

GRESEN®

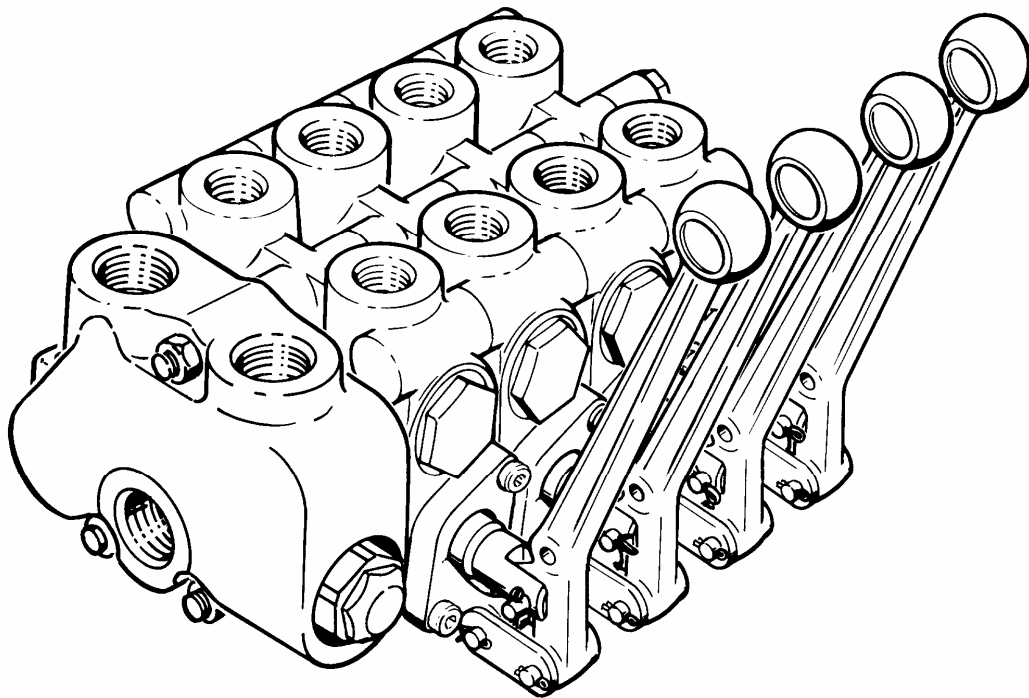


Model V20

Sectional Body

Directional Control Valve

Service and Parts Manual



| | |
|-------------------------------------|---------------------------|
| Maximum Operating Pressure: | 3500 PSI (242 bar) |
| Minimum Filtration Required: | 10 Micron |

The information in this Service Manual was current at the time of publication. This information is subject to change at any time without notice.

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V20 Work Section Housing Identification

Warning

There is a visual similarity between Gresen's Model V20 Directional Control Valve closed center and open center work sections. Work sections for these two valve assemblies should NEVER be intermixed or interchanged without prior consultation with the factory.

Intermixing a V20C, V20LS or V20PC closed center section with a V20P, V20T or V20S work section will convert the complete valve bank to closed center operation and in some cases, could render the valve assembly inoperable and cause damage to components in the hydraulic circuit.

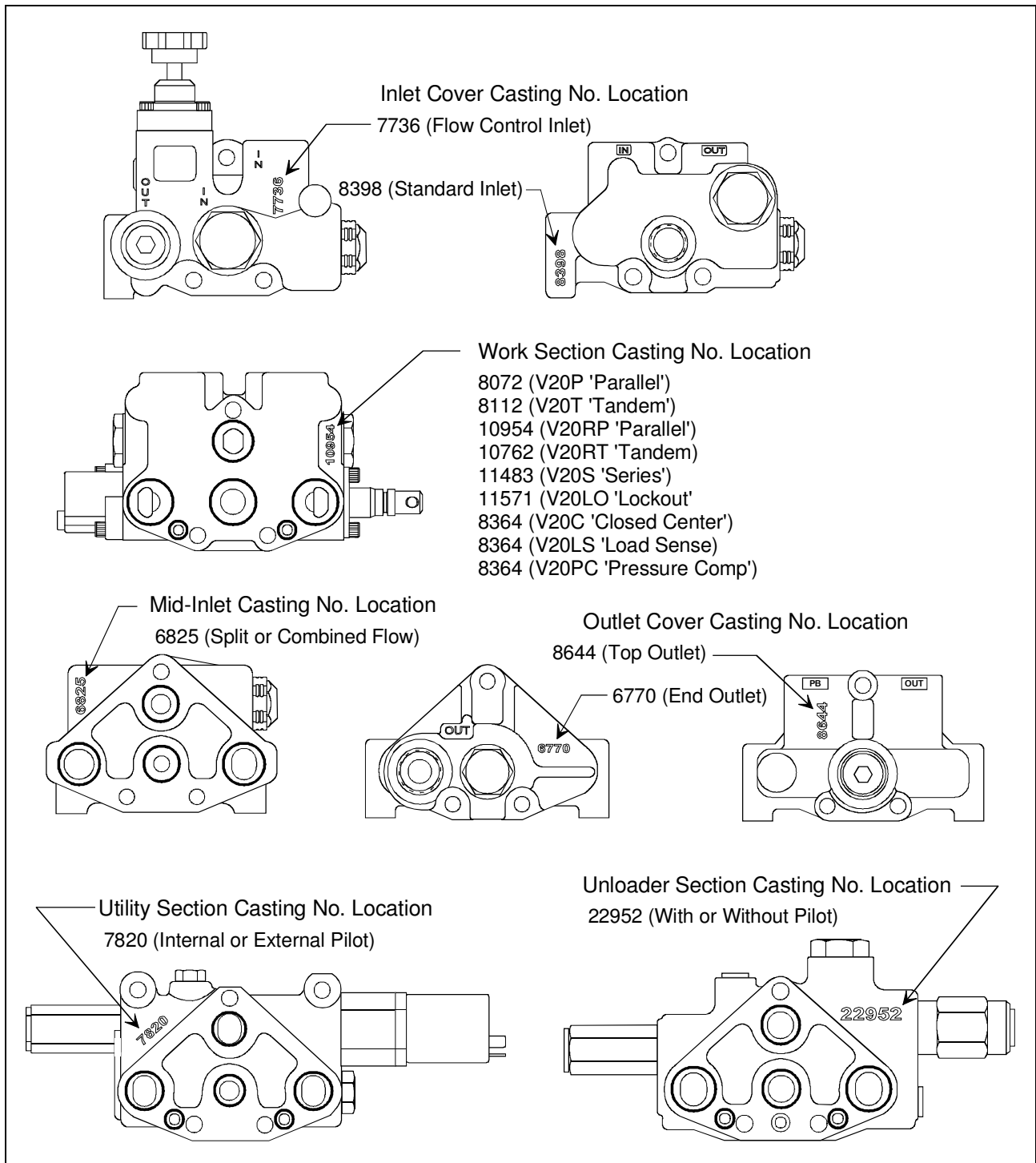


Figure 1. Casting Identification Numbers

K-61XX Assembly Stud Kits

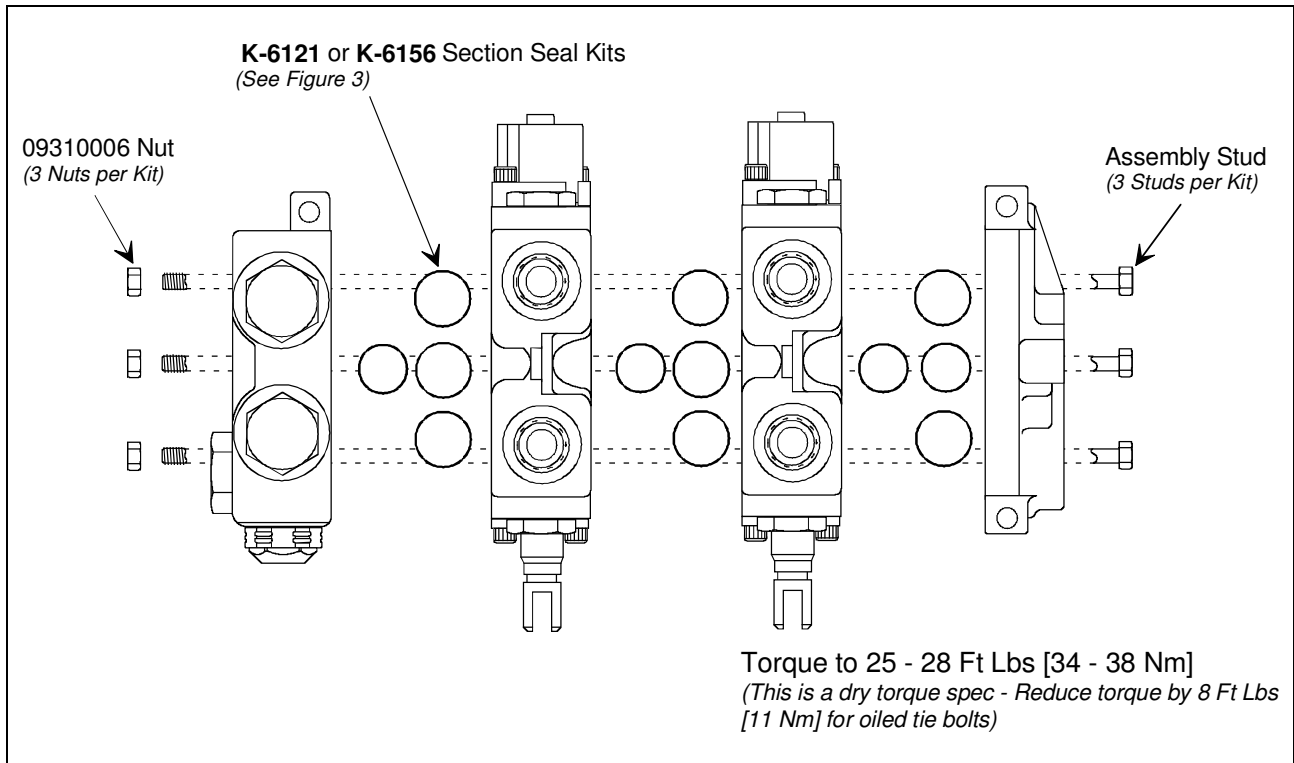


Figure 2. K-61XX Stud Kit Components

| Kit No. and Description | | Number of Mid Sections Using: | | Tie Bolts and Nut Part Numbers | |
|-------------------------|---------------|-------------------------------|-----------------|--------------------------------|---------------------|
| Part Number | Kit No. | No. 6770 Outlet | No. 8644 Outlet | Bolt No. (3) per Kit | Nut No. (3) per Kit |
| 12807001 | K-6104 | One Section | ---- | 09120124 | 09310106 |
| 12808001 | K-6105 | Two Sections | One Section | 09120129 | 09310106 |
| 12809001 | K-6106 | Three Sections | Two Sections | 09120301 | 09310106 |
| 12810001 | K-6107 | Four Sections | Three Sections | 08100004 | 09310106 |
| 12811001 | K-6108 | Five Sections | Four Sections | 08100005 | 09310106 |
| 12812001 | K-6109 | Six Sections | Five Sections | 08100006 | 09310106 |
| 12813001 | K-6110 | Seven Sections | Six Sections | 08100007 | 09310106 |
| 12814001 | K-6111 | Eight Sections | Seven Sections | 08100008 | 09310106 |
| 12815001 | K-6112 | Nine Sections | Eight Sections | 08100009 | 09310106 |
| 12697001 | K-6113 | Ten Sections | Nine Sections | 08100010 | 09310106 |
| 12816001 | K-6114 | Eleven Sections | Ten Sections | 08100011 | 09310106 |

Notes: When using the 8644 Right End Cover, add one section to assure proper stud length.

Torque Specifications

Replace the stud nuts and torque evenly to 25 - 28 Ft Lbs [34 - 38 Nm]. This is a dry stud torque spec. Reduce torque spec to 18 - 20 Ft Lbs [25 - 27 Nm] for oily studs.

CAUTION

If the stud nuts are not tightened to the proper torque, valve spools may bind or stick, or cause O-Ring seals to extrude.

Section Seal Identificaton and Section Seal Kits

Section Seal Changes

As of April 1, 1991, the section seals for the V20 changed. The new versions have larger cross section (the old was .070, the new is .103) and different configurations for open center and closed center sections. It is important to note that the seal kits include all O-Rings (new and old), therefore there will be some left unused.

WARNING

Do not pre-lube the O-Ring section seals prior to installation. Make sure that the O-Rings and valve counterbores are dry. Compression of lubricants can distort the valve body causing spool bind.

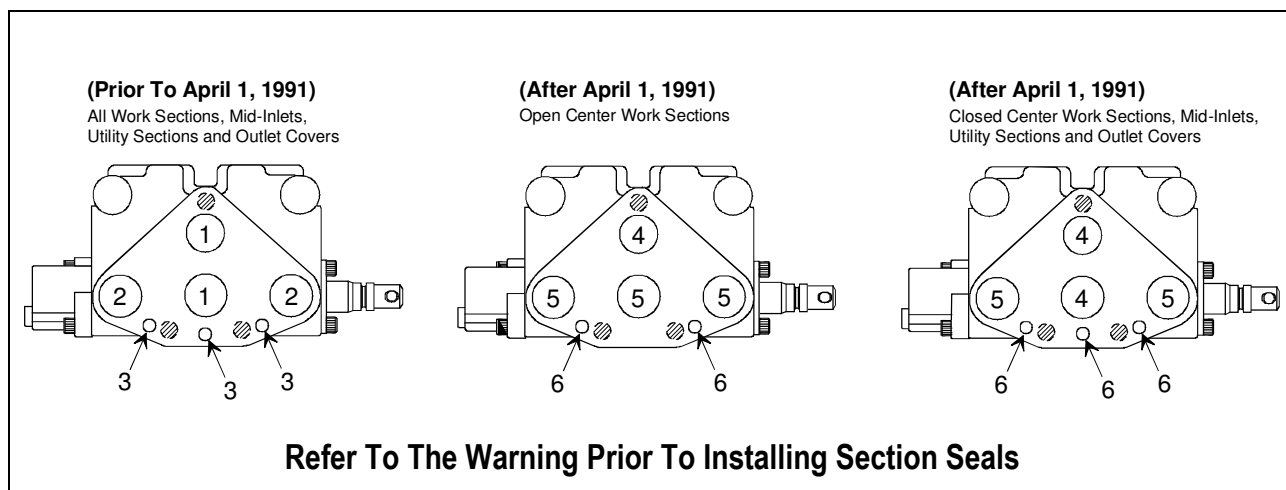


Figure 3. Section Seal Identification

Section Seal Kits

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 08340001 | K-6121 Open Center Section Seal Kit (Includes all Seals Listed Below) ① | |
| | 10749001 | K-6156 Load Sense Section Seal Kit (Includes all Seals Listed Below) ① | |
| 1 | 06814002 | O-Ring Section Seal (Serviced in K-6121 & K-6156 Seal Kits) | 2 |
| 2 | 06815002 | O-Ring Section Seal (Serviced in K-6121 & K-6156 Seal Kits) | 2 |
| 3 | 08316001 | O-Ring Section Seal (Serviced in K-6121 & K-6156 Seal Kits) | 3 |
| 4 | 21857001 | O-Ring Section Seal (Serviced in K-6121 & K-6156 Seal Kits) | 3 |
| 5 | 21733001 | O-Ring Section Seal (Serviced in K-6121 & K-6156 Seal Kits) | 3 |
| 6 | 21866001 | O-Ring Section Seal (Serviced in K-6121 & K-6156 Seal Kits) | 3 |

① **K-6121** and **K-6156** Section Seal Kits include the same seal part numbers. The quantities of seals in each kit are different.

Spool Seal Replacement and Spool Seal Kits

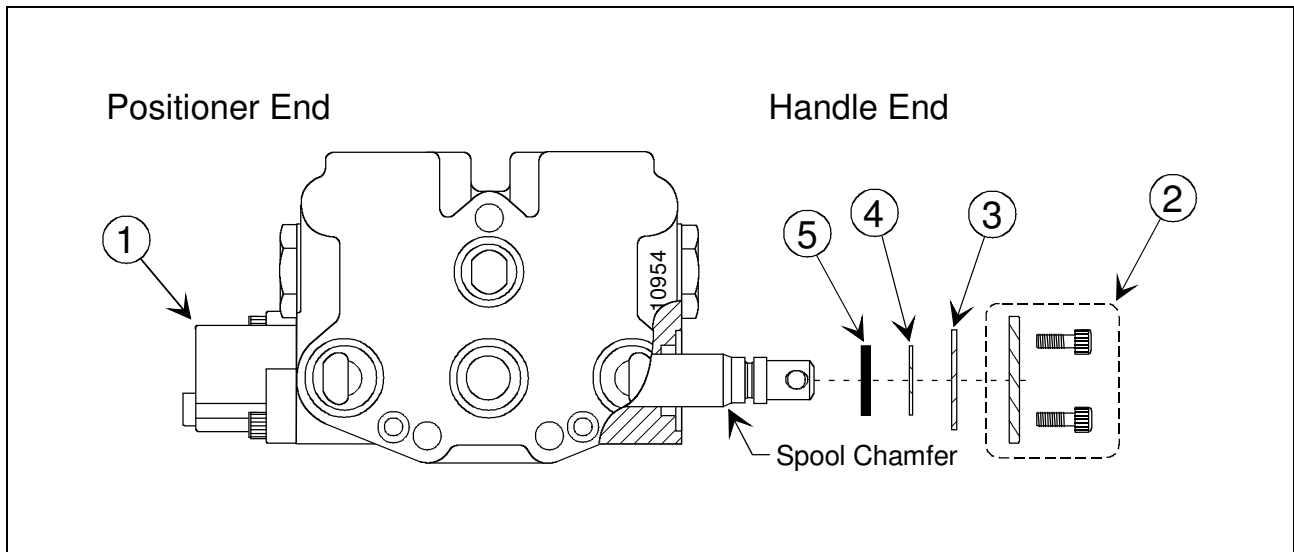


Figure 4. Spool Seal Removal

Warning: DO NOT hold the spool with a pliers or wrench. This will destroy the finish.

Spool Seal Removal

These instructions apply to valves which have been removed from machines. If room permits rebuilding on the machine, first disconnect any lines which could hold pressure or supply oil into the valve assembly. It is recommended to drain the valve prior to rebuilding.

For clarification, the control handle side of the valve is considered the front side. The seal retainer plate (Item 3) is the larger round plate with a hole in the center and two half round notches opposite each other on the outer edge.

1. Remove the bonnet and spool positioner hardware (Item 1) from the back of the work section. Keep parts in order of disassembly. If the work section does not include a handle assembly, prevent the spool from turning or moving by inserting a screw driver through clevis slot, or running a rod through the pin hole and using it as a handle.

2. Remove the complete handle, handle bracket or seal retainer hardware (Item 2) from the front of the work section.

3. Push the spool into the housing from the front of the valve until the front seal is exposed. Since the spool seals can be replaced externally, it is not necessary to remove the spool from the housing. Remove the retainer plate washers (Item 3), back-up washers (Item 4), and spool seals (Item 5).

4. Remove the back seal in the same manner.

Note: The back spool seal is located inside the detent sleeve in V20 Float sections. Refer to **Figures 60 & 61** for parts illustration for float positioner.

5. Remove the bonnet and spool positioner assembly parts (Item 1) from the back of the work section. Keep in order of disassembly.

Spool Seal Replacement and Spool Seal Kits

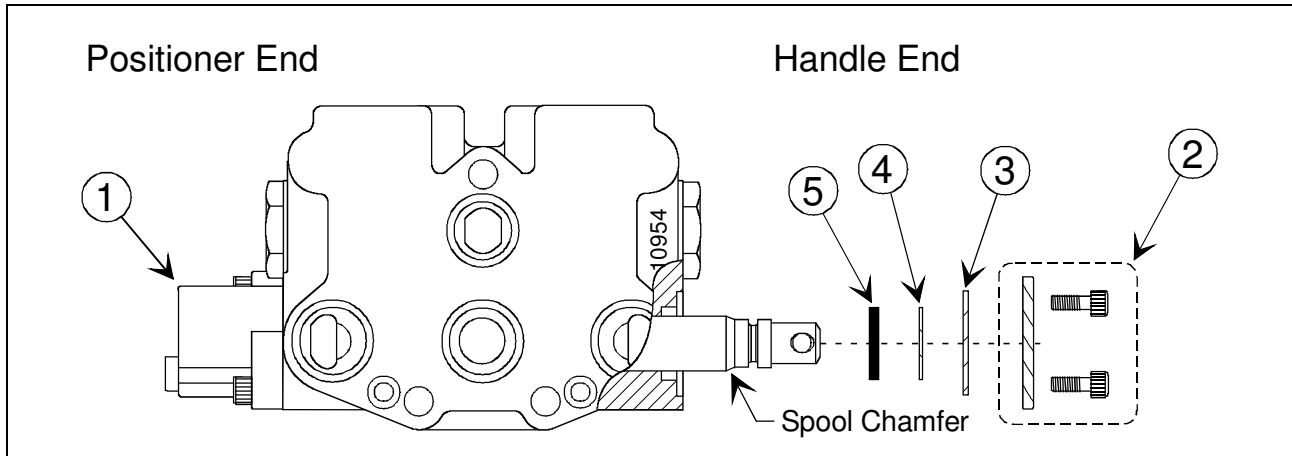


Figure 5. Spool Seal Installation

Spool Seal Kits

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 07385001 | K-6035 Standard Buna-N Spool Seal Kit (Includes Items 4 and 5 Only) | |
| 1 | 12741001 | K-6125 Spool Positioner Assembly (See Figures 52 thru 62 for Positioner Options) | 1 |
| 2 | 12786001 | K-6033 Seal Retainer Assembly (See Figures 96 thru 99 for Handle End Options) | 1 |
| 3 | 06752001 | Seal Retainer Plate | 2 |
| 4 | 03265001 | Back-Up Washer | 2 |
| 5 | 07700001 | Buna-N Spool Seal (Serviced in K-6035 Spool Seal Kit) | 2 |

Spool Seal Installation

Front Spool Seal Installation (O-Ring Spool Seal)

1. Push the spool into the housing from the front side of the valve until the chamfer on the spool is flush with the bottom of the seal gland. Install O-Ring spool seal into the seal gland.
2. Place the new back-up washer (Item 4) over the spool and up against the spool seal.
3. Place the seal retainer plate (Item 3) over the spool and up against the back-up washer. Push firmly into place.
4. Hold the seal retainer plate against the valve body and push the spool from the back side thru the seal approximately 1/4 inch.

Back Seal Installation (Standard 3- and 4-Way Sections)

5. Push the spool into the housing from the back side until the end of the spool is flush with the valve back face, not the bottom of the seal gland. If the spool is pushed in too far, the metering notches and/or spool land may be moved into the seal area on the front end of the valve. If this happens, DO NOT push the spool back into the valve. Disassemble the seal assembly and carefully remove the seal from the spool. Reassemble per Steps 1 thru 4.

6. Install O-Ring spool seal and backup washer into the seal gland in the same manner as in the front side.
7. Reassemble (in reverse order) all hardware disassembled in Steps 1 & 2, **Spool Seal Removal**.

Back Seal Installation (Float Work Sections Only)

(Refer to Figures 60 & 61 for Float Positioner illustration)

5. With the float positioner disassembled from the spool, slip the retainer sleeve over the spool into the counterbore in the valve housing. Slide the spool seal onto the spool and against the retainer sleeve.
6. Install the face seal O-Ring into the spotface in the end of the detent sleeve. Slip the detent sleeve onto the spool, over the spool seal, and up against the valve housing.
7. Reassemble (in reverse order) all hardware disassembled in Steps 1 & 2, **Spool Seal Removal**.

Model V20 Directional Control Valve – Typical Main Assembly

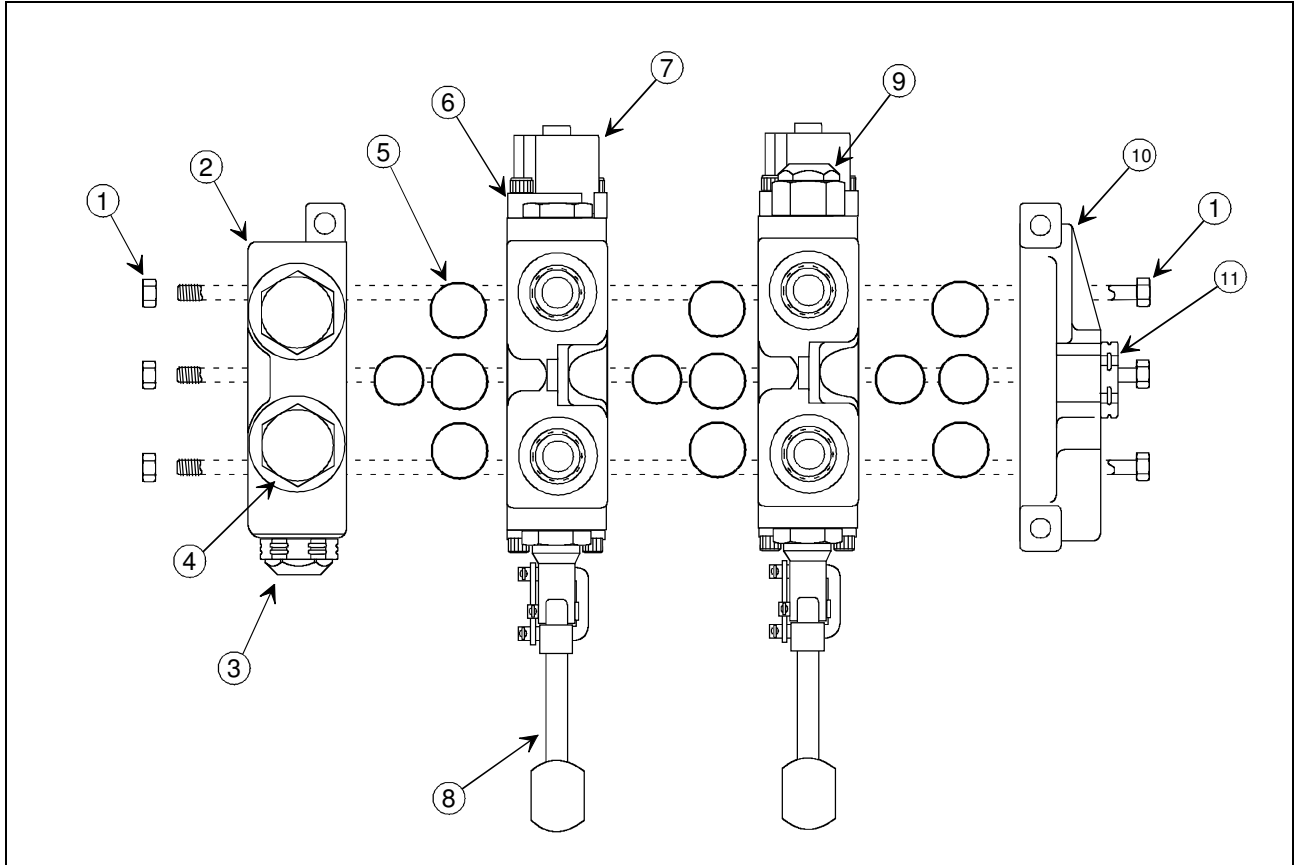


Figure 6. Model V20 Directional Control Valve – Typical Main Assembly

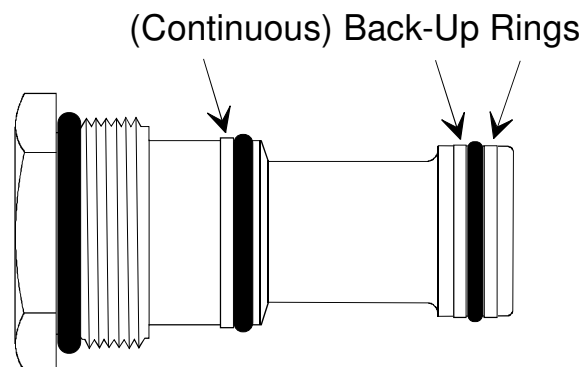
| Ref No. | Description | Refer To Page(s): |
|---------|--|-------------------|
| 1 | Assembly Bolts and Nuts | |
| 2 | Inlet Cover Housing | |
| 3 | Main Relief Cartridge | |
| 4 | Port Plugs | |
| 5 | Section Seals | |
| 6 | Mid Sections/Mid-Inlets/Utility Sections | |
| 7 | Spool Positioners | |
| 8 | Handles | |
| 9 | Work Port Relief Cartridge | |
| 10 | Outlet Cover Housing | |
| 11 | Outlet Cover Conversion Options | |

Special Note Regarding Back-Up Rings

Back-Up Rings in Used Seal Kits

Many of the plugs and cartridges used in the Gresen product line utilize back-up rings. Therefore, many of the seal kits in this Service Manual include back-up rings, some of which are continuous back-up rings.

Since the continuous back-up rings are installed at the factory using a special sizing tool, only replace this back-up ring if it has been damaged.



Preparing the Back-Up Ring for Installation

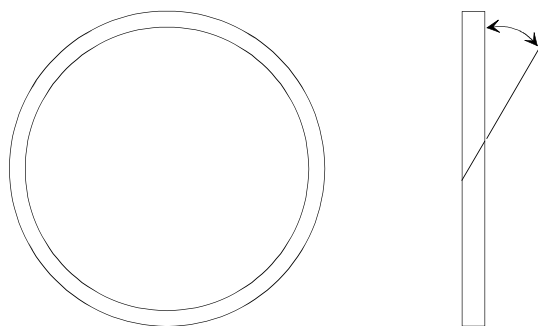
If the continuous back-up ring should need replacing, follow these simple procedures.

1. Using a single edge razor blade, carefully cut through the back-up ring in an angle as shown in the drawing.

*Caution: Make only one diagonal cut thru the back-up ring. **Do not** separate the ring into two pieces.*

2. Slip the back-up ring over the cartridge and into place.

Carefully make one cut thru Back-Up Ring at approximately 30 degree angle as shown here.



No. 8398 Inlet Cover

No. 8398 Inlet Cover

No. 8398 Inlet Covers offers top and end inlet and outlet ports. All unused ports must be plugged.

If a gauge port is required, a port plug may be drilled and tapped for a 1/4" NPTF or SAE 4 and installed in the unused inlet port.

Port Plugs and the main relief cartridge are the serviceable components located in the inlet cover.

Main Relief Cartridge Options

No. 8398 Inlet Covers are machined to accept the inlet (main) relief valve cartridge. Main relief cartridges are available in the following options:

Model WH – Differential Area Relief – Available in internal shim adjustable, externally adjustable, and dual pressure versions.

Model RP51 – Pilot Operated Relief - Available in externally adjustable, tamper resistant and dual pressure versions.

No Relief Plug – Must be used when no main relief is required.

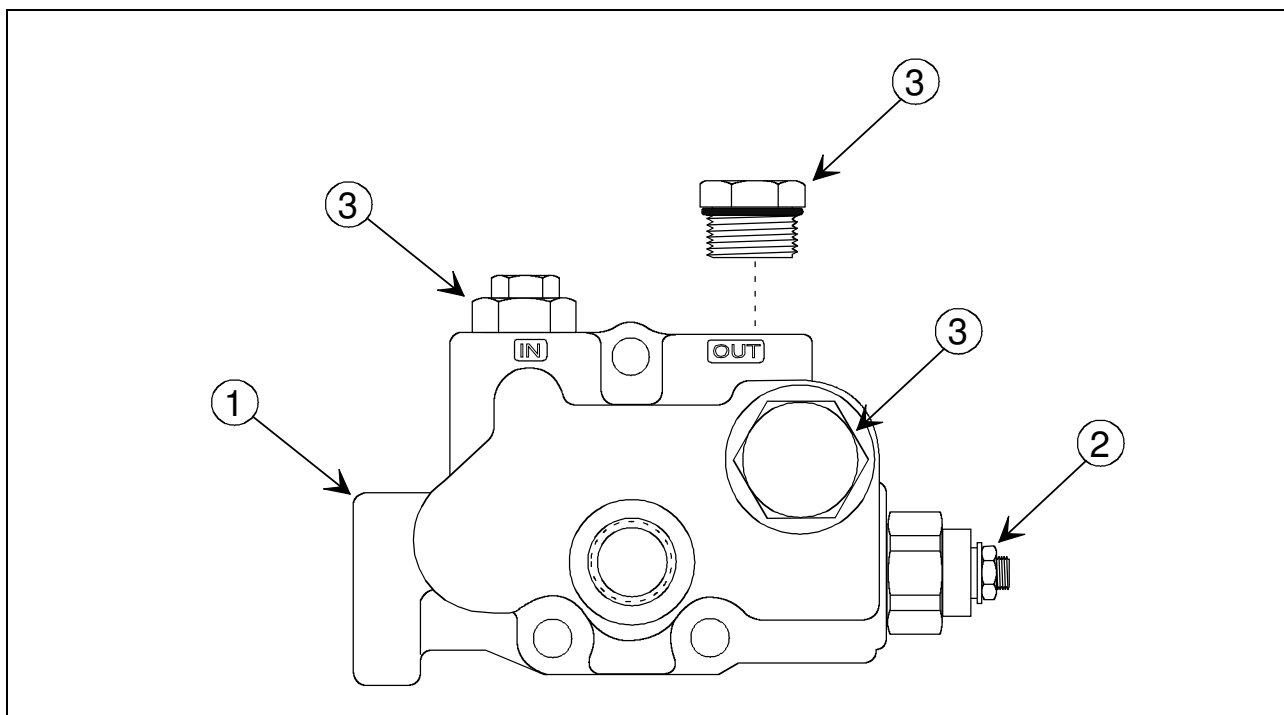


Figure 7. No. 08120xxx Inlet Cover Assembly – Using 08398xxx Inlet Cover Housing

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| 1 | 08398xxx | Inlet Cover Housing ① | 1 |
| 2 | 06532xxx | WH Relief Cartridge (See Figure 9) | 1 |
| | 08853xxx | WHA Relief Cartridge (See Figure 10) | 1 |
| | 11387xxx | WH Dual Pressure Relief Cartridge (See Figure 11) | 1 |
| | 08950xxx | RP51A Relief Cartridge (See Figure 12) | 1 |
| | 08950xxx | RP51N Relief Cartridge (See Figure 12) | 1 |
| | 27005xxx | RP51 Dual Pressure Relief Cartridge (See Figure 13) | 1 |
| | 12797001 | CK-6132 No Relief Cavity Plug (See Figure 14) | 1 |
| 3 | 06089001 | SAE 12 Port Plug (Plug Selection Determined by Inlet Porting – Refer to Page 105 for a listing of available port plugs. | A/R |

① No. 08398 Inlet Cover Housing are available in many porting configurations. Contact the **Gresen** factory for help in identifying No. 08398 housing part numbers.

No. 7736 Inlet Cover with Flow Control

No. 7736 Inlet Cover

This inlet cover offers top and end inlet and end outlet ports. All unused ports must be plugged. Port plugs, inlet relief cartridge, and the flow control are the serviceable components located in the inlet cover.

Inlet Flow Control Option

This cover is equipped with an adjustable flow control assembly. Installation of the conversion plug in the excess flow port will permit use of the excess flow for power beyond applications.

Oil will only be directed out this port when a work section is actuated. With all sections in neutral, oil is directed thru open center and back to tank.

Main Relief Cartridge Options

No. 7736 inlet covers are machined to accept the inlet (main) relief valve cartridge. Main relief cartridges are available in the following options:

Model WH – Differential Area Relief – Available in internal shim adjustable, externally adjustable, and dual pressure versions.

Model RP51 – Pilot Operated Relief - Available in externally adjustable, tamper resistant and dual pressure versions.

No Relief Plug – Must be used when no main relief is required.

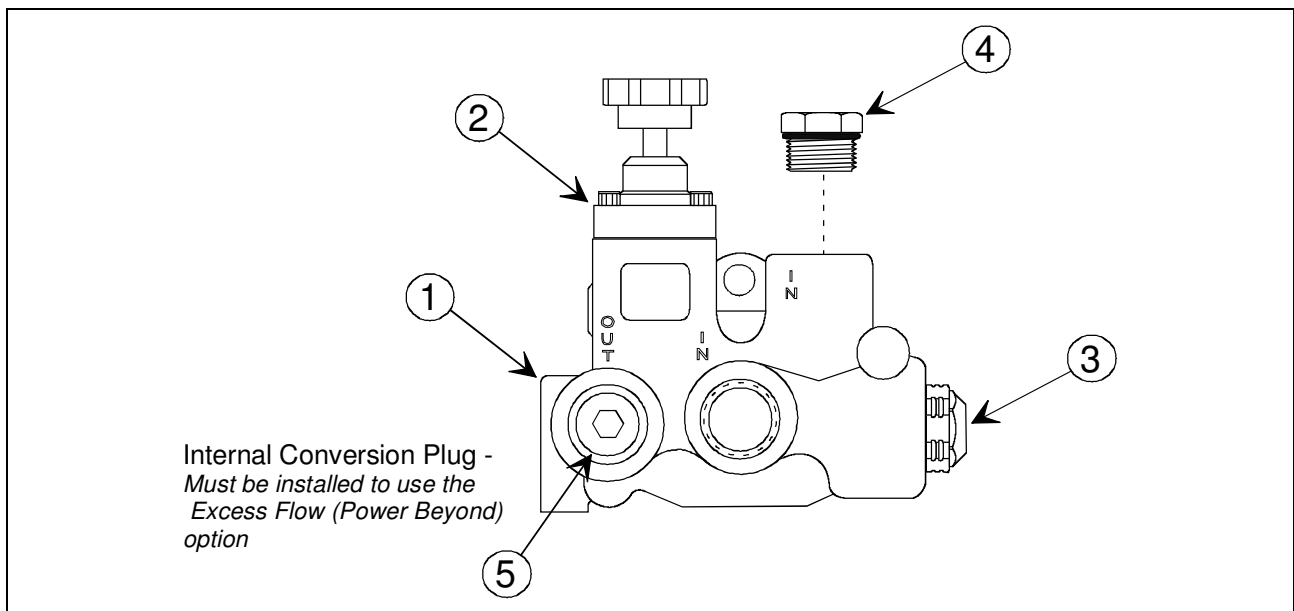


Figure 8. No. 07737xxx Inlet Cover Assembly – Using 07736xxx Inlet Cover Housing

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| 1 | 07736xxx | Inlet Cover Housing ① | 1 |
| 2 | 07400xxx | Flow Control Assembly (See Figure 15) | 1 |
| 3 | 06532xxx | WH Relief Cartridge (See Figure 9) | 1 |
| | 08853xxx | WHA Relief Cartridge (See Figure 10) | 1 |
| | 11387xxx | WH-Dual Pressure Relief Cartridge (See Figure 11) | 1 |
| | 08950xxx | RP51A Relief Cartridge (See Figure 12) | 1 |
| | 08950xxx | RP51N Relief Cartridge (See Figure 12) | 1 |
| | 27005xxx | RP51 Dual Pressure Relief Cartridge (See Figure 13) | 1 |
| | 12797001 | CK-6132 No Relief Cavity Plug (See Figure 14) | 1 |
| 4 | 06089001 | SAE 12 Port Plug (Plug Selection Determined by Inlet Porting – Refer to Page 105 for a listing of available port plugs. | A/R |
| 5 | 00947001 | Excess Flow Conversion Plug (1/2" NPTF) | 1 |

① No. 07736 Inlet Cover Housing are available in many porting configurations. Contact the **Gresen** factory for help in identifying No. 07736 housing part numbers.

Model 'WH' and 'WHA' (Differential Poppet) Main Relief Cartridges

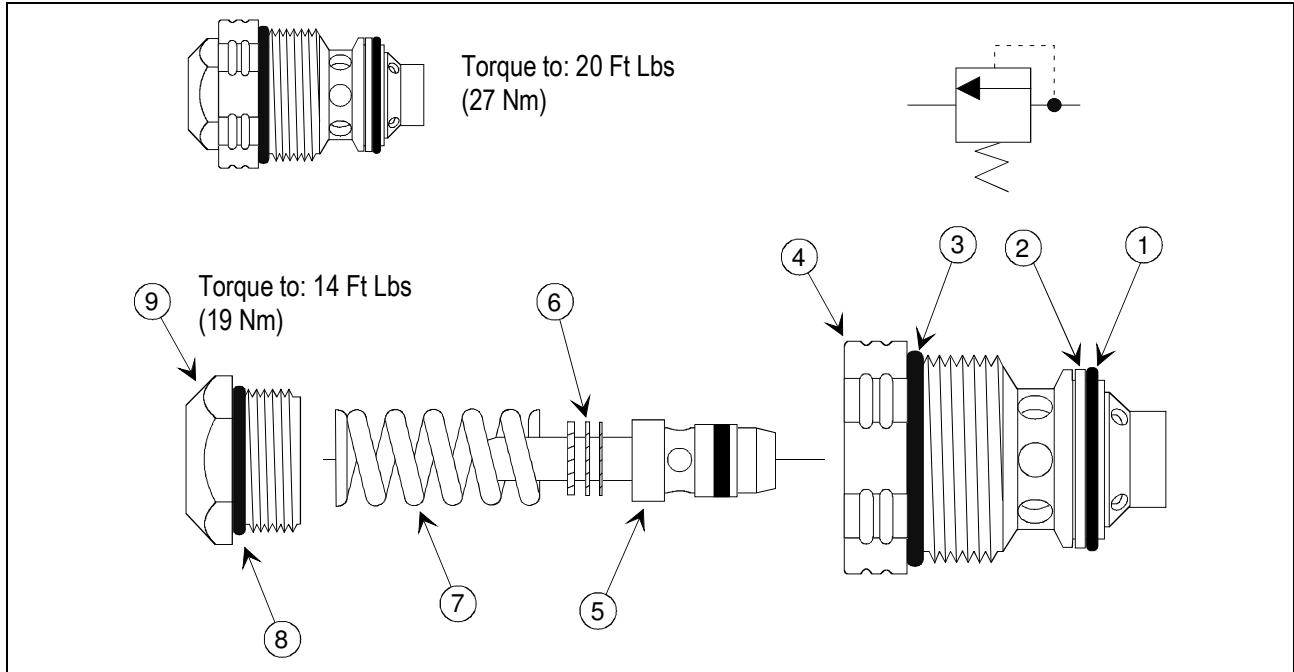


Figure 9. Model 'WH' and 'WHA' (Differential Poppet) Main Relief Cartridges (Model WH Shown)

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 06532xxx | Model WH Relief Cartridge , Complete (Specify Pressure Setting When Ordering) ③ | |
| | 08853xxx | Model WHA Relief Cartridge , Complete (Specify Pressure Setting When Ordering) ② ③ | |
| | 07523001 | K-19003 WH Relief Seal Kit (Includes Items 1, 2, 3 & 8) ① | |
| | 12727001 | K-19002 Relief Poppet Service Kit (Contains Item 5 - Poppet and Seal Assembly) | |
| 1 | 01718001 | O-Ring Seal (Serviced in K-19003 Relief Seal Kit) ① | 1 |
| 2 | 09020022 | Back-Up Ring (Serviced in K-19003 Relief Seal Kit) ④ | 1 |
| 3 | 01615001 | O-Ring Seal (Serviced in K-19003 Relief Seal Kit) ① | 1 |
| 4 | 06533001 | WH Relief Body | 1 |
| 5 | 03936001 | Poppet | 1 |
| 6 | 00458001 | Shim (.040 inch [1,0 mm] thick) ③ | A/R |
| | 00459001 | Shim (.020 inch [0,5 mm] thick) ③ | A/R |
| | 00462001 | Shim (.010 inch [0,25 mm] thick) ③ | A/R |
| 7 | 01869001 | Spring (500 - 1249 PSI [35 - 87 bar] Pressure Range) ③ | 1 |
| | 07638001 | Spring (1250 - 1749 PSI [88 - 122 bar] Pressure Range) ③ | 1 |
| | 07078001 | Spring (1750 - 1999 PSI [123 - 140 bar] Pressure Range) ③ | 1 |
| | 01870001 | Spring (2000 - 2599 PSI [141 - 183 bar] Pressure Range) ③ | 1 |
| | 07497001 | Spring (2600 - 2999 PSI [184 - 209 bar] Pressure Range) ③ | 1 |
| | 11912001 | Spring (3000 - 3500 PSI [210 - 245 bar] Pressure Range) ③ | 1 |
| 8 | 02707001 | O-Ring Seal (Serviced in K-19003 Relief Seal Kit) ① ② | 1 |
| 9 | 01880001 | Relief Cap ② | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

② Model **WHA Relief Cartridge** replaces Items 8 & 9 with the **CK-19001 External Adjustment Kit** shown in Figure 10.

③ Do not attempt to change shims or springs in these reliefs unless you have the capability to test for proper pressure setting. Without the capability to test you may exceed the maximum pressure rating of the product or draw the relief spring solid, which in turn means there is no relief (NR).

④ Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

CK-19001 (K-WH-A) External Adjustment Kit

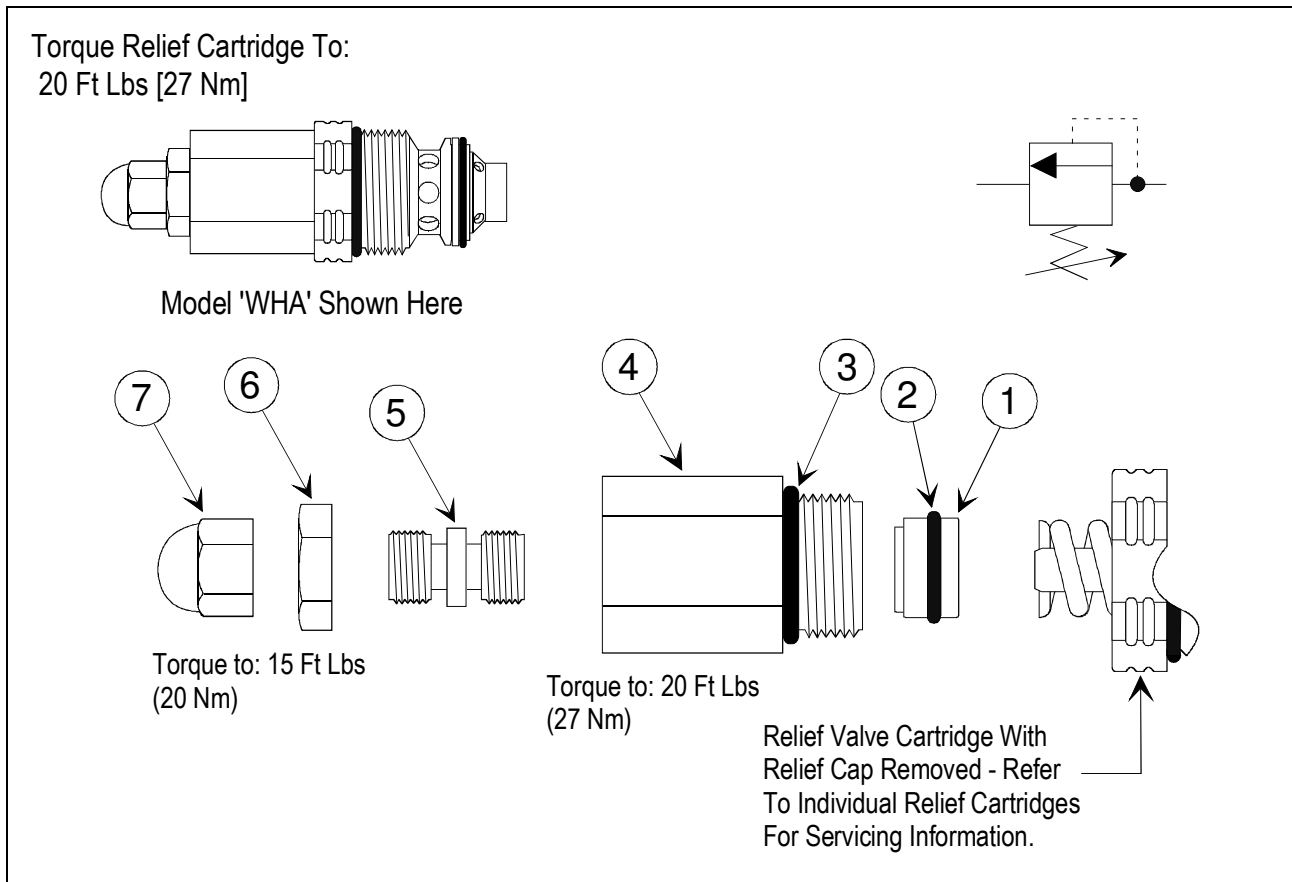


Figure 10. CK-19001 (K-WH-A) External Adjustment Kit

Note: This Kit May Be Used On Model WH (Figure 9), RC (Figure 85), RCS (Figure 86), RCPC (Figure 90) and CRA (Figure 88) Relief Cartridges

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 06489001 | CK-19001 External Adjustment Kit (Contains All Items listed here) ② | |
| | 06489002 | K-19015 Adjustment Kit Seal Kit (Contains Items 2 and 3 Only) ① | |
| 1 | 11481001 | Piston | 1 |
| 2 | 01818001 | O-Ring Seal ① | 1 |
| 3 | 02707001 | O-Ring Seal ① | 1 |
| 4 | 03498001 | Adjustment Adapter | 1 |
| 5 | 03496001 | Adjustment Stem ② | 1 |
| 6 | 03500001 | Jam Nut | 1 |
| 7 | 03497001 | Acorn Nut | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies.

② Do not attempt to adjust these reliefs unless you have the capability to test the reliefs for proper pressure setting. Without the capability to test you may exceed the maximum pressure rating of the product or draw the relief spring solid, which in turn means there is no relief (NR).

K-19006 Dual Pressure Relief Head Kit

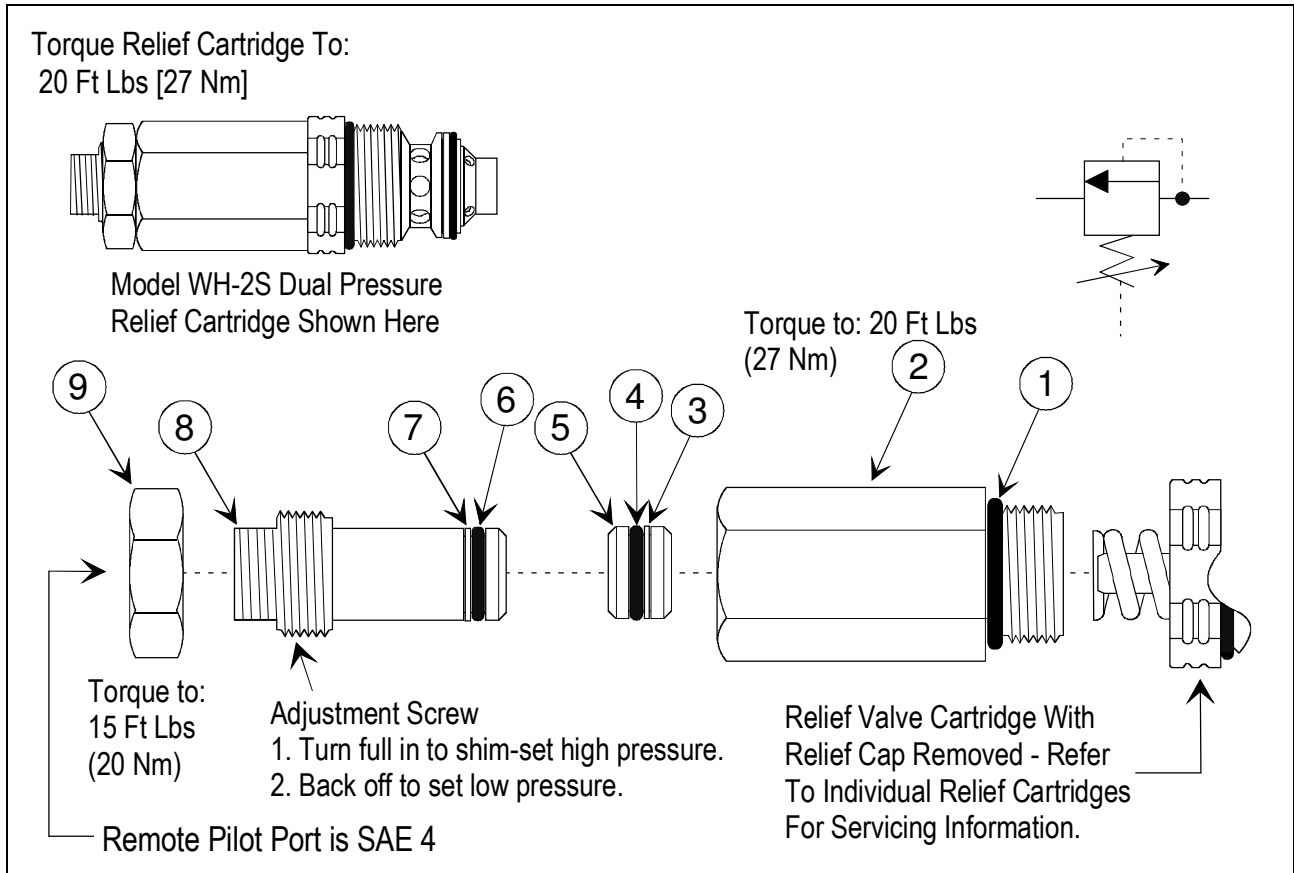


Figure 11. K-19006 Dual Pressure Relief Head Kit

Note: This Kit May Be Used On Model WH (Figure 9), RC (Figure 85), RCS (Figure 86), RCPC (Figure 90) and CRA (Figure 88) Relief Cartridges

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 12731001 | K-19006 Dual Pressure Relief Head Kit (Contains All Items listed here) | |
| | 12194002 | K-19016 Relief Head Seal Kit (Contains Items 1, 3, 4, 6 & 7) ① | |
| 1 | 02707001 | O-Ring Seal ① | 1 |
| 2 | 08931001 | Body | 1 |
| 3 | 09021113 | Back Up Ring ③ | 1 |
| 4 | 09000113 | O-Ring Seal ① | 1 |
| 5 | 08932001 | Piston | 1 |
| 6 | 06839001 | O-Ring Seal ① | 1 |
| 7 | 09021016 | Back Up Ring ③ | 1 |
| 8 | 08933001 | Adjustment Screw ② | 1 |
| 9 | 09302014 | Hex Jam Nut | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies.

② Do not attempt to adjust these reliefs unless you have the capability to test the reliefs for proper pressure setting. Without the capability to read pressure, you may exceed the maximum pressure rating of the product or compress the relief spring solid, which in turn means there is no relief (NR).

③ Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

Model 'RP51' Main Relief Cartridges

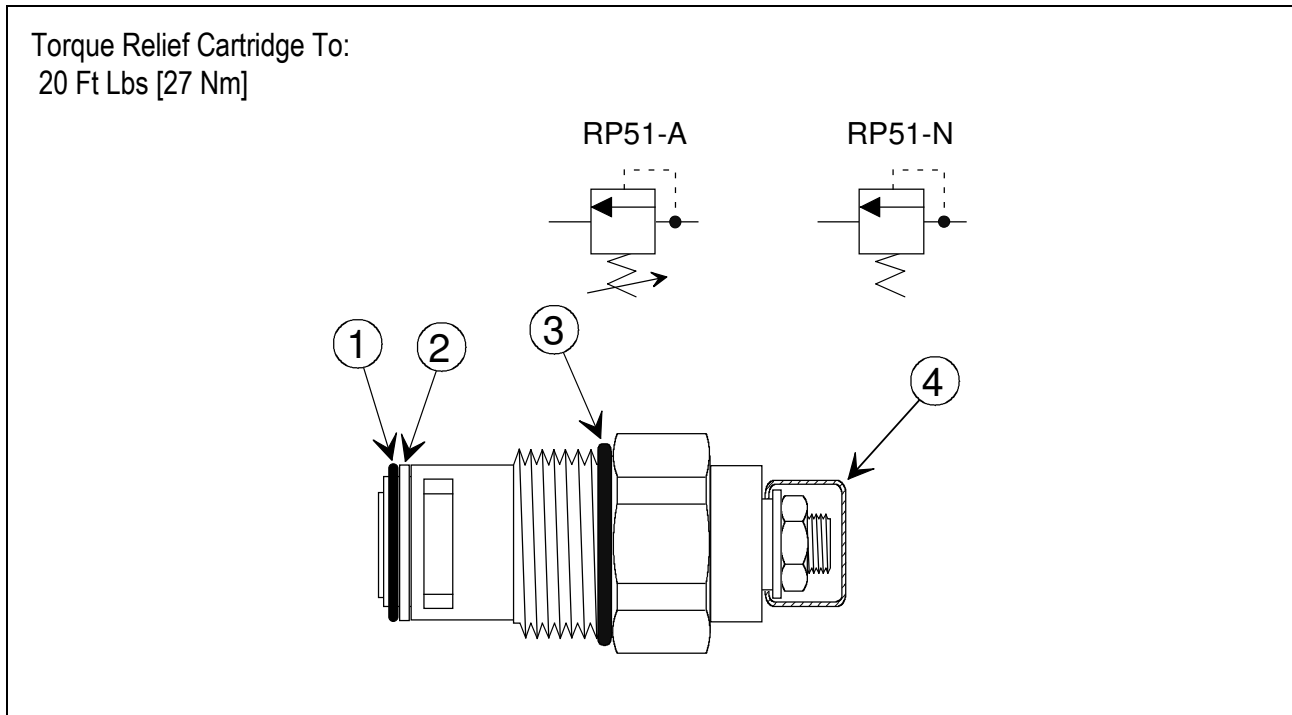


Figure 12. Model 'RP51' (Pilot-Operated) Main Relief Cartridges

NOTE

Due to close tolerances on working parts, the RP51 Pilot-Operated Relief Valve is not field serviceable. If service other than external seal replacement is required, replace the complete cartridge.

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 08950005 | RP51-A Cartridge, Adjustable from 1000 - 3500 PSI [69 – 240 bar] ② | |
| | 08950014 | RP51-A-LP Cartridge, Adjustable from 500 - 999 PSI [35 – 239 bar] ② | |
| | 08950006 | RP51-N Cartridge, Tamper Resistant, Preset 1000 – 3500 PSI [69 – 240 bar] ②③ | |
| | 08950011 | RP51-N-LP Cartridge, Tamper Resistant, Preset 500 – 999 PSI [35 – 239 bar] ②③ | |
| | 08427001 | K-28062 Plug Seal Kit (Contains Items 1 thru 3 Only) See Note Below ① | |
| 1 | 01718001 | O-Ring Seal ① | 1 |
| 2 | 09020022 | Back Up Ring ④ | 1 |
| 3 | 01615001 | O-Ring Seal ① | 1 |
| 4 | 10034001 | Tamper Resistant Cap (<i>Installed at the factory on RP51-N Versions Only</i>) | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies.

② Specify relief valve pressure setting when ordering. Do **NOT** attempt to adjust these relief valves unless you have the capability to test the reliefs for proper pressure setting. Without the capability to test you may exceed the maximum pressure rating of the product or draw the relief spring solid, which in turn means there is no relief (NR).

③ RP51-N and RP51-N-LP Cartridges are preset at the factory and then the Tamper Resistant Cap is installed.

