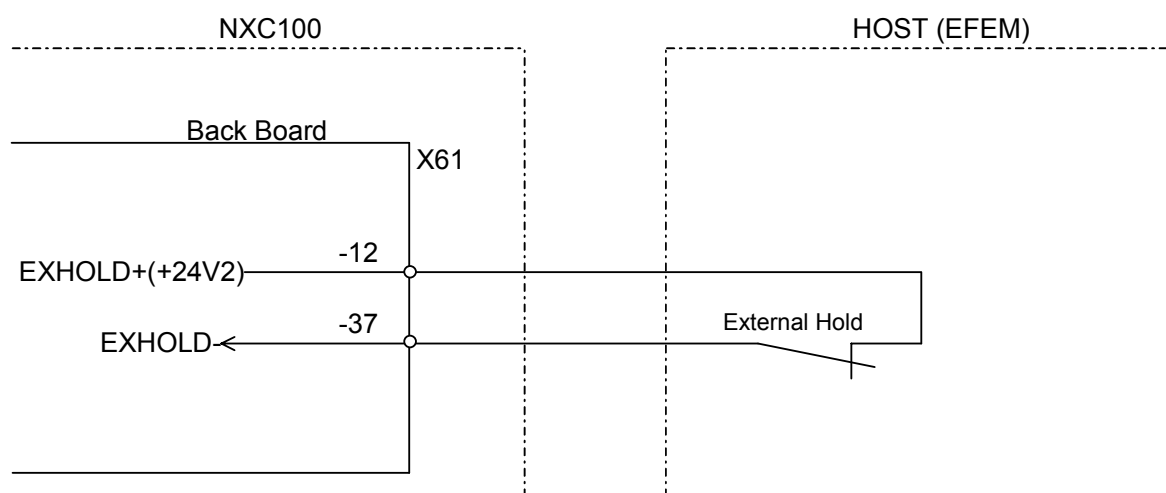


Fig. 30 Connection for External Hold

◆ External SERVO ON: EXSVON

This signal is used to connect the SERVO ON switch of an external operation device on EFEM. If the signal is input, the servo power supply is turned ON.

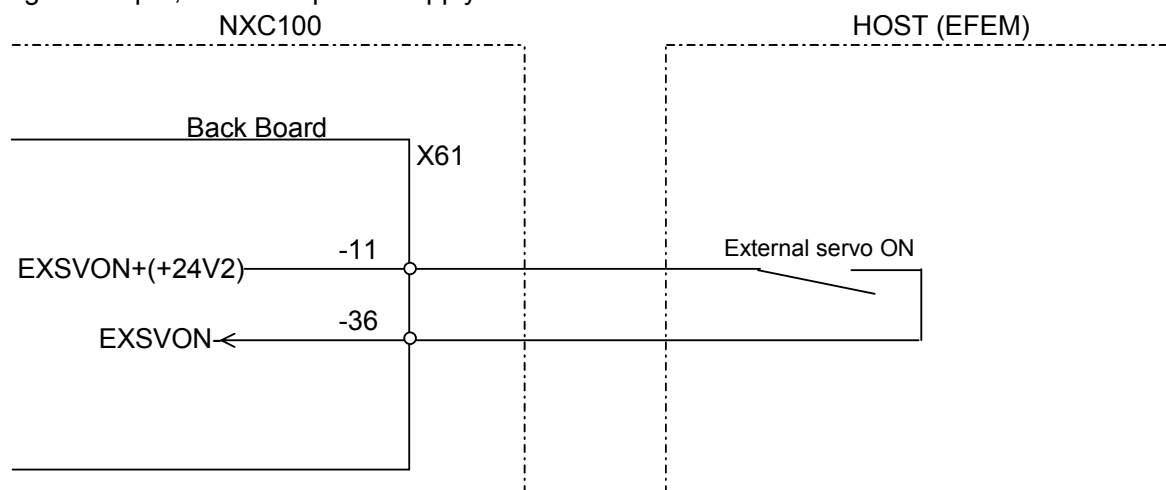


Fig. 31 Connection for External SERVO ON



While "EXSVON" is short-circuited, servo power is turned ON when the SERVO ON signal from either teaching pendant or host command is turned ON.

In case "EXSVON" is open and servo power is OFF, the servo power will not be turned ON even though the SERVO ON signal becomes ON.

Meanwhile, in case "EXSVON" becomes open while servo power is ON, the servo power will not be turned OFF (due to the SERVO ON keep function of the NX100 controller). Thus, "EXSVON" cannot be utilized for emergency stop purpose.

For use of the robotic system installed in the host system, "EXSVON" signal must be short-circuited all the time in general.

◆ External Enable Switch (External Dead-Man Switch): EXDSW11, EXDSW12

When teaching operation is performed by two people, connect the enable switch held by the one who does not hold the teaching pendant.

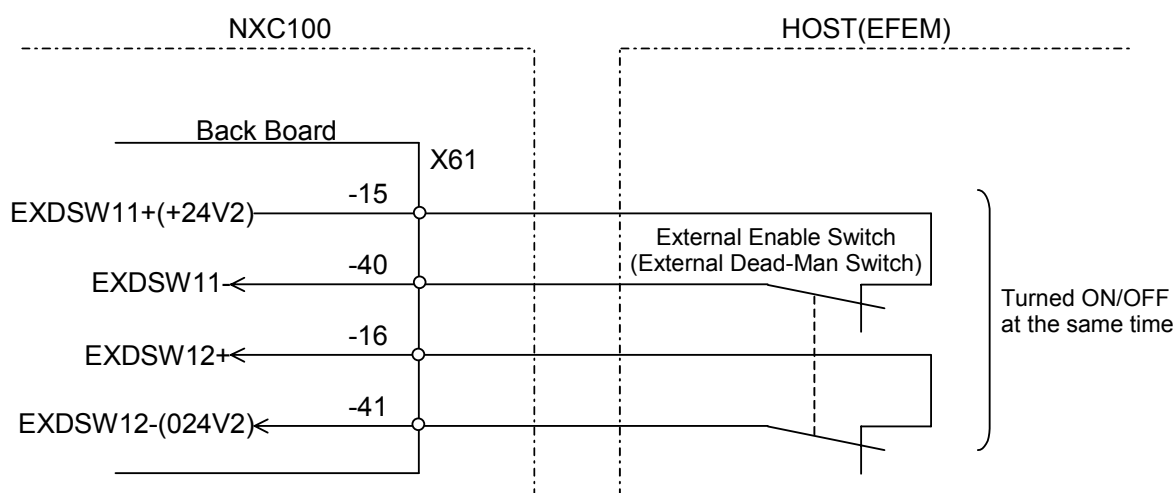


Fig. 32 Connection for External Enable Switch

◆ SERVO-ON Enable Input: ONEN1, ONEN2

When the robotic system is constructed with two or more NXC100 controllers, connect the ONEN1 and ONEN2 signal lines to utilize the function to turn ON or OFF the servo power of respective NXC100 controllers.

Since these signals are not used for units of standard specifications, connect a jumper cable as shown in the following figure.

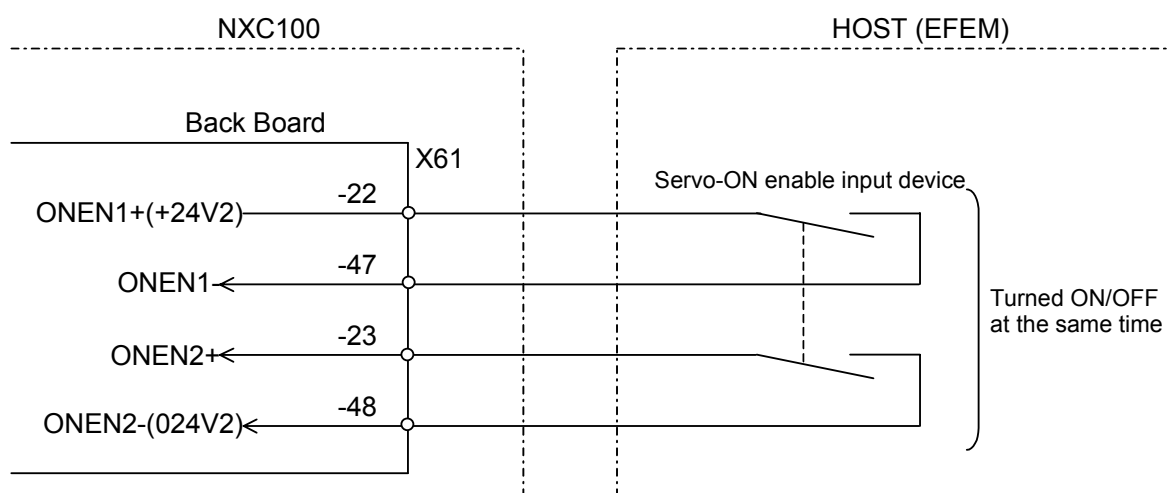


Fig. 33 Connection for SERVO ON Enable Input

◆ Mode Output: EX-SEL SWa, EX-SEL SWb

The following diagram shows the mode select switch on the teaching pendant.

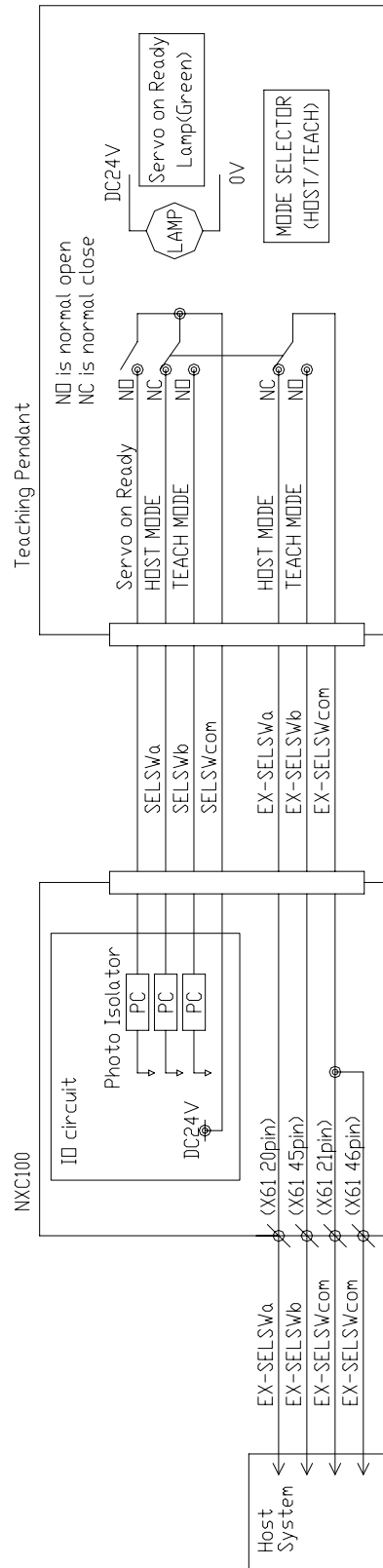


Fig. 34 Connection Diagram of Mode Output

Connector X61

Pin No.	Signal Name	Pin No.	Signal Name	Dual input	Contents	Logic *1		Signal Direction	
						1	0	Host System	NXC 100
1	SAFF1+	26	SAFF1-	Applicable	Safety Plug ----- Used to turn OFF the servo power if the door on the safeguarding is opened. Connect to the interlock signal from the safety plug on the safeguarding door (EFEM door). If the interlock signal is input, the servo power turns OFF. While the signal is being input, the servo power cannot be turned ON. [WARNING !] These signals are disabled in teach mode.	Normal (Safeguarding door Close)	Emergency Stop (Safeguarding door Open)	→	
2	SAFF2+	27	SAFF2-						
3	FORCE1+	28	FORCE1-	Applicable	Maintenance Input ----- If the signal input circuit is short-circuited, the Enable switch on the Teaching Pendant is disabled. [WARNING !] Usually, use the system with this signal circuit open (nothing connected). If the circuit for this signal must be used for an unavoidable reason, be sure to use a switch with a key that is kept under the care of the system manager.	Enable (Switch Close)	Normal (Switch Open)	→	
4	FORCE2+	29	FORCE2-						
5	(NC)	30	(NC)	-----	Not connected	--	--		
6	(NC)	31	(NC)	-----	Not connected	--	--		
7	(NC)	32	(NC)	-----	Not connected	--	--		
8	FST1+	33	FST1-	Applicable	Full Speed Test ----- Used to reset the slow speed limit for the test run in the teach mode. If this signal input circuit is short-circuited, the speed of the test run becomes 100 % in the teach mode. If circuit of this signal is open, the status SS-P input signal determines the slow speed: the first slow speed (16%) or second slow speed (2%).	Top speed (Switch Close)	Slow Speed select (Switch Open)	→	
9	FST2+	34	FST2-						
10	SS-P+	35	SS-P-	-----	Slow Speed Mode Selection ----- Used to determine the speed of the test run when the FST (full-speed test) signal input circuit is open. Open: second slow speed (2%) Short-circuit: first slow speed (16%)	1 st slow speed (16%) (Switch Close)	2 nd slow speed (2%) (Switch Open)	→	

Pin No.	Signal Name	Pin No.	Signal Name	Dual input	Contents	Logic *1		Signal Direction	
						1	0	Host System	NXC 100
11	EXSVON+	36	EXSVON-	-----	External SERVO ON ----- Used to connect the SERVO ON switch of the host system. If the signal is input, the servo power supply is turned ON.	SERVO ON (Switch Close)	SERVO OFF (Switch Open)	→	
12	EXHOLD+	37	EXHOLD-	-----	External Hold ----- Used to connect the temporary stop switch of an external device on the host system. If the signal is input, the motions of manipulator, track, and prealigner are stopped. While the signal is input, command and axis operations are disabled.	Normal (Switch Close)	HOLD (Switch Open)	→	
13	EXESP1+	38	EXESP1-	Applicable	External Emergency Stop ----- Used to connect the emergency stop switch of an external device on the host system. If the signal is input, the servo power is turned OFF. While the signal is input, the servo power cannot be turned ON.	Normal (Switch Close)	Emergency Stop (Switch Open)	→	
14	EXESP2+	39	EXESP2-						
15	EXDSW11+	40	EXDSW11-	Applicable	External Enable Switch ----- When two people are teaching, connect the enable switch held by the one who does not hold the teaching pendant.	SERVO ON (Teach mode) (Switch Close)	SERVO OFF (Teach mode) (Switch Open)	→	
16	EXDSW12+	41	EXDSW12-						
17	(NC)	42	(NC)	-----	Not connected	--	--		
18	(NC)	43	(NC)	-----	Not connected	--	--		
19	(NC)	44	(NC)	-----	Not connected	--	--		
20	EX-SELSWa	--	--	-----	Mode Output ----- Output of the mode selection switch on the teaching pendant.	HOST mode (Switch Close)	TEACH mode (Switch Open)	←	
21	EX-SELSWcom	--	--	-----					
--	--	45	EX-SELSWb	-----		TEACH mode (Switch Close)	HOST mode (Switch Open)	←	
--	--	46	EX-SELSWcom	-----					
22	ONEN1+	47	ONEN1-	Applicable	SERVO ON Enable ----- Used to connect the SERVO ON switch on the host system.	SERVO ON (Switch Close)	SERVO OFF (Switch Open)	→	
23	ONEN2+	48	ONEN2-						
24	(NC)	49	(NC)	-----	Not connected	--	--		
25	(NC)	50	(NC)	-----	Not connected	--	--		

*1 1: Photocoupler ON; 0: Photocoupler OFF

◆ The Correlation of the Speed Signal

Logic		FST	
		1	0
SS-P	1	Top Speed (100 %)	1 st Slow Speed (16%)
	0	Top Speed (100%)	2 nd Slow Speed (2%)

◆ The Correlation of the Interlock Signal

		X61: Signals		T.P.	X61: Signals					
T.P Mode	Preconditions	SAFF	FORCE	DSW	EXDSW	FST	SS-P	ONEN	Servo Status	Speed
Host	EXSVON=1 EXESP=1	0	0	Void	Void	Void	1	1	OFF	1 st Safety
								0	OFF	Speed (16 %)
			0				1	OFF	2 nd Safety	
							0	OFF	Speed (2 %)	
			1				1	ON	1 st Safety	
								0	OFF	Speed (16 %)
		0	1				ON	2 nd Safety		
							0	OFF	Speed (2 %)	
		1	0				Void	1	ON	Top Speed
								0	OFF	(100 %)
		1	1				1	ON	1 st Safety	
								0	OFF	Speed (16 %)
0	1	ON	2 nd Safety							
			0	OFF	Speed (2 %)					
Teach	EXSVON=1 EXESP=1	Void	0	1	1	0	1	1	ON	1 st Safety
								0	OFF	Speed (16 %)
							0	1	ON	2 nd Safety
									0	OFF
						1	Void	1	ON	Top Speed
								0	OFF	(100 %)
				0	Void	0	1	1	OFF	1 st Safety
								0	OFF	Speed (16 %)
							0	1	OFF	2 nd Safety
								0	OFF	Speed (2 %)
						1	Void	1	OFF	Top Speed
								0	OFF	(100 %)
				Void	0	0	1	1	OFF	1 st Safety
								0	OFF	Speed (16 %)
							0	1	OFF	2 nd Safety
								0	OFF	Speed (2 %)
						1	Void	1	OFF	Top Speed
								0	OFF	(100 %)
			1	Void	Void	1	1	ON	1 st Safety	
							0	OFF	Speed (16 %)	
						0	1	ON	2 nd Safety	
								0	OFF	Speed (2 %)

Logic: 1 = Switch is closed, 0 = Switch is open.

T.P.: teaching pendant

◆ Circuit Example for HOST (EFEM)

The following diagram shows the circuit example to operate only the external emergency stop "EXESP1, 2" and the safety plug input "SAFE 1,2".



This circuit example does not assure the safety of the robotic system.

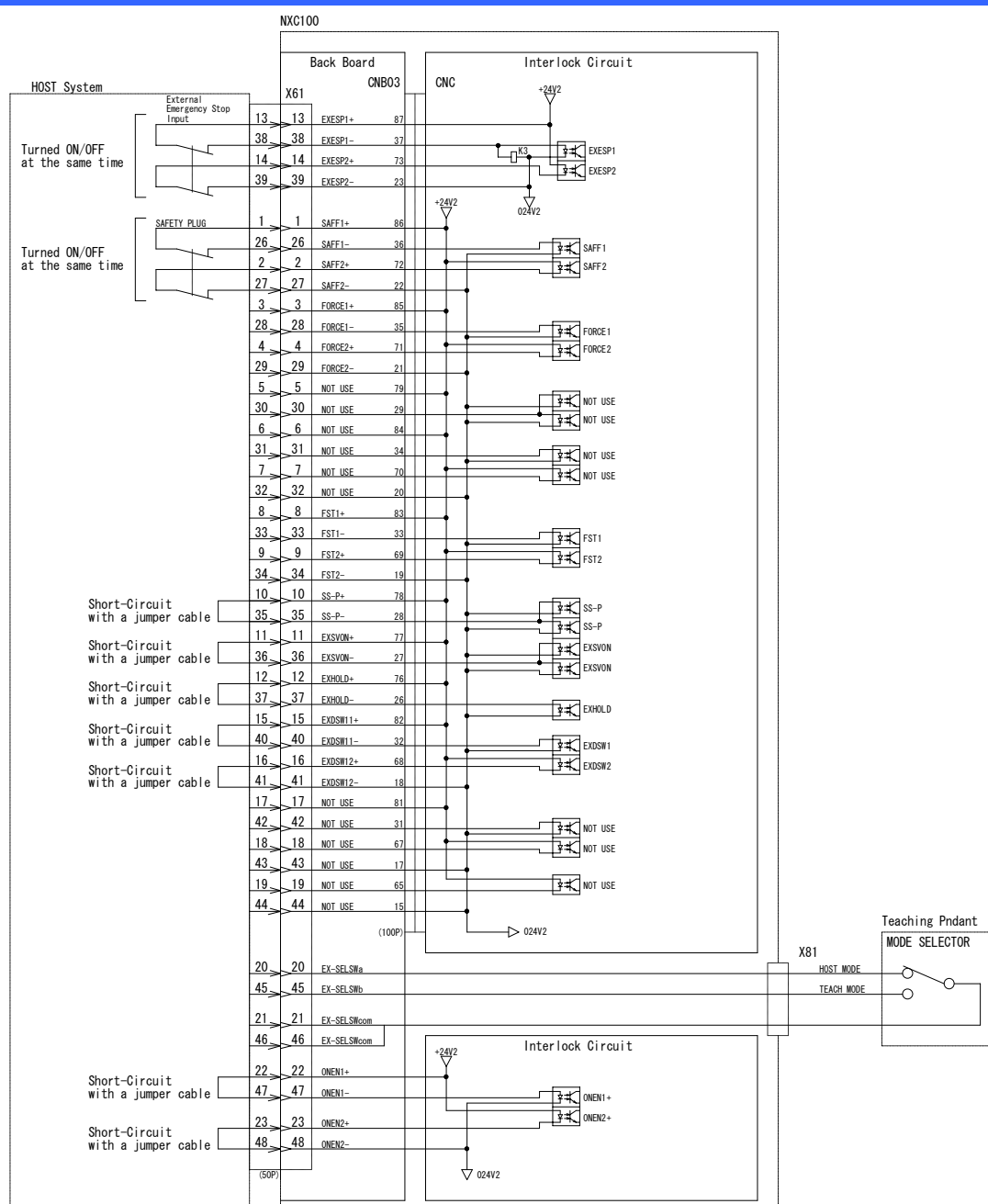
Make sure to perform the risk assessment in compliance with EN1050 and/or ISO 1412-1. Then choose safety category in compliance with EN954-1 and/or ISO 13849-1. Based on the result of risk assessment, design and configure the most suitable circuit.

