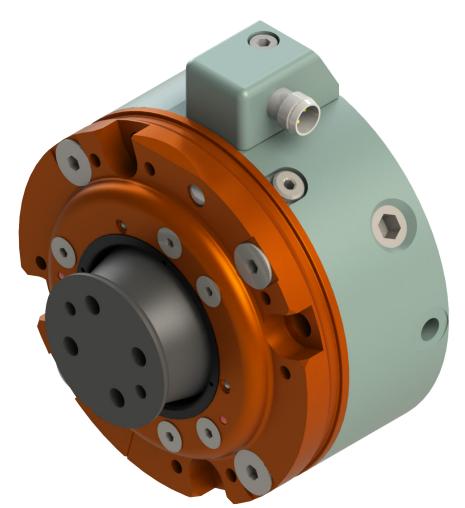


# Robotic Collision Sensor SR-81 and SR-101 Switch Replacement and Adjustment Manual

U.S. Patent Nos. 6069415 and 6690208



Document #: 9610-60-1010

#### **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. Failure to read and understand the information in this manual may result in damage to equipment or injury to personnel.

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## **Glossary**

Term	Definition	
8 mm Connector	8 mm electrical connector mounted in block attached to the side of the body.	
Body	Cylindrical aluminum housing and air pressure chamber. An interface plate to the user's robot is usually attached here.	
Cam	A hardened steel ring mounted inside the cover on which the hardened steel ball segments mounted to the stem are nested.	
Collision Sensing Switch	A mechanical switch that changes state to an open circuit when a crash is detected. It is mounted in the center of the body.	
Collision	The accidental impact between the end of arm tooling and some obstruction in its path.	
Cover Plate	Disk-shaped aluminum cover for Collision Sensor body.	
Crash	The result of a disturbance that displaces the Collision Sensor components from their standard, working position.	
Interface Plate	Optional component used to adapt the Collision Sensor body or stem to the user's robot or tooling.	
Piston	The component which, together with the body, creates a pressure chamber. Varying the pressure in this chamber varies the load required to move the piston.	
Reset	The ability of the Collision Sensor to return to its working position when a disturbing force or displacement is removed.	
Stem	Round tapered post containing tapped holes and a dowel pin hole. An interface plate to the user's tooling is usually attached here.	

## 1. Safety

The safety section describes general safety guidelines to be followed with this product, explanation of the notifications found in this manual, and safety precautions that apply to the product. More specific notifications are imbedded within the sections of the manual were they apply.

#### 1.1 Explanation of Notifications

The notifications included here are specific to the product(s) covered by this manual. It is expected that the user 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 maintenance, operation, installation, or setup of the product that if not followed could result in damage to equipment. The notification can emphasize specific grease types, good operating practices, or maintenance tips.

#### 1.2 General Safety Guidelines

The Collision Sensor is not designed for, nor should it be used in, situations involving the safety of humans or animals. The Collision Sensor is designed as a safety device to protect industrial components and machinery from damage resulting from collisions and impacts. In all situations the user is responsible for insuring that applicable safety practices are followed as outlined by the manufacturer of the equipment on which the Collision Sensor is used.

The routing of electrical and pneumatic lines must minimize the possibility of stress, pullout, kinking, rupture, etc. Failure of critical electrical and/or pneumatic lines to function properly may result in injury to personnel and damage to equipment.



**CAUTION:** The customer should lock out and discharge all energy to the work cell prior to working on any Collision Sensor system. Failure to do so may result in damage to equipment or injury to personnel.

#### 1.3 Safety Precautions



**WARNING:** Do not perform maintenance or repair on the Collision Sensor with air pressure applied, current supplied to the sensor, or the robot not in a safe condition. Injury or equipment damage can occur if this is not observed. Always ensure that air pressure has been vented from the unit, that electrical current is not supplied to the Collision Sensor's signal circuit, and that the robot is in a safe, locked-out condition consistent with local and national safety standards before performing maintance or repair on the Collision Sensor.



