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C. Control and Signal Modules

CV14xxx—Control/Signal Module

1. Product Overview

Through the discrete control modules, customers are able to determine the status of the Tool Changer (i.e. Locked or Unlocked), control the Tool Changer locking mechanism, determine if the Tool is nested in the Tool Stand, and read Tool ID inputs.

Tool Changer I/O is provided to the customer through the M16 connector on the control/signal Master module. Lock, Unlock, and Tool Present is provided for confirmation of Tool Changer and locking mechanism positions. An integrated solenoid valve is provided on the Master module for tool changer actuation. Other customer assigned discrete I/O points are also available through the connector.

NOTICE: The customer is required to provide a voltage source in order for this module and tool changer to operate. Refer to *Section 9—Drawings* for pin out information and location of the I/O signals.

The Master pin blocks have compliant spring probes, and the Tool pin blocks have fixed contact pins (refer to *Figure 1.1*). When the Tool Changer is coupled, the Master transfers signals and power to the Tool through the pin block, which is surrounded by a V-ring seal protecting the connection from moisture and liquid.

To avoid unintentional human contact, the Master spring pins are recessed below an insulated surface.

When used with the Tool Changer, the module has a special safety feature available. In addition to the standard Lock and Unlock sensor inputs, the modules have Tool Stand Interlock (TSI). The TSI feature consists primarily of a physical break in the unlatch solenoid valve circuit so that the Tool Changer ONLY releases the Tool in the stand or storage location. Refer to *Section 2—Product Information* for additional information regarding TSI. Refer to *Section 4.1—Recommended Sequence of Operations* for additional information.

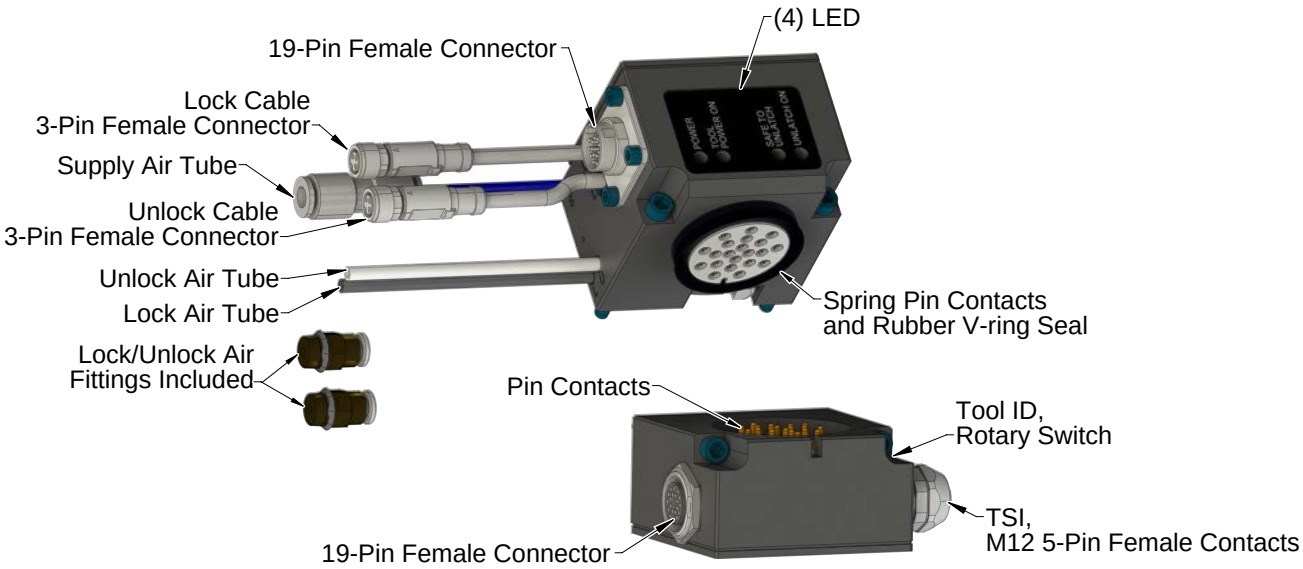
1.1 CV14 Master

The Master module is equipped with a 19-pin M16 male connector for interfacing with the Tool Changer's lock and unlock sensors as well as for supplying signals and power to the end-of-arm tooling. Power supply signals go through an arc prevention circuit to extend the life of the electrical contacts.

Interface to the Tool Changer's lock and unlock sensors are provided through (2) M8, 3-pin cordsets (available with straight or 90º connectors) on the Master module. Refer to the specific Tool Changer manual for details on the operation of lock and unlock sensors. The lock and unlock cables are provided as an integrated part of the control module. The Master has an integrated valve with unlock (U - white) and lock (L - black) air tubes for the latch and unlatch of the Tool Changer. Lock and unlock air fittings are included, refer to *Figure 1.4* for fitting sizes and threads. The Master requires only one air supply that connects to the (S - blue) air tube with a 4 mm to 6 mm expander fitting.

Electrical and air connector details are provided in drawings in *Section 9—Drawings*.

Figure 1.1—CV14 Master and CV10 Tool Modules



1.2 CV10 Tool

The CV10 Tool module has a 19-pin M16 female connector and provides the interface for supplying signals and power to the end-of-arm tooling. A 5-pin M12 female connector passes TSI signals. Refer to *Section 9—Drawings* for additional information and connector details.

The Tool-ID feature distinguishes between the different tools coupled by the Tool Changer. Using a rotary feature, the user may set a maximum of (16) unique Tool-ID values (0-F). To set Tool-ID, refer to *Section 3.5—Setting the Tool-ID on Tool Module*.0

1.3 Module Compatibility

Some Tool Changers require the use of a module with right angle or straight connectors, in accordance with the following table:

Table 1.1—CV14 Master Module Tool Changer Compatibility

Tool Changer	Tool Changer Flat	Compatible Master Module W = Straight Connector R = Right Angle
QC-29	C	9120-CV14xRM-M
QC-40	A	9120-CV14x**W**-M
QC-40Q	A	9120-CV14x**W**-M
QC-41	A	9120-CV14x**W**-M
QC-46	D	9120-CV14x**W**-M
QC-60	B	9120-CV14x**W**-M
QC-62	D	9120-CV14x**W**-M
QC-71	B	9120-CV14x**W**-M
QC-76	B	9120-CV14x**R**-M
QC-110	B	9120-CV14x**W**-M

Figure 1.2—Example of 9120-CV14xW-M (QC-40 Shown)

