

**GROUP 6**

**CLUTCH**

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**DATA AND SPECIFICATIONS**

Models	SC-1, SC-2	C-300H
TRANSMISSION.....	Standard 3 Speed Transmission	
CLUTCH		
Make.....	Borg & Beck	Borg & Beck
Model.....	1506	1579
CLUTCH DISC		
Facing Type.....	Moulded Woven Asbestos	
Outside Diameter.....	10½"	11"
Thickness.....	.125"	.125"
Disc Springs (number).....	10	10
Disc Spring Color.....	5 Green 5 Tan	5 Green 5 Tan
CLUTCH COVER		
Pressure Springs (number).....	9	12
Spring Color.....	6 No Color 3 White	6 White 6 Orange
Spring Pressure (lbs.).....	189 ea. 201 ea.	233 ea. 162 ea.
Total Spring Pressure (lbs. @ 1½").....	1920	2490
Number of Levers.....	3	3
Height from Face of Flywheel.....	2"	2"
Lever Setting Gauge Number.....	20	19
Pedal Free Play (at clutch fork).....	⅝"	⅝"

**TORQUE TIGHTENING**

	Foot-Pounds
Clutch housing to engine bolts .....	30
Clutch cover to flywheel bolts ( $\frac{3}{8}$ " (C-300H) .....	30
Clutch pan bolts .....	100 Inch-Pounds
Clutch fork pivot bolts .....	15
Flywheel bolt nut .....	60
Transmission to clutch housing bolts .....	50
Torque shaft pivot (engine side) .....	40
Torque shaft pivot bracket bolts (frame side) .....	15

**GROUP 6**

**CLUTCH**

The semi-centrifugal clutch combines the feature of low pedal effort with that of a clutch capable of transmitting the full torque of the engine.

Six cylindrical rollers, located in the pressure plate, are free to move outward under centrifugal

force until they contact the cover, as shown in Figure 1. As engine speed increases the rollers act as wedges between the cover and the pressure plate. The faster the clutch revolves, the greater the pressure on the plate. The greater pressure increases the normal load on the disc assembly.

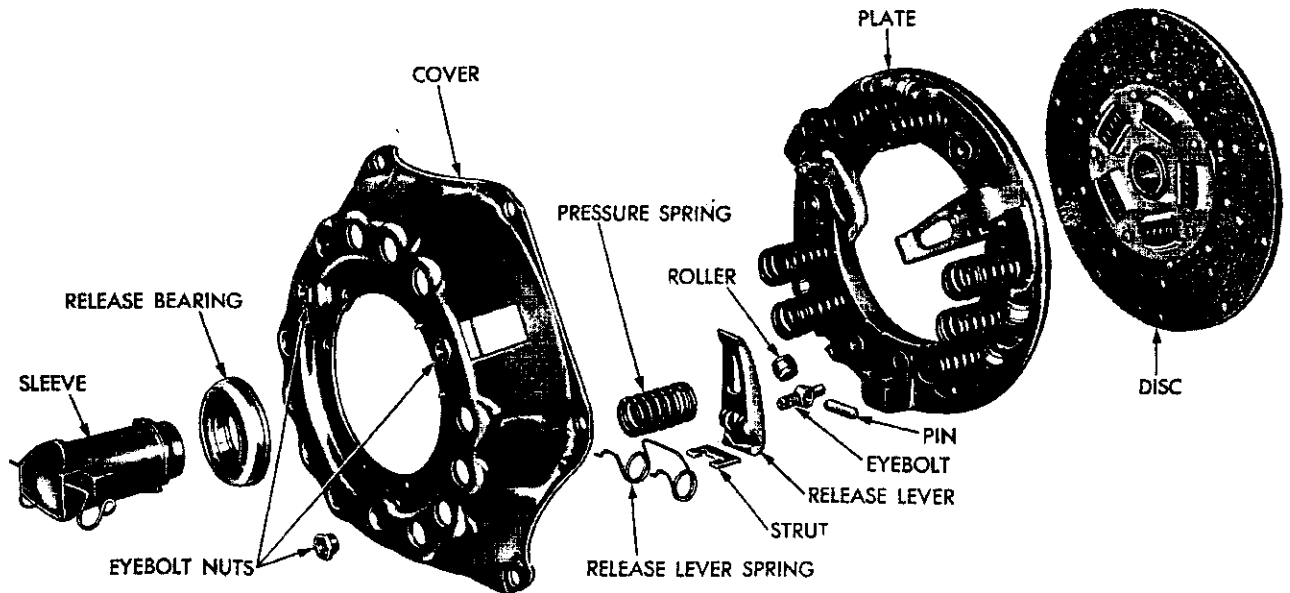


Fig. 1—Semi-Centrifugal Clutch (Disassembled View)

