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Glossary

Term	Definition
ATI Tool Changer CRX Plugin Software	An ATI software program that enables the Fanuc CRX robot to implement Tool Changer commands in a robot program.
Center of Gravity (CG)	The point of a mass around which the resultant torque from gravity forces is zero.
CRX Kit	A packaged option that includes the ATI Tool Changer, an interface plate kit for mounting the Master plate to the robot, electrical module, and ATI CRX Plugin software.
CRX robot	A collaborative robot manufactured and distributed by the company, Fanuc.
Interface Plate	A separate plate that attaches the Tool Changer to another surface. Interface plates are often used if the bolt pattern on the Master or Tool plate doesn't match the bolt pattern on the robot arm or customer tooling. The interface plate has (2) bolt patterns on either side of the plate. One side is for the Master or Tool plate. The other side is for the robot arm or customer tooling.
IPL File	(Installation Program Load) a file extension for the Plugin software that is downloaded from the ATI website.
Latch	An output command to couple the ATI Tool Changer.
Lock Sensor	A device that detects when the Master plate has coupled and locked with the Tool plate.
Plugin Technology	A customized program that when downloaded and installed onto a host device adds a specific feature to an existing computer program.
P/N	Part Number
Qty	Quantity
TCP	Tool Center Point
Teach Pendant	A handheld device or control box for programming the motions of a robot.
Tool Changer	A Master plate assembly and Tool plate assembly. When the Master plate couples to the Tool plate, utilities pass from the robot to the Master plate and through the Tool plate. The Tool plate mounts to the customer tooling. On a manufacturing floor, one robot and Master plate could be interchangeable with multiple Tool plates that each have different customer tooling for an operation.
Unlatch	An output command to uncouple the ATI Tool Changer.
Unlock Sensor	A device that detects when the Master Plate has uncoupled and unlocked with the Tool plate.
USB Drive	A USB (universal serial bus) drive is a device that data such as the downloaded ATI Plugin software and can be attached to a host device with plugin technology. Sometimes a USB drive is called a USB stick or USB disk.

B. Tool Changer

CRX Plugin

1. Product Overview

This manual provides an overview of an ATI Tool Changer kit compatible with the CRX robot, procedures to set up the ATI CRX Plugin software, and instructions for including the ATI CRX commands in a robot program.

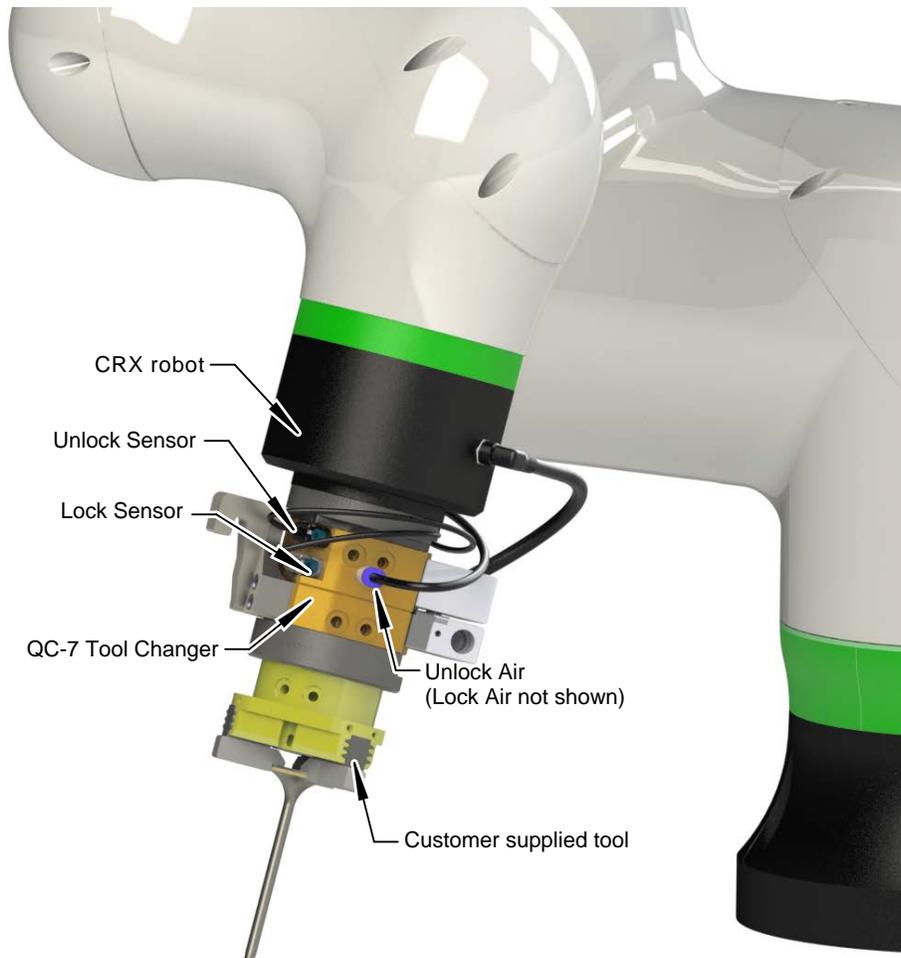
The user must understand how to operate the CRX teach pendant interface in order to operate the Tool Changer with a CRX robot. For more information about Fanuc products, refer to <https://www.fanucamerica.com/>. To access the product manual, customers should log-in to their account on the Fanuc website or contact their Fanuc representative.

