



## ATI HO1/HO2 HYDRAULIC OVERRIDE

### Scope of Supplement

This supplement is intended to assist those who are involved with the installation, operation and maintenance of ATI Linear Actuators with the optional model “HO1” or “HO2” hydraulic overrides with hand pumps. This supplement shall be used in conjunction with a relevant ATI Installation, Operation & Maintenance Manual (IOM) and with any other applicable manuals and supplements that apply to a Product.

### Applicable Product

This manual is intended as a guide for the HO1/HO2 hydraulic override on all ATI linear pneumatic actuators and it may be referenced for use of HO1/HO2 Hydraulic Controls used for optional manual override of Hydraulic Actuators. Failure to read and comply with installation, operation and maintenance instructions may result in bodily injury or equipment damage and will void the manufacturer’s warranty.

### Company Contact

For any questions or clarification, or for details on your nearest ATI Authorized Representative, contact ATI.

Email: [Sales@ATlactuators.com](mailto:Sales@ATlactuators.com)

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### Reference Documents

This IOM Supplement is referenced in the following standard IOM’s and may be referenced in additional documents.

- IOM 1001 ATI Pneumatic Spring-Return Extend (SRE) Actuator
- IOM 1002 ATI Pneumatic Spring-Return Retract (SRR) Actuator
- IOM 1003 ATI Pneumatic Double-Acting (DA) Actuator
- IOM 1004 ATI Hydraulic Spring-Return Extend (SRE) Actuator
- IOM 1005 ATI Hydraulic Spring-Return Retract (SRR) Actuator
- IOM 1006 ATI Hydraulic Double-Acting (DA) Actuator

### Safety Warnings

**THIS SUPPLEMENT IS NOT A COMPLETE INSTALLATION, OPERATION AND MAINTENANCE MANUAL (IOM). USERS MUST FOLLOW INSTRUCTIONS AND GUIDELINES OF A COMPLETE IOM TO PREVENT PERSONAL INJURY, PROPERTY DAMAGE, AND DAMAGE TO THE PRODUCT.**

**DO NOT INSTALL, OPERATE, OR MAINTAIN AN ATI PRODUCT UNLESS TRAINED AND QUALIFIED IN PRODUCT AND ACCESSORY INSTALLATION, OPERATION AND MAINTENANCE.**

### Revision Record

Rev #	Issue Date	Description	Reviewed By	Approved By
A	5/04/2016	Initial Release, replaces IOM1017 Rev B.	EBW/TRH	DAR/DPL
B	8/07/2017	Add Figures 1B & 3B Appendix B, add detail on hand pump maintenance, other minor corrections	EBW/TRH/BJC	DAR/DPL



## General Description

The HO1 is a unidirectional hydraulic override for use on single-acting, spring-return actuators. This override compresses the spring and repositions the valve. Hydraulic controls allow for the override to hold the valve in place. When hydraulic override is terminated, spring force will move the valve to its failure position.

The HO2 is a bi-directional override for double-acting actuators. This override will extend or retract the actuator. Hydraulic controls allow this override to hold the actuator in place.

Where an HO1/HO2 override is in tandem with another power-stroke cylinder, speed-control and bypass valves in the override circuit can be used to regulate the snubbing or dampening effect that the override will have on the power stroke.

## Installation

A hydraulic filter is recommended to maintain contaminant-free supply fluid to the actuator hydraulic cylinder.

Special note for 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. Proper support can range anywhere from ground supports to ceiling suspension. It is also the customer's duty to ensure hydraulic controls are suitably oriented. Typical controls for hydraulic overrides include a small reservoir tank that must be positioned with its filler/breather cap at the top of the tank.

## Product Operation

The HO1/HO2 Hydraulic Override is a hydraulic piston actuator that is mounted in tandem to the primary power (pneumatic) cylinder. Optional speed-control valves at each exhaust port of the HO1/HO2 cylinder allow for precise speed control of the power stroke by regulating the flow of the hydraulic fluid in the override. Speed control may be set differently for extend and retract strokes.

HO1/HO2 Controls may be engaged on loss of primary supply pressure or loss of control signal. A hand pump included with HO1/HO2 Controls provides necessary hydraulic force to move the actuator and reposition the valve. Hydraulic pressure can be locked in place to hold the valve in position. Hydraulic overrides use a 1-stage or 2-stage hand pump to generate fluid pressure and adjust position of a hydraulic cylinder.

- 1-stage hand pumps displace about 1 gallon of fluid per 400 pumps ( $\sim 0.66 \text{ in}^3 / \text{pump}$ ).
- 2-stage single-handle pumps are common for most applications, particularly longer stroke, larger bore size overrides. The 1<sup>st</sup> stage displaces about 1 gallon per 50 pumps ( $\sim 4.7 \text{ in}^3 / \text{pump}$ ), and when pressure reaches 300 psig, the pump switches internally to its 2<sup>nd</sup> stage that displaces about 1 gallon per 800 pumps ( $\sim 0.29 \text{ in}^3 / \text{pump}$ ) up to the pressure relief setting of the circuit.
- 2-stage dual-handle pumps have also been used for some ATI override circuits, particularly on HO1 assemblies. The 1<sup>st</sup> stage displaces about 1 gallon per 100 pumps ( $\sim 2.1 \text{ in}^3 / \text{pump}$ ) up to a limit of 1,000 psig. For fluid pressure above 1,000 psig, the 2<sup>nd</sup> stage handle is used to displace about 1 gallon per 400 pumps ( $\sim 0.58 \text{ in}^3 / \text{pump}$ ) up to 3,000 psig or to the pressure relief setting of the circuit.
- For use with hydraulic actuators, ATI's Gevalco brand automatic-reset, 1-stage hand pumps are available to displace about 1 gallon of fluid per 20 or 60 pumps ( $\sim 12 \text{ in}^3$  or  $\sim 4 \text{ in}^3$  per pump) up to 1,500 psig.

