Table of Contents

C. Control and Signal Modules

VB18—Control/Signal Module

1. Product Overview

The VB18 module is designed to provide control of the Tool Changer, pass electrical power and signal connections to a servomotor, and pass PROFINET data to the end-of-arm tooling. Power and signal circuits are electrically isolated both from each other and the Tool Changer.

Compliant spring probes are provided on the Master and fixed contact pins on the Tool (refer to *Figure 1.1*). When the Tool Changer is coupled, the Master and Tool modules transfer signals and power across the spring probes and contact pins. V-ring seal surrounds the pin blocks to seal the connections from moisture and liquid while coupled.

To avoid unintentional human contact, the Master spring pins are recessed below an insulated surface on both the power and signal circuits.

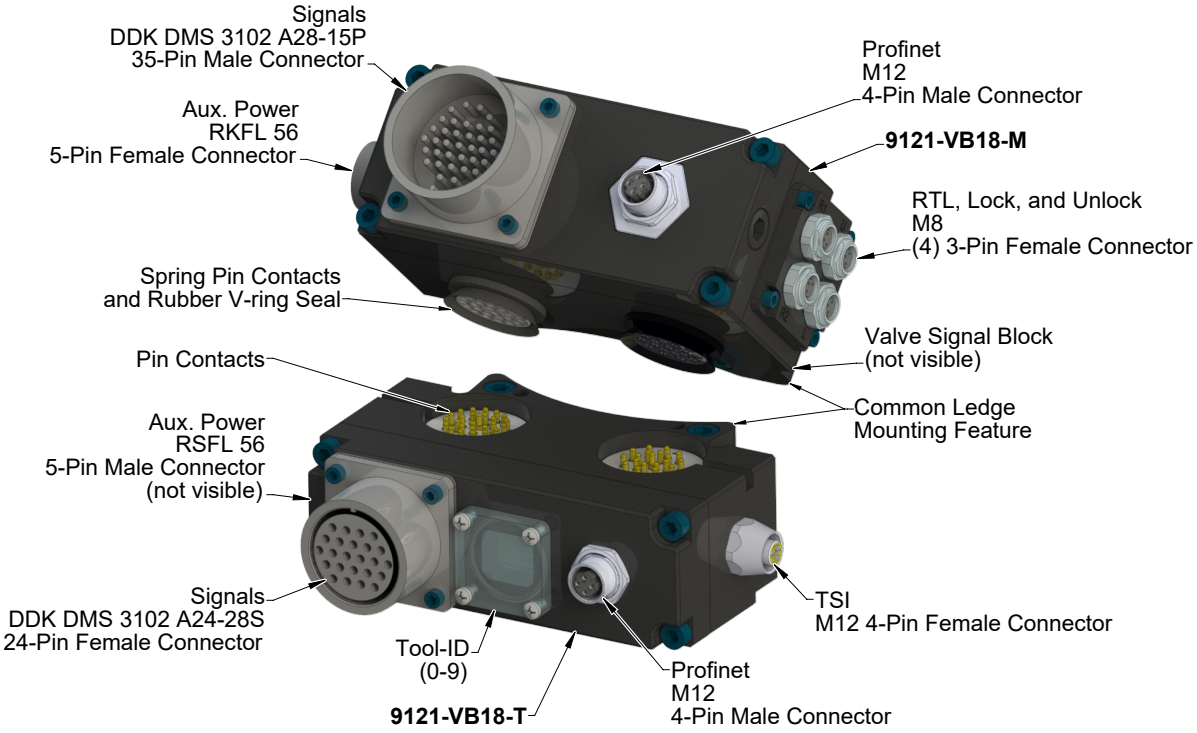
The VB18 module is designed with special features to afford the user the opportunity to operate the Tool Changer in the safest manner possible. In addition to providing the standard Lock, Unlock, and Ready-to-Lock sensor inputs, the modules are outfitted with tool stand interlock (TSI). The TSI feature consists primarily of a physical break in the unlatch solenoid valve circuit. The TSI circuit is designed to allow Tool Changer release only when the Tool is in the stand or storage location. Refer to *Section 2.1—Tool Side TSI* for detailed information regarding the safety features of the discrete control/signal modules.

1.1 VB18 Master Module

A MS3102 male connector is provided for signals. A 3-pin M8 female valve connector is provided for Lock/Unlock control of the Tool Changer. A 4-pin M12 female D-coded connector is provided for passing PROFINET signals (4) 3-pin M8 female connectors are provided for passing of sensor signals. A 5-pin Minifast female connecter is provided for auxiliary power. Refer to *Section 9—Drawings* for addition information and connector details.

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-JR2-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*.

Figure 1.1—VB18 Modules



1.2 VB18 Tool Module

A MS3102 female connector assembly is provided on the VB18 Tool module to support Tool Changer I/O, weld gun control, and field bus data lines. A 4-pin M12 female connector is provided for passing TSI signals. A 4-pin M12 female D-coded connector is provided for passing PROFINET signals. A 5-pin Minifast male connecter is provided for auxiliary power. Refer to Section 8—Drawings for addition information and connector details.

The Tool-ID feature on the VB18 Tool module allows the customer to distinguish between the different Tools being coupled by the Tool Changer. Setting of Tool-ID is facilitated using a push button switch provided on the Tool modules (10) unique Tool-ID values are available (0–9).

2. Product Information

Information on the behavior of the Master and Tool modules is provided in the following section.

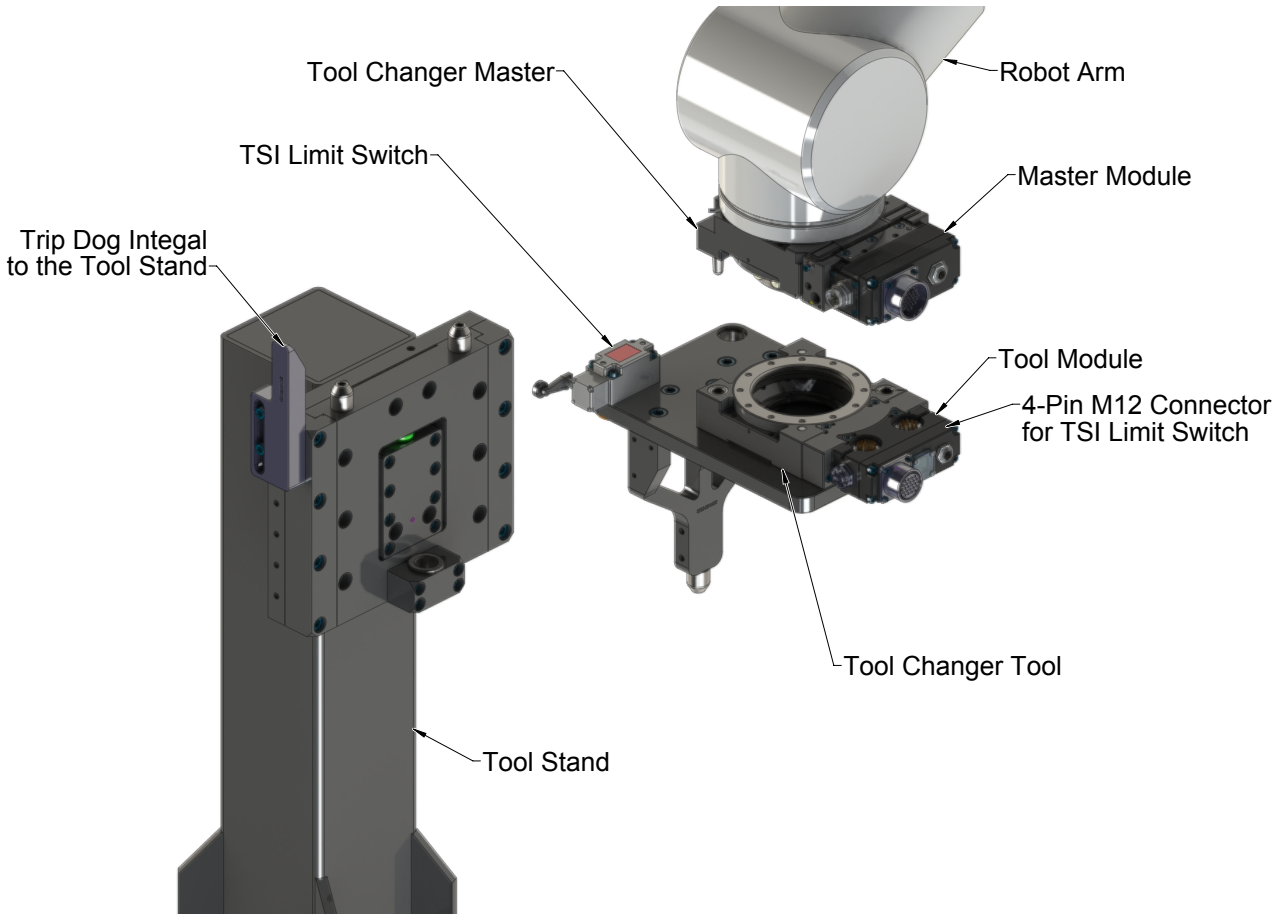
2.1 Tool Side TSI

To prevent an unintended Tool release, the electrical power to the unlatch valve circuit is switched only when a Tool mounted limit switch indicates that the Tool is nested safely in the tool stand. The limit switch ensures that a Tool can only be released at the tool stand (refer to *Figure 2.1*).

A momentary action normally open, single-pole, single-throw mechanical limit switch is recommended to work with the TSI circuit. The limit switch must be mounted 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 VB18 Tool module via a 4-pin M12 female connector. A teach plug is available from ATI to overide TSI during setup and maintenance.

The function of the VB18 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 Tool Changer is locked, use solenoid valve manual override on the Tool Changer to unlock before attempting to latch Master with Tool.

