

SECTION 7A1

DIAGNOSIS

CONTENTS

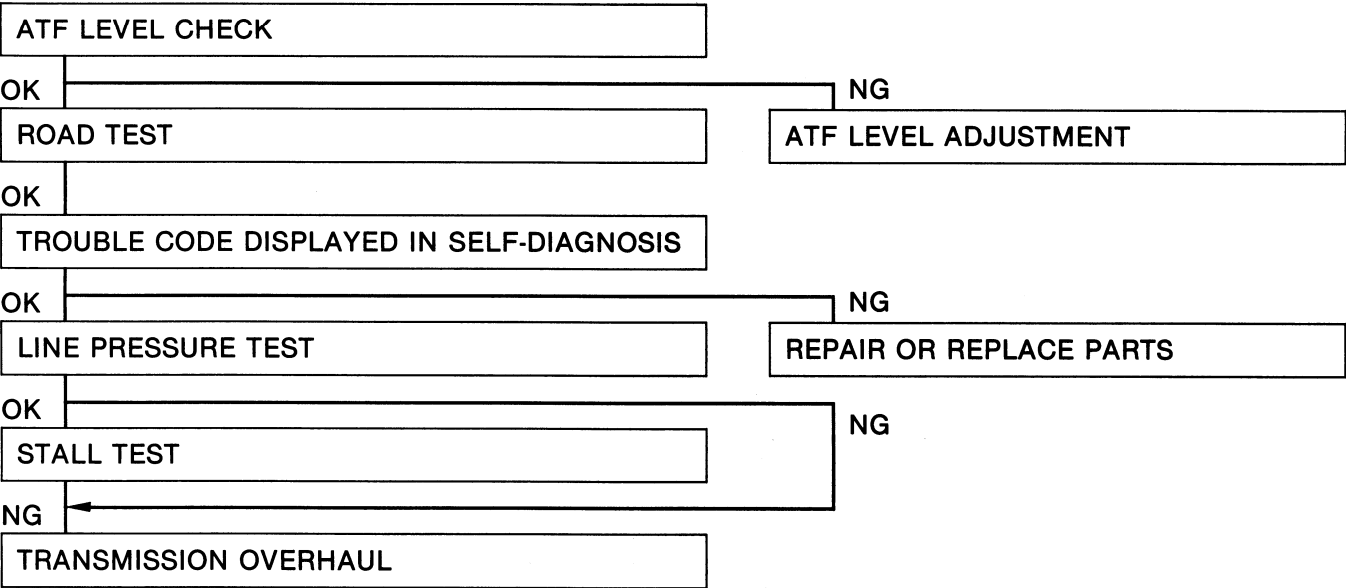
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DESCRIPTION

Transmission fluid pressure together with clutch and brake band friction and other important transmission functions are controlled by electrical signals from the microcomputer.

This system is quite complex. Random troubleshooting can produce inaccurate and misleading indications. It is important that the troubleshooting procedure be carried out systematically.

Carefully follow the sequence outlined below to diagnose the automatic transmission assembly.



CAUTION:

When the clutch appears to be slipping off in a road test, etc., or when the line pressure does not reach a preset value in a line pressure test, do not proceed to a stall test.

ROAD TEST

The road test should be performed by two people (one to drive and the other to note the required data) on a lightly travelled ordinary public road.

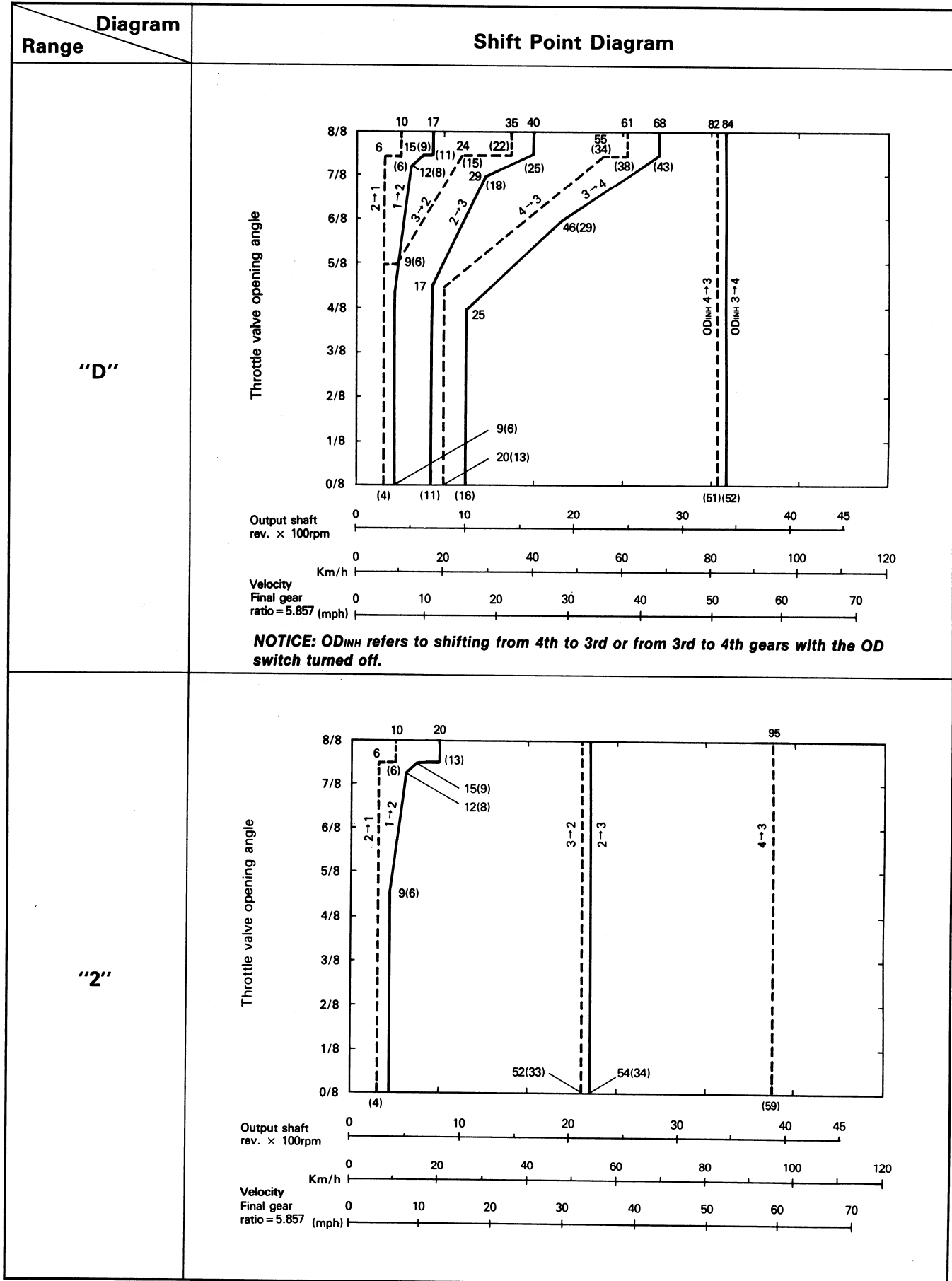
General Test Items

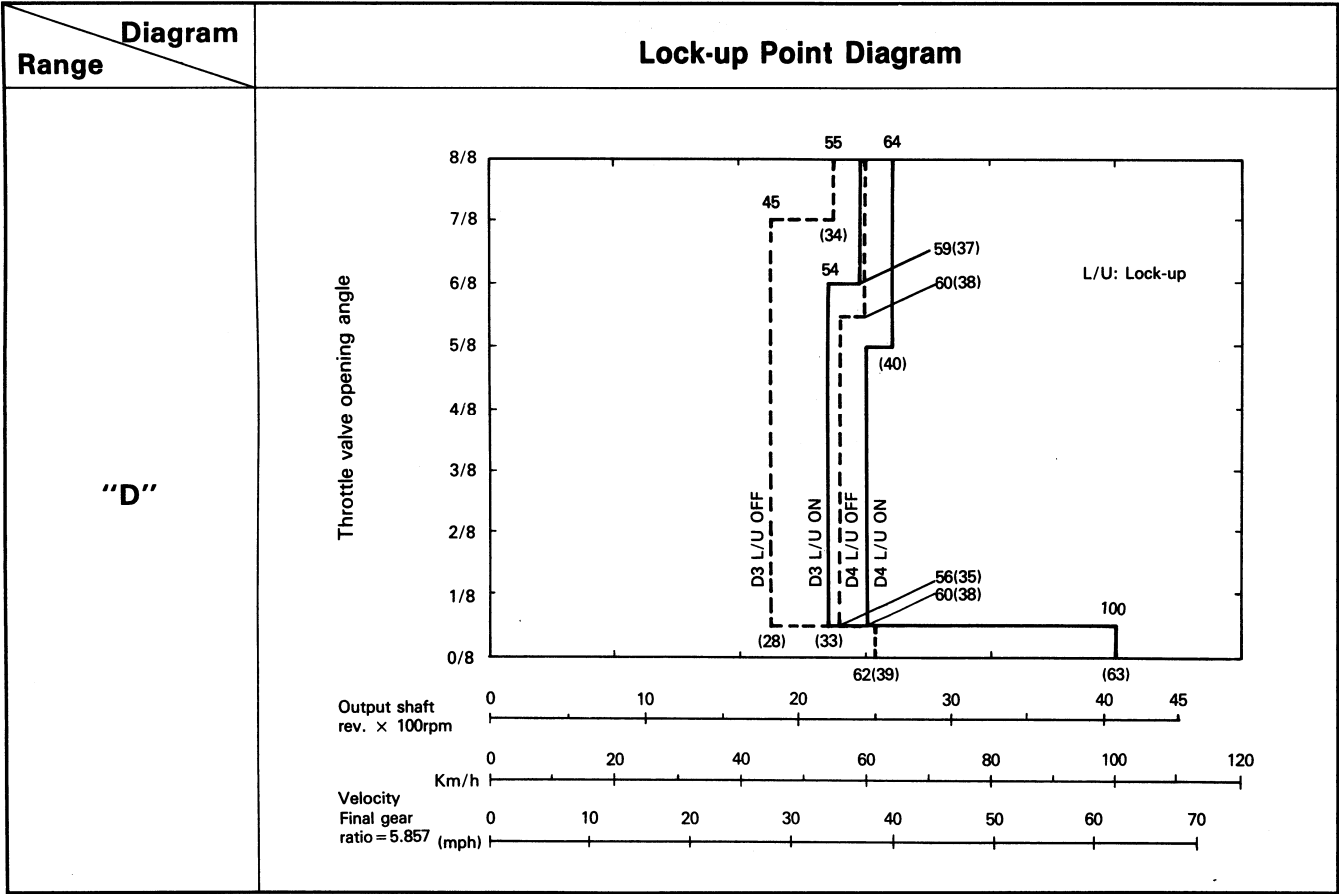
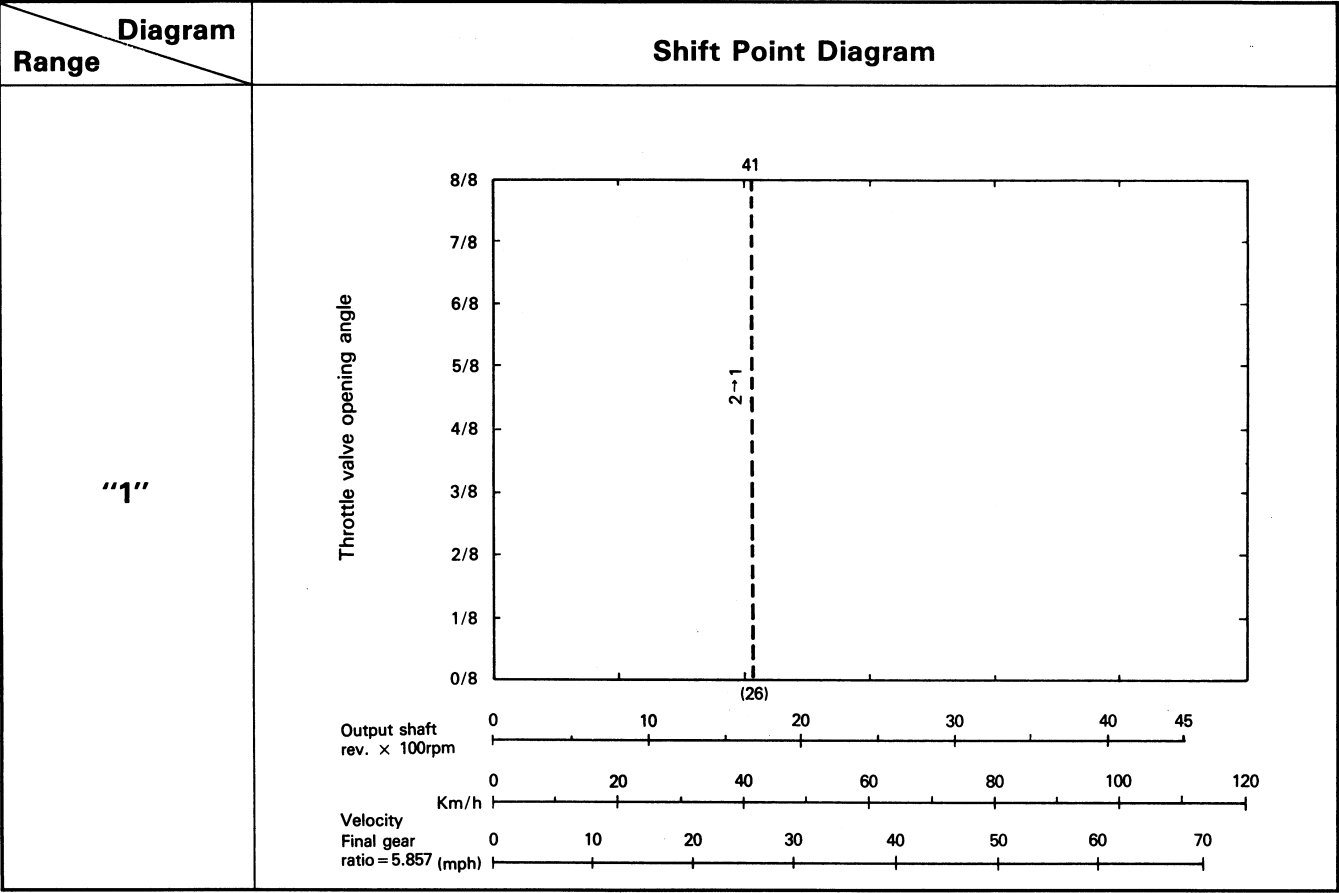
- 1. Compare the actual automatic shift speeds with the fixed shift schedule.
 - a. Perform the diagnosis procedures.
 - b. Note the actual shift up, shift down, and lock up speeds on the fixed shift schedule.
- 2. Check for shock or drag when the transmission shifts from one gear to another.
- 3. Check that the engine brake functions in the “2” and “1” ranges.
- 4. Check for abnormal noise or vibration.