**WARNING:** The Collision Sensor is only to be used for intended applications and applications approved by the manufacturer. Using the Collision Sensor in applications other than intended will result in damage to Collision Sensor or end-of-arm tooling and could cause injury to personnel.



**CAUTION:** Do not adjust or remove either of the (3) set screws installed in the wall of the body. Doing so may result in damage to the unit or failure of the switch to operate. See *Figure 1.1*.

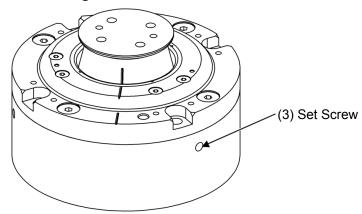


Figure 1.1—Location of Set Screws

### 2. Switch Replacement

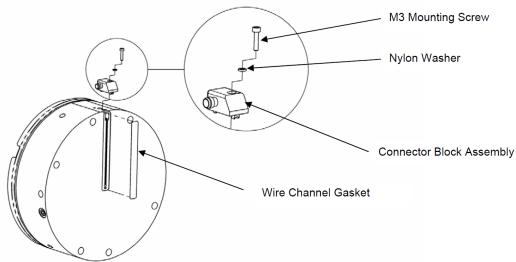
Parts required: ATI Tool (3810-60-1489), Switch kit (9160-SWITCHKIT-081 for the SR-81 or 9160-SWITCHKIT-101 for the SR-101)

Tools required: Allen wrenches (hex keys), Wire cutters, ATI Tool (3810-60-1489)

Supplies required: Loctite 222

- 1. Remove the customer tooling from the Collision Sensor. Refer to 9610-60-1004 for procedure.
- 2. Remove the Collision Sensor from the robot. Refer to 9610-60-1004 for procedure.
- 3. Remove the M3 socket head cap screw and nylon washer that secure the connector block to the body using a 2.5 mm Allen wrench.
- 4. Remove the wire channel gasket.

Figure 2.1—Removing the Connector Block



- 5. Pull the connector block away from the Collision Sensor as shown in *Figure 2.1* and cut the wires as shown in *Figure 2.2*.
- 6. Unplug the connector from PCB Header.
- 7. Remove the connector by cutting the wires and discard the connector.

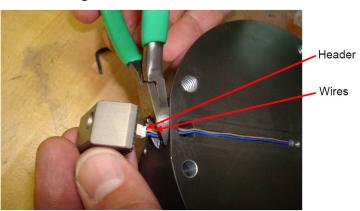


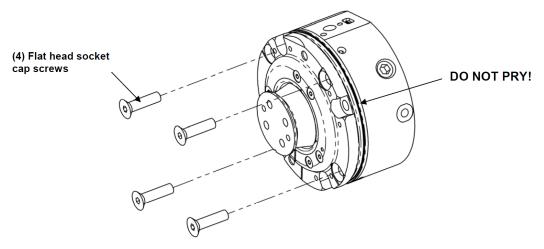
Figure 2.2—Remove the Connector

8. Remove the (4) screws that secure the cover plate assembly to the body.



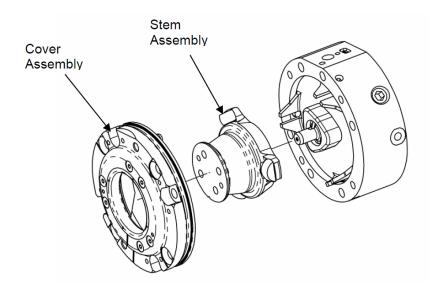
**CAUTION:** Do not attempt to pry or wedge the cover plate assembly and body apart. Doing so can damage the mating surfaces and may render the parts unusable.

