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C. Control and Signal Modules

Heavy Duty to Series 8 Valve Adapters

1. Product Overview

Valve adapters provide air to the locking mechanism of the Tool Changer. Valve adapters provide a fully integrated set-up for which the customer only needs to provide a single air supply. The air supply should be clean, dry, and non-lubricated, within 60 to 100 psi (4.1–6.9 Bar), and filtered to ISO 8573-1:2010 [7:4:4].

The valve adapter mounts to Flat 'A', and a control/signal module mounts to the valve adapter. The JU10 valve adapter allows the use of a 9128-series control/signal module with a 9121-series QC-210, QC-213, or QC-1510 Tool Changer, while the JU11 allows a 9128-series control/signal module to mount to a 9121-series QC-310, QC-510, QC-313, QC-1210, or QC-1310 Tool Changer.

The control/signal module sends a Latch or Unlatch signal to the Master valve adapter through the card edge connector. Then the signal is sent to the Master adapter module's integrated double solenoid valve that routes either locked or unlocked air to the locking mechanism. *Figure 1.1* shows a 9128-series control/signal module and the adapter interface.

Figure 1.1—9128-series Control Modules and Valve Adapters

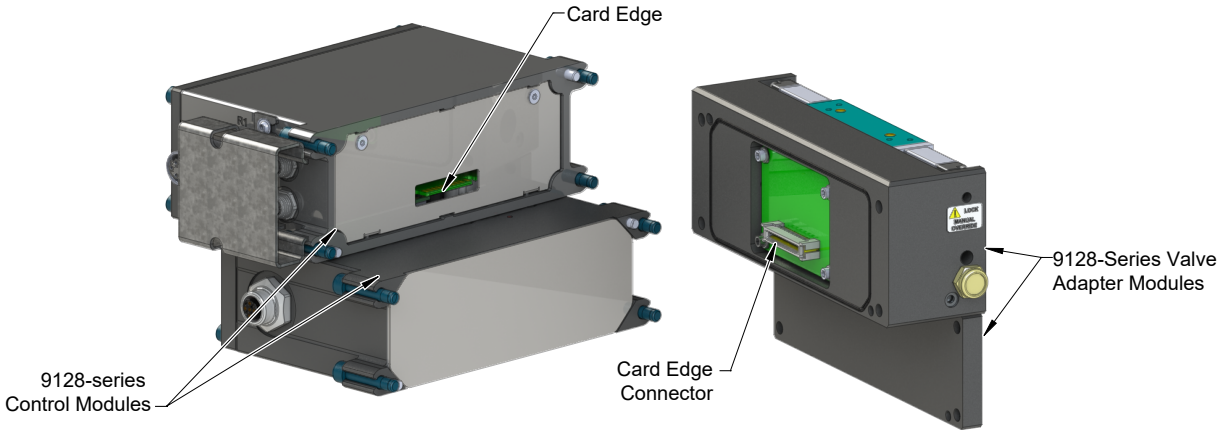
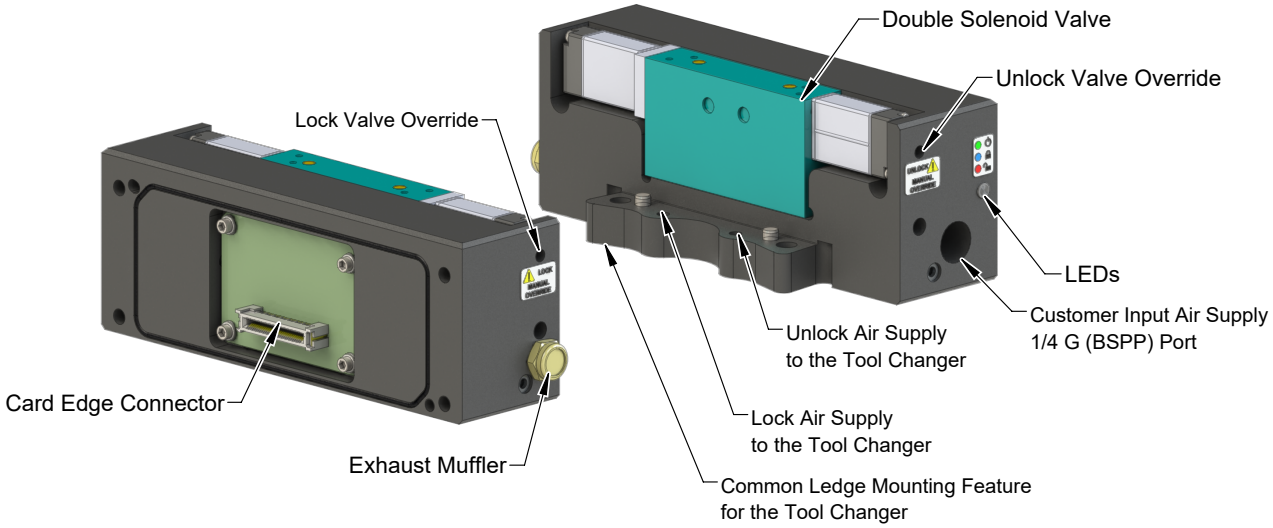


