MTS FSE MODULAR TRAINING

Landmark Load Frames

June 3, 2016 rev B

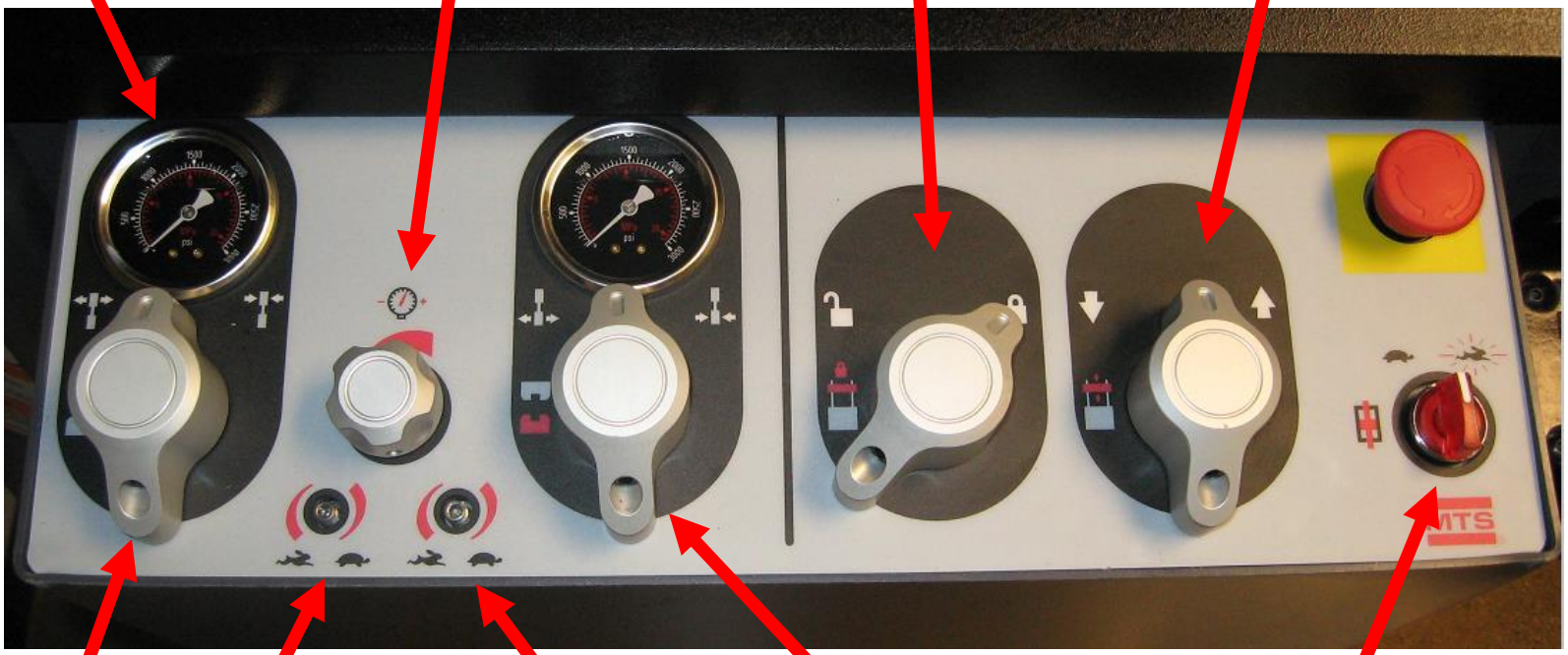
be certain.

Overview

MTS Landmark Model	Load Frame Force Capacity	Actuator Force Rating Options	Dynamic Stroke Options
370.02	25 kN (5.5 kip)	15 kN (3.3 kip) 25 kN (5.5 kip)	100 mm (4 in) 150 mm (6 in)
370.02 A/T		100 N-m 200 N-m	270 degree 270 degree
370.10	100 kN (22 kip)	15 kN (3.3 kip) 25 kN (5.5 kip) 50 kN (11 kip) 100 kN (22 kip)	100 mm (4 in) 150 mm (6 in) 250 mm (10 in)
370.25	250 kN (55 kip)	100 kN (22 kip) 250 kN (55 kip)	150 mm (6 in) 250 mm (10 in)
370.50	500 kN (110 kip)	250 kN (55 kip) 500 kN (110 kip)	150 mm (6 in)

Handset

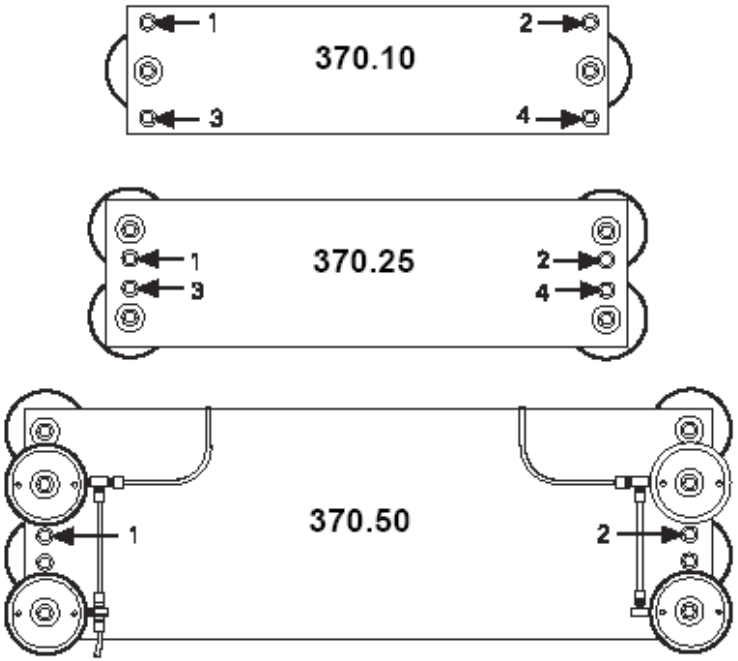
Controls


Grip Pressure
Grip Pressure Adjustment
Crosshead Lock - Unlock
Crosshead Up / Down
Upper Grip Control
Upper Grip Rate Adjustment
Lower Grip Rate Adjustment
Lower Grip Control
Actuator Velocity Control

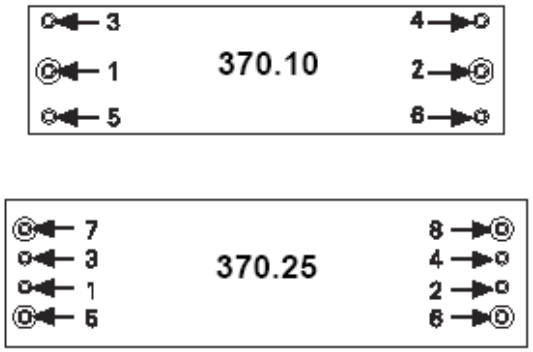
Landmark

- All Metric Fasteners:
  - Includes Actuator threads and Load Cell threads
    - » Only available in metric M12, M27, M36, and M52
    - » Adapter studs available for standard MTS grips
    - » Currently no pre-designed Metric to US Customary thread adapters for non MTS fixtures
  - Servo-Valve fastener M8
  - Hydraulic connections NOT metric
  - Will ship with metric hex key for manual crosshead locking bolts
- Hydraulic Velocity Limiter Standard
  - Meets requirements for CE compliance
- Lifts require hydraulics to lower crosshead
  - Designed for both power up and power down using double acting cylinder
  - Meets requirements for CE compliance

Crosshead Lock Bolts



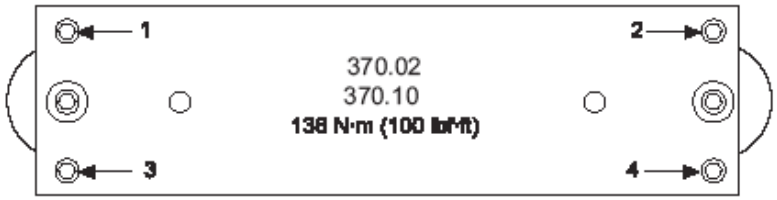
Hydraulically Locked Crossheads

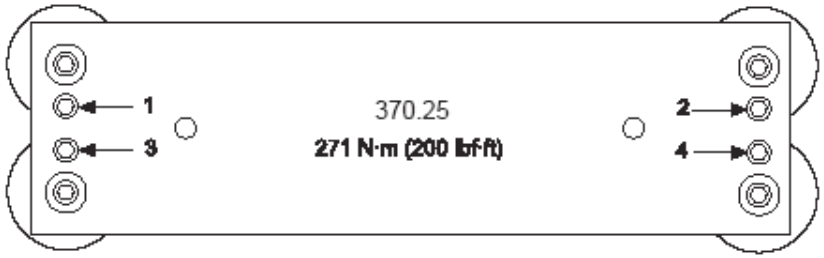


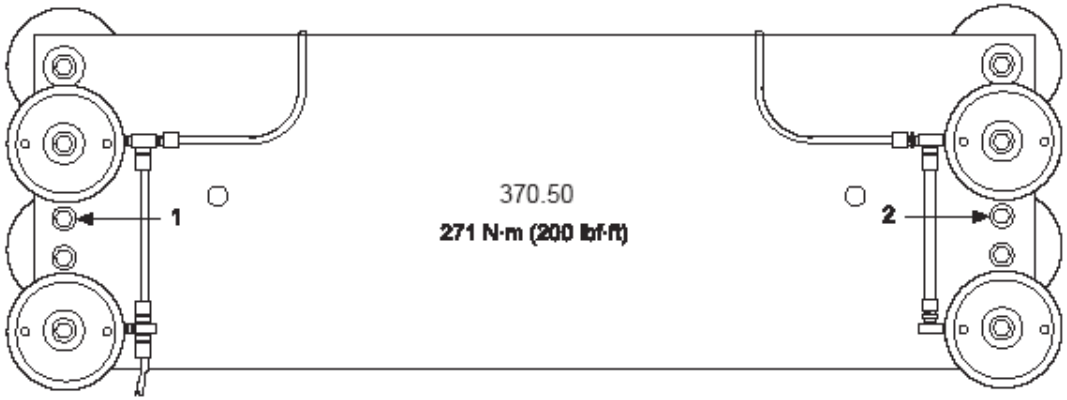
Manual locks not available on Model 370.50

Manually Locked Crossheads

Manual crosshead lock bolts – Hydraulic locks







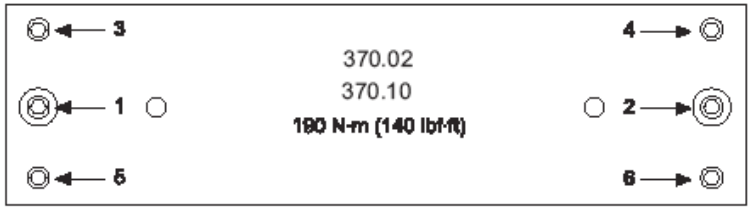
Manual Crosshead lock bolts – No Hydraulic Locks

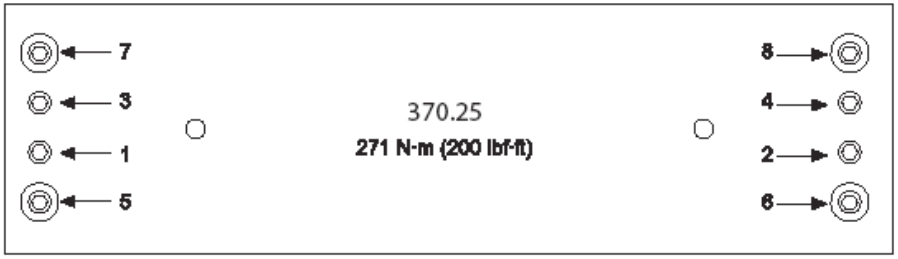
Tighten the crosshead clamping bolts according to the torque settings shown in the following table. Torque the crosshead bolts to the values in Step 1 and so on until Step 4 is complete. Use the same sequence as when you loosened the bolts.

Torque Values

Load Unit	Step 1	Step 2	Step 3	Step 4*
370.02	20 N·m (15 lbf·ft)	171 N·m (126 lbf·ft)	190 N·m (140 lbf·ft)	190 N·m (140 lbf·ft)
370.10	20 N·m (15 lbf·ft)	171 N·m (126 lbf·ft)	190 N·m (140 lbf·ft)	190 N·m (140 lbf·ft)
370.25	20 N·m (15 lbf·ft)	244 N·m (180 lbf·ft)	271 N·m (200 lbf·ft)	271 N·m (200 lbf·ft)

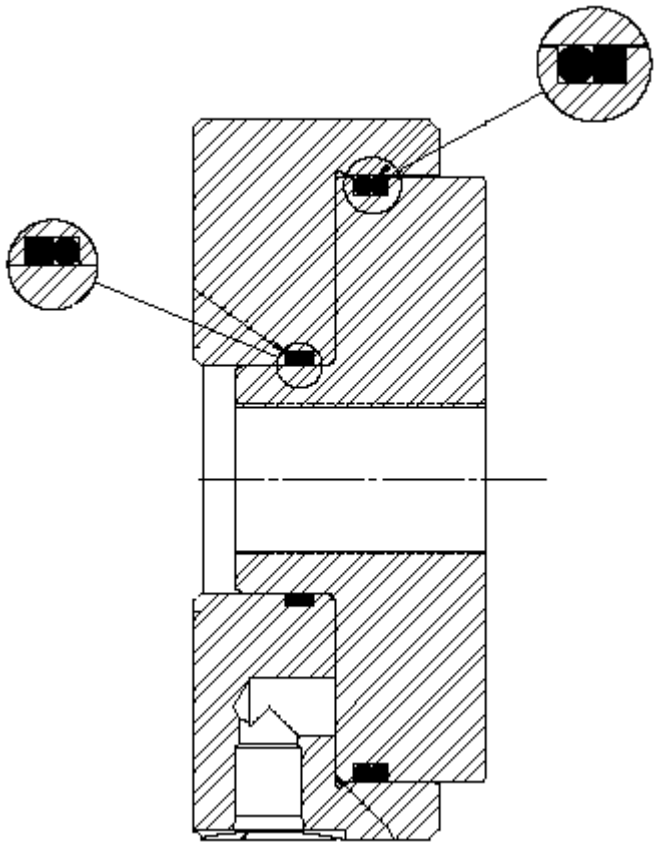
* This step ensures uniform tightness.



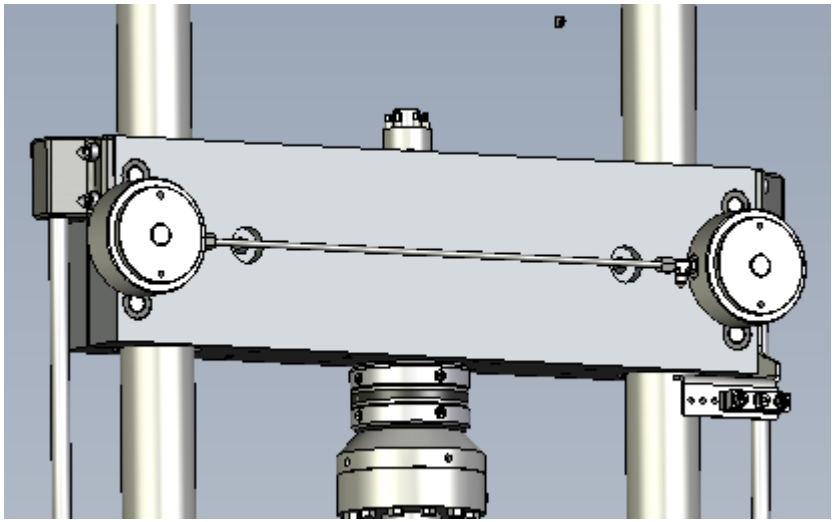


Manual locks not available on 370.50 Load Units

Lock Cylinders

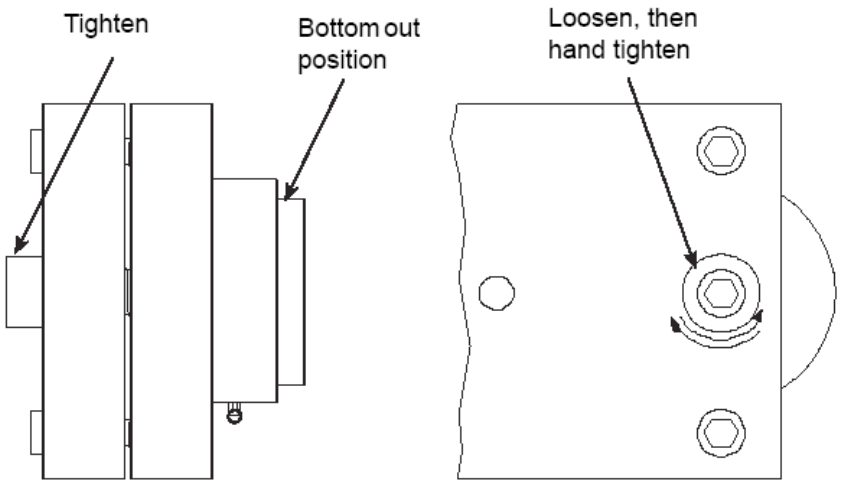


Lock cylinders use o-ring and backup ring.
O-ring installed on pressure side of cylinder.
Thread for lock cylinder bolt is M24 X 3.00

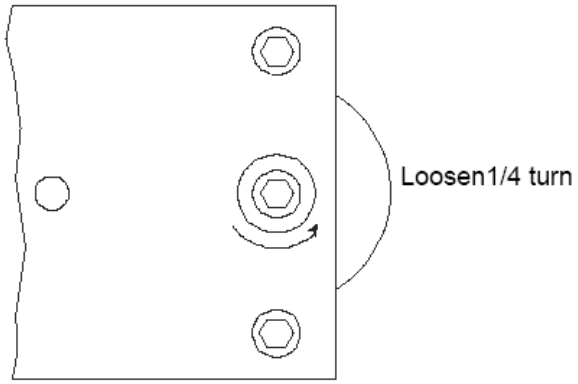


Lock Cylinder Adjustment

Tighten each lock's cap screw until its piston bottoms out. Then loosen and hand-tighten each cap screw.



Loosen each of the hydraulic lock cap screws 1/4 turn.



Lift Cylinders

If Hoses to lift cylinder are cut, crosshead will not fall due to counter balance valve

No Lift cylinder bleed screws required

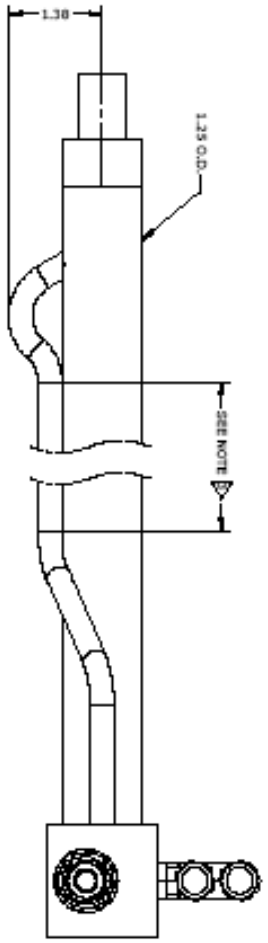
Raise Crosshead

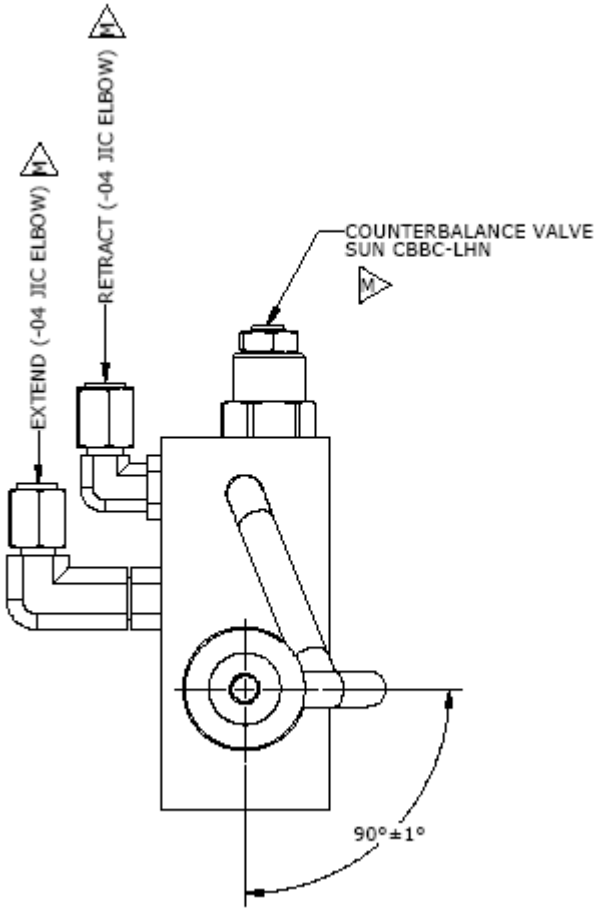
2 Hoses to each Lift Cylinder

Lower Crosshead

Counter Balance Valve

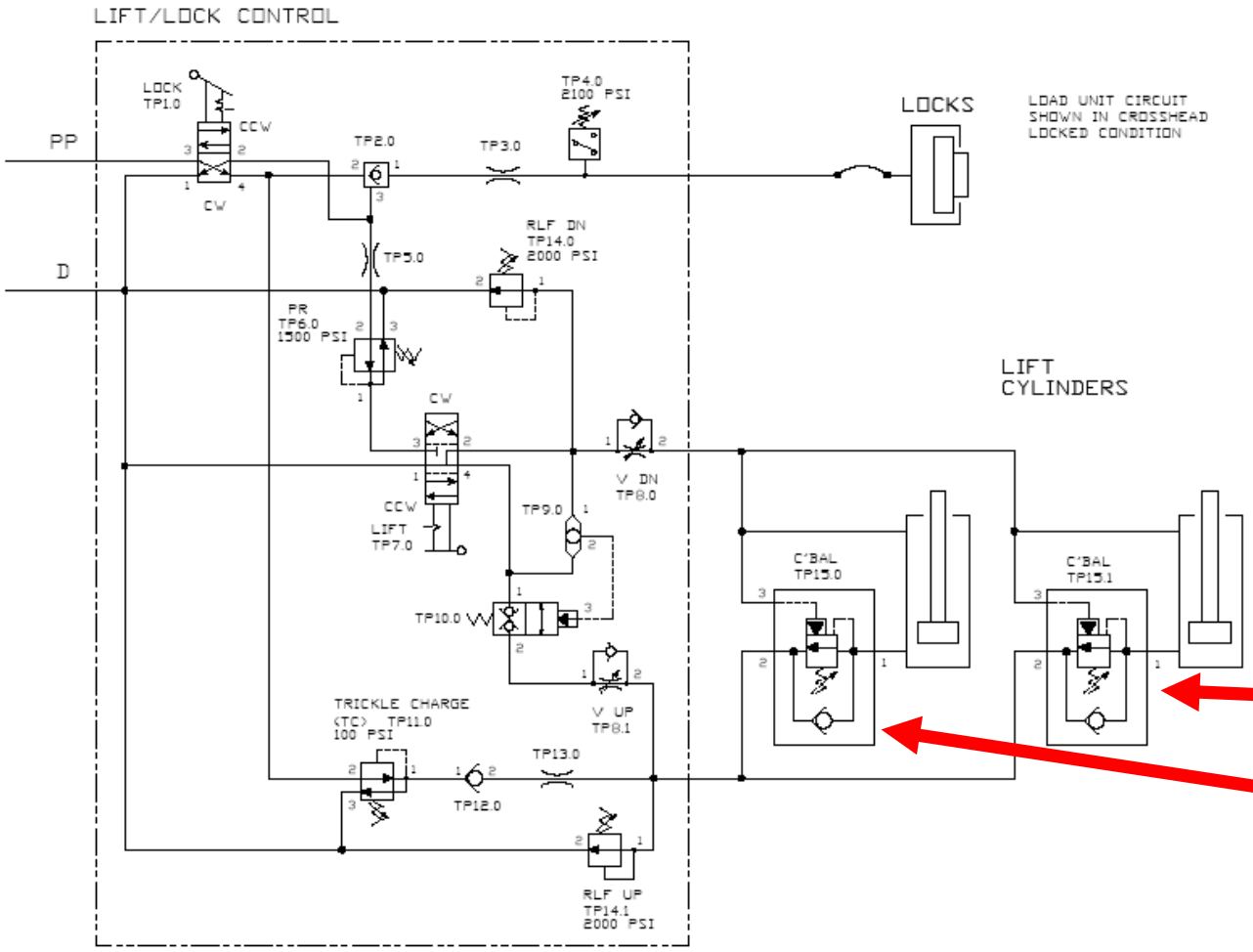
Lift Cylinders





Lift cylinders are purchased as a complete assembly from a vendor which supplies custom cylinders.

Lift / Lock



Adjustment for valves – set relief pressure greater than pressure caused by gravity for crosshead and fixture weight

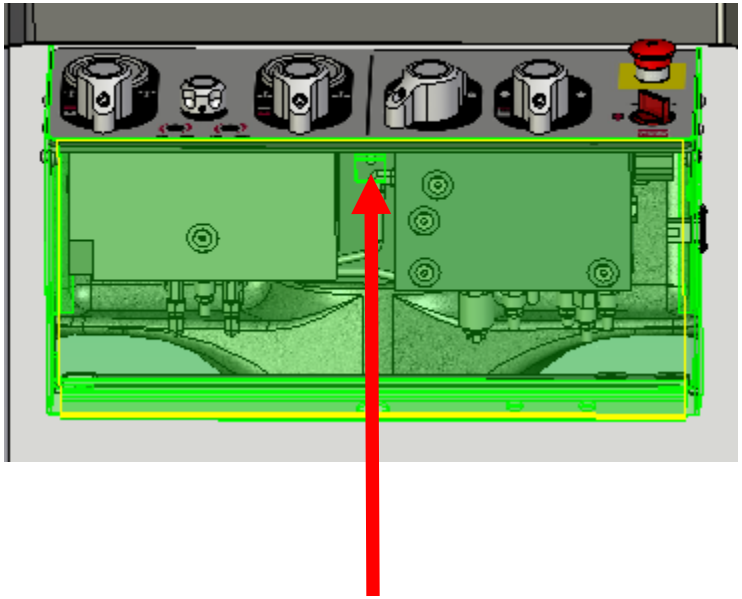
Counter Balance Valve – one for each cylinder

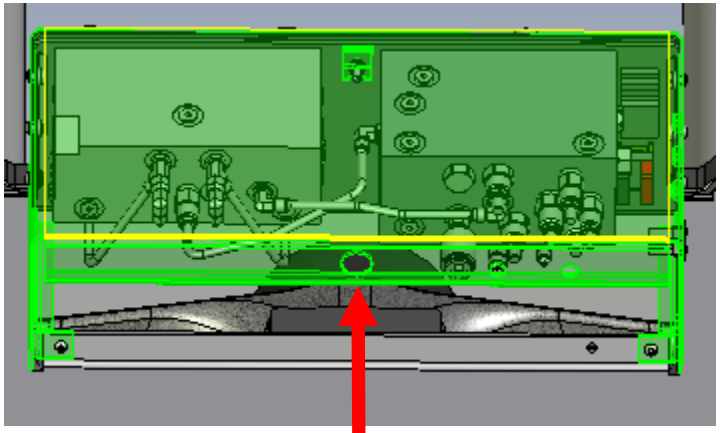
Lift Cylinders / Lock Circuit

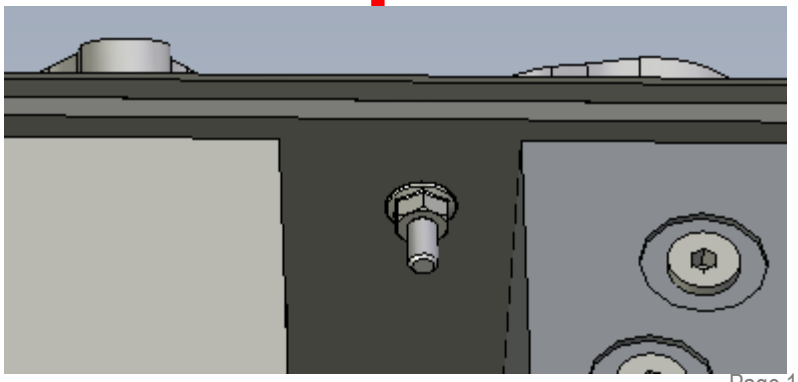
- Maximum Lift Cylinder Working pressure – 1500 PSI / 10.34 MPa
- Maximum Lift Cylinder Proof Test pressure – 2300 PSI / 15.86 MPa
- Counter balance valve set at pressure higher than pressure created by gravity for crosshead / grip mass
- Pressure relief in lift control set for 1500 PSI / 10.34 MPa
- Secondary relief in lift control set for 2000 PSI / 13.79 MPa
- Lift pressure relief setting does not effect lock circuit
  - Lock circuit requires 2000 PSI (13.79 MPa) to close crosshead lock switch
    - Low HPU pressure will not activate lock switch
- Crosshead lock circuit utilizes Pilot operated check valve similar to 318 style load frame
  - Requires hydraulic pressure to unlock crosshead

Floor Standing – Lift / Lock / Grip Control Cover

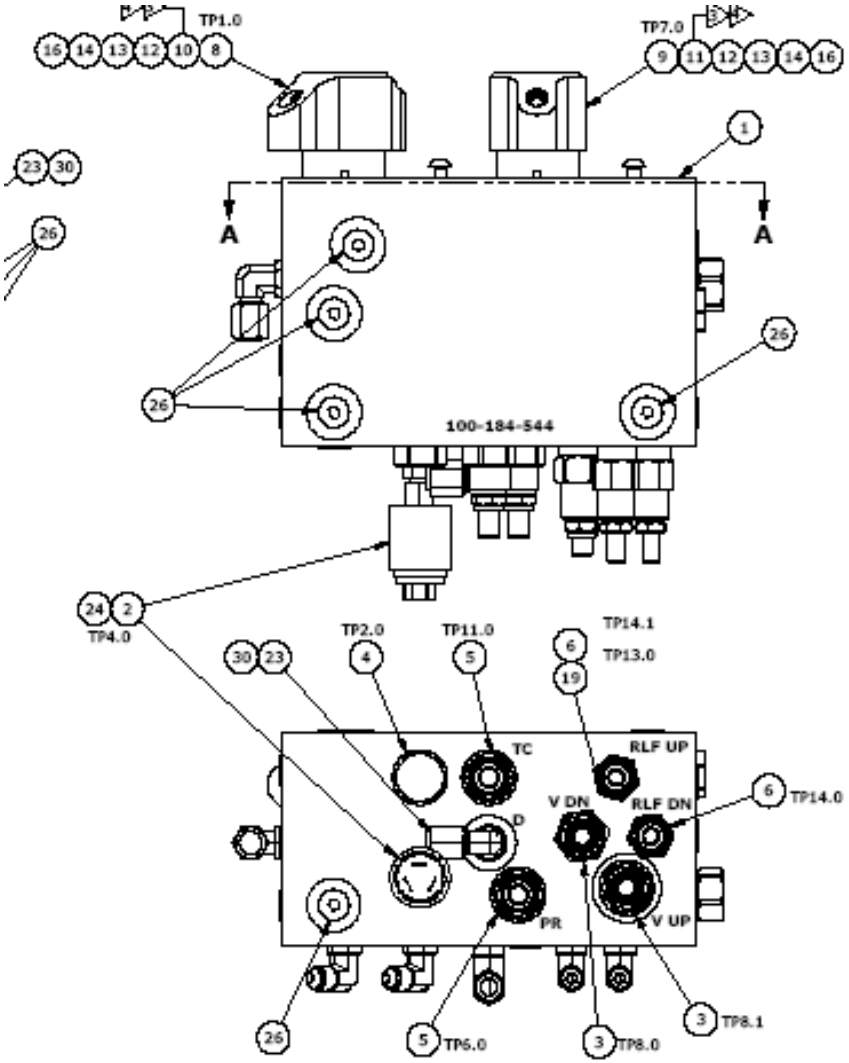
» To remove cover on grip control remove 8 bolts on outside of cover and then loosen nut inside grip cover by inserting 10 mm deep well socket through hole in the bottom of the cover in the center front wall. Nut is M6 X 1.00 thread





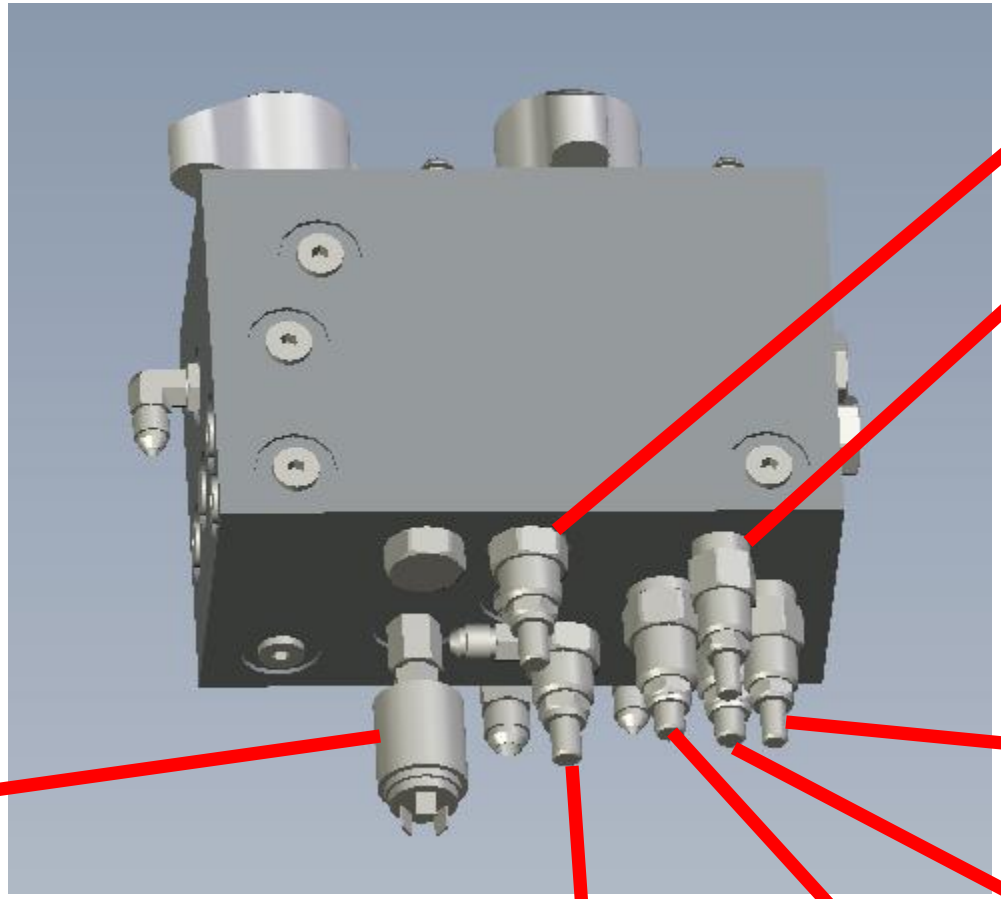


Lift / Lock Control



- Adjustments located on bottom of manifold
- TC - Trickle Charge – makeup oil due to loss – Set at 100 PSI / 0.69 MPa
- PR - Pressure relief for lifts – Set at 1500 PSI / 10.34 MPa
- RLF UP - Secondary pressure relief up direction – Set at 2000 PSI / 13.79 MPa
- RLF DN - Secondary pressure relief down direction – Set at 2000 PSI / 13.79 MPa
- V UP – Up direction rate adjustment
- V DN – Down direction rate adjustment

Lift / Lock Manifold



Lift / Lock Manifold

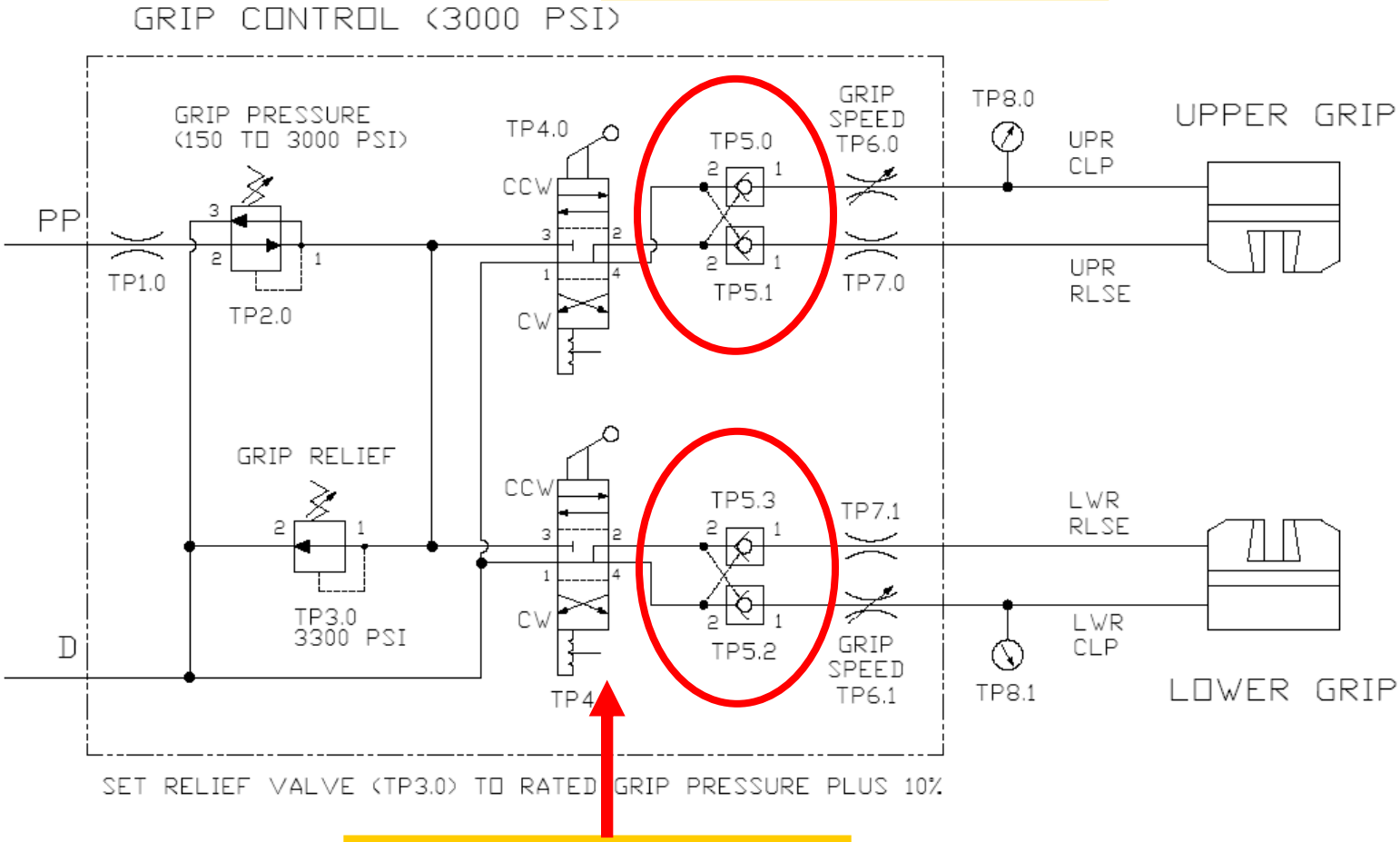
Lift / Lock Manifold attachment fasteners located under printed overlay. To access bolts for removal of manifold requires removing overlay and replacing when complete. Overlay may be damaged during removal. Manifold must be removed for proper handle alignment.

