

SERVICE REFERENCE BOOK

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124

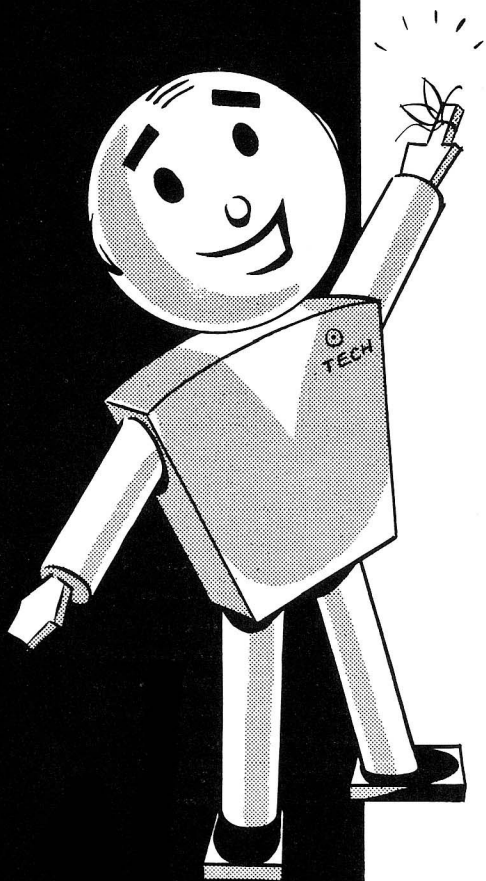


**TRANSMISSION
MAINTENANCE**



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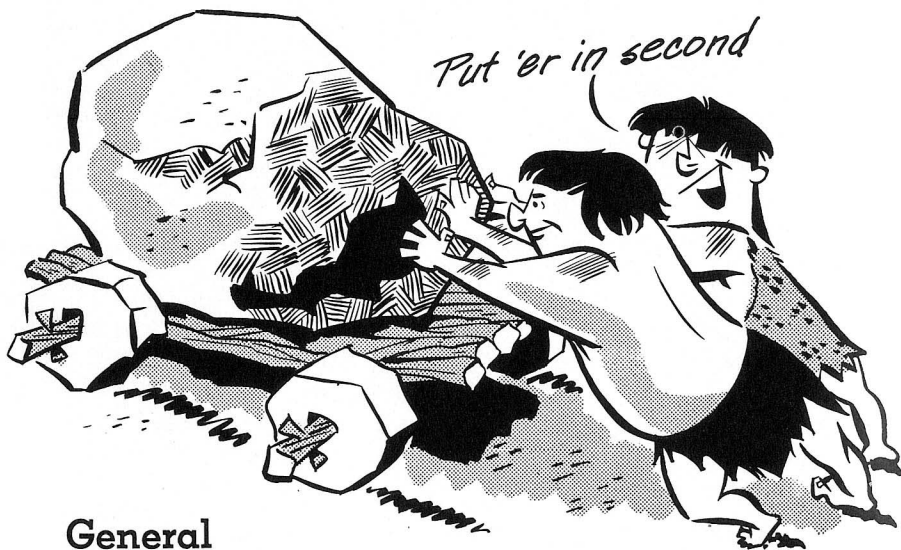
In these days of automation it is pretty easy to get all wrapped up in automatic transmissions, power steering units, and such, and forget all about the manually operated units like the manually operated transmission. But, while all the development work has been going on to perfect the automatically operated units, work has also been going on to improve the efficiency of the manually operated transmission. It has served the automobile for many years, and is still in considerable demand.

Therefore, it is important that we continue our study of this unit, along with the others. That's why you'll find this Reference Book devoted to the recent improvements and service procedures applicable to the manually operated transmission; also, you'll find some space devoted to recent improvements in the TorqueFlite transmission.

Here's how this information is arranged:

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THE MANUALLY OPERATED TRANSMISSION



General

The three-speed, manually operated transmission is of the synchromesh type, with helically cut gears to provide quiet operation and long life. Gear selection is accomplished by moving the shift lever through the familiar "H" shift pattern, and silent meshing of gears is accomplished through the use of a synchronizing unit which functions for second- and high-speed positions.

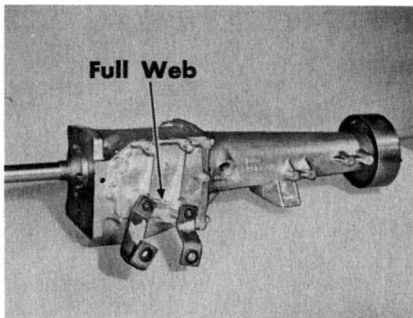
Locating the gearshift lever on the steering column, necessitating the use of a lever-and-linkage arrangement to transmit movement of the shift mechanism inside the transmission has brought about some operating difficulties. As a matter of fact, a very large percentage of difficulties reported as transmission conditions are actually due to improper gearshift linkage adjustment.

It is important, therefore, that every technician be cautioned not to remove a transmission for repair until he is sure that the linkage works freely, and that it is properly adjusted.

