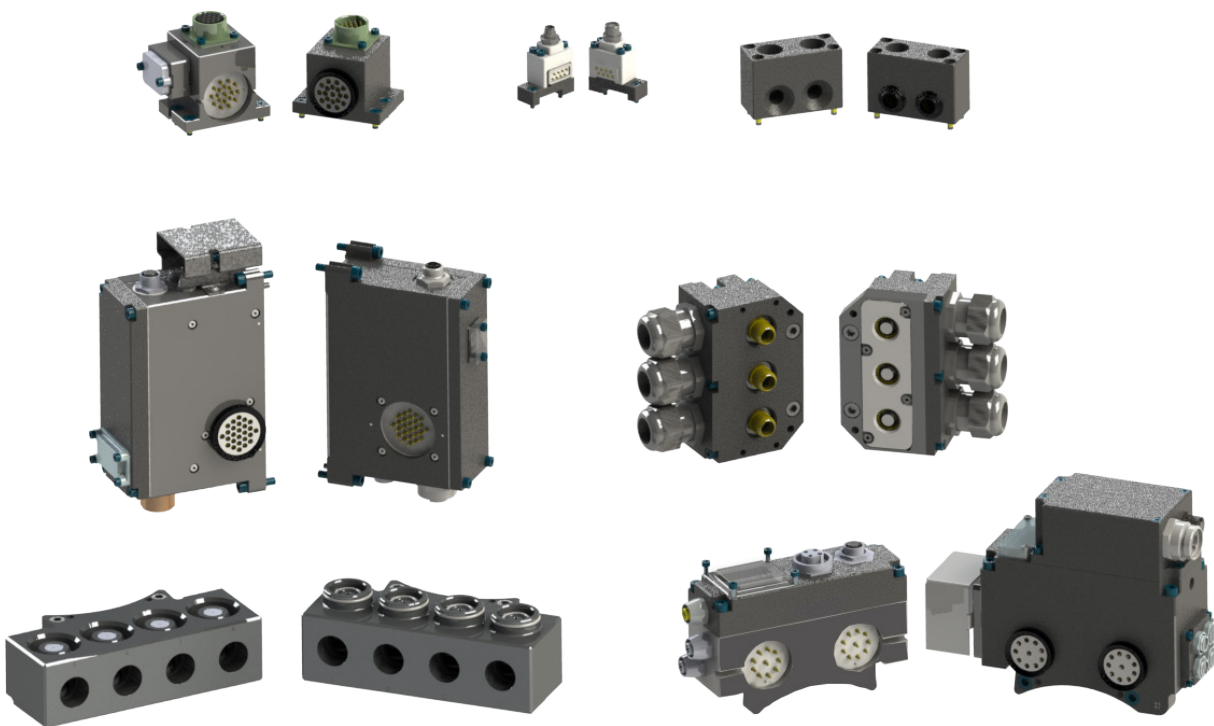




Operating Manual

Tool Changer Utility Modules



Document # 9610-20-4452

Engineered Products for Robotic Productivity

Pinnacle Park • 1041 Goodworth Drive • Apex, NC 27539 • Tel: 919.772.0115 • Fax: 919.772.8259 • ati.novanta.com

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Utility Modules

1. Safety

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

1.1 Explanation of Notifications

These notifications are used in all of ATI manuals and are not specific to this product. The user should heed all notifications from the robot manufacturer and/or the manufacturers of other components used in the installation.



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



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



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

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

1.2 General Safety Guidelines

Prior to purchase and installation, the customer should verify that the Tool Changer or Utility Coupler selected is rated for the maximum loads and moments expected during operation. Give particular attention to dynamic loads caused by robot acceleration and deceleration. These forces can be (exponentially) greater than the static forces in high acceleration or deceleration situations. To verify an ATI product is rated for a particular application, refer to the product specifications section and/or drawing section for each component in this manual or contact ATI for assistance.

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

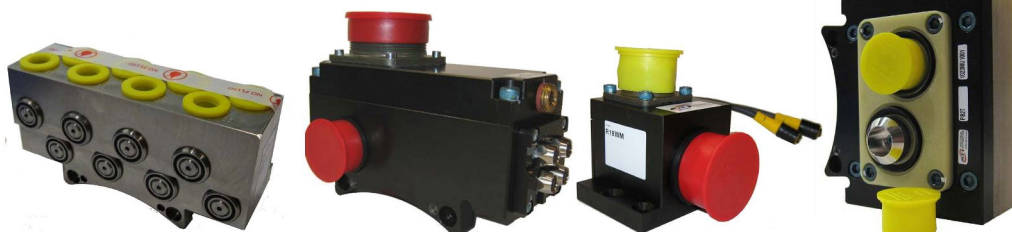


DANGER: The gap between the Master and Tool sides is a pinch point. All personnel should abstain from placing any body part or clothing in the gap, especially during actuation of the locking mechanism.

The customer is responsible for understanding the function of the Tool Changer or Utility Coupler and installing the proper fasteners and/or software to operate products safely. Control the Tool Changer or Utility Coupler so there is no chance of coupling or uncoupling in a position that endangers personnel and/or equipment. If locked/unlocked (L/U) and Ready-to-Lock (RTL) sensing capability are used, monitor the status and apply interlocks to prevent injury or damage to personnel and equipment.



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



2. Product Overview

NOTICE: ATI utility modules are one essential component to the overall robotic system. These modules work in conjunction with an ATI Tool Changer and Tool Stand products.

ATI Tool Changer Operating Manual: [9610-20-4451](#)

ATI Tool Stand Operating Manual: [9610-20-4453](#)

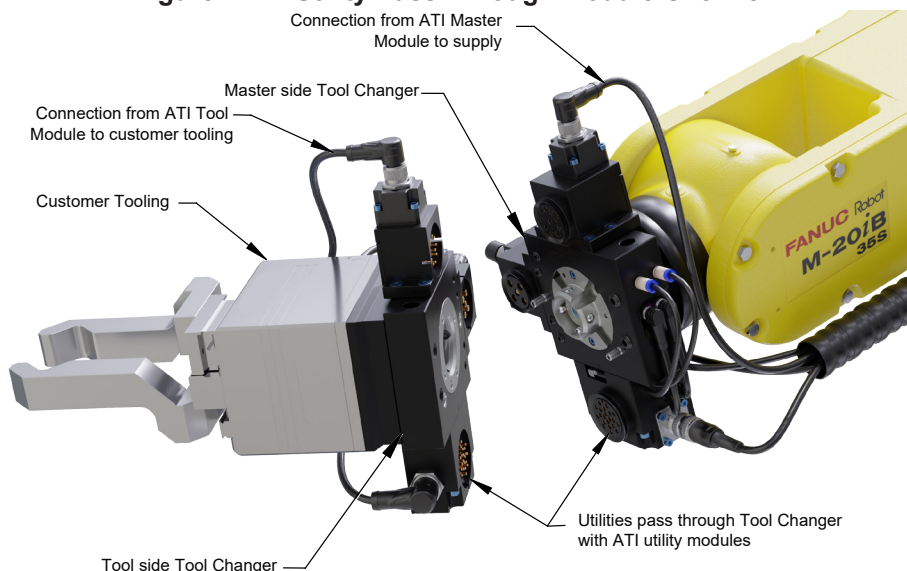
This instructional manual covers ATI's utility module product family installation, operation, maintenance and troubleshooting procedures. For individual product specification and technical drawings, refer to the [ATI Tool Changer Catalog](#).

