Table of Contents

C. Control and Signal Modules C-2
VB7Z1—Control/Signal Module C-2
1. Product Overview C-2
1.1 VB7Z1 Master C-3
1.2 VB2 Tool C-3
1.3 VB3 Tool C-3
1.4 VB4 Tool C-3
2. Product Information C-4
2.1 Tool Side TSI C-4
2.2 TSI Operational Function C-5
3. Installation C-8
3.1 Module Installation C-8
3.2 Master Module Removal C-9
3.3 Tool Module Installation C-10
3.4 Tool Module Removal C-10
3.5 Setting the Tool-ID on Tool Module C-11
4. Operation C-12
4.1 Lock, Unlock, and Ready-To-Lock (RTL) Sensor Cable LED Behavior C-13
4.2 Recommended Sequence of Operations C-14
5. Maintenance C-16
5.1 Pin Block Inspection and Cleaning C-17
6. Troubleshooting and Service Procedures C-18
6.1 Troubleshooting C-18
6.1.1 Solenoid Valve Manual Override Procedure C-20
6.2 Service Procedures C-21
6.2.1 Seal Replacement C-21
7. Serviceable Parts C-22
7.1 Module Parts C-22
7.2 Accessories C-22
8. Specifications C-23
9. Drawings C-24

C. Control and Signal Modules

VB7Z1—Control/Signal Module

1. Product Overview

The control/signal modules are required to provide a means for the customer to communicate with and control the Tool Changer.

Tool Changer I/O is provided to the customer through the Amphenol MS3102E28-12P connector on the control/signal Master module. Lock, Unlock, and Ready-to-Lock proximity sensor inputs are provided for confirmation of Tool Changer and locking mechanism positions. Other customer-assigned discrete I/O points are also available through the connector.

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

CAUTION: Never couple or uncouple the unit without first disconnecting and discharging the power that passes through the contacts. This is especially true if high voltage circuits are involved. Arcing and contact damage will occur if this is not observed. Always disconnect and discharge electrical power from both upstream and downstream modules.

NOTICE: The 0 and 24 VDC supply lines are required to be on certain pin locations of the customer interface connector. Refer to *Section 9—Drawings* for pin out information and location of the I/O signals.

To avoid unintentional Tool release, the power for the unlatch valve is routed through a safety switch connector. A safety switch must be connected to support this function. Refer to *Section 2.1—Tool Side TSI* for detailed information regarding the safety features of the discrete control/signal modules.

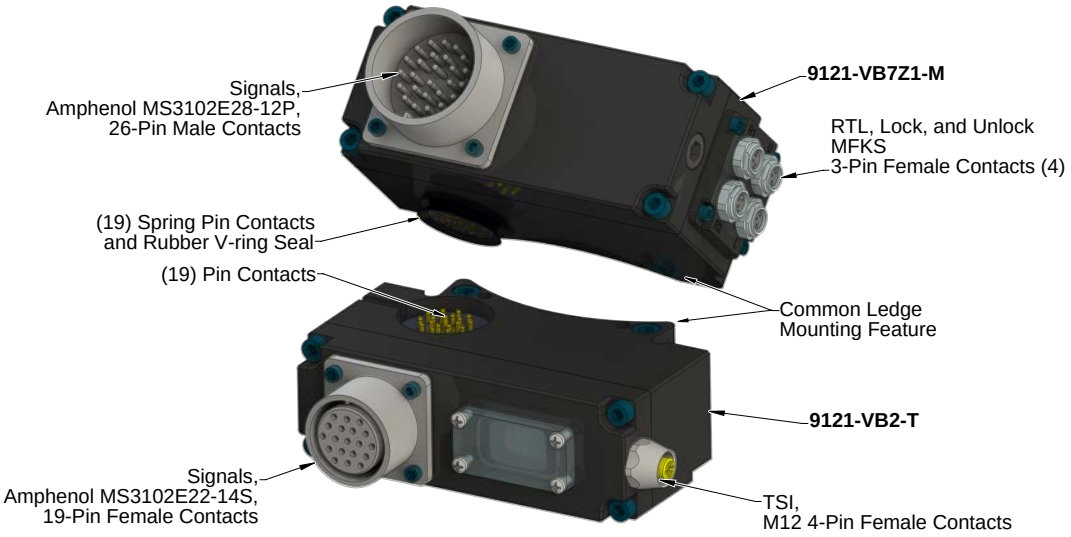
1.1 VB7Z1 Master

The Master module is equipped with a 26-pin, MS-style Amphenol connector for interfacing with the Tool Changer's Lock, Unlock, and Ready-to-Lock sensors and for supplying signals to the end-of-arm tooling. Electrical schematics and connector details are provided in *Section 9—Drawings*.

Interface to the Tool Changers integrated RTL, Lock, and Unlock sensors are provided through (4) M8, 3-pin connectors on the Master module. Refer to the specific Tool Changer manual for details on the operation of RTL, Lock, and Unlock sensors. The Lock, Unlock, and RTL cables are provided as an integrated part of the Tool Changer.

An electrical interface is provided on the Master module for support of only integrated double solenoid valves (DC Voltage, sourcing-type). The integrated valve can be supplied from ATI as part of the valve adapter block (such as 9121-JU2-M). Refer to the Valve Adapter Manual for more information (9620-20-C-Jxx Air and Valve Adapters with Valve Signal Pass Through). Electrical interface drawings and connector details are provided in drawings in *Section 9—Drawings*. When the Tool Changer is coupled, the Master and Tool modules interface using a spring-loaded pin blocks. A V-ring seal surrounds the pin block and is designed to be water resistant but not waterproof when modules are coupled.

Figure 1.1—VB7Z1 Master Module with VB2 Tool Module



1.2 VB2 Tool

The VB2 Tool module is equipped with a 19-pin, MS-style Amphenol connector and provides the interface for supplying (14) pass through signals to the end-of-arm tooling. A 4-pin M12 female connector passes TSI signals. Refer to *Section 9—Drawings* for additional information and connector details. No Tool-ID feature.

1.3 VB3 Tool

The VB3 Tool module is equipped with a 19-pin, MS-style Amphenol connector and provides the interface for supplying (10) pass through signals to the end-of-arm tooling. Refer to *Section 9—Drawings* for additional information and connector details. The (1) digit Tool-ID feature distinguished between the different tools coupled by the Tool Changer.

