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B. Base Tool Changer

MC-36R—Manual Tool Changer

1. Product Overview

The Manual Tool Changer allows the robot to use different end-effectors (e.g., grippers, vacuum cup tooling, pneumatic and electric motors, etc.) by changing the tooling manually. The Tool Changer consists of a Master plate and a Tool plate. The Master plate, installed on the robot arm, locks to the Tool plate with a manually driven locking mechanism. Robotic Tool Changers also provide a method for quick Tool change for maintenance purposes. The MC-36R replaces the MC-36 model, utilizing the same Tool plate and mounting patterns. Unlike the MC-39 that includes the ratchet knob as an optional feature, the ratchet knob is standard for added security in the locked position.

1.1 Master Plate Assembly

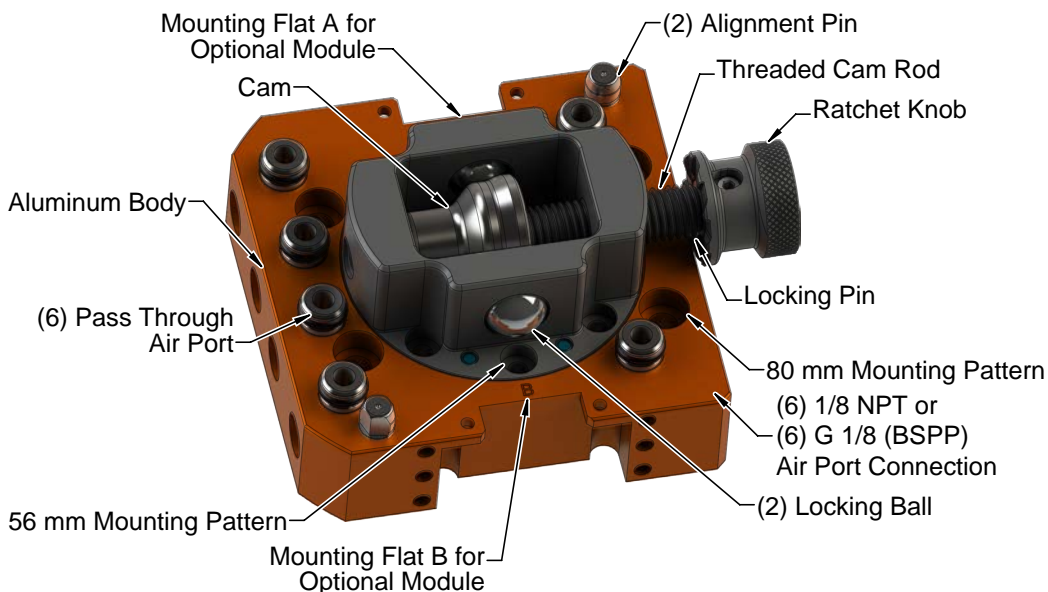
The Master base assembly includes an anodized aluminum body, a hardened steel locking mechanism, and hardened steel alignment pins (see [Figure 1.1](#)).

The Master plate assembly is equipped with (6) pass through air ports, 1/8 NPT or G 1/8 (BSPP) port connections are provided in the body for the pneumatic connections. The body or Master plate has (2) flat sides for mounting of optional modules. Flats 'A' and 'B', are fully interchangeable, and optional modules can be arranged to suit the application or robot dress as required.

The locking mechanism consists of a tapered cam, a set of hardened steel ball bearings, a steel threaded rod, and a ratchet knob. The surfaces on the cam are tapered and contacts the ball bearings as the cam is turned in to lock the mechanism. When the Master and Tool are brought together, the user turns the ratchet knob to move the cam toward the lock position. Then the user applies the final tightening torque by turning the knob. This final tightening is required to ensure the unit has full locking force applied. The ball bearings slide on the tapered surfaces of the Tool side to apply the lock. Tapered pins located on the Master body mate with holes in the Tool body to ensure repeatable alignment during the coupling process. An extreme pressure grease is applied to the cam and pins to enhance performance and maximize the life of the Master assembly.

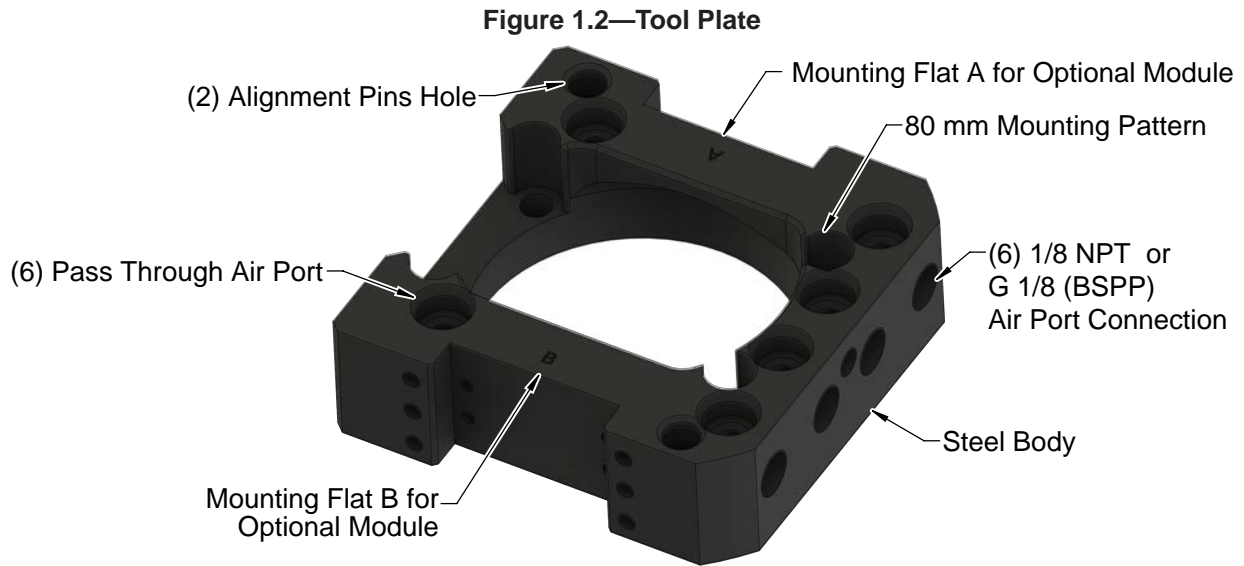
A ratchet knob provides additional protection in an application where extreme vibrations can cause the lock to loosen. The ratchet knob locks in the closed position preventing it from coming loose during operation.

Figure 1.1—Master Plate Assembly



1.2 Tool Plate

The hardened steel body of the Tool plate has (2) flat sides for the mounting of optional modules. The Tool plate is equipped with (6) pass through air ports, 1/8 NPT or G 1/8 (BSPP) ports for the pneumatic connections.



1.3 Optional Modules

There are (2) flats available for the mounting of the optional modules for support of various utility pass-through, such as signal, fluid/air, and power. The flats support modules with both K series and modules with a J16 mounting pattern. The J16 mounting is a M4X0.7 thread on a 18 mm high and 50 mm wide rectangular pattern. ATI has many electrical, servo, control/signal, pneumatic, and other modules with the J16 mounting pattern. Modules for flats 'A' and 'B' are interchangeable to suit the application as required.


For assistance in choosing the right modules for your particular application, visit our website to see what is available or contact an ATI Sales Representative.


The optional modules are mounted to the Master or Tool plate using a common side mounting feature. The K series modules require (2) socket head cap screws in order to mount the module from the Master/Tool plate. Modules with J16 mounting patterns require (4) socket flat head cap screws or socket head cap screws in order to mount the module from the Master/Tool plate.

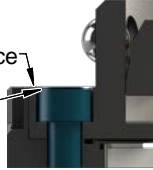
For installation of optional modules refer to [Section 2.7—Optional Module Installation](#).

2. Installation

All fasteners used to mount the Tool Changer to the robot and to customer's tooling should be tightened to a torque value as indicated in [Table 2.1](#). Furthermore, removable Loctite must be used on these fasteners. [Table 2.1](#) contains recommended values based on engineering standards.

 **WARNING:** Do not perform maintenance or repair on 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 purged and power discharged from circuits in accordance with the customer's safety practices and policies. Injury or equipment damage can occur with Tool not placed and energized circuits on. Place the Tool safely in the tool stand, turn off and discharge all energized circuits, purge all pressurized connections, verify all energized circuits are de-energized before performing maintenance or repair on 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.



 Mating Surface
 Head of Mounting Fastener Must Be Flush or Below Mating Surface. (Do Not Use Lock Washer under Head of Mounting Fastener.)


 **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.

Table 2.1—Fastener Size, Class, and Torque Specifications

Mounting conditions	Fastener Size & Property Class	Recommended Torque	Thread Locker
Master plate to interface plate (6061-T6 aluminum) 56 mm pattern Minimum thread engagement of 6 mm (0.24") [1.5X fastener Ø]	M4-0.7 Class 12.9	12 in-lbs. (1.4 N-m)	Pre-applied Adhesive or Loctite® 222
Master plate to Robot (steel; USS ≥ 90KSI) 56 mm pattern Minimum thread engagement of 6 mm (0.24") [1.5X fastener Ø]	M4-0.7 Class 12.9	25 in-lbs. (2.8 N-m)	
Master plate to interface plate (6061-T6 aluminum) 80 mm pattern Minimum thread engagement of 9 mm (0.35") [1.5X fastener Ø]	M6-1.0 Class 12.9	89 in-lbs (10 N-m)	Pre-applied Adhesive or Loctite 242
Master plate to interface plate (steel; USS ≥ 90KSI) 80 mm pattern Minimum thread engagement of 9 mm (0.35") [1.5X fastener Ø]	M6-1.0 Class 12.9	120 in-lbs. (13.6 N-m)	
Tool plate to interface plate (6061-T6 aluminum) 80 mm pattern Minimum thread engagement of 9 mm (0.35") [1.5X fastener Ø]	M6-1.0 Class 12.9	89 in-lbs (10 N-m)	
Tool plate to interface plate (steel; USS ≥ 90KSI) 80 mm pattern Minimum thread engagement of 9 mm (0.35") [1.5X fastener Ø]	M6-1.0 Class 12.9	120 in-lbs. (13.6 N-m)	
Optional Module or adapter plate to Master or Tool plate, Supplied Fasteners	M3 x 0.5 Class 12.9		Pre-applied Adhesive or Loctite 222
	Socket head cap	10 in-lbs (1.13 Nm)	
	Socket flat head cap	8 in-lbs (0.9 Nm)	
	M4 x 0.7 Class 12.9		
	Socket head cap	15 in-lbs (1.69 Nm)	
	Socket flat head cap	10 in-lbs (1.13 Nm)	

2.1 Master Interface

The Master assembly is attached to the robot arm. The Master plate is designed with bolt holes and dowel holes as mounting features. These features are used to accurately position and secure the Master to the robot. An interface plate is utilized to adapt the Master plate to a specific robot flange that is not compatible with the Master plate mounting features. Custom interface plates are available upon request. (Refer to [Section 8—Drawings](#) for technical information on mounting features.)

