



# STEERING

## Repair Information

*Series 20*

*Steering Control Unit*

White is a leading global provider of motor and steering solutions that power the evolution of mobile and industrial applications around the world.



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# Chapter 1

## Series 20 Exploded View

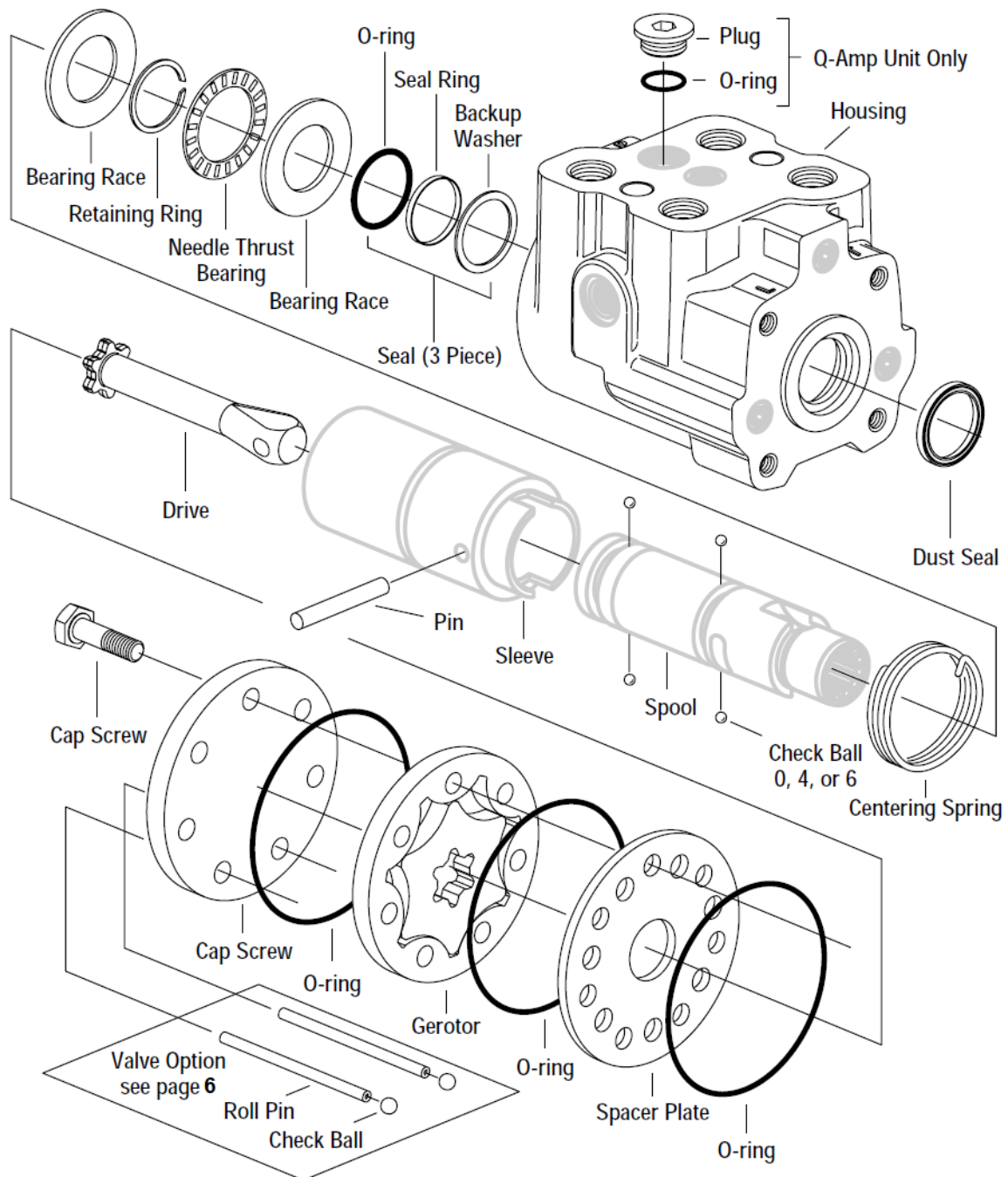


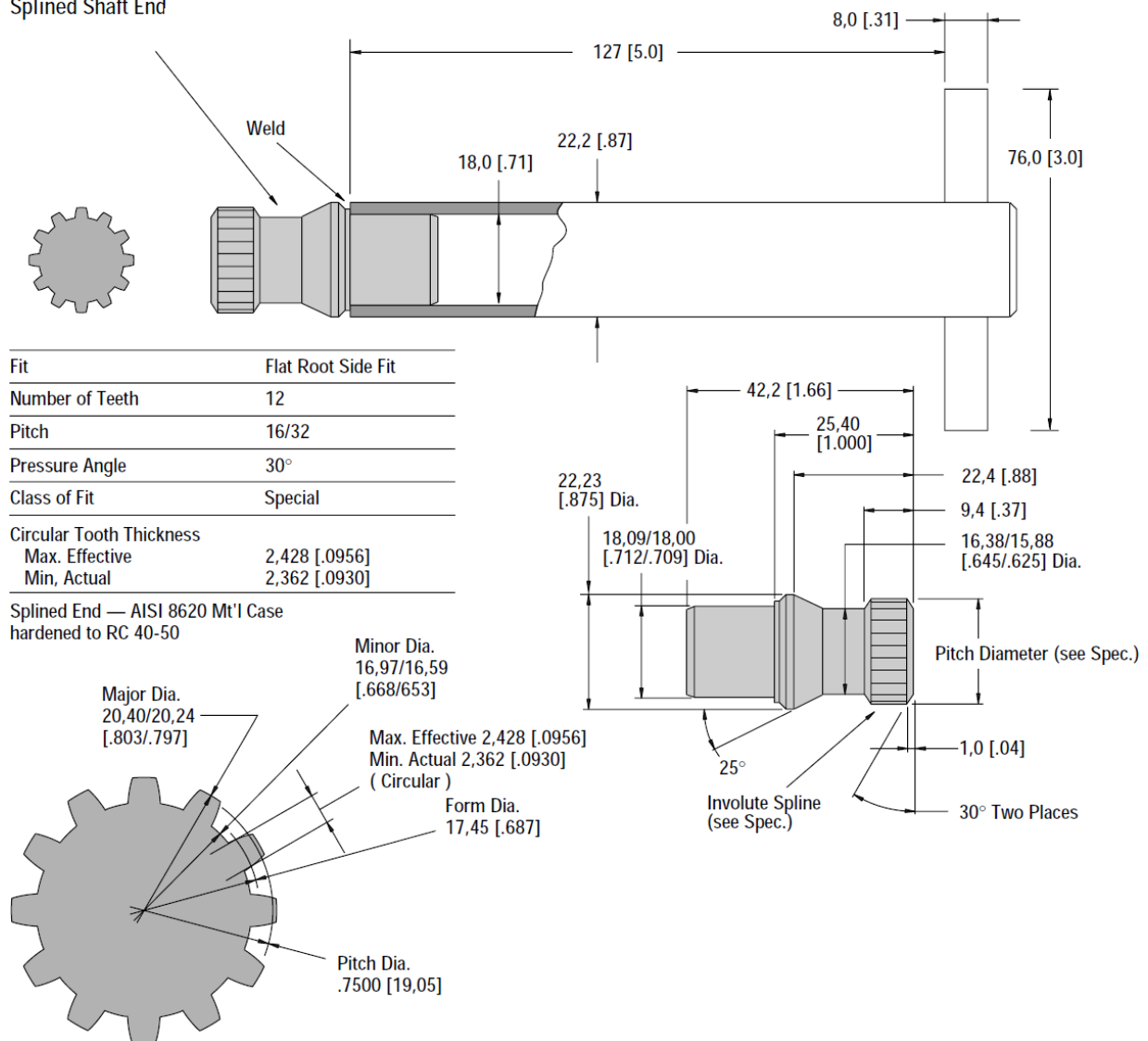
Figure 1: Series 20 Exploded View

### Tools Required

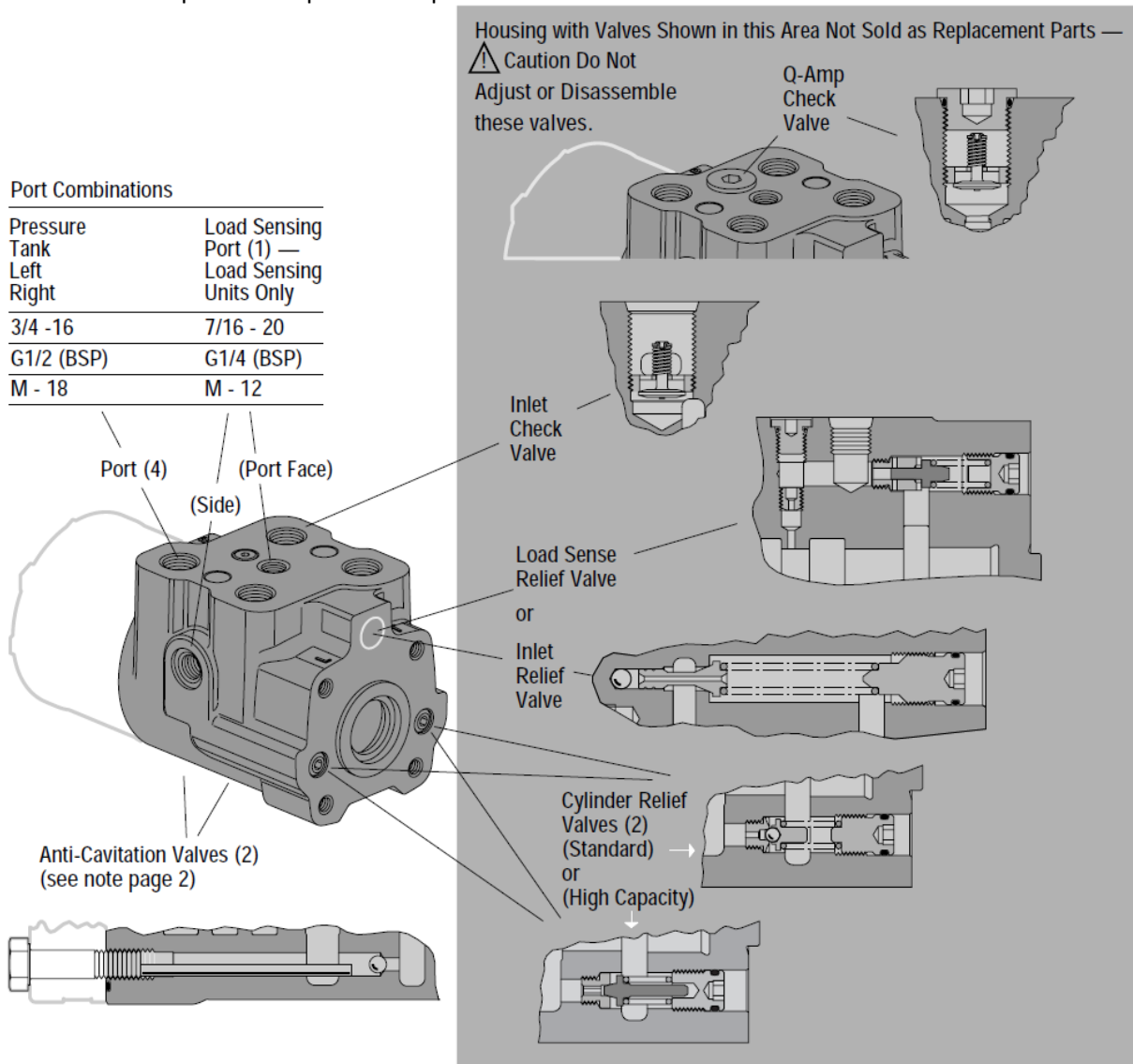
- 13 mm Socket
- 15/16 in. Hex Key
- Torque Wrench (40 Nm [350 lb-in] Capacity)
- Small Blade Screwdriver
- Soda Straws (2)
- Retaining Ring Pliers

