GENERAL

The Valeo single-disc diaphragm spring pull type clutch is a lightweight, high performance clutch designed for class 6, 7 and 8 trucks in the North American market (Fig. 1-1). This clutch is designed to replace the heavier two-disc design clutches in a wide variety of applications that include both flat and pot flywheels and in capacities to 1850 pound-feet of torque. The Valeo clutch offers significant advantages over the heavier and more complex two-disc clutches:

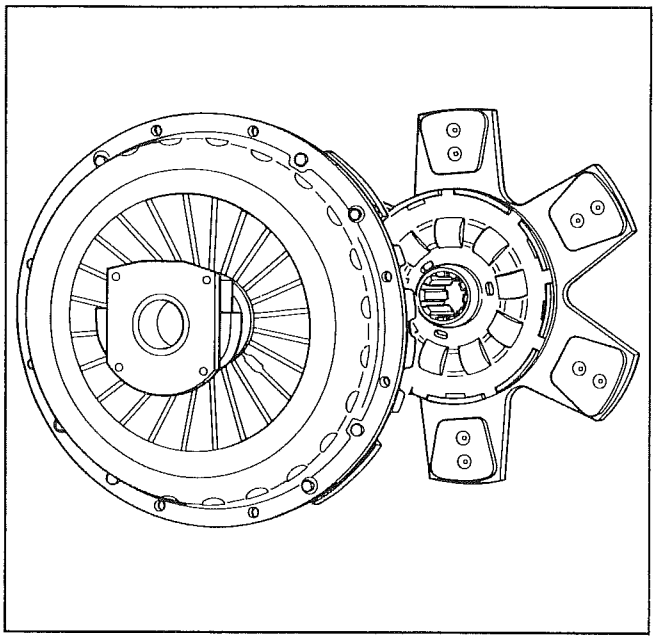


Figure 1-1. Single-Disc Diaphragm Spring Pull Type Clutch

- Reduced Weight
- Low Clutch Pedal Effort
- Smooth Engagement
- Long Life
- Easier Transmission Shifting
- Longer Driveline Life

A major factor in the Valeo design is that the single-disc clutch has less inertia than two-disc clutches, which results in smoother and easier transmission shifting.

The most distinctive difference, and the key to the unique qualities of the Valeo clutch, is the use of a diaphragm spring and a single driven disc. The diaphragm spring provides a minimum safe clamp load throughout the life of the clutch without internal pressure plate adjustment.

Other factors contribute to the design efficiency of the Valeo clutch. When compared with the two-disc design:

- The single-disc clutch with its cerametallic friction material provides long life and smooth engagement, and can handle the requirements of medium and heavy duty applications.
- The design of the clutch assures a lower operating temperature than the two-disc design. Lower operating temperatures increase clutch life.
- Because of the unique single-disc design, the operation of the clutch is much simpler and eliminates the troublesome drive lugs sometimes found on two-disc clutches.
- By eliminating the intermediate plate found in the two-disc clutch, the single-disc design provides improved clutch release and less drag.

Installation of the Valeo single-disc clutch is much easier than comparable two-disc clutches. The primary reasons for this are the light weight of the Valeo clutch, and the use of fewer and less-complicated parts. The compact design of the Valeo clutch means even more advantages over two-disc designs:

- More space for larger diameter damper springs and a stronger disc hub.

GENERAL

- Increased air circulation within the clutch housing for better cooling.
- Thicker pressure plate with integral cooling fins for better heat transfer and cooler operation.

The simple design, use of high quality materials, built-in driver-friendly features, and reduced maintenance make the Valeo clutch the ideal choice for any medium and heavy-duty truck application.

PRESSURE PLATE AND CLUTCH ASSEMBLY COMPONENTS

The following descriptions provide an in-depth look at all the major components of the Valeo single-disc clutch. The exploded view shows how the parts fit in relation to each other in the clutch and pressure plate assembly (Fig. 1-2).

Clutch Disc

The clutch disc is the driven portion of the assembly that transmits power from the engine flywheel to the transmission input shaft (Fig. 1-3). A typical disc has six paddle arms with cerametallic friction facings on the front and back sides of each arm. Power is transmitted through the friction facings to the splined hub that couples to the transmission input shaft.

In the center portion of the clutch disc, between the friction facings and the splined hub, is the clutch damper unit. The damper unit is comprised of several coil springs designed to absorb the torsional vibrations generated by the engine, reducing driveline noise and transmission input shaft spline wear. Because of the design of the single-disc clutch, the damper unit is able to have larger springs for improved damping over comparable two-disc clutches.

NOTE

A dual damper option is available on some clutch applications. The additional springs are designed to eliminate transmission gear rattle at idle. This noise can occur when the transmission is in neutral with the clutch engaged and the engine idling.

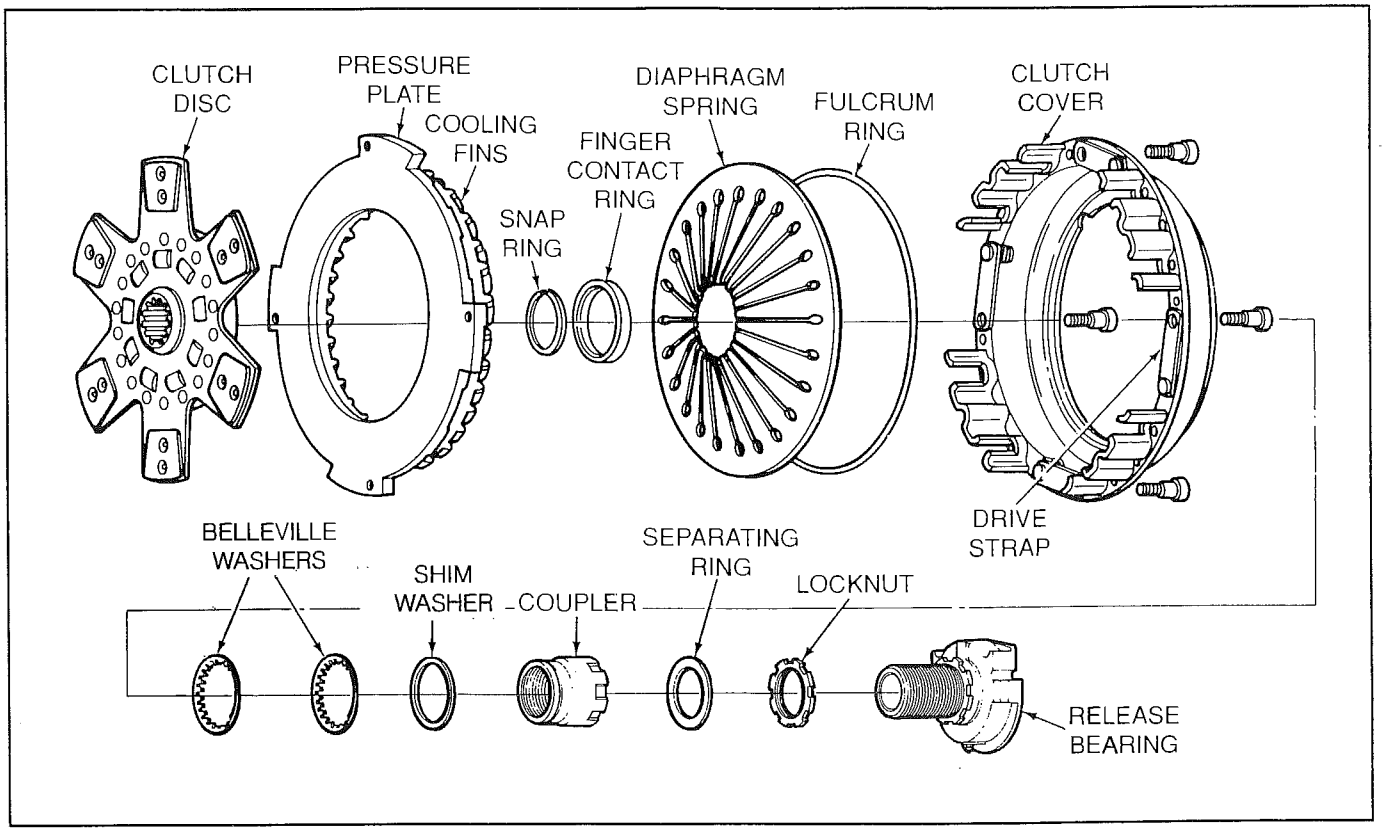


Figure 1-2. Valeo Single-Disc Clutch Exploded View

PRESSURE PLATE AND CLUTCH ASSEMBLY COMPONENTS

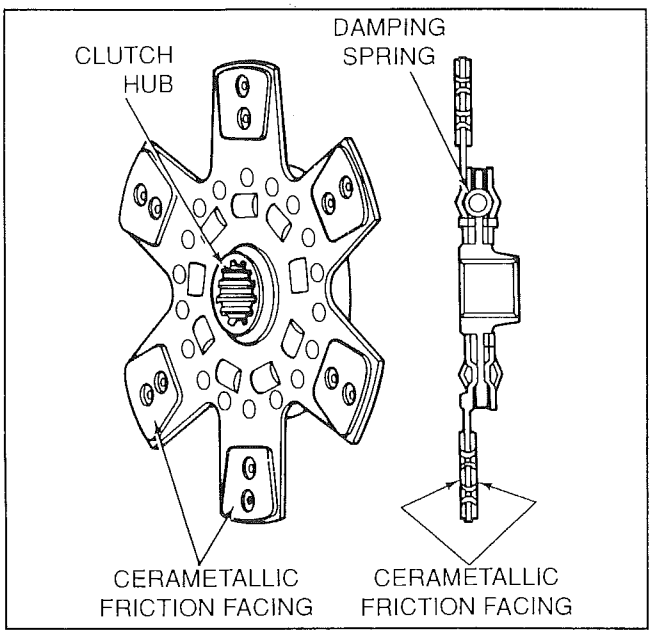


Figure 1-3. Typical Clutch Disc

Pressure Plate

The pressure plate is a large cast-iron disc precisely machined on one side to press flat against the clutch disc. The pressure plate is attached to the flywheel through the clutch cover. Using spring pressure it clamps the clutch disc to the engine flywheel allowing engine power to be transmitted to the transmission input shaft.

The simple, single-disc design of the Valeo clutch allows the use of a larger pressure plate casting (Fig. 1-4). The heavy duty design is not only tougher, but also promotes improved heat dissipation through cooling fins which are cast into the back side of the pressure plate. They draw air into the clutch housing for improved cooling and longer clutch life.

The pressure plate casting is attached to the clutch cover by four sets of spring-steel drive straps (Fig. 1-5). These drive straps transmit engine power to the pressure plate through a flexible connection. The flexible connection allows the pressure plate the freedom to be moved toward or away from the engine. The drive straps act as springs to pull the pressure plate casting off the disc when the diaphragm spring clamping load is disengaged. This eliminates drag by mechanically retracting the pressure plate when the clutch pedal is depressed.

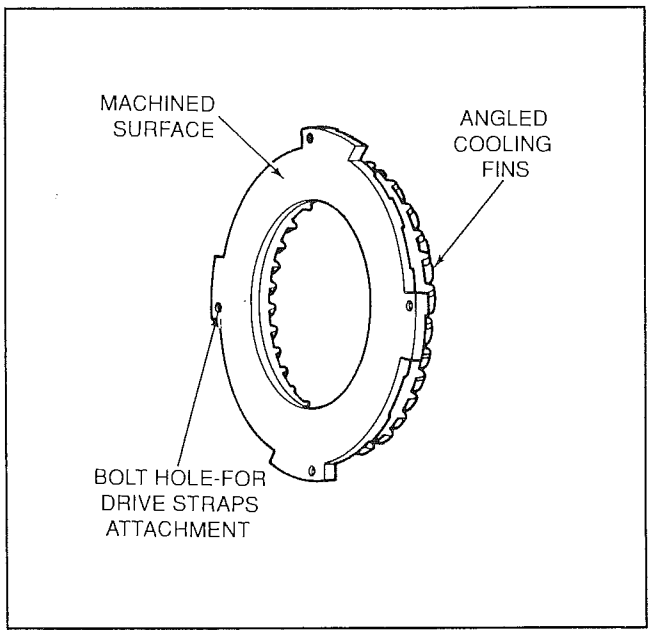


Figure 1-4. Clutch Pressure Plate Casting

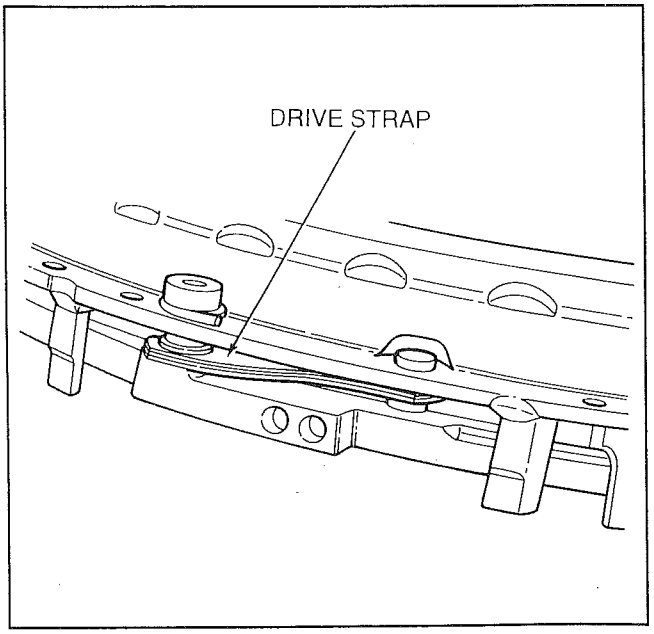


Figure 1-5. Spring-Steel Drive Straps

PRESSURE PLATE AND CLUTCH ASSEMBLY COMPONENTS

Diaphragm Spring

The diaphragm spring is a circular disc manufactured from high quality spring steel (Fig. 1-6). The spring portion contains several fingers that are moved back and forth to engage and disengage the clutch. The force generated by the diaphragm spring provides the load necessary to clamp the clutch disc between the pressure plate casting and flywheel. The spring is placed inside the clutch cover between the fulcrum ring and a ridge on the pressure plate. The fingers of the diaphragm are attached to the coupler.

Careful design of the diaphragm spring allows it to provide a clamp force that is always equal to or greater than the minimum required value throughout the life of the clutch. This means there is no internal clutch adjustment to compensate for wear.

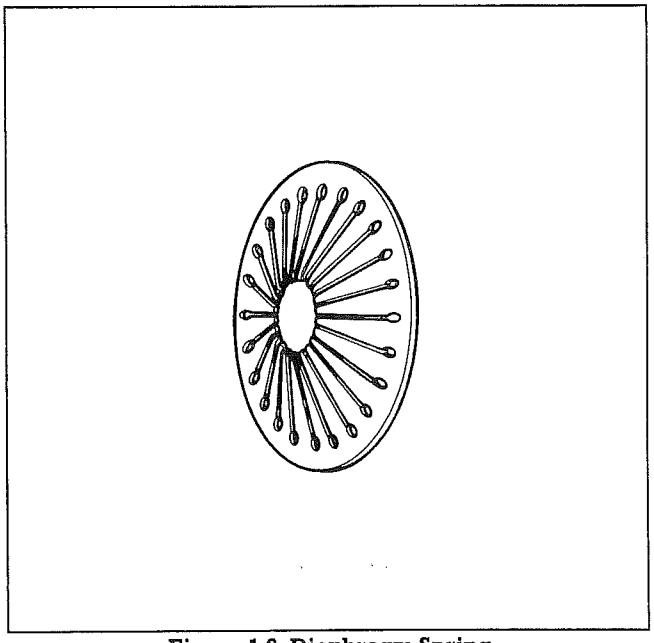


Figure 1-6. Diaphragm Spring

A typical diaphragm spring load curve is shown in Figure 1-7. The curve shows how clamp force varies when the clutch disc thickness is reduced due to wear. Point A represents the as-new engaged clamp load. For the first half of the wear life of the clutch, the clamp load provided by the diaphragm actually increases to a maximum value, shown at point B. For the last half of the wear life, the clamp load decreases back to the original as-new value at point C. Because of this characteristic, no internal clutch adjustments are required to maintain a safe level of clamp load over the life of the clutch. The only necessary adjustment is for release-bearing length to maintain clutch pedal freeplay and release yoke geometry (non self-adjusting release systems).

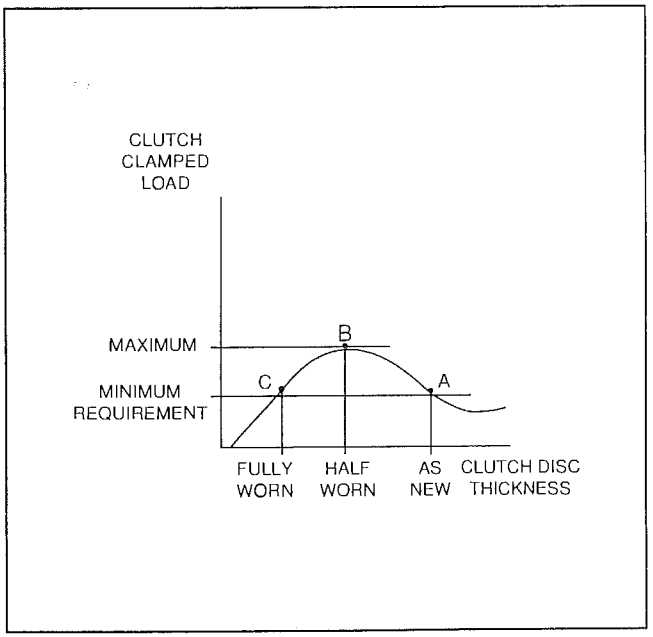


Figure 1-7. Typical Diaphragm Spring Clamped Load Characteristic

Fulcrum Ring

The 16 and 17-inch models of the Valeo single-disc clutch contain a fulcrum ring. This ring is located within the clutch cover. The fulcrum ring provides a pivot surface for the diaphragm spring. The advantage of the Valeo design is that the fulcrum ring contacts the spring around its entire circumference, to decrease internal friction and wear.

NOTE

On 14-inch model clutches the fulcrum ring is an integral part of the stamped cover.

PRESSURE PLATE AND CLUTCH ASSEMBLY COMPONENTS

Clutch Cover

The clutch cover is a lightweight steel stamping designed to provide high strength and excellent heat dissipation (Fig. 1-8). It is much lighter than cast-iron covers, but by design is more rigid, and has a narrower profile. It protects the vehicle from damage in case the pressure plate casting breaks. The cover completely covers the outside of the clutch and is attached to the flywheel with 8 or 12 capscrews, depending on the application. Attachment of the cover to the pressure plate is through the four spring-steel drive straps.

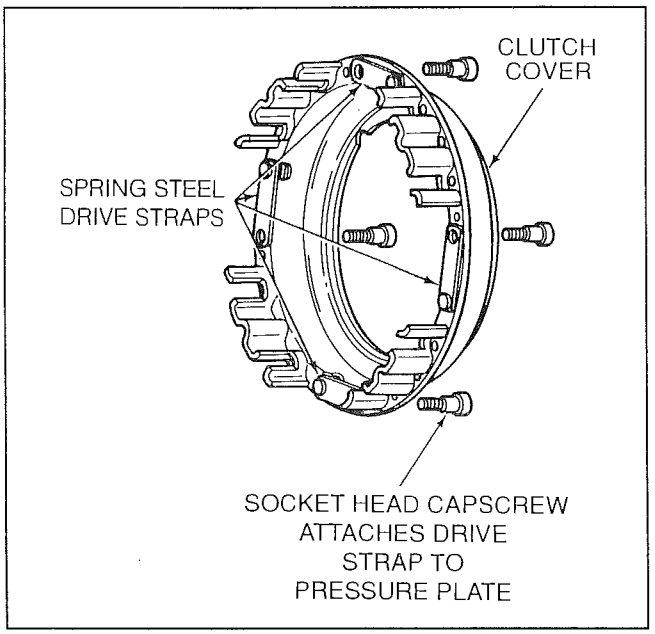


Figure 1-8. Clutch Cover

Clutch Release Bearing

The clutch release bearing assembly is used to connect the clutch diaphragm spring to the clutch release linkage (Fig. 1-9). The release bearing assembly is retained to the diaphragm spring with a coupler and snap ring. The coupler, threaded sleeve and ball bearing inner race rotate at engine speed along with the clutch. The release bearing outer race remains fixed inside the bearing housing which is held stationary by the release yoke.

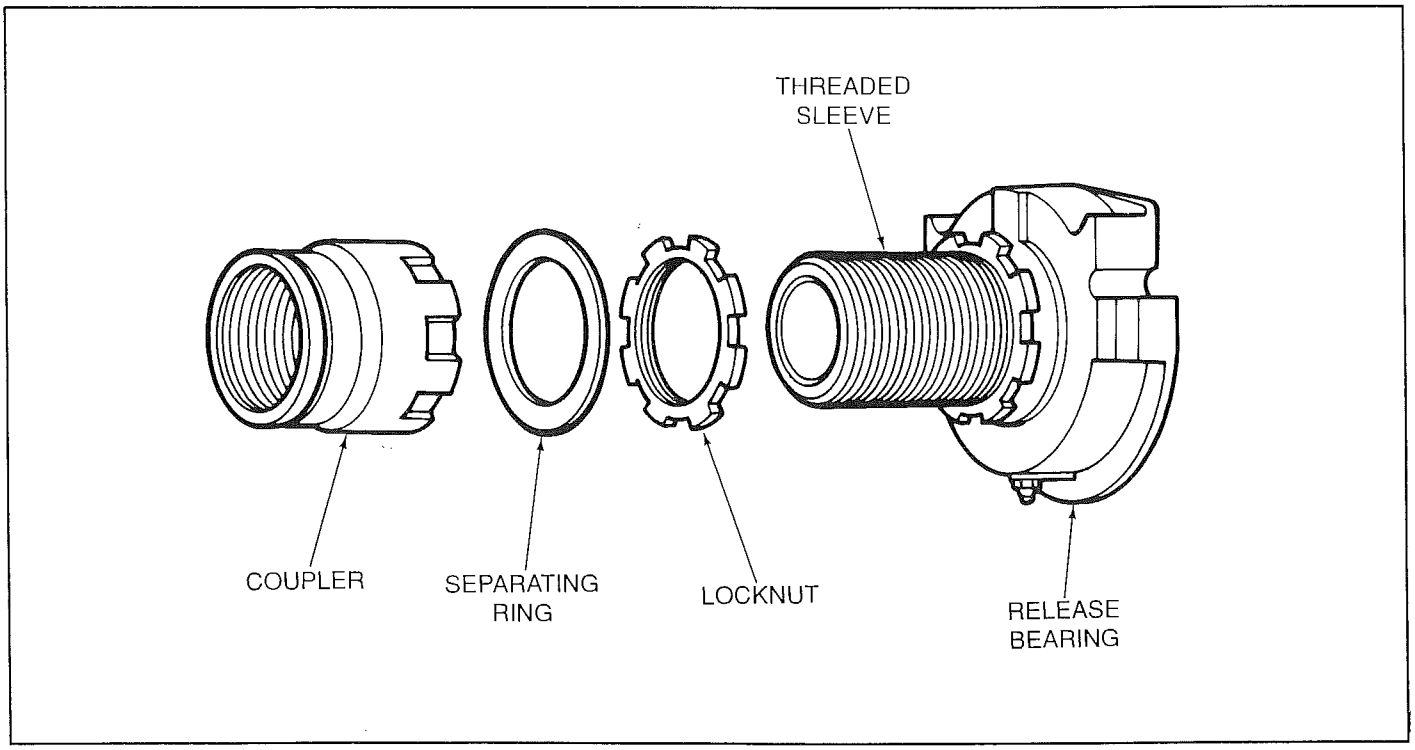


Figure 1-9. Clutch Release Bearing

THEORY OF OPERATION

Clutch Operation

The clutch is a mechanical device used to disconnect and reconnect driving (engine) and driven (transmission) members of a driveline. The clutch has three basic purposes:

1. When engaged, the clutch allows the engine and driveline to rotate together as one solid member.

2. When disengaged, the clutch disconnects the engine from the driveline allowing it to remain running while the vehicle is stopped.

3. The clutch can be used to interrupt and reconnect the flow of engine power to allow the changing of transmission gears, or to engage or disengage a power takeoff unit.

A foot pedal allows the driver to control the engagement and disengagement of the clutch (Fig. 2-1). When the clutch pedal is depressed, the release bearing is pulled rearward, toward the transmission. It pulls the diaphragm spring along with it, disengaging the clamp load on the driven disc. During clutch engagement, the release bearing moves toward the engine allowing the diaphragm spring to clamp the clutch disc between the pressure plate and engine flywheel and transmit engine power to the transmission. The advantages of the Valeo clutch in general operation is that it provides a much softer pedal feel allowing the driver improved control of clutch engagement.

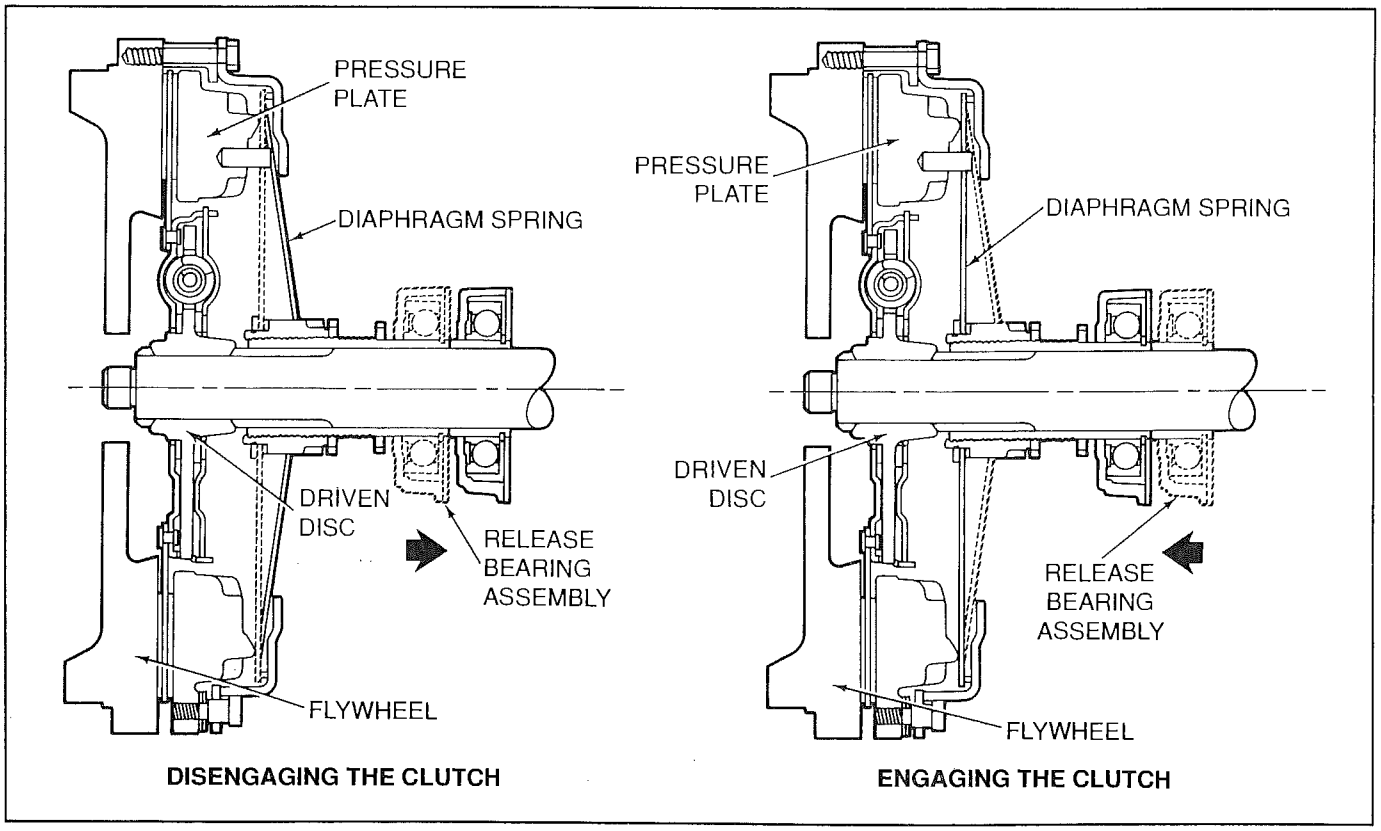


Figure 2-1. Clutch Engaged and Disengaged

THEORY OF OPERATION

Clutch Brake Operation

Non-synchronized transmissions may use a clutch brake (Fig. 2-2). The brake is a steel disc with two tangs, encased in a cover that has a facing material bonded to both sides.