## SERVICE PROCEDURES

## CLUTCH ADJUSTMENT IN THE VEHICLE

The only adjustment required while the clutch is in the vehicle, is linkage adjustment to obtain the correct amount of clutch pedal free play. The clutch pedal free play is the movement of the pedal required to close the clearance between the throwout bearing and the clutch fingers. The linkage adjustment is required to restore the pedal free play when it has been reduced by the normal wear of the clutch.

## CLUTCH PEDAL FREE PLAY

Shorten or lengthen the clutch release fork rod by turning the adjusting nut until there is  $\frac{5}{32}$  inch free movement of the clutch fork outer end (Fig. 2). This adjustment if correctly set, will give the necessary 1 (one) inch free play at the pedal.

## CLUTCH—REMOVAL

- (1) Remove the transmission. See "Manual Transmission" Group 21 for detailed procedure.
- (2) Remove the clutch housing pan and the dust seal.
- (3) Disconnect the release fork rod at the release fork.
- (4) Remove the release fork pull-back spring.
- (5) Detach the release fork from its pivot and remove the fork, dust seal, sleeve and the bearing.
- (6) Mark the flywheel, the clutch cover and one pressure plate lug to maintain their same relative positions during reassembly and installation.
- (7) Loosen and back off the attaching bolts a turn or two at a time in rotation to avoid bending the flange of the cover. The disc facings should not be handled or placed in contact with grease, oil or dirt.

