Table of Contents

D. Air Modules D-2
AQ2—Air Module D-2
1. Product Overview D-2
2. Installation D-3
2.1 Module Installation D-3
2.2 Module Removal D-4
3. Operation D-5
4. Maintenance D-5
4.1 Preventive Maintenance D-5
5. Troubleshooting and Service Procedures D-6
5.1 Troubleshooting D-6
5.2 Service Procedures D-7
5.2.1 Master Side Self Sealing Valve D-7
5.2.2 Tool Side Self Sealing Valve D-9
6. Serviceable Parts D-11
7. Specifications D-11
8. Drawings D-12

D. Air Modules

AQ2—Air Module

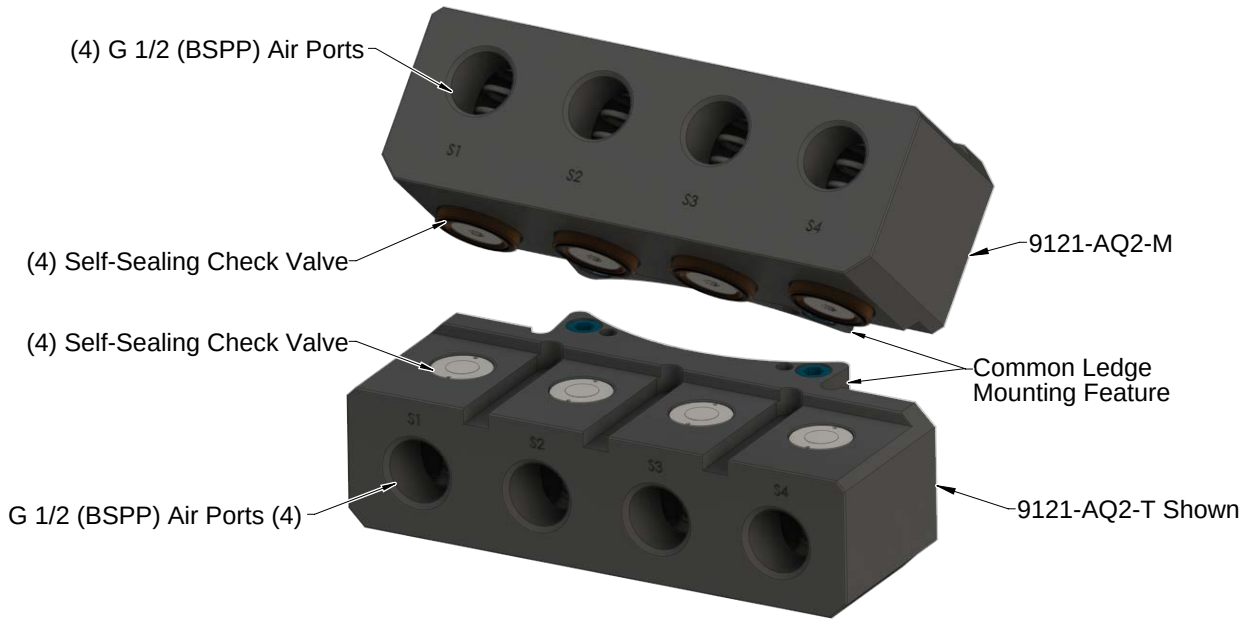
1. Product Overview

Air modules provide air utility and are attached to the Master and Tool plates. When the Tool Changer is coupled, the Master module passes the air supply to the Tool module for use by the customer tooling. Significant forces are encountered when using these modules. Assistance from the robot may be required to overcome these forces when coupling the Tool Changer.

NOTICE: The Master and Tool modules contain self-sealing valves. Do not use self-sealing valves for vacuum utility.

Table 1.1—Air Modules		
Module	**Air Ports**	**Valves**
AQ2-M	**(4) G 1/2 (BSPP)**	**(4) self sealing**
AQ2-T	**(4) G 1/2 (BSPP)**	**(4) self sealing**
AQ7-T	**(4) G 1/2 (BSPP)**	**(4) pass-through**

Figure 1.1—Air Modules



The Master (AQ2-M) and Tool (AQ2-T) modules each contain (4) self sealing check valves. Self sealing valves are not to be used for vacuum utility.