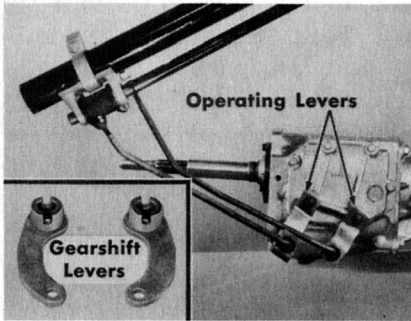
Four Types of Manually Operated Transmissions. From a maintenance point of view we are concerned with four types of manually operated transmissions. First is the transmission that has been in use for a number of years; improvements have been made from time to time, but it remains basically the same transmission that has proved itself over and over again, throughout the years. This transmission has been made in two models—the standard six-cylinder model, and a heavy-duty model used on some six-cylinder cars, and on all eight-cylinder cars.

Next is a new transmission, replacing the original transmission. The new transmission is made in two models, and entered production during the “L” Series schedule. One of the models is used in cars equipped with the six-cylinder engine; the other is used in cars equipped with the eight-cylinder engine. These two models are not interchangeable—they are two separate transmissions, even though they may look alike. For a specific example, the low gear of the six-cylinder transmission has a 2.5 to 1 ratio; in the eight-cylinder transmission the low gear ratio is 2.12 to 1. The second gear ratio in the six-cylinder transmission is 1.68 to 1; in the eight-cylinder transmission the second gear ratio is 1.43 to 1. The low-reverse gear is much wider than heretofore, and the reverse idler gear is set farther back in the case, to accommodate the wider gear.

The transmission case is different from the former manually operated transmission, too. The later “L” Series transmission can be identified by the new gearshift housing which has a full web between the two gearshift shaft bosses.



The gearshift linkage used with the new "L" Series transmission is different from the linkage formerly used. The gearshift operating



levers are the same length as the earlier series, but are of different shape. Gearshift rod levers at the lower end of the steering column are of equal length, but also of different shape than formerly. However, the adjusting procedure is the same for both linkage mechanisms.

Malfunctions. There are three malfunction conditions which have been associated with manually operated transmissions, and they are:

1. Hard shifting, neutral to low and neutral to reverse.
2. Hard shifting, neutral to second and neutral to high.
3. Jumping out of gear, particularly out of second gear.

Since all three of these conditions are very closely related to the adjustment of the gearshift linkage, and to the alignment of the centerline of the transmission mainshaft with the centerline of the engine crankshaft, it is vital that every technician have a thorough understanding of the adjusting and aligning procedures involved.

Accuracy in making these adjustments is of utmost importance. Carelessness or oversight in performing any one of the operations can destroy the good effect of all the other operations.

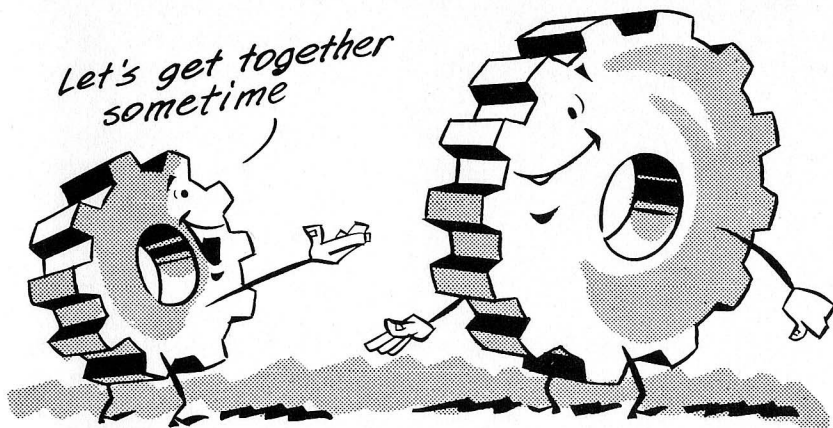
Let's review the procedures necessary for the correction of each of the conditions mentioned.

MAINTENANCE

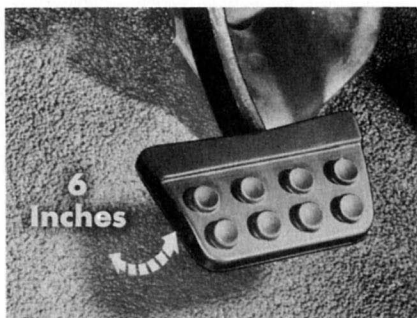
Hard Shifting—Neutral to Low and/or Reverse

This is a condition which produces gear clashing when attempting to mesh the low-and-reverse sliding gear with the mating cluster gear.

It can be caused either by failure of the clutch to completely release, or by improper action of the gearshift linkage due to binding or incorrect adjustment. If the condition is not corrected it will eventually result in the gear teeth becoming burred or chipped, and might result in extensive damage to the whole transmission.

