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C. Control and Signal Modules

VB12-M, VB13-M, and VB12-T—Discrete Control Module Supporting Integrated Valve

1. Product Overview

The Discrete Control 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 MS-style Amphenol connector on the control/signal Master module. Lock, Unlock, and Ready-to-Lock proximity sensor inputs (PNP sourcing-type) are provided for confirmation of Tool Changer and locking mechanism positions. Other customer-assigned discrete I/O points are also available through the connector. Note that 0 and 24 VDC supply lines are required to be on certain pin locations of the customer interface connector. Reference drawings in Section 8 for pin out information and location of the I/O signals.

Refer to the specific Tool Changer manual for details on the operation of the Tool Changer and recommended procedure for coupling.

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 1.3 Master-side TSI with Safety Switch](#) for detailed information regarding the safety features of the discrete control modules.



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



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.

1.1 VB12 and VB13 Master Module

The Master module is equipped with a 36-Pin, MS-3122 style connector for interfacing with the Tool Changer's Lock, Unlock, and Ready-to-Lock sensors and for supplying signals and power to the end-of-arm tooling (Note: the Ready-to-Lock sensors in the Master are wired in series). The Master is designed to support only PNP sensors. Electrical schematics and connector details are provided in [Section 8—Drawings](#).

Interface to the Tool Changers integrated RTL, Lock, and Unlock sensors are provided through four 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.

The safety switch is connected to the Master module via a 5-Pin, M12 connector mounted to the side of the Master module. Refer to [Section 1.3 Master-side TSI with Safety Switch](#) for detailed information regarding the safety features of the discrete control modules.

An electrical interface is provided on the Master module for support of a double-solenoid integrated valve (DC Voltage, sourcing-type: single-solenoid valve is not supported). The integrated valve can be supplied from ATI as part of the valve adapter block (such as 9121-JR2-M). Refer to the valve adapter block manual for more information (9620-20-C-Jxx Air and Valve Adapters with Valve Signal Pass Thru). Electrical interface drawings and connector details provided are in [Section 8—Drawings](#).

1.2 VB12 Tool Module

The VB12 Tool module is equipped with a 36-Socket, MS-3122 style connector and provides the interface for supplying signals and power to the end-of-arm tooling. When the Tool Changer is coupled, the Master and Tool modules interface using a spring-loaded pin blocks. A flexible boot surrounds the pin block to seal the connection from moisture and liquid while coupled..

Figure 1.1—VB12-M and VB12-T Discrete Control Modules

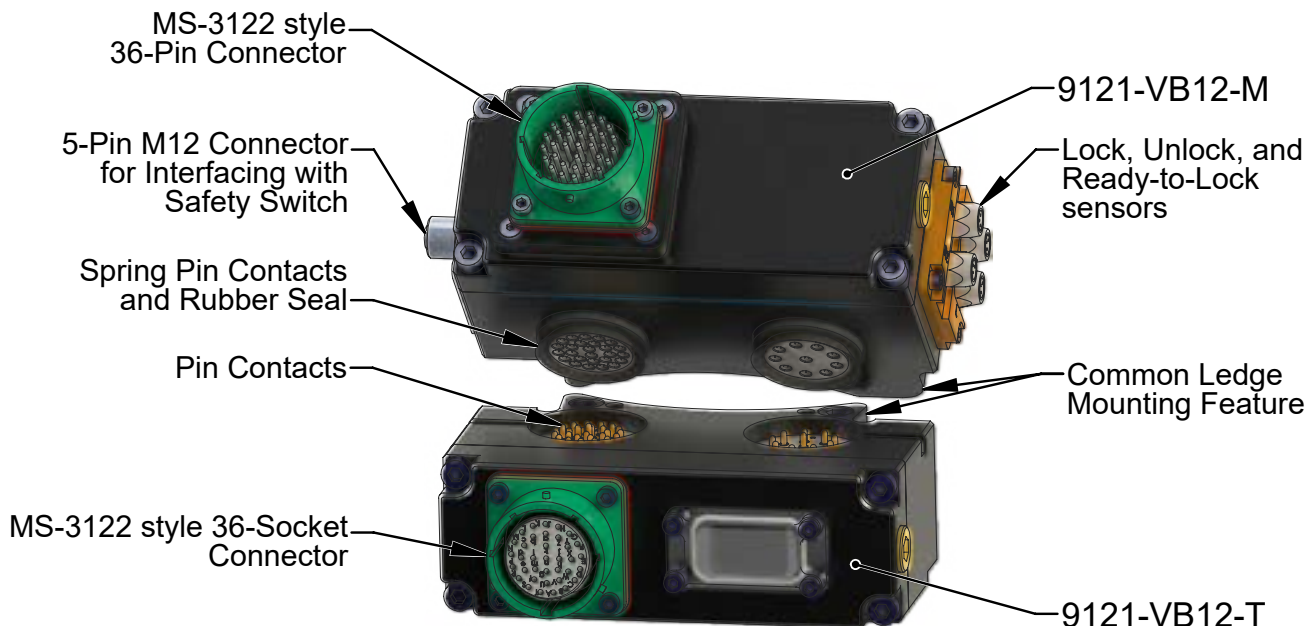
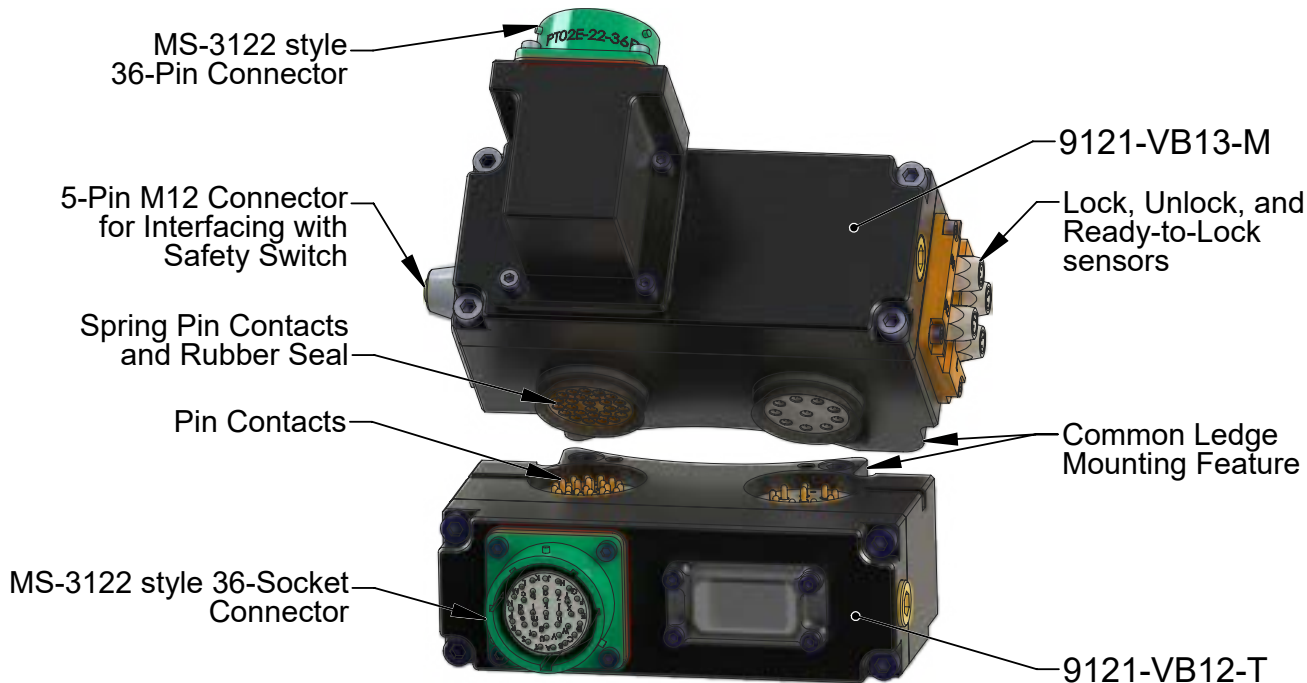