For more information on the ATI QC-7 Tool Changers, refer to the ATI webpage: <https://www.ati-ia.com/products/toolchanger/QC.aspx?ID=QC-7>.

For the ATI QC-7 manual, click this link: [9620-20-B-7](#).

For more information about the QC-7 post hanger and rail adapter module, refer to the ATI TSS (Tool Stand Small) manual: [9610-20-1068](#).

Figure 1.1—ATI Tool Changer Installed on a CRX



1.1 ATI Tool Changer Kit

ATI provides the following kit option (for more information, refer to [Section 6—Drawings](#)):

Table 1.1—ATI QC-7 Tool Changer Kit for CRX (P/N 9120-COB-CRX10-007-01)		
Item	P/N	Qty
QC-7 Master Plate Assembly with a ML8 module (Orange Body, with a 20 mm boss, PNP inductive sensors with a 2 m potted cable and straight M8 connector)	9120-007CM-ML8-0-SM	1
QC-7 Tool Plate Assembly with ML8 module and Tool hook	9120-007DT-ML8-H1	1
Master Interface Plate Kit for QC-7 to a robot arm with 50 mm bolt circle configuration The kit has: (4) M6 socket head cap screws, 31.5 mm boss, and dowel pin. Included mounting screws have 6.0 mm engagement.	9120-007M-IP-10719-E060A15	1
QC-7M Cable and Tubing Management Kit for IP-10719	9005-20-9111	1
Tool Interface Plate Kit for QC-7 Tool to a robot arm with 50 mm bolt circle configuration The kit has: (4) M6 socket head cap screws, a 31.5 mm recess, and dowel pin.	9120-007T-IP-11291	1
QC-7 Post Hanger and Rail Adapter module	9120-TSS-MMH-11392	1
High-flex sensor cable with straight screw-on connector, 5 m (16.4 ft) long with flying leads (Type - BB)	8590-9909999-15	2
Cable, female 8-Pin M8 thread connector, right angle, flying leads, 1 m	9120-C-0321208-00-1	1
2.5 mm hex key	3690-0000109-00	1
4 mm hex key	3690-0000105-00	1
5 mm hex key	3690-0000103-00	1
6 mm hex key	3690-0000106-00	1

1.1.1 Unpacking the ATI Tool Changer Kit

Upon receipt of a kit, complete the following:

- Check the shipping container and components for damage that may have occurred during shipping. Report damage to ATI Industrial Automation.
- Verify the components from the packing list are included in the kit.

2. Risk Assessment



CAUTION: ATI products are one component in a multi-component industrial/collaborative robot application; therefore, the robot integrator must perform a risk assessment on the whole industrial/collaborative robot application.

In this risk assessment, consider all safety aspects of that application for the safe operation of ATI products.

For guidance in completing this risk assessment, consult the following resources:

- [ISO 12100](#) and [ISO 10218-2](#)
- Technical Specification [ISO/TS 15066](#)

ATI has identified some potential hazards that could be present in an application. Consider the following points with respect to Tool Change applications. Note these points are not comprehensive and should only be considered as a guide.

- An article of clothing or hair caught in a tool change application
- A pinch-point between a Master and Tool side, during a Tool Changer lock operation

Depending on the application, end-of-arm tooling can be inherently dangerous and there may be risks that require additional protection and/or safety considerations that are not presented in this manual.

3. Install the Tool Changer to the Robot



WARNING: Performing maintenance or repair on the Tool Changer when circuits (for example: power, water, and air) are energized could result in death or serious injury. Discharge and verify all energized circuits are de-energized in accordance with the customer's safety practices and policies.

3.1 Install the Tool Changer to the Robot and Customer Tooling

Prior to shipment, the electrical modules and Tool hook are installed on the Tool Changer. For complete installation instructions, refer to the [QC-7 manual](#) and [Section 6—Drawings](#). For instructions on how to install the QC-7 rail adapter on the tool stand, refer to the [TSS manual](#). Installation instructions can also be viewed in a how-to video available at the following link: www.ati-ia.com/9670201060.

3.2 Install the Lock and Unlock Sensor Inputs and Lock and Unlock Air Outputs

Customers should route the unterminated wires from the customer supplied pneumatic regulator valves to the CRX control cabinet I/O terminal block. ATI does not supply regulator valves in the kit.

For the lock and unlock sensor inputs, install the unterminated wires from the lock and unlock cables per the following table. For additional information and specifications about the Lock and Unlock sensors, refer to the [QC-7 manual](#). For more information about the control box, refer to the CRX Plugin manual available on the Fanuc website: <https://www.fanuc.com/>.

Table 3.1—Class 1 Connection Information		
ATI QC Sensor		Digital Input on Terminal Block in the CRX Control Box
Cable Wire	Color	
+Vs	Brown	+24 V
Output	Black	Any DI (DI101 to DI112)
0 V	Blue	0 V

4. Install the ATI Tool Changer CRX Plugin

To use an ATI Tool Changer with a CRX, the user must first install the ATI Tool Changer CRX Plugin on the robot. For more detailed information on the CRX and teach pendant software functionality such as safety, operation, programming, and nomenclature, refer to the applicable CRX manual available on the Fanuc website: <https://www.fanuc.com>.

