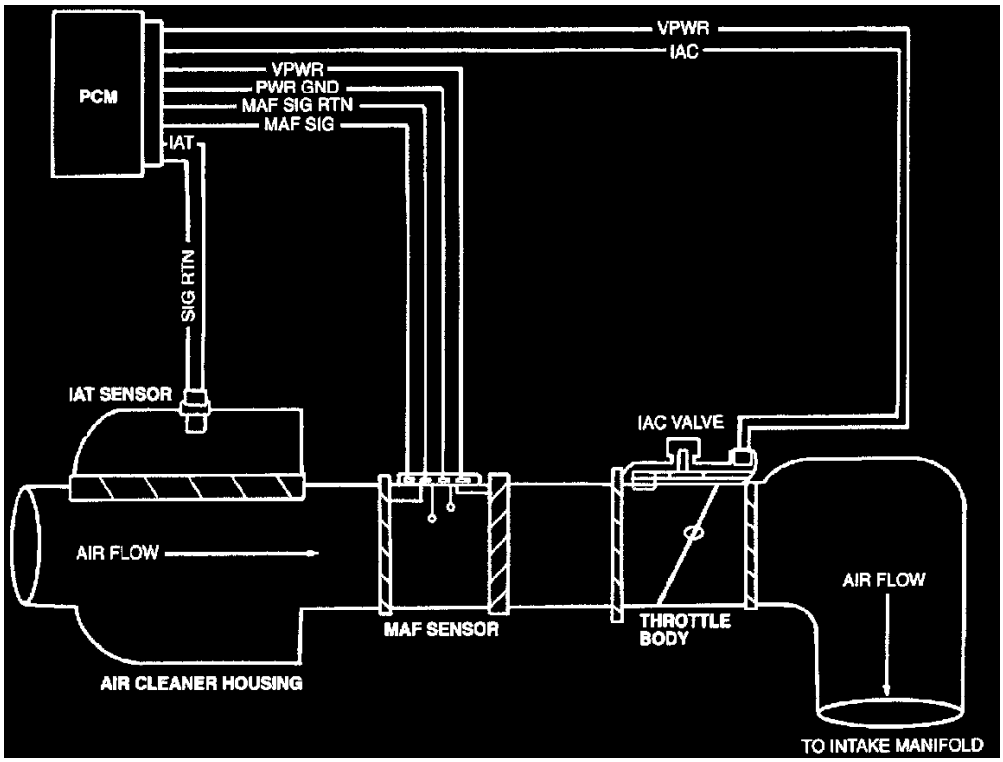
Computers and Control Systems: Pinpoint Tests
HU - Intake Air System

Test Notes



Enter this pinpoint test only when directed here.

This pinpoint test is intended to diagnose the following:
- Throttle body assembly
- Speed control cable
- Accelerator cable linkage to throttle body
- Air cleaner assembly (including air cleaner element)
- Air inlet tube
- Clean air tube (hose) and resonator
- Intake Manifold Runner Control **(IMRC)** housing assembly
- IMRC actuator assembly
- Harness circuits: IMRC, IMRC Monitor, SIG RTN, PWR GND, VPWR
- Intake Manifold tuning valve **(IMT)** electric
- IMT valve vacuum
- IMT valve vacuum control solenoid
- Powertrain control module

Parameter (PID) Values

Vehicle	Engine	Trans	RPM	IACDC %	ECT
Escort / Tracer	2.0L-2V	IF4E	780±25	21-45	80°C (180°F)
Escort / Tracer	2.0L-2V	MT	725±25	20-44	80°C (180°F)
Escort / Tracer	2.0L-4V	IF4E	780±25	21-45	80°C (180°F)
Escort / Tracer	2.0L-4V	MT	725±25	21-45	80°C (180°F)
Contour / Mystique	2.0L	CD4E	800±25	19-43	80°C (180°F)
Contour / Mystique	2.0L	MTX	880±25	21-45	80°C (180°F)
Contour / Mystique	2.5L	CD4E	744±25	20-44	80°C (180°F)
Contour / Mystique	2.5L	MTX	725±25	19-43	80°C (180°F)
Taurus / Sable	3.0L 2V	AX4N / AX4S	900±25	19-43	80°C (180°F)
Taurus / Sable	3.0L FF	AX4N / AX4S	900±25	19-43	80°C (180°F)
Taurus / Sable	3.0L 4V	AX4N	900±26	19-43	80°C (180°F)
Taurus SHO	3.4L	AX4N	900±27	19-43	80°C (180°F)
Mustang	3.8L	4R70W	700±25	21-45	80°C (180°F)
Mustang	3.8L	T5OD	720±25	20-44	80°C (180°F)
Mustang	4.6L 2V	4R70W	656±25	21-45	80°C (180°F)
Mustang	4.6L 2V	T45	656±25	20-44	80°C (180°F)
Mustang	4.6L 4V	T45	656±25	20-44	80°C (180°F)
Crown Victoria / Grand Marquis	4.6L	4R70W	800±25	19-43	80°C (180°F)
Crown Victoria	4.6L NG	4R70W	800±25	19-43	80°C (180°F)
Continental	4.6L	AX4N	800±25	19-43	80°C (180°F)
Town Car	4.6L	4R70W	800±25	20-44	80°C (180°F)
Mark VIII	4.6L	4R70W	900±28	20-45	80°C (180°F)
Ranger	2.5L	4R44E	768±25	20-44	80°C (180°F)
Ranger	2.5L	M5OD	720±25	20-45	80°C (180°F)
Ranger	3.0L	4R44E	900±25	20-44	80°C (180°F)
Ranger	3.0L	M5OD	850±25	20-44	80°C (180°F)

