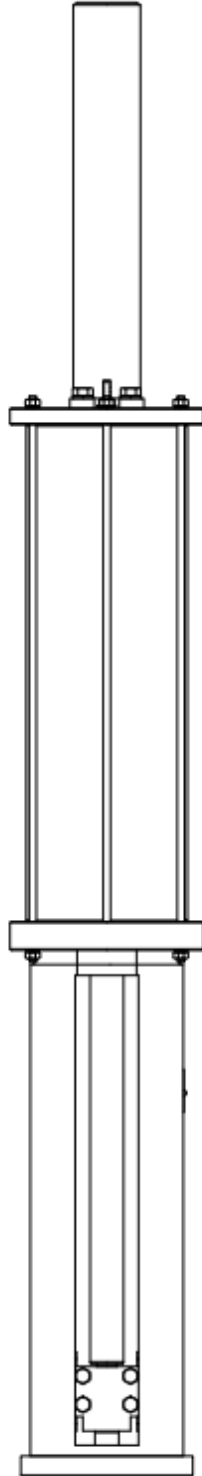


# **INSTALLATION, OPERATION & MAINTENANCE MANUAL**

## **Cushioning Pneumatic Double Acting (DA) Linear Actuators**





## *The Severe Service Standard in Valve Automation*

### **Table of Contents**

1. Introduction.....	3
2. Revision Record.....	3
3. WARNING STATEMENT.....	4
4. Storage and Preservation Instructions .....	4
5. Installation.....	5
6. Testing.....	7
7. Maintenance.....	7
8. Terms & Conditions/Warranty.....	10
Appendix.....	13
Appendix A – ATI Torque Tightening Guide .....	13

**1. Introduction**

**1.1. General Note**

Automation Technology, Inc. (ATI) was founded in 1995 as a manufacturer of pneumatic and hydraulic linear valve actuators. With products in a wide range of applications such as petro-chemical, pipelines, refineries, pulp and paper, food, drug, municipalities, mining, power plants and ships; ATI has succeeded in becoming The Severe Service Standard in the valve automation industry.

**1.2. Scope**

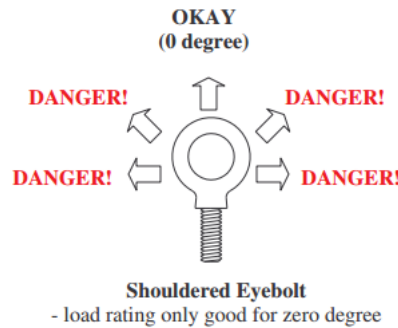
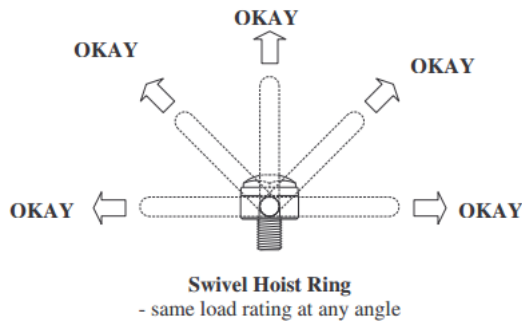
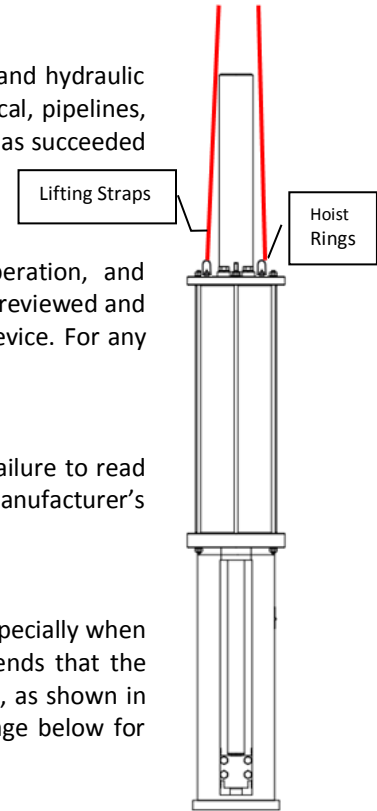
This manual is intended to assist those who are involved with the installation, operation, and maintenance of ATI Pneumatic Double Acting (DA) Series Actuators. This manual should be reviewed and thoroughly understood prior to installation, operation, or maintenance on the actuating device. For any questions or clarification please contact the manufacturer.

**1.3. Type**

This IOM Manual is strictly intended for ATI Cushioning Pneumatic DA Series Actuators. Failure to read and comply with installation, operation, and maintenance instructions will void the manufacturer’s warranty and may result in bodily injury or equipment damage.

**1.4. Receiving/Lifting**

Proper care and precautions should be taken when unloading and handling the actuator, especially when rigging and lifting. Ensure that the valve is not connected to the actuator. ATI recommends that the actuator only be lifted using appropriately rated hoist rings threaded into the upper head, as shown in the diagram to the right. Hoist rings are depicted above to show type only. Refer to image below for proper load angle orientation.



**1. Revision Record**

Rev. #	Issue Date	Description	Engr. Approval eSign & Date	Prepared by eSign & Date
A	1/28/14	Initial Release	David Leese, 1/28/14	Joseph Pollard, 1/28/14
B	8/4/14	Updated Section 1.4 Receiving/Lifting to recommend the use of hoist rings for the lifting of DA and SRR actuators (per ECN# 741)	D. Rojas, 8/4/14	J. Pollard, 8/4/14

## 2. WARNING STATEMENT

BEFORE ATTEMPTING TO INSTALL, OPERATE, SERVICE, OR PERFORM MAINTENANCE ON ANY ATI ACTUATOR, ALL PERSONNEL INVOLVED SHOULD READ AND THOROUGHLY UNDERSTAND THIS MANUAL. THIS MANUAL DOES NOT CLAIM TO ADDRESS ALL SAFETY FACTORS ASSOCIATED WITH ATI ACTUATORS. IT IS THE RESPONSIBILITY OF THE USER TO ENSURE PROPER SAFETY, ALWAYS TAKE NECESSARY PRECAUTIONS AND UTILIZE PROPER PERSONAL PROTECTIVE EQUIPMENT (PPE) WHEN DEALING WITH COMPRESSED GAS, COMPRESSED HYDRAULIC FLUID, PINCH POINTS, AND ELECTRICITY.

VALVE AND ACTUATOR MUST BE RIGGED AND LIFTED SEPARATELY, NEVER AT THE SAME TIME. BEFORE RIGGING, ENSURE THE CRANE/HOIST/RIGGING HARDWARE LIFTING CAPACITY CAN SAFELY ACCOMMODATE THE DESIRED LOAD.

