ETHERNET/IP-SAFE CONFIGURATION
MLX300 CONTROLLER AS ADAPTER
SUPPLEMENT
FOR: Rockwell EtherNet/IP Safety and MLX300

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

Carelessness contributes to serious accidents in the work area.

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, operations, and maintenance of the Robot 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:
  – SAFETY MANAGEMENT SYSTEM
    by designating authorized operators and safety managers for the Robot, as well as giving continuing safety education and training.

• Teaching, operation, and maintenance of the Robot 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.
We suggest that you obtain and review a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems (ANSI/RIA R15.06-2012). You can obtain this document from the Robotic Industries Association (RIA) at the following address:

Robotic Industries Association
900 Victors Way
P.O. Box 3724
Ann Arbor, Michigan 48106
TEL: (734) 994-6088
FAX: (734) 994-3338
www.roboticsonline.com

Ultimately, well-trained personnel are the best safeguard against accidents and damage that can result from improper operation of the equipment. The customer is responsible for providing adequately trained personnel to operate, program, and maintain the equipment.

We recommend approved YASKAWA training courses for all personnel involved with the operation, programming, or repair of the equipment.

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.
WARNING

- Safe operation of this equipment is the user's 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, ANSI/RIA R15.06-2012 safety standards, and other local codes that may pertain to the installation and use of this equipment.

Not following all national codes, safety standards, and local codes can result in death or serious injury.

- Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location.
  - The following safety equipment is provided as standard:
    - Safety barriers
    - Door interlocks
    - EMERGENCY STOP button

Not providing additional safety measures as required can result in death or serious injury.

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

If safety equipment does not operate properly, death or serious injury can result.

CAUTION

- Only trained personnel familiar with the operation, manuals, electrical design, and interconnections of this equipment should program, or maintain the system.

Any personnel involved with the operation of the equipment must understand potential dangers of operation.

NOTICE

- The drawings and photos in this manual are examples. Differences may exist between them and the delivered product.

- YASKAWA may modify this model without notice due to product improvements, modifications, or changes in specifications. If such modification is made, the manual number will also be revised.

- Some operations require standard passwords and while others require special passwords.

- If a manual is damaged or lost, contact Customer Support to order a new copy. Make sure to tell Customer Support the Part Number listed on the front cover.
Notes for Safe Operation

Read this manual carefully before installing, operating, maintaining, or inspecting the system.

In this instruction, Safe Operations are classified as “DANGER”, “WARNING”, “CAUTION” or “NOTICE”.

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

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

**CAUTION**
Indicates a hazardous situation, which if not avoided, **MAY result in minor to moderate injury**.

**CAUTION**
Indicate a situation which if not avoided may result in equipment damage.

**NOTICE**
Indicates practices not related to personal injury.

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

Review the Robot and Controller 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 Robot:

<table>
<thead>
<tr>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Maintenance and inspection must be performed by specified personnel.</td>
</tr>
<tr>
<td>Failure to observe this caution may result in electric shock or injury.</td>
</tr>
<tr>
<td>• For disassembly or repair, contact Customer Support.</td>
</tr>
<tr>
<td>• Do not remove the motor, and do not release the brake.</td>
</tr>
<tr>
<td>Failure to observe these safety precautions may result in death or serious injury from unexpected motion of the Robot's arm.</td>
</tr>
<tr>
<td>• Any person who programs, teaches, operates, maintains or repairs the included system MUST be trained and demonstrates competence to safely perform assigned tasks.</td>
</tr>
<tr>
<td>Failure to observe these safety precautions may result in death or serious injury from unexpected movements.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Run the piping, wiring, and cables for the Controller, Robot, Positioner control panel, peripheral devices, etc. in a pit so that they are not stepped on by personnel or run over by a forklift.</td>
</tr>
<tr>
<td>Failure to observe this Warning may cause personnel to trip over exposed piping, wiring, or a cables, which may result in personal injury. Additionally it may also cause damage to piping, wiring, or cables, and unexpected movement of the Robot, which may result in personal injury and/or equipment damage.</td>
</tr>
</tbody>
</table>
CAUTION

- Make sure all covers and shields are installed correctly before operating.
  - Some drawings in this manual may have protective covers or shields removed to show details.