Table 1.1—Series 8 Valve Adapters to Heavy Duty Tool Changers		
Module	**Air Port Size**	**Compatible Tool Changers**
9121-JU10-M	G 1/4 (BSPP)	QC-210, QC-213, QC-1510
9121-JU11-M	G 1/4 (BSPP)	QC-310, QC-313, QC-510, QC-1210, QC-1310

1.1 Master Valve Adapter

The Master valve adapter attaches to the ledge mount on the Tool Changer. A single 1/4 G (BSPP) air port connection is for the customer air supply. Ports on the ledge mount of the adapter pass lock and unlock air to the sealed ports on the ledge mount of the Tool Changer. The Master valve adapter has an exhaust muffler, double solenoid valve, and LED indicators for the solenoid lock and unlock position, refer to *Figure 1.2*. Two small bores in the housing provide access to the lock and unlock valve override (for more information, refer to *Section 5.1.1—Solenoid Valve Manual Override Procedure*).

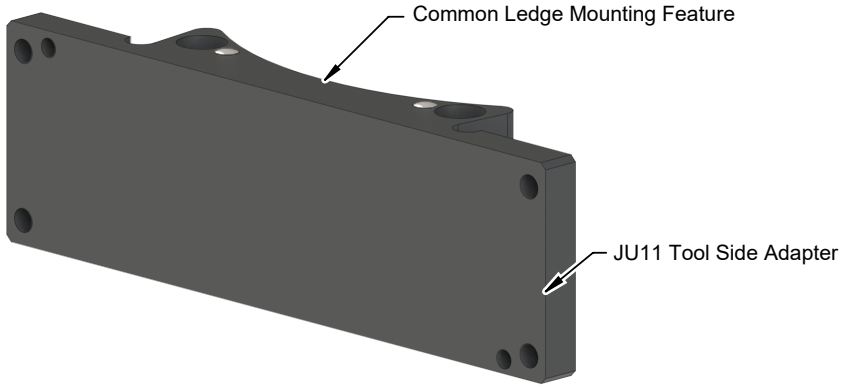
Figure 1.2—Master Valve Adapter Module (JU11 shown)



1.2 Tool Adapter

For the 9128-series Tool control/signal module to properly align with the 9128-series Master module during coupling, the JU11 Tool side adapter must be installed. The JU11 Tool adapter has a ledge mount that attaches to the Tool Changer. The opposite face of the JU11 Tool adapter has a 9128-series bolt pattern for installation of the Tool control/signal module. The JU11 Tool adapter is compatible with all of the Series 8 to Heavy Duty Tool Changer valve adapters.

