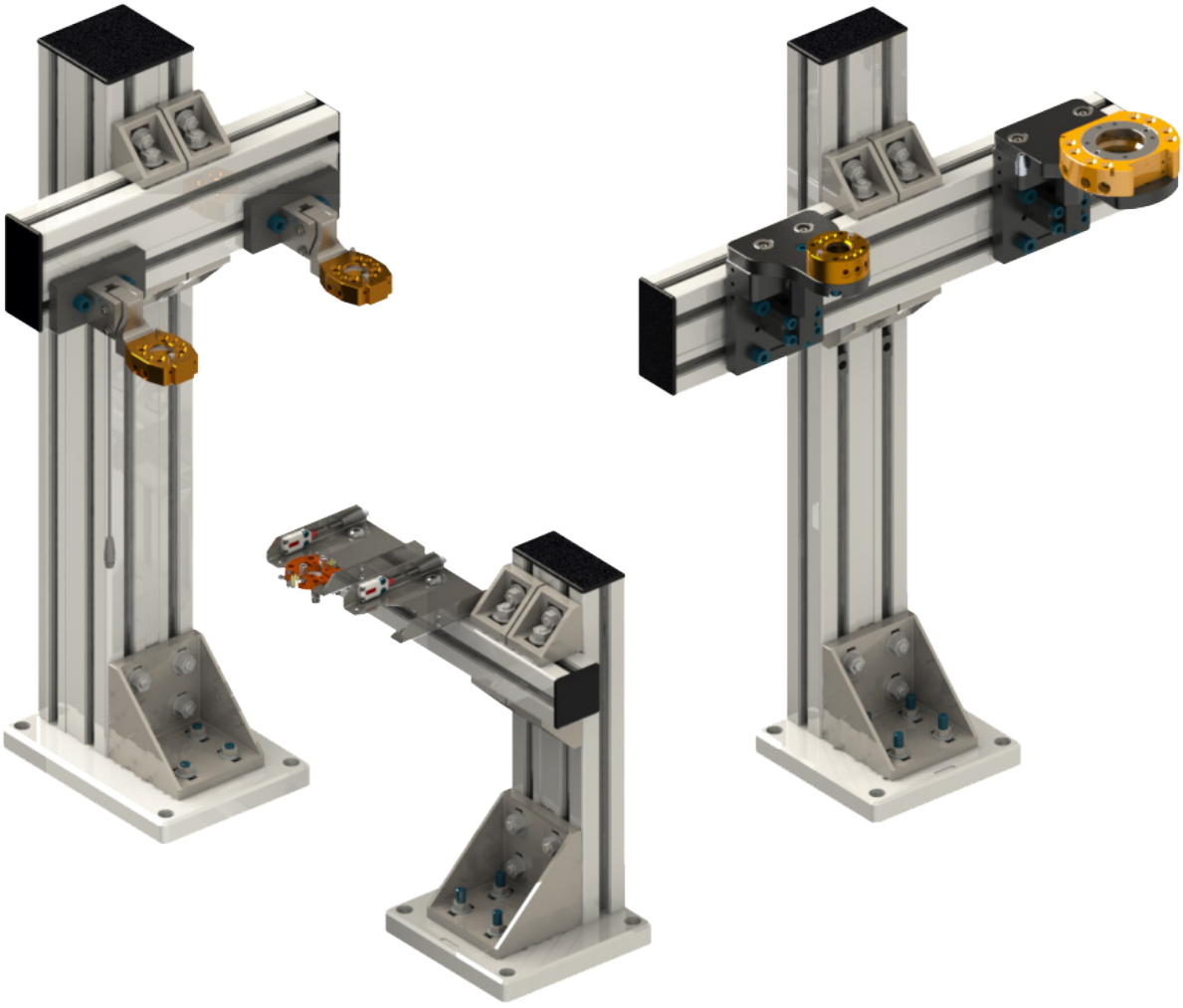
ATI INDUSTRIAL AUTOMATION

A Novanta Company

TSS Tool Stand

Manual



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Engineered Products for Robotic Productivity

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Foreword

Please contact ATI Industrial Automation with any questions concerning your particular model.

CAUTION: This manual describes the function, application, and safety considerations of this product. This manual must be read and understood before any attempt is made to install or operate the product, otherwise damage to the product or unsafe conditions may occur.

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Glossary

Term	Definition
Alignment Pin	Attaches to the interface plate and mounting module to support and position the tooling in the Tool Stand.
Clamp Module	A cylinder used to constrain the interface plate against deflection caused by cables and hoses.
End-Effector	A tool or other device attached to the robot arm in order to perform a task.
Forward Adapter	Provides extra clearance from the Tool Stand to accommodate larger tooling.
Horizontal Module	A rail that supports multiple tool positions.
Interface Plate Assembly	Provides mounting for the Tool Changer Tool plate and the customer tooling.
Master plate	The half of the Tool Changer that is mounted to an interface plate or the robot.
Module	An optional component that can be added to the Master and Tool plates to enhance the capabilities of the Tool Changer; for example: fluid/air, electrical, control/signal, servo, or high-current modules.
Mounting Block	Provides a mount for the Tool bar, forward adapter, or rack module for the pin and rack Tool Stand.
Mounting Module	Provides a mount on the Tool Stand for the tooling interface plate, or mounts the Tool plate directly for some models.
Pin Block	Mounts to a flat on the Tool Changer Tool plate and provides a mount for an alignment pin.
Pin and Bushing Tool Stand	A Tool Stand that uses mounting modules and Tooling interface plates with pins and bushings to support and position the Tool Changer Tool plate and customer tooling.
Pin and Rack Tool Stand	A Tool Stand that uses rack assemblies to support and position the Tool Changer Tool plate and customer tooling.
Post Hanger and Rail Adapter	A post hanger has two pins where the Tool hook can rest. The hanger attaches to a rail adapter that mounts to the TSS post module.
Post Module	A vertical post for (1) or more mounting modules.
Proximity Sensor	Provides a signal that indicates the tool is located in the Tool Stand.
Proximity Sensor Assembly	Provides a mount on the Tool Stand for the proximity sensor.
Rack Module	Mounts to the Tool bar, forward adapter, or mounting block to provide support and position the tooling in the Tool Stand.
Tool Bar	Provides fixed additional tool mounting positions on the Tool Stand.
Tool Hook	A module that attaches to the Tool Changer Tool plate and rests on hanger pins, when placed on the TSS.
Tooling Interface Plate	A machined plate that adapts the Tool plate to customer tooling and provides mounting features for a Tool Stand.
Tool Plate	The half of the Tool Changer that is mounted to a Tooling interface plate and customer-supplied tooling.
Tool Stand Small (TSS) Tool Stand	A fixture provided by ATI that holds the Tool plate and attached hardware when not in use.
Vertical Tooling Interface Plate	A machined plate with a vertical surface that adapts the customer end-effector and provides mounting features for a Tool Stand.

1. Safety

The safety section describes general safety guidelines to be followed with this product, explanations of the notifications found in this manual, and safety precautions that apply to the product. Product specific notifications are imbedded within the sections of this manual (where they apply).

1.1 Explanation of Notifications

These notifications are used in all of ATI manuals and are not specific to this product. The user should heed all notifications from the robot manufacturer and/or the manufacturers of other components used in the installation.

DANGER: Notification of information or instructions that if not followed will result in death or serious injury. The notification provides information about the nature of the hazardous situation, the consequences of not avoiding the hazard, and the method for avoiding the situation.

WARNING: Notification of information or instructions that if not followed could result in death or serious injury. The notification provides information about the nature of the hazardous situation, the consequences of not avoiding the hazard, and the method for avoiding the situation.

CAUTION: Notification of information or instructions that if not followed could result in moderate injury or will cause damage to equipment. The notification provides information about the nature of the hazardous situation, the consequences of not avoiding the hazard, and the method for avoiding the situation.

NOTICE: Notification of specific information or instructions about maintaining, operating, installing, or setting up the product that if not followed could result in damage to equipment. The notification can emphasize, but is not limited to: specific grease types, best operating practices, and maintenance tips.

1.2 General Safety Guidelines

This system is intended for use in industrial applications for tool changing and storage in conjunction with a Tool Changer.

The customer must select a Tool Changer that is rated for the maximum loads and moments expected during operation. Contact ATI for assistance.

WARNING: The customer is responsible for ensuring that the area between the tool and the Tool Stand and the area between the Master and Tool plates are clear during operation. Failure to do so may result in serious injury to personnel or damage to equipment.

WARNING: The gap between the Master and Tool sides is a pinch point. All personnel should be prevented from placing any part of their body or clothing in the gap, especially during actuation of the locking mechanism.

1.3 Safety Precautions

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: The TSS Tool Stand system is only to be used for intended applications and applications approved by the manufacturer.

2. Product Overview

The ATI TSS system is compatible with ATI Tool Changer sizes QC-001 through QC-41. The modular system enables you to customize your tool storage rack based on the number of tools and mounting requirements. The following TSS systems are available:

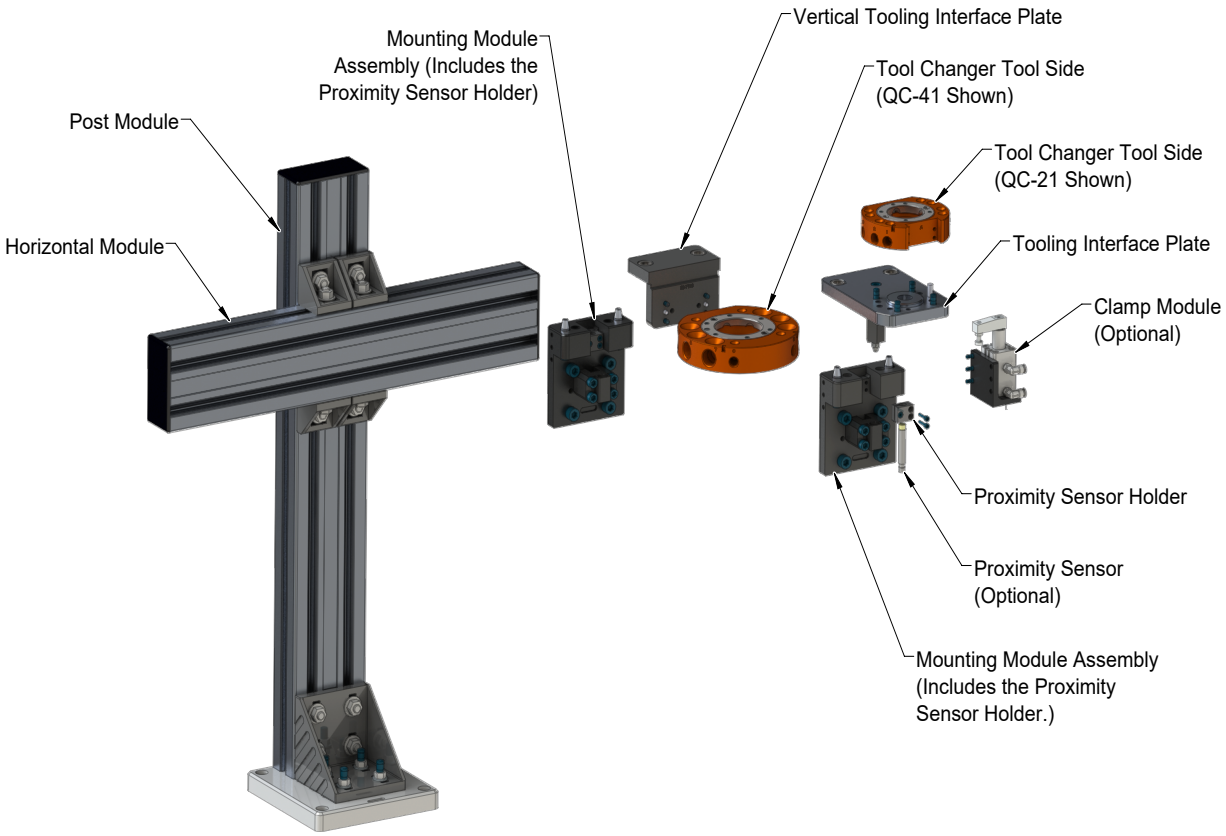
- *Section 2.1—TSS Pin and Bushing Tool Stands*
- *Section 2.2—TSS Tool Stands with Slotted Mounting Modules*
- *Section 2.3—TSS Tool Stands with Hook and Hanger Mounting Modules*
- *Section 2.4—TSS Pin and Rack Tool Stands*
- *Section 2.5—TSS Tool Stand for the QC-001*

2.1 TSS Pin and Bushing Tool Stands

The TSS Pin and Bushing Tool Stand system is compatible with ATI Tool Changer sizes QC-5 through QC-41. The Tool Stand can be equipped with horizontal modules and mounting modules that support the Tool Changer Tool plate, tool interface plate, and customer tooling. Mounting modules can be placed anywhere along a horizontal module. For an example of a TSS Pin and Bushing Tool Stand, refer to *Figure 2.1*.

The horizontal module is necessary when accommodating (3) or more tool positions. The mounting module assemblies or single pin mounting module can be mounted to either side of the post module.

Figure 2.1—TSS Pin and Bushing Tool Stand



2.1.1 Post Modules

The post module is a common component to all TSS Tool Stands. The post module is available in different post heights and consists of a base assembly, rail assembly, and gusset; refer to *Section 2.5.1—Post Module*.

2.1.2 Horizontal Modules

The horizontal module mounts to the post module and can be positioned vertically and horizontally. The rail gussets accommodate customer tooling. The rail is an aluminum extrusion (45x90) and comes in 12”, 18”, 24”, 36”, and 48” standard lengths. The rail can accommodate multiple mounting modules, depending on tool spacing requirements, and can be positioned anywhere along the horizontal module.

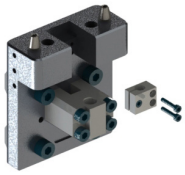
Item	Part Number	Refer to Drawing in:	QC-Models
Horizontal Module 300 mm (12”)[1,2]	9120-TSM-HM-3362	*Section 9.1.1* ~ *Section 9.1.4*	QC-5 ~ QC-41
Horizontal Module 457 mm (18”)[1,2]	9120-TSM-HM-3323		
Horizontal Module 610 mm (24”)[1,2]	9120-TSM-HM-1020		
Horizontal Module 914 mm (36”)[1,2]	9120-TSM-HM-3317		
Horizontal Module 1220 mm (48”)[1,2]	9120-TSM-HM-3325		
Horizontal Module 1520 mm (60”)	9120-TSM-HM-3353		

Notes:

1. The horizontal module is used with TSS Pin and Bushing Tool Stands.
2. The customer can specify other rail lengths.

2.1.3 Mounting Modules

The mounting module includes (2) vertical alignment pins and one vertical pin receiver. Mounting hardware is included, and can mount to the horizontal module or to the post module. The mounting module can be positioned anywhere along the rail to accommodate customer tooling. A proximity sensor holder is included with the mounting module. A mounting module is required for each tool position. The mounting module provides mounting holes for optional right and left clamp modules.



Item	Part Number	Refer to Drawing in:	QC-Models
Mounting Module[1,2]	9120-TSS-MMB-7124	*Section 9.1.1* ~ *Section 9.1.4*	QC-5, QC-11
	9120-TSS-MMB-7130		QC-20 ~ QC-41

Notes:

1. The mounting module is used with TSS Pin and Bushing Tool Stands.
2. The mounting module is used with a proximity sensor assembly 9120-TSS-SM-3315 and proximity sensors 8590-9909999-08 and 8590-9909999-09.

2.1.4 Proximity Sensor Assembly and Proximity Sensors for Mounting Modules

Proximity sensors provide a signal that indicates the tool is located in the Tool Stand. The proximity sensor assembly mounts proximity sensors to the mounting block, adapter bar, forward adapter, or mounting module. The assembly includes mounting hardware and can accommodate any 8 mm barrel-type sensor, threaded or unthreaded. Sensor cables are available in various lengths.

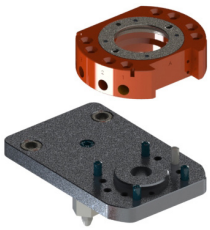
Proximity Sensor Assembly			
Item	**Part Number**	**Refer to Drawing in:**	**QC-Models**
Proximity Sensor Assembly[1, 2]	9120-TSS-SM-3315	*Section 9.1.1* ~ *Section 9.1.4*	QC-5, QC-10 ~ QC-41
Proximity Sensors			
Proximity Sensor PNP 3 wire DC	8590-9909999-08	*Section 9.1.1* ~ *Section 9.1.4*	QC-5, QC-10 ~ QC-41
Proximity Sensor NPN 3 wire DC	8590-9909999-09		

Notes:

1. The proximity sensor holder is only included with the mounting module. The proximity sensor holder is sold separately for the following: adapter bar, forward adapter, and mounting block.
2. The proximity sensor is not included.

2.1.5 Tooling Interface Plates

The tooling interface plate adapts the tool and Tool Changer to the mounting module. The tooling interface plate uses (2) bushings and (1) alignment pin to position the tooling to the mounting module. Custom tooling interface plates with specific mounting patterns are available, contact ATI for details.



Item	Part Number	Refer to Drawing in:	QC-Models
Tooling Interface Plate for QC-5,11-Blank[1,2]	9120-TSS-HBQ-7123	*Section 9.2.1*	QC-5, QC-11
Tooling Interface Plate for QC-20,21-Blank[1,3]	9120-TSS-HBQ-9483	*Section 9.2.2*	QC-20, QC-21
Tooling Interface Plate for QC-29-Blank[1,3]	9120-TSS-HBQ-11659	*Section 9.2.3*	QC-29
Tooling Interface Plate for QC-40-Blank[1,3]	9120-TSS-HBQ-9400	*Section 9.2.4*	QC-40, QC-40Q
Tooling Interface Plate for QC-41-Blank[1,3]	9120-TSS-HBQ-7539	*Section 9.2.5*	QC-41

Notes:

1. The tooling interface plate is only used with TSS Pin and Bushing Tool Stands.
2. Used with mounting module 9120-TSS-MMB-7124.
3. Used with mounting module 9120-TSS-MMB-7130.

2.1.6 Vertical Tooling Interface Plates

The vertical tooling interface plate adapts the tool and Tool Changer to the mounting module. The tooling interface plate attaches to a flat on the Tool Changer and provides mounting for the customer tooling. The tooling interface plate uses (2) bushings and (1) alignment pin to align with the mounting module. Custom vertical tooling interface plates with specific mounting patterns are available, contact ATI for details.

Item	Part Number	Refer to Drawing in:	QC-Models
Vertical Tooling Interface Plate-Blank[1, 2]	9120-TSS-VBB-7963	*Section 9.1.2* *Section 9.2.6*	QC-20, QC-21
Vertical Tooling Interface Plate-J16 Pattern[1, 2]	9120-TSS-VBQ-8206	*Section 9.1.4* *Section 9.2.7*	QC-40, QC-41
Vertical Tooling Interface, QC-18[1, 2]	9120-TSS-VBQ-9968	NA	QC-18

Notes:

1. The vertical tooling interface plate is only used with TSS Pin and Bushing Tool Stands.
2. Used with mounting module 9120-TSS-MM-7130.

2.1.7 Clamp Modules

Clamp modules secure the Tooling plate in cases where the customer tooling and utility lines pull the tooling plate to one side. The clamps ensure that the tooling interface plate is properly positioned in the mounting module. Optional clamp modules can be used on one or both sides of the mounting module.

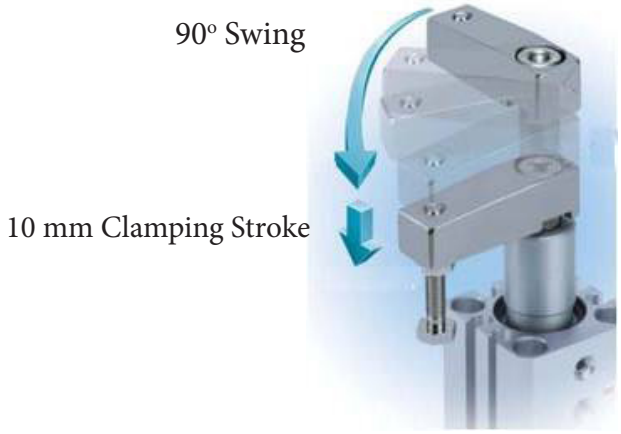
The clamp arm consists of a 90° swing, rotary actuator, which has a clamp stroke of 10 mm and rotates clockwise when opening (see *Figure 2.2*). The hex head screw in the clamp arm of the rotary actuator can be adjusted to contact the Tool plate and is secured with a lock nut (see *Section 9—Drawings*). M5 elbow air fittings are supplied to clamp and unclamp the arm. A supply pressure in the range of 90 to 145 psi is recommended for operation. The lock/unlock sensors included with the clamp module verify the position of the clamp arm.