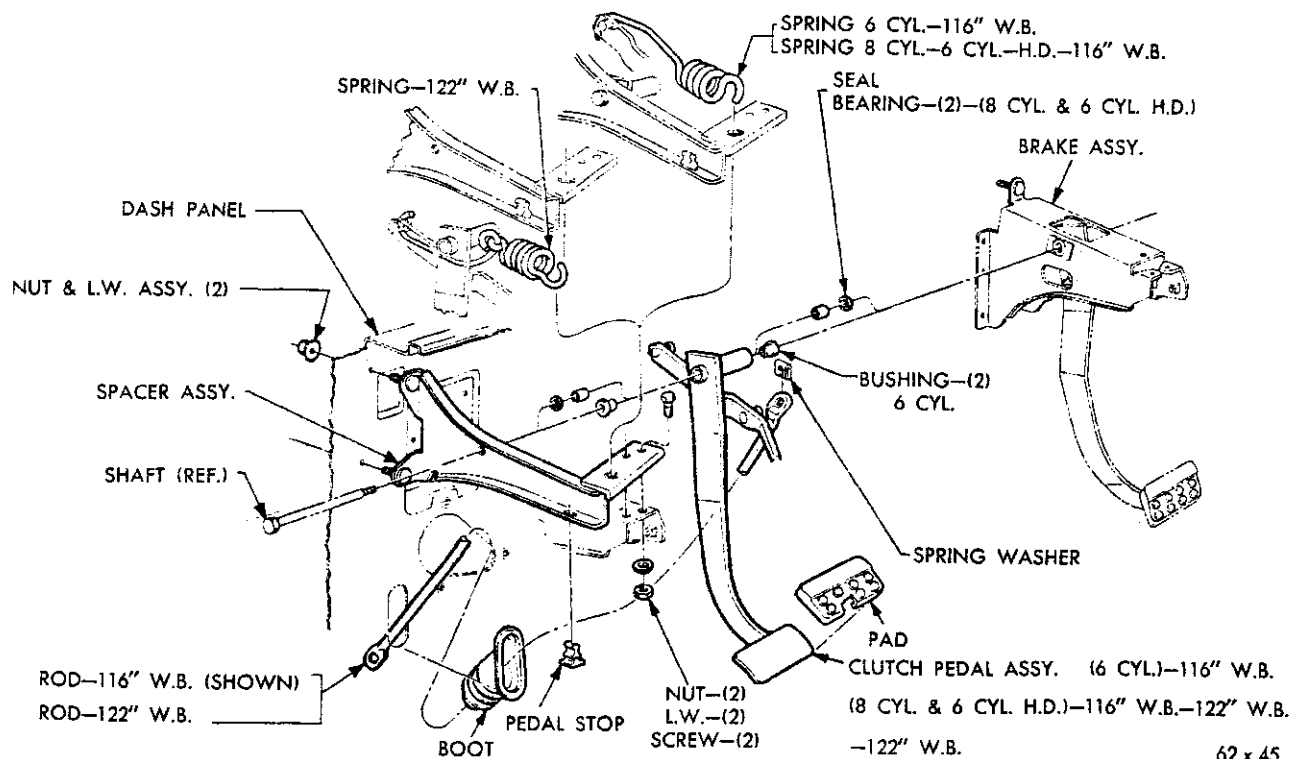


Fig. 2—Clutch Pedal Linkage (Disassembled View)

**COVER DISASSEMBLY**

(1) Place the cover assembly on the adjusting fixture, Tool C-585A.

(2) Place the three-legged spider over the center screw, so that the legs are located midway between the staked nuts. Install the thrust washer and compression nut. Tighten the nut until the cover contacts the base of the fixture. (Fig. 3).

(3) Remove the three eye-bolt nuts, then remove the compression nut, washer and spider.

(4) Remove the clutch cover, the springs and the rollers.

(5) To remove the levers (Fig. 4), grasp the eye-bolt between the thumb and index finger to hold it up against the lever while the other fingers raise the lever up. With the other hand, lift the strut over the ridge on the end of lever. Lift the lever and eye bolt off the pressure plate and remove the strut.

**CLEANING, INSPECTION AND TESTING**

(1) Use compressed air to clean the dust out of the clutch housing. Inspect for leakage through the engine rear main bearing oil seal. If leaking, it should be corrected at this time.

(2) The back face of the flywheel should have a uniform appearance throughout the entire clutch contact area. If there is evidence of heavy contact on one portion of the wear circle and a very light contact 180° from that portion, the flywheel may be improperly mounted or sprung. In such cases, a dial indicator, mounted on the clutch housing with the plunger in contact with the wear circle, should show no more than .003 inch runout throughout a complete rotation of the flywheel.

(3) The friction face of the flywheel should also

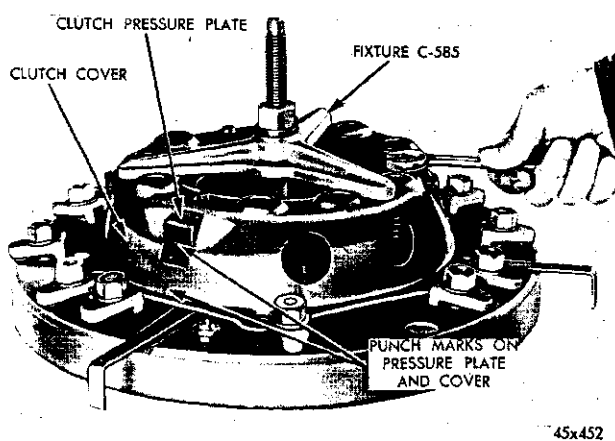


Fig. 3—Clutch Cover and Pressure Plate Assy. in Fixture

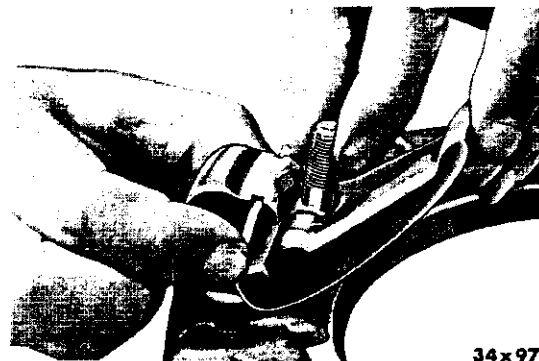


Fig. 4—Removing Release Lever

be free from discolored, burned areas, small cracks and excessive grooves or ridges.