ATI tool changers are extremely flexible with the ability to function in a wide variety of applications. This flexibility is due in large part to ATI's expansive utility module catalog available for passing air, water, power, electrical signals, and more.

ATI's utility module product line can mostly be broken into the following groups.

- **Electrical Modules** support the following pass-through utilities:
 - **Signals** for basic I/O, sensors, and low voltage.
 - **Communication** for industrial data transmission.
 - **Power** for medium voltage or electrical current.
 - **Servo** for servo motor power and encoder signals.
 - **High-Current** for welding and grounding.
- **Fluid-Air Modules** support the following pass-through utilities:
 - **Pneumatics** for compressed air or vacuum.
 - **Fluids** with self-sealing connections for water, air, and liquids.
 - **Vacuum** for high-flow vacuum and debris extraction.
 - **Hydraulics** for high-pressure hydraulic tool actuation.
- **Control Modules** for control and status monitoring of Tool Changers lock and unlock actuation, with integrated pneumatic valves and safety circuit. Contact ATI for more details.

Figure 2.1— Utility Pass-Through Module Overview



3. Installation



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 are turned off, pressurized connections are purged and power is discharged from circuits. Injury or equipment damage can occur with the Tool not placed and energized circuits on.



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

These optional modules are typically installed on the Tool Changer by ATI prior to shipment. The following section outlines field installation and removal. There are multiple module mounting patterns across ATI's Tool Changer catalog. These mounting patterns can generally be categorized into one of five categories:

- M7 Mount
- K Mount
- J Mount
- L Mount
- S8 Mount

Refer to [Table 3.1](#) to identify the specific module mounting style for each ATI Tool Changer.

Installation Instructions:

1. Place Tool in a secure location.
2. Uncouple Master and Tool.
3. Turn off and de-energize all circuits.
4. Clean the mounting surfaces.
5. Align module to mounting position on the Master or Tool side.
6. Add threadlocker to the mounting fasteners. Refer to [Table 3.1](#) for threadlocker and fasteners information.
7. Torque according to specification outlined in [Table 3.1](#).

Figure 3.1—ATI Module Mounting Styles

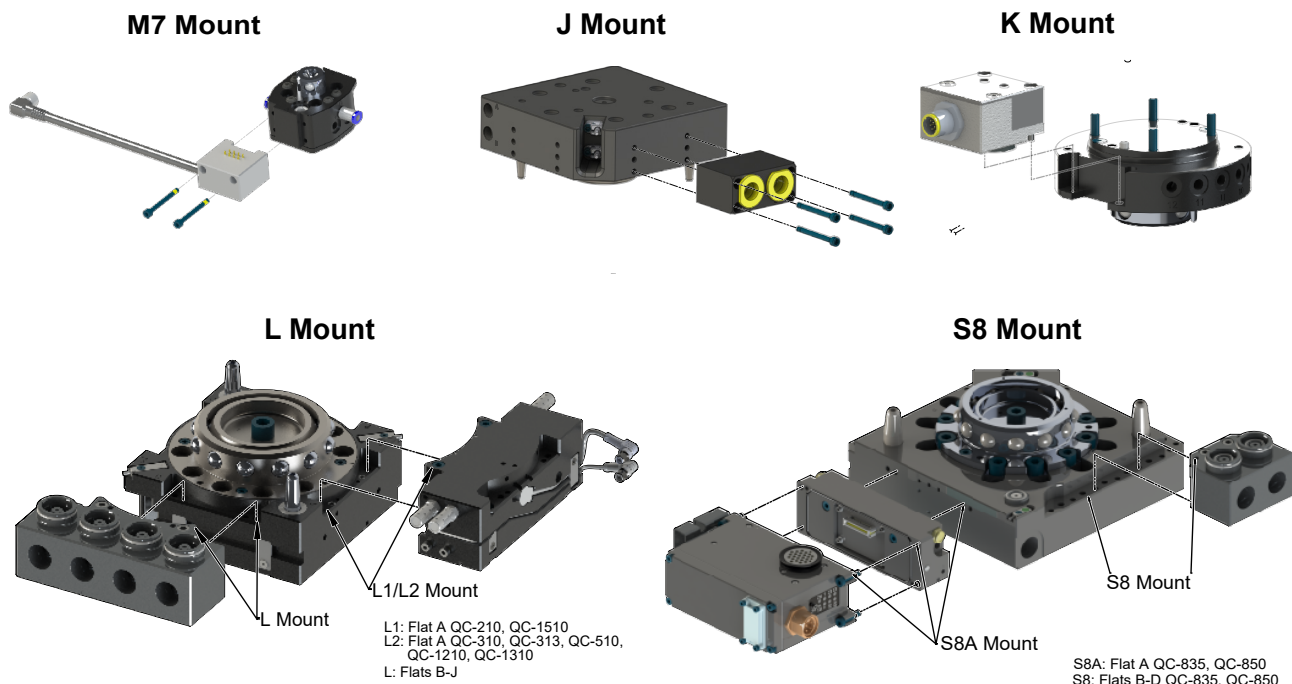


Table 3.1—Module Mounting Fastener Size and Torque Specifications				
QC Model	Mounting Style ¹	Fastener Size ²	Torque	Hex Tool
QC-1	M1	(2) M2 SHCS	0.25 Nm	1.5 mm
QC-7	M7 / M7+	(2) M3 SHCS	1.13 Nm	2.5 mm
QC-11	M7	(2) M3 SHCS	1.13 Nm	2.5 mm
QC-20	K	(2) M3 SHCS	1.13 Nm	2.5 mm
QC-21 Flat A	K	(2) M3 SHCS	1.13 Nm	2.5 mm
QC-21 Flat B	J with adapter	(4) M4 SHCS	1.7 Nm	3 mm
QC-29	J	(4) M4 SHCS	1.7 Nm	3 mm
		(4) M4 SFHCS	1.13 Nm	2.5 mm
QC-40Q	J	(4) M4 SHCS	1.7 Nm	3 mm
		(4) M4 SFHCS	1.13 Nm	2.5 mm
QC-41	J	(4) M4 SHCS	1.7 Nm	3 mm
		(4) M4 SFHCS	1.13 Nm	2.5 mm
QC-46	J	(4) M4 SHCS	1.7 Nm	3 mm
		(4) M4 SFHCS	1.13 Nm	2.5 mm
QC-60 Flat A	K	(2) M3 SHCS	1.13 Nm	2.5 mm
QC-60 Flat B	J with adapter	(4) M4 SHCS	1.7 Nm	3 mm
QC-71	J	(4) M4 SHCS	1.7 Nm	3 mm
		(4) M4 SFHCS	1.13 Nm	2.5 mm
QC-76	J	(4) M4 SHCS	1.7 Nm	3 mm
		(4) M4 SFHCS	1.13 Nm	2.5 mm
QC-110	J	(4) M4 SHCS	1.7 Nm	3 mm
		(4) M4 SFHCS	1.13 Nm	2.5 mm
QC-160	J	(4) M4 SHCS	1.7 Nm	3 mm
		(4) M4 SFHCS	1.13 Nm	2.5 mm
QC-210 ³	L1 / L	(2) M6 SHCS	10.1 Nm	5 mm
QC-310 ³	L2 / L	(2) M6 SHCS	10.1 Nm	5 mm
QC-510 ³	L2 / L	(2) M6 SHCS	10.1 Nm	5 mm
	J	(4) M4 SHCS	1.7 Nm	3 mm
QC-835 ^{3,4}	S8A	(6) M5 SHCS	5.1 Nm	4 mm
	S8	(2) M6 SHCS	10.1 Nm	5 mm
QC-850 ^{3,4}	S8A	(6) M5 SHCS	5.1 Nm	4 mm
	S8	(2) M6 SHCS	10.1 Nm	5 mm
QC-1210 ³	L2 / L	(2) M6 SHCS	10.1 Nm	5 mm
QC-1310 ³	L2 / L	(2) M6 SHCS	10.1 Nm	5 mm
QC-1510 ³	L1 / L	(2) M6 SHCS	10.1 Nm	5 mm
1. Detailed mounting style information found in ATI catalog. 2. Loctite 222 should be applied to all fasteners without pre-applied adhesive. Threadlocker is not required for any pre-applied fasteners. 3. Some modules may require Loctite 242 when used with ATI's heavy duty product line. Refer to module customer drawing. 4. Series 8 Tool Changers (QC-835 and QC-850) support one standard heavy-duty ledge-mount module position.				