NOTICE: Update the CRX Fanuc software V9.40P/06 or later. ATI Plugin software uses the CRX Plugin specific alarm feature which is available on Fanuc software V9.40P/06 or later.

4.1 Download the ATI Tool Changer CRX Plugin from the ATI Website

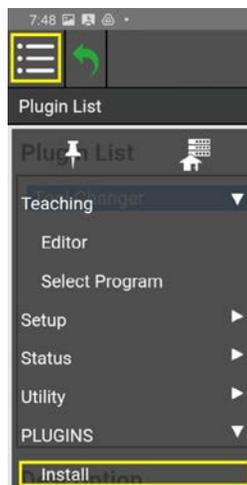
Supplies required: Computer with web browser and internet access, USB drive

1. Using a web browser, navigate to <https://www.ati-ia.com/library/download.aspx>.
2. Download the ATI Tool Changer CRX Plugin software package **Tool Changer**.
3. Save the file to a local drive. (right click on the folder, and select **Export** or **Export All**)
4. Unzip the file.
5. Save the IPL file to the root directory of a portable USB drive that is known to work with the CRX.
6. Eject the USB drive.

4.2 Load the ATI Tool Changer CRX Plugin on the Teach Pendant

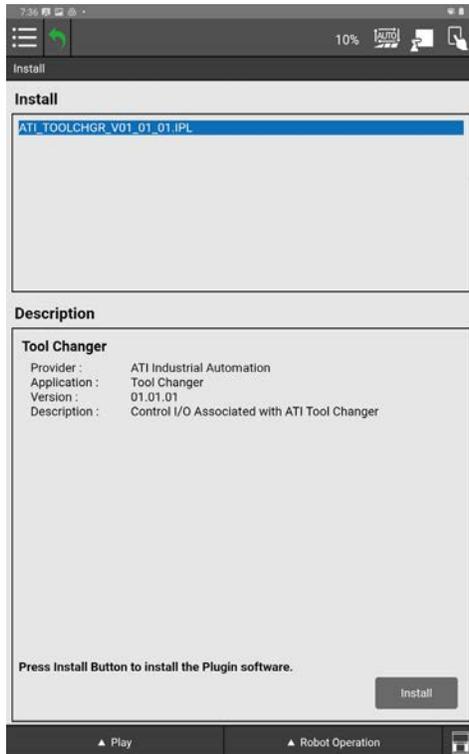
1. Insert a USB drive that contains the ATI Tool Changer CRX Plugin IPL file into the USB port in the CRX control cabinet.
2. From the **Main Menu** drop-down on the teach pendant, select **Install**.

Figure 4.1—Main Menu



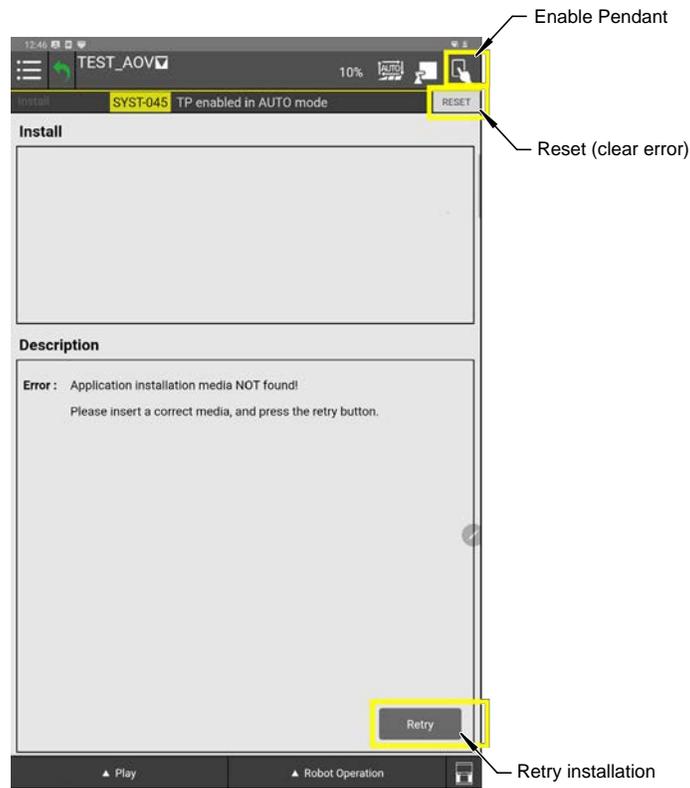
3. Select the ATI Tool Changer CRX Plugin.
4. Click **Install**. The file loads onto the teach pendant and is visible in the **Install** window (refer to the following figure).

Figure 4.2—Install the ATI Plugin File onto the Teach Pendant



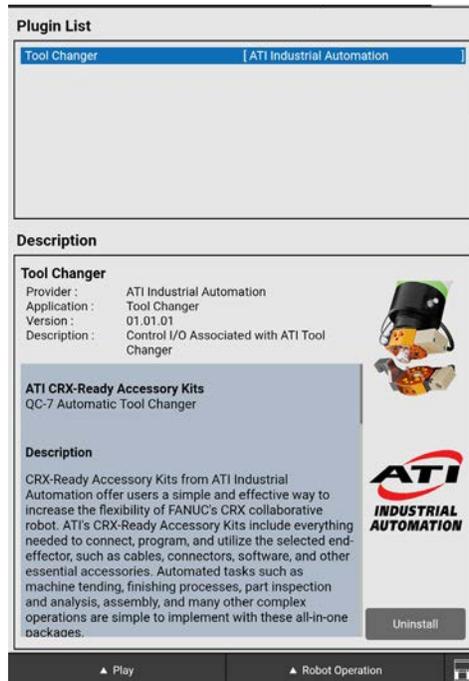
5. (Optional) If the Plugin does not show in the **Install** field and a teach pendant error appears in the top bar, complete the following steps.
 - a. Select the **Enable Pendant** icon on the top right corner.
 - b. Select **RESET**.
 - c. Select **Retry**.
 - d. If the Plugin still does not install, verify the correct software is installed on the USB drive and confirm that the USB drive works with the CRX.