(4) The bushing in the end of the crankshaft should be smooth and show no excessive wear. A new transmission main drive pinion or bushing driver and burnisher, Tool C-3181, can be used to gauge the size of the bushing. The tool should have a snug fit in the bushing. See Paragraph on "Pinion Pilot Bushing Replacement."

(5) The end of the transmission main drive pinion should be smooth and bright, without grooves and ridges.

(6) The disc assembly should be handled without touching the facings. Replace facings that show evidence of grease or oil soakage or that are worn to within less than  $\frac{1}{32}$  inch of the rivet heads. The hub splines and the splines on the transmission main drive pinion should be a snug fit without signs of excessive wear. The metallic portions of the assembly should be dry and clean and should show no evidence of having been hot. The coil springs should have sufficient tension to be tight in the hub. The coils should indicate that the springs have not been fully compressed in service. Each of the arched springs between the facings should be unbroken or cracked and all rivets should be tight.

(7) Clean all parts of the pressure plate and cover assembly in kerosene, mineral spirits or other similar solvents.

(8) Using the clutch fixture, Tool C-585, as a surface plate, try the cover for flatness. All the sections around the attaching bolt holes should be in contact with the surface plate within .015 inch.

The cover should be a snug fit on the pressure plate lugs, in the marked location.

The pressure plate friction area should be flat within .005 inch and should be free from discolored, burned areas, cracks, grooves or ridges.

(9) The eyebolts should be a snug but free fit in the pressure plate.

(10) The rollers and the lugs of the pressure plate should not show excessive wear. The three sections of each roller should be free on the pin and free to revolve independently.

(11) The inner ends of the release levers should have a uniform wear pattern. Levers which are rough or badly worn should be replaced.

(12) It is advisable to test pressure springs when the clutch is dismantled after considerable service or if there has been a great amount of slippage creating excessive heat, which may have caused the springs to lose their initial load. To test a spring, first determine the length at which the spring is to be tested. As an example, the compressed length of the spring to be tested is  $1\frac{5}{16}$  inch. Turn the table of Tool C-647 until surface is in line with the  $1\frac{5}{16}$  inch mark on the threaded stud and the zero mark to the front. Place spring over stud on table and lift compressing lever to set tone device. Pull on torque wrench tool C-3005 as shown in Figure 5, until ping is heard. Take reading on wrench at this instant. Multiply reading by two. This will give the spring load to the test length. Fractional measurements are indicated on table of finer adjustments. (Refer to Specifications and select model of clutch for spring pressure.) Discard springs that do not meet minimum requirement.

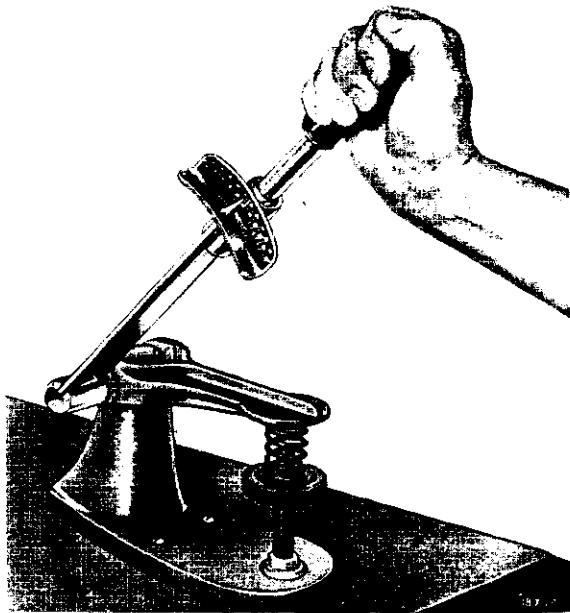


Fig. 5—Testing Clutch Pressure Springs

#### COVER—ASSEMBLY AND ADJUSTMENT

Whenever the clutch pedal is operated, a slight movement of internal clutch parts must take place. Normally, any moving parts should be lubricated, but in lubricating a dry disc type clutch, a **very minimum amount of lubricant must be used**. When the clutch pedal is depressed, the disc moves on the splines of the transmission main drive pinion shaft. The pressure plate also moves in the slots of the cover and on the eye bolts. The release levers contact the strut, the cross pin, the lever spring and the release bearing. The roller assemblies also require minimum lubrication. When it is advisable to lubricate these parts, a thin film of wheel bearing grease should be applied only to the contact area of the part at time of assembly.