④ Continuous Back-Up Rings are installed at the factory using special sizing tools. It is **Not** necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

Model 'RP51 - Dual Pressure' Main Relief Cartridges

Torque Relief Cartridge To:
20 Ft Lbs [27 Nm]

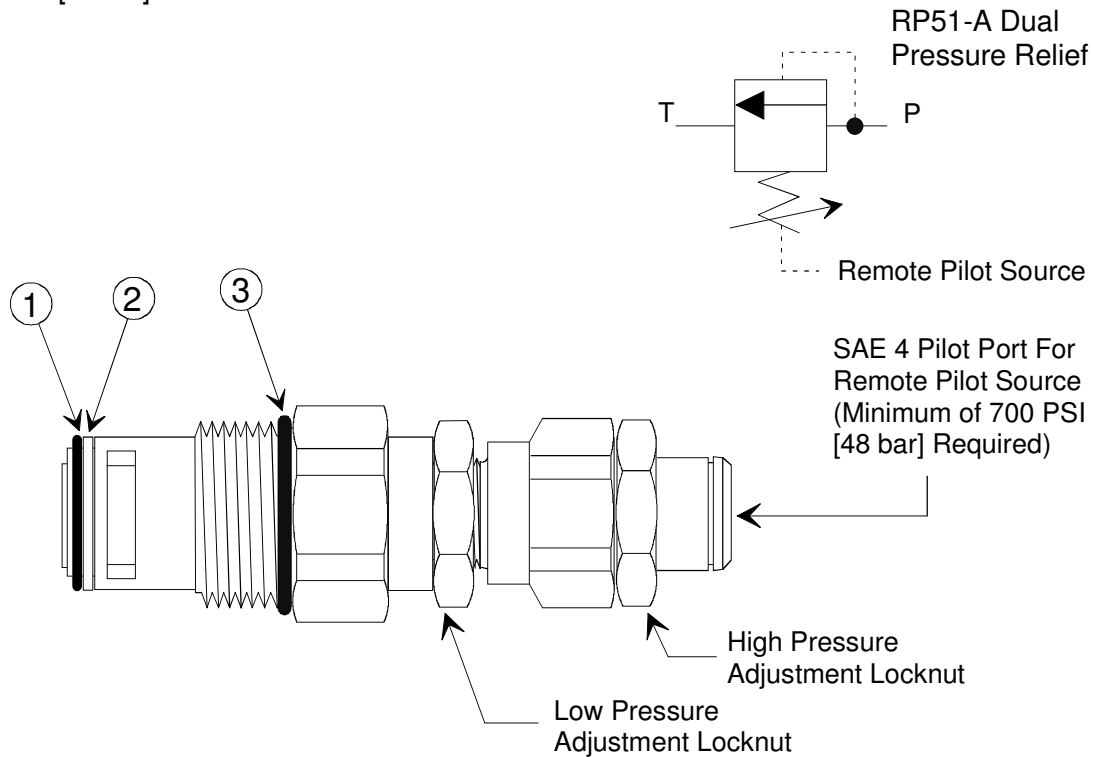


Figure 13. Model 'RP51 – Dual Pressure' Main Relief Cartridges

NOTE

Due to close tolerances on working parts, the RP51 Dual Pressure Pilot-Operated Relief Valve is not field serviceable. If service other than external seal replacement is required, replace the complete cartridge.

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 27005001 | RP51-A-DP Cartridge, Dual Pressures, Adjustable from 1000 - 3500 PSI [69 – 240 bar] ② | |
| | 08427001 | K-28062 Plug Seal Kit (Contains Items 1 thru 3 Only) See Note Below ① | |
| 1 | 01718001 | O-Ring Seal ① | 1 |
| 2 | 09020022 | Back Up Ring ③ | 1 |
| 3 | 01615001 | O-Ring Seal ① | 1 |
| 4 | 10034001 | Tamper Resistant Cap (<i>Installed at the factory on RP51-N Versions Only</i>) | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies.

② Specify relief valve pressure setting when ordering. Do **NOT** attempt to adjust these relief valves unless you have the capability to test the reliefs for proper pressure setting. Without the capability to test you may exceed the maximum pressure rating of the product or draw the relief spring solid, which in turn means there is no relief (NR).

③ Continuous Back-Up Rings are installed at the factory using special sizing tools. It is **Not** necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

CK-6132 Main Relief 'NR' Cavity Plug

Torque Relief Cavity Plug To:
20 Ft Lbs [27 Nm]

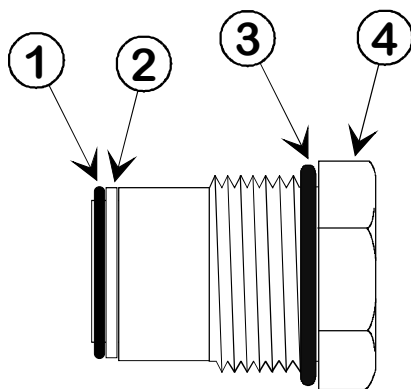
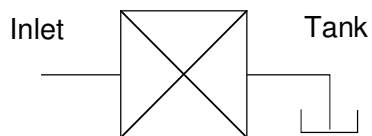


Figure 14. CK-6132 Main Relief 'NR' Cavity Plug

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 12797001 | CK-6132 No Relief 'NR' Plug Kit (Contains All Items Listed Below) | |
| | 08427001 | K-28062 Plug Seal Kit (Contains Items 1 thru 3 Only) ① | |
| 1 | 01718001 | O-Ring Seal (Serviced in K-28062 Plug Seal Kit) ① | 1 |
| 2 | 09020022 | Back-Up Ring (Serviced in K-28062 Plug Seal Kit) ② | 1 |
| 3 | 01615001 | O-Ring Seal (Serviced in K-28062 Plug Seal Kit) ① | 1 |
| 4 | 06760001 | Relief Cavity Plug | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

② Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

Inlet Cover Flow Control – Used In 07737xxx Inlet Assemblies

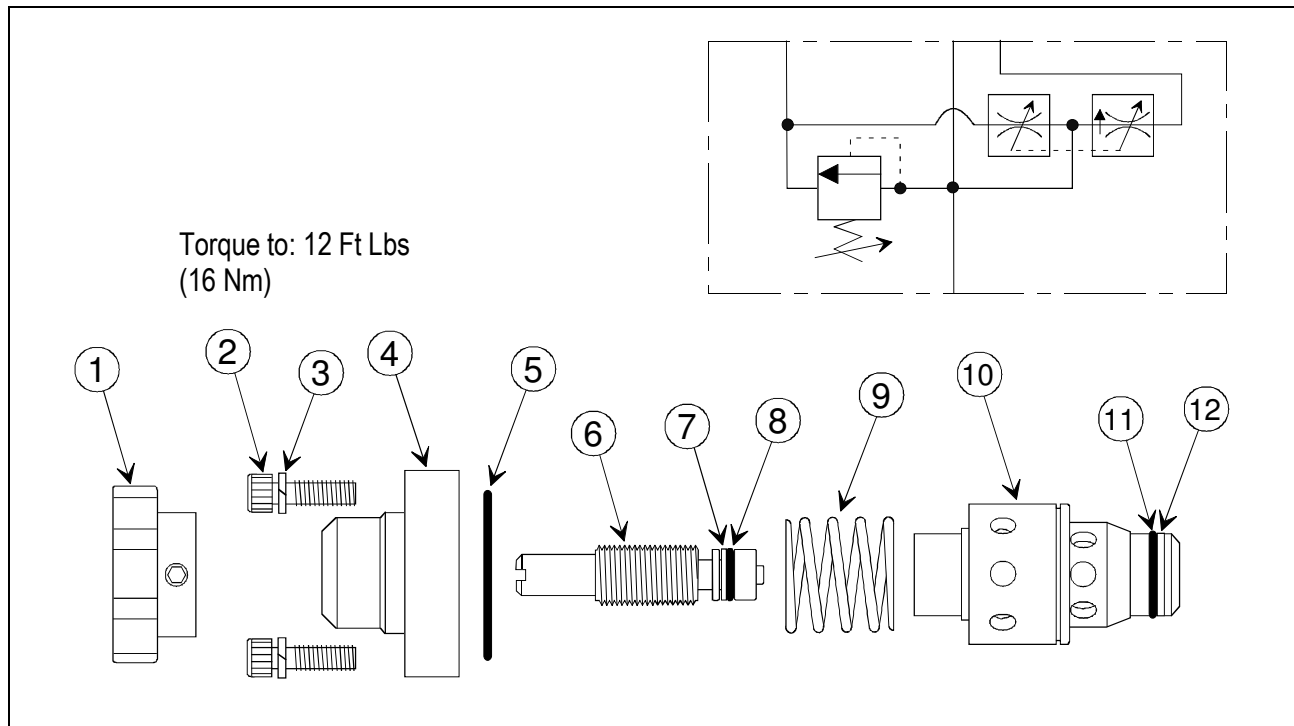


Figure 15. Inlet Cover Flow Control

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 12833001 | K-6067 (3 to 16 GPM - 11 to 60 lpm) Flow Control Kit (Contains Item 10 thru 12 Only) | |
| | 12832001 | K-6068 (8 to 25 GPM - 30 to 95 lpm) Flow Control Kit (Contains Item 10 thru 12 Only) | |
| | 13110001 | K-6193 (4 to 25 GPM - 15 to 95 lpm) Flow Control Kit (Contains Item 10 thru 12 Only) | |
| | 07990001 | K-6065 Flow Control Seal Kit (Contains Items 5, 7, 8, 11 & 12 Only) ① | |
| | 12834001 | K-6066 Flow Control Adjustment Kit (Contains Items 1 thru 8 Only) | |
| 1 | 03236001 | Knob | 1 |
| 2 | 03731101 | Hex Head Screw | 1 |
| 3 | 00563001 | Lock Washer | 4 |
| 4 | 03906001 | Cap | 4 |
| 5 | 03911001 | O-Ring Seal (Serviced in K-6065 Seal Kit) ① | 1 |
| 6 | 06309001 | Flow Adjuster (Standard) | 1 |
| | 03902001 | Flow Adjuster (Optional - 3 inch [76 mm] stem) | 1 |
| 7 | 03908001 | Back-Up Ring (Serviced in K-6065 Seal Kit) ② | 1 |
| 8 | 09001012 | O-Ring Seal (Serviced in K-6065 Seal Kit) ① | 1 |
| 9 | 03882001 | Spring | 1 |
| 10 | 07400006 | Flow Control Assembly (3 to 16 GPM [11 to 60 lpm]) (Serviced in K-6067 F/C Kit) | 1 |
| | 07400007 | Flow Control Assembly (4 - 25 GPM [15 - 95 lpm]) (Serviced in K-6193 F/C Kit) | 1 |
| | 07400005 | Flow Control Assembly (8 to 25 GPM [30 to 95 lpm]) (Serviced in K-6068 F/C Kit) | 1 |
| 11 | 01819001 | O-Ring Seal (Serviced in K-6065 Seal Kit) ① | 1 |
| 12 | 01821001 | Back-Up Ring (Serviced in K-6065 Seal Kit) ② | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

② Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

No. 8644 Outlet Cover

No. 8644 Outlet Cover

This cover offers top, end or bottom outlet ports in addition to a top power beyond port. All unused outlet ports must be plugged.

An internal plug (09435108) is available for conversion to closed center or power beyond.

Caution:

No. 8644 Outlet Cover may only be used in open center and closed center (high pressure standby) systems. They may not be used with V20LS Work Sections.

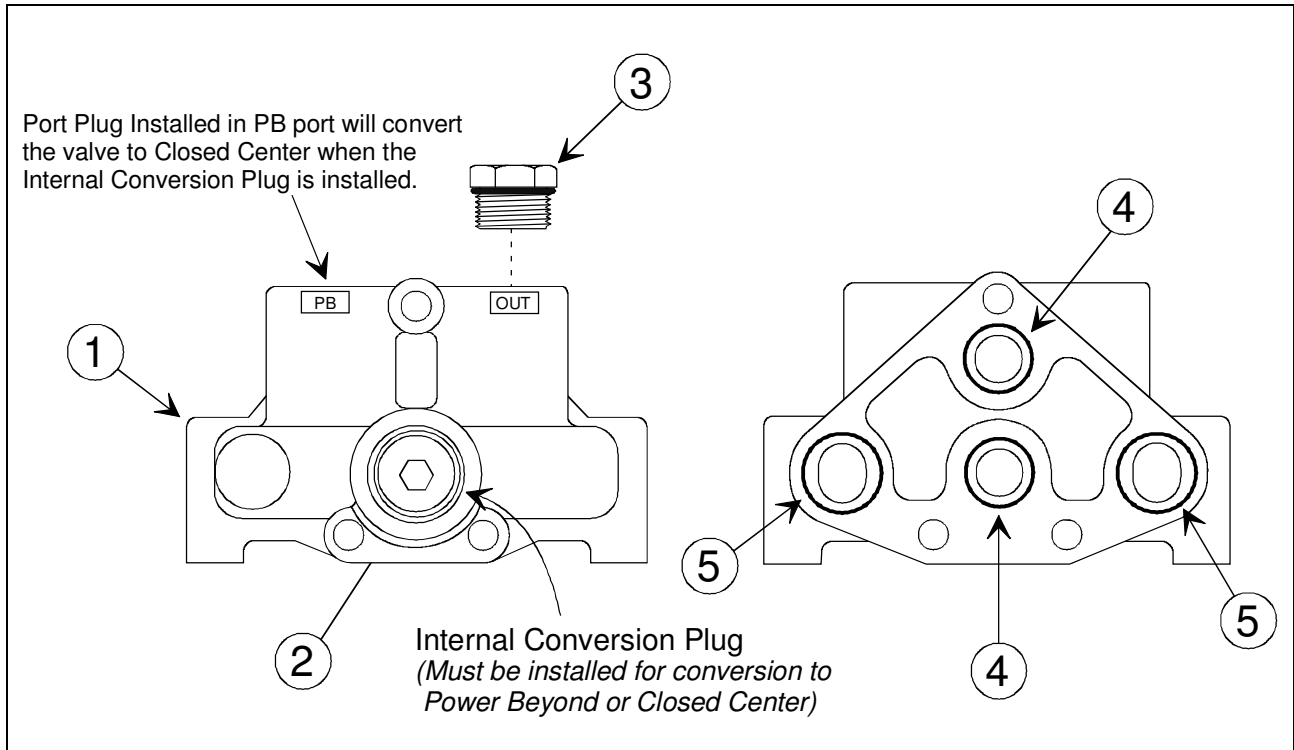


Figure 16. No. 8644 Outlet Cover

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 08340001 | K-6121 Section Seal Kit (Includes Ref No's. 3 & 4) ① | |
| 1 | 08644xxx | Outlet Cover Housing ② | 1 |
| 2 | 09435108 | Internal Conversion Plug (SAE 8 Socket Head) | 1 |
| 3 | 06089001 | SAE 12 Port Plug (Plug Selection Determined by Inlet Porting – Refer to Page for a listing of available port plugs. | A/R |
| 4 | 21857001 | O-Ring Seal (Serviced in K-6121 Section Seal Kit) ① | 2 |
| 5 | 21733001 | O-Ring Seal (Serviced in K-6121 Section Seal Kit) ① | 2 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory.

② No. 08644 Outlet Cover Housing are available in many porting configurations. Contact the **Gresen** factory for help in identifying No. 08644 housing part numbers.

No. 6770 Outlet Cover With Conversion Port – Non Load Sense

No. 6770 Outlet Cover

This outlet cover offers an end outlet port (port on left). A second (conversion) port is located in the center of the outlet cover. This port accepts the closed center or power beyond conversion plugs.

Closed Center Conversion

Provides a “Closed Center” system by plugging the open center flow passage. This is normally used with a variable displacement pump.

A closed center plug is installed in the option port in the outlet cover.

Power Beyond Conversion

Provides for proper hook-up of an additional valve “downstream”. The Power Beyond Sleeve prevents subjecting the exhaust core to back pressure.

A power beyond sleeve is installed in the option port in the outlet cover to convert to power beyond.

Caution: *Never attempt to plug the power beyond sleeve, as this will convert the valve to “Closed Center”.*

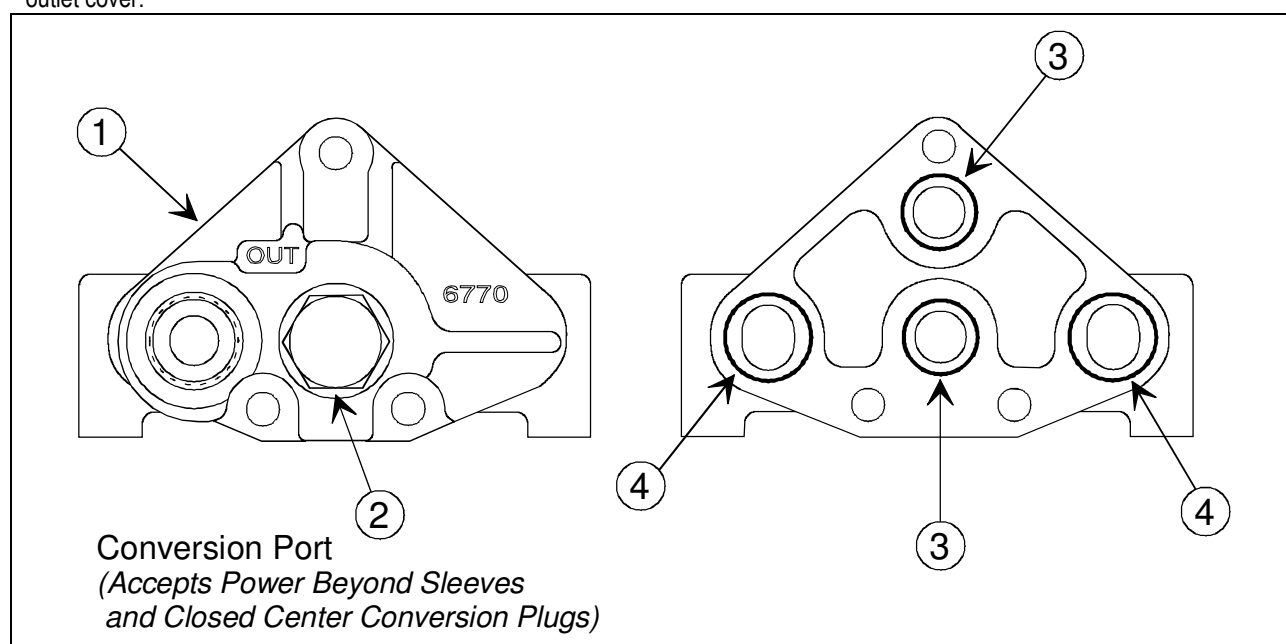


Figure 17. No. 6770 (Open Center) Outlet Cover Assembly

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 08340001 | K-6121 Section Seal Kit (Includes Ref No's. 3 & 4 Only) ① | |
| 1 | 06770xxx | Outlet Cover Housing ② | 1 |
| 2 | 06395001 | K-6016 Conversion Plug (See Figure 15) | 1 |
| | 12735001 | CK-6015 (Optional) Closed Center Plug (See Figure 15) | 1 |
| | 12745001 | CK-6017 (Optional) 1/2" NPT Power Beyond Sleeve (See Figure 15) | 1 |
| | 12746001 | CK-6018 (Optional) SAE 8 Power Beyond Sleeve (See Figure 15) | 1 |
| | 12747001 | CK-6019 (Optional) SAE 10 Power Beyond Sleeve (See Figure 15) | 1 |
| | 12748001 | K-6168 (Optional) SAE 12 Power Beyond Sleeve (See Figure 15) | 1 |
| | 12749001 | K-6060 (Optional) SAE 16 Male Power Beyond Sleeve (See Figure 15) | 1 |
| 3 | 21857001 | O-Ring Seal (Order K-6121 Section Seal Kit) ① | 2 |
| 4 | 21733001 | O-Ring Seal (Order K-6121 Section Seal Kit) ① | 2 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory.

② No. 06770 Outlet Cover Housing are available in many porting configurations. Contact the **Gresen** factory for help in identifying No. 06770 housing part numbers.

No. 6770 Outlet Cover With Solenoid Cartridge – Non Load Sense

No. 6770 Outlet Cover

This outlet cover offers an end outlet port (port on left). A second (conversion) port is located in the center of the outlet cover. This port accepts the closed center or power beyond conversion plugs.

Power Beyond Conversion

A power beyond sleeve is installed in the option port in the outlet cover to convert to power beyond.

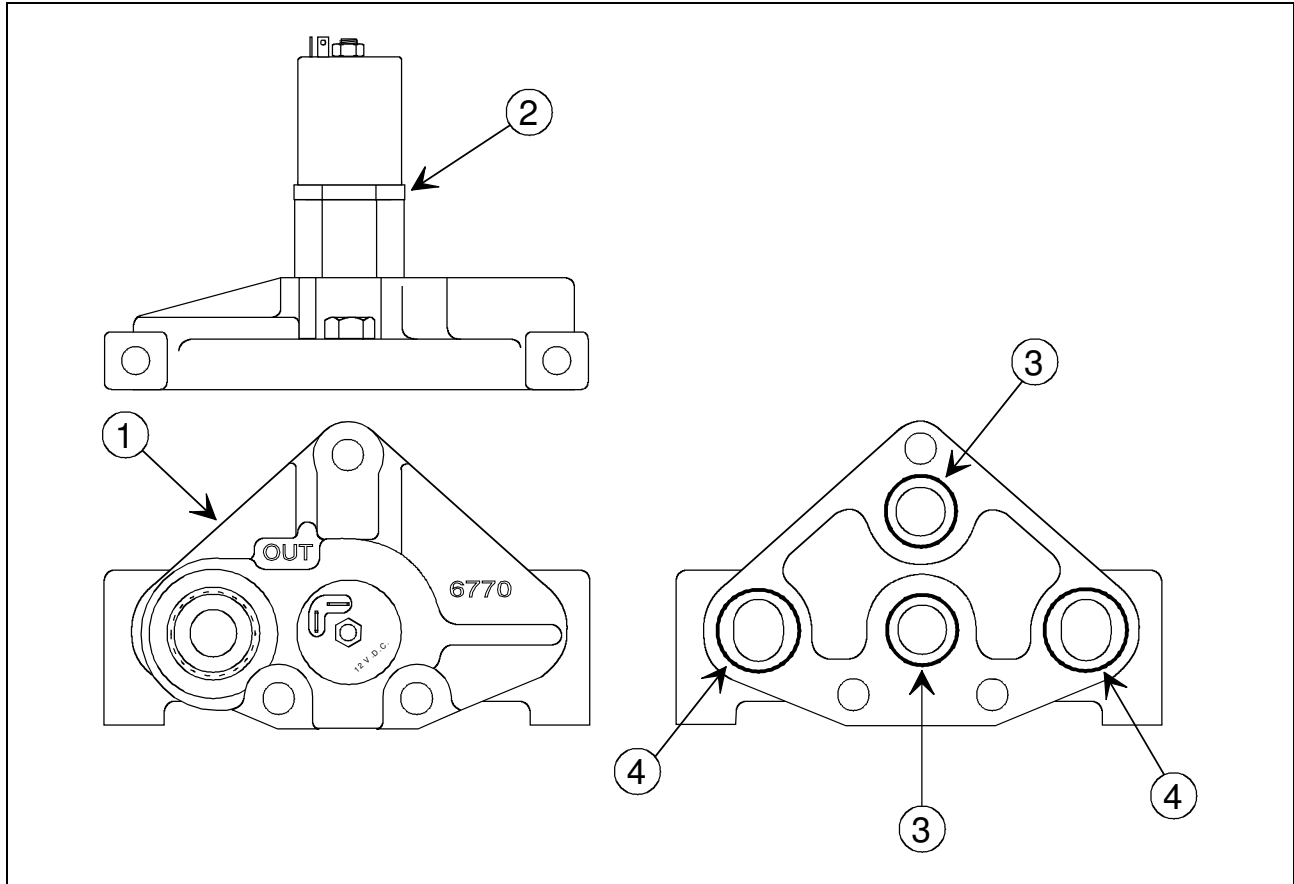


Figure 18. No. 6770 Outlet Cover With Solenoid Cartridge

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 08340001 | K-6121 Section Seal Kit (Includes Ref No's. 3 & 4 Only) ① | |
| 1 | 06770xxx | Outlet Cover Housing ② | 1 |
| 2 | 12968001 | CK-6177 12VDC Build Up Cartridge - See Figure xx | 1 |
| | 12969001 | CK-6178 24VDC Build Up Cartridge - See Figure xx | 1 |
| | 12970001 | CK-6179 Mechanical Build Up Cartridge Kit – See Figure xx | 1 |
| 3 | 21857001 | O-Ring Seal (Order K-6121 Section Seal Kit) ① | 2 |
| 4 | 21733001 | O-Ring Seal (Order K-6121 Section Seal Kit) ① | 2 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory.

② No. 06770 Outlet Cover Housing are available in many porting configurations. Contact the **Gresen** factory for help in identifying No. 06770 housing part numbers.

No. 6770 V20LS Outlet Cover (No Load Sense Bleed-Down Plug)

No. 6770 Outlet Cover

The outlet cover offers top and end outlet ports. The unused outlet port must be plugged.

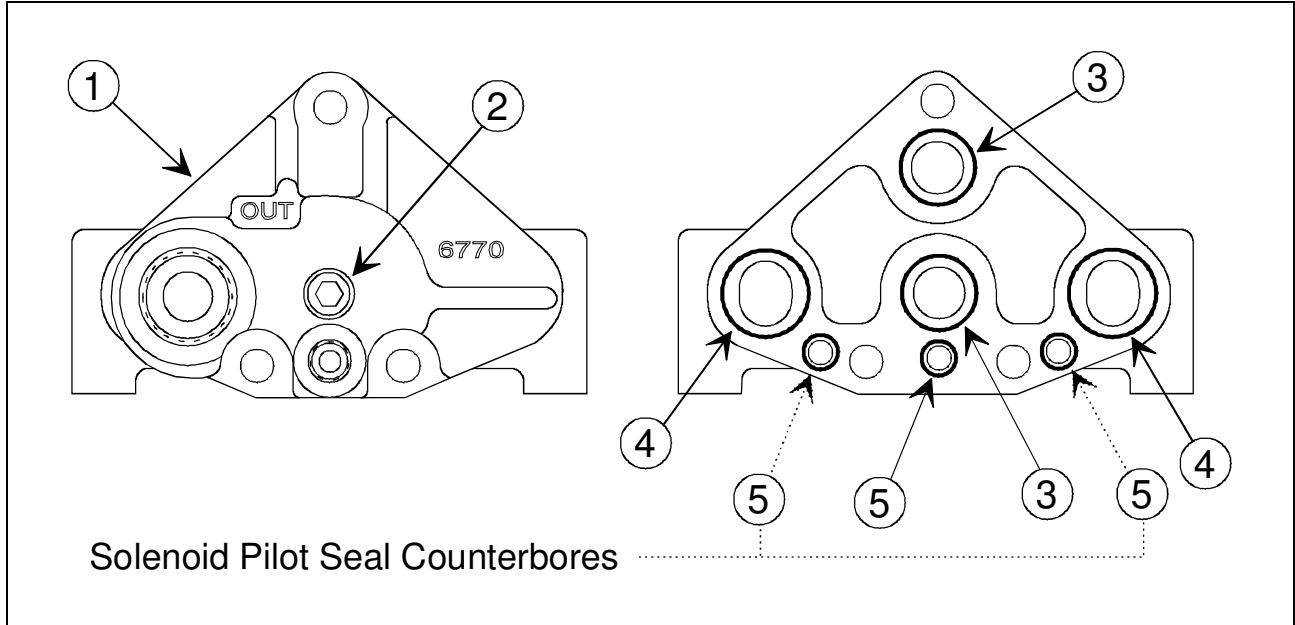


Figure 19. No. 6770 V20LS Outlet Cover Assembly

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 10749001 | K-6156 Section Seal Kit (Includes Ref No's. 3 thru 5) ① | |
| 1 | 06770xxx | Outlet Cover Housing ② | 1 |
| 2 | 00073001 | 3/8" - 18 NPTF Port Plug | 1 |
| 3 | 21857001 | O-Ring Seal (Serviced in K-6156 Section Seal Kit) ① | 2 |
| 4 | 21733001 | O-Ring Seal (Serviced in K-6156 Section Seal Kit) ① | 2 |
| 5 | 21866001 | O-Ring Seal (Serviced in K-6156 Section Seal Kit) ① | A/R |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory.

② No. 06770 Outlet Cover Housing are available in many porting configurations. Contact the **Gresen** factory for help in identifying No. 06770 housing part numbers.

No. 6770LS Outlet Cover (With Load Sense Bleed-Down Plug)

No. 6770LS Outlet Cover

The outlet cover offers top and end outlet ports. The unused outlet port must be plugged.

Port plugs and bleed-down cartridges are field serviceable components located in the outlet cover.

Optional Outlet Plugs

Bleed-Down Plug

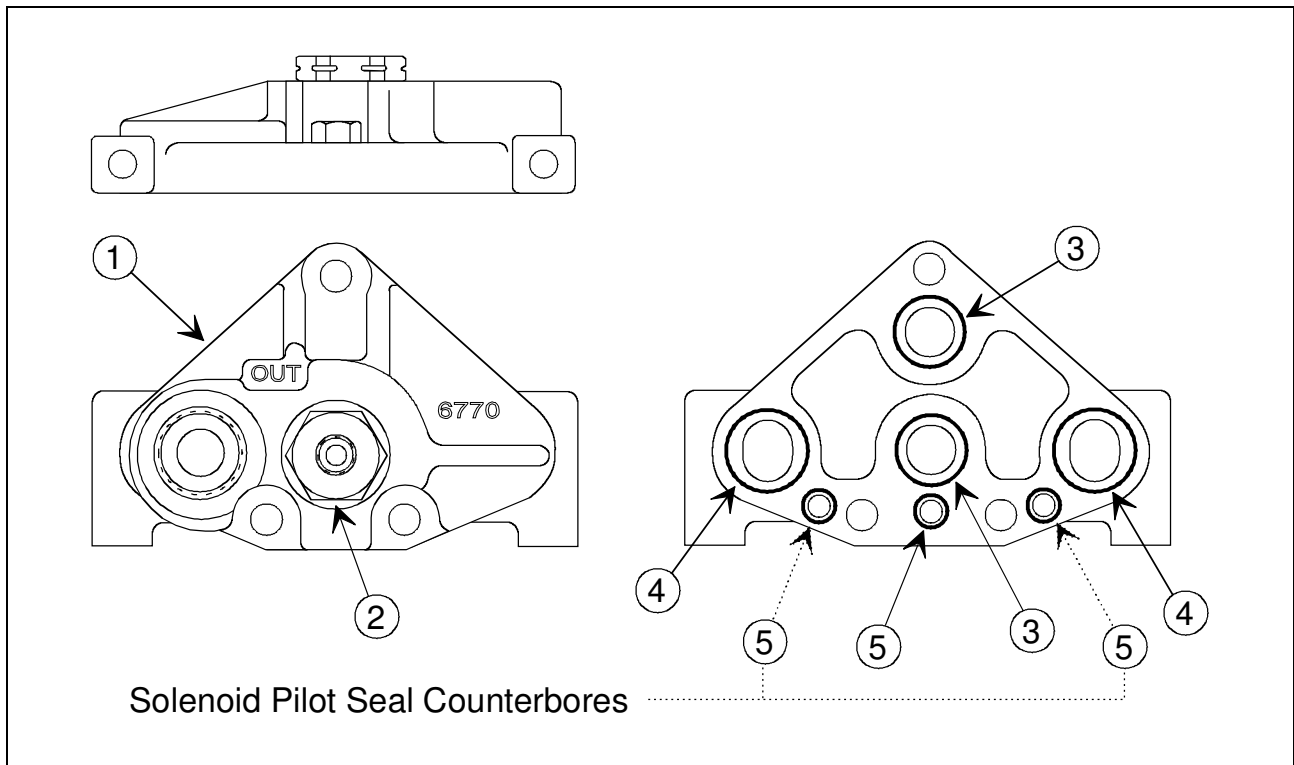


Figure 20. No. 6770LS Outlet Cover Assembly

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 10749001 | K-6156 Section Seal Kit (Includes Ref No's. 3 thru 5) ① | |
| 1 | 06770xxx | Outlet Cover Housing ② | 1 |
| 2 | 16012001 | K-6255 Bleed-Down Cartridge Kit (See Figure 16) | 1 |
| 3 | 21857001 | O-Ring Seal (Serviced in K-6156 Section Seal Kit) ① | 2 |
| 4 | 21733001 | O-Ring Seal (Serviced in K-6156 Section Seal Kit) ① | 2 |
| 5 | 21866001 | O-Ring Seal (Serviced in K-6156 Section Seal Kit) ① | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory.

② No. 06770 Outlet Cover Housing are available in many porting configurations. Contact the **Gresen** factory for help in identifying No. 06770 housing part numbers.

Conversion Port Option Plugs for 6770 Outlet Cover

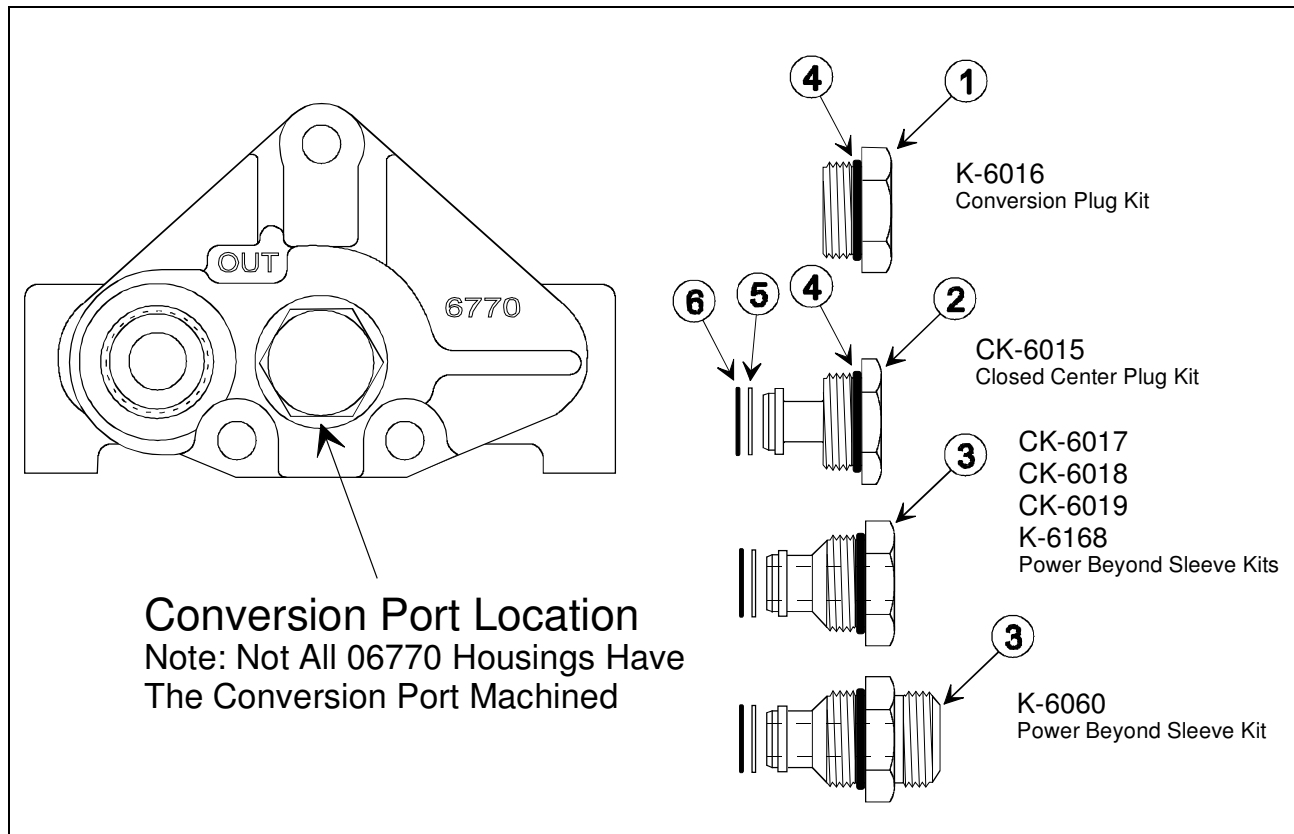


Figure 21. Conversion Plugs for 6770 Outlet Cover (Open Center)

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 06395001 | K-6016 Conversion Plug Kit - Supplied as Standard (Includes Ref No's. 1 & 2) | |
| | 12735001 | CK-6015 Closed Center Plug Kit (Includes Ref No's. 2, 4, 5 & 6) | |
| | 12745001 | CK-6017 1/2" NPT Power Beyond Sleeve Kit (Includes Ref No's. 3 thru 6) | |
| | 12746001 | CK-6018 SAE 8 Power Beyond Sleeve Kit (Includes Ref No's. 3 thru 6) | |
| | 12747001 | CK-6019 SAE 10 Power Beyond Sleeve Kit (Includes Ref No's. 3 thru 6) | |
| | 12748001 | K-6168 SAE 12 Power Beyond Sleeve Kit (Includes Ref No's. 3 thru 6) | |
| | 12749001 | K-6060 SAE 16 Power Beyond Sleeve Kit (Includes Ref No's. 3 thru 6) | |
| | 06418001 | K-6025 Plug Seal Kit (Includes Ref No's. 4 thru 6 Only) ① | |
| 1 | 01727001 | Conversion Plug | 1 |
| 2 | 01830001 | Closed Center Plug | 1 |
| 3 | 01833001 | Power Beyond Sleeve with 1/2" NPT Port | 1 |
| | 01835001 | Power Beyond Sleeve with SAE 8 Port | 1 |
| | 01836001 | Power Beyond Sleeve with SAE 10 Port | 1 |
| | 01913001 | Power Beyond Sleeve with SAE 12 Port | 1 |
| | 07716001 | Power Beyond Sleeve with SAE 16 Male Connection | 1 |
| 4 | 02709001 | O-Ring Seal (Serviced in K-6025 Plug Seal Kit) ① | 1 |
| 5 | 09020017 | Back-Up Ring (Serviced in K-6025 Plug Seal Kit) ② | 1 |
| 6 | 01721001 | O-Ring Seal (Serviced in K-6025 Plug Seal Kit) ① | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory.

② Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

Load Sense Bleed-Down Plug for 6770LS Outlet Cover

K-6255 Bleed Down Cartridge Kit

Cleaning Instructions?????

1 Required per LS System

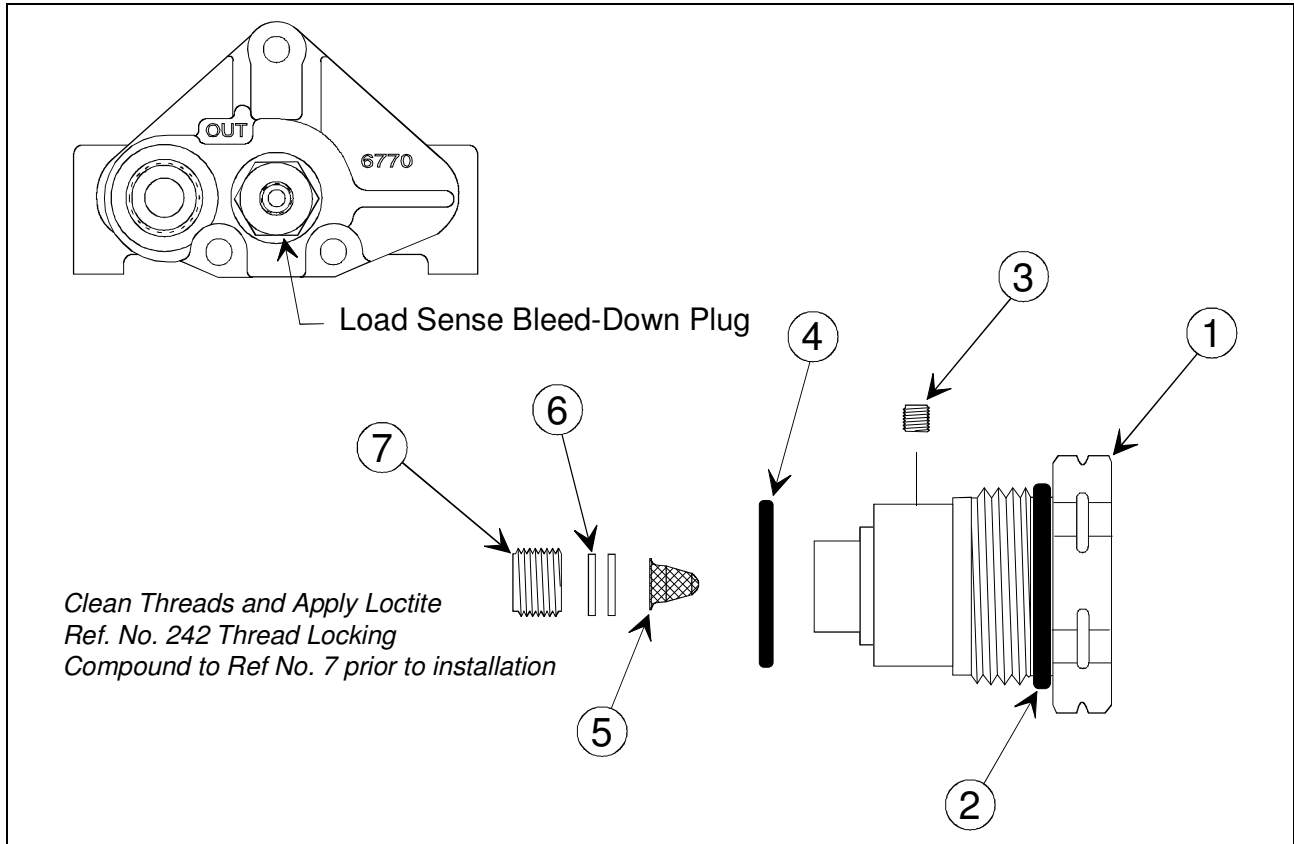


Figure 22. Load Sense Bleed-Down Plug for 6770LS Outlet Cover

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 16012002 | K-6240 Bleed-Down Cartridge Kit (Includes All Ref No's Listed Below) | |
| | 16088001 | K-6269 Cartridge Seal Kit (Includes Ref No's. 2 and 4 Only) ① | |
| 1 | 22249001 | Bleed-Down Plug | 1 |
| 2 | 02708001 | O-Ring Seal (Serviced in K-6269 Cartridge Seal Kit) ① | 1 |
| 3 | 22489001 | .018 Orifice Screw (Standard) ②③ | 1 |
| 4 | 09001115 | O-Ring Seal (Serviced in K-6269 Cartridge Seal Kit) ① | 1 |
| 5 | 11839001 | Filter Screen | 1 |
| 6 | 12293001 | Back-Up Washer | 2 |
| 7 | 11056001 | Locking Screw | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory.

② Optional Orifice Screws are available from the **Gresen** factory. Available bleed hole diameters sizes are: .020, .030 & .040.

③ The Load Sense Bleed-Down Plug can be converted to a no-bleed assembly in the field by replacing the Orifice Screw with a solid screw – **Gresen** Part Number 09275304. Install plug flush or slightly below surface.

3-Way, 3-Position Parallel & Tandem Work Sections

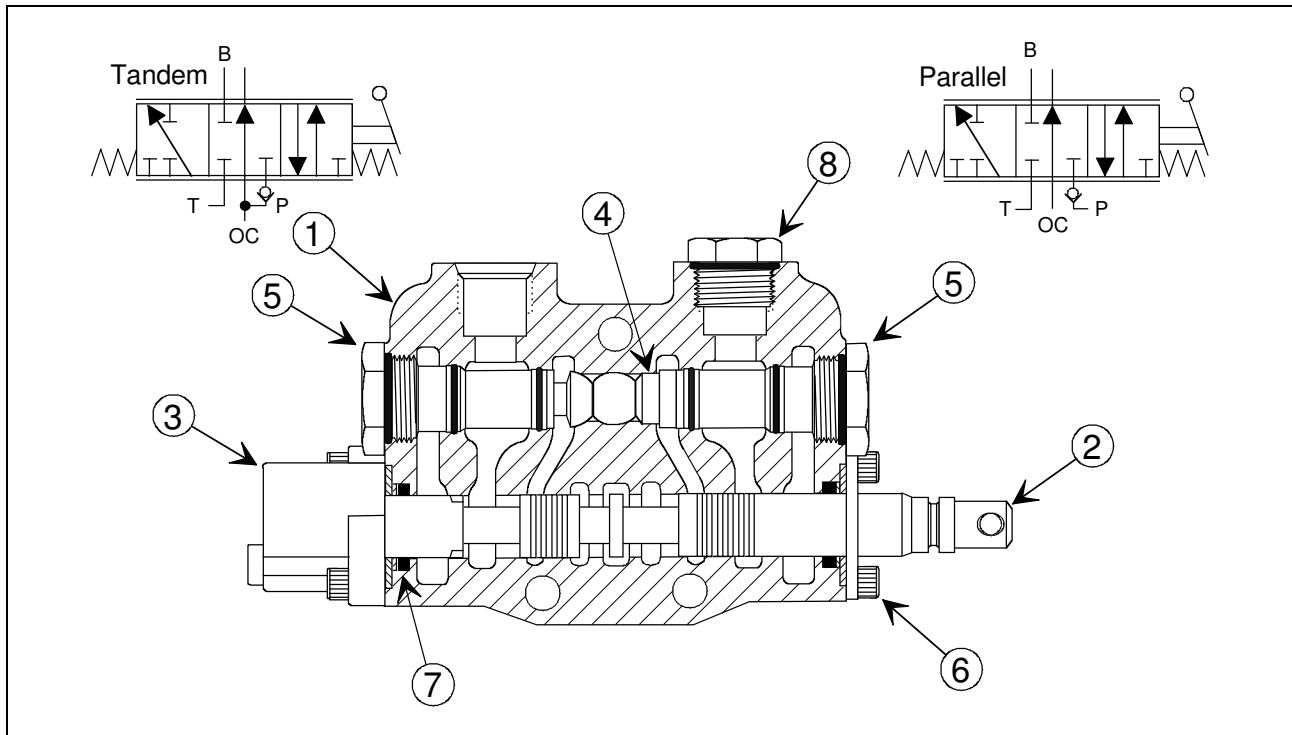


Figure 23. 3-Way, 3-Position Parallel & Tandem Work Sections (Parallel Housing Shown Here)

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| 1 | 07018001 | K-6027 Work Section Service Kit - Standard Buna-N O-Rings ① | |
| | 08072xxx | V20P Parallel Work Section Housing (Not Serviceable) ②③ | 1 |
| | 10954xxx | V20RP Parallel Work Section Housing (Not Serviceable) ②③ | 1 |
| | 08112xxx | V20T Tandem Work Section Housing (Not Serviceable) ②③ | 1 |
| | 10762xxx | V20RT Tandem Work Section Housing (Not Serviceable) ②③ | 1 |
| 2 | 08083001 | 3-Way Spool (Not Serviceable) ③④ | 1 |
| 3 | 12741001 | K-6125 (V20P and V20T) Spring-Return Spool Positioner Kit (See Figure 6) ⑤ | 1 |
| | 12933001 | K-6207 (V20RP and V20RT) Spring-Return Spool Positioner Kit (See Figure 6) ⑤ | 1 |
| 4 | 06754001 | 3-Way Conversion Plug | 1 |
| 5 | 12742001 | K-6030 Load Check Plug Assembly (See Figures 24 thru 25 for Options) ⑥ | 2 |
| 6 | 12786001 | K-6033 Seal Retainer Kit (See Figures 26 thru 29 for Handle End Options) | 1 |
| 7 | 07385001 | K-6035 Spool Seal Assembly (Serviced in Spool Seal Kits - See Figure 2) | 2 |
| 8 | 07054001 | SAE 10 Port Plug (Plug Selection Determined By Port Size) | 1 |
| | 00947001 | ½" - 14 NPT Port Plug | 1 |

① Work Section Service Kits include all the seals and back-up rings required to service one V20 work section.

② Contact the **Gresen** factory in Minneapolis for porting options.

③ The work section housing and spool are matched and are not sold separately.

④ **Warning:** If you are using the free flow (F4) spool configuration in a cylinder lift application, it must be used in conjunction with a load holding device. A load holding device will prevent the load from free falling when the spool is in the neutral position. A free falling load could cause serious bodily injury or property damage if the holding device is not installed.

⑤ Manual Positioners and Actuators will **NOT** work on Solenoid Work Section housings.

⑥ Do not install the load check poppet and spring on the same side that the conversion plug (Item 4) is installed.

4-Way, 3-Position Parallel & Tandem Work Sections

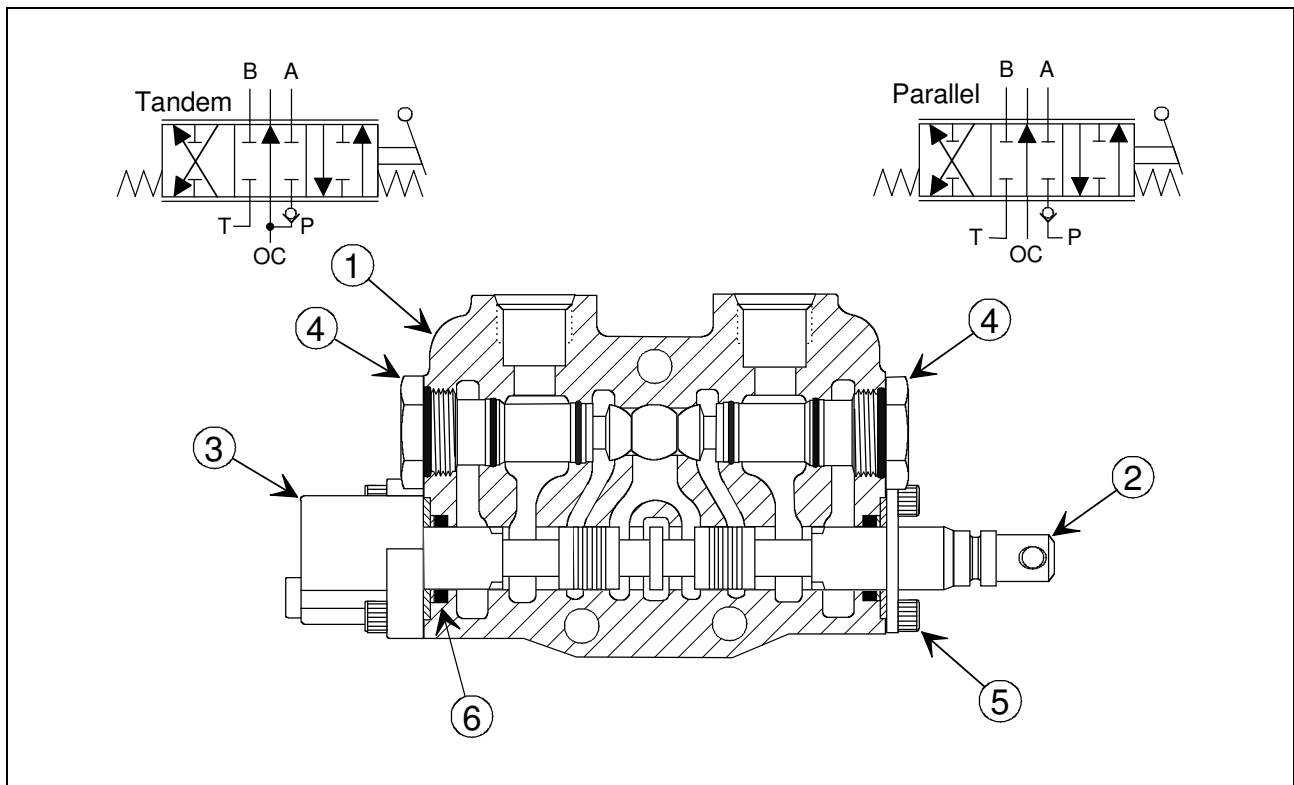


Figure 24. 4-Way, 3-Position Parallel & Tandem Work Sections (Tandem Housing Shown Here)

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| 1 | 07018001 | K-6027 Work Section Service Kit - Standard Buna-N O-Rings ① | |
| | 08072xxx | V20P Parallel Work Section Housing (Not Serviceable) ②③ | 1 |
| | 10954xxx | V20RP Parallel Work Section Housing (Not Serviceable) ②③ | 1 |
| | 08112xxx | V20T Tandem Work Section Housing (Not Serviceable) ②③ | 1 |
| | 10762xxx | V20RT Tandem Work Section Housing (Not Serviceable) ②③ | 1 |
| 2 | 08084001 | 4-Way Spool (Not Serviceable) ③④ | 1 |
| | 08108001 | 4-Way Free Flow Spool (Not Serviceable) ③④ | 1 |
| 3 | 12741001 | K-6125 (V20P and V20T) Spring-Return Spool Positioner Kit (See Figure 6) ⑤ | 1 |
| | 12933001 | K-6207 (V20RP and V20RT) Spring-Return Spool Positioner Kit (See Figure 6) ⑤ | 1 |
| 4 | 12742001 | K-6030 Load Check Plug Assembly (See Figures 24 thru 25 for Options) | 2 |
| 5 | 12786001 | K-6033 Seal Retainer Kit (See Figures 26 thru 29 for Handle End Options) | 1 |
| 6 | 07385001 | K-6035 Spool Seal Assembly (Serviced in Spool Seal Kits - See Figure 2) | 2 |

① Work Section Service Kits include all the seals and back-up rings required to service one V20 work section.

② Contact the **Gresen** factory in Minneapolis for porting options.

③ The work section housing and spool are matched and are not sold separately.

④ Warning: If you are using the free flow (F4) spool configuration in a cylinder lift application, it must be used in conjunction with a load holding device. A load holding device will prevent the load from free falling when the spool is in the neutral position. A free falling load could cause serious bodily injury or property damage if the holding device is not installed.

⑤ Manual Positioners and Actuators will NOT work on Solenoid Work Section housings.

4-Way, 4-Position Float Parallel & Tandem Work Sections

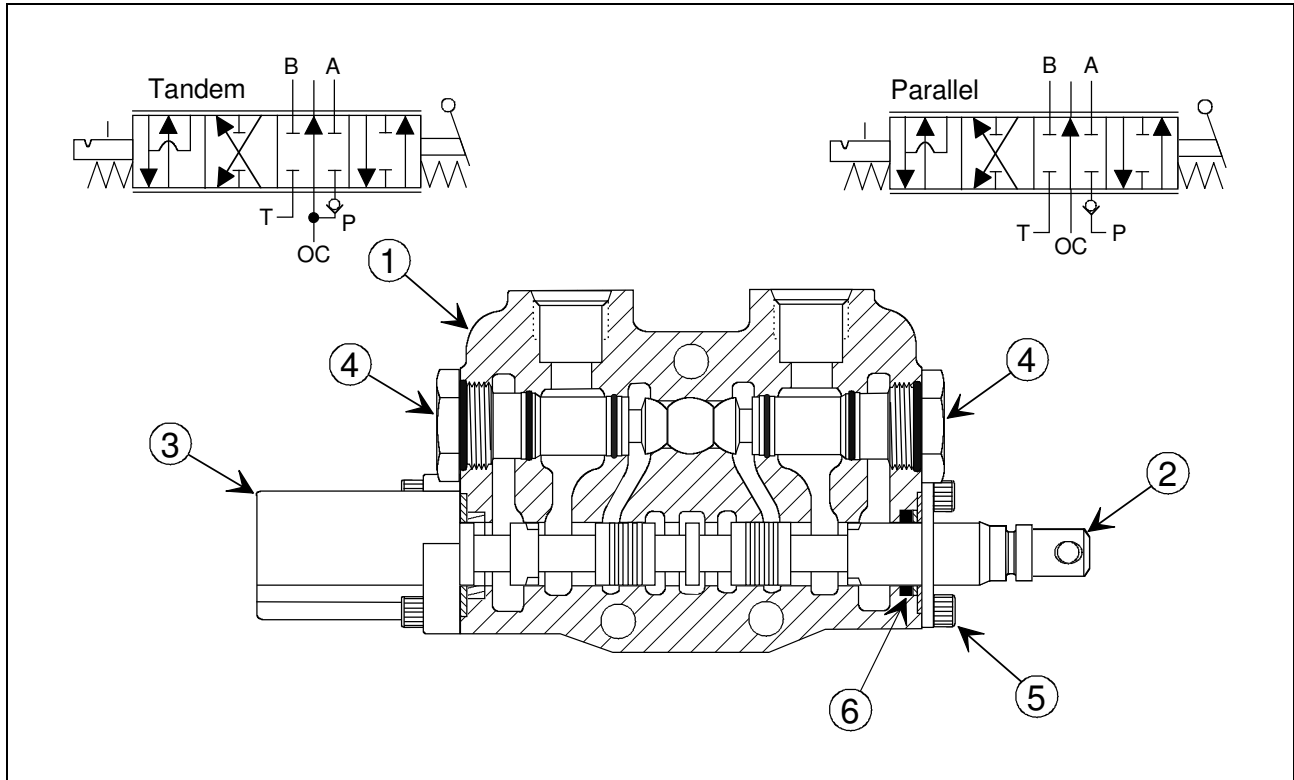


Figure 25. 4-Way, 4-Position Float Parallel & Tandem Work Sections (Parallel Housing Shown Here)

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| 1 | 07019001 | K-6028 Float Work Section Service Kit - Standard Buna-N O-Rings ① | |
| | 08072xxx | V20P Parallel Work Section Housing (Not Serviceable) ② ③ | 1 |
| | 10954xxx | V20RP Parallel Work Section Housing (Not Serviceable) ② ③ | 1 |
| | 08112xxx | V20T Tandem Work Section Housing (Not Serviceable) ② ③ | 1 |
| | 10762xxx | V20RT Tandem Work Section Housing (Not Serviceable) ② ③ | 1 |
| 2 | 08085001 | 4-Way Float Spool (Not Serviceable) ③ | 1 |
| 3 | 12888001 | K-6127 4-Position Float Spool Positioner Kit (See Figure 6) ④ | 1 |
| 4 | 12742001 | K-6030 Load Check Plug Assembly (See Figures 24 thru 25 for Options) | 2 |
| 5 | 12786001 | K-6033 Seal Retainer Kit (See Figures 26 thru 29 for Handle End Options) | 1 |
| 6 | 07385001 | K-6035 Spool Seal Assembly (Serviced in Spool Seal Kits - See Figure 2) | 1 |

① Work Section Service Kits include all the seals and back-up rings required to service one V20 work section.

② Contact the **Gresen** factory in Minneapolis for porting options.

③ The work section housing and spool are matched and are not sold separately.

④ 3-Position Spool Positioners and Actuators will NOT work on Float Work Sections.

4-Way, 3-Position 'V20LO' Lockout Work Section

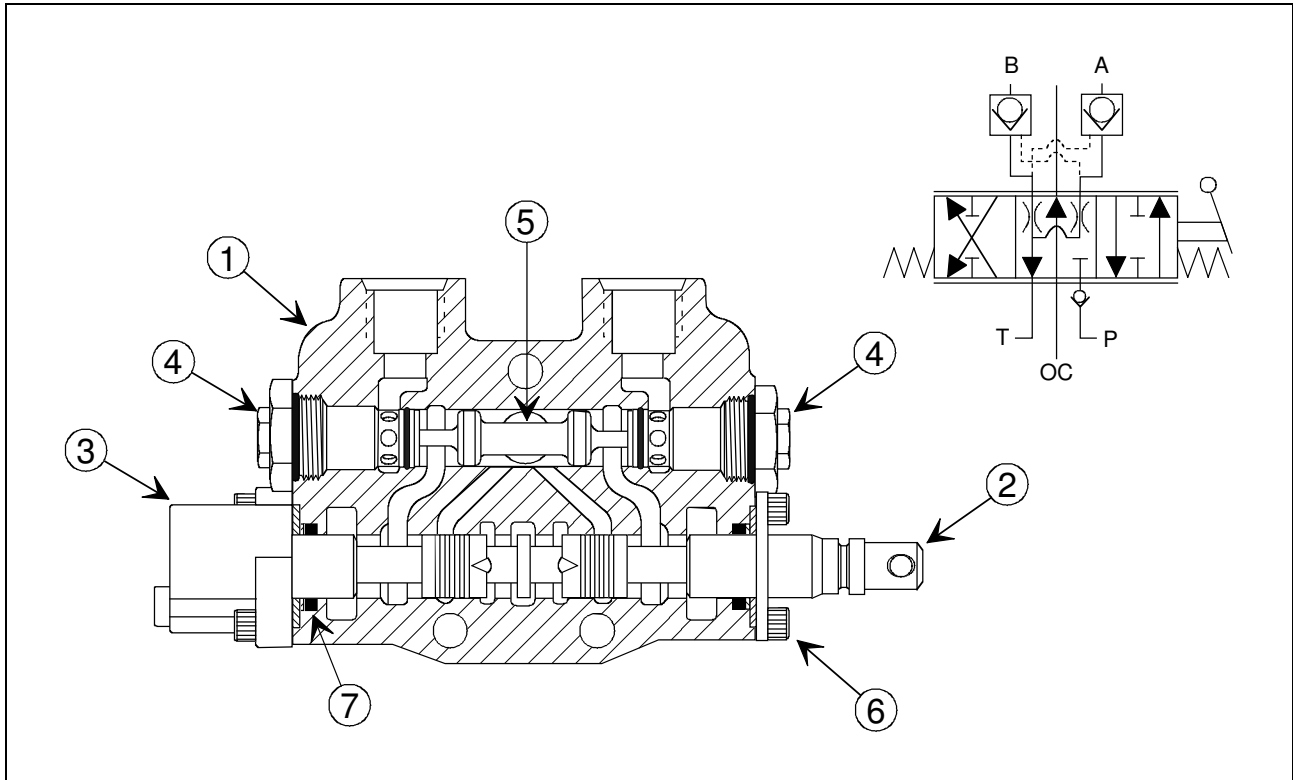


Figure 26. 4-Way, 3-Position 'V20LO' Lockout Work Section

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 07018001 | K-6027 Work Section Service Kit - Standard Buna-N O-Rings ① | |
| 1 | 11571xxx | V20LO Lockout Work Section Housing (Not Serviceable) ② ③ | 1 |
| 2 | 08397001 | 4-Way Lockout Spool (Not Serviceable) ③ | 1 |
| 3 | 12741001 | K-6125 (V20P and V20T) Spring-Return Spool Positioner Kit (See Figure 6) | 1 |
| | 12933001 | K-6207 (V20RP and V20RT) Spring-Return Spool Positioner Kit (See Figure 6) | 1 |
| 4 | 06638001 | K-6024 Lockout Check Plug Assembly (See Figure 24) | 2 |
| 5 | 11572001 | Unlocking Piston | 1 |
| 6 | 12786001 | K-6033 Seal Retainer Kit (See Figures 26 thru 29 for Handle End Options) | 1 |
| 7 | 07385001 | K-6035 Spool Seal Assembly (Serviced in Spool Seal Kits - See Figure 2) | 1 |

① Work Section Service Kits include all the seals and back-up rings required to service one V20 work section.

