ATI Pneumatic Angle Grinder

(Model 9150-CGV-900)

Product Manual
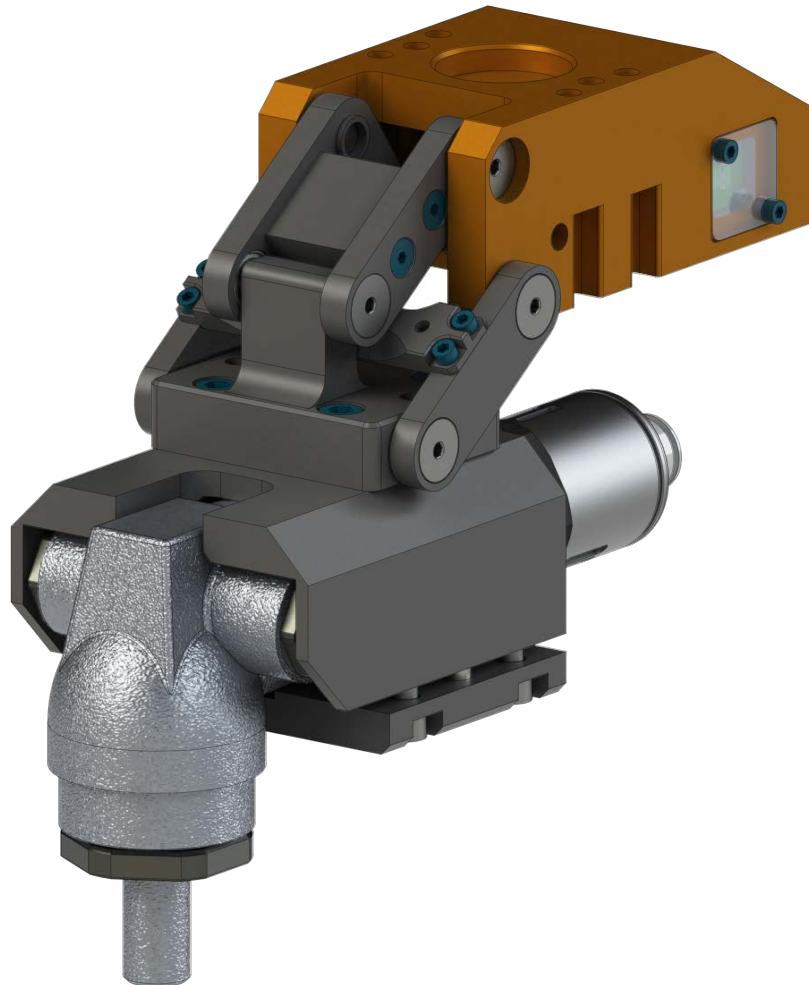
Document #: 9610-50-1056

Foreword

⚠️ **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
Air Filter	Device for removing contamination from air supply lines. Typically refers to removal of particulates.
Baud Rate	A number that is related to the speed of data transmission in a system. The data indicates the number of electrical oscillations per second that occurs within a data transmission.
Coalescing Filter	Device that removes liquid aerosols from the supply air lines.
Compliance	The ability of the motor to passively move in response to protrusions on or deviations of the work piece.
Compliance Assembly	The upper body of the unit which includes the mounting features
Communication Interface Version	The software standard that the customer device uses to apply features to the sensor and for the sensor to report data, for example: RS485.
Float	A data type: IEEE 754-2008 binary32 (or 'single') floating point number.
Gearhead	Tool subcomponent used for transferring output shaft 90° to media.
Hall Effect	The production of a potential difference across an electrical conductor when a magnetic field is applied in a direction perpendicular to that of the flow of current. An optional sensor assembly in the CGV uses a hall effect sensor to detect the tool position during gravity compensation.
IIR	Infinite Impulse Response is a digital signal filter that uses a feedback mechanism based on current and output data.
IP67	Ingress protection rating "67" designates protection against dust and submersion under 1 m of fresh water. This IP rating only applies to the optional sensor assembly cable.
Interface Plate	Device for attaching the tool to robots or work surfaces.
Main Housing	The main body of the unit which includes the motor and gearhead.
MCU	Microcontroller unit. A part of the software and electronics of the sensor. The MCU contains a computer processing unit that includes memory.
Media	Term referring to tools and/or abrasives held by the tool during the completion of a manufacturing process.
Motor	The rotating device of the tool assembly.
N/A	Not/Applicable
NVM	Non-Volatile Memory. Storage of information or device memory that can be retrieved even after the device goes through a power cycle (turned off and then back on).
Qty	Quantity
Regulator	Device used to set and control the supplied air pressure to lower acceptable levels.
Solenoid Valve	Electrically controlled device for switching air supplies on and off.
STRING*n*	String of *n* characters
STRING(20)	A data type representing (20) characters, using (20) bytes.
STRING(32)	A data type representing (32) characters, using (32) bytes.
STRING(40)	A data type representing (40) characters, using (40) bytes.
STRING(100)	A data type representing (100) characters, using (100) bytes.
uint8	A data type that is an 8-bit unsigned integer.
uint16	A data type that is a 16-bit unsigned integer.
uint32	A data type that is a 32-bit unsigned integer.

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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. More specific notifications are embedded within the sections of the 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

Before installation or operation of the CGV, first read and understand the operating procedures and information described in this manual. Never use the CGV for any purpose not explicitly described in this manual. Follow installation instructions and pneumatic connections as described in this manual.

All pneumatic fittings, tubing, and electrical lines must be capable of withstanding the repetitive motions of the application without failing. The routing of pneumatic and electrical lines must minimize the possibility of stress/strain, kinking, rupture, etc. Failure of critical pneumatic lines to function properly may result in equipment damage.

1.3 Safety Precautions

⚠	**CAUTION:** Do not use serviceable parts other than original ATI serviceable parts. Use of serviceable parts not supplied by ATI can damage equipment and void the warranty. Always use original ATI serviceable parts.

⚠	**CAUTION:** Do not perform maintenance or repair on the CGV product unless the tool is safely supported or placed in the tool stand and air has been turned off. Injury or equipment damage can occur with tool not placed in a tool stand and air remaining on. Place the tool safely in the tool stand and turn off the air before performing maintenance or repair on the CGV product.

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2. Product Overview

ATI's Compliant Pneumatic Robotic Angle Grinder (CGV) is a compliant tool that is best for finishing, blending, and light grinding operations. The CGV can be a replacement for handheld grinders and is compatible with industry-standard grinding media such as flap wheels, sanding discs, and wire brushes. The CGV has a strong pneumatic vane motor with high-torque performance and has minimal noise and vibration. Here are other important features and benefits of the CGV:

- Can mount to a robot arm with a bolt-up or bolt-down pattern, or 30-degree angled mounting pattern (for mounting pattern geometry, refer to *Section 11—Drawings*)
- Has an optional 90° mounting bracket that rotates the main housing for applications such as a cut-off wheel (refer to *Section 4.4.3—90° Mounting Bracket (ATI P/N 9005-50-6274)*)
- Has built-in compliance that reduces robot programming
- Has compliance travel position sensing, through RS485 communication, that monitors media wear and part differences
- Has gravity compensation that provides consistent force in any orientation

The CGV's adjustable compliance force maintains a constant force along surface irregularities and gives on-demand adjustments that achieve the desired surface finish.

The CGV assembly has two main components. The compliance assembly bolts to a robot/bench and controls the CGV's motion. The grinding tool component attaches to the bottom part of the assembly. ATI can also provide an exhaust assembly that collects oil from the motor exhaust slots into a muffler or can be adapted to a customer-supplied oil recovery system.

Figure 2.1—Overview

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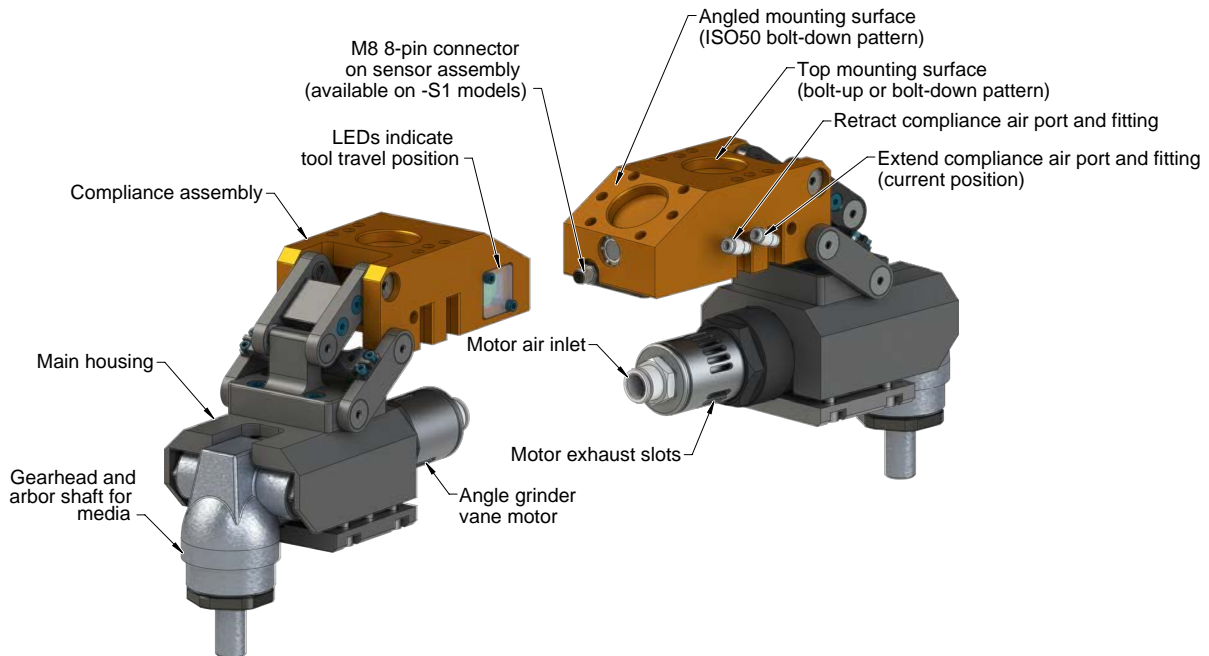
2.1 Technical Description

A technical overview of the product is provided in the following tables and graphs. For additional technical specifications, refer to *Section 10—Specifications*.