Not having all covers and shields installed correctly can result in injury.

- When installing the Robot system, avoid interference with buildings, structures, utilities, other machines.

Not avoiding these items may create trapping or pinch points.

- Do not make unauthorized modifications.

Unauthorized modifications can result in injury or equipment damage and will void the warranty.

- Inspect:
  - For problems with movement
  - Damages to external wires

Repair any problems immediately and perform all necessary procedures. If problems are not repaired or procedures are not fixed unexpected results can occur causing injury.

NOTICE

- If supplying a supplementary audible means for Robot operation, it shall exceed the ambient noise at the end-use of the application.

- Any changes or additions to the applicable information as provided by the manufacturer is to be provided by the party that makes the change or addition to the Robot system.
Ensure Safety

DANGER

- When the power supplies of the Robot and Controller are turned ON at start-up, be sure to confirm the following:
  - Safety protection devices such as the E-STOP circuit, door interlocks, etc. operate normally.
  - Each axis operates normally in TEACH mode.
  - Robot operates normally at the speed limit or less in the TEACH mode. (Speed limit: 250 mm/s at the TCP or the flange)
  - The teaching function and the playback function operate normally.
- The Robot may stop movements while waiting for a condition to be satisfied during operation.
  Once meeting the condition, the Robot starts movement causing a danger that will cause death or severe injury.
- Make sure to clearly indicate when the Robot is in operation:
  - Use a pilot lamp and/or an audible alert or
  - The Robot stops operation if the operator comes close.
- Install a safety fence around the Robot to prevent any accidental contact with the Robot when power is applied.
  - 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 to turn the servo power OFF when the gate opens.
  - Make sure interlocks operate properly before use.
- For areas not enclosed by safety fences, use a photoelectric sensor, a safety light curtain, etc. to make sure that the Robot stops its operation if the operator enters its operating range.

Failure to observe this Danger notice will result in death or serious injury due to contact with the Robot.
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 Robot 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 death or serious 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 death or serious injury due to fire, electric shock, caused by contact with the Robot or other 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 Robot.
  - Do not allow underwear, shirts, or neckties hang out from the work clothes.
  - Do not wear 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 death or serious 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 Robot is installed.

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

• Turn OFF servo power before operating.
  – Press the EMERGENCY STOP button to turn off SERVO POWER. When servo power is OFF, the SERVO ON LED on the Programming Pendant is OFF.

If the EMERGENCY STOP button(s) do not work correctly, death or serious injury may result. Do not use if the EMERGENCY STOP button does not perform correctly.

Fig. : EMERGENCY STOP Button

• Clear the cell of all items which could interfere with the operation before releasing the EMERGENCY STOP button.

Death or serious injury may result from unintentional or unexpected motion.

Fig. : Release of EMERGENCY STOP Button

• Make sure no person is in the operating range and the operator is in a safe location before:
  – Turning ON power to the Controller
  – Moving the Robot with the Programming Pendant
  – Running the system in the TEACH mode
  – Performing automatic operations

Death or serious injury may result if a person enters the operating range during operation. Immediately press an EMERGENCY STOP button whenever there is a problem.
CAUTION

• All operators, programmers, maintenance personnel, supervisors, and anyone working near the system must be 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:
  – Place system in E-STOP mode whenever it is not in use.
  – Use lockout/tagout procedures during equipment maintenance in accordance with ANSI/RIA R15.06-2012, section 4.2.5, Sources of Energy. Refer also to Section 1910.147 (29CFR, Part 1910), Occupational Safety and Health Standards for General Industry (OSHA).
  – Only trained personnel familiar with the operation of this equipment, the operator's manuals, the system equipment, and options and accessories can operate equipment.

Improper operation can result in personal injury and/or damage to the equipment.

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

CAUTION

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

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

**DANGER**

- Personnel engaged in teaching or inspection, etc. of the Robot must receive special training required by applicable laws and regulations.
- While performing inspection and maintenance, wiring, or attaching a tool to the Robot, etc., make sure to turn OFF the power supply of the Controller and the tool, and keep the switch of the power supply locked so that unauthorized personnel cannot turn ON the power supply.
  In addition, display a warning sign stating “Energizing Prohibited”.