Vehicle	Engine	Trans	RPM	IACDC %	ECT
Ranger	4.0L	5R55E	824±25	20-44	80°C (180°F)
Ranger	4.0L	M5OD	750±25	20-45	80°C (180°F)
Windstar	3.0L	AX4S	700±25	20-45	80°C (180°F)
Windstar	3.8L	AX4S	700±25	20-45	80°C (180°F)
Explorer	4.0L	5R55E	750±26	20-46	80°C (180°F)
Explorer	4.0L	M5OD	750±27	20-47	80°C (180°F)
Explorer	4.0L S0HC	5R55E	750±26	20-46	80°C (180°F)
Explorer/Mountaineer	5.0L	4R70W	750±27	20-47	80°C (180°F)
E/F-Series	4.2L	4R70W	824±25	20-44	80°C (180°F)
F-Series	4.2L	M5OD	750±25	20-44	80°C (180°F)
E/F/Expedition	4.6L	4R70W	824±25	20-44	80°C (180°F)
F-Series	4.6L	M5OD	750±25	20-44	80°C (180°F)
E/F/Expedition/Navigator	5.4L	E4OD	824±25	20-44	80°C (180°F)
E/F-Series	5.4L NG	E4OD	750±25	20-45	80°C (180°F)
E/F-Series	6.8L	E4OD	776±24	25-37	80°C (180°F)
E/F-Series	6.8L	E4OD	780-810	20-44	180°F

RPM	IMRCM VDC (electric)	*IMRCM VDC (vacuum)	IMRC ON/OFF
KOEO	5.0 ± 0.2	3.5 ± 0.5	OFF
Idle to 3000	5.0 ± 0.2	3.5 ± 0.5	OFF
Above 3500	0.6 ± 0.3	0.6 ± 0.3	ON
3000 to Idle	5.0 ± 0.2	3.5 ± 0.5	OFF

* Voltage valves in this column will display approximately twice this valve at the breakout box with digital multimeter.

NOTE: During some Intake Manifold Runner Control **(IMRC)** service procedures, it will be necessary to perform a drive cycle for verification of the IMRC and PCM operation. The table lists RPM PID, IMRCM PID and IMRC PID values during acceleration and deceleration.

Test Step	Result ▶	Action to Take
HU1 CONFIRM DRIVE SYMPTOM This Pinpoint Test addresses these drive symptoms: • Stick, bind, grab feeling in accelerator pedal. • Hard start / long crank. • Hesitation or stalls at idle. • Idle quality symptoms. • Lack of power. • **Is the drive symptom listed above?**	Yes ▶ No ▶	GO to HU2. RETURN to Symptom Charts, to address other drive Symptoms.
HU2 SELECT DIAGNOSTIC TEST STEP • **Does the intake air system symptom relate to stick, bind, grab conditions on the throttle body?**	Yes ▶ No ▶	GO to HU3. GO to HU6.
HU3 CHECK ACCELERATOR AND SPEED CONTROL *CABLES FOR FREEDOM OF TRAVEL* • Disconnect accelerator cable and speed control cable from throttle body linkage. • Inspect cables for freedom of travel from accelerator pedal / speed control device to throttle body linkage cable connector. • **Do cables travel freely?**	Yes ▶ No ▶	GO to HU4. REPAIR cable as necessary. VERIFY a symptom no longer exists.
HU4 CHECK THROTTLE RETURN STOP • Cables removed from throttle body linkage. • Remove the clean air tube from the throttle body and verify that there is no foreign material or debris preventing the throttle plate from rotating to the fully closed position. • Verify that the throttle return stop is in contact with the throttle linkage lever arm when the throttle is in the closed plate (idle) position. • **Does the throttle return stop contact lever arm?**	Yes ▶ No ▶	GO to HU5. NOTE: Do not adjust throttle return stop to try to correct idle quality concerns. REPLACE throttle body assembly. RESTORE vehicle. VERIFY a symptom no longer exists.
HU5 CHECK FOR THROTTLE BODY STICKING, BINDING, GRABBING • Gently cycle throttle from open to closed position several times. • Gently cycle throttle by hand from closed to WOT position. Inspect for freedom of travel particularly during the initial throttle opening. • NOTE: Throttle bodies use a special coating / sealant on the throttle bore and plate area to make them tolerant to engine sludge accumulation. **CAUTION: Do not clean the throttle bore and plate area. Cleaning will damage the throttle body assembly.** • **Does the throttle rotate freely without sticking, binding or grabbing condition?**	Yes ▶ No ▶	RECONNECT accelerator cable and clean air tube to the throttle body assembly. RETURN to Symptom Charts, if the drive Symptom persists. REPLACE throttle body assembly. RESTORE vehicle. GO to HU . Start the engine. Gently cycle throttle by hand from closed to partially open position. Inspect for freedom of travel particularly during the initial throttle opening.
HU6 CHECK AIR CLEANER ELEMENT • Inspect air cleaner element. • **Is the air cleaner element excessively dirty?**	Yes ▶ No ▶	REPLACE air cleaner element. RETURN Symptom Charts, if the drive Symptom persists. GO to HU8.

	Test Step	Result ▶	Action to Take
HU8	CHECK FOR PROPER OPERATION OF RELATED ENGINE SYSTEMS		
	NOTE: If here from Pinpoint Test QA, go directly to HU9. • Verify that the following engine systems have been properly diagnosed and corrected before proceeding with the Intake Air system diagnostics: — Positive Crankcase Ventilation (PCV) System. — Ignition System. — Exhaust System. — Engine Cooling System (engine coolant temperature is above 80°C (180°F)). — Incorrect fuel pressure, plugged fuel filter, fuel quality (contamination). • **Have the systems been properly checked and are they operating properly?**	Yes ▶ No ▶	GO to HU9. GO to Symptom Charts with the symptom for direction.
HU9	CHECK FOR VACUUM LEAKS		
	• Key on, engine running. • With engine at idle, listen for vacuum leaks. • Inspect the entire Intake Air System from the mass air flow (MAF) sensor to the intake manifold for leaks such as: — Cracked or punctured inlet air tube. — Loose connections on the inlet air tube at the air cleaner housing or throttle body. — Idle air control (IAC) valve assembly or gasket seal. — EGR valve gasket seal leak to intake manifold. — Intake manifold assembly or gasket seal. — EGR valve diaphragm or control solenoid. — Vacuum supply connectors and hose. — PCV connectors and hose. • **Are any leaks detected in the areas listed above?**	Yes ▶ No ▶	REPAIR as necessary. VERIFY a symptom no longer exists. GO to HU10.