Figure 2.3—Removing the Cover Plate



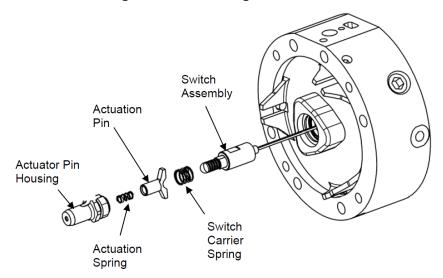
9. Remove the cover plate by carefully pulling it straight up and off of the body. This may be difficult due to the close fit of the dowel pins used to align the parts and the sealer used between the cover and body. It may be necessary to tap the cover with a rubber or plastic mallet.

Figure 2.4— Removing the Cover and Stem Assembly



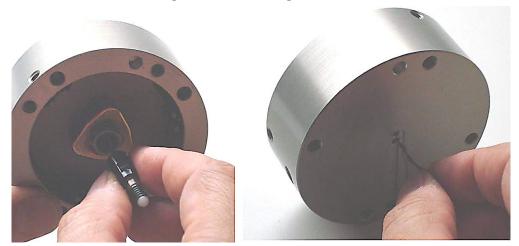
10. Remove actuator spring housing, actuation spring, actuation pin, switch carrier spring, and switch assembly. Discard parts.





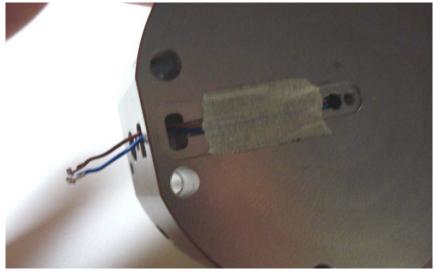
11. Insert the wires of the new switch assembly through the body post. Slide the switch assembly into position. Twisting the switch wires will simplify insertion of the wires into the body post.

Figure 2.6—Installing the Switch



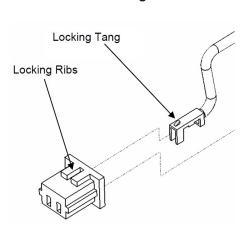
12. Untwist the wires and feed them through the slot leading to the cavity on the side of the body. Ensure that the wires will lie side-by-side in the channel once the assembly has been completed. To prevent damage to the wires, temporarily apply masking tape to the channel once the wires are correctly positioned.

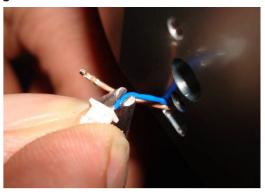




13. Insert the wire connectors into the micro header socket with the locking tang of the wire connectors facing the locking ribs on the micro header socket. Grip each wire with needle-nose pliers just behind the wire connector and push it firmly into the micro header socket. Check to be sure that the wire connectors are locked into place and will not pull out accidentally.

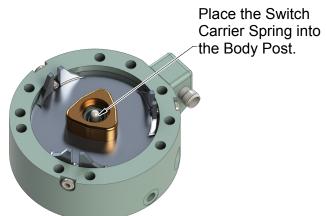
Figure 2.8—Inserting the Wire Connectors





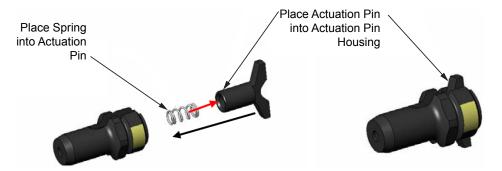
14. Place the switch carrier spring into the body post on top of the switch assembly.

Figure 2.9—Installing the Switch Carrier Spring



15. Place the spring into the actuation pin and then slide actuation pin into actuation pin housing.

Figure 2.10—Inserting the Wire Connectors



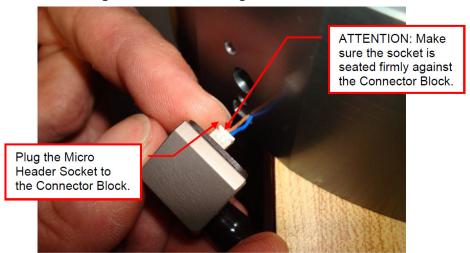
16. Screw the actuation pin housing into the body using tool 3810-60-1489 and tighten to 6 in-lbs (0.68 Nm).

