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F. High Current Modules

PA21—High Current Module

1. Product Overview

The PA21 module carries high current from a power supply to customer tooling. The module features (3) plated copper contacts each capable of carrying 200 Amps; the voltage must not exceed 600 Volts. Power must be off when coupling and uncoupling. Over-current protection in the primary power supply circuit is recommended.

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 PA21 modules use advanced, patented, cone-mating technology to transfer current from the Master to the Tool. The mating conical surfaces provide misalignment capability and a large contact area, allowing efficient coupling/uncoupling without high spring forces or excessive wear. If required, the contact tips on either the Master or Tool can be replaced without removing the wiring. The contact tips on the Master side contain a central insulated post and are recessed below the surface. The Master module's contact pins are designed such that the average adult finger cannot reach the metallic parts.

The modules can accept cabling from either side by changing the position of the end cover plate. An "L" or "R" in the part number designates the direction of cable feed. An "A" in the part number designates the module is outfitted with a RobiFix connector (see table below and *Section 8—Drawings*). The standard or plain model requires a fitting plate with strain reliefs to attach customer cabling; some models utilize fixed connectors. For fitting plate assembly options, refer to *Section 1.1—Optional Fitting Plate Assemblies*. ATI requires the use of high-flex, finely-stranded cables and proper strain relief to allow for motion. The high current tool module provides axially compliant motion in the power contacts. Refer to *Section 2.1—Cable Preparation and Installation* for instructions.

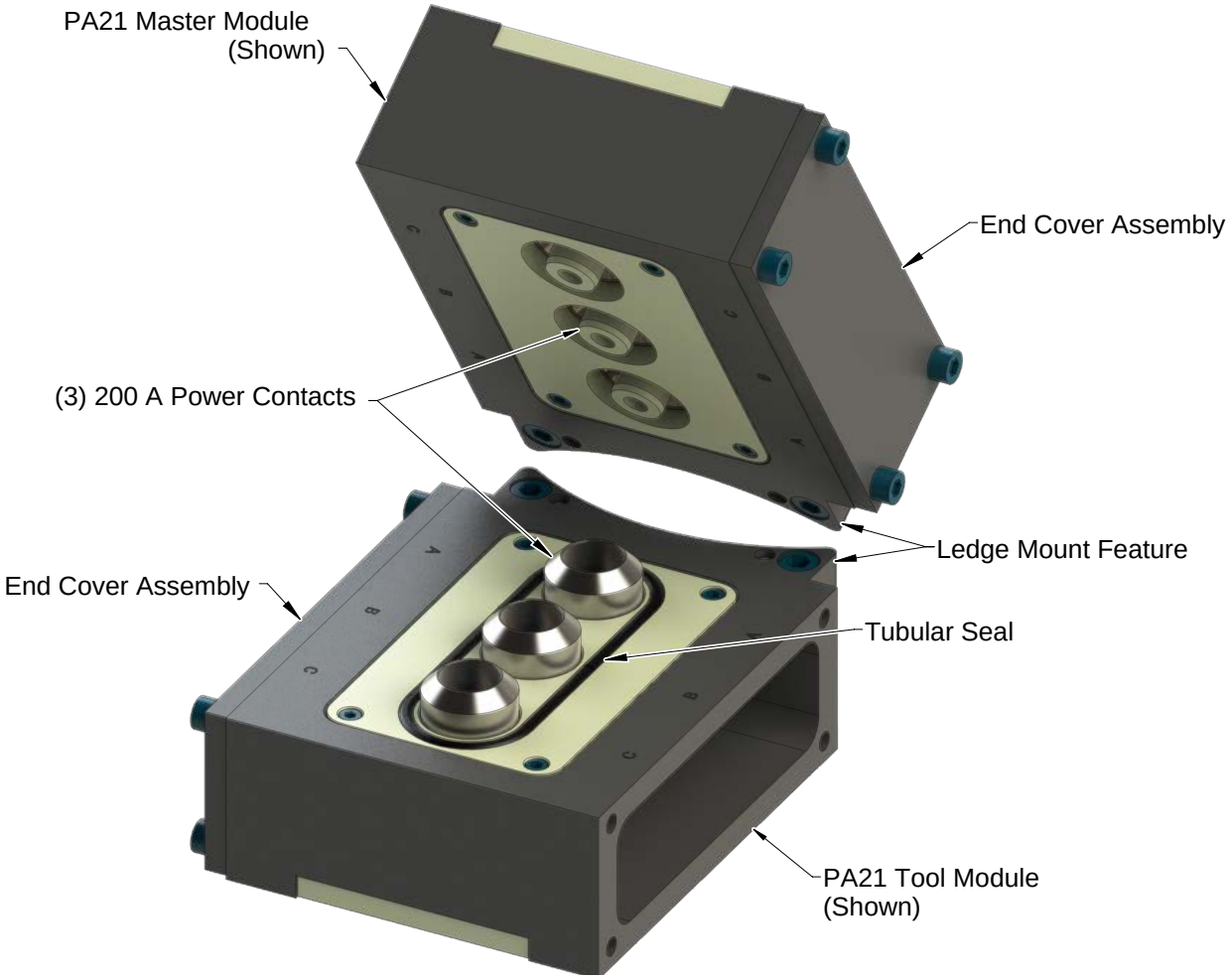
Table 1.1—High Current Modules

Module	Description/Connection
9121-PA21L-M	Plain[1,2] PA21-M, no connector, Left Feed
9121-PA21R-M	Plain[1,2] PA21-M, no connector, Right Feed
9121-PA21L-T	Plain[1,2] PA21-T, no connector, Left Feed
9121-PA21R-T	Plain[1,2] PA21-T, no connector, Right Feed
9121-PA21LA-M	PA21-M, Robifix connector[3], Left Feed
9121-PA21RA-M	PA21-M, Robifix connector[3], Right Feed
9121-PA21LAPX.XX-T	PA21-T, X.XX[4] m Robifix Pigtail[3], Left Feed
9121-PA21RAPX.XX-T	PA21-T, X.XX[4] m Robifix Pigtail[3], Right Feed

Notes:

1. Plain PA21 modules require a fitting plate with cord grips. For fitting plate assembly options, refer to *Section 1.1—Optional Fitting Plate Assemblies*.
2. Plain PA21 modules are rated for up to 200 Amps continuous.
3. PA21 modules with Robifix connectors or cable mounted Robifix connectors are limited to 150 Amps continuous due to the connector rating.
4. X.XX: length of module cable in meters

Figure 1.1 —PA21 Modules



When no module is used on the Tool side, a PAE-T cover may be supplied (per customer request) to protect the Master side power module from dust, debris, and weld spatter.

