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B. Base Tool Changer

QC-7 Series—Robotic Tool Changer

1. Product Overview

ATI Tool Changers enhance the versatility of a robot by enabling the use of multiple customer tools, such as: grippers, vacuum cup tooling, pneumatic and electric motors, weld guns, and more.

The Tool Changer consists of a Master plate, which is attached to the robot arm, and a Tool plate, which is attached to customer tooling. When the robot picks up the customer tooling, a pneumatically-driven locking mechanism couples the two plates. The patented, fail-safe locking mechanism utilizes a multi-tapered cam with ball locking technology to ensure the Tool Changer does not uncouple if air pressure falls below 60 psi (4.1 bar) during operation.

The robot can be programmed to select the desired customer tooling by coupling the Master plate to the Tool plate. Electricity, fluid, and other forces of energy transfer to the customer tooling through optional modules that are attached to the Master and Tool plates. Refer to the ATI website for compatible modules or contact an ATI sales representative for more details.

For the most current product information and specifications on the QC-7 Series of Tool Changers, click the following link: *QC-7 Series*.

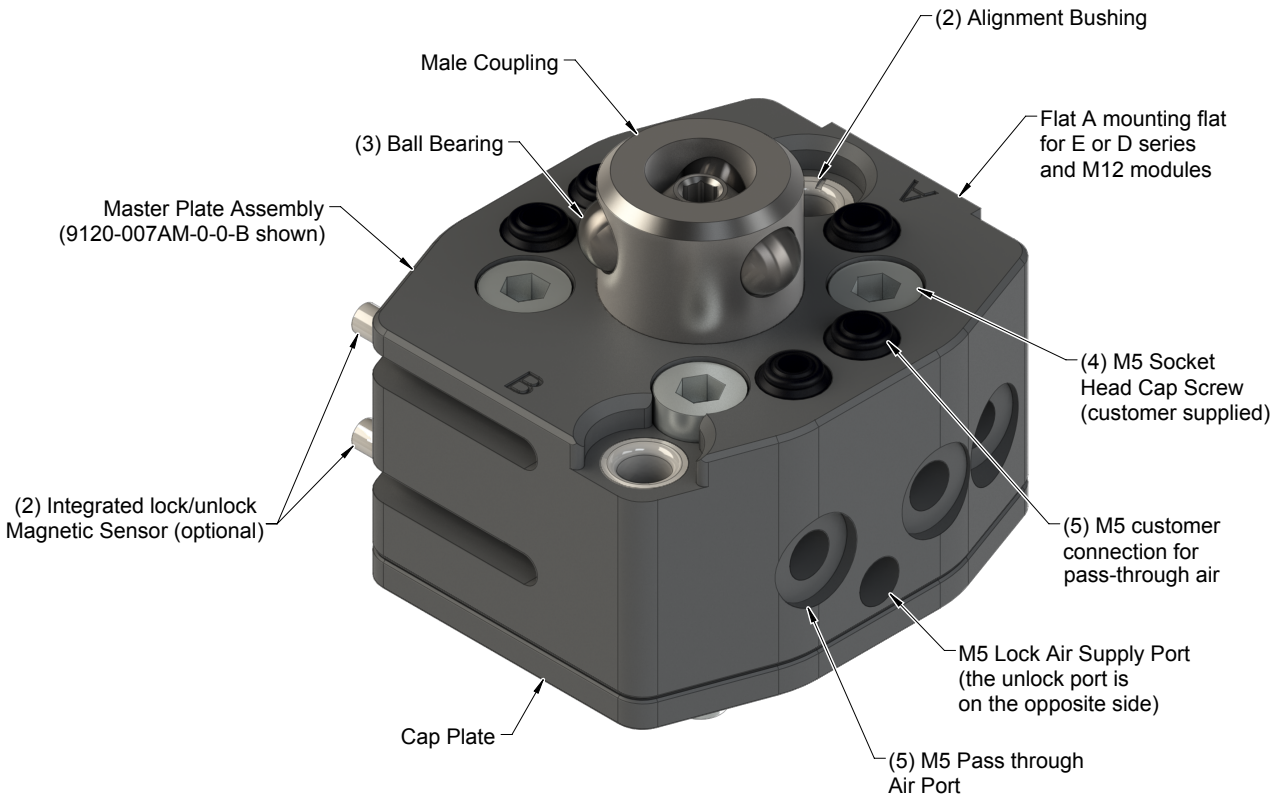
1.1 Master Plate Assembly

The Master plate assembly includes the following features:

- An anodized aluminum body
- A hardened stainless steel locking mechanism (a cam, male coupling, and (3) chrome steel ball bearings)
- (2) Alignment bushings that mate with pins on the Tool plate
- (1) Flat for mounting an optional module
- (2) M5 connections to supply pneumatic pressure for coupling and uncoupling the Tool Changer
- (2) Lock and unlock fittings for 4 mm (5/32”) outer diameter (OD) tubes (refer to *Figure 1.2*)
- (5) Axial pass-through air ports with rubber bushings and M5 customer connections
- (2) Optional integrated magnetic sensors are used to verify the lock/unlock position of the piston and cam. Refer to *Section 6.1—Master Plate Assembly Serviceable Parts* for different sensor options

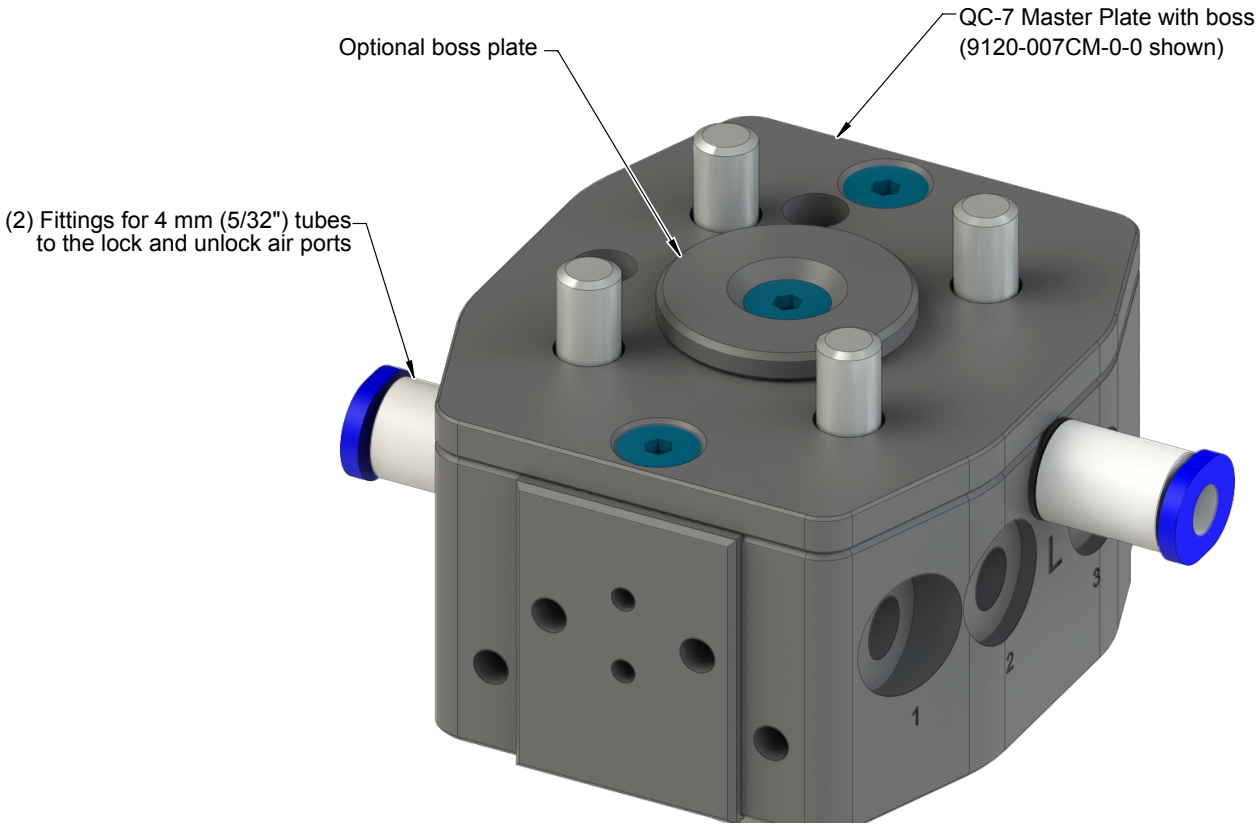
An extreme pressure grease is applied to the cam, male coupling, and ball bearings to enhance performance and maximize the life of the Master plate, (refer to *Section 4.2—Cleaning and Lubrication of the Locking Mechanism and Alignment Pins* for details about the cleaning procedure and type of grease).

Figure 1.1—Master Plate Assembly (Shown with Optional Sensors)



The master plate includes a machined mounting pattern, which is in accordance with ISO-9409-1-31, 5-4-M5, for mounting to a robot arm or an interface plate (refer to *Section 8—Drawings* for the specific mounting pattern). Additional interface plates are available (refer *Section 6.1—Master Plate Assembly Serviceable Parts*).

Figure 1.2—Master Plate Assembly (Optional Boss and Lock and Unlock Fittings)



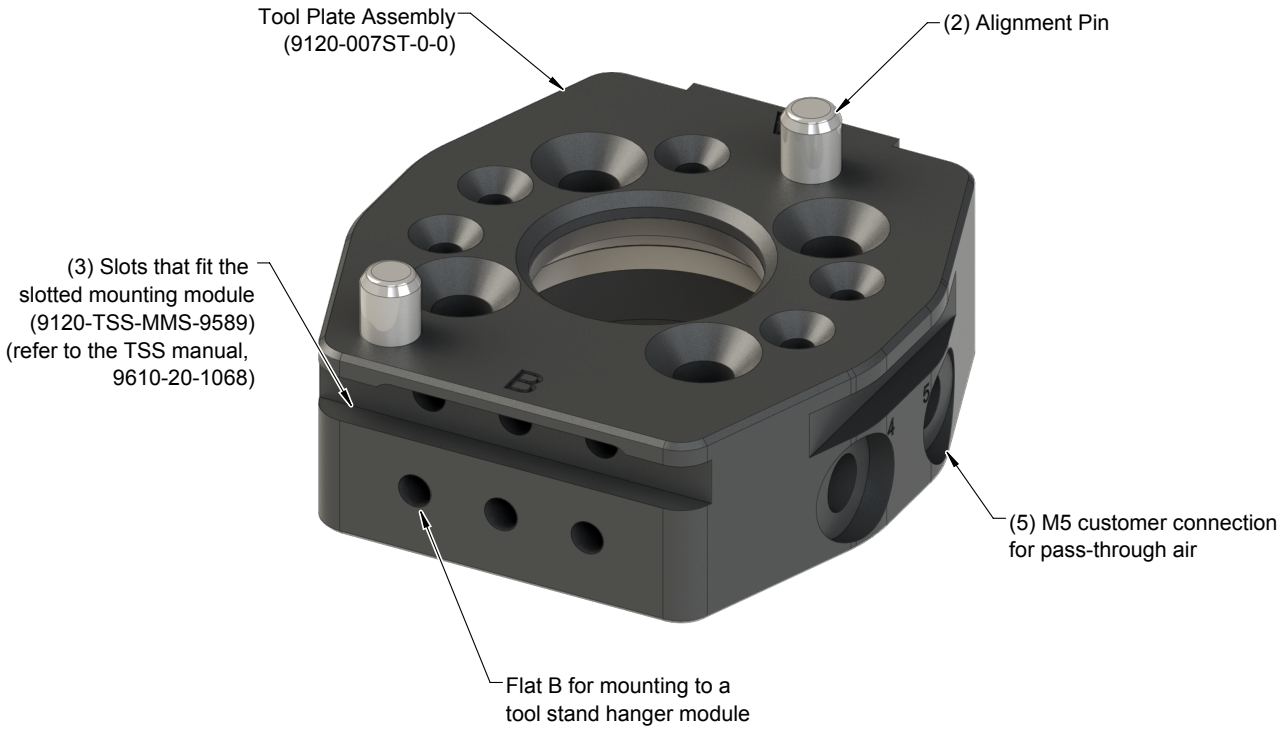
1.2 Tool Plate Assembly

The Tool plate assembly includes the following features:

- An anodized aluminum body
- A hardened stainless steel bearing race
- (2) Hardened steel alignment pins that mate with bushings on the Master plate
- (5) M5 radial pass-through air ports. The customer can make these ports axial by removing the phillips head screws. Refer to *Figure 1.4*. If the customer turns the radial ports to axial ports, the customer must supply o-rings to seal these axial ports and plugs to seal the radial port; refer to *Section 8—Drawings*
- Flats for mounting optional modules (refer to *Figure 1.4*).
- (1) Flat for mounting a tool stand hanger module
- A machined mounting pattern for mounting to customer tooling or an interface plate (refer to *Section 8—Drawings* for the specific mounting pattern).
- (3) slots that interface with an ATI Tool Stand Small (TSS) slotted mounting module. An optional Tool plate assembly without slots is available, if the user needs a thinner Tool plate assembly that reduces stack height. For more information about the TSS, visit the ATI website: *https://www.ati-ia.com/products/toolchanger/toolstand/small/smallstand.aspx*.

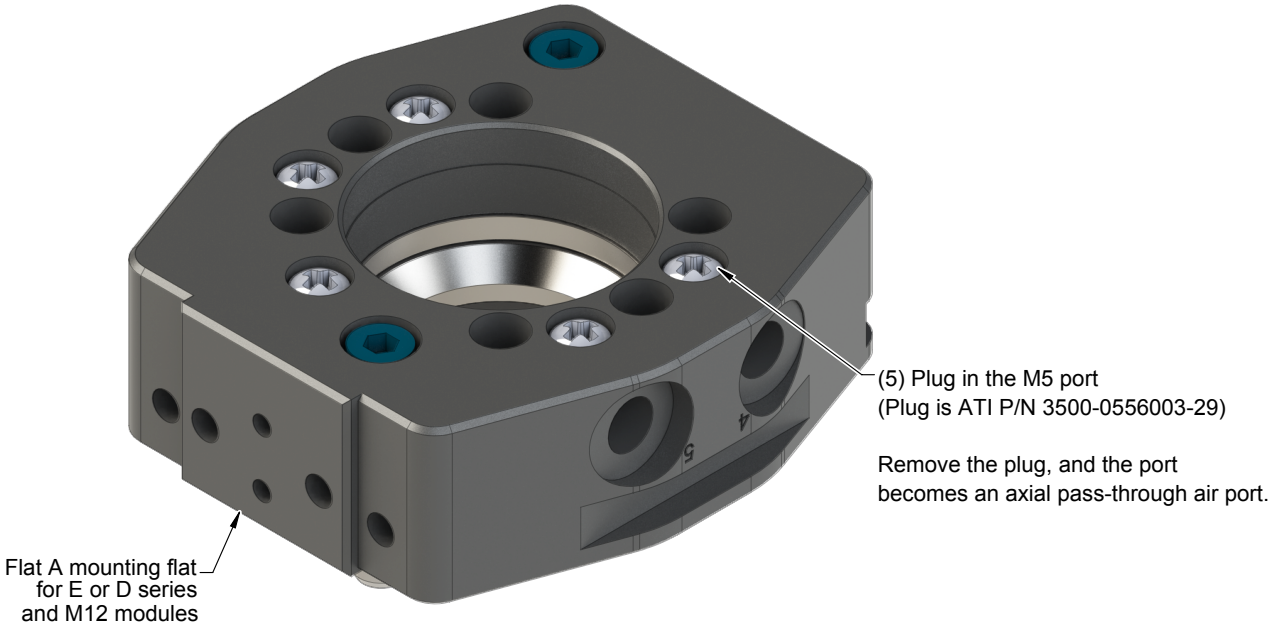
An extreme pressure grease is applied to the alignment pins to enhance performance and maximize the life of the Tool Changer (refer to *Section 4.2—Cleaning and Lubrication of the Locking Mechanism and Alignment Pins* for details about the cleaning procedure and type of grease).

Figure 1.3—Tool Plate Assembly



The Tool plate has (1) flat that has a mounting pattern that fits the E or Series and M12 modules. Another flat is for mounting a tool stand hanger module.