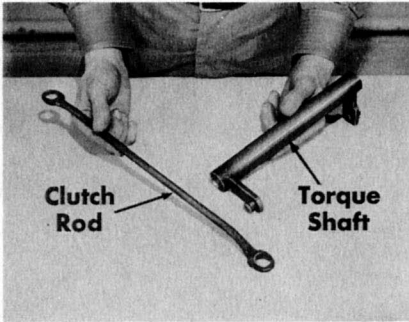


Clutch Pedal Linkage Adjustment. Since failure of the clutch to completely release is one of the major causes of this condition, the first step in its correction is an adjustment of the clutch pedal linkage. The clutch pedal must be the same height as the brake pedal (except power brakes). It may be necessary to either shim or replace the stop to adjust the clutch pedal height. When it is the same height as the brake pedal it will have about six inches of travel from the fully raised position to the fully depressed position.



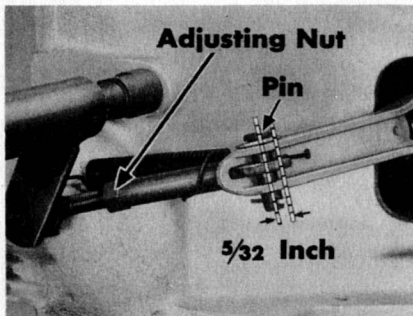
If the pedal doesn't have proper travel, check for interference between the clutch pedal and the clutch pedal rod—the perpendicular

rod between the pedal and the torque shaft. Sometimes, springing the clutch pedal bracket slightly will provide the necessary clearance. If, however, you have difficulty in getting the six inches total travel you may have to install the new, shorter clutch pedal rod, part number



1829406, and the new clutch torque shaft with the longer lever on the tube at the clutch end. Two shafts are available, one (part number 1829402) for all standard models, and the other (part number 1829407) for the high-performance models. In each case, the new rod and shaft must be used as a set.

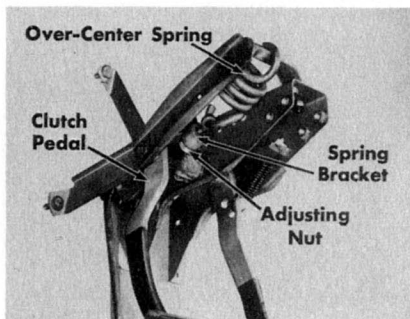
Clutch Pedal Free-Play Adjustment. Clutch pedal free-play is important, to insure that the clutch is completely engaged when the pedal is at the at-rest or clutch-engaged position. So, check the free-play by measuring the free travel at the clutch release fork pin—the distance from the at-rest position to the point at which the clutch starts to release. This distance should be $5/32$ -inch. You can also



take this measurement on the release fork rod, between the adjusting nut and the tubular portion of the rod. Adjust the fork rod “in” or “out” as required, to obtain the exact dimension. That distance— $5/32$ -inch—will give one inch of free pedal movement, measured at the pedal pad.

Clutch Pedal Over-Center Spring Adjustment. The over-center spring is used to reduce the amount of foot pressure needed to release the clutch. If the clutch operation needs adjusting, loosen the adjusting nut until the pedal drops to the floor. Then tighten the adjusting nut

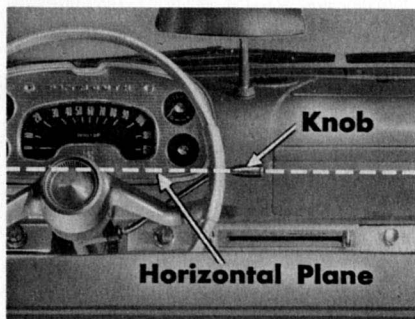
against the spring bracket five full turns for six-cylinder cars, and seven full turns for eight-cylinder cars. Check the pedal action. If heavier pressure is desired, loosen the nut one turn; if lighter action is desired, tighten the nut one turn. Specifications call for 30 to 32 pounds pressure at the pedal pad. If the nut is too tight it will cause a lazy pedal return—may even stick the pedal at the floor. Too little spring tension will cause a hard pedal.



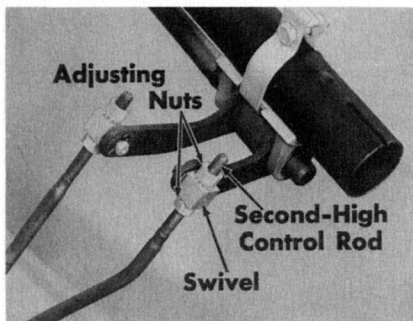
Gearshift Linkage Adjustment. In addition to proper clutch operation, the performance of the transmission depends on proper control linkage adjustment. There are no shortcuts to gearshift linkage adjustment—each step must be taken individually, and care exercised to see that each adjustment is right before going to the next step.



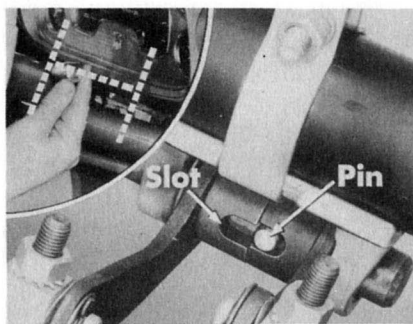
The first point to check is the position of the gearshift lever *knob*. Sight through the rear window, or sight over the end of the lever and knob to a horizontal section of the instrument panel. See if the centerline of the gearshift lever *knob* is in a horizontal plane. Move the lever through the neutral position crossover several times, and release it. The lever should drop down, and the knob should be in a horizontal plane.



