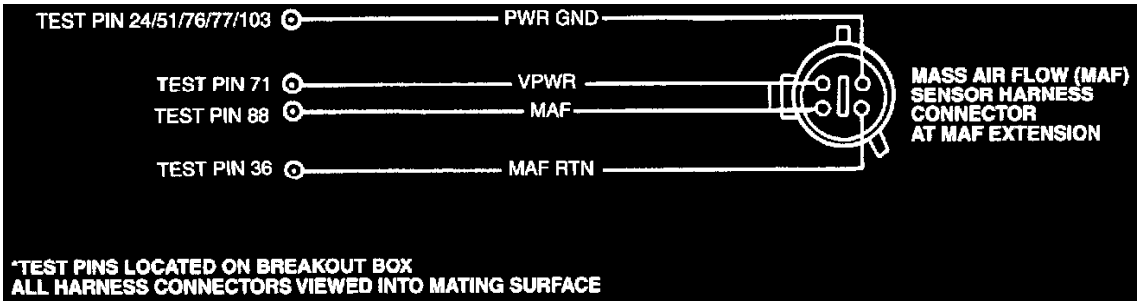
Computers and Control Systems: Pinpoint Tests
DC - Mass Air Flow (MAF) Sensor

Test Notes
Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:
- Mass Air Flow **(MAF)** Sensor
- Harness Circuits: MAF SIG, MAF RTN, Vehicle Power (VPWR), and Power Ground (PWR GND)
- Powertrain Control Module



Applications	Voltage Signal					
	0.34V	0.39V	0.60V	1.00V	1.96V	3.90V
2.0L Contour/Mystique	0.39 gm/sec	0.45 gm/sec	0.72 gm/sec	2.10 gm/sec	7.64 gm/sec	40.59 gm/sec
2.5L Contour/Mystique	0.33 gm/sec	0.95 gm/sec	1.69 gm/sec	5.53 gm/sec	22.92 gm/sec	137.98 gm/sec
3.4L Taurus SHO 4.6L Mustang 4.6L Continental 4.6L Mark VIII	1.39 gm/sec	1.60 gm/sec	2.69 gm/sec	8.36 gm/sec	32.99 gm/sec	193.69 gm/sec
4.6L F-Series/E-Series 5.4L F-Series/E-Series 6.8L E-Series 7.5L F-Series	1.35 gm/sec	1.56 gm/sec	2.66 gm/sec	8.31 gm/sec	32.99 gm/sec	190.18 gm/sec
3.8L Mustang 4.0L/5.0L Explorer 5.0L Mountaineer 4.0L Ranger	1.46 gm/sec	1.68 gm/sec	2.52 gm/sec	7.64 gm/sec	27.09 gm/sec	151.79 gm/sec
4.6L/5.4L Expedition 5.4L Navigator 5.8L F-Series	1.68 gm/sec	1.93 gm/sec	3.32 gm/sec	8.43 gm/sec	28.97 gm/sec	151.44 gm/sec
5.8L E-Series	1.24 gm/sec	1.42 gm/sec	2.98 gm/sec	8.38 gm/sec	29.88 gm/sec	151.25 gm/sec
3.0L Windstar	0.82 gm/sec	0.88 gm/sec	1.25 gm/sec	3.44 gm/sec	14.48 gm/sec	135.95 gm/sec
3.0L 4V Taurus/Sable 3.8L Windstar 4.2L F-Series/E-Series	1.43 gm/sec	1.64 gm/sec	2.58 gm/sec	7.53 gm/sec	26.57 gm/sec	154.40 gm/sec
2.0L/2.5L Cougar	1.44 gm/sec	1.66 gm/sec	2.73 gm/sec	8.06 gm/sec	20.33 gm/sec	153.31 gm/sec
3.0L 2V Taurus/Sable 3.0L Taurus FF	1.31 gm/sec	1.11 gm/sec	1.72 gm/sec	4.82 gm/sec	17.00 gm/sec	146.84 gm/sec
2.3L Ranger 3.0L Ranger	0.93 gm/sec	1.07 gm/sec	1.71 gm/sec	4.58 gm/sec	16.23 gm/sec	135.17 gm/sec
2.0L Escort/Tracer	0.94 gm/sec	1.07 gm/sec	1.68 gm/sec	4.77 gm/sec	16.87 gm/sec	88.91 gm/sec
4.6L Crown Victoria/Grand Marquis 4.6L NGV Crown Victoria 4.6L Town Car	1.28 gm/sec	1.48 gm/sec	2.37 gm/sec	6.97 gm/sec	26.16 gm/sec	148.18 gm/sec