ACTUATORS AND VALVES COME INTO CONTACT WITH CAUSTIC GASES AND FLUIDS IN MANY APPLICATIONS. AS A RESULT, ALL TOXIC OR FLAMMABLE FUMES MUST BE VENTED AND LIQUIDS MOVED TO A SAFE LOCATION. THIS WILL HELP PREVENT PERSONNEL INJURY. THE INSTANTANEOUS RELEASE OF PRESSURE AND VENTING CAN PRODUCE NOISES DUE TO THE DISCHARGE AT SONIC VELOCITY. IT IS THE USER'S RESPONSIBILITY TO UTILIZE APPROPRIATE PROTECTION AGAINST HEARING DAMAGE TO ANY AND ALL NEAR THE ACTUATOR.

SPRING IS UNDER COMPRESSION. DO NOT ATTEMPT TO ADJUST OR DISMANTLE ANY PART OF THE SPRING MECHANISM WITHOUT CONSULTING THE MANUFACTURER, DOING SO MAY RESULT IN SEVERE INJURY OR EVEN DEATH. WHEN OPERATING DEVICE, ENSURE THAT ALL BODY PARTS, TOOLS, AND FOREIGN OBJECTS ARE CLEAR OF THE ACTUATOR'S ADAPTION BRACKET.

WARNING LABELS AND TAGS LOCATED ON THE ACTUATOR ARE MADE OF METAL FOILS THAT VARY IN THICKNESS. BECAUSE THE METAL TAGS HAVE SHARP EDGES, PERSONNEL INSTALLING, HANDLING, OR WORKING AROUND THE TAGS SHOULD PROTECT AGAINST CUTS OR INJURY.

PROPER INSTALLATION OF THE ACTUATOR IS CRITICAL TO PERFORMANCE AND SAFETY. DUE TO THE MANY VARIATIONS OF LINEAR ACTUATORS AND VALVES, THE FOLLOWING ARE GENERAL INSTRUCTIONS. THE TECHNICIAN FOLLOWING THESE INSTRUCTIONS MUST BE COMPETENT, TRAINED, AND HAVE A WORKING KNOWLEDGE OF VALVE ACTUATORS AND VALVES.

FOLLOWING THE ABOVE INSTRUCTIONS WILL HELP IN PREVENTING PERSONAL INJURY, PROPERTY DAMAGE, AND DAMAGE TO THE ACTUATOR.

## 3. Storage and Preservation Instructions

- 3.1. **CAUTION:** Actuators should not be stored in environments harmful to resilient seals. Never use any form of abrasive when cleaning rod surfaces.
- 3.2. Actuator(s) should be stored in the vertical position.
- 3.3. When actuators are stored, piston rods are often exposed to the outside elements for extended periods without cycling. Identify all exposed piston rod areas and pressure ports.
- 3.4. Pressure ports are plugged with plastic plugs during manufacturing/assembly. These plastic plugs should be removed and replaced with steel plugs; a pipe thread sealant such as should be applied to steel plug threads.
- 3.5. Using a soft cloth dampened with an appropriate oil-based solvent: remove all dirt, dust, grease and contaminants from the exposed piston rod surface.
- 3.6. Inspect the piston rod for surface defects.
- 3.7. Apply a coating of rust preventative solvent to all exposed piston rod surfaces.
- 3.8. Periodically inspect the piston rod surfaces and apply additional rust preventative solvent as needed.
- 3.9. If the actuator will be moved and stored again, repeat the above steps.

For applications where the actuator is not put into immediate service it is recommended that the actuator be stored and preserved properly. Care should be taken to plug all open ports on actuator and controls to keep foreign particles and moisture from entering the actuator. Ideal actuator storage would allow for an indoor environment with a vertical storage position. For extended storage, please contact the manufacturer.

#### 4. Installation

An air filter with an automatic drain is recommended to maintain a dry and contaminate free air supply to the actuator. If the actuator is to be cycled more than 10 times a month, an oil lubricator is recommended.

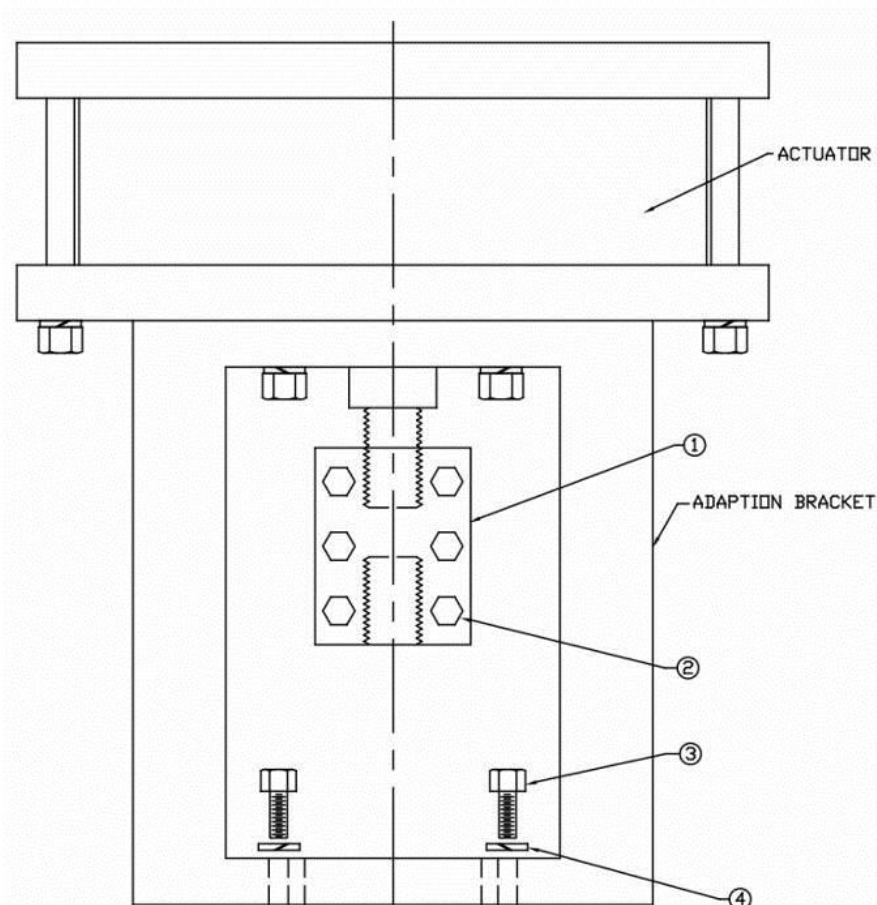
##### 5.1. HORIZONTAL INSTALLATION

Special care must be taken when installing an actuator to a horizontal service orientation. To avoid cantilever loads on the valve stem and adaption bracket, it is the customer's duty to ensure proper support for the horizontal actuator. For proper design of actuator supports, consult factory for dimensional location of the actuator center of gravity.

