



DIAGNOSIS and TESTING

Perform On-Board Diagnostics

NOTE: If equipped, turn the power take-off unit off to ensure proper test results. On-Board Diagnostic is not accessible when the power take-off is in operation.

After a road test, with the vehicle warm and before disconnecting any connectors, perform the Quick Test using the New Generation Star (NGS) Tester. Refer to the Powertrain Control/Emissions Diagnosis Manual ¹ for diagnosis and testing of the powertrain control system.

Diagnosing an electronically controlled automatic transmission (7003) is simplified by using the following procedures. One of the most important things to remember is that there is a definite procedure to follow. **DO NOT TAKE SHORT CUTS OR ASSUME THAT CRITICAL CHECKS OR ADJUSTMENTS HAVE ALREADY BEEN MADE.** Follow the procedures as written to avoid missing critical components or steps. By following the diagnostic sequence, the technician will be able to diagnose and repair the concern the first time.

Transmission Drive Cycle Test

NOTE: If equipped, turn the power take-off unit off for proper test results.

NOTE: Always drive the vehicle in a safe manner according to driving conditions and obey all traffic laws.

NOTE: The Transmission Cycle Test must be followed exactly. Malfunctions must occur four times consecutively for the shift error DTC code to be set and five times consecutively for the continuous torque converter clutch code to set.

NOTE: When performing the Transmission Drive Cycle Test refer to the Solenoid Operation Chart for proper solenoid operation.

Use the Transmission Drive Cycle Test for checking continuous codes

1. Record and then erase the Quick Test codes.
2. Warm the engine to normal operating temperature.
3. Make sure the transmission fluid level is correct.
4. With the transmission in OVERDRIVE, moderately accelerate from stop to 80 km/h (50 mph). This allows the transmission to shift into fourth gear. Hold speed and throttle open steady for a minimum of 15 seconds.
5. With transmission in OVERDRIVE, press transmission control switch (TCS) (transmission control illuminator lamp (TCIL) should illuminate) and moderately accelerate from stop to 64 km/h (40 mph). This allows the transmission to shift into third gear. Hold speed and throttle open steady for a minimum of 15 seconds (30 seconds above 4000 ft altitude).
6. Press TCS (TCIL should turn off) and accelerate from 64 km/h (40 mph) to 80 km/h (50 mph). This allows transmission to shift into fourth gear. Hold speed and throttle position steady for a minimum of 15 seconds.
7. With transmission in fourth gear and maintaining steady speed and throttle opening, lightly apply and release brake to operate stoplamps. Then hold speed and throttle steady for an additional 5 seconds (minimum).
8. Brake to a stop and remain stopped for a minimum of 20 seconds.
9. Repeat Steps 4 through 8 at least five times.
10. Perform Quick Test and record continuous codes.

After On-Board Diagnostics

NOTE: The vehicle wiring harness, powertrain control module and non-transmission sensors can affect transmission operations. Repair these concerns first.

After the On-Board Diagnostics procedures are completed, repair all DTCs.