Figure 1.2—VB13-M and VB12-T Discrete Control Modules

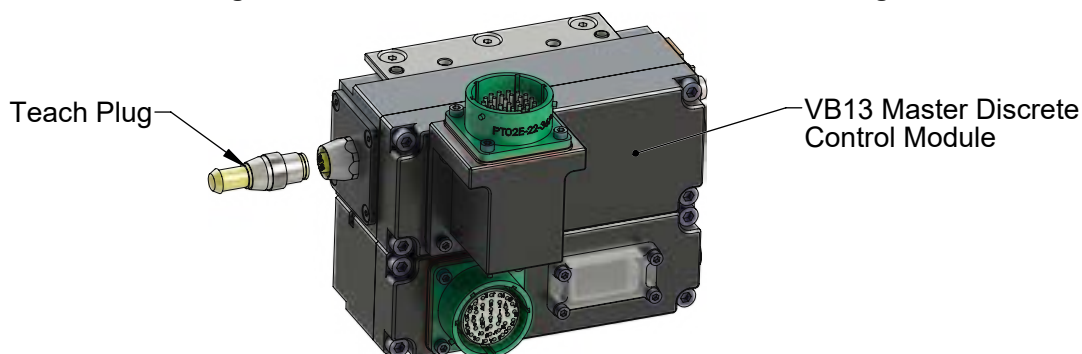


1.3 Master-side TSI with Safety Switch

To prevent an unintended Tool release, the electrical power to the unlatch valve circuit is routed through a safety switch that is mounted to the Master. With the transponder, actuator, or trip dog mounted on the Tool Stand, the safety switch will insure that a Tool can only be released at the Tool Stand. [Section 1.3.1](#) through [Section 1.3.4](#) provide a detailed description of the safety circuit.

The safety switch is connected to the Master module via a 5-pin M12 connector that is mounted to the side of the module. A teach plug, can be connected to the 5-pin M12 TSI connector to override the TSI circuit during setup and integration. Refer to [Section 6. Recommended Spare Parts and Accessories](#).

Figure 1.3—Discrete Control Modules with Teach Plug



The VB12-M, VB13-M, and VB12-T support three types of safety switches:

Klaschka Wident Sensor 13.28-06 and Klaschka Sident 13.14.68 Transponder - (RFID-type)

Sipha Sensor S22 and Sipha Actuator S20 - (Magnetic-type)

Euchner Safety Switch NZ1HS-3131- (Mechanical-type)

Note: With the RFID-type sensor, always use the safety switch in conjunction with a proximity sensor. Due to its fairly wide sensing range, the safety switch is not intended to replace a Tool Stand sensor or switch to signal the robot that the Tool is positioned in the Tool Stand and can be released.

Figure 1.4—Master-side TSI with RFID-type or Magnetic-type Safety Switch

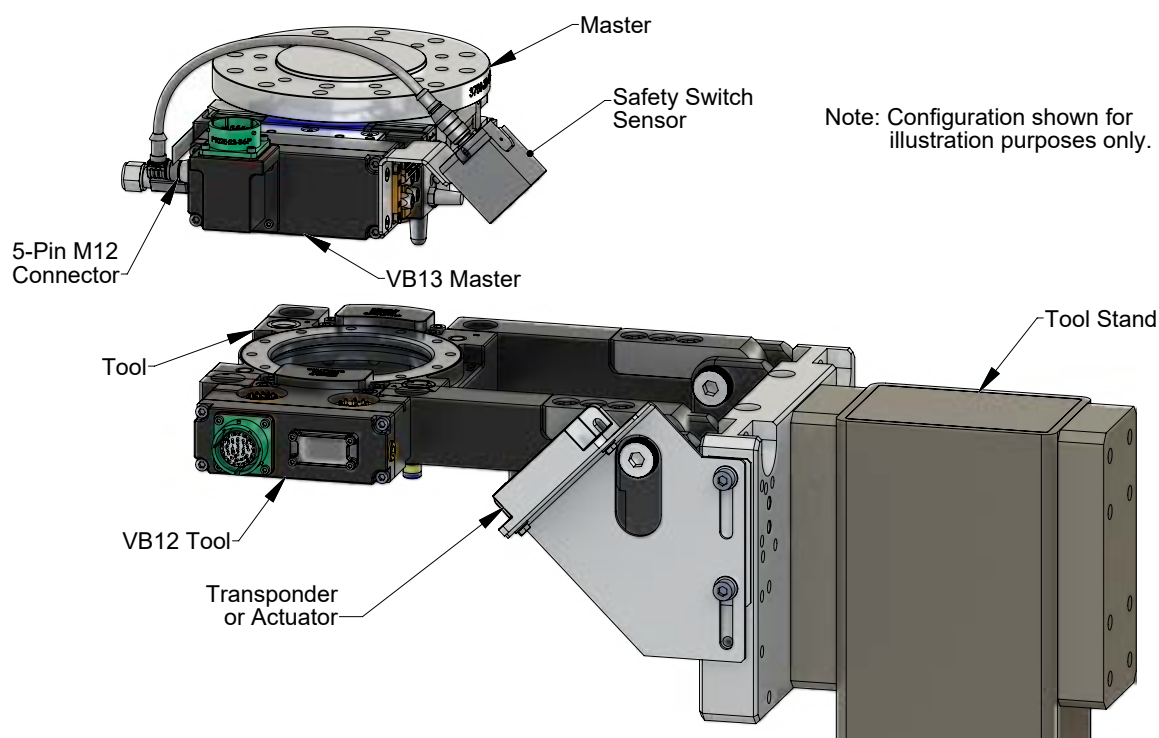
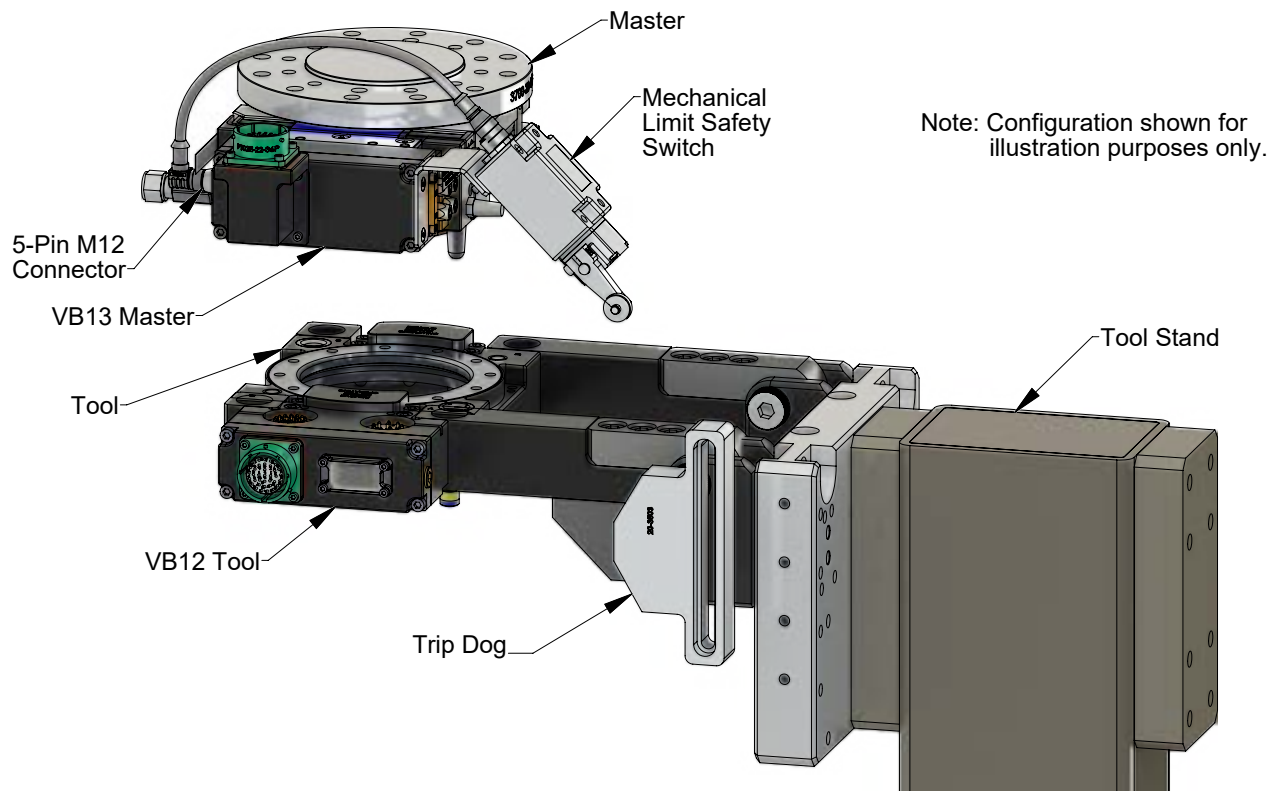