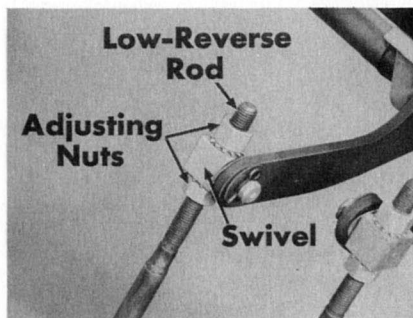
If the control lever binds, so it doesn't drop freely to its released position, check for interference at the duffy pad and floor pan, and at the column jacket bracket at the instrument panel, and at the upper and lower rod supports.



If the *knob* is not in a horizontal plane when the lever is at rest, adjust the length of the second-high control rod at its swivel. Adjust the nuts up or down on the rod to correctly position the knob. Then tighten the nuts against the swivel.



Crossover Adjustment. The crossover movement of the lever, from the second-high side to the low-reverse side should be made without binding or interference. If the slots in the lever are not aligned you can feel the gearshift tube pin striking a corner of the slot when moving through crossover.



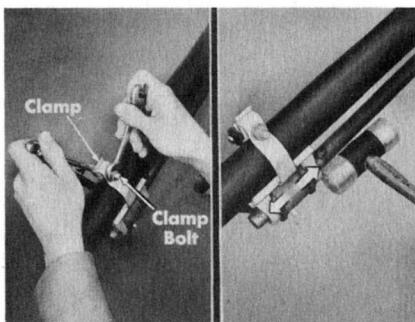
To bring the slots into line, adjust the low-reverse rod—the upper one—by adjusting the two nuts at the swivel, so the gearshift tube pin can be moved up or down through crossover, without interference.

The next point is to check the operation of the shift lever to be sure it has equal crossover-direction free-play in the high-second and low-reverse positions. Also check to see that there is sufficient clearance between the rim of the steering wheel and the knob on the shift lever.

If you have to make an adjustment to provide this clearance, move the lower support up or down on the steering column to properly position the pin and obtain the correct free-play.

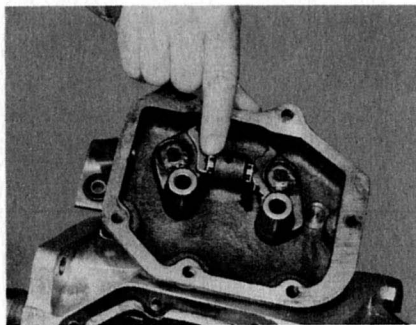


Just loosen the lower support (two clamp bolts on early models, a single clamp bolt on later models) and tap the support up or down. When the proper clearance has been obtained, tighten the clamp bolts. If you are working on a "K" Series manual steering job, tighten the clamp bolt 120 inch-pounds. Tighten it to 90 inch-pounds on "K" Series power steering models. The single clamp bolt on "L" Series manual steering jobs is tightened to 40 inch-pounds; on "L" Series power steering jobs, tighten to 205 inch-pounds.

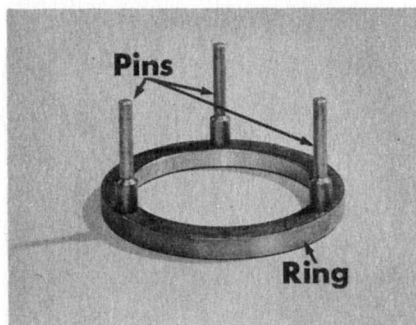


Hard Shifting— Neutral to second and/or high

This condition, like hard shifting into low or reverse, can be caused by incorrect adjustment of the gearshift linkage. In addition, improper operation of the interlock in the gearshift housing could cause the difficulty, and a faulty synchronizer could be responsible. Starting



with the "K" Series transmission, a gearshift housing with the interlocks in the housing instead of in the case was used. So, make a careful inspection of this operation. If there is no interference at this point, and the linkage is properly adjusted, remove the transmission and inspect the parts for wear or damage.

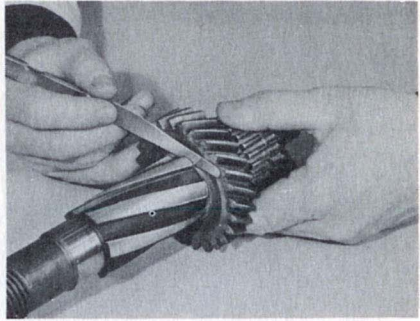


When inspecting the synchronizer, make sure the stop ring pins are straight, and are tight in the ring. If they are not straight, or if they are loose in the ring, replace the ring.



When assembling the synchronizer, use the new thinner, lighter load stop ring spring, part number 1823916. This new spring improves shifting into second, and will prolong the life of the synchronizer.