Figure 1.2—Protective Cover for Tool-side (PAE-T)



1.1 Optional Fitting Plate Assemblies

A fitting plate can integrate cord grips for customer-supplied cables. ATI supplies fitting plate assembly options in the following table. To know which fitting plate is best suited for an application, contact an ATI representative.

Table 1.2—Fitting Plate Assembly

Part Number		Description
	9005-20-2500	(1) Fitting plate assembly (material: aluminum) (3) M25x1.5 Cord grip, 9-16 mm cable diameter (material: nickel plated brass) (4) M5x40 socket head cap screws, 12.9, ISO4762/DIN912, ES-ATI-007
	9005-20-8887	(1) Fitting plate assembly (material: black Delrin) (3) M25x1.5 cord grips, 5-17 mm cable diameter (material: nylon) (4) M5 x 45 socket head cap screws, 18-8 stainless steel, DIN912-A2

2. Installation

On the standard model, a fitting plate is installed on the modules, the prepared cable ends are fed through the fitting plate into the modules, and the conductors are attached to the contact bases. For ease of cable installation, remove the modules from the Tool Changer. Ring terminals are supplied for use with #2 AWG and #4 AWG cables.

The following steps outline installation or removal of the module and also detail connecting cables to the contacts.



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: Do not use stiff, heavy stranded cables which can inhibit operation of the high current module. Stiff cables can prevent compliant motion of the contacts and cause an intermittent or improper power connection. Operation of the high current module requires the customer supplied cables to be high-flex type with fine stranding and sufficient strain relief to allow free cable motion.



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.

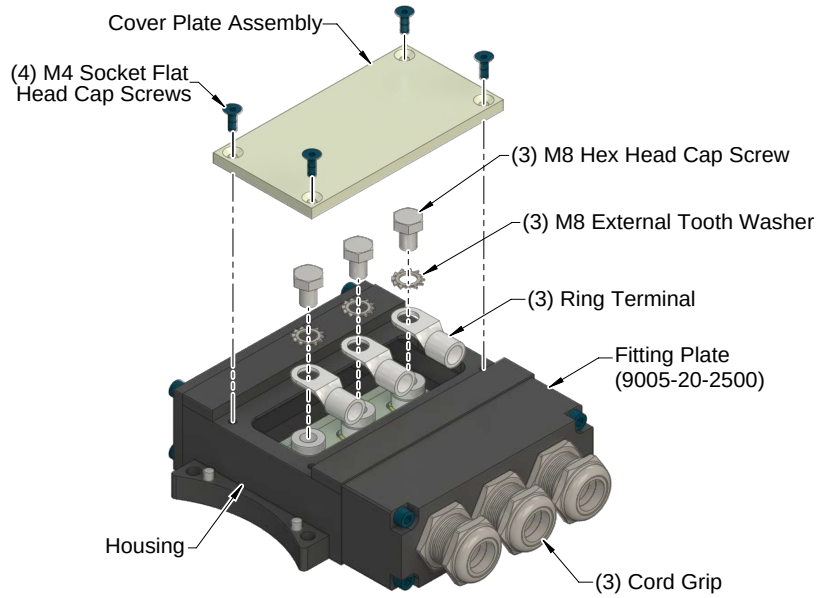
2.1 Cable Preparation and Installation

Tools required: *2.5 mm and 5 mm hex key, 13 mm socket wrench, 30 mm crows foot wrench, torque wrench, wire stripper, heat gun, manual/hydraulic crimping tool (See Section 6—Serviceable Parts and Special Tools for recommendations)*

Supplies required: *heat shrink, Loctite® 222 and 242*

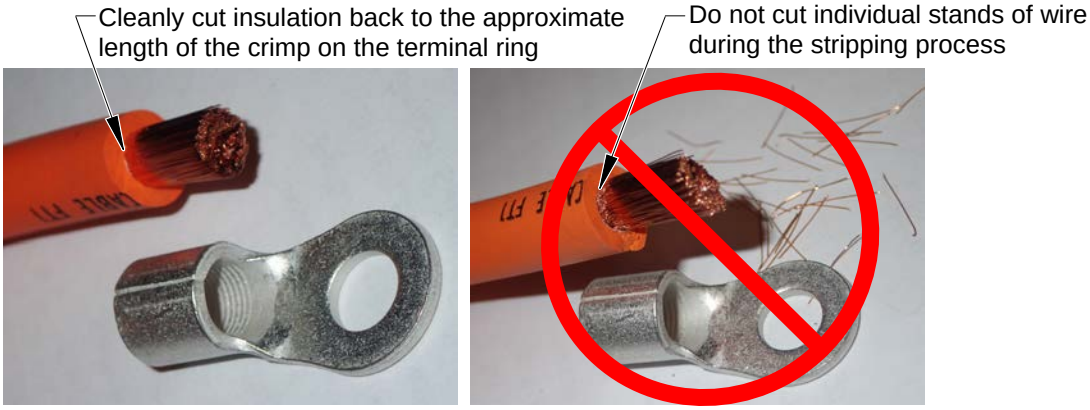
1. Prepare the module for cable installation:
   a. If the module is already installed on the Tool Changer, remove the (2) M6 socket head cap screws that secure the module to the Tool Changer using a 5 mm hex key. Lift the module assembly off the Tool Changer body.
   b. Using a 2.5 mm hex key, remove the (4) M4 socket flat head cap screws that secure the cover plate assembly to the housing and remove the cover plate.
   c. Using a 13 mm socket wrench, remove the (3) M8 hex-head cap screws and (3) M8 external tooth washers that secure the ring terminals to the (3) contact bases.
   d. Remove the (6) ring terminals, which will be used to attach the customer-supplied, high-flex type cables. Note: (3) ring terminals are provided for 25 mm^2 cable and (3) for 35 mm^2 cable. Use the size which best fits the cable.

