



TIF 1700 COMPUTER SCANNER-PRINTER



Owner's Manual

TABLE OF CONTENTS

<u>SECTION</u>		<u>PAGE</u>
I	INTRODUCTION	1
II	DIAGRAM/DESCRIPTIONS	3
III	GENERAL MOTORS SECTION	5
IV	CHRYSLER CORP. SECTION	12
V	PRINT/DISPLAY MODE INSTRUCTIONS	17
VI	FORD MOTOR CO. SECTION	19
VII	UPDATING	22
VIII	TROUBLE SHOOTING	23
IX	APPENDIX (G.M., FORD and CHRYSLER)	24
X	REPAIR AND REPLACEMENT	38

SECTION I

INTRODUCTION

Thank you for your purchase of the 1700 scanner/printer. The 1700 communicates with a vehicle on-board computer and can provide you with all the available data from the computer. Depending on the vehicle, you can obtain sensor values and trouble codes and perform switch and actuator tests. It will work on all of the "Big Three" (GM, FORD, and CHRYSLER) American made vehicles where the manufacturer gives access.

The 1700 is capable of outputting data stream information (sensor values) in two ways. An LED digital screen displays "live" values from any accessible GM or CHRYSLER. The thermal printer outputs data stream, trouble codes and any other available information onto a hard copy. A single button controls the method you choose to retrieve data. You may switch back and forth between display and print at any time. No connections to a printer or auxiliary device are needed. Your 1700 is entirely self-contained.

Operation is quick and simple, there are only six switches to operate. Unique plastic programming cards replace a keyboard. Each card is encoded with the correct information for each particular engine/computer. Simply sliding a card in the card reader slot programs the 1700 for the specific engine to which it is connected. No codes to enter, no patterns to memorize. Advanced technology has been applied to keep your tester up to date. A single EPROM computer chip contains all the programs for GM, FORD, AND CHRYSLER. Updating is a very simple procedure that can be performed by you in the field. Just replace the one chip and your 1700 is ready to access the newest cars. A master PROM is also used for the testing procedure instructions. In the event of design changes by the automakers, your 1700 will be capable of accomodating these; your scanner will not become obsolete.

SPECIAL NOTE!

The information in this manual and the output from the printer are the latest available at the time of publication. We reserve the right to make changes at any time and cannot be held responsible for any change or deletions.

SAFETY WARNINGS

When scanning an automobile, remember the following:

1. Keep the scanner leads away from spinning engine fan and hot engine parts.
2. Connect a shop exhaust hose to the tailpipe when running the engine while scanning.
3. Set the car's parking brake and block the wheels before starting the car engine and scanning.
4. Remember the explosive power of hydrogen gas around the top of car batteries. The slightest spark could cause an explosion.
5. When test driving the car while scanning for problems, do not allow the scanner to distract you and result in an accident.
6. Keep in mind that electric radiator fans can turn on at any time. Keep your hands away from the fan even when it is not running.
7. Also remember that some charging systems can produce 110 volts A.C. for operating a windshield de-icing system. This is enough voltage and current to cause electrocution.
8. Although not normally fatal, avoid being shocked by the secondary voltage of late model ignition systems. The pain of the shock could cause you to fall or be injured by reflex action.
9. Wear eye protection when working around running engines, spinning electric fans, batteries, and other potential dangers.
10. Remember! Safety is your responsibility.

GENERAL PRINTER MESSAGES

The following are a few general messages output by the printer:

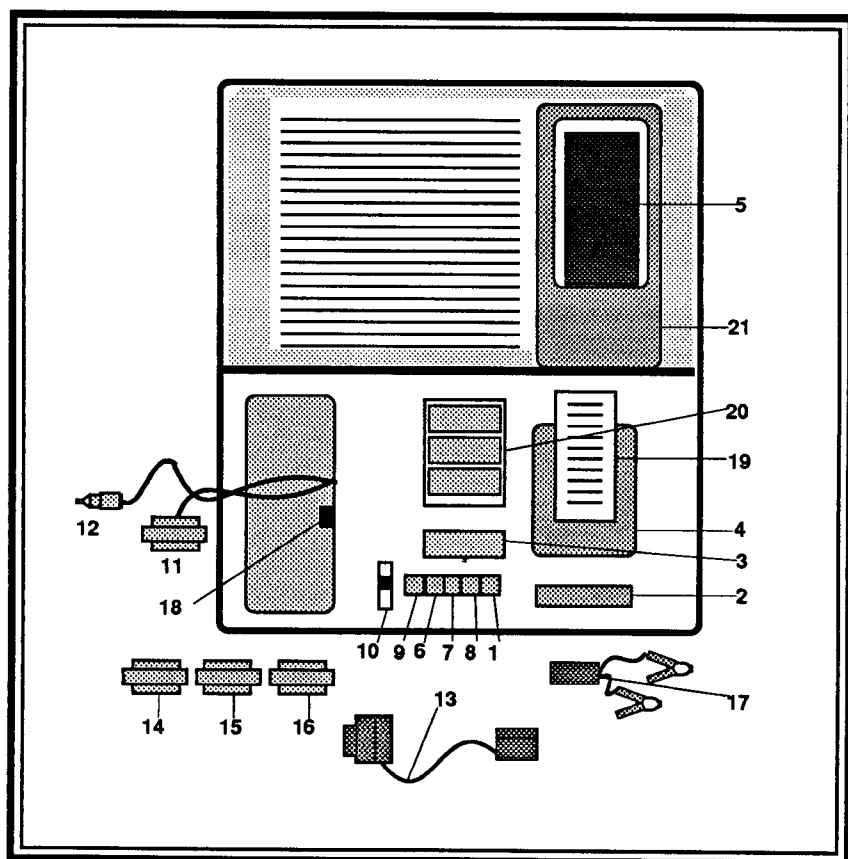
INSERT CARD This printout means the tester is ready for you to insert the program card for the specific car. Do not insert the card until reading this message or the scanner may not work.

NO ENG DATA This message means that the car's computer is not sending readable data to the scanner. This could be due to several problems: incorrect program card, bent diagnostic pin making bad connection, wrong adapter, no adapter needed, etc.

TEST COMPLETE This printout means the series of tests is over.

Note: Other printer messages are explained later in this manual where they apply. Various messages are output by the different auto makers.

SECTION II



Description

1. Power (On/Off) Switch
2. Program Card Reader Slot
3. LED Display
4. Thermal Printer
5. Program Cards
6. Display/Print and Hold Switch
7. Advance and Read Switch
8. Delete Switch
9. Actuator Switch
10. Diagnostic Mode Switch (GM only)
11. Diagnostic Link Connector
12. Power Supply Cord
13. Ford/Chrysler Adaptor
14. 1981 GM Adaptor
15. 1986 and up Corvette Adaptor
16. Minimum "T" Adaptor
17. Battery Adaptor
18. Fuse
19. Data Printout
20. Selector Charts/ EPROM Cover
21. Program Card Pocket

DESCRIPTION

1. Power (On/Off) Switch- Once connected to a 12V DC power supply one push will switch the scanner on. Push again to turn the scanner off. The switch may be operated at any time during testing, without harm to any circuit.

2. Program Card Reader Slot- The program cards are inserted into this slot to identify the specific engine and on board computer. Once inserted the scanner is automatically programmed with the correct information and all available data is output.

3. LED Display - This screen displays "live" data from a single sensor when in the display mode (GM and Chrysler only). In addition the center segments light up as a power on indication when the scanner is on but not in use.

4. Thermal Printer- When in the continuous or custom printout mode, this printer will output a hard copy list of sensor values.

5. Program Cards- These cards are coded for each particular engine (GM, Chrysler) or for specific testing procedures (Ford). They are chosen by using the selector charts, and instruct the scanner as to what information is available or what test(s) to perform.

6. Display/Print and Hold Switch- Primarily, this switch controls whether the scan tool is in print-out mode or display mode (GM and Chrysler only). Furthermore, on Chrysler vehicles the "hold" function is used to identify a particular engine type and initiate certain procedures. When first turned on, the scanner defaults to "print-out" mode. Depressing this switch will change to display mode, pressing it again will switch back to printout mode. **This switch has no effect on Ford.**

Description (continued)

7. Advance and Read Switch- The main function is to scroll through the sensor values when in display mode (GM, Chrysler only). In addition, this switch's "read" function is used on Chryslers to identify a particular engine and initiate certain procedures. **This switch has no effect on Ford.**

8. Delete Switch- This button is depressed when deleting sensor values from printout (when using the customizing feature). **This switch has no effect on Ford.**

9. Actuator- Primarily used to activate actuators on '83-'88 Chryslers. Also used to end certain Ford tests. **This switch is not used on GM.**

10. Diagnostic Mode Switch- (GM only) GM vehicles have multiple "diagnostic testing modes" (two on early cars, four on later models). This four position switch changes the resistance across the ALDL terminals in order to change diagnostic modes.

11. Diagnostic Link Connector- This is the connection between the scanner and the on board computer. It will plug directly into the Assembly Line Diagnostic Link (ALDL) on most GM vehicles and, with adaptors, connect to the remaining GMs and all Ford and Chryslers.

12. Power Supply Cord- When connected to 12V DC this provides power for the scanner. This cord may be plugged directly into the cigarette lighter or connected to the battery with adaptor.

13. Ford/Chrysler Adaptor- This dual ended adaptor will connect to the Diagnostic Link Connector from the scan tool and then to the ALDL on either Ford (big end) or Chrysler (small end).

14.-16. GM Adaptors- plug between Diagnostic Link Connector and ALDL.

- a. '81 GM- use on all 1981 GM computer controlled engines.
- b. '86 and later Corvettes- use on all 1986 and later model year Chevrolet Corvettes.
- c. Minimum "T"- use on all "T" body GM vehicles (Chevrolet Chevettes and Pontiac T1000's).

17. Battery Adaptor- This adaptor allows you to hook the power supply cord directly to the battery when a cigarette lighter is not available or when direct connection is more convenient.

18. Fuse- This is a 1.5 amp removable fuse for circuit protection. The scanner will not operate if this fuse is blown or missing.

19. Data Printout- The "hard copy" printed data list. Available on all vehicles.

20. Selector Charts/E-Prom Cover- The plastic pocket contains selector charts for program card selection. The removable cover allows access to the E-Prom for updating.

21. Program Card Pocket- provides storage for the program cards when not in use.

SECTION III

GENERAL MOTORS SECTION

This section of the operating manual will outline the general procedures for utilizing the 1700 computer scanner-printer. It will detail scanner use but will not explain all of the tests needed to verify the source of trouble codes or detail how to use all of the data printed out by the tester. You **MUST BE** well trained and versed in the technical areas of General Motors Computer Command Control to take full advantage of all the testing capabilities provided by the 1700.

DIAGNOSTIC MODES

GM vehicles can be tested in different diagnostic states. The 1700 can change the on-board computer mode with the diagnostic mode switch. There are four possible modes. **Not all are available on all vehicles.**

NORMAL-(ALCL, 10K Ohm State)- this state is available on all cars. The on board computer makes adjustments to idle and advance. It is recommended that this mode be used for all initial testing.

