

GROUP 4

CLUTCH, S-M TRANSMISSION, UNIVERSAL JOINT

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SECTION 4-A

CLUTCH

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4-1 CLUTCH SPECIFICATIONS

a. Tightening Specifications

Part	Location	Thread Size	Torque Ft.-Lbs.
Bolt	Clutch Release Lever Yoke to Clutch Cover.....	$\frac{5}{16}$ —24	20-25
Bolt	Clutch Pedal to Pedal Pivot Shaft.....	$\frac{5}{16}$ —18	10-15
Bolt	Equalizer Bracket to Flywheel Housing.....	$\frac{3}{8}$ —18	15-20
Bolt	Clutch Cover to Flywheel.....	$\frac{5}{16}$ —18	20-25
Bolt & Nut	Over Center Spring Bracket to Frame.....	$\frac{3}{8}$ —24	25-35
Screw	Clutch Equalizer Bracket to Frame.....	$\frac{3}{8}$ —16	15-20
Nut	Clutch Idler Lever Bracket to Dash.....	$\frac{3}{8}$ —24	25-35
Nut	Clutch Pedal Mounting Bracket to Dash.....	$\frac{3}{8}$ —24	25-35
Bolt	Clutch Equalizer Bracket to Flywheel Housing.....	$\frac{7}{16}$ —14	55-60
Stud	Clutch Release Yoke Ball.....	$\frac{1}{2}$ —20	30-35

b. Clutch Specifications

Clutch Type.....	Single Plate-Dry Disc
Clutch Pedal Pressure (Production).....	28 Lbs.
Clutch Pedal Pressure (Heavy Duty).....	33 Lbs.
Clutch Pedal Lash.....	1 $\frac{1}{8}$ " to 1 $\frac{1}{4}$ "
Driven Plate Diameter.....	11"
Driven Plate Facings—	
Type and Number.....	Woven, 2
Attachment to Plate.....	Rivets
Facing Thickness.....	.125" \pm .002"
Total Effective Area (sq. in.).....	113
Max. Allowable Run-out at Rear Face of Plate.....	.025"
Clutch Springs—	
Type and Number.....	Coil, 9
Total Pressure (lbs.).....	1845
Spring Pressure (lbs.) @ Length.....	200-210 @ 1 $\frac{3}{4}$ "
Free Length.....	Approx. 2 $\frac{1}{2}$ "
Press. Plate Driving Lug Clearance in Cover.....	.005"—.008"
Height, Inner Ends of Release Levers to Flywheel.....	2 $\frac{1}{16}$ "
Max. Allowable Variation.....	.031"

4-2 DESCRIPTION OF CLUTCH

A single plate, dry disc clutch is used in cars equipped with synchromesh transmissions. The clutch is of conventional design with coil type clutch springs and three release levers. The

release levers are adjustable. A kit consisting of release lever and yoke assemblies, release lever pins, and pressure springs is available for converting a production pressure plate and cover assembly to a heavy duty pressure plate and cover assembly.

a. Clutch Assembly

The clutch cover is bolted to the flywheel and three lugs on the pressure plate engage slots in the cover to transmit torque to the plate. Nine clutch springs are located between the cover and the pressure plate. The three clutch release levers are located so that their inner ends are in position to be engaged by the clutch release bearing. The levers pivot on fulcrums bolted to the clutch cover and on bearings in the three pressure plate lugs. See figure 4-1.

The outer ends of the release levers are weighted so that at higher engine speeds where slipping is liable to occur, centrifugal force causes more pressure to be applied on the pressure plate. The faster the clutch revolves, the greater the pressure exerted against the clutch plate, thereby increasing the torque transmitting ability of the clutch. This additional pressure allows the use of a clutch which requires lower foot pressure at the pedal for normal clutch operation.

