



Tool Changer Teaching Aid Assembly QC-1310

Manual



Document #: 9610-20-3847

Foreword

This manual contains basic information applicable to all ATI robotic Tool Changers. Certain Tool Changer models have their own manuals that contain more detailed information. Also, additional information about electrical, pneumatic, fluid, high-power and high-current modules and other options are available in other manuals and documents.

Please contact ATI Industrial Automation with any questions concerning your particular model.



CAUTION: This manual describes the function, application, and safety considerations of this product. This manual must be read and understood before any attempt is made to install or operate the product, otherwise damage to the product or unsafe conditions may occur.

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Glossary

Term	Definition
Bearing Race	Hardened steel ring in the Tool Plate that is engaged by the locking balls during the locking process.
End-Effector	Tool used by the robot to perform a particular function.
Locking Mechanism	A pneumatic driven device that draws the Master and Tool plates together and secures the plates in a fail-safe locked condition, until the mechanism is unlocked. The locking mechanism contains the following components: locking balls, cam, ball cage, bearing race, and a pneumatic cylinder.
Master Plate	The half of the Tool Changer that the customer attaches to a robot. The Master plate contains the locking mechanism that couples and secures the Master plate to the Tool plate.
Pick-Up Position	The robot coordinate position at which the Master plate draws the Tool plate into a locked position.
Tool Stand	A fixture that holds Tools that aren't used for a portion of an automated process.
Tool Plate	The half of the Tool Changer to which the customer attaches various tools or end-effectors.
No-Touch™	An ATI Tool Changer design feature that allows the Master plate and Tool plate to couple without physical contact prior to locking.

1. Safety

The safety section describes general safety guidelines to be followed with this product, explanations of the notifications found in this manual, and safety precautions that apply to the product. More specific notifications are imbedded within the sections of the manual where they apply.

1.1 Explanation of Notifications

The following notifications are specific to the product(s) covered by this manual. It is expected that the user heed all notifications from the robot manufacturer and/or the manufacturers of other components used in installation.



DANGER: Notification of information or instructions that if not followed will result in death or serious injury. The notification provides information about the nature of the hazardous situation, the consequences of not avoiding the hazard, and the method for avoiding the situation.



WARNING: Notification of information or instructions that if not followed could result in death or serious injury. The notification provides information about the nature of the hazardous situation, the consequences of not avoiding the hazard, and the method for avoiding the situation.



CAUTION: Notification of information or instructions that if not followed could result in moderate injury or will cause damage to equipment. The notification provides information about the nature of the hazardous situation, the consequences of not avoiding the hazard, and the method for avoiding the situation.

NOTICE: Notification of specific information or instructions about maintaining, operating, installing, or setting up the product that if not followed could result in damage to equipment. The notification can emphasize, but is not limited to: specific grease types, best operating practices, and maintenance tips.

1.2 General Safety Guidelines

Prior to purchase and installation, the customer should verify that the Tool Changer selected is rated for the maximum loads and moments expected during operation. Refer to product specifications section in each module of this manual or contact ATI for assistance. Particular attention should be paid to dynamic loads caused by robot acceleration and deceleration. These forces can be many times the value of static forces in high acceleration or deceleration situations.

The customer is responsible for ensuring that the area between the Master and Tool sides is clear of foreign objects during mating and subsequent coupling. Failure to do so may result in serious injury to personnel.



DANGER: The gap between the Master and Tool sides is a pinch point. All personnel should be prevented from placing any part of their body or clothing in the gap, especially during actuation of the locking mechanism.

The customer is responsible for understanding the function of the Tool Changer and implementing the proper fasteners and/or software to operate the Tool Changer safely. The Tool Changer should be controlled such that there is no chance of locking or unlocking in a position that would endanger personnel and/or equipment. If the Tool Changer is equipped with Lock/Unlock (L/U) and Ready-to-Lock (RTL) sensing capability, the status should be monitored and interlocks applied to prevent injury to personnel and equipment.

All pneumatic fittings and tubing must be capable of withstanding the repetitive motions of the application without failing. The routing of electrical and pneumatic lines must minimize the possibility of stress/strain, kinking, rupture, etc. Failure of critical electrical or pneumatic lines to function properly may result in injury to personnel and equipment.

All electrical power, pneumatic and fluid circuits should be disconnected during servicing.

1.3 Safety Precautions



WARNING: Remove all temporary protective materials (caps, plugs, tape, etc.) on locking face of Tool Changer and modules prior to operation. Failure to do so will result in damage to Tool Changers, modules, and end-of-arm tooling and could cause injury to personnel.



WARNING: Do not perform maintenance or repair(s) on the Tool Changer or modules unless the Tool is safely supported or placed in the tool stand, all energized circuits (e.g. electrical, air, water, etc.) are turned off, pressurized connections are purged and power is discharged from circuits in accordance with the customer safety practices and policies. Injury or equipment damage can occur with the Tool not placed and energized circuits on. Place the Tool in the tool stand, turn off and discharge all energized circuits, purge all pressurized connections, and verify all circuits are de-energized before performing maintenance or repair(s) on the Tool Changer or modules.



WARNING: During operation, the area between the Master and Tool must be kept clear. Failure to keep area clear will result in damage to Tool Changer, modules, or end-of-arm tooling and could cause injury to personnel.



WARNING: The Tool Changer is only to be used for intended applications and applications approved by the manufacturer. Using the Tool Changer in applications other than intended will result in damage to Tool Changer, modules, or end-of-arm tooling and could cause injury to personnel.



CAUTION: The Master plate locking mechanism must not be actuated without being mounted to the interface plate. Damage to the Cover Plate and O-ring may result. Always attach the Master plate to the Interface plate prior to attempting any operations.