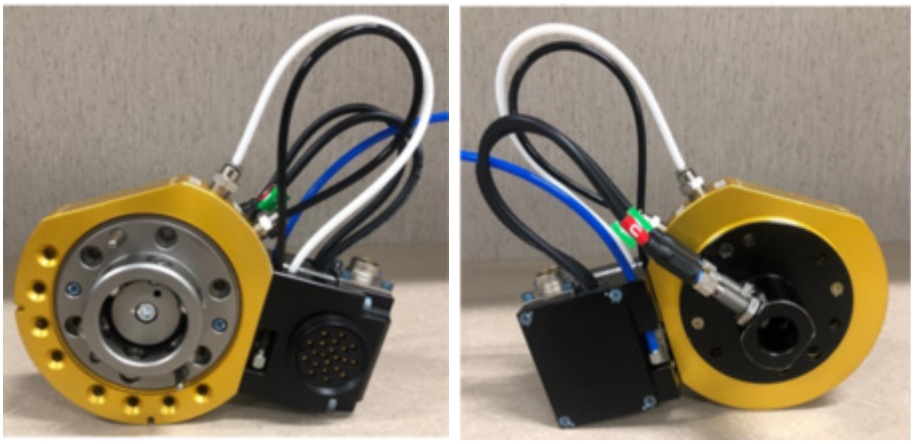
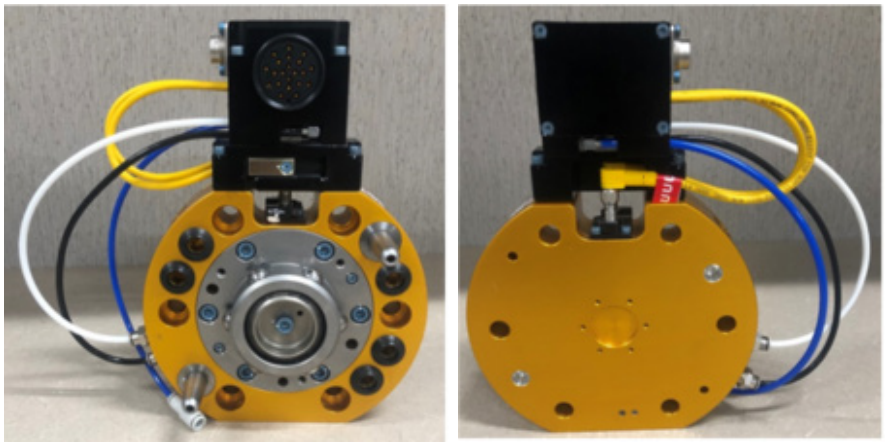


Figure 1.3—Example of 9120-CV14xR-M (QC-76 Shown)



1.4 Part Number Guide

Notes:

- PNP Master only mates with PNP Tool
- NPN Master only mates with NPN Tool
- Customer must ensure the selected lock and unlock air fittings (included with the Master module) are compatible with the Tool Changer's lock/unlock port thread type.

Figure 1.4—Master Module Part Number Guide

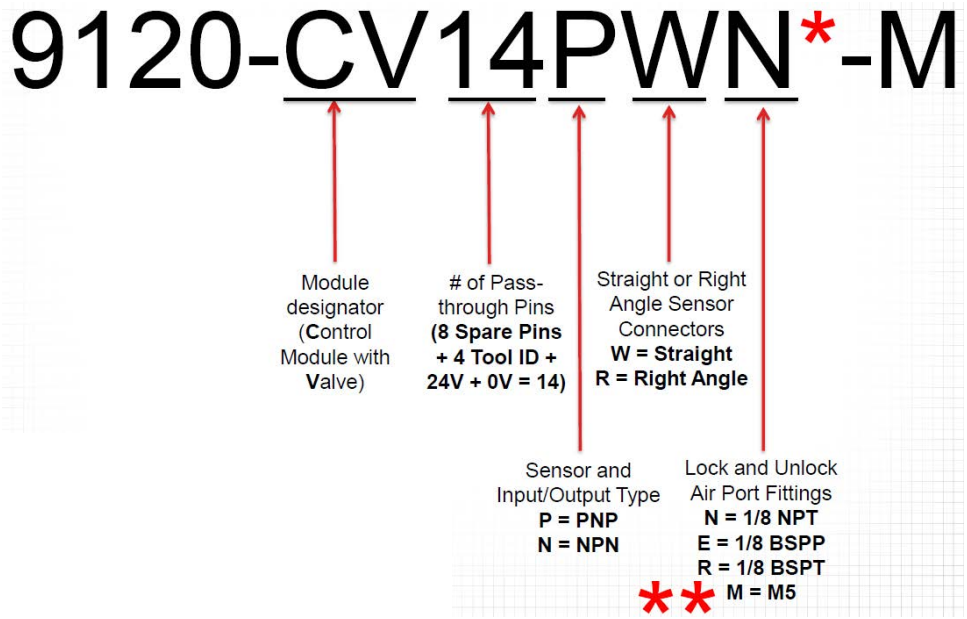
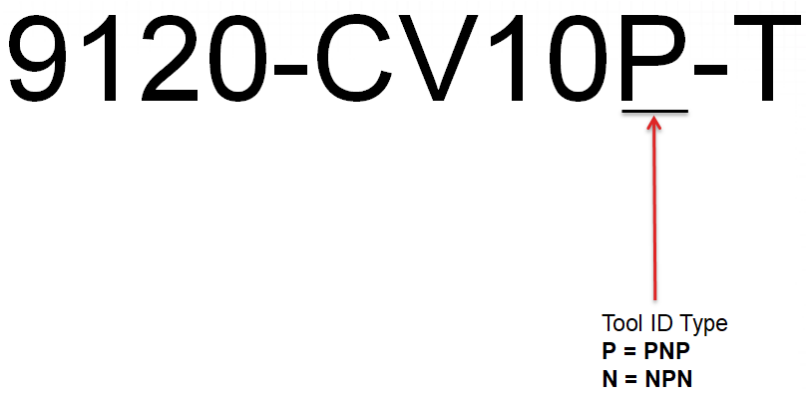


Figure 1.5—Tool Module Part Number Guide



2. Product Information

This section provides more detailed information on the behavior of the CV14 Master and CV10 Tool modules.

2.1 Master Module Information

2.1.1 Connector Information

Figure 2.1—M16 19-Pin Connector Pin Designations on Master

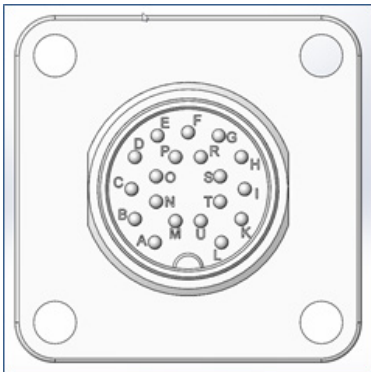


Table 2.1—M16 19-Pin Connector Pin Designations on Master		
Connector Pin	**Signal Name**	**Description**
A	Input V+ (24V)	24V (+20%/-10%) Input Power supplied from the robot. Maximum supported current is 4A.
B	Locked	Tool Changer Locked proximity sensor input
C	Unlocked	Tool Changer Unlocked proximity sensor input
D	Tool Present	This input shall be high when the two “Tool Present” Master-side spring probes at the pin block interface are in electrical contact with the Tool Module.
E	Unlatch Enabled	This pin shall be high when the conditions for a safe Unlatch have been met. Refer to *Section 2.5—Tool Side TSI (Tool Stand Interlock)*
F	Tool ID1	Tool ID Inputs from Tool Side 0-F Rotary Switch
G	Tool ID2	
H	Tool ID4	
I	Tool ID8	
K	Unlatch	Unlatch output command from robot (24V -15%/+10%). Only executed when conditions for a safety tool release are met.