2.1.1 Environmental Considerations

2.1.1.1 Operation

Table 2.1—Operation	
Installation position	Mounted to robot or fixed post/bench by various means, customer-supplied tool holders/adapters.
Temperature range	41 °F – 95 °F
	5 °C – 35 °C
Utilities	The tool requires the following: • Clean, dry, filtered, and lubricated air • A coalescing filter and filter elements that are rated 5 micron or better. • The axial force/compliance air supplied from a regulated source and must not exceed 40 psi (2.75 bar).

2.1.1.2 Storage

Table 2.2—Storage	
Conditions	The tool should be stored in its crate located in a cool, dry place. When not in use, keep the unit in its crate, if possible. Consult *Section 3.4—Storage and Preventive Maintenance During Storage* of this manual.

2.2 Compliance Unit Performance

The force from the compliance mechanism varies linearly with air pressure as shown in *Figure 2.2*. This shown compliance force does not include the friction or weight of the attached tooling. Therefore, when calculating this force, customers should include the weight of the motor assembly (5.1 lbs or 2.3 kg), additional accessories, and the tool's orientation.

If the CGV is pointed upward, this weight reduces the net compliance force. Therefore, to achieve the desired compliance force, the CGV needs a higher operating pressure. But if the CGV is pointed downward, this weight increases the total compliance force. Therefore, to achieve the desired compliance force, the CGV needs a lower operating pressure (or a higher pressure applied to the retract compliance fitting).

Figure 2.2—Compliance Force Curves

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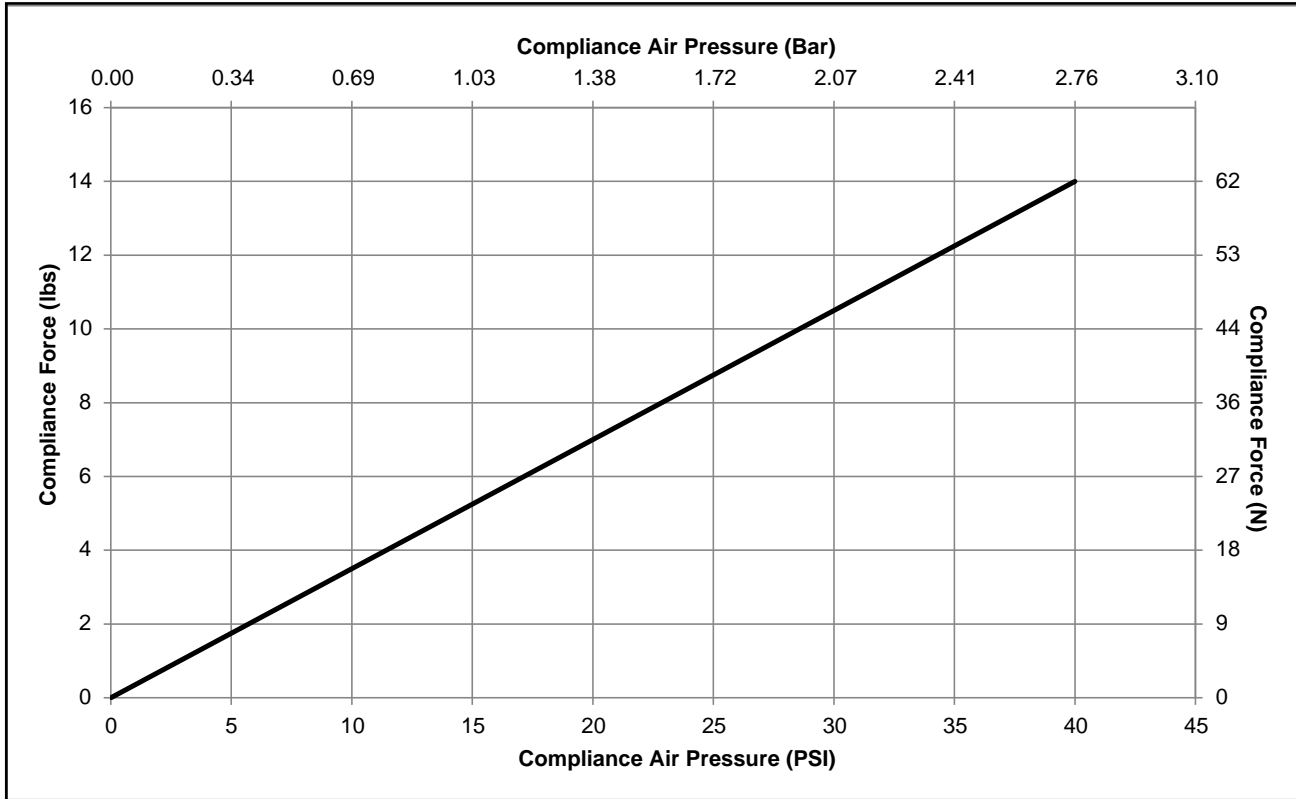
3. Guidelines for Transporting, Unpacking, and Storing the CGV

3.1 Protection During Transportation

The CGV arrives in packaging that secures and protects the tool during transportation. Always use this packaging to safely transport the CGV.

3.2 Inspect the Product Condition When Delivered

Upon receipt, verify the following:

- The product is delivered in accordance with freight documents.
- The product's packaging is in good condition.

If there is damage to any of the packaging, or if any of the goods have been exposed to abnormal handling, thoroughly inspect and verify that the products are not damaged. Contact ATI for assistance.

3.3 Unpacking and Handling

Always place the CGV inside the provided packaging, while transporting, storing, and handling the product.

3.4 Storage and Preventive Maintenance During Storage

For short-term storage, place the tool in its provided packaging and store in a dry place.

For long-term storage, clean the CGV thoroughly for any dust or debris before storing the product. The unit should not be disassembled. Place the tool inside a sealed, plastic bag and place the bagged tool inside the crate.

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4. Installation

4.1 General Guidelines:

- Mount the tool onto a rigid fixture, prior to use.

- Do not use the unit for handheld operations.

- Supply the unit with clean air filtered (5) micron or better. The use of a coalescing filter is recommended to remove trace moisture from the air supply. Lubrication is required for the motor supply air.

4.2 Robot Mounting Options

When used with a robot, the CGV has three available mounting patterns:

- An ISO50 bolt-down pattern, which is located on an angled surface on the rear of the tool

- A bolt-up pattern, which is located on the top of the tool (refer to *Figure 4.2*)

- A bolt-down pattern, which is located on the top of the tool

For more information on the mounting patterns, refer to *Section 11—Drawings*.

Figure 4.1—Tool Mounting Patterns

ISO50 bolt-down pattern on the angled surface

A bolt-down or bold-up pattern on the top surface. Interface plate ATI P/N 9005-50-6267 is for a bolt-up configuration.
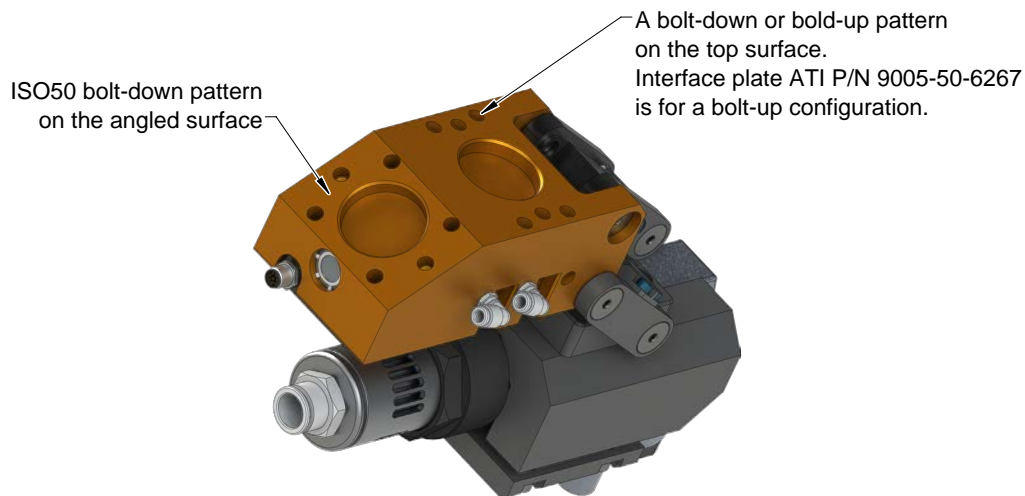
Figure 4.2—Bolt-up Top Surface (ATI Interface Plate Kit P/N 9005-50-6267)
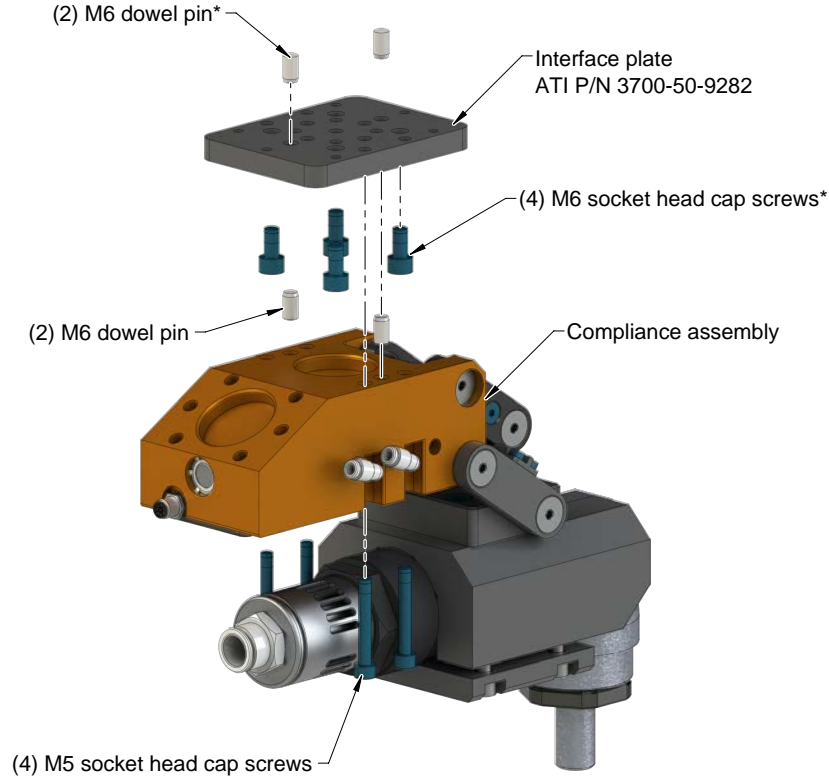
*These dowel pins and screws are for mounting
 to a ISO50 bolt pattern on the robot or customer device.