Figure 1.3—JU11 Tool Adapter



2. Installation

Valve adapters and tool adapter assemblies are typically installed by ATI prior to shipment. The following procedures outline customer-installation or removal as required.

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

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.

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.

2.1 Master Valve Adapter Installation

Tools required: *4 mm and 5 mm hex key, and torque wrench*

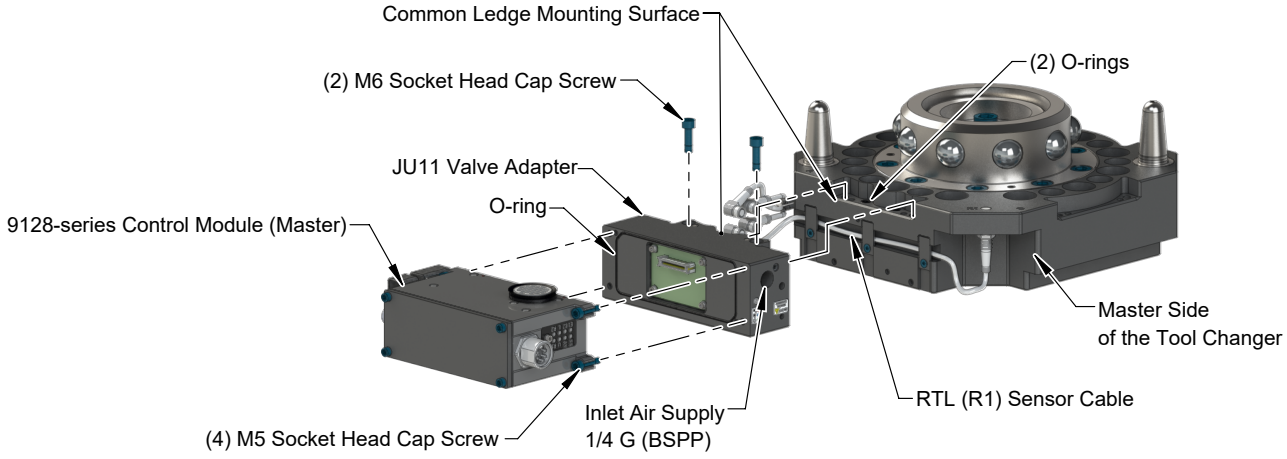
Supplies required: *clean cloth, Loctite® 242, Magnalube*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all circuits, for example: power and air.
4. Wipe down the mounting surfaces with a clean cloth.
5. Verify that (2) O-rings are present and lightly lubricated in air ports of the Flat 'A' mounting ledge on the Tool Changer Master side (refer to *Figure 2.1*).

NOTICE: Make sure the RTL (R1) sensor cable is in the cable channel in the Tool Changer body, so it will not get pinched when installing the valve adapter.

6. Install the valve adapter on Flat 'A' of the Tool Changer or Utlity Coupler:
   a. Place the valve adapter onto Flat 'A' of the Tool Changer.
   b. Apply Loctite® 242 to the supplied M6 socket head cap screws.
   c. Install the (2) M6 socket head cap screws and secure the module to the Tool Changer using a 5 mm hex key. Tighten to 90 in-lbs (10.2 Nm).
7. Install the control/signal Master module on the valve adapter:
   a. Apply Magnalube to the O-ring.
   b. Place the control/signal module along the valve adapter module so that the card edge connection is secure.
   c. Apply Loctite® 242 to the (4) supplied M5 socket head cap screws.
   d. Install the (4) M5 socket head cap screws and secure the module to the Tool Changer using a 4 mm hex key. Tighten to 45 in-lbs (5.1 Nm).
   e. Finish installing the control/signal module. Refer to the control /signal module manual (ATI document# 9620-20-C-*Module Name*).
8. Ensure the inlet air supply port on the valve adapter is clean and connect air.
9. Safely resume normal operation.