1999 Ford 4R100 Diagnostic Trouble Code Chart		1999 Ford 4R100 Symptom Chart	
Diagnostic Code	Description	Symptom	
P0102 P0103	MAF sensor system fails to operate in a normal manner, which causes a transmission concern.	High EPC pressure. Firm shifts and engagements. May flash TCIL.	do not operate in a normal manner, which may cause a transmission concern.
P0107 P0108	BARO sensor circuit signal higher or lower than expected.	Firm shift feel, late shifts at higher altitudes.	higher or lower than expected.
P0122	(TP) Throttle Position sensor or (AP) Accelerator Pedal Position sensor below specification during normal operation.	Harsh engagements, firm shift feel, abnormal shift schedule, abnormal TCC operation or does not engage.	sensor or (AP) Accelerator Pedal Position sensor below specification during normal operation.
P0123	(TP) Throttle Position sensor or (AP) Accelerator Pedal Position sensor above or below normal specifications during normal operation.	Harsh engagements, firm shift feel, abnormal shift schedule, abnormal TCC operation or does not engage.	sensor or (AP) Accelerator Pedal Position sensor above or below normal specifications during normal operation.
P0235	MAP sensor or circuit open, shorted to ground or to 5V.	Firm shift feel, late shifts at higher altitudes.	open, shorted to ground or to 5V.
P0236	MAP sensor signal higher or lower than expected or no response due to circuit damaged, disconnected or restricted.	Firm shift feel, late shifts at higher altitudes.	higher or lower than expected or no response due to circuit damaged, disconnected or restricted.
P0237	MAP sensor out of On-Board Diagnostics range. No response during Dynamic Response (Goose) test.	Rerun On-Board Diagnostics and perform "Goose" test when asked.	MAP sensor out of On-Board Diagnostics range. No response during Dynamic Response (Goose) test.
P0340 P0341 P0344	(DI) Distributor Ignition circuit concern or (CKP) Crankshaft Position sensor failure.	Engine will stall or will not run. May flash TCIL.	(DI) Distributor Ignition circuit concern or (CKP) Crankshaft Position sensor failure.
P0500 P0503	Insufficient or intermittent input from VSS/ABS.	Harsh engagements, firm shift feel, abnormal shift pattern, unexpected downshifts may occur at closed throttle, abnormal TCC operation or engages only at WOT. May flash TCIL.	Insufficient or intermittent input from VSS/ABS.
P0571	(BPP) Brake Pedal Position sensor or not connected.	Failed off. TCC will not disengage when brake is applied.	(BPP) Brake Pedal Position sensor or not connected.
P0703	(BPP) Brake Pedal Position sensor or not connected.	Failed off. TCC will not disengage when brake is applied.	(BPP) Brake Pedal Position sensor or not connected.
P0705	(DTR) Digital Transmission Range sensor circuit malfunction.	Harsh engagements, firm shift feel. May flash TCIL.	(DTR) Digital Transmission Range sensor circuit malfunction.
P0708	(DTR) Digital Transmission Range sensor circuit malfunction.	Slight increase in EPC pressure.	(DTR) Digital Transmission Range sensor circuit malfunction.
P0712	TFT sensor circuit grounded, set for temperature of 315°F.	Harsh engagements, firm shift feel, abnormal shift schedule, abnormal TCC operation or does not engage.	TFT sensor circuit grounded, set for temperature of 315°F.
P0713	TFT sensor circuit open, set for temperature of minus 40°F.	TCC and stabilized shift schedule may be enabled sooner after cold start. May flash TCIL.	TFT sensor circuit open, set for temperature of minus 40°F.
P0715	Insufficient input from TSS sensor.	Set DTC, Flash TCIL and Flash MIL.	Insufficient input from TSS sensor.
P0717	TSS sensor signal intermittent.	Set DTC, Flash TCIL.	TSS sensor signal intermittent.
P0718	TSS sensor signal noisy.	Set DTC.	TSS sensor signal noisy.

1999 FORD 4R100
Diagnostic Trouble Code Chart

<i>Diagnostic Code</i>	<i>Description</i>	<i>Symptom</i>
P0720	Insufficient input from OSS sensor.	Set DTC, Flash TCIL and Flash MIL.
P0721	OSS sensor signal noisy.	Set DTC.
P0722	OSS sensor signal intermittent.	Set DTC, Flash TCIL.
P0731	1-2 shift error because of SSA, SSB, or internal transmission components.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P0732	2-3 shift error because of SSA, SSB, or internal transmission components.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P0733	3-4 shift error because of SSA, SSB, or internal transmission components.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P0741	The PCM picked up an excessive amount of TCC slippage during normal operation.	TCC slippage/erratic or no torque converter clutch operation. Flash TCIL.
P0743	TCC Solenoid circuit failure.	<i>Short Circuit:</i> Engine stalls in "D" or "2" at idle with brake applied. <i>Open Circuit:</i> TCC never engaged.
P0750	SSA circuit failure.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P0755	SSB circuit failure.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P0781	1-2 shift error because of SSA, SSB, or internal transmission components.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P0782	2-3 shift error because of SSA, SSB, or internal transmission components.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P0783	3-4 shift error because of SSA, SSB, or internal transmission components.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P1100 P1101	MAF sensor system fails to operate in a normal manner, which may cause a transmission concern.	High EPC pressure. Firm shifts and engagements. May flash TCIL.
P1111	System Pass.	No Codes Detected.