2.2 TSI Operational Function

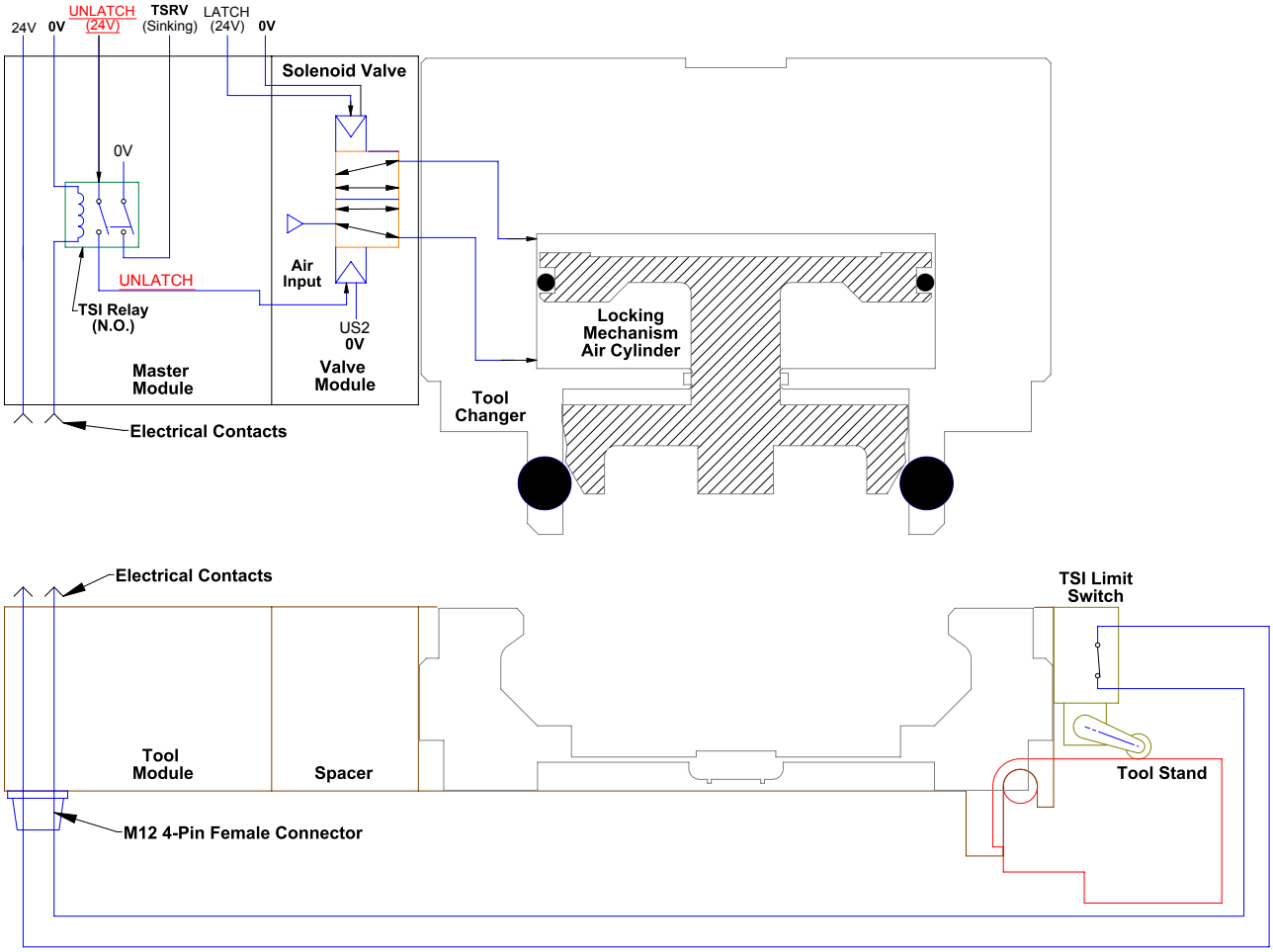
The Master is away from the tool stand and the Tool is nested safely in the tool stand. The TSI relay, located in the Master module, is driven by closure of the mechanical TSI limit switch located on the Tool. When closed, the relay passes the unlatch signal from the robot to the solenoid valve.

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*).

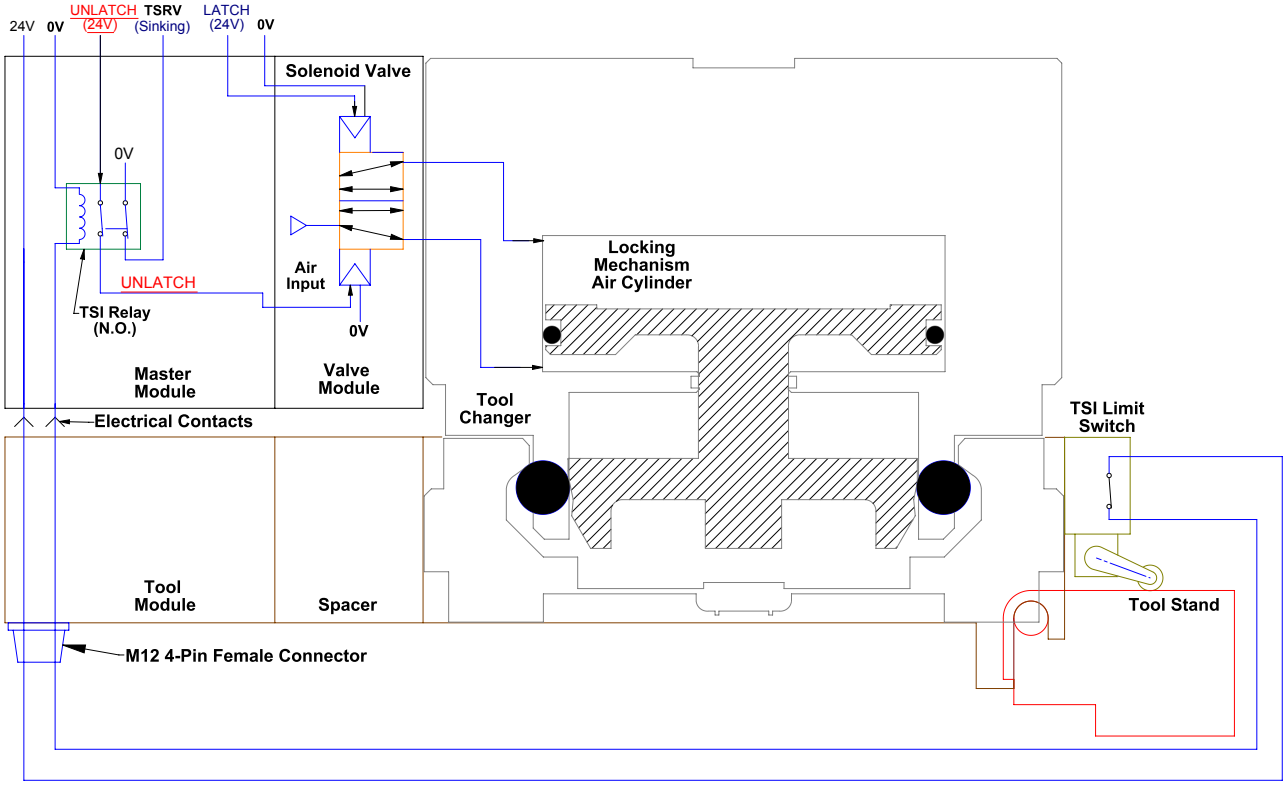
The second set of contacts on the TSI relay is used to provide the TSRV (TSI Relay Verify) diagnostic signal (when the TSI relay is open, the TSRV signal should be low) (Note: in the VB18 module the TSRV signal is sinking.) The TSRV signal can indicate if there is damage to the TSI relay, cable, or mechanical 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



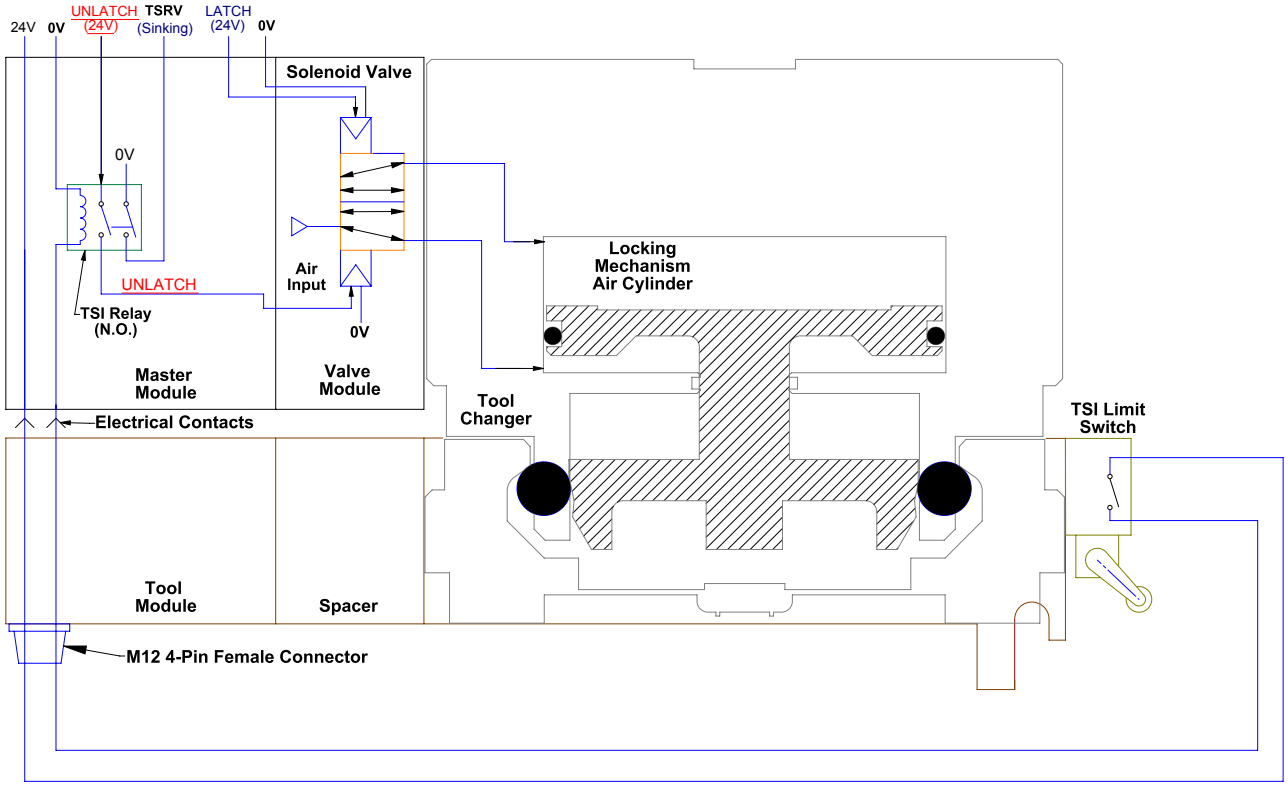
The Master and Tool are within coupling distance and the electrical contacts are touching. The TSI relay closes because the TSI limit switch is actuated and the electrical contacts are touching. It is now possible for the TSI relay to pass the unlatch signal from the robot to the solenoid valve.

