

SECTION 02: CLUTCH

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1. CLUTCH

1.1 Description

Vehicles equipped with a manual transmission are provided with the "Spicer" Angle-Spring Clutch. The clutch assembly consists of a 15 1/2" dry disc two-plate model. It is a pull-type design with riveted organic wear surface facing on driven discs. It is manually adjustable to compensate wear, hydraulically operated and pneumatically assisted. A torque limiting clutch brake as well as a positive separator pin system are also provided. One type of clutch is installed regardless of transmission (6 or 7 speeds).

Refer to the "SPICER - SERVICE MANUAL" annexed to the end of this section for the following:

- Transmission Removal

Note: For more details, refer to section 07 "Transmission".

Note: Disconnect the clutch operating cylinder external linkage and remove cylinder assembly (without disconnecting hydraulic hose), to permit the release yoke to turn up and pull free of the release bearing thrust pads, then disconnect the transmission shift linkage.

- Clutch Removal
- Engine and Transmission Alignment (Inspection)
- Clutch Installation
- Transmission Installation

Note: For more details, refer to Section 07 "Transmission"

Note: Position the torque limiting clutch brake on the main drive gear of the transmission, then shift transmission into gear so that the input shaft can be rotated during assembly to align with clutch-driven disc hub splines.

Note: Rotate clutch release bearing housing so that flat section is on top.

Note: Rotate clutch release yoke so that release yoke fingers clear the pads on the release bearing housing. Use a suitable transmission jack to support and maintain the engine-to-transmission alignment while installing the transmission. Use care to avoid having the weight of the transmission bearing on the clutch or forcing the transmission into the clutch or flywheel housing. Such abuse can cause bent or "sprung" driven discs and prevent the clutch from releasing. Rotate clutch release yoke into proper position as transmission is moved into place.

Note: Start all transmission bell housing cap screws and tighten progressively around the housing to 45 lbf•ft (61 Nm).

Note: Connect the transmission shift linkage. Install the clutch operating cylinder and its linkage, then proceed with the clutch adjustment in accordance with paragraph 2.

2. CLUTCH ADJUSTMENT

Note: If for any reason, air is present inside clutch hydraulic line, bleed clutch in accordance with paragraph 3.1.

2.1 Clutch Pedal Adjustment

Adjust clutch pedal as follows:

1. Free play adjustment is made by loosening nut (1, Fig. 1) and moving bolt in slot. The pedal moves down allowing a 1/4" (6 mm) of **free play** before the master cylinder (5, Fig. 1) starts to move.
2. Keep this adjustment by tightening nut (1, Fig. 1).
3. Push the clutch pedal until the master cylinder piston touches the cylinder bottom.

4. Loosen the adjustment bolt (2, Fig. 1) until it touches the pedal wall support (3, Fig. 1).
5. Loosen the adjustment bolt (2, Fig. 1) for another 1-1/2 turn. Lock in position by tightening nut (4, Fig. 1).

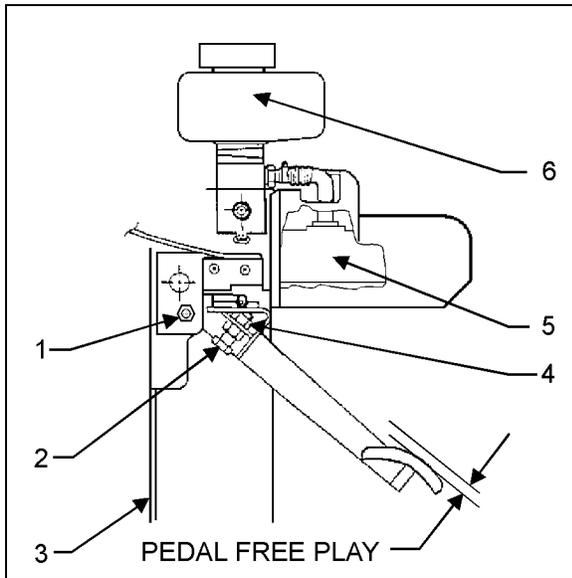


FIGURE 1: FREE PLAY ADJUSTMENT 02004

Note: Clean reservoir internal pieces with jet air to eliminate dirt.

2.2 Internal Clutch Adjustment

1. Remove inspection cover at bottom of clutch housing (Fig. 4).
2. Measure the **release travel** (clearance between release bearing housing and clutch brake) (Fig. 2). The clearance should be between 1/2" and 9/16" (13 and 14 mm).
3. If clearance is incorrect, release the clutch by depressing the clutch pedal to end of pedal travel. Insert a 3/4" socket (12 points) or a 3/4" box-end wrench through inspection hole. Depress square-head bolt to adjust clutch (Figs. 3 & 4).