Grip Control

- Independent grip rate adjustments for upper and lower grips
- Independent pressure gages for upper and lower grips
- Optional hydraulic intensifiers for pressures up to 10000 psi
- 2 intensifiers, 1 for upper grip, 1 for lower grip
- Intensifiers mounted inside load frame external to grip control
- Secondary relief valve set for 3300 PSI / 22.75 MPa
  - This applies to both 3000 PSI / 20.68 MPa and 10000 PSI / 68.95 MPa configurations
- Upper and lower grips isolated from each other with cross port check valves.
  - These behave similar to crosshead lock circuit requiring pressure be applied to control port to open check valve
  - These check valves prevent cross-talk between grips from spikes on the hydraulic lines when operating grips

Grip Control

New!!
Cross Port Check Valves

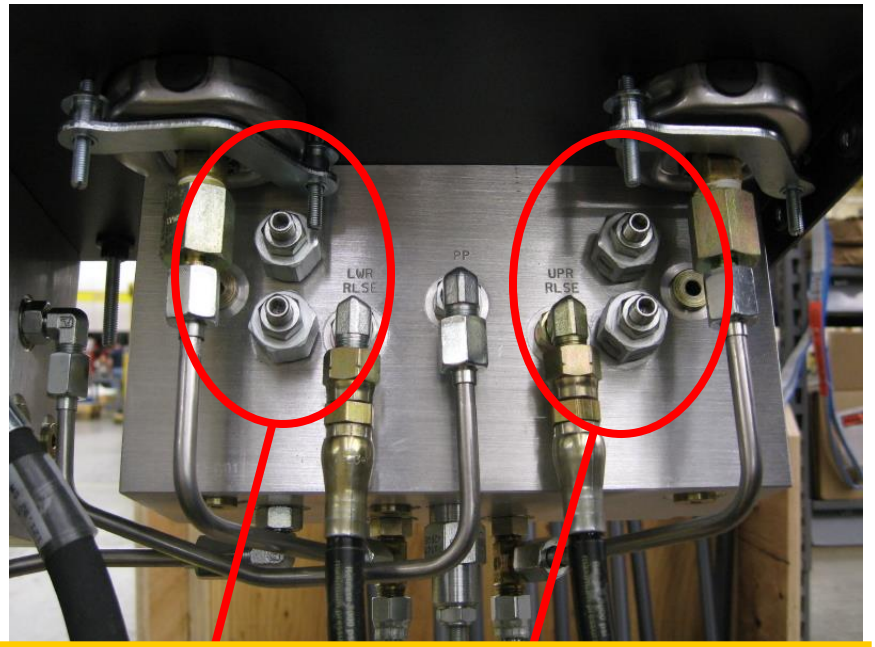


New!!
3 Position Detent control

Grip Control – Cross Port Check Valves

- Check valves will maintain pressure in hose
- Pressure may not indicate on gauge
  - If hoses are plugged with no grip in use and release direction activated then release hose may pressurize and not indicate on gauge
  - If grip attached and allowed to fully retract in the release direction pressure may build and not indicate on gauge
- Check valves have manual release to ensure all pressure has been removed from hoses

Grip control – Cross port check valves

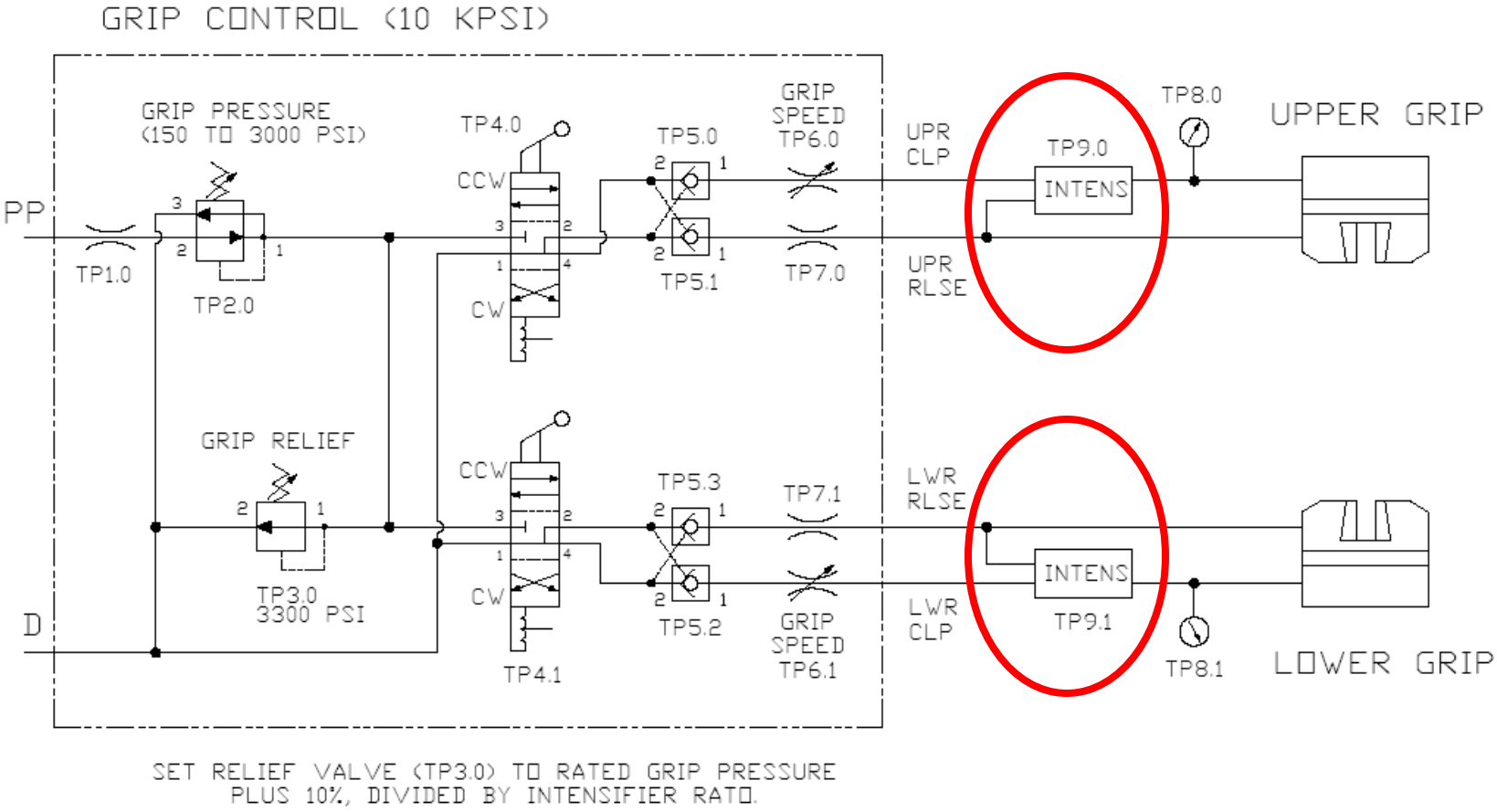


Valves can be accessed by removing load frame table top.

Check Valve Manual Release
4 valves total
Loosen lock nut with 9/16” wrench, turn release with 5/32” hex key clockwise to release pressure

Grip Control

2 Intensifiers, 1 for each grip

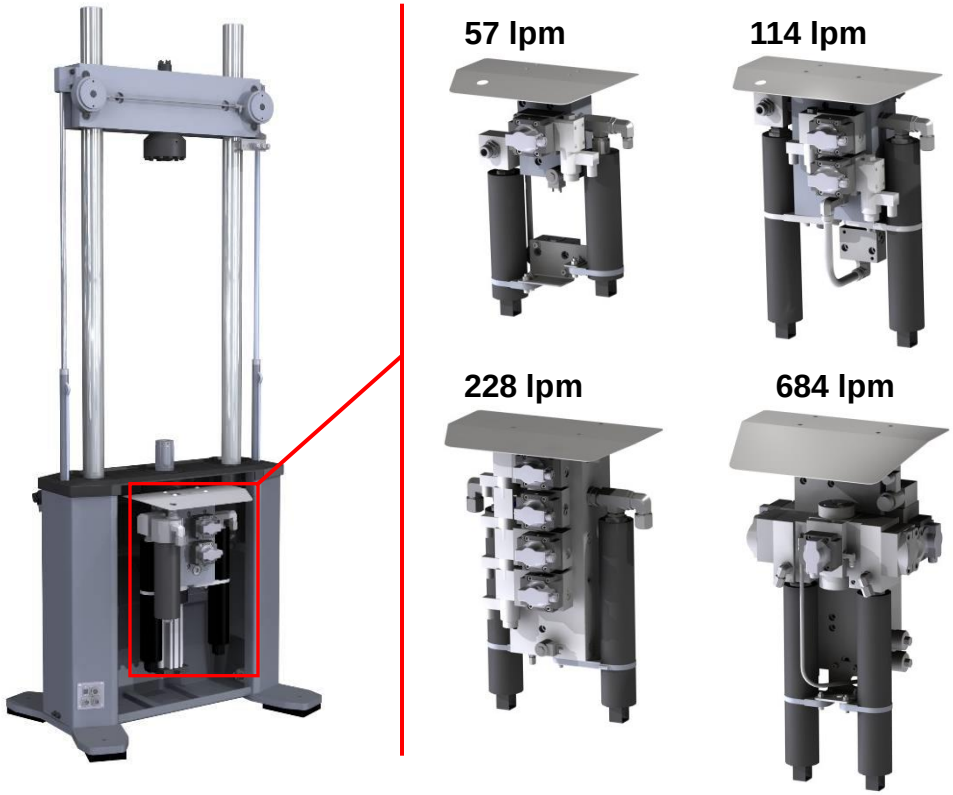


Servo Valve Manifold

- Servo valve Manifold available in 4 standard configurations
- HSM located on servo valve manifold for 252.XX series
- HSM located on floor for 256.XX series
- All standard configurations have hydraulic velocity limiting
- 15 GPM Single 252.XX valve (57 lpm) – With HSM Incorporated
- 30 GPM Dual 252.XX valve (114 lpm) – With HSM Incorporated
- 60 GPM Quad 252.XX valve (228 lpm) – External Floor Standing HSM
- 180 GPM 256.XX valve with additional 252.XX valve (684 lpm)
  - 180 GPM manifold supports either 256.09 90 GPM valve or 256.18 180 GPM valve

Servo Valve Manifold

» Standard Servo Valve manifold choices available



HSM

- HSM Details
- Integrated HSM only available with proportional control
  - Floor mount version Off/Low/High
- True proportional control: Low pressure = Full flow
  - Older 298 style manifold Low pressure = Low flow
- Optional oil filter external to manifold located at Pressure hose connection
- Accumulators restrained
- Uses cartridge valve for proportional control
  - Older versions do not have Wandfluh or Continental valves found on 298 manifold
  - New version have both the Wandfluh poppet and Continental valves
- Uses valve inside manifold to switch from low to high flow

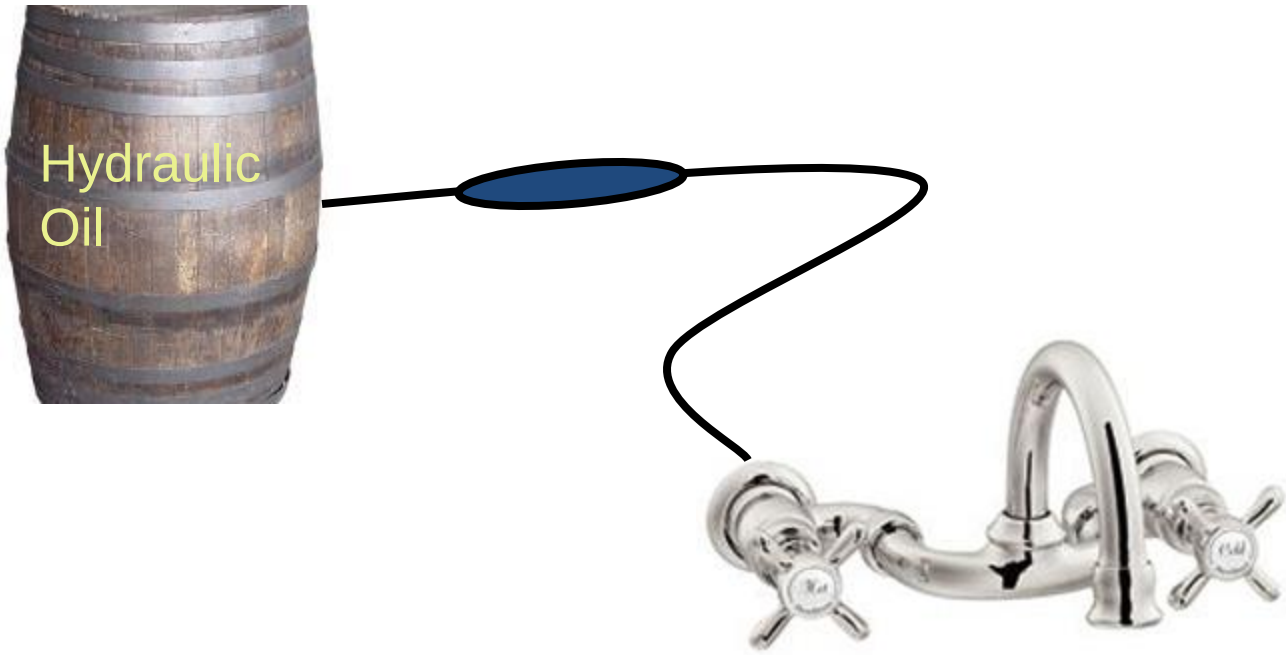
Integrated HSM

- HSM design for 15 GPM and 30 GMP servo-valve manifolds updated for improved operation
- Product Launch through January 2010 revision A
  - Poppet valves for low velocity located between servo-valve and actuator
  - This can cause a small bump in the actuator when switching from high flow to low flow or back. If testing stiff specimen this small displacement change may cause a load to be induced into test specimen
  - HSM can generate hissing noise when HPU is on and HSM is off. This is from oil flow from pressure to return in this condition.
- February 2010 to March 2015 revision B
  - Check valves for low velocity located between pressure inlet and servo-valve. This eliminates the load bump that may be present when switching velocity.
  - The hissing noise has been addressed with a design change altering the amount of oil flowing from pressure to return when the HSM is in the off condition. The HSM now has an adjustable orifice to eliminate the noise.
  - Parasitic losses were in the neighborhood of 6% loss, worst case on 100 and 500 kN

Integrated HSM – New Style as of 3/2015

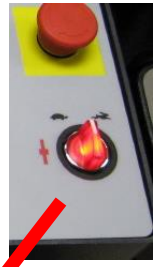
- March 2015 to present revision C
  - Best of the Old and the New to eliminate parasitic losses.
  - Windfluh High Pressure Poppet Valve, like on 298, poppet velocity is controlled by…
  - Continental Proportional valve, like on 298
  - Preserved low flow check valves and control orifice
  - Removed pressure reducing valve to improve maximum force
  - Removed needle valve
  - Added pressure and return test points.

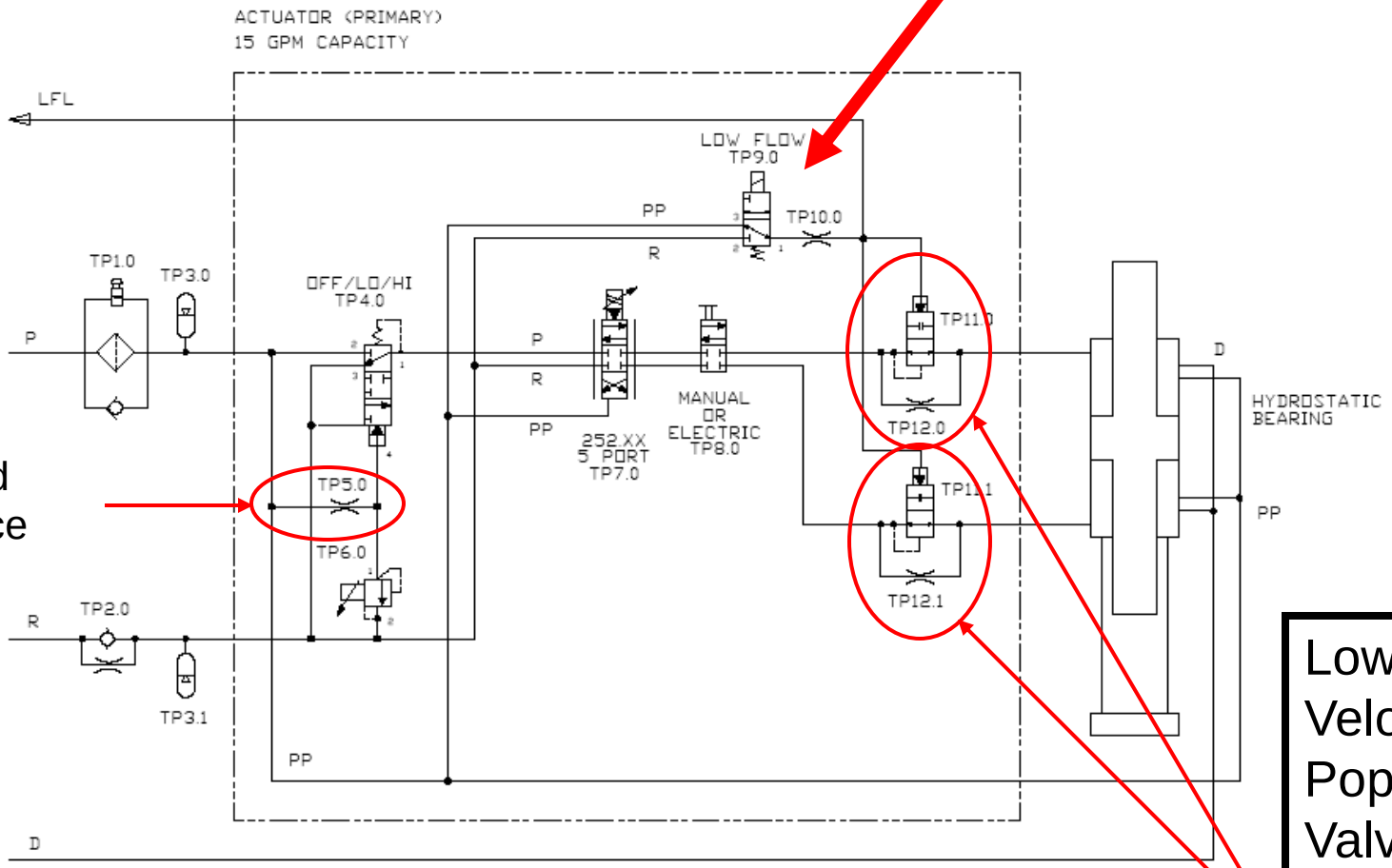
Version A HSM Models



HSM Version A

» 15 GPM Single 252.XX





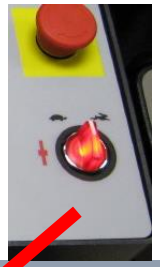
Fixed Orifice

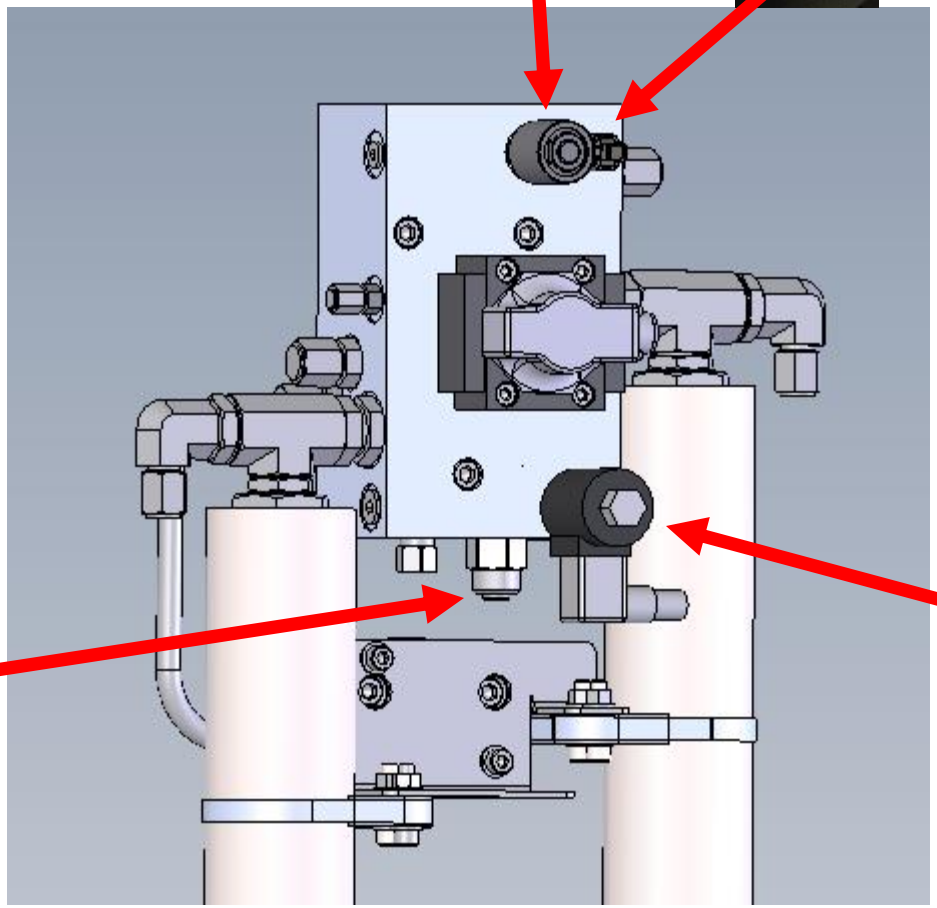
Low Velocity Poppet Valves and orifice

HSM Version A

- 15 GPM Single 252.XX

Low Flow
Cartridge Valve



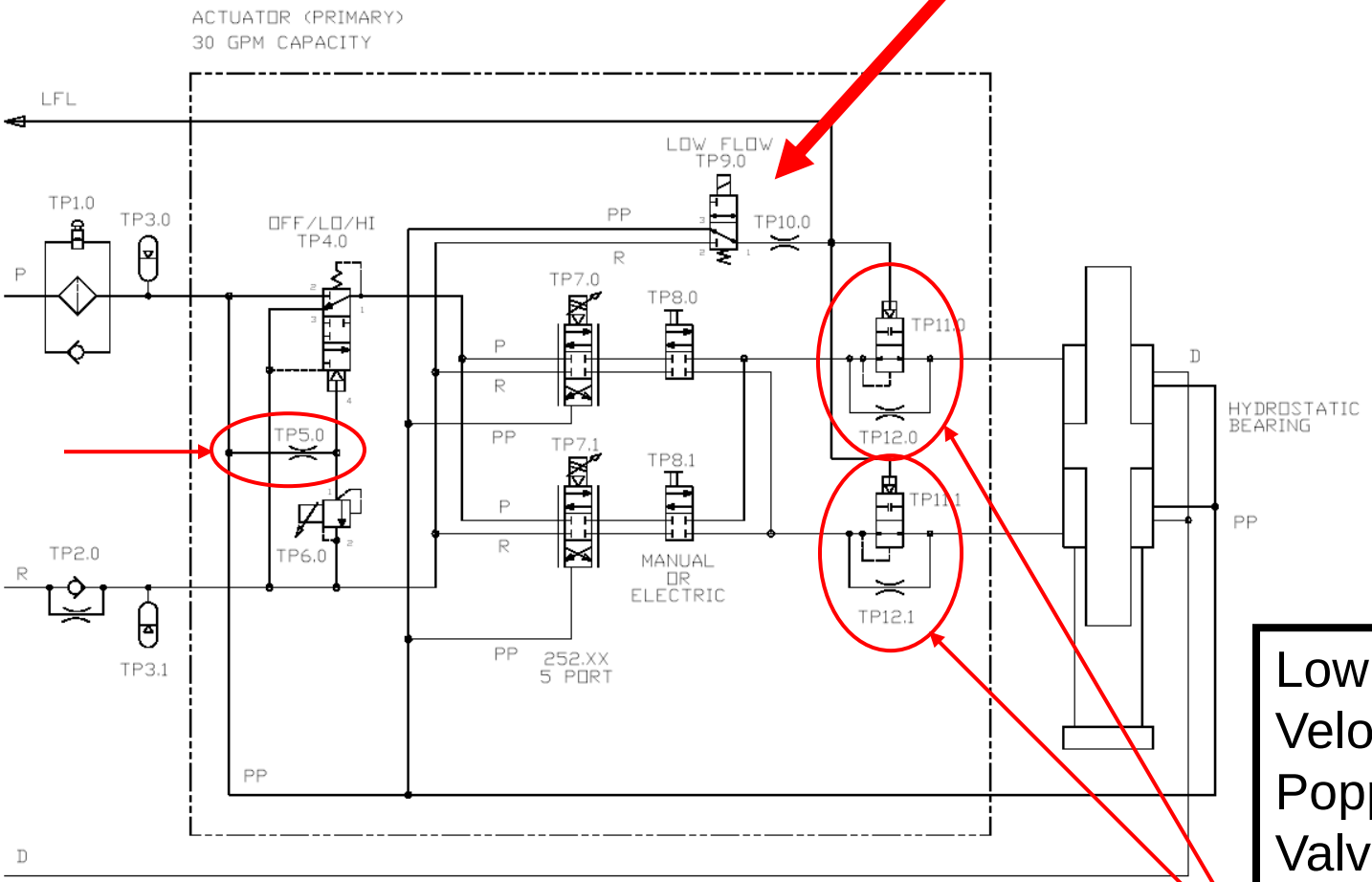


Main Hydraulic
Pressure
Control
Proportional
Valve

Electric
Operated
Pressure
Control
Proportional
Valve

HSM Version A

» 30 GPM Dual 252.XX



Fixed Orifice

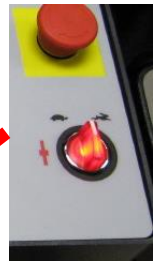
Low Velocity Poppet Valves and orifice

HSM Version A

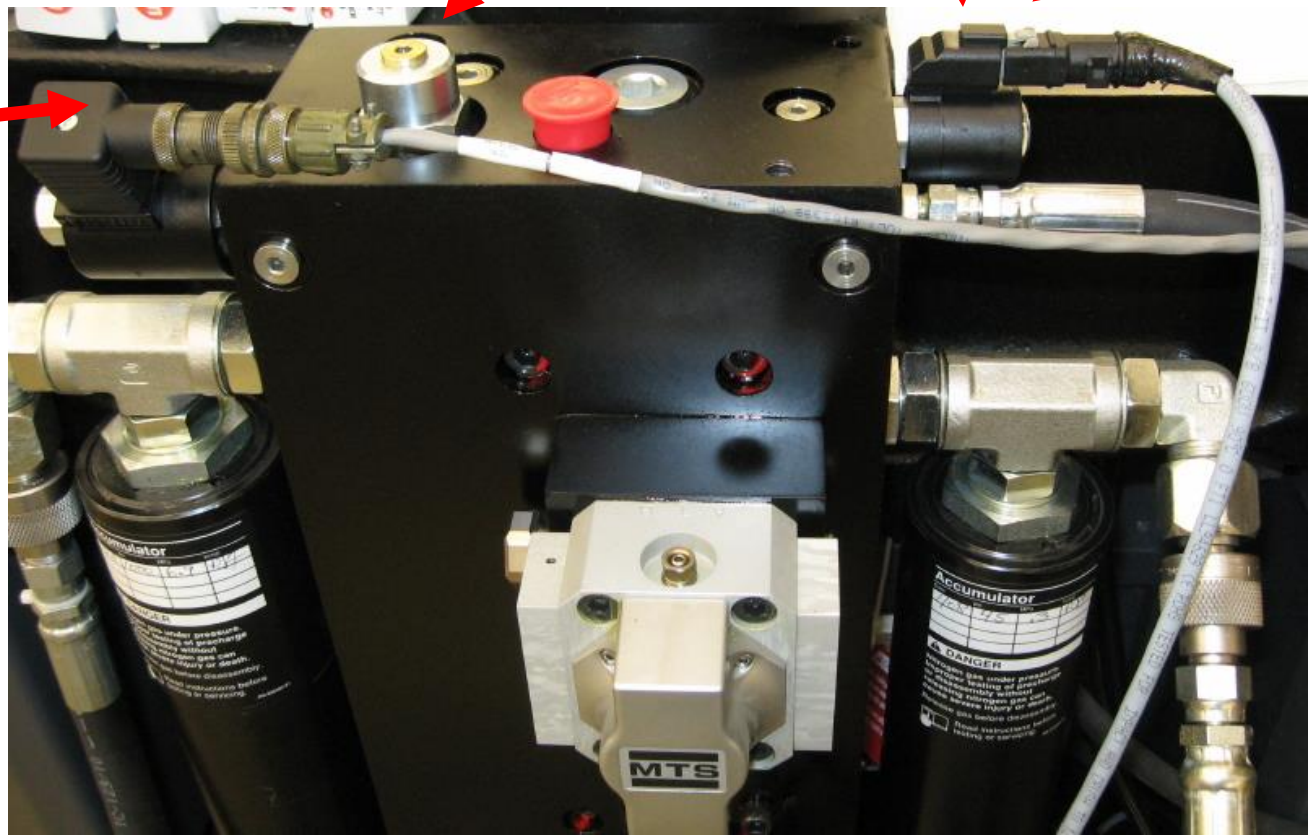
- 30 GPM Dual 252.XX

Main Hydraulic Pressure Control Proportional Valve

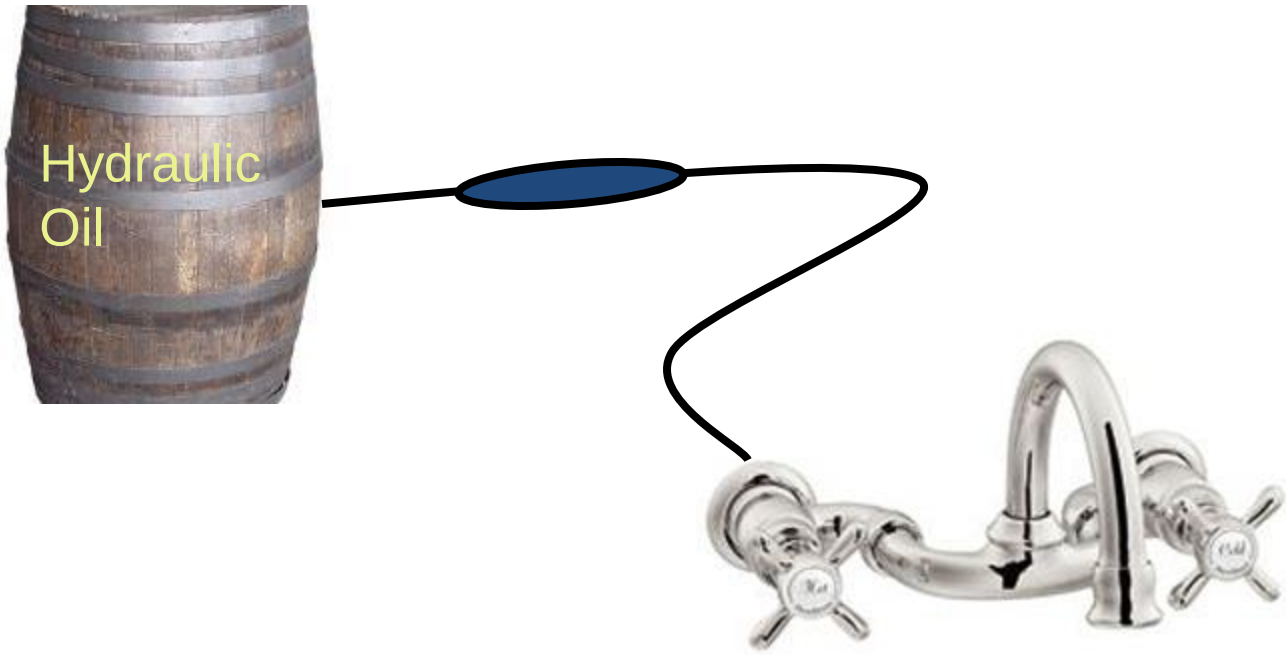
Low Flow Cartridge Valve



Electric Operated Pressure Control Proportional Valve

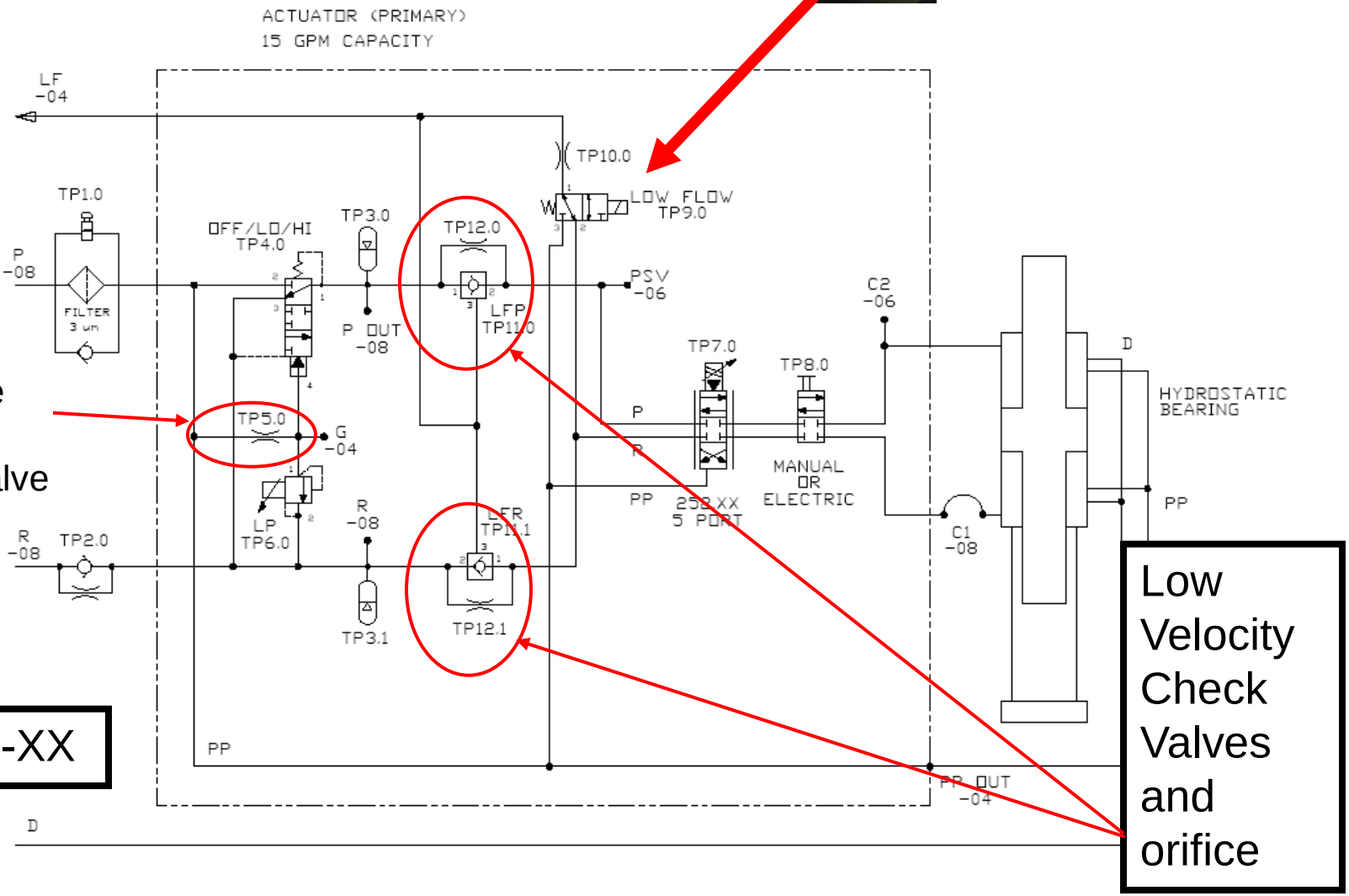


Version B HSM Models



HSM Version B

- 15 GPM Single 252.XX



Adjustable Orifice / Needle Valve

574762-XX

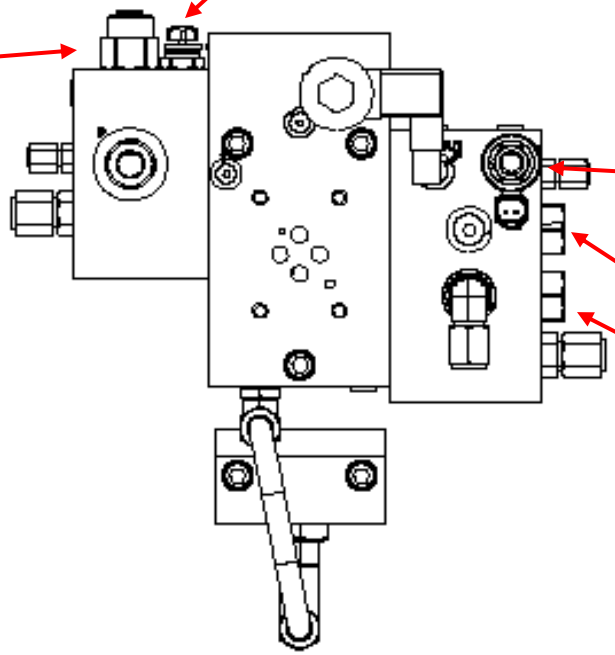
Low Velocity Check Valves and orifice

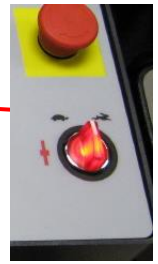
HSM Version B

- 15 GPM Single 252.XX

Adjustable Orifice / Needle Valve	This is Not a low pressure adjustment
	Adjustment: Fully seat and then open ½ turn

Main Hydraulic Pressure Control Proportional Valve

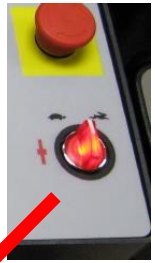


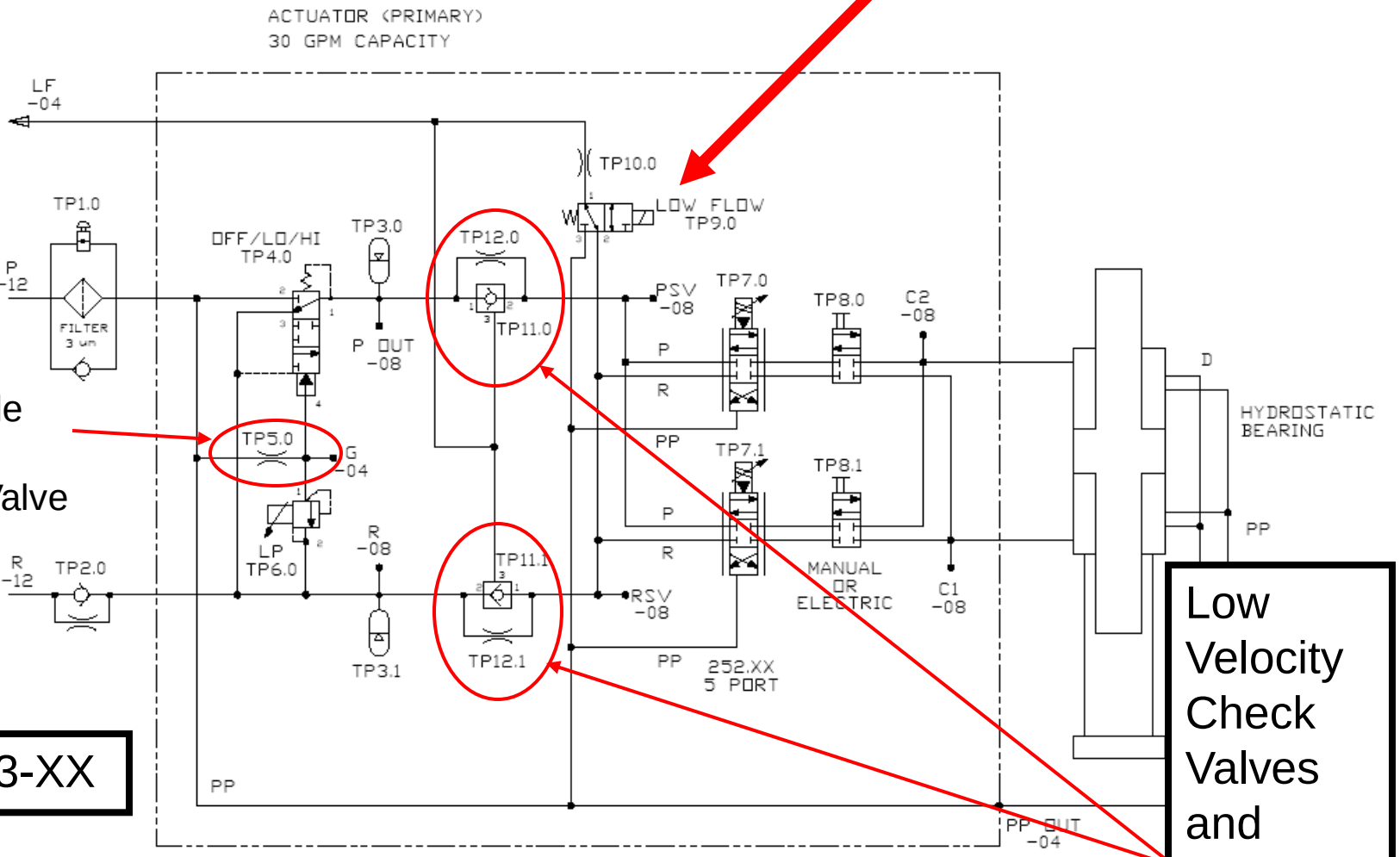


Low Velocity Check Valves and orifice

HSM Version B

» 30 GPM Dual 252.XX





Adjustable Orifice / Needle Valve

574763-XX

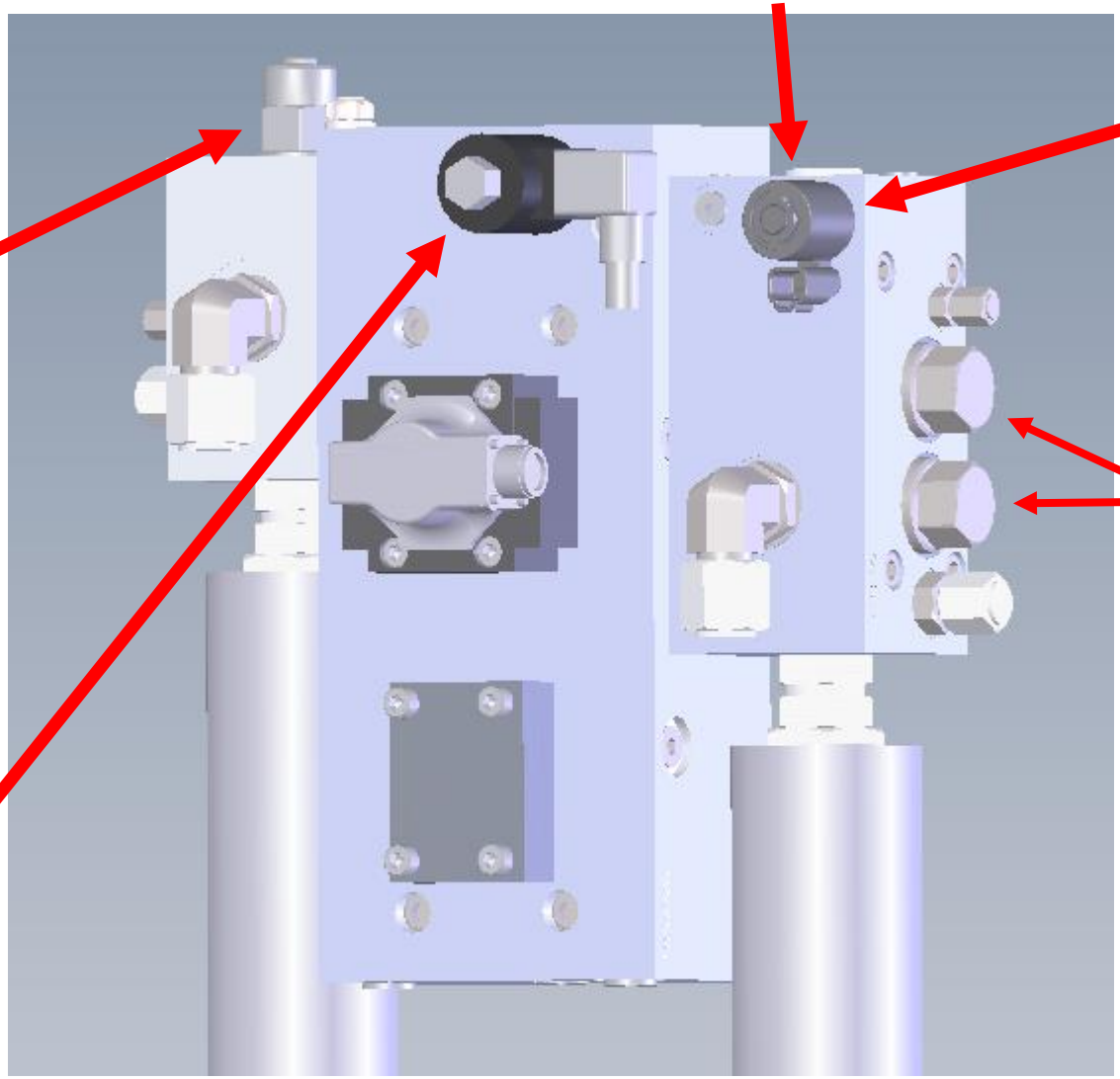
Low Velocity Check Valves and orifice

HSM Version B

30 GPM Dual 252.XX

Low Flow Cartridge Valve

Main Hydraulic Pressure Control Proportional Valve



Low Velocity Check Valves

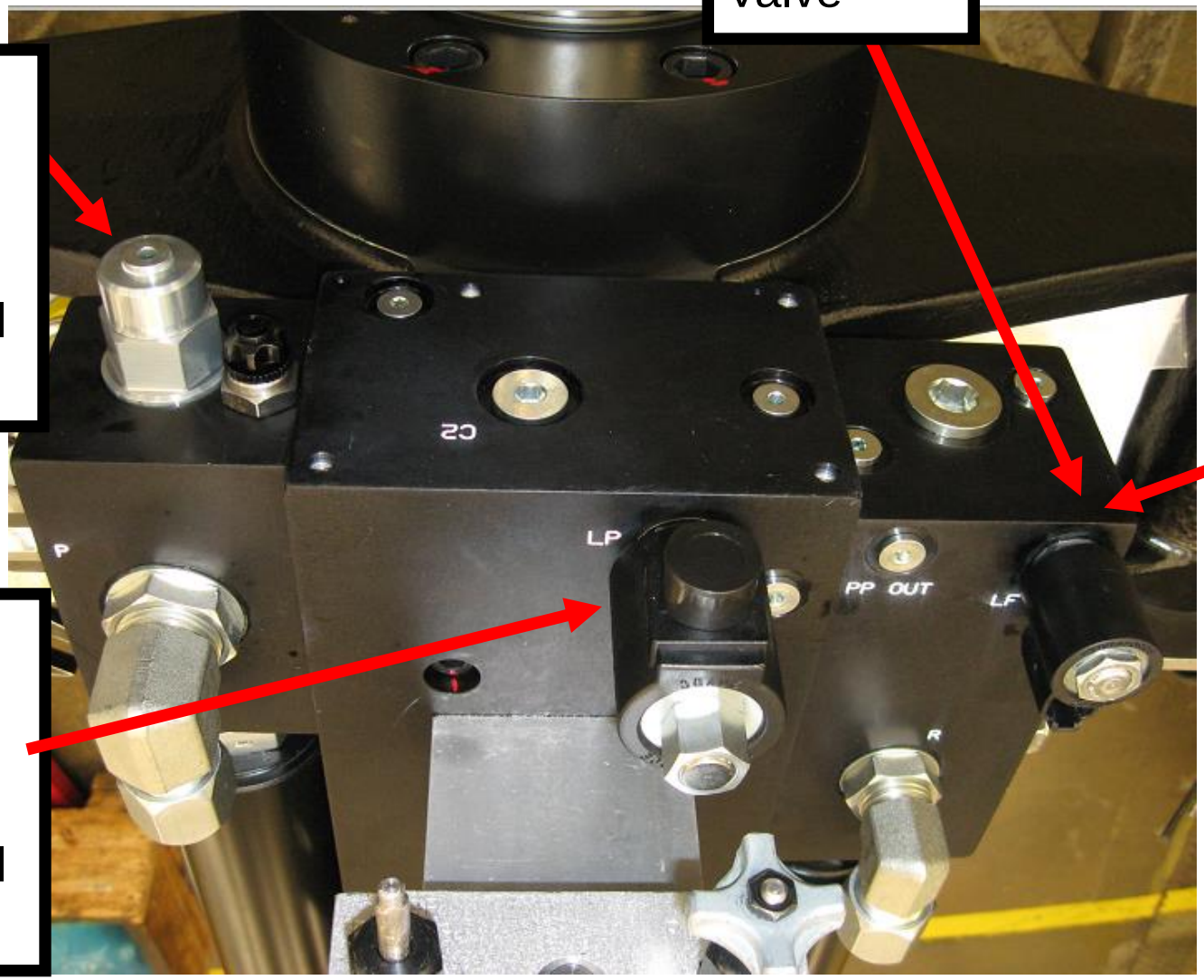
Electric Operated Pressure Control Proportional Valve

