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III. HBC Procedures

Removal of Actuator from HBC Gearbox

CAUTION: Ensure that the valve is not hard seated, either in open or shut position. Also ensure coordination with operations to engage the manual handwheel and operate the valve several turns opposite of valve position.

NOTE: Place valve in mid position if possible.

1. Attach lifting device to valve actuator and take up slack.
2. Match mark actuator mounting flange to HBC mounting flange.
3. Carefully remove actuator to HBC mounting fasteners and store.
4. Carefully pull actuator away from gearbox and off of splined shaft of HBC gearbox.
5. Transport actuator to designated work area.

Removal of HBC Gearbox from Valve

1. Drive unit has been removed (i.e. actuator).
2. Match mark gearbox mounting flange to valve mounting flange.
3. Record valve position.
 - Assure valve position can be determined by use of a pointer on the valve shaft, a scribe mark on the valve shaft end, or some other means.
4. Install lifting equipment and take up slack.
5. Carefully remove gearbox to valve mounting fasteners and store.
6. Carefully pull HBC gearbox off valve stem.
7. Transport gearbox to designated work area.

Disassembly of HBC-0 Through HBC-3 Gearbox Refer to Figures 2-51 & 2-52

NOTE: All parts should be properly stored after removal.

1. Match mark pointer cap to drive sleeve.

NOTE: The pointer cap can be installed in more than one position. Operators may have become accustomed to the pointer indicating open or closed in a different position than normal.

2. Match mark drive sleeve to housing cover.
3. Match mark housing cover to housing.
4. Remove limit stop housing cover and gasket.
5. Rotate worm shaft clockwise until pointer stops turning. This separates the worm from the drive sleeve and worm gear.
6. Remove pointer cap and housing cover.
7. Remove stop nuts and limit stop housing. The limit stop housing has to be removed in conjunction with stop nuts due to stop nuts not having room to come off worm shaft while limit stop housing is still installed.
8. Remove thru cap.
9. Remove worm shaft by pulling from housing.
 - It will be necessary to slightly rotate or cock the drive sleeve/worm gear away from the worm shaft in order to allow the wormshaft bearing to clear.
 - It is NOT necessary to remove bearings from worm shaft.
10. Drive sleeve and worm gear can now be removed from housing.

Disassembly of HBC-4 Through HBC-10 Gearbox Refer to Figure 2-53

NOTE: All parts should be properly stored after removal.

1. Match mark pointer cap to drive sleeve.

NOTE: The pointer cap can be installed in more than one position. Operators may have become accustomed to the pointer indicating open or closed in a different position than normal.

2. Match mark drive sleeve to housing cover.
3. Match mark housing cover to housing.
4. Remove stop screw cover.
5. Remove stop screws and lockscrews.
6. Rotate worm shaft in clockwise direction until pointer cap stops rotating or until worm shaft can no longer be turned.
7. Remove end cap and thru cap.
8. Remove pointer cap and housing cover.
9. Remove worm shaft from housing by pulling.
 - It will be necessary to slightly rotate or cock the drive sleeve/worm gear away from the worm shaft in order to allow the worm shaft bearing to clear.
 - It is NOT necessary to remove bearings from worm shaft.
10. Remove drive sleeve and worm gear from housing.

Cleaning, Inspection and Repair

1. Clean all parts with site approved solvent.
2. Inspect all parts for wear, abrasion, breakage and deterioration. Replace as necessary.
3. If replacing housing cover gaskets, assure worm shaft bearing preload is correct by rotating worm shaft and drive sleeve after tightening housing cover fasteners.
 - If preload is too great (bearing tight), add approximately 0.005" to gasket thickness.
 - Continue to add thickness until preload is acceptable.
4. If drive sleeve, worm gear or drive sleeve bushing is replaced, do blue check of worm/worm gear to assure correct alignment.