Item	Part Number	Refer to Drawing in:	QC-Models
Clamp Module Right Hand[1]	9120-TSS-CM-7335	*Section 9.3.1*	QC-5, QC-10 ~ QC-21
Clamp Module Left Hand[1]	9120-TSS-CM-7336	*Section 9.3.2*	QC-5, QC-10 ~ QC-21

Notes:

1. The clamp module is only used with TSS Pin and Bushing Tool Stands.

Figure 2.2—Adjustable Actuator Arm Swing and Stroke



2.2 TSS Tool Stands with Slotted Mounting Modules

The TSS Tool Stand with a slotted mounting module is compatible with ATI Tool Changers. The Tool Stand must be equipped with a horizontal module and slotted mounting modules to support the Tool Changer Tool plate and customer tooling. Slotted mounting modules can be placed horizontally or vertically on the horizontal module, and the TSS holding plate kit must be adjusted accordingly. For more information, see the drawing in *Section 9.6—TSS Slotted Mounting Modules*. For an example of a TSS Tool Stand with slotted mounting modules that are attached both vertically and horizontally, see the following figure:

Figure 2.3—TSS Tool Stand with Slotted Mounting Modules for the QC-11 Tool Changer

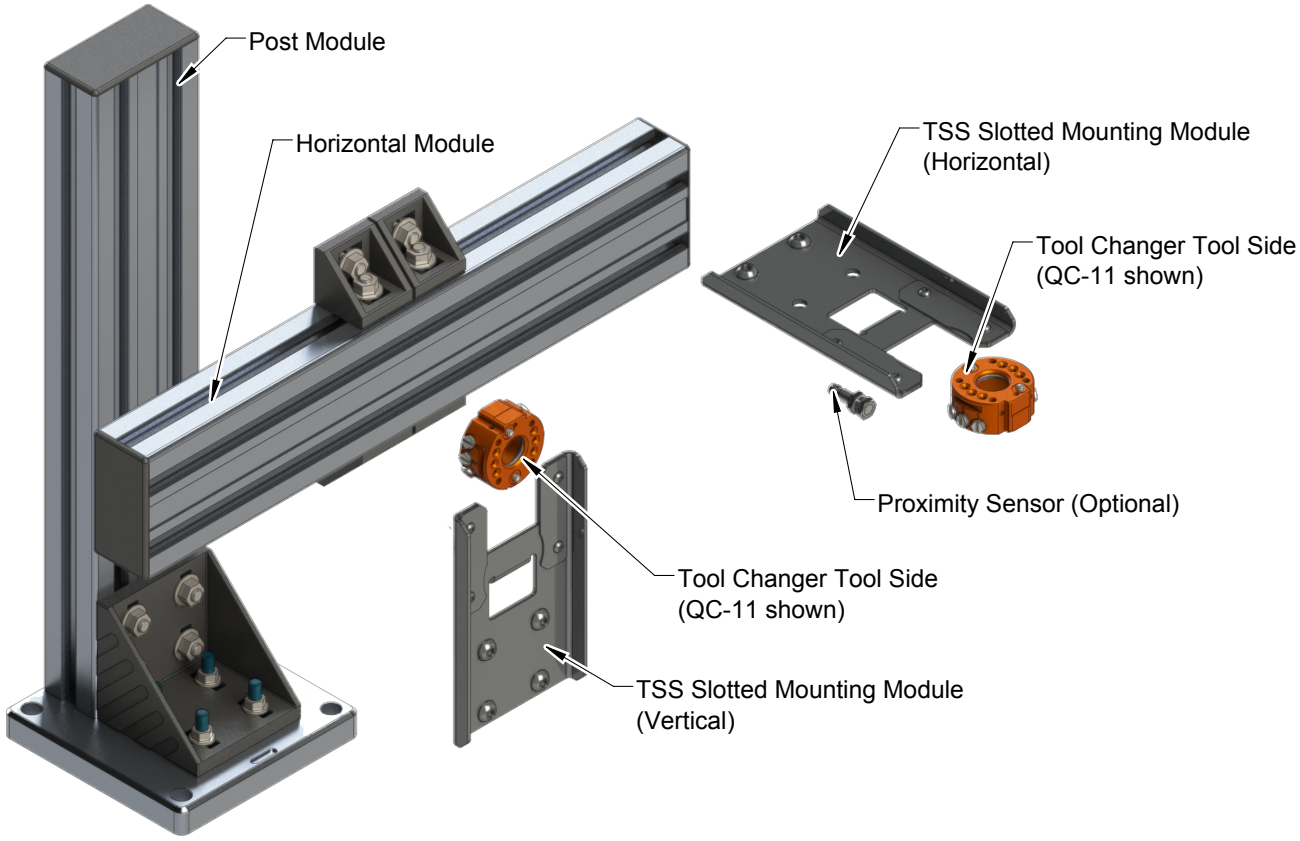
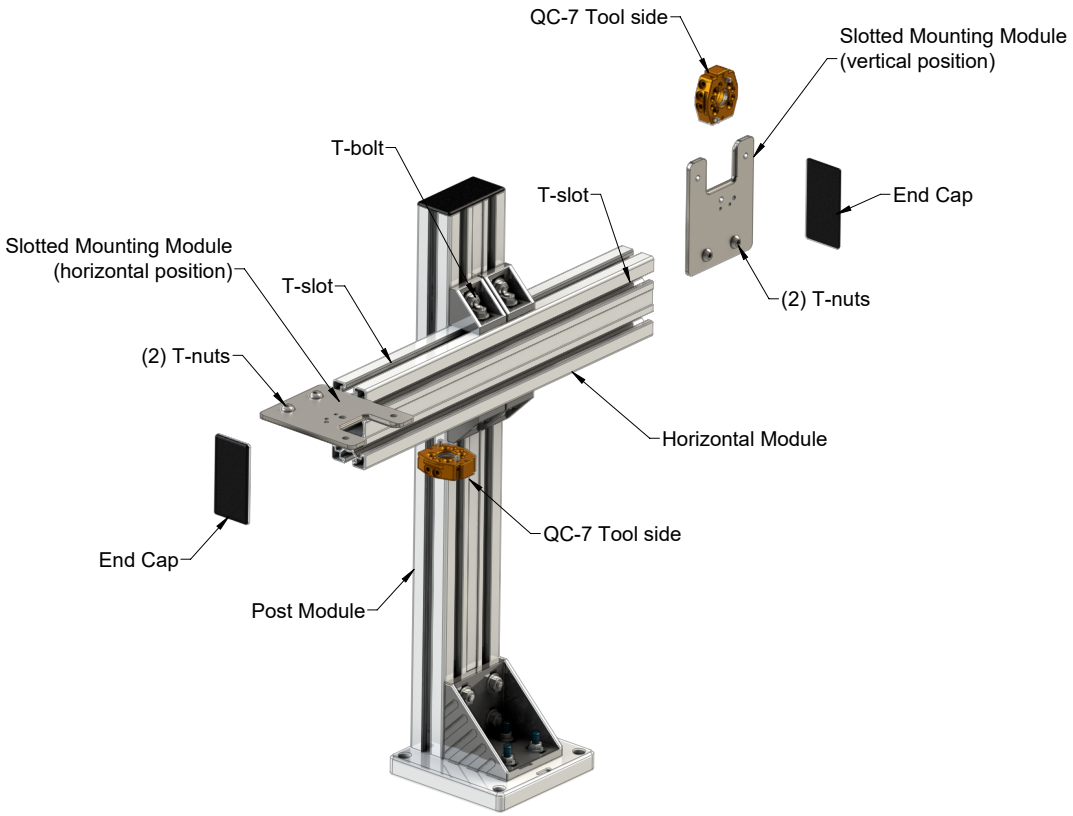


Figure 2.4—TSS Tool Stand with Slotted Mounting Modules for the QC-7 Tool Changer



2.2.1 Post Modules

The post module is a common component to all TSS Tool Stands. The post module is available in different post heights and consists of a base assembly, rail assembly, and gusset; refer to *Section 2.5.1—Post Module*.

2.2.2 Horizontal Modules

The horizontal module mounts to the post module and can be positioned vertically and horizontally using the rail gussets. The rail is an aluminum extrusion (45x90) and comes in 12”, 18”, 24”, 36”, and 48” standard lengths. The rail can accommodate multiple mounting modules, depending on tool spacing requirements, and can be positioned anywhere along the horizontal module.

Item	Part Number	Refer to Drawing in:	QC-Models
Horizontal Module 300 mm (12”)[1,2]	9120-TSM-HM-3362	*Section 9.1.1* ~ *Section 9.1.4*	QC-5 ~ QC-41
Horizontal Module 457 mm (18”)[1,2]	9120-TSM-HM-3323		
Horizontal Module 610 mm (24”)[1,2]	9120-TSM-HM-1020		
Horizontal Module 914 mm (36”)[1,2]	9120-TSM-HM-3317		
Horizontal Module 1220 mm (48”)[1,2]	9120-TSM-HM-3325		

Notes:

1. The horizontal module is used with TSS Pin and Bushing Tool Stands.
2. The customer can specify other rail lengths.

2.2.3 Slotted Mounting Modules

The slotted mounting module is compatible with ATI Tool Changers. The module mounts to the horizontal module, and can be positioned vertically or horizontally. For information about torque and required fasteners, see *Section 9.6—TSS Slotted Mounting Modules*.

NOTE: For QC-11, if mounting the module horizontally, use the (2) T-nuts. The TSS holding plate kit must be adjusted accordingly. The module can accommodate any threaded 8 mm barrel-type proximity sensor.

Item	Part Number	Refer to Drawing in:	QC-Models
Slotted Mounting Module	9120-TSS-MMS-11345	*Section 9.6.2*	QC-7
Slotted Mounting Module	9120-TSS-MMS-9589	*Section 9.6.3*	QC-11

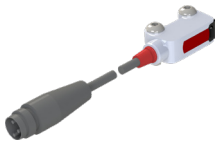
2.2.4 Barrel-type Proximity Sensors

Proximity sensors provide a signal that indicates the tool is located in the Tool Stand. The slotted mounting module can accommodate any threaded 8 mm barrel-type sensor. Sensor cables are available in various lengths. See *Figure 2.3*.

Proximity Sensors			
Item	**Part Number**	**Refer to Drawing in:**	**QC-Models**
Proximity Sensor PNP 3 wire DC[1]	8590-9909999-08	*Section 9.6.3*	QC-5 ~ QC-41
Proximity Sensor NPN 3 wire DC[1]	8590-9909999-09		
Notes: 1. Proximity sensors include nuts and washers that attach to the Slotted Mounting Module.			

2.2.5 Photoelectric Proximity Sensors

Proximity sensors provide a signal that indicates the tool is located in the Tool Stand. For the QC-7 slotted mounting module, the following sensor options are available:

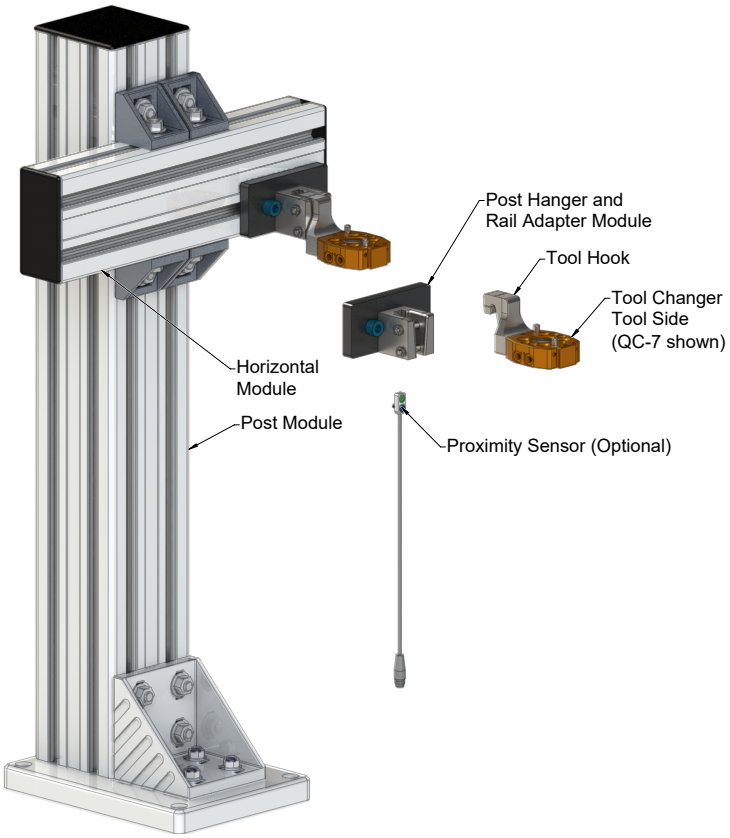


Proximity Sensors			
Item	**Part Number**	**Refer to Drawing in:**	**QC-Models**
PNP proximity sensor kit, M8 3-pin connector with .12 meter cable	9120-TSS-SMA-11345	*Section 9.6.2*	QC-7
NPN Proximity Sensor Kit, 1 meter cable with flying leads	9120-TSS-SMB1-11345		
Notes: 1. Proximity sensors include screws for installing the sensor to the slotted mounting module.			

2.3 TSS Tool Stands with Hook and Hanger Mounting Modules

The TSS with hook and hanger mounting modules are compatible with ATI QC-7 Tool Changers. A post hanger and rail adapter module mounts horizontally to the horizontal module. An optional proximity sensor can be installed on the post hanger module. A tool hook module attaches to Flat B of the QC-7 Tool Changer Tool Plate. For more information, see the drawing in *Section 9.7—TSS Hook and Hanger Mounting Modules*.

Figure 2.5—TSS Tool Stand with Hook and Hanger Modules for the QC-7 Tool Changer



2.3.1 Post Modules

The post module is a common component to all TSS Tool Stands. The QC-7 hook and hanger configuration must be used with a 90 x 90 post module. The post module is available in different post heights and consists of a base assembly, rail assembly, and gusset; refer to *Section 2.6—Post Module Components*.

2.3.2 Horizontal Modules

The horizontal module mounts to the post module and can be positioned vertically and horizontally using the rail gussets. The rail is an aluminum extrusion (45x90) and comes in 12”, 18”, 24”, 36”, and 48” standard lengths. The rail can accommodate multiple mounting modules, depending on tool spacing requirements, and can be positioned anywhere along the horizontal module.

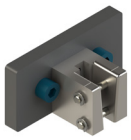
Item	Part Number	Refer to Drawing in:	QC-Models
Horizontal Module 300 mm (12”)[1,2]	9120-TSM-HM-3362	*Section 9.1.1* ~ *Section 9.1.4*	QC-7
Horizontal Module 457 mm (18”)[1,2]	9120-TSM-HM-3323		
Horizontal Module 610 mm (24”)[1,2]	9120-TSM-HM-1020		
Horizontal Module 914 mm (36”)[1,2]	9120-TSM-HM-3317		
Horizontal Module 1220 mm (48”)[1,2]	9120-TSM-HM-3325		

Notes:

1. The horizontal module is used with TSS Pin and Bushing Tool Stands.
2. The customer can specify other rail lengths .

2.3.3 Post Hanger and Rail Adapter Modules

The post hanger and rail adapter mounts to the horizontal module and must be oriented horizontally. For information about torque and required fasteners, see *Section 9.7—TSS Hook and Hanger Mounting Modules*.



Item	Part Number	Refer to Drawing in:	QC-Models
Post Hanger and Rail Adapter Module	9120-TSS-MMH-11392	*Section 9.7.3*	QC-7

2.3.4 Proximity Sensors

Proximity sensors provide a signal that indicates the tool hook is in the post hanger. Sensor options available are listed in the following table:

Proximity Sensors			
Item	**Part Number**	**Refer to Drawing in:**	**QC-Models**
PNP proximity sensor kit, M8 3-pin male connector with 0.2 meter cable	9120-TSS-SMA-11392	*Section 9.7.1*	QC-7
NPN proximity sensor kit, M8 3-pin male connector with 0.2 meter cable	9120-TSS-SMB-11392		

Notes:

1. Proximity sensors include a screw for installing the sensor to the post hanger module.

2.3.5 Tool Hook Modules

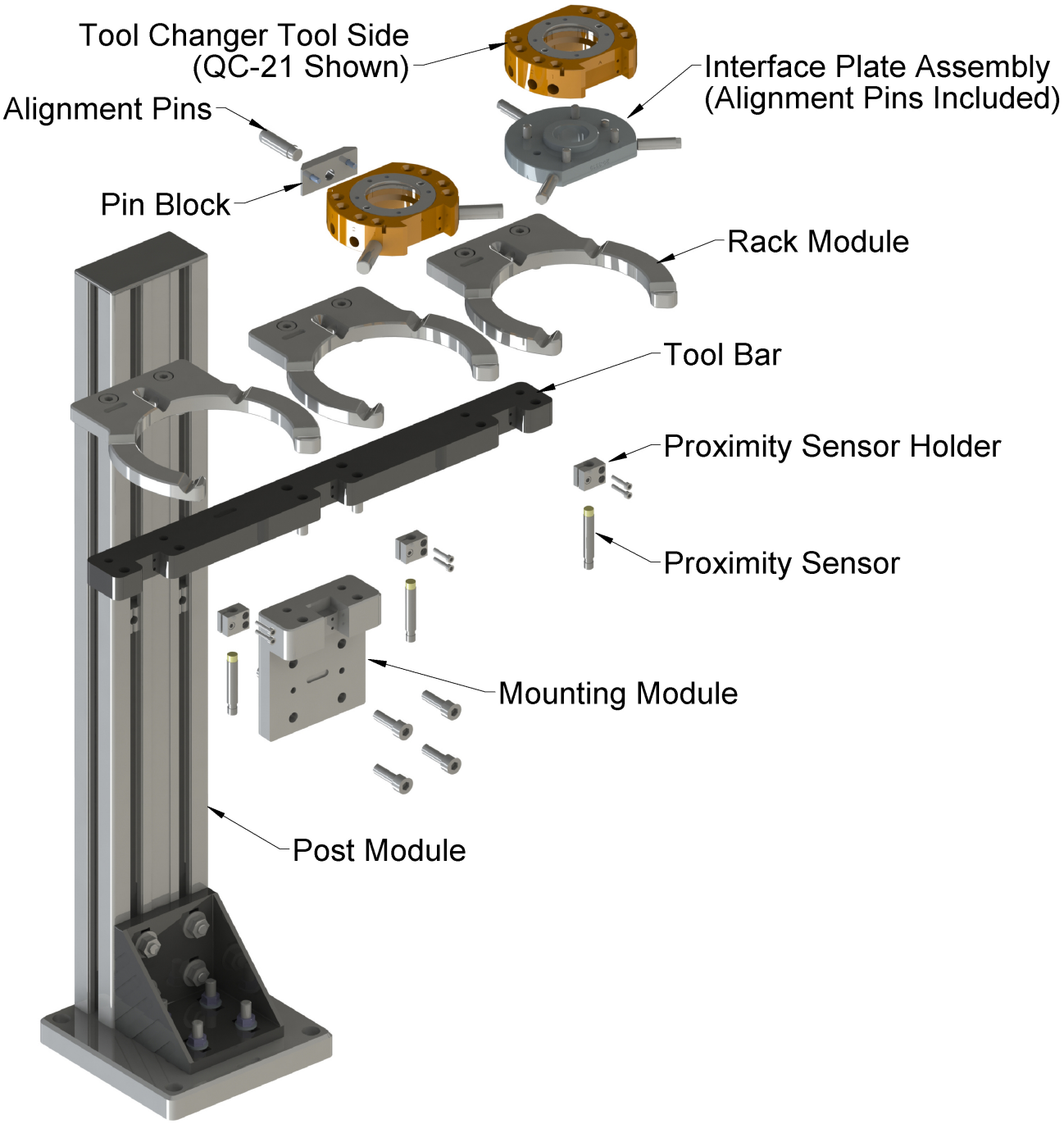
The tool hook module mounts to the QC-7 Tool. For information about torque and required fasteners, see *Section 9.7*

Item	Part Number	Refer to Drawing in:	QC-Models
Tool Hook	9120-TSS-TH-11391	*Section 9.7.2*	QC-7

2.4 TSS Pin and Rack Tool Stands

The TSS Pin and Rack Tool Stand system is compatible with ATI Tool Changer sizes QC-5 and QC-10 through QC-41. The Tool Stand can be equipped with either a forward adapter or an adapter bar with fixed tool spacing. The rack assemblies provide the option to either use interface plates or empty air ports as mounting points for the alignment pins.

Figure 2.6—TSS Pin and Rack Tool Stand

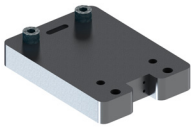


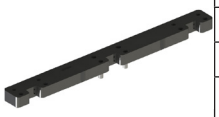
2.4.1 Post Modules

The post module is a common component to all TSS Tool Stands. The post module is available in different post heights and consists of a base assembly, rail assembly, and gusset; refer to *Section 2.6—Post Module Components*.

2.4.2 Tool Bars and Forward Adapter

There is (1) type of forward adapter and (3) types of tool bars. The tool bar mounts to the mounting block and can hold (3) to (5) rack modules, depending on the model. Tool bars also allow for the attachment of a proximity sensor holder for each rack. The forward adapter is used when tooling requires extra clearance from the rail, and also accommodates a proximity sensor holder.



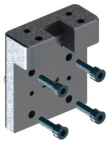


Item	Part Number	Refer to Drawing in:	QC-Models
Forward Adapter Assembly*	9120-TSS-FA-3361	*Section 9.4.4*	QC-5, QC-10 ~ QC-41
Tool Bar – 3 Position[1]	9120-TSS-TB-3308	*Section 9.4.1*	
Tool Bar – 4 Position[1]	9120-TSS-TB-3431	N/A	
Tool Bar – 5 Position[1]	9120-TSS-TB-3570	*Section 9.4.5*	

Notes:
1. The forward adapter and adapter bars are used with TSS Pin and Rack Tool Stands only.

2.4.3 Mounting Module

The mounting module mounts to the post module and can be positioned anywhere along the rail to the desired height. The rack module, forward adapter, or tool bar can mount to the block. The block also can accommodate a proximity sensor holder.



Item	Part Number	Refer to Drawing in:	QC-Models
Mounting Block[1]	9120-TSS-MMA-3306	*Section 9.4.1* ~ *Section 9.4.5*	QC-5, QC-10 ~ QC-41

Notes:
1. The forward adapter and adapter bars are only used with TSS Pin and Rack Tool Stands.

2.4.4 Proximity Sensor Assembly and Proximity Sensors

The proximity sensor assembly can be mounted to the mounting block, adapter bar, forward adapter, and mounting module to secure a proximity sensor. The assembly includes mounting hardware and can accommodate any 8 mm barrel-type sensor, threaded or unthreaded. The proximity sensor provides a signal that indicates the tool is located in the Tool Stand. Sensor cables are available in various lengths. The proximity sensor assembly is not compatible with the Tool Stand for the QC-001.

Proximity Sensor Assembly			
Item	**Part Number**	**Refer to Drawing in:**	**QC-Models**
Proximity Sensor Assembly[1, 2]	9120-TSS-SM-3315	*Section 9.4.1*	QC-5, QC-10 ~ QC-41
Proximity Sensors			
Proximity Sensor PNP 3 wire DC	8590-9909999-08	*Section 9.4.1*	QC-5, QC-10 ~ QC-41
Proximity Sensor NPN 3 wire DC	8590-9909999-09		

Notes:
1. The proximity sensor holder is only included with the mounting module. For all others: adapter bar, forward adapter, and mounting block, the proximity sensor holder is sold separately.
2. The proximity sensor is not included.

2.4.5 Rack Modules, Interface Plate Assemblies, Alignment Pins and Pin Blocks

The rack module consists of a rigid "U"-shaped plate that supports the Tool Changer and customer tooling. The assembly includes mounting hardware and mounts to the mounting block, adapter bar, and forward adapter. Each rack has V-grooves that orient the alignment pins. The groove-pin combination allows for limited compliance in the horizontal plane, and also provides repeatable tool positioning.

The Interface plate assembly adapts the customer tooling to the Tool Changer. Interface plates are sized specifically to correspond with the Tool Changer and Rack Module. Interface plate assemblies that are designed for fixed-tool spacing stands include (3) stainless steel alignment pins. Standard interface plates are sold blank to allow customers to machine their own tooling bolt patterns. ATI can provide specific tooling patterns upon request.

