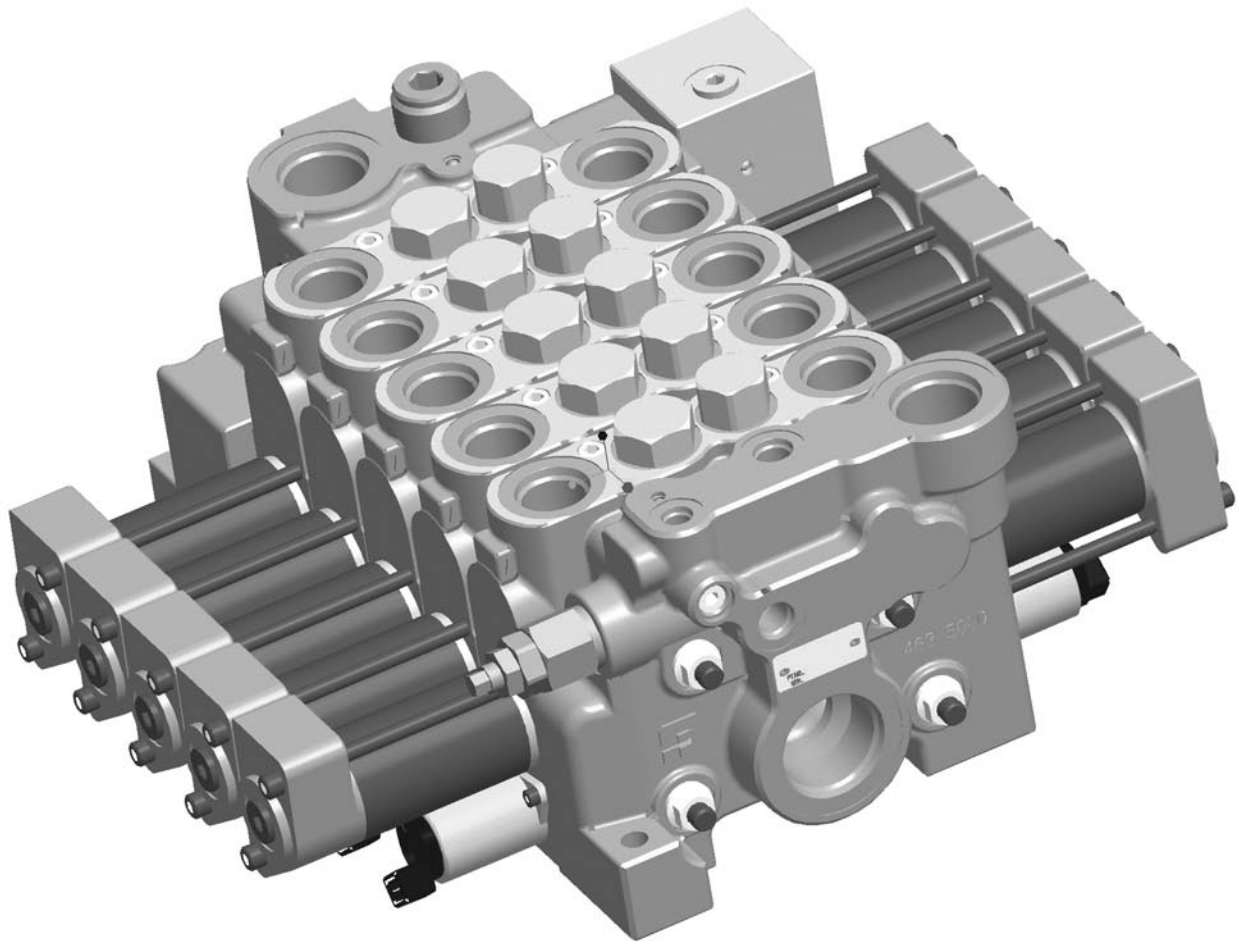




Bulletin HY14-2006-M1/US
Service Bulletin

VP170 Load-Sense Directional Control Valve

Effective: October 15, 2006



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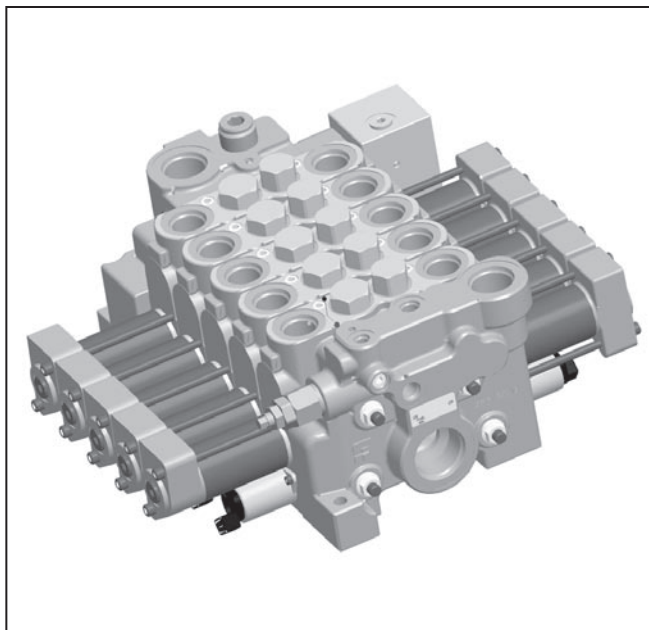
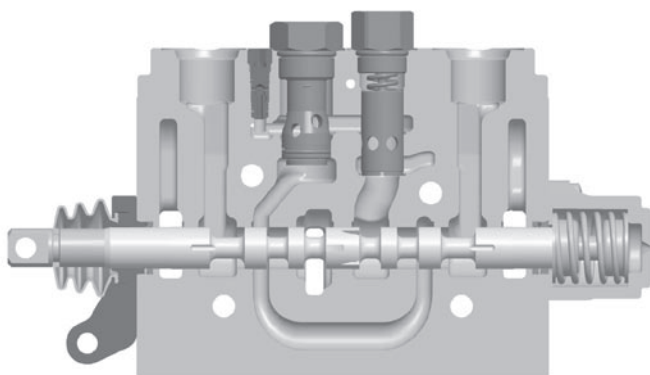
General Description

The VP170 can be configured either as pressure compensated load-sense (PCLS) or as load-sense (LS). Both have the flexibility of sectional construction. The PCLS work section has its own compensator, so that speed control of multiple functions is achieved, regardless of changes in pressure or engine rpms. The key technology integrated into the VP170 is flow-sharing. In pump over-demand conditions, flow-sharing benefits machine productivity by maintaining the speed relationship of the selected functions, but at a reduced speed. Thus, the operator can maintain the rhythm of the machine.

The design of the VP170 is modular, allowing for content to be added or taken out of the valve to better match its value to varying machine requirements. For example, it is available as a load-sense pressure compensated, load-sense only, and with and without induced-load protection.

The valve can be operated manually, pneumatically, hydraulic remote or with solenoids. The same solenoid is used for on/off and proportional control. A bypass unloader is available for use with fixed-displacement pumps. Also, a new, low-pressure regeneration feature has been designed to overcome the damaging affects of cavitation – premature component wear and spongy operation.

The VP170 uses the same spool positioners and port accessories as its open-center counterpart – VA/VG20. The standard spool types are 3-way, 4-way and 4-position float. The standard flow limited spools are 8, 16, 24, 32 and 45 GPM based upon a margin pressure of 250 PSI. There is also a standard spool that is not flow limited.

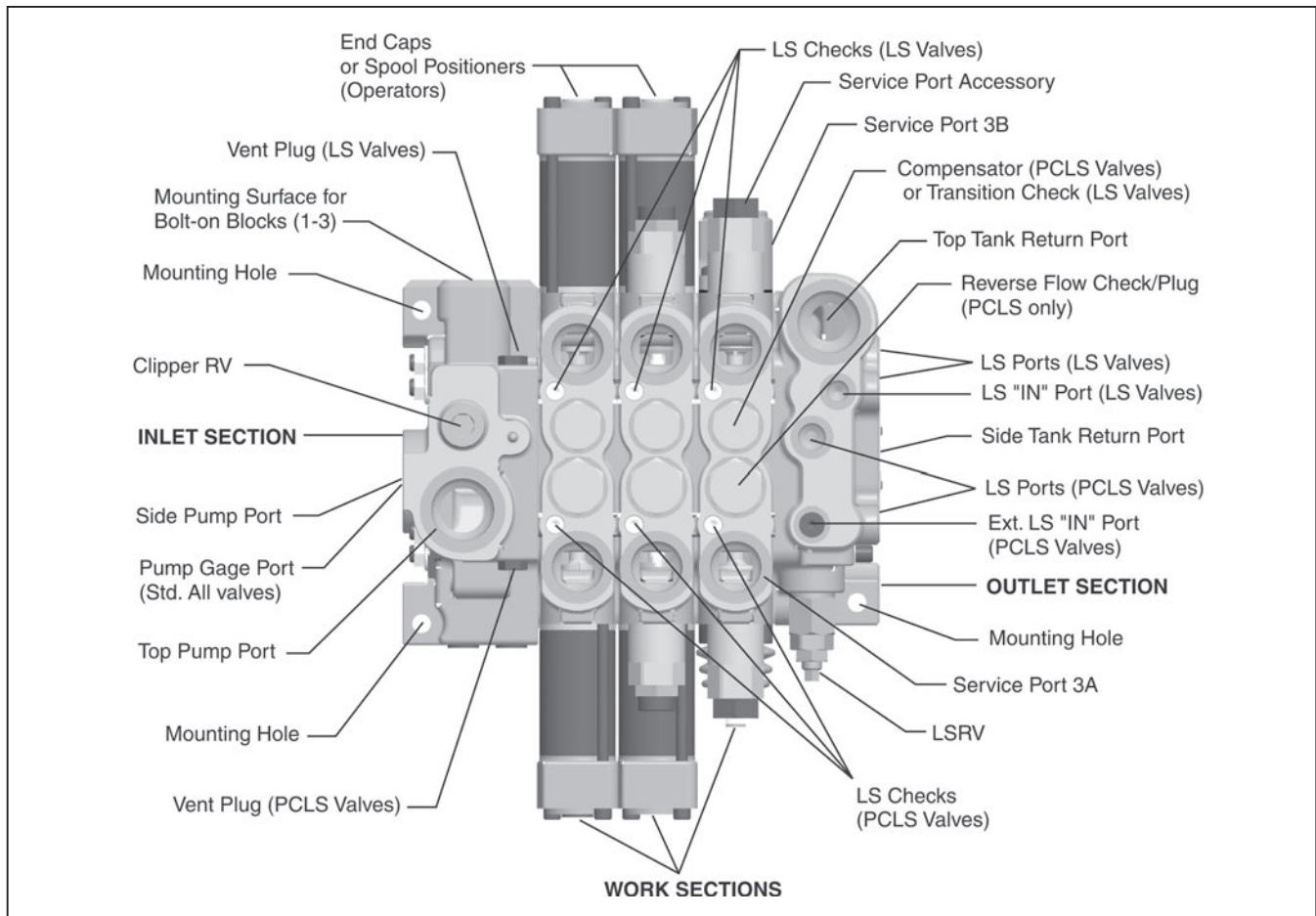


Operation

The VP170 (PCLS) is an individually compensated load-sense directional control valve. For optimum horsepower utilization and heat generation, it is normally used with a piston pump. However, it does have the flexibility to be interfaced with a fixed (gear or vane) displacement pump.

During single function use, the pump control will determine the flow to the valve, based upon the area opening of the spool notch and the load-sense signal being sent back to the pump.

During multi-function operation, the pump control will determine the flow for the highest loaded function, while the section compensator will control the flow for the lighter loaded function.



Benefits

- **Excellent machine controllability** – individual pressure compensation in each work section delivers predictable metering with single and multi-function operation, regardless of changes in pressure or input flow. This enhances machine control, improves productivity and helps to make every operator an “expert” operator -- all of which saves money. Also, this valve type lends itself to closed-loop control.
- **Improved system efficiency** – optimized horsepower utilization and heat management are inherent with load-sense pressure compensated valves. This is because of a closer match between horsepower consumption and horsepower demand. Fuel savings between 30-50% can be achieved vs. open-center type systems. Also, better horsepower utilization may enable the use of a smaller, less costly engine.
- **Enhanced machine productivity** – the VP170 incorporates flow-sharing technology. This means that during a pump over-demand condition the valve will automatically apportion the available pump flow to the selected functions, based upon control spool area openings. The selected functions will maintain their speed relationship, but at a lower overall speed. This automatic adjusting by the valve can improve machine productivity as much as 20% and reduce operator fatigue.
- **Flexible design** – the modular design of the VP170 enables the machine designer to add or remove content to achieve a better “value match” with the machine requirements. For example, the VP170 is available as load-sense pressure compensated, load-sense only, and with or without induced-load protection. Also, a full line of spool positioners and port accessories is available.
- **Wide flow range** – offers application potential across a family of machines. The VP170 can handle a pump input of 230 LPM (60 GPM) and work sections flows from 30-190 LPM (8-50 GPM).
- **Induced-load protection** – is available for machines whose duty cycles might generate induced loads greater than the load-sense relief valve setting. This is an important option for valves with flow-sharing technology and has the benefit of maintaining machine productivity.
- **Addresses cavitation and maintains system responsiveness** – a unique, optional low-pressure regeneration feature combats cavitation and the damage it causes to hydraulic components -- reducing warranty costs as much as 15%. This device assures there is hydraulic oil in the loop at all times.
- **Ease of service** – the load-sense check, compensator and transition check are located on top of each work section making it a “service friendly” design.

Specifications

Pressures	Pump inlets: 350 Bar (5000 PSI) Service Ports: 350 Bar (5000 PSI) Pilot (input or internal supply): 35 Bar (508 PSI) Tank Return: 15 Bar (220 PSI) Solenoid Drain: 2 Bar (29 PSI)
Flow Rates	Maximum Input: 227 LPM (60 US GPM) Maximum Flow out of Service Ports: 190 LPM (50 US GPM) Max. Return to Service Port: 280 LPM (75 US GPM)
Leakage Performance With mineral oil, 100 SUS @ 120°F at 1100 PSI differential	Workport w/Steel Plug or no Accessory: 20 cc/min max. Workport w/RV or RV+AC: 24 cc/min max. Thru Reverse Flow Check: 180 cc/min max. Thru Compensator Only (no Reverse Flow Check): 1100 cc/min max.
Hydraulic Fluid	Mineral base oil. For other fluids consult factory. Viscosity, working range: 15-380mm ² /s (15-380 cSt).
Hydraulic Oil Temperature	Recommended Operating Range without Solenoid Operation: -30° to 90°C (-22° to 194°F) Recommended Operating Range with Solenoid Operation: -20° to 80°C (-4° to 176°F)
Filtration (ISO 4406)	20/18/14 in Main Flow Paths 18/16/13 Pilot Supply

Weights

Inlet w/o Bolt-on Block	9.53 kg (21 lb)
Inlet with Bolt-on Block	12.25 kg (27 lb)
Work Sections	
Manual	9.10 kg (20 lb)
Hydraulic Remote	9.53 kg (21 lb)
EH	9.98 kg (22 lb)
Outlets	
Standard	8.62 kg (19 lb)
LP Regen	10.43 kg (23 lb)
LS Unloader	10.43 kg (23 lb)

Mounting Surface

There is no restriction on orientation.
 Flatness should be at least 0.5 mm (0.020")
 Surface must be stable and not put stress on valve.

Connections

O-ring boss ports SAE-J1926-1
 BSPP ports ISO 1179-1
 Pump gage port standard
 o-ring boss 9/16"-18 UNF , BSPP ports 1/4"-19

Description	SAE #	Thread Size	
		O-ring Boss (UNF)	BSPP
inlet, top	16	1 ⁵ / ₁₆ -12	1"-11
inlet, top	12	1 ¹ / ₁₆ -12	3/4"-14
inlet, side	16	1 ⁵ / ₁₆ -12	1"-11
inlet, side	12	1 ¹ / ₁₆ -12	3/4"-14
EH inlet, pilot	6	9/16-18	1/4"-19
All block ports	6	9/16-18	1/4"-19
outlet, top	16	1 ⁵ / ₁₆ -12	1"-11
outlet, top	12	1 ¹ / ₁₆ -12	3/4"-14
outlet, side	16	1 ⁵ / ₁₆ -12	1"-11
outlet, side	12	1 ¹ / ₁₆ -12	3/4"-14
outlet, side	20	1 ⁵ / ₈ -12	1 ¹ / ₄ "-11
work section	8	3/4-16	(none)
work section	10	7/8-14	1/2"-14
work section	12	1 ¹ / ₁₆ -12	3/4"-14

Solenoid Specifications

Voltage	12 or 24 VDC		
Pilot	35 Bar (508 PSI), 15-23 LPM (4-6 GPM)		
Current Input (I)	1.5A for 12 VDC 0.75A for 24 VDC		
Current (mA) for Spool Shift	Start Shift	12V 500	24V 250
	Full Shift	1250	625
Insulation Material	Class H		
Duty Cycle	100%		
R20 Ohm	5.3 (±5%) for 12 VDC 21.2 (±5%) for 24 VDC		
Fluid Cleanliness	17/14 per ISO 4406		
Ambient Temperature	-30° to 80°C (-22° to 176°F)		
Fluid Temperature	-20° to 80°C (-4° to 176°F)		

Definitions

PCLS = Pressure Compensated Load-Sense, or load-sensing with individual pressure compensation. Individual pressure compensation means each circuit (work section) has a pressure compensator. These pressure compensators reduce pressure to individual circuit needs resulting in flows for each circuit being proportional to spool stroke.

LS = Load-Sensing (no individual pressure compensators). Flow is proportional to spool stroke in the highest loaded function only.

LSRV = Load-Sense Relief Valve – normally a small RV that sets maximum LS pressure.

Clipper RV = “Clips” or reduces pressure spikes normally caused when flow demand decreases faster than the pump flow output can decrease.

Margin_{valve} = Pressure at valve inlet – pressure at valve LS port = M_v .

Margin_{pump} = Pressure at pump outlet – pressure at pump LS port = M_p .

Margin_{neutral} = M_v or M_p when all valve spools are in neutral.

Margin_{stall} = M_v or M_p when one valve function is deadheaded and the LSRV relieves.

FLO = Flow Limit Orifice, limits flow over LSRV. Normally it is 0.045" diameter.

Over-demand = When functions demand flow in excess of pump capacity.

EH = Electrohydraulic or solenoid controlled spool positioning.

Induced load = Occurs when an actuator tries to force fluid into a valve workport.

PRRV = Pressure Reducing and Relieving Valve.

Q = Flow or Flow rate.

LS vent = A small connection (0.014"/0.017" diameter) of the LS gallery to tank to “bleed down” the LS pressure to the tank level when LS pressure is not required.

LS check = Helps decide which circuit has the highest LS pressure.

Flow sharing = A valve arranged so available flow is shared between active circuits – also known as “post compensated”.

Conversion Factors:

1 kg = 2.2 lbs.

1 N = 0.225 lbs. force

1 Bar = 14.5 PSI

1 liter = 0.22 UK gallon

1 liter = 0.264 US gallon

1 cm³ = 0.061 in³

1 m = 3.28 feet

1 mm = 0.039 inches

$9/5 \text{ } ^\circ\text{C} + 32 = \text{ } ^\circ\text{F}$

Major Valve Options

I Circuits:

- A) LS – when individual pressure compensation isn't needed.
- B) PCLS without reverse flow check – when “induced loads”* are not anticipated. Also, the check may be eliminated when load drift is not required.
- C) PCLS with reverse flow check – when “induced loads”* are anticipated. Also, the check serves as a low leak transition check.

* Induced loads are actuators trying to force fluid back into valve – of particular concern is when pressure exceeds the setting of the LS RV.

II Inlets:

- A) Standard - all spool operators except solenoid
- B) “EH” - “external supply” to solenoids – port for connecting external supply to solenoids and drain port – 1.7 Bar (25 PSI) max
- C) Inlet + block 1, 2, 3

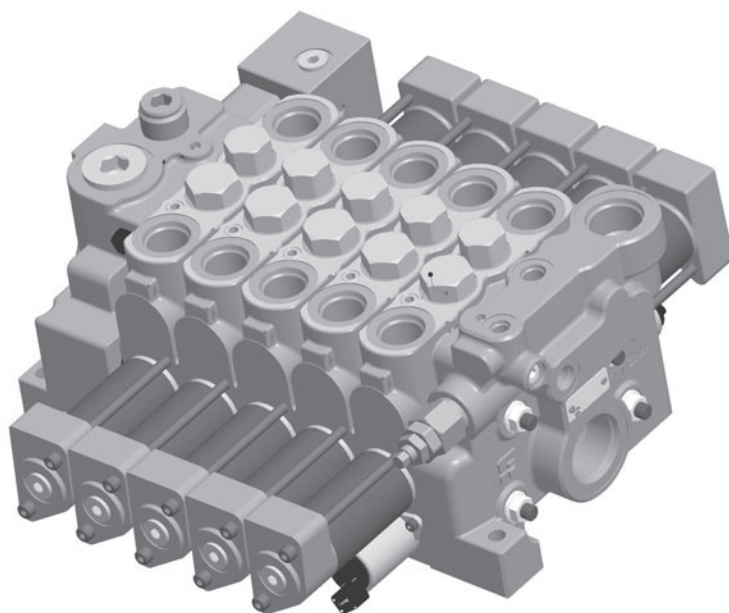
Block 1: “Internal supply” – reduced PSI to solenoids via internal pilot gallery
Internal supply to solenoid positioners.

Block 2: “Joystick supply” – reduced PSI to external port to supply joystick(s)
No internal pilot supply.

Block 3: “Kidney loop” – reduced PSI to an external pilot port. The signal can then be routed to a filter and back into the valve. The signal is then routed to the solenoids via internal pilot gallery.