The HO1/HO2 control circuit will dampen the power stroke by regulating the flow of hydraulic fluid in the override. Speed control valves in the circuit can be used to further the snubbing effect of the HO controls. In the control circuit, a bypass valve connecting the upper and lower ports of the hydraulic cylinder can reduce or eliminate the dampening effect of the override (see *Appendix B, Figures 1A and 1B*).

Where an HO1/HO2 override is in tandem with another power-stroke cylinder, bypass valves must be installed at the ports of the power-stroke cylinder to ensure proper operation. These bypass valves must vent to prevent pressure lock in the power-stroke cylinder when operating the hydraulic override. Operating the override in a pressure-lock condition may cause damage to the override or its tandem actuator.



## ***Operation of HO1/HO2 Override for Pneumatic Actuator***

### **Engage the Override**

Isolate supply pressure to the pneumatic cylinder ports, and vent both sides of the pneumatic cylinder to atmospheric pressure. If the pneumatic controls include volume boosters to more than one port of the actuator, then each booster must be isolated to ensure that the pneumatic cylinder is not pressurized during manual operation.

Set the directional control valve in the hydraulic override controls to either the open position or the close position.

### **Operate the Override**

**CAUTION:** If supply pressure is not vented from pneumatic cylinder ports, the actuator will pressure lock. Operating the hydraulic override may damage equipment and create a safety risk.

Begin pumping. To pump the unit, it may be necessary to install the lever onto the hand pump.

### **Disengage the Override**

Set the directional control valve in the hydraulic override controls to neutral / auto.

Close bypass valve(s) and restore supply pressure to the pneumatic cylinder ports.

## ***Operation of HO1/HO2 Controls for Hydraulic Actuator***

### **Engage the Override**

Isolate supply pressure from the hydraulic cylinder ports and connect the override circuit to the hydraulic cylinder ports. Refer to Appendix B, Figures 3A and 3B, for common HO circuits.

Set the directional control valve in the hydraulic override controls to either the open position or the close position.

### **Operate the Override**

Begin pumping. To pump the unit, it may be necessary to install the lever onto the hand pump.

### **Disengage the Override**

Set the directional control valve in the hydraulic override controls to neutral / auto.

Return the control valves of the hydraulic actuator and override to their original position, to isolate the override circuit from the hydraulic cylinder ports and to connect the supply lines to the hydraulic cylinder ports.

## **Maintenance**

**IMPORTANT SAFETY REMINDER:** Before carrying out any maintenance operation, it is necessary to isolate all feed lines and exhaust all pressure from the actuator and all control manifolds and vessels, to ensure safety of maintenance staff. Ensure that any electrical connections to actuator controls are de-energized. If product operation is required for troubleshooting or partial stroke testing, the maintenance personnel must ensure that electrical and pressure connections are in a controlled state (lockout/tagout) for safe operation.

If there are leaks in the hydraulic cylinder or a malfunction in the mechanical components of the override, or in case of scheduled preventive maintenance, the actuator must be disassembled and seals must be replaced.

### ***Oil Level***

The reservoir tank should be filled to within 2 inches of the filler/breather cap when the actuator is fully retracted (open on a push-to-close gate or globe valve). Oil level should be checked regularly, at least one time every 12 months.



## Replacing Seals

If there are leaks in the cylinder or a malfunction in the mechanical components, or in case of scheduled preventive maintenance, the actuator must be disassembled and seals must be replaced.

Refer to the sketch in “Appendix A – HO# Assembly” for the parenthetical references that follow in this section.

The Standard contents in the ATI Maintenance Seal Kit for hydraulic overrides are listed next. If additional seals are required for a customized design, they will be provided with the ATI Maintenance Seal Kit for the actuator serial number.

### *Maintenance Seal Kit*

Item # (App. B)	Description	Qty
4	O-ring & single Backup	1
8	Wear Band	2
9	Piston T-seal	1
10	O-ring & double Backup	1

Item # (App. B)	Description	Qty
12	O-ring & single Backup	1
14	Bearing T-seal	1
16	O-ring & single Backup	1
17	Wiper Ring	1

The instruction that follow is applicable for seal replacement in the cylinder of the Hydraulic Override. For seal replacement in the pneumatic cylinder, refer to the IOM for the primary actuator cylinder—IOM1001, IOM1002, IOM1003 or as applicable to the Product.

