



Bulletin HY14-2705-M4/US
Service and Parts Bulletin
Model V20/V26

Effective: September 1, 2003
Supersedes: Cat. No. GSD-1107 dated 4/98



Internally-Piloted
Solenoid Operated
Work Section
Directional Control Valve

Table of Contents

Figures and Tables

List of Figures and Tables	Page 3
----------------------------------	--------

Model V20/V26 Work Sections

Section Seal Identification and Section Seal Kits	Page 4
V20 & V26 [SOL] and [EPC] Solenoid Work Sections	Page 5
V20 & V26 [SOL] and [EPC] Solenoid Work Sections with Handle	Page 6

Electric Solenoid Spool Actuators and Components

[SOL] and [EPC] Solenoid Actuators	Page 7
[SOL-IH] and [EPC-IH] Solenoid Actuators (with Handle)	Page 8
[SOL-IH] and [EPC-IH] Handle Assembly	Page 9
[SOL-IH] and [EPC-IH] Solenoid Bonnet Assembly	Page 10
(K-CRT-SXXX) On/Off Solenoid Cartridge Kits	Page 11
(K-CRT-EXXX) Proportional Solenoid Cartridge Kits	Page 12
Solenoid Coil Connector Type Identification	Page 13
Bonnet Conversion for 2-Way, 2-Position Operation	Page 14
Solenoid Bonnet Spool Travel Limiter/Override Kits	Page 15
Solenoid Bonnet (with Handle) Spool Travel Limiter Kit	Page 16

Utility and Unloading Sections and Components

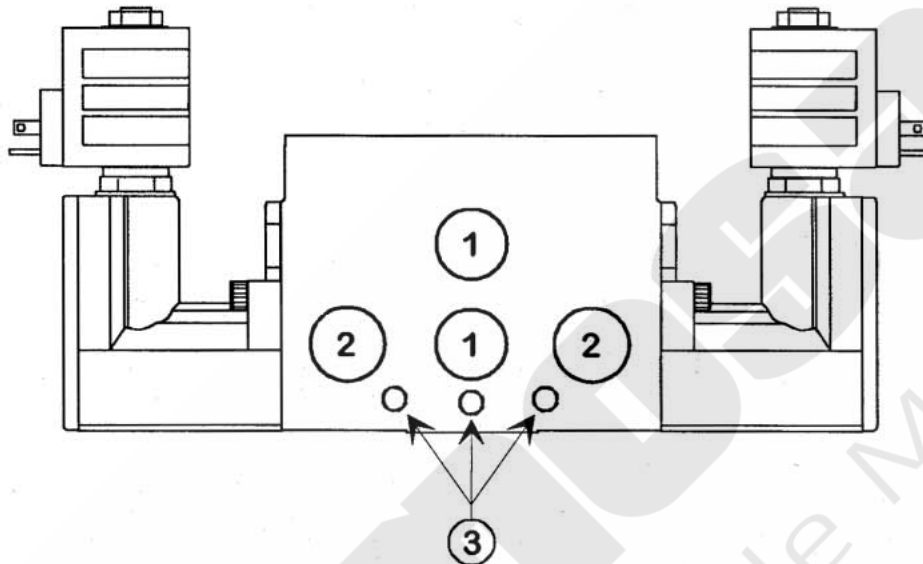
Open Center Utility Sections	Page 17
Closed Center (Load Sensing) Utility Section	Page 18
Unloading Utility Sections	Page 19
Unloading Section Applications	Page 20
Standard Unloading Utility Section - No Power Beyond Option	Page 21
Unloading Utility Section with Power Beyond Option	Page 22
Solenoid-Operated Pressure Build-Up Valve Cartridges	Page 23
Mechanical Pressure Build-Up Valve Cartridge	Page 24
Power Beyond Sleeves for use in Utility Sections	Page 25
Closed Center Plug for use in Utility Sections	Page 26
Pressure Reducing Valve Cartridge	Page 27
No Pressure Reducing Valve Plug	Page 28
Bleed-Down Plug for use in Unloading Utility Sections	Page 29
Unloading Valve Cartridge for use in Unloading Utility Sections	Page 30

List of Figures and Tables

Figure 1: Section Seal Identification	Page 4
Figure 2: V20/V26 [SOL] and [EPC] Solenoid Work Sections (Model V26 Shown)	Page 5
Figure 3: V20/V26 [SOL] and [EPC] Solenoid Work Sections with Handle (Model V26 Shown).....	Page 6
Figure 4: [SOL] and [EPC] Solenoid Actuators	Page 7
Figure 5: [SOL-IH] and [EPC-IH] Solenoid Actuators (with Handle)	Page 8
Figure 6: [SOL-IH] and [EPC-IH] Handle Assembly	Page 9
Figure 7: [SOL-IH] and [EPC-IH] Solenoid Bonnet Assembly	Page 10
Figure 8: On/Off [SOL] Solenoid Cartridges	Page 11
Figure 9: Proportional [EPC] Solenoid Cartridges	Page 12
Figure 10: Solenoid Coil Connectors	Page 13
Figure 11: Solenoid Bonnet Conversion	Page 14
Figure 12: Solenoid Bonnet Spool Travel Limiter and Spool Overrides	Page 15
Figure 13: Solenoid Bonnet (with Handle) Spool Travel Limiter	Page 16
Figure 14: Open Center Utility Section with Solenoid-Operated Build Up Valve	Page 17
Figure 15: Closed Center (Load Sensing) Utility Section	Page 18
Figure 16: Unloading Utility Section	Page 19
Figure 17: Unloading Section Applications	Page 20
Figure 18: Unloading Utility Section (Selecting the Standard Return Option)	Page 21
Figure 19: Unloading Utility Section (Selecting Power Beyond Option)	Page 22
Figure 20: Solenoid-Operated Pressure Build-Up Valve Cartridges	Page 23
Figure 21: Mechanical Pressure Build-Up Valve Cartridge	Page 24
Figure 22: Power Beyond Sleeves for use in Utility Sections	Page 25
Figure 23: Closed Center Plug for use in Utility Sections	Page 26
Figure 24: Pressure Reducing Valve Cartridge	Page 27
Figure 25: No Pressure Reducing Valve Plug	Page 28
Figure 26: Bleed-Down Plug for use in Unloading Utility Sections	Page 29
Figure 27: Unloading Valve Cartridge for use in Unloading Utility Sections	Page 30

Section Seal Identification and Section Seal Kits

Important: Do NOT lubricate O-Ring section seals prior to installation. Install dry.



O-Ring Section Seals are located in the Upstream side of V20/V26 Work Sections.

Figure 1. Section Seal Identification

Section Seal Kits

Ref No.	Part No.	Description	Quantity
	10749001	K-6156 Section Seal Kit (Between section seals listed below) ①	
1	21857001	O-Ring Section Seal (Power Core and Open Center Counterbore)	2
2	21733001	O-Ring Section Seal (Exhaust Cores)	3
3	21866001	O-Ring Section Seal (Load Sense and Solenoid Pilots)	3

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

Section Seal Replacement Precautions

- Do not lubricate the O-Ring section seals prior to installation. Compression of lubricants can distort the valve body causing spool bind.
- If the stud nuts are not torqued to the proper specifications, valve spools may bind or stick, or cause O-Ring seals to extrude.
- 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.

V20 & V26 [SOL] and [EPC] Solenoid Work Sections

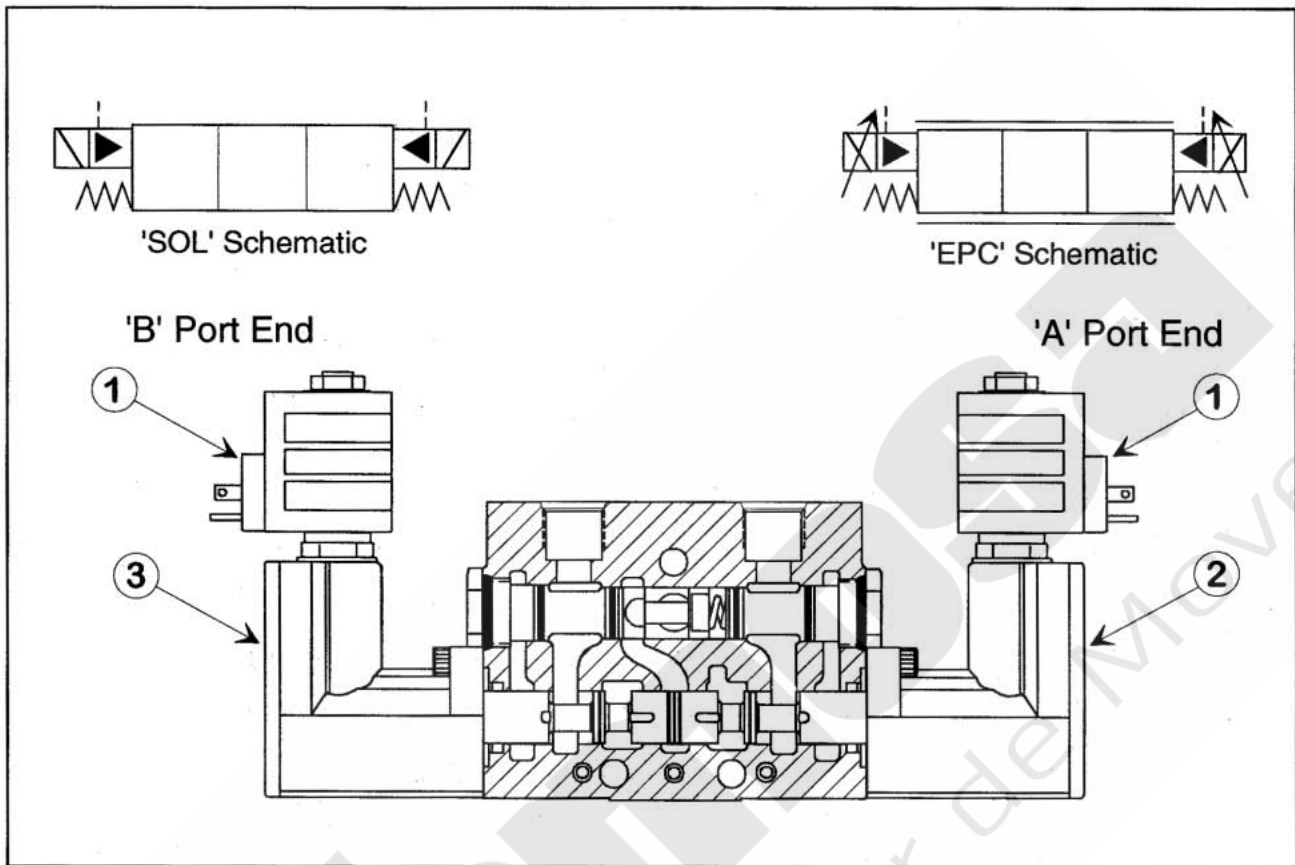


Figure 2. V20/V26 [SOL] and [EPC] Solenoid Work Sections (Model V26 Shown)

Ref No.	Part No.	Description	Quantity
1		K-CRT-SXXX On/Off Solenoid Cartridge (See Figure 8)	2
		K-CRT-EXXX Proportional Solenoid Cartridge (See Figure 9)	2
2	21477XXX	On/Off [SOL] Solenoid Actuator Assembly - 'A' Port End (See Figure 4) ①	1
	21475XXX	Proportional [EPC] Solenoid Actuator Assembly - 'A' Port End (See Figure 4) ①	1
3	21478XXX	On/Off [SOL] Solenoid Actuator Assembly - 'B' Port End (See Figure 4) ①	1
	21476XXX	Proportional [EPC] Solenoid Actuator Assembly - 'B' Port End (See Figure 4) ①	1

① Complete solenoid actuator part numbers are determined by the components used to assemble them. Since numerous options are available, contact the Gresen factory in Minneapolis for complete actuator part number.