Turning ON the power supply without due care during inspection and maintenance, etc., may cause electric shock or unexpected movement of the Robot, which may result in personal injury.

- Use the Robot only within the specifications described in the manuals for the Robot.
  Failure to observe this instruction may result in personal injury and/or equipment damage.
- Observe the following precautions when performing a teaching operation within the Robot'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 the sign that the operation is being performed so that no other person closes the safety fence.
  - View the Robot from the front whenever possible.
  - Always follow the predetermined operating procedure.
  - Always keep in mind emergency response measures against the Robot'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 Robot, which may result in personal injury.
DANGER

• Before operating the Robot, make sure the servo power is turned OFF by performing the following operations. When the servo power is turned OFF, the SERVO ON LED on the Programming Pendant is turned OFF.
  – Press the EMERGENCY STOP buttons on the front door of the Controller, on the Programming Pendant, on the external control device, etc.
  – Disconnect the safety plug of the safety fence. (when in the PLAY mode or REMOTE mode)

If operation of the Robot cannot be stopped in an emergency, personal injury and/or equipment damage may result.

• Make sure that all safety protection devices are activated before starting a job in the PLAY mode.

• Confirm that no person is present in the Robot's operating range and that the operator is in a safe location before:
  – Turning ON the Controller
  – Moving the Robot using the Programming Pendant
  – Running the system in TEACH mode
  – Performing automatic operations

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

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

- Read “Safety” of the Controller instructions before operating. Not reading and understanding chapter 1 of the Controller instruction can result in death or serious injury.

- Read and understand all Warning Labels before operating. Not reading and understanding all Warning Labels can result in death or serious injury.

- Confirm that no person is present in the P-point maximum envelope of the Robot before:
  - Turning on the power for the Controller.
  - Moving the Robot with the Programming Pendant.
  - Running the system in the TEACH mode.
  - Performing automatic operations.

Injury may result if anyone enters the working envelope of the Robot during operation. Always press an EMERGENCY STOP button immediately if there are problems.

- Observe the following when performing teaching operation within the operating range:
  - Lockout by putting a lockout device on the safety fence when going into the area enclosed by the safety fence.
  - Display a sign that operations are being performed so no other person closes the safety fence.
  - View from the front whenever possible.
  - Always follow the predetermined operating procedure.
  - Always keep in mind emergency response measures against unexpected movement toward a person.
  - Ensure a safe place to retreat in case of emergency.

Failure to observe this precautions may cause improper or unintended movement, which may result in personal injury.

- Maintenance and inspection must be performed by specified personnel.

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

- Contact Customer Support for disassembly or repairs.

Not contacting Customer Support can result in electrical shock or injury.
CAUTION

Robot Cells have Collaborative Motion functionality:
Collaboration is a special type of operation between a person and Robot 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 Robots 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.

CAUTION

- Do not operate the Robot when a [COOLING FAN2 ERROR] appears on the Programming Pendant.

  If operation continues with a warning message, equipment damage can occur.

- During high speed continuous operation Robot temperature may rise quickly depending on ambient temperature and operation pattern.

  If a warning message displays stop operations or equipment damage may occur.

- Monitor warning messages on the Programming Pendant.

  Not monitoring warning messages may cause equipment damage.

- Refer to the Controller Concurrent I/O manual for details on the signal output.

  Not referring to Controller Concurrent I/O manual can result in equipment damage.
Maintenance Safety

**WARNING**

- Make sure equipment has no potentially hazardous conditions.
  - area is clean and free of water, oil, debris, etc.
  - all safeguards are in place.
  - all safety equipment work correctly. Repair or replace any non-functioning safety equipment immediately.
  - Check the EMERGENCY STOP button(s) for proper operation before programming. The equipment must be in E-STOP mode when not in use.

If a hazardous condition is present death or serious injury may occur.

- Use care when modifying software.
  - The equipment allows modifications to the software for maximum performance.

All modifications made to the software will change the way the equipment operates and may cause death or serious injury, as well as damage parts of the system.

- Make sure all modifications did not make create a hazardous or dangerous condition in all modes.

All modifications made to the software will change the way the equipment operates and may cause death or serious injury, as well as damage parts of the system.

- Disconnect and lockout/tagout all sources of energy before making modifications or connections.

