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

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.

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.

Ensure Safety

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

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

- 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 Manual mode.
  - Robot operates normally at the speed limit or less in the Manual mode. (Speed limit: 250 mm/s at the TCP or the flange)
  - The manual function and the playback function operate normally.

- 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.
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.
**Safety**

**Ensure Safety**

---

**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 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 Pendant
  - Running the system in the Manual 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.
Ensure Safety

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 supplied with 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.
Before operating the Robot, make sure servo power is OFF by performing the following operations. When servo power is OFF, the SERVO ON LED on the Pendant is OFF.

- Press the EMERGENCY STOP buttons.
- 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 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 Pendant
  - Running the system in Manual 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 Manual 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 Safety

**WARNING**

- 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.

**CAUTION**

- Do not modify the Controller.
  Making modifications without written permission from YASKAWA voids 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.

- All connections must be made within the standard voltage and current ratings of the equipment.

Improper connections can damage the equipment.
Safety

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>Proface or Allen Bradley MobileView Pendant</td>
<td>Pendant</td>
</tr>
<tr>
<td>Conveyor Tracking Option Manipulator Robot</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 Character Keys /Symbol Keys</td>
<td>The keys which have characters or symbols printed on them are denoted with [ ]. e.g. [ENTER]</td>
</tr>
<tr>
<td>Axis Keys /Numeric Keys</td>
<td>[Axis Key] and [Numeric Key] are generic names for the keys for axis operation and number input.</td>
</tr>
<tr>
<td>Keys pressed simultaneously</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>Mode Switch</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>Button</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>Displays</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.
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   1.2 Conveyor Tracking Requirements .................................................................................................... 1-3
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      1.2.2 RSLogix 5000 files included with the MLX300 Control Module: ........................................... 1-4
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## Conveyor Tracking Option

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  5.2  Part is Gripped Consistently at the Wrong Location ............................... 5-1

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This manual describes the configuration and use of the MLX300 Conveyor Tracking feature. The Add On Instruction (AOI)s and other functionality listed in this manual are only available if the Conveyor Tracking option is enabled on the Robot Controller.

### 1.1 Conveyor Tracking Overview

The conveyor tracking AOIs enable the robot to perform movements relative to a part as it travels down a conveyor. The positions are originally taught with the conveyor stopped. During playback, any motion commands between the MLxRobotConvSyncStart and MLxRobotConvSyncStop AOIs will be synchronized with the linear motion of the part moving on the conveyor.

*Fig. 1-1: Conveyor Tracking Cell Configuration*
Conveyor Tracking Option

1 Introduction
1.1 Conveyor Tracking Overview

Referring to the example in Fig. 1-2 “Robot Taught Positions with Conveyor Off”, the conveyor stops with the part at a known distance from the sensor. Seven points are taught near the part. The move commands points P2-P6 be placed in the job between the MLxRobotConvSyncStart and MLxRobotConvSyncStop AOs.

*Fig. 1-2: Robot Taught Positions with Conveyor Off*

In Automatic mode, when the job executes, the robot moves to the points taught relative to the part, while moving down the conveyor. The conveyor motion will be interpolated or added to the taught positions to create a tracking sequence (*Fig. 1-3 “Robot Path During Playback”.*)

*Fig. 1-3: Robot Path During Playback*
1.2 Conveyor Tracking Requirements

The following items are needed for conveyor tracking:

- **MLX300 Controller**
- **Conveyor**
- **Incremental Encoder** - mounted to the conveyor for reading conveyor position.
- **Counter Card** - reads encoder position with ControlLogix/CompactLogix.
- **Sensor with Trigger Output** - captures the position of an object on the conveyor. Normally, this output is wired in to the “latch” input of the counter card.

**NOTICE**

To improve conveyor tracking accuracy, use a thru-beam/opposed mode sensor.

1.2.1 Equipment Used for Verifying Conveyor Tracking Operations

Conveyor tracking has been tested using the following:

- **Conveyor** - A straight conveyor with speeds up to 1000 mm/sec.
- **Incremental Encoder** - Allen Bradley 845H
- **Sensor** - Photo Eye/Switch (e.g. Keyence # FS-N41P or Banner # PIT46U sensor, along with the correct fibers for the conveyor width)

The controller is delivered with a sample conveyor tracking program. The sample program consists of a basic conveyor tracking program that uses the conveyor tracking AOI's. This sample program can be used as a starting point to build a full conveyor tracking application.
1.2.2 RSLogix 5000 files included with the MLX300 Control Module:

- MLX300_ControlLogix.ACD - preconfigured project for use with ControlLogix systems
- MLX300_CompactLogix.ACD - preconfigured project for use with CompactLogix systems
- MLX300_Import.L5X - skeleton application for importing MLX300 AOIs and User Defined Types (UDTs)
- MLX300Communications_[0-3].L5X - RSLogix task for MLX300 communications
- MLX300HMI.APA - MLX300 HMI Project File
- MLxConveyorSync_[0-3].L5X - conveyor update task (used only for conveyor tracking)
- HMIUpdates.L5X - a RSLogix task that is needed to communicate with the MLX300 HMI

1.3 Manual References

There may be a requirement for the following manuals when configuring the Conveyor Tracking Option.