EN1050: Safety of machinery - Principle for risk assessment

EN ISO 14121-1: Safety of machinery – Risk assessment, Part 1: Principles

EN954-1: Safety of machinery - Safety-related parts of control systems - General principles for design

EN ISO 13849-1: Safety of machinery – Safety-related parts of control systems, Part1: General principles for design

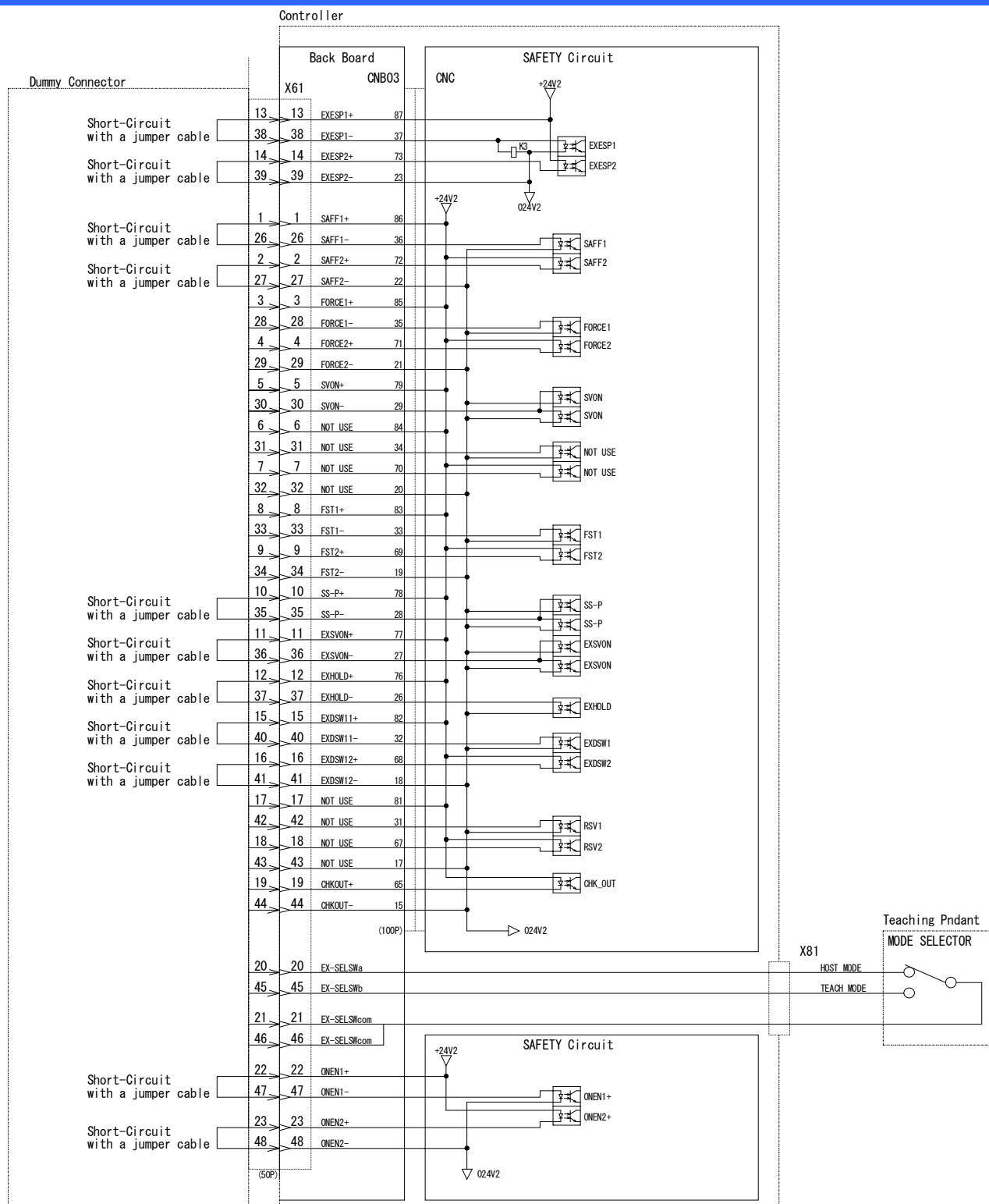


◆ Circuit Example for Dummy Connector

The following diagram shows the circuit example to perform operation by disabling the interlock signal input from the host system for troubleshooting.



Do not use the dummy connector for normal operation.
For normal operation, wire as shown in "Circuit Example for HOST (EFEM)" on the previous page.



(7) X32: RESET signal

Connector on the NXC100 controller: 231-104/026-000 (WAGO)

Connector on cable: 231-604-019-000 (WAGO), delivered with the NXC100 controller

Pin No.	Signal Name	Contents
1	R-IN	Reset Input *1
2	R-IN com	Reset Input Common *1
3	R-OUT	Not Connected
4	R-OUT com	Not Connected

*1 Short-circuit between the pin No. 1 and No. 2 when reset input signal is not used.

The control power unit in the NXC100 controller can be turned ON and OFF by input signals from the host system, and is operated by the external switch connected to the connector X32 on the NXC100 controller. Pins X32-1 and X32-2 are short-circuited at the factory.

Secure the reset time for more than 1 sec in case of using reset signals.

In case of signals of which reset time is 1 sec or less, the NXC100 controller will not respond, or start-up error will occur.

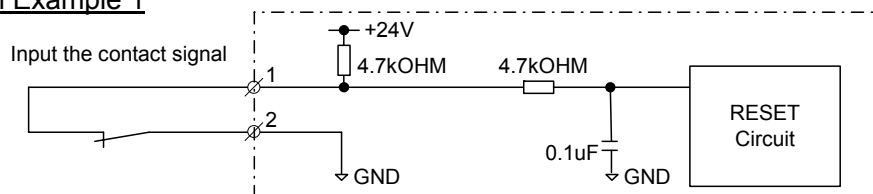
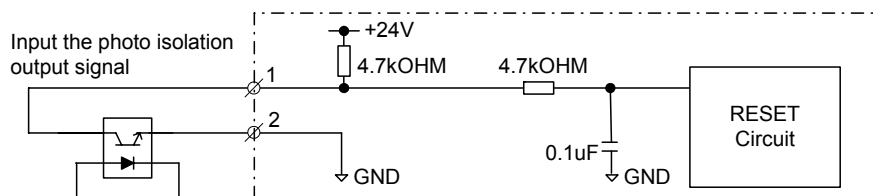
Connection Example 1Connection Example 2

Fig. 35 Circuit Diagram for Reset

Refer to " WAGO Connector " in this chapter for wiring of X32 connector.

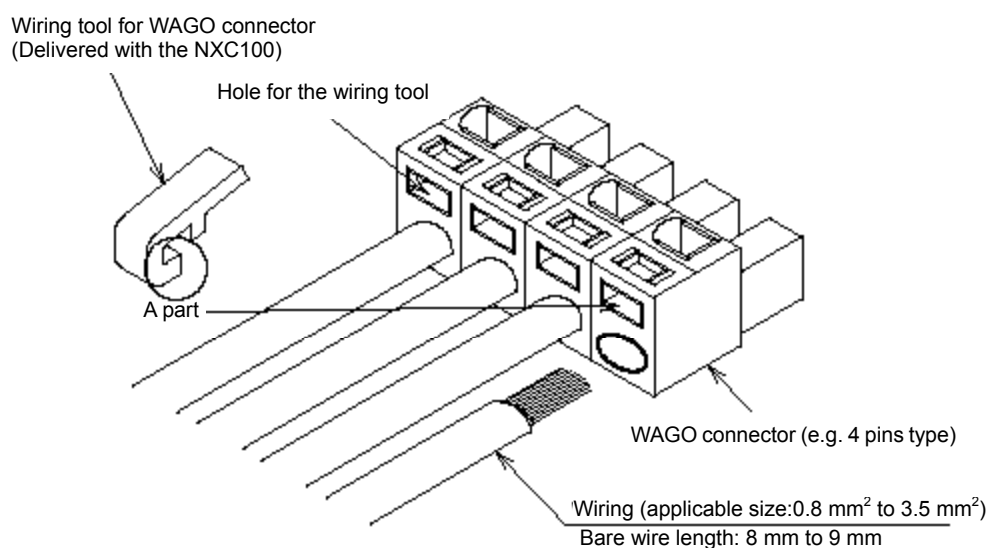
◆ WAGO Connector

X32 and X34 on the NXC100 controller are equipped with a connector made by WAGO. The connector X32 is for reset signals, and the connector X34 is for brake release signals.

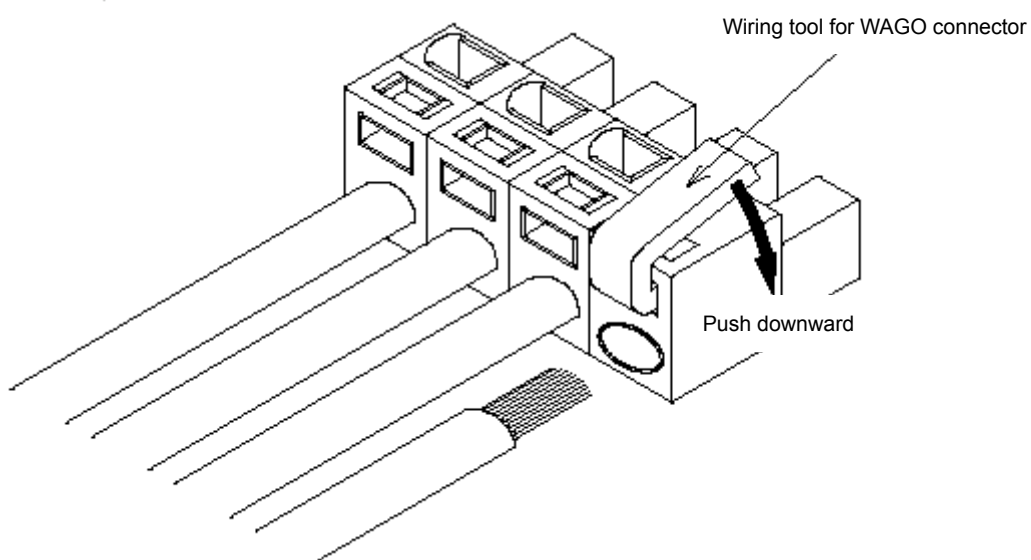
Connecting the WAGO connector requires the WAGO connector wiring tool which will be delivered with the NX100 controller.

The wiring procedure is described as follows:

- 1) Insert A part of the wiring tool into one of the holes designed for the tool.



- 2) Insert or pull out the wire while pushing the wiring tool downward (direction of the arrow).



- 3) Remove the wiring tool from the connector to complete the procedure.
Keep this wiring tool for the future use.

(8) X72: SENSOR analog signal

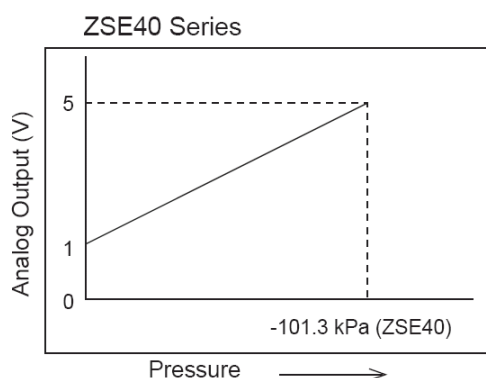
If the pressure sensor of the manipulator has analog output function, the sensor can be connected to the host system through this connector.

Connector on the NXC100 controller: DSUB 9 Pin (Socket)

Connector on cable: DSUB 9 Pin (Pin)

Pin No.	Signal Name	Contents
1	ASEN1+	Analog Output 1 (+1 VDC ~ +5 VDC), From Manipulator
2	ASEN1-	Analog Output 1 Common , From Manipulator
3	ASEN2+	Analog Output 2 (+1 VDC ~ +5 VDC) , From Manipulator
4	ASEN2-	Analog Output 2 Common, From Manipulator
5	(N.C.)	Not Connected
6	RESERVE+	Spare, From Manipulator
7	RESERVE-	Spare, From Manipulator
8	(N.C.)	Not Connected
9	(N.C.)	Not Connected

Example of sensor analog output signal



(9) X34: BRAKE release signal

The 24VDC power for brake release from the host system can be connected to this connector.

Connector on the NXC100 controller: 231-602/019-000 (WAGO)

Connector on cable: 231-102/026-000 (WAGO), delivered with the NXC100 controller.

Pin No.	Signal Name	Contents
1	BK RELE+	Brake Release Input (+24 VDC)
2	BK RELE-	Brake Release Input (0 V)



WARNING

- **The Z-axis instantly falls down under its own weight when the brake is released by operator.**
Failure to observe this instruction may result in injury or damage to the NXC100 controller.
- **Do not input the signal while the NXC100 controller power is ON.**
Failure to observe this instruction may result in injury or damage to the NXC100 controller.
- **During the initialization of the NXC100 controller, the brake is all that supports the manipulator in the Z-axis. Inputting 24 VDC into X34 (Z-axis brake release) during this time can result in an instant drop of the Z-axis. The initialization is completed when the 7-segment LED on the NXC100 controller indicates "1.000" after indicating the character "d", and the teaching pendant displays the firmware version on the screen. If operator releases the brake, the elevation axis of manipulator (the Z-axis) drops immediately.**

Failure to observe this warning may result in injury or damage to the NXC100 controller.

Refer to " WAGO Connector " in this chapter for wiring of X34 connector.

(10) X81: teaching pendant

Connector on the NXC100 controller: SRCN2A25-24S (JAE)

Connector on cable: SRCN6A25-24P (JAE)

Dummy connector: HB0480289, delivered with the NXC100 controller for RoHS Directive Model



Be sure to connect the dummy connector to the connector X81 on the NXC100 controller when the teaching pendant is not used.

◆ Dummy Connector

	1	DSW11
	2	DSW12
	3	DSW21
	4	DSW22
	5	+24V
	6	024
	7	TX+
	8	TX-
	9	RX+
	10	RX-
	11	ESP11
	12	ESP12
	13	ESP21
	14	ESP22
	15	SELSW _a
	16	SELSW _b
	17	SELSW _{com}
	18	EXSELSW _a
	19	EXSELSW _b
	20	EXSELSW _{com}
	21	SW1
	22	SHIELD
	23	
	24	

Maintenance

10 Maintenance Schedule



WARNING

- **Before conducting maintenance, inspection or wiring, turn OFF all supplied power (including the compressed air) to the robotic system, lock the switch in the "OFF" position and put up a warning sign, such as "DO NOT TURN ON THE POWER".**
- **The robotic system does not have the switches to turn OFF the power. Turn OFF the switch in the host system to which the robotic system is connected.**

Failure to observe this warning may result in electric shock or injury.

Follow " 10.6 Hazardous Energies Isolation Procedure " in this chapter.



CAUTION

- **Maintenance and inspections must be performed by specified personnel.**

Failure to observe this caution may result in electric shock or injury.

- **Read and understand the Explanation of Warning Labels of " INSTRUCTION MANUAL FOR MANIPULATOR " and this instruction manual before operating the manipulator.**

Failure to observe this caution may result in injury.

- **Perform the following inspection procedures prior to conducting manipulator teaching. If problems are found, repair them immediately, and be sure that all other necessary processing has been performed.**
 - **Check for problems in manipulator motion.**
 - **Check for damage to insulation and sheathing of external cables.**

Failure to observe this caution may result in electric shock, injury, or damage to devices.

- **For safety, operate under the proper lighting.**

Failure to observe this caution may result in injury.

- **Turn OFF the compressed air supply and perform LockOut/TagOut operations in non-pressurized state before handling any air tubes.**

Failure to observe this caution may result in injury.

10.1 Inspection Schedule

Proper inspections are essential not only to assure that the mechanism will be able to function for a long period, but also to prevent malfunctions and assure safe operation.

The inspection interval should be based on the power supply ON time.

Inspection intervals are classified into three levels: weekly inspections, every 6 months inspections and after 5 years inspections (overhaul) as the case used for 6,000 hours in year.

Weekly inspections and every 6 months inspections are essential mainly to assure safe operation and assure that the mechanism will be able to function for a long period. These are the inspections which can be conducted at the customer's facilities (on-site inspections).

Conduct these on-site periodical inspections according to the inspection schedule in " 10.2 Inspection Items ".

In addition, YASKAWA recommends the complete check (including the items which cannot be done on-site) at YASKAWA as a preventive maintenance after 5 years (30,000 hours). In this case, for the best adjustment, YASKAWA recommends to check the manipulator, track, pre-aligner, and the NX100 controller as a set.

10.2 Inspection Items

The inspection items are categorized by three types of operation: operations to be performed by personnel authorized by the user, operations to be performed by trained personnel, and operations to be performed by YASKAWA. Only specified personnel are to do inspection work.

Table 5 Inspection Items

Item		Schedule			Inspection Method	Operation	Inspection			Type of task
		Weekly	Every 3,000H 6 months	After 30,000H After 5 years			Specified Personnel	Licensee	YASKAWA or Service Provider	
1	Cable	√	√		Visual	Check for excess wear. Fix or replace as necessary.	√	√		1
2	Entire exterior	√	√		Visual	Check for crack and damage in each part.	√	√		1
3	Cable connection	√	√		Wrench, Screwdriver	Check for defective/loose connector. Tighten as necessary.	√	√		1
4	Cover screw		√		Wrench, Screwdriver	Check for loose screws. Tighten as necessary.	√	√		1
5	Cooling fan	√	√		Visual	Check for fan alarm occurrence	√	√		2

Item		Schedule			Inspection Method	Operation	Inspection			Type of task
		Weekly	Every 3,000H 6 months	After 30,000H After 5 years			Specified Personnel	Licensee	YASKAWA Or Service Provider	
6	Battery	√	√		Visual	Check for battery alarm occurrence	√	√		2
7	Emergency stop button	√	√		Function check	Refer to “10.7 Inspection for Safety”.	√	√		2
8	Safety Interlock	√	√		Function Check	Refer to “10.7 Inspection for Safety”.	√	√		2
9	Enable switch	√	√		Function Check	Refer to “10.7 Inspection for Safety”.	√	√		2
10	Data backup	√			Data backup	Backup data for position data and parameters		√		2
11	Overhaul			√	Various	YASKAWA recommends the complete check at YASKAWA as a preventive maintenance			√	---

**Type of task (SEMI S2)**

Type 1: Equipment is fully de-energized.

Type 2: Equipment is energized. Energized circuits are covered or insulated.

Type 3: Equipment is energized. Energized circuits are exposed and inadvertent contact with un-insulated energized parts is possible. Potential exposures are no greater than 30 volts rms, 42.4 volts peak, 60 volts dc or 240 volt-amperes in dry locations.

Type 4: Equipment is energized. Energized circuits are exposed and inadvertent contact with un-insulated energized parts is possible. Potential exposures are greater than 30 volts rms, 42.4 volts peak, 60 volts dc or 240 volt-amperes in dry locations. Potential exposures to radio-frequency currents, whether induced or via contact, exceed the limits in Table A5-1 of SEMI S2 Appendix 5.

**MANDATORY**

- **Persons who teach, inspect, or maintain the manipulator must undergo required training before using the manipulator.**

For more information on training, inquire at the nearest YASKAWA branch office.
The telephone numbers are listed on the back cover of this manual.

10.3 Hazardous Energy Source List

The robotic system (the manipulator, track, pre-aligner, and the NXC100 controller) has the hazardous energy sources as listed below.

Fully comply with precautions and safety information on all the related manuals including this instruction manual and warning labels.

