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F. High-Current Modules

MTC6A—High Current Module

1. Product Overview

The MTC6A modules provide a connection to customer tooling. When the modules are coupled, the V-ring seal forms a water resistant but not waterproof seal.

DANGER: This module has a voltage of 50V or greater; always remove power before contacting the module. Arcing and damage occur if power is not removed from the module during maintenance or service. Always remove power before attaching or disconnecting cables, separating or inserting the mating couplers, or making any contact with the Tool Changer or Utility Coupler.

CAUTION: Do not couple or uncouple the high-current modules unless electrical power has been disconnected and discharged both upstream and downstream from the modules. Arcing and contact damage will occur. Remove power and discharge both upstream and downstream modules before coupling or uncoupling modules.

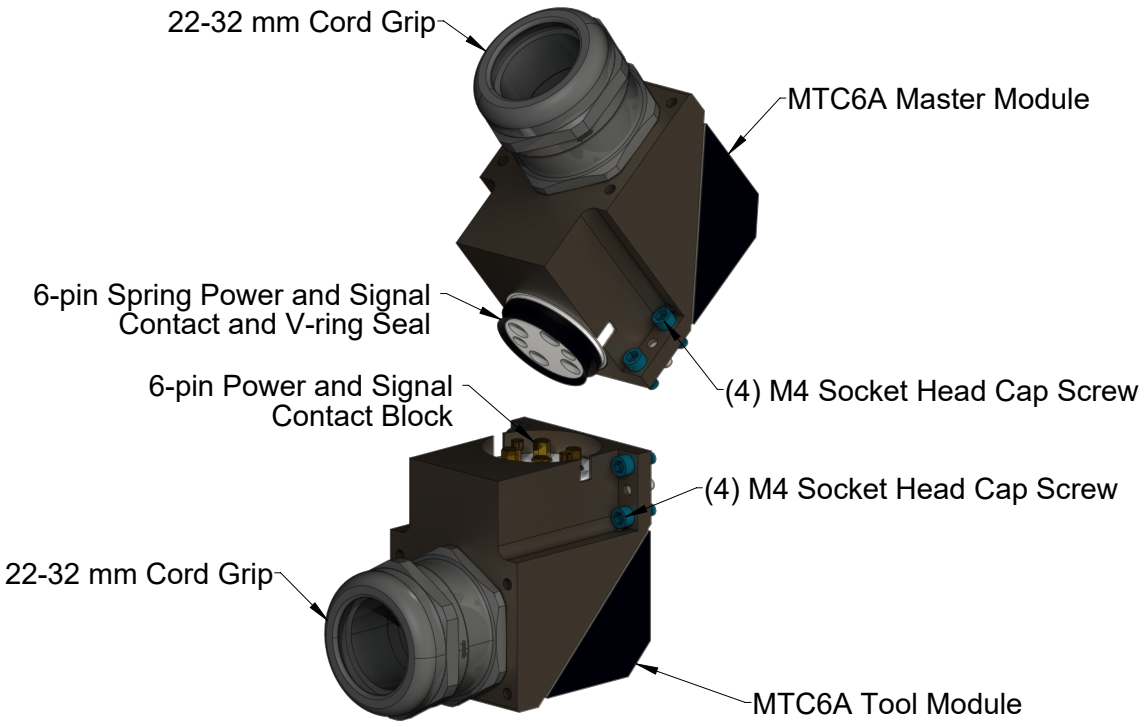
1.1 MTC6A Master

The MTC6A Master module includes: (1) 22-32 mm cord grip, V-ring seal, and serviceable connection components. The module has (4) internal power terminals and (2) internal signal terminals. Power terminal 1 provides an optional PE connection. Refer to *Section 8—Drawings* for additional information and connector details.

1.2 MTC6A Tool

The MTC6A Tool module includes (1) 22-32 mm cord grip and serviceable connection components. The module has (4) internal power terminals and (2) internal signal terminals. Power terminal 1 provides an optional PE connection. Refer to *Section 8—Drawings* for connector details and additional information.

Figure 1.1—MTC6A Modules



2. Installation

Electrical modules are typically installed by ATI prior to shipment. Installation and removal are outlined in the following section: For wiring information, refer to *Section 8—Drawings*.

DANGER: This module has a voltage of 50V or greater; always remove power before contacting the module. Arcing and damage occur if power is not removed from the module during maintenance or service. Always remove power before attaching or disconnecting cables, separating or inserting the mating couplers, or making any contact with the Tool Changer or Utility Coupler.

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 (for example: 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.