V20/V26 [SOL] and [EPC] Solenoid Work Sections with Handle

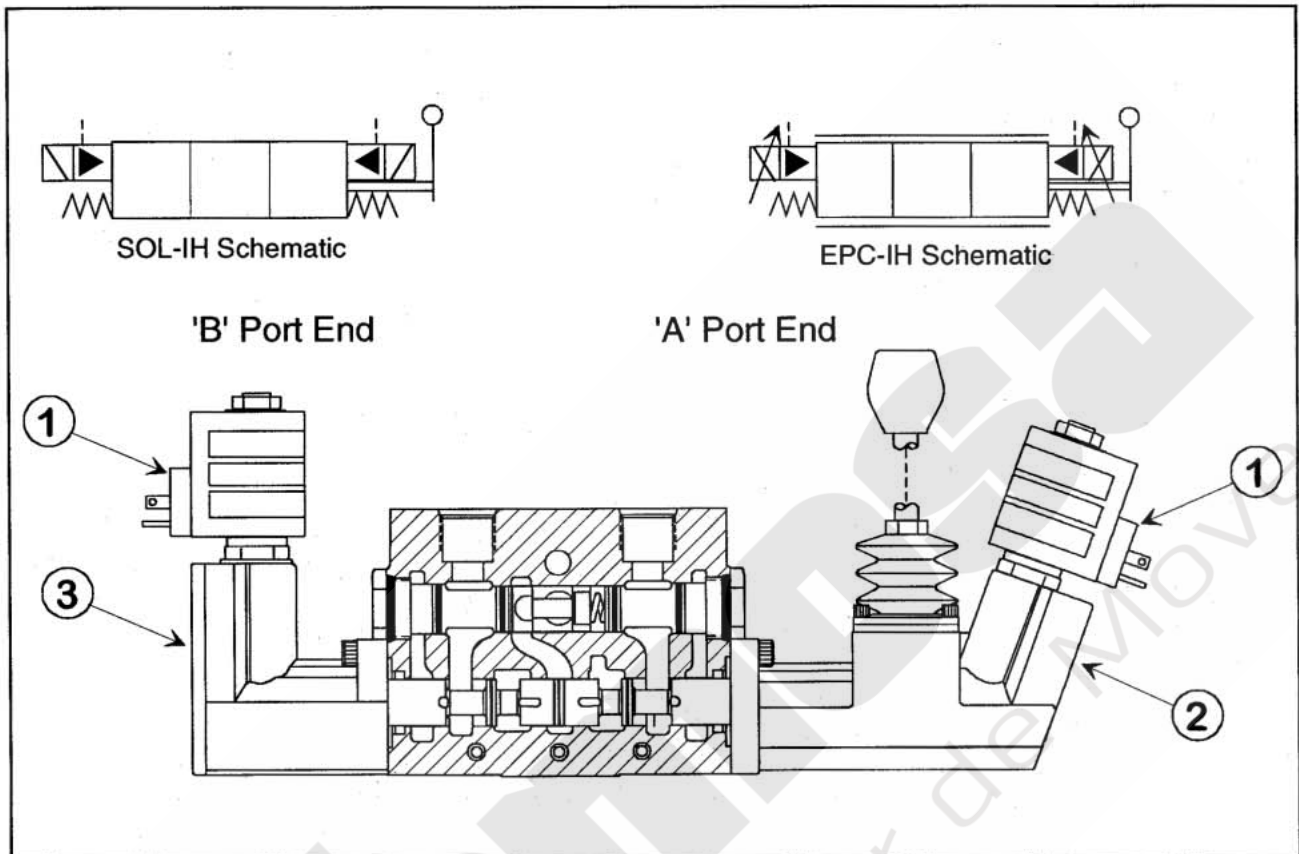


Figure 3. V20/V26 [SOL] and [EPC] Solenoid Work Sections with Handle (Model V26 Shown)

Ref No.	Part No.	Description	Quantity
1		K-CRT-SXXX On/Off Solenoid Cartridge (See Figure 8)	2
		K-CRT-EXXX Proportional Solenoid Cartridge (See Figure 9)	2
2	21561XXX	On/Off [SOL-IH] Solenoid Actuator Assembly - 'A' Port End (See Figure 5) ①	1
	21562XXX	Proportional [EPC-IH] Solenoid Actuator Assembly - 'A' Port End (See Figure 5) ①	1
3	21478XXX	On/Off [SOL] Solenoid Actuator Assembly - 'B' Port End (See Figure 4) ①	1
	21476XXX	Proportional [EPC] Solenoid Actuator Assembly - 'B' Port End (See Figure 4) ①	1

① Complete solenoid actuator part numbers are determined by the components used to assemble them. Since numerous options are available, contact the Gresen factory in Minneapolis for complete actuator part number.

[SOL] and [EPC] Solenoid Actuators

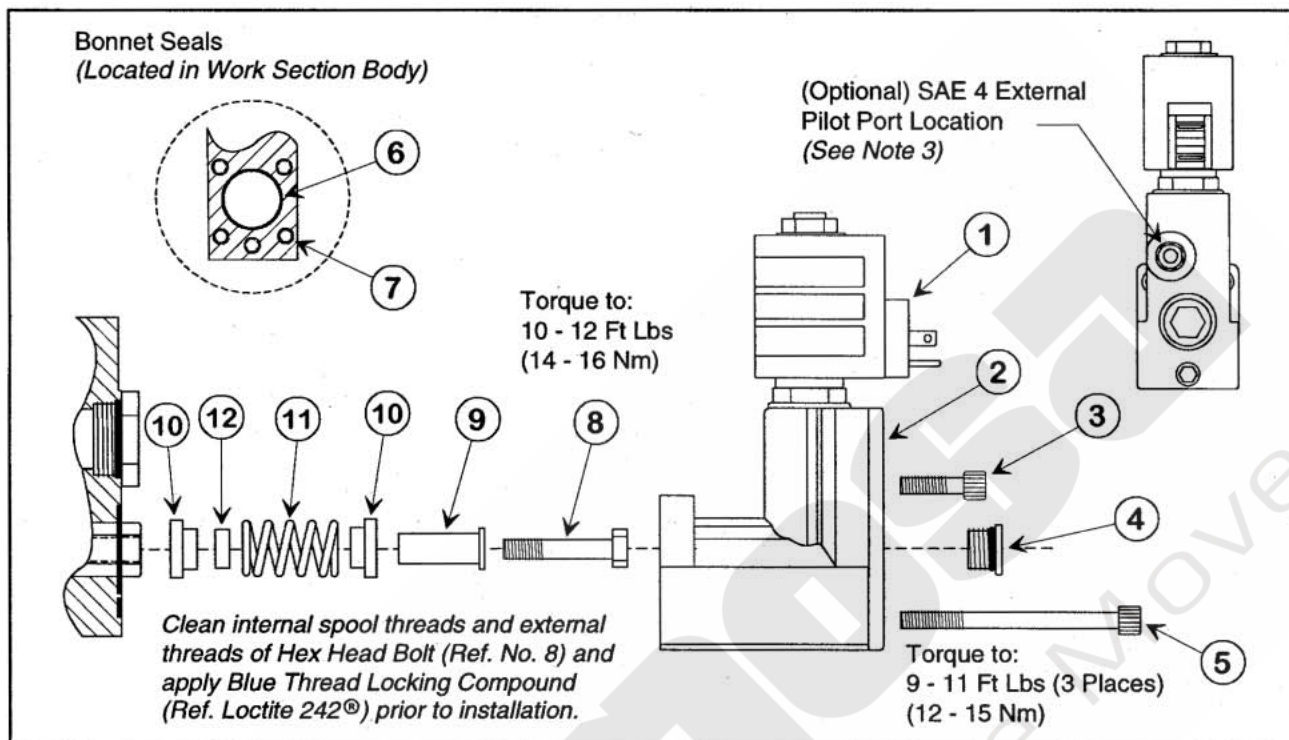


Figure 4. [SOL] and [EPC] Solenoid Actuators

Ref No.	Part No.	Description	Quantity
1	16081001	K-6266 Bonnet Seal Kit (Kit Includes Items 6 and 7 Only) ①	1
		K-CRT-SXXX [SOL] Solenoid Cartridge Kits (See Page 11 for Options)	1
		K-CRT-EXXX [EPC] Solenoid Cartridge Kits (See Page 12 for Options)	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)

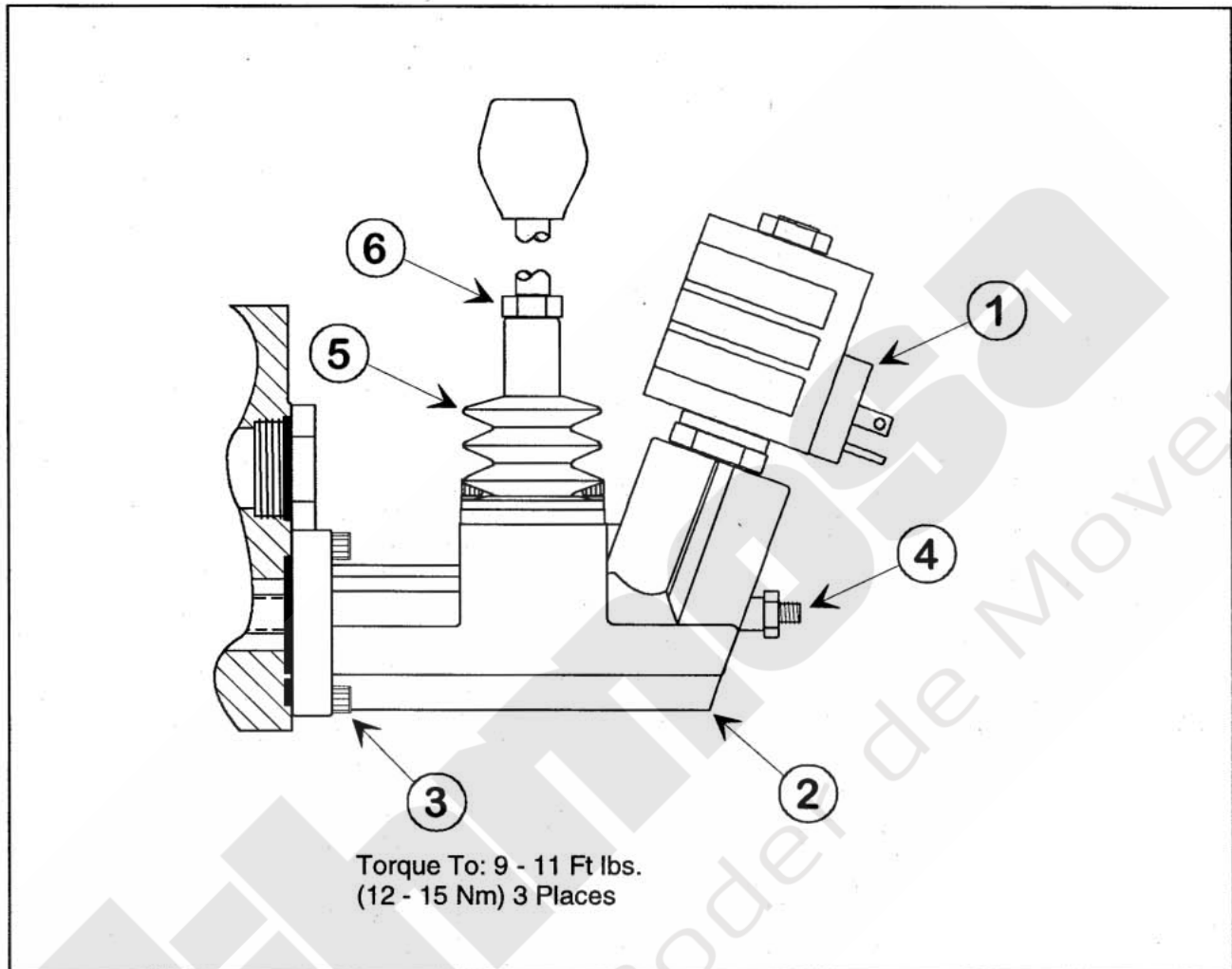


Figure 5. [SOL-IH] and [EPC-IH] Solenoid Actuators (with Handle)

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

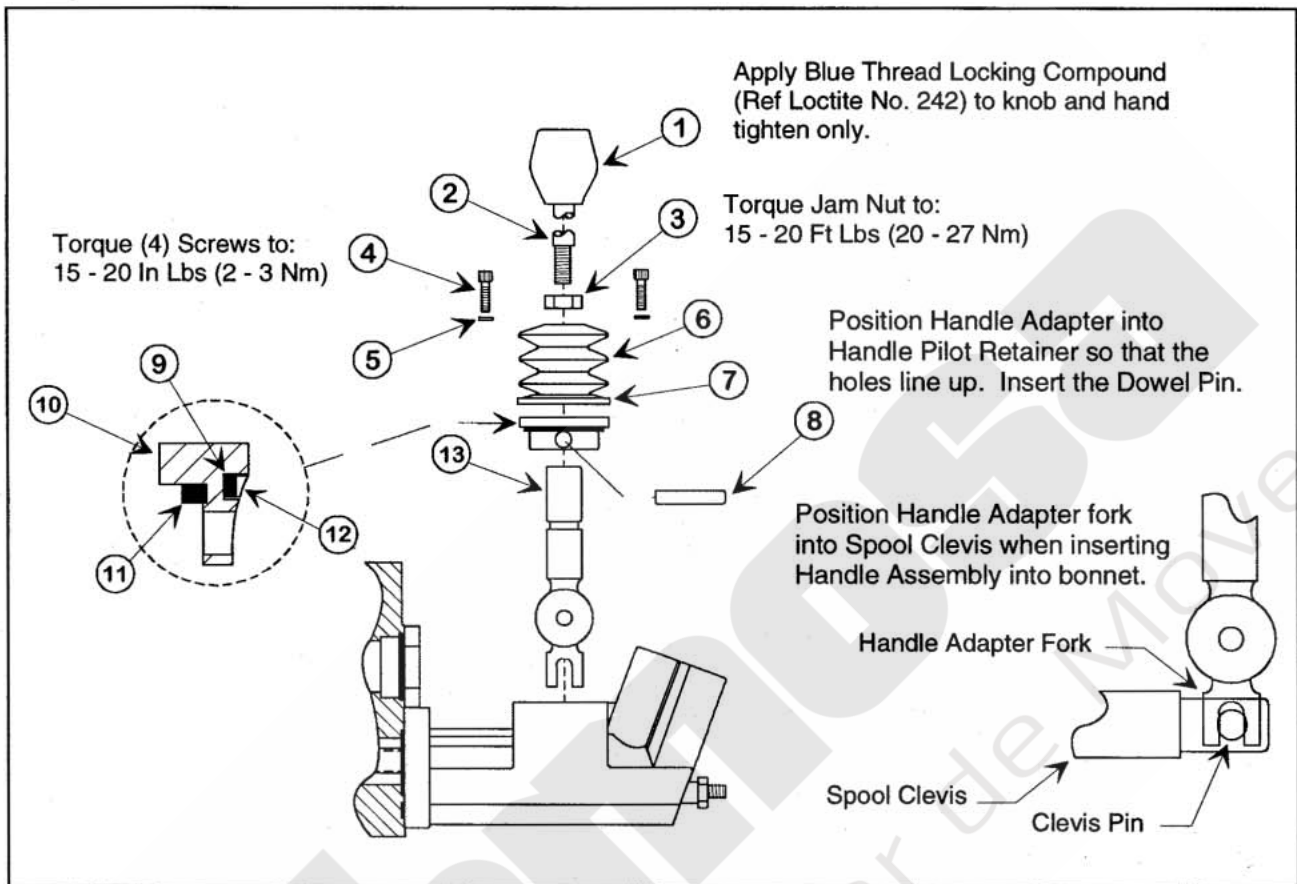


Figure 6. [SOL-IH] and [EPC-IH] Handle Assembly

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	07028001	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