Figure 2.1—Remove the Ring Terminals from the PA21 Module



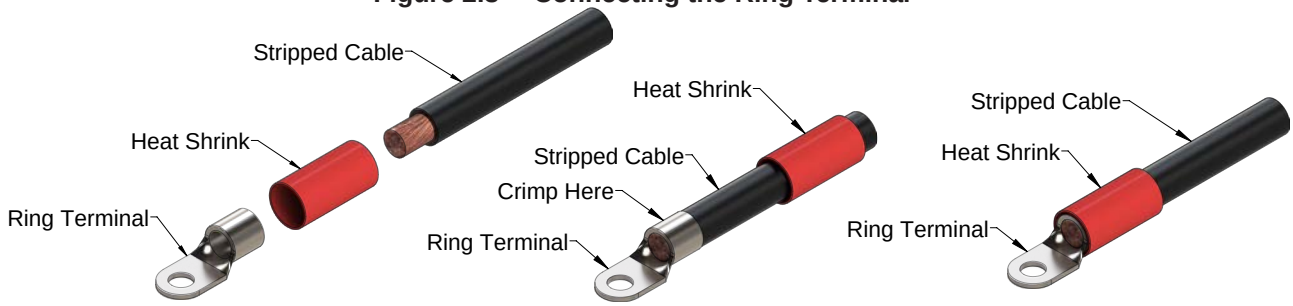
2. Prepare the cables for installation:
    a. Select the proper size ring terminals (supplied by ATI) for the customer supplied cable. Note: Where multiple ring terminal sizes are supplied, select the one which best fits the cable.
    b. Refer to the customer-supplied crimping tool manufacturer's instructions and select the proper size hex dies for the ring terminal and cable.
    c. Refer to manufacturer instructions for the wire on specific wire preparation and crimping details.
    d. Prepare the high-flex type cable ends by stripping the insulation back to the approximate length of the crimp of the ring terminal, about 0.5'' (12.7 mm). Avoid cutting wire strands while stripping the cable insulation.

Figure 2.2—Wire Stripping



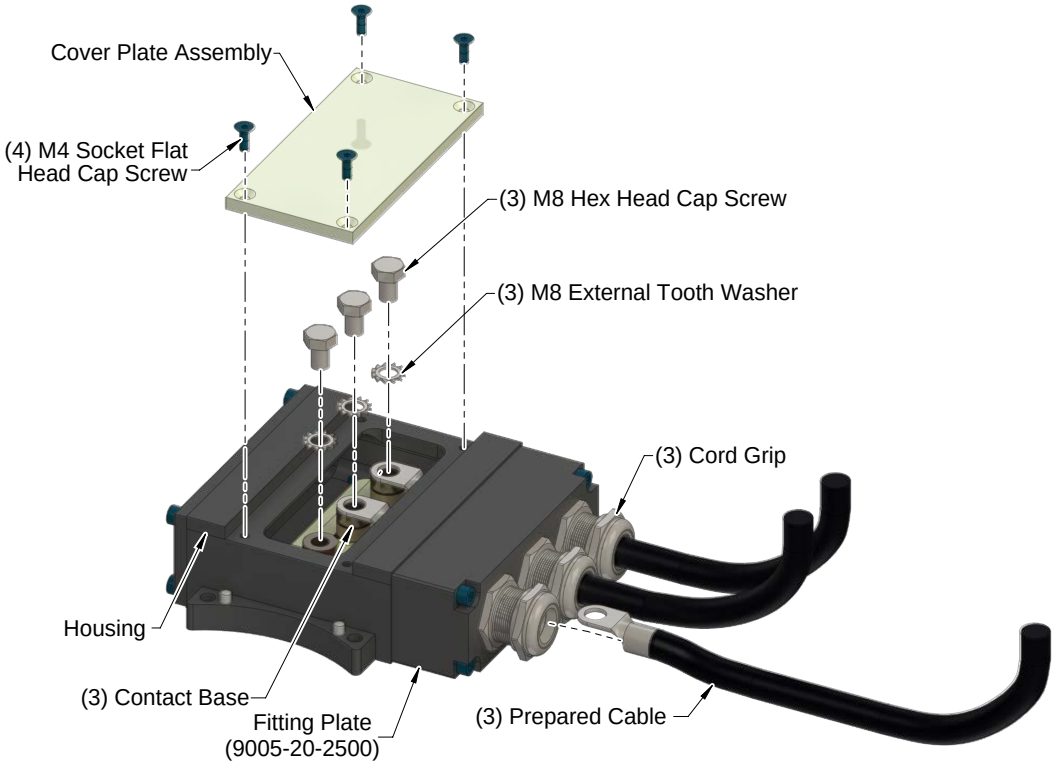
    e. Cut a piece of heat shrink long enough to cover the crimp on the ring terminal and a portion of the cable insulation.
    f. Slide the piece of heat shrink onto the cable; position the heat shrink behind the stripped end of the cable.
    g. Slide the ring terminal over the stripped end of the cable. Ensure there are no wire strands protruding from the ring terminal.
    h. Following manufacturer instructions for the customer-supplied crimp tool, crimp the ring terminal onto the cable.
    i. If the ring terminal tongue distorts during crimping, flatten and straighten the tongue such that its flat portion is parallel to the cable's center axis.
    j. Slide the piece of heat shrink tubing over the ring terminal barrel making sure it completely covers the ring terminal barrel and crimp. Shrink in place using a heat gun.

Figure 2.3 —Connecting the Ring Terminal



3. Install the cables in the module:
   a. Using a 30 mm crows foot wrench, loosen the cord grips and route the cable through the fitting plate and cord grips.
   b. Install and secure the (3) ring terminals to the contact bases using the (3) M8 external tooth washers and (3) M8 hex head cap screws. Tighten finger tight.
   c. Using a 13 mm socket wrench tighten the (3) M8 hex head cap screws to 90 in-lbs (10 Nm).
   d. Beginning with the middle cord grip, tighten the cord grip dome nuts to 60 in-lb (6.8 Nm) using the 30 mm crows foot wrench (depending on specific customer cable, the torque value may need to be increased to prevent cable movement).
   e. Apply Loctite 222 to the (4) M4 socket flat head cap screws and use the screws to install the cover plate assembly to the housing.
   f. Using a 2.5 mm hex key, tighten the (4) M4 socket flat head cap screws of the cover plate assembly to 12 in-lb (1.4 Nm).
4. Install the module onto the Tool Changer. Refer to *Section 2.2—Module Installation*.