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 50 V 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 (e.g. 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

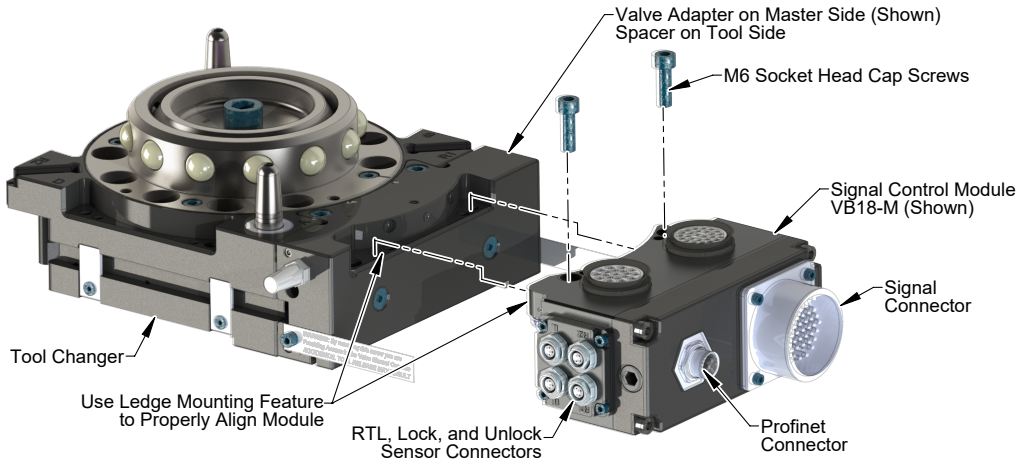
Refer to *Figure 3.1*

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 (e.g. electrical, air, water, etc.).
4. Clean the mounting surfaces.
5. Place the module onto the air adapter.
6. Apply Loctite 242 to the supplied M6 socket head cap screws. Install the (2) M6 socket head screws securing the module to the valve adapter using a 5 mm hex key. Tighten to 70 in-lbs (7.9 N-m).
7. Connect (e.g. power, signal, auxiliary, etc.) cables to the module. Ensure that the connectors are cleaned prior to being secured.
8. Safely resume normal operation.

Figure 3.1—Module Installation



3.2 Module Removal

Tools required: *5 mm hex key*

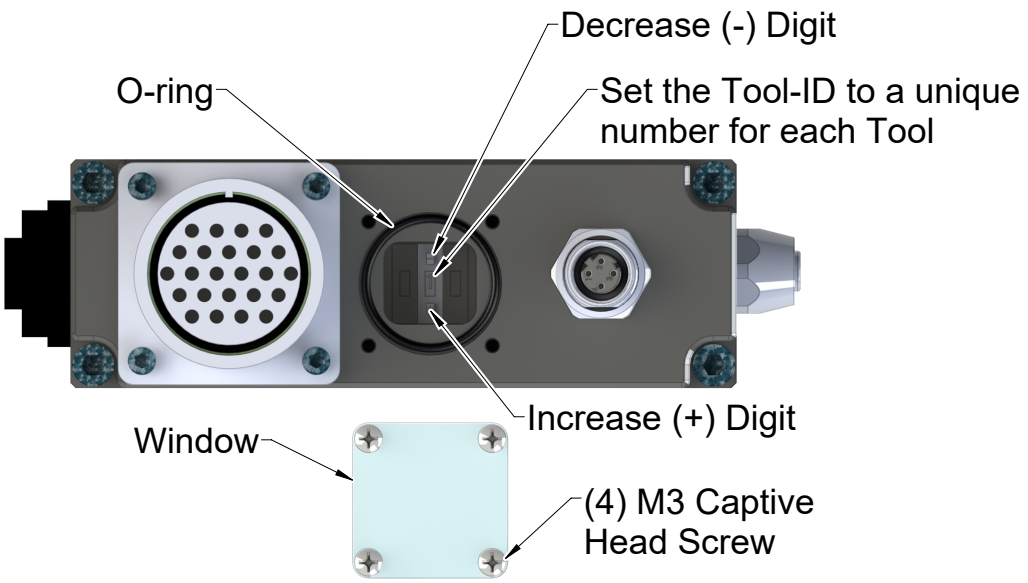
1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits (e.g. electrical, air, water, etc.).
4. Disconnect (e.g. power, signal, auxiliary, etc.) cables from the control/signal module.
5. Support the control/signal module, remove the (2) M6 socket head cap screws using a 5 mm hex key, and remove the module.

3.3 Setting the Tool-ID

Tools required: *Phillips screwdriver*

(1) push button switch is provided on the Tool module for setting a Tool-ID number. Each Tool must have a unique Tool-ID number (0-9).

Figure 3.2—Setting the Tool-ID



1. Loosen the (4) M3 pan head captive screws and remove the Tool-ID window.
2. Use a non-conductive tool (for example, a plastic stylus) to press the Tool-ID push buttons to increase (+) or decrease (-) the digit value.

NOTICE: When replacing the Tool-ID window, ensure that the seal is repositioned correctly to prevent fluid ingress.

3. Re-install the Tool-ID window and tighten the (4) M3 pan head captive screws.

4. Operation

The VB18 module is designed to provide control of the Tool Changer and pass signal connections to the end-of-arm tooling. Functional characteristics of the module are detailed in the following section.

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.

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.

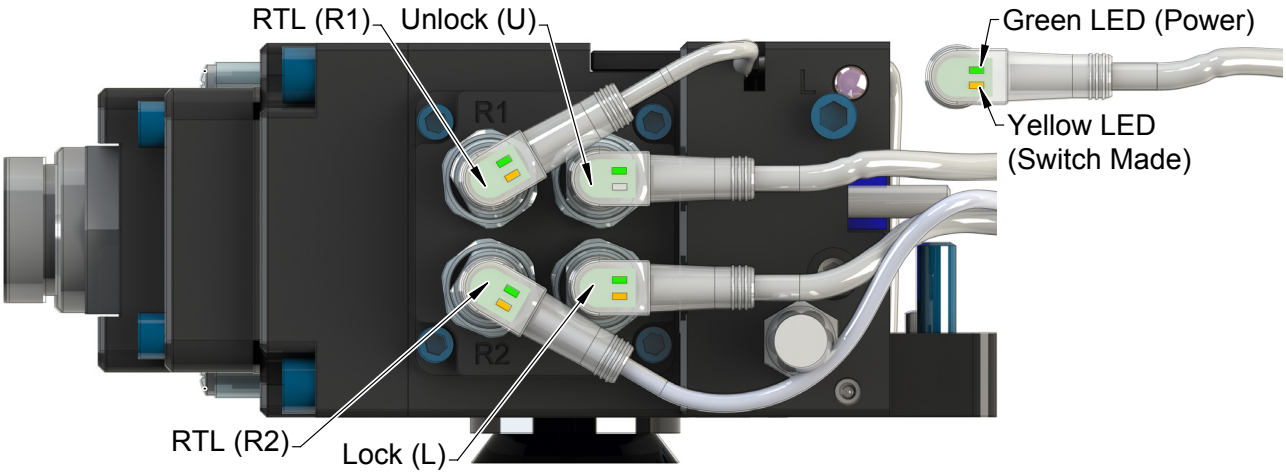
4.1 Lock, Unlock, and Ready-To-Lock (RTL) Sensor Cable LED Behavior

The Lock, Unlock, and RTL sensor cables are equipped with (2) 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 (Green) OFF	ON (Green) ON (Yellow)	Unlock (U) Sensor
	RTL (R2) Sensor	ON (Green) OFF	ON (Green) 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 (Green) ON (Yellow)	ON (Green) ON (Yellow)	Unlock (U) Sensor
	RTL (R2) Sensor	ON (Green) ON (Yellow)	ON (Green) OFF	Lock (L) Sensor
Locked (Tool Changer Master plate with Tool plate attached in fully locked position)	RTL (R1) Sensor	ON (Green) ON (Yellow)	ON (Green) OFF	Unlock (U) Sensor
	RTL (R2) Sensor	ON (Green) ON (Yellow)	ON (Green) ON (Yellow)	Lock (L) Sensor
Missed Tool (Tool Changer Master plate locked with no Tool plate attached)	RTL (R1) Sensor	ON (Green) OFF	ON (Green) OFF	Unlock (U) Sensor
	RTL (R2) Sensor	ON (Green) OFF	ON (Green) 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) 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 **RTL1** and **RTL2** inputs are false
    b. The **TSRV** input is true.
    c. The ATI Tool and any downstream device(s) are offline.