Test Step	Result ▶	Action to Take
HU10 CHECK IDLE		
• Transmission in PARK (wheels blocked and parking brake engaged). • A/C, heater and all accessories are off. • Engine at normal operating temperature and fan control off. **CAUTION: Do not disconnect fan control harness. It may cause engine overheating.** • Connect Scan Tool. • Access engine RPM PID. NOTE: Engine idle rpm is controlled by the PCM and cannot be adjusted. The PCM is calibrated to control idle at the speeds listed in the Hot Idle PID Value Table at the beginning of this Pinpoint Test. When performing this test, verify the rpm is within specification. If the engine is allowed to idle for an extended period of time, or if the engine temperature is hot enough to require fan control operation, it may be necessary to turn the engine off and repeat this test procedure. Vehicle must idle for at least one minute after startup before reading PID. • Access IAC PID, idle air percent duty cycle. • **Do the RPM and IAC PID readings match the values in the Hot Idle PID Value Table at the beginning of the pinpoint test?**	Yes ▶ No ▶	GO to HU11. GO to HU12.
HU11 CHECK IDLE CONTROL RESPONSE		
• Transmission still in PARK. • A/C, heater and all accessories off. • Engine at normal operating temperature and fan control off, but not disconnected. **CAUTION: Do not disconnect fan control harness. It may cause engine overheating.** • Briefly perform wide open throttle and let it return to the idle position. • **Does the engine stall or does the rpm fluctuate excessively before returning to the idle speed specified in HU10?**	Yes ▶ No ▶	GO to HU12. Intake Air system is OK. RESTORE vehicle. RETURN to Symptom Charts to check other possible causes of the drive symptoms.

Test Step	Result ▶	Action to Take
HU12 CHECK IAC VALVE FOR PROPER FUNCTION • Transmission still in PARK. • A/C, heater and all accessories off. • Engine at normal operating temperature and fan control off, but not disconnected. **CAUTION: Do not disconnect fan control harness. It may cause engine overheating.** • Disconnect IAC valve harness connector. • Listen to engine rpm. • Key off. • **Did the rpm drop or engine stall?**	Yes ▶ No ▶	**Fast Idle Symptom:** GO to HU14. **Other Symptoms:** GO to HU13. NOTE: Do not attempt to clean the IAC valve. IAC valve is inoperative. REPLACE IAC valve only. RESET Keep Alive Random Access Memory (RAM). VERIFY symptom no longer exists.
HU13 THROTTLE BODY VISUAL / FUNCTIONAL CHECK • Remove throttle body assembly (refer to Workshop Manual). • Hold throttle body up to a light source. The hole in the throttle plate (in some applications only) must be visible and unobstructed. • Rotate the throttle lever and allow it to return. It must not stick or bind and must return to the closed plate position (throttle return stop contacting lever) freely when released. • **Does the throttle body pass these visual/functional checks?**	Yes ▶ No ▶	Throttle body is operating properly. REINSTALL throttle body assembly. RETURN to Symptom Charts to check other possible causes of symptom. Throttle body is inoperative. REPLACE entire throttle body assembly. RESET Keep Alive Random Access Memory (RAM). VERIFY a symptom no longer exists.
HU14 CHECK IAC CIRCUIT FOR SHORT TO GROUND • Install breakout box, leave PCM disconnected. • Measure resistance between PCM test pin 83 (IAC) and PCM test pins 51 or 103 (PWR GND). • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE damaged PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short circuit. RESTORE vehicle. RERUN Quick Test.

Test Step		Result ▶	Action to Take
HU15	PERFORM VISUAL INSPECTION		
	DTCs P1518, P1537 and P1536 indicate IMRC is stuck open. DTCs P1512, P1513 and P1519 can indicate IMRC may be stuck closed. DTCs P1516 and P1517 indicate IMRC input error. Possible causes: — Damaged vacuum lines. — Damaged vacuum solenoid. — Damaged vacuum actuator. — IMRC actuator cable / gears seized. — Cables improperly routed (binding) or seized. — Damaged / disconnected IMRC housing return springs. — Lever / shaft return stop obstructed / bent. — Lever / shaft wide open stop obstructed / bent. — IMRC lever / shaft stick / bind or disconnected. • For electric IMRC, view cable routing. Make sure cables are not binding or improperly routed. Cable core wire at IMRC housing attachment must have slack and lever must contact closed plate stop screw. For Escort / Tracer, view IMRC actuator lever. Make sure lever is visible. For vacuum operated IMRC systems, make sure sensor linkage is attached and secure. Lever must contact closed plate stop screw with key on engine running. • NOTE: IMRC return spring is strong. Make sure return springs operate properly and plates open and close fully. Manually open and close IMRC plates at intake manifold (press IMRC lever down for Escort / Tracer) and feel for sticking / binding. • **Is fault indicated?**	Yes ▶	REPAIR as necessary. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. RESTORE vehicle. VERIFY service.
		No ▶	Passed visual inspection. GO to HU16.

Test Step	Result ▶	Action to Take
HU16 PERFORM IMRC FUNCTIONAL TEST		
• Connect scan tool to data link connector (DLC). • Key on, engine off. • Access Output Test Mode (OTM). **WARNING: KEEP FINGERS CLEAR OF IMRC LEVER/CABLE MECHANISM.** • Turn all outputs on (IMRC included). • When IMRC is commanded on, lever(s) should rotate to full open position. At least one of the levers should contact the wide open stop, the other may be slightly off the wide open stop. This is normal. For Escort/Tracer, IMRC actuator lever will rotate to full open position at approximately 90 degrees. • **Did the IMRC lever(s) cycle from fully closed and remain fully open while all outputs were on?**	Yes ▶ No ▶	Passed operational test. **For DTC P1516 and P1517:** GO to HU64. **For DTC P1518:** GO to HU26. **For DTC P1519:** GO to HU29. Exit OTM. GO to HU17.
HU17 PERFORM IMRC OPERATIONAL TEST		
• Key on, engine running • Increase engine speed to above 3500 rpm. **CAUTION: Keep fingers clear of IMRC lever/cable mechanism.** • When engine speed is above approximately 3500 rpm, lever(s) must rotate to full open position. At least one lever should contact the wide open stop (for Escort/Tracer, lever will not be visible), the other (if applicable) may be slightly off the wide open stop. This is normal. When engine returns to idle (or below 3000 rpm), lever(s) must return to original closed position. • Key off. • **Did the IMRC lever(s) cycle from fully closed and remain fully open while the rpm was above 3500?**	Yes ▶ No ▶	Passed operational test. **For DTC P1516 and P1517:** GO to HU64. **For DTC P1518:** GO to HU26. **For DTC P1519:** GO to HU29. Failed operational test. GO to HU18 (except Escort/Tracer). **For Escort/Tracer:** GO to HU20.