Table 4.1—ATI Interface Plate Kit For ISO50 Bolt Pattern (P/N 9005-50-6267)		
Part Number	**Quantity**	**Description**
3500-1064035-15A	4	M5-0.8 x 35 mm socket head cap screw, CPC, pre-applied threadlocker
3500-1066012-15A	4	M6-1 x 12mm socket head cap screw, Blue, pre-applied threadlocker
3540-0106012-11	4	6 mm x 12 mm dowel pin, alloy steel
3700-50-9282	1	Interface plate, CGx compliance to these customer configurations: 50 mm bolt circle, 31.5 bolt circle, or ATI QC-22 Tool Changer

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4.3   Installation Procedure

Parts required: *Refer to Section 9—Parts and Accessories*

Supplies required: *Loctite® 242, M5 or M6 socket head cap screws*

Tools required: *4 or 5 mm hex key wrench, torque wrench*

The CGV can be installed to a robot/interface plate using one of the three mounting patterns: bolt-up or bolt-down on the top of the compliance assembly; or bolt-down on the angled surface on the rear of the compliance assembly.

If using the interface plate kit (P/N 9005-50-6267), first install the interface plate to the robot or customer device with the (4) M6 socket head cap screws. Then install the CGV.

For installation instructions of the 90° mounting bracket for a cutoff wheel application, refer to *Section 4.4.3—90° Mounting Bracket (ATI P/N 9005-50-6274)*.

The following procedure outlines the standard installation process for the CGV:

1. Apply Loctite 242 to the mounting fasteners for the CGV.

2. Install the appropriate screws to the CGV for the chosen mounting pattern (refer to *Figure 4.1*):
   a.   For the bolt-down/ angle mounting pattern, install M6 socket head cap screws.

   b.   For the bolt-up pattern, install M5 socket head cap screws.

3. Secure the CGV to the robot/interface plate:
   a.   For the bolt-down or angle pattern, use a 5 mm hex key to tighten the M6 screws to 89 in-lbs (10.1 Nm).

   b.   For the bolt-up pattern, use a 4 mm hex key to tighten the M5 screws to 52 in-lbs (5.9 Nm).

4. Connect the compliance air supply to the air fittings on the side of the compliance assembly (refer to *Figure 2.1*).

5. Install media to the gearhead shaft; for instructions, refer to *Section 8.3.1—Media Installation*.

6. (Optional) Install the exhaust muffler assembly. Refer to *Section 4.4.1—Exhaust Assembly (ATI P/N 9005-50-6273)*.

7. Connect the motor air supply to the air fitting on the rear of the CGV (refer to *Figure 2.1*).

8. (Optional for position sensing) Connect the 8-pin M8 connection on the cable to the sensor assembly. Refer to *Section 4.4.2—Position Sensing*.

9. Safely start normal operation.

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4.4 Optional Installation of Accessories

4.4.1 Exhaust Assembly (ATI P/N 9005-50-6273)

Parts required: Refer to *Section 9—Parts and Accessories*

Tools required: *2 mm hex key, spanner wrench or box wrench*

Supplies required: *Magnalube*

1. Apply a thin layer of Magnalube to the O-rings inside the exhaust assembly.

2. Slide the exhaust assembly over the motor exhaust slots.

> **NOTICE:** When installing the exhaust muffler, orient the muffler so that the compliance mechanism has full range of motion.

3. Install the snap ring to prevent the assembly from sliding along the motor.

4. Rotate the muffler to the desired orientation.

5. Use a 2 mm hex key to install (2) M4 set screws that prevent the assembly from rotating.

6. Install the exhaust muffler or connect a hose to the G 1/2 (BSPP) port that routes to a customer-supplied oil recovery system.

Figure 4.3—Optional Exhaust Assembly Installation

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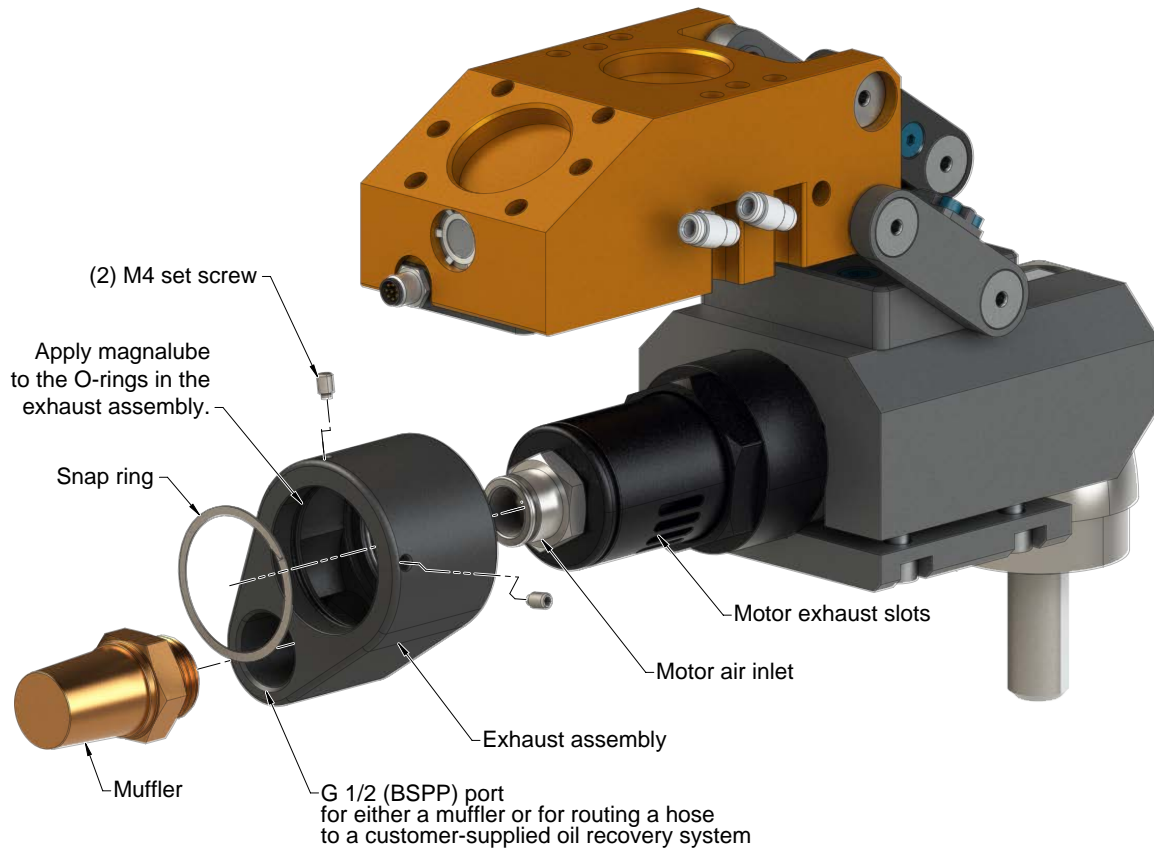
4.4.2 Position Sensing

1. Connect a sensor cable such as ATI P/N 9105-C-ZC27-ZC28 to the M8 connector on the compliance housing. For connector pinouts, refer to *Section 4.6—M8 Sensor Connection* and *Section 4.7—Sensor Assembly Cable (P/N 9105-C-ZC27-ZC28)*.

2. To connect power and either an analog or serial connection, refer to the connection pinout descriptions in *Section 4.6—M8 Sensor Connection* or *Section 4.7—Sensor Assembly Cable (P/N 9105-C-ZC27-ZC28)*.

    a. For setting up a serial interface, refer to *Section 4.8—Set-up of the RS485 Communication Interface*.

Figure 4.4—CGV Electrical Connection for Position Sensing

M8 8-pin male connector for position sensing
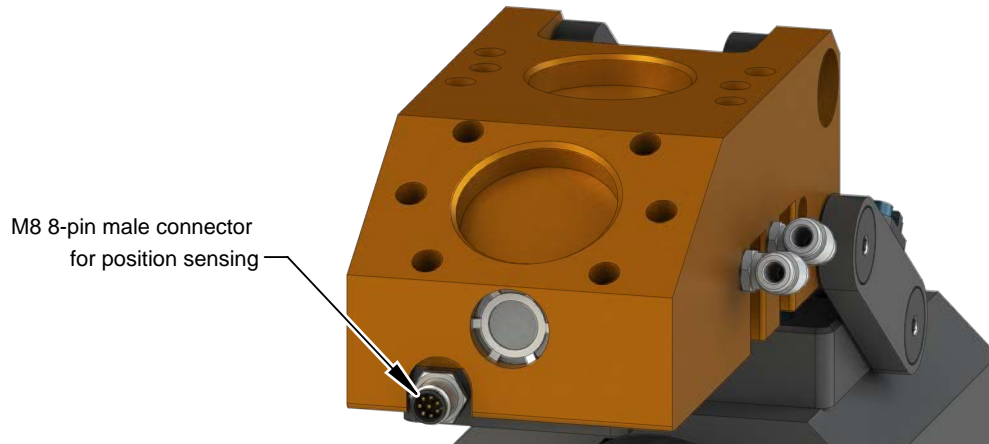
4.4.3   90° Mounting Bracket (ATI P/N 9005-50-6274)

Parts required: *Refer to Section 9—Parts and Accessories*

Tools required: *2.5 mm, 5 mm hex key, T20 Torx® bit, torque wrench*

Supplies required: *Locite® 222, 242, and 7649*

1. Remove the lower crossbar:

    a. Use a 2.5 mm hex key to unscrew the (4) M3 socket head cap screws.

    b. Lift the lower crossbar from the compliance assembly.

2. Remove the upper crossbar:

    a. Use a T20 Torx bit to unscrew the (4) M4 socket flat head cap screws.

    b. Lift the upper crossbar from the compliance assembly.

3. Remove the compliance assembly from the main housing:

    a. Use a 5 mm hex key to unscrew the (4) M6 socket head cap screws.

    b. Lift the compliance assembly from the main housing.