Figure 2.11—Installing the Switch Actuator



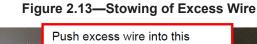
17. Plug the micro header socket into the pcb header in the connector block.

Figure 2.12—Connecting the Connector Block



- 18. Place the nylon washer on M3. Apply Loctite 222 to the connector block's M3 mounting screw and thread it into the body and torque to 64 in-ozs (0.45 Nm). To avoid bunching of the wires in the channel, work any slack in the wires into the slot leading to the cavity on the side of the body.
- 19. To avoid bunching of the wires in the channel, work any slack in the wires into the body cavity indicated above.





20. If the unit was equipped with a C1 or C5 style IP-65 sealing boot apply Loctite 548 Gasket Eliminator to the underside of the cover.



Figure 2.14—Applying Gasket Eliminator

21. With the stem assembly upright, set the cover plate assembly onto it. Make certain that the alignment grooves are properly aligned.



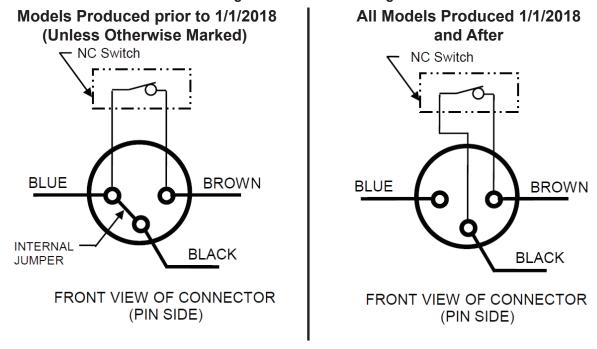
Figure 2.15—Orientation of the Stem and Cover Plate

#### 2.1 Switch Adjustment

Tools required: Allen wrenches (hex keys), Arbor press, Dial idicator

- 1. Provide 20 psi to the air supply port (not required if equipped with preload springs) and insure that the Collision Sensor returns to its reset or working position with the stem fully extended and the alignment mark on the stem in line with the alignment mark on the cover plate.
- 2. Set a volt-ohm meter to ohms or continuity and connect it between the black and brown wires of the cord (see *Figure 2.16*) connected to the 8 mm connector on the switch housing.

Figure 2.16—Switch Wiring



- 3. Attach an interface plate to the stem of the Collision Sensor.
- 4. Center the Collision Sensor under the press ram of an arbor press (see *Figure 2.17*).

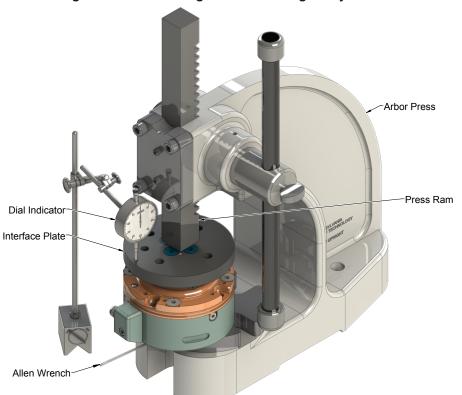


Figure 2.17—Checking the Switch Height Adjustment

- 5. Set a dial indicator in contact with the interface plate and adjust it so that the probe is vertical. Set the dial indicator height so that it can read at least 0.10" (2.5 mm) stroke. Set the dial ring to zero. The factory default switch setting is 0.025" (0.64 mm).
- 6. Push on the press handle until the switch circuit opens and check the distance traveled on the dial indicator.

7. If the distance traveled before the switch turns off is greater than desired, turn the adjusting screw clockwise. If the distance traveled is less, turn the adjusting screw counterclockwise (use a 1.5 mm hex key).