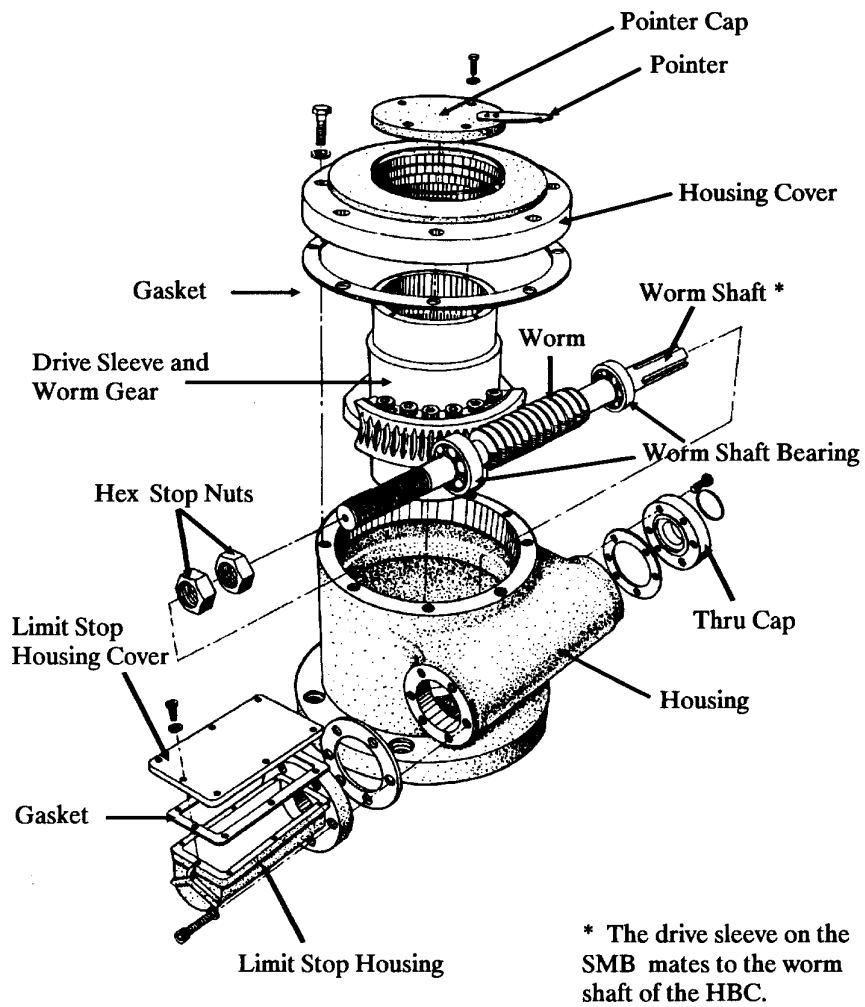


Figure 2-51 HBC -0 Through 3 Exploded View

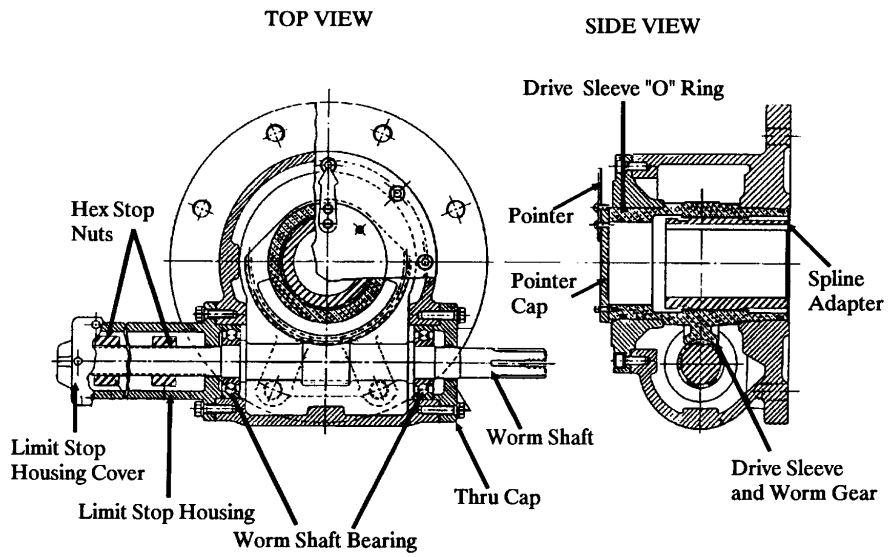


Figure 2-52 HBC- 0 Through 3 Top and Side Views

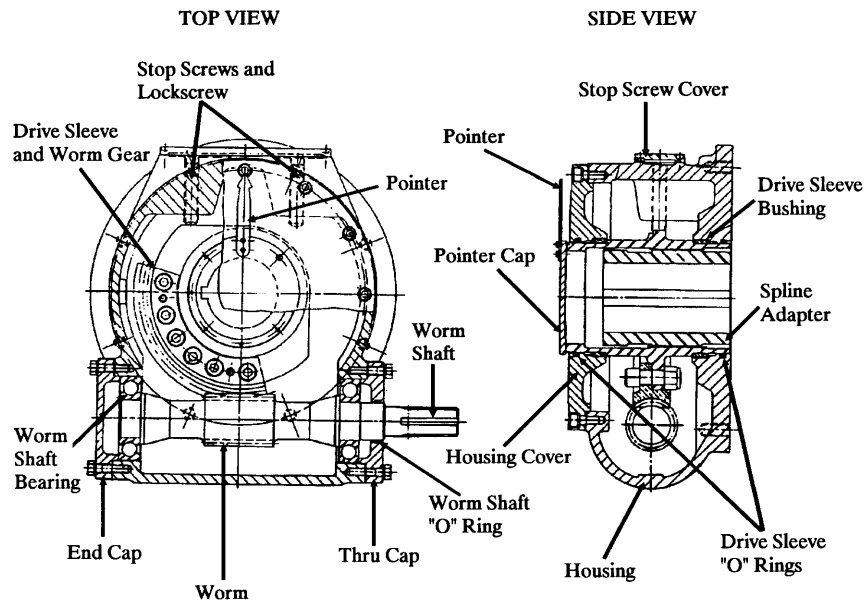


Figure 2-53 HBC- 4 Through 3 Top and Side Views

HBC-0 Through HBC-3 Reassembly Refer to Figure 2-52

NOTE: Line up match marks when reassembling.

NOTE: Replace any gaskets which are stiff or damaged.

1. Replace drive sleeve "O" ring in housing and housing cover.
2. Coat "O" rings with a thin film of grease.
3. Install worm gear and drive sleeve in housing.
4. Pack worm shaft bearings with site approved lubricant.
5. Coat worm with site approved lubricant.
6. Install worm shaft in housing.

NOTE: It is easier to install the worm shaft in the housing if the worm gear on the drive sleeve is moved to one side. The drive sleeve can be rotated with a strap wrench.

7. Install limit stop housing with end and thru cap gasket in conjunction with hex stop nuts.

NOTE: Do not place any axial load on worm shaft bearings due to lack of gasket thickness.

Install thru cap without its gasket, drawing it up finger tight with its fasteners.

- Using a thickness (feeler) gauge, measure and record the gap between the thru cap and housing at four places 90 degrees apart.
- Add the four readings and divide by 4.
- Multiply the average value by 1.1 which allows 10 percent for gasket crush.
- Remove the fasteners and thru cap.
- Select a gasket or gaskets to match the thickness of the calculated value, error to the high side if a precise match can't be obtained.

Install thru cap with gasket or gaskets and worm shaft "O" ring. Coat "O" ring with a film of gear housing grease.