##### 5.2. SPLIT COUPLING

###### INSTALLATION PROCEDURE: (FULL CLOSE POSITION)

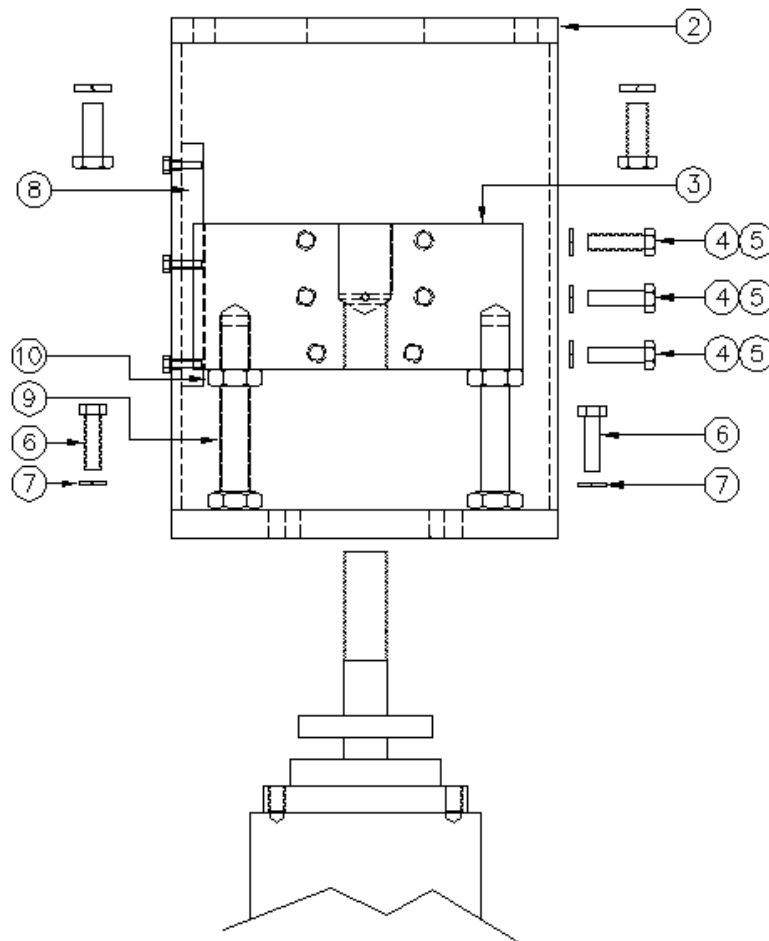
1. Position the subject valve to the full close position (tight shut off).
2. Remove the valve handwheel and handwheel drive assembly. (See Valve Assembly/Disassembly Instructions).
3. Position the Actuator in the full close (fully extended) position. (For DA and SRR models, this can be done by installing a block valve in the closing port and applying air pressure). This applies to the DA and SRR models only.
4. Install two (2) ¼" shims, 180 degrees apart between the Actuator Adaptation Bracket and Valve flange, and install the Cap Screws. This method will ensure that there will be reserve actuator stroke, so that the valve will always be fully seated when closed.
5. Remove the Coupling Block (ITEM 1) by removing (ITEM 2) cap screws.
6. Install the Adaptation Bracket onto the valve. The hardware may vary depending on the application and type of valve being actuated.
7. Install the Coupling Block (ITEM 1) on to the valve stem and Actuator piston rod (split coupling block) using cap screws (ITEM 2).
8. Install and tighten the (ITEMS 3,4,) fasteners. Fastener types and mounting positions may vary depending on your application.
9. Loosen Cap Screws connecting the Actuator Lower Head and Bracket, remove the two (2) shims previously installed and tighten Cap Screws.
10. Cycle Actuator fully open and fully closed. Ensure full stroke and smooth operation.



### 5.3. ADJUSTABLE STOPS, SPLIT BLOCK

#### INSTALLATION PROCEDURE (FULL CLOSED POSITION)

1. Position the subject valve to the full closed position (TIGHT SHUT OFF).
2. Remove the valve hand wheel and hand wheel drive assembly. (SEE VALVE MANUFACTURERS ASSEMBLY/DISASSEMBLY INSTRUCTIONS).
3. Position the actuator in the full closed position (Piston rod (item 1) fully extended). This can be done by installing a block valve in the closing port and applying air pressure.
4. If applicable, remove the final adaptation assembly (This assembly configuration varies per application) from the bottom of the basic adaptation bracket (item 2).
5. If applicable, install final adaptation on subject valve.
6. Remove the position indicator guide, screws and lock washers, if items exist on basic adaptation.
7. Remove the position indicator from the split coupling block (item 3).
8. Remove split coupling block (item 3) by removing bolts (item 4) and lock washers (item 5).
9. Position the actuator and the basic adaptation to the final adaptation or the valve as per application. Attach with the appropriate fasteners (items 6 & 7) the recommended torque specs.
10. Install split coupling block (item 3), by clamping on valve stem and piston rod (item 1) threads. Coupling block groove must be clamped over split block guide (item 8).
11. Reinstall bolts (item 4) and lock washers (item 5). Tighten to the recommended torque specs.
12. Reinstall position indicator to split coupling block (item 3).
13. If applicable reinstall position indicator guide, screws and lock washers.
14. Cycle the actuator to check for full open and full close. Adjustments may be necessary.
15. Adjustments may be made by repositioning the stop adjustment bolts (item 9) in split coupling block (item 3). Loosen jam nut (item 10), then reposition the stop adjusting bolts (item 9), then cycle actuator for full open and full close.
16. Retighten jam nut (item 10) to split coupling block (item 3).



#### 5.4. ADJUSTABLE CUSHION

1. Control the speed control of the cushioning by adjusting the Adjustment Pins (ITEMS 17 & 18).
2. Loosen the Hex Nuts (ITEM 19).
3. Turn the Upper Adjustment Pin to the right (screw further in to the upper head) to restrict air flow through the cushion plate and slow the end of stroke in the open position (piston rod retracted into the cylinder).
4. Turn the Lower Adjustment Pin to the right (screw further in to the lower head) to restrict air flow through the cushion plate and slow the end of stroke in the closed position (piston rod fully extended out of the cylinder).
5. Tighten the Hex Nuts (ITEM 19) to lock the position of the adjustment pins.

#### 5. Testing

- 5.1. Following the installation, standard testing procedures must be followed to ensure proper actuator function.
- 5.2. Connect all necessary hose/air fittings to the corresponding labeled ports.
- 5.3. Pressurize the lower side of the piston cavity. Ensure that the open/close time and reaction time satisfy specification.

#### 6. Maintenance

- 6.1. As a result of their robust design and corrosion resistant coatings, ATI Actuators require a minimum amount of maintenance. As with any mechanical application, the service interval is determined by the conditions of use. In an ideal environment the customary service interval is five years. More frequent service may be required in harsh environments.

The Standard contents in the Manufacturer's Maintenance Seal Kit are listed below. If additional seals are required for your actuator, they will be provided with the Manufacturer's Maintenance Seal Kit.