1.4 VB4 Tool

The VB4 Tool module is equipped with a 19-pin, MS-style Amphenol connector and provides the interface for supplying (6) pass through signals to the end-of-arm tooling. Refer to *Section 9—Drawings* for additional information and connector details. The (2) digit Tool-ID feature distinguished between the different tools coupled by the Tool Changer.

2. Product Information

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

2.1 Tool Side TSI

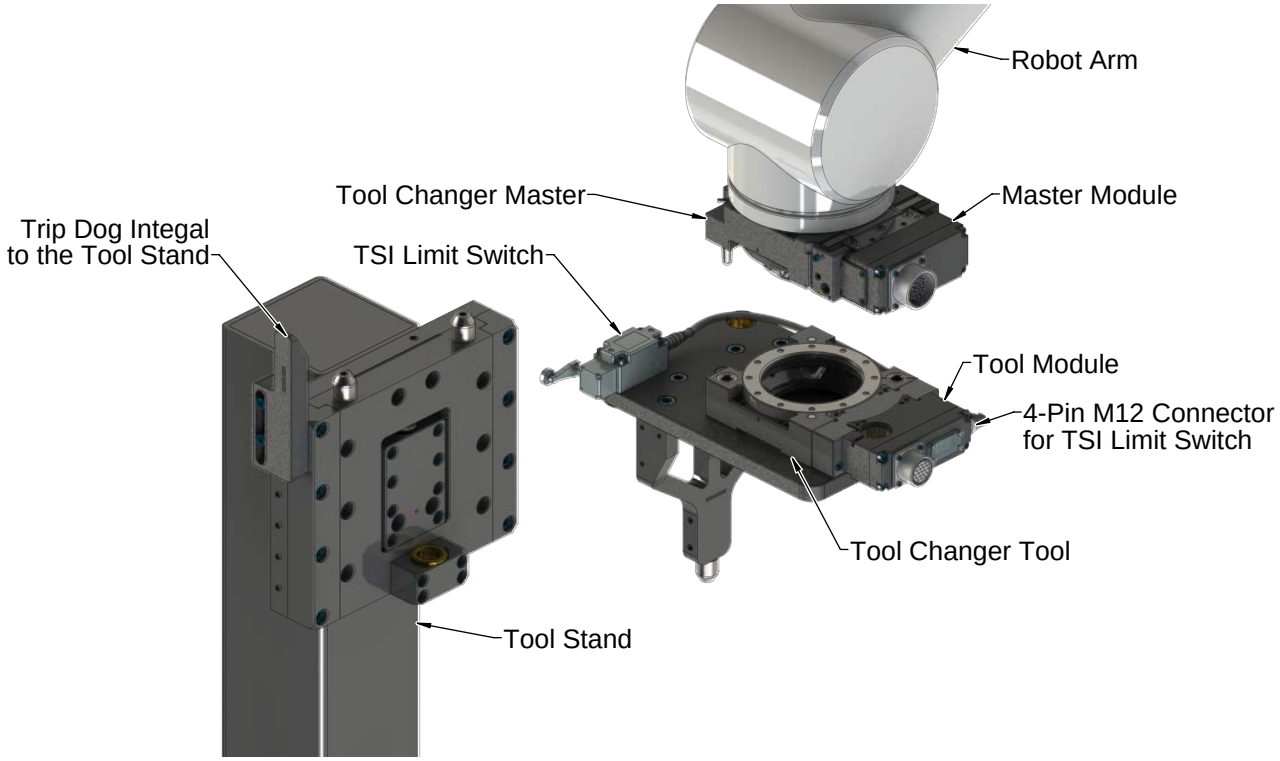
To prevent an unintended Tool release, the electrical power to the unlatch valve circuit is switched ONLY when the Tool mounted limit switch indicates that the Tool is nested safely in the tool stand. The limit switch ensures that the Tool Changer Master release the Tool in the tool stand (refer to *Figure 2.1*). If an Unlatch command is given and the Tool is not docked properly, the Unlatch command will not be recognized.

ATI recommends installation of a momentary action normally open, single-pole, single-throw mechanical limit switch to work with the TSI circuit. The limit switch must mount to the Tool in a manner that guarantees that the switch is closed only when the Tool is nested in the tool stand (see *Figure 2.2* and *Figure 2.3*). The limit switch is connected to the VB Tool module via a 4-pin M12 female connector.

A teach plug is available to override the TSI safety feature during initial setup and maintenance situations.

The function of the VB safety circuitry can be more clearly understood by referencing the schematics shown in *Figure 2.2* and *Figure 2.3*.

Figure 2.1—Tool Stand Interlock (TSI)



CAUTION: The Master locking mechanism must be fully retracted prior to the Master entering the Tool. Failure to do so will cause ball bearings to damage the Tool bearing race. If the Tool changer is locked, use solenoid valve manual override on the Tool Changer to unlock before attempting to latch the Master with the Tool. Refer to *Section 6.1.1—Solenoid Valve Manual Override Procedure*.