Rack Assemblies That Use an Interface Plate				
Rack Assemblies				
Item	**Quantity**	**Part Number**	**Refer to Drawing in:**	**QC-Models**
Rack Module for QC-5,10,11[1]	1	9120-TSS-MMV-3310	*Section 9.4.6*	QC-5
			Section 9.4.7	QC-10
			Section 9.4.8	QC-11
Rack Module for QC-21, 21E[1]	1	9120-TSS-MMV-3313	*Section 9.4.9*	QC-20
			Section 9.4.10	QC-21
			Section 9.4.11	QC-21 (Euro)
Rack Module for QC-41[1]	1	9120-TSS-MMV-4175	N/A	QC-41
Interface Plates Assemblies				
Tool Interface Plate Assembly for QC-5, 10,11-Blank[1, 2]	1	9120-TSS-HVQ-3314	*Section 9.4.6*	QC-5
			Section 9.4.7	QC-10
			Section 9.4.8	QC-11
Tool Interface Plate Assembly for QC-21, 21E-Blank[1, 2]	1	9120-TSS-HVQ-3319	*Section 9.4.9*	QC-20
			Section 9.4.10	QC-21
			Section 9.4.11	QC-21 (Euro)
Tool Interface Plate Assembly for QC-41-Blank[1, 2]	1	9120-TSS-HVQ-4174	N/A	QC-41
Alignment Pin				
Alignment Pin[2]	3	3700-20-3303	*Section 9.4.6* ~ *Section 9.4.11*	ALL

Notes:

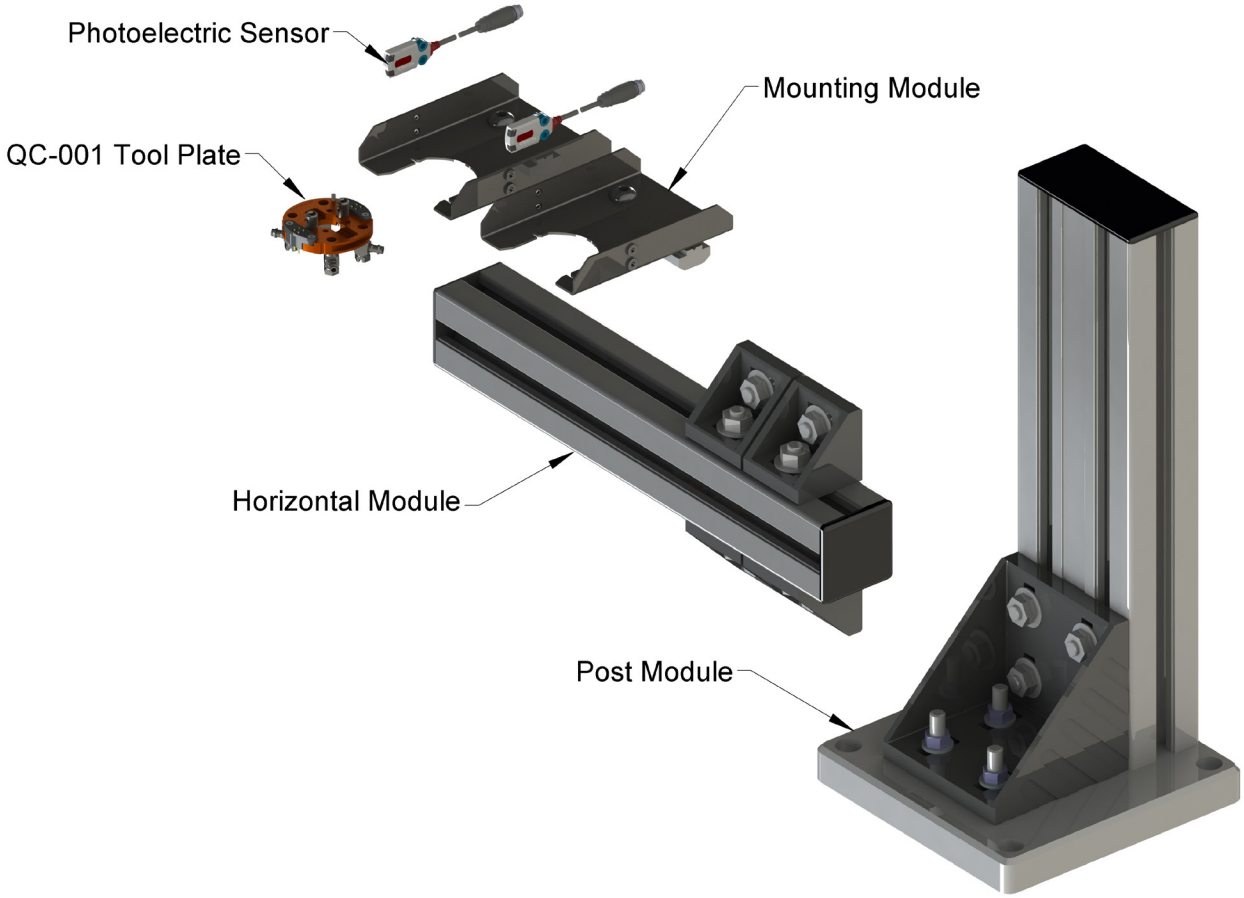
1. Only used with TSS Tool Stands with fixed tool spacing.
2. The adapter plate assembly includes (3) 3700-20-3303 alignment pins.

2.5 TSS Tool Stand for the QC-001

The TSS Tool Stand for the ATI QC-001 Tool Changer combines the rack-type mounting module with adjustable tool spacing. The mounting module attaches to the horizontal module and can be positioned anywhere along the rail. An optional photoelectric sensor can attach to the mounting module and indicate if the tool is located in the stand.

Horizontal modules can accommodate up to (6) tool positions, depending on the size of the tooling.

Figure 2.7—QC-001 - Complete TSS Tool Stand



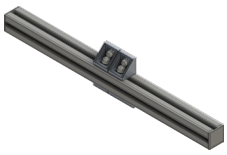
2.5.1 Post Module

The post module is a common component to all TSS Tool Stands. The post module is available in different post heights and consists of a base assembly, rail assembly, and gusset; refer to *Section 2.6—Post Module Components*.

2.5.2 Horizontal Modules

The horizontal module mounts to the post module and can be positioned vertically or horizontally using the rail gussets to accommodate customer tooling. The rail is an aluminum extrusion and comes in standard lengths. Multiple tool plate assemblies can be added to the rail depending on tool spacing requirements.

The 24” horizontal module can accommodate up to (6) tool positions, depending on tooling size.



Item	Part Number	Refer to Drawing in:	QC-Models
Horizontal Module 610 mm (24”)[1]	9120-TSS-HM-1020	*Section 9.6.1*	QC-001

Notes:
1. This Horizontal Module is only used with TSS Tool Stand for QC-001.

2.5.3 Mounting Module

QC-001 mounting module “U” shaped plates adapt the Tool Changer and customer tooling to the TSS Tool Stand. The mounting module includes mounting hardware and attaches to the horizontal module.

Item	Part Number	Refer to Drawing in:	QC-Models
Mounting Module[1]	9120-TSS-MM-7869	*Section 9.6.1*	QC-001

Notes:
1. The mounting module and photoelectric sensor are only used with TSS Tool Stand for QC-001.

2.5.4 Photoelectric Sensor

Photoelectric sensors mount to the mounting module and indicate if the tool is located in the Tool Stand.

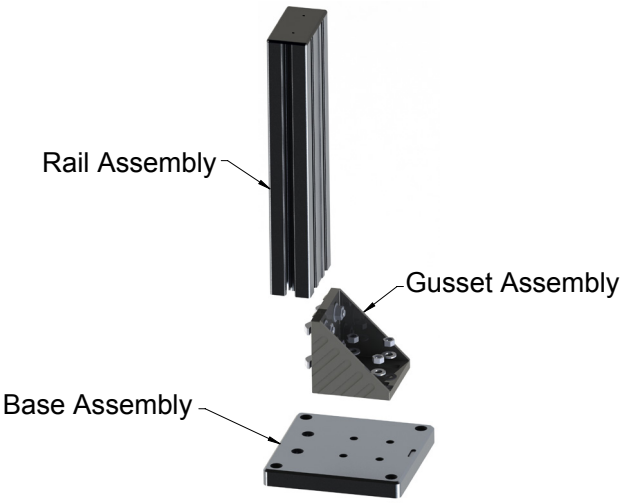
Item	Part Number	Refer to Drawing in:	QC-Models
Photoelectric Sensor Kit[1]	9120-TSS-SMA-7869	*Section 9.6.1*	QC-001

Notes:
1. The mounting module and photoelectric sensor are only used with TSS Tool Stand for QC-001.

2.6 Post Module Components

The post module is a common component to all TSS Tool Stands. The post module is available in different post heights and consists of a base assembly, rail assembly, and gusset.

Figure 2.8—Post Module Components

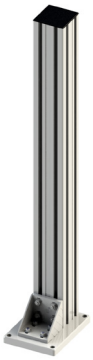


2.6.1 Post Modules (Complete Assembly)

The post module is a common component to all TSS Tool Stands. The post module is available in different post heights and consists of a base assembly, rail assembly, and gusset.

Post Module			
Item	**Part Number**	**Refer to Drawing in:**	**QC-Models**
Post Module 914 mm (36”)[1]	9120-TSS-PM-3317	*Section 9.5*	QC-5 ~ QC-11[2]

Notes:
1. The Post Module is available factory assembled; an assembly charge will apply.

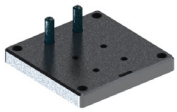


Post Module with a 90 x 90 Base			
Item	**Part Number**	**Refer to Drawing in:**	**QC-Models**
Post Module 914 mm (36”)[1]	9120-TSS-PM-3435	*Section 9.5*	QC-001~ QC-41
Post Module 610 mm (24”)[1]	9120-TSS-PM-3442		QC-5 ~ QC-41[2]
Post Module 1220 mm (48”)[1]	9120-TSS-PM-3436		
Post Module 1520 mm (60”)[1]	9120-TSS-PM-3434		

Notes:
1. The Post Module is available factory assembled; an assembly charge will apply.
2. Only use 90x90 for the QC-7 hook and hanger configuration.

2.6.2 Base Assembly

The base assembly consists of a square aluminum machined plate and hardware that attaches to the rail and gusset assemblies. The base is the foundation for the Tool Stand system.



Item	Part Number	Refer to Drawing in:	QC-Models
Base Assembly[1]	9120-TSS-BA-3311	*Section 9.5*	All
Base Assembly[2]	9120-TSS-BA-11435	*Section 9.5*	QC-5 ~ QC-41

Note:
1. Use with 45 x 90 rail assemblies.
2. Use with 90 x 90 rail assemblies.

2.6.3 Rail Assemblies

The rail assembly mounts to the base assembly. The standard rail assembly is an aluminum extrusion (45x90 or 90x90). Customers can request custom lengths when ordering.

Rail Assemblies (45 x 90)			
Item	**Part Number**	**Refer to Drawing in:**	**QC-Models**
Post Rail 300 mm (12”)[1]	9005-20-2225	*Section 9.5*	QC-001
Post Rail 610 mm (24”)[1]	9005-20-2226		QC-5 ~ QC-11
Post Rail 914 mm (36”)[1]	9005-20-2227		
Post Rail 1220 mm (48”)[1]	9005-20-2228		
Post Rail 1520 mm (60”)[1]	9005-20-2229		

Note:
1. The customer can specify other rail lengths.

Rail Assemblies (90 x 90)			
Item	**Part Number**	**Refer to Drawing in:**	**QC-Models**
Post Rail 610 mm (24”)[1]	9005-20-3442	*Section 9.5*	QC-7[2] ~ QC-41
Post Rail 914 mm (36”)[1]	9005-20-3435		
Post Rail 1220 mm (48”)[1]	9005-20-3436		
Post Rail 1520 mm (60”)[1]	9005-20-3434		

Note:
1. The customer can specify other rail lengths.
2. Only use 90x90 for the QC-7 hook and hanger configuration.

2.6.4 Gusset Assembly

The gusset assembly (90x90) provides additional structural support at the Tool Stand base. The gusset assembly mounts to the base assembly and includes alignment and mounting hardware. Note: Tabs must be removed from the series 90x90 gusset to allow flush contact to the base assembly. For more information, see *Section 9.5—Post Modules*.

Item	Part Number	Refer to Drawing in:	QC-Models
Gusset	9120-TSS-GA-1030	*Section 9.5*	All

2.7 Determining Tool Stand Configurations

See *Figure 2.10*.

When determining the Tool Stand components, consider the following variables:

- The model of the Tool Changer, and if add-on modules are required
- The dimensions, weight, and number of tools that the stand must accommodate
- The size, reach, and capabilities of the robot being used
- The area available for the Tool Stand
- The area between the tool positions required for pneumatic fittings, hoses, electrical cabling and other utilities

Figure 2.9—Tool Stand and Tool Spacing

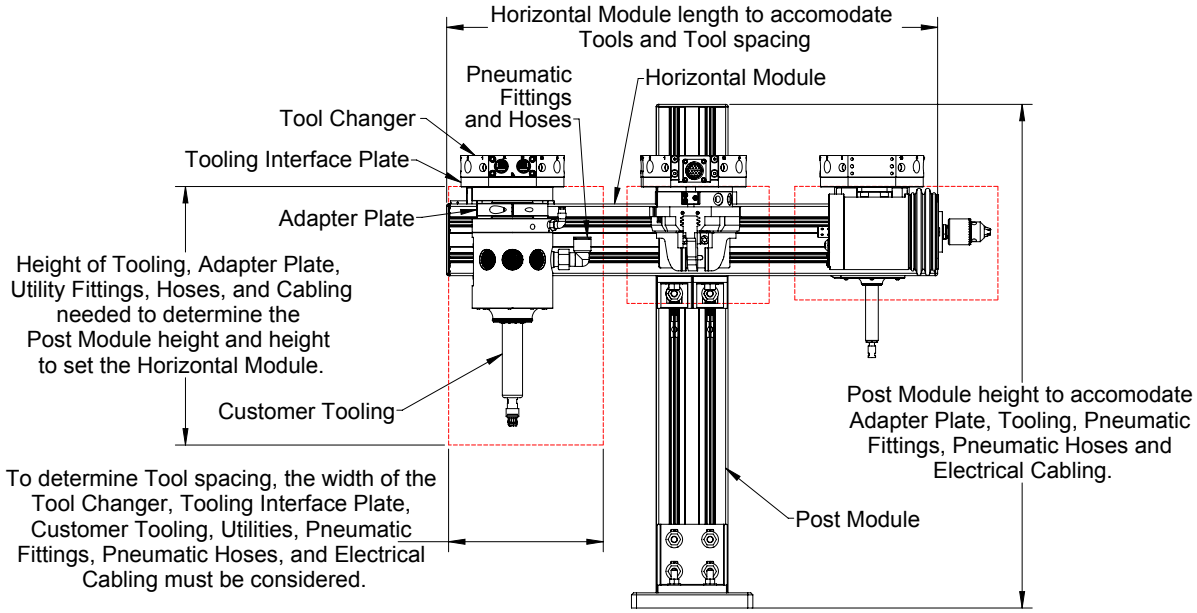
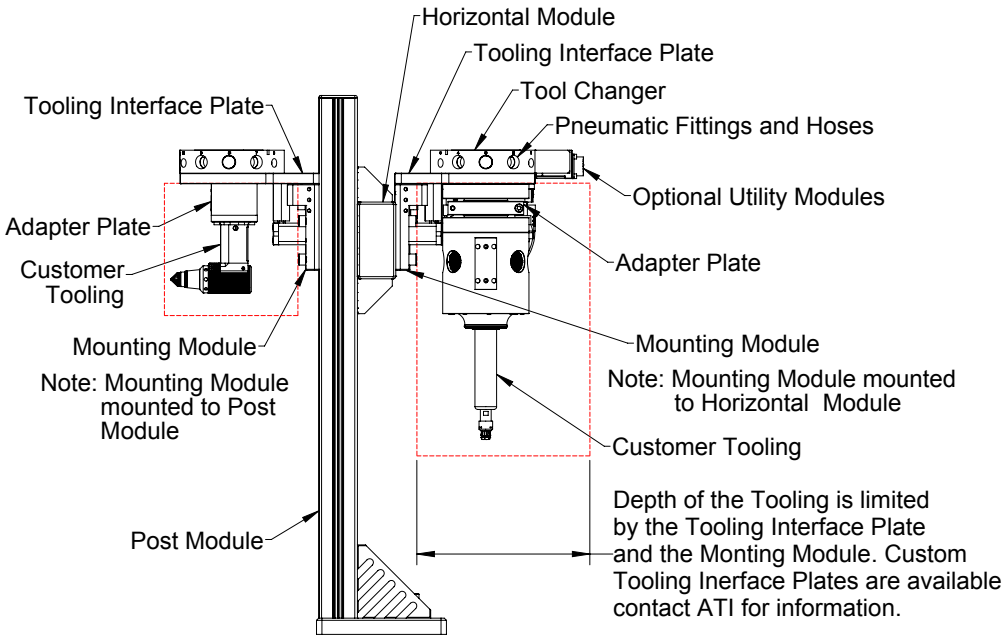


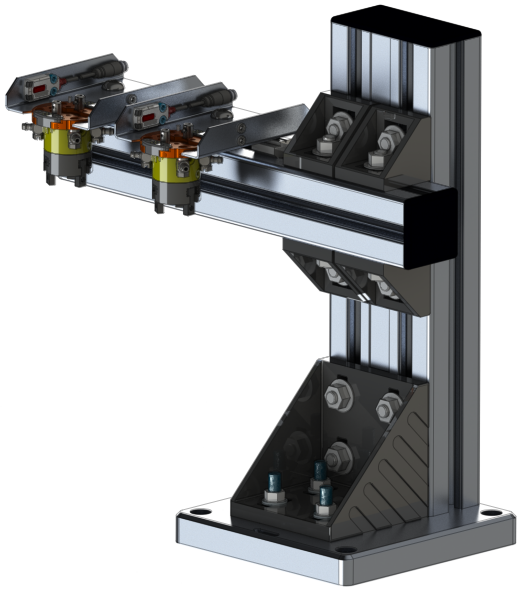
Figure 2.10—Tool Stand Configurations



2.7.1 Configuring a Tool Stand for a QC-001 Tool Changer

When configuring a Tool Stand for the QC-001 model Tool Changer, consider the quantity and size of the tools required. This information determines the number of mounting modules and the length of the horizontal module. If sensors are required, a photoelectric sensor kit must be added for each tool. Refer to *Section 9.6.1—TSS Tool Stand for QC-001* for detailed information.

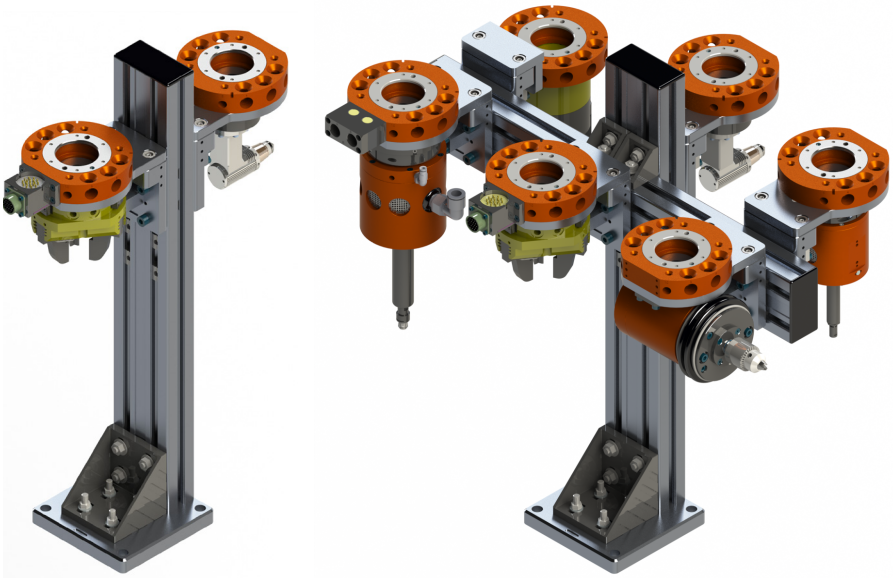
Figure 2.11—QC-001 Tool Stand Configuration



2.7.2 Configuring a Pin and Bushing Tool Stand

Pin and Bushing Tool Stands support multiple tool positioning, sensing, and clamping options for Tool Changer models QC-5 through QC-41. The mounting module can mount to the post module for up to (2) tool positions, or mount to an optional horizontal module to accommodate multiple tool positions. Horizontal or vertical tooling interface plates can be used to secure the Tool Changer and tooling to the stand. Refer to *Section 9.1—TSS Pin and Bushing Tool Stands* for detailed information.

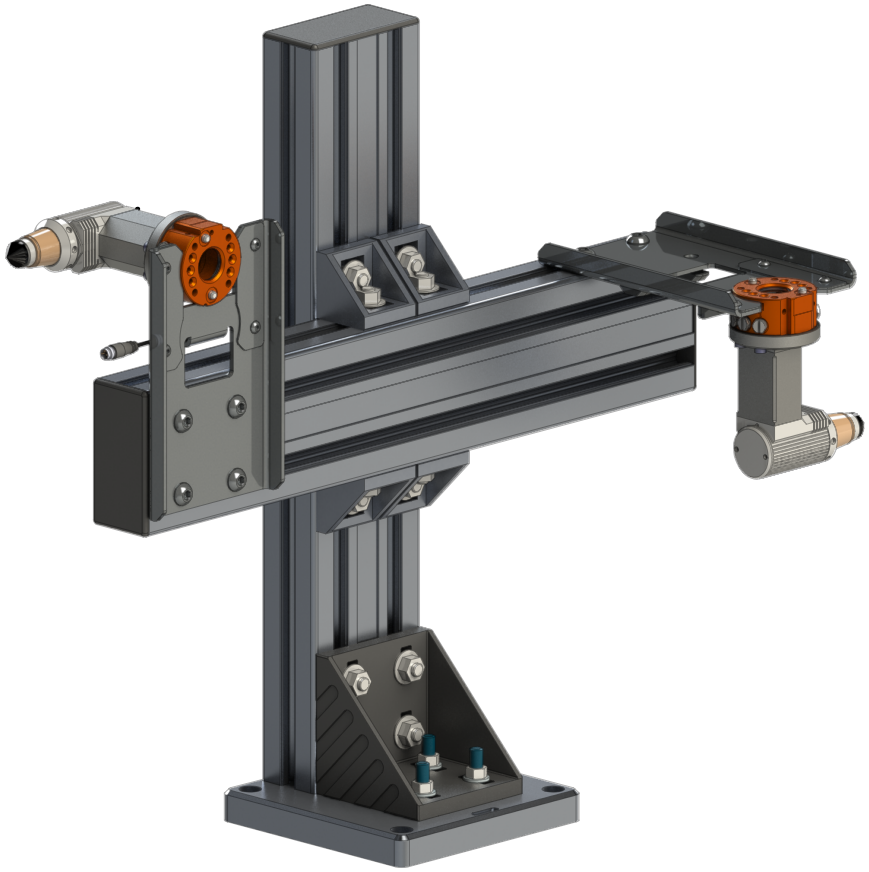
Figure 2.12—Pin and Bushing Tool Stand Configurations



2.7.3 Configuring TSS Tool Stands with Slotted Mounting Modules

When configuring a Tool Stand with slotted mounting modules, consider the quantity and size of the tools required. This information determines the amount of mounting modules required and the required length of the horizontal module. Slotted mounting modules can mount either horizontally or vertically. If required, sensors can be added for each tool. For detailed information, refer to *Section 9.6—TSS Slotted Mounting Modules.*

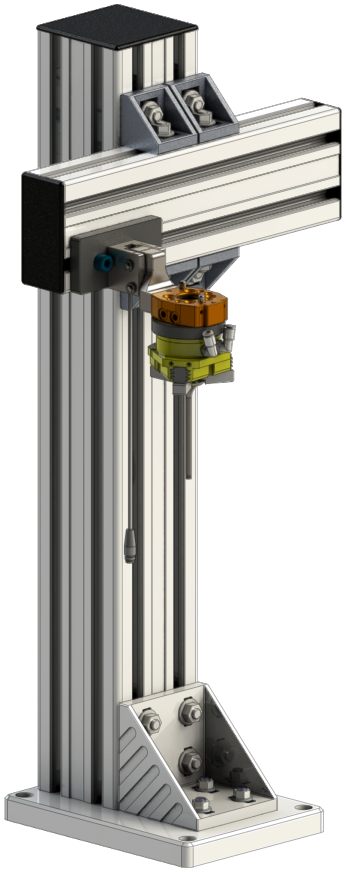
Figure 2.13—TSS Tool Stand with Slotted Mounting Module Configuration



2.7.4 Configuring QC-7 TSS Tool Stands with Hook and Hanger Modules

When configuring a Tool Stand with hook and hanger mounting modules, consider the quantity and size of the tools required. This information determines the amount of mounting modules required and the required length of the horizontal module. Hook and hanger modules can mount horizontally. If required, sensors can be added for each tool. For detailed information, refer to *Section 9.7—TSS Hook and Hanger Mounting Modules*.