Electrical

220 V/110 V (switchable) power in:

Cables

NXC100 controller

Stored Energy

Heavy components. Pinch/Crush warning

NXC100 controller weighs 14 kgf

Manipulator

Track

Pre-aligner

For details, refer to each instruction manual.

Compressed air (maximum 0.61 MPa (88 psi)) lines in:

Manipulator

Track

Pre-aligner

For details, refer to each instruction manual.

10.4 Compressed Air

The robotic system requires the regulated compressed air to grip wafers.

If the air tubes are removed in pressurized state, air will jet. Turn OFF the compressed air supply, and perform LockOut/TagOut operations in non-pressurized state before handling air tubes.

10.5 Relocation

Relocating the robotic system for scheduled inspections and maintenance is not necessary.

If relocation is required, refer to instruction manual for manipulator/track/pre-aligner, or

" 3 Transport/Installation " in this manual.

10.6 Hazardous Energies Isolation Procedure

The following energy hazards exist in this product:

- Electrical energy: 200 VAC, 1 A; or 100 VAC, 2 A
 - Compressed Dry Air (CDA): 0.61 MPa (88 psi) or more
- Refer to instruction manual for manipulator/track/pre-aligner.

Follow the procedure below to safely isolate the robotic system before maintenance:

1. Stop motion
 - a) End cycle or other motion via host software; or
 - b) Use the teaching pendant's Emergency Stop button; or
 - c) Use the external emergency stop "EXESP" from the connector X61 on the NXC100 controller.
2. Set the main power switch of the host system to "OFF".
3. Set the power switch "SW 1" on the NXC100 controller front panel to "OFF".
4. Perform the following operations for the CDA regulator and shutoff valve of the host system.
 - i) Shut the valve to disconnect the air-supply (CDA)



Compressed air still exists in the system at this point.

- ii) Release the stored air using the CDA regulator to slowly bleed the system.
5. Perform LockOut/TagOut operations to the CDA valve and the main power switch in their de-energized positions ("Safe" or "OFF").
 - i) Locks: Lock out the energy-isolating devices, both the CDA valve and the main power switch in a designated method. The personnel (authorized personnel) who does the service or maintenance work shall execute the lockout operation and place the a personal identification tag. To ensure the secure locking, the energy-isolating devices shall be fixed at the "Safe" or "OFF" position.
 - ii) Tags: The authorized personnel who will be doing the service or maintenance work must place tags on the energy-isolating devices. The tags must clearly state that changing the energy-isolating devices from the "Safe" or "OFF" position is prohibited.
Because the tags themselves do not eliminate the hazard, additional methods such as blocking a control switch or opening an alternative disconnect are required. If it is difficult to place a tag on the energy-isolating device, place it as close as possible to the device.
 - iii) The switch with LockOut/TagOut provisions must be located outside of the enclosure where the manipulator, track, and pre-aligner are installed.
For SEMI S8, the switch shall be located at a position less than 1.638 m (64.5") from the floor.
 - iv) If the energy-isolating device is lockable, the personnel will use a lock unless he or she can prove that the use of tags would provide the same protection at least as effective as a lock and would assure "full personnel protection".
 - v) When a tag has been attached, it must not be removed except by the personnel who placed it. The tag should never be bypassed, ignored or otherwise defeated.
 - vi) Tags must be legible and understandable by all personnel. The person responsible for placing the tag on the equipment is required to put his/her name and the date on the tag.
6. Verify that the CDA source is isolated by checking that the pressure gauge at the regulator reads 0.
7. Verify that the main power supply is disconnected by setting the power switch "SW 1" on the NXC100 controller to "ON", and verify that the SOURCE LED lights on the NXC100 controller are not turned on.

8. Turn OFF the power switch "SW 1" by setting the switch to "OFF" again after the confirmation of step 7.
9. Re-energize the equipment as follows after the maintenance.
Before you remove locks or tags and re-energize the equipment, you must:
 - i) Remove all nonessential tools and equipment from the work area. Make sure all the equipment components are back in place.
 - ii) Notify all personnel around devices that the LockOut or TagOut device(s) will be removed.
 - iii) Check the work area to be sure all personnel are clear off the equipment.
10. Remove the LockOut or TagOut device.
11. Open CDA valve and operate the regulator to bring the air pressure to the operating pressure.
12. Set the power switch "SW1" on the NXC100 controller to "ON" position.
13. Set the main power switch of the host system to "ON" position.

10.7 Inspection for Safety

Before operating the manipulator, be sure that the safety devices function properly.



WARNING

- **Before operation, confirm that the safety devices properly function.**

Failure to observe this warning may result in injury.

- **Never remove/insert connectors when operating the equipment or turning ON the power supply.**

Failure to observe this warning may result in electric shock, damage on the operation circuit or uncontrollable manipulator.



CAUTION

- **Put an interval time of five minutes or more on ON/OFF of the emergency stop or the power supply.**

Frequent ON/OFF of the emergency stop or power supply may result in deterioration in the main circuit elements of AC Servo Driver.

10.7.1 Inspections of Emergency Stop Button on the Teaching Pendant

Refer to " 6.3.1 Emergency Stop Button Inspections " for details.

10.7.2 Interlock Circuit Inspections

Refer to " 6.3.2 Interlock Inspections " for details.

10.7.3 Enable Switch Inspections

The teaching pendant is equipped with a three-position Enable switch. Perform the following operation to ensure that the Enable switch functions correctly.

1. Turn OFF the power supply to the NXC100 controller.
2. Connect the teaching pendant to the connector X81 on the NXC100 controller.
3. Turn ON the power supply to the NXC100 controller. The 7-segment LED on the NXC100 controller

front panel indicates  →  -----> . When the NXC100 controller is

in the normal operation, it indicates , and dot "." will start to flush at 1 second interval.

4. Set the mode selector switch of the teaching pendant to "TEACH".
5. The SERVO ON READY switch on teaching pendant turns the light OFF (SERVO OFF status).
6. Hold the Enable switch of the teaching pendant to the position of the middle. The SERVO ON READY switch lights up. (SERVO ON condition)
7. If the Enable switch is held further until it clicks, or is released, the servo power is cut OFF and the SERVO ON READY switch on the teaching pendant turns the light OFF (SERVO OFF status).



• Servo Power ON/OFF by the Enable Switch

When the Enable switch of the teaching pendant is held, the servo power is turned ON and the SERVO ON READY switch lights up. However, if the Enable switch is held until it clicks, the servo power is turned OFF and the SERVO ON READY switch on the teaching pendant turns the light OFF.





If the SERVO ON READY switch does not light up in the procedural step (6) above, i.e. the servo power is in the OFF status, confirm the followings since they can be attributed to the SERVO OFF status.

- The emergency stop button on the teaching pendant is pressed.
- The emergency stop signal is input externally.
- The Interlock is operating, i.e. the signal "EX-SVON" is open.
- Major alarm is occurring.

10.8 Daily Inspections

10.8.1 Cable Inspections

Check for damage and rust on cables connected to the robotic system.
Replace cables if necessary.

10.8.2 NXC100 Controller Exterior Inspections

Check for cracks and dents on the NXC100 controller exterior, and check if the warning labels are in perfect condition and stuck in place.
Replace if necessary.

10.8.3 Cable Connection Inspections

Check for coming off of connectors, loose connectors, and damaged connectors which are connected to the robotic system.
For connectors fixed with screws, check for loose screws.
Replace connectors if necessary.

10.8.4 Cover Screw Inspections

Check for coming off of screws, loose screws, and damaged screws which are used for the NXC100 controller.
Tighten screws if necessary.

10.8.5 Cooling Fan Inspections

Inspect the cooling fans as required. A defective fan can cause the NXC100 controller to malfunction due to excessive high temperatures inside.
The cooling fan normally operates while the power is turned ON. Check if the fans are operating correctly by visual inspection and by feeling air moving into the air intake vent and from the air exhaust vent.

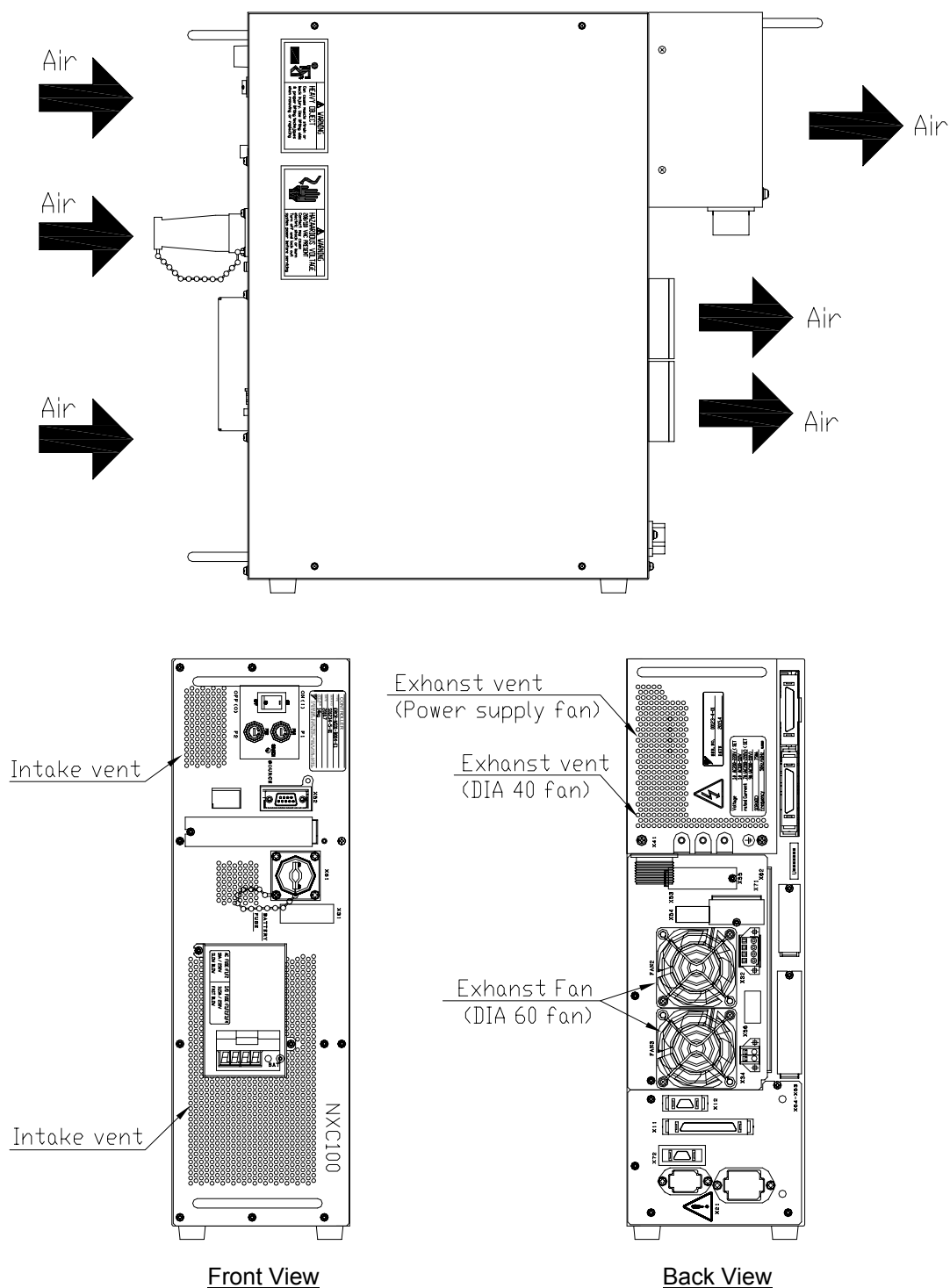


Fig. 37 Cooling Fan Diagram



When the 7-segment LED on the NXC100 controller front panel indicates "A44" (COOLING FAN ERROR), it may be caused by an error occurred in the cooling fan inside the NXC100 controller. If an error occurs at the cooling fan, the temperature rises in the NXC100 controller leading to the alarm "725", "726" (HIGH TEMPERATURE), and the playback operation is not performed. When the 7-segment LED on the NXC100 controller front panel indicates "A44" (COOLING FAN ERROR), carry out an inspection and the replacement of the cooling fan in the NXC100 controller as soon as possible.

10.8.6 Battery Inspections



CAUTION

- **The NXC100 controller uses lithium batteries.**
When disposing of batteries, follow the applicable national/local laws and regulations.

Type: lithium battery

The NXC100 controller has a battery which backs up the important program files for user data in the CPU memory.

The "BAT" LED indicator on the NXC100 controller front panel lights up when the battery power runs out and needs to be replaced. Additionally, the 7-segment LED on the NXC100 controller front panel indicates "A4F" (BATTERY BACKUP SRAM ERROR).

Replace the battery if necessary.

10.8.7 Backup Data

The data stored in the NXC100 controller is updated every performing the teaching operation or calibration. Backup data saves time for recovery operation at the NXC100 controller failure, and can be utilized for the error analysis. On this account, make sure to backup data after setting up, teaching operation, or calibration. The backup data should be stored displaying the subject NXC100 controller information with the YASKAWA's serial number and customer's control number, and the date when the data was updated.



MANDATORY

- **Make sure to backup data after setting up, teaching operation, or calibration.**

For data backup operation, refer to "12.2 Parameters/Position Data Upload/Download Procedure" in this manual.

• Data Stored in the NXC100 Controller

Data Name	Extension	Remarks
Position data	U*pos.dat	Refer to "12.2 Parameters/Position Data Upload/Download Procedure".
Parameters		
Common parameter	COMprm.dat	
Unit parameters	U*prm.dat	
NXC servo parameter	allprm.bin	

11 Recommended Spare Parts

The following tables show the ranks of our recommended spare parts.

 CAUTION
• For replacement, be sure to use the parts recommended by YASKAWA. Failure to observe this caution may affect the NXC100 controller performance or the NXC100 controller may not perform as expected.

[Ranks of Recommended Parts]

- Rank "A": Expendable and frequently replaced parts
- Rank "B": Parts for which replacement may be necessary as a result of frequent operation
- Rank "C": Drive unit

Table 6 Recommended Spare Parts

No.	Rank	Part Name	Part Number	Qty. per Unit	Remarks
1	C	Controller Kit	HB0480608	1	(Specification A) Revision R<A>
			HB0480609	1	(Specification B) See "12.1 Replacing
			HB0480610	1	(Specification C) Controller Kit"
2	C	Controller Fan Kit	HB0480354	1	Size: 40 mm dia. See "12.3 Replacing Controller Fan Kit (DIA40)".
3	C	Controller Fan Kit	HB0480355	1	Size: 60 mm dia. See "12.4 Replacing Controller Fan Kit (DIA60)".
4	C	Fuse Kit	HB0480169	1	AC fuse (F1, F2): 10 A, 250 V, fast-acting, 25 fuses/kit See "12.5 Replacing AC Fuse (F1, F2)".
					I/O Fuse (F1, F2, F3, F4): 3.15 A, 250 V, fast-acting, 25 fuses/kit See "12.6 Replacing I/O Fuse (F1, F2, F3, F4)".
5	C	Brake Fuse Kit	HB0480209	1	Brake Fuse, 25 fuses/kit See "12.8 Replacing Brake Fuse".
6	A	Controller Battery Kit	HB0480170	1	For backup of CPU memory inside the NXC100 controller See "12.7 Replacing Controller Battery Kit"
7	C	Dummy Connector for Teaching Pendant	HB0480289	1	For connector X81 on the NXC100 controller when the teaching pendant is not connected to it. To NXC100 controller (X81)
8	C	Controller Reset Connector	HB0480097	1	To NXC100 controller (X32)
9	C	Brake Release Connector	HB0480098	1	To NXC100 controller (X34)
10	C	Mechatrolink Dummy Connector	HB0480302	1	To NXC100 controller (X54/X56)

No4 and No5 fuses were discontinued. Purchase the new part number on table 9.

Table 7 Service Parts

No.	Part Name	Part Number	Qty. per Unit	Remarks
1	Teaching Pendant	HE0400944 (Discontinuance)	1	Used for troubleshoot and teaching Type: JZRCR-NPP02-01

This model - JZRCR-NPP02-01 was discontinued. Purchase the part number of HB0480423. Refer to table 10.

Table 8 Optional Parts

No.	Part Name	Part Number	Qty. per Unit	Remarks
1	Dummy Connector for 24 VDC Universal Digital I/O Signals	HB0480081	1	To NXC100 controller (X33)
2	Dummy Connector for Interlock Signals	HB0480230	1	For the 1st safety speed (16 %) To NXC100 controller (X61)
3	Cable for DC24V General Purpose Digital I/O	HB0380063-A	1 (3 m)	Cables connected to X33 on the NXC100 controller The cable end connected to the host system is unprocessed (bare cable).
		HB0380063-B	1 (6 m)	
		HB0380063-C	1 (9 m)	
4	Cable for Interlock Signals	HB0380062-A	1 (3 m)	Cables connected to X61 on the NXC100 controller The cable end connected to the host system is unprocessed (bare cable).
		HB0380062-B	1 (6 m)	
		HB0380062-C	1 (9 m)	
5	Power Cable	HB0480175	1 (5 m)	Cables connected to X41 on the NXC100 controller The cable end connected to the host system is unprocessed (bare cable).

To use for RoHS Directive Model (Controller type: ERCR-NS01-B004-E1), see table 9 to 11.

Table 9 Recommended Spare Parts

No.	Rank	Part Name	Part Number	Qty. per Unit	Remarks
1	C	Controller Kit	HB0480708	1	(Specification A)
			HB0480709	1	(Specification B)
			HB0480710	1	(Specification C)
2	C	Controller Fan Kit	HB0480711	1	Size: 40 mm dia. See "12.3 Replacing Controller Fan Kit (DIA40)".
3	C	Controller Fan Kit	HB0480712	1	Size: 60 mm dia. See "12.4 Replacing Controller Fan Kit (DIA60)".
4	C	Fuse Kit	HB0480713	1	AC fuse (F1, F2): 10 A, 250 V, fast-acting, 25 fuses/kit See "12.5 Replacing AC Fuse (F1, F2)".
					I/O Fuse (F1, F2, F3, F4): 3.15 A, 250 V, fast-acting, 25 fuses/kit See "12.6 Replacing I/O Fuse (F1, F2, F3, F4)".
5	C	Brake Fuse Kit	HB0480714	1	Brake Fuse, 25 fuses/kit See "12.8 Replacing Brake Fuse".
6	A	Controller Battery Kit	HB0480715	1	For backup of CPU memory inside the NXC100 controller See "12.7 Replacing Controller Battery Kit"
7	C	Dummy Connector for Teaching Pendant	HB0480289	1	For connector X81 on the NXC100 controller when the teaching pendant is not connected to it. To NXC100 controller (X81)
8	C	Controller Reset Connector	HB0480717	1	To NXC100 controller (X32)
9	C	Brake Release Connector	HB0480718	1	To NXC100 controller (X34)
10	C	Mechatrolink Dummy Connector	HB0480689	1	To NXC100 controller (X54/X56)

Table 10 Service Parts

No.	Part Name	Part Number	Qty. per Unit	Remarks
1	Teaching Pendant	HB0480423	1	Used for troubleshoot and teaching Type: JZRCR-NPP02-01-E1

Table 11 Optional Parts

No.	Part Name	Part Number	Qty. per Unit	Remarks
1	Dummy Connector for 24 VDC Universal Digital I/O Signals	HB0480697	1	To NXC100 controller (X33)
2	Dummy Connector for Interlock Signals	HB0480698	1	For the 1st safety speed (16 %) To NXC100 controller (X61)
3	Cable for DC24V General Purpose Digital I/O	HB0380711-A	1 (3 m)	Cables connected to X33 on the NXC100 controller The cable end connected to the host system is unprocessed (bare cable).
		HB0380711-B	1 (6 m)	
		HB0380711-C	1 (9 m)	
4	Cable for Interlock Signals	HB0380712-A	1 (3 m)	Cables connected to X61 on the NXC100 controller The cable end connected to the host system is unprocessed (bare cable).
		HB0380712-B	1 (6 m)	
		HB0380712-C	1 (9 m)	
5	Power Cable	HB0480719	1 (5 m)	Cables connected to X41 on the NXC100 controller The cable end connected to the host system is unprocessed (bare cable).

12 Replacing Parts



WARNING

- Before conducting maintenance, inspection, or wiring, turn OFF all supplied power (including the compressed air) to the robotic system, lock the switch in the "OFF" position, and put up a warning sign, such as "DO NOT TURN ON THE POWER".
- The robotic system does not have the switches for turning OFF the power. Turn OFF the switches in the host system to which the robotic system is connected.

Failure to observe this warning may result in electric shock or injury.