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 **Latch** output command is false and the Unlatch output command is true.

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

NOTICE: For maximum safety, ATI strongly recommends editing the robot program to verify that TSRV is OFF just before tool pick up.

3. 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 is true.
    b. The **RTL1** and **RTL2** inputs are true, indicating that it is okay to couple the Tool.
    c. 'Input' power connections become available on the Tool.
    d. Communications with downstream device(s) should now be established.

4. Coupling the Tool Changer.

    a. The **Unlatch** output is made false.
    b. The **Latch** output is made true.
    c. 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.

NOTICE: For maximum safety, ATI strongly recommends editing the robot program to verify that RTLV is ON at tool pick up.

5. 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.

6. Normal operation:
    a. The following inputs are true:
        i. **Locked**
        ii. **RTL1**
        iii. **RTL2**
    b. The following inputs are false:
        i. **Unlocked**
        ii. **TSRV**
    c. The following outputs are false:
        i. **Latch**
        i. **Unlatch**
7. Robot moves into the tool stand with the Tool Changer coupled.
8. 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 **TSRV** input is true.
    b. The **Unlatch** output is made true.
    c. The **Latch** output is made false.
    d. 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.
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 is true.
    b. The **RTL1** and **RTL2** inputs go false.
    c. ‘Input’ power connections become unavailable on the Tool.
    d. Communications with downstream device(s) should now be lost.
10. Robot and Master in free space.
    a. The following inputs are true:
        i. **Unlocked**
        ii. **TSRV**
    b. The following inputs are false:
        i. **Locked**
        ii. **RTL1**
        iii. **RTL2**

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 50 V 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 (e.g. 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 (e.g., 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:

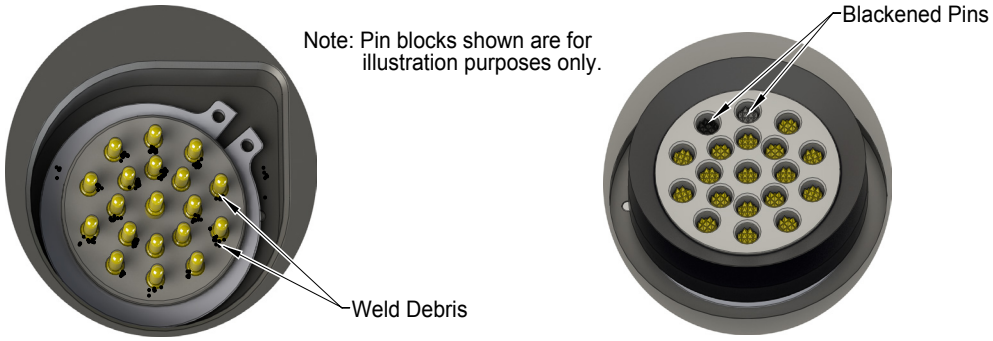
- Inspect mounting fasteners to verify they are tight and if loose, then tighten to the proper torque.
- Cable connections should be inspected during maintenance periods to ensure they are secure. Loose connections should be cleaned and re-tightened as appropriate. Inspect cable sheathing for damage, 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—Troubleshooting and Service Procedures*.

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 (e.g. electrical, air, water, etc.).
4. Inspect the Master and Tool pin blocks for debris or darkened pins.

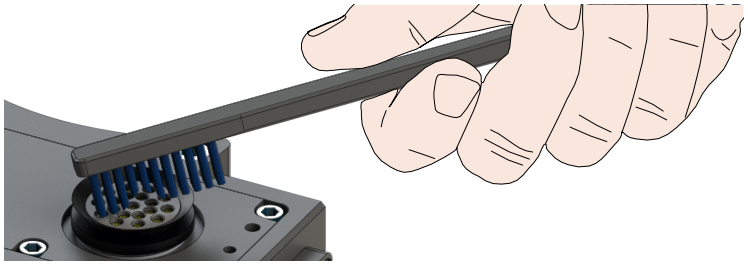
Figure 5.1—Inspect Master and Tool Pin Blocks



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).

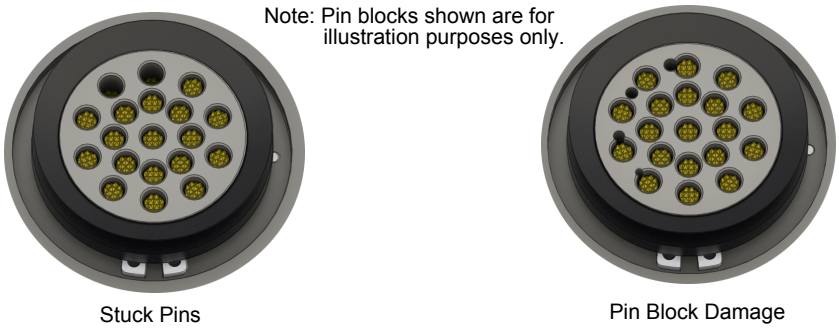
NOTICE: Do not use an abrasive media, cleaners, or solvents to clean the contact pins. Using abrasive media, cleaners, or solvents will cause damage to the contact surface, or cause pins to stick. Clean contact surfaces with a vacuum or non-abrasive media such as a nylon brush (ATI Part Number 3690-0000064-60)

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 there are stuck pins or pin block damage, 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 50 V 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 (e.g. 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 unable to lock or unlock.	Debris caught between the Master and Tool plates.	Clean debris from between the Master and Tool plates. Verify mounting fasteners is secure and does not protrude above the mating surfaces.
	Ball bearings are not moving freely.	Verify that ball bearings are moving freely. Clean and lubricate as needed. Refer to the Maintenance section of the Tool Changer manual for instructions.
	Master and Tool are not 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 Installation – tool stand Design Section of the Tool Changer manual for specifications.
	Air supply is not to specifications.	Air pressure must be at the proper pressure. Refer to the Installation section of the Tool Changer manual for specifications.
	Signals are mapped incorrectly.	Verify that signals are mapped and are communicating properly. Refer to *Section 9—Drawings* for electrical schematic.
	Exhaust port is not properly vented.	Check that exhaust port is properly vented. Refer to Pneumatic Connection section of the Base Tool Changer Manual for valve requirements.
	Valve adapter exhaust muffler clogged.	The valve adapter exhaust muffler may be clogged. Refer to the valve adapter manual for more information.

Tool Changer is locked without the Tool.	Robot provided a latch command to the Tool Changer without the Tool Changer coupled.	Unlock the Tool Changer using the manual override button on the valve adapter (refer to *Section 6.1.1—Solenoid Valve Manual Override Procedure*).
Sensors not operating properly.	Sensor cables damaged or incorrectly connected.	Verify that 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.	Verify that the sensors are set correctly. Refer to the Troubleshooting Section of the Tool Changer 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 and that nothing is trapped between their surfaces.
	Air is trapped in the Unlock (U) air port.	Ensure that there is no air trapped in the Unlock (U) air port. Refer to Air and Valve adapter section for pneumatic specification and requirements.
	Sensor is malfunctioning.	Verify the sensors are functioning properly. Refer to the Tool Changer manual.
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

The manual override procedure should be used when the Tool Changer is locked without the Tool plate attached. The control/signal 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.

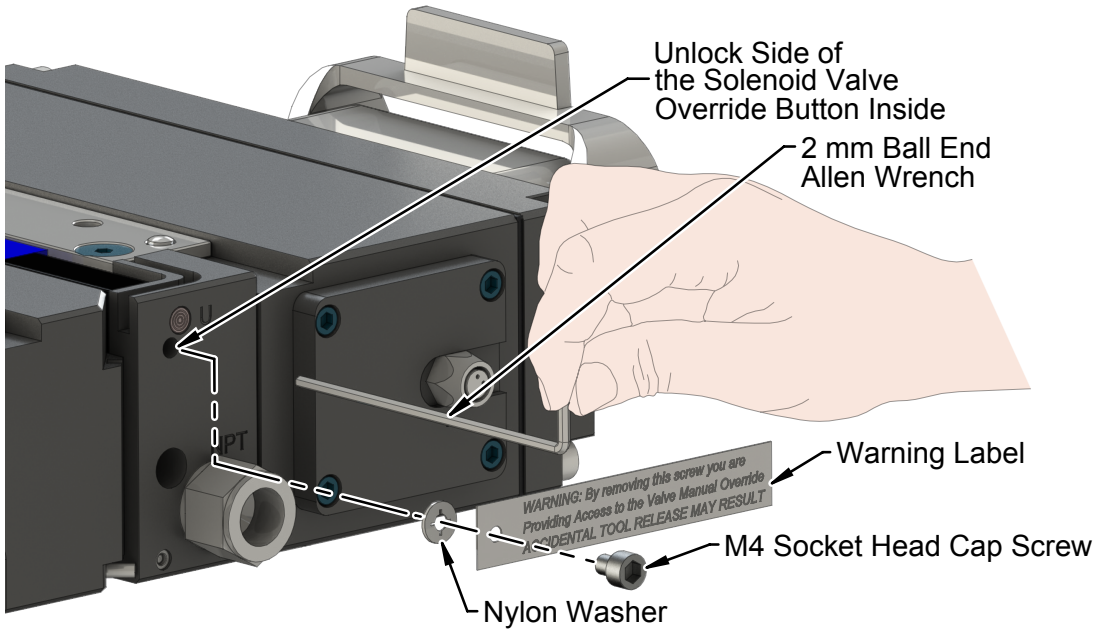
Tools required: *3 mm hex key, 2 mm ball end hex key*

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 Allen 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.