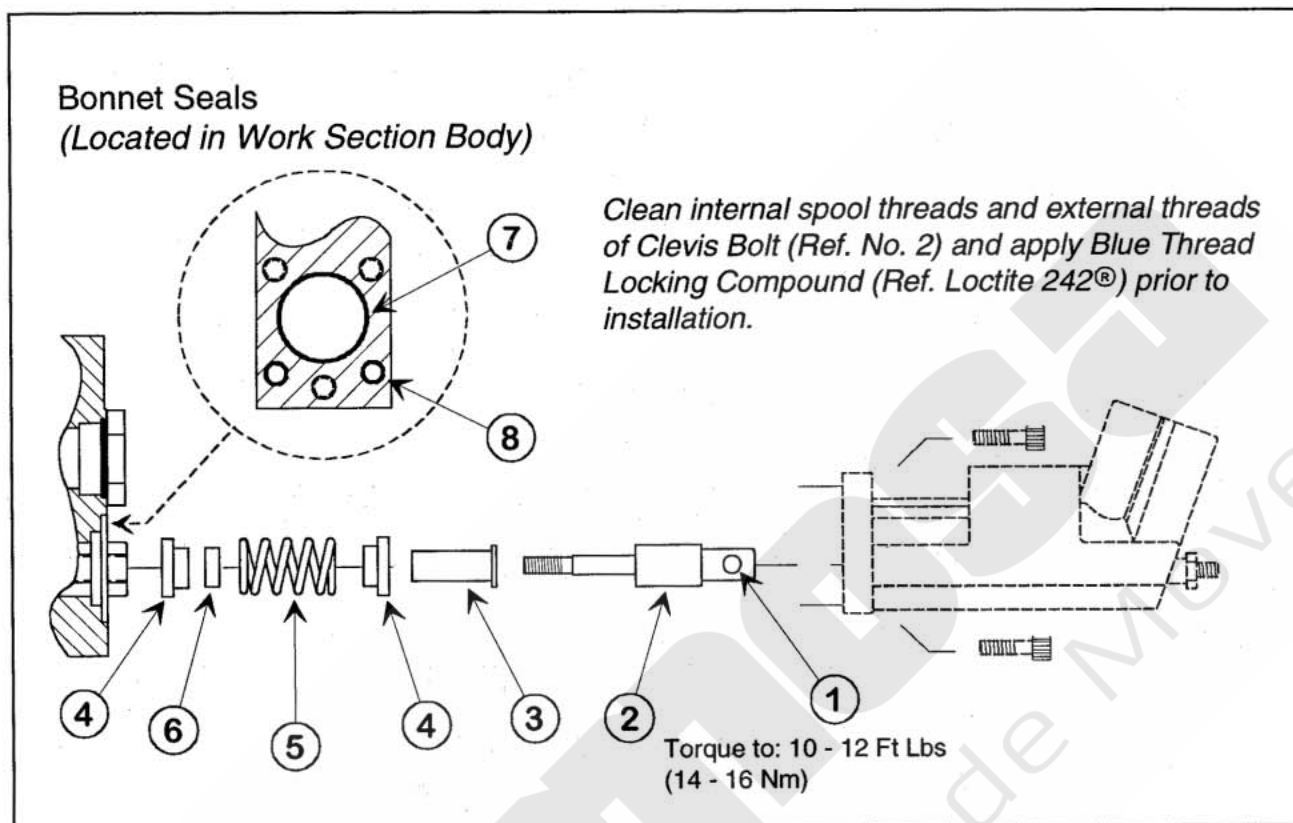


Figure 7. [SOL-IH] and [EPC-IH] Solenoid Bonnet Assembly

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 (Served in K-6277 Actuator Service Kit) ①	1
8	07773001	O-Ring Seal (Served 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.

(K-CRT-SXXX) On/Off Solenoid Cartridge Kits

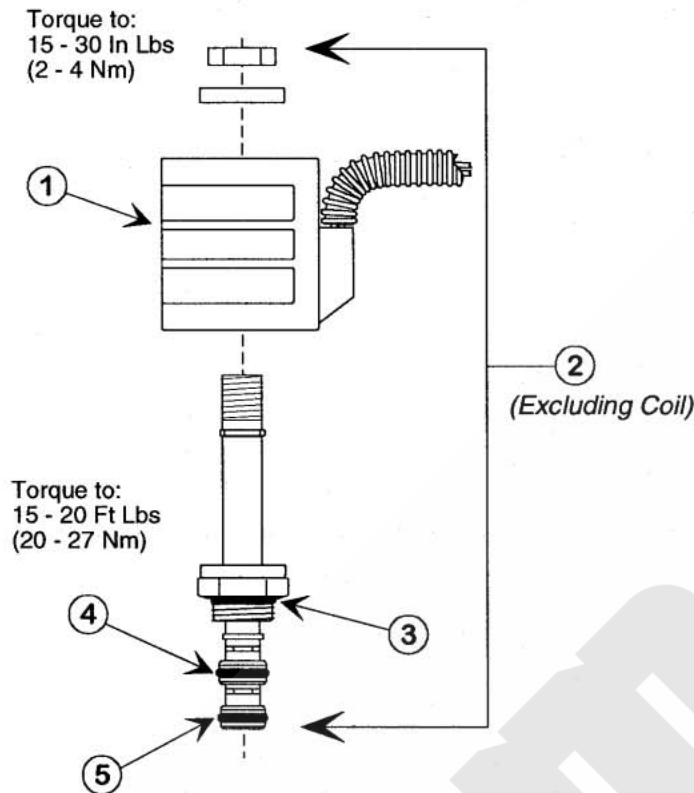


Figure 8. On/Off [SOL] Solenoid Cartridges

Installation Instructions for [SOL] Cartridges

- Step 1.** Bonnet cavities **MUST** be clean prior to installing the Solenoid Cartridge. Remove the bonnet and flush 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 bonnet 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).

Service Parts List

Complete Cartridge Kits	Coil Connector Type ④	Ref No. 1 (Coil Kits) ①④	Ref No. 2 (Tube Kit) ②	Ref No. 3 (O-Ring) ③	Ref No. 4 (O-Ring) ③	Ref No. 5 (O-Ring) ③
K-CRT-S12F	12" Wire Leads	K-6260	K-6263	02706001	01091001	07828001
K-CRT-S24F	12" Wire Leads	K-6261	K-6263	02706001	01091001	07828001
K-CRT-S12D	43650 DIN	K-6230	K-6263	02706001	01091001	07828001
K-CRT-S24D	43650 DIN	K-6231	K-6263	02706001	01091001	07828001
K-CRT-S12W	Weather Pack®	K-6278	K-6263	02706001	01091001	07828001
K-CRT-S24W	Weather Pack®	K-6279	K-6263	02706001	01091001	07828001
K-CRT-S12S	1/4" Male Spade	K-6280	K-6263	02706001	01091001	07828001
K-CRT-S24S	1/4" Male Spade	K-6264	K-6263	02706001	01091001	07828001
K-CRT-S12H	Deutsch DT04-2P	K-6292	K-6263	02706001	01091001	07828001
K-CRT-S24H	Deutsch DT04-2P	K-6293	K-6263	02706001	01091001	07828001

① The Coil Kits (No. 1) listed above include the connector type indicated.

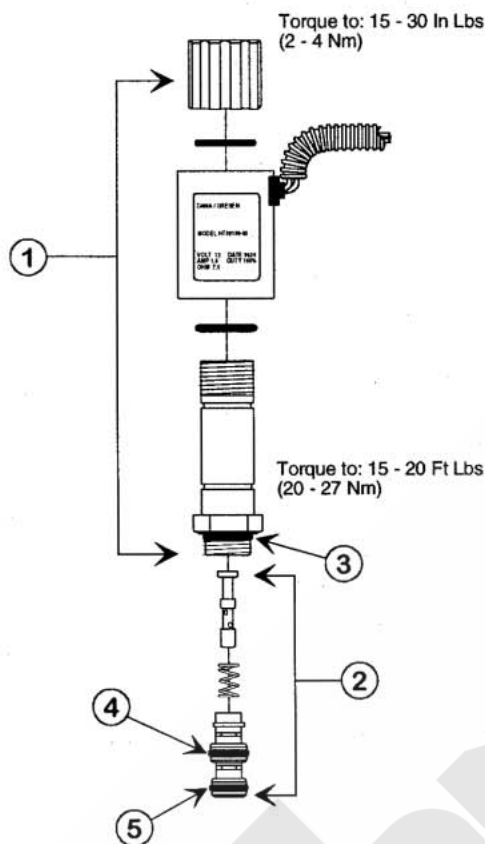
② K-6263 Cartridge Tube Kit includes the Cartridge Tube, Washer, Coil Nut and O-Ring Seals. These parts are not sold separately.

③ Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.

④ Refer to **Figure 10** for Connector Type Identification.

(K-CRT-EXXX) Proportional Solenoid Cartridge Kits

Installation Instructions for [EPC] Cartridges



Step 1. Bonnet cavities **MUST** be clean prior to installing the Solenoid Cartridge. Remove the bonnet and flush if necessary.

Step 2. Install O-Rings (No's. 4 and 5) on Sleeve (No. 2). Carefully insert spool into sleeve as shown.

Hold the assembly between the thumb and fore finger and lightly shake back and forth. Verify that the spool moves freely inside the sleeve without dragging or sticking. If it does, insert spring.

If it doesn't, remove spool and inspect both the spool and inner sleeve surfaces for burrs or contamination. Once problem is located, correct it, and return the spool and spring to the sleeve and repeat.

Step 3. Lightly oil Sleeve Assembly (No. 2) and insert into bonnet 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 9. Proportional [EPC] Solenoid Cartridges

Service Parts List

Complete Cartridge Kits	Coil Connector Type ④	Ref No. 1 (Coil Kits) ①④	Ref No. 2 (Insert Kit) ②	Ref No. 3 (O-Ring) ③	Ref No. 4 (O-Ring) ③	Ref No. 5 (O-Ring) ③
K-CRT-E12F	12" Wire Leads	K-6270	CK-6198	02706001	01091001	07828001
K-CRT-E24F	12" Wire Leads	K-6271	CK-6198	02706001	01091001	07828001
K-CRT-E12D	43650 DIN	K-6232	CK-6198	02706001	01091001	07828001
K-CRT-E24D	43650 DIN	K-6233	CK-6198	02706001	01091001	07828001
K-CRT-E12W	Weather Pack ®	K-6252	CK-6198	02706001	01091001	07828001
K-CRT-E24W	Weather Pack ®	K-6253	CK-6198	02706001	01091001	07828001
K-CRT-E12S	1/4" Male Spade	K-6283	CK-6198	02706001	01091001	07828001
K-CRT-E24S	1/4" Male Spade	K-6284	CK-6198	02706001	01091001	07828001
K-CRT-E12H	Deutsch DT04-2P	K-6294	CK-6198	02706001	01091001	07828001
K-CRT-E24H	Deutsch DT04-2P	K-6295	CK-6198	02706001	01091001	07828001

① The Coil Kits (No. 1) listed above include the connector type indicated.

② The Insert Sleeve, Spool, and Spring are **NOT** sold separately. They are serviced in **CK-6198** Cartridge Kit.

③ Buna-N seals are standard for all **Gresen** valve assemblies. Contact the Gresen factory in Minneapolis for optional seals.

④ Refer to **Figure 10** for Connector Type Identification.