**Technical Service Information Ford 4R100****1999 FORD 4R100****Diagnostic Trouble Code Chart**

<i>Diagnostic Code</i>	<i>Description</i>	<i>Symptom</i>
P1120	Throttle Position Sensor voltage lower than expected.	Harsh engagements, firm shift feel, abnormal shift schedule, abnormal TCC operation or does not engage.
P1124	Throttle Position Sensor out of On-Board Diagnostics range during KOEO test.	TP sensor (Gas Engines) not at idle position during KOEO test.
P1280	Injection Control Pressure (ICP) sensor circuit failure (Diesel Engine), or out of range low.	May result in firm shifts.
P1281	Injection Control Pressure (ICP) sensor circuit failure (Diesel Engine), or out of range high.	May result in firm shifts.
P1460 P1463 P1464	A/C switch error.	<i>Failed On:</i> EPC pressure slightly low with A/C off. <i>Failed Off:</i> EPC pressure slightly low with A/C on.
P1500	Insufficient or intermittent vehicle speed input from VSS/ABS.	Harsh engagements, firm shift feel, abnormal shift pattern, unexpected downshifts may occur at closed throttle, abnormal TCC operation or engages only at WOT. May flash TCIL.
P1702	Digital Transmission Range (DTR) sensor signal intermittent.	Erratic harsh shift engagements.
P1703	(BPP) Brake Pedal Position switch not actuated during KOER test.	Failed on or not connected, TCC will not engage at less than one-third throttle opening.
P1704	Digital Transmission Range (DTR) sensor misaligned or failed electronically.	Increase in EPC pressure.
P1705	Digital Transmission Range (DTR) sensor not run in park or neutral during On-Board Diagnostics KOEO or KOER tests.	Rerun On-Board Diagnostics.
P1711	Transmission not at operating temperature during On-Board Diagnostics.	Warm vehicle to normal operating temperature and rerun On-Board Diagnostics.
P1713	No change in TFT sensor - Low range.	May flash TCIL.
P1714	SSA mechanical failure detected.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P1715	SSB mechanical failure detected.	Improper gear selection depending on failure mode and transmission range selector position. Refer to shift solenoid operation chart.
P1718	No change in TFT sensor - High range.	May flash TCIL.



Technical Service Information Ford 4R100

1999 FORD 4R100 <i>Diagnostic Trouble Code Chart</i>		
P1728	Excessive amount of transmission slippage has been detected.	Transmission slippage, erratic or no TCC operation. May flash TCIL.
P1729	4X4 Low switch circuit failure.	Early or delayed shift schedule.
P1740	TCC solenoid mechanical failure detected.	Harsh shift, may flash TCIL.
P1744	The PCM picked up an excessive amount of TCC slippage during normal operation.	TCC slippage/erratic or no torque converter clutch operation. Flash TCIL.
P1746	Failure of the EPC control pressure driver located inside the PCM.	Open circuit causes maximum EPC pressure, harsh engagements and shifts. May flash TCIL.
P1747	EPC shorted circuit failure, or PCM.	Shorted circuit causes minimum EPC pressure, limits engine torque with partial fuel shut off and heavy misfire. Flashing TCIL.
P1754	CCS circuit failure.	<i>Failed Off:</i> No third gear engine braking in O.D. cancel. <i>Failed On:</i> Third gear engine braking in O.D. range. Coast clutch may be damaged causing eventual failure.
P1760	EPC signal intermittent short.	Short circuit causes minimum EPC pressure.
P1780	TCS not cycled during the On-Board Diagnostics or the circuit is open or shorted.	No overdrive cancel when switch is cycled.
P1781	4X4 Low switch circuit failure.	Early or delayed shift schedule.
P1783	Transmission Fluid Temperature has exceeded 270°F.	Slight increase in EPC pressure. May flash TCIL.

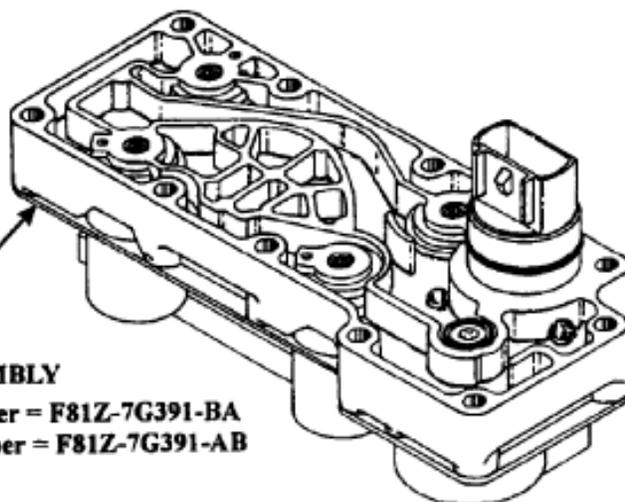
DIAGNOSIS and TESTING
**FORD 4R100
SOLENOID RESISTANCE CHARTS**