1. Before rigging, ensure the crane/hoist/rigging hardware lifting capacity can safely accommodate the desired load.
2. Thread lifting eyes into upper head.
3. Detach the actuator from valve and place actuator in an upright position on a disassembly platform.
4. Loosen the tie rod nuts (Item 1) in a criss-cross pattern.
5. Remove nuts and lock washers (Items 1 and 2).
6. Lift upper head (Item 3) off of actuator with crane and place on a flat surface.
7. Remove tie-rods (Item 5) from lower head (Item 13).
8. 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.
9. Remove set-screw installed between the piston (Item 7) and end of piston rod (Item 11).
10. Remove piston (Item 7) from piston rod (Item 11).
11. Thread lifting eye into piston rod (Item 11). (In some assemblies, this will require removal of a locking bolt from the top of the piston rod, and in some cases this locking bolt may be a Left Hand thread.)
12. Attach lifting straps and remove piston rod assembly (Item 11) from the lower head (item 13).
13. Place piston rod (Items 11) on a clean soft flat surface, along with other items.
14. Remove wear bands (Items 8), T-Seal (Item 9) from piston (Item 7).
15. Remove O-ring/back-up (Items 4 & 12) from upper & lower head (Items 3 & 13) and clean the groove with a light degreaser.
16. Remove adaptation plate between hydraulic cylinder and pneumatic cylinder to gain access.
17. Flip lower head (Item 13) upside down.
18. Extract cap screws (Item 19) from lower head (Item 13).
19. Remove bearing retainer (Item 18) and rod bearing (Item 15) from bearing housing.
20. Remove wiper ring (Item 17), O-ring/ back-up (Item 16), and T-seal (Item 14) from the rod bearing (Item 15).
21. Clean the rod bearing (Item 15) with a light degreaser.
22. Lightly lubricate the new bearing O-ring/back-up (Item 16) and T-seal (Item 14) and install on rod bearing (Item 15).
23. Without lubrication, install the new wiper ring (Item 17) on the rod bearing (Item 15).
24. Lightly lubricate new O-ring/back-up (Items 4 & 12) and install on upper & lower head (Items 3 & 13).
25. Remove threaded bearing from pneumatic head and remove/replace seals with light grease.



26. Remove the piston rod from the piston. Note that thread locking compound may be applied to this threaded connection during assembly. If the piston does not unthread from the rod, disassembly will require heat to loosen the thread locking compound. To remove the piston rod seal (Item 10), use a torch to apply concentrated heat to the assembly for several minutes to raise temperature at the threaded connection to 550°F (288°C), softening the thread locking compound. Unthread the piston rod (Item 11) from piston (Item 7) while warm, and set aside to cool.
27. After the piston rod has completely cooled, remove piston rod seal (Item 10) and clean the threads on the rod and in the piston.
28. Clean the piston rod seal groove with a light degreaser.
29. Clean piston seal grooves. With light hydraulic oil, lubricate and install new T-Seal (Item 9).
30. Without lubrication, install new wear bands (Item 8). Trim to length if necessary. If desired, use a heavy grease or a small amount of adhesive (e.g. RTV) to hold ends of the band against the piston before re-installing in the cylinder.
31. Clean cylinder and lubricate.
32. Reassemble actuator in reverse order of disassembly.

### Replacing Hydraulic Fluid

Oil in a hydraulic system performs multiple functions of lubrication, power transmission and corrosion protection. The oil is a vital factor for long-term reliability of the actuator and all system components. The override cylinder must be filled completely with a hydraulic fluid that provides inherent corrosion protection to carbon steel materials. This hydraulic fluid should be inspected regularly to ensure that water and other contaminants are properly filtered and to ensure that air remains purged and the cylinder 100% filled with oil.

The following oils are used by ATI for standard working temperature and are suitable for use with the Product:

MANUFACTURER	EXXONMOBIL	CHEVRON	SMITTY'S
TYPE	HUMBLE HYDRAULIC H32	AW32	SUPERS R&O 32
COLOR	AMBER	YELLOW	AMBER
VISCOSITY AT 40°C	31 cSt	30.4 cSt	30-42 cSt
FLASH POINT	206°C / 403°F	220°C / 428°F	200°C / 390°F
POUR POINT	-18°C / 0°F	-25°C / -13°F	-23°C / -10°F

The following oils are used by ATI for cold temperatures and are recommended for use with the Product:

MANUFACTURER	CHEVRON	PHILLIPS66
TYPE	HYDRAULIC OIL 5606A	ARCTIC LOW POUR
COLOR	RED	YELLOW
VISCOSITY AT 40°C	15 cSt	15 cSt
FLASH POINT	82°C / 180°F	103°C / 217°F
POUR POINT	-63°C / -81°F	-60°C / -76°F

Use of other hydraulic fluids may be suitable if proven compatible with seal specification in the actuator. Consult ATI with questions on alternatives.

