The Americas YASKAWA Representative

- 24-hour Telephone Number: **(937) 847-3200**
  Use for urgent or emergency needs for technical support, service and/or replacement parts
- Routine Technical Inquiries: *techsupport@motoman.com*
  Allow up to 36 hours for response

YASKAWA

READ FIRST!!
SAFETY REQUIREMENTS

FOR: YRC1000, DX200, DX100, or NX100 CONTROLLER

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

Have the following information available when contacting the YASKAWA Representative:

- System
- Primary Application
- Software Version *(Located on Programming Pendant by selecting: {Main Menu} - {System Info} - {Version})*
- Warranty ID *(Located on Robot Controller)*
- Robot Serial Number *(Located on Manipulator data plate)*
- Robot Sales Order Number *(Located on Robot controller data plate)*

MANUAL NO.
179526-1CD ②

YASKAWA Representative Information

The following information is for a YASKAWA representative in America, for other locations refer to the back cover.

(937) 847-3200

For **routine** technical inquiries, you can also contact your local YASKAWA representative at the following e-mail address:

techsupport@motoman.com

When using e-mail to contact your local YASKAWA representative, please provide a detailed description of your issue, along with complete contact information. Please allow approximately 24 to 36 hours for a response to your inquiry.

Please have the following information ready before calling your local YASKAWA representative:

NOTICE

Please use e-mail for routine inquiries only. If you have an urgent or emergency need for service, replacement parts, or information, you must contact your local YASKAWA representative at the telephone number shown above or on the back cover.

- System _____
- Robots _____
- Positioner _____
- Primary Application _____
- Robot Controller _____

YRC1000, DX200, DX100, or NX100 Controller

- Software Version _____

Access this information on the Pendant's LCD display screen by selecting {MAIN MENU} - {SYSTEM INFO} - {VERSION}

- Robot Serial Number _____

Located on the Robot data plate

- Robot Sales Order Number _____

Located on the Robot Controller data plate

- Warranty ID: _____

Located on Controller

Registered Trademark

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www.motoman.com

Table of Contents

1 Safety

1.1 Summary of Safety Information

This manual provides help for users to establish safe conditions for operating the equipment. Specific considerations and precautions are also described in the manual, but appear in the form of Dangers, Warnings, Cautions, and Notes.

It is important that users operate the equipment in accordance with this instruction manual and any additional information which may be provided by YASKAWA. Address any questions regarding the safe and proper operation of the equipment to your YASKAWA representative.

DANGER

- Read this manual and other related documents carefully before installation, operation, maintenance, or inspection of the equipment.
- In YASKAWA manuals, Notes for Safe Operation are classified as “DANGER”, “WARNING”, “CAUTION”, or “NOTICE”.
- YASKAWA manuals may not sufficiently provide all the safety precautions.

For your safety, be sure to follow safety measures and management before operation.

CAUTION

- Drawing in YASKAWA manuals, may have protective covers or shields removed to show details.

Make sure that all the covers or shields are installed and in place before operating products.

- YASKAWA is not responsible for incidents arising from unauthorized modification of its products.

Unauthorized modification voids the product warranty.

NOTICE

- The drawings and photos in YASKAWA manuals are representative examples and differences may exist between them and the delivered product.
- YASKAWA may modify models without notice when necessary due to product improvements, modifications, or changes to specifications. If a modification is made, the manual number revision will be revised.
- If manuals are damaged or lost, contact a YASKAWA representative to order a new copy. Be sure to tell the representative the manual number listed on the front cover.

1.2 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, etc., 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.

1.3 Laws and Regulations

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.

DANGER

- Teaching operation and maintenance operation of the equipment must conform to:
  - Industrial Safety and Health Law
  - Order for Enforcement of the Industrial Safety and Health Law
  - Industrial Safety and Health Regulations
  - Technical Standards for Electrical Facilities

Other related laws and regulations are:

  - Occupational Safety and Health Act in USA
  - Factory Act (Gewerbeordnung) in Germany
  - Health and Safety at Work, etc. Act in UK
  - EC Machinery Directive 2006/42/EC
- Prepare
  - SAFETY WORK REGULATIONS

Based on concrete policies for safety management complying with related laws and regulations.

- Observe
  - JIS B 8433-1: 2015 "Robots for industrial environments-Safety requirements" (ISO 10218-1: 2011)
    for safe operation of the Robot. (JIS B 8433 is for Japan only)
- Reinforce the
  - SAFETY MANAGEMENT SYSTEM

By designating authorized operators and safety managers for the equipment, as well as giving continuing safety education and training.

- Teaching operation and maintenance operation of the equipment are specified as "Hazardous Operations" in the Industrial Safety and Health Act (for Japan only).

Personnel engaged in these operations must receive special training offered by YASKAWA.

CAUTION

- Do not use this equipment in residential environments.
  - This equipment is a compatible with EN 55011 (Group 1, Class A.)

This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

1.3.1 National Safety Standard Information

YASKAWA suggest obtaining and reviewing a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems (ANSI/RIA R15.06-2012). This document is available from the Association for Advancing Automation (A3) at:

Association for Advancing Automation
900 Victors Way
Suite 140
Ann Arbor, Michigan 48108
TEL: (734) 994-6088
FAX: (734) 994-3338
www.automate.org

Ultimately, well-trained personnel are the best safeguard against accidents and damage that can result from improper operation of equipment. The customer is responsible for providing adequately trained personnel to operate, program, and maintain the equipment. NEVER ALLOW UNTRAINED PERSONNEL TO OPERATE, PROGRAM, OR REPAIR THE EQUIPMENT!

1.4 Safety Signal Words

Read the included equipment manuals carefully before installing, operating, maintaining, or inspecting the included equipment.

In the included manuals, the Notes for Safe Operation are classified as “DANGER”, “WARNING”, “CAUTION”, or “NOTICE”.

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

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

Indicates a hazardous situation, which if not avoided, could result in minor or moderate injury. It may also be used without the safety alert symbol as an alternative to “NOTICE”.

NOTICE is the preferred signal word to address practices not related to personal injury. As an alternative to “NOTICE”, the word “CAUTION” without the safety alert symbol may be used to indicate a message not related to personal injury.

Even items described as “NOTICE” may result in a serious accident.

Make sure to follow these important items.

NOTICE

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

1.5 Special Training

DANGER

- Personnel engaged in operation, maintenance, or management of the equipment must receive required training before using the equipment.

For more information on training, contact your YASKAWA representative.