Figure 2.1—Master Valve Adapter Installation (JU11 and QC-310 Shown)



2.2 Master Valve Adapter Removal

NOTICE: Depending on maintenance or repair being performed, utilities to modules and Master plate may need to be disconnected.

Refer to *Figure 2.1.*

Tools required: *4 mm and 5 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, and water.
4. Disconnect all connections, for example: power and air.
5. Remove the control/signal module off the valve adapter:
   a. Use a 4 mm hex key to remove the (4) M5 socket head cap screws.
   b. Finish removing the control/signal module. Refer to the control /signal module manual (ATI document# 9620-20-C-*Module Name*).
6. Remove the valve adapter:
   a. Use a 5 mm hex key to remove the (2) M6 socket head cap screws.
   b. Lift the valve adapter off the Tool Changer.
7. Verify that the (2) O-rings remain in the lock and unlock air ports along Flat 'A' mounting flange of the Tool Changer.

2.3 Tool Adapter Installation

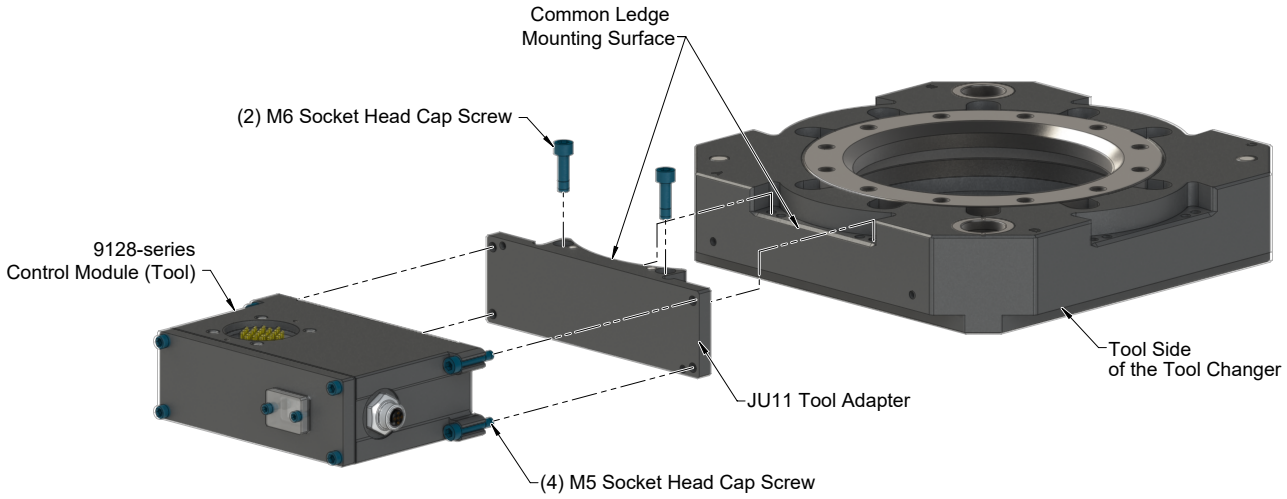
Refer to *Figure 2.2.*

Tools required: *4 mm and 5 mm hex key, and torque wrench*

Supplies required: *clean cloth, Loctite® 242*

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: power and air.
4. Wipe down the mounting surfaces with a clean cloth.
5. Install the Tool adapter on Flat 'A' of the Tool Changer:
   a. Place the Tool adapter onto Flat 'A' of the Tool Changer.
   b. Apply Loctite® 242 to the supplied M6 socket head cap screws.
   c. Install the (2) M6 socket head cap screws and secure the module to the Tool Changer using a 5 mm hex key. Tighten to 90 in-lbs (10.2 Nm).
6. Install the control/signal Tool module on the Tool adapter:
   a. Place the control/signal module along the Tool adapter.
   b. Apply Loctite® 242 to the (4) supplied M5 socket head cap screws.
   c. Install the (4) M5 socket head cap screws and secure the module to the Tool Changer using a 4 mm hex key. Tighten to 45 in-lbs (5.1 Nm).
   d. Finish installing the control/signal module. Refer to the control/signal module manual (ATI document# 9620-20-C-*Module Name*).
7. Safely resume normal operation.