DIAGNOSTIC-(Field Service, 0-Ohm State)- also available on all vehicles. The output values should not be used for diagnosis. Trouble codes will flash on the Check Engine Light, base timing can be checked and air is rerouted through the bypass system. **CAUTION, DO NOT RUN THE ENGINE FOR MORE THAN TWO (2) MINUTES.** Air is directed into the catalytic converter and damage may result if this warning is ignored. **Do not drive the vehicle in this mode.**

ROAD TEST-(Open, 20K Ohm State)- available on most fuel injected vehicles. In this state the computer controls the engine just as it does when no scan tool is connected. If data seems frozen or erroneous when in this mode, the particular vehicle to which you are connected is not able to enter this mode. When this mode exists on a vehicle it is the only state in which the vehicle should be driven

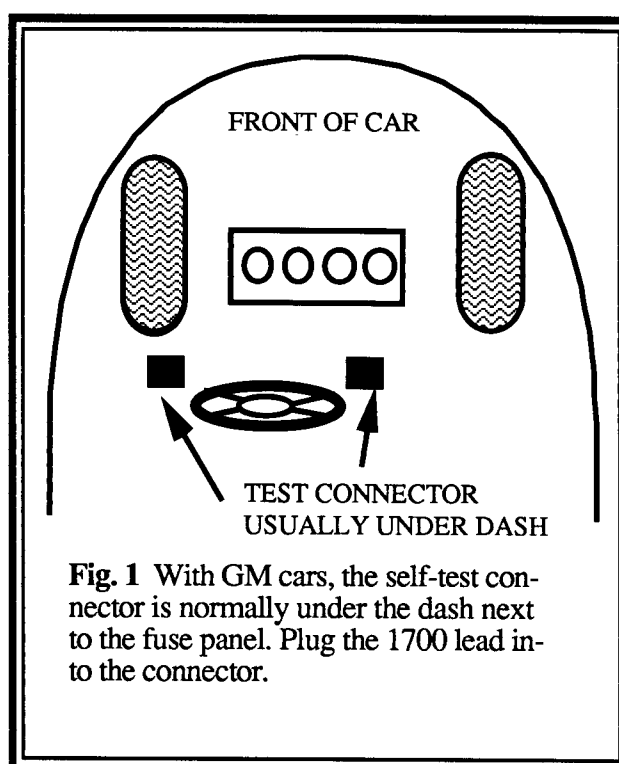


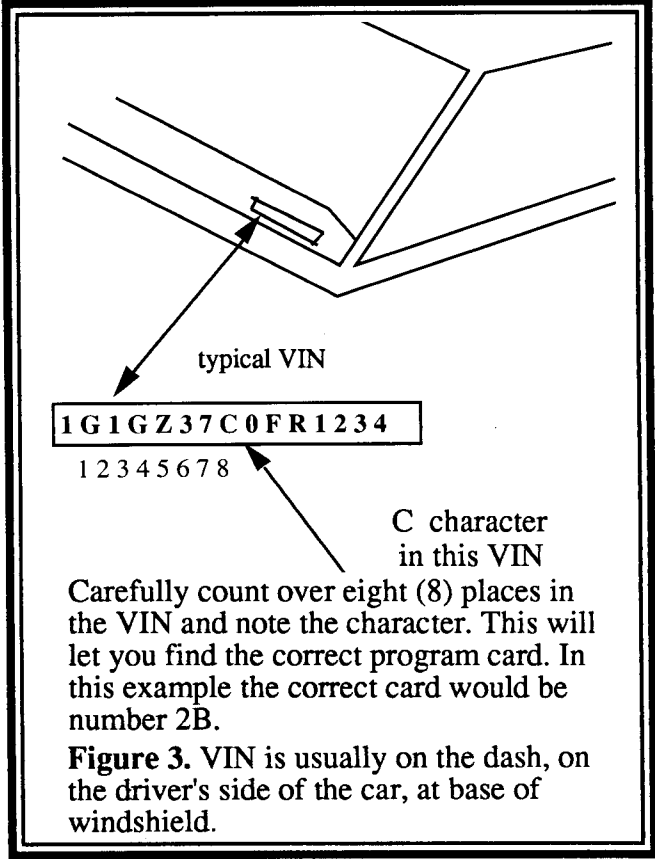
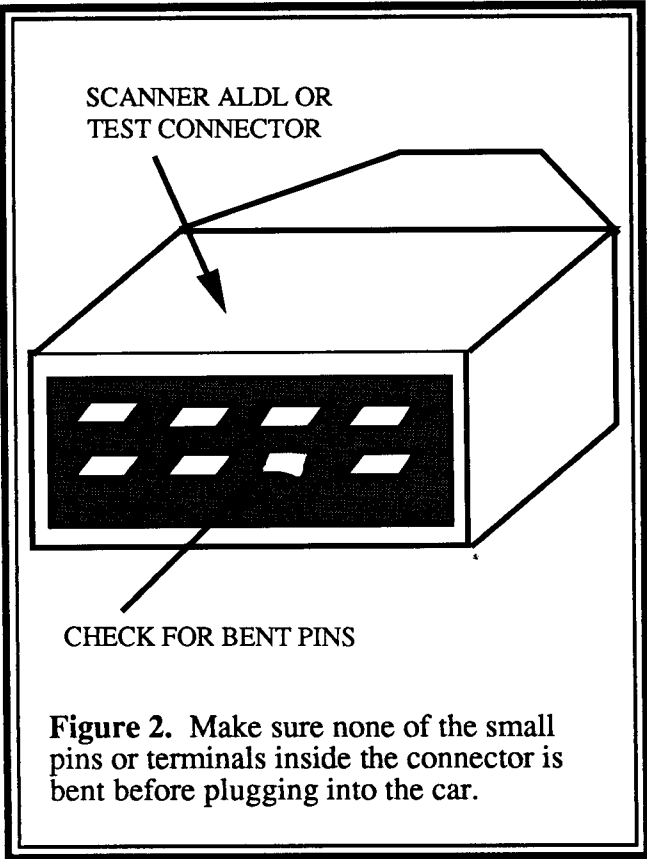
Fig. 1 With GM cars, the self-test connector is normally under the dash next to the fuse panel. Plug the 1700 lead into the connector.

BACK UP-(Limp in, 3.9K Ohm State)- available on all fuel injected cars, this state simulates computer failure. The vehicle runs on the "cal-pak," pre-programmed information that allows basic operation.

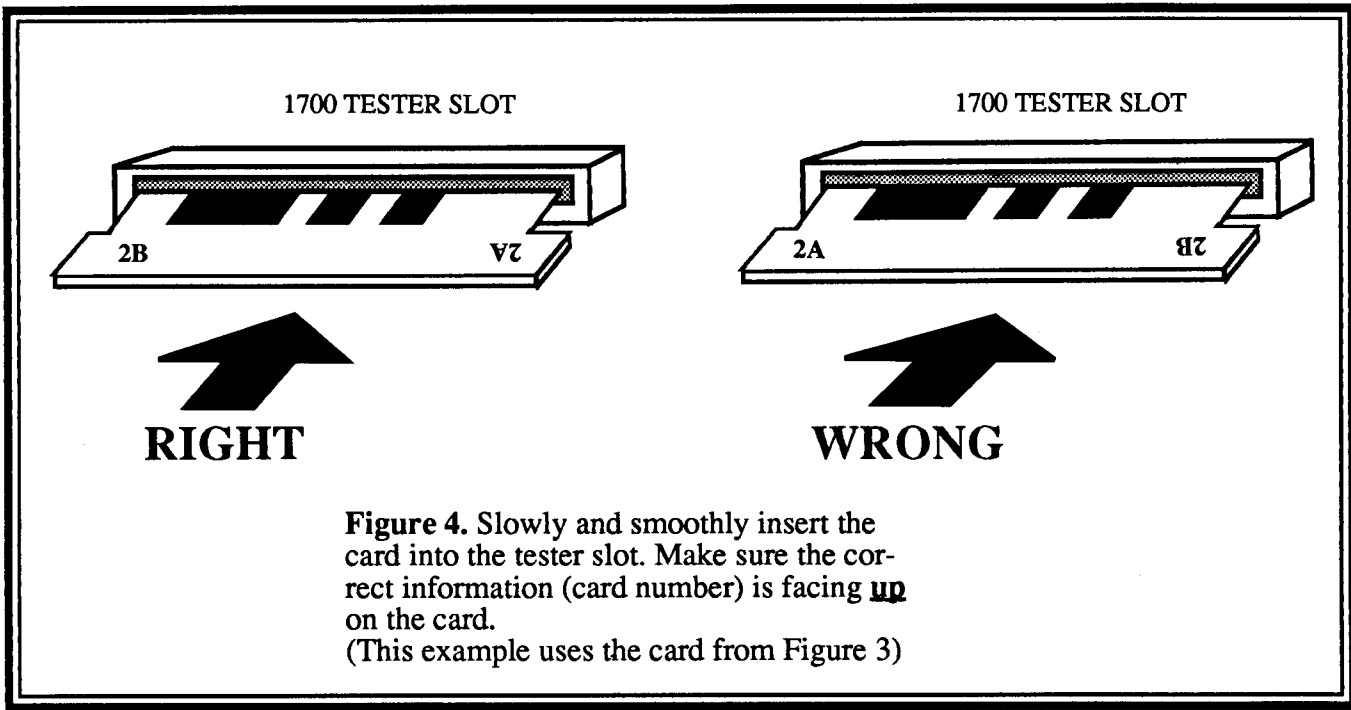
GM SCANNING INSTRUCTIONS

1. Plug the tester diagnostic lead into the car's ALDL or self-test connector. The car's test connector is usually under the dash, next to the fuse panel. **Refer to Figure 1.**

NOTE- Be careful when plugging the tester connector into the car's connector. Make sure all of the connector pins are straight, **Figure 2.**



GENERAL MOTORS (SECTION III)



2. If you are testing an '81, a "T" body or an '86 or later Corvette you must use an adaptor. The adaptors are labeled accordingly. **Do not use an adaptor if you are not testing one of these cars.**
3. Plug the power cord into the cigarette lighter plug or directly to the battery with the power cord adapter.
4. Use the car's Vehicle Identification Number (VIN) to determine which program card you need to insert into the tester. The VIN is on the top of the driver's side of the dash. As illustrated in **Figure 3**, count over 8 places in the VIN and note the character. This will allow you to refer to the selector chart to find the correct program card for the specific car.
5. Pull out the GM selector chart from the EPROM cover. Use the MODEL YEAR of the car (or the 10th digit info in the 1700 lid) and VIN character from step 4 to find which program card to use. Sight over to find out where the model year and 8th digit intersect and note the program card number. **NOTE-** If you are diagnosing a truck or a van, you must use the truck selector chart.
6. Make sure the engine is fully warm so sensors are at a normal operating temperature.
7. Turn the tester on. The printer will then output the message- **INSERT CARD.**
8. Insert the correct program card into the tester slot. Slide it in slowly and smoothly. Make sure the correct card number is facing up; the other side of the card is for another car, **Figure 4.**
9. The printer will first output sensor values and then any stored trouble codes (see Appendix A). The printout will repeat with **UPDATED DATA** until you remove the program card. **NOTE-** Some trouble codes are only set while driving. You might want to scan the system while test driving the car.

Once the card has been inserted you can switch over to the "live" data LED display. See the instructions in **section V.**

GM PRINTOUT MESSAGES

AC CLUTCH ON This means the air conditioning compressor clutch is switched on. This message is only printed when the clutch is engaged.

AIR COND REQ This means that air conditioning is requested. The message is printed out when car's computer triggers air conditioning to switch on.

AIR DIV ON This printout shows that the air divert solenoid is switched on. The message is printed when the air pump is sending air downstream. The divert solenoid either diverts air to the atmosphere or downstream to the air switch.

AIR DIV OFF The opposite of the above, this means the air divert is off. Message is printed when air divert solenoid is venting air from the air pump to the atmosphere.

AIRFLOW (G/S) This printout refers to the airflow sensor reading in grams per second. It shows the amount of air flowing through the airflow meter in grams per second. The airflow meter measures how much air is entering the engine. The computer uses this data to adjust how much fuel is metered into the engine. A typical airflow reading might be 4 to 7 grams per second at idle.

AIR SW ON This printout shows that the air divert switch is on. Air from the divert valve is routed into the engine exhaust manifolds.

AIR SW OFF The printout tells you that the air switch is off. Air is being vented to the atmosphere.

ALDL COUNT This printout is the ALDL count (crosscount) or the number of times the oxygen sensor voltage crosses above or below 500 millivolts (.5 volts) since last data transmission. The range is from 0 to 256 counts. It is used to determine the activity level of the computer and oxygen sensor.

range is from 0 to 256. A normal block learn reading is typically 128. Below this would indicate the computer is trying to richen the mixture and above 128 would show the computer is leaning out the mixture.

CAN/ILC ON Printout shows the fuel vapor canister purge on. Canister solenoid is energized to allow vacuum to control purging of fuel vapors.

	BAROMETRIC PRESSURE										
KPA	100	90	80	70	60	50	40	30	20	10	0
HG	29.6	26.6	23.7	20.7	17.7	14.8	11.8	8.9	5.9	2.9	0
VOLTS	4.9	4.4	3.8	3.3	2.7	2.2	1.7	1.1	0.6	0.3	0.3

Figure 5. Chart shows typical voltage values for specific barometric pressure values.

BARO (V/10) To get the barometric pressure sensor value, divide the printout number by 10 to get volts. The chart above, **Fig. 5**, will let you convert this value to actual pressure. The baro sensor determines the present altitude of the engine and car above or below sea level. At or near sea level the air is comparatively dense and the computer has to richen the mixture. On the other hand, high in the mountains, the air is less dense and the fuel metering must be reduced for an ideal ratio.

BASPULS MS/10 To get the base injector pulse, divide the printed number by 10. This will give you the on time of the fuel injectors in milliseconds. A typical base pulse reading might be between 1 and 4 at idle.

BATTERY (V/10) To get battery voltage, divide the printed number by 10. For example, a printout of 141 would equal 14.1 volts across the battery terminals.

BLK LRN MULTY This stands for block learn multiplier. This reading is a measurement of the

CALYTC °Cx10 This printout is the temperature of the catalyst in the catalytic converter in degrees Celsius. A cool catalyst might require replacement or it might also indicate another problem. A hot catalyst might point to a fuel mixture or engine control problem.

CLR FLOD FLG Printout means clear flooded engine mode is energized. This occurs when the gas pedal is held to the floor when starting.

COOLANT (°C) This printout value represents the engine coolant temperature in degrees Celsius. The normal operating temperature of engine is about 95 to 115 degrees Celsius.