### Complete Tool:

#### Splined Shaft End



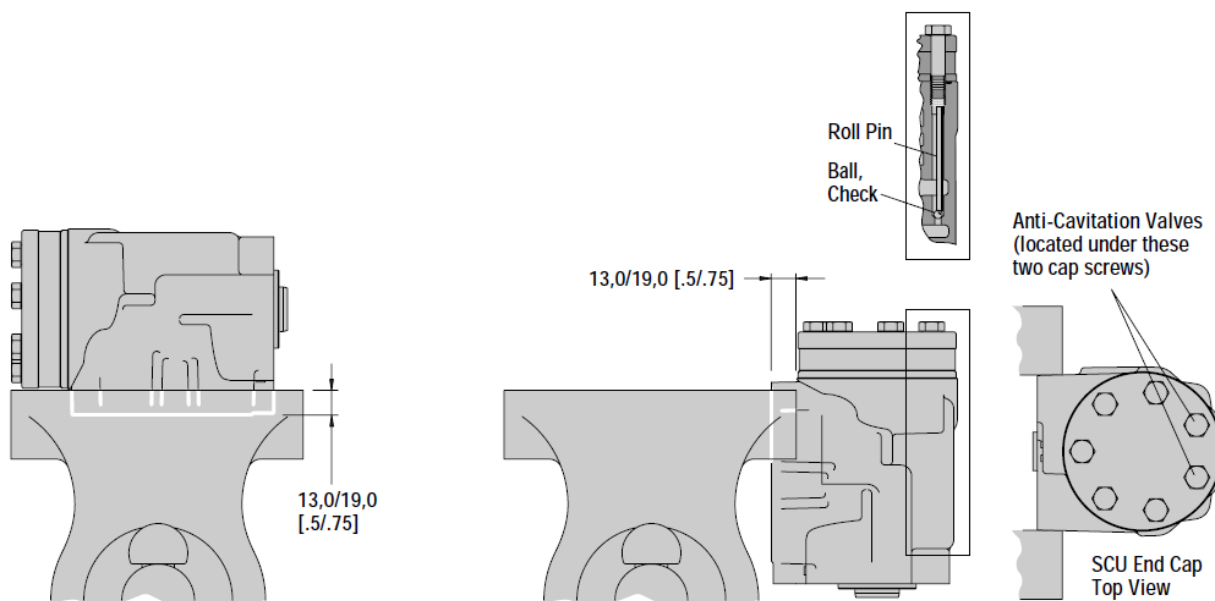
All housing valves are factory adjusted on assembled units to a code designation and are not to be changed. This housing (with specified valve pressure settings), the mating spool, and the sleeve are not practical replacement parts.



## Disassembly

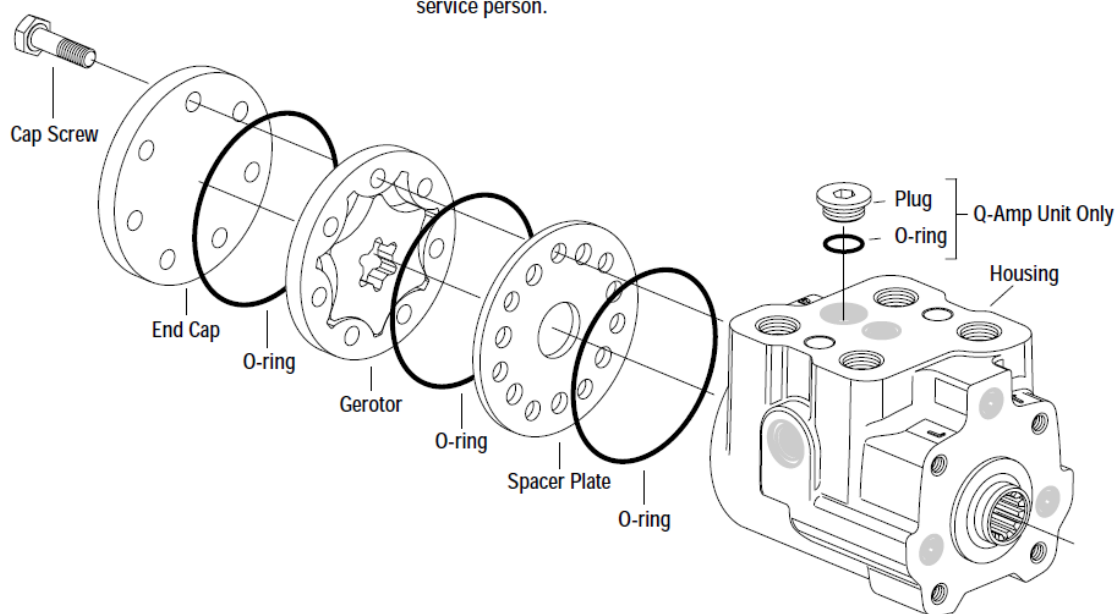
Cleanliness is extremely important when repairing a hydraulic Steering Control Unit (SCU). Work in a clean area. Before disconnecting the hydraulic lines, clean the port area of the SCU. Before disassembly, drain the oil, then plug the ports and thoroughly clean the exterior of the SCU. During repairs, always protect machined surfaces.