Solenoid Coil Connector Type Identification

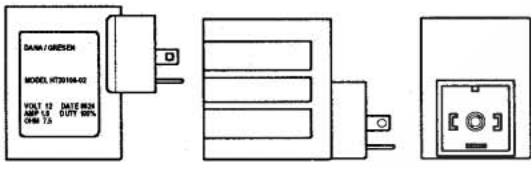
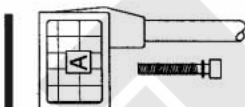
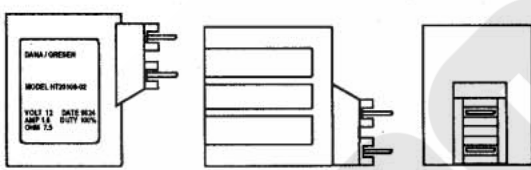
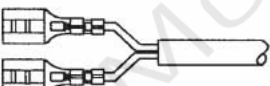
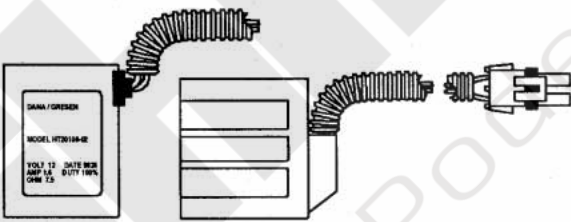
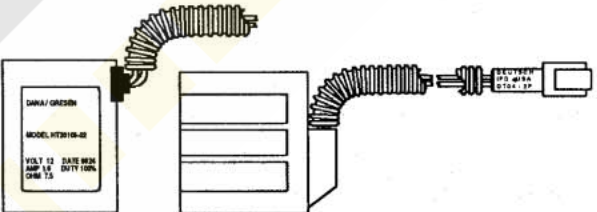
Cartridge Type (from Pages 11 and 12)	Coil Connector Type (On/Off Coils Pictured Below)	Mating Connector Part Number
K-CRT-S12D K-CRT-S24D K-CRT-E12D K-CRT-E24D	 'EPC' 'SOL' 43650 DIN (Hirschmann®)	 24790001 Connector Assembly
K-CRT-S12S K-CRT-S24S K-CRT-E12S K-CRT-E24S	 'EPC' 'SOL' 1/4" Spade Terminals	 24473002 Spade Terminal (2 Req.)
K-CRT-S12W K-CRT-S24W K-CRT-E12W K-CRT-E24W	 'EPC' 'SOL' Weather Pack®	 22247001 Connector Assembly
K-CRT-S12H K-CRT-S24H K-CRT-E12H K-CRT-E24H	 'EPC' 'SOL' Deutsch ® DT04 - 2P	(Not Supplied by Gresen) Deutsch ® DT06 - 2S

Figure 10. Solenoid Coil Connectors

Bonnet Conversion for 2-Way, 2-Position Operation

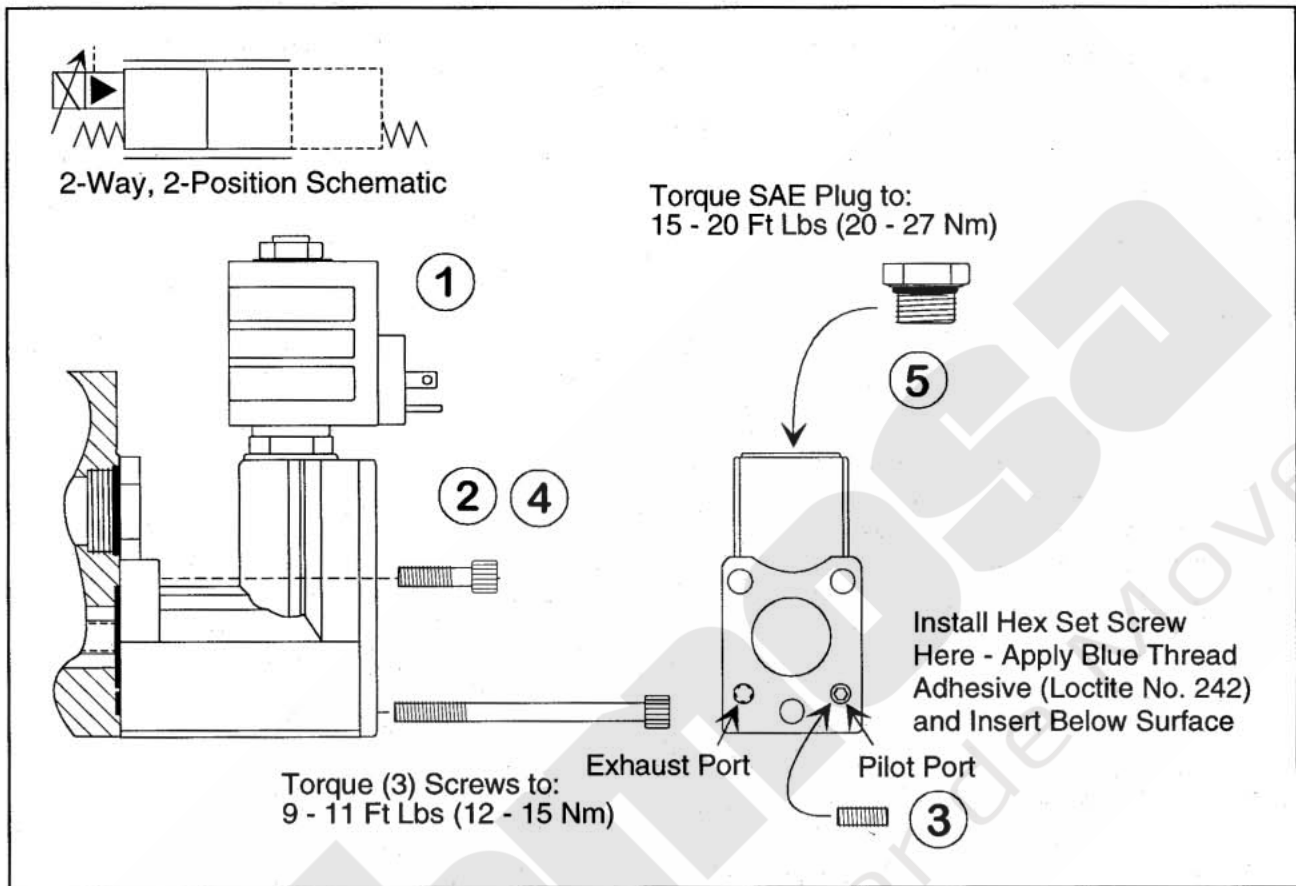


Figure 11. Solenoid Bonnet Conversion

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
2	21472002	K-CRT-XXXX Solenoid Cartridge	1
3	09276408	Solenoid Bonnet	1
4	06879001	Hex Set Screw (1/4 - 20 X .500) ①	1
		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

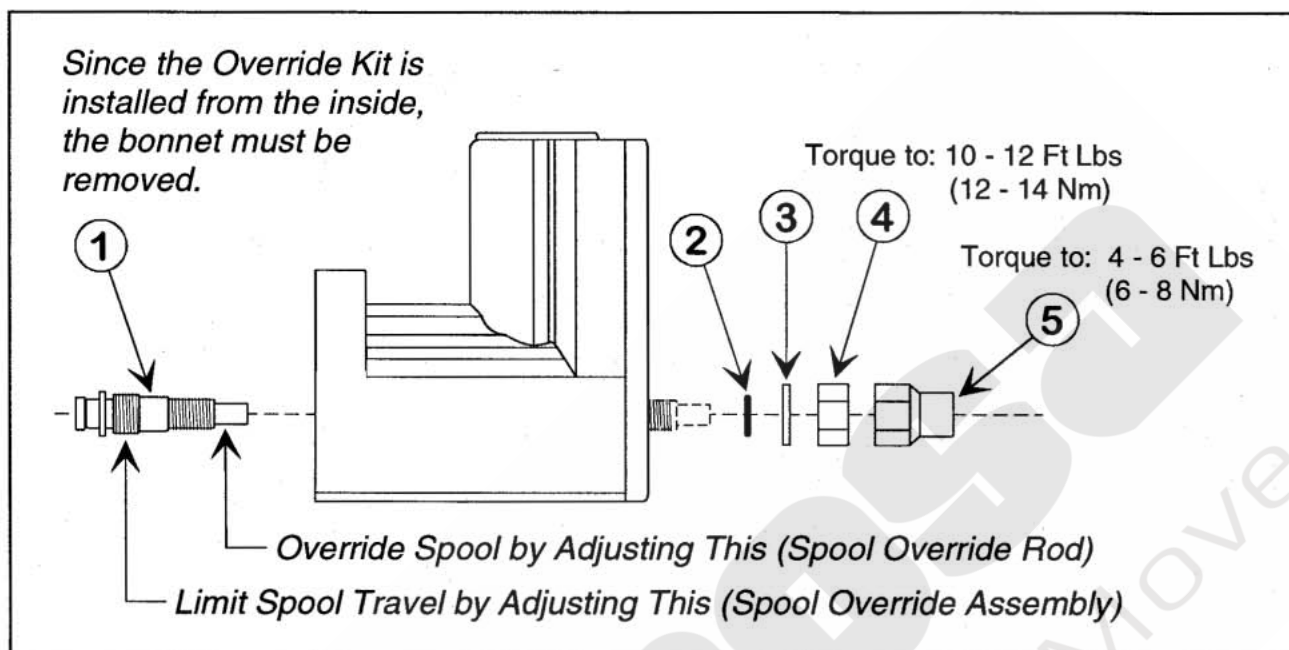


Figure 12. Solenoid Bonnet Spool Travel Limiter and Spool Overrides

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

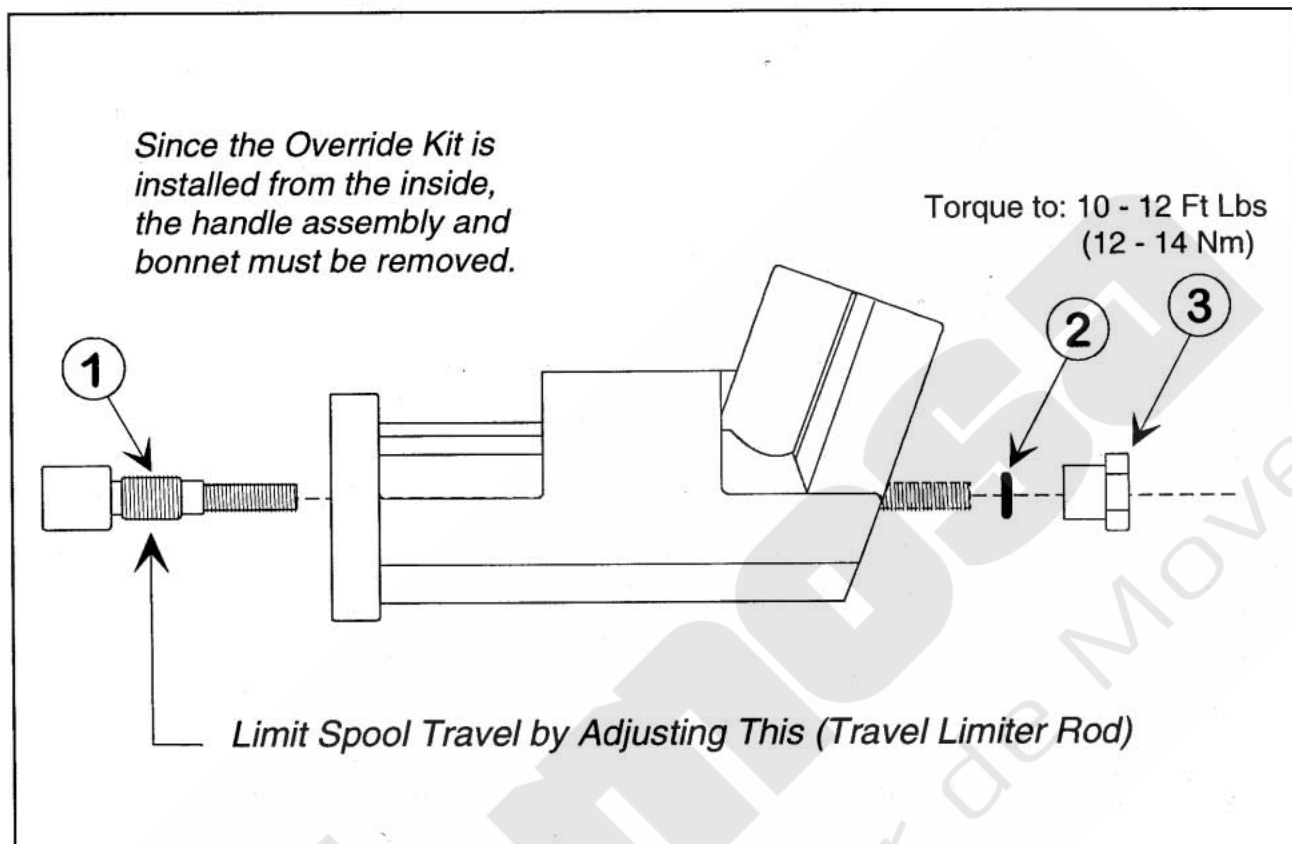


Figure 13. Solenoid Bonnet (with Handle) Spool Travel Limiter

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.