EGR DUTY CYCL This is the exhaust gas recirculation duty cycle in percent. The message is given when the EGR or exhaust gas recirculation valve is allowed to operate. The solenoid valve in the vacuum line to the EGR valve is de-energized to allow vacuum to control the EGR valve. The range is from 0 to 100 percent. At idle, the EGR duty cycle should show a de-energized EGR valve. Note that on Oldsmobile and Chevrolet cars, zero percent means the EGR

is fully closed and 100 percent means the EGR is fully open. On Buick cars, zero percent means the EGR is fully open and 100 percent means it is fully closed. The operation is reversed so refer to specs if in doubt.

EGR OFF The printout tells you the vacuum solenoid for the exhaust gas recirculation valve is OFF or de-energized. This allows the EGR valve to operate normally from engine vacuum.

EGR ON This message means the EGR solenoid control valve is ON and vacuum to the EGR valve is blocked. The EGR valve does not function in this mode.

ERLY FUL EVAP This abbreviation means the early fuel evaporation relay or solenoid has been energized. The computer will de-energize EFE when the engine coolant temperature sensor has reached approximately 85 degrees Celsius.

FAN DC (%) This is the cooling fan duty cycle in percent. Zero is off, 100 is on.

4th GEAR This printout is produced when the transmission is shifted into fourth gear or overdrive. If message is not printed when in fourth or overdrive, check sensor operation and wiring between computer and sensor. This applies to automatic transmissions only.

FREON LOW Message is printed when refrigerant level is unacceptable.

FREON OK This message is printed when the refrigerant level in the air conditioning system is acceptable.

HIGH VOLTAGE A high voltage printout means that the alternator output voltage is 16.9 volts or higher. This could make the idle speed control motor inoperative. Measure the voltage across the battery terminals while the engine is at a fast idle. Use an accurate voltmeter.

HI P STR PRES Message indicates that power steering pressure is too high. The idle speed motor will increase engine idle to compensate for the added load.

IAC MOTOR POS This printout gives information on the position of the idle air control motor. The IAC reading is in counts. A reading of 255 indicates full retraction of the solenoid and a MAXIMUM air bypass. A reading approaching

zero indicates the solenoid is in the fully extended position allowing zero bypass air. When the IAC motor is retracted (higher count), the extra air entry leans the mixture. When extended (lower count), less air is bypassing into the engine and the mixture is richened.

IDLE CONTROL Message printed when the idle speed control motor is controlling the engine idle speed. It compensates as accessory units load or lug the engine and helps keep the engine idling at the same rpm.

INTEGRATOR The integrator number relates to short term adjustments to the air-fuel ratio. The printed number is from 0 to 256. Below 128 would show the computer is richening the mixture and above 128 would mean the computer is leaning the mixture. You can use this and the block learn as an aid to diagnosis. One example, a vacuum leak would lean the mixture and the computer would try to richen the mixture to compensate for the air leak. The integrator and block learn messages might help you check for this type of problem.

ISC SWCH CLOS Message tells you the idle speed control switch is closed and idle speed control motor is maintaining idle speed.

KNOCK RTD (°) Knock retard is a message giving the amount of ignition spark retard in degrees of crankshaft rotation. The knock sensor will send a signal to the computer when it "hears" pinging or spark knock. The computer can then retard timing to prevent further abnormal combustion.

LEAN MIXTURE This printout shows that the air mixture is greater than 14.7 parts air to one part fuel. An air-fuel ratio of 14.7:1 is stoichiometric or ideal.

LOAD VARIABLE The load variable message refers to the amount of air being displaced per cylinder and represents how the computer is adjusting the pulse width to control fuel metering into the engine.

LO P STR PRES This indicates low power steering system pressure. As a result, the idle speed control motor will not be given information to increase idle speed to compensate for power steering pump load. You would check for low power steering system fluids or other problems.

MANIFOLD ABSOLUTE PRESSURE											
KPA	100	90	80	70	60	50	40	30	20	10	0
HG	29.6	26.6	23.7	20.7	17.7	14.8	11.8	8.9	5.9	2.9	0
VOLTS	4.9	4.4	3.8	3.3	2.7	2.2	1.7	1.1	0.6	0.3	0.3

VACUUM											
KPA	0	10	20	30	40	50	60	70	80	90	100
HG	0	2.9	5.9	8.9	11.8	14.8	17.7	20.7	23.7	26.6	29.6
VOLTS	0.3	0.3	0.6	1.1	1.7	2.2	2.7	3.3	3.8	4.4	4.9

Fig. 6. Chart gives typical voltage values for specific vacuum levels

LOW BATTERY When the battery voltage is below 9.0 volts, the printer outputs this message. The low voltage could also keep the idle speed motor from working. The battery, connections and charging system should be tested for potential problems.

LOW COOLANT This message is printed when the engine coolant level is low.

MAN PRES V/10 Manifold pressure is the opposite of engine intake manifold vacuum. This value should be **DIVIDED BY TEN**. Manifold pressure or manifold vacuum relates to the amount of load on the engine. A high pressure or low vacuum would show a high load, as when accelerating. A low pressure or high vacuum occurs when the engine is decelerating or coasting down a hill. The manifold pressure sensor measures this pressure or vacuum so that the computer can adjust for engine load. The preceeding chart, **Fig.6**, gives typical specs for a manifold pressure sensor. If in doubt, refer to exact factory specs.

MAN TEMP This message is engine intake manifold temperature. Manifold temperature sensor signal informs the computer of the manifold temperature for adjustments to engine operation. A cold manifold would require a little more fuel than a hot manifold.

MIXTURE DWELL Mixture dwell is given in degrees and it is the computer command being sent to the carburetor mixture control solenoid. During normal closed loop operation, the mixture dwell should fluctuate between 5 and 55 degrees.

MPH This printout is a vehicle speed signal in miles per hour. It is produced by the vehicle speed sensor and is critical to the operation of the lock-up torque converter in the automatic transmission or transaxle.

OPEN LOOP An open loop printout means the computer system is operating on pre-determined values and the computer is **NOT** using sensor inputs to control the system. The oxygen sensor must be hot before going into closed loop.

OPEN THROTTLE This message means the throttle position sensor is sending a wide open throttle signal to the computer. At wide open throttle, the signal tells the computer that maximum power is needed and the fuel mixture, ignition timing, and other outputs can be adjusted for maximum engine performance.

OVERDRIVE An overdrive printout means the transmission or transaxle is in high or overdrive. This will only occur while test driving the car.

OXYGEN (x 10mv) An oxygen message refers to the output voltage from the oxygen sensor. You must multiply the printout value by 10 to get millivolts. For example, a readout of 55 is equal to 550 millivolts or .55 volts. The normal output of the oxygen sensor should vary between about .1 volt and .9 volt or 100 millivolts and 900 millivolts.

PARK/NEUTRAL This message is printed when the transmission or transaxle is in park or neutral. It is **NOT** displayed when the shift lever is in any other position (auto trans only).

PROM ID Printout is PROM (programmable read only memory) identification number. The PROM chip programs the computer or ECM to adjust operating parameters for particular body, engine, transmission combination. Note that up-date PROMs are available for correcting some performance problems. Check with the auto dealership to see if up-date PROMs can be purchased or are needed to correct different kinds of driveability problems.

PURGE DC (%) Printout is the canister purge duty cycle in percent. Zero means closed.

RICH MIXTURE Printed message indicates that the mixture has less than 14.7 parts air to one part of fuel. More air is needed to make the mixture stoichiometric or ideal. Use conventional testing methods to find any problem. Note that a rich mixture will result when engine is accelerated or when not warmed to full operating temperature.

RPM Printout equals engine revolutions per minute. If the printout value does not equal a test rpm from a tach-dwell meter, check the crank sensor and related components.

SPARK-BASE (°) This printout is the ignition system base timing in degrees before TDC. This value or number can be subtracted from "total spark" to calculate spark advance.

T B BACKUP This printout refers to throttle body backup and it means the fuel system has gone into the backup mode. Fuel is being fed to the engine at a fixed rate. This limp-in mode operates when there is a failure of a component, affecting fuel metering.

3rd GR/OVR DR Message is printed when the transmission is in third gear or overdrive. If computer is capable of this output and does not give output, check the transmission speed sensor, and other related components.

THROTTLE V/100 This is the throttle position sensor output. Divide the printed number by 100 to obtain the TPS output in volts. Typically, a GM throttle position sensor will have less than one volt output when the throttle is closed. At wide open throttle, the TPS will normally have approximately 5 volts output.

TOTAL SPK (°) This printout is total spark advance in degrees from TDC. It is the total spark advance as determined by the computer or ECM. You can check this value for accuracy with an electronic advance timing light.

WASTEGATE DC Message shows the turbo-charger wastegate duty cycle.

XM CLUTCH ON Printout means the transmission torque converter is in locked up mode. This printout might occur when test driving the car above a specific speed and with the engine fully warmed. Torque converter lockup depends upon vehicle speed, engine temperature, throttle position, manifold pressure/vacuum, etc. If the torque converter fails to lockup when it should, you should test related components: vehicle speed sensor, wiring to transmission, etc.

XM CLUTCH OFF This message is printed when the torque converter clutch is NOT locked up or engaged.

SECTION IV

CHRYSLER CORP. SECTION

This section of the 1700 operating manual has been designed to be utilized by technicians knowledgeable in the Chrysler computer control systems. Proper training is needed to take full advantage of the capabilities of the scanner. Refer to factory or aftermarket service manuals for more information as needed.

Test modes

Chrysler tests are classified into two modes: display mode and interrogator mode. The **DISPLAY MODE** is usually the first test made because it will output any trouble codes. It can also be used to perform switch tests, actuator tests, and sensor tests. The **INTERROGATOR MODE** gives actual sensor readings.

Note: the interrogator test **CANNOT** be done on Chrysler engines equipped with computer controlled carburetors. Some early model computer control cars had limited self-test capabilities so refer to the service manual for detailed instructions. You can also refer to Appendix B for more data.

CHRYSLER TERMINOLOGY

TROUBLE CODES A trouble code is a number that represents a potential problem in a specific electrical circuit. It is a code number generated by the car's computer. A **Chrysler code 88 means that it is OK to test. A code 55 means the trouble code section of the test is complete.** Other code numbers represent specific circuits; see Appendix B.

SWITCH TESTS The switch tests are used to determine if the car's computer can detect a circuit turning on and off. Specific switches are operated and the scanner will indicate if everything is working normally. This provides a quick way of checking various switches and their circuits for proper operation.

ACTUATOR TESTS Actuator tests will actually make the computer "fire" or operate various solenoids, relays, injectors, the ignition coil and other output devices. The scanner can be used to make the car's computer cycle power to the actuators to check their operation quickly and easily. Test numbers printed out will tell you which actuator is being operated. If the actuator does not "fire," it or its wiring may be faulty.

SENSOR TESTS Sensor tests allow the scanner to give you actual sensor readings while in the actuator test mode. By using the read and hold buttons on the tester, you can get sensor readings. A number is used to tell you which sensor is being tested. **Note:** not all sensors and cars will allow for sensor tests!

CHRYSLER MESSAGES

AIS MOTOR DRIVE Message is printed before auto idle speed test (89 and later cars only).

ATM/STM READY This printed message is given after the trouble codes and before the switch, actuator, and sensor tests.

ATM TEST This message is printed before the start of the actuator tests.

SENSOR TESTS This message is printed before the sensor tests.

DISPLAY MODE Message means you are doing display mode test to get trouble codes.

INTERROGATOR This printout indicates you are in the interrogator test mode for getting specific electrical values.

SWITCHED This message is printed during the switch test (83-88 only) as you open and close one of the car's switches. No printout "SWITCHED" means the switch or switch circuit is not working properly.

CHRYSLER DISPLAY TEST PROCEDURE (1983 to 1988)

ENGINE OFF

1. Normally, the display test is done first to obtain any trouble codes.
2. Warm the engine to full operating temperature.
3. Connect the Chrysler adapter to the car's diagnostic connector. The diagnostic connector is in the engine compartment, **Fig 7**.
4. Plug the tester lead into the Chrysler adapter, **Fig. 8**. Make sure none of the metal pins is bent or no data will enter the scanner.

5. Connect the scanner to a source of battery power. Connect the alligator clips to the battery posts or use the cigarette lighter plug. Make sure you have a good connection.