8. Engage worm/worm gear if not engaged. Rotate drive sleeve with strap wrench if required.
9. Add site approved lubricant to housing. Insure adequate amount is added to keep worm/worm gear interface covered during operation.
10. Install housing cover with gasket.
11. Install limit stop housing cover with limit stop housing gasket.
12. To set up gearbox, do the following: Refer to Figure 2-54
 - Rotate worm shaft until index mark on top of drive sleeve points toward housing cover bolt lined up between center point of drive sleeve and middle of worm. This mark indicates mid point of segmental gear on drive sleeve. This will set gearbox at mid position. Match marks between housing cover and drive sleeve should be close if valve was left in mid position.
 - There are two housing cover mounting bolts approximately lined up between the top center of the drive sleeve and each bearing, and two additional bolts are exactly opposite toward back of gearbox. These bolts are 90 degrees apart. There is a bolt directly between them indicating midpoint. When operating the gearbox the indicating mark on top of the drive sleeve should not be driven past the two bolts closer to the bearings because the worm could become disengaged from the worm gear.
13. Install pointer cap with pointer. Refer to Figures 2-52 and 2-54
 - Install pointer in position it was in before removal.
 - The pointer may be pointing toward either the housing cover mounting bolts in the back, or in the front toward the bearings.
14. Hold a finger on top of the hex nuts to prevent them rotating and rotate the worm shaft. Determine direction the stop nuts will move during operation.
15. Rotate worm shaft until pointer is pointing at one of 90 degree housing indicating bolts.