**Note: Steering control units with anti-cavitation valves require special handling in both disassembly and reassembly. Ball valves (2) can end up in a cavity in the housing were they are not supposed to be. The unit must be disassembled and reassembled in the vertical position; removal of anti-cavitation valves is outlined in step 8.**



Mount steering control unit in vise horizontally for breaking loose seven cap screws. Use this mounting position for final torque of reassembled unit.

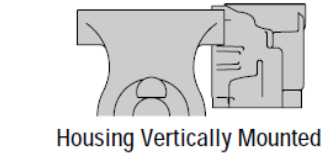
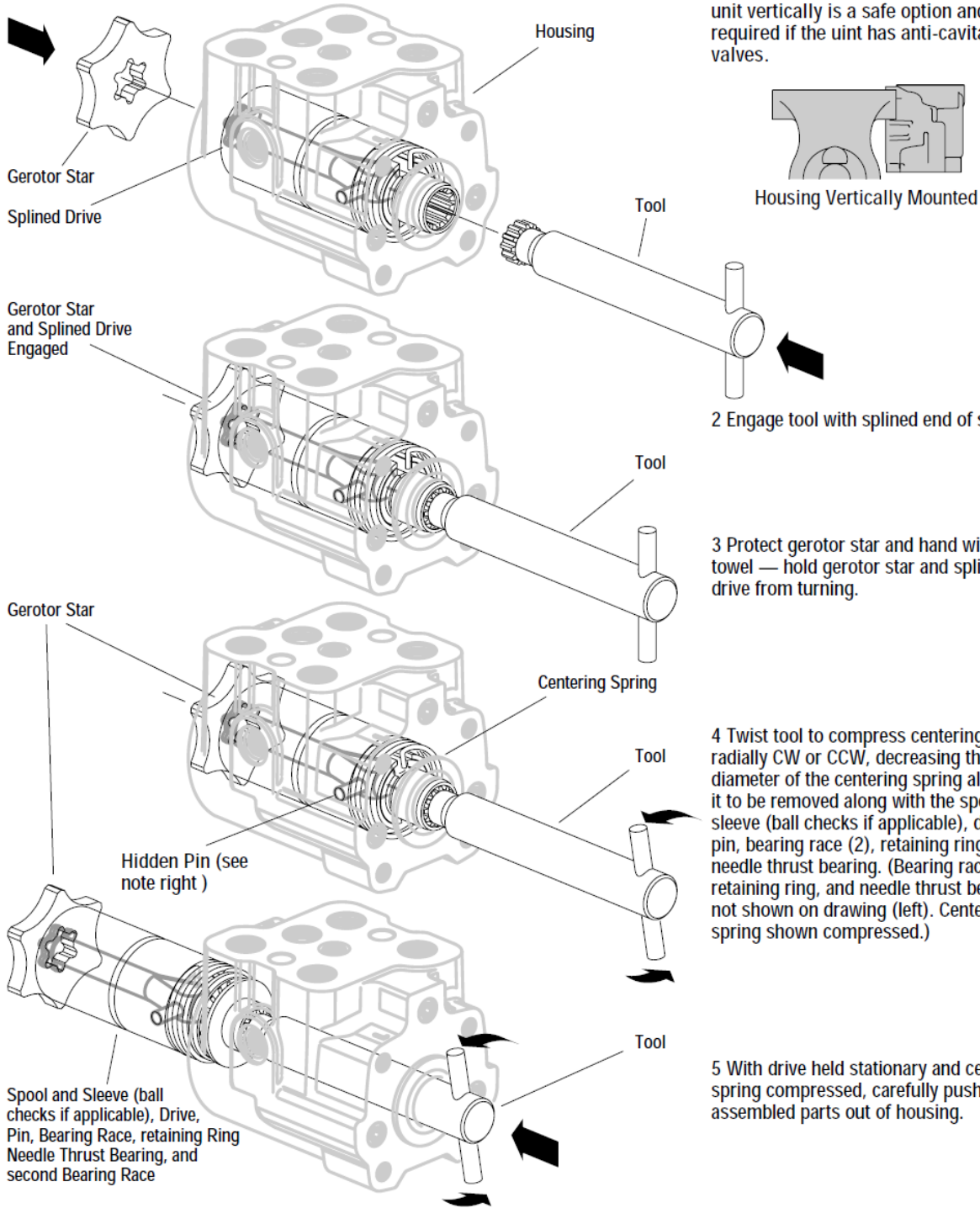
After cap screws have been loosened, mount steering control unit in the vise vertically for disassembly and reassembly. Note: Illustrations have been created from the exploded parts drawing, and do not relate the parts correctly as seen by the service person.



1. Remove the seven cap screws, end cap, o-ring, gerotor, o-ring spacer plate and o-ring.

**Note:** Plug on port face only on Q-Amp steering control units.

Note Hidden Pin. If tension on this pin is released before these parts are fully disengaged and the pin is not horizontal, the pin can drop and lockup can occur like a deadbolt. Positioning unit vertically is a safe option and is required if the unit has anti-cavitation valves.



Housing Vertically Mounted

2 Engage tool with splined end of spool.

3 Protect gerotor star and hand with shop towel — hold gerotor star and splined drive from turning.

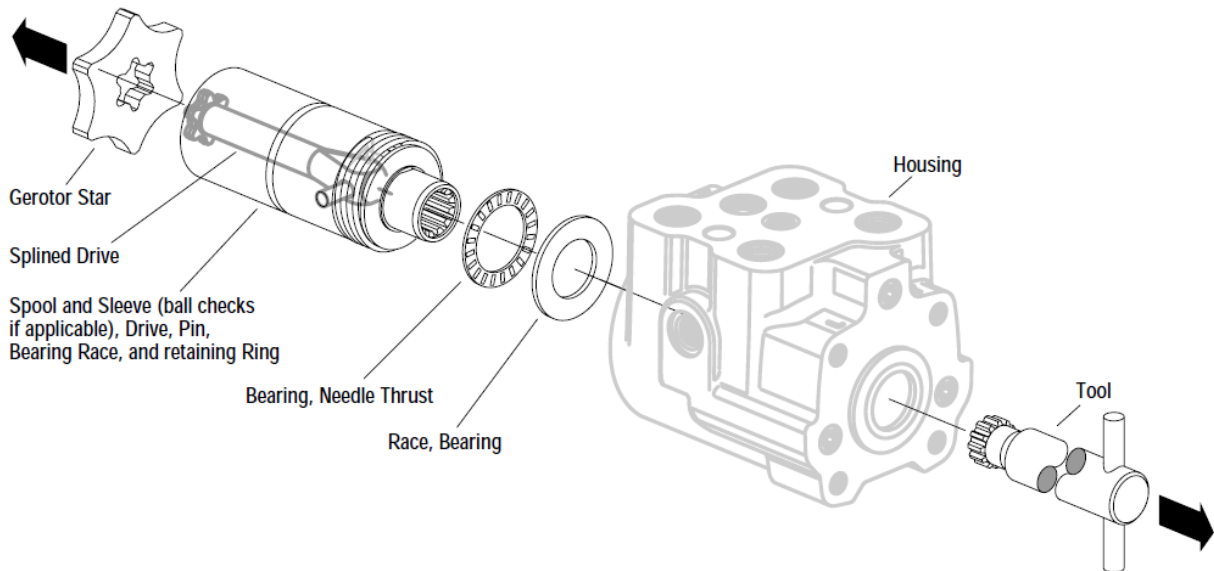
4 Twist tool to compress centering spring radially CW or CCW, decreasing the coil diameter of the centering spring allowing it to be removed along with the spool and sleeve (ball checks if applicable), drive, pin, bearing race (2), retaining ring, and needle thrust bearing. (Bearing races, retaining ring, and needle thrust bearing, not shown on drawing (left). Centering spring shown compressed.)