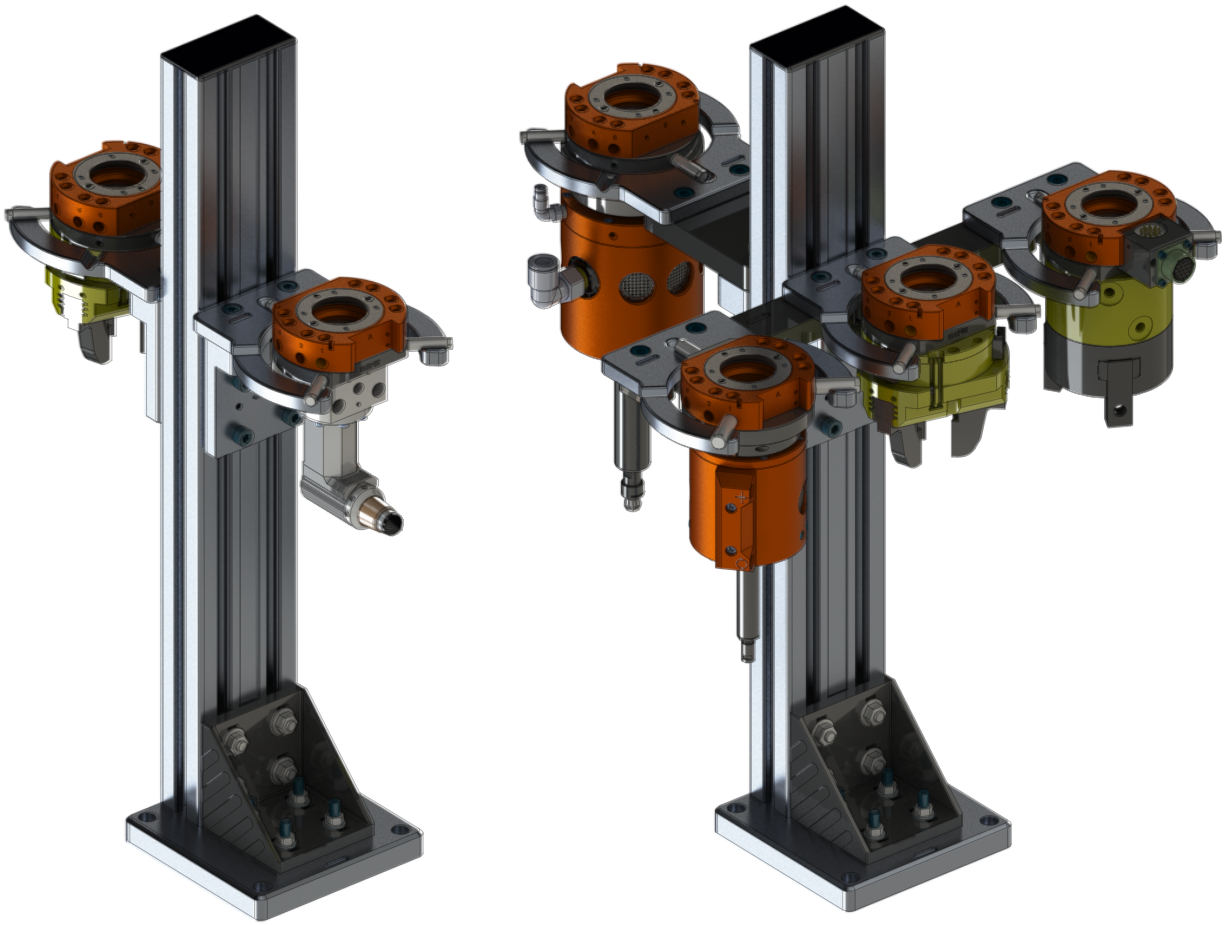
Figure 2.14—QC-7 TSS with Hook and Hanger Module Configuration



2.7.5 Configuring a Pin and Rack Tool Stand

The pin and rack tool stands support up to (6) fixed tool positions for Tool Changer models QC-5, QC-10 through QC-41. The mounting block is mounted to the post module for up to (2) tool positions, or an adapter bar can be used to accommodate up to (5) fixed tool positions. The Tool Changer can be supported in the rack module with or without an interface plate. Rack assemblies can support the Tool Changer and customer tooling in the rack. An optional proximity sensor holders and proximity sensors can be added if tool presence sensing is required. A forward adapter can provide additional tool spacing from the rack. For detailed information, refer to *Section 9.4—TSS Pin and Rack Tool Stands*.

Figure 2.15—Pin and Rack Tool Stand Configurations



3. Installation

The Tool Stand is shipped unassembled. The customer must perform the final assembly and determine the proper location for the Tool Stand.

CAUTION: Improper cable routing can result in wires and cables being pinched in the joint between the Tool Changer plates and premature failure of the electrical connectors. Properly route and secure all cables, particularly on the Master side.

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 Assembling the Post Module

Tools required: *6 mm and 10 mm hex key, 13 mm socket wrench, torque wrench, flat head screwdriver*

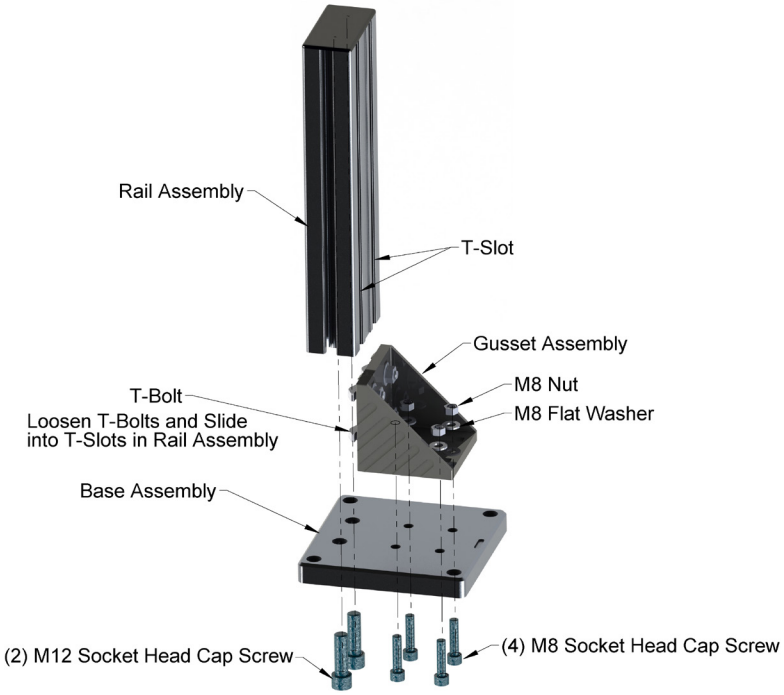
The post module can be ordered assembled or unassembled. Use the following steps to assemble and mount the post module.

1. Determine the proper location and configuration of your Tool Stand. Assemble the base, rail and gusset assemblies prior to anchoring the TSS base.
2. Assemble the gusset to the rail by inserting the T-bolts into the T-Slots in the rail and turning the T-bolts 90°. Note: Tabs must be removed from the gusset assembly to allow flush contact to base assembly. For more information, see *Section 9.5—Post Modules*.

NOTICE: 45x90 Rails require (2) M12 socket head screws to fasten to the base. 90x90 Rails require (4) M12 socket head cap screws to fasten to the base.

3. Assemble the rail to the base using a 10 mm hex key and (2) or (4) M12 socket head cap screws. for specific details on torque and thread locking requirements, refer to *Section 9.5—Post Modules*.
4. Insert the (4) M8 socket head cap screw through the base and gusset. Secure using the M8 flat washer and nut. Tighten the nut on the T-bolts holding the gusset to the rail. For specific details on torque and thread locking requirements, refer to *Section 9.5—Post Modules*.

Figure 3.1—Installing Base, Rail, and Gusset Assemblies



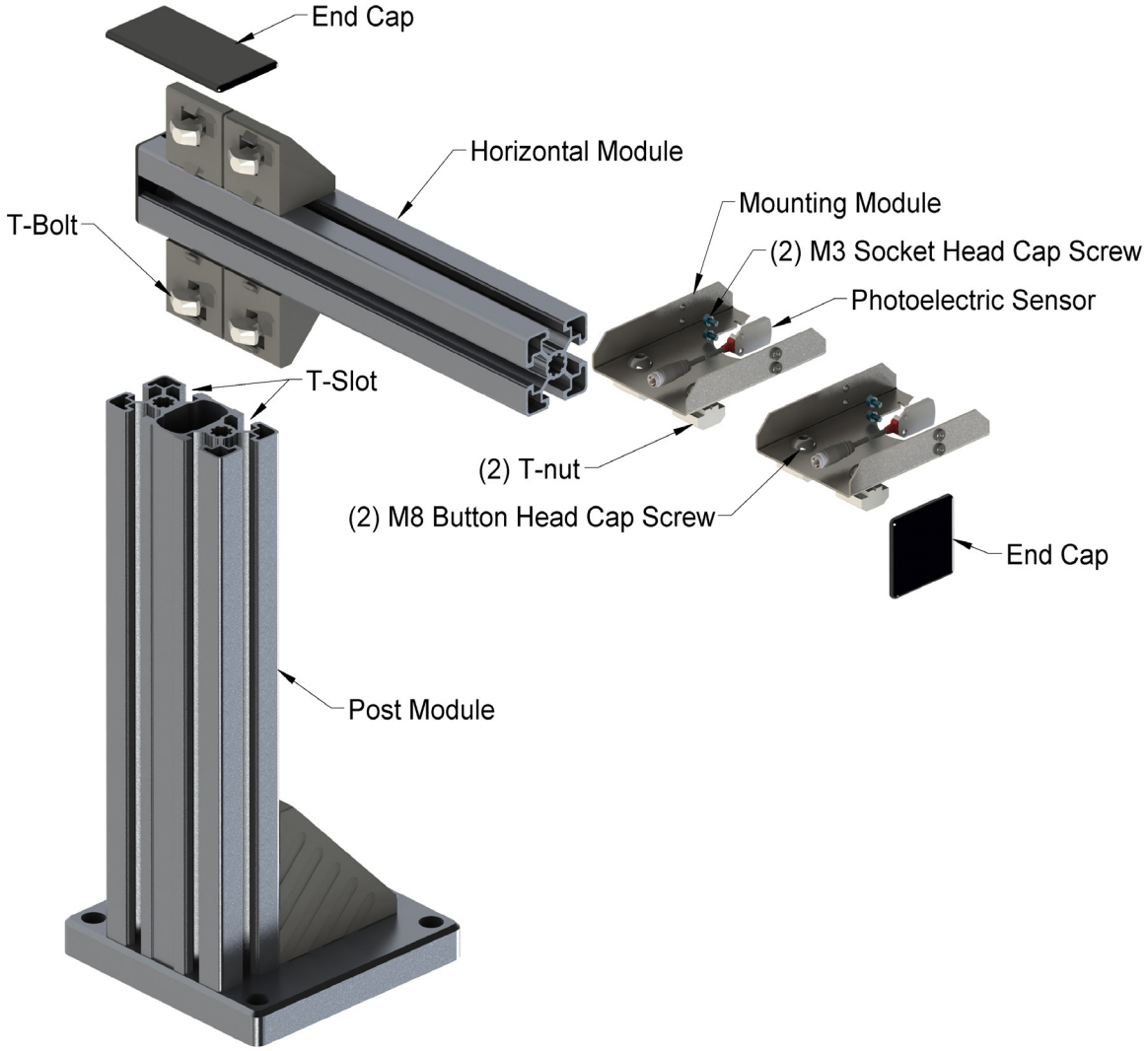
5. Anchor the base assembly to a smooth flat surface using the (4) 13 mm through-holes provided (hardware not included).
6. To continue the installation, refer to the following sections:
   Section 3.2—Installing TSS Tool Stands for QC-001
   Section 3.3—Installing TSS Pin and Bushing Tool Stands
   Section 3.4—Installing TSS Tool Stands with Slotted Mounting Modules
   Section 3.5—Installing Hook and Hanger Modules
   Section 3.6—Installing TSS Pin and Rack Tool Stands

3.2 Installing TSS Tool Stands for QC-001

Tools required: *2.5 mm and 5 mm hex key, torque wrench*

1. Refer to the drawing for the model being assembled in *Section 9.6.1—TSS Tool Stand for QC-001.* The drawings will provide torque, thread locking, and other specific requirements.
2. Assemble the horizontal module to the post module by inserting the T-bolts into the T-slot in the post module. Turn the T-bolts 90°.
3. Adjust the height of the horizontal module to accommodate the tooling for the application and tighten the nuts on the T-bolts to secure the vertical position of the rail.
4. Remove the horizontal module end cap and assemble the mounting module to the horizontal module by sliding the T-nuts into the horizontal module.
5. Install additional mounting modules if needed.
6. Position the horizontal module and the mounting modules to accommodate the tool spacing desired and tighten the T-bolts for the horizontal position of the rail. Using a 5 mm hex key, tighten the M8 button head cap screws to secure the mounting modules.
7. Replace the end cap on the horizontal module.
8. If equipped, install the optional photoelectric sensor to the mounting module. Refer to *Section 3.2.1—Installing Proximity Sensors for QC-001*.

Figure 3.2—Installing TSS Tool Stand for QC-001



3.2.1 Installing Proximity Sensors for QC-001

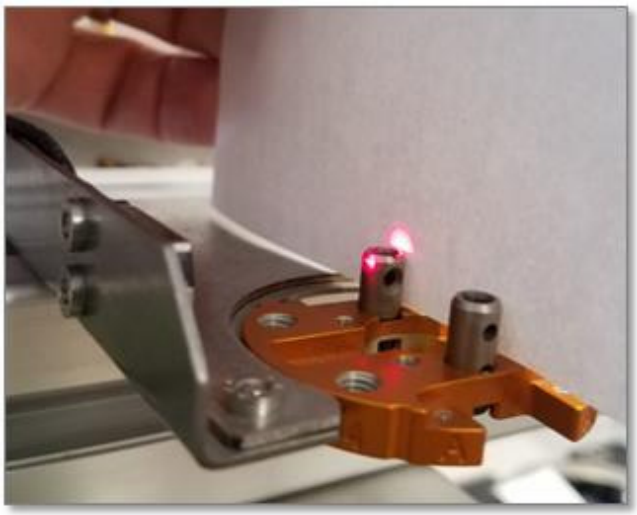
Tools required: *2.5 mm hex key*

Supplies required: *Loctite 222*

1. Apply Loctite 222 or similar to the M3 socket head cap screw used to mount the proximity sensor.
2. Attach the sensor cable to the proximity sensor.
3. Using a 2.5 mm hex key, tighten the (2) M3 socket head cap screws so that the sensor is loosely secured to the QC-001.
4. Using a sheet of paper as a guide, position the sensor so that the laser hits the post of the Tool Changer, as shown in *Figure 3.3*.
5. Tighten the M3 socket head cap screws until contact. Tighten ¼ turn.

CAUTION: Do not over tighten M3 screws. Over tightening the screws can damage the sensor. Tighten the screw until contact. Then tighten ¼ turn.

Figure 3.3—Adjusting QC-001 Proximity Sensors



3.3 Installing TSS Pin and Bushing Tool Stands

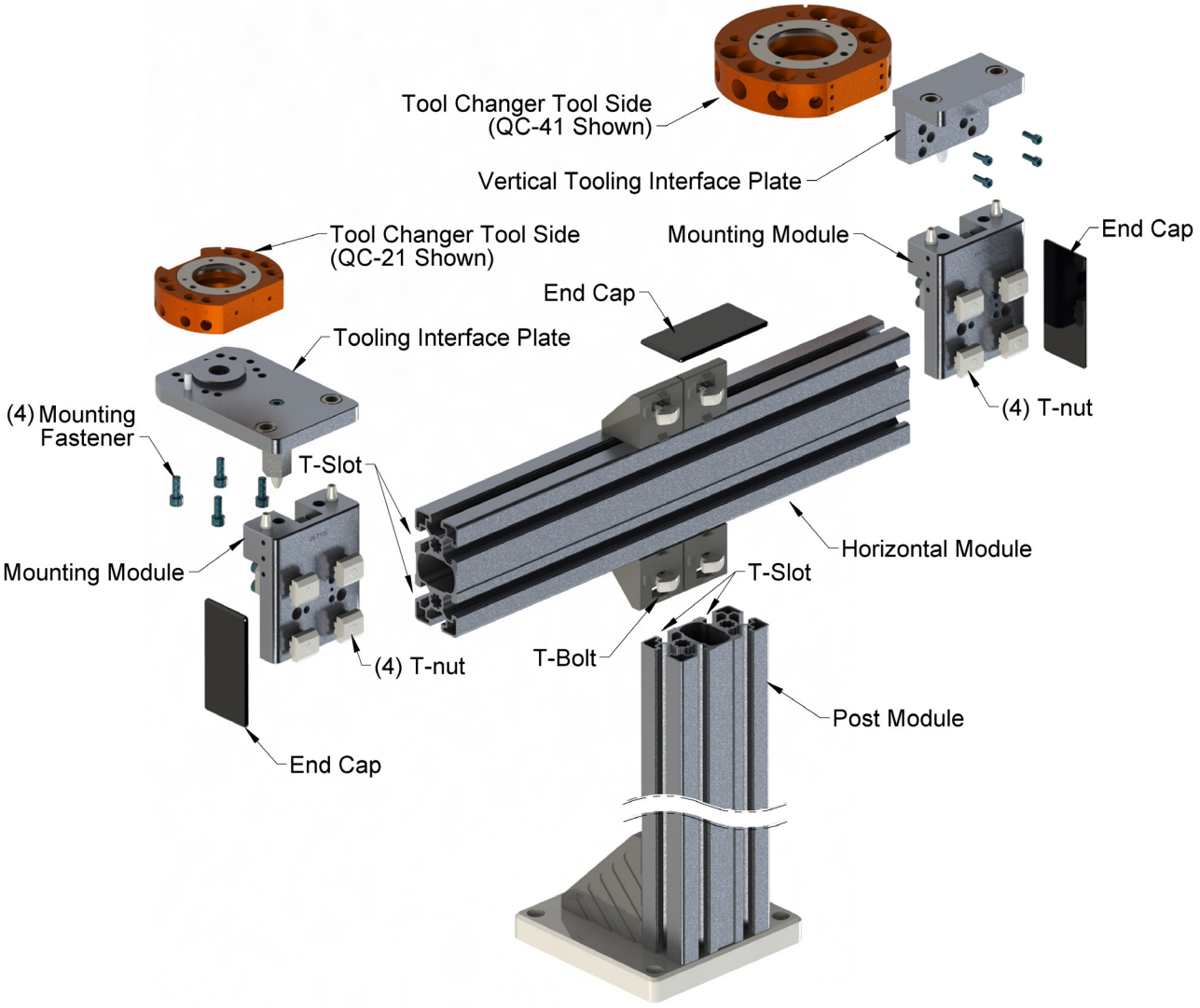
Refer to *Figure 3.4*.

Tools required: *6 mm hex key, 2.5 mm hex key for the Tool Stand Hanger Module, torque wrench*

1. Refer to drawing for the model being assembled in *Section 9.1—TSS Pin and Bushing Tool Stands*. The drawings provide torque, thread locking, and other specific requirements.
2. Assemble the horizontal module to the post module by inserting the T-bolts into the T-slot in the post module. Turn the T-bolts 90°.
3. Adjust the height of the horizontal module to accommodate the tooling for the application and tighten the nuts on the T-bolts to secure the vertical position of the rail.
4. Remove the horizontal module end cap and assemble the mounting module or single pin mounting module to the horizontal module by sliding the T-nuts into the horizontal module.
5. Install additional mounting modules or single pin mounting modules if needed.

6. Position the horizontal module and the mounting modules to accommodate the tool spacing desired and tighten the T-bolts for the horizontal position of the rail. Tighten the M8 socket head cap screws to secure the mounting modules using a 6 mm hex key.
7. Replace the end cap on the horizontal module.

Figure 3.4—Installing TSS Pin and Bushing Tool Stand



8. If equipped, install the optional proximity sensor.
   - For a mounting module, refer to *Section 3.3.1—Installing a Proximity Sensor on Mounting Modules.*
9. If equipped, install the optional clamp assembly to the mounting module, Refer to *Section 3.3.2—Installing Clamp Modules*.

NOTICE: If the tooling interface plate is a blank tool plate, it must be machined with a mounting pattern that matches customer tooling. Refer to the manual for the specific Tool Changer model (*http://www.ati-ia.com/products/toolchanger/tool_changer_models.aspx*).

10. Assemble the customer tooling and Tool Changer to the tooling interface plate.
11. Place on the mounting module.

3.3.1 Installing a Proximity Sensor on Mounting Modules

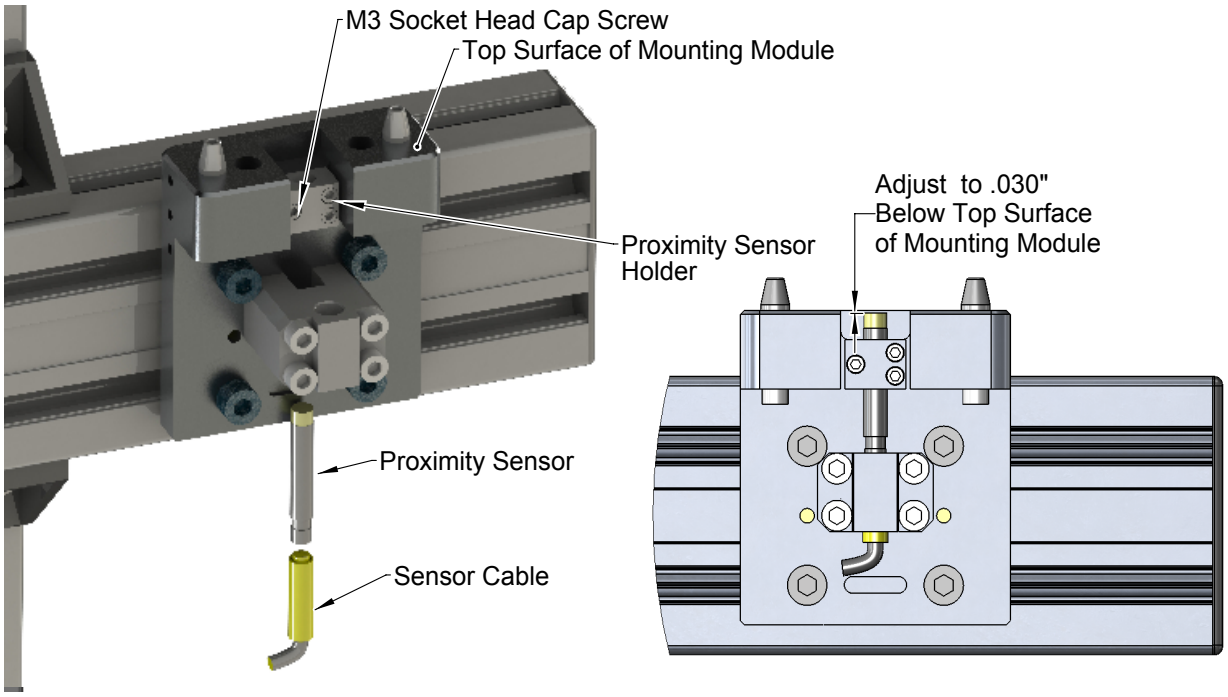
Tools required: *2.5 mm hex key*

Supplies required: *Loctite 222*

1. Apply Loctite 222 or similar to the M3 socket head cap screw used to mount the proximity sensor.
2. Attach the sensor cable to the proximity sensor and slide the proximity sensor into the holder as shown in *Figure 3.5*.
3. Tighten the M3 socket head cap screw using a 2.5 mm hex key until the mount loosely secures the sensor (Sensor should freely move up and down in the holder).
4. Position the sensor so the sensor face is 0.030” below the top surface of the mounting module as shown in *Figure 3.5*.
5. Tighten the M3 socket head cap screw until contact. Then tighten ¼ turn.

> **CAUTION:** Do not over tighten M3 screw. Over tightening the screw can damage the sensor. Tighten the screw until contact. Then tighten ¼ turn.