Follow " 10.6 Hazardous Energies Isolation Procedure " in this instruction manual.

- Turn OFF the power, perform LockOut/TagOut operations in the "OFF" position, and wait for 5 minutes before
 - Replacing the cooling fan.
 - Installing the optional board.

Do not open the NXC100 controller panel during this period.

Failure to observe this warning may result in electric shock.



CAUTION

- **Maintenance and inspections must be performed by specified personnel.**

Failure to observe this caution may result in electric shock or injury.

- **Read and understand the instruction manuals for manipulator, track, pre-aligner, and the Explanation of Warning Labels described in this manual before operating the manipulator.**

Failure to observe this caution may result in injury.

- **Perform the following inspection procedures prior to conducting manipulator teaching. If problems are found, repair them immediately, and be sure that all other necessary processing has been performed.**
 - Check for problems in manipulator motion.
 - Check for damage to insulation and sheathing of external cables.

Failure to observe this caution may result in electric shock, injury, or damage to devices.

- **For safety, operate under the proper lighting.**

Failure to observe this caution may result in injury.

- **Turn OFF the compressed air supply and perform LockOut/TagOut operations in non-pressurized state before handling any air tubes.**

Failure to observe this caution may result in injury.

- **Always return the teaching pendant to the hook on the prescribed position after use.**

The teaching pendant can be damaged if it is left in the motion range of the manipulator's work area, on the floor, or near fixtures.

- **After maintenance is completed, carefully check that no tools are left in the host system, that the NXC100 controller panel is securely closed, and that the cables are properly connected.**

Failure to observe this caution may result in electric shock or injury.



The inspection items are categorized by three types of operation: operations to be performed by personnel authorized by the user, operations to be performed by trained personnel, and operations to be performed by YASKAWA. Only specified personnel are to do inspection work.

12.1 Replacing Controller Kit

12.1.1 Preparation before the Parts Replacement

No.	Part Name	Part Number		Qty. per Unit	Remarks
		--	For RoHS		
1	Controller Kit	HB0480608	HB0480708	1	Specification A
		HB0480609	HB0480709	1	Specification B
		HB0480610	HB0480710	1	Specification C



CAUTION

- **This replacement work must be performed by licensee.**

Failure to observe this caution may result in electric shock or injury.

- **Before conducting maintenance, inspection, or wiring, turn OFF all supplied power (including the compressed air) to the robotic system, lock the switch in the "OFF" position, and put up a warning sign, such as "DO NOT TURN ON THE POWER".**
- **The robotic system does not have the switches for turning OFF the power. Turn OFF the switches in the host system to which the robotic system is connected.**

Failure to observe this caution may result in electric shock or injury.

- **Be sure not to cut cables or air tubes when cutting off cable ties.**

Failure to observe this caution may result in electric shock or injury.

- **Carry out the process of the Hazardous Energies Isolation before replacement.**

For details, refer to " 10.6 Hazardous Energies Isolation Procedure ".

- **Before connecting the incoming AC power source to the NXC100 controller, verify that the NXC100 controller is configured to that AC power source rating.**

Failure to observe this caution may result in injury or equipment damage.

12.1.2 Operation after the Parts Replacement

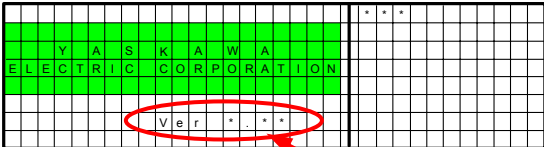
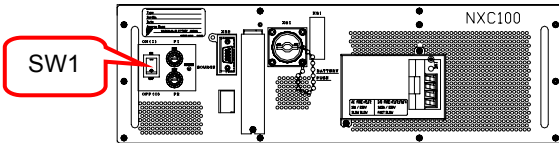
No.	Items	Remarks
1	Confirmation of the NXC100 controller LED status	Refer to "6.1 Turning ON the NXC100 controller Power Supply".

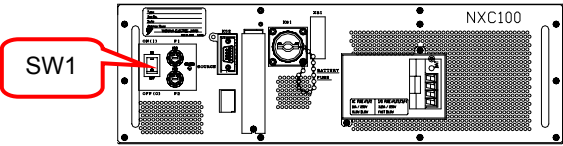
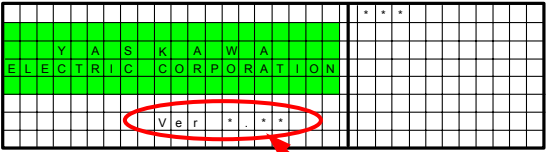
12.1.3 Replacement Procedure



The procedures in this section "12.1 Replacing Controller Kit" is to be performed in premise of the conditions listed below. If replacement is performed under different conditions, recover the NXC100 data referring to "12.2.11 Restoring the NXC100 Controller".

- The version of the NXC100 software for replacement is the same or later version of the NX100 software before replacement.
- The NXC100 controller before replacement is ready for uploading data.

No.	Procedure	Note	Illustration																		
1	Connect the teaching pendant to the NXC100 controller, and turn ON the power to the NXC100 controller. The initial teaching pendant screen displays the version number of the NXC100 software. Keep the version number on record.	Refer to "NXC100 OPERATOR'S MANUAL FOR TEACHING PENDANT" .	Initial screen of the teaching pendant  Software version																		
2	Use the Data Upload/Download PC.*1 to upload the data stored in the NXC100 controller.	Refer to "12.2 Parameters/Position Data Upload/Download Procedure". *1 Refer to "12.2.1 Preparation before the Parts Replacement".	Data stored in the NXC100 controller <table><tr><th>Data Name</th><th>Extension</th></tr><tr><td rowspan="4">Position data</td><td>U1pos.dat</td></tr><tr><td>U2pos.dat</td></tr><tr><td>U3pos.dat</td></tr><tr><td>U4pos.dat</td></tr><tr><td rowspan="2">Parameters</td><td></td></tr><tr><td>Common parameter</td></tr><tr><td rowspan="4">Unit parameters</td><td>COMprm.dat</td></tr><tr><td>U1prm.dat</td></tr><tr><td>U2prm.dat</td></tr><tr><td>U3prm.dat</td></tr><tr><td rowspan="2">NX servo parameter</td><td>U4prm.dat</td></tr><tr><td>allprm.bin</td></tr></table> The data of the standard specification is as follows. · Unit 1 (U1): manipulator + track · Unit 2 (U2): pre-aligner · Unit 3 (U3): unused · Unit 4 (U4): unused	Data Name	Extension	Position data	U1pos.dat	U2pos.dat	U3pos.dat	U4pos.dat	Parameters		Common parameter	Unit parameters	COMprm.dat	U1prm.dat	U2prm.dat	U3prm.dat	NX servo parameter	U4prm.dat	allprm.bin
Data Name	Extension																				
Position data	U1pos.dat																				
	U2pos.dat																				
	U3pos.dat																				
	U4pos.dat																				
Parameters																					
	Common parameter																				
Unit parameters	COMprm.dat																				
	U1prm.dat																				
	U2prm.dat																				
	U3prm.dat																				
NX servo parameter	U4prm.dat																				
	allprm.bin																				
3	Turn OFF the power supply from host system. Turn OFF the air supply as well.	Carry out the process of Hazardous Energies Isolation referring to steps 1 to 8 of " 10.6 Hazardous Energies Isolation Procedure " in this instruction manual.																			
4	Turn OFF the switch (SW1) on the NXC100 controller.																				

No.	Procedure	Note	Illustration
5	Disconnect all cables from the NXC100 controller front and back panels. Remove the NXC100 controller from frame of the host system.		Front  Back 
6	Attach the new NXC100 controller (Controller Kit) to frame of the host system. Connect all cables to the NXC100 controller.		
7	Remove all LockOut/TagOut. Turn ON the switch(SW1) on the NXC100. Turn ON the Power supply from the host system.	Carry out the process of the Hazardous Energies Isolation referring to steps 9 to 13 of "10.6 Hazardous Energies Isolation Procedure" in this instruction manual.	
8	The initial teaching pendant screen displays the version number of the NXC100 software. Check if the version number is the same or later version compared to the one kept on record in the step 1.	Refer to "NXC100 OPERATOR'S MANUAL FOR TEACHING PENDANT". If the software version is different, perform operations in "12.2.11 Restoring the NXC100 Controller".	Initial screen of the teaching pendant  Software version
9	Use the Data Upload/Download PC.*1 to download the data uploaded in the step 2 to the NXC100 controller.	Refer to "12.2 Data Upload/Download Procedure". *1 Refer to "12.2.1 Preparation Before the Parts Replacement". When downloading the data, follow the correct order as shown in the right column. Downloading the data in an incorrect order may damage the data, causing malfunction when starting the NXC100 controller.	Data downloading sequence (1) Common parameter ↓ "COMprm.dat" (2) NXC servo parameter ↓ "allprm.dat" (3) Unit parameters ↓ "U1prm.dat" "U2prm.dat" "U3prm.dat" "U4prm.dat" (4) Position data ↓ "U1pos.dat" "U2pos.dat" "U3pos.dat" "U4pos.dat"



Perform the operation in "12.2.12 Detecting the Absolute Linear Scale Magnet Pole" when using the system with a track of the XU-ACT series (XU-ACT1010) which is equipped with linear scale.

12.2 Data Upload/Download Procedure

12.2.1 Preparation Before the Parts Replacement

No.	Part Name	Part Number	Qty. per Unit	Remarks
1	Dummy connector for teaching pendant (X81)	HB0480289	1	Set the NXC100 controller to HOST mode
2	Data Upload/Download PC		1	Personal computer in which the tool software for the NXC100 controller maintenance is installed. For the installation method, refer to "NXC100 Maintenance Tool Operation Manual".
3	Ethernet cable		1	Crossing cable



Set the Ethernet communication protocol of the personal computer as follows.

- **IP address: 10.0.0.3**
- **Subnet mask: 255.255.255.0 (default ^{*1})**

***1:** When the parameters of the NXC100 controller are different from the default value, the IP address and the Subnet mask are different.

Check the NXC100 controller parameter. Refer to "NXC100 Standard Teaching Pendant Instruction" and "NXC100 Standard Error Code Table".

- NXC100 controller parameter
 - IU0020-0023: Ethernet IP address: 0 (default)
 - IU0025-0028: Ethernet Subnet mask: 0 (default)
 - IU0030-0033: Ethernet default gateway: 0 (default)
- The IP address of the NXC100 controller
 - IP address: 10.0.0.2 (default)

Check the initial settings of the tool software for the NXC100 controller maintenance. Refer to "NXC100 Maintenance Tool Operation Manual".



CAUTION

- **The operation must be performed by licensee.**

Failure to observe this caution may result in electric shock or injury.

- **Before conducting maintenance, inspection, or wiring, turn OFF all supplied power (including the compressed air) to the robotic system, lock the switch in the "OFF" position, and put up a warning sign, such as "DO NOT TURN ON THE POWER".**
- **The robotic system does not have the switches for turning OFF the power. Turn OFF the switches in the host system to which the robotic system is connected.**

Failure to observe this caution may result in electric shock or injury.

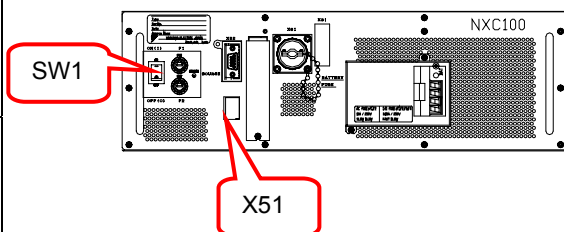
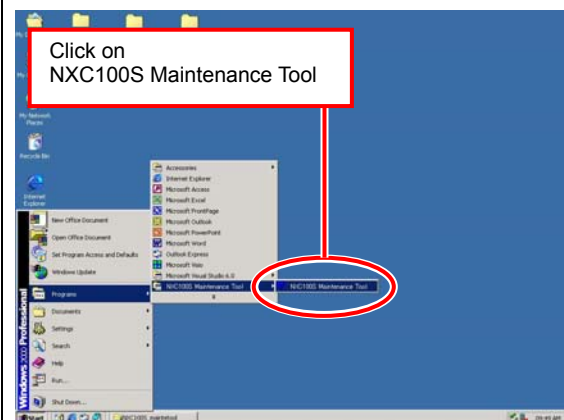
- **Be sure not to cut cables or air tubes when cutting off cable ties.**

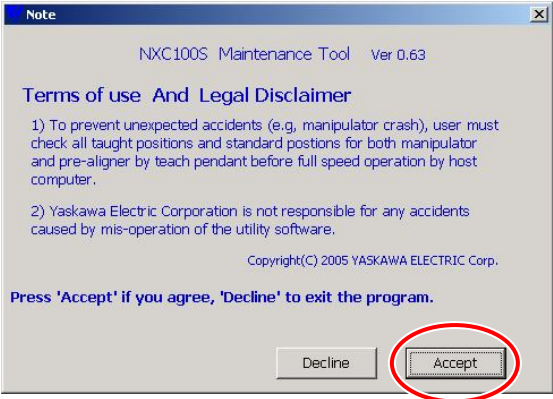
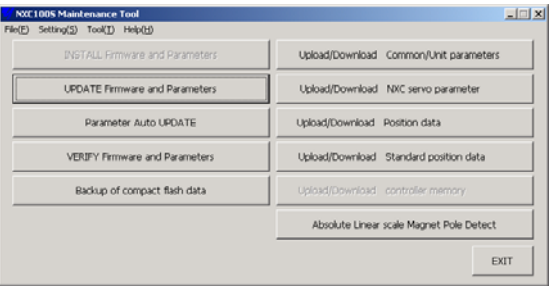
Failure to observe this caution may result in electric shock or injury.

12.2.2 Operation After the Parts Replacement

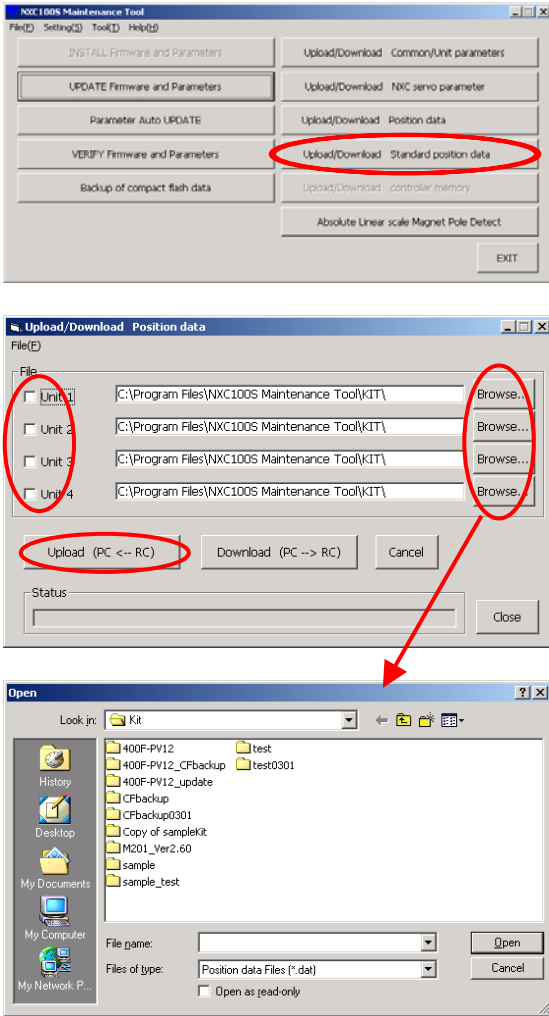
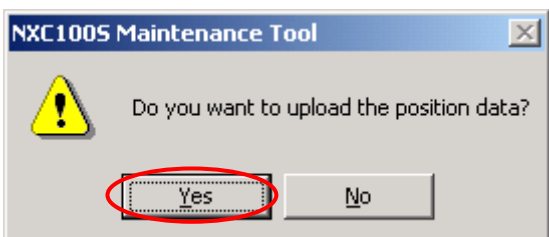
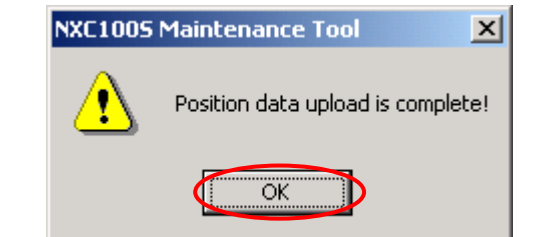
No.	Items	Remarks
1	Confirmation of the NXC100 controller LED status	Refer to "6.1 Turning ON the NXC100 controller Power Supply"

12.2.3 Activating the Maintenance Tool Software

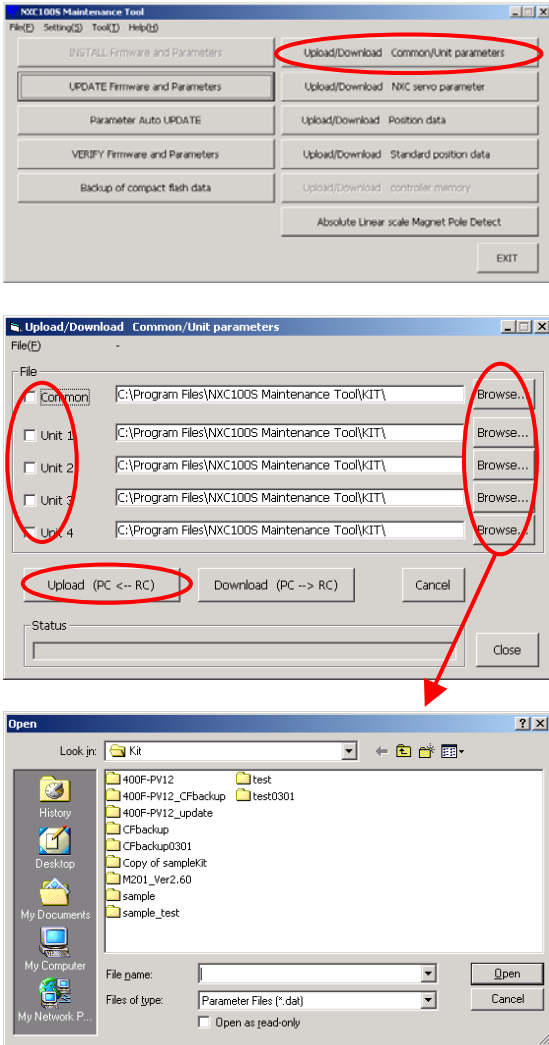
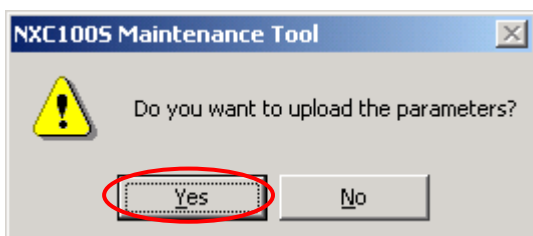
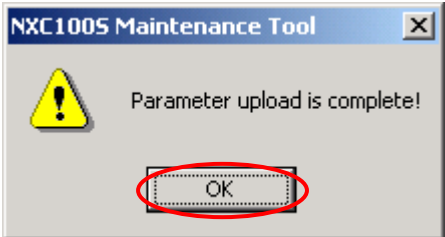
No.	Procedure	Note	Illustration
1	Turn OFF the power supply from host system. Turn OFF the air supply.	Carry out the process of Hazardous Energies Isolation referring to steps <u>1 to 8</u> of " 10.6 Hazardous Energies Isolation Procedure " in this instruction manual.	
2	Turn OFF the switch (SW1) on the NXC100 controller.		
3	Connect the Data Upload/Download PC*1 to the connector X51 on the NXC100 controller as shown on the right.	*1 Refer to "12.2.1 Preparation Before the Parts Replacement".	
4	Remove all LockOut/TagOut. Turn on the switch (SW1) on the NXC100 controller. Turn on the Power supply from the host system.	Carry out the process of the Hazardous Energies Isolation referring to steps <u>9 to 13</u> of " 10.6 Hazardous Energies Isolation Procedure " in this instruction manual.	
5	Open the NXC100S Maintenance Tool application. Click the "Start" button, then click "Programs". From the menu list, select " NXC100S Maintenance Tool ", then click on " NXC100S Maintenance Tool ".		

No.	Procedure	Note	Illustration
6	The NXC100S Maintenance Tool application will appear as shown on the right column. Click on "Accept" button.		
7	The menu window appears as shown right.		