2.1 Cable Installation

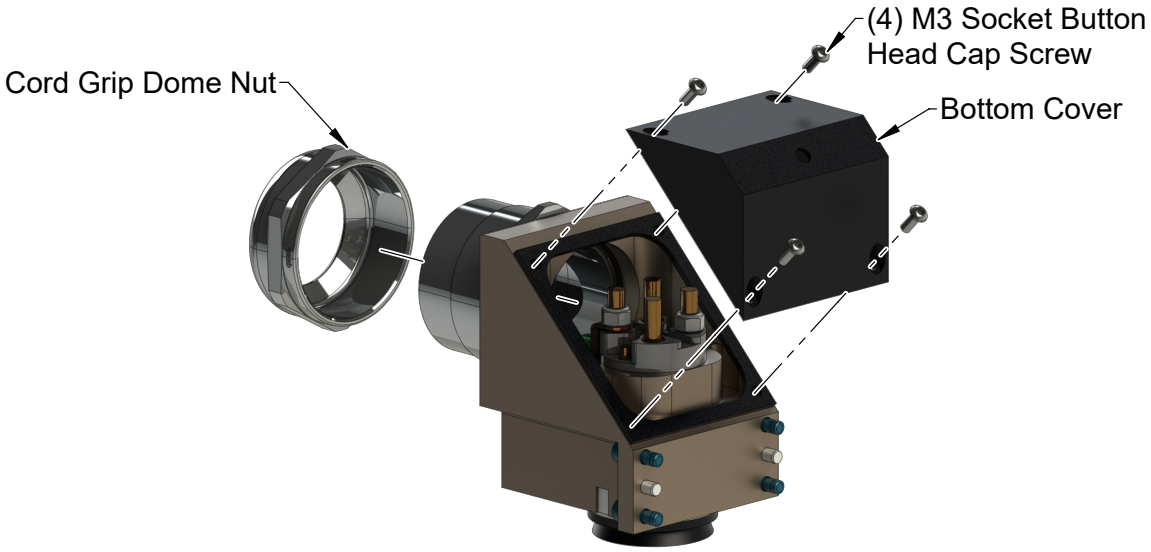
Parts required: *Nuts and ring terminals supplied with module p/n 9005-20-8740 (which includes: 9600-20-1401, 9600-20-1402, and 9600-20-1403)*

Tools required: *50 mm hex key, 2 mm hex key, 5.5 mm and 8 mm socket and ratchet wrench, crimping tool, wire strippers, heat gun, torque wrench*

Supplies required: *heat shrink, Loctite® 222, Loctite primer 7649*

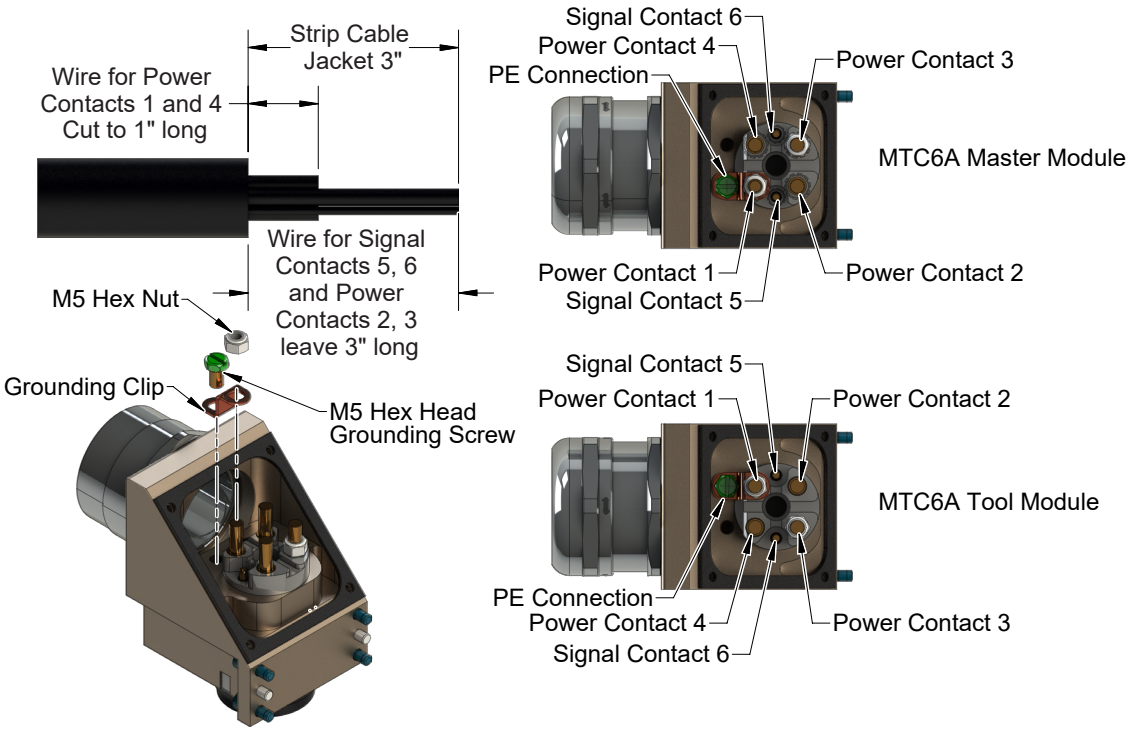
1. If already installed on the application, remove the module. Refer to *Section 2.3—Module Removal*.
2. Using a 2 mm hex key remove the (4) M3 socket button head cap screws securing the bottom cover to the module.
3. Using a 50 mm hex key remove the dome nut from the cord grip.