2.2 TSI Operational Function

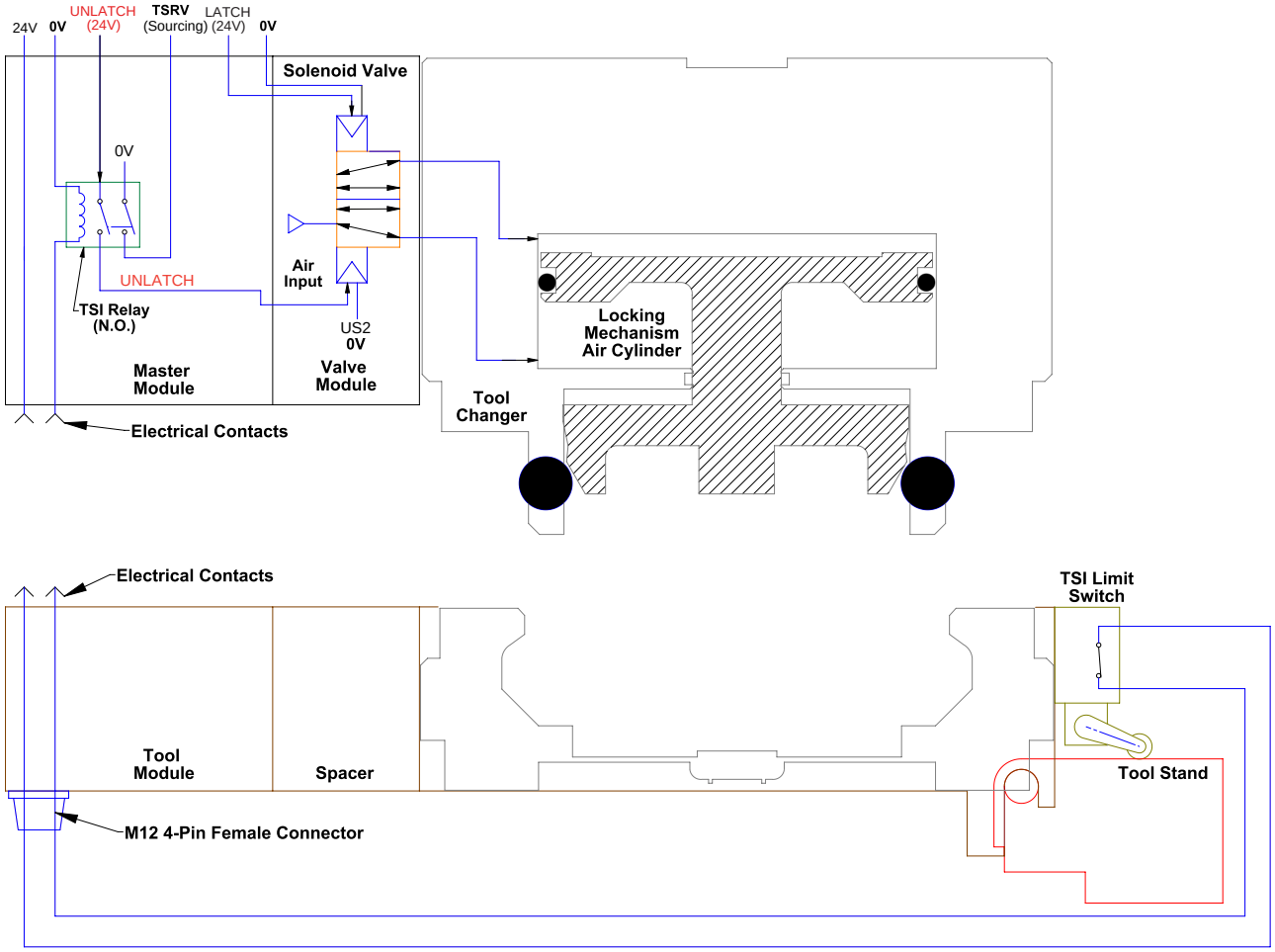
The Master is away from the tool stand and the Tool is nested safely in the tool stand. The TSI relay, located in the Master module, is driven by closure of the mechanical TSI limit switch located on the Tool. When closed, the relay passes the unlatch signal from the robot to the solenoid valve.

Since the Master and Tool are not coupled and the electrical contacts are not touching, it is not possible to close the TSI relay and unlock the Tool Changer locking mechanism. Even if an unlatch command is provided by the robot, the Tool Changer will not unlock.

In the event that the Tool Changer is locked without a Tool, it must be unlocked using the manual override button on the valve (refer to *Section 6.1.1—Solenoid Valve Manual Override Procedure*).

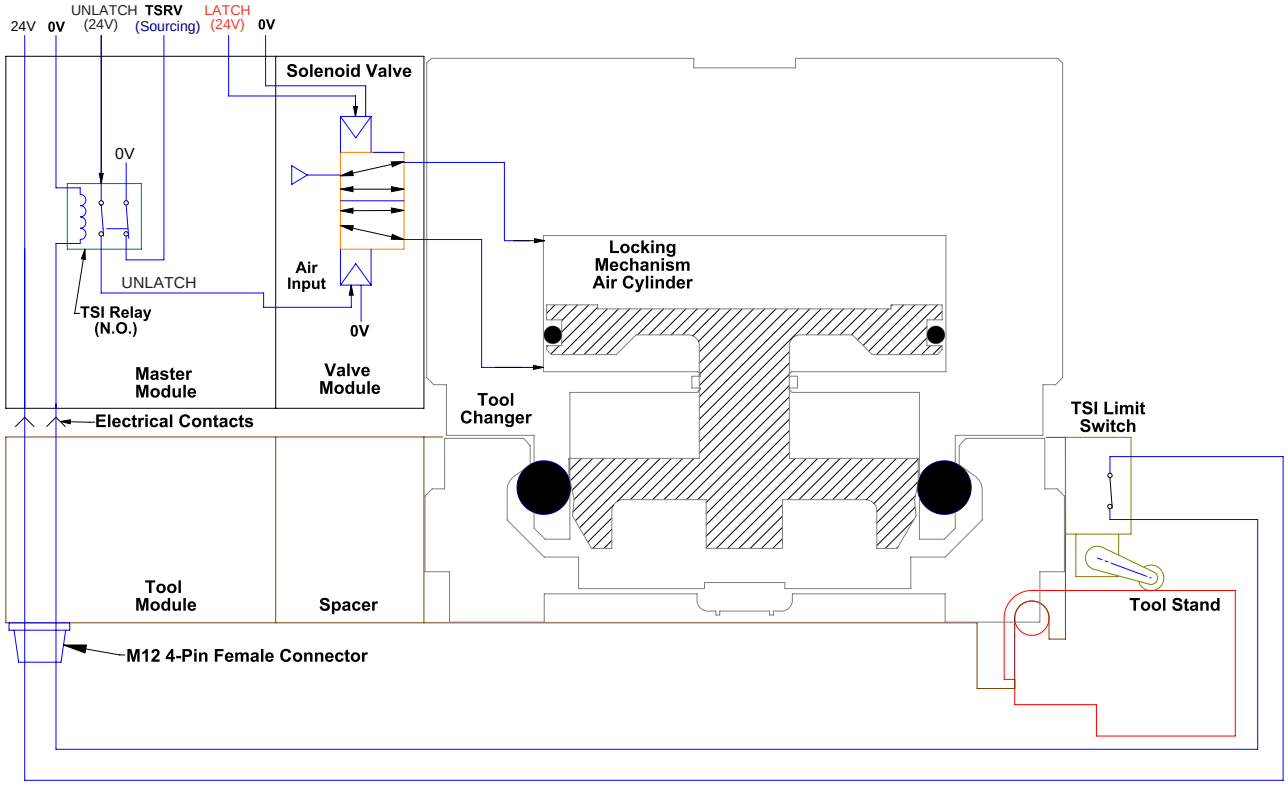
The second set of contacts on the TSI relay is used to provide the TSRV (TSI Relay Verify) diagnostic signal (when the TSI relay is open, the TSRV signal should be low) (Note: in the VB7Z1 module the TSRV signal is sourcing.) The TSRV signal can indicate if there is damage to the TSI relay, cable, or mechanical switch. For maximum safety, the status of the TSRV signal should be monitored in the manner described in *Section 4.2—Recommended Sequence of Operations*.