5 With drive held stationary and centering spring compressed, carefully push these assembled parts out of housing.

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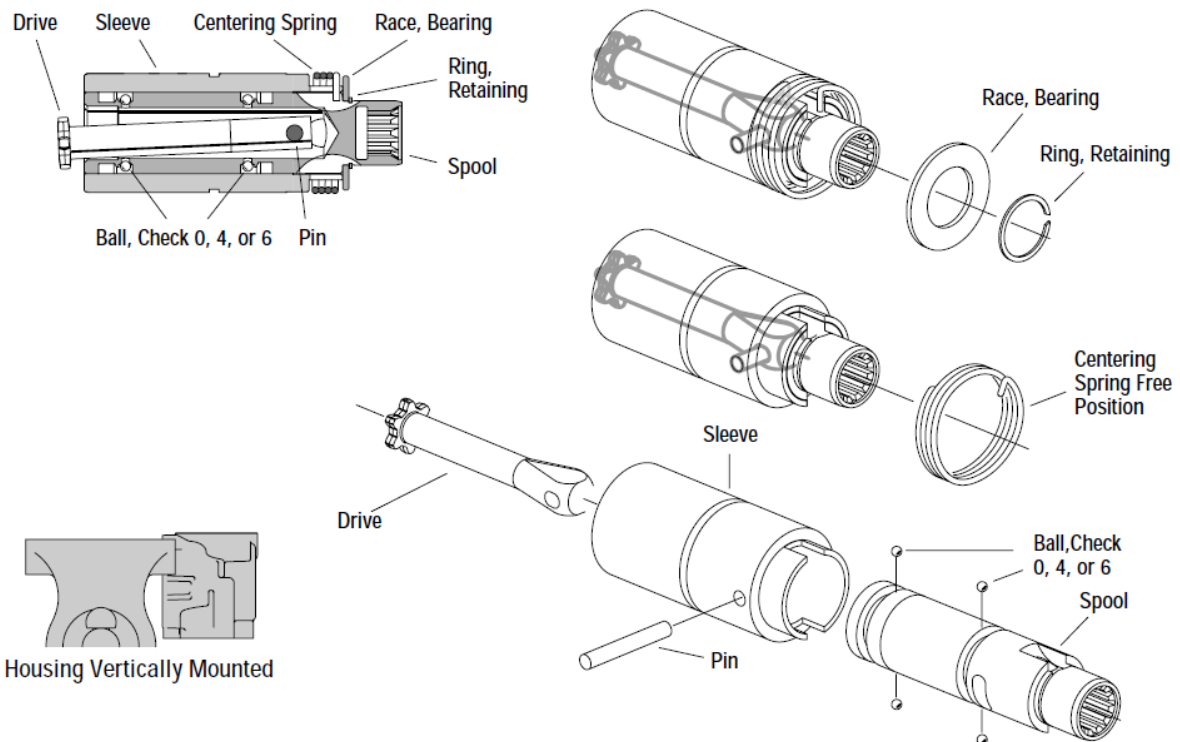
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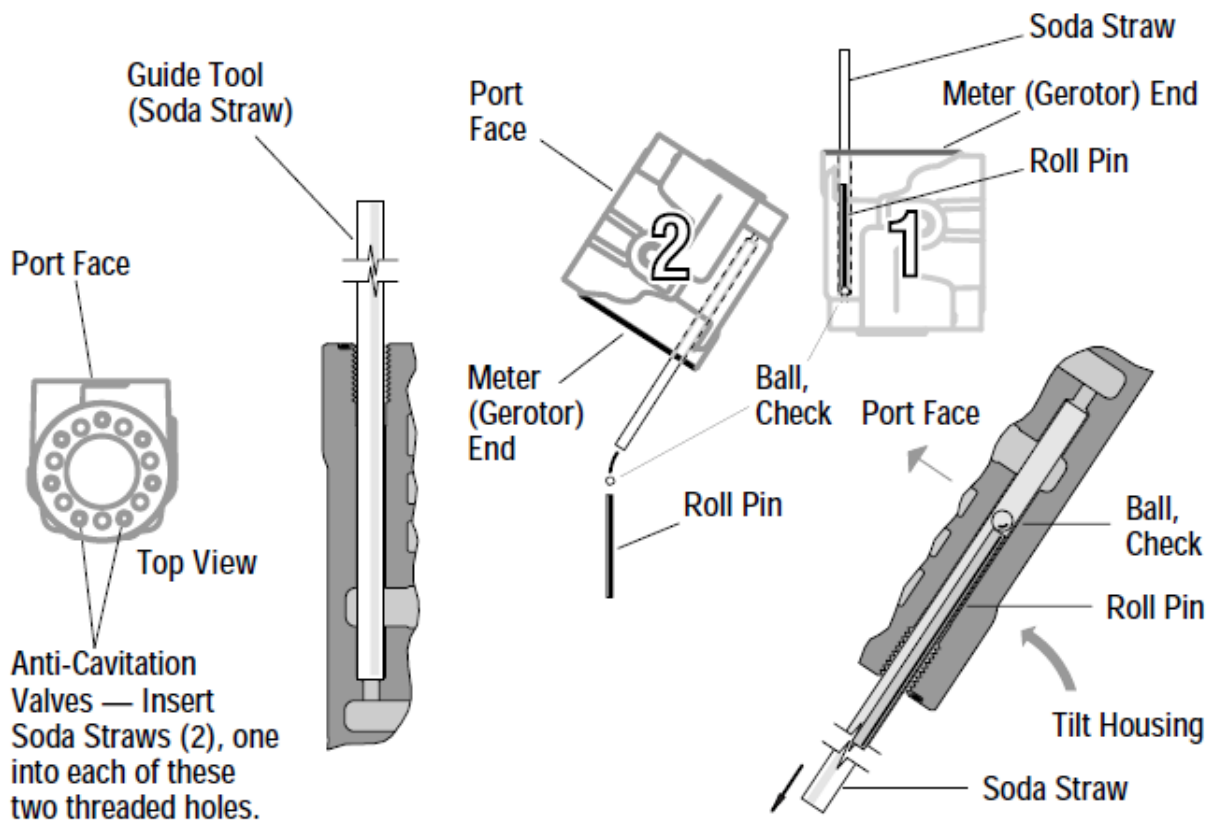
6. Remove the thrust bearing race and needle thrust bearing.

7. Remove the retaining ring (use retaining ring pliers), bearing race, centering spring, pin, drive, spool, sleeve, and ball checks if applicable.