Figure 2.1—Remove Bottom Cover and Cord Grip



4. Refer to *Figure 2.2* to identify the power and signal contact terminals.
5. The PE connections is installed from ATI on Power Contact #1, if PE connection is not desired preform steps 5a, 5b, and 5c otherwise go to step 6.
   a. Remove the M5 hex nut using an 8 mm socket wrench.
   b. Using a phillips head screw driver remove the M5 hex head grounding screw and remove the grounding clip.
   c. Replace the M5 hex nut and tighten to 20 in-lbs (2.3 Nm) using an 8 mm socket wrench.
6. Strip the external cable jacket back 3", be careful not to cut internal wire insulation.
7. Cut the wires for the power contact 1 and 4 to 1" long.

Figure 2.2—Strip Cable Jacket and Identify Contact Terminals

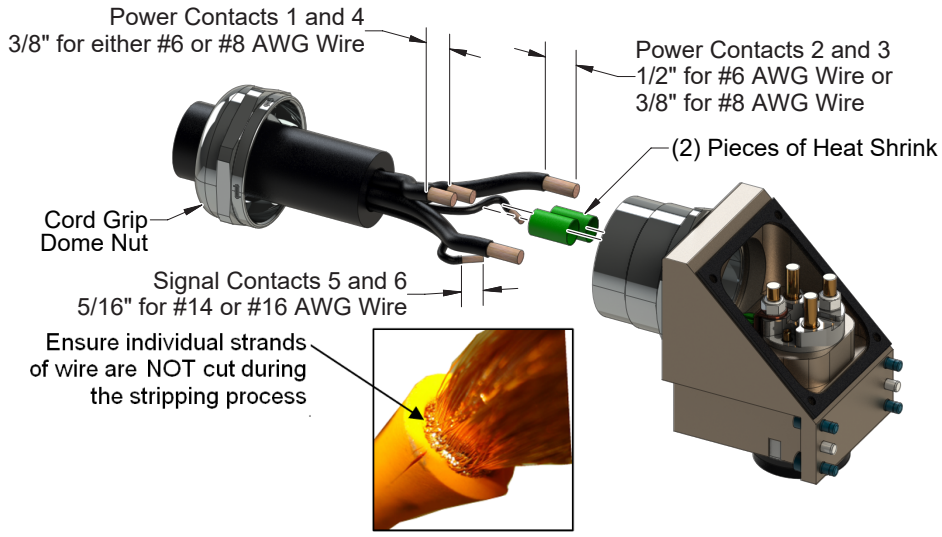


8. Slide the cord grip dome nut onto the cable, refer to *Figure 2.3*.
9. If using #8 AWG wire remove the (8) ring terminals from the plastic bag ATI part number 9600-20-1401. If using #6 AWG wire remove the (8) ring terminals from the plastic bag ATI part number 9600-20-1402.

NOTICE: ATI supplies spare parts in the kits in case parts are lost or improperly crimped. ATI also provides ring terminals for both #6 and #8 AWG wire. Not all of the parts are required for proper assembly.

10. Prepare the wire ends by stripping the insulation back. Be careful not to cut individual strands.
    a. For power contacts 2 and 3, if using #8 AWG wire strip the insulation back 3/8" for the flag ring terminals, if using #6 AWG strip the insulation back 1/2" for the flag ring terminals.
    b. Strip wire insulation 3/8" for power contacts 1 and 4.
    c. Strip wire insulation 5/16" for signal contacts 5 and 6.
    d. Cut (2) pieces of heat shrink 5/8" long to fit over the #1 and #4 power contact wires and ring terminals.
11. Slide the pieces of heat shrink over the power contact wire 1 and 4.

Figure 2.3—Wire Stripping



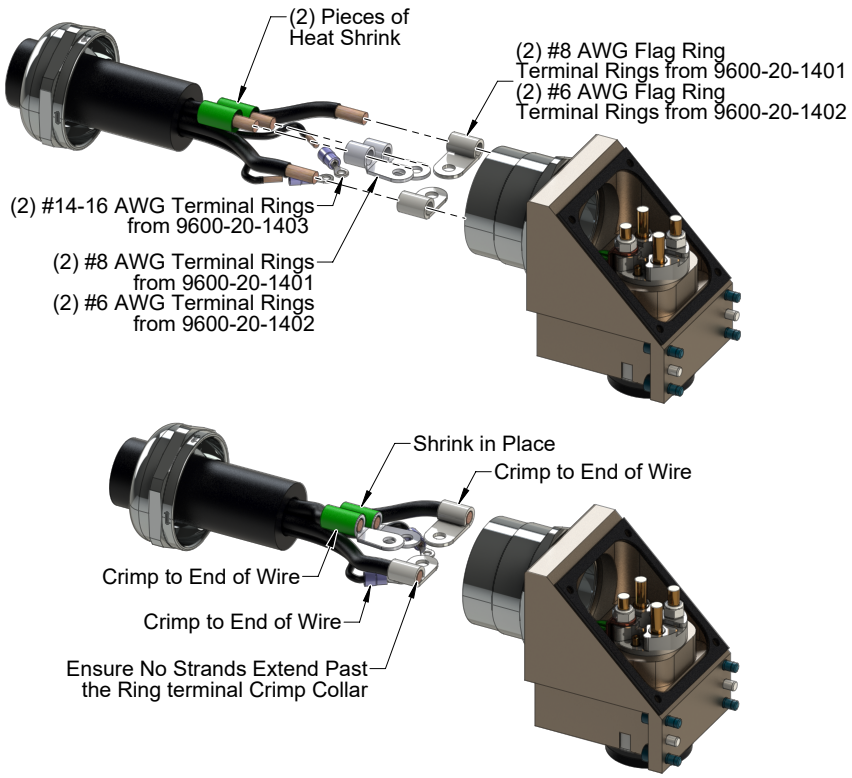
12. Slide ring terminals on the stripped ends of the wire and crimp ring terminals to the wire. Ensure no strands extend past the ring terminal crimp collar.