Table 2.1—M16 19-Pin Connector Pin Designations on Master		
Connector Pin	**Signal Name**	**Description**
L	Input V- (0V)	8X spare pass-through signals. Maximum Voltage = 50V Maximum Current = 3A
M	Spare 1	
N	Spare 2	
O	Spare 3	
P	Spare 4	
R	Spare 5	
S	Spare 6	
T	Spare 7	
U	Spare 8	

2.2 LED's

Figure 2.2—LED's



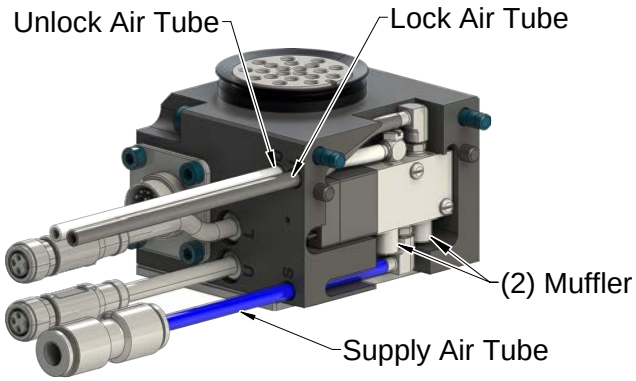
The Master provides LED's for the following:

- POWER - This LED is green if input voltage is above 21.6V (+/-1.3V). Note: other LED's may turn on even if the voltage is less than 21.6V.
- TOOL POWER ON - Indicates that Arc Prevention has turned on power to the Tool. This LED shall be on when the Unlatch Output is false and Tool Present is true
- SAFE TO UNLATCH - The Safe to Unlatch LED shall on if the following are true:
    - Safety switch 1 (SSO1) is true and safety switch 2 (SSO2 is true

      OR
    - Tool Present is low (i.e. the Tool is not coupled to the Master)
- UNLATCH ON - the unlatch output to the valve is active

2.3 Valve Specifications

Figure 2.3—Valve and Mufflers



- Valve Type: 5-port, 2-position, single solenoid valve. Maximum operating pressure is 120psi.
- The required air filtration is 40 microns.

2.4 Arc Prevention

The CV14 module incorporates ATI's Arc Prevention Circuit, which extends the life of electrical power contacts by eliminating arcing caused by inductive loads and high inrush current during coupling/uncoupling. The Arc Prevention Circuit makes it possible to couple/uncouple without switching power off and prevents damage to the contacts.

In the CV14, the Arc Prevention Circuit controls the Input Power on pin A of the M16 connector (refer *Section 9—Drawings*).

The Arc Prevention Circuit turns power on when the Tool Present input is true and the Unlatch output is false. Power is turned off when Tool Present goes low OR the Unlatch output goes true.

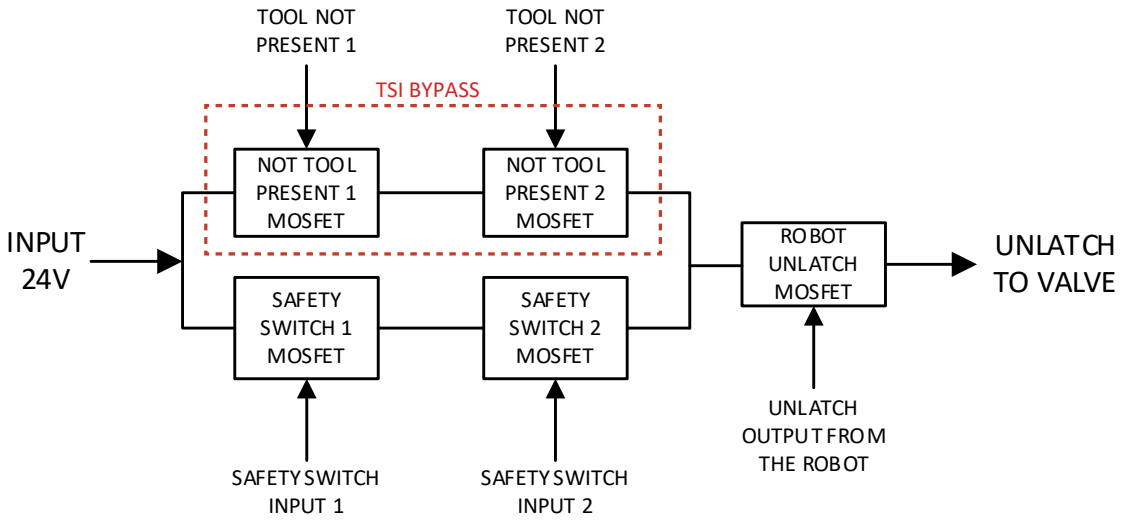
2.5 Tool Side TSI (Tool Stand Interlock)

The CV14 is also equipped with circuitry that is designed to prevent the module from executing a command to actuate the valve and unlock the tool changer UNLESS the Tool is nested safely in the Tool Stand.

The CV14 Master module is equipped with a 5-port single solenoid, 2-position valve with spring return to lock position. By energizing this valve, the CV14 is able to unlock the Tool Changer.

The unlatch command will only be executed if the safety switch inputs, SSO1 and SSO2, are both true, indicating that the Tool is in the Tool Stand. Refer to *Figure 2.4* for a simplified schematic of the TSI circuit.