2. Product Overview

The ATI robot Teaching Aids are to be used with the QC-1310 ATI No-Touch™ locking Tool Changer. With the Teaching Aid, programming the robot to pick up and drop off customer tooling takes less time while ensuring optimal X, Y, and Z alignment. Additionally, Teaching Aids extend the life of the Tool Changer by reducing unnecessary wear on the alignment pins and bushings.

ATI Teaching Aids have high-contrast alignment marks to aid the user in the set-up process. When positioned, the Master Teaching Aid and Tool Teaching Aid must have a 1 mm clearance between them (refer to [Figure 2.1](#)). This distance will ensure the No-Touch™ Locking zone for the Tool Changer is set correctly. [Figure 2.2](#) is an overview of the different Teaching Aid assemblies. Refer to [Section 7—Drawings](#), for more information.

2.1 Master Teaching Aid

The Master Teaching Aid assembly is a red, anodized aluminum body. The center interior has a clamp feature that locks the Teach Aid to the Tool Changer Master plate. Teaching Aids have holes bored into the Master Teaching Aid plate at the opposite corners of the alignment pin bushings; these holes provide a clearance to avoid activating the RTL sensors if a user installs a Teaching Aid assembly manually.

2.2 Tool Teaching Aid

The Tool Teaching Aid is a red, anodized aluminum body with hardened steel alignment pins that secure the Tool Teaching Aid to the Tool plate's bearing race using magnets. The different type of flat head socket cap screws installed in the Tool Teaching Aid are called out in [Figure 2.2](#).

Figure 2.1—Master and Tool Teaching Aid Assembly

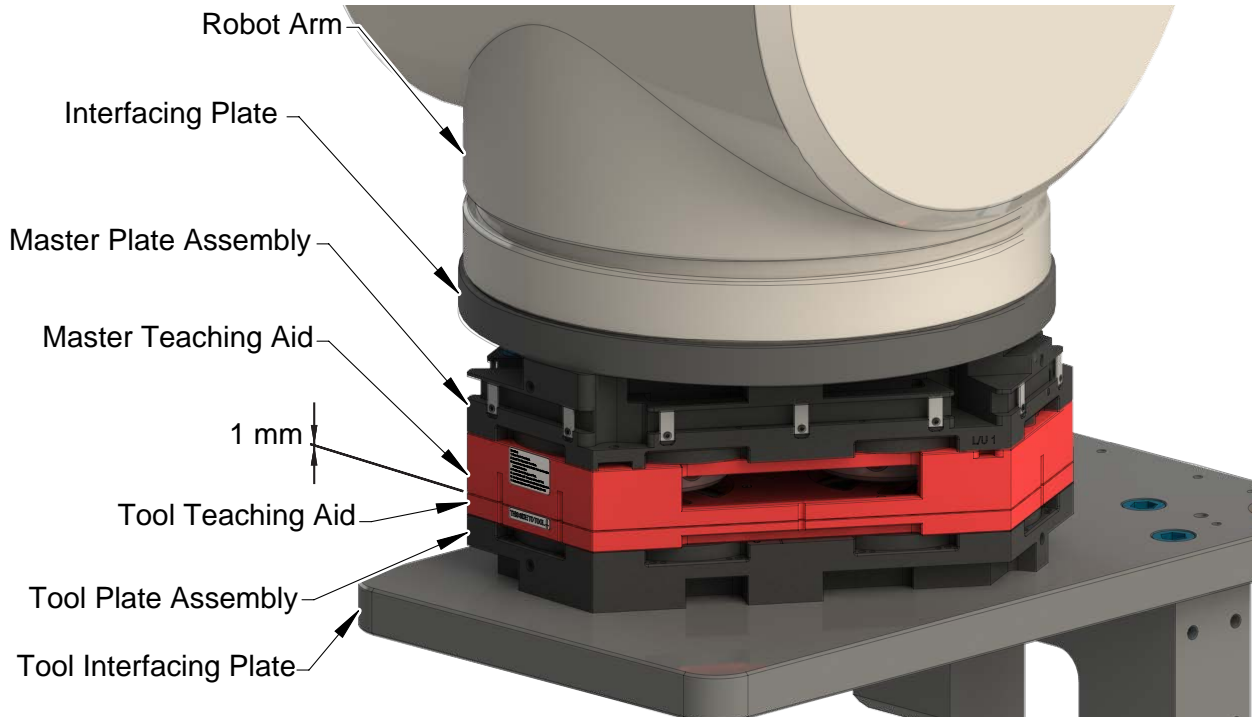
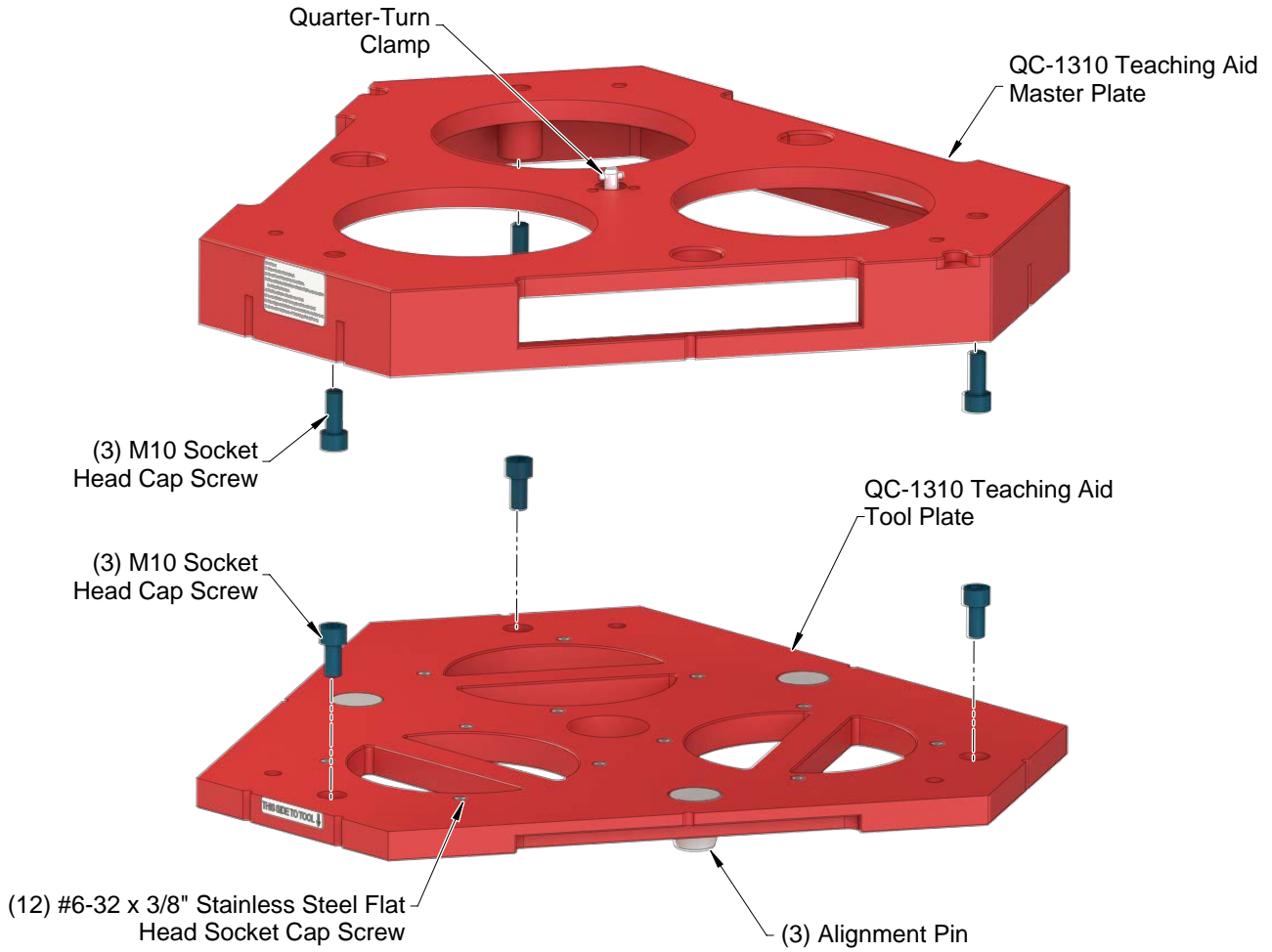