Figure 2.4—Installing the Cables to the Contact Bases



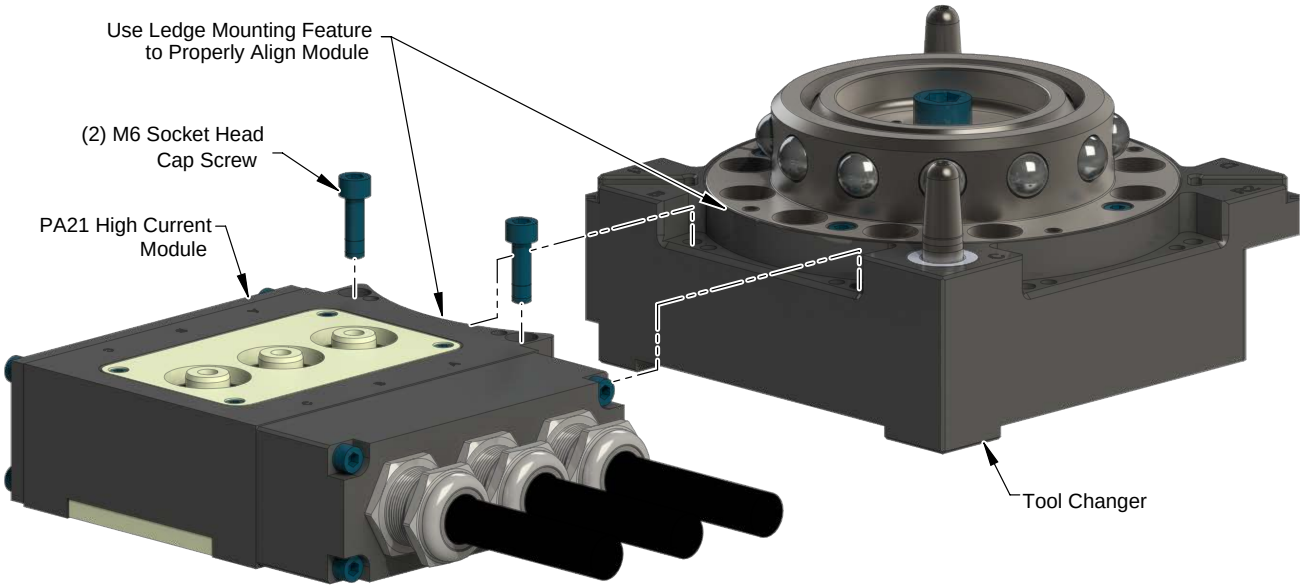
2.2 Module Installation

Tools required: *5 mm hex key*

Supplies required: *Clean, lint-free rag, Loctite® 242*

1. Clean the mating surfaces with a clean, lint-free rag.
2. Place the module on the Tool Changer body. Align the module with the Tool Changer using the dowels in the bottom of the ledge feature.
3. If fasteners do not have pre-applied adhesive, apply Loctite 242 to the supplied (2) M6 socket head cap screws.
4. Install the (2) M6 socket head cap screws securing the module to the Tool Changer using a 5 mm hex key. Tighten to 70 in-lbs (7.9 Nm).
5. Power connections can be connected to the module after attaching the module to the Tool Changer body. Ensure that the connectors are cleaned prior to being secured.
6. After the procedure is complete, resume normal operation.

Figure 2.5—Module Installation



2.3 Module Removal

Tools required: *5 mm hex key*

Supplies required: *marker pen*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits (e.g. electrical, air, water, etc.).
4. Use a marker pen to indicate where the module is to be re-installed.
5. Disconnect all utility connections.
6. Remove the (2) M6 socket head cap screws using a 5 mm hex key and lift the module from the Tool Changer.

3. Operation

The high current modules are designed to carry large currents to various industrial devices, providing 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.



CAUTION: Always protect the un-used Tool modules when not coupled to a Master module. Dust, debris, and weld spatter can contaminate the contact tips, which can cause arcing and a significant decrease in contact life.



CAUTION: Do not use stiff, heavy stranded cables which can inhibit operation of the high current module. Stiff cables can prevent compliant motion of the contacts and cause an intermittent or improper power connection. Operation of the high current module requires the customer supplied cables to be high-flex type with fine stranding and sufficient strain relief to allow free cable motion.

4. Maintenance

The condition of the contacts should be checked periodically. Use a stiff nylon brush to remove contamination from the contacts. During inspection, ensure that the fasteners that attach the modules to the Tool Changer are secure.



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. Troubleshooting and Service Procedures

The following section provides troubleshooting and service information to help diagnose conditions and repair the high current module.

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

The high current modules provide a separable joint in the cabling between power sources and industrial devices. Failure of the industrial devices to operate for any reason must be diagnosed electrically.

Table 5.1—Troubleshooting

Symptom	Possible Cause	Correction
Power malfunctioning	Object trapped between modules	Remove object, then re-attempt coupling.
	Contact contamination due to environment	Ensure that the spring loaded contacts on the Tool 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 5.2.2—Module Contact Base Replacement*. Inspect seal and replace if damaged; refer to *Section 5.2.5—Tubular Seal Replacement.*
	Contact pin separation	Any contamination on the contacts should be removed using a stiff, nylon brush.
		Air supplied to Tool Changer insufficient. Improper valve used. Refer to Tool Changer manual for pneumatic requirements.
	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 *Section 5.2.2—Module Contact Base Replacement* for Tool module.
	Connector or Cable damage - Pinched, torn, or fatigued cables, contact base, or contact spring is worn or damaged	Inspect cables and contact base for damage, test cables, test contact springs, refer to *Section 5.1.1—Troubleshooting Sequence*.

5.1.1 Troubleshooting Sequence

If it is determined the module contact base is damaged, replace the base. Refer to *Section 5.2.2—Module Contact Base Replacement.* If the Robifix adapter cable is damaged, replace the adapter. Refer to *Section 5.2.3—PA21A-M RobiFix Adapter Assembly Replacement*. If the cable is damaged, replace the cable. Refer to *Section 5.2.4—PA21APX.XX-T RobiFix Pigtail Assembly Replacement.*

5.2 Service Procedures

The following service procedures provide instructions for component replacement.

CAUTION: Do not use fasteners with pre-applied adhesive more than once. Fasteners might become loose and cause equipment damage. Always apply new thread locker when reusing fasteners.

5.2.1 Master Module Contact Tip Replacement

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

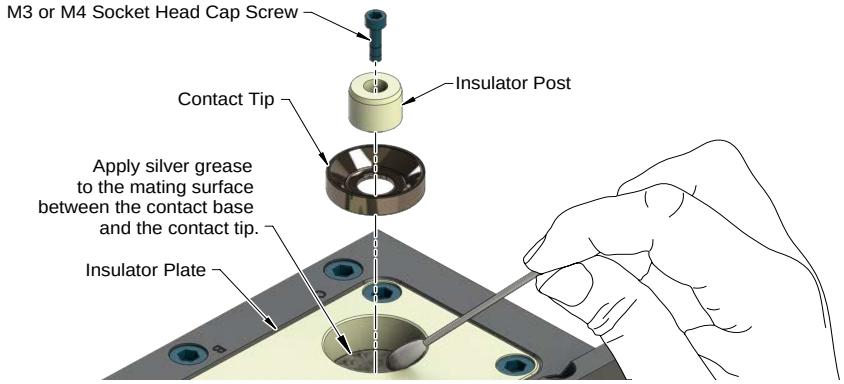
Tools required: *2.5 mm hex key, torque wrench*

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

Removal:

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. Remove the M3 socket head cap screw from the center of the insulator post using a 2.5 mm hex key.
5. Remove the insulator post and the Master contact tip. Discard the contact tip.