Figure 4.5—Remove the Compliance Assembly

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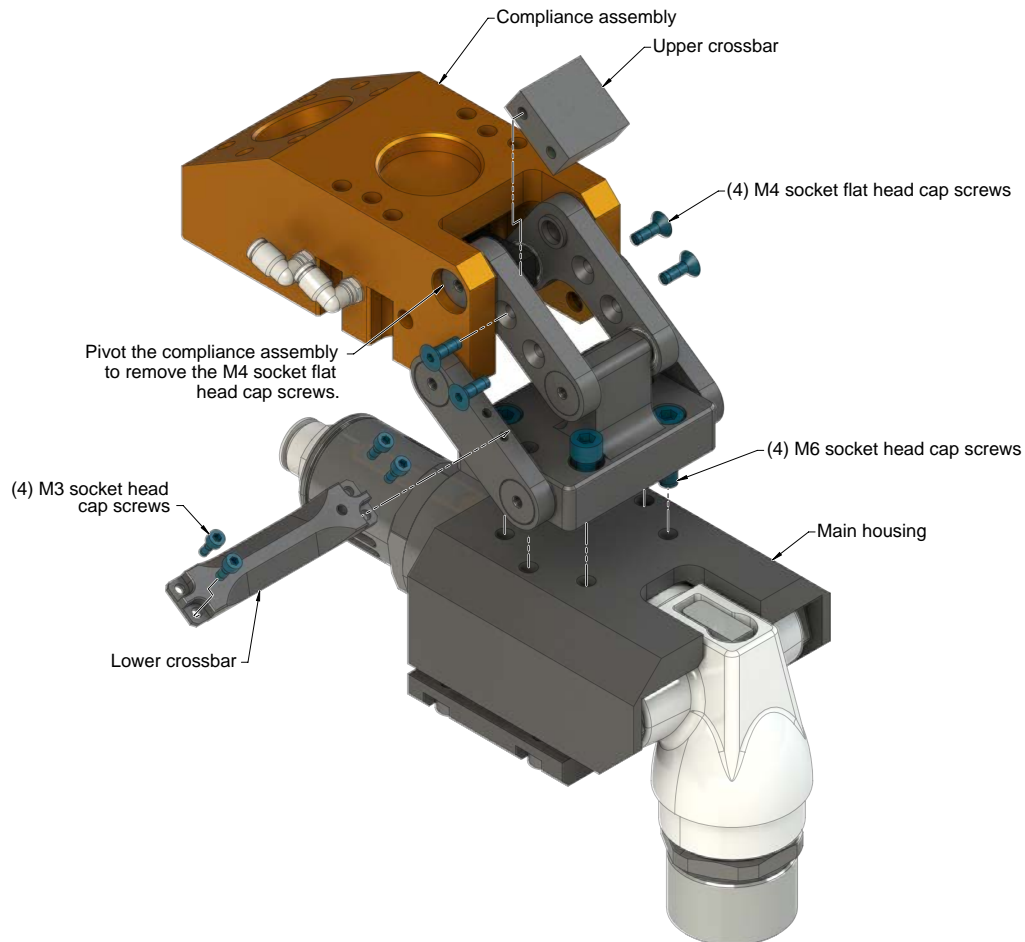
> **NOTICE:** The 90° mounting bracket and main housing have a 50 mm bolt pattern for (4) M6 socket head cap screws and (2) M6 dowel pins. The bracket can be installed as shown or rotated 180°.

4. Install the 90° mounting bracket to the main housing:
   a. Apply Loctite 242 to the threads of the (4) M6 socket head cap screws that are part of the mounting bracket kit.
   b. Secure the bracket to the main housing with the (4) M6 socket head cap screws. Use a 5 mm hex key to tighten the screws 89 in-lbs (10.06 Nm).

5. Install the compliance assembly to the 90° mounting bracket:
   a. Apply Loctite 242 to the threads of the (4) M6 socket head cap screws.
   b. Secure the compliance assembly to the mounting bracket with the (4) M6 socket head cap screws. Use a 5 mm hex key to tighten the screws 89 in-lbs (10.06 Nm).

6. Install the lower crossbar to the compliance assembly:
   a. Apply Loctite 222 to the threads of the (4) M3 socket head cap screws.
   b. Secure lower crossbar to the compliance assembly with the (4) M3 socket head cap screws. Use a 2.5 mm hex key to tighten the screws 12 in-lbs (1.4 Nm).

7. Install the upper crossbar to the compliance assembly:
   a. Apply Loctite 7649 as a primer to the threads of the (4) M4 socket flat head cap screws.
   b. Apply Loctite 222 to the threads of the (4) M4 socket flat head cap screws.
   c. Secure the upper crossbar to the compliance assembly with the (4) M6 socket head cap screws. Use a T20 torx bit to tighten the screws 50 in-lbs (5.6 Nm).

Figure 4.6—Install the 90° Mounting Bracket
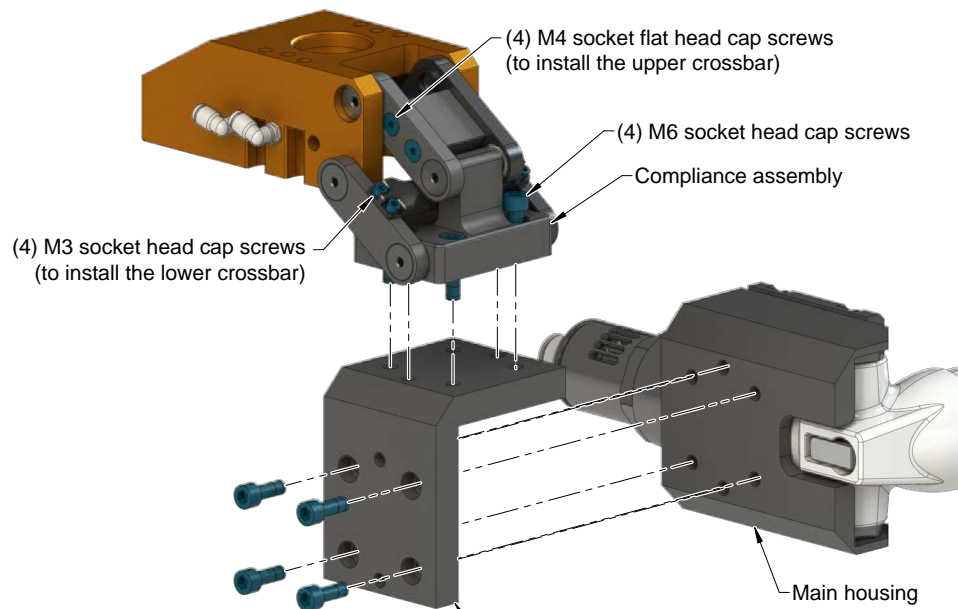
4.5 Pneumatic Connections

Connect the CGV as outlined in *Section 4.3—Installation Procedure*.

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

> **NOTICE:** It is recommended that the customer use a coalescing filter and filter elements rated 5 micron or better to remove trace moisture. Water damage of the air motor or damage associated with debris in the air lines is not covered under warranty.

The end user may need a regulator for the extend and retract compliance. Minimal airflow is required for the compliance mechanism. The compliance force is applied axially and is adjusted until the desired finishing result is achieved.

> ⚠️ **CAUTION:** Pneumatic components used for the motor drive circuit must be capable of meeting the air consumption requirements (See *Section 10—Specifications*). Poor performance will result if the correct components are not used. Lubricators must be located as close to the unit as possible with performance rapidly deteriorating when the distance exceeds 15 feet (5 meters).

Table 4.2—Pneumatic Connections		
Function	**Connection Type**	**Pressure**
Motor Inlet	1/2" (12 mm) Tube	90 psi (6.2 bar)
Compliance (Axial) Force Inlet	(2) 5/32" (4 mm) Tube	0 to 40 psi (0 to 2.75 bar)

The CGV must be plumbed using flexible tubing. The compliance force air supply pressure regulator should be adjusted up to 40 psi (2.75 bar). The minimum force air supply pressure to overcome friction depends upon the orientation of the device and the customer's application. When testing for the proper contact force, start with a very low pressure and increase slowly until the desired process result is achieved.

4.6 M8 Sensor Connection

Electrical connection pinouts and ratings are listed in the following table. Cable shielding is required.

Figure 4.7—M8 8-Pin Connector Wiring (Face View Shown)
(see also *Figure 4.4***)**

1510-1313037-08
8-Pin Male Connector
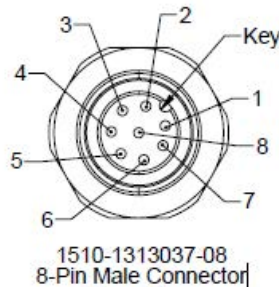
**Table 4.3—M8 8-Pin Male Connector Wiring**			
Pin Number	**Signal name**	**Description**	**Voltage/Current Rating**
1	V +	Power (Positive)	24 VDC+/-20%
2	VO - /IO -	Analog Output Reference	0 V
3	VO/IO_POS +	Analog output (Position)	0-5 V, 0-10 V, 4-20 mA[1]
4	VO/IO_REG +	Analog output (Regulator)	0-5 V, 0-10 V, 4-20 mA[1]
5	RS485+	Serial Data	N/A
6	Reserved		
7	V -	Power (Negative) / Ground (GND)	0 V
8	RS485 -	Serial Data	N/A
Note:			
1. Default value for a new unit is 0-5 V.			

4.7   Sensor Assembly Cable (P/N 9105-C-ZC27-ZC28)

> **NOTICE:** ATI can provide a sensor assembly cable to install from the position sensor connector on the CGV (ZC27 connector) to the customer interface (ZC28 connector).

For cable electrical specifications, refer to *Section 10—Specifications*.

Table 4.4—ZC27 Connector, M8, 8-pin, Female			
Connector Schematic	**Pin Number**	**Signal**	**Description**
	1	V +	Power (Positive)
	2	VO - / IO -	Analog Output Reference
	3	VO/IO_Pos +	Analog Output Position
	4	VO/IO_Reg +	Analog Output Regulator
	5	RS485 +	Serial Data
	6	Reserved	
	7	V -	Power (Negative) / Ground (GND)
	8	RS485 -	Serial Data
	Shell	Shield	
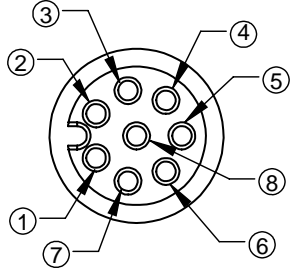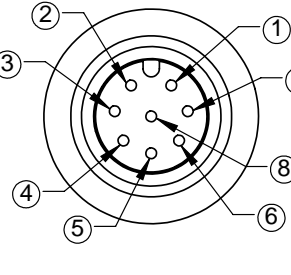
Table 4.5—ZC28 Connector, M12, 8-pin, Male			
Connector Schematic	**Pin Number**	**Signal**	**Description or Rating**
	1	V +	Power (Positive)
	2	VO - / IO -	Analog Output Reference
	3	VO/IO_Pos +	Analog Output Position
	4	VO/IO_Reg +	Analog Output Regulator
	5	RS485 +	Serial Data
	6	Reserved	
	7	V -	Power (Negative) / Ground (GND)
	8	RS485 -	Serial Data
	Shell	Shield	

4.8   Set-up of the RS485 Communication Interface

The optional sensor assembly in the CGV is a serial device that can be used programmatically with the user's application.