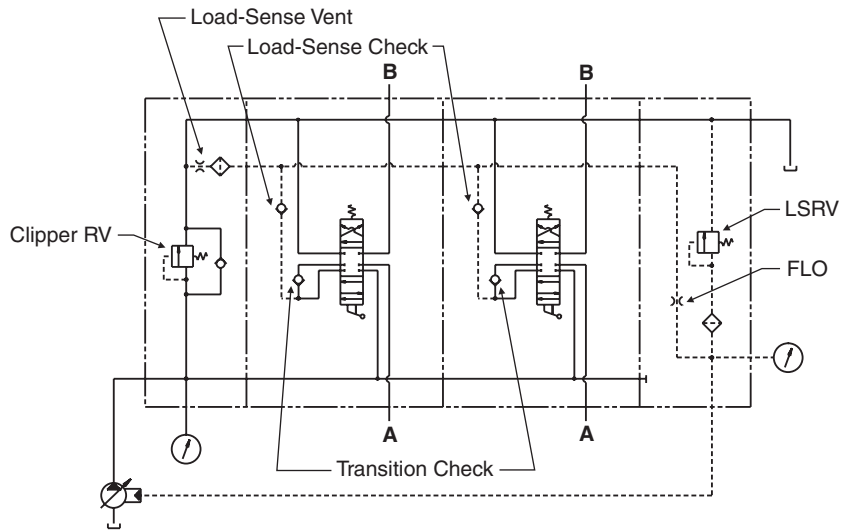
All 3 blocks have:

- a) PRRV and screen upstream of it
- b) Accumulator port and check valve
- c) Drain port for connection of solenoid drains and PRRV spring to tank – 1.7 Bar (25 PSI) max

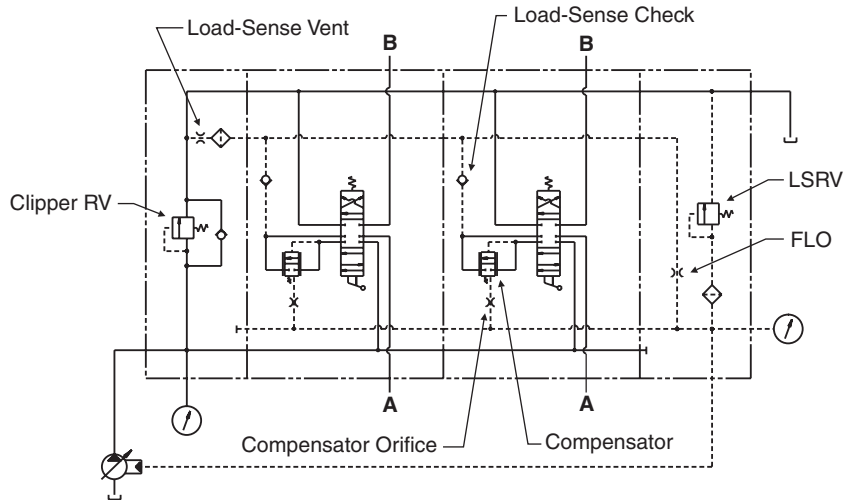


How VP170 May Be Arranged

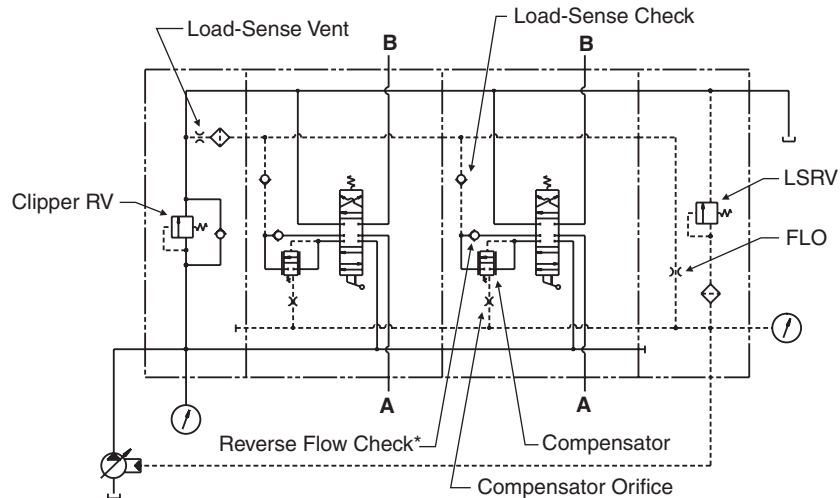
Load-Sense Valve



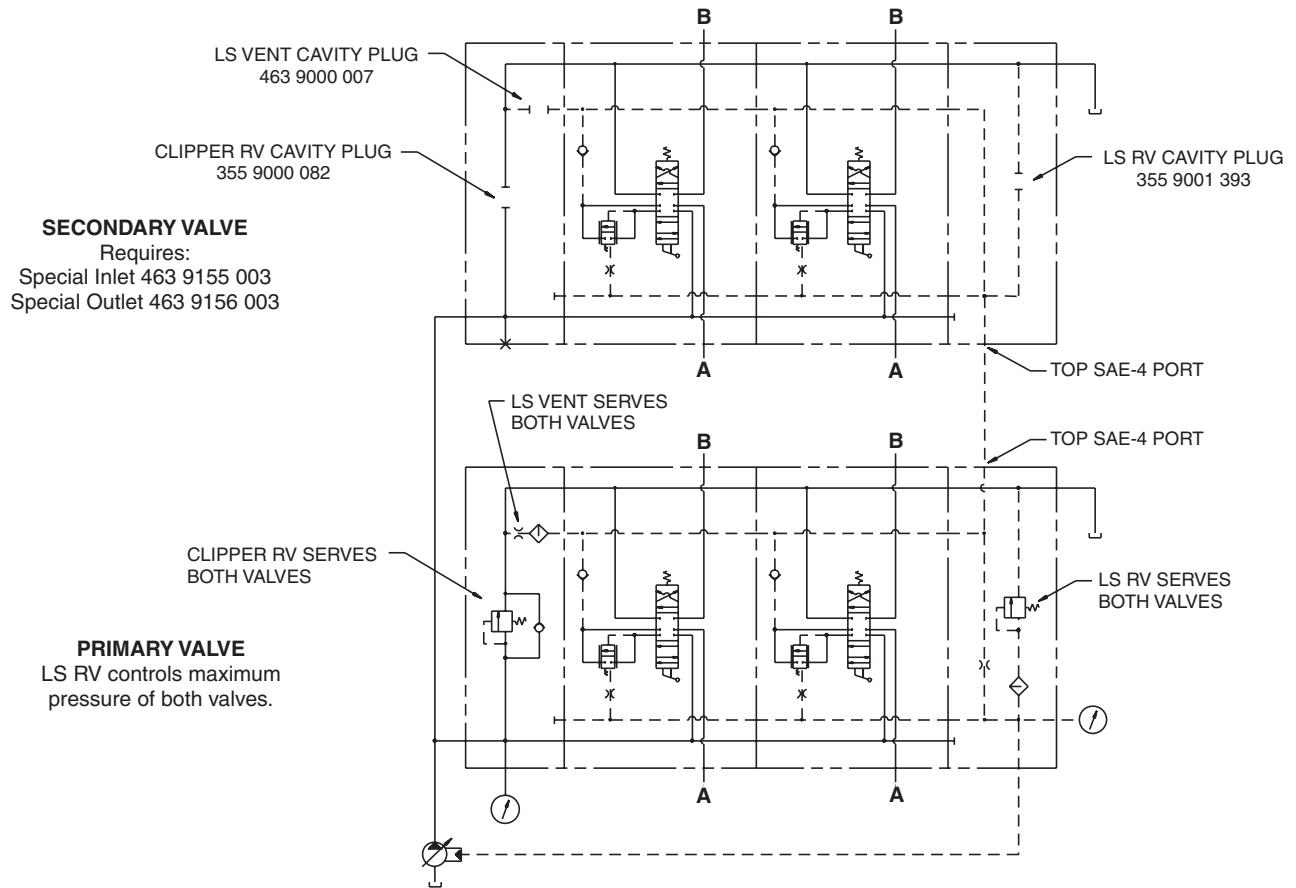
**Pressure Compensated Load-Sense (PCLS)
 without Reverse Flow check**



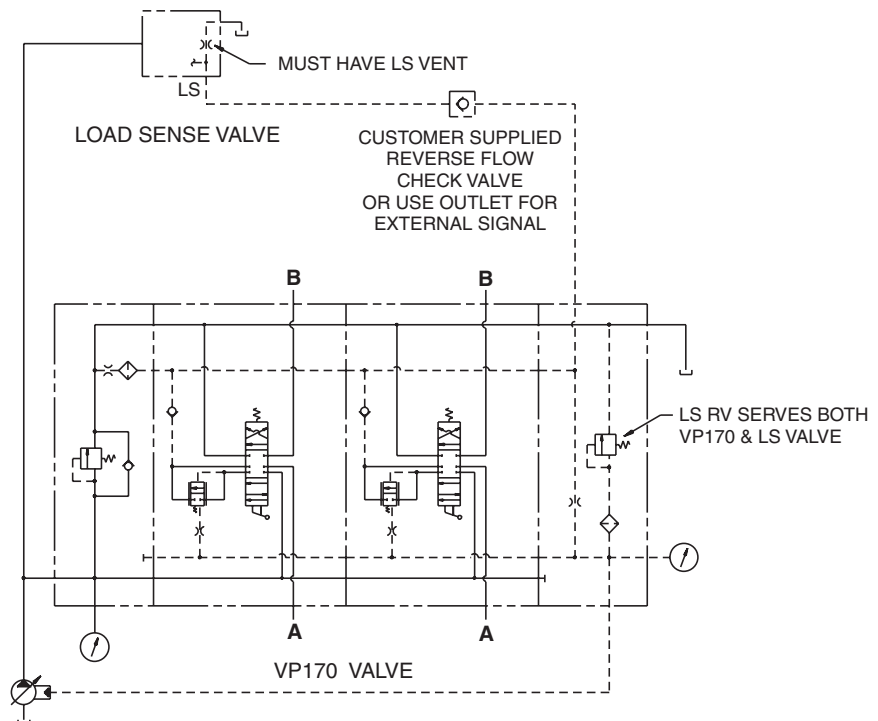
**Pressure Compensated Load-Sense (PCLS)
 with Reverse Flow Check*
 (Protects against Induced Loads)**



How to Arrange Two VP170 Valves



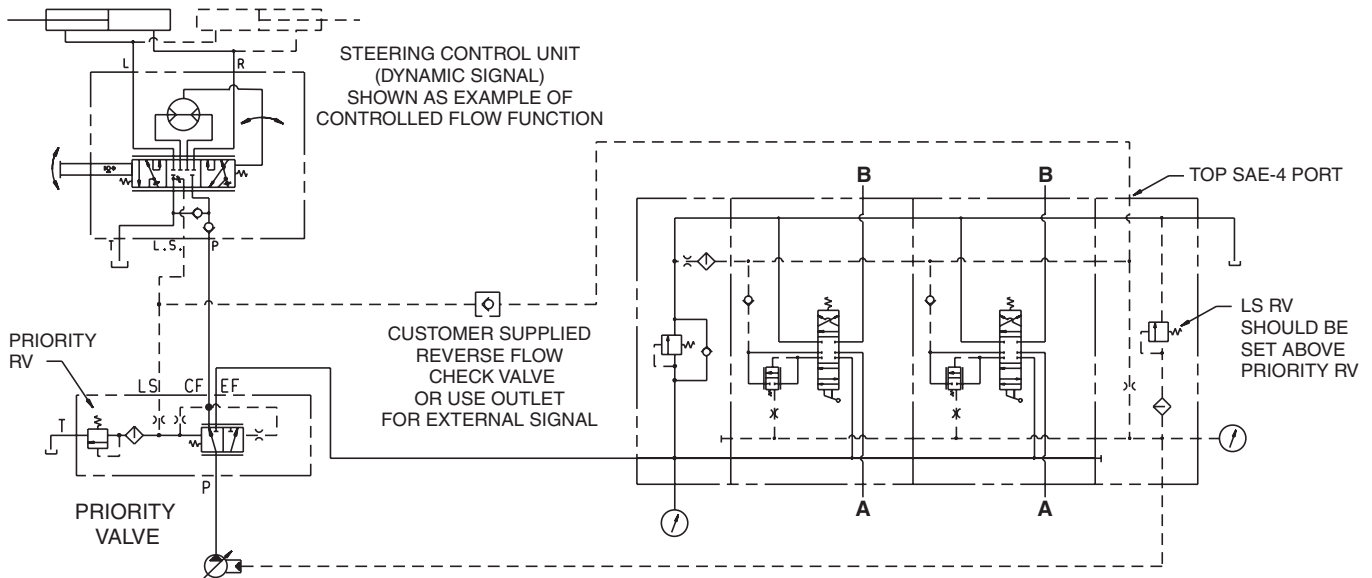
How to Arrange VP170 + LS Valve



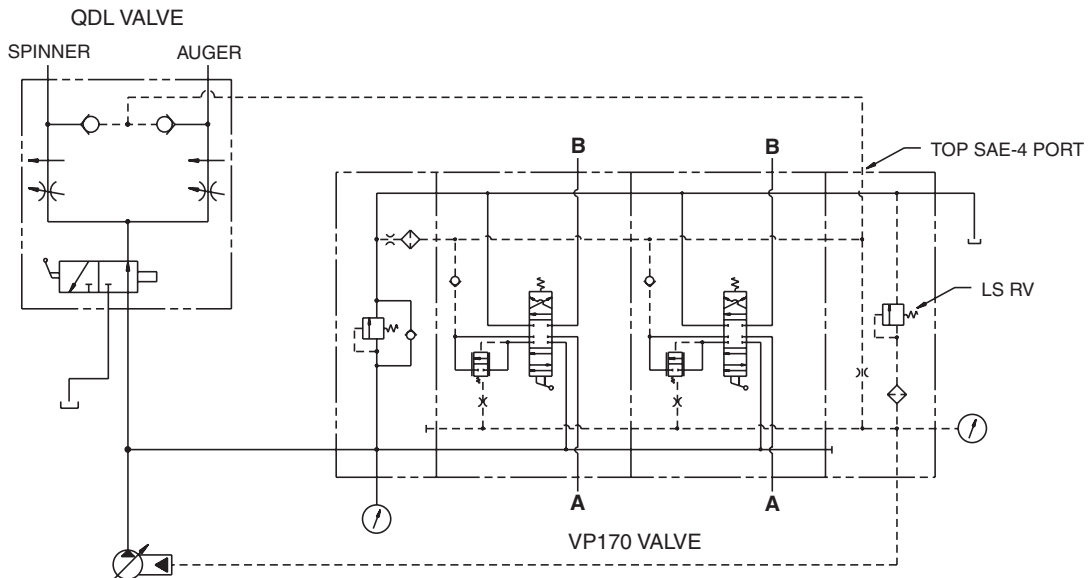
NOTES:

- 1 When in over-demand, the flow splits between the VP170 and the LS valve based on path of least resistance. Use a priority valve if this is not acceptable.
- 2 The LS valve's pressure must be controlled with the VP170 LS RV. The VP170 clipper RV serves both valves.

How to Arrange VP170 with Priority Valve

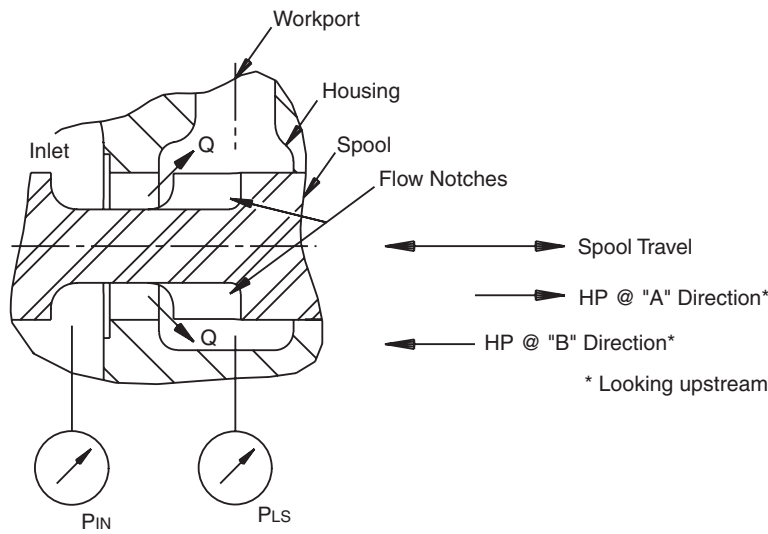


How to Arrange VP170 + QDL (Spinner/Auger)



- NOTES:
- 1) This circuit has no overdemand protection.
 - 2) LSRV controls both valves.

Control of Workport Flow Rate [61A, B] and [70]



Flow Rate to Workport = Q

$$Q = CA \sqrt{\Delta P}$$

Where C = Number derived by experiment, constant for a spool position

A = Area of flow notches

$$\Delta P \approx P_{IN} - P_{LS} \approx M_v$$

Or, at any spool position, Q is proportional to A, as long as M_v is constant.

[61A, B] Q Set @ A, B

Given above that Q is proportional to A, Q may be set by setting stroke length of spool. This may be done with screw in positioner codes PCA and ECA.

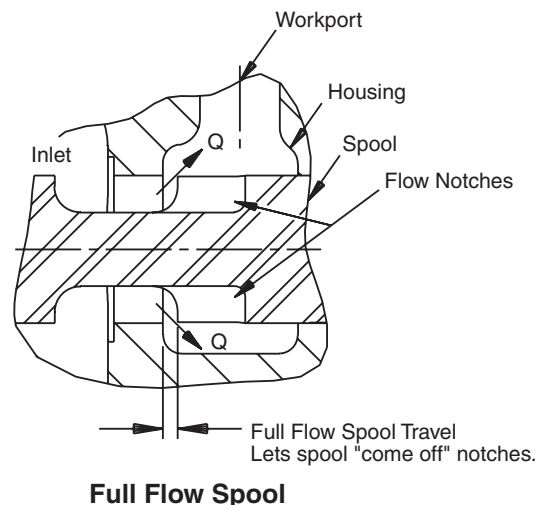
[70] Spool Flow Rate @ A, B

Given above that Q is proportional to A, notch geometry can be sized so that when at full stroke, a certain A/Q may be achieved.

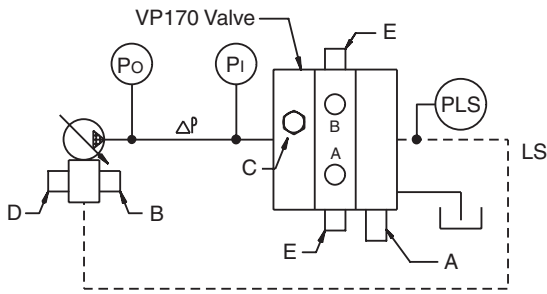
Notch geometries may be selected to give these flows at both 'A' & 'B' workports:

LPM	GPM
30	8
61	16
91	24
121	32
170	45
Full	Up to 50

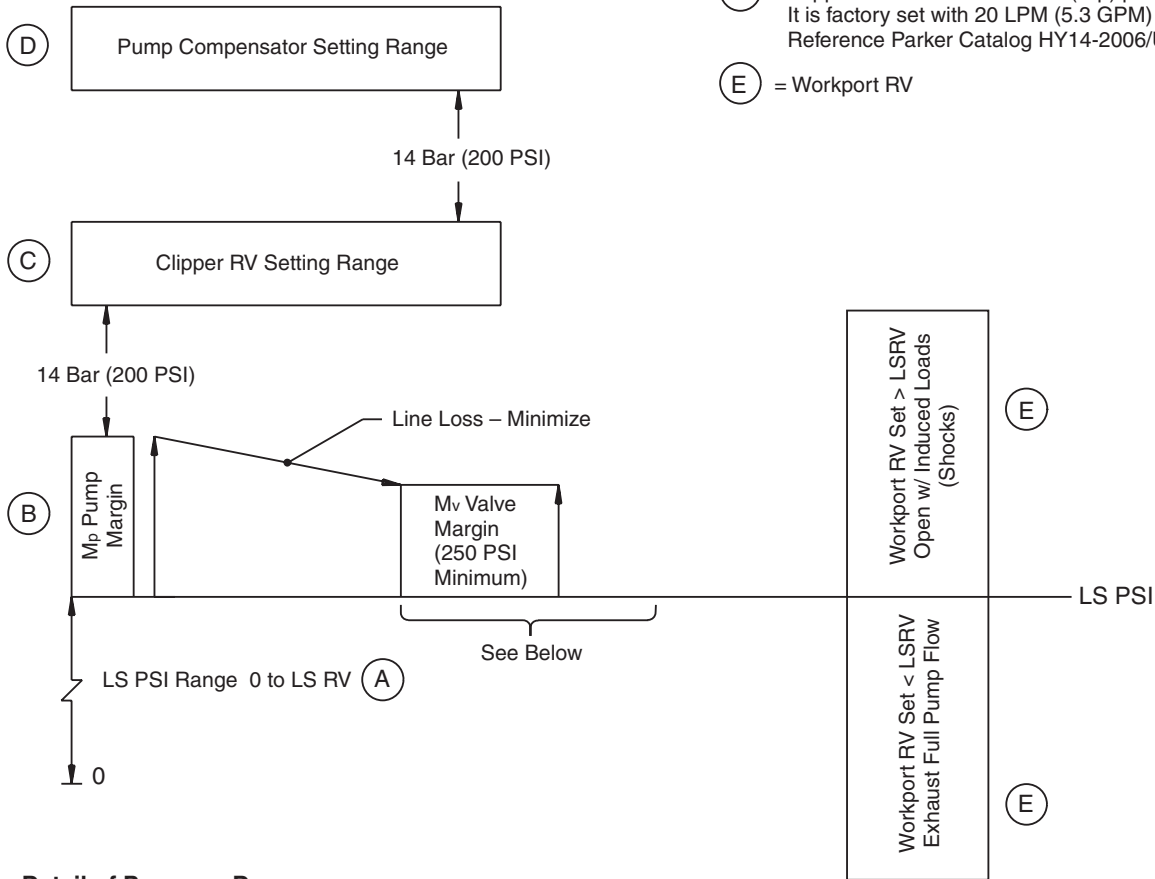
The full flow spool (shown at right) has the 45 GPM notches.



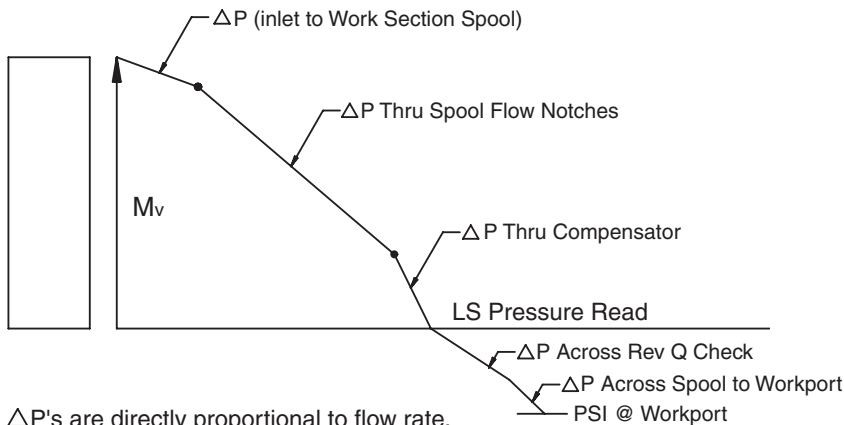
Setting of Pressures



- (A) = LS RV is low flow ≈ 1 GPM based on Mv & FLO.
- (B) (D) = Pressure Controls on Pump
- (C) = Clipper RV – Intended to limit (clip) pump destroke spikes
 It is factory set with 20 LPM (5.3 GPM)
 Reference Parker Catalog HY14-2006/US
- (E) = Workport RV

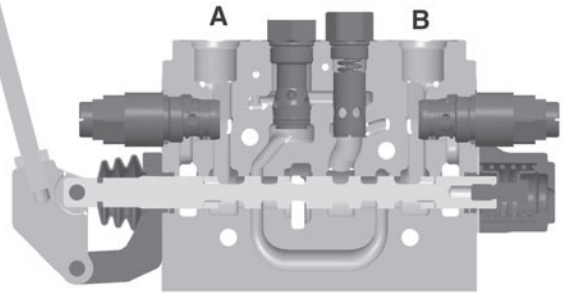


Detail of Pressure Drop

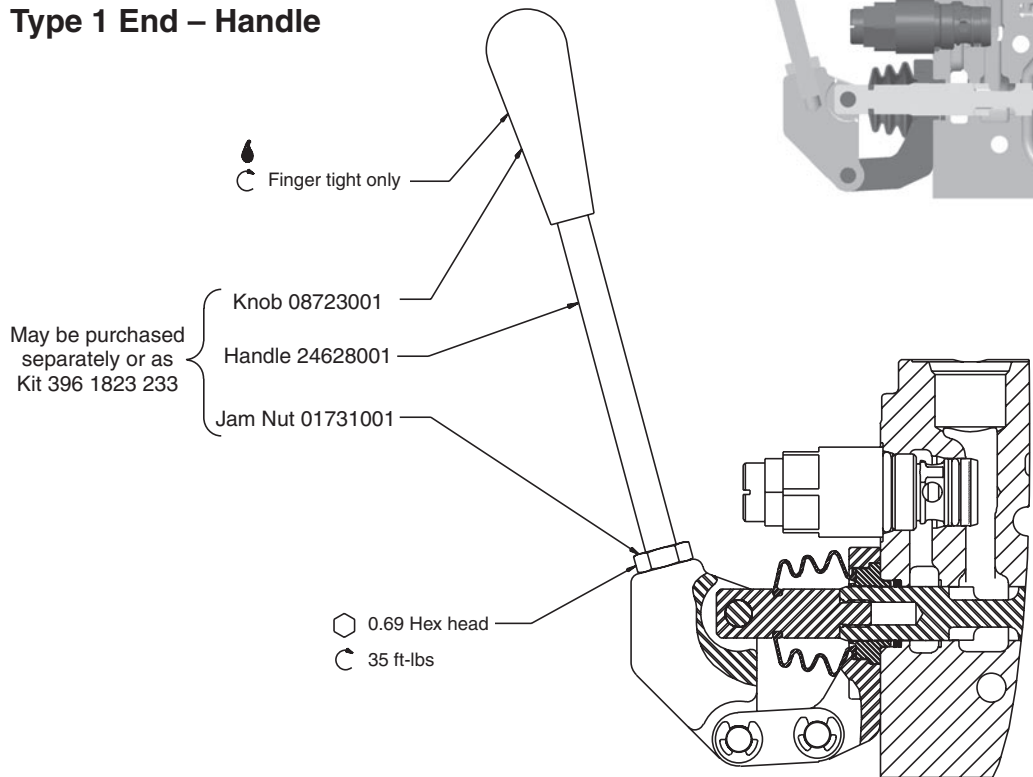


All ΔP's are directly proportional to flow rate.