Figure 4.3—Clear Teach Pendant Error



- When the file has loaded, the installed Plugin shows in the **Plugin List** window.

Figure 4.4—Plugin Installed

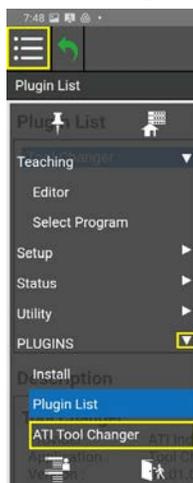


- Once the installation is complete, the user may receive a message to restart the controller. Restart the controller by manually power cycling.
- After restart and installation, the user may configure the Plugin.

4.3 Configure the ATI Tool Changer CRX Plugin

- From the **Main Menu** drop-down, select the arrow for **Plugins** to expand the submenu.
- Select the ATI Tool Changer Plugin (or select Plugin List and select the ATI Tool Changer Plugin from the list of all Plugins installed on the teach pendant).

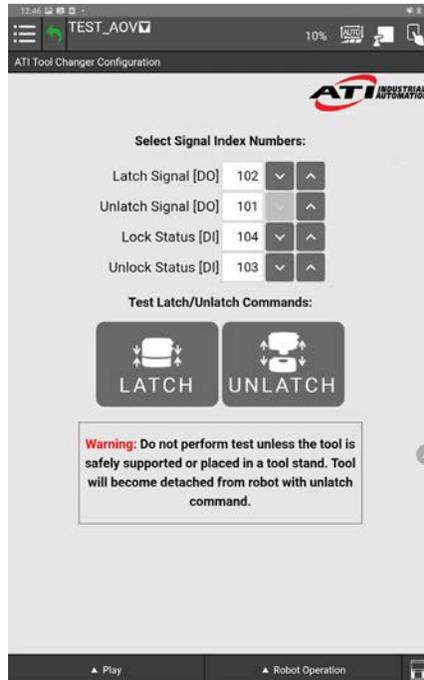
Figure 4.5—Select the ATI Plugin from the Main Menu



3. On the **ATI Tool Changer CRX Plugin Configuration** screen, either type or use the arrows to set the signal index numbers that match the wiring configuration installed in *Section 3.2—Install the Lock and Unlock Sensor Inputs and Lock and Unlock Air Outputs*.
4. (Optional) Then press the **Latch** and **Unlatch** buttons to manually Lock and Unlock the Tool Changer.

 **WARNING:** Before sending an Unlatch command, verify the Tool plate is supported in a tool stand or other secure location. Before the Unlatch command is sent, a pop-up warning prompts the user to verify the Tool plate is securely supported. After verification that the Tool plate is secured, select **OK** on the prompt, and then the Tool Changer unlocks. Failure to verify, can result in damage to equipment or harm personnel.

Figure 4.6—Plugin Configuration Screen

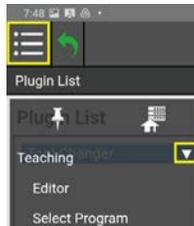


4.4 Insert Latch and Unlatch Plugin Nodes in a Robot Program

NOTICE: For more detailed information on the CRX and teach pendant software functionality such as safety, operation, programming, and nomenclature, refer to the CRX manual available on the Fanuc website: <https://www.fanuc.com/>.

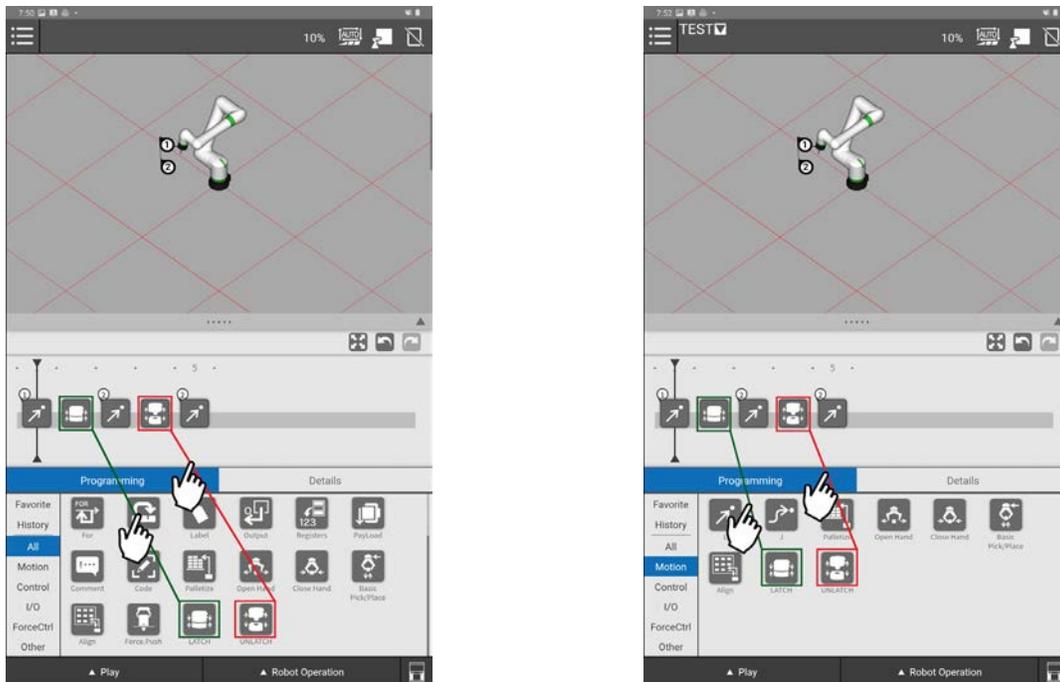
1. From the **Main Menu** drop-down, select the arrow for **Teaching** to expand the submenu.
2. Open or create a robot program.
 - a. To create a new program, select **Editor**, or to modify an existing program, select **Select Program**.