Open Center Utility Sections

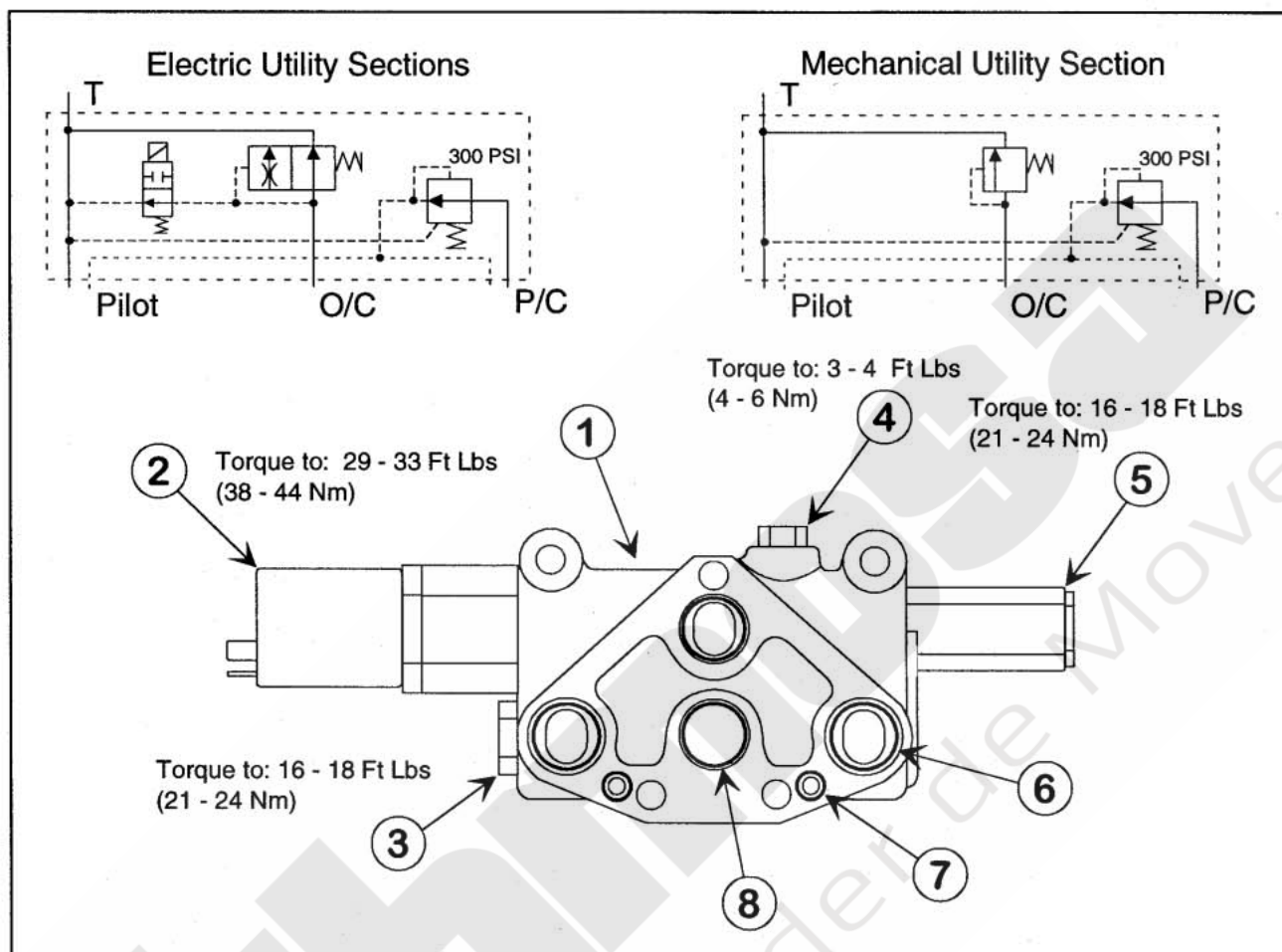


Figure 14. Open Center Utility Section with Solenoid-Operated Build Up Valve Cartridge

(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 3/4" 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

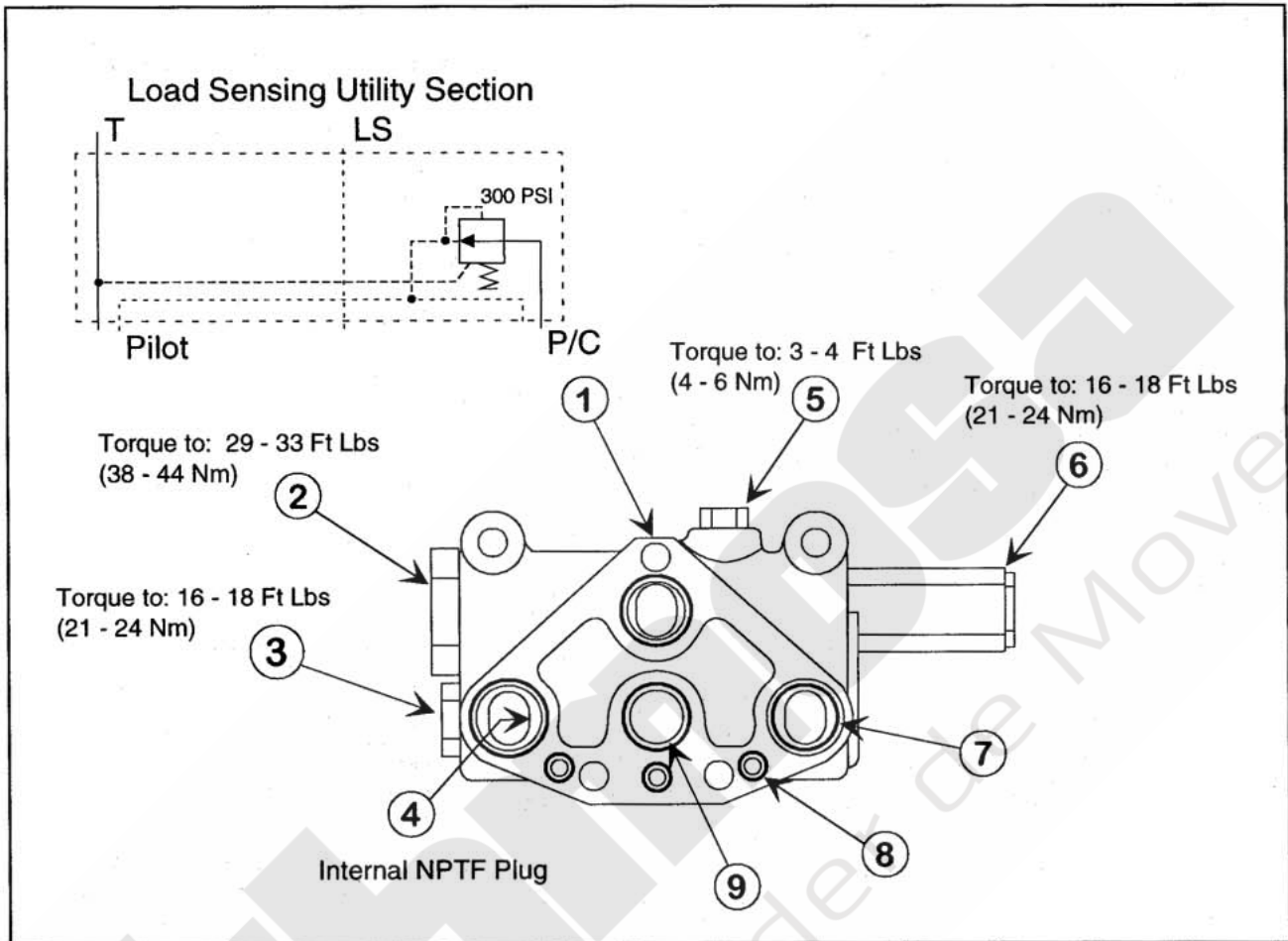


Figure 15. Closed Center (Load Sensing) Utility Section

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

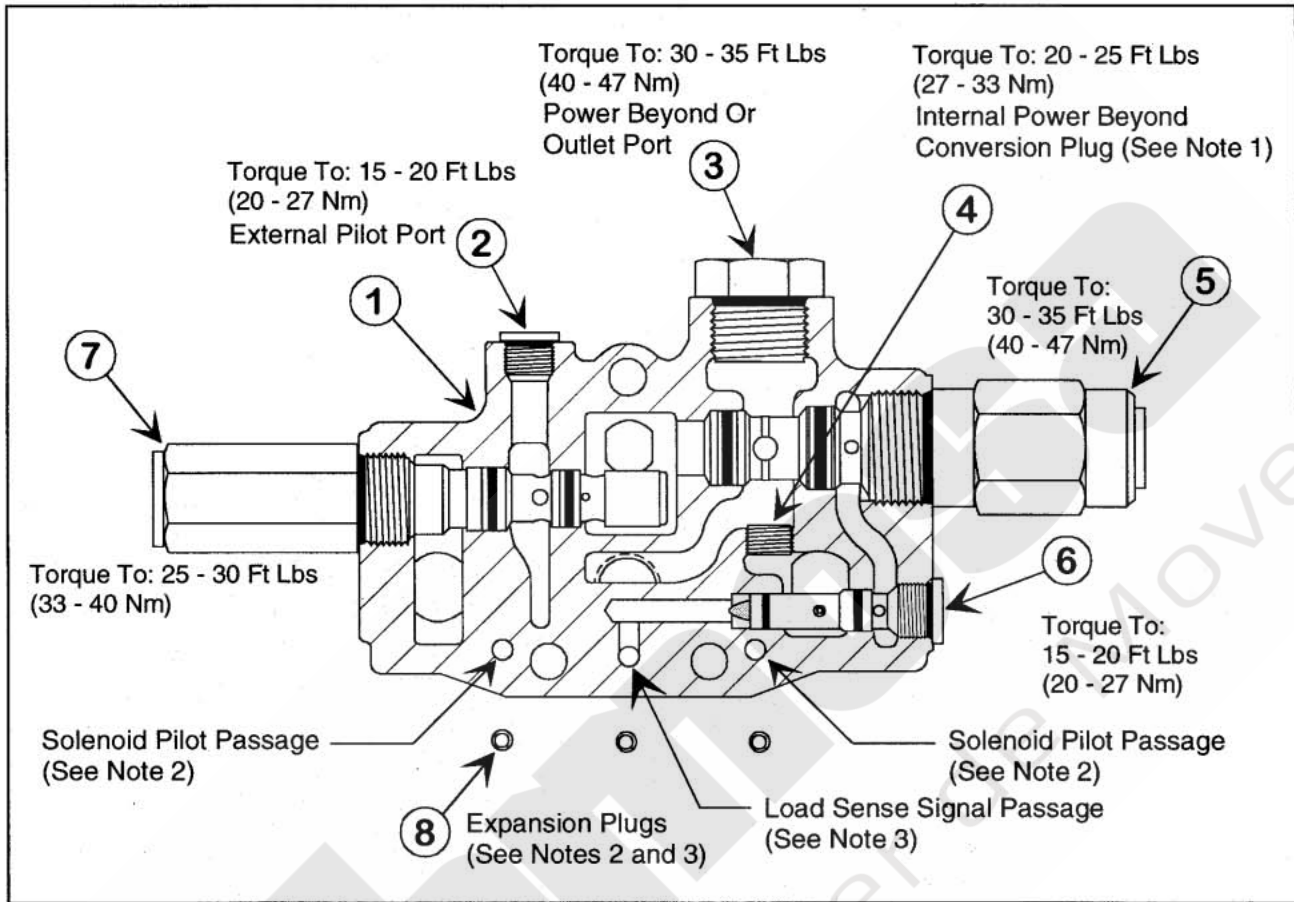


Figure 16. Unloading Utility Section

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	23343001	Unloading Valve Cartridge (See Figure 27)	1
6	23337001	Bleed-Down Plug (See Figure 26)	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