Test Step	Result ▶	Action to Take
HU18 PERFORM IMRC PHYSICAL TEST		
• Disconnect IMRC cables from both LH and RH intake runners. • NOTE: IMRC return springs are strong. Rotate by hand both the LH and RH bank IMRC housing lever assembly fully open and then closed. • Feel for sticking or binding plate rotation. • Feel for return spring tension.34 to.45 N-m (3 to 4 lb-in). • **Do the IMRC plates open and close completely (lever contacting closed plate stop screw) without obstruction?**	Yes ▶	Passed physical check, RECONNECT IMRC cables or IMRC monitor assembly: **For DTC P1516 and P1517:** GO to HU64. **For DTC P1518:** GO to HU26. **For DTC P1519:** GO to HU29.
	No ▶	Failed physical test. INSPECT IMRC runner plates for sludge contaminants, warping, misalignment, etc. CLEAN as necessary. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HU19 VERIFY IMRC CIRCUIT FAULT		
Intake Manifold Runner Control circuit malfunction: Possible causes: — IMRC control circuit open. — IMRC VPWR circuit open. — IMRC control circuit shorted to PWR GND or SIG RTN. — IMRC control circuit shorted to VPWR. — Damaged IMRC actuator. — Damaged PCM. • Connect scan tool to DLC. • Key on, engine off. • Access IMRCF PID. • **Does PID display On?**	Yes ▶ No ▶	Fault is present. GO to HU20. Fault is intermittent. GO to HU36.
HU20 CHECK IMRC ACTUATOR VPWR CIRCUIT FOR OPEN IN HARNESS		
• Disconnect IMRC actuator harness connector. • Key on, engine off. • Measure voltage between VPWR circuit at the IMRC actuator harness connector and B-. • Key off. • **Is IMRC VPWR voltage greater than 10.5 volts?**	Yes ▶ No ▶	VPWR OK. GO to HU21. REPAIR open in IMRC VPWR circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.

Test Step		Result ▶	Action to Take
HU21	CHECK PWR GND CIRCUIT FOR OPEN IN HARNESS		
	• IMRC actuator harness connector disconnected. • Key on, engine off. • Measure voltage between PWR GND circuit and VPWR circuit at the IMRC actuator. • Key off. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	Passed PWR GND check. GO to HU22. REPAIR open in IMRC PWR GND circuit. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test.
HU22	CHECK IMRC DRIVER CIRCUIT FOR SHORT TO GROUND		
	• Disconnect scan tool from DLC. • IMRC actuator harness connector disconnected. • Measure resistance from IMRC signal circuit at the harness connector to B-. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	Passed check. GO to HU23. GO to HU39.
HU23	CHECK IMRC DRIVER CIRCUIT FOR SHORT TO VPWR / VREF		
	• Install breakout box, leave PCM disconnected. • Measure voltage between PCM test pin 42 and PCM test pins 51 or 103 at the breakout box. • **Is voltage less than 1.0 volt?**	Yes ▶ No ▶	GO to HU24. REPAIR IMRC control circuit short to VPWR / VREF. RESTORE vehicle. RERUN Quick Test.
HU24	CHECK IMRC DRIVER CIRCUIT FOR OPEN IN HARNESS		
	• IMRC actuator harness connector disconnected. • Install breakout box, leave PCM disconnected. • Disconnect scan tool from DLC. • Measure resistance from PCM test pin 42 and IMRC signal circuit at IMRC actuator harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to HU25. REPAIR open IMRC control circuit. RESTORE vehicle. RERUN Quick Test.
HU25	VERIFY PCM IMRC DRIVER		
	• Reconnect IMRC actuator harness connector. • Key on, engine off. • Jumper PCM test pin 42 to PCM test pins 51 or 103. • Key off. • **Did the IMRC plates open after the jumper was inserted?**	Yes ▶ No ▶	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPLACE IMRC actuator. RESTORE vehicle. RERUN Quick Test.

Test Step	Result ▶	Action to Take
HU26 DTC P1518: VERIFY IMRC MONITOR CIRCUIT VOLTAGE Diagnostic Trouble Code (DTC) P1518 indicates the IMRC monitor circuit voltage is less than expected. Possible causes: — IMRC monitor signal circuit shorted to PWR GND or SIG RTN. — Damaged IMRC actuator. — Damaged PCM. • Connect scan tool to data link connector (DLC). • Key on, engine off. NOTE: If the IMRC plates are physically open, go to HU20 except Escort / Tracer. Escort / Tracer go to HU22. • Access IMRCM PID. • **Is IMRCM PID reading with the plates closed greater than 1.6 volts?**	Yes ▶ No ▶	Fault is intermittent. GO to HU34. Failed IMRC monitor circuit check. GO to HU27.
HU27 CHECK IMRC MONITOR CIRCUIT • Key off. • Disconnect IMRC harness connector from IMRC actuator. • Key on, engine off. • Access IMRCM PID. • **Did PID reading increase to more than 1.6 volts when the IMRC actuator harness connector was disconnected?**	Yes ▶ No ▶	Make sure IMRC plates are closed. For Escort / Tracer, be sure IMRC actuator lever is visible and plates closed. Then REPLACE IMRC actuator. COMPLETE PCM Reset to clear DTCs. RESTORE vehicle. RERUN Quick Test. GO to HU28.
HU28 CHECK IMRC MONITOR CIRCUIT FOR SHORT TO GROUND • Key off. • IMRC actuator harness connector disconnected. • Disconnect PCM. • Disconnect scan tool from DLC. • At the harness connector measure resistance from IMRC monitor circuit to B-. • At the harness connector, measure resistance from IMRC monitor circuit to SIG RTN. • **Is resistance greater than 10,000 ohms for B- and SIG RTN?**	Yes ▶ No ▶	Monitor circuit OK. REPLACE damaged PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short in IMRC monitor circuit to B- or SIG RTN. RESTORE vehicle. RERUN Quick Test.