If the customer chooses to design and build a interface plate, the following should be considered:

- The interface plate should be designed to include bolt holes for mounting, and dowel pins for accurate positioning on the robot and Master plate.
- The thickness of the interface plate must be great enough to provide the necessary thread engagement for the mounting bolts.
- The interface plate must be properly designed to provide rigid mounting to the Master plate boss area.
- The plate design should take into account clearances required for Tool Changer module attachments and accessories.

2.2 Master Plate Installation

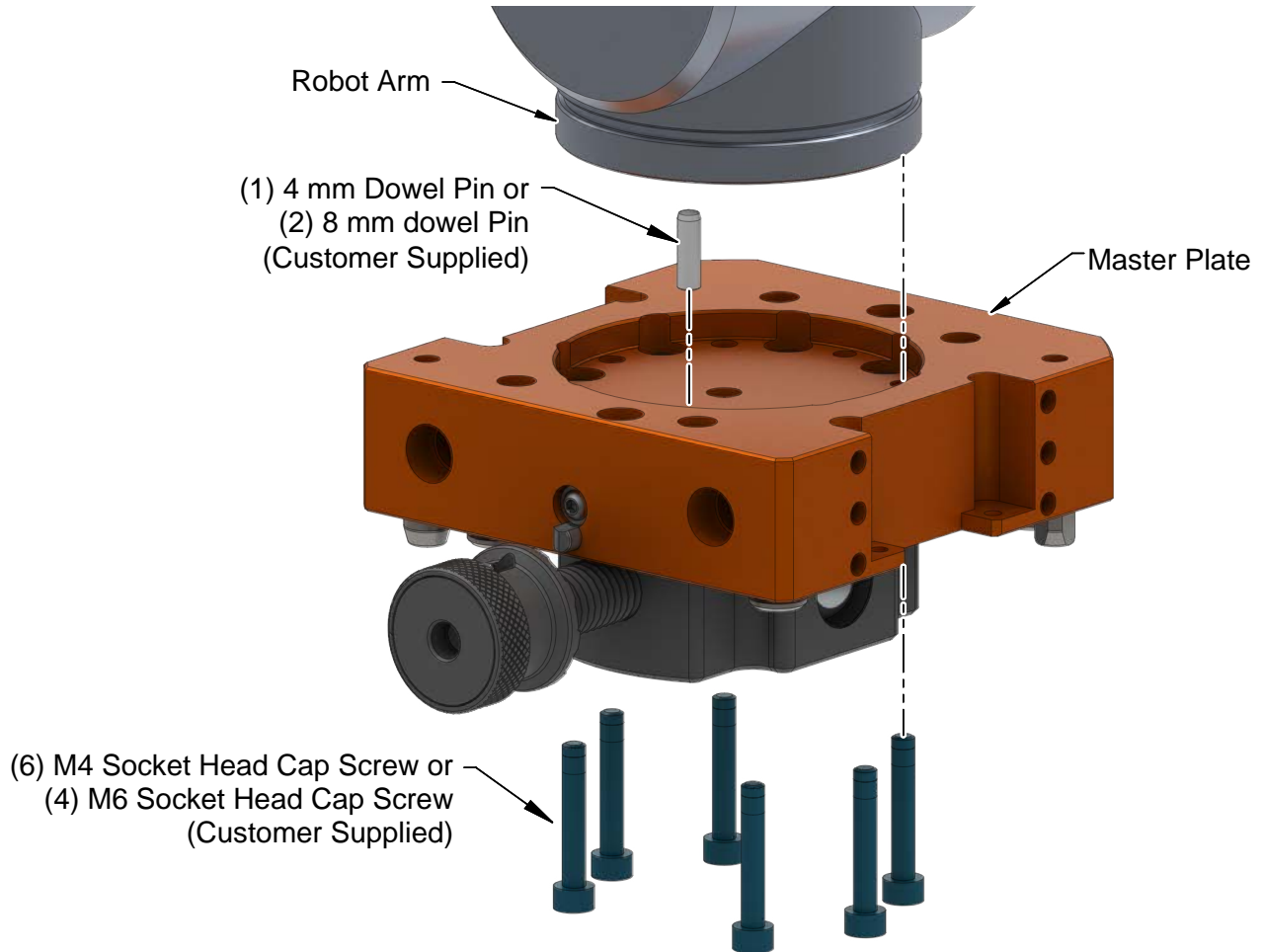
Tools required: 3 mm or 5 mm Allen® wrenches (hex key), torque wrench

Supplies required: Clean rag, Loctite 222 or 242

Refer to [Figure 2.1](#)

1. Clean the mounting surfaces.
2. Apply Loctite to threads of the customer supplied (6) M4 socket head cap screws or (4) M6 socket head cap screws. Refer to [Table 2.1](#) for proper fasteners, torque and thread locker recommendations.
3. Align the dowel pins to the corresponding holes in the Master plate and secure the Master plate to the robot arm, or interface plate with (6) M4 or (4) M6 socket head cap screws.
4. After the procedure is complete, resume normal operation.

Figure 2.1—Master Plate Installation



2.3 Master Plate Removal



WARNING: Do not perform removal unless the Master is safely supported. Injury or equipment damage can occur with Master not supported. Support the Master safely before performing removal.

Tools required: 3 mm or 5 mm Allen wrenches (hex key)

1. Support the Tool side of the Tool Changer safely and uncouple the Tool Changer to allow clear access to the Master and Tool plates.
2. Turn off and de-energize all energized circuits (e.g. electrical, air, water, etc.).
3. Remove the (6) M4 socket head cap screws or (4) M6 socket head cap screws connecting the Master plate to the robot arm, or interface plate

2.4 Tool Interface

The Tool plate is attached to customer-supplied tooling. The Tool plate has bolt and dowel holes as mounting features. These features are used to accurately position and secure the end-effector. Most often an End-effector interface plate is utilized to adapt the Tool plate to an end-effector that is not compatible with the Tool plate mounting features. Custom interface plates can be supplied by ATI to meet customer requirements (refer to the application drawing).

When the customer chooses to design and build an End-effector Interface Plate, the following should be considered:

- The interface plate should be designed to include bolt holes for mounting, and dowel pins for accurate positioning.
- The thickness of the interface plate must be great enough to provide the necessary thread engagement for the mounting bolts.
- The plate design should take into account clearances required for Tool Changer module attachments and accessories.

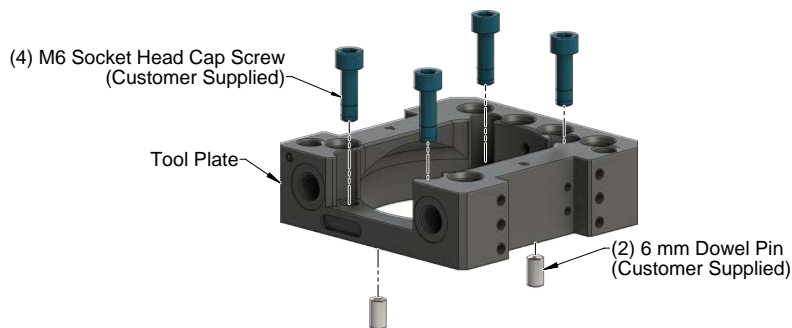
2.5 Tool Plate Installation

Tools required: 5 mm Allen wrench (hex key), torque wrench

Supplies required: Clean rag, Loctite 242

1. Clean the mounting surfaces.
2. If required, install the tool interface plate to the customer tooling, align using the boss or dowel pins and secure with customer supplied fasteners.
3. Apply Loctite 242 to threads of the (4) customer supplied M6 socket head cap screws. Refer to [Table 2.1](#) for proper fasteners, torque and thread locker recommendations.
4. Align the dowel pins to the holes in the Tool plate and secure the Tool plate to the tool interface plate or customer tooling with (4) M6 socket head cap screws.
5. After the procedure is complete, resume normal operation.

Figure 2.2—Tool Plate Installation



2.6 Tool Plate Removal



WARNING: Do not perform removal unless the Tool and tooling is safely supported. Injury or equipment damage can occur with Tool and tooling not supported. Support the Tool and tooling safely before performing removal.

Tools required: 5 mm Allen wrench (hex key), torque wrench

1. Support the Tool side of the Tool Changer safely and uncouple the Tool Changer to allow clear access to the Master and Tool plates.
2. Turn off and de-energize all energized circuits (e.g. electrical, air, water, etc.).
3. Remove the (4) M6 socket head cap screws securing the Tool plate to the tooling or tool interface plate.

2.7 Optional Module Installation

The optional modules are typically installed on Tool Changers by ATI prior to shipment. The steps below outline field installation or removal as required. Tool Changers are compatible with many different types of modules.