After completing the road test, make the necessary adjustments and repairs to the automatic transmission and related parts.

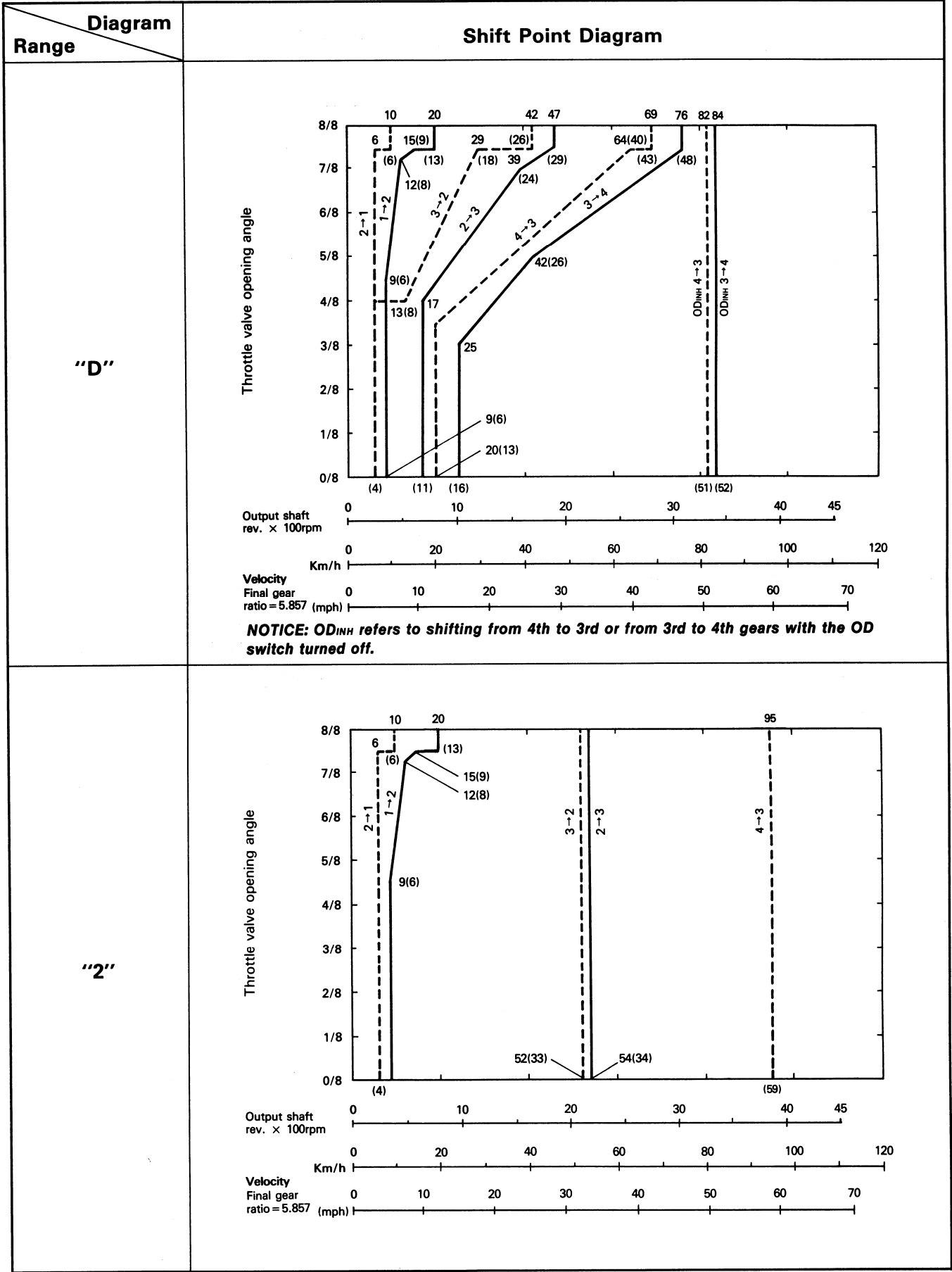
SHIFT POINT DIAGRAM AND LOCK-UP POINT DIAGRAM

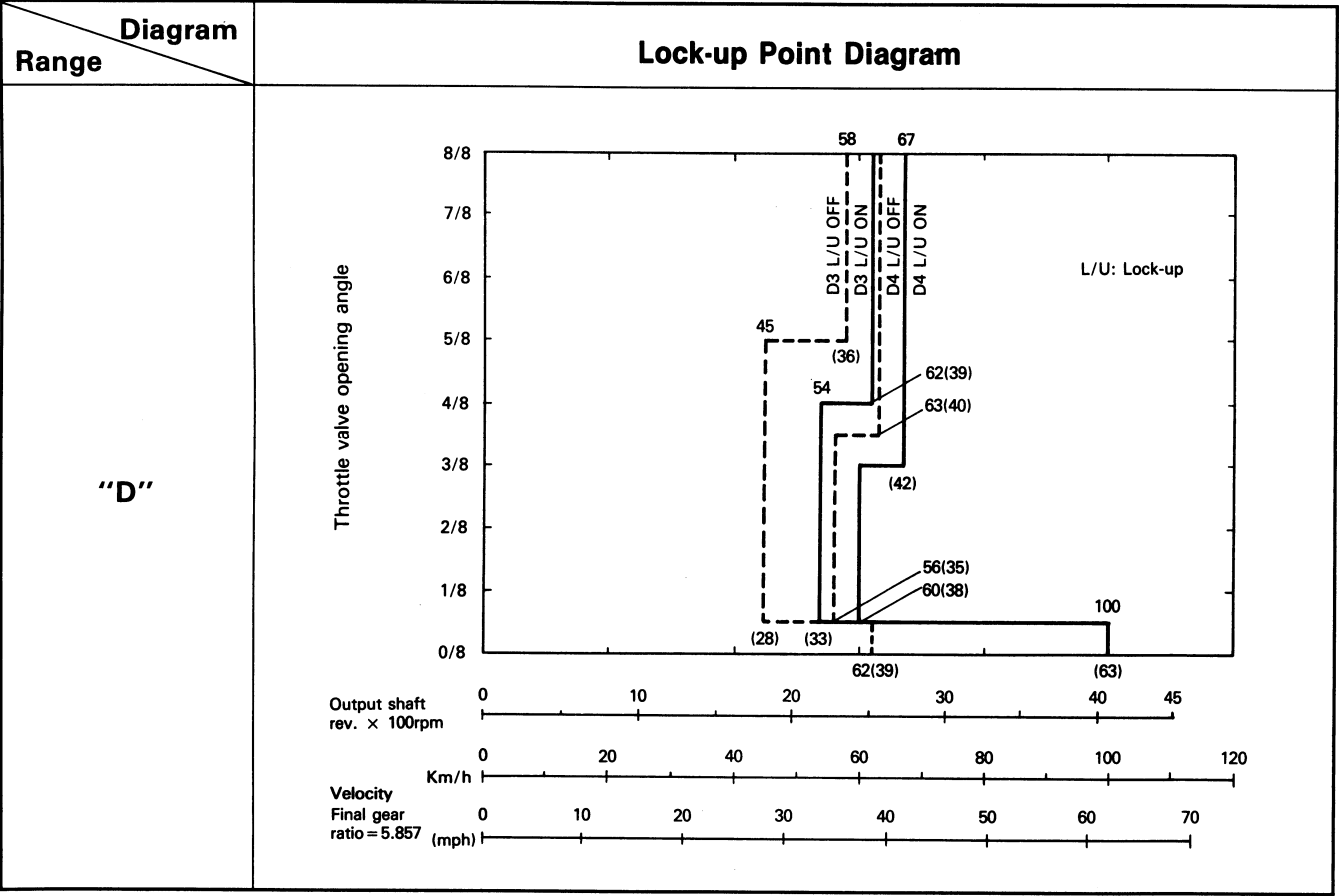
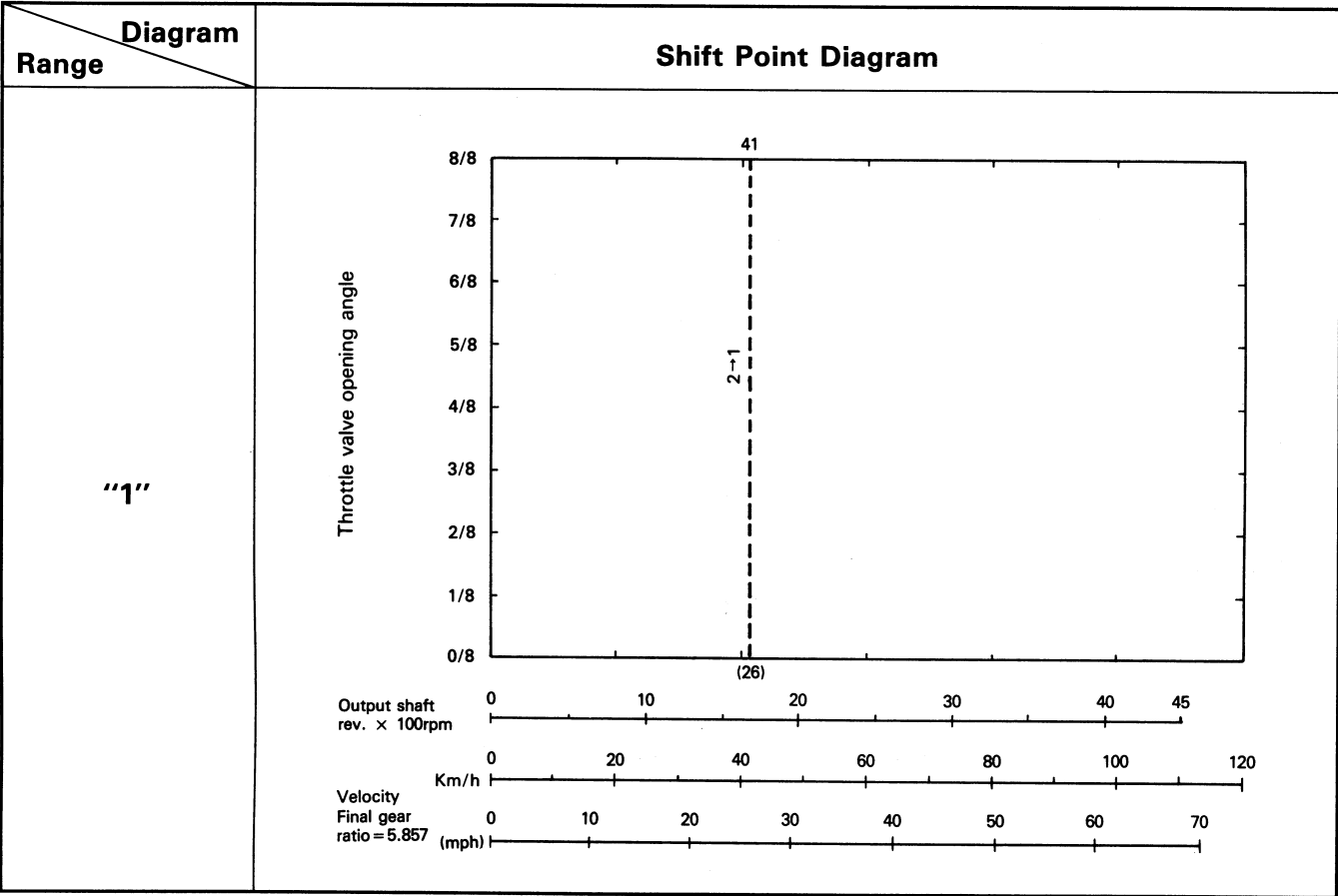
ECONOMY PATTERN





NORMAL PATTERN





VEHICLE CONDITION DIAGNOSIS

This section is divided into eleven sub-sections.