Figure 1.5—Master-side TSI with Mechanical-type Safety Switch



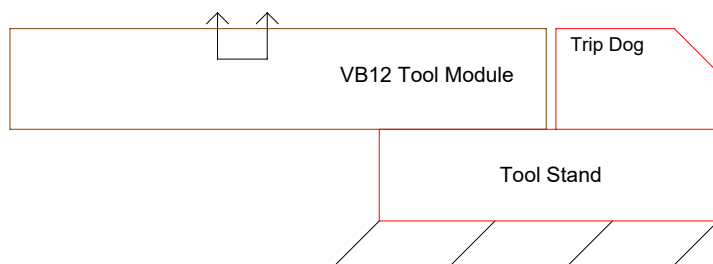
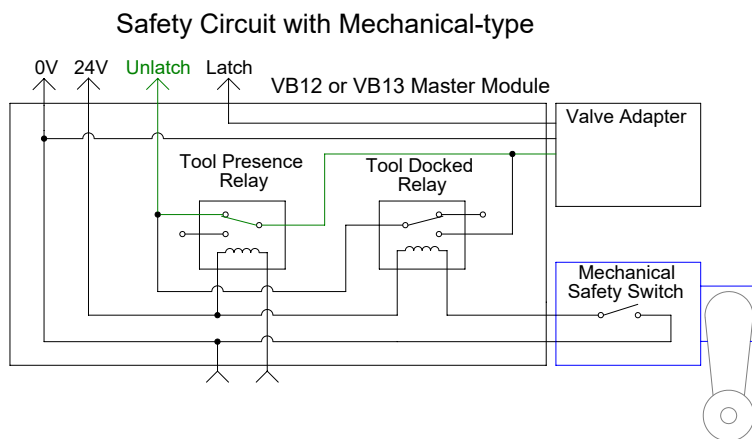
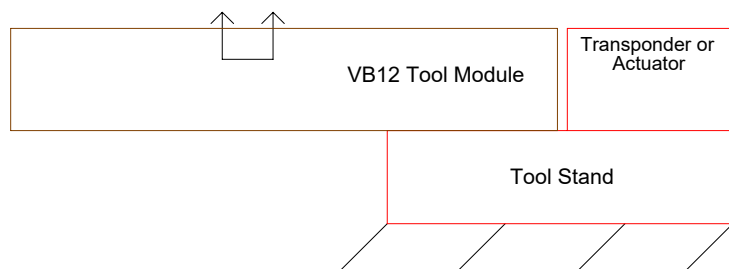
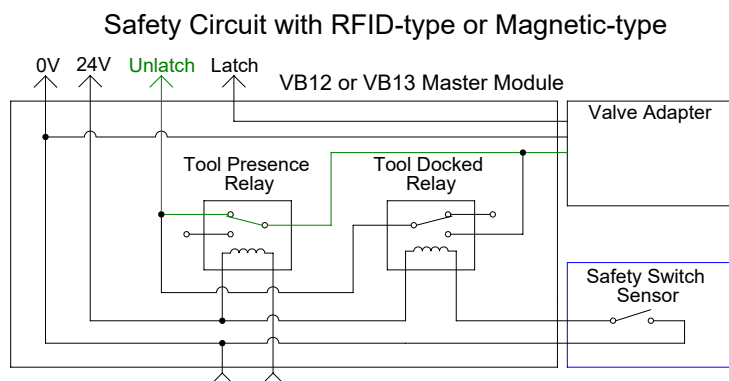
CAUTION: This Tool Changer is equipped with Tool Stand Interlock (TSI). Special procedures are required to uncouple the Tool Changer..

The following sections provide a detailed sequential description of the discrete control modules safety circuitry.

1.3.1 Master Free of Stand, Tool in the Stand

The Master is away from the Tool Stand and the Tool is in the Stand. In order to allow the Tool Changer to uncouple when the Tool is not present, a Tool Presence relay circuit is utilized. This relay circuit is located in the Master module and is triggered by electrical contact between the Master and Tool. When there is no electrical contact, indicating no Tool Presence, then the relay circuit is closed, allowing Unlatch power to be supplied to the solenoid valve.