When the sensor is attached via cable to the customer's device such as a personal computer or robot, the computer assigns the sensor a COM port. Then by using a console on the computer, the user can communicate with the sensor. Free console software, such as PuTTY, is available online. Commands are covered in *Section 6—RS485 Serial Console Interface*.

For additional instructions on setting up a console like PuTTY, refer to the following procedure:

1. If an RS485 serial port is not on the customer device, use a third party serial device to add the port, for example: a high-speed USB to an RS485 adapter module.

2. Connect the customer-supplied RS485 cable from the CGV or optional sensor assembly cable to the RS485 serial port.

3. Find the COM port that is assigned to the CGV sensor assembly device.

   • In Windows®, from the Control Panel go to the Device Manager > **ports** > **USB Serial Port**. The sensor is assigned **COM6** in the following figure.

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> **NOTICE:** The name of the device may differ based on the name of the PC's RS485 port or name of the third-party RS485 device.

Figure 4.8—Device Manager, Port Assignment
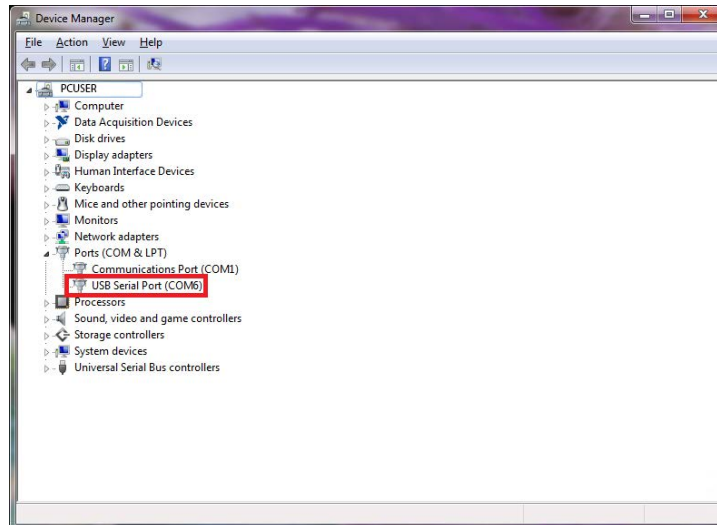
4. Open the console, for example: PuTTY. A window opens that allows the user to set the configuration for the session.

5. Set the configuration:
   a. Under **Connection type:** select the radio button for **Serial**.

Figure 4.9—Set the Connection Type to Serial

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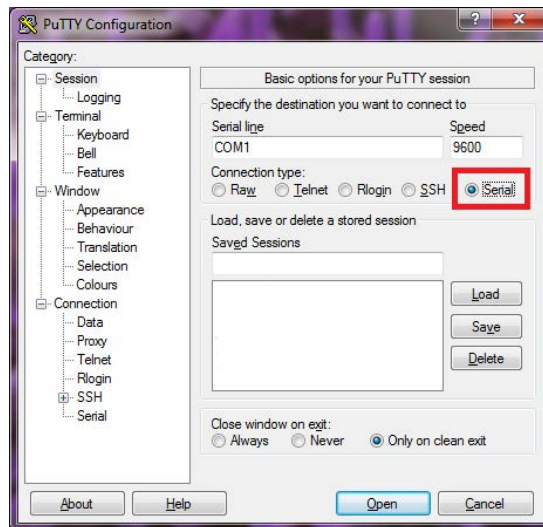
b. In the **Serial Line** field, enter the assigned COM port from step *3*.

c. In the **Speed** field, enter the default baud rate of 115200.

NOTICE: If the baud rate that is set on the console configuration does not match the baud rate set on the CGV sensor, then the console terminal window will open but commands cannot be sent. The factory default baud rate is 115200.

Figure 4.10—Set the COM port and the Baud Rate
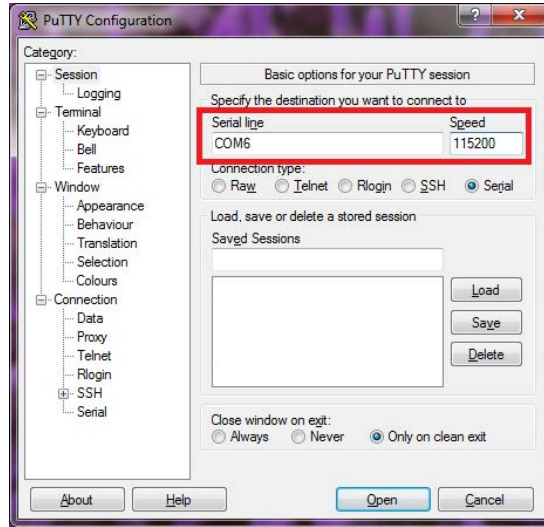
d. Select **Open**.

e. After a terminal window opens, the user can then start entering commands.

f. After a command is entered from *Section 6—RS485 Serial Console Interface*, press the (enter) key to send the command.

NOTICE: Commands which are entered are not case sensitive.

Figure 4.11—PuTTY Terminal Window

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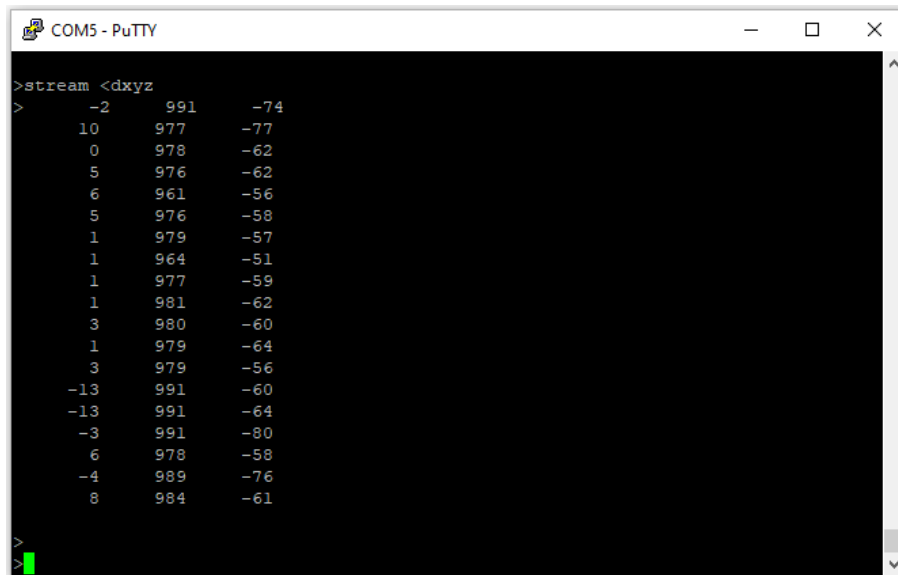
5. Operation

These operating instructions are intended to help system integrators program their robots and make a functional robotic work cell with a finishing tool. System integrators must be generally familiar with the task of surface finishing and have extensive knowledge of robots and robotic automation.

5.1 Tool Working Environment

Only use the CGV with a robot in a secured work cell/chamber.

Secure the work cell with barriers to stop people from entering during operation. The barriers should have a lockable door to only allow authorized people to enter. The barriers could be made partly or fully of Plexiglas so that people can watch the deburring operations from outside the work cell.

For system or tool maintenance, verify that the CGV and robot have stopped before entering the work cell. During installation and testing, no one should be in the work cell as the CGV is operating.

Be aware of rotating parts. Use eye-protection while working around the CGV.

Be aware of high sound levels. While the CGV air motor is not loud, the cutting action is loud from grinding frequently. Always use hearing protection while working near the cell.

5.2 Safety Precautions

⚠	**DANGER:** Never use the CGV for purposes other than automated processes. Never use the CGV as a hand-held machine.
⚠	**DANGER:** Never use the CGV in a manner to produce radial loads. If a failure occurs due to forces caused by improper use, hazardous situations for both people and equipment could be created.
⚠	**WARNING:** All people, who are involved in the operation of the CGV, should have a thorough understanding of the operating procedures. Failure to follow these procedures or neglecting safety precautions can create hazardous situations that may injure people or damage the deburring installation and the CGV.
⚠	**WARNING:** Never operate the CGV without wearing hearing protection. High sound levels can occur during grinding. Failure to wear hearing protection can cause hearing impairment. Always use hearing protection while working near the finishing tool.
⚠	**WARNING:** Never operate the CGV without wearing eye protection. Flying debris can cause injury. Always use eye protection while working near the finishing tool.
⚠	**CAUTION:** Do not use replacement parts other than original ATI replacement parts. Use of replacement parts not supplied by ATI can damage equipment and void the warranty. Always use original ATI replacement parts.

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5.3 Normal Operation

Recommended operating conditions for the CGV are described in the following sections.

5.3.1 Air Quality

The motor's supply air should be clean, lubricated, dry, and filtered. Use a coalescing filter that has elements rated for 5 micron or better. The motor supply air must be 90 psi (6.2 bar).

The compliance component's supply air should be clean, dry, and filtered, but not lubricated. Compliance air should not exceed 40 psi (2.75 bar).

Air quality can greatly affect tool performance. Particulates can block airflow or slow motion. Any water in the system damages the housing and pneumatic drives.

5.3.2 Lubrication

To the motor supply air, apply one to two drops per minute of turbine oil that is ISO VG32 or equivalent. Operating the CGV-900 vane motor with lubrication in the motor supply air maximizes the motor life.

5.3.3 Media Selection

Do not use media that requires radial loading (refer to *Section 10—Specifications*).

Media selection is highly dependent upon the material and geometry of the workpiece and the amount of material to be removed. Do not use media that is rated below the CGV-900 idle speed.

5.3.4 CGV Approach Path Should Be Slow and at an Angle

Power on the CGV before it contacts the workpiece. The CGV's approach to the workpiece should be slow and broadly angled to the surface.

If the tool approaches the workpiece too quickly, then the tool bearings will scar and wear sooner: the unit will fail prematurely. Also, collisions could result and create a hazardous situation for both people and equipment in the work cell.

5.3.5 No Radial Loads

Only apply forces in the direction of compliance motion. Forces applied perpendicular to the axis of compliance will overload linkage and wear bearings.

5.3.6 Program the Robot to Incorporate 50% Compliance Travel of the Tool

Program the robot to have the tool's compliance at 50% travel when on the nominal path.

As the part's surface deviates from the perfect path, the CGV wheel can use compliance to follow along high and low spots without losing contact or hitting the positive stop and gouging.