Table 1-1: Reference Manuals

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>188423-1CD</td>
<td>Ethernet/IP-Safe Configuration, MLX300 Controller as Adapter Supplement</td>
</tr>
</tbody>
</table>
1.4 Customer Support Information

If you need assistance with any aspect of the Conveyor Tracking Option contact Customer Support at the following 24-hour telephone number:

(937) 847-3200

For routine technical inquiries, you can also contact Customer Support at the following e-mail 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 your inquiry.

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

Please have the following information ready before calling:

- System
- Robots
- Positioner
- Primary Application
- Software Version

MLX300

Access this information on the Status Display screen of the Control Module.

- Robot Serial Number
- Robot Sales Order Number

Located on the robot data plate

Located on the Control Module data plate
2 Configuring Conveyor Tracking

This section explains how to setup the conveyor tracking tags and the High Speed Counter (HSC) card for the CompactLogix PLC.

**NOTICE**
This section can be used as a reference for setting up the ControlLogix PLC HSC card.

### 2.1 Importing Conveyor Tracking Programs

**WARNING**

- Failure to set up the Conveyor Tags correctly can lead to unexpected behavior during conveyor tracking.
- Not setting the Conveyor Tags correctly may result in death or serious injury.

1. Import the following programs from the software CD under PLC ➔ Conveyor Tracking to MLX_Task
   - CompactLogix_MLxConveyorSync_0.L5X
   - ConveyorTrackingExample.L5X

**NOTICE**

- Importing the example program also imports the conveyor tracking AOIs.
- Ignore any import or controller verification errors.
  - These errors will be eliminated when the HSC card is added, and the tags are linked.

2. Right-click on the “MLX_Task and press “Add”.

   *Fig. 2-4: Importing Conveyor Tracking Programs*

3. Select each of the following programs:
   - CompactLogix_MLxConveyorSync_0.L5X
   - ConveyorTrackingExample.L5X
2 Configuring Conveyor Tracking

2.1 Importing Conveyor Tracking Programs

4. Right-click MLX_Task, and select “Properties”.

Fig. 2-5: Scheduling Program Order

5. On the “Program / Phase Schedule” tab, use the [Move] buttons to order the programs as shown on the right side of Fig. 2-5.

6. After importing the conveyor tracking programs, several new tags will show up in the Control Module-Scope Conveyor tags.

Fig. 2-6: Control Module-Scope Conveyor Tags

NOTICE

- These tags will have the prefix “Conveyor0” for the first conveyor, “Conveyor1” for the second conveyor, etc…
- These tags need to be linked to the proper hardware devices being used for reading/latching the conveyor position.
- Table 2-2 “Control Module-Scope Conveyor Tag Descriptions” shows a brief introduction to what each of these tags means.
## Configuring Conveyor Tracking

### 2.1 Importing Conveyor Tracking Programs

**Table 2-2: Control Module-Scope Conveyor Tag Descriptions**

<table>
<thead>
<tr>
<th>Tag Name</th>
<th>Input/Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conveyor0_SensorState</td>
<td>Input</td>
<td>This bit should turn on when an object is in front of the sensor or under a camera.</td>
</tr>
<tr>
<td>Conveyor0_NewData</td>
<td>Input</td>
<td>This bit should turn on when a new object has passed by the camera and stay on until the ResetNewData signal is sent.</td>
</tr>
<tr>
<td>Conveyor0_ResetCounter</td>
<td>Output</td>
<td>Turning this bit on should reset the counter card position to 0.</td>
</tr>
<tr>
<td>Conveyor0_ResetNewData</td>
<td>Output</td>
<td>Turning this bit on will reset the NewData flag (used internally to tell the counter that the current object has been processed and queued).</td>
</tr>
<tr>
<td>Conveyor0_CurrentValue</td>
<td>Input</td>
<td>This should contain the current position of the conveyor in encoder counts.</td>
</tr>
<tr>
<td>Conveyor0_LatchedValue</td>
<td>Input</td>
<td>This should contain the current latched position of the conveyor. When a new object passes the sensor, this position will be stored until the ResetNewData flag is sent.</td>
</tr>
<tr>
<td>Conveyor0_RollOver</td>
<td>Input</td>
<td>The RollOver value of the conveyor. This must be set to the proper RollOver value or Conveyor Tracking will not function properly during rollover conditions.</td>
</tr>
<tr>
<td>Conveyor0_EncoderEnable</td>
<td>Output</td>
<td>This tag enables the encoder processing. This tag is not used for the ControlLogix HSC card.</td>
</tr>
<tr>
<td>Conveyor0_EncoderTriggerDisable</td>
<td>Output</td>
<td>This tag will disable the sensor input. This tag is not used for the ControlLogix HSC card.</td>
</tr>
</tbody>
</table>