1. Abnormal gear change
2. Slippage
3. Excessive shock when changing gears
4. Abnormal braking
5. Lock-up device malfunction
6. Abnormal transmission noise
7. Abnormal creepage
8. Hard engine starting
9. Engine stalling
10. Vehicle movement
11. Overheating/white smoke/abnormal smell/low maximum speed/poor acceleration

Note: Numbers in the chart show the inspection sequence.

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Inspection Item	Vehicle Condition	On-Vehicle Inspection																
		ATF level and contamination	Control linkage	Inhibitor switch	Throttle sensor	Vehicle speed sensor	Engine revolution sensor	Engine idling speed	Line pressure	Shift solenoid A	Shift solenoid B	Line pressure solenoid	Lock-up solenoid	Overrun clutch solenoid	ATF thermosensor	Starter circuit	OD switch	Exhaust brake switch
			2	1		4				3					5		6	
	Does not upshift from 3rd to 4th when the selector is in the "D" range																	
	Shifts from 1st to 3rd (missing 2nd) when the selector is in the "D" range	1				2												
	All upshift points too high				1	4				5	6							2
	All downshift points too high				1	4												2
	Downshifts from 4th to a lower gear when the accelerator pedal is fully depressed with the vehicle speed exceeding the kick-down limit, causing engine overrunning				2	1				5	6							3
	2. SLIPPAGE																	
	Slippage when upshifting from 1st to 2nd	1			2				5									3
	Slippage when upshifting from 2nd to 3rd	1			2				5									3
	Slippage when upshifting from 3rd to 4th	1			2				5									3
	Fully depressing the accelerator pedal causes the transmission to downshift from 4th to 3rd, but the engine races and slippage occurs	1			2				5			6						3
	Fully depressing the accelerator pedal causes the transmission to downshift from 4th to 2nd, but the engine races and slippage occurs	1			2				5	7		6						3

7A1-10 DIAGNOSIS

Note: Numbers in the chart show the inspection sequence.

[illegible]

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Inspection Item	Vehicle Condition	On-Vehicle Inspection																			
		Economy drive switch	Kick-down switch	Idle switch	Exhaust brake switch	OD switch	Starter circuit	ATF thermosensor	Overrun clutch solenoid	Lock-up solenoid	Line pressure solenoid	Shift solenoid B	Shift solenoid A	Line pressure	Engine idling speed	Engine revolution sensor	Vehicle speed sensor	Throttle sensor	Inhibitor switch	Control linkage	ATF level and contamination
8. ENGINE STARTING PROBLEM							1														
	Engine will not start in either the "P" range or the "N" range																		3	2	
	Engine starts in one of the drive ranges																	2	1	1	
	Vehicle moves when shifting with the selector in the "N" range																				
9. ENGINE STALL																					
	Engine stalls when vehicle stopped with foot brake																			1	
	Engine stalls when the selector is moved from the "N" or "P" range to one of the drive ranges									2				1							
10. VEHICLE MOVEMENT																					
	Vehicle will not move when the selector is in the "D" range (Vehicle moves in other drive ranges)																		1		
	Vehicle will not move in either the "D" range or the "2" range (Vehicle moves in other drive ranges)										3			2							1
	Severe slippage and poor acceleration in either the "D" range or the "2" range (No problem in other drive ranges)										3			2							
	Vehicle will not move in the "R" range (Vehicle moves in other drive ranges)										3			2						1	
	Severe slippage in the "R" range (No problem in other drive ranges)										2			1							

Note: Numbers in the chart show the inspection sequence.

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Inspection Item Vehicle Condition	Unit Inspection													
	Torque converter	Oil pump	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrun clutch	Low one-way clutch	Low and reverse brake	Brake band (include servo)	Parking linkage	Valve body assembly	Accumulator (N-D)	Accumulator (1-2)
1. ABNORMAL GEAR CHANGE														
Does not downshift from 4th to 3rd							3	2				1		
Dose not downshift from 4th to 2nd				2						3		1		
Does not downshift from 3rd to 2nd				2						3		1		
Does not downshift from 3rd to 1st				3				2		4		1		
Does not downshift from 2nd to 1st				3				2		4		1		
Does not downshift from 4th to a lower gear when the accelerator pedal is fully depressed and the vehicle speed is not exceeding the kick-down range limit														
Does not downshift from 3rd to 2nd when the selector is moved from the "D" range to the "2" range							3			2		1		
Upshifts from 2nd to 3rd when the selector is in the "2" range														
Upshifts from 1st to 2nd when the selector is in the "1" range														
Does not downshift from 2nd to 1st when the selector is moved from the "2" range to the "1" range							2	3				1		
Does not upshift from 1st to 2nd when the selector is in the "D" range										2		1		
Does not upshift from 2nd to 3rd when the selector is in the "D" range				3						2		1		

Note: Numbers in the chart show the inspection sequence.

Inspection Item	Unit Inspection														
	Torque converter	Oil pump	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrun clutch	Low one-way clutch	Low and reverse brake	Brake band (include servo)	Parking linkage	Valve body assembly	Accumulator (N-D)	Accumulator (1-2)	Accumulator (2-3)
Does not upshift from 3rd to 4th when the selector is in the "D" range										1					
Shifts from 1st to 3rd (missing 2nd) when the selector is in the "D" range										2			1		
All upshift points too high															
All downshift points too high															
Downshifts from 4th to a lower gear when the accelerator pedal is fully depressed with the vehicle speed exceeding the kick-down limit, causing engine overrunning															
2. SLIPPAGE															
Slippage when upshifting from 1st to 2nd										3		2	1		
Slippage when upshifting from 2nd to 3rd				3						4		2		1	
Slippage when upshifting from 3rd to 4th				3						4		2			1
Fully depressing the accelerator pedal causes the transmission to downshift from 4th to 3rd, but the engine races and slippage occurs				2	3							1			
Fully depressing the accelerator pedal causes the transmission to downshift from 4th to 2nd, but the engine races and slippage occurs					3					2		1			

Note: Numbers in the chart show the inspection sequence.

Inspection Item	Vehicle Condition	Unit Inspection															
		Torque converter	Oil pump	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrun clutch	Low one-way clutch	Low and reverse brake	Brake band (include servo)	Parking linkage	Valve body assembly	Accumulator (N-D)	Accumulator (1-2)	Accumulator (2-3)	Accumulator (3-4)
	Fully depressing the accelerator pedal causes the transmission to downshift from 3rd to 2nd, but the engine races and slippage occurs				5	4				3		1			2		
	Fully depressing the accelerator pedal causes the transmission to downshift from 4th or 3rd to 1st, but the engine races and slippage occurs					2	3		4			1					
	Slippage felt during initial acceleration	7	6	4		3				5		1	2				
3. EXCESSIVE SHOCK WHEN CHANGING GEARS																	
	Excessive shock when upshifting from 2nd to 3rd with the selector in the "D" range				3						4	2			1		
	Excessive shock when upshifting from 3rd to 4th with the selector in the "D" range							3			4	2			1		
	Excessive shock when the selector is moved to the "1" range from the "2" range or the "D" range									2		1					
	Excessive shock when the selector is moved from the "N" range to the "D" range											2	1				
	Shock is felt when the accelerator pedal is released and the vehicle begins to slow down											1					
	Excessive shock when upshifting from 1st to 2nd with the selector in the "D" range											2		1			
4. ABNORMAL BRAKING																	
	Brake functions when upshifting from 1st to 2nd in the "D" range			1	3												

Note: Numbers in the chart show the inspection sequence.

Inspection Item	Vehicle Condition	Unit Inspection															
		Torque converter	Oil pump	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrun clutch	Low one-way clutch	Low and reverse brake	Brake band (include servo)	Parking linkage	Valve body assembly	Accumulator (N-D)	Accumulator (1-2)	Accumulator (2-3)	Accumulator (3-4)
	Brake functions when upshifting from 2nd to 3rd in the "D" range									1							
	Brake functions when upshifting from 3rd to 4th in the "D" range			3		2	1										
	Engine brake does not function with the selector in the "1"						2		3			1					
	Brake functions abruptly when the selector is moved to the "R" range from the "N" range or the "P" range				2	4	5			3		1					
	5. LOCK-UP DEVICE MALFUNCTION																
	Lock-up device does not function	2										1					
	Lock-up piston slippage	2										1					
	Lock-up point too high or too low											1					
	Excessive lock-up shock	2										1					
	6. ABNORMAL TRANSMISSION NOISE																
	Noisy at idling when vehicle is stationary	2	1														
	Transmission noisy in all drive ranges	1															
	7. ABNORMAL CREEPAGE																
	Excessive creepage																
	No. creepage	4	3			2										1	

Note: Numbers in the chart show the inspection sequence.

Inspection Item	Unit Inspection														
	Torque converter	Oil pump	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrun clutch	Low one-way clutch	Low and reverse brake	Brake band (include servo)	Parking linkage	Valve body assembly	Accumulator (N-D)	Accumulator (1-2)	Accumulator (2-3)
Vehicle Condition	8. ENGINE STARTING PROBLEM														
	Engine will not start in either the "P" range or the "N" range														
	Engine starts in one of the drive ranges														
	Vehicle moves when shifting with the selector in the "N" range		2		1		3								
	9. ENGINE STALL														
	Engine stalls when vehicle stopped with foot brake														
	Engine stalls when the selector is moved from the "N" or "P" range to one of the drive ranges	2										1			
	10. VEHICLE MOVEMENT														
	Vehicle will not move when the selector is in the "D" range (Vehicle moves in other drive ranges)														
	Vehicle will not move in either the "D" range or the "2" range (Vehicle moves in other drive ranges)							1							
	Severe slippage and poor acceleration in either the "D" range or the "2" range (No problem in other drive ranges)							1							
	Vehicle will not move in the "R" range (Vehicle moves in other drive ranges)		2	3	4		5		6			1			
	Severe slippage in the "R" range (No problem in other drive ranges)		2	3	4		5		6			1			

Note: Numbers in the chart show the inspection sequence.

Inspection Item	Vehicle Condition	Unit Inspection															
		Torque converter	Oil pump	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrun clutch	Low one-way clutch	Low and reverse brake	Brake band (include servo)	Parking linkage	Valve body assembly	Accumulator (N-D)	Accumulator (1-2)	Accumulator (2-3)	Accumulator (3-4)
	Vehicle will not move in any of the drive ranges	5	1		2					4	3	6					
	Vehicle moves when the selector lever is in the "P" range											1					
	Parking gear does not release when the selector lever is moves from the "P" range											1					
	11. OVERHEATING/WHITE SMOKE/ABNORMAL SMELL/LOW MAXIMUM SPEED/POOR ACCELERATION																
	A/T unit overheating	9	2	3	4	6		7		8	5		1				
Transmission fluid escaping from breather pipe during vehicle operation				1	2	4		5		6	3						
Abnormal smell from fluid charge pipe		1	2	3	4	6		7		8	5						
Low maximum speed and/or poor acceleration		7	6	2	3					5	4		1				

SELF DIAGNOSIS

SELF DIAGNOSIS PROCEDURE

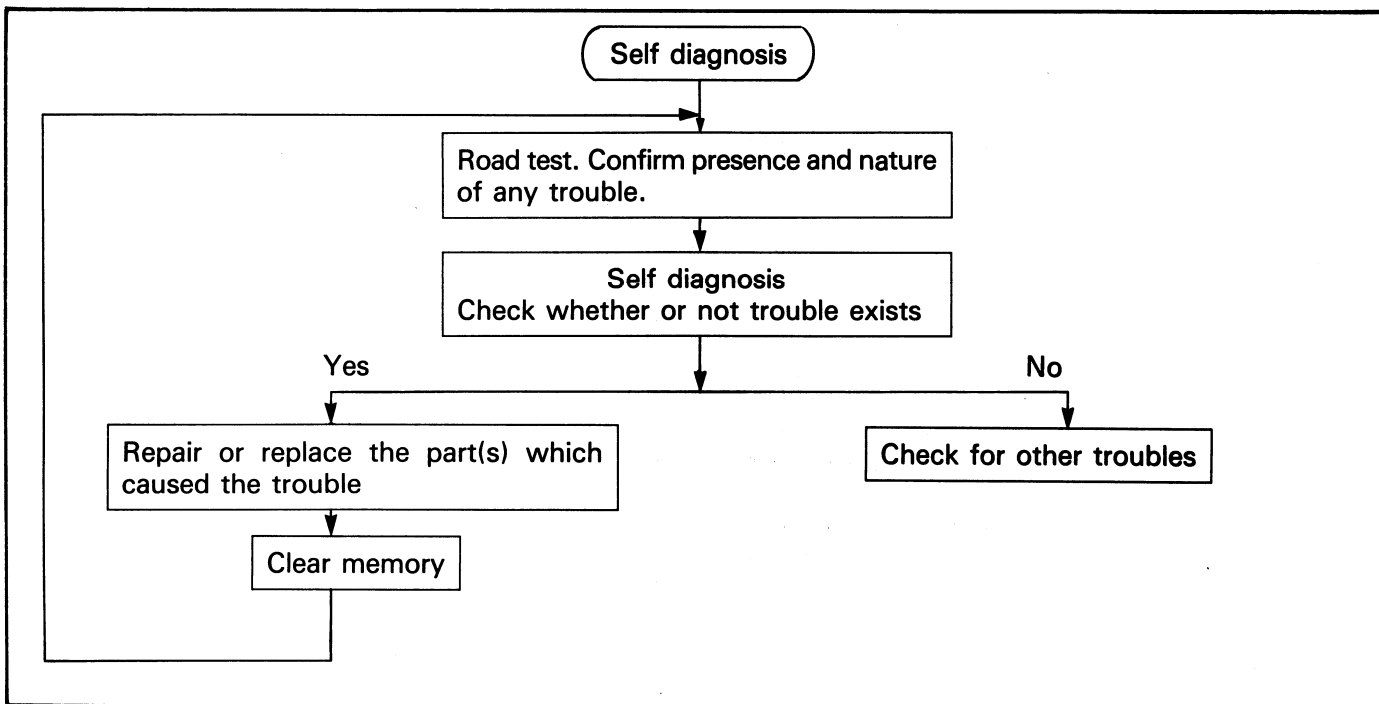


Figure 1. Self diagnosis procedure

SELF DIAGNOSIS INFORMATION

The ATCU of this system has the function of self diagnosis. If any trouble occurs in this system, the economy drive indicator light functions to inform operator of possible troubles related to the following 10 components.

