

## SECTION 5-E TROUBLE DIAGNOSIS

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### 5-37 SUPER TURBINE 400 AUTOMATIC TRANSMISSION TROUBLE DIAGNOSIS PROCEDURE

Accurate diagnosis of 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. Analytical diagnosis will protect the technician from comebacks and certainly will improve owner satisfaction.

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. It may be found that the condition the customer wants corrected is standard and should not be altered.

The following sequence, based on field experience, provides the desired information quickly and in most cases actually corrects the malfunction without requiring the removal of the transmission. Details of the items listed in this

sequence are covered further in the text.

### 5-38 SEQUENCE FOR DIAGNOSIS IN THE SUPER TURBINE 400

1. Check and correct oil level.
2. Check and correct detent and stator switches.
3. Check and correct vacuum line and fittings.
4. Check and correct manual linkage.
5. Road Test

Install line pressure gauge and road test, (correcting Items 1, 2, 3, and 4 on previous page may have eliminated the complaint.)

a. Road test using all selective ranges, noting when discrepancies in operation or oil pressure occur.

b. Attempt to isolate the unit or circuit involved in the malfunction.

c. If engine performance indicates an engine tune-up is required, this should be performed before road testing is completed or transmission correction attempted. Poor engine performance can result in rough shifting or other malfunctions.

d. If the malfunction or complaint is determined during road test, check list of transmission problems and related causes as detailed in this diagnosis section.

After having used the above sequence to find the source of the problem, the cause of the problem can be corrected.

### 5-39 OIL LEVEL CHECK

Always check the oil level before road testing. Erratic shifting, pump noise, or other malfunctions can in some cases be traced to improper oil level.

1. Oil level should be checked with the selector lever in the Park (P) position, engine running, and the vehicle on level pavement.

2. CAUTION: With unit at room temperature (engine running) oil must be visible on dipstick prior to operating the vehicle.

3. Bring the transmission oil to operating temperature of 170° F. (This can be accomplished by driving approximately five miles with frequent starts and stops.) If oil level is low, add automatic transmission fluid to "Full" mark.

4. If oil level was low, refer to Oil Leaks.

**CAUTION:** Use "Automatic Transmission Fluid (Type A) which has been approved and labeled AQ-ATF-A" or equivalent.

**5-40 MANUAL LINKAGE**

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

With the selector lever in the Park position, the parking pawl should freely engage and prevent the vehicle from rolling. The pointer on the indicator quadrant should line up properly with the range indicators in all ranges. Refer to Group 4A for linkage adjustments.

**5-41 SHIFT PATTERN CHECK**

Check all the shifts in the following manner:

Drive Range:

Position selector lever in Drive Range, accelerating the vehicle from 0 MPH. A 1-2 and 2-3 shift should occur at all throttle openings. (The shift points will vary with the throttle opening.) As the vehicle decreases in speed to 0 MPH, the 3-2 and 2-1 shifts should occur.

L<sup>2</sup> Range:

Position the selector lever in L<sup>2</sup> Range and accelerate the vehicle from 0 MPH. A 1-2 shift should occur at all throttle openings. (No 2-3 shift can be obtained in this range.) The 1-2 shift point will vary with throttle opening. As the vehicle decreases in speed to 0 MPH, a 2-1 shift should occur.

L<sup>1</sup> Range:

Position the selector lever in L<sup>1</sup> Range. No upshift should occur in this range regardless of throttle opening.

2nd Gear Overrun Braking

Position the selector lever in the Drive Range and with the car speed at approximately 35 MPH move the selector lever to Intermediate Range. The transmission should downshift to 2nd. An increase in engine RPM and an engine braking effect should be noticed. Line pressure should change from 70 psi\* to approximately 150 psi\* in 2nd.

1st Gear - Downhill or Overrun Braking

With the selector lever in Intermediate at approximately 30 MPH

L<sup>2</sup> Range

2nd Gear - Steady road load at approximately 25 MPH.