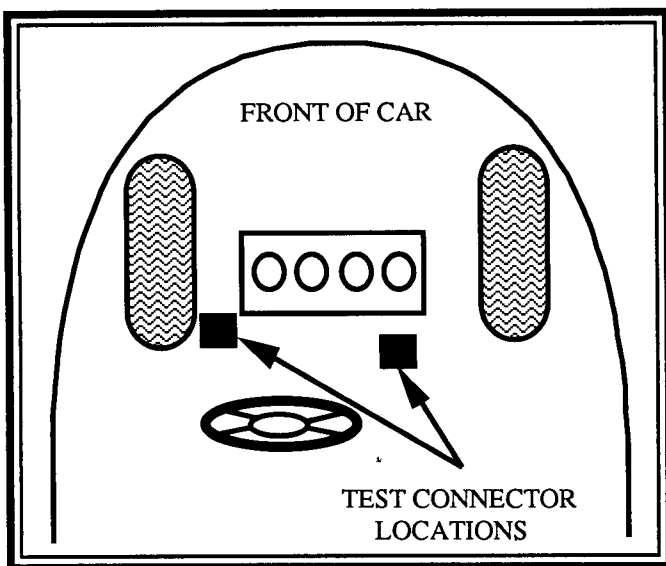


Fig. 7. Chrysler cars can have the test connector on the fenderwells or near the firewall.

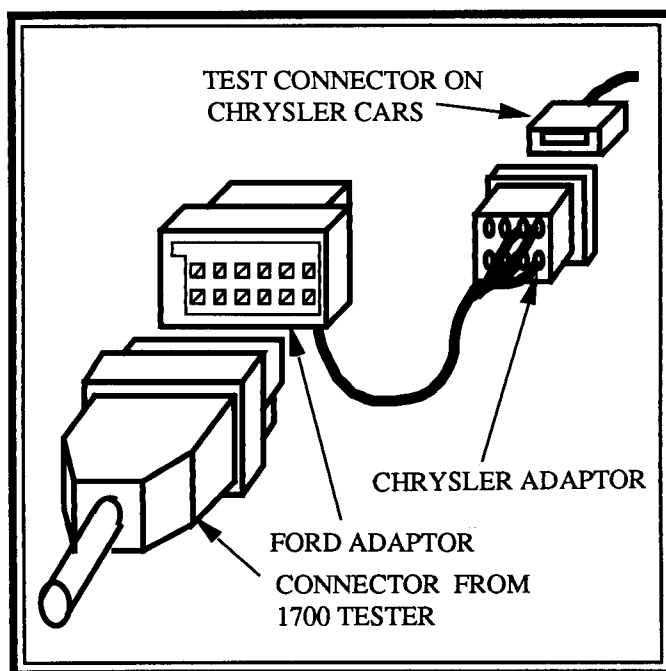


Fig. 8. Plug Ford end of adapter into 1700 then plug Chrysler end of adapter into connector on the car. Make sure the plugs are inserted into each other.

6. Turn the tester on and insert the program card for the display test. This will be card 49A. (Fig. 9)

7. Follow printout instructions. For EFI and TURBO SYSTEMS, press READ. For FBC (feedback carburetor) SYSTEMS, press HOLD.

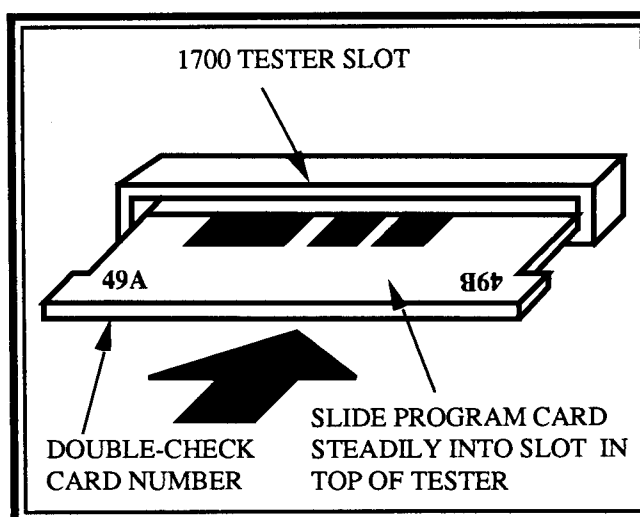


Fig. 9. For Chrysler engine off test, use card 49A (Pre-89) or card 49C (89 and later). Make sure correct number is facing up because the other side is for another test.

8. After inserting the correct Chrysler test card, wait until the printout "88 OK TO TEST" is given. After this message, use the car's ignition key to trigger self-diagnosis and the output of stored trouble codes.

9. To trigger self-diagnosis, turn the ignition key on and off three times and leave the key ON. Turn the key on, off, on, off, on within five seconds. DO NOT START ENGINE. The on-board computer will then feed any trouble codes to the scanner. **Note:** on FBC engines, carburetor idle switch must be in open position.

10. If any trouble codes are shown, use basic testing methods to verify the source of the problem. Test the sensor and its circuit wiring for problems. Refer to a shop manual if needed.

11. Next, you can perform switch tests. You can turn various switches on and off to check their circuit for proper operation. For example, on most late model Chrysler cars, you can move the gear shift lever to check the neutral safety switch. As the switch is activated on and off, the printer should output the message SWITCHED.

12. Refer to the charts in Appendix B for an explanation of which switches can be tested on which cars. Switch test capabilities vary considerably.

13. If a switch is moved and no printout message occurs, check the switch and its circuit for electrical problems.

14. Next, you can perform the actuator tests. Simply press the ACTUATOR button to select each actuator. When you reach the test you wish to perform, release the button. As you release the button, the actuator is energized. You should usually hear it working. For example, you might hear a solenoid click or an idle speed motor whining.

15. A printout number represents the name of the actuator being tested. A printout 3 might equal the idle speed motor, a 4 the radiator fan, a 5 the AC cutout relay, etc. Refer to the charts in Appendix B for an explanation.

16. After the actuator tests, you can perform the sensor tests. The sensor test will give specific electrical output values for certain sensors. Press the READ button for sensor test. Afterwards, press the actuator to select each sensor. Charts in Appendix B explain the number code system for each sensor and model year.

ENGINE ON

The display mode engine ON test will give you a rich or lean indication based on O2 sensor output. The LED will display "rich" or "lean" depending upon the signal given to the computer.

1. Use card 49B for the display mode engine running test.
2. Start engine, turn on the scanner and insert program card 49B.
3. The LED will begin displaying the mixture condition.
4. The test will continue until the card is removed.

CHRYSLER DISPLAY TEST PROCEDURE (1989 and later)

1. Follow steps 2-5 in 1983-88 section.
2. Turn the ignition key on but do not start the engine.

3. Turn tester on and insert card 49C, Fig. 9

4. The scanner will print "CHRYSLER TEST, DISPLAY MODE," and then any trouble codes.

5. If any trouble codes are shown, use basic testing methods to verify the source of the problem.

6. You can clear any corrected trouble codes by removing the scanner card after printer outputs "CLEAR MEMORY, REMOVE CARD." You have 5 seconds to remove the card. Once removed, the message "INSERT CARD" is output. Once again, you have 5 seconds to do so. The message "MEM CLEARED" should follow. If you do not want to clear codes, leave the card in the tester slot.

7. After the memory clear function you can perform switch tests. The printer will output the message "SWITCH TEST/PRESS READ/TO PROCEED." The switch tests are arranged in three groups of eight. Refer to the appendix for details.

8. Press the READ button and the LED will display "1" then "2" then "3" and repeat.

9. Press the HOLD button when the group number you want to test appears on the screen.

10. The numbers 1-8 are output with an L or an H beneath them, indicating switch position. This procedure may be repeated as often as desired.

11. To proceed to actuator/sensor tests remove the program card and re-insert it when the message "INSERT CARD" is output.

12. Follow the printed instructions. Press READ if you want to perform actuator tests or HOLD for sensor tests.

13. Once the READ or HOLD button has been pressed the printer will output the three group choices - 1-10, 11-20, or 21-30. See Appendix B for the corresponding actuators or sensors.

14. Press the HOLD button when the group you wish to test is printed out.
15. Once the group is chosen press READ button again. The LED will now display the numbers in that group.
16. Press the HOLD button when the number you want appears on the display. The test is now performed. If you are checking an actuator, you should hear a clicking or buzzing sound as that item is energized. If you are checking a sensor, a value will be printed; see Appendix B for the correct units and conversion.
17. Remove the program card when you are done, or at any time to abort the test.

-AUTO IDLE SPEED TEST-

1989 and later vehicles have an AIS (Auto idle speed) test.

1. Turn on the scanner and insert card number 49F. The LED will display "600" and begin counting by 100 (... , 700, 800, 900, etc..) until it reaches 2000, at which time it will repeat. These are idle RPM.
2. Press the HOLD button when the desired RPM appears. The engine will then increase to that speed.
3. Press the READ button to return to 600 and repeat the cycle.

(The purpose of this is to verify that the AIS motor is able to adjust to the commanded RPM).

4. Remove the card to abort the test.

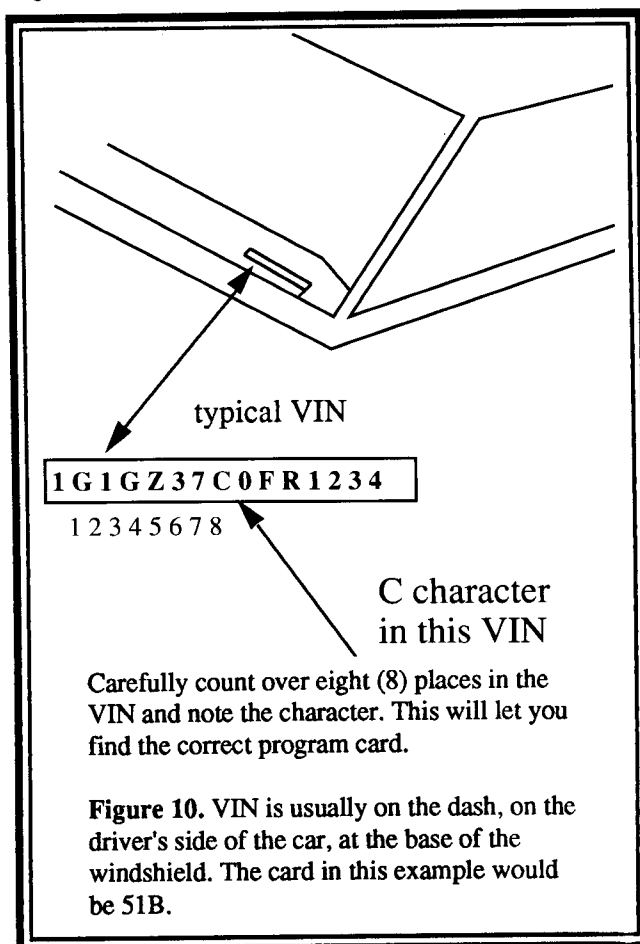
CHRYSLER INTERROGATOR TEST

Note! This mode only available on vehicles with fuel injected engines. The interrogator test will make the scanner output various sensor readings.

1. Make sure the engine is fully warmed to operating temperature.

2. Turn ignition ON; engine OFF.

3. Connect the tester to the car. As explained earlier, plug the Chrysler adapter into the car's diagnostic connector and then plug the tester lead into the adapter. Make sure none of the metal pins is bent in the connectors. Also, connect the tester to a source of voltage at the battery or cigarette lighter.



4. Use the VIN to find the correct program card. Note the 8th character in the VIN. Go to the Chrysler selector chart on the tester. It will show you which program card is needed, Fig. 10.

5. Turn the tester on and the printer will output the message INSERT CARD. Insert the correct program card with the chosen number facing up.

6. You need to crank the engine momentarily before the engine OFF interrogator test or start the engine for the engine running interrogator test.

7. The 1700 should then start printing out sensor values. Refer to the factory service manual to fully utilize these values. An abnormally high or low value would point to problems. Note that all values listed may not be printed; this is due to the capabilities of the car's computer and NOT the tester.

8. At this point it is possible to switch over to "live" data readings on the LED display. Refer to Section V.

9. Remove the program card to stop the printout. It will repeat as long as the card is in its slot.

INTERROGATOR TEST DEFINITIONS

AIS MOTOR POS This message refers to auto idle speed motor position given in steps.

BARO PRESS (89 and later only) This is atmospheric or barometric pressure given in millimeters of Mercury (mm Hg.)

BATTERY(V/10) This message gives the battery voltage. Divide the number by ten to get actual volts from the battery.

BOOST PRESS (89 and later only) This is the turbocharger boost pressure given in mm Hg.

CHARGE TEMP This is inlet air temperature in degrees Celsius (89 and later) or as a voltage (83-88). The charge sensor is used to vary the injector pulse width to compensate for a warm or cold air temperature. You can use a digital thermometer to test air temperature and compare it to the sensor output. Test the sensor with a DVOM if needed.

COOLANT (°C) This message shows the engine coolant temperature in degrees Celsius. Again, a digital thermometer can be used to compare this output to actual coolant temperature. Test the sensor and its circuit if needed.

INJECTOR PULS (83-88 only) This is the injector pulse width in microseconds. Divide by 1000 to get milliseconds.

KNOCK RTD (°) Refers to knock sensor signal in degrees of ignition retard. Knock sensor can signal the computer to alter ignition timing. You can use a timing light and light taps with a wrench to check knock sensor operation.