**NOTICE**

This manual uses “Conveyor0” prefix to describe the setup, configuration, and operation for Conveyor Tracking. If using a different conveyor number, simply replace with the correct conveyor number in the prefix.
2 Configuring Conveyor Tracking

2.2 Configuring the HSC Card

This section describes how to set up the HSC card (1769-HSC) for the CompactLogix PLC. The setup for the ControlLogix HSC card is similar, and this section can be used for reference.

### 2.2.1 Wiring the HSC Card

The HSC card can be configured in several different ways. Each HSC card can support up to four independent counters. The setup described in this document uses only one of the four counters.

Each conveyor encoder needs to be connected to a one counter input. The HSC should be wired in the following manner:

- HSC card Input A: Wired to conveyor encoder channel A
- HSC card Input B: Wired to conveyor encoder channel B
- HSC card Input Z: Wired to sensor switch or any other input that acts as a trigger for object detection, such as a vision system.

Refer to the HSC USERS GUIDE for details on wiring the HSC card to a conveyor.

### NOTICE

The ControlLogix HSC card is not exactly the same as the CompactLogix PLC, but the information on the screens are the same.

### NOTICE

Use an opposed optical sensor, where a part breaks a through-beam, for better tracking accuracy.
2.2.2 Configuring the HSC Card in Studio 5000

2.2.2.1 Adding a HSC Card

1. Right-click on the “1769 Bus” in the “I/O Configuration”, select “New Module.” and navigate to the HSC card.

*Fig. 2-7: Adding a New Module*

2. Using the check boxes, select “Specialty”, Rockwell Automation/Allen-Bradley and 1769-HSC and press [Create]. See Fig. 2-8 “Adding the 1769-HSC Card to PLC Rack”.

*Fig. 2-8: Adding the 1769-HSC Card to PLC Rack*
2 Configuring Conveyor Tracking

2.2 Configuring the HSC Card

3. On the {General} tab, enter the “Name:” and set the “Slot:” number for the HSC.

*Fig. 2-9: 1769-HSC General Tab*

4. Make sure the “Series” and “Revision” numbers are correct for the actual card being used.

5. Click on the {Connection} tab, and set the “Requested Packet Interval (RPI)” to 1.0 ms.

*Fig. 2-10: 1769-HSC Connection Tab*

6. Make sure that “Inhibit Module” is unchecked and “Major Fault on Controller if Connection Fails While in Run Mode” is checked.
2 Configuring Conveyor Tracking

2.2 Configuring the HSC Card

7. Click on the {Counter Configuration} tab, and select “Encoder X4” for the “Operation Mode”.

Fig. 2-11: 1769-HSC Counter Configuration Tab

8. Uncheck the “Counter Reset Enable” box, check the “Store on Rising Z” box, and press {OK}.

9. Press {Close} on the “Select Module Type” screen.

2.2.3 Linking the Conveyor Tags to the HSC Card Tags

After configuring the HSC card, the Conveyor Tags need to be linked to the proper HSC tags as shown in Fig. 2-13(a “CompactLogix: Conveyor Tags Linked to HSC” and Fig. 2-13(b “ControlLogix: Conveyor Tags Linked to HSC”.

1. Press the “Edit Tags” tab on the “Controller Tags” screen.

Fig. 2-12: Controller Tag Screen

2. Enter the data shown in Fig. 2-13(a) and Fig. 2-13(b) in the middle column “Alias For”, for each new tag in the left column

**NOTICE**

The “Local” number needs to be set to the slot the HSC card is installed in. For this example, it is slot 1
Conveyor Tracking Option