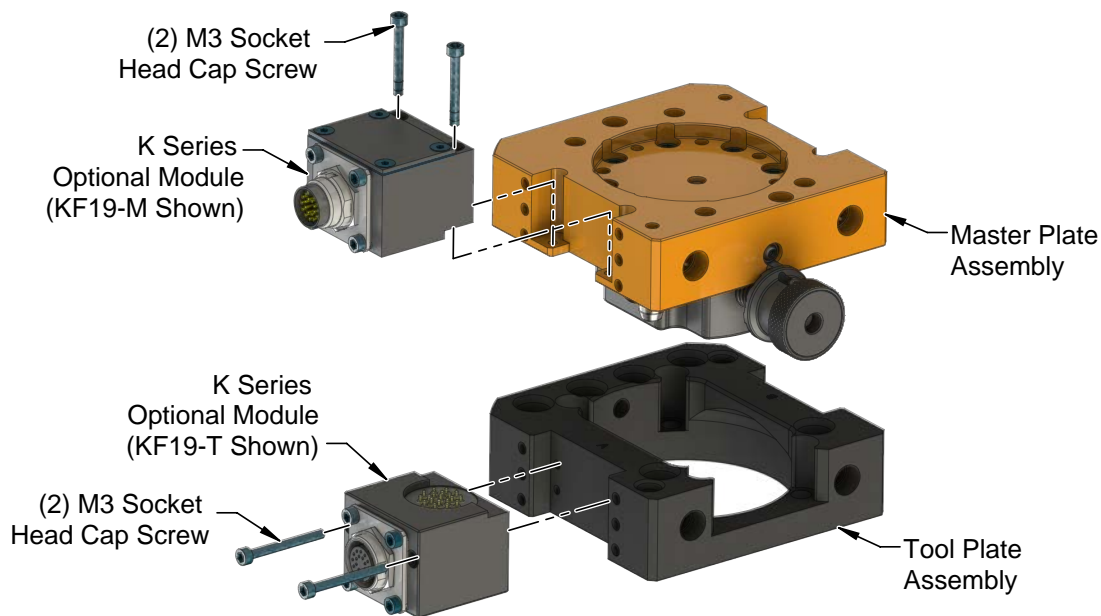
2.7.1 K Series Module Installation

Tools required: 2 mm or 2.5 mm Allen wrench (hex key), torque wrench

Supplies required: Clean rag, Loctite 222

1. Uncouple the Master and Tool plates.
2. Turn off and de-energize all energized circuits (e.g. electrical, air, water, etc.).
3. Clean the mounting surfaces.
4. If not using fasteners with pre-applied adhesive, apply Loctite 222 to M3 mounting fasteners. Secure module with (2) M3 mounting fasteners using a 2 mm or 2.5 mm Allen wrench. Refer to [Table 2.1](#) for proper torque for your specific mounting fasteners.
5. Remove all protective caps, plugs, tape, etc. from the module prior to operation.
6. After the procedure is complete, resume normal operation.

Figure 2.3—K Series Module Installation



2.7.2 K Series Module Removal

Tools required: 2.5 mm Allen wrench (hex key)

1. Uncouple the Master and Tool plates.
2. Turn off all energized circuits (e.g. electrical, air, water, etc.).
3. Disconnect any cables, air line, etc. if required.
4. Remove the (2) M3 socket head cap screws using a 2 mm or 2.5 mm Allen wrench. Note: For the module on the master, the Master plate may have to be removed refer to [Section 2.3—Master plate Removal](#).
5. Remove the module from the Master or Tool plate.

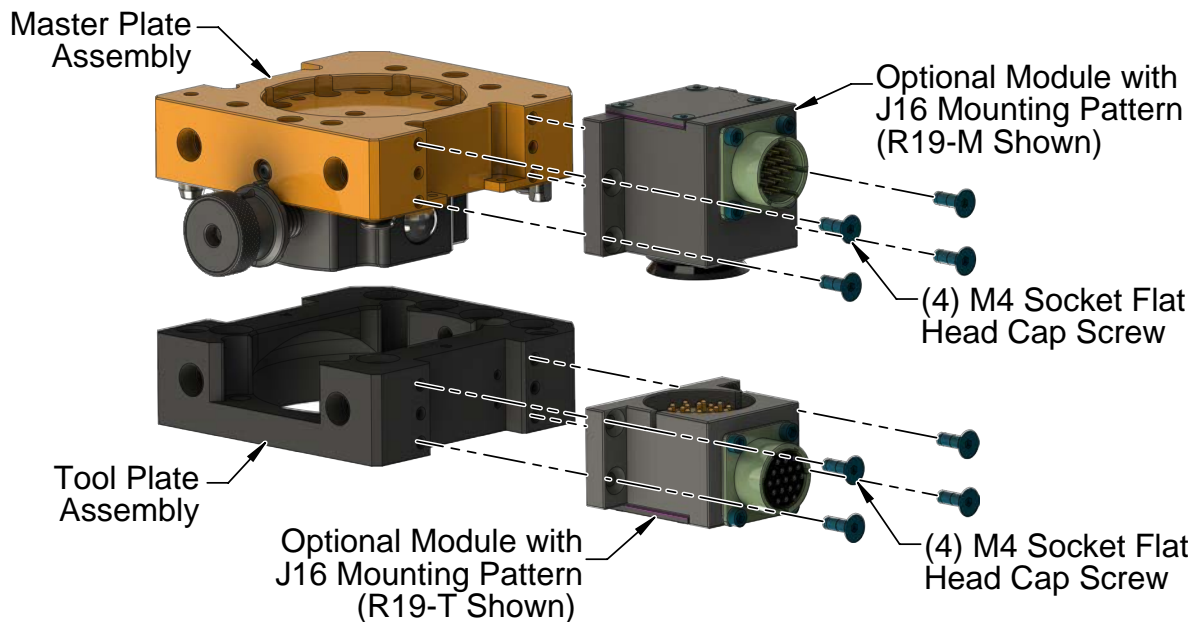
2.7.3 Installation for Modules with a J16 Mounting Pattern

Tools required: 2.5 mm or 3 mm Allen wrench (hex key), torque wrench

Supplies required: Clean rag, Loctite 222

1. Turn off and de-energize all energized circuits (e.g. electrical, air, water, etc.).
2. Uncouple the Master and Tool plates.
3. Clean the mounting surfaces. Align optional module on the Master or Tool plate as shown in [Figure 2.4](#).
4. If not using fasteners with pre-applied adhesive, apply Loctite 222 to (4) M4 socket head cap screws or (4) M4 socket flat head cap screws. Secure module with (4) M4 mounting fasteners. Refer to [Table 2.1](#) for proper torque for your specific mounting fasteners.
5. Remove all protective caps, plugs, tape, etc from the module prior to operation.
6. After the procedure is complete, resume normal operation.

Figure 2.4—J16 Series Module Installation



2.7.4 Removal for Modules with a J16 Mounting Pattern

The J16 mounting is a M4X0.7 thread on a 18 mm high and 50 mm wide rectangular pattern. ATI has many electrical, servo, control, pneumatic, and other modules with the J16 mounting pattern.

Tools required: 2.5 mm or 3 mm Allen wrench (hex key)

1. Uncouple the Master and Tool plates.
2. Turn off all energized circuits (e.g. electrical, air, water, etc.).
3. Disconnect any cables, air lines, etc. if required.
4. Remove the (4) M4 socket head cap screws or (4) M4 socket flat head cap screws, and lift the module from the Master or Tool plate.

3. Operation

The Master locking mechanism is manually-driven to couple and uncouple with the Tool plate. The Master plate utilizes mechanical action from the ratchet knob and cam to provide lock and unlock force to the locking mechanism.

NOTICE: All Tool Changers are initially lubricated using XHP-222 Special type of lubrication. The end user must apply additional lubricant to the locking mechanism components and alignment pins prior to start of service (See [Section 4.2—Cleaning and Lubrication of the Master and Tool plate](#)). Tubes of lubricant for this purpose are shipped with every Tool Changer. Note: XHP-222 Special type of lubrication is a special grease suited for the locking mechanism and alignment pins.

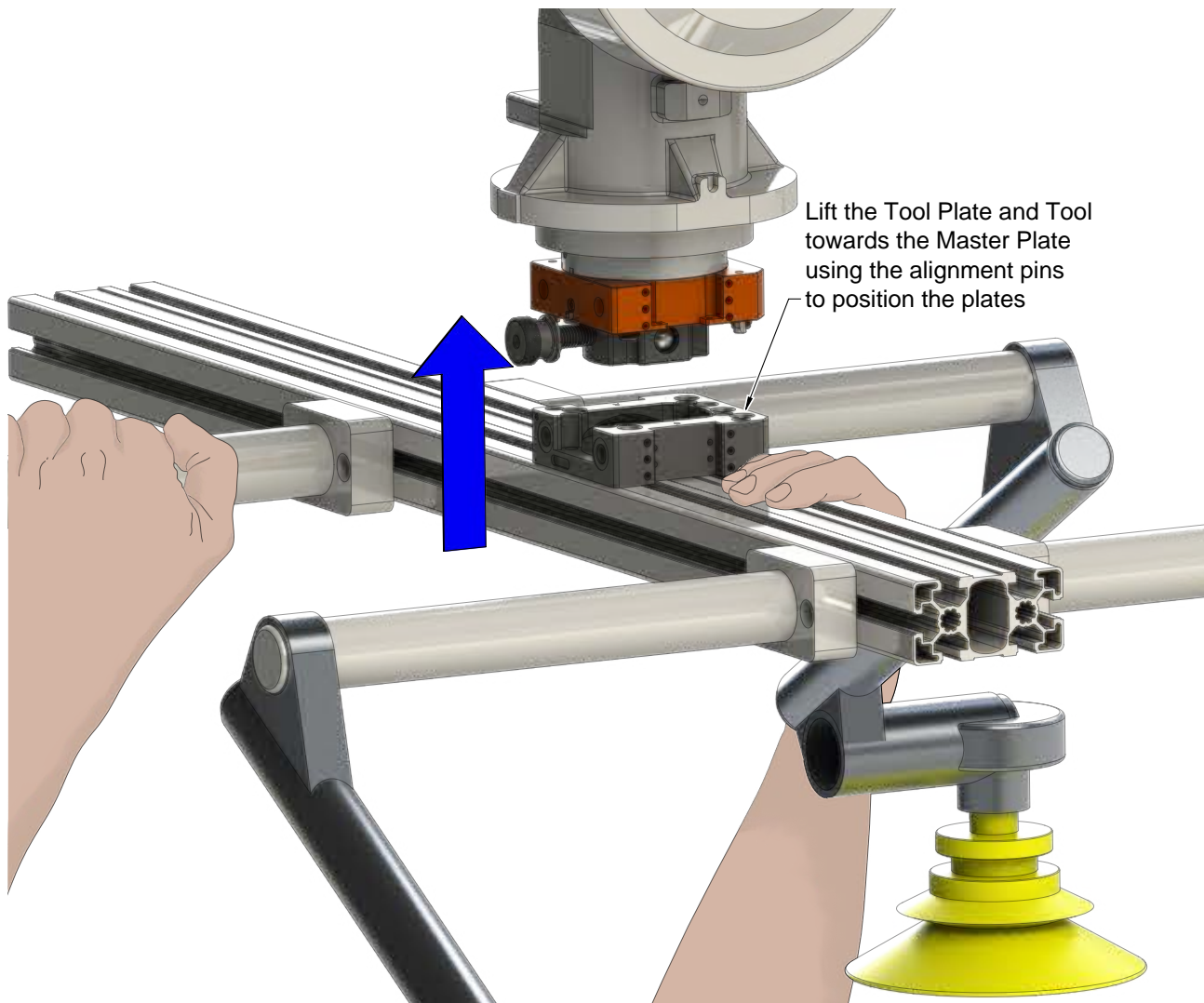
3.1 Coupling Sequence



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. Unlock the locking mechanism before attempting coupling.