### Optional Anti-Cavitation Valves Disassembly:

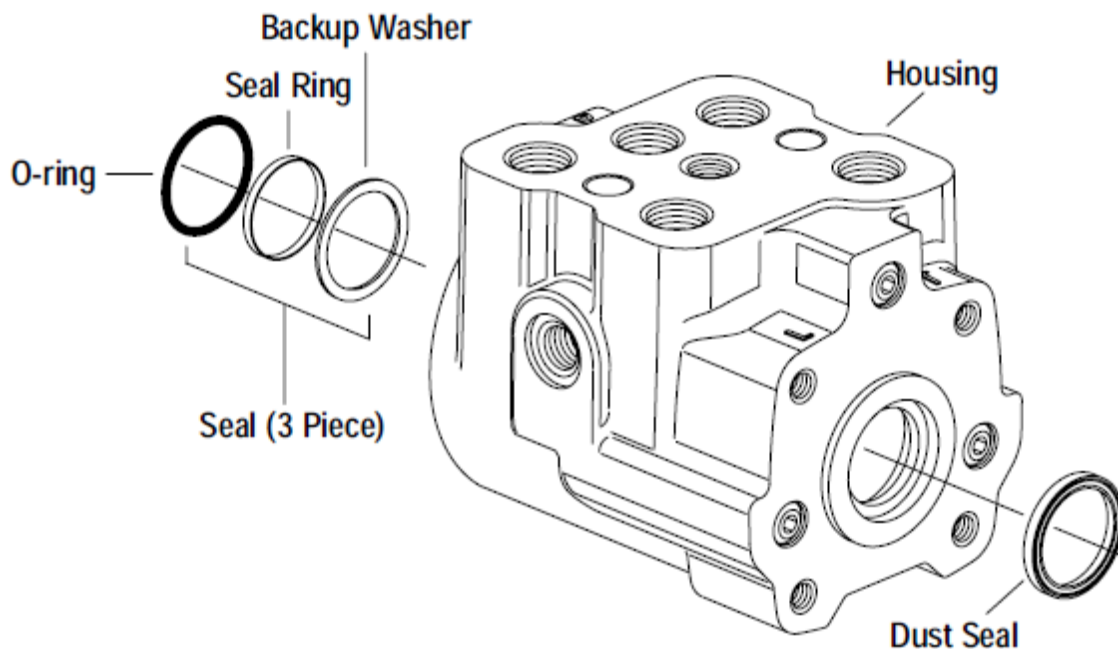
8. Insert two soda straws, one in each of two threaded holes, as a safety measure for removal of two small ball check valves and roll pins (correct threaded holes identified in illustration below). Remove housing from vise, tilt the housing and bring the port face upward. Continue turning the housing until the roll pins and ball checks slide through the straws from the meter (gerotor) end of the housing.



9. Remove the shaft seal. These three parts may or may not still be in the housing. These parts include o-ring, seal ring, and backup washer.

10. Using a small blade screwdriver, carefully pry the dust seal from the housing.

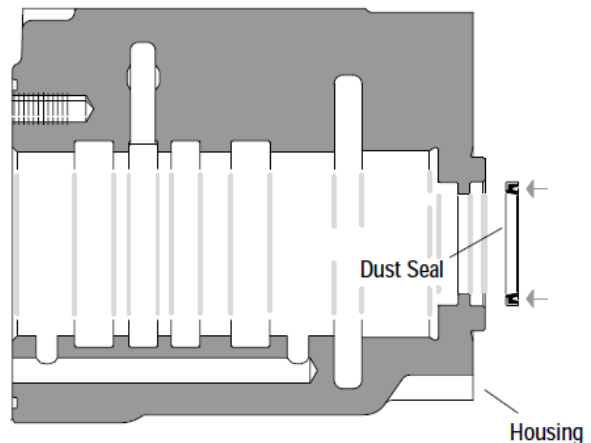
**Important:** Do not damage the dust seal seat.



## Reassembly

Check all mating surfaces. Replace any parts that have scratches or burrs to lessen the chance of leakage. Wash all metal parts in clean solvent. Blow them dry with pressurized air. **Do not** wipe parts dry with paper towels or cloth as lint in a hydraulic system will cause damage.

**Note: Always use new seals when reassembling hydraulic steering control units. Refer to parts list for seal kit numbers, replacement parts, and ordering information. Important: During reassembly lubricate the new seals with a petroleum jelly such as vaseline. Also lubricate machined surfaces with clean hydraulic fluid.**

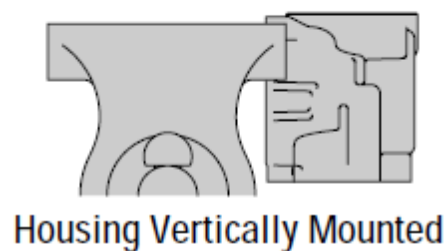
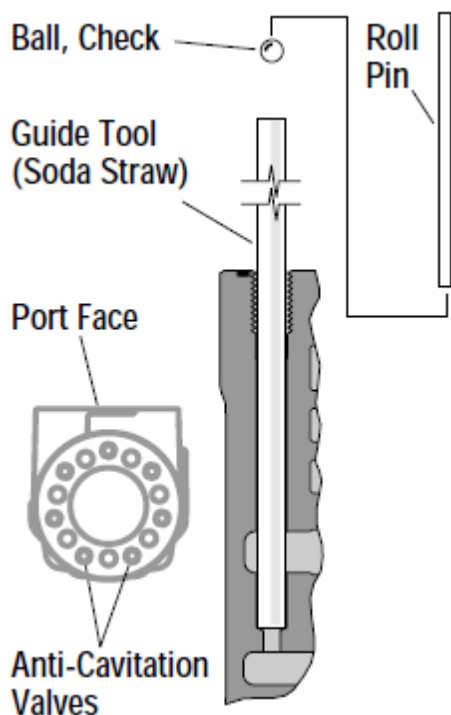


**11** Lubricate and install the dust seal (see drawing (right) for correct seal orientation).

### Optional Anti-Cavitation Valves

#### Reassembly:

**12.** Installing the anti-cavitation ball checks seems simple enough. However, a word of caution: use a soda straw as a guide tool. Drop the straw into the hole to the bottom of bore, then drop ball through straw. Pull straw and use the same procedure in second ball seat. Check each bore with small light to make sure each ball is in the correct place. Add roll pin in each bore.