Figure 1.6—Master Free of Stand, Tool in the Stand

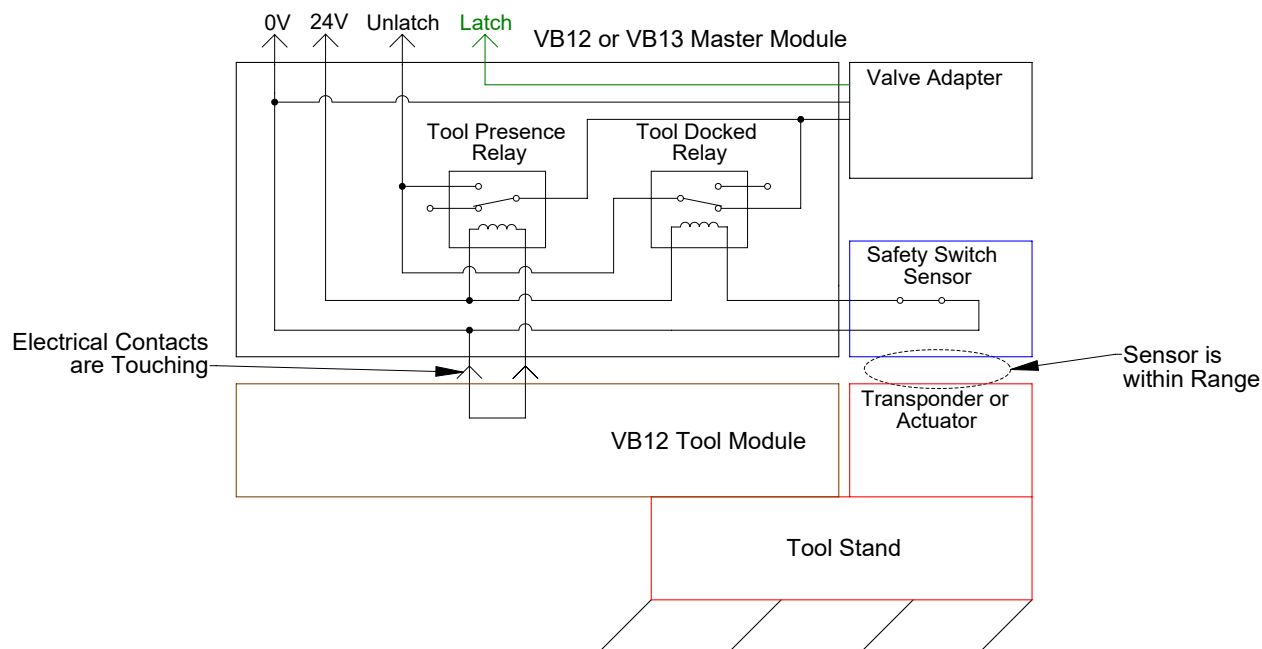


1.3.2 Master and Tool Ready to Couple

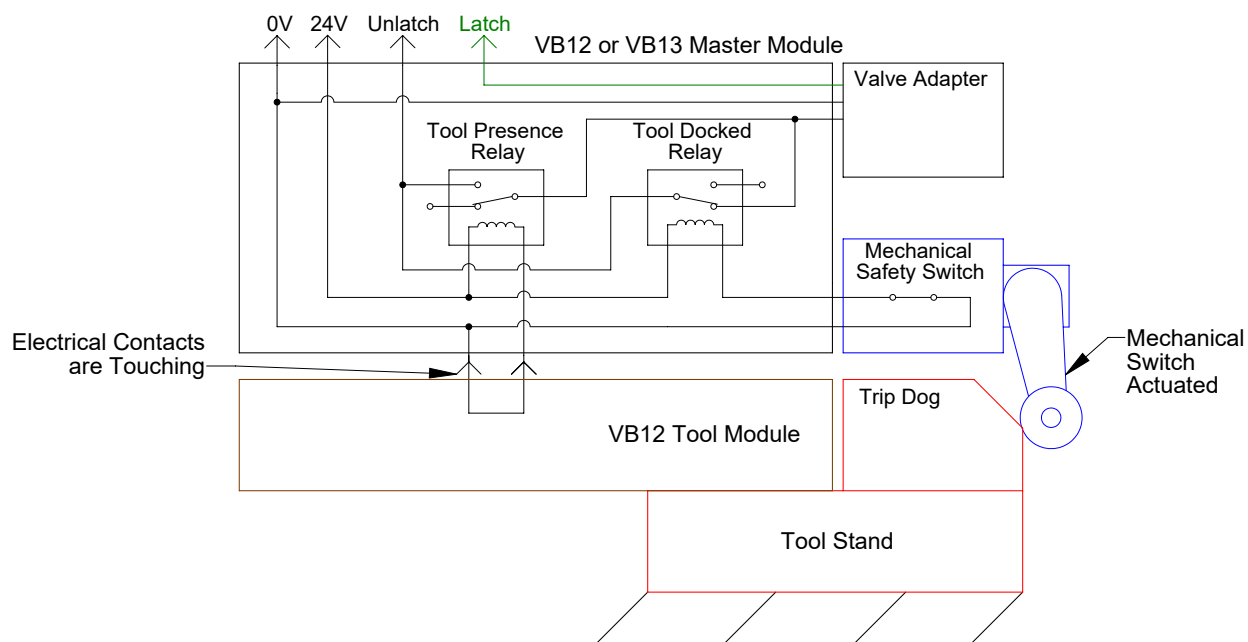
The Master and Tool are within coupling distance and the electrical contacts are touching, indicating Tool presence. Latch power is provided to the valve and the Tool Changer couples.