Figure 4.7—Select the ATI Plugin from the Main Menu



3. To add a **Latch** or **Unlatch** node into the program, select the **Programming** view.
4. From the side menu, select either **All** or **Motion**, then scroll through the icons to find the **Lock** or **Unlock** node.
5. Drag-and-drop the node into the programming sequence.
6. To remove the node, drag-and-drop to the lower part of the screen where the nodes/icons are displayed.

Figure 4.8—Add Lock or Unlock Nodes to a Robot Program Sequence
All/Motion Screens



7. (Optional) If the user has inserted a payload command in their program, a payload command update may be required to ensure safe operation after the program executes an **Unlatch** command.

4.4.1 Latch and Unlatch Program Logic

When the robot issues a **Latch** command:

1. Verifies the Tool Changer is in a unlocked state.
2. Tool Changer locks.
3. Verifies the Tool Changer is in a locked state.

A locked state is defined that the Locked sensor is on and the Unlocked sensor is off.

Then when the robot issues an **Unlatch** command:

1. Verifies the Tool Changer is in a locked state.
2. Tool Changer unlocks.
3. Verifies the Tool Changer is in a unlocked state.

An unlocked state is defined as the Unlocked sensor is on and the Locked sensor is off.

5. Troubleshoot the ATI Tool Changer CRX Plugin

This section includes answers to some issues that might arise when setting up and using the ATI CRX Plugin software with an ATI Tool Changer. In the following section, the question or problem is listed on the left followed by the plausible solution to the right.

The information in this section should answer many questions that might arise in the field. Customer service is available to users who have problems or questions addressed in the manuals.

Note

Please read the manual before calling customer service and have the following information available:

1. Tool Changer model (for example: QC-7 or 9120-COB-CRX10-007-01)
2. Accurate and complete description of the question or problem
3. Computer and software information (operating system, PC type, drivers, application software, and other relevant information about the application's configuration)

Be near the system when calling (if possible).

For additional troubleshooting assistance or to speak with a customer service representative, please contact ATI:

ATI Industrial Automation

1031 Goodworth Drive
Apex, NC 27539 USA
www.ati-ia.com
Tel: +1.919.772.0115
Fax: +1.919.772.8259

Application Engineering

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E-mail: ApplicationsEngineers@ati-ia.com

5.1 Alarm Codes

The six types of alarm codes or error messages are specific to the ATI Tool Changer CRX Plugin are included in the following table.

Table 5.1—Alarm Codes		
Alarm Code	Error Message	Definition/Solution
001	Not in Unlocked state	<p>A Latch command is sent to the Tool Changer, but the Tool Changer is not ready to unlock because its unlocked.</p> <p>Verify in the robot program logic that Tool Changer enters the routine in a unlocked position.</p> <p>Manually unlock the Tool Changer (refer to Section 4.3—Configure the ATI Tool Changer CRX Plugin) and then click RESET to clear the error.</p>
002	Lock sensor input off	<p>The Tool Changer did not successfully lock. The Lock sensor input is not on.</p> <p>Verify that the Tool Changer is mechanically able to lock (and the pneumatic line to the Tool Changer Lock air port is not damaged).</p> <p>Verify the Plugin settings correctly correlate to how the wires are connected to the control box (refer to Section 4.3—Configure the ATI Tool Changer CRX Plugin and Section 3.2—Install the Lock and Unlock Sensor Inputs and Lock and Unlock Air Outputs).</p> <p>Verify the sensors are correctly installed. Refer to the QC-7 manual.</p>
003	Unlock sensor input is off.	<p>The Tool Changer did not successfully lock. The Unlock sensor is still on.</p> <p>Verify that the Tool Changer is mechanically able to lock.</p> <p>Verify the Plugin settings correctly correlate to how the wires are connected to the control box (refer to Section 4.3—Configure the ATI Tool Changer CRX Plugin and Section 3.2—Install the Lock and Unlock Sensor Inputs and Lock and Unlock Air Outputs).</p> <p>Verify the sensors are correctly installed. Refer to the QC-7 manual.</p>
004	Not in Locked state.	<p>A Unlatch command is sent to the Tool Changer, but the Tool Changer is not ready to lock because its locked.</p> <p>Verify in the robot program logic that Tool Changer enters the routine in a locked position.</p> <p>Manually lock the Tool Changer (refer to Section 4.3—Configure the ATI Tool Changer CRX Plugin) and then click RESET to clear the error.</p>