3.2 Tool-ID

Certain ATI Tool modules are equipped with a Tool ID feature, which allows each Tool to be set to a unique digit for easy Tool identification. ATI offers two Tool ID styles: rotary switch and push button Tool ID.

The following sections outline the use of each style.

3.2.1 Rotary Switch ID

Figure 3.2—Rotary Switch ID



1. Remove screws that secure plastic window to access rotary switch.
1. 0-F rotary switch is provided on the Tool module.
2. Ensure seal and window are re-positioned correctly to prevent a leakage path to the module inside.
3. Tighten socket head cap screws to 34 cN m.

3.2.2 Push Button ID

Figure 3.3—Push Button ID



Push button switches are provided on certain Tool modules for setting a unique Tool ID number.

1. Remove screws that secure Tool ID window to access push buttons.
2. Use a non-conductive tool (plastic stylus) to press the Tool ID push buttons.
 - Increase (+) or Decrease (-) digit value.
3. Set Tool ID to the desired unique digit.
4. Re-install Tool ID window screws.
5. Torque to 23 cN m.

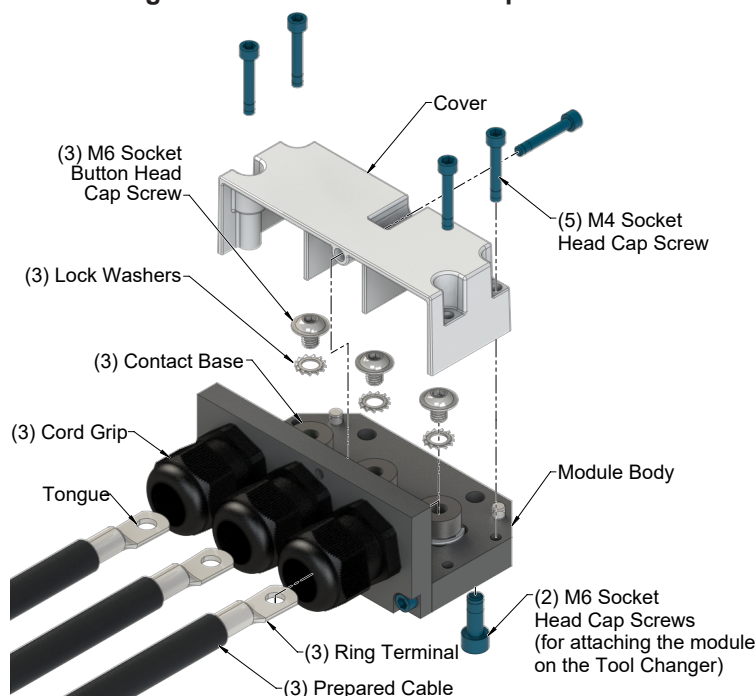
3.3 High Current Module Cable Preparation

Many of ATI's high current module line require special procedures for cable installation.

Tools required: 3 and 4 mm hex tools, torque wrench, wire stripper, crimping tool, open wrench

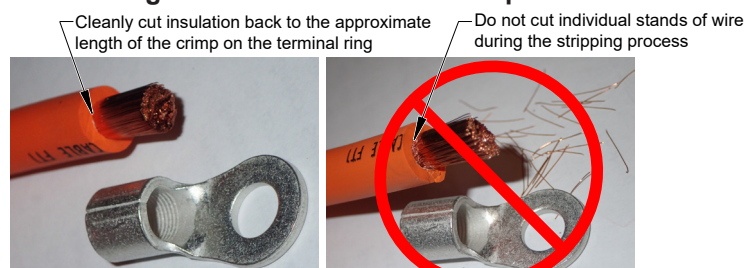
Supplies required: Loctite® 222

Figure 3.4— Module Cable Preparation



1. Remove cover and any applicable end covers to access contact bases.
2. Refer to crimping tool instructions to select proper sized ring terminal.
3. Strip insulation on cables back to approximate length of the ring terminal's crimp, about 12.7 mm.

Figure 3.5— Module Cable Preparation



4. Slide ring terminal over stripped end of the cable, ensuring no wire strands are coming out of ring terminal.
5. Following crimp tool instructions to crimp ring terminal onto the cable.
6. If ring terminal tongue distorts during crimping, flatten and straighten tongue so flat end is parallel to cable's center axis.
7. Use an open wrench to loosen cord grips and route cable through the cord grips.
8. Install all (3) ring terminals and cables so that the flat end of the terminal touches the contact base.
9. Secure (3) ring terminals to contact bases with (3) lock washers and (3) M6 screws. Tighten finger tight.
10. Tighten (3) M6 hex head cap screws to 5.65 Nm.
11. Beginning with middle cord grip, tighten cord grip dome nuts to 5 Nm.
12. Install cover to module body. Pre-apply Loctite 222 to fasteners. Tighten to 0.68 Nm.
13. Install module to Tool Changer.

4. Operation

Adhere to the following operating specifications on any Tool Changer application:

- **Operating Pressure Range:** Refer to the *ATI Tool Changer manual* individual product specification.
- **Operating Temperature Range:** minimum +5° to maximum +60° C
- **Supply Air Requirements:** Compressed air quality per ISO 8573-1:2010 [6:4:4] is recommended for robotic applications to improve reliability and service life; ISO [7:4:4] is the minimum acceptable standard.

Table 4.1—Pass-Through Module Operation Requirements

Module Type	Requirements and Procedures
Electrical Modules	 WARNING: No contact should be attempted before removing power.  CAUTION: Never couple or uncouple servo modules unless electrical power has been disconnected and discharged both upstream and downstream from modules. Arcing and contact damage can occur if power is not discharged.  CAUTION: Improper cable routing can result in wires and cables being pinched in the joint between the Tool Changer plates and premature failure of electrical connectors.  CAUTION: Do not use stiff, heavy stranded cables which can inhibit operation of the high current module.  CAUTION: Always protect the unused Tool modules when not coupled to a Master module. Dust, debris, and weld splatter can contaminate contact tips.
Fluid-Air Modules	In all liquid coupling applications, take the following steps: • Use flexible hoses, which can absorb pressure spikes and pulses. Do not use highly reinforced hoses or hard pipe. • Turn off supply pump to the circuit and discharge pressure in the lines prior to a tool change. • Accumulators can be installed on both Master and Tool side plumbing. This is particularly important on the Tool side with the pump turned off and Master side pressure discharged. • Ensure fluids are near a neutral pH, minimize particle size.
Control Modules	• Control modules require unique operating instructions. Contact ATI for additional information.