Figure 1.7—Master and Tool Ready to Couple

Safety Circuit with RFID-type or Magnetic-type



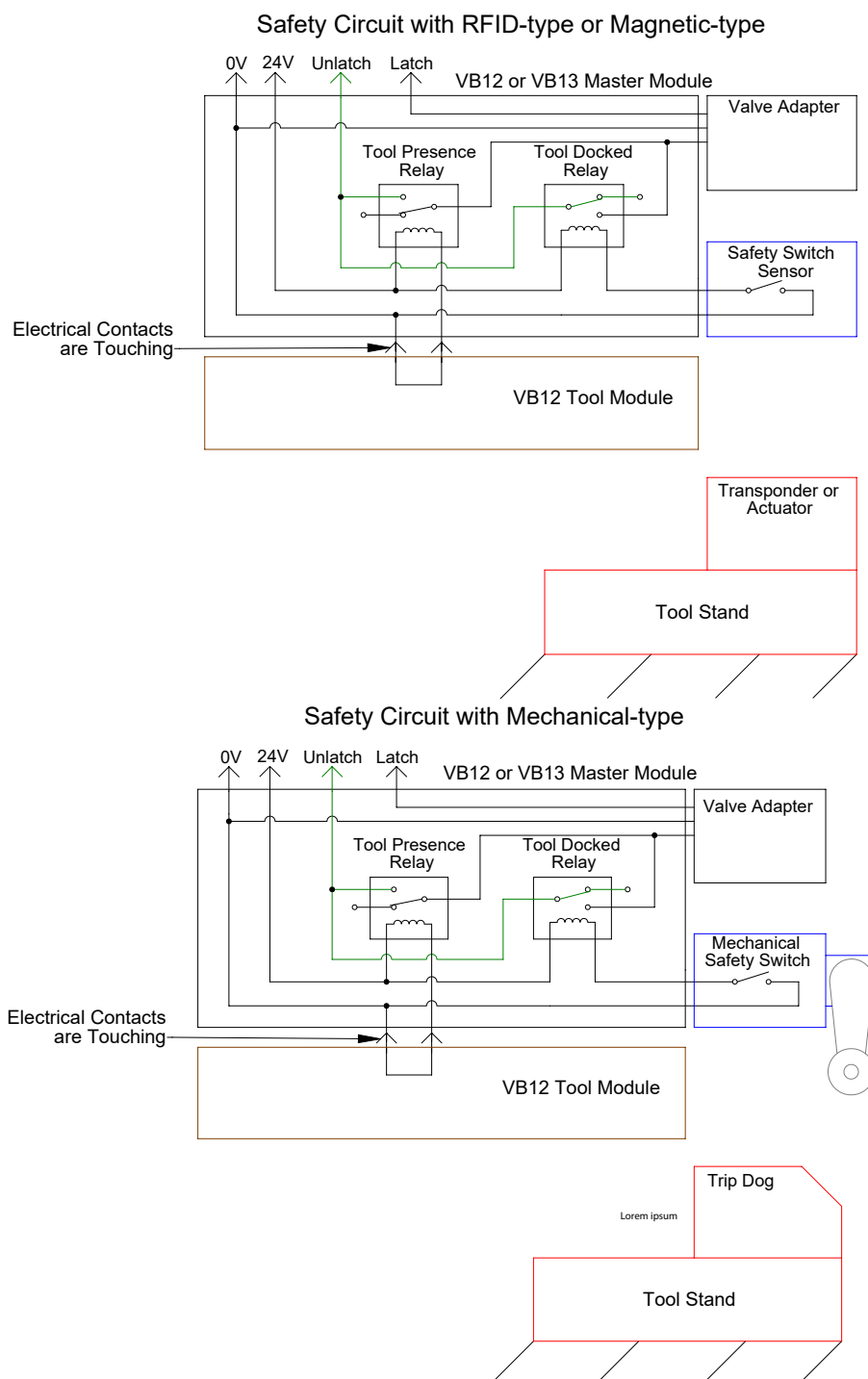
Safety Circuit with Mechanical-type



1.3.3 Master and Tool are Coupled and Away from Stand

The Master and Tool are within coupling distance and the electrical contacts are touching, indicating Tool presence. Latch power is provided to the valve and the Tool Changer couples The Master and Tool are coupled and away from the Stand. The electrical contacts are touching, therefore the Tool Presence relay is open and valve Unlatch power is diverted through the Tool Docked relay. The Tool Docked relay will provide Unlatch power to the valve ONLY when the safety switch is closed. Since the Tool is not in the stand and the transponder/actuator is not within range of the switch or the mechanical switch is not actuated, an unintended Tool release is not possible.