2 Configuring Conveyor Tracking
2.2 Configuring the HSC Card

Fig. 2-13(a): CompactLogix: Conveyor Tags Linked to HSC

<table>
<thead>
<tr>
<th>Tag</th>
<th>Data Type</th>
<th>Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conveyor0_CurrentValue</td>
<td>Local: 11.0</td>
<td>DINT</td>
</tr>
<tr>
<td>Conveyor0_BrakeEnable</td>
<td>Local: 1.0.0</td>
<td>BOOL</td>
</tr>
<tr>
<td>Conveyor0_HSCEnable</td>
<td>Local: 1.0</td>
<td>BOOL</td>
</tr>
<tr>
<td>Conveyor0_LatchedValue</td>
<td>Local: 11.0.0</td>
<td>DINT</td>
</tr>
<tr>
<td>Conveyor0_ResetCounter</td>
<td>Local: 1.0.0</td>
<td>DINT</td>
</tr>
<tr>
<td>Conveyor0_SensorState</td>
<td>Local: 11.1.0</td>
<td>DINT</td>
</tr>
</tbody>
</table>

Fig. 2-13(b): ControlLogix: Conveyor Tags Linked to HSC

<table>
<thead>
<tr>
<th>Tag</th>
<th>Data Type</th>
<th>Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conveyor0_CurrentValue</td>
<td>Local: 21.0</td>
<td>L DINT</td>
</tr>
<tr>
<td>Conveyor0_LatchedValue</td>
<td>Local: 21.2</td>
<td>L DINT</td>
</tr>
<tr>
<td>Conveyor0_ResetCounter</td>
<td>Local: 2.0</td>
<td>L BOOL</td>
</tr>
<tr>
<td>Conveyor0_SensorState</td>
<td>Local: 21.1</td>
<td>L BOOL</td>
</tr>
</tbody>
</table>

NOTICE

The Conveyor0_CurrentValue, Conveyor0_LatchedValue, and Conveyor0_RollOver are in units of pulse counts.
2.3 Conveyor Parameter Configuration for the Robot Controller

The information for configuring a specific conveyor for the Robot Controller is located in the Controller Tags under the ApplicationData.ConveyorData tag structure.

Fig. 2-14: Conveyor Data Inside Application Data

The ConveyorData tag structure contains the following variables:

Fig. 2-15: Conveyor Application Data
## 2 Configuring Conveyor Tracking

### 2.3 Conveyor Parameter Configuration for the Robot Controller

Table 2-3: Conveyor Tag Descriptions

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conveyor Name</td>
<td>User defined name of conveyor.</td>
</tr>
<tr>
<td>IsActive</td>
<td>Turns conveyor reading on for conveyor. This must be turned on for any active conveyors and turned off for unused conveyors to preserve MLX_Task load.</td>
</tr>
<tr>
<td>ControlIndex</td>
<td>Defines the Robot Controller being used if PLC is connected to multiple Robot Controllers.</td>
</tr>
<tr>
<td>ConveyorPosition</td>
<td>Feedback conveyor position in mm (Note this value is for reading only - modifying this value has no effect.)</td>
</tr>
<tr>
<td>ConveyorStartPosition</td>
<td>Conveyor Position where tracking operation begins (distance past sensor). This is an array of four positions. There is a start position for up to four robots.</td>
</tr>
<tr>
<td>ConveyorTeachPosition</td>
<td>Conveyor Position where positions are taught (distance past sensor) This is an array of four positions. There is a teach position for up to four robots.</td>
</tr>
<tr>
<td>MaxStartPosition</td>
<td>Conveyor Position where the part should be ignored, because it moves out of reach, or OL - overlimit (distance past sensor) This is an array of four positions. There is a max start position for up to four robots.</td>
</tr>
<tr>
<td>UserFrameNumber</td>
<td>User frame number taught for the conveyor. The conveyor movement is in the direction of +X. <strong>NOTE:</strong> The PLC job needs to set the active frame to this number using the MLxRototSetUserFrame instruction)</td>
</tr>
<tr>
<td>ConveyorType</td>
<td>Not Used. Set to 0.</td>
</tr>
<tr>
<td>EncoderToMMConversion</td>
<td>The number of mm per encoder count. i.e. [\text{EncoderCount}] \times \text{EncoderToMMConversion} = \text{Distance (mm)}</td>
</tr>
<tr>
<td>SpeedConversionFactor</td>
<td>Not Used</td>
</tr>
<tr>
<td>NbrOfPointsToLinearFit</td>
<td>Not Used</td>
</tr>
<tr>
<td>NbrOfPointsToAverage</td>
<td>The number of points used to calculate a moving average of the encoder positions. Useful for noisy encoder signal. The valid range for this parameter is 0 - 100. Default setting is 25.</td>
</tr>
<tr>
<td>LagOffset</td>
<td>An offset in mm along the x direction of the conveyor. This can offset a constant error along the conveyor. This value can be used to fine tune the execution positions of the motion instructions that execute after a call to MLxRobotConvSyncStart. A positive value corresponds to adjustments in the +X direction.</td>
</tr>
</tbody>
</table>
2 Configuring Conveyor Tracking

2.4 Conveyor Tracking Setup Procedure

2.4.1 Verify Counter Card is Functional

Before attempting Conveyor Tracking operations, the functionality of the counter card (or comparable device) should be verified.