Figure 3.5—Proximity Sensor Position



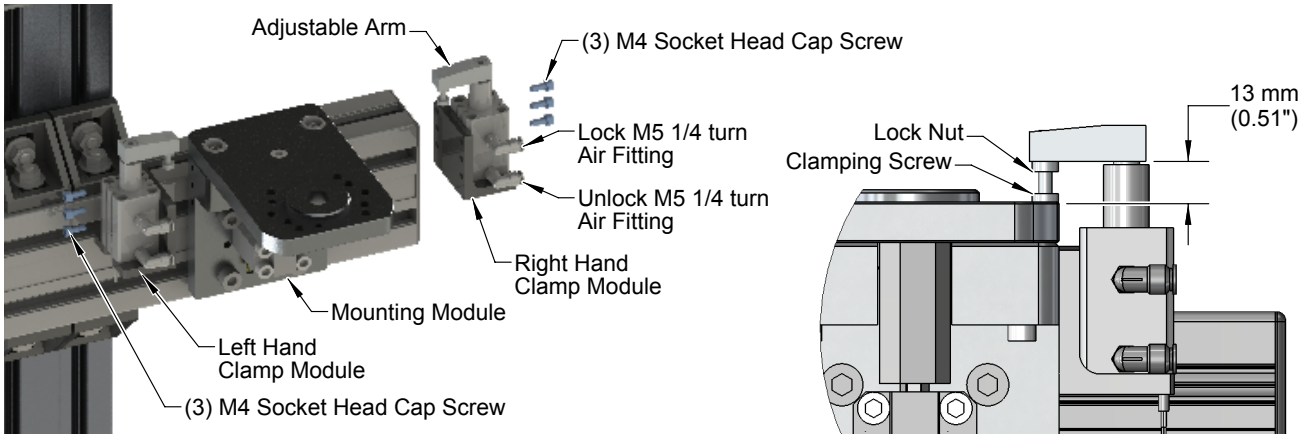
3.3.2 Installing Clamp Modules

Tools required: *3 mm hex key, small flat screwdriver, torque wrench*

The clamp module is shipped unattached. Some adjustment may be necessary depending on the application. If needed, the clamp module can be mounted on the opposite side to orient the cylinder air supply ports on the inside of the tool stand, the adjustable arm will need to be rotated 180°.

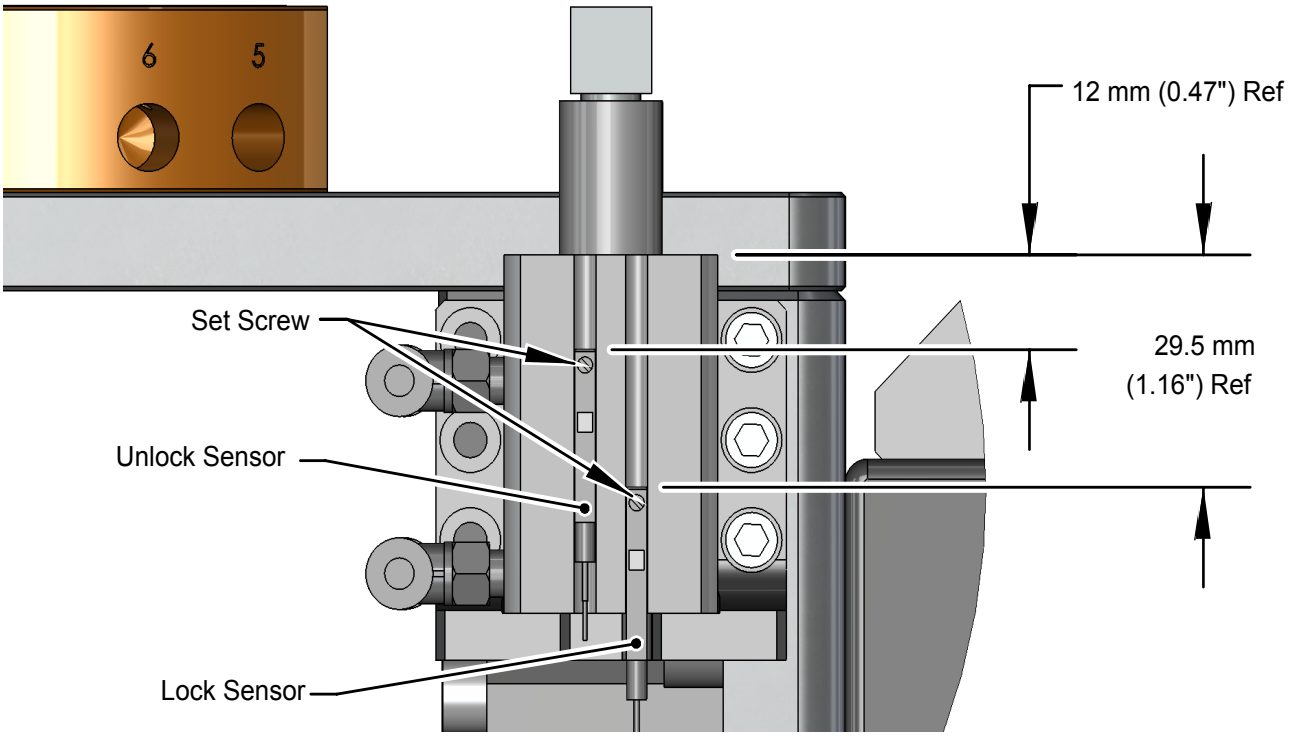
1. Refer to the drawing in *Section 9.3.1—TSS Clamp Module, Right Hand* or *Section 9.3.2—TSS Clamp Module, Left Hand* for details on torque, thread locking, and other specific requirements.
2. If needed adjust the clamping screw. With the rotary actuator in the locked position, loosen the lock nut. Adjust the clamping screw until it extends 13 mm (0.51”) from the adjustable arm. Tighten the lock nut. Refer to the drawing for details.
3. Assemble the clamp module to the mounting module, using the (3) M4 socket head cap screws provided and a 3 mm hex key. Tighten to 25 in-lbs (2.82 Nm).
4. Attach the lock and unlock air supply to the M5 (¼ turn) air connections. Note: It is recommended to appropriately exhaust the cylinder air in order to allow the cylinder piston to spring back.

Figure 3.6—Install Clamp Module



5. Install the actuator sensors, if not already installed. Slide the sensor into the track as shown. Refer to the drawing in *Section 9.3.1—TSS Clamp Module, Right Hand* or *Section 9.3.2—TSS Clamp Module, Left Hand* for details on torque, thread locking, and other specific requirements.
   a. Position the sensors to the reference dimension shown in *Figure 3.7.*
   b. Secure the sensor in the track by tightening the set screw with a small flat head screw driver (jewelers small). Tighten to 1.0 in-lbs (0.11 Nm). Do not over-tighten.
   c. Label the ends of the sensor cables as shown on the drawing. Route and connect the sensor cables.
   d. Cycle the cylinder both extending and retracting a number of times to confirm the correct operation and sensor placement. Adjust the sensor position as desired.

Figure 3.7—Clamp Module Sensor Installation



3.4 Installing TSS Tool Stands with Slotted Mounting Modules

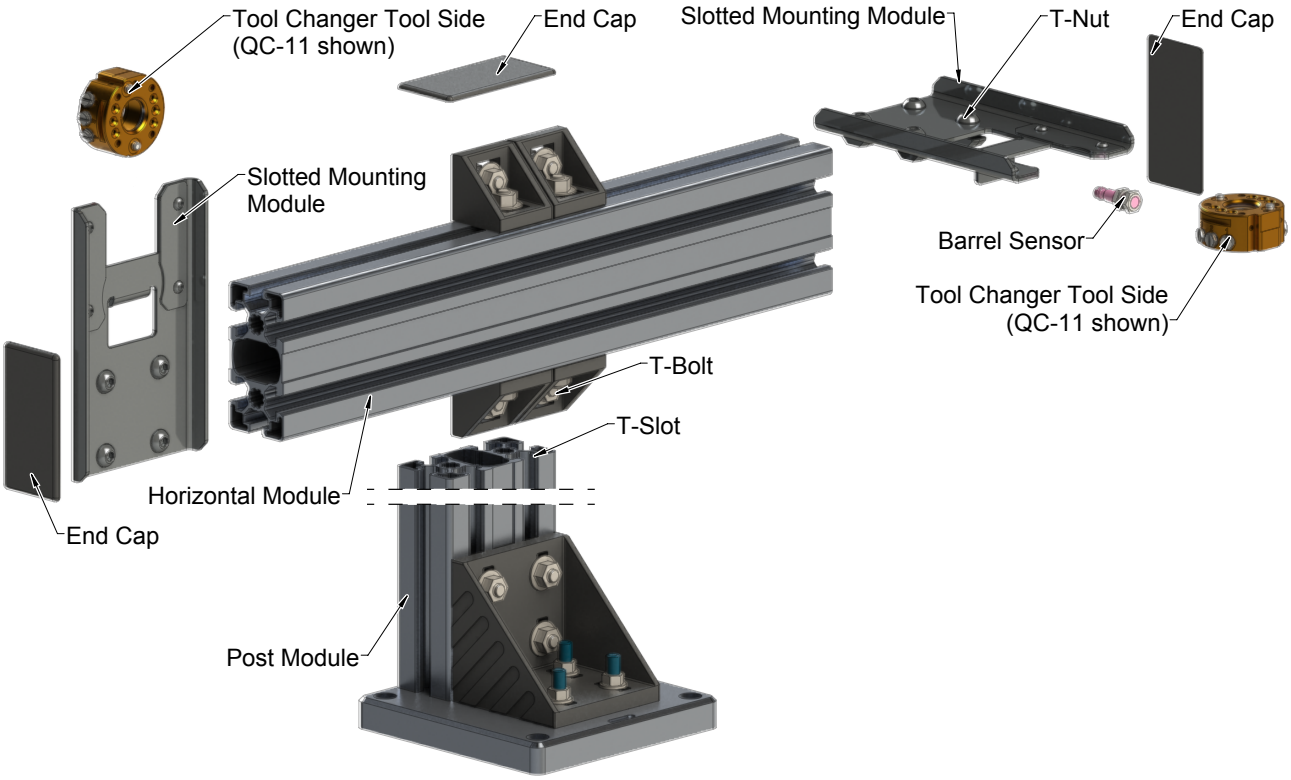
Tools required: *3 mm and 5 mm hex key, torque wrench*

Refer to the drawing for the model being assembled in *Section 9.6—TSS Slotted Mounting Modules.* The drawings provide torque, thread locking, and other specific requirements.

1. Assemble the horizontal module to the post module by inserting the T-bolts into the T-slot in the post module. Turn the T-bolts 90°.
2. Adjust the height of the horizontal module to accommodate the tooling for the application and tighten the nuts on the T-bolts to secure the vertical position of the rail.
3. Remove the horizontal module end cap.
4. Orient the slotted mounting module either horizontally or vertically. If using the horizontal configuration, use (2) M8 button head cap screws and T-nuts. If using the vertical configuration, use either (4) or (2) M8 button head cap screws and T-nuts, depending on the required sensor configuration. For example, if installing a barrel sensor in the vertical orientation, use (2) M8 button head cap screws and T-nuts in order to provide adequate clearance for the sensor. See *Figure 3.8*.
5. Adjust the TSS holding plate kit according to the orientation. See the drawing in *Section 9.6—TSS Slotted Mounting Modules*.
6. Assemble the slotted mounting module to the horizontal module by sliding the T-nuts into the horizontal module.
7. Install additional mounting modules if needed.
8. Adjust the slotted mounting module to the desired position and tighten the M8 button head cap screws using a 5 mm hex key.
9. Replace the end caps on the post module and horizontal module.

10. If equipped, install optional proximity sensors to the slotted mounting module.
    - For barrel sensors (QC-11), refer to *Section 3.4.1—Installing Barrel Sensors on TSS Tool Stands with Slotted Mounting Modules.*
    - For photoelectric sensors (QC-7), refer to *Section 3.4.2—Installing Proximity Sensors for QC-7 Slotted Mounting Module*.
11. Assemble the customer tooling and Tool Changer to the tooling interface plate.
12. Place the Tool Changer Tool side on the slotted mounting module.

Figure 3.8—Installing TSS Tool Stands with Slotted Mounting Modules (QC-11 Shown)



NOTICE: When working with air fittings, position fittings to avoid contact with the slotted mounting module or the Tool Stand. Refer to *Figure 3.9*.

Figure 3.9—Tool Changer with Air Fittings routed (QC-11 Shown)

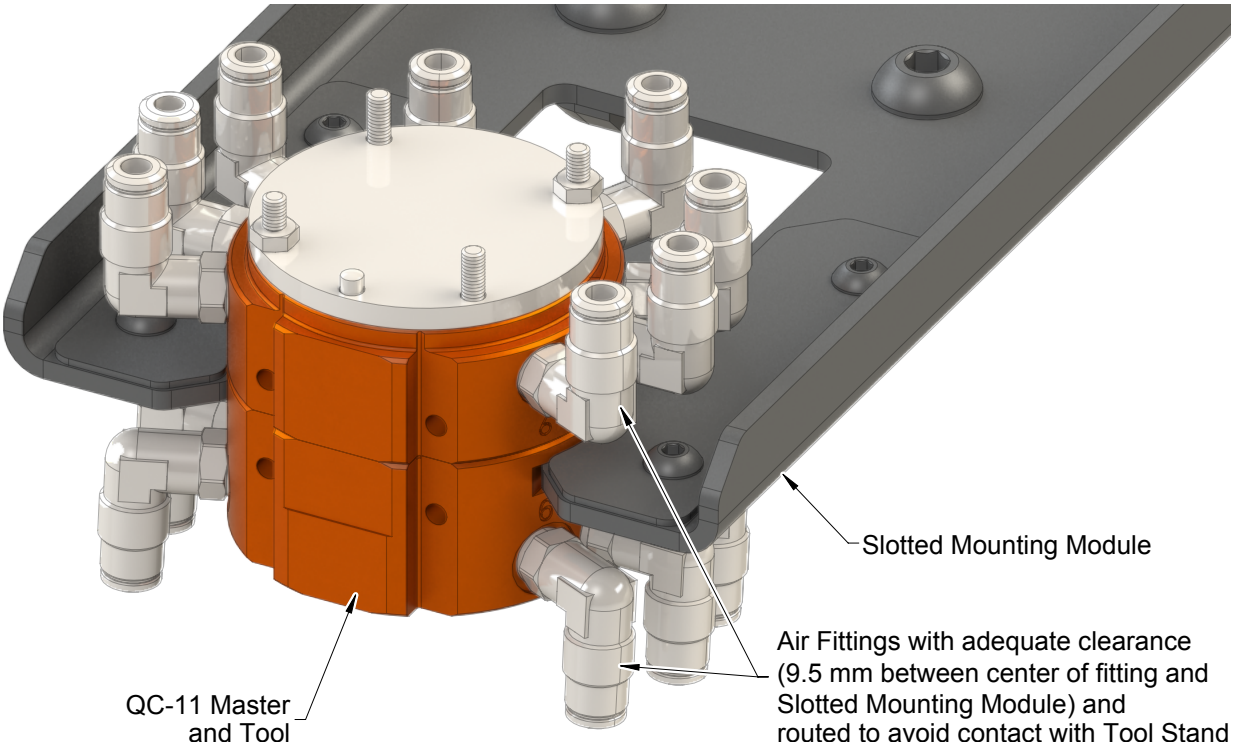
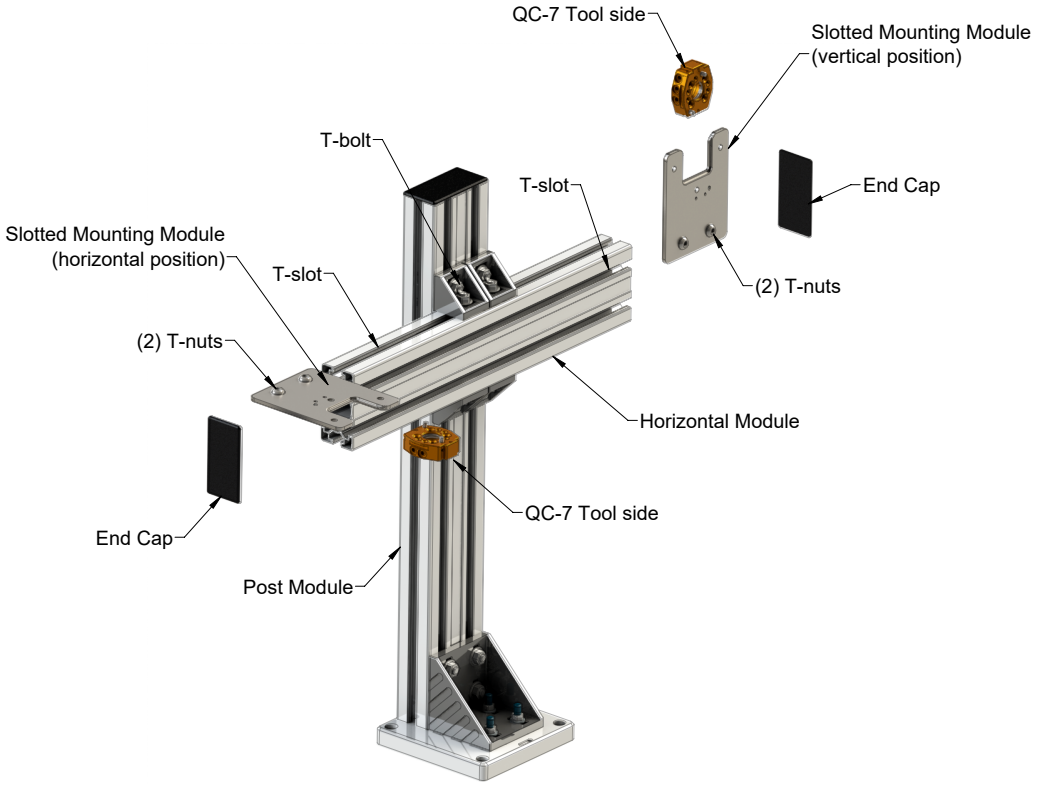
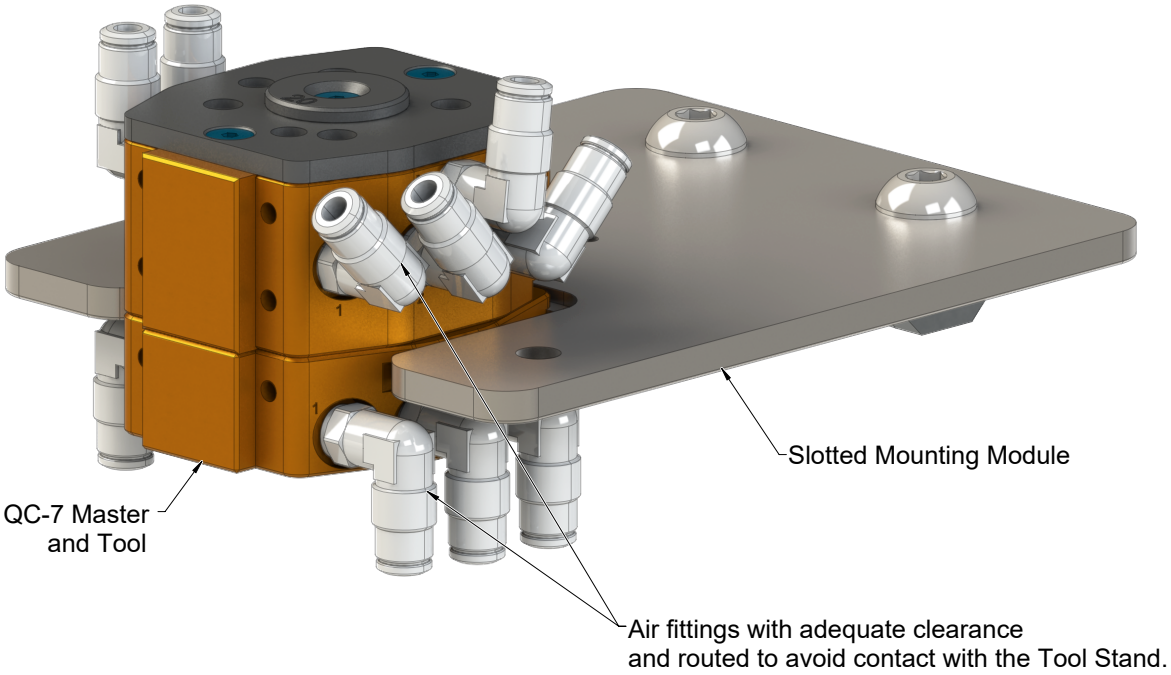


Figure 3.10—Installing TSS Tool Stands with QC-7 Slotted Mounting Modules



NOTICE: When working with air fittings, position fittings to avoid contact with the slotted mounting module or the Tool Stand (refer to *Figure 3.9*).

Figure 3.11—QC-7 Tool Changer with Air Fittings routed



3.4.1 Installing Barrel Sensors on TSS Tool Stands with Slotted Mounting Modules

Tools required: *(2) 24 mm wrench*

Slotted mounting modules have sensor mounts that can accommodate most 8 mm barrel sensors. To install barrel sensors to slotted mounting modules, complete the following steps.

1. Mount the slotted mounting module using (2) M8 button head cap screws and T-nuts. Refer to *Section 3.4—Installing TSS Tool Stands with Slotted Mounting Modules*.
2. Insert the barrel sensor into the sensor mount on the slotted mounting module, as shown in *Figure 3.12*.
3. Adjust the barrel sensor face 0.19” (4.5 mm) from the target, as shown in *Figure 3.13*.
4. Tighten the jam nuts finger tight and attach the sensor cable.
5. Cycle the Tool pick-up and drop off, and adjust the sensor position accordingly.
6. Tighten the jam nuts using 24 mm wrenches.