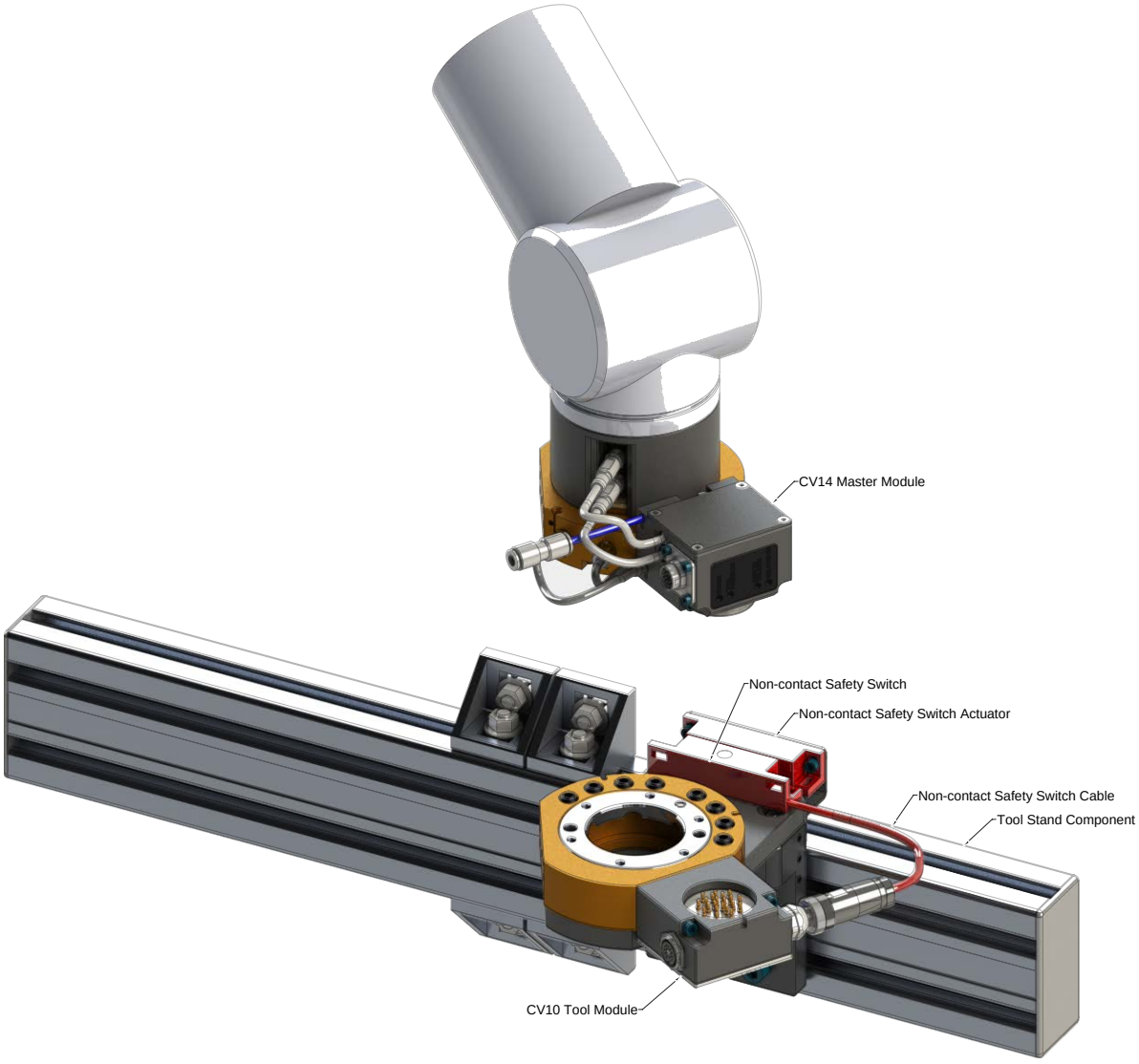
Figure 2.4—TSI



In the event of power loss, the single solenoid valve in the CV14 will automatically latch the Tool Changer locking mechanism. If this were to occur when no tool is present then it would be necessary to actuate the valve's manual override and hold the tool changer unlocked until the Master was coupled to the Tool. To avoid this inconvenience, the CV14 is equipped with a TSI Bypass circuit that allows an unlatch command to be executed when NO TOOL is present, as indicated by the two Tool Present signals. With the TSI bypass circuit, the tool changer can be locked and unlocked at will, so long as no Tool is coupled to the Master.

A safety rated mechanical or magnetic limit switch with two Normally Open contacts must be used with TSI. The contacts should only close when the Tool is nested safely in the Tool Stand. The safety switch must be connected to the 5-Pin M12 connector located on the side of the CV10 Tool module.

Figure 2.5—TSI Example



3. Installation

The control/signal modules are typically installed by ATI prior to shipment. The following procedure outline the field installation or removal as required. For wiring information refer to *Section 9—Drawings*.

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.

3.1 Master Module Installation

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

Supplies required: *Clean rag, Loctite® 222*

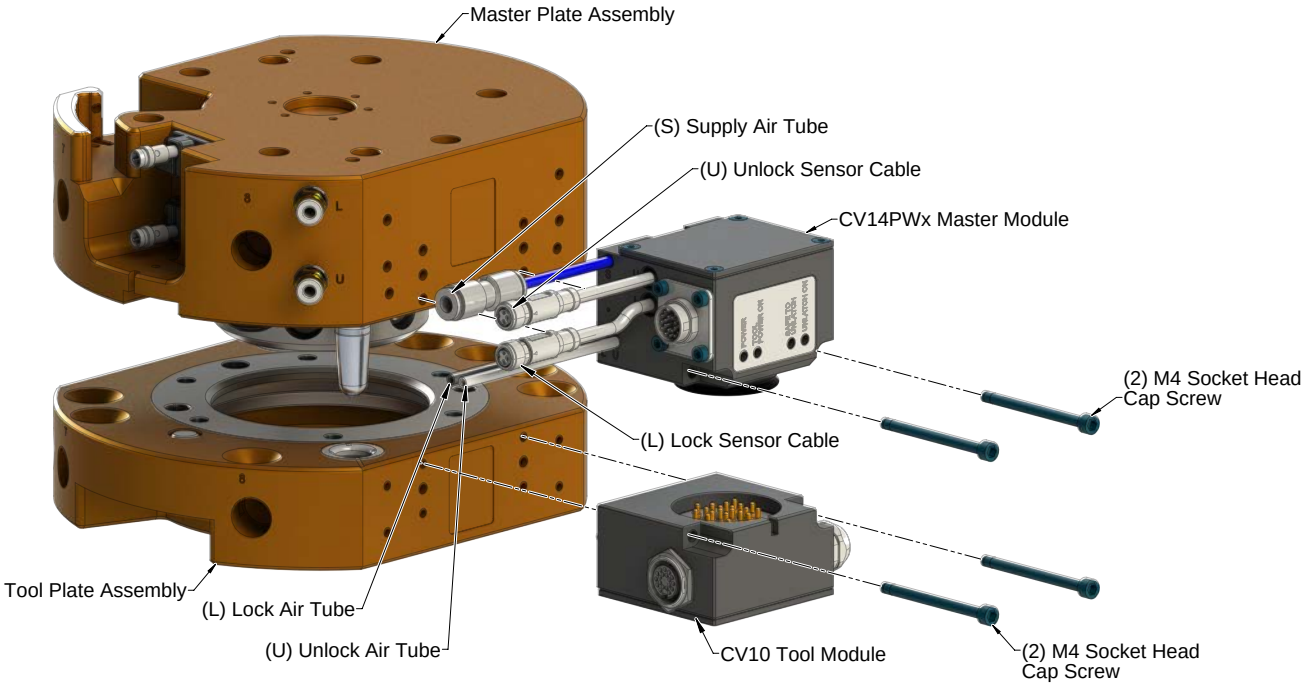
1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, and hydraulic circuits).
4. Wipe down the mounting surfaces with a clean rag.
5. Place the module into the appropriate location on the Tool Changer.
6. Install lock and unlock air fittings to Tool Changer.
7. Apply Loctite 222 to the supplied M4 socket head cap screws.
8. Install the (2) M4 socket head cap screws and secure the module to the air or valve adapter using a 3 mm hex key. Tighten to 15 in-lbs (1.7 Nm).
9. Ensure the lock (L) and unlock (U) sensor connectors are clean and connect to the sensors on the Tool Changer.
10. Ensure the power, signal, and auxiliary connector is clean and connect the cable to the module.
11. Ensure the tube connectors (lock, unlock, and supply air) are clean and connect the tubes to the Tool Changer.
12. Safely resume normal operation.