(1) Assemble the eye bolt, cross pin and release lever. Hold the threaded end of the eye bolt between the thumb and index finger.

(2) With the other hand, hold the strut in the slot in the pressure plate lug (Fig. 4).

(3) Insert the eye bolt in the hole in the pressure plate and position the release lever under the strut so that the strut can be positioned in the groove in the lever.

(4) Install the other levers in the same manner.

(5) Place the pressure plate on the clutch fixture Tool C-585A with the levers over the fixture feeler blades.

(6) Place the pressure springs on the pressure plate in the following order: Painted (white) next to release spring levers followed by two unpainted springs. There is no spring in the fourth cavity.

(7) Place the rollers in position on the pressure plate.

(8) Place the cover over the rollers and springs, with the aligning mark on the cover over the marked lug of the pressure plate.

(9) Install the three-legged spider over the center screw with the legs contacting the cover midway between the eye bolt holes.

(10) Install the thrust washer and compression nut. While tightening the nut, guide the eye bolts through the cover and guide the cover over the pressure plate lugs. Also make certain that the rollers are free to move in their slots. Tighten the compression nut until the cover contacts the base of the fixture.

(11) Apply fixture clamps at each cover retainer bolt hole to hold the assembly to the fixture.

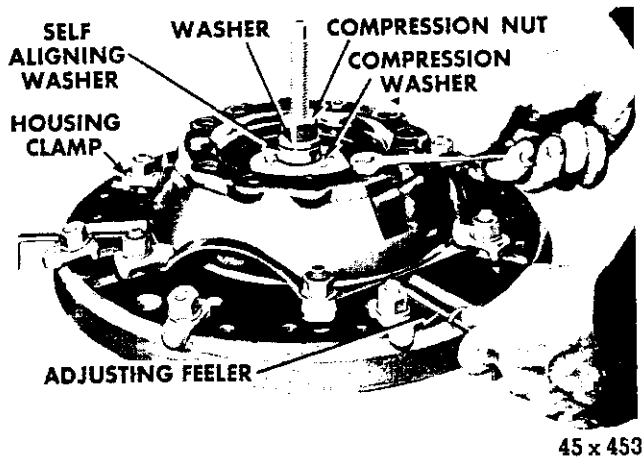


Fig. 6—Adjusting Clutch Release Levers

(12) Turn the eye bolt nuts down the eye bolts, flush with ends of the bolts. This is a temporary position.

(13) Remove the compression nut, washer and spider and push each lever down several times to be sure that the levers are seated properly.

(14) To adjust the release levers, install tool spacer C-585-19 on the fixture center screw, then lever compression plate C-585-36, flat side down. Install the thrust washer and compression nut and tighten the nut (Fig. 6).

(15) Adjust the eye bolt nuts until the feeler blades have the same drag or feel while being pushed in or pulled out.

(16) After all levers are adjusted, recheck the drag of the feeler blades before staking the eye bolt and nuts.

(17) Remove the clutch from the fixture.

#### TRANSMISSION MAIN DRIVE PINION PILOT BUSHING

See Paragraph "Cleaning, Inspection and Testing," Step 4, for testing the size of the pilot bushing.

##### a. Removal

(1) Position the outer portion of Tool C-3181 in contact with the button on the end of the center screw.

(2) Thread the outer portion of the tool tightly into the bushing.

(3) Turn the center screw in through the outer portion to remove the bushing.

##### b. Installation

Soak a new bushing in engine oil prior to installation.

(1) Remove the nut and cup from installing and burnishing Tool C-3181.