<u>Gear</u>	<u>Selector Lever Position</u>	<u>Minimum</u>	<u>Maximum</u>
1st	Drive	70	150
2nd	("Zero" throttle to full throttle.)		
3rd	Drive Range, Zero Throttle 30 MPH.	70	
Reverse	Rev. (Zero to full throttle)		230

2. Oil Pressure Check - With Car Stationary

Transmission Oil pressure gauge and engine tachometer should be connected and the oil pressures should check as follows:

<u>Approximate Altitude of Check (Ft. above sea level)</u>	<u>Drive Neutral Park</u>	<u>Int. or Lo</u>	<u>Reverse</u>
0	150	150	244
2,000	150	150	233
4,000	145	150	222
6,000	138	150	212
8,000	132	150	203
10,000	126	150	194
12,000	121	150	186
14,000	116	150	178

at constant throttle, reposition the selector lever into Lo Range. An increase in engine RPM and a braking effect should be noticed. Line pressure should be approximately 150 psi\*.

**5-42 SUPER TURBINE 400 TRANSMISSIONS— OIL PRESSURE CHECK**

1. Oil Pressure Check - Road or Normal operating conditions.

While road testing (with the transmission oil pressure gauge attached and the vacuum modulator tube connected) the transmission pressures should check approximately as follows:

	<u>Minimum</u>	<u>Maximum</u>
2nd Gear - Steady road load at approximately 25 MPH.	150 (±5) psi	150 (±5) psi

A. Pressures indicated below are at 0 output speed with the vacuum modulator tube disconnected and with engine at 1200 RPM.

B. Pressures indicated below are at closed throttle with the vacuum

tube connected for normal modulator operation, and with the engine at 1200 RPM. NOTE: Pressures are not significantly affected by altitude or barometric pressure when the vacuum tube is connected.

Drive, Neutral, Park	L <sup>2</sup> or L <sup>1</sup>	Reverse
70	150	107

### 5-43 TRANSMISSION OIL LEAKS

Before attempting to correct an oil leak, the actual source of the leak must be determined. In many cases the source of the leak can be deceiving due to "wind flow" around the engine and transmission.

The suspected area should be wiped clean of all oil before inspecting for the source of the leak. Red dye is used in the transmission oil at the assembly plant and will indicate if the oil leak is from the transmission.

The use of a "black Light" to identify the oil at the source of leak is also helpful. Comparing the oil from the leak to that on the engine or transmission dipstick (when viewed by black light) will determine the source of the leak.

Oil leaks around the engine and transmission are generally carried toward the rear of the car by the air stream. For example, a transmission "oil filler tube to case leak" will sometimes appear as a leak at the rear of the transmission. In determining the source of an oil leak it is most helpful to keep the engine running.

### 5-44 POSSIBLE POINTS OF TRANSMISSION OIL LEAKS

#### 1. Transmission Oil Pan Leak

a. Attaching bolts not correctly torqued.

b. Improperly installed or damaged pan gasket.

c. Oil pan gasket mounting face not flat.

#### 2. Rear Extension Leak

a. Attaching bolts not correctly torqued.

b. Rear Seal Assembly - damaged or improperly installed.

c. Square Seal - (Extension to Case) damaged or improperly installed.

d. Porous casting.

#### 3. Case Leak

a. Filler pipe "O" ring seal damaged or missing; misposition of filler pipe bracket to engine - "loading" one side of "O" ring.

b. Modulator assembly "O" ring seal - damaged or improperly installed.

c. Governor cover, gasket and bolts - damaged, loose; case face leak.

d. Speedo gear - "O" ring damaged.

e. Manual shaft seal - damaged, improperly installed.

f. Line pressure tap plug - stripped, shy sealer compound.

g. Vent pipe (refer to Item 5 below)

h. Porous case.

#### 4. Front End Leak

a. Front Seal - damaged (Check converter neck for nicks, etc., also for pump bushing moved forward); garter spring missing.

b. Pump attaching bolts and seals - damaged, missing, bolts loose.

c. Converter - leak in weld.

d. Pump "O" ring seal-damaged. (Also check pump groove and case bore.)

e. Porous casting (pump or case).