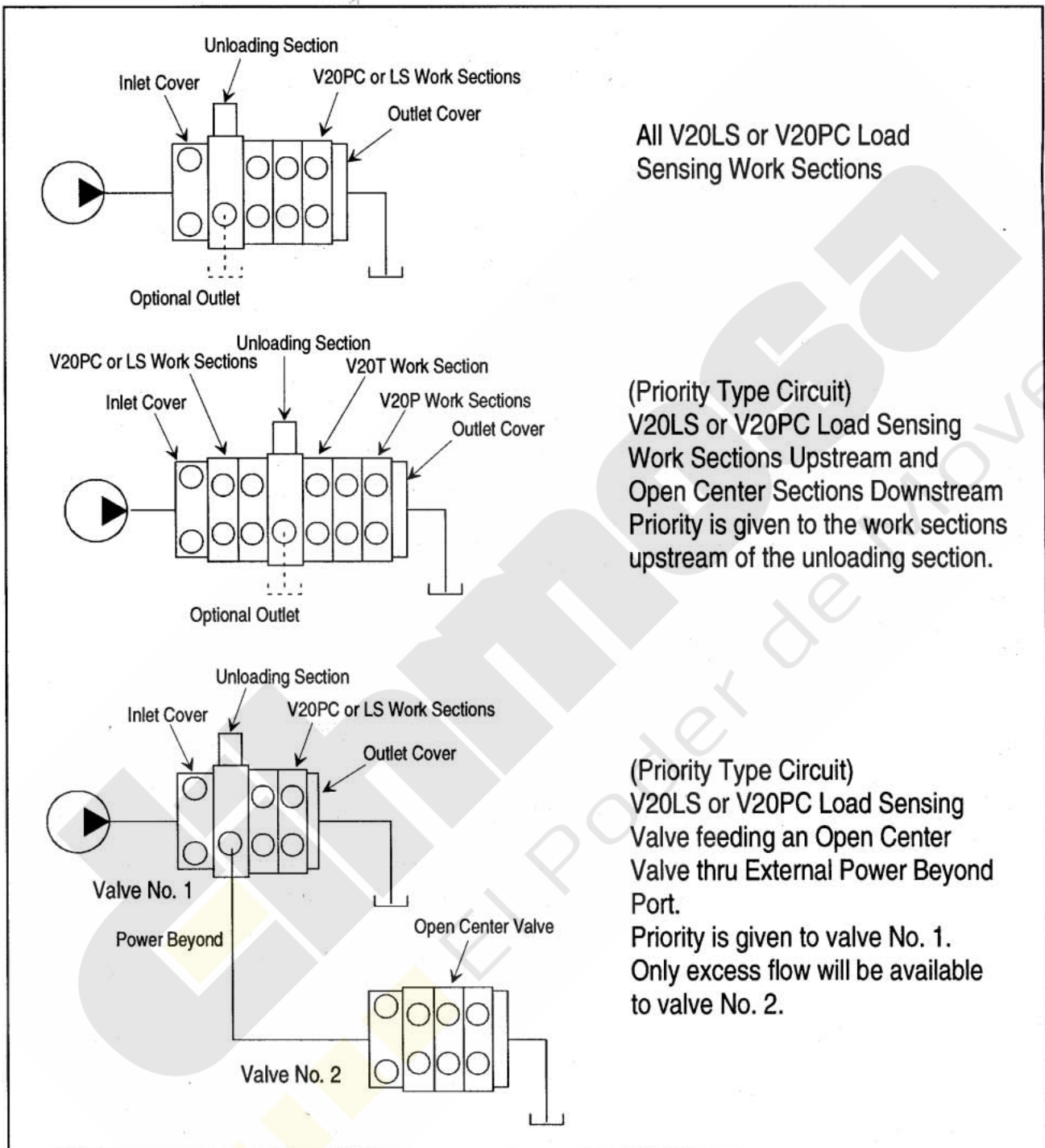


Figure 17. Unloading Section Applications

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

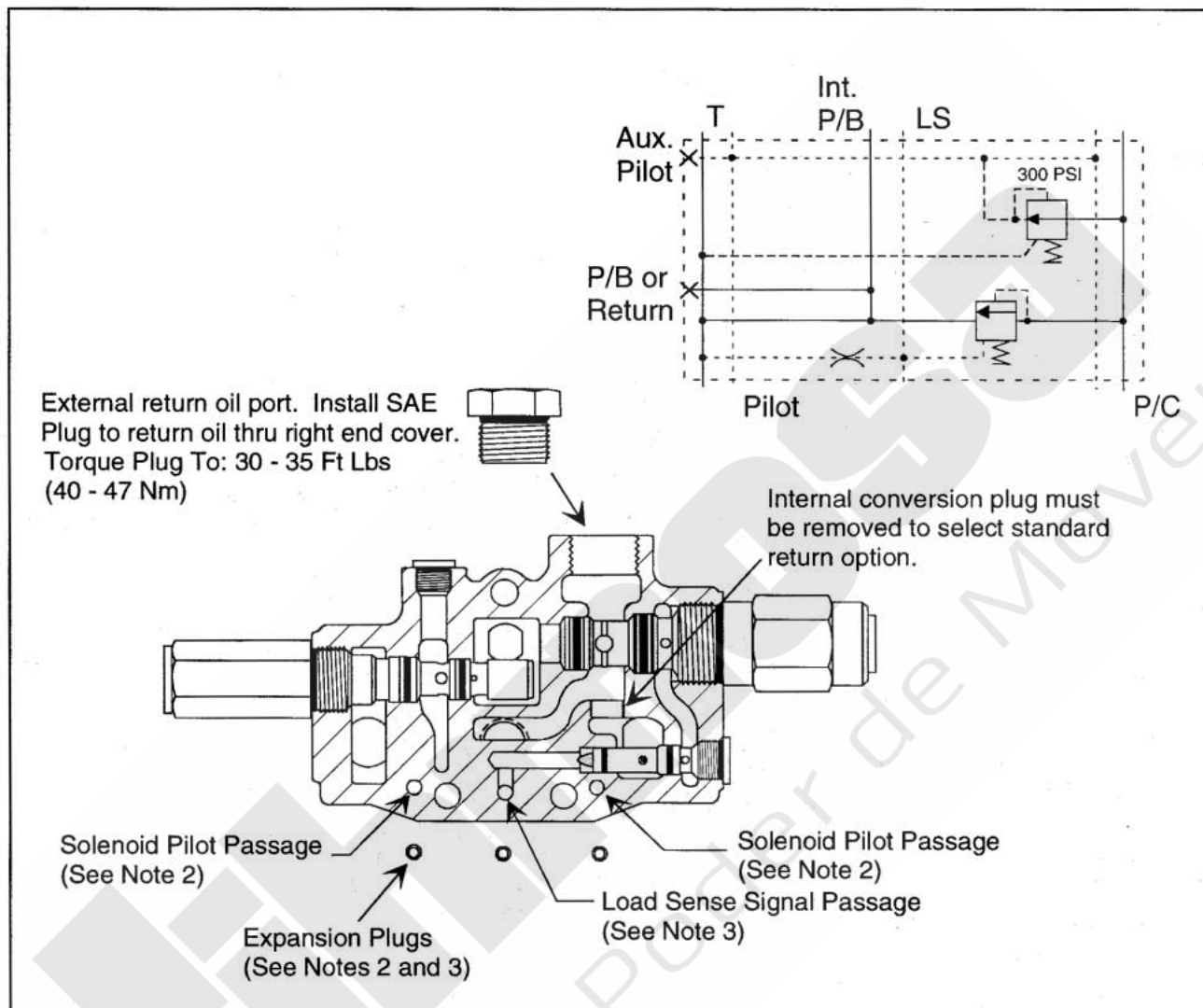


Figure 18. Unloading Utility Section (Selecting the Standard Return Option)

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

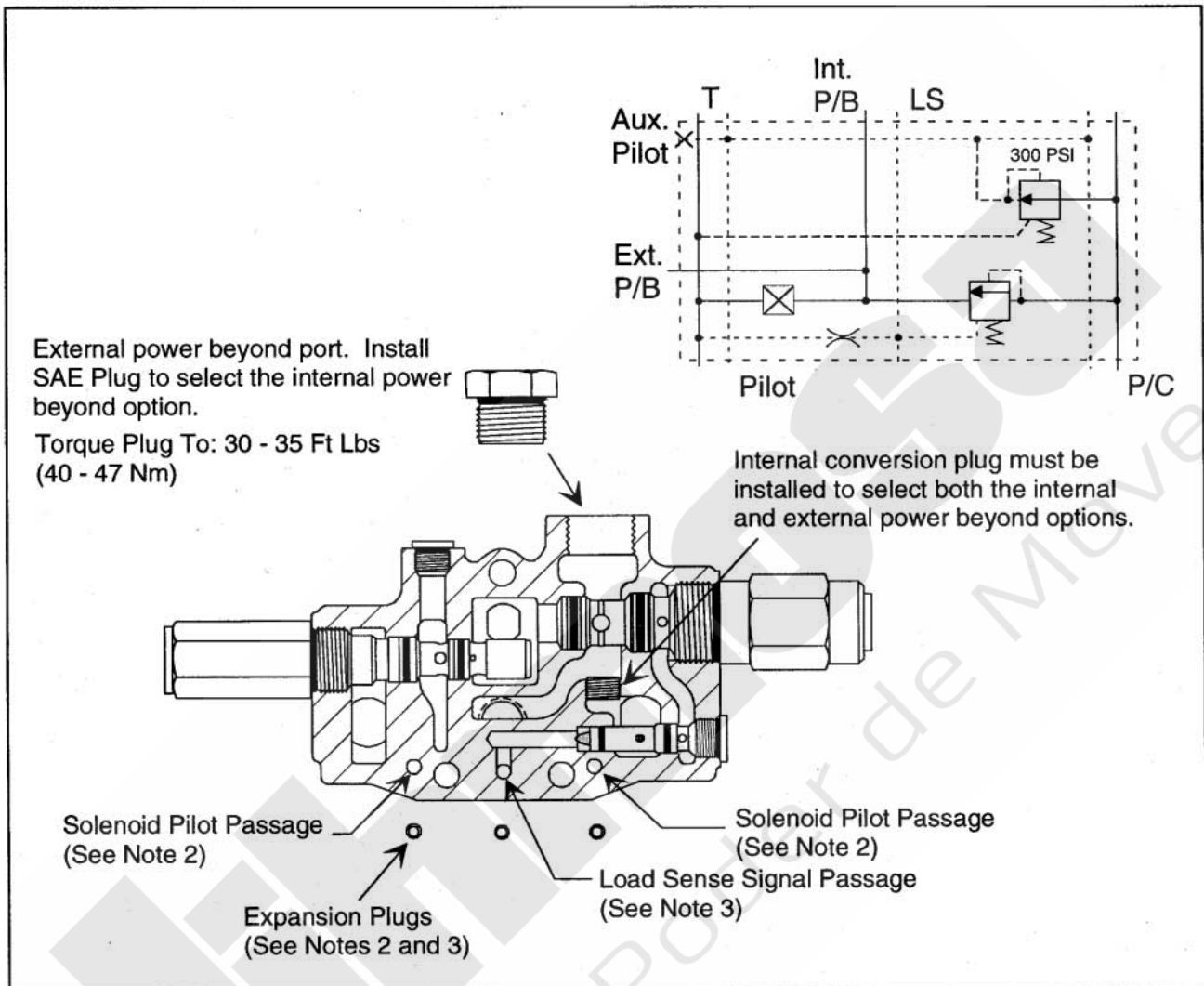


Figure 19. Unloading Utility Section (Selecting the Power Beyond Option)

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

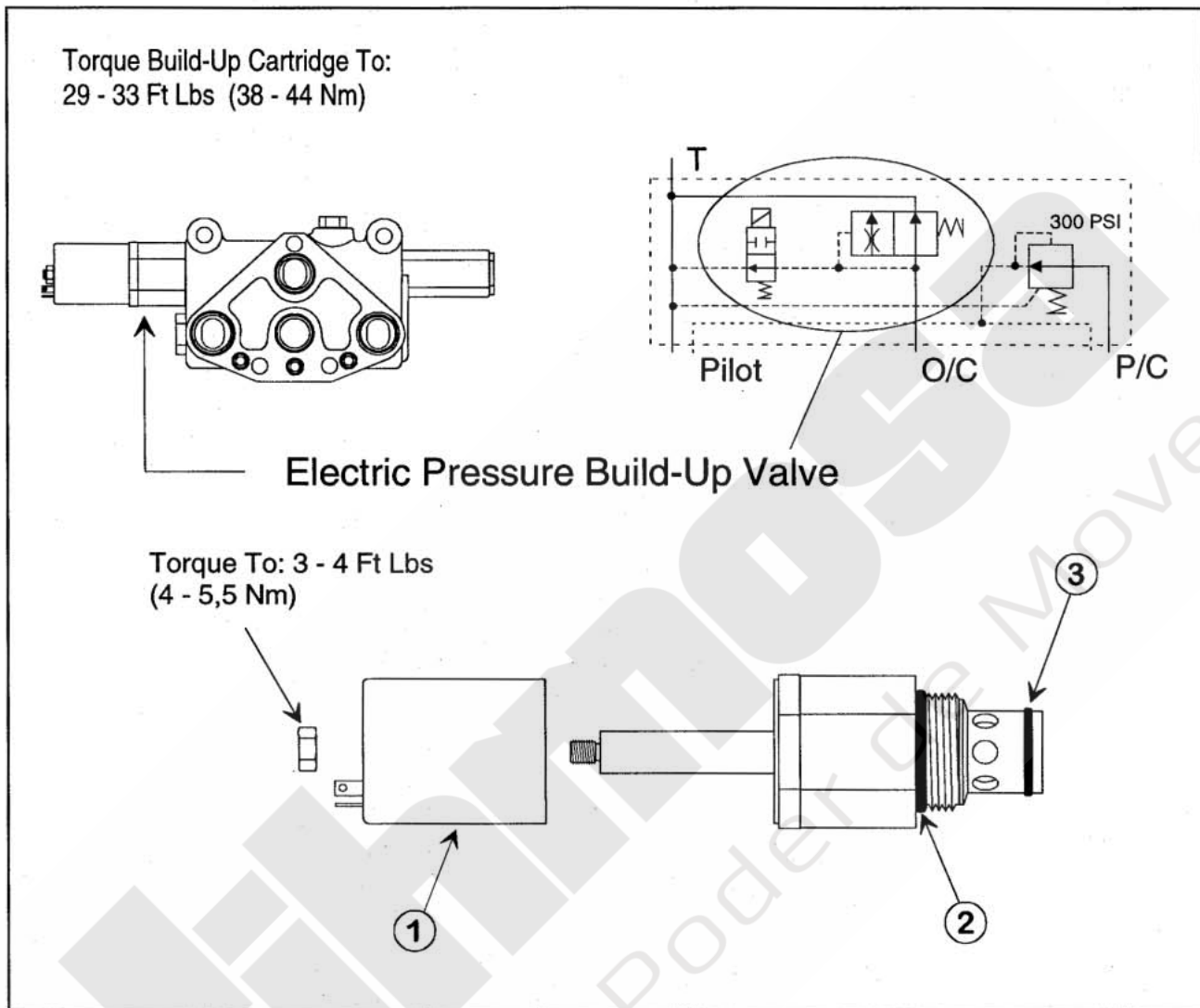


Figure 20. Solenoid-Operated Pressure Build-Up Valve Cartridges

Ref No.	Part No.	Description	Quantity
1	12968001	CK-6177 12 VDC Build-Up Cartridge, Complete	1
	12969001	CK-6178 24 VDC Build-Up Cartridge, Complete	
	12052001	K-6184 Cartridge Seal Kit	
	08512001	12 VDC Replacement Coil	
	08511001	24 VDC Replacement Coil	
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

Torque Build-Up Cartridge To:
29 - 33 Ft Lbs (38 - 44 Nm)