Also, when assembling the transmission, check the second gear end play. It must be between .003 inch and .008 inch. End play in excess of .008 inch might let the gear work out of mesh, or might result in noise.



Another point that deserves careful attention is the mainshaft roller bearing which is pressed into the bore at the front end of the extension housing. If this bearing is worn or damaged it will cause a noise that will be heard in all gears and at all speeds.

If this bearing needs to be replaced, set it in the bore with the lettered end up, and press it in until it is flush and square with the end of the housing.



Jumping out of gear— second and/or high

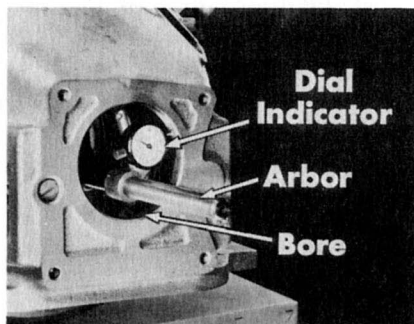
When checking a condition of this kind, always start with an examination of the gearshift linkage. Check for worn parts and, of course, for proper linkage adjustment. If the gears are not moved completely into mesh they will slip out when a load is applied. Worn, or improperly adjusted linkage will affect the movement of the sliding gears and could result in only partial engagement.

If the linkage is in good condition and is properly adjusted, and the condition is still present, you would suspect the alignment of the

transmission—specifically, the alignment of the centerline of the transmission mainshaft with the centerline of the engine crankshaft. This alignment is controlled by the clutch housing.



Clutch Housing Bore and Face Runout. With the transmission and clutch removed, mount the arbor (C-870) on the flywheel, and then mount the dial indicator (C-435) on the arbor, with the indicator arm contacting the housing bore. Rotate the flywheel and read the amount of runout on the dial. A runout of over .004 inch should be corrected.



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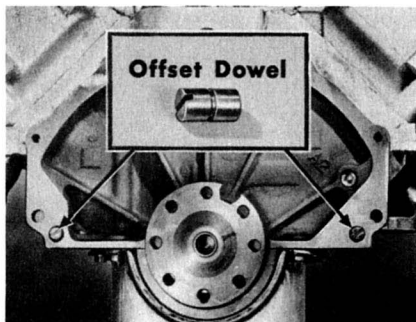
Mark the amount and the direction of greatest runout, and then shift the dial indicator farther out on the arbor so the dial contact arm rests on the face of the housing. Again, rotate the flywheel and read the total runout of the face of the housing. A total runout of .003 inch is the limit—more than that calls for a correction.



Mark the amount and the direction of greatest runout, and then shift the dial indicator farther out on the arbor so the dial contact arm rests on the face of the housing. Again, rotate the flywheel and read the total runout of the face of the housing. A total runout of .003 inch is the limit—more than that calls for a correction.

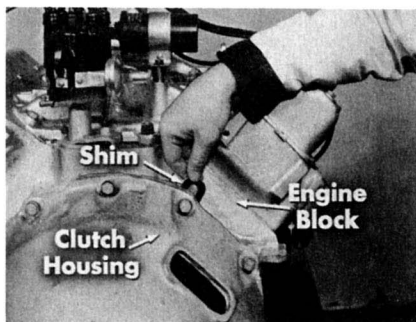
If excessive runout is found during both inspections, the corrections can be made during the same operation, or each correction can

be made individually. For example, the correction for housing bore runout involves removing the housing and removing the dowels. Install offset dowels (available in .007", .014" and .021" offset) of the proper offset to permit shifting the housing one-half the total amount of the runout measured.



To determine the size dowel to use, let's assume that the indicator reading is .016" in a direction approximating 2 o'clock on the rear face of the engine. This means the housing is off .008"—one-half the total reading. So, you would select the .007" offset dowel, and install two of them. This will permit a correction of .007", leaving the runout still .001". Since the allowable runout is .004", this job will then be well within the allowable limit. Slots in the ends of the dowels must be kept parallel, because they indicate the direction of greatest offset.

At the same time, correcting face runout involves installing shims of the proper thickness between the clutch housing and the engine block. So, while the mounting bolts are loose, install shims as needed to bring the housing face into alignment. When the housing is properly aligned, tighten the mounting bolts to 50 foot-pounds torque.



The offset dowels mentioned are available under the following part numbers:

| | | |
|------------------|------------------|------------------|
| .007" offset | .014" offset | .021" offset |
| Part No. 1736347 | Part No. 1736348 | Part No. 1736353 |

New Synchronizer Unit. When a transmission is disassembled, inspect the teeth of the synchronizer clutch gear, main drive pinion and second speed gear. If they are damaged, use the new clutch gear, part number 1853672 as a replacement. This gear can be identified by the



two grooves instead of the single groove of the former gear. This new gear can be used for replacement in any transmission using the pin-type synchronizer. If you install the gear only, be sure to use the new, lighter-load synchronizer stop ring spring, part number 1823916.

The "K" and "L" Series cars use a new pin-type synchronizer assembly, part number 1853909. This synchronizer cannot be used on models prior to the "K" Series because of a difference in the outside diameter of the clutch gear sleeve. This difference in size will cause interference between the clutch gear sleeve and the shift fork.