Figure 2.2—TSI Circuit with Master Free of Stand, Tool in the Stand



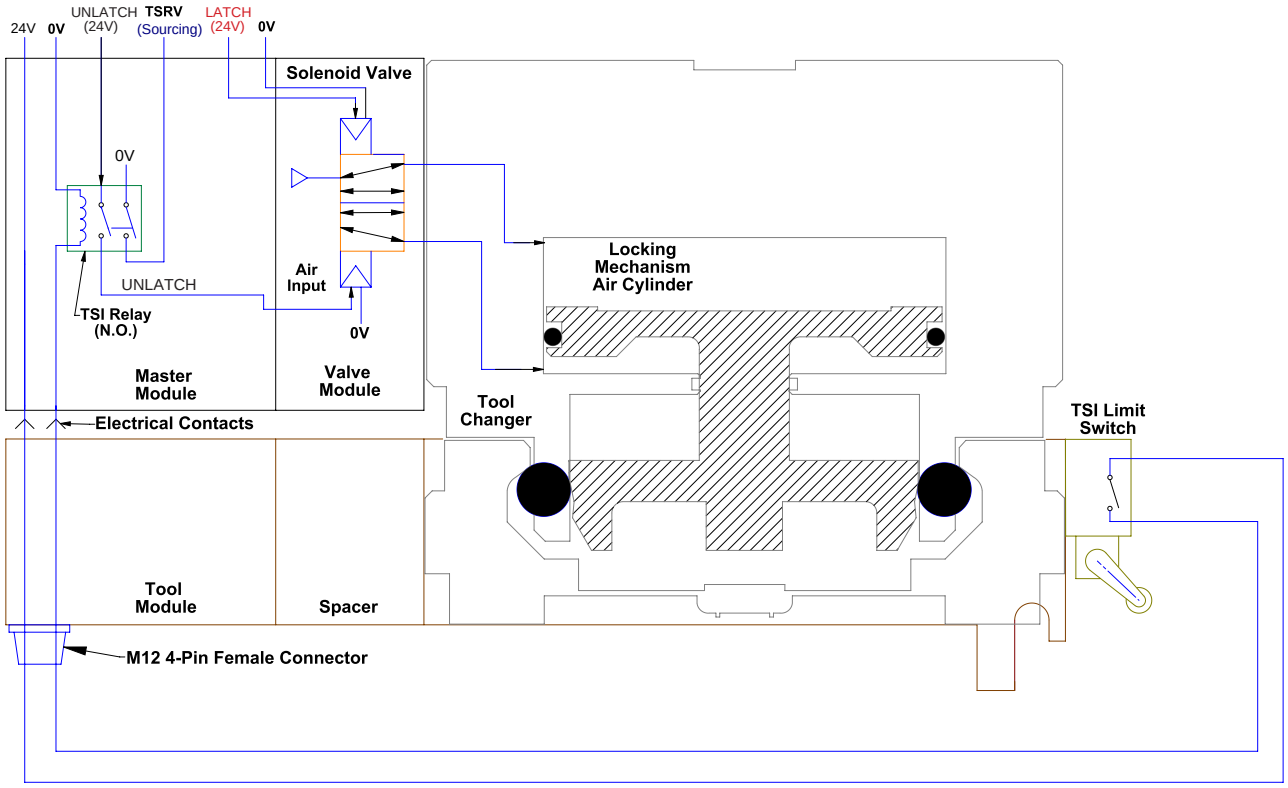
The Master and Tool are within coupling distance and the electrical contacts are touching. The TSI relay closes because the TSI limit switch is actuated and the electrical contacts are touching. It is now possible for the TSI relay to pass the unlatch signal from the robot to the solenoid valve.

Figure 2.3—TSI Circuit with Master and Tool Locked



The Master and Tool are coupled together and free of the tool stand, the TSI Limit Switch (normally Open) is not tripped breaking the circuit in the TSI relay. It is not possible to close the TSI relay and unlock the Tool Changer locking mechanism, even if an unlatch command is provided by the robot the Tool Changer will not unlock.

Figure 2.4—TSI Circuit with Master and Tool Locked (free of stand)



3. Installation

The control/signal modules are typically installed by ATI prior to shipment. Installation and removal are outlined in the following section. For wiring information refer to *Section 9—Drawings*.