Figure 2.2—QC-1310 Teaching Aid Assembly



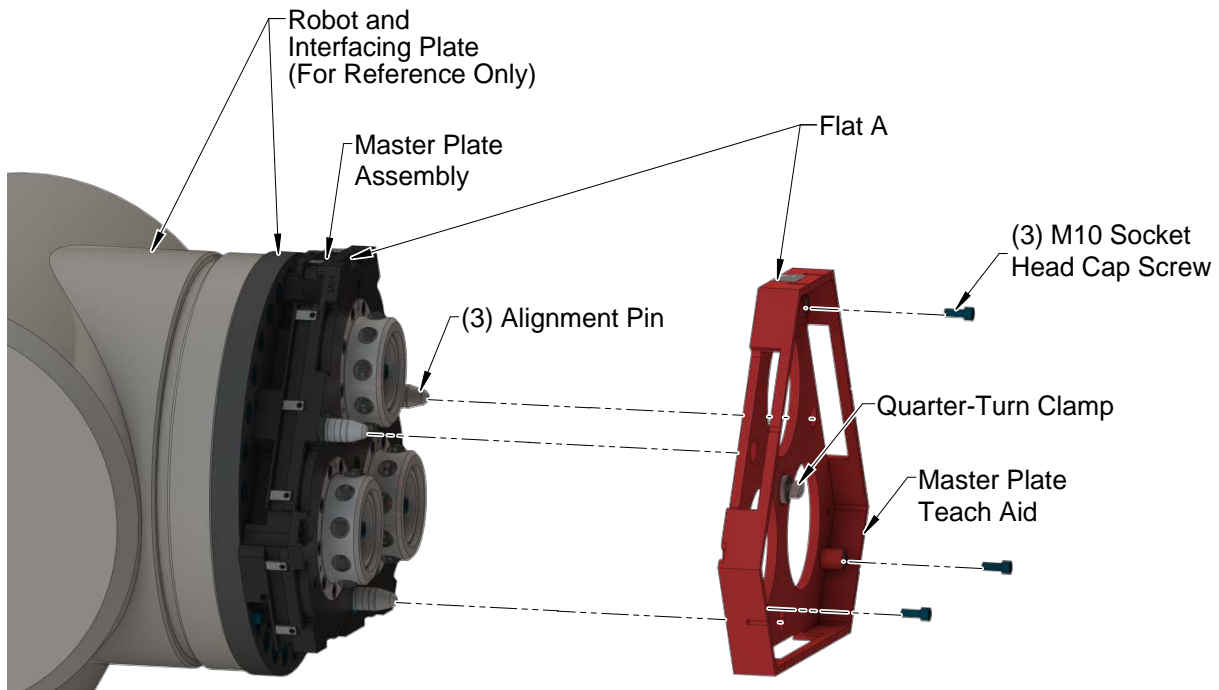
3. Installation and Alignment Procedure

Tools required: 8 mm hex key wrench.