Figure 2.2—Tool Adapter Installation



2.4 Tool Adapter Removal

NOTICE: Depending on maintenance or repair being performed, utilities to modules may need to be disconnected.

Tools required: *4 mm and 5 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, and water.
4. Disconnect all connections, for example: power and air.
5. Remove the control/signal module off the Tool adapter:
   a. Use a 4 mm hex key to remove the (4) M5 socket head cap screws.
   b. Finish removing the control/signal module. Refer to the control /signal module manual (ATI document# 9620-20-C-*Module Name*).
6. Remove the Tool adapter:
   a. Use a 5 mm hex key to remove the (2) M6 socket head cap screws.
   b. Lift the Tool adapter off the Tool Changer.

2.5 Pneumatic Connections

The air supply used for coupling and uncoupling the Tool Changer should be filtered to ISO 8573-1:2010 [7:4:4]. A supply pressure in the range of 60 to 100 psi (4.1–6.9 Bar) is acceptable for operation of the locking mechanism, with a setting of 80 psi suggested. Use a single air supply to the valve adapter for lock and unlock air, refer to *Figure 2.1* for connection.

CAUTION: Do not use the Tool Changer in a fail-safe condition. Do not transport the Tool Changer in a fail-safe condition. Possible damage to the locking mechanism could occur. Re-establish air pressure before returning to normal operations.

2.6 Electrical Connections

Power is supplied to the Master adapter module valve adapter through the card edge connection with the control/signal module. For more information, refer to *Section 1—Product Overview* and *Section 8—Drawings*. The control/signal module controls the double solenoid valve in the Master adapter module.

3. Operation

Users can program the control/signal module to send Latch and Unlatch commands through the edge connector and to the Master adapter module. The solenoid valve in the Master adapter module provides lock or unlock air to the locking mechanism in the Tool Changer.

The functionality of the control/signal module depends on the model. Refer to the control/signal module manual (ATI document# 9620-20-C-*Module Name*) for more information and instructions. The control/signal module can provide customer-specified safety features that prevent the accidental unlock of the Tool, unless the Tool is safely placed in the tool stand. In some cases, a safety feature may prevent the Tool from unlocking unless the Tool is coupled or safely in the tool stand. The manual override functionality can be used to unlock the Tool Changer. Refer to *Section 5.1.1—Solenoid Valve Manual Override Procedure*. Only use the manual override feature when the Tool is in a stand or storage location. Do not use the feature for normal operations. The Unlatch valve manual override feature releases the Tool.

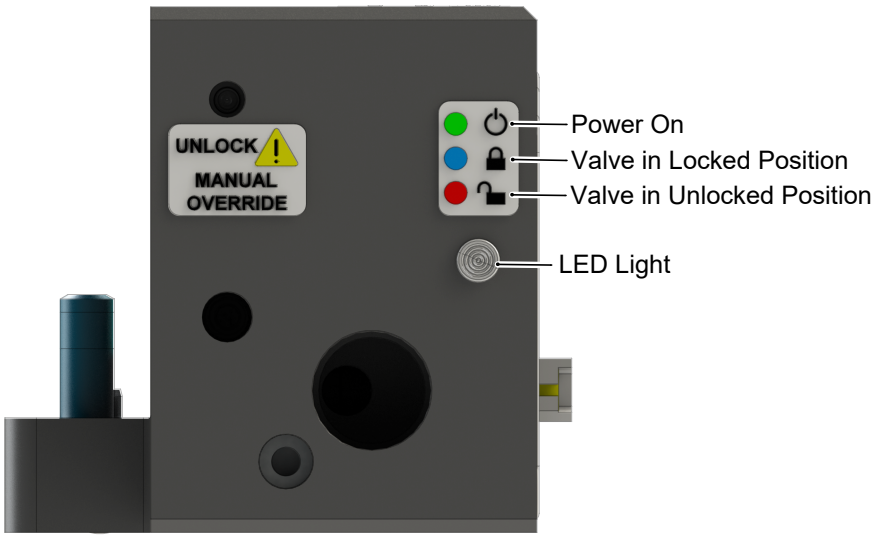
WARNING: Tool Changer release will occur with actuation of the Unlatch valve manual override. Use of the manual override should be restricted to contingency situations. The Tool Changer and Tool should be in a stand or storage location prior to actuation of the manual override.