**CAUTION:** The switch can be adjusted to open between 0.01" and 0.05" (0.3 mm and 1.3 mm) of axial stem displacement. Setting the switch to open beyond the maximum value of 0.05" (1.3 mm) may result in failure of the switch to detect a crash condition. Setting the switch to open under the minimum value of 0.01" (0.3 mm) may result in damage to the switch and eventual failure of the switch to detect a crash condition.

- 8. Place the switch adjustment mask onto the bottom of the Collision Sensor. Use the (2) fastener holes closest to connector block to locate the mask on the Collision Sensor.
- 9. Insert the Allen wrench through the hole in the mask to adjust the switch.



Figure 2.18—Locating of Adjusting Screw with Mask

10. After turning the adjusting screw, confirm that the switch is functioning properly by pushing down on the interface plate until the switch circuit opens. Verify that the switch setting is within the adjustment range of 0.01" to 0.05" (0.3 mm to 1.3 mm).



**CAUTION:** Before putting the Collision Sensor back into operation, confirm that the switch is functioning properly and is set within the adjustment range of 0.01" to 0.05" (0.3 mm to 1.3 mm).

Allen Wrench

11. Remove the masking tape covering the wire channel. Peel the paper backing off of the wire channel gasket and apply the gasket to the shallow recess straddling the wire channel. Be sure that the wires are laying side-by-side in the channel before smoothing the gasket into place. Also, be sure that the gasket resides completely within the shallow recess and that the wires are not twisted or bunched up under the gasket.

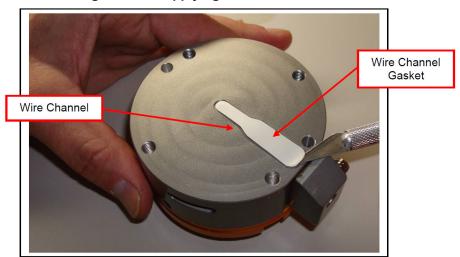
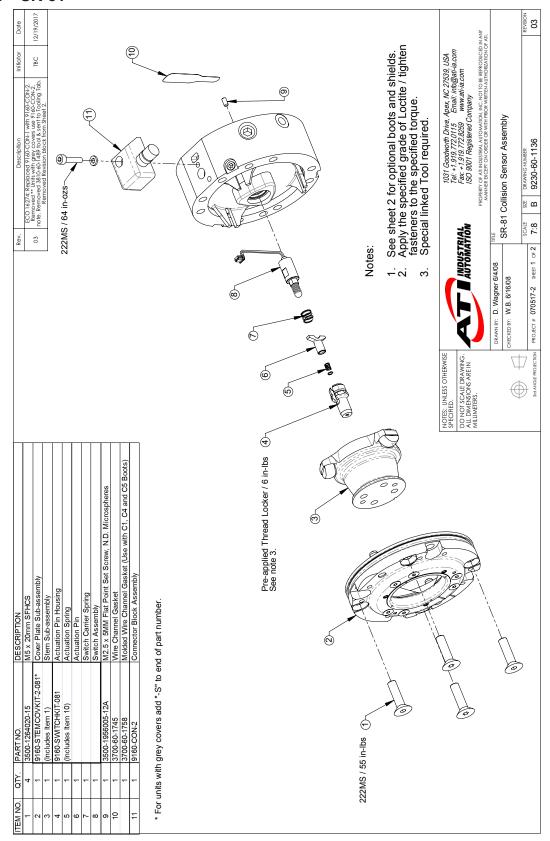
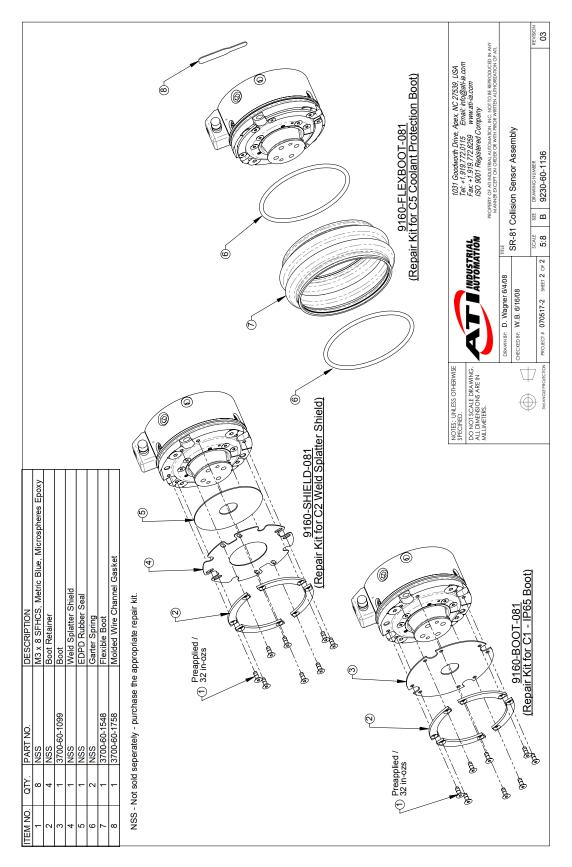