1.6 MOTOMAN Manual List

The MOTOMAN is a YASKAWA Industrial Robot product.

DANGER

- For safety, make sure to have the following manuals on hand, read them thoroughly and understand the contents.
  - Confirm that you have all the manuals on hand. If any of these manuals are missing, contact your YASKAWA representative.

Not reading and understanding the content completely included in the Manuals will result in death or serious injury.

Robot Controller	**YRC1000**	**DX200**	**DX100**	**NX100**
READ FIRST!!	*179208-1*	*170294-1*	*156797-1*	Not Applicable
Robot Controller Instruction Manual	*RE-CTO-A221*	*RE-CTO-A220*	*RE-CTO-A215*	*RE-CTO-A211*
Concurrent IO Manual	*RE-CKI-A467*	*RE-CKI-A465*	*RE-CKI-A453*	*RE-CKI-A442*
Robot Controller Maintenance Manual	*RE-CHO-A114*	*RE-CHO-A113*	*RE-CHO-A108*	*RE-CHO-A104*
Robot Controller Alarm Codes	*RE-CER-A600*	*Included in Robot Controller Maintenance Manual*	*Included in Robot Controller Maintenance Manual*	*Included in Robot Controller Maintenance Manual*
Manipulator Manuals (varies)				
Positioner Manuals (If included)				
Operator Manuals (Various by Robot Controller and application)				
OSHA's Lockout/Tagout Procedures (1910.147)				
Association for Advancing Automation (ANSI/RIA R15.06-2012)				

For equipment mounting guidelines refer to the installation section of the product manual. The installation section contains repulsion forces. Consult with a licensed civil engineer and anchor manufacturer concerning the strength and integrity of the floor and required anchors.

1.7 Definition of Terms Used Often in This Manual

The MOTOMAN Robot usually consists of a Manipulator (Robot), Robot Controller, Programming Pendant, and supply cables.

In this manual, the equipment is designated as follows unless the instructions is for a specific piece of equipment:

Equipment	Manual Designation
YRC1000, DX200, DX100, or NX100 Controller	Robot Controller
Programming Pendant or Smart Pendant	Pendant (optional)
Manipulator	Robot
Cable between the Robot and the Robot Controller	Robot Cable

1.7.1 Programming Pendant

Descriptions of the programming pendant keys, buttons, and displays are as follows:

Equipment		Manual Designation
Programming Pendant	Character Keys /Symbol Keys	The keys which have characters or symbols printed on them are denoted with [ ]. e.g. [ENTER]
	Axis Keys /Numeric Keys	[Axis Key] and [Numeric Key] are generic names for the keys for axis operation and number input.
	Keys pressed simultaneously	When two keys are to be pressed simultaneously, the keys are shown with a “+” sign between them, e.g. [SHIFT]+[COORD].
	Mode Switch	Mode Switch can select three kinds of modes that are denoted as follows: REMOTE, PLAY or TEACH. (The switch names are denoted as symbols)
	Button	The three buttons on the upper side of the programming pendant are denoted as follows: START, HOLD, or EMERGENCY STOP. (The button names are denoted as symbols)
	Displays	The menu displayed in the programming pendant is denoted with { }. e.g. {JOB}

NOTICE

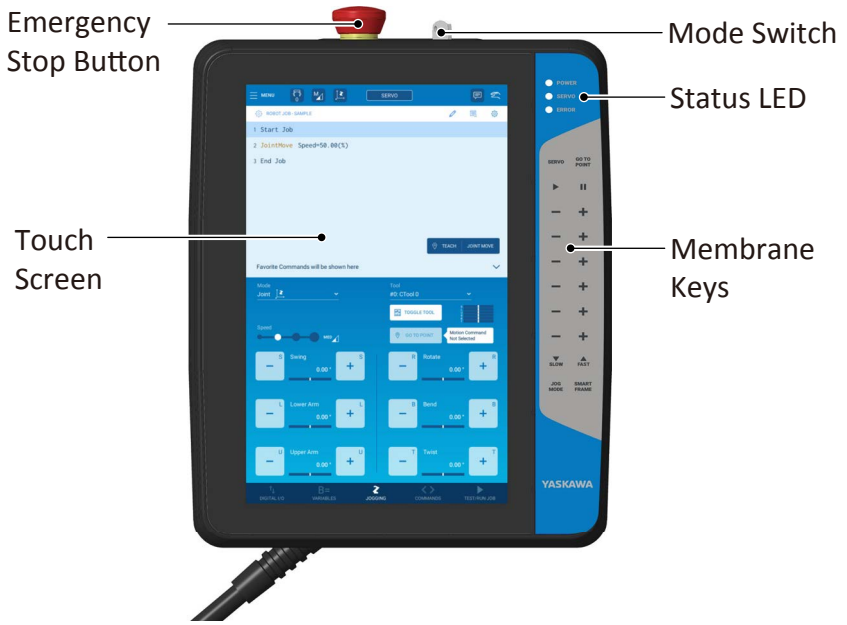
This pendant is only a representative of the actual Programming Pendant and differences may exist.

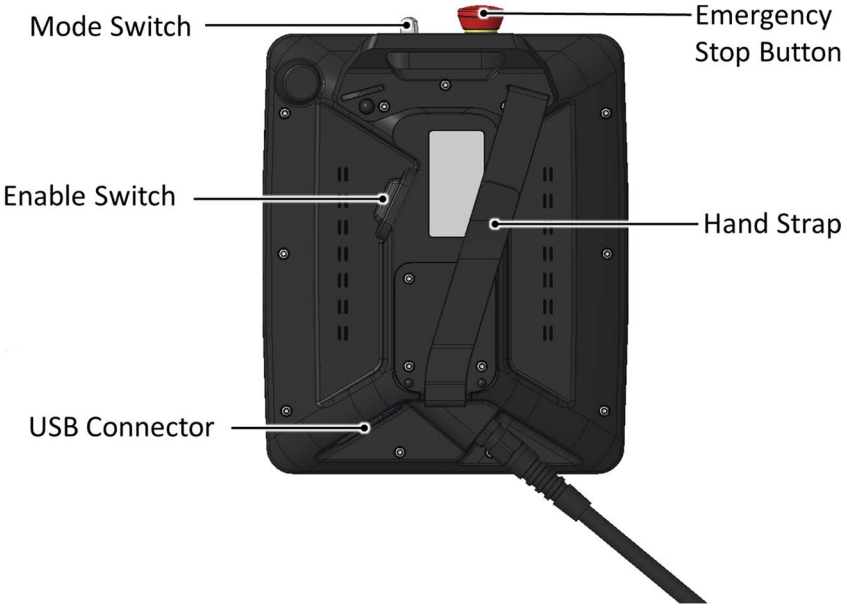
1.7.2 Smart Pendant

The Smart Pendant can only be used with a YRC1000 Controller.