It is important that the valve adapter be supplied with clean, dry, non-lubricated air supplied between 60 and 100 psi (4.1–6.9 Bar) and filtered to ISO 8573-1:2010 [7:4:4].

3.1 LED Function

When the LED is green, the Master adapter module has power from the control/signal module and is ready for operation. When the LED pulses blue, the Latch command was issued. When the LED pulses red, the Unlatch command was issued.

Figure 3.1—LEDs on the Master Module



4. Maintenance

Valve adapters should require little maintenance. The only wear components are the valve itself and an exhaust muffler. Under normal operating conditions, the valve will last for millions of cycles. Every six months check that the exhaust muffler is not clogged. Check more frequently if used in dirty environments.

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

To check if the exhaust muffler is clogged remove the muffler and blow through the muffler. If it is difficult to blow or no air moves through, replace the exhaust muffler. Refer to *Section 5.2.1—Exhaust Muffler Replacement.*

5. Troubleshooting and Service Procedures

Troubleshooting guidance is in the following section to help resolve issues that might arise. Service procedures are provided for recommended replacement components.

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

5.1 Troubleshooting

When troubleshooting the valve adapter, follow the suggested actions in *Table 5.1*. Also, use the LEDs on the Master adapter module as a troubleshooting tool. If issues persist, contact an ATI representative.

Table 5.1—Troubleshooting

Symptom	Cause	Resolution
Tool Changer will not lock or unlock.	Exhaust muffler is clogged.	Check/Replace exhaust muffler; ensure clean air supply. Refer to *Section 5.2.1—Exhaust Muffler Replacement*.
	Inlet air supply port is clogged.	Clean the inlet air supply port. Ensure that the supply air meets requirements listed in *Section 2.5—Pneumatic Connections* and *Section 7—Specifications*.
	Not enough air pressure is supplied to the Tool Changer.	Make sure the pneumatic connection has minimum pressure, refer to *Section 2.5—Pneumatic Connections.*
	The valve adapter is not securely attached to the Tool Changer and control/signal module. O-rings in the air ports on the Tool Changer's Flat 'A' mounting ledge are damaged or lost.	Verify that the valve adapters are properly installed and the fasteners are secure. Refer to *Section 2—Installation*. If air is still leaking, remove the valve adapter module from the Tool Changer. Verify the O-rings are in the air ports of Flat 'A' mounting ledge. Refer to *Section 2—Installation*.
	Power is not supplied to the solenoid valve in the Master adapter module.	Verify that the Master adapter module LED is green. Monitor the Locked and Unlocked LEDs. Refer to *Section 3.1—LED Function*. If the LEDs do not light, verify the control/signal module is properly installed to the Master adapter module and that the edge card is securely connected. Refer to *Section 2—Installation*. Verify power cables to the control/signal module are properly routed and not damaged. Refer to the control/signal module manual for further troubleshooting guidance.
Tool Changer will lock but not unlock.	The Tool Stand Interlock, or other safety feature is preventing the Tool Changer from unlocking, refer to the control/signal module manual for more information.	Control/signal module may not have a bypass circuit and must be unlocked manually. Refer to *Section 5.1.1—Solenoid Valve Manual Override Procedure.*

5.1.1 Solenoid Valve Manual Override Procedure

Double solenoid valve adapters have manual override buttons on both the lock and unlock sides of the adapter housing. The manual override should only be used for unlocking the Tool Changer.