(2) Place the new bushing on the tool shaft and drive the bushing flush with the end of the crankshaft. Use a soft hammer to prevent damage to the tool.

(3) To remove the driver, install the cup and nut. As the nut is tightened, the tool will burnish the bushing.

(4) Insert a small amount of wheel bearing lubricant ahead of the bushing. Remove as much of the lubricant as is possible with one finger. The forward edge of the bushing will retain a sufficient amount of lubricant.

#### CLUTCH RELEASE BEARING

The clutch release bearing is a prelubricated sealed thrust bearing. It should not be submerged in solvents. The bearing should turn freely, when held in the hands, with no evidence of roughness.

(1) To install the bearing on the sleeve, support the sleeve on the press bed.

(2) Align the bearing with the sleeve and hold the old bearing on the new one.

(3) Bring the ram into contact with the old bearing and apply sufficient pressure to seat the new bearing on the shoulder on the sleeve. Rotate the bearing when installing.

#### TORQUE SHAFT AND BEARINGS

##### a. Removal

(1) Remove the spring clip and pedal rod from the torque shaft lever (Fig. 2).

(2) Remove the clutch fork pull-back spring.

(3) Remove the spring clip and clutch release fork rod from the torque shaft lever.

(4) Remove the torque shaft support bracket attaching bolts.

(5) Pull the torque shaft away from the stud on the engine assembly and remove the two bearings.

(6) Remove the retainer and bracket from the torque shaft and remove the two bearings.

##### b. Cleaning and Inspection

(1) Clean all parts in kerosene, mineral spirits or other suitable solvent. Remove all grease from the inside of the torque shaft.

(2) The two ball studs should be bright and without scratches, ridges or other surface imperfections.

(3) The inner surfaces of the bearings should also be smooth, without surface scratches or embedded foreign material. The wear pattern should be uniform over the entire surface.

### c. Installation

(1) Fill the torque shaft with chassis lubricant and coat the bearings and ball studs with the same lubricant.

(2) Install bearings on the bracket ball stud and force the bearings into the torque shaft far enough to install the retainer.

(3) Install bearings on the engine assembly ball stud and force the torque shaft over the bearings.

(4) Position the torque shaft support bracket. Install the bolts and tighten securely.

(5) Connect the clutch release fork rod and the spring clip.

(6) Install the clutch fork pull-back spring.

(7) Connect the pedal rod and install the spring clip.

(8) Adjust the clutch pedal free play.

## 6. CLUTCH HOUSING ALIGNMENT

When performing adjustments or repairs that involve removing the clutch housing, it will be necessary to align the face of the housing parallel with that of the cylinder block when assembling.

To correctly align the clutch housing, proceed as follows:

(1) Mount Tool C-870 with a dial indicator Tool C-435 on the flywheel.

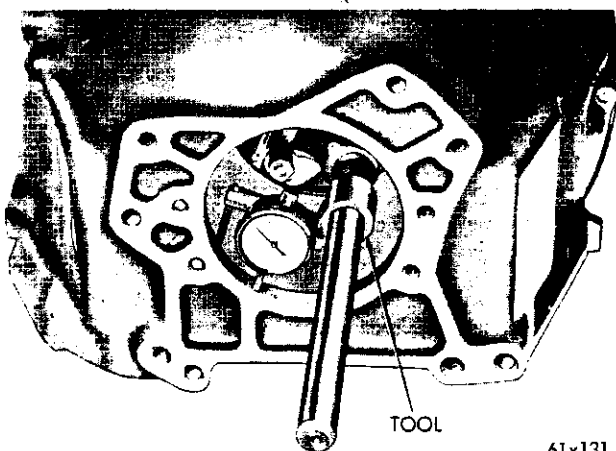


Fig. 7—Measuring Clutch Housing Bore

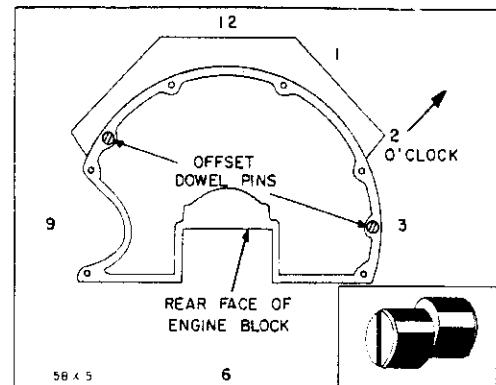


Fig. 8—Offset Dowel Orientation Diagrams

(2) With the flywheel turning Tool C-771, crank the engine while noting dial indicator needle deflection. Out-of-round of bore must not exceed .008 maximum total indicator reading (See Fig. 7).