3.2 Master 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, pneumatic, and hydraulic circuits).
4. Disconnect the lock (L) and unlock (U) sensor cables from the sensors on the Tool Changer.
5. Disconnect the power, signal, and auxiliary cable from the module.
6. Disconnect the tube connectors (lock, unlock, and supply air) from the Tool Changer.
7. Support the control/signal module, remove the (2) M4 socket head cap screws using a 3 mm hex key, and lower the module until it clears the guide pin.

Figure 3.1—Module Installation and Removal



3.3 Tool Module Installation

Prior to installing the Tool module, set the Tool-ID to a unique value. Refer to *Section Figure 3.2——Tool Module Tool-ID Rotary Switch*.

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

Supplies required: *Clean rag, Loctite 222*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, and hydraulic circuits).
4. Wipe down the mounting surfaces with a clean rag.
5. Place the module onto the Tool Changer.
6. Apply Loctite 222 to the supplied M4 socket head cap screws. Install the (2) M4 socket head cap screws and secure the module to the air adapter using a 3 mm hex key. Tighten to 15 in-lbs (1.7 Nm).
7. Ensure the power, signal, and auxiliary connector is clean and connect the cable to the module.
8. Ensure the TSI limit switch connection is clean and connect the cable to the module.
9. Safely resume normal operation.

3.4 Tool 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, pneumatic, and hydraulic circuits).
4. Disconnect the power, signal, and auxiliary cable from the control/signal module.
5. Disconnect the cable from the control/signal module to the TSI limit switch.
6. Support the control/signal module, remove the (2) M4 socket head cap screws using a 3 mm hex key, and lift the module from the valve adapter.

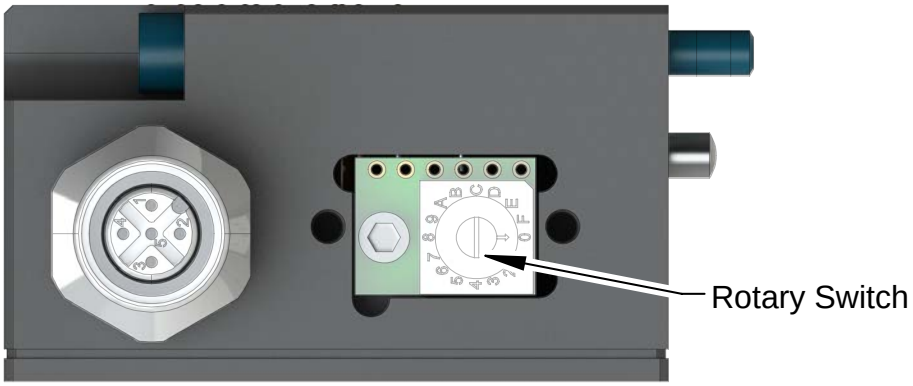
3.5 Setting the Tool-ID on Tool Module

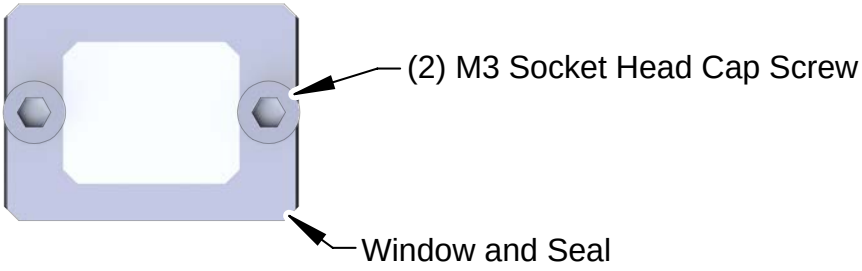
Tools required: *2.5 mm hex key, flat head screwdriver*

Use the rotary switch on the Tool module to set Tool-ID numbers. Each Tool should be set to a unique number from 0-F. The Tool binary output is listed in the customer drawing.

Note: If using the PNP version of the CV10 Tool Module, the Tool ID common is 24V. When using the NPN version of the CV10 Tool Module, the Tool ID common is 0V.

Figure 3.2—Tool Module Tool-ID Rotary Switch





1. Loosen the (2) M3 socket head cap screws and remove the window.
2. Use a flat head screw driver to turn the rotary switch to the digit value from 0 through F. Set the Tool-ID to the desired unique number for each Tool.

NOTICE: When replacing the window, ensure that the seal is positioned correctly to prevent fluid leakage into the module and damage to the electronics.

3. Re-install the window and tighten the M3 socket head cap screws.

4. Operation

The control/signal module is designed to provide control of the Tool Changer, pass electrical power, and signal connections to the end-of-arm tooling. The sections below detail the various functional characteristics of the module.

NOTICE: The customer is required to provide a voltage source in order for this module and tool changer to operate. Refer to *Section 9—Drawings* for pin out information and location of the I/O signals.

NOTICE: The Unlatch output should not be held energized for an extended period of time after coupling and uncoupling. Doing so may reduce the life of the valve.

Refer to the specific Tool Changer manual for conditions for coupling of the Tool Changer and *Section 4.1—Recommended Sequence of Operations*. When coupled, the module Tool can be communicated with, Tool-ID can be read (if equipped), and attached end-effectors can be used.

4.1 Recommended Sequence of Operations

This Recommended Sequence of Operations procedure is to be used as a general guide when programming a robot or PLC for use with a Tool Changer and control/signal modules. This procedure is intended for "automatic" modes used during normal application processes.