Figure 5.1—Master Module Contact Tip Replacement



Installation:

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.

6. Apply a thin film of non-hardening, conductive silver bearing grease (ATI 0290-70-0000-50-008, McMaster-Carr #1219K57, AI Technology #ELGR8501 or equivalent) with a volume resistivity of 0.001 ohm-cm minimum to the mating surface between the contact base and the new contact tip. Insert the new contact tip into the insulator plate and reinstall the center insulator post.
7. For an M3 socket head cap screw, insert the screw into the insulator post and secure using a 2.5 mm hex key. Tighten to 10 in-lbs (1.1 Nm).
8. After the procedure is complete, resume normal operation.

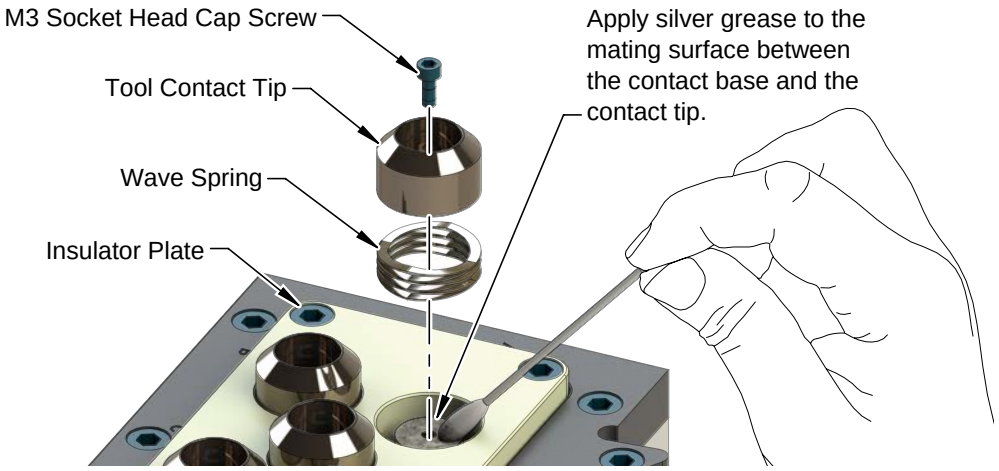
Tools required: *2.5 mm hex key, torque wrench*

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

Removal:

9. Place the Tool in a secure location.
10. Uncouple the Master and Tool plates.
11. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, and hydraulic circuits).
12. Remove the M3 socket head cap screw from the center of the Tool contact tip using a 2.5 mm hex key.
13. Remove the Tool contact tip and wave spring from the insulator plate and discard.

Figure 5.2—Tool Module Contact Tip and Wave Spring Replacement



Installation:

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.

14. Apply a liberal amount of non-hardening, conductive silver bearing grease (ATI #0290-70-0000-50-008, McMaster-Carr #1219K57, AI Technology #ELGR8501 or equivalent) with a volume resistivity of 0.001 ohm-cm minimum to the mounting surface between the contact tip and the contact base.
15. Insert the new wave spring and contact tip into the insulator plate.
16. Insert the M3 socket head cap screw into the Tool contact tip and secure using a 2.5 mm hex key. Tighten to 10 in-lbs (1.1 Nm).
17. Safely resume normal operation.

5.2.2 Module Contact Base Replacement

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

Tools required: *2.5 mm and 3 mm hex key, 13 mm socket wrench, torque wrench*

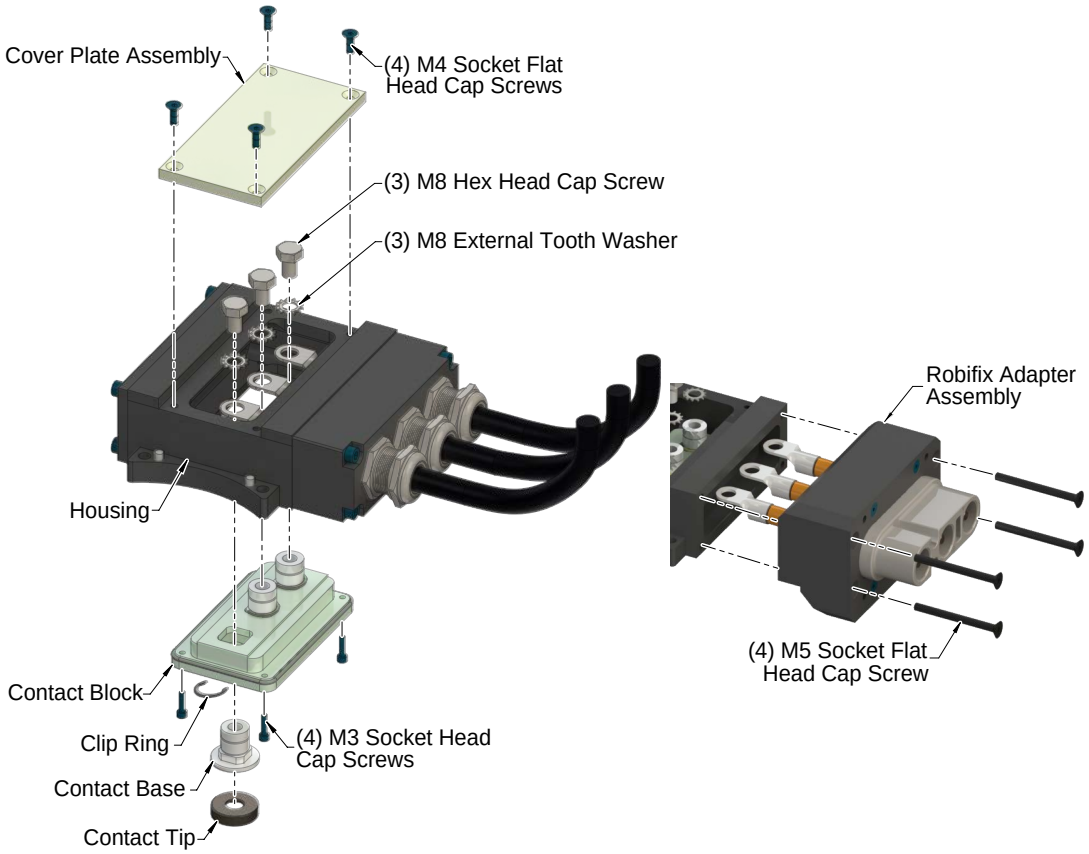
Supplies required: *Loctite 222*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits (e.g. electrical, air, water, etc.).
4. Remove module from the Tool Changer. Refer to *Section 2.3—Module Removal*.
5. Remove the contact tip from the contact base to be replaced. Refer to *Section 5.2.1—Master Module Contact Tip Replacement*.
6. For models with a Robifix adapter, remove the (4) M5 socket flat head cap screws that secure the adapter to the housing using a 3 mm hex key.
7. Using a 2.5 mm hex key, remove the (4) M4 socket flat head screws that secure the cover plate assembly to the housing and remove the cover plate assembly.
8. Using a 13 mm socket wrench, remove the (3) M8 hex head cap screws and (3) M8 external tooth washers securing the ring terminals to each contact base.
9. Using a 2.5 mm hex key, remove the (4) M3 socket head cap screws that secure the contact