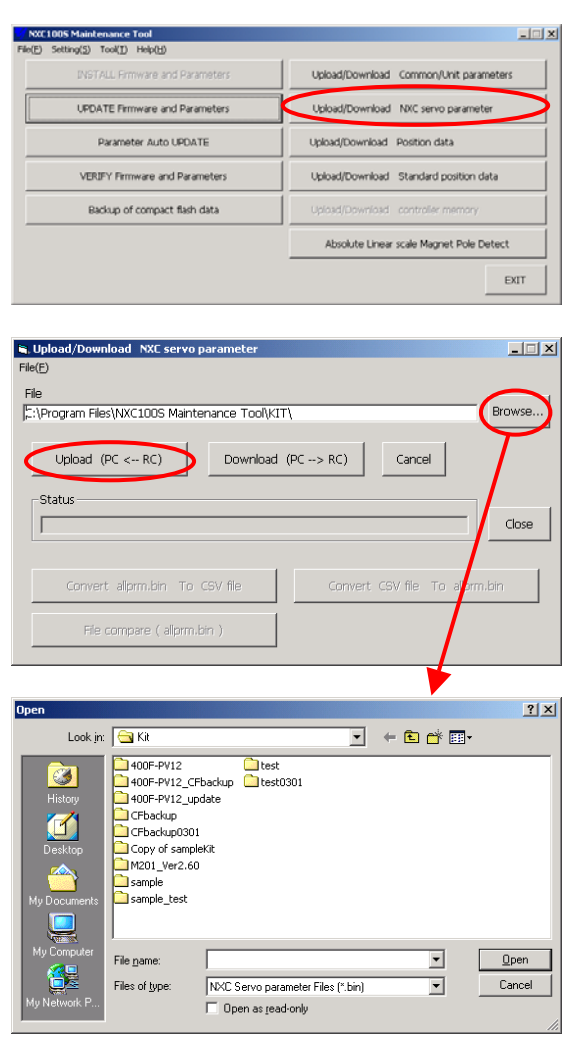
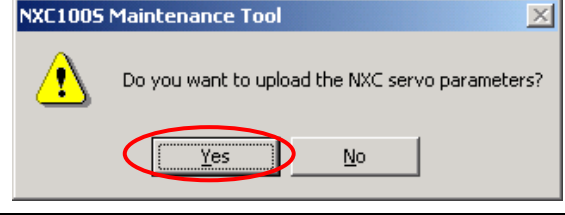
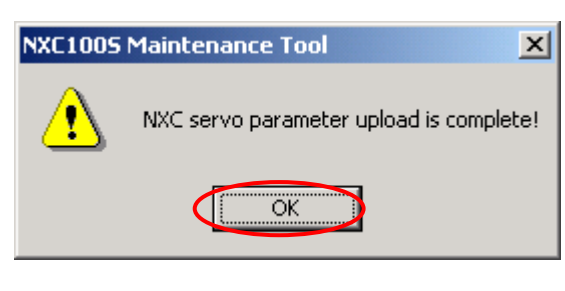
12.2.4 Uploading the Position Data

No.	Procedure	Note	Illustration
1	(1) Click on the "Upload/Download Standard position data" button. (2) Click on the "Browse" button. Locate and select the folder which contains the desired data to store. (3) Enter the file name. (4) Check the box and click on the "Upload (PC <-- RC)" button.	Recommended file names are as follows: UNIT1: U1POS UNIT2: U2POS UNIT3: U3POS UNIT4: U4POS	
2	A confirmation dialog box appears as shown on the right column. Select "Yes" to upload the position data (from RC to PC).		
3	When the position data upload is completed, a confirmation dialog box appears as shown on the right column. Click the "OK" button; then click the "Close" button on the bottom right of the "Upload/Download Position data" dialog box.		

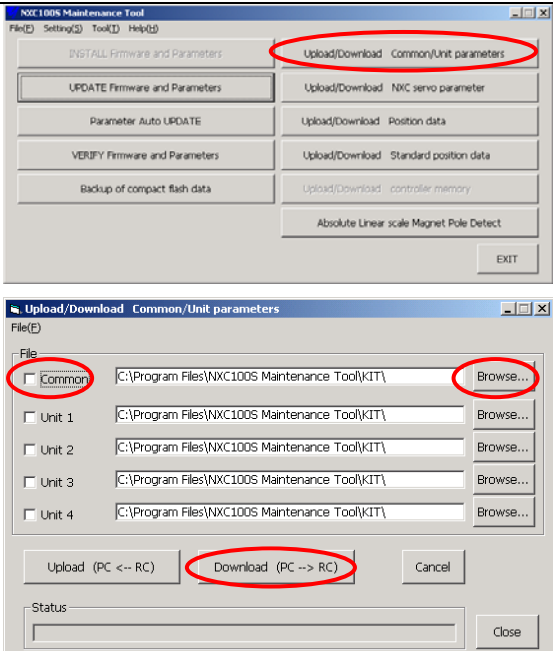
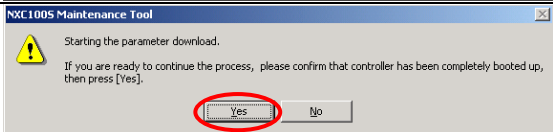
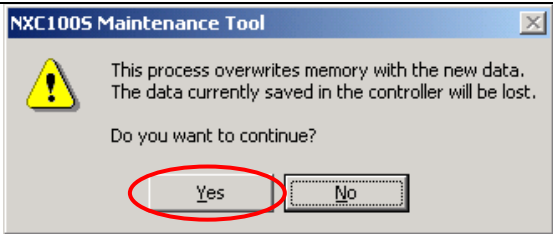
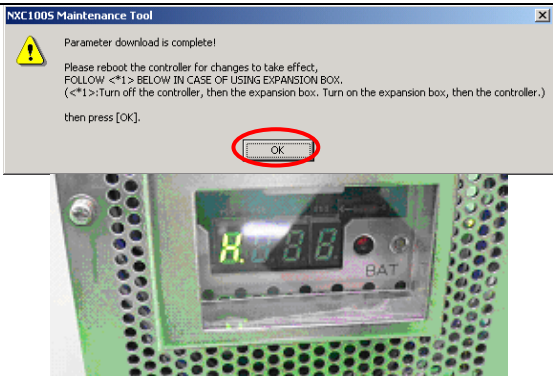
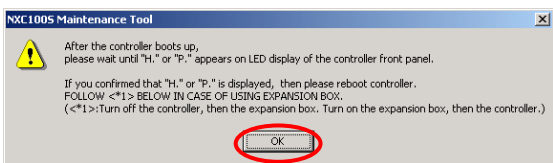
12.2.5 Uploading the Common/Unit Parameters

No.	Procedure	Note	Illustration
1	(1) Click on the "Upload/Download Common/Unit parameters" button. (2) Click on the "Browse" button. Locate and select the folder which contains the desired data to store. (3) Enter the file name. (4) Check the box and click on the "Upload (PC <-- RC)" button.	Recommended file names are as follows: COMMON: COMPRM UNIT1: U1PRM UNIT2: U2PRM UNIT3: U3PRM UNIT4: U4PRM	
2	A confirmation dialog box appears as shown on the right column. Select "Yes" to upload the parameters (from RC to PC).		
3	When the parameter upload is completed, a confirmation dialog box appears as shown on the right column. Click the "OK" button; then click the "Close" button on the bottom right of the "Upload/Download Common/Unit parameters" dialog box.		

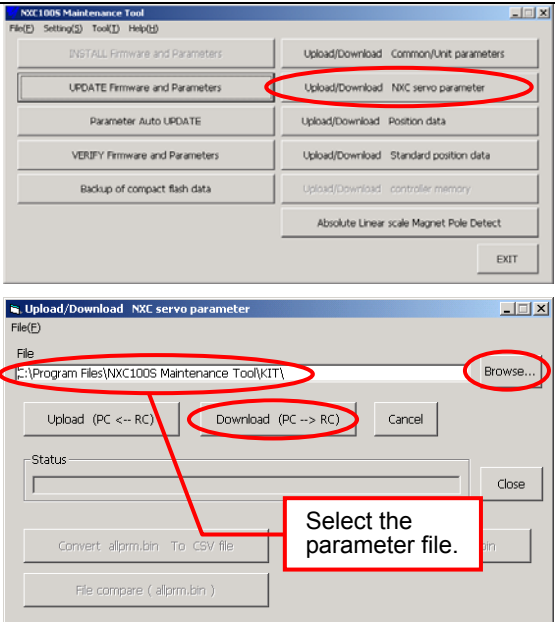
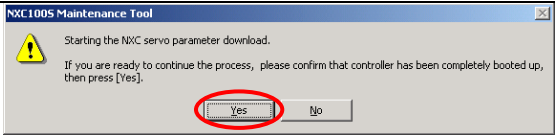
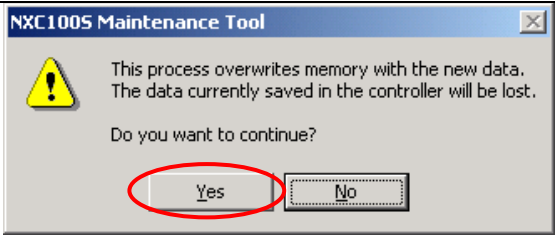
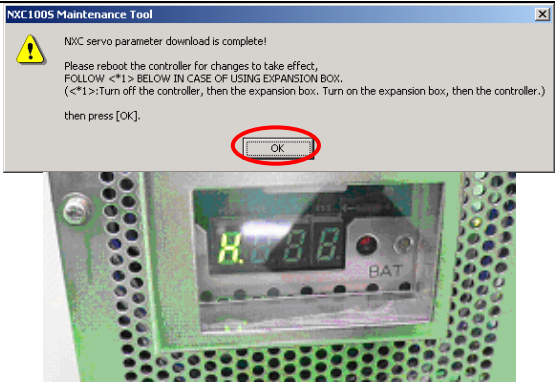
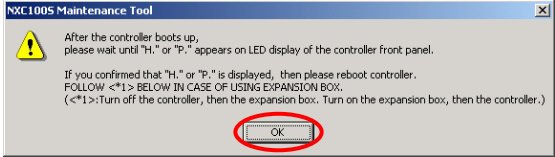
12.2.6 Uploading the NXC Servo Parameter

No.	Procedure	Note	Illustration
1	(1) Click on the "Upload/Download NXC servo parameter" button. (2) Click on the "Browse" button. Locate and select the folder which contains the desired data to store. (3) Enter the file name. (4) Click on the "Upload (PC <-- RC)" button.	Recommended file name is "ALLPRM".	 The illustration shows three sequential screenshots. The first is the 'NXC100S Maintenance Tool' main window, where the 'Upload/Download NXC servo parameter' button is circled in red. The second is the 'Upload/Download NXC servo parameter' dialog box, where the 'Upload (PC <-- RC)' button and the 'Browse...' button are circled in red. A red arrow points from the 'Browse...' button to the third screenshot, which is a Windows File Explorer window showing a folder named 'Kit' selected, with various files and subfolders listed.
2	A confirmation dialog box appears as shown on the right column. Select "Yes" to upload the NXC servo parameter (from RC to PC).		 The screenshot shows a confirmation dialog box titled 'NXC100S Maintenance Tool' with a yellow warning icon. The text asks 'Do you want to upload the NXC servo parameters?'. The 'Yes' button is circled in red.
3	When the NXC servo parameter upload is completed, a confirmation dialog box appears as shown on the right column. Click the "OK" button; then click the "Close" button on the bottom right of the "Upload/Download NXC servo parameter" dialog box.		 The screenshot shows a confirmation dialog box titled 'NXC100S Maintenance Tool' with a yellow warning icon. The text states 'NXC servo parameter upload is complete!'. The 'OK' button is circled in red.

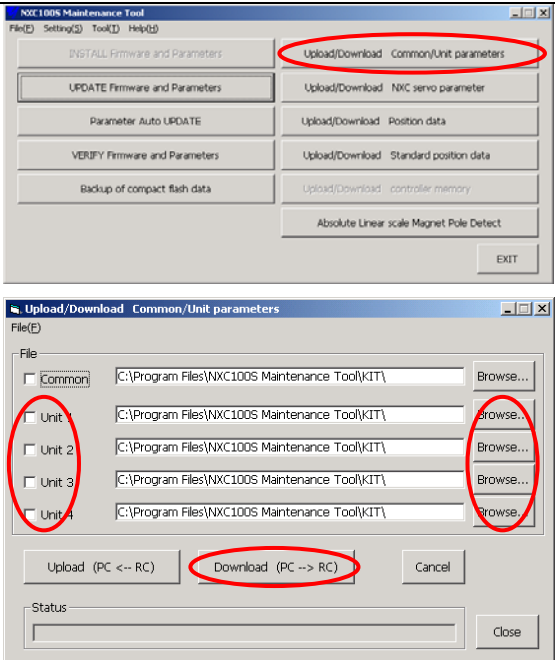
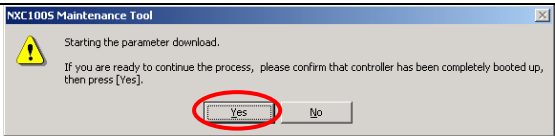
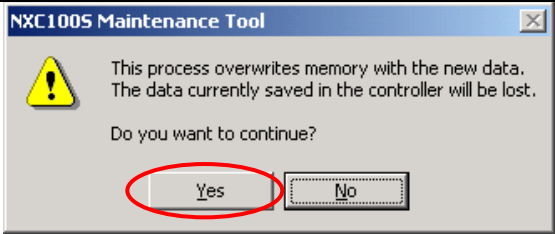
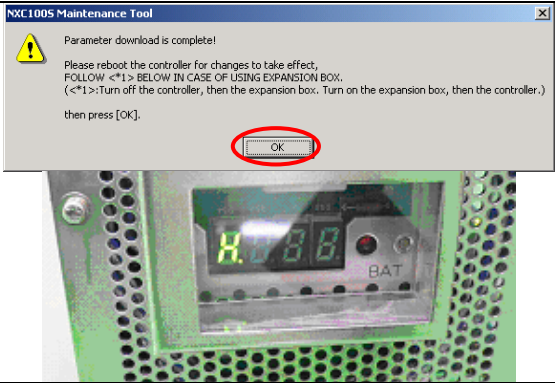
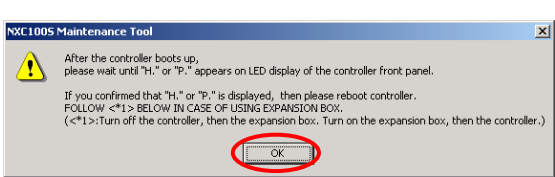
12.2.7 Downloading the Common Parameters

No.	Procedure	Note	Illustration
1	(1) Click on the "Upload/Download Common/Unit parameters" button. (2) Click on the "Browse" button. Locate and select the common parameter file. (3) Check the box and click on the "Download (PC --> RC)" button.	Use the file name uploaded in "12.2.5 Uploading the Common/Unit parameters". Example COM: COMPRM.DAT	
2	A dialog box appears; check the content and select "Yes".		
3	Check the content of the dialog box and select "Yes". The parameter download starts.		
4	When the parameter download is completed, a confirmation dialog box appears as shown on the right column. Turn OFF the controller power, then turn it ON again. Click "OK" when the LED on the controller displays "H".		
5	Turn OFF the controller power, then turn it ON again. When the controller starts, click the "OK" button; then click the "Close" button on the bottom right of the "Upload/Download Common/Unit parameters" dialog box.		

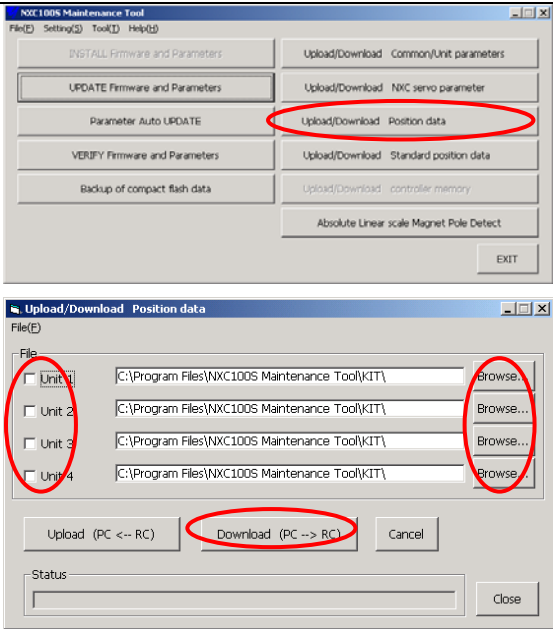
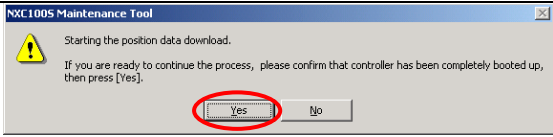
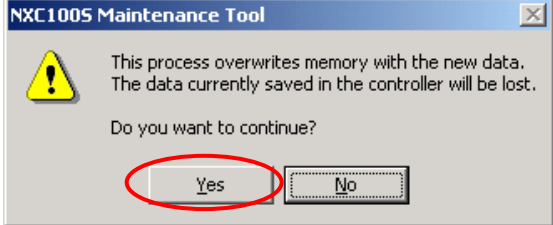
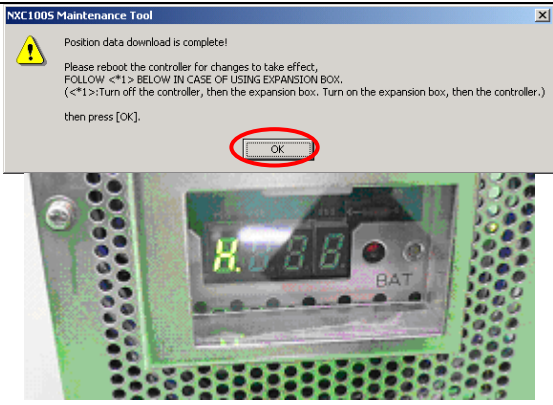
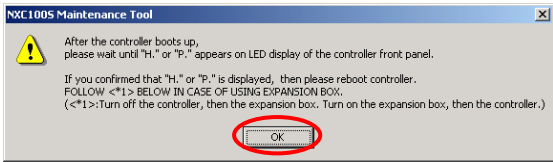
12.2.8 Downloading the NXC Servo Parameter

No.	Procedure	Note	Illustration
1	(1) Click on the "Upload/Download NXC servo parameter" button. (2) Click on the "Browse" button. Locate and select the parameter file. (3) Click on the "Download (PC --> RC)" button.	Use the file name uploaded in "12.2.6 Uploading the NXC Servo Parameter". Example File name: ALLPRM.BIN	
2	A dialog box appears; check the content and select "Yes".		
3	Check the content of the dialog box and select "Yes". The parameter download starts.		
4	When the parameter download is completed, a confirmation dialog box appears as shown on the right column. Turn OFF the controller power, then turn it ON again. Click "OK" when the LED on the controller displays "H".		
5	Turn OFF the controller power, then turn it ON again. When the controller starts, click the "OK" button; then click the "Close" button on the bottom right of the "Upload/Download NXC servo parameter" dialog box.		

12.2.9 Downloading the Unit Parameter

No.	Procedure	Note	Illustration
1	(1) Click on the "Upload/Download Common/Unit parameters" button. (2) Click on the "Browse" button. Locate and select the unit parameter file. (3) Check the box and click on the "Download (PC --> RC)" button.	Use the file name uploaded in "12.2.5 Uploading the Common/Unit parameters". Example U1: U1PRM.DAT U2: U2PRM.DAT U3: U3PRM.DAT U4: U4PRM.DAT	
2	A dialog box appears; check the content and select "Yes".		
3	Check the content of the dialog box and select "Yes". The parameter download starts.		
4	When the parameter download is completed, a confirmation dialog box appears as shown on the right column. Turn OFF the controller power, then turn it ON again. Click "OK" when the LED on the controller displays "H".		
5	Turn OFF the controller power, then turn it ON again. When the controller starts, click the "OK" button; then click the "Close" button on the bottom right of the "Upload/Download Common/Unit parameters" dialog box.		

12.2.10 Downloading the Position Data

No.	Procedure	Note	Illustration
1	(1) Click on the "Upload/Download Position data" button. (2) Click on the "Browse" button. Locate and select the position data file. (3) Check the box and click on the "Download (PC --> RC)" button.	Use the file name uploaded in "12.2.4 Uploading the Position Data". Example U1 pos data: U1POS.DAT U2 pos data: U2POS.DAT U3 pos data: U3POS.DAT U4 pos data: U4POS.DAT	
2	A dialog box appears; check the content and select "Yes".		
3	Check the content of the dialog box and select "Yes". The parameter download starts.		
4	When the parameter download is completed, a confirmation dialog box appears as shown on the right column. Turn OFF the controller power, then turn it ON again. Click "OK" when the LED on the controller displays "H".		
5	Turn OFF the controller power, then turn it ON again. When the controller starts, click the "OK" button; then click the "Close" button on the bottom right of the "Upload/Download Common/Unit parameters" dialog box.		