NOTICE: For power contacts 2 and 3 use the flag ring terminals, the terminals should be crimped in the opposite direction of one another and oriented facing up to fit properly as shown in *Figure 2.4.*

NOTICE: Not all Ring terminal crimping tool are suitable for flag ring terminals. Consult with the crimp tool manufacturer or ATI for suitable crimping tools.

13. For power contacts 1 and 4 slide the heat shrink over the ring terminal as shown in *Figure 2.4* and shrink in place using a heat gun.

Figure 2.4—Connecting the Ring Terminal

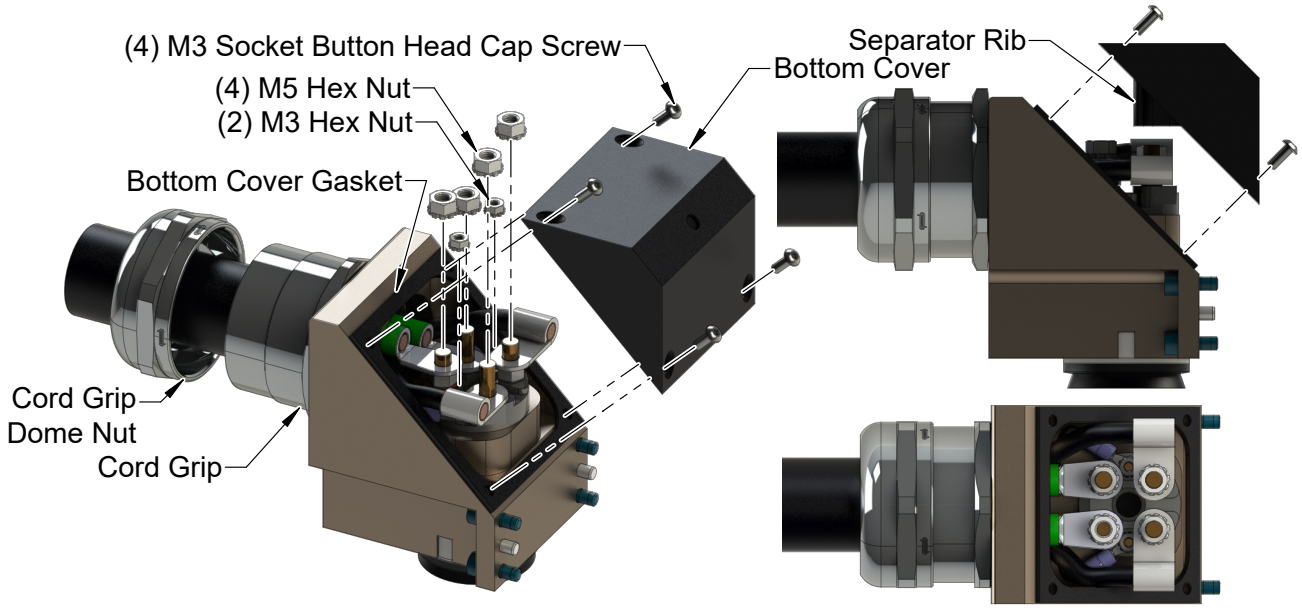


14. Remove the (4) ring terminals, (4) M3 hex nuts, and (4) M5 hex nuts from the plastic bag ATI part number 9600-20-1403.
15. Attach the signal contact 5 and 6, secure using (2) M3 hex nuts. Tighten to 12 in-lbs (1.5 Nm) using an 5.5 mm socket wrench.
16. Attach the power contact 2 and 3, secure using (2) M5 hex nuts. Tighten to 30 in-lbs (3.4 Nm) using an 8 mm socket wrench.
17. Attach the power contact 1 and 4, secure using (2) M5 hex nuts. Tighten to 30 in-lbs (3.4 Nm) using an 8 mm socket wrench.
18. Apply Loctite primer 7649 and Loctite 222 to the (4) M3 socket button head cap screws.
19. Make sure the bottom cover gasket is in place and install the bottom cover. Secure with (4) M3 socket button head cap screws using a 2 mm hex key. Tighten to 48 in-oz (34 N cm).

NOTICE: If bottom cover does not go on, cover is not oriented properly or ring terminals may not be positioned properly. Either rotate cover 180 degrees or reposition the ring terminals to allow the bottom cover separator rib to go in between the ring terminals. Refer to *Figure 2.5*.

20. Tighten the cord grip nut to secure the cable using a 50 mm hex key. Tighten until cable is secured, torque may vary depending on cable approximately 50 in-lbs (5.6 Nm).
21. Install module refer to *Section 2.2—Module Installation*.