<i>Solenoid Resistance Chart</i>		
<i>Solenoid</i>	<i>Solenoid Body Pin Numbers</i>	<i>Resistance</i>
<i>Shift Solenoid "B" (2)</i>	<i>1 and 2</i>	<i>20-30 Ohms</i>
<i>Shift Solenoid "A" (1)</i>	<i>1 and 3</i>	<i>20-30 Ohms</i>
<i>TCC Solenoid, Gasoline (On-Off)</i>	<i>1 and 4</i>	<i>20-30 Ohms</i>
<i>TCC Solenoid, Diesel (PWM)</i>	<i>1 and 4</i>	<i>10-20 Ohms</i>
<i>Coast Clutch Solenoid</i>	<i>1 and 5</i>	<i>20-30 Ohms</i>
<i>Electronic Pressure Control Solenoid</i>	<i>11 and 12</i>	<i>3.0-5.0 Ohms</i>
<i>Transmission Fluid Temp Sensor</i>	<i>7 and 8</i>	<i>See Chart Below</i>

<i>Transmission Fluid Temperature</i>		
<i>°C</i>	<i>°F</i>	<i>Resistance</i>
<i>-40 to -20</i>	<i>-40 to -4</i>	<i>1062k - 284k Ω</i>
<i>-19 to -1</i>	<i>-3 to 31</i>	<i>284k - 100k Ω</i>
<i>0 - 20</i>	<i>32-68</i>	<i>100k - 37k Ω</i>
<i>21-40</i>	<i>69-104</i>	<i>37k - 16k Ω</i>
<i>41-70</i>	<i>105-158</i>	<i>16k - 5k Ω</i>
<i>71-90</i>	<i>159-194</i>	<i>5k - 2.7k Ω</i>
<i>91-110</i>	<i>195-230</i>	<i>2.7k - 1.5k Ω</i>
<i>111-130</i>	<i>231-266</i>	<i>1.5k - 0.8k Ω</i>
<i>131-150</i>	<i>267-302</i>	<i>0.8k - 0.54k Ω</i>

SOLENOID ASSEMBLY

Gasoline Engines Only - Part Number = F81Z-7G391-BA
Diesel Engines Only - Part Number = F81Z-7G391-AB



Copyright © 1998 ATSG

DIAGNOSIS and TESTING
Shift Solenoid Application Chart

Selector Lever Range	Commanded Gear	Shift Solenoid "A"	Shift Solenoid "B"	TCC Solenoid	Coast Clutch Solenoid
P/R/N	1	ON	OFF	*	*
Ⓚ	1	ON	OFF	*	*
Ⓚ	2	ON	ON	*	*
Ⓚ	3	OFF	ON	*	*
Ⓚ	4	OFF	OFF	*	*
Ⓚ <i>Cancel</i> First Through 3rd Gear Only, SSA, SSB, TCC, Same as Overdrive, CCS Always On.					
MANUAL 2	2	*	*	*	ON
MANUAL 1	2	OFF	OFF	OFF	ON
MANUAL 1	1	ON	OFF	OFF	ON

* Controlled by PCM

SHIFT SOLENOID "A" ALWAYS OFF

PCM Gear Commanded	Selector Lever Position		
	Ⓚ	2	1
Actual Gear Obtained			
1st	4	2	1
2nd	3	2	2
3rd	3	2	2
4th	4	2	2

SHIFT SOLENOID "B" ALWAYS OFF

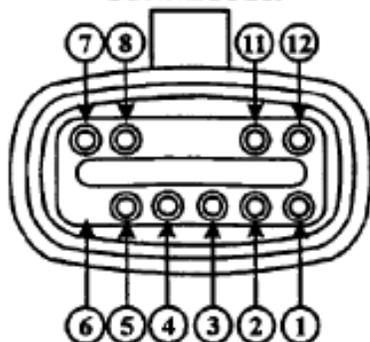
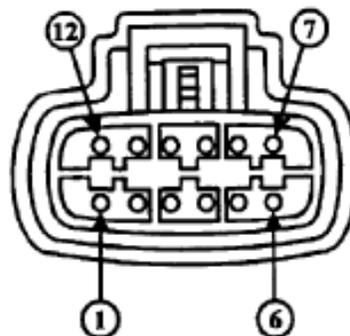
PCM Gear Commanded	Selector Lever Position		
	Ⓚ	2	1
Actual Gear Obtained			
1st	1	2	1
2nd	1	2	1
3rd	4	2	2
4th	4	2	2