MANIFOLD PRES This is the manifold pressure sensor output. It indicates the engine intake manifold pressure in Kilopascals (for 1989 and later cars, value is in mm Hg.). This output indicates the general load on the engine because manifold pressure or vacuum varies with load.

MAN PRES V/10 (89 and later only) Similar to previous definition but value is in volts. Divide by ten and refer to service manual for conversion.

MPH Vehicle road speed in miles per hour.

MIN THROTTLE This is the preset closed throttle position. Divide the value by ten (V/10) to get actual voltage.

OXYGEN (X10mv) This is oxygen sensor output. Multiply by 10 to get millivolts.

RPM This is engine revolutions per minute.

SPARK ADV (°) Printout is spark or ignition advance in degrees of crankshaft rotation.

T/BODY TEMP °C This represents the temperature of the fuel in the throttle body assembly. You can use a digital pyrometer to check actual temperature. If different from displayed value, test the sensor with a digital voltmeter.

T/BODY TEMP V/10 (89 and later only) As above, however, value is given in volts. Refer to shop manual for conversion.

THROTTLE (V/100) This value is throttle position sensor voltage when divided by one hundred (100). A low voltage indicates a closed throttle condition and a higher voltage (5 volts) equals a wide open throttle.

SECTION V PRINT/DISPLAY MODES

As discussed earlier, it is possible to obtain sensor values from GM and Chrysler products in one of two ways - printed form or digital, "live" readings. Furthermore, in the print mode, either the standard continuous printout or a customized printout may be obtained.

I. CONTINUOUS PRINTOUT-

When a program card is inserted into the card reader the scanner will automatically begin printing. This continuous printout contains all the available data from the particular on-board computer to which it is connected. On all vehicles of the same make, the values will be output in the same order. Refer to the charts in Appendix A and B for the complete lists. (NOTE: not all information is available from all vehicles. If a specific value is not available from a vehicle it is, obviously, not printed and the next available value takes its place.) The printout will be repeated until the program card is removed. Once the card is removed the printer will finish the current list and stop. Unless the scanner is switched OFF, the printout can be restarted at anytime simply by re-inserting the card. Once again, the printout will repeat until the card is removed.

II. DISPLAY MODE

At any time during the sensor value printout it is possible to switch over to the digital display. In this mode a single sensor value maybe isolated on the LED screen. This is a "live" or "real time" display. In other words, the display will change concurrently with the changing sensor value.

- As soon as the scanner begins printing (or at anytime during the printing) depress the "display/print" button until the LED comes on.
- At this point the printer will stop and the value of the last printed item will appear on the screen. NOTE: this value is in the units denoted on the printout (e.g. if the last printed item is "OXYGEN (X10MV)" then the value on the screen must also be multiplied by 10 to get O2 sensor output in millivolts.)
- Once the display mode is initiated it is possible to scroll forward to any desired sensor value. Reference the listing order charts in the appendix, or in the plastic pocket on the front of the scanner, to quickly find the value you want.
- Depress the "advance" button to move on to the next item. By holding this button down you may quickly advance through the list.
- To return to continous printout mode, depress the "display/print" button until printing begins.

III. CUSTOMIZING PRINTOUT

Once in the display mode it is possible to customize the printout. Any number (from one to the entire list) of values may be deleted to provide a shorter, more concise printout. If, for example, you only wanted to see four (4) values, such as O2 sensor, RPM, TPS voltage and coolant temperature, it is possible to delete all other values from the printout.

- Enter the display mode as described above.
- Use the **"advance"** button to scroll to the value which is to be deleted.
- Now press the **"delete"** button. The printer will advance to the next item (which will then be displayed on the screen). This can be repeated on as many or as few sensor values as you like.

When the printout is repeated (either by returning to print mode or by scrolling with the **"advance"** button) these deleted items will no longer appear.

FOR EXAMPLE: If you wanted to delete **"MPH"**, **"AIRFLOW"** and **"ALDL COUNT"**.

- Use the **"advance"** button to scroll to **"MPH"**.
- Now, while **"MPH"** is displayed on screen press the **"delete"** button. The printer will advance and **"MAN PRESS V/10"** (the next available item) will appear.
- Once again use the advance button to move ahead to **"AIRFLOW"**.
- Press the **"delete"** button twice (removing **"AIRFLOW"** and the next item, **"ALDL COUNT"**).
- Press the **"display/print"** button to return to continuous printout. As usual the current list will be completed and a new list will repeat.

This list no longer contains the 3 deleted items.

The customized printout will remain in the scanner's memory until the unit is switched OFF. It is possible to stop and then repeat the custom list, as with the continuous printout, by removing or re-inserting the program card. Unless the printer is turned OFF, you may make further deletions at anytime by using the same procedure. In order to return to the original, complete list, the scanner must be switched OFF and the card re-inserted.

SECTION VI

FORD MOTOR COMPANY

This section of the manual will describe how to use the 1700 computer scanner-printer to scan cars manufactured by the Ford Motor Company. The following instructions are intended to supplement the detailed instructions given in a factory shop manual. They will explain scanner use but will NOT give all of the information needed to verify the source of trouble codes or intermittent driveability problems. You must be well versed in Ford computer systems to take full advantage of the 1700.

FORD COMPUTER SYSTEM TYPES

Since 1981, Ford Motor Company has primarily used three types of computer control systems. These are:

MCU- Microprocessor Control Unit System. It was first used in 1981. Note that no scanner access was provided prior to 1981 EEC III and earlier EEC systems. No access provided.

EEC-IV- This stands for Electronic Engine Control series 4. It was first used in 1983.

EEC-IV SEFI- This means Electronic Engine Control series 4 with Sequential Electronic Fuel Injection. It was first used by Ford in 1986.

FORD SCANNING INSTRUCTIONS

1. Before testing, make sure the engine is warmed to full operating temperature.
2. Plug the Ford adapter into the car's diagnostic connector, **Fig. 11**. The diagnostic connector is usually in the engine compartment on the firewall. **Fig. 12** shows the Ford adapter. On EEC-IV systems, make sure the small pigtail connector and the main connector are installed in Ford end of the adaptor.
3. Plug the tester lead into the adaptor. Be careful that none of the small metal pins is bent or a poor electrical connection can result and data will not flow out to the scanner.
4. Connect the tester to a source of power at the battery or at the cigarette lighter.
5. Turn the tester power switch ON. The printer will output the message **INSERT CARD**.

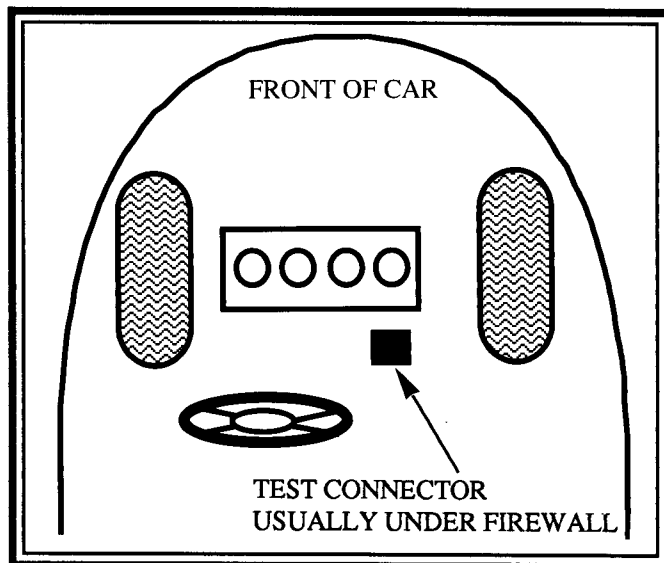


Fig. 11. With Ford cars, test connector is usually in engine compartment near the firewall.

6. Find the three Ford program cards in the tester pocket. The three cards will perform six different tests.

ENGINE ON SEFI This card is for an engine running test on late model Ford cars with sequential fuel injection only.

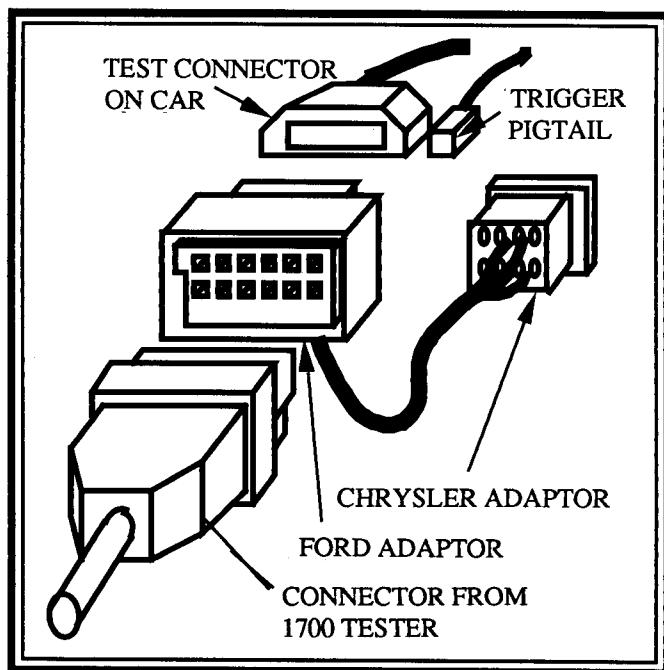


Fig. 12. Plug car's test connector and trigger pigtail (if an EEC-IV system), into the 1700 Ford-Chrysler adaptor, Ford end of adaptor plugs into 1700 connector.

TIMING TEST This card will check that the car's computer can advance the ignition timing.

ENGINE ON This card is for an engine running test on Ford cars without sequential fuel injection.

ENGINE OFF This card is to scan Ford cars without the engine running.

WIGGLE TEST This card is to help find poor connections in the car's wiring harnesses.

CLEAR MEMORY This program card will erase stored trouble codes.

7. To determine which of the program cards can be used on the specific car, refer to the Ford card selector chart. It will show you which cards will work for the type of computer system. You do not have to use the VIN to select the program cards. If you are not sure of the system, refer to the appendix.

8. To avoid false scanner data, turn OFF all electrical accessories: blower, radio, etc. You should lower the driver's window so that you do not have to open a car door while scanning. This could also trip a false trouble code.

9. Before scanning, check **BASE TIMING**. If applicable, unplug the spout wire plug near the distributor. Check the shop manual for directions. Adjust base or initial timing if needed. When done, reconnect the spout wire.

10. To perform the **ENGINE OFF TEST**, turn the printer on and insert the engine off card. The off label on the card must face up, **Fig.13**. The LED will display "FORD." Follow the instructions printed out by the 1700. **Note:** if the key is ON before inserting the card, you may not trigger self-diagnosis.

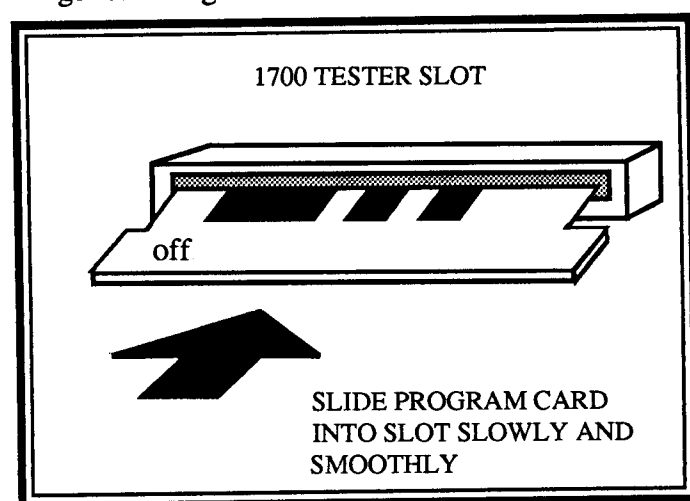


Fig. 13. Slowly and smoothly insert card into tester slot. Make sure correct data on card is facing up.

11. The printer will output "stored" and "present" trouble codes. Refer to the operating manual and service manual for more information on correcting any trouble codes.

12. Always correct the lowest trouble code number first.

13. Next, perform the timing test. Remove the engine off test card and insert the **TIMING TEST** card. Turn the key off for ten seconds (the LEDs will count to ten for you) and start the engine. Use an electronic advance timing light to make sure the computer can advance the timing properly. Refer to the manual for specs but 20 degrees advance is typical.

14. To do the **ENGINE ON TEST**, remove the timing test card and slide in the engine on test card. Turn the ignition key off for ten seconds and then start the warmed engine.

15. Wait while the scanner communicates with the car's computer. Any trouble codes will then be printed out. Refer to a service manual for detailed pinpoint tests for correcting problems.

16. To perform the **WIGGLE TEST**, remove the **ENGINE ON** card and insert the wiggle test card.

17. Wiggle all of the wires going to sensors and actuators in the engine compartment. If you find a bad connection, the printer will output the message **BAD CONNECTION**. You would then know to correct a wiring problem in that section of the harness.