12.2.11 Restoring the NXC100 Controller



The procedures in this section "12.2.11 Restoring the NXC100 Controller" is to be performed in premise of the conditions listed below. If this operation is performed under different conditions, the NXC100 controller may not be restored. Contact your Yaskawa representative if the NXC100 controller cannot be restored.

- The NXC100 backup data has been prepared.

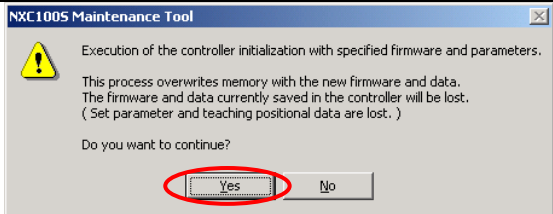
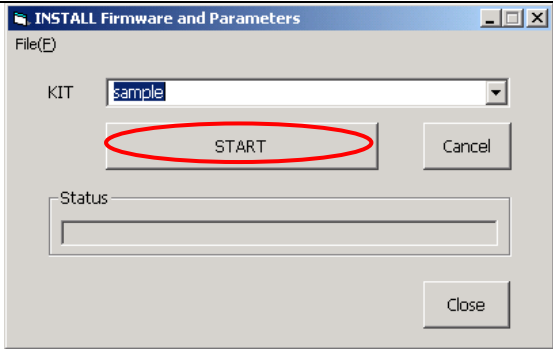
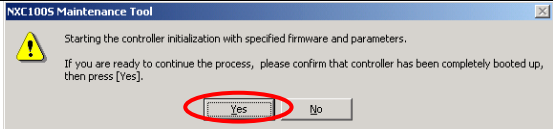
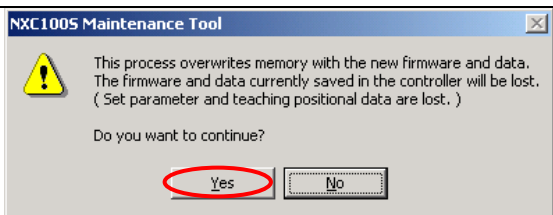
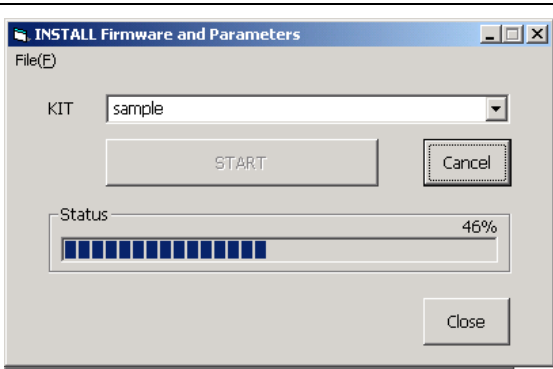
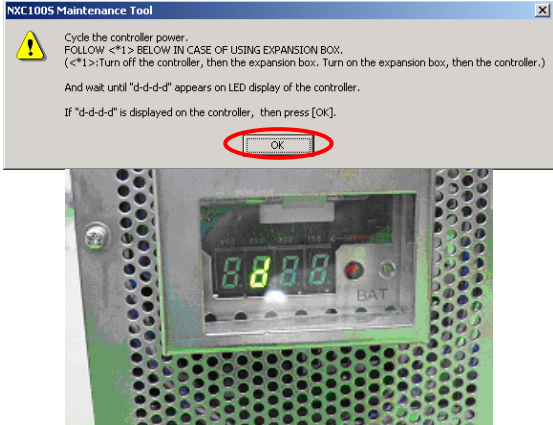
- The LAN properly functions.

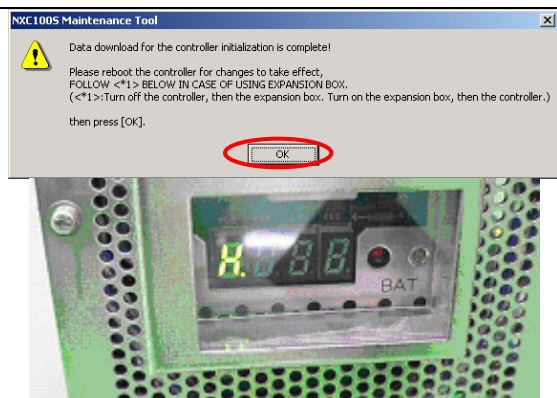
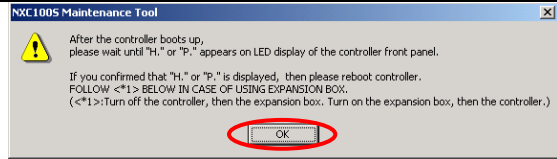
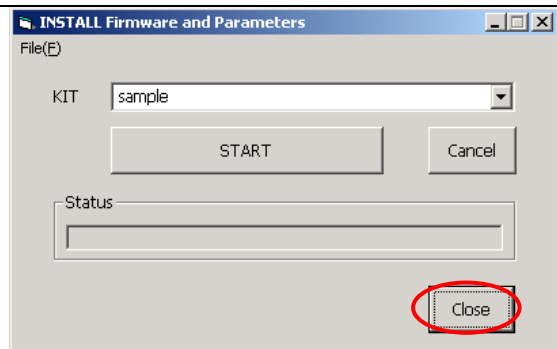
The 7-segment LED displays "1.000", with the dot "." blinks every 1 second. Refer to "6.1 Turning ON the NXC100 Controller Power Supply" for details.

If the LED displays other contents, contact your Yaskawa representative.

- The customer obtains and keeps the maintenance tool and the product KIT file (data).
To obtain the maintenance tool and the product KIT file (data), contact your Yaskawa representative.

No.	Procedure	Note	Illustration
1	From the top menu of the NXC100S Maintenance Tool dialog box, select "Setting(S)" - "Operation Mode Setting" - "ENGINEER mode".		
2	A password entry dialog box appears as shown on the right column. Enter the password and press "OK".	Password: yaskawa (One-byte lowercase letters)	
3	Press "OK" to set the mode to the engineer mode.		
4	Click on the "INSTALL Firmware and Parameters" button.		

No.	Procedure	Note	Illustration
5	Click "Yes".		
6	Select the KIT to be setup, and press the "START" button.	Copy the desired file into the following folder beforehand: c:\Program Files\ Maintenance Tool\Kit	
7	Check the content of the dialog box and select "Yes".		
8	Check the content of the dialog box and select "Yes".		
9	The execution status screen appears as shown on the right column, and the LAN transmission starts.		
10	A confirmation dialog box appears as shown on the right column. Turn OFF the controller power, then turn it ON again. When the LED on the NXC100 controller displays "d-d-d-d", press "OK" on the dialog box. The NXC100 controller starts setup operation.		

No.	Procedure	Note	Illustration
11	When the setup operation is completed, a confirmation dialog box appears as shown on the right column. Turn OFF the controller power, then turn it ON again. Click "OK" when the LED on the controller displays "H".		
12	A confirmation dialog box appears as shown on the right column. Turn OFF the controller power, then turn it ON again. When the NXC100 controller restarts, click "OK".		
13	Click on the "Close" button on the bottom right of the execution status screen to terminate the setup operation.		



After completing the setup operation in accordance with "12.2.11 Restoring the NXC100 Controller", download the data following the procedures in sections "12.2.7 Downloading the Common Parameters" to "12.2.10 Downloading the Position Data".
The data for downloading shall be the backup data prepared before restoring the controller.

12.2.12 Detecting the Absolute Linear Scale Magnet Pole



Perform the operation in this section when using the system with the TLxxxxS series track which is equipped with linear scale.

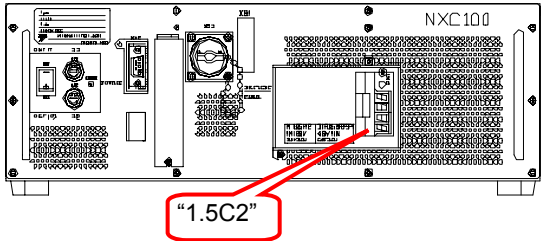
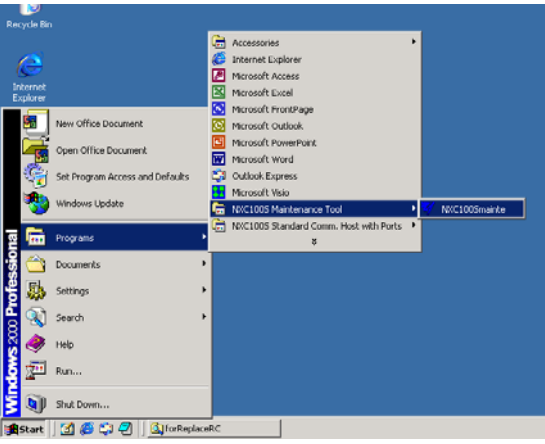
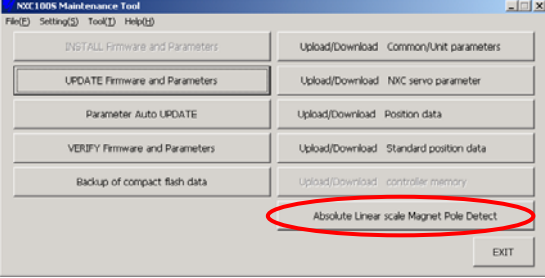
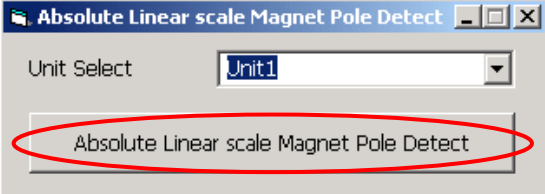
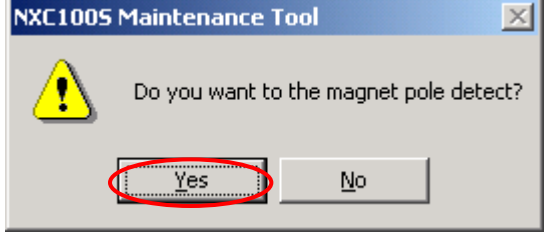
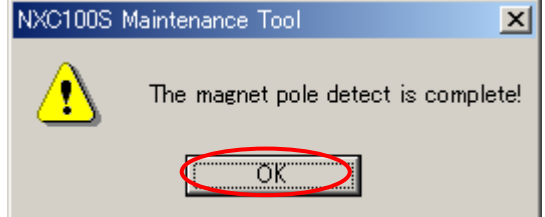


MANDATORY

- **Make sure to perform operation to detect the magnet pole of absolute linear scale.**

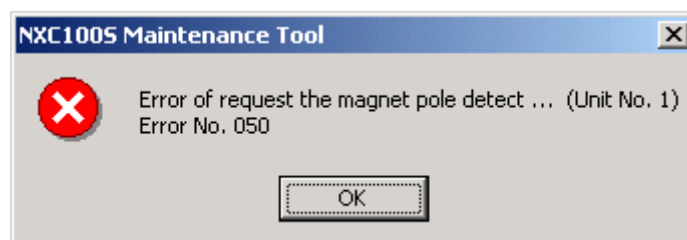
Failure to observe this instruction may result in malfunction.
Contact your Yaskawa representative if you have any questions.

No.	Procedure	Note	Illustration
1	Replace the NXC100 controller following the procedure in "12.1 Replacing Controller Kit".	Verify the software configuration. Perform operation referring to "12.2.11 Restoring the NXC100 Controller".	
2	Turn OFF the power supply from host system. Turn OFF the compressed air supply.	Carry out the process of Hazardous Energies Isolation referring to steps 1 to 8 of " 10.6 Hazardous Energies Isolation Procedure " in this instruction manual.	
3	Turn OFF the switch (SW1) on the NXC100 controller.		
4	Connect the teaching pendant to the NXC100 controller, and set the mode to "TEACH".		
5	Remove all LockOut/TagOut. Turn ON the switch(SW1) on the NXC100.	Carry out the process of the Hazardous Energies Isolation referring to steps 9 to 13 of " 10.6 Hazardous Energies Isolation Procedure " in this instruction manual.	

No.	Procedure	Note	Illustration
6	When the NXC100 controller starts, the 7-segment LED on its front panel displays an error "1.5C2: phase false detection".		
7	Start the software for uploading/downloading data "NXC100S Maintenance Tool".	Perform steps 5 to 7 of "12.2.3 Activating the Maintenance Tool Software" in this manual.	
8	Click on the "Absolute Linear scale magnet Pole Detect" button.		
9	Select "Unit1" for the Unit Select. Press the "Absolute Linear scale Magnet Pole Detect" button.		
10	Select "Yes".	Note: The manipulator and track jiggle; therefore, perform the operation from outside the range of their motions.	
11	Click on the "OK" button.	Note: The NXC100 controller obtains information on position and phase from the linear scale.	

No.	Procedure	Note	Illustration
12	Turn OFF the switch (SW1) on the NXC100 controller.		
13	Turn ON the switch (SW1) on the NXC100 controller.		
14	Check the track operation using the teaching pendant.	Perform “JOG operation” and “HOME positioning operation” referring to “6 Testing” in this manual.	

Re-executing the magnet pole detection function after completing detection in the step 11 causes a detection request error as shown below; however, you may proceed to the step 12.



For operation of the teaching pendant, refer to “NXC100 Standard Teaching Pendant Instruction”.

12.3 Replacing Controller Fan Kit (DIA40)

12.3.1 Preparation Before the Parts Replacement

No.	Part Name	Part Number	Qty. per Unit	Remarks
1	Controller Fan Kit	HB0480354 HB0480711 (For RoHS)	1	DIA40
2	Philips screwdriver	-	1	Size: P.2
3	Spanner	-	1	Size: 7 mm



CAUTION

- **This replacement work must be performed by licensee.**

Failure to observe this caution may result in electric shock or injury.

- **Before conducting maintenance, inspection, or wiring, turn OFF all supplied power (including the compressed air) to the robotic system, lock the switch in the "OFF" position, and put up a warning sign, such as "DO NOT TURN ON THE POWER".**
- **The robotic system does not have the switches for turning OFF the power. Turn OFF the switches in the host system to which the robotic system is connected.**

Failure to observe this caution may result in electric shock or injury.

- **Be sure not to cut cables or air tubes when cutting off cable ties.**

Failure to observe this caution may result in electric shock or injury.

- **Carry out the process of the Hazardous Energies Isolation before replacement.**

For details, refer to " 10.6 Hazardous Energies Isolation Procedure ".

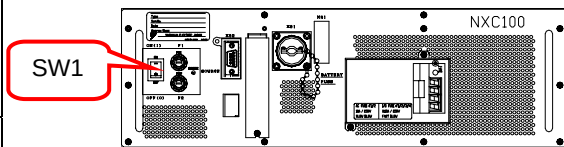
- **Turn OFF the power, perform LockOut/TagOut operations in the "OFF" position, and wait for 5 minutes before operation. Do not open the NXC100 controller panel during this period.**

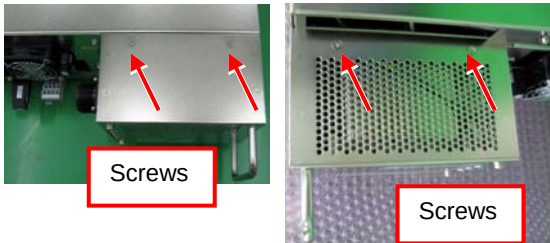
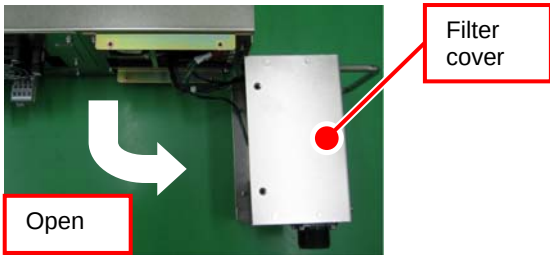
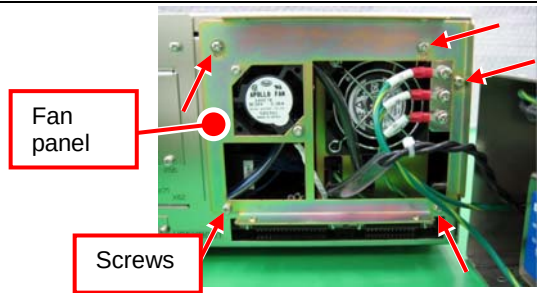
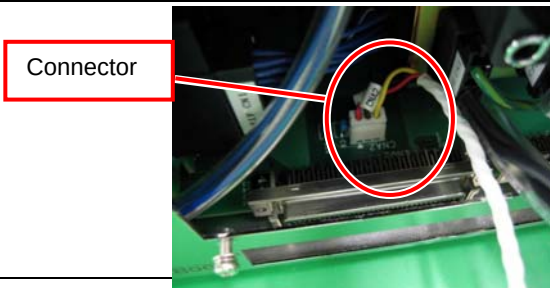
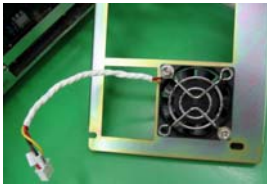
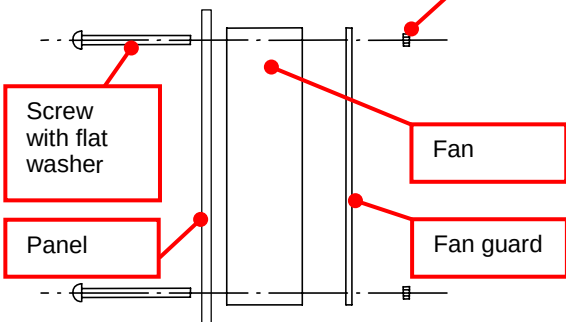
Failure to observe this caution may result in electric shock.

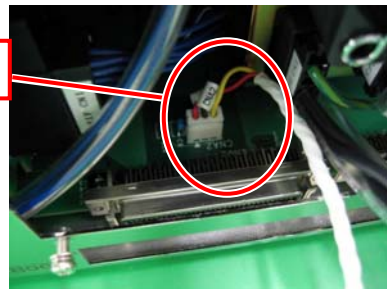
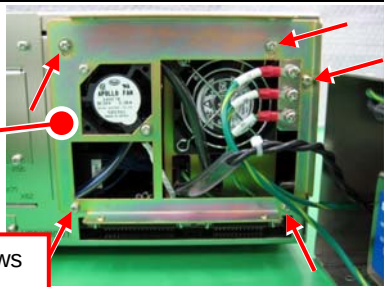
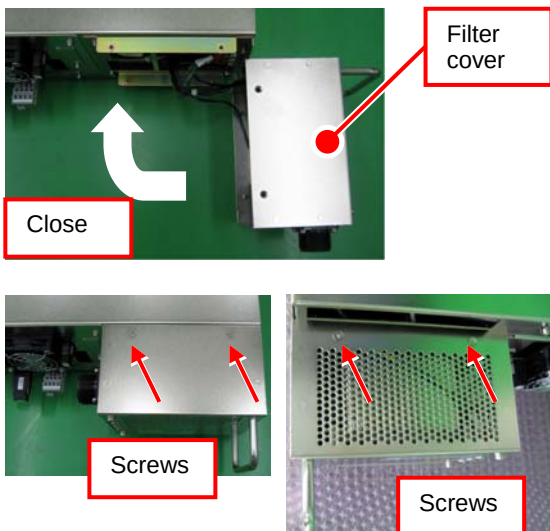
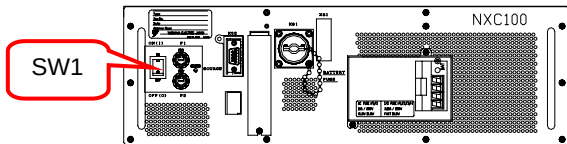
12.3.2 Operation After the Parts Replacement

No.	Items	Remarks
1	Confirmation of the NXC100 controller LED status	Refer to "6.1 Turning ON the NXC100 controller Power Supply".
2	Controller fan inspection	Refer to "10.8.5 Cooling Fan Inspection".