Figure 2.19—Applying the Wire Channel Gasket

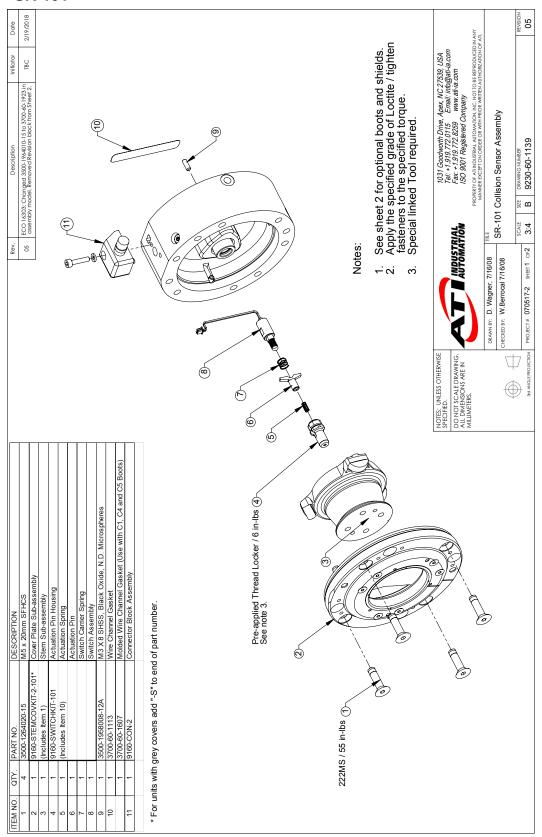
### 3. Drawings

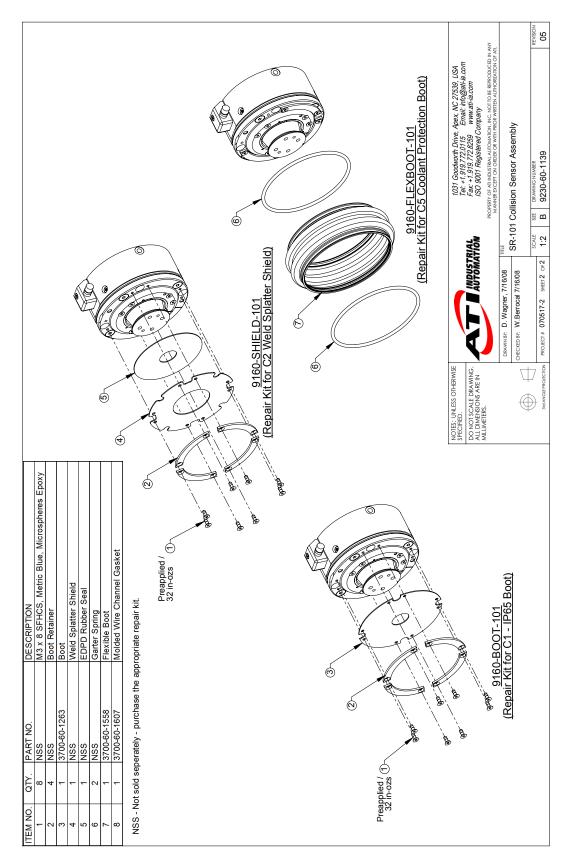
#### 3.1 SR-81





#### 3.2 SR-101





#### 4. Terms and Conditions of Sale

The following Terms and Conditions are a supplement to and include a portion of ATI's Standard Terms and Conditions, which are on file at ATI and available upon request.

ATI warrants to Purchaser that Collision Sensor products purchased hereunder will be free from defects in material and workmanship under normal use for a period of one (1) year from the date of shipment. The warranty period for repairs made under a RMA shall be for the duration of the original warranty, or ninety (90) days from the date of repaired product shipment, whichever is longer. ATI will have no liability under this warranty unless: (a) ATI is given written notice of the claimed defect and a description thereof within thirty (30) days after Purchaser discovers the defect and in any event not later than the last day of the warranty period; and (b) the defective item is received by ATI not later ten (10) days after the last day of the warranty period. ATI's entire liability and Purchaser's sole remedy under this warranty is limited to repair or replacement, at ATI's election, of the defective part or item or, at ATI's election, refund of the price paid for the item. The foregoing warranty does not apply to any defect or failure resulting from improper installation, operation, maintenance or repair by anyone other than ATI.

ATI will in no event be liable for incidental, consequential or special damages of any kind, even if ATI has been advised of the possibility of such damages. ATI's aggregate liability will in no event exceed the amount paid by purchaser for the item which is the subject of claim or dispute. ATI will have no liability of any kind for failure of any equipment or other items not supplied by ATI.

No action against ATI, regardless of form, arising out of or in any way connected with products or services supplied hereunder may be brought more than one (1) year after the cause of action occurred.