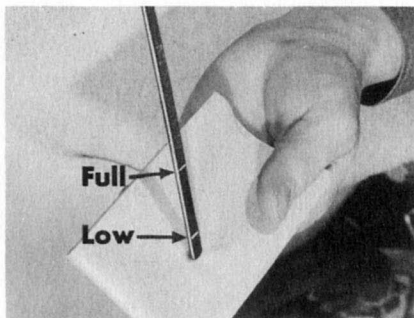
TORQUEFLITE TRANSMISSION

A number of improvements have been incorporated in the Torque-Flite transmission since its introduction. In some cases these improvements have been made to improve the performance of the transmission, and in others they have simplified service operations and diagnosis. Some of these changes will be covered here, in order that all technicians may be informed.

Before discussing the changes, however, it is well to review certain procedures which have been found to be basic in the diagnosis of any malfunction of the transmission. So many times removal and disassembly of the transmission would have been unnecessary if the technician had only taken the time to go through these basic tests. The importance of proper diagnosis before repairs are attempted cannot be overemphasized.



Fluid Level. Erratic performance of the transmission, particularly its shifting performance when hot, can often be traced to incorrect fluid level. Fluid level should be checked with the engine running at normal idle speed, the transmission in neutral, and the hand brake applied. All five push buttons should be operated slowly, returning to the neutral button each time. The fluid level on the indicator should be between the low mark to one-half inch *below* the low mark if the fluid is cold. After the car has been driven approximately ten miles and the fluid level is checked, the level will have risen to between the low mark and the full mark. Only Automatic Transmission Fluid – type “A” should be used. Overfilling leads to foaming, and loss of pressure, resulting in erratic shift performance.

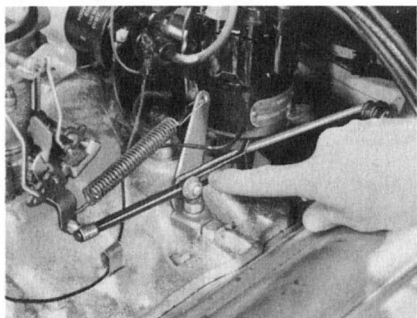


Throttle Linkage Adjustment.

The procedure for adjusting throttle linkage has been given in previous publications, and will not be repeated here. However, it might be well to review the importance of making this adjustment so everyone will understand why it is a major part of proper diagnosis. Many reports of harsh shifting, and clutch slippage during acceleration can be traced directly to inaccurate throttle linkage adjustment—when those adjustments were made the conditions disappeared.

We all understand that the amount of torque transmitted from the engine through the torque converter and into the transmission is directly related to the throttle opening. Generally there are two degrees of throttle opening—light throttle, where the shifts are made at low engine speed, and low torque; and, wide-open throttle, where the shifts are made at high engine speed, and high torque. The hydraulic control system is designed to supply the right amount of hydraulic pressure to the operating units, in proportion to the amount of torque transmitted by the engine—in other words, in proportion to the throttle opening.

The throttle linkage acts directly on the throttle pressure valve in the transmission. Throttle pressure ranges from Zero at closed throttle to 90 psi at wide-open throttle. Since the amount of throttle opening and resultant throttle pressure determines the road speed at which the transmission shifts to the various speed ranges, it is easy to understand why incorrect throttle linkage adjustment can result in the wrong throttle pressure being present at a given throttle opening. If the pressure is too high, the shift is harsh; if the pressure is too low, the clutch or band will slip and the engine will race.



Push-Button Cable Adjustment. Many a case of poor shift performance, engine runaway and clutch slippage has been blamed on the transmission when the actual cause was incorrect push-button cable adjustment. Let's see how this cable adjustment can affect the operation of the transmission.

Regulated line pressure is directed through the manual valve to the control valves, and on to the band servo pistons and to the clutch

apply pistons. So, if the manual valve is not properly positioned by the cable, fluid flow through the valve will be reduced. Therefore, the volume of fluid to the apply pistons will be affected, and the result is the transmission won't operate properly.

It is important, as you can see, that the push-button cable adjustment be checked before any disassembly of transmission components is attempted. And, when you adjust the cable, have someone hold the "R" button all the way IN. This removes all the free-play at the push-button box. Then loosen the screw which holds the control cable adjustable bracket to the adapter housing. Remove the neutral starter switch and hold the manual valve lever in the Reverse detent position. Push the cable into the housing, and mark it. Then, gently, pull it out, and mark it again.

Now, slowly push the cable into the housing *one-half* of the total travel. Tighten the bracket screw to secure the adjustment, making sure the cable ferrule doesn't move.