Figure 2.5—Connecting the Ring Terminal



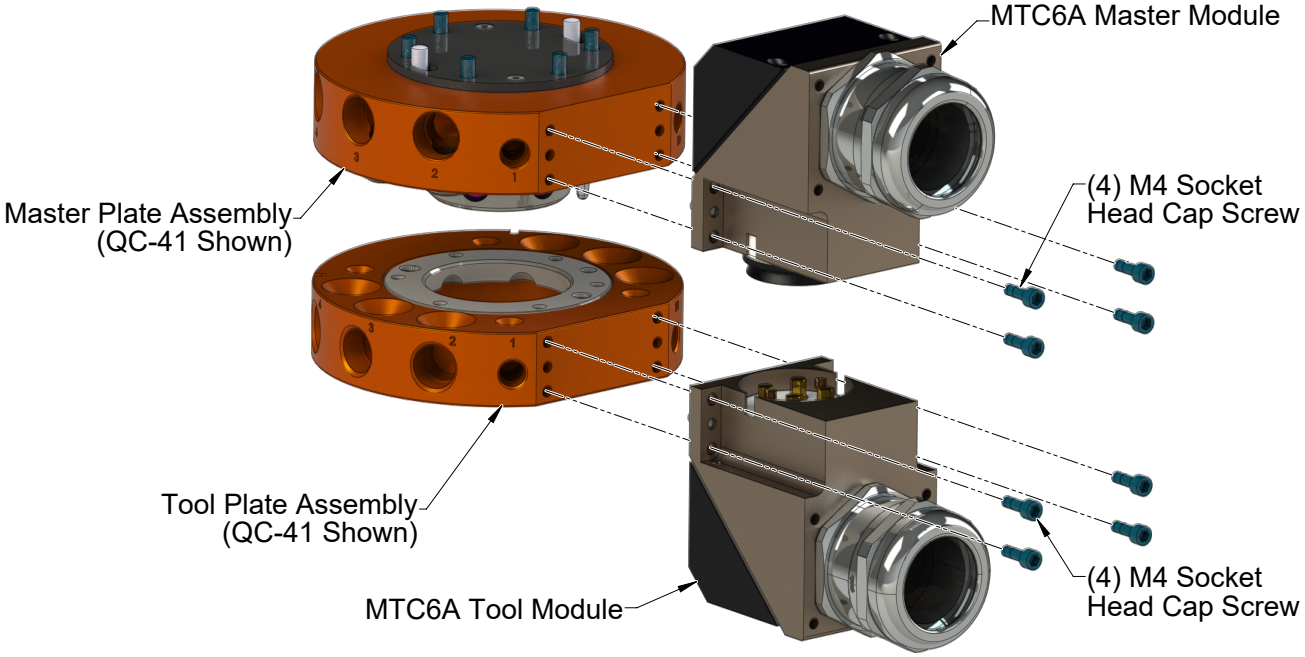
2.2 Module Installation

Tools required: *3 mm hex key, torque wrench*

Supplies required: *Clean rag and Loctite® 222*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits; for example: electrical, air ,water, etc.
4. Wipe down the mounting surfaces with a clean rag.
5. Align the optional module on the Master or Tool plate as shown in *Figure 2.6*.
6. Apply Loctite 222 to (4) M4 socket head cap screws.
7. Secure module with (4) M4 mounting fasteners using a 3 mm hex key and tighten to 15 in-lbs (1.69 Nm).
8. Safely resume normal operation.

Figure 2.6—Module Installation



2.3 Module Removal

Tools required: *3 mm hex key*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits; for example: electrical, air ,water, etc.
4. Disconnect any cables, air line, etc (if required).
5. Remove the (4) M4 socket head cap screws using a 3 mm hex key and lift the module from the Master or Tool plate.

3. Operation

High-current modules are designed to carry large currents to various industrial devices, to provide a separable joint in the power wiring. To maximize the service life of these components, the following points must be observed:

WARNING: The contacts are not a switch. For safety and to prevent equipment damage, disconnect and drain all power before coupling or uncoupling the Tool Changer or Utility Coupler.

CAUTION: Do not couple or uncouple the high-current modules unless electrical power has been disconnected and discharged both upstream and downstream from the modules. Arcing and contact damage will occur. Remove power and discharge both upstream and downstream modules before coupling or uncoupling modules.

CAUTION: Improper cable routing can result in wires and cables being pinched in the joint between the Tool Changer plates and premature failure of the electrical connectors. Properly route and secure all cables, particularly on the Master side.

4. Maintenance

Under normal conditions, no special maintenance is necessary; however, it is recommended that periodic inspections be performed to assure long-lasting performance and verify that unexpected damage has not occurred. Refer to the list below for periodic maintenance items.

DANGER: This module has a voltage of 50V or greater; always remove power before contacting the module. Arcing and damage occur if power is not removed from the module during maintenance or service. Always remove power before attaching or disconnecting cables, separating or inserting the mating couplers, or making any contact with the Tool Changer or Utility Coupler.

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 (for example: 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.