- (1) Vehicle speed sensor-1
(Installed on the A/T)
- (2) Vehicle speed sensor-2
(Built in the speedometer)
- (3) Throttle sensor
- (4) Shift solenoid A
- (5) Shift solenoid B
- (6) Overrun clutch solenoid
- (7) Lock-up solenoid
- (8) ATF thermosensor or battery back-up voltage
- (9) Engine revolution sensor
- (10) Line pressure solenoid

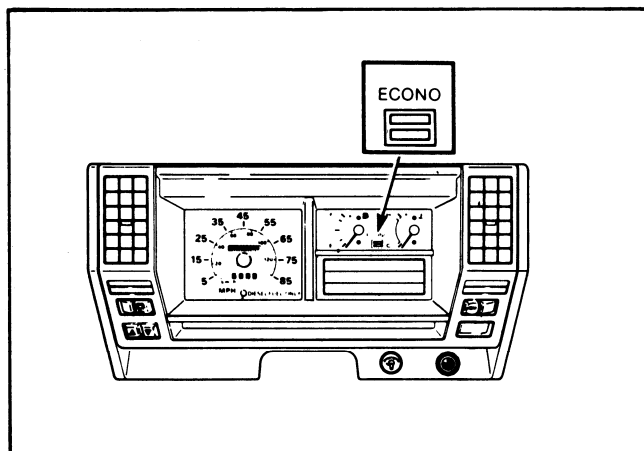


Figure 2. Economy Drive Indicator Light

1989 AND 1990 MODEL

When the key switch is turned to "ON" position (figure 3).

- a) If no trouble occurs in the system,
1) the economy drive indicator light comes on for 2 seconds, and then goes off.

(When the economy drive switch is in "NORMAL" position.)

- 2) The economy drive indicator light comes on continuously.

(When the economy drive switch is in "ECONOMY" position.)

- b) If trouble occurs in this system, the economy drive indicator light will come on for 2 seconds and then blink on and off.

(With the economy drive switch in either "NORMAL" or "ECONOMY" position.)

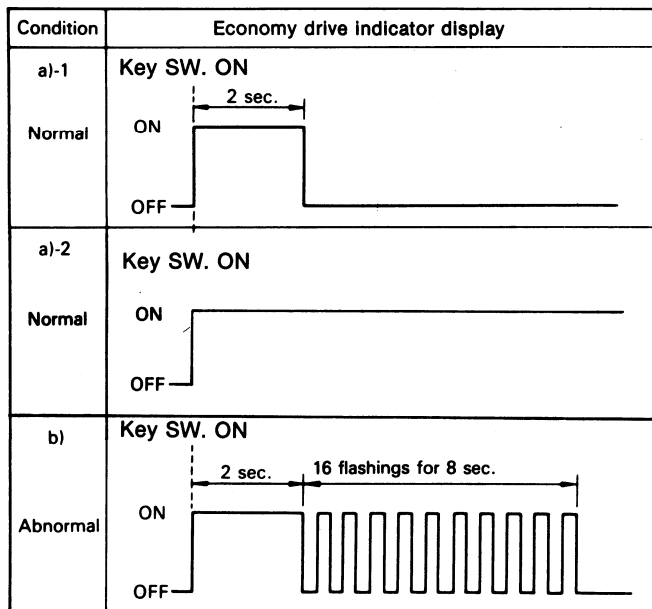


Figure 3. Indicator Light Display

If the indicator light flashes as the above (b) pattern, self diagnosis should be carried out to check which parts have the problem according to the following "Self diagnosis input steps" (figure 4).

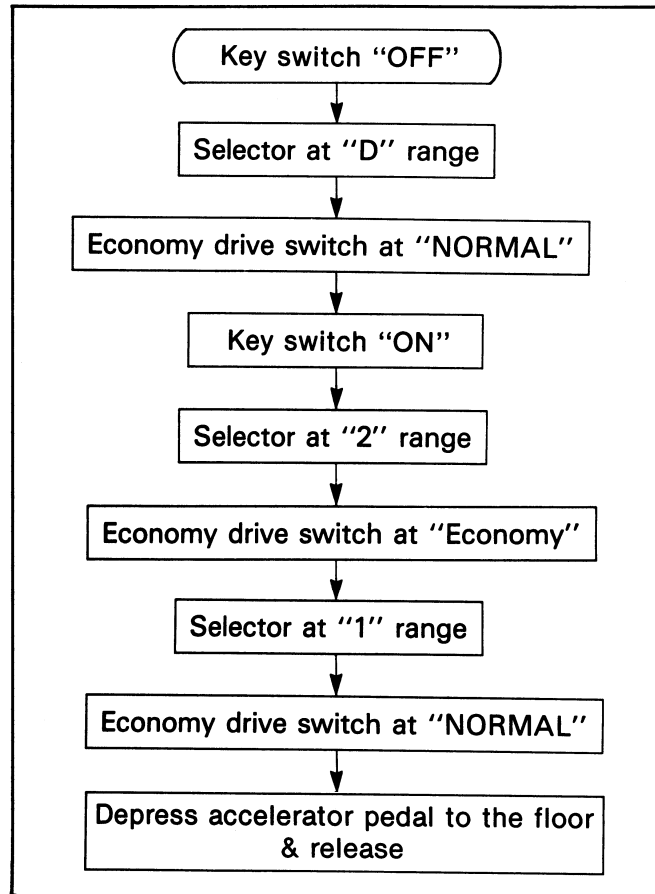
SELF DIAGNOSIS INPUT STEP

Figure 4. Self Diagnosis Input Step

7A1-22 DIAGNOSIS

When the previously “Self diagnosis input steps” procedure is completed, the indicator light flashes to inform which part has the problem.

In case the indicator light doesn’t start flashing, check the following items one by one.

CHECK ITEM	CONTENTS
1) Battery source voltage	—
2) Key switch	Operation and related wiring/connectors
3) Inhibitor switch	See page 7A2-7, 8/ Wiring diagram 8-118, 139
4) Economy drive switch	Operation and related wiring/connectors
5) Kick down switch	See page 7A2-5, 6/ Wiring diagram 8-118, 139
6) Idle switch	See page 7A2-3, 4/ Wiring diagram 8-118, 139

INDICATOR LIGHT FLASHING PATTERN

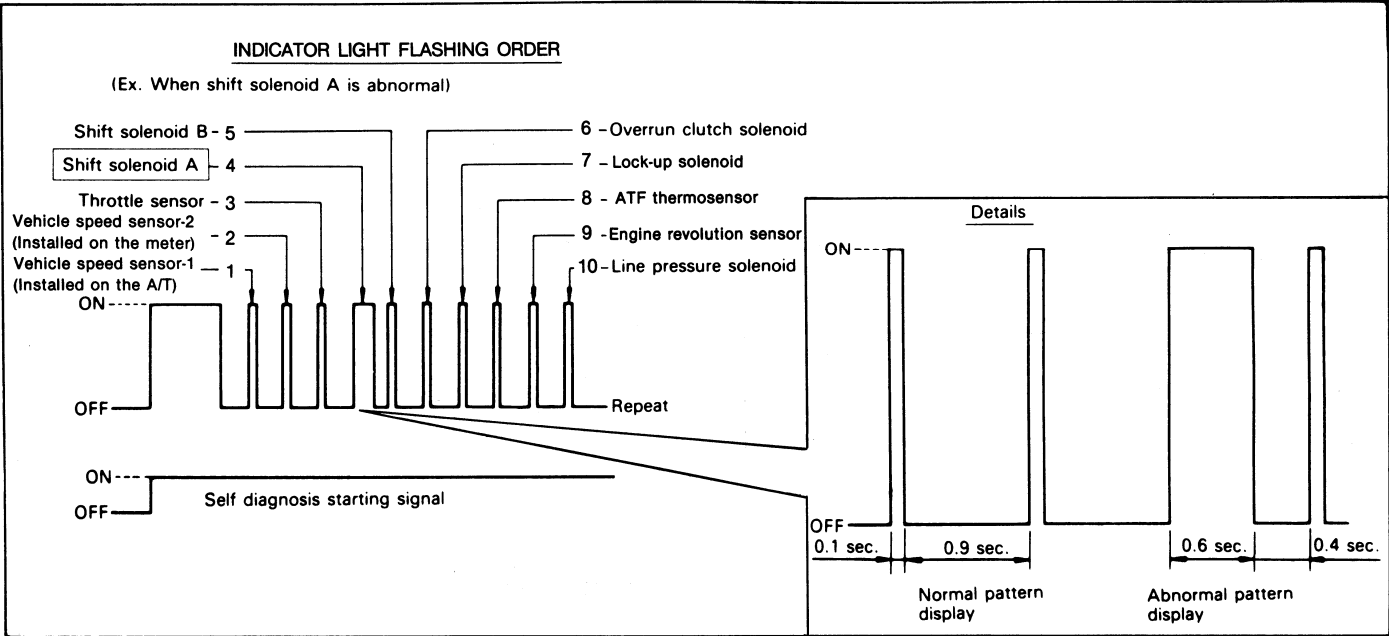


Figure 5. Indicator Light Flashing Order

After performing “Self diagnosis input steps”, the indicator light begins to flash for 2 seconds at first, and then indicates the status of each component, by the time difference in flashing of the light “ON” and “OFF”.

The above illustration shows, for example, the flashing pattern of which indicates some trouble with No. (4) shift solenoid A.

Normal operation — The light comes on for 1/10 of a second and goes off for 9/10 of a second.

Abnormal operation — The light comes on for 6/10 of a second and goes off for 4/10 of a second.

For flashing order and probable trouble, refer to the above illustration and the following table.

No.	Component	Probable Trouble
1	Vehicle speed sensor-1	Sensor installed to the A/T open circuit
2	Vehicle speed sensor-2	Sensor installed to the meter open circuit
3	Throttle sensor	Open or short circuit
4	Shift solenoid A	Open or short circuit
5	Shift solenoid B	
6	Overrun clutch solenoid	
7	Lock-up solenoid	
8	ATF thermosensor	ATF thermosensor or battery power source open circuit
9	Engine-revolution sensor	Open circuit
10	Line pressure solenoid	Open or short circuit

1991 MODEL

INDICATION OF THE INDICATOR LIGHT WITH THE IGNITION KEY TURNED ON (USER MODE)

When the throttle sensor, vehicle speed sensor, solenoid, etc., starts to malfunction when the vehicle is running (the key switch turned on), the economy drive indicator light blinks to warn the driver (figure 6).

- The indicator begins to blink as soon as a problem occurs during driving, and keeps blinking until it is corrected.
- The trouble code registered in memory cannot be reset by turning the key switch off and on until self-diagnosis begins.

Condition	Economy drive indicator light display	
	Economy drive SW "Normal" position	Economy drive SW "Economy" position
Normal	Key SW ON ON OFF 2.0 sec.	Key SW ON ON OFF
Abnormal	Trouble occur ON OFF 3.2 0.4 0.4 0.4 (sec.) --- Constantly flashings	Trouble occur ON OFF 3.2 0.4 0.4 0.4 (sec.) --- Constantly flashings

Figure 6. Economy Drive Indicator Light Display

7A1-24 DIAGNOSIS

INDICATION OF THE INDICATOR LIGHT DURING SELF-DIAGNOSIS (DEALER MODE)

To help the mechanic locate the problem more easily, the indicator light blinks in different cycles. Each cycle represents one of the ten possible sources of problem.

INDICATION OF SELF-DIAGNOSTIC RESULTS

The trouble code registered in memory can be displayed by connecting diagnosis terminal of the harness connector of the ATCU. The harness connector is located at the same position as the ATCU (figure 7).