The AQ2 modules provide (4) G 1/2 Air ports for customer connections.

2. Installation

Air modules are typically installed by ATI prior to shipment. Use the following steps to install or remove air modules.

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

CAUTION: The air supply must be clean, dry, and non-lubricated. Air supply must be filtered at minimum to 40 micron. Connection lines must be properly strain relieved.

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

2.1 Module Installation

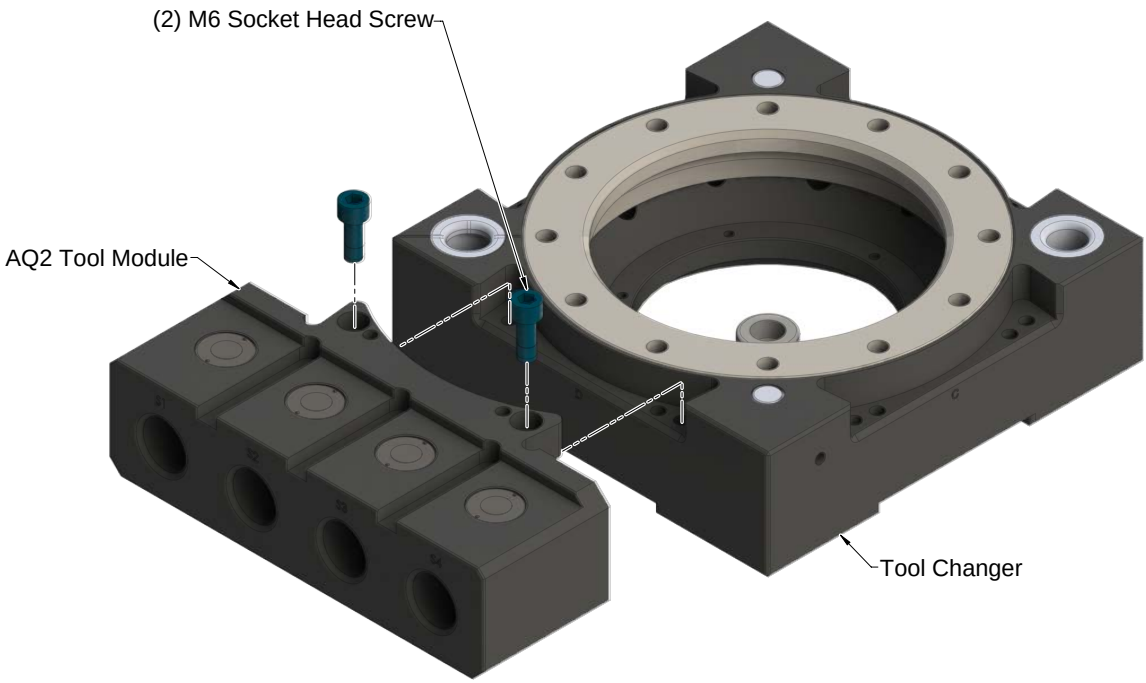
Refer to *Figure 2.1*.

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

Supplies required: *clean rag, Loctite® 242*

1. Place the Tool in a secure location.
2. Uncouple the Master and Tool plates.
3. Turn off and de-energize all energized circuits (for example: electrical, pneumatic, and hydraulic circuits).
4. Wipe down the mounting surfaces with a clean rag.
5. Place the module into the appropriate location on the Tool Changer or Utility Coupler body. Align the module with the Tool Changer using the dowels in the bottom of the ledge feature.
6. Apply Loctite 242 to the supplied M6 socket head cap screws. Using a 5 mm hex key, install the (2) M6 socket head cap screws securing the module to the Tool Changer or Utility Coupler and tighten to 89 in-lbs (10.0 Nm).
7. Ensure the air connectors are clean and connect to the module.
8. Safely resume normal operation.

Figure 2.1—Installation and Removal of the Module



2.2 Module Removal

Tools required: *5 mm hex key*

Supplies required: *clean rag, paint marker*

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

NOTICE: Debris can be expelled at high velocity during the purge, take all required safety precautions.