HSM Version B

30 GPM Dual 252.XX

Low Flow Cartridge Valve

Main Hydraulic Pressure Control Proportional Valve

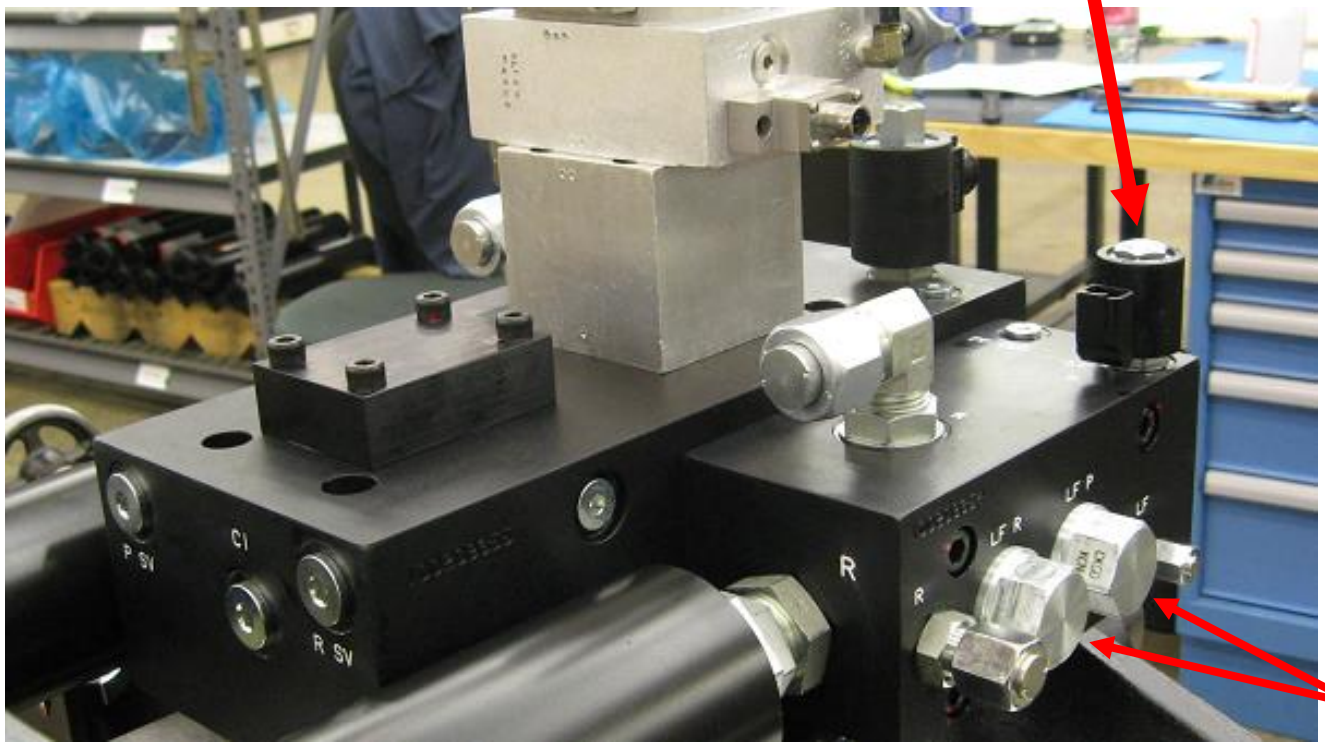


Electric Operated Pressure Control Proportional Valve

HSM Version B

30 GPM Dual 252.XX

Low Flow Cartridge Valve



Low Velocity Check Valves

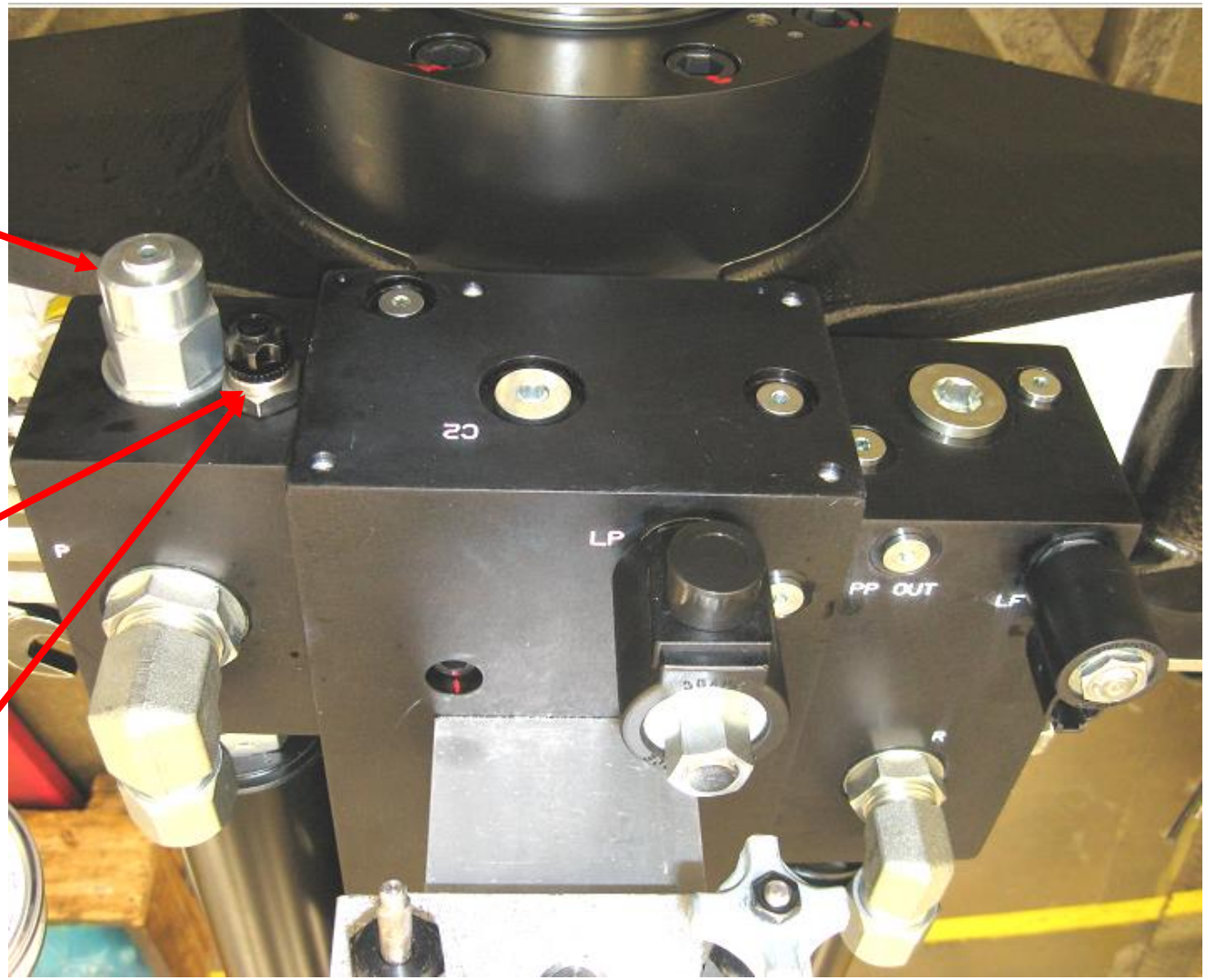
HSM Version B

30 GPM Dual 252.XX

Main Pressure Control

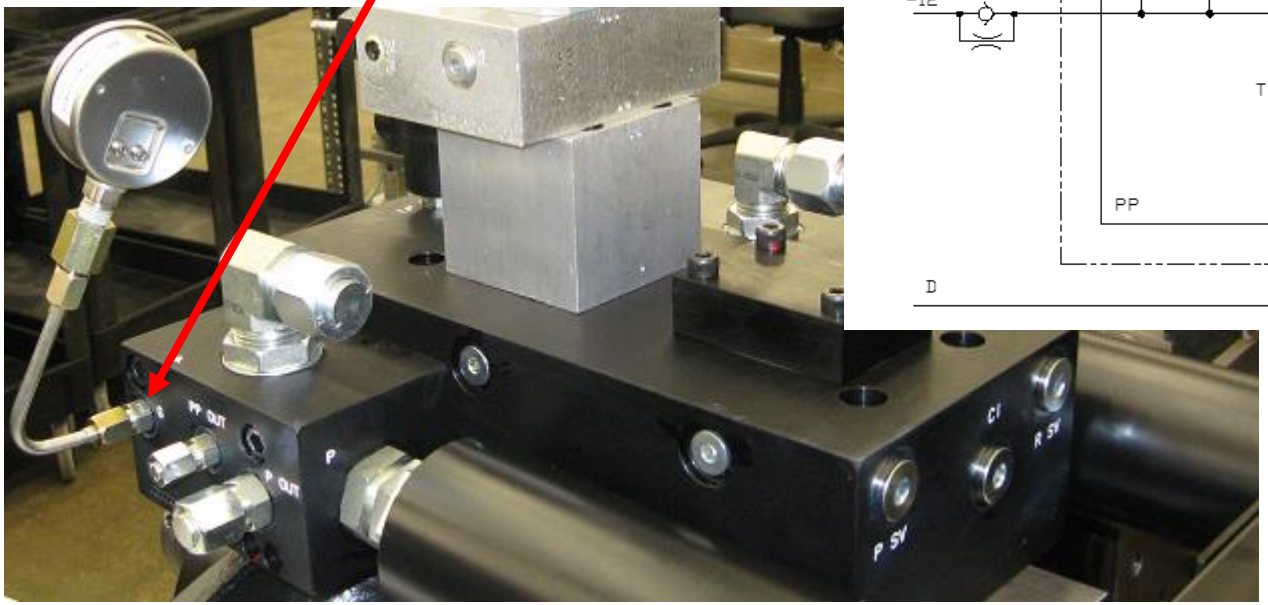
Adjustable Orifice / Needle Valve. This is Not a low pressure adjustment.

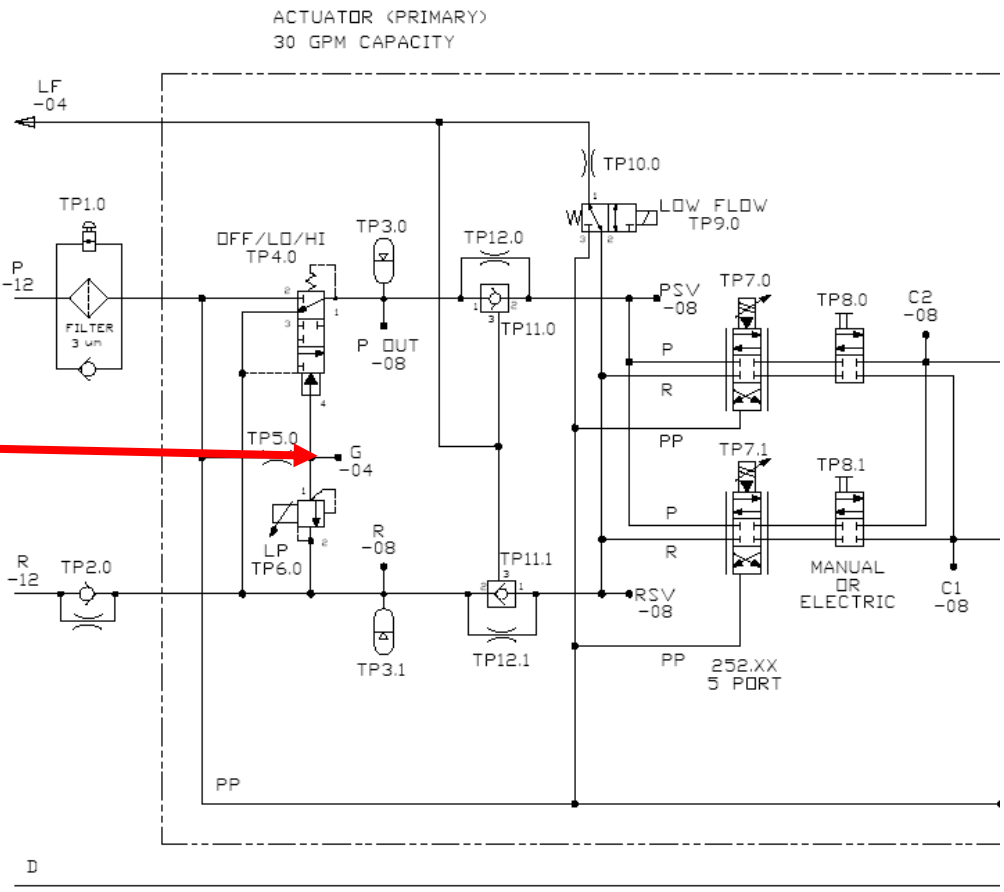
Adjustment: Fully seat and then open ½ turn



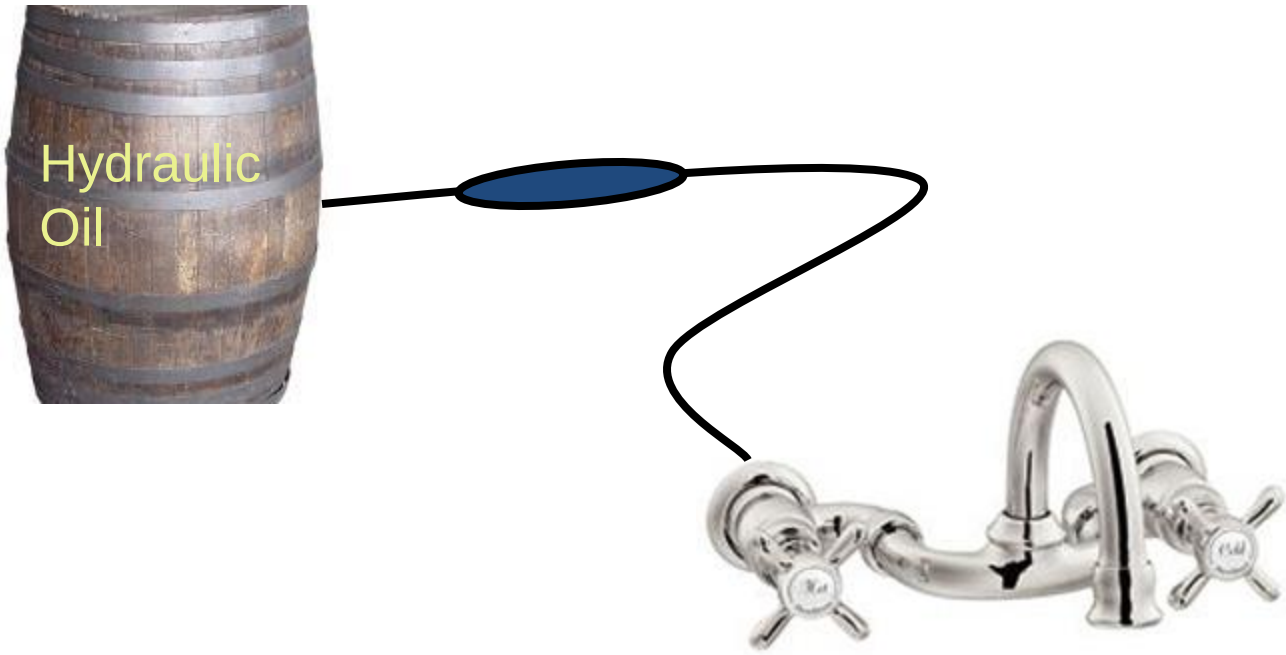
HSM Version B

A Gage port has been added to assist with troubleshooting and measuring low pressure. This port is labeled “G” on the manifold.



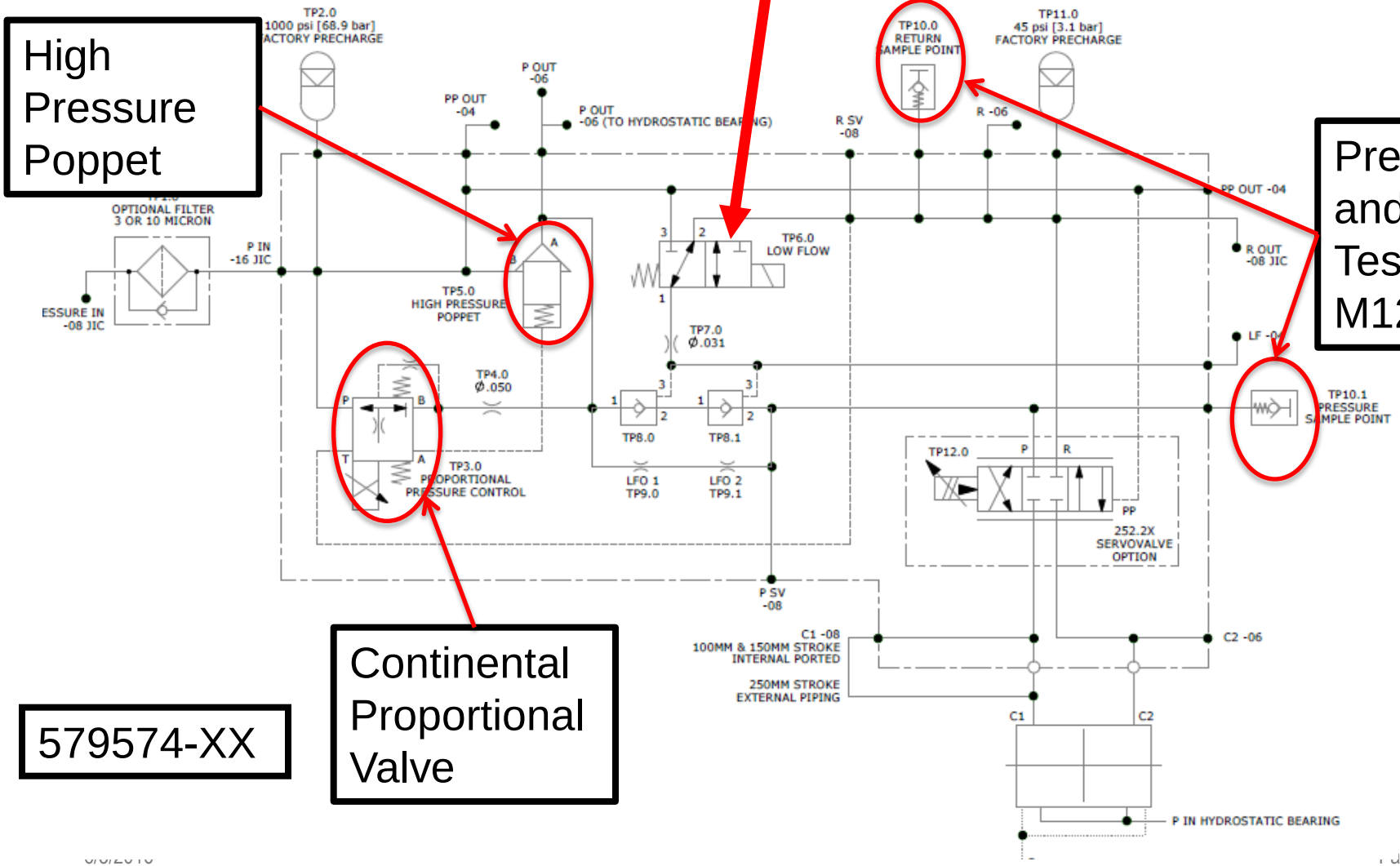


Version C HSM Models



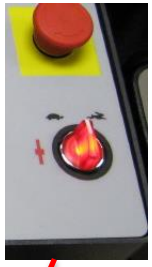
HSM Version C

- 15 GPM Single 252.XX

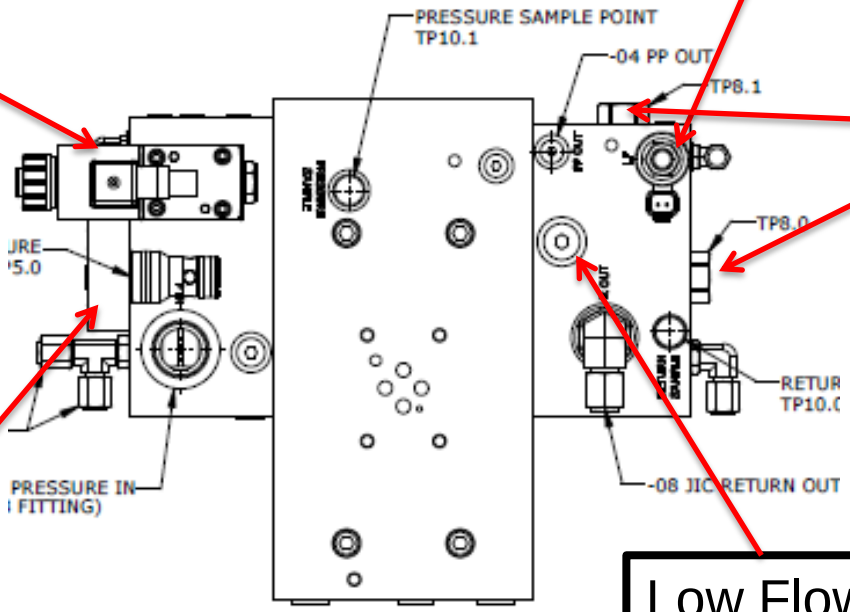


HSM Version C

» 15 GPM Single 252.XX



Continental Proportional Valve



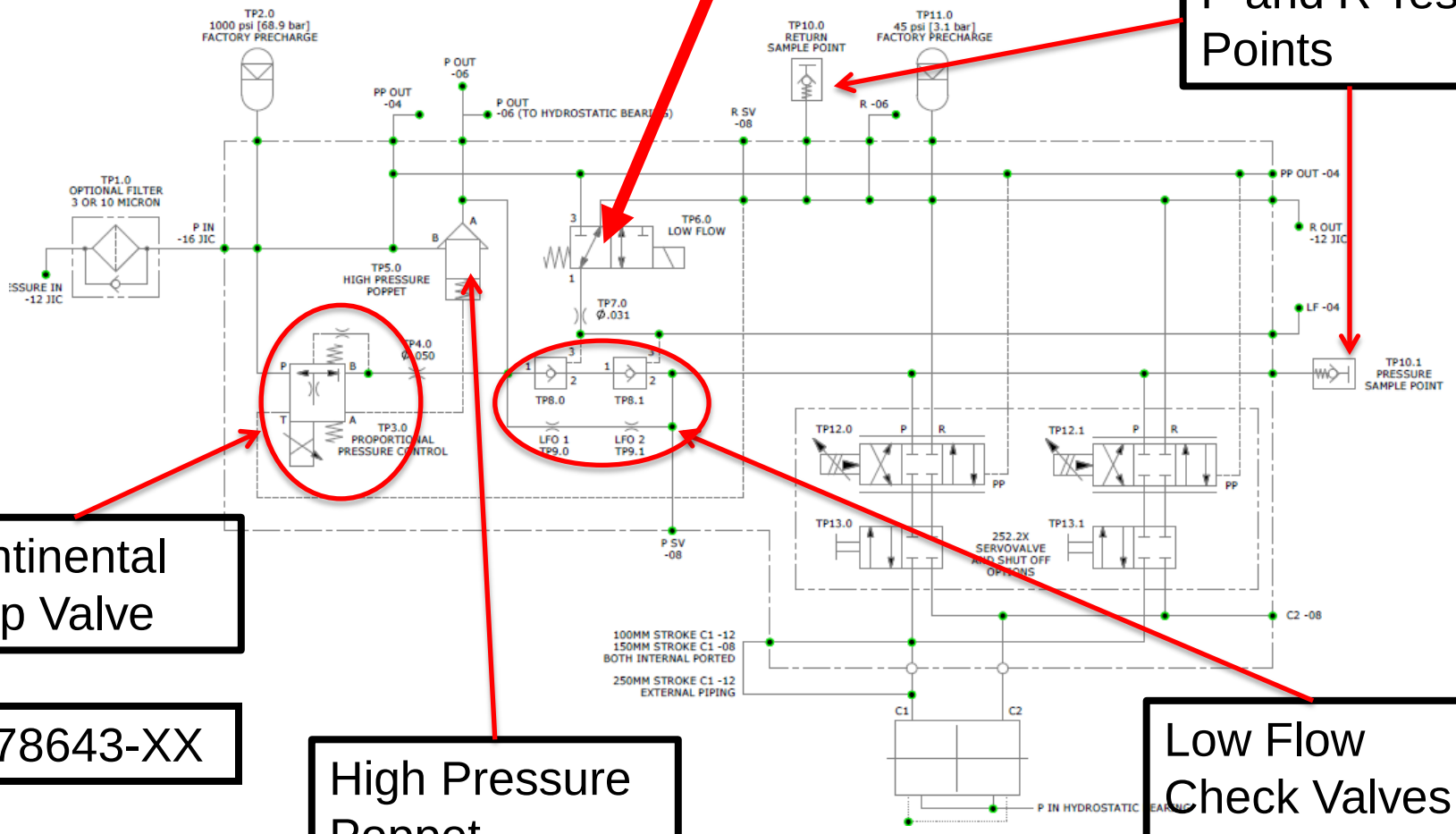
Low Flow Check Valves

High Pressure Poppet

Low Flow Orifices

HSM Version C

- 30 GPM Dual 252.XX



P and R Test Points

Continental Prop Valve

578643-XX

High Pressure Poppet

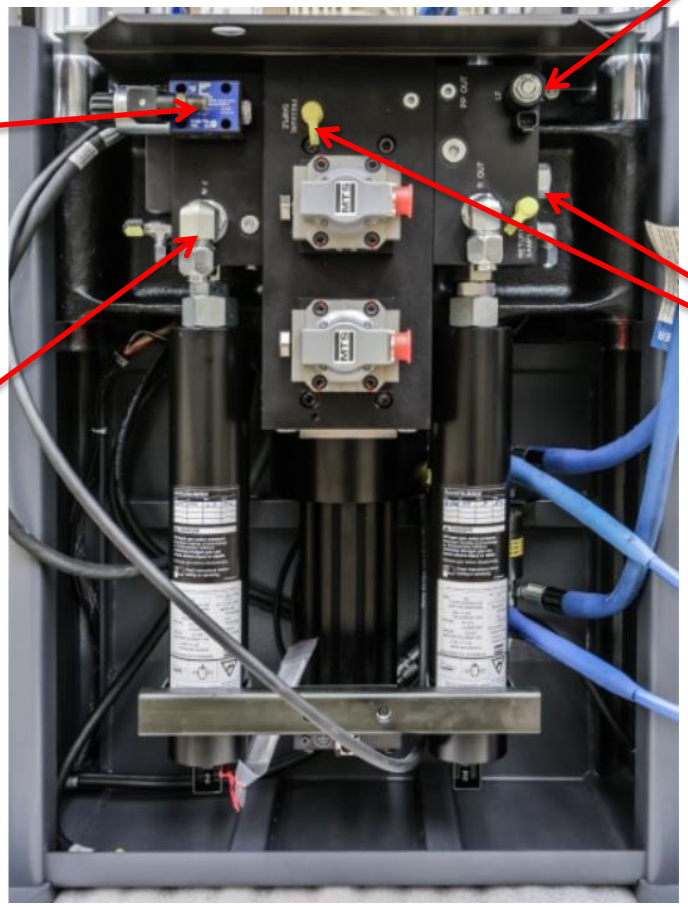
Low Flow Check Valves and Orifices

HSM Version C

- 30 GPM Single 252.XX

Continental Proportional Valve like 298

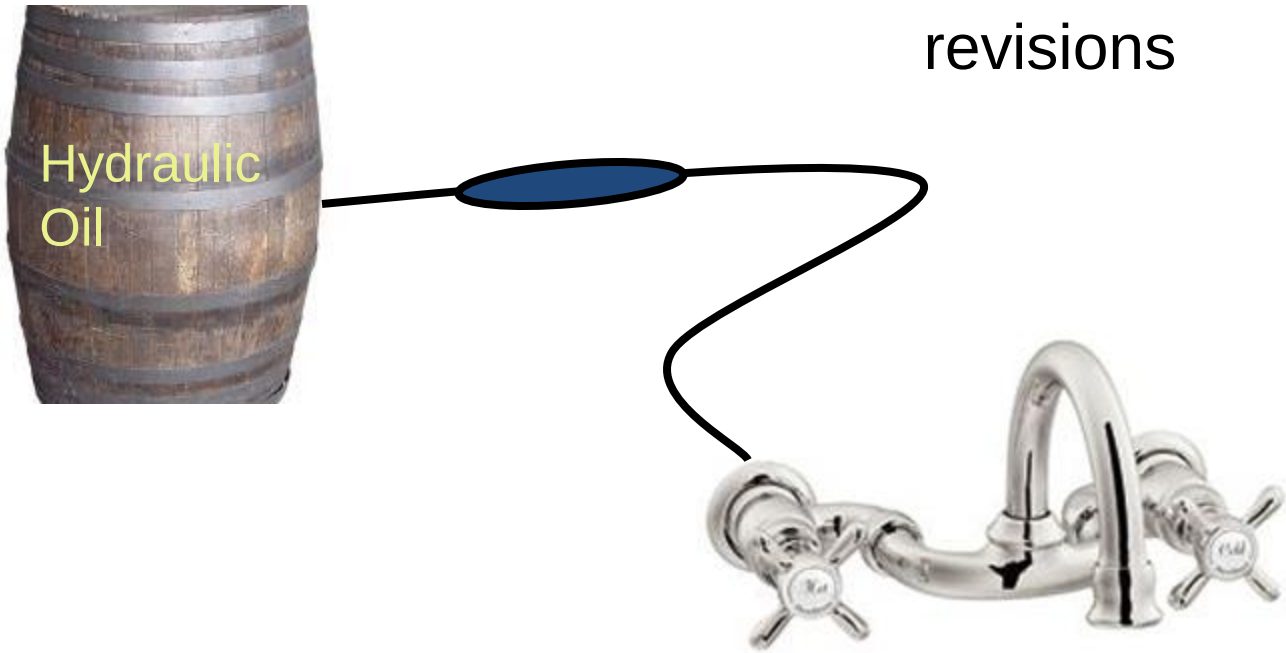
Accumulators back on 90 deg. fittings



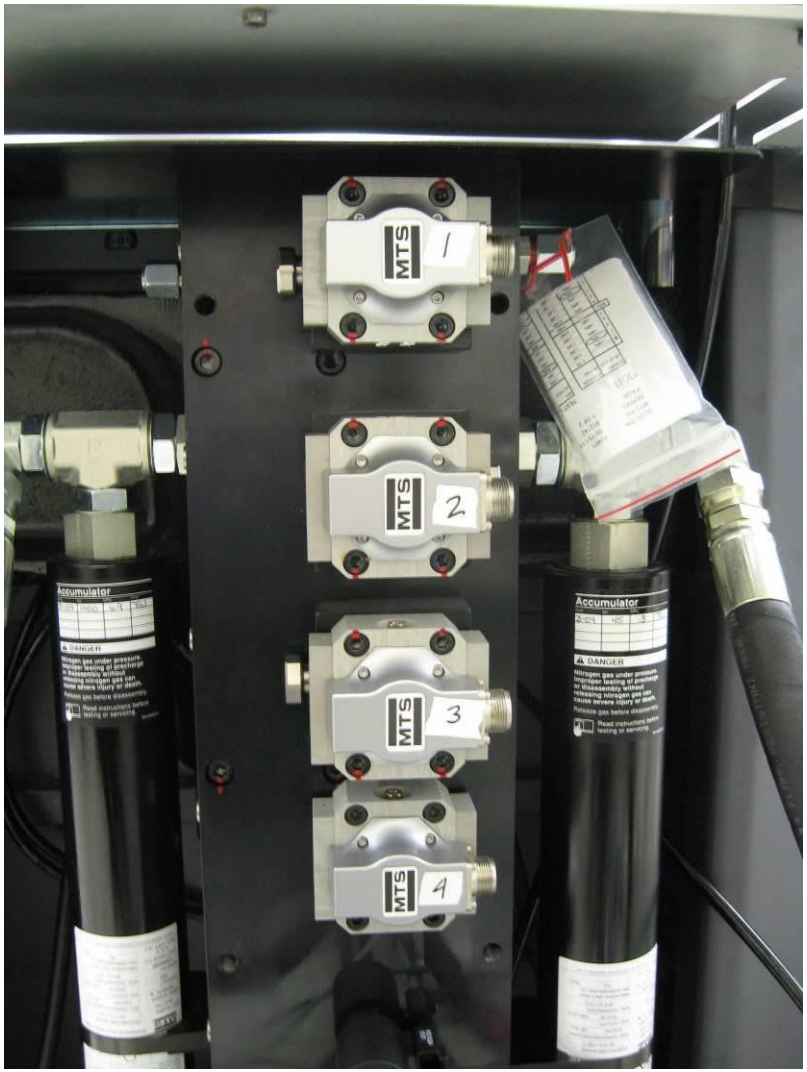
P and R Test Points

Landmark HSM

End of HSM revisions



60 GPM (4) 252 Type Servo-Valve Manifold

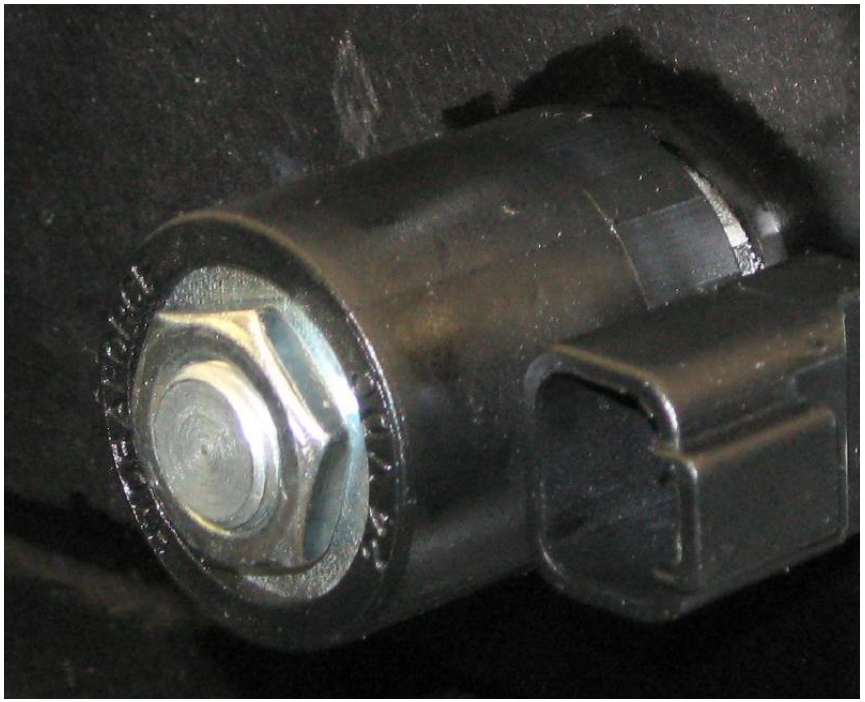


No onboard HSM. Requires external floor standing HSM

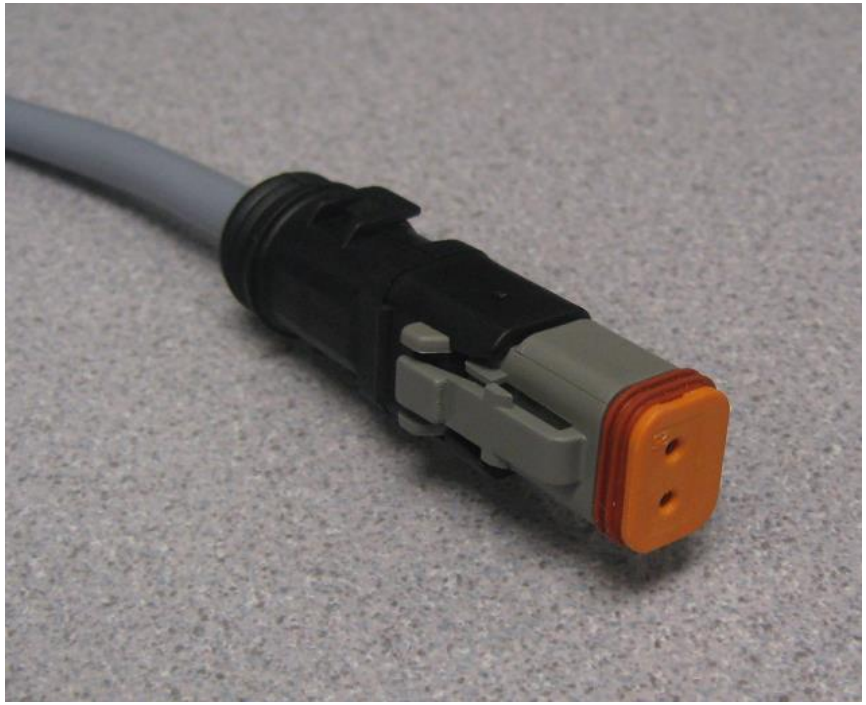
Velocity limiting included using poppet valves.