5. 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 are turned off, pressurized connections are purged and power is discharged from circuits. Injury or equipment damage can occur with the Tool not placed and energized circuits on.

General maintenance guidelines and instructions are outlined below. Serviceable parts are listed in the utility module customer drawing, which can be found on the [ATI website](#).

5.1 Electrical Module Maintenance

Table 5.1—Maintenance Checklist	
Monthly Maintenance:	
☐	Clean mating surfaces.
6 months or 50,000 cycle Maintenance:	
☐	Inspect pin blocks for damage, debris or darkened pins. Refer to 5.4 .
☐	Inspect V-ring seals for wear, abrasions, or cuts. Replace as needed. Refer to 5.5 .
☐	For modules with serviceable contact springs, visually inspect for damage or debris. Do not touch spring . Replace, as needed. Refer to 5.7 .
☐	For modules with contacts, visually inspect for damage or debris. Refer to 5.8 , 5.9 , and 5.12 .
☐	Verify cable connections are secure. If loose, tighten.
☐	Check that module mounting bolts are secure. Refer to Section 3—Installation .
☐	Replace batteries on any servo module enclosures.

5.2 Fluid-Air Module Maintenance

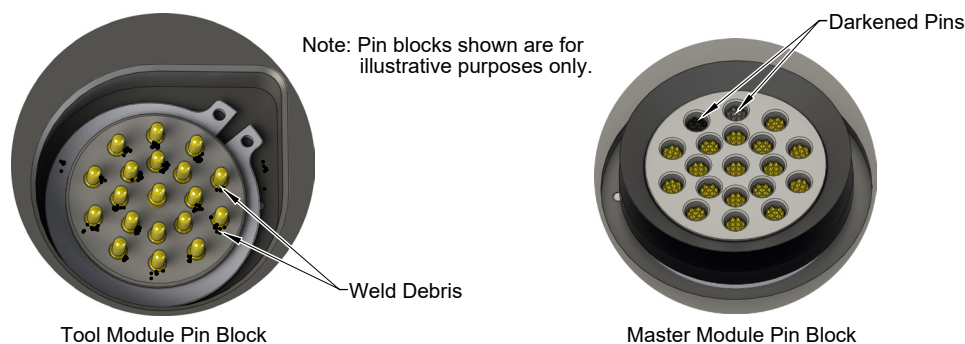
Table 5.2—Maintenance Checklist	
Monthly Maintenance:	
☐	Clean mating surfaces.
☐	Inspect modules for leaks. Replace components as necessary.
6 months or 50,000 cycle Maintenance:	
☐	On modules with self-sealing ports, remove and replace self-sealing valve O-rings and seals. Inspect valve components. Replace as necessary. Refer to 5.10 and 5.11 .
☐	Inspect rubber bushings for wear, abrasions, or cuts. Replace as needed. Refer to 5.6 .
☐	Inspect couplers for fluid leaks. Replace couplers as necessary.
☐	Check that module mounting bolts are secure. Refer to Section 3—Installation .

5.3 Pin Block Inspection and Cleaning

Tools required: Nylon Brush (ATI part number 3690-0000064-60)

1. Place Tool in a secure location.
2. Uncouple Master and Tool.
3. Turn off and de-energize all circuits.
4. Inspect the Master and Tool pin blocks for debris or darkened pins.

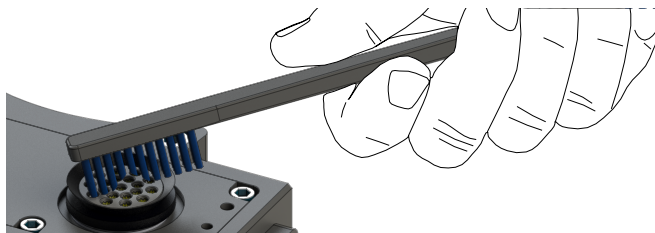
Figure 5.1—Inspect Master and Tool Pin Blocks



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).

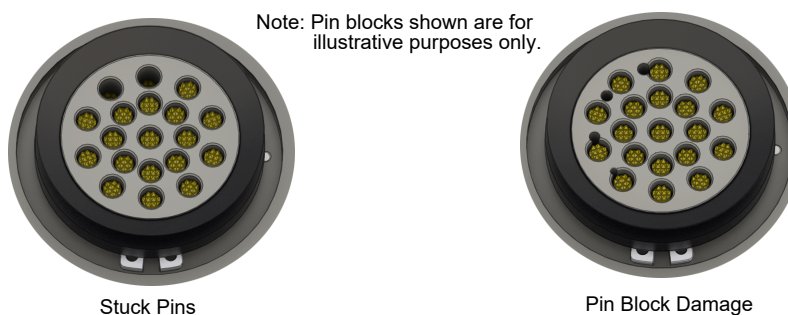
NOTICE: Do not use an abrasive media and/or cleaners or solvents to clean the contact pins. Using abrasive media and/or cleaners or solvents will cause damage to the contact surface or cause pins to stick. Clean contact surfaces with a vacuum or non-abrasive media such as a nylon brush (ATI part number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

Figure 5.2—Clean Pin Blocks with a Nylon Brush



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

Figure 5.3—Stuck Pin and Pin Block Damage



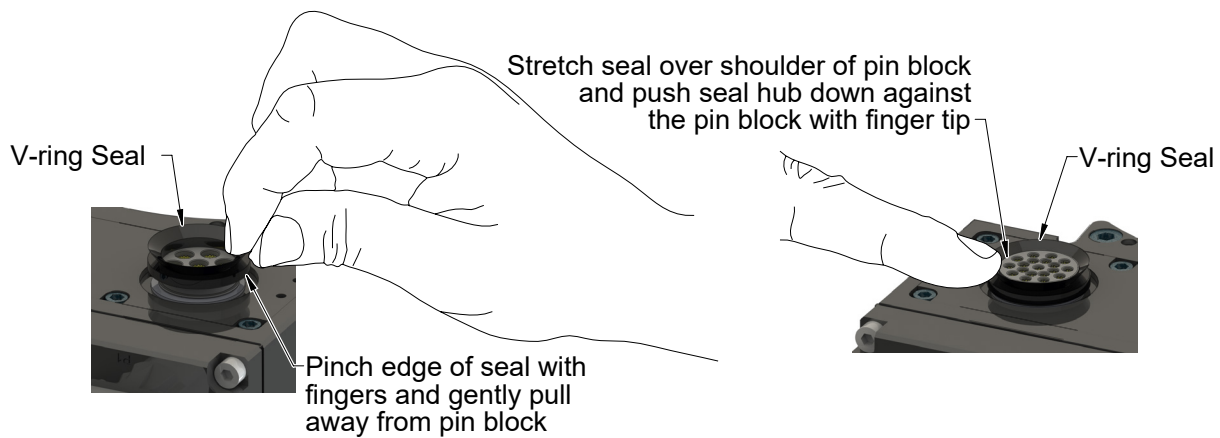
7. If pins become stuck or if there is damage to the pin block, contact ATI for either a possible pin replacement procedure or module replacement.
8. Safely resume normal operation.

5.4 Seal Replacement

The seal protects the electrical connection between the Master and Tool module. Replace the seal if it becomes worn or damaged.