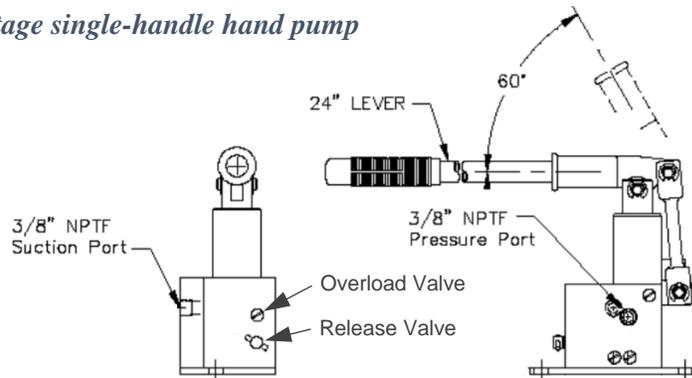
### Air Purge

Air accumulation in a hydraulic system will cause erratic action, which may appear as pump failure. For this reason, it is advisable to air bleed each pump before attempting to operate. To remove air from the pump, open the Release Valve with the pump in an upright position. Operate the pump slowly through the full piston stroke about a dozen times. Close the Release Valve. The pump should then be ready for use.

## Hand Pump Maintenance

Details that follow are intended for the 2-stage single-handle hand pump. Contact ATI for questions about other hand pump configurations.

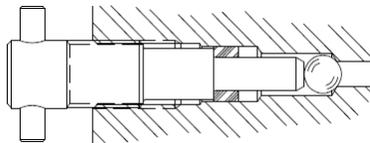
### 2-stage single-handle hand pump



### Release Valve

The 2-stage hand pump has a pressure release valve integral to the pump body.

#### Release Valve screw assembly

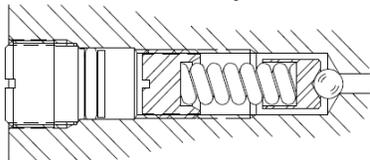


If the pump fails to lift or hold a load, the release valve may be dirty. Remove the release screw, release valve seal and release valve ball. Clean and inspect valve seat and screw. A slight depression in the end of the screw is not harmful. Screws with excessive deformation should be replaced. If the ball seat is marred, re-seat the release ball using a ball seating tool or contact ATI for assistance. Reassemble the release valve and the release screw.

### Overload Valve

The override hydraulic circuit has a relief valve to limit the maximum force from the override. In the 2-stage single-handle hand pump, the Overload Valve can be adjusted to relieve maximum pressure in the range 1,000 to 3,000 psig.

#### Overload Valve assembly

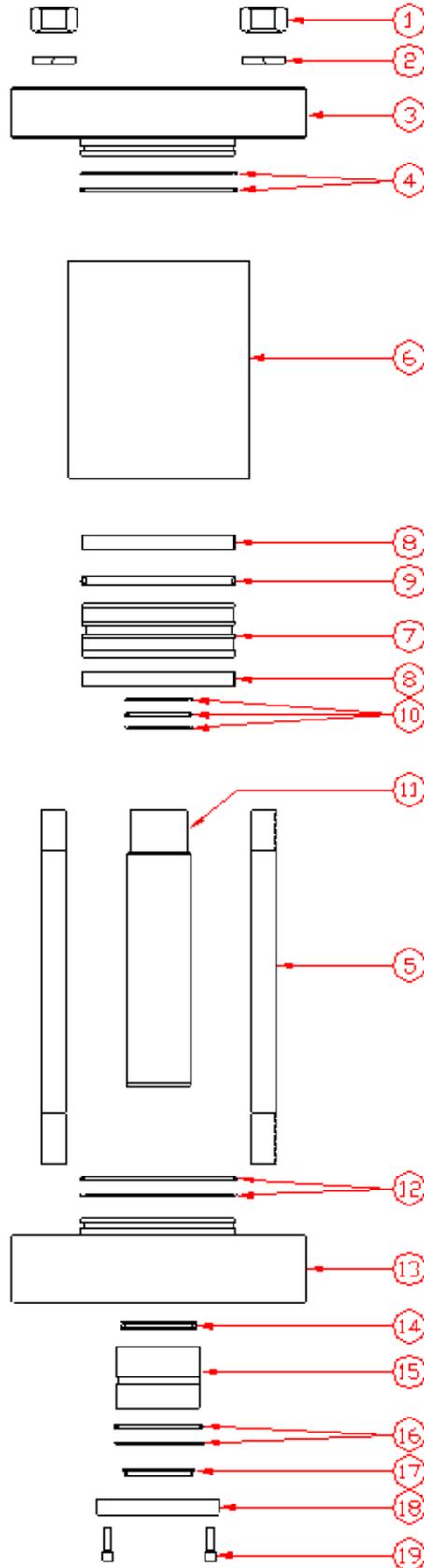


If the pump fails to lift or hold a load after the release valve has been checked, the overload valve may be dirty. To clean the valve, remove valve plug and valve plug seal. Using a screwdriver, remove the overload valve screw, valve spring, valve plunger and steel ball. Clean and inspect valve cavity. If the ball seat is marred, re-seat the overload ball by lightly tapping the ball on seat using an appropriate ball seating tool or contact ATI for assistance. Remove the ball after seating to prevent sticking. Reassemble the ball, plunger, spring and valve screw. Connect a pressure gage to the pressure outlet. Stroke the pump to obtain maximum desired pressure. Turn the valve screw clockwise to increase the pressure reading and counter-clockwise to reduce the maximum reading. After valve is set properly, replace valve plug. Note that the seal kit contains the new style valve plug and seal.