Velocity limit electrical connector

HSM



Low flow cartridge valve coil uses connector Deutsch DT04-2P

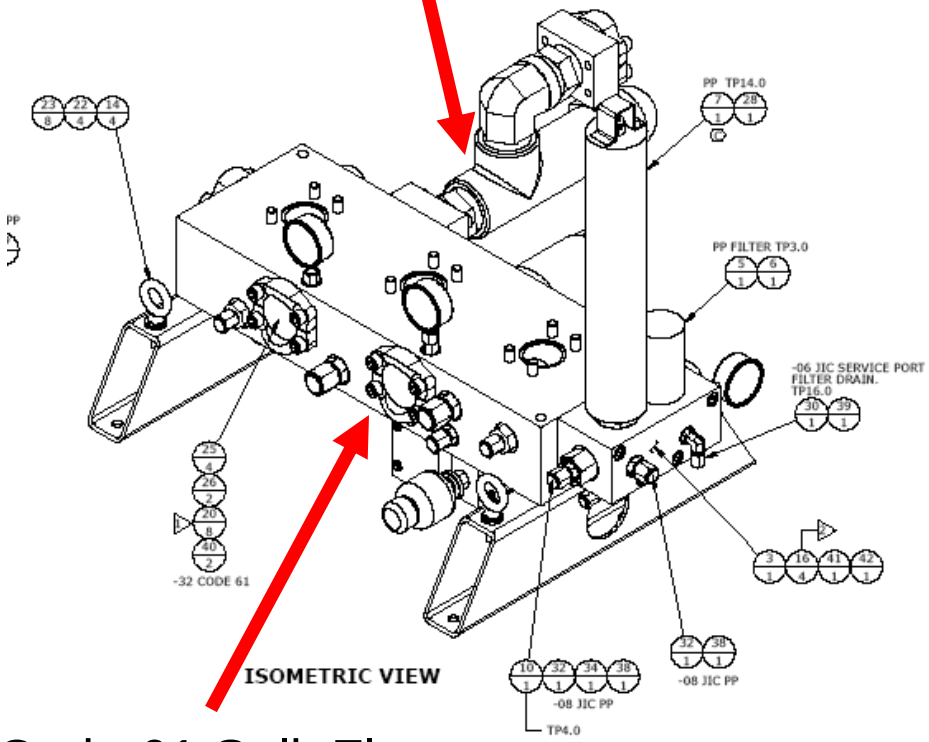


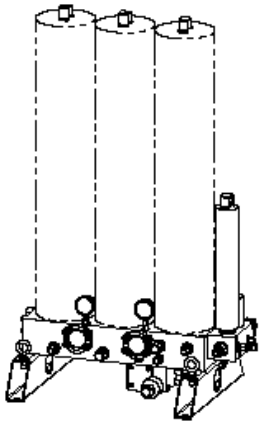
Low flow cartridge valve cable mating connector Deutsch DT06-2S

HSM – 90 / 180 GPM floor mount

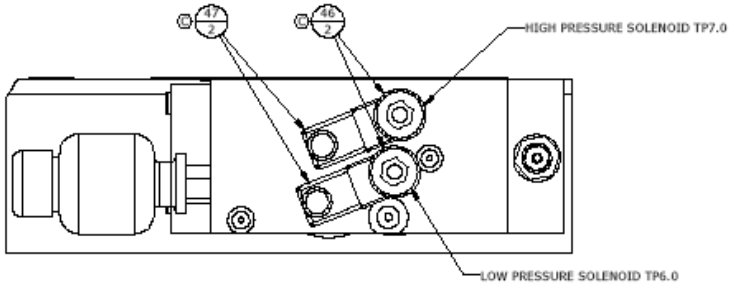
Off / Low / High Control

Relief valve on return



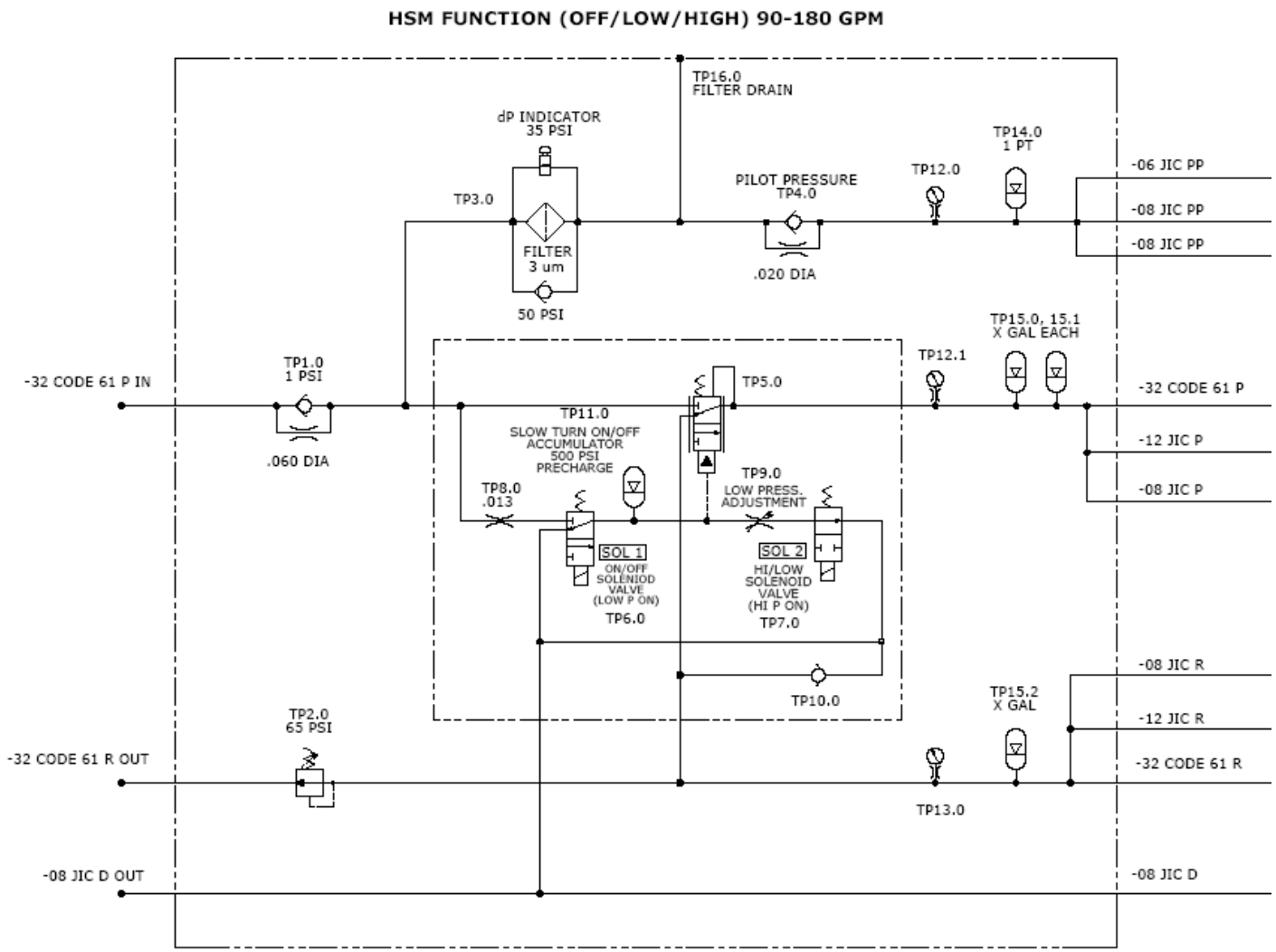


ASSEMBLY SHOWN WITH
5 GAL ACCUMULATORS

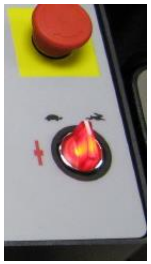


Code 61 Split Flange connection

HSM – 90 / 180 GPM Floor Mount



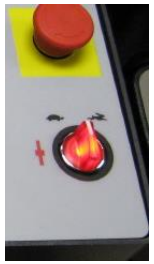
Hydraulic Velocity Limit



- Actuator velocity is limited by hydraulic flow limit

- Velocity is limited to 10 mm/sec
- Low Velocity is still fast
- On a system with low maximum velocity due to large piston area or small servo valve size the operator may not notice a difference visually when in low velocity mode
- Each actuator force capacity (piston area) has different size orifice to provide velocity limit

Hydraulic Velocity Limit

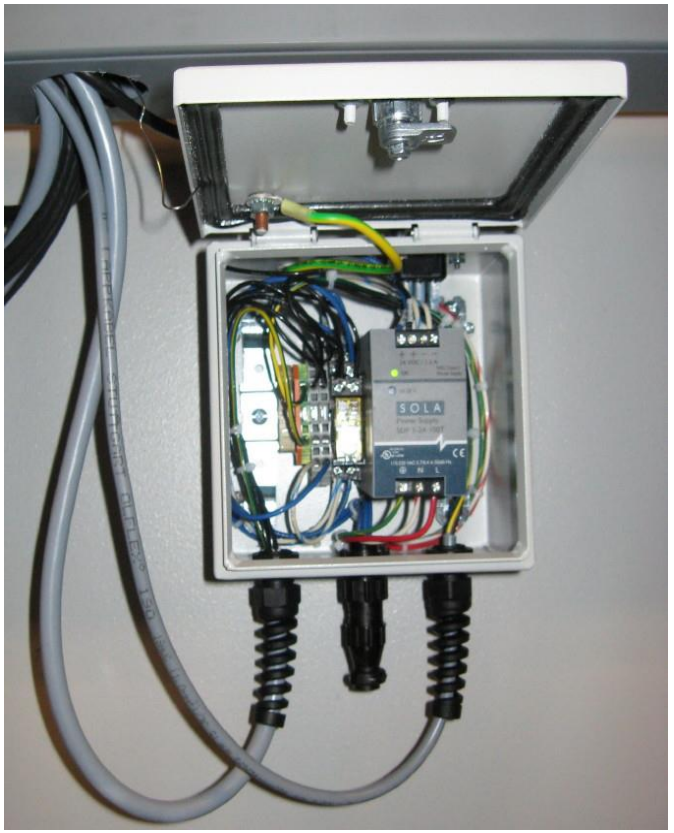


- Load frame has hydraulic velocity limit
- Low flow selected by switch on load frame
- Flow selection switch is a momentary switch and spring returns to the center position
- Low flow engaged by door switch on optional test area enclosure
- Requires external power supply / logic control
- Defaults to low velocity on power supply power up
- Velocity limit is created by low flow in Servo valve manifold
- Low velocity selection activates “Program Interlock”
- Must have electrical power applied to get into full flow
- Velocity control switch illuminates in high velocity mode

Hydraulic Velocity Limit

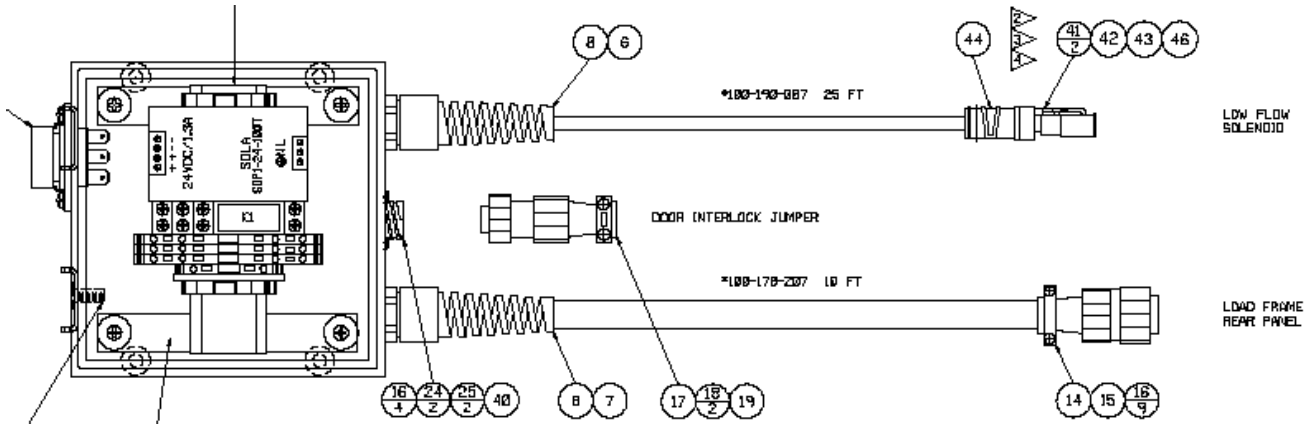
» 24 VDC Power supply / logic control for hydraulic flow limit

Line Power
85-264 VAC
47-63 Hz



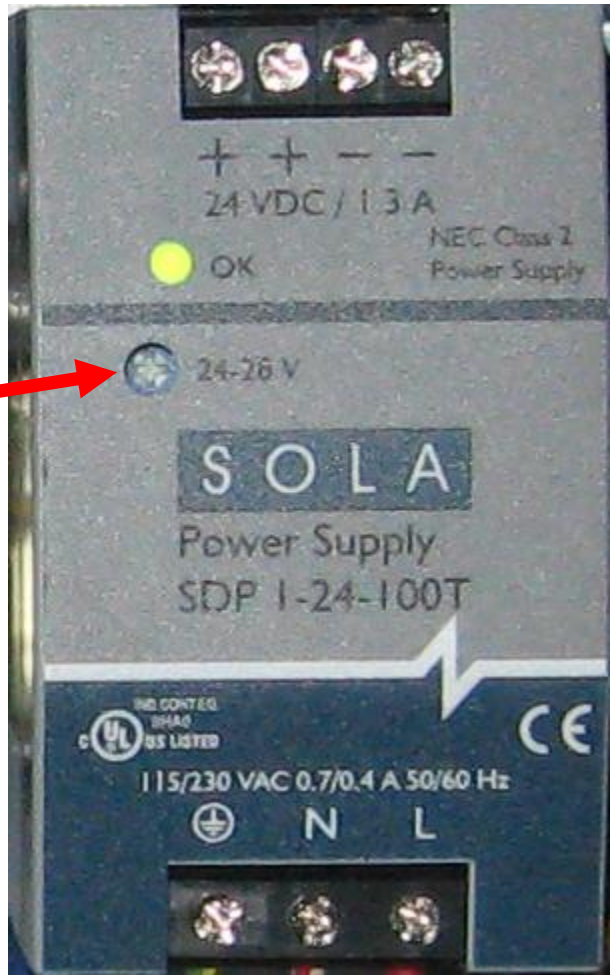
Hydraulic Velocity Limit

- External Power Supply
- Uses 110/230 VAC line power
- Must be mounted within 10 feet of load frame due to cable length
- Must have line power available near load frame location
- Has connector for optional test part enclosure interlock
- Must have jumper plug if no optional test part enclosure



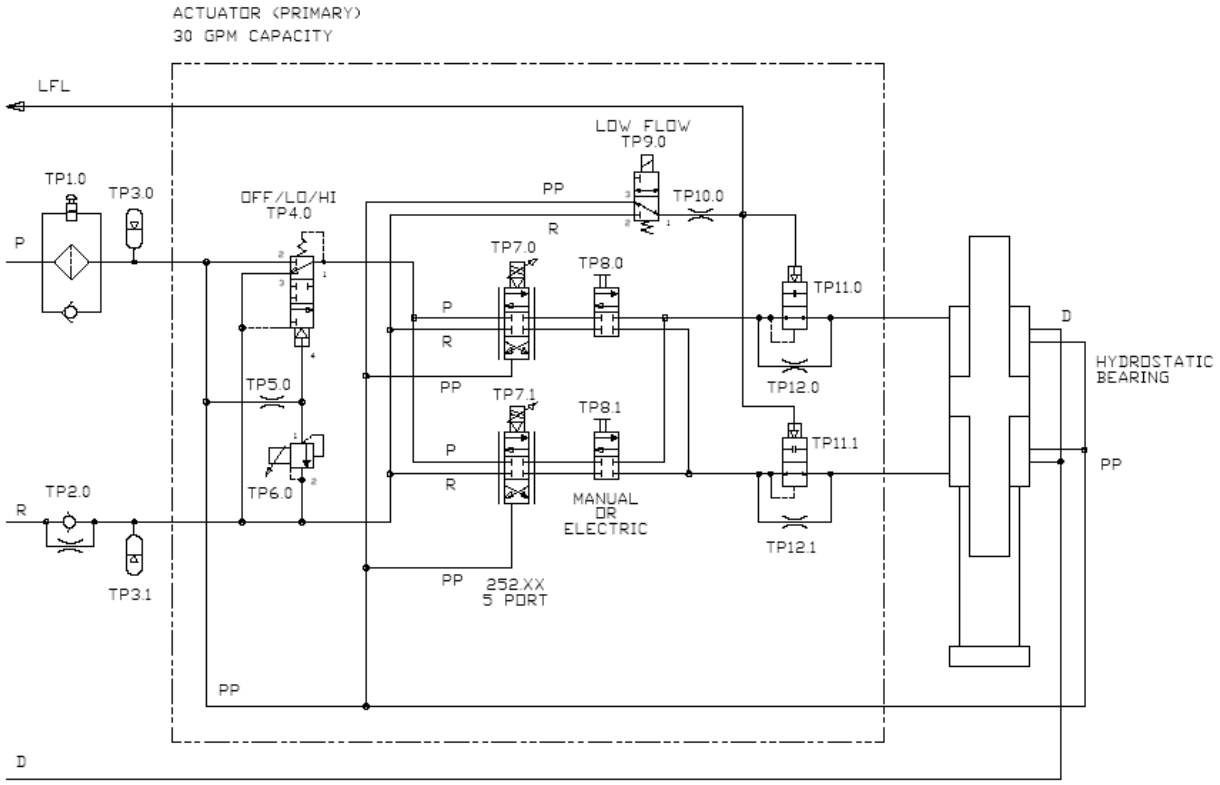
Hydraulic Velocity Limit

Power Supply adjustable with front panel adjustment



HSM Version A

- High Flow Electrically activated
- No Power = Low Flow
- Cartridge valve hydraulically activates poppet valves located inside manifold
- While low flow mode engaged oil passes through fixed orifice

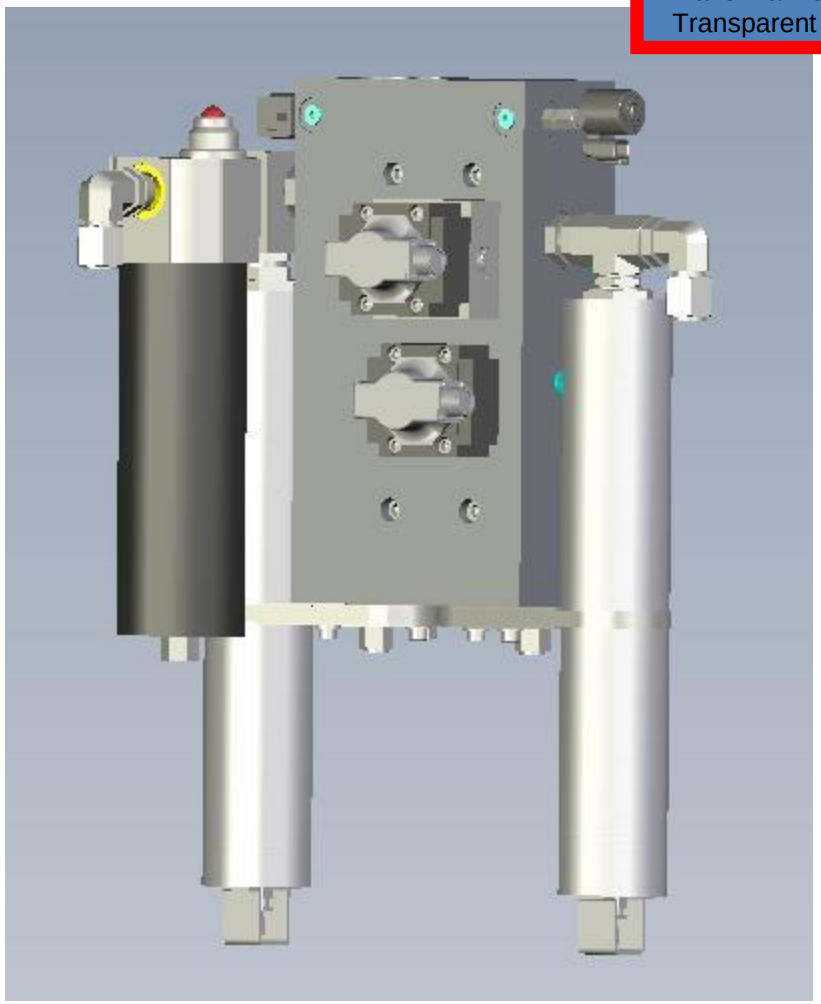


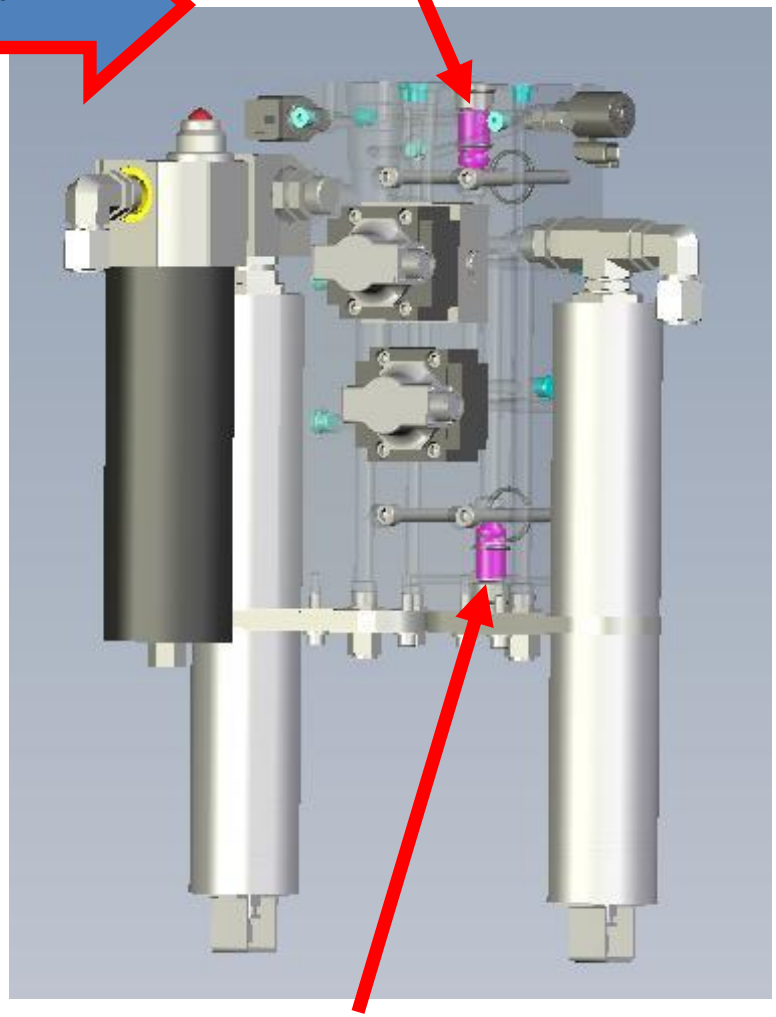
Assembly
571338-XX

Landmark – HSM Version A

» 30 GPM Dual 252.XX

Make Manifold Transparent

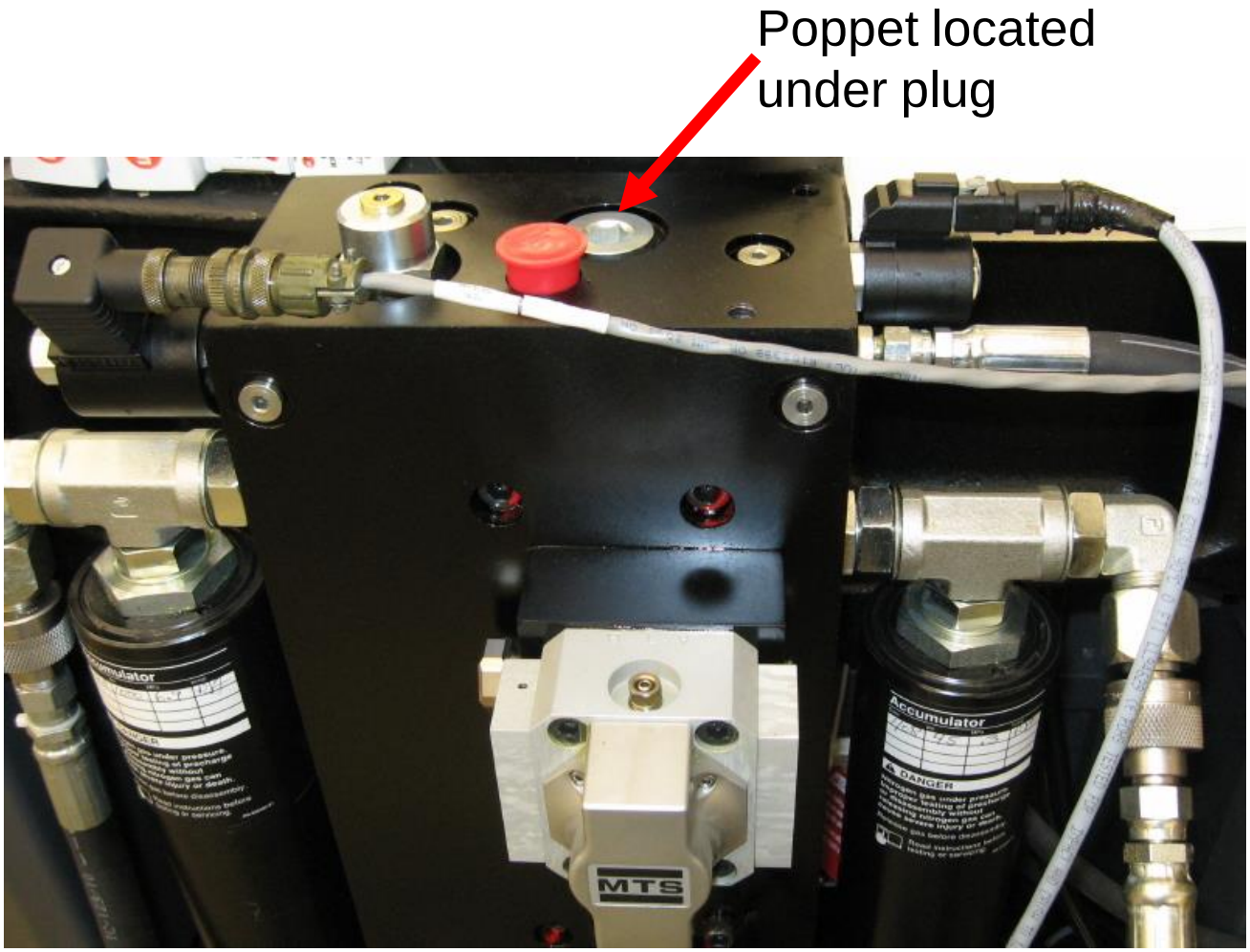




Low Flow Poppet

Low Flow Poppet

HSM Version A



HSM Version A

- To remove poppet from HSM manifold
- Turn off hydraulics
- Remove plug from manifold using hex key
- Insert bolt into threaded hole in poppet
- Remove poppet from manifold using bolt as pulling tool

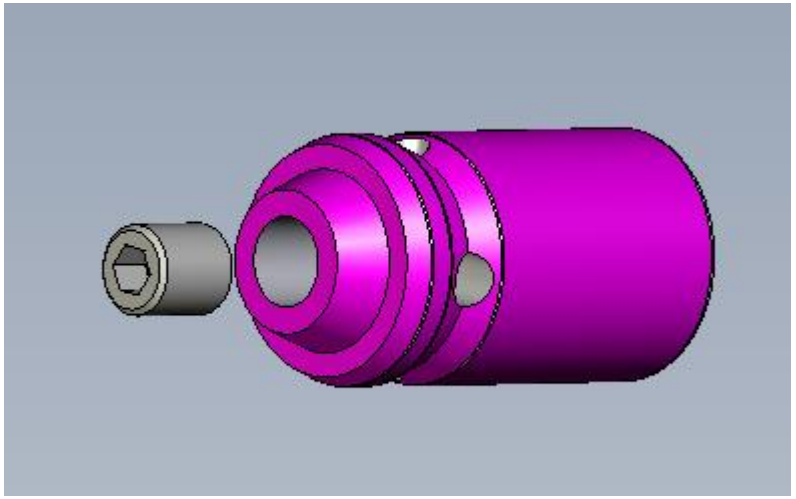
S/V Manifold Flow Rating	Poppet Diameter	Thread pitch for bolt
15 GPM	0.875	M12X1.75
30 GPM	0.875	M12X1.75
60 GPM	1.625	M24X3.0
90 GPM	1.625	M24X3.0
180 GPM	1.625	M24X3.0

HSM Version A

Actuator Capacity	Part Number	Orifice Size *
15 kN	100-181-356	0.010
25 kN	100-181-357	0.013
50 kN	100-181-358	0.018
67 kN	100-181-360	0.021
100 kN	100-181-361	0.025
250 kN	100-181-362	0.042
500 kN	100-181-363	0.060

Thread Size: M8 X 10MM Long

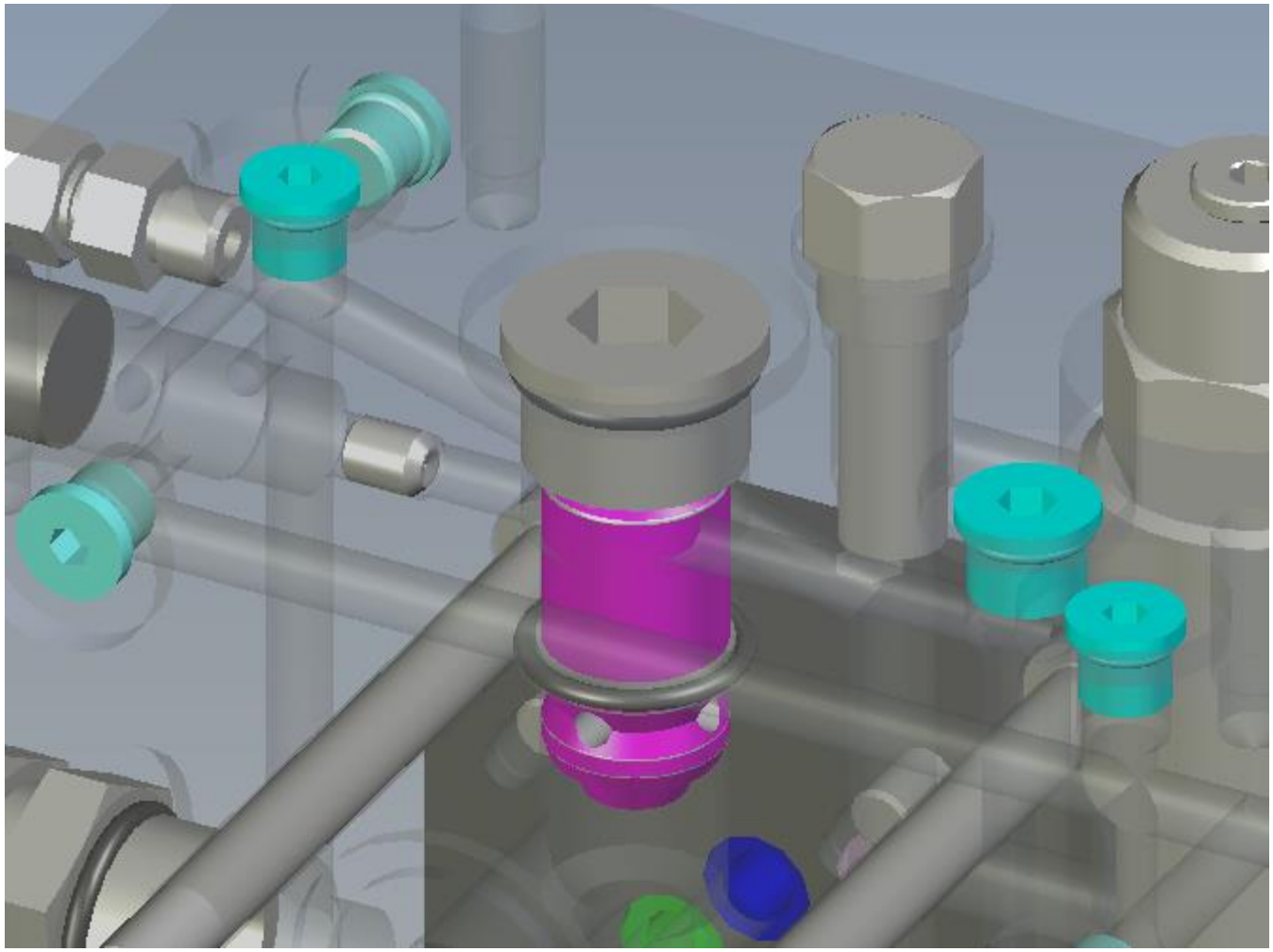
» The poppet valve contains an orifice to control maximum oil flow to cylinder during low flow operation. Orifice size is based on piston area.



FSE Service Hint: If Orifice gets contaminated, there will be no flow in low flow mode causing actuator not to move. Excess leakage across piston or end cap can also cause the actuator not to move in low flow.

Poppet valve seal Version A

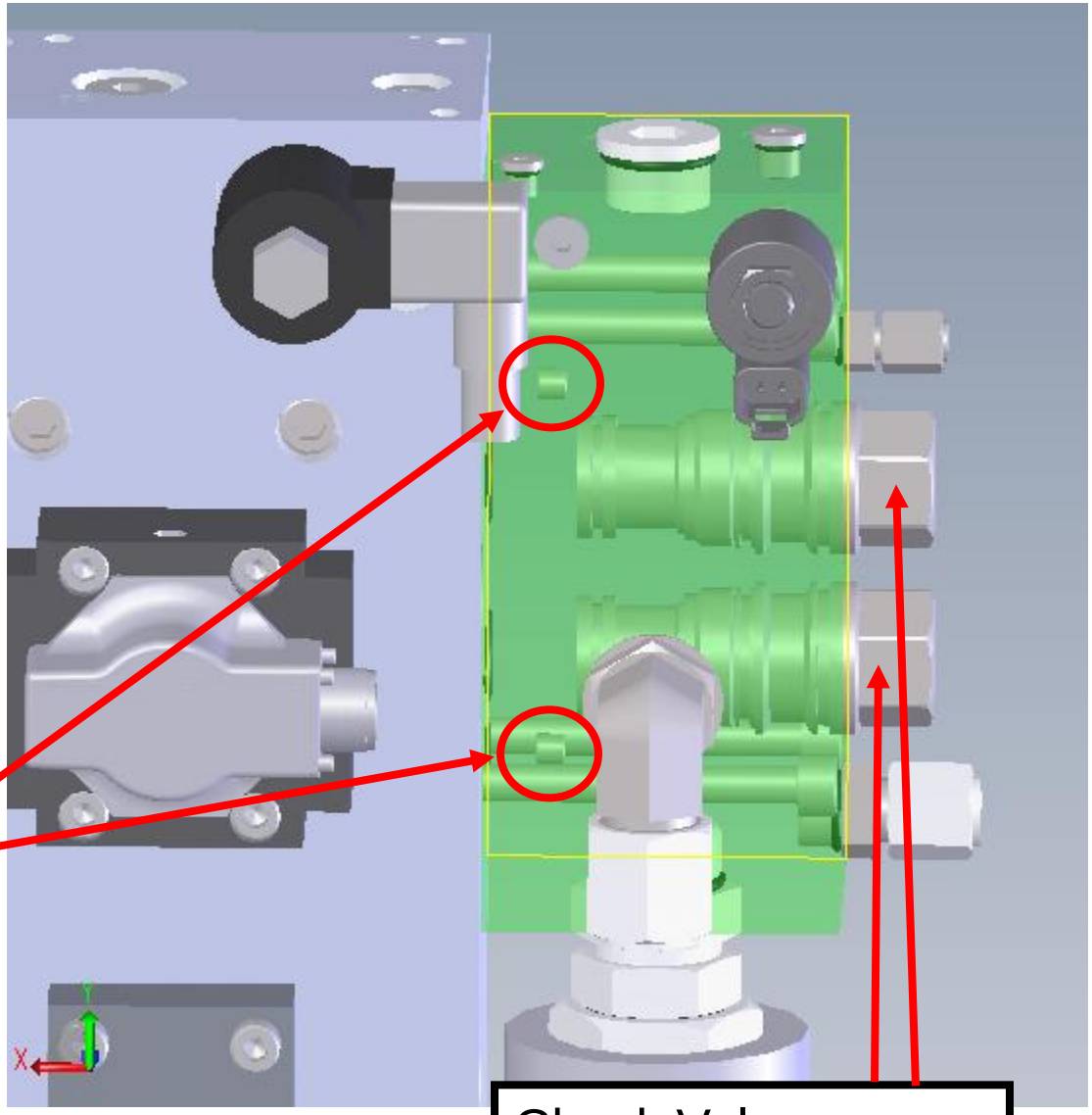
Poppet valve has o-ring and glyde ring seal. Tool required for seal installation.



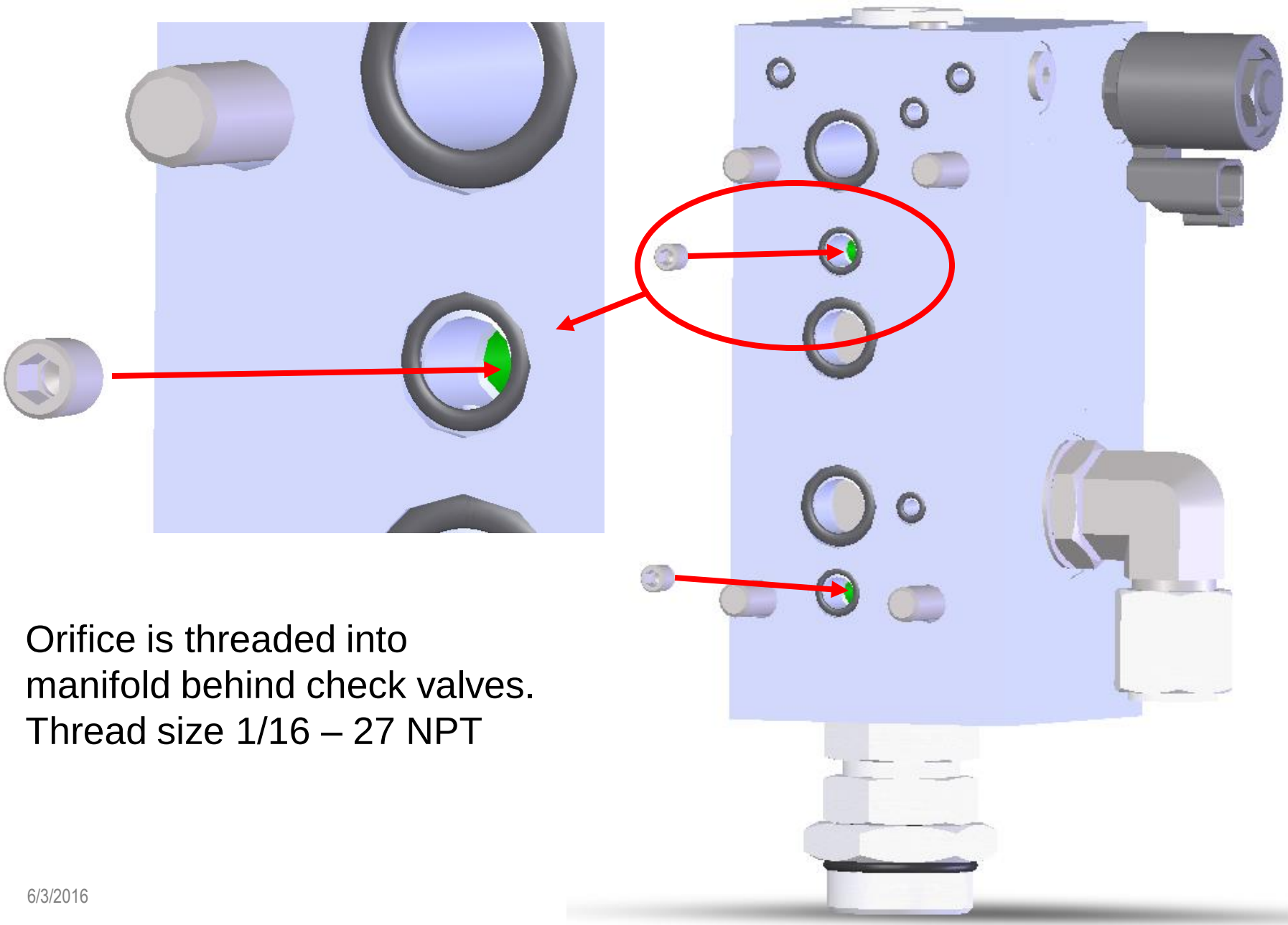
HSM Version B

»When low flow is selected the check valves close and oil flows through an orifice to limit the actuator velocity.

»There are two orifice located inside the manifold where the check valves are mounted.