1. Place Tool in a secure location.
2. Uncouple Master and Tool.
3. Turn off and de-energize all circuits.
4. To remove the existing seal, pinch the edge of the seal and pull the seal away from the pin block on the Master module.
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.
7. Safely resume normal operation.

Figure 5.4—V-ring Seal Replacement

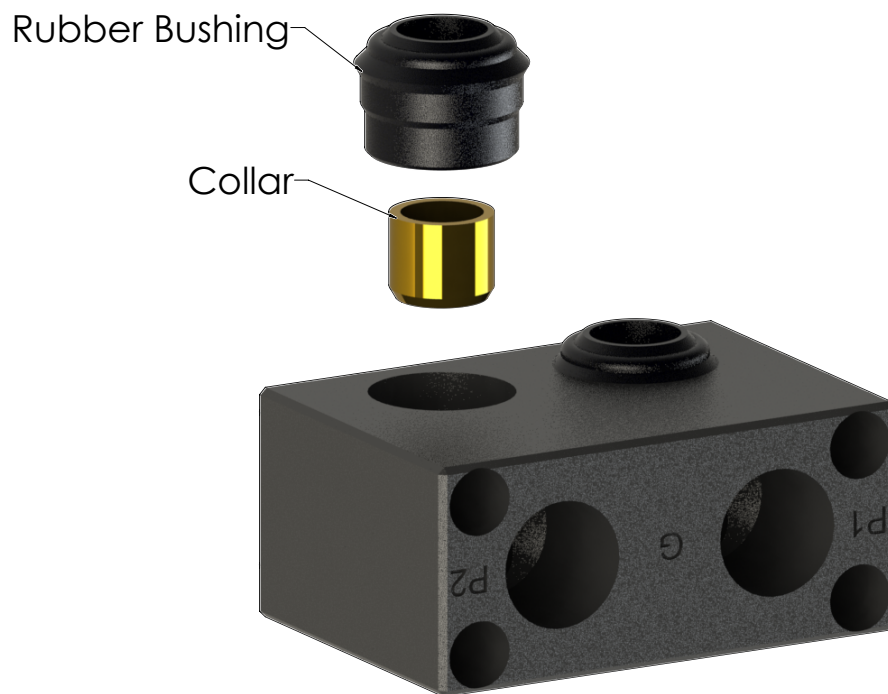


5.5 Rubber Bushing Replacement

The rubber bushing protects the fluid-air connection between the Master and Tool module. Replace the bushings if they become worn or damaged.

1. Place Tool in a secure location.
2. Uncouple Master and Tool.
3. Turn off and de-energize all circuits.
4. Remove existing bushing by pinching the edges of the bushing and pulling straight out.
 - Some ports include an interior collar. Set collar aside.
5. Install a new bushing by inserting it directly into the port.
 - If applicable, ensure collar is placed within rubber bushing after bushing is installed.
6. Safely resume normal operation.

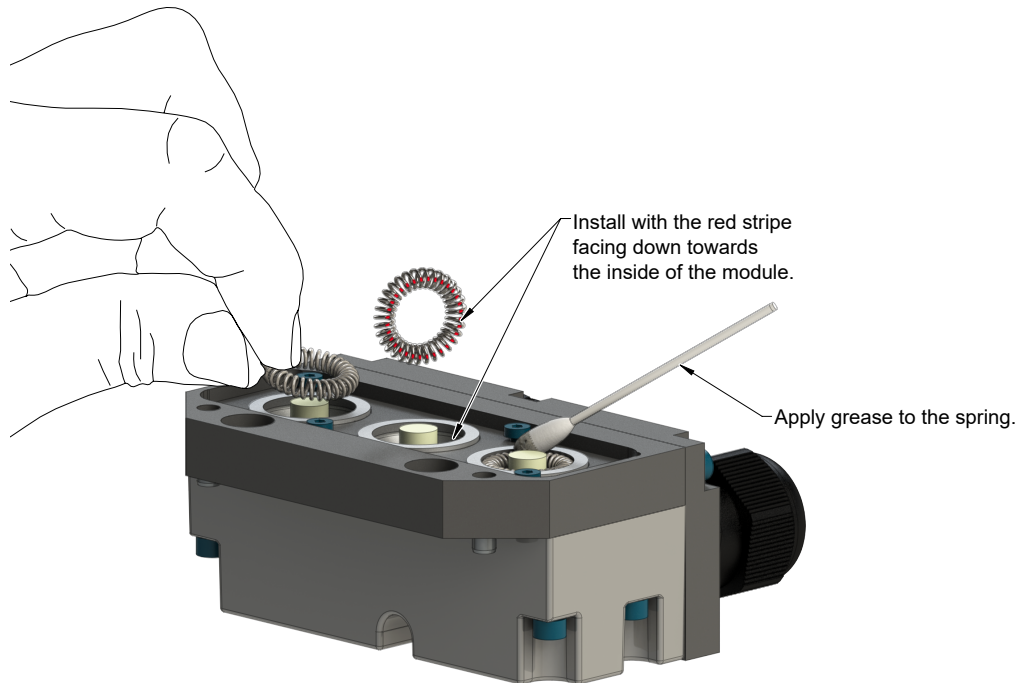
Figure 5.5— Rubber Bushing Replacement



5.6 Spring Replacement

This procedure is applicable to high current modules with canted coil springs, such as the PY4X module series.

Figure 5.6—Spring Replacement



Tools required: Clean towel

Supplies required: ATI #0290-70-0000-70-016 contact grease

1. Place Tool in a secure location.
2. Uncouple Master and Tool.
3. Turn off and de-energize all circuits.
4. Pick the springs from the module housing.
5. Use a towel to clean the contact surfaces.
6. Insert new springs with the red stripe facing down.
7. Apply ATI #0290-70-0000-70-016 contact grease to the springs.
8. Safely resume normal operation.

5.7 Master High Current Module Insulator Post and Contact Replacement

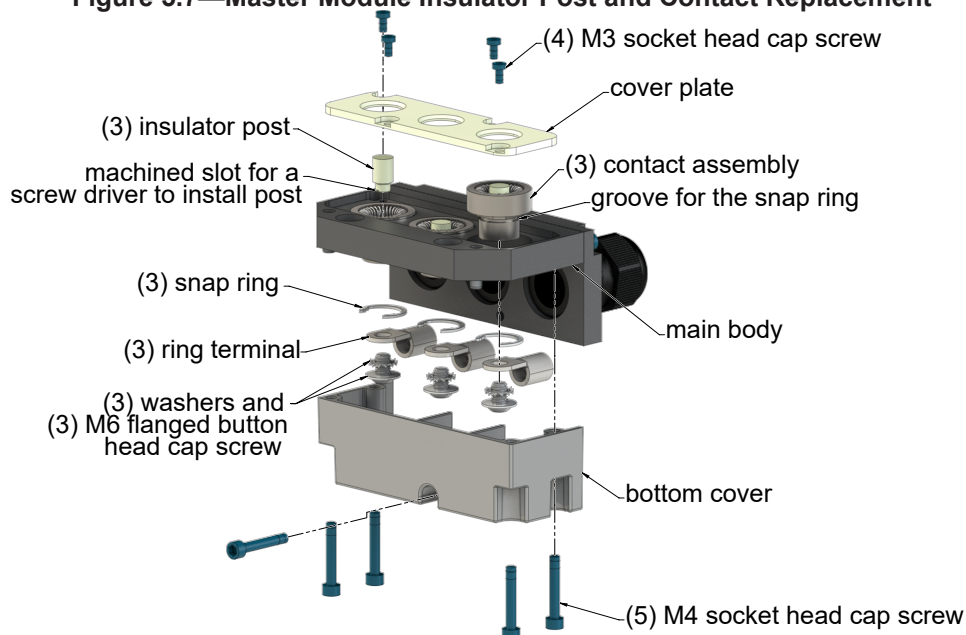
This procedure is applicable to high current modules with serviceable contact parts, such as the PY4X module series.