If the bore runout is in excess of .008 inch total indicator reading proceed with correction as follows:

To illustrate the recommended correction procedure, assume that the total indicator reading is .020 inch, in a direction which approximates 2 o'clock on engine block (Fig. 8).

In this case, the housing is off crankshaft centerline .010 inch (one-half total indicator reading) which is .006 inch greater than the allowable limit of .004 (one-half total indicator reading).

In the case under consideration, use of the .007 inch offset dowels (pair) will bring the runout well within the allowable limits of .008 inch: or .008 inch minus .007 inch (offset dowels) equals .001 inch runout. Dowels must be used in pairs (same part number).

(3) To install the dowel pins (pair), remove the clutch housing after disconnecting and removing the starting motor). Remove the dowel pins from the engine block. Select eccentric dowels (pair) which are available with the following amount of offset: .007" (No. 1736347), .014" (No. 1736348), .021" (No. 1736353).

The amount of eccentricity of the dowel will produce a total indicator reading change of double the dowel eccentricity, therefore, a pair of dowels with the nearest to  $\frac{1}{2}$  of the total indicator runout of the bore. For runout (total indicator reading) of .012" through .020", use a .007" dowel (P/N 1736347), .022" through .034", use .014" dowel (P/N 1736348), and .036" through .052", use .021" dowel (P/N 1736353).

(4) Install both dowels with the slots parallel and aligned in the direction to correct the bore run-

out. (Slot indicates the direction of maximum dowel eccentricity.) Both dowels must be inserted into the engine block, up to the off-set shoulder.

(5) Install and tighten the clutch housing bolts to 50 foot-pounds torque. Remount dial indicator and recheck the bore runout. Small corrections can be made by removing the clutch housing (if necessary) and turning the dowels with a screw driver to shift the housing and bring the bore within limits.

#### Face Runout

(1) Relocate the dial indicator, as shown in Figure 9. Rotate the flywheel, using Tool C-771. If the total indicator reading is greater than .003 note the amount of the total indicator reading and the location of the lowest indicator reading (i.e., the point where the indicator arm or follower is extended the furthest).

(2) To correct excessive runout, place the proper thickness of shim stock between the clutch housing and the engine block or between the transmission and the clutch housing. After rechecking the face runout, tighten the housing bolts to 50 foot-pounds torque. Install clutch as follows:

#### CLUTCH INSTALLATION

When installing the clutch:

(1) Coat the clutch shaft pilot bushing (in the end of the crankshaft) with medium short fiber wheel bearing lubricant (about a half teaspoon). Place lubricant in radius at back of bushing.

(2) Clean the surface of the flywheel and the pressure plate thoroughly, making certain that all oil or lubricant has been removed.