The purpose of the clutch brake is to slow down or stop the transmission input shaft from rotating when the clutch pedal is depressed.

Pushing the clutch pedal to the floorboard beyond the normal clutch disengage position brings the clutch release bearing in contact with the clutch brake and the transmission front cover. Because the tangs on the brake hub are engaged in the transmission input shaft splines, the transmission is slowed down or stopped. The driver can then quickly shift into gear without clashing or damaging the gears.

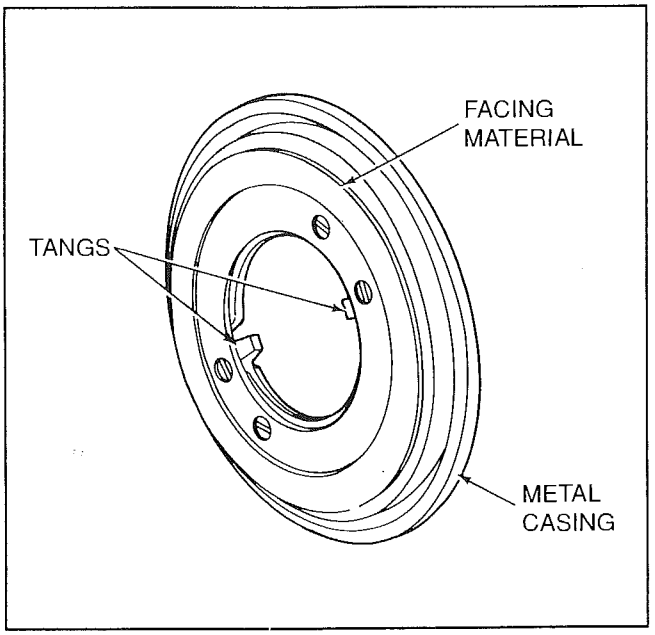


Figure 2-2. Typical Clutch Brake

FACTORS AFFECTING CLUTCH LIFE

Valeo single-disc diaphragm spring clutches are designed to provide years of trouble-free service. However, if today's powerful trucks are not serviced and driven correctly, greatly reduced clutch life may result.

Clutch wear life depends on how often and how long the clutch is slipped. There are three factors that technicians should be aware of that affect clutch life:

1. **Frequency of clutch engagements** - Vehicle application influences the frequency of clutch engagements. Stop and go driving will shorten clutch wear life.

2. **Long clutch engagements** - Extended slippage on vehicle start ups can be caused by:

   - Driver operation

     – Slips clutch excessively

     – Starts in too high a gear

   - Insufficient vehicle startability

     – Insufficient gear reduction in transmission and axle to allow short and quick clutch engagement.

3. **Clutch Slippage** - Abnormal clutch slippage can severely reduce clutch life:

   - Driver influence

     – Poor driving techniques, such as using the clutch instead of brakes, to hold the truck on a hill.

   - Improper maintenance

     – Improper free play adjustment (no free play) can result in reduced clamp loads because it creates a condition similar to riding the clutch pedal.

Preventing Clutch Slippage

Clutch wear life is proportional to the amount of slippage it is subjected to. Therefore, to maximize life, abnormal or excessive slippage must be avoided. If the clutch begins to slip, back off the throttle or change to a lower gear to stop the slippage. If slipping continues for more than a few seconds under high load conditions, the clutch will become hot and will "fade" in the same way that hot brakes will fade.

Should excessive clutch slippage and/or overheating occur, pull the truck off the road and allow the clutch to cool completely. Clutches heat up faster and take longer to cool than brakes because they are in an enclosed space with minimal airflow. During the cooling off period, the clutch should be checked to determine the cause of slippage. (See Troubleshooting Section for causes.) At the very least, clutch pedal free play should be checked and adjusted if required.

If the clutch continues to slip after cooling, downshift one or two gears until the slippage stops. Then, drive to the nearest service location to have the clutch adjusted or repaired as needed.

The following are driver tips on how to improve clutch performance and extend the useful life of the entire driveline.

DO:

- Gently engage the clutch while the engine is at idle and start increasing the throttle only after the clutch is fully engaged.
- Start the truck in a gear low enough to allow a smooth and quick clutch engagement.
- Minimize clutch-engagement slip time to avoid excessive generation of heat.
- Use the clutch when performing normal upshifts and downshifts.
- Make every effort to match the engine speed to the transmission input shaft speed during upshifts and downshifts to avoid inducing drivetrain shock loads.
- Readjust the release bearing position whenever the clutch pedal free play drops below specification (see Section 11 for more information) (applies only to trucks that have non self-adjusting clutch release linkage).
- Complete a short and simple break-in procedure (see Clutch Installation in this manual) whenever a new clutch has been installed to properly "bed in" the new clutch facings.

DON'T:

- Start the truck with high engine rpm and long clutch slip times or the clutch will overheat.
- Start the truck with very short (abrupt) clutch slip times that shock the driveline.
- Upshift or downshift before reaching the correct engine rpm because this will shock-load the driveline.
- Rest your foot on the clutch pedal. This will start to disengage the clutch and could cause slippage.
- Coast down hill with the clutch disengaged and the transmission in gear. Safe vehicle control will be lost and maximum clutch disc rpm operating limits could be exceeded.
- Engage the clutch brake while the truck is moving. This can easily destroy the clutch brake.
- Use the clutch brake to stop the truck or hold it on a hill. It is too fragile for this purpose.
- Slip the clutch to hold the truck in place on a hill. This will quickly overheat the clutch.

MAXIMIZING CLUTCH LIFE

DON'T: (Continued)

- Allow irregular clutch action to go unreported. Submit a driver's report after each trip and keep the maintenance director informed of a possible problem.

- Excessively slip the clutch when a vehicle is stuck. Rocking the vehicle by quickly changing gears (reverse to first) or excessive clutch slippage can cause extreme damage to the driveline.

- Allow the engine to lug. A lugging engine creates damaging torsional vibrations that can destroy the driveline of a vehicle. Keep the engine in its recommended operating range.

- Overload the vehicle. The vehicle's driveline, suspension and brakes were designed for a specific capacity. When this capacity is exceeded, the life expectancy of these components will decrease.

- Allow an untrained driver to operate a vehicle.

OPERATING CONDITION AND PROBABLE CAUSE

Problem	Corrective Action
I. Clutch Slippage	
1. Insufficient clutch pedal free play	1. Adjust release bearing position, then adjust linkage if necessary
2. Linkage blocked from complete return	2. Remove blockage
3. Linkage needs lubrication	3. Lubricate linkage
4. Release bearing locknut loose	4. Adjust release bearing length and tighten locknut
5. Worn clutch disc facings	5. Replace clutch disc
6. Worn or damaged flywheel	6. Resurface or replace flywheel
7. Worn or damaged clutch pressure plate	7. Replace pressure plate and cover assembly
8. Grease or oil contamination on facings	8. Clean facings and repair cause of contamination. If contaminant cannot be removed, replace clutch disc
9. New clutch installation needs break-in	9. Perform clutch break-in procedure
II. Clutch Drag/Hard Shifting	
1. Linkage blocked from full travel	1. Remove blockage
2. Linkage incorrectly adjusted	2. Adjust clutch linkage
3. Linkage worn/damaged	3. Replace faulty linkage components
4. Clutch damaged – damaged clutch disc hub splines – bent clutch disc – bent drive straps – broken/warped pressure plate	4. Replace damaged component
5. Contamination/grease in release bearing bore	5. Clean release bearing bore and transmission input shaft
6. Excessive side loading on release bearing	6. Eliminate source of excessive side loading (usage of improper release bearing grease, worn/damaged cross shaft bushings, worn/damaged cross shaft, worn/damaged or bent release yoke tips, worn/damaged or uneven release bearing yoke contact wear pads, excessive release bearing travel during disengagement, worn/damaged pilot bearing, excessive flywheel runout, excessive engine to transmission misalignment, etc.)

OPERATING CONDITION AND PROBABLE CAUSE

Problem	Corrective Action
II. Clutch Drag/Hard Shifting - Continued	
7. Failed pilot bearing	7. Replace pilot bearing and input shaft if damaged
8. Transmission input shaft splines worn/damaged	8. Replace input shaft
9. Tight or contaminated clutch disc splines	9. Clean clutch disc and input shaft splines or replace clutch disc as necessary
10. Flywheel housing to clutch housing excessive misalignment	10. Replace faulty housing
11. Grease or oil contamination on facings	11. Clean facings and repair cause of contamination. If contaminant cannot be removed, replace clutch disc
12. Excessive free play due to fine dust packing inside the clutch	12. Remove and clean or replace the clutch. Block all dust entry points. In extremely dusty applications, leave one hole in the bottom of the clutch housing and apply a regulated compressed air line at the top of the housing to give a slightly positive air pressure inside the clutch housing.
III. High Pedal Effort	
1. Clutch/linkage incorrectly adjusted	1. Adjust clutch/linkage
2. Linkage needs lubrication	2. Perform lubrication maintenance
3. Linkage worn or damaged	3. Replace faulty linkage components
4. Linkage contacting air/electrical/fuel/etc. lines	4. Reroute obstructing lines
5. Clutch disc worn too thin	5. Replace clutch disc
IV. Abrupt Engagement	
1. Linkage needs lubrication	1. Perform lubrication maintenance
2. Linkage worn/damaged	2. Replace faulty linkage components
3. Grease or oil contamination on facings	3. Clean facings and repair cause of contamination. If contaminant cannot be removed, replace clutch disc
4. Clutch/linkage needs adjustment	4. Adjust release bearing length and adjust clutch linkage
V. Frequent Adjustments	
1. Release bearing locknut insufficiently/ incorrectly tightened	1. Carefully adjust release bearing length per procedures
2. Insufficient free play gap	2. Adjust release bearing length then adjust clutch linkage

OPERATING CONDITION AND PROBABLE CAUSE

Problem	Corrective Action
V. Frequent Adjustments - Continued	
3. Excessive clutch slippage	3. See Heading I. Clutch Slippage
4. Clutch wearing excessively	4. Review vehicle application. Review driver practices. See section on clutch life page 2-3
5. Clutch gaining free play due to fine dust packing inside the clutch	5. Remove and clean or replace the clutch. Block all dust entry points. See Heading II. Point no. 12
VI. Clutch Noise	
1. Linkage needs adjustment	1. Adjust clutch linkage
2. Linkage needs lubrication	2. Perform lubrication maintenance
3. Linkage contacting cab or frame	3. Determine cause (misinstallation, misadjustment, wear, etc.) and correct
4. Clutch brake rattle	4. Replace with different style of clutch brake
5. Pilot bearing worn or damaged	5. Replace pilot bearing and input shaft if damaged
6. Release bearing bore incorrect size (2-inches instead of 1 3/4-inches, etc.)	6. Replace release bearing with correct size
7. Clutch incorrectly installed	7. Remove clutch and reinstall correctly
8. Clutch disc damper worn or damaged	8. Replace clutch disc
9. Idle rattle (incorrectly specified clutch disc damper)	9. Replace clutch disc with correct specification design
10. Release bearing worn or damaged or grease contaminated	10. Clean and re-grease or replace release bearing
VII. Clutch Vibration	
1. Excessive driveline torsional activity (poorly phased drive shaft u-joints, incorrect driveline angles, incorrect air ride height adjustment, excessive driveshaft imbalance, incomplete ignition, etc.)	1. Find and correct cause of excessive driveline torsional activity
2. Clutch incorrectly installed	2. Remove clutch and reinstall correctly
3. Pilot bearing worn or damaged	3. Replace pilot bearing and input shaft if damaged
4. Transmission input shaft/splines/pilot bearing worn or damaged	4. Replace worn and damaged components

OPERATING CONDITION AND PROBABLE CAUSE

Problem	Corrective Action
VII. Clutch Vibration - Continued	
5. Clutch disc facings damaged	5. Replace clutch disc
6. Flywheel housing to clutch housing excessive misalignment	6. Replace faulty housing
7. Clutch out of balance	7. Replace clutch
8. Release bearing worn or damaged or grease contaminated	8. Clean and re-grease or replace release bearing
VIII. Low Pedal Effort	
1. Linkage incorrectly adjusted	1. Adjust clutch linkage
2. Clutch incorrectly installed	2. Remove clutch and reinstall correctly
3. Clutch mounting capscrews loose/broken	3. Remove broken capscrew ends and replace broken or damaged capscrews, retighten all to specifications
4. Release bearing worn/damaged	4. Replace release bearing

CLUTCH IDENTIFICATION AND MODEL DESIGNATIONS

Valeo single-disc diaphragm spring pull type clutches are available in 14, 16 and 17-inch sizes. The clutches are identified in catalogs and other publications by model number. The model number is not found on the clutch or any of its components. A separate numbering system, which is discussed in this section, is used on the individual parts. The clutch model number is coded to identify the torque capacity and size.

Clutch Model Number

Clutches are numbered in the following manner:

Example:

Clutch Model No. EV14016

EV = Valeo

140 = Torque capacity (multiply number by 10 to get torque capacity – 140 x 10 = 1400 lb.-ft. of torque)

16 = Clutch size in inches

Following the model number is a suffix that details specific information about the clutch (Fig. 4-1).

- The first letter of the suffix shows the type of flywheel (flat or pot) the clutch will fit. All Valeo clutches require a flat flywheel except those 17-inch models used on older high torque (greater than 1400 lb.-ft.) N14 Cummins engines. These have the pot type flywheel.
- The second letter describes the clutch disc friction material. The "C" stands for cerametalic which is standard on Valeo clutches.
- The third letter indicates the model type damper hub used on the clutch disc. The damper hub varies with torque capacity and is determined by Valeo.
- The fourth letter indicates whether a single or dual damper hub has been used.
- The fifth letter gives the size of the transmission input shaft spline.

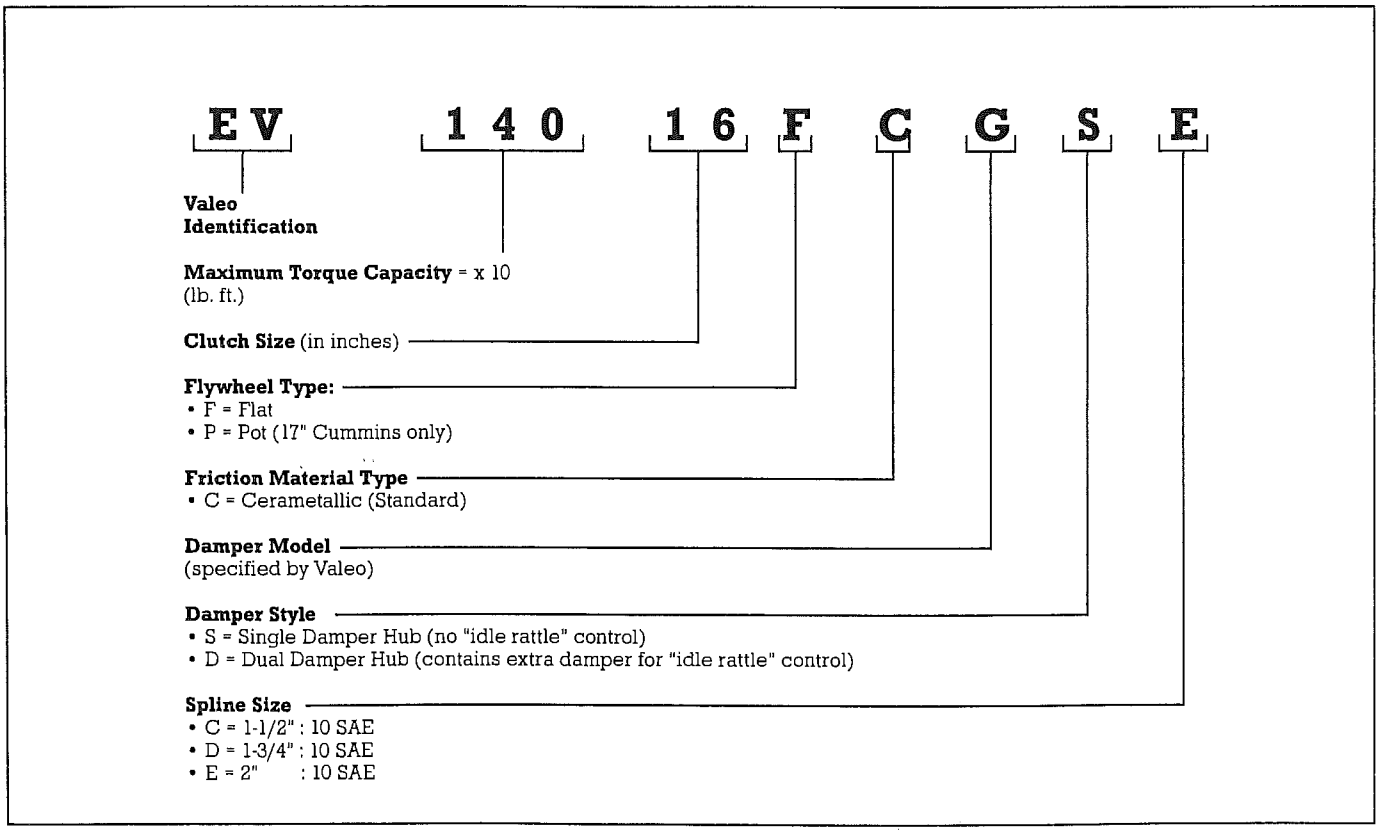


Figure 4-1. Model Number and Suffix Designation

CLUTCH IDENTIFICATION AND MODEL DESIGNATIONS

Component Numbering and Identification

The clutch pressure plate and cover assembly, and the clutch disc have ink-stamped reference numbers. The cover assembly and disc numbers are not the same (Fig. 4-2). These reference numbers are important for clutch model identification. Locate the reference numbers on the driven disc hub and on the rear face of the cover assembly. Used parts may require cleaning to locate the numbers. These numbers can be cross referenced through the Illustrated Parts List Catalog to establish the clutch model designation (Fig. 4-3).

NOTE

Clutch model torque capacity values listed are for trucks with mechanical clutch release systems with clutch pedal free play. Some vehicles with hydraulic clutch release systems without clutch pedal free play exert a continuous pressure on the clutch release bearing. This pressure causes a reduction in clutch torque capacity of about 10%. Consult the specific vehicle parts manual to determine the correct clutch to use in trucks not equipped with free play type clutch release systems.

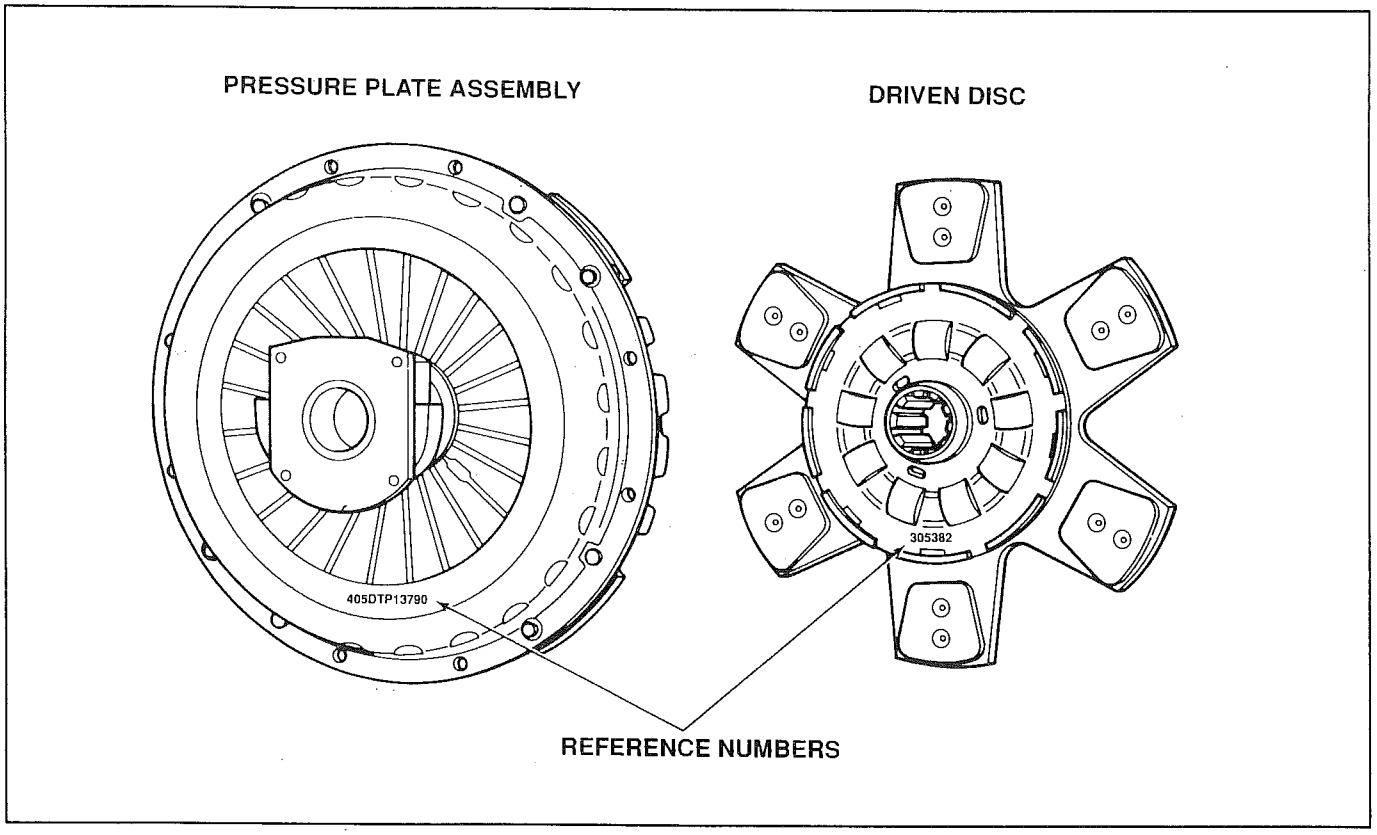


Figure 4-2. Reference Number Locations

CLUTCH IDENTIFICATION AND MODEL DESIGNATIONS

REFERENCE CHART

Pressure Plate Reference No.	Driven Disc Reference No.	Clutch Model	Clutch Reference	Page
350DTR9200	257098	EV06514-FCLSD	B	6
350DTR9200	305668	EV06514-FCLSC	A	6
350DTR11970	257098	EV08814-FCLSD	D	6
350DTR11970	305058	EV06514-FCLSD	B	6
350DTR11970	305058	EV06514-VCLSD (Volvo FE)	C	6
350DTR11970	305929	EV08814-FCLSE	E	6
405DTP13790	305382	EV11516-FCLSE	F	7
405DTP13790	305673	EV12516-FCWSE		
405DTP13790	305836	EV12516-FCWDE		
405DTP16050	305917	EV11516-FCLSE		
405DTP16050	305064	EV14016-FCWSE		
405DTP16050	305362			
	305363			
	305382			

Figure 4-3. Example of Clutch Selection Chart From Illustrated Parts List Catalog

Visual Identification

Clutches can be visually identified by measuring the diameter of the clutch pressure plate and flywheel.

14-inch Clutch

Pressure Plate

- Measure the pressure plate diameter (Fig. 4-4).

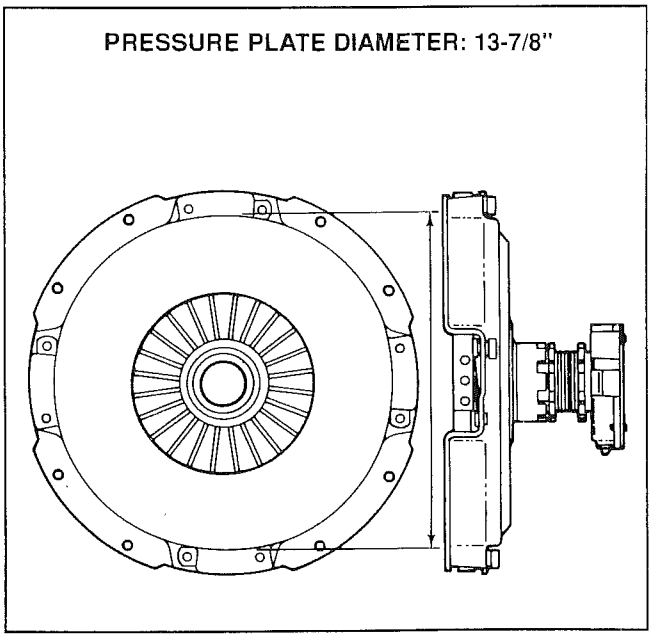


Figure 4-4. Measuring Points on Pressure Plate for 14-inch Clutch

CLUTCH IDENTIFICATION AND MODEL DESIGNATIONS

14-inch Clutch

Flywheel

- Measure bolt circle diameter (Fig. 4-5).