Voltage To Mass Air Flow Conversion Tables

	Test Step	Result ▶	Action to Take
DC1	DTC P1101: CHECK FOR MAF SENSOR CONTINUOUS MEMORY DTCs		
	Key On Engine Running (KOER) Diagnostic Trouble Code (DTC) P1101 indicates the MAF sensor signal was not between 0.82 and 14.48 gm/sec. (0.34 and 1.96 volts) during KOER Self-Tests. • Drive vehicle for 6 to 10 minutes. • Rerun KOEO Self-Test and retrieve Continuous Memory DTCs. • **Is a Continuous Memory DTC present with the KOER DTC P1101?**	Yes ▶	**For Continuous Memory DTC P0102:** GO to DC6. **For Continuous Memory DTC P0103:** GO to DC20 **All other Continuous Memory DTCs:** ADDRESS those DTCs
		No ▶	GO to DC2.
DC2	DTC P1101 AND KOER DTC P1101: CHECK VOLTAGE BETWEEN MAF PWR GND CIRCUITS TO MAF SENSOR		
	Diagnostic Trouble Code (DTC) P1101 indicates the mass air flow (MAF) sensor signal was greater than 0.20 volt during KOEO Self-Test. NOTE: DTC P1101 can be generated by a low charged vehicle battery or the garage exhaust ventilation system. Repair the battery as necessary. Then remove ventilation system and properly vent to outside atmosphere. Rerun KOEO Self-Test. Possible causes: — Damaged MAF sensor. — Contaminated MAF sensor. — MAF sensor partially connected. — Open PWR GND harness circuit. — Open MAF RTN harness circuit. — Damaged PCM. • Key off. • Check that the MAF sensor is connected. If not, repair as necessary. • Connect scan tool. • *Install breakout box, connect* PCM to breakout box. • Key on, engine off. • Measure voltage of the MAF circuit between PCM test pin 88 and PCM test pins 24 and 103. • Key off. • **Was voltage greater than 0.20 volt?**	Yes ▶ No ▶	GO to DC12. GO to DC8.

Test Step		Result ▶	Action to Take
DC3	DTC P1100: CHECK MAF CIRCUIT INTERMITTENT VOLTAGE		
	Continuous Memory Diagnostic Trouble Code (DTC) P1100 indicates the MAF sensor signal went below 0.39 volt or above 3.90 volts (refer to Voltage to Mass Air Flow Conversion Table at beginning of this pinpoint test) sometime during the last 40 warm-up cycles. Possible causes: — MAF sensor connector with poor continuity. — MAF sensor harness with poor continuity. — MAF sensor harness intermittent short. — MAF sensor internal intermittent open or short. • Start engine and bring to idle. • If a stabilized idle is not at least 700 rpm, go to Symptom Charts. • Scan tool connected. • Run throttle up to 1500 rpm for 5 seconds, and bring back to idle. • Access MAF PID (MAF V PID) for a fault indication while performing the following: — Lightly tap on MAF sensor and wiggle harness connector to simulate road shock. • Key off. • **Was MAF PID (MAF V PID) at idle changing below the minimum 0.39 volt or above a maximum 3.90 volts (refer to Voltage To Mass Air Flow Conversion Table at the beginning of this pinpoint test)?**	Yes ▶ No ▶	INSPECT MAF sensor connector. If OK, REPLACE the MAF sensor. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test. GO to DC4.
DC4	CHECK MAF SENSOR CIRCUIT FOR INTERMITTENT OPENS OR SHORTS		
	• Install breakout box, reconnect PCM to breakout box. • Key on, engine off. • Connect digital multimeter between PCM test pins 88 and 36. • While viewing digital multimeter, do the *following:* — Grasp the MAF sensor harness and MAF sensor harness connector. — Shake and bend a small section of the harness all the way to the dash panel. — Wiggle, shake and bend the harness from the dash panel to the PCM. • Key off. • **Was the voltage changing below the minimum 0.39 volt or above the maximum 3.90 volts?**	Yes ▶ No ▶	ISOLATE and REPAIR as necessary. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test. Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: MAF PID (MAF V PID) and list of Possible causes.