#### 5. Oil Comes Out Vent Pipe

a. Transmission over-filled.

b. Water in oil.

c. Pump to case gasket mispositioned.

d. Foreign material between pump and case, or between pump cover and body.

e. Case - Porous, pump face improperly machined.

f. Pump - Shy of stock, porous.

### 5-45 SUPER TURBINE 400 DIAGNOSIS GUIDE TRANSMISSION PROBLEMS AND RELATED CAUSES

#### I. No Drive In Drive Range - (Install Pressure Gauge)

##### A. Low oil level

1. Correct level - check for external leaks or defective vacuum modulator (leaking diaphragm will evacuate oil from unit).

##### B. Manual linkage

1. Maladjusted; correct alignment in manual lever shift quadrant essential.

C. Low oil pressure - (Refer to oil pressure table for specifications)

1. Strainer Assembly - "O" ring missing or damaged, neck weld leaking, strainer blocked.

2. Pump Assembly - Pressure Regulator; pump drive gear - tangs damaged by converter.

3. Case - porosity in intake bore.

##### D. Control valve assembly

1. Manual valve disconnected from manual lever pin.

##### E. Forward clutch

1. Forward clutch does not apply-piston cracked; seals missing, damaged; clutch plates burnt.

2. Pump feed circuit to forward clutch oil seal rings missing,

broken, on pump cover; leak in feed circuits; pump to case gasket mispositioned or damaged. Piston ball check stuck or missing.

#### F. Low sprag assembly

1. Sprag assembled backwards, sprags inoperative (rolled over).

### II. 1-2 Shift - Full Throttle Only

#### A. Detent switch

1. Sticking or defective (may stick in cold or wet weather).

#### B. Detent solenoid

1. Loose
2. Gasket leaking
3. Sticks open

#### C. Control valve assembly

1. Valve body gaskets - leaking, damaged, incorrectly installed.
2. Detent valve train.
3. 3-2 valve stuck.

#### D. Case assembly

1. Porosity

### III. First Speed Only, No. 1-2 Shift

#### A. Governor assembly

1. Governor valve sticking.
2. Driven gear loose, damaged or worn, (check for pin in case and length of pin showing); also check output shaft drive gear for nicks or rough finish, if driven gear shows damage.

#### B. Control valve assembly

1. 1-2 shift valve train stuck closed.
2. Governor feed channels blocked, leaking, pipes out of position.
3. Valve body gaskets - leaking, damaged, incorrectly installed.

#### C. Case

1. Intermediate clutch plug leaking or blown out.
2. Porosity between channels.

3. Governor feed channel blocked.

#### D. Intermediate clutch

1. Case center support - oil rings missing, broken, defective.
2. Clutch piston seals - missing, improperly assembled, cut.

### IV. First and Second Speeds Only, No 2-3 Shift

#### A. Detent solenoid

1. Stuck open (Detent shifts only - the 2-3 shift would occur at very high speeds being interpreted as no 2-3 shift.)

#### B. Detent Switch

#### C. Control valve assembly

1. 2-3 valve train stuck.
2. Valve body gaskets - leaking, damaged, incorrectly installed.

#### D. Direct clutch

1. Case center support - oil rings missing, broken, defective.
2. Clutch piston seals - missing, improperly assembled, cut, piston ball check stuck or missing.

### V. Drive In Neutral

#### A. Manual linkage

1. Maladjusted

#### B. Forward clutch

1. Clutch does not release - (this condition will also cause "No Reverse").

### VI. No Drive in Reverse, or Slips in Reverse - (Install Pressure Gauge)

#### A. Low oil level

#### B. Manual linkage

C. Oil pressure - (refer to oil pressure table for specifications)

1. Vacuum modulator assembly - defective.
2. Vacuum modulator valve - sticking.
3. Restricted strainer or leak at intake pipe, or intake "O" ring.