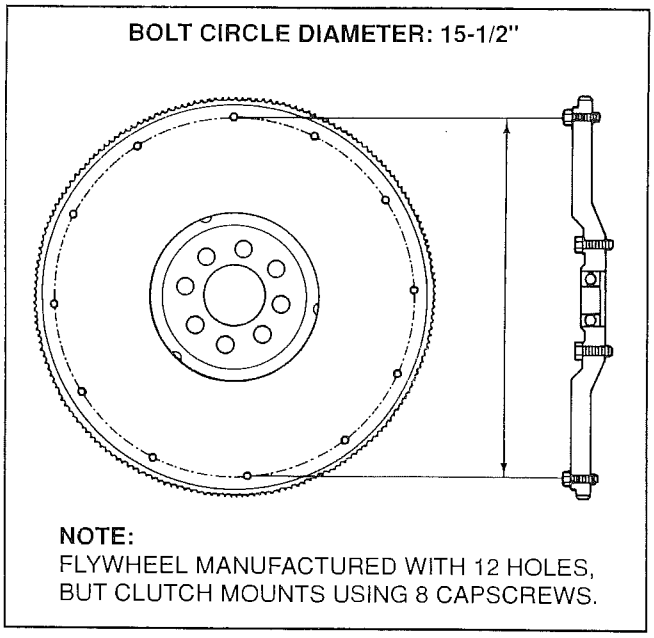


Figure 4-5. Measuring Points on Flywheel for 14-inch Clutch

16-inch Clutch

Pressure Plate

- Measure the pressure plate diameter (Fig. 4-6).

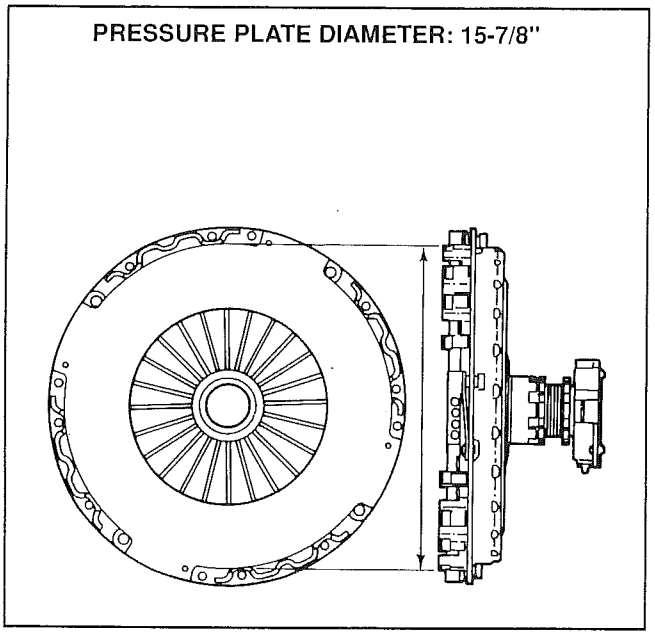


Figure 4-6. Measuring Points on Pressure Plate for 16-inch Clutch

16-inch Clutch

Flywheel

- Measure bolt circle and pilot diameter (Fig. 4-7).

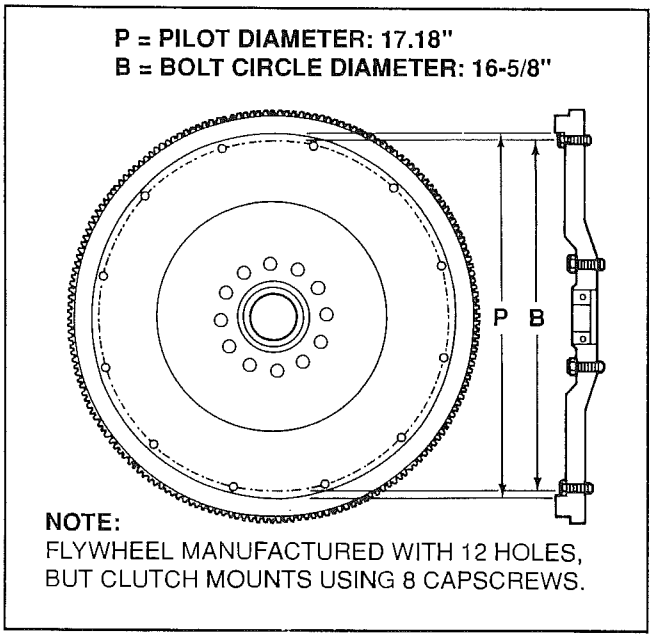


Figure 4-7. Measuring Points on Flywheel for 16-inch Clutch

CLUTCH IDENTIFICATION AND MODEL DESIGNATIONS

17-inch Clutch (Flat Type)

Pressure Plate

- Measure the pressure plate diameter (Fig. 4-8).

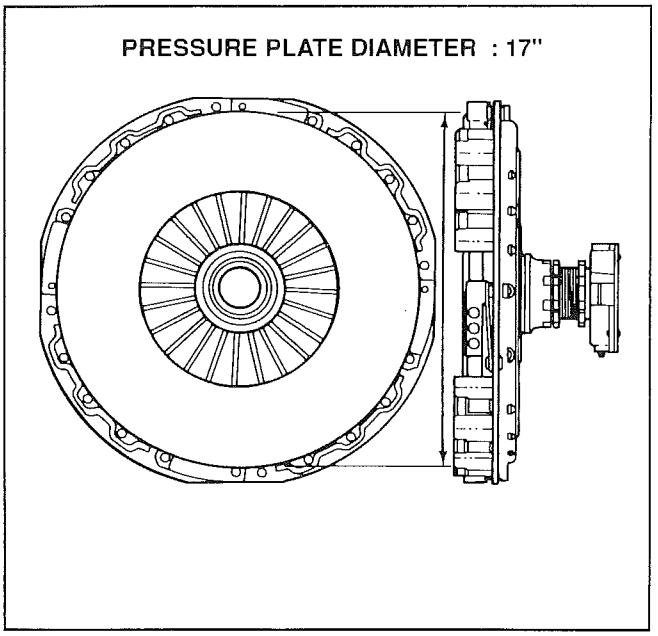


Figure 4-8. Measuring Points on Pressure Plate for 17-inch Clutch (Flat Type)

17-inch Clutch (Flat Type)

Flywheel

- Measure bolt circle and pilot diameter (Fig. 4-9).

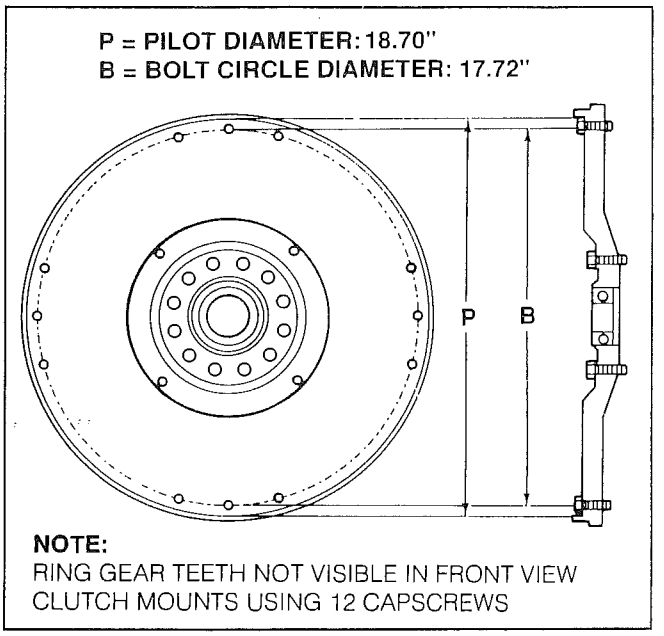


Figure 4-9. Measuring Points on Flywheel for 17-inch Clutch (Flat Type)

17-inch Clutch (Pot Type)

Pressure Plate

- Measure the pressure plate diameter (Fig. 4-10).

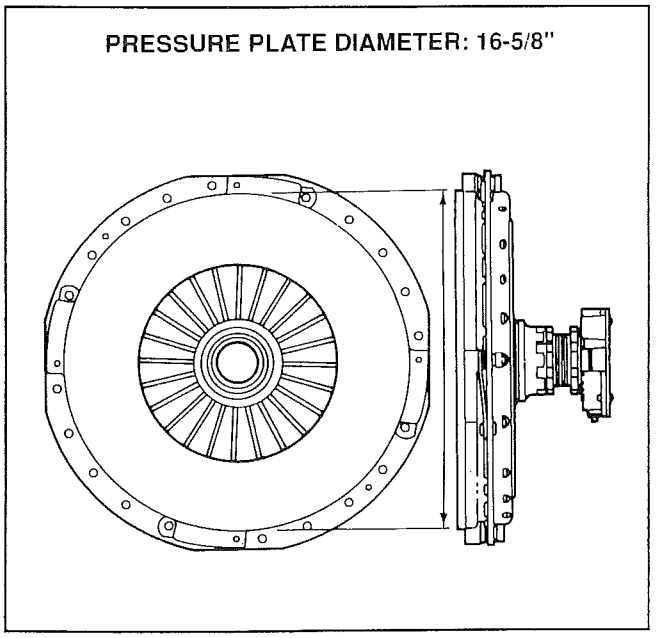


Figure 4-10. Measuring Points on Pressure Plate for 17-inch Clutch (Pot Type)

CLUTCH IDENTIFICATION AND MODEL DESIGNATIONS

17-inch Clutch (Pot Type)

Flywheel

- Measure bolt circle diameter (Fig. 4-11).

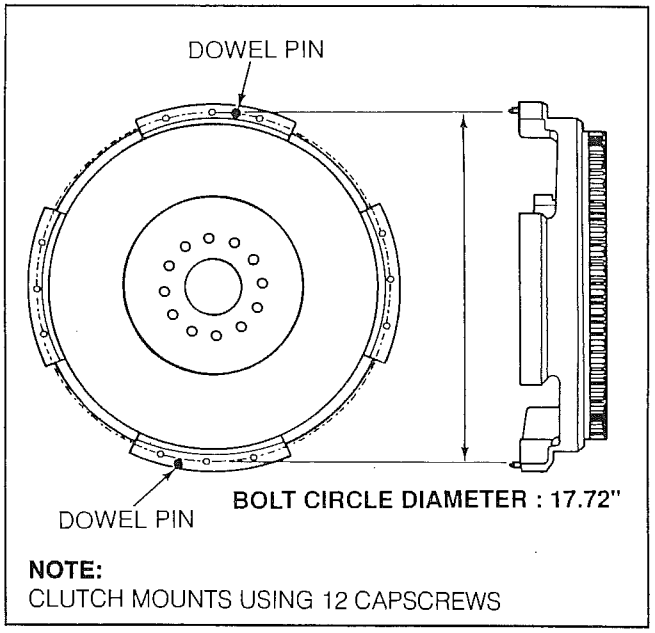


Figure 4-11. Measuring Points on Flywheel for 17-inch Clutch (Pot Type)

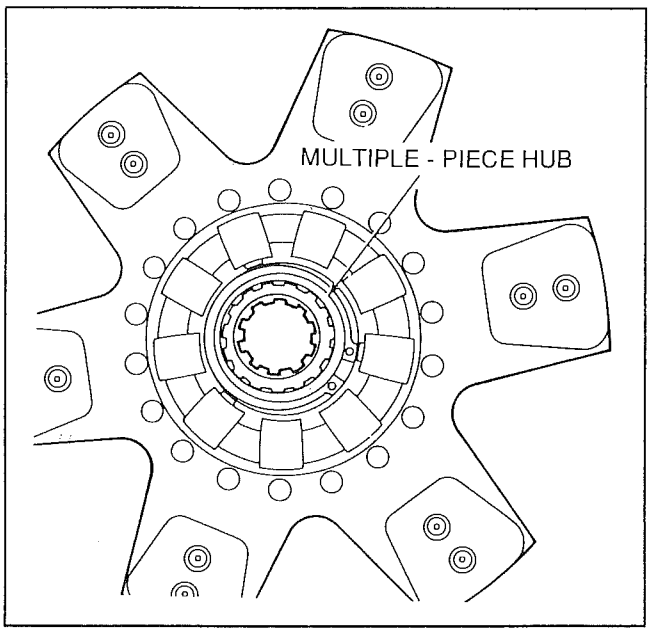


Figure 4-12. Flywheel Side of Clutch with Dual Damper Option

Optional Dual Damper Driven Disc

The dual damper driven disc pre-damper option eliminates transmission idle gear rattle. To identify a dual damper driven disc, look for the following features:

Flywheel Side

The flywheel side of a dual damper driven disc will have a multiple-piece hub (Fig. 4-12).

Pressure Plate Side

The pressure plate side of a dual damper driven disc will have three white plastic buttons located in the three slots surrounding the hub (Fig. 4-13).

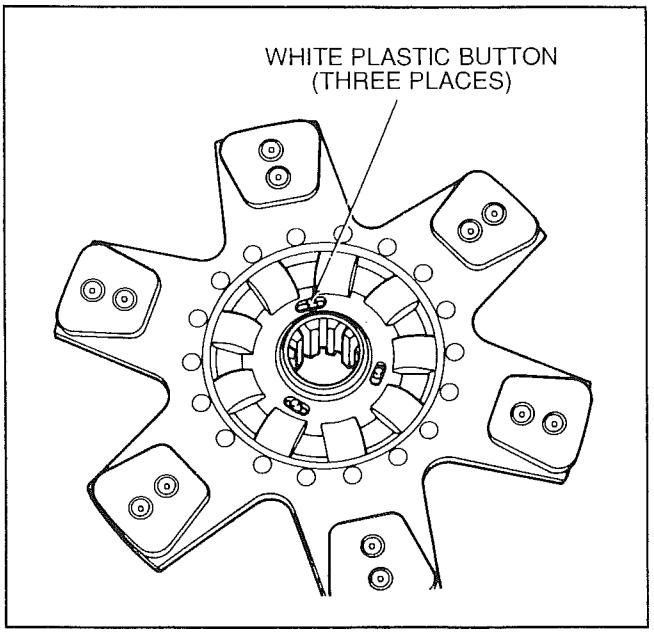


Figure 4-13. Pressure Plate Side of Clutch with Dual Damper Option

Tri-Cone Diaphragm

Valeo introduced a new type of diaphragm design in late 1991. This new design has bends in the fingers which create the appearance of three different cone angles. This clutch design is completely interchangeable with previous designs (Fig. 4-14).

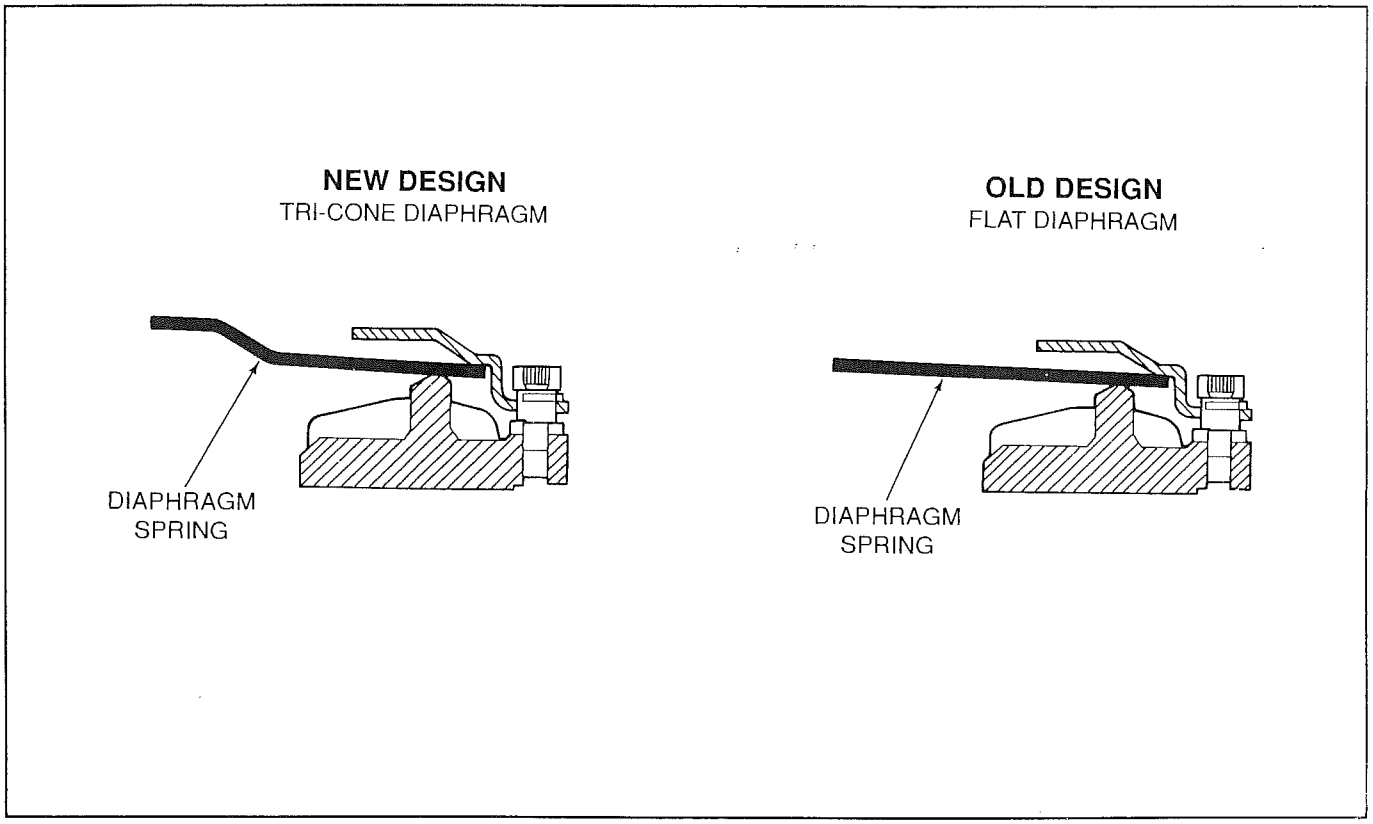


Figure 4-14. Diaphragm Design

CLUTCH SELECTION

Valeo single-disc diaphragm spring pull type clutches are marketed to match specific engine peak torque specifications. To select the correct clutch for a truck, look for the clutch model with a torque capacity that is equal to or greater than the engine's peak torque.

For example, if the engine has a peak torque of 1300 lb.-ft., the clutch with the lowest torque rating that could be used is the EV14016. Selection of the remaining details that are coded in the model number suffix must also be determined to match the specific application. Also, optional features, such as the dual damper hub (pre-damper), must be selected as part of the ordering process. An explanation of the model number suffix is found at the beginning of this selection.

Before ordering the Valeo clutch, check that the flywheel on the engine is compatible with the clutch you are ordering. Flywheel-to-clutch mounting details are also provided in this section of this manual. For additional specification information, reference the Valeo Illustrated Parts List Catalog.

NOTE

Some trucks are equipped with hydraulic self-adjusting clutch release systems that provide preload to the clutch release bearing. Because there is preload, the torque specification of the clutch is reduced about 10% due to reduction of the clamping force. Consult specific OEM parts catalog for clutch specification to assure the proper clutch is installed in the truck.

Refer to Figure 4-15 for General Clutch Model Specifications.

Models/Sizes	Base Model Designations	Maximum Torque Rating	Flywheel Size/Type	Input Shaft Spline Size	Disc Damper Option
14"	EV06514 EV08814 EV10514	650 lbs. ft. 880 lbs. ft. 1050 lbs. ft.	14" - Flat	1-1/2" or 1-3/4" 1-3/4" or 2" 2"	Single
16"	EV12516 EV14016	1250 lbs. ft. 1400 lbs. ft.	15-1/2"/16" - Flat	2"	Single or Dual
17" - Flat	EV14517-F EV16517-F EV18517-F	1450 lbs. ft. 1650 lbs. ft. 1850 lbs. ft.	17" - Flat	2"	Single or Dual
17" - Pot	EV16517-P	1650 lbs. ft.	17" - Pot	2"	Single or Dual

Figure 4-15. Clutch Model Specifications

LUBRICATION

Lubricate the following areas on a once per month schedule.

Release Bearing - The cast-iron housing of the release bearing is equipped with a standard grease fitting located on the lower edge of the housing (Fig. 5-1). Grease the bearing with **HIGH TEMPERATURE** grease (rated higher than 300°F) through this grease fitting. Valeo recommends using a good quality grease of N.L.G.I. grade 2 or 3 made with a lithium soap base with E.P. additives and suitable for ball or roller bearings. If there is any question as to what grease to use consult with Valeo.

NOTE

Do not use low temperature chassis grease.
Do not use excessive amounts of grease.
Excessive grease may contaminate the clutch friction material and promote clutch slipping or chatter.

The bearing is sufficiently lubricated if only half the housing capacity is filled with grease. Sufficient grease is indicated by grease just starting to come out of the front or rear of the bearing housing.

If the release bearing housing contains a sealed for life bearing no grease fitting will be present and the addition of grease is not necessary.

Release Bearing Wear Pads - Apply a small amount of grease to the release bearing wear pads where they are contacted by the release yoke fingers.

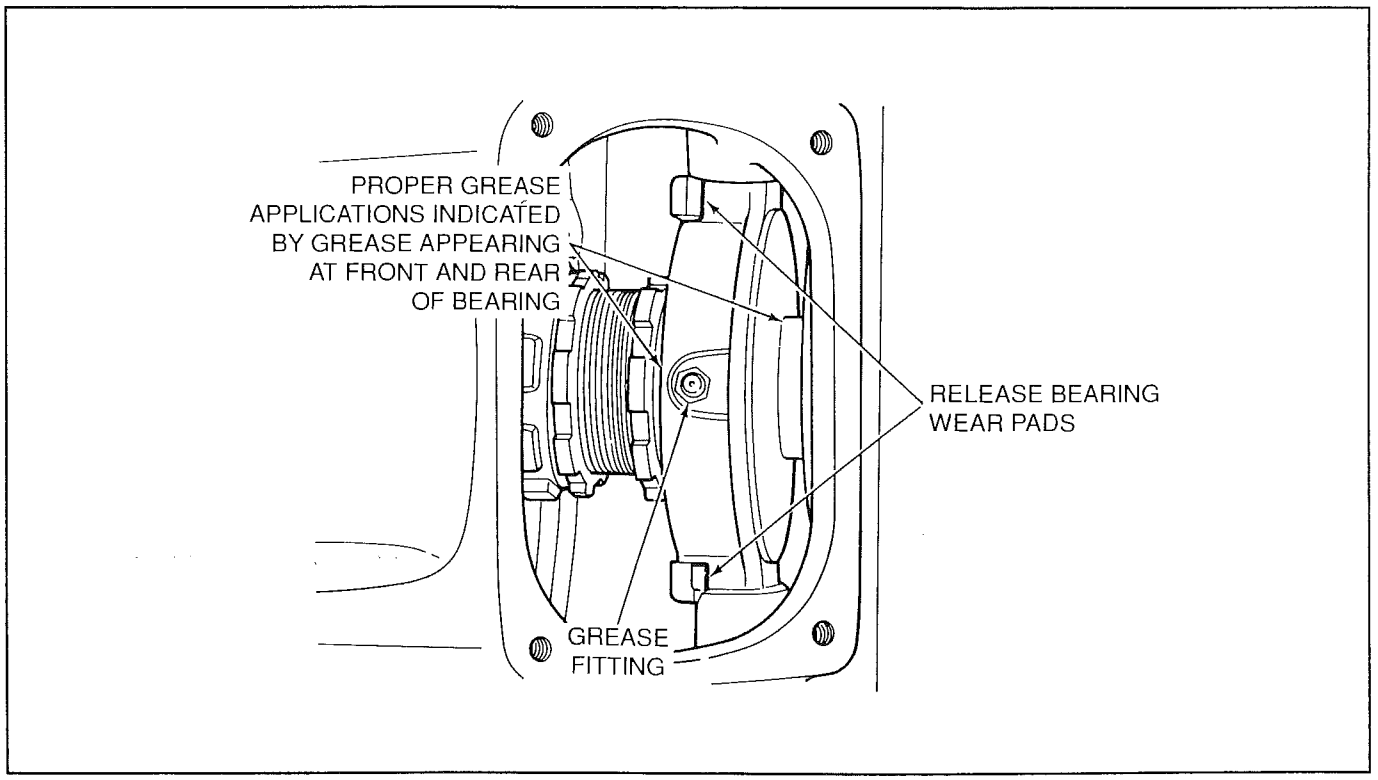


Figure 5-1. Release Bearing Lubrication

LUBRICATION

Clutch Housing Cross Shaft Bushings - Apply grease to each grease fitting on the clutch housing (Fig. 5-2). Use the lubricant recommended by the vehicle manufacturer.

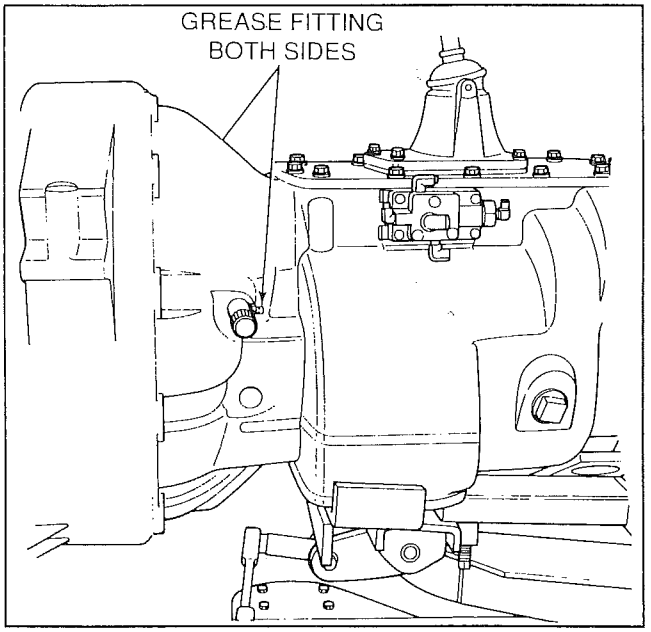


Figure 5-2. Clutch Housing Lubrication Points

Clutch Linkage - Lubricate each pivot point on the clutch linkage (Fig. 5-3). Use the lubricant recommended by the vehicle manufacturer.