HSM Version B

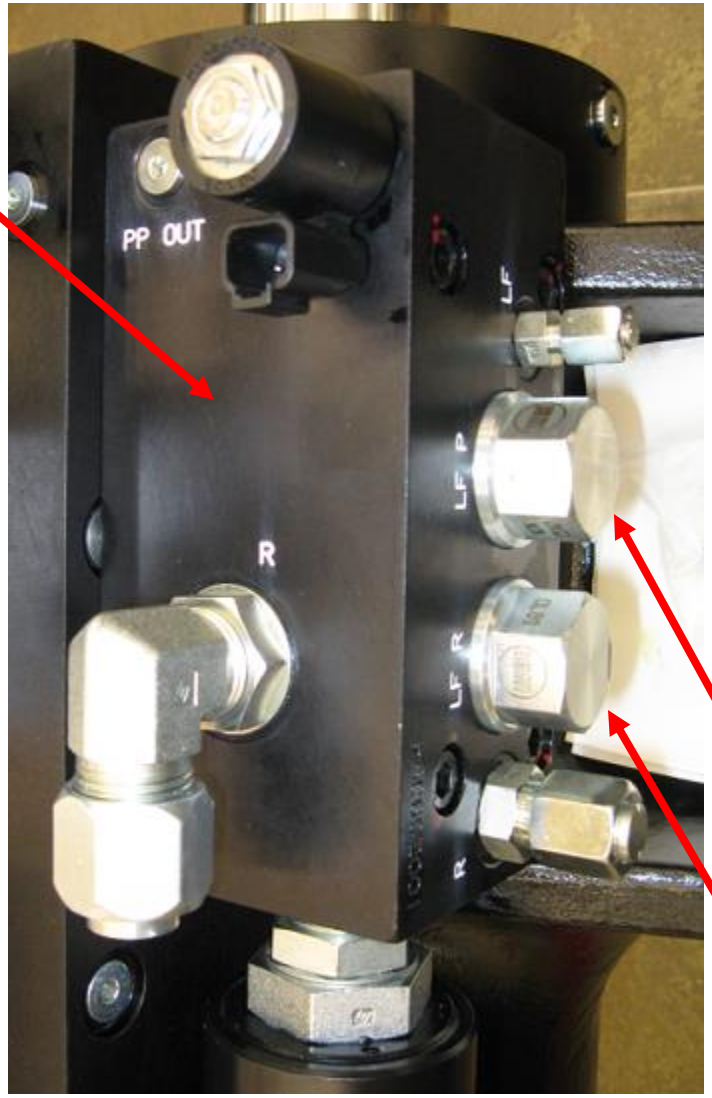


Orifice is threaded into manifold behind check valves.
Thread size 1/16 – 27 NPT

HSM Version B

»Low flow orifice located inside this manifold

Actuator Capacity	Part Number	Orifice Size *
15 kN	100-188-414	0.010
25 kN	100-188-414	0.010
50 kN	100-198-658	0.013
67 kN	100-198-659	0.016
100 kN	100-198-660	0.020
250 kN	100-201-873	0.039
500 kN	100-198-662	0.047

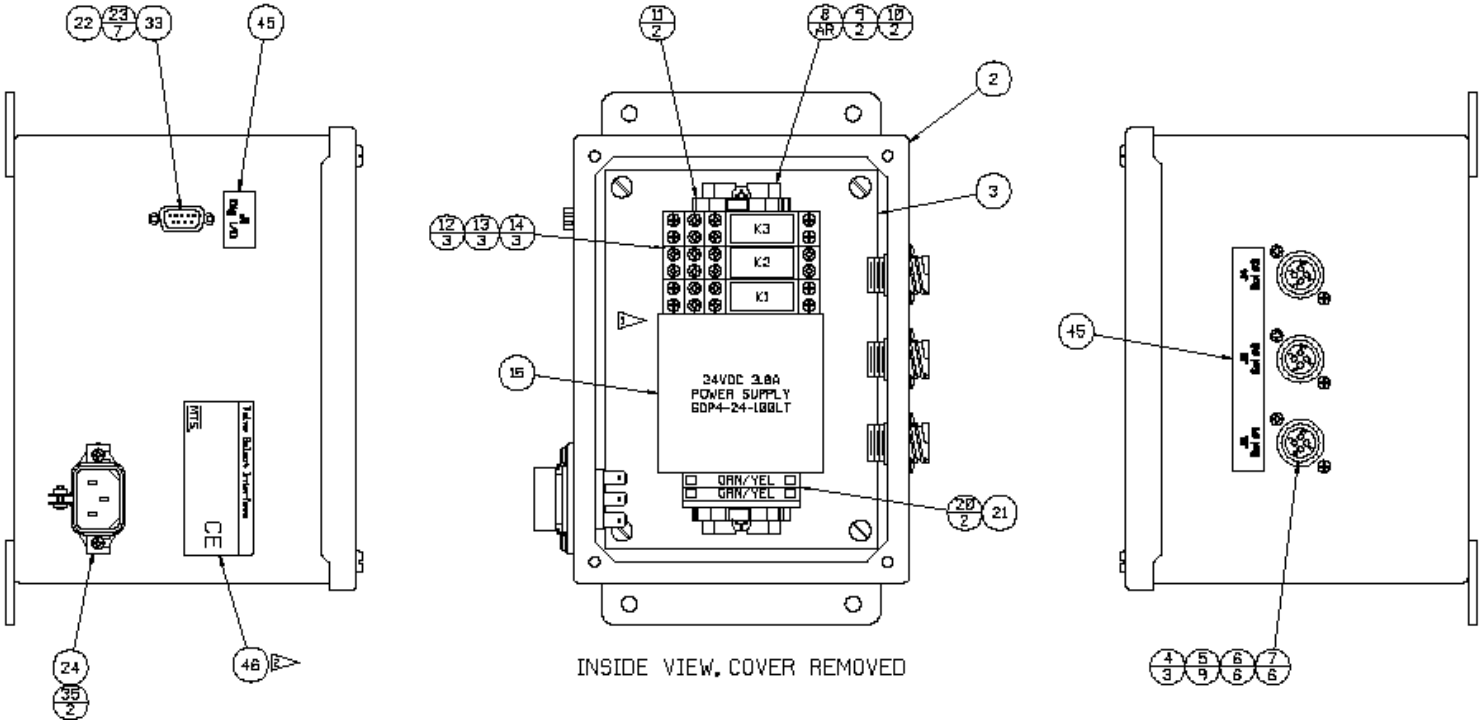


Check Valve

Thread Size: 1/16 – 27 NPT

Servovalve Manifold

- Servovalve Manifold available with manual or electric switching on/off of multiple 252.XX servo valves
- Optional electric switching requires additional power supply to operate solenoid valves – Not same as low flow power supply
- Valve switching controlled by digital outputs from controller
- Power supply connects to 120/230 VAC line power



HSM removal

Hoist ring thread:
M10X1.5

Threaded Holes for Hoist rings in service manifold.

Interface Connections

- Connector interface panel located at bottom rear of load frame
- Wiring harness from connector panel to controls

Connector Interface Panel

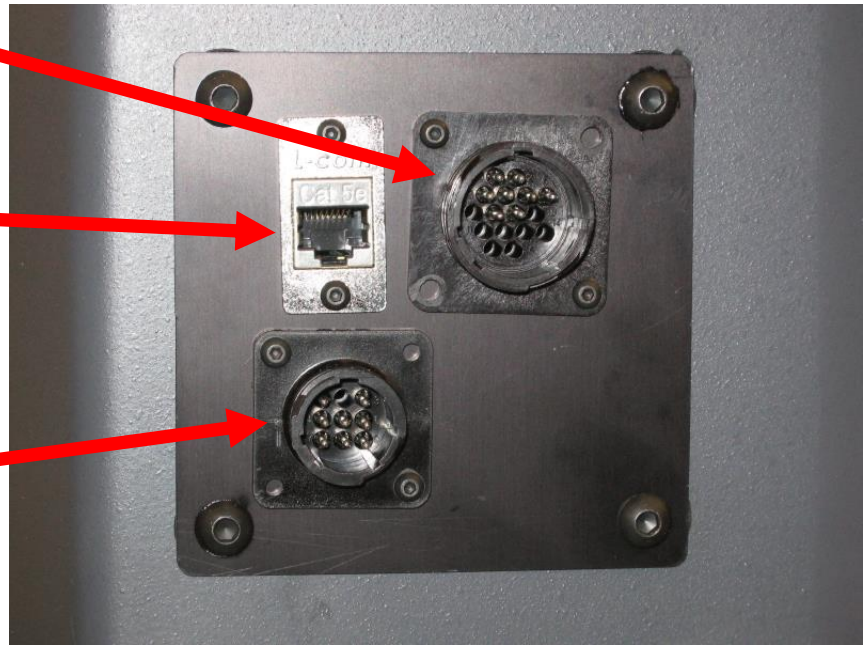
Interface Connections

- Connectors moved to rear of frame for easy access
- New connector for low flow power supply / logic control
- New RJ45 connector for handset cable to 494 controller
  - Uses RJ50 cable
- Standard J1 to J29 of controller

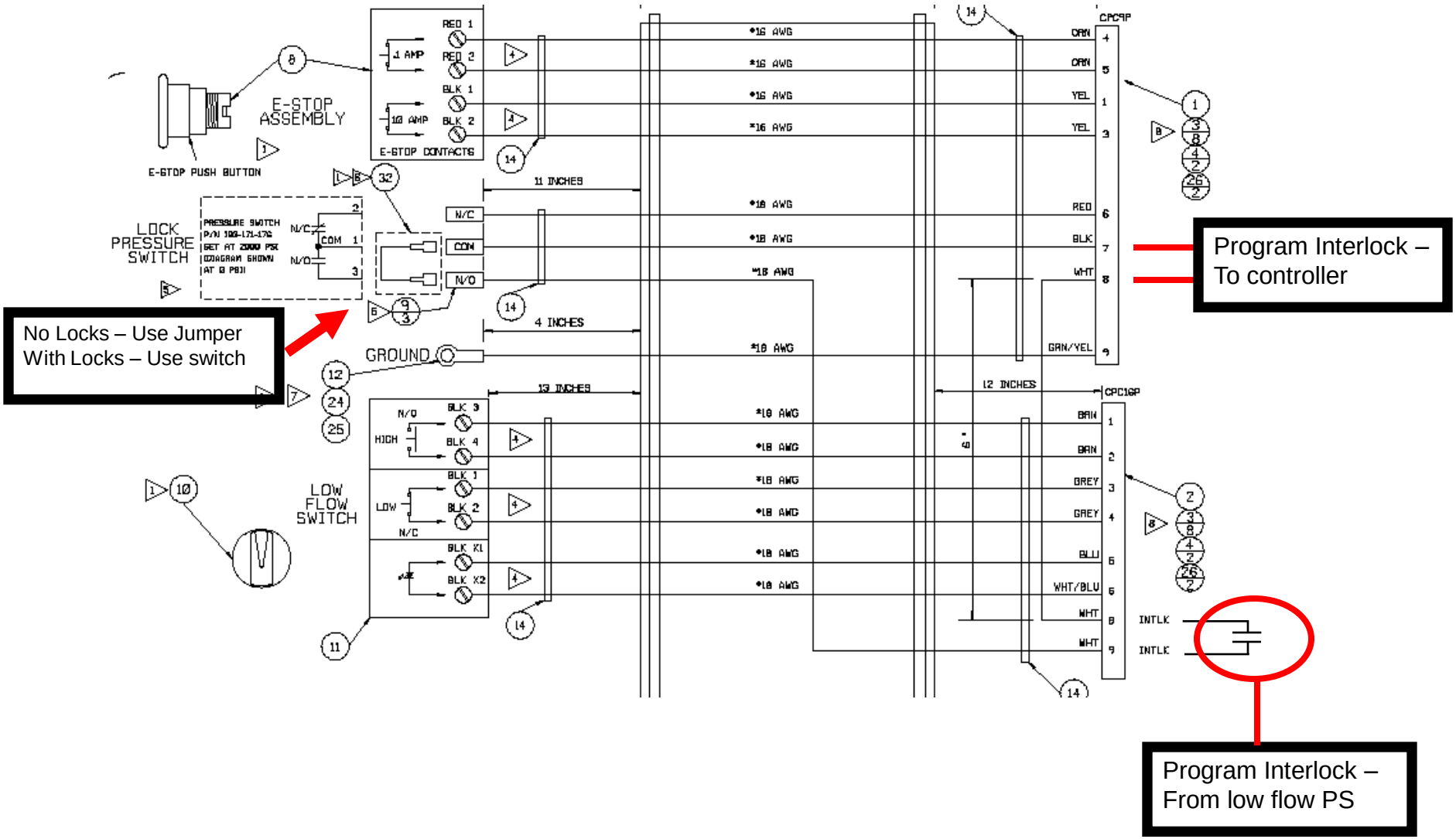
Low Flow – To power supply

Handset – To 494 Controller

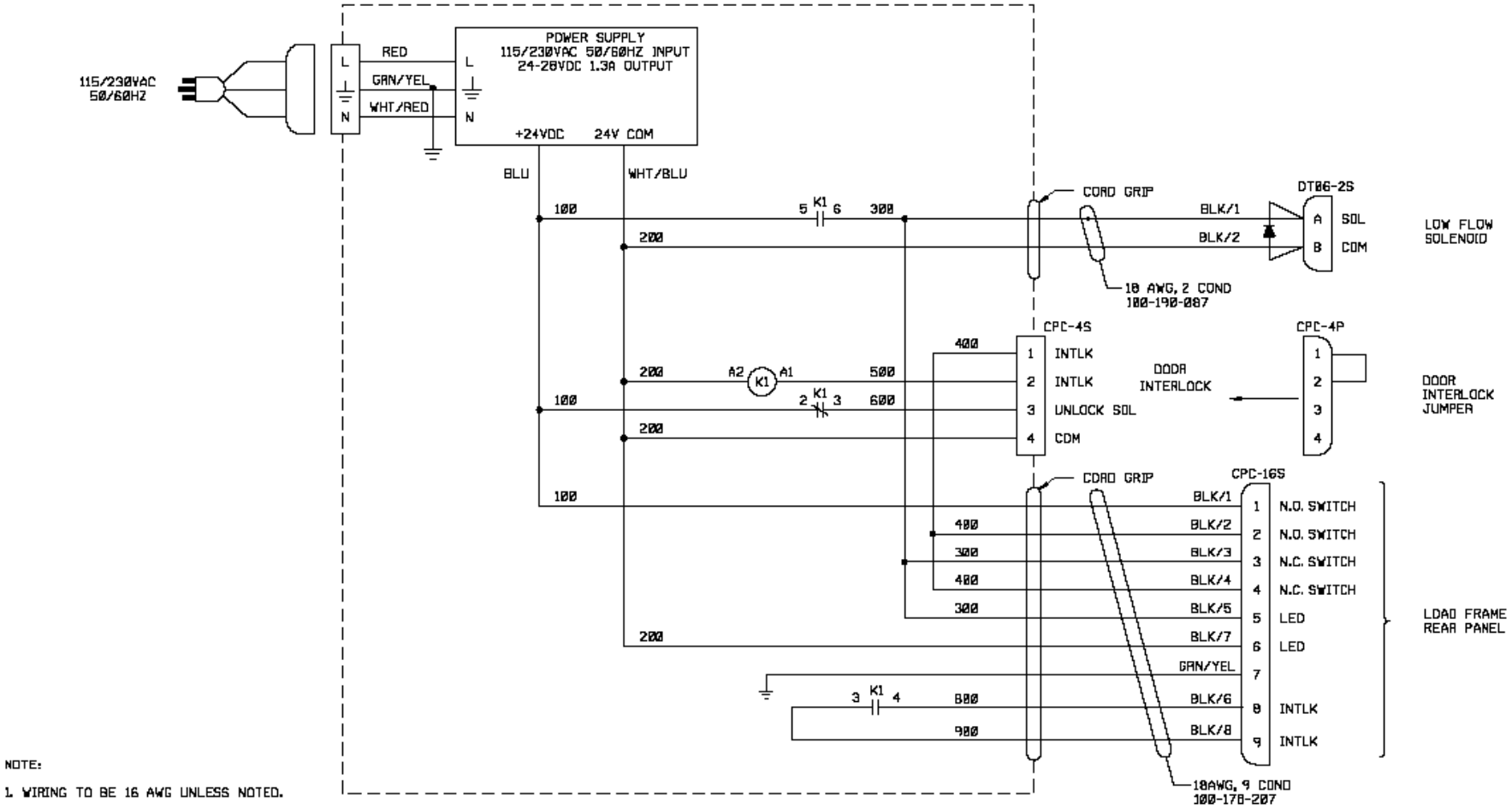
J1 – To Controller J29 E-Stop / Lock



Wiring harness

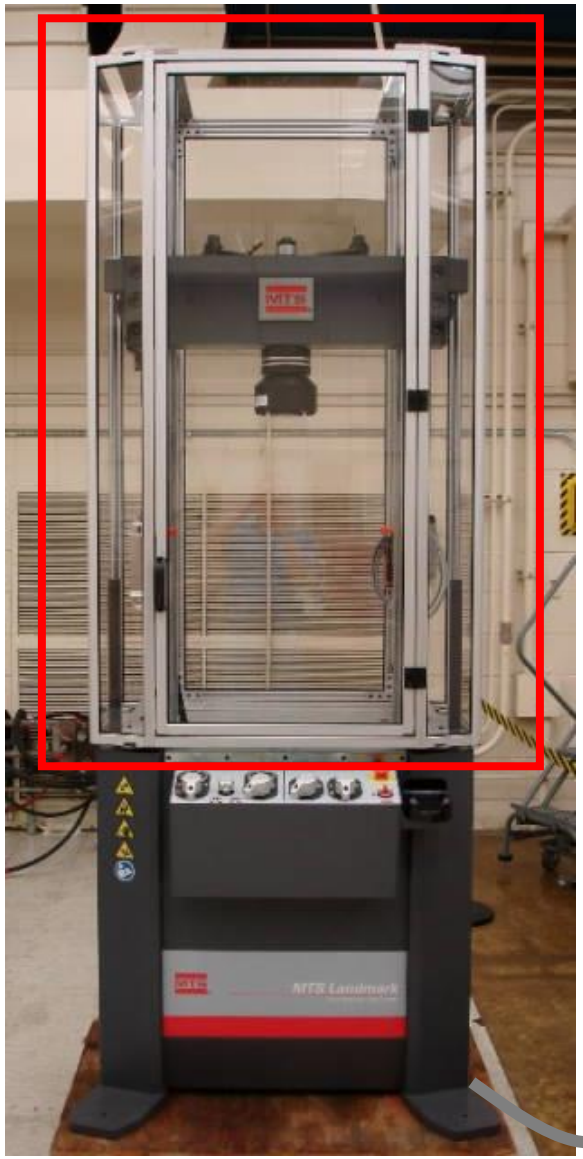


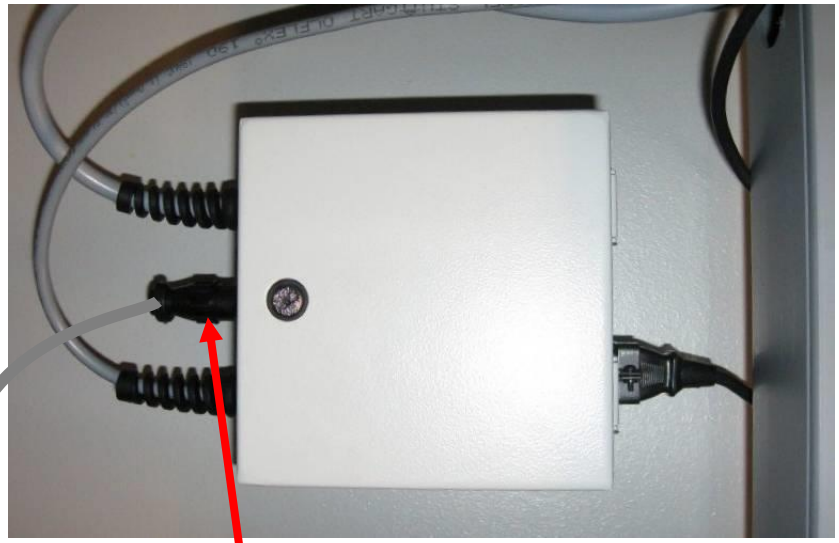
Low Flow Power Supply



Schematic Drawing 700-004-047

Optional Test Enclosure





Cable from test enclosure connects to low flow power supply. If cable is not present a jumper is required.

Door Operation – Door cannot be opened unless the load frame is in low velocity. When opened the load frame cannot be placed into high velocity.

Optional Test Enclosure

Cable to enclosure has both power to operate the latch and an interlock to indicate the door is open.

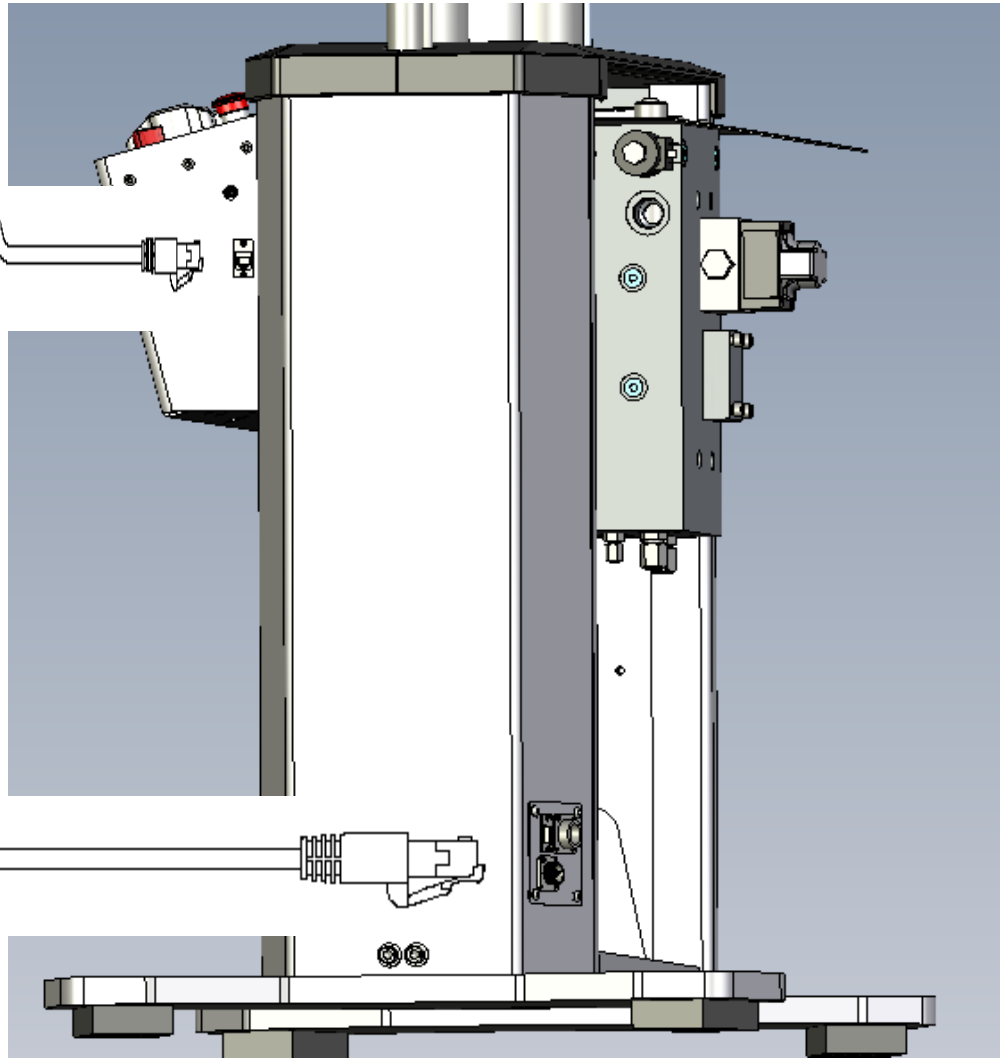
The enclosure door latch requires power to be applied to release the latch and allow the door to be opened. The latches on both the front door and the rear door are shipped with the emergency exit lever in the open position to allow the doors to be opened until installation is complete. Following installation these latches must be rotated to the closed position for proper enclosure operation.

Program / Gate Interlock

- Interlock caused by
  - Crosshead Unlocked
  - No High pressure to lock crosshead
  - Low Flow
  - Optional Test Enclosure door open
  - If test enclosure not present - missing jumper plug
  - No Line Power to Low Flow power supply

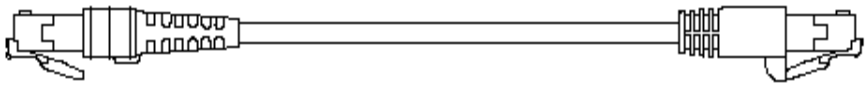
Handset Connection

Cable P/N
100-147-718



Front

Cable P/N
569849-XX



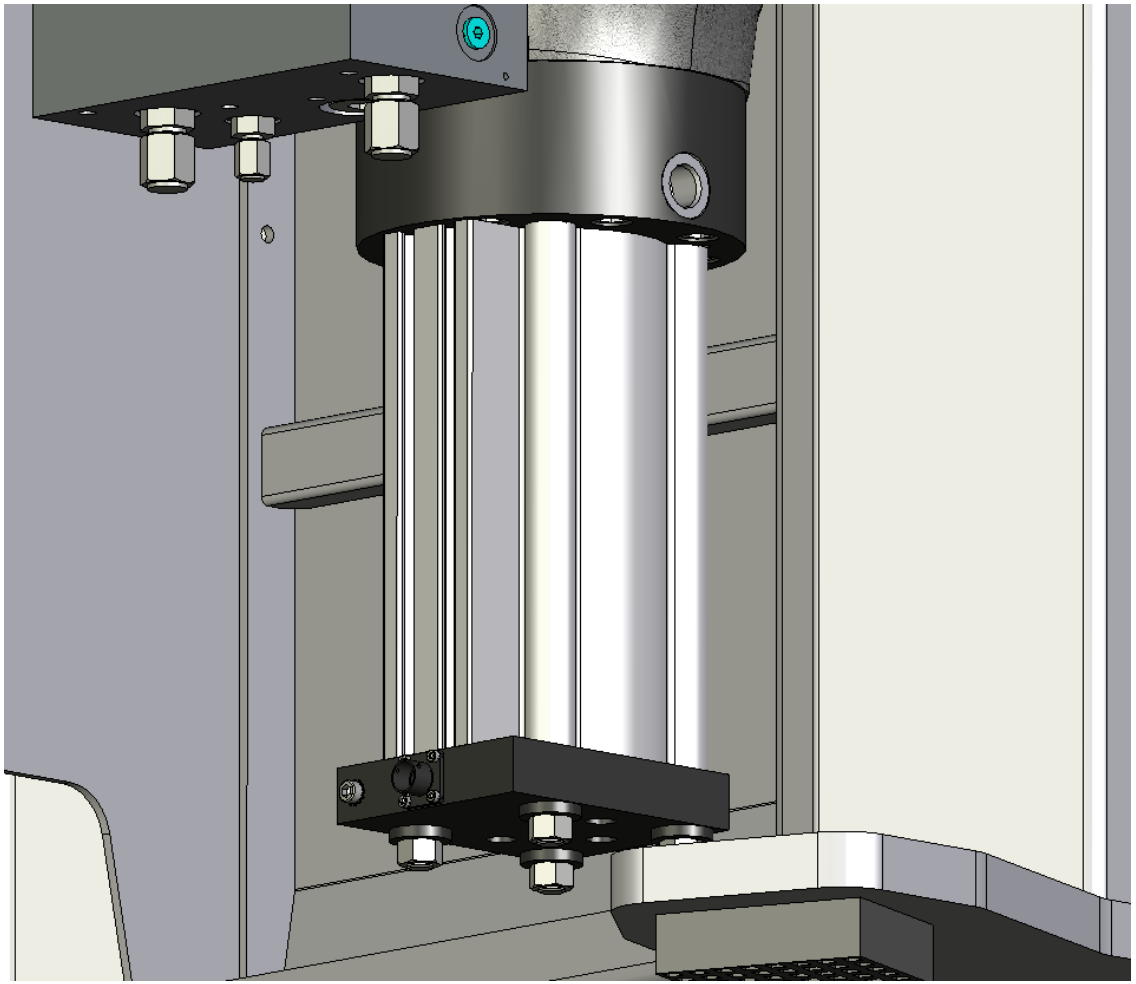
Actuator

- Integral actuator to load frame

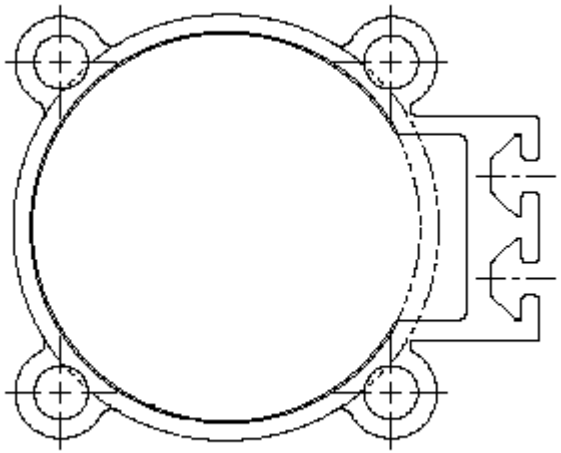
- Actuator housing is “Actuator Beam”
- End caps are piloted – Similar to 248 actuator
- Can remove end cap without removing servo valve manifold
- Closed LVDT housing standard
  - Meets requirements for CE compliance

Actuator

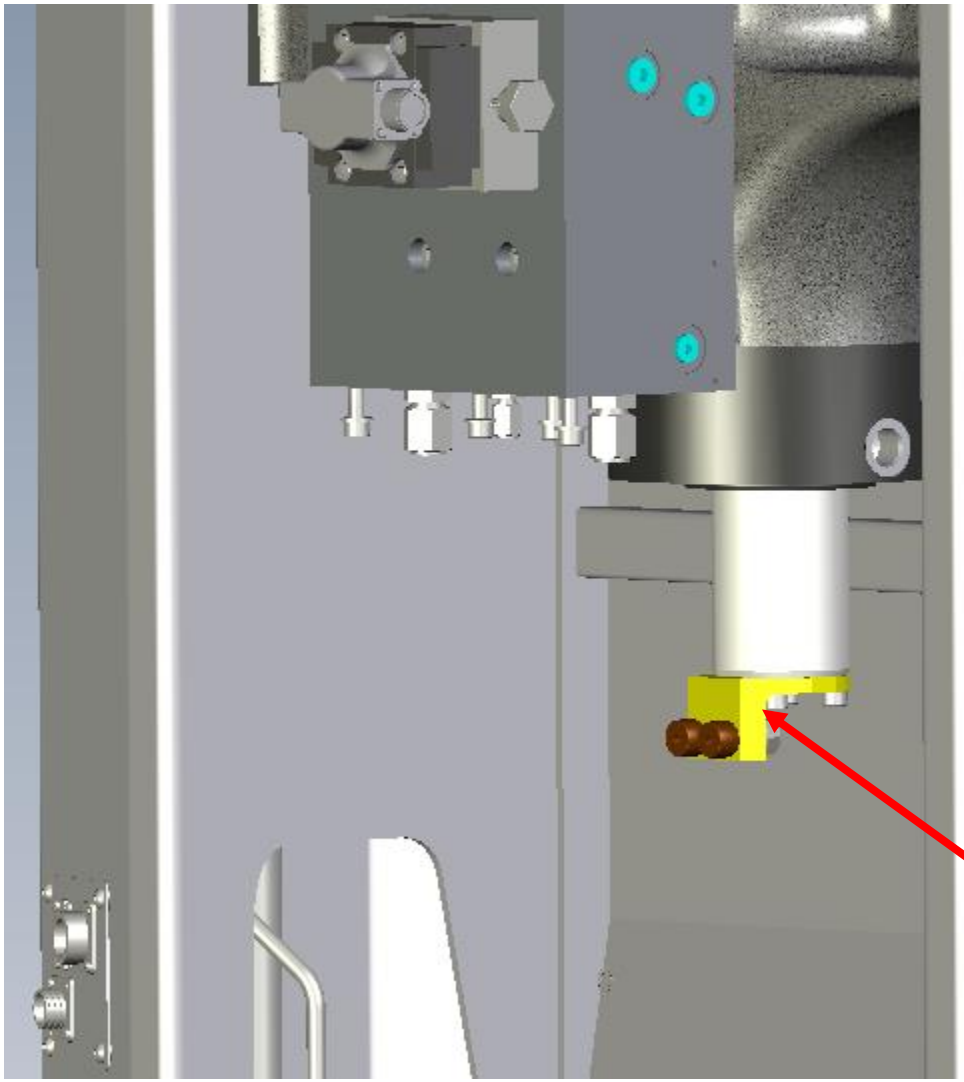
Closed LVDT housing standard

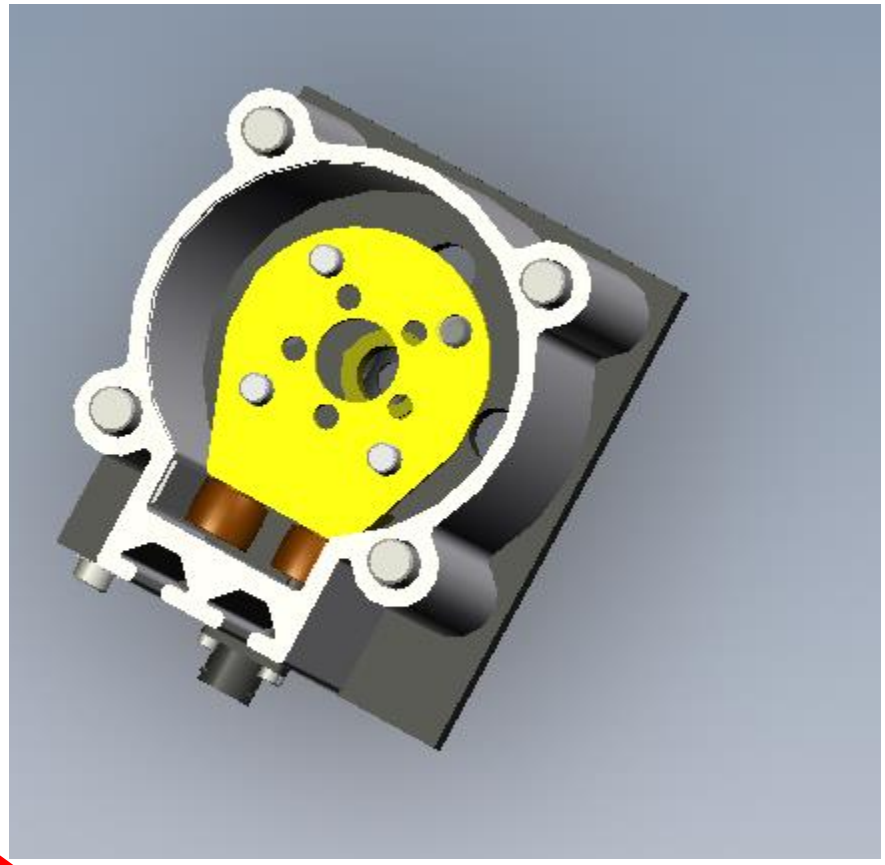


LVDT Housing standard to accommodate optional anti-rotate hardware



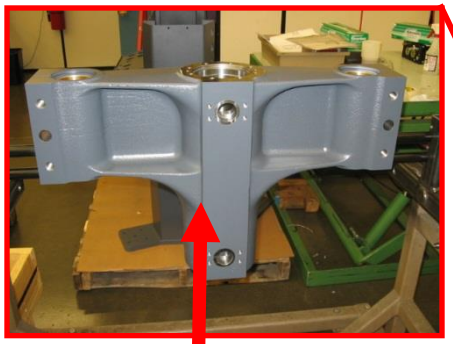
Actuator – Anti-rotate





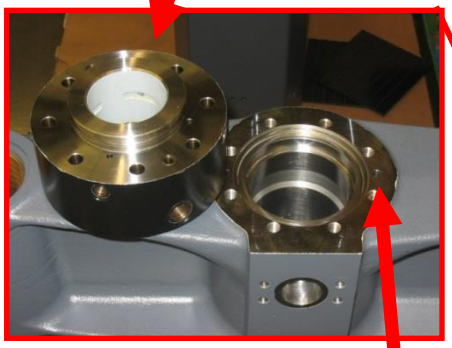
Optional Anti-Rotate Hardware

Actuator

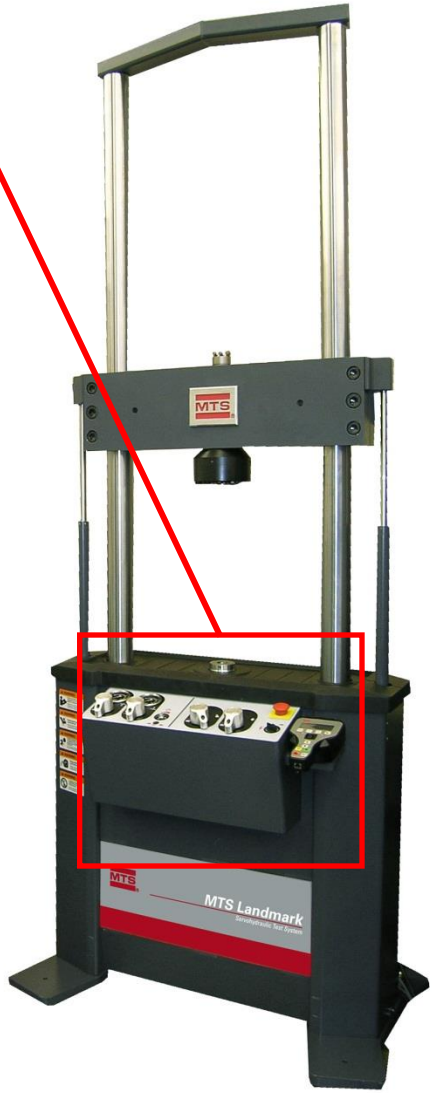


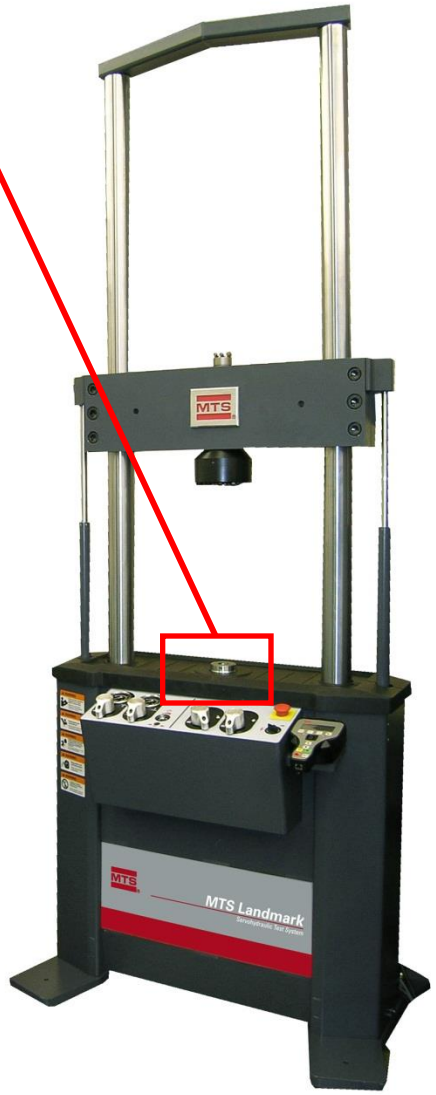
Actuator Beam - Cylinder

End Cap



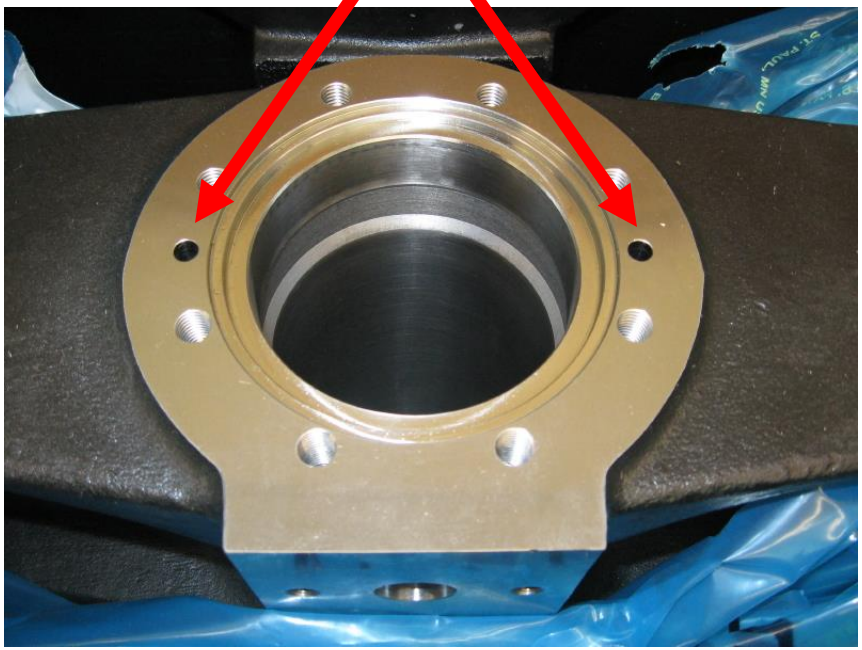
Drain Line porting internal – End cap orientation important





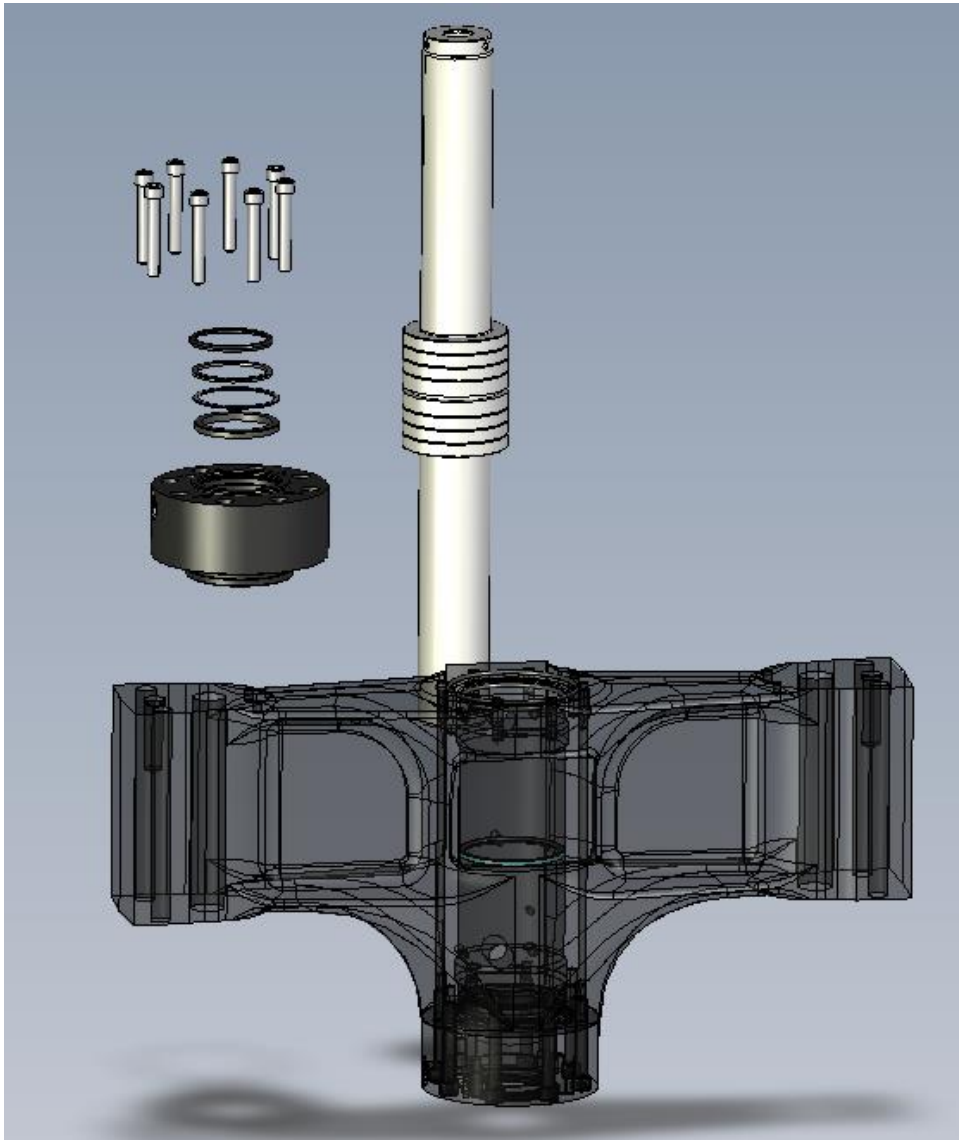
Actuator Beam

2 Internal ports
Hydrostatic bearing pressure
Drain flow

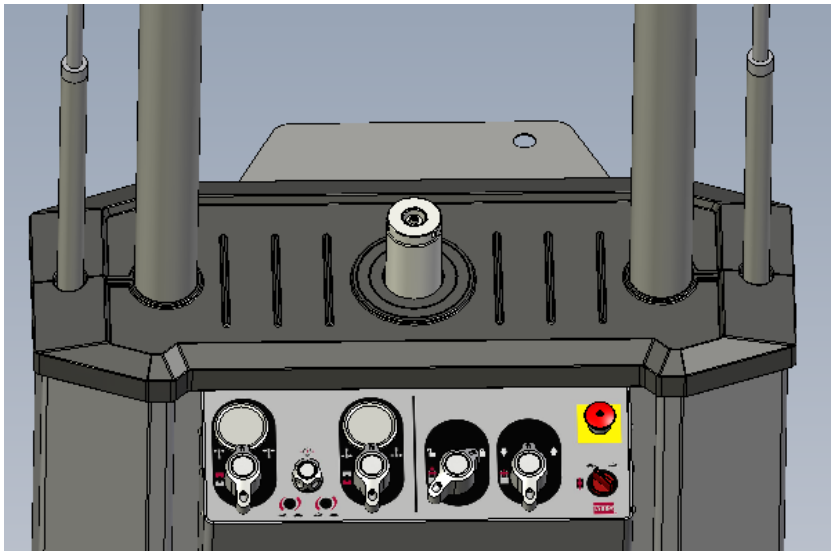


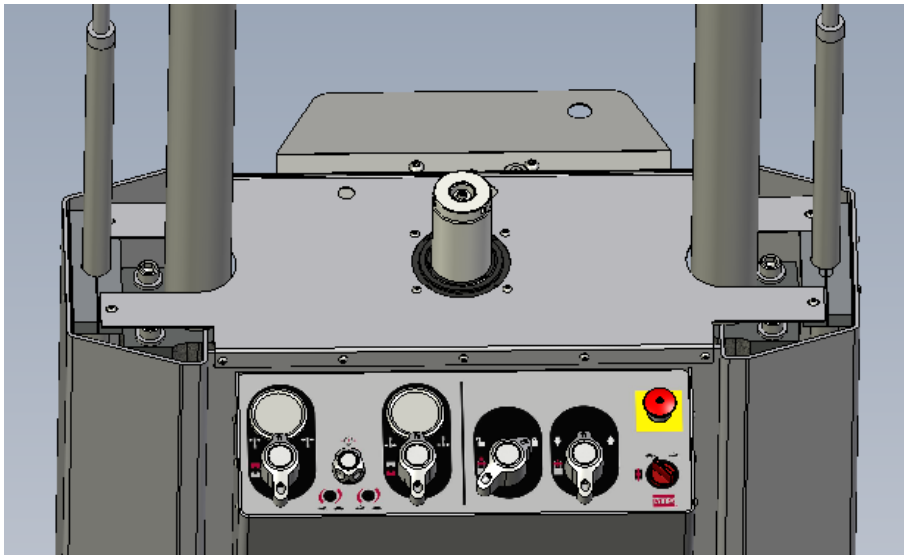
Piston Removal

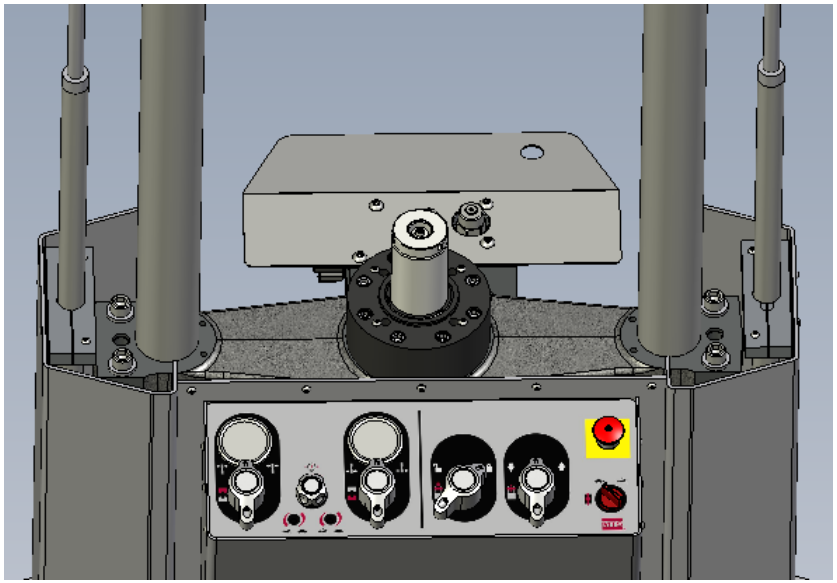
1. Remove LVDT core. Same tools as in use today
2. Remove Rubber table top
3. Remove Load frame top
4. Remove upper end cap bolts
5. Remove end cap
6. Lift out piston rod