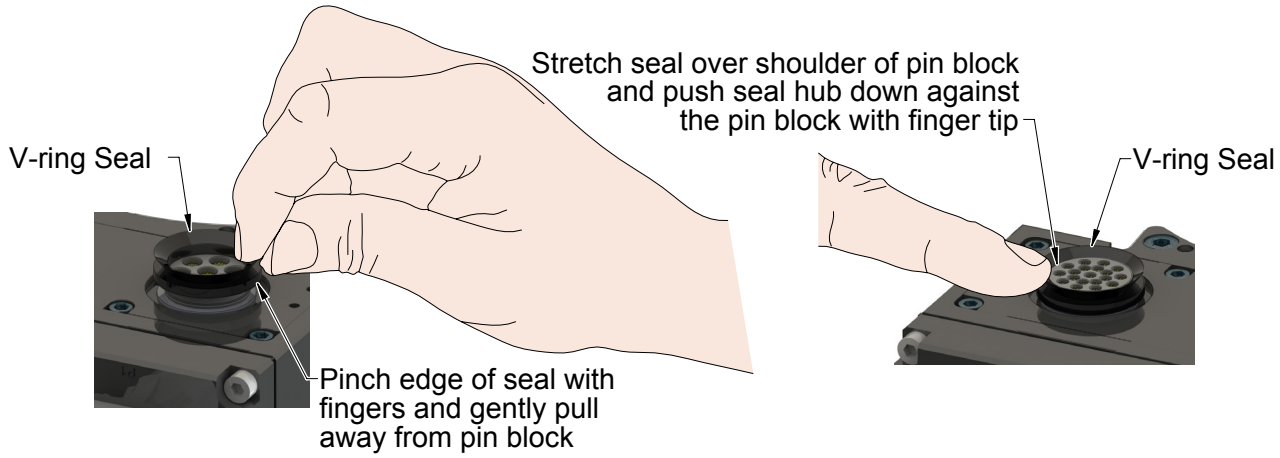
6.2.1 Seal Replacement

Parts required: *Refer to Section 7.1—VB18 Master Serviceable Parts*

The seal protects the electrical connection between the Master and Tool module. If the seal becomes worn or damaged, replace the seal.

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits (e.g. electrical, air, water, etc.).
4. To 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 VB18 Master Serviceable Parts

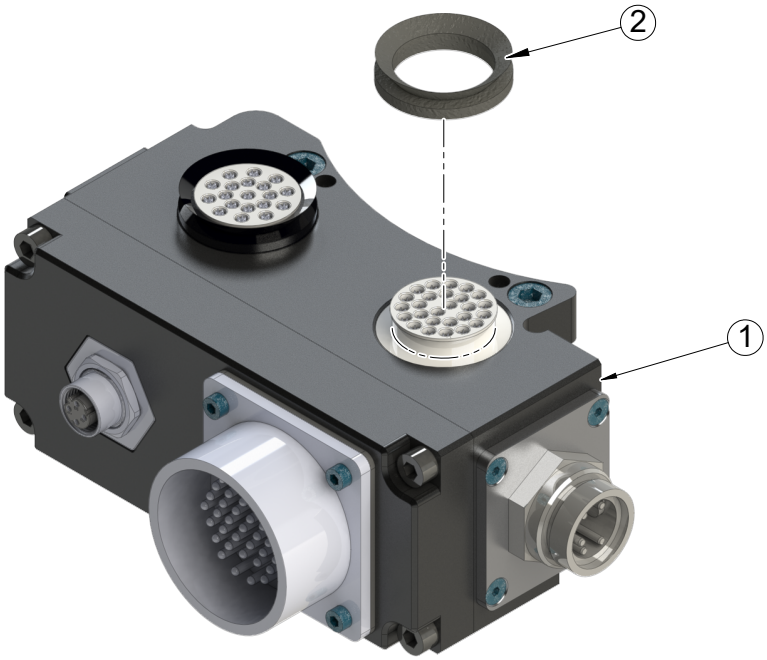


Table 7.1—Master Module Serviceable Parts			
Item No.	**Qty**	**Part Number**	**Description**
1	1	9121-VB18-M	VB18 Master Servo Module Assembly
2	1	4010-0000030-01	V-ring Seal

7.2 VB18 Tool Serviceable Parts

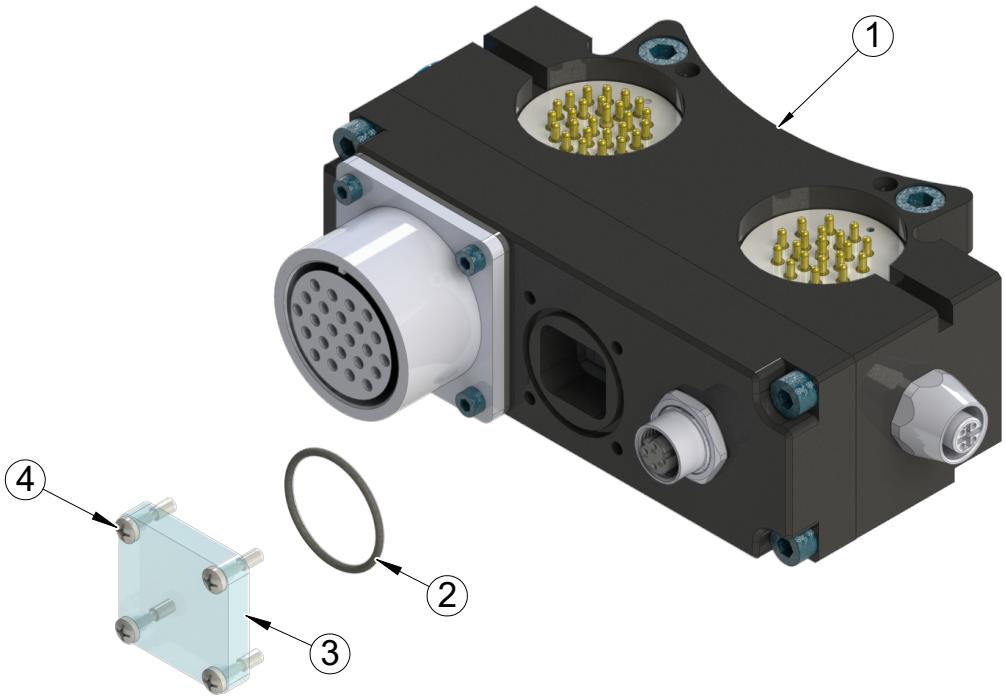


Table 7.2—Tool Module Serviceable Parts			
Item No.	**Qty**	**Part Number**	**Description**
1	1	9121-VB18-T	VB18 Tool Servo Module Assembly
2	1	3410-0001008-01	O-ring
3	1	3700-20-5844	Window
4	4	3500-9957012-21	Pan Head M3 Captive Screw

7.3 Accessories

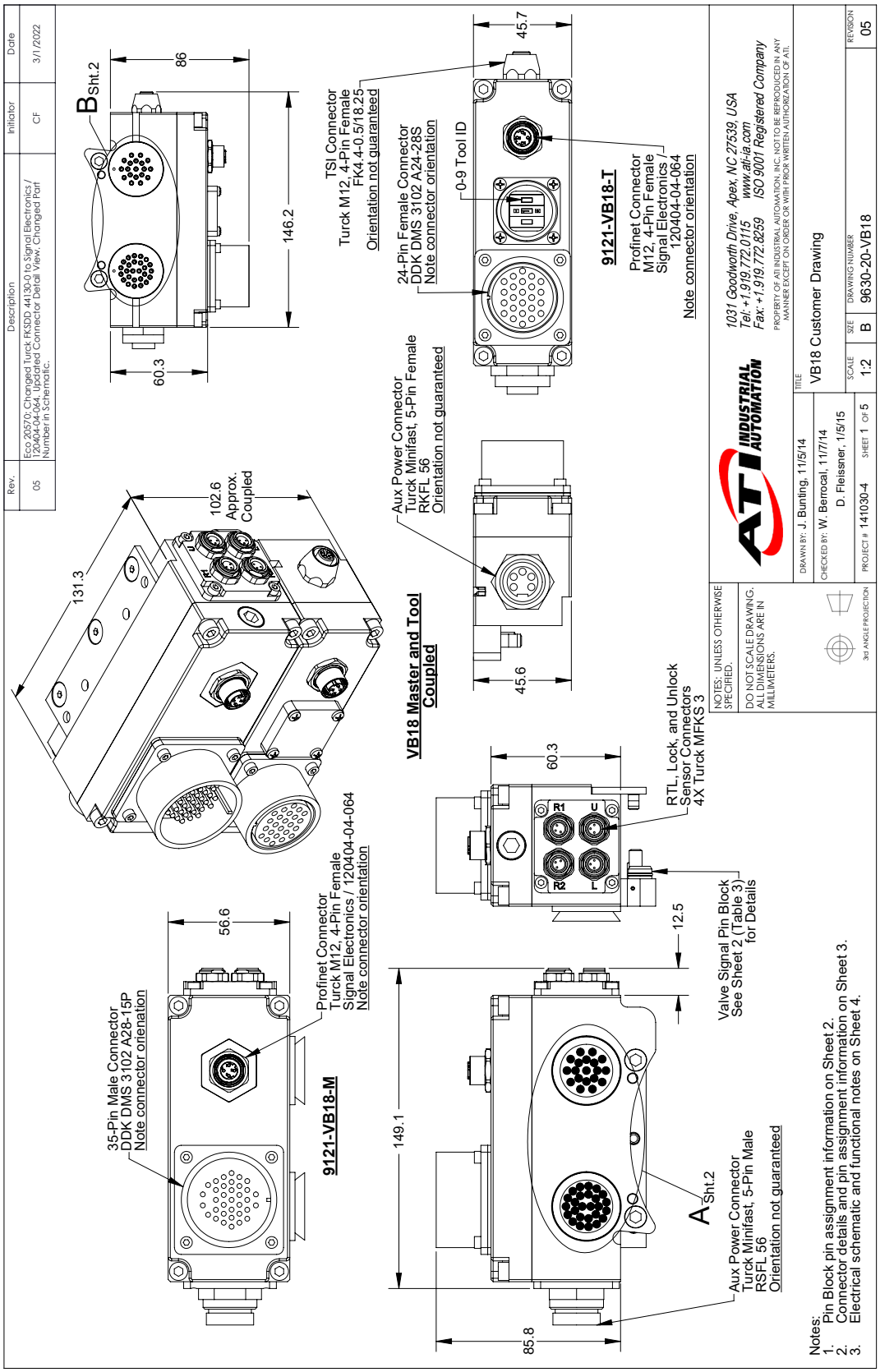
Table 7.3—Accessories			
Item No.	**Qty**	**Part Number**	**Description**
*	*	3690-0000064-60	Brush, Blue Nylon All Purpose (Contact Pin Cleaning)