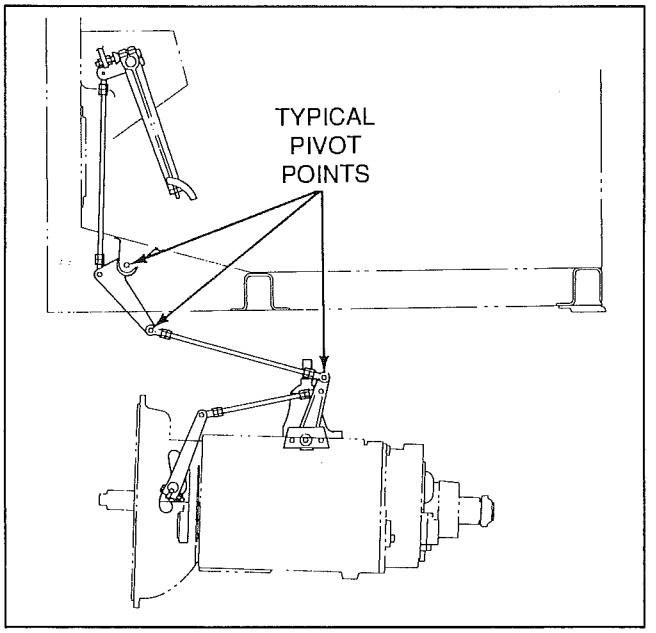


Figure 5-3. Typical Clutch Linkage

WHEN TO INSPECT THE CLUTCH

Check the clutch adjustment when any of the following conditions are present:

- As required by the maintenance schedule provided by the vehicle manufacturer.
- Whenever any part of the clutch or linkage is serviced, such as lubricating the release bearing.
- When clutch pedal free play is low. See Section 11 for specification.

INSPECTING THE CLUTCH LINKAGE

Proper operation of the clutch linkage is critical to clutch function and clutch life. Check the linkage according to the following procedures.

- **Release Yoke Free Play** - On non self-adjusting linkages, make sure free play of 1/8-inch is present between the release yoke and bearing wear pads. Self-adjusting linkage applications have no free play.

- **Confirm that Release Yoke Moves Bearing** - While an assistant depresses the clutch pedal, confirm that the release yoke moves the release bearing a full 1/2-inch.

- **Linkage Operation** - Inspect the linkage to assure that it reacts whenever the clutch pedal is actuated. Assure that the linkage is not obstructed and that each pivot point operates freely. Check for any looseness. If the linkage is obstructed or loose, repair as needed. Also check the clutch housing pedal shaft bushings for wear, damage or binding. Replace if needed.

- **Linkage Condition** - Inspect all components of the linkage for wear, damage or binding. This includes the pedal, springs, brackets, shafts and related bushings, clevis pins, levers, cables, and rods. If a hydraulic system is used, assure that there is no leakage and that there is sufficient fluid in the reservoir. Replace any parts that are worn, missing or damaged. Do not attempt to repair any individual parts - replace them.

SPECIAL TOOLS

Most clutch service discussed in this manual requires standard tools. In some cases special tools are required and these are called out in the text along with the special tool that is required (Fig. 6-1). The following special tools (or equivalents) must be available to properly service Valeo clutches (Fig. 6-2).

- **Clutch Disc Alignment Tool** - This tool must have same pilot bearing and spline diameters as the transmission input shaft. The tool is used to align the clutch disc during installation of the pressure plate and cover assembly.

NOTE

A tool can be made by removing the gear from a transmission input shaft that fits the particular application.

- **Alignment Pins** - These pins must have the same thread as the clutch-to-flywheel attaching bolt holes. They should be at least 2 inches long for 14-inch clutches and 3 inches long for 16 and 17-inch clutches. The alignment pins are used to mount the pressure plate and cover assembly to the flywheel.

NOTE

Alignment pins can be fabricated from capscrews by cutting off the capscrew heads. With the heads removed, deburr the cut end and then saw a screwdriver slot on the end opposite the threads.

- **Pressure Plate and Cover Assembly Shipping Clips** - These clips can be saved from previous clutch installations. They can also be made from 0.118-inch (3 mm) diameter wire.

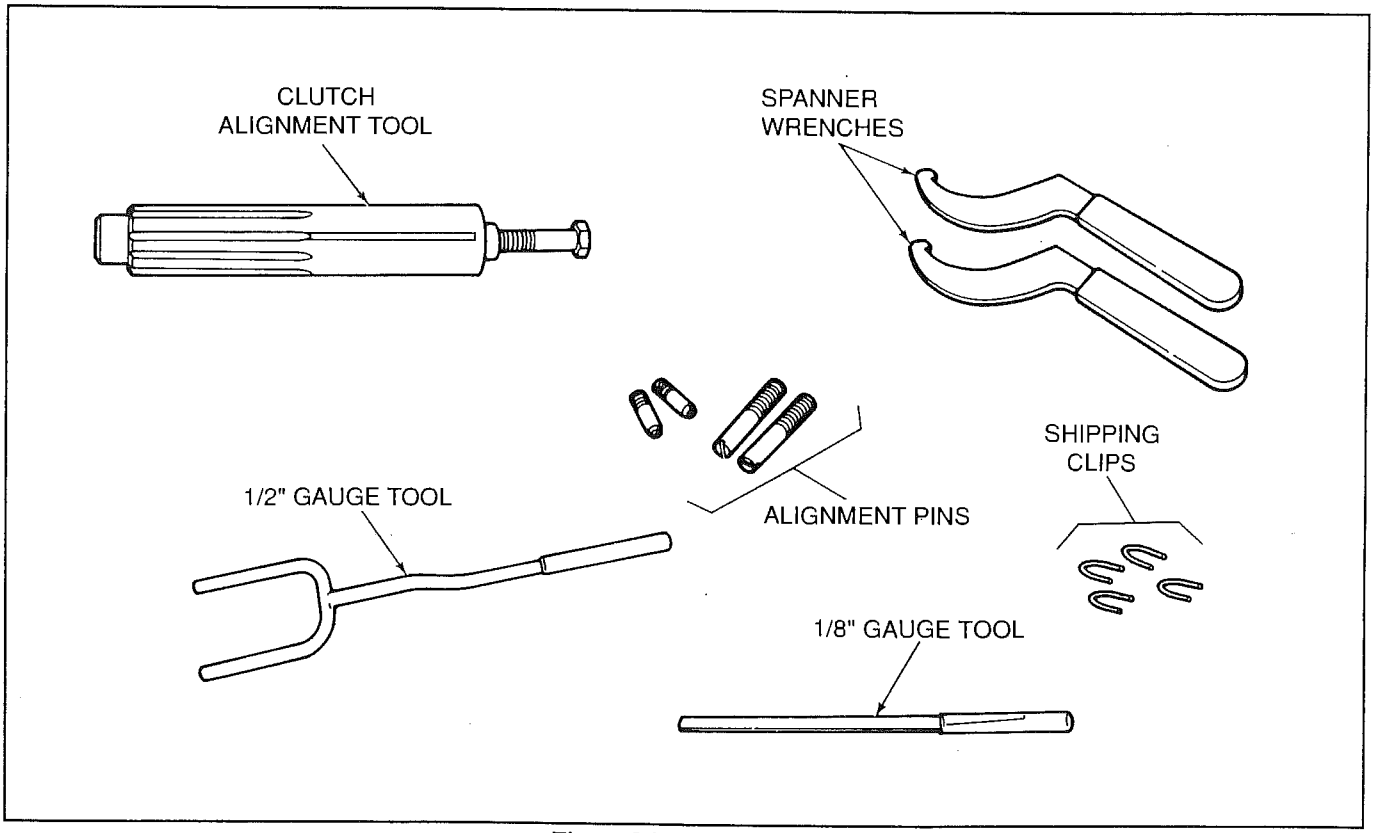


Figure 6-1. Special Tools

SPECIAL TOOLS

Description	Kent-Moore Tool Number	Owatonna Tool Number	Snap-on Tool Number	VALEO
Clutch Alignment Tool - 1-3/4 Inch	J 35990	7073-A	HTT2501-2	——
Clutch Alignment Tool - 2 Inch	J 26455-A	7074-A	HTT2501-3	——
Pilot Bearing Puller	J 36212 or J 36213	7318 or 7319	SP2031	——
1/2 Inch Gauge Tool (Non-Synchronized Transmission)	——	——	SP2033	——
1/8 Inch Gauge Tool	——	——	SP2034	——
7/16 Inch Guide Studs (16-17 Inch Clutches)	——	——	SP2035	——
3/8 Inch Guide Studs (14 Inch Clutches)	——	——	SP2036	——
Spanner Wrenches	——	——	——	10100

Figure 6-2. Special Tool List

- **Spanner Wrenches** - Two spanner wrenches are required to adjust the clutch release bearing. Valeo now offers a 12" Spanner Wrench Set containing two spanner wrenches. The part number is 10100.

- **Gaging Tools** - Gaging tools are used to measure the release bearing travel gap and release yoke free play clearance.

NOTE

Gaging tools can be made from 1/8, 1/2, and 3/4-inch steel stock.

Please contact Valeo for assistance with all your tool needs.

NOTE

Tools are available from:

Kent-Moore
29784 Little Mack
Roseville, MI 48066-2298
Phone: 1-800-328-6657

Valeo, Inc.
310 E Street
Hampton, VA 23661
Phone: 888-71-VALEO

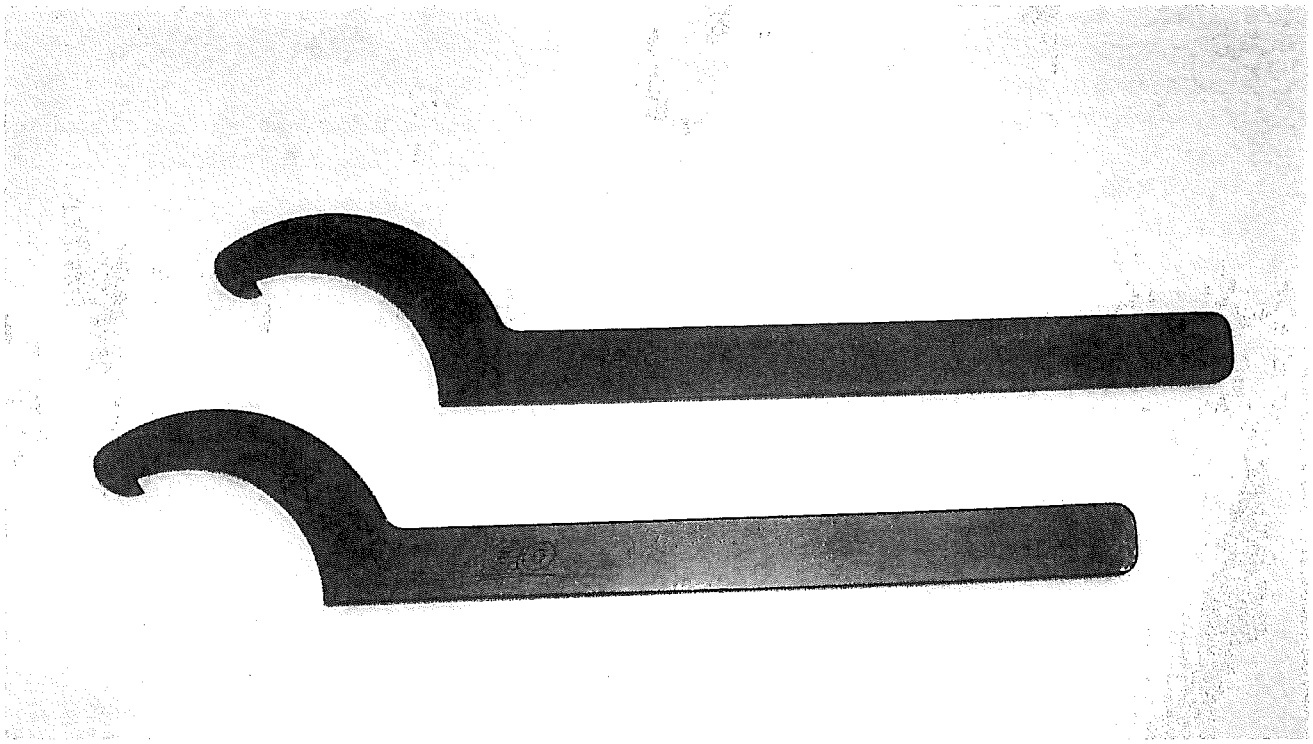
Owatonna Tool Company
655 Eisenhower Drive
Owatonna, MN 55060
Phone: 1-507-455-1480

Snap-On Tools Corporation
World Headquarters
Kenosha, WI 53141-1410
Phone: 1-414-656-5200

Valeo

SPANNER WRENCHES NOW AVAILABLE FROM VALEO

Get the proper tool for adjustment purposes directly from Valeo. Order part number 10100 which is a set of two spanner wrenches



The spanner wrench tightens the two rings on the bearing after the adjustment is made This is a required tool when making adjustments on 14 – 17 inch clutches.

GENERAL INSTRUCTIONS

Refer to the recommended clutch removal procedures in the manufacturer's service manual for the vehicle being repaired. The following procedures provide general instructions for clutch removal. Prior to removal make sure that the vehicle is stable and cannot move. Use wheel chocks and jack stands as necessary to assure a safe work area.

1. Disconnect the transmission electrical wiring and transmission air lines.

2. Disconnect the speedometer cable and/or wiring.

3. Disconnect the clutch release linkage system from the transmission.

4. If a hydraulic system is used to operate the clutch, disconnect the pushrod and the spring from the release lever. Remove the hydraulic cylinder from the support bracket on the transmission. Support the cylinder with wire attached to the frame.

5. Put marks on the yoke or the flange of the driveshaft and the output shaft of the transmission. These marks are necessary to assure the driveshaft is correctly reinstalled.

6. Remove the driveshaft. Support the rear of the engine if necessary (nodal mounting systems).

7. Support the transmission using a transmission jack.

8. Rotate the clutch release yoke so that it will clear the clutch release bearing.

9. Remove the fasteners that attach the transmission to the frame cross-member.

CAUTION

Keep the transmission in line with the engine during removal. Do not allow the weight of the transmission to hang on the input shaft. Doing so could bend the clutch disc hub or result in internal transmission damage.

10. Remove the capscrews and washers that attach the clutch housing to the engine. Pull the transmission straight back from the engine until it has cleared the Pressure Plate and Cover Assembly (PPCA) (Fig. 7-1). Remove the transmission from the vehicle.

11. If a clutch brake is used, remove the assembly from the input shaft. Inspect the transmission input shaft bearing retainer surface for excessive wear and/or damage. Repair as necessary.

12. If the clutch is to be reinstalled, install a shipping clip under the head of each of the 4 allen-head capscrews that attach the drive straps to the pressure plate (Fig. 7-2). The clips will keep the pressure plate in a partially retracted position and make pressure plate installation easier.

GENERAL INSTRUCTIONS

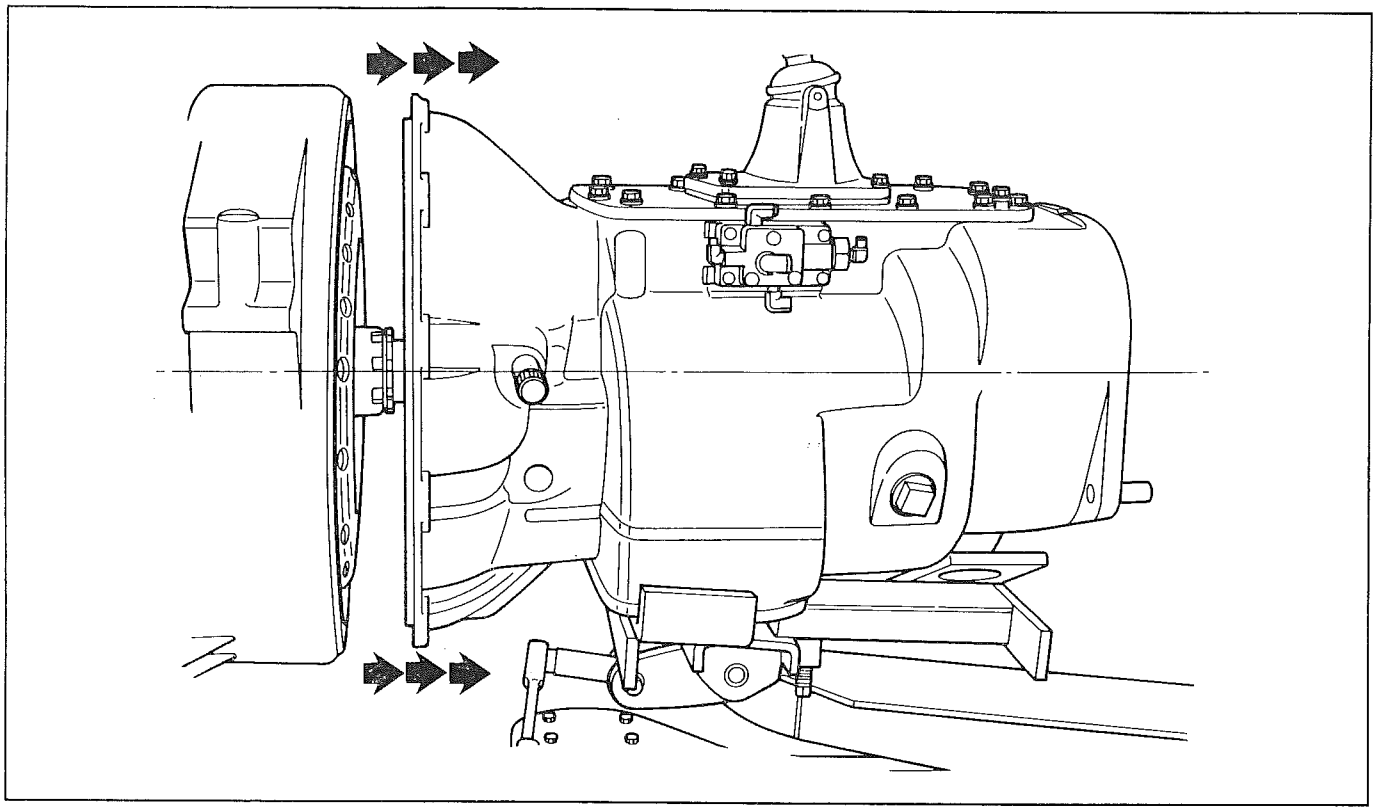


Figure 7-1. Pulling Transmission Away From Engine

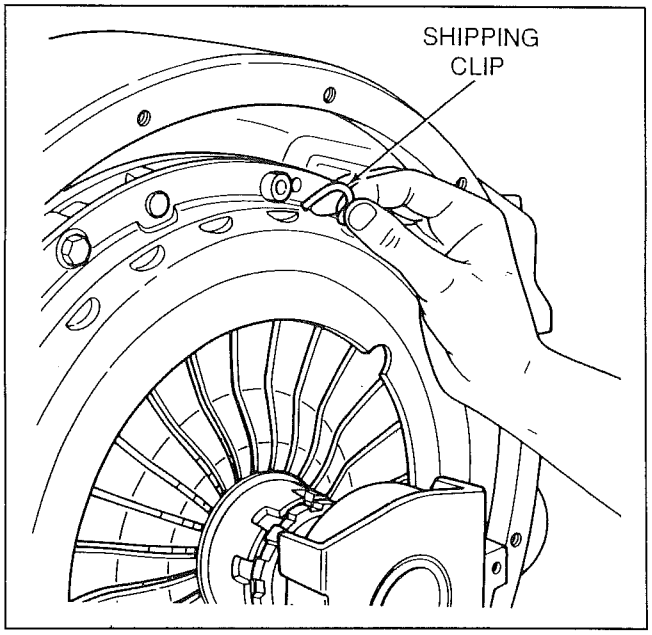


Figure 7-2. Installing Shipping Clips

13. Insert the clutch disc alignment tool through the release bearing and clutch disc and into the pilot bearing (Fig. 7-3).

14. Loosen, but do not remove the capscrews attaching the PPCA to the flywheel. The capscrews should be loosened in an alternating pattern. This will allow the diaphragm spring to relax in a uniform manner.

GENERAL INSTRUCTIONS

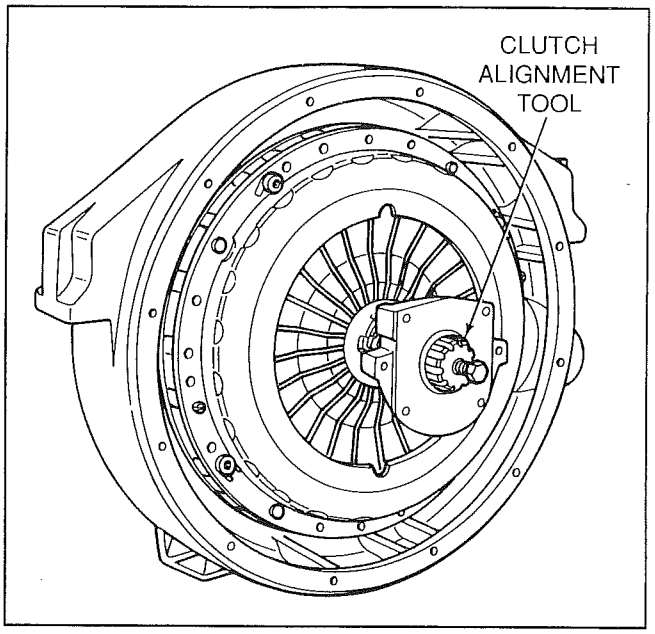


Figure 7-3. Clutch Alignment Tool Installed for Clutch Removal

CAUTION

Do not loosen or remove the four allen-head capscrews attaching the drive straps to the clutch pressure plate. Removal and reinstallation of these capscrews can cause the clutch to be out of balance and/or cause the clutch to drag.

15. Remove two PPCA attaching capscrews, 180 degrees opposed to each other.

16. Install two alignment pins in the capscrew holes (Fig. 7-4).

17. Remove the remaining PPCA attaching capscrews.

18. Remove the PPCA by sliding it straight back and off the two alignment pins.

CAUTION

Do not drop or handle the PPCA roughly. Doing so can cause minor bends or kinks in the four drive stap assemblies. Any bends or kinks can reduce or eliminate the ability of the pressure plate to retract into the clutch cover and cause incomplete clutch release (clutch drag).

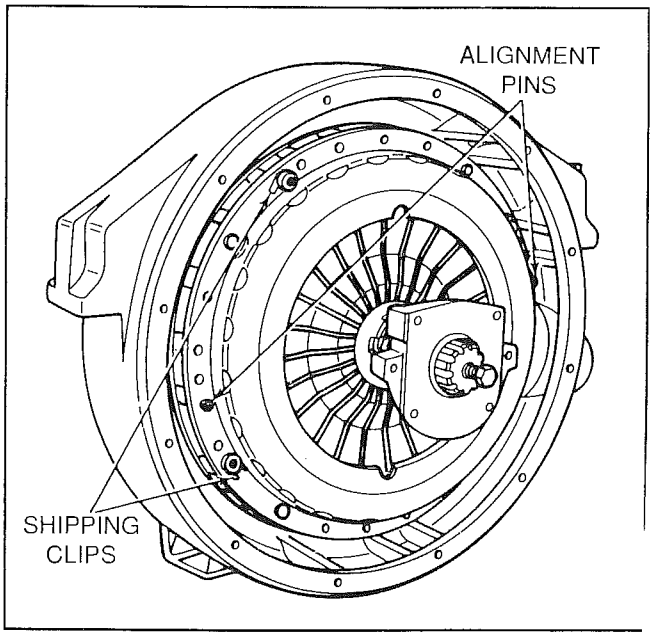


Figure 7-4. Alignment Pins Installed for PPCA Removal

19. Remove the clutch disc and clutch alignment tool

20. If necessary, remove the pilot bearing using a bearing puller and discard the bearing (Fig 7-5).

GENERAL INSTRUCTIONS

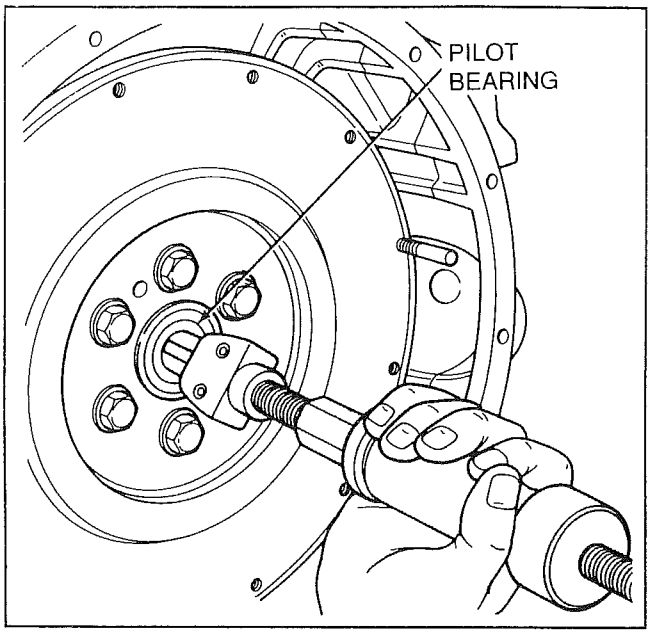


Figure 7-5. Removing the Pilot Bearing

GENERAL CLEANING CONSIDERATIONS

CAUTION

If a clutch is to be reused, do not immerse the complete unit in solvent, or steam clean it. The recommended cleaner to use is a brake/electrical/clutch cleaning solvent that does not leave a residue.

WARNING

Do not under any circumstances use gasoline as a parts cleaner.

Ground or polished parts should be cleaned with a cleaning solvent. These parts corrode easily. Therefore, they should not be cleaned in a hot solution tank, with water, or in alkaline solutions.

CAUTION

Do not disassemble the pressure plate assembly for cleaning. The assembly is difficult to properly reassemble.

Dry parts with clean rags or paper towels immediately after cleaning. Applying a light lubricant to prevent corrosion is allowable, but keep all oil and grease away from the clutch friction surfaces.

To remove grease, oil or dirt from clutch friction surfaces use a brake/electrical/clutch cleaning solvent, normally sold in an aerosol container. Follow instructions found on the container for proper use.

CLUTCH COMPONENTS

If the old clutch was removed after giving satisfactory service, no clutch inspection or diagnosis is required. Continue with the inspection of the clutch environment to ensure the best performance after reinstallation. If, however, some clutch problem had developed, examination of the old parts could help to isolate the malfunction and allow its repair prior to installation of new parts. Refer to the troubleshooting section to assist in the clutch inspection, problem determination and recommended correction.

Clutch Release Bearing

1. Rotate the bearing housing relative to the threaded barrel while applying a pulling load and feel for ball bearing roughness. Any degree of roughness indicates a bearing which has been contaminated by dirt or which is failing. It must be thoroughly cleaned and regreased or replaced.
2. Look for signs of excessive heat, inadequate lubrication or excessive clutch brake wear.
3. Inspect the release bearing wear pads for signs of excessive wear, uneven loading or lack of lubrication.
4. Check the locknut for adequate tightness against the release bearing coupler.
5. Inspect the bore of the release bearing threaded sleeve to see if the bushing is seated in its proper location (Fig. 9-1). Examine the bushing condition. Look for signs of excessive side loading that would indicate transmission misalignment.