② Contact the **Gresen** factory in Minneapolis for porting options.

③ The work section housing and spool are matched and are not sold separately.

4-Way, 3-Position Parallel & Tandem Work Sections with 'KO'

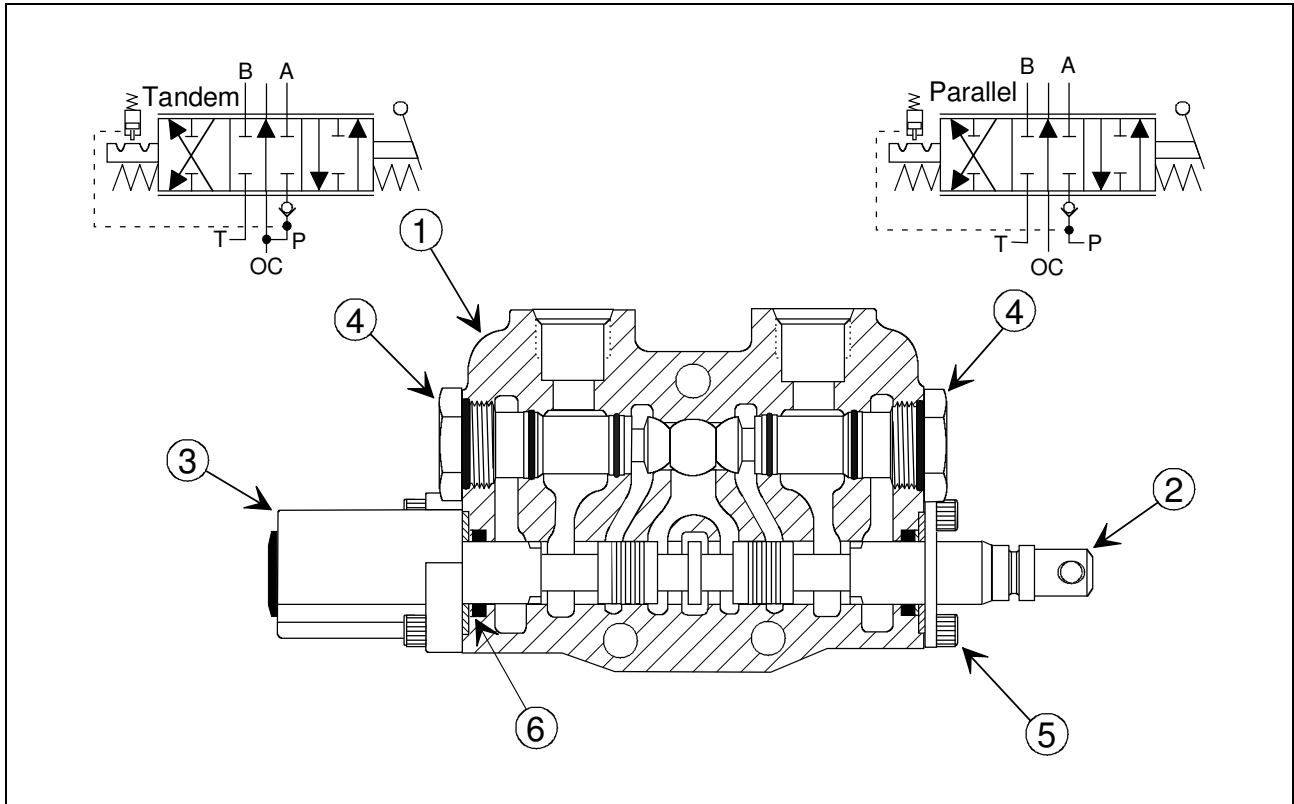


Figure 27. 4-Way, 3-Position Parallel & Tandem Work Sections with 'KO' (Tandem Housing Shown Here)

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| 1 | 07018001 | K-6027 Work Section Service Kit - Standard Buna-N O-Rings ① | |
| | 08072xxx | V20P Parallel Work Section Housing (Not Serviceable) ②③ | 1 |
| | 10954xxx | V20RP Parallel Work Section Housing (Not Serviceable) ②③ | 1 |
| | 08112xxx | V20T Tandem Work Section Housing (Not Serviceable) ②③ | 1 |
| | 10762xxx | V20RT Tandem Work Section Housing (Not Serviceable) ②③ | 1 |
| 2 | 08534001 | 4-Way 'KO' (Knockout) Spool (Not Serviceable) ③ | 1 |
| 3 | 08542002 | 3-Position 'KO' Spool Positioner Kit (See Figure 6) ④ | 1 |
| 4 | 12742001 | K-6030 Load Check Plug Assembly (See Figures 24 thru 25 for Options) | 2 |
| 5 | 12786001 | K-6033 Seal Retainer Kit (See Figures 26 thru 29 for Handle End Options) | 1 |
| 6 | 07385001 | K-6035 Spool Seal Assembly (Serviced in Spool Seal Kits - See Figure 2) | 1 |

① Work Section Service Kits include all the seals and back-up rings required to service one V20 work section.

② Contact the **Gresen** factory in Minneapolis for porting options.

③ The work section housing and spool are matched and are not sold separately.

④ 'KO' Knockout Spool Positioners will NOT work with standard spools.

Model V20 Externally Piloted Solenoid Work Sections

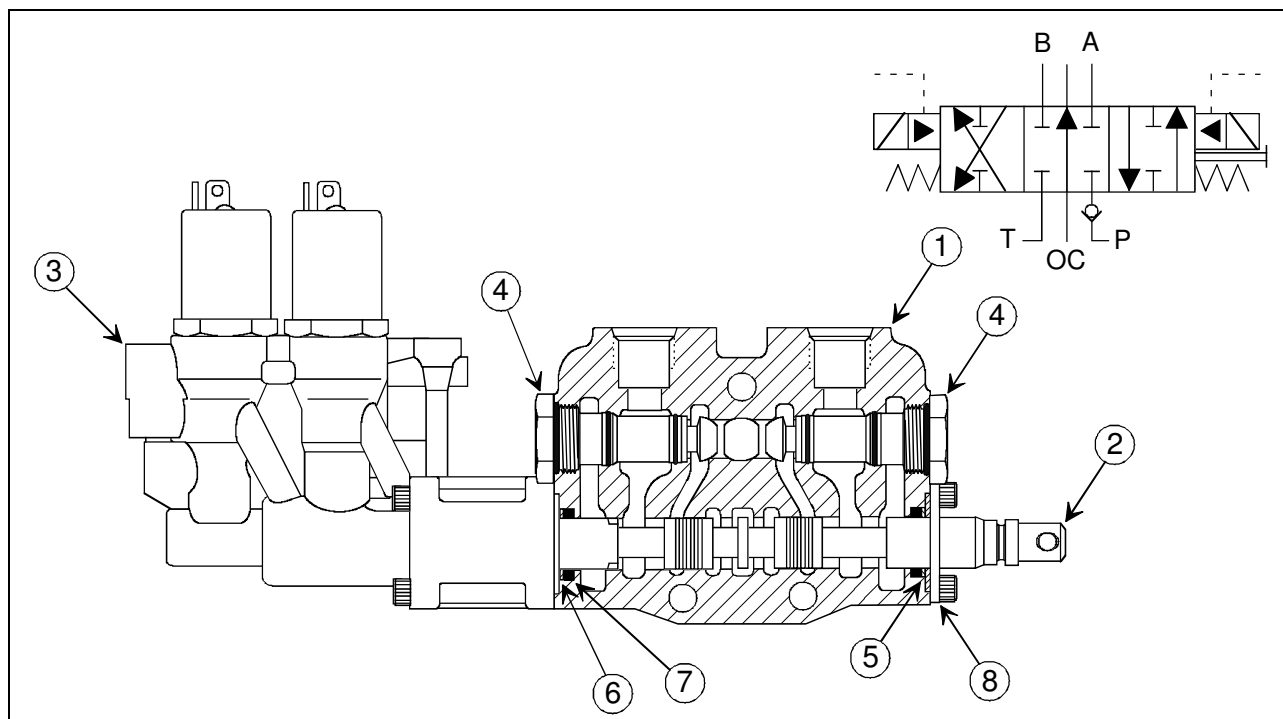


Figure 28. Model V20 Externally Piloted Solenoid Work Sections (Parallel 4-Way Section Shown)

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| 1 | 07018001 | K-6027 Work Section Service Kit - Standard Buna-N O-Rings ① | |
| | 08072xxx | V20P Parallel Work Section Housing (Not Serviceable) ②③ | 1 |
| | 10954xxx | V20RP Parallel Work Section Housing (Not Serviceable) ②③ | 1 |
| | 08112xxx | V20T Tandem Work Section Housing (Not Serviceable) ②③ | 1 |
| | 10762xxx | V20RT Tandem Work Section Housing (Not Serviceable) ②③ | 1 |
| 2 | 08084001 | 4-Way Spool (Not Serviceable) ③④ | 1 |
| | 08108001 | 4-Way Free Flow Spool (Not Serviceable) ③④ | 1 |
| 3 | 10490001 | K-6167 12VDC Solenoid Actuator Kit (See Figure 6) ⑤ | 1 |
| 4 | 12742001 | K-6030 Load Check Plug Assembly (See Figures 24 thru 25 for Options) | 2 |
| 5 | 07385001 | K-6035 Spool Seal Assembly (Serviced in Spool Seal Kits - See Figure 2) | 1 |
| 6 | 07700001 | O-Ring Seal (Serviced in Spool Seal Kits – Figure 2) ① | 1 |
| 7 | 03265001 | Back-Up Ring (Serviced in Spool Seal Kits – Figure 2) ⑥ | 1 |
| 8 | 12786001 | K-6033 Seal Retainer Kit (See Figures 26 thru 29 for Handle End Options) | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies.

② Work Section Service Kits include all the seals and back-up rings required to service one V26PC work section, including spool seals. Do NOT install spool seals into V26PC Solenoid Work Sections.

③ SAE porting standard. Contact the **Gresen** factory in Minneapolis for optional porting.

④ The work section housing and spool are matched and are not sold separately.

⑤ Warning: If you are using the free flow (F4) spool configuration in a cylinder lift application, it must be used in conjunction with a load holding device. A load holding device will prevent the load from free falling when the spool is in the neutral position. A free falling load could cause serious bodily injury or property damage if the holding device is not installed. Be sure to clear the work area prior to testing the cylinder lift application to avoid a potential dangerous situation.

⑥ Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

‘V20P’ Parallel & ‘V20T’ Tandem 4-Way Solenoid Work Sections

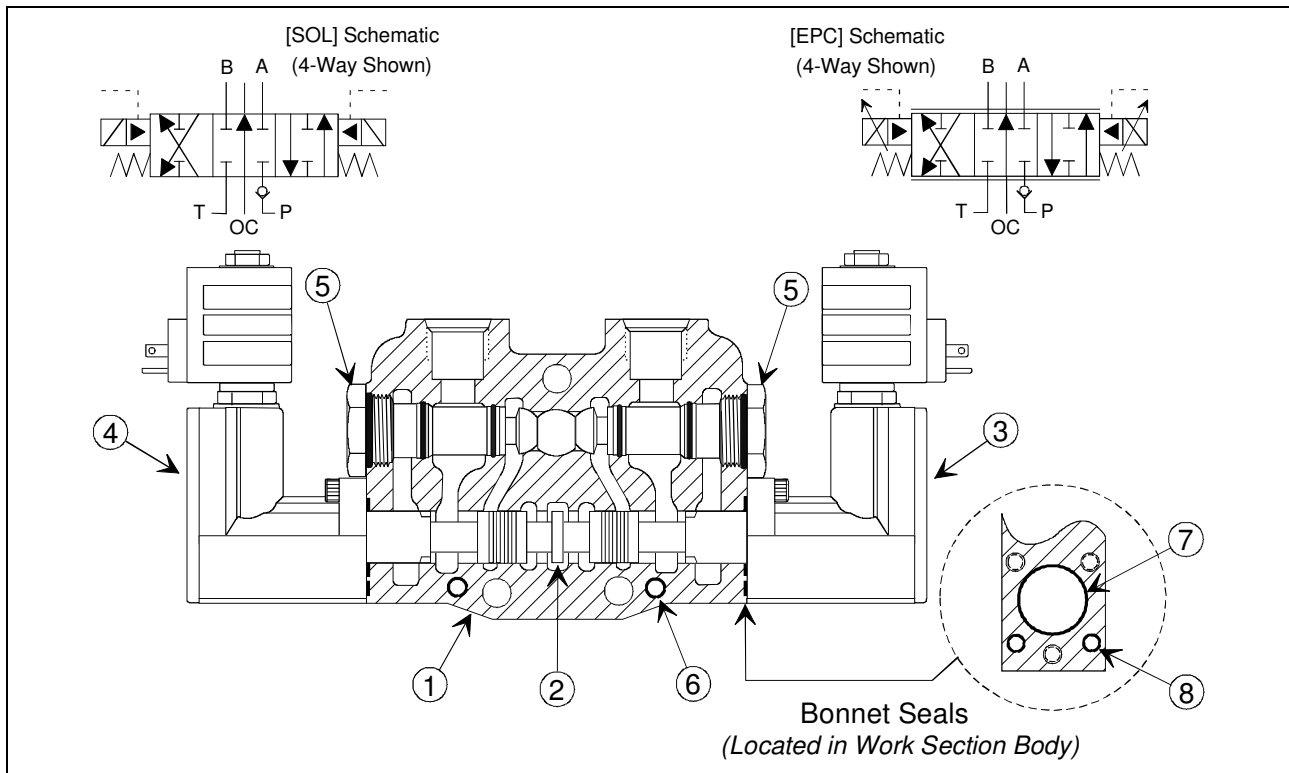


Figure 29. ‘V20P’ Parallel & ‘V20T’ Tandem 4-Way Solenoid Work Sections (Parallel Housing Shown)

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | | K-6 V20 Solenoid Work Section Service Kit - Buna-N O-Rings ①② | |
| 1 | 10954xxx | V20RP ‘Parallel’ Solenoid Work Section Housing (Not Serviceable) ③④ | 1 |
| | 10762xxx | V20RT ‘Tandem’ Solenoid Work Section Housing (Not Serviceable) ③④ | 1 |
| 2 | 21500001 | 4-Way Solenoid Spool (Not Serviceable) ④⑤ | 1 |
| | 21504001 | 4-Way Free Flow Solenoid Spool (Not Serviceable) ④⑤ | 1 |
| 3 | 21477xxx | On/Off [SOL] Solenoid Actuator Assembly - ‘A’ End (See Figure 14) ⑥ | 1 |
| | 21475xxx | Proportional [EPC] Solenoid Actuator Assembly - ‘A’ End (See Figure 14) ⑥ | 1 |
| 4 | 21478xxx | On/Off [SOL] Solenoid Actuator Assembly - ‘B’ End (See Figure 14) ⑥ | 1 |
| | 21476xxx | Proportional [EPC] Solenoid Actuator Assembly - ‘B’ End (See Figure 14) ⑥ | 1 |
| 5 | 12742001 | K-6030 Load Check Plug Kit (See Figure 24) | 2 |
| 6 | 21866001 | O-Ring Seal | 2 |
| 7 | 21801001 | O-Ring Seal | 2 |
| 8 | 07773001 | O-Ring Seal | 4 |

- ① Buna-N seals are standard for all **Gresen** valve assemblies.
- ② Work Section Service Kits include all the seals and back-up rings required to service one V26PC work section, including spool seals. Do **NOT** install spool seals into V26PC Solenoid Work Sections.
- ③ SAE porting standard. Contact the **Gresen** factory in Minneapolis for optional porting.
- ④ The work section housing and spool are matched and are not sold separately.
- ⑤ **Warning:** If you are using the free flow (F4) spool configuration in a cylinder lift application, it must be used in conjunction with a load holding device. A load holding device will prevent the load from free falling when the spool is in the neutral position. A free falling load could cause serious bodily injury or property damage if the holding device is not installed. Be sure to clear the work area prior to testing the cylinder lift application to avoid a potential dangerous situation.

‘V20P’ & ‘V20T’ Solenoid Work Sections with Handle

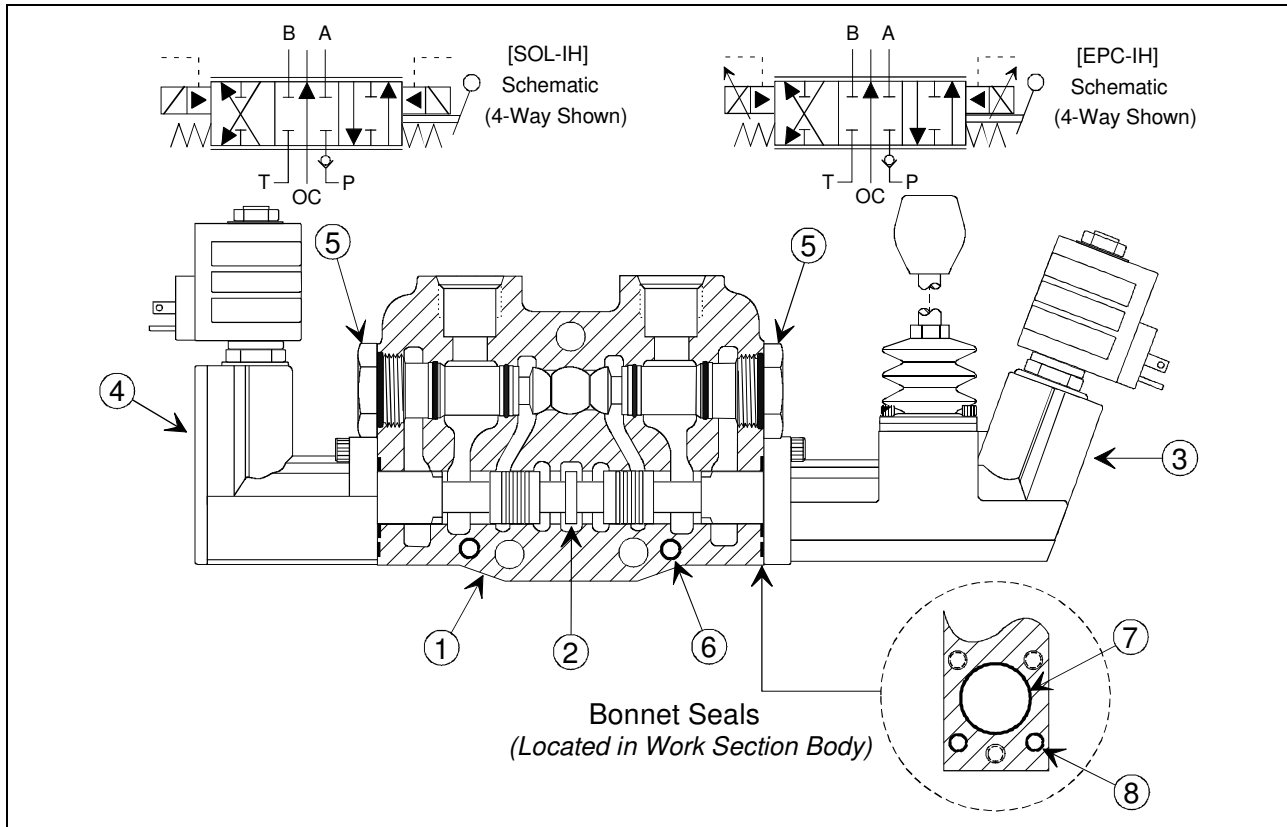


Figure 30. ‘V20P’ & ‘V20T’ Solenoid Work Sections with Handle

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| 1 | 10954xxx | K-6 V20 Solenoid Work Section Service Kit - Buna-N O-Rings ①② | 1 |
| | 10762xxx | V20RP ‘Parallel’ Solenoid Work Section Housing (Not Serviceable) ③④ | 1 |
| | 10762xxx | V20RT ‘Tandem’ Solenoid Work Section Housing (Not Serviceable) ③④ | 1 |
| 2 | 21500001 | 4-Way Solenoid Spool (Not Serviceable) ④⑤ | 1 |
| | 21504001 | 4-Way Free Flow Solenoid Spool (Not Serviceable) ④⑤ | 1 |
| 3 | 21561xxx | On/Off [SOL] Solenoid Actuator with Handle - ‘A’ End (See Figure 14) ⑥ | 1 |
| | 21475xxx | Proportional [EPC] Solenoid Actuator with Handle - ‘A’ End (See Figure 14) ⑥ | 1 |
| | 21478xxx | On/Off [SOL] Solenoid Actuator Assembly - ‘B’ End (See Figure 14) ⑥ | 1 |
| | 21476xxx | Proportional [EPC] Solenoid Actuator Assembly - ‘B’ End (See Figure 14) ⑥ | 1 |
| 4 | 12742001 | K-6030 Load Check Plug Kit (See Figure 24) | 1 |
| 5 | 21801001 | O-Ring Seal | 2 |
| 6 | 21866001 | O-Ring Seal | 2 |
| 7 | 07773001 | O-Ring Seal | 4 |

- ① Buna-N seals are standard for all **Gresen** valve assemblies.
- ② Work Section Service Kits include all the seals and back-up rings required to service one V26PC work section, including spool seals. Do NOT install spool seals into V26PC Solenoid Work Sections.
- ③ SAE porting standard. Contact the **Gresen** factory in Minneapolis for optional porting.
- ④ The work section housing and spool are matched and are not sold separately.
- ⑤ Warning: If you are using the free flow (F4) spool configuration in a cylinder lift application, it must be used in conjunction with a load holding device. A load holding device will prevent the load from free falling when the spool is in the neutral position. A free falling load could cause serious bodily injury or property damage if the holding device is not installed. Be sure to clear the work area prior to testing the cylinder lift application to avoid a potential dangerous situation.
- ⑥ Manual Positioner and Actuators will NOT work on Solenoid Type Work Section housings.

4-Way, 3-Position 'Series' Work Sections

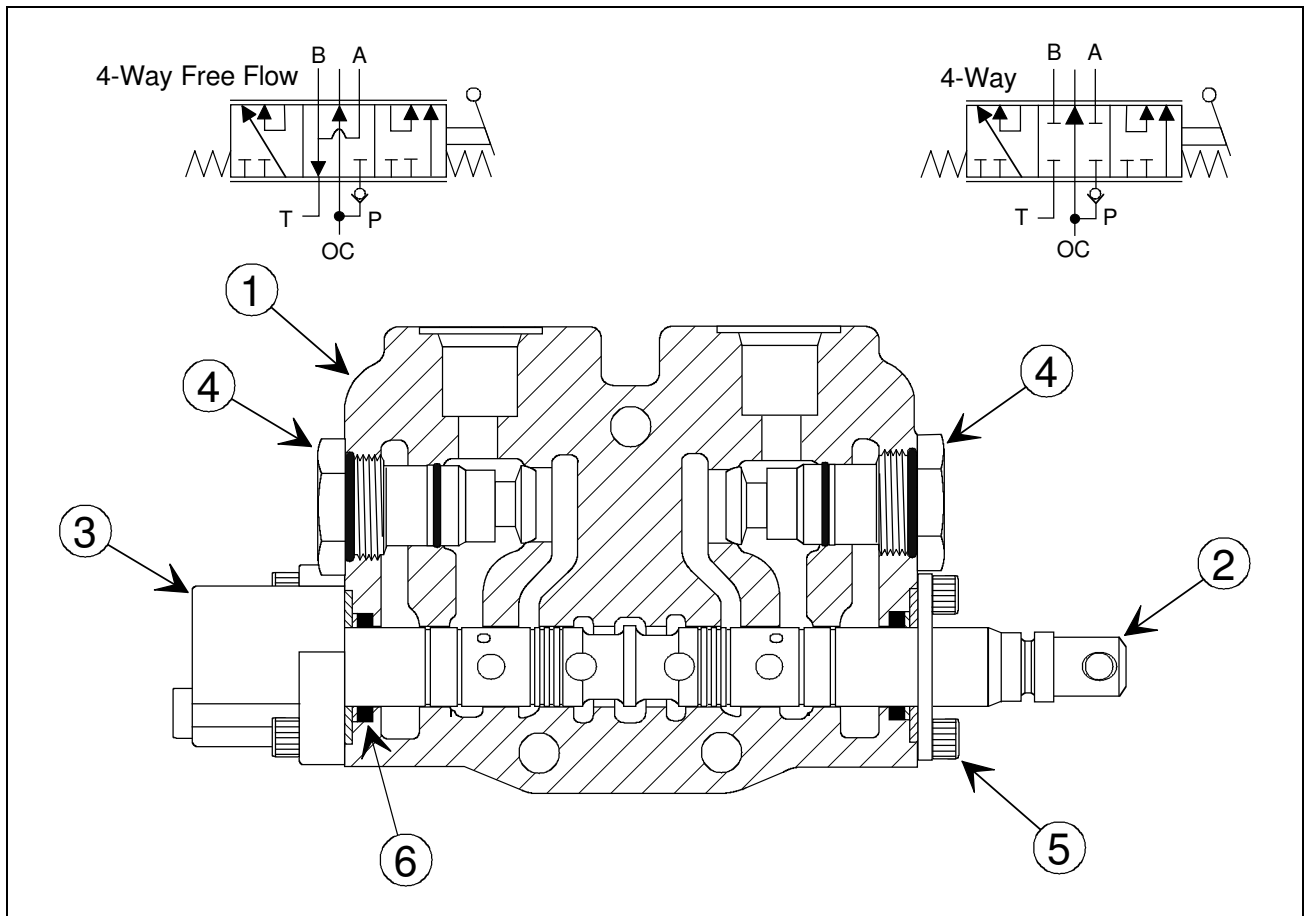


Figure 31. 4-Way, 3-Position 'Series' Work Section

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 11499001 | K-6209 V20S Series Work Section Service Kit - Standard Buna-N O-Rings ① | |
| 1 | 11483xxx | V20S 'Series' Work Section Housing (Not Serviceable) ②③ | 1 |
| 2 | 11245001 | 4-Way 'Series' Spool (Not Serviceable) ③④ | 1 |
| | 12653001 | 4-Way 'Series' Free Flow Spool (Not Serviceable) ③④ | 1 |
| 3 | 12933001 | K-6207 Spring-Return Spool Positioner Kit (See Figure 6) ⑤ | 1 |
| 4 | 12953001 | K-6203 'Series' Load Check Plug Assembly (See Figures 24 thru 25 for Options) | 2 |
| 5 | 12786001 | K-6033 Seal Retainer Kit (See Figures 26 thru 29 for Handle End Options) | 1 |
| 6 | 07385001 | K-6035 Spool Seal Assembly (Serviced in Spool Seal Kits - See Figure 2) | 2 |

① Work Section Service Kits include all the seals and back-up rings required to service one V20S 'Series' work section.

② Contact the **Gresen** factory in Minneapolis for porting options.

③ The work section housing and spool are matched and are not sold separately.

④ Warning: If you are using the free flow (F4) spool configuration in a cylinder lift application, it must be used in conjunction with a load holding device. A load holding device will prevent the load from free falling when the spool is in the neutral position. A free falling load could cause serious bodily injury or property damage if the holding device is not installed.

⑤ Manual Positioners and Actuators will NOT work on Solenoid Work Section housings.

4-Way, 4-Position Float 'Series' Work Sections

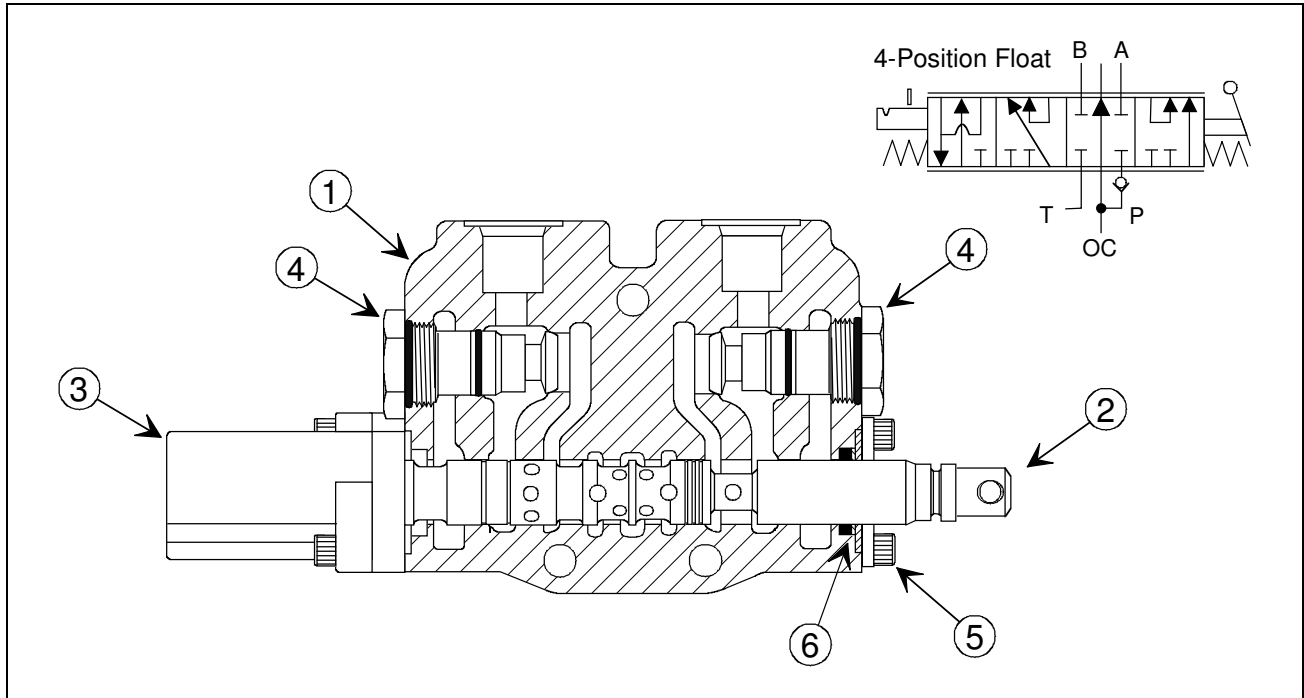


Figure 32. 4-Way, 3-Position 'Series' Float Work Section

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 11500001 | K-6210 V20S Series Work Section Service Kit - Standard Buna-N O-Rings ① | |
| 1 | 11483xxx | V20S 'Series' Work Section Housing (Not Serviceable) ② ③ | 1 |
| 2 | 11377001 | 4-Way 'Series' Float Spool (Not Serviceable) ③ ④ | 1 |
| 3 | 12701001 | K-6208 'Series' Float Spool Positioner Kit (See Figure 6) ⑤ | 1 |
| 4 | 12953001 | K-6203 'Series' Load Check Plug Assembly (See Figures 24 thru 25 for Options) | 2 |
| 5 | 12786001 | K-6033 Seal Retainer Kit (See Figures 26 thru 29 for Handle End Options) | 1 |
| 6 | 07385001 | K-6035 Spool Seal Assembly (Serviced in Spool Seal Kits - See Figure 2) | 1 |

① Work Section Service Kits include all the seals and back-up rings required to service one V20S 'Series' work section.

② Contact the **Gresen** factory in Minneapolis for porting options.

③ The work section housing and spool are matched and are not sold separately.

④ 3-Position Spool Positioners and Actuators will NOT work on Float Work Sections.

V20LS 'Load Sensing' Work Sections

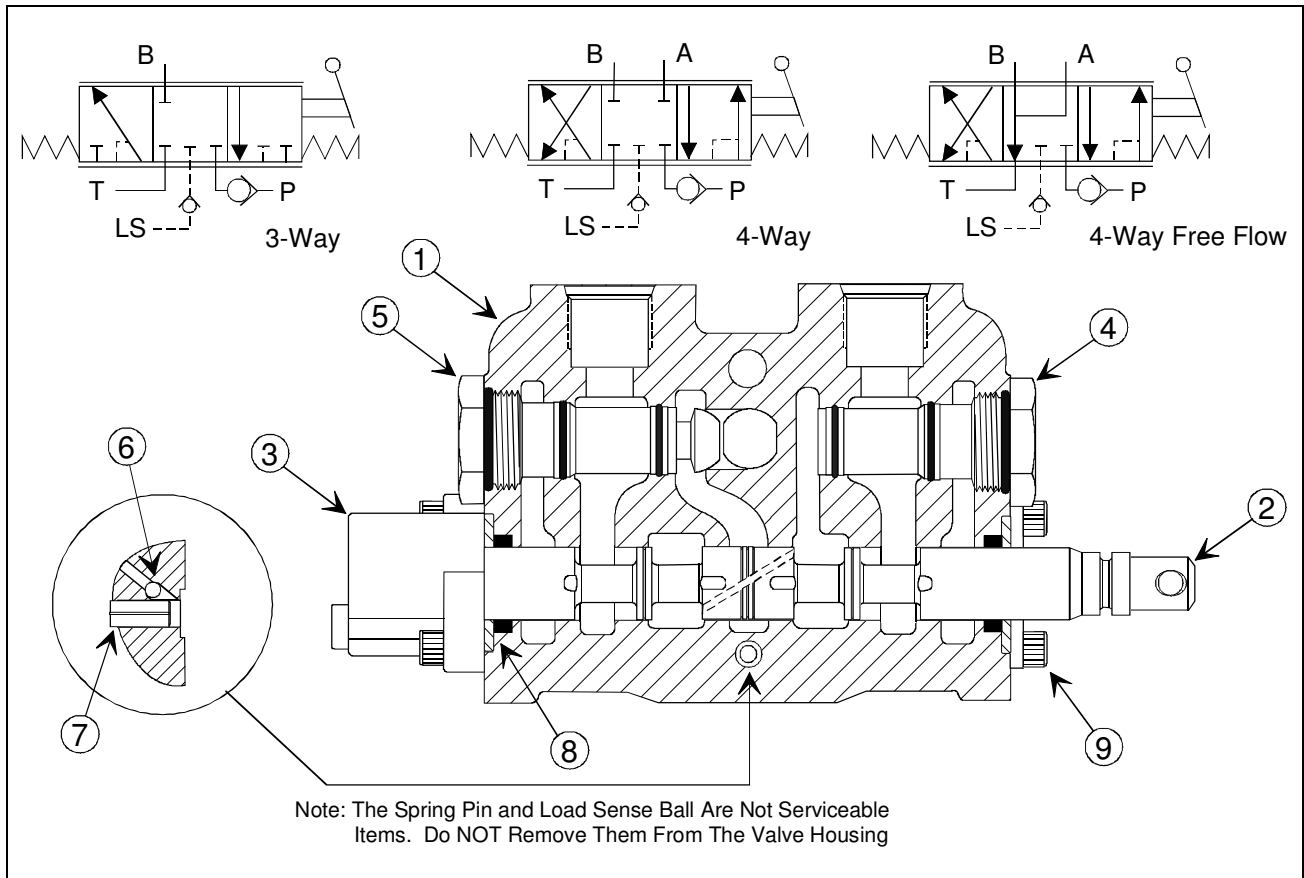


Figure 33. V20LS 'Load Sensing' Work Sections

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | | K- V20 Work Section Service Kit - Standard Buna-N O-Rings ①② | |
| 1 | 08364xxx | V20LS Work Section Housing (Not Serviceable) ③④ | 1 |
| 2 | 08388001 | 4-Way Load Sensing Spool (Not Serviceable) ④⑤ | 1 |
| 3 | 12741001 | K-6125 Spool Positioner Kit (See Figures 6 thru 13 for Positioner Options) ⑥ | 1 |
| 4 | 12742001 | K-6030 Load Check Plug Assembly (See Figure) | 2 |
| 5 | 12786001 | K-6033 Seal Retainer Kit (See Figures 26 thru 29 for Handle End Options) | 1 |
| 6 | 07385001 | K-6035 Spool Seal Assembly (Serviced in Spool Seal Kits - See Figure 2) ① | 2 |
| 7 | 07397001 | Load Sense Check Ball (Not Serviceable) | 1 |
| 8 | 08392001 | Spring Pin (Not Serviceable) | 1 |

- ① Buna-N seals are standard for all **Gresen** valve assemblies.
- ② Work Section Service Kits include all the seals and back-up rings required to service one V20 work section.
- ③ SAE porting standard. Contact the **Gresen** factory in Minneapolis for optional porting.
- ④ The work section housing and spool are matched and are not sold separately.
- ⑤ Warning: If you are using the free flow (F4) spool configuration in a cylinder lift application, it must be used in conjunction with a load holding device. A load holding device will prevent the load from free falling when the spool is in the neutral position. A free falling load could cause serious bodily injury or property damage if the holding device is not installed.
- ⑥ Manual Positioners and Actuators will NOT work on Solenoid Work Section housings.

V20LS 'Load Sensing' Work Section With Flow Control

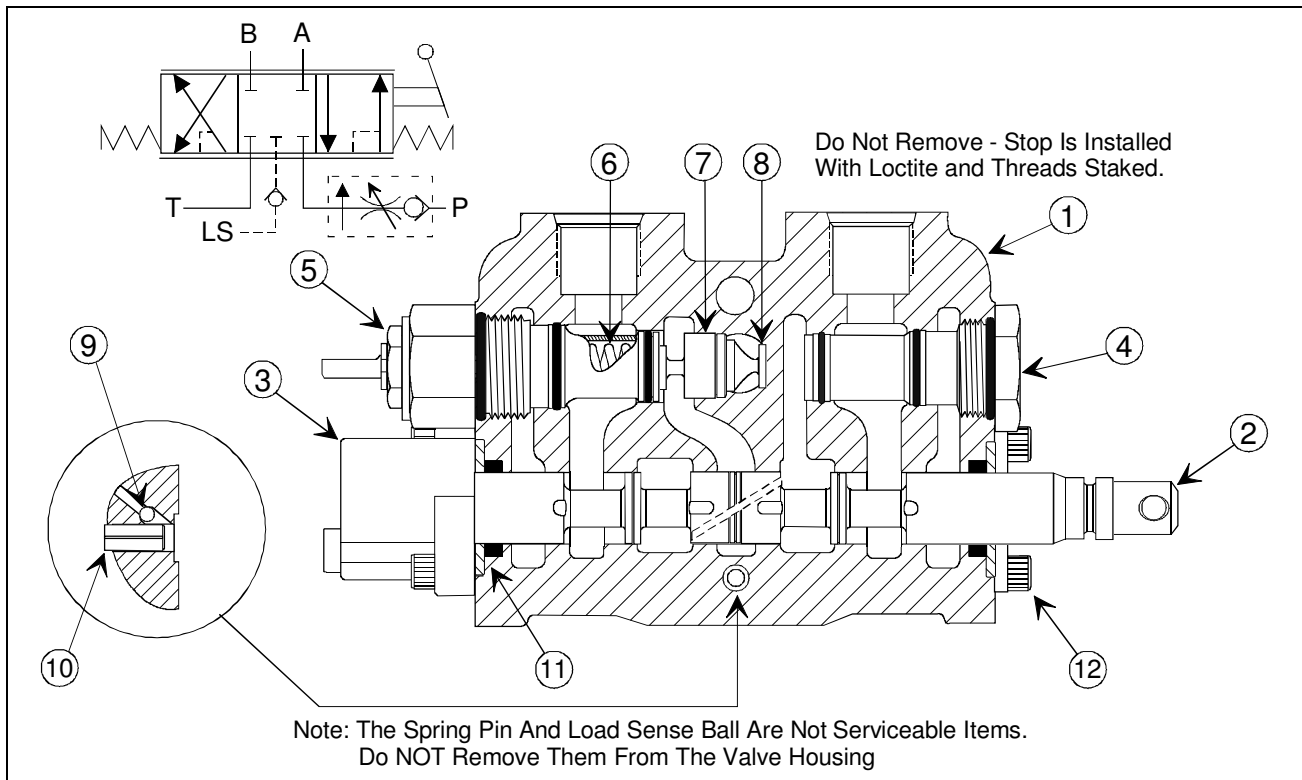


Figure 34. V20LS 'Load Sensing' Work Section With Flow Control

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | | K- V20 Work Section Service Kit - Standard Buna-N O-Rings ① ② | |
| 1 | 08364xxx | V20LS-W/FC Work Section Housing (Not Serviceable) ③ ④ | 1 |
| 2 | 08388001 | 4-Way Load Sensing Spool (Not Serviceable) ④ ⑤ | 1 |
| 3 | 12741001 | K-6125 Spool Positioner Kit (See Figures 6 thru 13 for Positioner Options) ⑥ | 1 |
| 4 | 12742001 | K-6030 Load Check Plug Assembly (See Figure) | 1 |
| 5 | 10981001 | Flow Control Cartridge (See Figure) | 1 |
| 6 | 10983001 | Flow Control Spring (See Figure) | 1 |
| 7 | 10982001 | 5-25 GPM Flow Control Piston (See Figure) | 1 |
| 8 | 10984001 | Flow Control Stop (Not Serviceable – Do NOT Remove) | 1 |
| 9 | 07397001 | Load Sense Check Ball (Not Serviceable – Do NOT Remove) | 1 |
| 10 | 08392001 | Spring Pin (Not Serviceable – Do NOT Remove) | 1 |
| 11 | 07385001 | K-6035 Spool Seal Assembly (Serviced in Spool Seal Kits - See Figure 2) ① | 2 |
| 12 | 12786001 | K-6033 Seal Retainer Kit (See Figures 26 thru 29 for Handle End Options) | 1 |

- ① Buna-N seals are standard for all **Gresen** valve assemblies.
- ② Work Section Service Kits include all the seals and back-up rings required to service one V20 work section.
- ③ SAE porting standard. Contact the **Gresen** factory in Minneapolis for optional porting.
- ④ The work section housing and spool are matched and are not sold separately.
- ⑤ Warning: If you are using the free flow (F4) spool configuration in a cylinder lift application, it must be used in conjunction with a load holding device. A load holding device will prevent the load from free falling when the spool is in the neutral position. A free falling load could cause serious bodily injury or property damage if the holding device is not installed.
- ⑥ Manual Positioners and Actuators will NOT work on Solenoid Work Section housings.

V20PC 'Pressure Compensated' Manual Work Sections

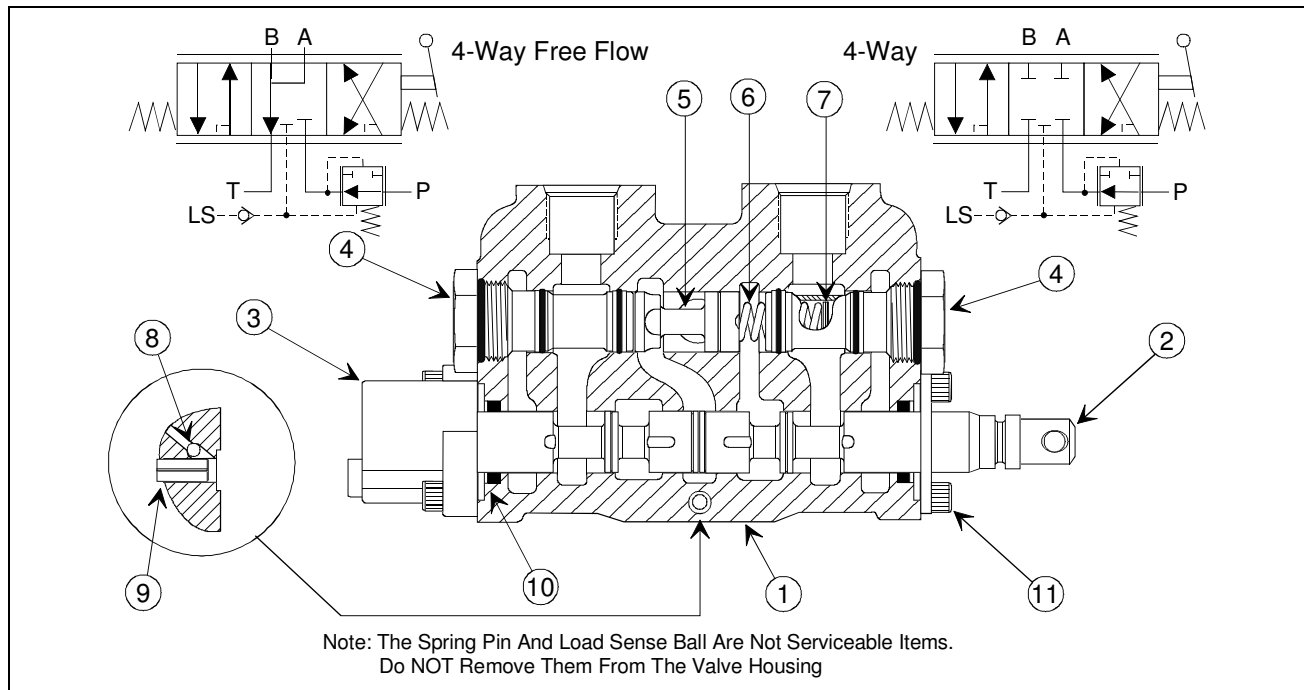


Figure 35. V20PC 'Pressure Compensated' Manual Work Sections

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 16102001 | K-6272 V20 Work Section Service Kit - Standard Buna-N O-Rings ① ② | |
| 1 | 08364XXX | V20PC Work Section Housing (Not Serviceable) ③ ④ | 1 |
| 2 | 21430001 | 3-Way 'V20PC' 15 GPM Spool (Not Serviceable) ④ ⑤ ⑥ | 1 |
| | 21427001 | 4-Way 'V20PC' 15 GPM Spool (Not Serviceable) ④ ⑤ ⑥ | 1 |
| | 21568001 | 4-Way Free Flow 'V20PC' 15 GPM Spool (Not Serviceable) ④ ⑤ ⑥ | 1 |
| 3 | 12741001 | K-6125 Spool Positioner Kit (See Figures 6 thru 13 for Positioner Options) ⑦ | 1 |
| 4 | 16092001 | K-6215 Compensator Plug Assembly (See Figures 24 thru 25 for Options) | 2 |
| 5 | 20972003 | Compensator Piston (Not Serviceable) | 1 |
| 6 | 22092002 | Compensator Spring | 1 |
| 7 | 00458001 | Shim (.040 inch [1,0 mm] thick) ⑧ | A/R |
| | 00459001 | Shim (.020 inch [0,5 mm] thick) ⑧ | A/R |
| | 00462001 | Shim (.010 inch [0,25 mm] thick) ⑧ | A/R |
| 8 | 12786001 | K-6033 Seal Retainer Kit (See Figures 26 thru 29 for Handle End Options) | 1 |
| 9 | 07385001 | K-6035 Spool Seal Assembly (Serviced in Spool Seal Kits - See Figure 2) ① | 2 |
| 10 | 07397001 | Load Sense Check Ball (Not Serviceable) | 1 |
| 11 | 08392001 | Spring Pin (Not Serviceable) | 1 |

- ① Buna-N seals are standard for all **Gresen** valve assemblies.
- ② Work Section Service Kits include all the seals and back-up rings required to service one V20 work section.
- ③ SAE porting standard. Contact the **Gresen** factory in Minneapolis for optional porting.
- ④ The work section housing and spool are matched and are not sold separately.
- ⑤ Contact the **Gresen** factory in Minneapolis for spool flow sizes.
- ⑥ Warning: If you are using the free flow (F4) spool configuration in a cylinder lift application, it must be used in conjunction with a load holding device. A load holding device will prevent the load from free falling when the spool is in the neutral position. A free falling load could cause serious bodily injury or property damage if the holding device is not installed.
- ⑦ Manual Positioners and Actuators will NOT work on Solenoid Work Section housings.
- ⑧ The amount of 'preload' on the compensator piston is preset at the factory. Do NOT change the shim quantity without first contacting the factory.

V20PC 'Pressure Compensated' Solenoid Work Sections

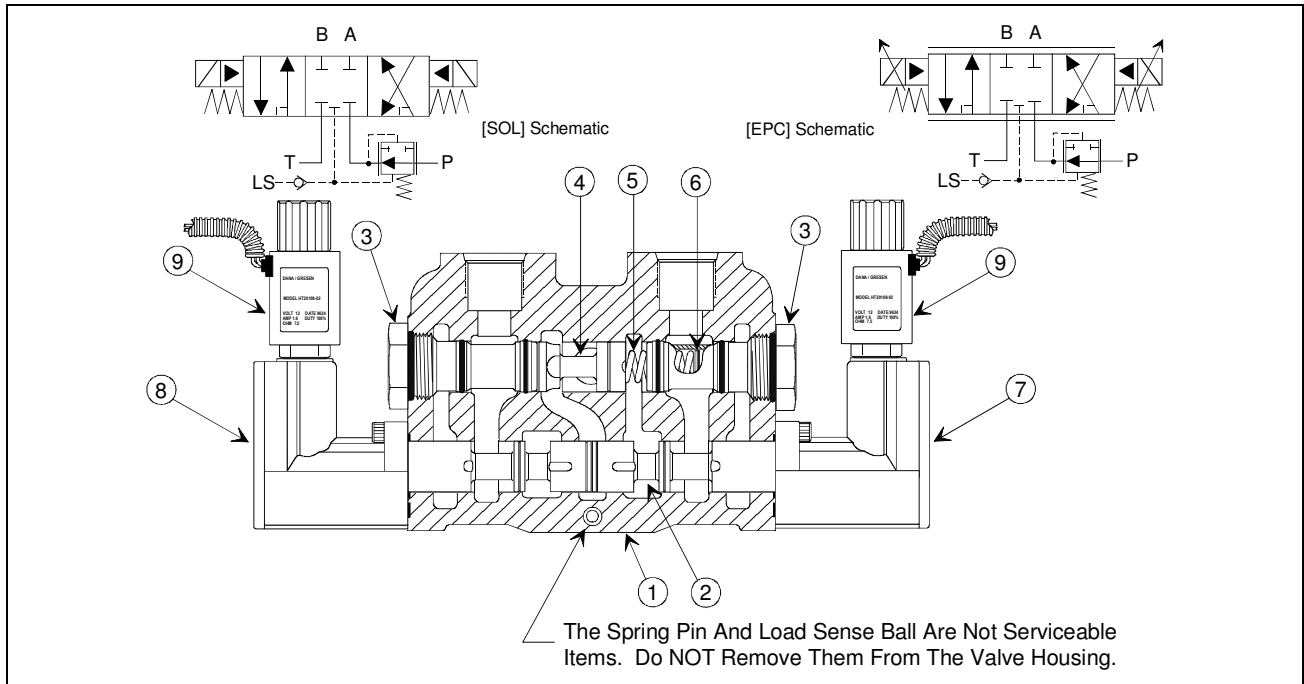


Figure 36. Model V20 [SOL] and [EPC] Solenoid Work Sections

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 16102001 | K-6272 V20 Work Section Service Kit - Standard Buna-N O-Rings ①② | |
| 1 | 08364XXX | V20PC Solenoid Work Section Housing (Not Serviceable) ③④ | 1 |
| 2 | 21433001 | 3-Way 'V20PC' 15 GPM Spool (Not Serviceable) ④⑤⑥ | 1 |
| | 21295001 | 4-Way 'V20PC' 15 GPM Spool (Not Serviceable) ④⑤⑥ | 1 |
| | 21484001 | 4-Way Free Flow 'V20PC' 15 GPM Spool (Not Serviceable) ④⑤⑥ | 1 |
| 3 | 21477XXX | On/Off [SOL] Solenoid Actuator Assembly - 'A' End (See Figure 14) ⑦ | 1 |
| | 21475XXX | Proportional [EPC] Solenoid Actuator Assembly - 'A' End (See Figure 15) ⑦ | 1 |
| 4 | 21478XXX | On/Off [SOL] Solenoid Actuator Assembly - 'B' End (See Figure 14) ⑦ | 2 |
| | 21476XXX | Proportional [EPC] Solenoid Actuator Assembly - 'B' End (See Figure 15) ⑦ | 1 |
| 5 | 21345002 | Compensator Plug Assembly (See Figures 24 thru 25 for Options) | 1 |
| 6 | 20972003 | Compensator Piston (Not Serviceable) | A/R |
| 7 | 22092002 | Compensator Spring | A/R |
| 8 | 00458001 | Shim (.040 inch [1,0 mm] thick) ⑧ | A/R |
| | 00459001 | Shim (.020 inch [0,5 mm] thick) ⑧ | 1 |
| | 00462001 | Shim (.010 inch [0,25 mm] thick) ⑧ | 1 |

- ① Buna-N seals are standard for all **Gresen** valve assemblies.
- ② Work Section Service Kits include all the seals and back-up rings required to service one V20 work section. Do NOT install spool seals into V20 Solenoid Work Sections.
- ③ SAE porting standard. Contact the **Gresen** factory in Minneapolis for optional porting.
- ④ The work section housing and spool are matched and are not sold separately.
- ⑤ Contact the **Gresen** factory in Minneapolis for spool flow sizes.
- ⑥ Warning: If you are using the free flow (F4) spool configuration in a cylinder lift application, it must be used in conjunction with a load holding device. A load holding device will prevent the load from free falling when the spool is in the neutral position. A free falling load could cause serious bodily injury or property damage if the holding device is not installed.
- ⑦ Solenoid Actuators will NOT work on Manual Work Section housings.
- ⑧ The amount of 'preload' on the compensator piston is preset at the factory. Do NOT change the shim quantity without first contacting the factory.

Model V20 Split and Combined Flow Mid-Inlet Sections

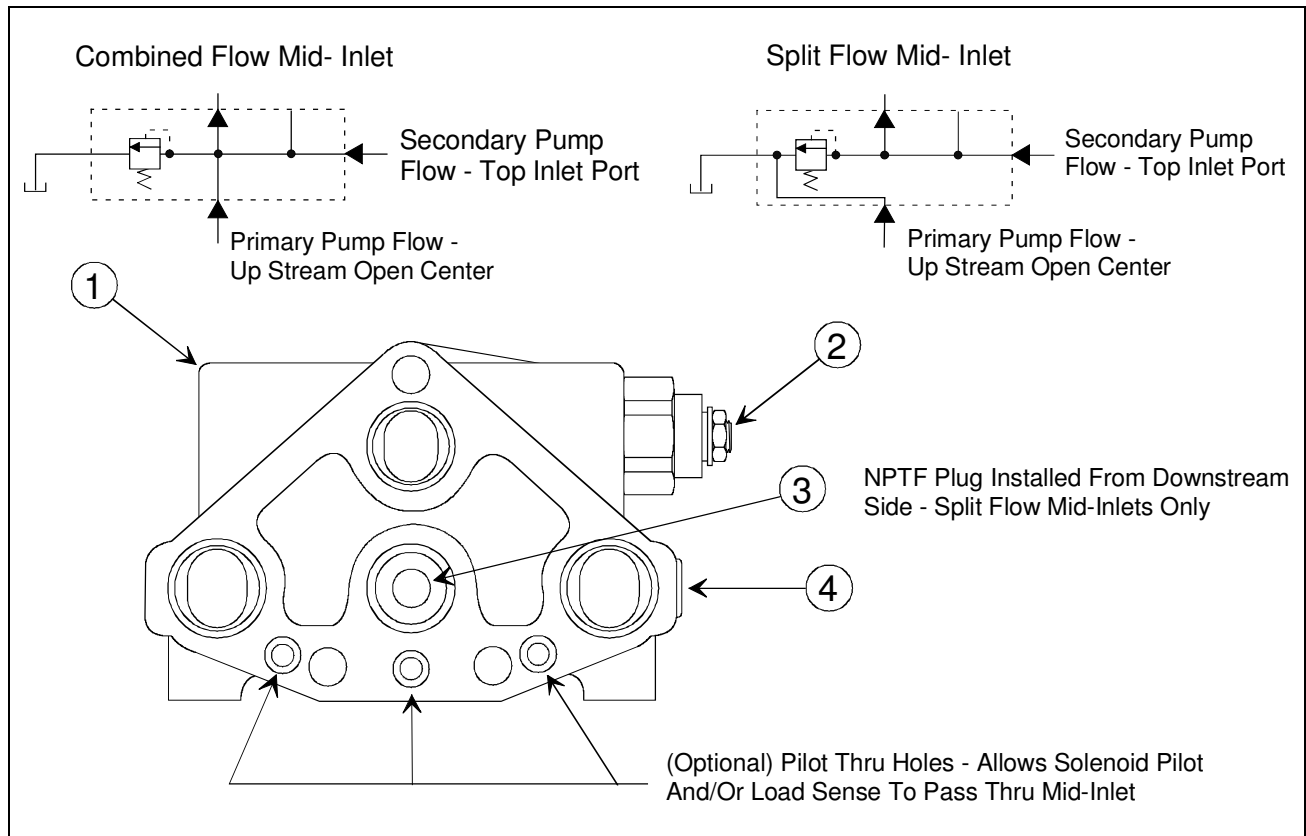


Figure 37. Model V20 Split and Combined Flow Mid-Inlet Sections

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| 1 | 06825xxx | Mid-Inlet Section Housing ① | 1 |
| 2 | 06532xxx | WH Relief Cartridge (See Figure 6) | 1 |
| | 08853xxx | WHA Relief Cartridge (See Figure 7) | 1 |
| | 11387xxx | WH Dual Pressure Relief Cartridge (See Figure 7) | 1 |
| | 08950xxx | RP51A Relief Cartridge (See Figure 8) | 1 |
| | 08950xxx | RP51N Relief Cartridge (See Figure 8) | 1 |
| | 27005xxx | RP51 Dual Pressure Relief Cartridge (See Figure 8) | 1 |
| | 12797001 | CK-6132 No Relief Cavity Plug (See Figure 9) | 1 |
| 3 | 00017001 | 1/4 - 18 NPTF Plug (Split Flow Versions Only) | 1 |
| 4 | 09435105 | SAE 5 Socket Head Plug (Split Flow Versions Only) | 1 |

① Contact the **Gresen** factory in Minneapolis for Combined Flow and Split Flow housing options.