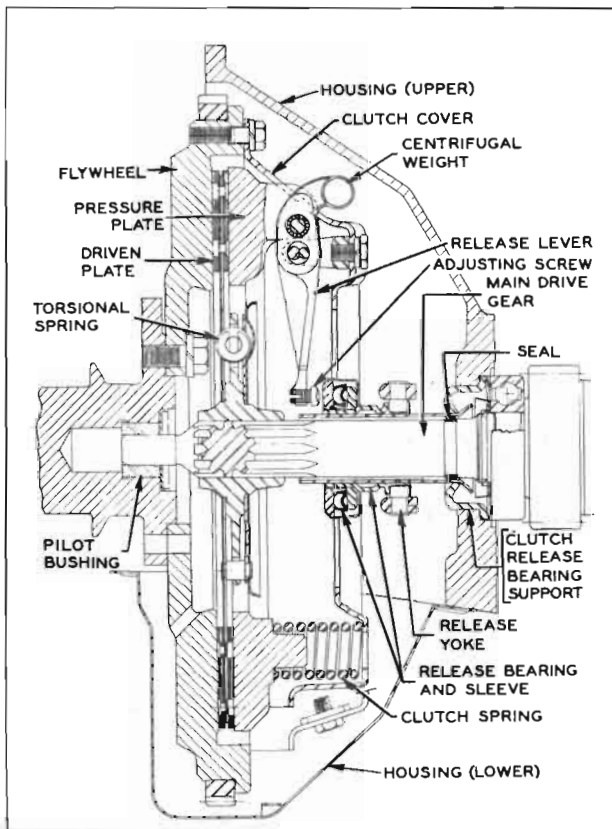


Figure 4-1—Clutch and Flywheel Assembly

When the clutch is in the engaged position, the release levers are clear of the release bearing and the clutch springs cause the pressure plate to clamp the driven plate against the fly-

wheel with sufficient force to transmit power of the engine without slippage. The power drive is from flywheel to clutch cover, cover to pressure plate, and from pressure plate and flywheel to driven plate.

When the clutch is disengaged, the clutch release bearing presses forward on the inner ends of the release levers which pivot and force the pressure plate rearward against the pressure of clutch springs. The pressure plate is moved rearward far enough to free the driven plate. See figure 4-1.

b. Clutch Driven Plate

The clutch driven plate assembly is mounted with a free sliding fit on the transmission main drive gear and is keyed to the gear by ten splines. The front end of the main drive gear is piloted by a bushing pressed into a recess on rear end of engine crankshaft. See figure 4-1.

The outer area of the driven plate is divided into segments which are formed in low waves to provide springs between the plate facings and thereby cushion engagement of the clutch. A woven facing, grooved to give quick release, is riveted to each side of every segment of plate. When the clutch is fully released, the waved segments cause the facings to spread approximately $.050''$ and the movement of pressure plate provides an additional clearance of approximately $.030''$ to assure full release of driven plate. See figure 4-2.

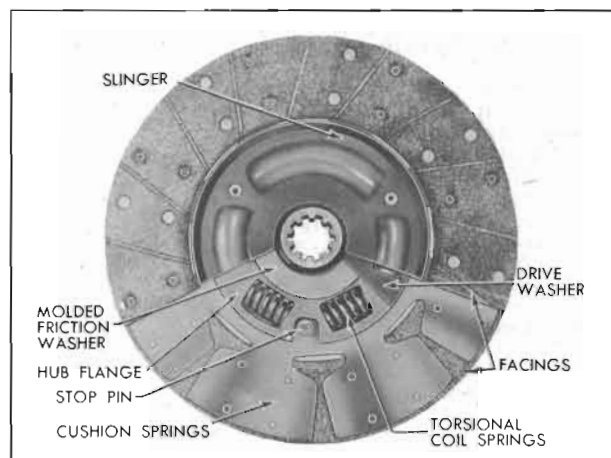


Figure 4-2—Driven Plate—Transmission Side

The driven plate assembly is designed to prevent torsional periods of the engine from being transmitted to the transmission gears and causing rattle. This is accomplished by driving the plate hub through torsional coil springs and

providing frictional dampening by means of molded friction washers.