Manually move the Tool plate toward the Master plate and begin to engage with the alignment features on the Master plate. Make sure that the tapered alignment pins from the Master plate enter the alignment holes on the Tool plate.

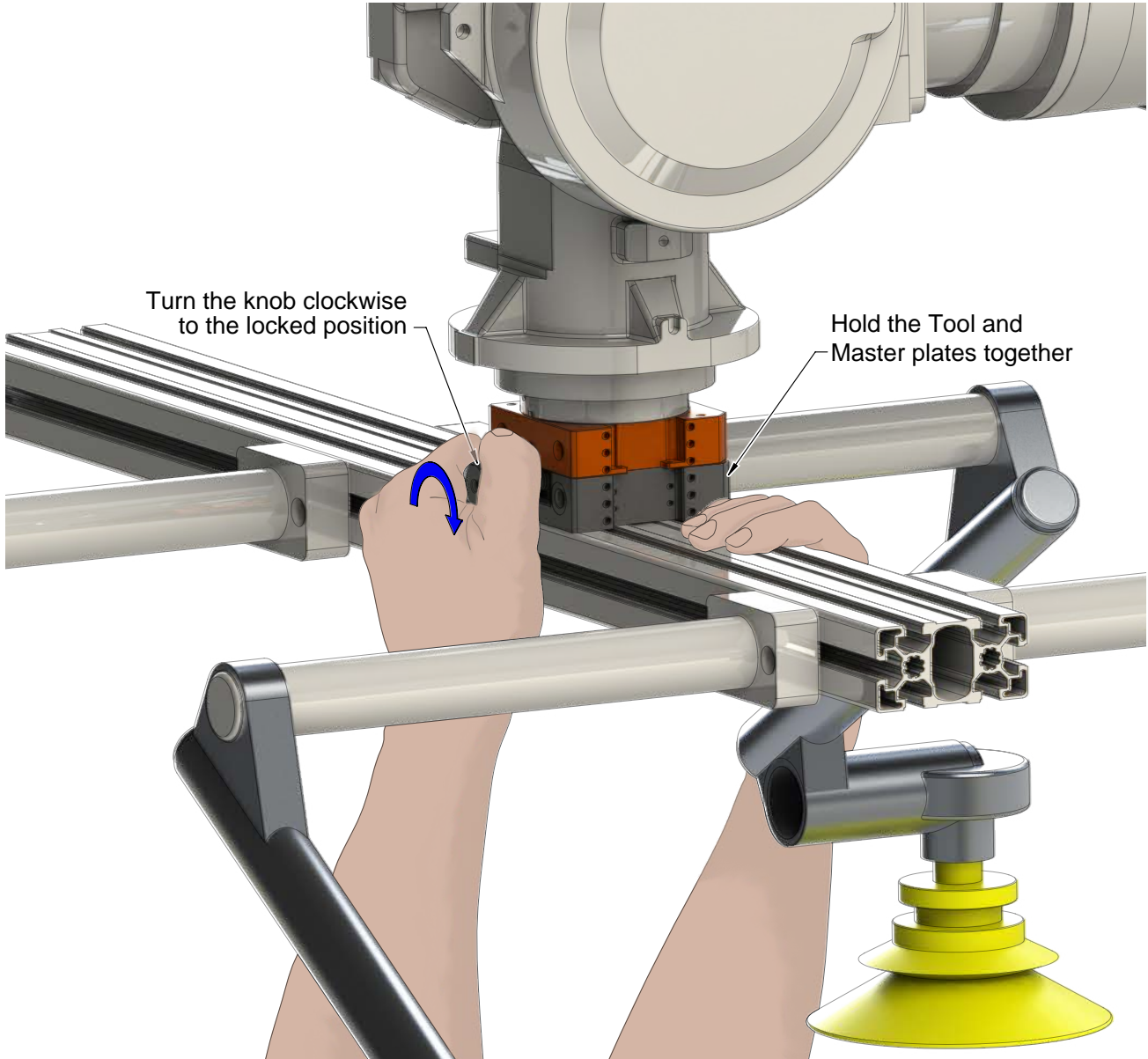
Figure 2.5—Coupling Sequence



Turn the knob clockwise toward the locked position to rotate the cam in the Master body. Be sure the Tool is engaged with the Master. There should be no gap between the Master and Tool mating surfaces at this time.

Then apply the tightening torque to the knob to provide the final clamping force. In lab testing, 25 in-lbs of tightening torque was determined to provide the optimal clamping force but anywhere between 10 in-lbs and 25 in-lbs is adequate. This tightening force range equates to the average human tightening a knob by hand.

Figure 2.6—Locking the Tool Changer



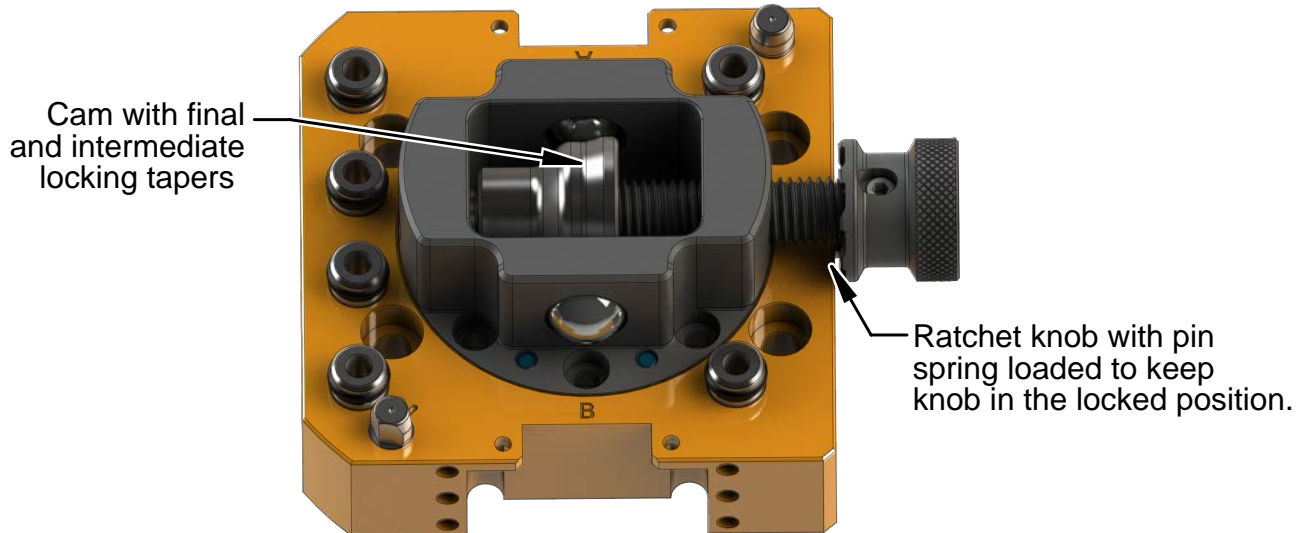
3.2 Fail-Safe Operation



CAUTION: Do not use the Tool Changer in the fail-safe condition. Do not transport the Tool Changer in the fail-safe condition. Possible damage to the locking mechanism could occur. Repair the locking mechanism before resuming operation.

The manual Tool Changer has (2) fail-safe features. The first feature is the ratchet knob feature. When the Master is locked, the ratchet pin is spring-loaded to bias against the knob to keep it locked. This spring prevents the knob from vibrating to the unlock position.

Figure 2.7—Fail-Safe Features



The second fail-safe feature is the tapered surface on the cam. As the cam is screwed in towards lock position, the ball bearings roll along the first taper. The first taper simply provides the travel necessary to move towards lock. Then the ball bearings roll past the intermediate tapered surface and onto the final tapered surface called the lock angle. This lock angle, combined with the tightening torque from the cam shaft, results in a high mechanical advantage and reliable locking force. In the event that the cam shaft is accidentally loosened, the cam may want to back out toward unlock position. If this happens, the ball bearings contact the intermediate “fail-safe” taper on the cam profile, and become trapped. Both the ratchet knob and the fail-safe cam tapered surface act together to provide a high assurance and high level of safety.

3.3 Uncoupling Sequence



CAUTION: Tool must be in a securely supported position before attempting to uncouple the Tool Changer. Failure to adhere to this condition may result in damage to the Tool and/or the robot. Securely support the Tool before uncoupling Tool Changer.

The Tool Changer should be positioned in the same location as that when coupling took place.

The unit is equipped with a ratchet knob, pull out on the knob and unscrew counter-clockwise until the ratchet knob is passed the ratcheting device on the Tool Changer body. The unit not fully disengage the Tool until the cam is all the way unscrewed. It is safe to remove the Master from the Tool only when the cam is in the fully unlocked position.

4. Maintenance

Regular preventative maintenance can extend the life and provide trouble free operation of the Tool Changer.



WARNING: Do not perform maintenance or repair on 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 purged and power discharged from circuits in accordance with the customer’s safety practices and policies. Injury or equipment damage can occur with Tool not placed and energized circuits on. Place the Tool safely in the tool stand, turn off and discharge all energized circuits, purge all pressurized connections, verify all energized circuits are de-energized before performing maintenance or repair on 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:

- 1) Placement of tool stands away from debris generators.
- 2) Covers incorporated into the tool stands.
- 3) 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 table below depending upon the application.

Detailed assembly drawings are provided in [Section 8—Drawings](#) of this manual.