4. All customer plumbing connections to the module must be purged.
   a. Verify that the supply lines are turned off.
   a. Cover the valves with a rag for safety.
   a. Manually actuate the self-sealing valves to purge the line pressure.
5. Use a paint marker to indicate where the module is to be re-installed.
6. Disconnect air plumbing to the module.
7. Remove the (2) M6 socket head cap screws using a 5 mm hex key.
8. Remove the module from the Tool Changer or Utility Coupler.

3. Operation

Air modules pass air utilities from the Master to the Tool for use by the customer's tooling. Unlike pass-through ports, self-sealing valves prevent the air circuits from discharging, which eliminates the need to close upstream circuits. Self-sealing valves and pass-through ports operate at a maximum pressure of 100 psi (6.9 bar).

4. Maintenance

Perform maintenance to maximize the operational life of the module.

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

4.1 Preventive Maintenance

A preventive maintenance schedule and checklist are provided in the following table:

Table 4.1—Preventive Maintenance Schedule

Inspection Schedule	Action Required
Weekly	Clean and inspect
6 months or 500,000 cycles	Seal replacement
Checklist	
Weekly Maintenance:	
☐ Clean mating surfaces.	
☐ Inspect modules for air leaks. Replace components as necessary.	
6 months or 500,000 cycle Maintenance:	
☐ Remove and replace self sealing valve O-ring seals in both the Master and Tool Module. During O-ring and seal replacement inspect valve stem and dowel pin for straightness. During O-ring and seal replacement re-lubricate bores. Refer to *Section 5.2.1—Master Side Self Sealing Valve* and *Section 5.2.2—Tool Side Self Sealing Valve*.	
☐ Inspect the mounting fasteners for tightness, tighten if loose refer to *Section 2.1—Module Installation*.	

5. Troubleshooting and Service Procedures

The following section provides troubleshooting information to help diagnose conditions with the Tool Changer or air module and service procedures to help resolve these conditions.

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

5.1 Troubleshooting

Refer to the following table for troubleshooting information:

Table 5.1—Troubleshooting

Symptom	Possible Cause	Correction
Air leakage.	Damaged/Worn seals.	Replace seals. Refer to *Section 5.2.1—Master Side Self Sealing Valve* and *Section 5.2.2—Tool Side Self Sealing Valve.*
	Debris blocking valve seal.	Clean in and around valve components. Ensure air stream is free of large particulates, filter as necessary.
	Bent stem.	Replace stem. Check module attachment to Tool Changer. Check robot program and ensure parallel approach trajectory during Tool Changer coupling. Refer to *Section 5.2.1—Master Side Self Sealing Valve* and *Section 5.2.2—Tool Side Self Sealing Valve.*
	Corrosion.	Consult ATI for assistance.
Reduced flow.	Air hose supply/return lines or connections damaged or blocked.	Inspect supply/return hoses and connections for damage or blockage, clean/repair/replace as necessary.
	Valve blockage.	Inspect valve components and clean/repair as necessary. Refer to *Section 5.2.1—Master Side Self Sealing Valve* and *Section 5.2.2—Tool Side Self Sealing Valve.*
Modules won't Couple.	Debris between Tool Change Master and Tool plates or modules.	Clean debris from between Master and Tool Plates and modules.
	Bent stem, dowel pin.	Replace stem, dowel pins as necessary. Check module attachment to Tool Changer. Check robot program and ensure parallel approach trajectory during Tool Changer coupling. Refer to *Section 5.2.1—Master Side Self Sealing Valve* and *Section 5.2.2—Tool Side Self Sealing Valve.*

5.2 Service Procedures

The following service procedures provide instructions for component replacement and adjustment.