Do not "bottom out" the compliance, hitting the positive stop.

Repeated impacts on the positive stop can damage the compliance mechanism and motor.

5.4 Gravity Compensation

The CGV-900 sensing option supports gravity compensation. This feature allows the tool to apply consistent force to the work piece by automatically adjusting its compliance force as the tool's orientation changes during operation. An internal sensor tracks the tool's movements and detects its rotation about the X or Y axis.

As this rotation occurs, a signal is sent from the sensor to a programmable regulator. Based on this signal, the regulator adjusts the air pressure supplied to the retract air inlet. Because of this increase or decrease in air pressure, the tool can compensate for the changing forces applied to the work piece by the weight of the CGV-900 motor assembly.

5.5 LEDs Normal Operation

CGVs with the sensor kit have LEDs on the side of the compliance assembly indicate the tool position and notify users of when the tool is in a safe travel zone.

Figure 5.1—LEDs
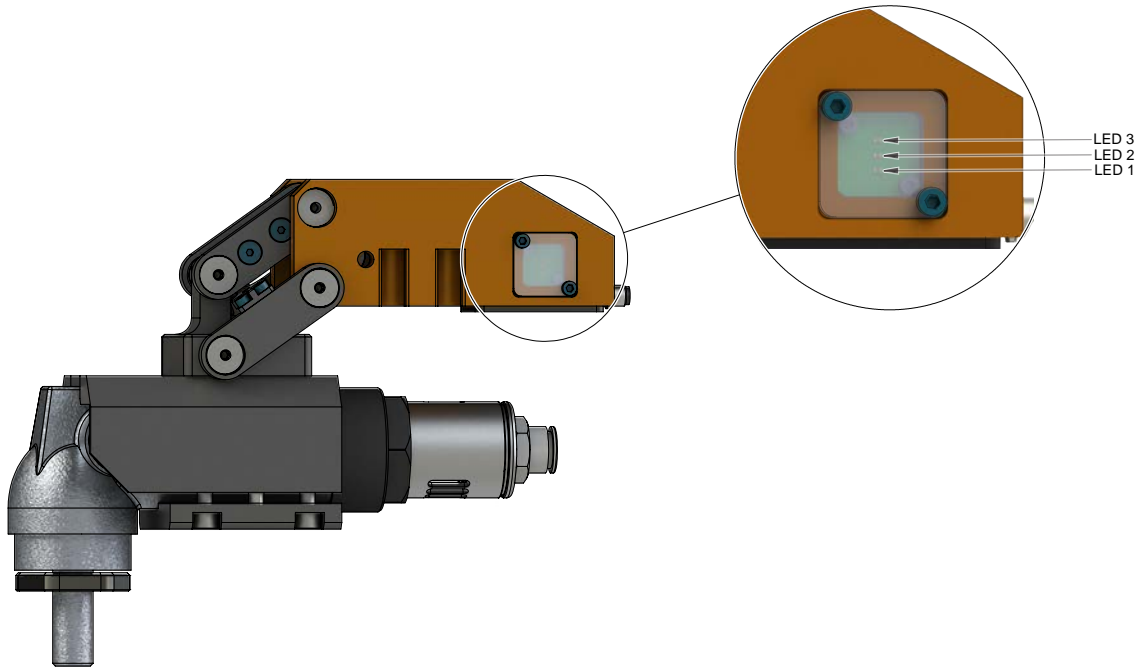
	Full Extend (> 95% Extension)	Start of Travel (Extension > 70% and <= 95%)	Safe Travel Zone (Extension >= 30% and <= 70%)	End of Travel (Extension >= 5% and < 30%)	Robot Crash (< 5% Extension)
LED 1	🟥	🟥			
LED 2		🟩	🟩	🟩	
LED 3				🟥	🟥

6. RS485 Serial Console Interface

6.1 Serial Console Commands

These commands can be used to view the status, parameters, and adjust settings of the sensor assembly with a program like PuTTY (available online) at a default baud rate of 115200. For instructions on setting up a serial console, refer to *Section 4.8—Set-up of the RS485 Communication Interface*.

Command	Operand(s)	Description
Table 6.1—Serial Console Commands		
?	N/A	Print help text.
H		
Help		
Man		
SysVer	N/A	Print firmware version.
Set / Cal	No Operand	Read all parameters.
	[parameter name]	Read all parameters that match the input parameter name; refer to *Table 6.2*.
	[parameter name][value]	Write a new value to the parameter matching input parameter name; refer to *Table 6.2*.
MANCAL	N/A	Precisely calibrate the position sensor. Run this command multiple times to complete the calibration process.
FASTCAL	N/A	Calibrate the position sensor. Run this command multiple times to complete the calibration process.
SaveAll	N/A	Save all changes to parameters.
Flow	N/A	Display current data during each step of main signal flow.
Status	N/A	Display status report.
LEDTest	N/A	Run startup LED test. A response is not returned.
Reset	N/A	Reset MCU (Microcontroller Unit)
Stream		Stream data over console interface with all or a combination of these operands: `[HDBXYZTP%OR]`.
	X	Raw accelerometer X axis.
	Y	Raw accelerometer Y axis.
	Z	Raw accelerometer Z axis.
	I	Filtered accelerometer X axis.
	J	Filtered accelerometer Y axis.
	K	Filtered accelerometer Z axis.
	R	Prints the DAQ regulator output.
	O	Prints the DAC position.
	%	Position.
	P	Raw hall effect sensor.
	F	Filtered hall effect sensor.
	T	Temperature.
	#	Line counter.
	S	Checksum.
	H	The data is displayed as a hexadecimal number.
	D	The data is displayed as a decimal number. This setting is a default.
	B	The data is displayed as a binary number.

Table 6.1—Serial Console Commands		
Command	**Operand(s)**	**Description**
Stream	>	Compressed: The data is displayed in a formatted human-readable output, for example: lined-up columns. ">" is the default setting.
	<	Formatted: The data is displayed in a compressed output that has no leading zeros, trailing zeros, or unnecessary blanks. This output is intended for high-speed applications that are used in an automated setting.

6.2 Help Command: "help", "h", or "?"

The help command reports a list of the main commands and software version.

"h" command format:

user: h

response:

```
================================================================

ATI Compliant Angle Grinder

Version: 1.0.6-next+5906-ge7978addf => BL=3

=> Enter most commands without operands to display current status.

================================================================

HELP      [string] => Print help for commands that start with
the given string

SYSVER    => Print version

SET       => Print all fields

SET       [field-name] => Print matching field(s)

SET       [field-name] [value] => Write field with value

RESET     => Reset the MCU

STATUS    => Print Status Report

SAVEALL   => Save all parameters to NVM

FLOW      => Signal Flow Report

LEDTEST   Cycle through LEDs

MANCAL    Manually calibrate the position.  Run command multiple times to
complete manual calibration process.

STREAM    [HDBXYZTP%OR in any order] => Continuous mode

STREAM    H=Hex D=Decimal B=Binary XYZ=Accelerometer Axes T=Temperature

STREAM    P=HallEffect %=Position% O=DAC Position R=DAC
Regulator S=checkSum

STREAM    '>'=condensed '<'=formatted #=LineCounter !=StatusWord

STREAM    Press multiple keys to exit

================================================================

>
```

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6.3   MANCAL Command

The MANCAL command calibrates the CGV more precisely than the FASTCAL command. However, the process is more intricate and takes more time to complete. To calibrate with the MANCAL command, follow these steps:

1.   Run the MANCAL command.

2.   Move the main housing to the fully extended position.

3.   Run the MANCAL command.

4.   Move the main housing by 3 degrees towards the retracted position.

5.   Run the MANCAL command.

6.   Repeat Step 4 until the main housing is in the fully retracted position (approximately eleven times) and the MANCAL command is run for the final time.

The calibration process is now complete. If an error occurs during calibration, the system discards erroneous calibration data, and LED 1 and LED 3 flash three times. A calibration error could occur if the main housing was not moved in Step 4, or if the main housing was moved in the wrong direction.

6.4   FASTCAL Command

To calibrate with the FASTCAL command, follow these steps:

1.   Run the FASTCAL command.

2.   Move the main housing to the fully retracted position.

3.   Run the FASTCAL command again.

4.   Move the main housing to the fully extended position.

5.   Run the FASTCAL command again.

The calibration process is now complete.

6.5   Save All Command: "saveall"

The "saveall" command records all values that remain through a power cycle to NVM.

"saveall" command format:

```
user:        saveall
response:    Parameters saved to NVM bank 0
             Parameters saved to NVM bank 1
```

6.6 Flow Command: "flow"

During a step of the main flow, users can observe the following parameter data (the content may vary among CGV sensor assemblies):

user: `flow`

response:

```
>flow
Accelerometer                    17 mg    985 mg     -2 mg
Filtered Accl                    25 mg    987 mg    -15 mg
Temperature                    52.3443  C
Hall Effect                      1652 mV
Filtered Hall                    1651 mV
Position %                     50.0303  %
DacPosition                    5.00303  V
Angle                          17.5957 degrees
GravityComp                   0.391877  %
DacRegulator                 0.0195939  V
 38 RF3  SPARE1           Tied low
>
```

6.7 Status Command: "status"

If there could be an underlying problem within the CGV sensor assembly hardware, the "status" command can be used to retrieve detailed information or for the user to send the information to ATI for troubleshooting.

"status" command format (the content may vary among CGV sensor assemblies):

user: status

response:

```
>status
NVM-Image-0 Good  523 Kbytes
NVM-Image-1 ----  523 Kbytes
SPI-Param-0 Good  284  bytes
SPI-Param-1 Good  284  bytes
RAM-Param   Good  284  bytes
MCU-RAM     ----  512 Kbytes Errors: 0
Stack       Good  438 Kbytes available
UART        ---- 115.4 KHz RX faults: 0
SPI-ACCL    ----    8.4 MHz
SPI-DAC     ----   21.0 MHz
SPI-EEPROM  ----    8.4 MHz
MCU-Clock   Good 168.0 MHz
Background  ---- 185.6 KHz   5.2  sec Max: 25823.9  sec Overruns: 0
ISR-APP     ---- 997.3  Hz  45.4  sec Max:   96.0  sec Overruns: 0
MCU-Part    Good PIC32MZ2048EFH064 A1 S/N: 8f9fd880 39c4f904
MCU-Mode    Good Mode=Run Protection=On
MCU-FPU     ---- ID=a7 REV=32 UFRP=1 FC=1 HAS08=1 F64=1 L=1 W=1 3D=0 PS=0 D=1
S=1 FS=1 FO=0 FN=0 MAC=0 ABS=1 NAN=1 RM=0
MCU-WatchDg ---- Timeout: 62500.0  sec Windowed: Off
MCU-RCON    Good
MCU-Regs    Good
MCU-PC      Good
MCU-GPIO    BAD  Stuck bits:
MCU-Supply  Good  24.0 V
PCB-Temp    Good  52.3 *C
ACCL-RegWr  BAD
DAC1        Good
DAC2        Good
Cal-Status  ----
EEPROM      Good Type: 24-bit Tries: 1


Pin GPIO Name               Details
--- ---- ----               -------
```

6.8 Reset Command: "reset"

The "reset" command resets the MCU.