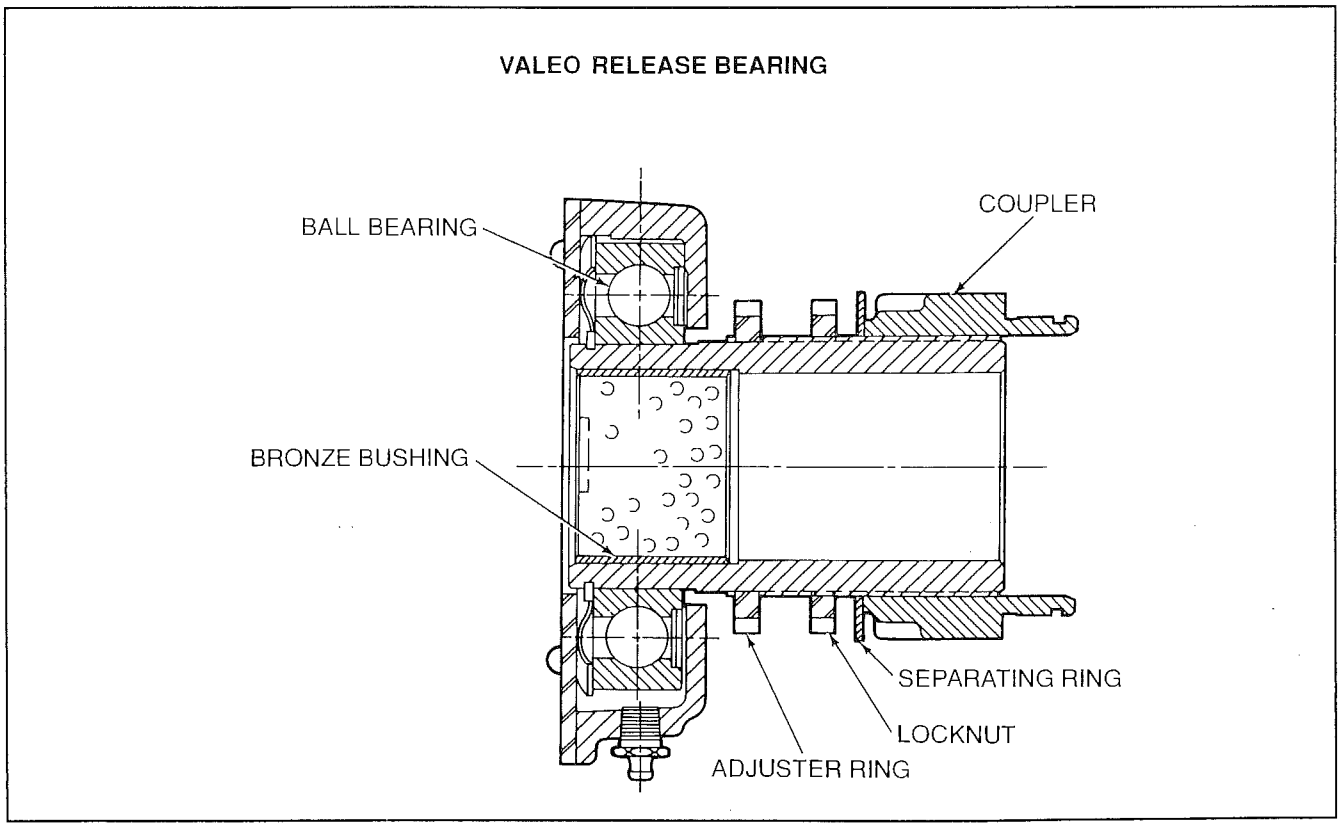


Figure 9-1. Clutch Release Bearing Sectional View

Pressure Plate and Cover Assembly (PPCA)

1. Inspect the pressure plate friction surface for wear by placing a straight edge across the width of the friction face (Fig. 9-2). A gap in the worn area of 0.030-inch (0.75 mm) or more indicates the PPCA should be replaced.

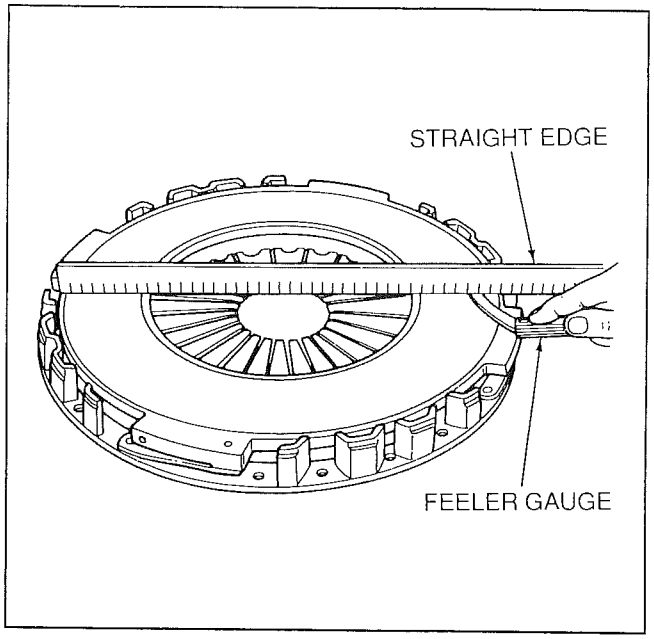


Figure 9-2. Checking Pressure Plate for Wear and Warpage

2. If **reusing** the PPCA with a **new** disc, inspect the pressure plate for warpage or uneven wear by placing a straight edge across the entire diameter of the plate. If the gap at the inside wear diameter exceeds the gap at the outside wear edge by 0.008-inch (0.20 mm), there is excessive concave warpage and that PPCA should be replaced. No measurable amount of convex warpage is allowed, so the PPCA should be replaced if the gap at the outside diameter exceeds the gap at the inside edge of the clutch wear area.

3. Inspect the pressure plate for heat damage such as discoloration, surface checking or cracks. Slight coloration or light checking is normal. Deep checking or cracks indicate the PPCA should be replaced.

4. Examine the drive strap assemblies for bends or kinks. Normal drive strap units form a smooth, gently curving "S" shape when viewed from the edge, with all laminations fitting tightly together (Fig. 9-3). Bent or kinked drive straps will show an area of sharp bending next to the rivet or bolt attachments and/or noticeable gaps between laminations.

⚠ CAUTION

Do not use a clutch with damaged drive straps as clutch release problems can result.

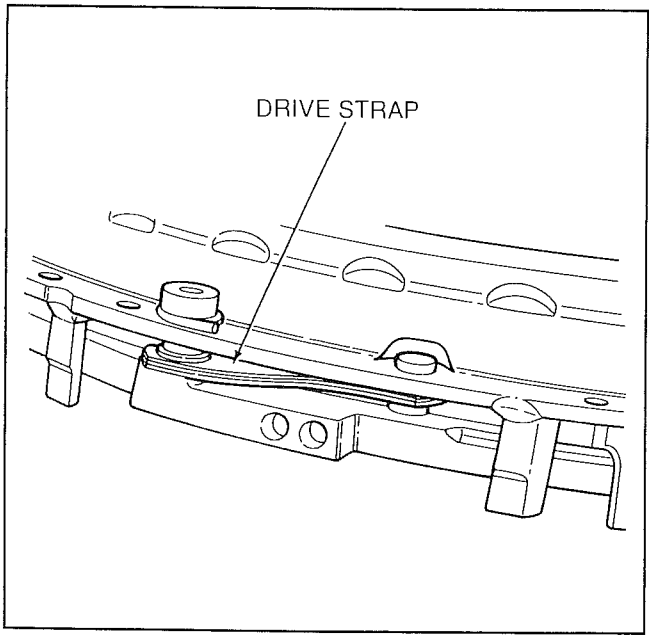


Figure 9-3. Normal Drive Strap

5. Check the stamped steel cover mounting flange and sides for distortion due to shipping damage or incorrect vehicle installation. PPCA assemblies with this condition must be replaced.

CLUTCH COMPONENTS

Clutch Disc

The clutch disc must be checked for wear or damage and should also be closely examined for contamination. Make sure that the damping springs are not loose in the hub. If the springs have any axial (back and forth) movement, they are loose. Check the hub splines for wear or damage and make sure that the hub is firmly fastened to the disc.

A disc that is worn or damaged must be replaced. If it is necessary to clean a disc, use a brake/electrical clutch cleaning solvent to remove contaminants (typically grease and/or oil). If the contaminants cannot be removed, replace the disc.

Perform the following checks on the clutch disc.

1. Inspect the friction material for signs of excessive wear or heat damage. Disc thickness should be checked with calipers or an outside micrometer (Fig. 9-4). Minimum disc thickness:

- 14-inch clutch - 0.272-inch (6.90 mm)
- 16 and 17-inch clutch - 0.295-inch (7.50 mm)

2. Slide the clutch disc onto the transmission input shaft to look for evidence of sticking or binding splines. Clean and correct source of interference or replace clutch disc.

3. Lay the clutch disc on a new PPCA or flywheel to check for bent cerametallic paddle arms. Using a feeler gage, check the gap between the friction material pads and the PPCA or flywheel face (Fig. 9-5). The gap must not exceed 0.030-inch (0.75 mm).

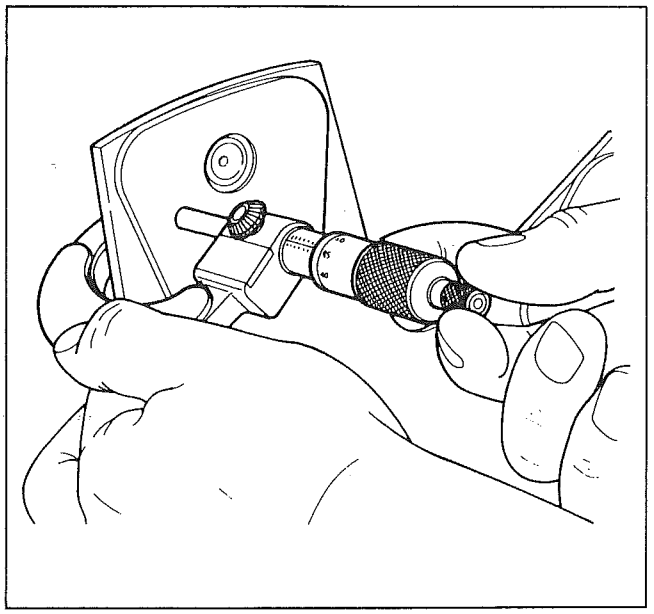


Figure 9-4. Clutch Disc Thickness Check

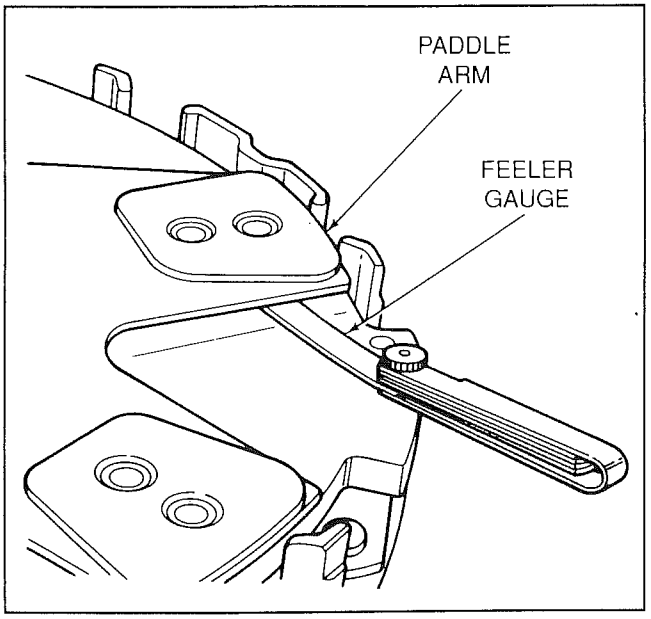


Figure 9-5. Checking For Bent Paddle Arms

4. Examine the clutch disc for a bent hub by looking for unusually heavy and uneven friction material wear.

Check the clutch disc for signs of driveline torsional vibration or shock loading damage such as broken springs, cracked damper retainer plates or damaged splines. (Fig. 9-6).

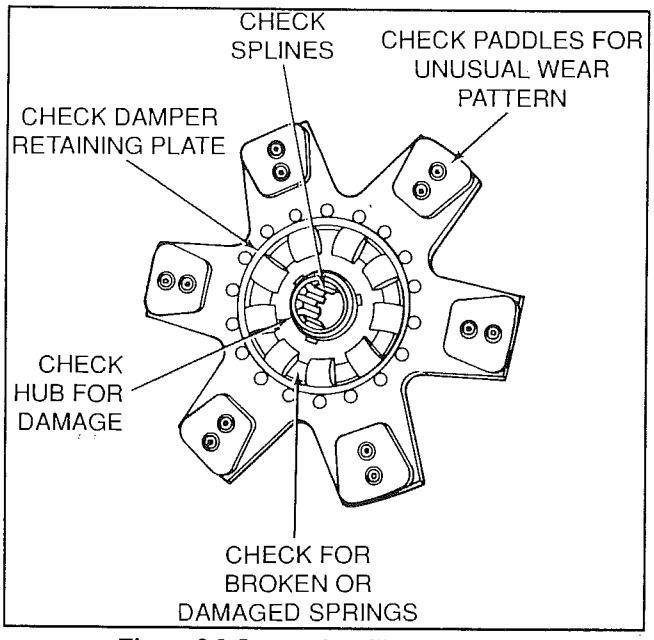


Figure 9-6. Inspecting Clutch Disc for Vibration or Shock Damage

CLUTCH ENVIRONMENT

The environment in which the clutch operates is extremely important to proper function. There are three major points to the environment check. They are:

- Alignment of the engine and transmission
- Presence of oil leakage or foreign materials
- Component condition

These points are interrelated and must be checked whenever clutch service is performed.

Alignment Considerations

Alignment is extremely important to proper clutch operation. Improper alignment can result in incomplete clutch release, transmission gear slipout, clutch disc breakage or input bearing failure. For proper operation, the engine and transmission must be in line and the flywheel perpendicular to the input shaft. The procedures outlined in this manual are general in nature. When checking for possible misalignment, refer to the specific engine manufacturer service manual for exact procedure and specifications.

The basic instrument required to take readings for misalignment is a dial indicator. Accuracy of the readings is essential when identifying and correcting alignment problems. All surfaces must be clean before readings are taken.

IMPORTANT: When taking readings, rotate the engine by hand. DO NOT crank the engine with the starter. Remove spark plugs on gasoline engines and release the compression on diesel engines where possible to make engine rotation easier.

Engine

Make a general inspection of the engine and determine if there are any oil or coolant leaks that could contaminate the clutch. Correct as required.

Crankshaft

Measure the endplay of the crankshaft and compare the results to the engine or vehicle manufacturer's specifications. Correct as required. To perform the check, attach the dial indicator base to the flywheel housing and place the indicator pointer against the flywheel (Fig. 9-7). Then, force the crankshaft forward and rearward with a prybar.

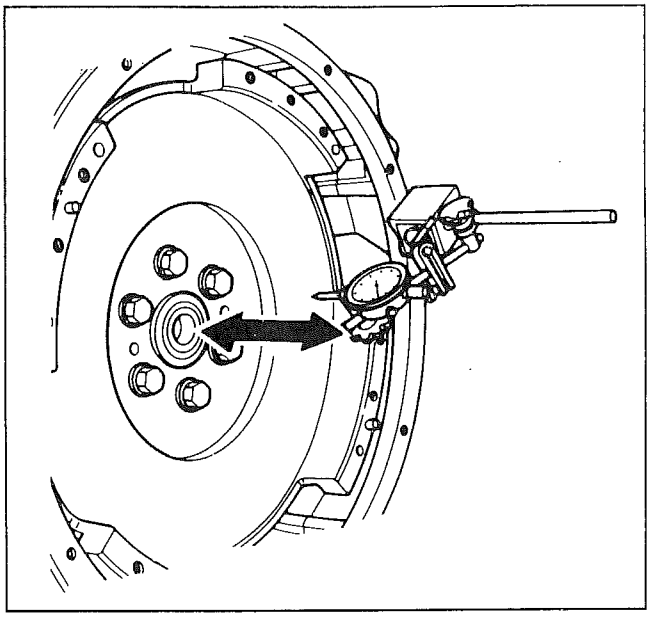


Figure 9-7. Checking Crankshaft End Play

Flywheel

1. Inspect the flywheel for excessive wear or heat damage. Sometimes minor wear or damage can be corrected by resurfacing the flywheel. The flywheel should be resurfaced if any of the following conditions exist:
   - **Heat Checking** - Do not use the flywheel if the heat checking is evident after resurfacing.
   - **Metal Flow** - Metal flow indicates that metal has actually melted due to excessive heat.
   - **Wear** - Look for any detectable step in the flywheel surface caused by clutch contact.

For flywheel wear limits and resurfacing specifications, please refer to the engine manufacturer's guidelines.

NOTE

If the flywheel has been resurfaced, check to be certain the capscrews can be threaded in by hand to a point deeper than is required to install the PPCA.

2. Measure the **axial runout** at the outer diameter of the flywheel. Secure the dial indicator base to the engine flywheel housing near the outer edge and place the dial indicator tip on the flywheel (Fig. 9-8). Turn the engine over by hand and observe the reading on the dial indicator. Measure at four places, 90 degrees apart. Force flywheel rearward when taking each measurement to take up crankshaft endplay. Typical runout limits are:

   - 14-inch clutch - 0.007-inch (0.178 mm) max
   - 16-inch clutch - 0.008-inch (0.203 mm) max
   - 17-inch clutch - 0.009-inch (0.216 mm) max

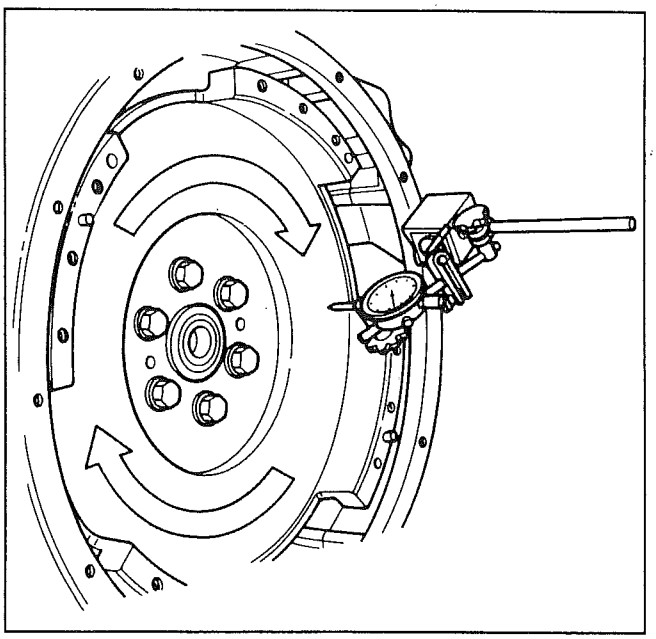


Figure 9-8. Checking Flywheel Axial Runout

Check the engine manufacturer's specifications and recommended corrective actions if runout is excessive.

3. Measure the **radial runout** of the pilot bearing bore with a dial indicator (Fig. 9-9). Secure the dial indicator to the flywheel housing and position the pointer of the dial indicator to contact the pilot bearing bore surface. Turn the engine over by hand while observing the dial indicator. A typical runout limit is:

   - 0.005-inch (0.127 mm)

Check the engine manufacturer's specifications and recommended corrective actions if runout is excessive.

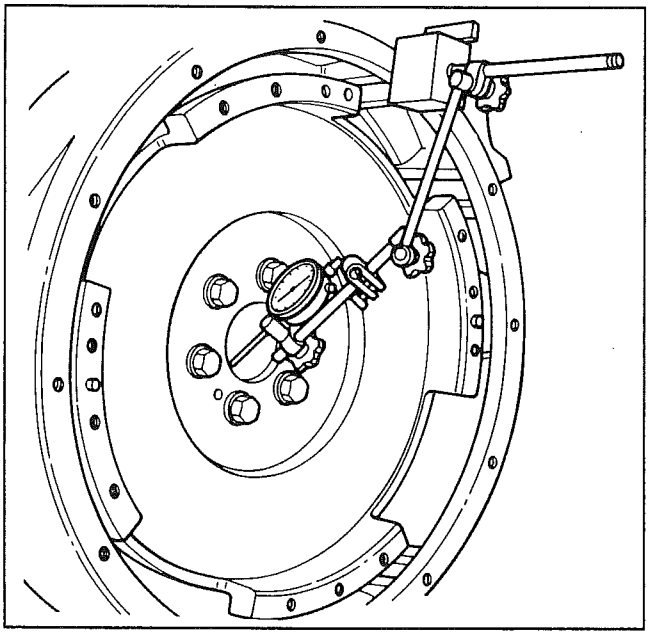


Figure 9-9. Measuring Pilot Bearing Bore Radial Runout

CLUTCH ENVIRONMENT

Flywheel Housing

1. Inspect the flywheel housing pilot bore for wear. The pilot lip of the transmission clutch housing can wear into the flywheel housing. This can be caused by the transmission attaching bolts becoming loose (caused by road and engine vibrations over a long period) or high mileage. Any appreciable amount of wear on either housing will cause misalignment.

   This wear will usually be in the area of the 3 to the 8 o'clock position (Fig. 9-10). Refer to the engine or vehicle manufacturer's allowable wear limits.

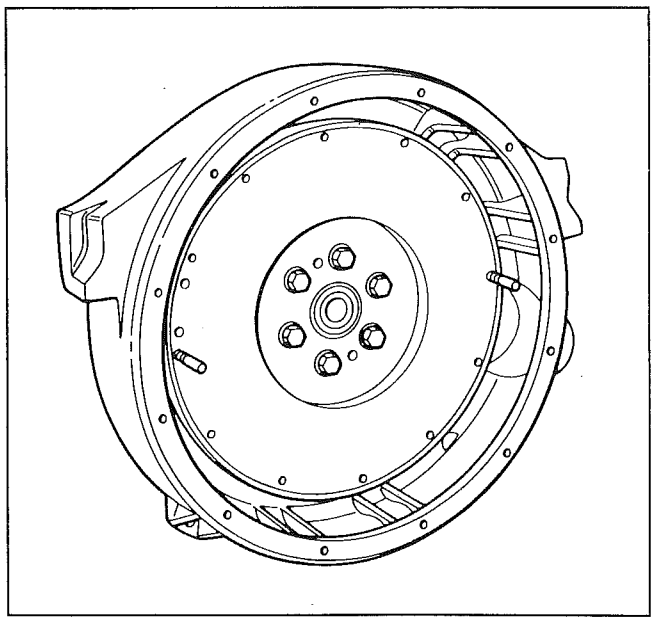


Figure 9-10. Flywheel and Clutch Housing Typical Wear Areas

2. Measure the housing pilot bore **radial runout** by attaching a dial indicator base to the flywheel (Fig. 9-11). Position the gage pointer against the housing pilot and zero the gage. Rotate the engine by hand. Mark the high and low points of the housing pilot as indicated by the dial indicator reading as the flywheel turns.

   The total **radial runout** is the difference between the highest plus and minus readings. The typical maximum limit is 0.008-inch (0.203 mm). Refer to the engine or vehicle manufacturer's specifications and recommended corrective actions if runout exceeds specification.

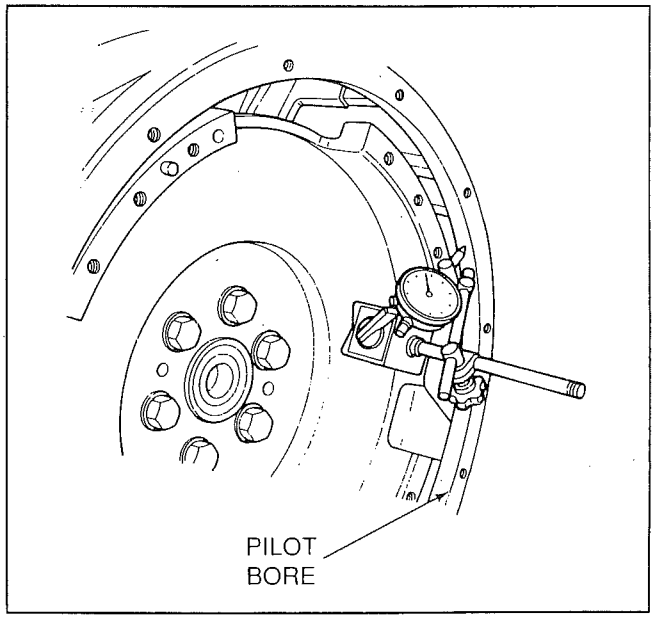


Figure 9-11. Checking Flywheel Housing Pilot Bore For Runout

3. Measure the rear face **axial runout** by positioning the dial indicator pointer against the flange face of the flywheel housing. Rotate the flywheel and record dimension at four places, each 90 degrees apart (Fig. 9-12). Force the flywheel back to take up crankshaft endplay prior to taking each measurement. Rotate the engine again and mark the high and low points as in Step 2. Typical maximum allowable limit is 0.008-inch (0.203 mm). Refer to the engine or vehicle manufacturer's specifications and recommended corrective actions if runout exceeds specification.

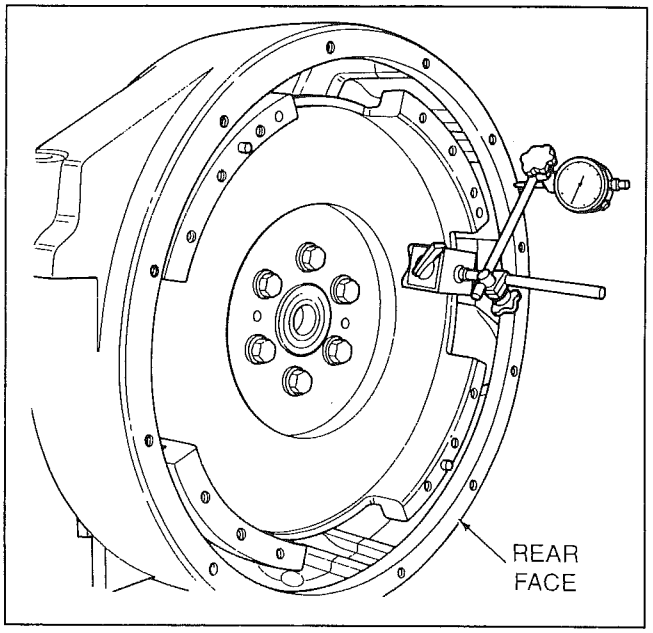


Figure 9-12. Checking Flywheel Housing Rear Face Axial Runout

Clutch Housing

1. Inspect the clutch housing front pilot for excessive wear in the same manner as was described for the flywheel housing. Wear in this area can result in engine to transmission misalignment. Refer to the transmission or vehicle manufacturer's specifications for allowable wear limits.

2. If the inspection shows signs of wear, measure the rear pilot bore radial runout (Fig. 9-13). Refer to the transmission or vehicle manufacturer's specifications and recommended corrective actions if not within specifications.