Figure 1.4—Tool Plate Assembly (Axial Port Plugs and Optional Mounting Flat)

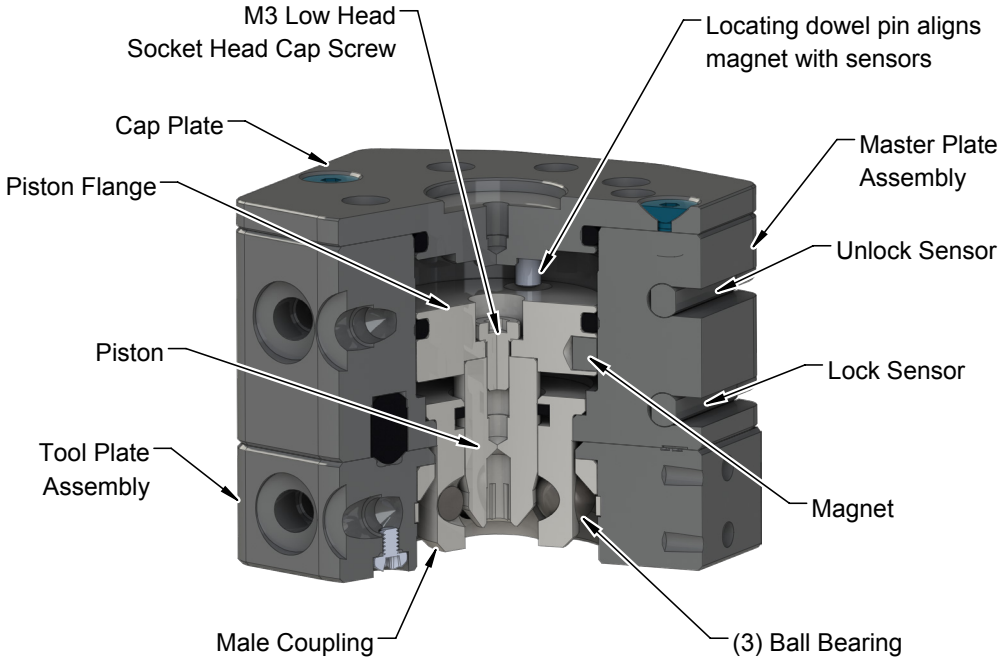


1.3 Master Plate/Tool Plate Locking Mechanism

The coupling of the Master plate and the Tool plate is achieved through a patented high-strength and stainless steel mechanism. During locking, steel balls in the Master plate are driven outward by a circular cam attached to a pneumatically actuated piston. The cam profile has (3) features: A lead-in angle (conical), a flat (cylindrical) area, and a secondary angle (conical). The lead-in angle initiates the coupling process, the flat area assures the coupling will not be compromised in case of air loss (fail-safe feature), and the secondary angle provides rigid coupling during normal operation. The balls engage a bearing race (or "locking ring") in the Tool plate and lock the Master plate and Tool plate tightly together.

The lock and unlock magnetic proximity sensors detect the position of the magnet in the piston flange and indicate when the Tool Changer is in the Locked or Unlocked position.

Figure 1.5—Locking Mechanism



1.4 Optional Modules

Tool Changers have (1) or (2) flats depending on the model. Flat A is for mounting M12 and D or E series electrical modules. Some modules require an adapter plate. Flat B on the standard Tool module is for mounting a tool stand hanger block that can interface with a single pin tool stand nest on a small tool stand; refer to the 9610-20-1068 small tool stand manual for more information. For assistance in choosing the modules for a particular application, visit the ATI website (*QC-7 Series*) to see what is available or contact an ATI sales representative directly.

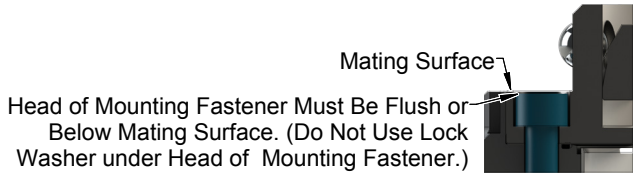
2. Installation

On the Master and Tool plates, the QC-7 Tool Changer has a standard ISO pattern 31.55 mm bolt pattern that mounts many common robot models and common tools directly to the plates; for all other robot models and tools, an interface plate can be used.

Refer to *Section 2.1—Master Interface* and *Section 2.4—Tool Interface* for information about designing an interface plate. Custom interface plates are available from ATI upon request. Refer to *Section 6.2—Master Interface Plate Kits* for interface kits that are available to purchase from ATI.

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.

WARNING: Do not use lock washers under the head of the mounting fasteners or allow the mounting fasteners to protrude above the mating surfaces of the Master and Tool plates. Allowing fasteners to protrude above the mating surface will create a gap between the Master and Tool plates and not allow the locking mechanism to fully engage, this can cause damage to equipment or personal injury. The mounting fasteners must be flush or below the mating surfaces of the Master and Tool plates.



WARNING: 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 over stressing, pullout, or kinking the lines. Failure to do so can cause critical electrical and/or pneumatic lines to malfunction and might result in injury to personnel or damage to equipment.

CAUTION: Thread locker applied to fasteners must not be used more than once. Fasteners might become loose and cause equipment damage. Always apply new thread locker when reusing fasteners.

CAUTION: Do not use fasteners that exceed the thread depth in the Tool Changer. Refer to *Section 8—Drawings* for details on mounting hole thread depth. Secure the Tool Changer with the proper length fasteners. This is true for both robot and tool interfaces.

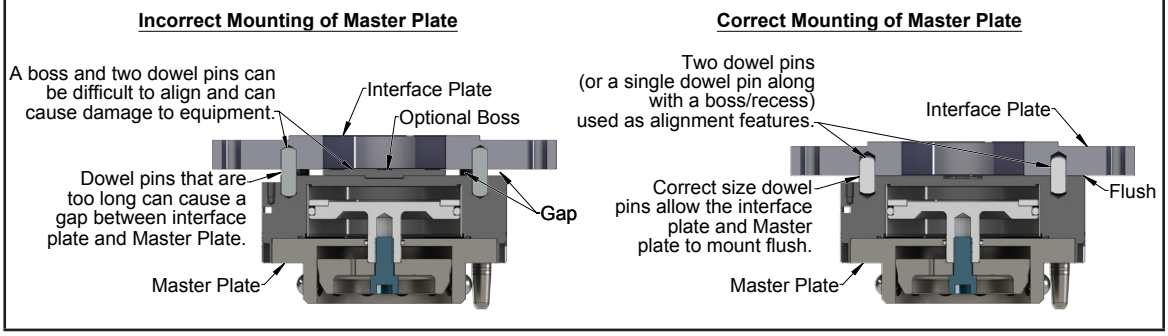
Table 2.1—Fastener Size, Class, and Torque Specifications			
Mounting Conditions	**Fastener Size, Property Class, and Type**	**Recommended Torque**	**Thread Locker**
Optional Master interface plate to a robot	M6 x 0.8 Class 12.9		Pre-applied Adhesive or Loctite® 242
	Socket flat head cap	55 in-lbs (6.21 Nm)	
QC-7 Master plate to a Master interface plate or robot	M5 x 0.8 Class 12.9		Pre-applied Adhesive or Loctite® 222
	Socket flat head cap	45 in-lbs (5.08 Nm)	
Tool Interface Plate to QC-7 Tool plate with a minimum thread engagement of 7.5 mm [1.5X fastener Ø]. Do not exceed maximum available thread depth of 8 mm for M5 socket head cap screws as shown in *Section 8—Drawings*	M5 x 0.8 Class 12.9		
	Socket head cap	45 in-lbs (5.08 Nm)	
	M4 Class 12.9		
	Socket flat head cap	10 in-lbs (1.13 Nm)	
Optional Tool Hanger Module to the QC-7 Tool plate (Flat B)	M3 x 20 Class 12.9	12 in-lbs (1.36 Nm)	
Optional M12 Module and adapter plate to the Master or Tool plate (Flat A), supplied fasteners	M3 x 5 Button Head Cap Screw	48 in-oz (0.34 Nm)	
	M2.5 x 8 Class 12.9 Socket head cap	30 in-oz (0.21 Nm)	
Optional D or E Series Modules with metal housings to the Master or Tool plate (Flat A)	M3 x 16 Socket Head Cap Screw, Zinc	10 in-lbs (1.13 Nm)	
Optional D or E Series Modules with Delrin housings to the Master or Tool plate (Flat A)		96 in-oz (0.68 Nm)	

2.1 Master Interface

The Master plate is typically attached to the robot arm. An interface plate can adapt the Master plate to a specific robot arm. Alignment features (dowel holes and bosses) accurately position and bolt holes secure the Master plate to the robot arm or an interface plate. Custom interface plates are available from ATI upon request. (refer to the drawings for technical information on mounting features.)

CAUTION: Do not use more than two alignment features when securing a Master plate to an interface plate. Using more than two alignment features can cause damage to equipment. Use either two dowel pins or a single dowel pin, along with a boss/recess feature to align the Master plate with the interface plate.

CAUTION: Do not use dowel pins that are too long or do not allow the interface plate and Master body to mate flush. Using dowel pins that are too long will cause a gap between the interface plate and Master body and damage the equipment. Use dowel pins that will not extend further than allowed by the Master body.



If the customer chooses to design and build an interface plate, consider the following points:

- The interface plate should include bolt holes for mounting and either two dowel pins or a dowel pin and a boss for accurate positioning on the robot and Master plate. The dowel and boss features prevent unwanted rotation. Refer to the robot manual for robot mounting features.
- The thickness of the interface plate must be sufficient to provide the necessary thread engagement for the mounting bolts.
- Dowel pins must not extend out from the surface of the interface plate farther than the depth of the dowel holes in the Master plate.
- If a boss is used on the Master plate, a recess of proper depth and diameter must be machined into the interface plate to correspond with the boss on the Master plate.
- Mounting bolts that are too long can create a gap between the interface plate and the Master plate, which can damage equipment.
- The interface plate must provide rigid mounting to the Master plate.
- The interface plate design must account for clearances required for Tool Changer module attachments and accessories.

2.2 Master Plate Assembly Installation

Refer to *Figure 2.1*.

Tools required: *5 mm and 4 mm hex key, torque wrench*

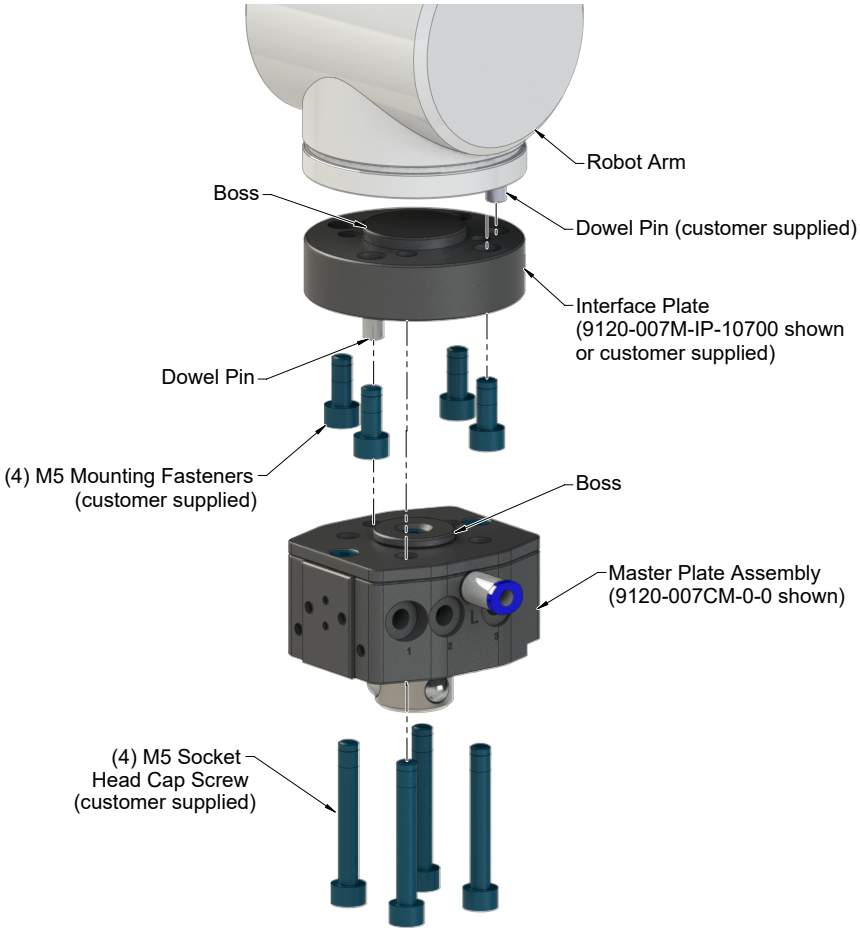
Supplies required: *Clean rag, Loctite 242 and 222*

1. Clean the mounting surfaces.
2. If required, install the interface plate to the robot arm, align using the boss or dowel pins and secure with customer supplied fasteners. The following are procedures for installing an ATI interface plate:
   a. Apply Loctite 242 to the threads of the (4) M6 socket head cap screws.
   b. Use the boss and/or dowel pins to align the interface plate to the robot arm.
   c. Using a 5 mm hex key secure the interface plate to the robot arm or interface plate with customer supplied (4) M6 shoulder head cap screws. Tighten to 55 in-lbs (6.21 Nm).

NOTICE: If an interface plate is purchased from ATI, fasteners to mount the Master plate to the interface plate are supplied by ATI.

3. Install the Master plate assembly to the robot arm or interface plate:
   d. Apply Loctite 222 to the threads of the (4) M5 socket head cap screws.
   e. Align the Master plate to the interface plate or robot arm.
   f. Using a 4 mm hex key secure the Master plate assembly to the robot arm or interface plate with customer supplied (4) M5 shoulder head cap screws. Tighten to 45 in-lbs (5.08 Nm).
4. If equipped, connect the lock and unlock M8 sensor end cable connections.
5. Connect all lock/ unlock and pass through air connections to the Master plate assembly. For lock and unlock air, refer to *Section 2.8—Lock and Unlock Pneumatic and Valve Requirements*.
6. Connect utilities to the optional module and Master plate assembly connections.
7. Safely resume normal operation.

Figure 2.1—Master Plate Assembly Installation



2.3 Master Plate Assembly Removal

Tools required: *4 mm hex key*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plate assemblies.
3. De-energize all energized circuits (e.g. electrical, air, water, etc.).
4. Disconnect all utilities (e.g. electrical, air, water, etc.).

NOTICE: Support the Master plate assembly while removing the fasteners.

5. Using a 4 mm hex key, remove the (4) M5 shoulder head cap screws that connect the Master plate assembly to the robot arm or interface plate.

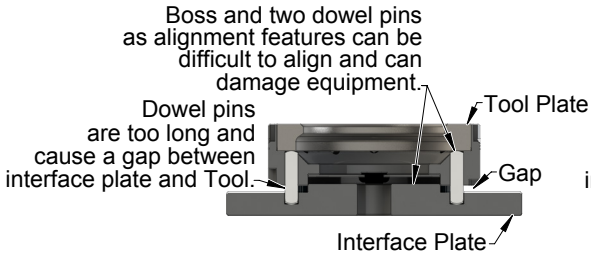
2.4 Tool Interface

The Tool plate is attached to the customer's tooling. An interface plate can adapt the Tool plate to customer tooling. Alignment features (dowel holes and a recess) accurately position and bolt holes to secure the Tool plate to customer tooling. Custom interface plates can be supplied by ATI (refer to the application drawing).

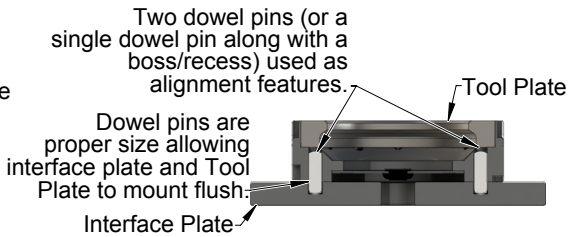
CAUTION: Do not use more than two alignment features when securing a Tool plate to an interface plate. Using more than two alignment features can cause damage to equipment. Use either two dowel pins or a single dowel pin, along with a boss/recess feature to align the Tool plate with the interface plate.

CAUTION: Do not use dowel pins that are too long or do not allow the interface plate and Tool body to mate flush. Using dowel pins that are too long will cause a gap between the interface plate and Tool body and damage the equipment. Use dowel pins that will not extend further than allowed by the Tool body.