Table 3.1—Preventive Maintenance Check List

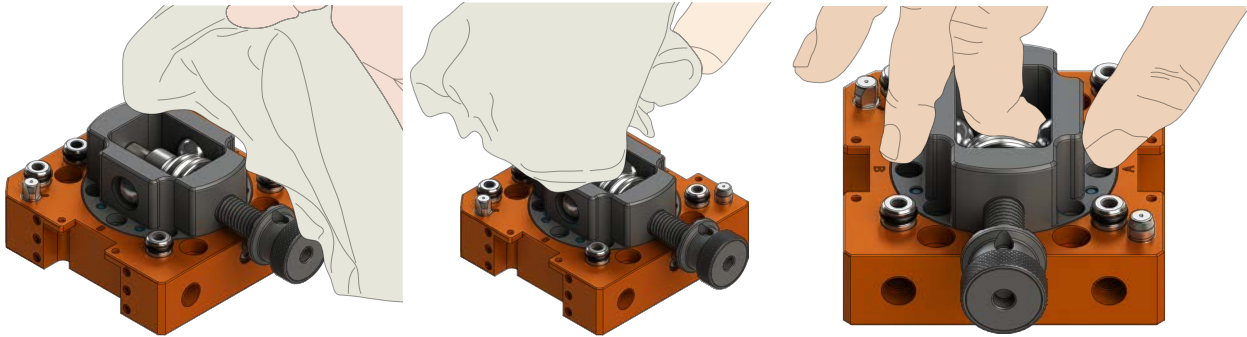
Application(s)	Inspection Schedule
General Usage Material Handling Docking Station	Monthly
Welding/Servo/Deburring, Foundry Operations (Dirty Environments)	Weekly
Checklist	
Mounting Fasteners/Interface Connections	
<input type="checkbox"/> Inspect fasteners for proper torque, interferences, and wear. Tighten and correct as required. Refer to Section 2—Installation .	
Balls/Alignment Pins/Holes/Bearing Race	
<input type="checkbox"/> Inspect for wear and proper lubrication. 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 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 Master and Tool plate .	
<input type="checkbox"/> Inspect for excessive alignment pin/bushing wear, 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. To replace worn alignment pins, refer to Section 5.2.2—Alignment Pin Replacement .	
<input type="checkbox"/> Inspect for wear on the ball bearings/bearing race, may be an indication of excessive loading.	
Electrical Contacts/Pin Block (Modules)	
<input type="checkbox"/> Inspect for damage, debris, and stuck/burnt pins. Clean pin blocks as required, refer to Section 4.3—Pin Block Inspection and Cleaning .	
Seals	
<input type="checkbox"/> Inspect V-ring seals for wear, abrasion, and cuts. Refer to Section 5.2.1—V-ring Seal Inspection and Replacement .	
<input type="checkbox"/> Inspect O-ring seals for wear, abrasion, and cuts. Refer to Section 5.2.3—Replace O-ring Seals .	

4.2 Cleaning and Lubrication of the Master and Tool Plate

Supplies required: Clean rag, MobilGrease XHP222 Special is a NLGI #2 lithium complex grease with molybdenum disulfide

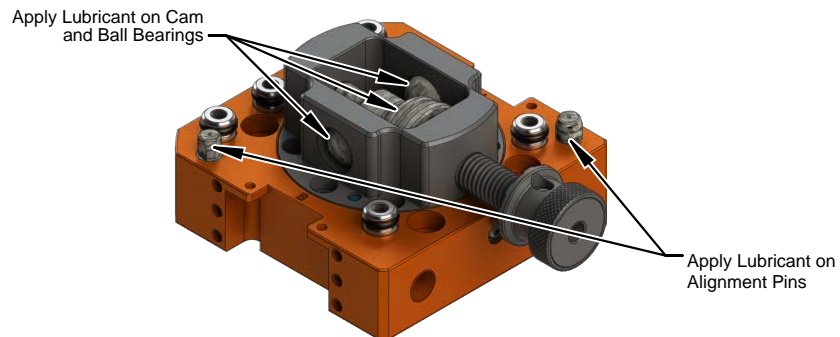
1. Turn off and de-energize all energized circuits (e.g. electrical, air, water, etc.).
2. Uncouple the Tool Changer to allow clear access to the Master and Tool plates.
3. Use a clean rag to thoroughly remove the existing lubricant and debris from the ball bearings, alignment pins, and cam.
4. Check each ball bearing to make sure it moves freely. Additional cleaning may be necessary to free up any ball bearings that are sticking in place.

Figure 3.1—Cleaning Ball Bearings, Alignment Pin and Cam



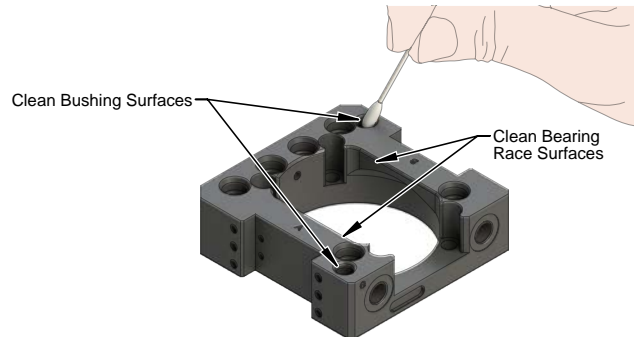
5. Apply a light coating of XHP-222 Special lubricant to the cam, ball bearings, and the alignment pins.

Figure 3.2—Lubricate Ball Bearings, Alignment Pin and Cam



6. Use a clean lint free rag and a cotton swab to thoroughly remove the any lubricant and debris from the engagement surfaces and alignment holes in the Tool plate.

Figure 3.3—Cleaning Tool plate



NOTICE: No application of lubrication is necessary on the Tool plate components.

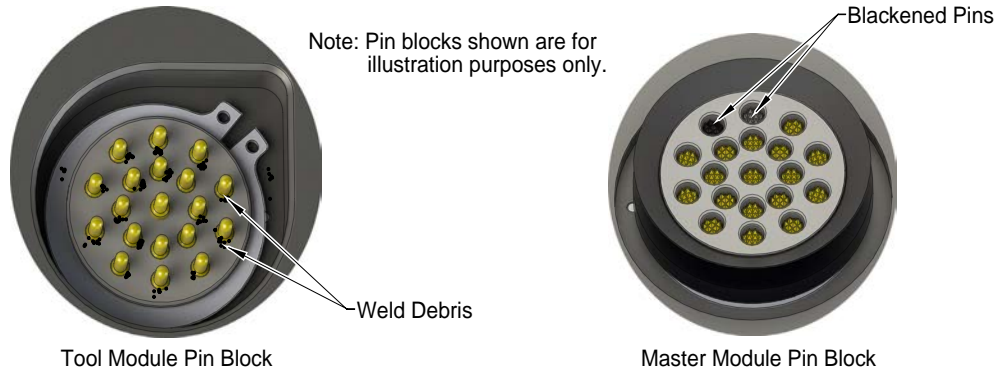
8. After the procedure is complete, resume normal operation.

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 any debris or darkened pins.

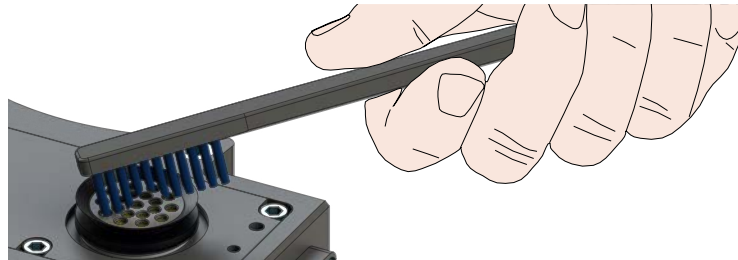
Figure 3.4—Inspect Master and Tool Pin Blocks



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

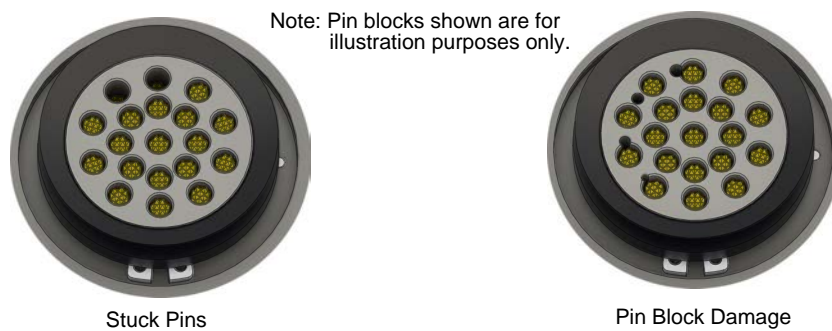
NOTICE: Do not use an abrasive media, cleaners, or solvents to clean the contact pins. Using abrasive media, cleaners, or solvents will cause damage to the contact surface or cause pins to stick. Clean contact surfaces with a vacuum or non-abrasive media such as a nylon brush (ATI Part Number 3690-0000064-60)

Figure 3.5—Clean Pin Blocks with a Nylon Brush



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

Figure 3.6—Stuck Pin and Pin Block Damage



7. If stuck pins or pin block damage exists, contact ATI for possible pin replacement procedures or module replacement.
8. After the procedure is complete, resume normal operation.

5. Troubleshooting and Service Procedures

The following section provides troubleshooting and service information to help diagnose conditions and repair the Tool Changer.



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

5.1 Troubleshooting

The table below offers some diagnosis and resolution of the Tool Changer.

Table 4.1—Troubleshooting Procedures		
Symptom	Cause	Resolution
Unit will not lock or unlock.	The locking mechanism cam is jammed.	Clean and lubricate as needed to restore smooth operation (see Section 4.2—Cleaning and Lubrication of the Master and Tool plate).
	The knob is not moving.	Check for debris in the knob or cam area of the locking mechanism, and clean if necessary.
	The Master and Tool are not touching prior to lock.	Check the Tool is properly oriented in the Master. Verify there is no debris between the Master and Tool prior to locking.
Gapping between Master and Tool plates.	Locking mechanism loose.	Tighten ratch knob, refer to Section 3.1—Coupling Sequence .
Air leaking.	Air hose damage.	Inspect air hoses for cracks or damage replace as necessary.
	Lose connection.	Make sure air hose connections are tight.
	O-ring seal worn or damaged.	Inspect O-ring seal for damage, replace damaged seal. Refer to Section 5.2.3—Replace O-ring Seals .
Units Equipped with Electrical Modules		
Contamination in electrical contacts.	V-ring seal damaged.	Inspect V-ring seal for damage, replace damaged seal. Refer to Section 5.2.1—V-ring Seal Inspection and Replacement .

5.2 Service Procedures

The following service procedures provide instructions for component replacement and adjustment.