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

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

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

3.1 Module Installation

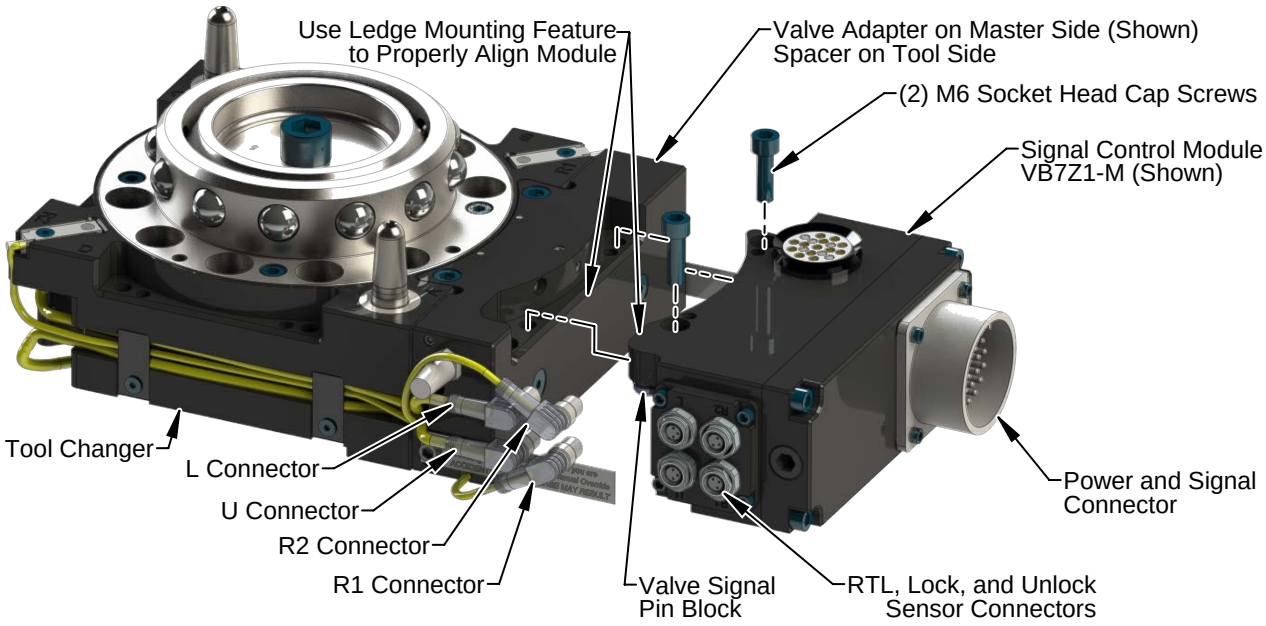
Refer to *Figure 3-1*

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

Supplies required: *Clean rag, 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: electrical, pneumatic, and hydraulic circuits).
4. Ensure that the mounting surface is clean.
5. Place the module into the appropriate location on the air or valve adapter.
6. Apply Loctite 242 to the supplied M6 socket head cap screws.
7. Install the (2) M6 socket head cap screws and secure the module to the air or valve adapter using a 5 mm hex key. Tighten to 70 in-lbs (7.9 N-m).
8. Ensure the Lock (L), Unlock (U), RTL (R1), and RTL (R2) connectors are clean and connect the sensor cables to the control/signal module.
9. Ensure that the connectors (power, signal, auxiliary, etc.) are clean and connect the cables to the module.
10. Safely resume normal operation.

Figure 3.1—Module Installation



3.2 Master Module Removal

Tools required: *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, pneumatic, and hydraulic circuits).
4. Mark the Lock, Unlock, and RTL sensor cables so that the cables can be reinstalled to the appropriate sensor.
5. Disconnect the Lock (L), Unlock (U), and RTL (R1), and RTL (R2) sensor cable connectors from the module.
6. Disconnect (for example: power, signal, auxiliary, etc.) cables from the control/signal module.
7. Support the control/signal module, remove the (2) M6 socket head cap screws using a 5 mm hex key, and lower the module until it clears the guide pin.

3.3 Tool Module Installation

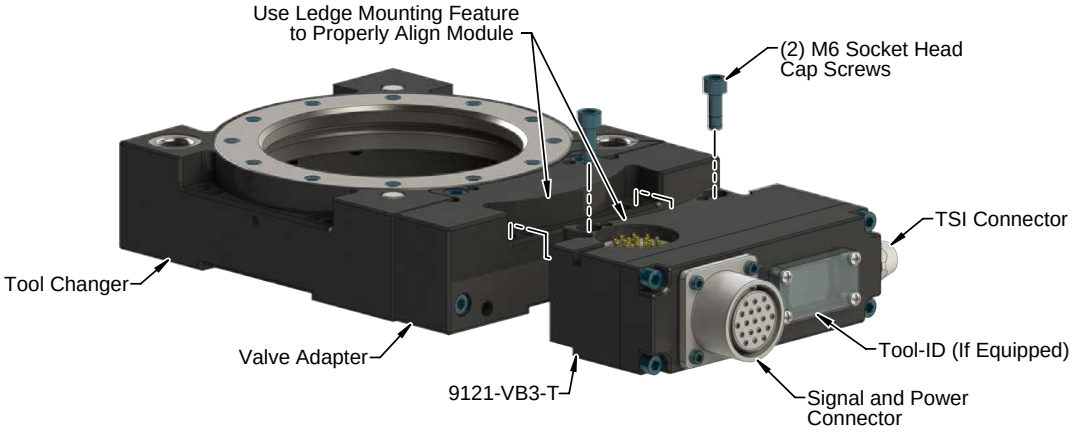
To set Tool-ID, refer to *Section 3.5—Setting the Tool-ID on Tool Module*.

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

Supplies required: *Clean rag, 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: electrical, pneumatic, and hydraulic circuits).
4. Wipe down the mounting surfaces with a clean rag.
5. Place the module onto the air adapter or Tool plate.
6. Apply Loctite 242 to the supplied M6 socket head cap screws. Install the (2) M6 Socket Head Cap Screws and secure the module to the air adapter using a 5 mm hex key. Tighten to 70 in-lbs (7.9 Nm).
7. Ensure the power, signal, auxiliary, and other connectors are clean and connect the cables to the module.
8. Ensure the TSI limit switch connection is clean and connect the cable to the module.
9. Safely resume normal operation.

Figure 3.2—Module Installation



3.4 Tool Module Removal

Tools required: *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, pneumatic, and hydraulic circuits).
4. Disconnect (for example: power, signal, auxiliary, etc.) cables 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) M6 socket head cap screws using a 5 mm hex key, and lift the module from the valve adapter.

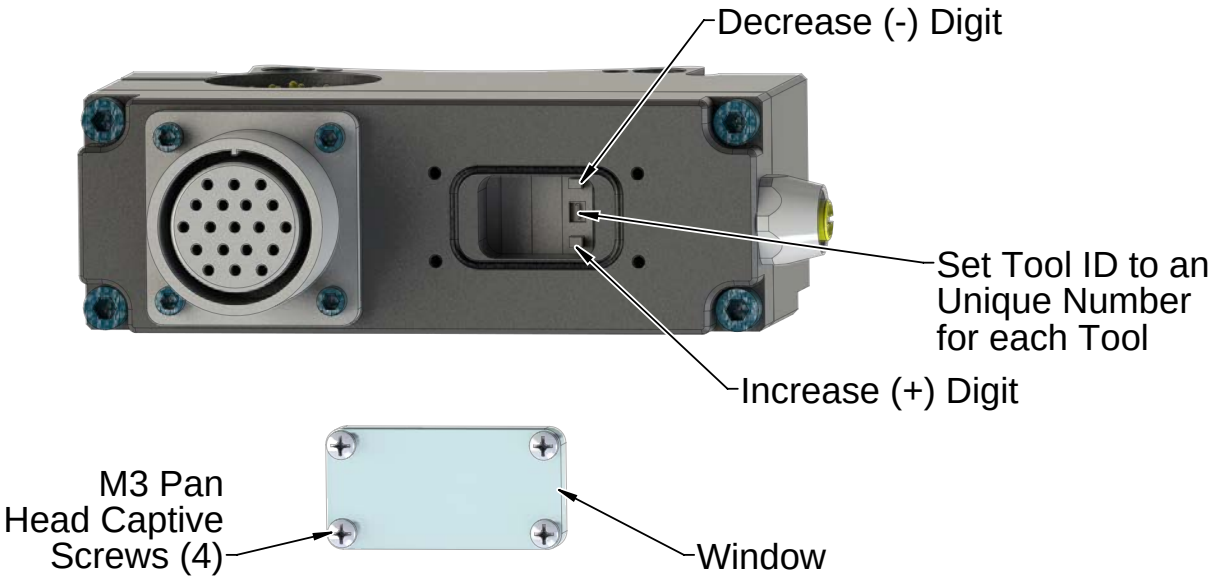
3.5 Setting the Tool-ID on Tool Module

Push button switches are provided on the Tool module for setting of a unique digit Tool-ID number.