The unlock manual override procedure should be used when the Tool Changer is locked without the Tool plate attached. The control module safety circuit does not allow the Tool Changer to be unlatched without the Tool plate attached and the Tool in the tool stand.

WARNING: Do not use the solenoid valve unlock manual override if the Tool is locked to the Master. Using the unlock manual override will release the Tool and may cause bodily injury or damage to equipment. If the Tool is attached to the Master, it must be secured in the tool stand or in a location where the Tool weight is supported before using the manual override.

CAUTION: The manual override is not intended for normal operations. Manual override is to be used in situations where no alternative is available to unlock the Master. Do not execute the Latch command unless the Master and the Tool are ready to be coupled.

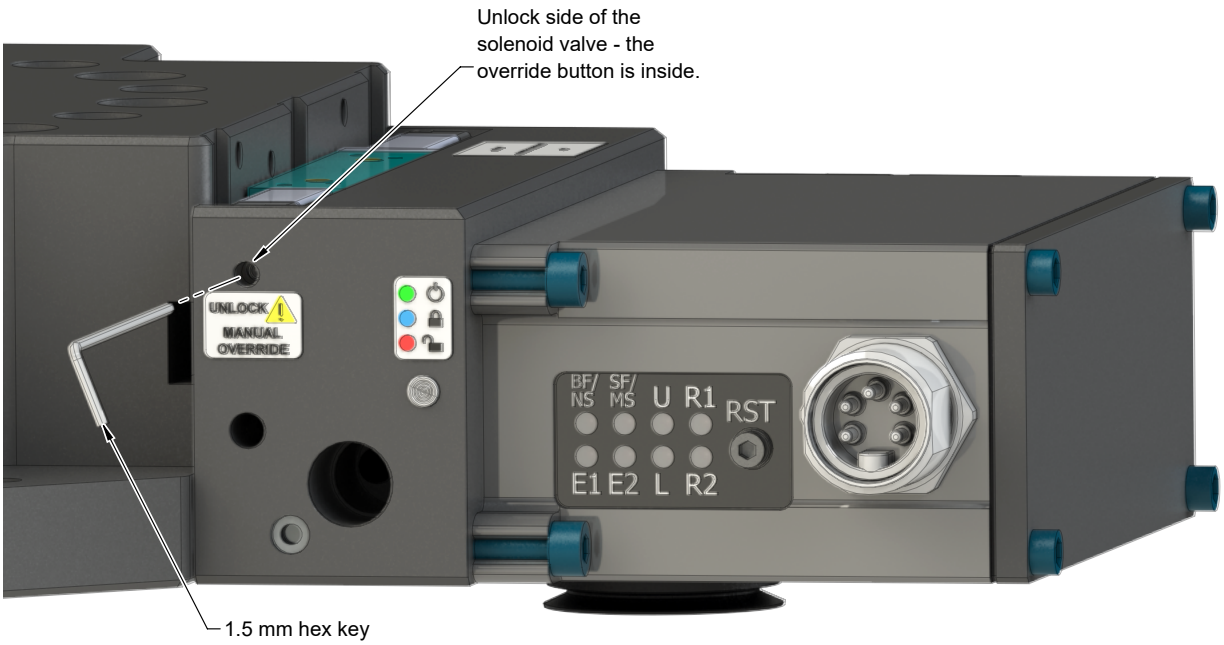
Tools required: *1.5 mm ball end hex key*

1. Locate the Unlock side which is marked with a “Unlock Manual Override” sticker.

CAUTION: Applying excess force can damage the solenoid or cause the override button to stick in one position. Actuation of valve override buttons requires about 1 mm of travel and minimal force. Use a non-sharp object, similar to ball nose 2 mm hex key, to gently depress the override button; an air release should be heard when the solenoid is activated.