5.2.1 Master Side Self Sealing Valve

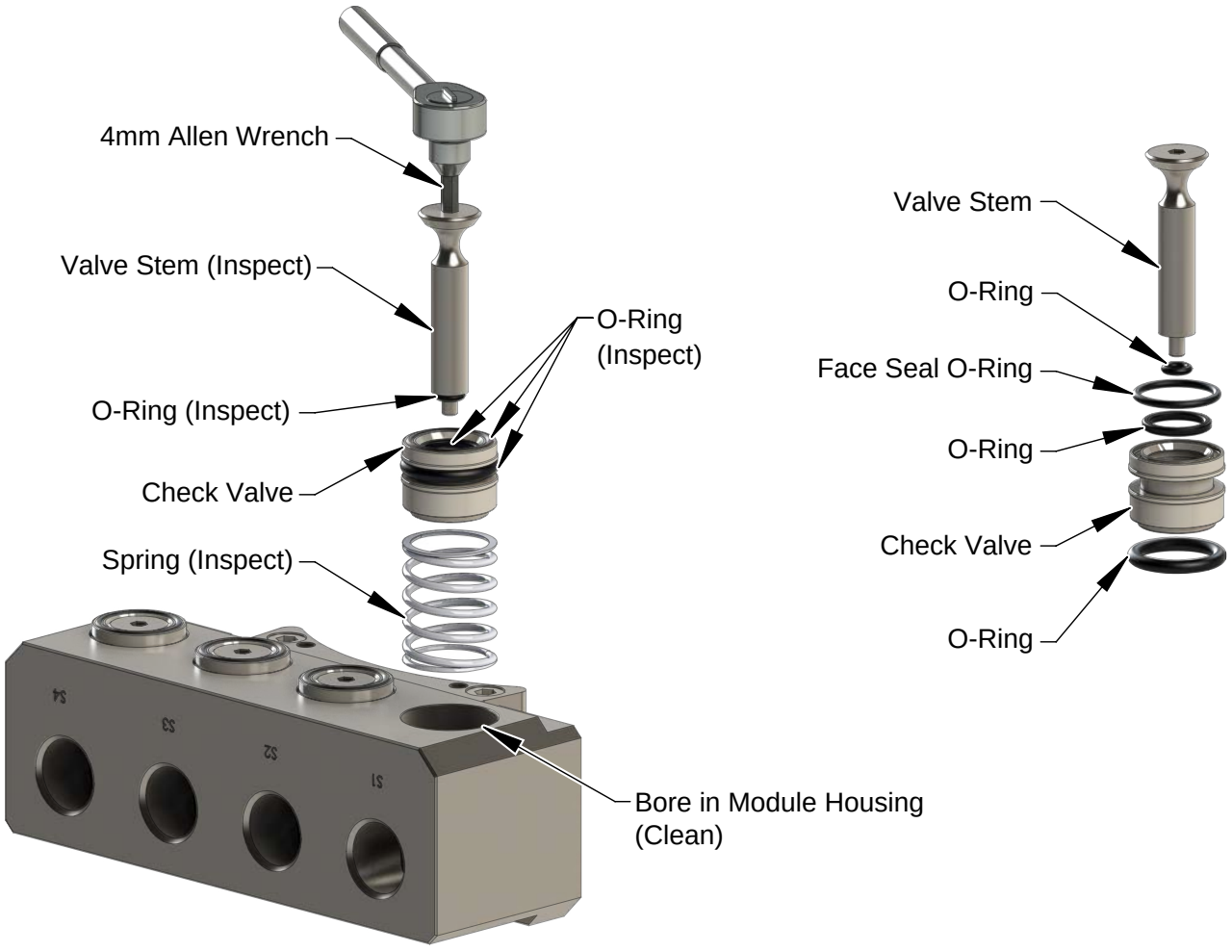
Parts required: *Refer to Section 8—Drawings*

Tools required: *4 mm Allen wrench (hex key), torque wrench*

Supplies required: *Loctite 222, Magnalube G lubricant*

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. Remove the self-sealing valve assembly (stem, check valve, spring and seals) using a 4 mm Allen wrench. Be careful not to strip the hex on the valve stem during removal. Refer to *Figure 5.1*.
5. Clean any lubrication from the check valve, valve stem, and bore in the module housing using a clean rag.
6. Inspect all seals and replaced as required.
7. Inspect the spring in the assembly and replaced as required.
8. Inspect the valve stem for straightness and replace if bent.