Open Center Utility Sections

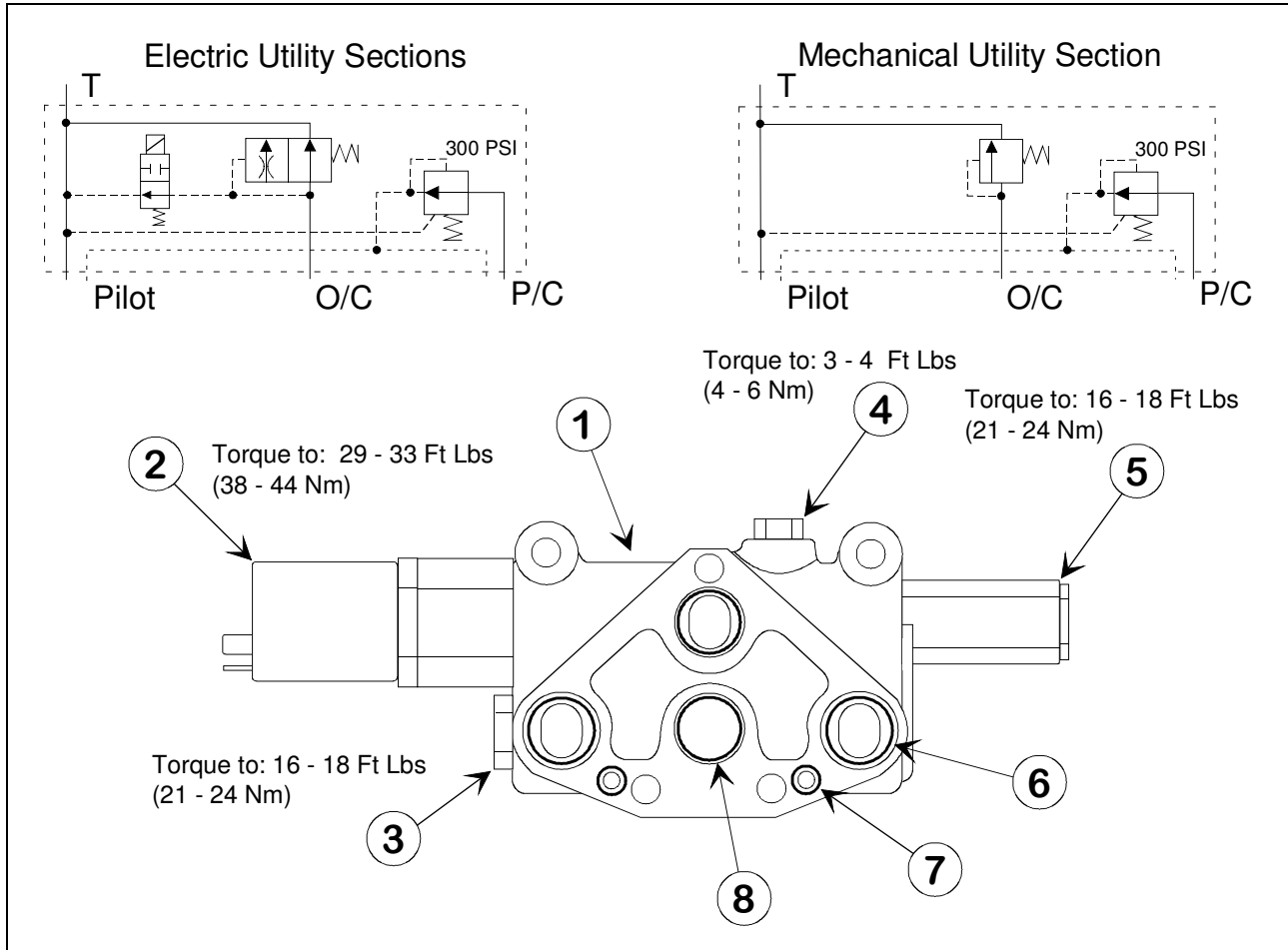


Figure 38. Open Center Utility Section with Solenoid-Operated Build Up Valve Cartridge

(V20T) tandem work sections must not be used in solenoid valve applications where a Utility Section is required because the blocked power core in the tandem work section interrupts oil flow to the solenoid actuators. Tandem sections may only be used with the Unloading Utility Section (Page 19) or where an external pilot source is available.

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| 1 | 07820XXX | Utility Section Housing (Not Serviceable) | 1 |
| 2 | 12968001 | CK-6177 12 Volt Build-Up Cartridge (See Figure 20) | 1 |
| | 12969001 | CK-6178 24 Volt Build-Up Cartridge (See Figure 20) | 1 |
| | 12970001 | CK-6179 Mechanical (Continuous On) Build-Up Cartridge (See Figure 21) | 1 |
| | 12880001 | CK-6097 SAE 12 Power Beyond Sleeve (See Figure 22) | 1 |
| | 12879001 | CK-6098 ¾" NPT Power Beyond Sleeve (See Figure 22) | 1 |
| 3 | 06879001 | SAE 8 Plug | 1 |
| 4 | 08103001 | SAE 4 Plug | 1 |
| 5 | 12956001 | CK-28096 Pressure Reducing Valve Cartridge (See Figure 24) | 2 |
| 6 | 21733001 | O-Ring Seal (Exhaust) (Serviced in K-6156 Section Seal Kit) ① | 2 |
| 7 | 21866001 | O-Ring Seal (Pilot) (Serviced in K-6156 Section Seal Kit) ① | 2 |
| 8 | 21857001 | O-Ring Seal (Open Center and Power Core) (Serviced in K-6156 Section Seal Kit) ① | 2 |

① Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.

Closed Center (Load Sensing) Utility Section

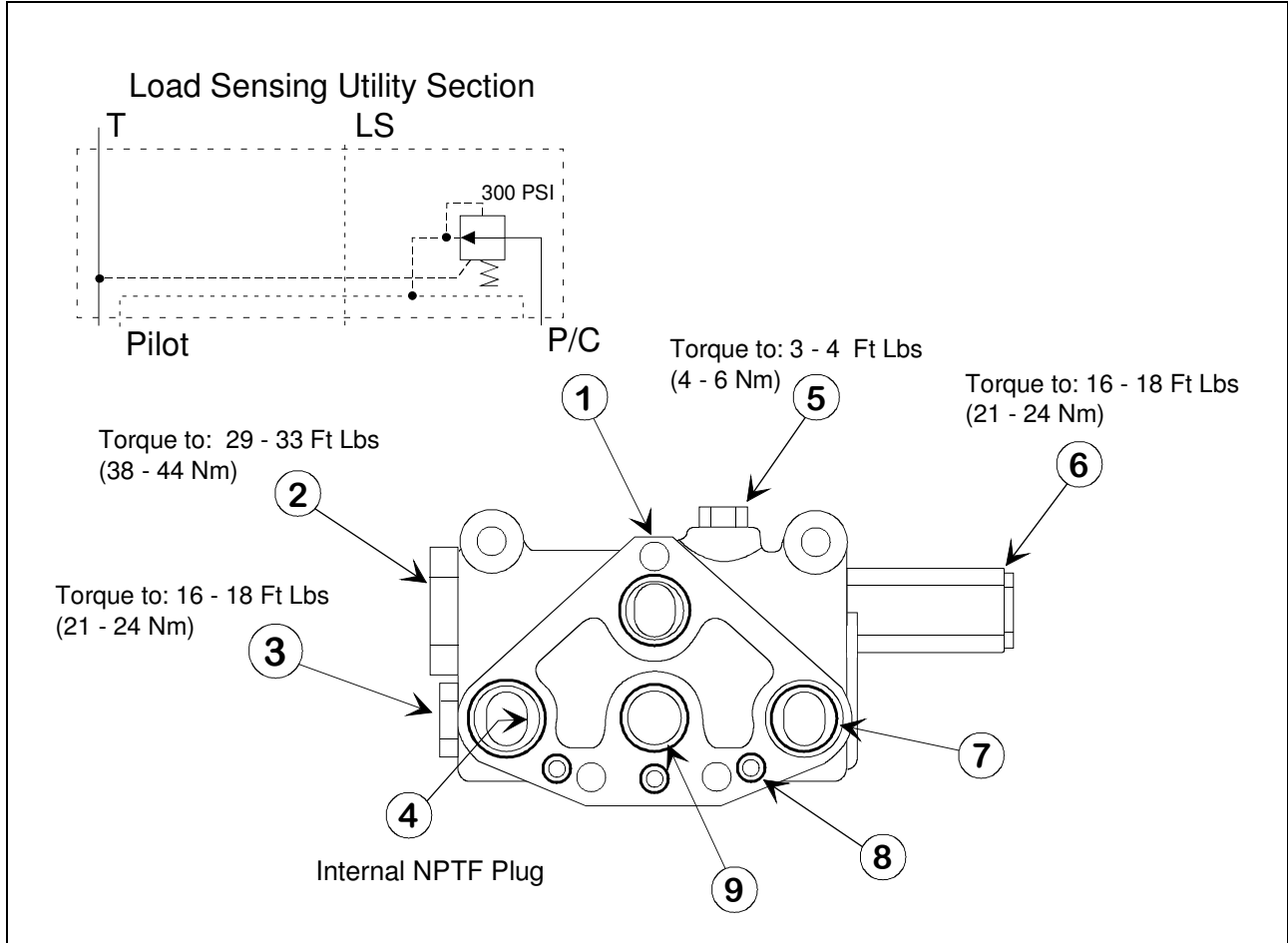


Figure 39. Closed Center (Load Sensing) Utility Section

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| 1 | 07820XXX | Utility Section Housing (Not Serviceable) | 1 |
| 2 | 11543001 | CK-6103 Closed Center Plug (See Figure 23) | 1 |
| 3 | 06879001 | SAE 8 Plug | 1 |
| 4 | 00017001 | 1/4 - 18 NPTF Plug | 1 |
| 5 | 08103001 | SAE 4 Plug | 1 |
| 6 | 12956001 | CK-28096 Pressure Reducing Valve Cartridge (See Figure 24) | 1 |
| 7 | 21733001 | O-Ring Seal (Exhaust) (Serviced in K-6156 Section Seal Kit) ① | 2 |
| 8 | 21866001 | O-Ring Seal (Solenoid Pilot and Load Sense) (Serviced in K-6156 Section Seal Kit) ① | 3 |
| 9 | 21857001 | O-Ring Seal (Open Center and Power Core) (Serviced in K-6156 Section Seal Kit) ① | 2 |

① Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.

Unloading Utility Section

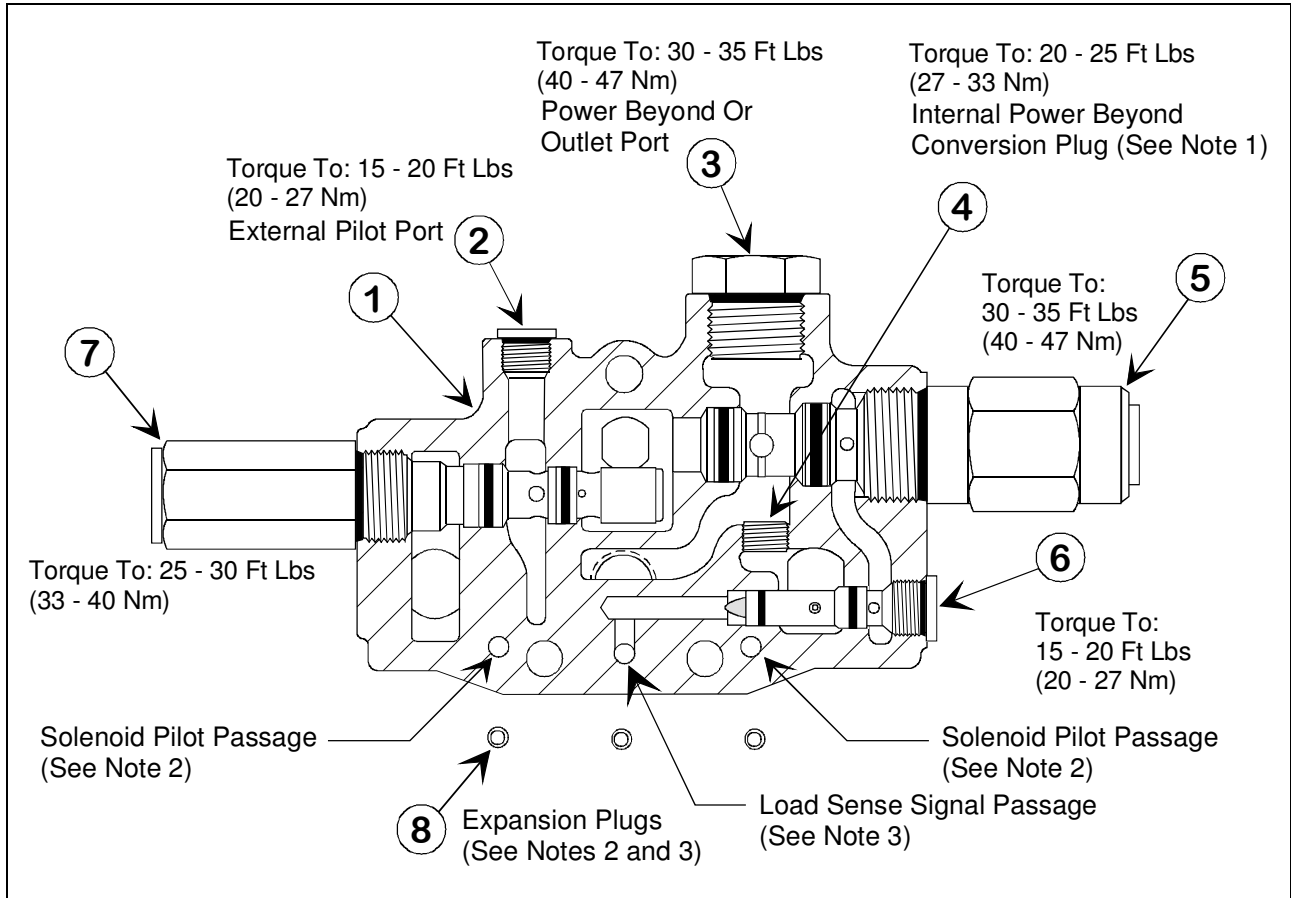


Figure 40. Unloading Utility Section

IMPORTANT

O-Ring Seals and Plugs furnished with these sections makes it easily adapted to many valve applications. Refer to Page 20 for circuit applications using the V20 Unloading Section.

Refer to Pages 21 and 22 for procedures on how to select power beyond or outlet options.

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| 1 | 22952XXX | Unloading Section Housing (Not Serviceable) | 1 |
| 2 | 09435106 | SAE 6 Plug | 1 |
| 3 | 06089001 | SAE 12 Plug | 1 |
| 4 | 00017001 | 1/4 - 18 NPTF Plug | 1 |
| 5 | 16134001 | K-6237 Unloading Valve Cartridge (See Figure 51) | 1 |
| 6 | 16133001 | K-6236 Bleed-Down Plug (See Figure 50) | 1 |
| 7 | 12956001 | CK-28096 Pressure Reducing Valve Cartridge - For Solenoid Valves (See Figure 24) | 1 |
| | 22273001 | No Pressure Reducing Valve Plug - For Manual Valves (See Figure 25) | 1 |
| 8 | 22962002 | 6mm Expansion Plug (Not Serviceable) | 3 |

Unloading Section Applications

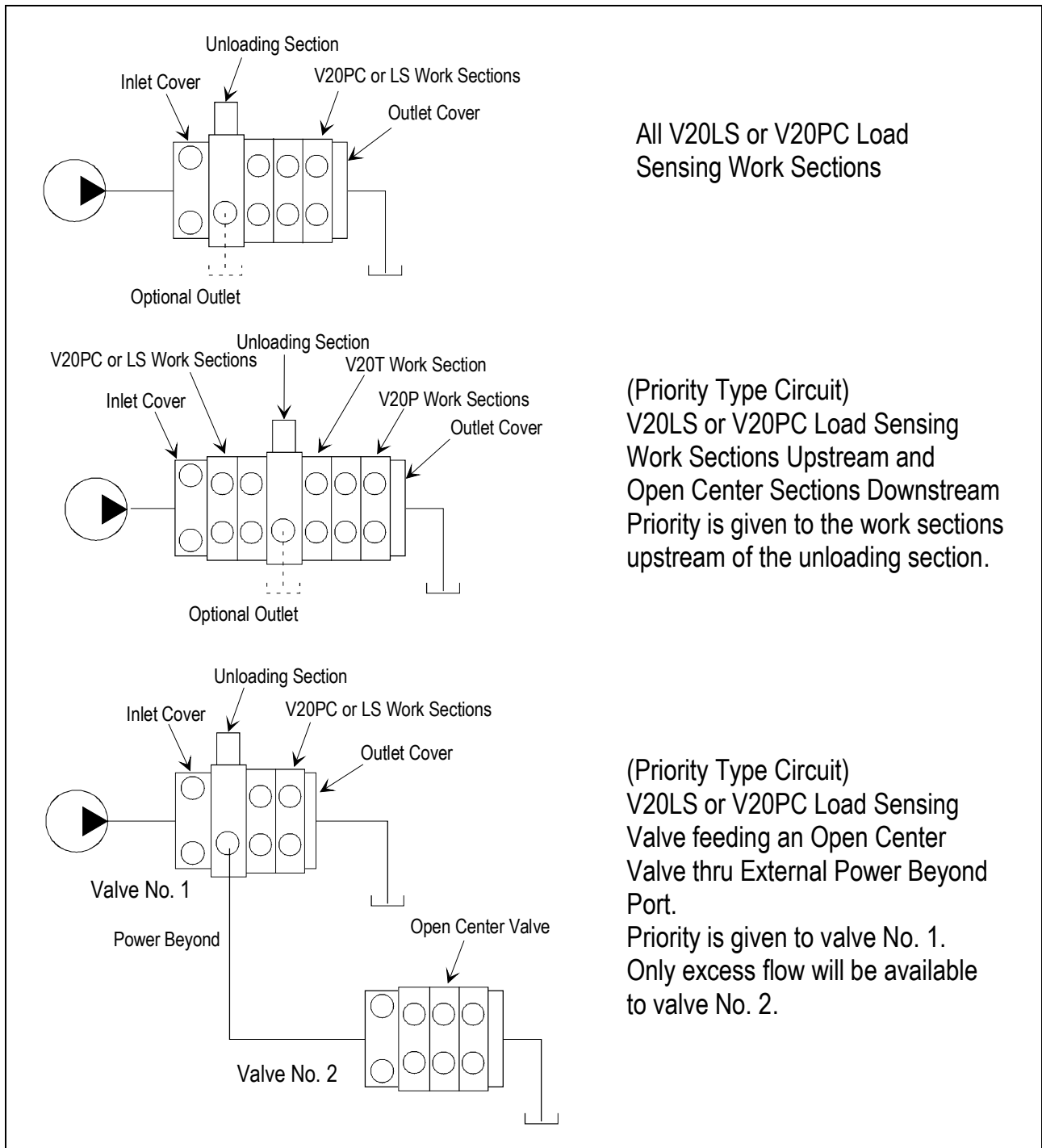


Figure 41. Unloading Section Applications

Note: When mixing Closed Center and Open Center work sections in the same stack, the open center sections must be downstream from the unloading section. A tandem (V20T) section must be installed between the unloading section and parallel (V20P) work sections. Refer to Pages 21 and 22 for information on when and where to install the conversion plugs supplied with the unloading section.

Standard Unloading Utility Section - No Power Beyond Option

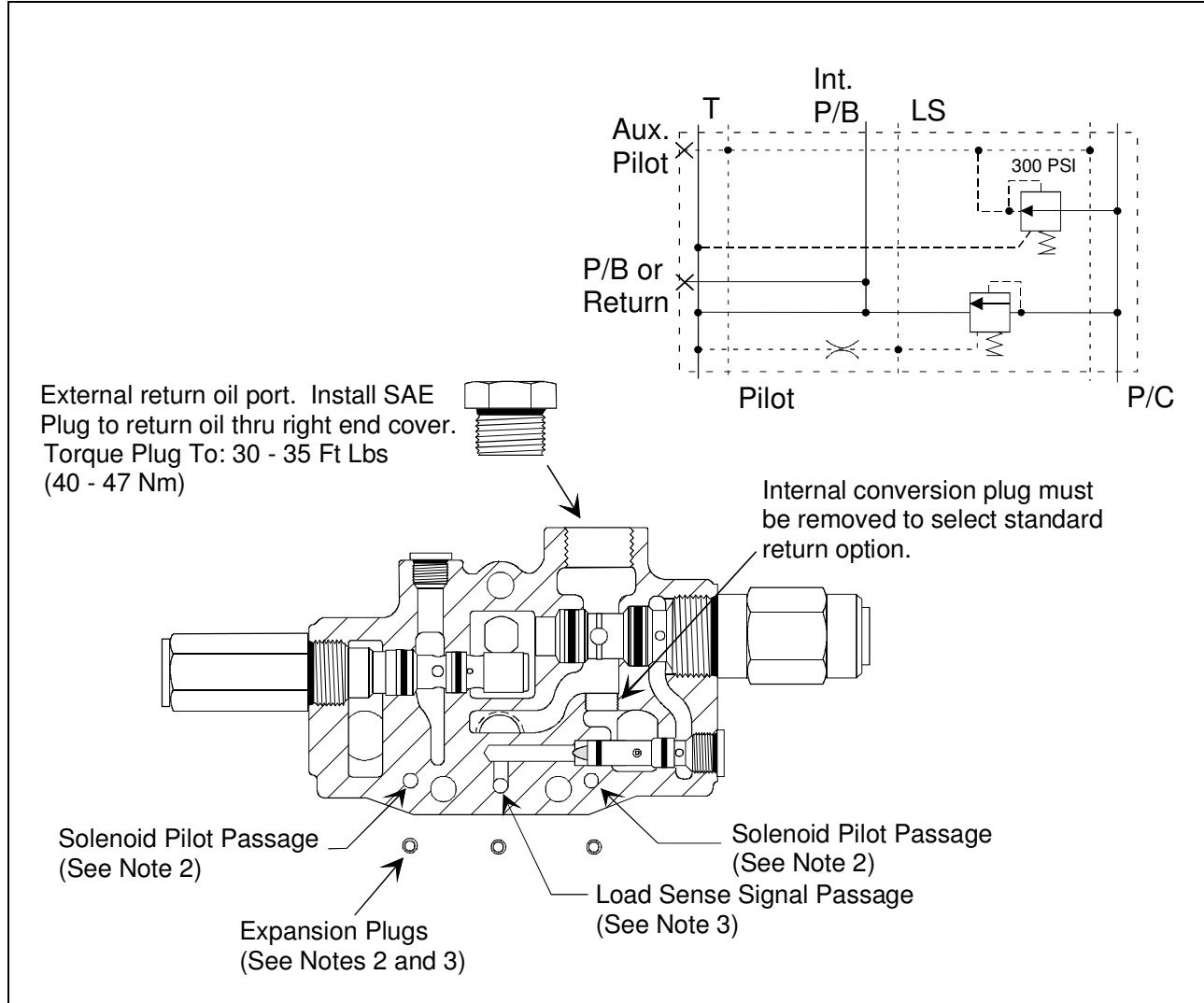


Figure 42. Unloading Utility Section (Selecting the Standard Return Option)

Procedures for Selecting the Standard Return Option

- ① The internal (1/4" NPTF) conversion plug must be removed to select the standard return option. Return oil will exit thru the top SAE 12 port or may be directed thru the outlet port located in the inlet or outlet cover.
- ② Install expansion plugs in the outer solenoid pilot passages on the downstream side of the unloading section when downstream work section(s) do not have pilot holes (i.e. manual work sections). Refer to Note 3 for information on when to install the expansion plug in the center load sense signal passage.
- ③ Install expansion plug in the center load sensing passage on the downstream side of the unloading section when the downstream section(s) are not load sensing work sections. Refer to Note 2 for information on when to install the expansion plugs in the outer solenoid pilot passages.

Unloading Utility Section with Power Beyond Option

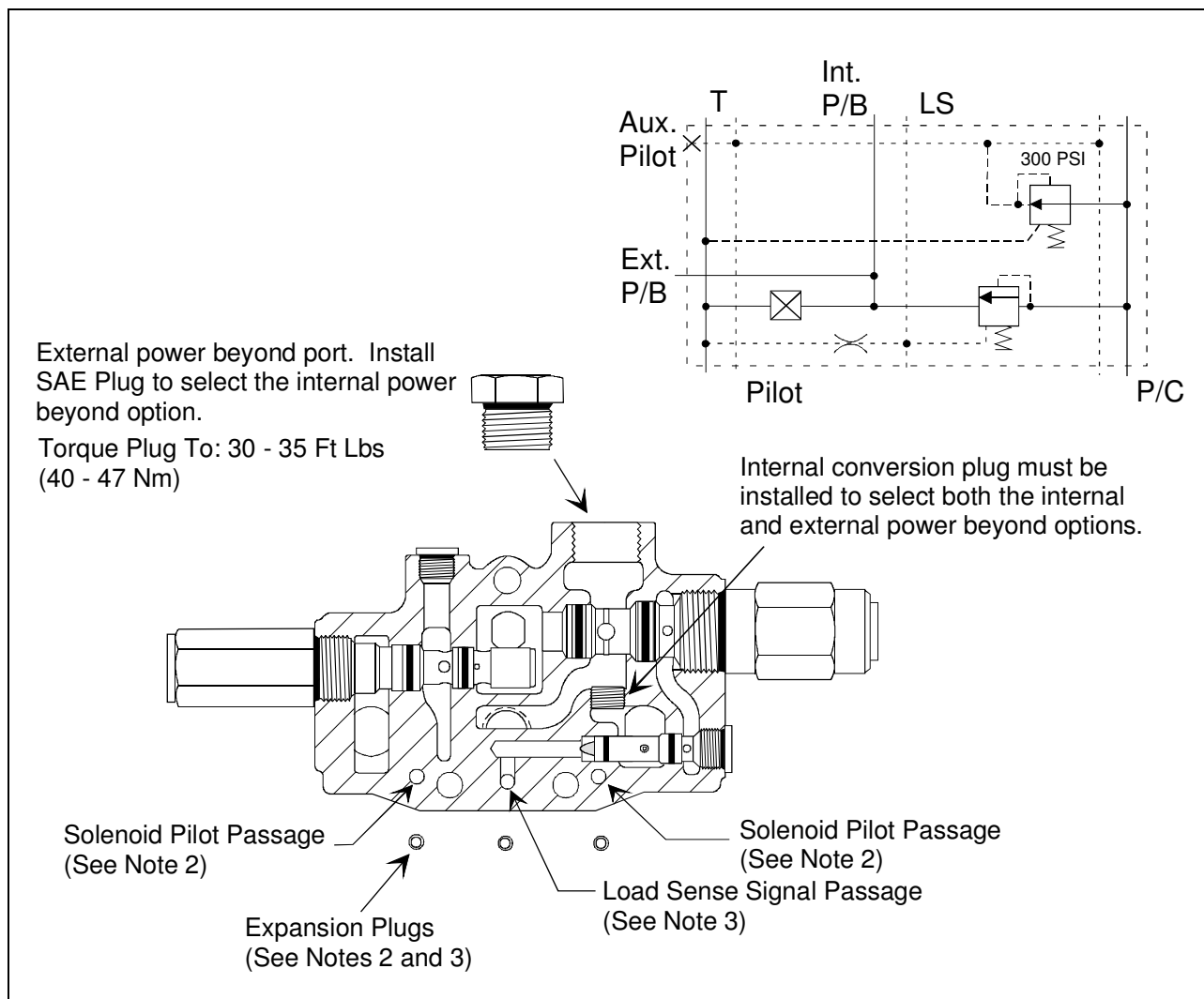


Figure 43. Unloading Utility Section (Selecting the Power Beyond Option)

Procedures for Selecting the Internal or External Power Beyond Option

- ① The internal (1/4" NPTF) power beyond conversion plug must be installed to select the power beyond option. Power beyond oil will exit thru the top SAE 12 port or may be directed internally to downstream work sections. **IMPORTANT:** If selecting the internal power beyond option, a V20 Tandem work section must be installed immediately downstream from the unloading section.
- ② Install expansion plugs in the outer solenoid pilot passages on the downstream side of the unloading section when downstream work section(s) do not have pilot holes (i.e. manual work sections). Refer to Note 3 for information on when to install the expansion plug in the center load sense signal passage.
- ③ Install expansion plug in the center load sensing passage on the downstream side of the unloading section when the downstream section(s) are not load sensing work sections. Refer to Note 2 for information on when to install the expansion plugs in the outer solenoid pilot passages.

Solenoid-Operated Pressure Build-Up Valve Cartridges

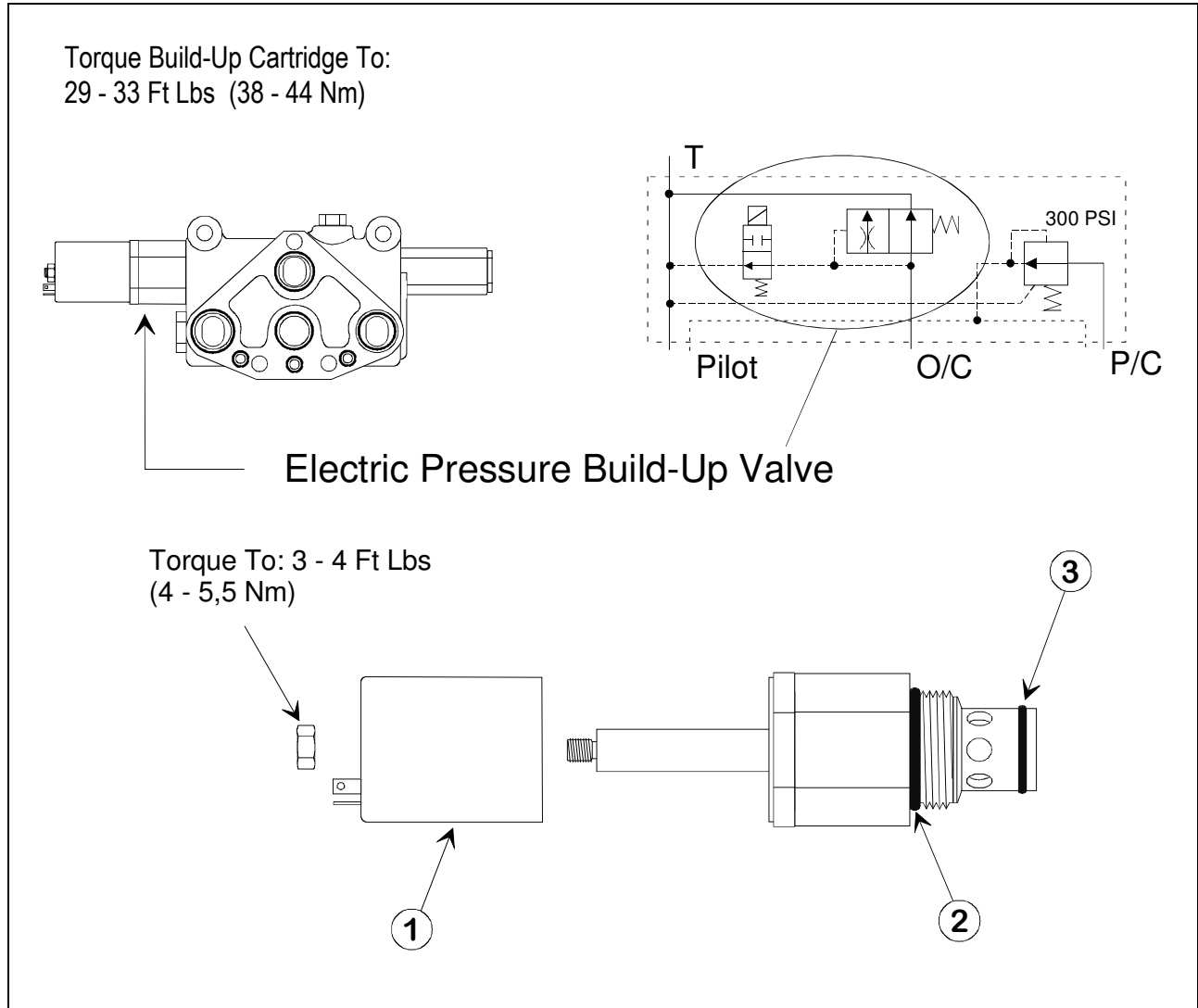


Figure 44. Solenoid-Operated Pressure Build-Up Valve Cartridges

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 12968001 | CK-6177 12 VDC Build-Up Cartridge, Complete | |
| | 12969001 | CK-6178 24 VDC Build-Up Cartridge, Complete | |
| | 12052001 | K-6184 Cartridge Seal Kit | |
| 1 | 08512001 | 12 VDC Replacement Coil | 1 |
| | 08511001 | 24 VDC Replacement Coil | 1 |
| 2 | 09002018 | O-Ring Seal (Serviced in K-6184 Cartridge Seal Kit) ① | 1 |
| 3 | 06277001 | O-Ring Seal (Serviced in K-6184 Cartridge Seal Kit) ① | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.

Mechanical Pressure Build-Up Valve Cartridge

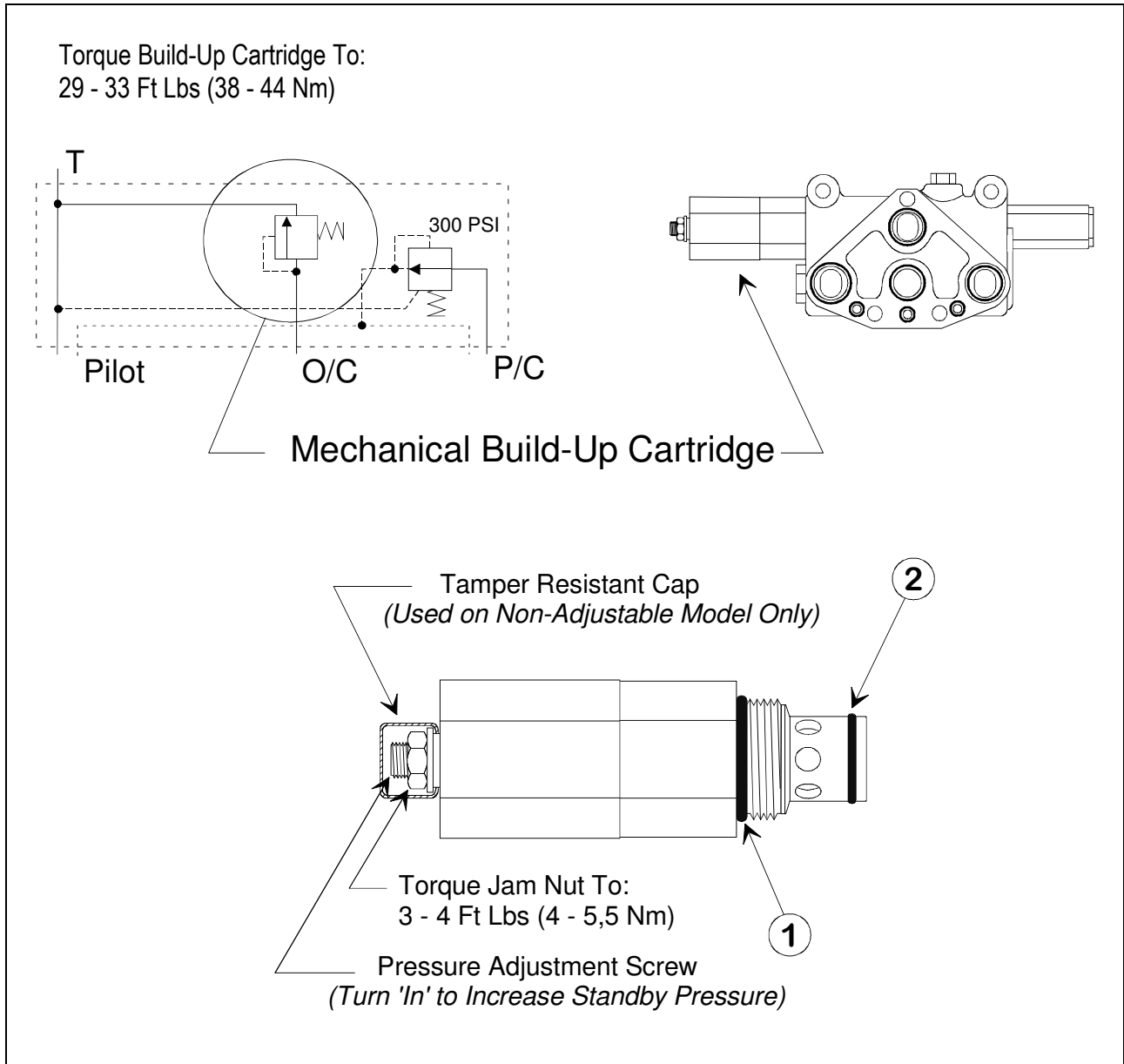


Figure 45. Mechanical Pressure Build-Up Valve Cartridge

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 12970001 | CK-6179 Mechanical (Continuous On) Build-Up Cartridge, Complete | |
| | 12690001 | K-6188 Cartridge Seal Kit ① | |
| 1 | 06277001 | O-Ring Seal (Serviced in K-6184 Cartridge Seal Kit) ① | 1 |
| 2 | 09002018 | O-Ring Seal (Serviced in K-6184 Cartridge Seal Kit) ① | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.

Power Beyond Sleeves for use in Utility Sections

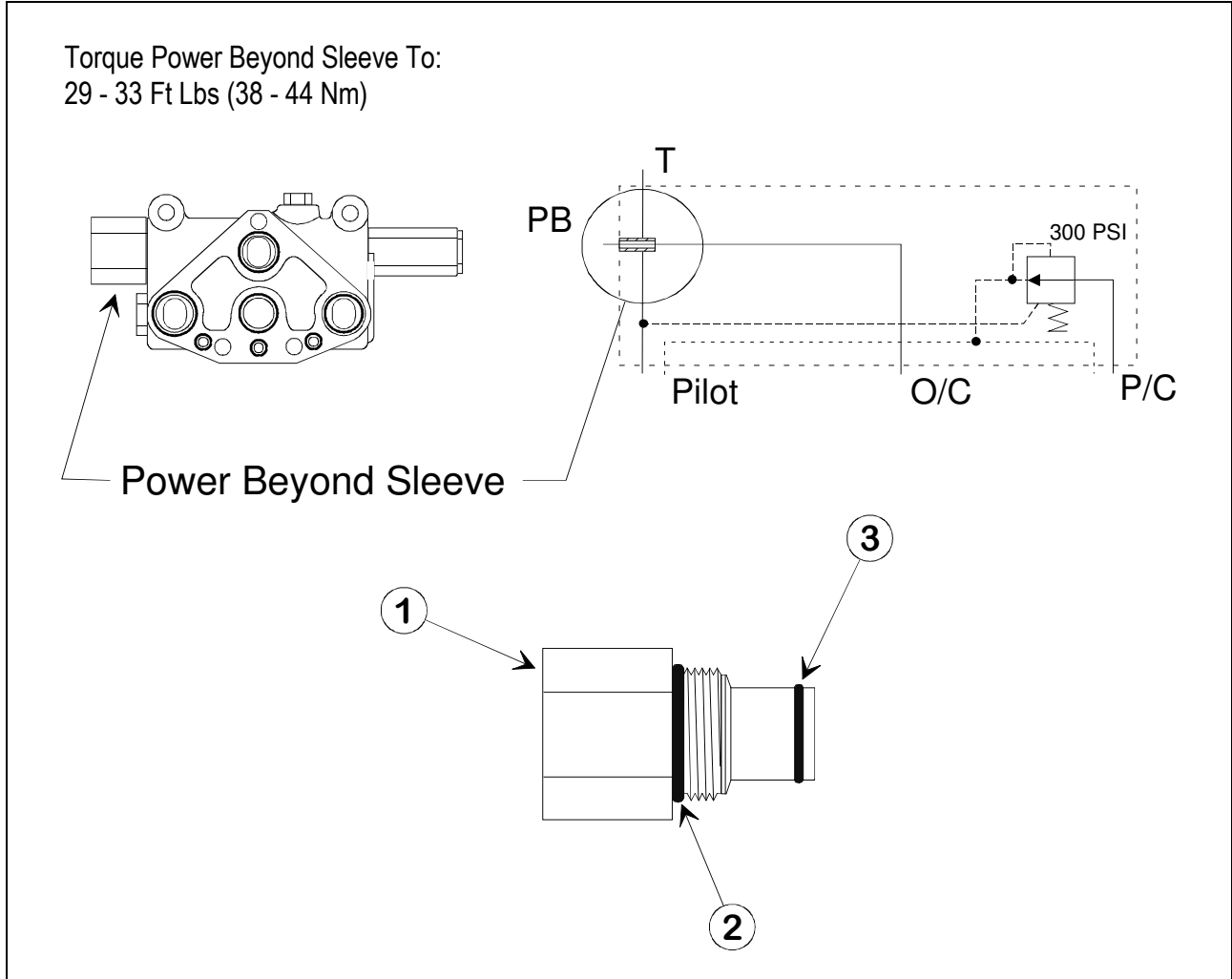


Figure 46. Power Beyond Sleeve for use in Utility Sections

In V20 Solenoid Valves, the power beyond conversion is made in the utility section. Since the power beyond sleeve is installed where the pressure build-up valve is normally located, there will be no pressure build-up valve in the valve assembly. The pressure build-up valve must be located in the downstream valve circuit.

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 12880001 | CK-6097 SAE 12 Power Beyond Sleeve Kit, Complete | |
| | 12879001 | CK-6098 3/4" NPT Power Beyond Sleeve Kit, Complete | |
| | 16097001 | K-6234 Plug Seal Kit ① | |
| 1 | 08193001 | 3/4" NPT Power Beyond Sleeve (Serviced in CK-6098 Power Beyond Sleeve Kit) | 1 |
| 2 | 08194001 | SAE 12 Sleeve (Serviced in CK-6097 Power Beyond Sleeve Kit) | 1 |
| 3 | 02709001 | O-Ring Seal (Serviced in K-6234 Cartridge Seal Kit) ① | 1 |
| | 01910001 | O-Ring Seal (Serviced in K-6234 Cartridge Seal Kit) ① | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.

Closed Center Plug for use in Utility Sections

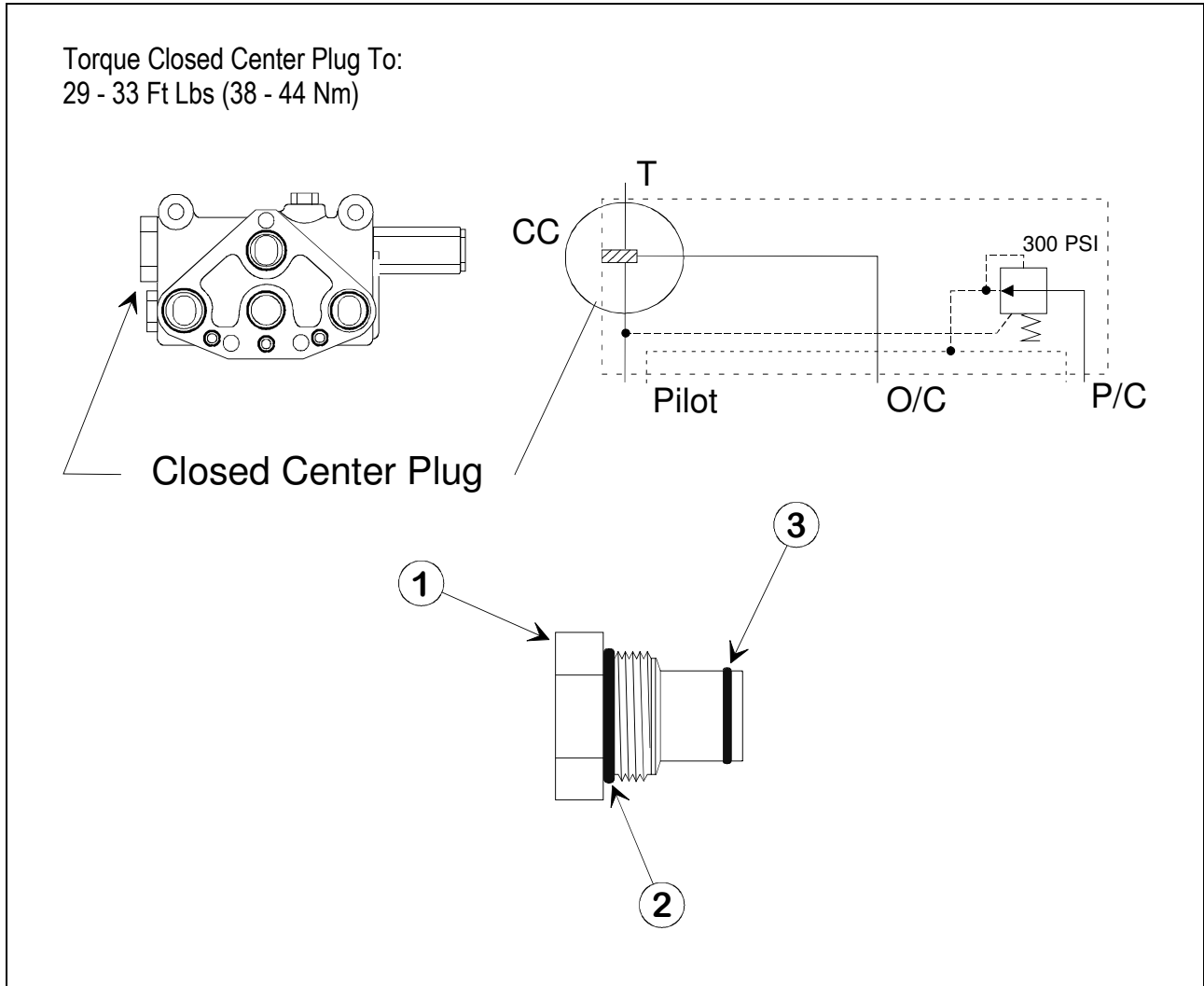


Figure 47. Closed Center Plug for use in Utility Sections

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 11543001 | CK-6103 Closed Center Plug Kit, Complete | |
| | 16097001 | K-6234 Plug Seal Kit ① | |
| 1 | 08195001 | Plug (Serviced in CK-6103 Closed Center Plug Kit) | 1 |
| 2 | 02709001 | O-Ring Seal (Serviced in K-6234 Plug Seal Kit) ① | 1 |
| 3 | 01910001 | O-Ring Seal (Serviced in K-6234 Plug Seal Kit) ① | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.

Pressure Reducing Valve Cartridge

Torque PRV Cartridge To:
25 - 30 Ft Lbs ([33 - 40 Nm])

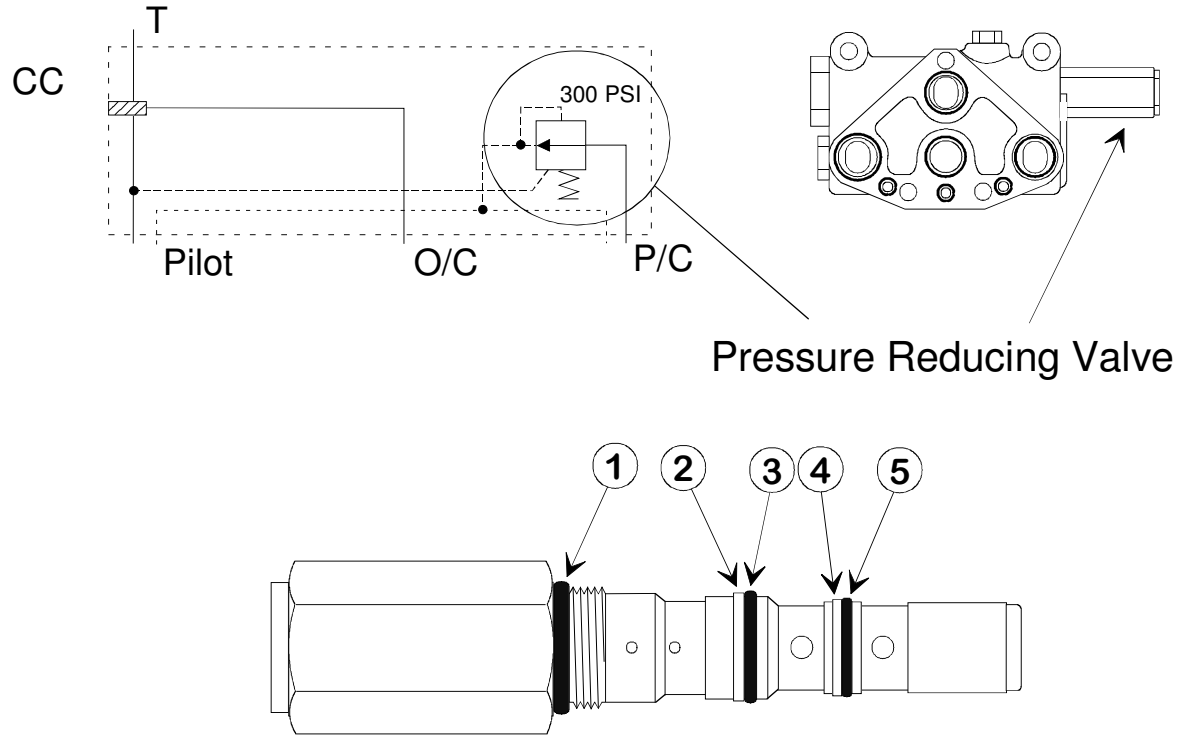


Figure 48. Pressure Reducing Valve Cartridge

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 12956001 | CK-28096 Pressure Reducing Valve Cartridge Kit (300 PSI Cartridge), Complete | |
| | 08569001 | K-28078 PRV Cartridge Seal Kit (Includes Items Listed Below, Plus Plug Seals) | |
| 1 | 02707001 | O-Ring Seal (Serviced in K-28078 Cartridge Seal Kit) ① | 1 |
| 2 | 03092001 | Back-Up Ring (Serviced in K-28078 Cartridge Seal Kit) ② | 1 |
| 3 | 07829001 | O-Ring Seal (Serviced in K-28078 Cartridge Seal Kit) ① | 1 |
| 4 | 00682001 | Back-Up Ring (Serviced in K-28078 Cartridge Seal Kit) ② | 1 |
| 5 | 01091001 | O-Ring Seal (Serviced in K-28078 Cartridge Seal Kit) ① | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.

② Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

No Pressure Reducing Valve Plug

Torque No PRV Plug To:
25 - 30 Ft Lbs (33 - 40 Nm)

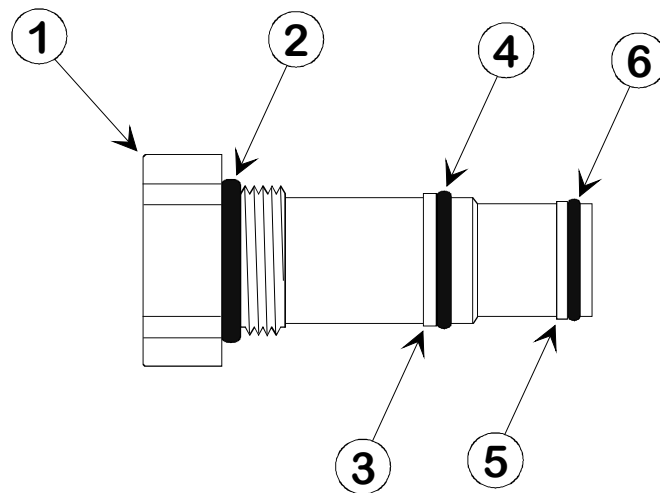
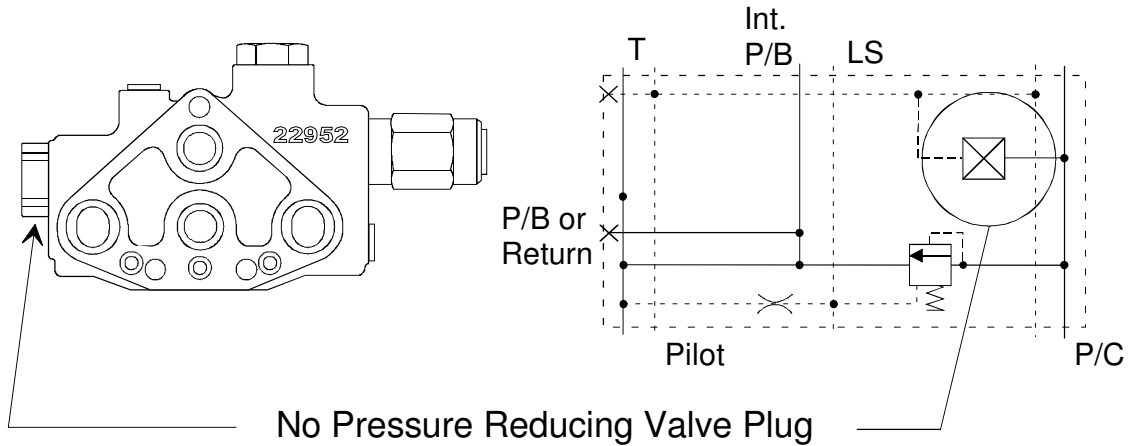


Figure 49. No Pressure Reducing Valve Plug

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 16123001 | K-6297 No Pressure Reducing Valve Plug, Complete | |
| | 08569001 | K-28078 PRV Cartridge Seal Kit (Includes Items Listed Below, Plus Plug Seals) | |
| 1 | 21204001 | Plug (Serviced in K-6297 No Pressure Reducing Valve Plug Kit) | 1 |
| 2 | 02707001 | O-Ring Seal (Serviced in K-28078 Cartridge Seal Kit) ① | 1 |
| 3 | 03092001 | Back-Up Ring (Serviced in K-28078 Cartridge Seal Kit) ② | 1 |
| 4 | 07829001 | O-Ring Seal (Serviced in K-28078 Cartridge Seal Kit) ① | 1 |
| 5 | 00682001 | Back-Up Ring (Serviced in K-28078 Cartridge Seal Kit) ② | 1 |
| 6 | 01091001 | O-Ring Seal (Serviced in K-28078 Cartridge Seal Kit) ① | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.

② Continuous Back-Up Rings are installed at the factory using special sizing tools. It is **Not** necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

Bleed-Down Plug for use in Unloading Utility Sections

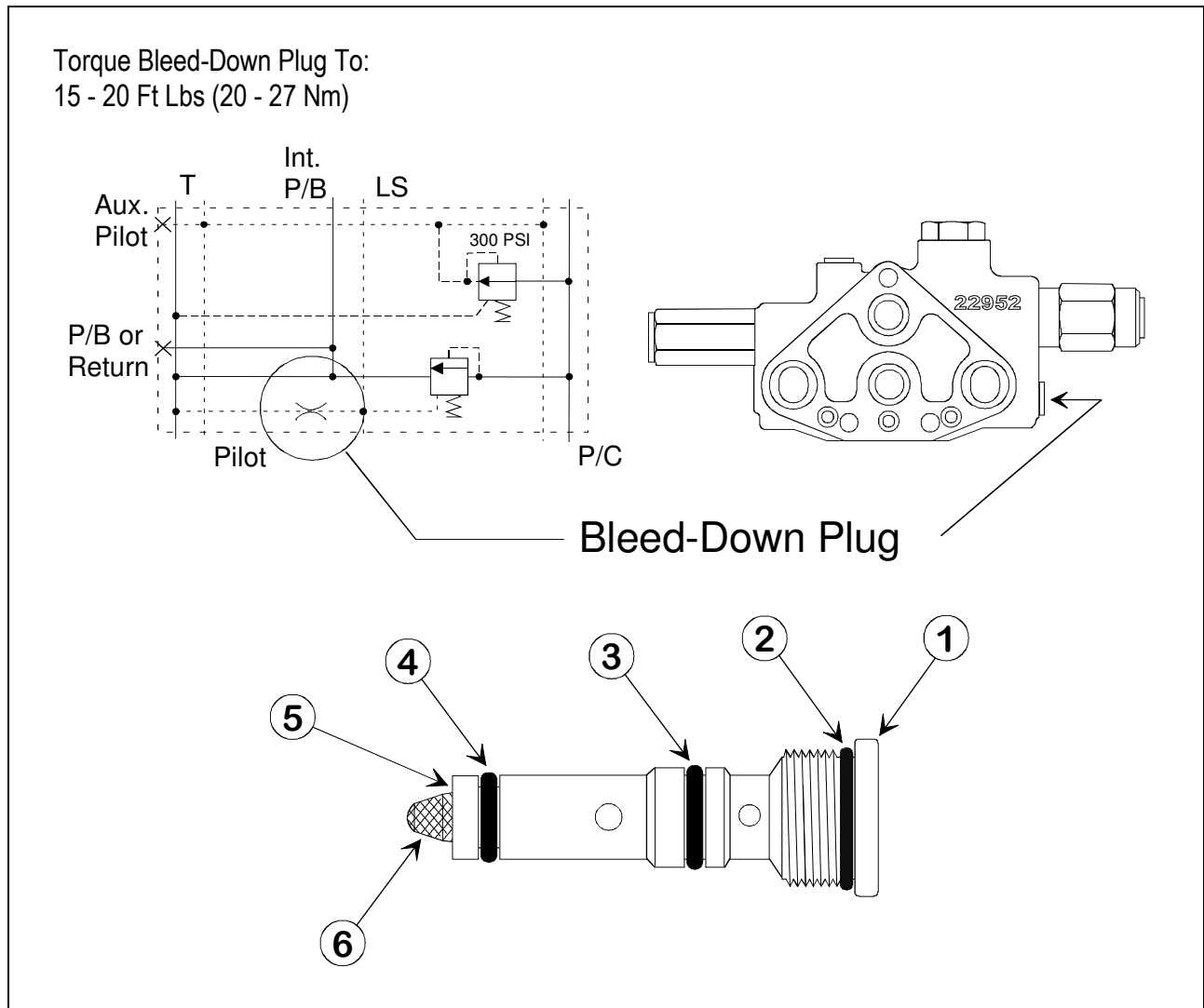


Figure 50. Bleed-Down Plug for use in Unloading Utility Sections

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 16133001 | K-6236 Bleed-Down Plug, Complete | |
| | 16082001 | K-6268 Bleed-Down Plug Seal Kit ① | |
| 1 | 23336001 | Bleed Plug (Serviced in K-6236 Bleed-Down Plug Kit) | 1 |
| 2 | 02705001 | O-Ring Seal (Serviced in K-6268 Plug Seal Kit) ① | 1 |
| 3 | 23445001 | O-Ring Seal, Urethane (Serviced in K-6268 Plug Seal Kit) ① | 1 |
| 4 | 23444001 | O-Ring Seal, Urethane (Serviced in K-6268 Plug Seal Kit) ① | 1 |
| 5 | 11840001 | Retaining Ring (Serviced in K-6236 Bleed-Down Plug Kit) | 1 |
| 6 | 11839001 | Filter Screen (Serviced in K-6236 Bleed-Down Plug Kit) | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.

Unloading Valve Cartridge for use in Unloading Utility Sections

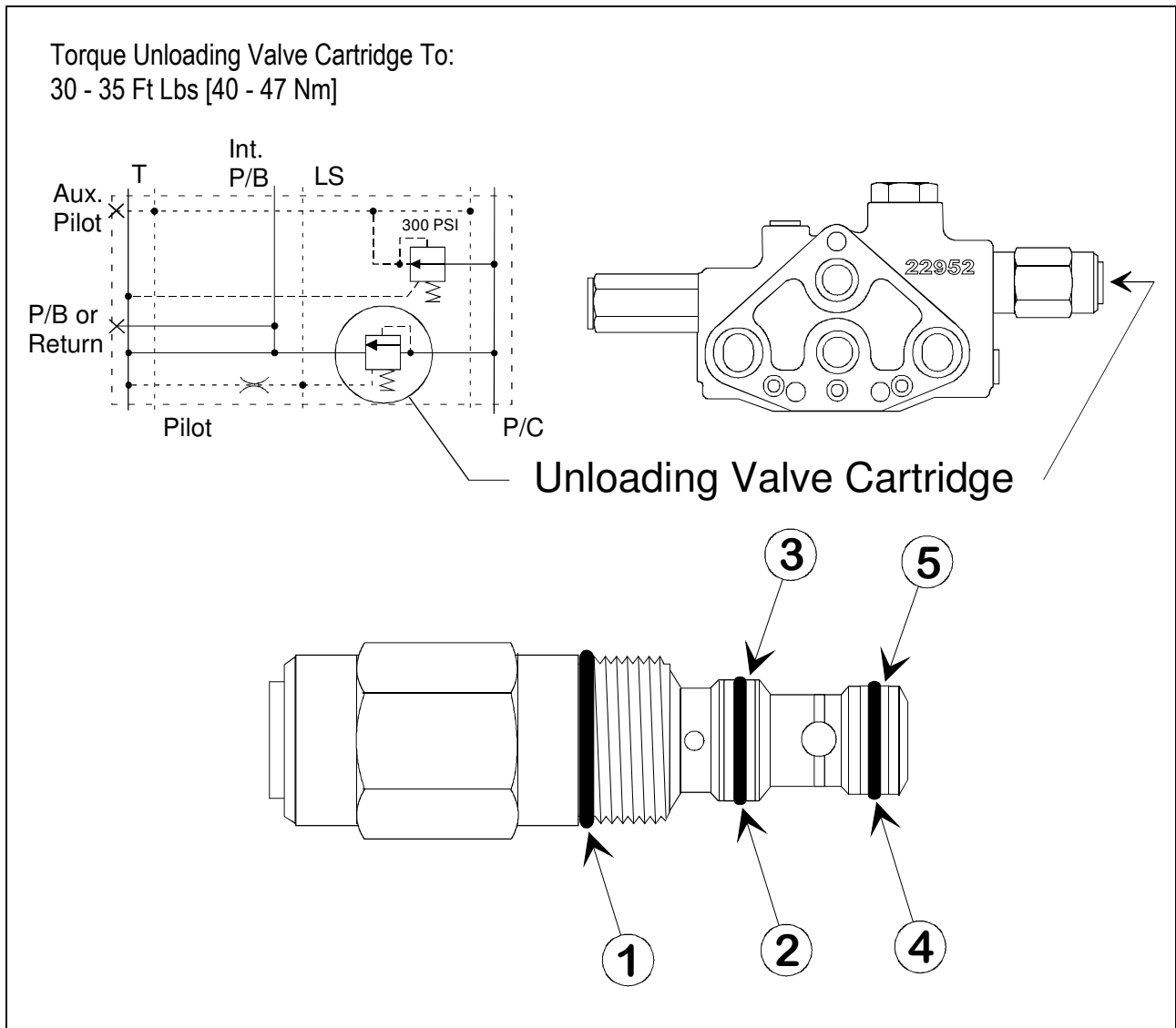


Figure 51. Unloading Valve Cartridge for use in Unloading Utility Sections

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 16134001 | K-6237 Unloading Valve Cartridge, Complete | |
| | 16094001 | K-6267 Unloading Cartridge Seal Kit ① | |
| 1 | 02708001 | O-Ring Seal (Serviced in K-6267 Plug Seal Kit) ① | 2 |
| 2 | 01910001 | O-Ring Seal (Serviced in K-6267 Plug Seal Kit) ① | 1 |
| 3 | 09021018 | Back-Up Ring (Serviced in K-6267 Plug Seal Kit) ② | 2 |
| 4 | 09000017 | O-Ring Seal (Serviced in K-6267 Plug Seal Kit) ① | 1 |
| 5 | 09021017 | Back-Up Ring (Serviced in K-6267 Plug Seal Kit) ② | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.

② Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

Spring-Return and Manual Spool Positioner Kits

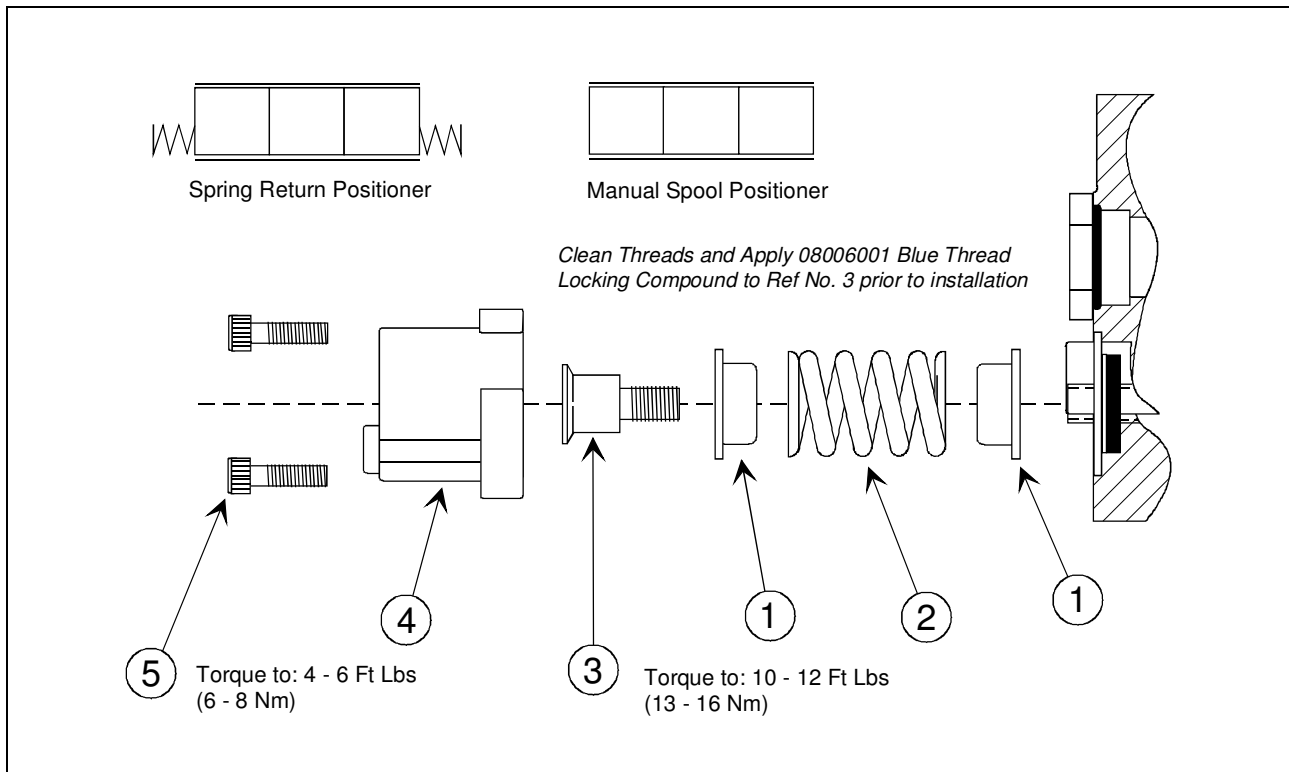


Figure 52. Spring-Return and Manual Spool Positioners

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 12741001 | K-6125 Spring-Return Positioner Kit (For use in V20P, V20C, V20LS & V20PC) | |
| | 12933001 | K-6207 Spring-Return Positioner Kit (For use in V20S, V20RP and V20RT Sections) | |
| | 12740001 | K-6020 Heavy Duty Spring-Return Kit (May be used in all V20 Sections) | |
| 1 | 01809001 | Spring Collar | 2 |
| 2 | 07433001 | Standard (Red) Centering Spring (Serviced in K-6125 Kit) ①② | 1 |
| | 10956001 | Standard (Silver) Centering Spring (Serviced in K-6207 Kit) ①② | 1 |
| | 22633001 | Heavy Duty (Blue) Centering Spring (Serviced in K-6020 Kit) ①② | 1 |
| 3 | 10892001 | Spool Screw | 1 |
| 4 | 01811003 | Bonnet | 1 |
| 5 | 09161407 | Bonnet Screw (1/4 - 20 X .875) | 2 |
| | 08006001 | Blue Thread Adhesive (Ref. Loctite No. 242) | 1 |

① 07433001 Centering Spring is standard. An Optional Heavy Duty Centering Spring (22633001) is available. Refer to the Table below for spool force comparisons. Note: These measurements are taken at the spool clevis.

② Remove the Centering Spring from the above Spring-Return Assembly to make a Manual Spool Positioner. Manual spool positioners are typically used with external linkage devices having their own spring-centering mechanisms.

| Part No. | Spring Color | Force Required to Begin Spool Movement | Force Required for Full Spool Shift |
|----------|--------------|--|-------------------------------------|
| 07433001 | Red | 30 Lbs. (13,6 Kg) | 70 Lbs. (31,7 Kg) |
| 10956001 | Silver | 45 Lbs. (20,4 Kg) | |
| 22633001 | Blue | 55 Lbs. (24,9 Kg) | 130 Lbs. (58,9 Kg) |

'D' Detented Spool Positioner Kits

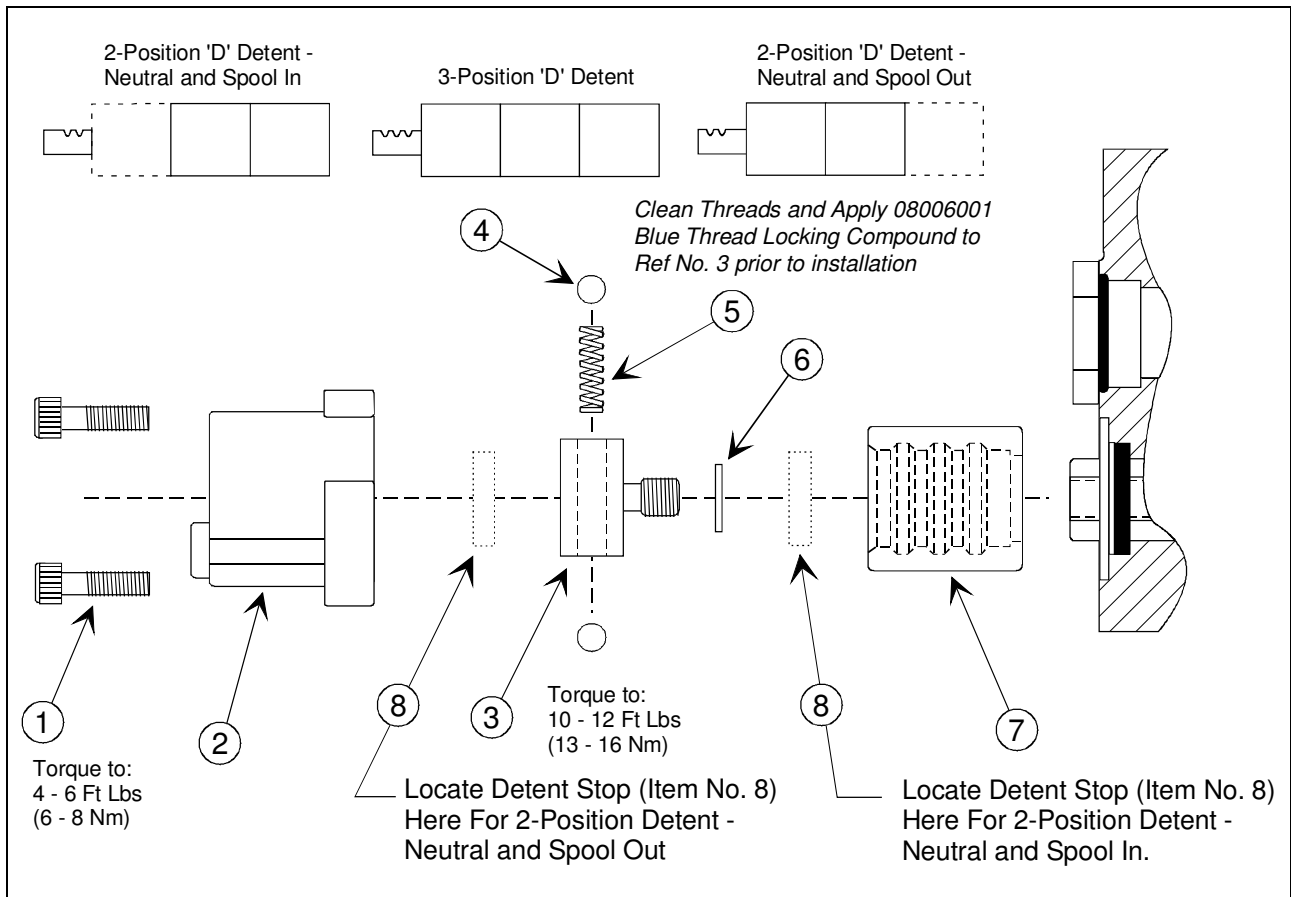


Figure 53. 'D' Detented Spool Positioner Kits

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 12739001 | CK-6012 'D' Detent Spool Positioner Kit (Kit Includes all Items Listed Below) | |
| 1 | 09161407 | Bonnet Screw (1/4 - 20 X .875) | 2 |
| 2 | 01811003 | Bonnet | 1 |
| 3 | 01840001 | Detent Ball Holder | 1 |
| 4 | 00023001 | .250 Diameter Detent Ball | 2 |
| 5 | 01838001 | Detent Spring | 1 |
| 6 | 01837001 | Lock Washer | 1 |
| 7 | 06812001 | 3-Position Detent Sleeve | 1 |
| 8 | 01889001 | 2-Position Detent Stop (<i>Optional - Not Included in Kit – Refer to the above drawing to insert the Detent Stop in the correct location to block out the desired spool position.</i>) | 1 |
| | 08006001 | Blue Thread Adhesive (Ref. Loctite No. 242) | 1 |

‘R’ Detent - Spring Return Spool Positioner Kits

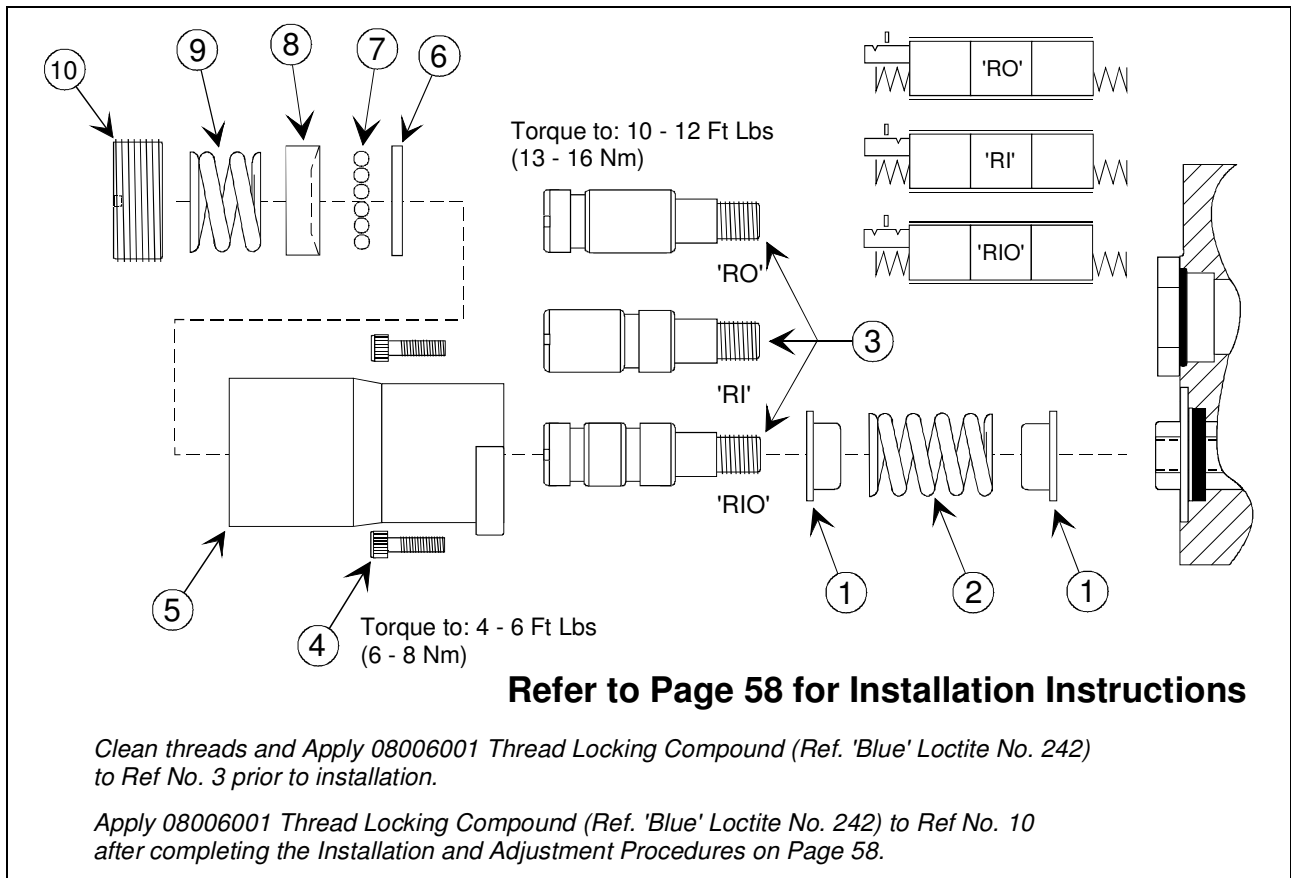


Figure 54. ‘R’ Detent - Spring Return Spool Positioners

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 12904001 | CK-6152 'RI' Detent 'In' Kit (Kit Includes all Items Listed Below) ① | |
| | 12903001 | K-6151 'RO' Detent 'Out' Kit (Kit Includes all Items Listed Below) ① | |
| | 12905001 | K-6153 'RIO' Detent 'In' and 'Out' Kit (Kit Includes all Items Listed Below) ① | |
| 1 | 01809001 | Spring Collar | 2 |
| 2 | 03250001 | Centering Spring | 1 |
| 3 | 08573001 | 'RI' Detent Spud (Detent in Spool 'IN' Position Only – Included in CK-6152) | 1 |
| | 08572001 | 'RO' Detent Spud (Detent in Spool 'OUT' Position Only – Included in K-6151) | 1 |
| | 08574001 | 'RIO' Detent Spud (Detents in both Spool 'IN' and 'OUT' Positions – Included in K-6153) | 1 |
| 4 | 03731099 | Bonnet Screw (1/4 - 20 X .625) | 2 |
| 5 | 08325004 | Bonnet | 1 |
| 6 | 20722001 | Thrust Plate | 1 |
| 7 | 01700001 | .219 Diameter Detent Ball | 12 |
| 8 | 21990002 | Ball Race | 1 |
| 9 | 03252001 | Detent Spring | 1 |
| 10 | 20723001 | Adjusting Cap ① | 1 |
| | 08006001 | Blue Thread Adhesive (Ref. Loctite No. 242) | 1 |

① The amount of force required to release the spool from the detented position(s) is adjustable by the tension applied by the detent spring (No. 9). Turning the Adjusting Cap (No. 10) Clockwise will increase the spring tension, while turning it Counter-Clockwise will reduce the tension. Once the desired detent force is obtained, apply 08006001 Locking Compound (Ref. 'Blue' Loctite No. 242) to the threads of the Adjusting Cap.

Installation and Adjustment Procedures for 'R' Detent Positioners



The Reference Numbers referred to in the following procedures may be found in the 'R' Detent - Spring Return Spool Positioner Drawing on Page 57 .

'R' Detent Installation and Adjustment Procedures

1. Remove the existing positioner from the control valve. Do not remove the spool seal, back-up washer or seal retainer plate. Remove any oil film from the internal threads of the valve spool.
2. Insert the detent spud (No. 3) thru the outer spring collar (No. 1), centering spring (No. 2), and inner spring collar (No. 1).
3. Remove any oil film from the threads of the detent spud (No. 3) and apply 08006001 thread locking adhesive (Loctite 242®, supplied in the kit). Install in the detent spud into the valve spool and tighten to 10 - 12 Ft Lbs (13 - 16 Nm) torque.
4. Mount the bonnet (No. 5) using the provided screws (No. 4). Tighten to 4 - 6 Ft Lbs (6 - 8 Nm) torque.
5. Insert the thrust plate (No. 6) into the bonnet and into place over the detent spud.
6. Insert the 12 detent balls (No. 7) around the detent spud next to the thrust plate. Applying a small amount of grease to the thrust plate surface may help hold the detent balls in place.
7. Position the ball race (No. 8) over the detent balls with the beveled side facing in.
8. Slide the detent spring (No. 9) inside the bonnet.
9. Thread the adjusting cap (No. 10) into the bonnet. The amount of force required to release the spool from the detented position(s) is set by the tension applied to the detent spring (No. 9). Turning the adjusting cap clockwise will increase the spring tension, while turning it counter-clockwise will reduce the tension.
10. Test the detent force by shifting the valve spool into and out of the detented position(s).
11. Once the desired detent force is obtained, apply 08006001 Thread Locking Compound (Ref. 'Blue' Loctite No. 242) to the thread surface of the adjusting cap.

Spring Extended (Spool Out) Positioner Kits

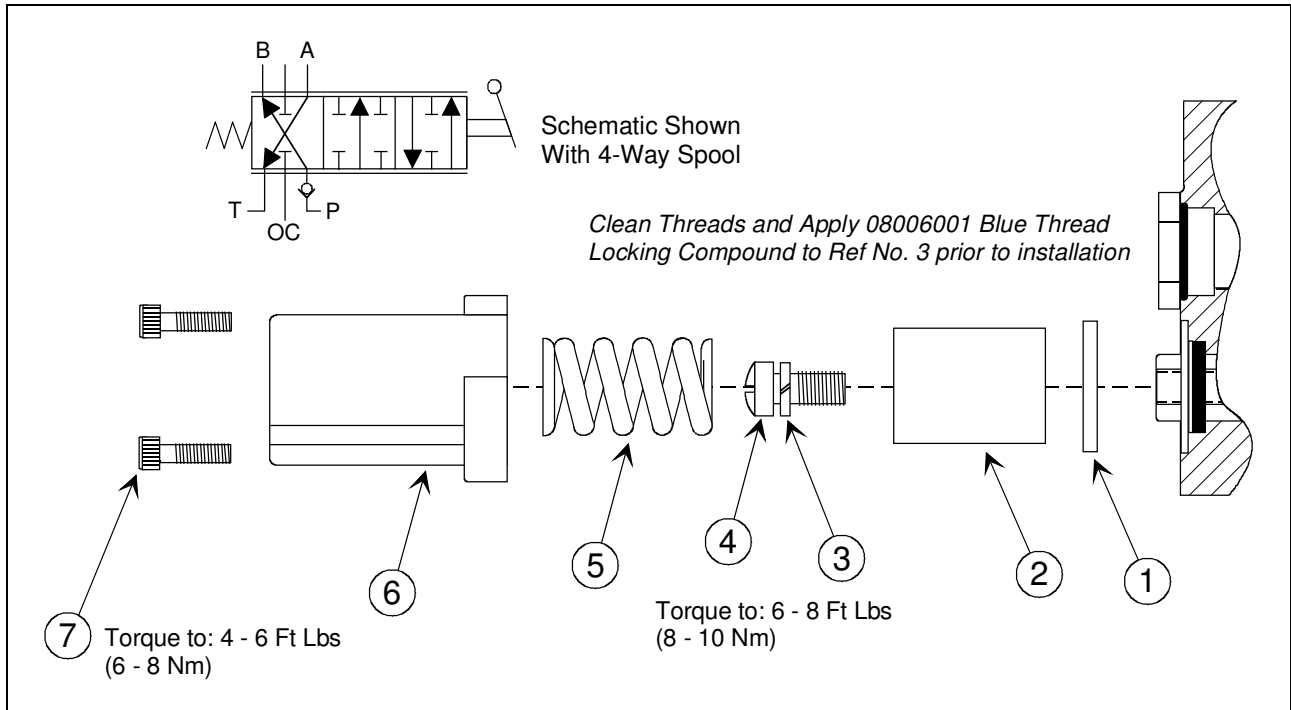


Figure 55. Spring Extended (Spool Out) Positioner Kits

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 08667001 | K-6150 Spring Extended Spool Positioner Kit (Kit Includes all Items Listed Below) | |
| 1 | 06756001 | Bonnet Sleeve | 1 |
| 2 | 01860001 | Stop Collar | 1 |
| 3 | 01813001 | Lock Washer | 1 |
| 4 | 01812001 | Cap Screw | 1 |
| 5 | 08666001 | Spring | 1 |
| 6 | 01824001 | Bonnet | 1 |
| 7 | 09161407 | Screw | 2 |

Electro-Magnetic Detent Positioner Kits

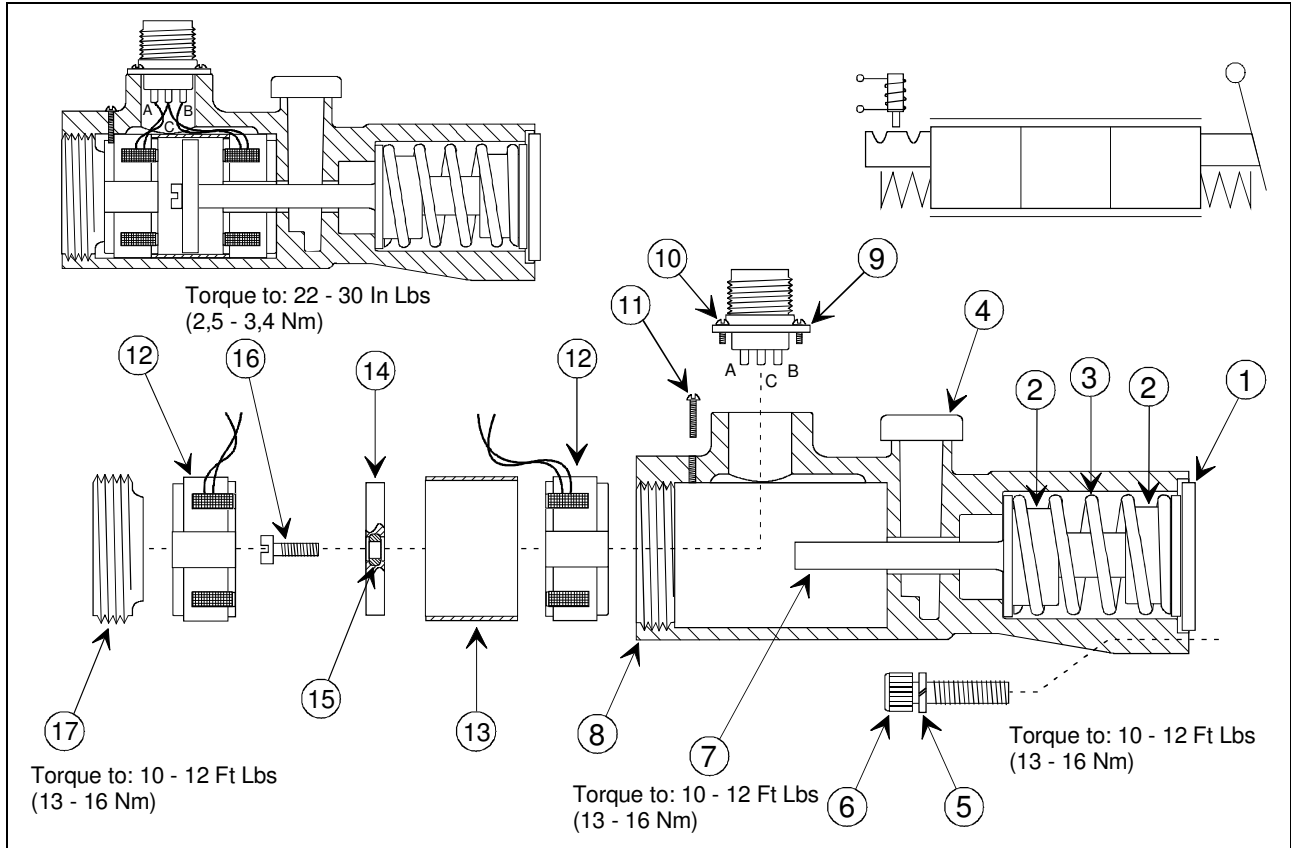


Figure 56. Electro-Magnetic Detent Positioner Kits

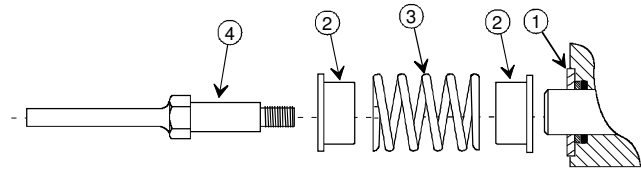
Installation Procedures for Electro-Magnetic Detent Positioners Are Found On Next Page

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 12877001 | CK-6140 Electro-Magnetic Detent Positioner Kit (Kit Includes all Items Listed Below) | |
| | 07989001 | K-6064 Electro-Mag Positioner Rebuild Kit (Kit Includes 7, 12, 14, 15 & 16) | |
| 1 | 07572001 | Spool Seal Retainer | 1 |
| 2 | 07573001 | Spring Collar | 2 |
| 3 | 03250001 | Centering Spring | 1 |
| 4 | 07589001 | Seal Cap | 1 |
| 5 | 00563001 | Lock Washer | 2 |
| 6 | 03731103 | Housing Screw | 2 |
| 7 | 07954001 | Positioner Spud | 1 |
| 8 | 07583004 | Electric Detent Bonnet | 1 |
| 9 | 07955001 | Electrical Connector | 1 |
| 10 | 07593001 | Thread Cutting Screw | 4 |
| 11 | 07956001 | Thread Cutting Screw | 1 |
| 12 | 22993001 | Electro-Magnet | 2 |
| 13 | 07958001 | Spacer | 1 |
| 14 | 08555001 | Armature | 1 |
| 15 | 07755001 | Alignment Washer | 1 |
| 16 | 07756001 | Shoulder Screw | 1 |
| 17 | 07957001 | Bonnet Plug | 1 |

Installation Procedures for Electro-Magnetic Detent Positioners

Required Tools and Supplies for EMD Positioner Installation

- 1.
- 2.
- 3.
- 4.



1. Slide Spool Seal Retainer (1) over spool end and into place in into counterbore in valve housing.

2. Clean threads of Positioner Spud (4) and apply Blue Thread Locking Compound (Ref Loctite No. 242) to the threads. Carefully insert Positioner Spud thru the two Spring Collars (2) and Spring (3).

While compressing Spring, screw the Positioner Spud into the valve spool. Tighten and torque to specification.

3. Locate the two Mounting Screws (5) and Lock Washers (6). Slide the EMD Bonnet (7) into position and fasten to housing with screws. Tighten and torque to specifications.

4. Carefully slide one of the Detent Magnets (8) into the EMD Bonnet with the wires to the top. Run the wires up thru the hole in the top of the Bonnet.

5. Slide the Spacer (9) into the Bonnet and next to the Detent Magnet. Clean threads of Shoulder Screw (11) and apply Blue Thread Locking Compound (Ref Loctite No. 242) to the threads. Carefully insert Shoulder Screw thru the Armature (10) and install onto rod end of the Positioner Spud.

6. Take the remaining Detent Magnet (8) and slide into place next to spacer and run the wires out the hole in the top of the Bonnet.

7. Install the long Thread Cutting Screw into the hole in the top of the Bonnet. This screw should enter the bore of the Bonnet and hold the Detent Magnet in place while installing the Bonnet Plug (13).

8. Clean threads of Bonnet Plug (13) and apply Blue Thread Locking Compound (Ref Loctite No. 242) to the threads. Tighten and Torque to specification.

9. Solder one of the wire leads from the inner Detent Magnet to the 'B' terminal of the Electrical Connector (14). Take the remaining wire lead from this Detent Magnet and one of the wire leads from the outer Detent Magnet and Solder to the 'C' terminal of the Electrical Connector. Solder the remaining wire lead from the outer Detent Magnet to the 'A' terminal of the Electrical Connector.

10 Push wire leads back down into Bonnet and position Electrical Connector into place in Bonnet. Install the four short Thread Cutting Screws (15) into the Connector.

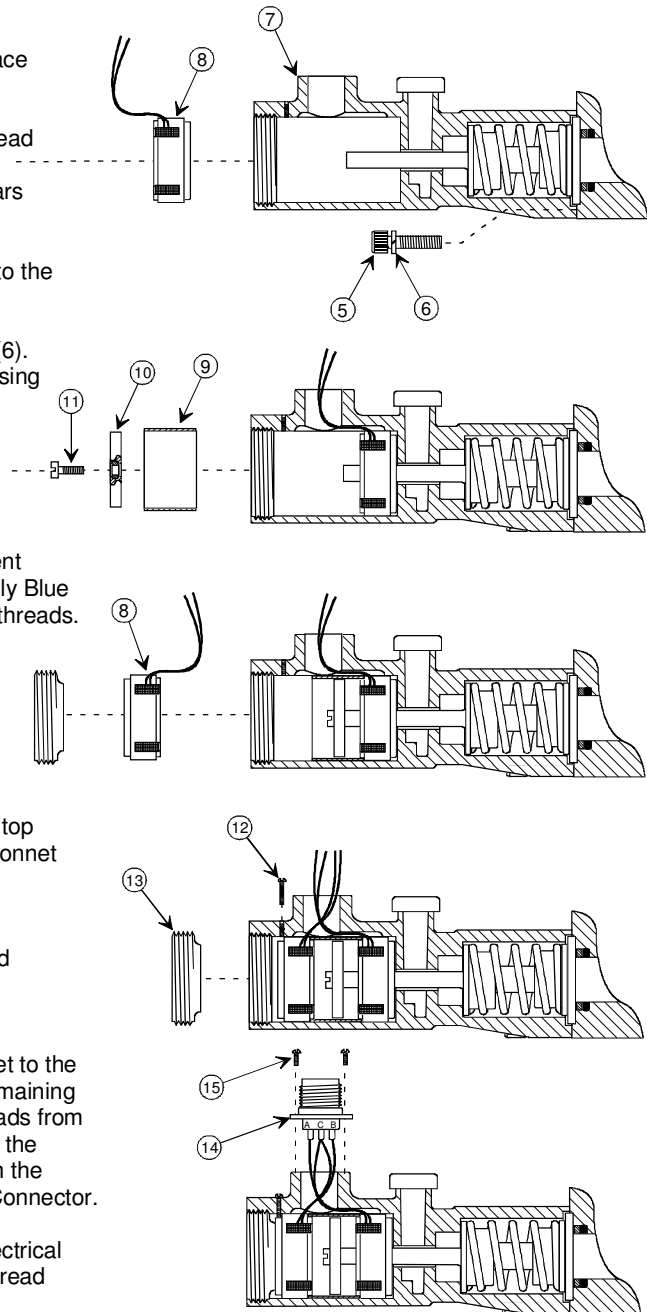


Figure 57. Installation Procedures for Electro-Magnetic Detent Positioners

Pressure Detent Release (KO) Positioner Kits

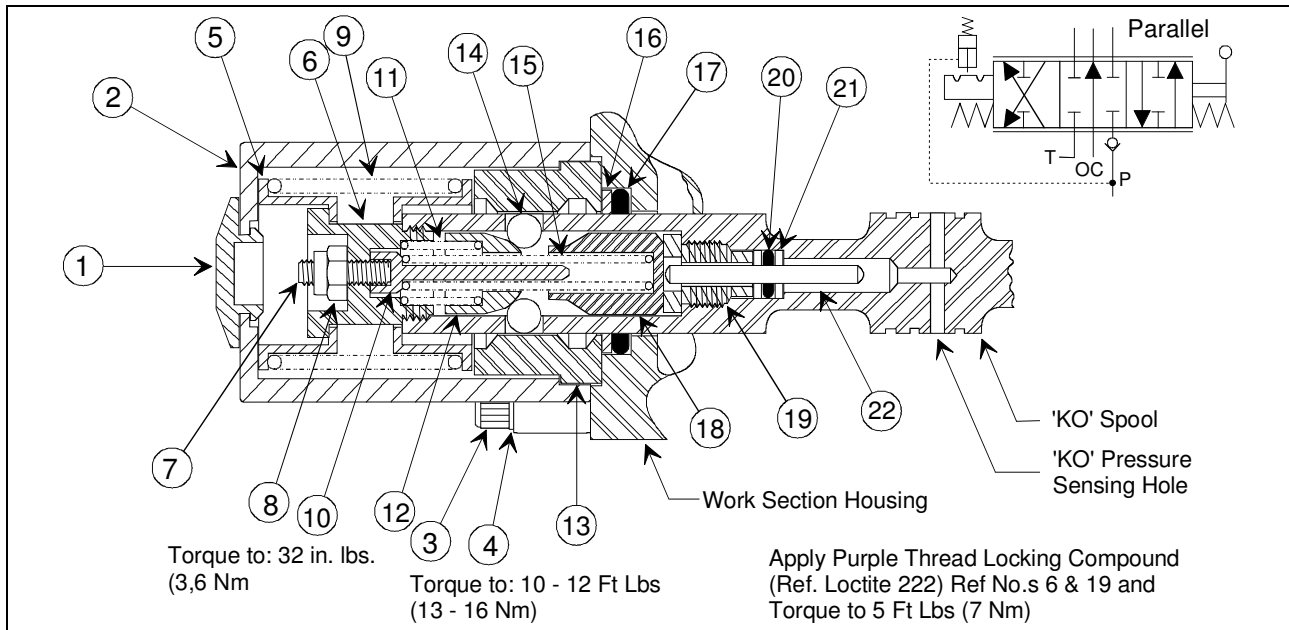


Figure 58. Pressure Detent Release (KO) Positioner Kits

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 08542001 | 'KO' Positioner , Complete, (1200 – 1600 PSI [83 – 110 bar]) | |
| | 08542002 | 'KO' Positioner , Complete, (1601 – 2400 PSI [111 – 165 bar]) | |
| | 08542003 | 'KO' Positioner , Complete, (2401 – 3000 PSI [166 – 207 bar]) | |
| | 07934001 | K-6061 Pressure Detent Release Positioner Seal Kit (Kit Includes 16, 17, 20 & 21) ① | |
| 1 | 07902001 | Flush Head Button Plug | 1 |
| 2 | 01824002 | Bonnet | 1 |
| 3 | 09161407 | Screw | 2 |
| 4 | 07904001 | Bearing Plate | 2 |
| 5 | 08536001 | Spring Collar | 2 |
| 6 | 08535001 | Spool Collar | 1 |
| 7 | 08014001 | Screw | 1 |
| 8 | 06229001 | Locknut | 1 |
| 9 | 07433001 | Centering Spring | 1 |
| 10 | 07899001 | Spring Guide | 1 |
| 11 | 07898001 | Spring | 1 |
| 12 | 07897001 | Ball Follower | 1 |
| 13 | 08007001 | Detent Sleeve (Standard 2-Position Detent) | 1 |
| | 08341001 | Detent Sleeve (Optional 1-Position Detent - Spool In Only – Must be ordered separately) | 1 |
| 14 | 01700001 | Steel Ball | 4 |
| 15 | 08047001 | Spring, 1200 – 1600 PSI [83-110 bar] - Used in 08542001 'KO' Positioner | 1 |
| | 08010001 | Spring, 1601 – 2400 PSI [111-165 bar] - Used in 08542002 'KO' Positioner | 1 |
| | 08538001 | Spring, 2401 – 3000 PSI [166-207 bar] - Used in 08542003 'KO' Positioner | 1 |
| 16 | 03265001 | Back-Up Ring ② | 2 |
| 17 | 07700001 | O-Ring Seal ① | 1 |
| 18 | 07896001 | Knockout Plunger | 1 |
| 19 | 07906001 | Piston Guide | 1 |
| 20 | 03328001 | O-Ring Seal ① | 1 |
| 21 | 07907001 | Back-Up Ring ② | 1 |
| 22 | 07908001 | Needle Roller | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

② Continuous Back-Up Rings are installed at the factory using special sizing tools. It is **Not** necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

Pressure Detent Release (KO) Adjustment Procedures



The Reference Numbers referred to in the following procedures may be found in the 'KO' Spool Positioner Drawing on Page 62 .

Pressure Detent Release (KO) Adjustment Procedures

1.

Figure 59. Pressure Detent Release (KO) Adjustment Procedures

Rotary 'W' Spool Positioner Kits

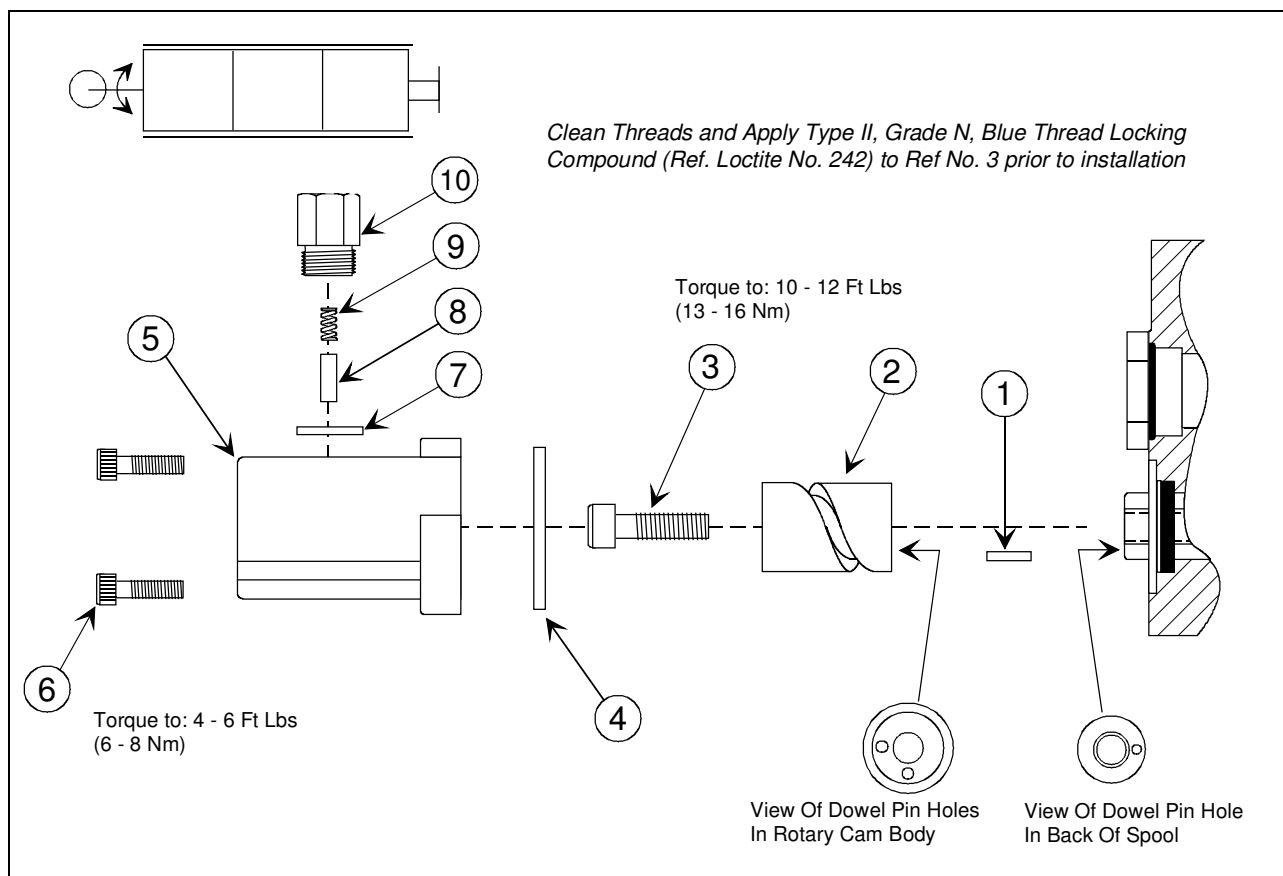


Figure 60. Rotary 'W' Spool Positioners

Note: Apply heavy duty general purpose grease to the helical groove of Cam Body (Item 2) and Pin (Item 8).
For Standard assembly, dowel pin hole in spool clevis must be horizontal with valve spool in neutral.

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 12913001 | K-6141 Rotary Spool Positioner Kit (Includes all items listed below) | |
| 1 | 00888001 | Dowel Pin | 1 |
| 2 | 08746001 | Rotary Cam Body | 1 |
| 3 | 03731150 | HSHC Screw 5/16-18 by 1 inch long | 1 |
| 4 | 06552001 | Seal Retainer Plate | 1 |
| 5 | 01824006 | Rotary Bonnet | 1 |
| 6 | 09161407 | HSHC Screw 1/4-20 by 7/8 inch long | 2 |
| 7 | 08743001 | Detent Cap Washer | 1 |
| 8 | 02676001 | Detent Pin | 1 |
| 9 | 08808001 | Detent Spring | 1 |
| 10 | 08744004 | Rotary Detent Cap | 1 |

4-Position Float Spool Positioner Kits For Non-Series Sections

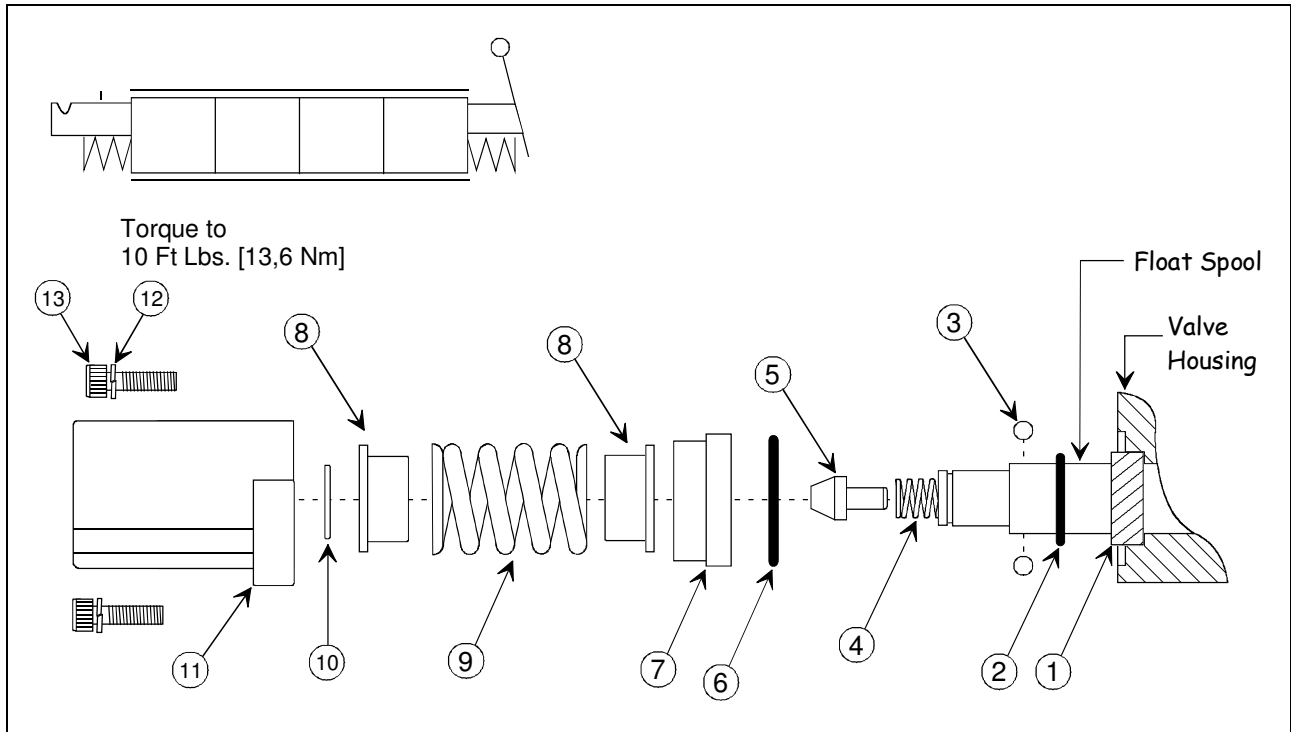


Figure 61. 4-Position Float Spool Positioners For Non-Series Sections

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 12888001 | K-6127 Float Positioner Kit (Includes all items listed below) ① | |
| 1 | 08079001 | Retainer Sleeve | 1 |
| 2 | 01853001 | O-Ring Seal (Spool Seal) ② | 1 |
| 3 | 01700001 | Detent Ball | 4 |
| 4 | 08098001 | Detent Spring ① | 1 |
| 5 | 01828001 | Detent Ball Follower | 1 |
| 6 | 21047001 | O-Ring Seal ② | 1 |
| 7 | 08077001 | Detent Sleeve | 1 |
| 8 | 01826001 | Stop Collar | 2 |
| 9 | 08099001 | Centering Spring ① | 1 |
| 10 | 01852001 | Retaining Ring | 1 |
| 11 | 08082001 | Float Bonnet | 1 |
| 12 | 00563001 | Lock Washer | 1 |
| 13 | 03731101 | HSCH Screw 1/4-20 x 7/8 inch long | 2 |

① 08099001 Centering Spring and 08098001 Detent Springs are standard. Optional Heavy Duty Centering Spring (03091001) and Detent Spring (01829001) are available. Refer to the Table below for spool force comparisons. Note: These measurements are taken at the spool clevis.

② Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

| Part No. | Spring Color | Force Required to Begin Spool Movement | Force Required for Full Spool Shift |
|----------|--------------|--|-------------------------------------|
| 08099001 | | | |
| 03091001 | Gray | 64 Lbs. (29,0 Kg) | 90 Lbs. (40,7 Kg) |

4-Position Float Spool Positioner Kits For V20S Series Sections

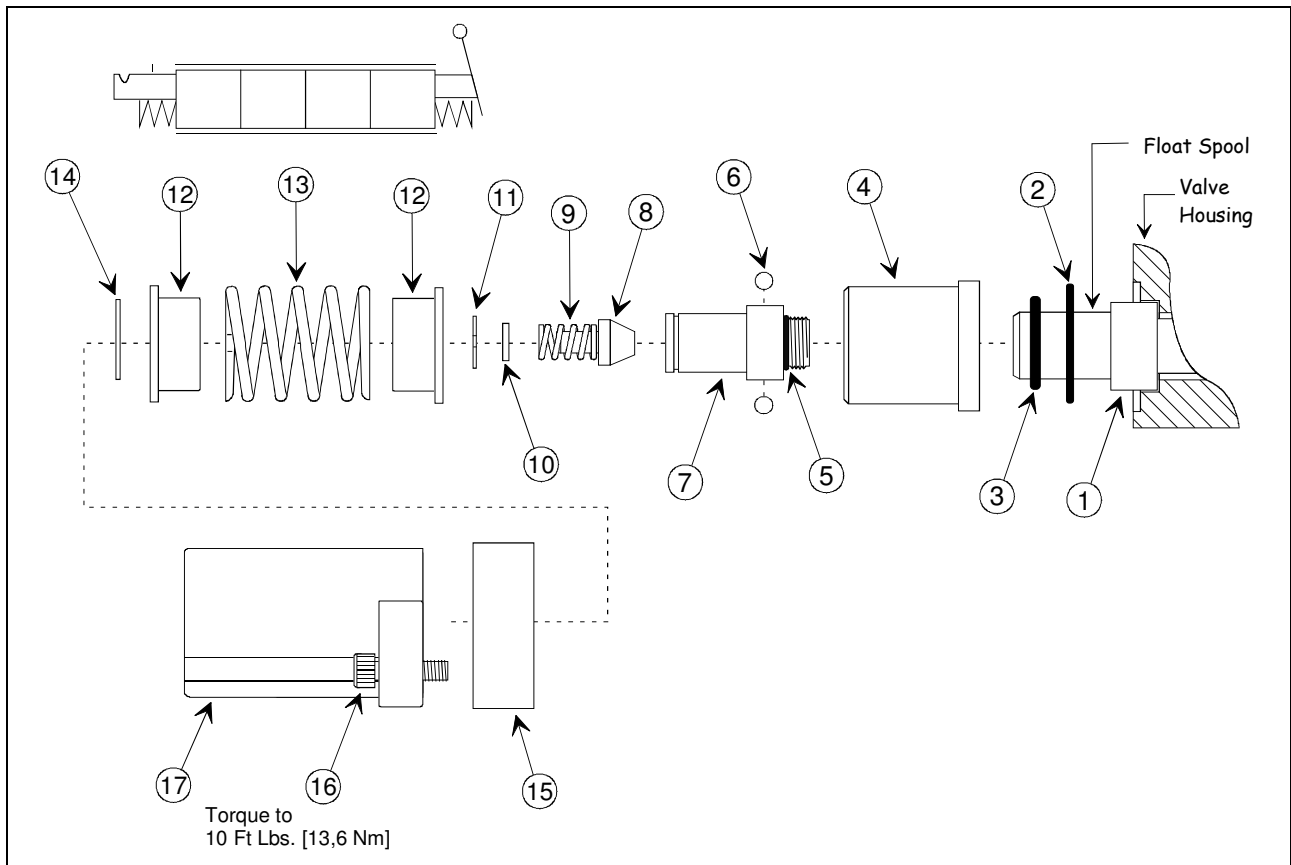


Figure 62. 4-Position Float Spool Positioners For V20S Series Sections

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 12701001 | K-6208 V20S Series Float Spool Positioner Kit (Includes all items listed below) ① | |
| 1 | 08079001 | Retainer Sleeve | 1 |
| 2 | 21047001 | O-Ring Seal ① | 1 |
| 3 | 01853001 | 4-Lobed Seal | 1 |
| 4 | 11372001 | Detent Sleeve | 1 |
| 5 | 00449001 | O-Ring Seal ① | 1 |
| 6 | 01700001 | Detent Ball | 4 |
| 7 | 11373001 | Spool Collar | 1 |
| 8 | 01828001 | Ball Follower | 1 |
| 9 | 01829001 | Detent Spring | 1 |
| 10 | 11371001 | Shim | 1 |
| 11 | 09320016 | Retaining Ring | 1 |
| 12 | 01826001 | Spring Collar | 2 |
| 13 | 01807001 | Centering Spring | 1 |
| 14 | 01852001 | Retaining Ring | 1 |
| 15 | 07905001 | Bonnet Spacer | 1 |
| 16 | 09161412 | HSHC Screw ¼ - 20 x 1-1/2 inch long | 2 |
| 17 | 08282001 | V20S Float Bonnet | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

'PA' Pneumatic Spool Actuator Kit

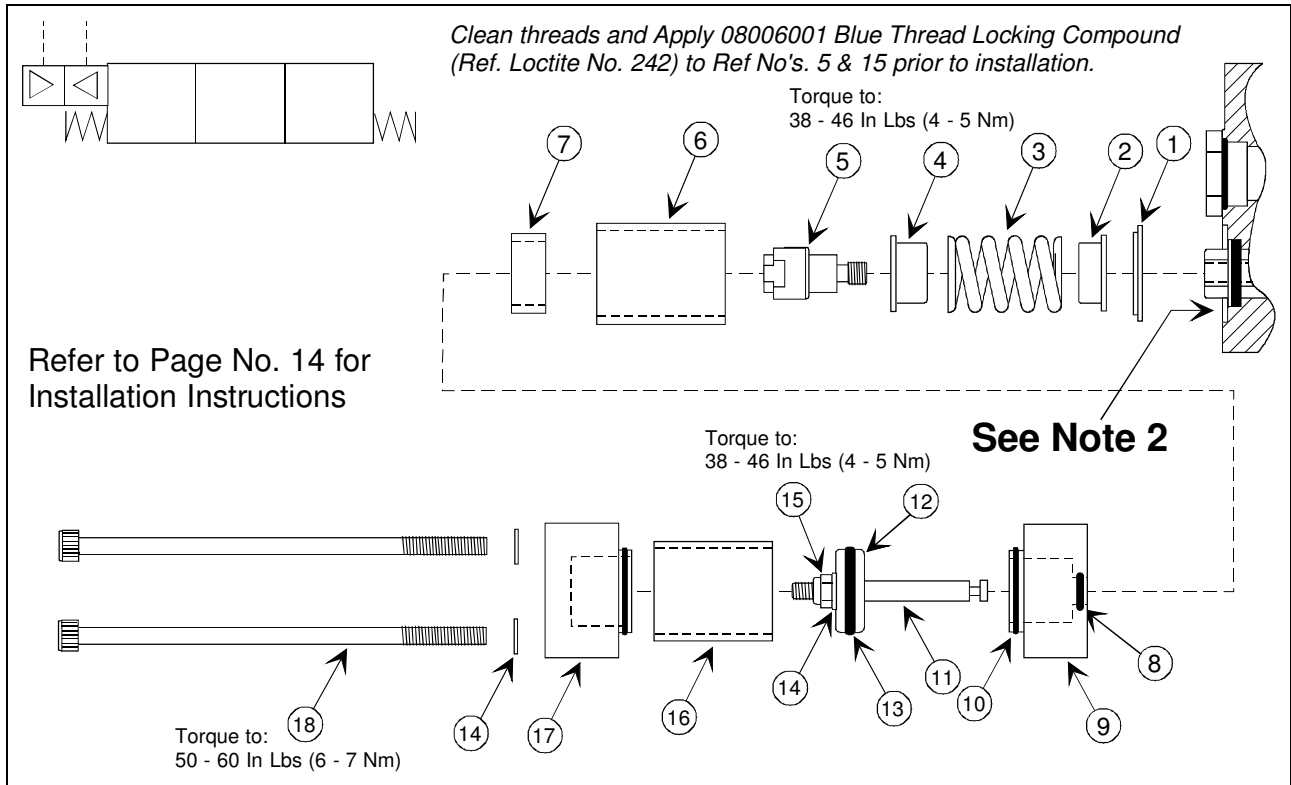


Figure 63. 'PA' Pneumatic Spool Actuator

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 11732001 | CK-6173 'PA' Pneumatic Spool Actuator Kit (Kit Includes all items listed below) | |
| | 11734001 | K-6174 Actuator Seal Kit (Kit Includes Items 8, 10 and 13 Only) ① | |
| 1 | 24143001 | Seal Retainer Plate | 1 |
| 2 | 11724001 | Spring Collar (Short) | 1 |
| 3 | 10956001 | Centering Spring | 1 |
| 4 | 11725001 | Spring Collar (Long) | 1 |
| 5 | 24144001 | Spool Collar | 1 |
| 6 | 24145001 | Spring Tube | 1 |
| 7 | 24151001 | Spacer | 1 |
| 8 | 08316001 | O-Ring Rod Seal (Serviced in K-6174 Actuator Seal Kit) ① | 1 |
| 9 | 24159001 | Inner End Cap | 1 |
| 10 | 12196001 | O-Ring End Cap Seal (Serviced in K-6174 Actuator Seal Kit) ① | 2 |
| 11 | 24146001 | Piston Rod | 1 |
| 12 | 24147001 | Actuator Piston | 1 |
| 13 | 00006001 | O-Ring Piston Seal (Serviced in K-6174 Actuator Seal Kit) ① | 1 |
| 14 | 11652001 | Washer | 5 |
| 15 | 11651001 | Lock Nut | 1 |
| 16 | 24016001 | Cylinder Shell | 1 |
| 17 | 11719001 | Outer End Cap | 1 |
| 18 | 03731120 | Bonnet Screw (1/4 - 20 X 6.00) | 4 |
| | 08006001 | Blue Thread Adhesive (Ref. Loctite No. 242) | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

② Remove the standard spool seal retainer plate (06752001) prior to installing the 'PA' kits. Refer to Figure 2 for part identification.

Installation Instructions for 'PA' Pneumatic Actuators

The pneumatic actuator is installed on one end of the valve spool in place of the standard positioner. A manual lever can be used on the opposite end as an override to the actuator if required. The pneumatic actuator must be controlled by a four-way, three-position pneumatic directional control valve.



The Reference Numbers referred to in the following procedures may be found in the 'PA' Pneumatic Spool Actuator Assembly Drawing on Page 13 .

Actuator Installation

1. Remove the existing positioner and seal retainer plate from the control valve. Do not remove the spool seal or back-up washer. Remove any oil film from the internal threads of the valve spool.
2. Insert the seal retainer plate (No. 1) over the end of the spool ensuring that it locates in the counter bore correctly.
3. Insert the spool collar (No. 5) thru the outer spring collar (No. 4), centering spring (No. 3), and inner spring collar (No. 2).
Note: The shorter of the two spring collars goes next to the spool.
4. Remove any oil film from the threads of the spool collar (No. 5) and apply 08006001 thread locking adhesive (Loctite 242®, supplied in the kit). Install in the spool and tighten to 38 - 46 in lb (4 - 5 Nm) torque.
Caution: Over tightening the spool collar may cause spool binding.
5. Slide the spring tube (No. 6) into place over the spring assembly.
6. Insert spacer (No. 7) into spring tube (No. 6).
7. Lubricate the piston rod (No. 11) with the supplied grease (high temperature silicon based bearing grease with a NLGI #2 consistency). Avoid getting lubricant on the threads.
8. Carefully insert the threaded end of the piston rod thru the inner end cap assembly (No. 9).
9. Install the piston assembly (No. 12) and washer (No. 14) on the piston rod (No. 11) as shown.
10. Remove any oil film from the threads of the piston rod and apply 08006001 thread locking adhesive (Loctite 242® supplied in the kit). Install lock nut (No. 15) and tighten to 38 - 46 in lb (4 - 5 Nm) torque.
11. Insert the end of the piston rod (No. 11) into the spool collar (No. 5). Also position the inner end cap assembly (No. 9) onto the spring tube (No. 6).
12. Using the above mention grease, lubricate the inner surface of the cylinder shell (No. 16) and install over the piston assembly (No. 12).
13. Mount the outer end cap assembly (No. 17) using the provided screws (No. 18) and washers (No. 14) and tighten to 50 - 60 in lb (6 - 7 Nm) torque.

Lubrication

The pneumatic actuator comes pre-lubed. In the event the lubrication is wiped off, liberally apply a high temperature silicon-based bearing grease with a NLGI #2 consistency to the piston seal (No. 13), rod seal (No. 8), and all seal travel surfaces.