"reset" command example format (the content may vary among CGV sensor assemblies):

user: `reset`

response:

```
========================================================================
ATI Compliant Angle Grinder
Version: 1.0.6-next+5906-ge7978addf => BL=3
=> Enter most commands without operands to display current status.
========================================================================
HELP     [string] => Print help for commands that start with
the given string
SYSVER   => Print version
SET      => Print all fields
SET      [field-name] => Print matching field(s)
SET      [field-name] [value] => Write field with value
RESET    => Reset the MCU
STATUS   => Print Status Report
PINS     => Print Pins report
GPIOS    => Print GPIO configuration report
SAVEALL  => Save all parameters to NVM
FLOW     => Signal Flow Report
LEDTEST  Cycle through LEDs
MANCAL   Manually calibrate the position.  Run command multiple times to
complete manual calibration process.
STREAM   [HDBXYZTP%OR in any order] => Continuous mode
STREAM   H=Hex D=Decimal B=Binary XYZ=Accelerometer Axes T=Temperature
STREAM   P=HallEffect %=Position% O=DAC Position R=DAC
Regulator S=checkSum
STREAM   '>'=condensed '<'=formatted #=LineCounter !=StatusWord
STREAM   Press multiple keys to exit
========================================================================
>SPI EEPROM POST: Good 24-bit
SPI EEPROM Parameter status: copy 0 Good, copy 1 Good
```

6.9 Stream Command: "stream [HDBXYZTP%OR]"

The following is an example of the "stream" command with specifiers "d" (decimal), "#" (line counter), "x" (raw acceleration X axis), "y" (raw acceleration Y axis), and "z" (raw acceleration Z axis):

Note that the content may vary among CGV sensor assemblies. To stop streaming, press the 'enter' key several times.

user: stream d#xyz%

response:

```
>    0       21      982     -27     50.030
     1       26      988     -28     50.000
     2       16      982     -29     50.030
     3       22      981     -25     50.030
     4       21      982     -30     50.061
     5       22      982     -28     50.030
     6       26      989     -21     50.061
     7       18      982     -31     50.061
     8       25      991     -23     50.030
     9       23      985     -25     50.030
    10       21      986     -28     50.000
    11       27      988     -20     50.030
    12       19      978     -31     50.030
    13       46      980     -19     50.030
    14       44      979     -18     50.030
    15       27      990     -19     50.030
    16       21      983     -30     50.030
    17       21      985     -29     50.061
    18       41      980     -27     50.061
    19       24      986     -28     50.000
    20       23      986     -30     50.000
    21       23      986     -24     50.030
    22       19      981     -27     50.030
    23       26      991     -23     50.061
    24       19      981     -30     50.030
    25       20      989     -26     50.030
    26       19      983     -24     50.061
    27       28      983     -42     50.061
    28       17      984     -30     50.061
    29       25      988     -19     50.061
    30       22      981     -31     50.000
    31       25      983     -19     50.030
    32       18      986     -22     50.030

>
```

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6.10 Set/Cal Commands

The following fields can be called after entering "Set" or "Cal" to read the current value of a field or write a new value to writable fields.

Table 6.2—Set/Cal Commands						
Field	**Long Name**	**Type**	**Description**	**Default Value**	**Example Contents**	**User Read/ Write**
paramWrites	Parameter Writes	Uint16	Number of times parameters were saved to NVM	0	0	Read only
filTcAccl	Accelerometer filter time constant	Uint16	Accelerometer IIR filter shift constant	6	6	Read/ Write
filTc	Hall effect sensor filter time constant	Uint16	Hall effect sensor IIR filter shift constant. For available values, refer to *Table 6.3*.	3	3	Read/ Write
Location	Location	String (40)	Intended to add comment about physical location	insert your location here	cell A	Read/ Write
serNum	Serial Number	String (100)	Product serial number	Serial Number	Serial Number	Read only
hwProdCode	Hardware product code	String (20)	Hardware productcode	HW Product Code	HW Product Code	Read only
hwRev	Hardware revision	Uint16	Hardware revision	0	0	Read only
baud	Serial baud rate	Uint32	Serial console baud rate	115200	115200	Read/ Write
Msg	Message	Uint8	1=Print all messages 0=Print only prompted messages	0	0	Read/ Write
productName	Product name	String (32)	Product name	ATI Compliance Assembly	ATI Compliance Assembly	Read only
posOutputRange	Position Output Range	Uint16	Analog output ranges: 5=0-5 V (default) 10=0-10 V 20=4-20 mA	5	5	Read/ Write
regOutputRange	Regulator Output Range	Uint16	Analog output ranges: 5=0-5 V (default) 10=0-10 V 20=4-20 mA	10	10	Read/ Write
toolMass	Tool Mass	Float	Weight of the attached tooling in lbs.	5	5	Read/ Write
maxRegulatorPSI	Max Regulator PSI	Float	Maximum air pressure (PSI) the regulator can apply.	70	70	Read/ Write

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Table 6.2—Set/Cal Commands						
Field	**Long Name**	**Type**	**Description**	**Default Value**	**Example Contents**	**User Read/ Write**
Lin0	Linearization Values	Uint16	Position sensor calibration data	0	0	Read/ Write
Lin1				275	275	
Lin2				550	550	
Lin3				825	825	
Lin4				1100	1100	
Lin5				1375	1375	
Lin6				1650	1650	
Lin7				1925	1925	
Lin8				2200	2200	
Lin9				2475	2475	
Lin10				2750	2750	
Lin11				3025	3025	
Lin12				3300	3300	

6.11 Filter "filTC" Parameters

The user can adjust the IIR filter shift constant or value by applying a filter with a low-pass frequency cutoff:

Table 6.3—filTc Parameters	
Selected Filter Parameter Value	**Low-pass frequency cutoff**
0	No filter
1	119.7 Hz
2	46.6 Hz
3	21.7 Hz
4	10.4 Hz
5	5.1 Hz
6	2.6 Hz
7	1.2 Hz
8	0.7 Hz-

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6.12 Baud Rate Command: "set baud

The user can set the baud rate of the CGV sensor assembly. The default baud rate is 115200.

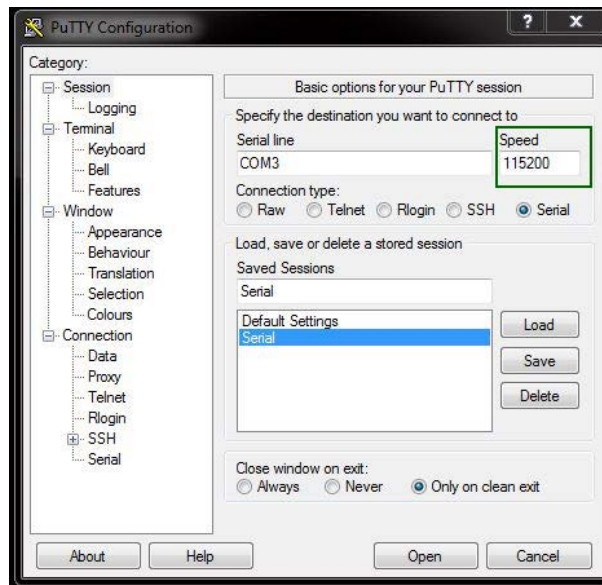"set baud" read and write command format:

```
user:       set baud
response:  Field           Value

           -----           -----

           baud            115200
user:       set baud 460800
response:   baud was 115200 now 460800
           Changing console baud rate to 460800.
           Change your baud rate to now!
```

The response "to change your console baud rate to match" refers to the *speed* field in *Figure 6.1*, which shows PuTTY but may be different if another console is used.

Figure 6.1—Changing the Speed to Match the "set baud" Rate

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7. Maintenance

7.1 Routine Operational Maintenance

When keeping to normal use, the CGV provides many hours of operation before service or repair is necessary. When under high shock loading or periods of continuous service without interruption, the CGV requires service or repair sooner than normal. It is recommended to return the CGV to ATI for service.

If the painted torque marks on the bolts and upper and lower crossbars have become misaligned, check that the crossbars are properly torqued. If the bolts are coming loose, re-torque the bolts (refer to *Section 4.4.3— 90° Mounting Bracket (ATI P/N 9005-50-6274)*).

Check that the robot's program for the tool's path is not causing increased loads and vibrations, which leads to early tool failure. For more information on how to select the best route for the tool, refer to *Section 5—Operation*.

For all service, it is recommended that the electrical connections be disconnected. Drain any trapped air pressure in the lines. To prevent accidental operation of the compliance component, lock-out air and electric lines. During maintenance operations, refer to *Section 11—Drawings*.

7.1.1 Gearhead Assembly Maintenance

Every 100 hours of normal operation, lubricate the gearhead assembly. Refer to the following procedure:

Tools required: *Phillips head screw driver*

Supplies required: *Lithium Grease Extreme Pressure NLGI-2 or equivalent*

1. Use a phillips head screw driver to remove the screw from the gearhead.

2. Inject Lithium Grease Extreme Pressure NLGI-2 or equivalent into the screw hole.

3. Install the screw back into the gearhead.

Figure 7.1—Gearhead Grease Maintenance

Remove screw.

Inject Lithium Grease Extreme Pressure NLGI-2 or equivalent.

Gearhead
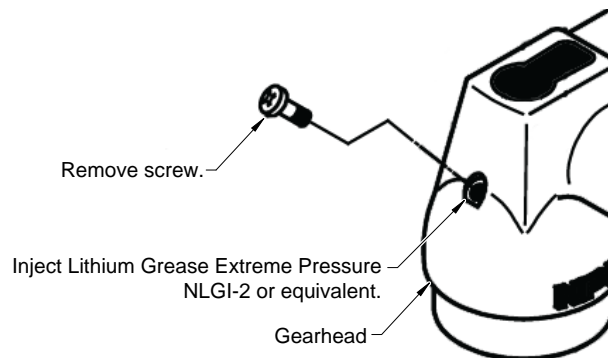
7.2 Media Replacement

Check the quality of the media regularly to ensure it is not dull or worn. Using worn media causes an undesirable surface finish and increases wear on the bearings that results in early tool failure.