Figure 3.12—Installing Barrel Sensors to Slotted Mounting Modules

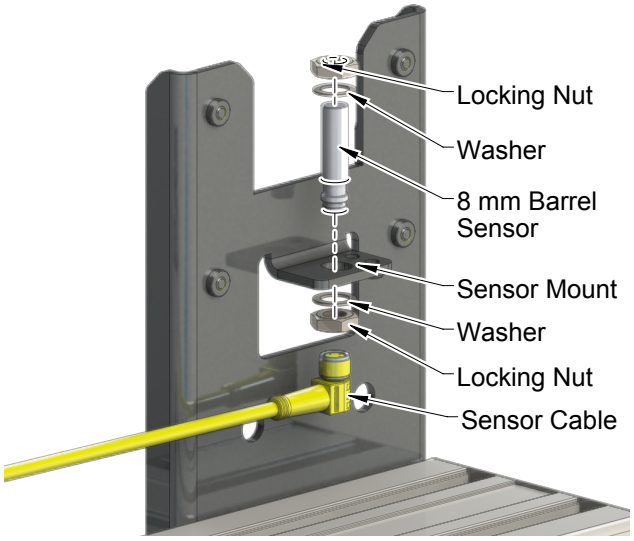
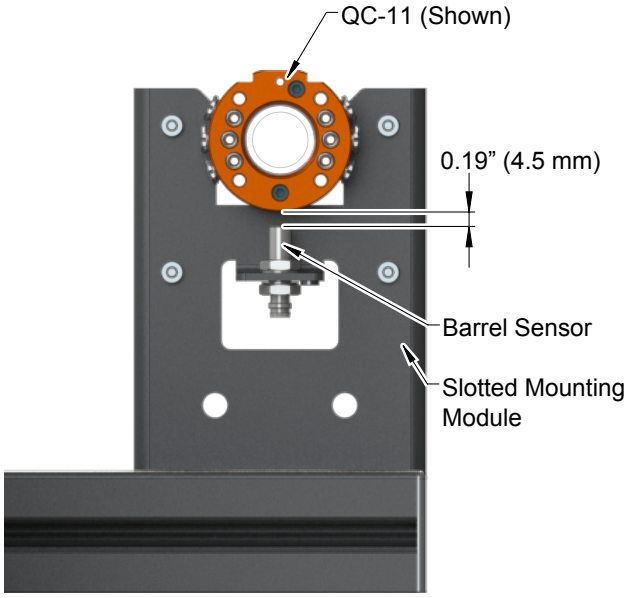


Figure 3.13—Adjusting Barrel Sensors



3.4.2 Installing Proximity Sensors for QC-7 Slotted Mounting Module

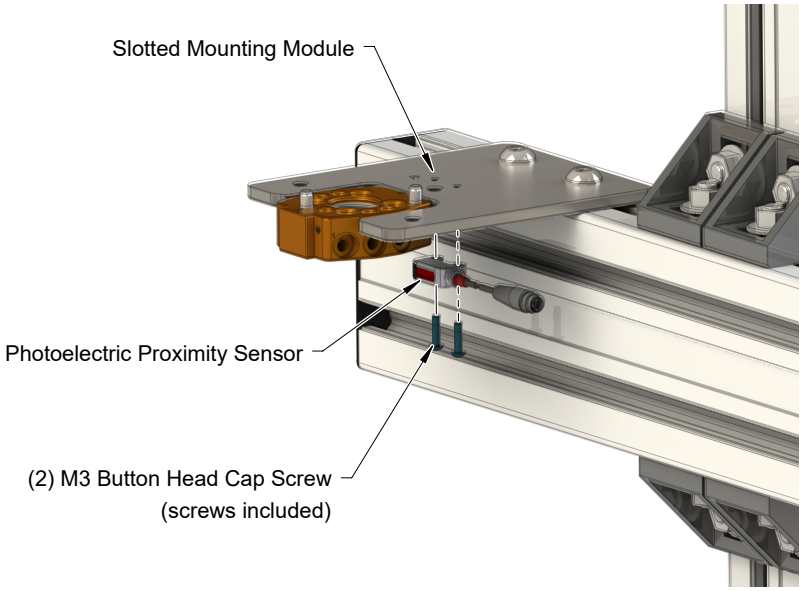
Parts required: *Refer to Section 2.2.5—Photoelectric Proximity Sensors.*

Tools required: *2 mm hex key, torque wrench*

NOTICE: The proximity sensor can only be installed as shown in *Figure 3.14*.

1. Position the sensor so that the holes in the sensor align with the holes in slotted mounting module.
2. Use a 2 mm hex key to install the (2) M3 button head cap screws into the sensor and slotted mounting module. Tighten to 0.68 Nm (6 in-lbs).
3. Connect the sensor connector to the appropriate connection on a control/signal module on the Tool.
4. Safely resume normal operation.

Figure 3.14—Installing Photoelectric Proximity Sensor for QC-7



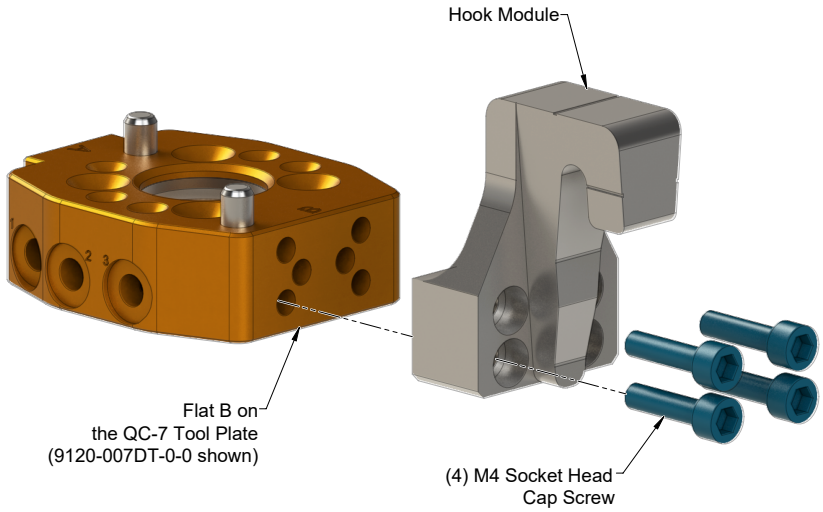
3.5 Installing Hook and Hanger Modules

Tools required: *3 mm and 6 mm hex key, torque wrench*

Refer to the drawing for the model being assembled in *Section 9.4—TSS Pin and Rack Tool Stands.* The drawings provide torque, thread locking, and other specific requirements.

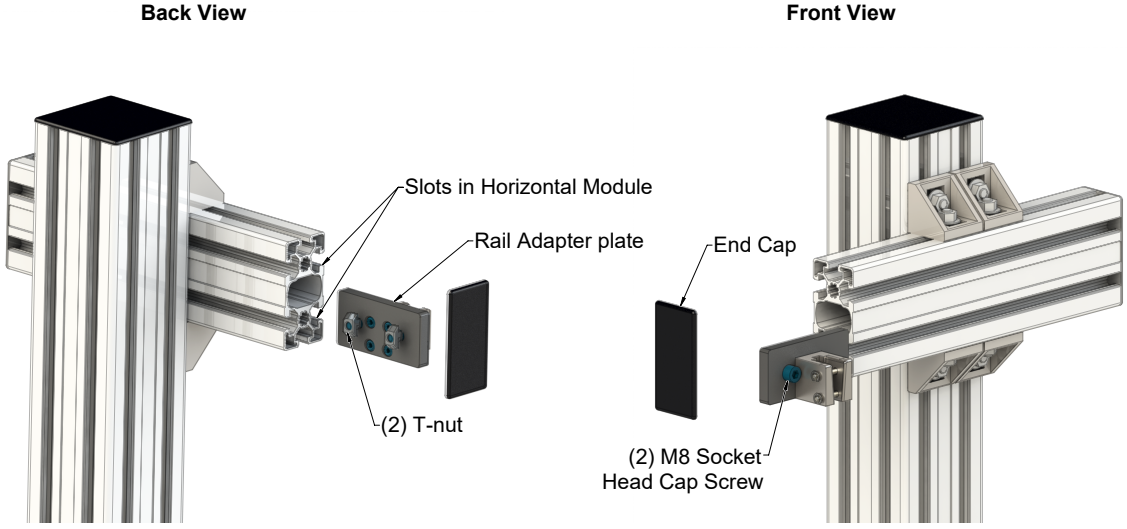
1. Install the tool hook module on Flat B of the QC-7 tool plate.
   a. Use a 3 mm hex key to install the (4) M4 socket head cap screws into the Tool hanger and QC-7 Tool plate.
   b. Tighten the fasteners to 5 Nm (44.25 in-lbs).

Figure 3.15—Install the Tool Hanger Module on the QC-7



2. Install the post hanger and rail adapter module on the horizontal module.
   a. Remove the end cap from one end of the horizontal module.
   b. Slide the T-nuts of the post hanger and rail adapter module through the slot in the horizontal module.
   c. Use a 6 mm hex key to tighten the M8 socket head cap screws to secure the rail adapter plate to the horizontal module.
   d. Tighten to 21.5 Nm (15.8 ft-lbs).

Figure 3.16—Install the Post Hanger and Rail Adapter Module



3.5.1 (Optional) Install the Post Hanger Module to a Flat Surface

The post hanger module can also be mounted on a flat surface, if a Tool Stand is not applicable to the application.

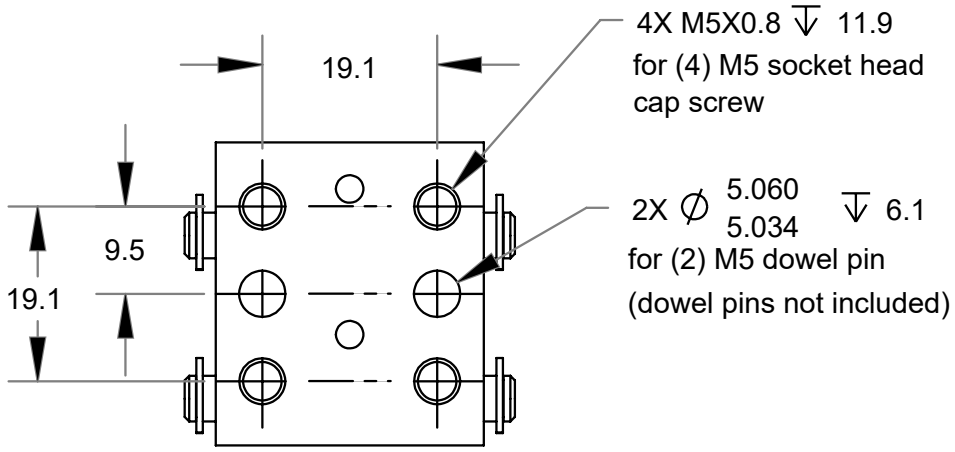
Parts required: *(2) M5 Dowel pins (refer to Figure 3.17)*

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

Supplies required: *Loctite 242*

1. Insert (2) M5 dowel pins in the back of the post hanger module.
2. Apply Loctite 242 to the threads of the M5 socket head cap screws.
3. Use a 4 mm hex key to install the (4) M5 socket head cap screws and secure the post hanger to the flat surface. Tighten to 6 Nm (53.1 in-lbs).

Figure 3.17—Post Hanger Mounting Pattern



3.5.2 Installing Proximity Sensors for QC-7 Hook and Hanger Module

Parts required: *Refer to Section 2.3.4—Proximity Sensors.*

Tools required: *2 mm hex key, torque wrench*

1. Position the sensor so that the sensor M3 hole algin with one of the M3 holes post hanger and rail adapter module.
2. Use a 2 mm hex key to install the M3 flat head cap screw into the sensor and post hanger module. Tighten to 0.68 Nm (6 in-lbs).
3. Connect the sensor connector to the appropriate connection on a control/signal module on the Tool.
4. Safely resume normal operation.

Figure 3.18—Installing Proximity Sensor for QC-7 Hook and Hanger Module

3.6 Installing TSS Pin and Rack Tool Stands

Tools required: *3 mm and 6 mm hex key, torque wrench*

Refer to the drawing for the model being assembled in *Section 9.4—TSS Pin and Rack Tool Stands.* The drawings provide torque, thread locking, and other specific requirements.

1. Remove the post module end cap and slide the T-nuts out of the T-Slots. Attach the T-nuts to the mounting block using the M8 socket head cap screws provided with a 6 mm hex key. Refer to *Figure 3.19*.
2. Assemble the mounting block to the rail by sliding the T-nuts into the T-Slots in the rail.
3. Adjust the height of the mounting block to accommodate the tooling for the application and tighten the M8 socket head cap screws using a 6 mm hex key.
4. Replace the end cap on the post module.
5. Attach the tool bar or forward adapter and the center rack module to the mounting block using the M8 socket head cap screws provided with the adapter bar and a 6 mm hex key.
6. If a tool bar is being used, attach the additional rack modules to the adapter bar using the M8 socket head cap screws provided with the rack modules and a 6 mm hex key.
7. Install the mounting to the Tool Changer:

- If an interface plate is being used, attach the interface plate to the Tool side of the Tool Changer and place in the rack.
- If no interface plate is being used, perform the following steps:

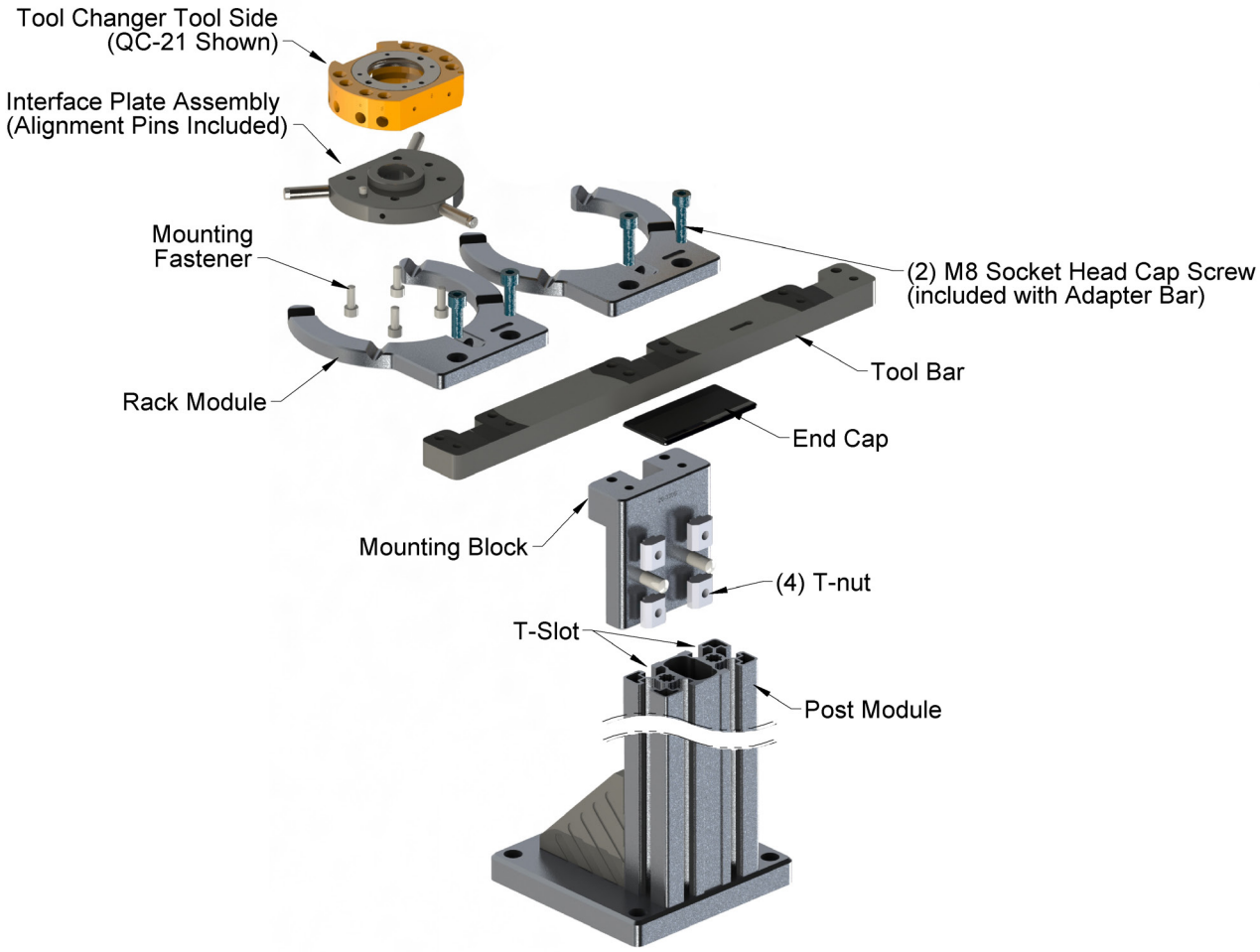
    a. Attach the alignment pin to the appropriate air ports on the tool side of the Tool Changer.

    b. If a pin block is required, attach the pin block to Flat B of the tool side of the Tool Changer using the M4 socket head cap screws provided and a 3 mm hex key.

    c. Attach the alignment pin to the pin block.

    d. Place the Tool Changer in the rack.

Figure 3.19—Installing TSS Pin and Rack Tool Stand



8. If equipped, install the optional sensor holder and proximity sensor; refer to *Section 3.6.1—Installing Proximity Sensors for TSS Pin and Rack Tool Stands.*

3.6.1 Installing Proximity Sensors for TSS Pin and Rack Tool Stands

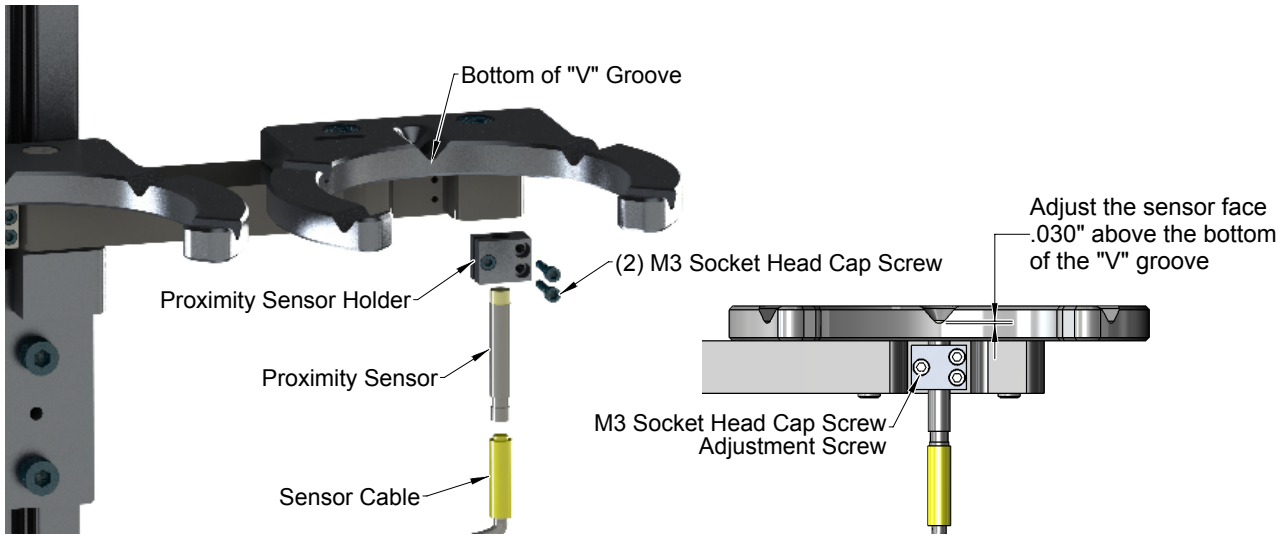
Tools required: *2.5 mm hex key*

Supplies required: *Loctite 222*

1. Apply Loctite 222 or similar to the (2) M3 socket head cap screws used to mount the proximity sensor holder.
2. Attach the proximity sensor holder to the adapter bar or forward adapter using the (2) M3 socket head cap screws and a 2.5 mm hex key. Tighten to 6 in-lbs (0.68 Nm).
3. Attach sensor cable to the proximity sensor and slide the proximity sensor into the holder as shown in *Figure 3.20*.
4. Gently tighten the M3 socket head cap screw (adjustment screw) until the sensor holder loosely secures the sensor (Sensor should still move up and down in holder).
5. Position the sensor so the sensor face is 0.030” above the bottom surface of the “V” groove as shown in *Figure 3.20*.
6. Tighten the M3 socket head cap screws (adjustment screw) (Contact plus ¼ turn).

CAUTION: Do not over tighten M3 screw. Over tightening the screw can damage the sensor. Tighten the screw until contact. Then tighten ¼ turn.

Figure 3.20—Proximity Sensor Position



4. Operation

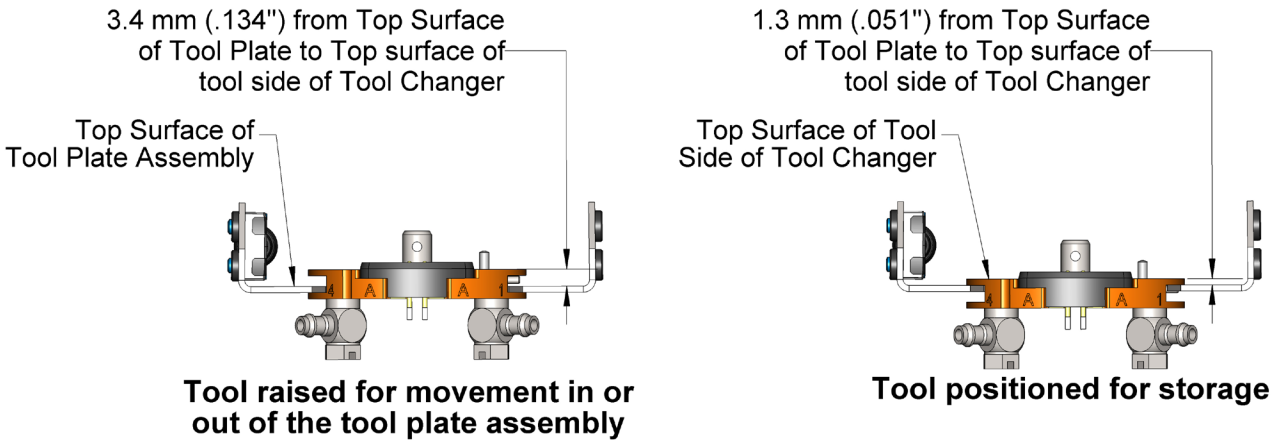
The ATI TSS Tool Stand is intended for use with No-touch locking Tool Changers only, such as ATI changers QC-001 through QC-41.

4.1 TSS Tool Stands for QC-001 Operation

CAUTION: Damage will occur if contact is made between the TSS Tool plate assembly and the Tool Changer prior to tool drop-off.

For proper tool drop-off, ATI recommends 3.4 mm (.134”) maximum distance from the top surface of the tool plate assembly and the top surface of the tool side of the Tool Changer. See *Figure 4.14* for reference.

Figure 4.1—TSS Tool Stand for QC-001 Maximum Clearance for Proper Tool Drop-off



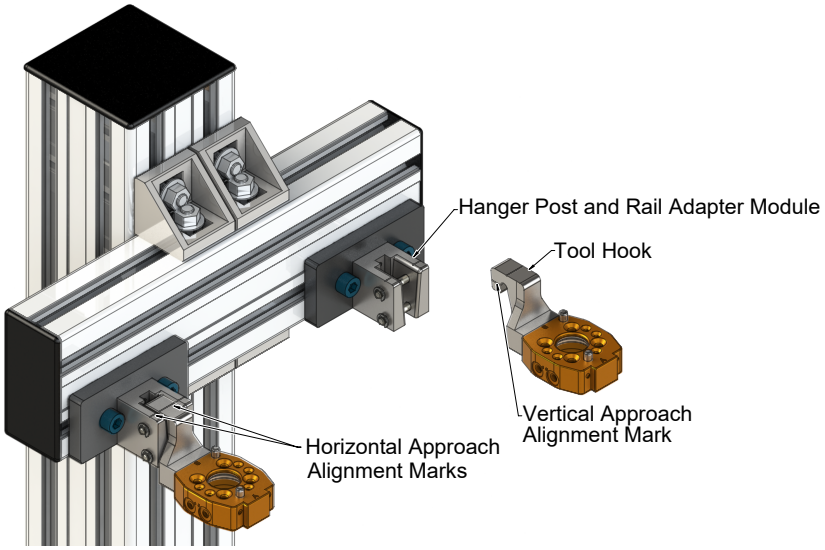
4.2 TSS Tool Stands for Hook and Hanger Modules (QC-7)

CAUTION: Damage will occur if cables and hoses are not properly secured and routed away from the tool hook module. Route lock/unlock cables, pneumatic hoses, and additional cables away from where the hook rests in the hanger post module so that cables and hoses do not become tangled in the Tool Stand.

4.2.1 Operation Sequence

As the tool hook module approaches the hanger post module, use the vertical and horizontal approach markings to correctly drop off the Tool plate assembly.

