

**SECTION 5-E
TROUBLE DIAGNOSIS**

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**5-34 DIAGNOSIS
PROCEDURE**

Accurate diagnosis of apparent transmission problems begins with a thorough understanding of normal transmission operation. In particular, knowing which units are involved in the various speeds or shifts so that the specific units or circuits involved in the problem can be isolated and investigated further.

An important and often overlooked aspect of diagnosis is finding out specifically what the customer is complaining of. For this purpose, a short ride with the customer will often prove beneficial. In some cases through a customer's misunderstanding of how the transmission should operate, it may be found that the condition the customer wants corrected is standard and should not be altered. Determine that all shifts are being obtained in the following manner:

3RD AND 2ND CHECK

Position the selector lever in the Drive position, and keep the car speed at approximately 35 MPH. While gradually accelerating, move the selector lever to Lo Range. The transmission should downshift to 2nd. An increase in

engine RPM and an engine braking effect should be noticed.

2-1 CHECK

Leaving the selector lever in Lo Range and coasting down to approximately 18 MPH, the transmission should downshift to 1st gear. An increase in engine RPM and braking effect should be noticed.

The following sequence provides the desired information quickly and in most cases corrects the malfunction without requiring the removal of the transmission.

**5-35 DIAGNOSIS
SEQUENCE**

- A. OIL LEVEL
- B. OIL PRESSURE
- C. MANUAL LINKAGE
- D. ENGINE IDLE AND DASH POT ADJUSTMENT
- E. VACUUM LINE
- F. VACUUM MODULATOR ASSEMBLY
- G. DETENT SWITCH AND SOLENOID
- H. GOVERNOR ASSEMBLY
- I. CONTROL VALVE ASSEMBLY

- J. REAR SERVO ASSEMBLY
- K. FRONT SERVO ASSEMBLY
- L. FORWARD CLUTCH
- M. INTERMEDIATE CLUTCH
- N. DIRECT CLUTCH
- O. FRONT AND REAR BANDS

a. Oil Level

Before attempting to check and or correct any transmission complaint it is absolutely essential that the oil level be checked and corrected if necessary. Either too high or too low an oil level can cause slippage in all ranges or excessive noise.

Oil level should be checked with the selector lever in the Park (P) position, engine running, and the vehicle on level pavement. The transmission oil should be at operating temperature 170°. (This can be accomplished by driving approximately 5 miles with frequent starts and stops). If oil level is low, add automatic transmission fluid to "Full" mark.

If oil level was low, refer to Oil Leaks Page 11.

b. Oil Pressure

Check and correct oil level (Item A).

Before road testing an oil pressure gauge should be connected and the pressures checked as follows:

Engine Idle Pressure Check

With the selector lever in "DR" Range and vehicle running at 30 MPH, with the throttle closed, line pressure should be 70 psi.

Full Throttle Pressure Check

A satisfactory full throttle pressure check can be made with the vacuum line removed from carburetor, transmission in Neutral and engine speed at fast idle (700-1000). This pressure should be 145 psi.

In order to completely diagnose a specific shift trouble it may be necessary to check the line pressure at the full throttle 1-2 and 2-3 shift points. If this becomes necessary a road test must be made in an uncongested area. The pressure at the 1-2 full throttle shift point is 120 psi and at the 2-3 full throttle shift point it is 100 psi. This check will point out any errors in the governor feed oil to the modulator.

If the pressure was low check:

1. The vacuum modulator assembly for loose attaching bolt, collapsed bellows, stuck modulator valve.
2. The pressure regulator valve and spring for sticking plugged orifice, collapsed spring.
3. Boost valve for - sticking.

If the engine idle pressure was high; check:

1. Vacuum line (See Item E).
2. Vacuum modulator for leaks (See Item F).
3. Modulator valve for sticking.
4. Pressure regulator valve for sticking.

5. Boost valve for sticking.

c. Manual Linkage

Manual linkage adjustment and the associated neutral safety switch are important from a safety standpoint. The safety switch should be adjusted so that the engine will start only in Park or Neutral.