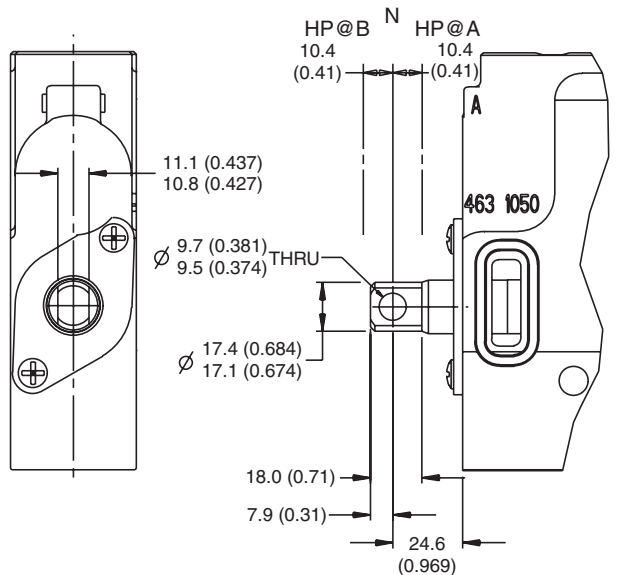
Spool Direction, Handle Ends



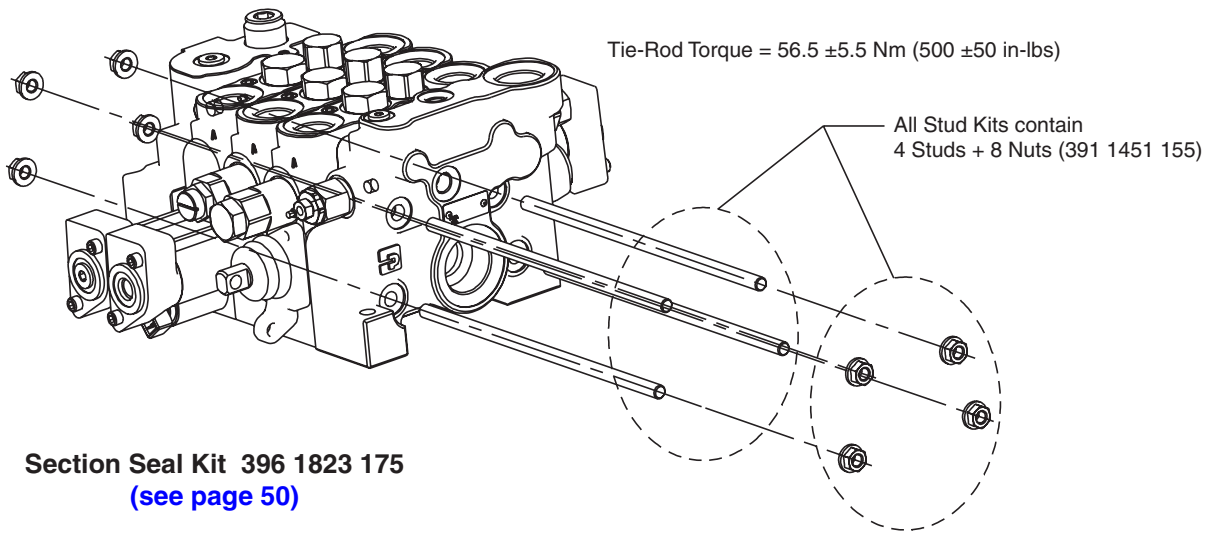
Type 1 End – Handle



Type 2 End – Lug



Tie Rod Kits



# Work Sections	Tie Rod Kit Number	Length (in)
1	391 9425 108	6.75
2	391 9425 107	8.50
3	391 9425 085	10.25
4	391 9425 109	12.00
5	391 9425 111	13.75
6	391 9425 121	15.50
7	391 9425 122	17.25
8	391 9425 123	19.00
9	391 9425 124	20.75

NOTES:

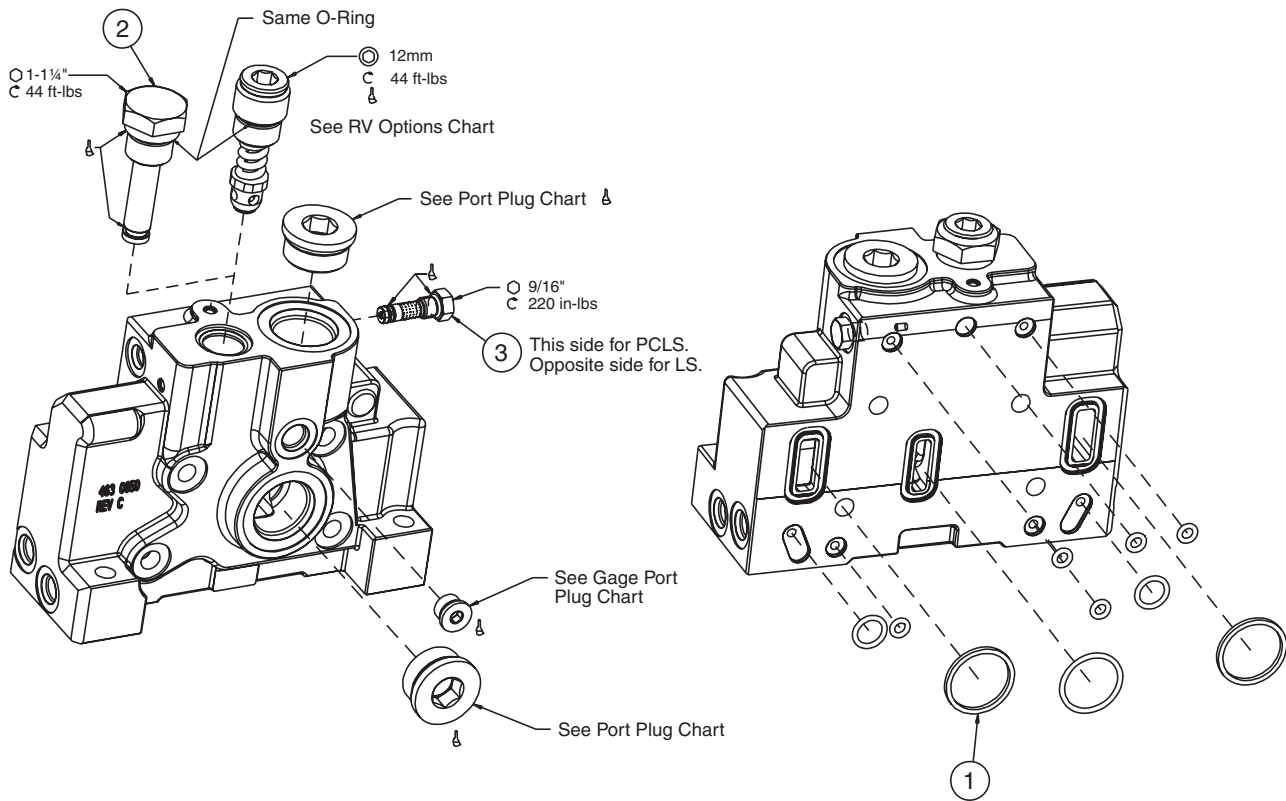
- 1 Ensure proper torque on all tie rods to prevent spools from binding and section seals from extruding. Before applying final torque, align sections on a flat surface.
- 2 Do not lubricate section seals prior to installation.
- 3 Torque all tie-rods evenly to ensure proper alignment of surfaces and avoid spool bind.
- 4 If using special outlets that unload a fixed displacement pump or use low pressure regeneration, consult factory for stud kit.

VP170 Service/Seal Kits – Inlet Section

Description	Complete Service Kit	Seals Included in Complete Kit*	Seal Subkit #	See Page
Inlets: Std and EH	396 1823 214			14
		standard section seals	396 1823 175	50
		section seals for EH operation		
		seals for vent plug	396 1823 226	19
		seal for clipper RV+AC	396 1823 108	18
		seals for clipper RV+AC steel plug	396 1823 179	19
Inlet + Blocks 1, 2, or 3	396 1823 215			15
		standard section seals	396 1823 175	50
		section seals for EH operation		
		block service kit	396 1823 224	16
		seals for vent plug	391 1823 226	19
		seal for clipper RV+AC	396 1823 108	18
		seals for clipper RV+AC steel plug	396 1823 179	19
		seals in blocks	396 1823 225	17

* Discard seals not required

Standard or EH Inlet Service Kit 396 1823 214



Item	Part Number	Qty	Description
1	396 1823 175	1	Section Seal Kit
2	396 1823 179	1	Clipper RV Plug Seal Kit
3	396 1823 226	1	Vent Plug Seal Kit

- ⊕ Hex Head
- ⊙ Socket Head
- C Tightening Torque ± 10%
- ⚡ Locking Fluid per H.E. Std. 35-20
- ⚡ Parker "O-Lube"

Optional Inlet Port Plug

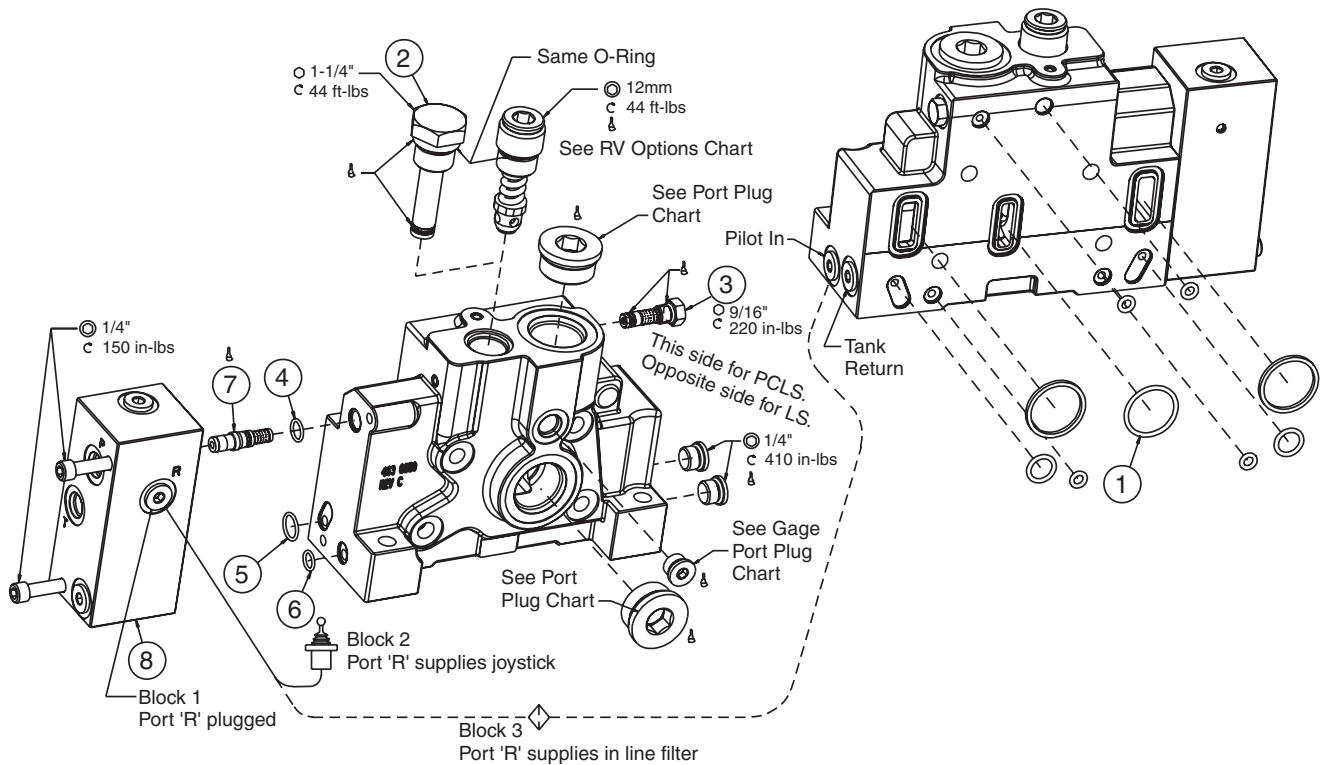
Port Type	Port Size	Plug Type	Torque
SAE	1 ⁵ / ₁₆ "-12	⊙ 5/8"	75 ft-lbs
BSPP	1-11	⊙ 17mm	50 ft-lbs

Optional Gage Port Plug

Port Type	Port Size	Plug Type	Torque
SAE	9/16"-18	⊙ 1/4"	410 in-lbs
BSPP	1/4	⊙ 6mm	105 in-lbs

See Page 18 for RV Options Chart.

Inlet with Blocks Service Kit 396 1823 215



Item	Part Number	Qty	Description
1	396 1823 175	1	Section Seal Kit
2	396 1823 179	1	Clipper RV Plug Seal Kit
3	396 1823 226	1	Vent Plug Seal Kit
4	391 2881 362	1	O-Ring (0.57 OD x 0.46 ID)
5	391 2881 209	1	O-Ring (0.69 OD x 0.55 ID)
6	06884001	1	O-Ring (0.50 OD x 0.36 ID)
7	463 9000 008	1	Screen Assembly
8	396 1823 224	1	Block Service Kit

- ⬡ Hex Head
- ⊙ Socket Head
- C Tightening Torque ± 10%
- ⬇ Locking Fluid per H.E. Std. 35-20
- ⌚ Parker "O-Lube"

Optional Inlet Port Plug

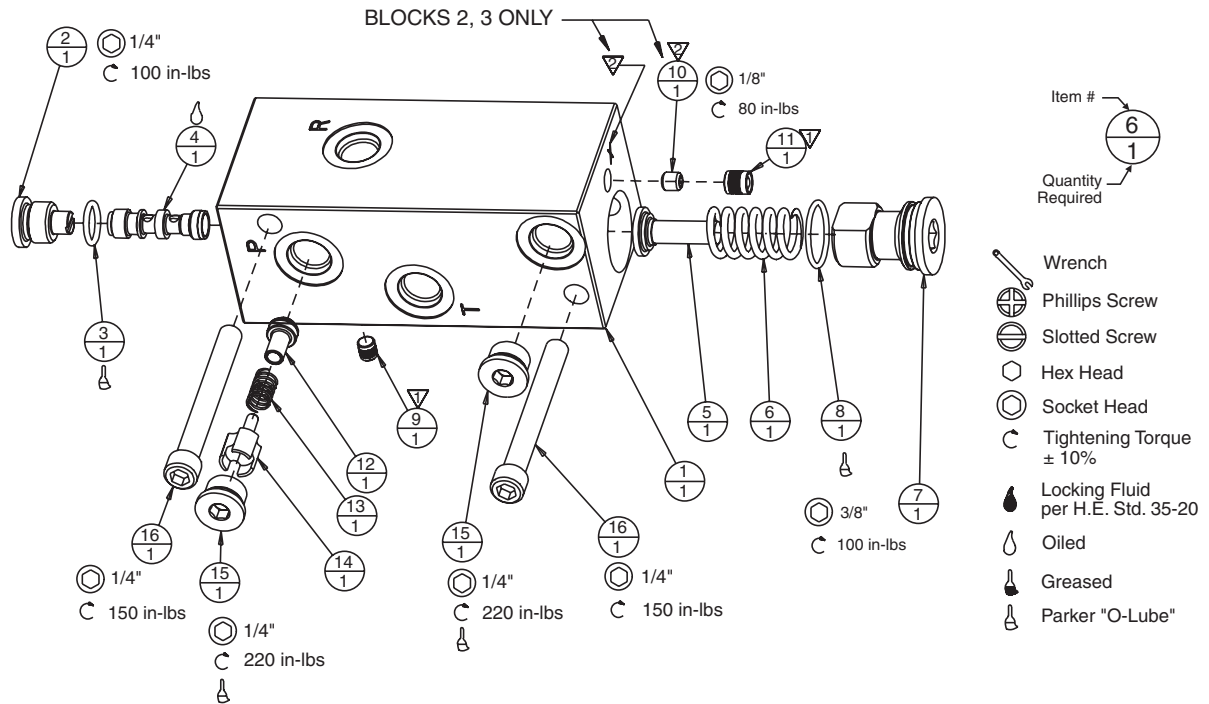
Port Type	Port Size	Plug Type	Torque
SAE	15/16"-12	⊙ 5/8"	75 ft-lbs
BSPP	1-11	⊙ 17mm	50 ft-lbs

Optional Gage Port Plug

Port Type	Port Size	Plug Type	Torque
SAE	9/16"-18	⊙ 1/4"	410 in-lbs
BSPP	1/4	⊙ 6mm	105 in-lbs

[See Page 18 for RV Options Chart.](#)

Block Service Kit 396 1823 224



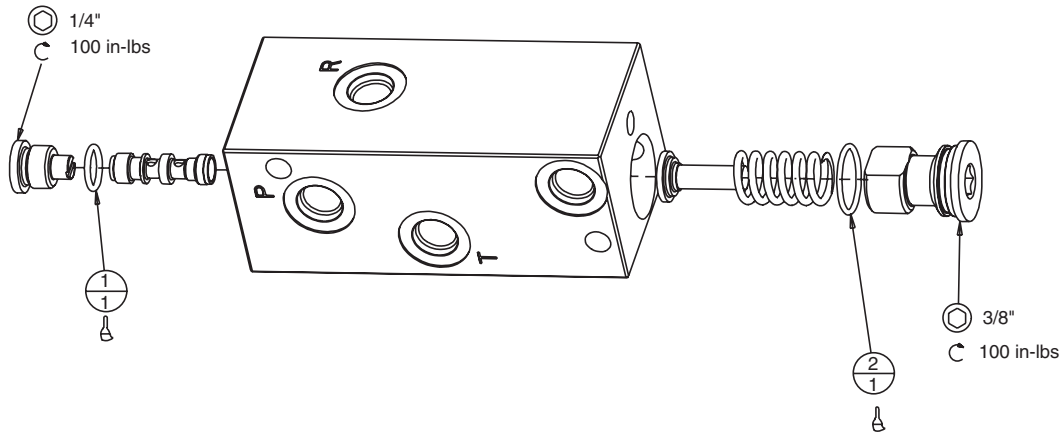
NOTES:

- 1 Assemble per 2.003.335
- 2 Assembler to stamp "X" approximately 0.25" high to indicate that the 1/4"-20 plug has been installed. (Blocks 2, 3 only)

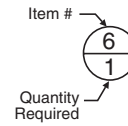
Seal Service Kit 396 1823 225 includes items in bold text.

Item	Part Number	Qty	Description
1	355 0500 034	1	Housing
2	396 2282 028	1	3/8 O.D. Tube Plug (Special)
3	391 2881 834	1	Seal, O-Ring (0.62 OD x 0.47 ID)
4	91264368-02	1	Spool
5	91273200-18	1	Spring Guide
6	91273200-14	1	Spring
7	396 2282 029	1	Plug
8	06814002	1	O-Ring, AS018 70 DUR Nitrile
9	391 2282 314	1	Expander Plug
10	396 1401 010	1	1/4-20 Plug, Set Screw
11	391 2282 242	1	Expander Plug
12	001839	1	Poppet
13	1300173	1	Spring
14	396 1642 025	1	Spring Retainer
15	391 2281 012	2	Tube Plug, 3/8 OD
16	391 1401 446	2	Capscrew, 5/16-18 x 2.75 Lg.

Block Seal Kit 396 1823 225



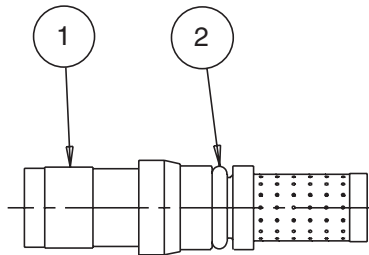
Item	Part Number	Qty	Description
1	391 2881 834	1	Seal, O-Ring (0.62 OD x 0.47 ID)
2	06814002	1	O-Ring, AS018 70DUR Nitrile



Screen Kit 463 9000 008

This kit helps keep contaminants out of PRRV and pilot accumulator seat. Clean contaminate from outside.
 Can blow air from inside to assist cleaning.

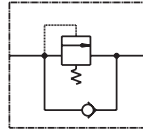
Lubricate seals with Parker O-Lube prior to installation of sub-assembly.



Item	Part Number	Qty	Description
1	396 3384 060	1	Tube
2	391 2881 324	1	Seal, O-Ring (0.38 OD x 0.24 ID)

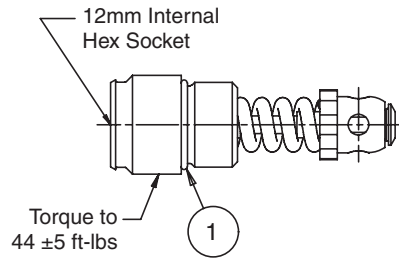
Inlet Clipper Relief Valve

Pressure setting is "factory only" and is not adjustable. Flow rate at factory setting is 20 LPM (5.3 GPM). Should you require a pressure setting not listed in the table, or require the pressure setting to be made at a flow different to standard, please contact your Parker Hannifin representative.