##### Manufacturer's Maintenance Seal Kit

- 4 – O-ring (Item A)
- 1 – O-ring (Item B)
- 2 – Wiper Ring (Item C)
- 2 – O-ring (Item D)
- 2 – Quad Seal (Item E)
- 1 – Quad Seal (Item F)
- 1 – Wear Ring (Item G)
- 2 – Retaining Ring (Item H)
- 2 – Wiper Ring (Item J)
- 2 – O-ring (Item K)

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29 SEAL KIT		
ITEM	QTY.	DESCRIPTION
A	4	'O'-RING
B	1	'O'-RING
C	2	WIPER RING
D	2	'O'-RING
E	2	QUAD SEAL
F	1	QUAD SEAL
G	1	WEAR RING
H	2	RETAINING RING
J	2	WIPER RING
K	2	'O'-RING

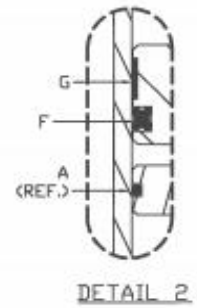
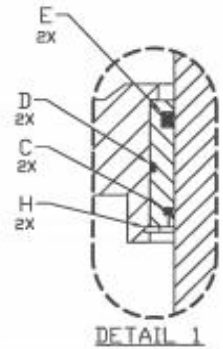
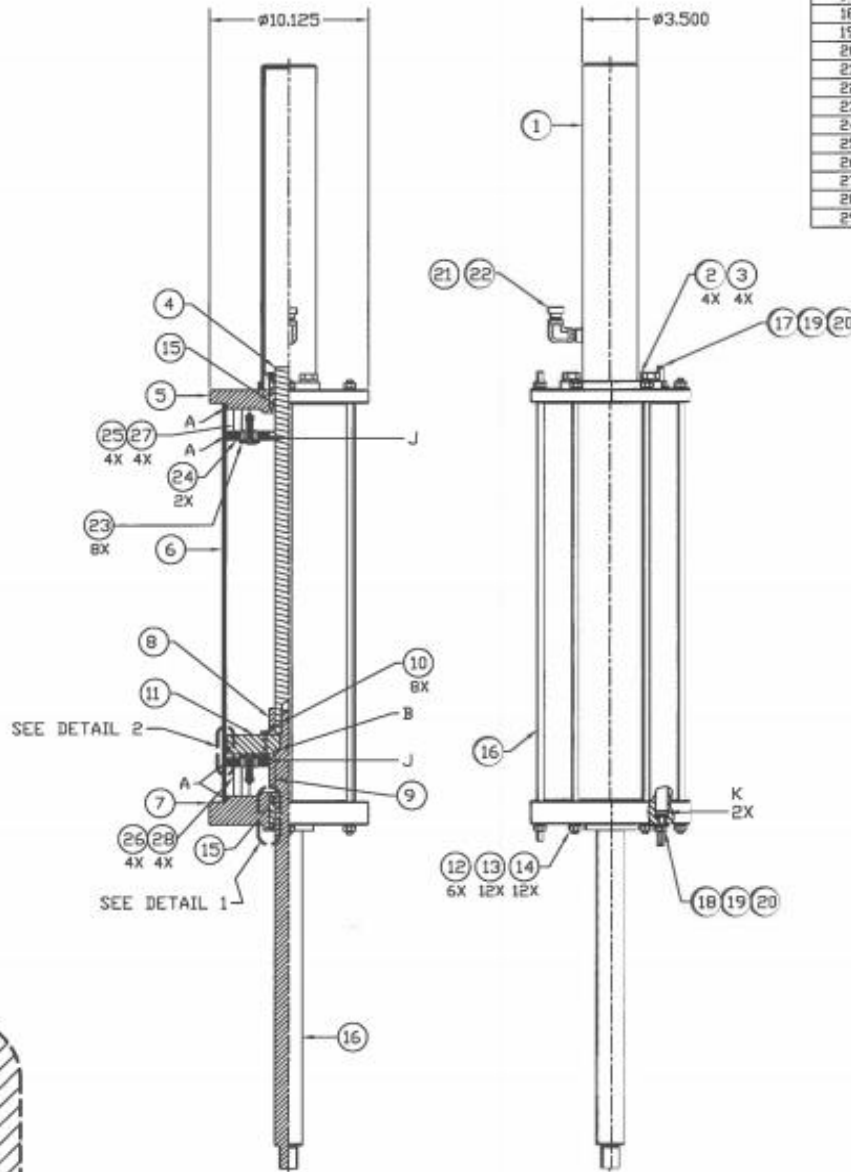
BILL OF MATERIALS		
ITEM NO.	QTY.	DESCRIPTION
1	1	TAILROD HOUSING
2	4	HHCS, 5/8-11UNC X 1.50
3	4	LOCK WASHER, 5/8"
4	1	TAIL ROD
5	1	UPPER HEAD
6	1	CYLINDER
7	1	LOWER HEAD
8	1	UPPER CUSHION HUB
9	1	LOWER CUSHION HUB
10	8	F5HCS, #10-32 X .50 LONG
11	1	PISTON
12	6	TIE ROD
13	12	LOCK WASHER, 3/8"
14	12	HEX NUT, 3/8"-11UNC
15	2	BEARING
16	1	PISTON ROD
17	1	UPPER ADJUSTMENT PIN
18	1	LOWER ADJUSTMENT PIN
19	2	HEX NUT, 3/8-16
20	2	THREAD SEAL
21	1	STREET ELBOW
22	1	BREATHER VENT
23	8	POPPET VALVE
24	2	CUSHION PLATE
25	4	UPPER SPACER
26	4	LOWER SPACER
27	4	HHCS, 3/8-16 X 2.875
28	4	HHCS, 3/8-16 X 3.375
29	1	SEAL KIT

(1) 3/8" NPT  
PORT (REF.)