With the selector lever in Park position, the parking pawl should prevent the vehicle from rolling. The pointer on the indicator quadrant should line up properly with the range indicators in all ranges.

d. Engine Idle Speed and Dash Pot Adjustment

Specific instructions for adjustment vary from one model to another, so it will be necessary to refer to the car manufacturer's Service Manuals for details.

e. Vacuum Line Check

1. Check vacuum line for:
 - A. Leaks
 - B. Plugged
 - C. Crimped
 - D. Plugged Carburetor orifice.

f. Vacuum Modulator Assembly

The vacuum modulator assembly controls the transmission line pressure. A faulty vacuum modulator assembly, such as a leaking diaphragm, bellows or a stuck modulator valve may cause:

1. High line pressure.
2. Low line pressure.
3. High shift points.
4. Low shift points.
5. Harsh shifts.
6. Slipping shifts.

g. Detent Switch and Solenoid

The detent switch and solenoid can be checked by listening for the detent solenoid to click while operating the switch by hand (with the ignition "ON" but engine not running). If the solenoid did not engage:

1. Check detent switch and adjust (See Shop Manual for adjustment).
2. Check electrical connections.
3. Replace the detent solenoid.

If the solenoid did engage, but the shift points were late (detent shifts) check:

1. For loose solenoid attaching screws.
2. Mispositioned solenoid gasket.
3. Solenoid for plugged orifice.
4. For a leak between control valve assembly spacer plate and case.
 - a. Bent spacer.
 - b. Blown gasket.
 - c. Case face not flat.

h. Governor Assembly

The governor assembly controls the transmission shift points. A stuck governor can cause:

1. No upshift.
2. 2nd or 3rd Gear start.
3. Low or high line pressures.

i. Control Valve Assembly Check

The control valve assembly check involves a disassembly and a thorough inspection of the control valve assembly with particular attention to the following items.

1. Bolts

Attaching bolts must not be loose or excessive leakage will occur

between the adjacent channels. Over torquing the bolts can cause distortion or warpage, which also causes leakage and sticking valves.

2. Distorted or Mispositioned Springs In Valve Body

The position and condition of the springs is important. The exact number of springs and their location varies with model of transmission. Reference to the manufacturer's shop manual will be helpful in determining the exact location and number of springs.

3. Sticky Valves

The valves should be free enough to fall because of their own weight. Burrs or small dents can be removed using a fine abrasive stone. The sharp edges on the valve lands should not be removed.

4. Porosity

Porosity between channels or passages can be detected by using a solvent and observing if any leakage occurs.

5. Bodies or Plates Out of Flat

The valve body, case and spacer plate, must be flat or cross leakage can occur.

A surface plate and bluing is useful in checking for out of flat conditions of the bodies. Gentle and careful lapping of the valve body sealing faces will often correct an out of flat condition.

j. Rear Servo

The rear servo applies the rear band in reverse, and Lo Range 1st gear. It also is the accumulator for the 1-2 shift. A faulty

rear servo, such as a leaking accumulator or servo piston oil seal, a stuck piston, or wrong piston, pin can cause:

1. Slipping 1-2 Shift
2. Harsh 1-2 Shift
3. Slipping Reverse
4. No Reverse
5. No Overrun Braking in Lo Range.

k. Front Servo

The front servo applies the front band in 2nd gear for overrun braking. It also acts as an accumulator for the 2-3 shift. A faulty servo, such as a broken oil seal ring, or stuck piston, may cause:

1. Slipping 1-2 Shift
2. Slipping 2-3 Shift
3. No 3rd Gear
4. No Engine Braking in 2nd
5. Harsh 2-3 Shift

l. Forward Clutch

The forward clutch is the connection between the converter and the transmission gear set and is applied in all forward driving ranges.

No forward drive or slipping first gear may be caused from the following:

1. Missing or broken pump oil seal ring.
2. Leaking inner or outer piston seal.
3. Check ball stuck.
4. Clutch plates worn.

m. Intermediate Clutch

The intermediate clutch is applied in second gear, which makes the sprag effective in holding the sun gear shaft and sun gear from turning counterclockwise.