Incorrect Mounting of Tool Plate



Correct Mounting of Tool Plate



If the customer chooses to design and build a tool interface plate, consider the following points:

- The interface plate should include bolt holes for mounting and either two dowel pins or a dowel pin and a boss for accurate positioning on the customer tooling and Tool plate. The dowel and boss features prevent unwanted rotation.
- Dowel pins must not extend out from the surface of the interface plate farther than the depth of the dowel holes in the Tool plate.
- The thickness of the interface plate must be sufficient to provide the necessary thread engagement for the mounting bolts. Fasteners should meet minimum recommended engagement lengths while not exceeding the maximum available thread depth. Use of bolts that are too long can cause damage to the tool side changer.
- The plate design must account for clearances required for Tool Changer module attachments and accessories.
- If a boss is to be used on the interface plate, a boss of proper height and diameter must be machined into the interface plate to correspond with the recess in the Tool plate.
- The interface plate must have a hole in its center for manually returning the locking mechanism to the unlocked position under adverse conditions (i.e. unintended loss of power and/or air pressure). The center access hole with a minimum diameter of 1" (25.4 mm) prevents debris from contaminating the locking mechanism. Greater protection is provided by leaving the race cover and grommet in place.

2.5 Tool Plate Assembly Installation

Tools required: *2.5 mm hex key for M4 flat head socket cap screw, 4 hex key for M5 socket head cap screw, torque wrench*

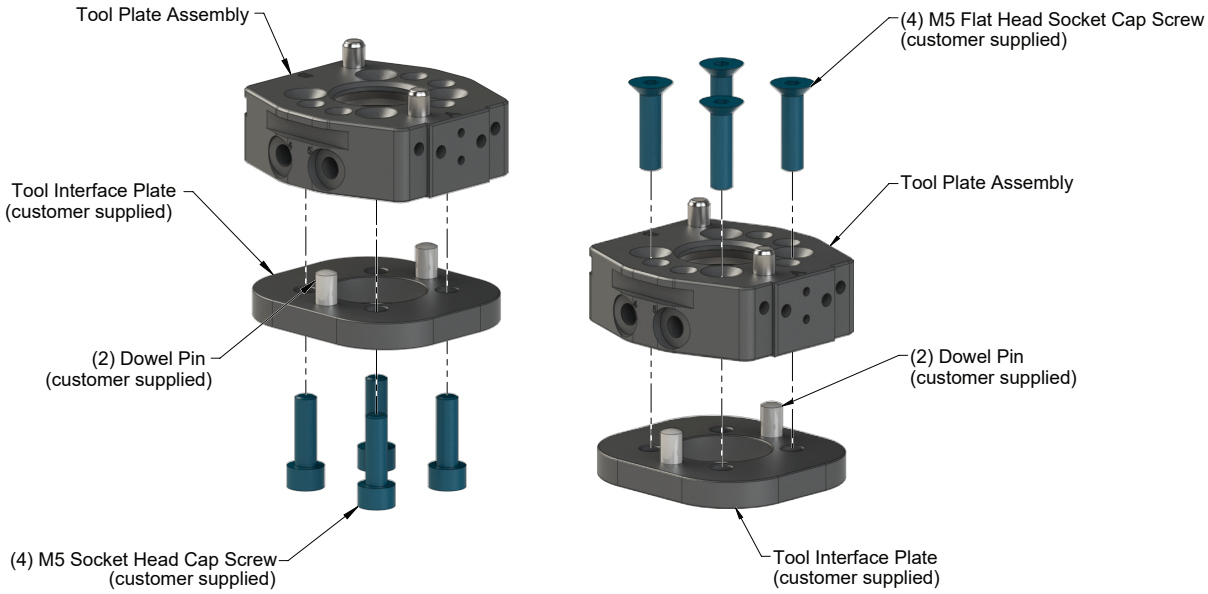
Supplies required: *Clean rag, Loctite 222*

1. Clean the mounting surfaces.

NOTICE: If an interface plate is purchased from ATI, fasteners to mount the Tool plate to the interface plate are supplied by ATI.

2. Install the Tool plate assembly to the customer tooling or an interface plate with customer supplied fasteners (see *Table 2.1* for fastener and threadlocker specifications).
3. Connect utilities to the optional module and Tool plate assembly connections.
4. Safely resume normal operation.

Figure 2.2—Tool Plate Assembly Installation



2.6 Tool Plate Assembly Removal

Tools required: *2.5 mm hex key for M4 flat head socket cap screw, 4 mm hex key for M5 socket head cap screw, torque wrench)*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plate assemblies.
3. De-energize all energized circuits (e.g. electrical, air, water, etc.).
4. Disconnect all utilities (e.g. electrical, air, water, etc.).
5. Remove the socket head cap screws that connect the Tool plate to the tooling or interface plate.

2.7 Optional Module Installation

Tool Changers are compatible with different types of modules. Some modules require an adapter plate to be installed to the Tool Changer. The optional modules are typically installed on Tool Changer by ATI prior to shipment. The following procedure outlines field installation or removal.

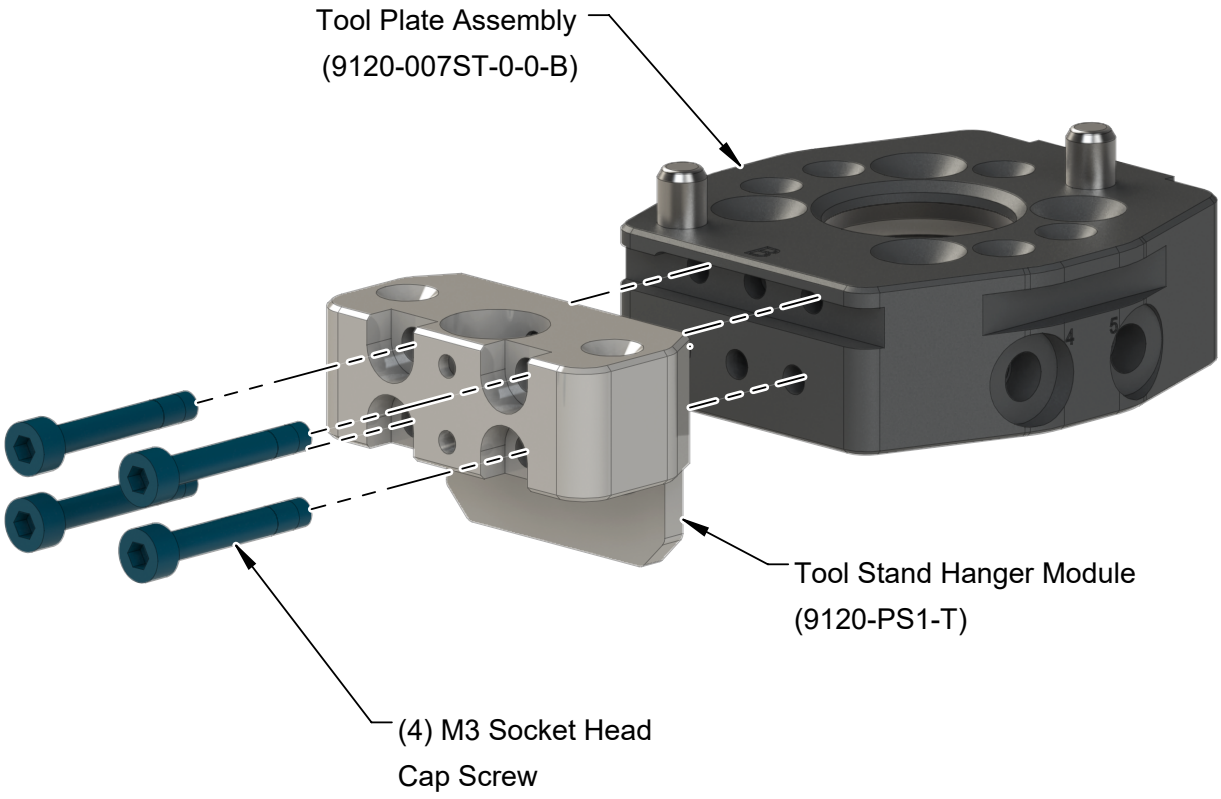
2.7.1 Tool Stand Hanger Module

Tools required: *2.5 mm hex key, torque wrench*

Supplies required: *Clean rag*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plate assemblies.
3. De-energize all energized circuits (e.g electrical, air, water, etc.).
4. Clean the mounting surface on Flat B of the Tool plate assembly.
5. Install the tool stand hanger module on Flat B of the Tool plate assembly:
   a. Using the dowel pins as a guide, place the mounting bracket on the flat.
   b. Using a 2.5 mm hex key, secure the module to the flat with the (4) M3 socket head cap screw. Tighten to 12 in-lbs (1.36 Nm).
6. Remove all protective caps, plugs, and tape from the module prior to operation.
7. Safely resume normal operation.

Figure 2.3—Tool Stand Hanger Module Installation



2.7.2 Tool Stand Hanger Module Removal

Refer to *Figure 2.3*.

Tools required: *2.5 mm hex key, torque wrench*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plate assemblies.
3. De-energize all energized circuits (e.g. electrical, air, water, etc.).
4. With the module supported, use a 2.5 mm hex key to remove the (4) M3 socket head cap screw.
5. Remove the module.

2.7.3 M12 Master and Tool Modules Installation

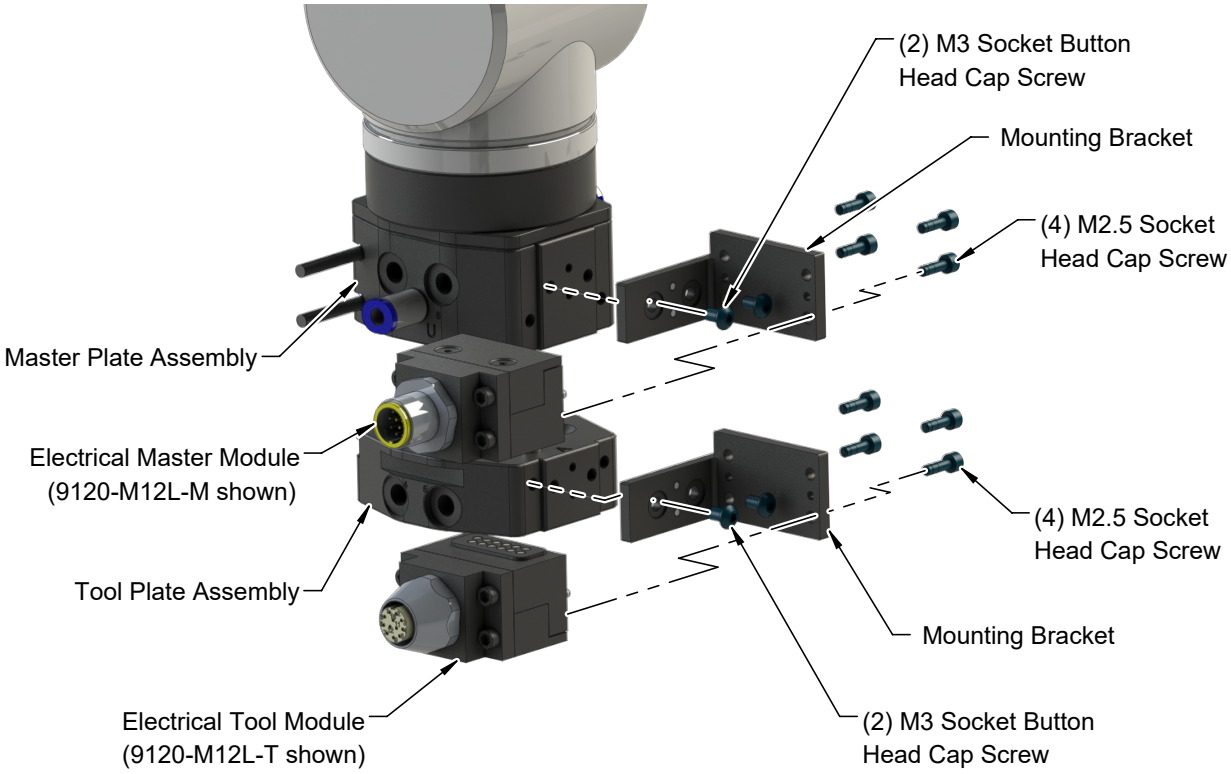
Refer to *Figure 2.4*.

Tools required: *2 mm hex key, torque wrench*

Supplies required: *Clean rag, Loctite 222*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plate assemblies.
3. De-energize all energized circuits (e.g. electrical, air, water, etc.).
4. Clean the mounting surfaces.
5. Install the mounting bracket on the flat of the Master or Tool plate assembly:
   a. Using the dowel pins as a guide, place the mounting bracket on the flat.
   b. Using a 2 mm hex key, secure the bracket to the flat with the (2) M3 button head cap screws. Tighten to 48 in-oz (0.34 Nm).
6. Install the module on the mounting bracket, which is on the Master or Tool plate assembly:
   a. Using the dowel pins as a guide, align the module to the face of the bracket.
   b. Using a 2 mm hex key, secure the module to the bracket with the (4) M2.5 socket head cap screws. Tighten to 30 in-oz (0.21 Nm).
7. Remove all protective caps, plugs, and tape from the module prior to operation.
8. If required, connect any cables, electrical lines, etc.
9. Safely resume normal operation.

Figure 2.4—M12 Module Installation



2.7.4 M12 Master and Tool Modules Removal

Tools required: *2 mm hex key, torque wrench*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates assemblies.
3. De-energize all energized circuits (e.g. electrical, air, water, etc.).
4. If required, disconnect any cables, air lines, etc.
5. With the module supported, use a 2 mm hex key to remove the (4) M2.5 socket head cap screws.
6. Remove the module.
7. Use a 2 mm hex key to remove the (2) M3 button head cap screws.
8. Remove the mounting bracket.

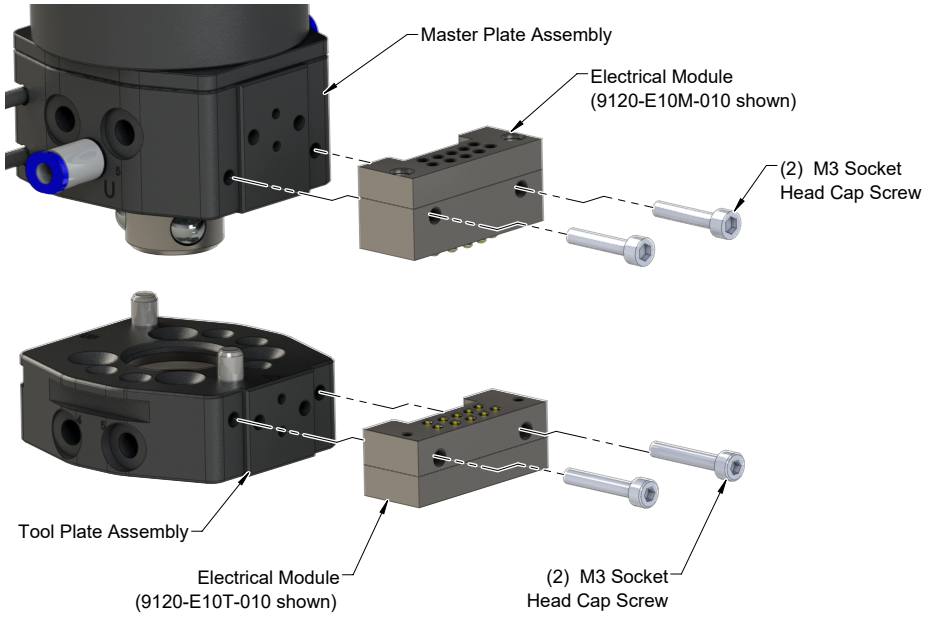
2.7.5 D and E Series Master and Tool Modules Installation

Tools required: *2.5 mm hex key, torque wrench*

Supplies required: *Clean rag, Loctite 222*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plate assemblies.
3. De-energize all energized circuits (e.g. electrical, air, water, etc.).
4. Clean the mounting surfaces.
5. Install the module on the flat of the Master or Tool plate assembly:
   a. Align the module on the flat.
   b. Apply Loctite 222 to the threads of the (2) M3 socket head cap screws.
   c. Using a 2.5 mm hex key, secure the module to the flat with the (2) M3 socket head cap screws. Refer to *Table 2.1* for torque specifications.
6. Remove all protective caps, plugs, and tape from the module prior to operation.
7. If required, connect any cables, electrical lines, etc.
8. Safely resume normal operation.

Figure 2.5—D and E Series Module Installation



2.7.6 D and E Series Master and Tool Modules Removal

Tools required: *2.5 mm hex key, torque wrench*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits (e.g. electrical, air, water, etc.).
4. If required, disconnect any cables, air lines, etc.
5. With the module supported, use a 2.5 mm hex key to remove the (2) M3 socket head cap screws.
6. Remove the module.