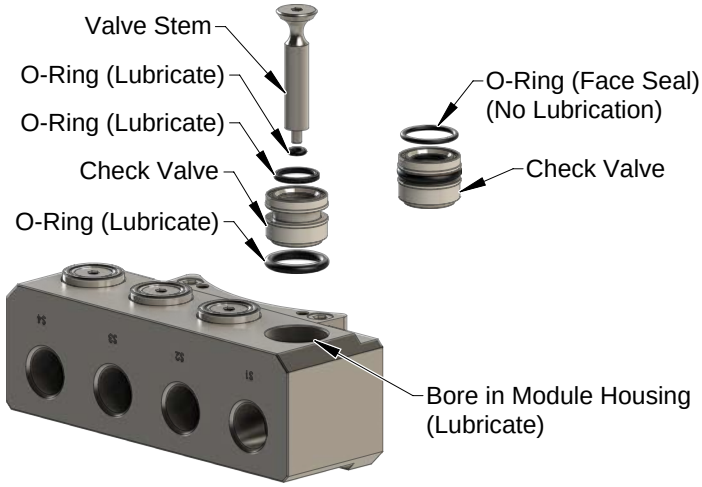
Figure 5.1—Disassemble Self Sealing Master Valve



NOTICE: Do not lubricate the O-ring face seal until after installation. Lubricating O-ring before installation can cause O-ring to blow out during coupling and uncoupling.

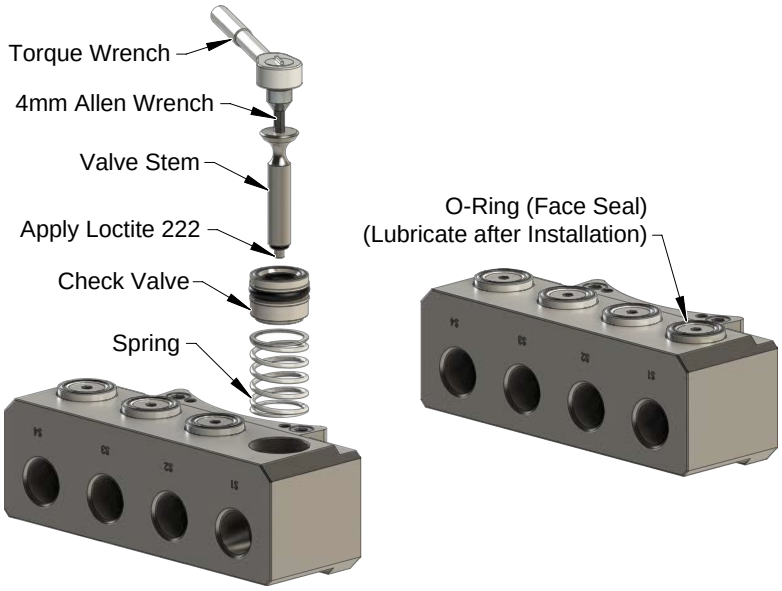
9. Lubricate bore in the module housing and the O-ring seals except the face seal as shown in *Figure 5.2* with Magnalube G (Teflon/Petroleum based grease).
10. Install the O-ring on the valve stem.
11. Install the internal O-ring and the outer O-ring on the check valve.
12. Install the non-lubricated O-ring (face seal) into the check valve.

Figure 5.2—Master Valve O-ring Installation and Lubrication



13. Re-install the valve assembly, all components should be arranged in order as removed. See *Figure 5.3*.
14. Apply Loctite 222 or similar thread locker to the threaded end of the stem, re-install and tighten to 10 in-lbs (1.1 Nm). The piston will have to be pushed down flush with the mating surface in order to get the stem thread started.
15. Lubricate the installed O-ring (face seal) as shown in *Figure 5.3* with Magnalube G (Teflon/Petroleum based grease)
16. After the procedure is complete, resume normal operation.