Not disconnecting and doing lockout/tagout of all sources of energy can result in death or serious injury.

- Read and understand all maintenance procedures before completing procedures.

Not reading and understanding maintenance procedure may result in death or serious injury.
CAUTION

• Do not modify the Controller.
  Making modifications without written permission from YASKAWA will void the warranty.

• 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.

• Use proper replacement parts only.
  Not using proper replacement parts can cause damage to equipment.

• All connections must be made within the standard voltage and current ratings of the equipment.
  Improper connections can damage the equipment.

Notes for Moving and Transferring the Robot

DANGER

• When relocating, transferring, or selling the Robot, make sure that the Robot is always accompanied by its manuals so that all users have access to necessary manuals.

See the Bill of Material for a list of the manuals.

If any of them is missing, contact Customer Support. The telephone numbers of our offices are listed on the back cover of this manual.

• If a warning label on the Robot or the Controller is dirty and unreadable, clean the label to make it clearly readable. If a warning label has come 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 Customer Support if you require new warning labels.

• After the Robot is relocated, inspection by Customer Support is recommended.

If installation or wiring of a device is incorrect, personal injury and/or equipment damage may result.
Safety
Definition of Terms Used Often in This Manual

Definition of Terms Used Often in This Manual

The Robot is the YASKAWA industrial robot product.

The Robot usually consists of a Robot, Controller, Programming Pendant, and Robot cables.

In this manual, the equipment is designated as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLX300 Controller</td>
<td>Controller</td>
</tr>
<tr>
<td>MLX300 Programming Pendant</td>
<td>Programming Pendant</td>
</tr>
<tr>
<td>EtherNet/IP-Safe Configuration Manipulator</td>
<td>Robot</td>
</tr>
<tr>
<td>Cable between the Robot and the Controller</td>
<td>Robot cable</td>
</tr>
<tr>
<td>Positioner</td>
<td>Positioner</td>
</tr>
</tbody>
</table>

Descriptions of the Programming Pendant keys, buttons, and displays are shown as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programming Pendant</td>
<td>Character Keys /Symbol Keys</td>
</tr>
<tr>
<td>Programming Pendant</td>
<td>The keys which have characters or symbols printed on them are denoted with [ ]. e.g. [ENTER]</td>
</tr>
<tr>
<td>Programming Pendant</td>
<td>Axis Keys /Numeric Keys</td>
</tr>
<tr>
<td>Programming Pendant</td>
<td>[Axis Key] and [Numeric Key] are generic names for the keys for axis operation and number input.</td>
</tr>
<tr>
<td>Programming Pendant</td>
<td>Keys pressed simultaneously</td>
</tr>
<tr>
<td>Programming Pendant</td>
<td>When two keys are to be pressed simultaneously, the keys are shown with a &quot;+&quot; sign between them, e.g. [SHIFT]+[COORD].</td>
</tr>
<tr>
<td>Programming Pendant</td>
<td>Mode Switch</td>
</tr>
<tr>
<td>Programming Pendant</td>
<td>Mode Switch can select three kinds of modes that are denoted as follows: REMOTE, PLAY or TEACH. (The switch names are denoted as symbols)</td>
</tr>
<tr>
<td>Programming Pendant</td>
<td>Button</td>
</tr>
<tr>
<td>Programming Pendant</td>
<td>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)</td>
</tr>
<tr>
<td>Programming Pendant</td>
<td>Displays</td>
</tr>
<tr>
<td>Programming Pendant</td>
<td>The menu displayed in the Programming Pendant is denoted with { }. e.g. {JOB}</td>
</tr>
</tbody>
</table>
Registered Trademark

In this manual, names of companies, corporations, or products are trademarks, registered trademarks, or bland names for each company or corporation. The indications of ® and ™ are omitted.
Robot Disposal

**WARNING**

- Take precautionary measures to prevent the Robot 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 Robot, which may result in personal injury.

**CAUTION**

- Do not modify the Robot or the Controller

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

**NOTICE**

- When disposing of or recycling the Robot, follow the applicable national/local laws and regulations.

- This symbol is applicable in some locations.