block to the module housing. Remove the contact block. (Note: the contact block may also be referred to as an insulator plate).

10. Remove the C-clip from the contact base being replaced.
11. Remove the contact base by sliding it out of the contact block.

Figure 5.3—Remove Old Contact Base



12. Install the new contact base into the contact block in the correct orientation.
13. Install the C-clip onto the new contact base.
14. Install the contact block in the housing using the (4) M3 socket head cap screws and a 2.5 mm hex key. Tighten the screws to 10 in-lb (1.1 Nm).
15. Attach the ring terminals to the contact bases and secure with (3) M8 external tooth washers and (3) M8 hex head cap screws. Using a 13 mm socket wrench, tighten the screws to 90 in-lbs (10 Nm).
16. Apply Loctite 222 to the cover plate assembly's (4) M4 socket flat head cap screws. Use a 2.5 mm hex key to install and secure the cover plate assembly to the housing; tighten the screws to 12 in-lb (1.4 Nm).
17. For models with a Robifix adapter, apply Loctite 222 to the adapter's (4) M5 socket flat head cap screws. Use a 3 mm hex key to install and secure the adapter to the housing (refer to *Figure 5.3*) and tighten the screws to 25 in-lb (2.8 Nm).
18. Install the contact tip to the contact base to be replaced. Refer to *Section 5.2.1—Master Module Contact Tip Replacement*.
19. Install the module onto the Tool Changer. Refer to *Section 2.2—Module Installation*.
20. When the above procedure is complete, resume normal operation.

5.2.3 PA21A-M RobiFix Adapter Assembly Replacement

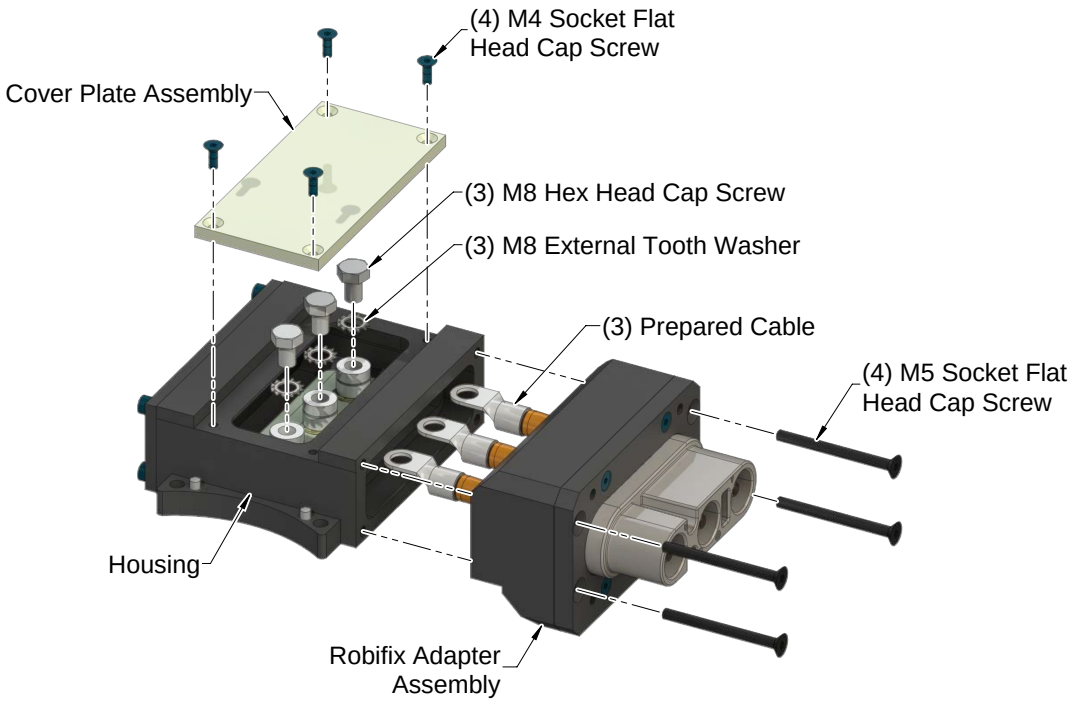
Parts required: *Refer to Section 8—Drawings.*

Tools required: *2.5 mm and 3 mm hex key, 13 mm socket wrench, torque wrench*

Supplies required: *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 (e.g. electrical, air, water, etc.).
4. Remove module from the Tool Changer. Refer to *Section 2.3—Module Removal*.
5. Using a 3 mm hex key, remove the (4) M5 socket flat head cap screws that secure the RobiFix adapter assembly to the housing.
6. Using a 2.5 mm hex key, remove the (4) M4 socket flat head cap screws that secure the cover plate assembly to the housing and remove the cover plate assembly.
7. Using a 13 mm socket wrench, remove the (3) M8 hex head cap screws and (3) M8 external tooth washers that secure the ring terminals to the contact bases. Remove the old RobiFix adapter assembly.