Testing the CK-6173 Pneumatic Actuator after Installation

1. Apply a soap solution to all of the actuator joints, ports, and connectors. Actuate the control device to move the spool in one direction. Allowable leakage would be defined as enough to cause a one inch bubble in 3 seconds.
2. Reapply soap solution and repeat test while spool is being moved in the other direction.
3. If leakage is excessive, ensure that the joints are tight and that the installation is correct.
4. Verify that the spool moves easily thru its entire travel range and that there is no evidence of sticking or binding. **If binding is detected, the installation should be checked immediately. Failure to do so could result in improper actuation in the future and should be corrected.**

‘HR’ Hydraulic Remote Spool Actuator Kit (Positioner End)

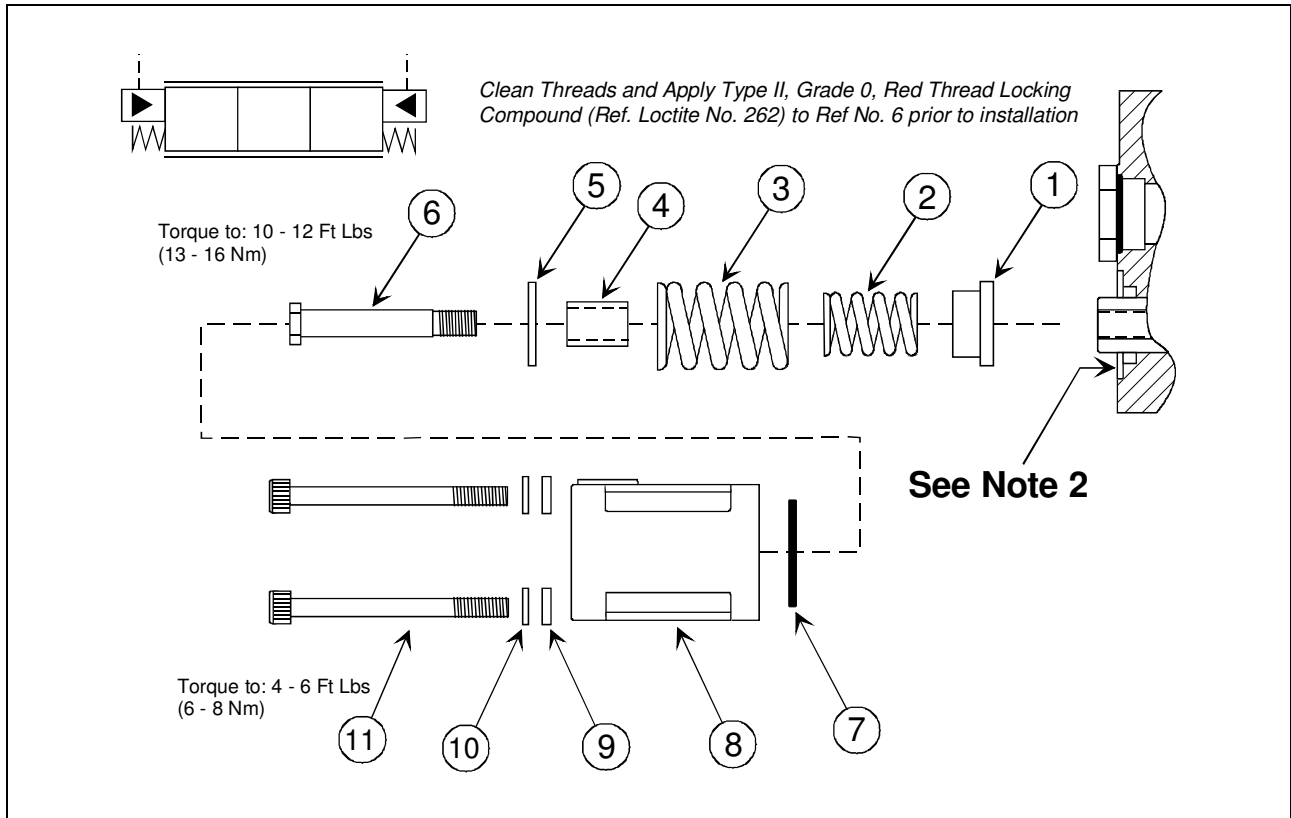


Figure 64. ‘HR’ Hydraulic Remote Spool Actuator (Positioner End)

Note: K-6128 HR Actuator is also used on the positioner end of Model HRH Actuator.

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 12940001 | K-6128 ‘HR’ Spool Actuator Kit (Kit Includes all Items Listed Below) ① ② | |
| 1 | 11127001 | Stop Collar | 1 |
| 2 | 11117001 | Spring (Inner) | 1 |
| 3 | 11116001 | Spring (Outer) | 1 |
| 4 | 11113001 | Stop Sleeve | 1 |
| 5 | 11114001 | Washer | 1 |
| 6 | 11115001 | Positioner Spud | 1 |
| 7 | 11126001 | Square-Cut Seal | 1 |
| 8 | 08338001 | ‘HR’ Bonnet | 1 |
| 9 | 07904001 | Bearing Plate | 4 |
| 10 | 00563001 | Lock Washer | 4 |
| 11 | 03731110 | Screw (1/4 - 20 X 3.00) | 4 |
| | 08006001 | Blue Thread Adhesive (Ref. Loctite No. 242) | 1 |

① **K-6128** Actuator Kit is for installation on the positioner end of the work section (opposite the spool clevis).

② Remove all Spool Seal Components from the work section prior to installing ‘HR’ Actuator Kits.

‘HR’ Hydraulic Remote Spool Actuator Kit (Spool Clevis End)

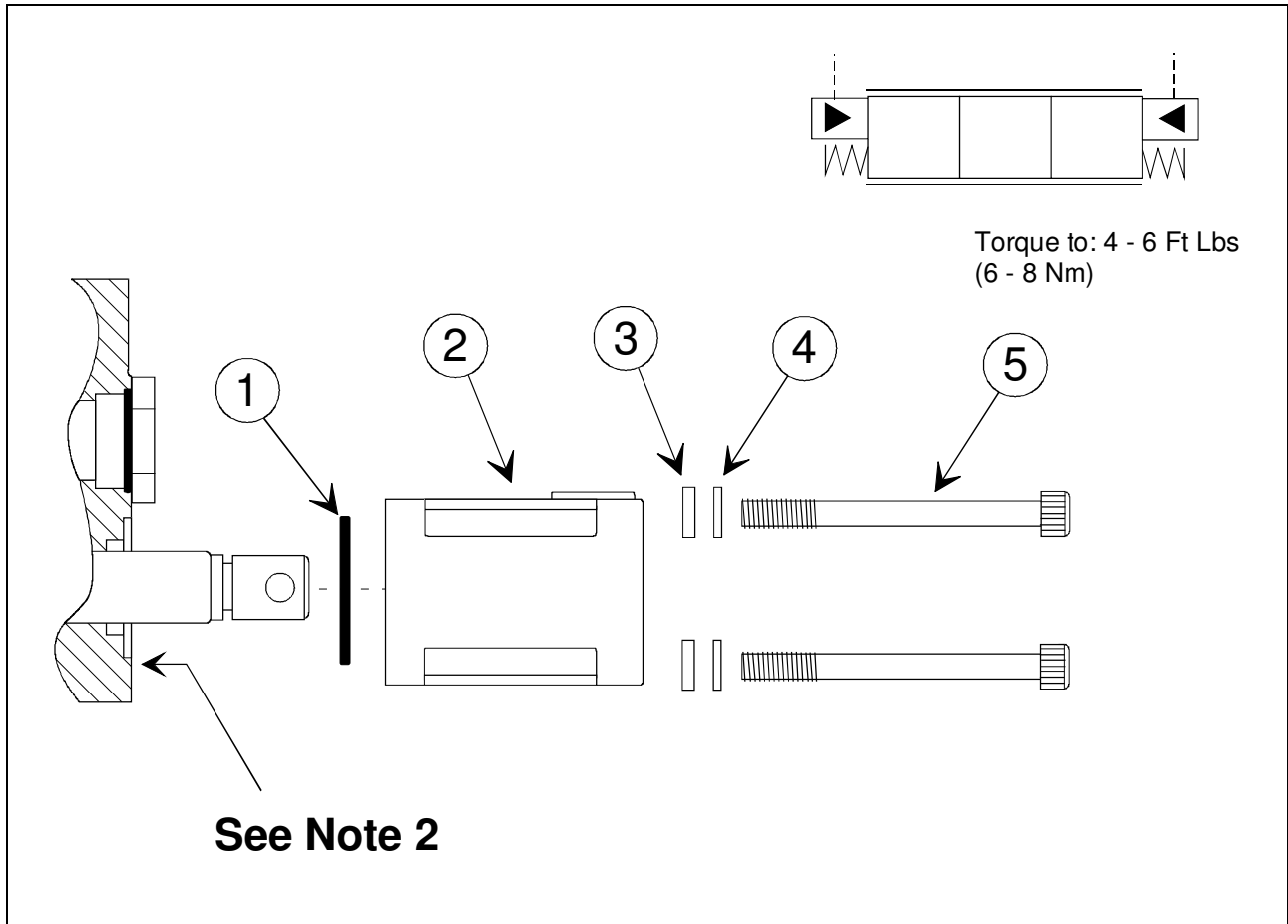


Figure 65. ‘HR’ Hydraulic Remote Spool Actuator (Spool Clevis End)

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 12942001 | K-6129 ‘HR’ Spool Actuator Kit (Kit Includes all Items Listed Below) ① ② | |
| 1 | 11126001 | Square-Cut Seal | 1 |
| 2 | 08338001 | ‘HR’ Bonnet | 1 |
| 3 | 07904001 | Bearing Plate | 4 |
| 4 | 00563001 | Lock Washer | 4 |
| 5 | 03731110 | Screw (1/4 - 20 X 3.00) | 4 |

① **K-6129** Actuator Kit is for installation on the spool clevis end of the work section.

② Remove all Spool Seal Components from the work section prior to installing ‘HR’ Actuator Kits.

‘HRO’ Hydraulic Remote Spool Actuator Kit (Positioner End)

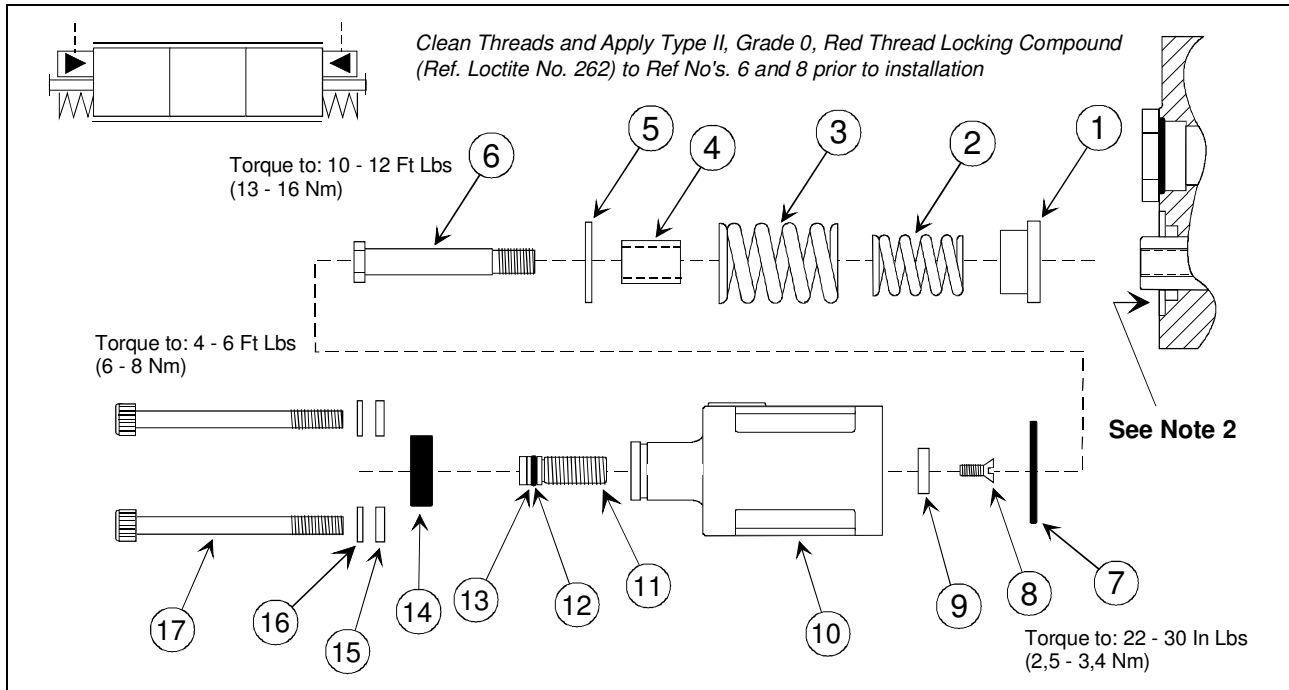


Figure 66. ‘HRO’ Hydraulic Remote Spool Actuator (Positioner End)

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 12944001 | K-6130 ‘HRO’ Spool Actuator Kit (Kit Includes all Items Listed Below) ① ② | |
| 1 | 11127001 | Stop Collar | 1 |
| 2 | 11117001 | Spring (Inner) | 1 |
| 3 | 11116001 | Spring (Outer) | 1 |
| 4 | 11113001 | Stop Sleeve | 1 |
| 5 | 11114001 | Washer | 1 |
| 6 | 11115001 | Positioner Spud | 1 |
| 7 | 11126001 | Square-Cut Seal | 1 |
| 8 | 08319001 | Screw (Countersunk Head) | 1 |
| 9 | 08318001 | Travel Stop | 1 |
| 10 | 08320001 | ‘HRO’ Bonnet | 1 |
| 11 | 08317001 | Spool Override Screw ③ | 1 |
| 12 | 08316001 | O-Ring Seal | 1 |
| 13 | 08315001 | Back-Up Ring ④ | 1 |
| 14 | 07826001 | Boot | 1 |
| 15 | 07904001 | Bearing Plate | 4 |
| 16 | 00563001 | Lock Washer | 4 |
| 17 | 03731110 | Bonnet Screw (1/4 - 20 X 3.00) | 4 |
| | 08006001 | Blue Thread Adhesive (Ref. Loctite No. 242) | 1 |

① **K-6130** Actuator Kit is for installation on the positioner end of the work section (opposite the spool clevis).

② Remove all Spool Seal Components from the work section prior to installing ‘HRO’ Actuator Kits.

③ Turning the Spool Override Screw (No. 11) Clockwise will move the Travel Stop (No. 9) in, making contact with the valve spool. Continued Clockwise rotation will force the spool from the center position. The Override may also be used as a Spool Travel Limiter. The farther in the Spool Override Screw is adjusted (without actually making contact with the valve spool), the less distance from center the valve spool can travel.

④ Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

‘HRO’ Hydraulic Remote Spool Actuator Kit (Spool Clevis End)

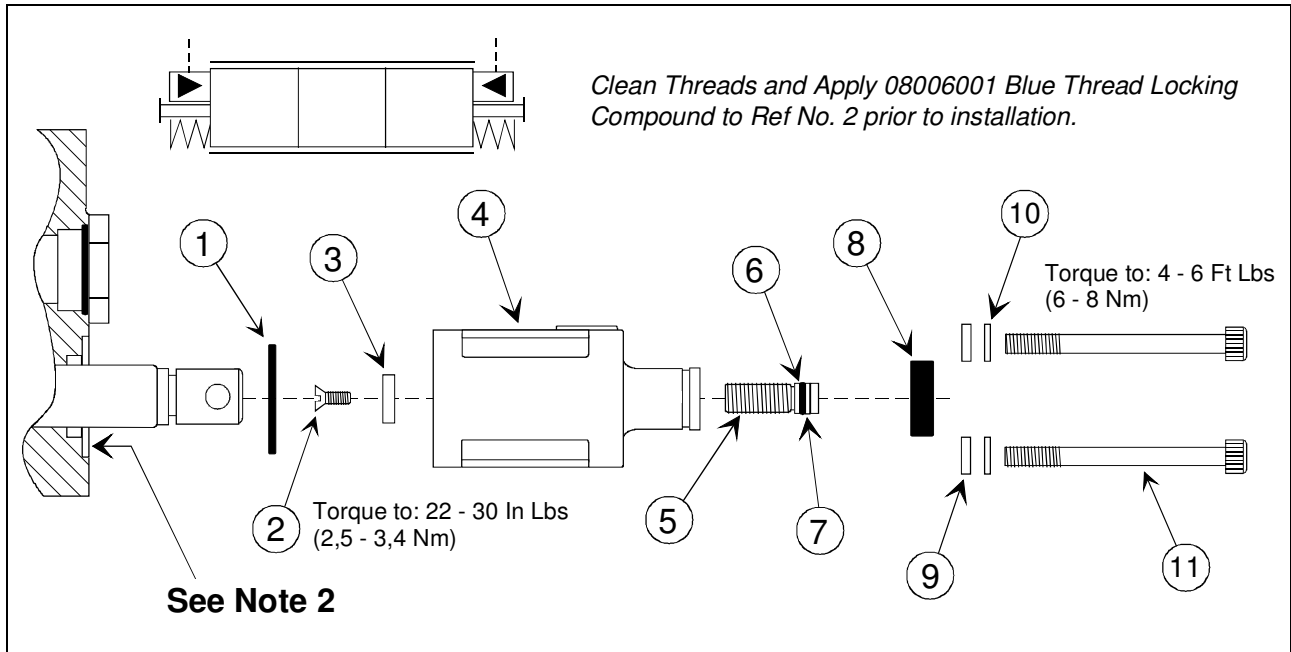


Figure 67. ‘HRO’ Hydraulic Remote Spool Actuator (Spool Clevis End)

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 12945001 | K-6131 ‘HRO’ Spool Actuator Kit (Kit Includes all Items Listed Below) ① ② | |
| 1 | 11126001 | Square-Cut Seal | 1 |
| 2 | 08319001 | Screw (Countersunk Head) | 1 |
| 3 | 08318001 | Travel Stop | 1 |
| 4 | 08320001 | ‘HRO’ Bonnet | 1 |
| 5 | 08317001 | Spool Override Screw ③ | 1 |
| 6 | 08316001 | O-Ring Seal | 1 |
| 7 | 08315001 | Back-Up Ring ④ | 1 |
| 8 | 07826001 | Boot | 1 |
| 9 | 07904001 | Bearing Plate | 4 |
| 10 | 00563001 | Lock Washer | 4 |
| 11 | 03731110 | Bonnet Screw (1/4 - 20 X 3.00) | 4 |
| | 08006001 | Blue Thread Adhesive (Ref. Loctite No. 242) | 1 |

① **K-6131** Actuator Kit is for installation on the spool clevis end of the work section.

② Remove all Spool Seal Components from the work section prior to installing ‘HRO’ Actuator Kits.

③ Turning the Spool Override Screw (No. 5) Clockwise will move the Travel Stop (No. 3) in, making contact with the valve spool. Continued Clockwise rotation will force the spool from the center position. The Override may also be used as a Spool Travel Limiter. The farther in the Spool Override Screw is adjusted (without actually making contact with the valve spool), the less distance from center the valve spool can travel.

④ Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

‘HRH’ Hydraulic Remote Spool Actuator Kits

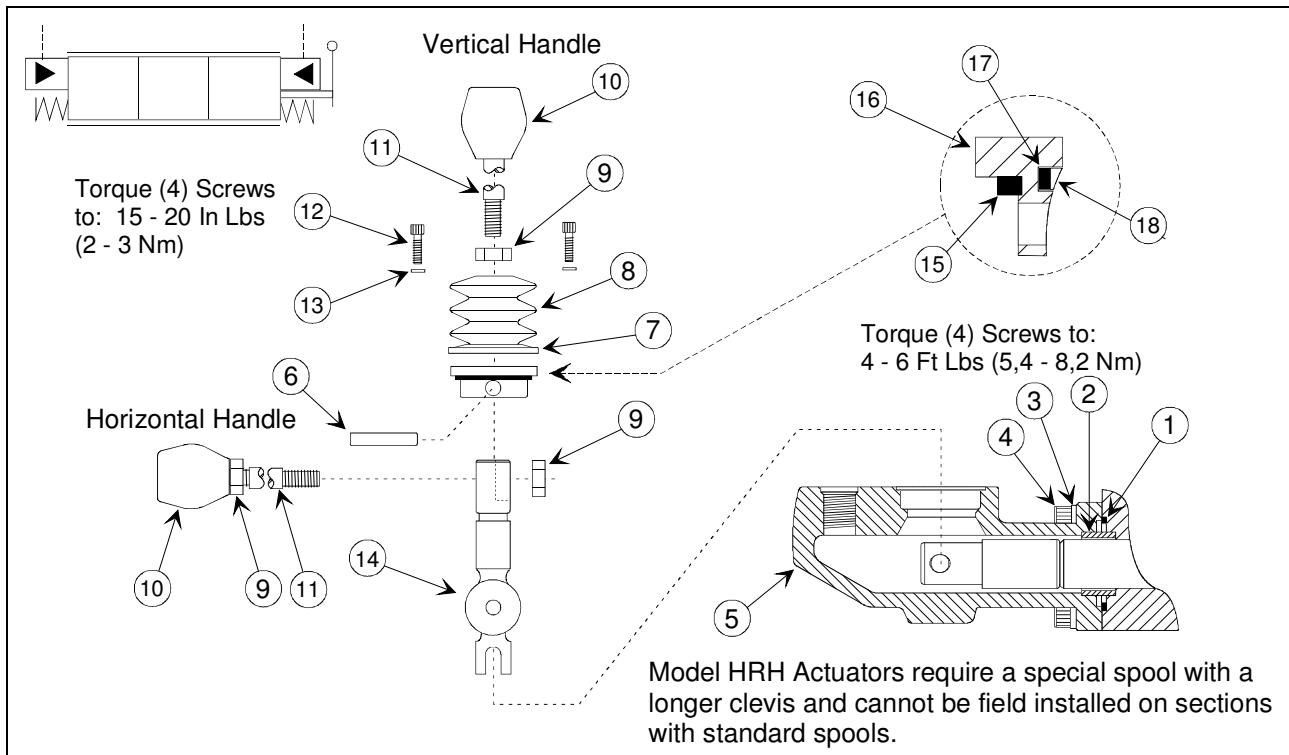


Figure 68. ‘HRH’ Hydraulic Remote Spool Actuators

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 12900001 | K-6142 Vertical Handle HRH Actuator Kit (Includes all Items Listed Below) ① | |
| | 10357001 | K-6149 Horizontal Handle HRH Actuator Kit (Includes all Items Listed Below) ① | |
| | 12347001 | K-6187 Actuator Seal Kit (Includes Items 1, 15, 17 & 18 Only) ① | |
| 1 | 11126001 | O-Ring Seal (Serviced in K-6187 Actuator Seal Kit) ① | 1 |
| 2 | 11685001 | Bonnet Guide | 1 |
| 3 | 00563001 | Lock Washer | 4 |
| 4 | 03731100 | Screw | 4 |
| 5 | 10073003 | HRH Bonnet | 1 |
| 6 | 09350310 | Dowel Pin | 1 |
| 7 | 08587001 | Boot Retainer | 1 |
| 8 | 07622001 | Boot | 1 |
| 9 | 09302106 | Jam Nut ② | A/R |
| 10 | 08815001 | Knob | 1 |
| 11 | 08962002 | Vertical Handle Rod (Included in K-6142 Vertical Handle HRH Kit) | 1 |
| | 08962001 | Horizontal Handle Rod (Included in K-6149 Horizontal Handle HRH Kit) | 1 |
| 12 | 03731003 | Screw | 4 |
| 13 | 09285002 | Lock Washer | 4 |
| 14 | 08589001 | Vertical Adapter (Included in K-6142 Vertical Handle HRH Kit) | 1 |
| | 08961001 | Horizontal Adapter (Included in K-6149 Horizontal Handle HRH Kit) | 1 |
| 15 | 09000027 | O-Ring Seal (Serviced in K-6187 Actuator Seal Kit) ① | 1 |
| 16 | 08963001 | Seal Retainer | 1 |
| 17 | 07028002 | O-Ring Seal (Serviced in K-6187 Actuator Seal Kit) ① | 1 |
| 18 | 08959001 | Special Seal (Serviced in K-6187 Actuator Seal Kit) ① | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

② Horizontal Handle requires 2 jam nuts.

Model V20 SOL-E Solenoid Actuator Kits

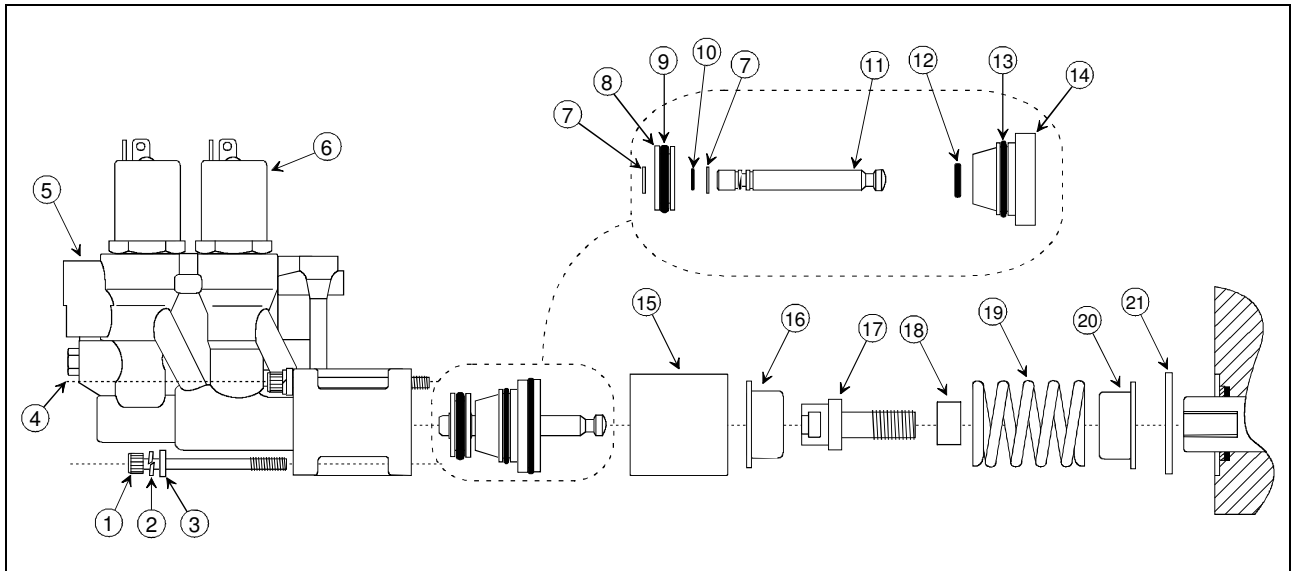


Figure 69. Model V20 SOL-E Solenoid Actuator Assembly

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 07978001 | CK-6080 Actuator Kit (Contains Items 1 thru 5, plus 7 thru 22) | |
| | 07983001 | K-6074 Actuator Seal Kit (Contains Items 9, 10, 12 & 13) | |
| | 07979001 | K-6079 Piston Kit (Contains Items 7 thru 11) | |
| 1 | 03731111 | Screw, 1/4-20 x 3.25" | 4 |
| 2 | 00563001 | Lock Washer | 4 |
| 3 | 07904001 | Bearing Plate | 4 |
| 4 | 03637001 | SAE 6 Plug | 1 |
| 5 | 07850001 | Actuator Housing | 1 |
| 6 | 12893001 | CK-6083 12VDC Solenoid Cartridge Kit – See Figure 73 | 2 |
| | 12895001 | CK-6093 24VDC Solenoid Cartridge Kit – See Figure 73 | 2 |
| | 12518001 | CK-6169 120VAC Solenoid Cartridge Kit – See Figure 73 | 2 |
| 7 | 07855001 | Retaining Ring | 2 |
| 8 | 07856001 | Piston | 1 |
| 9 | 07700001 | O-Ring Seal | 1 |
| 10 | 03191001 | O-Ring Seal | 1 |
| 11 | 07857001 | Piston Rod | 1 |
| 12 | 07854001 | O-Ring Seal | 1 |
| 13 | 07028002 | O-Ring Seal | 1 |
| 14 | 07858001 | Piston Rod Guide | 1 |
| 15 | 07851001 | Sleeve, 1.43 x 1.49 inches [36,3 x 37,8] | 1 |
| 16 | 10815001 | Spool Centering Collar | 1 |
| 17 | 11640001 | Spool Screw | 1 |
| 18 | 11639001 | Spacer | 1 |
| 19 | 07853001 | Spring, Centering 1.250 x .156 [31,8 x 4,0 mm] | 1 |
| 20 | 10816001 | Stop Collar | 1 |
| 21 | 07572001 | Seal Plate | 1 |
| | 08006001 | Loctite Tube, Grade 262 | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

② Continuous Back-Up Rings are installed at the factory using special sizing tools. It is **Not** necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

Model V20 SOL-E Solenoid Actuator Installation Procedures

Required Tools and Supplies for Actuator Installation

1. 9/16" Flat Wrench
2. Model V20 Handle Kit
3. 5/16" Allen Wrench
4. Medium Grade Loctite
5. Oil Lubricant

1. Install Model V20 Handle Kit.
2. Clean threads and apply a small amount of medium grade thread locking compound to the threads of the Spool Adapter. Insert Spool Adapter thru Spacer, Spring Collars, Centering Spring and Seal Plate in order shown here.
3. While compressing the spring, screw the Spool Adapter into the valve spool approximately two or three turns. Do not tighten at this time.
4. Slide the large (sleeve) Spacer over the assembled spring components.
5. Slide the rod of the Piston & Rod Assembly thru the into the slot in the Spool Adapter.
6. The Spool Adapter may now be tightened using a 9/16" open end wrench. Verify that the small Spacer is positioned properly between the two Spring Collars.
7. Apply a film of oil on the inside surface of the Actuator Housing and the O-Ring seals on the Piston & Rod Assembly.
8. Carefully slide the Actuator Housing over the Piston & Rod Assembly and into position next to the valve housing.
9. Slide the Bonnet Screws thru the Lock Washer and Bearing Plate and attach the Actuator Housing to the valve housing.
10. Using the valve Handle Kit, shift the valve spool back and forth to verify that the valve spool moves freely inside the Actuator Housing. If it does not, remove actuator assembly and repeat assembly procedures
11. Install SAE 6 Plug, Solenoid Cartridges, Fittings and Tubing Kits.

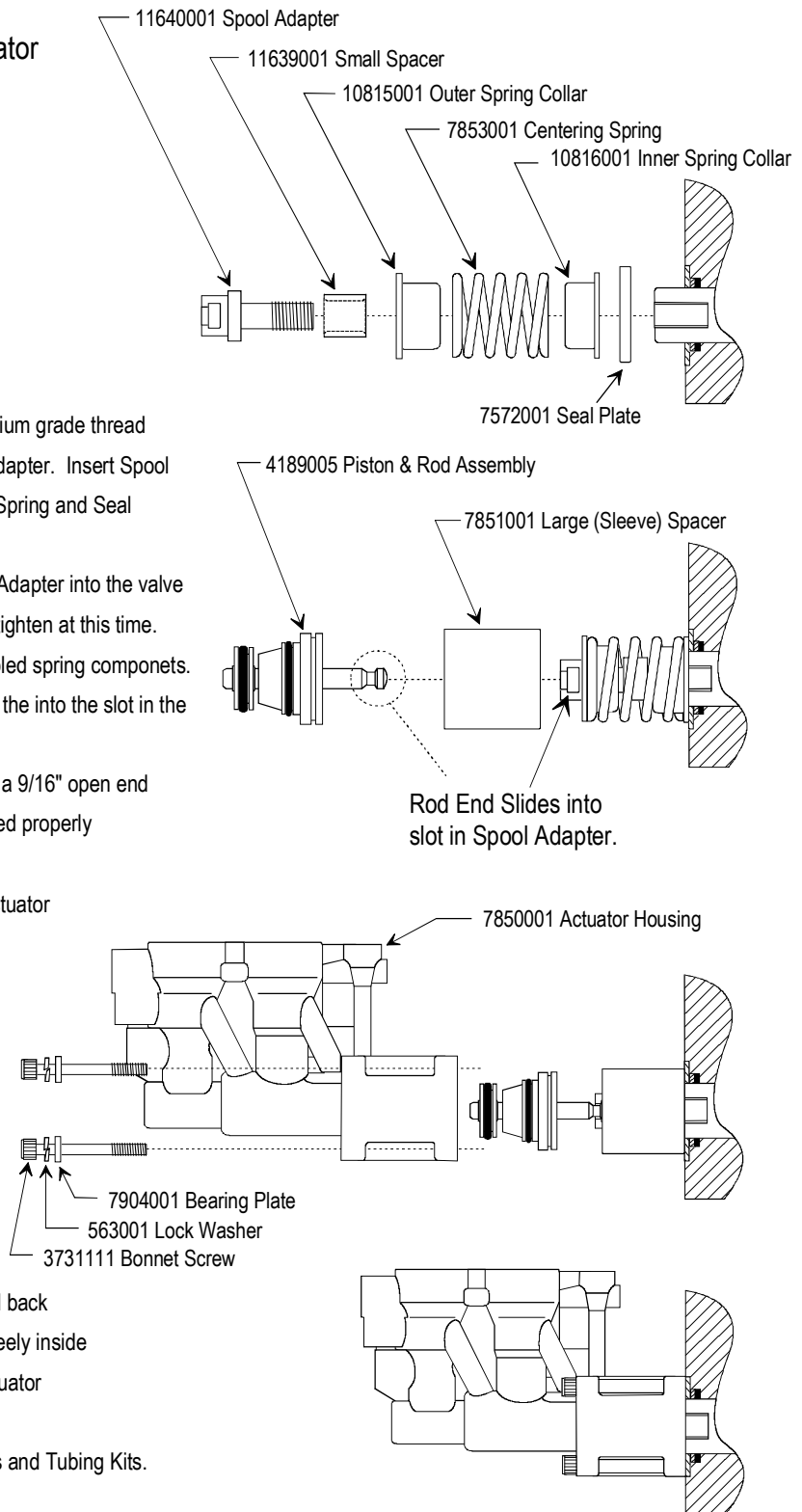


Figure 70. Model V20 SOL-E Solenoid Actuator Installation Procedures

SOL-E Solenoid Cartridges

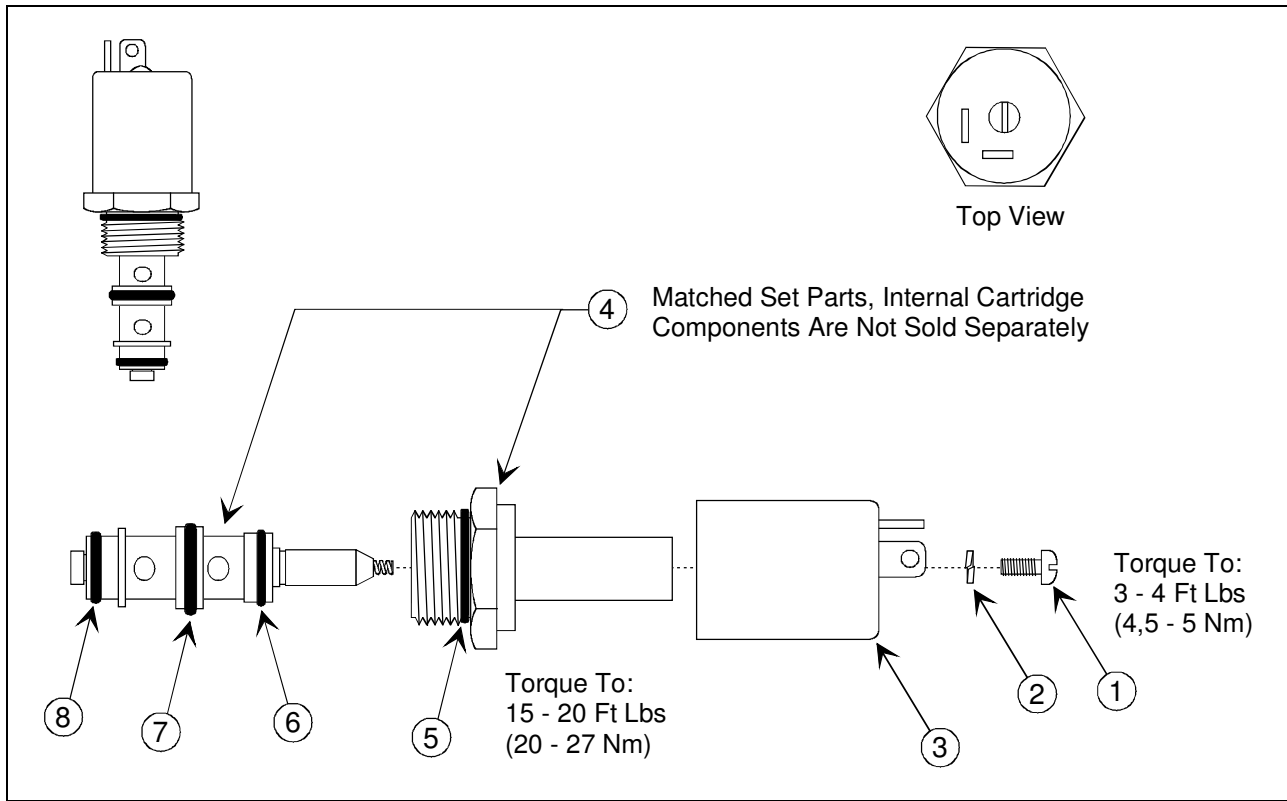


Figure 73. SOL-E Solenoid Cartridges

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 12893001 | CK-6083 12VDC Solenoid Cartridge Kit, Complete ② | |
| | 12895001 | CK-6093 24VDC Solenoid Cartridge Kit, Complete ② | |
| | 11518001 | CK-6169 120VAC Solenoid Cartridge Kit, Complete ② | |
| | 07980001 | K-6077 Cartridge Seal Kit (Contains Items 5 thru 8) ① | |
| | 08607001 | K-6143 Replacement Coil Kit, 12 VDC (Contains Items 1 thru 3 Only) ② | |
| | 08607002 | K-6144 Replacement Coil Kit, 24 VDC (Contains Items 1 thru 3 Only) ② | |
| | 08607003 | K-6241 Replacement Coil Kit, 120 VAC (Contains Items 1 thru 3 Only) ② | |
| 1 | 07836001 | Pan Head Screw, No. 10-24 x .31" | |
| 2 | 07837001 | Lock Washer | |
| 3 | 08512001 | 12 VDC Solenoid Coil with Spade Terminals – Serviced in K-6143 Coil Kit ② | |
| | 08512002 | 12 VDC Solenoid Coil with Flying Leads – Sold as Piece Part Only ② | |
| | 08511001 | 24 VDC Solenoid Coil with Spade Terminals - Serviced in K-6144 Coil Kit ② | |
| | 08511002 | 24 VDC Solenoid Coil with Flying Leads - Sold as Piece Part Only ② | |
| | 11430001 | 120 VAC Solenoid Coil with Spade Terminals - Serviced in K-6241 Coil Kit ② | |
| 4 | 21007001 | Cartridge Tube Assembly – Matched Components –Not Sold Separately ③ | |
| 5 | 02708001 | O-Ring Seal – Serviced in K-6077 Cartridge Tube Seal Kit ① | |
| 6 | 06839001 | O-Ring Seal – Serviced in K-6077 Cartridge Tube Seal Kit ① | |
| 7 | 01910001 | O-Ring Seal – Serviced in K-6077 Cartridge Tube Seal Kit ① | |
| 8 | 07829001 | O-Ring Seal – Serviced in K-6077 Cartridge Tube Seal Kit ① | |

① Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.

② These Cartridges and Replacement Coil Kits are NOT for use in the newer internal piloted solenoid versions.

③ Cartridge Tube Assembly 21007001 includes O-Ring Seals 5 thru 8.

[SOL] and [EPC] Solenoid Actuators

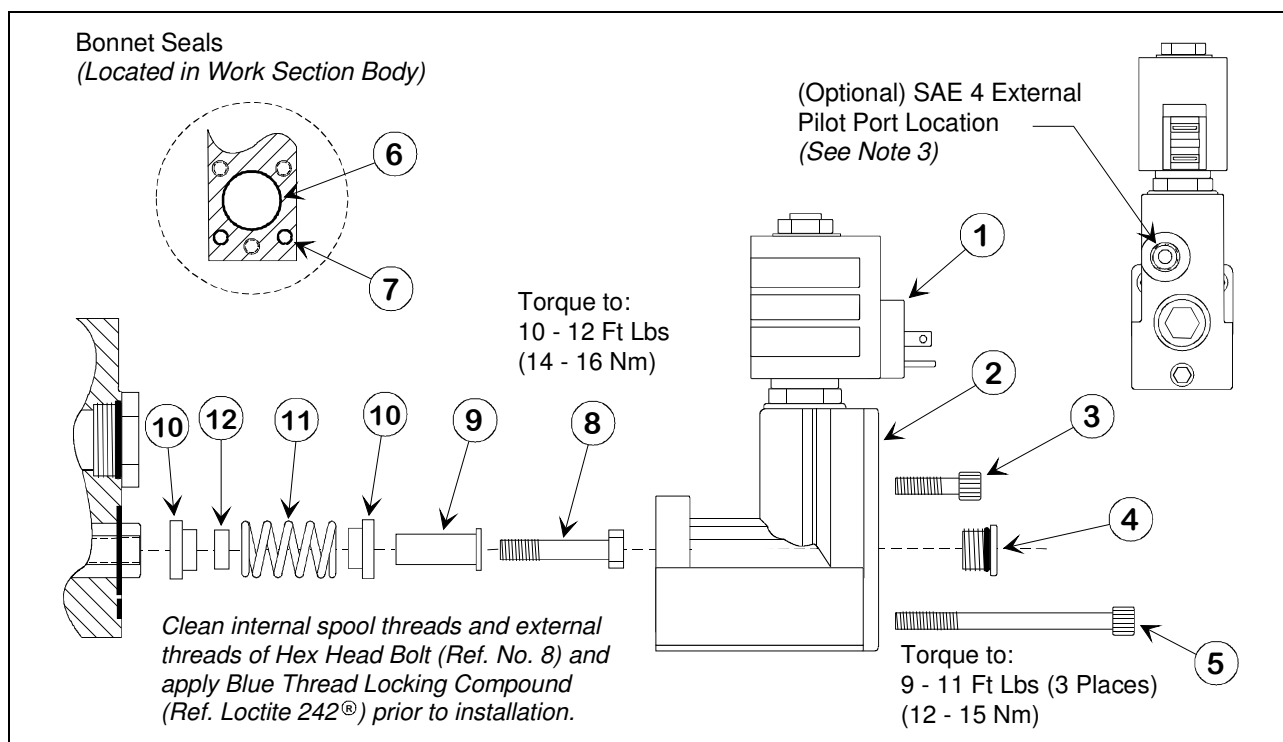


Figure 74. [SOL] and [EPC] Solenoid Actuators

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| 1 | | K-CRT-SXXX [SOL] Solenoid Cartridge Kits (See Page 11 for Options) K-CRT-EXXX [EPC] Solenoid Cartridge Kits (See Page 12 for Options) | 1 |
| | 16081001 | K-6266 Bonnet Seal Kit (Kit Includes Items 6 and 7 Only) ① | |
| 2 | 21472002 | Solenoid Actuator Bonnet | 1 |
| | 21472004 | Solenoid Actuator Bonnet with (Optional) External SAE 4 Pilot Port ③ | 1 |
| 3 | 03731101 | Bonnet Screw (1/4 - 20 X .875) | 2 |
| 4 | 09435106 | SAE 6 Plug (See Figure 12 for Optional Spool Override Kits) | 1 |
| 5 | 03731110 | Bonnet Screw (1/4 - 20 X 3.00) | 1 |
| 6 | 21801001 | O-Ring Seal (Serviced in K-6266 Solenoid Bonnet Seal Kit) ① | 1 |
| 7 | 07773001 | O-Ring Seal (Serviced in K-6266 Solenoid Bonnet Seal Kit) ① | 2 |
| 8 | 09140062 | Hex Head Bolt (5/16 - 18 X 1.75) | 1 |
| 9 | 21451001 | Spool Collar | 1 |
| 10 | 21453001 | Spring Collar | 2 |
| 11 | 06855001 | Centering Spring (Used on the 'A' Port [SOL] Actuators) ② | 1 |
| | 10742001 | Centering Spring (Used on the 'A' Port [EPC] Actuators) ② | 1 |
| | 21558001 | Centering Spring (Used on the 'B' Port of both [SOL] and [EPC] Actuators) | 1 |
| 12 | 21452001 | Spacer (Used in the 'A' Port of both [SOL] and [EPC] Solenoid Actuators) | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.

② To achieve maximum metering performance when converting an On/Off [SOL] Solenoid Actuator to a Proportional [EPC] Solenoid Actuator, replace Spring No. 06855001 with Spring No. 10742001 on the 'A' port end actuators.

③ The Solenoid Actuator Bonnet with external SAE 4 pilot port is used in applications where an external pilot source is available. Since the pilot passages are isolated within the valve when no Utility Section is used, one of the bonnets must be used on both the 'A' and 'B' port end of the valve assembly.

[SOL-IH] and [EPC-IH] Solenoid Actuators (with Handle)

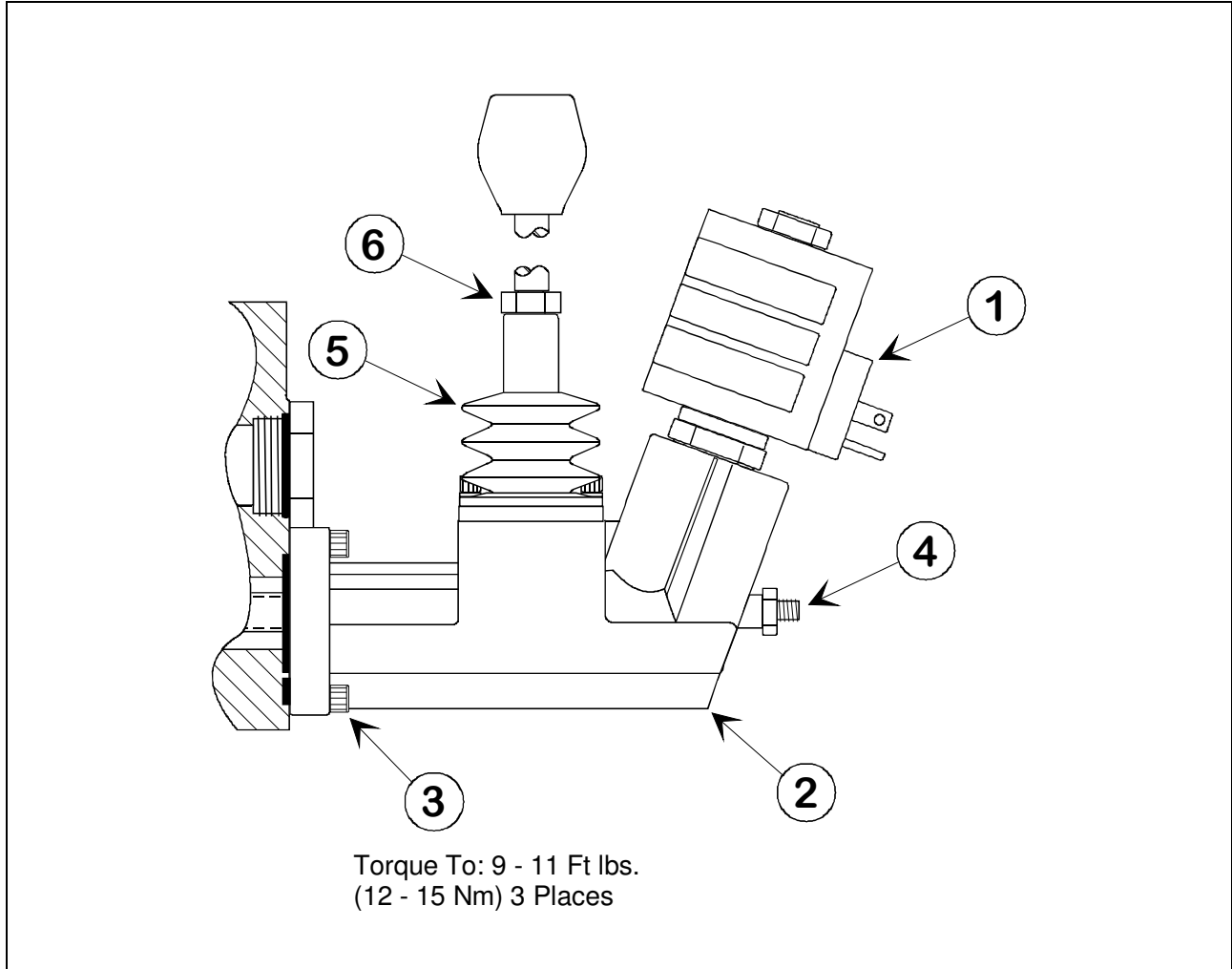


Figure 75. [SOL-IH] and [EPC-IH] Solenoid Actuators (with Handle)

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| 1 | | K-CRT-SXXX [SOL] Solenoid Cartridge Kits (See Page 11 for Options) K-CRT-EXXX [EPC] Solenoid Cartridge Kits (See Page 12 for Options) | 1 |
| 2 | 21560002 | Solenoid Bonnet | 1 |
| 3 | 03731101 | Bonnet Screw (1/4 - 20 X .875) | 3 |
| 4 | 16103003 | K-6276 Spool Travel Limiter Kit - (See Figure 13) | 1 |
| 5 | 04220004 | Handle Actuator Assembly (See Figure 6) | 1 |
| 6 | 04220002 | Handle Rod Assembly (See Figure 6) | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.

[SOL-IH] and [EPC-IH] Handle Assembly

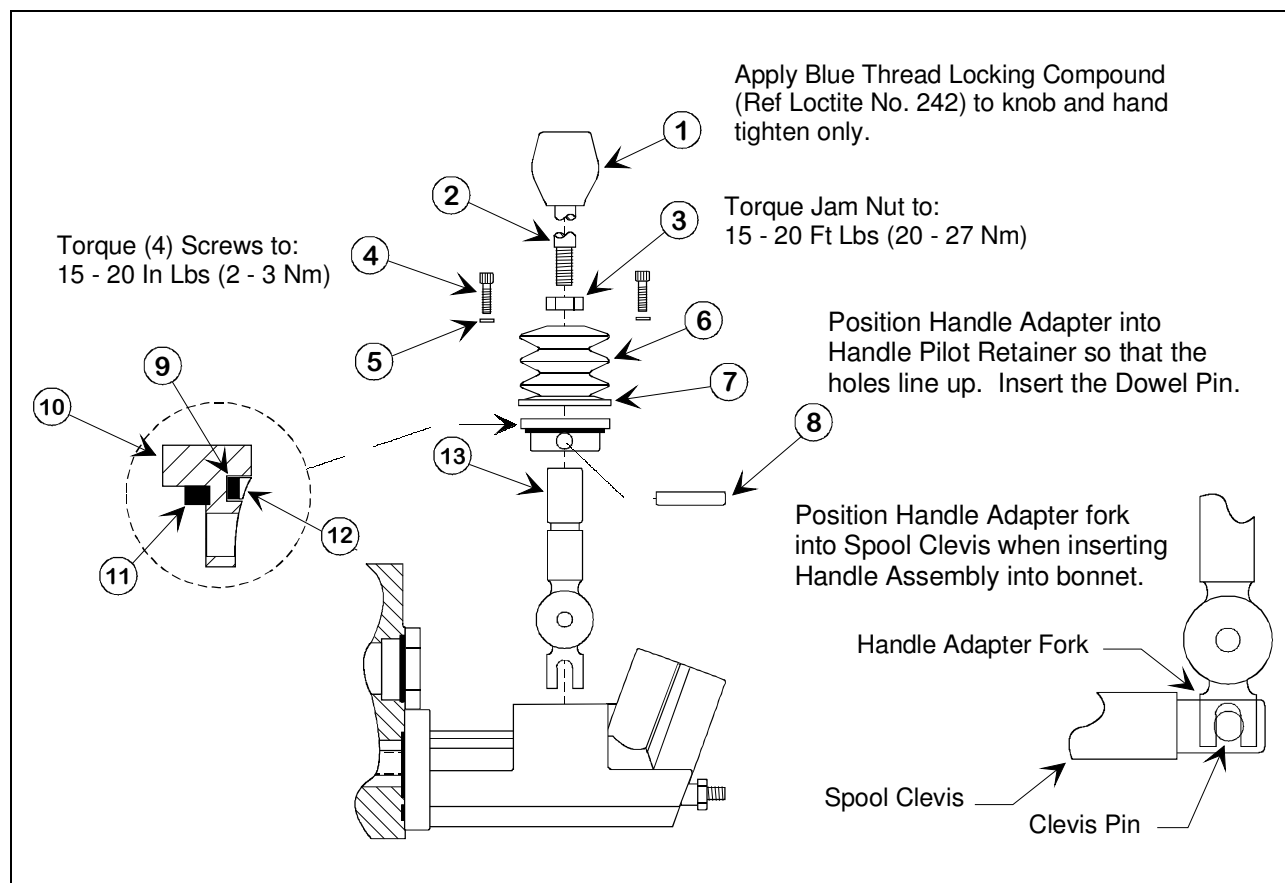


Figure 75. [SOL-IH] and [EPC-IH] Handle Assembly

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 16104001 | K-6277 Actuator Service Kit (Items 6, 7, 9 thru 12, plus K-6266 Seals)① | |
| | 04220002 | Handle Rod Assembly (Assembly Includes Items 1 thru 3 Only) | |
| | 04220004 | Handle Actuator Assembly (Assembly Includes Items 4 thru 13 Only) | |
| 1 | 08815001 | Handle Knob | 1 |
| 2 | 08962002 | Handle Rod | 1 |
| 3 | 09302106 | Jam Nut | 1 |
| 4 | 03731003 | Screw (#8 - 32 X .625) | 4 |
| 5 | 09285002 | Lock Washer | 4 |
| 6 | 07622001 | Protective Boot (Serviced in K-6277 Actuator Service Kit) | 1 |
| 7 | 08587001 | Boot Retainer (Serviced in K-6277 Actuator Service Kit) | 1 |
| 8 | 09350310 | Dowel Pin | 1 |
| 9 | 07028002 | O-Ring Seal (Serviced in K-6277 Actuator Service Kit) | 1 |
| 10 | 08963001 | Handle Pivot Retainer (Serviced in K-6277 Actuator Service Kit) | 1 |
| 11 | 09000027 | O-Ring Seal (Serviced in K-6277 Actuator Service Kit) | 1 |
| 12 | 08959001 | Seal (Serviced in K-6277 Actuator Service Kit) | 1 |
| 13 | 08589001 | Handle Adapter | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.

[SOL-IH] and [EPC-IH] Solenoid Bonnet Assembly

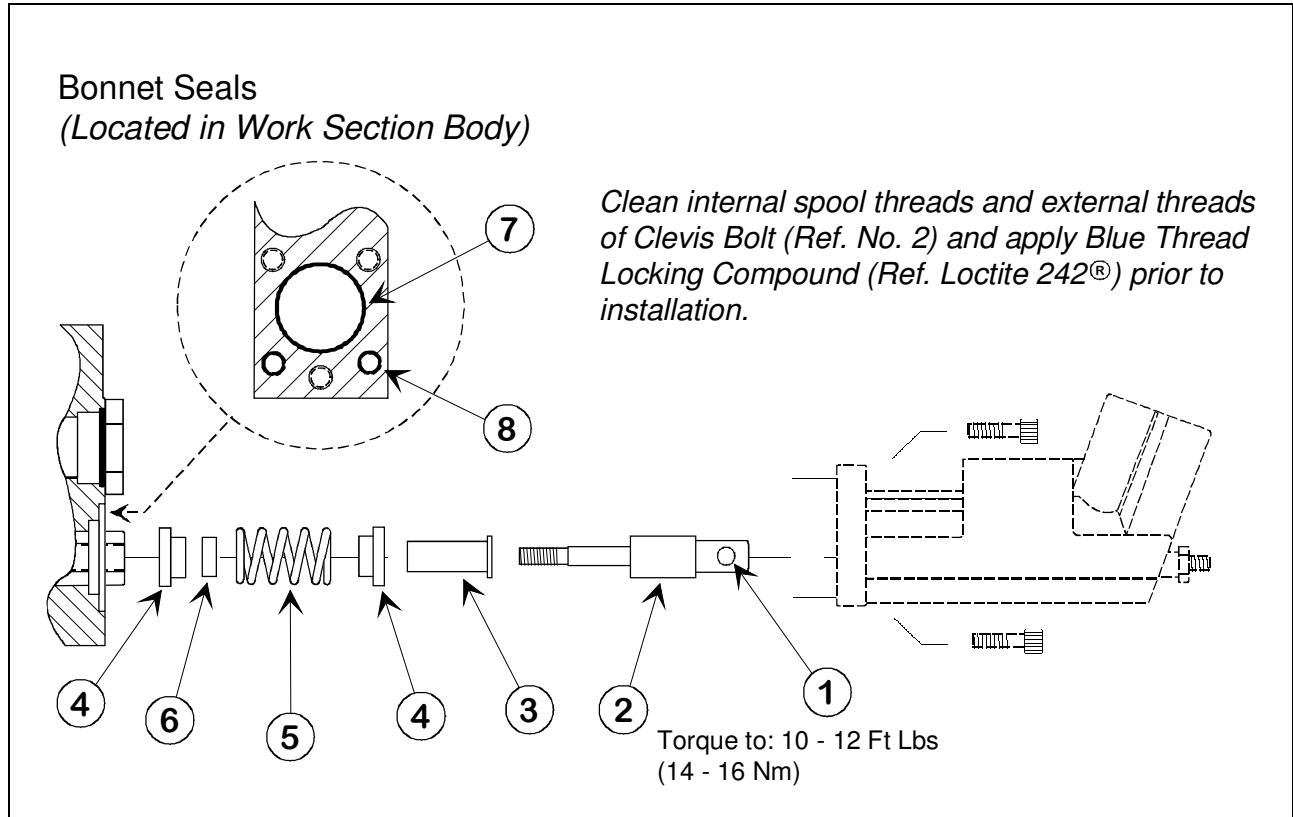


Figure 76. [SOL-IH] and [EPC-IH] Solenoid Bonnet Assembly

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 16081001 | K-6266 Solenoid Bonnet Seal Kit (Includes Items 8 and 9 Only) ① | |
| 1 | 09350405 | Dowel Pin | 1 |
| 2 | 21544001 | (Extended) Spool Clevis | 1 |
| 3 | 21451001 | Spool Collar | 1 |
| 4 | 21453001 | Spring Collar | 2 |
| 5 | 06855001 | Centering Spring (Used in On/Off [SOL-IH] Actuators) | 1 |
| | 10742001 | Centering Spring (Used in Proportional [EPC-IH] Actuators) ② | 1 |
| 6 | 21452001 | Spacer | 1 |
| 7 | 21801001 | O-Ring Seal (Serviced in K-6277 Actuator Service Kit) ① | 1 |
| 8 | 07773001 | O-Ring Seal (Serviced in K-6277 Actuator Service Kit) ① | 2 |

① Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.

② To achieve maximum metering performance when converting an On/Off [SOL-IH] Solenoid Actuator to a Proportional [EPC-IH] Solenoid Actuator, replace Spring No. 06855001 with Spring No. 10742001.