Part Number	Setting Bar	Setting PSI
9120 0292 53	80	1160
9120 0292 54	100	1450
9120 0292 55	125	1813
9120 0292 56	140	2030
9120 0292 57	160	2320
9120 0292 58	175	2538
9120 0292 59	190	2755
9120 0292 60	210	3045
9120 0292 61	230	3335
9120 0292 62	250	3625
9120 0292 63	280	4060
9120 0292 64	300	4350
9120 0292 65	330	4785
9120 0292 66	350	5075
9120 0292 67	380	5510
9120 0292 68	400	5800

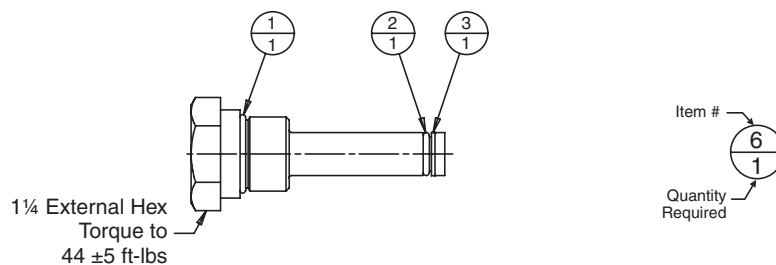
Clipper RV Seal Kit 396 1823 108



Lubricate seal with Parker O-Lube prior to installation.

Item	Part Number	Qty	Description
1	91256889	1	Seal, O-Ring (1.00 OD x 0.86 ID)

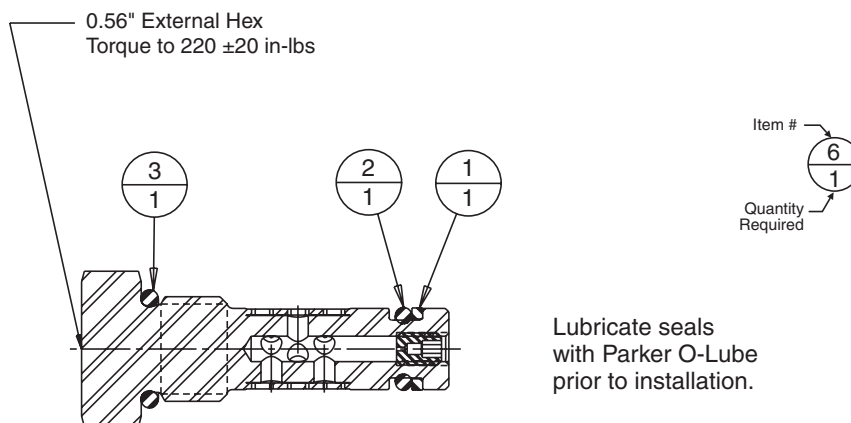
Steel Plug Seal Kit 396 1823 179



Lubricate seals with Parker O-Lube prior to installation.

Item	Part Number	Qty	Description
1	391 2882 228	1	Seal, O-Ring (1.00 OD x 0.86 ID)
2	396 2881 028	1	Seal, O-Ring (0.39 ID x 0.55 OD)
3	396 2681 020	1	Ring, Back-Up (0.55 OD x 0.44 ID)

LS Vent Seal Kit 396 1823 226



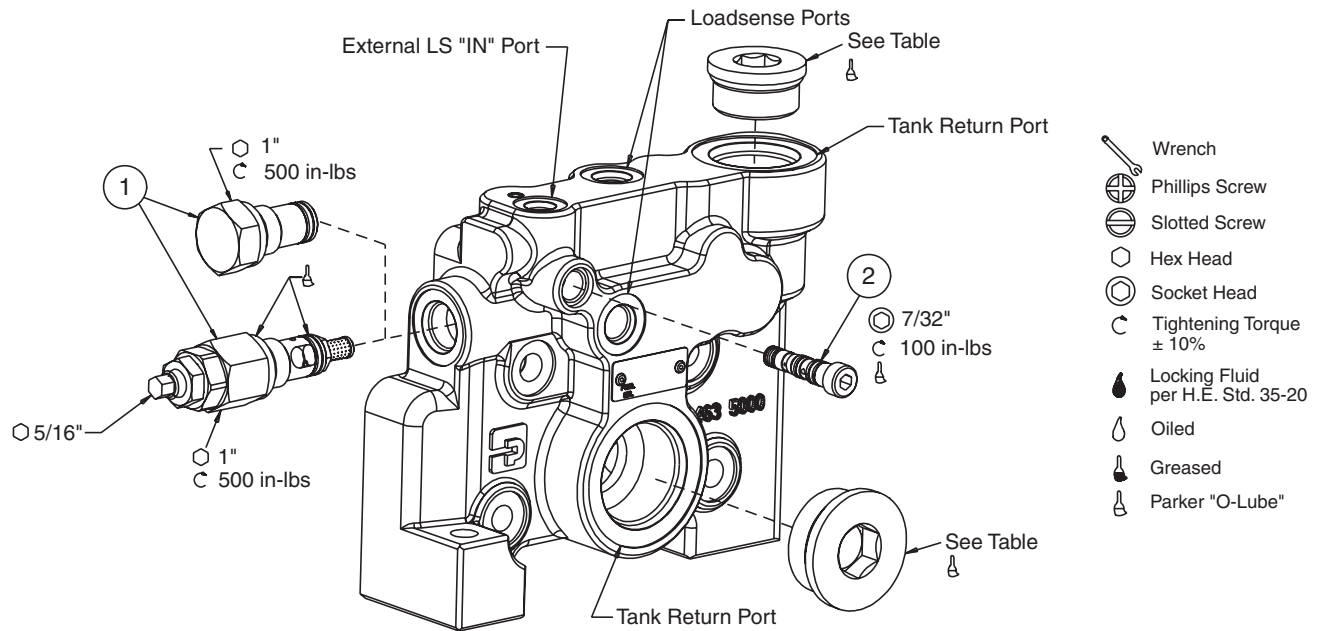
Lubricate seals with Parker O-Lube prior to installation.

Item	Part Number	Qty	Description
1	391 2681 593	1	Ring, Back-Up (0.34 OD x 0.25 ID) Peek
2	391 2882 192	1	Seal, O-Ring (0.35 OD x 0.21 ID)
3	396 2881 027	1	Seal, O-Ring (0.50 OD x 0.35 ID)

VP170 Service/Seal Kits – Outlet Section

Description	Complete Seal Kit	Seals Included in Complete Kit	Seal Subkit #	See Page
PCLS Outlets	396 1823 217 (see below)	LS RV or its steel plug	396 1823 112	22
		LS IN shuttle check	396 1823 216	22
LS Outlets	396 1823 227 (see next page)	LS RV or its steel plug	396 1823 112	22
		LS IN shuttle check	396 1823 216	22

PCLS Outlet Service/Seal Kit 396 1823 217

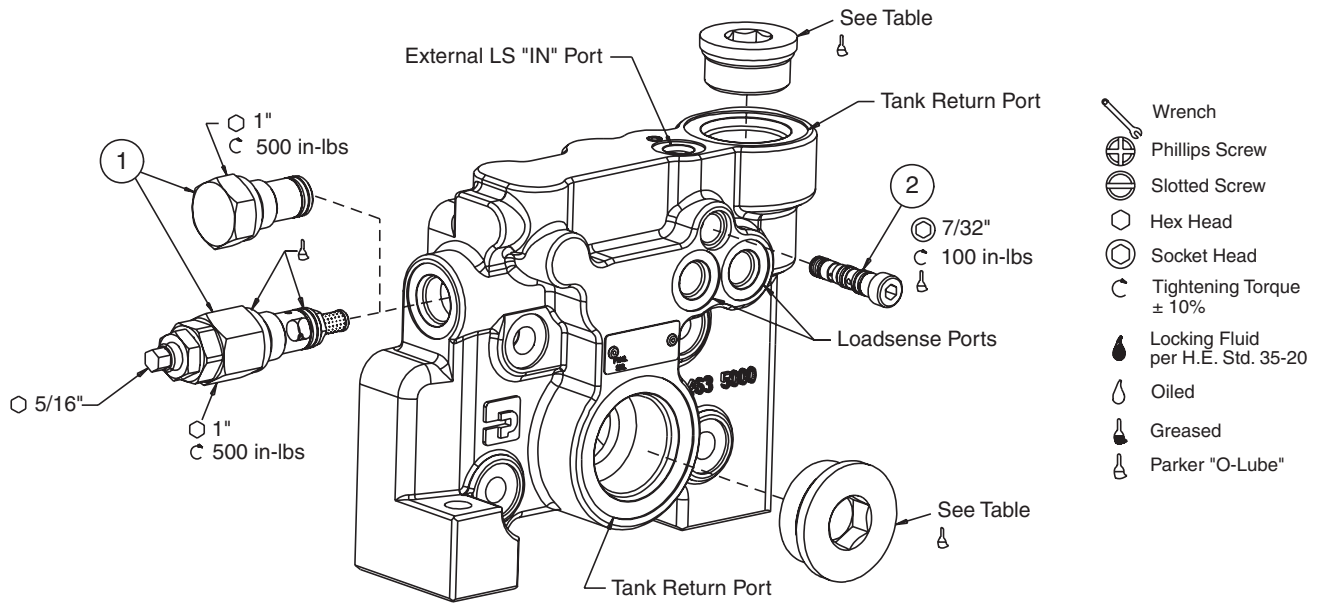


Item	Part Number	Qty	Description
1	396 1823 112	1	Seal Kit for LS RV or Plug
2	396 1823 216	1	Seal Kit for LS "IN" Shuttle Check

Outlet Port Plug

Port Type	Port Size	Plug Type	Torque
BSPP	1-11	⊙ 17mm	50 ft-lbs
SAE	1 ⁵ / ₁₆ "-12	⊙ 5/8"	75 ft-lbs
BSPP	1 ¹ / ₄ "-11	⊙ 22mm	75 ft-lbs
SAE	1 ⁵ / ₈ "-12	⊙ 3/4"	75 ft-lbs

Load-Sense Outlet Service/Seal Kit 396 1823 227

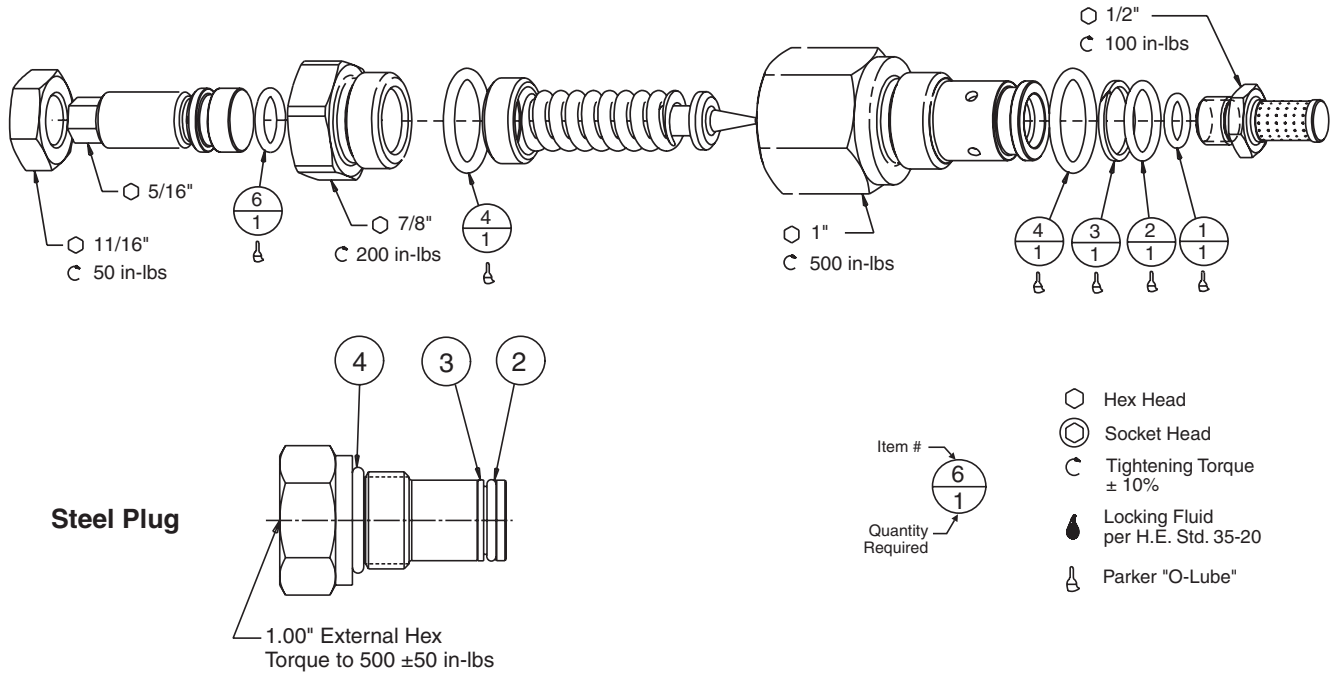


Item	Part Number	Qty	Description
1	396 1823 112	1	Seal Kit for LS RV or Plug
2	396 1823 216	1	Seal Kit for LS "IN" Shuttle Check

Outlet Port Plug

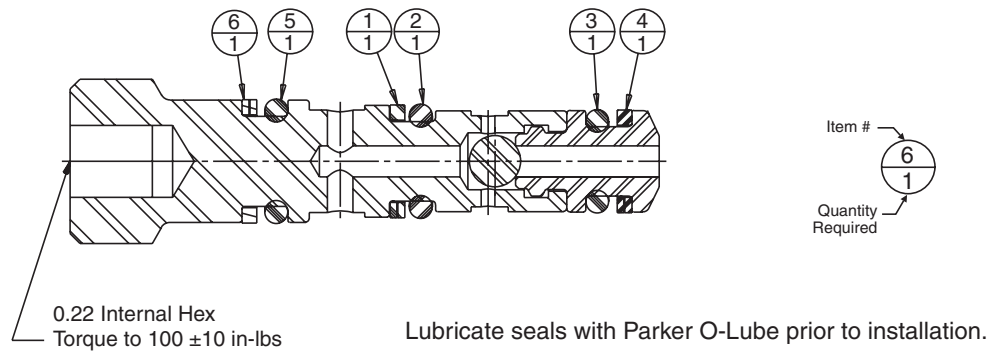
Port Type	Port Size	Plug Type	Torque
BSPP	1-11	⊙ 17mm	50 ft-lbs
SAE	1 ⁵ / ₁₆ "-12	⊙ 5/8"	75 ft-lbs
BSPP	1 ¹ / ₄ "-11	⊙ 22mm	75 ft-lbs
SAE	1 ⁵ / ₈ "-12	⊙ 3/4"	75 ft-lbs

Load-Sense RV or Steel Plug Seal Kit 396 1823 112



Item	Part Number	Qty	Description
1	391 2882 213	1	Seal, O-Ring (0.43 OD x 0.30 ID)
2	391 2881 363	1	Seal, O-Ring (0.63 OD x 0.49 ID)
3	396 2681 019	1	Ring, Back-Up (0.63 OD x 0.53 ID) Peek
4	391 2881 197	2	Seal, O-Ring, (0.82 OD x 0.64 ID)
6	396 2881 029	1	Seal, O-Ring (0.50 OD x 0.36 ID)

**Load-Sense IN Shuttle Check Valve
 Seal Kit 396 1823 216**



Item	Part Number	Qty	Description
1	391 2681 593	1	Ring, Back-Up (0.34 OD x 0.25 ID) Peek
2	391 2882 192	1	Seal, O-Ring (0.35 OD x 0.21 ID)
3	391 2881 322	1	Seal, O-Ring (0.31 OD x 0.18 ID)
4	396 2681 018	1	Ring, Back-Up (0.31 OD x 0.22 ID) Peek
5	391 2881 324	1	Seal, O-Ring (0.38 OD x 0.24 ID)
6	391 2681 594	1	Ring, Back-Up (0.37 OD x 0.28 ID) Peek

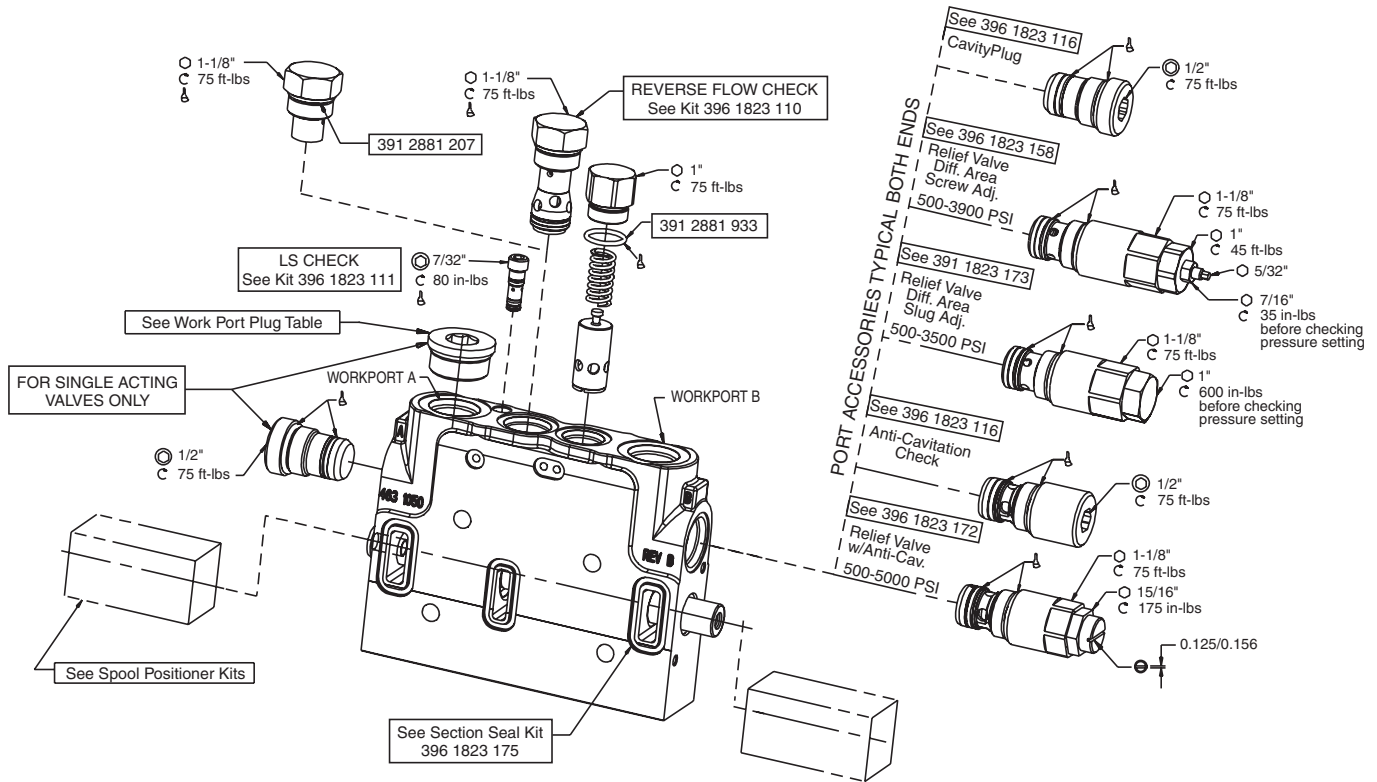
VP170 Service Kits – Work Section Positioners

Service Kit Description	Section	Complete Service Kit	See Page	Seal Kit Only
Manual operation, spring return, 3-position	work - type 1 end	463 9000 009 (positioner)	27	See pages 25-26 for seal kit locations.
	work - type 2 end	463 9000 021 (positioner)	28	
Manual operation, spring return, detent 4th position (float)	work - type 1 end	463 9000 010 (positioner)	29	
	work - type 2 end	463 9000 022 (positioner)	30	
Manual operation, detent, 3-position	work - type 1 end	463 9000 011 (positioner)	31	
	work - type 2 end	463 9000 023 (positioner)	32	
Special manual operation, spring return spool out, detent spool in, 3-position	work - type 1 end	463 9000 012 (positioner)	33	
	work - type 2 end	463 9000 024 (positioner)	34	
Air operation (pneumatic)	work - type 1 end	463 9000 013 (positioner)	35	
	work - type 2 end	463 9000 025 (positioner)	36	
Hydraulic remote pilot, 3-position	work	463 9000 014 (positioner)	37	
Hydraulic remote pilot, 3-position, spool stroke limiters	work	463 9000 015 (positioner)	38	
Hydraulic remote pilot, 4th-position (float)	work	463 9000 016 (positioner)	39	
Solenoid – 3-position	work	463 9000 017 (positioner)	40	
Solenoid – 3-position w/stroke limiter	work	463 9000 026 (positioner)	41	

VP170 Seal Kits – Work Section – PCLS or LS, Type 1 or Type 2 Ends

Description	Complete Seal Kit	Included in Complete Kit	Seal Subkit	See Page
Manual, 3 or 4-position	396 1823 218	section seals	396 1823 175	50
		LS check	396 1823 111	45
		reverse flow check or its plug	396 1823 110	45
		seal for compensator cap	391 2881 933	25
		seal for LS check cap	391 2881 933	26
		seal for SAE 8 LS plug	391 2881 197	26
		boot + spool seals	396 1823 174	43
		Grommet	391 1203 002	—
Pneumatic 3-position	396 1823 219	section seals	396 1823 175	50
		LS check	396 1823 111	45
		reverse flow check or its plug	396 1823 110	45
		seal for compensator cap	391 2881 933	25
		seal for LS check cap	391 2881 933	26
		seal for SAE 8 LS plug	391 2881 197	26
		boot, spool, endcap seals	396 1823 178	43
		back-up ring	391 2681 378	—
Hydraulic remote, 3 or 4-position	396 1823 220	section seals	396 1823 175	50
		LS check	396 1823 111	45
		reverse flow check or its plug	396 1823 110	45
		seal for compensator cap	391 2881 933	25
		seal for LS check cap	391 2881 933	26
		seal for SAE-8 LS plug	391 2881 197	26
		seals for std or stroke limiter endcaps	396 1823 176	44
Solenoid operated, 3 or 4-position	396 1823 221	section seals	396 1823 175	50
		LS check	396 1823 111	45
		reverse flow check or its plug	396 1823 110	45
		seal for compensator cap	391 2881 933	25
		seal for LS check cap	391 2881 933	26
		seal for SAE-8 LS plug	391 2881 197	26
		seals for std or stroke limiter endcaps	396 1823 177	44
Reverse flow check	396 1823 110			45
Work section LS check	396 1823 111			45
Anti-cavitation check	396 1823 116			46
Workport RV + AC	396 1823 172			47
Workport steel plug	396 1823 116			47
RV1, RV2, RV3 – screw adj.	396 1823 158			48
RV4, RV5, RV6 – shim adj.	391 1823 173			49
Section seals	396 1823 175			50