Figure 5.4—Replacing the PA21A-M RobiFix Adapter Assembly



8. Apply Loctite 222 to the adapter's (4) M5 socket flat head cap screws. Use a 3 mm hex key to install and secure the adapter to the housing; tighten the screws to 25 in-lb (2.8 Nm).
9. Attach the ring terminals to the contact bases and secure with the (3) M8 external tooth washers and (3) M8 hex head cap screws using a 13 mm socket wrench. Tighten to 90 in-lbs (10 Nm).
10. Apply Loctite 222 to the cover plate assembly's (4) M4 socket flat head cap screws. Use a 2.5 mm hex key to install and secure the cover plate assembly to the housing; tighten the screws to 12 in-lb (1.4 Nm).
11. Install the module onto the Tool Changer. Refer to *Section 2.2—Module Installation*.
12. When the above procedure is complete, resume normal operation.

5.2.4 PA21APX.XX-T RobiFix Pigtail Assembly Replacement

(X.XX: length of PA21AP-T cable in meters)

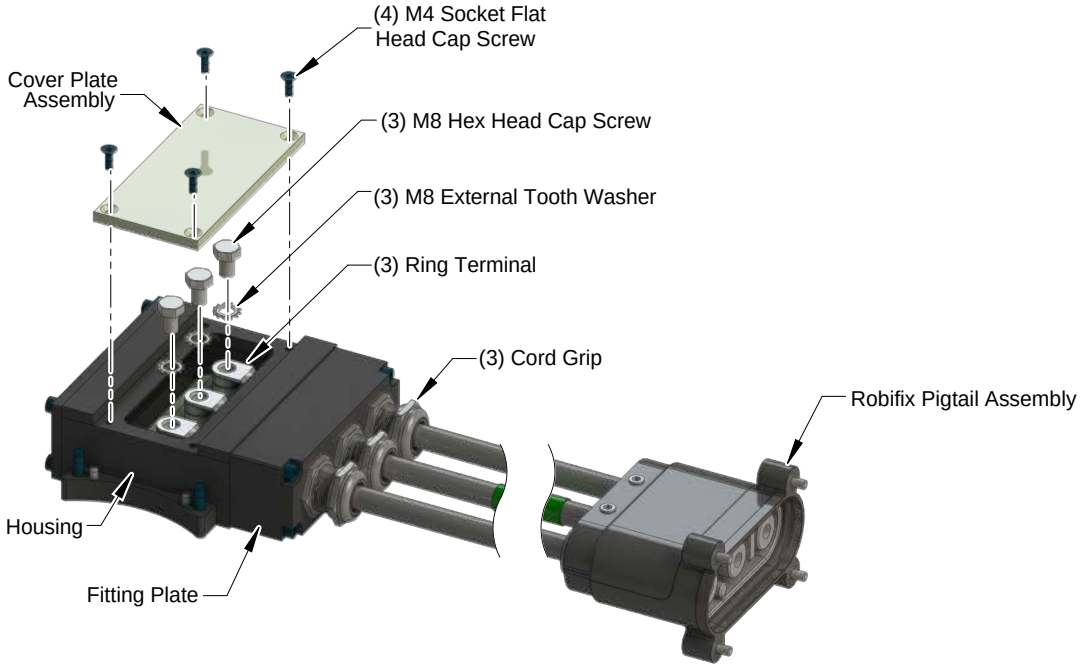
Parts required: *Refer to Section 8—Drawings.*

Tools required: *2.5 mm hex key, 13 mm socket wrench, 30 mm crows foot wrench, torque wrench*

Supplies required: *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 (e.g. electrical, air, water, etc.).
4. Remove the module from the Tool Changer. Refer to *Section 2.3—Module Removal*.
5. Using a 2.5 mm hex key, remove the (4) M4 socket flat head cap screws that secure the cover plate assembly to the housing. Remove the cover plate assembly.
6. Using a 13 mm socket wrench, remove the (3) M8 hex head cap screws and (3) M8 external tooth washers that secure the ring terminals to the contact bases. Remove the old RobiFix pigtail assembly.
7. If needed, use a 30 mm crows foot wrench to loosen the cord grips and route the cable through the cord grips and fitting plate.
8. Attach each of the ring terminals to the appropriate contact base and secure with the M8 external tooth washer and M8 hex head cap screw. Tighten to 90 in-lb (10 Nm) using a 13 mm socket wrench.
9. Tighten the cord grip dome nut finger-tight. Starting with the middle fitting, tighten an additional 1-1/2 turns using a 30 mm crows foot wrench.
10. Apply Loctite 222 to the cover plate assembly's (4) M4 socket flat head cap screws. Use a 2.5 mm hex key to install and secure the cover plate assembly to the housing; tighten the screws to 12 in-lb (1.4 Nm).
11. Install the module onto the Tool Changer. Refer to *Section 2.2—Module Installation*.
12. When the above procedure is complete, resume normal operation.