12.3.3 Replacement Procedure

Item	Procedure	Note	Illustration
1	Turn OFF the power supply from host system. Turn OFF the compressed air supply.	Carry out the process of Hazardous Energies Isolation referring to steps 1 to 8 of " 10.6 Hazardous Energies Isolation Procedure " in this instruction manual.	
2	Turn OFF the switch (SW1) on the NXC100 controller.		
3	Disconnect all cables from the NXC100 controller front and back panels and remove the NXC100 controller from frame of the host system.		FRONT  BACK 

Item	Procedure	Note	Illustration
4	Remove the filter cover on the back panel. Screws: screw M3, 6 pieces		 
5	Remove the fan panel on the back panel. Screws: screw M3, 5 pieces		
6	Remove the connector. Do not strongly pull the cable.		
7	Remove the fan guards from the back panel and remove the fan. Screws: M3 x 2 pieces		 

Item	Procedure	Note	Illustration
8	Place the new fan (controller fan kit) and connect the connector for fan.		 Connector
9	Attach the fan panel on the back panel. Screws: screw M3, 5 pieces		 Fan panel Screws
10	Attach the filter cover on the back panel. Screws: screw M3, 4 pieces		 Filter cover Close Screws Screws
11	Attach the NXC100 controller to frame of the host system. Connect all cables to the NXC100 controller.		
12	Remove all LockOut/TagOut. Turn ON the switch(SW1) on the NXC100. Turn on the Power supply from the host system.	Carry out the process of the Hazardous Energies Isolation referring to steps 9 to 13 of " 10.6 Hazardous Energies Isolation Procedure " in this instruction manual.	 SW1 NXC100

12.4 Replacing Controller Fan Kit (DIA60)

12.4.1 Preparation before the Parts Replacement

No.	Part Name	Part Number	Qty. per Unit	Remarks
1	Controller Fan Kit	HB0480355 HB0480712 (For RoHS)	1	DIA60
2	Philips screwdriver	-	1	Size: P.2



CAUTION

- **This replacement work must be performed by licensee.**

Failure to observe this caution may result in electric shock or injury.

- **Before conducting maintenance, inspection, or wiring, turn OFF all supplied power (including the compressed air) to the robotic system, lock the switch in the "OFF" position, and put up a warning sign, such as "DO NOT TURN ON THE POWER".**
- **The robotic system does not have the switches for turning OFF the power. Turn OFF the switches in the host system to which the robotic system is connected.**

Failure to observe this caution may result in electric shock or injury.

- **Be sure not to cut cables or air tubes when cutting off cable ties.**

Failure to observe this caution may result in electric shock or injury.

- **Carry out the process of the Hazardous Energies Isolation before replacement.**

For details, refer to " 10.6 Hazardous Energies Isolation Procedure ".

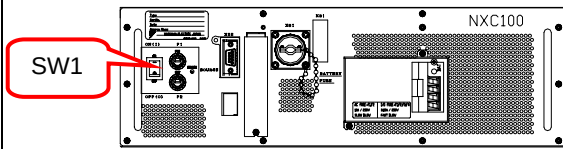
- **Turn OFF the power, perform LockOut/TagOut operations in the "OFF" position, and wait for 5 minutes before operation. Do not open the NXC100 controller panel during this period.**

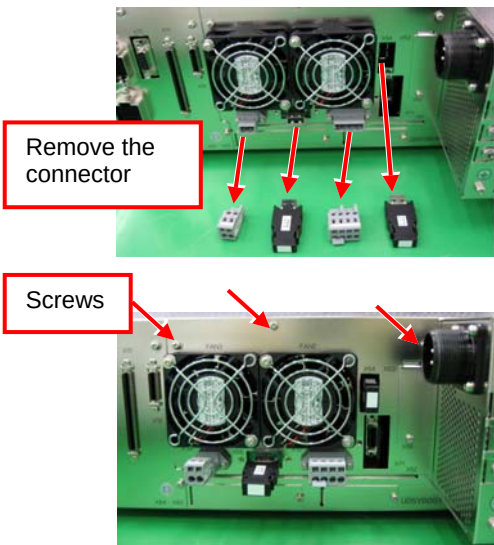
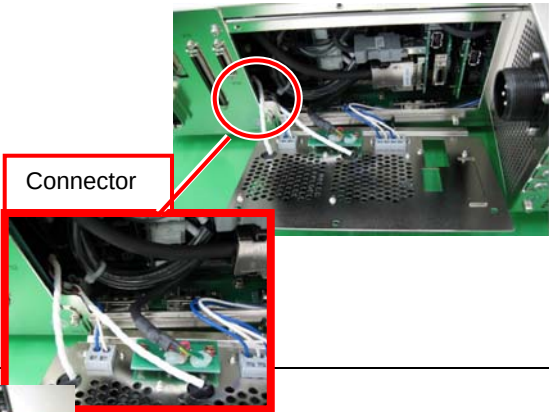
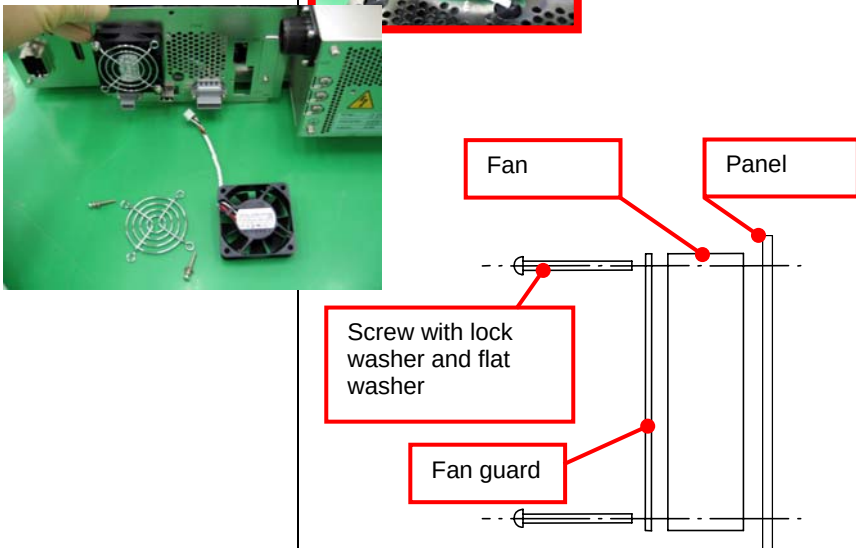
Failure to observe this caution may result in electric shock.

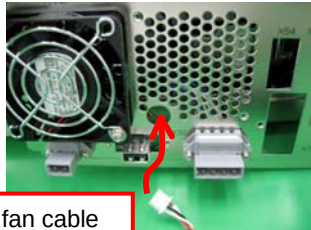
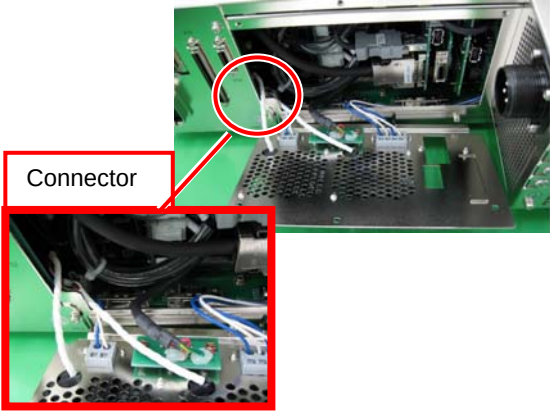
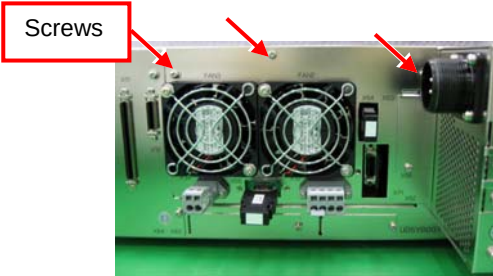
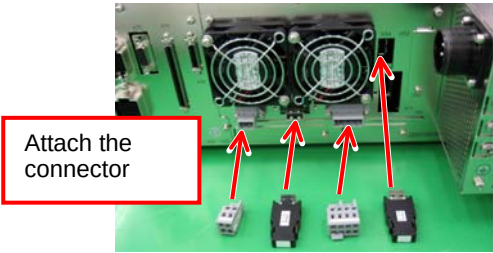
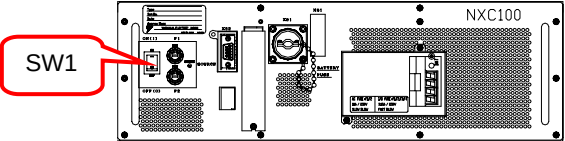
12.4.2 Operation After the Parts Replacement

No.	Items	Remarks
1	Confirmation of the NXC100 controller LED status	Refer to "6.1 Turning ON the NXC100 controller Power Supply".
2	Controller fan inspection	Refer to "10.8.5 Cooling Fan Inspection".

12.4.3 Replacement Procedure

Item	Procedure	Note	Illustration
1	Turn OFF the power supply from host system. Turn OFF the compressed air supply.	Carry out the process of Hazardous Energies Isolation referring to steps 1 to 8 of " 10.6 Hazardous Energies Isolation Procedure " in this instruction manual.	
2	Turn OFF the switch (SW1) on the NXC100 controller.		
3	Disconnect all cables from the NXC100 controller front and back panels and remove the NXC100 controller from frame of the host system.		FRONT  BACK 

Item	Procedure	Note	Illustration
4	Remove the connector on the back panel. - X32, X34, X54, X56 Remove the fan cover on the back panel. Screws: screw M3, 3 pieces		
5	Remove the connector. Do not strongly pull the cable.		
6	Remove the fan guards from the back panel and remove the fan. Screws: screw M3, 2 pieces		

Item	Procedure	Note	Illustration
7	Place the new fan (controller fan kit) and connect the connector for fan.		 
8	Attach the fan panel on the back panel. Screws: screw M3, 3 pieces Attach the connector on the back panel. - X32, X34, X54, X56		 
9	Attach the NXC100 controller to frame of the host system. Connect all cables to the NXC100 controller.		
10	Remove all LockOut/TagOut. Turn ON the switch(SW1) on the NXC100. Turn ON the Power supply from the host system.	Carry out the process of the Hazardous Energies Isolation referring to steps 9 to 13 of " 10.6 Hazardous Energies Isolation Procedure " in this instruction manual.	

12.5 Replacing AC Fuse (F1, F2)

12.5.1 Preparation Before the Parts Replacement

No.	Part Name	Part Number	Qty. per Unit	Remarks
1	Fuse Kit	HB0480169 HB0480713 (For RoHS)	1	AC fuse (F1, F2): 10 A, 250 V, fast-acting type, 25 fuses/kit



CAUTION

- **This replacement work must be performed by licensee.**

Failure to observe this caution may result in electric shock or injury.

- **Before conducting maintenance, inspection, or wiring, turn OFF all supplied power (including the compressed air) to the robotic system, lock the switch in the "OFF" position, and put up a warning sign, such as "DO NOT TURN ON THE POWER".**
- **The robotic system does not have the switches for turning OFF the power. Turn OFF the switches in the host system to which the robotic system is connected.**

Failure to observe this caution may result in electric shock or injury.

- **Be sure not to cut cables or air tubes when cutting off cable ties.**

Failure to observe this caution may result in electric shock or injury.

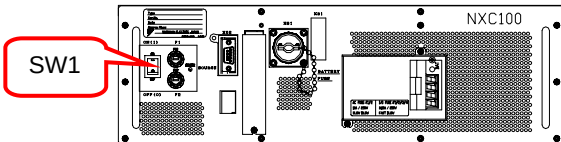
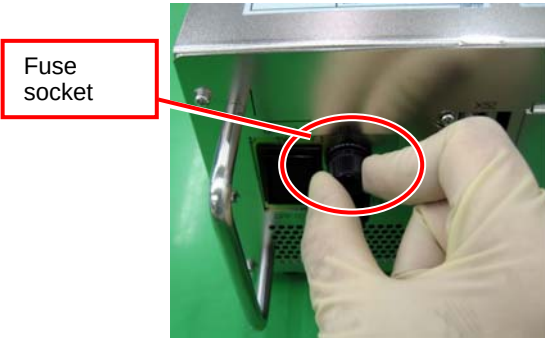
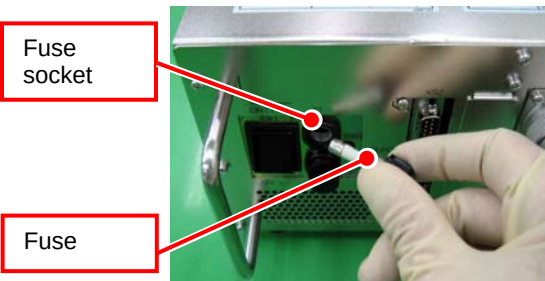
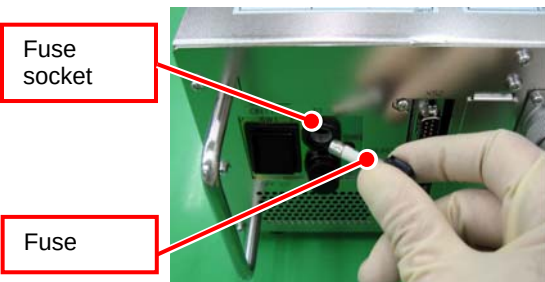
- **Carry out the process of the Hazardous Energies Isolation before replacement.**

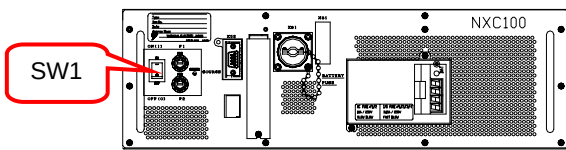
For details, refer to " 10.6 Hazardous Energies Isolation Procedure ".

12.5.2 Operation After the Parts Replacement

No.	Items	Remarks
1	Confirmation of the NXC100 controller LED status	Refer to "6.1 Turning ON the NXC100 Controller Power Supply"

12.5.3 Replacement Procedure

Item	Procedure	Note	Illustration
1	Turn OFF the power supply from host system. Turn OFF the air supply.	Carry out the process of Hazardous Energies Isolation referring to steps 1 to 8 of " 10.6 Hazardous Energies Isolation Procedure " in this instruction manual.	
2	Turn OFF the switch (SW1) on the NXC100 controller.		 SW1
3	Remove the fuse socket.		 Fuse socket
4	Take out the fuse from the fuse socket.		 Fuse socket Fuse
5	Replace the fuse.		 Fuse socket New fuse
6	Set the fuse socket to the panel.		 Fuse socket Fuse

Item	Procedure	Note	Illustration
7	Remove all LockOut/TagOut. Turn ON the switch(SW1) on the NXC100. Turn ON the power supply from the host system.	Carry out the process of the Hazardous Energies Isolation referring to steps 9 to 13 of " 10.6 Hazardous Energies Isolation Procedure " in this instruction manual.	

12.6 Replacing I/O Fuse (F1, F2, F3, F4)

12.6.1 Preparation Before the Parts Replacement

No.	Part Name	Part Number	Qty. per Unit	Remarks
1	Fuse Kit	HB0480169 HB0480713 (For RoHS)	1	I/O fuse (F1, F2, F3, F4): 3.15 A, 250 V, fast-acting type, 25 fuses/kit
2	Philips Screwdriver	-	1	Size: P.2



CAUTION

- **This replacement work must be performed by licensee.**

Failure to observe this instruction may result in electric shock or injury.

- **Before conducting maintenance, inspection, or wiring, turn OFF all supplied power (including the compressed air) to the robotic system, lock the switch in the "OFF" position, and put up a warning sign, such as "DO NOT TURN ON THE POWER".**
- **The robotic system does not have the switches for turning OFF the power. Turn OFF the switches in the host system to which the robotic system is connected.**

Failure to observe this instruction may result in electric shock or injury.

- **Be sure not to cut cables or air tubes when cutting off cable ties.**

Failure to observe this instruction may result in electric shock or injury.

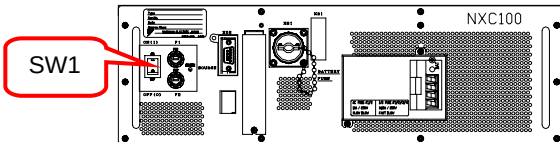
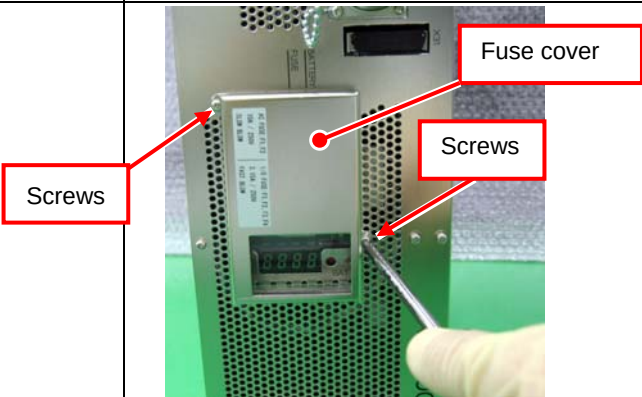
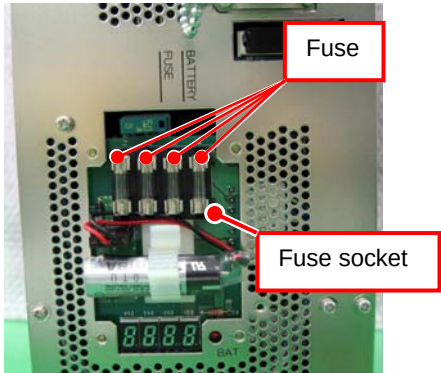
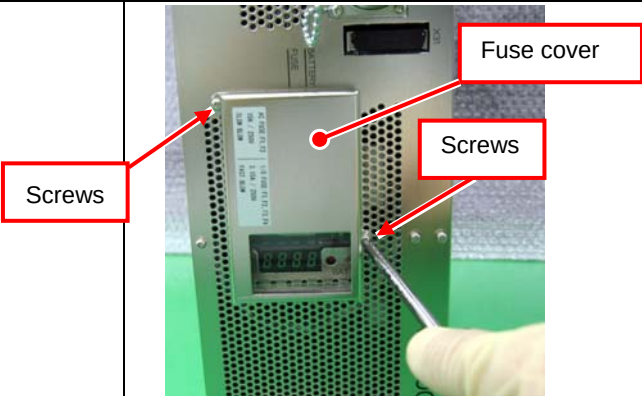
- **Carry out the process of the Hazardous Energies Isolation before replacement.**

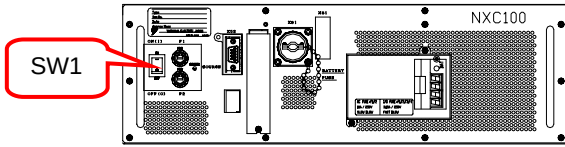
For details, refer to " 10.6 Hazardous Energies Isolation Procedure ".

12.6.2 Operation After the Parts Replacement

No.	Items	Remarks
1	Confirmation of the NXC100 controller LED status	Refer to "6.1 Turning ON the NXC100 controller Power Supply"

12.6.3 Replacement Procedure

Item	Procedure	Note	Illustration
1	Turn OFF the power supply from host system. Turn OFF the air supply.	Carry out the process of Hazardous Energies Isolation referring to steps 1 to 8 of " 10.6 Hazardous Energies Isolation Procedure " in this instruction manual.	
2	Turn OFF the switch (SW1) on the NXC100 controller.		 A schematic diagram of the NXC100 controller. A red box labeled 'SW1' points to a switch located on the left side of the unit, near the power input terminals.
3	Remove the fuse cover from the front of the NXC100 controller. Screws: screw M3, 2 pieces		 A photograph showing the front of the NXC100 controller. A person's gloved hand is using a screwdriver to remove two screws from the fuse cover. Red labels with arrows point to the 'Fuse cover' and the 'Screws' being removed.
4	Replace the fuse.		 A photograph showing the internal fuse compartment of the NXC100 controller. A red label points to the 'Fuse' being inserted into the 'Fuse socket'. Other labels point to the 'FUSE' and 'BATTERY' terminals.
5	Set the fuse cover to the front of the NXC100 controller. Screws: screw M3, 2 pieces		 A photograph showing the front of the NXC100 controller. A person's gloved hand is using a screwdriver to attach the fuse cover with two screws. Red labels with arrows point to the 'Fuse cover' and the 'Screws' being attached.

Item	Procedure	Note	Illustration
6	Remove all LockOut/TagOut. Turn ON the switch(SW1) on the NXC100. Turn ON the power supply from the host system.	Carry out the process of the Hazardous Energies Isolation referring to steps 9 to 13 of " 10.6 Hazardous Energies Isolation Procedure " in this instruction manual.	

12.7 Replacing Controller Battery Kit

12.7.1 Preparation Before the Parts Replacement

No.	Part Name	Part Number	Qty. per Unit	Remarks
1	Controller Battery Kit	HB0480170 HB0480715 (For RoHS)	1	
2	Philips Screwdriver	-	1	Size: P.2



CAUTION

- **This replacement work must be performed by licensee.**

Failure to observe this caution may result in electric shock or injury.