2.8 Lock and Unlock Pneumatic and Valve Requirements

To lock or unlock the Tool Changer, a constant supply of compressed air is required. If there is a loss of air pressure in the locked state, the cam profile prevents the Master plate and Tool plate from unlocking, and the Tool Changer goes into the fail-safe condition.

CAUTION: Do not use or transport the Tool Changer in the fail-safe condition, a state where the master plate is locked to a tool plate with no air pressure supplied. Damage to the locking mechanism might occur. Restore proper air pressure before continuing to use the Tool Changer.

2.8.1 Air Requirements

Proper operation of the locking mechanism requires a constant supply of clean, dry, non-lubricated air, with the following conditions:

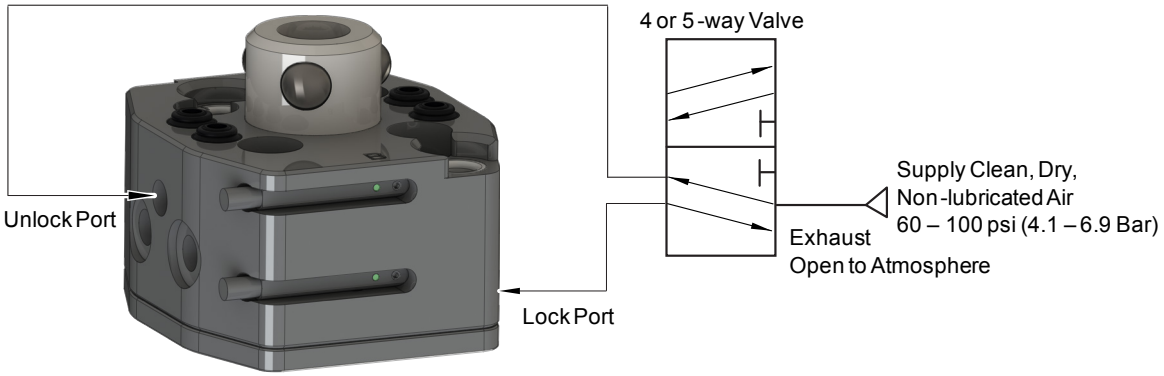
- Pressure range: 60-100 psi (4.1–6.9 Bar)
- Filter minimum: 40 microns
- Flow maximum: 1/3 CFM at 70 psi (4.8 Bar), when cycled continuously
- Fittings that are for 4 mm (5/32”) tubes (refer to *Figure 1.2*)

2.8.2 Valve Requirements and Connections

To lock the Tool Changer, air must vent to the atmosphere from the unlock port and be supplied to the lock port. Conversely, to unlock the Tool Changer, air must vent to the atmosphere from the lock port and be supplied to the unlock port. Therefore, a single, 2-position, 4-way or 5-way valve with either a 4-port or 5-port configuration is required.

CAUTION: Do not use a single, 3-way valve to supply air to the Tool Changer, as this type of valve can not vent trapped air. Improper venting might result in damage to the product and attached tooling, or injury to personnel. Connect the lock and unlock air supplies to a single, 2-position, 4-way or 5-way valve with either a 4-port or 5-port configuration.

Figure 2.6—Lock and Unlock Pneumatic Connections



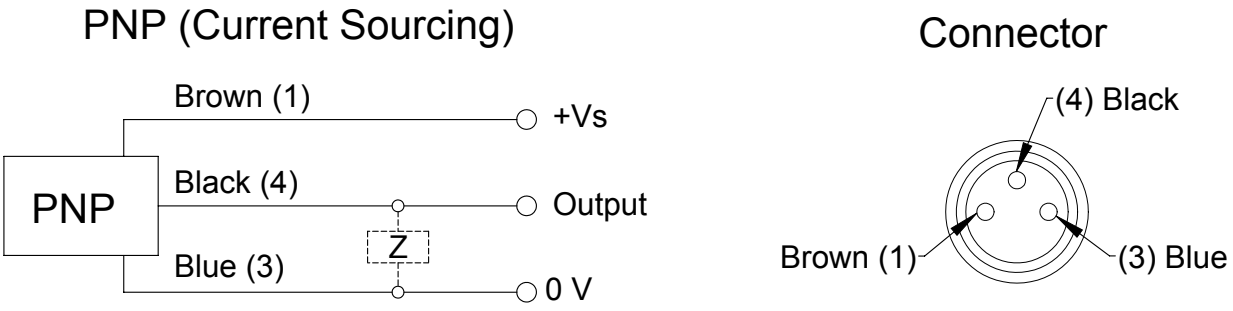
2.9 Electrical Connections

The Tool Changer is available with integrated lock/unlock sensors. The magnetic sensor is hard wired to a 30 cm (11.81 in) cable that has a 3-pin male M8 end cable connector.

2.9.1 PNP Type Lock and Unlock Sensors

Table 2.2—PNP (Current Sourcing)	
Description	**Value**
Voltage Supply Range	10-30VDC
Output Circuit	PNP make function (NO)

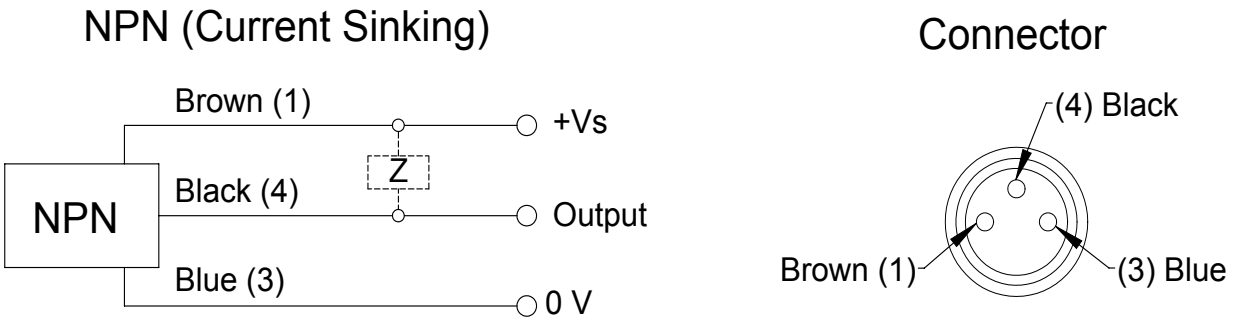
Figure 2.7—PNP Type Lock, Unlock and RTL Sensors



2.9.2 NPN Type Lock and Unlock Sensors

Table 2.3—NPN (Current Sinking)	
Description	**Value**
Voltage Supply Range	10-30 VDC
Output Circuit	NPN make function (NO)

Figure 2.8—NPN Type Lock, Unlock and RTL Sensors



3. Operation

The Master plate locking mechanism is pneumatically driven to couple and uncouple with the Tool plate bearing race.

CAUTION: Operation of the Tool Changer is dependent on maintaining an air pressure of 60 to 100 psi (4.1 - 6.9 bar). Damage to the locking mechanism could occur. Robot motion must be halted if the air supply pressure drops below 60 psi (4.1 bar).

NOTICE: All Tool Changers are lubricated prior to shipment. The customer must apply additional lubricant to the locking mechanism components and alignment pins prior to operation. Tubes of lubricant for this purpose are shipped with every Tool Changer. Standard Tool Changers require MobilGrease XHP222 Special (a NLGI #2 lithium complex grease with molybdenum disulfide). For custom applications, such as food grade or surgical applications, specialized lubricants might be required.

Coupling should occur with the Master plate in the No-Touch™ locking zone. As coupling occurs, the Master plate should pull the Tool plate into the locked position.

Program the robot to minimize misalignment during coupling and uncoupling. Greater offsets can be accommodated by the Master and Tool plates but will increase wear. Misalignments can be caused by improper tool stand design. Refer to Tool Storage Considerations section.

Figure 3.1—Offset Definitions

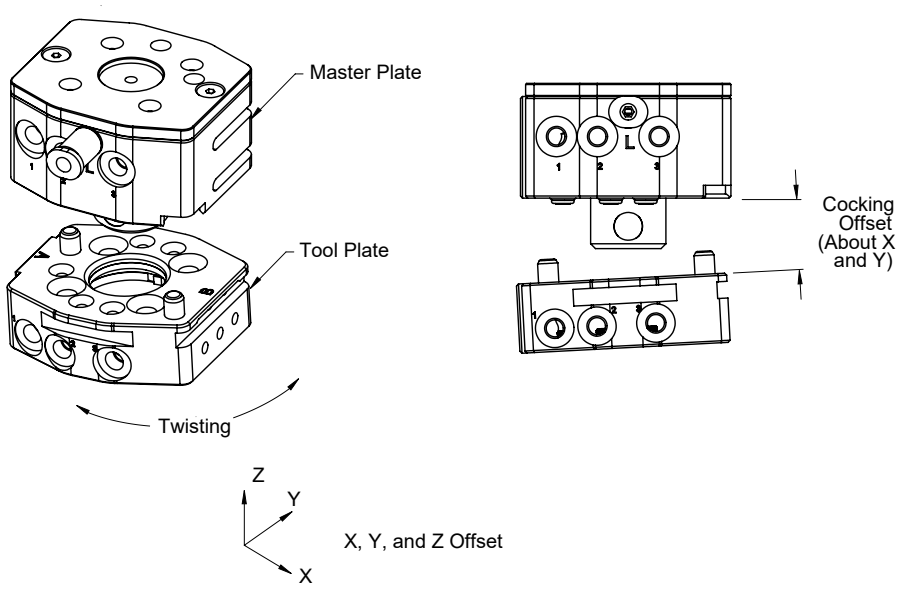


Table 3.1—Maximum Recommended Offsets Prior to Coupling (These values are for Master plate assembly that is used with a slotted Tool plate assembly)				
Model	**No-Touch Zone Z Offset (Max)[1]**	**X and Y Offset (Max) [2]**	**Cocking Offset (Max)**	**Twisting Offset (Max)**
QC-7	0.06” (1.5 mm)	±0.039” (1 mm)	±0.8°	±2°

Notes:
1. Maximum values shown. Decreasing the actual values minimizes wear during coupling and uncoupling.
2. Actual allowable values may be higher in some cases but higher offsets increase wear during coupling.

3.1 Conditions for Coupling

CAUTION: During coupling, do not allow the male coupling to be struck. If struck, the male coupling can be dislodged and not function properly. The Tool Changer will not be able to lock and unlock properly. Be sure that the male coupling has clearance and is not struck, during coupling.

CAUTION: The locking mechanism must be in the unlock position when attempting to couple the Tool Changer. Failure to adhere to this condition may result in damage to the unit and/or the robot.

1. Position the Master plate above the Tool plate with the air supplied to the Unlock Port (if equipped, the Unlock sensor indicates the Tool Changer is Unlocked).
2. Move the Master plate toward the Tool plate so that the (2) alignment pins enter the alignment holes on the opposite plate. Program the robot so that the Master plate and Tool plate are aligned axially and are parallel to each other (as closely as possible). This will minimize Tool movement and subsequent wear during lock-up.

CAUTION: No-Touch™ locking technology allows the unit to couple with a separation distance between the Master and Tool. Direct contact of the Master and Tool mating surfaces is not suggested or required prior to coupling. Contact may result in damage to the unit and/or the robot.

3. When the (2) faces are within the specified No-Touch™ distance, release the pressure from the Unlock port and supply air to the Lock port. The Tool plate is drawn toward the Master plate and coupled. Air must be maintained on the Lock Port during operation to assure rigid coupling (if equipped, the Lock sensor indicates the Tool Changer is in the Locked position).
4. A sufficient delay must be programmed between locking valve actuation and robot motion so that the locking process is complete before moving the robot.

CAUTION: If air pressure is lost during operation, ATI's patented fail-safe design prevents the Tool plate from being released. Do not use the Tool Changer in a fail-safe condition. Re-establish air pressure and ensure the Tool Changer is in a secure lock position before returning to normal operations.

3.2 Fail-Safe Operation

A fail-safe condition occurs when there is an unintended loss of lock air pressure to the Master plate. When air pressure is lost, the Tool Changer relaxes and there may be a slight separation between the Master and Tool plates. The lock sensor may indicate that the unit is not locked. ATI's patented fail-safe feature utilizes a multi-tapered cam to trap the ball bearings and prevent an unintended release of the Tool plate. Positional accuracy of the tooling is not maintained during this fail-safe condition. Do not operate the Tool Changer in the fail-safe condition. If source air is lost to the unit, movement should be halted until air pressure is restored.

After air pressure is re-established to the Master plate, the locking mechanism will energize and securely lock the Master and Tool plates together. In some cases when the load on the tool changer is significantly off center, it may be necessary to position the load underneath the tool changer or return the tool to the tool storage location to ensure a secure lock condition. If equipped, make sure the lock sensor indicates the Tool Changer is in the locked position before resuming normal operations. Consult your Control/Signal Module Manual for specific error recovery information.

CAUTION: Do not use the Tool Changer in a fail-safe condition. Damage to the locking mechanism could occur. Re-establish air pressure and ensure the Tool Changer is in a secure lock position before returning to normal operations.

3.3 Conditions for Uncoupling

1. Position the Tool plate in the tool stand so that there is little or no contact force between the Tool plate and tool stand.
2. Release air on the Lock port and apply air to the Unlock Port (if equipped, the Unlock sensor will indicate the Tool Changer is in the Unlocked position).

> **NOTICE:** The air will cause the locking mechanism to be released and the weight of the Tool plate and attached tooling will assist in its removal. The Tool weight assists in uncoupling if the Tool is released in the vertical position only.

3. A sufficient delay must be programmed between unlocking valve actuation and robot motion, so that the unlocking process is complete and the Tool plate is fully released before moving the robot.
4. Move the Master plate axially away from the Tool plate.
5. In automated Tool change applications, it is recommended that a Tool presence sensor(s) be used in the tool stand to verify that the Tool is present and that the Tool remains in place as the robot moves away after the unlocking process.

3.4 Tool Identification

When using multiple Tools, it is good practice to implement a Tool-ID system that identifies each Tool with a unique code. Tool-ID can be used to verify that the robot has picked up the proper Tool. Modules with Tool-ID are available for purchase through the ATI website. Go to *http://www.ati-ia.com/products/toolchanger/tool_changer_modules.aspx* for products available or contact ATI for assistance.

3.5 Tool Storage Considerations

NOTICE: Tool stand design is critical to operation of the Tool Changer. Improperly designed tool stands can cause jamming and excessive wear of the Tool Changer components.

Tooling plates with customer tooling attached may be stored in a tool stand. ATI provides compatible tool stands that are designed for durability, longevity, and maximum adaptability to fit most customers' applications. The ATI TSS system is compatible with ATI Tool Changer sizes QC-001 to QC-41. The TSS systems can be equipped with horizontal modules, clamp modules, and different types of Tool sensing. The QC-7 is compatible with these (2) mounting styles of TSS components: slotted style and pin and bushing style. Visit the ATI website: *http://www.ati-ia.com/products/toolchanger/toolstand/small/SmallStand.aspx* for products available or contact ATI for assistance.

NOTICE: When a Tool plate assembly is placed in a slotted tool stand configuration, the Tool will have some movement in the stand. This movement could make coupling the Master plate assembly to the Tool plate assembly difficult with certain robot types. Therefore, gantry or non-6 axis robots should not be used with slotted tool stand configurations.

If the customer is supplying the tool stand, they must provide a fixed, repeatable, level, and stable position for tool pick-up and drop-off. The tool stand must support the weight of the Tool Changer Tool plate assembly, interface plate, optional modules, cables, hoses, and customer tooling without allowing deflection in excess of the offsets.

The Tool should be hanging vertically in the tool stand so that gravity assists to uncouple the Tool plate assembly from the Master plate assembly during unlocking. It is possible to design tool stands that hold tools in the horizontal position, but the necessary compliance must be provided during coupling and uncoupling. "Horizontal-Position" tool stands cause more wear on the locking mechanism and locating features of both the Tool and tool stand.

A variety of methods may be used to position the Tool in the tool stand. A common method is to use tapered alignment pins and bushings. Robot programming and positional repeatability are vital in Tool pick-up and drop-off.

A sensor that detects the presence of a Tool in the tool stand is recommended. The sensor may be used prior to coupling to ensure there is a Tool properly seated in the stand. Sensors may also be used as the robot starts to move away after uncoupling. Sensors provide an added safety measure if the Tool becomes jammed in the stand or if the Tool fails to release from the robot. Proximity sensors should be positioned so that the sensing face is vertical to prevent metal shavings, weld spatter, or other debris from falling on the sensor and creating false readings.

Tool stand debris shields can cover Tools and modules to protect them in dirty environments, such as grinding or welding. Alternatively, positioning tool stands in areas shielded from weld spatter, fluids, adhesives, or other debris would eliminate the need for debris shields.