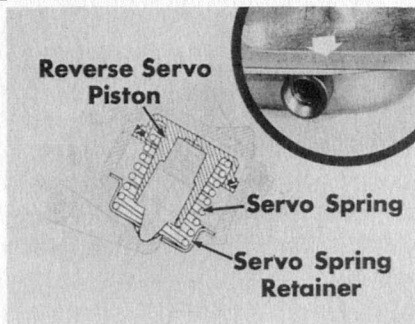


Checking Fluid Pressure. Conditions due to incorrect hydraulic pressure will not be confused with mechanical conditions if pressures are checked first, before disassembly is attempted. It's a lot easier to check pressure than to drain the transmission and remove the valve body or perform other mechanical operations which may not be necessary.

There are four convenient pressure tap locations on the transmission which permit the installation of pressure gauges to determine the hydraulic pressure at those particular points. Installing either a 100 psi gauge, or a 300 psi pressure gauge, and taking pressure readings, is the work of only a few minutes, and may save hours of unnecessary work later.

Design changes

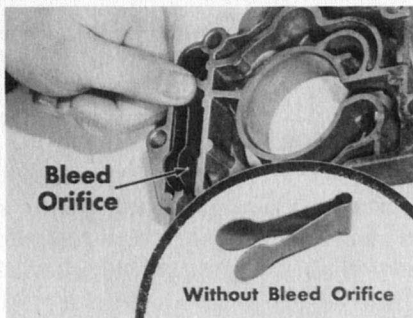
Reverse Servo Spring and Retainer. Transmissions having the letter “J” (or letters following alphabetically) stamped on the right-side pan rail of the case use a new reverse servo spring, part number



1824316, and a new spring retainer, part number 1824317. These parts are designed to prevent the “no reverse” condition some owners have reported. The parts prevent the servo piston from cocking over and missing the pilot hole in the reverse band lever.

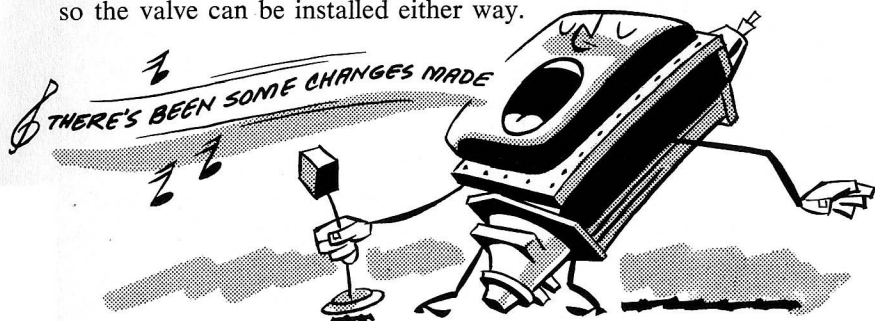
Rear Oil Pump Gear. If you have occasion to disassemble the rear oil pump you may find the gear has been changed from steel to plastic. The housing also has been changed to accommodate the new gear. The pinion can be used with either the steel or the plastic gear, but if the steel gear is to be replaced by the plastic gear it will be necessary to replace the housing also. This change was effective with transmissions having the letter “H” (or letters following alphabetically) stamped on the right-side pan rail of the case.

Front and Rear Pump Check Valve. In order to improve line pressure at idle and low speeds, the installed position of the front and rear pump check valve in the regulator valve body was changed. This

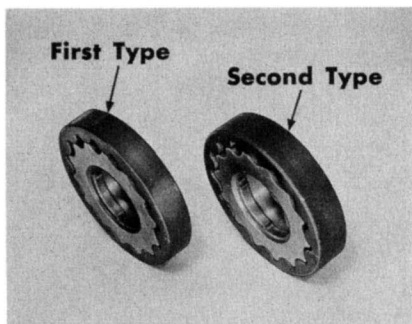


placed the small bleed orifice inward, against the front pump pressure port. This change became effective with transmission serial number 547,000. If you have occasion to service a transmission prior to the above serial number, install the valve with the orifice facing the front pump pressure port.

Later on, transmissions used a check valve without a bleed orifice, so the valve can be installed either way.



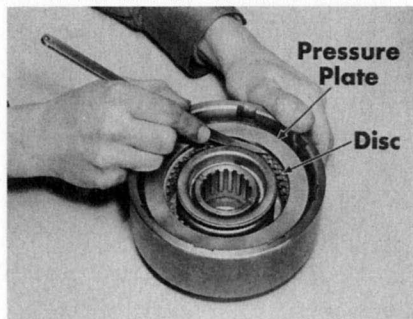
Front Pump. Another change, designed to improve front pump capacity at idle speed, and to prevent premature wear of the front clutch discs, was a new front pump. It is much wider than the former pump, and can be used as a replacement when installed as an assembly only. Shown here are the old and new front pump rotors, plainly indicating the difference in width. This change became effective with transmission serial number 587523, and the case bears the letter "L" (or later) on the right-side pan rail.