- **Before conducting maintenance, inspection, or wiring, turn OFF all supplied power (including the compressed air) to the robotic system, lock the switch in the "OFF" position, and put up a warning sign, such as "DO NOT TURN ON THE POWER".**

- **The robotic system does not have the switches for turning OFF the power. Turn OFF the switches in the host system to which the robotic system is connected.**

Failure to observe this caution may result in electric shock or injury.

- **Be sure not to cut cables or air tubes when cutting off cable ties.**

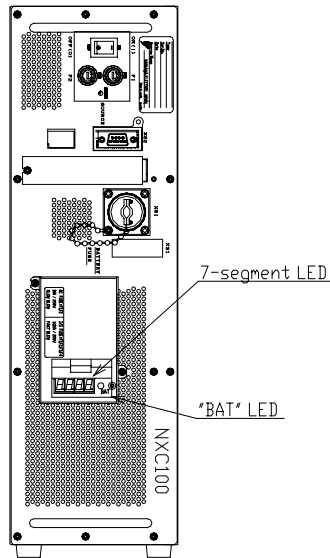
Failure to observe this caution may result in electric shock or injury.

- **Carry out the process of the Hazardous Energies Isolation before replacement.**

For details, refer to " 10.6 Hazardous Energies Isolation Procedure ".

- **Battery is Lithium type.**
When disposing of Battery, follow the applicable national/local laws and regulations.

Type: Lithium battery

NOTE

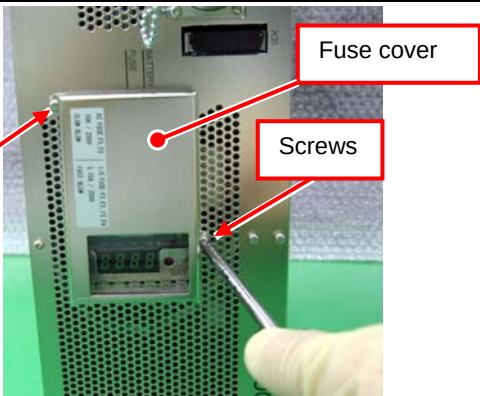
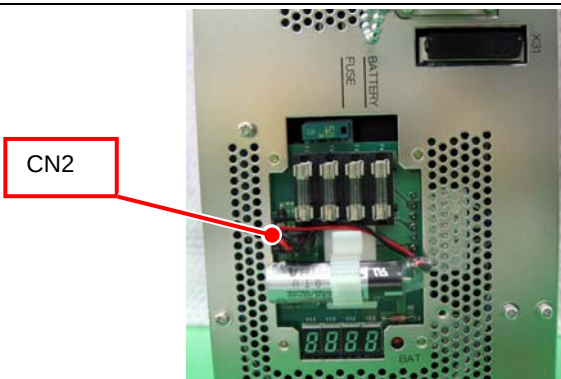
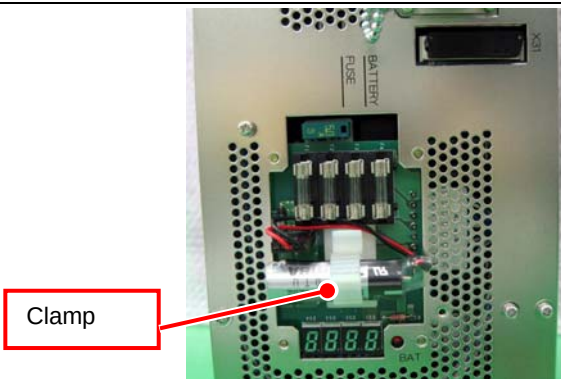
The data on the memory are kept by the battery and the capacitor.
 When the energy inside the battery disappears, “BAT” LED lights up during the operation and the 7-segment LED indicates “A4F.”
 Supply the electric power for more than thirty minutes before turning OFF the power supply to the NXC100 controller. It requires at least thirty minutes to charge the capacitor.

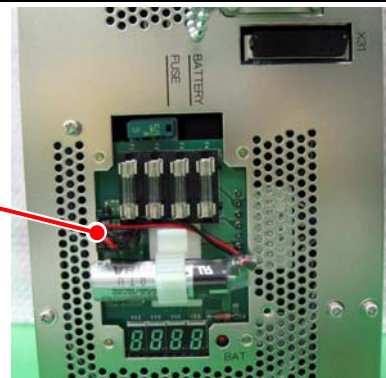
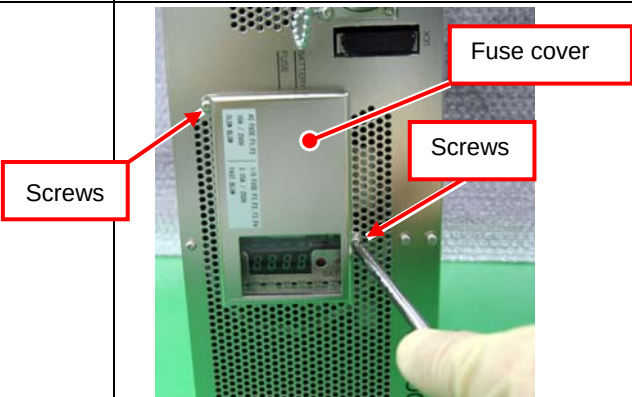
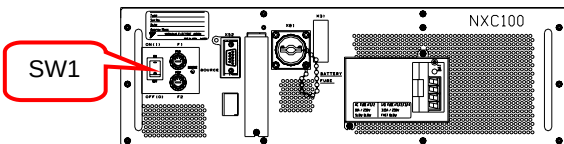
12.7.2 Operation After the Parts Replacement

No.	Items	Remarks
1	Confirmation of the NXC100 controller LED status	Refer to “6.1 Turning ON the NXC100 controller Power Supply”

12.7.3 Replacement Procedure

Item	Procedure	Note	Illustration
1	Turn OFF the power supply from host system. Turn OFF the air supply.	Carry out the process of Hazardous Energies Isolation referring to steps <u>1 to 8</u> of " 10.6 Hazardous Energies Isolation Procedure " in this instruction manual.	
2	Turn OFF the switch (SW1) on the NXC100 controller.		A schematic diagram of the NXC100 controller. A red box highlights a switch labeled 'SW1' on the left side of the board. The controller is labeled 'NXC100' at the bottom right.

Item	Procedure	Note	Illustration
3	Remove the fuse cover from the front of the NXC100 controller. Screws: screw M3, 2 pieces		
4	Disconnect the CN2 connector.		
5	Remove the battery from the clamp.		
6	Install the new battery (battery kit) on the clamp.		Battery Kit 

Item	Procedure	Note	Illustration
7	Connect the CN2 connector.		
8	Set the fuse cover to the front of the NXC100 controller. Screws: screw M3, 2 pieces		
9	Remove all LockOut/TagOut. Turn ON the switch(SW1) on the NXC100. Turn ON the power supply from the host system.	Carry out the process of the Hazardous Energies Isolation referring to steps 9 to 13 of " 10.6 Hazardous Energies Isolation Procedure " in this instruction manual.	

12.8 Replacing Brake Fuse

12.8.1 Preparation Before the Parts Replacement

No.	Part Name	Part Number	Qty. per Unit	Remarks
1	Brake Fuse Kit	HB0480209 HB0480714 (For RoHS)	1	Brake fuse, 25 fuses/kit
2	Philips screwdriver	-	1	Size: P.2



CAUTION

- **This replacement work must be performed by licensee.**

Failure to observe this caution may result in electric shock or injury.

- **Before conducting maintenance, inspection, or wiring, turn OFF all supplied power (including the compressed air) to the robotic system, lock the switch in the "OFF" position, and put up a warning sign, such as "DO NOT TURN ON THE POWER".**

- **The robotic system does not have the switches for turning OFF the power. Turn OFF the switches in the host system to which the robotic system is connected.**

Failure to observe this caution may result in electric shock or injury.

- **Be sure not to cut cables or air tubes when cutting off cable ties.**

Failure to observe this caution may result in electric shock or injury.

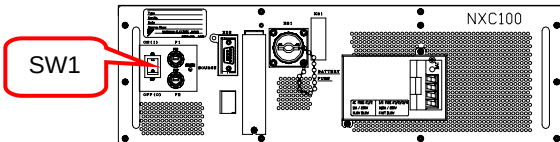
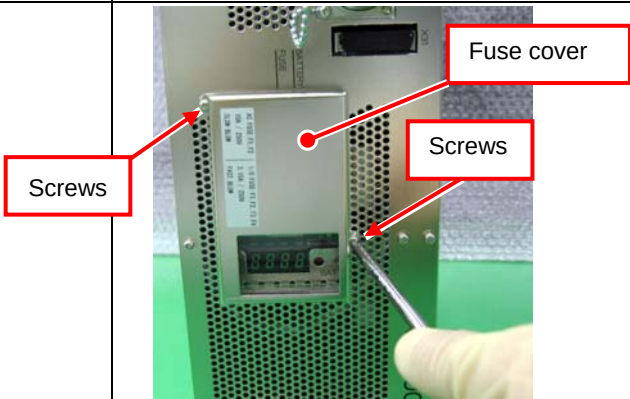
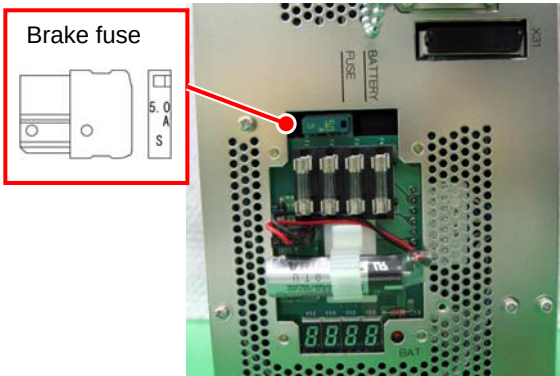
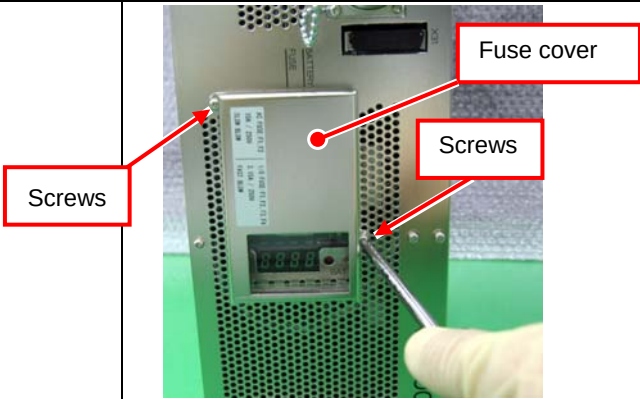
- **Carry out the process of the Hazardous Energies Isolation before replacement.**

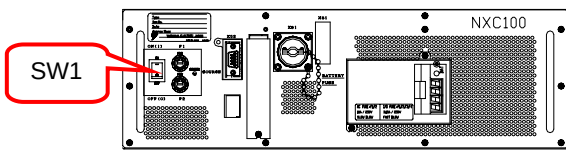
For details, refer to " 10.6 Hazardous Energies Isolation Procedure ".

12.8.2 Operation after the Parts Replacement

No.	Items	Remarks
1	Confirmation of the NXC100 controller LED status	Refer to "6.1 Turning ON the NXC100 controller Power Supply"

12.8.3 Replacement Procedure

Item	Procedure	Note	Illustration
1	Turn OFF the power supply from host system. Turn OFF the air supply.	Carry out the process of Hazardous Energies Isolation referring to steps 1 to 8 of " 10.6 Hazardous Energies Isolation Procedure " in this instruction manual.	
2	Turn OFF the switch (SW1) on the NXC100 controller.		 A schematic diagram of the NXC100 controller. A red box labeled 'SW1' points to a switch located on the left side of the unit, near the power input terminals.
3	Remove the fuse cover from the front of the NXC100 controller. Screws: screw M3, 2 pieces		 A photograph showing the front of the NXC100 controller. A hand is using a screwdriver to remove two screws from the fuse cover. Red labels 'Screws' point to the screws being removed, and 'Fuse cover' points to the cover itself.
4	Replace the fuse.		 A photograph of the fuse compartment. A red box labeled 'Brake fuse' points to a fuse being inserted into a slot. The fuse is labeled '5.0 A S'. The background shows the internal components of the controller, including a digital display showing '8888'.
5	Set the fuse cover to the front of the NXC100 controller. Screws: screw M3, 2 pieces		 A photograph showing the front of the NXC100 controller. A hand is using a screwdriver to attach the fuse cover with two screws. Red labels 'Screws' point to the screws being attached, and 'Fuse cover' points to the cover.

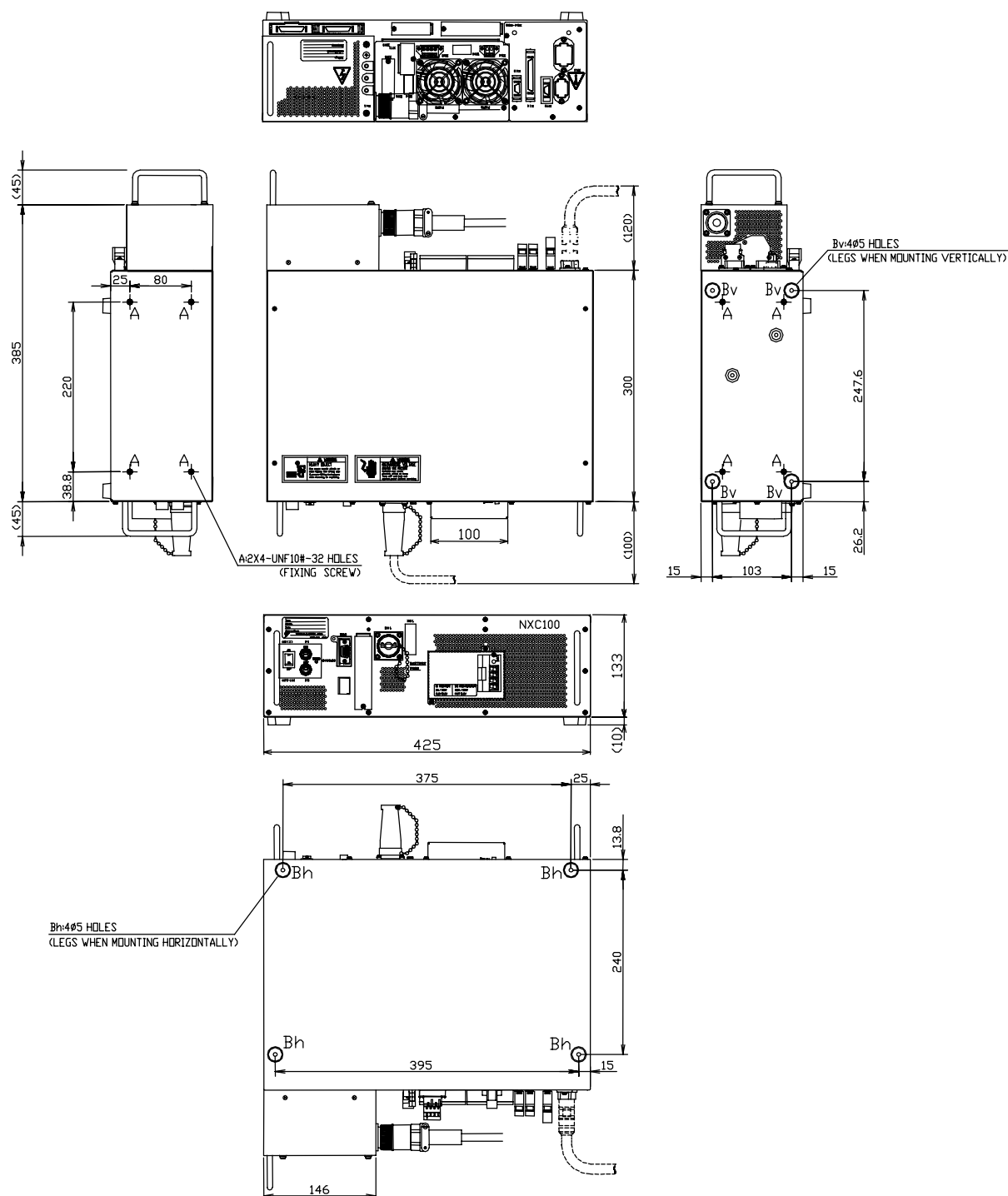
Item	Procedure	Note	Illustration
6	Remove all LockOut/TagOut. Turn ON the switch(SW1) on the NXC100. Turn ON the power supply from the host system.	Carry out the process of the Hazardous Energies Isolation referring to steps 9 to 13 of " 10.6 Hazardous Energies Isolation Procedure " in this instruction manual.	

13 Drawings

13.1 External Drawings

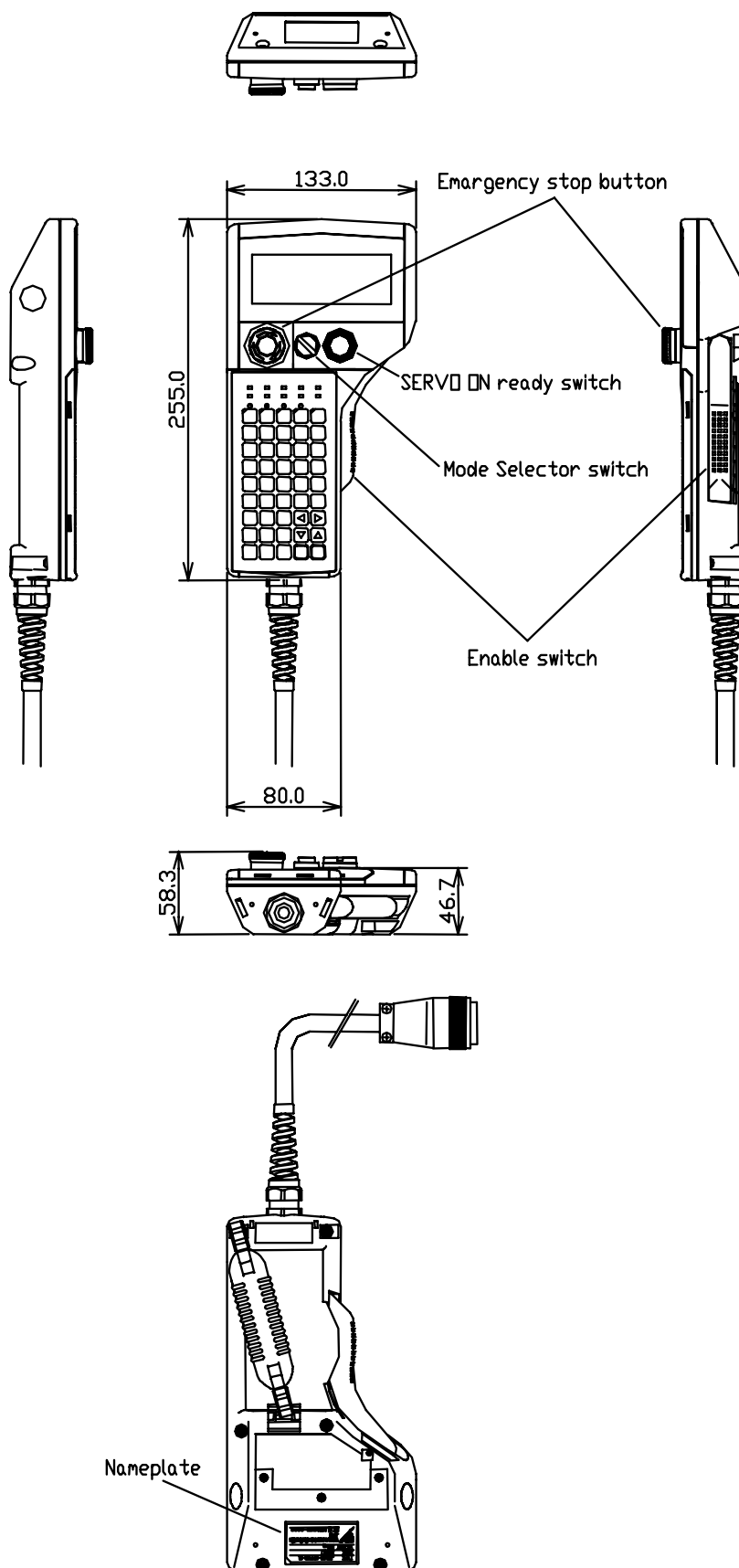
1. NXC100 Controller

Type: ERCR-NS01-B004, ERCR-NS01-B004-E1



2. Teaching Pendant

Type: JZRCR-NPP02-01, JZRCR-NPP02-01-E1



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NXC100 INSTRUCTIONS

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