Test Step		Result ▶	Action to Take
HU29	DTC P1519: IMRC MONITOR CIRCUIT INPUT GREATER THAN EXPECTED		
	Diagnostic Trouble Code (DTC) P1519 indicates the IMRC monitor circuit signal voltage is greater than expected. Possible causes: — IMRC monitor circuit open. — IMRC control circuit open. — IMRC monitor circuit short to VREF. — IMRC monitor return circuit open. — Damaged IMRC actuator. — IMRC VPWR circuit open. — Damaged PCM. • Key off. • Connect scan tool to data link connector (DLC). • Disconnect IMRC actuator harness connector. • Connect a wire jumper from IMRC monitor circuit pin to SIG RTN at the IMRC harness connector. NOTE: If any scan tool communication concern exists, remove jumper and go to HU38. • Key on, engine off. • Access IMRCM PID. • Key off. • **Was IMRCM PID reading less than 0.2 volt?**	Yes ▶ No ▶	Expected reading. REMOVE jumper wire. GO to HU40. REMOVE jumper wire. GO to HU30.
HU30	CHECK SIG RTN CIRCUIT FOR OPEN IN HARNESS		
	• Disconnect scan tool from DLC. • Measure resistance between B- and SIG RTN circuit at the IMRC harness connector. • **Is reading less than 5.0 ohms?**	Yes ▶ No ▶	Expected reading. GO to HU31. REPAIR open SIG RTN circuit. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33.
HU31	CHECK IMRC MONITOR CIRCUIT FOR OPEN IN HARNESS		
	• *Install breakout box, leave PCM disconnected.* • Measure resistance between PCM test pin 8 and IMRC monitor circuit at the IMRC actuator harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	REPLACE damaged PCM. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33. REPAIR open in IMRC monitor circuit. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33.

Test Step	Result ▶	Action to Take
HU32 ACCESS OTM TO CHECK CIRCUIT OPERATION • Connect scan tool to DLC. • Key on, engine off. • Access Output Test Mode (OTM). • While in Output Test Mode, access the IMRC and IMRCM PIDs. If the scan tool will not allow access to PIDs while in Output Test Mode, disconnect PCM, install a breakout box, reconnect PCM, connect a digital multimeter between PCM test pin 8 and PCM test pins 51 or 103. • Command the outputs on. The IMRCM PID value should be less than 1.6 volts (the digital multimeter voltage should show the same reading). Also, the IMRC PID should be in the ON state. • **Is the PID/digital multimeter reading less than 1.6 volts?**	Yes ▶ No ▶	Fault is intermittent. GO to HU34 REPLACE damaged IMRC actuator. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33.
HU33 IMRC REPAIR VERIFICATION DRIVE CYCLE • Key on, engine off. • Connect scan tool to data link connector (DLC). • Complete PCM Reset. • Access IMRC, IMRCM and RPM PIDs. • Vehicle at operating temperature. • Drive vehicle, obeying all traffic and safety laws. • Transmission in OVERDRIVE range. • SAFELY perform three accelerations from stop to more than 3500 rpm. Watch for IMRC, IMRCM and RPM PIDs to change. Refer to IMRC Drive Cycle PID Table at the beginning of this Pinpoint Test. • Perform Quick Test. • **Are any DTCs received?**	Yes ▶ No ▶	GO to Powertrain DTC chart. PASSED IMRC Drive Cycle. No IMRC fault is present at this time.
HU34 IMRC MONITOR CIRCUIT LOW WIGGLE TEST • *Key on, engine off.* • Connect scan tool to data link connector (DLC). • IMRC actuator disconnected. • Connect a wire jumper from IMRC monitor circuit pin to SIG RTN pin at IMRC connector. • Access IMRCM PID (with jumper connected, reading must be less than 0.2 volt). • While viewing the PID, wiggle wiring from IMRC connector to PCM connector. • **Did IMRCM PID reading jump from less than 0.2 volt to greater than 1.6 volts?**	Yes ▶ No ▶	Intermittent fault area has been identified. ISOLATE and REPAIR as necessary. REMOVE jumper wire. RESTORE vehicle. COMPLETE PCM Reset to clear DTCs. RERUN Quick Test. GO to HU35.

Test Step	Result ▶	Action to Take
HU35 IMRC MONITOR CIRCUIT HIGH WIGGLE TEST		
• Key off. • IMRC actuator harness connector disconnected. • Key on, engine off. • Access IMRCM PID. • While viewing the IMRCM PID, wiggle wiring from IMRC connector to PCM connector. • **Did IMRCM PID reading drop to less than 1.6 volts?**	Yes ▶	Intermittent fault area has been identified. ISOLATE and REPAIR as necessary. PERFORM this test step again to verify repair.
	No ▶	Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: IMRCM and IMRC PIDs and list of Possible causes.
HU36 INTERMITTENT CIRCUIT HIGH FAULT TEST		
• Key off. • Reconnect all components. • Connect scan tool to DLC. • Key on, engine off. • Access Output Test Mode. • While in Output Test Mode, access the IMRC and IMRCM PIDs. If the scan tool will not allow access to PIDs while in Output Test Mode, install a breakout box, reconnect PCM and connect a digital multimeter between PCM test pin 42 and PCM test pins 51 or 103. • Command the outputs on. The IMRC PID value should be on (the digital multimeter voltage should be less than 1.0 volt) and the IMRCM PID value should be less than 1.6 volts. — Shake, wiggle and bend the IMRC Signal Circuit wiring from the IMRC actuator back to the PCM while viewing the IMRC digital multimeter reading or IMRCM PID reading. — Look for a sudden change in the IMRCM PID reading or in the digital multimeter reading to indicate when a fault is detected. • **Is a fault indicated?**	Yes ▶	Possible open in IMRC control circuit or VPWR circuit to the IMRC actuator. ISOLATE fault and REPAIR as necessary. REPEAT this test step to verify repair.
	No ▶	GO to HU37.