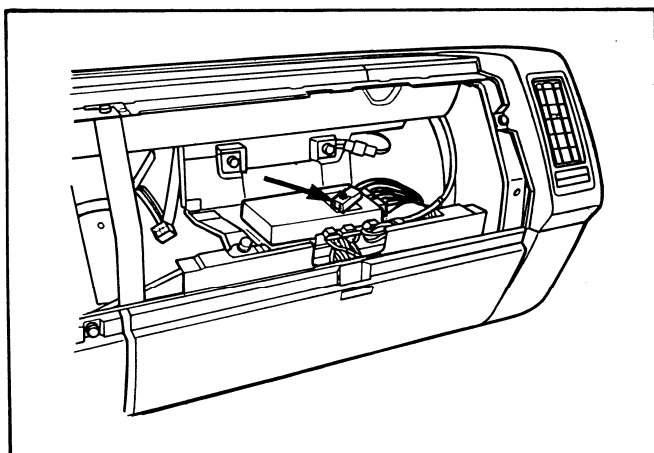


Figure 7. Diagnosis Terminal

- When no problem exists, the display flashes "1" repeatedly (figure 8-A).
- When a malfunction exists, the appropriate trouble code is displayed three times repeatedly (figure 8-B).
- When two or more trouble codes are registered, they are all displayed three times repeatedly, one at a time, starting with the lowest code number (figure 8-C).

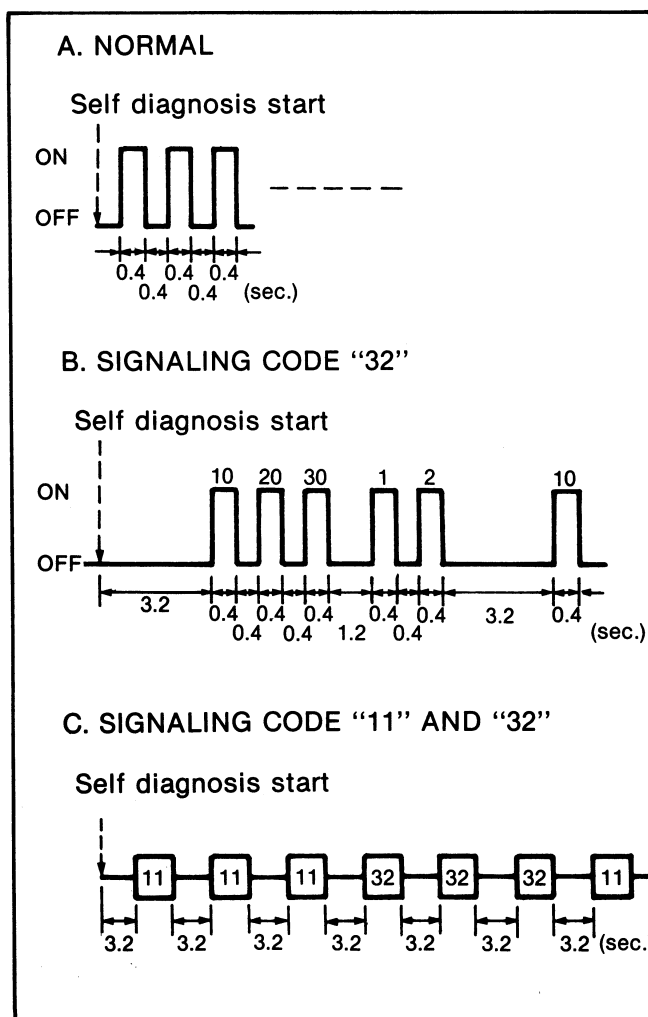


Figure 8. Self Diagnosis Display

DIAGNOSTIC CODES

CODE No.	DIAGNOSIS ITEM	DIAGNOSED CONTENT
11	Vehicle speed sensor "1"	Vehicle speed sensor 1 circuit open or shorted
24	Vehicle speed sensor "2"	Vehicle speed sensor 2 circuit open or shorted
13	Engine revolution sensor	Engine revolution sensor circuit open or shorted
15	ATF thermosensor or battery back-up voltage	ATF thermosensor or battery back-up voltage circuit open or shorted
21	Throttle sensor	Throttle sensor circuit open or shorted
31	Shift solenoid A	Solenoid circuit open or shorted
32	Shift solenoid B	
33	Over-run clutch solenoid	
34	Lock-up duty solenoid	
35	Line pressure duty solenoid	

CLEARING MEMORY

- 1) Clear the memory in ATCU by removing Fuse No. 11 or Battery — cable for about 10 seconds, after repairing. Otherwise, self diagnosis system continues to display the same trouble as before repairing (figure 9).
- 2) Perform the self diagnosis input steps, before road test.
The first flashing pattern after clearing the memory is rapid flashing ("ON" — 0.125 sec, "OFF" — 0.125 sec) (figure 10).
- 3) After the road test is completed, confirm the normal flashing pattern by performing self diagnosis input steps.

Note:

If the above short flashing pattern is displayed again, by the self diagnosis after the road test, check the circuit for Fuse No. 11.

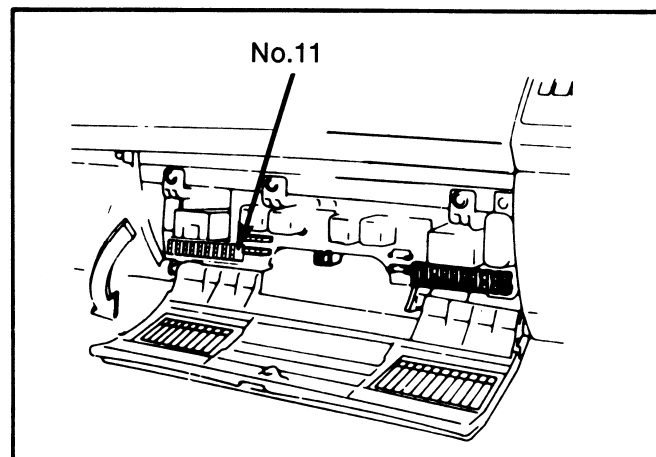


Figure 9. Clearing Memory

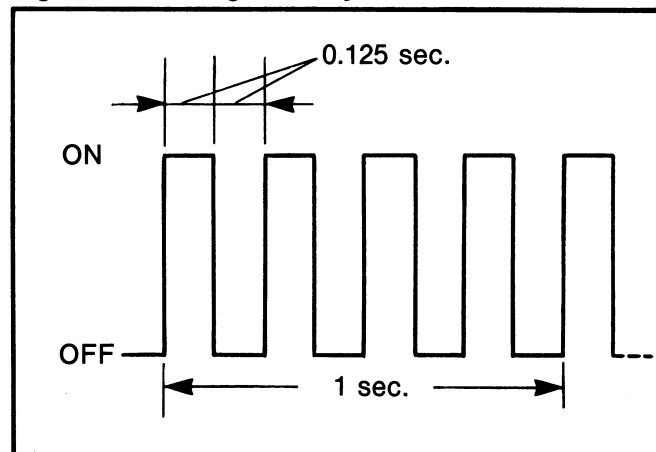
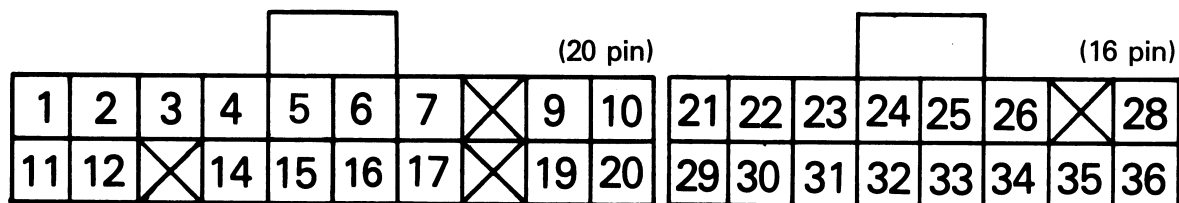


Figure 10. First Flashing Pattern After Clearing Memory

ATCU CONNECTOR PIN LAYOUT



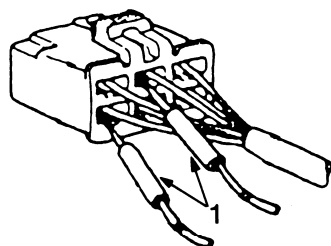
Pin No. Function

1. 2 range switch
2. 1 range switch
3. Exhaust brake signal
4. Idle switch
5. Diagnosis terminal
6. Overdrive switch
7. Kick-down switch
8. —
9. Economy drive switch
10. Throttle sensor voltage (5V out)
11. Throttle sensor
12. ATF Thermosensor
13. —
14. Idle switch voltage
15. Throttle sensor ground
16. Vehicle speed sensor 1
17. Full throttle switch
18. —

Pin No. Function

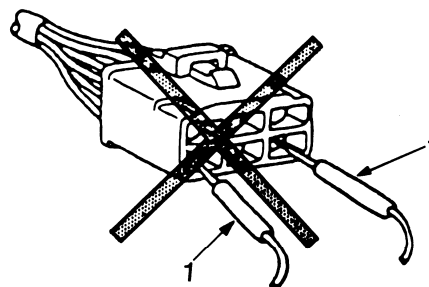
19. Neutral range switch
20. D range switch
21. Overrun clutch solenoid
22. Lock-up duty solenoid
23. Economy drive indicator
24. Vehicle speed sensor 2
25. Engine revolution sensor
26. Reverse range switch
27. —
28. Battery back-up voltage
29. Battery voltage
30. Battery voltage
31. Ground
32. Ground
33. Duty solenoid (Dropping register)
34. Duty solenoid (Line pressure)
35. Shift solenoid A
36. Shift solenoid B

Figure 8. ATCU Connector Pin Layout



1. Test Probe

Figure 9. Connector Inspection



1. Test Probe

Figure 10. Connector Inspection

Connector Inspection

Use circuit tester to check the connector for continuity. Insert the test probes (1) from the connector wire side (figure 9).

Caution:

Never insert the circuit tester test probes (1) into the connector open side to test the continuity (figure 10).

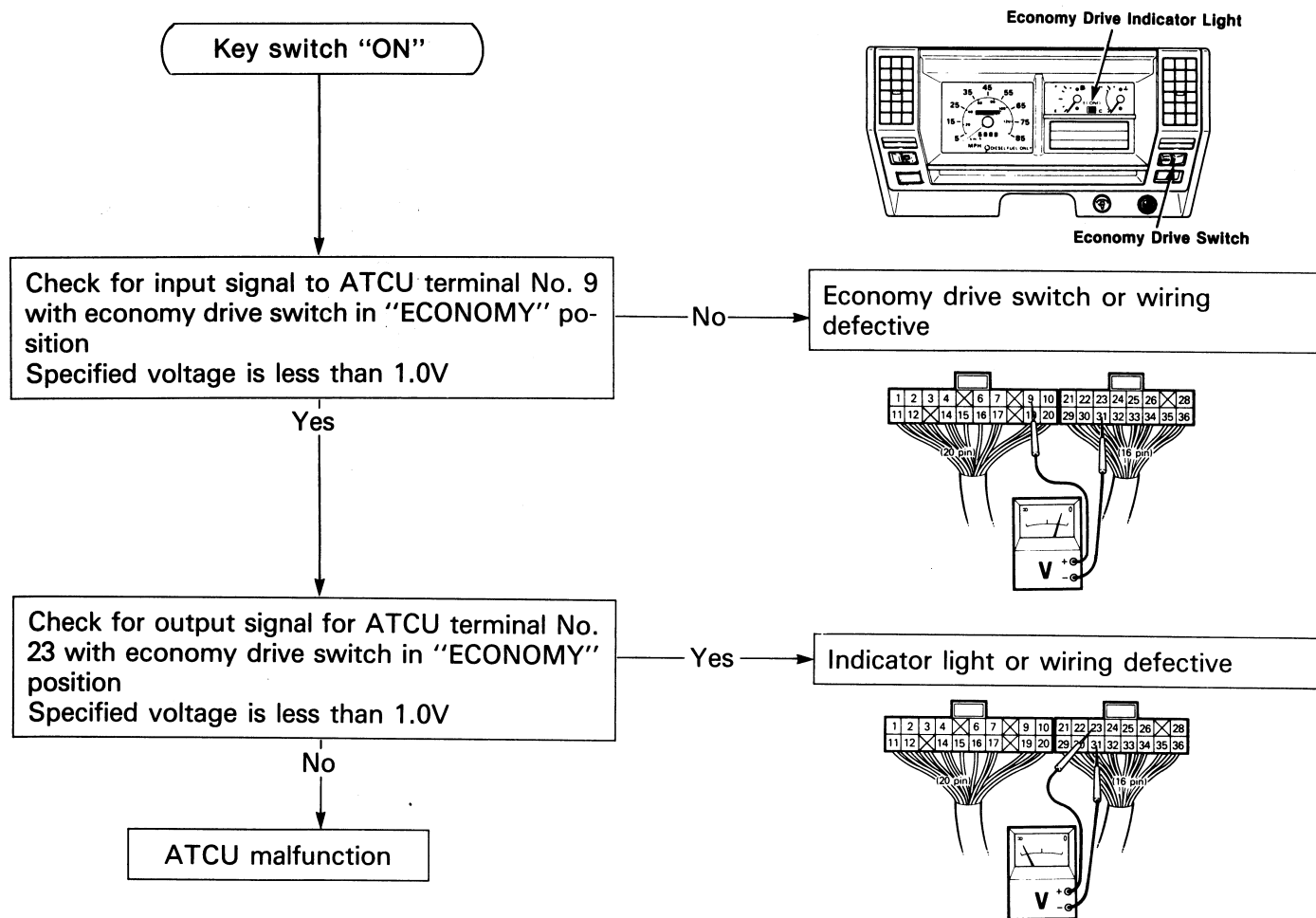
Broken or open connector terminals will result.