1. Click on and slide the MLxConveyorSync_0 program into the “Unscheduled Programs” folder to unschedule.

   Fig. 2-16: Unschedule MLxConveyorSync_0

2. Access the “Conveyor0_” tags in the Controller Tags list.
3. Set “Conveyor0_EncoderEnable” to 1 for the CompactLogix HSC card.

   Fig. 2-17: Conveyor0 Tags

4. Turn conveyor on and start moving. The Conveyor0_CurrentValue should start increasing.

   NOTICE
   The ControlLogix HSC card does not have the “Conveyor0_” tag.

   If the value decreases, reverse the encoder direction by changing Local:x:O.Ctr0DirectionInvert, where “x” is the slot number.
Configuring Conveyor Tracking

2.4 Conveyor Tracking Setup Procedure

5. Place an object on the conveyor and move it past the sensor.
   • As it crosses, the Conveyor0_CurrentValue stores in the Conveyor0_LatchedValue tag, and the Conveyor0_NewData bit turns to 1.
   • When the part is blocking the sensor The Conveyor0_SensorState will be 1.

6. Toggle the Conveyor0_ResetNewData bit.
   • The Conveyor0_NewData bit turns to 0.

   **NOTICE**
   • If the counter card does not work properly it is important to debug the counter card before moving on.
   • The Conveyor0_ResetCounter can be toggled to reset the Conveyor0_CurrentValue to 0.

7. Re-schedule the MLx_ConveyorSync_0 program under the MLX_Task and move it to the top of all scheduled programs.
2 Configuring Conveyor Tracking

2.4 Conveyor Tracking Setup Procedure

2.4.2 Calculate Conveyor Resolution

1. Access the ApplicationData.ConveyorData[0] tags. These tags were explained in section 2.3 “Conveyor Parameter Configuration for the Robot Controller”.

Fig. 2-18: Conveyor Application Data

2. Set the ApplicationData.ConveyorData[0].IsActive to 1.

3. With the conveyor stopped, place a part on the conveyor.

4. Place a ruler next to the conveyor and record the Conveyor0_CurrentValue for the current position. (Initial Pulse Count)

5. Operate the conveyor to move the part approximately 1000 mm.

6. Measure the distance that the part traveled (mm) and record the new Conveyor0_CurrentValue (Final Pulse Count).

7. Calculate the pulse count conversion factor
   • Conversion Factor = Distance (mm) / (Final Pulse Count - Initial Pulse Count).

8. Enter the Conversion Factor in ApplicationData.ConveyorData[0].EncoderToMMConversion tag.

9. Verify the Conversion Factor is correct,

10. Operate the conveyor again and verify that the changing ApplicationData.ConveyorData[] . ConveyorPosition variable is reporting the correct distance traveled in mm.
   • When parts move past the sensor, the conveyor position sets to 0.
   • After part moves 1000 mm past the sensor, stop the conveyor and verify the ApplicationData.ConveyorData[] . ConveyorPosition value is the correct distance.

NOTICE

• The switch must be in Manual mode for ApplicationData.ConveyorData[] . ConveyorPosition to reset to 0 when the part crosses the sensor.

• If the switch is in Automatic, the ApplicationData.ConveyorData[] . ConveyorPosition will reset to 0 when the queue is empty.
2.4.3 Teach a User Frame

1. Install a pointing device on the robot and enter the tool data.
2. Teach a user frame for the conveyor, so motion is in the +X direction of the user frame.
3. Enter the frame number in the ApplicationData.ConveyorData[0].UserFrameNumber tag.
4. Change the user frame number in the MLxRobotSelectUserFrame command for the “Startup” routine.

–An example program is shown in Fig. 2-19. This user frame number was changed to 10.

Fig. 2-19: Setting User Frame in Startup Routine

NOTICE

The MLxRobotSetUserFrame command is already in the ConveyorTrackingExample program. This AOIs user frame needs to be changed to the frame taught.
2 Configuring Conveyor Tracking

2.4 Conveyor Tracking Setup Procedure

2.4.4 Teach Points and Setup Tracking Parameters

**NOTICE**

The Teach Points and Setup Tracking Parameters section needs to be completed for each robot number.