Figure 5.3—Assemble Self Sealing Master Valve



5.2.2 Tool Side Self Sealing Valve

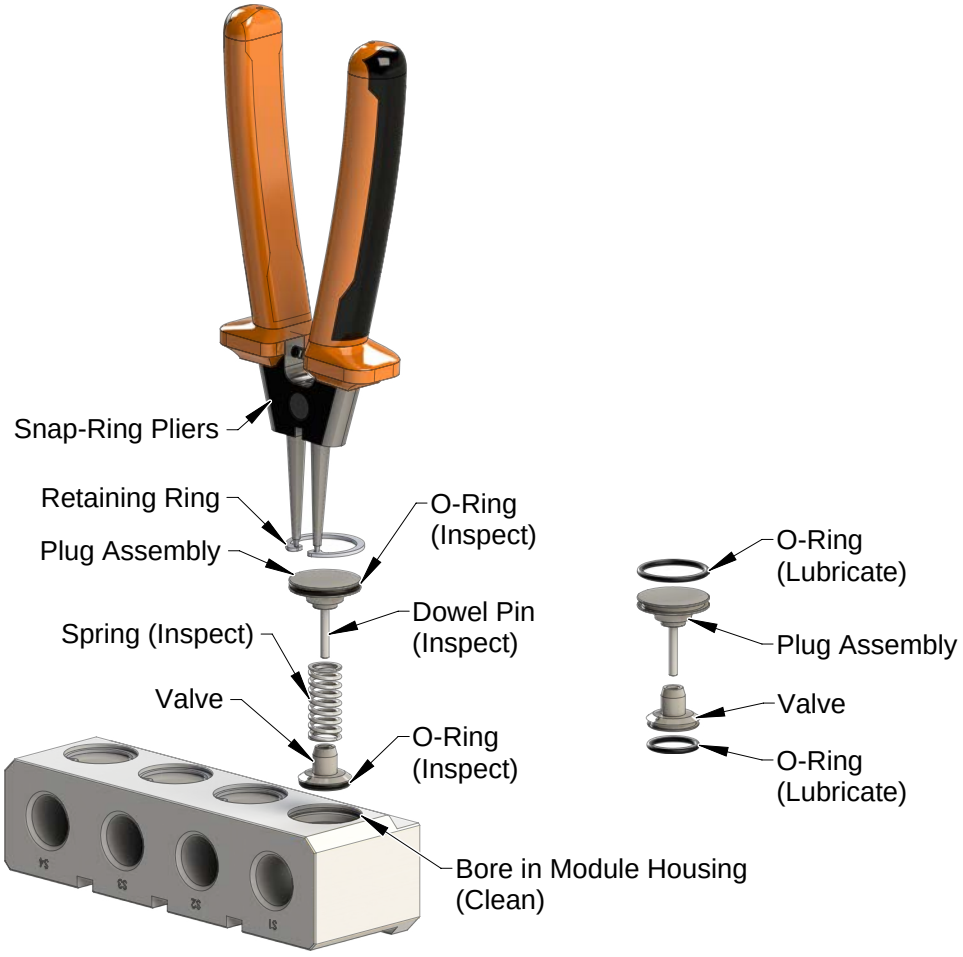
Parts required: *Refer to Section 8—Drawings*

Tools required: *snap-ring pliers*

Supplies required: *Magnalube G lubricant*

1. Place the Tool in a secure location. Leave the locking mechanism unlocked.
2. Turn off and de-energize all energized circuits (e.g. electrical, air, water, etc.)
3. Remove the retaining ring from the bottom of the tool side module using snap-ring pliers. Remove the self sealing valve assembly (plug, spring, valve, and seals). It may be necessary to remove the tool side module to have access to the plug. Refer to the *Section 2.2—Module Removal* for instructions for module removal.
4. Once the retaining ring is removed, the seals on the plug assembly and valve assembly can be inspected and replaced as required.
5. The spring in the assembly should be inspected and replaced as required.
6. The plug assembly contains a dowel pin. The dowel pin should be inspected for straightness, replace the plug assembly if the dowel pin is bent.
7. Clean any excess lubrication from the valve assembly, plug assembly, and bores in the module housing using a clean rag.
8. Lubricate O-ring seals and bores in the module housing with Magnalube G (Teflon/ Petroleum-based grease).