TROUBLESHOOTING

This section is divided into four-sections, in which the troubleshooting of the following phenomena is explained.

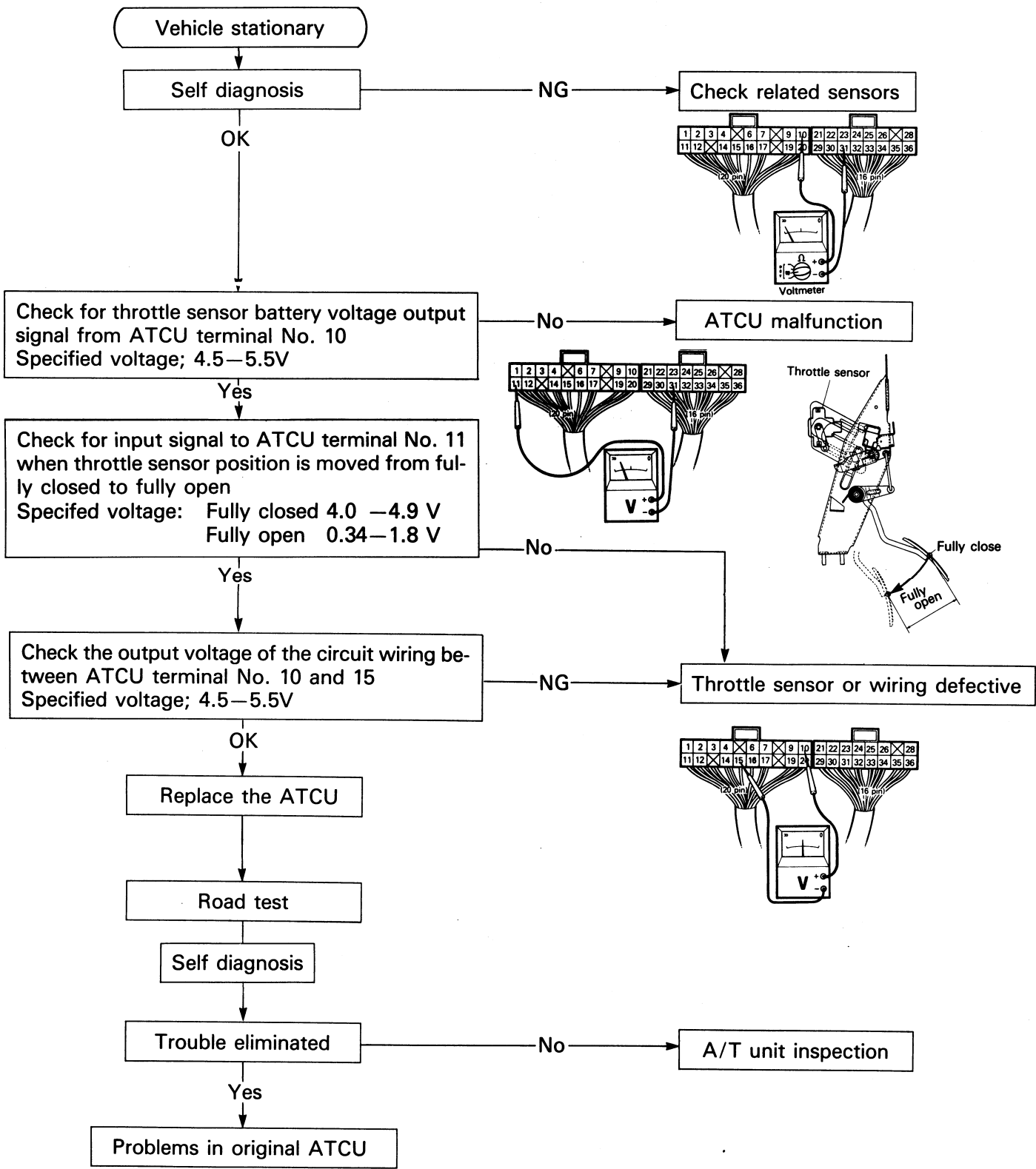
1. Economy drive indicator light does not light with the economy drive switch in the "ECONOMY" position.
2. Gear change control malfunction.
 - 1) Transmission does not downshift when the accelerator is quickly pressed to the floor in the "D" range.
 - 2) Transmission does not upshift during gradual acceleration in the "D" range.
3. Lock-up control malfunction (Lock-up does not occur at the specified vehicle speed)
4. Abnormal throttle signal (Input signal to ATCU No. 11)

1. Economy drive indicator light does not light with the economy drive switch in the "ECONOMY" position.

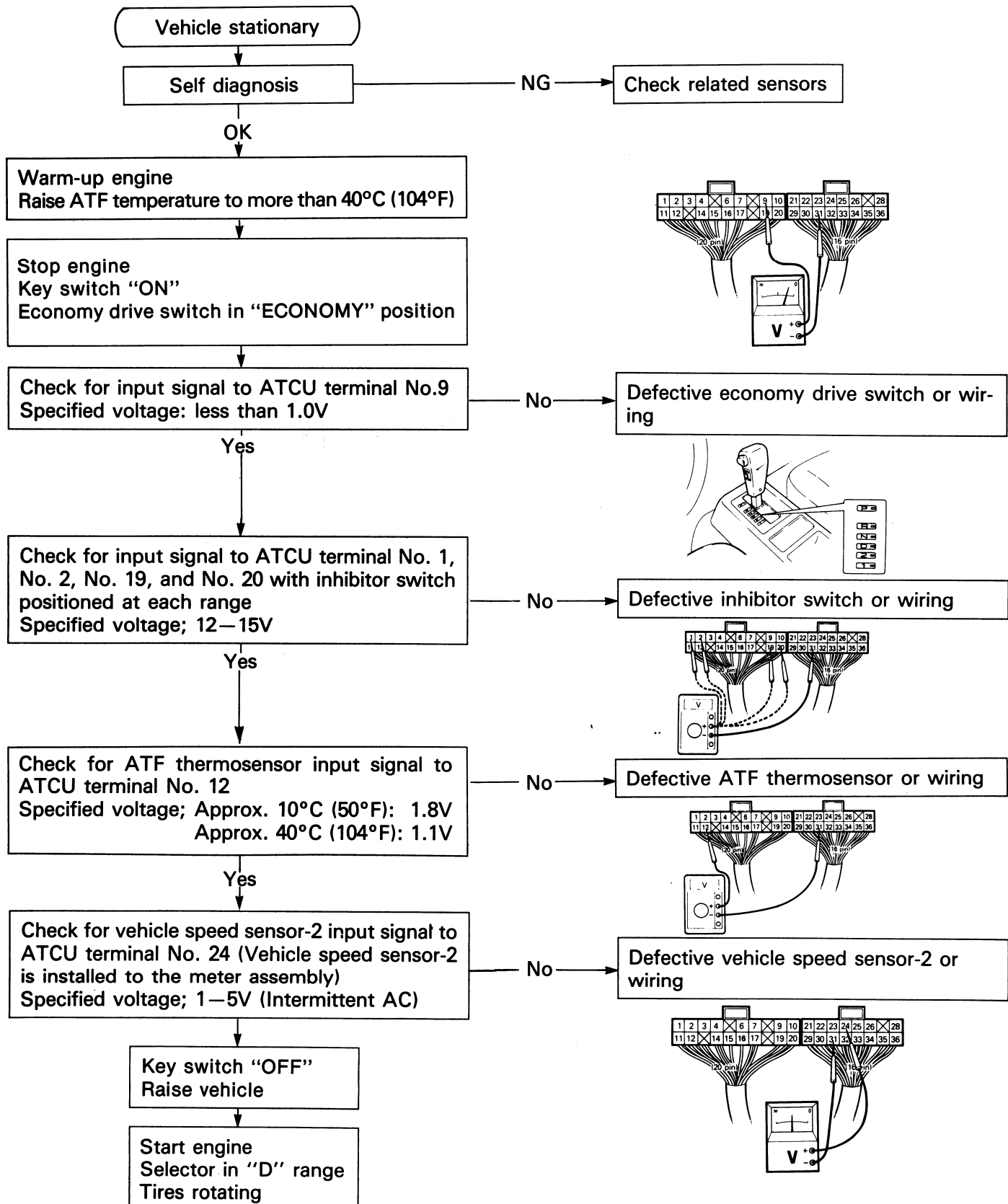


2. Gear change control malfunction

1) Transmission does not downshift when the accelerator is quickly pressed to the floor in the “D” range.

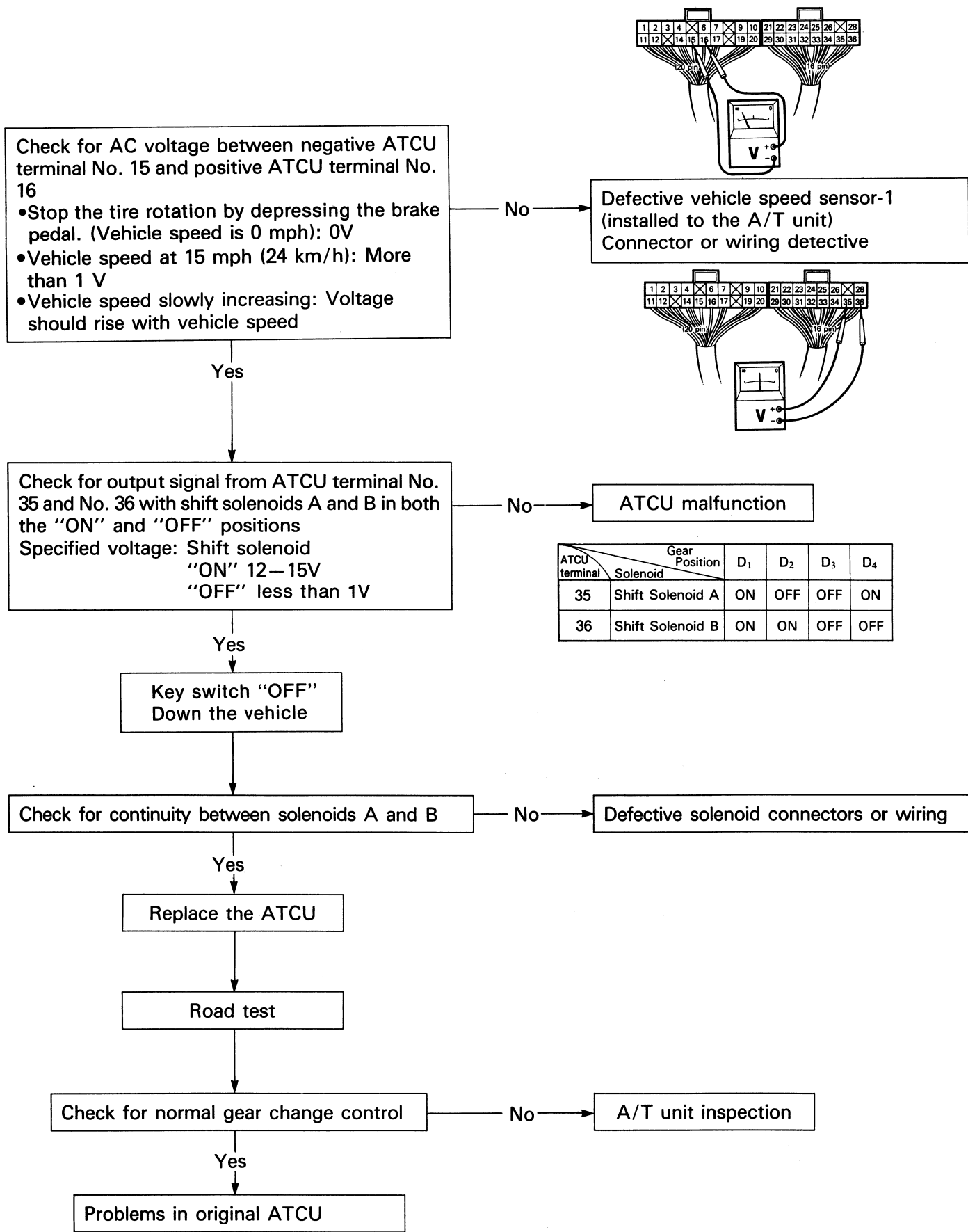


2) Transmission does not upshift during gradual acceleration in the "D" range.