If the Tool Changer or Utility Coupler is used in dirty environments (for example: welding or deburring applications), limit the exposure of the Tool Changer or Utility Coupler. Idle Tool assemblies should be covered to prevent debris from settling on the mating surface. Also, the Master assembly should be exposed for only a short period of time during Tool change and down time. Perform the following visual inspection monthly:

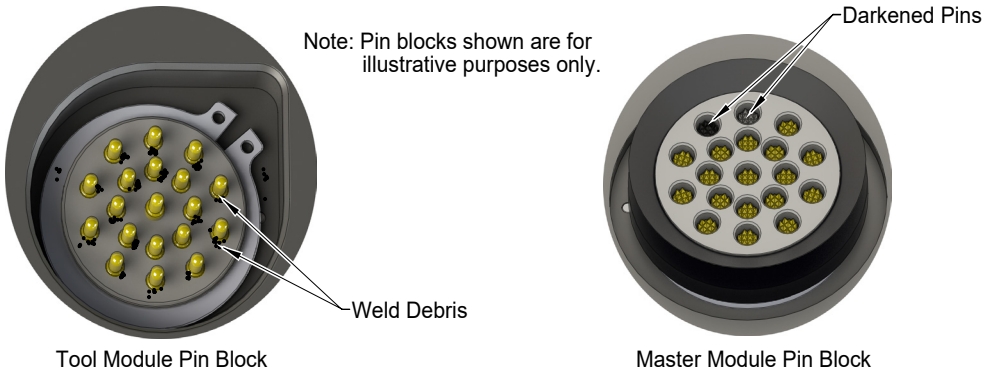
- Inspect mounting fasteners to verify they are tight. If loose, then tighten to the proper torque. Refer to *Section 2—Installation*.
- Cable connections should be inspected during maintenance periods to ensure they are secure. Loose connections should be cleaned and re-tightened, as appropriate. Inspect cable sheathing for damage, repair or replace damaged cabling. Loose connections or damaged cabling are not expected and may indicate improper routing and/or strain relieving.
- Inspect the Master and Tool pin blocks for pin damage, debris or darkened pins. Refer to *Section 4.1—Pin Block Inspection and Cleaning*.
- Inspect V-ring seals for wear, abrasions, and cuts. If worn or damaged, replace. Refer to *Section 5.2.1—Seal Replacement*.

4.1 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 (for example: electrical, pneumatic, and hydraulic circuits).
4. Inspect the Master and Tool pin blocks for debris or darkened pins.

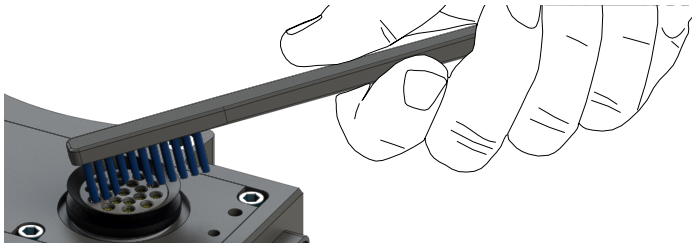
Figure 4.1—Inspect Master and Tool Pin Blocks



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).

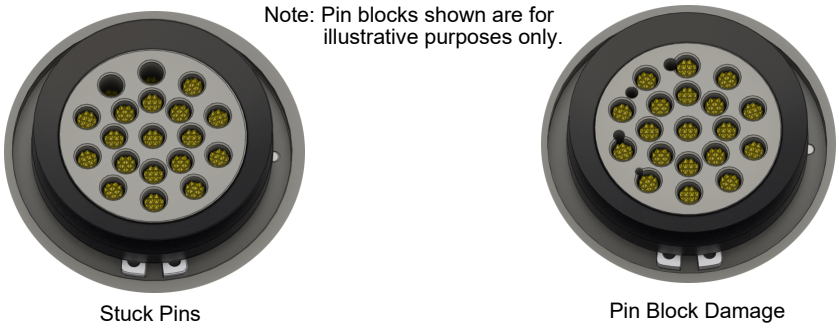
NOTICE: Do not use an abrasive media, cleaners, or solvents to clean the contact pins. Using abrasive media, cleaners, or solvents will cause damage to the contact surface, or cause pins to stick. Clean contact surfaces with a vacuum or non-abrasive media such as a nylon brush (ATI part number 3690-0000064-60)

Figure 4.2—Clean Pin Blocks with a Nylon Brush



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

Figure 4.3—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

The following section provides troubleshooting and service information to help diagnose conditions and repair the MTC6A modules.

DANGER: This module has a voltage of 50V or greater; always remove power before contacting the module. Arcing and damage occur if power is not removed from the module during maintenance or service. Always remove power before attaching or disconnecting cables, separating or inserting the mating couplers, or making any contact with the Tool Changer or Utility Coupler.