8. Specifications

Table 8.1—Master Module Specifications	
9121-VB18-M	Discrete, Supports L/U/R1/R2 PNP Sensors and Integrated Valve, 35-pin DDK (MS Style) Connector, TSI on Tool w/ No RTL bypass, 0-9 Tool-ID, 22 Pass through, PROFINET Pass through
Interface Connector(s)	Customer Interface: 35-pin MS3102 Male Connector for Signal and Power 5-pin Male Minifast Connector for Aux Power 4-pin Female M12 D-Coded Connector for PROFINET Integrated Tool Changer I/O: (4X) 3-pin Female M8 Connector Supporting Tool Changer Locked, Unlocked, and Ready-to-Lock Proximity Sensor in Series 3-pin female M8 Connector for Valve
Electrical Rating	Power: TBD Signal: TBD PROFINET Signals: 6 A, 600 V Tool Changer (TSI): 3 A, 24 V Tool Changer (Tool-ID): 100 mA, 50 V Tool Changer (Valve Control): 19-29 V
Weight	TBD

Table 8.2—Tool Module Specifications	
9121-VB18-T	Discrete, 24-pin Amphenol (MS Style) Connector, TSI on Tool w/ No RTL bypass, 0-9 Tool-ID, 22 Pass through, PROFINET Pass through.
Interface Connector(s)	Customer Interface: 24-pin MS3102 Connector for Signal and Power 5-pin Male Minifast Connector for Aux Power 4-pin Female M12 D-Coded Connector for PROFINET 4-pin Female M12 Connector for TSI
Electrical Rating	Power: TBD Signal: TBD PROFINET Signals: 6 A, 600 V Tool Changer (TSI): 3 A, 24 V Tool Changer (Tool-ID): 100 mA, 50 V
Tool-ID	10 Tool-ID Values Available (0–9), Factory Setting = 1
Weight	TBD

9. Drawings


Rev.
Description
Initiator
Date
05
Eco 20570: Changed Turck RKSDD 44130-0 to Signal Electronics / 120404-04-064. Updated Connector Detail View. Changed Part Number in Schematic.
CF
3/1/2022
B Sht.2
86
146.2
60.3
TSI Connector
Turck M12, 4-Pin Female
FK4.4-0.5/18.25
Orientation not guaranteed
24-Pin Female Connector
DDK DMS 3102 A24-28S
Note connector orientation
0-9 Tool ID
45.7
9121-VB18-T
Profinet Connector
M12, 4-Pin Female
Signal Electronics /
120404-04-064
Note connector orientation
Aux Power Connector
Turck Minifast, 5-Pin Female
RKFL 56
Orientation not guaranteed
45.6
102.6
Approx.
Coupled
131.3
VB18 Master and Tool
Coupled
RTL, Lock, and Unlock
Sensor Connectors
4X Turck MFKS 3
60.3
R1
U
R2
L
12.5
56.6
35-Pin Male Connector
DDK DMS 3 102 A28-15P
Note connector orientation
Profinet Connector
Turck M12, 4-Pin Female
Signal Electronics / 120404-04-064
Note connector orientation
9121-VB18-M
149.1
Valve Signal Pin Block
See Sheet 2 (Table 3)
for Details
A Sht.2
Aux Power Connector
Turck Minifast, 5-Pin Male
RSFL 56
Orientation not guaranteed
85.8
NOTES: UNLESS OTHERWISE SPECIFIED.
DO NOT SCALE DRAWING. ALL DIMENSIONS ARE IN MILLIMETERS.
3rd ANGLE PROJECTION
DRAWN BY: J. Bunting, 11/5/14
CHECKED BY: W. Berrocal, 11/7/14
D. Fleissner, 1/5/15
PROJECT # 141030-4
SHEET 1 OF 5
TITLE
VB18 Customer Drawing
SCALE
1:2
SIZE
B
DRAWING NUMBER
9630-20-VB18
REVISION
05
INDUSTRIAL AUTOMATION
1031 Goodworth Drive, Apex, NC 27539, USA
Tel: +1.919.772.0115
Fax: +1.919.772.8259
www.ati-ia.com
ISO 9001 Registered Company
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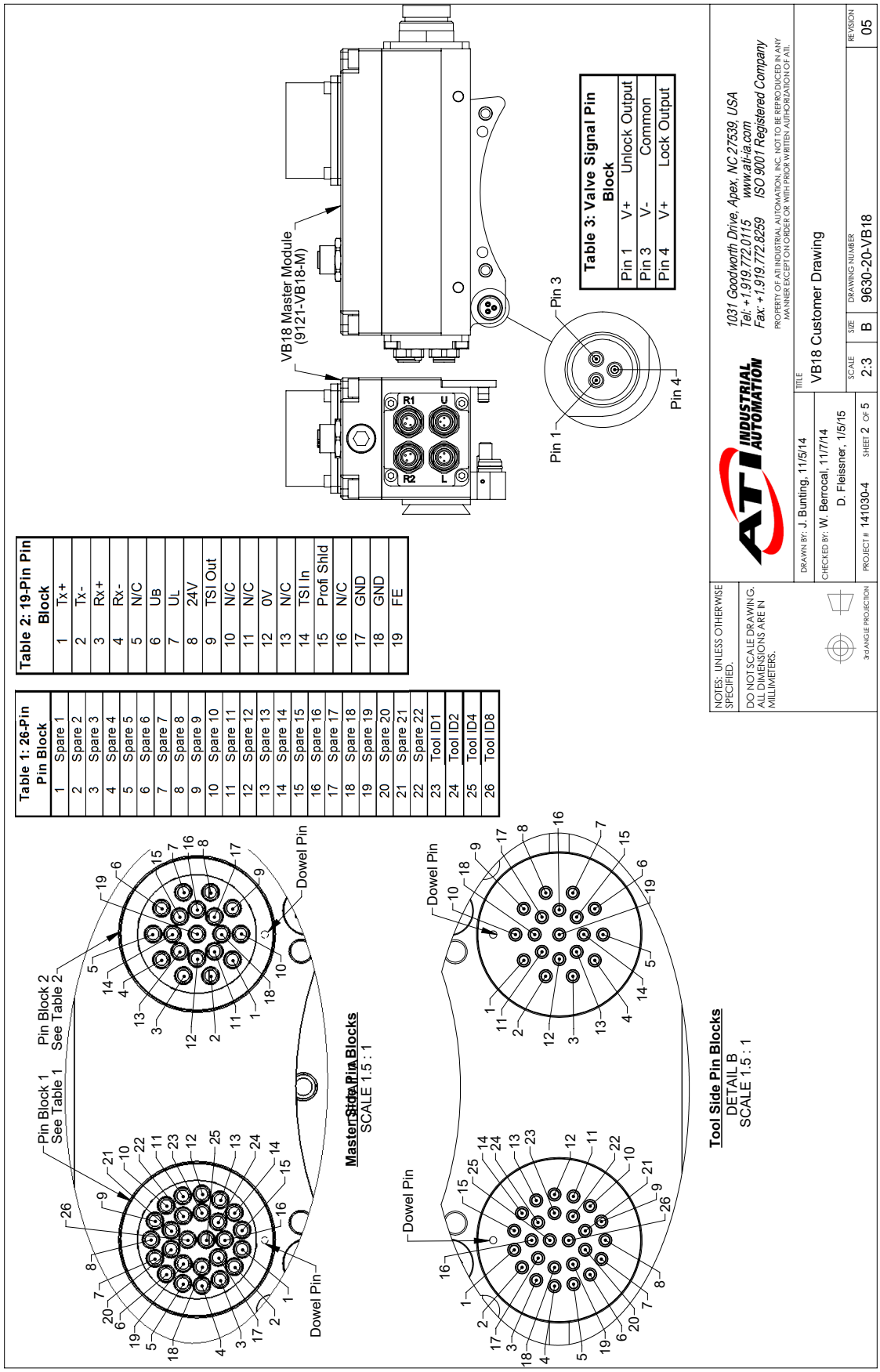
Notes:
1. Pin Block pin assignment information on Sheet 2.
2. Connector details and pin assignment information on Sheet 3.
3. Electrical schematic and functional notes on Sheet 4.