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.
Customer Support Information

If assistance is needed with any aspect of the system, please contact Customer Support at the following 24-hour telephone number:

(937) 847-3200

Customer Support also has an e-mail address for routine technical inquiries, to contact Customer Support through e-mail use the following address:

techsupport@motoman.com

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

WARNING

• Maintenance and inspection must be performed by specified personnel. Failure to observe this caution may result in electric shock or injury.
• For disassembly or repair, contact Customer Support. Do not remove the motor, and do not release the brake. Failure to observe these safety warnings may result in death or serious injury from unexpected turning of the Manipulator's arm.

NOTICE

Use e-mail for routine inquiries only. If there is an urgent or emergency need for service, replacement parts, or information, contact Customer Support at the telephone number shown above.
Have the following information ready before calling Customer Support:

- **System**
  - EtherNet/IP-Safe Configuration

- **Primary Application**

- **Robot Controller**
  - MLX300

- **Software Version**

- **Manipulator Serial Number**
  - Located on the Manipulator data plate

- **Manipulator Sales Order Number**
  - Located on the Robot Controller data plate

- **Positioner**
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1 Introduction

The purpose of this document is to integrate the EtherNet/IP-Safe (CIP Safe over EtherNet/IP) communication of a Rockwell GuardLogix series PLC with a MLX300 Robot Controller. This document contains the hardware and software steps required for generating a successful configuration.

1.1 Requirements

1.1.1 Programmable Logic Controller (PLC) Hardware:

- 1769-L30ERMS CPU (Compact GuardLogix)

1.1.2 Personal Computer (PC)

- PLC Software: "PLC Software Studio 5000 version 28.011 or later

1.1.3 Notice

- Other PLC hardware and software combinations may be compatible.
- YASKAWA DOES NOT give any type of promise or guarantee that other programmable logic controllers are compatible.

OTHER PROGRAMMABLE LOGIC CONTROLLERS MAY BE COMPATIBLE. YASKAWA DOES NOT GIVE ANY TYPE OF PROMISE OR GUARANTEE THAT OTHER PROGRAMMABLE LOGIC CONTROLLERS ARE COMPATIBLE.

OTHER PROGRAMMABLE LOGIC CONTROLLERS MAY BE COMPATIBLE. YASKAWA DOES NOT GIVE ANY TYPE OF PROMISE OR GUARANTEE THAT OTHER PROGRAMMABLE LOGIC CONTROLLERS ARE COMPATIBLE.

- See the PLC Software Studio 5000 documentation for the PC requirements.
- If using an earlier version of the Studio 5000, add a separate AOP.
  - The add-on profile (AOP) described in this manual has been supported since version 24 software.
1.1.3 MLX300 Robot Controller

- Any configuration of the Robot Controller firmware with EtherNet/IP and EtherNet/IP Safe options enabled.

**NOTICE**

- The Robot Controller EtherNet/IP and EtherNet/IP safe are available options that must be enabled.
- When purchasing EtherNet/IP Safe it includes both EtherNet/IP (non-safe) and EtherNet/IP Safe.

1.2 Manual References

There may be a requirement for the following manuals when configuring the Robot Controller LAN connection.

**Table 1-1: Reference Manuals**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLX300</td>
<td></td>
</tr>
<tr>
<td>180952-1CD</td>
<td>MLX300 Hardware Installation, Software Upgrade and Options</td>
</tr>
<tr>
<td>180247-1CD</td>
<td>MLX300 Software and Operating User's</td>
</tr>
<tr>
<td>YRC1000</td>
<td></td>
</tr>
<tr>
<td>179526-1CD</td>
<td>YRC1000 READ FIRST!! Safety Requirements</td>
</tr>
<tr>
<td>178642-1CD</td>
<td>YRC1000 Instructions</td>
</tr>
<tr>
<td>Varies depending on operations</td>
<td>YRC1000 Operators Manual</td>
</tr>
<tr>
<td>178643-1CD</td>
<td>YRC1000 Maintenance Manual</td>
</tr>
<tr>
<td>178644-1CD</td>
<td>YRC1000 Alarm Codes</td>
</tr>
<tr>
<td>178651-1CD</td>
<td>YRC1000 EtherNet/IP Communication for a Standard LAN Port.</td>
</tr>
<tr>
<td>179321-1CD</td>
<td>YRC1000 Options Instructions For EtherNet/IP Safety Function (For Standard LAN Port)</td>
</tr>
<tr>
<td>DX200</td>
<td></td>
</tr>
<tr>
<td>170294-1</td>
<td>Read First DX200</td>
</tr>
<tr>
<td>165292-1CD</td>
<td>DX200 Installation and Operation Manual</td>
</tr>
<tr>
<td>Varies depending on operations</td>
<td>DX200 Operators Manual</td>
</tr>
<tr>
<td>165293-1CD</td>
<td>DX200 Maintenance Manual</td>
</tr>
<tr>
<td>165838-1CD</td>
<td>DX200 EtherNet Communication Function Manual</td>
</tr>
<tr>
<td>175297-1CD</td>
<td>DX200 EtherNet/IP Safety Function Supplement</td>
</tr>
</tbody>
</table>
2 Setup