PCLS Work Section Seal Kit Detail



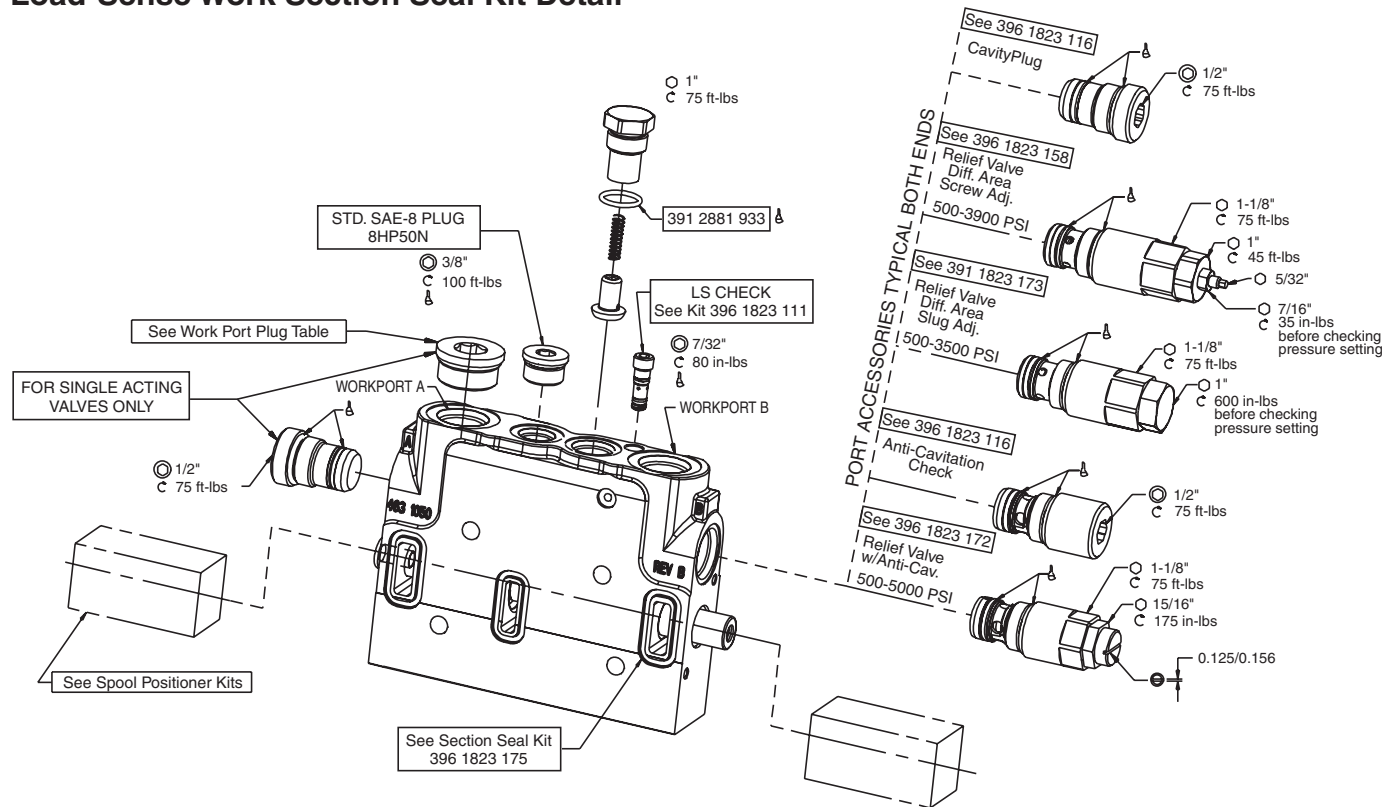
Description	Positioner Kit	Seal Kit	Pages
Spring Return – Type 1 End	463 9000 009	396 1823 174	27, 43
Spring Return – Type 2 End	463 9000 021	396 1823 174	28, 43
4th Position Detent – Type 1 End	463 9000 010	396 1823 174	29, 43
4th Position Detent – Type 2 End	463 9000 022	396 1823 174	30, 43
3-Position Detent – Type 1 End	463 9000 011	396 1823 174	31, 43
3-Position Detent –Type 2 End	463 9000 023	396 1823 174	32, 43
Spring Return, Detent IN – Type 1 End	463 9000 012	396 1823 174	33, 43
Spring Return, Detent IN – Type 2 End	463 9000 024	396 1823 174	34, 43
Pneumatic – Type 1 End	463 9000 013	396 1823 178	35, 43
Pneumatic – Type 2 End	463 9000 025	396 1823 178	36, 43
Hydraulic Remote, 3-Position	463 9000 014	396 1823 176	37, 44
Hydraulic Remote, 3-Position Adj. Screw	463 9000 015	396 1823 176	38, 44
Hydraulic Remote, 4-Position	463 9000 016	396 1823 176	39, 44
Solenoid, 3-Position	463 9000 017	396 1823 177	40, 44
Solenoid, 3-Position with Stroke Limiters	463 9000 026	396 1823 177	41, 44

- Wrench
- Phillips Screw
- Slotted Screw
- Hex Head
- Socket Head
- Tightening Torque ± 10%
- Locking Fluid per H.E. Std. 35-20
- Oiled
- Greased
- Parker "O-Lube"

Work Port Plug

Port Type	Port Size	Plug Type	Torque
SAE	3/4"-16	⊙ 5/16"	60 ft-lbs
SAE	7/8"-14	⊙ 3/8"	100 ft-lbs
SAE	1-1/16"-12	⊙ 9/16"	135 ft-lbs
BSPP	1/2-14	⊙ 10mm	20 ft-lbs
BSPP	3/4-14	⊙ 12mm	35 ft-lbs

Load-Sense Work Section Seal Kit Detail



Description	Positioner Kit	Seal Kit	Pages
Spring Return – Type 1 End	463 9000 009	396 1823 174	27, 43
Spring Return – Type 2 End	463 9000 021	396 1823 174	28, 43
4th Position Detent – Type 1 End	463 9000 010	396 1823 174	29, 43
4th Position Detent – Type 2 End	463 9000 022	396 1823 174	30, 43
3-Position Detent – Type 1 End	463 9000 011	396 1823 174	31, 43
3-Position Detent – Type 2 End	463 9000 023	396 1823 174	32, 43
Spring Return, Detent IN – Type 1 End	463 9000 012	396 1823 174	33, 43
Spring Return, Detent IN – Type 2 End	463 9000 024	396 1823 174	34, 43
Pneumatic – Type 1 End	463 9000 013	396 1823 178	35, 43
Pneumatic – Type 2 End	463 9000 025	396 1823 178	36, 43
Hydraulic Remote, 3-Position	463 9000 014	396 1823 176	37, 44
Hydraulic Remote, 3-Position Adj. Screw	463 9000 015	396 1823 176	38, 44
Hydraulic Remote, 4-Position	463 9000 016	396 1823 176	39, 44
Solenoid, 3-Position	463 9000 017	396 1823 177	40, 44
Solenoid, 3-Position with Stroke Limiters	463 9000 026	396 1823 177	41, 44

- Wrench
- Phillips Screw
- Slotted Screw
- Hex Head
- Socket Head
- Tightening Torque ± 10%
- Locking Fluid per H.E. Std. 35-20
- Oiled
- Greased
- Parker "O-Lube"

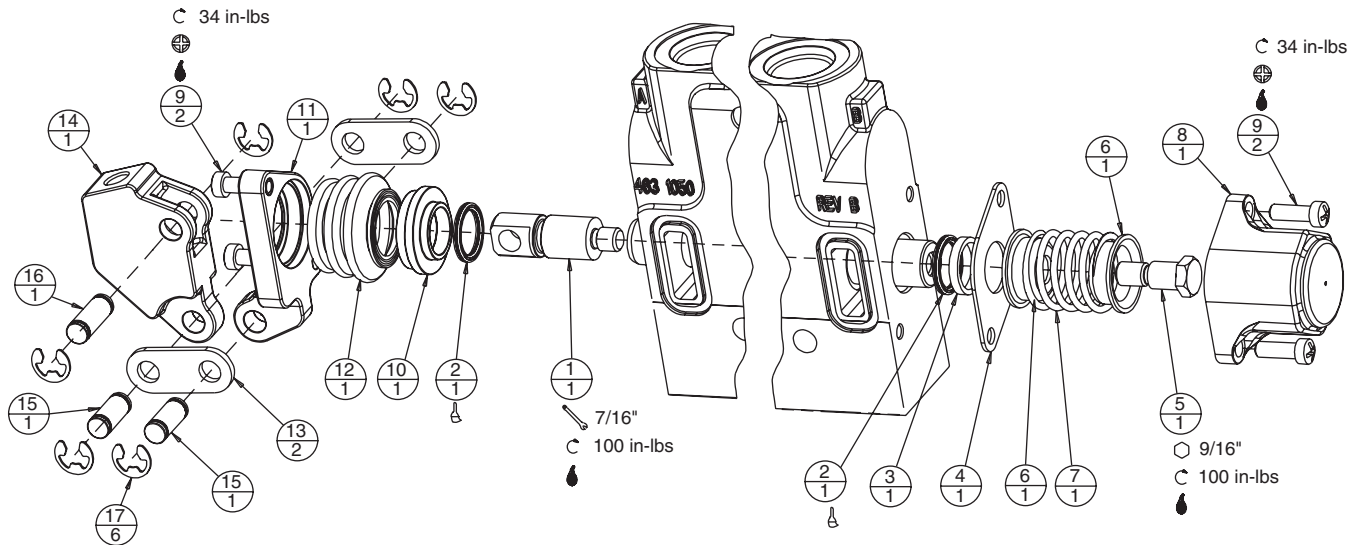
Work Port Plug

Port Type	Port Size	Plug Type	Torque
SAE	3/4"-16	⊙ 5/16"	60 ft-lbs
SAE	7/8"-14	⊙ 3/8"	100 ft-lbs
SAE	1-1/16"-12	⊙ 9/16"	135 ft-lbs
BSPP	1/2-14	⊙ 10mm	20 ft-lbs
BSPP	3/4-14	⊙ 12mm	35 ft-lbs

Spring Return, Type 1 End
Positioner Service Kit 463 9000 009








Seal Service Kit 396 1823 174
includes items in bold text.

Seal Service Kit for Entire Section
396 1823 218



Item	Part Number	Qty	Description
1	396 1881 014	1	Lug with Boot Groove
2	391 1985 014	2	Quad Seal
3	391 2681 378	1	Back-Up Ring
4	391 2183 001	1	Retainer Plate
5	391 1432 022	1	Stripper Bolt
6	391 1642 045	2	Spring Guide
7	391 3581 608	1	Spring
8	341 6000 100	1	Cap
9	391 1433 020	4	Screw (0.75 lg.)
10	396 3384 058	1	Seal Retainer
11	396 0981 001	1	Bracket
12	396 4041 013	1	Boot, Spool
13	396 1841 024	2	Link
14	396 1841 026	1	Lever
15	391 2080 011	2	Pin
16	391 2080 003	1	Pin, Clevis
17	391 2681 470	6	Snap Ring

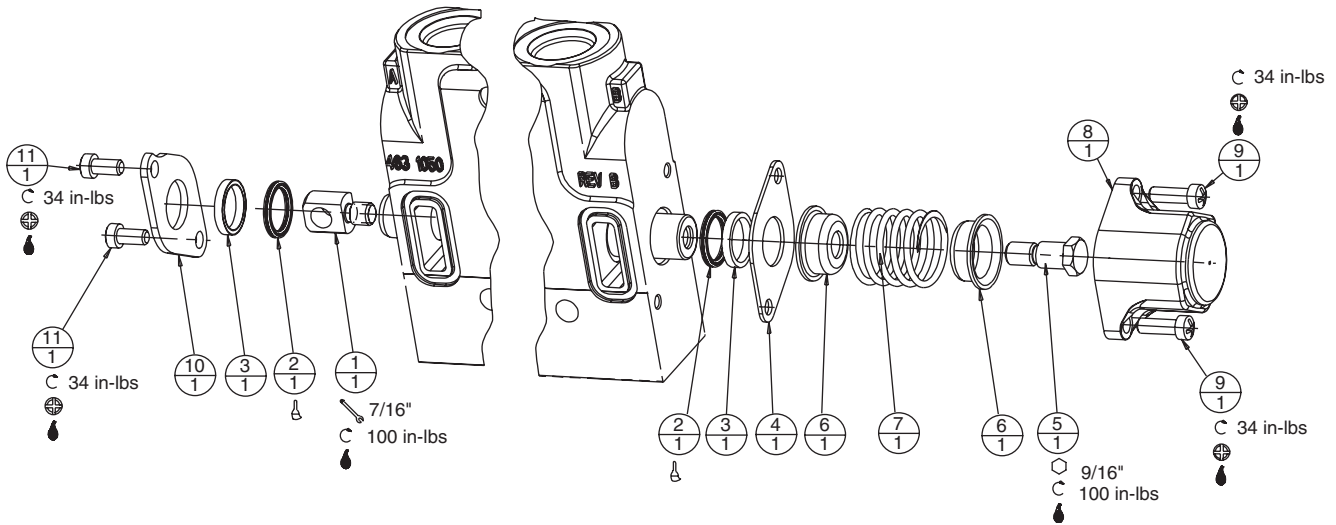
Item # 
Quantity Required

-  Wrench
-  Phillips Screw
-  Slotted Screw
-  Hex Head
-  Socket Head
-  Tightening Torque ± 10%
-  Locking Fluid per H.E. Std. 35-20
-  Oiled
-  Greased
-  Parker "O-Lube"

Spring Return, Type 2 End
Positioner Service Kit 463 9000 021

Seal Service Kit 396 1823 174
includes items in bold text.

Seal Service Kit for Entire Section
396 1823 218



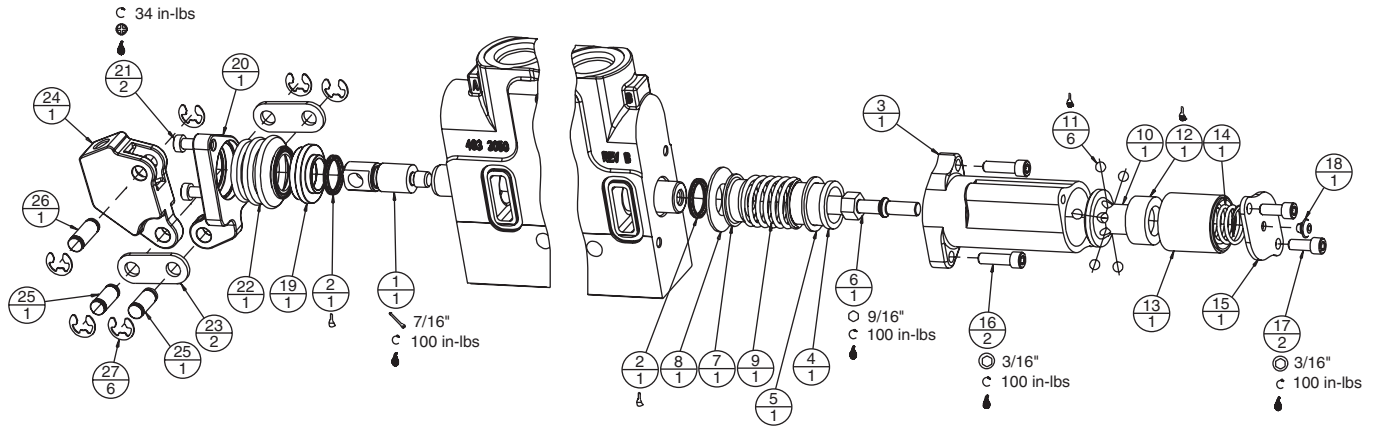
Item	Part Number	Qty	Description
1	396 1881 015	1	Lug, Type 2 End
2	391 1985 014	2	Quad Seal
3	391 2681 378	2	Back-Up Ring
4	391 2183 001	1	Retainer Plate
5	391 1432 022	1	Stripper Bolt
6	391 1642 045	2	Spring Guide
7	391 3581 608	1	Spring
8	341 6000 100	1	Cap
9	391 1433 020	2	Screw (0.75 lg.)
10	391 2183 226	1	Retainer Plate
11	391 1433 015	2	Screw (1/2 lg.)



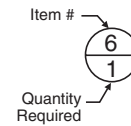
4th Position Detent, Type 1 End
Positioner Service Kit 463 9000 010

Seal Service Kit 396 1823 174
includes items in bold text.

Seal Service Kit for Entire Section
396 1823 218



Item	Part Number	Qty	Description
1	396 1881 014	1	Lug w/ Boot Groove
2	391 1985 014	2	Quad Seal
3	347 6400 902	1	End Cap
4	391 1642 186	1	Spring Retainer
5	391 3782 160	1	Washer
6	391 1401 694	1	Detent Bolt
7	391 1642 045	1	Spring Guide
8	391 2183 108	1	Locating Ring
9	391 3581 212	1	Spring
10	391 3283 116	1	Ball Carrier
11	346 0505 368	6	Ball (6.0mm Dia.)
12	391 3283 117	1	Ball Retainer
13	391 3384 270	1	Location Sleeve
14	391 3581 835	1	Spring
15	391 2183 225	1	Plate, Retaining
16	391 1402 095	2	Capscrew (1/4-20 x 0.88 lg.)
17	391 1402 094	2	Capscrew (1/4-20 x 0.62 lg.)
18	391 1203 002	1	Grommet
19	396 3384 058	1	Seal Retainer
20	396 0981 001	1	Bracket
21	391 1433 020	2	Screw (0.75 lg.)
22	396 4041 013	1	Boot, Spool
23	396 1841 024	2	Link
24	396 1841 026	1	Lever
25	391 2080 011	2	Pin
26	391 2080 003	1	Pin, Clevis
27	391 2681 470	6	Snap Ring

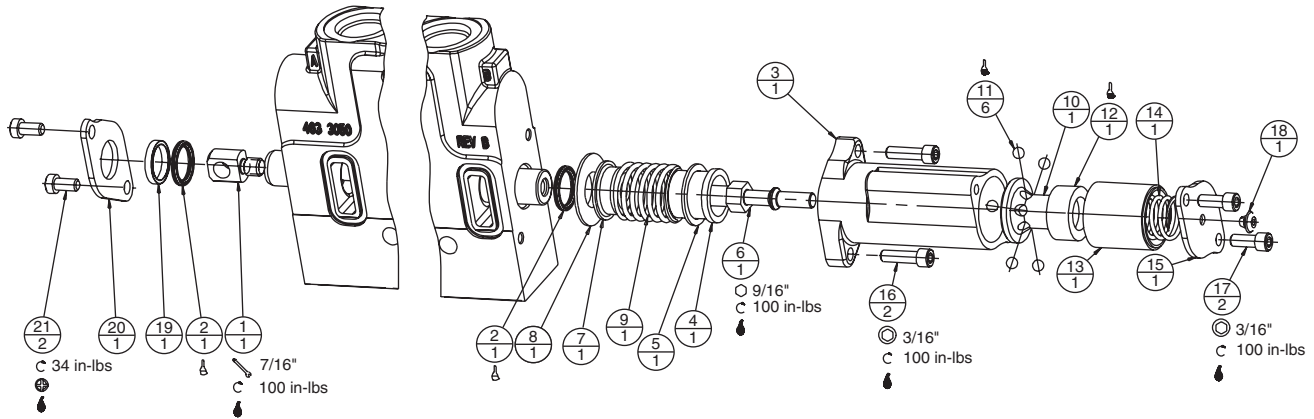


- Wrench
- Phillips Screw
- Slotted Screw
- Hex Head
- Socket Head
- Tightening Torque ± 10%
- Locking Fluid per H.E. Std. 35-20
- Oiled
- Greased
- Parker "O-Lube"

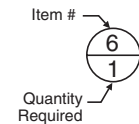
**4th Position Detent, Type 2 End
Positioner Service Kit 463 9000 022**

**Seal Service Kit 396 1823 174
includes items in bold text.**

**Seal Service Kit for Entire Section
396 1823 218**



Item	Part Number	Qty	Description
1	396 1881 015	1	Lug, Type 2 End
2	391 1985 014	2	Quad Seal
3	347 6400 902	1	End Cap
4	391 1642 186	1	Spring Retainer
5	391 3782 160	1	Washer
6	391 1401 694	1	Detent Bolt
7	391 1642 045	1	Spring Guide
8	391 2183 108	1	Locating Ring
9	391 3581 212	1	Spring
10	391 3283 116	1	Ball Carrier
11	346 0505 368	6	Ball (6.0mm Dia.)
12	391 3283 117	1	Ball Retainer
13	391 3384 270	1	Location Sleeve
14	391 3581 835	1	Spring
15	391 2183 225	1	Plate, Retaining
16	391 1402 095	2	Capscrew (1/4-20 x 0.88 lg.)
17	391 1402 094	2	Capscrew (1/4-20 x 0.62 lg.)
18	391 1203 002	1	Grommet
19	391 2681 378	1	Back-Up Ring
20	391 2183 226	1	Retainer Plate
21	391 1433 015	2	Screw (1/2 lg.)

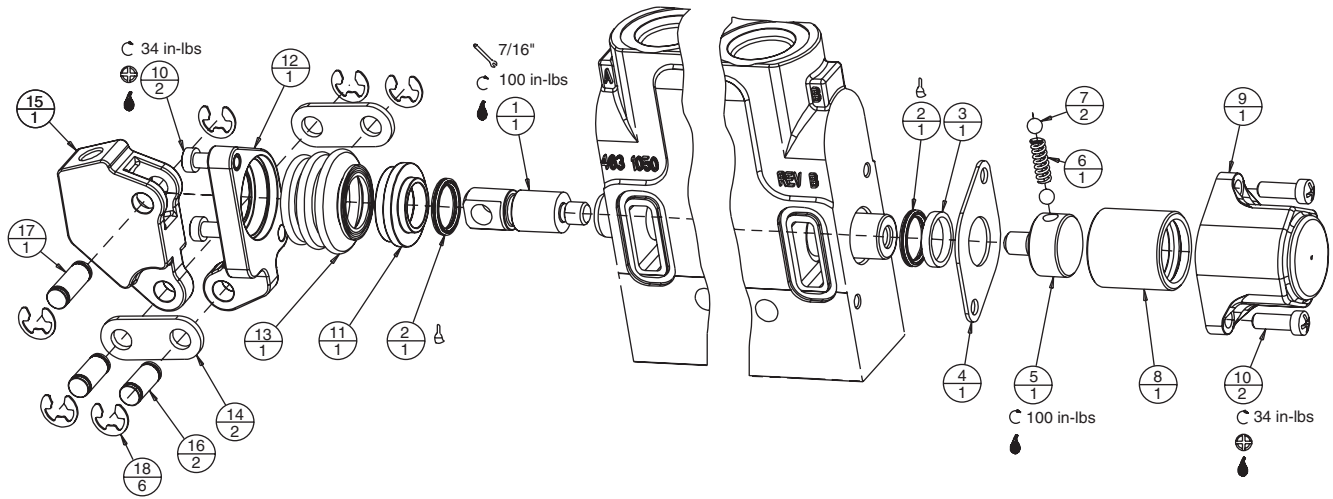


- Wrench
- Phillips Screw
- Slotted Screw
- Hex Head
- Socket Head
- Tightening Torque ± 10%
- Locking Fluid per H.E. Std. 35-20
- Oiled
- Greased
- Parker "O-Lube"

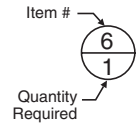
**3-Position Detent, Type 1 End
Positioner Service Kit 463 9000 011**

**Seal Service Kit 396 1823 174
includes items in bold text.**

**Seal Service Kit for Entire Section
396 1823 218**



Item	Part Number	Qty	Description
1	396 1881 014	1	Lug with Boot Groove
2	391 1985 014	2	Quad Seal
3	391 2681 378	1	Back-Up Ring
4	391 2183 001	1	Retainer Plate
5	391 2583 008	1	Detent Retainer
6	391 3581 130	1	Spring
7	391 0282 010	2	0.25 Dia. Ball
8	391 3283 015	1	Detent Sleeve
9	341 6000 100	1	Cap
10	391 1433 020	4	Screw (0.75 lg.)
11	396 3384 058	1	Seal Retainer
12	396 0981 001	1	Bracket
13	396 4041 013	1	Boot, Spool
14	396 1841 024	2	Link
15	396 1841 026	1	Lever
16	391 2080 011	2	Pin
17	391 2080 003	1	Pin, Clevis
18	391 2681 470	6	Snap Ring

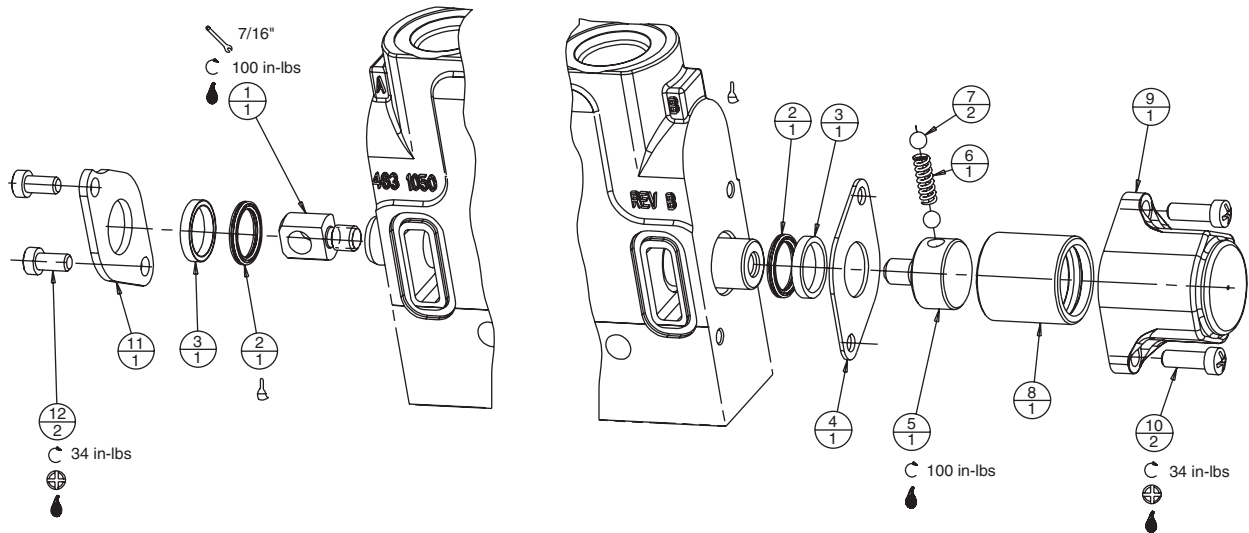


- Wrench
- Phillips Screw
- Slotted Screw
- Hex Head
- Socket Head
- Tightening Torque ± 10%
- Locking Fluid per H.E. Std. 35-20
- Oiled
- Greased
- Parker "O-Lube"

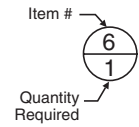
**3-Position Detent, Type 2 End
Positioner Service Kit 463 9000 023**

**Seal Service Kit 396 1823 174
includes items in bold text.**

**Seal Service Kit for Entire Section
396 1823 218**



Item	Part Number	Qty	Description
1	396 1881 015	1	Lug, Type 2 End
2	391 1985 014	2	Quad Seal
3	391 2681 378	2	Back-Up Ring
4	391 2183 001	1	Retainer Plate
5	391 2583 008	1	Detent Retainer
6	391 3581 130	1	Spring
7	391 0282 010	2	0.25 Dia. Ball
8	391 3283 015	1	Detent Sleeve
9	341 6000 100	1	Cap
10	391 1433 020	2	Screw (0.75 lg.)
11	391 2183 226	1	Retainer Plate
12	391 1433 015	2	Screw (1/2 lg.)