NOTICE: Always replace Master and Tool contact tips at the same time. Failure to change both halves of a mating pair will result in decreased life of new component.

Tools required: 2.5 mm, 3 mm, and 4 mm hex key, torque wrench, pliers, flat head screw driver

Supplies required: Loctite® 425 and Loctite® 222

Figure 5.7—Master Module Insulator Post and Contact Replacement



Note: Cables are not shown for better clarity

Removal:

1. Remove (5) M4 screws to remove bottom cover.
2. Remove (3) M6 button screws and (3) washers from contact assemblies.
3. If only removing the insulator posts:
 - a. Use screw driver to remove insulator posts from contact assemblies.
 - b. Go to step 5.
4. If removing contact assemblies:
 - a. Remove insulator posts with screw driver.
 - b. Remove (4) M3 screws to remove cover plate.
 - c. Use pliers to remove (3) snap rings from bases of contact assemblies.
 - d. Remove contact assemblies.
 - e. Go to step 6.

Installation:

5. If only installing the insulator posts:
 - a. Apply Loctite 425 to insulator post threads.
 - b. Insert insulator posts into contact assemblies.
 - c. Tighten posts to 0.67 Nm.
 - d. Go to step 8.
6. If installing contact assemblies and insulator posts:
 - a. Place contact assemblies in main body.
 - b. Secure contact assemblies with snap rings.
 - c. Apply Loctite 222 to (4) M3 cover plate screws.
 - d. Tighten (4) M3 screws to 0.67 Nm.
 - e. Apply Loctite 425 to insulator post threads.
 - f. Insert insulator posts into contact assemblies.
 - g. Tighten posts to 0.67 Nm.
7. Secure ring terminals to contact assemblies:
 - a. Insert (3) M6 button screws with washers through ring terminals and in contact assembly.
 - b. Tighten (3) M6 screws to 5 Nm.
 - Install and torque middle screw first.
8. Install bottom cover on main body:
 - a. Apply Loctite 222 to (5) M4 screws.
 - b. Install (5) M4 screws. Tighten to 0.67 Nm.

5.8 Tool High Current Module Contact Replacement

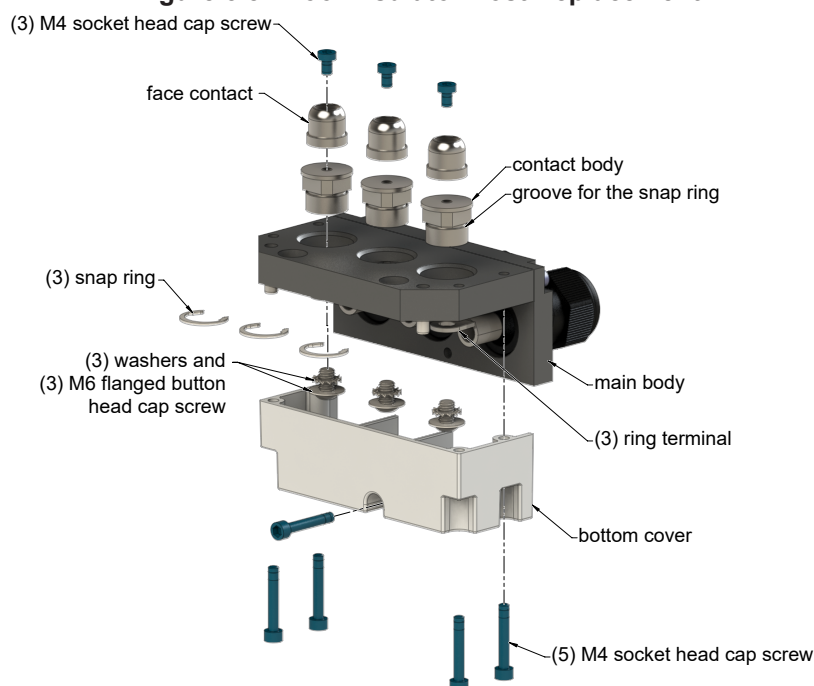
This procedure is applicable to high current modules with serviceable contact parts, such as the PY4X module series.

NOTICE: Always replace Master and Tool contact tips at the same time. Failure to change both halves of a mating pair will result in decreased life of new component

Tools required: 3 mm and 4 mm hex key, torque wrench, pliers

Supplies required: Loctite® 222

Figure 5.8—Tool Insulator Post Replacement



Note: Cables are not shown for better clarity

Removal:

1. If only replacing face contacts:
 - a. Use 3 mm hex tool to remove the (3) M4 screws to remove face contacts.
 - b. Go to step 4.
2. If replacing contact bodies:
 - a. Use 3 mm hex tool to remove the (3) M4 screws to remove face contacts.
 - b. Use 3 mm hex tool to remove (5) M4 screws to remove bottom cover.
 - c. Use 4 mm hex tool to remove (3) M6 button screws. Remove (3) washers.
 - d. Use pliers to remove (3) snap rings from contact body base.
 - e. Remove contact bodies.
 - b. Secure contact bodies with snap rings.
 - c. Insert (3) M6 button screws with washers through ring terminals and into contact bodies.
 - d. Use 4 mm hex tool to tighten (3) M6 screws to 6 Nm.
 - Install and torque middle screw first.
 - e. Place bottom cover on main body.
 - f. Apply Loctite 222 to (5) M4 screws.
 - g. Use 3 mm hex tool to install (5) M4 screws and secure bottom cover.
 - h. Tighten to 0.67 Nm.
 - i. Go to step 4.

Installation:

3. If installing the contact bodies:
 - a. Insert contact bodies into main body.
4. Installing face contacts:
 - a. Place face contacts on contact bodies.
 - b. Apply Loctite 222 to (3) M4 screw threads.
 - c. Use 3 mm hex tool to install (3) M4 screws and secure contact faces to contact bodies
 - d. Tighten to 0.67 Nm.