2. Insert a 1.5 mm ball end hex key in the unlock valve screw hole and gently depress the valve override button. An air release should be heard when the solenoid is actuated. Make sure the locking mechanism is fully retracted.

Figure 5.1—Manual Override



5.2 Service Procedures

These service procedures provide instructions for inspection, adjustment, test or replacement of components by the user.

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

5.2.1 Exhaust Muffler Replacement

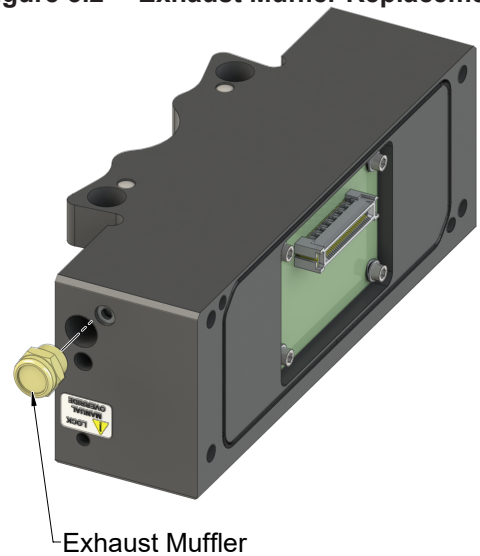
The exhaust muffler allows air from the Tool Changer locking mechanism to be released to the atmosphere. If the muffler is clogged, the locking mechanism may not operate efficiently. To check the exhaust muffler, refer to the following steps.

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

Tools required: *11 mm wrench, Loctite® 562*

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: power and air.
4. Use an 11 mm wrench to remove the exhaust muffler.
5. Check if the exhaust muffler is clogged:
   a. Blow air through the muffler.
   b. If it is difficult to blow or air cannot pass through, discard the exhaust muffler and replace.
   c. If air can pass through, reinstall the exhaust muffler.
6. Apply Loctite® 562 to the threads of the exhaust muffler.
7. Thread the exhaust muffler into the valve adapter housing. Tighten to 40 in-lbs (4.5 Nm).
8. Safely resume normal operation.

Figure 5.2— Exhaust Muffler Replacement



6. Serviceable Parts

Refer to *Section 8—Drawings*.

7. Specifications

Table 7.1—JU10 and JU11 Master Valve Adapter Specifications	
Specification	**Value or Description**
P/N: 9121-JU10-M 9121-JU11-M	JU10: Valve Adapter for 9128-series control/signal Master module to a 9121-series QC-210 or QC-1510 Tool Changer. The JU10 Master has a double solenoid 5/2 valve. JU11: Valve Adapter for 9128-series control/signal Master module to a 9121-series QC-213, QC-310, QC-313, QC-510, QC-1210, or QC-1310 Tool Changer. The JU11 Master has a double solenoid 5/2 valve.
Interface Connections	Card Edge Connector
Electrical Rating	10.2 to 13.2 VDC (Solenoid Valve)
Current Draw	Switched Power: 330 mA at 12 VDC (Solenoid Valve) (only when locking or unlocking Tool Changer).
Air Pressure	Between 60 and 100 psi (4.1–6.9 Bar)
Air Filtration	ISO 8573-1:2010 [7:4:4]
Environmental Resistance	Dust and water resistant, but not water proof or IP67 compliant
Operational Temperature Range	0 °F - 120 °F (-17.8 °C - 49 °C)
Cv of the Solenoid Valve	1.0
Input Pneumatic Supply Connection	1/4 G (BSPP)
Weight	TBD

Table 7.2—JU11 Tool Adapter Assembly Specifications	
Specification	**Value or Description**
P/N 9121-JU11-T	JU11 Tool Adapter for 9128-series control/signal Tool module to a 9121-series QC-210, QC-213, QC-310, QC-313, QC-510, QC-1210, QC-1310, or QC-1510 Tool Changer.
Weight	0.43 lbs (0.20 kg)

8. Drawings

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