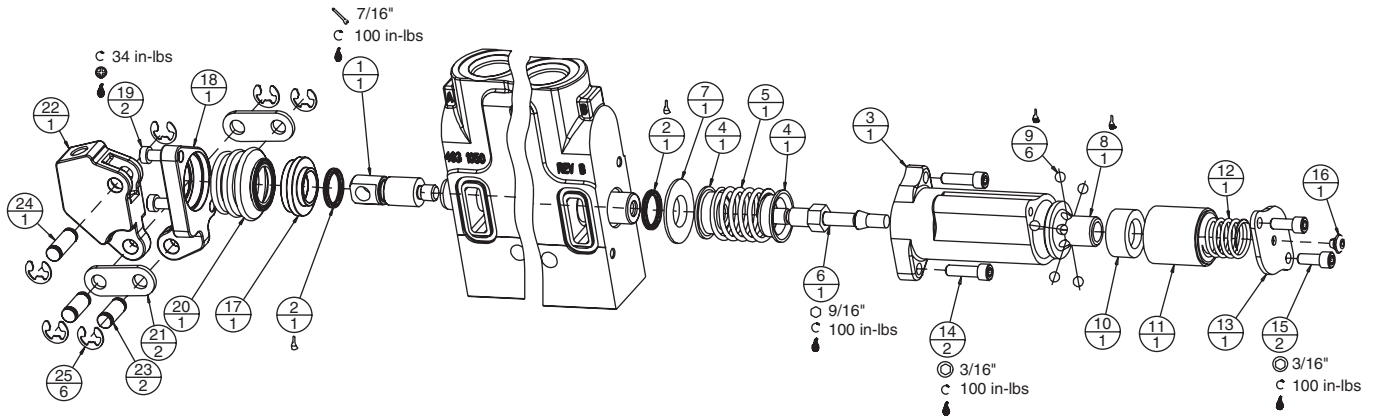


- Wrench
- Phillips Screw
- Slotted Screw
- Hex Head
- Socket Head
- Tightening Torque ± 10%
- Locking Fluid per H.E. Std. 35-20
- Oiled
- Greased
- Parker "O-Lube"

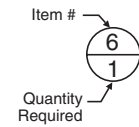
Spring Return, Detent IN, Type 1 End
Positioner Service Kit 463 9000 012

Seal Service Kit 396 1823 174
includes items in bold text.

Seal Service Kit for Entire Section
396 1823 218



Item	Part Number	Qty	Description
1	396 1881 014	1	Lug with Boot Groove
2	391 1985 014	2	Quad Seal
3	347 6400 100	1	End Cap
4	391 1642 045	2	Spring Guide
5	391 3581 608	1	Spring
6	391 1401 539	1	Detent Bolt
7	391 2183 108	1	Locating Ring
8	391 3283 116	1	Ball Carrier
9	346 0505 368	6	Ball (6.0mm Dia.)
10	391 3283 117	1	Ball Retainer
11	391 3384 270	1	Location Sleeve
12	391 3581 835	1	Spring
13	391 2183 225	1	Plate, Retaining
14	391 1402 095	2	Capscrew (1/4-20 x 0.88 lg.)
15	391 1402 094	2	Capscrew (1/4-20 x 0.62 lg.)
16	391 1203 002	1	Grommet
17	396 3384 058	1	Seal Retainer
18	396 0981 001	1	Bracket
19	391 1433 020	2	Screw (0.75 lg.)
20	396 4041 013	1	Boot, Spool
21	396 1841 024	2	Link
22	396 1841 026	1	Lever
23	391 2080 011	2	Pin
24	391 2080 003	1	Pin, Clevis
25	391 2681 470	6	Snap Ring

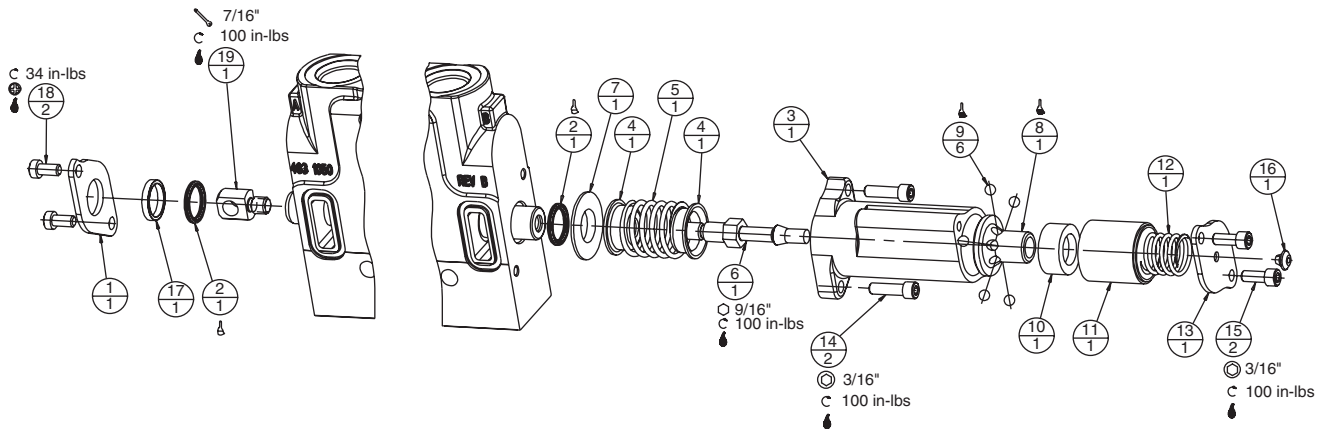


- Wrench
- Phillips Screw
- Slotted Screw
- Hex Head
- Socket Head
- Tightening Torque ± 10%
- Locking Fluid per H.E. Std. 35-20
- Oiled
- Greased
- Parker "O-Lube"

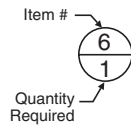
Spring Return, Detent IN, Type 2 End
Positioner Service Kit 463 9000 024

Seal Service Kit 396 1823 174
includes items in bold text.

Seal Service Kit for Entire Section
396 1823 218



Item	Part Number	Qty	Description
1	391 2183 226	1	Retainer Plate
2	391 1985 014	2	Quad Seal
3	347 6400 100	1	End Cap
4	391 1642 045	2	Spring Guide
5	391 3581 608	1	Spring
6	391 1401 539	1	Detent Bolt
7	391 2183 108	1	Locating Ring
8	391 3283 116	1	Ball Carrier
9	346 0505 368	6	Ball (6.0mm Dia.)
10	391 3283 117	1	Ball Retainer
11	391 3384 270	1	Location Sleeve
12	391 3581 835	1	Spring
13	391 2183 225	1	Plate, Retaining
14	391 1402 095	2	Capscrew (1/4-20 x 0.88 lg.)
15	391 1402 094	2	Capscrew (1/4-20 x 0.62 lg.)
16	391 1203 002	1	Grommet
17	391 2681 378	1	Back-Up Ring
18	391 1433 015	2	Screw (1/2 lg.)
19	396 1881 015	1	Lug, Type 2 End

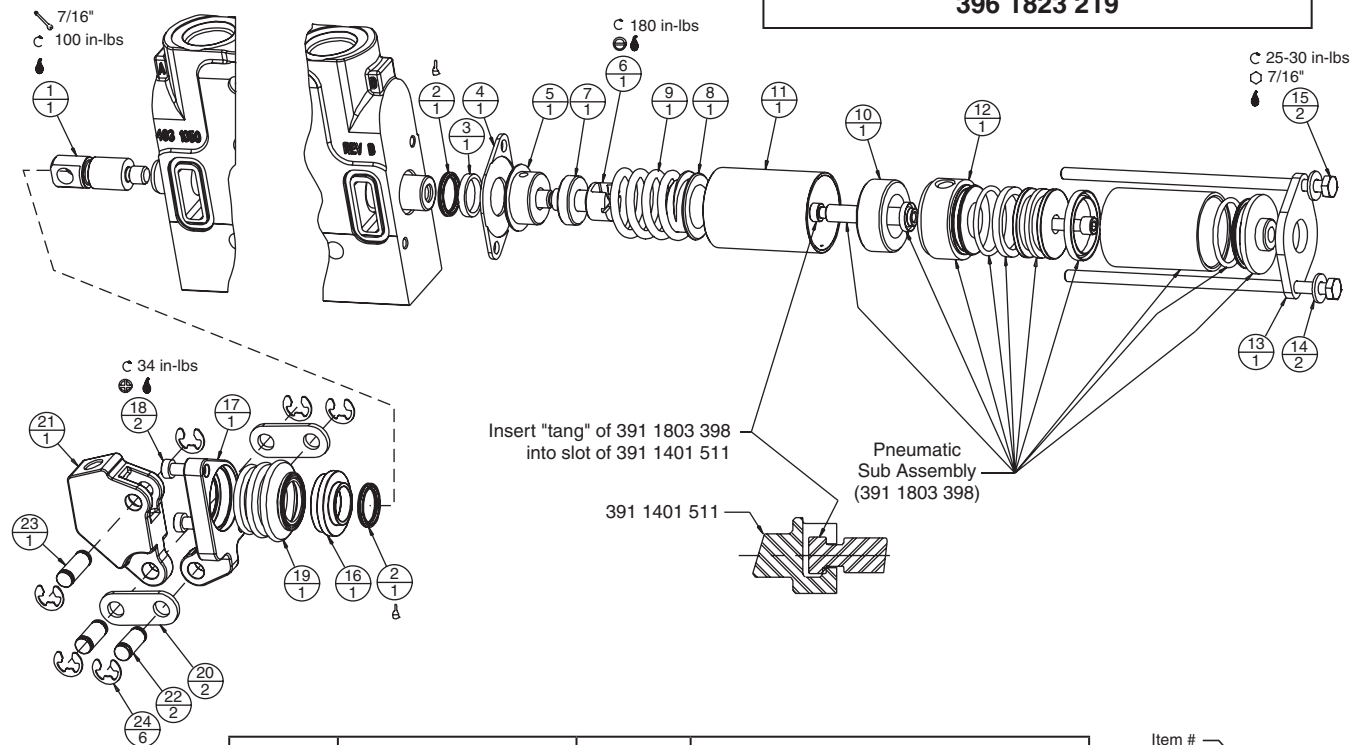


- Wrench
- Phillips Screw
- Slotted Screw
- Hex Head
- Socket Head
- Tightening Torque ± 10%
- Locking Fluid per H.E. Std. 35-20
- Oiled
- Greased
- Parker "O-Lube"


**Pneumatic, Type 1 End
Positioner Service Kit 463 9000 013**

**Seal Service Kit 396 1823 178
includes items in bold text.**









**Seal Service Kit for Entire Section
396 1823 219**



Item	Part Number	Qty	Description
1	396 1881 014	1	Lug with Boot Groove
2	391 1985 014	2	Quad Seal
3	391 2681 378	1	Back-Up Ring
4	391 2183 198	1	Retainer Plate
5	391 1642 129	1	Spring Retainer
6	391 1401 511	1	Stripper Bolt
7	391 3384 362	1	Spacer Tube
8	396 1642 022	1	Spring Retainer
9	391 3581 927	1	Spring
10	391 3384 366	1	Spacer Tube
11	391 3384 365	1	Spacer Tube
12	391 1803 398	1	Pneumatic Sub Assembly
13	396 2183 034	1	Retainer Plate
14	391 3782 018	2	Washer
15	391 1425 421	2	Capscrew (1/4-20 x 6.25 lg.)
16	396 3384 058	1	Seal Retainer
17	396 0981 001	1	Bracket
18	391 1433 020	2	Screw (0.75 lg.)
19	396 4041 013	1	Boot, Spool
20	396 1841 024	2	Link
21	396 1841 026	1	Lever
22	391 2080 011	2	Pin
23	391 2080 003	1	Pin, Clevis
24	391 2681 470	6	Snap Ring

Item # 

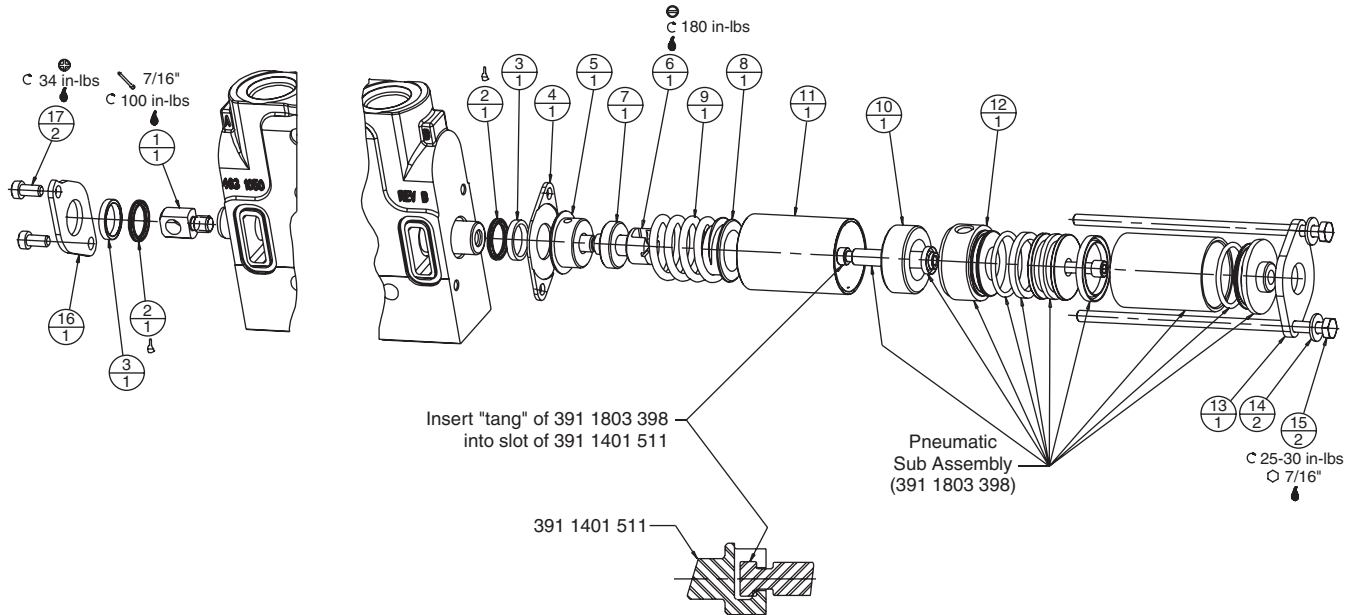
Quantity Required

-  Wrench
-  Phillips Screw
-  Slotted Screw
-  Hex Head
-  Socket Head
-  Tightening Torque ± 10%
-  Locking Fluid per H.E. Std. 35-20
-  Oiled
-  Greased
-  Parker "O-Lube"

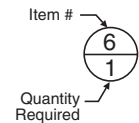
**Pneumatic, Type 2 End
Positioner Service Kit 463 9000 025**

**Seal Service Kit 396 1823 178
includes items in bold text.**

**Seal Service Kit for Entire Section
396 1823 219**



Item	Part Number	Qty	Description
1	396 1881 015	1	Lug, Type 2 End
2	391 1985 014	2	Quad Seal
3	391 2681 378	2	Back-Up Ring
4	391 2183 198	1	Retainer Plate
5	391 1642 129	1	Spring Retainer
6	391 1401 511	1	Stripper Bolt
7	391 3384 362	1	Spacer Tube
8	396 1642 022	1	Spring Retainer
9	391 3581 927	1	Spring
10	391 3384 366	1	Spacer Tube
11	391 3384 365	1	Spacer Tube
12	391 1803 398	1	Pneumatic Sub Assembly
13	396 2183 034	1	Retainer Plate
14	391 3782 018	2	Washer
15	391 1425 421	2	Capscrew (1/4-20 x 6.25 lg.)
16	391 2183 226	1	Retainer Plate
17	391 1433 015	2	Screw (1/2 lg.)

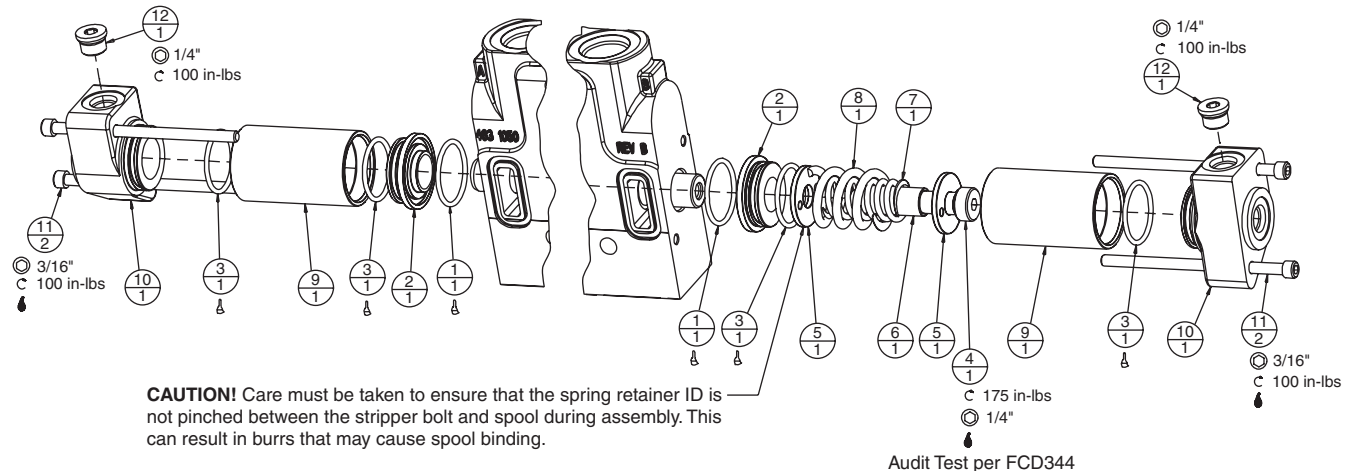


- Wrench
- Phillips Screw
- Slotted Screw
- Hex Head
- Socket Head
- Tightening Torque ± 10%
- Locking Fluid per H.E. Std. 35-20
- Oiled
- Greased
- Parker "O-Lube"

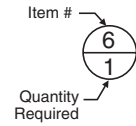
**Hydraulic Pilot 3-Position
Positioner Service Kit 463 9000 014**

**Seal Service Kit 396 1823 176
includes items in bold text.**

**Seal Service Kit for Entire Section
396 1823 220**



Item	Part Number	Qty	Description
1	391 2881 625	2	Seal, O-Ring (1.51 OD x 1.30 ID)
2	391 3384 243	2	Seal Retainer
3	391 2881 242	4	Seal, O-Ring (1.44 OD x 1.24 ID)
4	391 1401 450	1	Stripper Bolt
5	391 3782 133	2	Washer
6	391 3384 300	1	Tube
7	391 3581 764	1	Spring
8	391 3581 765	1	Spring
9	391 3384 216	2	Tube
10	341 6011 932	2	End Cap
11	391 1401 355	4	Capscrew, Hex, Socket (4.50 lg.)
12	391 2281 012	2	Tube Plug, 3/8 OD

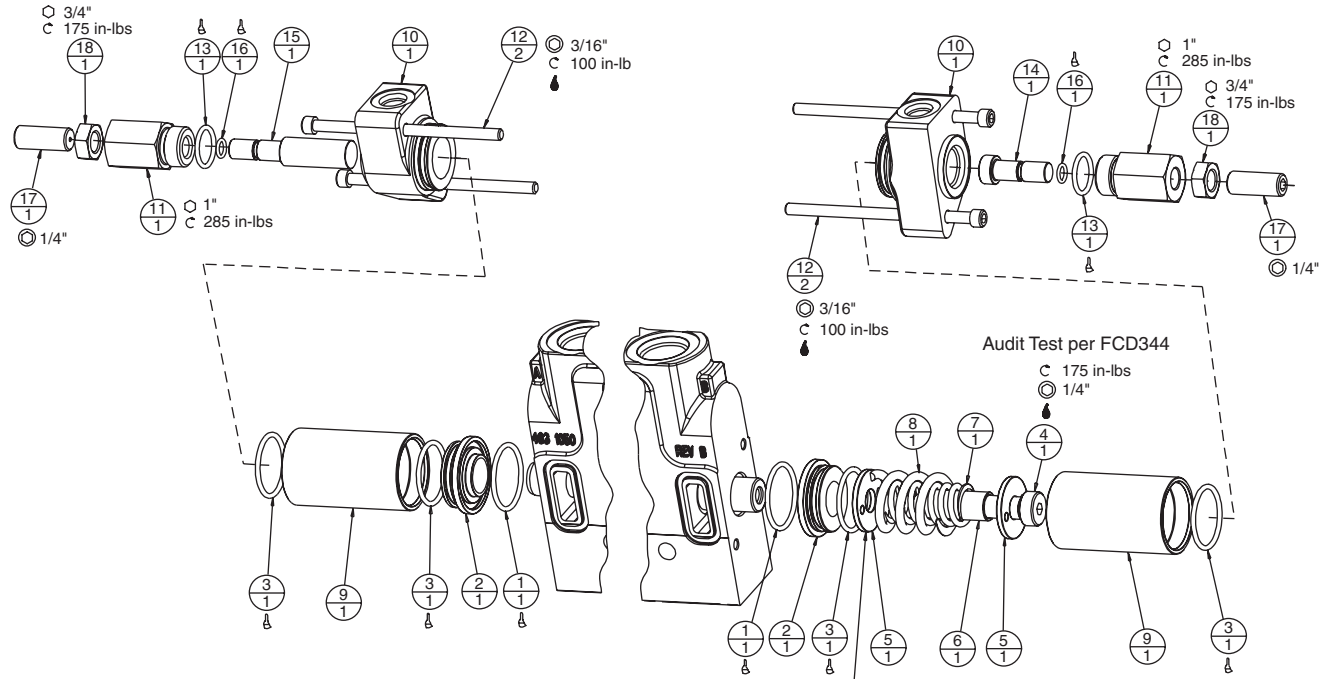


- Wrench
- Phillips Screw
- Slotted Screw
- Hex Head
- Socket Head
- Tightening Torque ± 10%
- Locking Fluid per H.E. Std. 35-20
- Oiled
- Greased
- Parker "O-Lube"

**Hydraulic Pilot 3-Position
with Spool Adjustment Screws
Positioner Service Kit 463 9000 015**

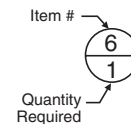
**Seal Service Kit 396 1823 176
includes items in bold text.**

**Seal Service Kit for Entire Section
396 1823 220**



CAUTION! Care must be taken to ensure that the spring retainer ID is not pinched between the stripper bolt and spool during assembly. This can result in burrs that may cause spool binding.