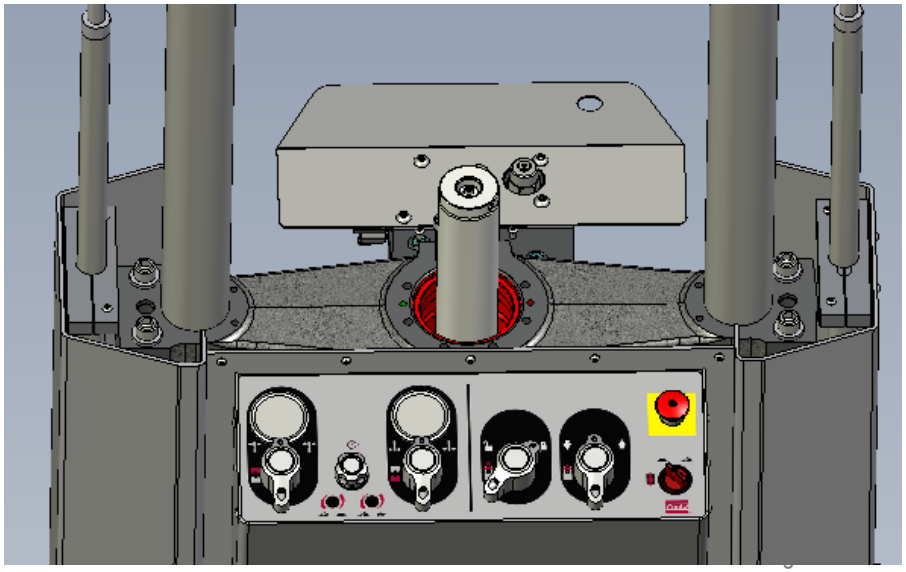


Piston removal



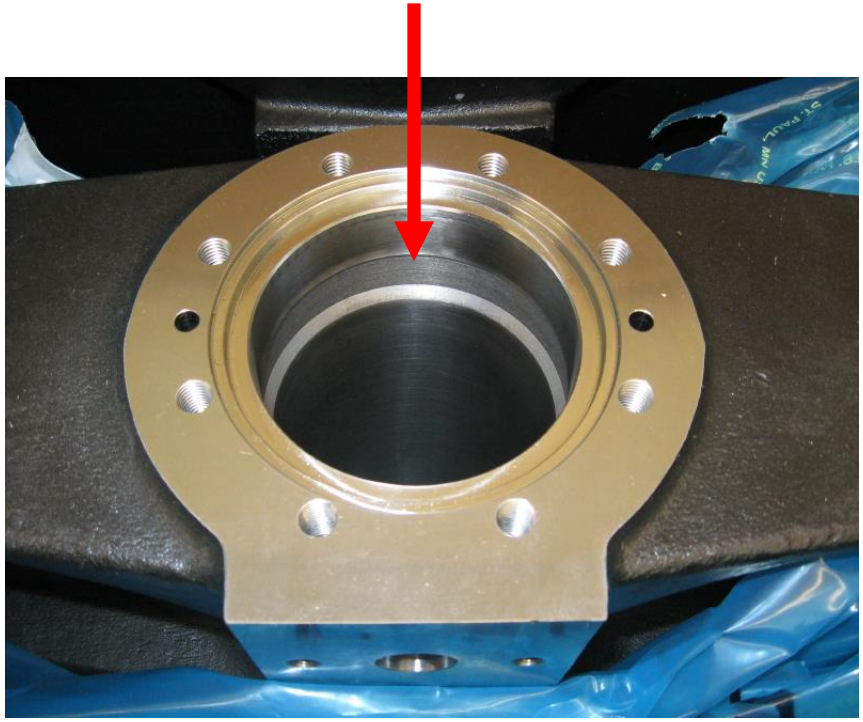


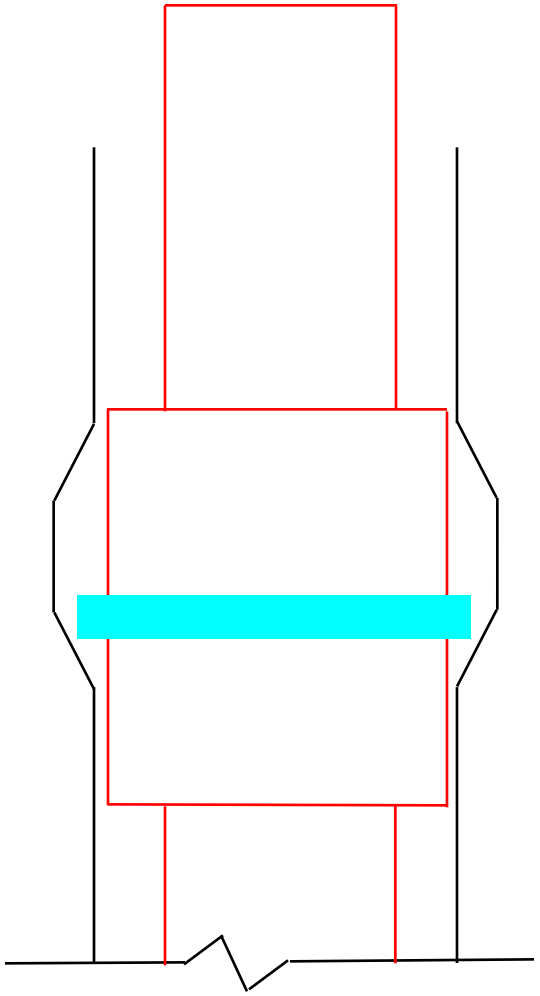




250 kN and 500 kN Actuator

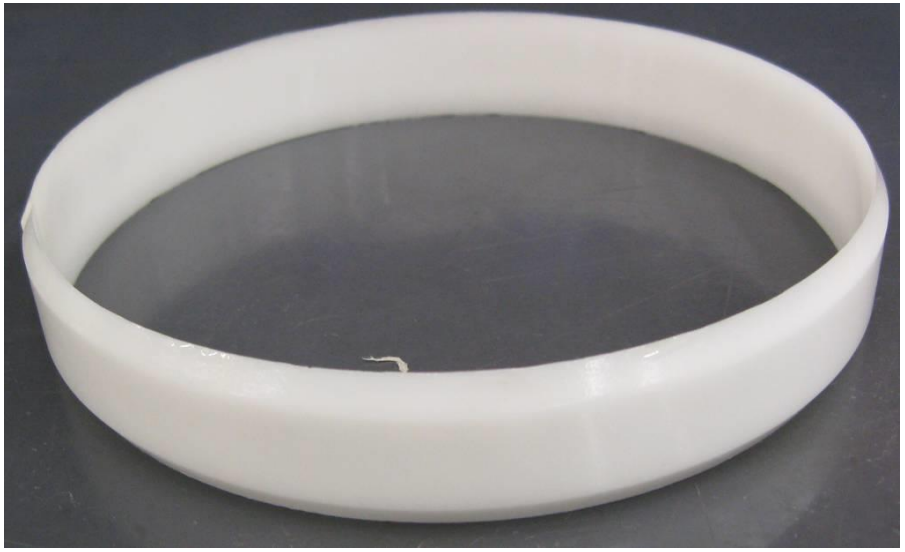
Piston Seal will get obstructed during piston rod installation on the 250 kN and 500 kN sizes by the hydraulic cushion groove in cylinder. Tool is required for piston rod installation.





250 kN and 500 kN Actuator

Piston Rod Insertion Tool Part Number 574961-XX



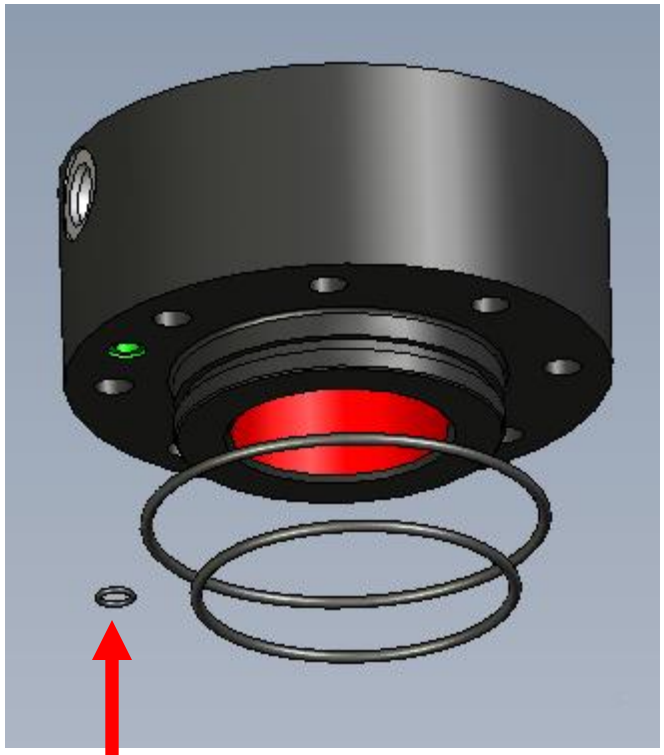
Place tool into recessed area in cylinder to allow piston seal to smoothly pass over recessed area.

250 kN and 500 kN Actuator

Remove tool after piston has been installed.

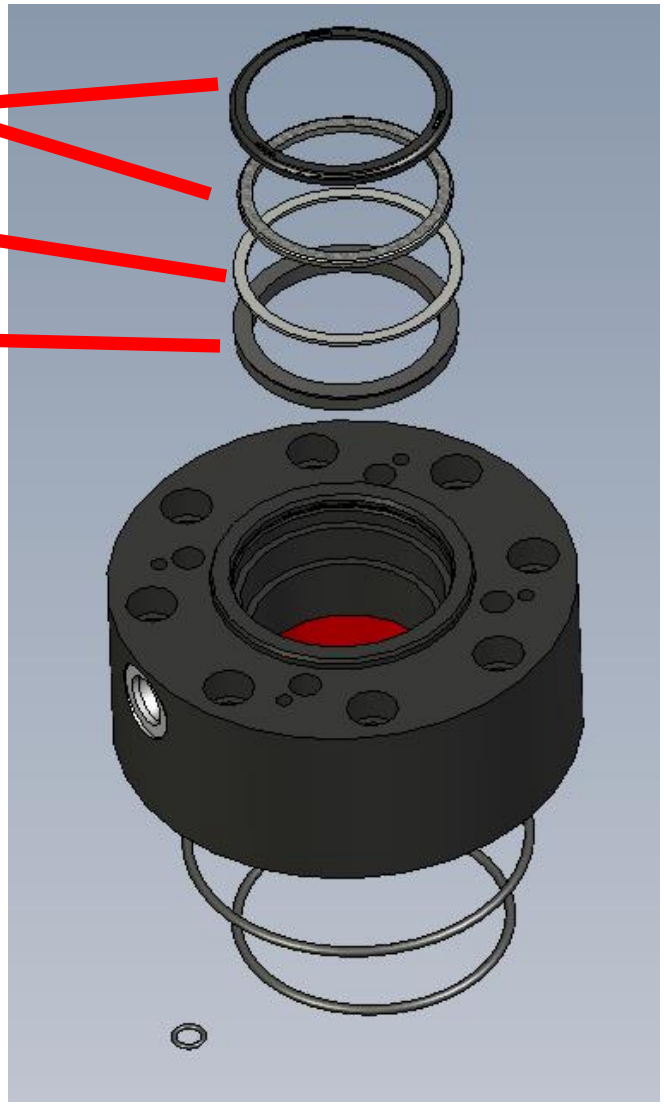
Piston insertion tool part number 572214-XX

End cap assembly components



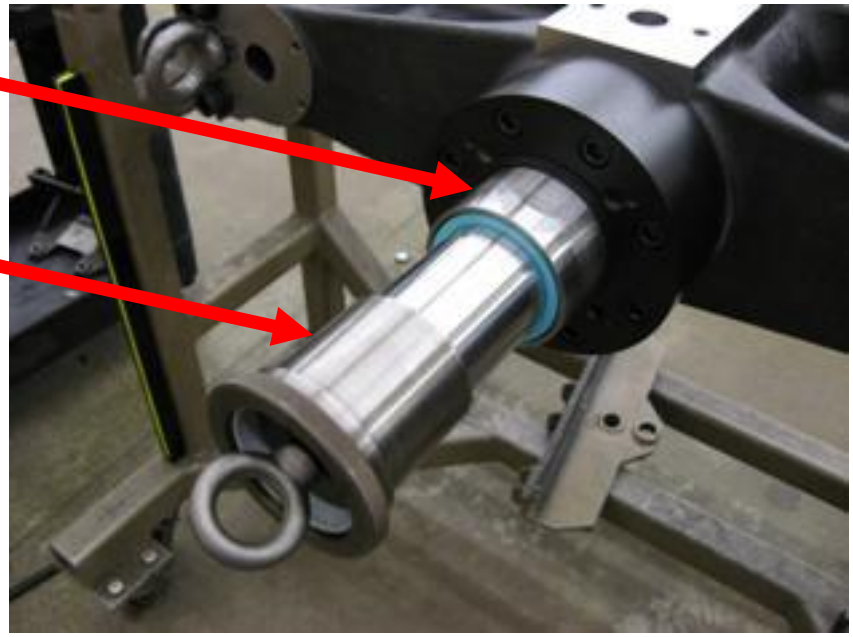
Drain Port o-ring
If hydrostatic – additional o-ring required

1. Felt retainer and wiper
2. Spirolox retainer
3. Low pressure seal

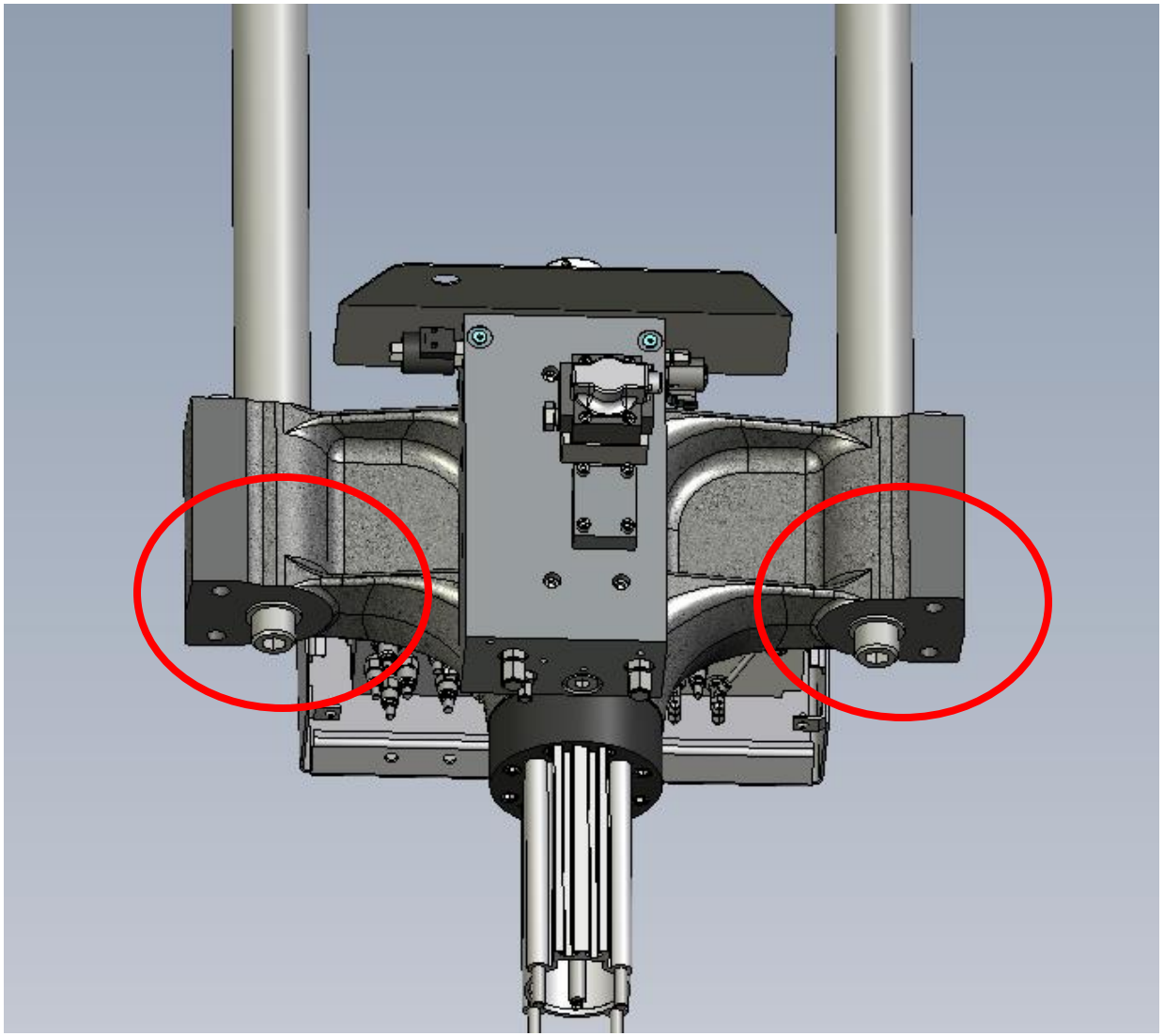


Low pressure seal insertion

Low pressure seal insertion tool part number 487377-XX

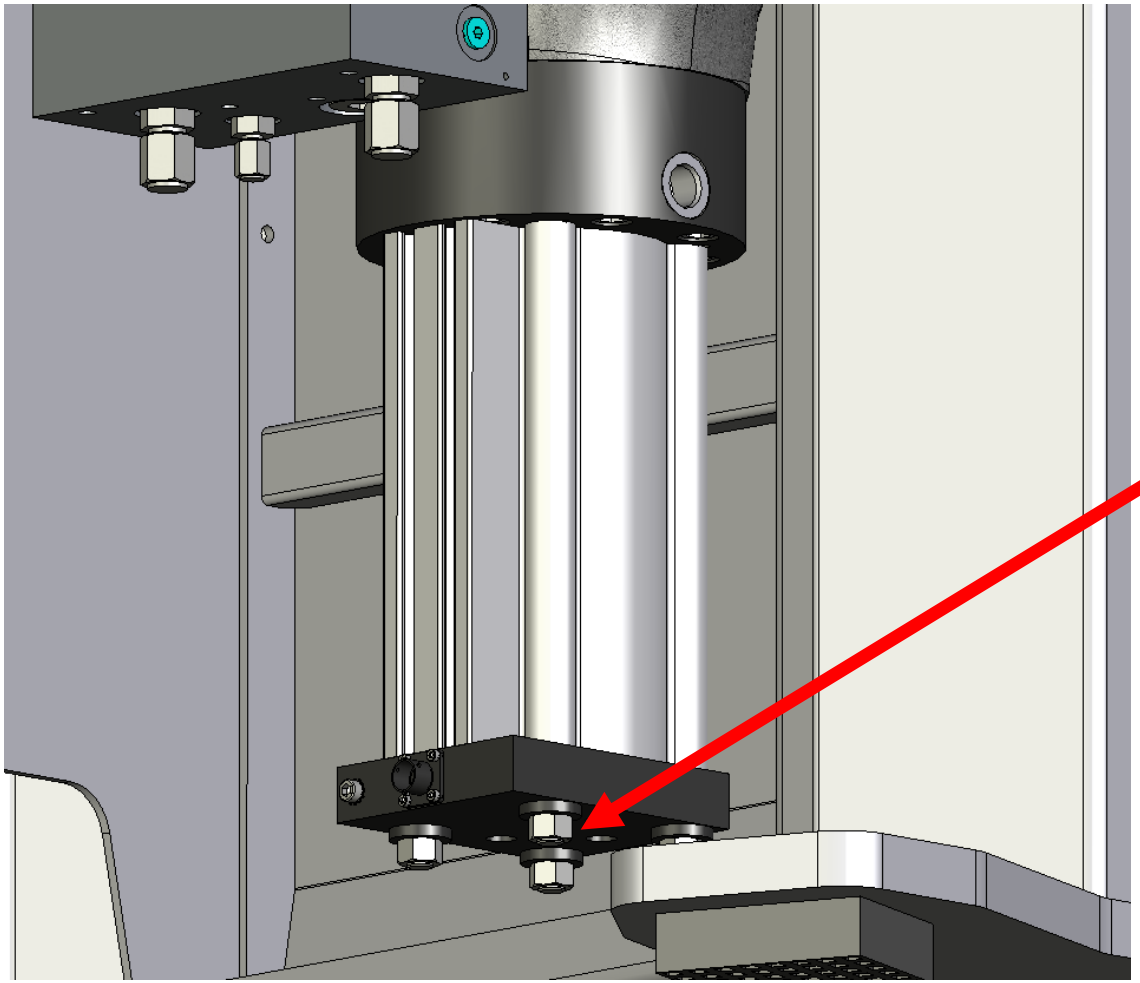


Actuator



Load Frame Columns attached to actuator beam using single bolt. Proper Torque is accomplished with hydraulic torque wrench.

LVDT replacement



1. Remove Core
2. Mechanically raise piston rod to maximum vertical travel
3. Remove 4 nuts and washers on bottom LVDT plate
4. Lower plate to access tie rod bolts
5. Remove tie rod bolts
6. Rotate LVDT housing, tie rod bolts, and bottom plate to remove coil

Table Top Models 370.02

Axial

Axial-Torsional

Table Top – Controls

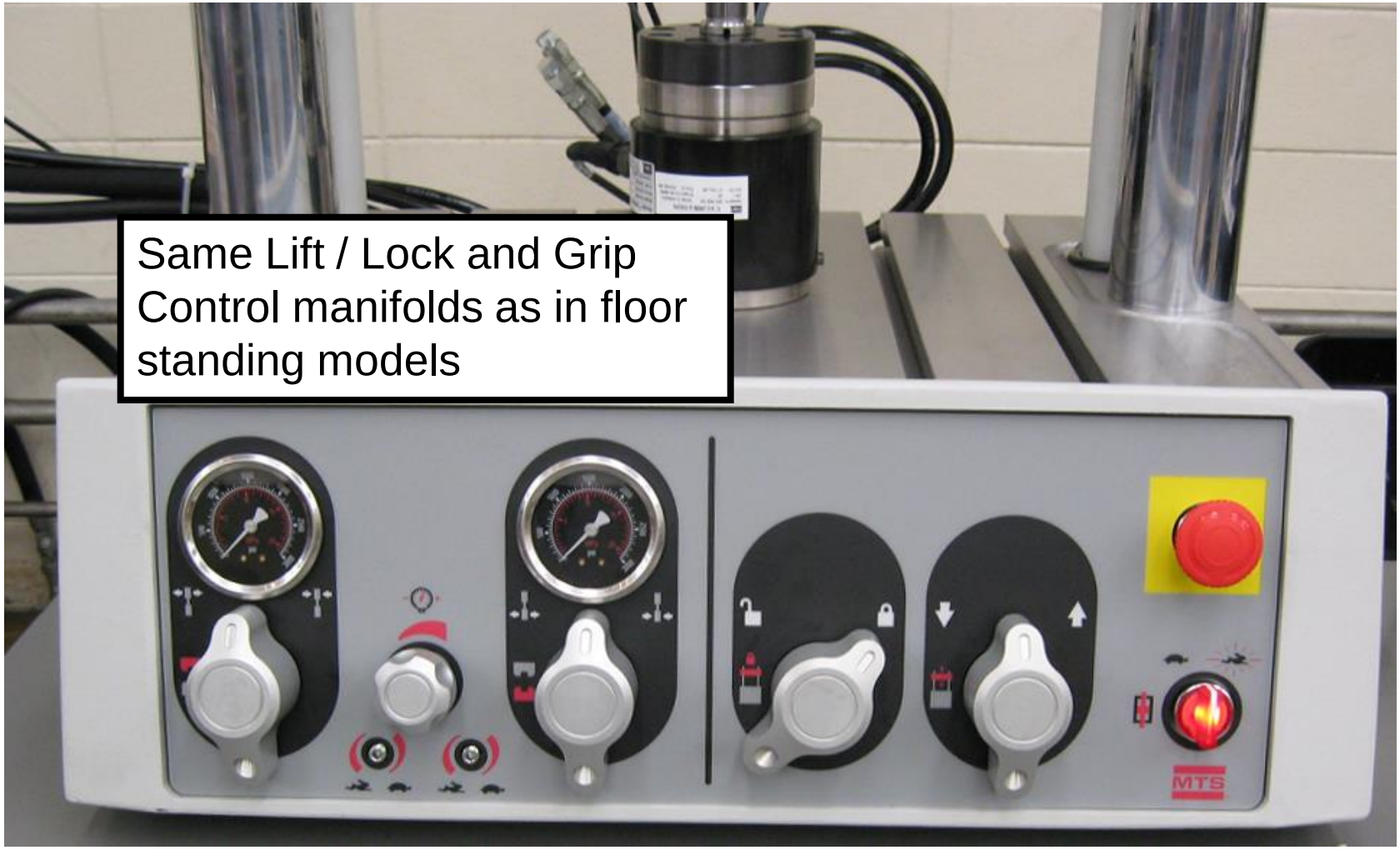


Table Top – Front Panel

Front Panel can be removed for access to adjustments by removing 7 screws, 3 on each side and one on the bottom

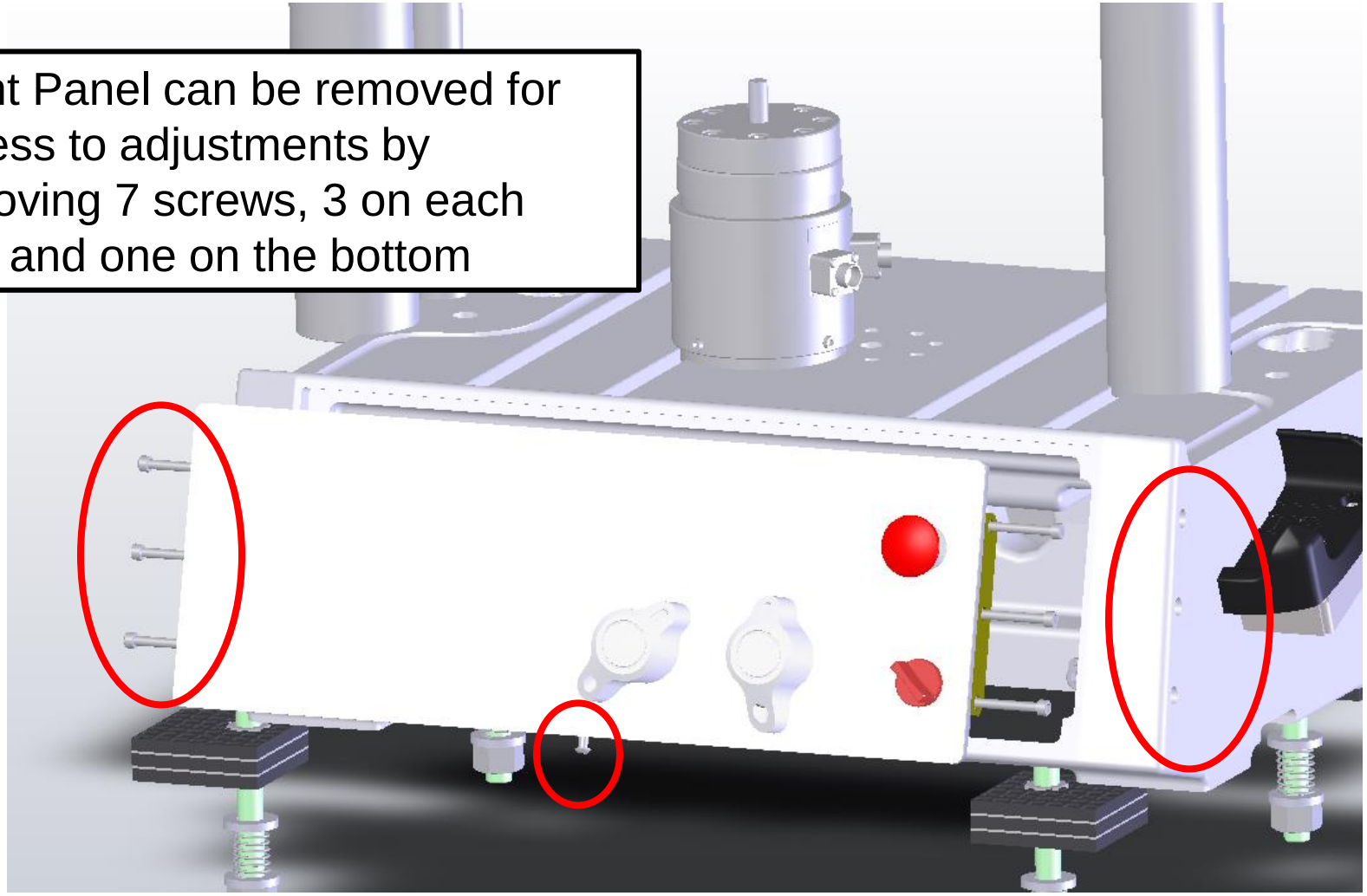


Table Top – Load Cell attachment

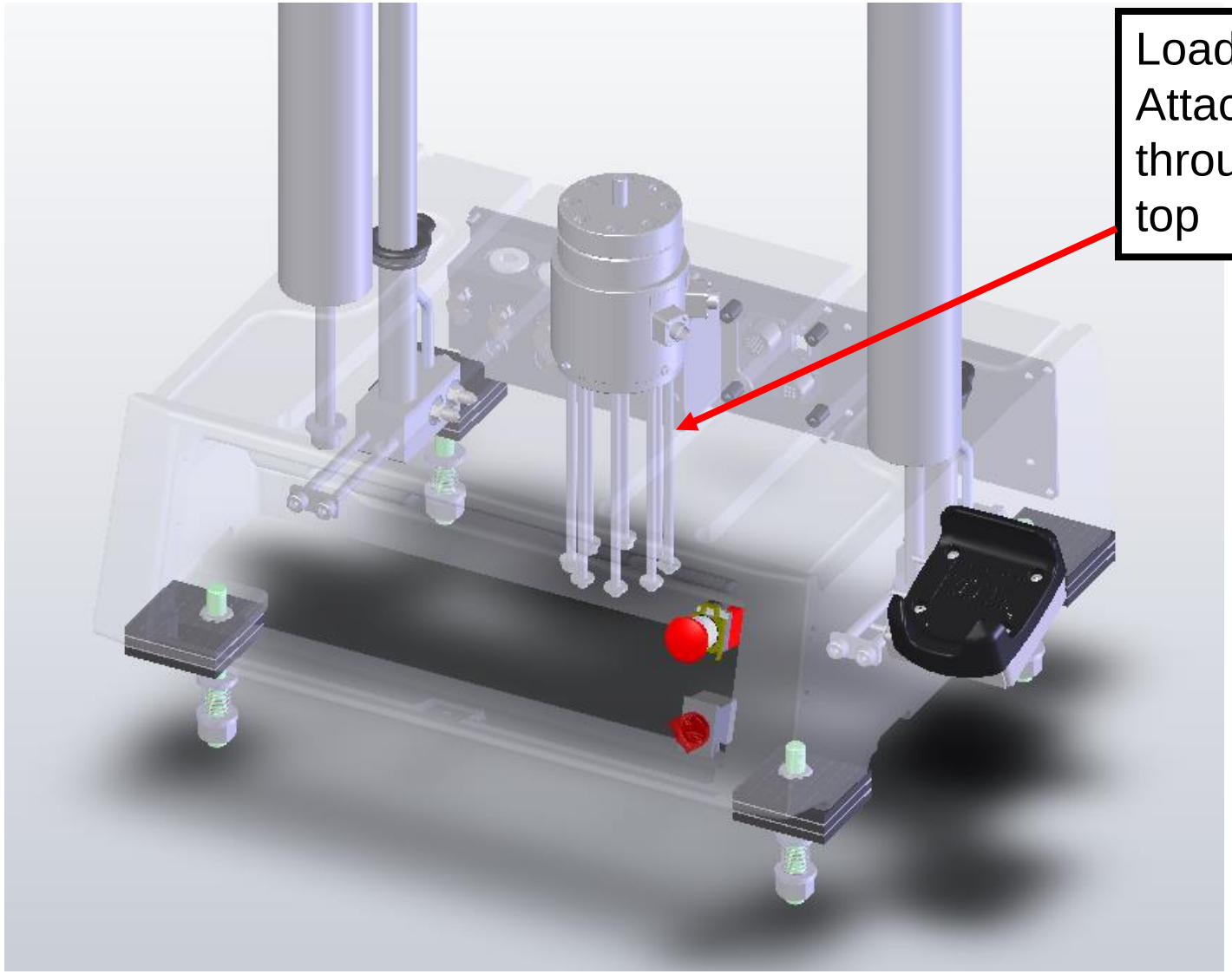
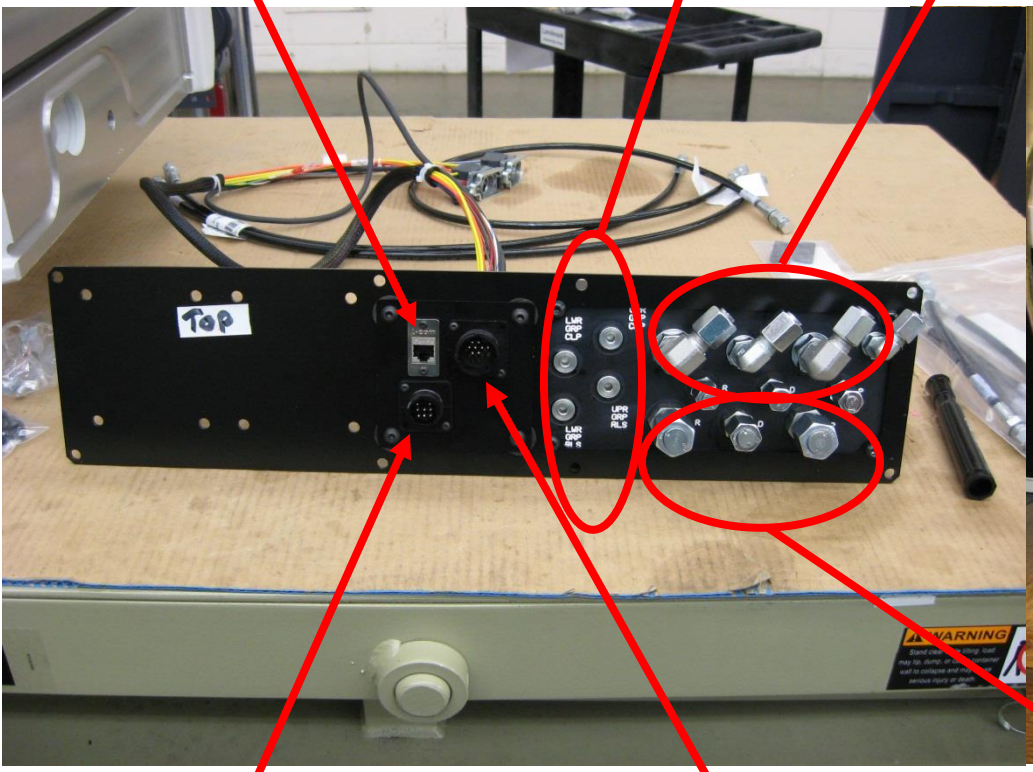


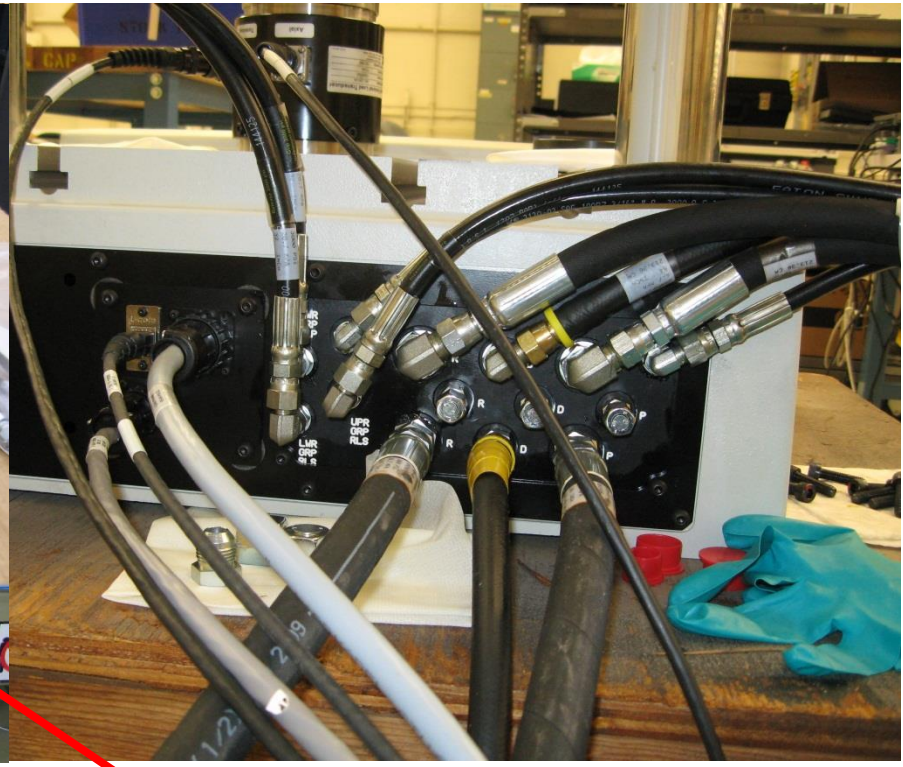
Table Top – Rear Panel

To Controller Handset Connector

Grips

Actuator





To Controller J29

To Low Flow Power supply

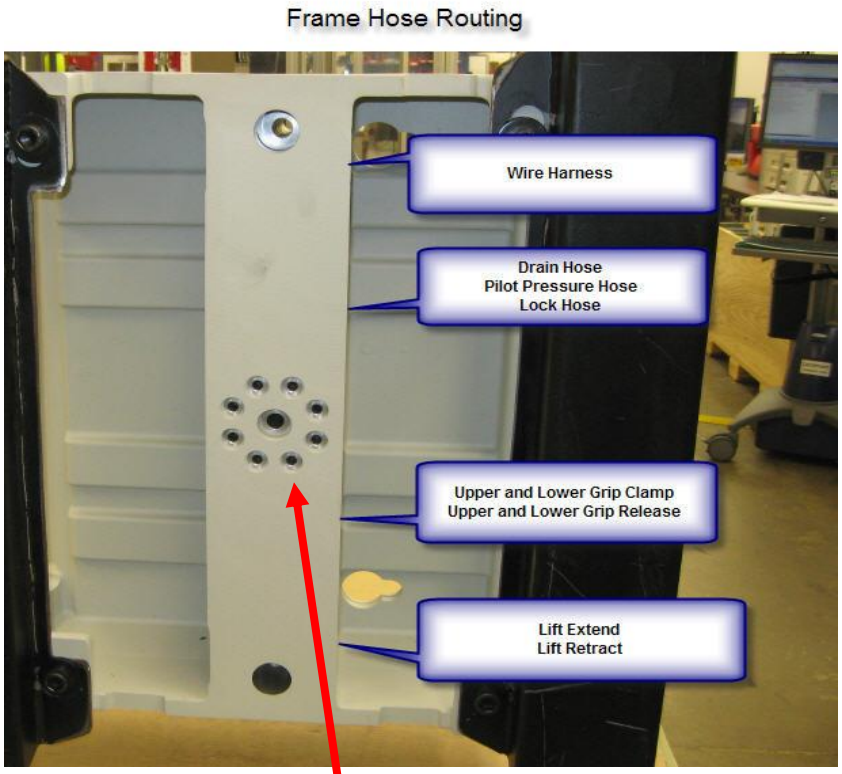
HPU

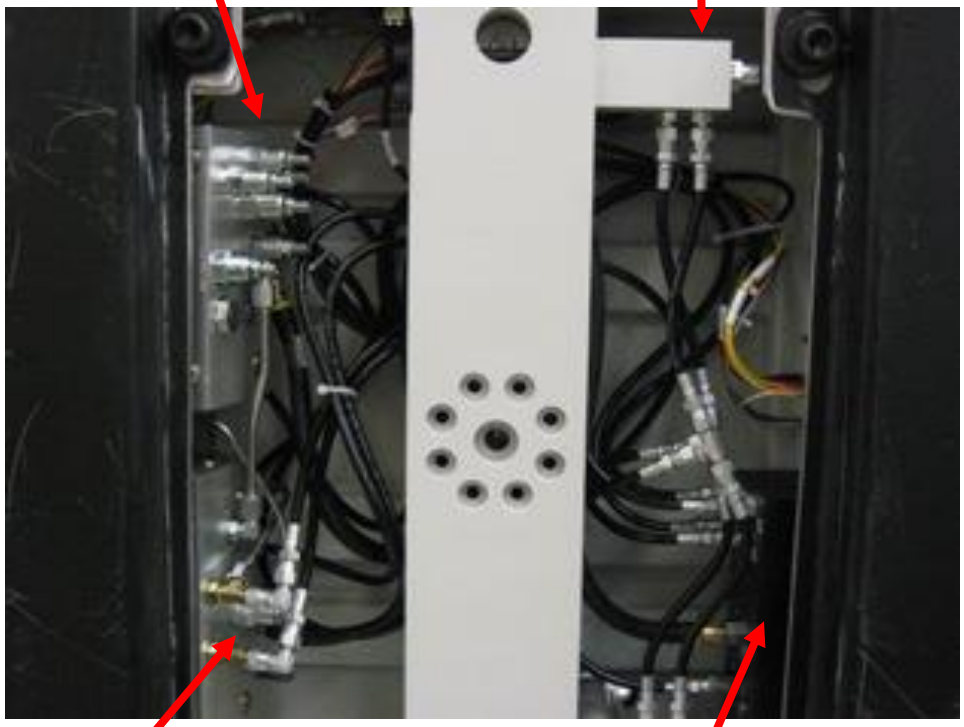
This view is the bottom of load frame table

Interconnect hoses routed under table top.