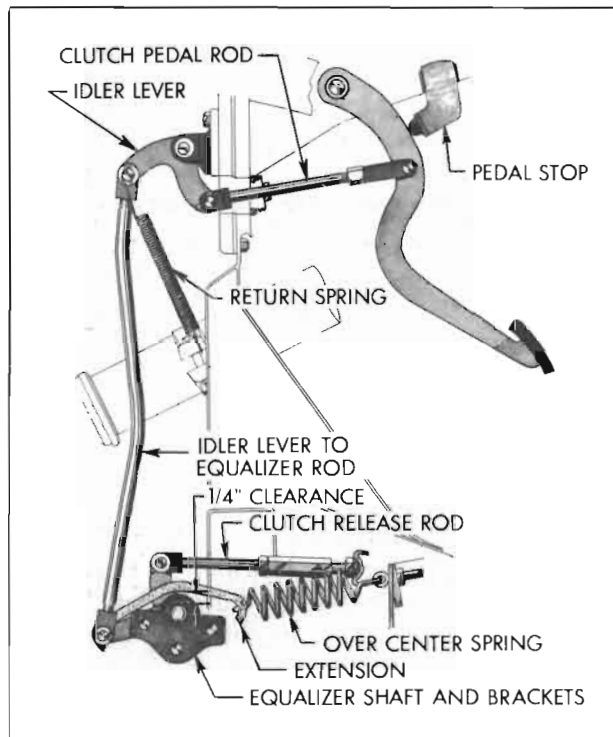


Figure 4-3—Clutch Linkage

c. Clutch Linkage

The clutch pedal is of the suspended type and pivots on a shaft which extends through brackets bolted to the cowl. This shaft is also used to suspend the standard brake pedal. (Power brakes are not available on a synchro-mesh car.) The clutch pedal returns against a non-adjustable pedal stop under the instrument panel. See Figure 4-3.

An adjustable pedal rod and clevis extends through the cowl to connect the pedal to an idler lever which pivots in a bracket bolted on the forward side of the cowl. An idler lever to equalizer rod extends downward to the clutch release equalizer. The equalizer pivots between the engine at one end and the frame at the other. The clutch release rod and adjusting nut extends from the equalizer to the clutch release yoke. See Figure 4-4.

A light pedal return spring extends from the idler lever to the mast jacket bracket. A heavy over center spring and extension is stretched from an eye bolt at the frame to a pin at the equalizer.

The release rod has an adjustable nut. The yoke is held on a ball stud by a U-shaped spring riveted to the yoke. A boot around the yoke pro-