5.9 Master Side Self-Sealing Valve Replacement

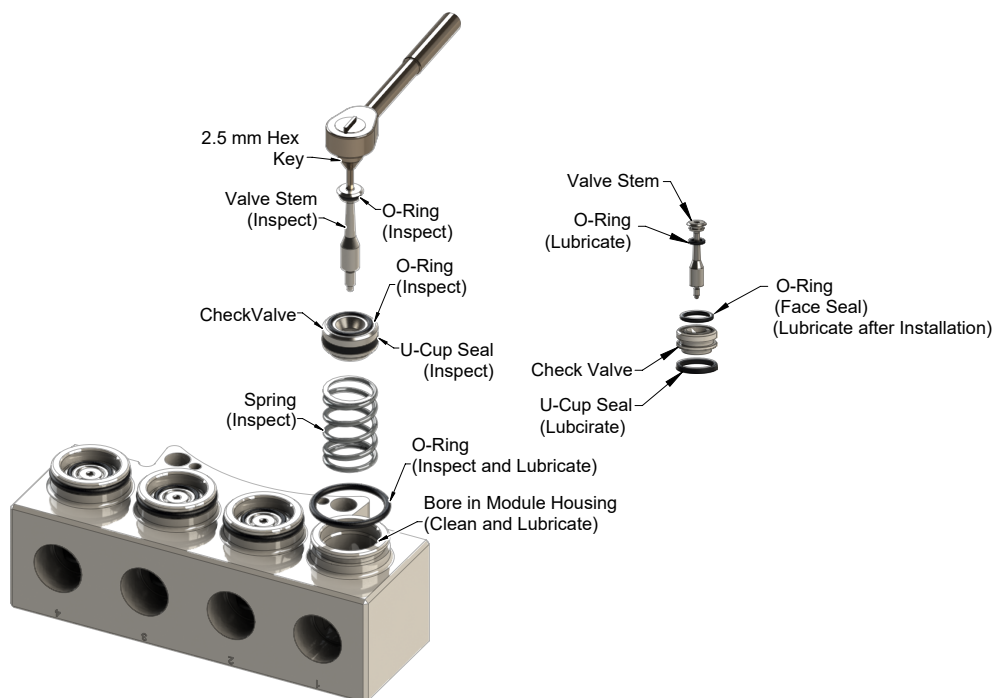
This procedure is applicable to any fluid-air module with self-sealing valves.

Tools required: 2.5 mm hex key, torque wrench, flat head screw driver

Supplies required: Clean rag, Magnalube G lubricant, Loctite 7649 and 222

WARNING: Debris can be expelled at high velocity during the purge, take all required precautions.

Figure 5.9—Master Self-Sealing Valve



1. Purge and disconnect all customer plumbing connections to the module:
 - a. Turn the supply lines off.
 - b. Cover the valves with a rag for safety.
 - c. Manually actuate valves to purge line.
 - d. Remove connections to module.
2. Remove valve stem with a 2.5 mm hex tool.
3. Remove the check valve piston and spring.
4. Clean any lubrication from check valve piston, valve stem, spring, and bore with a clean rag.
5. Inspect valve stem. Replace if bent.
6. Inspect O-rings and U-cup seal on valve stem and check valve piston for wear and damage. Replace any worn components.
7. Inspect spring in the assembly. Replace if worn.
8. Inspect the O-ring on the outside of the bore.
9. Clean the mating surfaces of the module.
10. Lubricate module housing bore with Magnalube G.
11. Install, then lubricate O-ring on outside of module housing bore with Magnalube G.
12. If replacing seals, lubricate valve stem o-ring and U-cup seal with Magnalube G.
13. Install the O-ring on the valve stem.
14. Install U-cup seal on check valve. Avoid lubricating face seal groove in check valve.
15. Install non-lubricated O-ring into check valve.
16. Install spring into module housing. Seat the check valve on the spring.
17. Apply Loctite 7649 and 222 to valve stem threads.
18. Install valve stem:
 - a. Push check valve piston flush with mating surface module housing.
 - b. Use a flat-head screwdriver to ensure U-cup seal is fully located in the recess and not folded over.
 - c. Install threaded end of valve stem. Do not damage U-cup seal around check valve piston.
 - d. Tighten stem to 2.8 Nm.
19. Lubricate installed O-ring (face seal) with Magnalube G.

5.10 Tool Side Self-Sealing Valve Replacement

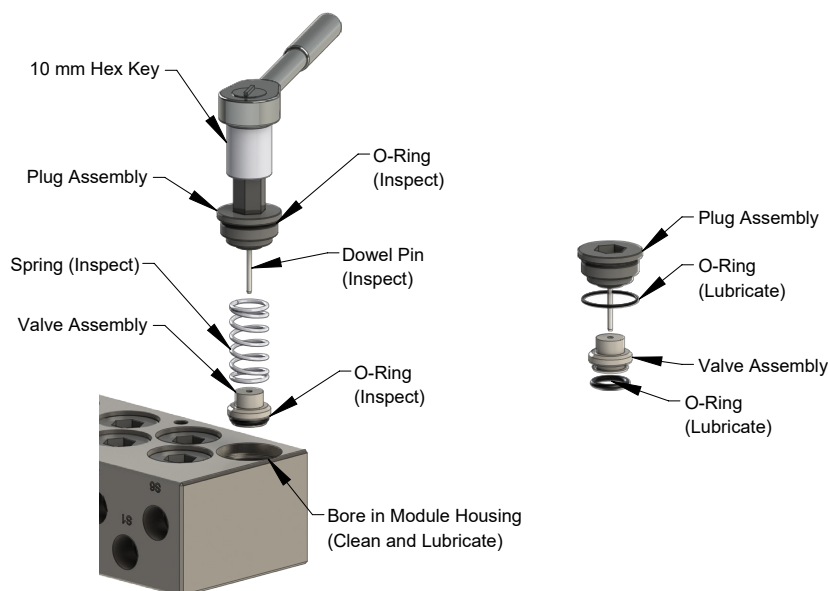
This procedure is applicable to any fluid-air module with self-sealing valves.

Tools required: 10 mm hex key, Torque wrench

Supplies required: Clean rag, Magnalube G lubricant

WARNING: Debris can be expelled at high velocity during the purge, take all required precautions.

Figure 5.10—Tool Self-Sealing Valve Replacement



1. Purge and disconnect all customer plumbing connections to the module.
 - a. Turn off all supply lines.
 - b. Cover the valves with a rag for safety.
 - c. Manually actuate valves to purge line.
 - d. Remove connections to the module.
2. Remove plug assembly from air module using 10 mm hex tool.
3. Remove spring and valve from housing.
4. Clean lubrication from plug, valve, spring, module housing bore with clean rag.
5. Inspect dowel in plug. Replace if bent.
6. Inspect O-rings on plug and valve. Replace if worn.
7. Inspect spring in assembly. Replace if worn.
8. If replacing O-rings, lubricate new O-rings with Magnalube G.
9. Install O-rings on plug and the valve.
10. Install valve. Ensure it's seated properly.
11. Install spring into housing. Ensure it is installed over step on valve.
12. Install plug:
 - a. Aligning dowel pin into valve piston
 - b. Thread plug into housing by hand until several threads are engaged.
13. Tighten plug using 10 mm hex tool to 3.39 Nm.
14. Verify check valve piston is seated properly.



CAUTION: Do not use excess force when installing plug into housing. Using excessive force can damage O-ring and strip the threads on plug.