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

5.1 Troubleshooting

Troubleshooting information is provided in the following table:

Table 5.1—Troubleshooting

Symptom	Possible Cause	Correction
Signal(s) malfunctioning	Object trapped between modules	Remove object, then re-attempt coupling.
	Module contact pin contamination	Ensure that the spring pins on the Master side can move freely and are not bound by debris. Clean the spring pins to restore free operation. Clean Tool side module contacts, refer to *Section 4.1—Pin Block Inspection and Cleaning*. Inspect seal, replace if damaged refer to *Section 5.2.1—Seal Replacement*.
	Contact pin separation due to air supply to Tool Changer	Ensure that the Tool Changer has proper pneumatic connections and air is supplied to proper specification. Refer to Tool Changer section of this manual for air supply requirements.
	Coupling/uncoupling Tool Changer under load	Revise operating procedures to only couple/uncouple with power disconnected and discharged. Replace module contacts, refer to *Section 5.2.2—Master Power Spring Probe Replacement* or *Section 5.2.3—Master Signal Spring Probe Replacement* for the Master module and *Section 5.2.4—Tool Power Contact Replacement* or *Section 5.2.5—Tool Signal Spring Probe Replacement* for the Tool module.
	Cable damage: Pinched, torn, or fatigued cables	Examine cables for damage, perform a continuity test on cables and replace any bad cables. Inspect cables and contact base for damage, test cables, test contact springs, refer to *Section 5.1.1—Troubleshooting Sequence.*
	Loose cable connection	Cable Connection to terminal block loose, refer to *Section 2—Installation*.

5.1.1 Troubleshooting Sequence

DANGER: This module has a voltage of 50V or greater; always remove power before contacting the module. Arcing and damage occur if power is not removed from the module during maintenance or service. Always remove power before attaching or disconnecting cables, separating or inserting the mating couplers, or making any contact with the Tool Changer or Utility Coupler.

The following sequence is recommended for troubleshooting primary current problems:

1. First examine all the cables, cable connectors, and power sources for problems and correct as necessary.
2. Use a known good cable to bypass the modules and directly connect the supply to the load.
3. If the load does not operate properly with known good cables, the problem is in the supply or load. Troubleshoot these components using that manufacturer's procedures.
4. If the load operates properly, use the known good cables from the step 2 to connect between the supply and Master module. Use a second set of the known good cables to connect the Tool module to the load
5. If the load operates properly, the problem is in the old cables, which must be repaired or replaced.
6. If the load does not operate properly, the problem is in the high-current modules.
7. Externally, examine the modules for loose, missing, or damaged contacts replacing and tightening as necessary.
8. Remove the covers from the modules and insure that the cables have not come loose from the contact bases. Re-secure the cables as necessary. Refer to the cable installation section.
9. Use a hardwood dowel or other non-metallic, soft rod to push axially on the tool side contacts to verify free axial motion. If the springs under these contacts do not allow axial motion of the contacts, replace the springs accordingly as outlined above in the maintenance section.

If the above steps fail to restore proper operation contact ATI for service.

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5.2 Service Procedures

Component replacement and adjustment procedures are provided in the following section:

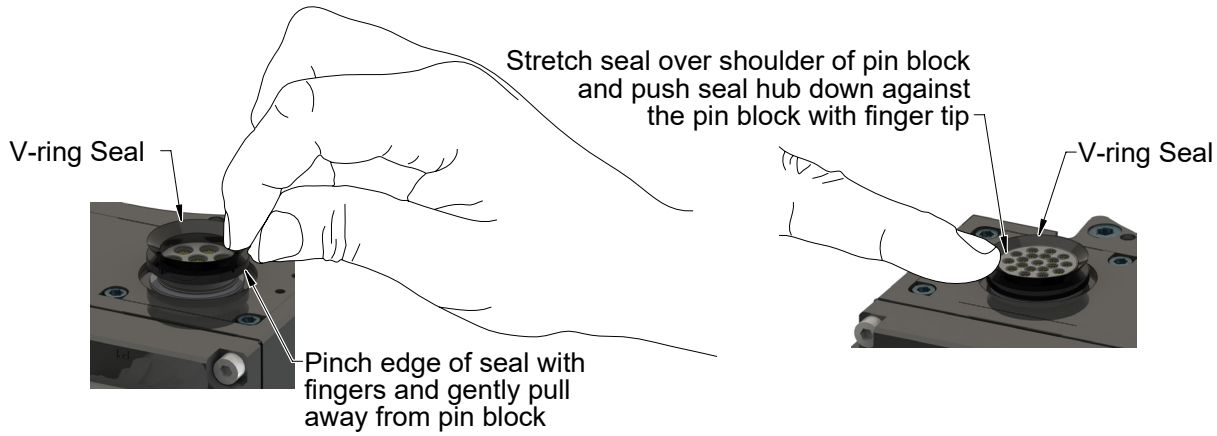
5.2.1 Seal Replacement

Parts required: *Refer to Section 8—Drawings.*

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

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, and hydraulic 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 5.1—V-ring Seal Replacement



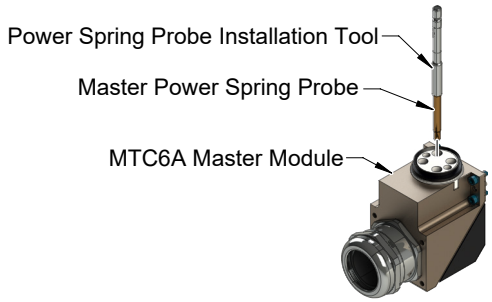
5.2.2 Master Power Spring Probe Replacement

Parts required: *Refer to Section 8—Drawings.*

Tools required: *power spring probe installation tool, 6 mm wrench, 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 (for example: electrical, pneumatic, and hydraulic circuits).
4. Use a power spring probe installation tool and a 6 mm wrench to unscrew the Master power spring probe and remove probe.
5. Install new Master power spring probe, use a power spring probe installation tool to tighten probe to 56 in-oz (40 N-cm).
6. Safely resume normal operation.