Figure 1.8—Master and Tool are Coupled and Away from Stand

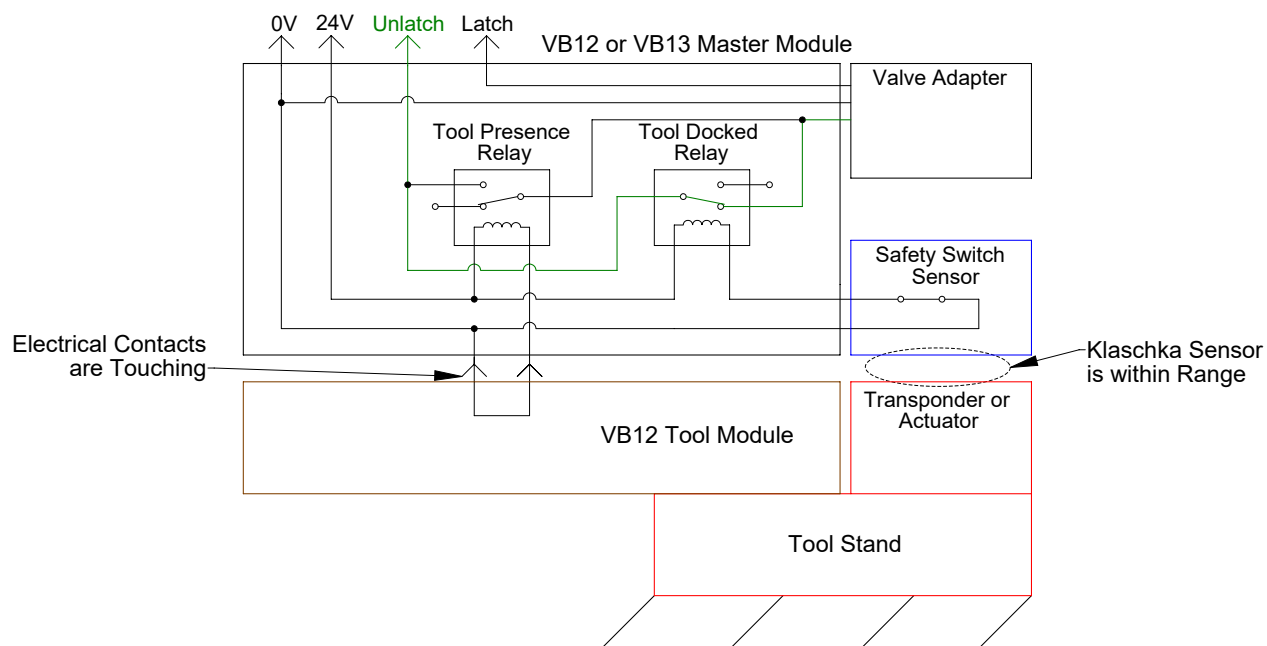


1.3.4 Master and Tool are Ready to Uncouple

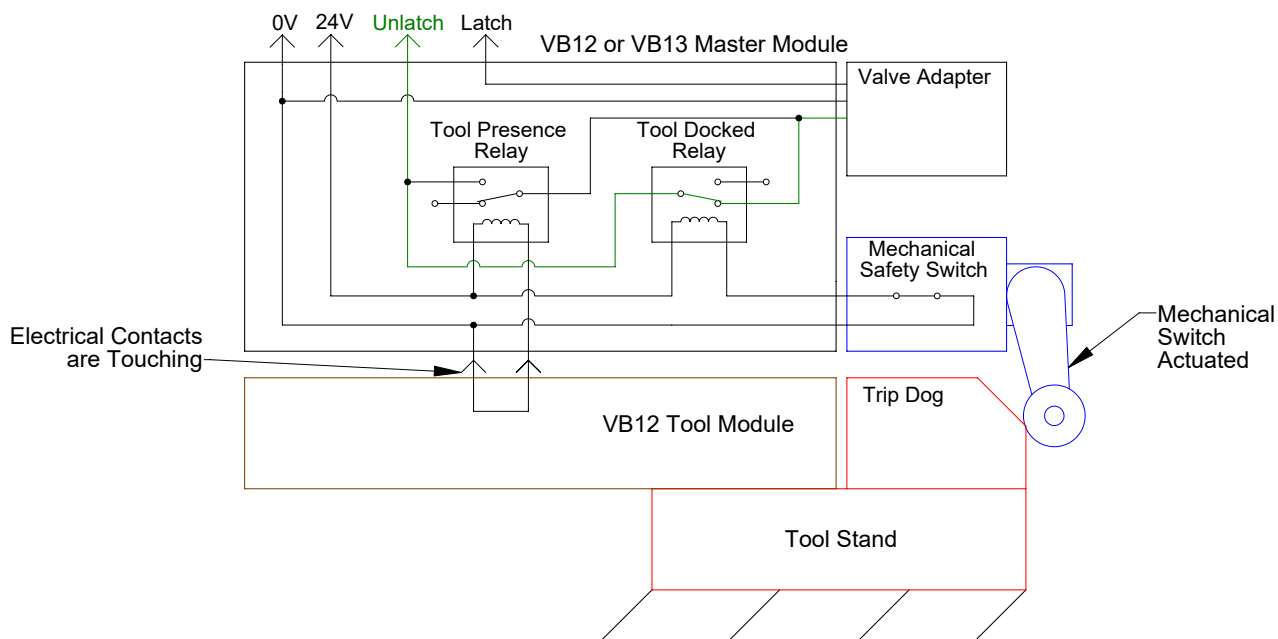
The robot moves into the Tool Stand with the Tool Changer coupled. The electrical contacts are touching, therefore the Tool Presence relay is open and valve Unlatch power is diverted through the Tool Docked relay. Since the Tool is in the Stand, the transponder/actuator is within range of the switch or the mechanical switch is actuated, which causes the Tool Docked relay to close. Unlatch power to the valve is now available to release the Tool.

Figure 1.9—Master and Tool are Ready to Uncouple

Safety Circuit with RFID-type or Magnetic-type



Safety Circuit with Mechanical-type



2. 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 8—Drawings](#).



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



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



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

2.1 Master Module Installation

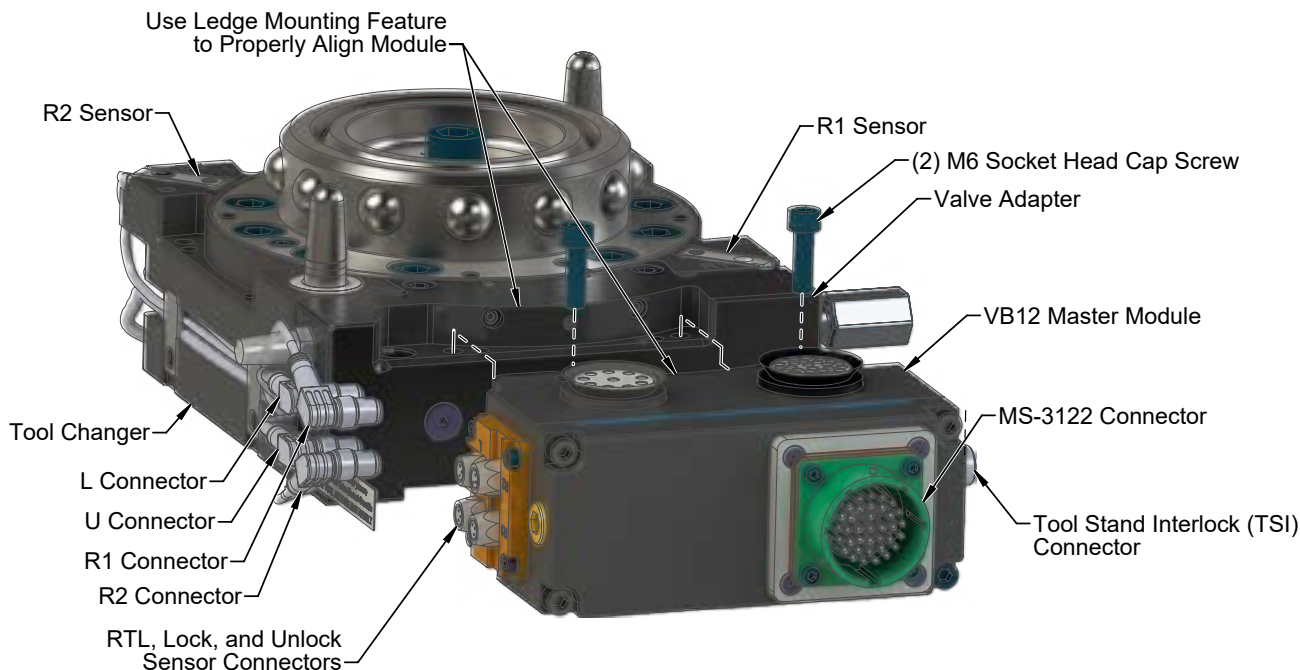
Refer to [Section Figure 2.1](#) for Master module installation instructions.

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 into the appropriate location on the air adapter.
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 valve adapter using a 5 mm hex key. Tighten to 70 in-lbs (7.9 N-m).
7. Ensure the Lock (L), Unlock (U), RTL (R1), and RTL (R2) connectors are clean and connect the sensor cables to the control/signal module.
8. Ensure the TSI limit switch connection is clean and connect to the control/signal module.
9. Ensure that the power, signal, auxiliary, and other connectors are clean and connect the cables to the module.
10. Safely resume normal operation.

Figure 2.1—Master Module Installation and Removal



2.2 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. 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.