Solenoid Coil Connector Type Identification

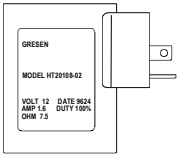
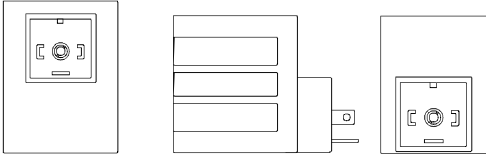
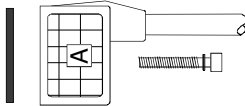
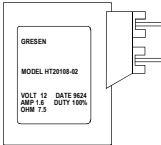
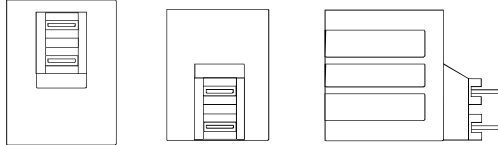
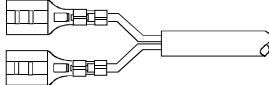
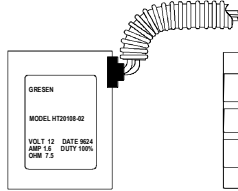
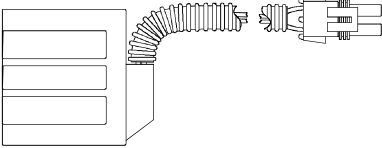
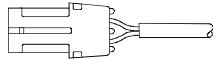
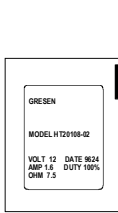
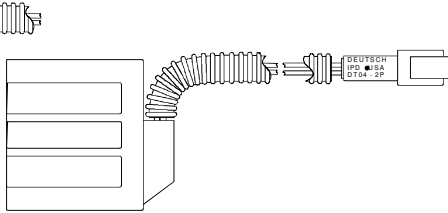
| Coil Connector Type And Order Code Letter | Mating Connector Part No. <i>(Sold Separately)</i> |
|---|---|
| <p style="text-align: center;">Code Letter 'D'</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>[E] Proportional</p> </div> <div style="text-align: center;">  <p>[S] On/Off</p> </div> </div> <p style="text-align: center;">43650 DIN (Hirschmann®)</p> |  <p>24790001 Hirschmann® Connector Assembly</p> |
| <p style="text-align: center;">Code Letter 'S'</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>[E] Proportional</p> </div> <div style="text-align: center;">  <p>[S] On/Off</p> </div> </div> <p style="text-align: center;">1/4" Male Spade Terminals</p> |  <p>24473002 Female Spade Terminal (2 Req.)</p> |
| <p style="text-align: center;">Code Letter 'W'</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>[E] Proportional</p> </div> <div style="text-align: center;">  <p>[S] On/Off</p> </div> </div> <p style="text-align: center;">Weather Pack®</p> |  <p>22247001 Weather Pack® Connector Assembly</p> |
| <p style="text-align: center;">Code Letter 'H'</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>[E] Proportional</p> </div> <div style="text-align: center;">  <p>[S] On/Off</p> </div> </div> <p style="text-align: center;">Deutsch® DT04 - 2P</p> | <p>Deutsch® DT06 - 2S <i>(Not Supplied by Gresen)</i></p> |

Figure 77. Solenoid Coil Connectors

On/Off [SOL] Solenoid Cartridge and Replacement Coil Kits

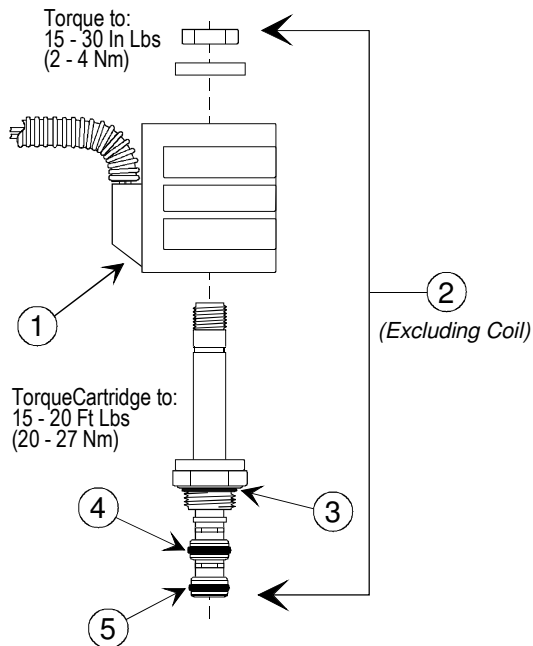


Figure 78. On/Off [SOL] Solenoid Cartridge

Installation Instructions for [SOL] Cartridges

- Step 1. Cartridge cavities **MUST** be clean prior to installing the Solenoid Cartridge. Flush cavity if necessary.
- Step 2. Install O-Rings (No's. 3, 4, and 5) on Solenoid Tube Assembly (Ref No. 2).
- Step 3. Remove the Coil from the Solenoid Tube Assembly (No. 1). Lightly oil and screw the Solenoid Tube Assembly into the cavity. Torque to 15 - 20 Ft Lbs (20 - 27 Nm).
- Step 4. Slide Solenoid Coil into place on the Solenoid Cartridge Tube and Torque to Coil Nut to 15 - 30 In Lbs (2 - 4 Nm).

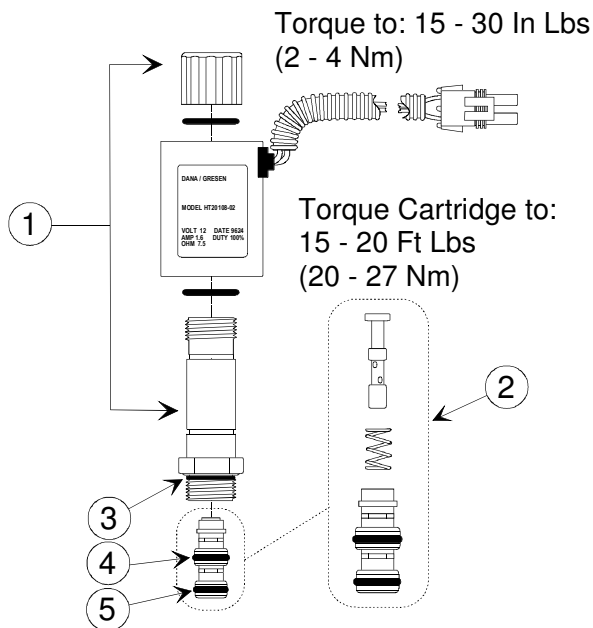
| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 16044007 | K-6263 Cartridge Tube Kit (Includes Ref No's. 2 thru 5 Only - Coil NOT included) ①② | |
| | 16059001 | K-6265 Cartridge Seal Kit (Includes Ref No's. 3 thru 5 Only) ① | |
| 1 | | Complete Solenoid Cartridge Kit or Replacement Coil Kit – Refer to the Table Below ③ | 1 |
| 2 | 24097001 | Solenoid Cartridge Tube (Serviced in K-6263 Cartridge Tube Kit) | 1 |
| 3 | 02706001 | O-Ring Seal (Serviced in K-6265 Cartridge Seal Kit) | 1 |
| 4 | 01091001 | O-Ring Seal (Serviced in K-6265 Cartridge Seal Kit) | 1 |
| 5 | 07828001 | O-Ring Seal (Serviced in K-6265 Cartridge Seal Kit) | 1 |

- ① Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.
- ② **K-6263** Cartridge Tube Kit includes the Cartridge Tube, Washer, Coil Nut and O-Ring Seals. These parts not sold separately.
- ③ All Coil Kits and Cartridge Kits include the connector type indicated. Refer to **Figure 77** for coil connector identification.

On/Off [SOL] Complete Solenoid Cartridge Kits and Replacement Coil Kits

| Complete K-CRT-S Cartridge Kits | Cartridge Kit Part Number | Replacement Coil Kit | Coil Kit Part Number | Coil Voltage [12] [24] | Flying Leads [F] | 43650 DIN [D] | ¼" Male Spade [S] | Weather Pack® [W] | Deutsch® DT04-2P [H] |
|---------------------------------|---------------------------|----------------------|----------------------|------------------------|------------------|---------------|-------------------|-------------------|----------------------|
| K-CRT-S12F | 21246001 | K-6260 | 16044004 | 12 | • | | | | |
| K-CRT-S24F | 21246002 | K-6261 | 16044005 | 24 | • | | | | |
| K-CRT-S12D | 23535001 | K-6230 | 16089001 | 12 | | • | | | |
| K-CRT-S24D | 23535002 | K-6231 | 16089002 | 24 | | • | | | |
| K-CRT-S12W | 22969001 | K-6278 | 16108001 | 12 | | | • | | |
| K-CRT-S24W | 22969002 | K-6279 | 16108002 | 24 | | | • | | |
| K-CRT-S12S | 24102001 | K-6280 | 16108003 | 12 | | | | • | |
| K-CRT-S24S | 24102002 | K-6264 | 16050001 | 24 | | | | • | |
| K-CRT-S12H | 25479001 | K-6292 | 16044008 | 12 | | | | | • |
| K-CRT-S24H | 25479002 | K-6293 | 16044009 | 24 | | | | | • |

Proportional [EPC] Solenoid Cartridge and Replacement Coil Kits



Installation Instructions for [EPC] Cartridges

- Step 1.** Cartridge cavities **MUST** be clean prior to installing the Solenoid Cartridge. Flush Cavity if necessary.
- Step 2.** Install O-Rings (No's. 4 and 5) on Sleeve (No. 2). Carefully insert Spring and Spool into Sleeve as shown. Verify that the spool moves freely inside the sleeve. If not, remove and inspect spool and sleeve for burrs or contamination. Once problem is located, fix and return the spool and spring to the sleeve and repeat.
- Step 3.** Lightly oil Sleeve Assembly (No. 2) and insert into cavity. Carefully push into place.
- Step 4.** Remove the Solenoid Coil from the Solenoid Tube (Ref No. 1). Install O-Ring (No. 3) on the Solenoid Tube and screw into the bonnet cavity. Torque the Solenoid Tube to 15 - 20 Ft Lbs (20 - 27 Nm).
- Step 5.** Slide Solenoid Coil and Bumper Seals into place on Solenoid Tube and Torque to Coil Nut to 15 - 30 In Lbs (2 - 4 Nm).

Figure 79. Proportional [EPC] Solenoid Cartridge

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 16044007 | CK-6198 PRV Cartridge Kit (Includes Ref No's. 2 thru 5 Only - Coil NOT included) ①② | |
| | 16059001 | K-6265 Cartridge Seal Kit (Includes Ref No's. 3 thru 5 Only) ① | |
| 1 | | Complete Solenoid Cartridge Kit or Replacement Coil Kit – Refer to the Table Below ③ | 1 |
| 2 | 21226000 | PRV Cartridge (Serviced in CK-6198 PRV Cartridge Kit – Parts Not Sold Separately) | 1 |
| 3 | 02706001 | O-Ring Seal (Serviced in K-6265 Cartridge Seal Kit) | 1 |
| 4 | 01091001 | O-Ring Seal (Serviced in K-6265 Cartridge Seal Kit) | 1 |
| 5 | 07828001 | O-Ring Seal (Serviced in K-6265 Cartridge Seal Kit) | 1 |

- ① Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.
 ② **CK-6198** PRV Valve Kit includes the Insert Sleeve, Spool, Spring, and O-Ring Seals. These parts are not sold separately.
 ③ All Coil Kits and Cartridge Kits include the connector type indicated. Refer to **Figure 77** for coil connector identification.

Proportional [EPC] Solenoid Cartridge and Coil Kits

| Complete K-CRT-E Cartridge Kits | Cartridge Kit Part Number | Replacement Coil Kit | Coil Kit Part Number | Coil Voltage [12] [24] | Flying Leads [F] | 43650 DIN [D] | ¼" Male Spade [S] | Weather Pack® [W] | Deutsch® DT04-2P [H] |
|---------------------------------|---------------------------|----------------------|----------------------|------------------------|------------------|---------------|-------------------|-------------------|----------------------|
| K-CRT-E12F | 21226001 | K-6270 | 16096001 | 12 | • | | | | |
| K-CRT-E24F | 21226002 | K-6271 | 16096002 | 24 | • | | | | |
| K-CRT-E12D | 21226006 | K-6232 | 16091001 | 12 | | • | | | |
| K-CRT-E24D | 21226007 | K-6233 | 16091002 | 24 | | • | | | |
| K-CRT-E12S | 21226004 | K-6283 | 16109001 | 12 | | | • | | |
| K-CRT-E24S | 21226005 | K-6284 | 16109002 | 24 | | | • | | |
| K-CRT-E12W | 21226008 | K-6252 | 16011003 | 12 | | | | • | |
| K-CRT-E24W | 21226009 | K-6253 | 16011004 | 24 | | | | • | |
| K-CRT-E12H | 21226015 | K-6294 | 16108008 | 12 | | | | | • |
| K-CRT-E24H | 21226016 | K-6295 | 16108009 | 24 | | | | | • |

Bonnet Conversion for 2-Way, 2-Position Operation

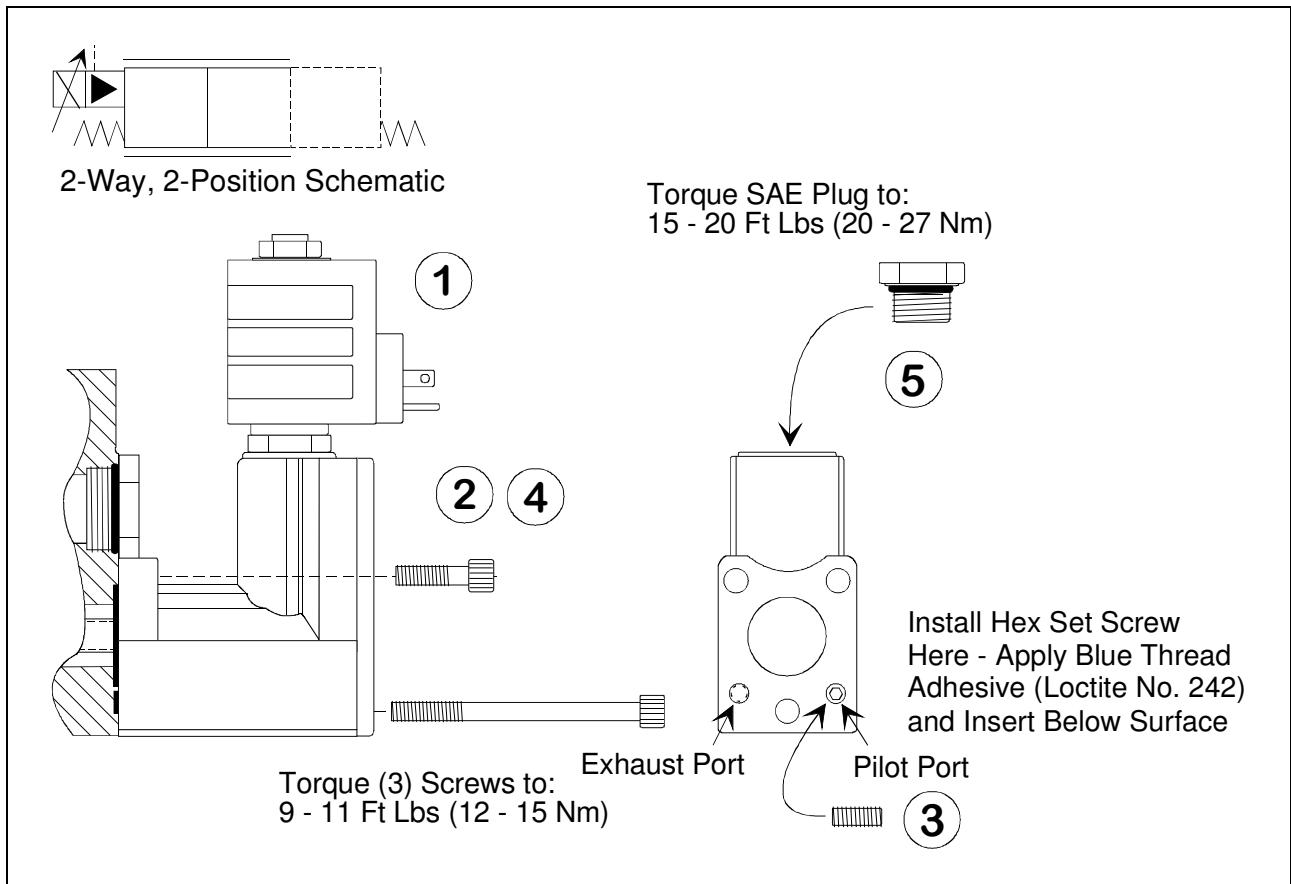


Figure 80. Solenoid Bonnet Conversion

Solenoid Bonnet Conversion Procedures

1. Remove the solenoid and cartridge insert ① from the solenoid bonnet.
2. Remove the solenoid bonnet ② from the work section. Flush and dry.
3. Apply Blue thread adhesive (Ref. Loctite No. 242) and install hex set screw ③ into the pilot port in the solenoid bonnet as shown in the above illustration.
4. Re-attach the solenoid bonnet ④ to the work section.
5. Install an SAE 8 Plug ⑤ into the solenoid cartridge cavity.

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| 1 | 21473002 | 2-Way Bonnet Assembly (Item No. 2 with installed Item No. 3) | |
| 1 | | K-CRT-XXXX Solenoid Cartridge | 1 |
| 2 | 21472002 | Solenoid Bonnet | 1 |
| 3 | 09276408 | Hex Set Screw (1/4 - 20 X .500) ① | 1 |
| 4 | 06879001 | SAE 8 Plug (with O-Ring Seal) | 1 |

① The Hex Set Screw **MUST** be installed in the pilot port (not the exhaust port), and inserted below the surface, for proper operation. Refer to the above illustration for pilot port identification.

Solenoid Bonnet Spool Travel Limiter/Override Kits

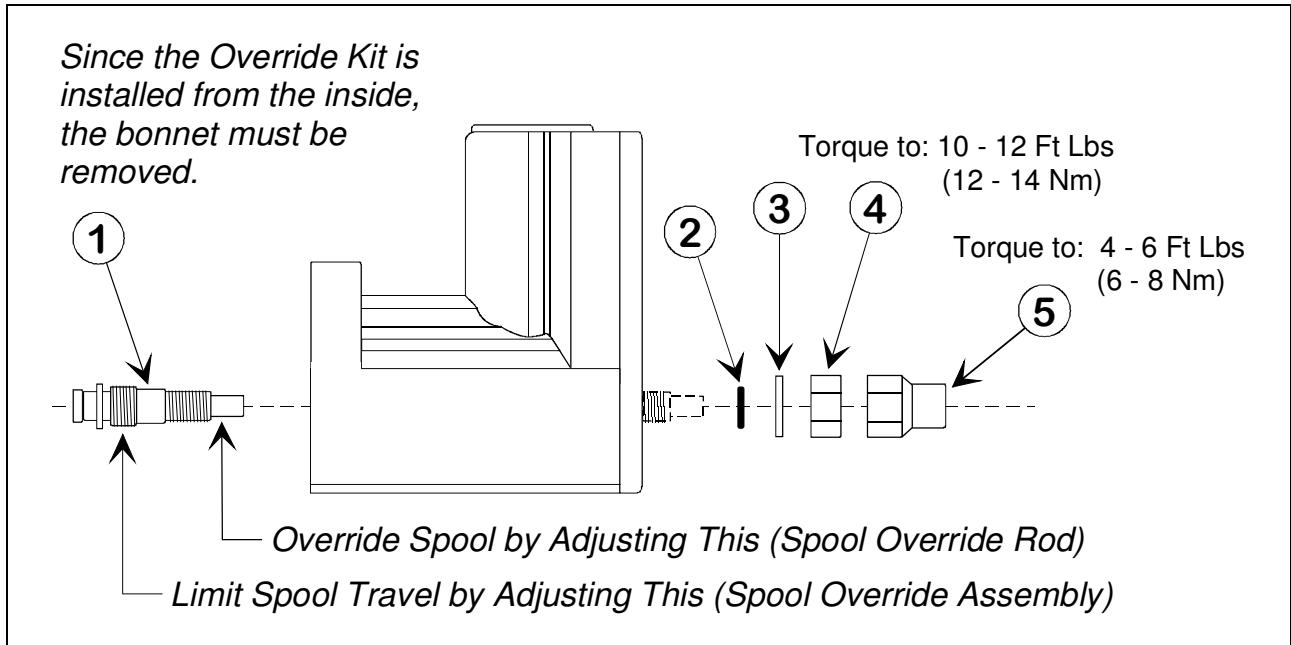


Figure 81. Solenoid Bonnet Spool Travel Limiter and Spool Overrides

Travel Limiter Adjustment Procedures

1. Remove the cap nut ⑤.
2. Make sure that the spool override rod (shown above) is out as far as it goes.
3. Loosen lock nut ④.
4. Using a flat wrench, turn the spool override assembly ① in or out as necessary to limit spool travel.
5. Once spool travel limiter is set, torque lock nut ④ to 10 - 12 Ft Lbs (12 - 14 Nm).
6. Install cap nut ⑤ and torque to 4 - 6 Ft Lbs (6 - 8 Nm).

Using the Spool Override Function

1. Remove the cap nut ⑤. It is NOT necessary to loosen the lock nut ④.
2. Screw Type Overrides - Turn the spool override rod clockwise to force the valve spool from the neutral position.
Push Pin Overrides - Push the spool override rod in to force the valve spool from the neutral position.
3. When the override function is complete, return the spool override rod to the full out position, install cap nut ⑤ and torque to 4 - 6 Ft Lbs (6 - 8 Nm).

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 16103001 | K-6274 Screw Type Travel Limiter/Override Kit (Kit Includes all Items Listed Below) | |
| | 16103002 | K-6275 Push Pin Type Travel Limiter/Override Kit (Kit Includes all Items Listed Below) | |
| 1 | 04295001 | Override Assembly (Used in K-6274 Screw Type Override Only) | 1 |
| | 04295003 | Override Assembly (Used in K-6275 Push Pin Type Override Only) | 1 |
| 2 | 02705001 | O-Ring Seal ① | 1 |
| 3 | 21361001 | Back-Up Washer | 1 |
| 4 | 21359001 | Lock Nut | 1 |
| 5 | 21523001 | Cap Nut | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.

Solenoid Bonnet (with Handle) Spool Travel Limiter Kit

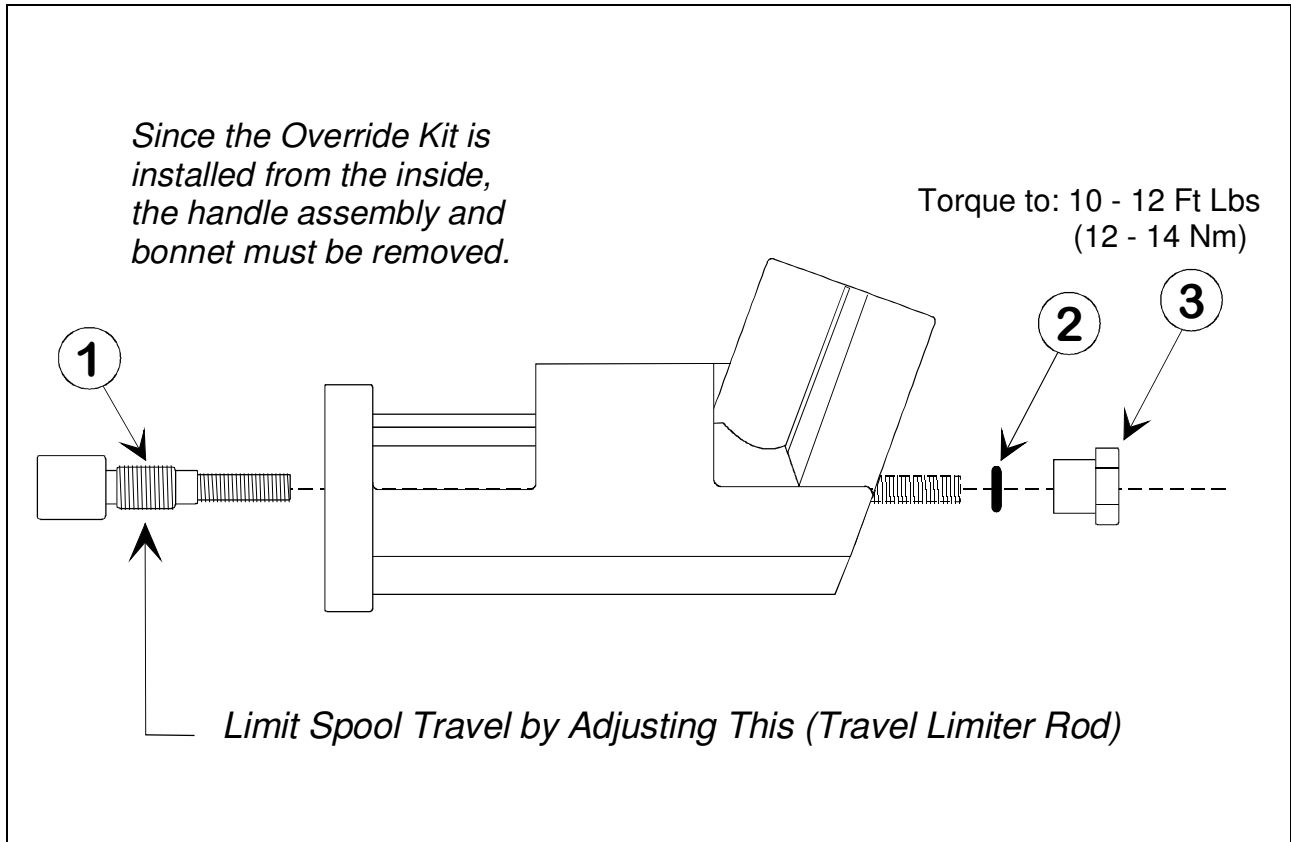


Figure 82. Solenoid Bonnet (with Handle) Spool Travel Limiter

Spool Travel Limiter Adjustment Procedures

1. Loosen lock nut (No. 3).
2. Using a flat wrench, turn the travel limiter rod (No. 1) in or out as necessary to limit spool travel.
3. Once travel limiter is set, torque lock nut (No. 3) to 10 - 12 Ft Lbs (12 - 14 Nm).

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 16103003 | K-6276 Screw Type Travel Limiter Kit (Kit Includes all Items Listed Below) | |
| 1 | 21628001 | Travel Limiter Rod | 1 |
| 2 | 03119001 | O-Ring Seal ① | 1 |
| 3 | 21627001 | Lock Nut | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.

K-6030 and K-6203 Load Check Plug Kits

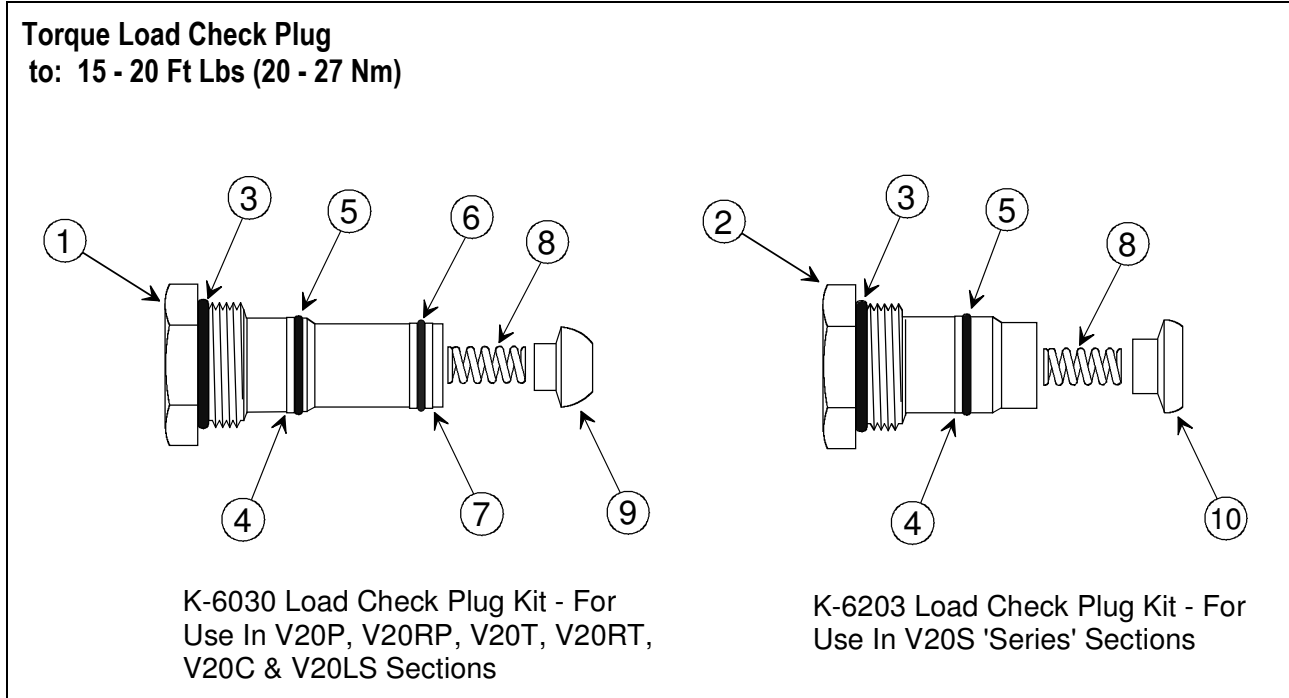


Figure 83. K-6030 and K-6203 Load Check Plug Kits

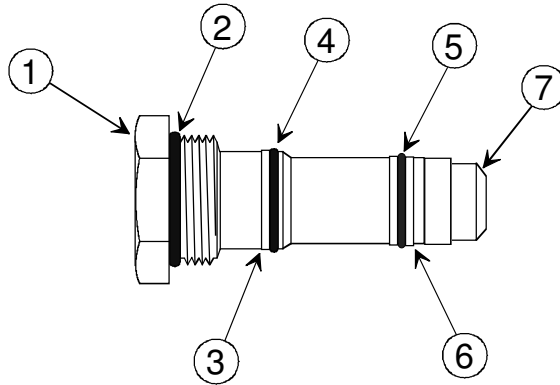
| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 12742001 | K-6030 Load Check Plug Kit For All Non-V20S Sections (Contains all Items Listed Here) | |
| | 12953001 | K-6203 Load Check Plug Kit For All V20S Sections (Contains all Items Listed Here) | |
| | 07382001 | K-6032 Plug Seal Kit For K-6030 Load Check Plugs (Contains Items 3 thru 7 Only) ① | |
| | 11497001 | K-6204 Plug Seal Kit For K-6203 Load Check Plugs (Contains Items 3 thru 5 Only) ① | |
| 1 | 03411001 | Load Check Plug (Serviced in K-6030 Load Check Plug Kit) | 1 |
| 2 | 11241001 | Load Check Plug – V20S (Serviced in K-6203 Load Check Plug Kit) | 1 |
| 3 | 02707001 | O-Ring Seal (Serviced in both K-6032 and K-6203 Plug Seal Kits) ① | 1 |
| 4 | 01821001 | Back-Up Ring (Serviced in both K-6032 and K-6203 Plug Seal Kits) ② | 1 |
| 5 | 01819001 | O-Ring Seal (Serviced in both K-6032 and K-6203 Plug Seal Kits) ① | 1 |
| 6 | 01818001 | O-Ring Seal (Serviced in K-6032 and Plug Seal Kit Only) ① | 1 |
| 7 | 01820001 | Back-Up Ring (Serviced in K-6032 and Plug Seal Kit Only) ② | 2 |
| 8 | 01868001 | Spring (Serviced in K-6030 and K-6203 Load Check Plug Kits) | 1 |
| 9 | 02781001 | Check Poppet (Serviced in K-6030 Load Check Plug Kit) | 1 |
| 10 | 07791001 | Check Poppet – V20S (Serviced in K-6203 Load Check Plug Kit) | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

② Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

3-Way Conversion Check Plug

Torque Load Check Plug
to: 15 - 20 Ft Lbs (20 - 27 Nm)



06140006 Three-Way Conversion Plug Assy
For Use In The Non-Active Work Port Of
V20P, V20RP, V20T, V20RT 3-Way Sections

Figure 84. 3-Way Conversion Check Plug

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 06140006 | 3-Way Conversion Plug Assy (Contains all Items Listed Here) ① ③ | |
| | 07382001 | K-6032 Plug Seal Kit For K-6030 Load Check Plugs (Contains Items 2 thru 6 Only) ① | |
| 1 | 03411001 | Load Check Plug (Serviced in 06140006 Conversion 3-Way Check Plug Assy) | 1 |
| 2 | 02707001 | O-Ring Seal (Serviced in K-6032 Plug Seal Kits) ① | 2 |
| 3 | 01821001 | Back-Up Ring (Serviced in both K-6032 Plug Seal Kit) ② | 1 |
| 4 | 01819001 | O-Ring Seal (Serviced in both K-6032 Plug Seal Kit) ① | 1 |
| 5 | 01818001 | O-Ring Seal (Serviced in K-6032 Plug Seal Kit) ① | 1 |
| 6 | 01820001 | Back-Up Ring (Serviced in K-6032 Plug Seal Kit) ② | 1 |
| 7 | 06754001 | 3-Way Conversion Plug (Included in 06140006 Conversion Plug Assy) | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

② Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

K-6215 Compensator Plug Kit

**Torque Compensator Plug
to: 15 - 20 Ft Lbs (20 - 27 Nm)**

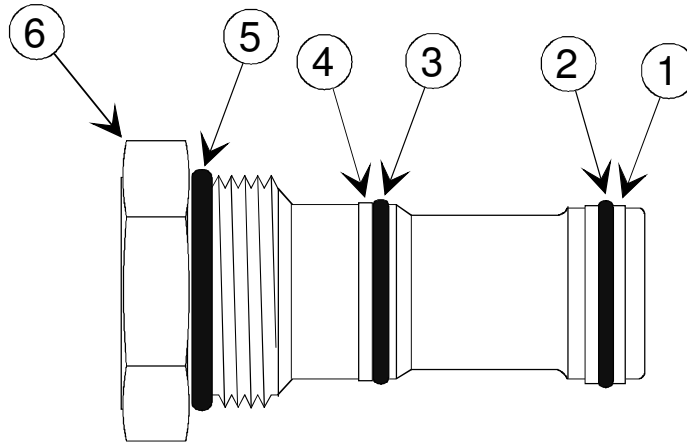


Figure 85. K-6215 Compensator Plug Kit – For Use In V20PC Work Sections

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 16092001 | K-6215 Compensator Plug Kit (Contains all Items Listed Here) | |
| | 16095001 | K-6216 Compensator Plug Seal Kit (Contains Items 1 thru 5 Only) ① | |
| 1 | 02707001 | O-Ring Seal (Serviced in K-6216 Plug Seal Kit) ① | 1 |
| 2 | 09023017 | Back-Up Ring (Serviced in K-6216 Plug Seal Kit) ② | 1 |
| 3 | 01721001 | O-Ring Seal (Serviced in K-6216 Plug Seal Kit) ① | 1 |
| 4 | 01821001 | Back-Up Ring (Serviced in K-6216 Plug Seal Kit) ② | 2 |
| 5 | 01819001 | O-Ring Seal (Serviced in K-6216 Plug Seal Kit) ① | 1 |
| 6 | 20971002 | Compensator Plug (Serviced in K-6215 Compensator Plug Kit) | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

② Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

Model 'RC' Work Port Relief Cartridges

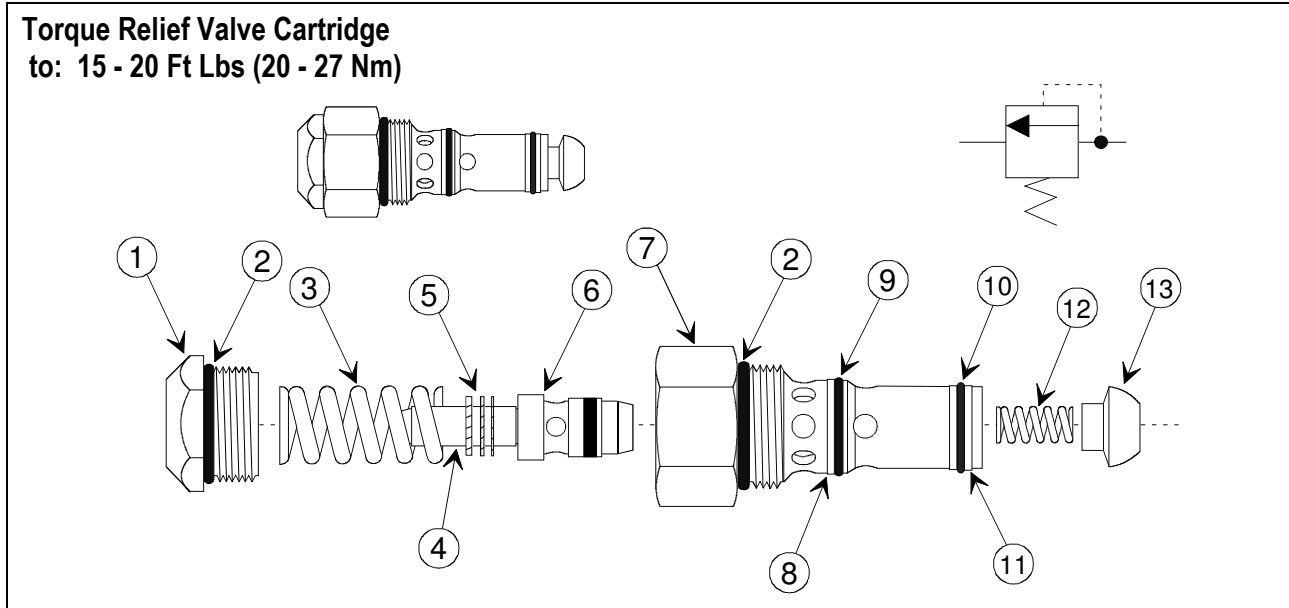


Figure 86. Model 'RC' Work Port Relief Cartridges

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 03838xxx | RC Relief Cartridge - With Check (Specify Pressure Setting When Ordering) ② | |
| | 06419001 | K-6005 Relief Seal Kit (Contains Items 2 thru 6 Only) ① | |
| | 12727001 | K-19002 Relief Poppet Service Kit (Contains Item 5 - Poppet and Seal Assembly) | |
| 1 | 01880001 | Relief Cap | 1 |
| 2 | 02707001 | O-Ring Seal (Serviced in K-6005 Relief Seal Kit) ① | 2 |
| 3 | 20949001 | Spring (200 - 499 PSI [13 - 33 bar] Pressure Range) ② | 1 |
| | 01869001 | Spring (500 - 1249 PSI [34 - 86 bar] Pressure Range) ② | 1 |
| | 07638001 | Spring (1250 - 1749 PSI [87 - 121 bar] Pressure Range) ② | 1 |
| | 07078001 | Spring (1750 - 1999 PSI [122 - 138 bar] Pressure Range) ② | 1 |
| | 01870001 | Spring (2000 - 2599 PSI [139 - 179 bar] Pressure Range) ② | 1 |
| | 07497001 | Spring (2600 - 2999 PSI [180 - 207 bar] Pressure Range) ② | 1 |
| | 11912001 | Spring (3000 - 3500 PSI [208 - 242 bar] Pressure Range) ② | 1 |
| 4 | 07874001 | Dampening Sleeve | 1 |
| 5 | 00458001 | Shim (.040 inch [1,0 mm] thick) ② | A/R |
| | 00459001 | Shim (.020 inch [0,5 mm] thick) ② | A/R |
| | 00462001 | Shim (.010 inch [0,25 mm] thick) ② | A/R |
| 6 | 03936001 | Poppet Assembly (Not Serviceable) | 1 |
| 7 | 01884001 | RC Relief Body | 1 |
| 8 | 01821001 | Back-Up Ring (Serviced in K-6005 Relief Seal Kit) ③ | 1 |
| 9 | 01819001 | O-Ring Seal (Serviced in K-6005 Relief Seal Kit) ① | 1 |
| 10 | 01818001 | O-Ring Seal (Serviced in K-6005 Relief Seal Kit) ① | 1 |
| 11 | 01820001 | Back-Up Ring (Serviced in K-6005 Relief Seal Kit) ③ | 2 |
| 12 | 01868001 | Check Spring (Omit This Part In Free Flow Sections) | 1 |
| 13 | 02781001 | Check Poppet (Omit This Part In Free Flow Sections) | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

② Do not attempt to adjust/shim these reliefs unless you have the capability to test the reliefs for proper pressure setting. Without the capability to test you may exceed the maximum pressure rating of the product or draw the relief spring solid, which in turn means there is no relief (NR).

③ Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

Model 'RCS' Work Port Relief Cartridge

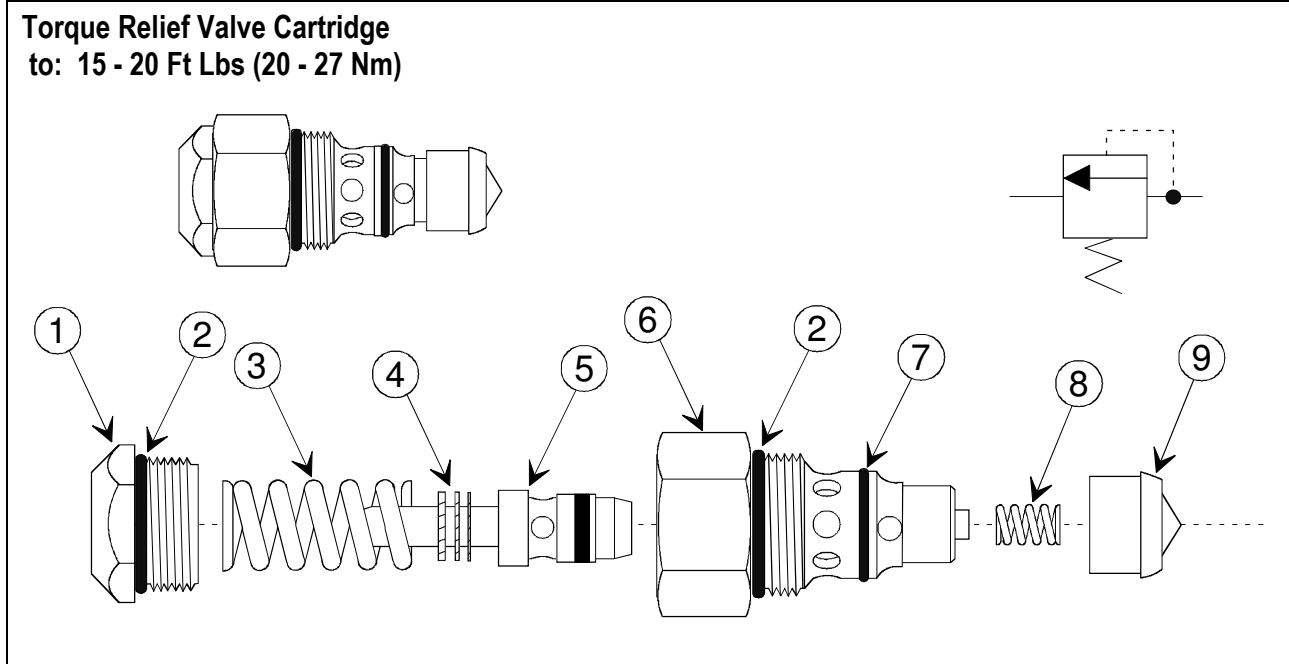


Figure 87. Model 'RCS' Work Port Relief Cartridge For V20S 'Series' Work Sections

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 11472xxx | Model RCS Relief Cartridge - With Check (Specify Pressure When Ordering) ② | |
| | 11498001 | K-6206 Relief Seal Kit (Contains Items 2 and 7 Only) ① | |
| | 12727001 | K-19002 Relief Poppet Service Kit (Contains Item 5 - Poppet and Seal Assembly) | |
| 1 | 01880001 | Relief Cap | 1 |
| 2 | 02707001 | O-Ring Seal (Serviced in K-6206 Relief Seal Kit) ① | 2 |
| 3 | 20949001 | Spring (200 - 499 PSI [13 - 33 bar] Pressure Range) ② | 1 |
| | 01869001 | Spring (500 - 1249 PSI [34 - 86 bar] Pressure Range) ② | 1 |
| | 07638001 | Spring (1250 - 1749 PSI [87 - 121 bar] Pressure Range) ② | 1 |
| | 07078001 | Spring (1750 - 1999 PSI [122 - 138 bar] Pressure Range) ② | 1 |
| | 01870001 | Spring (2000 - 2599 PSI [139 - 179 bar] Pressure Range) ② | 1 |
| | 07497001 | Spring (2600 - 2999 PSI [180 - 207 bar] Pressure Range) ② | 1 |
| | 11912001 | Spring (3000 - 3500 PSI [208 - 242 bar] Pressure Range) ② | 1 |
| 4 | 00458001 | Shim (.040 inch [1,0 mm] thick) ② | A/R |
| | 00459001 | Shim (.020 inch [0,5 mm] thick) ② | A/R |
| | 00462001 | Shim (.010 inch [0,25 mm] thick) ② | A/R |
| 5 | 03936001 | Poppet Assembly (Not Serviceable) | 1 |
| 6 | 11471001 | RCS Relief Body | 1 |
| 7 | 01819001 | O-Ring Seal (Serviced in K-6206 Relief Seal Kit) ① | 1 |
| 8 | 11470001 | Check Spring (Omit This Part In Free Flow Sections) | 1 |
| 9 | 11469001 | Check Poppet (Omit This Part In Free Flow Sections) | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

② Do not attempt to adjust/shim these reliefs unless you have the capability to test the reliefs for proper pressure setting. Without the capability to test you may exceed the maximum pressure rating of the product or draw the relief spring solid, which in turn means there is no relief (NR).

Anti-Cavitation Check Cartridges

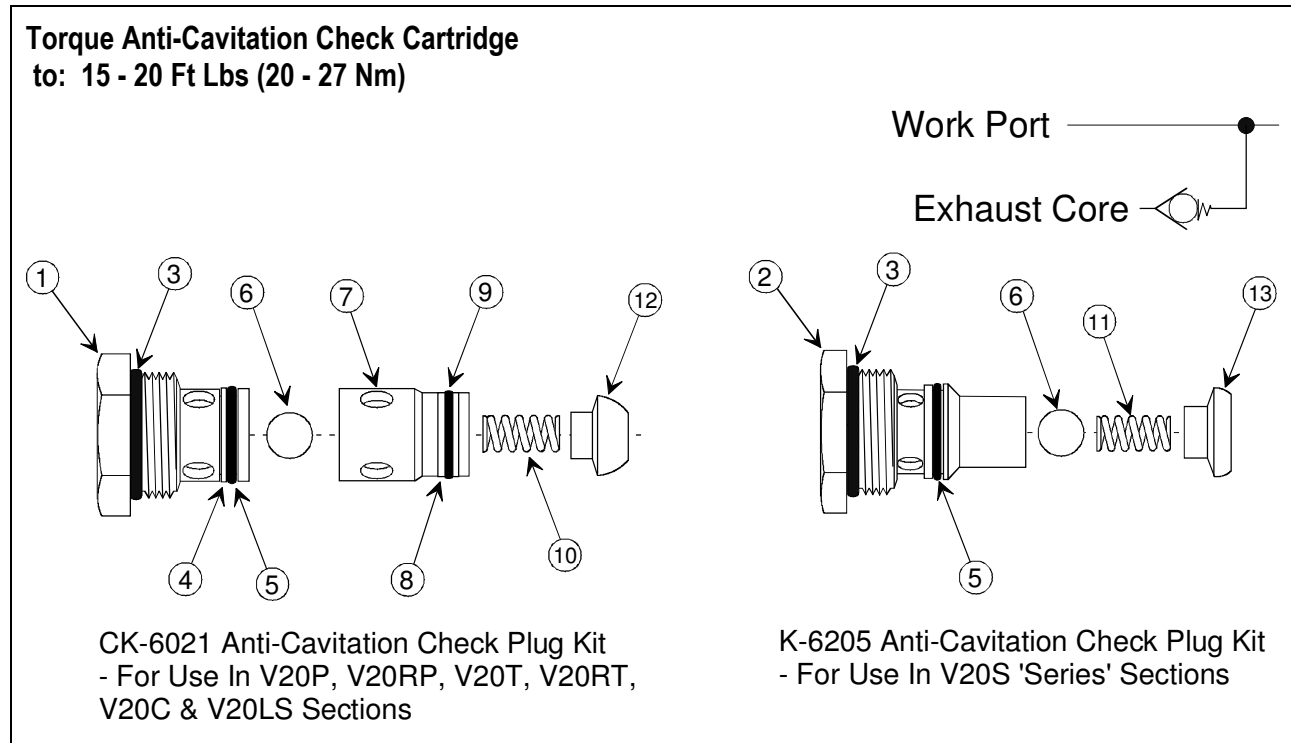


Figure 88. Anti-Cavitation Check Cartridges

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 12751001 | CK-6021 Anti-Cav Check Plug Kit, Excluding V20S (Contains All Items Listed Below) | |
| | 12955001 | K-6205 Anti-Cav Check Plug Kit For V20S 'Series' (Contains All Items Listed Below) | |
| | 07382001 | K-6032 Plug Seal Kit – Services CK-6021 Cartridge (Contains Items 3, 4, 5, 8 & 9) ① | |
| | 11498001 | K-6206 Plug Seal Kit – Services K-6205 Cartridge (Contains Items 3 thru 5 Only) ① | |
| 1 | 01822001 | Anti-Cavitation Check Body – (Serviced In CK-6021 A/C Check Plug Kit) | 1 |
| 2 | 11340001 | Anti-Cavitation Check Body – (Serviced In K-6205 Series A/C Check Plug Kit) | 1 |
| 3 | 02707001 | O-Ring Seal (Serviced in both K-6032 and K-6026 Plug Seal Kits) ① | 1 |
| 4 | 01820001 | Back-Up Ring (Serviced in K-6032 Plug Seal Kit) ② | 1 |
| 5 | 01819001 | O-Ring Seal (Serviced in both K-6032 and K-6026 Plug Seal Kits) ① | 1 |
| 6 | 00071001 | 7/16" Steel Ball | 1 |
| 7 | 01823001 | Check Ball Retainer – (Serviced In CK-6021 A/C Check Plug Kit) | 1 |
| 8 | 01820001 | Back-Up Ring (Serviced in K-6032 Plug Seal Kit) ② | 2 |
| 9 | 01818001 | O-Ring Seal (Serviced in K-6032 Plug Seal Kit) ① | 1 |
| 10 | 01868001 | Check Spring (Serviced In CK-6021 A/C Check Plug Kit) ③ | 1 |
| 11 | 11343001 | Check Spring (Serviced In K-6205 Series A/C Check Plug Kit) ③ | 1 |
| 12 | 02781001 | Check Poppet (Serviced In CK-6021 A/C Check Plug Kit) ③ | 1 |
| 13 | 07791002 | Check Poppet (Serviced In K-6205 Series A/C Check Plug Kit) ③ | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

② Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

③ Omit This Part In Free Flow Sections

Model 'CRA' Work Port Relief/Anti-Cav Cartridges

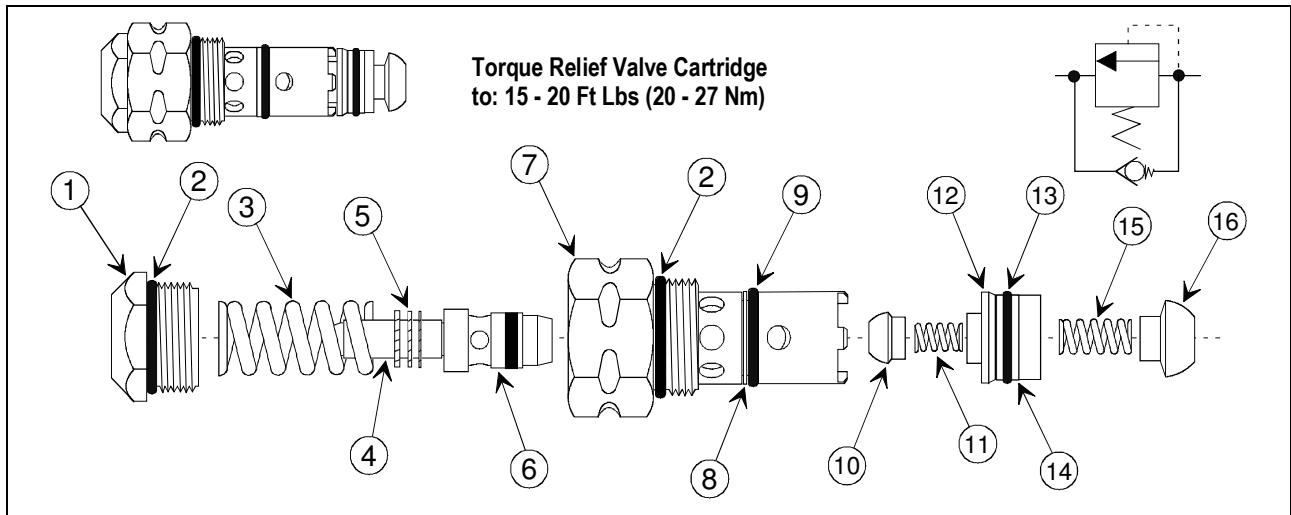


Figure 89. Model 'CRA' Work Port Relief/Anti-Cavitation Check Cartridges

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 07745xxx | CRA Relief/Anti-Cav Check Cartridge (Specify Pressure Setting When Ordering) ② | |
| | 06419001 | K-6005 Relief Seal Kit (Contains Items 2 and 7 Only) ① | |
| | 12727001 | K-19002 Relief Poppet Service Kit (Contains Item 5 - Poppet and Seal Assembly) | |
| 1 | 01880001 | Relief Cap | 1 |
| 2 | 02707001 | O-Ring Seal (Serviced in K-6005 Relief Seal Kit) ① | 2 |
| 3 | 20949001 | Spring (200 - 499 PSI [13 - 33 bar] Pressure Range) ② | 1 |
| | 01869001 | Spring (500 - 1249 PSI [34 - 86 bar] Pressure Range) ② | |
| | 07638001 | Spring (1250 - 1749 PSI [87 - 121 bar] Pressure Range) ② | |
| | 07078001 | Spring (1750 - 1999 PSI [122 - 138 bar] Pressure Range) ② | |
| | 01870001 | Spring (2000 - 2599 PSI [139 - 179 bar] Pressure Range) ② | |
| | 07497001 | Spring (2600 - 2999 PSI [180 - 207 bar] Pressure Range) ② | |
| | 11912001 | Spring (3000 - 3500 PSI [208 - 242 bar] Pressure Range) ② | |
| 4 | 07874001 | Dampening Sleeve | 1 |
| 5 | 00458001 | Shim (.040 inch [1,0 mm] thick) ② | A/R |
| | 00459001 | Shim (.020 inch [0,5 mm] thick) ② | A/R |
| | 00462001 | Shim (.010 inch [0,25 mm] thick) ② | A/R |
| 6 | 03936001 | Poppet Assembly (Not Serviceable) | 1 |
| 7 | 07741001 | CRA Relief Body | 1 |
| 8 | 01821001 | Back-Up Ring | 1 |
| 9 | 01819001 | O-Ring Seal (Serviced in K-6005 Relief Seal Kit) ① | 1 |
| 10 | 07743001 | Anti-Cavitation Check Poppet | 1 |
| 11 | 07744001 | Anti-Cavitation Spring | 1 |
| 12 | 07742001 | Poppet Retainer | 1 |
| 13 | 01818001 | O-Ring Seal (Serviced in K-6005 Relief Seal Kit) ① | 1 |
| 14 | 01820001 | Back-Up Ring (Serviced in K-6005 Relief Seal Kit) ③ | 1 |
| 15 | 06016001 | Check Spring (Omit This Part In Free Flow Sections) | 1 |
| 16 | 06015001 | Check Poppet (Omit This Part In Free Flow Sections) | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

② Do not attempt to adjust/shim these reliefs unless you have the capability to test the reliefs for proper pressure setting. Without the capability to test you may exceed the maximum pressure rating of the product or draw the relief spring solid, which in turn means there is no relief (NR).

③ Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

Model 'CRA' Work Port Relief Installation Procedures

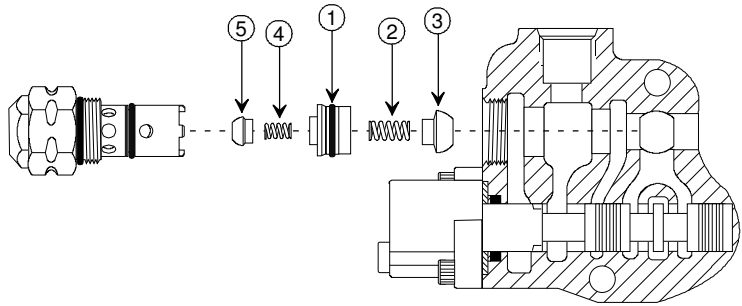
Installation Tools Required

Needle Nose Pliers

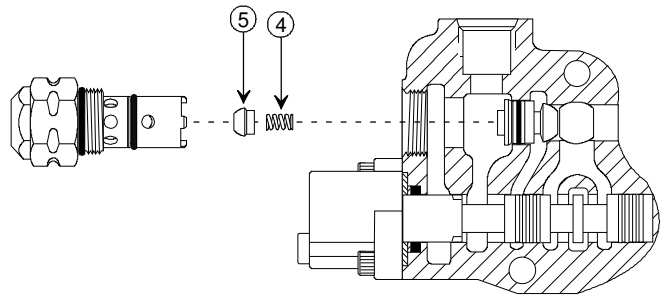
General Purpose Grease

1. Apply a liberal amount of grease to the I.D.'s on both ends of the Poppet Retainer assembly (1).

Insert the Load Check Spring (2) and Load Check Poppet (3) into the larger greased I.D. end of the Poppet Retainer (1).



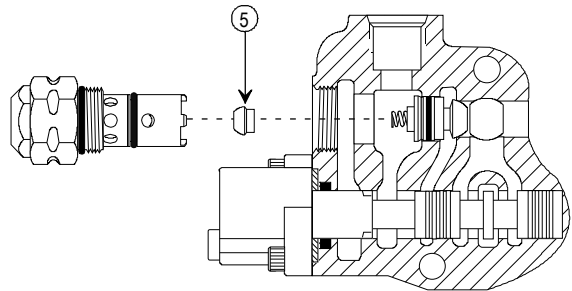
2. Using a suitable tool with a hollow end, install the assembly created in Step 1, into work port option cavity and push until poppet retainer seats into the bore as shown.



3. Using a needle nose pliers, insert the Anti-Cavitation Spring (4) into the Poppet Retainer as shown.

4. Apply a liberal amount of grease to the open end of the Relief Cartridge.

Insert the Anti-Cavitation Check Poppet (5) into the greased end of the cartridge with the open end of the poppet facing out as shown.



5. Carefully insert the CRA Relief Cartridge into the cavity so that the bore end of the Anti-Cavitation Poppet slides over the spring protruding out of the Poppet Retainer.

If the hex head of the CRA Relief Cartridge will not screw into the seat the O-Ring, the Anti-Cavitation Poppet did not slide over the spring and the stem of the Poppet Retainer.

Realign the Anti-Cavitation Check Poppet and re-install. Once alignment is obtained, the CRA Relief Cartridge can be torqued to specifications.