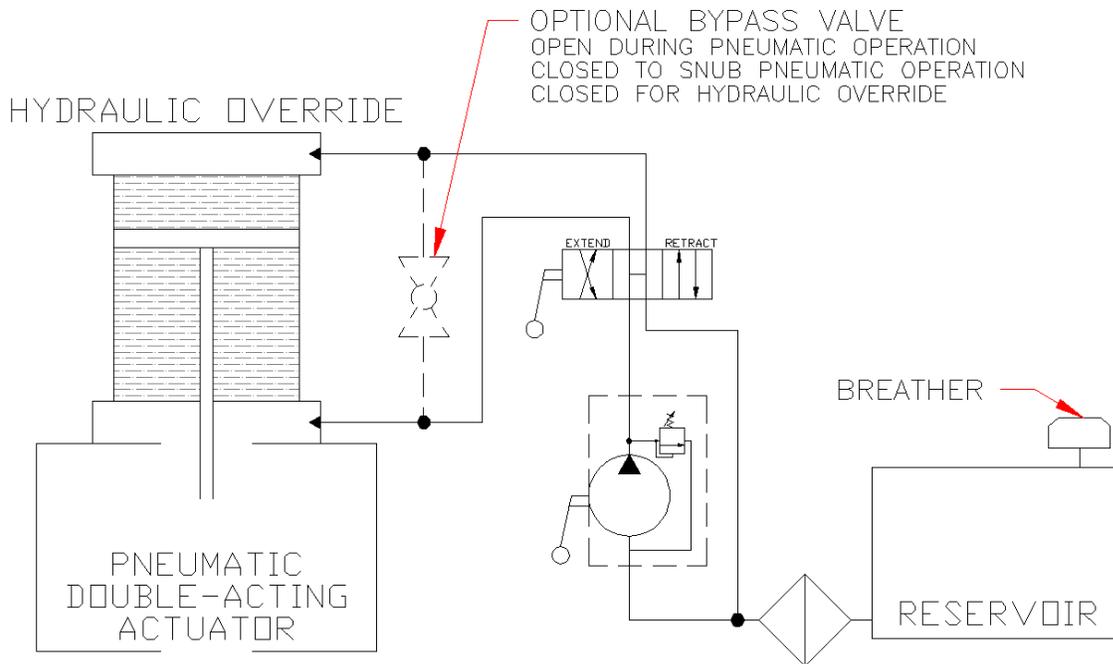
# APPENDIX A – HO# ASSEMBLY

## *Typical HO Assembly*

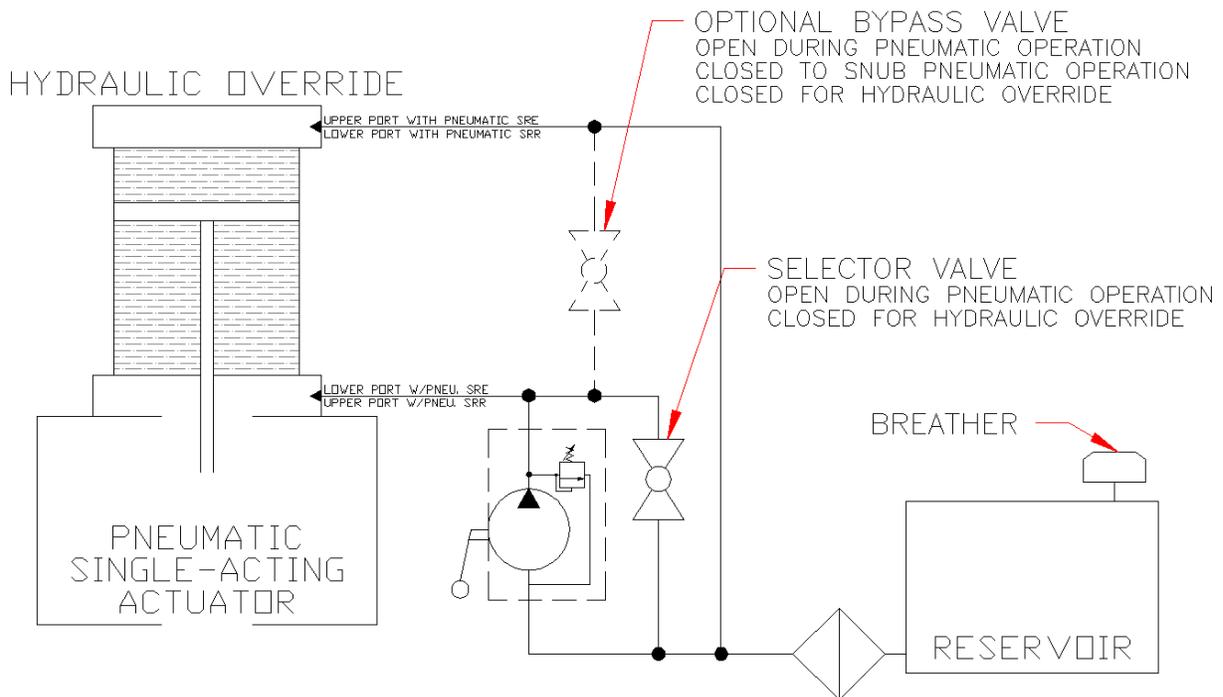


## APPENDIX B – HO# CONTROL SCHEMATIC

**Figure 1A, HO2 Control, Double-acting HO in Tandem with Pneumatic Actuator**  
(adapted from Drawing 8654)

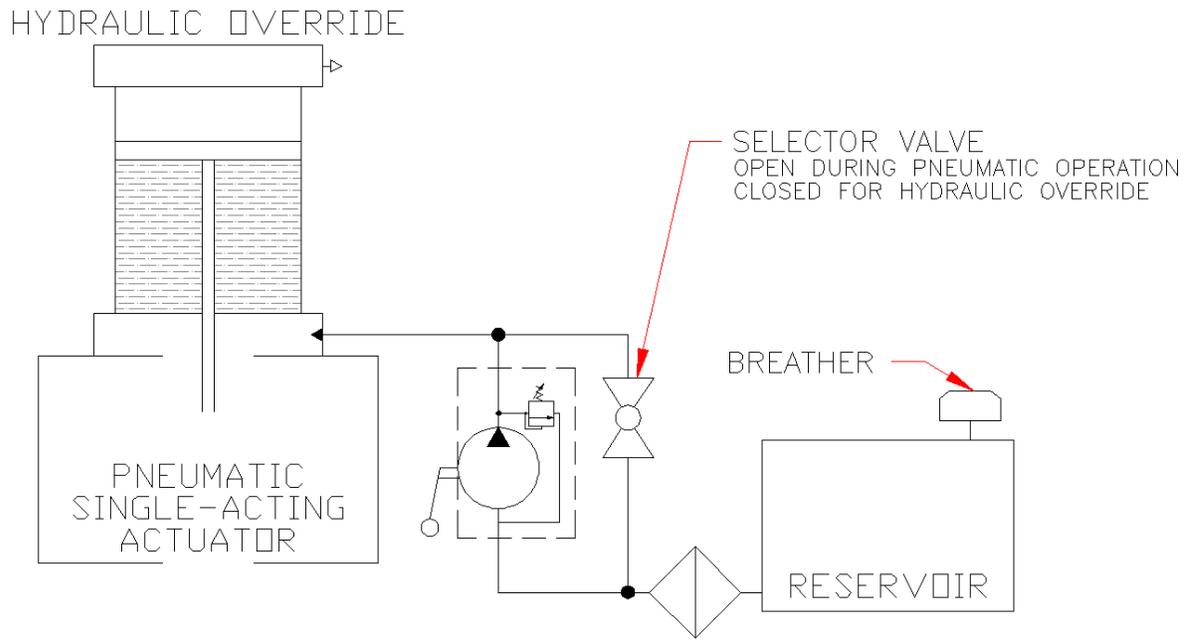


**Figure 1B, HO1 Control, Single-acting HO in Tandem with Pneumatic Actuator**  
(adapted from Drawing 8654)



**Figure 2, HO1 Control, Single-acting Vented HO in Tandem with Pneumatic Single-acting Actuator (adapted from Drawing 23310)**

*With one chamber of override vented to atmosphere, this arrangement is generally suitable for indoor environments or other dry atmospheres with limited risk of corrosion. Refer to Figure 1B for a closed-loop override circuit to limit HO corrosion in harsh environments.*