**WARNING**

The motions performed while conveyor tracking will be different from those taught with the conveyor stationary. Thus, certain errors may be encountered while tracking that would not show up otherwise (e.g. speed/limit violations).

1. Press {Menu} then {Conveyor Tracking} on the Pendant.

*Fig. 2-20: Selecting Conveyor Tracking*

**NOTICE**

If the {Conveyor Tracking} button does not display on the Menu screen, it is due to not enabling the conveyor tracking license on the controller.
2. Select the robot number at the top of the screen

Fig. 2-21: Conveyor Tracking Setup Screen

3. Turn the switch to Manual mode.
   • Verify every time a part crosses the sensor the Conveyor Position reset to 0.

4. Operate the conveyor to move a part past the photo eye and stop the conveyor at a position where the part will be taught.
   • Refer to the Conveyor Position, shown on the Pendant, and enter this number as the “Conveyor Teach Position Value”. This is the conveyor position where all the robot motion points will be taught.

5. Teach all robot positions relative to the part with the conveyor stopped.
   • The positions need to be taught in the World Coordinate system.
   • Typical points taught will be an approach position above the part, a grip position at the part, and a depart position above the part.
   • During playback, Linear Motion instructions can be used to move the robot TCP to these points while tracking the part motion on the conveyor, as long as they fall between a MLxRobotConvSyncStart and a MLxRobotConvSyncStop.
   • Only Linear move commands are used for conveyor tracking.
   • For a faster speed use the VMAX option of the motion commands.
   • All of the entries and feedback on the Pendant Conveyor Tracking screen are stored in the ApplicationData.ConveyorData[0] tags.

6. Enter the remaining parameters on the “HMI Conveyor Tracking Setup” screen:
2 Configuring Conveyor Tracking

2.4 Conveyor Tracking Setup Procedure

- **Sync Start Position Value**
  Determine how far past the photo eye the conveyor tracking sequence should begin. The robot will wait at the MLxRobotConvSyncStart instruction until the part has traveled to this distance past the sensor. At this point, the robot will begin to move.

- **Max Start Position Value**
  Estimate the worst case distance past the photo eye that the robot will be able to begin tracking a part and successfully pick it up without reaching a software limit. This parameter is used for queued parts. After moving a part, if a new part had already crossed the photo eye and is in a queue, the MLxRobotConvSyncStart AOI will determine if its location is past the Max Start Position value. If the part is past the Max Start Position, the AOI will turn on its Sts_OL output, (Over Limit). Whenever the speed of the conveyor is changed, this value should be adjusted.

- **# of Points to Average for Conveyor Position**
  The number of points used to calculate a moving average of the encoder positions. Useful for a noisy encoder signal.

- **Conveyor Position**
  This field is for conveyor position reference only and cannot be changed.

- **Lag Offset**
  The lag offset parameter can be adjusted to speed up or slow down the SyncStart instruction execution time, so that parts can be picked up at a consistent location on the part. It can compensate for I/O hardware delays. A positive value corresponds to an adjustment in the +X direction.

NOTICE
There are four values for the ConveyorStartPosition, ConveyorTeachPosition and MaxStartPosition in the ApplicationData.ConveyorData[0] tag array. These values can be used for up to four robots, so that they can work on different sections of the conveyor.
3 Developing a Conveyor Tracking Application

The following sections will describe the basic methodology to program a conveyor tracking application.

3.1 Program Structure Overview

Fig. 3-22 “Basic Program Structure for a Conveyor Tracking Application” shows the basic structure of a simple Conveyor Tracking program. On Step 10, an Axis Motion (e.g. MLxRobotMoveAxisAbsolute) is used to move the robot to its “pounce” position. This is the position where the robot will wait to start tracking objects. After this motion is complete, Step 20 will wait at an MLxRobotConvSyncStart command until a part crosses the photo eye and moves past the defined ConveyorStartPosition. After this happens, the program will move to Step 30 where the linear motions to the taught points relative to the part are executed while tracking the moving part. When these motions are complete, Step 40 will call an MlxRobotConvSyncStop command which will stop the tracking action and also remove the part from the queue.

**NOTICE**
- The points taught for the linear motion during conveyor tracking, need to be taught in world coordinate, not in the conveyor user frame.
- Only linear moves are supported when conveyor tracking is on. Any other type of motion will result in an error.