A slipping 1-2 shift or no 2nd gear may be caused from:

1. Leaking piston seals.
2. Worn clutch plates.
3. Loose case to case center support bolt.

n. Direct Clutch

1. Leaking piston seals.
2. Stuck check ball.
3. Broken or missing case support oil seal rings.
4. Worn clutch plates.
5. Loose case to center support bolt.

The direct clutch is applied in 3rd gear and reverse to drive the sun gear clockwise.

A slipping 2-3 shift, slipping reverse, no 3rd gear, or no reverse, may be caused from:

o. Front and Rear Bands

The front and rear bands are used to back up the sprags for overrun braking.

A broken or burnt front band will cause no 2nd gear over-run braking.

A broken or burnt rear band will cause no first gear over-run braking in Lo Range, and no reverse.

5-36 DIAGNOSIS GUIDE

CONDITION	POSSIBLE CAUSE
No Drive in Drive Range	A-B-C-I-L
First Speed Only - (No. 1-2 Shift)	F-G-H-I-J-M
No Third Gear (No. 2-3 Shift)	H-I-K-N
Drive in Neutral	C-L
No Reverse	A-B-C-I-J-N-O
Slipping - All Ranges	A-B-F-H-I
Slipping - 1-2 Shift	A-B-F-I-J-K-M
Rough 1-2 Shift	B-D-E-F-G-I-J-M
Slipping 2-3 Shift	A-B-F-I-K-N
Rough 2-3 Shift	B-D-E-F-G-I-N
No Engine Braking (Lo Range Second Gear)	I-K-O
No Engine Braking (Lo Range First Gear)	I-J-O
No Part Throttle Downshifts	A-B-F-H-I
No Detent Downshifts	E-F-G-I
Low or High Shift Points	A-B-E-F-G-H-I

5-37 OIL LEAKS

If a transmission is found consistently low on oil an inspection should be made to find and correct all external oil leaks.

All external oil leaks should be traced to their original source. Due to wind currents, a leak at the manual lever seal can form a pool of oil at the rear bottom pan bolts, indicating a leak at the bottom pan bolts. The use of black light can be helpful in determining source of leak.

The vacuum modulator must also be checked to insure that the diaphragm has not ruptured, as this would allow transmission oil to be drawn into the intake manifold. Usually, the exhaust will

be excessively smokey, due to transmission oil added to the combustion.

5-38 POSSIBLE POINTS OF EXTERNAL OIL LEAKS

1. Bottom Pan Gasket
2. Bottom Pan Bolt
3. Porosity In Case
4. Case Extension To Case
5. Rear Seal
6. Front Seal
7. Governor Cover Plate
8. Speedo Gear Housing "O" Ring
9. Speedo Shaft to Housing Seal
10. Detent Solenoid Adapter "O" Ring
11. Manual Lever Seal
12. Pump To Case "O" Ring
13. Vacuum Modulator Assembly To Case "O" Ring
14. Filler Pipe
15. Parking Pawl Shaft "O" Ring
16. Front Pump To Case Bolt "O" Ring
17. Converter Weld
18. Vent Pipe
19. Cooler Fittings
20. Pressure Take-Off Plug
21. Vacuum Modulator Diaphragm