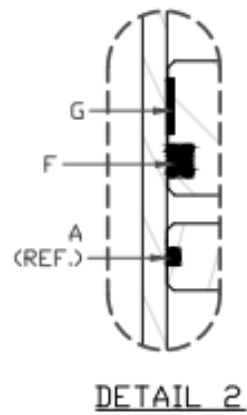
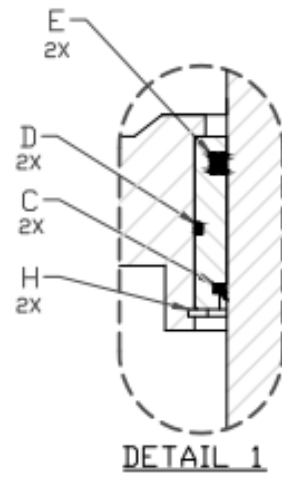
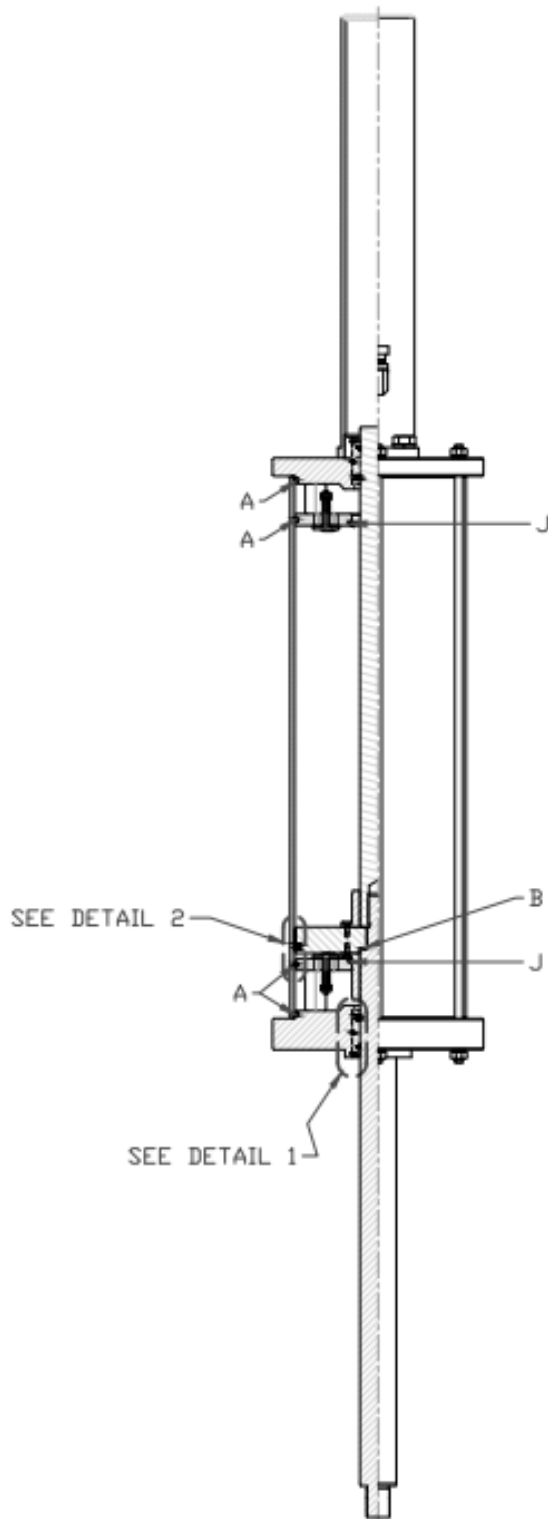
(1) 3/4" NPT  
PORT (REF.)

TOP VIEW



<b>AUTOMATION TECHNOLOGY, INC.</b> "INDUSTRY'S AUTOMATION SPECIALIST" P.O. BOX 210, INDUSTRY TOWNSHIP, 78944, (714) 527-2570	SHOP NOTES: 1. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED. 2. ALL DIMENSIONS ARE TO DIM LINE UNLESS OTHERWISE SPECIFIED.	<b>ACTUATOR ASSEMBLY</b> <b>L819DA</b>	DWG.# <b>24226</b>	A 04/19/13 INITIAL DRAWING REV. REV. DATE DESCRIPTION MODEL: L ENG. BY: J.C. APPR. BY: A.S.A. DATE: 04/19/13 DWN. BY: J.C. SCALE: MTS
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## 6.2. Seal Replacement Instructions

1. Before rigging, ensure the crane/hoist/rigging hardware lifting capacity can safely accommodate the desired load.
2. The following steps pertain to the actuator assembly after the valve has been detached.
3. Loosen, then remove the cap screws and lock washers from the Actuator Bracket to the lower head (Item 5).
4. Thread lifting eyes into upper head (Item 5).
5. Loosen the cap screws and lock washers from the tailrod housing (Item 1).
6. Remove cap screws, lock washers, and tailrod housing (Item 1).
7. Attach rigging straps to the upper head lifting eyes
8. Lift actuator assembly off of actuator bracket.
9. Thread lifting eyes into lower head (Item 7) and attach rigging straps from a 2<sup>nd</sup> crane.
10. With rigging straps affixed to upper and lower lifting eyes, manipulate the two cranes to rotate the actuator upside down, with the lower head facing upward.
11. After giving appropriate slack from the lifting eyes in the upper head, remove rigging straps.
12. With rigging straps still connected into the lifting eyes of the lower head, raise the assembly (now upside down) and place on top of Actuator Bracket.
13. Loosen the tie rod nuts (Item 14) in a crisscross pattern.
14. Remove nuts and lock washers.
15. Lift lower head (Item 7) off of actuator with crane and place on a flat surface.
16. Extract rod bearing (Item 15) from lower head (Item 7) bearing housing.
17. Remove wiper ring (Item C), O-ring (Item D), and quad seal (Item E) from the rod bearing (Item 15).
18. Clean the rod bearing (Item 15) with a light degreaser.
19. Lightly grease the new bearing O-ring and quad seal (Item D, E) and install on rod bearing (Item 15).
20. Without grease, install the new wiper ring (Item C) on the rod bearing (Item 15).
21. Flip lower head (Item 7) so that the O-ring side is facing up. Remove O-ring (Item A) and clean the groove with a light degreaser.
22. Lightly grease new O-ring (Item A) and install on lower head (Item 7).
23. Remove tie rods (Item 12) from upper head (Item 5).
24. Thread a female lifting eye onto the piston rod and attach rigging straps.
25. Lift piston assembly (Item 4, 11, 16) out of the cylinder tube (Item 6) and place on a flat surface.
26. Remove wear band (Item G) and quad seal (Item F) from piston (Item 11).
27. Remove O-ring (Item A) from each Cushion Plate (Item 24) and clean the groove with a light degreaser.
28. Lightly grease new O-ring (Item A) and install on each Cushion Plate (Item 24).
29. Thread locking compound is applied to the threads by the manufacturer during initial assembly. As a result, disassembly will require heating to loosen the thread locking compound. To remove the piston rod seal (Item B), heat the piston assembly using a torch and unthread piston rod (Item 16) from piston (Item 11).
30. After the piston rod has completely cooled, remove piston rod seal (Item B).
31. Clean the piston rod seal groove with a light degreaser.
32. Lightly grease the piston rod seal (Item B) and install to piston rod (Item 16).
33. Clean piston assembly seal grooves. Install new lightly greased quad seal to piston (Item F).
34. Without grease, trim to length and then install new wear band (Item G).
35. Attach lifting hardware and rigging straps to cylinder tube (Item 6). Take extra precaution to avoid scarring the inner diameter of the metal cylinder tube. Lift cylinder vertically and place on a flat surface.
36. Remove O-ring (Item A) from the upper head (Item 5). Clean seal groove.
37. Install lightly greased O-ring (Item A) to upper head (Item 5) seal groove.
38. Refer to ATI MP1002 Pneumatic DA Assembly Procedure for reassembly after seal replacement.