Tools required: *Phillips screwdriver*

1. Loosen (4) M3 pan head captive screws and remove Tool-ID window.

Figure 3.3—Set Tool-ID (VB3-T Shown)



2. Use a non-conductive tool (e.g., plastic stylus) to press on the Tool-ID push buttons to increase (+) or decrease (-) the digit value. Set the Tool-ID to the desired unique digit number. Refer to *Section 9—Drawings* for Tool-ID output tables.
3. Re-install the Tool-ID window and tighten the (4) M3 pan head captive 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.



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.

Refer to the specific Tool Changer manual for conditions for coupling of the Tool Changer and *Section 4.2—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.

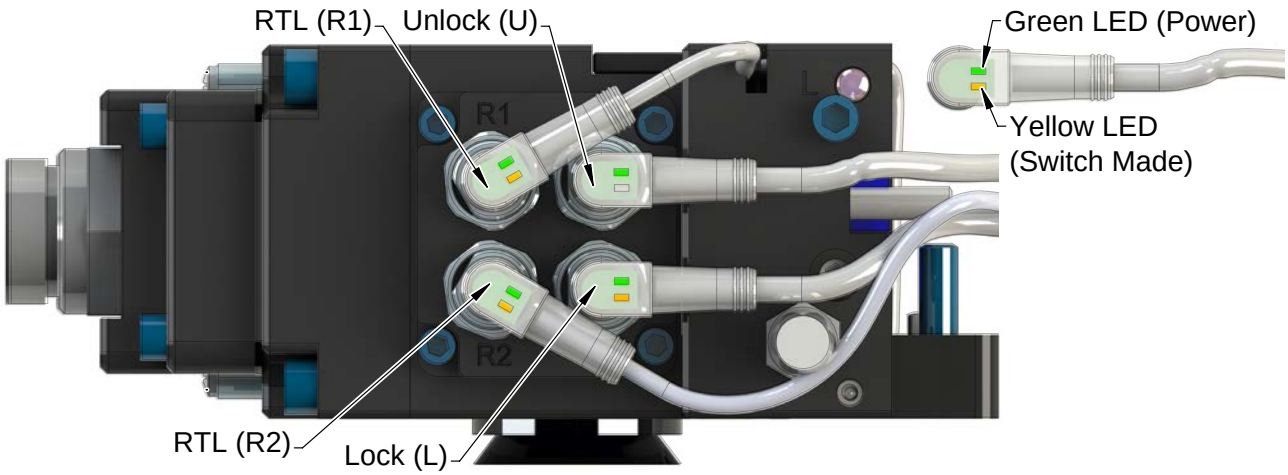
4.1 Lock, Unlock, and Ready-To-Lock (RTL) Sensor Cable LED Behavior

The Lock, Unlock, and RTL sensor cables are equipped with two LEDs. The Green LED indicates the sensor has power and the yellow LED indicates the switch has been made. The LED behavior is affected by the control/signal module.

Table 4.1—Sensor Cable LED Behavior for Common Tool Changer Positions

Tool Changer Position	Sensor cable LED Behavior			
Unlocked (Tool Changer Master plate free of stand with no Tool plate attached)	RTL (R1) Sensor	ON	ON	Unlock (U) Sensor
	RTL (R2) Sensor	ON	OFF	Lock (L) Sensor
Ready to Lock (Tool Changer Master plate with Tool plate parallel and at a distance of 1.22 mm or less from each other)	RTL (R1) Sensor	ON	ON	Unlock (U) Sensor
	RTL (R2) Sensor	ON	ON	Lock (L) Sensor
Locked (Tool Changer Master plate with Tool plate attached in fully locked position)	RTL (R1) Sensor	ON	OFF	Unlock (U) Sensor
	RTL (R2) Sensor	ON	ON	Lock (L) Sensor
Missed Tool (Tool Changer Master plate locked with no Tool plate attached)	RTL (R1) Sensor	ON	OFF	Unlock (U) Sensor
	RTL (R2) Sensor	ON	OFF	Lock (L) Sensor

Figure 4.1—Lock, Unlock, and RTL Sensor cable LED Behavior (Shown in Locked Position)



(Control module shown for reference only)

4.2 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 VB18 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). The Tool is by itself in the Tool Stand.

   a. The **RTL1** and **RTL2** inputs are off
   b. The **TSRV** input is off.
   c. The **Unlocked** input is on, indicating that the Tool Changer locking mechanism is fully retracted.
   d. Communication to the ATI Tool and downstream device(s) are not available.

   NOTICE: In the event that the Tool Changer is locked without a Tool, it must be unlocked using the manual override button on the valve, refer to *Section 6.1.1—Solenoid Valve Manual Override Procedure.*

   NOTICE: For maximum safety, ATI strongly recommends editing the robot program to verify that TSRV is OFF just before tool pick up. If the TSRV is ON it may indicate the TSI relay is not fuction properly and the VB7Z1 module should be replaced.

2. Robot and Master move into the Tool are parallel and within 0.06" of the Tool (i.e., the module contact pins are touching, the **RTL** sensors have sensed the targets on the Tool).

   a. The **TSRV** input turns on.
   b. The **RTL1** and **RTL2** inputs turn on, indicating that it is okay to couple the Tool.
   c. 'Input' power connections become available on the Tool.
   d. Communications with the ATI Tool and downstream device(s) should now be established. If equipped **Tool-ID** becomes available within 50ms

3. Coupling the Tool Changer.

   a. The **Unlatch** output must be turned off.
   b. The **Latch** output must be turned on.
   c. The **Unlocked** input turns off a short time later, indicating piston travel. Subsequently, the **Locked** input turns on and remains on, indicating that the coupling operation is complete.

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

NOTICE: For maximum safety, ATI strongly recommends editing the robot program to verify that TSRV is OFF when the tool is above the stand immediately after tool pickup. If the TSRV is ON it may indicate the TSI relay or the TSI switch is not fuction properly.