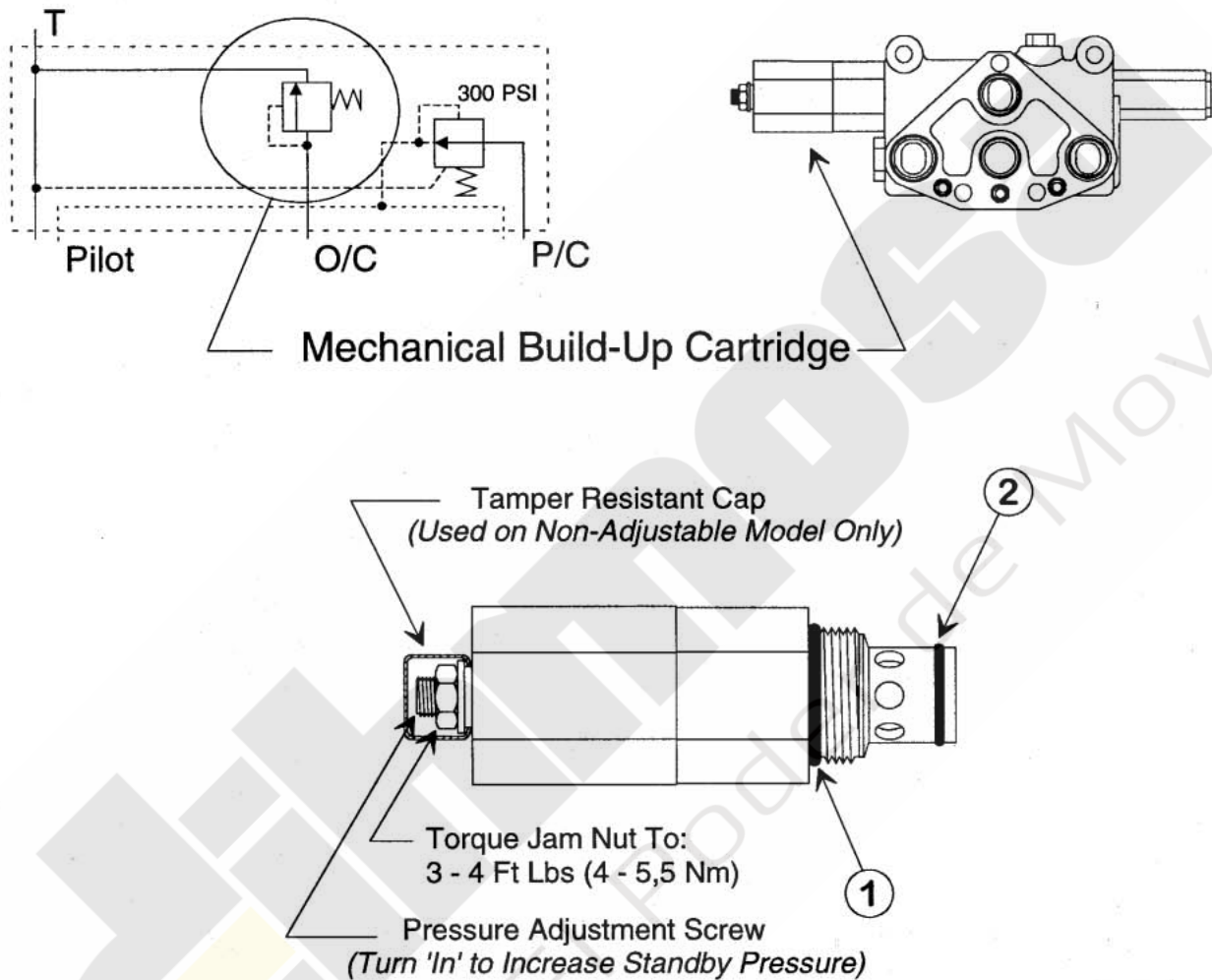


Figure 21. Mechanical Pressure Build-Up Valve Cartridge

Ref No.	Part No.	Description	Quantity
	12970001	CK-6179 Mechanical (Continuous On) Build-Up Cartridge, Complete	
	12052001	K-6184 Cartridge Seal Kit ①	
1	09002018	O-Ring Seal (Serviced in K-6184 Cartridge Seal Kit) ①	1
2	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.

Power Beyond Sleeves for use in Utility Sections

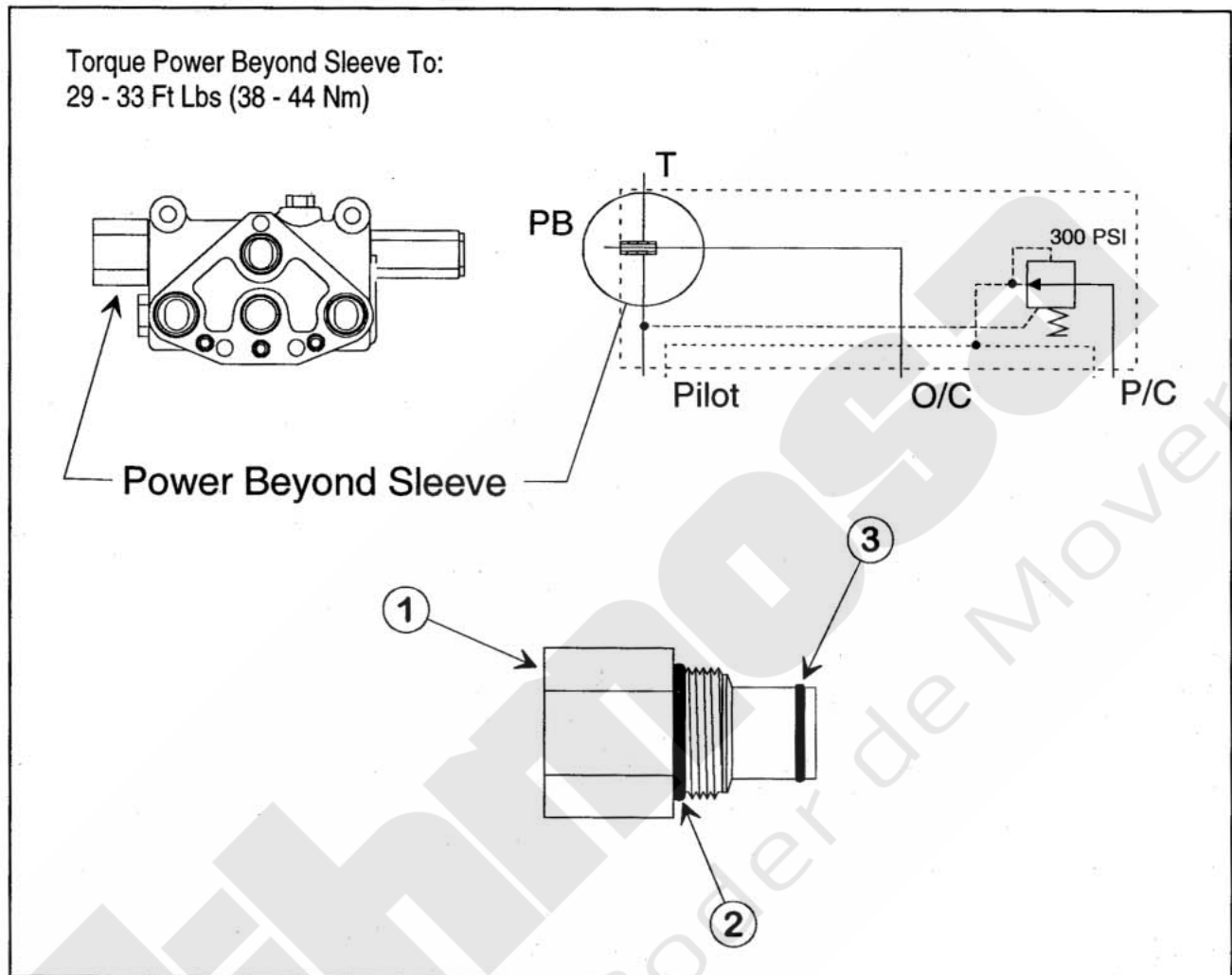


Figure 22. Power Beyond Sleeve for use in Utility Sections

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

Torque Closed Center Plug To:
29 - 33 Ft Lbs (38 - 44 Nm)

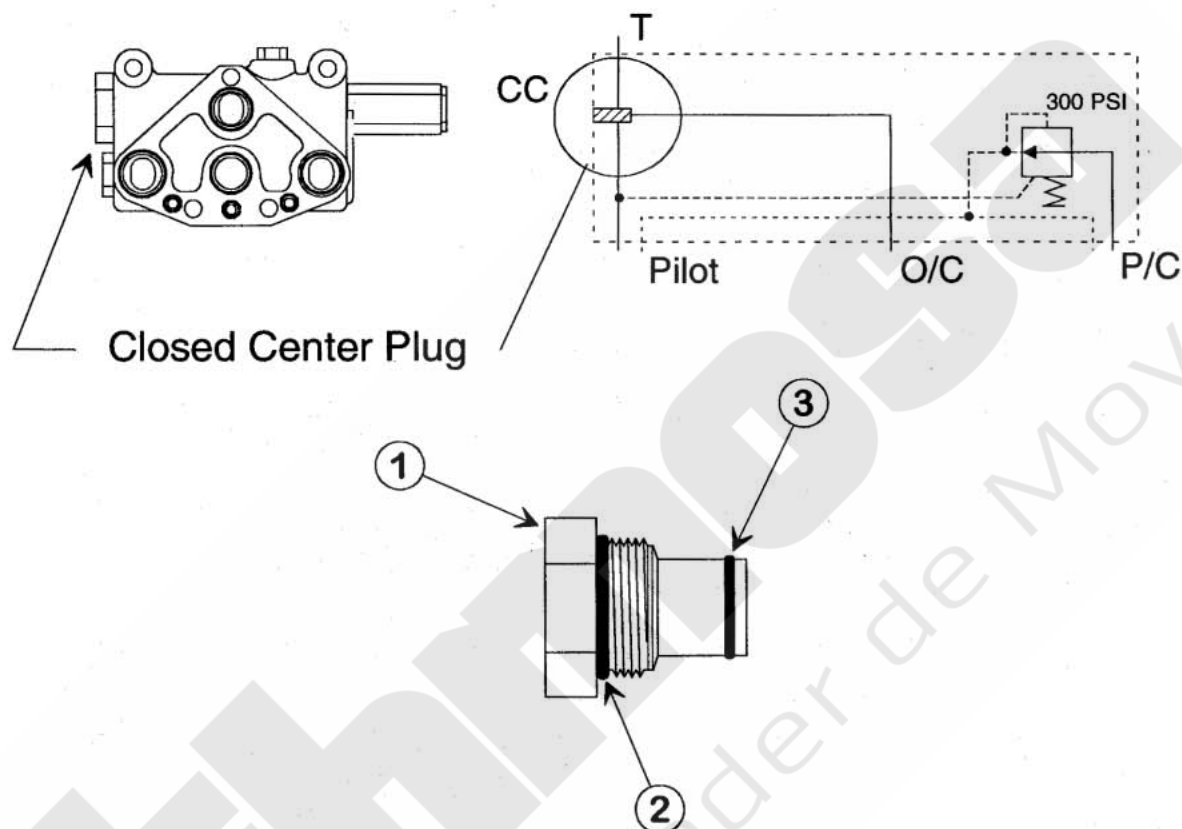


Figure 23. Closed Center Plug for use in Utility Sections

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])

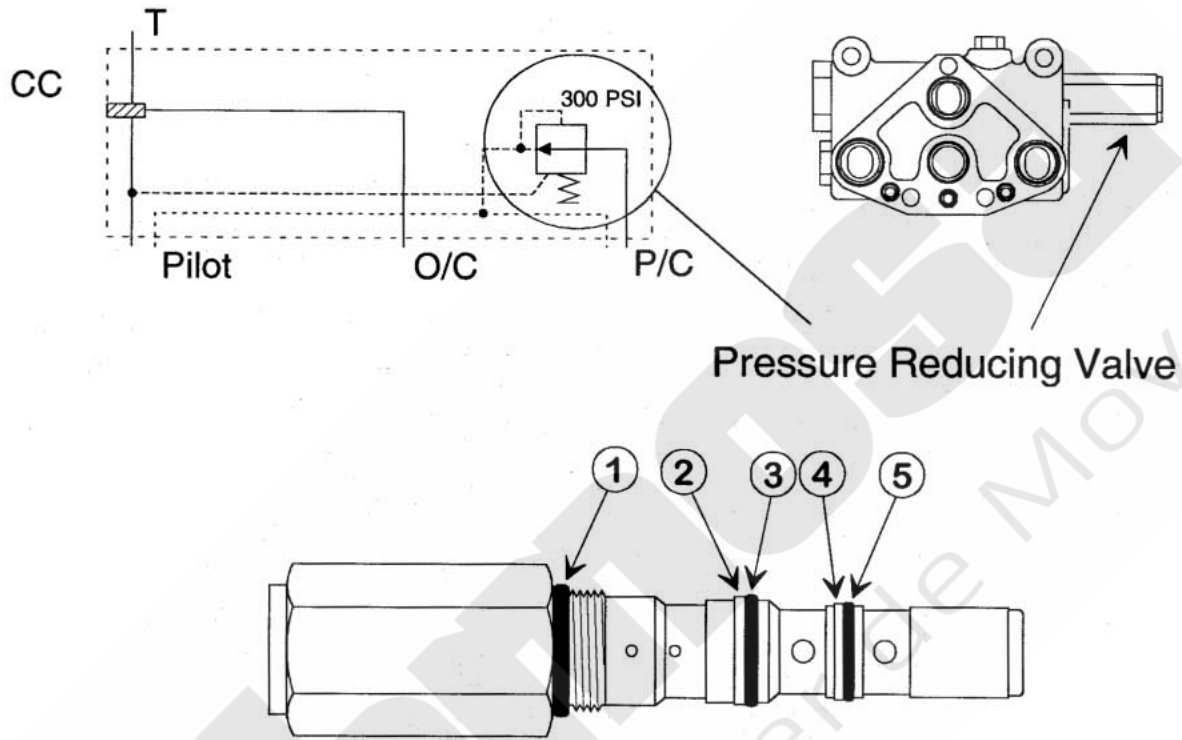


Figure 24. Pressure Reducing Valve Cartridge

Ref No.	Part No.	Description	Quantity
	08569001	K-28078 PRV Cartridge Seal Kit (Includes Items Listed Below, Plus Plug Seals)	
	12956001	CK-28096 Pressure Reducing Valve Cartridge Kit (300 PSI Cartridge), Complete	
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)	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)	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.