**Figure 3A, HO Control for Hydraulic Actuators**

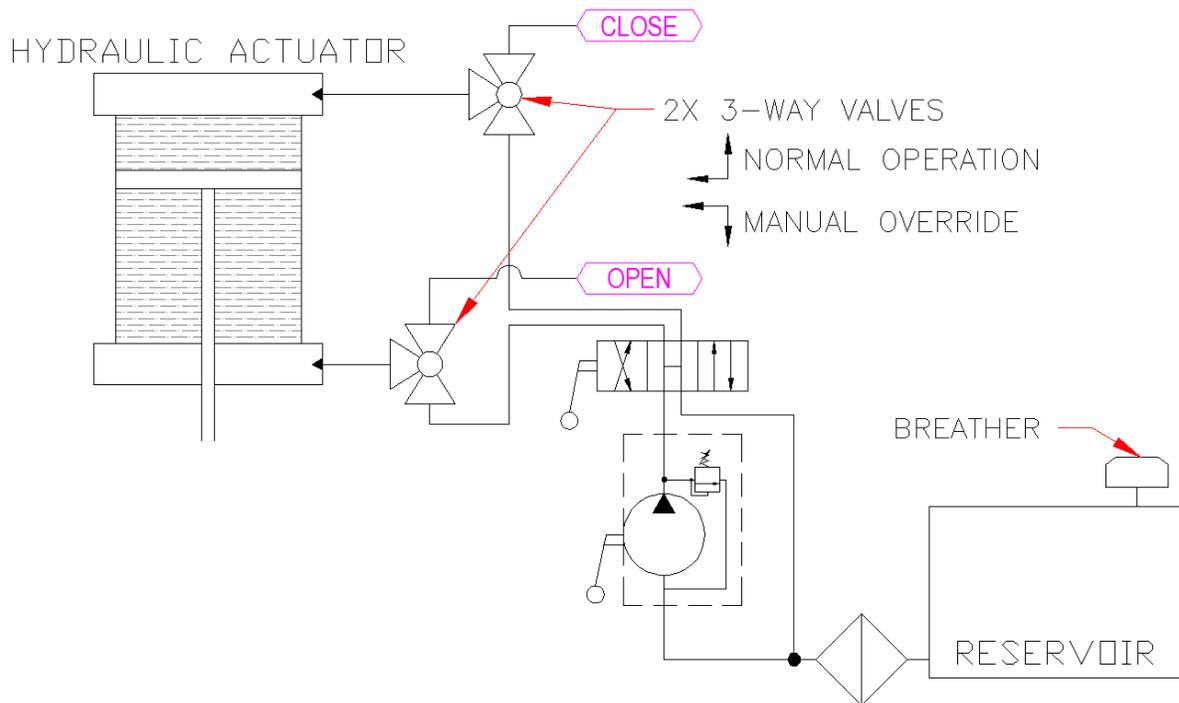