Tighten all fasteners when completing maintenance. When replacing media, securely install the media. Ensure the threaded connection is tightened per the media manufacturer's recommendation. For guidance on how to properly secure the media to the CGV, always refer to the manufacturer of the media.

7.3 Utilities

Routinely check the condition of the air tubing, fittings, and electrical lines to the unit. Replace these utilities as required. The lines must be flexible to allow free motion, when the unit is mounted to a moving surface or robot. The air supply to the motor must be clean, dry, and lubricated. The air supply to the compliance component should be clean, dry, and not lubricated. The life of the filter depends on the quality of compressed air at the user's facility.

8. Troubleshooting and Service Procedures

Troubleshooting guidance is in the following section to help resolve issues that might arise. Service procedures are provided for recommended replacement components.

8.1 Troubleshooting for Material Finishing

For assistance when solving finishing problems, refer to the following table:

Table 8.1—Troubleshooting Material Finishing		
Symptom	**Cause**	**Resolution**
Unequal compliance	Defective regulator	Replace defective regulator
Poor finish	Travel rate is too fast	Reduce travel rate
	Media is worn	Replace media
	Speed incorrect for media	Confirm recommended speed for media and adjust setting on CGV.
Motor Stalls	Too much compliance force	Decrease compliance force and make multiple passes
	Compliance bottom out	Examine/correct path

8.2 Troubleshooting for the Sensor Assembly

For assistance when solving sensor assembly or serial communication issues, refer to the following table:

Table 8.2—Troubleshooting Sensor Assembly or Serial Communication Interface		
Symptom	**Cause**	**Resolution**
The sensor assembly (LEDs) are not responsive.	The sensor has insufficient power supply.	Verify the power supply meets the requirements listed in *Section 10—Specifications*. Verify the cables are not damaged and are properly routed.
	The sensor has a hardware or software failure.	Observe the LEDs; refer to *Section 5.4.1—LEDs Normal Operation*.
The sensor assembly is connected but not streaming data.	The user's devices are not compatible with real time RS485 communication.	Verify devices are compatible; refer to *Section 4.8—Set-up of the RS485 Communication Interface*.
	The current baud rate of the user's device does not match the current baud rate of the sensor.	Verify the baud rate is properly set; refer to the "baud" field in *Table 6.2* or *Section 6.12—Baud Rate Command: "set baud*.
	The sensor has had a hardware or software failure.	Observe the LEDs; refer to *Section 5.4.1—LEDs Normal Operation*.

8.3 Service Procedures

The following service procedures provide instructions for component replacement, when the user chooses to service the unit in the field. For all service, the user should disconnect the air supply to the solenoid valves and vent trapped air pressure from the lines. This step prevents accidental operation of the motor.

> ⚠ **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.

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8.3.1 Media Installation

Refer to *Figure 8.1*.

Parts required: *Refer to Section 9—Parts and Accessories.*

Tools required: *spanner wrench or box wrench, clean rag*

1. Disconnect power and air supply lines to the CGV.
2. Use clean rag to wipe dust and debris from mounting surfaces.
3. Press and hold the button on the gearhead, then fit the media to the arbor shaft. The button locks the arbor so the media can be torqued appropriately.
4. Tighten the media to the shaft according to media specifications:
   - If media requires a lock nut to fasten to arbor shaft, use appropriately sized wrench, or supplied spanner wrench, to tighten lock nut after fitting the media on to the shaft.
   - If no additional fasteners are necessary, tighten and secure media manually.
   - Always refer to the media manufacturer's instructions for the specific type of media.
5. Release button on the top of the gearhead when the media is secured to the arbor shaft.
6. Reconnect air and position sensing lines.
7. Safely resume normal operation.

8.3.2 Media Removal

Refer to *Figure 8.1*.

Tools required: *spanner wrench or box wrench*

1. Disconnect power and air supply lines to the CGV.
2. Press and hold the button on the gearhead, then remove the media from the arbor shaft. If necessary use the appropriate tools for the media type to loosen the media.
3. Release the button only when the media is completely removed from the arbor shaft.
4. Use clean rag to wipe dust and debris from the CGV mounting surfaces.

Figure 8.1—Installing and Removing Cutting Media
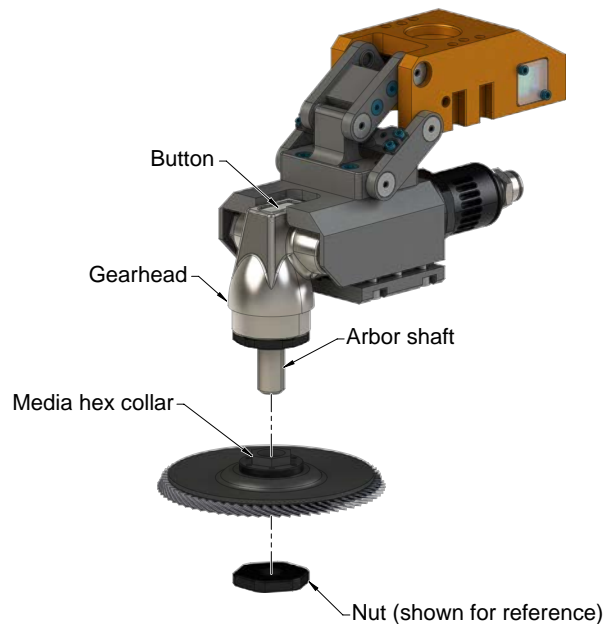
9. Parts and Accessories

Refer to *Section 11—Drawings* for exploded drawings that show the user replaceable components of the CGV. Available accessories, tools, and replacement parts are listed in the following section. All other repairs must be performed by ATI.

9.1   Replacement Parts

Table 9.1—Accessories and Tools		
ATI Part Number	**Quantity**	**Description**
3405-2220021-01	2	Compliance Air Fitting
3405-1210032-01	1	Supply Air Fitting (English)
3405-1230022-01	1	Supply Air Fitting (Euro)
9005-50-6273	1	Exhaust Assembly - includes (2) set screws, snap ring, and exhaust muffler
9005-50-6168	1	Precision Regulator for compliance
9005-50-6267	1	CGX Compliance Bolt-up interface plate kit for the top mounting surface; refer to *Table 4.1*.
9005-50-6274	1	90° Mounting Bracket; refer to *Table 9.2*.

Table 9.2—90° Bracket Kit (P/N 9005-50-6274)		
Part Number	**Quantity**	**Description**
3500-1066016-15A	4	M6-1 x 16mm socket head cap screw with pre-applied threadlocker
3540-0106014-11	2	6 mm x 14 mm dowel pin, alloy steel
3700-50-9284	1	90° mounting bracket, CGV-900

10. Specifications

Table 10.1—Specifications for the CGV	
Parameter	**Rating**
Weight total (w/o adapter)	9.00 lbs (4.08 kg)
Compliance travel	.98" / 25 mm
Compliance travel recommended	.49" / 12.5 mm
(f) Compliance Force (pneumatically variable)	0 –14 lbf[1] 0 – 61.3 N[1]
Idle Speed (RPM)	12000 RPM
Air Connection (Supply)	1/2" (12 mm)Tube
Air Connection (Compliance)	5/32" (4 mm) Tube
Spindle	5/8"–11
Power	900 Watts
Mounting Feature	Bolt Up / Bolt Down, 30 degree ISO 50 pattern

Note:

1. For the compliance force, these ratings do not include friction or the weight of the attached tooling.

Table 10.2—Power Supply for the Sensor Assembly				
Power Source	**Voltage**			**Power Consumption**
	Minimum	**Nominal**	**Maximum**	**Maximum**
DC Power	12 V	24 V	30 V	1.5 W

Note:

1. The power supply input is reverse polarity protected. If the power and ground to the power supply inputs are plugged in reverse, then the reverse polarity protection stops the incorrectly wired supply input from damaging or powering on the sensor.

Table 10.3—Optional Sensor Cable (P/N 9105-C-ZC27-ZC28) M8, 8-pin, Female Connector to M12 A-Coded, 8-pin, Male Connector	
Parameter	**Value**
Voltage Rating	> 30 V
Current Rating	> 0.25 A
IP Rating	IP67[1]
Operating Temperature Range (Min–Max)	-5 °C – 70 °C

Note:

1. The cable is rated IP67 when the cable is connected at both ends. The IP rating of the cable may exceed the IP rating of the CGV.

11. Drawings

Refer to ATI website for CGV customer drawing: *https://www.ati-ia.com/app_content/Documents/9630-50-CGV-900.auto.pdf*.

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12. 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 the compliant tool product will be free from defects in design, materials and workmanship for a period of one (1) year from the date of shipment and only when used in compliance with manufacturer's specified normal operating conditions. This warranty does not extend to tool components subject to wear and tear under normal usage; including but not limited to those components requiring replacement at standard service intervals.

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. This warranty is void if the unit is not used in accordance with guidelines presented in this document. 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.

12.1 Motor Life and Service Interval Statement

The air motors that are used in ATI deburring/finishing tools are subject to wear and have a finite life. Motors that fail, during the warranty period, will be repaired or replaced by ATI as long as there is no evidence of abuse or neglect and that the normal operating practices outlined in this manual have been observed.

Components such as: motor vanes, bearings, any gear reduction components, and collet nuts/chucks are considered consumable and are not covered by warranty. The customer should expect to service or replace these items at designated service intervals. For any part this is not detailed in this manual, contact ATI for part numbers and pricing.

Premature bearing failure can occur from exposing the deburring tool to coolants and water or impacts from collisions. Other failure modes that are outlined in the manual and relate to improper machining practices and deburring media selection.

12.1.1 Vane Motor Products

Vane type motors have a finite life and require regular service. At that time the customer should expect to replace the bearings and motor vanes. Any gear reduction components should also be inspected and replaced as necessary. Vane type motors perform best and longest when supplied with lubricated air. The service interval will be catastrophically shortened if the tool is ran without lubrication. The expected life of a properly lubricated vane motor in normal operation is entirely application dependent based on a multitude of factors. To maximize the life of a vane type motor products the customer should follow closely the normal operation guide in the product manual. The supplied air must be lubricated, and filtered to remove particulates and moisture. Premature bearing failure can occur from exposing the deburring tool to coolants and water or impacts from collisions. Other failure modes are outlined in the manual and relate to improper machining practices and deburring media selection.

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