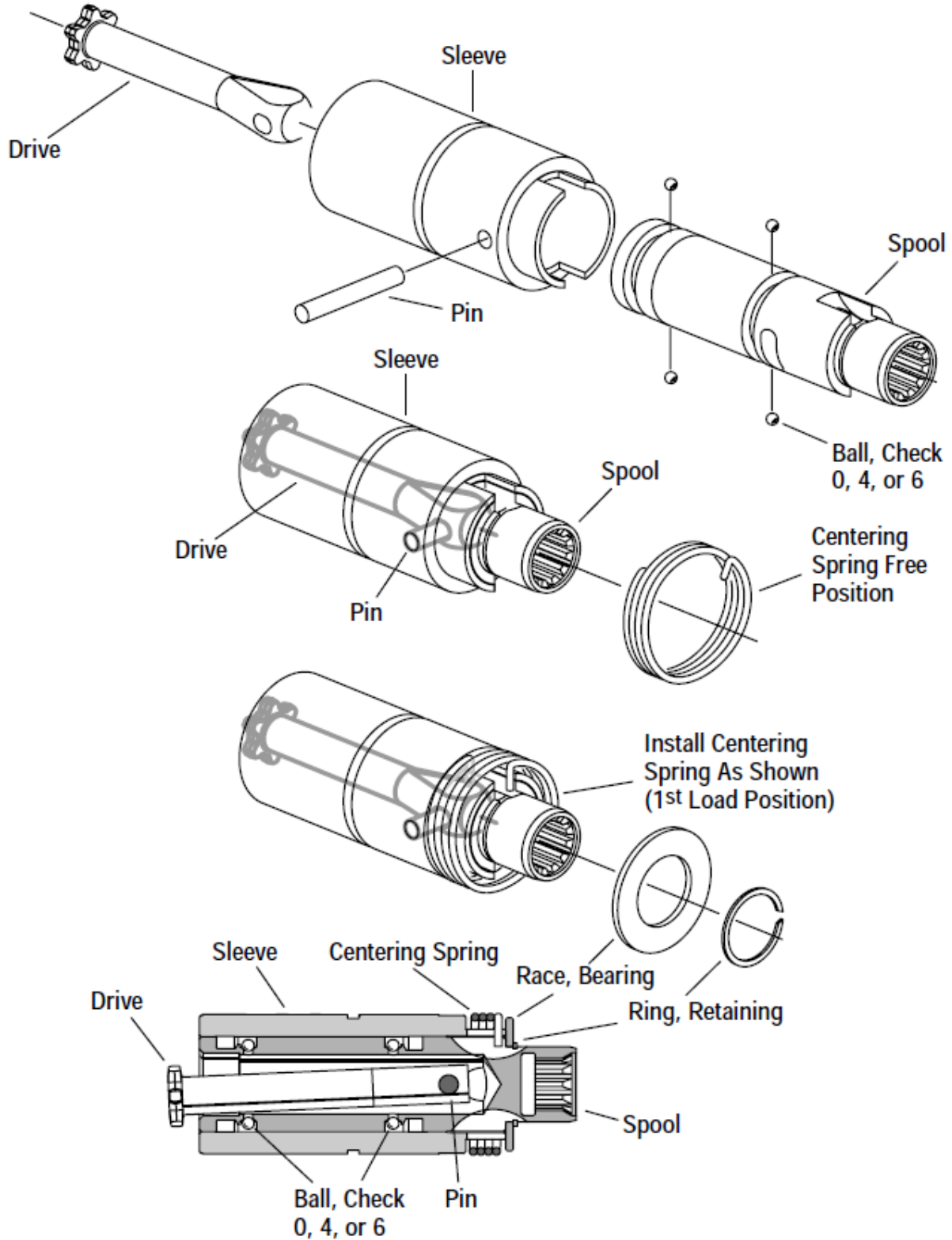


**13.** Apply a light coating of clean hydraulic fluid to the spool and slide it into the sleeve along with the ball checks if applicable.

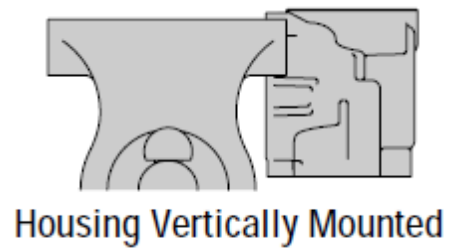
**14.** Install the drive and pin.

**15.** Install the centering spring. Position one end of spring in slotted end of spool and sleeve, and compress the spring radially (CCW) to engage free end of spring.

**16.** Install the bearing race and retaining ring (use retaining ring pliers) onto spool.



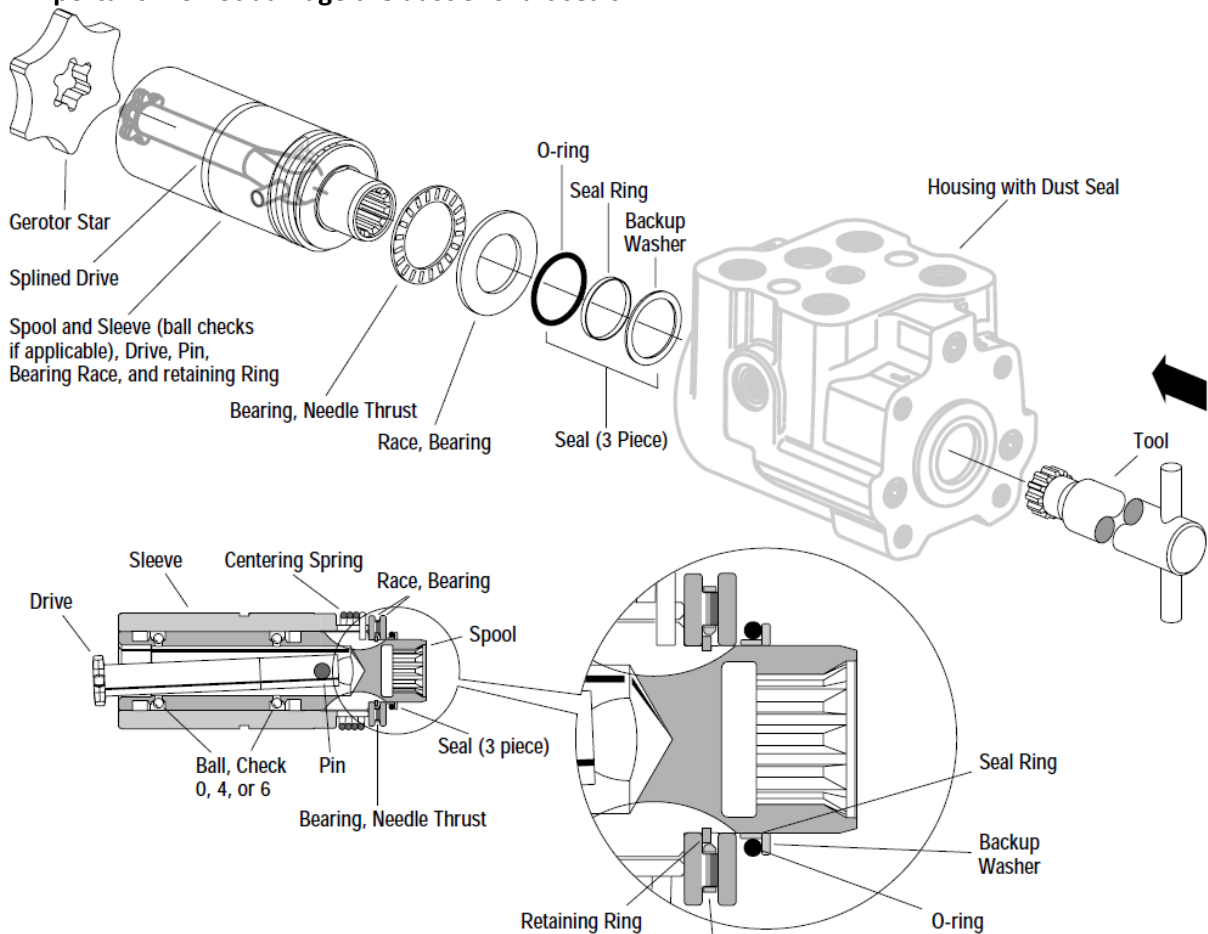
17 Apply a light coating of petroleum jelly to the inside diameter of the previously mounted dust seal in the housing.



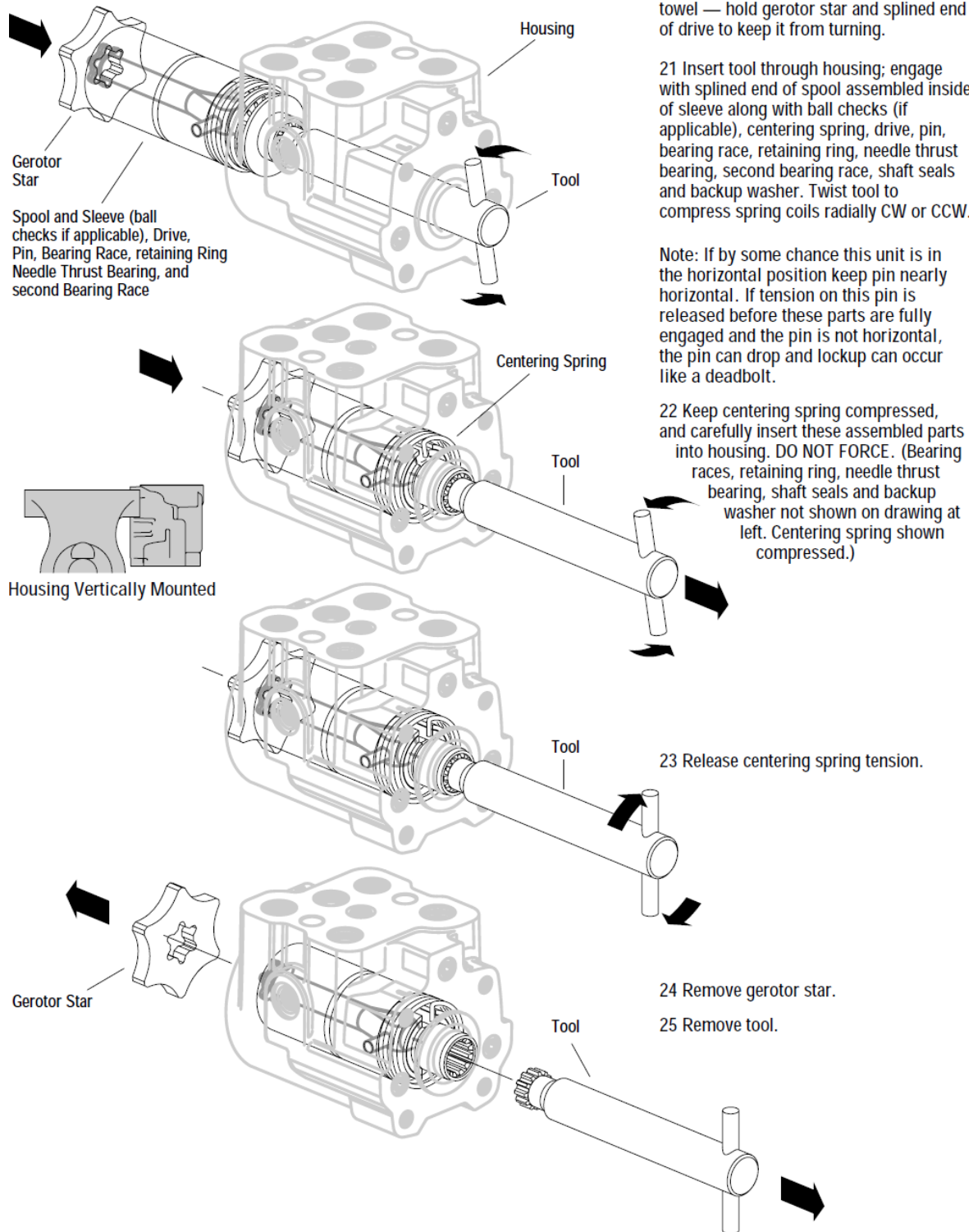
18 Apply a light coating of petroleum jelly to the needle thrust bearing, second bearing race, and three part shaft seal. Position each part onto the spool as shown in enlarged section drawing below. The needle thrust bearing goes between the two bearing races and must be centered around retaining ring.