Descriptions of the Smart Pendant, buttons, and displays are as follows:

Equipment		Manual Designation
Smart Pendant	Emergency Stop button	This button on the Smart Pendant will be denoted as Emergency Stop button
	Mode Switch	Three kinds of modes that can be selected by the mode switch are denoted as follows: REMOTE, PLAY (AUTOMATIC), or TEACH (MANUAL)
	Displays	The buttons and items displayed in the Smart Pendant is denoted with { }. ex. {Save}
	Status LED	These LED indicators will be denoted as: POWER LED, SERVO LED, or ERROR LED
	Membrane Key	The membrane keys are denoted with [ ]. ex. [JOG MODE]
	Jog Keys	“Jog Keys” is a generic names for the jog operation keys.
	Keys pressed simultaneously (for membrane key only)	When two keys are to be pressed simultaneously, the keys are shown with a “+” sign between them, ex. [S+] + [L+].





1.7.3 Description of Pendant Operations

In the explanation of the Pendant Operations, the expression “Select • • •” means that the cursor is moved to the object item and [SELECT] is pressed, or that the item is directly selected by touching the screen.

1.8 Personnel Safety

The entire Robot P-point maximum envelope is potentially dangerous.

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

WARNING

- In the vicinity of the area where the equipment is installed, avoid any dangerous actions, such as entering the Robot's operating range without due care.

Failure to observe this instruction may cause contact with the Robot or peripheral equipment, which may result in personal injury.

- Strictly observe the safety precautions and signs in the factory, such as “Flammable”, “High Voltage”, “Danger”, “Off-limits to Unauthorized Personnel”.

Failure to observe this instruction may result in fire, electric shock, and/or personal injury caused by contact with the equipment.

- Strictly observe the following precautions about clothing:
  - Always wear approved work clothes (no loose-fitting clothes).
  - To prevent mis-operation, do not wear gloves when operating the equipment.
  - Do not let the underwear, shirts, or neckties hang out from the work clothes.
  - Do not wear large accessories, such as earrings, rings, or necklaces.
  - Always wear protective safety equipment, such as hard hats, safety shoes (with slip-proof soles), face shields, safety glasses, and gloves as necessary.

Failure to observe this instruction may result in personal injury.

- The following must be understood and strictly observed by all personnel as rules:
  - Unauthorized personnel other than the operator must not approach the area where the equipment is installed.
  - Do not let unauthorized personnel other than the operator approach the area where the equipment is installed.

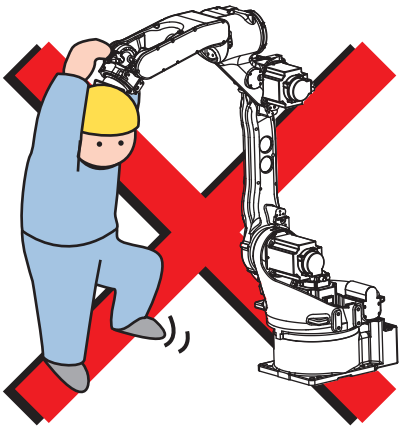
Failure to observe this instruction may cause contact with the Robot, Robot Controller, control panel, workpiece, or Positioner, etc., may result in personal injury.

- Make sure that the pendant or brake open switch is prepared in the work area so that the Robot moves the target axis without power for driving in an emergency or abnormal time.

WARNING

- Do not forcibly move an axis of the Robot. Do not hang from or get on the Robot.

Failure to observe this instruction may result in personal injury and/or equipment damage.

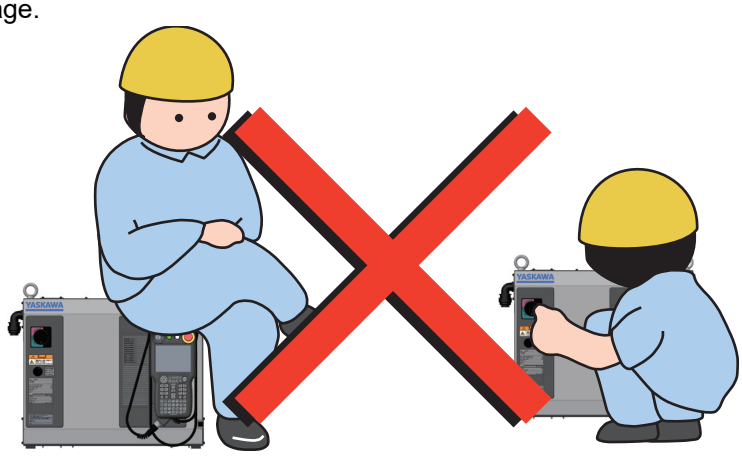


- Do not sit or lean on the Robot Controller.

Failure to observe this instruction may result in personal injury and/or equipment damage.

- Do not turn a switch or press a button, etc. on the Robot Controller or other control panels without due care.

Failure to observe this instruction may cause unexpected movement of the equipment, which may result in personal injury and/or equipment damage.



- Do not let unauthorized personnel touch the Robot Controller or the pendant while power is ON.

Failure to observe this instruction may cause unexpected movement of the equipment, which may result in personal injury and/or equipment damage.

CAUTION

- Conduct regular inspections according to the directions described in the product manuals.

Neglecting to inspect the product not only causes adverse effects on the product and its service life but may also lead to an unexpected accident.

- Only use recommended spare parts

If recommended parts are not used product performance cannot be guaranteed and mechanical and/or fire may result.