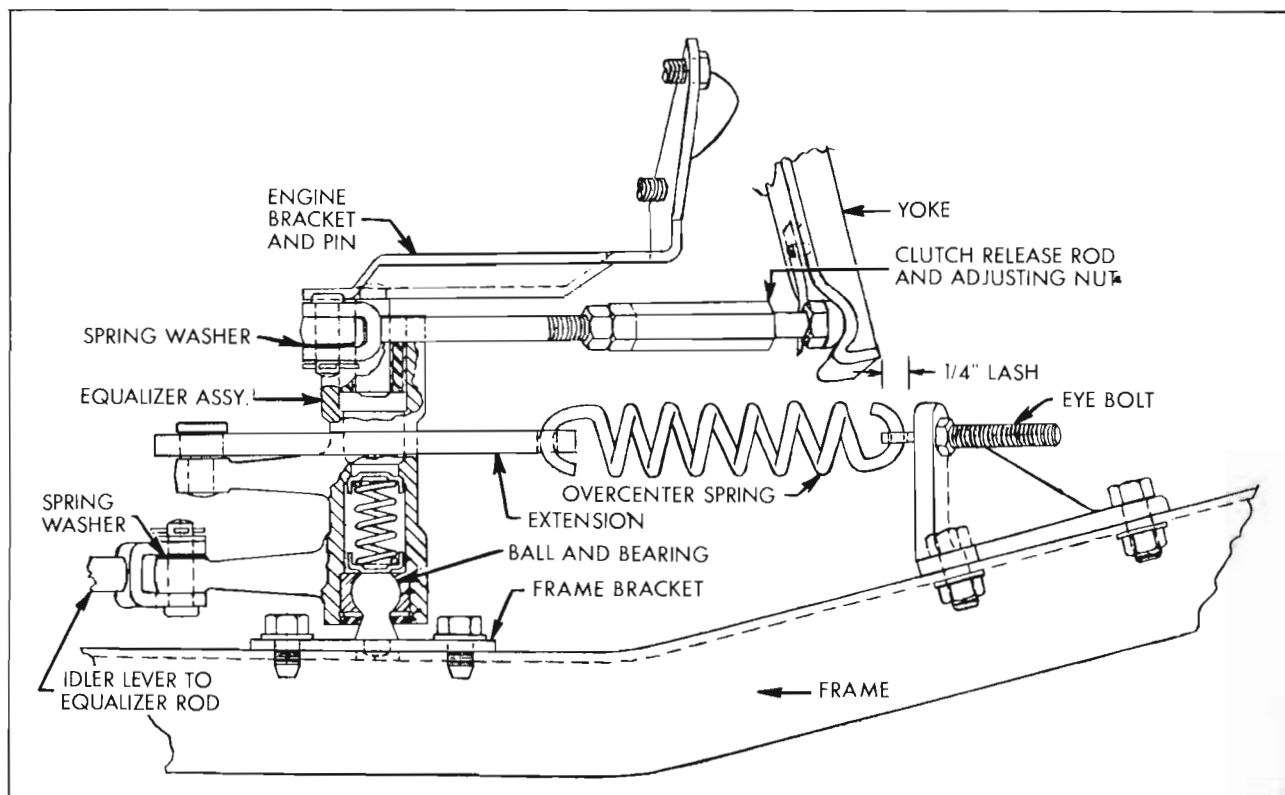


Figure 4-4—Clutch Release Equalizer

vides a flexible closure for the yoke opening in the flywheel housing. The inner end of the yoke is in position to push forward on the release bearing when the clutch pedal is depressed. A U-shaped spring riveted to the release bearing holds the bearing in contact with the yoke. The release rod length must be adjusted to provide clearance between the release bearing and the clutch release levers (par. 4-4).

The release bearing and sleeve assembly is mounted on a bearing support which encircles the transmission main drive gear. The bearing is filled with lifetime lubricant in production and no further lubrication is required. The bearing support is flared at the rear end to seat in the flywheel housing and is held in place by a spring washer and the outer race of the transmission main drive gear bearing. See Figure 4-1.

4-3 CLUTCH TROUBLE DIAGNOSIS

a. Excessive Pedal Pressure

The pressure required to depress clutch pedal to toe board should not exceed 28 pounds. If pedal pressure is excessive, make certain that pedal rod is not binding where it passes through the cowl. Thoroughly lubricate release equalizer with chassis lubricant. Lubricate all linkage pins with engine oil.

If excessive pedal pressure still exists after release linkage is properly lubricated, lubricate internal working parts of clutch as described in paragraph 4-4.

b. Clutch Noise

Squeaking and grinding noises during clutch pedal operation are usually caused by heavy friction in the release linkage or internal parts of clutch assembly. Before condemning the release bearing, thoroughly lubricate release equalizer and, if necessary, lubricate internal working parts of clutch as described in paragraph 4-4.

c. Clutch Grab or Chatter

A very slight amount of oil on driven plate facings will cause clutch grab and chatter. A new driven plate must be installed if original plate facings contain oil since removal of oil from facings is not practical.

When oil is found on facings, examine pilot bushing, transmission drainback, rear engine bearing, and oil leaks which might drain back

into clutch housing between upper and lower flywheel housings.

Improper variation in height of release levers will cause clutch chatter. See paragraph 4-5(b). To correct this condition, the clutch assembly must be removed and the release lever height adjusted using the procedure in paragraph 4-5 (c).

d. Clutch Drag or Failure to Release

To test for clutch drag or failure to release, depress clutch pedal to toeboard with engine running and shift transmission into low gear. Hold pedal depressed and shift transmission to neutral, wait about 15 seconds with pedal depressed and again shift into low gear. If clutch is not releasing completely a gear clash will occur.

If test shows that clutch is not releasing properly, check clutch pedal lash (par. 4-4) and check release linkage for lost motion. Correct as necessary and again test for clutch drag.