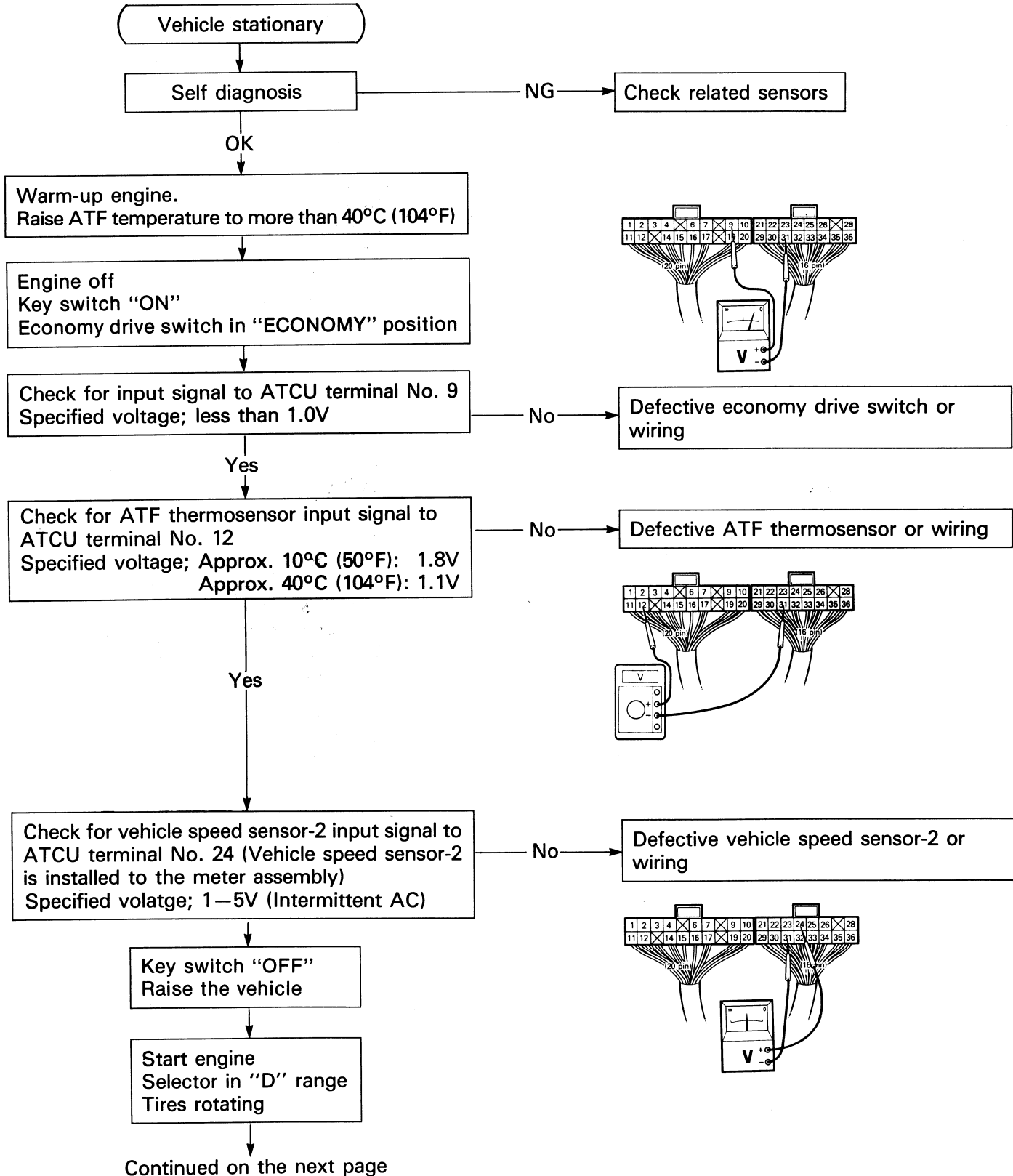


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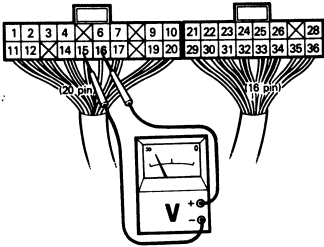
3. Lock-up control malfunction (Lock-up does not occur at the specified vehicle speed)



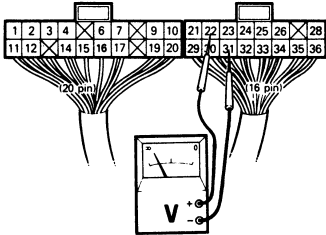
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Check for AC voltage between negative ATCU terminal No. 15 and positive ATCU terminal No. 16

- Stop the tire rotation by depressing the brake pedal. (Vehicle speed is 0 mph): 0V
- Vehicle speed at 15 mph (24 km/h): More than 1 V
- Vehicle speed slowly increasing: Voltage should rise with vehicle speed



No → Defective vehicle speed sensor-1 (installed to the A/T unit) or wiring



Yes → Check for output signal from ATCU terminal No. 22 with lock-up solenoid in "ON" position
Specified voltage; 8—15V

No → ATCU malfunction

Yes → Starter switch "OFF"
Down the vehicle

Check lock-up solenoid, connector, and wiring continuity

No → Defective lock-up solenoid, connectors or wiring

Yes → Replace the ATCU

Road test

Check for normal lock-up speed

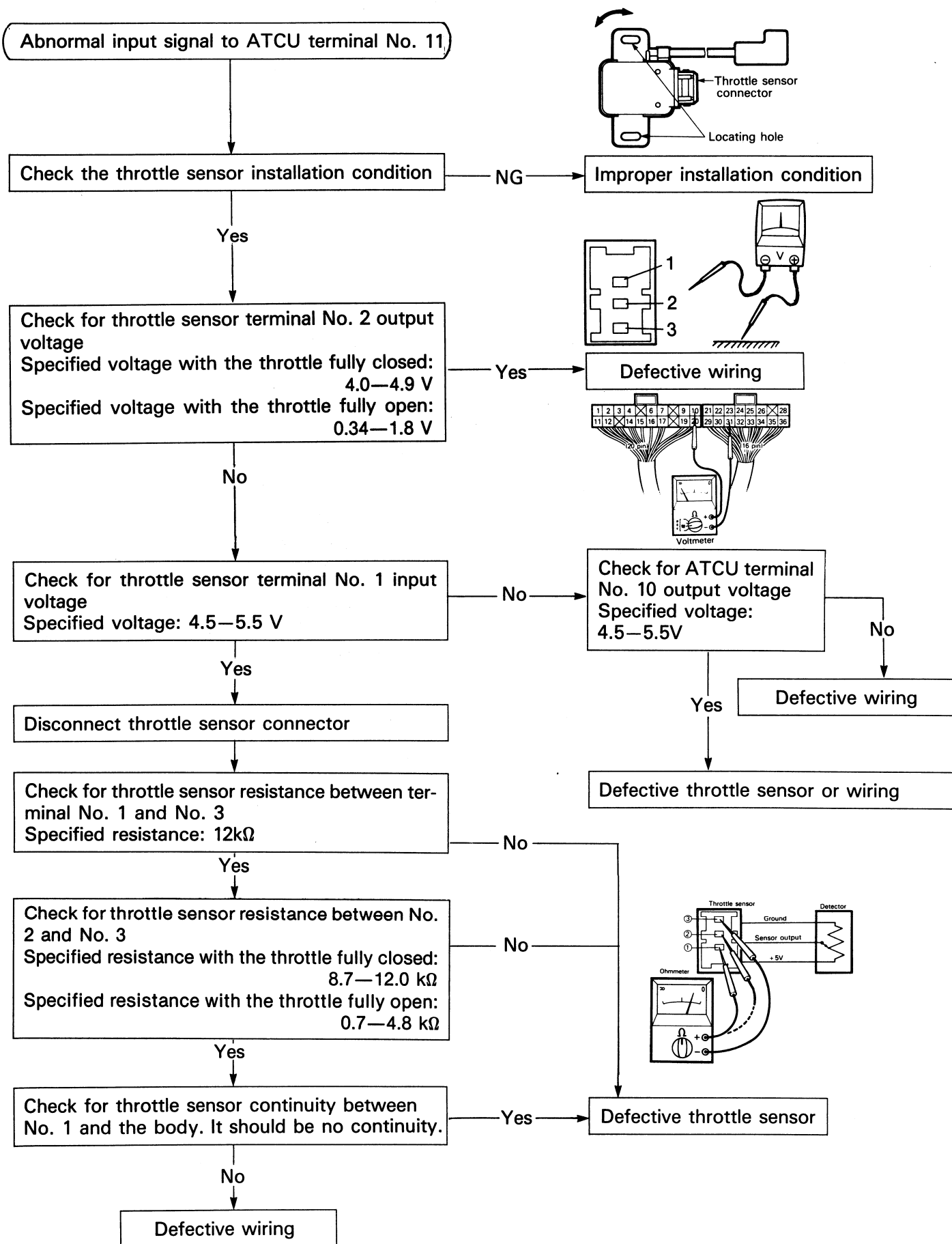
No → A/T unit inspection

Yes → Problems in original ATCU

Note:

- Selector in "D" range.
- If the vehicle speed is more than about 37mph (59km/h) — 1/2 throttle, lock-up solenoid should be "ON" position.
- Refer to LOCK-UP POINT DIAGRAM in detail (see page 7A1-4, 7A1-6).

4. Abnormal throttle signal (Input signal to ATCU terminal No. 11)



CONTROL SIGNAL
INSPECTION

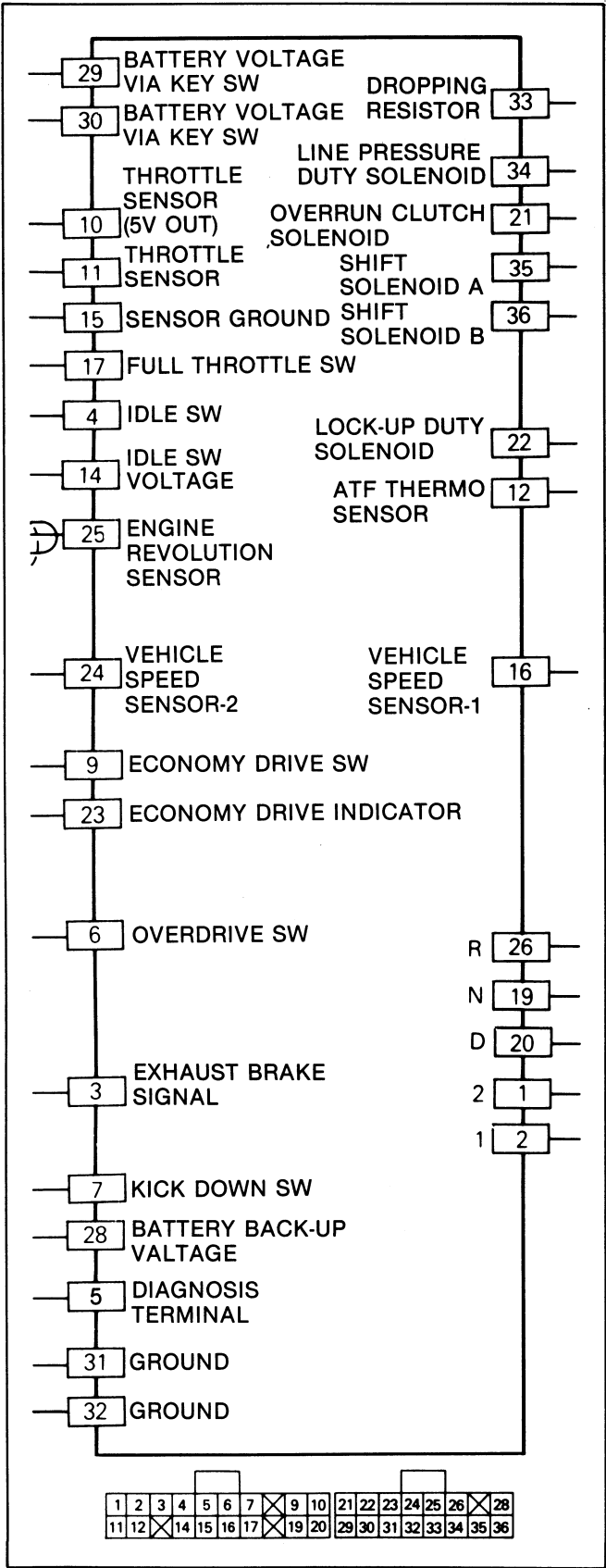


Figure 11. ATCU connection

Control signal inspection is done to check for transmission and ATCU problems which cannot be detected by self diagnosis. Additionally, it serves as a back-up check for self diagnosis.

Measure the voltage drop and make a continuity test for each of the sensors, solenoids, and switches.

If the voltage is within the specified range and continuity exists, that particular area of the ATCU and automatic transmission assembly is normal.

If voltage deviation or lack of continuity is discovered, disconnect the applicable parts and check each of them individually. This will allow you to determine the trouble location (ATCU, automatic transmission unit, or another area of the vehicle).

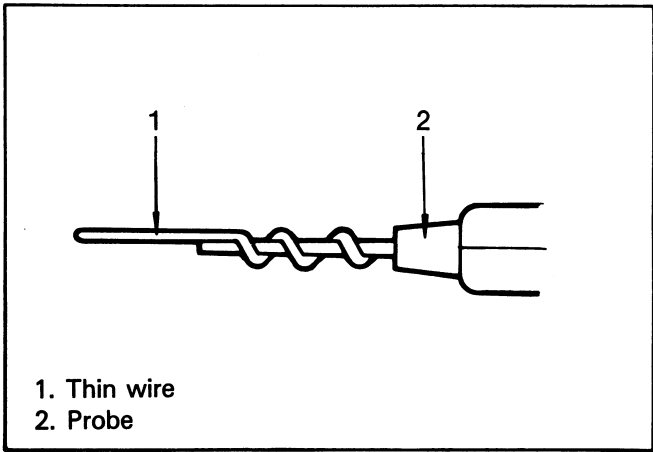


Figure 12. Inspection Tool

Inspection Tool

Use a circuit tester to measure voltage and circuit continuity.

Refer to the following table for the specified voltage ranges.

ATCU terminals are extremely small.