4. Pump assembly - regulator or boost valve sticking.

#### D. Control valve assembly

1. Valve body gaskets - leaking, damaged, incorrectly installed. (Other malfunctions may also be indicated.)

2. Low Reverse ball check - missing from case (this will also cause no overrun braking in Lo Range).

3. 2-3 Valve train stuck open (this will also cause 1-3 upshift in Drive Range).

4. Reverse feed passage - missing (refer to Shop Manual for location); also check case passages.

#### E. Rear servo and accumulator

1. Servo piston seal ring, damaged or missing.
2. Short band apply pin (this may also cause no overrun braking or slips in overrun braking - Lo Range). Refer to Shop Manual for pin selection procedure.

#### F. Reverse or low band

1. Burnt, loose lining, apply pin or anchor pins not engaged, band broken.

#### G. Direct clutch

1. Outer seal damaged or missing.
2. Clutch plates burnt - may be caused by stuck ball check in piston.

#### H. Forward clutch

1. Clutch does not release (will also cause Drive in Neutral).

### VII. Slips in All Ranges, Slips on Start - (Install pressure gauge)

#### A. Oil level

B. Oil pressure (refer to oil pressure table for specifications).

1. Vacuum modulator defective.
2. Vacuum modulator valve sticking.

3. Strainer assembly - plugged or leaks at neck; "O" ring missing or damaged.

4. Pump assembly - regulator or boost valve sticking, cross leak.

5. Pump to case gasket damaged or incorrectly installed.

C. Case - cross leaks, porosity.

D. Forward and direct clutches slipping (if burnt, look for cause).

E. Lo sprag - assembled wrong, sprags turned over.

VIII. Slips 1-2 Shift - (Install pressure gauge)

A. Oil level incorrect (refer to Service Manual).

B. Oil pressure (refer to table for specifications).

1. Vacuum modulator assembly defective.

2. Modulator valve sticking.

3. Pump pressure regulator valve stuck.

C. Front accumulator

1. Oil ring damaged or missing.

D. Control valve assembly

1. 1-2 accumulator valve train (may be slip-bump).

2. Porosity in valve body or case.

E. Rear accumulator - oil ring missing or damaged, case bore damaged.

F. Pump to case gasket - mispositioned.

G. Case

1. Intermediate clutch plug - leaking excessively.

2. Porosity between channels.

H. Intermediate clutch

1. Lip seals missing or damaged; clutch plates burnt.

2. Case center support - leak in feed circuit (oil rings damaged or grooves defective, or excessive, leak between tower and bushing).

IX. Rough 1-2 Shift - (Install pressure gauge)

A. Oil pressure - (refer to oil pressure table for specifications).

1. Vacuum modulator - check for loose fittings, restrictions in line, modulator assembly defective.

2. Modulator valve stuck.

3. Pump - regulator or boost valve stuck.

4. Pump to case gasket - off location or damaged.

B. Control valve assembly

1. 1-2 accumulator valve train.