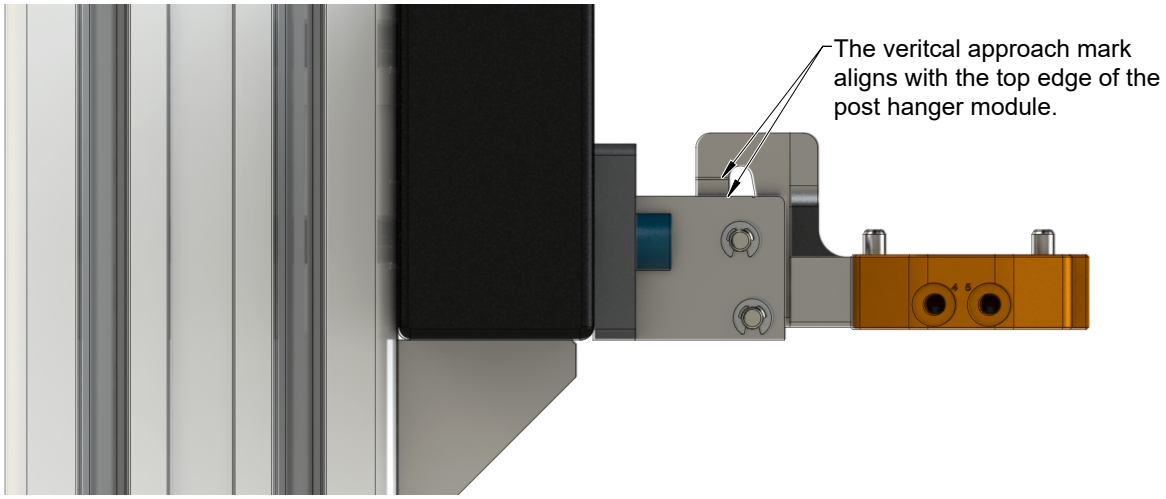
Figure 4.2—Approach Alignment Marks on the Tool Hook and Hanger Post



4.2.1.1 Tool Drop-Off

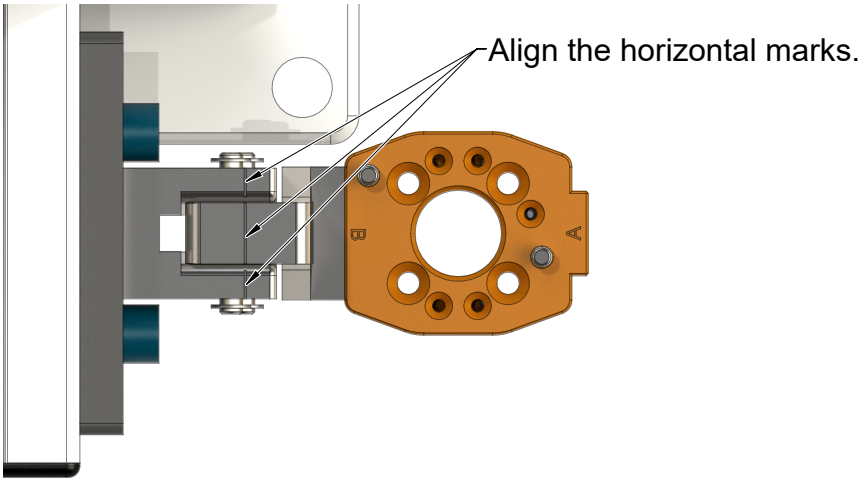
1. Move the Tool plate and Tool Hook downward until the vertical alignment mark is even with the edge of the post hanger module.

Figure 4.3—Align Vertical Approach Alignment Marks



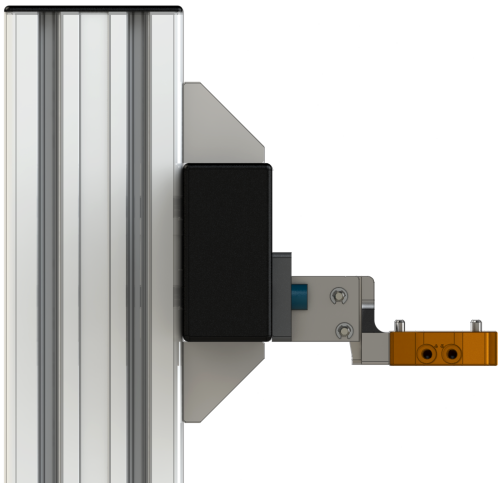
2. Move the robot so that the horizontal approach marks on the tool hook module align with the marks on the post hanger module.

Figure 4.4—Align Horizontal Approach Alignment Marks



3. Lower the tool hook module until the hook rests in the post hanger.

Figure 4.5—Tool Hook Placed in the Post Hanger



4.2.2 Payload

For a Tool Stand with a hook and hanger module configuration, both the safe zones for different payloads and the distance of their center of gravity from the hook and hanger modules are shown in *Figure 4.6* and *Figure 4.7*. If the center of gravity for the Tool plate, modules, and customer tooling is out side of the zone for the respective payload, then the user should contact ATI for assistance in configuring a Tool Stand.

Figure 4.6—Maximum Allowable Offset for QC-7 Hook and Hanger (Imperial Units)

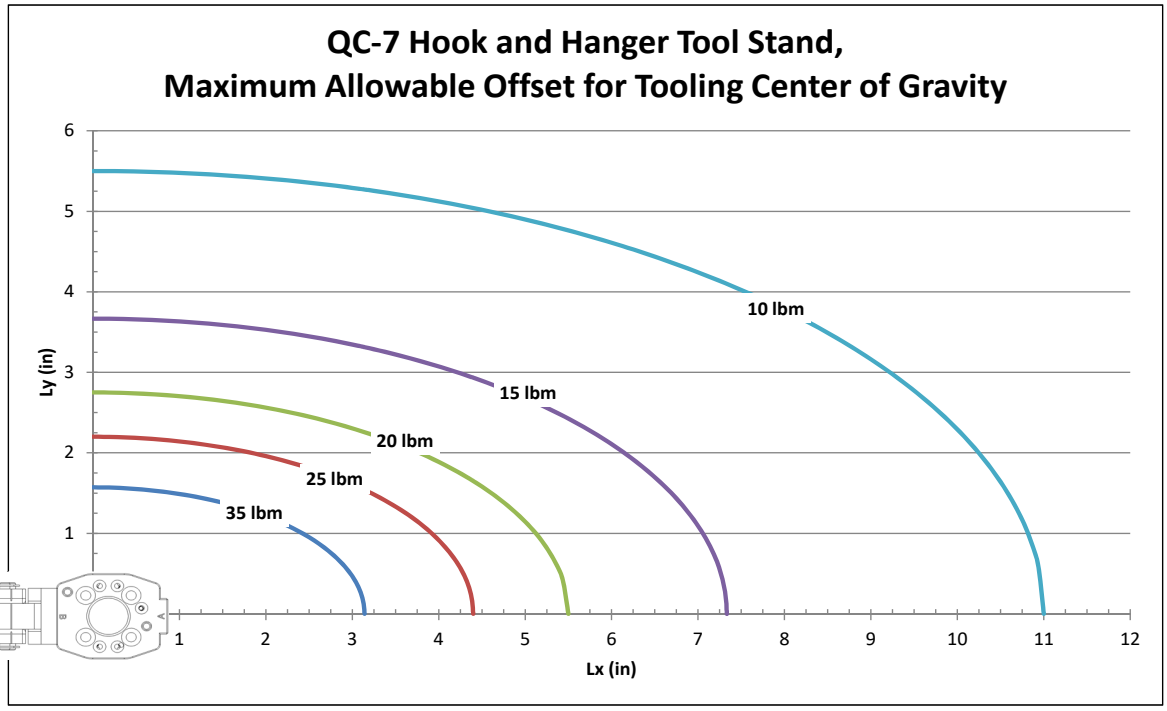
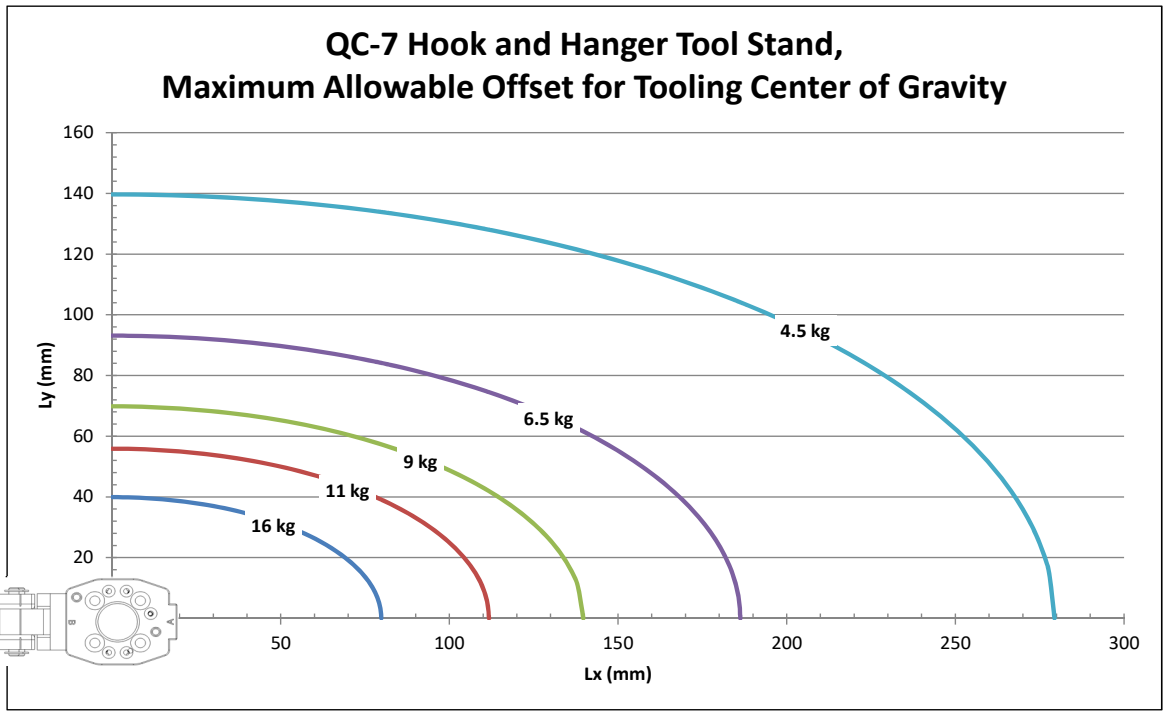


Figure 4.7—Maximum Allowable Offset for QC-7 Hook and Hanger (Metric Units)

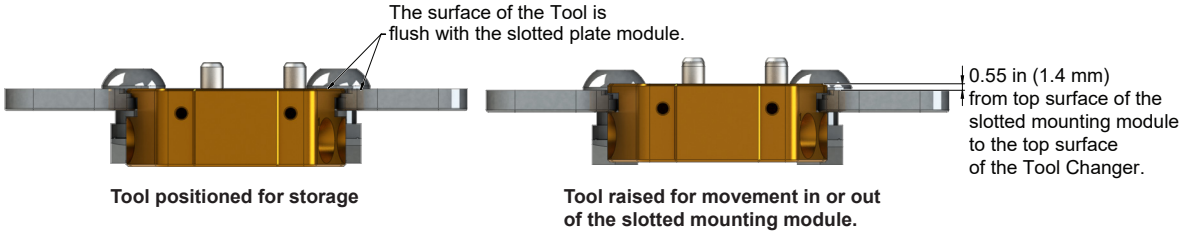


4.3 TSS Tool Stands with QC-7 Slotted Mounting Modules

CAUTION: Damage will occur if contact is made between the TSS slotted mounting module and the Tool Changer prior to tool drop-off.

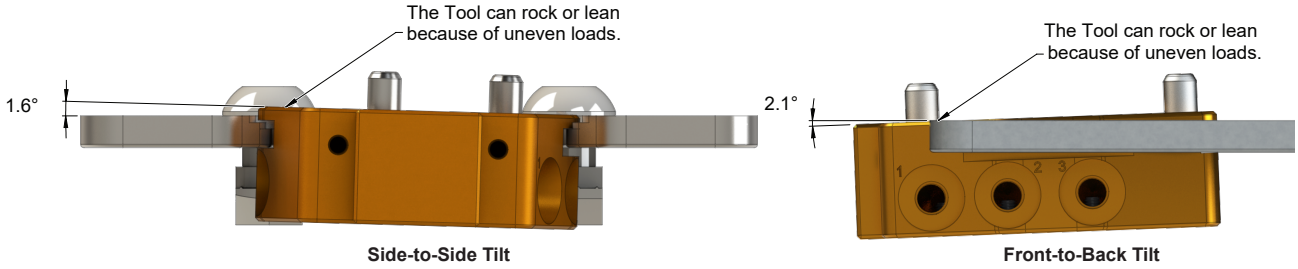
For proper tool drop-off, ATI recommends the distances in the following figure.

Figure 4.8—Slotted Mounting Module Maximum Clearance for Tool Drop-off



When the Tool is in the mounting module, it has the range of movement listed in the following figure or drawing (refer to *Section 9.6.2—TSS Tool Stand for QC-7*). Uneven weight distribution can cause the Tool Changer to sit unevenly in the mounting module.

Figure 4.9—Tool Changer Seated Unevenly in Mounting Module



4.3.1 Payload

For a Tool Stand with a slotted tool nest configuration, both the safe zones for different payloads and the distance of their center of gravity from the slotted mounting module are shown in *Figure 4.10* and *Figure 4.11*. If the center of gravity for the Tool plate, modules, and customer tooling is out side of the zone for the respective payload, then the user should contact ATI for assistance in configuring a Tool Stand.

Figure 4.10—Maximum Allowable Offset for QC-7 Slotted Tool Stand (Imperial Units)

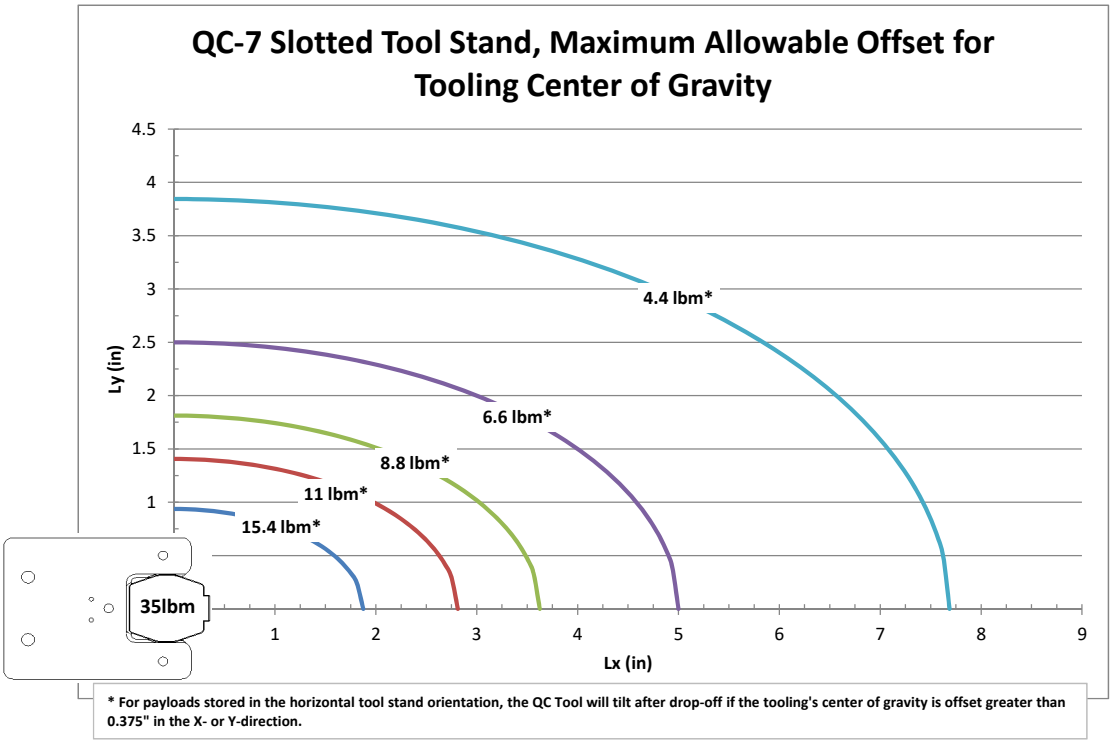
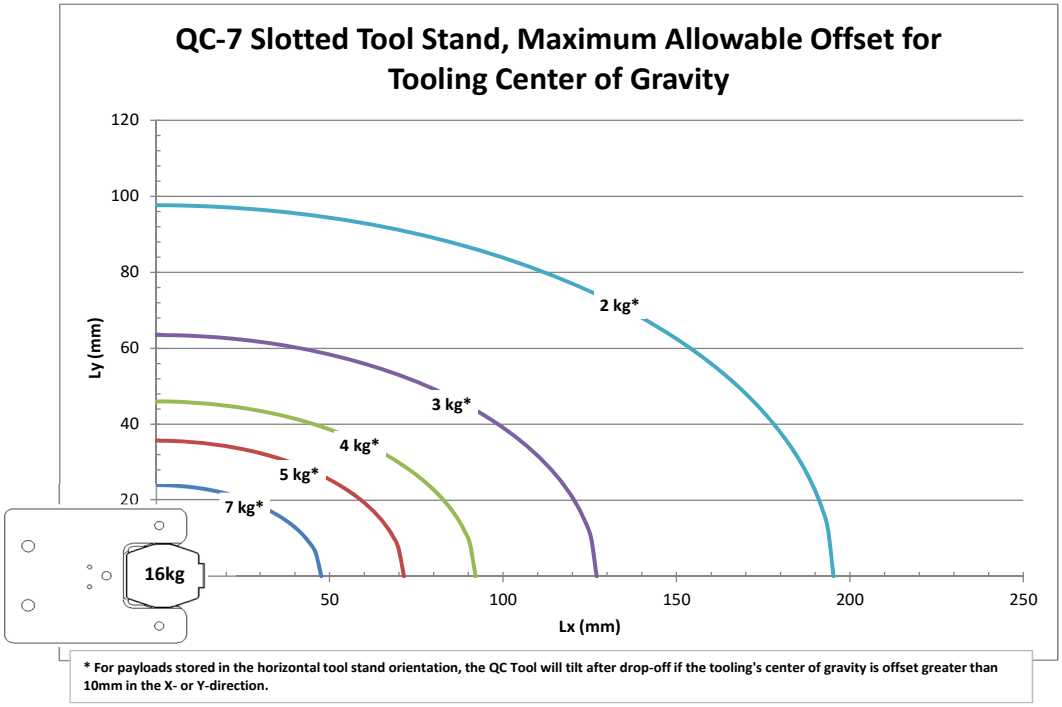


Figure 4.11—Maximum Allowable Offset for QC-7 Slotted Tool Stand (Metric Units)

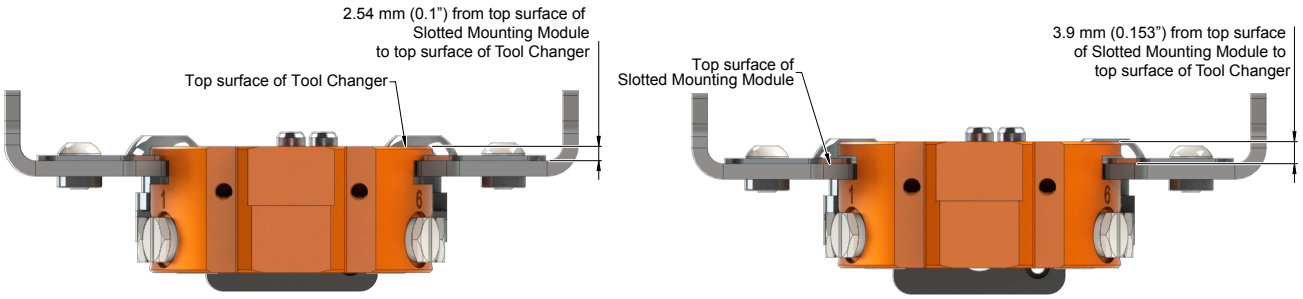


4.4 TSS Tool Stands with QC-11 Slotted Mounting Modules

CAUTION: Damage will occur if contact is made between the TSS slotted mounting module and the Tool Changer prior to tool drop-off.

For proper tool drop-off, ATI recommends 3.9 mm (.153”) maximum distance from the top surface of the Tool plate assembly and the top surface of the tool side of the Tool Changer. Refer to the following figure.

Figure 4.12—Slotted Mounting Module Maximum Clearance for Tool Drop-off

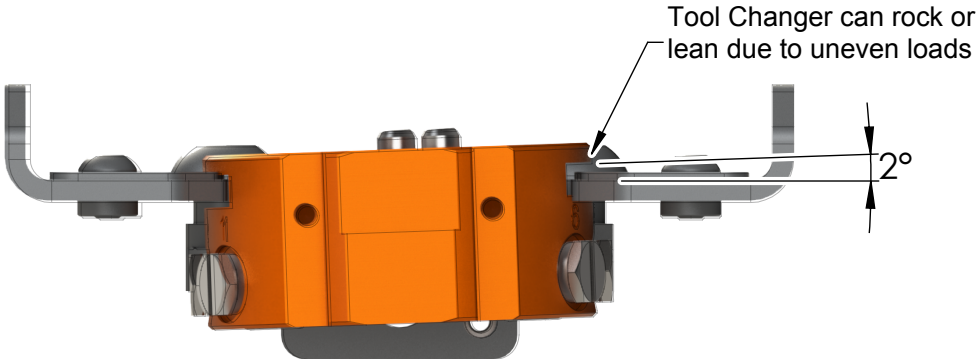


Tool positioned for storage

Tool raised for movement in or out of the Slotted Mounting Module

The Tool Changer has 2° of movement when seated in the mounting module. Uneven weight distribution can cause the Tool Changer to sit unevenly in the mounting module. Refer to the following figure.

Figure 4.13—Tool Changer Seated Unevenly in Mounting Module

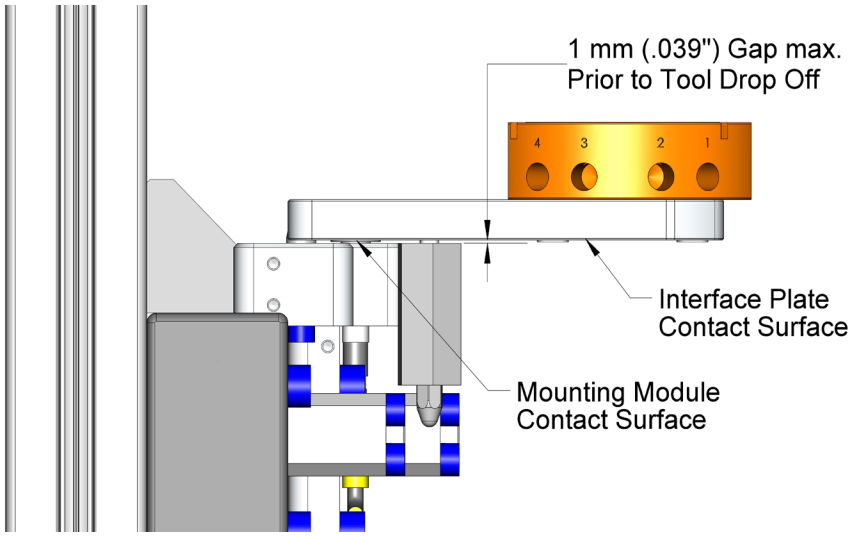


4.5 TSS Pin and Bushing Tool Stand Operation

CAUTION: Damage will occur if contact is made between the TSS Pin and Bushing Tooling Plate and the mounting module prior to tool drop-off.

For proper tool drop-off, ATI recommends 1 mm maximum clearance between mounting module contact surfaces and the tooling interface plate contact surface. See *Figure 4.14* for reference.