Test Step		Result ▶	Action to Take
DC6	DTC P0102: CHECK MAF SENSOR SIGNAL LOW INPUT TO PCM		
	Diagnostic Trouble Code (DTC) P0102 indicates the MAF sensor signal went below 0.39 volt (refer to Voltage to Mass Air Flow Conversion Table at beginning of this Pinpoint Test) sometime during normal engine operation (Continuous) or during Key On Engine Running (KOER) Self-Test. Possible causes: — Damaged MAF sensor. — MAF sensor disconnected. — MAF circuit open. — VPWR circuit open. — PWR GND circuit open. — MAF RTN circuit open. — MAF circuit shorted to ground. — Intake Air leak (near MAF sensor). — Throttle position (TP) system (possible closed throttle indication). — Damaged PCM. • Check broken / loose air outlet tube clamps (throttle body and air cleaner assembly ends), cracks / holes in air outlet tube, worn gaskets between MAF sensor and air cleaner assembly. Repair as necessary. • Start engine and bring to idle. • If a KOER DTC P0505 is present, go to the Powertrain Diagnostic Trouble Code (DTC) Charts. For A / T vehicles, if the engine stalls and cannot maintain an idle, go to DC9. • Run engine up 1500 rpm for 5 seconds, then bring it back to idle. • Access MAF PID (MAF V PID) with a Scan Tool. • Key off. • **Was MAF PID (MAF V PID) less than 0.39 volt (refer to Voltage to Mass Air Flow Conversion Table at beginning of this pinpoint test)?**	Yes ▶ No ▶	GO to DC7. **For KOER reading between 1.25 and 3.44 gm / sec. (0.60 and 1.00 volt) (refer to Voltage To Mass Air Flow Conversion Table at the beginning of this pinpoint test):** GO to DC15. **All others:** GO to DC2.
DC7	CHECK VPWR VOLTAGE TO MAF SENSOR		
	• Disconnect MAF sensor. • Key on, engine off. • Measure the VPWR circuit voltage at the MAF sensor harness connector. • Key off. • **Was voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to DC8. REPAIR open circuit. RESTORE vehicle. RESET Keep Alive RandomAccess Memory (RAM). RERUN Quick Test.

Test Step		Result ▶	Action to Take
DC8	CHECK FOR OPEN VPWR CIRCUIT BETWEEN PCM AND MAF SENSOR		
	• MAF sensor disconnected. • Install breakout box, leave PCM disconnected. • Measure resistance of VPWR circuit between PCM test pin 71 and MAF sensor harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to DC9. REPAIR open circuit. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.
DC9	CHECK MAF CIRCUIT FOR SHORT TO PWR GND OR MAF RTN IN HARNESS		
	• Disconnect scan tool from DLC. • Measure resistance between PCM test pin 88 and PCM test pins 51, 103 and 36. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to DC10. REPAIR short circuit. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.
DC10	CHECK MAF RTN CIRCUIT FOR SHORT TO PWR GND IN HARNESS		
	• Measure resistance between PCM test pin 36 and PCM test pins 51 and 103. • **Are both resistances greater than 10,000 ohms?**	Yes ▶ No ▶	RECONNECT scan tool to DLC. GO to DC11. REPAIR short circuit. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.
DC11	CHECK MAF CIRCUIT FOR OPEN IN HARNESS		
	• Measure resistance of MAF circuit between PCM test pin 88 and MAF sensor harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to DC12. REPAIR open circuit. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.

Test Step		Result ▶	Action to Take
DC12	CHECK VOLTAGE BETWEEN VPWR AND PWR GND CIRCUITS TO MAF SENSOR		
	• Reconnect PCM to breakout box. • Key on, engine off. • Measure voltage between VPWR and PWR GND circuits at the MAF sensor harness connector. • Key off. • **Was voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to DC14. GO to DC13.
DC13	CHECK PWR GND CIRCUIT FOR OPEN IN HARNESS		
	• Disconnect PCM. • Disconnect scan tool from DLC. • Measure resistance of PWR GND circuit between MAF sensor and battery negative post. • **Is resistance less than 10 ohms?**	Yes ▶ No ▶	RECONNECT scan tool. GO to DC14. REPAIR open circuit. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.
DC14	CHECK MAF RTN CIRCUIT FOR OPEN IN HARNESS		
	• Measure resistance of MAF RTN circuit between PCM test pin 36 and MAF sensor harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to DC15. REPAIR open circuit. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.
DC15	CHECK MAF CIRCUIT FOR SHORTS TO PWR GND OR MAF RTN		
	• Reconnect PCM to breakout box. • Disconnect scan tool from DLC. • Measure resistance between PCM test pin 88 and PCM test pins 36, 51 and 103. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to DC16. REPLACE the PCM. RESTORE vehicle. RERUN Quick Test.
DC16	CHECK MAF RTN CIRCUIT FOR SHORT TO PWR GND IN PCM		
	• Measure resistance between PCM test pin 36 and PCM test pins 51 and 103. • **Are both resistances greater than 10,000 ohms?**	Yes ▶ No ▶	RECONNECT scan tool. GO to DC17. REPLACE PCM. RESTORE vehicle. RERUN Quick Test.