2. Valve body to case bolts loose.

3. Wrong gaskets or off location - damaged.

C. Case

1. Intermediate clutch ball missing or not sealing.

2. Porosity between channels.

D. Rear servo accumulator assembly

1. Oil rings damaged.

2. Piston stuck.

3. Broken or missing spring.

4. Bore damaged.

X. Slips 2-3 Shift - (Install pressure gauge)

A. Oil level

B. Oil pressure low - (refer to oil pressure tables for specifications).

1. Modulator assembly.

2. Modulator valve.

3. Pump pressure regulator valve or boost valve; pump to case gasket - off location.

C. Control valve assembly

1. Accumulator piston pin - leak at swedged end.

D. Case

1. Porosity.

E. Direct clutch

1. Piston seals leaking.

2. Case center support - oil seal rings damaged; excessive leak between tower and bushing.

XI. Rough 2-3 Shift - (Install pressure gauge)

A. Oil pressure - high (refer to oil pressure table for specifications).

1. Modulator assembly defective.

2. Modulator valve sticking.

3. Pump - pressure regulator or boost valve inoperative.

B. Front servo accumulator assembly

1. Front accumulator spring missing, broken.

2. Accumulator piston stuck.

XII. No Engine Braking - Intermediate Range - 2nd Gear

A. Front servo accumulator assembly

1. Servo or accumulator oil rings or bores leaking.

B. Front band

1. Front band broken, burnt, (check for cause); not engaged on anchor pin and/or servo pin.

XIII. No Engine Braking - Lo Range - 1st Gear

A. Control valve assembly

1. Lo-Reverse check ball missing from case.

B. Rear servo

1. Oil seal ring, bore or piston damaged; leaking apply pressure.

2. Rear band apply pin short, improperly assembled.

C. Rear band

1. Rear band - broken, burnt, (check for cause), not engaged on anchor pins or servo pin.

NOTE: Items A, B, C, will also cause slips in Reverse or no Reverse.

**XIV. No Part Throttle Downshifts**

A. Oil pressure - (refer to table for oil pressure specifications).

1. Vacuum modulator assembly, modulator valve, pump regulator, valve train. (Other malfunctions may also be noticed.)

B. Control Valve assembly

1. 3-2 Valve stuck, spring missing or broken.

**XV. No Detent Downshifts**

A. Detent switch - refer to paragraph 5.

1. Adjustment, connections, etc.

B. Solenoid

1. Inoperative, connections.

C. Control Valve assembly

1. Detent valve train.

**XVI. Low or High Shift Points - (Install pressure gauge)**

A. Oil pressure - (refer to table for oil pressure specifications).

1. Vacuum modulator assembly vacuum line connections at engine and transmission, modulator valve, pump pressure regulator train valve.

B. Governor

1. Valve sticking.

2. Feed holes restricted or leaking, pipes damaged or mispositioned.

C. Detent solenoid - stuck open, loose, etc. (Will cause late shifts.)

D. Control valve assembly

1. Detent valve train

2. 3-2 Valve train (detent upshifts possible).

3. 1-2 Shift valve train.

a. 1-2 Regulator valve stuck - (this would cause a constant 1-2 shift point regardless of throttle opening).

b. 1-2 Detent valve sticking open (will probably cause early 2-3).

4. Spacer plate gaskets - mispositioned, spacer plate orifice holes missing or blocked.

E. Case - porosity; intermediate plug leaking, missing.

**XVII. Won't Hold in Park**

A. Manual linkage - maladjusted.

B. Internal linkage

1. Parking brake lever and actuator assembly - defective. (Check for chamfer on actuator rod sleeve.)

2. Parking pawl broken or inoperative.

**XVIII. No Converter Stator Angle Change**

A. Stator switch inoperative or maladjusted.

B. Pump

1. Stator valve train stuck.

2. Lead wires not connected at outside or inside terminal, or grounded out, may be pinched.

3. Feed circuit to stator restricted or blocked (check feed hole in stator shaft).

4. Converter outer check valve broken or missing.

C. Turbine shaft

1. Oil seal ring defective, damaged, missing; shaft ring lands defective.

D. Case

1. Stator orifice plug missing or blocked.

E. Converter assembly-defective.

**XIX. Transmission Noisy**

A. Pump noise

1. Oil low or high; water in oil.

2. Cavitation due to plugged strainer, strainer "O" ring damaged, porosity in intake circuit.

3. Pump gears - driving gear assembled backwards, gears damaged or defective, crescent interference.

B. Gear Noise - first gear (Drive Range)

1. Planetary gear set.

C. Clutch noise-during application

1. Forward clutch - (Neutral to Drive, Park to Drive). Check clutch plates.

2. Intermediate clutch - (1-2 in L<sup>2</sup> & Dr. Range). Check clutch plates.

3. Direct clutch - (2-3 shift in L<sup>2</sup> & Dr. Range and in Neutral to Reverse, Park to Reverse). Check clutch plates.