Before beginning to set up the Robot Controller LAN Connection, refer to the Manipulator manual to ensure the Robot is set to the standard shipping configuration.

2.1 Connecting Ethernet Cables

1. Using networking equipment attach Ethernet cables between:
   - MLX300 Robot Controller’s LAN2 connector
   - PLC
   - PC

2.2 Setting Up the PLC

2.2.1 Setting General Information

1. Power on the Robot Controller in normal operating mode.
2. On the PC open Studio 5000 and select “New Project”.
3. Enter the “New Project” Name, select the PLC Model number and click next.
4. Select the revision number, pick the rest of the hardware specifications and press the {Finish} button.

5. From “I/O Configuration” tree select “New Module” and observe the “Select Module Type” screen appears.

   NOTICE
   - The Robot Controller EtherNet/IP and EtherNet/IP Safe are available options that must be enabled.
   - When purchasing EtherNet/IP Safe it includes both EtherNet/IP (non-safe) and EtherNet/IP Safe.

   NOTICE
   - The Compact GuardLogix PLC suggested in section 1.1.1 “Programmable Logic Controller (PLC) Hardware:” on page 1-1 includes an Ethernet connection in the “I/O Configuration” tree.
     - If using a different PLC type, right-click on the (I/O Configuration), and then add, select and create the correct module (example: 1756-EN2T) to the configuration.
6. Select “ETHERNET-SAFETY-STANDARD MODULE” and press {Create} and observe a “New Module” screen appears.

7. On the “New Module” screen select the “General” Tab and enter the following:
   • Name in the “Name” field
   • IP address of the Robot Controller under “Ethernet Address”.

   **NOTICE**
   - When entering a Name, make the name easy to tell what it is, for example MLX300_R1, MH12_Robot, PalletizerBot. This name is the name used for the program later.
   - The Default IP address for the Robot Controller is 192.168.1.31

8. Press {Change...} and observe the “Module Definition” “Define Module, Electronic Keying and Connection” screen appears.

10. Set the values per Table 2-1 and press the {OK} button.

Table 2-1: Module Definitions.

| Vendor: 44 |
| Product Type: 140 |
| Product Code\(^1\): YRC1000 - 1284 or DX200 - 1282 |
| Major Revision: 1 |
| Minor Revision: 1 |
| Electronic Keying: Exact Match |
| Connection: Safety and Standard |
| Input Data: Safety and Standard |
| Output Data: Safety and Standard |
| Data Format: SINT (8-Bit) |

---

\(^1\) The original Robot Controller (YRC1000 or DX200) determines the Product Code.

---

NOTICE

Refer to the *EtherNet/IP Safety Function* manual for more details concerning required values to enter on the “Define Module, Electronic Keying and Connection” screen. See section 1.2 “Manual References” on page 1-2 for more details.
2.2.2 Setting the Connections

1. Select the “Connections” Tab on the left and observe the “Connections” screen appears.

2. On the “Connections” screen set the values as follows:

<table>
<thead>
<tr>
<th>Connection</th>
<th>Input</th>
<th>Output</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assembly Instance</td>
<td>Size (bytes)</td>
<td>Assembly Instance</td>
</tr>
<tr>
<td>SafetyInput</td>
<td>776</td>
<td>8</td>
<td>1024</td>
</tr>
<tr>
<td>SafetyOutput</td>
<td>1024</td>
<td>904</td>
<td>8</td>
</tr>
<tr>
<td>Standard</td>
<td>200</td>
<td>436</td>
<td>201</td>
</tr>
</tbody>
</table>

NOTICE

• These settings assume the Robot Controller configuration has eight safety bytes and eight non-safe Ethernet/IP bytes.