1.9 Equipment Safety

– The followings are safety functions of Robot/Robot Controller/ Positioner:
  • Emergency stop SW input (pendant)
  • Enable SW input (pendant)
  • Safeguarding interlock signal input (safety plug)
  • External emergency stop SW input
  • Protected stop signal input
  • Overrun input (Robot/external axis)
  • General-purpose safety input (YRC1000 Controller only)
  • Safety logic circuit

– These safety functions conform to the following safety standards:
  • EN ISO 13849-1: 2015 Cat.3/PLe
  • EN 62061 (IEC 61508) SIL CL3

– This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules.
  • These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.
  • This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

– The use frequency of each switch for safety functions is assumed as follows:
  • Emergency stop SW 500 times/year
  • Enable SW (pendant) 2000 times/year

1.10 Installation and Wiring Safety

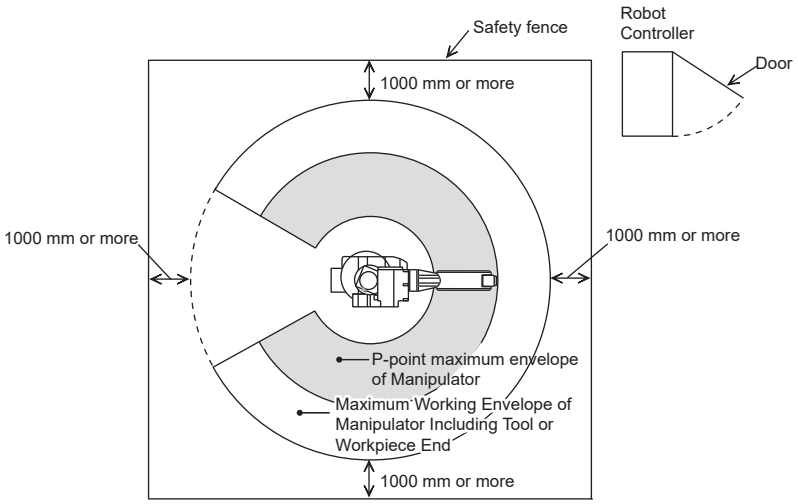
Refer to the Robot instructions, Robot Controller instructions and/or Positioner instructions for details on installation and wiring.

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

WARNING

- For the installation site for the equipment, select an area such as the following:
  - Confirm the area is large enough so that the fully-extended Robot arm with the tool will not reach the wall, the safety fence, the Robot Controller, etc.

Failure to observe this instruction may cause contact with the Robot and or Positioner which may result in personal injury and/or equipment damage.



- Make sure that the maximum operating range of the Robot including the ends of the tool and the workpiece can be clearly recognized by lines marked on the floor or color-coding of the floor.

- Perform grounding in accordance with all applicable electrical codes and technical standards for electrical facilities.

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

WARNING

- Operation of the crane, sling, or forklift must be performed only by authorized personnel.

Failure to observe this instruction may result in personal injury and/or equipment damage.

- Use a crane or forklift, to transport the equipment as required.
  - Before lifting the equipment, make sure to securely fix the equipment using bolts and brackets and set required equipment posture for transportation as described in the equipment instructions.

Failure to observe this instruction may cause overturning of the equipment during transportation, which may result in personal injury and/or equipment damage.

- Use a platform truck to carry the Robot Controller.
  - Avoid jarring, dropping, or hitting the Robot Controller during handling.

Failure to observe this instruction may cause falling or overturning of the Robot Controller during transportation, which may result in personal injury and/or equipment damage.

- If storing the equipment temporarily before installation, be sure to place it on a stable and flat surface and take precautions to prevent unauthorized personnel from touching it.

Failure to observe this instruction may cause overturning of the equipment, which may result in personal injury and/or equipment damage.

WARNING

- Secure enough space for maintenance on the equipment and other peripheral devices.

Failure to observe this instruction may result in personal injury during maintenance.

- Install the Robot Controller and the control panel, etc. in a place from where the movement of the Robot and or Positioner can easily be checked visually and the equipment can be operated safely.

Failure to observe this instruction may cause improper operation, which may result in personal injury.

- Install the Robot Controller outside the safety fence around the Robot and/or Positioner.

Failure to observe this instruction may cause contact with the Robot and/or Positioner, which may result in personal injury.

- Place the pendant outside the safety fence around the Robot.

Failure to observe this instruction may cause contact with the equipment, which may result in personal injury.

WARNING

- To install the Robot and or Positioner, use the bolts and screws of the types and sizes specified in the equipment instructions.

Failure to observe this instruction may cause overturning of the equipment, which may result in personal injury and/or equipment damage.

- After installing the Robot Controller, firmly anchor it to the floor or baseplate by using the screws and the tapped holes on the lateral bottom of the Robot Controller.

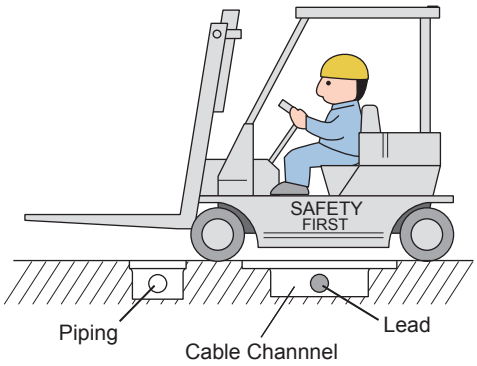
Failure to observe this instruction may cause overturning of the Robot Controller, which may result in personal injury and/or equipment damage.

- Perform wiring to the Robot Controller with a thorough understanding of and in accordance with the connection diagram.

Failure to observe this instruction may cause improper wiring and/or unexpected movement of the equipment, which may result in personal injury and/or equipment damage.

WARNING

- Run the piping, wiring, and cables for the Robot Controller, the Robot, the Positioner, control panel, peripheral devices, etc. in a pit so that they are not stepped on by personnel or run over by a forklift.



Failure to observe this instruction may cause personnel to trip over exposed piping, wiring, or a cable, which may result in personal injury.

Failure to observe this instruction may also cause damage to piping, wiring, or a cable and unexpected movement of the equipment, which may result in personal injury and/or equipment damage.

CAUTION

When installing the equipment, avoid interference with buildings, structures, utilities, other machines and equipment that may create trapping or pinch points.

1.11 Work Area Safety

Carelessness contributes to serious accidents in the work area.

To ensure safety, enforce the following precautions:

DANGER

- The equipment may stop its movement while waiting for a condition to be satisfied during operation. In this case, the equipment starts its movement again immediately after the condition is satisfied, thus it is dangerous to come close to the equipment even if it is not moving. Make sure to clearly indicate that the equipment is in operation by using a pilot lamp and/or an audible alert so that the operator does not come close to the equipment, or make sure that the equipment stops its operation if the operator comes close to it.
- Install safety fences around the Robot and/or Positioner to prevent any accidental contact with the equipment while the power is ON. Display a warning sign stating “Off-Limits During Operation” at the entrance of the safety fence.
  The gate of the safety fence must be equipped with a safety interlock (safety plug) to turn the servo power OFF when the gate opens. Make sure the interlock operates properly before using.
- For areas not enclosed by a safety fences, use a photoelectric sensor, a safety light curtain, etc. to make sure that the equipment stops its operation if the operator enters its operating range.