1. Start→ The robot and Tool Changer Master are free of the stand or storage location, the Tool Changer is uncoupled and the Tool Changer locking mechanism may be fully retracted (unlocked condition) or fully extended (missed Tool condition, for example: Locked and Unlocked inputs are false). The Tool is by itself in the tool stand.

   a. The **Tool Present** input is false.

   b. The **Unlatch Enabled** input is true.

   c. The following LEDs are on:
      - Power
      - Safe to Unlatch

Figure 4.1—Step 1 LED's



2. Ensure the Master is Unlocked (The Master must be unlocked prior to entering the Tool to prevent the ball bearings from impinging on the Tool bearing race.)

   a. The Unlatch output command is made true.

   b. The following LEDs are on:
      - Power
      - Safe to Unlatch
      - Unlatch ON

Figure 4.2—Step 2 LED's



   The **Unlocked** input goes true and remains true, indicating that the Tool Changer locking mechanism is fully retracted and the unlock operation is complete.

3. Coupling the Tool Changer.

   a. The **Unlatch** output is made false.

   b. The **Unlocked** input goes false a short time later, indicating piston travel. Subsequently, the Locked input goes true and remains true, indicating that the coupling operation is complete.

   c. The **Tool Present** input is made true.

   d. Arc Prevention power to the Tool Module is turned on.

   e. The following LEDs are on:
      - Power
      - Tool Power ON
      - Safe to Unlatch may or may not be on depending on the state of the Safety Switches

Figure 4.3—Step 3 LED's



4. Robot moves away from the tool stand with the Tool Changer coupled.

5. Normal operation:

   a. The following input is true:
      i. **Locked**
      ii. **Tool Present**
   b. The following input is false:
      i. **Unlocked**
      ii. **Unlatch Enabled**
   c. The following output is false:
      i. **Unlatch**
   d. The following LEDs are on:
      - **Power**
      - **Tool Power ON**

Figure 4.4—Step 5 LED's



6. Robot moves into the tool stand with the Tool Changer coupled.

7. Uncoupling the Tool Changer. IMPORTANT: It is critical that the Tool be nested securely in the tool stand prior to uncoupling the Tool Changer.

   a. The **Unlatch Enabled** input is true.
   b. The **Unlatch** output is made true.
   c. The **Locked** input goes false a short time later and subsequently the **Unlocked** input goes true and remains true, indicating that the uncoupling operation is complete.
   d. Arc Prevention power to the Tool is turned off.
   e. The following LEDs are on:
      - **Power**
      - **Safe to Unlatch**
      - **Unlatch ON**

Figure 4.5—Step 7 LED's



8. Robot and Master move up and away and are at a distance greater than 0.125” from the Tool (the module contact pins are no longer touching).

   a. The **Unlatch Enabled** input is true.
   b. The **Tool Present** input goes false.
   c. The following LEDs are on:
      - **Power**
      - **Safe to Unlatch**
      - **Unlatch ON**

Figure 4.6—Step 8 LED’s



9. Robot and Master in free space.

   a. The following inputs are true:
      i. **Unlocked**
      ii. **Unlatch Enabled**
   b. The following inputs are false:
      i. **Locked**
      ii. **Tool Present**
   c. The following outputs are false
      i. **Unlatch**
   d. The following LEDs are on:
      - **Power**
      - **Safe to Unlatch**
      - **Unlatch ON**

Figure 4.7—Step 9 LED’s



5. Maintenance

The modules are not designed to be field serviced as all point-to-point wiring connections are soldered. Component replacement is limited to the V-ring seal on the Master.



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 is used in dirty environments (for example: welding or deburring applications), limit the exposure of the Tool Changer. 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.

Under normal conditions, no special maintenance is necessary; however, perform periodic inspections to assess for unexpected damage and assure long-lasting performance. Perform the following visual inspection monthly:

- Inspect mounting fasteners to verify they are tight and if loose; then tighten to the proper torque.
- Cable connections should be inspected during maintenance periods to ensure they are secure. Loose connections should be cleaned and retightened. Inspect cable sheathing for damage, repair or replace damaged cabling. Loose connections and/or damaged cabling are not expected and may indicate improper routing and/or strain relieving.
- Inspect the Master and Tool pin blocks for any pin damage, debris or darkened pins. Refer to *Section 5.1—Pin Block Inspection and Cleaning*.
- Inspect V-ring seals for wear, abrasion, and cuts. If worn or damaged, replace. Refer to *Section 6.2.1—Seal Replacement*.

5.1 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.

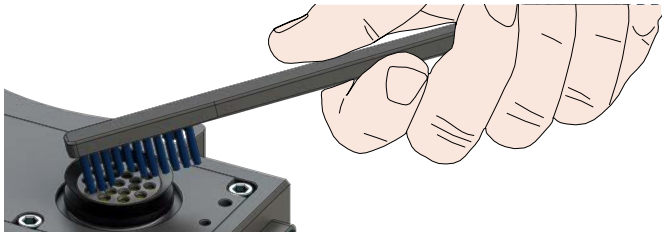
Figure 5.1—Inspect Master and Tool Pin Blocks



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).

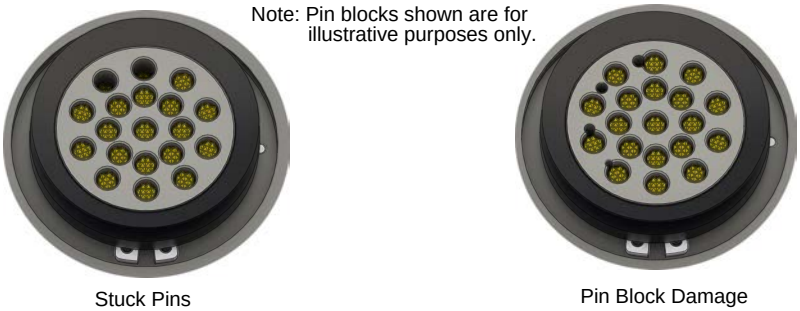
NOTICE: Do not use an abrasive media and/or cleaners or solvents to clean the contact pins. Using abrasive media and/or cleaners or solvents will cause damage to the contact surface or cause pins to stick. Clean contact surfaces with a vacuum or non-abrasive media such as a nylon brush (ATI part number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

6. Troubleshooting and Service Procedures

This troubleshooting section provides information to help diagnose conditions with the Tool Changer or control module.

WARNING: Do not perform maintenance or repair(s) on the Tool Changer or modules unless the Tool is safely supported or placed in the tool stand, all energized circuits (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.

6.1 Troubleshooting Procedures

Refer to the following table for troubleshooting information.