18. After correcting any fault, use the tester **CLEAR MEMORY** card to erase stored trouble codes. Insert the card and turn the ignition key OFF for ten seconds. Turn the key back on when the printer outputs the message.

FORD MESSAGES

BEGIN TEST Printout tells you when you can start to scan.

CLEAR MEMORY Message is given when you are using scanner card to remove stored trouble codes from car's computer memory.

CYLINDER BALANCE Message printed when you are using scanner to check cylinder balance on SEFI (sequential electronic fuel injection) equipped engine.

ENGINE ID This message is printed near the beginning of the engine running tests. The scanner will print a 2, 3 or 4 indicating a 4, 6 or 8 cylinder engine. After this code is printed, you may need to depress the brake pedal to assure an accurate test. Consult the Ford repair manual.

ENG OFF TEST The engine off test message is printed when you trigger self-test mode with engine off card and the engine is NOT running.

ENGINE RUN TEST This message is printed as a heading when the engine on test is performed.

FORD TEST WAIT This message is to remind you to wait while the Ford computer does its self-test.

KEY OFF 10 SEC When this message is printed, turn the ignition key off for ten seconds. The printer will then tell you to turn the key ON or START the engine depending upon the type of test being performed.

MEM CLEARED This printout informs you that the memory has been cleared.

RPM NOT 2500 On some MCU cars from Ford, the test must be made at 2500 rpm. This message reminds you that the engine speed must be adjusted while repeating the test.

SEFI EEC IV This heading is printed when the ENGINE ON SEFI card is inserted.

SNAP ACCEL This message tells you to momentarily show the computer wide open throttle.

START ENGINE This message reminds you to start the car's engine.

10 SEP Message informs you to tap on the engine next to the knock sensor during the timing test and engine test. You may also have to snap accelerate the engine so check in the factory service manual for detailed instructions.

TEST COMPLETE This message means you have completed the self-test procedure.

TESTING..WAIT Printout informs you that the on-board computer is self-testing. It may take up to 30 seconds.

TIMING TEST This message is output when you insert the timing test card. Preferably, use an electronic advance timing light for this test. To exit the timing test, turn the printer OFF.

TROUBLES.....

PAST (STORED) This heading is printed right before the printout of any trouble codes stored in the car's computer memory. The troubles are no longer present.

TROUBLES.....

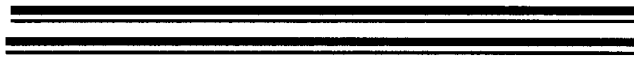
PRESENT NOW This message refers to any existing troubles detected by the car's computer at the time of the scan. It alerts you to a possible problem in the indicated circuit.

TURN KEY ON This message reminds you to turn the ignition key ON. The car's computer cannot output data codes without the key being turned from off to on.

WHEN FINISHED

PUSH ACTUATOR This message tells you to push the tester actuator button to signal the tester you are done with test.

WIGGLE TEST The wiggle test is done with the key on and the engine off. After inserting the wiggle test card, you can move wiring going to suspected sensors and actuators. The printer will output a message if a bad connection is found.



The 1700 scan tool is programmed to access GM and Ford vehicles from 1981-1990 and Chrysler vehicles from 1983-1990. When new model year (1991) vehicles become present, we will make available update kits to re-program the scanner for the new vehicles. When it becomes necessary for you to update your scan tool these kits may be obtained through your mobile tool dealer or jobber.

The update kit primarily consists of a replacement EPROM. This tiny computer chip contains all the necessary program information for GM, Ford and Chrysler vehicles. Also included are revised selector charts which include the new model year. The kit may also contain a few new or revised program cards if a new engine or computer system has been introduced.

In-field updating is very simple. Remove the EPROM cover in the center of the scan tool. Two chips are now visible. You will be replacing the one marked "SLV". **Ground your hand against the case metal before removing the old chip.** Carefully remove the chip by grasping the "ears" on either side and pulling upwards. Insert the new EPROM simply by pushing it into place. **CAUTION!** Keep dirt and moisture away from all chips. Make sure your fingers are clean and avoid touching the body of the chip and surrounding components in the scanner.

THERMAL PAPER

The built-in hard copy printer of the 1700 uses "black" thermal paper. This is the same type of paper used on many office calculators. It should be readily available from any office supply store. Be careful to use only "black" (a reference to **print** color, **not** paper color) as opposed to "blue" thermal paper. If the later is used the printout will be vague and difficult to read. If you are unable to locate such paper, see the replacement parts list below. **Reference the inside case label on the 1700 for complete loading/replacement instructions.**

FUSE

The 1700 is equipped with a 1/2A fuse to protect the internal circuitry. It is located inside the storage compartment on the right side. Should this fuse require replacement use only a 15093 replacement fuse. If after replacement the fuse blows again and it has been insured that connections are correct and there is no vehicle circuit fault, the scan tool should be returned to the factory for repair

REPLACEMENT PARTS

<u>ITEM</u>	<u>PART NUMBER</u>
FORD/CHRYSLER Adaptor plug	15051
Thermal Printer paper	15001
Paper Spool	15009
Cigarette Lighter to Battery Adaptor	15090
1981 Adaptor	15081
Minimum- T Adaptor (CHEVETTE & T-1000)	150MN
Corvette Adaptor	15051MC
Replacement Fuse	15093

NOTE: If there is a need to order a single card the part number for that card will be the card number preceded by the number 16026. For example, to order card 4, the the part number would be 1602604.

SECTION VIII

TROUBLESHOOTING

Problem	Possible Cause
Paper advances but nothing prints.	a) Thermal paper loaded up-side down. b) Wrong type of paper.
Printer does not advance or print.	a) Check power ON indication. b) Check for good connection to power source. c) Check fuse.
"NO ENGINE DATA" printed out.	a) Wrong program card. b) Ignition key not ON or turned ON out of sequence. c) Pins inside the ALDL connectors are bent. d) Adaptor needed or mis-applied. e) Hooked up to vehicle with no access.
"CHECK BATTERY" OR " REMOVE CARD" printed out.	a) Bad connection through cigarette lighter. b) Dirty fuse contacts. c) Card in slot when scanner is turned on.
"WAIT" printed out but nothing further happens.	<u>GM</u> - see causes for "NO ENGINE DATA" printout. <u>Ford</u> - on EEC-IV systems check that the power supply pigtail is connected to the diagnostic link.
On Ford- "ENGINE OFF" test is OK but "ENGINE ON" will not work.	BOO (Brake ON/OFF) or "SNAP ACCELERATE" test not performed after "WAIT" message.
Abnormal data printout.	a) Wrong program card. b) Scanning truck with car program card (GM only).
Printer stops.	a) With Chrysler, key not turned ON and OFF before codes. b) Poor tester connection. c) Wrong program card.

SPECIAL TROUBLESHOOTING NOTE

No scan tool access is provided by the automakers on these computer systems:
GM: Cadillac DFI, some 81 systems.
FORD: EEC I, II, and III systems.
CHRYSLER: Pre-1983 vehicles (Check appendix for details 84 and up).

If no program card appears on the selector chart, no access to that on-board computer is provided by the manufacturer.
Due to high levels of EMI (electro-magnetic interference), some 81GM computers may output changing PROM numbers and incorrect sensor values with the engine running. With key ON-engine OFF; PROM ID, trouble codes, and other values will be accurate.

SECTION IX

APPENDIX A - GENERAL MOTORS

Printout List

The following list includes all the possible sensor values that may be output when scanning a GM product. The order of printout is as below. All vehicles will output the values in this order. However, not all of these values are available on every car. If an item is not available it is merely skipped and will not be included on the list. Use this information when reading live data to quickly advance to desired item.

1. PROM ID	15. ALDL COUNT
2. OXYGEN (X10mv)	16. BASPULS MS/10
3. RPM	17. SPARK-BASE (°)
4. THROT V/100	18. TOTAL SPK (°)
5. BLK LRN MULTY	19. IAC MOTOR POS
6. INTEGRATOR	20. MASS AIRFLOW
7. MIXTURE DWELL	21. KNOCK RTD (°)
8. COOLANT (°C)	22. EGR DUTY CYCL
9. MPH	23. FAN DC (%)
10. MAN PRES V/10	24. PURGE DC (%)
11. MANIFOLD TEMP	25. WASTEGATE DC
12. BARO (V/10)	26. LOAD VARIABLE
13. BATTERY (V/10)	27. CATALYTIC °Cx10
14. AIRFLOW (G/S)	28. OIL TEMP (°C)

TROUBLE CODES

CODE			CODE		
#	YEAR	QUESTION AREA	#	YEAR	QUESTION AREA
12	all	no distributor reference pulse	42	84	fuel cutoff solenoid
13	all	O2 sensor	42	85 and up	EST
14	all	coolant sensor	42	88	fuel cutoff relay
14	86 and up	coolant sensor high temp.	43	82 and up	electronic spark control
15	all	coolant sensor	44	all	lean exhaust
15	86 and up	coolant sensor low temp.	45	all	rich exhaust
15	86-87	coolant switch	46	87-89	vehicle anti-theft system
16	88 and up	battery voltage	46	88-89	power steering switch
17	90	RPM signal problem	47	88-89	VART link
21	all	TPS high	48	88-89	misfire
21	84-87	idle or wot switch error	49	88-89	vacuum leak
22	82 and up	TPS low	51	all	prom failure
22	84	fuel cutoff solenoid	51	85,87 & up	checksum (ECM)
22	88	fuel cutoff relay/circuit	51	85,87&up	calibration prom
23	81-88	MC solenoid	52	84-89	calpack missing
23	84 and up	MAT sensor.low/open	52	85-88	bad ECM
23	89	TPS error	52	89	quad driver module
24	all	vehicle speed sensor	53	84-88	EGR/vacuum control
25	84	air switch solenoid	53	85-86	over voltage
25	84 and up	MAT sensor	53	85-88	water injection failure
25	89	vacuum switching valve circuit	53	86-89	high battery voltage
26	88 and up	quad driver module	53	85,89	voltage reference failure
27	88 and up	2nd gear switch	53	88-89	VATS
28	88 and up	3rd gear switch	54	81-84	MC solenoid/ECM
29	88 and up	4th gear switch	54	85-88	MC solenoid high
31	84-88	wastegate signal	54	85-89	fuel pump relay/circuit
31	85 and up	wastegate overboost	54	87	idle mixture adjustment
31	85, 89	MAP low	55	thru 86	faulty O2 sensor
31	88 and up	fuel injector	55	87-89	ECM failure
31	88 and up	park/neutral switch	55	89	serial bus error
32	thru 88	baro sensor	56	87-89	coolant level
32	86 and up	EGR	58	88 and up	VATS
32	84-86	EGR circuit	61	87-89	O2 sensor
32	85 and up	EVRV/EGR	61	90	cruise vent solenoid
33	82, 85 & up	MAP high	62	88 and up	gear switch input
33	84-89	mass airflow sensor high	62	90	cruise vac solenoid
34	thru 86	differential pressure/vacuum	63	87, 88	MAP high
34	85 and up	MAP low	63	88, 89	small EGR failure
34	84 and up	mass airflow sensor low	64	87, 88	MAP low
34	87-87	MAP sensor	64	88, 89	medium EGR failure
35	81-84	ISC circuit	65	88, 89	large EGR failure
35	85-89	idle air control	65	88,89	injector peak/hold
35	85-86,88	ISC nose switch	65	90	cruise servo position sensor
35	89	improper idle	66	88, 89	A/C pressure sensor
36	86-89	burnoff diagnostics	66	88, 89	ECM reset
36	90	transmission shift	67	90	cruise switch circuit
36	88	vacuum leak	68	90	cruise system circuit
38	88, 90	brake switch	69	90	A/C pressure switch
39	88 and up	torque converter clutch	88	89	ECM reset
41	82-86	no distributor pulse	Additional numbers may be printed out. For further information on correcting the trouble codes. You should follow the GM diagnostic procedure outlined in any General Motors or professional repair manual for computer controlled cars.		
41	84 and up	cam sensor failed			
41	85-88	cylinder select error			
41	87-88	tach input error			
42	all	electronic spark control			
42	84	error in distrib. or C3 system			

GM SELECTOR CHARTS														
VIN	A	B	C	D	D V6	E *	E	F	G	H	J	K	L	M
1981	1A	1A						1A		1A	1A	1A		
1982	1B		2B				1B	1B	1B	1B	1B	1B	1B	
1983	4A	4A	2B				4A	4A		4A			4A	
1984	7B	7B	2B				7B		7B	7B	8B		7B	
1985	7B		2B				7B	10B	7B	7B	8B		9A	
1986	7B	11B	2B					12A	7B	7B	5A		9A	
1987	7B		2B					18B	7B	7B		13B	16B	14B
1988			21A	19B			16A	22A	7B	7B		13B	16B	14B
1989	19B		21A	19B			16A	22A				13B		14B
1990	19B		21A	19B	22B	17B	16A	24A	23B			13B	24B	14B