No representation or agreement varying or extending the warranty and limitation of remedy provisions contained herein is authorized by ATI, and may not be relied upon as having been authorized by ATI, unless in writing and signed by an executive officer of ATI.

Unless otherwise agreed in writing by ATI, all designs, drawings, data, inventions, software and other technology made or developed by ATI in the course of providing products and services hereunder, and all rights therein under any patent, copyright or other law protecting intellectual property, shall be and remain ATI's property. The sale of products or services hereunder does not convey any express or implied license under any patent, copyright or other intellectual property right owned or controlled by ATI, whether relating to the products sold or any other matter, except for the license expressly granted below.

In the course of supplying products and services hereunder, ATI may provide or disclose to Purchaser confidential and proprietary information of ATI relating to the design, operation or other aspects of ATI's products. As between ATI and Purchaser, ownership of such information, including without limitation any computer software provided to Purchaser by ATI, shall remain in ATI and such information is licensed to Purchaser only for Purchaser's use in operating the products supplied by ATI hereunder in Purchaser's internal business operations.

Without ATI's prior written permission, Purchaser will not use such information for any other purpose or provide or otherwise make such information available to any third party. Purchaser agrees to take all reasonable precautions to prevent any unauthorized use or disclosure of such information.

Purchaser will not be liable hereunder with respect to disclosure or use of information which: (a) is in the public domain when received from ATI; (b) is thereafter published or otherwise enters the public domain through no fault of Purchaser; (c) is in Purchaser's possession prior to receipt from ATI; (d) is lawfully obtained by Purchaser from a third party entitled to disclose it; or (f) is required to be disclosed by judicial order or other governmental authority, provided that, with respect to such required disclosures, Purchaser gives ATI prior notice thereof and uses all legally available means to maintain the confidentiality of such information.