• Refer to EtherNet/IP Safety Function manual for more details concerning required values to enter onto the “Connection” screen. See section 1.2 “Manual References” on page 1-2.

3. Press (OK) on the “Connection” screen and observe a dialog box appears to confirm the changes to the module definition.

4. Press {Yes}.
2.2.3 Setting Requested Packet Interval

Setting the Requested Packet Interval needs to be set through Studio 5000 and Safety Task in the Controller Organizer.

2.2.3.1 Studio 5000

1. From the “New Module” Screen select the “Safety” tab on the left and observe the “Safety” screen appears.

2. On the “Safety” tab, uncheck {Configuration Signature}.

3. Set the table “Safety Input”, “Requested Packet Interval (RPI) (ms)”.

4. Press {OK}.

NOTICE

• The “Safety Input”, “Requested Packet Interval (RPI) (ms)” is determined by (multiples of four).

• Refer to EtherNet/IP Safety Function Manual for setting the “Safety Input”, “Requested Packet Interval”. See section 1.2 “Manual References” on page 1-2 for more details.
2.2.3.2 Safety Task in the Controller Organizer

1. In the Controller Organizer select SafetyTask using the right mouse button and select Properties and observe the “Task Properties - SafetyTask” screen appears.

2. On the “Task Properties - SafetyTask” screen select the “Configuration” tab.

3. In the “Period” field enter the same value that was entered in section 2.2.3.1 step 3.

4. In the “Watchdog:” field enter the same value that was entered in the “Period” field and press {OK}. 
2.2.4 Setting Date and Time

1. In the Controller Organizer select the processor (1769-L30ERMS) using the right mouse button and select "Properties" and observe the Robot Controller Properties screen appears.

2. Press the {Date/Time} tab and then Check {Enable Time Synchronization} and select {OK}. 
2.2.5 Configure While Online with PLC

1. Turn on the power supply of the PLC.

2. Select "Communications"/ "Who Active".

3. On the "Who Active" screen select the driver and PLC/CPU, then press the (Go Online) button.

4. When the "Connected To Go Online" screen appears press (Download).
5. When the “Download” screen appears verify the information on the screen, place a check-mark next to the text that reads “Download Project Documentation and Extended Properties” and press {Download}.

6. When the “Logix Designer” dialog box appears press {No}. 
2.2.6 Setting the Local Module Properties

The Local Module is broken down to the following areas:

- "Getting to the Local Module Properties"
- "Setting General Information"
- "UnInhibit Module"
- "Resetting Ownership"
- "Removing Inhibit From the Module"
- "Setting the Safety Network Number"

2.2.6.1 Getting to the Local Module Properties

1. In the Controller Organizer select “ETHERNET-SAFETY-STANDARD MODULE” using the right mouse button and select “Properties” and observe the “Module Properties Local” screen appears.

2.2.6.2 Setting General Information

1. Select the “General” tab on the left and observe the “General” screen appears.

2. On the “General” screen press the “Safety Network Number” {...}. 
3. The “Safety Network Number” dialog appears and observe if {Set} is grayed out or not.
   • If {Set} is not grayed out continue with step 2 in section 2.2.6.6.
   • If {Set} is grayed out, press {Cancel} and continue with section 2.2.6.3 (this is the next step in the manual.)
2.2.6.3 UnInhibit Module

1. Select the “Connection” tab on the left and observe the “Connection” screen appears.

2. On the “Connection” screen place a check-mark in the “Inhibit Module” and press {Apply}.

3. Observe the RSLogix 5000 dialog box appears concerning changing parameters and press {Yes}.
2.2.6.4 Resetting Ownership

1. Select the “Safety” tab on the left of the “Module Properties” screen and observe the Safety screen appears.

2. Press (Reset Ownership) and observe the “RSLogix 5000” DANGER reset ownership dialog appears and press {Yes}.

3. Observe the “RSLogix 5000” Safety Network Number DANGER appears and press {Yes}.
2.2.6.5 Removing Inhibit From the Module

1. From the “Module Properties” screen select the “Connection” tab on the left and un-check the “Inhibit Module” and press {Apply}.