VIN	N	O	P	R	S	T	U	V	W MAF	W MAP	X	Y	Z
1981									1A		1A		1A
1982	1B	3A		3A							1B	2A	1B
1983		5A	5A	5A	3A						4A	3B	4A
1984		7A	5A	7A							7B	8A	7B
1985		7A	5A	7A	10B		7A		10B		7B	10A	3A
1986		7A	5A	7A	6B		7A		6B		7B	10A	9B
1987				13B	15B		13B		13A			10A	17B
1988				13B	15B		13B		13A	20B		10A	16A
1989	21A			13B	15B	23A	13B			20B		10A	16A
1990	21A			13B		23A	13B	23A				10A	17B

VIN	1	2	3	4	5	6 L4	6	7	7 *	8 CH	8	9 V6	9 V8	9 #
1981							1A					1A	1A	1A
1982	1B	3A	1B	1B	1B			3A		3A	2A			
1983	4A	5A		4A	4A		4A			3A	4A	4A	3B	
1984	7B	7A	9A	7B			7B			3A	3A	7B	8A	9A
1985		7A	9A				7B			10B	10B	11A	10A	9A
1986		7A	11B				7B	11B		18B		6B	10A	
1987	14A		16B				7B	16B		18B			10A	15A
1988	19A		16B			20A	7B			22A			10A	15A
1989	19A							16A		22A			10A	
1990								16A	17B	24A			10A	

TRUCK SELECTOR CHART															
VIN	A	B	D	E	F	H	K	L	M	N	P	R	Z	6	7
1983	5B	4A	6A		3B	3B		3B							
1984	5B	4A	6A	4A	4A	4A		4A	4A						
1985	5B	7B		7A	7B	7B		7B		7B					3A
1986				7A	7B	7B		7B	7B	3A		6B			
1987				18A			9B					9B			
1988				20A		17B	17B			17B		17B	17B	20A	
1989				20A		17B	17B			17B		17B	17B	20A	
1990				20A		17B	17B		17B	17B	17B	17B	17B		

* Throttle Body Injection
Pontiac/Buick

APPENDIX B - CHRYSLER CORP.

Interrogator Mode Printout List

The following lists include all the possible sensor values that may be output when scanning a Chrysler vehicle. The order of printout is shown below. All vehicles will output the values in this order but not all of these values are available on every car. If an item is not available it is merely skipped and will not be included on the list. Use this information when reading "live" data to quickly advance to the desired item.

1983-1988 (incl. all 2.2L Turbo II, 89 & up)	1989 and later (except 2.2L Turbo II)
1. OXYGEN (x 10mv)	1. OXYGEN (x 10mv)
2. R.P.M.	2. R.P.M.
3. THROTTLE V/100	3. THROTTLE V/100
4. MIN THROTTLE	4. MIN THROTTLE
5. COOLANT (°C)	5. COOLANT (°C)
6. M.P.H.	6. M.P.H.
7. MANIFOLD PRES	7. MANIFOLD PRES
8. BATTERY (V/10)	8. MAN PRES V/10
9. T/BODY TEMP.	9. BARO PRES
10. CHARGE TEMP	10. BATTERY (V/10)
11. INJECTOR PULS	11. T/BODY TEMP °C
12. KNOCK RTD (°)	12. T/BODY V/10
	13. AIS MOTOR POS
	14. CHARGE TEMP °C
	15. BOOST PRES
	16. SPARK ADV (°)

GM SE					
VIN	A	B	C	D	D V6
1981	1A	1A			
1982	1B		2B		
1983	4A	4A	2B		
1984	7B	7B	2B		
1985	7B		2B		
1986	7B	11B			
1987	7B				
1988					
1989	19B				
1990	19B				

CODES

	EGR BAD
	FAN RELAY CIR
	36. WASTEGATE SOLENOID
	37. BARO READ SOLENOID
15. MPH SENSOR	41. CHARGING SYSTEM
16. UNDER VOLTAGE	42. AUTO SHUTDOWN
17. KNOCK SENSOR	43. PWR MODULE
21. OXYGEN SENSOR	44. MISC.
22. COOLANT SENSOR	45. OVERBOOST
23. CHARGE TEMP SENSOR	46. OVER VOLTAGE
24. TPS BAD	47. UNDER VOLTAGE
25. AIS MOTOR DRV	51. CLOSED LOOP
26. INJECTORS	52. MISC.
27. INJECTORS	53. ROM FAILURE
31.PURGE SOLENOID CIRC	54. LOGIC MODULE
32. PWR LOSS LAMP	55. TEST COMPLETE
33. A/C RELAY CIR	

The following information identifies switch, actuator and sensor tests for 1983-1988 Display Mode testing.

1983-'84 Throttle Body Injection

Switch Tests- Brake Pedal, Gear shift Selector, A/C Switch, and rear window defroster.

Actuator Tests-

- 01- Spark Trigger
- 02- Idle Speed Motor
- 03- Fuel Pulse
- 04- Repeat 01, 02, 03

1984 2.2 Turbo

Switch Tests- Brake Pedal, Gear shift Selector, A/C Switch and rear window defroster.

Actuator Tests-

- 01- Spark Trigger
- 02- Idle Speed Motor
- 03- Fuel Pulse
- 04- Repeat 01, 02, 03

1984 2.2 Mexican Turbo

Switch Tests- Brake Pedal, Gear shift Selector, A/C Switch and rear window defroster.

Actuator Tests-

- 01- Spark Trigger
- 02- Idle Speed Motor
- 03- Fuel Pulse
- 04- Repeat 01, 02, 03

1985-1986 Feedback Carburetor System 1.6 Engine

Actuator Tests-

- 91- Oxygen Sensor Clicking
- 92- Blinking Shift Light if equipped
- 96- Fan cycling on and off

CHRYSLER TESTS

1985 Feedback Carburetor Systems 2.2 Engine and 1986 2.2 L Body Only

Switch Tests- A/C Switch

Actuator Tests-

- 91- Oxygen Sensor Clicking
- 92- Blinking Shift Light if equipped
- 93- Canister Purge Solenoid
- 96- Fan cycling on/off
- 97- Throttle Control Solenoid
- 98- Vacuum operated Secondary Solenoid

1985 Feedback Carburetor Systems 3.7 Federal and 5.2 Cal Engine

Switch Tests- A/C Switch

Actuator Tests-

- 91- Oxygen Sensor Clicking
- 92- Blinking Shift Light if equipped
- 93- Air Switch Solenoid
- 97- Throttle Control Solenoid
- 98- EGR Solenoid

1985 2.2 EFI

Switch Tests- Brake Pedal, Neutral backup switch, A/C Switch, vehicle speed sensor.

Actuator Tests-

- 01- Spark Trigger
- 02- Injector Fire
- 03- Idle Speed Motor
- 04- Radiator Fan
- 05- A/C cutout
- 06- Auto shutdown
- 07- Canister Purge Solenoid

1985 2.2 Turbo

Switch Tests- Brake Pedal, Neutral backup switch, A/C Switch, vehicle speed sensor.

Actuator Tests-

- 01- Spark Trigger
- 02- Injector Fire
- 03- Idle Speed Motor
- 04- Radiator Fan
- 05- A/C cutout
- 06- Auto shutdown
- 07- Canister purge Solenoid
- 08- EGR Solenoid
- 09- Wastegate Solenoid
- 10- Baro Solenoid

1985 2.2 Mexican Turbo

Switch Tests- Brake Pedal, Neutral backup switch, A/C Switch, vehicle speed sensor.

Actuator Tests-

- 01- Spark Trigger
- 02- Injector Fire
- 03- Idle Speed Motor
- 04- Radiator Fan
- 05- A/C cutout
- 06- Auto Shutdown
- 07- Canister Purge Solenoid
- 08- Baro Solenoid
- 09- Wastegate Solenoid

1986 Feedback Carburetor Systems 2.2 Engine Except L Body

Switch Tests- A/C Switch

Actuator Tests-

- 91- Oxygen Solenoid
- 93- Vacuum Operated Secondary Solenoid
- 96- Radiator Fan
- 97- Throttle Control Solenoid
- 98- Canister Purge Solenoid

Sensor Tests-

- 91- Vacuum Transducer
- 92- Engine Temp Sensor
- 93- Radiator Fan Sensor
- 96- Speed Sensor

- 93- Charge Temp Sensor
- 96- Speed Sensor

1986 Feedback Carburetor Systems 3.7 and 5.2 Engine

Switch Tests- A/C Switch, Rear Window Defroster

Actuator Tests-

- 91- Oxygen Solenoid
- 92- Shift Indicator light or Transmission unlock relay
- 93- Air switching Solenoid
- 97- Throttle control Solenoid
- 98- EGR Solenoid, Canister Purge Solenoid

Sensor Tests-

- 91- Vacuum Transducer
- 92- Engine Temp. Sensor (3.7) Charge Temp (5.2)
- 93- Charge Temp Sensor (3.7)
- 96- Speed Sensor

1986 EFI 2.2 and 2.5 Engine

Switch Tests- Brake Pedal, Neutral backup switch, A/C Switch, vehicle speed sensor

Actuator Test-

- 01- Spark Trigger
- 02- Injector Fire
- 03- Idle Speed Motor
- 04- Radiator Fan
- 05- A/C cutout
- 06- Auto shutdown
- 07- Canister Purge Sol.
- 08- Shift Indicator
- 09- Wastegate Sol.

Sensor Test-

- 01- Battery Temp *
- 02- Oxygen Sensor *
- 03- Throttle Body Temp. *
- 04- Coolant Sensor #
- 05- Throttle Pos *
- 07- Battery Voltage
- 08- MAP Sensor *

1986 2.2 Turbo

Switch Tests- Brake Pedal, Neutral backup switch, A/C Switch, vehicle speed sensor.

Actuator Tests-

- 01- Spark Trigger
- 02- Injector Fire
- 03- Idle Speed Motor
- 04- Radiator Fan
- 05- A/C cutout

- 06- Auto shutdown
- 07- Canister Purge Solenoid
- 08- EGR Solenoid
- 09- Wastegate Solenoid
- 10- Baro Solenoid
- 11- Alternator Field

Sensor Tests-

- 01- Battery temperature *
- 02- Oxygen Sensor *
- 03- Charge Temperature *
- 04- Coolant Sensor #
- 05- Throttle position *
- 06- Peak Knock voltage *
- 07- Battery Voltage
- 08- MAP Sensor *

1986 2.2 Mexican Turbo

Switch Tests- Brake Pedal, Neutral backup switch, A/C Switch, vehicle speed sensor

Actuator Tests-

- 01- Spark Trigger
- 02- Injector Fire
- 03- Idle Speed Motor
- 04- Radiator Fan
- 05- A/C cutout
- 06- Auto shutdown
- 07- Canister Purge Solenoid
- 08- Baro Solenoid
- 09- Wastegate Solenoid

1987 EFI

Switch Tests- Brake pedal, Park/Neutral switch, A/C switch.

Actuator Tests-

- 01- Ignition coil
- 02- Fuel injector
- 03- AIS motor
- 04- Radiator fan relay
- 05- A/C cutout relay
- 06- Auto shutdown relay
- 07- Purge Solenoid
- 08- Speed control
- 09- Voltage Regulator
- 10- SIL lamp (man. only)

Sensor Tests-

- 01- Battery temperature sensor *
- 02- Oxygen sensor *
- 03- T/body temperature sensor *
- 04- Engine coolant temperature sensor #
- 05- Throttle position sensor *
- 06- Not used
- 07- Battery voltage sensor
- 08- MAP sensor *
- 09- Speed control switches

1987 Federal Turbo I and Turbo II

Switch Tests- Brake switch, Park/Neutral switch, A/C compressor switch.