If clutch drag cannot be corrected in release linkage, remove clutch and check height of release levers. Check driven plate for oil soaked or cracked facings, also for run-out and free movement on main drive gear (par. 4-6).

e. Clutch Slipping

First make certain that clutch pedal is adjusted for specified lash ($1\frac{1}{8}$ " to $1\frac{1}{4}$ ") and that pedal is not binding. One type of clutch slippage is sometimes wrongly diagnosed as due to weak clutch springs. This slippage occurs during gear shifting and full engagement of the clutch is not obtainable until the engine speed is reduced. After full engagement is obtained no further slippage occurs during acceleration or under full load. This condition is usually due to the clutch driven plate hub sticking on the splines of the transmission main drive gear. Correction can be made by removing the clutch and thoroughly cleaning splines of driven plate and main drive gear then applying a light coating of Lubriplate. Make sure that release lever pins are not binding, and that pressure plate driving lugs are not binding in clutch cover.

4-4 CLUTCH ADJUSTMENT AND LUBRICATION

a. Over Center Adjustment

The over center position of the equalizer, once properly adjusted, will remain in adjustment for

a considerable time unless the clutch linkage is disturbed. However, the over center adjustment should be given a quick check each time any clutch service is necessary.

The over center adjustment is important because when the equalizer position is properly adjusted, the over center spring helps hold the clutch pedal against its stop. As soon as the pedal is partially depressed, however, the equalizer passes over center and the over center spring helps depress the pedal. This results in a lower pedal pressure. See Figure 4-3.

Check over center adjustment as follows:

1. Make sure clutch pedal returns fully against pedal stop.
2. Raise car and measure clearance between over center spring extension and clutch equalizer using a piece of $\frac{1}{4}$ " drill rod or other suitable $\frac{1}{4}$ " thick spacer.
3. If clearance is not approximately $\frac{1}{4}$ ", the adjustment must be made.

Make over center adjustment as follows:

1. With car raised, back-off clutch release rod jam nut and adjusting nut approximately $\frac{3}{4}$ ". This is to make slack in the linkage so that the pedal rod clevis can be rotated in step 5.
2. Place $\frac{1}{4}$ " spacer between over center spring extension and equalizer.
3. Lower car and back-off pedal rod lock nut under instrument panel.
4. Remove clevis pin which fastens clutch pedal to pedal rod clevis. This allows the equalizer to rotate slightly to its correct position with the over center spring extension against the $\frac{1}{4}$ " spacer.
5. Rotate pedal rod clevis as necessary for clevis pin to slip in freely with both clutch pedal and clevis pulled to the rear. See Figure 4-3.

NOTE: Before clevis will rotate, pedal rod and clevis pin must be pushed forward, taking up slack in linkage.

6. Install clevis pin with spring washer, plain washer, and new cotter pin. Tighten pedal rod lock nut.

7. Raise car and remove $\frac{1}{4}$ " spacer.

8. Adjust pedal lash as described in subparagraph b.

b. Pedal Lash Adjustment

Pedal lash (free pedal) must be adjusted occasionally to compensate for normal wear of clutch facings. As the driven plate wears thinner, pedal lash decreases.

It is very important to maintain pedal lash at all times. Insufficient pedal lash will cause the

release bearing to ride against the release levers all of the time, resulting in abnormal wear of these parts. It may also cause clutch slippage and abnormal wear of the driven plate, flywheel, and pressure plate if pressure on the release levers is enough to prevent positive engagement of the clutch. See Figure 4-4.

Check pedal lash (free pedal) by pushing on the pedal pad with the hand. *Do not mistake the tension due to the pedal return spring as an indication of lack of pedal lash.* Pedal lash should be $\frac{1}{8}$ " to $1\frac{1}{4}$ " measured at the pedal pad.

Adjust pedal lash as follows:

1. Make certain that return spring pulls clutch pedal firmly against pedal bumper when pedal is released. If pedal does not contact bumper, check pedal and linkage for binding or lack of lubrication. Check condition of pedal return spring. Check condition of equalizer over center spring and make sure that spring eye bolt is fully tightened. See Figure 4-4.

2. With car raised, check over center adjustment as described in subparagraph a. above. Clutch equalizer must be in proper position before pedal lash is adjusted. See Figure 4-3.

3. Loosen adjusting nut jam nut on clutch release rod.

4. Turn adjusting nut so that when equalizer is rocked over center by hand total free movement at outer end of clutch release yoke is $\frac{1}{4}$ ". See Figure 4-3. This should give correct lash at the pedal. Tighten adjusting nut jam nut.