On the Master Teaching Aid, there are labels with abbreviated installation and alignment instructions. To install and align a Teaching Aid, complete the following procedure:

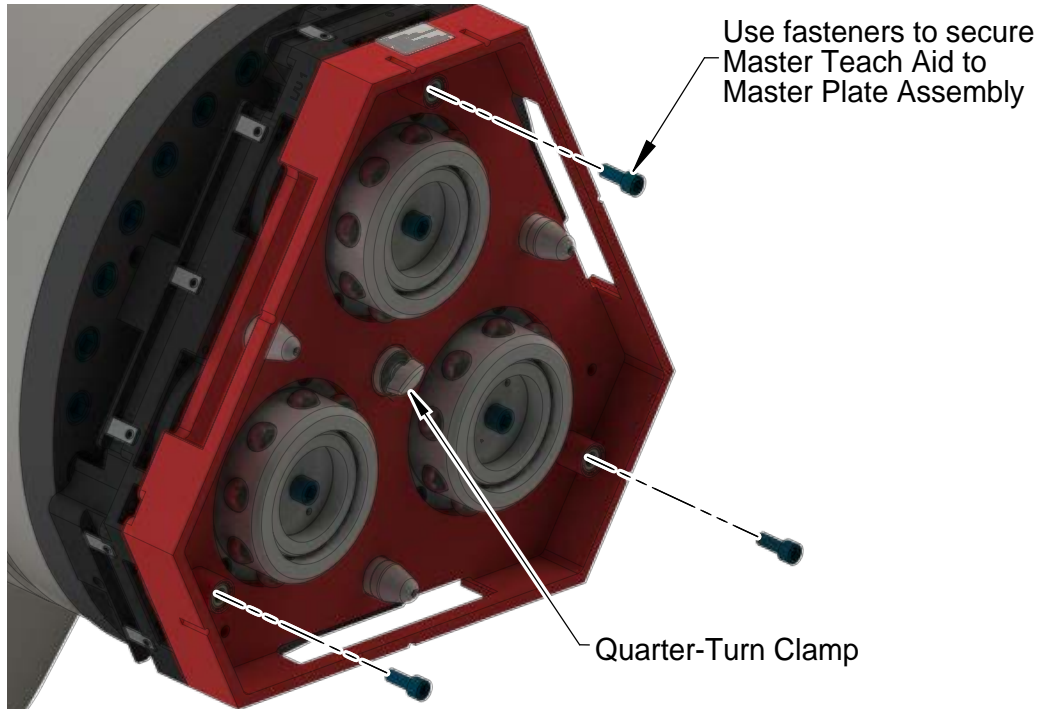
1. Position the robot and master tool changer such that the master plate is perpendicular to the floor. Refer to [Figure 3.1](#).
2. Orient the Master side Teaching Aid such that the 'A' flat corresponds to the 'A' flat on the Master plate.
3. Mount the Master side Teaching Aid to the Master plate by inserting the alignment pins into the corresponding holes in the Master side Teaching Aid.

Figure 3.1—Master Teaching Aid Assembly Installation (QC-1310 Shown)



4. Secure the Teach Aid to the Master Plate with the quarter-turn clamp in the center of the Master Teach aid body and the (3) Teach Aid fasteners:
 - a. Lock the quarter-turn clamp into the receptacle by turning the clamp 1/4 of a turn, approximately 90 degrees.
 - b. Tighten fasteners to 35 ft-lb.

Figure 3.2—Secure Teach Aid to Master Plate



5. Place the Tool plate in the tool stand. Robot programs should be written with the Tool plate resting in the Tool stand.
6. Orient the Tool side Teaching Aid such that the 'A' flat corresponds to the 'A' flat on the Tool plate.
7. Mount the Tool side Teaching Aid over the Tool plate by inserting the Tool Teach Aid alignment pins into the Tool Plate Assembly bushings.
8. Secure the Tool Teaching Aid to the Tool plate using the (3) M10 Socket Head Cap Screws. Tighten to 35 ft-lb.

Figure 3.3—Tool Teaching Aid Assembly Installation (QC-1310 Shown)

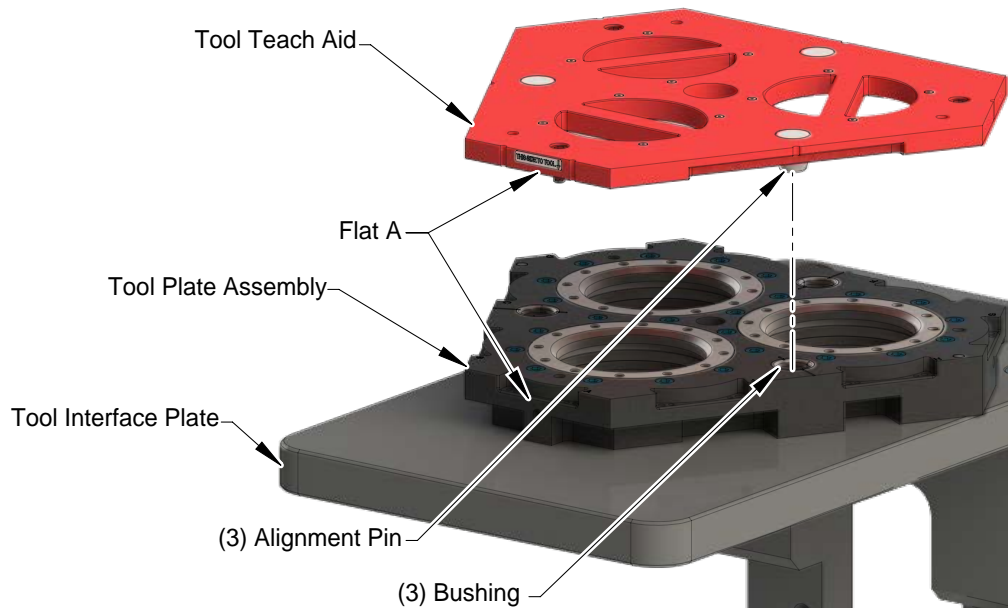
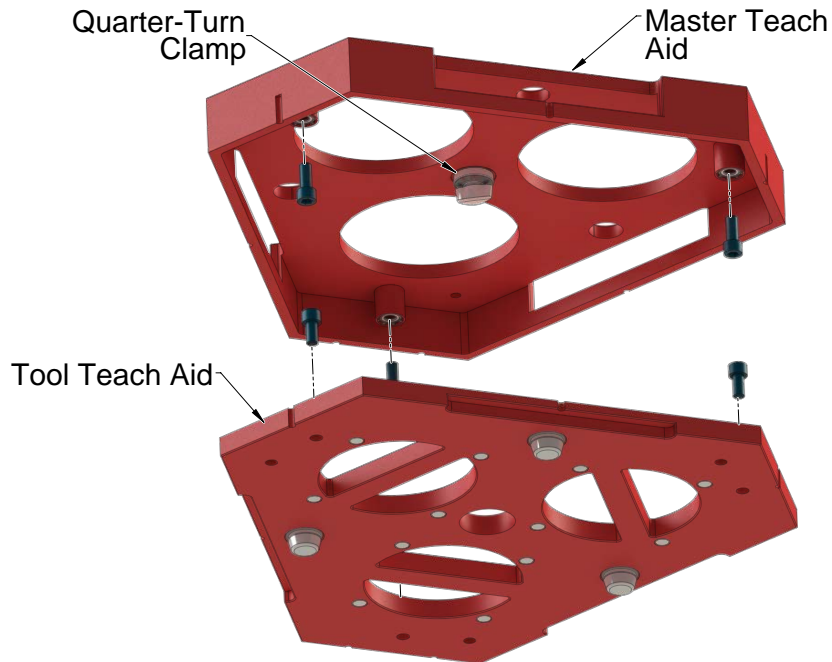