Test Step	Result ▶	Action to Take
HU37 INTERMITTENT CIRCUIT LOW FAULT TEST This step determines whether the IMRC Signal Circuit is intermittently shorting to ground and causing the IMRC plates to open. • Key on, engine off. • All components connected. • While viewing IMRC plates or actuator lever on Escort/Tracer, wiggle wiring and connectors from IMRC actuator to PCM. • **Did the IMRC lever move or plates open while wiggling/pulling on the wiring?**	Yes ▶ No ▶	Possible short to ground in the IMRC Control Circuit. ISOLATE fault and REPAIR as necessary. REPEAT this test step to verify service. Unable to duplicate or identify fault at this time. GO to Pinpoint Test Step Z1 with the following data: IMRCM and IMRC PIDs and list of Possible causes.
HU38 CHECK IMRC MONITOR CIRCUIT FOR SHORT TO VREF IN HARNESS • Key off. • IMRC actuator harness connector disconnected. • Install breakout box, leave PCM disconnected. • Disconnect scan tool from DLC. • Measure resistance between PCM test pin 8 and PCM test pin 90. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short between IMRC monitor circuit and VREF circuit. RESTORE vehicle. RERUN Quick Test.
HU39 CHECK IMRC CONTROL CIRCUIT FOR SHORT TO GROUND • IMRC actuator harness connector disconnected. • Install breakout box, leave PCM disconnected. • Disconnect scan tool from DLC. • Measure resistance between PCM test pin 42 and PCM test pins 51 or 103 and 91. • **Is resistance greater than 10,000 ohms for PWR GND and SIG RTN?**	Yes ▶ No ▶	REPLACE PCM. RESTORE vehicle. RERUN Quick Test. REPAIR short to GND or SIG RTN in IMRC control circuit. RESTORE vehicle. RERUN Quick Test.
HU40 ENTER OTM TO CHECK IMRC CIRCUIT • Reconnect IMRC actuator harness connector. • Connect scan tool to DLC. • Key on, engine off. • Access Output Test Mode (OTM) • While in OTM, turn all outputs on. Observe the IMRC lever(s). • Key off. • **Did the IMRC lever(s) cycle open during the OTM command?**	Yes ▶ No ▶	GO to HU32. GO to HU20.

Test Step	Result ▶	Action to Take
HU64 DETERMINE IMRC FAULT PATH		
Diagnostic Trouble Codes (DTCs) P1516 or P1517 indicate the IMRC plates were open or closed longer than expected. This step determines the diagnostic path for DTCs P1516 or P1517. • Connect scan tool to DLC. • Key on, engine off. • Access IMRCM and IMRC2M (for Escort / Tracer, do not access IMRC2M PID). • Key off. • **Were the PID values less than 3 volts?**	Yes ▶ No ▶	GO to HU29. GO to HU26.
HU65 PERFORM VISUAL INSPECTION		
DTC P1549 indicates IMTV circuit malfunction. Lack or loss of power may be caused by a damaged IMT valve. Vacuum control solenoid may be damaged for SOHC engine. Possible causes: — Open signal circuit. — Open VPWR circuit. — Shorted signal circuit. — Damaged IMT valve. — Damaged PCM. • Inspect IMT Valve System. Check to be sure the harness is intact and the connector is firmly in place. Check vacuum line for SOHC IMTV system. • **Is fault indicated?**	Yes ▶ No ▶	REPAIR as necessary. COMPLETE PCM reset. VERIFY a symptom no longer exists. Passed visual inspection. GO to HU66.
HU66 CHECK PCM DRIVER COMMAND		
• Connect scan tool to data link connector (DLC). • Key on, engine running. • Access IMTV PID. • Increase engine speed to about 3500 rpm while observing IMTV PID. • Key off. • **Did PID read 100% then drop to 50% while *rpm was above 3500* or did SOHC read ON?**	Yes ▶ No ▶	Passed test. GO to HU67. REPLACE damaged PCM. RERUN Quick Test and VERIFY a symptom no longer exists.
HU67 CHECK IMT VALVE ACTUATOR OR VACUUM CONTROL SOLENOID VPWR CIRCUIT FOR OPEN IN HARNESS		
• Disconnect harness connector from the actuator (solenoid for SOHC). • Key on, engine off. • Measure VPWR circuit voltage at the harness connector. • Key off. • **Was the voltage greater than 10.5 volts?**	Yes ▶ No ▶	Passed check. GO to HU69. REPAIR IMT Valve actuator (vacuum solenoid for SOHC) VPWR circuit for open. RESTORE vehicle. COMPLETE PCM Reset. RERUN Quick Test and VERIFY a symptom no longer exists.

	Test Step	Result ▶	Action to Take
HU69	CHECK FOR OPEN SIGNAL CIRCUIT BETWEEN PCM AND IMT VALVE ACTUATOR OR VACUUM CONTROL SOLENOID		
	• Install breakout box, leave PCM disconnected. • Measure resistance of Circuit between PCM test pin 46 and actuator or solenoid for SOHC harness connector. • **Is the resistance less than 5.0 ohms?**	Yes ▶ No ▶	Passed test. GO to HU70. REPAIR IMT Valve Actuator (vacuum solenoid for SOHC) Signal Circuit open. RESTORE vehicle. COMPLETE PCM Reset. RERUN Quick Test and VERIFY a symptom no longer exists.
HU70	CHECK IMT VALVE ACTUATOR OR VACUUM CONTROL SOLENOID SIGNAL FOR SHORT TO PWR GND		
	• Measure resistance between PCM test pin 46 and test pin 77 or 103. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	Passed check. GO to HU71. REPAIR IMT Valve actuator (solenoid for SOHC) signal circuit for short to PWR GND. RESTORE vehicle. COMPLETE PCM Reset. RERUN Quick Test and VERIFY a symptom no longer exists.
HU71	CHECK IMT VALVE ACTUATOR OR VACUUM CONTROL SOLENOID SIGNAL CIRCUIT FOR SHORT TO VPWR		
	• Key on, engine off. • Measure voltage between PCM test pin 46 and 77 or 103. • Key off. • **Was the voltage less than 1 volt?**	Yes ▶ No ▶	Passed check. GO to HU72. REPAIR IMT Valve actuator (vacuum solenoid for SOHC) signal circuit for short to VPWR. RESTORE vehicle. COMPLETE PCM Reset. RERUN Quick Test and VERIFY a symptom no longer exists.