Figure 5.4—Disassemble Self Sealing Tool Valve

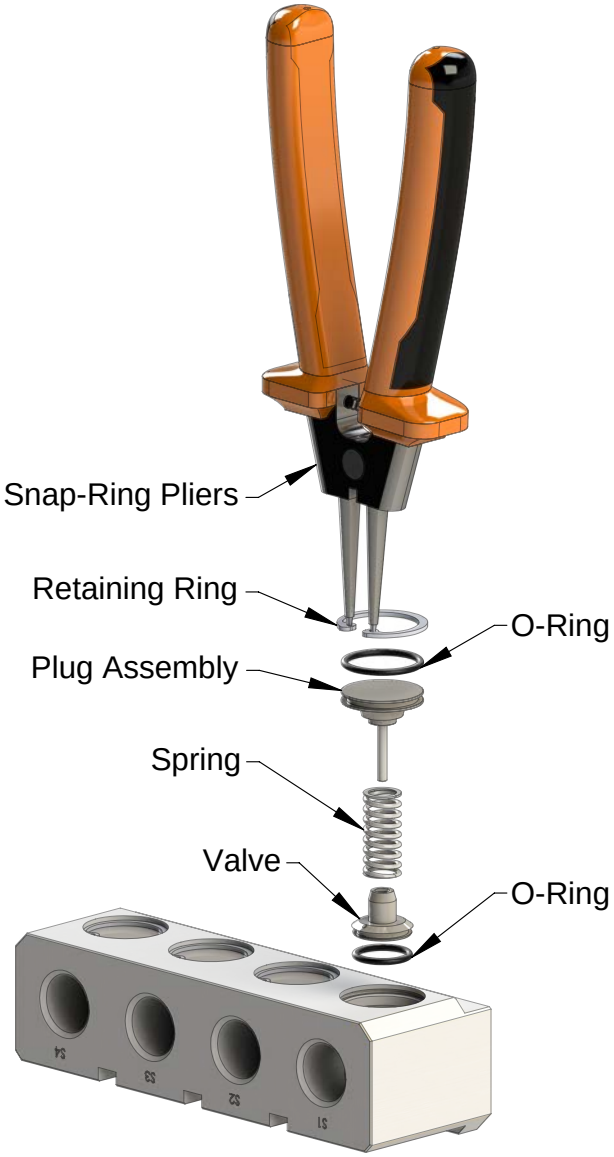


9. Install the O-rings on the plug assembly and the valve assembly.
10. Re-install the valve assembly, all components should be arranged in order as removed. Refer to *Figure 5.5*.

NOTICE: Care should be taken not to damage the O-ring around the plug base during installation.

11. After the procedure is complete, resume normal operation.

Figure 5.5—Assemble Self Sealing Master Valve



6. Serviceable Parts

See drawings in *Section 8—Drawings* of this manual.

7. Specifications

Table 7.1—AQ2 Module Specifications	
9121-AQ2-M	Pneumatic module with (4) self sealing valves with ½ G ports connections - Master Side
Materials of Construction	Various - Stainless Steel valve components, aluminum housing, Buna-N seals
Weight:	2.8 lbs. (1.3 kg)
Self Sealing Valves:	
Quantity	4
Air Pressure	Maximum pressure of 100 psi (6.9 bar)
Cv, Min	3.1
Customer Port Connection	G 1/2

Table 7.2—AQ2 Module Specifications	
9121-AQ2-T	Pneumatic module with (4) self sealing valves with ½ G ports connections - Tool Side
Materials of Construction	Various - Stainless Steel valve components, aluminum housing, Buna-N seals
Weight:	2.0 lbs. (0.9 kg)
Self Sealing Valves:	
Quantity	4
Air Pressure	Maximum pressure of 100 psi (6.9 bar)
Cv, Min	3.1
Customer Port Connection	G 1/2

Table 7.3—AQ7 Module Specifications	
9121-AQ7-T	Pneumatic module with (4) ½ G pass-through ports - Tool Side
Materials of Construction	Various - aluminum housing
Weight:	1.8 lbs. (0.8 kg)
Self Sealing Valves:	
Quantity	4
Air Pressure	Maximum pressure of 100 psi (6.9 bar)
Cv, Min	3.1
Customer Port Connection	G 1/2

8. Drawings

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