Failure to observe this DANGER may result in a serious accident due to contact with the equipment.

CAUTION

- Store industrial tools, etc. in a safe location outside the equipment's operating range.

If an industrial tool, etc. is left unattended on the equipment, on a fixture, or on the floor, etc., the equipment may come in contact with the industrial tool left unattended, which may result in damage to the equipment and/or the fixture.

- If the light in the operator's working space is not bright enough, provide the space with appropriate lighting.

1.11.1 Safeguarding Tips

All operators, programmers, maintenance personnel, supervisors, and anyone working near the system must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. General safeguarding tips are as follows:

- When installing the equipment, avoid interference with building structures, utilities, other machines and equipment that may create trapping or pinch points.
- Supplementary audible means of equipment operation is provided, the supplementary audible shall exceed the ambient noise at the end-use application if adding.
- If providing more than one EMERGENCY STOP button, each button shall be marked to indicated its designated safety function if it does not stop all equipment workcell motion.
- Making changes or additions to the applicable information provided by manufacturer are to be provided by the party making the changes or additions.
- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation of this equipment, the operator's manuals, the system equipment, and options and accessories should be permitted to operate this equipment.
- Improper connections can damage the equipment. All connections must be made within the standard voltage and current ratings of the equipment.
- Place the system in Emergency Stop (E-Stop) mode when not in use.
- In accordance with RIA R15.06-2012, section 5.2.4, Sources of Energy, use lockout/tagout procedures during equipment maintenance. Refer also to Section 1910.147 (29CFR, Part 1910), Occupational Safety and Health Standards for General Industry (OSHA).

1.12 Operation Safety

DANGER

- Any person who programs, teaches, operates, maintains or repairs the included system MUST be trained and can demonstrate competence to safely perform the assign tasks.

Failure to observe these DANGERS may result in death or serious injury from unexpected movements.

DANGER

- While performing inspection and maintenance, wiring, or attaching a tool to the manipulator, etc., make sure to turn OFF the power supply to the equipment, and keep the switches of the power supply locked so that unauthorized personnel cannot turn ON the power supply.
  - Display a warning sign stating “Energizing Prohibited.”

Turning ON the power supply without care during inspection and maintenance, etc., may cause electric shock or unexpected movement of the manipulator, if not avoided, will result in death or serious injury.

- Make sure to incorporate the equipment into the user’s system which has lockout/tagout function. That is to say, supply one or more devices to turn OFF the power supply of the Robot, servo track, Positioner and Robot Controller, and install them outside the enclosure in which the equipment and servo track are installed. The devices must be able to be locked out and tagged out.

Turning the power ON improperly during work may result in electric shock or personal injury due to unexpected movement of the equipment.

- Maintenance and inspection must be performed by specified personnel.

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

- Use the products within the specifications described in the manuals.

Failure to observe the instructions may result in personal injury and/or equipment damage.

- Perform teaching operation from outside the equipment's operating range whenever possible.

- Observe the following precautions when performing a teaching operation within the equipment's operating range:
  - Be sure to perform lockout by putting a lockout device on the safety fence when going into the area enclosed by the safety fence. In addition, the operator of the teaching operation must display a sign that an operation is being performed so that no other person closes the safety fence.
  - View the equipment from the front whenever possible.
  - Always follow the predetermined operating procedure.
  - Always keep in mind emergency response measures against the equipment’s unexpected movement toward a person.
  - Ensure a safe place to retreat in case of emergency.

Failure to observe this instruction may cause improper or unintended movement of the equipment, which may result in personal injury.

- Do not remove motors and do not release brakes except during an emergency or abnormality

Failure to observe this hazard may result in death or serious injury from unexpected turning of the Robot’s arm.

DANGER

- Confirm that no person is present in the equipment's operating range and that the operator is in a safe location before:
  - Turning ON the Robot Controller power
  - Moving the equipment by using the pendant
  - Running the system in TEACH mode
  - Performing automatic operations

Personal injury may result if a person enters the equipment's operating range during operation.

- Immediately press an EMERGENCY STOP button whenever there is a problem.

- Persons operating or inspecting the equipment should be trained as required by applicable laws and company policies.
- Refer to *section 1.5 “Special Training”.*

WARNING

- Perform the following inspection procedures before teaching equipment. If there is any problem, immediately take necessary steps to solve it, such as maintenance and repair.
  - Check for a problem in equipment movement.
  - Check for damage to insulation and sheathing of external wires.

WARNING

- After installing the equipment, replacing parts, modifying the taught job, or modifying the equipment system by changing the tool or a peripheral device, etc., make sure to perform the first operation of the equipment in low speed, and confirm there is no abnormal noise, abnormal vibration, or abnormal operation. If an error occurs, immediately turn OFF the Robot Controller power supply and inform the safety manager of the error.

- Return the pendant to a safe place after use.

If the pendant is left unattended on the equipment, fixture, or on the floor, etc., the Enable Switch may activate due to surface irregularities of where it is left, and servo power may be turned ON. In addition, in case the operation of the equipment starts, the equipment or the tool may hit the pendant left unattended, which may result in personal injury and/or equipment damage.

- Maintenance and inspection must be performed by specified personnel.

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

For Disassembly or repair, contact your YASKAWA representative.

CAUTION

- Be careful not to drop the Pendant on the floor.
- Pay attention to the handling of the cable so that it will not stumble on the Pendant cable.
- Handle carefully so as not to damage the cable.
- Do not place the Pendant with the touch screen facing down.
- Do not place the Pendant close to a heat source or in direct sunlight.
- Do not place the Pendant in an environment with excessive dust, humidity or strong magnetic fields.
- Pay attention not to adhere chemicals, cutting oil (including coolant), rust preventive oil, organic solvent etc. to the Pendant.
- Do not clean the Pendant with scrubbing sponges. Use a soft cloth and a little water or diluted neutral detergent (mild cleaning liquids).
- Operate the touch screen with your fingers, or use a touch-pen designed for use with capacitive screens. Never use sharp objects (ex. screwdriver) for operating the touch screen. This could damage the touch screen.
- Be careful not to get foreign objects or liquid into the connectors.
- Do not connect the Smart Pendant to anything except for a YRC Controller.

CAUTION

Equipment Cells have Collaborative Motion functionality:

Collaboration is a special type of operation between a person and equipment sharing a common workspace. The following are the guidelines for collaborative operation.