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.

NOTICE: The cleanliness of the work environment strongly influences the trouble free operation of the Tool Changer. The dirtier the environment, the greater the need for protection against debris. Protection of the entire EOAT, the Master, the Tool and all of the modules may be necessary. Protective measures include the following:

- Placement of tool stands away from debris generators.
- Covers incorporated into the tool stands.
- Guards, deflectors, air curtains, and similar devices built into the EOAT and the tool stand.

4.1 Preventive Maintenance

A visual inspection and preventive maintenance schedule is provided in the following table. Detailed assembly drawings are provided in *Section 8—Drawings* of this manual. Refer to module sections for detailed preventive maintenance steps for all utility modules.

Table 4.1—Preventive Maintenance Check List

Application(s)	Tool Change Frequency	Inspection Schedule
General Usage Material Handling Docking Station	> 1 per minute	Weekly
	< 1 per minute	Monthly
Welding/Servo/Deburring, Foundry Operations (Dirty Environments)	All	Weekly

Checklist

Mounting Fasteners/Interface Connections

- ☐ Inspect fasteners for proper torque, interference, or wear. Tighten and correct as required. Refer to *Section 2—Installation*.

Balls/Alignment Pins/Holes/Bearing Race

- ☐ Inspect for lubrication and wear. MobilGrease® XHP222 Special a NLGI #2 lithium complex grease with molybdenum disulfide additive is suggested for locking mechanism and alignment pin lubrication. Over time, lubricants can become contaminated with process debris. Therefore, it is recommended to thoroughly clean the existing grease and replace with new as needed. See *Section 4.2—Cleaning and Lubrication of the Locking Mechanism and Alignment Pins*.
- ☐ Inspect pin and bushing for excessive wear, which may be an indication of poor robot position during pickup/drop-off. Adjust robot position as needed. Check tool stand for wear and alignment problems. Replace worn alignment pins, refer to *Section 5.2.3—Alignment Pin Replacement*.
- ☐ Inspect for wear on the balls/bearing race, which could be an indication of excessive loading.

Sensors and Cables

- ☐ Inspect sensor cable connectors for tightness, and if loose, tighten connections.
- ☐ Inspect sensor cables for any damage, cuts, and abrasion. Replace as necessary.

Hoses

- ☐ Inspect hose connections for tightness and leaks. If leaking or loose, secure hose connection.
- ☐ Inspect hoses for interferences, abrasions, cuts, and leaks. Replace as required.

Seals (Pass-Through Air)

- ☐ Inspect for wear, abrasion, and cuts. Replace damaged rubber bushings as needed. Refer to *Section 5.2.2—Rubber Bushing Inspection and Replacement*.

Electrical Contacts/Pin Block (Optional Modules)

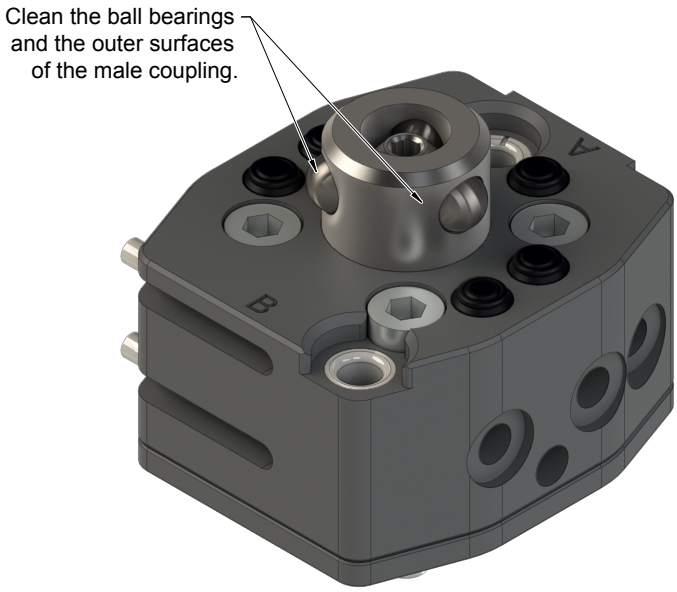
- ☐ Inspect for damage, debris, and stuck/burnt pins. Clean pin blocks as required. Refer to *Section 4.3—Pin Block Inspection and Cleaning*.

4.2 Cleaning and Lubrication of the Locking Mechanism and Alignment Pins

Supplies required: *Clean rag, MobilGrease® XHP222 Special Grease*

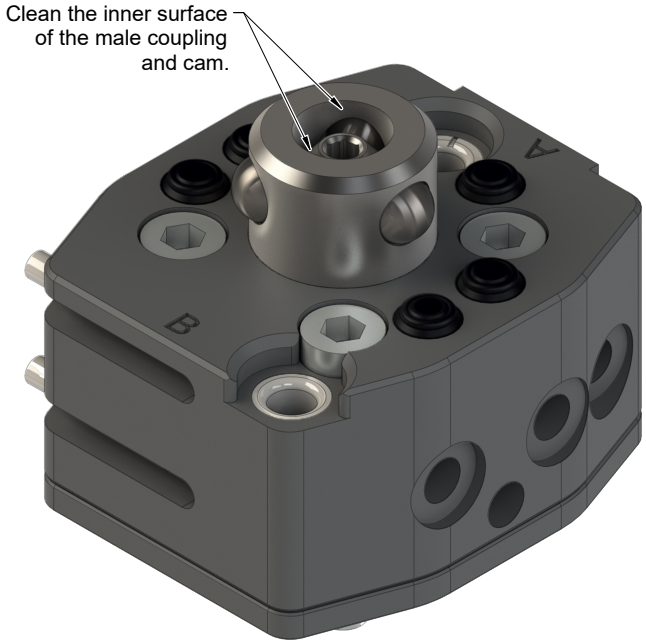
1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits (e.g. electrical, air, water, etc.).
4. Use a clean rag to thoroughly remove any lubricant and debris from the ball bearings, male coupling, cam, and alignment pins.

Figure 4.1—Cleaning Ball Bearings and Outer Surfaces of Male Coupling



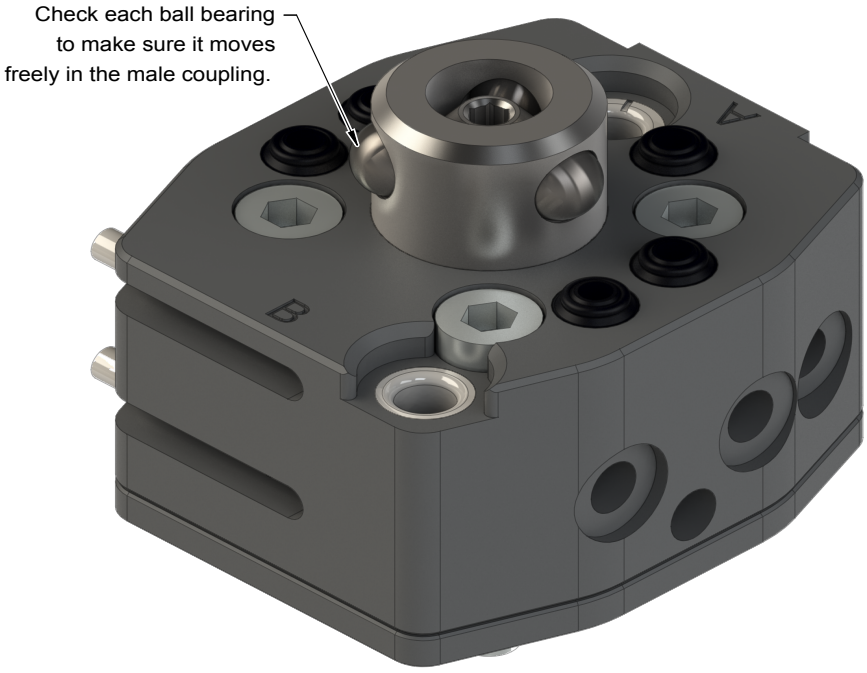
5. Use a clean rag to thoroughly remove any lubricant and debris from the inner surface of the male coupling and cam.

Figure 4.2—Cleaning the Inner Surfaces of Male Coupling or Cam



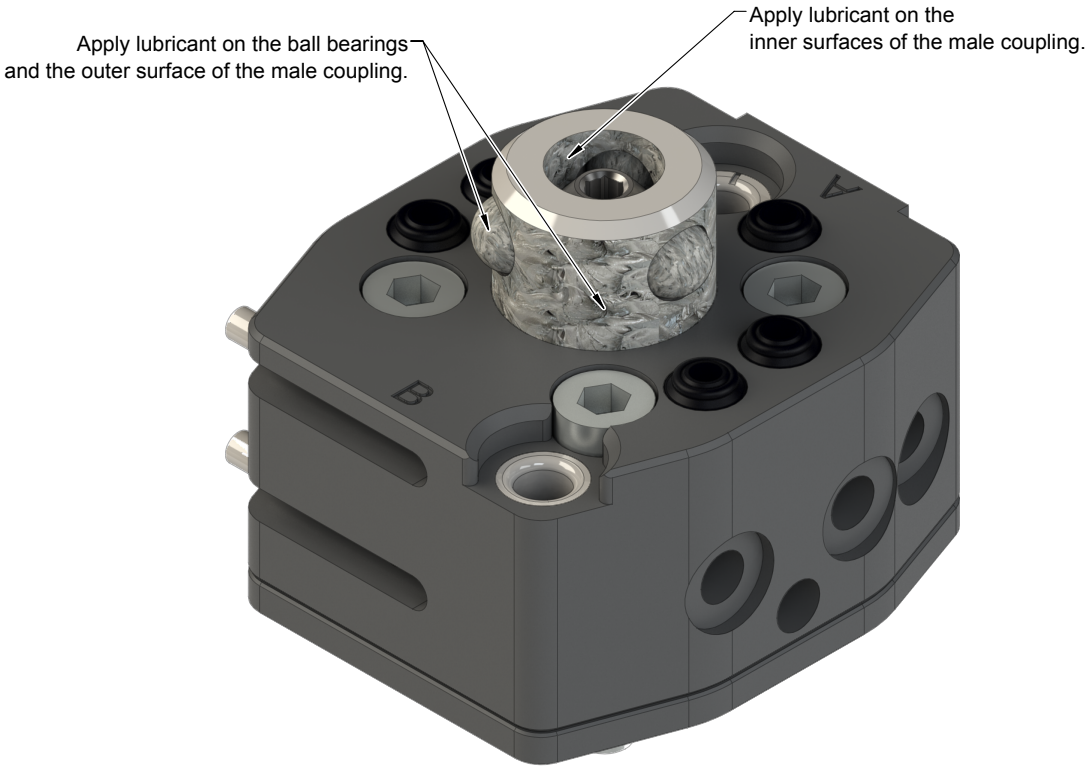
6. Check each ball bearing to make sure it moves freely in the male coupling. Additional cleaning may be necessary to free up any ball bearings that are sticking in place.

Figure 4.3—Check Ball Bearing Movement



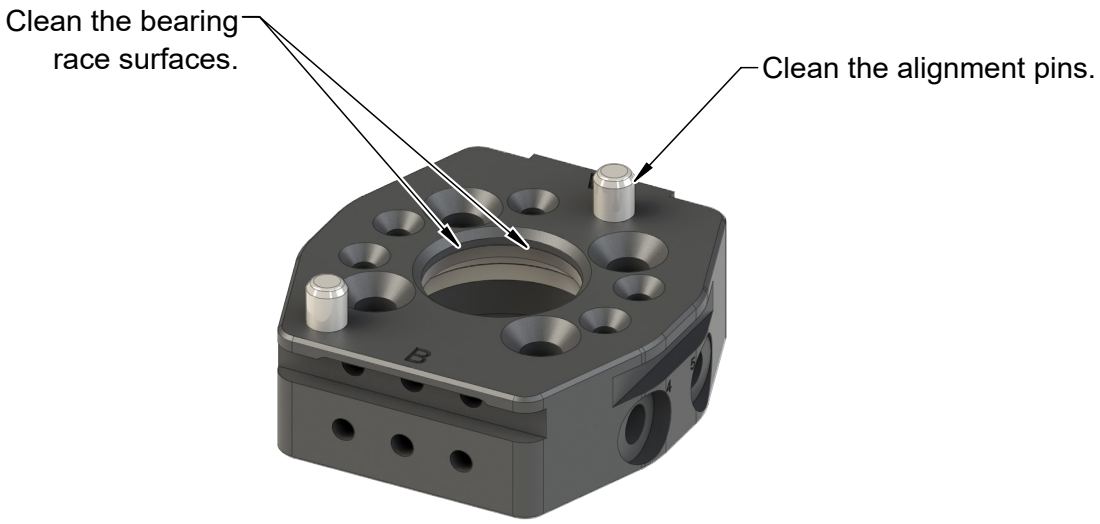
7. Apply a liberal coating of lubricant to the ball bearings, the male coupling (inside and out), and the alignment pins.

Figure 4.4—Apply Lubricant to Locking Mechanism



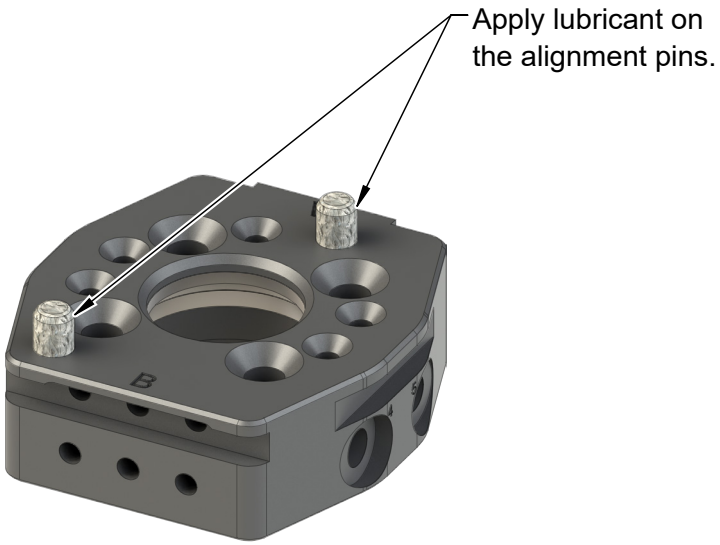
8. Use a clean rag to thoroughly remove any lubricant and debris from the Tool plate bearing race and alignment pins.

Figure 4.5—Clean Tool Plate Surfaces of Locking Mechanism



9. Apply a liberal coating of lubricant to the alignment pins (refer to *Figure 4.6*).
10. Safely resume normal operation.

Figure 4.6—Apply Lubricant to the Alignment Pins

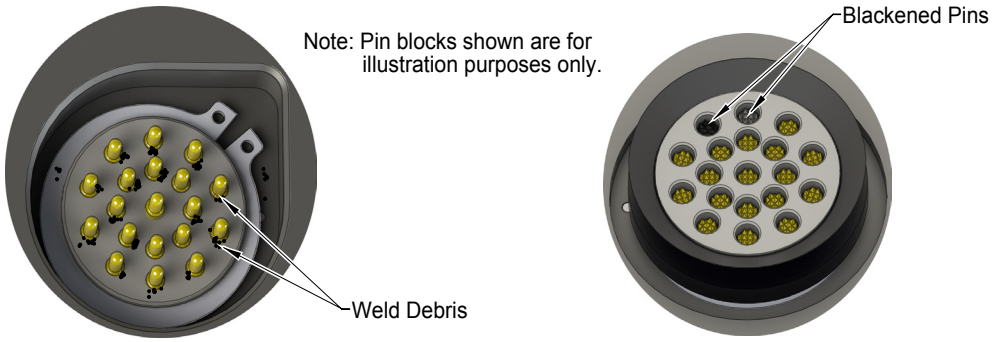


4.3 Pin Block Inspection and Cleaning

Tools required: *Nylon Brush (ATI Part Number 3690-0000064-60)*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits (e.g. electrical, air, water, etc.).
4. Inspect the Master and Tool pin blocks for debris or darkened pins.

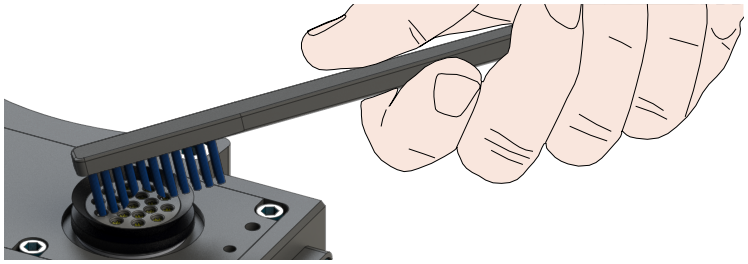
Figure 4.7—Inspect Master and Tool Pin Blocks



5. If debris or darkened pins are present, use a vacuum to remove the debris, and clean using a nylon brush (ATI Part Number 3690-0000064-60).