Item	Part Number	Qty	Description
1	391 2881 625	2	Seal, O-Ring (1.51 OD x 1.30 ID)
2	391 3384 243	2	Seal Retainer
3	391 2881 242	4	Seal, O-Ring (1.44 OD x 1.24 ID)
4	391 1401 450	1	Stripper Bolt
5	391 3782 133	2	Washer
6	391 3384 300	1	Tube
7	391 3581 764	1	Spring
8	391 3581 765	1	Spring
9	391 3384 216	2	Tube
10	341 6011 933	2	End Cap
11	391 0681 256	2	Cartridge
12	391 1401 355	4	Capscrew, Hex Socket (4.50 lg.)
13	391 2881 246	2	Seal, O-Ring (0.95 OD x 0.76 ID)
14	391 2383 160	1	Plunger
15	391 2383 161	1	Plunger
16	391 2881 156	2	Seal, O-Ring (0.44 OD x 0.30 ID)
17	391 1431 116	2	Setscrew (1/2-20 x 1.25 lg.)
18	391 1453 035	2	Jam Nut

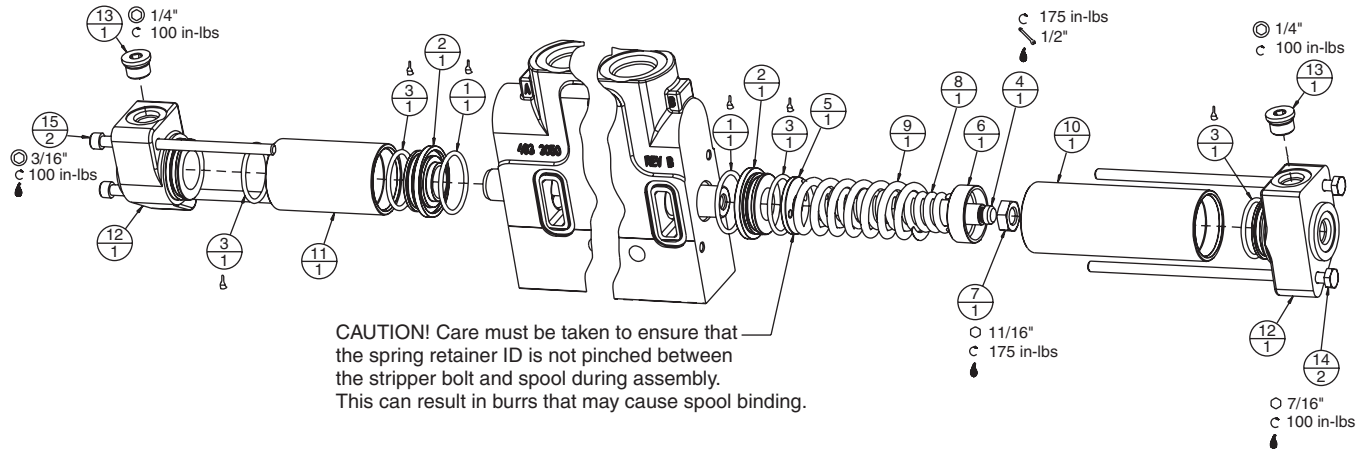


- Wrench
- Phillips Screw
- Slotted Screw
- Hex Head
- Socket Head
- Tightening Torque ± 10%
- Locking Fluid per H.E. Std. 35-20
- Oiled
- Greased
- Parker "O-Lube"

**Float Hydraulic Pilot
Positioner Service Kit 463 9000 016**

**Seal Service Kit 396 1823 176
includes items in bold text.**

**Seal Service Kit for Entire Section
396 1823 220**



Item	Part Number	Qty	Description
1	391 2881 625	2	Seal, O-Ring (1.51 OD x 1.30 ID)
2	391 3384 243	2	Seal, Retainer
3	391 2881 242	4	Seal, O-Ring (1.44 OD x 1.24 ID)
4	391 1401 648	1	Stripper Bolt
5	391 3782 133	1	Washer
6	391 1642 128	1	Spring Retainer
7	391 1453 013	1	Jam Nut
8	391 3581 988	1	Spring
9	391 3581 987	1	Spring
10	391 3384 217	1	Tube
11	391 3384 216	1	Tube
12	341 6011 932	2	End Cap
13	391 2281 012	2	Tube Plug, 3/8 OD
14	391 1425 421	2	Capscrew, 1/4-20 x 6.25 lg.
15	391 1401 355	2	Capscrew, Hex Socket (4.50 lg.)

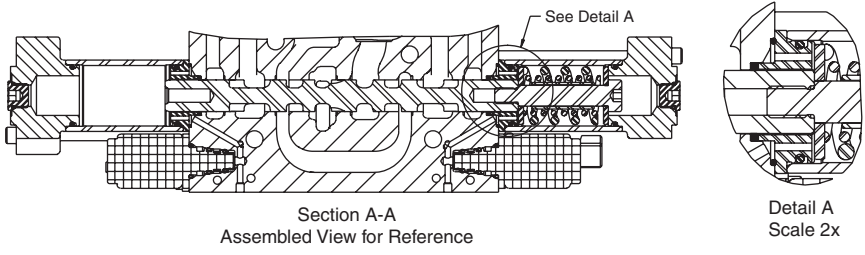
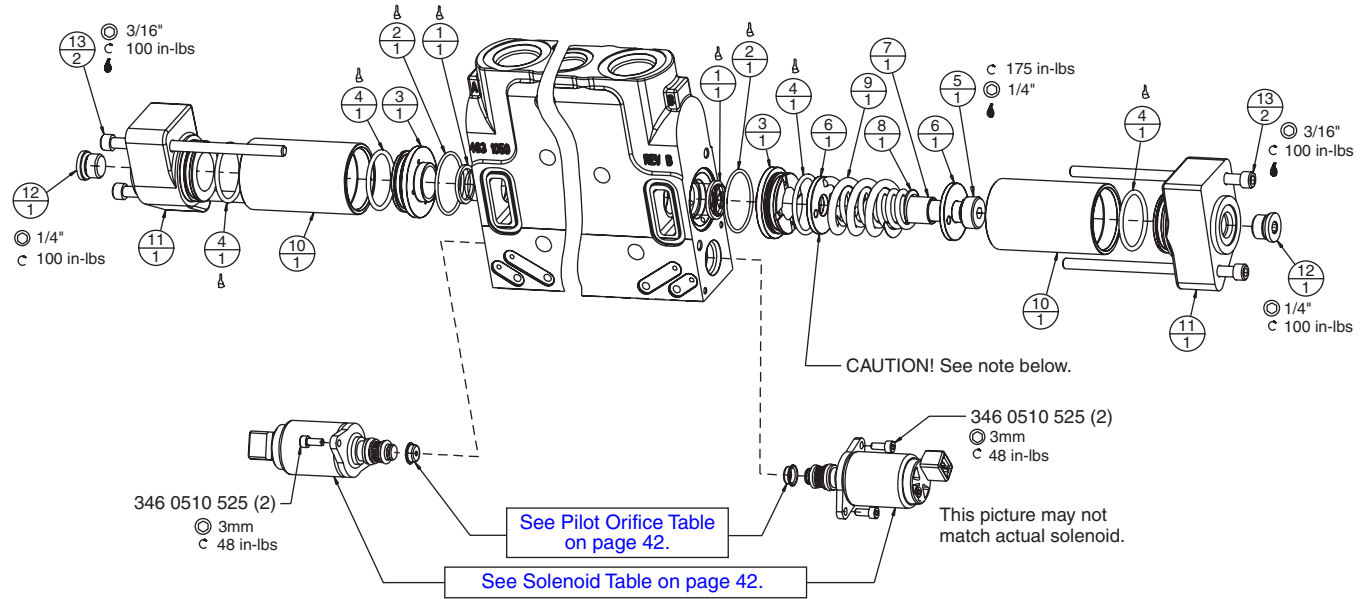
Item # Quantity Required

- Wrench
- Phillips Screw
- Slotted Screw
- Hex Head
- Socket Head
- Tightening Torque ± 10%
- Locking Fluid per H.E. Std. 35-20
- Oiled
- Greased
- Parker "O-Lube"

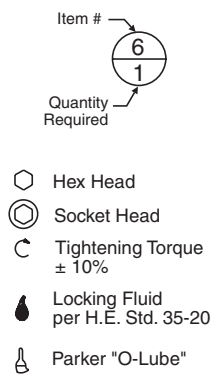
**3-Position Solenoid
Positioner Service Kit 463 9000 017**

**Seal Service Kit 396 1823 177
includes items in bold text.**

**Seal Service Kit for Entire Section
396 1823 221**



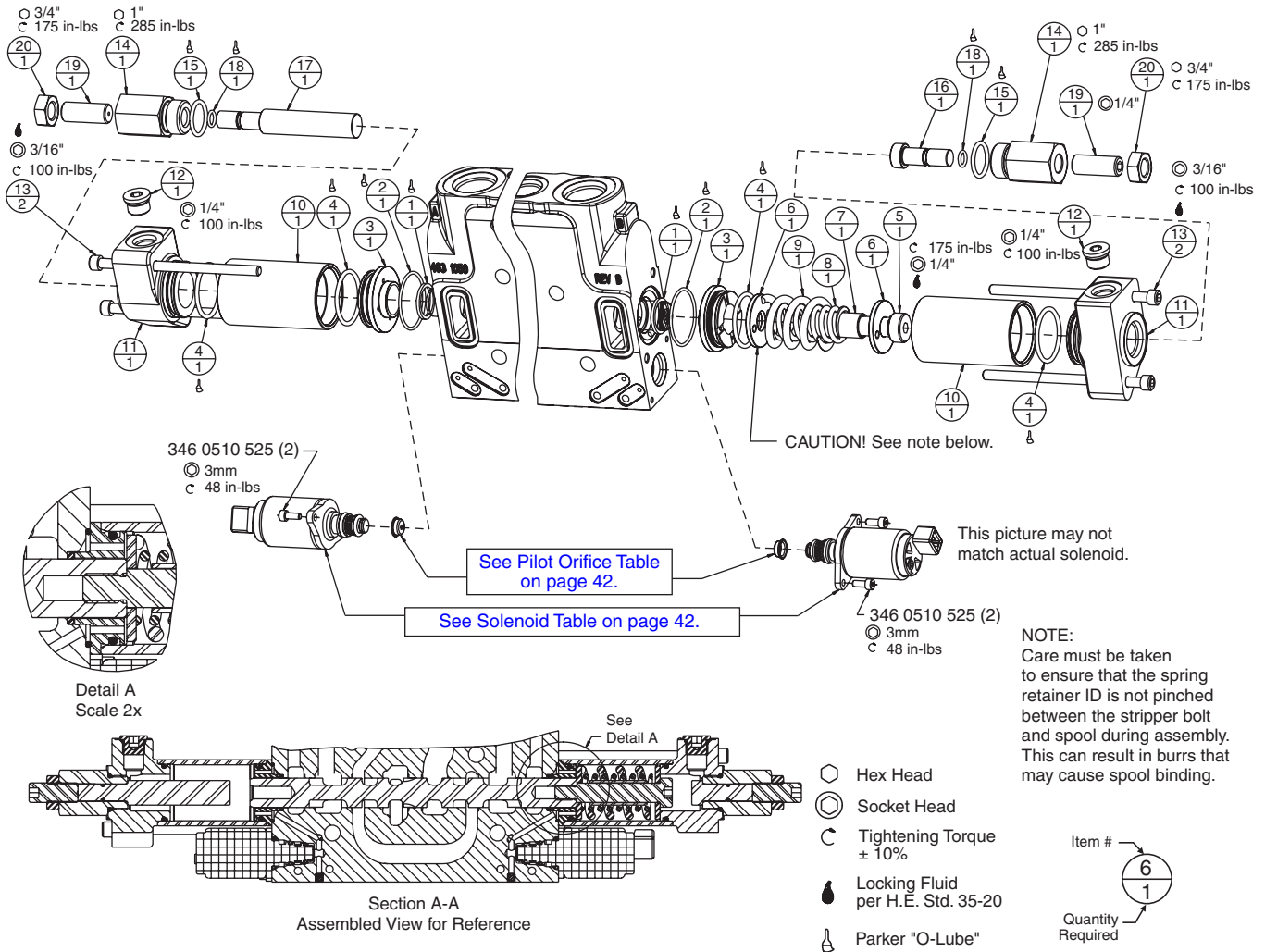
Item	Part Number	Qty	Description
1	396 2681 021	2	Back-Up Ring
2	391 2881 236	2	Seal, O-Ring (1.50 OD x 1.36 ID)
3	396 3384 057	2	Seal Retainer
4	391 2881 242	4	Seal, O-Ring (1.44 OD x 1.24 ID)
5	391 1401 450	1	Stripper Bolt
6	391 3782 133	2	Washer
7	391 3384 300	1	Tube
8	391 3581 764	1	Spring
9	391 3581 765	1	Spring
10	391 3384 216	2	Tube
11	341 6010 100	2	End Cap
12	391 2281 012	2	Tube Plug, 3/8 OD
13	391 1401 355	4	Capscrew, Hex Socket (4.50 lg.)



**3-Position Solenoid with Stroke Limiters
 Positioner Service Kit 463 9000 026**

**Seal Service Kit 396 1823 177
 includes items in bold text.**

**Seal Service Kit for Entire Section
 396 1823 221**



Item	Part Number	Qty	Description
1	396 2681 021	2	Back-Up Ring
2	391 2881 236	2	Seal, O-Ring (1.50 OD x 1.36 ID)
3	396 3384 057	2	Seal Retainer
4	391 2881 242	4	Seal, O-Ring (1.44 OD x 1.24 ID)
5	391 1401 450	1	Stripper Bolt
6	391 3782 133	2	Washer
7	391 3384 300	1	Tube
8	391 3581 764	1	Spring
9	391 3581 765	1	Spring
10	391 3384 216	2	Tube

Item	Part Number	Qty	Description
11	341 6011 933	2	End Cap
12	391 2281 012	2	Tube Plug, 3/8 OD
13	391 1401 355	4	Capscrew, Hex Socket (4.50 lg.)
14	391 0681 256	2	Cartridge
15	391 2881 246	2	Seal, O-Ring (0.95 OD x 0.76 ID)
16	391 2383 160	1	Plunger
17	396 2383 038	1	Plunger
18	391 2881 156	2	Seal, O-Ring (0.44 OD x 0.30 ID)
19	391 1431 116	2	Setscrew, 1/2-20 x 1.25 lg.
20	391 1453 035	2	Jam Nut

Solenoid Valves

Part Number	ID Number	Voltage	Connector	Pressure	Spool Bleed	Manual Override	On/Off Diode	Viton
3767729	61901	24V	AMP Jr.	25/50 Bar	yes	no	no	yes
3767646	61802	12V	Deutsch	25/50 Bar	yes	no	no	no
3767647	61801	24V	Deutsch	25/50 Bar	yes	no	no	no
396 4101 033	61302	12V	AMP Jr.	25/50 Bar	yes	no	no	no
396 4101 032	61301	24V	AMP Jr.	25/50 Bar	yes	no	no	no
396 4101 031	58401	24V	AMP Jr.	25/50 Bar	yes	yes	no	no
396 4101 030	58402	12V	AMP Jr.	25/50 Bar	yes	yes	no	no
396 4101 024	63802	12V	AMP Jr.	25/50 Bar	no	no	yes	no

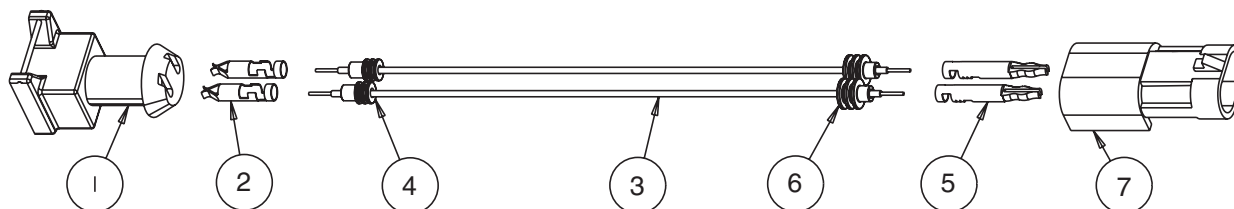
Solenoid Pilot Orifice

Orifice Dia.	Part Number	ID Spots
0.45 mm	3764310	11
0.6 mm	3762396	1
0.7 mm	3764762	12
0.8 mm	3762397	2
0.9 mm	3762910	10
1.0 mm	3762398	3
1.1 mm	3762609	4

Orifice Dia.	Part Number	ID Spots
1.2 mm	3762399	5
1.3 mm	3762610	6
1.4 mm	3762400	7
1.5 mm	3762611	8
2.0 mm	3762612	9
3.0 mm	3763308	–

Jumper Kit 396 1823 417

Kit will connect a solenoid with an AMP connector to a Weatherpack connector on a machine.



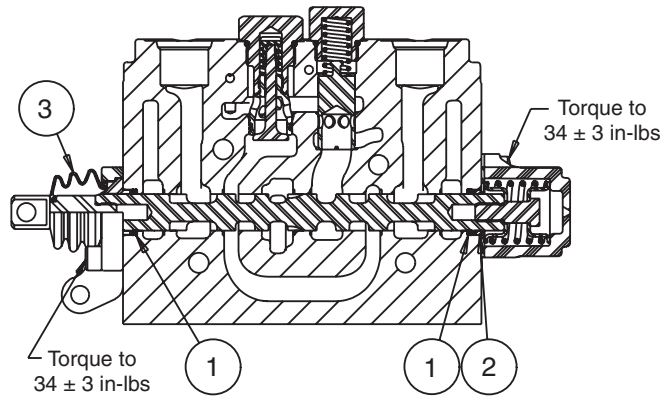
NOTES:

- 1 Use crimp tools 391 4101 381 and 391 4101 382 for assembly of AMP Jr. timer connector.
- 2 Use crimp tool 391 4101 261 for assembly of Packard connector.

Item	Part Number	Qty	Description
1	391 4101 378	1	Conn / Elec / Hsg, Plastic
2	391 4101 379	2	Conn / Elec / Terminal
3	391 4101 394	2	18 Ga. Wire, 6 in. lg.
4	391 4101 380	2	Wire Grommet
5	391 4101 191	2	Male Wire Terminal
6	391 4101 189	2	Wire Grommet
7	391 4101 190	1	Plastic Housing

Seal Kit 396 1823 174, All 3 and 4-Position Manual Positioners

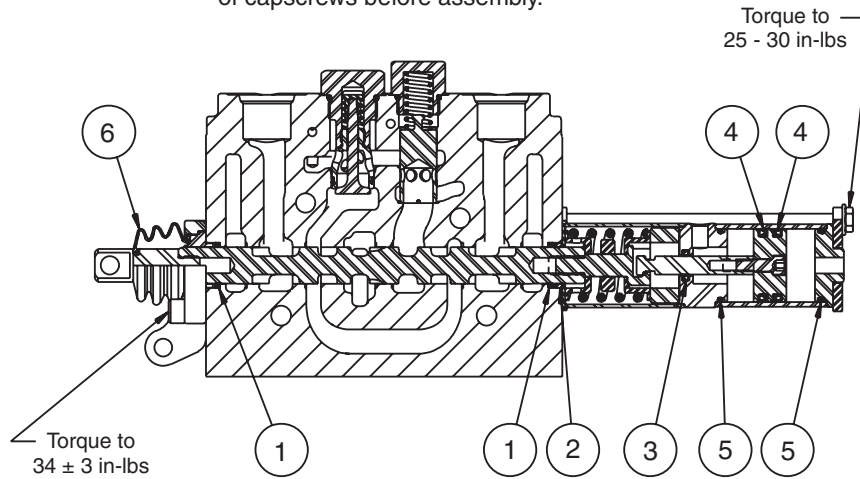
Apply 2-3 drops of Loctite "262" (Red) to female threads of capscrews before assembly.



Item	Part Number	Qty	Description
1	391 1985 014	2	Quad Seal
2	391 2681 378	2	Back-Up Ring (Spare for Type 2 End)
3	396 4041 013	1	Boot, Spool
4	391 1203 002	1	Grommet (4th Pos. Float)

Seal Kit 396 1823 178, All Pneumatic Positioners

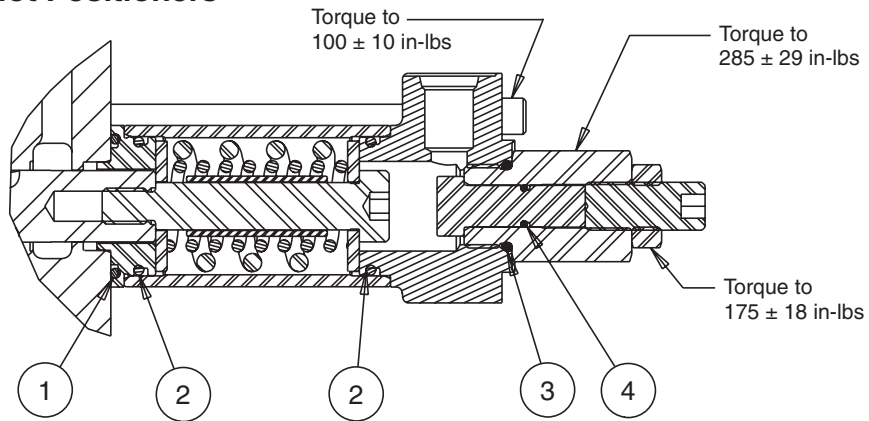
Apply 2-3 drops of Loctite "262" (Red) to female threads of capscrews before assembly.