1. Used for pre-determined tasks.
2. Possible when all protective measures are active.
3. For equipment with features specifically designed for collaborative operation.

The integrator shall include in the information for use the safeguards and mode selection required for collaborative operation.

1.12.1 Mechanical Safety Devices

The safe operation of this equipment is ultimately the users responsibility. The conditions under which the equipment will be operated safely should be reviewed by the user. The user must be aware of the various national codes, RIA R15.06-2012 safety standards, and other local codes that may pertain to the installation and use of this equipment.

Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location.

Check all safety equipment frequently for proper operation. Repair or replace any non-functioning safety equipment immediately.

1.12.2 Programming, Operation, and Maintenance Safety

WARNING

- Maintenance and inspection must be performed by specified personnel.

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

- For Disassembly or repair, contact your YASKAWA representative.

All operators, programmers, maintenance personnel, supervisors, and anyone working near the system must become familiar with the operation of this equipment. Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this equipment should be permitted to program, or maintain the system. All personnel involved with the operation of the equipment must understand potential dangers of operation.

– Inspect the equipment to be sure no potentially hazardous conditions exist. Be sure the area is clean and free of water, oil, debris, etc.

- Be sure that all safeguards are in place. Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.
- Check the E-Stop button on the operator station for proper operation before programming. The equipment must be placed in Emergency Stop (E-Stop) mode whenever it is not in use.
- Back up all programs and jobs onto suitable media before program changes are made. To avoid loss of information, programs, or jobs, a backup must always be made before any service procedures are done and before any changes are made to options, accessories, or equipment.
- Any modifications to the Robot Controller can cause severe personal injury or death, as well as damage to the equipment! Do not make any modifications to the Robot Controller. Making any changes without the written permission from YASKAWA will void the warranty.
- Some operations require standard passwords and some require special passwords.
- The equipment allows modifications of the software for maximum performance. Care must be taken when making these modifications. All modifications made to the software will change the way the equipment operates and can cause severe personal injury or death, as well as damage parts of the system. Double check all modifications under every mode of operation to ensure that the changes have not created hazards or dangerous situations.
- This equipment has multiple sources of electrical supply. Electrical interconnections are made between the Robot Controller and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.
- Do not perform any maintenance procedures before reading and understanding the proper procedures in the appropriate manual.
- Use proper replacement parts.
- Improper connections can damage the equipment. All connections must be made within the standard voltage and current ratings of the equipment.
- Turn the power OFF and disconnect and lockout/tagout all electrical circuits before making any modifications or connections.
  Perform only the maintenance described in the manuals. Maintenance other than specified in the manuals should be performed only by YASKAWA-trained, qualified personnel.
- Do not touch any part inside the Robot Controller for at least five minutes after turning OFF the power supply. In addition, confirm that the charge lamps (orange LED) on the converter and the inverter unit are turned OFF. Always handle the circuit boards with care
- Make sure to tighten terminal screws on the main circuit and control circuits.
- Use a grounding strap before touching a circuit board due to static electricity.

1.13 Notes for Moving and Transferring the Equipment

When moving or transferring the equipment, observe the following safety precautions:

DANGER

- When relocating, transferring, or selling the equipment, make sure the equipment is always accompanied by ALL its manuals so that all users have access to necessary manuals.
  - See *section 1.6 "MOTOMAN Manual List"* for a list of manuals.

If any of them is missing, contact your YASKAWA representative.

- If a label on the equipment is dirty and unreadable, clean the label to make it clearly readable. If a label comes off, put the label back in place. Note that some local laws and regulations may prohibit equipment operation if safety labels are not in place.

Contact your YASKAWA representative if requiring new warning labels.

- After relocating the equipment, it is recommended to have a YASKAWA representative do an inspection.

If installation or wiring of a device is incorrect, personal injury and/or equipment damage may result.

1.14 Notes on Equipment Disposal

DANGER

- Do not modify the equipment.

Failure to observe this instruction may cause fire, mechanical failure, or malfunction, which may result in personal injury and/or equipment damage.

WARNING

- Take precautionary measures to prevent the equipment from overturning, such as anchoring it firmly, etc., even when temporarily storing it before disposal.

Failure to observe this instruction may cause overturning of the equipment, which may result in personal injury.

NOTICE	
	• When disposing of or recycling the equipment, follow the applicable national/local laws and regulations. • This symbol is applicable for EU member states only. The wheelie bin symbol on this product, manual or its packaging indicates that at the end of life the product should enter the recycling system. It must be disposed at an appropriate collection point for electrical and electronic equipment (EEE) and should not be put in the normal waste stream.

1.15 Alarm Error Information

We make every effort to ensure safe delivery of the equipment. However, occasionally equipment will encounter problems with data loss and physical movement caused during the shipping process. Therefore, when turning on the system and a Minor Alarms occurs they are probably ALARM:4692 and ALARM:4107. The following is a description of each cause and remedy.

1.15.1 Alarm 4311 Encoder Backup Error

Should you receive a 4311 alarm, please contact a YASKAWA representative. While not a major cause for concern, there are several remedies for this error. A YASKAWA representative can help determine the best solution for your system.

1.15.2 Alarm 4107 Out of Range (ABSO DATA)

A 4107 Out of Range alarm occurs at power ON if the Robot's position has changed during shipment or since last shutdown. The out of range axes will highlight in the alarm display. After resetting the alarm and turning servo power ON, a "Check Position" prompt occurs. The "Check Position" procedure involves jogging the Robot to a known pulse count position (a specified point) and verifying that the Robot is physically at the proper position. This position called the "Second Home."

To check position:

1. Select ROBOT from the Main Menu.
2. Select SECOND HOME POS, the Second Home Position window appears.
3. Press the {Page} key. The group axes by which the second home position is set when there are two or more group axes.
4. Press FWD, and observe the Robot moves to the second home position. Robot speed is set as selected in manual operation speed.
5. Select DATA.
6. Select CONFIRM POSITION. The "Home position checked" message appears.

A comparison of the current pulse data and second home position to ensure allowable ranges, and resumes playback operations. However, if outside the allowable range, the alarm occurs again. Contact a YASKAWA representative if this occurs

1.16 Lithium Battery Safety Information

Your lithium batteries provide memory backup for approximately five years. Batteries are located in the Robot base and the Robot Controller.

DANGER

Only qualified electricians familiar with high voltage locations within the Robot Controller should replace the battery.

1.16.1 Safety

To ensure proper battery operation and to reduce personal hazards:

- Use only for intended operation;
- Dispose of cells only in according to recommended procedures;
- Only ship using aircraft freight.