Figure 5.5—RobiFix Pigtail Assembly Installation



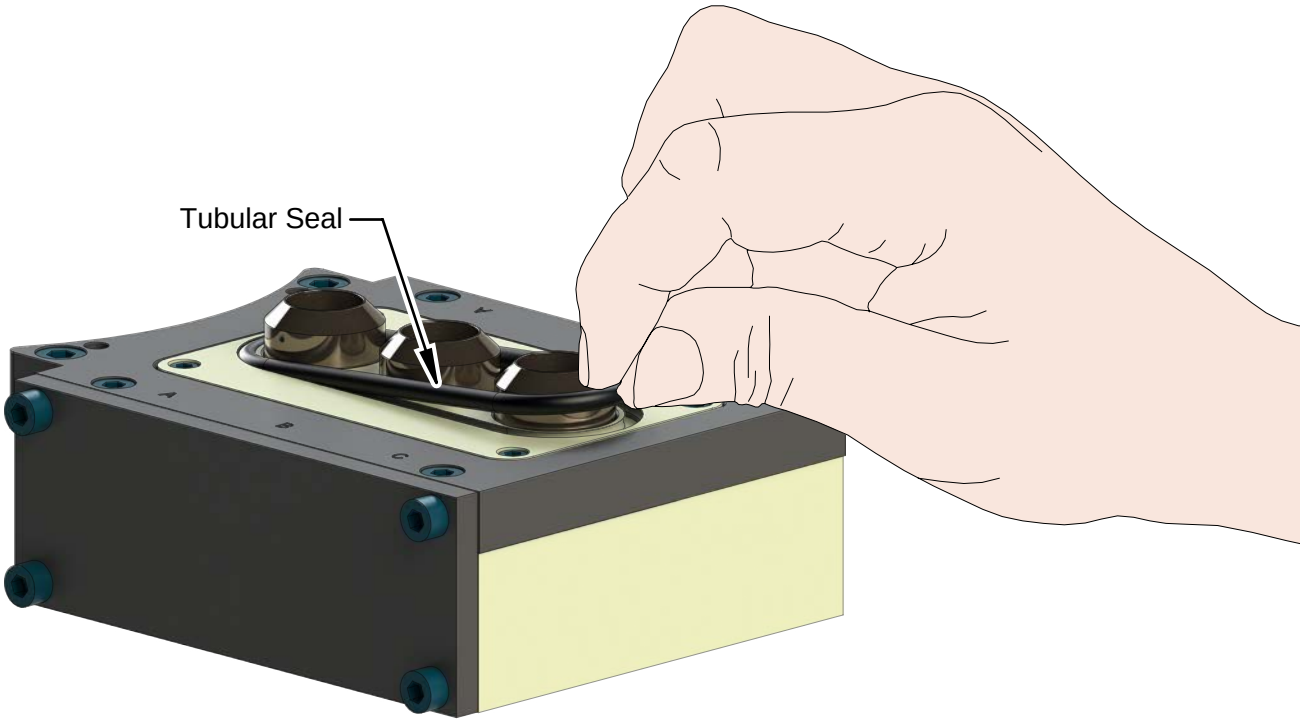
5.2.5 Tubular Seal Replacement

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

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

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 replace the tubular seal on the Tool module, use a small screwdriver to gently pry the seal out of its retention groove.
5. To install a new seal, place it over the empty groove in the Tool side insulator plate and press the seal in place.
6. After the procedure is complete, resume normal operation.

Figure 5.6—Tubular Seal Replacement



NOTICE: Individual parts may differ slightly in appearance from what is shown in the figure above.

6. Serviceable Parts and Special Tools

Refer to *Section 8—Drawings.*

Table 6.1—Master Module Mounting Fasteners		
Part Number	**QTY**	**Description**
3500-1066020-21A	2	M6 x 20 Socket Head Cap Screw, SS, ND Microspheres.

Table 6.2—Tool Module Mounting Fasteners		
Part Number	**QTY**	**Description**
3500-1066016-21A	2	M6 x 16 Socket Head Cap Screw, ND, Microspheres.

Table 6.3—Special Tools	
Part Number	**Description**
3690-0000064-60	Brush, Blue Nylon All Purpose (Contact Pin Cleaning)
Manual/Hydraulic crimping tool (Not sold by ATI)	Elpress 2600C, Multi-Contact/Staubli 18.3710, or equivalent
Crimping dies (Not sold by ATI)	Elpress TB9-13 (16 & 35 mm^2), TB11-14.5 (25 & 50 mm^2), Multi-Contact/Staubli 18.3712 (16 & 35 mm^2), 18.3713 (25 & 50 mm^2), or equivalent(s). Other crimp tools may also produce satisfactory results.

7. Specifications

Table 7.1—Master Module	
9121-PA21L(R)-M	200 A Compact Power Module, Master
Interface Connections	(3) Power Contacts
Electrical Rating	200 A, 600 V Max.
Cable Sizes Supported	#2 AWG (Ring Terminals) #4 AWG (Ring Terminals) Ring terminals are used to attach the conductor to the contact base.
Weight	2.3 lbs (1.04 kg)

Table 7.2—Master Module	
9121-PA21L(R)A-M	150 A Compact Power Module, Master
Interface Connections	Straight RobiFix Bulkhead Connector
Electrical Rating	150 A, 600 V Max. Current limited by connector.
Cable Sizes Supported	#2 AWG High-flex type with fine stranding (Others, Contact ATI) Ring terminals are used to attach the conductor to the contact base.
Weight	5 lbs (2.27 kg)

Table 7.3—Tool Module	
9121-PA21L(R)-T	200 A Compact Power Module, Tool
Interface Connections	(3) Power Contacts
Electrical Rating	200 A, 600 V Max.
Cable Sizes Supported	#2 AWG (Ring Terminals) High-flex type with fine stranding (Others, Contact ATI) #4 AWG (Ring Terminals) High-flex type with fine stranding (Others, Contact ATI) Ring terminals are used to attach the conductor to the contact base.
Weight	2.4 lbs (1.09 kg)

Table 7.4—Tool Module	
9121-PA21L(R) AP1.00-T	Primary Current Tool Module with 1.0 M Pigtail Robifix Connector, 150 Amps
Interface Connections	1 meter pigtail and RobiFix connector
Electrical Rating	150 A, 600 V Max. Current limited by connector.
Cable Sizes Supported	#2 AWG High-flex type with fine stranding (Others, Contact ATI) Ring terminals are used to attach the conductor to the contact base.
Weight	4.3 lbs (1.96 kg) + 6.5 lbs (2.95 kg) / meter of cable.

Table 7.5—Tool Module	
9121-PA21L(R) AP1.20-T	Primary Current Tool Module with 1.2 M Pigtail Robifix Connector, 150 Amps
Interface Connections	1.2 meter pigtail and RobiFix connector
Electrical Rating	150 A, 600 V Max. Current limited by connector.
Cable Sizes Supported	#2 AWG High-flex type with fine stranding (Others, Contact ATI) Ring terminals are used to attach the conductor to the contact base.
Weight	4.3 lbs (1.96 kg) + 6.5 lbs (2.95 kg) / meter of cable.

Table 7.6—Tool Module	
9121-PA21L(R) AP1.50-T	Primary Current Tool Module with 1.5 M Pigtail Robifix Connector, 150 Amps
Interface Connections	1.5 meter pigtail and RobiFix connector
Electrical Rating	150 A, 600 V Max. Current limited by connector.
Cable Sizes Supported	#2 AWG High-flex type with fine stranding (Others, Contact ATI) Ring terminals are used to attach the conductor to the contact base.
Weight	4.3 lbs (1.96 kg) + 6.5 lbs (2.95 kg) / meter of cable.

Table 7.7—Tool Module	
9121-PA21L(R) AP2.00-T	Primary Current Tool Module with 2.0 M Pigtail Robifix Connector, 150 Amps
Interface Connections	2 meter pigtail and RobiFix connector
Electrical Rating	150 A, 600 V Max. Current limited by connector.
Cable Sizes Supported	#2 AWG High-flex type with fine stranding (Others, Contact ATI) Ring terminals are used to attach the conductor to the contact base.
Weight	4.3 lbs (1.96 kg) + 6.5 lbs (2.95 kg) / meter of cable.

Table 7.8—Tool Side Cover	
9121-PAE-T	Protective cover when tool side module is not installed.
Weight	0.44 lbs (0.2 kg)

8. Drawings

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