5. Normal operation:
   a. The following inputs are on:
      i. **Locked**
      ii. **RTL1**
      iii. **RTL2**
      iv. **Tool-ID** (if equipped)
   b. The following inputs are off:
      i. **Unlocked**
      ii. **TSRV**
   c. The following outputs are on:
      i. **Latch**
   d. The following outputs are off:
      i. **Unlatch**
6. Robot moves into the tool stand with the Tool Changer coupled.
7. Uncoupling the Tool Changer.

NOTICE: It is critical that the Tool be nested securely in the tool stand prior to uncoupling the Tool Changer. The TSI switch must be tripped to activate the TSI relay allowing the Tool Changer to Unlock.

   a. The **TSRV** input turns on.
   b. The **Latch** output must be turned off.
   c. The **Unlatch** output must be turned on.
   d. The **Locked** input turns off a short time later and subsequently the **Unlocked** input turns on and remains on, indicating that the uncoupling operation is complete.
9. 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 **TSRV** input turns off.
   b. The **RTL1** and **RTL2** inputs turn off.
   c. ‘Input’ power connections become unavailable on the Tool.
   d. Communications with downstream device(s) should now be lost.
   e. If equipped the **Tool-ID** becomes unavailable (all 1 → 0xF) or (all 1 → 0xFF).
10. Robot and Master in free space.
   a. The following inputs are on:
      i. **Unlocked**
   b. The following inputs are off:
      i. **Locked**
      ii. **RTL1**
      iii. **RTL2**
      iv. **TSRV**
      v. **Tool-ID** (if equipped all 1 → 0xF or all 1 → 0xFF)
   c. The following outputs are on:
      i. **Unlatch**
   d. The following outputs are off:
      i. **Latch**

NOTICE: Latch and **Unlatch** outputs can be pulsed and do not have to remain on or off during normal operations.

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.

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

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

If the Tool Changer 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 re-tightened as appropriate. Inspect cable sheathing for damage, repair or replace damaged cabling. Loose connections or damaged cabling are not expected and may indicate improper routing and/or strain relieving.
- Inspect the Master and Tool pin blocks for 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

The troubleshooting section provides information to help diagnose conditions with the Tool Changer or control/signal module. The service procedures provide instructions for component replacement and adjustment.

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.

6.1 Troubleshooting

Troubleshooting information is provided in the following table.

Table 6.1—Troubleshooting

Symptom	Possible Cause	Correction
Unit will not lock or unlock	Debris caught between the Master and Tool plates.	Clean debris from between Master and Tool plates. Verify mounting fasteners is secure and does not protrude above the mating surfaces.
	Ball bearings are not moving freely.	Verify the ball bearings are moving freely. Clean and lubricate as needed. Refer to the Maintenance section of the Tool Changer manual for instructions.
	Air supply not to specifications.	Check air supply. Refer to the Installation section of the Tool Changer manual for specifications.
	Valve adapter exhaust muffler clogged.	*The valve adapter exhaust muffler may be clogged. Refer to the valve adapter manual for more information.*
	TSI switch not functioning properly.	*Verify the TSI switch is functioning and properly adjusted.*
	Signals are mapped incorrectly.	Verify signals are mapped and are communicating properly. Refer to *Section 9—Drawings* for electrical schematic.
	Master and Tool are within the specified No-Touch zone.	Verify the Master and Tool are within the specified No-Touch zone when attempting to lock. *Refer to the Installation – tool stand Design Section of the Tool Changer manual for specifications.*
	Solenoid valve not functioning.	*The valve adapter exhaust muffler may be clogged. Refer to the valve adapter manual for more information.*

Table 6.1—Troubleshooting		
Symptom	**Possible Cause**	**Correction**
Sensors not operating properly (but DeviceNet is operating correctly).	Tool plate is not secured properly or debris is trapped between surfaces.	Ensure that the Tool plate is securely held to the Master plate, that nothing is trapped between their surfaces.
	Valve adapter exhaust muffler clogged.	*The valve adapter exhaust muffler may be clogged. Refer to the valve adapter manual for more information.*
	Sensor cables damage or incorrectly connected.	Verify the cables are connected correctly and not damaged, replace if damaged. Refer to the Troubleshooting Section of the Tool Changer manual.
	Sensors are not set correctly or not functioning.	Verify the sensors are set correctly and functioning. *Refer to the Troubleshooting Section of the Tool Changer manual.*
Loss of Communication	Damaged signal cabling	Check/Replace signal cabling up- and down-stream of Tool Changer modules.
	Worn or damaged contact pins	Inspect module contact pins for debris/wear/damage.
	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.
No Power on the Tool-side	Latch command not issued	Verify the Latch command has been issued by the robot.
	Loss of DeviceNet power on the Master.	Restore DeviceNet Power to the Master.
Tool Changer is locked without Tool	Tool Changer was inadvertently locked without Tool.	Unlock Tool Changer Manually refer to *Section 6.1.1—Solenoid Valve Manual Override Procedure.*

6.1.1 Solenoid Valve Manual Override Procedure

The 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 manual override if the tool is locked to the Master. Using the 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.

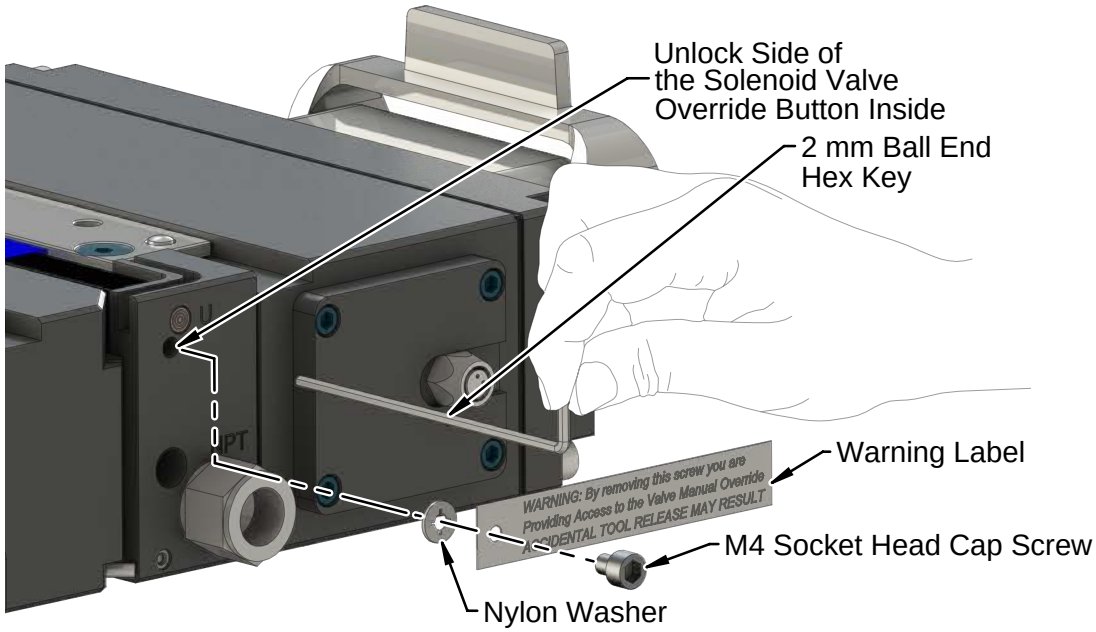
Tools required: *3 mm hex key, 2 mm ball end hex key*