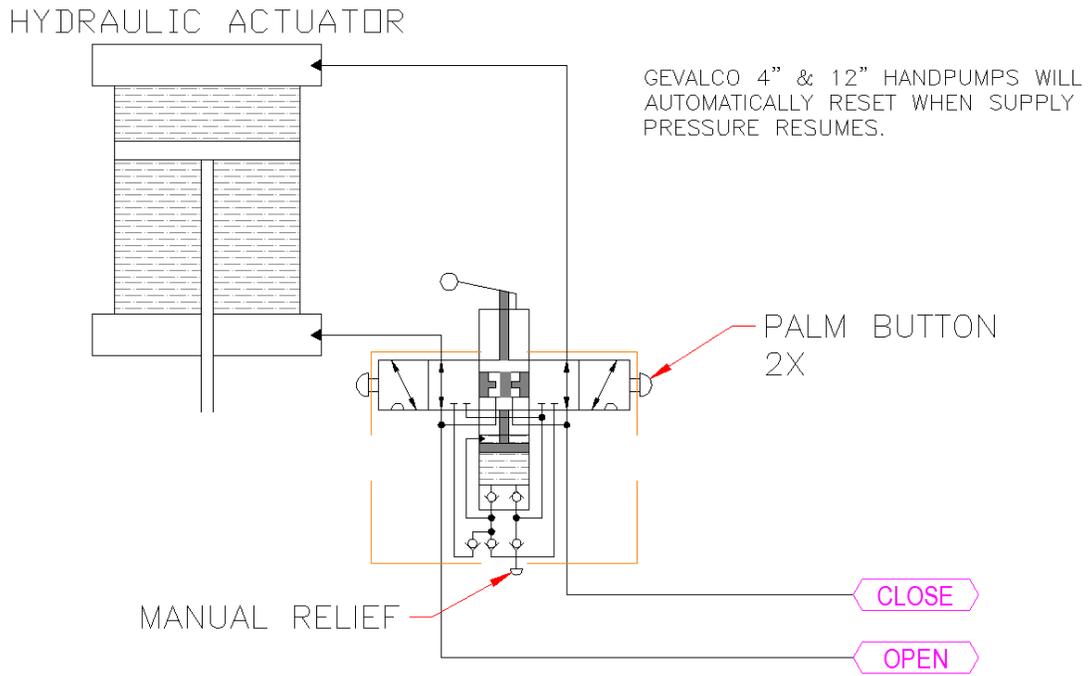
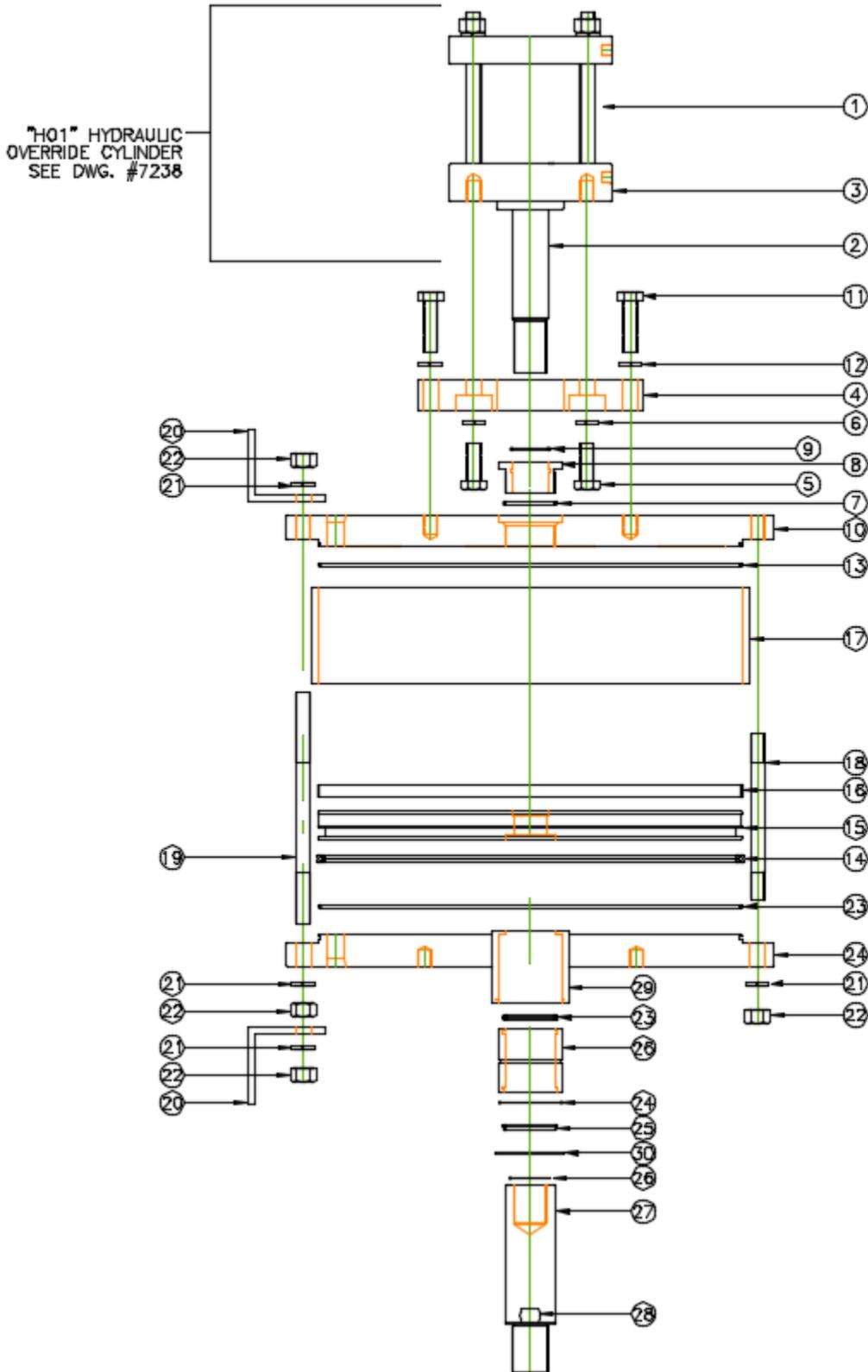