DANGER

Excessive heat may cause batteries to burn or explode, therefore:

- Do not charge batteries;
- Do not incinerate, solder or expose to high temperatures;
- Do not short positive and negative terminals together.

1.16.2 Storage

Always store the lithium batteries in a cool and dry place, typically 20°C to 25°C (68.5 to 77°F) at 40% to 60% relative humidity. Place batteries and a copy of these instructions away from flammable materials.

1.16.3 Transportation

Each battery contains 0.23 grams of lithium. Two batteries can ship together within the United States without restriction. Transportation procedures for transferring three or more batteries within the United States are in the Department of Transportation (DOT), Code of Federal Regulations, CFR49, “Transportation.” An exemption to these regulations, DOT-E7052, covers transportation of certain hazardous materials classified as flammable solids. This exemption authorizes transport of lithium batteries by motor vehicle, rail freight, cargo vessel and cargo-only aircraft, providing meeting certain conditions. Regulations governing shipment to or within other countries may differ from those of the U.S.A special provision of DOT-E7052 (11^{th} Rev., October 21, 1982, par. 8-a) provides that: Persons who receive cells and batteries covered by this exemption may reship them pursuant to the provisions received.

The Code of Federal Regulations, 49 CRF 173.22a, relates to the use of packaging authorized under exemptions. In part, you must maintain a copy of the exemption at each facility where the packaging is in connection with shipment under the exemption. Shipment of depleted batteries intended for disposal may be subject to specific regulations

under the IATA Restricted Articles of the International Air Transport Association, Geneva, Switzerland.

NOTICE

Periodically Regulations for transportation of lithium batteries are changed.

1.16.4 Robot Controller

A “Memory battery weak” error message appears on the pendant screen, indicating battery replacement must occur within 30 days after message appears. If this message occurs within 30 minutes of power-up following an extended power-off period of more than two days, replace battery immediately by referring to the ROBOT CONTROLLER MAINTENANCE MANUAL.

1.16.5 Robot

An “Encoder Battery Weak” error message appears on the pendant screen, indicating battery replacement must occur within 40 hours as follows. Refer to the section “Battery Pack Replacement” in the ROBOT MAINTENANCE MANUAL.

1.16.6 Disposal Information

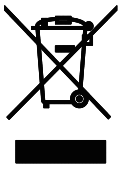
For disposal, batteries must be packaged and shipped in accordance with transportation regulations to a disposal site. For more information contact:

U. S. Department of Transportation
Research and Special Programs Administration
400 Seventh Street, S.W.
Washington, D.C. 20590

WARNING

Do not incinerate or dispose of lithium batteries in general trash collection. Explosion or violent rupture is possible. Collect batteries for disposal in a manner to prevent against short-circuiting, compacting, or destruction of integrity and hermetic seal. Although the Environmental Protection Agency has no specific lithium battery regulations at this time, lithium may be considered toxic, reactive, or corrosive. Persons disposing of the material are responsible for any hazard created in doing so. State and local regulations may exist regarding the disposal of these materials.

NOTICE



- When disposing of or recycling the equipment, follow the applicable national/local laws and regulations.
- This symbol is applicable for EU member states only.The wheelie bin symbol on this product, manual or its packaging indicates that at the end of life the product should enter the recycling system. It must be disposed at an appropriate collection point for electrical and electronic equipment (EEE) and should not be put in the normal waste stream.

1.17 Method to Move Robot Axes during an Emergency or Abnormality

DANGER

- Do not use the brake release unit except during an emergency or abnormality.

The arm rotates in an unexpected direction when the brakes are released and this may cause a serious personal injury. For this reason, ensure that the brakes are released by first confirming safety, such as by supporting the arm in an appropriate manner to handle arm rotation when the brakes are released.

The axes of the Robot can be moved without drive power from the motor by releasing the brakes during an emergency or abnormality, such as if a person is crushed by the Robot or a person is trapped inside the machine. For details on the brake release unit (optional), refer to the following manuals.

- *YRC1000 OPTIONS INSTRUCTIONS FOR BRAKE RELEASE UNIT INSTALLED IN ROBOT CONTROLLER CABINET (HW1484107)*
- *YRC1000 OPTIONS INSTRUCTIONS FOR INDEPENDENT TYPE BRAKE RELEASE UNIT (HANDY TYPE) (HW1484109)*
- *YRC1000 OPTIONS INSTRUCTIONS FOR INDEPENDENT TYPE BRAKE RELEASE UNIT (HANDY TYPE) (AC 220V/200V POWER SUPPLY SPECIFICATION) (HW2480839)*

Prepare the necessary quantity of brake release units for the environment in which the Robot is used and store the brake release units so that an emergency or abnormality can be handled quickly and appropriately.

2 Order Number Confirmation

Confirm that the order number pasted on the Robot and Robot Controller are the same. The order number plates are affixed to the figure below.

CAUTION

- Confirm that the equipment have the same order number.
  Pay special attention when installing two or more Robots.

Failure to observe the order number may cause improper movement of the Robot, which may result in personal injury and/or equipment damage.

3 Product Warranty Information

■ **Individual Contract (including specifications)**
In the event of any inconsistencies between the terms and conditions of the Individual Contract (including specifications) and this warranty policy, the former will prevail.

■ **Warranty Period**
YASKAWA product(s) are guaranteed for a period of 12 months from the date of delivery to the customer, or 18 months from the date of shipment from the YASKAWA factory, whichever occurs first.

■ **Scope of Warranty**
►Preliminary Investigation into Cases of Failure
The preliminary investigation into cases of failure is to be conducted by the customer. This preliminary investigation can be conducted by YASKAWA or by its authorized service representative upon request from the customer.
If YASKAWA or its authorized service representative conducts the preliminary investigation upon request from the customer, and finds that the failure of the YASKAWA product(s) is not due to YASKAWA workmanship or materials,
YASKAWA shall charge the customer for the investigation fee.
Such an investigation by YASKAWA or its authorized service representative, obtainable upon request from the customer, is only available within Japan.
For global after-sales service, please apply global after-sales service contract.
►Repairs
If a product failure occurs within the warranty period due to YASKAWA workmanship or materials, YASKAWA will provide, free of charge, repair and shipping of the repaired product back to the customer, or a new product to replace the defective product and shipping of the new product to the customer.
If YASKAWA or its designated company repairs the defective product(s), and if the warranty period has expired or the remaining effective warranty period is 6 months or less from the date of repair, the period of warranty for the repaired part(s) of the product will be extended for another 6 months from the date of repair.
The warranty does not apply to the following cases, where YASKAWA shall charge the customer for total fees and for the cost of repair or new product(s).