NOTE: The hex stop nuts may have to be moved during movement to prevent jamming against one end of limit stop housing.

- Run hex nut that was moving toward limit stop housing end into end of limit stop housing toward which it was moving. If flat of nut is not facing upwards, back off nut until flat is facing upwards. Move other nut close to this one with flat facing upwards.

- Install limit stop housing cap, tighten lightly. (Enough to keep hex stop nuts from rotating).
 - Rotate worm shaft in opposite direction until pointer is pointing at other 90 degree housing cover mounting bolt.
 - Remove limit stop housing cap and run other hex stop nut into end of limit stop housing which it was moving toward. If flat is not facing upwards after running into end of housing, back off nut until flat is facing upwards.
16. Install limit stop housing cap with gasket.
 17. The hex stop nuts should not require much adjustment after installation.
 18. Rotate worm shaft until match marks between drive sleeve and housing cover line up.
 19. The gearbox is ready for installation.

NOTE: If the valve is in a different position than when gearbox was removed, try to place both valve and gearbox in mid position before installation, then set up 45 degree movement on either side of the mid point.

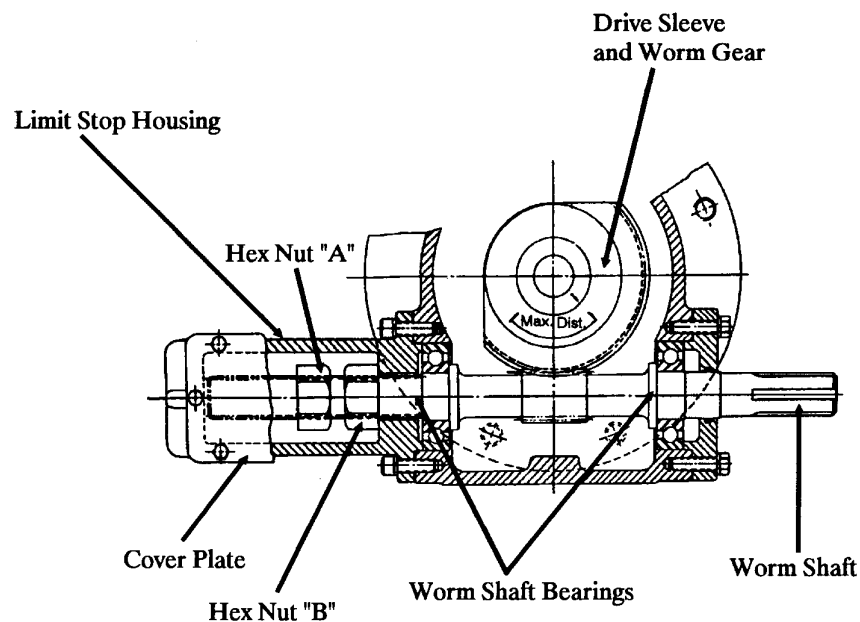


Figure 2-54 Hex Nut Type Stop (HBC-0 Through 3)

HBC-4 Through HBC-10 Reassembly Refer to Figure 2-53

NOTE: Line up match marks during reassembly.

NOTE: Replace any gaskets which are stiff or damaged.

1. Replace drive sleeve "O" rings in housing and housing cover.
2. Coat "O" rings with a thin film of grease.
3. Install worm gear and drive sleeve in housing.
4. Pack worm shaft bearings with site approved lubricant.
5. Coat worm with site approved lubricant.
6. Install worm shaft in housing.