Lift / Lock Manifold - Rear

Lift Cylinder Counter Balance Valve





Load Cell Mounting Fastener Holes

Grip Control Manifold - Rear

Load Frame Rear Panel (previous slide)

Table Top – Low Velocity Connections

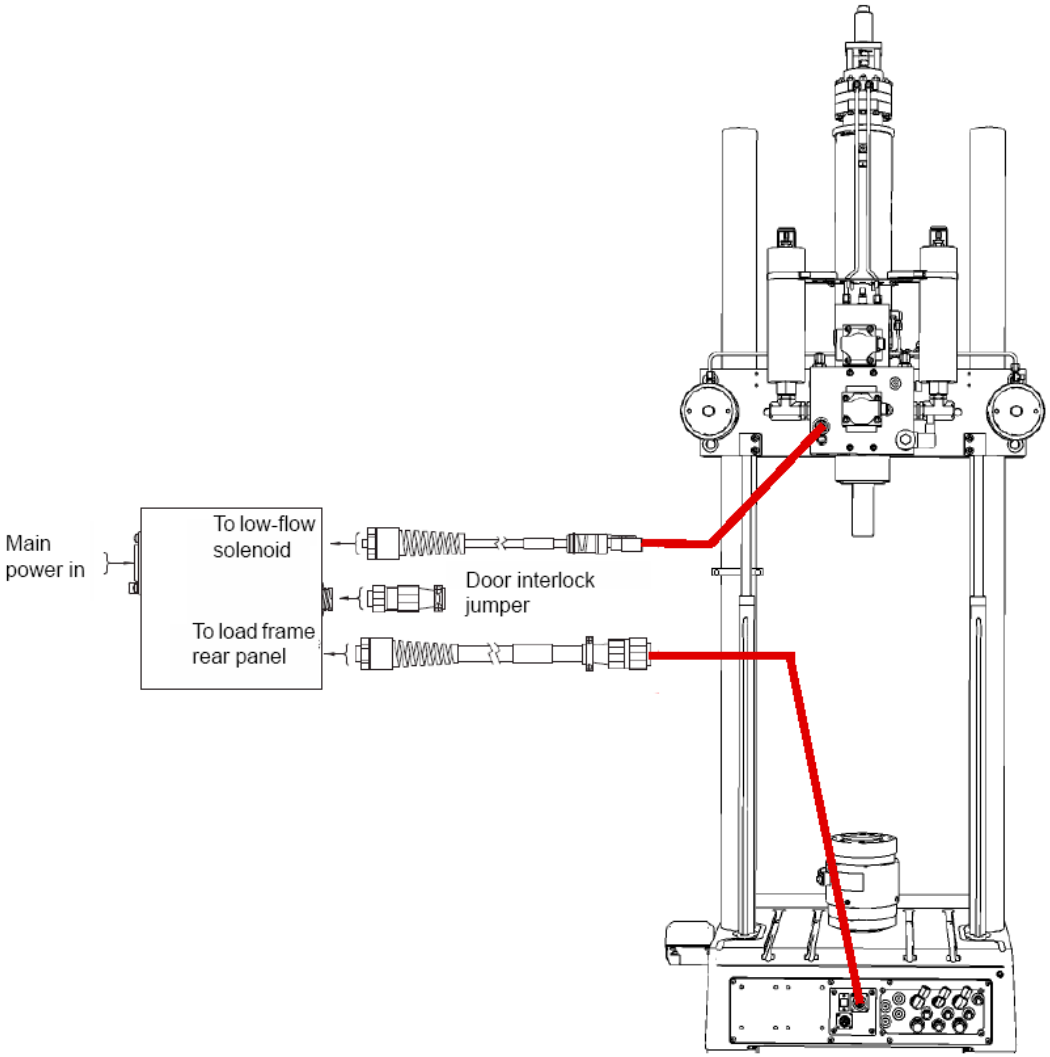
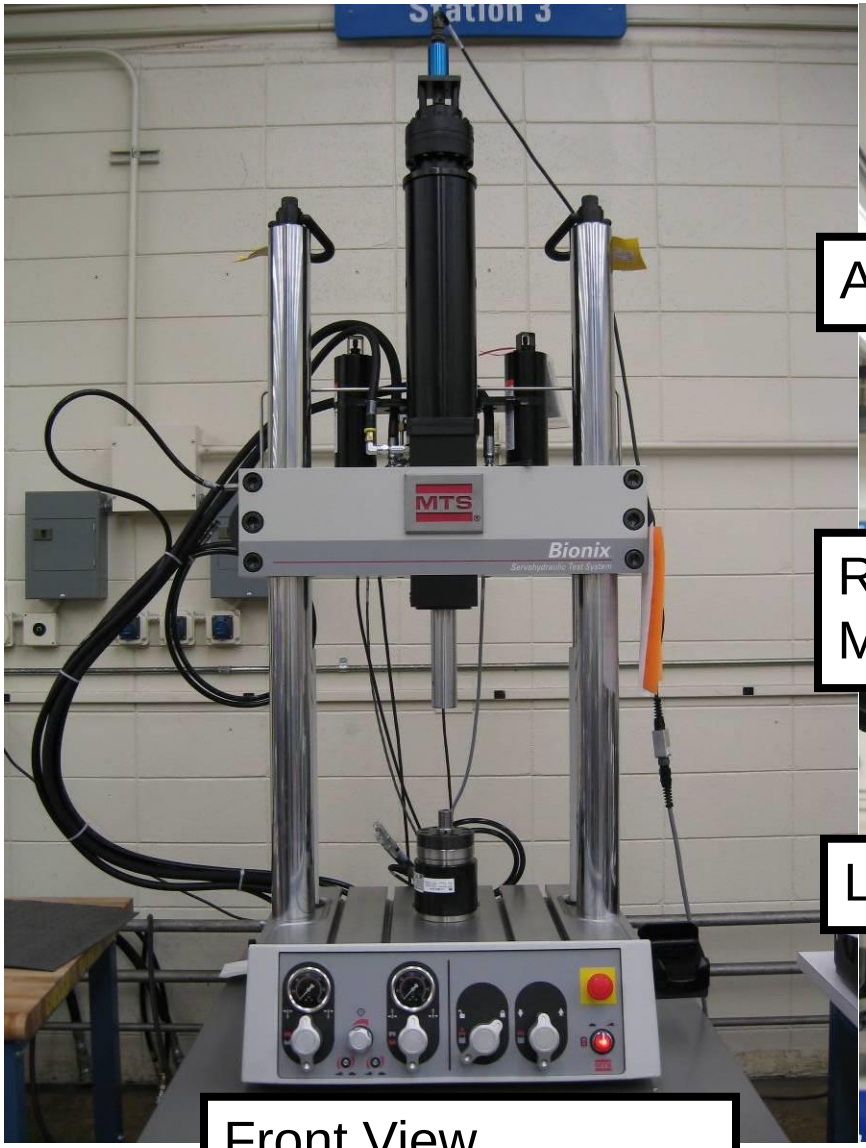
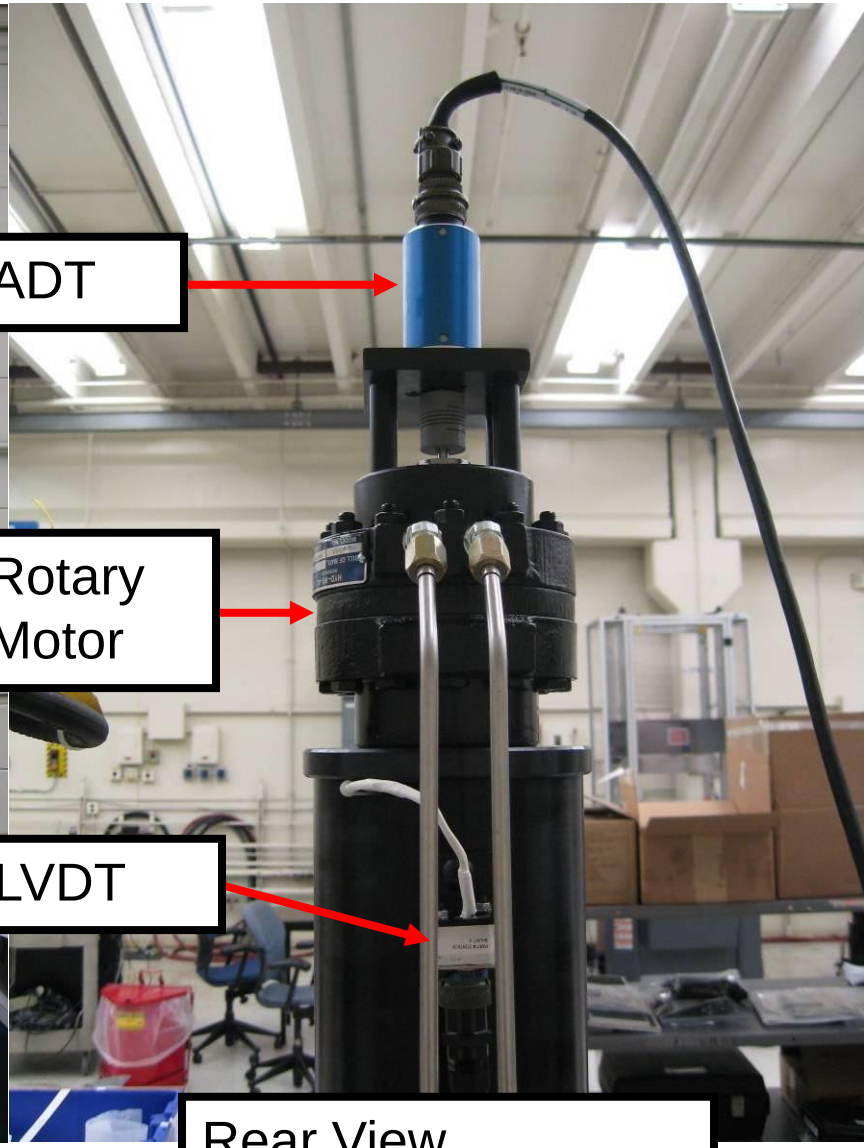


Table Top A/T



Front View



Rear View

Table Top – A/T

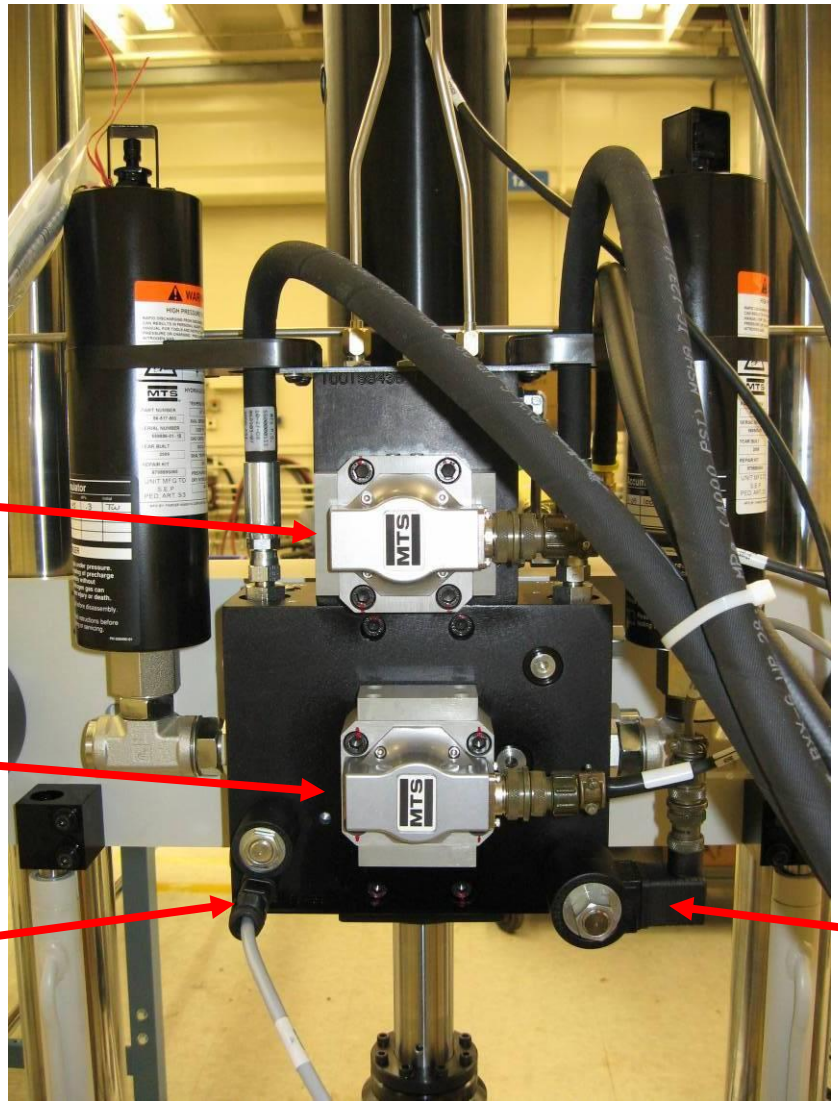
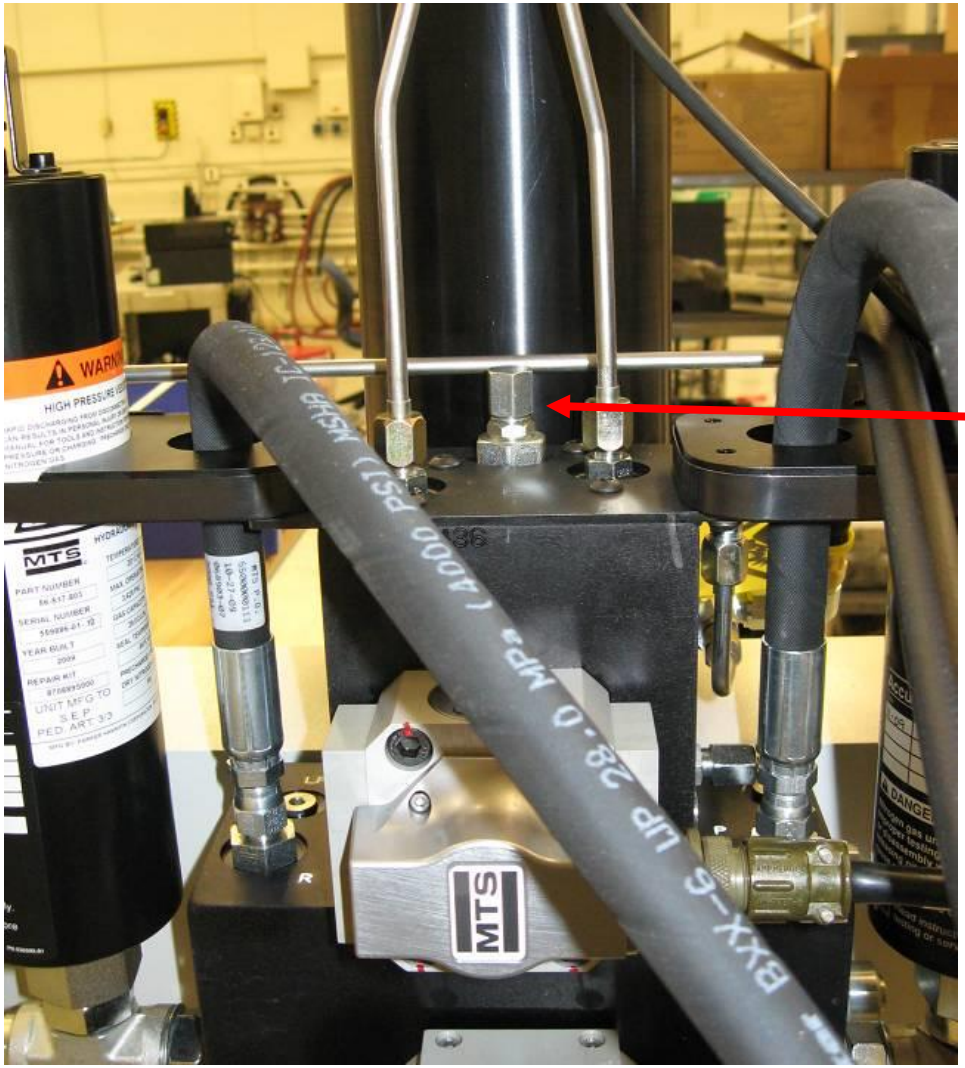

Torsional
Servo-Valve
Axial
Servo-Valve
Velocity
Control
Pressure
Control

Table Top A/T

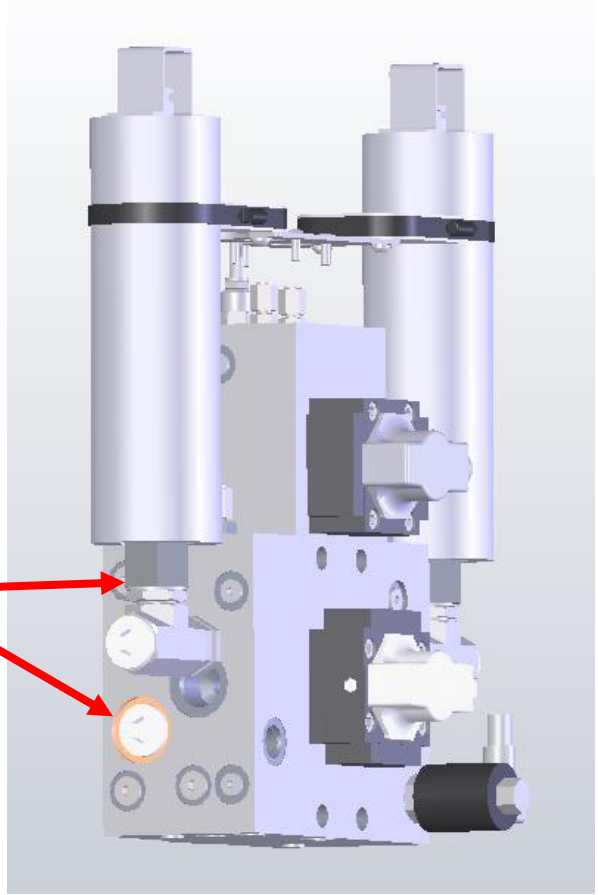


Pressure relief valve for rotary actuator. Sets maximum torsional operating pressure. Adjust to 1000 psi.

Table Top – HSM

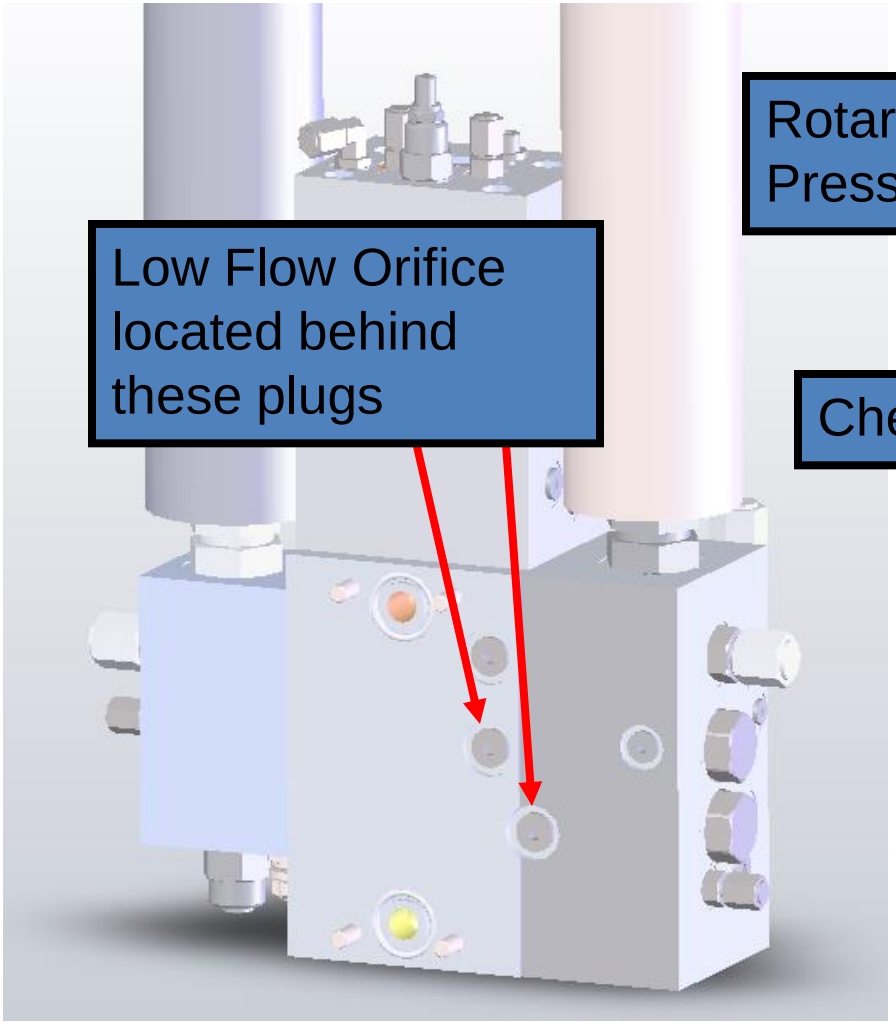
The HSM for both Axial only and Axial / Trorsional 370.02 table top load frames has 2 versions. Version A contains poppet valves for low velocity located between the servo-valve and actuator. Version B contains check valves located between the pressure input and the servo-valve.

Revision A HSM Poppet valves located behind these plugs.



Revision B HSM

Table Top – HSM



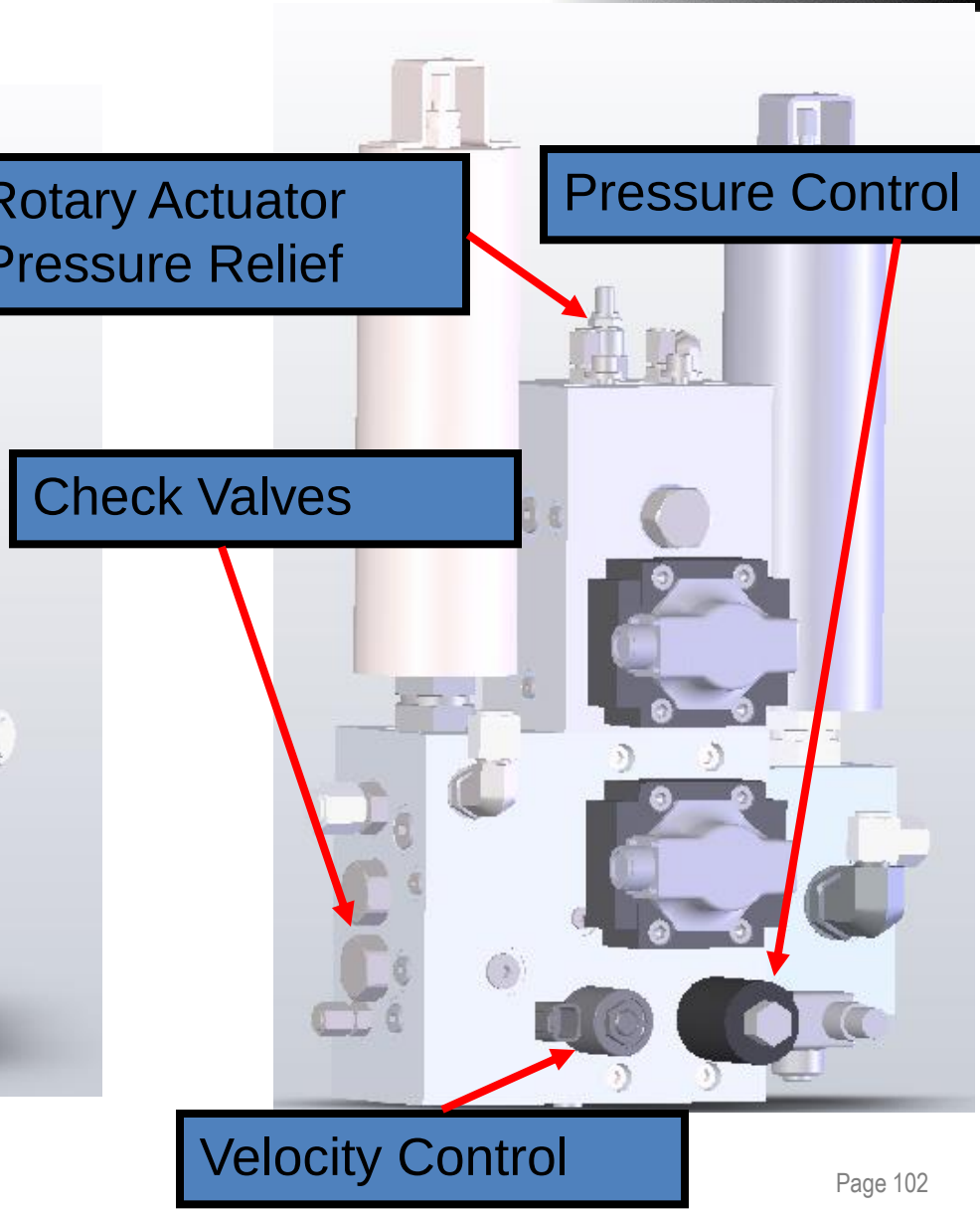
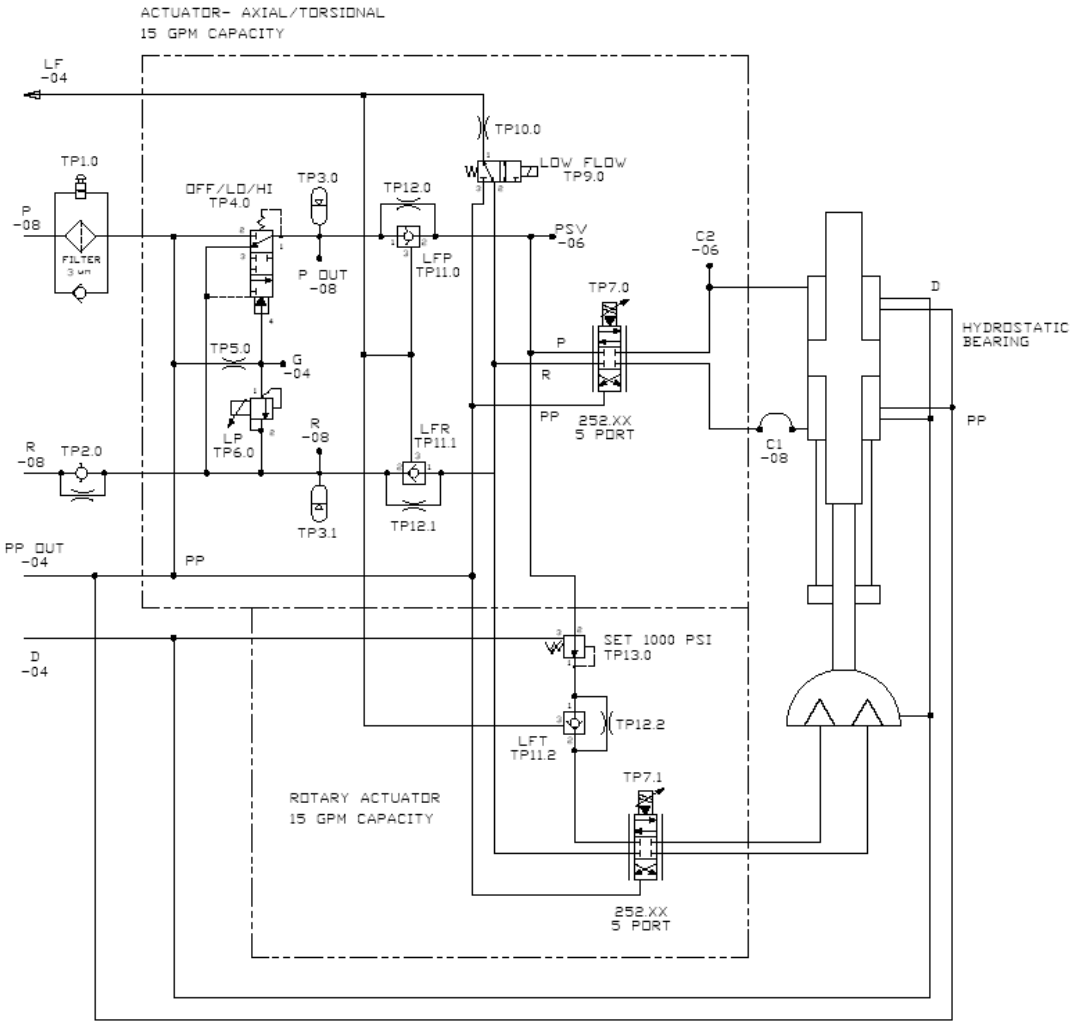


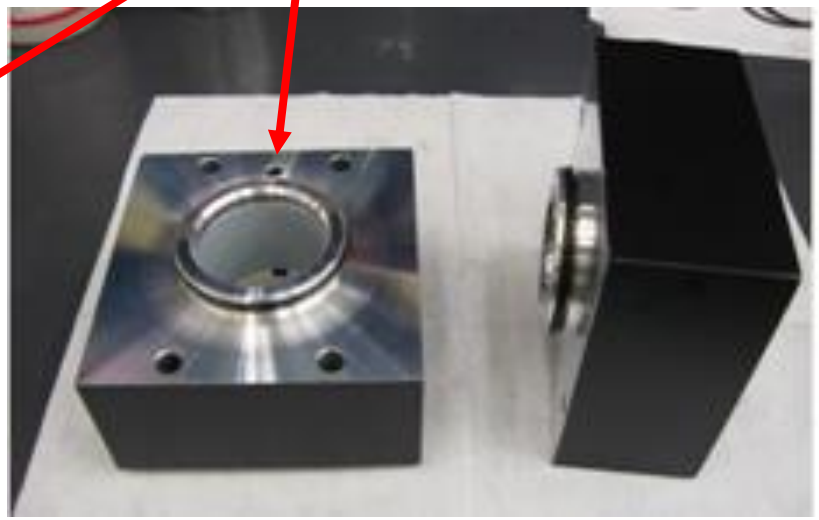
Table Top HSM Revision B



Revision B
Axial Only
574764-XX

Revision B
Axial/Torsional
574765-XX

Table Top – Actuator Beam



Internal Drain Port. End cap orientation must match for drain port.

Drain

O-ring

Table Top End Cap O-Rings

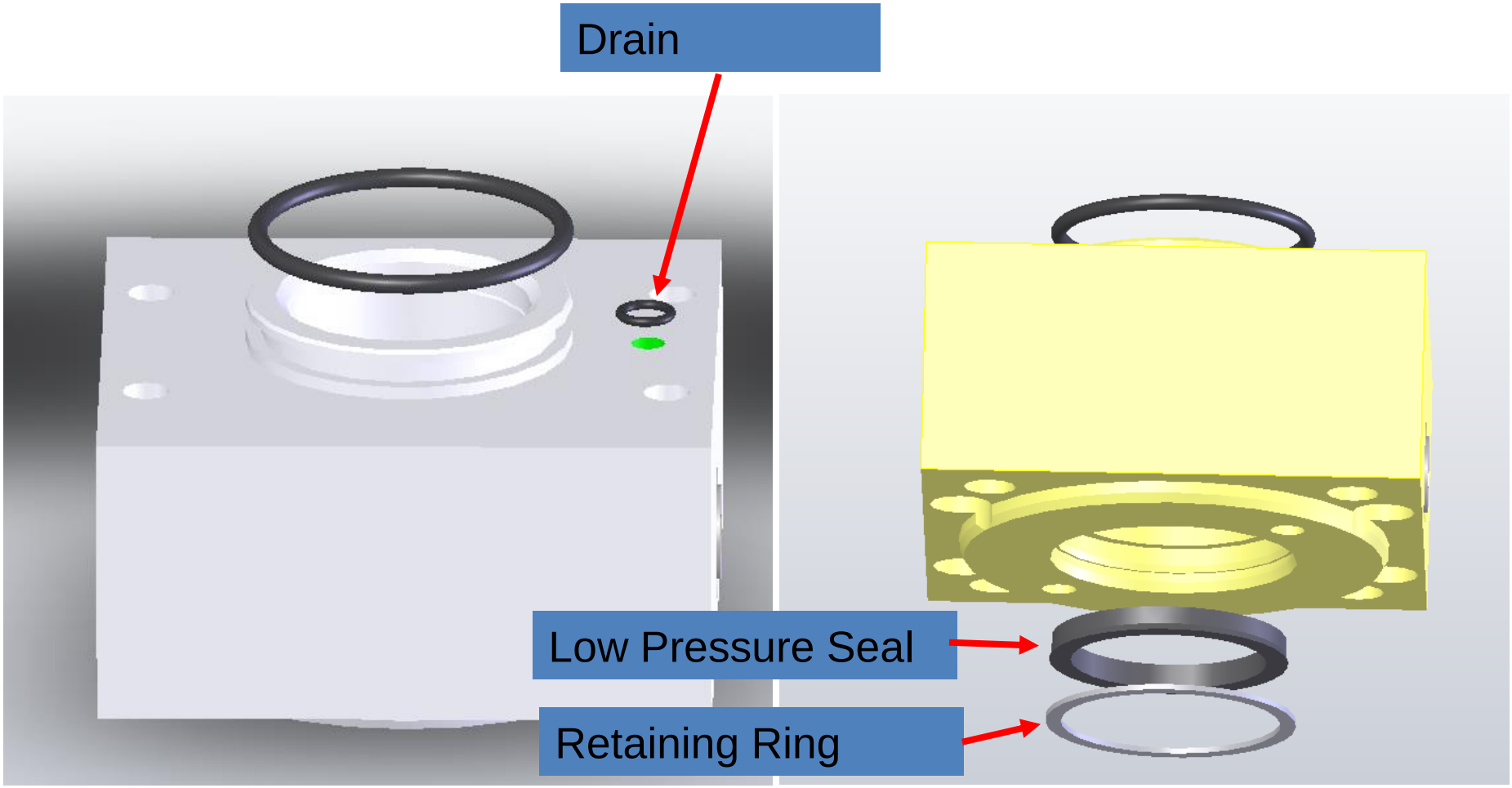


Table Top Low Pressure Seal

Low Pressure seal installation tool 487377-XX

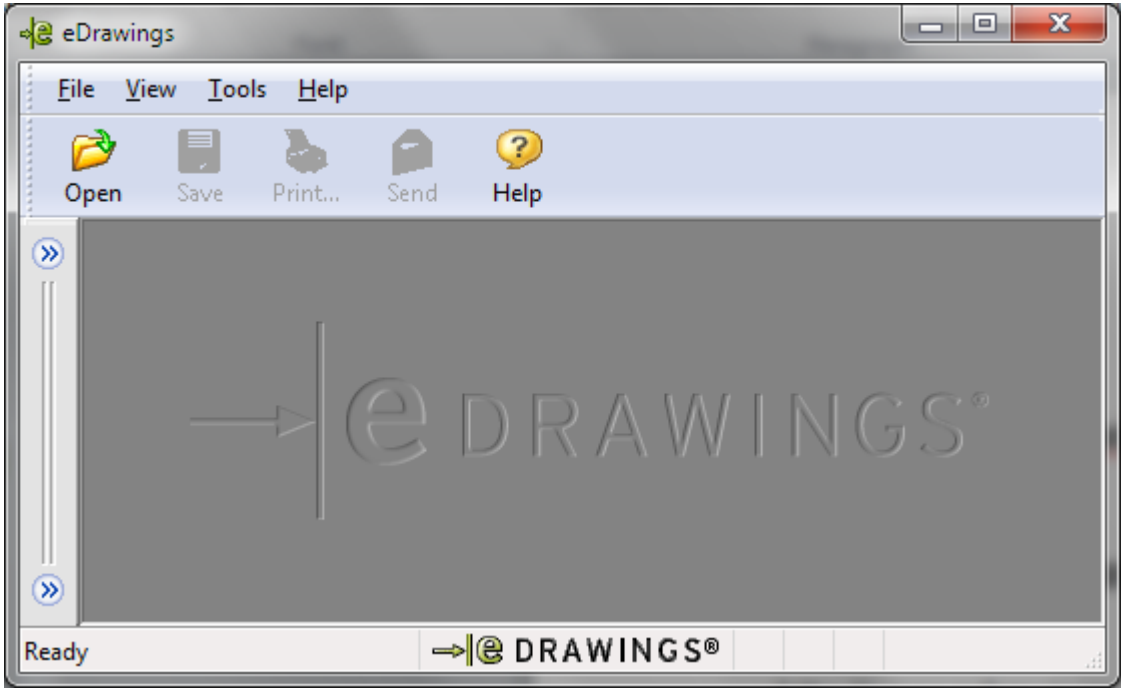
Landmark – Documentation

- Load Frame Assembly Drawings Created Completely In SolidWorks
- No Paper Assembly Drawings Available of Complete Load Frame
  - Some sub assemblies are available using Finder
- Can view complete load frame assembly in drawing viewer
- Can use viewer to disassemble entire load frame on computer
- Can use viewer to locate part numbers

eDrawing software

- Current viewer is eDrawings supplied by Solidworks
  - eDrawings reacts slowly on lower speed computer. Be patient when using eDrawings.