No Pressure Reducing Valve Plug

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

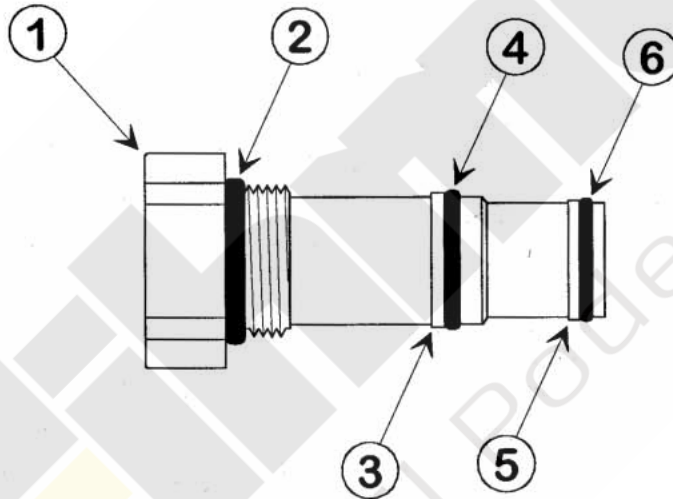
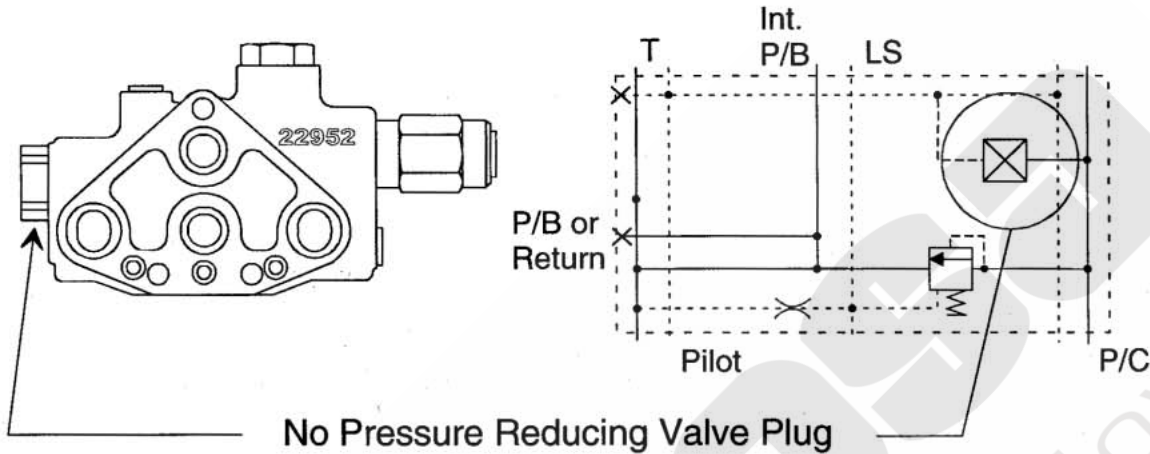


Figure 25. No Pressure Reducing Valve Plug

Ref No.	Part No.	Description	Quantity
	08569001	K-28078 PRV Cartridge Seal Kit (Includes Items Listed Below, Plus Plug Seals)	
	16123001	K-6297 No Pressure Reducing Valve Plug, Complete	
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)	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)	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.

Bleed-Down Plug for use in Unloading Utility Sections

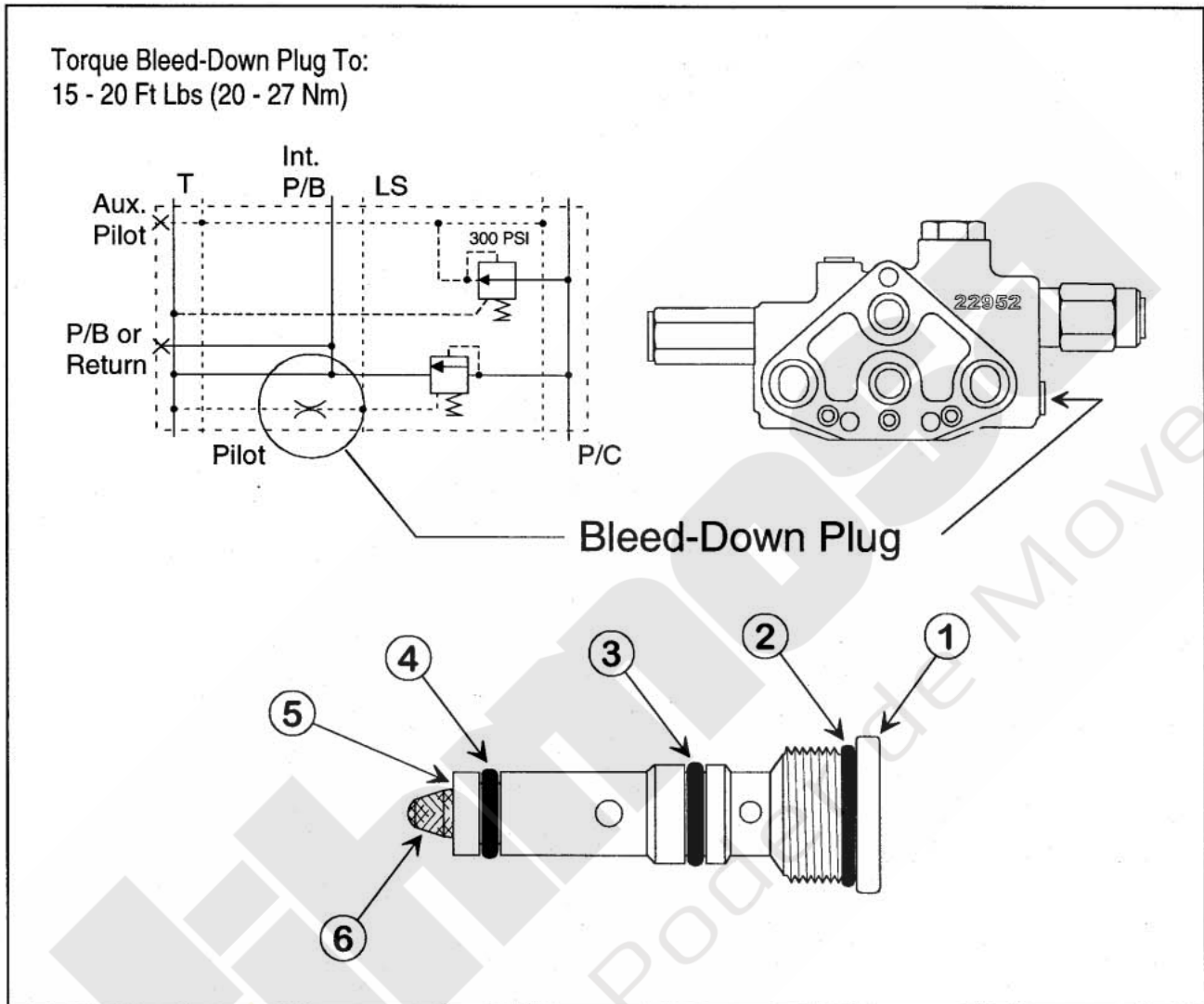


Figure 26. Bleed-Down Plug for use in Unloading Utility Sections

Ref No.	Part No.	Description	Quantity
	16082001	K-6268 Bleed-Down Plug Seal Kit ①	
	16133001	K-6236 Bleed-Down Plug, Complete	
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 (Serviced in K-6268 Plug Seal Kit) ①	1
4	23444001	O-Ring Seal (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

Torque Unloading Valve Cartridge To:
30 - 35 Ft Lbs [40 - 47 Nm]

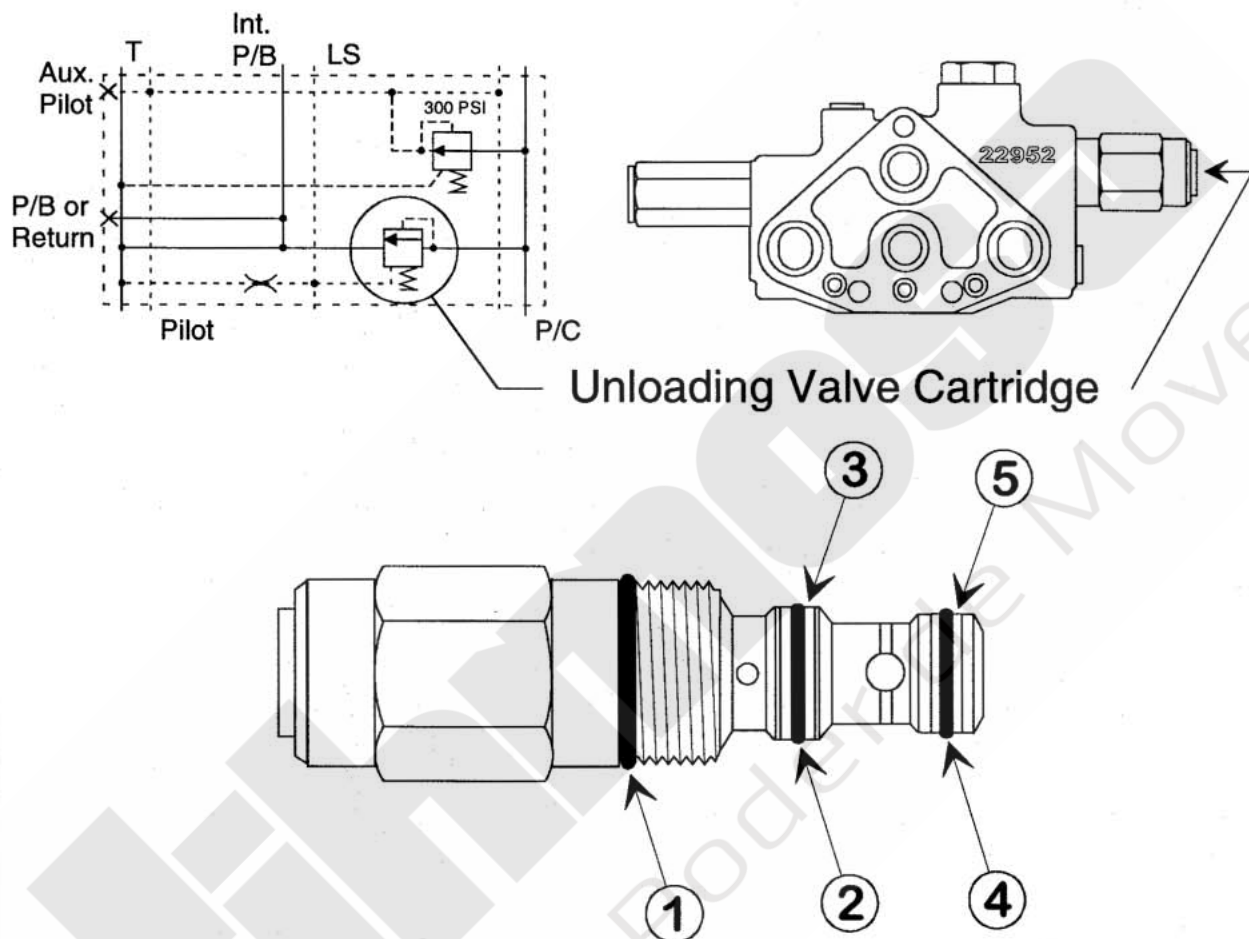


Figure 27. Unloading Valve Cartridge for use in Unloading Utility Sections

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
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)	1

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

Offer of Sale

The items described in this document and other documents or descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors are hereby offered for sale at prices to be established by Parker Hannifin Corporation, its subsidiaries and its authorized distributors. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any such items, when communicated to Parker Hannifin Corporation, its subsidiary or an authorized distributor ("Seller") verbally or in writing, shall constitute acceptance of this offer.

1. Terms and Conditions of Sale: All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller's products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer's acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between Buyer and Seller unless expressly accepted in writing by Seller. Seller's acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer's assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer's offer. Acceptance of Seller's products shall in all events constitute such assent.

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

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

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

5. Limitation Of Remedy: SELLER'S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLER'S SOLE OPTION. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOST PROFITS ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEMS SOLD HEREUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.

6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

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

paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

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

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

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

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

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

9/91-P





WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

Offer of Sale

The items described in this document are hereby offered for sale by Parker Hannifin Corporation, its subsidiaries or its authorized distributors. This offer and its acceptance are governed by the provisions stated in the "Offer of Sale".

© Copyright 2003, Parker Hannifin Corporation, All Rights Reserved



Parker Hannifin Corporation

Hydraulic Valve Division

520 Ternes Avenue

Elyria, Ohio, USA 44035

Tel: (440) 366-5200

Fax: (440) 366-5253

www.parker.com/hydraulicvalve

Bulletin HY14-2705-M4/US,
5C, 9/03, PHD