## 7. Terms & Conditions/Warranty

Except as otherwise expressly agreed to in writing by an authorized representative of Automation Technology, Inc. (hereinafter "ATI"), the following terms and conditions (these "Terms and Conditions") shall apply to all offers for the purchase or sale of products manufactured or supplied by ATI under brand names including, but not limited to "ATI", "Gevalco", etc.

**A. CONDITIONAL ACCEPTANCE; REJECTION OF PURCHASER TERMS** – All orders and acknowledgements of Purchaser shall constitute only consent to these Terms and Conditions and a representation that Purchaser is solvent. All quotations and offers of sale by ATI are expressly limited to these Terms and Conditions and are subject to written acceptance by ATI. Any such acceptance by ATI is expressly conditioned upon assent of Purchaser to these Terms and Conditions, and ATI hereby expressly objects to and rejects as material alterations to these Terms and Conditions any terms or conditions of Purchaser, whether contained in Purchaser's order, acknowledgement or otherwise, that are different from or in addition to these Terms and Conditions.

**B. PRICES** - ATI quotations are valid for thirty (30) days from date of issuance, unless otherwise stated by ATI in writing, and are subject to withdrawal or change at any time prior to acceptance by ATI. Prices are ex works, in United States Dollars, and firm for thirty (30) days from date of ATI's written acceptance of Purchaser's order and an unconditional authorization for the immediate manufacture based on customer supplied information. If for any reason authorization does not commence within such thirty (30) days, prices in effect at the time of release for manufacture will apply, unless otherwise stated in writing. All sales, use, excise, value-added, import, export and other taxes, duties, customs and the like (collectively "Taxes") are the responsibility of Purchaser and will be added to the price to the extent that ATI pays on Purchaser's behalf or is required by law to pay in connection with the sale. ATI reserves the right to invoice and be paid for any Tax at the time of shipment or any time thereafter. All orders are subject to laws and regulations that are in effect and that become effective prior to delivery. Typographical or clerical errors in quotations, orders and acknowledgements are subject to correction by ATI. Prices do not include installation or any other service, unless so stated expressly in the quotation or ATI's order acknowledgement. Prices include one (1) copy of any applicable manuals. Any additional manuals or other printed materials requested by Purchaser are subject to additional cost, to be quoted at or near the time that such materials are requested by Purchaser.

**C. PAYMENT** - Payment from Purchaser is due within thirty (30) days from date of first invoice, unless otherwise stated on ATI's quotation or order acknowledgement. For international orders, ATI reserves the right to require, before commencing filling the order, security in the form of a letter of credit or the like, in a form and from a bank or guarantor acceptable to ATI. Subject to any applicable usury law that would void or render invalid or unenforceable this sentence, in which case the specified rate will be deemed to be reduced to the maximum allowed by law, simple interest at the rate of 1.5 percent per month will apply to balances unpaid within 30 days from date of first invoice. ATI will invoice upon making available for shipment. ATI reserves the right to payment and Purchaser will be responsible for any cost associated with storage of products or delay in making products available for pickup that occurs at the request of Purchaser.

**D. FORCE MAJEURE** - In no event shall ATI be liable for non-delivery or delay in delivery, or for failure or delay in the performance of any obligation contained herein, that arises directly or indirectly from acts of God, unforeseeable circumstances, acts (including delays or failure to act) of any governmental authority (de jure or de facto), war (declared or undeclared), terrorism, riot, revolution, priorities, fires, floods, weather, strikes, labor disputes, sabotage, epidemics, factory shutdowns or alterations, embargoes, delays or shortages in transportation, delay in obtaining or procuring or inability to obtain or procure labor, materials or manufacturing facilities, delay in obtaining or inability to obtain timely instructions or information from the Purchaser, or any other cause or circumstance of any other kind beyond ATI's reasonable control. The foregoing provision shall apply even though such causes or circumstances may occur after ATI's performance has been delayed for other causes or circumstances.

**E. SHIPPING** - (a) Products are sold ex works. Risk of loss is the responsibility of and title transfers to Purchaser once products are made available at Seller's facility for pickup by Purchaser or its carrier.

(b) Acknowledged ship dates represent the estimated date of availability for pickup, rather than actual shipment or delivery at destination for which Purchaser is responsible. All indicated shipping dates are estimates, based on prompt receipt of all necessary information from Buyer necessary to process the order. ATI will use its best reasonable efforts to make products available for pickup by such dates, but there is no guarantee to do so. Indicated time periods for pickup availability are estimated from the latest to occur of: 1) ATI's acceptance of Purchaser's order, 2) ATI's receipt of valve dimensional information, if applicable, 3) ATI's receipt of Purchaser supplied components required to manufacture or supply the products, if applicable, or 4) ATI's receipt of drawings approved by Purchaser. Products ordered on an "in stock" basis are subject to prior sale to other customers. Acknowledged ship dates are subject to changes caused by additions to or modification of the original order agreed to by both Purchaser and ATI.

(c) Under no circumstances shall ATI have any liability whatsoever for loss of use or for any indirect or consequential damages as a result of delayed delivery.

(d) Purchaser is responsible for payment of carrier and all other shipping costs and for making all arrangements necessary for pickup, transport, export, import and delivery to Purchaser's destination. Without prejudice to any ex works rights of ATI and obligations of Purchaser, Purchaser consents in advance to ATI shipping collect any products that Purchaser fails to pick up, and Purchaser will remain responsible for all associated pickup, transport, export, import and delivery costs, including any unknown to ATI or Purchaser at the time of shipment.

**F. DESIGN** - Due to continuous product development, ATI reserves the right to modify designs, materials and specifications without prior notice.

**G. CANCELLATION** - Orders acknowledged by ATI are not subject to cancellation or suspension except with the advance written consent of ATI and upon terms which will compensate ATI for and indemnify ATI from and against loss or damage occasioned by such cancellation or suspension, including without limitation for all costs and expenses already incurred or commitments made by ATI in connection with the processing, purchasing, handling, and fabrication of equipment for the order and a reasonable profit thereon. ATI's determination of such termination charges shall be conclusive.

**H. INSPECTION** - Final inspection and acceptance of products must be made at ATI's facility and shall constitute a waiver by Purchaser of any claim for loss or damage, except for latent defects not reasonably discoverable by such inspection. Purchaser's representative may inspect products during normal business hours and must do so in a manner that does not interfere with ATI operations.