Figure 5.2—Master Power Spring Probe Replacement



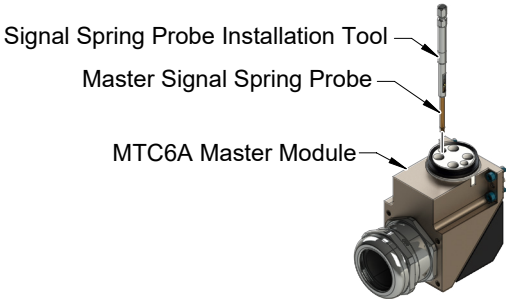
5.2.3 Master Signal Spring Probe Replacement

Parts required: *Refer to Section 8—Drawings.*

Tools required: *signal spring probe installation tool, 6 mm wrench, 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 (for example: electrical, pneumatic, and hydraulic circuits).
4. Use a signal spring probe installation tool and a 6 mm wrench to unscrew the Master signal spring probe and remove probe.
5. Install the new Master signal spring probe. Use a signal spring probe installation tool to tighten probe to 28 in-oz (20 N-cm).
6. Safely resume normal operation.

Figure 5.3—Master Signal Spring Probe Replacement



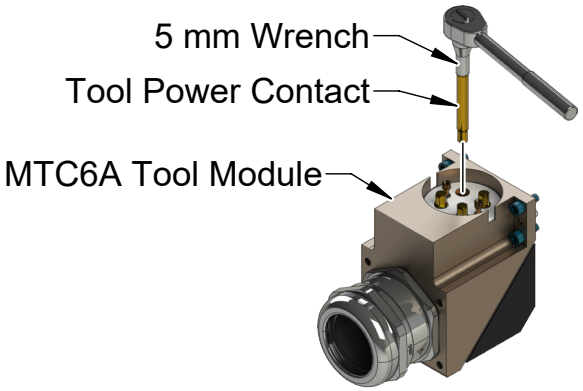
5.2.4 Tool Power Contact Replacement

Parts required: *Refer to Section 8—Drawings.*

Tools required: *5 mm wrench, 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 (for example: electrical, pneumatic, and hydraulic circuits).
4. Use 5 mm wrench to unscrew the Tool power contact and remove contact.
5. Install the new Tool power contact, use 5 mm socket to tighten probe to 56 in-oz (40 N-cm).
6. Safely resume normal operation.

Figure 5.4—Tool Power Contact Replacement

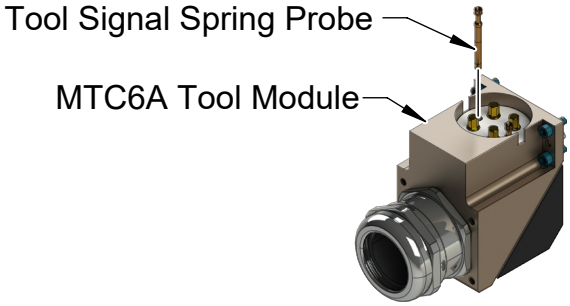


5.2.5 Tool Signal Spring Probe Replacement

Parts required: *Refer to Section 8—Drawings.l*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, and hydraulic circuits).
4. Pull the Tool signal spring probe out of the receptacle.
5. Push the new Tool signal spring probe into the receptacle.
6. Safely resume normal operation.

Figure 5.5—Tool Signal Spring Probe Replacement



6. Serviceable Parts

For mounting fasteners and accessories, refer to the following tables. For additional serviceable parts, refer to *Section 8—Drawings*.

6.1 Accessories

Table 6.1—Accessories	
Part Number	**Description**
3690-0000064-60	Brush, Blue Nylon All Purpose (Contact Pin Cleaning)

6.2 Third Party Accessories

Third party accessories to be purchased directly from the applicable manufacturer.

Table 6.2—Third Party Accessories			
Manufacturer	**Part Number**	**Description**	**Link**
Ingun	BIT-HSS-623M-600	Power Spring Probe Installation Tool	https://ingun.com/en-GB/BIT-HSS-623-M-600/BIT-HSS-623M-600
Ingun	BIT-HSS-150M-300	Signal Spring Probe Installation Tool	https://ingun.com/en-GB/BIT-HSS-150-M-300/BIT-HSS-150M-300

7. Specifications

Table 7.1—MTC6A Master Module Specifications	
9120-MTC6A-M	High Current 100A Master Module, 4 power + 2 brake pins, field wireable cord grip, radial exit, partially potted
Interface Connector(s)	Cord Grip with (4) internal power terminals and (2) signal terminals
Electrical Rating	Power: 100A, 600VDC Signal: 30A, 250VDC
Weight	1.7 lbs (0.77 kg)

Table 7.2—MTC6A Tool Module Specifications	
9120-MTC6A-T	High Current 100A Tool Module, 4 power + 2 brake pins, field wireable cord grip, radial exit, partially potted
Interface Connector(s)	Cord Grip with (4) internal power terminals and (2) signal terminals
Electrical Rating	Power: 100A, 600VDC Signal: 30A, 250VDC
Weight	1.6 lbs (0.73 kg)

8. Drawings

Drawings are available on the *ATI website* or by contacting an ATI representative.