5. Lower car. Check to make sure pedal lash is between $1\frac{1}{8}$ " and $1\frac{1}{4}$ ".

c. Lubrication of Clutch Internal Parts

Lubrication of clutch release equalizer and linkage is included in Lubricare every 1000 miles (par. 1-1). Lubrication of clutch internal working parts is usually required only at time clutch is assembled and installed; however, if lubrication becomes necessary to eliminate squeaks or excessive pedal pressure, proceed as follows:

1. Remove flywheel lower housing.

2. Disconnect release rod from yoke, unhook boot from opening in flywheel upper housing, and pull yoke outward to disengage it from ball stud. See figure 4-5.

3. Apply Lubriplate or Delco Brake Lubricant to ball stud and ball seat in yoke, then connect yoke to ball stud. Hook boot to opening in flywheel housing and connect release rod to yoke.

4. Examine clutch release bearing and sleeve assembly to see whether it is binding on release bearing support due to improper installation. Lubricate any contact point between bearing sleeve and support by brushing with Lubriplate or Delco Brake Lubricant.

5. Brush lubricant on pressure plate driving lugs where they contact cover. Work clutch pedal a number of times to work lubricant into contact points.

Rotate flywheel until each release lever in turn is in lowest position, then very sparingly oil the release lever fulcrums and sides of release levers. Allow time for any surplus oil to drain off before turning flywheel, to avoid getting oil on driven plate facings. Release lever fulcrums also may be lubricated by spraying with powdered graphite, which will not damage driven plate facings. This may not afford immediate relief but if clutch is operated while engine is running, after installation of flywheel lower housing, the graphite will work into the bearing surfaces.

6. Install flywheel lower housing.

4-5 REMOVAL AND INSTALLATION OF CLUTCH

a. Removal of Clutch

1. Remove rear axle assembly (par. 6-4) and transmission (par. 4-13). Remove flywheel lower housing.

2. Disconnect release rod from release yoke and remove yoke boot. See figure 4-5.

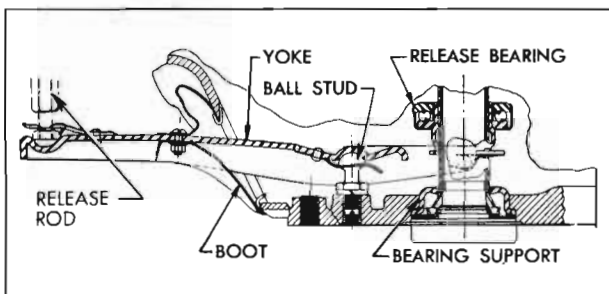


Figure 4-5—Clutch Release Yoke and Boot

3. Remove spring washer which retains release bearing support in flywheel housing and remove support and gasket.

4. Pull outward on release yoke to free it from the ball stud in flywheel housing and remove yoke and release bearing through bottom of housing. Separate yoke from bearing.

5. Mark the clutch cover and the flywheel with a center punch so that cover can be rein-

stalled in the same position on flywheel in order to preserve engine balance.

6. Loosen each clutch cover bolt a turn at a time in order to relieve clutch spring pressure evenly and thereby avoid distortion of the cover. Metal spacers (such as 1/4" nuts) placed between release levers and inner edge of clutch cover will aid removal and later reinstallation by holding clutch springs partially compressed.

7. Support pressure plate and cover assembly while removing last bolts, then remove the cover assembly and driven plate.

b. Checking Release Lever Height

Correct release lever height is essential to insure complete release of the clutch and also to allow smooth, positive engagement of the clutch. Before reinstalling a clutch pressure plate and cover assembly, release lever height should be checked as follows:

1. Mount clutch assembly for checking by placing Adjusting Gauge J-1036 on a spare flywheel and then placing clutch assembly over gauge so that release levers are directly above machined bosses of gauge. See Figure 4-6.

NOTE: Thickness of gauge at machined bosses is .295"; height of gauge at hub is 2-1/16".