(3) Hold the clutch disc, pressure plate and cover

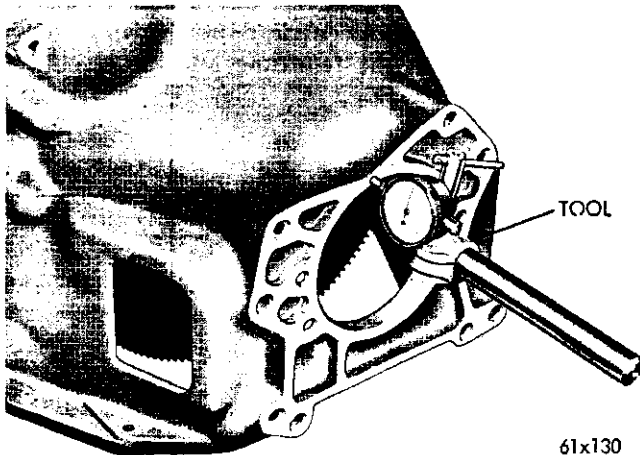


Fig. 9—Measuring Clutch Housing Alignment

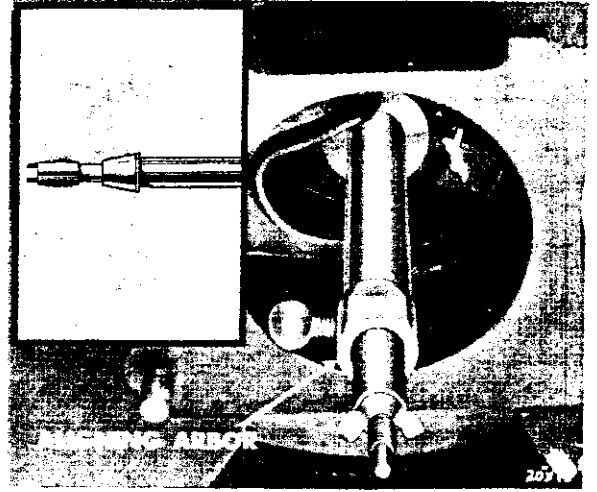


Fig. 10—Clutch Disc Aligning Arbor

in mounting position, with the springs on the disc damper facing away from the flywheel. **Do not touch disc facing, as clutch chatter may result.** Insert clutch disc aligning Tool C-360 through hub of disc and into the pilot bushing, as shown in Figure 10. (If Tool C-360 is not available, use a spare transmission drive pinion clutch shaft.)

(4) Insert the clutch cover attaching bolts (after aligning balance punch marks) but do not draw down.

(5) To avoid distortion of the clutch cover, the bolts should be tightened a few turns at a time (alternately) until they are all tight. Tighten the bolts. Refer to Specifications. Remove the Tool C-360 or pinion shaft if used.

(6) Inspect the clutch release bearing. If noisy, rough or dry, press off the old bearing and install a new one. Pack the recess in the sleeve (directly behind the bearing) with short fibre wheel lubricant. Coat the fork contact surfaces on the sleeve and the pivot ball with short fibre wheel lubricant. Slide the bearing and sleeve up into position, engaging the springs on the sleeve with the fork. **BE SURE THE SPRINGS HAVE LATERAL FREEDOM.** When installing the transmission, **DO NOT LUBRICATE THE PILOT SHAFT OR THE CLUTCH SPLINES.** This area must be kept dry.

(7) Install the transmission by guiding into position with pilot studs Tool C-730. Care should be taken in order not to bend the clutch disc by allowing the transmission to hang. Support the transmission with a suitable jack, then slide into place and secure with bolts.

(8) Adjust the clutch linkage. See Paragraph "Clutch Adjustment in the Vehicle."



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**SERVICE DIAGNOSIS**


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Condition	Possible Cause	Correction
<b>Clutch Chatter</b>	(a) Worn or damaged disc assembly. (b) Grease or oil on disc facings. (c) Improperly adjusted cover assembly.	(a) Replace the disc assembly. (b) Replace the disc facing or disc assembly. (c) Remove and recondition.
<b>Clutch Slipping</b>	(a) Burned, worn, or oil soaked facings. (b) Insufficient pedal free play. (c) Weak or broken pressure springs.	(a) Replace the facings or disc assembly. (b) Adjust the release fork rod. (c) Recondition the cover assembly.
<b>Difficult Gear Shifting</b>	(a) Excessive pedal free play. (b) Worn or damaged disc assembly. (c) Improperly adjusted cover assembly. (d) Clutch disc splines sticking.	(a) Adjust the release fork rod. (b) Replace the disc assembly. (c) Remove and recondition. (d) Remove the disc assembly and free up splines or replace the disc.
<b>Clutch Noisy</b>	(a) Dry clutch linkage. (b) Worn release bearing. (c) Worn disc assembly. (d) Worn release levers. (e) Worn or dry pilot bushing. (f) Dry contact-pressure plate lugs in cover.	(a) Lubricate where necessary. (b) Replace the release bearing. (c) Replace the facings or disc assembly. (d) Recondition the cover assembly. (e) Recondition the cover assembly. (f) Lubricate very lightly.

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