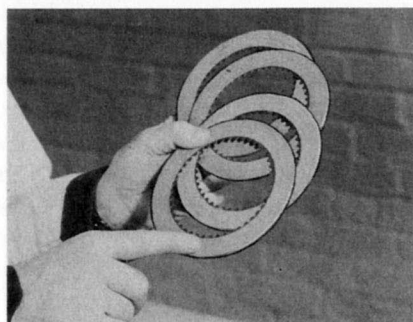
Governor Compensator Valve. If you have occasion to disassemble the valve body of a transmission bearing serial number 633519, or later, with the letter "P" (or letters following alphabetically) stamped on the case, you won't find a governor compensator valve. It has been discontinued. You'll also notice that the 1-2 shift valve has been reduced to approximately one-half the diameter of the 2-3 shift valve; this is to compensate for the missing compensator valve. Changing the size of the shift valve necessitated a change in the valve body and transfer plate, so this is something to keep in mind if you have to replace these parts.

Front Clutch Clearance. Sometime ago instructions were to use the rear clutch pressure plate, part number 1732114, as a gauge when checking the clearance in the front clutch. That part is no longer used in production. If you still have one, you can continue to use it as a gauge. The new rear clutch pressure plate is smaller in diameter at the splines, so it will not fit in the front clutch. However, if you don't have the old pressure plate, it would be smart to order the rear clutch pressure plate, part number 1824319, used in the truck transmission; this plate can be used as a gauge when checking the front clutch clearance.

Rear Clutch Clearance. While emphasis has been placed on checking the clearance in the front clutch, occasionally it is necessary to check the rear clutch clearance. Usually the clearance is right if the correct number of plates and discs have been installed. Since there are two sizes of rear clutches, it is well to remember the clearance for each. The clutch using 4 plates and 4 discs should have a clearance of from



.056" to .128". The clutch with 5 plates and 5 discs should have a clearance of from .070" to .160". The clearance can be checked with a feeler gauge between the pressure plate and the first driving disc, similar to the manner of checking the front clutch clearance.



Front Clutch Friction Material.

To improve the performance of the front clutch, a new friction material is being used on the driving discs. This material is capable of withstanding higher unit loads, and will tend to prevent slippage while increasing the life of the clutch.

Reaction Shaft. The reaction shaft, formerly made of aluminum, is now made of steel. The steel shaft provides better control of expansion characteristics. This change will be found in transmissions bearing the letter "R" (or letters following alphabetically) on the right-side pan rail. A new input shaft is used in connection with this new reaction shaft.

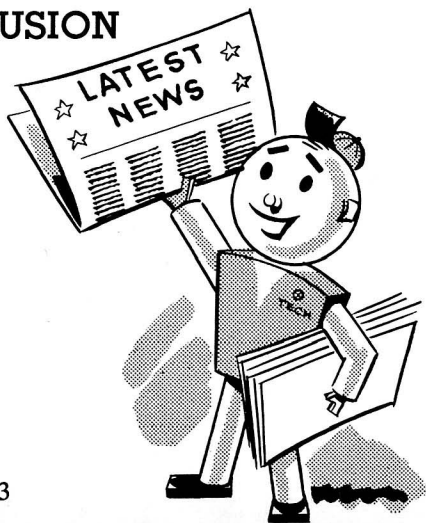
Antifreeze in transmission fluid

There have been reports of antifreeze (ethylene glycol) having been found in the transmission fluid, indicating there is a leak in the cooler located in the bottom tank of the radiator. If you get a condition of this kind, disconnect the lines to the cooler and test it with up to 50 pounds air pressure. If it leaks you'll have to remove and repair the cooler.

Then, you'll have to drain and flush the torque converter, disassemble the complete transmission including the valve body and clean it. If the clutch disc friction material is soft you'll have to replace the discs. Check for rust behind the front pump. Reassemble, and fill with transmission fluid, type "A".

CONCLUSION

Keeping up to date is an important part of every technician's job. Study the points mentioned in this Book, and supplement your study with a careful review of your factory Service Bulletins.



RECORD YOUR ANSWERS TO THESE QUESTIONS ON QUESTIONNAIRE NO. 124

Clutch pedal free-play is measured at the end of the clutch release fork pin, or on the fork rod between the adjusting nut and the tubular portion of the rod.

RIGHT

1

WRONG

If the gearshift lever knob is not horizontal, adjust the length of the second-high control rod.

RIGHT

2

WRONG

Binding or interference in the crossover movement of the gearshift lever can be relieved by adjusting the length of the low-reverse control rod.

RIGHT

3

WRONG

Equal horizontal free-play of the lever is obtained by adjusting the lower support on the steering column up or down, as required.

RIGHT

4

WRONG

Loose pins in the pin-type synchronizer do not interfere with its operation.

RIGHT

5

WRONG

Clutch housing bore runout up to .004" is considered within standard.

RIGHT

6

WRONG

Offset dowels are used to correct clutch housing bore runout.

RIGHT

7

WRONG

Erratic shift performance of the TorqueFlite transmission can sometimes be traced to too much fluid in the transmission.

RIGHT

8

WRONG

Harsh shifting, and clutch slippage during acceleration within the TorqueFlite transmission can sometimes be traced to inaccurate throttle linkage adjustment.

RIGHT

9

WRONG

Poor shift performance, engine runaway and clutch slippage within the TorqueFlite transmission can sometimes be traced to incorrect push-button cable adjustment.

RIGHT

10

WRONG