Test Step		Result ▶	Action to Take
HU72	CHECK PCM DRIVER FOR IMT VALVE ACTUATOR OR VACUUM CONTROL SOLENOID		
	• Reconnect PCM. • Connect DVOM to VPWR and signal at the harness connector. • Connect scan tool to data link connector (DLC). • Key on, engine off. • Access Output Test Mode (OTM). • Take a reading with the digital Multimeter. • Command all outputs on. • Take another reading with the digital Multimeter. • Key off. • **Was the voltage less than 1 volt before commanding all outputs on and greater than 10.5 volts with all outputs on?**	Yes ▶ No ▶	Passed test. GO to HU73. For SOHC GO to HU75. REPLACE PCM. RESTORE vehicle. COMPLETE PCM Reset. RERUN Quick Test and VERIFY a symptom no longer exists.
HU73	CHECK IMT VALVE SHUTTER FOR DAMAGE		
	• Remove IMT Valve . • Visually inspect IMT valve shutter for damage. • Rotate shutter by hand. • **Does the shutter bind or appear damaged?**	Yes ▶ No ▶	Damaged shutter. REPLACE IMT valve. RESTORE vehicle. COMPLETE PCM Reset. RERUN Quick Test and VERIFY a symptom no longer exists. Passed test. Leave IMT Valve disassembled. GO to HU74. For SOHC GO to HU77.
HU74	CHECK IMT VALVE ACTUATOR FOR COIL DAMAGE		
	• Reconnect IMT valve harness connector. • Key on, engine off. • Access Output Test Mode (OTM) • Command all outputs on. • **Did the IMT valve shutter rotate when commanding all outputs on?**	Yes ▶ No ▶	Passed check. Fault is intermittent. GO to Pinpoint Test Step Z1 with the IMTV PID and list of possible causes. REPLACE IMT valve actuator. COMPLETE PCM Reset. RESTORE vehicle. RERUN Quick Test and VERIFY a symptom no longer exists.

Test Step		Result ▶	Action to Take
HU75	CHECK MANIFOLD VACUUM TO IMT VALVE SOLENOID		
	• Reconnect solenoid harness connector. • Disconnect vacuum line at the solenoid from the intake manifold. • Install a vacuum gauge to the vacuum line. • Start engine and let idle. • Inspect both vacuum lines to solenoid for leaks, kinks, disconnects, blockage, routing or any damage. • Take a reading from the gauge. • **Is the gauge reading greater than 33.8 kPa (10 in-Hg) at idle and the vacuum lines ok?**	Yes ▶ No ▶	Passed check. RECONNECT vacuum line from the manifold to the solenoid. GO to HU76. REPAIR open in vacuum source. COMPLETE PCM Reset. RESTORE vehicle. RERUN Quick Test and VERIFY a symptom no longer exists.
HU76	CHECK VACUUM BETWEEN VACUUM SOLENOID AND IMT VALVE		
	• Disconnect vacuum line at the IMT valve from the solenoid. • Install a vacuum gauge to the vacuum line and take a reading. • Increase engine speed to about 3500 rpm while reading gauge. • Key off. • **Did the vacuum gauge read 0 kPa (0 in-Hg) at idle and greater than 33.8 kPa (10 in-Hg) at 3500 rpm?**	Yes ▶ No ▶	Passed check. GO to HU73. REPLACE IMT valve vacuum solenoid. COMPLETE PCM Reset. RERUN Quick Test and VERIFY a symptom no longer exists. RESTORE vehicle.
HU77	VACUUM CHECK ON IMT VALVE FOR INTERNAL DAMAGE		
	• Apply approximately 33.8 kPa (10 in-Hg) to IMT Valve. • Observe IMT valve shutter. • **Did IMT valve shutter rotate 90 degrees with vacuum applied and return to original position when vacuum was released?**	Yes ▶ No ▶	Passed check. Fault is intermittent. GO to Pinpoint Test Step Z1 with the IMTV PID and list of possible causes. REPLACE IMT valve. RESTORE vehicle. COMPLETE PCM Reset. RERUN Quick Test and VERIFY a symptom no longer exists.
HU80	CHECK VACUUM CONTROL SOLENOID VPWR CIRCUIT FOR OPEN IN HARNESS		
	• Disconnect harness connector from the solenoid. • Key on, engine off. • Measure VPWR circuit voltage at the harness connector. • **Was the voltage greater than 10.5 volts?**	Yes ▶ No ▶	Passed check. GO to HU81. REPAIR vacuum solenoid VPWR circuit for open. COMPLETE PCM Reset. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33.

Test Step		Result ▶	Action to Take
HU81	CHECK B+ TO VACUUM ACTUATOR VPWR CIRCUITS FOR OPEN IN HARNESS		
	• NOTE: IMRC vacuum actuator harness connectors are interchangeable. Be sure each connector is attached to the proper bank. Observe IMRCM (bank 1) and IMRCM2 (bank2) PID value change with scan tool while disconnecting each harness connector. Bank 1 on a "V" type engine is on the RH side when sitting in the driver seat or near the dash panel on the transverse mounted engine. • Disconnect harness connectors from each actuator. • Measure VPWR circuit voltage at each harness connector. • **Was the voltage greater than 10.5 volts.**	Yes ▶ No ▶	Passed test. GO to HU82 REPAIR the failed vacuum actuator VPWR circuit for open. COMPLETE PCM Reset. RESTORE vehicle. GO to HU33.
HU82	CHECK PCM DRIVER FOR VACUUM CONTROL SOLENOID		
	• Connect digital Multimeter to VPWR and signal at the harness connector. • Connect scan tool to data link connector (DLC). • Access Output Test Mode (OTM) • Take a reading with the digital mltimeter. • Command all outputs on. • Take another reading with the digital multimeter. • Key off. • **Was the voltage less than 1 volt before commanding all outputs on and greater than 10.5 volts with all outputs on?**	Yes ▶ No ▶	Passed check. GO to HU86. GO to HU83.
HU83	CHECK VACUUM CONTROL SOLENOID SIGNAL FOR SHORT TO PWR GND		
	• Install breakout box, leave PCM connected. • Measure resistance between PCM test pin 42 and 77 or 103. • ***Is the resistance greater than 10,000 ohms?***	Yes ▶ No ▶	Passed check. GO to HU84. REPAIR Vacuum Solenoid Signal Circuit. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33.