5.11 High Current Module Contact Tip Replacement

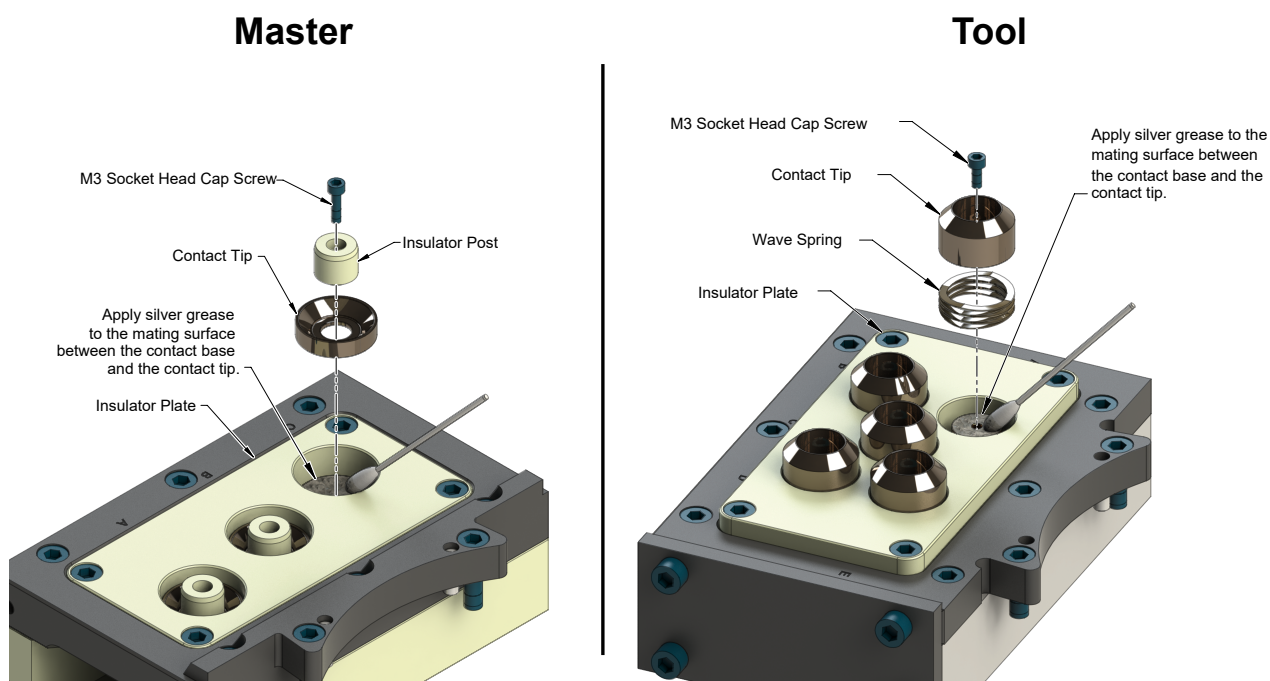
This procedure is applicable to any high current module with serviceable contact tips, such as the PA2X series.

Tools required: 2.5 mm hex key, torque wrench

Supplies required: Non-hardening, conductive silver bearing grease (ATI 0290-70-0000-50-008, McMaster-Carr #1219K57, AI Technology #ELGR8501 or equivalent)

NOTICE: Always replace Master and Tool contact tips at the same time as pairs. Failure to change both halves of a mating pair will result in decreased life of the new component.

Figure 5.11—Contact Tip Replacement: Master and Tool



Master Module Removal:

1. Uncouple Master and Tool.
2. Turn off and de-energize all circuits.
3. Remove M3 screw from insulator post.
4. Remove insulator post and contact tip. Discard contact tip.

Master Module Installation:

5. Apply thin film of non-hardening, conductive silver bearing grease with a volume resistivity of 0.001 ohm-cm minimum to mating surface between contact base and new contact tip.
6. Insert new contact tip into the insulator plate
7. Reinstall center insulator post.
8. Insert M3 screw into insulator post and
9. Tighten 1.1 Nm.

Tool Module Removal:

1. Uncouple Master and Tool.
2. Turn off and de-energize all circuits.
3. Remove M3 screw from contact tip.
4. Remove contact tip and wave spring from insulator plate and discard.

Tool Module Installation:

5. Apply liberal amount of non-hardening, conductive silver bearing grease with a volume resistivity of 0.001 ohm-cm minimum to the mounting surface between new contact tip and contact base.
6. Insert new wave spring and new contact tip into the insulator plate.
7. Insert M3 screw into contact tip
8. Tighten to 1.1 Nm

6. Troubleshooting

The following section provides troubleshooting information to help diagnose conditions with the Tool Changer utility modules and service procedures to help resolve these conditions.



WARNING: Do not perform maintenance or repair(s) on Tool Changer or modules unless Tool is safely supported in tool stand, all circuits are turned off, connections are purged and power is discharged. Injury or damage can occur with the Tool not placed and energized circuits on.

Table 6.1—Troubleshooting

Symptom	Possible Cause	Correction
Loss of communication	Object trapped between modules.	Remove the object, then re-attempt coupling.
	Contact contaminated	Ensure spring-loaded contacts on Tool side can move freely and are not bound by debris. Refer to 5.12 . Clean spring pins and Tool-side module contacts. Refer to 5.3 .
	Worn or damaged contact pins	Any contamination on the contacts should be removed using a stiff nylon brush.
	Module contact damage due to coupling/uncoupling under load.	Revise operating procedures to only couple/uncouple with power disconnected and discharged. Replace module contacts. Refer to 5.8 , 5.9 , and 5.12 .
	Connector or cable damage	Inspect cables and contact base for damage. Test cables and contacts. Ensure all connections are clean and tight.
	Servo module damaged	Replace module.
	Drive or motor damaged	Replace module.
	Batteries lost voltage.	Replace batteries.
Unit will not lock or unlock	Debris caught between Master and Tool	Clean debris from between Master and Tool. Verify mounting fasteners are secure and do not protrude above mating surfaces.
	Ball bearings not moving	Verify ball bearings are moving freely, clean and lubricate as needed.
	Air supply not to specifications	Air supplied to Tool Changer insufficient, improper valve used. Refer to Tool Changer manual for pneumatic requirements.
	Exhaust port not properly vented	Check that exhaust port is properly vented.
	Dirty card edge connection	Card edge connection must be cleaned.
	Incorrect valve operation	Check valve for proper operation. <i>Refer to Tool Changer Manual.</i>
	Signals are mapped incorrectly	Verify signals are mapped and communicating properly.
Sensors not operating properly	Sensor cables damaged or incorrectly connected	Verify cables are connected and not damaged. Replace if damaged.
	Sensor is malfunctioning	Verify sensors are set correctly.
	Tool plate not secured properly or debris between surfaces	Ensure Tool plate is securely held to Master plate and nothing is trapped between plates.
	Air trapped in unlock (U) air port	Ensure there is no air trapped in unlock (U) air port.
Air Leakage or reduced air flow	Flow path blockage.	Inspect valve components and supply/return lines for blockage. Clean/repair as necessary.
	Damaged/worn seals.	Replace O-rings, U-cup seals, and V-ring seals as needed.
	Debris blocking self-sealing valve	Clean in and around valve components. Ensure fluid stream is free of the large particulates; filter as necessary.
	Bent valve piston (for self-sealing valves).	Replace stem. Refer to 5.10 and 5.11 . Check robot program and ensure parallel approach trajectory during Tool Changer coupling.
	Corrosion.	Consult ATI Applications Engineering for assistance.
Vacuum Leakage.	Damaged/worn seals.	Replace seals as needed. Refer to 5.5 .

7. Warranty

The warranty is defined in the Terms and Conditions of the Sales Order Acknowledgement. If the product is used as intended, the warranty is valid from the ex-works delivery date for the duration of the warranty period under the following conditions:

- Observe the specified maintenance and lubrication intervals
- Observe the ambient conditions and operating conditions
- The product may only be used within the scope of its technical data.
- The product is intended for indoor industrial use. Use in outdoor spaces is only permitted if suitable protective measures are taken against outdoor exposure. The product is not suitable for use in salty air or high humidity environments.
- Appropriate use of the product includes compliance with all instructions in this manual.
- Any utilization that exceeds or differs from the appropriate use is regarded as misuse.
- Never disconnect or connect the module while a medium is being transferred.
- Incorrect ambient and operating conditions can make the product unsafe, leading to risk of injuries, equipment damage, and/or significant reduction to product life span.
- Parts touching the workpiece and wear parts are not included in the warranty.