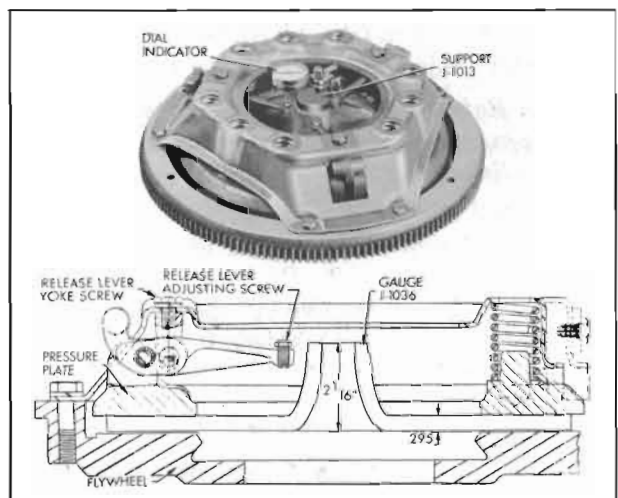


Figure 4-6—Checking Release Lever Height

2. Install cover bolts and tighten each a turn at a time until all are uniformly tight.

3. Zero dial indicator by mounting dial indicator on Support J-1013. See Figure 4-6. Then set support on flat surface, press indicator down against surface until indicator hand turns approximately one revolution, and tighten indicator to support. Now set indicator face to zero.

4. To measure release lever height, carefully place support and indicator on hub of gauge so that indicator stem bears on inner end of each release lever in turn. Indicator hand must turn one revolution and then read within plus or minus .031". Also, all three levers must read within .031" of each other.

5. If release lever heights are not within these specifications, adjust levers as described in subparagraph below.

c. Adjusting Release Lever Height

When any release lever height varies over .031" from the height of the gauge hub, or when the highest and lowest release lever are not within .031" of each other, release lever height must be adjusted.

1. Check tightness of three release lever yoke bolts by tightening to 25 foot pounds.

2. Check release lever height as described in subparagraph above. If any one lever is not within specifications, it is recommended that all three levers be adjusted.

3. Turn each adjusting screw up or down as required to give a dial indicator reading of zero. (Any free movement or "play" should be removed by holding lever downward.)

4. Remove clutch assembly from spare flywheel by loosening cover bolts a turn at a time until metal spacers are pinched between clutch levers and inner edge of clutch cover. A string or wire fastened to each spacer will keep it from dropping inside the clutch assembly during installation on the car.

5. Turn clutch assembly over so that pressure plate side is up and adjusting screw buttons are contacting a solid surface.

6. Stake each adjusting screw to release lever by peening release lever material into adjusting screw slot at both sides. A blunt screwdriver which nearly fills the slot may be used.

d. Installation of Clutch

1. Very sparingly apply front wheel bearing lubricant to main drive gear pilot bushing in crankshaft. If too much lubricant is used it will run out on face of flywheel when hot and ruin

driven plate facings. Make sure that surface of flywheel is clean and dry.

2. Make sure that splines in driven plate hub are clean and apply a light coating of Lubriplate. Driven plate facings must be clean and dry.

3. Place driven plate on pressure plate with oil slinger toward pressure plate, then place clutch assembly in position against flywheel, *being sure to align marks made on flywheel and cover before removal*. Install cover bolts with lockwashers but do not tighten bolts.

4. Insert a spare main drive gear through hub of driven plate and into the pilot bushing. Tighten each clutch cover bolt one turn at a time to draw cover down evenly and avoid distortion of cover. While tightening cover bolts, move main drive gear from side to side to center driven plate with pilot bushing. If plate is not properly centered it will be difficult to slide transmission into place. Make sure all cover bolts are uniformly tightened to 25 ft. lbs.

5. Remove spacers from between cover and release levers.

6. Fill groove in release bearing sleeve with wheel bearing lubricant. Coat release yoke ball stud and ball recess in release yoke with Lubriplate or Delco Brake Lubricant. Attach release bearing to release yoke and attach yoke to ball stud in flywheel housing.

7. Install release bearing support with a new gasket, placing support in flywheel housing with the tab on support aligned with molded recess in housing to permit positive drain back of oil to transmission. Install spring washer with outer edge against bearing support.