Figure 3.4—Master and Tool Teach Aid Assembly Installation

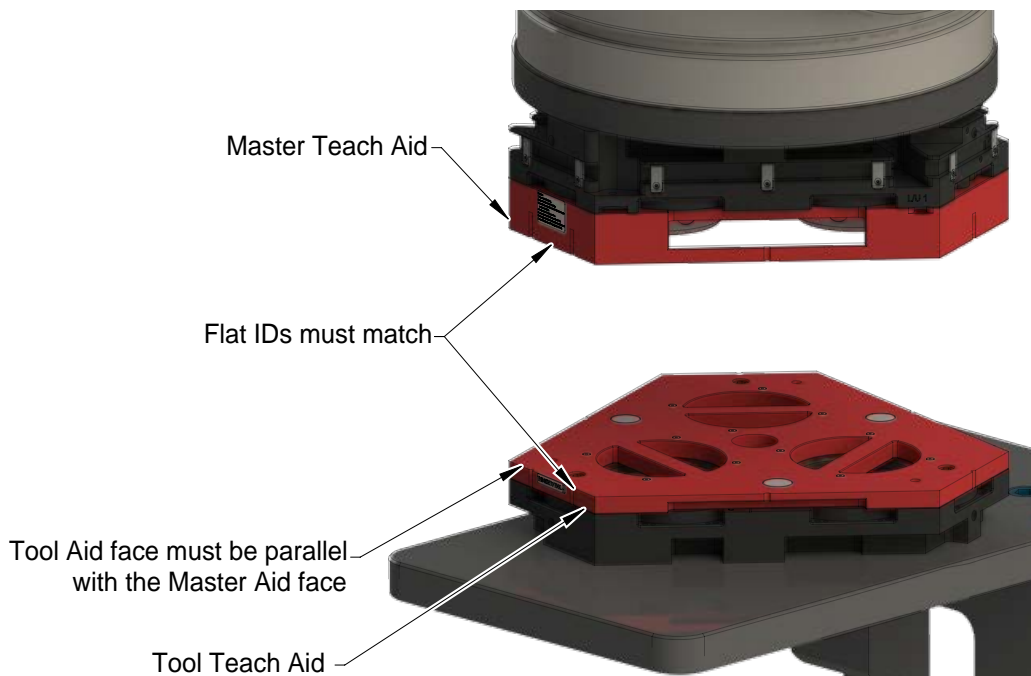


9. Position the mated Master Plate and Master Aid directly over and parallel to the Tool Teach Aid and Tool Plate. Align the Master and Tool flats; for example: the ‘A’ flat on the Master plate is aligned with the ‘A flat’ on the Tool plate.
10. Verify the Tool Changer locking mechanism is in the Unlocked position.



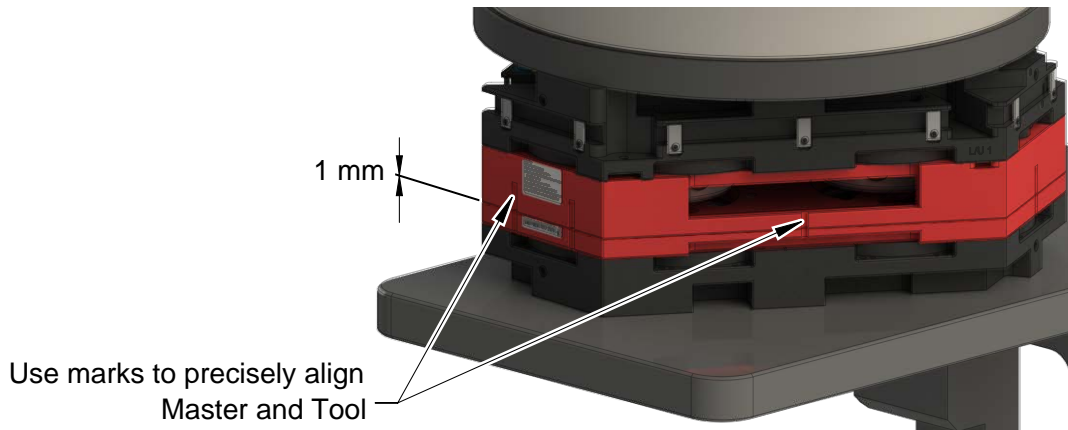
DANGER: The gap between the Master and Tool sides are pinch points. Physical contact in these pinch points will result in serious or permanent injury to personnel. Prevent all personnel from placing any body part or clothing in the gap, especially during actuation of the locking mechanism.