SHIFT SOLENOID "A" ALWAYS ON

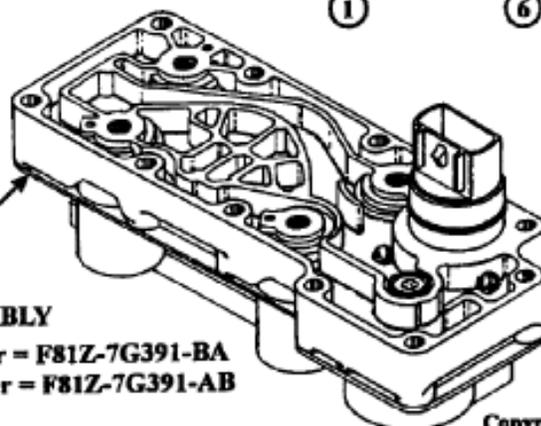
PCM Gear Commanded	Selector Lever Position		
	Ⓚ	2	1
Actual Gear Obtained			
1st	1	2	1
2nd	2	2	1
3rd	2	2	1
4th	1	2	1

SHIFT SOLENOID "B" ALWAYS ON

PCM Gear Commanded	Selector Lever Position		
	Ⓚ	2	1
Actual Gear Obtained			
1st	2	2	1
2nd	2	2	1
3rd	3	2	2
4th	3	2	2

DIAGNOSIS and TESTING
FORD 4R100
SOLENOID BODY PIN IDENTIFICATION AND FUNCTION
SOLENOID BODY CONNECTOR

VEHICLE HARNESS CONNECTOR

SOLENOID ASSEMBLY

Gasoline Engines Only - Part Number = F81Z-7G391-BA
 Diesel Engines Only — Part Number = F81Z-7G391-AB



Copyright © 1998 ATSG

Solenoid Connector Pin Identification and Function

Pin No.	Description	PCM Connector Pin	
		Gas & Diesel (Cal)	Diesel (49 State)
1	Vehicle Power In For Solenoids (VPWR)	71, 97	71, 97
2	Shift Solenoid "B" (2) Ground from PCM	11	1
3	Shift Solenoid "A" (1) Ground from PCM	6	27
4	Converter Clutch Solenoid Ground from PCM	54	28
5	Coast Clutch Solenoid Ground from PCM	20	53
6	Not Used		
7	Transmission Fluid Temp Sensor	37	37
8	Transmission Fluid Temp Sensor (Signal Return)	91	91
9	Not Used		
10	Not Used		
11	Electronic Pressure Control (EPC)	81	81
12	Vehicle Power In For EPC Solenoid (VPWR)	71, 97	71, 97



Technical Service Information Ford 4R100

Diagnosis by Symptom Index

4R100	Routines	
	Electrical (a)	Hydraulic/Mechanical
Engagement Concerns		
• No forward only	201	301
• No REVERSE only	202	302
• Harsh REVERSE only	203	303
• Harsh forward only	204	304
• Delayed/soft REVERSE only	205	305
• Delayed/soft forward only	206	306
• No forward and no REVERSE only	207	307
• Harsh forward and REVERSE	208	308
• Delayed/soft forward and REVERSE	209	309
Shift Concerns		
• Some or all shifts missing	210	310
• Timing concerns	—	—
— early/late (some/all)	211	311
— erratic/hunting (some/all)	212	312
• Feel concerns	—	—
— soft/slipping (some/all)	213	313
— harsh (some/all)	214	314
• No 1st gear in drive, engages in higher gear	215	315
• No MANUAL 1st gear	216	316
• No MANUAL 2nd gear	217	317
Torque Converter Clutch Operation Concerns		
• No apply	240	340
• Always applied/stalls vehicle	241	341
• Cycling/shudder/chatter	242	342
Other Concerns		
• Shift lever efforts high	251	351
• External leaks	252	352
• Poor vehicle performance	253	353
• Noise/vibration — forward or REVERSE	254	354
• Engine will not crank	255	355
• No PARK range	256	356
• Overheating	257	357
• No engine braking in MANUAL 2 position only	258	358
• No engine braking in MANUAL 1 position only	259	359
• No engine braking with OVERDRIVE cancelled	260	360
• Fluid venting or foaming	261	361

(a) Perform electrical routines first.

Other Concerns: Fluid Venting/Foaming

Possible Component	Reference/Action
261 — ELECTRICAL ROUTINE	
• No electrical concerns	
361 — HYDRAULIC/MECHANICAL ROUTINE	
• Case vent assembly blocked or damaged	• Check case vent assembly for damage or blockage. Repair/replace as required.
• Overfilled transmission	• Check level and adjust as required.
• Fluid contaminated (coolant, water)	• Check for contamination, locate source of contamination. Repair as required.
• Overheating	• Refer to Routine No. 257/357.
• Filter assembly and seal damaged or misassembled	• Inspect filter assembly and seal for damage. Replace as required.
• Pump to case gasket damaged, misaligned	• Inspect for damage and replace.