Table 6.1—CV14xxx Master and CV10 Tool Troubleshooting Procedures

Symptom	Possible Cause	Correction
Unit will not lock or unlock	Debris caught between the Master and Tool plates	Clean debris from between the Master and Tool plates. Verify mounting hardware is secure and does not protrude above the mating surfaces.
	Air supply not to specifications	Check air supply. Refer to the Installation section of the Tool Changer manual for specifications.
	Tool Changer Ball bearings are not moving freely	Verify ball bearings are moving freely, clean and lubricate as needed (refer to Maintenance section of Tool Changer manual for instructions)
	Clogged muffler	Inspection/ maintenance of the exhaust muffler
	Master and Tool are within the specified No-Touch zone	Verify Master and Tool are within specified No-Touch zone when attempting to lock (refer to Oper*ations Section of Tool Changer manual for specifications)*
	Signals are mapped incorrectly	Verify signals are mapped and communicating properly (refer to *Section 9—Drawings* for electrical schematic)
Sensors not operating properly	Tool plate is not secured properly or debris is trapped between surfaces	Ensure Tool plate is securely held to Master plate and nothing is trapped between plates
	Sensor cables damage or incorrectly connected	Verify that cables are connected correctly and not damaged, replace if damaged. Refer to the Troubleshooting Section of the Tool Change manual.
	Malfunction of sensor.	Verify the sensor is operating properly, replace if malfunctioning. Refer to the Tool Changer manual for instructions.
Loss of Communication	Damaged signal cabling	Check/Replace signal cabling upstream and downstream of Tool Changer modules.
	Worn or damaged contact pins	Inspect module contact pins for debris/wear/damage. Refer to *Section 5.1—Pin Block Inspection and Cleaning*. V-ring seal damaged and allow debris in contact pins. Replace V-ring seal, refer to *Section 6.2.1—Seal Replacement*.
	Product upstream and downstream of Tool Changer failed or damaged	Check product upstream and downstream of Tool Changer for failure. This failure can “appear” to be caused by the Tool Changer or affect Tool Changer performance.

6.1.1 Solenoid Valve Manual Override Procedure

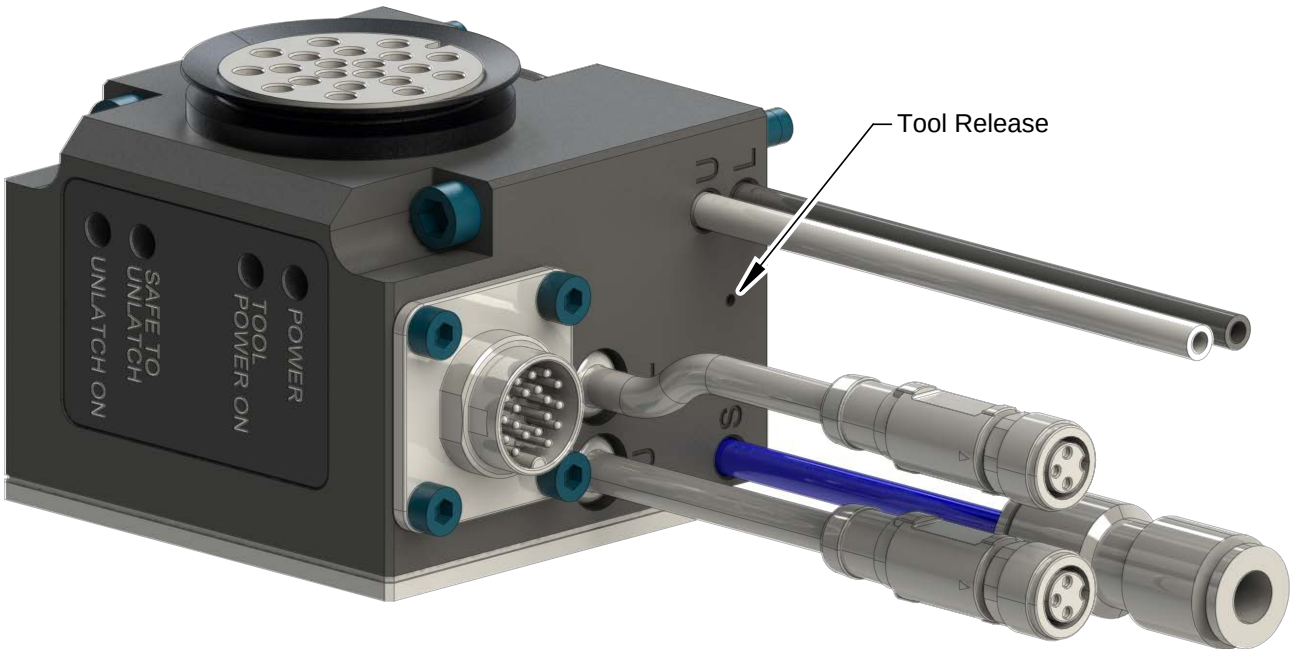
NOTICE: Only a small amount of force and short travel is required to manually override the valve.

NOTICE: The valve and locking mechanism will only stay in the unlocked state while the tool release switch is being depressed.

Tools required: *0.89mm [.035”] hex key or pin that is less than 1.27mm [.050”] in diameter (such as a paper clip)*

1. Support the Tool plate and customer tooling.
2. Using a 0.89mm [.035”] hex key or pin that is less than 1.27mm [.050”] in diameter (such as a paper clip), insert into the hole marked tool release and using a small amount of force push against the release button.

Figure 6.1—Manual Override (Tool Release)



6.2 Service Procedures

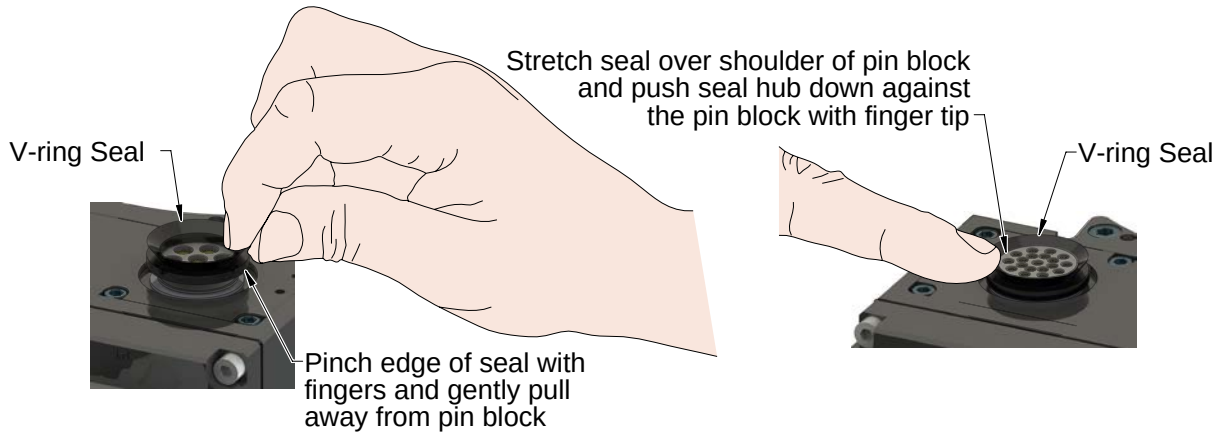
Component replacement and adjustment procedures are provided in the following section:

6.2.1 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 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 6.2—V-ring Seal Replacement



7. Serviceable Parts

7.1 Master Module

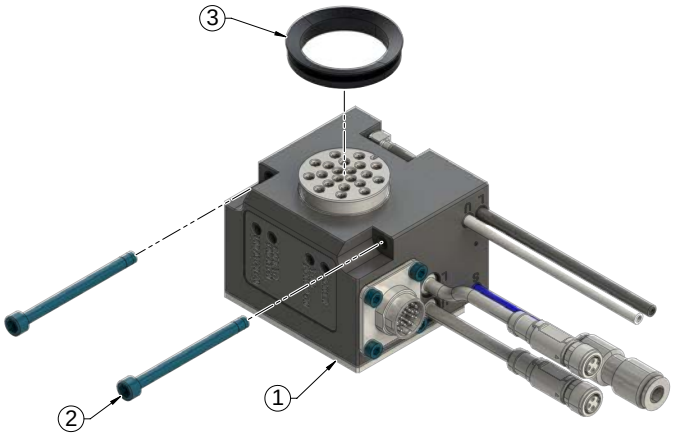


Table 7.1—CV14 Master Module			
Item No.	**Qty**	**Part Number**	**Description**
1	1	9121-CV14xxx-M	Master Module Assembly
2	2	3500-1062050-15A	M4x50 Socket Head Cap Screw, Class 12.9, Blue dyed Magni-565, ND Microspheres Epoxy, Yellow
3	1	4010-0000030-01	V-ring Seal

7.2 Master Module Air Fitting Kits/Accessories

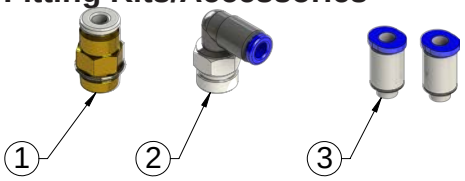


Table 7.2—CV14 Master ModuleAir Fitting Kits/Accessories			
Item No.	**Qty**	**Part Number**	**Description**
1	1	3405-1230003-01	Fitting, Straight, 1/8UniX4mm Tube
2	1	3405-2230007-01	Fitting, Elbow, 1/8Uni -oring x 5/32 (4mm) Tube
3	1	9005-20-9115	Fitting Kit, (2) Straight Fittings (M5 Male x 4mm Tube)

7.3 Tool Module

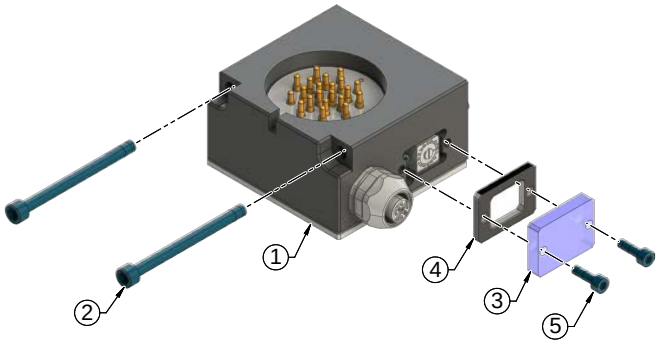


Table 7.3—CV10 Tool Module			
Item No.	**Qty**	**Part Number**	**Description**
1	1	9121-CV10-T	Tool Module Assembly
2	2	3500-1062050-15A	M4x50 Socket Head Cap Screw, Class 12.9, Blue dyed Magni-565, ND Microspheres Epoxy, Yellow
3	1	3700-20-5621	Tool-ID Window
4	1	3700-20-5622	Gasket
5	2	3500-1058010-15A	Fasteners

7.4 Tool Module Switches/Accessories and Pin Cleaning Brush

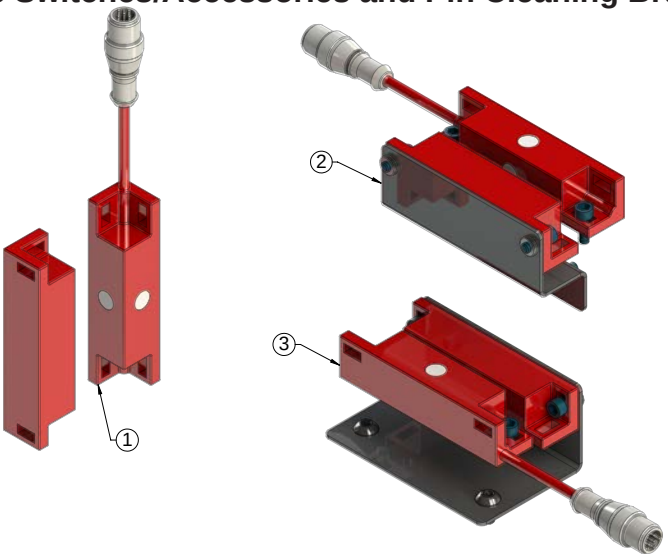


Table 7.4—CV10 Tool Module Switches/Accessories and Pin Cleaning Brush			
Item No.	**Qty**	**Part Number**	**Description**
1	1	8600-440N-S32023-01-M12-1.04	Sipha 440N-S32023 Sensor and Actuator with 1.04 meter long cable overmolded with Turck 5-Pin Male A-Coded M12 connector
2	1	9120-TSS-SS-11725	TSS TSI Safety Switch Module - MMB - Sipha
3	1	9120-TSM-SS-11726	TSM TSI Safety Switch Module - MMB - Sipha
Not Shown	*	3690-0000064-60	Brush, Blue Nylon All Purpose (Contact Pin Cleaning)

8. Specifications

Table 8.1—CV14 Master Module Specifications	
9121-CV14	Compact Discrete Control Master Module with Locked and Unlocked Sensor Cables, Integrated Valve
Interface Connector(s)	19-pin M16 male connector for signal and power.
Electrical Rating	4A/24V(+20%/-10%) on pins A and L, 3A/50V on the Spare Pass-Through Pins
	Lock and Unlock Sensors: 10-30VDC operational voltage, 150mA Operational Current.
Weight	0.62 lbs (0.28 kg)

Table 8.2—CV10 Tool Module Specifications	
9121-CV10	Discrete Signal Tool module with 24-Pin Amphenol (MS Style) Connector, TSI, 0-9 Tool ID and 22 Pass-Through Pins
Interface Connector(s)	19-pin M16 male connector for signal and power. **TSI Interface:** 4-pin M12 female connector
Electrical Rating	4A/24V(+20%/-10%) on pins A and L, 3A/50V on the Spare Pass-Through Pins **TSI:** 24V, 3 A
Weight	0.44 lbs (0.20 kg)

9. Drawings

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