3. Check for wear or damage to the clutch housing mounting flange. Replace clutch housing if required.

4. Inspect the clutch release yoke cross shaft bushings for wear and lubrication. Replace as necessary.

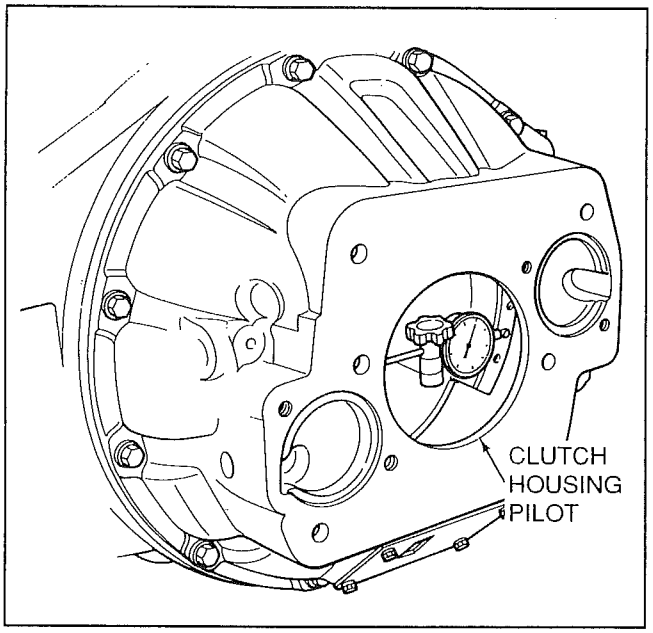


Figure 9-13. Checking Clutch Housing Pilot

Clutch Release Yoke and Cross Shafts

1. Inspect the clutch release yoke contact tips for excessive wear (Fig. 9-14). Replace as necessary.

2. Inspect the cross shafts for bushing wear and end spline damage and wear. Replace as necessary.

CLUTCH ENVIRONMENT

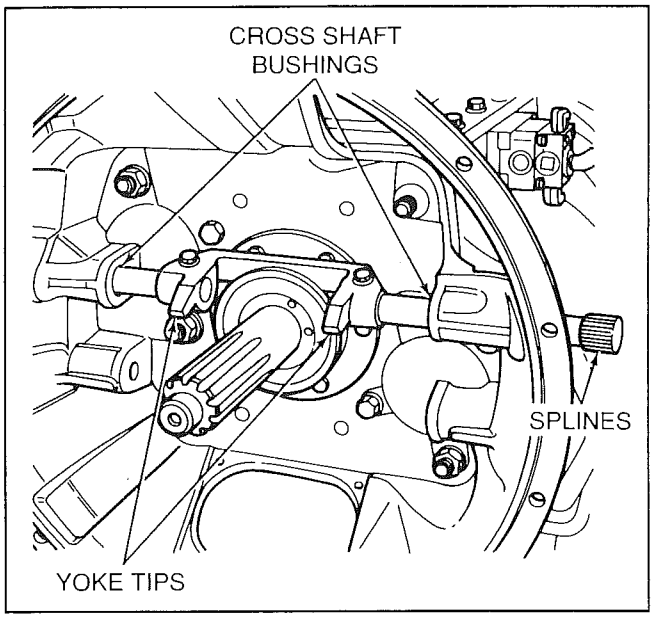


Figure 9-14. Clutch Release Yoke Contact Tip Inspection

Once the integrity of the clutch environment has been confirmed and all corrective actions are completed, clutch installation can begin.

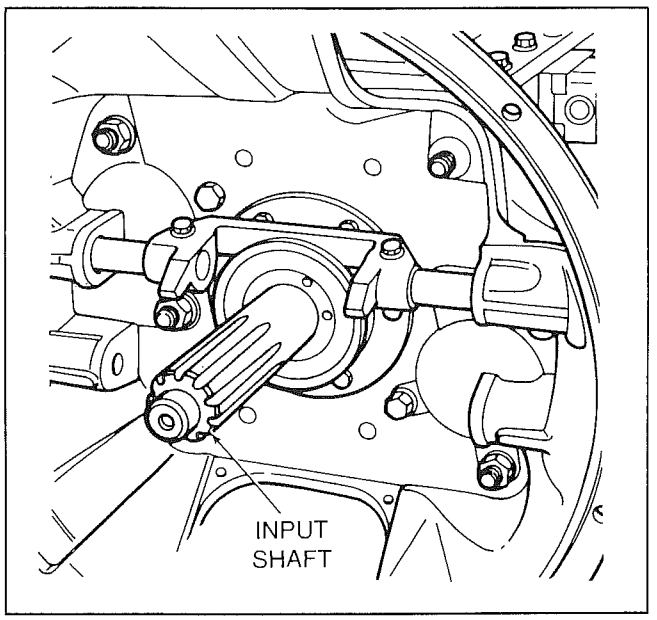


Figure 9-15. Input Shaft Inspection

Transmission

1. Inspect the input shaft for wear or damage of the splines, release bearing contact area and pilot bearing arbor (Fig. 9-15). Service as necessary.

2. If applicable, check the input shaft front bearing retainer for excessive clutch brake wear (Fig. 9-16). Refer to the transmission or vehicle manufacturer's specifications and recommended corrective actions.

3. Inspect for oil leaks that could contaminate the clutch. Correct as required.

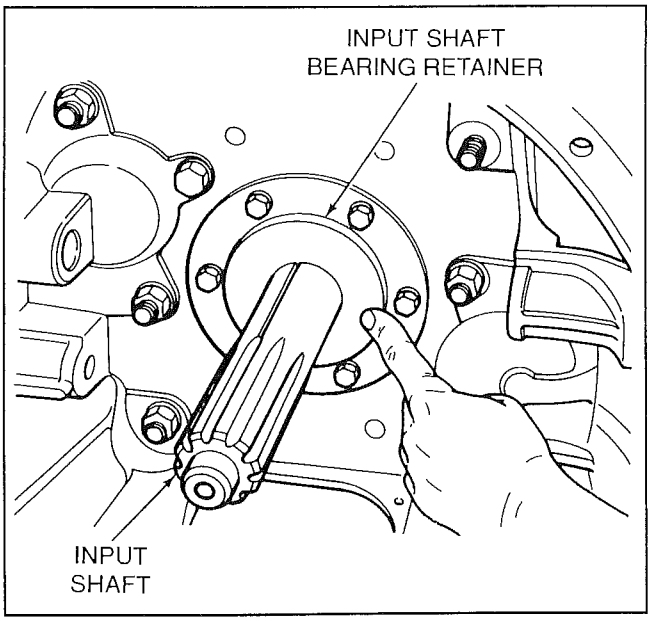


Figure 9-16. Input Shaft Bearing Retainer

FLYWHEEL PREPARATION

Used flywheels should be properly inspected for heat checks, warpage, scoring or cracks as outlined in the Inspection Section. Flywheels having these conditions may need to be resurfaced or replaced depending on engine or vehicle manufacturer's specifications and recommended corrective measures.

The inside and outside diameter of the clutch disc wear pattern on the flywheel should be measured and compared to the new clutch disc. If the new clutch disc facings go beyond the current flywheel wear pattern, check to be certain that no wear step exists at the edge of the flywheel wear pattern. If a wear step does exist, the flywheel MUST be resurfaced or replaced.

If no resurfacing is necessary, the flywheel face should be cleaned with emery paper to remove traces of old friction material. Following this, the friction surface should be thoroughly cleaned using a brake/electrical/clutch surface cleaning solvent.

NOTE

New flywheels usually have an anti-corrosion protection material applied to the surface. This must be removed thoroughly using a brake/electrical/clutch surface cleaning solvent.

Clutch mounting holes should be checked to ensure that the threaded holes are deep enough to allow the clutch mounting capscrews to be threaded by hand to a point deeper than is required to install the clutch. In addition, check to make sure the capscrew does not extend through the flywheel enough to contact the engine. Complete rotation of the flywheel may be necessary to assure there is no contact.

Install a new pilot bearing in the flywheel by pushing **only** on the outer race of the bearing (Fig. 10-1). Pushing on the inner race will damage the bearing. It is recommended that a high quality bearing with high temperature grease and high temperature seals are used to ensure long life. See SAE recommended practice J1731.

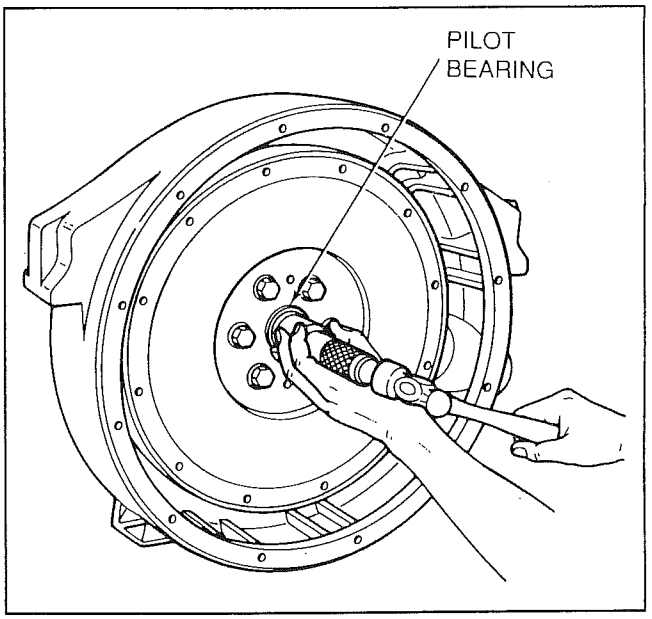


Figure 10-1. Installing Pilot Bearing

PRESSURE PLATE AND COVER ASSEMBLY (PPCA) INSTALLATION

1. If the PPCA is being reused it should be inspected for heat checks, warpage, excessive wear, scoring and cracks as outlined in the Inspection Section. If these conditions exist, the PPCA must be replaced.

2. Acceptable used PPCAs should have the friction surface cleaned using brake cleaning solvent to remove any trace of oil or grease.

3. The normal service unit consists of a PPCA with a new release bearing installed. To reuse an existing release bearing, make sure the ball bearing is free of rolling roughness, the bore bushing is in good condition, the yoke contact wear pads are not excessively or unevenly worn and the barrel threads are not damaged. Release bearings are usually replaced by threading the old bearing out of the coupler and threading in the new part. All Valeo clutches use the same size release bearing barrel threads (there are different internal diameters – 1 1/2, 1 3/4 or 2-inch bushing). To install a new or used coupler on a PPCA, use the procedure outlined in steps 4 through 13. If the service PPCA already has the release bearing installed, go to step 14.

NOTE

Installation of a coupler on a PPCA requires the use of an arbor press or equivalent.

4. Stand the bare coupler vertically on an arbor press working surface using the rear notched end face as a base.

5. Place the specified size and number of shim washers on the coupler pilot.

   14-inch Clutch – 1 shim (0.8 mm) (0.031-inch)
   16-inch Clutch – 1 shim (0.8 mm) (0.031-inch)
   17-inch Clutch – 1 shim (0.5 mm) (0.020-inch)

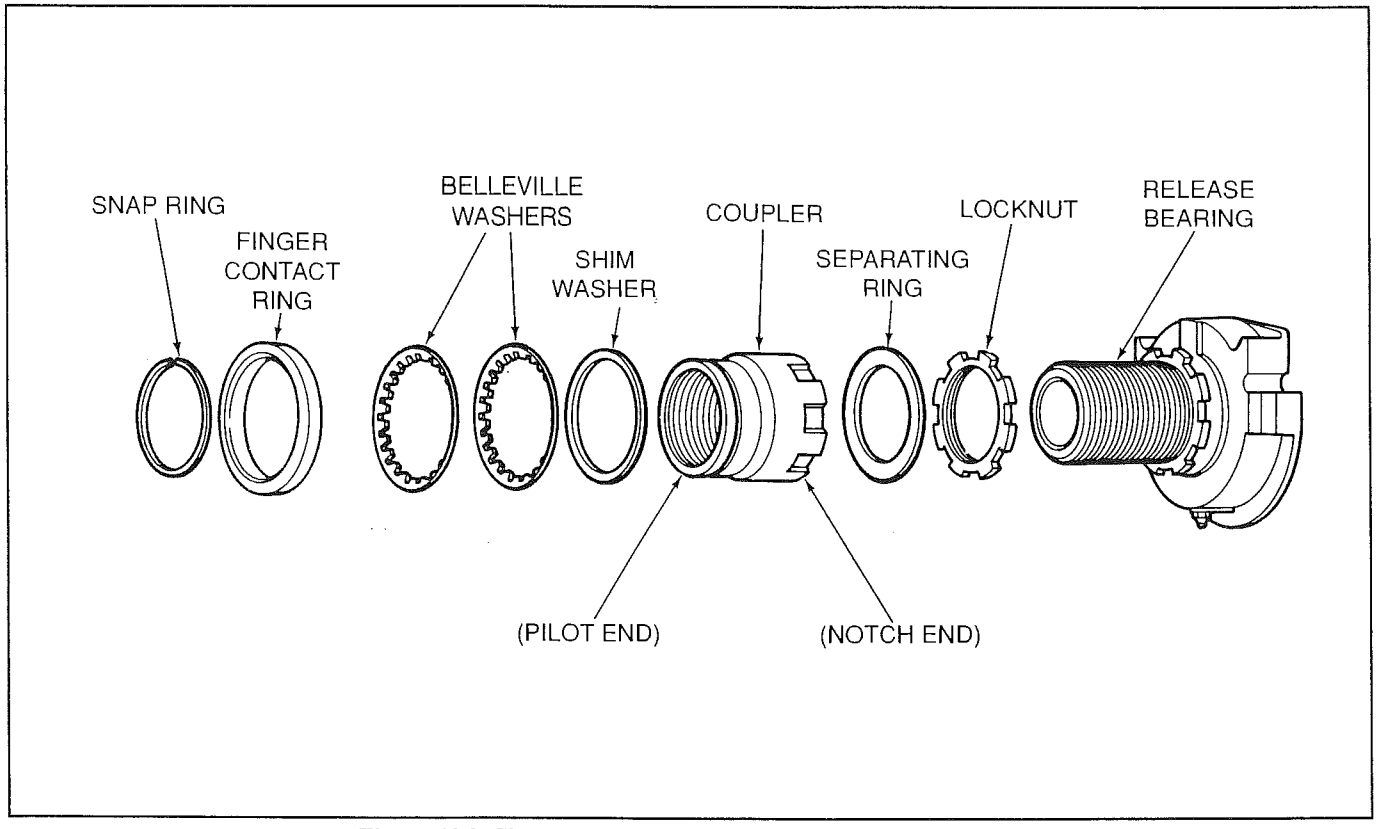


Figure 10-2. Clutch Release Bearing Assembly Disassembled

PRESSURE PLATE AND COVER ASSEMBLY (PPCA) INSTALLATION

6. Place two (2) toothed Belleville washers on the coupler pilot with the teeth pointing down toward the shim washers (Fig. 10-3).

7. Set the bare PPCA on the coupler pilot end with the pressure plate side (engine side) facing up. The PPCA should be positioned so that the diaphragm finger tips are resting on the solid edge of the Belleville washer.

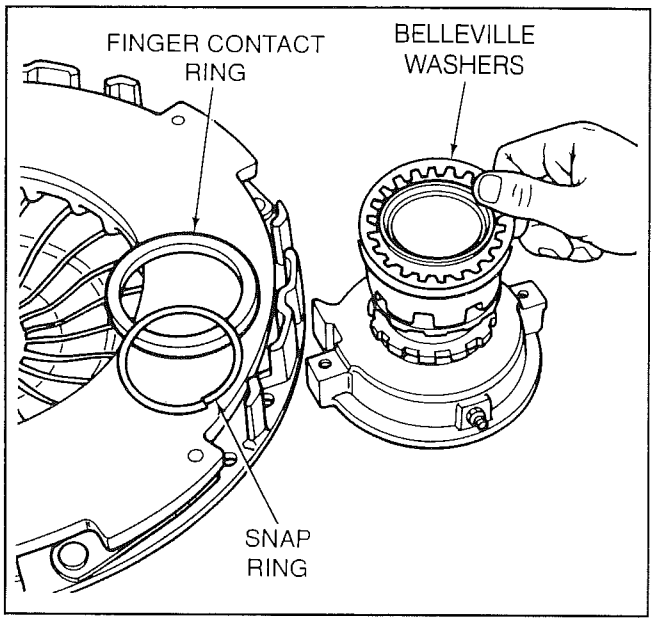


Figure 10-3. Belleville Washer Installation

NOTE

For ease of assembly, a shipping clip should be in place between each of the four drive strap attaching screw heads and the PPCA cover. If this is not the case, assemble the PPCA over a disc onto a flywheel and evenly and slowly tighten each PPCA mounting screw in a crisscross pattern just enough to allow shipping clips or an equivalent to be installed. Then remove the PPCA and continue with release bearing installation.

8. Place the finger contact ring on the coupler pilot with the rounded face down contacting the diaphragm spring fingers. The flat face with the counter bore at the ID will be up.

9. Place the round wire snap ring on the exposed end of the coupler pilot (Fig. 10-4).

10. Using the arbor press ram, push down on the finger contact ring at one point enough to deflect the Belleville washers and start the open end of the round wire snap ring into its groove. Continue in this manner around the coupler until the snap ring is fully seated into its groove.

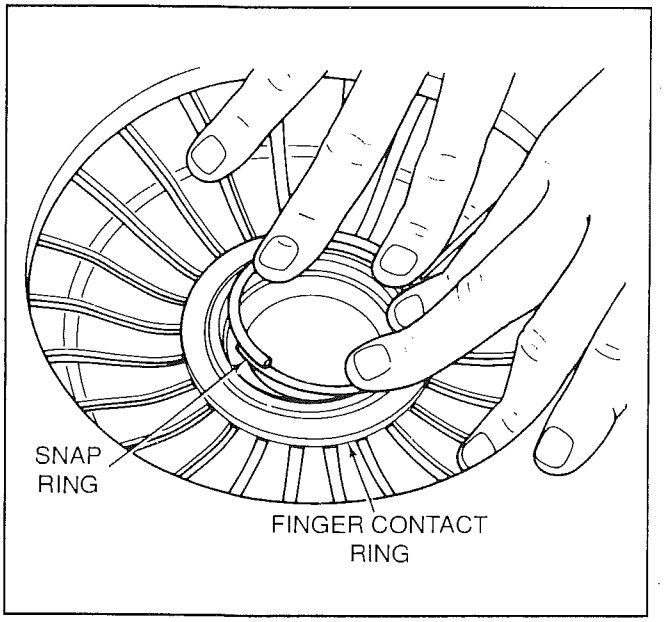


Figure 10-4. Snap Ring Installation

11. Thread the adjustment locknut on the release bearing barrel (Fig. 10-2).

12. Install a separating ring on the barrel.

13. Thread the release bearing assembly into the coupler deep enough so that it will not hit the transmission when it is installed.

14. Clean the friction surface of new and acceptable used PPCAs thoroughly with a brake surface cleaning solvent to remove all grease, oil or protective film.

PRESSURE PLATE AND COVER ASSEMBLY (PPCA) INSTALLATION

15. Install two alignment pins into two flywheel mounting holes that are 180 degrees apart (Fig. 10-5).

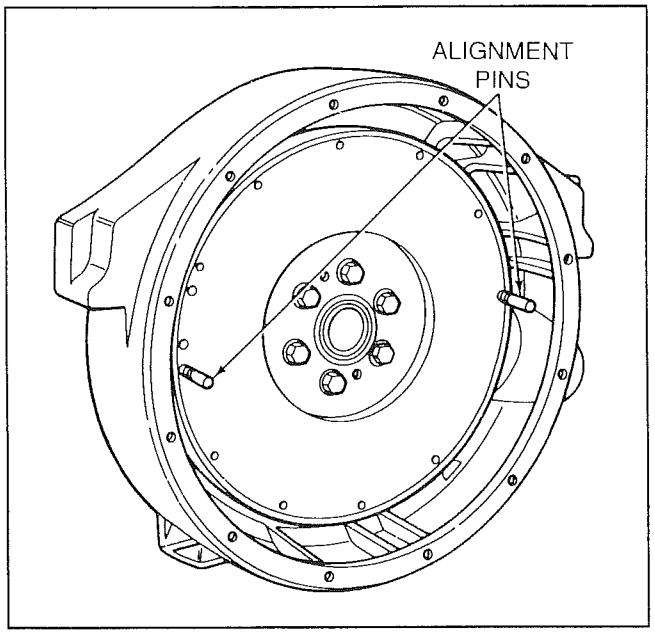


Figure 10-5. Alignment Pins Installed

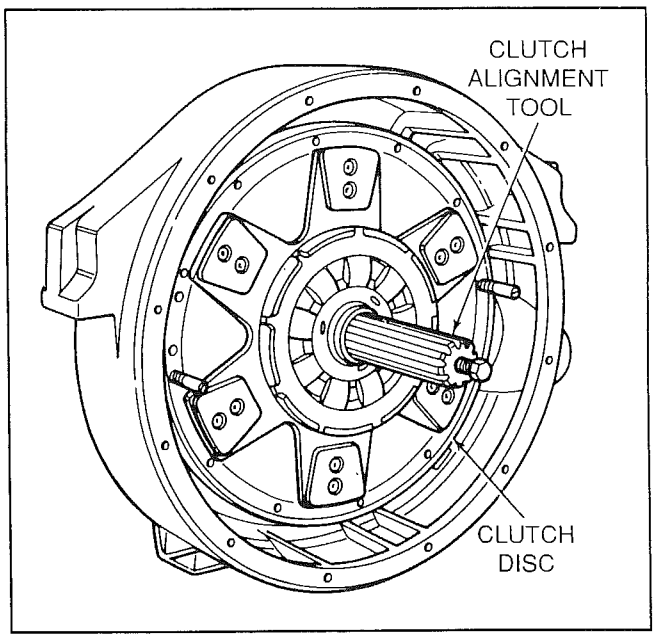


Figure 10-6. Clutch Disc Installed

16. The flatter side of the clutch disc goes toward the flywheel. With the disc correctly oriented, insert the clutch disc alignment tool through the splines on the disc. Next, insert the pilot arbor of the alignment tool into the flywheel pilot bearing and slide the clutch disc against the flywheel (Fig. 10-6).

17. Place the clutch PPCA and release bearing over the clutch disc alignment tool and onto the two alignment pins installed in the previous step (Fig. 10-7). Do not allow the weight of the PPCA to hang on the release bearing and clutch disc alignment tool.

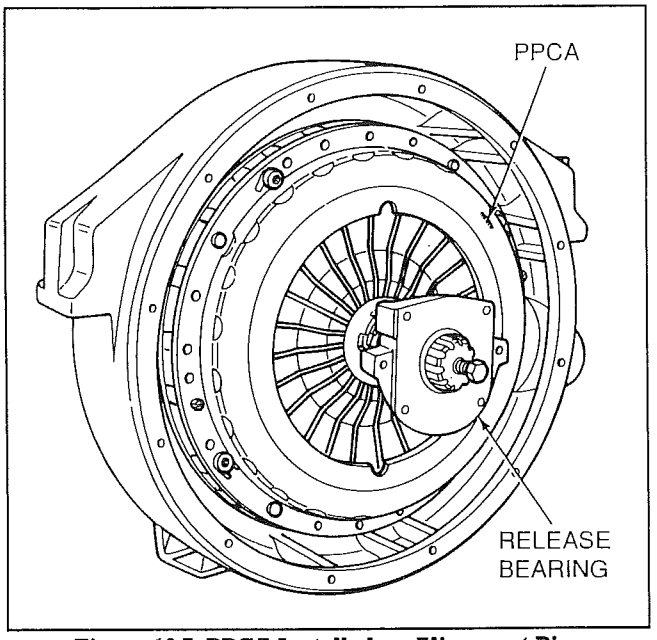


Figure 10-7. PPCA Installed on Alignment Pins

18. Slide the clutch forward against the clutch disc and flywheel.

PRESSURE PLATE AND COVER ASSEMBLY (PPCA) INSTALLATION

NOTE

The 17-inch pot type clutch is centered on the flywheel with two dowel pins located 180 degrees apart on the clutch mounting flanges. Be certain that the PPCA is correctly oriented so these two dowel pins will enter the corresponding dowel pin holes in the clutch cover housing (Fig. 10-8).

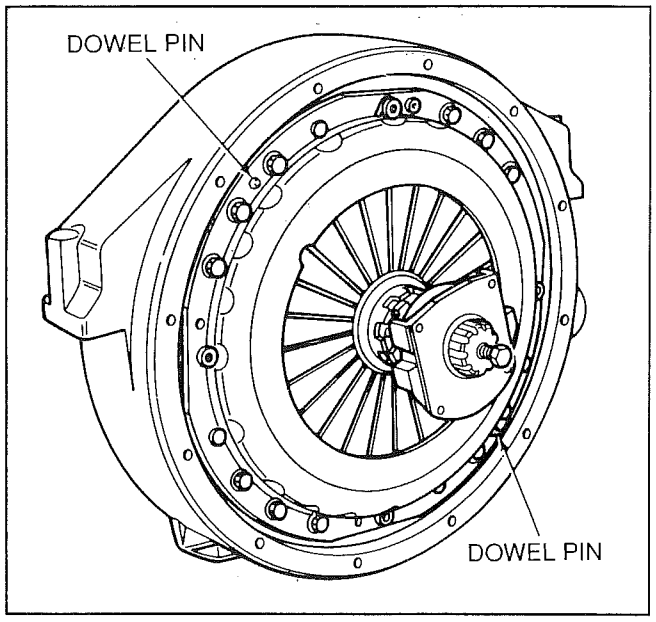


Figure 10-8. 17-inch Pot Type PPCA Installed On Dowel Pins

19. Place thick hardened flat or lock washers on each of the PPCA attaching capscrews.

20. Start each clutch attaching capscrew and washer assembly by hand and thread it in until the screw contacts the clutch housing cover.

NOTE

For the 14-inch clutch, two of the attaching capscrews are used to center the clutch on the flywheel. These two capscrews fit into two close fitting smaller pilot holes located 180 degrees apart on the PPCA. These "pilot" holes are identified by one or more of the following three methods.

- The letter "L" near the hole
- A dot of YELLOW paint with a minimum diameter of 6 mm near the hole
- A small hole, next to the pilot capscrew hole

Installing these two "pilot" capscrews first eases installation of the remaining six clutch attaching capscrews.

DO NOT tighten the attaching capscrews until all screws have been hand started.

21. Remove the two PPCA alignment pins and replace them with two attaching capscrew and washer assemblies.

PRESSURE PLATE AND COVER ASSEMBLY (PPCA) INSTALLATION

IMPORTANT: Be sure that the PPCA flange on flat flywheel type 16 and 17-inch clutches fully and evenly enters the pilot lip on the flywheel rim (Fig. 10-9).