Fig. 3-22: Basic Program Structure for a Conveyor Tracking Application

The ConvSyncStop on Step 40 could also be replaced with a ConvSyncStopWithAxisMot or ConvSyncStopWithLinearMot to allow smooth blending out of the conveyor tracking operations.
3 Developing a Conveyor Tracking Application

3.1 Program Structure Overview

3.1.1 Program Structure Details

This section will show an example of programming a PLC routine to track a part. Refer to the ConveyorTrackingExample PLC program that was imported in section 2. Follow along the programmed steps as they are being explained. In the Startup routine, the first steps of the application is to activate the Tool and the User Frame that was taught for the conveyor. The next step is to reset the conveyor state (Fig. 3-23 “Conveyor Initialization Step”). The following actions are performed to reset the conveyor:

- Moving 0 into the robot's QueueControl.POS variable will act to flush the queue. Thus, any parts remaining in the queue will be removed.
- The Conveyor0_ResetNewDataFlag tag is an acknowledgment that the last part was added to the queue. This tag needs to be toggled to reset any new data from the last execution.
- The Conveyor0_ResetCounter variable will simply reset the counter's current encoder count to 0.

Fig. 3-23: Conveyor Initialization Step
Developing a Conveyor Tracking Application

3.1 Program Structure Overview

After the initialization in the Startup routine is complete, the program step is set to 100. In the Conveyor_Tracking routine, on step 100, a linear motion command will move the robot to the conveyor pounce position. Note that this step is incremented to 200 when the Sts_DN bit (instead of Sts_PC bit) of the motion instruction turns on. This means that the program will move to Step 200 (Conveyor Sync Start) as soon as the motion is queued rather than waiting for the motion to complete. Thus, if a part crosses the photo eye while this motion is taking place, it can blend into the tracked motions.

Fig. 3-24: Move to Conveyor Pounce Position

On Step 200, the Conveyor Sync Start instruction will wait for an object to pass the sensor. When a part is detected, the Sts_DN bit will turn on. This instruction also has a Sts_OL bit (overlimit) which will turn on if the object moves past its Max Start Position. If the Sts_OL bit turns on, the application will advance to the Conveyor Sync Stop rung (Step 300.) Otherwise, it will move to the Tracked Motions (Step 210.) The reason the program needs to execute the Sync Stop command for a missed part is to flush this part from the queue. (Fig. 3-25.)

Fig. 3-25: Conveyor Sync Start Step
On Step 210, there are two linear motion commands that will move the gripper to the part, while conveyor tracking. The vacuum gripper turns on when the second motion is 50% completed.

**Fig. 3-26: Execute Tracked Motions Step**

The robot will lift the part on Step 230, while still tracking (refer to program).
On Step 300, the Conveyor Sync Stop instruction will turn off conveyor tracking operations and update the internal object queue (based on the values of KeepInQueue and NewRobotQueue as detailed in section 4.1.2 “MLxRobotConvSyncStop Instruction” on page 4-2. After the Sts_DN bit is set, the Sts_ON will be checked to determine if this part was out of reach. If it was, the program will return to the Conveyor Sync Start step (Step 200). If a part was actually picked, the program will advance to Step 310 to move to a placement location (refer to program).

Fig. 3-27: Conveyor Sync Stop Step
3 Developing a Conveyor Tracking Application

3.1 Program Structure Overview

After the part is placed, the program will advance to Step 320. There will be a small delay for the gripper release, and the robot will move up to a depart location. If the part queue is empty, the program will return to Step 100 to move back to the pounce position. However, if there is a new part already in the queue, the program will skip to Step 200 to immediately start tracking the part from this location.

**Fig. 3-28: Depart from Part Placement**

There are example rungs at the bottom of the ConveyorTrackingExample program that show how to use the MLxRobotConvSyncStopWithLinMot and MLxRobotConvSyncStopWithAxisMot commands.
4 Conveyor Tracking Commands (AOIs)

This section will describe each of the conveyor tracking AOIs. For additional information, refer to the Appendix A of the MLX300 SOFTWARE AND OPERATING USER’S MANUAL (180247-1CD).

4.1 Conveyor Tracking Instructions

The Robot Controller has four instructions related to Conveyor Tracking. There are two basic instructions to turn conveyor tracking sync on/off:

- **MLxRobotConvSyncStart**
  Starts conveyor tracking

- **MLxRobotConvSyncStop**
  Stops conveyor tracking

There are also two instructions for blending motion within the sync commands. These commands are available to assist with increasing pick rates.

- **MLxRobotConvSyncStopWithLinearMot**
  While turning off conveyor tracking operation, blend motion into a linear path to the next point.

- **MLxRobotConvSyncStopWithAxisMot**
  While turning off conveyor tracking operation, blend motion into a joint path to the next point.

4.1.1 MLxRobotConvSyncStart Instruction

- **MLxRobotConvSyncStart**
  AOI is used to begin conveyor tracking operations. When called, this AOI will wait for an object to be added to the queue (this happens automatically when an object passes the photo eye) and then turn on the Sts_DN bit. Each time a part crosses the photo eye, it is added to the queue.