**I. ATI WARRANTY; EXCLUSIVE PURCHASER REMEDY** – All products manufactured by ATI are warranted against defects in material and workmanship for a period of two (2) years after the date that the products were made available for pickup by Purchaser. ATI's warranty excludes any defects resulting from improper or abnormal shipping, operation or maintenance. Purchaser must immediately, and in no event later than thirty (30) days after becoming aware of a suspected defect, notify ATI in writing of any such suspected defect. Within a reasonable time following ATI's receipt of such notice, investigation and confirmation of a defect, ATI will have the right and the obligation, in its sole discretion, to repair at no cost to Purchaser such defect or replace the defective product or component thereof with a non-defective product or component thereof. Repair or component replacement by non-ATI authorized agents WILL VOID all remaining warranty on the product. Products purchased by ATI from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer. ATI's repair or replacement obligations under this Paragraph I do not extend to any labor or other loss or damage occasioned by, incidental to, or in consequence of any such defect. Purchaser's sole and exclusive remedy and ATI's obligation and liability for breach of warranty are expressly limited to such repair or replacement. Goods repaired or replaced during the warranty period shall be in warranty for the remainder of the original warranty or ninety (90) days, whichever is longer. All other remedies of Purchaser are hereby expressly excluded. THE WARRANTY CONTAINED IN THIS PARAGRAPH I IS THE SOLE AND EXCLUSIVE WARRANTY PROVIDED BY ATI WITH RESPECT TO ITS PRODUCTS AND SUPERSEDES AND IS IN LIEU OF ANY AND ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE, ALL OF WHICH ARE HEREBY EXPRESSLY DISCLAIMED. Purchaser acknowledges and agrees that ATI Manuals, printed materials and any other documentation do not constitute warranties of any kind, including with respect to quality or performance. Purchaser is expected to determine the suitability of ATI products for ordinary and Purchaser's particular purposes.

**J. EXCLUSION OF CONSEQUENTIAL DAMAGES; LIMITATION OF DIRECT DAMAGES** - ATI shall not be liable for and Purchaser shall have no right to recover from ATI for any indirect, special or consequential damages, even if ATI has actual notice of any special circumstances from which any such damages might arise. Moreover, subject to Paragraph I which would completely bar any such recovery of direct damages if ATI honors its warranty, in no event shall any recovery of direct damages against ATI exceed the amount of the order price attributable to the portion of the product or products that is determined to have caused any alleged loss, damage or injury that is compensable under these Terms and Conditions and not remedied by ATI.

**K. RETURNS** – No product may be returned for credit or adjustment without written permission and tagging instruction from ATI. Upon receipt of approved returns, any handling/restocking charges and/or cost to recondition for resale, will be the responsibility of Purchaser.

**L. GOVERNING LAW; VENUE AND JURISDICTION** - All sales of products by ATI and any disputes arising out of or related to such sales or products or these Terms and Conditions shall be governed by, and these Terms and Conditions shall be construed in accordance with, the laws of the State of Texas, without regard to its conflicts of law principles that would apply the law of another jurisdiction. The United Nations Convention on Contracts for the International Sale of Goods is expressly disclaimed by and excluded from these Terms and Conditions. ATI's offer of sale may only be accepted in Harris County, Texas and any resulting contract is performable in whole or in part in Harris County, Texas. Venue for any litigation arising out of such sale, products or contract shall be proper in the state or federal district courts of Houston, Harris County, Texas, U.S.A., to the exclusive jurisdictions of which Purchaser hereby expressly submits.

**M. NON-WAIVER** – Any waiver by ATI of any breach of any of these Terms and Conditions must be set forth in a writing signed by an authorized representative of ATI and shall not constitute a waiver of or otherwise prejudice ATI's right to demand strict performance of any other term or condition of these Terms and Conditions.

**N. REMEDIES CUMULATIVE** – ATI's remedies pursuant to these Terms and Conditions and applicable law are cumulative in nature and election or pursuit of any such remedy shall not prohibit ATI from electing or pursuing any other such remedy.

**O. SEVERABILITY** – In the event that any provision or portion of any provision of these Terms and Conditions is held void, invalid or unenforceable, such void, invalid or unenforceable provision or portion thereof shall be deemed severed from these Terms and Conditions, and the balance of these Terms and Conditions shall remain in full force and effect.

**P. EXPORT / IMPORT** - Buyer agrees that all applicable import and export control laws, regulations, orders, and requirements, including without limitations those of the United States will apply to the receipt and use of the Goods and Services provided by ATI. In no event shall Buyer use, transfer, release, import, export, re-export Goods in violation of such applicable laws, regulations, orders, or requirements.

**Q. BUYER SUPPLIED DATA** – To the extent that Seller has relied upon any specification, information, representation of operating conditions or other data or information supplied by Buyer to ATI, in the selection, or design of the Goods and the preparation of ATI's quotation, and in the event that actual operating conditions or other data differ from those represented by Buyer and relied on by ATI, any warranties or other provisions contained herein are null and void. To the degree such data errors cause re-design or re-manufacture of the Goods, Buyer shall be responsible for additional costs incurred by ATI.

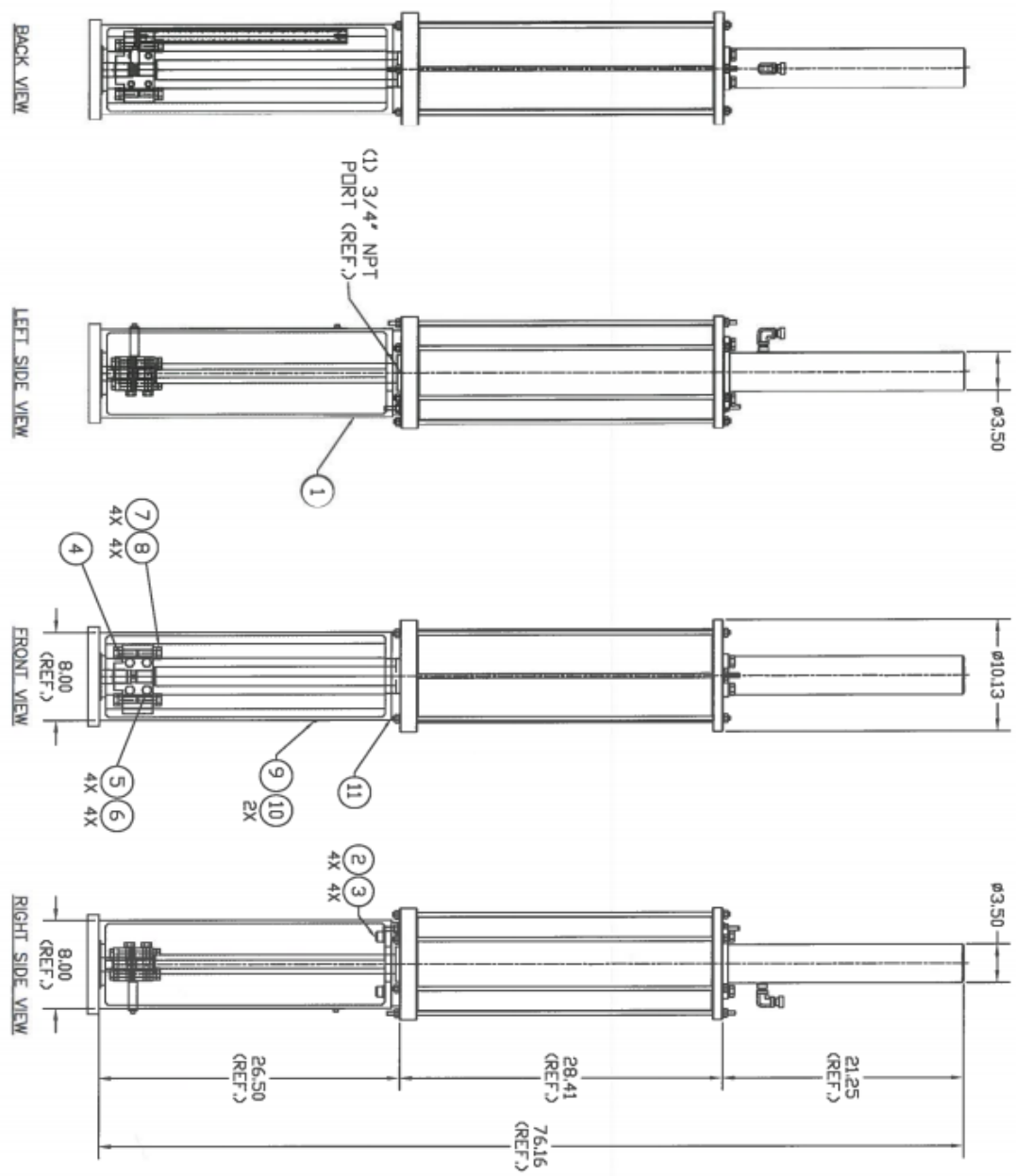
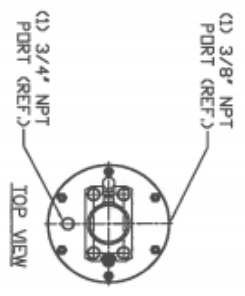
Appendix