8. Install transmission (par. 4-13), being careful to avoid damage to clutch driven plate which would result if weight of transmission is allowed to rest on main drive gear in driven plate hub.

9. Install boot and release rod nut lock on yoke (fig. 4-5), attach release rod to yoke, then adjust for clutch pedal lash of 1½" to 1¼" (par. 4-4).

10. Install flywheel lower housing, making sure that gasket is in condition to insure a tight seal. Install rear axle assembly (par. 6-4).

11. Road test car for clutch performance. *Under no circumstance should the clutch be harshly used immediately after installation of a new driven plate, flywheel, or pressure plate.* Sudden engagement of clutch with engine run-

ning at abnormal speed, or continual slipping of clutch, may permanently injure driven plate facings and may cause scoring of flywheel and pressure plate. *When these parts are new they must be given moderate use for several days until nicely burnished. Be sure that car owner is advised of this requirement.*

4-6 INSPECTION OF CLUTCH

Wash all metal parts of clutch, except release bearing and driven plate, in suitable cleaning solution to remove dirt and grease. Soaking release bearing in cleaning solution would permit solution to seep into bearing and destroy the lubricant. Soaking driven plate in cleaning solution would damage the facings.

1. *Flywheel and Pressure Plate.* Examine friction surfaces of flywheel and pressure plate for scoring or roughness. Slight roughness may be smoothed with fine emery cloth, but if surface is deeply scored or grooved the part should be replaced.

2. *Clutch Cover.* Inspect clutch cover for cracks or distortion. Check clearance between pressure plate driving lugs and edges of slots in cover, using feeler gauges. The clearance should be .005" to .008"; excessive clearance may cause rattle when engine is intermittently accelerated with clutch disengaged.

3. *Clutch Driven Plate.* Inspect driven plate for condition of facings, loose rivets, broken or very loose torsional springs, and flattened cushion springs. See figure 4-2.

If facings are worn down near rivets or are oily, the plate assembly should be replaced. A very slight amount of oil on clutch facings will cause clutch grab and chatter. A large amount of oil on facings will cause slippage or drag. Removal of oil by solvents or by buffing is not practical since oil will continue to bleed from facing material when hot.

When oil is found on driven plate facings, examine transmission drainback hole, pilot bush-

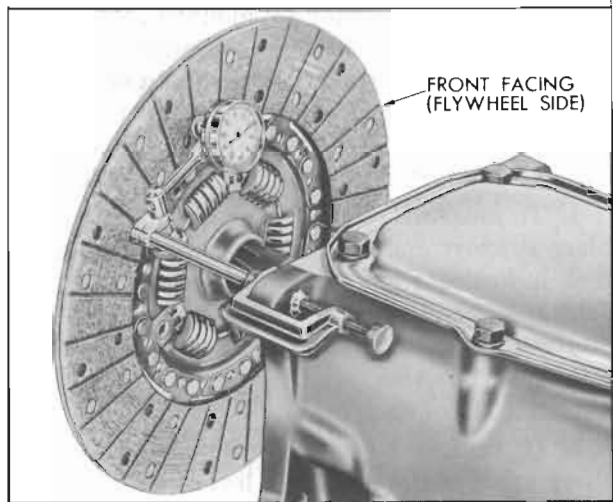


Figure 4-7—Checking Driven Plate for Run-out

ing, engine rear main bearing and other points of oil leakage.

Test the fit of driven plate hub on transmission main drive gear; an easy sliding fit should exist. Regardless of whether the old plate or a new one is to be installed, the plate should be checked for run-out. This check can be made by sliding the driven plate, *front side first*, over the transmission main drive gear until it is tight on the spline, then setting up a dial indicator to bear against the plate facing as shown in figure 4-7. While holding firmly against front end of main drive gear to take up play in main drive gear bearing, slowly rotate driven plate and observe the amount of run-out shown by indicator. If run-out of front facing exceeds .025" the plate should not be used since it is not practical to correct excessive run-out by bending.

4. *Bearings.* Inspect clutch release bearing for scoring or excessive wear on front contact face. Test for roughness of balls and races by pressing and turning front race slowly. Inspect main drive gear pilot bushing in crankshaft. If bushing is rough or worn it should be replaced, using Puller J-4383 for removal.