Table 5.1—Alarm Codes

Alarm Code	Error Message	Definition/Solution
005	Lock sensor input on.	<p>The Tool Changer did not successfully unlock. The Lock sensor input is still on.</p> <p>Verify the Plugin settings correctly correlate to how the wires are connected to the control box (refer to Section 4.3—Configure the ATI Tool Changer CRX Plugin and Section 3.2—Install the Lock and Unlock Sensor Inputs and Lock and Unlock Air Outputs).</p> <p>Verify the sensors are correctly installed. Refer to the QC-7 manual.</p>
006	Unlock sensor input off	<p>The Tool Changer did not successfully unlock. The Unlock sensor input is not on.</p> <p>Verify the Tool Changer is mechanically able to unlock (and the pneumatic line to the Tool Changer Unlock air port is not damaged).</p> <p>Verify the Plugin settings correctly correlate to how the wires are connected to the control box (refer to Section 4.3—Configure the ATI Tool Changer CRX Plugin and Section 3.2—Install the Lock and Unlock Sensor Inputs and Lock and Unlock Air Outputs).</p> <p>Verify the sensors are correctly installed. Refer to the QC-7 manual.</p>

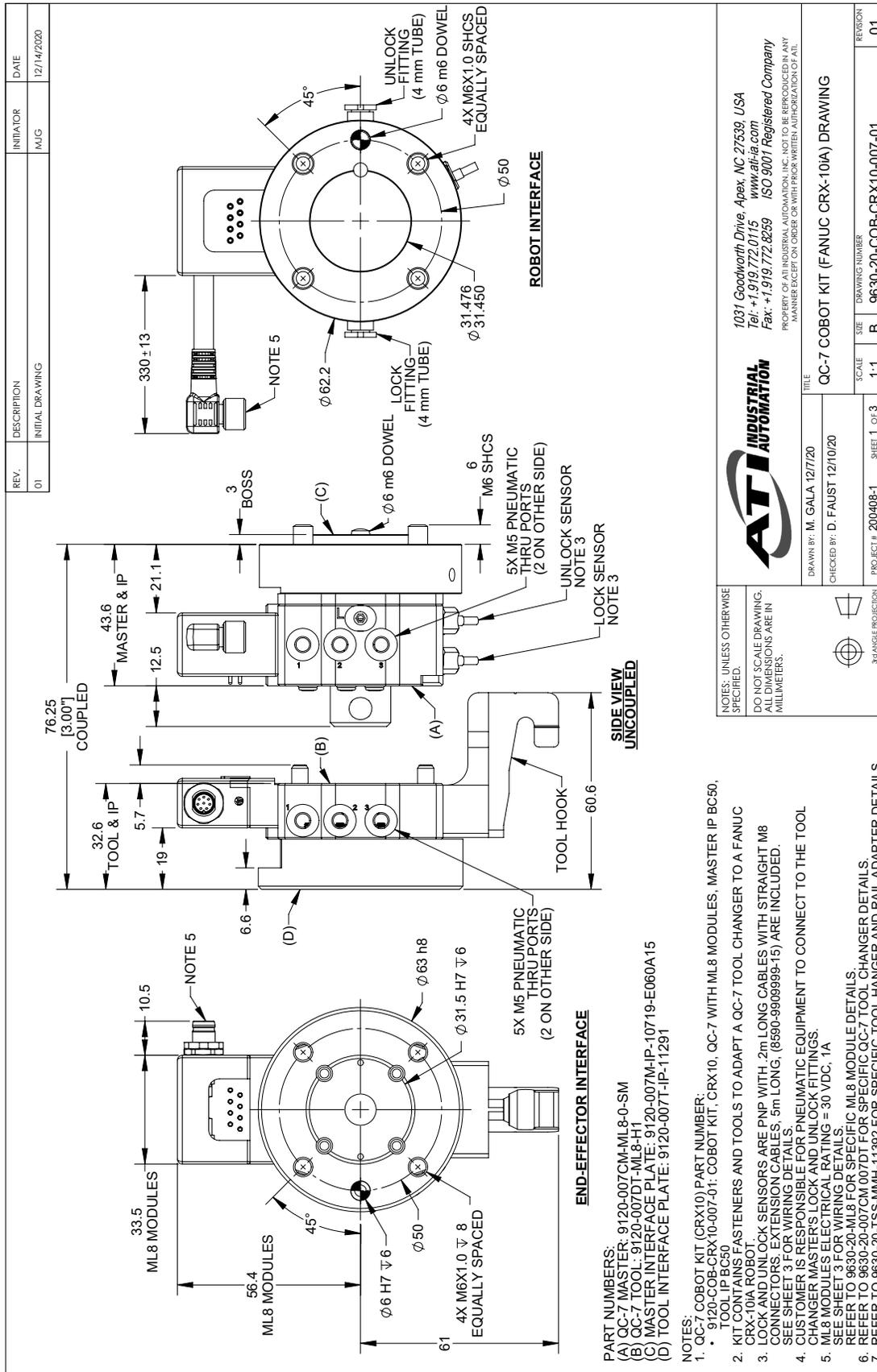
5.2 General Troubleshooting Guidelines

Basic problems and possible answers/solutions for the operation of the ATI Tool Changer CRX Plugin software are listed in the following table:

Table 5.2—General Troubleshooting Guidelines	
Problem	Answer/Solution
The ATI Tool Changer Plugin is not installing on the CRX teach pendant.	<p>Verify the USB drive is compatible with the CRX robot.</p> <p>Verify the ATI Plugin installed on the USB drive is the most current and saved on the root directory of the USB drive.</p> <p>Verify the Teach Pendant is enabled and errors are cleared (refer to Section 4—Install the ATI Tool Changer CRX Plugin).</p> <p>Verify that a robot program that uses the ATI plugin nodes (Latch and Unlatch) is not running or the program name is not in the top bar of the teach pendant. Abort or stop the robot program, and try to uninstall the Plugin.</p>
The manual test buttons for Latch and Unlatch are not locking or unlocking the Tool Changer.	<p>Verify that the Tool Changer is mechanically able to lock and unlock.</p> <p>Verify the Plugin settings correctly correlate to how the wires are connected to the control box (refer to Section 4.3—Configure the ATI Tool Changer CRX Plugin and Section 3.2—Install the Lock and Unlock Sensor Inputs and Lock and Unlock Air Outputs).</p>
The Lock and Unlock Tool Changer sensors are not operating.	<p>Verify the Tool Changer is mechanically able to lock and unlock (and the pneumatic lines to the Tool Changer Lock and Unlock air ports are not damaged).</p> <p>Verify the Plugin settings correctly correlate to how the wires are connected to the control box (refer to Section 4.3—Configure the ATI Tool Changer CRX Plugin and Section 3.2—Install the Lock and Unlock Sensor Inputs and Lock and Unlock Air Outputs).</p> <p>Verify the sensors are correctly installed. Refer to the QC-7 manual.</p>
The robot program is not correctly switching tools or ignores the ATI CRX Plugin software.	<p>Verify the ATI CRX Plugin is correctly programmed into the Robot program (refer to Section 4.4—Insert Latch and Unlatch Plugin Nodes in a Robot Program).</p>

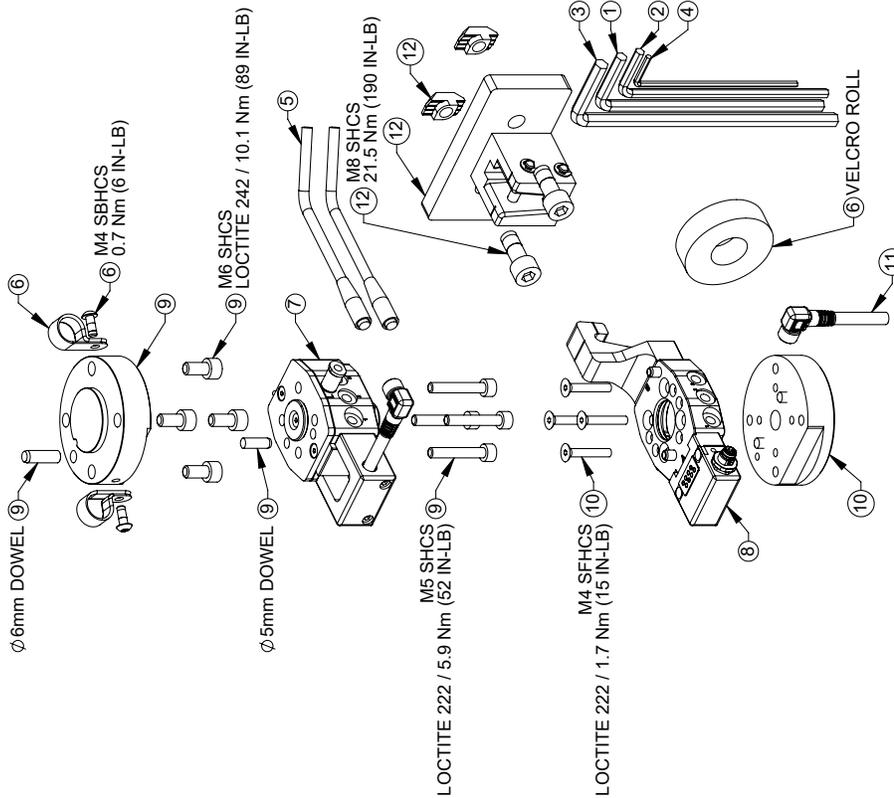
Table 5.2—General Troubleshooting Guidelines	
Problem	Answer/Solution
The ATI Tool Changer is malfunctioning.	Refer to the QC-7 manual .
The robot program is not playing past the first node, and no error messages/alarms are showing on the teach pendant.	Verify the Step feature is not enabled on the Programming Play screen. For more information, refer to the CRX manual.
The ATI Tool Changer CRX plugin won't uninstall.	Verify that a robot program that uses the ATI plugin nodes (Latch and Unlatch) is not running or the program name is not in the top bar of the teach pendant. Abort or stop the robot program, and try to uninstall the Plugin.