2.3 Tool Module Installation

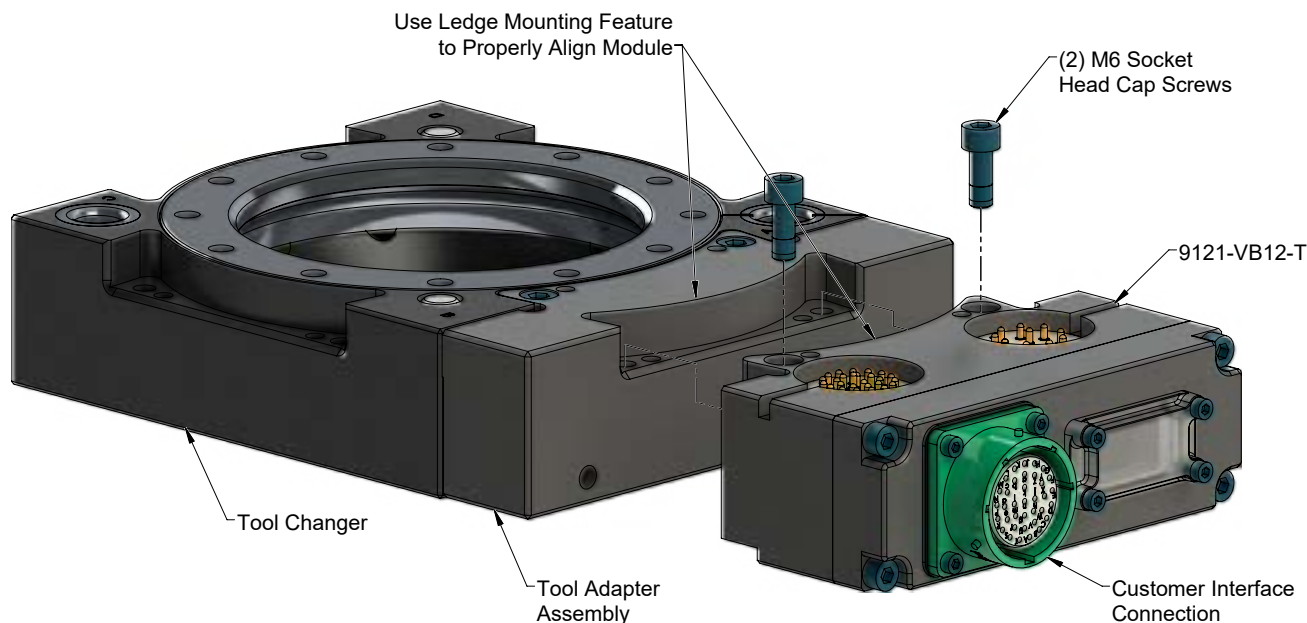
Refer to [Section Figure 2.2](#) for Tool module installation instructions. Set the Tool-ID by using push button switches on the Tool modules.

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 tool adapter.
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 tool adapter using a 5 mm hex key. Tighten to 70 in-lbs (7.9 N-m).
7. Ensure the power, signal, auxiliary, and other connectors are clean and connect cables to the module.
8. Safely resume normal operation.

Figure 2.2—Tool Module Installation and Removal



2.4 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. 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 tool adapter.

2.5 Utility Schematic



WARNING: All pneumatic fittings and tubing must be capable of withstanding the repetitive motions of the application without failing. The routing of electrical and pneumatic lines must minimize the possibility of over stressing, pullout, or kinking the lines. Failure to do so can cause some critical electrical and/or pneumatic lines not to function properly and may result in injury to personnel or damage to equipment.

Refer to [Section 8—Drawings](#) of this manual for customer interface and wiring details for the VB12-M, VB13-M, and VB12-T modules.

3. Operation

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 VB12-M, VB13-M, and VB12-T control/signal modules. This procedure is intended for “automatic” modes used during normal application processes.

3.1 Recommended Sequence of Operation

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, i.e., **Locked** and **Unlocked** inputs are false). The Tool is by itself in the Tool Stand.
 - a. The RTL input is false.
 - b. The ATI Tool and any downstream device is offline.
2. Unlock the Master. (This must be done prior to the Master entering the Tool to prevent the ball bearings from impinging on the Tool bearing race.)
 - a. The **Latch** output command is made false and the **Unlatch** output command is made true.
 - b. The **Unlocked** input goes true and remains true, indicating that the Tool Changer locking mechanism is fully retracted and the **Unlatch** operation is complete.
3. Robot and Master move into the Tool and are parallel and within 0.15” to 0.06” of the Tool (i.e., the module contact pins are touching, but the **RTL** sensors have not yet sensed the targets on the Tool).
 - a. Power and I/O connections with downstream devices are established.
4. Robot and Master move within 0.06” of the Tool.
 - a. The **RTL** input is true, indicating that it is okay to couple the Tool.
5. Couple the Tool Changer.
 - a. The **Unlatch** output is made false and the **Latch** output is made true.
 - 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.
6. Robot moves away from the Tool Stand with the Tool Changer coupled.

7. Normal operation.
 - a. The following inputs are true:
 - i. **Locked**
 - ii. **RTL**
 - b. The following inputs are false:
 - i. **Unlocked**
 - c. The following outputs are true:
 - i. **Latch**
 - d. The following outputs are false:
 - i. **Unlatch**
8. Robot moves into the Tool Stand with the Tool Changer coupled.
9. Uncouple 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 **Latch** output is made false and the **Unlatch** output is made true.
 - b. 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.
10. Robot and Master move away from the Tool and are parallel and between 0.15" to 0.06" of the Tool.
 - a. The **RTL** input is false.
11. Robot and Master move away from the Tool and are parallel and > 0.15" from the Tool.
 - a. Power and I/O connections with downstream devices are no longer available.
12. Robot and Master in free space.
 - a. The following inputs are true:
 - i. **Unlocked**
 - b. The following inputs are false:
 - i. **Locked**
 - ii. **RTL**

4. Maintenance

The VB12-M, VB13-M, and VB12-T discrete control/signal modules are designed to provide a long life with little maintenance required. Once installed the operation of the control modules is generally trouble free. 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. Refer to [Section 2—Installation](#).
- 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 4.1—Pin Block Inspection and Cleaning](#).
- Inspect V-ring seals for wear, abrasion, and cuts. If worn or damaged, replace. Refer [Section 5.2.1 Seal Replacement](#).

4.1 Pin Block Inspection and Cleaning

Tools required: Nylon Brush (ATI part number 3690-0000064-60)

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, and hydraulic circuits).
4. Inspect the Master and Tool pin blocks for debris or darkened pins.

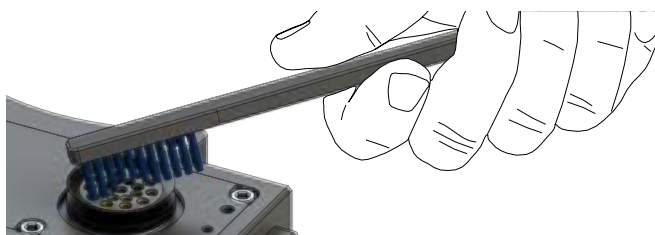
Figure 3.1—Inspect Master and Tool Pin Blocks



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).

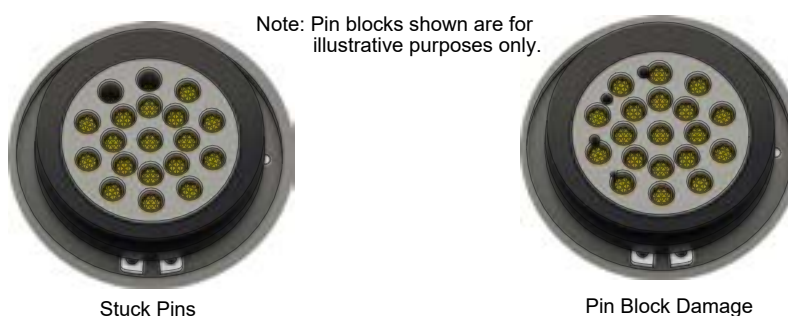
NOTICE: Do not use an abrasive media and/or cleaners or solvents to clean the contact pins. Using abrasive media and/or cleaners or solvents will cause damage to the contact surface or cause pins to stick. Clean contact surfaces with a vacuum or non-abrasive media such as a nylon brush (ATI part number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

Figure 3.2—Clean Pin Blocks with a Nylon Brush



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

Figure 3.3—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.