- eDrawing viewer software is available for free download at
  - http://www.edrawingsviewer.com/



Landmark – Documentation

- Drawings – Part Numbers – Available through Intranet
- Available to MTS Employees using DOD
- Documentation on DOD contains BOM
- Individual components available on Finder / DOD

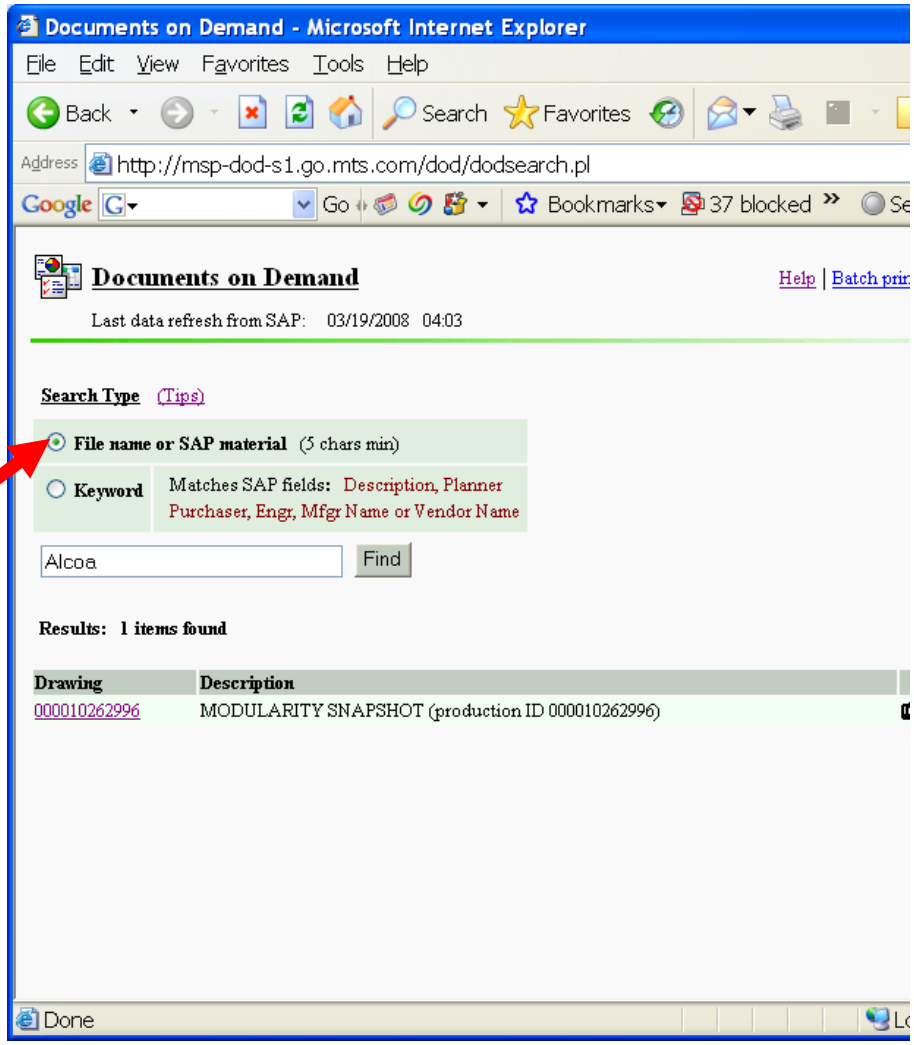
Documentation

» Use DOD to retrieve BOM and eDrawing file

Search DOD using any of the following

1. Load Frame Serial Number
2. Customer Name
3. Functional Location
4. Sales ID

Choose search by “File name or SAP material”



Documentation

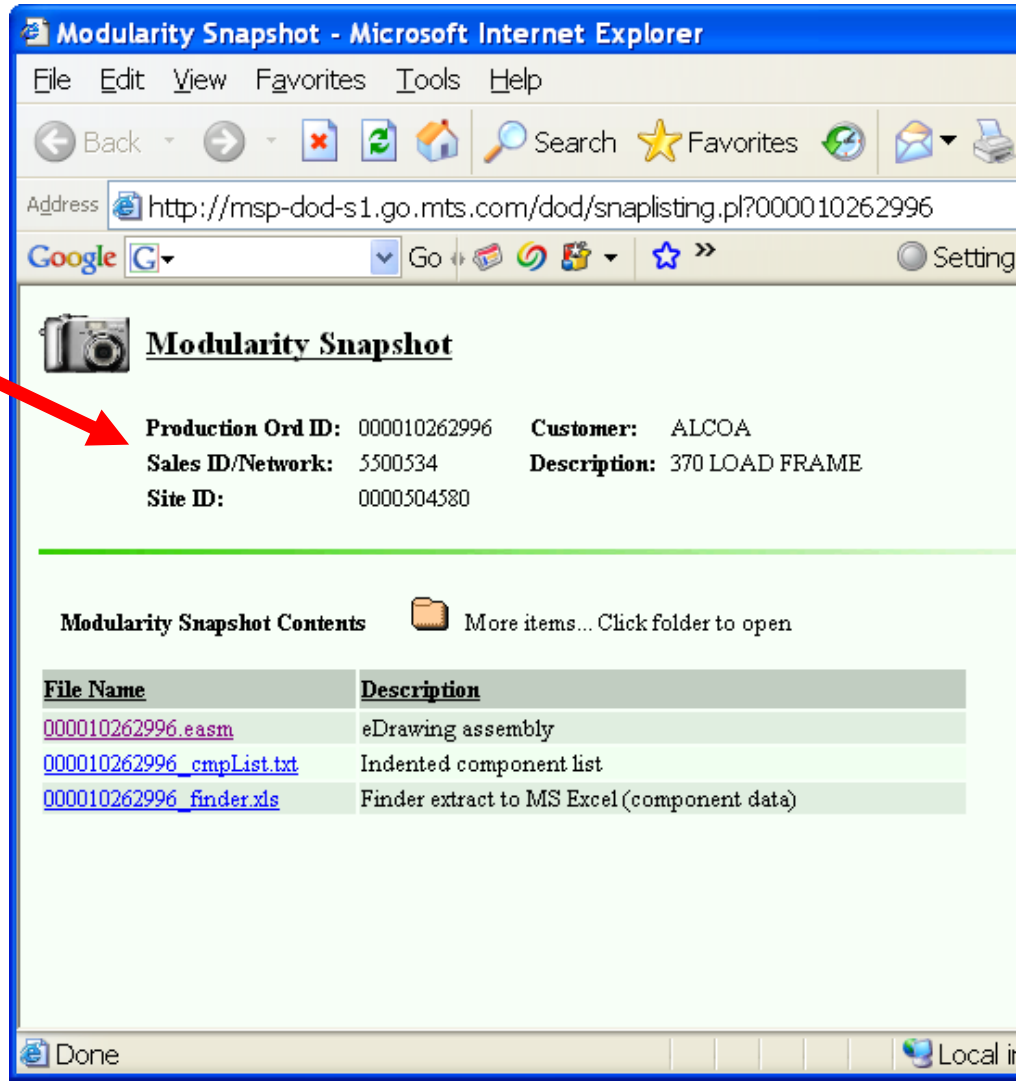
General information about order

eDrawing File

BOM Text File

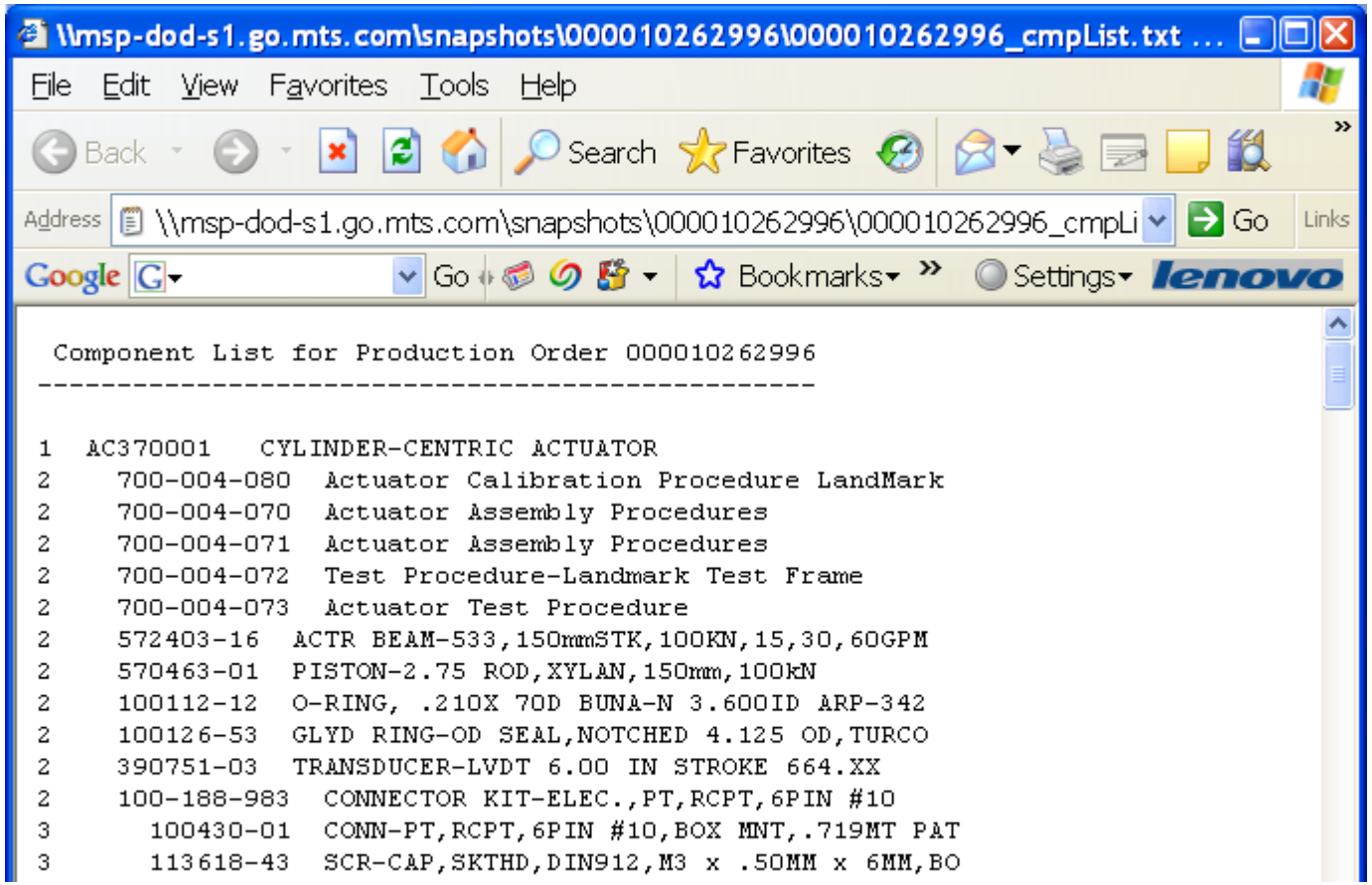
Excel file with Finder Data

Right Click – Save As
To save to local file on PC



Documentation

» The indented component list is a text file with part numbers for all assemblies and components. The assembly procedure documentation part numbers can also be located in this file.



Documentation

Finder extract to Excel from DOD – ONLY FOR ITEMS ON FINDER

Microsoft Excel - 000010262996_finder.xls [Shared]

File Edit View Insert Format Tools Data Window Help — Type a question for help

Arial

Reply with Changes... End Review...

H136

	A	B	C	D	E	F	G
1	Material Nbr	Description	Manufacturer	Mfgr Nbr	Vendor	Vendor Nbr	DOD
2	3953202	RETAINER ASSY-LVDT CORE			PERMAC INDUSTRIES		YES
3	5882204	HOSE ASSY-HYD,THERMOPLSTC 3K PSI,-4FTUBE					YES
4	5882206	HOSE ASSY-HYD,THERMOPLSTC 3K PSI,-4FTUBE					YES
5	5882290	HOSE ASSY-HYD,THERMOPLSTC 3K PSI,-4FTUBE					YES
6	6890004	HOSE ASSY-3000 PSI,1/4 IN 48 IN,PETRO BA			G & H DISTRIBUTING INC		YES
7	6890503	HOSE ASSY-DRAIN,3/8 NOM, 36 IN. PETRO BA			G & H DISTRIBUTING INC		YES
8	10010509	O-RING, .070X 90D BUNA-N .364	SEALS-GENERIC	AS568A-012	APPLIED POWER PRODUCTS	AS568A-012	
9	10010510	O-RING, .070X 90D BUNA-N .42	SEALS-GENERIC	AS568A-013	APPLIED POWER PRODUCTS	AS568A-013	
10	10010710	O-RING,.103X 90D BUNA-N .924	SEALS-GENERIC	AS568A-119	APPLIED POWER PRODUCTS	AS568A-119	
11	10010941	O-RING, .139X 90D BUNA-N 1.35	SEALS-GENERIC	AS568A-220	APPLIED POWER PRODUCTS	AS568A-220	
12	10010944	O-RING, .139X 90D BUNA-N 3.85	SEALS-GENERIC	AS568A-241	APPLIED POWER PRODUCTS	AS568A-241	
13	10010962	O-RING, .139X 90D BUNA-N 4.85	SEALS-GENERIC	AS568A-249	APPLIED POWER PRODUCTS	AS568A-249	
14	10011212	O-RING, .210X 70D BUNA-N 3.60	SEALS-GENERIC	AS568A-342	APPLIED POWER PRODUCTS	AS568A-342	
15	10012653	GLYD RING-OD SEAL,NOTCHED	SHAMBAN (BUSAK)	S-12547-343 N	APPLIED POWER PRODUCTS	S-12547-343 N	
16	10012703	GLYD RING-ID SEAL .875 ID,TUF	SHAMBAN (BUSAK)	S-12546-118	APPLIED POWER PRODUCTS	S-12546-118	
17	10022928	WSHR-FLT,STL,M20,DIN433 21 I	METRIC & MULTI ST	"NO.433,M20 "	** multiple vendors **		
18	10024101	ADAPTER-BOSS/TUBE -04 MBC	PARKER	4 F5OX-S	QUEST ENGINEERING		
19	10024102	ADAPTER-BOSS/TUBE -06 MBC	PARKER	4-6 F5OX-S	QUEST ENGINEERING		
20	10024104	ADAPTER-BOSS/TUBE -08 MBC	PARKER	8 F5OX-S	QUEST ENGINEERING		
21	10024301	CAP-TUBE -04 TUBE	PARKER	4 FNTX-S	QUEST ENGINEERING		
22	10024302	CAP-TUBE -06 TUBE	PARKER	6 FNTX-S	QUEST ENGINEERING		

Sheet1

Ready

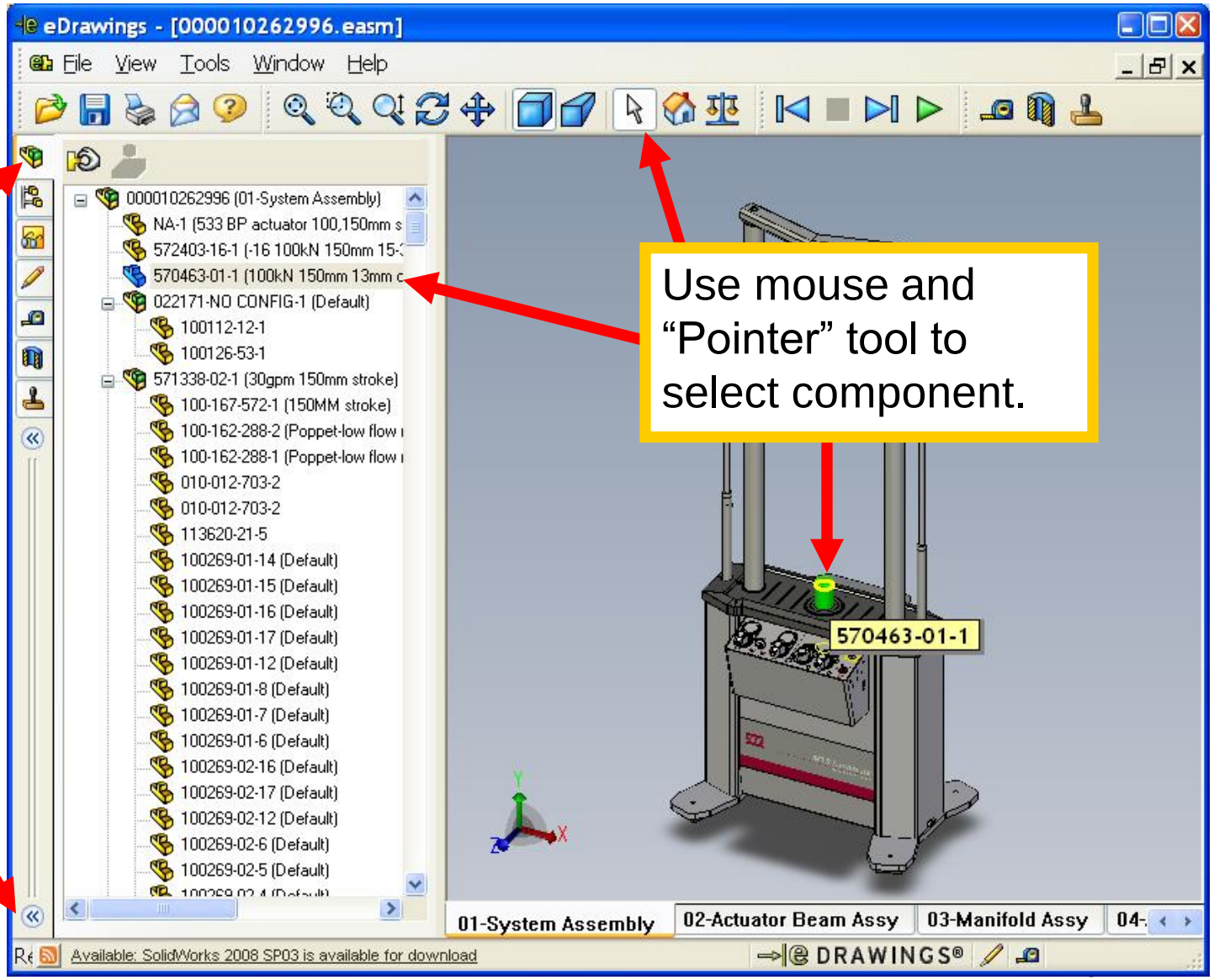
Viewing with eDrawing software

- Use of eDrawing does not require internet
- Load frame eDrawing file size about 4 meg
- eDrawings capabilities
  - Rotate / zoom / move any piece or assembly
  - Make components transparent or totally hidden
  - Identify any component part number
  - Create cross section on drawing at any plane
  - Trace hydraulic channels
  - Add notes to eDrawing

eDrawing – Offline viewing

Press to show BOM. Default view when opening software is with BOM (Components List) closed.

Use double arrow icon to show / hide the left window pane



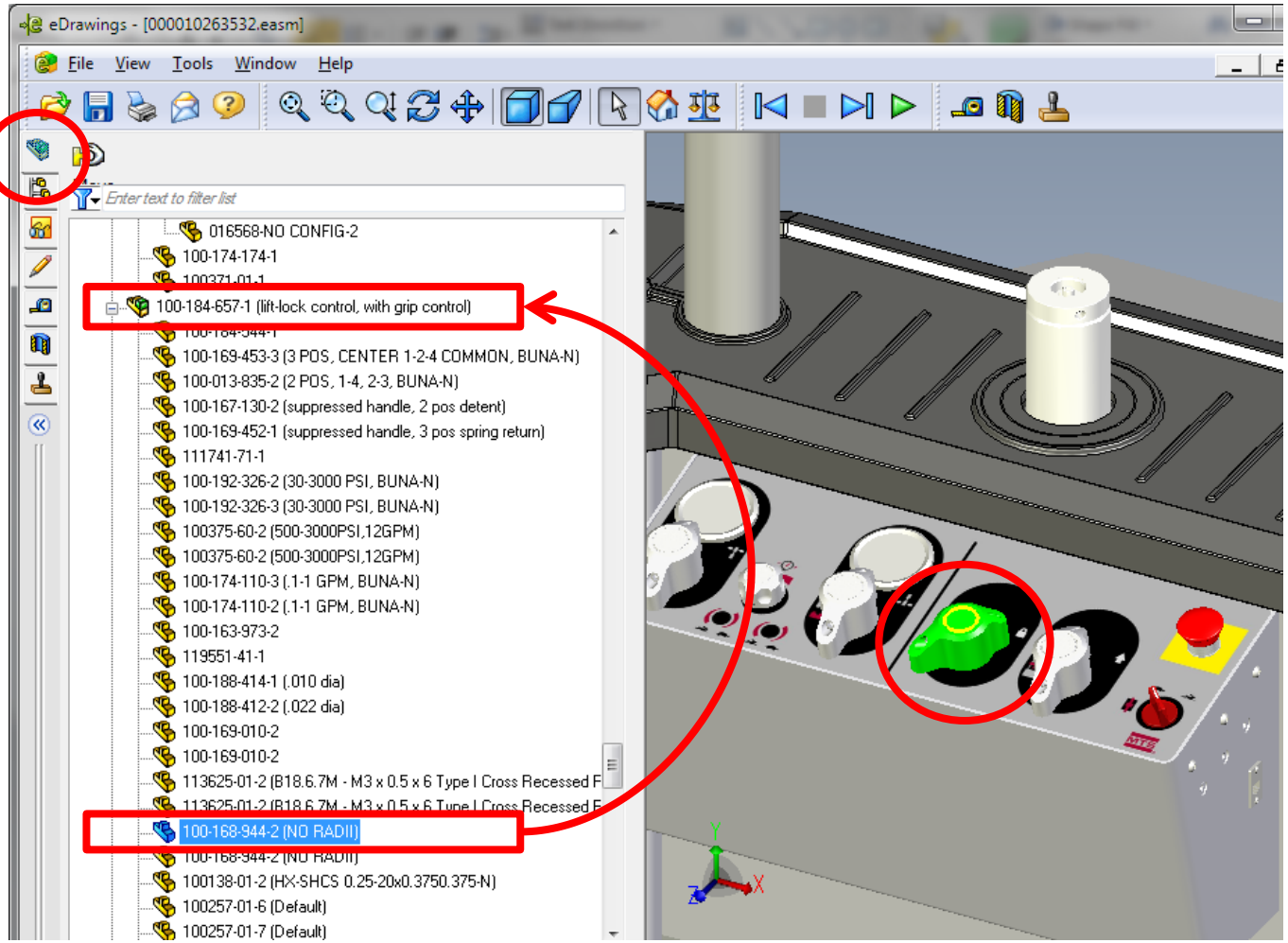
eDrawing – Locating Assembly numbers

» Use either indented components list or use components icon in eDrawings

Select part in question.

Look upward in the components list to where the change in indent is at to identify assembly that part is used on.

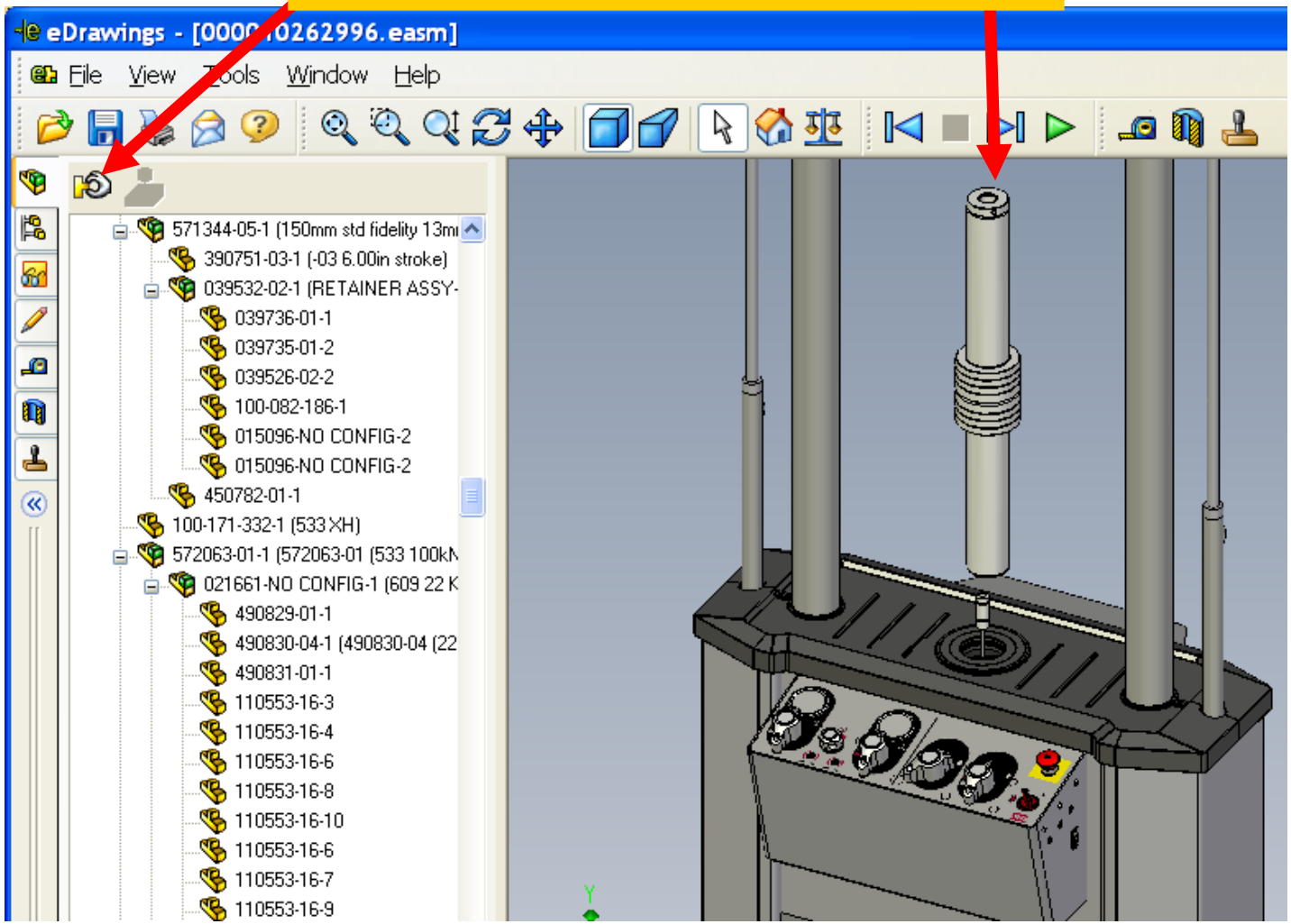
Use Finder to locate assembly drawing



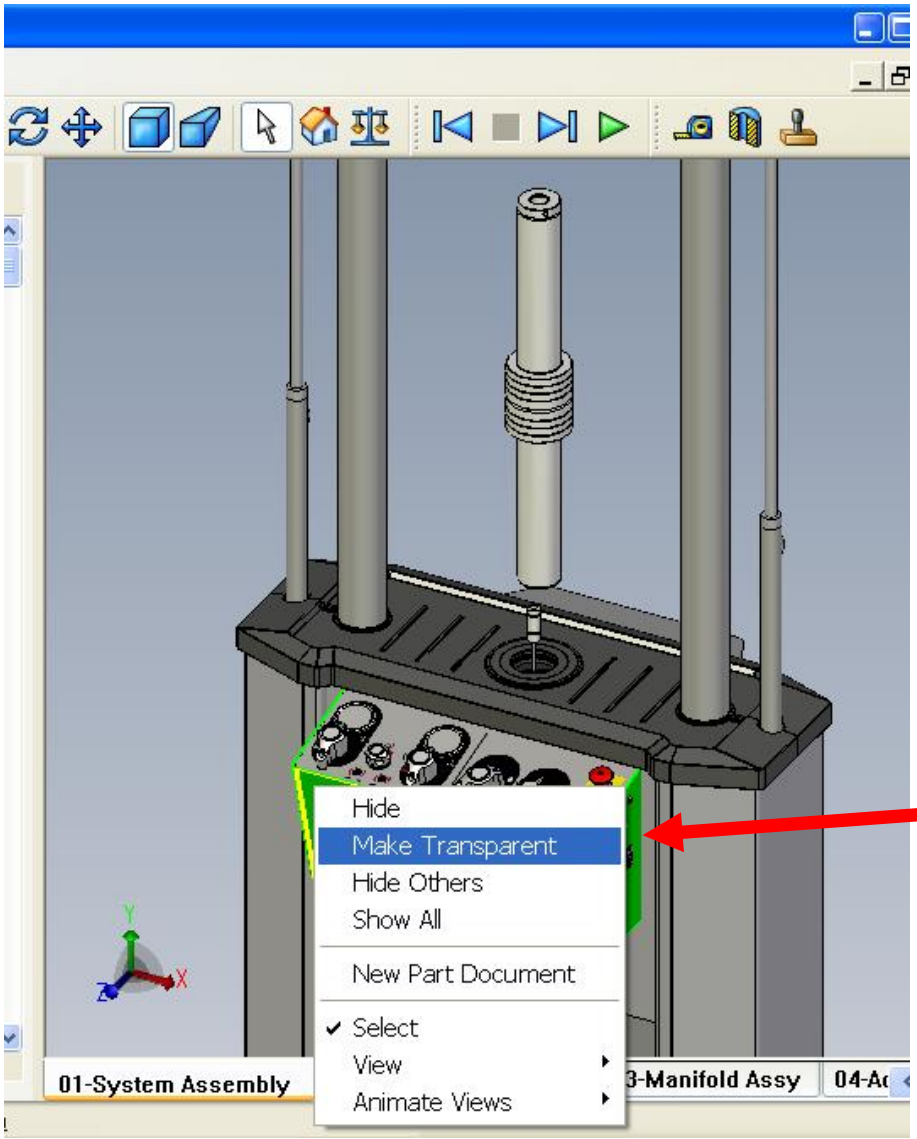
eDrawing software

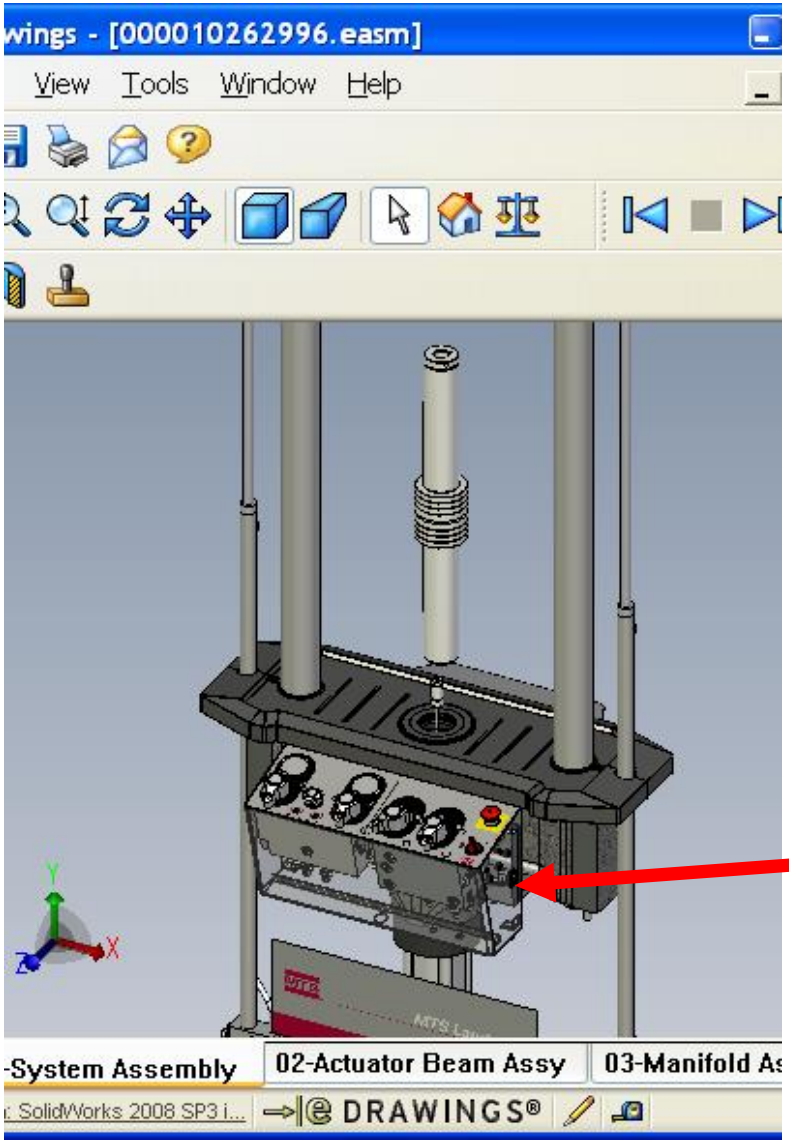
In this example the piston rod was moved out of the way to view the LVDT retainer and identify the part number

Use “Move component” tool to grab any component and move



eDrawing – Right click to hide or make transparent





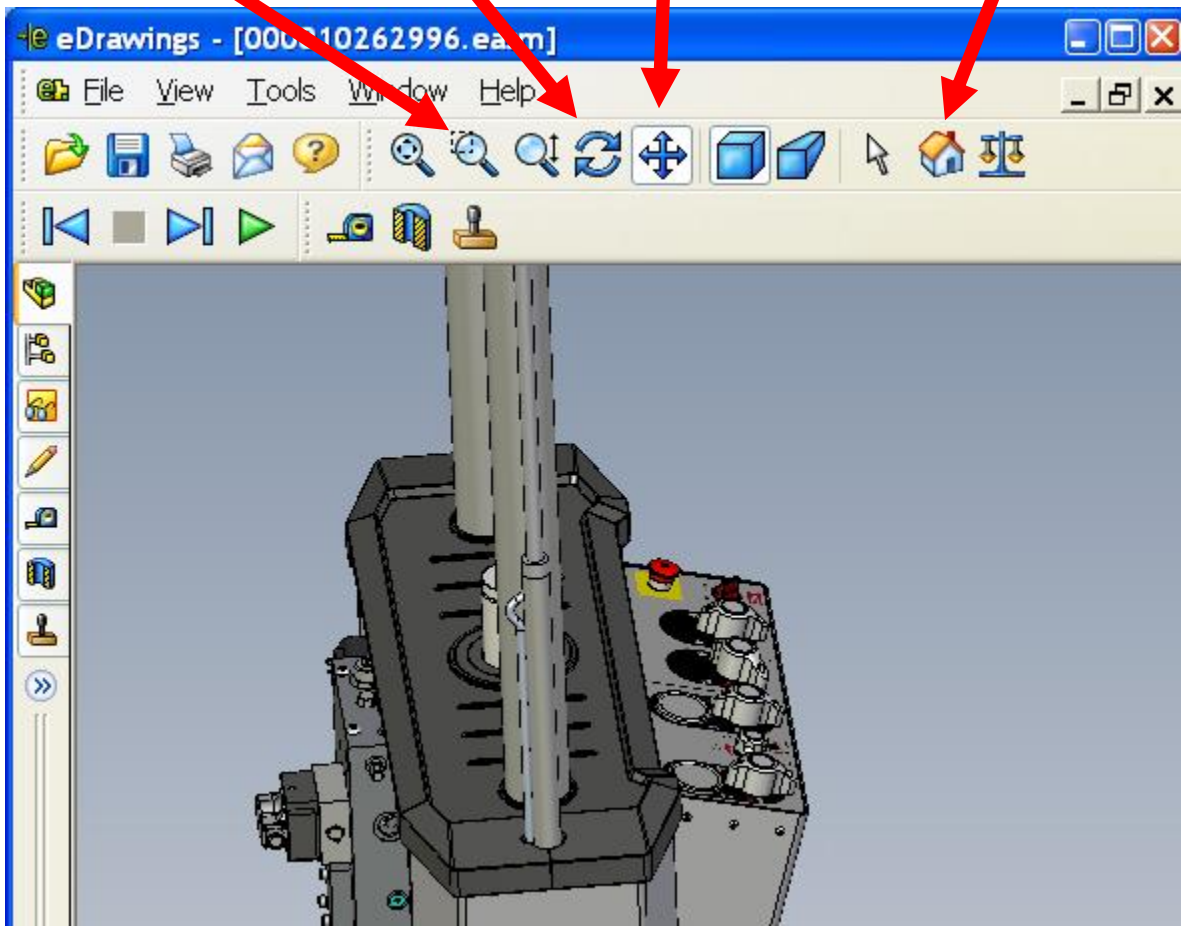
eDrawing

Zoom

Rotate

Pan

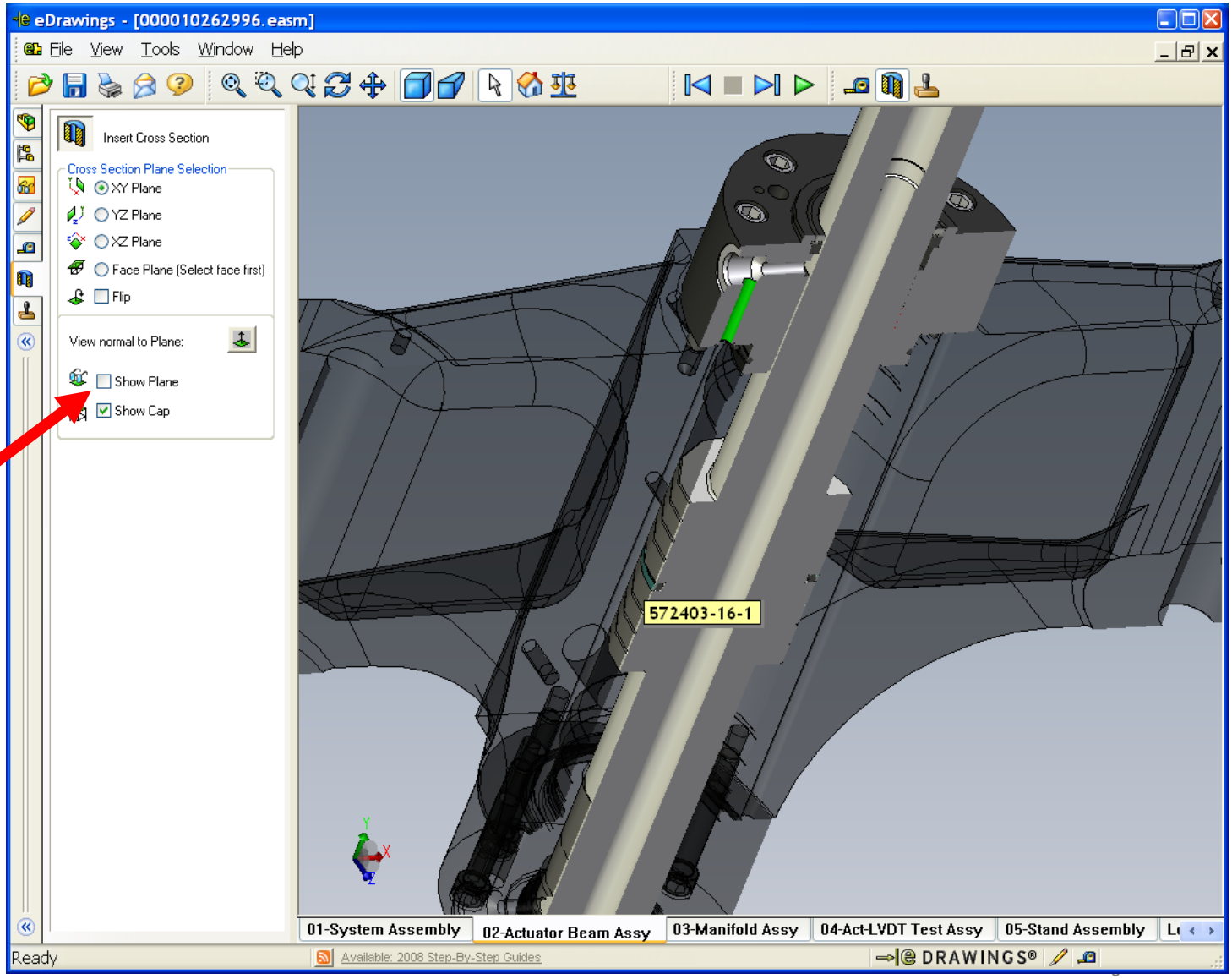
Home (Reset drawing to original state)



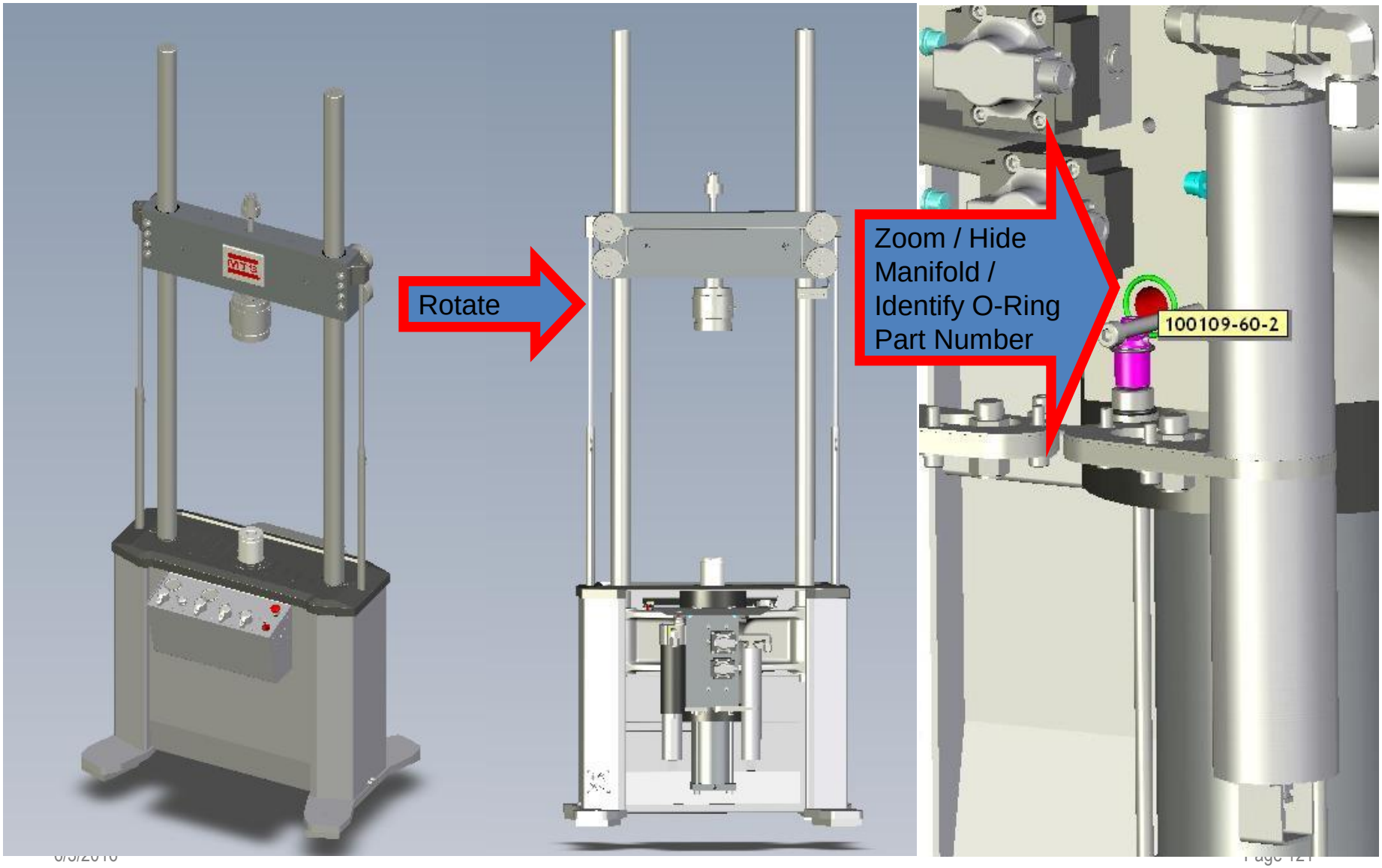
eDrawing – Cross Section

Can create cross-section at any location. Can aid in parts identification or tracing oil channels

Un-check “Show Plane” to allow “Pointer” or other tools to be used



eDrawings


Rotate
Zoom / Hide Manifold / Identify O-Ring Part Number
100109-60-2

eDrawing Torque Specs

- Torque specifications are not called out on eDrawings

- To identify a torque spec
  - Locate the thread size and pitch on the drawings using components icon
  - Lookup torque on a standard torque chart

  - Torque value charts available on MTS Intranet

  - Metric Threads
    - http://groups.mts.com/enghome/SPM_Engineering/ENGSection_2/2.04.htm

  - Inch Threads
    - http://groups.mts.com/enghome/SPM_Engineering/ENGSection_2/2.02.htm

Torque Spec - Example

» Identify the bolt size and torque used on the lift cylinder attachment bracket
- Select the bolt in eDrawings. Find bolt size in components.
- M10 X 1.5 X 30 SHCS: Torque to 53 N·M or 39 Lb – Ft.