19 Apply a light coating of clean hydraulic fluid to the spool and sleeve assembly and slide it into the housing (see steps 20-25).

**Important: Do not damage the dust or shaft seals.**



Note: Needle Thrust Bearing MUST Be Centered Around Retaining Ring. Use Petroleum Jelly to Hold Parts in Place.



20 Protect gerotor star and hand with shop towel — hold gerotor star and splined end of drive to keep it from turning.

21 Insert tool through housing; engage with splined end of spool assembled inside of sleeve along with ball checks (if applicable), centering spring, drive, pin, bearing race, retaining ring, needle thrust bearing, second bearing race, shaft seals and backup washer. Twist tool to compress spring coils radially CW or CCW.

Note: If by some chance this unit is in the horizontal position keep pin nearly horizontal. If tension on this pin is released before these parts are fully engaged and the pin is not horizontal, the pin can drop and lockup can occur like a deadbolt.

22 Keep centering spring compressed, and carefully insert these assembled parts into housing. DO NOT FORCE. (Bearing races, retaining ring, needle thrust bearing, shaft seals and backup washer not shown on drawing at left. Centering spring shown compressed.)

23 Release centering spring tension.

24 Remove gerotor star.

25 Remove tool.

26. Lubricate and install a new o-ring seal in the groove in the housing.

27. Install the wear plate o-ring groove up and align the holes in the wear plate with threaded holes in the housing.

28. Lubricate and install a new o-ring seal in the groove in the wear plate.

29. Install the gerotor and align the screw holes.

30. Lubricate and install a new o-ring seal in the groove in the gerotor ring.

30 Install the end cap and seven cap screws. Pretighten the cap screws, in a crisscross pattern, to 17 Nm [150 lb-in]. Finally, in a crisscross pattern, tighten cap screws to 33,9 Nm [300 lb-in].



# Chapter 2

## Series 20 Parts

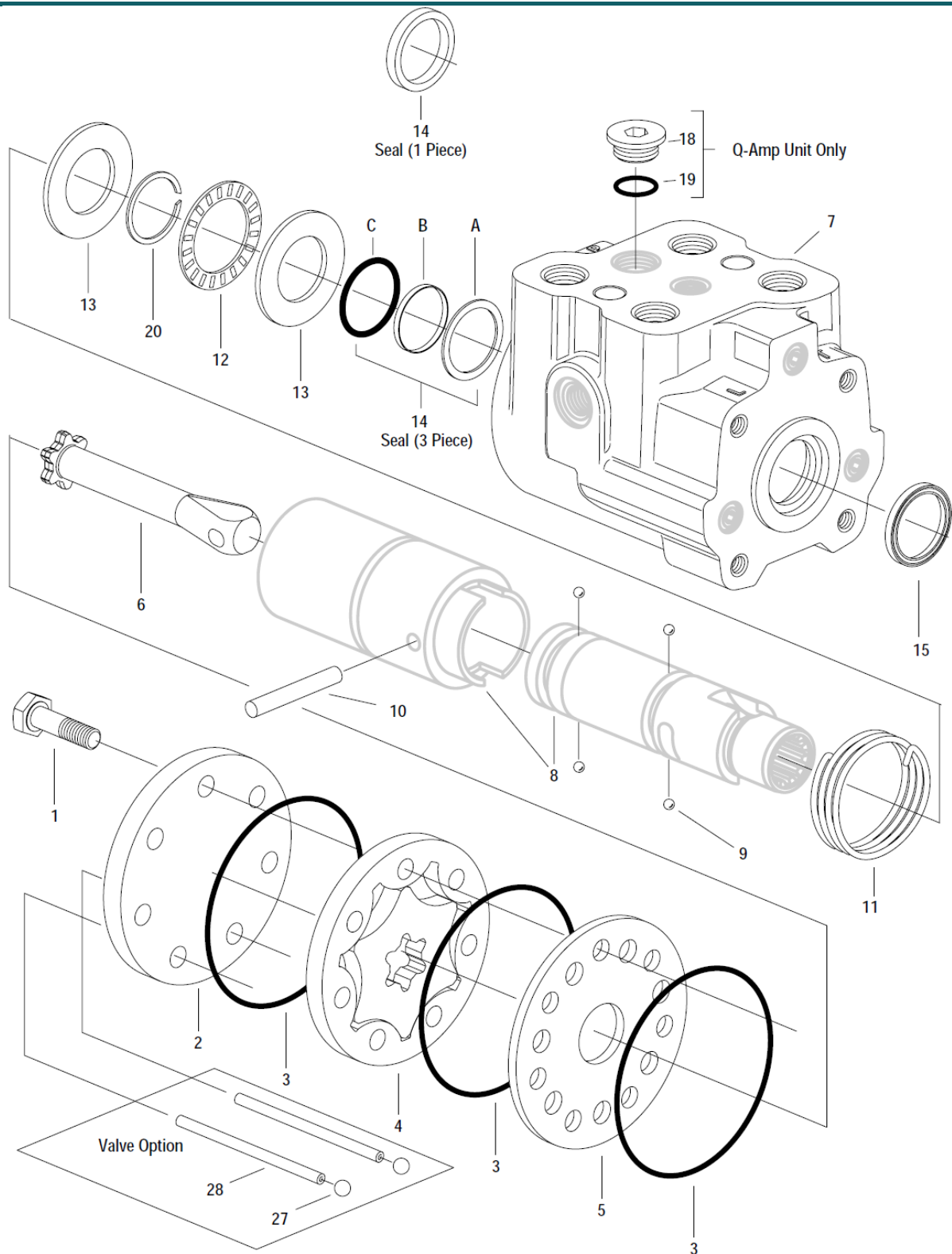


Figure 2: Series 20 Exploded View

WHITE can accept no responsibility for possible errors in catalogues, brochures, and other printed material. WHITE reserves the right to alter its products without notice. This also applies to products already on order provided that such alterations can be made without subsequent changes being necessary in specifications already agreed.