5. Troubleshooting and Service Procedures

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



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



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

5.1 Troubleshooting

Troubleshooting information is provided in the following table.

Table 4.1—Troubleshooting Procedures		
Symptom	Possible Cause	Correction
Unit will not lock or unlock	Verify that ball bearings are moving freely. Clean and lubricate as needed.	Verify that 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.
	Discrete signals are mapped incorrectly.	Verify that discrete signals are mapped and are communicating properly. Refer to Section 8—Drawings for electrical schematic.
	Master and Tool are within the specified No-Touch zone.	Verify that the Master and Tool are within the specified No-Touch zone when attempting to lock. Refer to the <i>Installation – tool stand Design Section of the Tool Change manual for specifications</i> .
Sensors not operating properly	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.
	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.

Table 4.1—Troubleshooting Procedures

Symptom	Possible Cause	Correction
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. Refer to Section 4.1—Pin Block Inspection and Cleaning . V-ring seal damaged and allowing debris in the contact pins. Replace V-ring seal, refer to Section 5.2.1 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.

5.2 Service Procedures

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

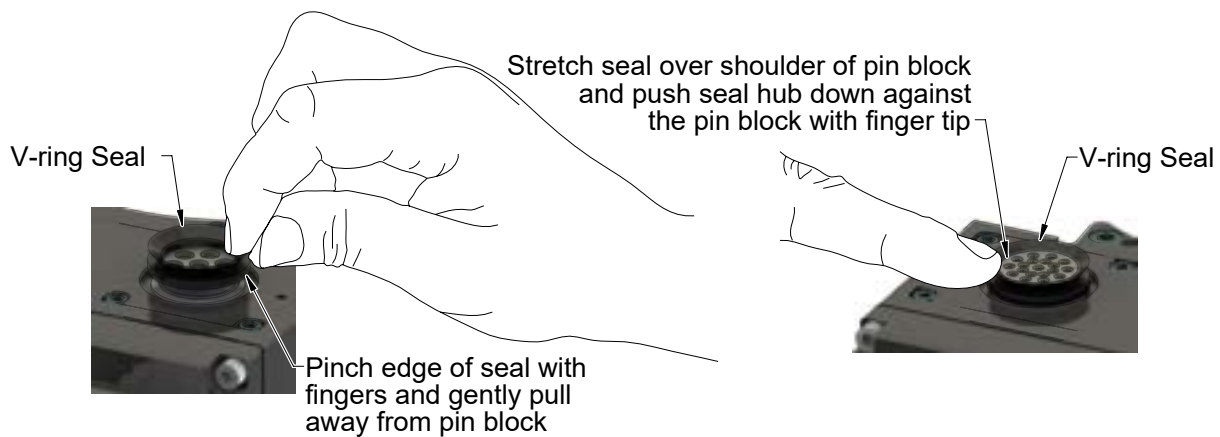
5.2.1 Seal Replacement

Parts Required: Refer to [Section 8—Drawings](#).

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

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

Figure 4.1—V-ring Seal Replacement



6. Recommended Spare Parts and Accessories

Description	Part Number
<i>VB12 Master Module Assembly</i>	9121-VB12-M
<i>VB13 Master Module Assembly</i>	9121-VB13-M
<i>VB12 Tool Module Assembly</i>	9121-VB12-T
Optional Accessories	
<i>Safety Switch Sensor (Klaschka WIDENT 13.28-06)</i>	8605-132806
<i>Safety Switch Transponder (Klaschka SIDENT 13.14-68)</i>	8605-131468
<i>Transponder Bracket Assembly</i>	9121-TSL-KT-5841
<i>Sipha S22/S20 Sensor and Actuator</i>	8600-440N-S32023-01
<i>Sipha S22 Sensor</i>	8600-440N-S32023
<i>Sipha S20 Actuator</i>	8600-440N-S32020
<i>Euchner Safety Switch NZ1HS-3131-M</i>	8510-9909999-01
<i>Teach Plug</i>	1700-0535501-01
<i>TSI Cable(s)</i>	9120-C-4EM-4EF-010 (1 Meter)
	9120-C-4EM-4EF-020 (2 Meter)
	9120-C-4EM-4EF-040 (4 Meter)
<i>Brush, Blue Nylon All Purpose (Contact Pin Cleaning)</i>	3690-0000064-60

See [Section 8—Drawings](#) of this manual for spare parts directly associated with the VB12-M, VB13-M, and VB12-T modules.

7. Specifications

Table 6.1—Master Module Specifications	
9121-VB12-M 9121-VB13-M	Discrete Signal Module with 36-pin MS connector, 19-pin and 10-pin pin blocks, supports PNP Lock and Unlock sensors and RTL sensors in series, supports an integrated double solenoid valve and TSI on the Master.
Interface Connections	<u>Tool Changer I/O:</u> Amphenol PT02E 22-36P, 36-pin (male contacts), male threaded connector. <u>Integrated Tool Changer I/O:</u> • (4) 3-pin M8 female connectors supporting Tool Changer Lock, Unlock, and Ready-to-Lock proximity <u>sensors in series</u>, PNP sensor type. • 3-pin Internal Pin Block to transmit Latch and Unlatch signals to the double solenoid valve. • M12, 5-Pin Female TSI Connector
Electrical Rating	<u>Power Pass-Through:</u>
	• Input Power: 5A, 30VDC maximum
	<u>Signal Pass-Through:</u> 5A, 250V maximum Straight through wiring, no special twisting or shielding <i>Note: A total of 29 signal/power pass-through connections are available.</i>
	<u>Tool Changer Control:</u> • Lock, Unlock, and Ready-to-Lock sensors: 10-30 VDC operational voltage (Sensors are PNP, sourcing-type) <i>Note: Input Power provides power to the L, U, and RTL sensors</i>
	<u>Valve Control Power:</u> • Latch and Unlatch Valve control: 24 VDC $\pm 20\%$ (19-29 VDC) operational voltage.
Weight	VB12 Master: 1.70 lbs (0.77 kg) VB13 Master: 1.72 lbs (0.78 kg)

Table 6.2—Tool Module Specifications	
9121-VB12-T	Discrete Signal Module with 36-pin MS Connector, 19-pin and 10-pin pin blocks, supports TSI on the Master.
Interface Connections	<u>Tool Changer I/O:</u> Amphenol PT02E 22-36S, 36-pin (female contacts), male threaded connector.
Electrical Rating	<u>Power Pass-Through:</u>
	• Input Power: 5A, 30VDC maximum
	<u>Signal Pass-Through:</u> 5A, 250V maximum Straight through wiring, no special twisting or shielding <i>Note: A total of 29 signal/power pass-through connections are available.</i>
Weight	1.30 lbs (0.59 kg)

8. Drawings

Drawings are available on the [ATI website](#) or by contacting an ATI representative.