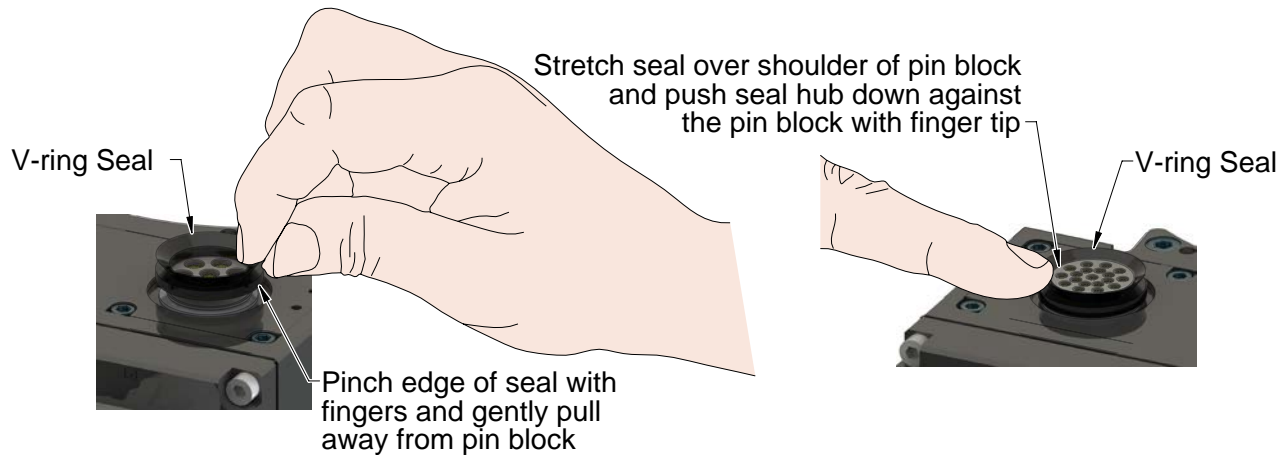
5.2.1 V-ring Seal Inspection and Replacement

Parts required: Refer to Module Manual

The seal protects the electrical connection between the Master and Tool module. If the seal becomes worn or damaged, it must be replaced.

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. To remove the existing seal, pinch the edge of the seal with your fingers and pull the seal away from the pin block on the Master.
5. To install a new seal, stretch the new seal over the shoulder of the pin block.
6. Push the seal hub down against the pin block using your finger tip.
7. After the procedure is complete, resume normal operation.

Figure 4.1—V-ring Seal Replacement



5.2.2 Alignment Pin Replacement

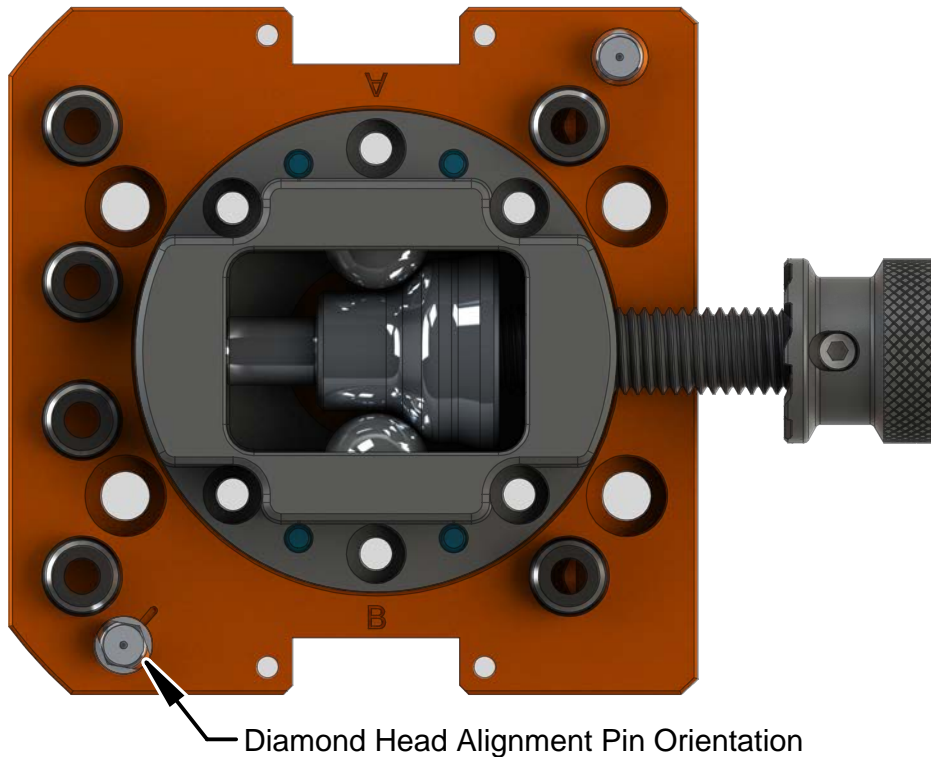
Parts required: Refer to [Section 6.1—MC-36R Master Serviceable Parts](#)

Tools required: Pliers

Supplies required: Clean rag, Loctite 242 MobilGrease XHP222 Special is a NLGI #2 lithium complex grease with molybdenum disulfide

1. Turn off and de-energize all energized circuits (e.g. electrical, air, water, etc.).
2. Uncouple the Master and Tool plates.
3. Remove the grease from the alignment pin using a clean rag.
4. Alignment pins are removed by pushing the pins out from the back of the Master plate. To remove the Master plate refer to [Section 2.3—Master plate Removal](#).

Figure 4.2—Alignment Pin Replacement



NOTICE: Make sure the diamond head alignment pin is oriented as shown in [Figure 4.2](#).

5. Install the new alignment pin into the body via an arbor press. Verify the pin is fully seated into the body. The pin heads should seat fully against the Master body.
6. Install the Master plate refer to [Section 2.2—Master plate Installation](#) for instructions.
7. After the procedure is complete, resume normal operation.

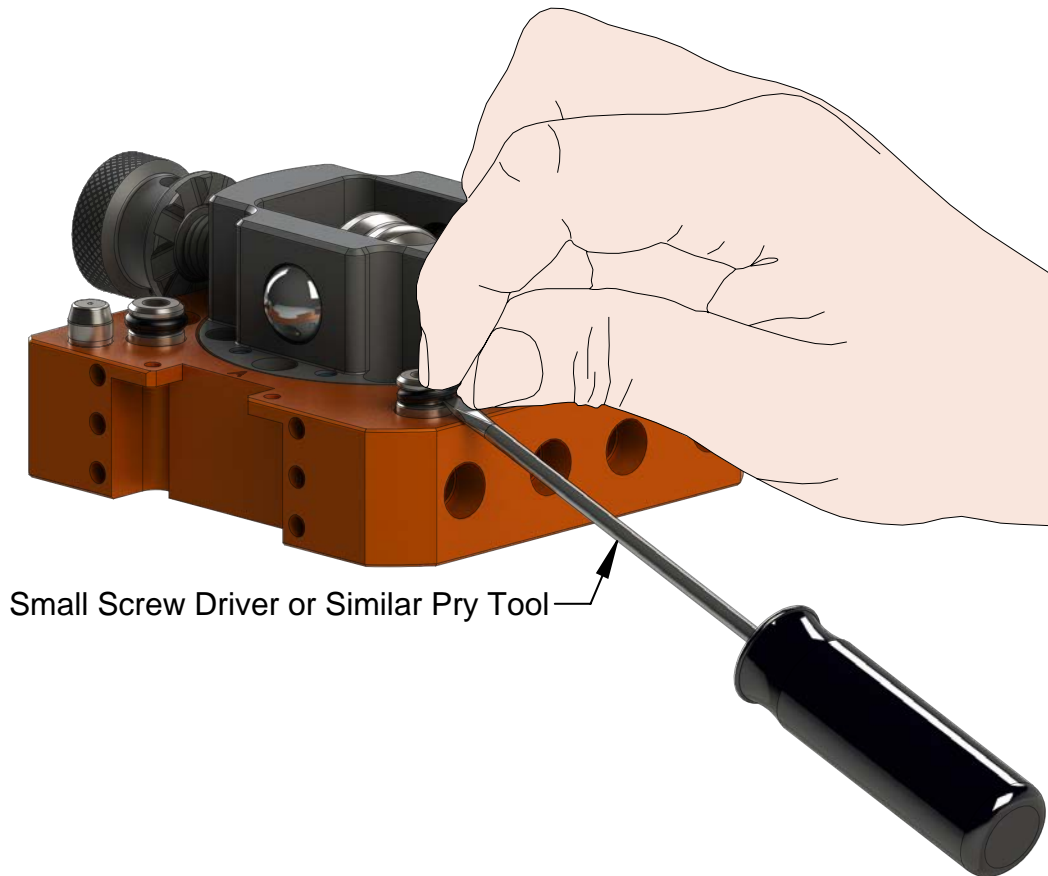
5.2.3 Replace O-ring Seals

Parts required: Refer to [Section 6.1—MC-36R Master Serviceable Parts](#)

Tools required: Small screw driver

1. Turn off and de-energize all energized circuits (e.g. electrical, air, water, etc.).
2. Uncouple the Master and Tool plates.
3. To remove the existing O-ring, use a small screw driver or similar tool to pry the O-ring out of the groove.
4. Pinch edge of O-ring with fingers and gently pull off the air port nipple.
5. To install a new O-ring, stretch the new O-ring over the air port nipple.
6. Push the O-ring onto the nipple.
7. After the procedure is complete, resume normal operation.