Actuator Tests-

- 01- Ignition coil
- 02- Fuel injector
- 03- AIS motor
- 04- Radiator fan relay
- 05- A/C cutout relay
- 06- Auto shutdown relay
- 07- EGR/Purge Solenoid
- 08- Speed control
- 09- Wastegate Solenoid
- 10- Baro Read Solenoid
- 11- Voltage regulator

Sensor Tests-

- 01- Battery Temperature sensor *
- 02- Oxygen sensor *
- 03- Charge temperature sensor *
- 04- Engine coolant temperature sensor #
- 05- Throttle position sensor *
- 06- Knock sensor *
- 07- Battery voltage
- 08- MAP sensor *
- 09- Speed control switches

1988 2.2L and 2.5L EFI

Switch Tests- Brake switch, Park/Neutral switch, A/C compressor switch

Actuator Tests-

- 01- Ignition coil
- 02- Fuel injector
- 03- AIS motor

- 04- Radiator fan relay
- 05- A/C clutch relay
- 06- Auto shutdown relay
- 07- Purge Solenoid
- 08- Speed control
- 09- Alternator field
- 10- Shift Indicator lamp (man.) or PTU Solenoid (auto)
- 11- EGR Solenoid (Calif. only)

Sensor Tests-

- 01- Battery Temperature Sensor *
- 02- Oxygen Sensor *
- 03- T/Body Temperature Sensor *
- 04- Engine coolant Temperature Sensor #
- 05- Throttle Position Sensor *
- 06- Not Used
- 07- Battery voltage
- 08- MAP Sensor *
- 09- Speed control switch ##
- 10- Fault code erase routine

1988 Turbo I and 1988- and later Turbo II

Switch Tests- Brake switch, Park/Neutral switch, A/C compressor switch

Actuator Tests-

- 01- Ignition coil
- 02- Fuel injector
- 03- AIS motor
- 04- Radiator fan relay
- 05- A/C clutch relay
- 06- Auto shutdown relay
- 07- Purge Solenoid
- 08- Speed control
- 09- Alternator Field
- 10- Baro read Solenoid
- 11- Wastegate Solenoid

Sensor Tests-

- 01- Battery Temperature Sensor *
- 02- Oxygen Sensor *
- 03- Charge Temperature Sensor *
- 04- Engine Coolant Temperature Sensor #
- 05- Throttle Position Sensor *
- 06- Knock Sensor *
- 07- Battery voltage
- 08- MAP Sensor *
- 09- Speed control Switches ##
- 10- Fault Code erase routine

1988 3.0L V-6

Switch Tests- Brake switch, Park/Neutral switch, A/C compressor switch

Actuator Tests-

- 01- Ignition coil
- 02- Fuel injector
- 03- AIS motor
- 04- Radiator fan relay
- 05- A/C clutch relay
- 06- Auto shutdown relay
- 07- Purge Solenoid
- 08- Speed control
- 09- Alternator field
- 10- PTU Solenoid (auto)
- 11- EGR Solenoid (Calif. only)

Sensor Tests-

- 01- Battery Temperature Sensor *
- 02- Oxygen Sensor *
- 03- Charge Temperature Sensor *
- 04- Engine Coolant Temp. Sensor #
- 05- Throttle Position Sensor *
- 06- Not Used
- 07- Battery voltage
- 08- MAP Sensor *
- 09- Speed control switches ##
- 10- Fault Code erase routine

1988 3.9L and 5.2L Trucks

Switch Tests- Brake switch, Park/Neutral switch, A/C compressor switch, Idle contact switch

Actuator Tests-

- 01- Ignition coil
- 02- Fuel injector
- 03- AIS motor
- 04- Not used
- 05- A/C clutch relay
- 06- Auto shutdown relay
- 07- Purge Solenoid
- 08- Not used
- 09- Alternator field
- 10- Shift Indicator lamp(man.) or PTU Solenoid (auto)
- 11- 4-speed overdrive, Over-ride Solenoid
- 12- Air Solenoid
- 13- EGR Solenoid

Sensor Tests-

- 01- Battery Temperature Sensor *
- 02- Oxygen Sensor *
- 03- T/Body Temperature Sensor *
- 04- Engine Coolant Temperature Sensor #
- 05- Throttle Position Sensor *
- 06- Not Used
- 07- Battery voltage
- 08- MAP Sensor *
- 09- Speed control switches ##
- 10- Fault Code erase routine

* For Proper value divide number by 10, units in volts

For proper value multiply number by 10, units in degrees °F

##	Switch Position	Display
	S/C OFF	BLANK
	S/C ON	00
	SET	10
	RESUME	01

1989 and up- All Engines (Except 2.2L Turbo II)

1989 Chrysler vehicles are equipped with two different computer systems, SBEC (Single Board Engine Controller) and SMEC (Single Module Engine Controller). In general, all V6, 2.2L and 2.5L L4's use the SBEC; Pick Ups and all V8's (car and truck) use the SMEC; all 1990's use the SMEC. Check module identification to be sure. NOTE: 2.2L Turbo II engines follow the same testing procedures as 1983-1988 vehicles. Refer to page 12 for Display Mode test information.

Switch Tests- Which set (A or B) to follow depends on computer system, see above. An H or an L indicates switch position as shown below. If the opposite letter appears the switch is in the opposite position. Example: Set A, Group 1, Number 7-L indicates the A/C is on, an H would indicate A/C is off.

A. Switches: Single Board Engine Controller (Switch Test)**Group 1**

- 1. L= Park/Neutral
- 2. H= Speed control set
- 3. H= Brake pedal On
- 4. H= speed control set/On
- 5. N/A
- 6. H= Speed control On
- 7. L= A/C On
- 8. H= auto shutdown rel. On

Group 2

- 1. H= S/C Vent Solenoid On
- 2. H= S/C Vacuum Solenoid On
- 3. H= PTU Solenoid On
- 4. H= A/C clutch On
- 5. N/A
- 6. H= EGR Disable Solenoid On
- 7. N/A
- 8. N/A

Group 3

- 1. N/A
- 2. N/A
- 3. N/A
- 4. N/A
- 5. H= auto shutdown rel. On
- 6. H= radiator fan On
- 7. H= Purge Disable Solenoid On
- 8. H= Check engine lamp On

B. Switches: Single Module Engine Controller (Switch Test)

<u>Group 1</u>	<u>Group 2</u>	<u>Group 3</u>
1. H= auto shut-down relay on or ign. sw. on START	1. H= S/C Vacuum Solenoid On	1. N/A
2. H= speed control on	2. H= Purge Solenoid On	2. N/A
3. H= speed control resume	3. H= shift indicator On	3. N/A
4. H= speed control set On	4. H= A/C clutch On	4. N/A
5. L= A/C On	5. H= radiator fan On	5. H= emission lamp On
6. L= Throttle blade closed or fuel sync. switch On	6. H= enable: fuel, coil, injectors	6. H= Barometer Solenoid On or Overdrive Solenoid On
7. H= brake pedal On or Air Switch Solenoid On	7. H= check engine light On	7. H= Wastegate Solenoid On or Air Switch Solenoid On
8. L= park/neutral	8. H= S/C Vent Solenoid On	8. H= EGR disabled or turbo bypassed

Actuator Tests 1989

01- Stop current actuator test	15- Tachometer output
02- Auto shutdown relay and ignition coil	16- PTU Solenoid
05- Auto shutdown relay and #1 Injector (TBI) or 1st bank	17- EGR Solenoid
06- Auto shutdown relay and #2 Injector (Truck TBI) or 2nd bank	18- Wastegate Solenoid
07- Auto shutdown relay and 3rd bank	19- Baro Read Solenoid
08- AIS motor	21- All Solenoids/relays
09- Radiator fan relay	22- Air Switch Solenoid
10- A/C clutch relay (A/C switch must be on)	23- Overdrive Solenoid
11- Auto shutdown relay	24- Shift indicator lamp
13- S/C Servo Solenoids	25- Fuel monitor signal
14- Alternator field	26- Surge Valve Solenoid

Sensor Tests 1989

01- Oxygen sensor signal (x 100mv)	18- Battery temperature sensor (x 100mv)
02- Engine speed	19- Coolant temperature sensor (volts)
03- Throttle position (V/100)	20- Knock sensor signal (x 100mv)
04- Minimum throttle (V/100)	21- Added fuel factor (micro-seconds)
05- Coolant temperature (Celsius)	22- Adaptive fuel factor (% for Truck EFI multiply by 2)
06- Vehicle speed (MPH)	23- Min airflow idle speed (RPM)
07- MAP gauge reading (mm Hg.)	24- Key-On information (key-Ons)
08- MAP sensor (x 100mv)	25- Cylinder 1 knock retard (degrees)
09- Barometric pressure (mm Hg.) (for Turbo, multiply x 1.9)	26- Cylinder 2 knock retard (degrees)
10- Battery voltage (V/10)	27- Cylinder 3 knock retard (degrees)
11- T/body temperature (Celsius)	28- Cylinder 4 knock retard (degrees)
12- T/body temperature sensor (V/10)	29- Charge temperature sensor (V/10)
13- T/body temperature sensor (V/10)	30- Oxygen sensor state: 160= Rich
14- AIS motor position (counts)	255= Center
15- Charge temperature (Celsius)	177= Lean
16- Boost pressure goal (mm Hg.)	
17- Module spark advance (deg. BTDC) (for 3.0L V6, add 6 degrees)	

**CHRYSLER SELECTOR CHART
INTERROGATOR MODE**

VIN	A	D	E	C	K	X	Y	3	J
1983		51A	50B	50A					
1984		51A	50B	50A					
1985		52B	52A	51B					
1986		54B	54A	51B					
1987		53A	53B	55A	53A				
1988	56B	56A	56B		56A	57B	57B	57A	
1989	56B	49E			49E	49E	49E	49E	49E
1990	56B	49E			49E	49E	49E	49E	49E

DISPLAY MODE (TROUBLE CODES, ETC.)

Use card 49 A/B (All Chrysler cars and trucks), prior to 1989.

Use card 49C for 1989 and later.

AIS TEST (1989 and later), use card 49F.

APPENDIX C - FORD MOTOR CO.

FORD SYSTEM IDENTIFICATION

1981			
SIZE	VIN	TYPE	SYSTEM
2.3	A	L4	MCU
3.3	B	L6	MCU
5.0	F	V8	MCU
5.8	G	V8	MCU
5.8	W	V8	MCU

1982			
SIZE	VIN	TYPE	SYSTEM
2.3	A	L4	MCU
2.3	A	L4	MCU
4.2	D	V8	MCU
4.9	E	V8	MCU

1983			
SIZE	VIN	TYPE	SYSTEM
1.6	2	L4	EEC-IV
3.8	3	V6	MCU
2.3	A	L4	MCU
2.0	C	L4	MCU
4.9	E	V8	MCU
5.0	F	V8	EEC-IV
5.8	G	V8	MCU
2.8	S	V6	EEC-IV

1984			
SIZE	VIN	TYPE	SYSTEM
3.8	3	V6	EEC-IV
1.6	4	L4	EEC-IV
1.6	5	L4	EEC-IV
2.3	5	L4	EEC-IV
2.3	A-Trck.	L4	MCU
2.3	A	L4	EEC-IV
2.0	C-Trck.	L4	MCU
5.0	F	V8	EEC-IV
5.8	G	V8	MCU
5.8	G-Trck.	V8	EEC-IV
5.0	M	V8	EEC-IV
2.3	R	L4	EEC-IV
2.8	S	V6	EEC-IV
4.9	Y	L6	EEC-IV

Beginning in 1985, the MCU system was no longer used except on 5.8L V8 carbureted passenger car engines. The EEC-IV system will be found in all other FORD vehicles from 1985 to present.

In 1986, FORD introduced the EEC-IV SEFI (Sequential Electronic Fuel Injection) System. Through 1988, this is only used on the 5.0L, V8, fuel injected passenger car engines. In 1989, the use was expanded to include the 3.0L, V6 SHO and 3.8L, V6 engines.

TEST MATRIX

	MCU	EEC-IV	EEC-IV SEFI
ENGINE OFF TEST			
ENGINE RUNNING TEST			
CLEAR MEMORY TEST			
ENGINE RUNNING SEFI TEST			
WIGGLE TEST			
TIMING TEST			

FORD TROUBLE CODES

11. NONE (ALL OK)	44. AIR SYSTEM	81. TAB
12. RPM OUT SPEC	45. AIR UPSTREAM	82. TAD
13. RPM OUT SPEC	46. AIR BYPASSED	83. EGR CONTROL
14. PIP ERRATIC	47. AIR/LEAN RICH	84. EGR VENT
15. ROM FAILURE	48. INJECTORS	85. CANISTER
16. RPM TOO LOW	51. ECT HIGH	86. WOT AC CUTOFF
17. RPM TOO LOW	52. PWR. STR. PRESS	87. FUEL PUMP
18. NO TACH	53. TPS TOO HIGH	88. THROTT KICKER
21. ECT OUT SPEC	54. ACT TOO HIGH	89. EX HEAT CNTRL
22. MAN PRESS BAD	55. UNDER VOLTAGE	91. RT EGO LEAN
23. TPS BAD	56. MAF/VAF HIGH	92. RT EGO RICH
24. ACT BAD	58. ITS BAD	93. RT EGO COOLDWN
25. NO RAPPING	61. ECT TOO LOW	94. RT SEC AIR
26. MAF/VAF BAD	63. TPS TOO LOW	95. RT AIR UPSTREAM
31. EGR OUT SPEC	64. ACT/VAT LOW	96. R NO BYPASSED
32. EGR BAD	65. OVER VOLTAGE	97. RPM/R OX RICH
33. EVP NOT CLOSED	66. MAF/VAF LOW	98. RPM/R OX LEAN
34. NO EGR	67. NDS/ACC	
35. EGR/RPM LOW	68. ITS BAD	
36. FUEL LEAN	72. NO MAP CHANGE	
37. FUEL RICH	73. NO TPS CHANGE	
41. SYSTEM LEAN	74. BRAKE ON/OFF	
42. SYSTEM RICH	76. NO MAF CHANGE	
43. EGO COOLDOWN	77. NO SNAP ACCEL	