Wrap a piece of thin wire (1) around the probe of tester (2) (figure 12).

This will make measurement easier.

ATCU Terminal No.		Standard Voltage	Inspection Procedure	Signal Type	Signal Name
Tester (-)	Tester (+)				
(31) or (32)	(29)	12—15	Key switch "ON"	Source	Battery voltage
	(30)	12—15	Key switch "ON"	Source	Battery voltage
	(28)	12—15		Source	Battery back-up
(15)	(10)	4.5—5.5		Source	Throttle sensor
(31) or (32)	(26)	12—15	Selector "R" range	Input	"R" range switch
		Less than 1.0	Selector all ranges except "R"	Input	"R" range switch
	(19)	12—15	Selector "N" or "P" range	Input	"N" range switch
		Less than 1.0	Selector all ranges except "N" and "P"	Input	"N" range switch
	(20)	12—15	Selector "D" range	Input	"D" range switch
		Less than 1.0	Selector all ranges except "D"	Input	"D" range switch
	(1)	12—15	Selector "2" range	Input	"2" range switch
		Less than 1.0	Selector all ranges except "2"	Input	"2" range switch
	(2)	12—15	Selector "1" range	Input	"1" range switch
		Less than 1.0	Selector all ranges except "1"	Input	"1" range switch
	(3)	12—15	Exhaust brake switch "ON"	Input	Exhaust brake signal
		Less than 1.0	Exhaust brake switch "OFF"	Input	Exhaust brake signal
	(4)	8—15	Accelerator pedal released	Input	Idle switch
		Less than 1.0	Accelerator pedal depressed	Input	Idle switch
	(17)	8—15	Accelerator pedal more than 1/2 depressed	Input	Full throttle switch
		Less than 1.0	Accelerator pedal released	Input	Full throttle switch
	(6)	12—15	Overdrive switch "ON"	Input	Overdrive switch
		Less than 1.0	Overdrive switch "OFF"	Input	Overdrive switch
	(7)	3—8	Accelerator pedal released	Input	Kick-down switch
		Less than 1.0	Accelerator pedal fully depressed	Input	Kick-down switch
	(9)	3—8	Economy drive switch in "NORMAL" position	Input	Economy drive switch
		Less than 1.0 Throttle full position	Economy drive switch in "ECONOMY" position	Input	Economy drive switch
	(24)	1—5 (Intermittent AC)	Vehicle moved at slowest possible speed at least one meter	Input	Vehicle speed sensor-2
	(5)	3—8	Self diagnosis OFF	Input	Diagnosis terminal
		Less than 1.0	Self diagnosis ON	Input	Diagnosis terminal
(15)	(11)	4.0—4.9 (Fully closed) 0.34—1.8 (Fully opened)	Measure the throttle valve voltage at two positions	Input	Throttle sensor
	(12)	1.8 (ATF temp. approx. 10°C (50°F)) 1.1 (ATF temp. approx. 40°C (104°F))	Measure the throttle valve voltage at each specified temperature	Input	ATF thermosensor

7A1-36 DIAGNOSIS

ATCU Terminal No.		Standard Votage	Inspection Procedure	Signal Type	Signal Name
Tester (-)	Tester (+)				
(15)	(16)	More than 1 (Vehicle speed 15 mph (24 km/h))	Measure the vehicle speed sensor-1 voltage at vehicle stop and 15 mph (24 km/h)	Input	Vehicle speed sensor-1
		0 (Vehicle stopped)		Input	Vehicle speed sensor-1
	(25)	More than 1	Check at an engine speed of approximately 2,000 rpm	Input	Engine revolution sensor
(31) or (32)	(23)	12—25	Economy drive switch in "NORMAL" position	Input	Economy drive indicator
		Less than 1.0	Economy drive switch in "ECONOMY" position	Input	Economy drive indicator
	(14)	8—15	Key switch "ON"	Output	Idle switch Full throttle switch
	(35)	12—15	Driving at "D1" and "D4" (Solenoid "ON")	Output	Shift solenoid "A"
		Less than 1.0	Driving at "D2" and "D3" (Solenoid "OFF")	Output	Shift solenoid "A"
	(36)	12—25	Driving at "D1" and "D2" (Solenoid "ON")	Output	Shift solenoid "B"
		Less than 1.0	Driving at "D3" and "D4" (Solenoid "OFF")	Output	Shift solenoid "B"
	(21)	12—15	Overrun clutch solenoid "ON", ("D" range, overdrive switch "OFF", vehicle speed 25 mph (40 km/h))	Output	Overrun clutch solenoid
		Less than 1.0	Overrun clutch solenoid "OFF", ("D" range, overdrive switch "ON", vehicle speed 25 mph (40 km/h))	Output	Overrun clutch solenoid
	(33)	5—14	Engine warmed up and stopped, throttle valve fully closed, key switch "ON"	Output	Dropping resistor
		Less than 0.5	Engine warmed up and stopped, throttle valve fully opened, key switch "ON"	Output	Dropping resistor
	(34)	1.5—2.5	Engine warmed up and stopped, throttle valve fully closed, key switch "ON"	Output	Line pressure solenoid
		Less than 0.5	Engine warmed up and stopped, throttle valve fully opened, key switch "ON"	Output	Line pressure solenoid
	(22)	8—15	Lock-up "ON"	Output	Lock-up solenoid
		Less than 1.0	Lock-up "OFF"	Output	Lock-up solenoid

LINE PRESSURE TEST

The line pressure test checks oil pump and control valve pressure regulator valve function. It will also detect oil leakage.

Line Pressure Test Procedure

1. Check the level of the engine coolant, the engine oil, and the automatic transmission fluid.

Replenish if required.

2. Set the parking brake.
3. Place chocks at the front and rear of each tire.
4. Remove the pressure detection plug at the bottom of the converter housing (figure 13).
5. Set a pressure gauge (1) to the pressure detection plug hole (figure 14).

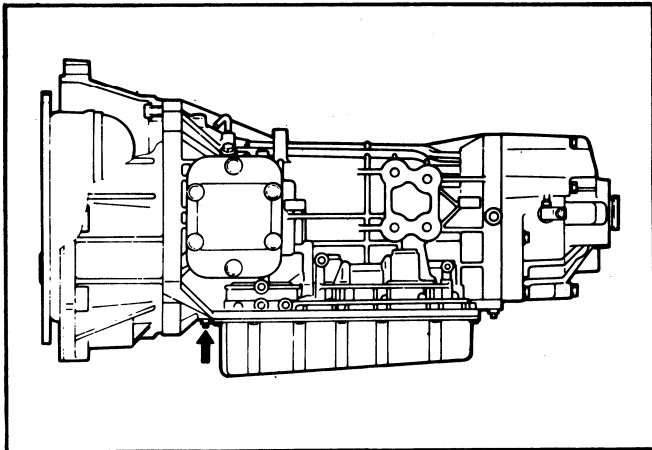


Figure 13. Detection Plug Hole

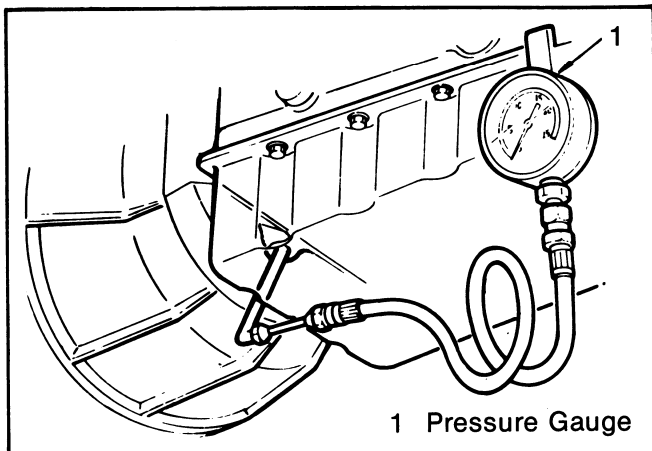


Figure 14. Setting Pressure Gauge

6. Start the engine and allow it to idle until the engine coolant temperature reaches 70—80°C (158—176°F).
7. Hold the brake pedal down as far as it will go.
8. Place the selector in the “D” range.
9. Note the pressure gauge reading with the engine idling.
10. Gradually push the accelerator pedal to the floor. The throttle valve will fully open.

Note the pressure gauge reading with the accelerator pedal fully depressed.



Measure

- Line Pressure kPa (psi)

Range	Engine Speed	
	Idling	Wide Open Throttle
D2 & 1	294.2—470.7 (42.7—68.3)	784.5—961.1 (113.8—139.4)
R	470.7—715.9 (68.3—103.8)	1176.8—1471.0 (170.6—213.3)

11. Release the accelerator pedal.
12. Place the selector in the “N” range.
13. Run the engine at 1,200 rpm for one minute.

This will cool the transmission fluid.
14. Repeat Steps 7—13 for the “2”, “1”, and “R” ranges.
15. Install a new pressure detection plug to the converter housing.
16. Tighten the pressure detection plug.



Tighten

- Detection Plug: 7.3 N•m (5.4 lb.ft)

7A1-38 DIAGNOSIS

Engine and Transmission Condition	Line Pressure Test Results	Probable Trouble Area
At idle	Line pressure is below the specified limit in all ranges	● Worn oil pump ● Defective control piston ● Sticking pressure regulator valve, plug, or worn spring ● Fluid leakage from fluid line (Oil strainer → oil pump → pressure regulator valve)
	Line pressure is below the specified limit in one or more ranges	● Fluid delivered from the manual valve in a given range(s) - Oil leakage from device(s) related to the given range(s) - Example: Leakage from Low and reverse brake lines 1. "R" and "1" range line pressure below the specified limit 2. All other ranges have normal line pressure
	Line pressure is above the specified limit in all ranges	● Poorly adjusted throttle sensor ● Defective ATF thermosensor ● Line pressure solenoid malfunction 1. Solenoid sticking at "OFF" position 2. Clogged filter 3. Open circuit ● Sticking pressure modifier valve ● Sticking pressure regulator valve and/or plug
At stall	Fluid pressure at stall is the same as fluid pressure at idle	● Poorly adjusted throttle sensor ● Control unit malfunction ● Line pressure solenoid malfunction 1. Solenoid sticking in "ON" position 2. Short circuit ● Sticking pressure regulator valve and/or plug ● Sticking pressure modifier valve ● Sticking pilot valve and/or clogged pilot filter
	Fluid pressure at stall is higher than at idle, but is below the specified range	● Poorly adjusted throttle sensor ● Defective control piston ● Line pressure solenoid malfunction 1. Sticking solenoid 2. Clogged filter ● Sticking pressure regulator valve and/or plug ● Sticking pressure modifier valve and/or worn valve spring ● Sticking pilot valve and/or clogged pilot filter

STALL TEST

The stall test allows you to check the transmission for internal abrasion and the one-way clutch for slippage. Torque converter performance can also be evaluated.

The stall test results together with the road test results will identify transmission components requiring servicing or adjustment.



CAUTION: When the clutch appears to be slipping in a road test, etc., or when the line pressure does not reach a preset value in a line pressure test, do not proceed to a stall test.

Stall Test Procedure

1. Set the parking brake.
2. Place chocks at the front and rear of each tire.
3. Check the level of the engine coolant, the engine oil, and the automatic transmission fluid.

Replenish if required.

4. Start the engine and allow it to idle until the engine coolant temperature reaches 70—80°C (158—176°F).
5. Set a tachometer to the engine.
6. Hold the brake pedal down as far as it will go.

7. Place the selector in the “D” range.

8. Gradually push the accelerator pedal to the floor.

The throttle valve will fully open.

Note the engine speed at which the tachometer needle stabilizes.



Measure

- Stall speed 1,700 $\begin{smallmatrix} +150 \\ -300 \end{smallmatrix}$ rpm

9. Release the accelerator pedal.

10. Place the selector in the “N” range.

11. Run the engine at 1,200 rpm for one minute.

This will cool the transmission fluid.

12. Repeat Steps 6—11 for the “2”, “1”, and “R” ranges.



CAUTION: Do not continuously run this test longer than 5 seconds so the transmission does not become overheated.

7A1-40 DIAGNOSIS

Stall Test Results	Road Test Results	Probable Trouble Area
Stall speed in all gear ranges exceeds the specified limit		Line pressure too low
Stall speed in "D" and "2" ranges exceeds the specified limit	• Slippage in 1st gear • 2nd and 3rd gear normal	Low oneway clutch slippage
	• Slippage in "D" range 1st, 2nd, and 3rd gears Engine brake functions when the throttle valve is fully closed in the "ECONOMY" pattern • Slippage in "2" range 1st and 2nd gears Engine brake functions when the throttle valve is fully closed	Forward clutch or forward oneway clutch slippage
Stall speed in "R" range exceeds the specified limit	• Engine brake does not function in the "1" range	Low and reverse brake slippage
	• Engine brake functions in the "1" range	Reverse clutch slippage
Stall speed within specifications	• Vehicle speed will not exceed 50 mph (80 km/h) This condition will cause very high A/T fluid temperature	Torque converter oneway clutch seizure
	• Slippage in "D" range 3rd and 4th gears	High clutch slippage
Stall speed within specifications	• Slippage in "D" range 2nd and 4th gears	Brake band slippage
Stall speed below the specified limit	• Poor initial acceleration	Torque converter oneway clutch slippage