Test Step	Result ▶	Action to Take
HU84 CHECK VACUUM CONTROL SOLENOID SIGNAL FOR SHORT TO VPWR		
• Key on, engine off. • Measure voltage between PCM test pin 42 and 77 or 103. • Key off. • **Was the voltage less than 1 volt?**	Yes ▶ No ▶	Passed check. GO to HU85. REPAIR Vacuum Solenoid Signal Circuit for short to VPWR. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33.
HU85 CHECK FOR OPEN SIGNAL CIRCUIT BETWEEN PCM AND VACUUM CONTROL SOLENOID		
• Measure resistance of circuit between PCM test pin 42 and solenoid harness connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	Passed check. REPLACE PCM. RESTORE vehicle. GO to HU33. REPAIR Vacuum Solenoid Signal Circuit for open. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33.
HU86 CHECK FOR VACUUM FROM MANIFOLD TO VACUUM CONTROL SOLENOID		
• Disconnect vacuum line at the solenoid from the intake manifold. • Install a vacuum gauge to the vacuum line. • Key on, engine running. • Inspect both vacuum lines to solenoid for leaks, kinks, disconnects, blockage, routing or any damage. • Take a reading from the gauge. • Key off. • **Was the gauge reading greater than 33.8 kPa (10 in-Hg) at idle and were vacuum lines ok?**	Yes ▶ No ▶	Passed check. RECONNECT vacuum line from the manifold to the solenoid. GO to HU87. REPAIR open in vacuum source. COMPLETE PCM reset. RESTORE vehicle. COMPLETE IMRC Repair Verification Drive Cycle. GO to HU33.
HU87 CHECK FOR VACUUM FROM VACUUM CONTROL SOLENOID TO VACUUM ACTUATORS		
• Disconnect vacuum line at the solenoid to actuators. • Install vacuum gauge to the solenoid. • Key on, engine running. • Take a reading from the gauge. • Increase engine speed to at least 3500 rpm. • Take another gauge reading at 3500 rpm. • Key off. • **Did the vacuum gauge read greater than 33.8 kPa (10 in-Hg) at idle and 0 kPa (0 in-Hg) above 3500 rpm?**	Yes ▶ No ▶	Passed check. GO to HU88. REPLACE vacuum solenoid. COMPLETE PCM reset. RESTORE vehicle. COMPLETE IMRC Repair Verification Drive Cycle. GO to HU33.

	Test Step	Result ▶	Action to Take
HU88	CHECK FOR OPEN PWR GND CIRCUIT BETWEEN VACUUM ACTUATORS AND BATTERY NEGATIVE POST		
	• Key on. • Measure voltage between VPWR and PWR GND at each actuator harness connector. • Key off. • **Was each voltage greater than 10.5 volts?**	Yes ▶ No ▶	Passed check. GO to HU89. REPAIR failed vacuum actuator PWR GND circuit for open. COMPLETE PCM reset. RESTORE vehicle. COMPLETE IMRC Repair Verification Drive Cycle. GO to HU33.
HU89	CHECK VACUUM ACTUATOR SIGNAL FOR SHORT TO VPWR		
	• Install breakout box, leave PCM disconnected. • Key on. • Measure voltage between signal and PWR GND at each actuator harness connector. • Key off. • **Was each voltage less than 1 volt?**	Yes ▶ No ▶	Passed check. GO to HU90. REPAIR Failed Vacuum Actuator Signal Circuit short to VPWR. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33.
HU90	CHECK VACUUM ACTUATOR SIGNAL FOR SHORT TO PWR GND		
	• Measure resistance between PCM test pin 8 and 77 or 103. • Measure resistance between PCM test pin 9 and 77 or 103. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	Passed check. GO to HU91. REPAIR Failed Vacuum Actuator Signal Circuit for short. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33.
HU91	CHECK FOR OPEN SIGNAL CIRCUIT BETWEEN PCM AND VACUUM ACTUATORS		
	• Measure resistance of circuit between PCM test pin 8 and vacuum actuator harness connector signal bank 1. • Measure resistance of circuit between PCM test pin 9 and vacuum actuator harness connector signal bank2. • ***Is each resistance less than 5 ohms?***	Yes ▶ No ▶	Passed check. GO to HU92. REPAIR Failed Vacuum Actuator Signal Circuit for open. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle. GO to HU33.

Test Step	Result ▶	Action to Take
HU92 CHECK PCM MONITOR CIRCUIT FOR DAMAGE • Reconnect PCM to breakout box. • Key on. • Connect scan tool to data link connector (DLC). • Access IMRCM and IMRC2M PIDs • Note PID readings for each bank. • Jumper PCM test pin 8 to 77 or 103 then 97 while observing IMRCM PID. • Jumper PCM test pin 9 to 77 or 103 then 97 while observing IMRC2M PID. • Remove both jumper wires. • **Did each PID read 0 volts then 2.5 volts (0 then 5 volts at the breakout box)?**	Yes ▶ No ▶	Passed check. GO to HU93. REPLACE PCM. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle.GO to HU33.
HU93 CHECK VACUUM ACTUATOR SIGNAL VOLTAGE • NOTE: Vacuum actuator rod retaining clips MUST be replaced whenever removed. Reconnect actuator harness connectors for bank 1 and bank2. • Reconnect vacuum solenoid harness connector. • Key on, engine running. • Note IMRCM and IMRC2M PIDs. • Increase engine speed to at least 3500 rpm. • Note IMRCM and IMRC2M PIDs. • Key off. • **Did both PIDs read at least 3 volts at idle and less than.5 volt above 3500 rpm (breakout box with DVOM will display at least 6 volts at idle and less than 1 volt above 3500 rpm)?**	Yes ▶ No ▶	Passed check. Fault is intermittent. GO to Pinpoint Test Step Z1 with the IMRC, IMRCM and IMRC2M PIDs. REPLACE vacuum actuator that failed. RESTORE vehicle. PERFORM IMRC Repair Verification Drive Cycle.GO to HU33.
HU95 PERFORM IMRC WIGGLE TEST • Connect scan tool. • Key on, engine off. • Access IMRCM PID. • While viewing the IMRCM PID, wiggle wiring from the IMRC monitor connector to the PCM connector. • **Did the PID voltage reading fluctuate?**	Yes ▶ No ▶	Intermittent fault area has been identified. ISOLATE and REPAIR as necessary. VERIFY repair by performing this test step again. REPLACE PCM. GO to HU33.