- Failure due to improper maintenance or handling, or carelessness, by the customer.
- Failure due to the customer’s system design
- Failure due to modifications made to a YASKAWA product without YASKAWA’s full agreement
- Failure due to the use of a YASKAWA product under conditions that fall outside the recommended specifications
- Problems due to force major events such as natural disaster and fire
- Failures after the free warranty period has expired
- Replenishment or replacement of consumables and expendables such as lubricants, batteries, bearings, cooling fans, and electrolytic capacitors

- Defective products caused by packaging, fumigation, or transportation that are made or arranged by the customer
- Malfunction or failure caused by program(s), such as run command(s), that have been made by the customer
- Requests for supplemental or replacement copies of manuals and/or warning labels because the originals have become dirty or damaged
- Causes that were not foreseeable with the scientific and technological understanding at the time of shipment from YASKAWA
- Other problems not due to defects in YASKAWA workmanship or materials

■ **Limitations of Liability**

Whether within or outside the warranty period, YASKAWA shall in no event be responsible for any damage or loss of opportunity, other related business and economic loss to the customer, as well as property damages other than YASKAWA products that arises due to failure of the delivered product.

[Examples]

- Opportunity loss (including compensation for shutdown)
- Damage to objects to be processed (such as raw materials, materials, and semi-finished products of end-user)
- Damage to any equipment
- Costs for investigation into the causes of failure paid by the customer (including fees for an external analysis facility engaged by the customer)
- The customer’s expenses incurred in investigating the causes of failure (such as personal costs for holding meetings)
- Costs paid by the customer to external facilities for restoration of a system line (such as the cost of labor, transportation, and trial operation/adjustments)

■ **Cybersecurity Consideration**

Regarding YASKAWA products that have the function of communicating via the Internet and other networks, the risk of leaking information of customer or their customer to third parties due to external attacks through the network or exposure to computer viruses, etc. Or there is a risk that YASKAWA products or computers with YASKAWA products (software) installed will be used for network attacks against third parties.

In order to avoid these risks, it is customer’s responsibility to build out, maintain and operate security measures. Reference examples are shown below, but please take appropriate measures according to customer’s network environment.

<Reference Examples>

- When connecting YASKAWA products or computers with YASKAWA products (software) installed to a network such as the Internet, build an appropriate security environment such as a firewall.
- Build a system that can monitor the contents of network communications, detect and block unauthorized communications.
- Take physical measures to prevent computer viruses from being taken into YASKAWA products or computers with YASKAWA products (software) installed via electromagnetic recording media (USB memory, etc.).

YASKAWA shall in no event be responsible for any information leakage, other accidents or troubles, malfunctions in YASKAWA products, or damage to customer, their customer, or third parties due to external attacks through the network or exposure to computer viruses, etc.

■ **Delivered Terms**

Standard products that do not entail trial operations or adjustments are regarded as having been received by the customer upon delivery to the customer.

YASKAWA is not responsible for local adjustments or trial operations.

■ **Specifications Change**

The names, specifications, appearance, and accessories of products in product catalogs and manuals may be changed at any time based on improvements and other reasons. The next editions of the revised catalogs or manuals will be published with updated code numbers. Consult with your YASKAWA representative to confirm the actual specifications before purchasing a product.

READ FIRST!!
SAFETY REQUIREMENTS

FOR: YRC1000, DX200, DX100, or NX100 CONTROLLER

For inquiries or after-sales service on this product, contact your local YASKAWA representative as shown below.

YASKAWA ELECTRIC CORPORATION
2-1 Kurosakishiroishi, Yahatanishi-ku, Kitakyushu, 806-0004, Japan
Phone: +81-93-645-7703 Fax: +81-93-645-7802
www.yaskawa.co.jp

YASKAWA AMERICA, INC. (MOTOMAN ROBOTICS DIVISION)
100 Automation Way, Miamisburg, OH 45342, U.S.A.
Phone: +1-937-847-6200 Fax: +1-937-847-6277
www.motoman.com

YASKAWA EUROPE GmbH (ROBOTICS DIVISION)
Yaskawastrasse 1, 85391, Allershausen, Germany
Phone: +49-8166-90-0 Fax: +49-8166-90-103
www.yaskawa.eu.com

YASKAWA NORDIC AB
Verkstadsgatan 2, Box 504, SE-385 25 Torsas, Sweden
Phone: +46-480-417-800 Fax: +46-486-414-10
www.yaskawa.se

YASKAWA ELECTRIC (CHINA) CO., LTD.
22F, One Corporate Avenue, No.222 Hubin Road, Huangpu District, Shanghai 200021, China
Phone: +86-21-5385-2200 Fax: +86-21-5385-3299
www.yaskawa.com.cn

YASKAWA SHOUGANG ROBOT CO., LTD.
No.2 Building, No.6 Rongchang East Street, Beijing E&T Development Area, Beijing 100176, China
Phone: +86-10-6788-2858 Fax: +86-10-6788-2878
www.ysr-motoman.cn

YASKAWA ELECTRIC KOREA CORPORATION
6F, 112, LS-ro, Dongan-gu, Anyang-si, Gyeonggi-do, 14118, Korea
Phone: +82-31-8015-4224 Fax: +82-31-8015-5034
www.yaskawa.co.kr

YASKAWA ELECTRIC TAIWAN CORPORATION
12F, No.207, Sec. 3, Beishin Rd., Shindian District, New Taipei City 23143, Taiwan
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www.yaskawa.com.tw

YASKAWA ASIA PACIFIC PTE. LTD.
30A Kallang Place, #06-01, 339213, Singapore
Phone: +65-6282-3003 Fax: +65-6289-3003
www.yaskawa.com.sg

YASKAWA ELECTRIC (THAILAND) CO., LTD.
59, 1st-5th Floor, Flourish Building, Soi Ratchadapisek 18, Ratchadapisek Road, Huaykwang,
Bangkok 10310, Thailand
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www.yaskawa.co.th

PT. YASKAWA ELECTRIC INDONESIA
Secure Building-Gedung B Lantai Dasar & Lantai 1 Jl. Raya Protokol Halim Perdanakusuma,
Jakarta 13610, Indonesia
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YASKAWA INDIA PRIVATE LIMITED (ROBOTICS DIVISION)
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