NOTE: It is easier to install the worm shaft in the housing if the worm gear on the drive sleeve is moved to one side. The drive sleeve can be rotated with a strap wrench.

7. Install end cap with gasket on housing.
8. Install worm shaft "O" ring, in thru cap. Coat "O" ring with a film of gear housing grease.

NOTE: Do not place any axial load on worm shaft bearings due to lack of gasket thickness.

- Install thru cap without its gasket, drawing it up finger tight with its fasteners.
- Using a thickness (feeler) gauge, measure and record the gap between the thru cap and housing at four places 90 degrees apart.
- Add the four readings and divide by 4.
- Multiply the average value by 1.1 which allows 10 percent for gasket crush.
- Remove the fasteners and thru cap.

- Select a gasket or gaskets to match the thickness of the calculated value, error to the high side if a precise match can't be obtained.

Install thru cap with gasket or gaskets and worm shaft "O" ring. Coat "O" ring with a film of gear housing grease.

9. If worm gear is not meshed with worm, rotate drive sleeve with strap wrench until gears can be meshed.
10. Rotate worm shaft until worm is approximately in worm gear mid position.
11. Install stop screws.
12. Establish reference mark for worm gear midpoint. Pointer can be set to point to housing cover mounting bolts spaced 90 degrees apart to use as reference marks determining worm gear travel limits. Mid point between 90 degree bolts will be worm gear center.
13. Add site approved grease to gearbox. Insure adequate amount is added to cover worm/worm gear interface during operation.
14. Install housing cover with gasket.
15. Install pointer cap with pointer.
16. Mark housing cover 90 degree reference bolts and midpoint if not already done. Pointer should be pointing close to midpoint. Match marks between housing cover and drive sleeve should be close if valve was placed in mid position before gearbox removal.
17. Rotate worm shaft and move pointer to one end of 90 degree travel.
18. Set appropriate stop screw for travel stop and lock in position.
19. Rotate worm shaft and move pointer to other end of 90 degree travel.
20. Set appropriate stop screw for travel stop and lock in position.
21. Install stop screw cover.

NOTE: Minor adjustment of stop screws may be required after installation.

22. Rotate worm shaft until match marks between drive sleeve and housing cover line up.
23. The gearbox is ready for installation.

NOTE: If the valve is in a different position than when the gearbox was removed, try to place both valve and gearbox in mid position before installation, then set up 45 degree movement on either side of the mid point.

HBC Installation on Valve

1. Determine position of valve (open-mid stroke close). Is valve in same position as it was when operator was removed?
2. If valve is in same position, do the following:
 - Insure HBC match marks between drive sleeve and housing line up.
 - Install HBC unit on valve so that match marks between valve mounting flange and HBC body line up.
 - Adjust stops as necessary (should be minor).
3. If valve is not in same position, but can be placed in mid position, do the following.
 - Position valve as accurately as possible in mid position.
 - Remove pointer cap from HBC and line up reference mark on top of drive sleeve with center of worm by rotating worm shaft (line up as accurately as possible).
 - Install HBC unit so that match marks between valve mounting flange and gearbox line up. (If match marks do not closely line up, check for problem.)
 - Run gearbox and valve opened and closed. Adjust stops as necessary.
 - Reinstall pointer cap to indicate valve position as required.
4. If valve is not in same position, but is either fully opened or fully closed and cannot be placed in the mid position, do the following.
 - Remove pointer cap from HBC and line up reference mark on top of drive sleeve with fully opened or fully closed (whichever is required) position by lining up index mark on top of drive sleeve with appropriate housing cover bolt or index mark on housing cover.

NOTE: Be sure position is correct before mounting HBC unit. If unit is in opposite position, it will have to be removed and remounted.

- Mount HBC gearbox to valve so that match marks on gearbox line up with match

marks on valve mounting flange. (If match marks do not line up, check for problem).

- Adjust stops as required.
- Reinstall pointer cap to indicate valve position as required.

Installing Actuator on HBC Gearbox

1. Install actuator so that match marks on actuator line up with match marks on gearbox.
2. Tighten fasteners.
3. Place actuator in manual and rotate hand wheel sufficiently to insure operation is correct.