The "Kwik-Adjust" will re-engage at a quarter of a turn. The flat surface on the bolt head will align with the flat edge of the bracket.

Note: If clearance between release bearing housing and clutch brake is less than 1/2" (13 mm), rotate the adjusting ring counterclockwise to move the release bearing towards the engine. If clearance is greater than 9/16" (14 mm), rotate the adjusting ring clockwise to move the release bearing towards the transmission.

4. Ensure "Kwik-Adjust" is engaged in the locked position. Release the clutch pedal to engage clutch.

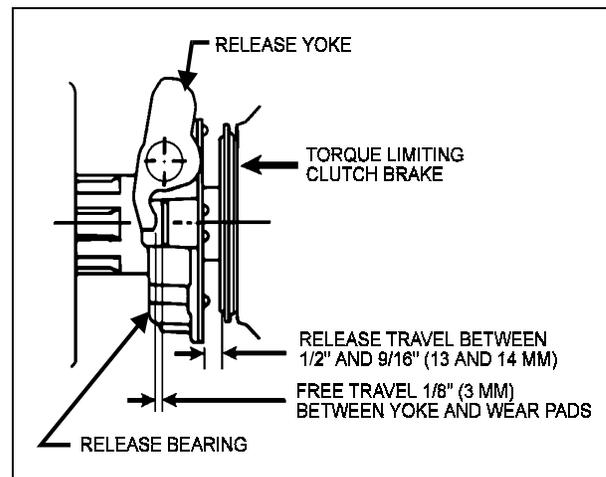


FIGURE 2: RELEASE TRAVEL AND FREE PLAY TRAVEL ADJUSTMENT 02005

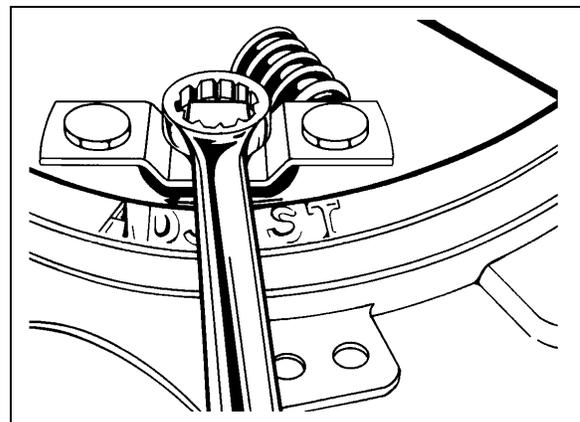


FIGURE 3: SQUARE HEAD BOLT 02006

2.3 Free Travel Setting

1. Check **free travel** as shown in figure 2. The clearance should be 1/8" (3 mm).
2. If clearance is incorrect, adjust bolt until it touches the shaft lever and locks in position with nut (Fig. 4).

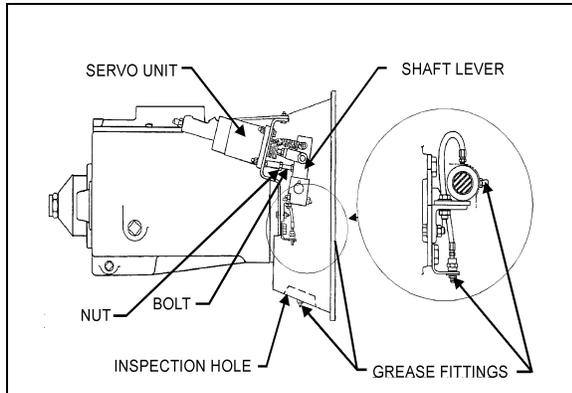


FIGURE 4: CLUTCH INSTALLATION 02001

Note: The return springs do not require any tension adjustment.

2.4 Air Pressure Regulator

The air pressure regulator is located in engine compartment and accessible through R.H. side door (Fig. 5). To adjust, remove dust cap from regulator. Attach a pressure gauge to port. Loosen adjusting screw lock nut. Turn screw to **adjust pressure to 40 psi (275 kPa)**. Tighten lock nut, then reinstall dust cap. Refer to Section 12, "BRAKE AND AIR SYSTEM".



FIGURE 5: AIR PRESSURE REGULATOR 02007

3. RENEW CLUTCH HYDRAULIC LINE

3.1 Bleeding

The clutch hydraulic system must be bled whenever air enters it. Unlike hydraulic fluid, air is compressible. This means that instead of transmitting pedal pressure through the hydraulic line, the master cylinder will compress air in the line. This results in a spongy feel in the pedal, incomplete clutch disengagement and hard shifting.

Note: Two people are required to bleed air from the hydraulic lines. One to operate the clutch pedal and the other to open and close the bleed valve.

Warning: Wear safety glasses during the following operation.