Test Step		Result ▶	Action to Take
DC17	CHECK MAF CIRCUIT VOLTAGE TO PCM		
	• Reconnect MAF sensor. • Key on, engine running. • If a stabilized idle is not at least 700 rpm, go to Symptom Charts. • Measure voltage of MAF circuit between PCM test pin 88 and battery negative post. • Key off. • **Was voltage at idle between 0.34 and 1.96 volts?**	Yes ▶ No ▶	GO to DC18. REPLACE MAF sensor. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.
DC18	CHECK VOLTAGE BETWEEN MAF AND MAF RTN AT PCM		
	• Key on, engine running. • Measure voltage between PCM test pins 88 and 36. • Key off. • **Was voltage between 0.34 and 1.96 volts?**	Yes ▶ No ▶	GO to DC19. REPLACE MAF sensor. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.
DC19	CHECK MAF CIRCUIT VOLTAGE WITH SCAN TOOL		
	• Key on, engine running. • Access MAF PID (MAF V PID) with a scan tool at idle. • Key off. • **Was MAF PID (MAF V PID) at idle between 0.34 and 1.96 volts (refer to Voltage To Mass Air Flow Conversion Table at the beginning of this Pinpoint Test)?**	Yes ▶ No ▶	Unable to identify fault at this time. RESTORE vehicle. GO to Pinpoint Test Step Z1. **If an idle conern is not present:** REPLACE PCM. RESTORE vehicle. RERUN Quick Test. **If a fault was not detected and an idle concern is still present:** RESTORE vehicle. Disregard DTC P0102 at this time. RETURN to Diagnostic Subroutines.

Test Step		Result ▶	Action to Take
DC20	DTC P0103: CHECK MAF SENSOR SIGNAL HIGH INPUT TO PCM		
	Diagnostic Trouble Code (DTC) P0103 indicates the MAF sensor signal went above 3.90 volts (refer to Voltage To Mass Air Flow Conversion Table at the beginning of this Pinpoint Test) sometime during normal engine operation (Continuous), during Key On Engine Off Self-Test, or during Key On Engine Running Self-Test.	Yes ▶	REPLACE MAF sensor. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.
	NOTE: DTC P0103 can be generated by foreign material blocking the MAF sensor screen causing an air flow restriction. If contaminants are found on the screen, check air cleaner element installation in air cleaner housing and proper sealing of air cleaner and air tubes before proceeding. Rerun Quick Test after service. Possible causes: — Blocked MAF sensor screen. — Damaged MAF sensor. — MAF SIG harness short to VPWR. — Damaged PCM. • Start engine and bring to idle. • If a KOER DTC P0505 is present, go to Powertrain Diagnostic Trouble Code (DTC) Charts. For 2.5L A/T Ranger that stalls and cannot maintain an idle, replace PCM. • Run throttle up to 1500 rpm for 5 seconds, and bring it back to idle. • NOTE: MAF PID (MAF V PID) should be greater than 3.90 volt (refer to Voltage To Mass Air Flow Conversion Table at the beginning of this Pinpoint Test). Access MAF PID (MAF V PID) with a scan tool. • Key off. • Disconnect MAF sensor. • Jumper PWR GND and MAF RTN circuit pins at the MAF sensor vehicle harness connector. • Key on, engine running. • Again access MAF PID (MAF V PID) with a scan tool. • Key off. • **Does MAF PID (MAF V PID) drop from the previous reading to below 0.39 volt (refer to Voltage To Mass Air Flow Conversion Table at the beginning of this Pinpoint Test)?**	No ▶	RESTORE vehicle. GO to DC21.

Test Step		Result ▶	Action to Take
DC21	CHECK MAF CIRCUIT FOR SHORT TO VPWR IN HARNESS		
	• Install breakout box, leave PCM disconnected. • Key on, engine off. • Measure voltage between PCM test pins 88 and 24 or 103. • Key off. • **Was voltage less than 1.0 volt?**	Yes ▶ No ▶	GO to DC22. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.
DC22	CHECK MAF CIRCUIT FOR SHORT TO VREF IN HARNESS		
	• Measure resistance between PCM test pins 88 and 90. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	**If an idle concern is not present:** REPLACE PCM. RESTORE vehicle. RERUN Quick Test. **If a fault was not detected and an idle concern is still present:** RESTORE vehicle. Disregard DTC P0102 at this time. RETURN to Diagnostic Subroutines. REPAIR short circuit. RESTORE vehicle. RESET Keep Alive Random Access Memory (RAM). RERUN Quick Test.