Figure 3.5—Positioning the Master Plate towards the Tool Plate



11. Move the Master plate assembly slowly toward the Tool plate until the Master and Tool side Teaching Aids are 1 mm apart.
12. Use the alignment marks to align the Tool side and Master side Teaching Aids. Store this position for later use.

Figure 3.6—Final Alignment Position of the Teaching Aid Plate Assembly



13. Support the Master-side Teaching Aid and unlock the Tool Changer.
14. Move the robot and Master plate away from the Aids and Tool plate.

NOTICE:

- Refer to the applicable Tool Changer manual for the maximum recommended offsets.
- Depending on the customer application, the pick-up position is not always vertical.

15. Move the Tool Changer Master plate towards the Tool plate until the Master plate is in the previously stored position.
16. Move the Master plate towards the Tool plate by the thickness of the Teach Aids as communicated on the labels provided on the Teach Aid.



CAUTION: Ensure the Master plate locking mechanism is unlocked prior to entering the Tool plate

17. Record the pick-up position.

4. Maintenance



WARNING: Do not perform maintenance or repair(s) on the Tool Changer or modules unless the Tool is safely supported or placed in the tool stand, all energized circuits (e.g. electrical, air, water, etc.) are turned off, pressurized connections are purged and power is discharged from circuits in accordance with the customer specific safety practices and policies. Injury or equipment damage can occur with the Tool not placed and energized circuits on. Place the Tool in the tool stand, turn off and discharge all energized circuits, purge all pressurized connections, and verify all circuits are de-energized before performing maintenance or repair(s) on the Tool Changer or modules.

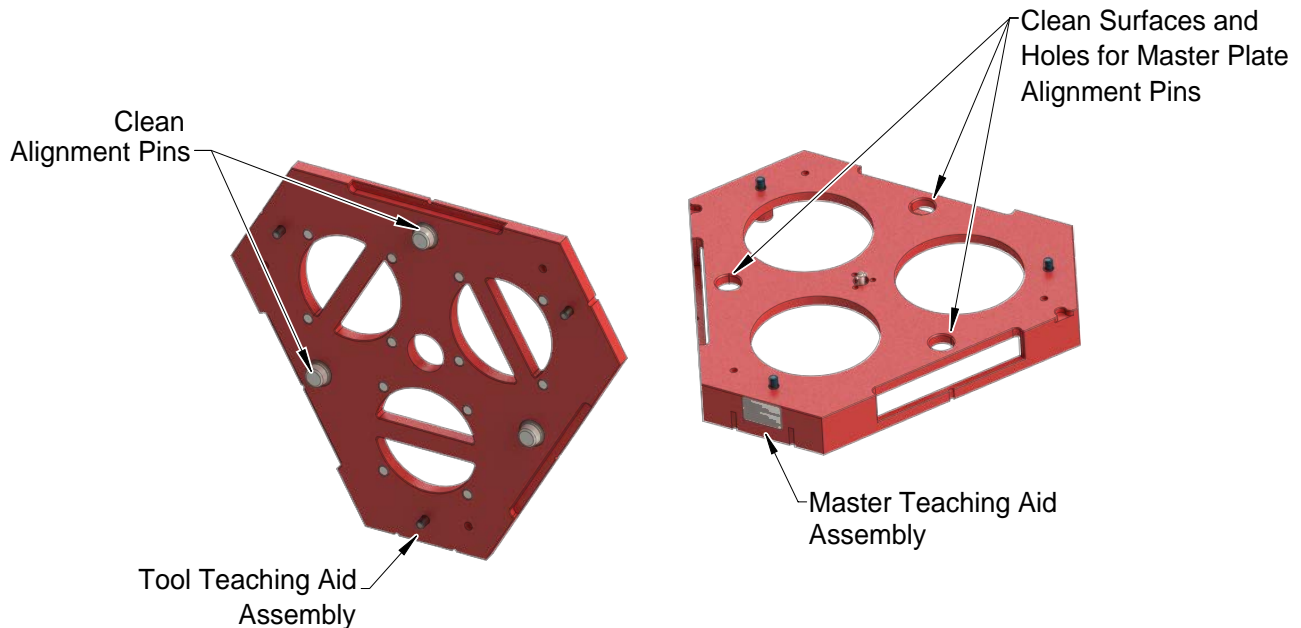
The Teach Aids may require two persons to handle the plates, given their large size. Extreme care should be taken during handling; the Teach Aids' dimensional integrity can be compromised if the Aids are struck by the robot or dropped.

The Tool Changer and Teaching Aid should be protected from exposure to contamination if used in environments where contamination is a risk, such as in welding or deburring applications. Cover idle Tool assemblies and Teaching Aids to prevent debris from settling on the mating surfaces. The Tool Changer Master plate assembly should not be exposed to this environment for long periods of time during Tool change and down time.

Under normal conditions, no special maintenance is necessary. If needed, inspect and clean the following:

- Inspect the flat head socket head screws in the Tool Teaching Aid to verify that they are tight. If loose, tighten. Refer to [Section 7—Drawings](#).
- Use a clean rag to thoroughly remove existing lubricant or debris from the Teach Aid surfaces and bores for Master Plate Alignment Pins from the Master Teaching Aid. Refer to [Figure 4.1](#).
- Use a clean rag to thoroughly remove any existing lubricant and debris from the alignment pins. Refer to [Figure 4.1](#).