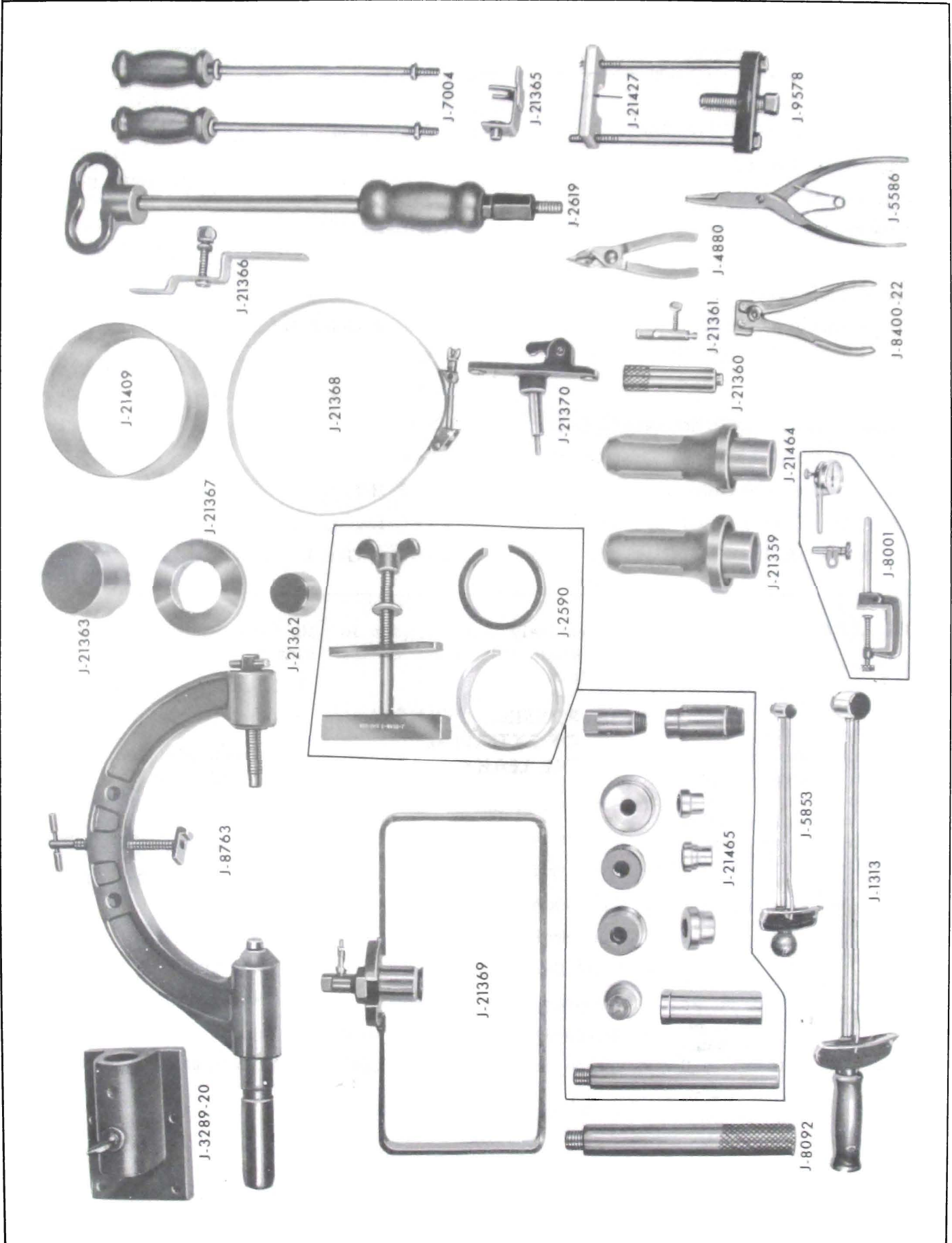


Figure 5-733—Special Tools

J-3289-20	-	HOLDING FIXTURE BASE
J-8763	-	HOLDING FIXTURE
J-21363	-	SEAL INSTALLER
J-21367	-	LOW SPRAG INSTALLER
J-21362	-	SEAL INSTALLER
J-21409	-	SEAL INSTALLER
J-21368	-	PUMP BODY TO COVER ALIGNMENT BAND
J-21366	-	CONVERTER HOLDING STRAP
J-2619	-	SLIDE HAMMER
J-7004	-	SLIDE HAMMERS
J-21360	-	CHECK VALVE INSTALLER
J-21361	-	CHECK VALVE REMOVER
J-4880	-	SNAP RING PLIERS
J-5586	-	SNAP RING PLIERS
J-9578	-	SPEEDO GEAR REMOVER
J-21365	-	GEAR ASSEMBLY REMOVER AND INSTALLER
J-21370	-	APPLY PIN SELECTION GAUGE
J-8001	-	DIAL INDICATOR SET
J-21464	-	REAR SEAL INSTALLER
J-21359	-	OIL PUMP SEAL INSTALLER
J-21369	-	CONVERTER PRESSURE CHECK FIXTURE
J-21465	-	BUSHING SET
J-8092	-	DRIVE HANDLE
J-5853	-	IN. LB. TORQUE WRENCH
J-1313	-	FT. LB. TORQUE WRENCH

Figure 5-734—Special Tools