  **Fig. 4-29: Conveyor Synchronization Start Instruction**

  ![Conveyor Synchronization Start Instruction](image)

- **ConveyorStartPosition**
  This is the position along the conveyor that the robot will start to track queued objects.

- **ConveyorTeachPos**
  The ConveyorTeachPos is the position along the conveyor where the robot programmed points were taught with the conveyor stopped.
4 Conveyor Tracking Commands (AOIs)

4.1 Conveyor Tracking Instructions

**Conveyor Tracking Option**

- **.Sts_DN**
  This output will be asserted once a part has crossed the ConveyorStartPos.

- **.Sts_OL**
  This output is asserted when a queued object has gone beyond the MaxStartPosition value.

*Fig. 4-30: MLxRobotConvSyncStart Instruction Parameters*

4.1.2 **MLxRobotConvSyncStop Instruction**

MLxRobotConvSyncStop is used to turn off conveyor synchronization and updates the internal object queue. The Conveyor0_CurrentValue for the correct conveyor must be passed into the AOI. In addition, there are two parameters (KeepInQueue and NewRobotQueue) which can be used to handle how the object queue is updated. If KeepInQueue is set to 0, the object is flushed from the queue and is no longer tracked. In this case, the value of NewRobotQueue does not matter. If KeepInQueue is set to 1, the value of NewRobotQueue will move the object to that robot’s queue. If NewRobotQueue is equal to the current robot, the object will be kept in the current robot's queue and will be the first object in the queue when another ConvSyncStart is called. This is useful if an application requires stopping conveyor tracking operations temporarily while still tracking the same object.

*Fig. 4-31: Conveyor Synchronization Stop Instruction*
4.1.3 MLxRobotConvSyncStopWithLinearMot Instruction

MLxRobotConvSyncStopWithLinearMot is basically a combination of a Linear Motion and a Conveyor Sync Stop. This instruction will turn off conveyor tracking operations and update the object queue like a normal Conveyor Stop. However, instead of stopping the robot motion, it will instead blend directly into a linear motion at another target. This can help decrease cycle times in demanding applications. The rest of the parameters for the Linear Motion are identical to a normal motion instruction.

4.1.4 MLxRobotConvSyncStopWithAxisMot Instruction

MLxRobotConvSyncStopWithAxisMot is basically a combination of an Axis Motion with a Conveyor Sync Stop. This instruction will turn off conveyor tracking operations and update the object queue like a normal Conveyor Stop. However, instead of stopping the robot motion, it will instead blend directly into a PTP motion at another target. This can help decrease cycle times in demanding applications. The rest of the parameters for the Axis Motion are identical to a normal motion instruction.
5 Debugging Pickup Position Errors

5.1 Grips at Different Locations on Part

If the part is gripped at different locations on the part, the conveyor resolution is not as accurate as it needs to be. This is typically observed when the part is picked from different locations on the conveyor.

To improve this resolution, slow the conveyor down, and add a long delay in the program after the move position above the part. During the playback, the robot will be tracking the conveyor with the gripper above the part. If the conveyor resolution tag is accurate, the robot should maintain its position relative to the moving part, while it is executing the long delay. If it is observed that the robot gripper is drifting forward or backward in respect to the part, modify the EncoderToMMConversion tag until the drift is eliminated.

5.2 Part is Gripped Consistently at the Wrong Location

If the part is picked up anywhere on the conveyor with the gripper consistently at the wrong location on the part, there is a small execution delay that needs to be calibrated. Typically, this is caused by the response time of hardware I/O. In most cases, it is desired to program the gripper to pick up the part at a center location on the part. On the “HMI Conveyor Tracking Setup” screen, the Lag Offset can be modified to fine tune the pickup of position of the gripper on the part.

Whenever the conveyor speed is changed, the Lag Offset might need to be modified. There is a method to calibrate a system where the pick location will not change when the conveyor speed is varied. The Robot Controller parameter, MF1G004, will need to be modified by YASKAWA. This will be a process of testing a low and high speed settings for each MF1G004 test value until an optimal value can be determined.

5.3 Excessive Segment Alarm

When the motion command plus the conveyor speed exceeds the robot max speed, there will be an Excessive Segment alarm. To resolve this, lower the speed of the either the motion command or the conveyor. Sometime, increasing the “# of Points to Average” on the conveyor tracking screen can help eliminate this alarm.
MLX300
SOFTWARE OPTIONS
USERS MANUAL
FOR: CONVEYOR TRACKING