Figure 4.1—Cleaning of Master and Tool Teaching Aid Assemblies



5. Troubleshooting

Troubleshooting and service information to help identify symptoms and resolve problems are available in the following sections.



WARNING: Do not perform maintenance or repair(s) on the Tool Changer or modules unless the Tool is safely supported or placed in the tool stand, all energized circuits (e.g. electrical, air, water, etc.) are turned off, pressurized connections are purged and power is discharged from circuits in accordance with the customer specific safety practices and policies. Injury or equipment damage can occur with the Tool not placed and energized circuits on. Place the Tool in the tool stand, turn off and discharge all energized circuits, purge all pressurized connections, and verify all circuits are de-energized before performing maintenance or repair(s) on the Tool Changer or modules.

5.1 Troubleshooting Procedures

Troubleshooting information is in the following table.

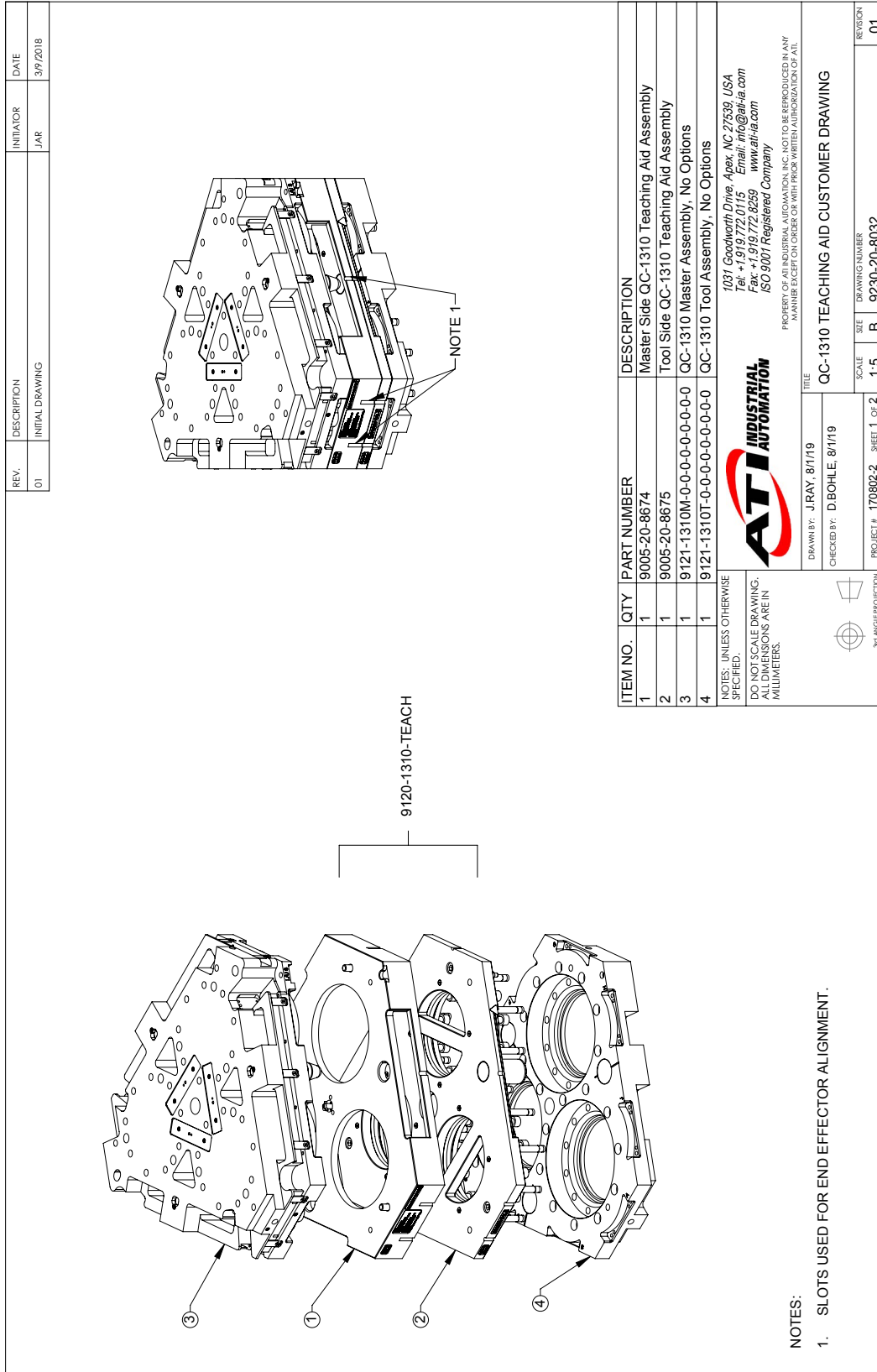
Symptom	Cause	Resolution
Master Teaching Aid plate will not lock with the Tool Changer Master.	Debris caught in Master Teach Aid Locking Receptacle.	Clean locking receptacle and alignment pin bushings. Refer to Section 4—Maintenance .
Tool Teaching Aid plate is not secure to the Tool Changer Tool plate.	Debris caught on surfaces of Tool Teaching Aid plate.	Clean Tool Teaching Aid assembly surfaces in accordance with Section 4—Maintenance .
	Fasteners securing the Tool Teaching Aid to the Tool Plate are loose.	Tighten fasteners. Refer to Section 7—Drawings .