Appendix A – ATI Torque Tightening Guide

STAT-O SEALS OR THREAD SEALS							
COARSE THREADS				FINE THREADS			
BOLT DIA.	CLAMP LOAD LBS.	PLAIN (FT-LBS)	PLATED (FT-LBS)	BOLT DIA.	CLAMP LOAD LBS.	PLAIN (FT-LBS)	PLATED (FT-LBS)
1/4-20	2,850	7	5	1/4-28	3,263	8	6
5/16-18	4,725	13	10	5/16-24	5,113	14	11
3/8-16	6,975	23	18	3/8-24	7,875	25	20
7/16-14	9,600	36	27	7/16-20	10,650	38	29
1/2-13	12,750	54	42	1/2-20	14,400	57	46
9/16-12	16,350	77	60	9/16-18	18,300	63	67
5/8-11	20,325	108	82	5/8-18	23,025	113	92
3/4-10	30,075	189	145	3/4-16	33,600	209	160
7/8-9	41,550	305	231	7/8-14	45,825	335	251
1-8	54,525	456	342	1-12	59,700	498	355
1-1/8-7	68,700	647	487	1-14	61,125	510	383
1-1/4-7	87,225	912	683	1-1/8-12	77,025	724	542
1-3/8-6	103,950	1197	896	1-1/4-12	96,600	1008	755
1-1/2-6	126,450	1585	1187	1-3/8-12	118,350	1357	1025
				1-1/2-12	142,275	1779	1335

ATI TIGHTENING TORQUE GUIDE FOR TIE RODS (100K STRESS PROOF)			
COARSE THREADS		FINE THREADS	
BOLT DIA.	TORQUE FT-LBS AT 100,000 PSI	BOLT DIA.	TORQUE FT-LBS AT 100,000 PSI
1/4-20	6	1/4-28	8
5/16-18	11	5/16-24	13
3/8-16	19	3/8-24	21
7/16-14	29	7/16-20	32
1/2-13	44	1/2-20	47
9/16-12	62	9/16-18	65
5/8-11	85	5/8-18	88
3/4-10	146	3/4-16	152
7/8-9	231	7/8-14	241
1-8	328	1-14	347
1-1/8-7	488	1-1/8-12	498
		1 1/4-12	600

ATI TIGHTENING TORQUE GUIDE(SAE GRADE 8 FASTENERS)							
COARSE THREADS				FINE THREADS			
BOLT DIA.	CLAMP LOAD LBS.	PLAIN (FT-LBS)	PLATED (FT-LBS)	BOLT DIA.	CLAMP LOAD LBS.	PLAIN (FT-LBS)	PLATED (FT-LBS)
1/4-20	2,850	12	9	1/4-28	3,263	14	10
5/16-18	4,725	25	18	5/16-24	5,113	27	20
3/8-16	6,975	44	33	3/8-24	7,875	49	37
7/16-14	9,600	70	52	7/16-20	10,650	78	58
1/2-13	12,750	106	80	1/2-20	14,400	120	90
9/16-12	16,350	153	115	9/16-18	18,300	172	129
5/8-11	20,325	212	159	5/8-18	23,025	240	180
3/4-10	30,075	376	282	3/4-16	33,600	420	315
7/8-9	41,550	606	454	7/8/2014	45,825	668	501
1-8	54,525	909	682	1-12	59,700	995	746
1-1/8-7	68,700	1288	966	1-14	61,125	1019	764
1-1/4-7	87,225	1817	1363	1-1/8-12	77,025	1444	1083
1-3/8-6	103,950	2382	1787	1-1/4-12	96,600	2012	1509
1-1/2-6	126,450	3163	2371	1-3/8-12	118,350	2712	2034
				1-1/2-12	142,275	3557	2668



BILL OF MATERIALS		
ITEM #	QTY.	DESCRIPTION
1	1	ADAPTATION BRACKET
2	4	SHCS, 5/8-11UNC X 2.50 LG
3	4	LOCK WASHER, 5/8"
4	1	SPLIT COUPLING BLOCK
5	4	HHCS, 1/2-13UNC X 3.00 LG
6	4	LOCK WASHER, 1/2"
7	4	STOPS
8	4	JAM NUT, 5/8-11
9	2	TAG
10	2	RIVET
11	1	BRACKET SPACER PLATE
12	4	5/8-18, HHCS FOR CUST. MOUNTING
13	4	5/8 LW FOR CUST. MOUNTING



**AUTOMATION TECHNOLOGY, INC.**  
INDUSTRY'S AUTOMATION SPECIALIST  
P.O. BOX 310, INDUSTRY TEXAS, 78844, (979)357-2570

**ADAPTATION ASSEMBLY**  
L819DA, 31484-1

SHOP NOTES:  
1. 4.000, 1. 1.17  
BREAK SWAP EDGES 0.031+0.0  
BALL BEINGS ARE TO BALL POINT  
ALL SERVICES IN PINK  
INDICATED OTHERWISE SPECIFIED.

DWG. NO. **24222**

DATE: 04/19/13

SCALE: NTS

ENG. BY: J.C. DWN. BY: J.C.

APPR. BY: A.S.A.

INITIAL DRAWING