Figure 4.3—O-Ring Replacement



6. Serviceable Parts

6.1 MC-36R Master Serviceable Parts

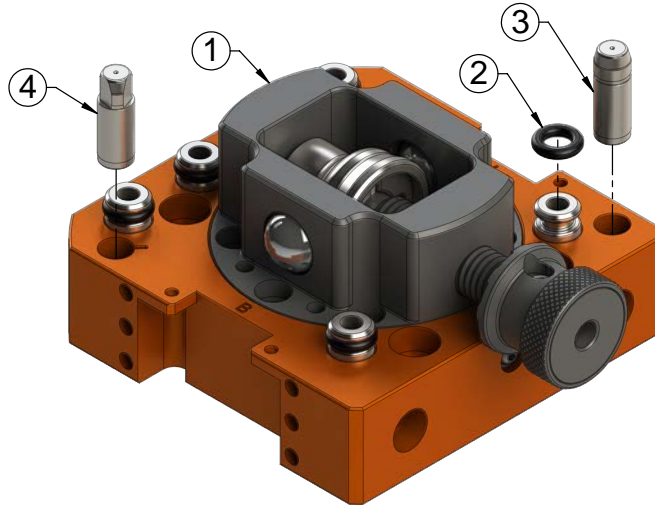


Table 5.1—MC-36R Master plate

Item No.	Qty	Part Number	Description
1	1	9122-036RM-000-000	MC-36R Base Master NPT, Steel Fully Threaded, Ratchet Knob
		9122-036RM-000-000-E	MC-36R Base Master BSPP, Steel Fully Threaded, Ratchet Knob Euro
2	4	3410-0001291-01	O-Ring AS568-108 Buna-N Shore A: 70 Black
3	1	3700-20-9943	Alignment Pin, Round, 8 mm OD x 7 mm L Head, 8 mm OD x 16 mm L Shank
4	1	3700-20-9944	Alignment Pin, Diamond, 8 mm OD x 7 mm L Head, 8 mm OD x 16 mm L Shank

6.2 MC-36 Tool Serviceable Parts

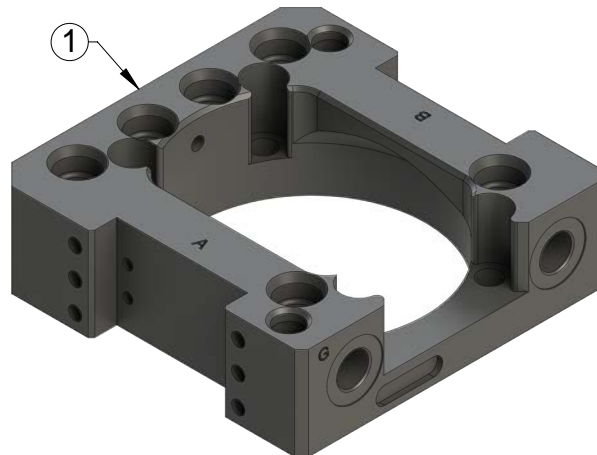


Table 5.2—MC-36 Tool plate

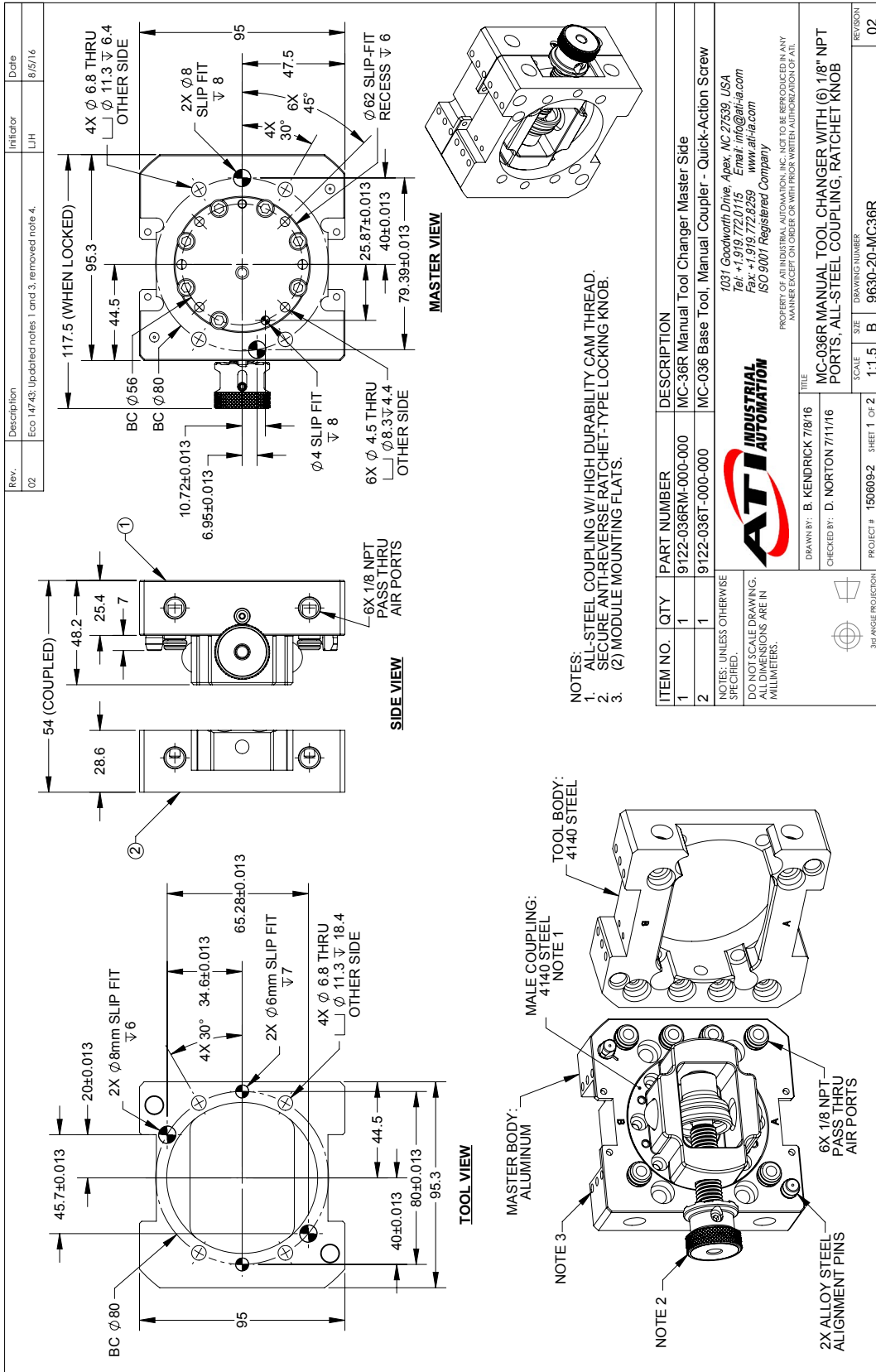
Item No.	Qty	Part Number	Description
1	1	9122-036T-000-000	MC-36 Manual Coupler Base Tool with (6) 1/8 NPT Ports
	1	9122-036T-000-000-E	MC-36 Manual Coupler Base Tool with (6) G 1/8 Ports, Euro

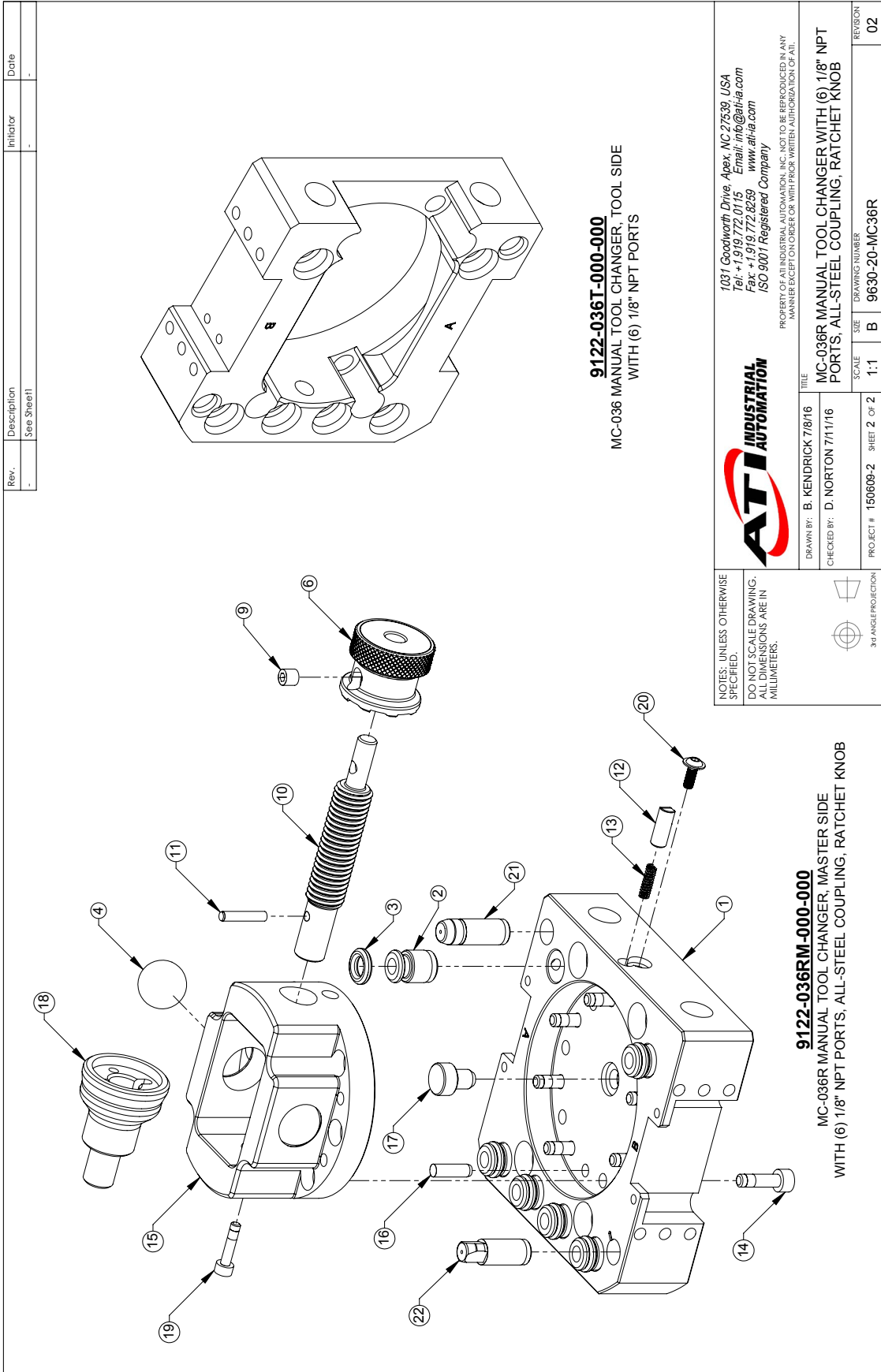
7. Specifications

Table 6.1—Master and Tool Plate Specifications		
Recommended Max Payload	80 lbs. (36 kg)	The mass attached to the Tool Changer.
Operating Temperature Range	-20–150°F (-30–66°C)	Optimal operating temperature range.
Recommended Max Moment X-Y (Mxy)	1000 in-lb (110 Nm)	Maximum recommended working load for optimum performance of the Tool Changer
Recommended Static Moment Z (Mz)	1,500 lbf-in (170 Nm).	Maximum recommended static load for optimum performance of the Tool Changer
Weight (coupled, no access.)	3.85 lbs (1.75 kg)	Master 2.2 lbs (1.00 kg) / Tool 1.65 lbs (0.748 kg)
Pneumatic Pass Through Ports	(6) 1/8 NPT or (6) 1/8 G (BSPP)	Optional. Specify –NP for version with No Ports
Mounting/Customer Interface	Master plate	80 mm Circular Pattern, and 56 mm Circular Pattern. See Section 8—Drawings .
	Tool plate	80 mm Circular Pattern. See Section 8—Drawings .