VB18 Master Module
(9121-VB18-M)
R1
C
R2
L
Pin 3
Pin 1
Pin 4
Table 3: Valve Signal Pin Block
Pin 1 V+ Unlock Output
Pin 3 V- Common
Pin 4 V+ Lock Output
Table 2: 19-Pin Pin Block
1 Tx+
2 Tx-
3 Rx+
4 Rx-
5 N/C
6 Ub
7 UL
8 24V
9 TSI Out
10 N/C
11 N/C
12 0V
13 N/C
14 TSI In
15 Profi Shld
16 N/C
17 GND
18 GND
19 FE
Table 1: 26-Pin Pin Block
1 Spare 1
2 Spare 2
3 Spare 3
4 Spare 4
5 Spare 5
6 Spare 6
7 Spare 7
8 Spare 8
9 Spare 9
10 Spare 10
11 Spare 11
12 Spare 12
13 Spare 13
14 Spare 14
15 Spare 15
16 Spare 16
17 Spare 17
18 Spare 18
19 Spare 19
20 Spare 20
21 Spare 21
22 Spare 22
23 Tool ID1
24 Tool ID2
25 Tool ID4
26 Tool ID8
Pin Block 1
See Table 1
Pin Block 2
See Table 2
Dowel Pin
Master Side Pin Blocks
SCALE 1.5 : 1
Tool Side Pin Blocks
DETAIL B
SCALE 1.5 : 1
NOTES: UNLESS OTHERWISE SPECIFIED.
DO NOT SCALE DRAWING. ALL DIMENSIONS ARE IN MILLIMETERS.
3rd ANGLE PROJECTION
DRAWN BY: J. Bunting, 11/5/14
CHECKED BY: W. Berrocal, 11/7/14
D. Fleissner, 1/5/15
PROJECT # 141030-4
SHEET 2 OF 5
TITLE
VB18 Customer Drawing
SCALE 2:3
SIZE B
DRAWING NUMBER 9630-20-VB18
REVISION 05
INDUSTRIAL AUTOMATION
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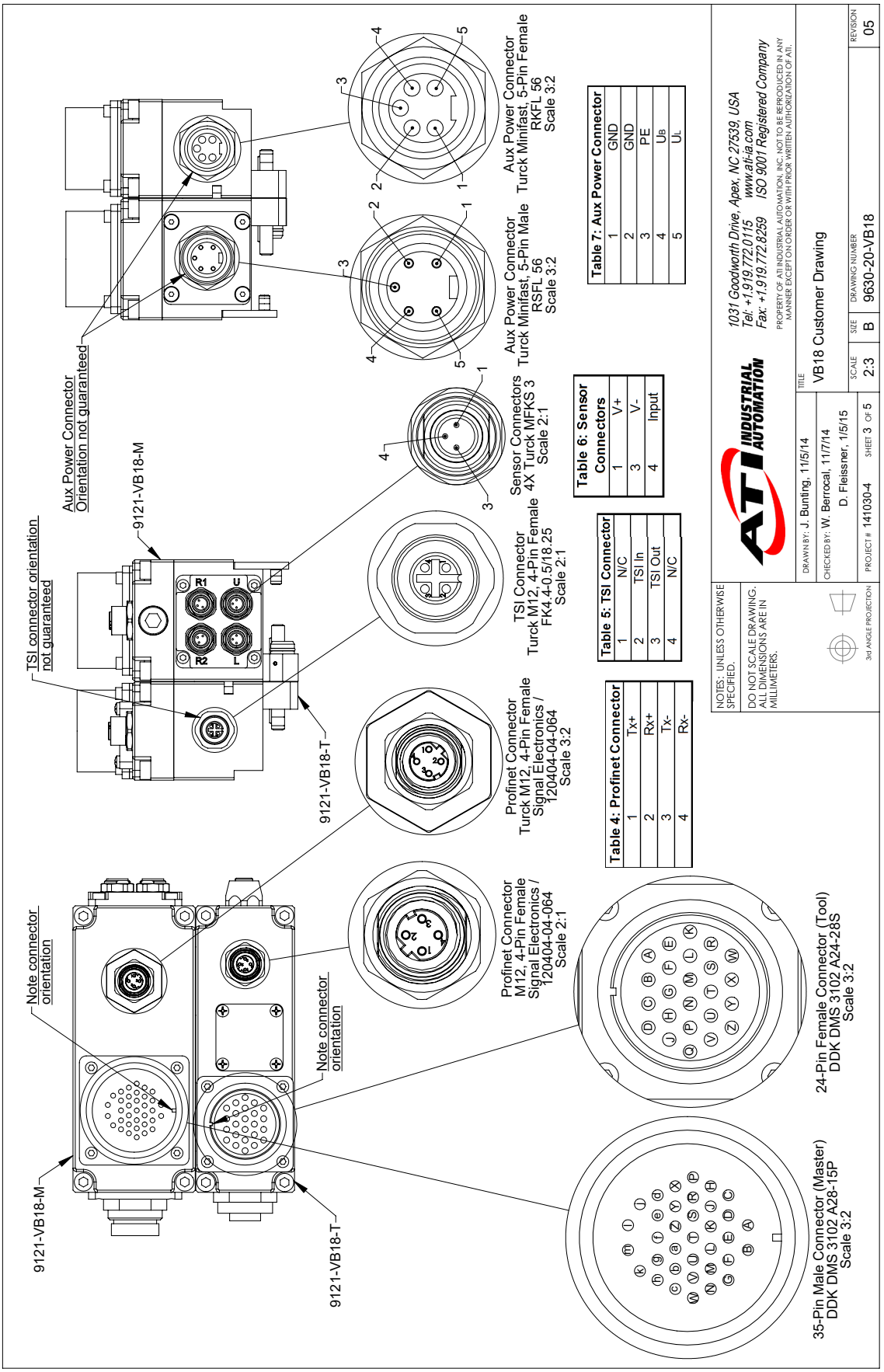
Aux Power Connector
Orientation not guaranteed
9121-VB18-M
TSI connector orientation
not guaranteed
9121-VB18-T
Note connector
orientation
Note connector
orientation
9121-VB18-M
9121-VB18-T
Aux Power Connector
Turck Minifast, 5-Pin Female
RKFL 56
Scale 3:2
Aux Power Connector
Turck Minifast, 5-Pin Male
RSFL 56
Scale 3:2
Sensor Connectors
4X Turck MFKS 3
Scale 2:1
TSI Connector
Turck M12, 4-Pin Female
FK4.4-0.5/18.25
Scale 2:1
Profinet Connector
Turck M12, 4-Pin Female
Signal Electronics /
120404-04-064
Scale 3:2
Profinet Connector
M12, 4-Pin Female
Signal Electronics /
120404-04-064
Scale 2:1
24-Pin Female Connector (Tool)
DDK DMS 3102 A24-28S
Scale 3:2
35-Pin Male Connector (Master)
DDK DMS 3102 A28-15P
Scale 3:2
Table 7: Aux Power Connector
1 GND
2 GND
3 PE
4 U_B
5 U_L
Table 6: Sensor Connectors
1 V+
3 V-
4 Input
Table 5: TSI Connector
1 N/C
2 TSI In
3 TSI Out
4 N/C
Table 4: Profinet Connector
1 Tx+
2 Rx+
3 Tx-
4 Rx-
NOTES: UNLESS OTHERWISE SPECIFIED.
DO NOT SCALE DRAWING. ALL DIMENSIONS ARE IN MILLIMETERS.
3rd ANGLE PROJECTION
DRAWN BY: J. Bunting, 11/5/14
CHECKED BY: W. Berrocal, 11/7/14
D. Fleissner, 1/5/15
PROJECT # 1410304
SHEET 3 OF 5
TITLE
VB18 Customer Drawing
SCALE 2:3
SIZE B
DRAWING NUMBER 9630-20-VB18
REVISION 05
ATI INDUSTRIAL AUTOMATION
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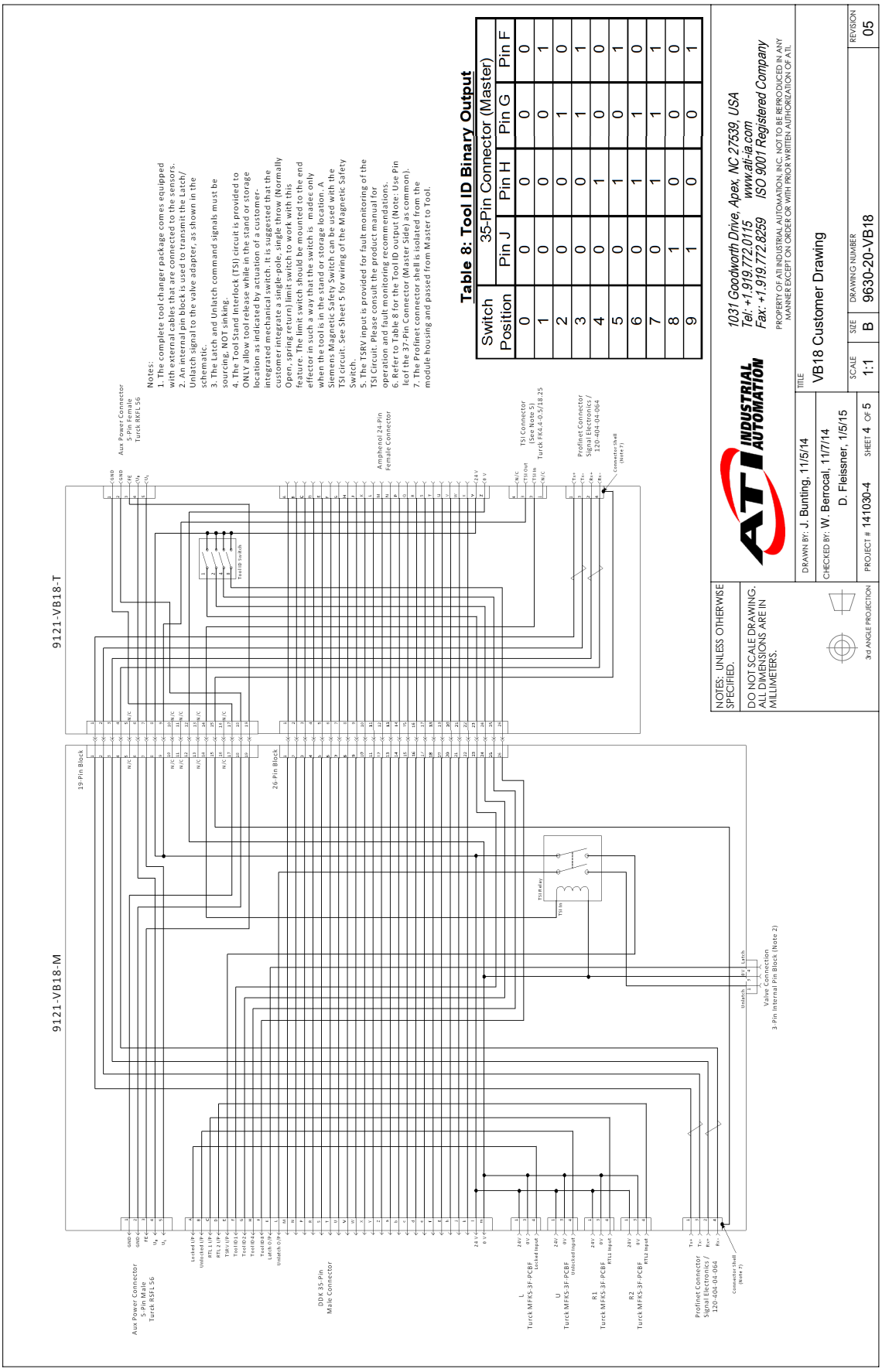
9121-VB18-T
9121-VB18-M
Notes:
1. The complete tool changer package comes equipped with external cables that are connected to the sensors.
2. An internal pin block is used to transmit the Latch/Unlatch signal to the valve adapter, as shown in the schematic.
3. The Latch and Unlatch command signals must be sourcing, NOT sinking.