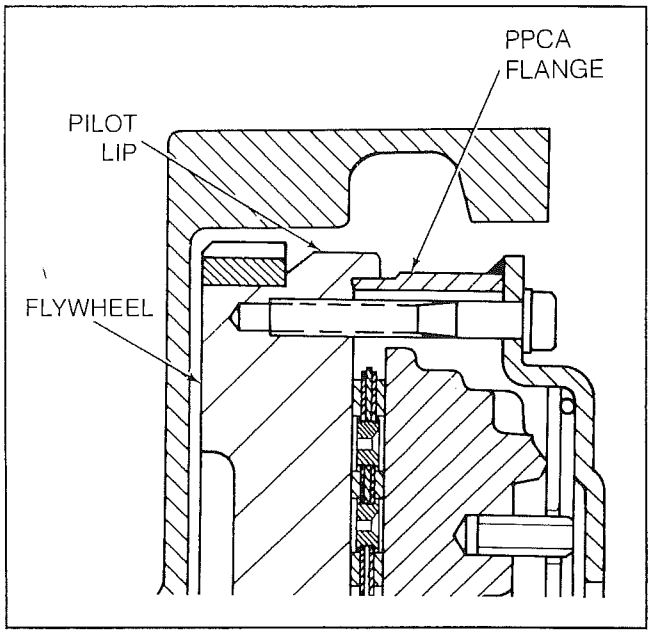


Figure 10-9. Flat Flywheel Type

22. Use a standard ratchet to initially tighten all capscrews in the recommended sequence (Fig. 10-10).

23. When tight, torque all capscrews to the specified torque (Fig. 10-11).

24. As the clutch attaching screws are tightened, the four shipping clips should become loose and may fall out (Fig. 10-12). **Be sure all four shipping clips are removed and that none of them drops inside the clutch.** These clips should be saved for possible reuse during future clutch removal operations.

NOTE

Do not remove the four allen-head capscrews that attach the drive straps to the clutch pressure plate. Serious clutch damage/malfunction will result.

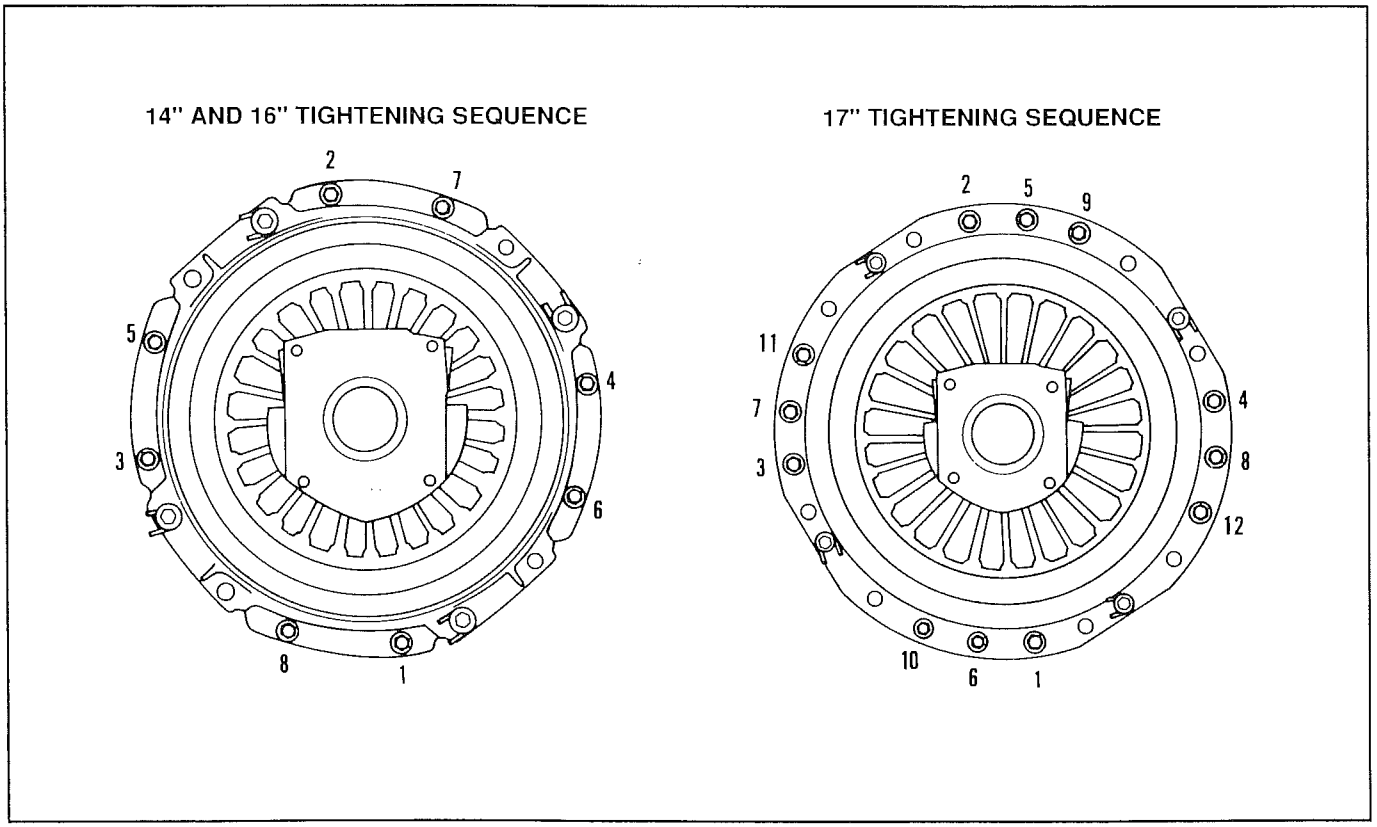


Figure 10-10. Tightening Sequence

PRESSURE PLATE AND COVER ASSEMBLY (PPCA) INSTALLATION

Clutch Pressure Plate and Cover Assembly to Flywheel — Mounting Screw Torque

Clutch Size	F/W Type	Capscrews (Min. Grade 5)		
		Size	Quantity	Instal. Torque lbs.-ft. (Nm)
14"	Flat	3/8"-16x1.25"	8	25-35 (34-47)
16"	Flat	7/16"-14x2.50"	8	40-55 (54-75)
17"	Flat	7/16"-14x2.75"	12	40-55 (54-75)
17"	Pot	7/16"-14x1.00"	12	40-55 (54-75)

Clutch Release Bearing locknut ring torque, for all clutch sizes 30-35 lbs.-ft. (41-47 Nm)

Figure 10-11. Torque Specifications

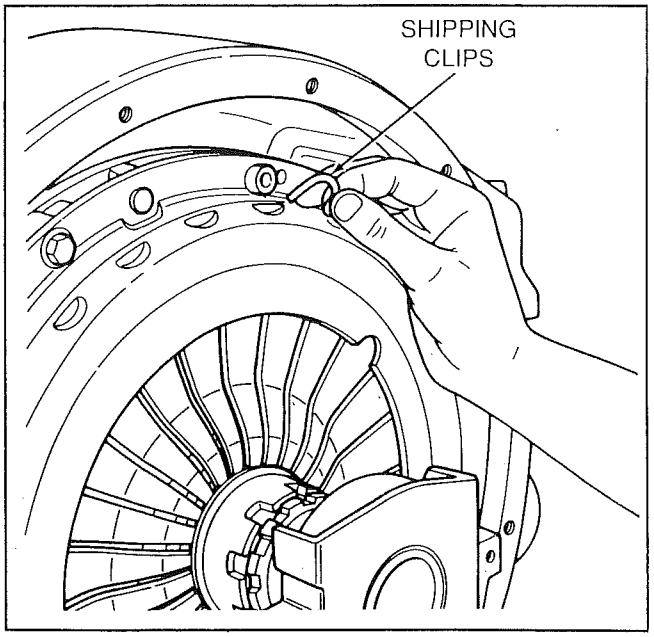


Figure 10-12. Removing Shipping Clips

25. Remove the clutch alignment tool.

CAUTION

Do not apply any type of lubricant to the bushing in the bore of the release bearing. The bushings are impregnated with graphite for lubrication. Grease or oil will only collect dust and dirt forming a sticky paste that can result in clutch drag.

TRANSMISSION INSTALLATION

1. Lubricate the clutch housing cross shaft bushings. Confirm that the grease fittings accept grease and are positioned so they may be easily greased at regular maintenance intervals. Lubricate the clutch release bearing housing and place a small amount of grease on the release bearing yoke contact pads. See Section 5, Lubrication and Maintenance in this manual.

2. If a clutch brake is used, install it on the transmission input shaft. Slide the clutch brake back into a position which will allow the release yoke contact fingers to be rotated up as high as possible (Fig. 10-13). This will allow the yoke tips to pass over the top of the release bearing during transmission insertion. If a clutch brake is not used, simply rotate the release yoke contact tips as high as possible.

3 Move the transmission, properly oriented, to a point close behind the clutch and flywheel. Be sure the release yoke tips are fully raised up and the clutch housing inspection cover is removed.

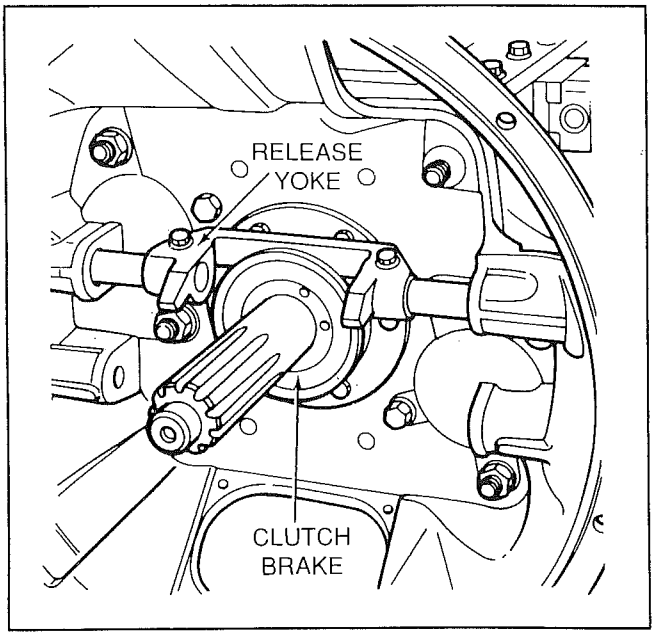


Figure 10-13. Release Yoke Tips Rotated Up

4. Adjust the transmission position so that the input shaft can just enter the rear end of the clutch release bearing. Adjust the transmission support so the transmission is as close as possible to perfect alignment with the engine crankshaft centerline (Fig. 10-14).

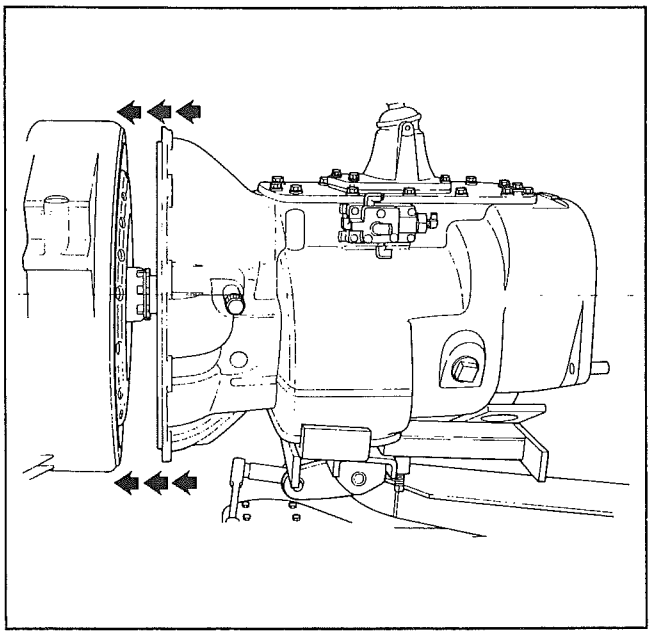


Figure 10-14. Aligning Transmission for Installation

CAUTION

Never let the weight of the transmission hang on the input shaft and clutch during transmission installation. The clutch disc and input shaft can be damaged if this occurs.

5. Move the transmission forward to insert the input shaft into the clutch disc spline. Be sure the clutch release yoke tips pass over the top of the clutch release bearing as the transmission is moved toward the engine. Continually readjust the transmission orientation as necessary to maintain alignment with the engine. Do not force the transmission forward. Any blockage or restriction must be located and corrected.

TRANSMISSION INSTALLATION

6. Place the transmission in direct drive or overdrive. Rotate the transmission output shaft as necessary to correctly align the clutch disc spline with the transmission input shaft spline during insertion.

7. Rotate the clutch release yoke tips down into the normal position as soon as they are in front of the clutch release bearing. If the release yoke tips are not rotated down to the normal working position, the release yoke bar can block full insertion of the transmission.

8. Push the transmission fully forward until the clutch housing pilot is seated against the flywheel housing bore. Install the transmission attaching capscrews and tighten according to the vehicle manufacturer's specifications.

⚠ CAUTION

Never use the transmission capscrews to pull the transmission into position. If the transmission does not completely and easily move into position, remove transmission and correct source of binding.

9. Reinstall transmission rear mounting support if applicable.

10. Remove the transmission jack or lifting device from the transmission.

11. Connect the air lines and electrical connectors to the transmission.

12. Connect the shifter assembly to the transmission.

13. Adjust clutch release bearing travel gap. See Section 11 of this manual for new clutch initial adjustment procedure.

14. Connect the clutch external linkage. Make sure all clutch pedal return springs are properly installed. Adjust the linkage for proper free play if necessary. See Section 11 of this manual for clutch release linkage adjustment procedure.

15. If a hydraulic release system is used for the clutch, reconnect slave cylinder and pushrod. Refer to specific vehicle service manual for installation procedure.

16. Lubricate the clutch and release system. See Section 5 of this manual for lubrication points and recommendations. Reinstall the clutch housing hand hole access cover plate.

NOTE

If vehicle operation in unusually dusty condition is anticipated, the release bearing housing should be completely filled with grease on a new clutch to help keep dust from entering and contaminating the bearing. Also, all clutch housing dust entry points should be blocked off. In extreme cases, a regulated compressed air line can be introduced at the top of the clutch housing with an exit hole added at the bottom. This will create a positive air pressure inside the clutch housing to keep dust from entering.

17. Connect the driveshaft to the output yoke on the transmission. Ensure the alignment marks (made when driveshaft was removed) on the output yoke and driveshaft are aligned.

18. Road test the vehicle and check for proper operation.

NEW CLUTCH INITIAL ADJUSTMENTS

Initial Release Bearing Length Adjustment

1. Make sure the vehicle clutch release linkage is disconnected.

2. If equipped with a clutch brake, slide the clutch brake rearward until it contacts the transmission front bearing retainer.

3. Using two spanner wrenches, loosen the release bearing locknut. Thread the locknut back toward the transmission a small distance to ensure that it will not interfere with the adjustment process.

4. Using the adjuster ring, rotate the release bearing threaded sleeve into or out of the release bearing coupler to obtain the specified gap at the rear of the release bearing (Fig. 11-1 and Table 11-1 for specified gap). Measure this gap with an appropriate tool (Fig. 11-2).

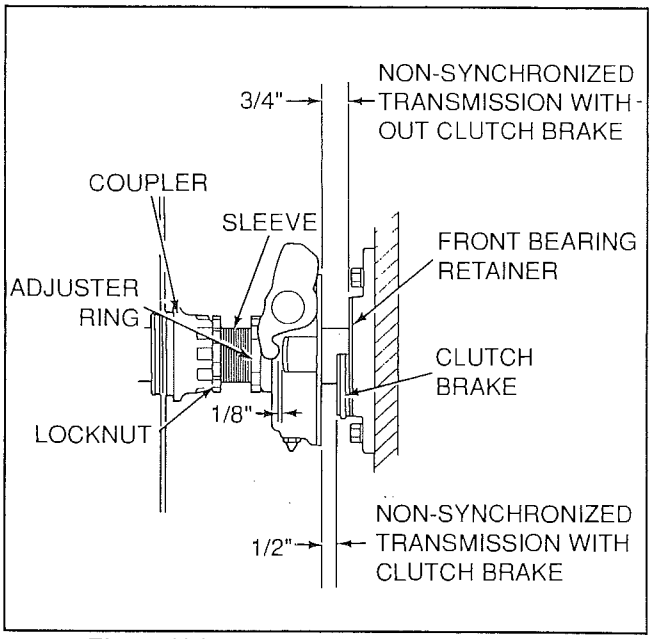


Figure 11-1. Release Bearing Travel Gap on Non-Synchronized Transmissions

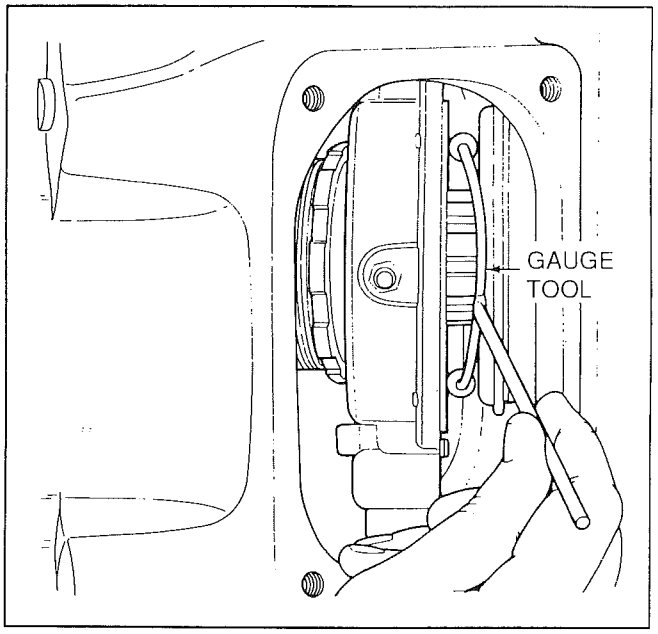


Figure 11-2. Checking Clutch Release Bearing Travel Gap

NOTE

Hydraulic Release Systems Without Free Play - Vehicles equipped with these types of systems require special adjustment procedures. Refer to the manufacturer's shop manual for the correct gap between the clutch release bearing and the transmission or clutch brake.

5. Thread the release bearing locknut forward by hand, toward the release bearing coupler, as far as it will go.

NEW CLUTCH INITIAL ADJUSTMENTS

Table 11-1. Release Bearing Travel Gap

Installation Description	Gap Between Release Bearing and Transmission/Clutch Brake
Non-synchronized transmission with clutch brake	1/2-inch
Non-synchronized transmission without clutch brake	3/4-inch
Synchronized transmission without clutch brake	See vehicle manufacturer's shop manual for specification. **(Must be at least 1/2-inch)**

6. Using two spanner wrenches, place one on the notches of the release bearing coupler and the other on the release bearing locknut. Use the first wrench to prevent the coupler from rotating while using the second wrench to tighten the locknut against the coupler as a jamnut. Final tightening can be done by placing the two wrenches in notches that will result in the two wrench handles diverging slightly from one another. Then both handles can be grasped with one hand and squeezed snugly together (Fig. 11-3).

7. Recheck the release bearing to transmission gap to be sure it is to specification. If not, loosen the locknut and repeat this procedure.

8. Connect the vehicle clutch release linkage to the clutch release yoke cross shaft and external lever following instructions from the vehicle manufacturer.

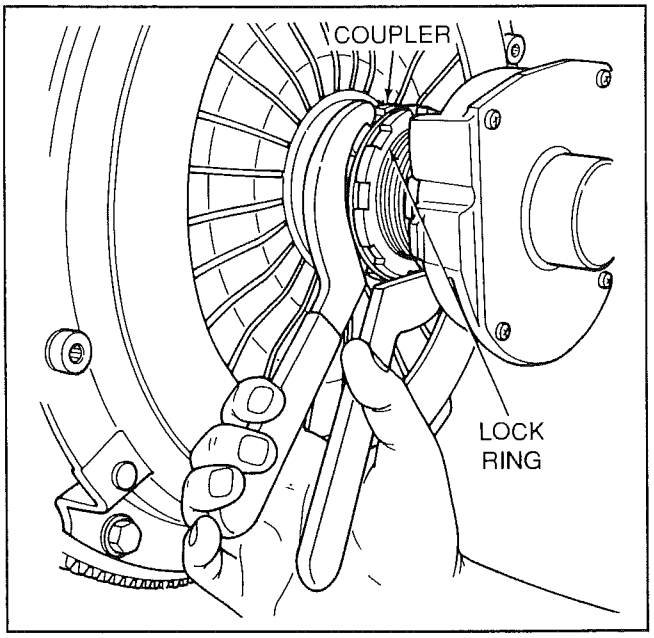


Figure 11-3. Tightening Locknut With Spanner Wrenches

NEW CLUTCH INITIAL ADJUSTMENTS

Clutch Release Linkage Adjustment — Systems with Free Play

1. Be certain that the clutch release bearing length adjustment has been properly completed.

2. Adjust the vehicle's clutch release linkage to obtain a 1/8-inch gap between the release yoke tips and the release bearing contact wear pads (Fig. 11-4). Measure gap with appropriate tool. Refer to the vehicle manufacturer's instructions for information on how to adjust the clutch linkage. See typical clutch linkage. (Fig. 11-5, Sheets 1 and 2)

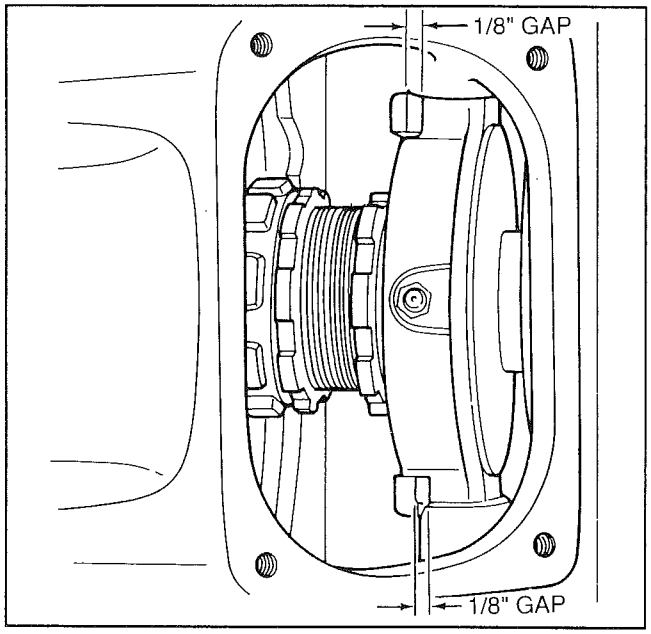


Figure 11-4. Clutch Release Bearing and Release Yoke Clearance

Clutch Release Adjustment — Hydraulic Release Systems without Free Play

1. Be certain that the clutch release bearing length adjustment has been completed following the vehicle manufacturer's specifications.

2. Follow the vehicle manufacturer's procedures to correctly set up each element of the release system to ensure proper system operation.