6. Drawings



KIT COMPONENTS

9120-COB-CRX10-007-01



ITEM NO.	QTY	PART NUMBER	DESCRIPTION
1	1	3690-0000103-00	ALLEN KEY, 5mm, HIGH VISIBILITY BLUE
2	1	3690-0000105-00	ALLEN KEY, 4mm, HIGH VISIBILITY BLUE
3	1	3690-0000106-00	ALLEN KEY, 6mm, HIGH VISIBILITY BLUE
4	1	3690-0000109-00	ALLEN KEY, 2.5mm, HIGH VISIBILITY BLUE
5	2	8590-9909999-15	HIGH-FLEX CABLE WITH STRAIGHT SCREW-ON CONNECTOR; 5M (16.4 FT.) LONG WITH FLYING LEADS (TYPE - BB)
6	1	9005-20-9111	QC-7M CABLE AND TUBING MANAGEMENT KIT FOR IP-10719
7	1	9120-007CM-ML8-0-SM	QC-7 MASTER, ORANGE BODY, 20mm BOSS, PNP INDUCTIVE SENSORS WITH .2M POTTED CABLE AND STRAIGHT M8 CONNECTOR
8	1	9120-007DT-ML8-H1	QC-7 TOOL, ML8 MODULE, TOOL HOOK
9	1	9120-007M-IP-10719-E060A15	IP KIT FOR QC-7 MASTER TO BC50, (4)M6 BOSS 31.5, DOWEL 6; INCLUDES MOUNTING SCREWS WITH 6.0mm ENGAGEMENT
10	1	9120-007T-IP-11291	IP KIT FOR QC-7 TOOL TO BC50, (4) M6, RECESS 31.5, DOWEL 6
11	1	9120-C-0321208-00-1	CABLE, FEMALE 8-PIN M8 THREAD CONNECTOR, RIGHT ANGLE, FLYING LEADS, 1 METER
12	1	9120-TSS-MMH-11392	QC-7 POST HANGER AND RAIL ADAPTER MODULE

NOTES: UNLESS OTHERWISE SPECIFIED:
 DO NOT SCALE DRAWING.
 ALL DIMENSIONS ARE IN MILLIMETERS.

ATI INDUSTRIAL AUTOMATION

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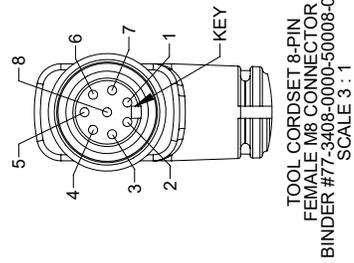
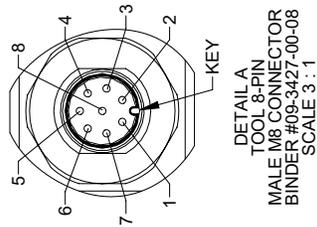
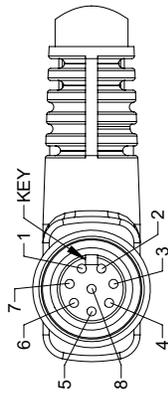
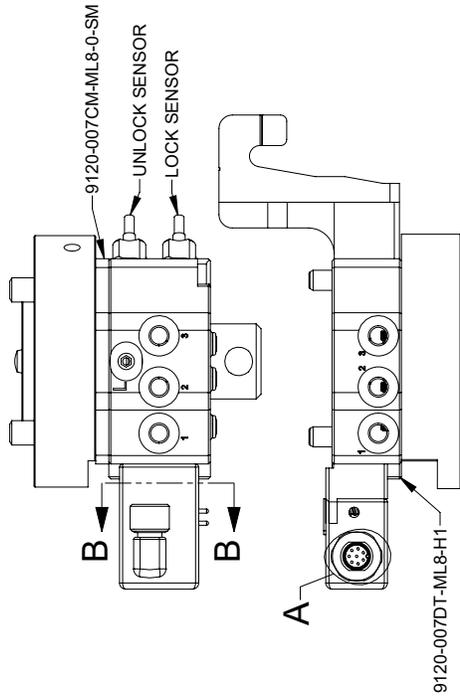
DRAWN BY: M. GALA 12/7/20
 CHECKED BY: D. FAUST 12/10/20

PROJECT # 200408-1 SHEET 2 OF 3

SCALE 1:2
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 REVISION 01

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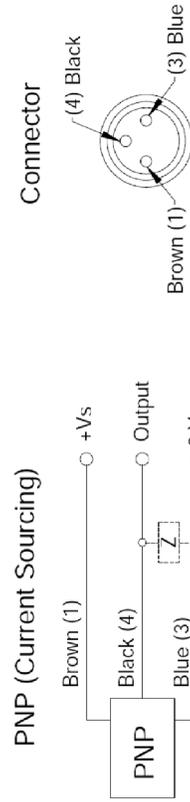
WIRING INFORMATION



PART NUMBER: 9120-C-0321208-00-1
 REFERENCE: BINDER #77-3408-0000-50008-0100

PIN	COLOR
1	WHITE
2	BROWN
3	GREEN
4	YELLOW
5	GREY
6	PINK
7	BLUE
8	RED

LOCK/UNLOCK SENSOR CONNECTIONS



NOTES: UNLESS OTHERWISE SPECIFIED.

DO NOT SCALE DRAWING. ALL DIMENSIONS ARE IN MILLIMETERS.



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TITLE

QC-7 COBOT KIT (FANUC CRX-10iA) DRAWING



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SCALE 1:1

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REVISION 01