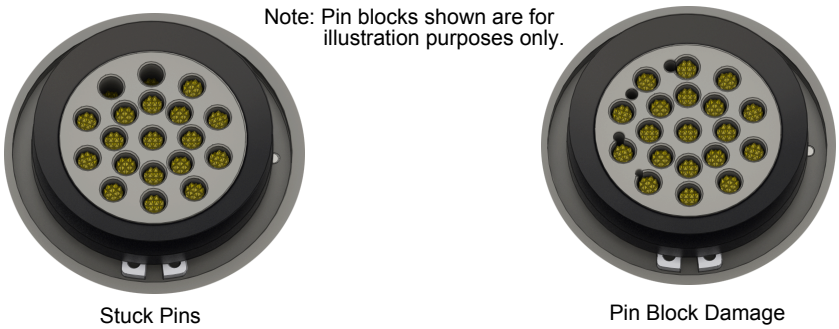
NOTICE: Do not use an abrasive media, cleaners, or solvents to clean the contact pins. Using abrasive media, cleaners, or solvents will cause damage to the contact surface, or cause pins to stick. Clean contact surfaces with a vacuum or non-abrasive media such as a nylon brush (ATI Part Number 3690-0000064-60)

Figure 4.8—Clean Pin Blocks with a Nylon Brush



6. Inspect the Master and Tool pin blocks for stuck pins or pin block damage.

Figure 4.9—Stuck Pin and Pin Block Damage



7. If there are stuck pins or pin block damage, contact ATI for either a possible pin replacement procedure or module replacement.
8. Safely resume normal operation.

5. Troubleshooting and Service Procedures

Troubleshooting and service information is provided in the following section to help diagnose conditions and repair the Tool Changer or control module.

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.

CAUTION: Thread locker applied to fasteners must not be used more than once. Fasteners might become loose and cause equipment damage. Always apply new thread locker when reusing fasteners.

5.1 Troubleshooting

Check these conditions for all symptoms prior to troubleshooting:

- Proper pneumatic and electrical connections to the Tool Changer
- Air supplied at a minimum of 60 psi (4.1 Bar)
- No air or vacuum can be trapped in a de-energized lock or unlock port (pressure must be vented to atmosphere)

Table 5.1—QC-7 Troubleshooting

Symptom	Cause	Resolution
Tool Changer cannot lock and/ or unlock (or the lock sensor does not indicate Tool Changer is locked).	Debris caught between the Master and Tool plates.	Clean debris from between the Master and Tool plates. Verify mounting fasteners are secure and does not protrude above the mating surfaces.
	Insufficient or no air pressure supply to the lock or unlock ports.	Verified proper air pressure and pneumatic valve is supplied. Refer to *Section 2.8—Lock and Unlock Pneumatic and Valve Requirements*.
	Air pressure trapped in de-energized lock or unlock ports.	Air pressure must be vented to the atmosphere properly, refer to *Section 2.8—Lock and Unlock Pneumatic and Valve Requirements*.
	Pneumatic connections loose or damaged.	Inspect hose connection for tightness and leaks. If leaking or loose secure hose connection. Inspect hoses for interferences, abrasions, cuts, and leaks. Replace as required.
	The ball bearings and/or cam are not moving freely in the male coupling.	Clean and lubricate as needed to restore smooth operation (see *Section 4.2—Cleaning and Lubrication of the Locking Mechanism and Alignment Pins*.
	The Master and Tool plates are not within the specified No-Touch zone when attempting to lock.	Check that the Tool is properly seated in the tool stand. Refer to *Section 3.5—Tool Storage Considerations*. Re-teach the robot to bring the Master and Tool plate closer together prior to attempting to lock.
	The male coupling in the Master plate was struck and became dislodged, during coupling.	Contact ATI for assistance.

Table 5.1—QC-7 Troubleshooting		
Symptom	**Cause**	**Resolution**
Insufficient air supply to tooling or an air leak.	The rubber bushings are damaged.	Inspect the rubber bushings for damage. Replace the damaged bushings. Refer to *Section 5.2.2—Rubber Bushing Inspection and Replacement*.
Unit is locked but the lock signal does not read ON.	Lock sensor/cable is damaged.	Replace the lock sensor sub-assembly as necessary. Refer to *Section 5.2.1—Magnetic Proximity Sensor Test or Replacement*.
Unit is unlocked but the unlock signal does not read ON.	Unlock sensor/cable is damaged.	Replace the unlock sensor sub-assembly as necessary. Refer to *Section 5.2.1—Magnetic Proximity Sensor Test or Replacement*.
Units Equipped with Electrical/Servo/Control/Signal Modules		
Loss of Communication.	Debris in and around contact pins. Contact pin worn or damaged.	Clean the contact pins. Refer to *Section 4.3—Pin Block Inspection and Cleaning*.
	Cable connections loose or cables damaged.	Check that the cable connections are secure, and cables are not damaged.

5.2 Service Procedures

The following service procedures provide instructions for inspection, adjustment, test, or replacement of components.

5.2.1 Magnetic Proximity Sensor Test or Replacement

The Proximity sensors are very reliable and normally do not need to be replaced. Exhaust all other possible solutions, check continuity, air supply, lubrication, and pneumatic components prior to testing or replacing the sensor.

Parts required: *Refer to Section 6.1—Master Plate Assembly Serviceable Parts.*

Tools required: *0.9 mm hex key, torque wrench*

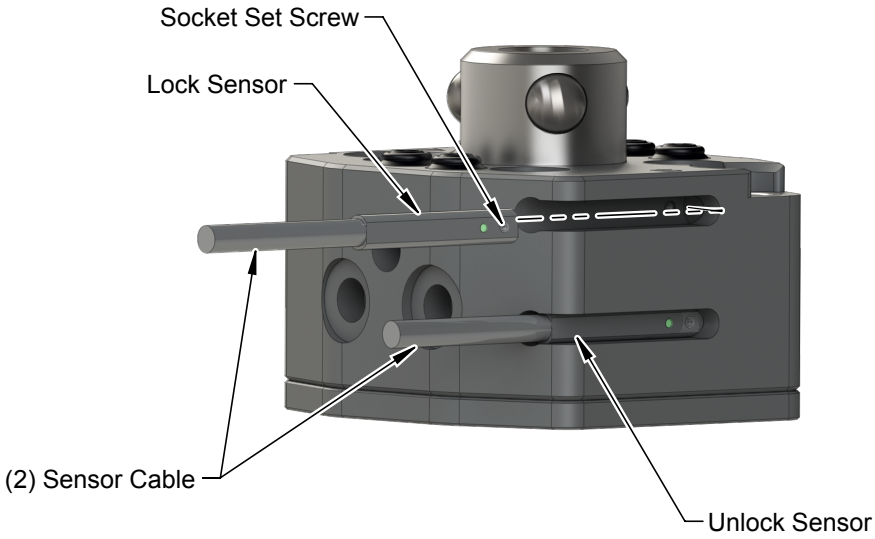
1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Test the sensors:
   d. If you are testing the lock sensor, make sure the Tool Changer is in the locked position. If you are testing the unlock sensor, make sure the Tool Changer is in the unlocked position.
   e. Check to see the signal is ON and the sensor LED is illuminated, for the senor being tested. If the sensors are not functioning, replace.
4. De-energize all energized circuits (e.g. electrical, air, water, etc.).
5. Disconnect any cables, air lines, etc. if required.
6. Using a 0.9 mm hex key, loosen the socket set screw and remove the sensor.
7. Discard the old sensor.

CAUTION: Sensors are preset at ATI. To ensure that the sensors are detecting correctly, purchase replacement sensors from ATI.

CAUTION: The lock and unlock sensors each have unique settings. ATI labels the lock sensor and unlock sensor to ensure that the user can differentiate the lock sensor from the unlock sensor. Be sure to read these labels carefully, and not swap the position of the lock and unlock sensor in the Master plate assembly.

8. Read the label on the sensors to identify the lock sensor from the unlock sensor.

Figure 5.1 —Magnetic Proximity Sensor Replacement



CAUTION: Be careful not to over tighten set screw. Over tightening set screw can cause damage to the proximity sensor.

9. Using a 0.9 mm hex key, secure the new sensor to the Master plate with the socket set screw. Tighten to 12 in-oz (0.08 Nm).
10. Connect to the M8 end cable connector of the sensor. When power is turned on to the sensor LED should be illuminated and sensor signal should be ON.
11. Connect other utilities to the optional modules on the Master plate.
12. Confirm the operation of the replaced sensor:
    f. Provide Lock or Unlock air to the Tool Changer.
    g. Verify the corresponding sensor signal is ON and the sensor LED is illuminated.
13. Safely resume normal operation

5.2.2 Rubber Bushing Inspection and Replacement

The rubber bushings seal the air passage from the Master plate to the Tool plate. If the bushings become cut or damaged, replace.

Parts required: *Refer to Section 6.1—Master Plate Assembly Serviceable Parts.*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. De-energize all energized circuits (e.g. electrical, air, water, etc.).
4. Remove the damaged rubber bushing by grasping with your fingers and pulling the bushing out of the body.
5. Dip the new bushing into water so that the bushing installs smoothly into the plate's bore.
6. Insert the beveled (chamfered) end of the rubber bushing into the bore, leaving ribbed end of the bushing facing outward.
7. Press the bushing in by hand until it is seated completely in the bore. If necessary, use a plastic or rubber soft-faced mallet to tap the bushings into place.
8. Safely resume normal operation.

Figure 5.2 —Rubber Bushing Replacement

5.2.3 Alignment Pin Replacement

Excessive alignment pin/bushing wear could indicate poor robot positioning during pickup/drop-off. Adjust the robot position as needed. Check the tool stand for wear and alignment problems. If necessary, replace the alignment pins.

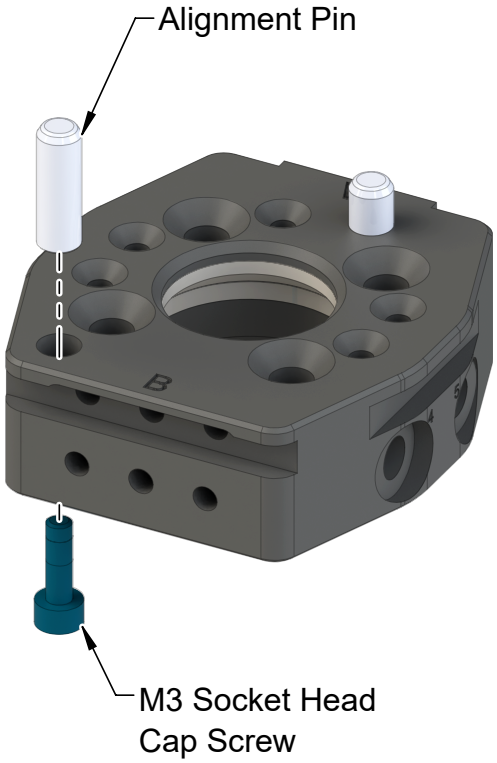
Parts required: *Refer to Section 6.3—Tool Plate Assembly Serviceable Parts.*

Tools required: *2.5 mm hex key, torque wrench*

Supplies required: *MobilGrease XHP222 Special is a NLGL #2 lithium complex grease with molybdenum disulfide.*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. De-energize all energized circuits (e.g. electrical, air, water, etc.).
4. If the M3 socket head cap screw cannot be accessed from the tool side of the Tool plate, remove the Tool plate from the customer tooling; refer to *Section 2.6—Tool Plate Assembly Removal*.
5. Using a 2.5 mm hex key, remove the M3 socket head cap screw from the Tool plate.
6. Remove the alignment pin from the Tool plate. Discard the old alignment pin.
7. Insert the new alignment pin into the Tool plate.
8. Using a 2.5 mm hex key, secure the alignment pin to the Tool plate with the M3 socket head cap screw. Tighten to 6 in-lbs (0.68 Nm).
9. Apply a liberal coating of MobilGrease XHP222 Special grease to the alignment pin.
10. If the customer tooling was removed in step *4*, install the Tool plate. Refer to *Section 2.5—Tool Plate Assembly Installation*.
11. Safely resume normal operation.

Figure 5.3 —Alignment Pin Replacement



6. Serviceable Parts

6.1 Master Plate Assembly Serviceable Parts

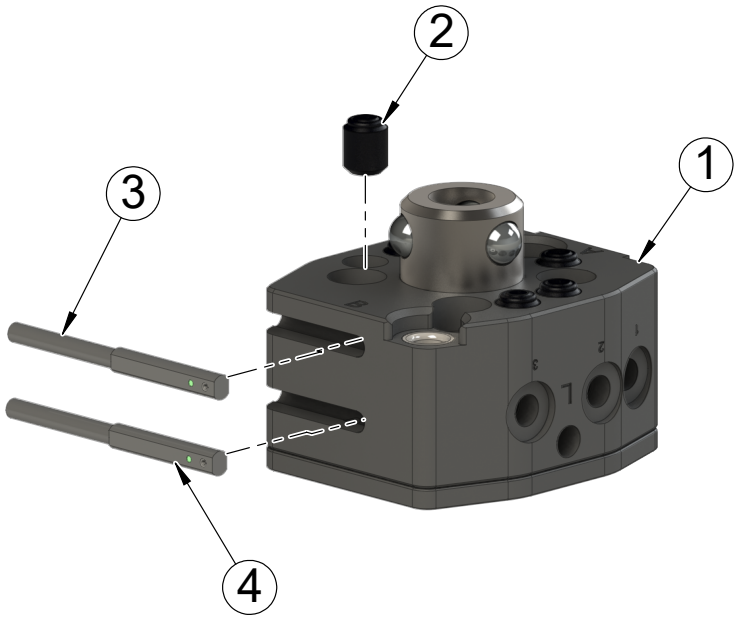


Table 6.1—QC-7 Master Assembly			
Item No.	**Qty**	**Part Number**	**Description**
1	1	9120-007***X***M-0-0-B[1]	QC-7 Base Master Assembly, black
		9120-007***X***M-0-0[1]	QC-7 Base Master Assembly, orange
		9120-007***X***M-0-0-SY1P-B[1]	QC-7 Master Assembly, black, lock and unlock magnetic sensor PNP, 0.3M Cable 3 Pin Threaded M8 Conn
		9120-007***X***M-0-0-SY1P[1]	QC-7 Master Assembly, orange, lock, unlock magnetic sensor PNP, 0.3M Cable 3 Pin Threaded M8 Conn
2	5	4010-0000009-02	M5 Rubber Bushing, Nitrile, Short
3	1	9005-20-8741	Magnetic lock sensor, PNP, 0.3 m, M8 straight connector
		9005-20-8743	Magnetic lock sensor, NPN, 0.3 m, M8 straight connector
4	1	9005-20-8742	Magnetic unlock sensor, PNP, 0.3 m, M8 straight connector
		9005-20-8744	Magnetic unlock sensor, NPN, 0.3 m, M8 straight connector

Notes:

1. The ***X*** represents the following:
   - A = no boss
   - C = 20 mm boss

6.2 Master Interface Plate Kits

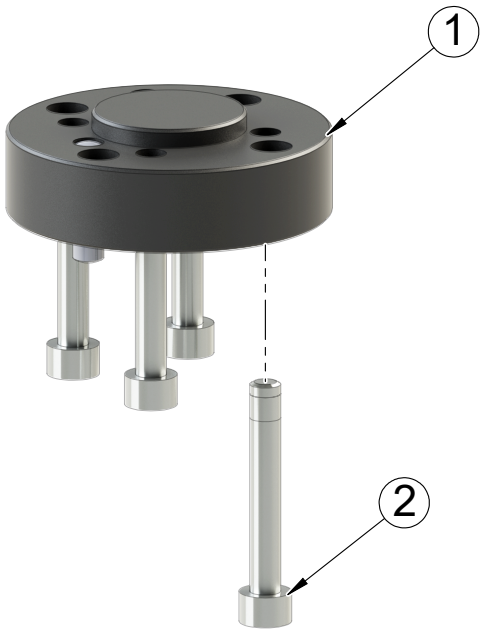


Table 6.2—9120-007M-IP-10700 Master Interface Plate Kit			
Item No.	**Qty**	**Part Number**	**Description**
1	1	9120-007M-IP-10700	Master Side: Interface plate has a 20 mm recess for a boss and comes with (1) 5 mm dowel pin and (4) M5 socket head cap screw. Robot Side: Interface plate has a BC40 pattern, (4) M6 through holes, a 25 mm boss, and a 6 mm through hole for a dowel pin.
2	4	3500-1064035-15A	M5x35 socket head cap screw, 12.9, ISO4762/DIN912, ES-ATI-007, YL M-spheres/IFI 525