Item	Part Number	Qty	Description
1	391 1985 014	2	Quad Seal
2	391 2681 378	2	Back-Up Ring (Spare for Type 2 End)
3	391 2883 165	1	Wiper Seal
4	391 2883 164	2	Wiper Seal
5	391 2881 625	2	Seal, O-Ring (1.51 OD x 1.30 ID)
6	396 4041 013	1	Boot

Seal Kit 396 1823 176
All Hydraulic Remote Pilot Positioners

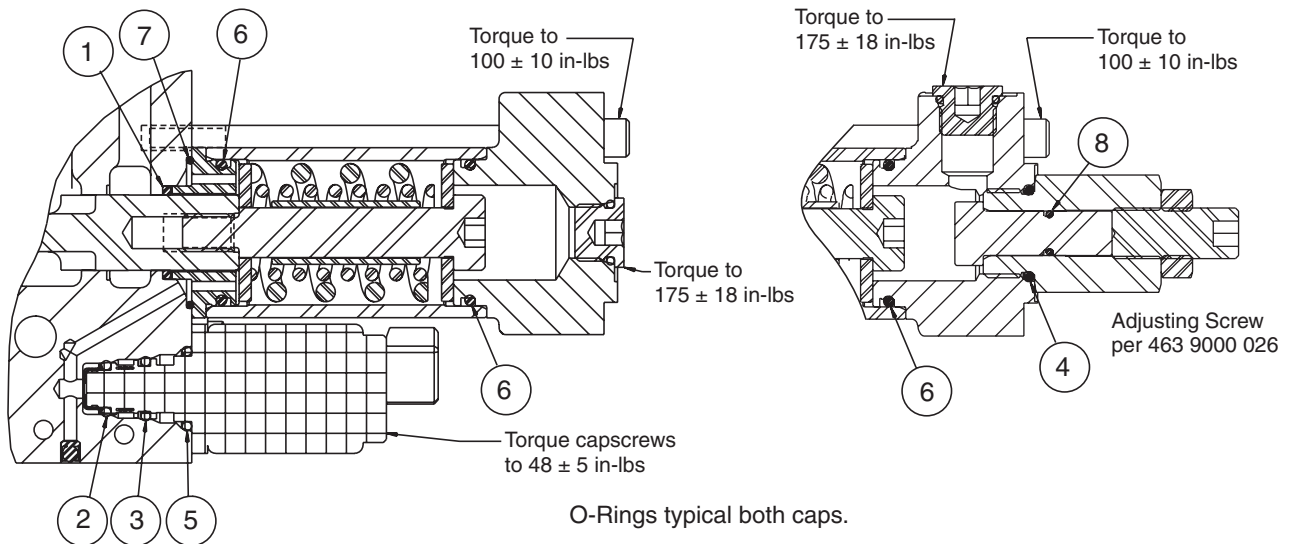
NOTE:
Stroke limiters available only
on 3 position operators.



O-Rings typical both caps.

Item	Part Number	Qty	Description
1	391 2881 625	2	Seal, O-Ring (1.51 OD x 1.30 ID)
2	391 2881 242	4	Seal, O-Ring (1.44 OD x 1.24 ID)
3	391 2881 246	2	Seal, O-Ring (0.95 OD x 0.76 ID)
4	391 2881 156	2	Seal, O-Ring (0.44 OD x 0.30 ID)

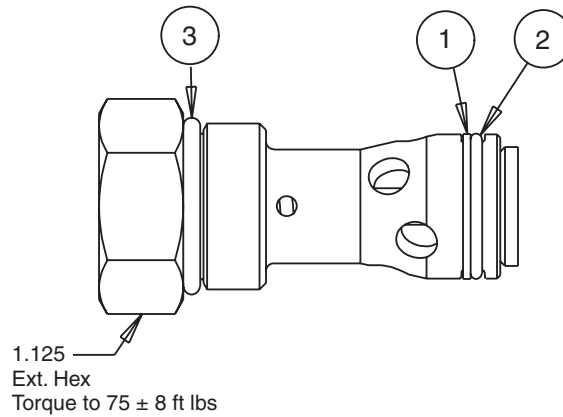
Seal Kit 396 1823 177
All Solenoid (EH) Positioners



O-Rings typical both caps.

Item	Part Number	Qty	Description
1	396 2681 021	2	Back-Up Ring
2	346 0510 660	2	Seal, O-Ring (0.52 OD x 0.33 ID)
3	346 0510 659	2	Seal, O-Ring (0.59 OD x 0.40 ID)
4	391 2881 246	2	Seal, O-Ring (0.95 OD x 0.76 ID)
5	346 0510 658	2	Seal, O-Ring (0.79 OD x 0.60 ID)
6	391 2881 242	4	Seal, O-Ring (1.44 OD x 1.24 ID)
7	391 2881 236	2	Seal, O-Ring (1.51 OD x 1.30 ID)
8	391 2881 156	2	Seal, O-Ring (0.44 OD x 0.30 ID)

**Reverse Flow Check
Seal Kit 396 1823 110**



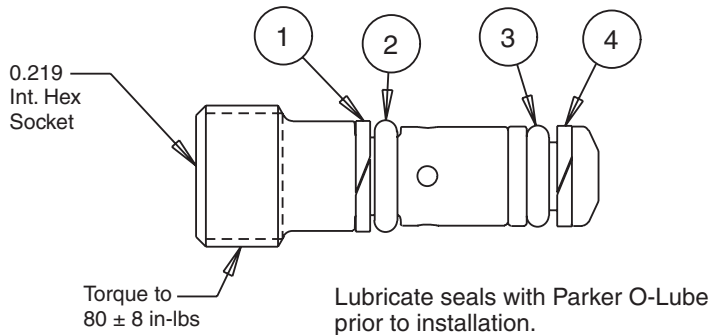
Item	Part Number	Qty	Description
1	396 2681 017	1	Ring, Backup (0.88 OD x 0.78 ID) Peek
2	346 0500 222	1	Seal, O-Ring (0.88 OD x 0.74 ID)
3	391 2881 207	1	Seal, O-Ring (1.07 OD x 0.86 ID)

**Load Sense Check
Seal Kit 396 1823 111**

NOTE:

It is strongly recommended that instead of servicing seals, the entire check be replaced.

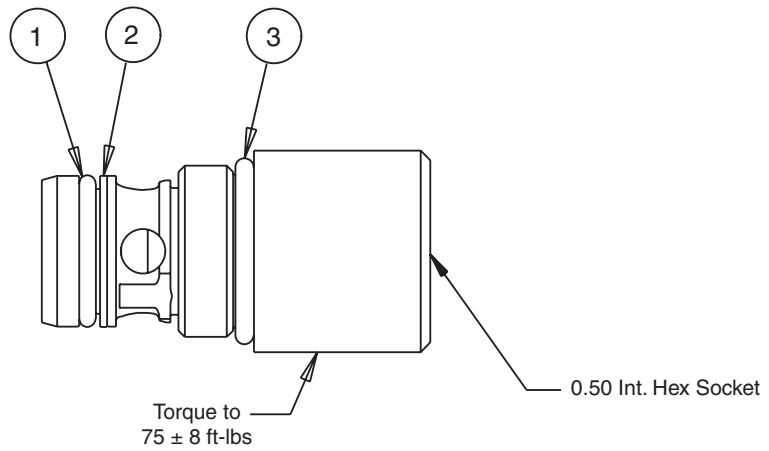
Install with continuous clockwise motion.
Do not ratchet.



Item	Part Number	Qty	Description
1	391 2681 593	1	Ring, Back-Up (0.34 OD x 0.25 ID)
2	391 2882 192	1	Seal, O-Ring (0.35 OD x 0.21 ID)
3	391 2881 322	1	Seal, O-Ring (0.31 OD x 0.18 ID)
4	396 2681 018	1	Ring, Back-Up (0.31 OD x 0.22 ID) Peek

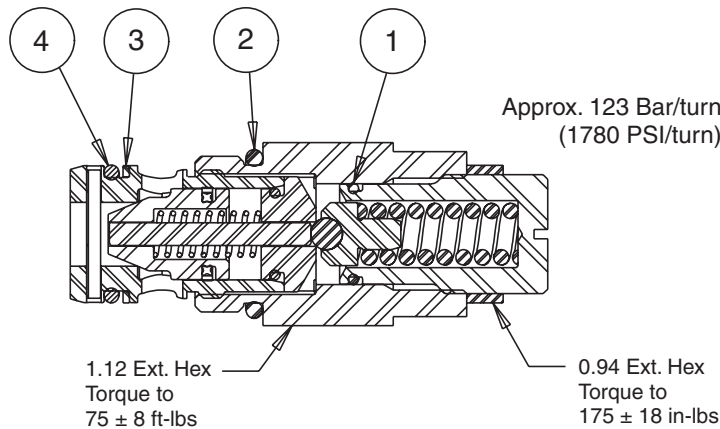
**Anti-Cavitation Check
Seal Kit 396 1823 116**

Lubricate seals with Parker
O-Lube prior to installation.



Item	Part Number	Qty	Description
1	391 2881 333	1	Seal, O-Ring (0.94 OD x 0.74 ID)
2	391 2681 542	1	Back-Up Ring, Peek
3	391 2881 204	1	Seal, O-Ring (1.15 OD x 0.92 ID)

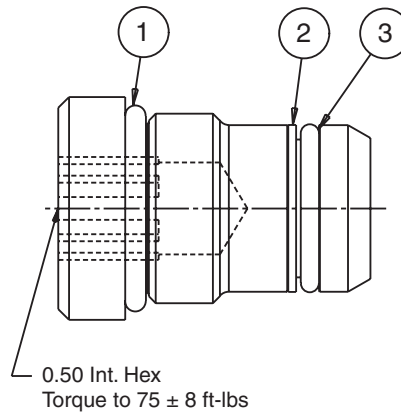
RV + AC Seal Kit 396 1823 172



Lubricate seals with Parker O-Lube prior to installation.

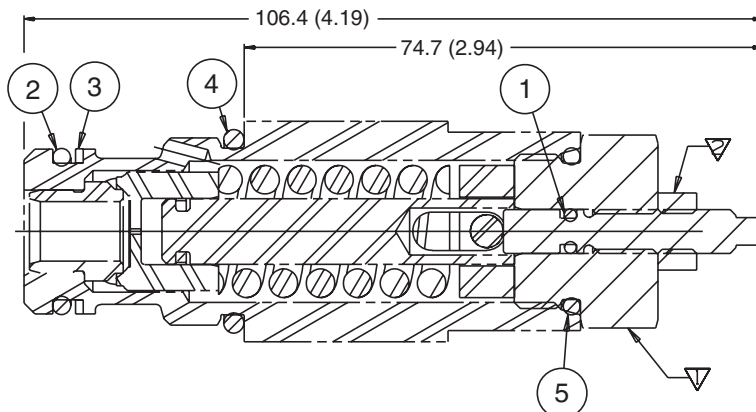
Item	Part Number	Qty	Description
1	391 2881 801	1	Seal, O-Ring (0.69 OD x 0.55 ID)
2	291 2881 204	1	Seal, O-Ring (1.15 OD x 0.92 ID)
3	391 2681 542	1	Back-Up Ring, Peek
4	391 2881 333	1	Seal, O-Ring (0.94 OD x 0.74 ID)

RV Plug Seal Kit 396 1823 116



Item	Part Number	Qty	Description
1	391 2881 204	1	Seal, O-Ring (1.15 OD x 0.92 ID)
2	391 2681 542	1	Back-Up Ring, Peek
3	391 2881 333	1	Seal, O-Ring (0.94 OD x 0.74 ID)

**Relief Valves with Screw Adjustment
Seal Kit 396 1823 158**



NOTES:

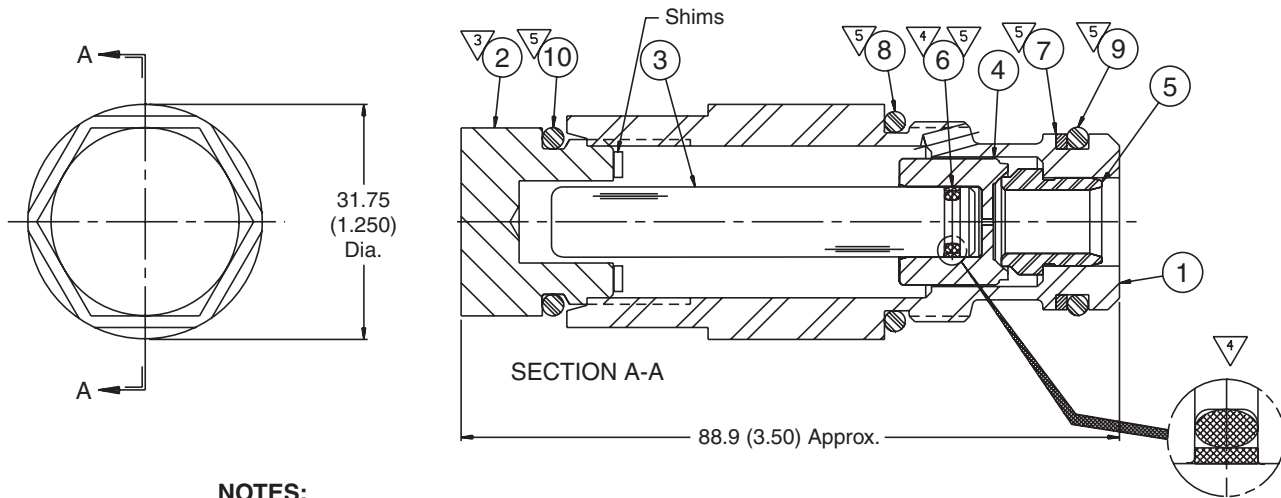
- 1 Torque cap to 45 ft-lbs.
- 2 Reference – Locknut to be torqued to 35 ± 5 in-lbs when setting RV.

Item	Part Number	Qty	Description
1	391 2881 211	1	O-Ring
2	391 2881 333	1	Seal, O-Ring (0.74 ID x 0.94 OD)
3	391 2681 542	1	Back-Up Ring, Peek
4	391 2881 204	1	Seal, O-Ring (1.15 oD x 0.92 ID)
5	391 2881 246	1	Seal, O-Ring (0.95 OD x 0.76 ID)

Adjustment

Pressure Range	PSI per Turn	Bar per Turn
500-1250 PSI (35-86 Bar)	380	26
1251-2650 PSI (86-183 Bar)	522	36
2651-3900 PSI (183-269 Bar)	752	52

**Relief Valves with Shim Adjustment
Seal Kit 391 1823 173**



NOTES:

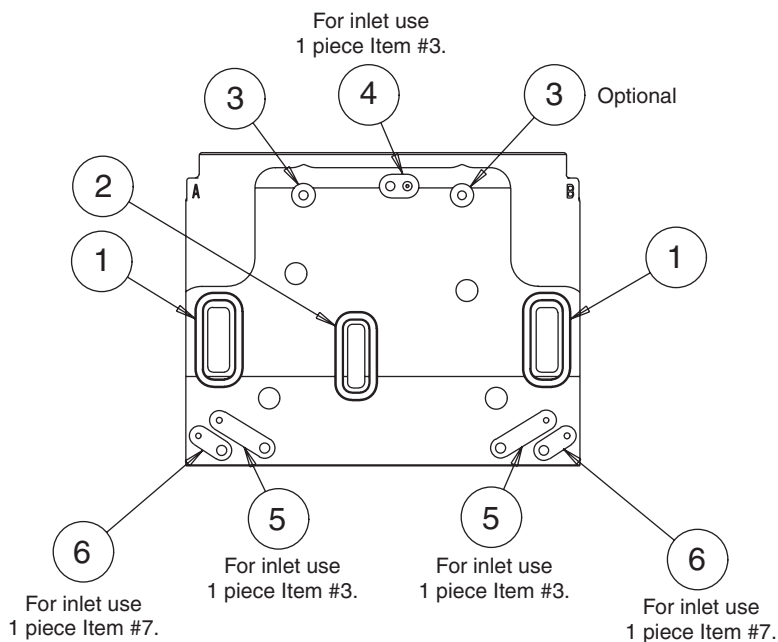
- 1 Press seat, Item #5 into cartridge, Item #1 with 400 lbs of force.
- 2 Seat poppet, Item #4 into seat, Item #5 with 2000 lbs of force.
- 3 Torque to 600 ±60 in-lbs.
- 4 Item #6, 391 2681 533, is a 2-piece seal consisting of a “Shamban” glyd-ring and o-ring.
- 5 All seals must be installed using a bullet guide.
- 6 External seals must be protected with plastic mesh tube.
- 7 Do not use above 150 LPM (40 GPM).

Item	Part Number	Qty	Description
1	391 0681 055	1	Cartridge
2	391 0585 070	1	Cap
3	391 2383 116	1	Plunger
4	391 2383 117	1	Poppet, Floating
5	391 2383 034	1	Seat, Poppet
6	391 2681 533	1	Ring, Glyd
7	391 2681 542	1	Ring, Back-Up, Peek
8	391 2881 204	1	Seal, O-Ring
9	391 2881 333	1	Seal, O-Ring
10	391 2881 246	1	Seal, O-Ring

Adjustment

Setting Range	Shim (Slug) Thickness	PSI/Shim	Bar/Shim
500-1000 PSI (35-69 Bar)	0.005"	40	2.8
	0.015"	122	8.4
	0.062"	502	34.6
1001-2500 PSI (69-172 Bar)	0.005"	56	3.9
	0.015"	168	11.6
	0.062"	694	47.9
2501-3500 PSI (172-241 Bar)	0.005"	74	5.1
	0.015"	222	15.3
	0.062"	918	63.3

Interface Seal Kit 396 1823 175



Item	Part Number	Qty	Description
1	391 2881 206	2	Square Section Seal (1.50 OD x 1.30 ID)
2	396 2881 023	1	Seal, O-Ring (1.38 OD x 1.17 ID)
3	396 2881 022	5	Seal, O-Ring (0.44 OD x 0.24 ID)
4	391 2881 328	1	Seal, O-Ring (0.63 OD x 0.42 ID)
5	391 2881 642	2	Seal, O-Ring (1.00 OD x 0.80 ID)
6	391 2881 329	2	Seal, O-Ring (0.69 OD x 0.49 ID)
7	391 2881 330	2	Seal, O-Ring (0.76 OD x 0.55 ID)

Symptom	Likely Cause(s)	What to Do to Correct the Problem
Valve will not build pressure	No orifice in vent plug in inlet	Install orifice plug
	No ball in LS check	Replace checks
	Spool not fully stroked	Check pilot signal, check spool stroke, if EH clean/replace 463 9000 008
Valve stays on pressure	Orifice in vent plug in inlet restricted	Clean or replace orifice or vent plug
Insufficient pressure	RV (workport, LS, clipper, other) set too low	Reset/clean or replace
	AC will not fully close	Clean/replace
Insufficient flow	Spool not fully stroked	Check pilot signal, check spool stroke, if EH clean/replace 463 9000 008
	Low margin pressure	Check/increase if possible
	LS signal not getting to pump	Check PSI at both ends of line
	LS signal to pump line leak	Check PSI at both ends of line – should be same, eliminate pump vent
	Workport accessory leak.	Check/clean or replace
Function drift down prior to raise	Poppet does not seat well – reverse flow or comp. (PCLS) or load check (LS)	Check/clean or replace poppet/section
	Spool position error	Check pilot signal, check spool stroke if possible
Function drift down	Workport accessory leak.	Check/clean or replace
	Spool position error	Check pilot signal, check spool stroke if possible
	Spool or bore quality	Visual inspection
Function does not stop completely	Spool position error	Check pilot signal, check spool stroke if possible
Slow response	Slow spool actuation	Check pilot strength
	Slow LS signal creation	Check that LS checks have balls, check/clean replace LS vent
	Slow LS signal transmission	Check/replace LSRV, FLO. Check that there is no psi drop in LS line.
	Slow workport accessory closure	Check/clean or replace
	Main spool sticky	Check/clean or replace section
	Compensator, reverse flow, or load check poppets sticky	Check/clean or replace section
Slow steering or other added function	Excessive internal LS leakage	Check/clean/replace LS RV, LS checks, LS vent
Noise	More than one RV active (chatter)	Clean/replace, change setting(s)
Function movement erratic	Main spool sticky	Check/clean or replace section
	AC will not fully close	Check/clean or replace
	Compensator, reverse flow, or load check poppets sticky	Check/clean or replace section
Valve pressure exceeds LS RV setting	LS RV screen plugged or FLO plugged	Check/clean or replace

SHEET 1 DE 1

REVISION	
Date	
App.	
Replace	

P/N

CUSTOMER _____ **APPLICATION** _____
 CITY: _____ STATE: _____ CUSTOMER NUMBER: _____
 DATE: _____ FILLED BY: _____

SYSTEM ATTRIBUTES

POS	DESCRIPTION	CODE
[01] Valve Type	POLS, LS	
[04] Port Type	U (UNF), G (BSPP)	
[05] System Voltage	12 V, 24 V	
[06] Connector Type	Weatherpak, AMP, Deutsch	
[07] Surface Treatment	No paint, black	
[08] Customer ID	enter number	number is code

STACK POS	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	# 10	# 11	# last	
	INLET												
pos	description	Code											
15	Type of Inlet												
16	Clipper relief cavity												
17	Pressure setting (PSI)												
26	Top inlet HP port												
27	Side inlet HP port												
	P/N SECTION												
	P/N MCH, CAST												
	WORK SECTION												
pos	description	Code											
46	Size of Workports												
50	Spool operator												
51	Lever Bracket/handle												
55A	Pilot orifice, A end												
55B	Pilot orifice, B end												
56A	Sol. pilot orifice, A end												
56B	Sol. pilot orifice, B end												
57	Diode (A and B)												
60	Spool function												
61A	Flow setting at port A												
61B	Flow setting at port B												
68	Reverse flow check												
70	Spool flow rate (A and B)												
76A	Workport acc. at A												
76B	Workport acc. at B												
	P/N SECTION												
	P/N MACH, CAST												
	OUTLET												
pos	description	Code											
31	Top LS IN port												
33	Top Tank connection												
34	Side Tank connection												
41	LS RV cavity												
43	LS RV setting												
	P/N SECTION												
	P/N MCH, CAST												
	REVISIONS												
rev.	date	doc	app										
A													
B													
C													
D													
E													
F													
G													
	TEST STANDARD:												
	2,003,337												
	PAINTING												
	Manual lever												
	CONNECTION PORT A												
	CONNECTION PORT B												
	ASSEMBLING KIT												

REMARKS:

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2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

4. Warranty: Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of 18 months from date of shipment from Parker Hannifin Corporation. **THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED. NOTWITHSTANDING THE FOREGOING, THERE ARE NOWARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGNS OR SPECIFICATIONS.**

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7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter,

discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

8. Buyer's Property: Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property, Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. Indemnity For Infringement of Intellectual Property Rights: Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. Patents, U.S. Trademarks, copyrights, trade dress and trade secrets (hereinafter 'Intellectual Property Rights'). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter 'Events of Force Majeure'). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government authority, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

9/91-P

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Parker Hannifin Corporation
Hydraulic Valve Division
520 Ternes Avenue
Elyria, Ohio 44035 USA
Tel: (440) 366-5200
Fax: (440) 366-5253
www.parker.com/hydraulicvalve

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