1. Locate the bleed valve mounted at the end of servo unit. Remove dust cap (Figs. 4 and 6).
2. Attach a plastic tube to the bleeding valve (Fig. 6). Dip the other end of the tube in a jar containing several inches of clean brake fluid.
3. Press the clutch pedal as far as it will go 2 or 3 times, then hold it down.
4. With the clutch pedal down, open the bleeding valve until the pedal goes to the floor, then close the bleeding valve. Do not release the pedal until the bleeding valve is closed.
5. Close valve and slowly release the pedal.

- Repeat steps 4-6 until the fluid entering the jar is free of air bubbles.

3.2 Filling

- Remove the master cylinder reservoir cap.
- Slightly loosen teflon flexible hydraulic hose connector from adapter mounted on extremity of servo unit (Fig. 6).

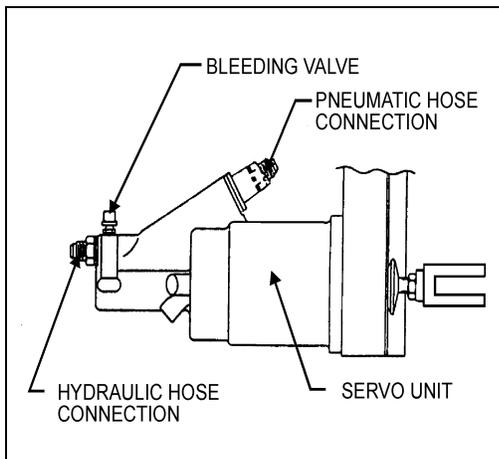


FIGURE 6: SERVO UNIT

02002

- Remove the plastic tube on the bleeding valve. Make sure the bleeding valve is open. Force fluid (meeting DOT 3 specifications) through the bleeding valve opening. Tighten teflon flexible hose connector when fluid is free of air bubbles. Continue to force brake fluid until it enters master cylinder reservoir and flows free of air bubbles.

Note: A 40 psi (275 kPa) pressure allows filling hydraulic line in reasonable time.

- Tighten bleeding valve and reinstall dust cap.
- Fill master cylinder reservoir.
- Install the master cylinder reservoir cap.

Note: To make the filling procedure easier to perform, the reservoir support may be unbolted and reservoir moved closer to you.

Caution: Never re-use brake fluid which has been bled from the system. Discard old brake fluid and use a fresh supply.

4. LUBRICATION

The clutch components should be lubricated every 6,250 miles (10 000 km) or twice a year, whichever comes first (refer to previous Fig. 4 to identify the clutch component grease fittings). The clutch release bearing (one grease fitting) and the clutch control cross shaft (three grease fittings, two on the operating cylinder side and one on the other side) should be lubricated with a good quality lithium-based soap or equivalent E.P. grease meeting N.L.G.I. grades 1 or 2.

5. TROUBLESHOOTING

Poor Clutch Release or Poor Engagement	
Probable cause	Corrective action
Clutch adjustment incorrect.	Recheck adjustment as per instructions.
Air in clutch hydraulic line.	Bleed clutch hydraulic line as per instructions.
Flywheel pilot bearing too tight in flywheel or on end of drive gear.	Free pilot bearing with a light push. If bearing is rough, replace it.
Damage clutch release bearing.	Replace bearing. Lubricate with recommended lube.
Clutch release shaft projecting through release yoke.	Relocate release shaft so that it does not project. Check bell housing bushing and release yoke for wear.
Release yoke contacting cover assembly at full release position.	Replace release yoke with proper yoke.
Release yoke not aligned properly with release bearing.	Check flywheel. Probably has been resurfaced more than the 0.060" (1,52 mm) recommended.
Intermediate plate sticking on drive lugs	Check that drive pins are 90° square to flywheel surface and that there is a minimum .006" (0,152 mm) clearance between drivepins and intermediate plate slots.
Pressure plate not retracting.	<ul style="list-style-type: none"> a. Check pressure plate drive lugs for 0.006" (0,152 mm) clearance. b. Check pressure plate return springs for proper tension. c. Check amount of release travel. d. Lever nose out of groove.
Driven disc distorted.	Should be straight within 0.015" (0,381 mm). Replace if distortion cannot be corrected.

Poor Clutch Release or Poor Engagement (cont'd)	
Probable cause	Corrective action
Worn splines on drive gear of transmission.	Check drive gear and driven disc hubs for excessive wear.
Disc facings gummed with oil or grease.	Replace facings or entire disc. Cleaning not recommended. Check for leak causing gumming.
Broken intermediate plate.	Replace entire intermediate plate/driven disc assembly. Damage such as this is almost always caused by abusive use of clutch.