Table 6.3—9120-007M-IP-10700 Master Interface Plate Kit			
Item No.	**Qty**	**Part Number**	**Description**
1	1	9120-007M-IP-10719	Master Side: Interface plate has a 20 mm recess for a boss and comes with (1) 5 mm dowel pin and (4) M5 socket head cap screw. Robot Side: Interface plate has a BC50 pattern, (4) M6 through holes, a 31.5 mm boss, and a 6 mm through hole for a dowel pin.
2	4	3500-1064030-12	M5 x 30 mm long, zinc socket head cap screw

6.3 Tool Plate Assembly Serviceable Parts

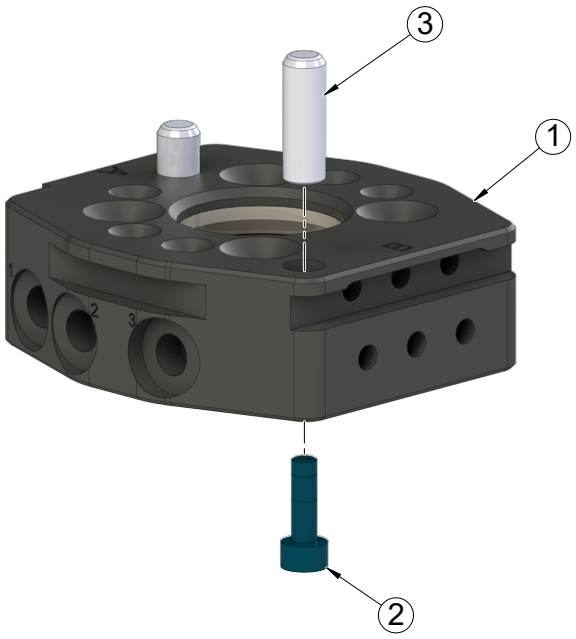


Table 6.4—QC-7 Tool Assembly			
Item No.	**Qty**	**Part Number**	**Description**
1	1	9120-007ST-0-0-B	QC-7 Base Tool Assembly, Slotted, Black
		9120-007ST-0-0	QC-7 Base Tool Assembly, Slotted, Orange
2	2	3500-1057006-15A	M3X6 Socket Head Cap Screw, 12.9, ISO4762/DIN912, ES-ATI-007, YL M-spheres/IFI 525
3	2	3700-20-1238	Alignment Pin

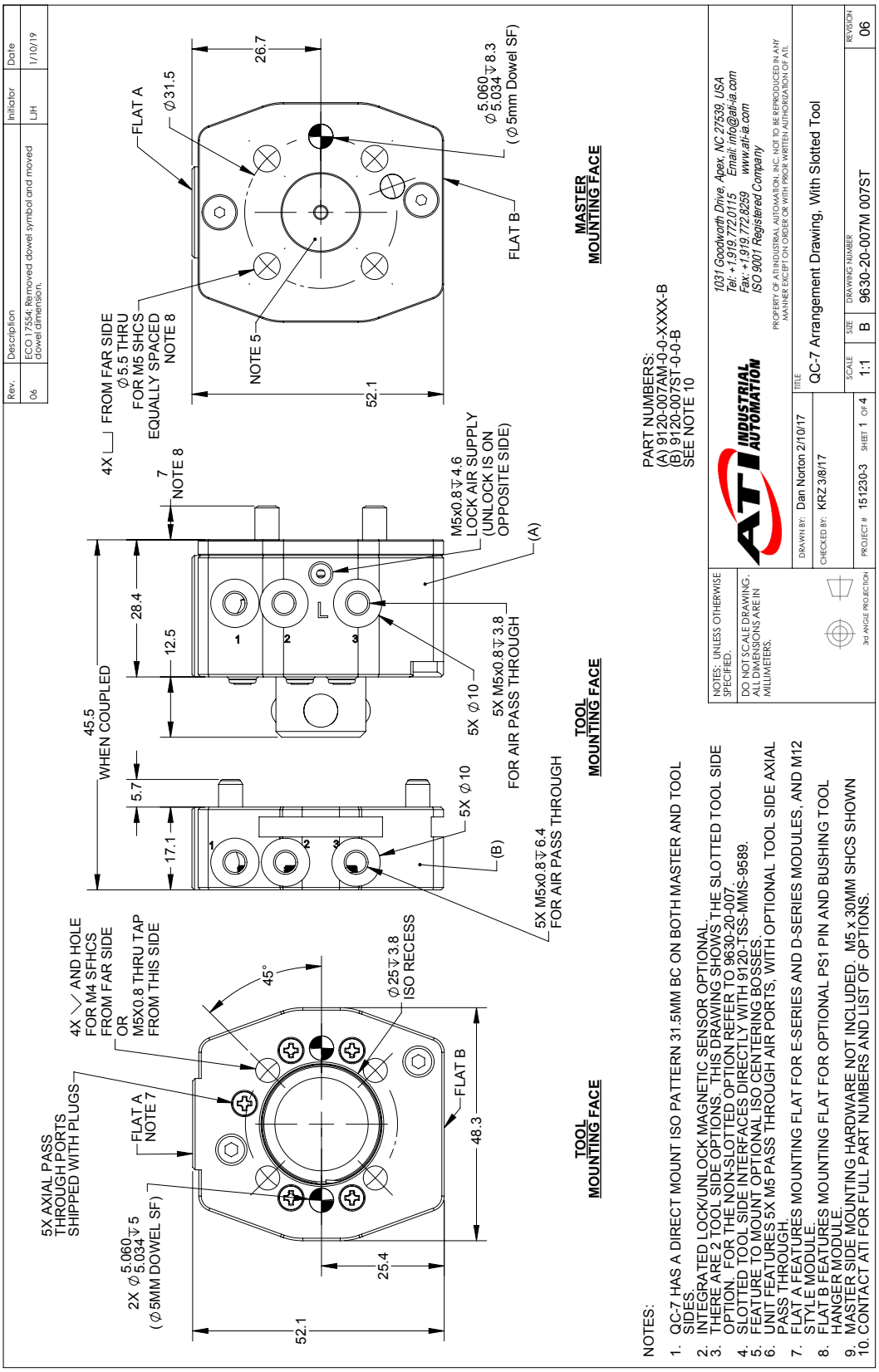
7. Specifications

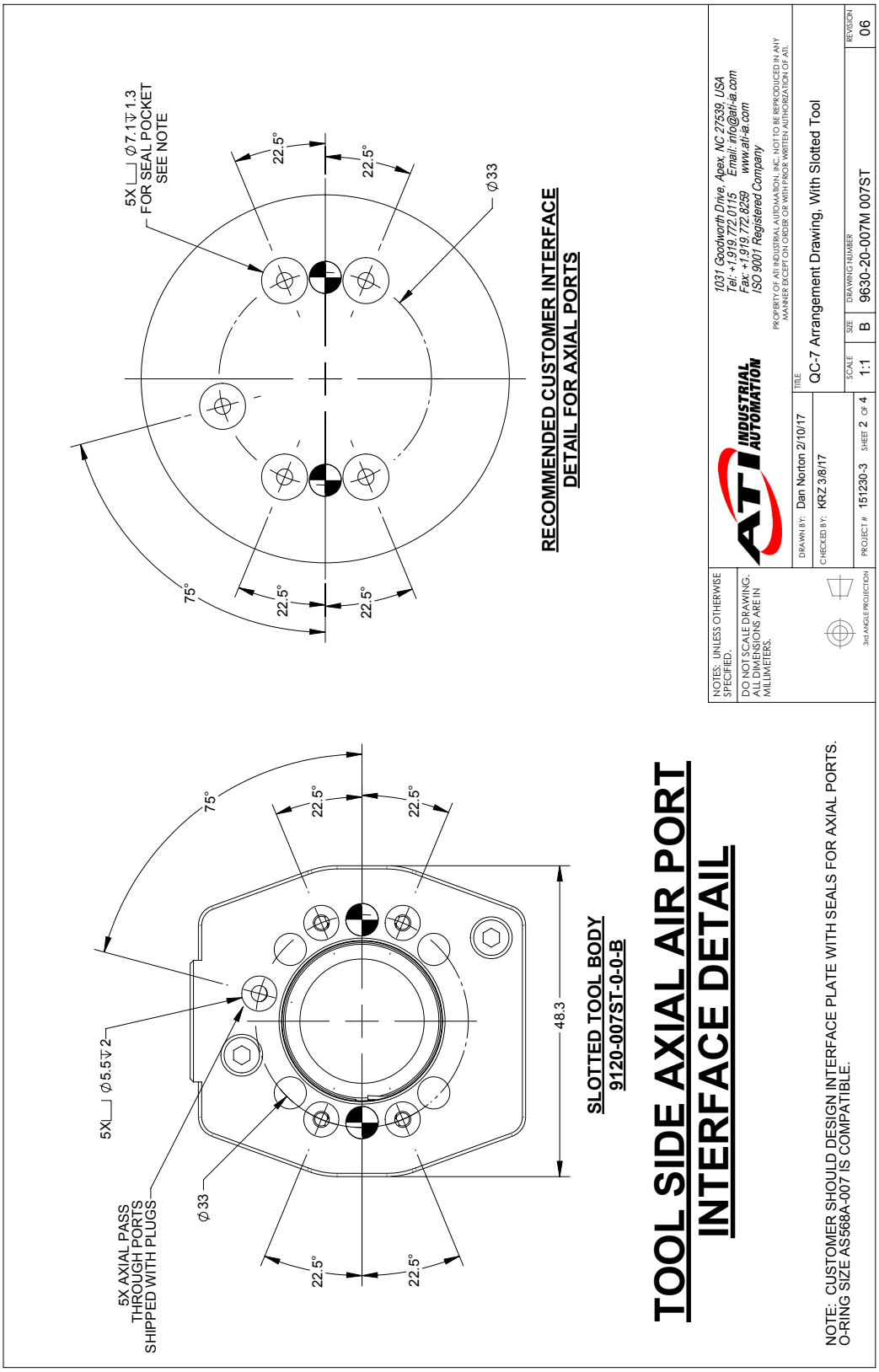
Table 7.1—QC-7 Specifications

Specification	Value	Description
Recommended Max Payload	35 lbs. (16 kg)	The mass attached to the Tool Changer.
Operating Temperature Range	-20–150°F (-30–66°C)	Temperature for optimal operation.
Operating Pressure Range	60–100 psi (4.1–6.9 bar)	Locking mechanism supply pressure operating range. Supply to be clean, dry, and filtered to 40 micron or better.
Locking Force @ 80 psi	224 lbs. (996.4 N)	Axial holding force
Recommended Max Moment X-Y (Mxy) Recommended Max Torque about Z (Mz)	180 in-lbs (20.34 Nm) 110 in-lbs (12.43 Nm)	Maximum recommended working load for optimum performance of the Tool Changer Maximum recommended working torque for optimum performance of the Tool Changer
Positional Repeatability	0.0004” (0.0102 mm)	Repeatability tested at rated load at one million cycles.
Weight (coupled, no access.)	0.55 lbs. (0.25 kg)	Master: 0.35 lbs.(0.16 kg) Tool: 0.2 lbs.(0.09 kg)
Max. Recommended distance between Master and Tool Plate	0.06 in.x (1.5 mm)	No-Touch™ locking technology allows the Master and Tool Plates to lock with separation when coupling.
Pass-Through Port Quantity and Connection Size	(5) M5 or #10-32	Fluid/Air can pass-through ports from the Master to the Tool at a maximum pressure of 100 psi (6.9 bar).
Pneumatic Lock and Unlock Port Connection Size	M5	Air port for coupling and uncoupling the Tool Changer.
Mounting/Customer Interface	Master Plate Tool Plate	Meets ISO 9409-1-A31.5

8. Drawings

8.1 QC-7 Arrangement Drawing with a Slotted Tool Plate Assembly




TOOL SIDE AXIAL AIR PORT INTERFACE DETAIL
SLOTTED TOOL BODY
9120-007ST-0-0-B
5X AXIAL PASS THROUGH PORTS SHIPPED WITH PLUGS
5X ⌴ ⌀5.5↧2
⌀33
48.3
75°
22.5°
RECOMMENDED CUSTOMER INTERFACE
DETAIL FOR AXIAL PORTS
5X ⌴ ⌀7.1↧1.3
FOR SEAL POCKET
SEE NOTE
⌀33
NOTE: CUSTOMER SHOULD DESIGN INTERFACE PLATE WITH SEALS FOR AXIAL PORTS.
O-RING SIZE AS568A-007 IS COMPATIBLE.
NOTES: UNLESS OTHERWISE SPECIFIED.
DO NOT SCALE DRAWING. ALL DIMENSIONS ARE IN MILLIMETERS.
DRAWN BY: Dan Norton 2/10/17
CHECKED BY: KRZ 3/8/17
PROJECT # 151230-3 SHEET 2 OF 4
3rd ANGLE PROJECTION
TITLE
QC-7 Arrangement Drawing, With Slotted Tool
SCALE 1:1
SIZE B
DRAWING NUMBER 9630-20-007M 007ST
REVISION 06
1031 Goodworth Drive, Apex, NC 27539, USA
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Fax: +1.919.772.8259 www.ati-ia.com
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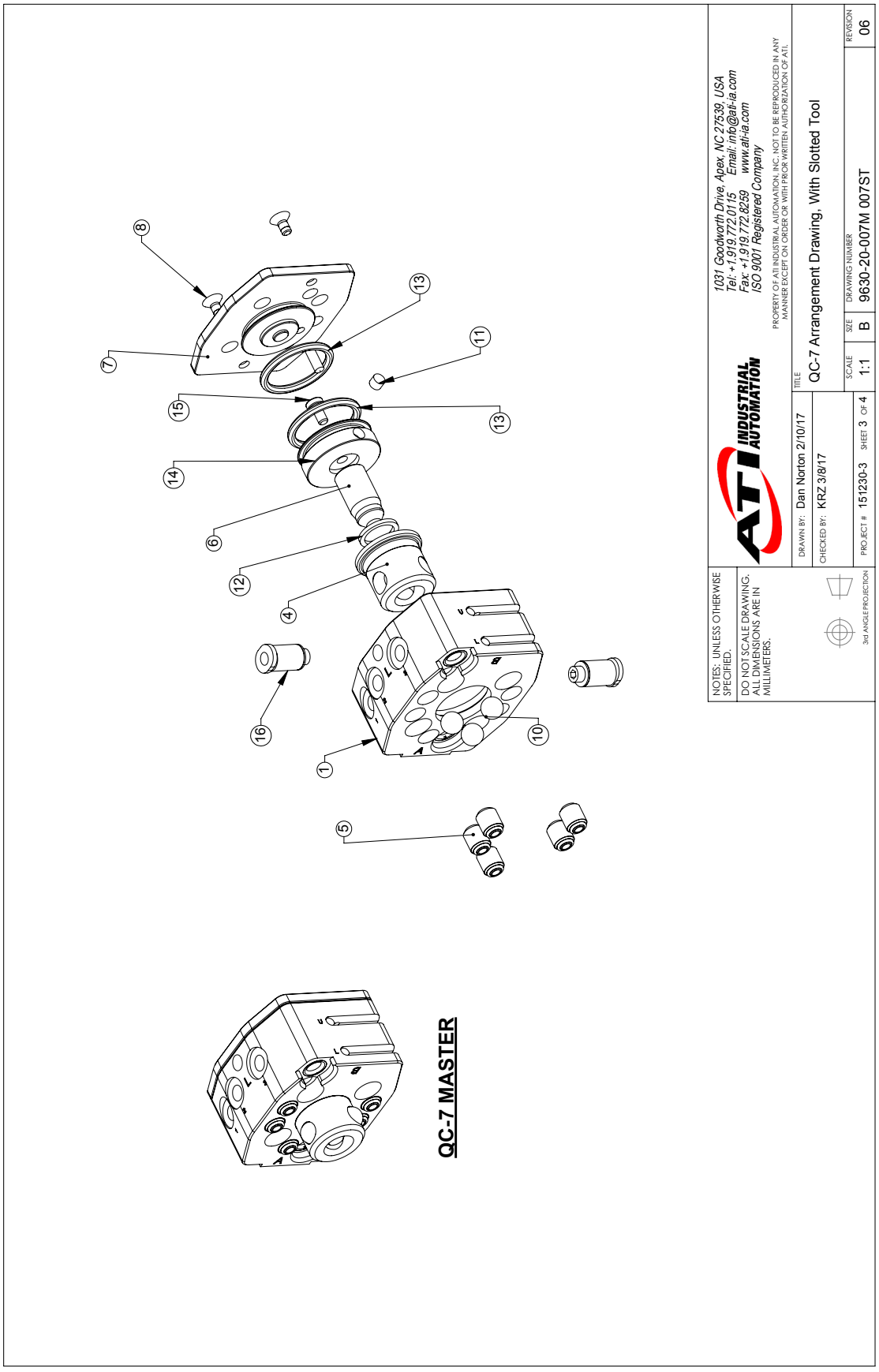
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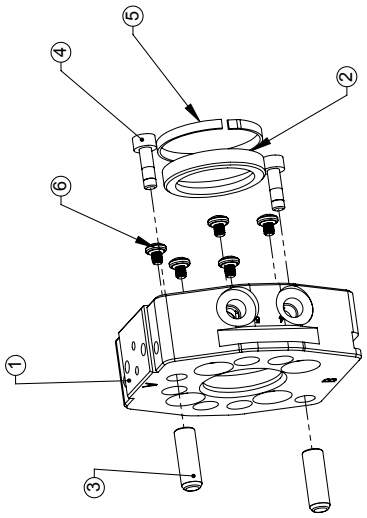
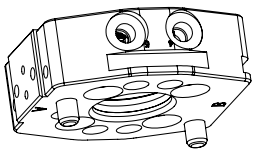
QC-7 Arrangement Drawing, With Slotted Tool
SCALE 1:1
SIZE B
DRAWING NUMBER 9630-20-007M 007ST
REVISION 06
PROJECT # 151230-3
SHEET 3 OF 4
3rd ANGLE PROJECTION
QC-7 MASTER