NEW CLUTCH INITIAL ADJUSTMENTS

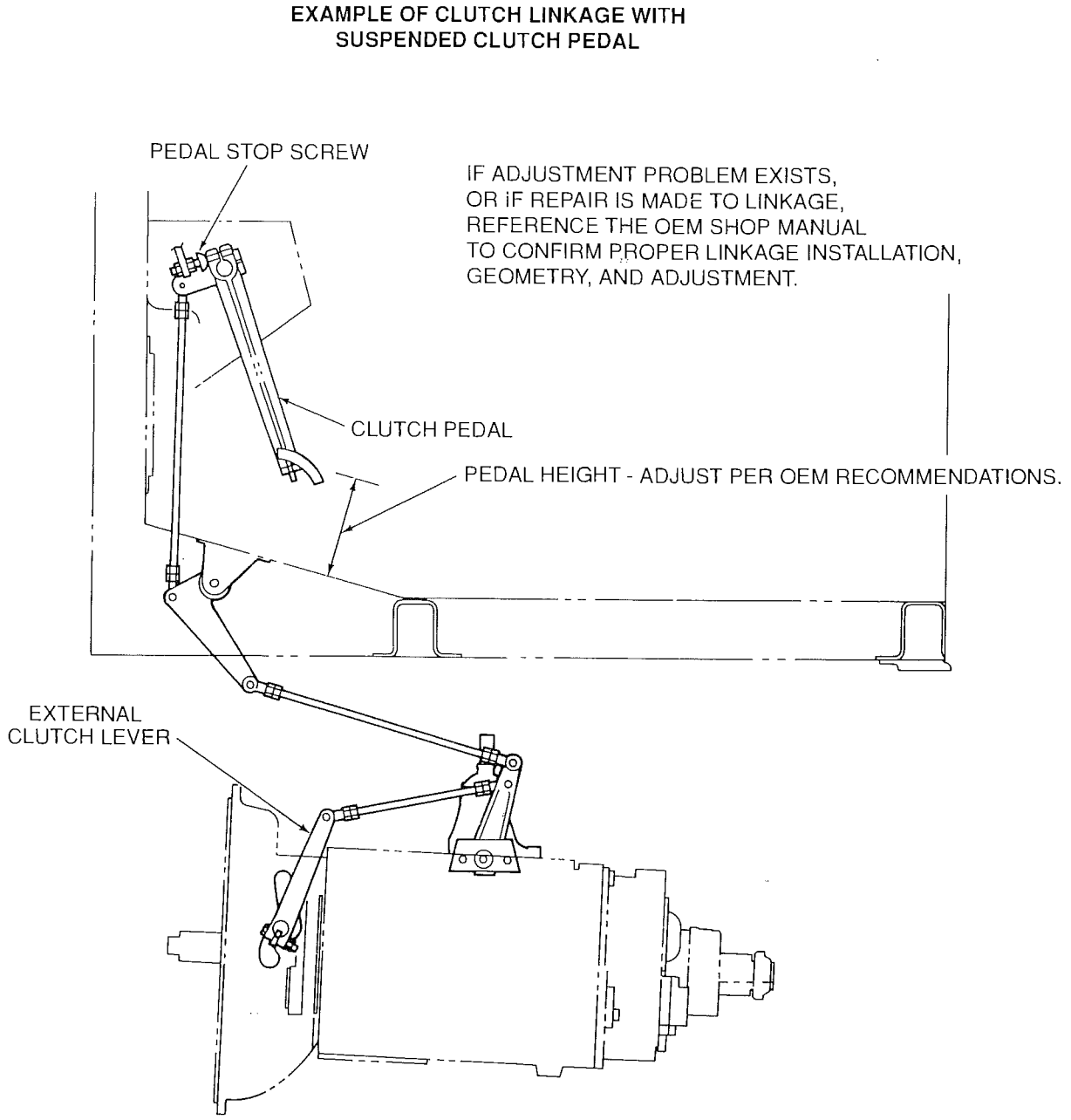


Figure 11-5. Sheet 1, Typical Clutch Release Linkage with Suspended Clutch Pedal

NEW CLUTCH INITIAL ADJUSTMENTS

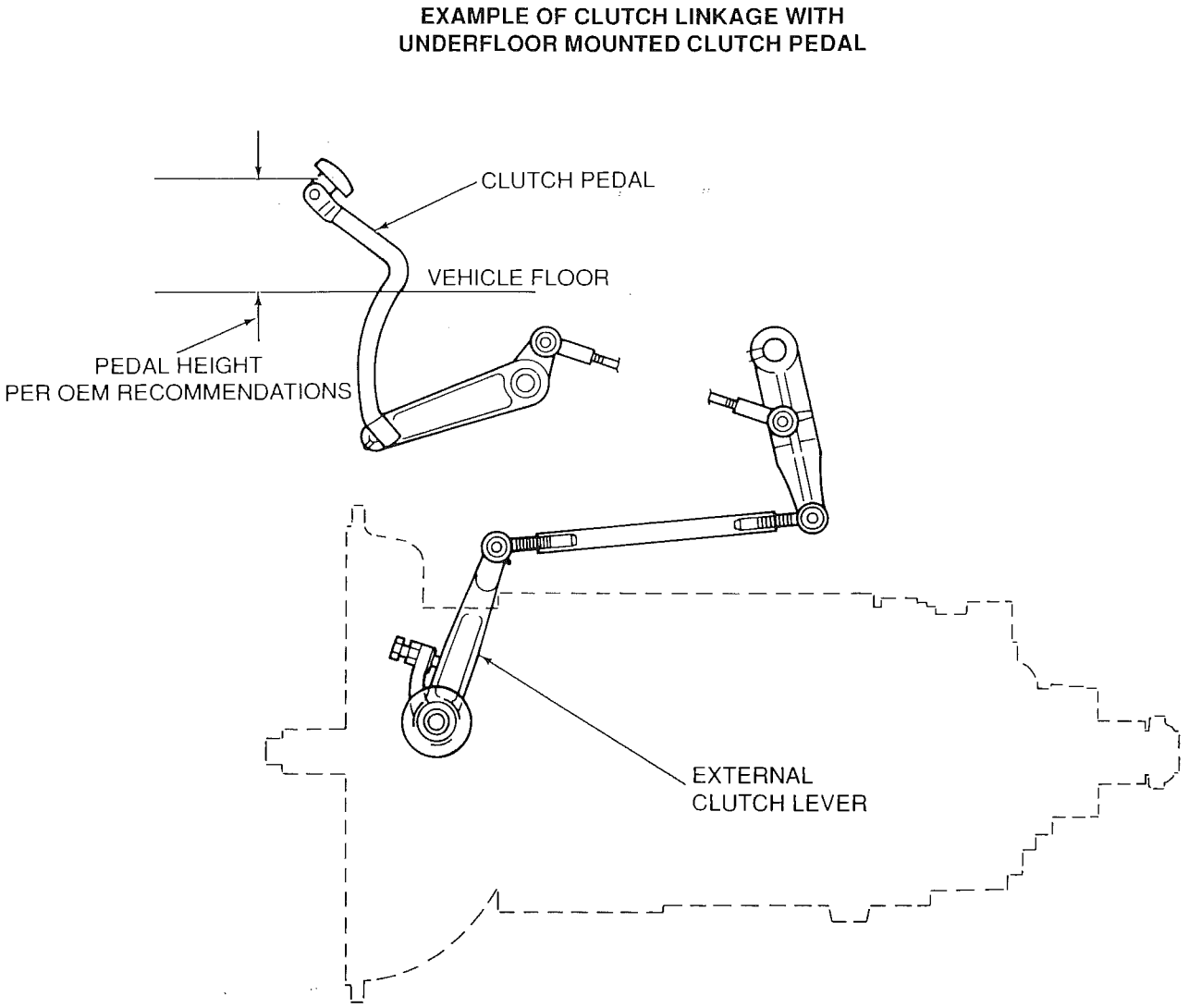


Figure 11-5. Sheet 2. Typical Clutch Release Linkage with Underfloor Mounted Clutch Pedal

Release System Final Functional Check — Systems with Free Play

A final functional check of the release system should be made at the clutch pedal. The clutch pedal stroke can be divided into three regions (Fig. 11-6).

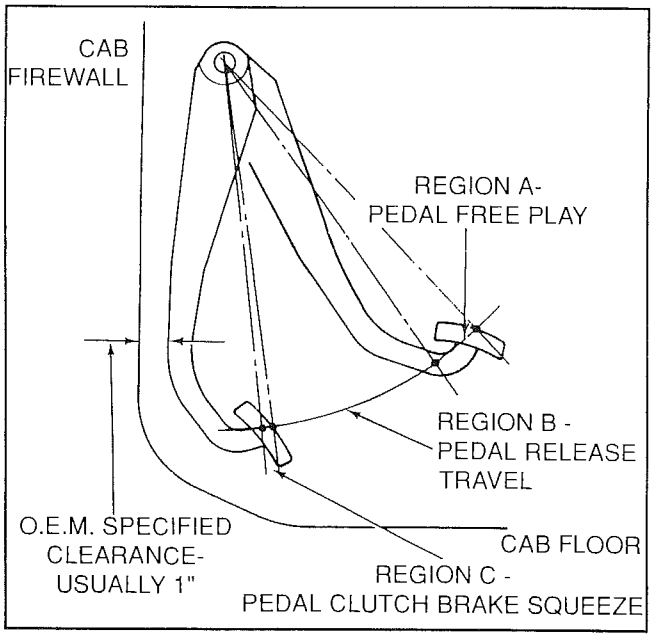


Figure 11-6. Pedal Stroke Operating Regions

Region A - Starting at the top of the pedal stroke is the free play region. The free play is created by the 1/8-inch gap between the release yoke tips and the release bearing wear pads. Depending on the O.E.M., this free play can vary from 1 1/8-inch on some chassis to 2 1/2-inch on others. Pedal movement here does not move the clutch release bearing.

NOTE

Because of the low pedal efforts of the Valeo clutch, it is recommended that the clutch pedal free play be checked with the TIPS OF ONE OR TWO FINGERS ONLY (Fig. 11-7). Checking free play with the palm or foot is not recommended due to the possibility of incorrect measurements.

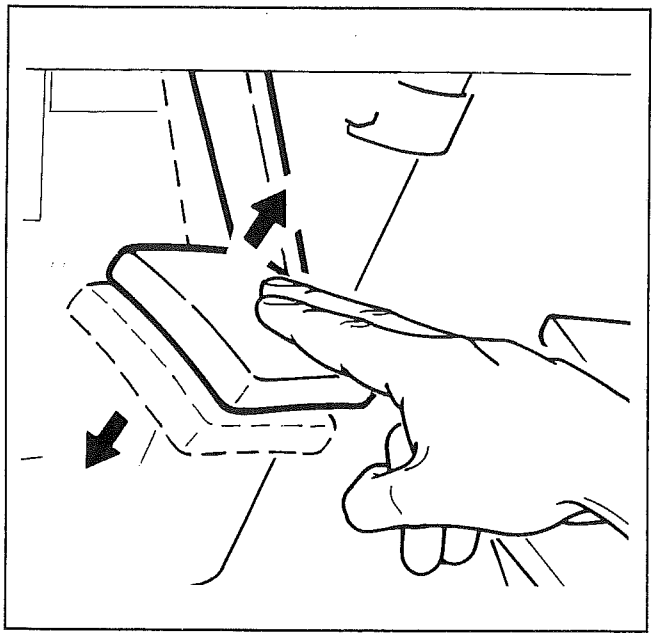


Figure 11-7. Checking Pedal Free Play

Region B - The second region is the release travel. During this movement of the clutch pedal, the release bearing is moved rearward through the 1/2-inch release bearing travel gap, and the clutch disengages.

Region C - The final portion of the clutch pedal travel is the clutch brake squeeze. (This only applies to vehicles equipped with a clutch brake.) This is the point at which the rearward moving release bearing contacts the clutch brake and squeezes it against the front of the transmission. This should occur when the clutch pedal is approximately 1-inch above its lower stop (often times the floor or firewall - see OEM specifications).

NEW CLUTCH INITIAL ADJUSTMENTS

Verify That All Three Regions are Correct

1. Use the two finger method to check region A free play. A foot or palm can be used to check regions B and C.
2. If the 1/8-inch free play gap and 1/2-inch release bearing travel gap are correct, and the clutch brake cannot be engaged, refer to the vehicle's shop manual for the procedure to check for proper clutch pedal height and linkage geometry (Fig. 11-5). In addition, check for wear in the linkage system.
3. Once the final check has been successfully completed, place a small amount of grease on the release bearing yoke contact pads. If vehicle operation in unusually dusty conditions is anticipated, fill the release bearing housing with grease to prevent dust from entering and contaminating the bearing. Reinstall the clutch housing inspection cover. In addition, check and lubricate the release linkage pivots and joints.
4. Measure and record the clutch pedal free play for use in future service adjustments (Fig. 11-8). Again, use the two finger method to measure free play.

Release System Final Functional Check — Hydraulic Release Systems without Free Play

1. Consult the vehicle shop manual to be certain that all procedures have been completed to make the release system ready to operate with a new clutch (master and slave cylinder adjustments, fluid level, special clutch pedal manipulations, etc.)
2. Have an assistant push the clutch pedal through its total travel and check for 1/2-inch minimum release bearing travel and clutch brake operation (if applicable) as described under Release System Final Functional Check.
3. With the clutch pedal fully "up", push on the external clutch release lever at the clutch housing in a direction that will push the slave cylinder piston deeper into its bore. If the piston cannot be moved, the release system is not functioning correctly and vehicle operation will cause severe damage to the clutch. See OEM vehicle specifications for corrective action. If no information is available, contact Valeo for a free copy of our trouble shooting guide for hydraulic clutch release systems.
4. Place a small amount of grease on the release bearing yoke contact wear pads.

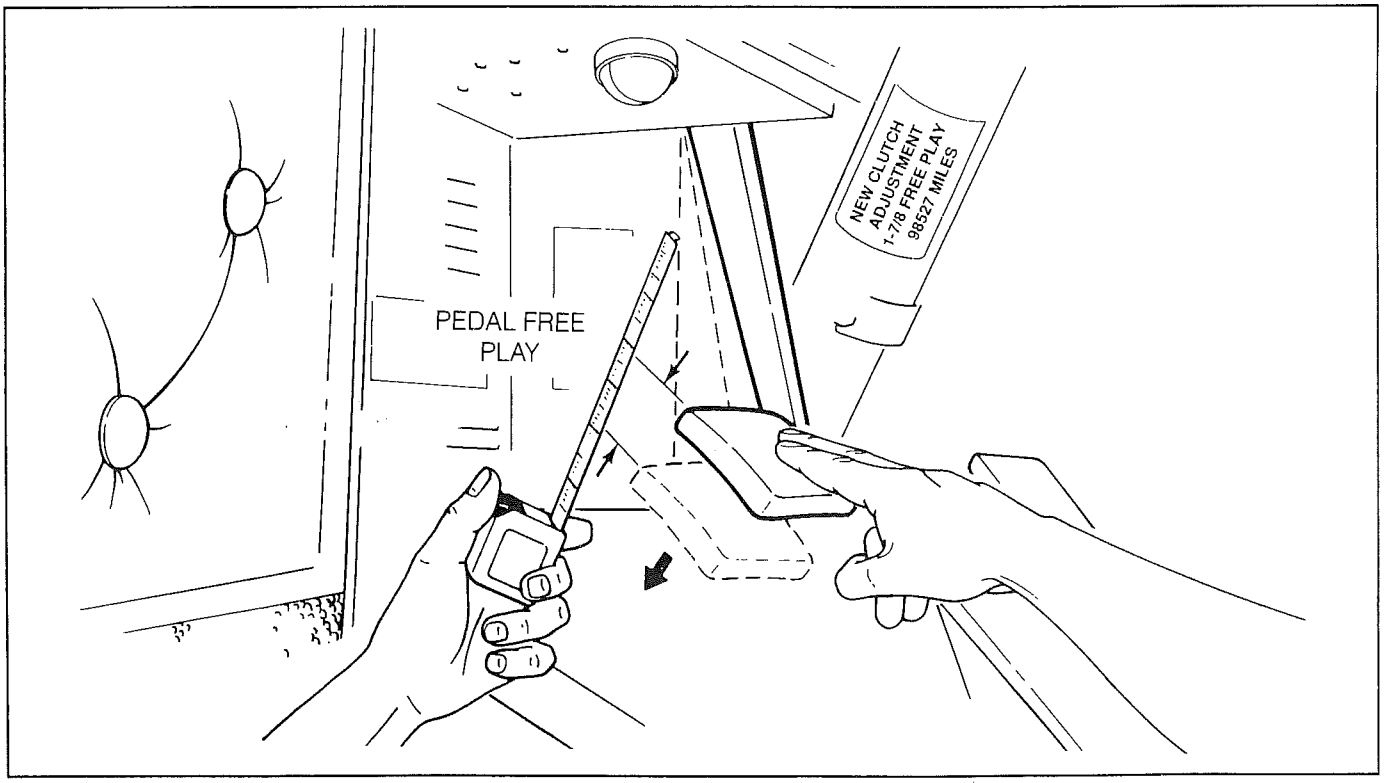


Figure 11-8. Checking and Recording Pedal Free Play

CLUTCH MAINTENANCE ADJUSTMENTS — SYSTEMS WITH FREE PLAY

Effects of Clutch Wear

During its operating life the clutch disc becomes thinner with wear. This causes the diaphragm spring fingers and release bearing to move forward toward the flywheel thereby reducing the 1/8-inch free play gap between the release yoke and the release bearing wear pads. At the same time, the release bearing travel gap will become larger (Fig. 11-9). This becomes evident at the clutch pedal through reduced pedal free play and lowered clutch brake engagement point (if applicable).

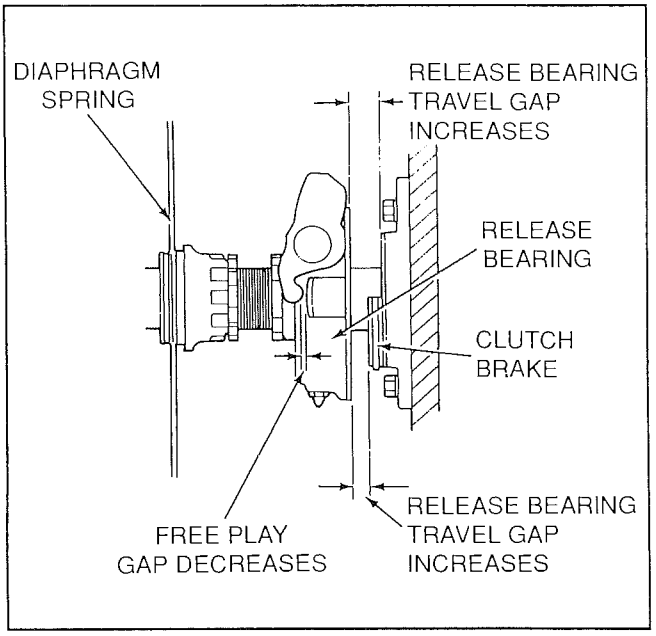


Figure 11-9. Effects of Wear

Valeo recommends that the clutch be readjusted when the 1/8-inch free play gap decreases to half its value — or 1/16-inch. The effect in the vehicle cab is that the clutch pedal free play will also decrease to approximately half its original value.

NOTE

Due to variations between specific O.E.M. clutch linkages, the 1/8-inch free play gap will generally result in 1 1/8-inch to 2 1/2-inches of clutch pedal free play. Therefore, if the clutch pedal free play was originally 2-inches on a particular chassis, the clutch should be readjusted when the pedal free play decreases to 1-inch.

Free play in the release system provides clearance so that clutch wear and vehicle component dynamic movement can be absorbed without the release yoke contacting the release bearing and causing the clutch to slip.

Maintaining Clutch Pedal Free Play

Clutch pedal free play should be checked on a regular basis. Vehicle application has the most significant effect on clutch wear and the maintenance interval should reflect this. As an example, in many on-highway fleet applications, the clutch pedal free play will be measured as part of a monthly vehicle maintenance procedure. In most fleets, the driver of the vehicle bears the greatest responsibility for making sure that the clutch is operating properly and that free play is present. The driver is to report any problem to the appropriate service personnel so that action can be taken to correct the problem.

Valeo recommends that the fleet service location have a trained clutch expert routinely evaluate clutch pedal free play on any vehicle in the shop for any reason (oil change, chassis lube, etc.). When the free play is half of the newly adjusted value, a readjustment should be done and can often be accomplished while the other service is performed. This can eliminate costly road-side service. Charting free play history per vehicle can also be a useful tool in predicting service adjustment intervals.

NOTE

Should clutch pedal free play decrease to 1/2-inch or less, the clutch should be adjusted immediately.

CLUTCH MAINTENANCE ADJUSTMENTS – SYSTEMS WITH FREE PLAY

1. Check and measure clutch pedal free play by using two fingers to depress the clutch pedal. Due to the lower clutch pedal efforts of the clutch, Valeo highly recommends the two finger method to check free play. The use of the palm or foot can cause an inaccurate reading (Fig. 11-8).

NOTE

If the clutch pedal requires a greater force than can be applied by two fingers, the clutch housing inspection cover should be removed to verify free play clearance of 1/8-inch between the release yoke and release bearing. In addition, check the linkage pivot points and release yoke shaft bushings for possible binding. Lubricate or repair as necessary.

2. Proceed with the clutch adjustment if any of the following conditions exist:

   - Clutch pedal free play is half its original value.
   - Release yoke fingers to release bearing gap is 1/16-inch or less.
   - Clutch pedal free play is less than 1/2-inch.
   - Clutch brake (if so equipped) cannot be activated at the bottom of the clutch pedal stroke.

Periodic Clutch Adjustment

1. Using 2 spanner wrenches, loosen the release bearing locknut (Fig. 11-10). Thread the locknut back toward transmission a small distance to ensure that it will not interfere with the adjustment process.

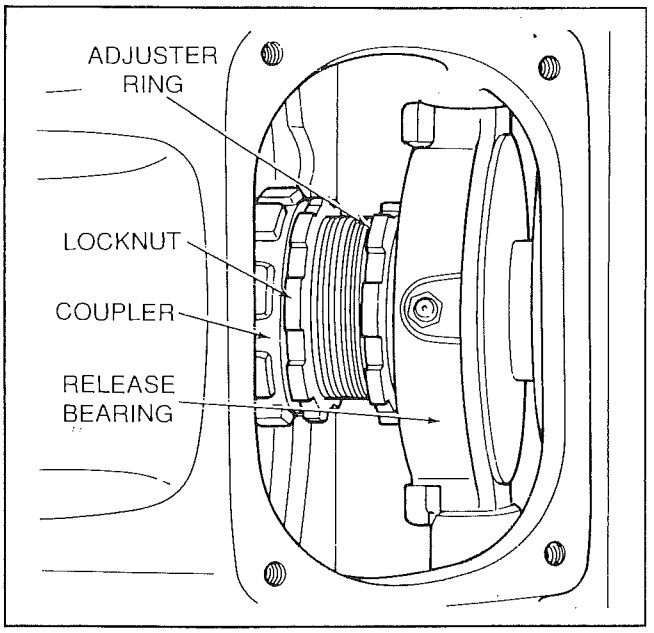


Figure 11-10. Release Bearing and Coupler

2. Using the adjuster ring, rotate the release bearing threaded sleeve into or out of the release bearing coupler to obtain the specified gap at the rear of the release bearing (see Fig. 11-11 and Table 11-1 for specified gap). Measure this gap with an appropriate tool.

NOTE

If the threaded sleeve is difficult to turn, it may be due to lack of clearance between the release yoke fingers and the release bearing. This will cause tension on the threads of the release bearing sleeve. In this case, disconnect the external linkage.

3. Thread the release bearing locknut forward by hand, toward the release bearing coupler, as far as it will go.

4. Using two spanner wrenches, place one on the notches of the release bearing coupler and the other on the release bearing locknut. Use the first wrench to prevent the coupler from rotating while using the second wrench to tighten the locknut against the coupler as a jamnut. Final tightening can be done by placing the two wrenches in notches that will result in the two wrench handles diverging slightly from one another. Then both handles can be grasped with one hand and squeezed snugly together (Fig. 11-3).

5. **Recheck the release bearing to transmission gap to be sure it is to specification.** If not, loosen the locknut and repeat this procedure.

6. After setting the specified gap at the rear of the release bearing, a 1/8-inch gap between the release yoke tips and release bearing contact wear pads should automatically result. If it does not, adjust truck's clutch release linkage to get the 1/8-inch gap (Fig. 11-5). Refer to vehicle manufacturer's specific chassis service manual for linkage adjustment.

7. Once the release bearing travel gap and the free play (1/8-inch gap) have been verified as correct, make sure the locknut and the external linkage adjustment (if adjusted) is tight and secure.

8. Verify the clutch adjustment by checking clutch function in the three travel regions. (Refer to Release System Final Functional Check Section 11, Page 11-6.)

   - Region A. Clutch pedal free play
   - Region B. Release stroke
   - Region C. Clutch brake squeeze

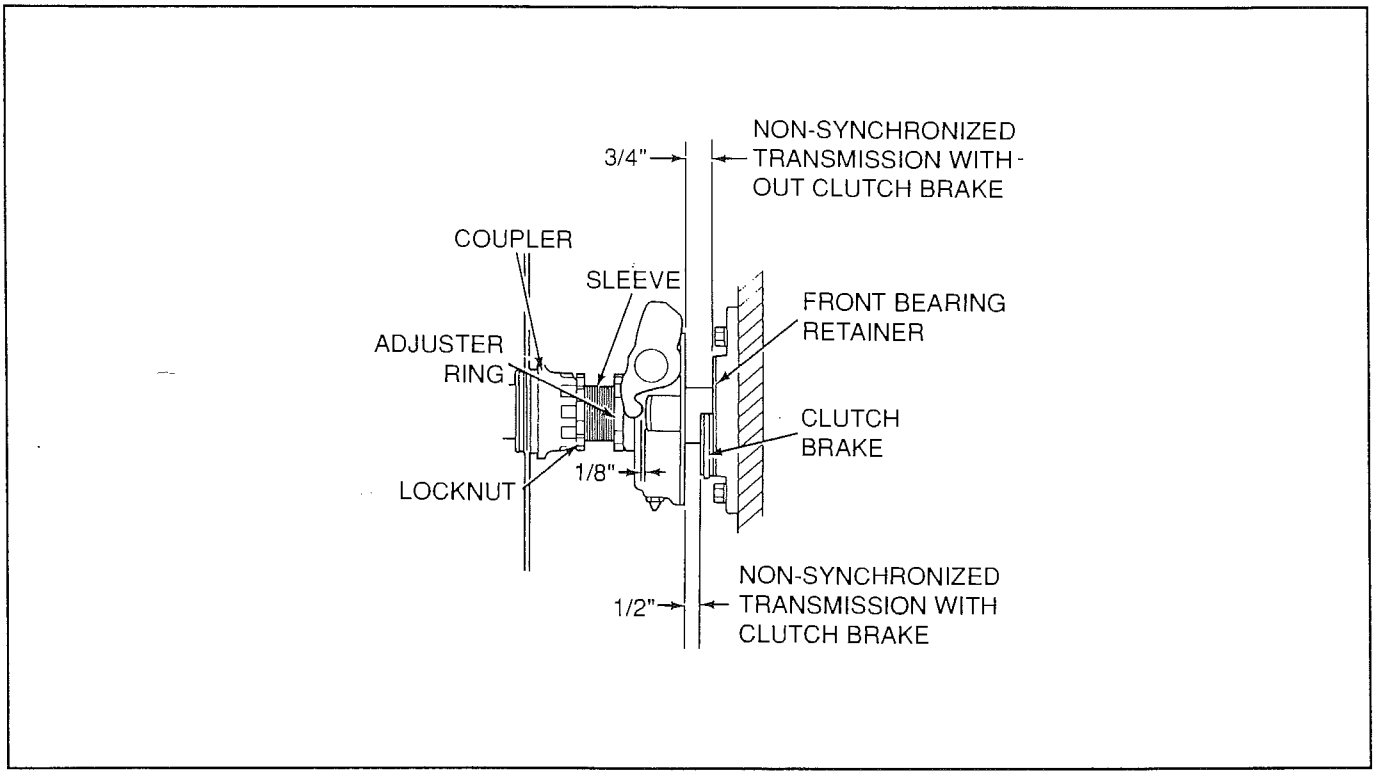


Figure 11-11. Release Bearing Travel Gap on Non-Synchronized Transmissions

CLUTCH MAINTENANCE – HYDRAULIC RELEASE SYSTEMS WITHOUT FREE PLAY

Some vehicles are equipped with a hydraulic release system that automatically compensates for clutch wear. These systems operate without free play and the release yoke fingers continuously contact the release bearing with a certain contact force (preload). The clutch is specifically engineered to compensate for this contact load. Initial adjustment and periodic maintenance differ on these systems depending on O.E.M. design. Some systems will require no adjustment, others will require minimal adjustment. Refer to the specific O.E.M. chassis service manual for correct release system maintenance and repair.

As a general rule, the release system must be capable of moving the release bearing 1/2-inch. If not, check the hydraulic system for fluid level and possible leaks.

Whenever a vehicle with a hydraulic release system without free play (self adjusting) demands constant and frequent clutch adjustments to avoid slippage, the release system is defective and needs correction to avoid severe clutch damage. If this condition is suspected, perform the following simple diagnostic check.

With the clutch pedal fully "up", push on the external clutch release lever at the clutch housing in a direction that will push the slave cylinder piston deeper into its bore. If the piston cannot be moved, the release system is not functioning correctly and vehicle operation will cause severe clutch damage. See O.E.M. vehicle specifications for corrective action. If no information is available, contact Valeo for a free copy of our trouble shooting guide for hydraulic clutch release systems.

Section 12 CLUTCH TESTING AND BREAK-IN

TEST DRIVE

Proper testing and break-in are critical to optimum performance and long clutch life. Clutch break-in must be performed under controlled circumstances. Also, checking for a correct installation through a test drive and break-in assures proper operation and results in a satisfied customer.

On new clutch installations, a short vehicle test drive should be completed to break in or seat the new friction material to the flywheel and pressure plate surfaces. During the test drive it is possible that the clutch could slip until the friction surfaces are seated in. Often, slippage indicates that the clutch or flywheel is contaminated with grease or oil and the break-in process is actually burning off this material. Limited slippage benefits the break-in process by allowing the friction surfaces to wear slightly, allowing the clutch to seat.

NOTE

If excessive slippage occurs and is allowed to continue, clutch temperatures will quickly rise and cause more slippage. If this happens, the vehicle should be allowed to stand for 30 to 60 minutes so that the clutch can cool down. Usually, normal operation (without slippage) will resume after cool down.

CAUTION

Sustained slippage of the clutch can damage the clutch friction material.