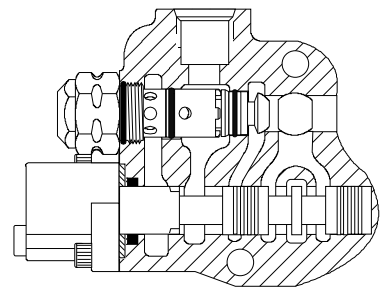


Figure 90. Model 'CRA' Work Port Relief Installation Procedures

Model 'RCPC' Work Port Relief Cartridges

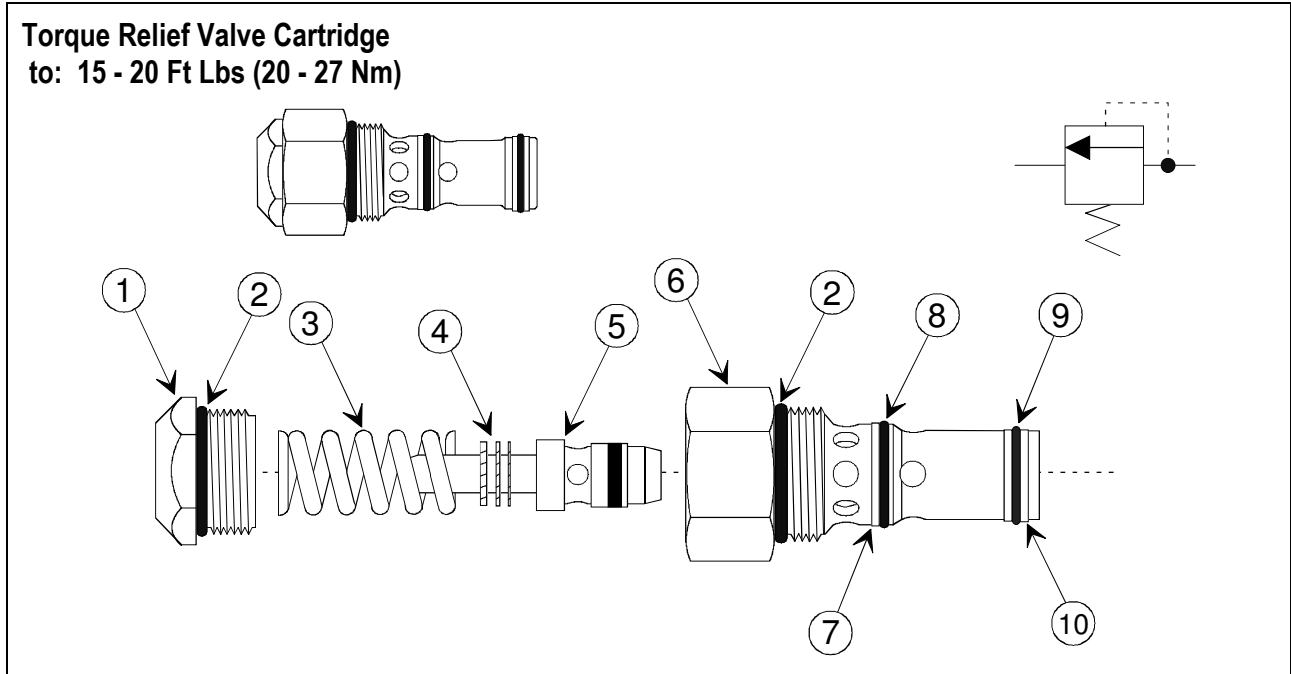


Figure 91. Model 'RCPC' Work Port Relief Cartridges – For Use In V20PC Work Sections

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 22252xxx | RCPC Relief Cartridge (Specify Pressure Setting When Ordering) ② | |
| | 06419001 | K-6214 RCPC Relief Seal Kit (Contains Items 2 thru 6 Only) ① | |
| | 12727001 | K-19002 Relief Poppet Service Kit (Contains Item 5 - Poppet and Seal Assembly) | |
| 1 | 01880001 | Relief Cap | 1 |
| 2 | 02707001 | O-Ring Seal (Serviced in K-6214 Relief Seal Kit) ① | 2 |
| 3 | 20949001 | Spring (200 - 499 PSI [13 - 33 bar] Pressure Range) ② | 1 |
| | 01869001 | Spring (500 - 1249 PSI [34 - 86 bar] Pressure Range) ② | 1 |
| | 07638001 | Spring (1250 - 1749 PSI [87 - 121 bar] Pressure Range) ② | 1 |
| | 07078001 | Spring (1750 - 1999 PSI [122 - 138 bar] Pressure Range) ② | 1 |
| | 01870001 | Spring (2000 - 2599 PSI [139 - 179 bar] Pressure Range) ② | 1 |
| | 07497001 | Spring (2600 - 2999 PSI [180 - 207 bar] Pressure Range) ② | 1 |
| | 11912001 | Spring (3000 - 3500 PSI [208 - 242 bar] Pressure Range) ② | 1 |
| 4 | 00458001 | Shim (.040 inch [1,0 mm] thick) ② | A/R |
| | 00459001 | Shim (.020 inch [0,5 mm] thick) ② | A/R |
| | 00462001 | Shim (.010 inch [0,25 mm] thick) ② | A/R |
| 5 | 03936001 | Poppet Assembly (Not Serviceable) | 1 |
| 6 | 22002001 | RCPC Relief Body | 1 |
| 7 | 09023017 | Back-Up Ring (Serviced in K-6214 Relief Seal Kit) ③ | 1 |
| 8 | 01721001 | O-Ring Seal (Serviced in K-6214 Relief Seal Kit) ① | 1 |
| 9 | 01819001 | O-Ring Seal (Serviced in K-6214 Relief Seal Kit) ① | 1 |
| 10 | 01821001 | Back-Up Ring (Serviced in K-6214 Relief Seal Kit) ③ | 2 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

② Do not attempt to adjust/shim these reliefs unless you have the capability to test the reliefs for proper pressure setting. Without the capability to test you may exceed the maximum pressure rating of the product or draw the relief spring solid, which in turn means there is no relief (NR).

③ Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

Anti-Drift Cartridges For V20LS and V20PC Sections

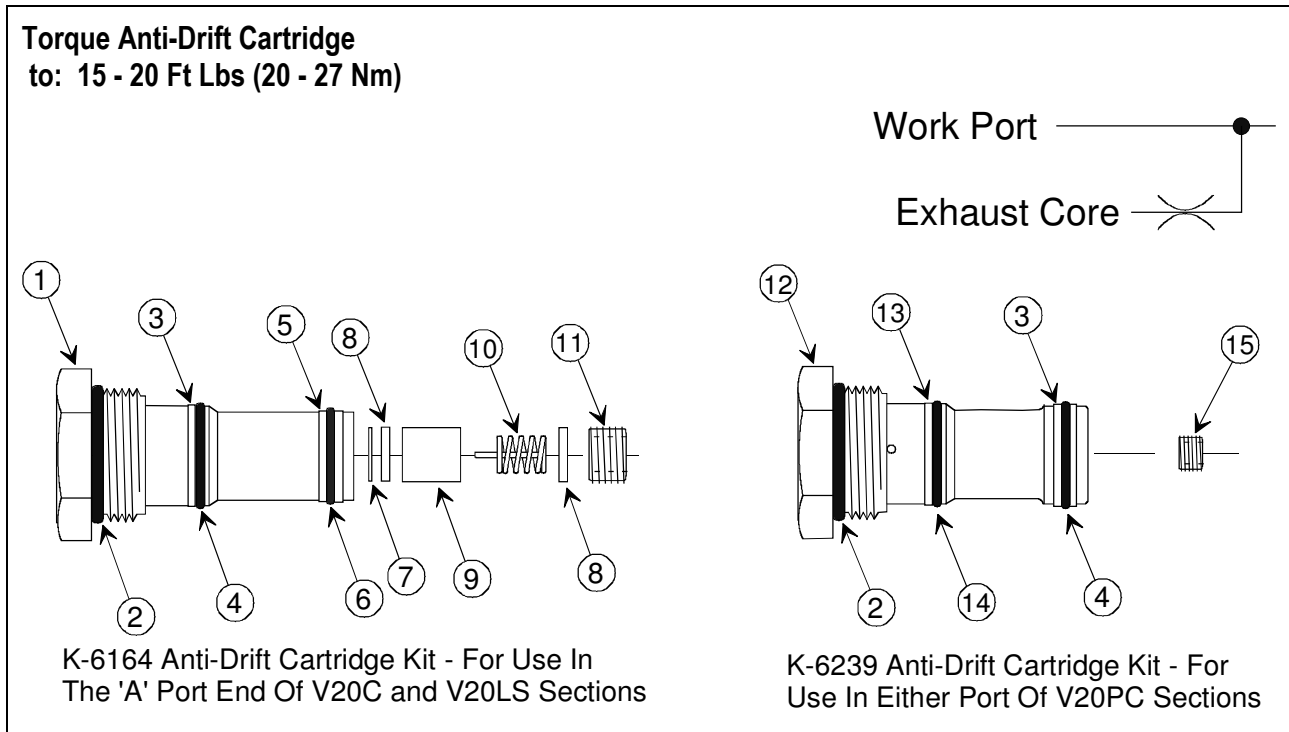


Figure 92. Anti-Drift Cartridges For V20LS and V20PC Sections

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 12935001 | K-6164 Anti-Drift Cartridge Kit, Complete - for V20C and C20LS Sections | |
| | 12935002 | K-6239 Anti-Drift Cartridge Kit, Complete - for V20PC Sections | |
| | 07382001 | K-6032 Plug Seal Kit – Services K-6164 Cartridge (Contains Items 3, 4, 5, 8 & 9) ① | |
| | 16095001 | K-6216 Plug Seal Kit – Services K-6239 Cartridge (Contains Items 3 thru 5 Only) ① | |
| 1 | 11052001 | Bleed Plug Body – (Serviced In K-6164 Bleed Plug Kit) | 1 |
| 2 | 02707001 | O-Ring Seal (Serviced in both K-6032 and K-6216 Plug Seal Kits) ① | 1 |
| 3 | 01821001 | Back-Up Ring (Serviced in K-6032 and K-6216 Plug Seal Kit) ③ | 1 |
| 4 | 01819001 | O-Ring Seal (Serviced in both K-6032 and K-6216 Plug Seal Kits) ① | 1 |
| 5 | 01820001 | Back-Up Ring (Serviced in K-6032 Plug Seal Kit) ③ | 2 |
| 6 | 01818001 | O-Ring Seal (Serviced in K-6032 Plug Seal Kit) ① | 1 |
| 7 | 11053001 | Bleed Washer | 1 |
| 8 | 12293001 | Spacer | 2 |
| 9 | 11055001 | Spacer | 1 |
| 10 | 11012001 | Spring | 1 |
| 11 | 11056001 | Locking Screw | 1 |
| 12 | 20971009 | Bleed Plug Body – (Serviced In K-6239 A/C Check Plug Kit) | 1 |
| 13 | 09023017 | Back-Up Ring (Serviced in K-6216 Plug Seal Kit) ② | 1 |
| 14 | 01721001 | O-Ring Seal (Serviced in K-6216 Plug Seal Kit) ① | 1 |
| 15 | 22174018 | .018 Orifice Plug | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

② Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

K-6024 Lockout Cartridges For V20LO Sections

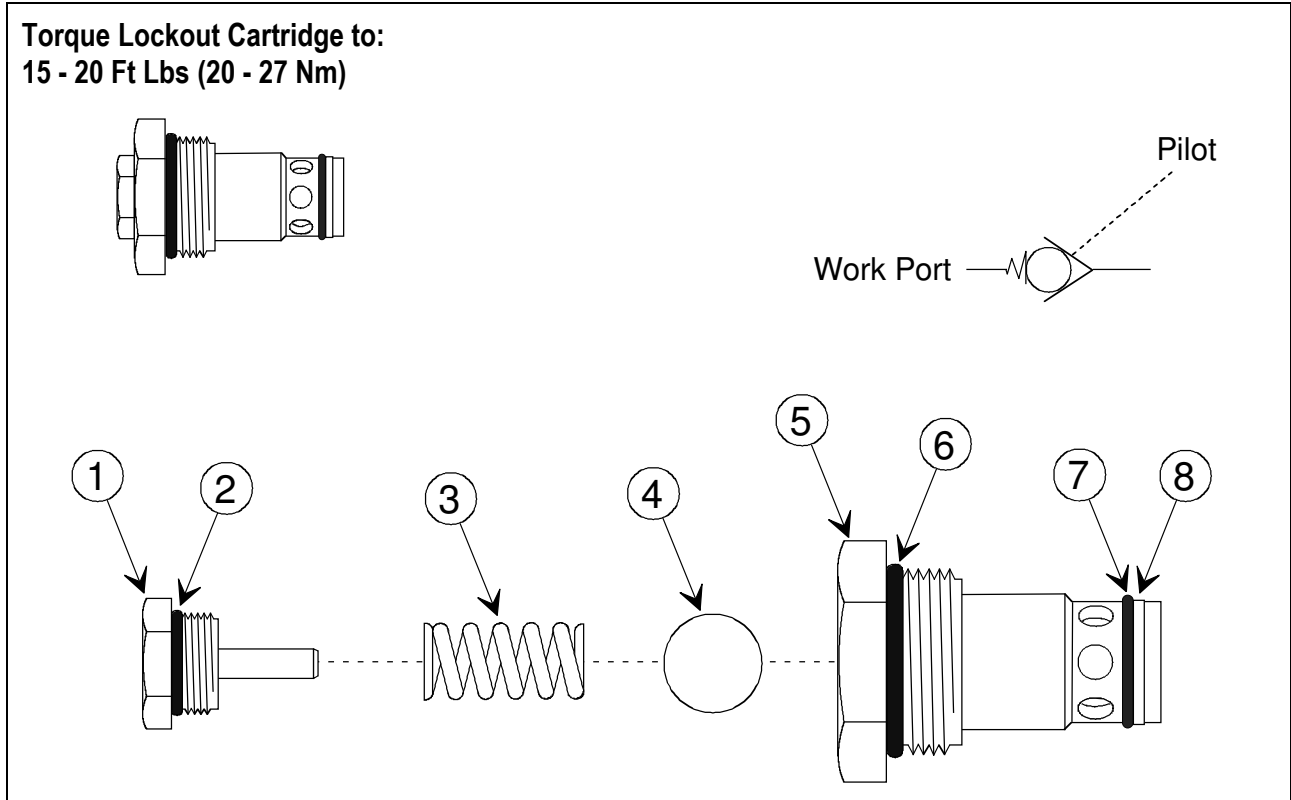


Figure 93. K-6024 Lockout Cartridges For V20LO Sections

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 06638001 | K-6024 Lockout Cartridge Kit, Complete - for V20LO Sections | |
| | 07474001 | K-6039 Plug Seal Kit – Services K-6164 Cartridge (Contains Items 3, 4, 5, 8 & 9) ① | |
| 1 | 00216001 | Check Plug Cap – (Serviced In K-6024 Lockout Check Plug Kit) | 1 |
| 2 | 00449001 | O-Ring Seal (Serviced in both K-6039 Plug Seal Kit) ① | 1 |
| 3 | 01571001 | Spring (Serviced In K-6024 Lockout Check Plug Kit) | 1 |
| 4 | 00071001 | Steel Ball (Serviced In K-6024 Lockout Check Plug Kit) | 1 |
| 5 | 11466001 | Lockout Check Body (Serviced In K-6024 Lockout Check Plug Kit) | 1 |
| 6 | 02707001 | O-Ring Seal (Serviced in both K-6039 Plug Seal Kit) ① | 1 |
| 7 | 01818001 | O-Ring Seal (Serviced in K-6039 Plug Seal Kit) ① | 1 |
| 8 | 03092001 | Back-Up Ring (Serviced in K-6039 Plug Seal Kit) ② | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

② Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

RP20 Pilot - Operated Relief Cartridges

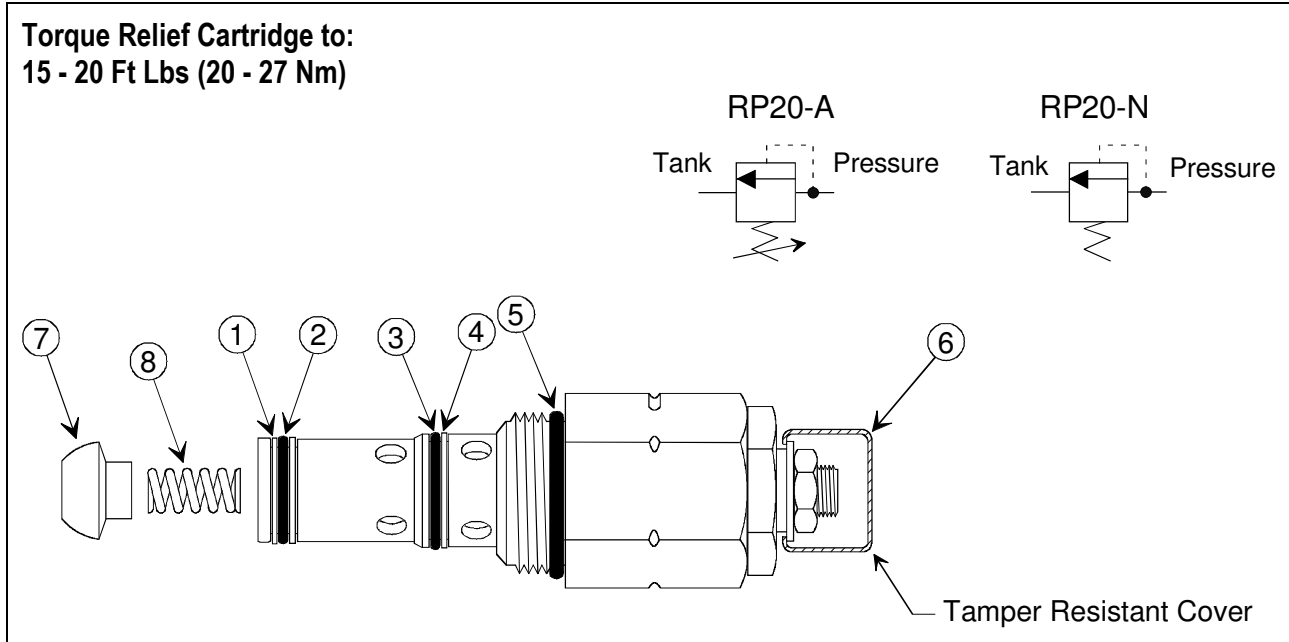


Figure 94. RP20 Pilot - Operated Relief Cartridges

NOTE

Due to close tolerances on working parts, the RP20 Pilot-Operated Relief Valve is not field serviceable. If service other than external seal replacement is required, replace the complete cartridge.

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 20498xxx | RP20-A Relief Cartridge (Adjustable) ① ② | |
| | 20498xxx | RP20-N Relief Cartridge (Tamper Resistant) ① ② | |
| | 20498xxx | RP20-A-LP Relief Cartridge (Adjustable) ① ② | |
| | 20498xxx | RP20-N-LP Relief Cartridge (Tamper Resistant) ① ② | |
| | 07474001 | K-6032 Plug Seal Kit – Services K-6164 Cartridge (Contains Items 1 thru 5) ① | |
| 1 | 01820001 | Back-Up Ring (Serviced in K-6032 Plug Seal Kit) ③ | 2 |
| 2 | 01818001 | O-Ring Seal (Serviced in both K-6032 Plug Seal Kit) ① | 1 |
| 3 | 01819001 | O-Ring Seal (Serviced in both K-6032 Plug Seal Kit) ① | 1 |
| 4 | 01821001 | Back-Up Ring (Serviced in K-6032 Plug Seal Kit) ③ | 1 |
| 5 | 02707001 | O-Ring Seal (Serviced in both K-6032 Plug Seal Kit) ① | 1 |
| 6 | 10034001 | Tamper Resistant Cap (<i>Installed at the factory on RP20-N Versions Only</i>) | 1 |
| 7 | 02781001 | Load Check Poppet ④ | 1 |
| 8 | 01868001 | Spring ④ | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

② Do not attempt to adjust/shim these reliefs unless you have the capability to test the reliefs for proper pressure setting. Without the capability to test you may exceed the maximum pressure rating of the product or draw the relief spring solid, which in turn means there is no relief (NR).

③ Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

④ Omit this part when installing RP20 Relief Cartridge into Free Flow Sections.

Work Port Flow Controls For V20C and V20LS Sections

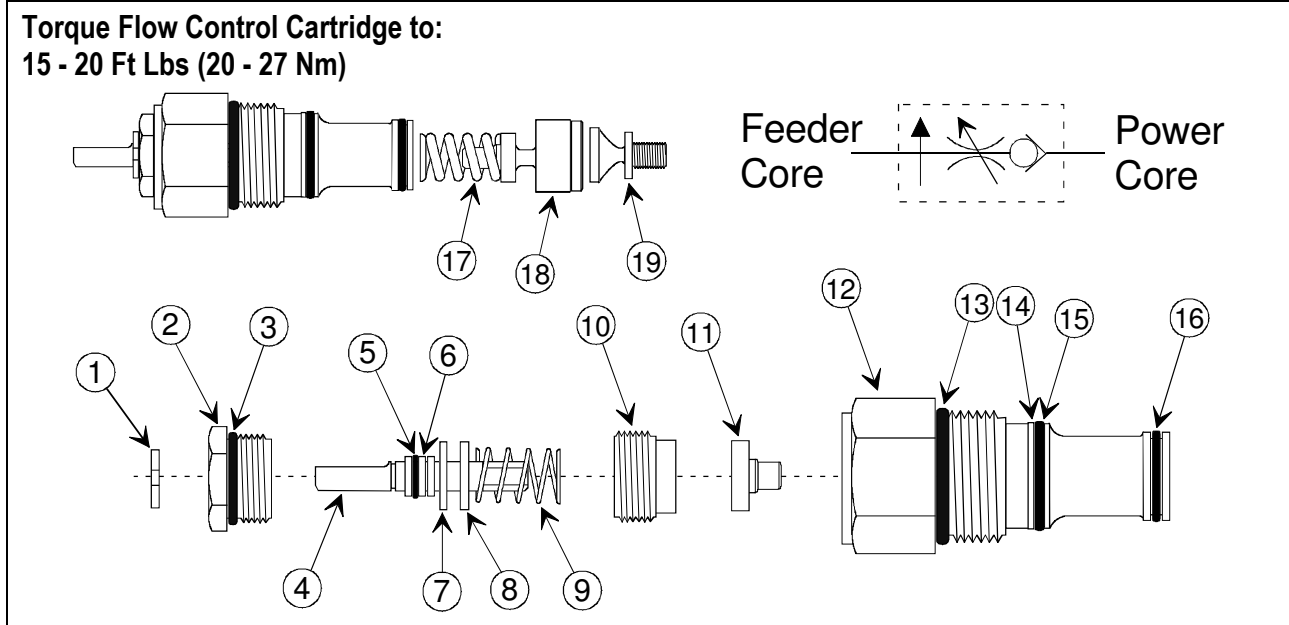


Figure 95. Work Port Flow Controls For V20C and V20LS Sections

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 10981001 | Flow Control Assembly for V20LO Sections (Contains Items 1 thru 16) | |
| | 10981002 | Flow Control W/Short Stem Assembly for V20LO Sections (Contains Items 1 thru 16) | |
| | 11565001 | K-6171 Flow Control Seal Kit (Contains Items 3, 5, 6, 7, 13, 14, 15 & 16) ① | |
| 1 | 10973001 | Retaining Ring | 1 |
| 2 | 10974001 | Flow Control Plug | 1 |
| 3 | 26294001 | O-Ring Seal (Serviced in both K-6171 Flow Control Seal Kit) ① | 1 |
| 4 | 10972001 | Flow Control Adjustment Drive Stem (Standard) | 1 |
| | 10972002 | Flow Control Adjustment Drive Stem (Short) | 1 |
| 5 | 07773001 | O-Ring Seal (Serviced in both K-6171 Flow Control Seal Kit) ① | 1 |
| 6 | 09020010 | Back-Up Ring (Serviced in K-6171 Flow Control Seal Kit) ② | 3 |
| 7 | 09020110 | Back-Up Ring (Serviced in K-6171 Flow Control Seal Kit) ③ | 1 |
| 8 | 10980001 | Thrust Washer | 1 |
| 9 | 10975001 | Spring | 1 |
| 10 | 10979001 | Adjustment Collar | 1 |
| 11 | 10977001 | Spring Retainer | 1 |
| 12 | 10976001 | Flow Control Body | 1 |
| 13 | 02707001 | O-Ring Seal (Serviced in K-6171 Flow Control Seal Kit) ① | 1 |
| 14 | 10978001 | Back-Up Ring (Serviced in K-6171 Flow Control Seal Kit) ② | 1 |
| 15 | 03158001 | O-Ring Seal (Serviced in K-6171 Flow Control Seal Kit) ① | 1 |
| 16 | 01819001 | O-Ring Seal (Serviced in K-6171 Flow Control Seal Kit) ① | 1 |
| 17 | 10983001 | Flow Control Spring (Not Included In FC Assembly – Purchase Separately) | 1 |
| 18 | 10982001 | 5-25 GPM Flow Control Piston ③ (Not Included In FC Assembly – Purchase Separately) | 1 |
| | 11006001 | 1-5 GPM Flow Control Piston ③ (Not Included In FC Assembly – Purchase Separately) | 1 |
| | 11006003 | 3-15 GPM Flow Control Piston ③ (Not Included In FC Assembly – Purchase Separately) | 1 |
| 19 | 10984001 | Flow Control Stop (Not a Serviceable Item – Refer To Work Section View) | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

② Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

③ Additional flow range piston are available from the **Gresen** factory in Minneapolis

Work Port Dump Valve Cartridges

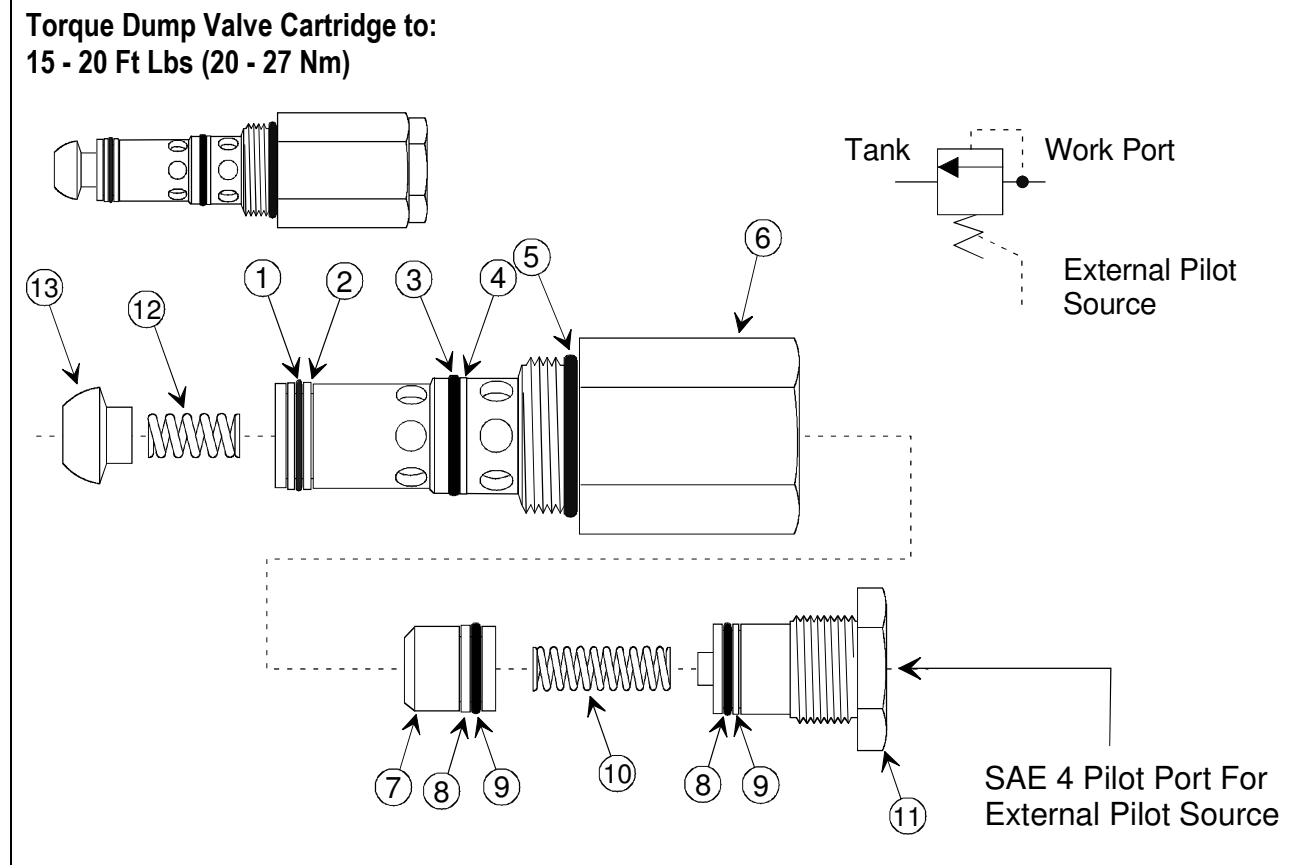


Figure 96. Work Port Dump Valve Cartridges

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 27158001 | Work Port Dump Valve Cartridge, Complete ①② | |
| | 12194003 | K-19017 Dump Valve Seal Kit (Contains Items 1 thru 5, 8 & 9) ① | |
| 1 | 01818001 | O-Ring Seal (Serviced in K-19017 Dump Valve Seal Kit) ① | 1 |
| 2 | 01820001 | Back-Up Ring (Serviced in K-19017 Dump Valve Seal Kit) ② | 2 |
| 3 | 01819001 | O-Ring Seal (Serviced in K-19017 Dump Valve Seal Kit) ① | 1 |
| 4 | 01821001 | Back-Up Ring (Serviced in K-19017 Dump Valve Seal Kit) ② | 1 |
| 5 | 02707001 | O-Ring Seal (Serviced in K-19017 Dump Valve Seal Kit) ① | 1 |
| 6 | 27139001 | Unloading Valve Body | 1 |
| 7 | 26932001 | Poppet | 1 |
| 8 | 00682001 | Back-Up Ring (Serviced in K-19017 Dump Valve Seal Kit) ② | 2 |
| 9 | 01091001 | O-Ring Seal (Serviced in K-19017 Dump Valve Seal Kit) ① | 2 |
| 10 | 27187001 | Spring | 1 |
| 11 | 27140001 | Pilot Head Sub Assembly (Internal Components Not Sold Separately) | 1 |
| 12 | 01868001 | Spring ③ | 1 |
| 13 | 02781001 | Load Check Poppet ③ | 1 |

① Buna-N seals are standard for all **Gresen** valve assemblies. For Viton seals, contact the **Gresen** factory in Minneapolis.

② Continuous Back-Up Rings are installed at the factory using special sizing tools. It is Not necessary to replace the original Back-Up Rings unless they have been damaged. See Page 9 for **Back-Up Ring Preparation and Installation** procedures.

③ Do Not install the Load Check Poppet and Spring into F4 (Free Flow) work sections.

Seal Retainer and Spool Wiper Kits

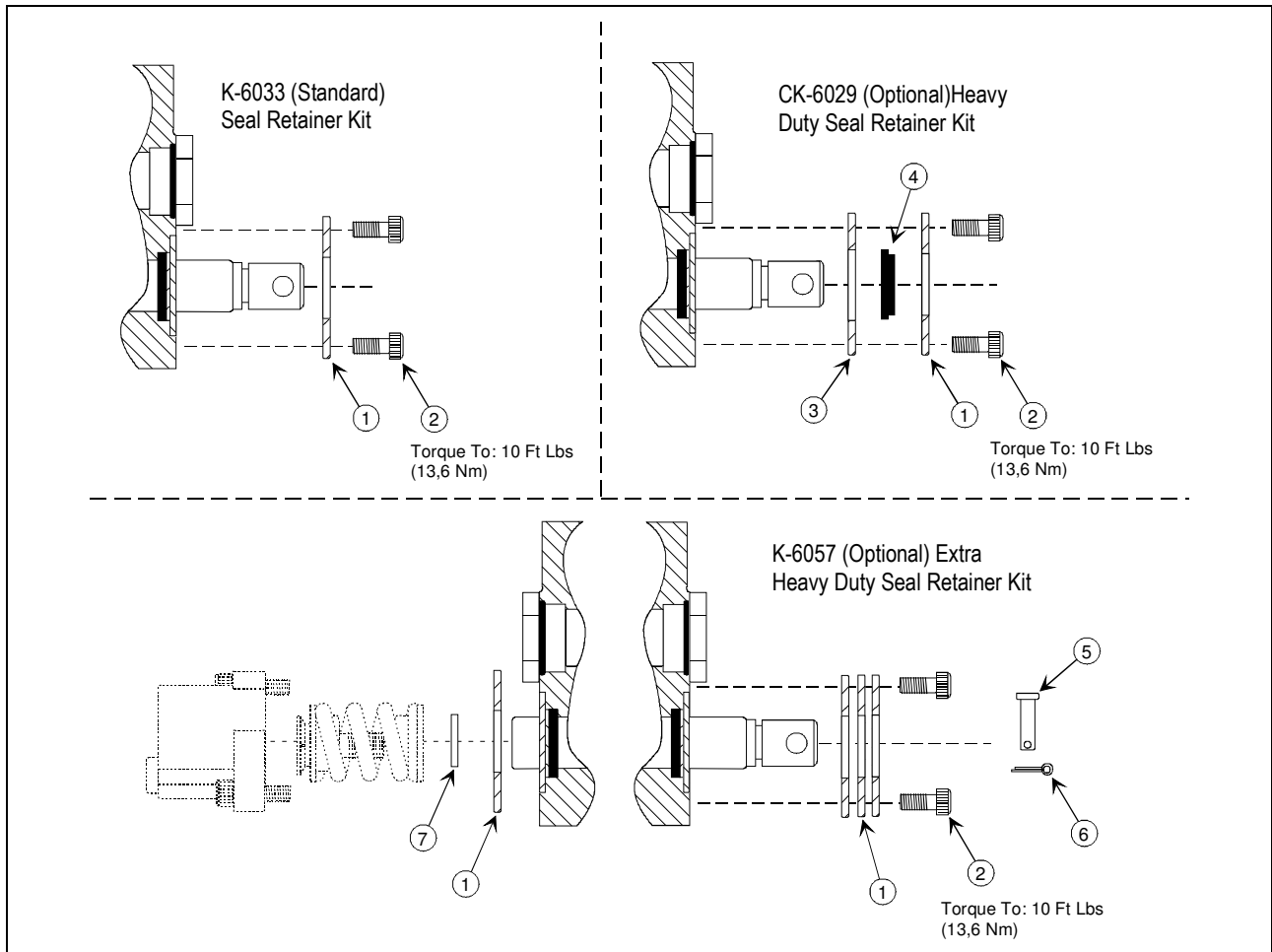


Figure 97. Seal Retainer and Spool Wiper Kits

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 12786001 | K-6033 Standard Seal Retainer Kit (Includes Items 1 and 2 Only) ① | |
| | 12806001 | CK-6029 Heavy Duty Seal Retainer With Wiper Kit (Includes Items 1 thru 4 Only) ② | |
| | 12860001 | K-6057 Extra Heavy Duty Seal Retainer Kit (Includes Items 1, 2, 5, 6 & 7) ③ | |
| | 16105001 | K-6223 Spool Wiper Kit (Includes Item No. 4 Only) | |
| 1 | 06552001 | Seal Retainer Plate (Serviced in all three Retainer Kits) | A/R |
| 2 | 03731098 | Screw (1/4 - 20 by 1/2" Long - Serviced in all three Retainer Kits) | 2 |
| 3 | 06802001 | Spool Wiper Retainer Plate (Serviced in CK-6029 Retainer Kit) | 1 |
| 4 | 01800001 | Wiper (Serviced in CK-6029 Seal Retainer Kit and K-6223 Spool Wiper Kit) | 1 |
| 5 | 01857001 | Clevis Pin (Serviced in K-6057 Seal Retainer Kit) | 1 |
| 6 | 00018001 | Cotter Pin (Serviced in K-6057 Seal Retainer Kit) | 1 |
| 7 | 07565001 | Spacer Washer (Serviced in K-6057 Seal Retainer Kit) | 1 |

① Used when handle bracket is not furnished and return line pressures are below 200 PSI [14 bar].

② Used when handle bracket is not furnished and return line pressures are below 1000 PSI [69 bar], and when wiper seal is desired.

③ Used when handle bracket is not furnished and return line pressures are subject to occasional peak pressures exceeding 1000 PSI [69 bar].

Handle Bracket Kits

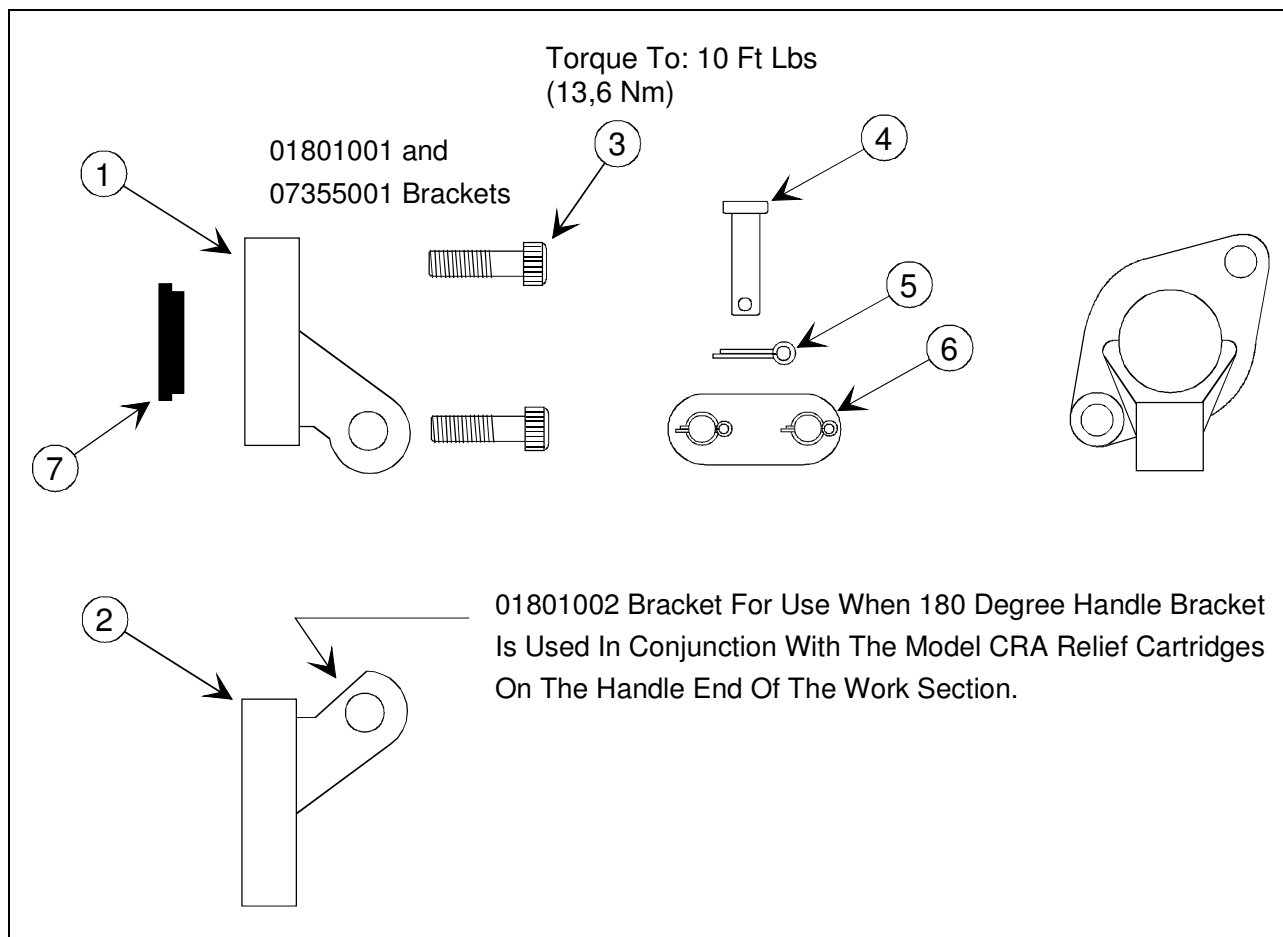


Figure 98. Handle Bracket Kits

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 12753001 | K-6031 Standard Bracket and Pin Kit (Contains Items 1, 3, 4 & 5 Only) | |
| | 08764001 | K-6037 (Optional) Heavy Duty Cast Iron Bracket Kit (Contains Items 1 & 3 Only) | |
| | 12732001 | K-6158 Link & Pin Kit (Includes Items 4 thru 6) | 1 |
| | 16105001 | K-6223 Spool Wiper Kit (Contains Item No. 7 Only) | 1 |
| 1 | 01801001 | Die Cast Bracket (Standard - Serviced in K-6031 Bracket Kit) | 1 |
| | 07355001 | Cast Iron Bracket (Heavy Duty - Serviced in K-6037 Bracket Kit) | 1 |
| 2 | 01801002 | Die Cast Bracket (Optional – For Use when CRA Relief is used with 180 Degree Handle) | 1 |
| 3 | 09161407 | Screw (1/4 - 20 X 7/8 Inch long - Serviced in K-6031 & K-6037 Bracket Kits) | 2 |
| 4 | 01857001 | Clevis Pin (.250 X .91 - Serviced in K-6158 Link & Pin Kit) | 1 |
| 5 | 00086001 | Cotter Pin (.078 X .5 - Serviced in K-6158 Link & Pin Kit) | 1 |
| 6 | 00928001 | Link and Pin Sub Assembly (Includes Link, Plate and 2 Cotter Pins) | 1 |
| 7 | 01800001 | (Optional) Spool Wiper (Serviced in K-6223 Spool Wiper Kit) | 1 |

Protective Spool Boot Kits

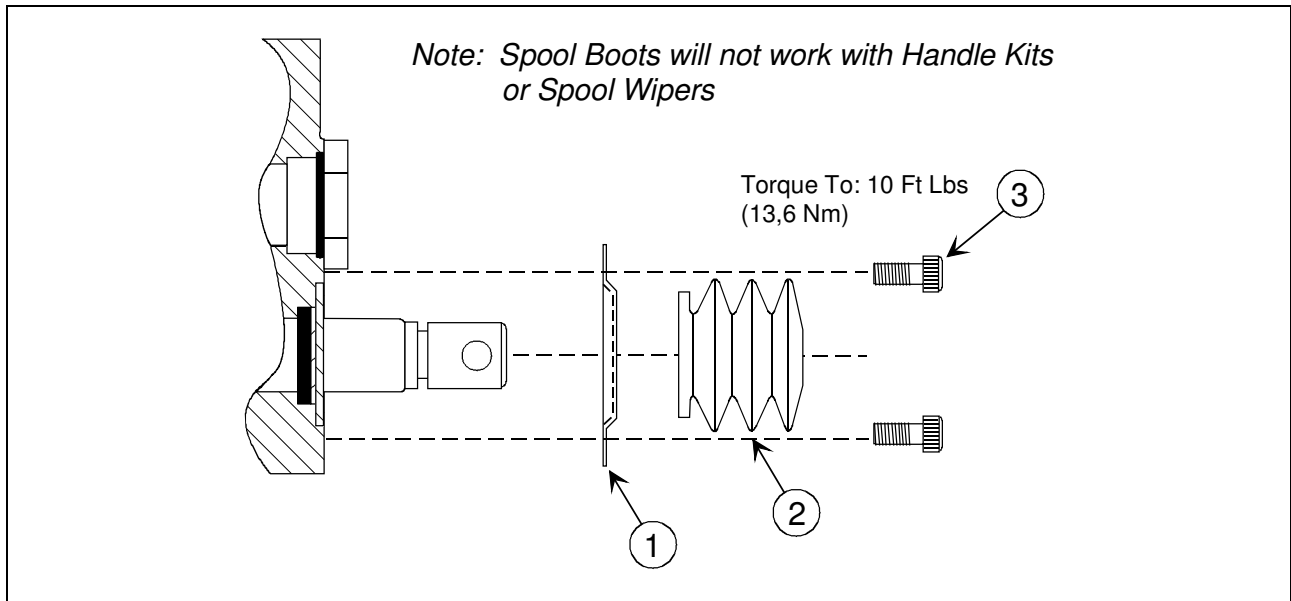


Figure 99. K-6056 Spool Boot Kit

| Ref No. | Part No. | Description | Quantity |
|---------|----------|---|----------|
| | 12859001 | K-6056 Spool Boot Kit (Contains all Items Listed Here) | |
| 1 | 07623001 | Boot Retainer | 1 |
| 2 | 07622001 | Spool Protective Boot | 1 |
| 3 | 03731098 | Screw (1/4 - 20 by 1/2" Long) | 2 |

Vertical and Horizontal Handle Kits

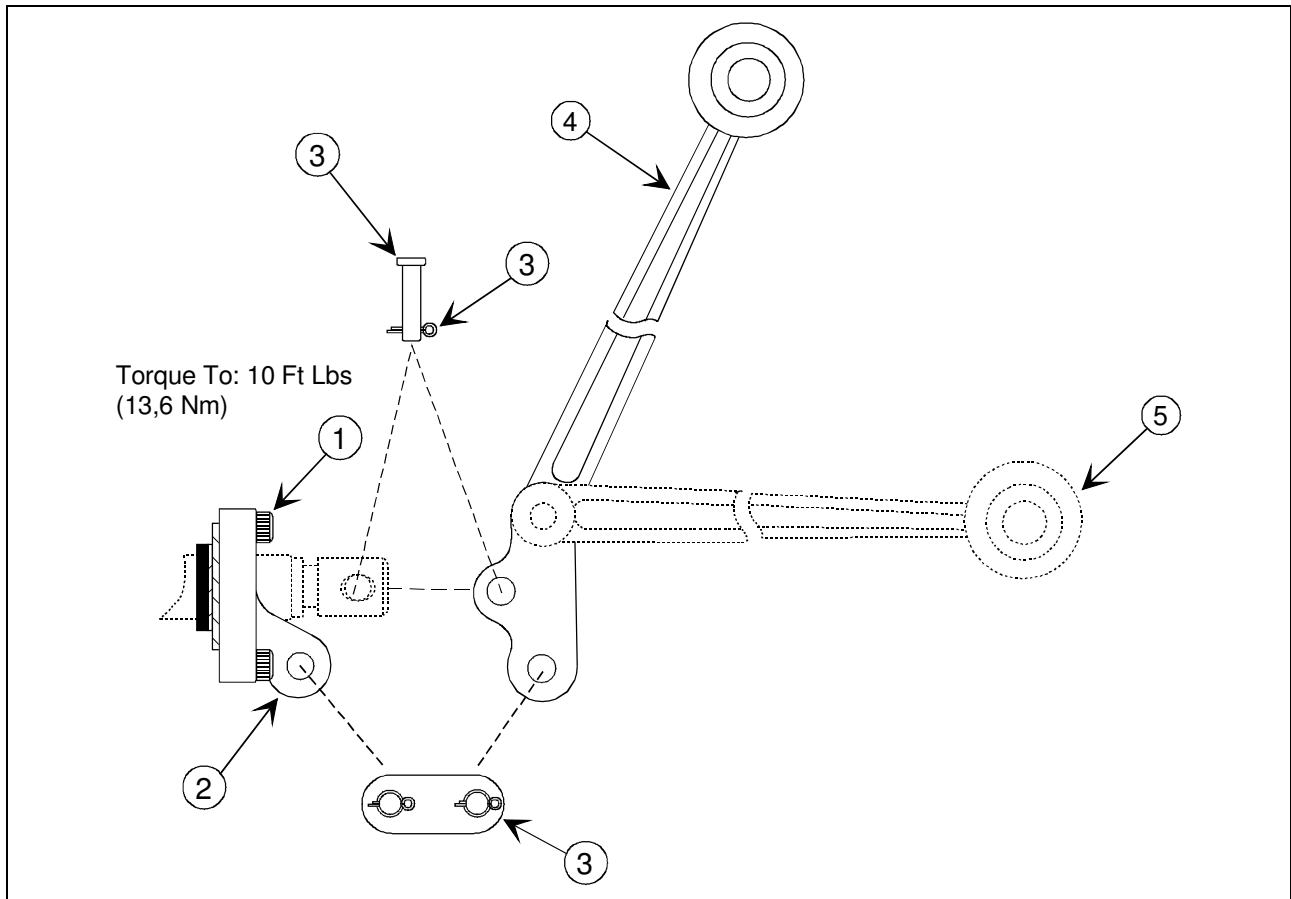


Figure 100. Vertical and Horizontal Handle Kits

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| | 12752001 | K-6004 Complete Vertical Handle & Bracket Kit (Black Plastic Coated Handle) ① | |
| | 12755001 | K-6137 Complete Vertical Handle & Bracket Kit (Optional Plain Handle) ① | |
| | 16106001 | K-6219 Vertical Handle & Linkage Kit (Black Plastic Coated Handle - No Bracket) | |
| | 16106002 | K-6220 Vertical Handle & Linkage Kit (Optional Plain Handle - No Bracket) | |
| | 08377001 | K-6007 Complete Horizontal Handle & Bracket Kit (Black Plastic Coated Handle)① | |
| | 13001001 | K-6139 Complete Horizontal Handle & Bracket Kit (Optional Plain Handle) ① | |
| | 16106003 | K-6221 Horizontal Handle & Linkage Kit (Black Plastic Coated Handle - No Bracket) | |
| | 16106004 | K-6222 Horizontal Handle & Linkage Kit (Optional Plain Handle - No Bracket) | |
| | 12732001 | K-6158 Link and Pin Kit (Contains Item No. 3 Only) | |
| 1 | 09161407 | Screw (1/4 - 20 by 7/8 Inch long) | 2 |
| 2 | 01801001 | Handle Bracket ① | 1 |
| 3 | 04238001 | Link, Plate and Cotter Pin Assembly | 1 |
| 4 | 01802001 | Standard Vertical Handle (Black Plastic Coated Handle) | 1 |
| | 01802003 | Optional Vertical Handle (Plain Handle) | 1 |
| 5 | 03249001 | Standard Horizontal Handle (Black Plastic Coated Handle) | 1 |
| | 03249003 | Optional Horizontal Handle (Plain Handle) | 1 |

① All of the Handle and Bracket Kits listed above include the Standard Die Cast Handle Bracket (No. 01801001). The Optional Heavy Duty Cast Iron Handle Bracket (No. 07355001) is supplied in **K-6037** Bracket Kit.

Work Port Restrictors

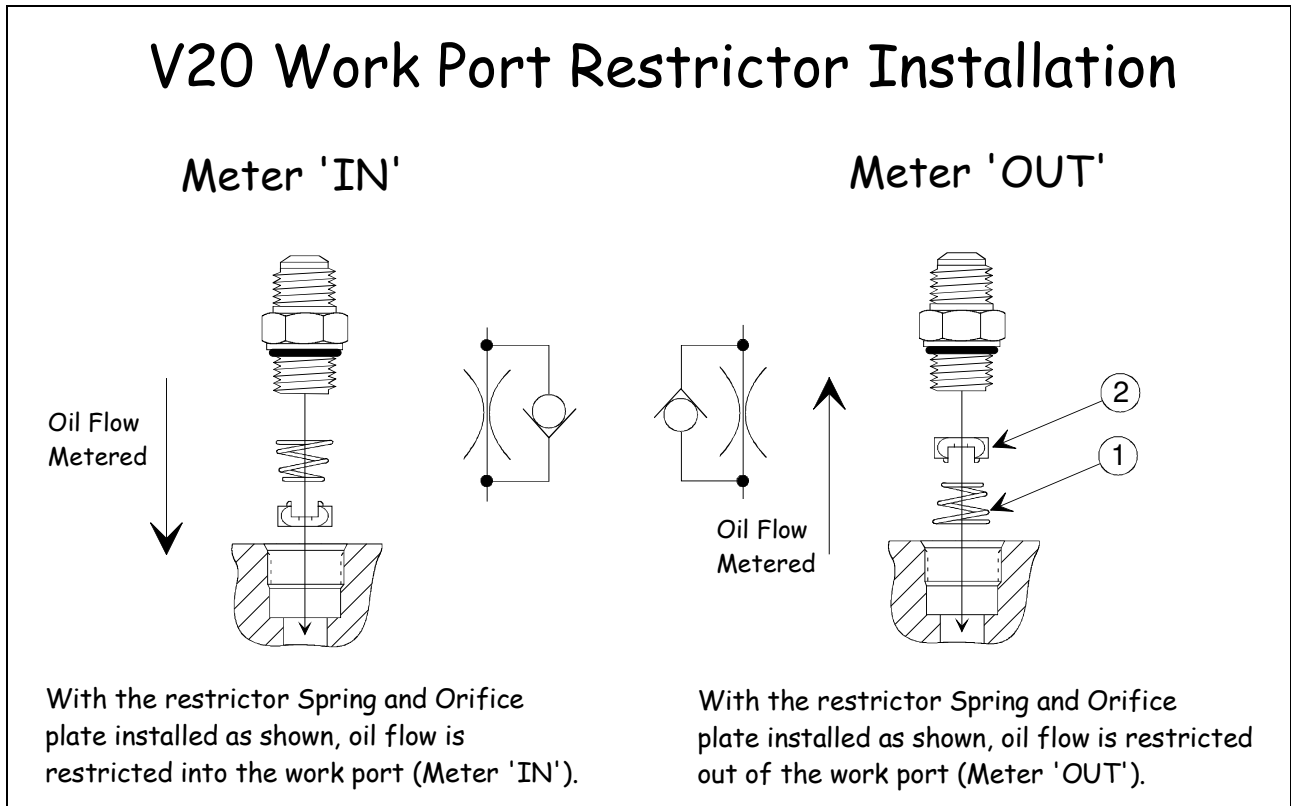


Figure 101. Work Port Restrictors

| Ref No. | Part No. | Description | Quantity |
|---------|----------|--|----------|
| 1 | 11031xxx | SAE 8 Port Restrictor Assembly (Contains Items 1 and 2) ① | 1 |
| | 10098xxx | SAE 10 Port Restrictor Assembly (Contains Items 1 and 2) ① | |
| 2 | 10821001 | Conical Spring (For Use In SAE 8 Restrictor Assembly) | 1 |
| | 10064001 | Conical Spring (For Use In SAE 10 Restrictor Assembly) | 1 |
| 2 | 10817xxx | SAE 8 Orifice Plate (Choose Orifice Hole Size From Table Below) ① | 1 |
| | 10063xxx | SAE 10 Orifice Plate (Choose Orifice Hole Size From Table Below) ① | 1 |

① The last three digits of the Restrictor Assembly and Orifice Plate are the same as the orifice hole size. Example: An SAE 8 Restrictor Plate with a .062 hole diameter is Restrictor Assembly part number 11031062. The table below identifies the available hole sizes for both SAE 8 and SAE 10 Orifice Plates.

Orifice Holes Sizes Available

| 10817xxx SAE 8 Orifice Plates | 10063xxx SAE 10 Orifice Plates |
|--|--|
| 015, 032, 040, 046, 055, 062, 074, 082, 095, 109, 125, 141, 156, 172, 189, 220 | 015, 032, 037, 042, 047, 053, 062, 070, 076, 082, 086, 095, 109, 125, 141, 156, 189, 203, 220, 281 |

Port Plugs

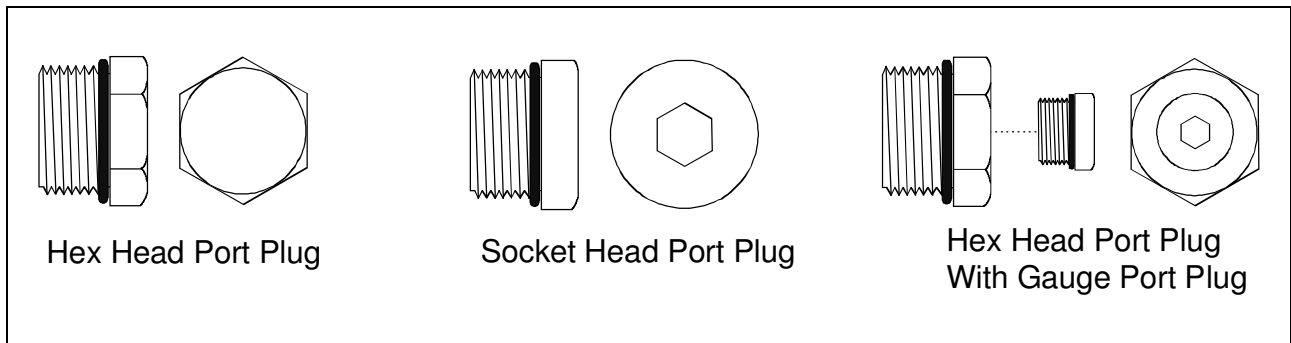


Figure 102. Port Plugs

Port Plug Identification Chart

| Plug Part Number | Viton Seal | SAE 4 | SAE 6 | SAE 8 | SAE 10 | SAE 12 | 1/4" NPT | 3/8" NPT | 1/2" NPT | 3/4" NPT | S.H. ① | H.H. ② | Notes |
|------------------|------------|-------|-------|-------|--------|--------|----------|----------|----------|----------|--------|--------|----------------------|
| 00017001 | NA | | | | | | • | | | | • | | |
| 00073001 | NA | | | | | | | • | | | • | | |
| 00947001 | NA | | | | | | | | • | | • | | |
| 01282001 | NA | | | | | | | | | • | | • | |
| 20527001 | NA | | | | | | | | | • | | • ③ | With 1/4" Gauge Port |
| 09435104 | | • | | | | | | | | | • | | |
| 08103001 | | • | | | | | | | | | | • | |
| 08103002 | Yes | • | | | | | | | | | | • | |
| 09435106 | | | • | | | | | | | | • | | |
| 03637001 | | | • | | | | | | | | | • | |
| 09435108 | | | | • | | | | | | | • | | |
| 06879001 | | | | • | | | | | | | | • | |
| 06879002 | | | | • | | | | | | | | • | |
| 09435110 | | | | | • | | | | | | • | | |
| 07054001 | | | | | • | | | | | | | • | |
| 07054002 | Yes | | | | • | | | | | | | • | |
| 09435112 | | | | | | • | | | | | • | | |
| 06089001 | | | | | | • | | | | | | • | |
| 06089002 | Yes | | | | | • | | | | | | • | |
| 06089003 | | | | | | • | | | | | | • ③ | With 1/4" Port Plug |
| 06089004 | | | | | | • | | | | | | • ③ | W/SAE 4 Port Plug |
| 06089005 | Yes | | | | | • | | | | | | • ③ | With 1/4" Port Plug |
| 06089006 | | | | | | • | | | | | | • ③ | W/SAE 6 Port Plug |
| 06089007 | | | | | | • | | | | | | • ③ | Open SAE 4 Port |
| 06089008 | | | | | | • | | | | | | • ③ | Open 1/4" NPT Port |

① S.H. (Socket Head) Port Plug

② H.H. (Hex Head) Port Plug

③ Plug is drilled and tapped for gauge port size indicated.

Buna-N and Viton O-Ring Cross Reference

All standard Gresen products utilize Buna-N seals which are compatible with petroleum base, water-in-oil emulsions, and water-glycol fluids. Phosphate ester type fire-resistant fluids will cause Buna-N seals to swell. This swelling is not normally detrimental to static seals, but will be a problem for dynamic seals such as valve spool seals. Swelling of these seals can result in binding. The temperature range of Buna-N seals is -40°F to +200°F [-40°C to +93°C].

Viton seals are recommended for most applications that use phosphate-ester type fluids. Viton seals are also recommended for applications that have a continuous operating temperature of +200°F [+93°C] or more.

Cross Reference For O-Ring Seals, Buna-N to Viton

| Buna-N Part Number | Viton Part Number | Common Application |
|--------------------|-------------------|-----------------------------|
| 00006001 | 09002214 | Pneumatic Actuator |
| 00449001 | 07611001 | Lockout Cartridge + Others |
| 01091001 | 09002014 | Solenoid Cartridge + Others |
| 01615001 | 07447001 | Main Relief Cartridge, NR |
| 01718001 | 07446001 | Main Relief Cartridge, NR |
| 01721001 | 07612001 | P/B Sleeve + Others |
| 01818001 | 07444001 | Load Check Plug + Others |
| 01819001 | 07445001 | Load Check Plug + Others |
| 01853001 | 07613001 | Quad Seal – Float |
| 01910001 | 09002018 | P/B Sleeve + Others |
| 02705001 | 07951001 | Bleed Down Plug + Others |
| 02706001 | 09003908 | Solenoid Cartridge + Others |
| 02707001 | 07448001 | Load Check Plug + Others |
| 02708001 | 07452001 | Bleed Plug + Others |
| 02709001 | 06277001 | P/B Sleeve + Others |
| 03119001 | 09002903 | EPC-IH Bonnet |
| 03158001 | 09002018 | PC Flow Control |
| 03328001 | 07952001 | KO Positioner |
| 03911001 | 09002028 | PC Flow Control |

| Buna-N Part Number | Viton Part Number | Common Application |
|--------------------|-------------------|---------------------------|
| 06814002 | 07450001 | Section Seal, Old |
| 06815002 | 07451001 | Section Seal, Old |
| 06839001 | 09002016 | Dual Pressure Relief Head |
| 07028002 | 09002022 | HRH, EPC-IH Actuators |
| 07700001 | 07449001 | Spool Seal |
| 07773001 | 09002010 | Solenoid Bonnet + Others |
| 07828001 | 09002013 | EPC Cartridge |
| 07829001 | 09002015 | PRV Cartridge |
| 08316001 | 09002011 | LS Section Seal, Old |
| 09000017 | 07612001 | Unloading Valve Cartridge |
| 09000027 | 09002027 | HRH Actuator |
| 09000113 | 09002113 | Dual Pressure Relief Head |
| 09001012 | 07877001 | PC Flow Control |
| 12196001 | 09002024 | Pneumatic Actuator |
| 21047001 | 09002023 | Float Positioners |
| 21733001 | 09002119 | Section Seal, New |
| 21801001 | 09002121 | EPC Bonnet + Others |
| 21857001 | 09003117 | Section Seal, New |
| 21866001 | 09002108 | LS Section Seal, New |