QC-7ST SLOTTED TOOL

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CHECKED BY: KRZ 3/8/17

PROJECT # 151230-3 SHEET 4 OF 4

3rd ANGLE PROJECTION

TITLE: QC-7 Arrangement Drawing, With Slotted Tool

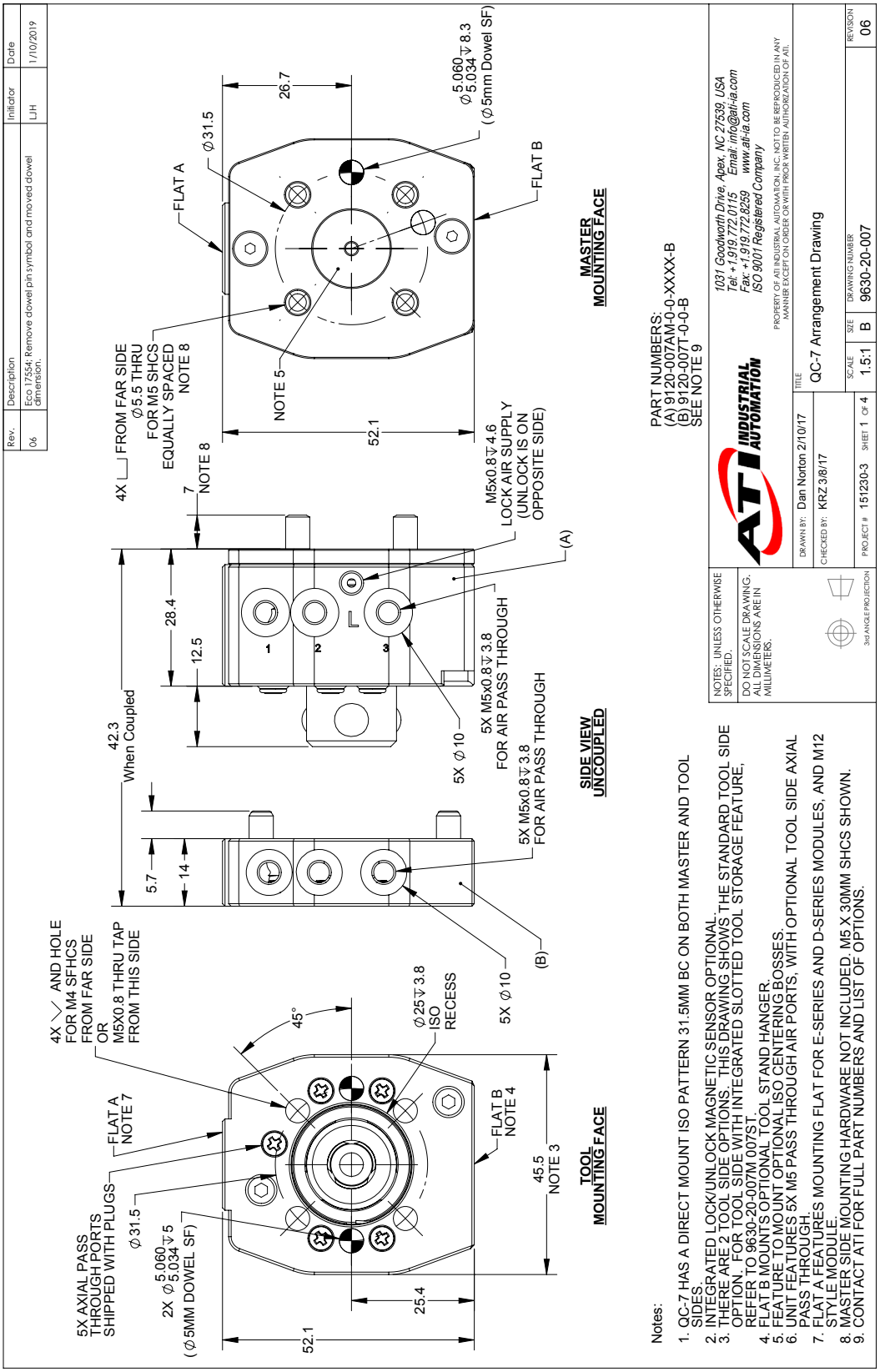
SCALE: 1:1

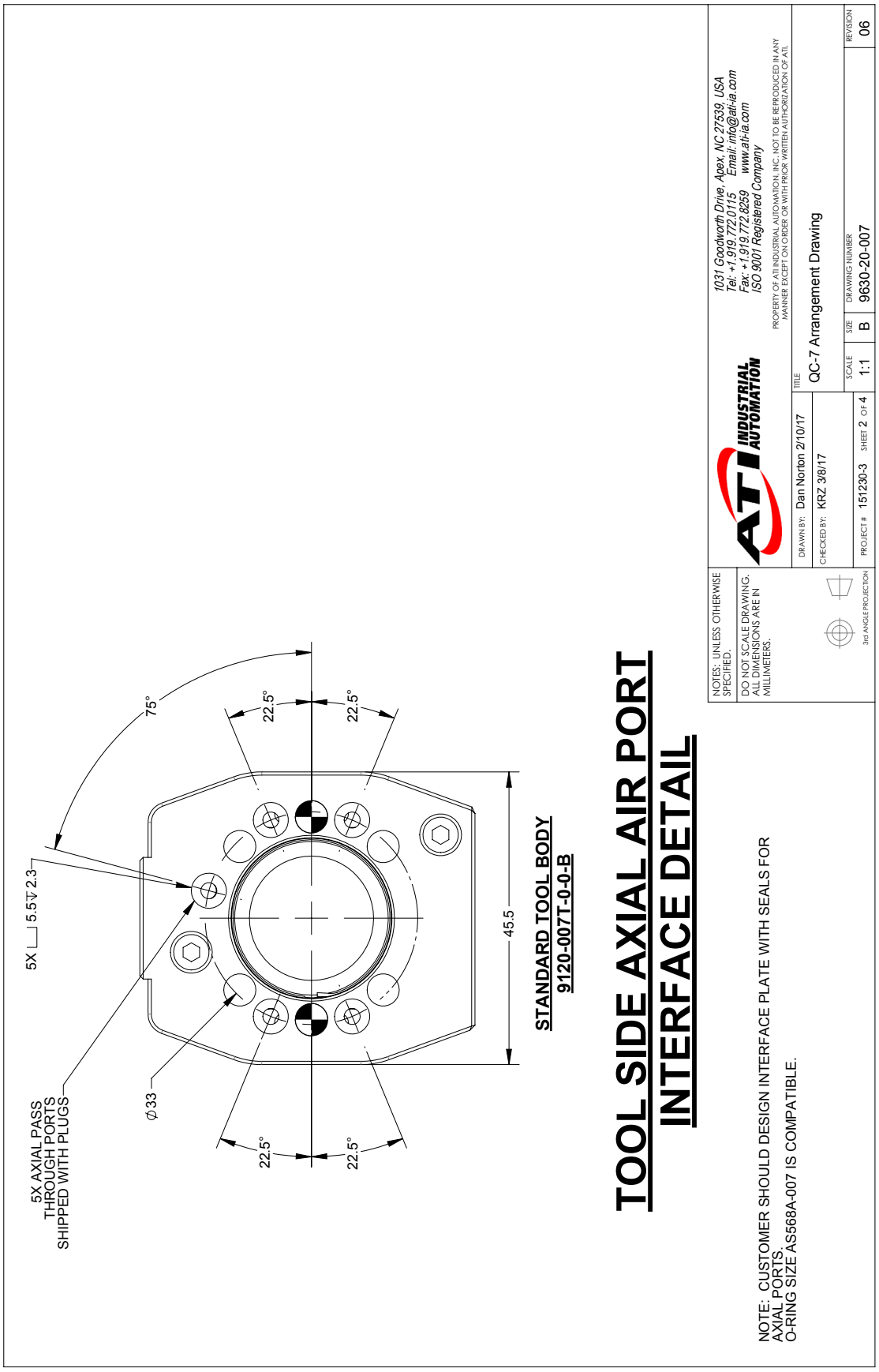
SIZE: B

DRAWING NUMBER: 9630-20-007M 007ST

REVISION: 06

8.2 QC-7 Arrangement Drawing




TOOL SIDE AXIAL AIR PORT
INTERFACE DETAIL
STANDARD TOOL BODY
9120-0077T-0-B
5X AXIAL PASS
THROUGH PORTS
SHIPPED WITH PLUGS
5X ⌴ 5.5↧2.3
Ø33
45.5
75°
22.5°
22.5°
22.5°
22.5°
NOTE: CUSTOMER SHOULD DESIGN INTERFACE PLATE WITH SEALS FOR AXIAL PORTS.
O-RING SIZE AS568A-007 IS COMPATIBLE.
NOTES: UNLESS OTHERWISE SPECIFIED.
DO NOT SCALE DRAWING. ALL DIMENSIONS ARE IN MILLIMETERS.
3rd ANGLE PROJECTION
DRAWN BY: Dan Norton 2/10/17
CHECKED BY: KRZ 3/8/17
PROJECT # 151230-3
SHEET 2 OF 4
TITLE
QC-7 Arrangement Drawing
SCALE 1:1
SIZE B
DRAWING NUMBER 9630-20-007
REVISION 06
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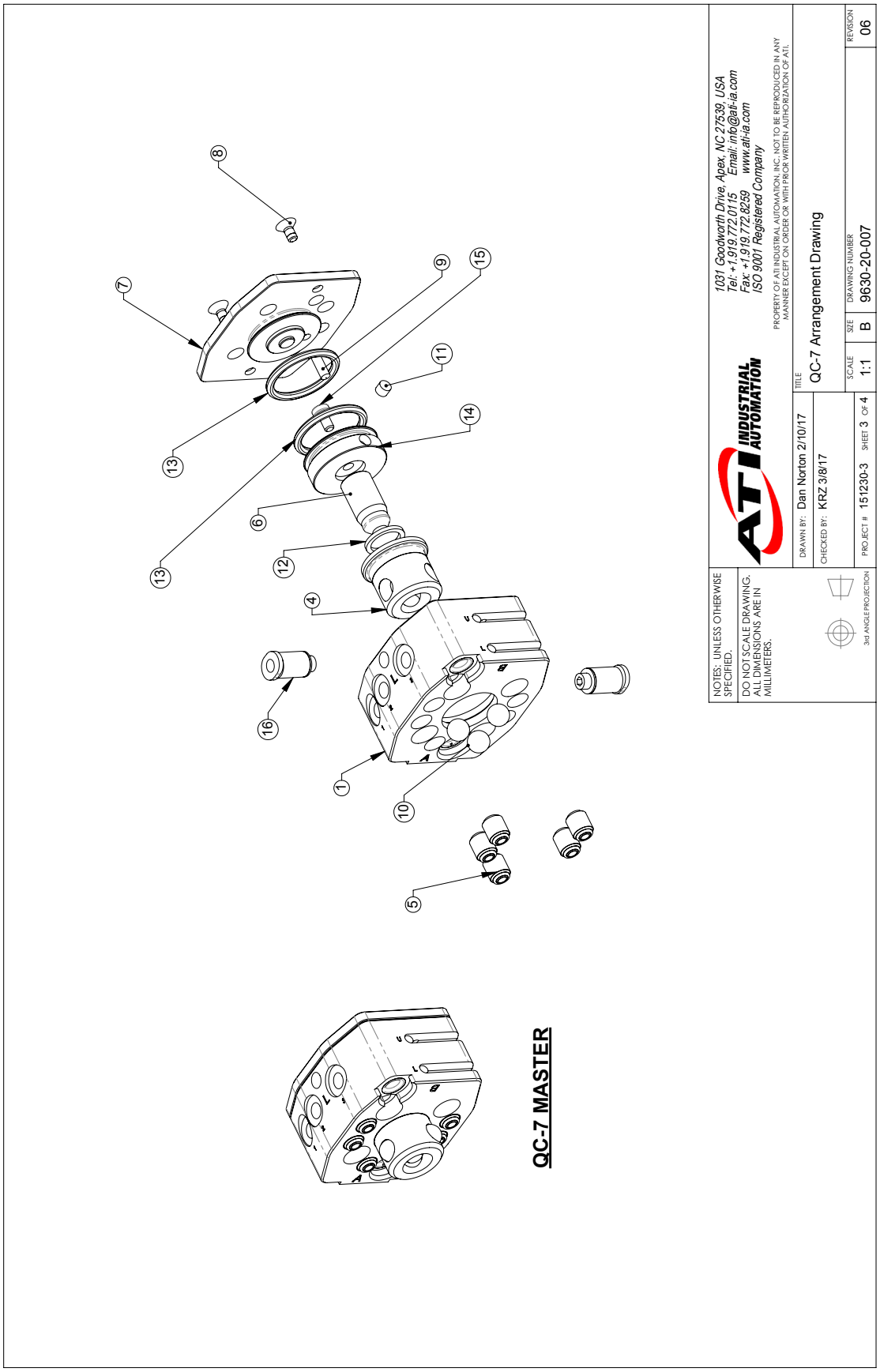
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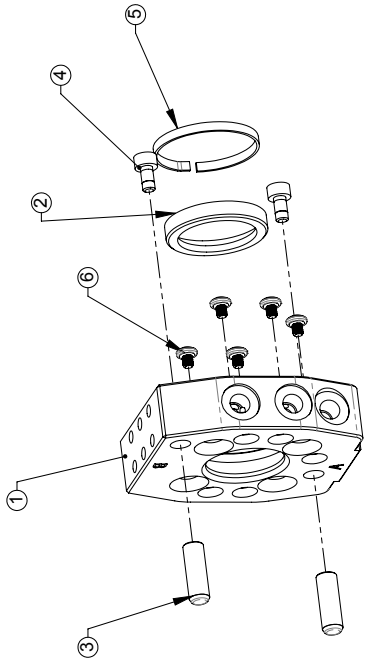
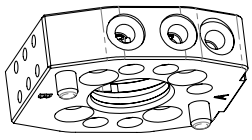
DRAWN BY: Dan Norton 2/10/17
CHECKED BY: KRZ 3/8/17
TITLE
QC-7 Arrangement Drawing
SCALE 1:1
SIZE B
DRAWING NUMBER 9630-20-007
REVISION 06
PROJECT # 151230-3 SHEET 3 OF 4
3rd ANGLE PROJECTION
QC-7 MASTER





QC-7 TOOL

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CHECKED BY: KRZ 3/8/17

PROJECT # 151230-3 SHEET 4 OF 4

3rd ANGLE PROJECTION

TITLE: QC-7 Arrangement Drawing

SCALE: 1:1 SIZE: B DRAWING NUMBER: 9630-20-007 REVISION: 06