4. The Tool Stand Interlock (TSI) circuit is provided to ONLY allow tool release while in the stand or storage location as indicated by actuation of a customer-integrated mechanical switch. It is suggested that the customer integrate a single-pole, single throw (Normally Open, spring return) limit switch to work with this feature. The limit switch should be mounted to the end effector in such a way that the switch is made only when the tool is in the stand or storage location. A Siemens Magnetic Safety Switch can be used with the TSI circuit. See Sheet 5 for wiring of the Magnetic Safety Switch.
5. The TSRV input is provided for fault monitoring of the TSI Circuit. Please consult the product manual for operation and fault monitoring recommendations.
6. Refer to Table 8 for the Tool ID output (Note: Use Pin 1 of the 37-Pin Connector (Master Side) as common).
7. The Profinet connector shell is isolated from the module housing and passed from Master to Tool.
Aux Power Connector 5-Pin Female Turck RKFL 5G
Aux Power Connector 5-Pin Male Turck RSFL 5G
19 Pin Block
26-Pin Block
DDK 35 Pin Male Connector
Amphenol 24 Pin Female Connector
TSI Connector (See Note 5) Turck FKC4.4-0.5/18.25
Profinet Connector Signal Electronics / 120-404-04-064
Connector Shell (Note 7)
TSI Relay
Valve Connection
3-Pin Internal Pin Block (Note 2)
L Turck MFKS-3F-PCBF Locked Input
U Turck MFKS-3F-PCBF Unlocked Input
R1 Turck MFKS-3F-PCBF RTL Input
R2 Turck MFKS-3F-PCBF RTU Input
Table 8: Tool ID Binary Output
Switch Position
35-Pin Connector (Master)
Pin J
Pin H
Pin G
Pin F
0 0 0 0 0
1 0 0 0 1
2 0 0 1 0
3 0 0 1 1
4 0 1 0 0
5 0 1 0 1
6 0 1 1 0
7 0 1 1 1
8 1 0 0 0
9 1 0 0 1
NOTES: UNLESS OTHERWISE SPECIFIED.
DO NOT SCALE DRAWING. ALL DIMENSIONS ARE IN MILLIMETERS.
3rd ANGLE PROJECTION
DRAWN BY: J. Bunting, 11/5/14
CHECKED BY: W. Berrocal, 11/7/14
D. Fleissner, 1/5/15
PROJECT # 141030-4
SHEET 4 OF 5
TITLE
VB18 Customer Drawing
SCALE 1:1
SIZE B
DRAWING NUMBER 9630-20-VB18
REVISION 05
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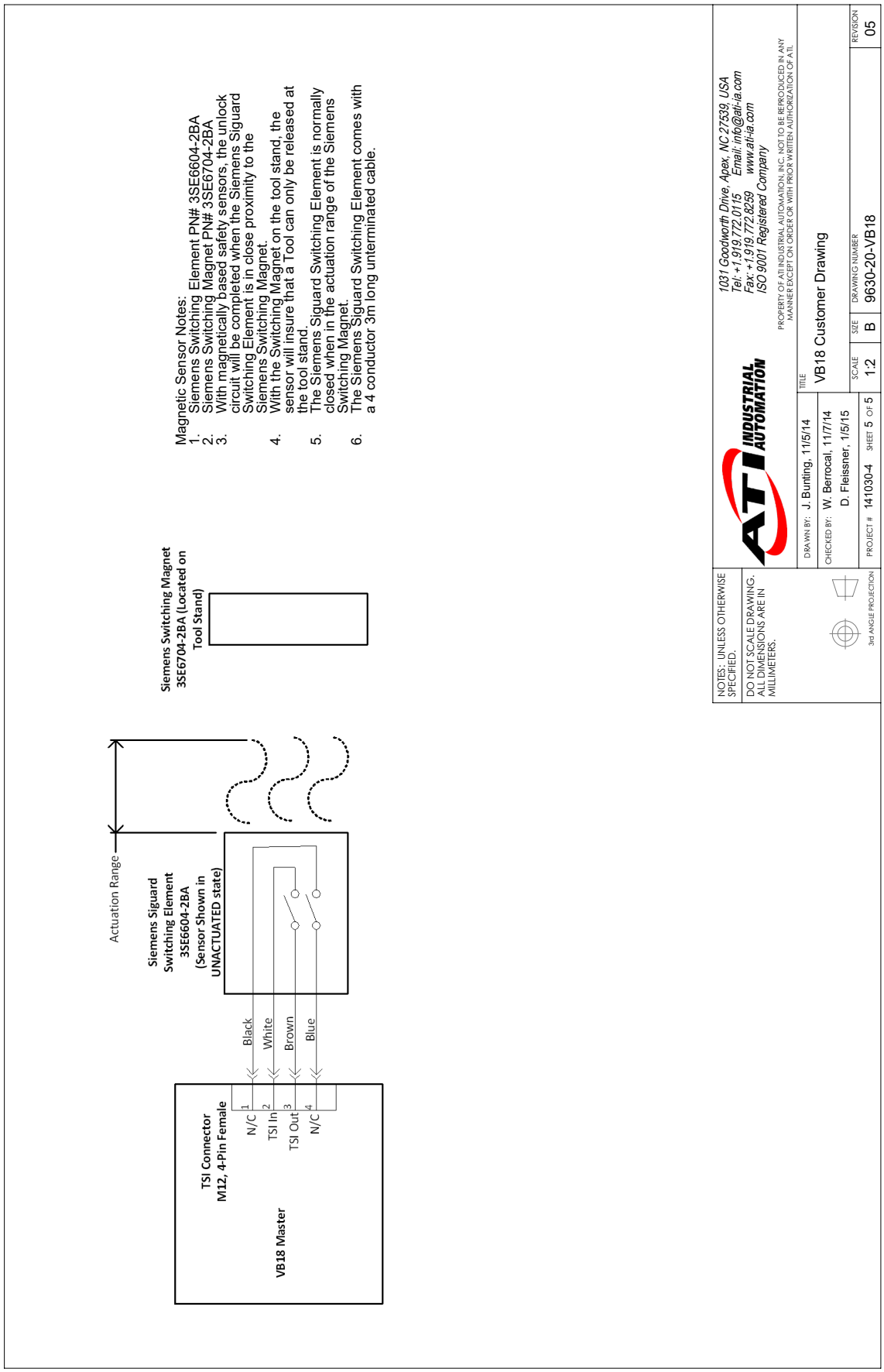
Magnetic Sensor Notes:
1. Siemens Switching Element PN# 3SE6604-2BA
2. Siemens Switching Magnet PN# 3SE6704-2BA
3. With magnetically based safety sensors, the unlock circuit will be completed when the Siemens Siguard Switching Element is in close proximity to the Siemens Switching Magnet.
4. With the Switching Magnet on the tool stand, the sensor will insure that a Tool can only be released at the tool stand.
5. The Siemens Siguard Switching Element is normally closed when in the actuation range of the Siemens Switching Magnet.
6. The Siemens Siguard Switching Element comes with a 4 conductor 3m long unterminated cable.
Siemens Switching Magnet
3SE6704-2BA (located on Tool Stand)
Actuation Range
Siemens Siguard Switching Element 3SE6604-2BA (Sensor Shown in UNACTUATED state)
Black
White
Brown
Blue
TSI Connector M12, 4-Pin Female
1 N/C
2 TSI In
3 TSI Out
4 N/C
VB18 Master
NOTES: UNLESS OTHERWISE SPECIFIED.
DO NOT SCALE DRAWING. ALL DIMENSIONS ARE IN MILLIMETERS.
3rd ANGLE PROJECTION
DRAWN BY: J. Bunting, 11/5/14
CHECKED BY: W. Berrocal, 11/7/14
D. Fleissner, 1/5/15
PROJECT # 141030-4
SHEET 5 OF 5
TITLE
VB18 Customer Drawing
SCALE 1:2
SIZE B
DRAWING NUMBER 9630-20-VB18
REVISION 05
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