Figure 4.14—TSS Pin and Bushing Tool Stands Maximum Clearance for Proper Tool Drop-off

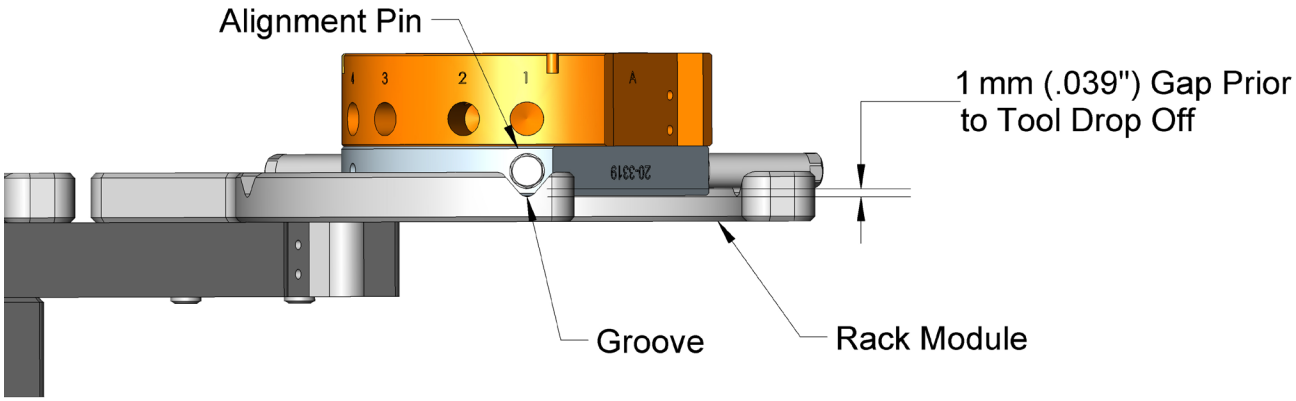


4.6 TSS Pin and Rack Tool Stand Operation

CAUTION: Damage can occur if contact is made between the rack module and alignment pins prior to tool drop-off.

For proper tool drop-off, ATI recommends 1 mm maximum clearance gap between rack groove and alignment pins. See the following figure for reference:

Figure 4.15 TSS Pin and Rack Tool Stands Maximum Clearance for Proper Tool Drop-off



5. Maintenance

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's 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.

It is recommended that the following areas are checked at least once every 100,000 cycles. Earlier intervention may be necessary if a problem is identified prior to the scheduled maintenance checks.

5.1 All TSS Tool Stands

During regular use, components of the Tool Stand can become loose. Verify regularly that the following components are tight; tighten if necessary:

- The Tool Stand base.
- The rail, gusset, and horizontal module(s).
- The mounting block.
- The proximity sensor holder and the proximity sensor.

Other maintenance actions:

- Inspect sensor cables and all utility lines for wear.
- Inspect and wipe clean all sensor faces to ensure proper function.
- Inspect the Tool Changer slot for signs of wear or damage from misalignment.

5.2 TSS Pin and Bushing Tool Stands

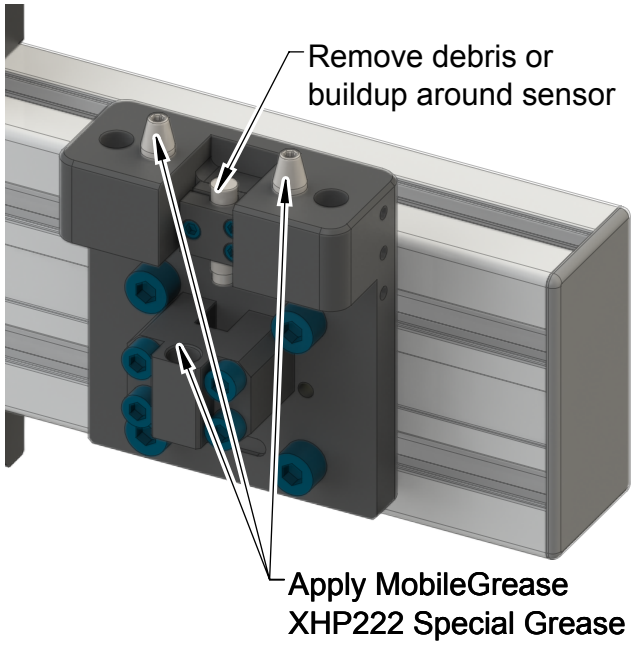
During regular use, components of the Tool Stand can become loose. Verify regularly that the following components are tight; tighten if necessary:

- The alignment pins. For the horizontal shoulder screw, re-apply Loctite 242, and tighten to 40 in-lbs (4.52 Nm). For the center vertical peg, re-apply Loctite 222 and tighten to 27 in-lbs (3.05 Nm). For the single pin mounting module, tighten to 62 in-lbs (7 Nm).
- The mounting modules and single pin nest. Apply Loctite 242 and tighten the M8 socket head cap screw to 150 in-lbs (16.95 Nm), if required.
- The clamp cylinder. Tighten if necessary.

Other maintenance actions:

- Inspect sensor cables and all utility lines for wear.
- Inspect and wipe clean all sensor faces to ensure proper function.
- Inspect the alignment pins and bushings for cracks and wear. Replace if necessary.
- Lubricate the mounting module pins and bushing, see *Figure 5.1* and *Section 9—Drawings* for details.

Figure 5.1—Sensor Cleaning and Lubrication Locations



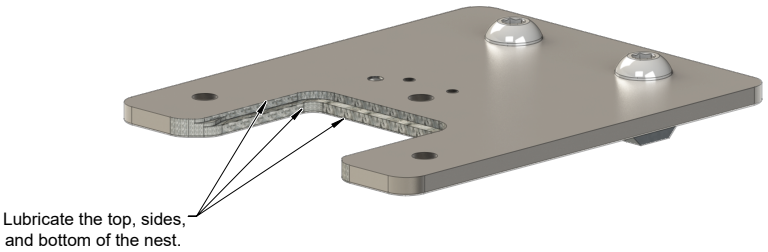
5.3 TSS Pin and Rack Tool Stands

- Inspect the alignment pins and rack grooves for cracks and wear. Replace if necessary.
- Check the alignment pins for looseness. Tighten if necessary.
- Check the mounting adapter bar for looseness. Tighten if necessary.

5.4 TSS QC-7 Slotted Mounting Module

- Clean the nest so that its free of debris.
- Apply MobileGrease® XHP222 Special Grease to the top, bottom, and sides of the nest (refer to the following figure).

Figure 5.2—QC-7 Slotted Mounting Module Nest Lubrication Locations



5.5 TSS QC-7 Hook and Hanger Module

- Verify fasteners that secure the tool hook module to the Tool plate and the post hanger/rail adapter module to the horizontal module are secure (refer to *Section 3.5—Installing Hook and Hanger Modules*).
- Verify components do not have excessive wear. If worn, replace.
- Verify that Tool Changer cables and hoses are not damaged. If damaged, replace.
- Verify that during operation, the Tool Changer cables and hoses are not becoming caught in the hook and hanger modules or tangling in the Tool Stand.
- Remove debris from and clean with a lint free cloth:
    - the hook and hanger modules
    - the proximity sensor installed on the post hanger module.
- Every 100, 000 cycles, lubricate the hook and hanger module per *Section 5.5.1—Lubricate Hook and Hanger Module*.

5.5.1 Lubricate Hook and Hanger Module

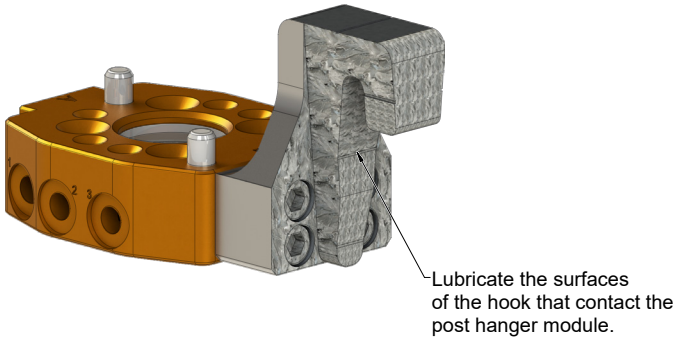
Parts required: *Refer to Section 2.3—TSS Tool Stands with Hook and Hanger Mounting Modules and Section 7—Serviceable Parts.*

Tools required: *Snap ring pliers*

Supplies required: *MobileGrease® XHP222 Special Grease*

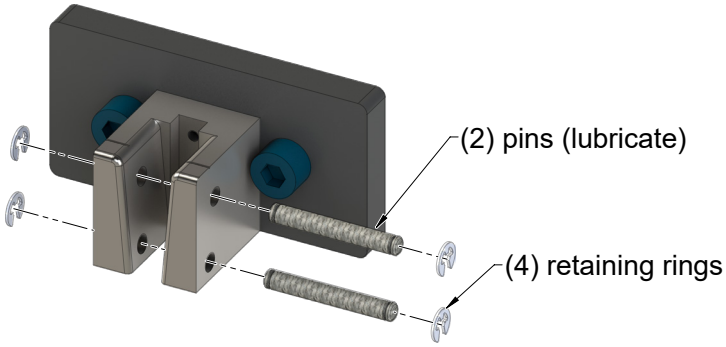
1. Apply MobileGrease® XHP22 Special Grease to all surfaces of the hook that contact the post hanger module.

Figure 5.3—Lubricate Hook



2. Remove the pins from the post hanger module:
   a. Use snap ring pliers to remove the (4) retaining rings.
   b. Remove the (2) pins.
3. Apply MobileGrease® XHP22 Special Grease to the (2) pins.
4. Install the pins in the post hanger module:
   a. Insert the pins into the post hanger module.
   b. Install a retaining ring on each side of the pin.

Figure 5.4—Lubricate Pins and Retaining Rings



6. Troubleshooting

Refer to the following table for troubleshooting information:

Table 6.1—Troubleshooting

Symptom	Possible Cause	Correction
Tool drop-off location is not repeatable.	The Tool alignment pin(s) may be loose or missing.	Tighten or replace alignment pin(s), if necessary.
	Tool Changer misaligned with mounting module.	Inspect the Tool Changer and slot for damage or signs of wear resulting from misalignment. Recalibrate if needed.
The proximity sensor fails.	Debris build up on the proximity sensor.	Check for debris build up and clean if necessary. Refer to *Section 5—Maintenance*.
	The proximity sensor is loose or not positioned correctly.	Verify that the correct distance between the sensing face and the target is set. Verify that the sensor is aimed properly at the sensor target. Adjust if necessary. Refer to *Section 3.2.1—Installing Proximity Sensors for QC-001* *Section 3.3.1—Installing a Proximity Sensor on Mounting Modules* *Section 3.4.1—Installing Barrel Sensors on TSS Tool Stands with Slotted Mounting Modules* *Section 3.4.2—Installing Proximity Sensors for QC-7 Slotted Mounting Module* *Section 3.5.2—Installing Proximity Sensors for QC-7 Hook and Hanger Module* *Section 3.6.1—Installing Proximity Sensors for TSS Pin and Rack Tool Stands.*
	The sensor cable broken or damaged.	Inspect sensor cable for damage, test continuity, replace if damaged.
	The proximity sensor damaged or not functioning.	Inspect the proximity sensor for damage, test sensor.
Tool/End Effector is malfunctioning.	Utility lines and cables are damaged.	Inspect utility lines and cables for damage or wear. Inspect all connections for damage. Test cable continuity. Replace any damaged utility lines and cables.
	Tool Changer or utility modules are not functioning properly.	Verify Tool Changer and utility modules for proper function. Refer to the Tool Changer and module manual for troubleshooting.

7. Serviceable Parts

The following items are commonly used as spare parts for the TSS Tool Stand.

Other components are available upon request.

Model	Part Number	Name	Used For
Common TSS Tool Stand Components	9120-TSS-SM-3315	Proximity Sensor Holder	Clamp used to hold 8 mm barrel type proximity sensor.
TSS Pin and Bushing Tool Stands	3700-20-7130	Mounting Block	Interface with TSS Plate.
	3500-2065050-11	Socket Cap Shoulder Screw, 8 mm x 50 mm, M6 Thread, Steel	Used as alignment Pin for Tooling Plate.
	3700-20-7124	Alignment Pin	Used as alignment Pin for Tooling Plate (Beta Units use 3700-20-5056 or 3700-20-3303).
	8590-9909999-75	Rotary Actuator Replacement Sensor	To detect lock or unlock Position (PNP 3-Wire DC, Normally Open, 10-30 VDC, comes with 2m cable).
	3415-0021022-00	Rotary Actuator	Clamp cylinder for mounting module (supplied with open/closed sensors).
	3700-20-11225	Alignment Pin	Mounting Module.
TSS Pin and Rack Tool Stands	3700-20-3303	Alignment Pin	Interface with TSS Rack (M5 Thread)*.
	3700-20-3316	Alignment Pin	Interface with TSS Rack for QC-21 Mounting Option #2 – Air Ports (NPT Thread).
	3700-20-3320	Alignment Pin	Interface with TSS Rack for QC-21 Euro Mounting Option #2 – Air Ports (BSPP Thread).
TSS Hook and Hanger Tool Stands	3690-5503200-10	Pin (shaft)	Used in the post hanger module for the hook module to rest. The post hanger requires (2) pins.
	3690-5400100-10	Retaining Ring	Used to secure the pin in the post hanger. (2) per pin.
Note: Contact ATI Application Engineering for questions about previous design.			

8. Specifications

Specifications for common components are included in the following sections.

8.1 Common TSS Tool Stand Components

Part Description	Part Number	Material	Weight-Mass
TSS Base (for 45 x 90 rail)	9120-TSS-BA-3311	T-6 Aluminum	1.09 kg (2.4 lb)
TSS Base (for 90 x 90 rail)	9120-TSS-BA-11435	T-6 Aluminum	1.5 kg (3.3 lb)
TSS Proximity Sensor Holder	9120-TSS-SM-3315	Black Nylon	0.0005 kg (.001 lb)
TSS Gusset	9120-TSS-GA-1030	Cast Aluminum, 90 x 90	3.08 kg (6.8 lb)
TSS Post Module Rail (45 x 90)			
TSS Rail, 300 mm (12”) long	9005-20-2225	Anodized T-6 Extruded Aluminum	0.91 kg (2.0 lb)
TSS Rail, 610 mm (24”) long	9005-20-2226	Anodized T-6 Extruded Aluminum	1.86 kg (4.1 lb)
TSS Rail,1220 mm (48”) long	9005-20-2228	Anodized T-6 Extruded Aluminum	3.72 kg (8.2 lb)
TSS Rail,1520 mm (60”) long	9005-20-2229	Anodized T-6 Extruded Aluminum	4.63 kg (10.2 lb)
TSS Post Module Rail (90 x 90)			
TSS Rail, 914 mm (36”) long	9005-20-3435	Anodized T-6 Extruded Aluminum	5.81 kg (12.8 lb)
TSS Rail, 1520 mm (60”) long	9005-20-3434	Anodized T-6 Extruded Aluminum	9.66 kg (21.3 lb)

8.2 TSS Tool Stand for QC-001 Components

Part Description	Part Number	Material	Weight-Mass
TSS Tooling Plate Assembly	9120-TSS-MM-7869	18 Ga. Stainless Steel	0.14 kg (0.3 lb)

8.3 TSS Tool Stand for QC-7 Slotted Tool Stand Components

Part Description	Part Number	Material	Weight-Mass
TSS Horizontal module 610 mm (24”) long	9120-TSM-HM-1020	Anodized T-6 Aluminum	2.41 kg (5.31 lb)
TSS Horizontal module 914 mm (36”) long	9120-TSM-HM-3317	Anodized T-6 Aluminum	3.33 kg (7.35 lb)
TSS Horizontal module 1220 mm (48”) long	9120-TSM-HM-3325	Anodized T-6 Aluminum	4.26 kg (9.39 lb)
TSS Tooling Plate Assembly	9120-TSS-MMS-11345	Stainless Steel	0.41 kg (0.90 lb)

8.4 Slotted Mounting Module Components

Part Description	Part Number	Material	Weight-Mass
TSS Horizontal module 300 mm (12”) long	9120-TSM-HM-3362	Anodized T-6 Aluminum	1.47 kg (3.24 lb)
TSS Horizontal module 457 mm (18”) long	9120-TSM-HM-3323	Anodized T-6 Aluminum	1.95 kg (4.29 lb)
TSS Horizontal module 610 mm (24”) long	9120-TSM-HM-1020	Anodized T-6 Aluminum	2.41 kg (5.31 lb)
TSS Horizontal module 914 mm (36”) long	9120-TSM-HM-3317	Anodized T-6 Aluminum	3.33 kg (7.35 lb)
TSS Horizontal module 1220 mm (48”) long	9120-TSM-HM-3325	Anodized T-6 Aluminum	4.26 kg (9.39 lb)
TSS Slotted Mounting Module	9120-TSS-MMS-9589	Anodized T-6 Aluminum	0.39 kg (0.85 lb)

8.5 QC-7 Hook and Hanger Module Components

Part Description	Part Number	Material	Weight-Mass
TSS Horizontal module 300 mm (12”) long	9120-TSM-HM-3362	Anodized T-6 Aluminum	1.47 kg (3.24 lb)
TSS Horizontal module 457 mm (18”) long	9120-TSM-HM-3323	Anodized T-6 Aluminum	1.95 kg (4.29 lb)
TSS Horizontal module 610 mm (24”) long	9120-TSM-HM-1020	Anodized T-6 Aluminum	2.41 kg (5.31 lb)
TSS Horizontal module 914 mm (36”) long	9120-TSM-HM-3317	Anodized T-6 Aluminum	3.33 kg (7.35 lb)
TSS Horizontal module 1220 mm (48”) long	9120-TSM-HM-3325	Anodized T-6 Aluminum	4.26 kg (9.39 lb)
Post Hanger Module	9120-TSS-MMH-11392	303 Stainless Steel	0.18 kg (0.40 lb)
Rail Adapter Module		Anodized T-6 Aluminum	0.16 kg (0.35 lb)
Tool Hook Module	9120-TSS-TH-11391	303 Stainless Steel	0.12 kg (0.26 lb)

8.6 TSS Pin and Rack Tool Stand Components

Part Description	Part Number	Material	Weight-Mass
TSS Forward Adapter Bar	9120-TSS-FA-3361	Anodized T-6 Aluminum	0.52 kg (1.15 lb)
TSS Mounting Block	9120-TSS-MMA-3306	Anodized T-6 Aluminum	0.45 kg (1 lb)
TSS 3 Tool Adapter Bar	9120-TSS-TB-3308	Anodized T-6 Aluminum	0.73 kg (1.6 lb)
TSS 4 Tool Adapter Bar	9120-TSS-TB-3431	Anodized T-6 Aluminum	1 kg (2.2 lb)
TSS 5 Tool Adapter Bar	9120-TSS-TB-3570	Anodized T-6 Aluminum	TBD kg (lb)
TSS Rack Assemblies	9120-TSS-MMV-3310 9120-TSS-MMV-3313 9120-TSS-MMV-4175	Anodized T-6 Aluminum	0.18 - 2.72 kg (0.4–6 lb)
TSS Interface Plate Assemblies	9120-TSS-HVQ-3314 9120-TSS-HVQ-3319 9120-TSS-HVQ-4174	Anodized T-6 Aluminum	0.07 - 0.23 kg (.15–.5 lb)
Alignment Pins	3700-20-3303	Stainless Steel	0.016 kg (.036 lb)

8.7 TSS Pin and Bushing Tool Stand Components

Part Description	Part Number	Material	Weight-Mass
Alignment Pins	3700-20-7124	Stainless Steel	0.016 kg (.036 lb)
TSS Horizontal module 300 mm (12”) long	9120-TSM-HM-3362	Anodized T-6 Aluminum	1.47 kg (3.24 lb)
TSS Horizontal module 457 mm (18”) long	9120-TSM-HM-3323	Anodized T-6 Aluminum	1.95 kg (4.29 lb)
TSS Horizontal module 610 mm (24”) long	9120-TSM-HM-1020	Anodized T-6 Aluminum	2.41 kg (5.31 lb)
TSS Horizontal module 914 mm (36”) long	9120-TSM-HM-3317	Anodized T-6 Aluminum	3.33 kg (7.35 lb)
TSS Horizontal module 1220 mm (48”) long	9120-TSM-HM-3325	Anodized T-6 Aluminum	4.26 kg (9.39 lb)
TSS Horizontal module 1520 mm (60”) long	9120-TSM-HM-3353	Anodized T-6 Aluminum	5.17 kg (11.40 lb)
TSS Mounting Module	9120-TSS-MMB-7124 9120-TSS-MMB-7130	Anodized T-6 Aluminum	0.91 kg (2 lb)
TSS Tooling Plate Assemblies	9120-TSS-HBQ-7123 9120-TSS-HBQ-9483 9120-TSS-HBQ-11659 9120-TSS-HBQ-9400 9120-TSS-HBQ-7539 9120-TSS-VBB-7963 9120-TSS-VBQ-8206 9120-TSS-VBQ-9968	Anodized T-6 Aluminum	0.23 - 0.34 kg (0.50–0.75 lb)
TSS Holding Clamp Module	9120-TSS-CM-7335 9120-TSS-CM-7336	Aluminum, SMC Brand, 90 degree rotation	0.18 kg (0.40 lb)

9. Drawings

Drawing links are available below or by contacting an ATI representative.

9.1 TSS Pin and Bushing Tool Stands

9.1.1 *QC-5/11 Pin and Bushing Tool Stand Customer Drawing*

9.1.2 *QC-20/21 Pin and Bushing Tool Stand Customer Drawing*

9.1.3 *QC-29 Pin and Bushing Tool Stand Customer Drawing*

9.1.4 *QC-40/41Pin and Bushing Tool Stand Customer Drawing*

9.2 Tooling Interface Plates

9.2.1 *QC-5/11 Tooling Interface Plate - Blank Customer Drawing*

9.2.2 *QC-20/21 Tooling Interface Plate - Blank Customer Drawing*

9.2.3 *QC-29 Tooling Interface Plate - Blank Customer Drawing*

9.2.4 *QC-40 Tooling Interface Plate - Blank Customer Drawing*

9.2.5 *QC-41 Tooling Interface Plate - Blank Customer Drawing*

9.2.6 *QC-20/21/40/41 Vertical Tooling Interface Plate - Blank Drawing*

9.2.7 *QC-40/41 Vertical Tooling Interface Plate J16 Mounting Pattern*

9.3 Clamp Modules

9.3.1 *TSS Clamp Module, Right Hand Customer Drawing*

9.3.2 *TSS Clamp Module, Left Hand Customer Drawing*

9.4 TSS Pin and Rack Tool Stands

9.4.1 *QC-5/11 Pin and Rack Tool Stand Customer Drawing*

9.4.2 *QC-20 Pin and Rack Tool Stand Customer Drawing*

9.4.3 *QC-21 Pin and Rack Tool Stand Customer Drawing*

9.4.4 *Tool Stand Forward Adapter Kit for QC-20, 21, and 21E Drawing*

9.4.5 *5 Position Tool Bar for QC-5 through 21 Customer Drawing*

9.4.6 *QC-5 Tool Rack Customer Drawing*

9.4.7 *QC-10 Tool Rack Customer Drawing*

9.4.8 *QC-11 Tool Rack Customer Drawing*

9.4.9 *QC-20 Tool Rack Customer Drawing*

9.4.10 *QC-21 Tool Rack Customer Drawing*

9.4.11 *QC-21 Euro Tool Rack Customer Drawing*

9.5 Post Modules

9.5.1 *Post Modules with 90 x 90 Rail Customer Drawing*

9.6 TSS Slotted Mounting Modules

9.6.1 *TSS Tool Stand for QC-001 Customer Drawing*

9.6.2 *TSS Tool Stand for QC-7 Customer Drawing*

9.6.3 *TSS Tool Stand for QC-11 Customer Drawing*

9.7 TSS Hook and Hanger Mounting Modules

9.7.1 *TSS Hook and Hanger Configuration Customer Drawing*

9.7.2 *TSS Tool Hook Customer Drawing*

9.7.3 *TSS Post Hanger and Rail Adapter Customer Drawing*