Figure 3B, HO Control for Hydraulic Actuators with automatic reset



### APPENDIX C – HO# ASSEMBLY ON DA ACTUATOR

*Typical HO Assembly (adapted from Drawing 8167)*



**ASSEMBLY INSTRUCTIONS**

1. Place hydraulic cylinder (item 1) on a flat surface with the piston rod (item 2) facing up.
2. Install adaptation plate (item 4) over hydraulic cylinder piston rod (item 2) onto lower head (item 3). Install and tighten hex head cap screws (item 5) and lock washers (item 6) into lower head (item 3).
3. Install "o" ring (item 7) onto threaded bearing (item 8) groove with a light coat of grease. Install bearing rod "T" seal with 2 back up rings (item 9) into threaded bearing (item 8) groove with a light coat of grease.
4. Lay "L" series (DA) upper head (item 10) groove side down, on flat surface that will allow piston rod clearance through head.
5. Install threaded bearing (item 8) into (DA) upper head (item 10).
6. Install hydraulic cylinder piston rod (item 2) assembly through threaded bearing (item 8) in (DA) upper head (item 10) so that adaptation plate (item 4) lay flat and aligned with threaded holes in (DA) upper head (item 10).
7. Install and tighten the hex head cap screws (item 11) and lock washers (item 12) through adaptation plate (item 4) into (DA) upper head (item 10).
8. Lay hydraulic cylinder and (DA) upper head assembly, groove side up, on flat stable surface.
9. Install "o" ring (item 13) onto (DA) upper head (item 10) groove with a light coat of grease.
10. Install "Quad" ring (item 14) onto piston (item 15) groove with a light coat of grease.
11. Place piston (item 15) over hydraulic cylinder piston rod (item 2), piston wear ring (item 16) side down. Note: Insure great care to protect piston rod threads from damage.
12. Install piston wear band (item 16) in piston (item 15) groove, while lowering cylinder (item 17) over piston (item 15) onto (DA) upper head (item 10).
13. Install shorter tie bolts (item 18) in (DA) upper head (item 10).
14. Install longer tie bolts (item 19) in (DA) upper head (item 10). Note: Be sure that threads extend beyond (DA) upper (item 10) top surface enough to install tank mount bracket (item 20) lock washer (item 21) and hex nut (item 22).
15. Install "O" ring (item 23) onto (DA) lower head (item 24) groove with a light coat of grease.
16. Install (DA) lower head (item 24) over tie bolts (items 18 & 19) onto cylinder (item 17). Note: Align NPT port on upper head with NPT port on lower head.
17. Adjust tie bolts (items 18 & 19), if necessary, so that the lock washers (item 21) and hex nuts (item 22) will have sufficient thread engagement. Tighten securely, then torque to recommended specs using a criss-cross pattern.
18. Install bearing seals (items 23, 24 & 25) on rod bearing (item 26) grooves, with a light coat of grease.
19. Install "O" ring (item 26) into piston rod (item 27) groove, with a light coat of grease.
20. Install piston rod (item 27) through (DA) lower head (item 24) and screw onto hydraulic cylinder piston rod (item 2). To tighten use flats or pin set holes (item 28) located 180 degrees apart on piston rod end. Note: Insure piston rod is fully seated.
21. Install bearing assembly (item 26) over piston rod (item 27) into bearing housing (item 29).
22. Install bearing retaining ring (item 30) into groove in bearing housing (item 29).
23. Cycle actuator and check for smooth operation and leaks.

**DISASSEMBLY:** Reverse assembly instructions.