Clutch Slipping	
Probable Cause	Corrective action
Pedal has no free play	Re-adjust as per instructions.
Release mechanism binding.	Check release mechanism and linkage. Lube if necessary.
Worn clutch facings.	Replace facings or complete disc, if necessary.
Grease or oil on facings.	Replace facings.
Weak pressure springs.	Replace springs
Overloaded clutch	Check to assure that proper clutch has been specified.

Noisy Clutch	
Probable Cause	Corrective action
Clutch release bearing dry or damaged.	Lubricate bearings or replace.
Flywheel pilot bearing dry or damaged.	Lubricate bearings or replace.
Clutch release bearing housing striking flywheel ring.	Adjust clutch. Also check wear on cross shafts, bell housing bushings and release yoke fingers. Replace if necessary.
Improper clearance between drive slots and drive lugs on pressure plates.	Clearance should be at least 0.006" (0,152 mm).

6. SPECIFICATIONS

Clutch Adjustment

Pedal free play	1/4 ±1/8" (6±3 mm)
Internal clutch adjustment.....	between 1/2-9/16" (13-14 mm)
Free travel setting	1/8" (3 mm)
Clutch brake setting (between stopper and adjusting bolt).....	between 1/4-3/8" (6-9 mm)

Clutch Assembly - Series 60

Make.....	DANA Corp. (Spicer)
Supplier number.....	108391-78
Prevost number.....	520147
Model.....	Easy Pedal
Type	Dry, two-plate, pull-type, manually adjustable (Kwik- Adjust)
Size	15 1/2" (394 mm)
Plate Load Capacity	4000 lbs (17 792 N)
Maximum Torque Capacity	1450 lbf•ft (1966 N•m)
Disc Facing Thickness.....	0.487/0.452
Hub Spline Size (No. splines).....	2" (10)
Disc Assembly Max. Runout (T.I.R.).....	0.015" (0,381 mm)
Disc Assembly Max. Out-of-Flat.....	0.020" (0,508 mm)
Release Sleeve Bushing Dia. (new).....	2.010/2.008" (51,054/51,003 mm)
Intermediate Plates, driving lugs to slot clearance (new min.).....	0.006" (0,152 mm)
Intermediate Plates, driving lugs to slot clearance (max. worn)	0.015 to .021" (0,381 to 0,508 mm)
Pressure Plates, driving lugs to slot clearance (new)	0.003 to .010" (0,076 to 0,254 mm)
Pressure Plates, driving lugs to slot clearance (max. worn).....	0.016/.021" (0,406/0,533 mm)
Intermediate Plates & Pressure Plates: Out-of-Flat.....	0.000 to .004 Concave (0,000 to 0,102 mm)
Scoring - Max. depth that can be re-used	0.015" (0,381 mm)
Release Sleeve Retainer, driving lugs to slot clearance (max. worn)	0.020" (0,508 mm)
Maximum Engine RPM.....	2600

Clutch Assembly - Series 50

Make.....DANA Corp. (Spicer)
 Supplier number..... 108925-84
 Prevost number..... 520148
 Model..... Easy Pedal
 Type Ceramic, two-plate, pull-type, manually adjustable (Kwik- Adjust)
 Size 15 1/2" (394 mm)
 Plate Load Capacity..... 3200 lbs (14 080 N)
 Maximum Torque Capacity 1150 lbf•ft (1564 N•m)
 Disc Facing Thickness..... 0.487/0.452
 Hub Spline Size (No. splines).....2" (10)
 Disc Assembly Max. Runout (T.I.R.) 0.015" (0,381 mm)
 Disc Assembly Max. Out-of-Flat 0.020" (0,508 mm)
 Release Sleeve Bushing Dia. (new).....2.010/2.008" (51,054/51,003 mm)
 Intermediate Plates, driving lugs to slot clearance (new min.)..... 0.006" (0,152 mm)
 Intermediate Plates, driving lugs to slot clearance (max. worn) 0.015 to .021" (0,381 to 0,508 mm)
 Pressure Plates, driving lugs to slot clearance (new) 0.003 to .010" (0,076 to 0,254 mm)
 Pressure Plates, driving lugs to slot clearance (max. worn) 0.016/.021" (0,406/0,533 mm)
 Intermediate Plates & Pressure Plates: Out-of-Flat0.000 to .004 Concave (0,000 to 0,102 mm)
 Scoring - Max. depth that can be re-used 0.015" (0,381 mm)
 Release Sleeve Retainer, driving lugs to slot clearance (max. worn) 0.020" (0,508 mm)
 Maximum Engine RPM.....2600

Master Cylinder

Make.....Kongsberg Automotive
 Supplier Number624409-P01
 Prevost Number 520139

Operating Cylinder (slave cylinder)

Make.....Kongsberg Automotive
 Supplier Number624410-P01
 Prevost Number 520138