1. Using a 3 mm hex key, remove the M4 socket head cap screws, warning label, and nylon washer from the Unlock side of the solenoid valve. The Unlock side is marked with a “U”.

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 of 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 2 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.
3. Using a 3 mm hex key, replace the M4 socket head cap screws, warning label, and nylon washer and tighten the screw.

Figure 6.1—Manual Override



6.2 Service Procedures

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

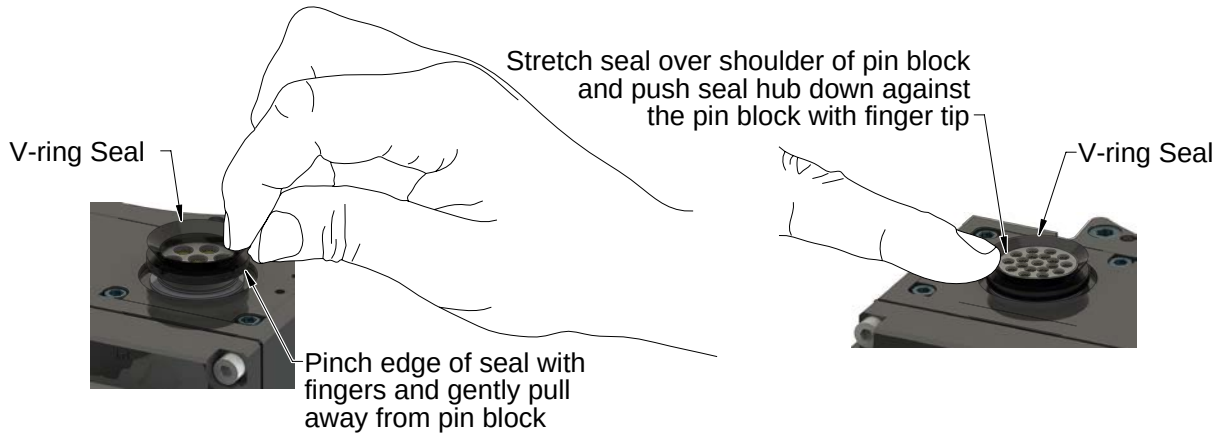
6.2.1 Seal Replacement

Parts required: *Refer to Section 9—Drawings.*

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

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, and hydraulic circuits).
4. To remove the existing seal, pinch the edge of the seal and pull the seal away from the pin block on the Master module.
5. To install a new seal, stretch the new seal over the shoulder of the pin block.
6. Push the seal hub down against the pin block.
7. Safely resume normal operation.

Figure 6.2—V-ring Seal Replacement



7. Serviceable Parts

7.1 Module Parts

Refer to *Section 9—Drawings*.

7.2 Accessories

Table 7.1—Accessories

Item No.	Qty	Part Number	Description
	2	3500-1066020-15A	M6 x 20 Socket Head Cap Screw, Class 12.9, blue dyed Magini-565, ND Microspheres Epoxy, Yellow (Mounting screws for modules)
*	*	3690-0000064-60	Brush, Blue Nylon All Purpose (Contact Pin Cleaning)

8. Specifications

Table 8.1—VB7Z1 Master	
9121-VB7Z1-M	Discrete Signal Master Module with 26-Pin Amphenol, 19-pin Block, Supports L/U/R1/R2 Sensors w/ Integrated Valve Pass Through (Uses Double Solenoid Valve) **Supports Tool Stand Interlock on Tool Side and Works w/VB
Interface Connections	Customer Interface: 26-pin Amphenol MS3102E28-12P male Connector. Integrated Tool Changer I/O: (4) M8 3-pin female connector supporting Tool Changer Locked, Unlocked, and Ready-to-Lock Proximity sensor in series.
Electrical Rating	Signal Pass Through: 5 A, 250 V Max.
	Tool Changer Control: Lock, Unlock, and Ready-to-Lock Sensors: 10-30 VDC operational voltage.
Weight	1.81 lbs (0.82 kg)

Table 8.2—VB2 Tool	
9121-VB2-T	Discrete Signal module with 19-pin Amphenol, 19-pin Block, Tool Stand Interlock, 16 Pass Throughs - Tool Side
Interface Connections	Customer Interface: 19-pin Amphenol MS3102E22-14S Female Connector. TSI Interface: 4-pin M12 Female Connector
Electrical Rating	Signal Pass Through: 5 A, 250 V Max.
Tool-ID	N/A
Weight	1.3 lbs (0.6 kg)

Table 8.3—VB3 Tool	
9121-VB3-T	Discrete Signal module with 19-pin Amphenol, 19-pin Block, Tool Stand Interlock, 12 Pass Throughs - Tool Side
Interface Connections	Customer Interface: 19-pin Amphenol MS3102E22-14S Female Connector. TSI Interface: 4-pin M12 Female Connector
Electrical Rating	Signal Pass Through: 5 A, 250 V Max.
Tool-ID	0-9, (1) digit
Weight	1.3 lbs (0.6 kg)

Table 8.4—VB4 Tool	
9121-VB4-T	Discrete Signal module with 19-pin Amphenol, 19-pin Block, Tool Stand Interlock, 8 Pass Throughs - Tool Side
Interface Connections	Customer Interface: 19-pin Amphenol MS3102E22-14S Female Connector. TSI Interface: 4-pin M12 Female Connector
Electrical Rating	Signal Pass Through: 5 A, 250 V Max.
Tool-ID	0-99, (2) digits
Weight	1.3 lbs (0.6 kg)

9. Drawings

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