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Ref. No.	Part Number	Description	Quantity
1	*	Cap Screw	7
2	23902-000	Cap, End	1
X 3	201139-000	Seal, O-ring	3
4	*	Gerotor	1
5	23903-000	Plate, Spacer	1
6	*	Drive	1
7	NSS	Housing	1
8	NSS	Sleeve	1
	NSS	Spool	1
9	285020-050	Ball, Check	0, 4, or 6
10	14606-000	Pin	1
11	230391-000	Spring, Centering (low torque — 2,49 mm [.098 inch] dia. wire)	1
	230415-000	Spring, Centering (standard torque — 2,77 mm [.109 inch] dia. wire)	1
12	7537-000	Bearing, Needle Thrust	1
13	14607-000	Race, Bearing	2
14	9233-001	Seal — One Piece	1
X 14a	14400-000	Backup Washer	1
X b	9092-033	Seal Ring 25,2 mm [.99 in.] ID	Three Piece Standard
X c	250001-121	O-ring 26,6 mm [1.05 in.] ID	
X 15	844-000	Seal, Dust	1
18	9214-001	Plug	1
19	250003-908	O-ring	1
20	265018-024	Ring Retaining	1
27	18015-000	Ball, Check (see page 4)	2
28	16026-436	Roll Pin (see page 4)	2
X	64533-000	Seal Kit—Contains Parts Indicated by X	

\* See Chart Below

NSS — Not Sold Separately

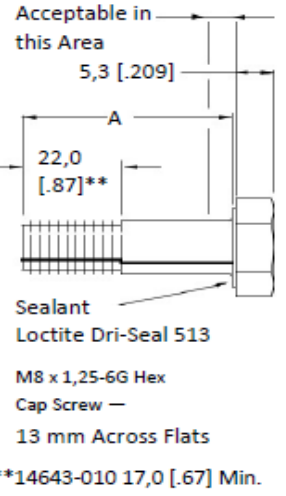
Displ. cm <sup>3</sup> /r [in <sup>3</sup> /r]	Ref. No. 6 Drive	Length mm [inch]	Ref. No. 4 Gerotor	Width mm [inch]	Ref. No. 1 Screw, Cap	Length A mm [inch]	Grade 10,9 (Approximate Equivalent to SAE Grade 8)
60 [ 3.6]	23904-000	99,4 [3.91]	201123-002	6,1 [ .24]	14643-001	30,0 [1.18]	
75 [ 4.5]	23904-000	99,4 [3.91]	201123-003	7,9 [ .31]	14643-002	35,0 [1.38]	
95 [ 5.9]	201864-000	105,9 [4.17]	201123-004	10,2 [ .40]	14643-002	35,0 [1.38]	
120 [ 7.3]	201864-000	105,9 [4.17]	201123-005	12,7 [ .50]	14643-003	40,0 [1.57]	
145 [ 8.9]	201864-000	105,9 [4.17]	201123-006	15,5 [ .61]	14643-003	40,0 [1.57]	
160 [ 9.7]	201864-000	105,9 [4.17]	201123-007	16,8 [ .66]	14643-004	45,0 [1.77]	
185 [11.3]	201864-000	105,9 [4.17]	201123-008	19,6 [ .77]	14643-004	45,0 [1.77]	
230 [14.1]	201864-000	105,9 [4.17]	201123-009	24,4 [ .96]	14643-005	50,0 [1.97]	
295 [17.9]	201864-000	105,9 [4.17]	201123-010	31,0 [1.22]	14643-006	55,0 [2.17]	
370 [22.6]	201864-000	105,9 [4.17]	201123-011	39,1 [1.54]	14643-007	65,0 [2.56]	
460 [28.2]	201864-000	105,9 [4.17]	201123-012	48,8 [1.92]	14643-008	75,0 [2.95]	
590 [35.9]	201864-000	105,9 [4.17]	201123-013	62,2 [2.45]	14643-009	90,0 [3.54]	
740 [45.1]	201864-000	105,9 [4.17]	201123-014	78,2 [3.08]	14643-010	105,0 [4.13]	
985 [60.0]	201864-000	105,9 [4.17]	201123-015	103,9 [4.09]	14643-011	130,0 [5.12]	

Table 1: Series 20 Component parts

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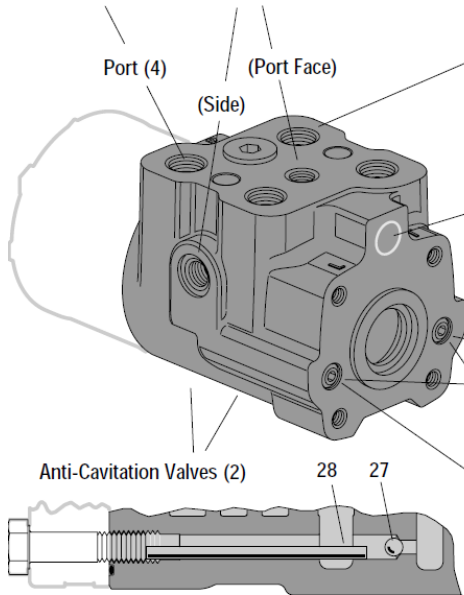
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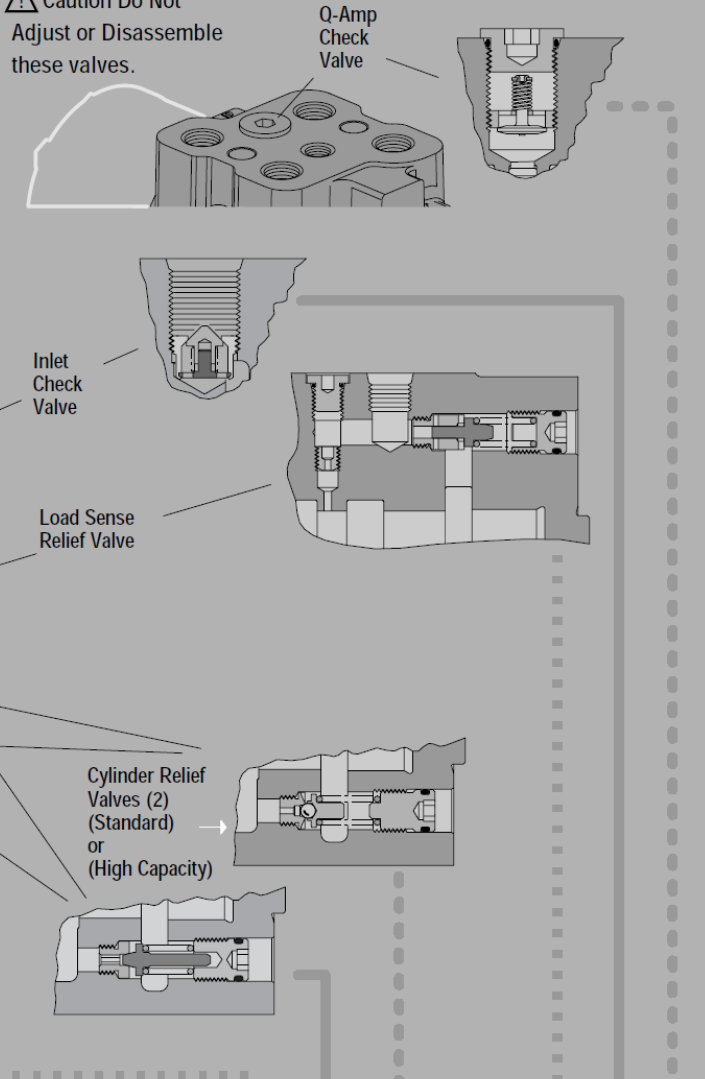
**Port Combinations**

Pressure Tank Left Right	Load Sensing Port (1) — Load Sensing Units Only
3/4 -16	7/16 - 20
G1/2 (BSP)	G1/4 (BSP)
M - 18	M - 12



Housing with Valves Shown in this Area Not Sold as Replacement Parts —

**⚠ Caution Do Not Adjust or Disassemble these valves.**



**Steering Control Unit Housing Series**

Steering Control Unit Housing Series	Port Size			Load Sensing		Check Valves* Ref. No. 9						
	3/4-16	G 1/2	M-18	Side	Port Face							
-101	•					•						
-102	•			•		•						•
-103	•				•	•						•
-104	•				•	•	•					•
-105	•				•	•	•	•				•
-106	•				•	•	•	•				•
-107	•				•	•	•	•				•
-306			•		•	•	•	•				•

\*Manual Steering Check Valves

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