2. Observe the “RSLogix 500” DANGER concerning uninhibiting module can affect running system and press {Yes}.
2.2.6.6 Setting the Safety Network Number

1. Select the “General” tab on the left and press “Safety Network Number” {...}.

2. On the “Safety Network Number” dialog box press {Set}.

**NOTICE**

Pressing the {Set} button sets the TUNID (Target Unique Network Identifier) for the Robot Controller safety adapter. The TUNID generates the YRC1000 Adapter Safety Network Number (SNN).

To see the TUNID on the Programming Pendent select {System Info} → {Fieldbus Info}.
Setup

2.2 Setting Up the PLC

3. Observe the “Set Safety Network Number in Module” DANGER dialog box appears and select {Yes}.

![Set Safety Network Number in Module dialog box]

4. After pressing {Yes} observe the Safety Network Number from the PLC is set to the same value on the Robot Controller and press {OK}.

![Studio 5000 and Programming Pendant View]

NOTICE

• In the Studio 5000 “Safety Network Number” dialog screen shows the “Safety Network Number” in the “Number:” dialog box.
• The Safety Network Number is confirmed from the “Main Menu/SYSTEM INFO/FIELDBUS INFORMATION” on the Programming Pendant and should match the value in the Studio 5000 Software.

5. Set safety signature and lock.

NOTICE

The safety signature does not require being set and locked for setting up communication. This is a recommendation and reminder for when the integration is complete.
### 3  Enabling Ethernet in Controller

When the Robot Controller is shipped, the Ethernet/IP communication is set to “VIRTUAL”. This setting will prevent alarms when a master/scanner safety PLC is not present or configured. After the safety portion of the PLC has been configured to communicate with the Robot Controller in the chapters before, change Ethernet/IP communication to “SAFETY”.

1. Turn the Robot Controller OFF.
2. Press the [MAIN MENU] key on the Programming Pendant and turn Robot Controller power ON. This boots the Robot Controller up in Maintenance Mode.
3. Press [SYSTEM] → [SECURITY], and enter the SAFETY MODE password.

**NOTICE**

The default SAFETY MODE password is sixteen “5”s.

4. Press [SYSTEM], and select [SETUP] on the Main Menu of the Programming Pendant.
6. Highlight DETAIL of EtherNet/IP (CPU Board), and press [SELECT] and repeat.

7. Highlight the VIRTUAL setting of VIRTUAL COMM and press [SELECT], to change this to SAFETY.

8. Press Enter, and press Yes to modify three times..
4 I/O Testing and Communication Confirmation

4.1 Checking Communication

1. After pressing {Yes}, place the operation of the PLC in “Run Mode” and check communication by the following indications within Studio 5000.

   a) When all device are OK the “I/O OK” indicator is steady:
   - GOOD:
     ![I/O light is solid]
   - BAD:
     ![I/O light is blinking]

   b) Confirm no warning in the “I/O Configuration”/device tree:
   - GOOD:
     ![Device tree indicating no warning]
   - BAD:
     ![Device tree indicating warning]
4. I/O Testing and Communication Confirmation

4.1 Checking Communication

c) Check text status in module window.
4.2 Checking Safety I/O

1. On the Programming Pendant “Main Menu” press the [SAFETY FUNC.] button and observe the “SAFETY LOGIC CIRCUIT” appears.

2. Confirm safety signal usage at the Robot Controller.
   - SFBOUT01 = Safety Fieldbus Output 01, which maps to PLC safety input YRC1000_R1:SI.Data[0].0 and so on
   - SFBIN01 = Safety Fieldbus Input 01, which maps to PLC safety output YRC1000_R1:SO.Data[0].0 and so on

3. Trigger appropriate safety conditions on the Robot Controller (E-Stop, Teach, Play, etc) and look for response signals as inputs at PLC.
4. Trigger safety outputs from the PLC which can enable E-Stops, or other safety logic conditions.
ETHERNET/IP-SAFE CONFIGURATION
MLX300 CONTROLLER AS ADAPTER SUPPLEMENT

Specifications are subject to change without notice for ongoing product modifications and improvements.

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