6. Specifications

Part Number	Description	Material	Weight	Stack Height
9120-1310-TEACH	QC-1310 Teaching Aids	6061-T6 Aluminum	25.3 lb (11.48 kg)	2.8 in (71 mm)
9005-20-8674	QC-1310 Master Side Teaching Aid	6061-T6 Aluminum	N/A	N/A
9005-20-8675	QC-1310 Tool Side Teaching Aid	6061-T6 Aluminum	N/A	N/A

7. Drawings

7.1 QC-1310 Teaching Aid Assembly



NOTES:
 1. SLOTS USED FOR END EFFECTOR ALIGNMENT.

7.2 QC-1310 Teaching Aid Assembly

REV.	DESCRIPTION	INITIATOR	DATE
01	INITIAL DRAWING	JAR	3/9/2018

STEP 1
 PLACE THE TOOL IN THE TOOL STAND. PROGRAM SHOULD BE WRITTEN WITH THE TOOL PLATE RESTING IN THE TOOL STAND.

DETAIL A
 SCALE 1 : 2

3X M10 SHCS PROVIDED TO FASTEN TOOL SIDE AID TO TOOL PLATE. IF THE TOOL PLATE IS NOT PARALLEL TO THE FLOOR WHILE RESTING IN THE TOOL STAND.

STEP 2
 MOUNT THE TOOL SIDE AID OVER THE TOOL PLATE BY INSERTING THE LOCATION PINS INTO THE BUSHINGS.
****SEE DETAIL A FOR FURTHER INSTRUCTIONS****

DETAIL B
 SCALE 1 : 2

OPTIONAL: 3X M10 SHCS PROVIDED TO FASTEN MASTER SIDE AID TO MASTER PLATE IF ROBOT WRIST IS NOT PARALLEL TO THE FLOOR WHILE TEACHING.

STEP 3
 MOUNT THE MASTER SIDE AID TO THE QC MASTER PLATE ENSURING THAT THE TAPER PINS ENTER THE CORRESPONDING HOLES IN THE MASTER SIDE AID. TURN THE CLAMPING PIN TO ENSURE THAT THE MASTER SIDE AID LOCKS TO THE QC MASTER PLATE.
****SEE DETAIL B FOR FURTHER INSTRUCTIONS****

CAUTION: MAKE SURE HANDS AND FINGERS ARE FREE AND CLEAR OF THE LOCKING MECHANISM.

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

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DRAWN BY: J.Ray, 3/9/18	TITLE: QC-1310 Teaching Aid Instruction Drawing	SCALE: 1:5	SIZE: B	DRAWING NUMBER: 9230-20-8033	REVISION: 01
CHECKED BY: D. BOHLE, 8/1/19	PROJECT #: 170802-2 SHEET 1 OF 2				

8. Terms and Conditions of Sale

The following Terms and Conditions are a supplement to and include a portion of ATI's Standard Terms and Conditions, which are on file at ATI and available upon request.

ATI warrants to Purchaser that robotic Tool Changer products purchased hereunder will be free from defects in material and workmanship under normal use for a period of three (3) years from the date of shipment. The warranty period for repairs made under a RMA shall be for the duration of the original warranty, or ninety (90) days from the date of repaired product shipment, whichever is longer. ATI will have no liability under this warranty unless: (a) ATI is given written notice of the claimed defect and a description thereof within thirty (30) days after Purchaser discovers the defect and in any event not later than the last day of the warranty period; and (b) the defective item is received by ATI not later ten (10) days after the last day of the warranty period. ATI's entire liability and Purchaser's sole remedy under this warranty is limited to repair or replacement, at ATI's election, of the defective part or item or, at ATI's election, refund of the price paid for the item. The foregoing warranty does not apply to any defect or failure resulting from improper installation, operation, maintenance or repair by anyone other than ATI.

ATI will in no event be liable for incidental, consequential or special damages of any kind, even if ATI has been advised of the possibility of such damages. ATI's aggregate liability will in no event exceed the amount paid by purchaser for the item which is the subject of claim or dispute. ATI will have no liability of any kind for failure of any equipment or other items not supplied by ATI.

No action against ATI, regardless of form, arising out of or in any way connected with products or services supplied hereunder may be brought more than one (1) year after the cause of action accrued.

No representation or agreement varying or extending the warranty and limitation of remedy provisions contained herein is authorized by ATI, and may not be relied upon as having been authorized by ATI, unless in writing and signed by an executive officer of ATI.

Unless otherwise agreed in writing by ATI, all designs, drawings, data, inventions, software and other technology made or developed by ATI in the course of providing products and services hereunder, and all rights therein under any patent, copyright or other law protecting intellectual property, shall be and remain ATI's property. The sale of products or services hereunder does not convey any express or implied license under any patent, copyright or other intellectual property right owned or controlled by ATI, whether relating to the products sold or any other matter, except for the license expressly granted below.

In the course of supplying products and services hereunder, ATI may provide or disclose to Purchaser confidential and proprietary information of ATI relating to the design, operation or other aspects of ATI's products. As between ATI and Purchaser, ownership of such information, including without limitation any computer software provided to Purchaser by ATI, shall remain in ATI and such information is licensed to Purchaser only for Purchaser's use in operating the products supplied by ATI hereunder in Purchaser's internal business operations.

Without ATI's prior written permission, Purchaser will not use such information for any other purpose or provide or otherwise make such information available to any third party. Purchaser agrees to take all reasonable precautions to prevent any unauthorized use or disclosure of such information.

Purchaser will not be liable hereunder with respect to disclosure or use of information which: (a) is in the public domain when received from ATI; (b) is thereafter published or otherwise enters the public domain through no fault of Purchaser; (c) is in Purchaser's possession prior to receipt from ATI; (d) is lawfully obtained by Purchaser from a third party entitled to disclose it; or (f) is required to be disclosed by judicial order or other governmental authority, provided that, with respect to such required disclosures, Purchaser gives ATI prior notice thereof and uses all legally available means to maintain the confidentiality of such information.