8. Drawings

8.1 MC-36R Tool Changer





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



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TITLE
 MC-036R MANUAL TOOL CHANGER WITH (6) 1/8" NPT PORTS, ALL-STEEL COUPLING, RATCHET KNOB

SCALE
 1:1

DRAWING NUMBER
 9630-20-MC36R

REVISION
 02

9122-036RM-000-000
 MC-036R MANUAL TOOL CHANGER, MASTER SIDE
 WITH (6) 1/8" NPT PORTS, ALL-STEEL COUPLING, RATCHET KNOB

PROJECT # 150609-2 SHEET 2 OF 2

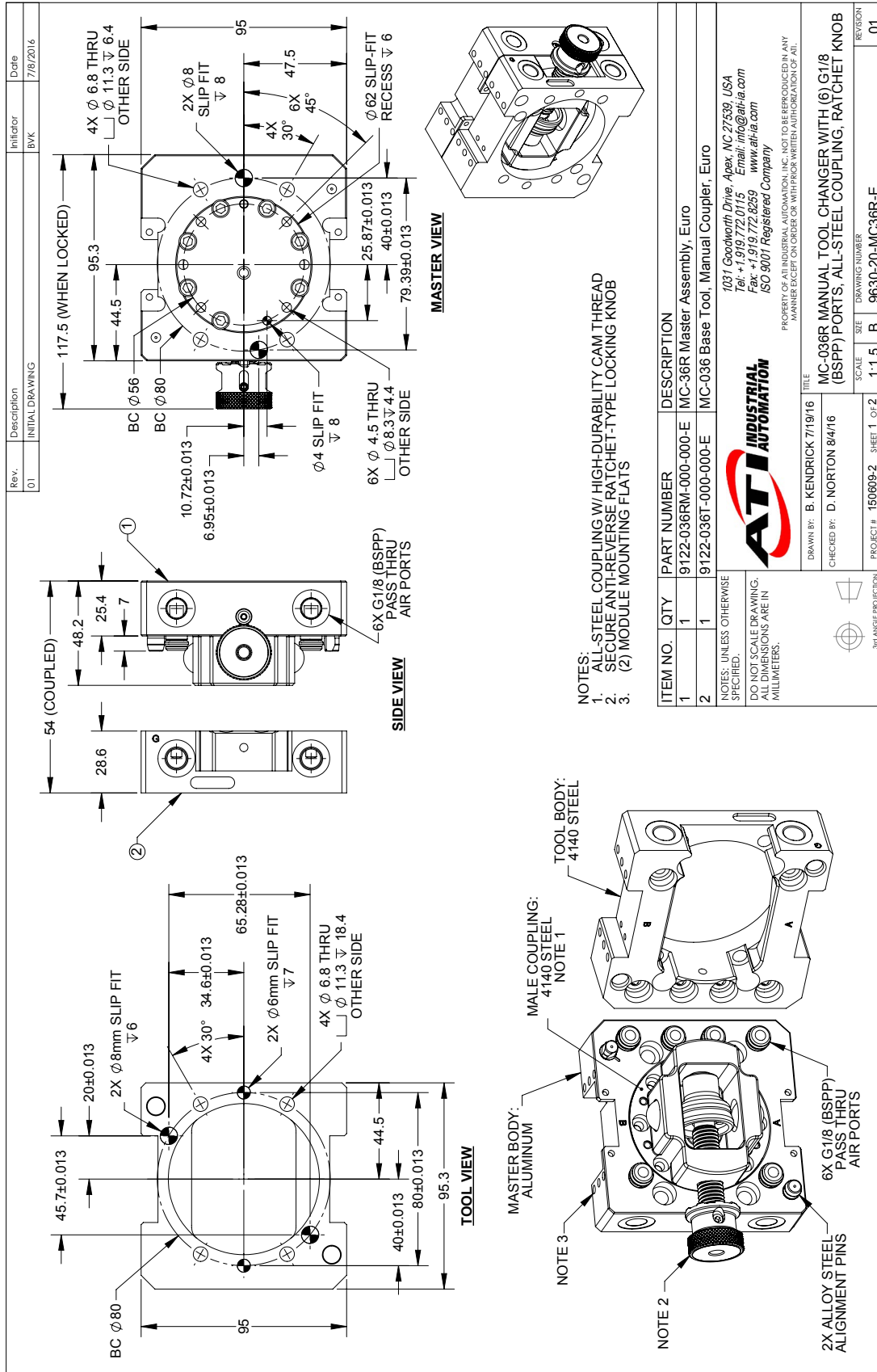
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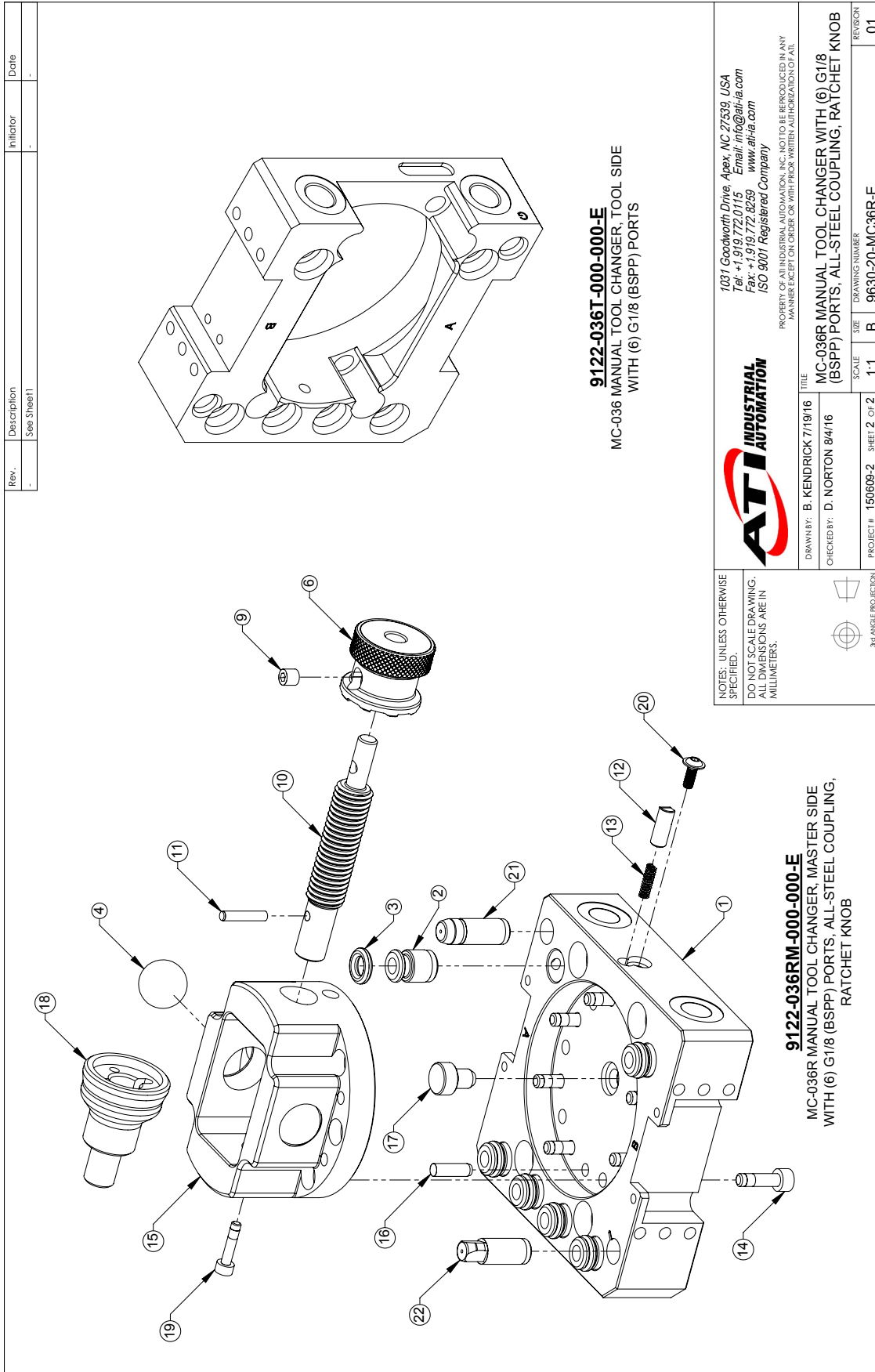
DRAWING NUMBER
 9630-20-MC36R

REVISION
 02

Rev.	Description	Initiator	Date
-	See Sheet 1	-	-

8.2 MC-36R-E Tool Changer





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3/4 ANGLE PROJECTION



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PROJECT #	150609-2	SHEET	2 OF 2
DRAWN BY:	B. KENDRICK	7/19/16	TITLE
CHECKED BY:	D. NORTON	8/4/16	MC-036R MANUAL TOOL CHANGER WITH (6) G1/8 (BSPP) PORTS, ALL-STEEL COUPLING, RATCHET KNOB
SCALE	1:1	SIZE	B
DRAWING NUMBER	9630-20-MC36R-E	REVISION	01

9122-036RM-000-000-E
 MC-036R MANUAL TOOL CHANGER, MASTER SIDE
 WITH (6) G1/8 (BSPP) PORTS, ALL-STEEL COUPLING,
 RATCHET KNOB

9122-036T-000-000-E
 MC-036 MANUAL TOOL CHANGER, TOOL SIDE
 WITH (6) G1/8 (BSPP) PORTS

Rev.	Description	Initiator	Date
-	See Sheet 1	-	-