SUZUKI 1995 ECM CARTRIDGE

Operator's Manual

For use with
Cartridge Part Number
02001998

tech 1®

SOME THINGS YOU SHOULD KNOW

CAUTION: EXHAUST GAS

When performing any checks with the engine running in an enclosed space such as a garage, be sure there is proper ventilation. Never inhale exhaust gases; they contain carbon monoxide, a colorless, odorless extremely dangerous gas which can cause unconsciousness or death.

CAUTION:

To help avoid personal injury always set the parking brake securely and block the drive wheels before performing any checks or repairs on the vehicle.

DISCLAIMER

The **TECH 1** is designed for use by trained service personnel only. It has been developed for the sole purpose of diagnosing and repairing automotive electronic systems. Every attempt has been made to provide complete and accurate technical information based on factory service information available at the time of publication. However, the right is reserved to make changes at any time without notice.

FCC COMPLIANCE

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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1.0 SUZUKI 1995 ECM CARTRIDGE DESCRIPTION

The SUZUKI 1995 ECM Cartridge is used with the **TECH 1** to diagnose and trouble-shoot the Engine Control Module (ECM) system used on 1995 Suzuki vehicles. This cartridge supports testing of engines equipped with sequential multiport fuel injection (SFI). It takes full advantage of advanced diagnostic features introduced in 1995 vehicles.

The SUZUKI 1995 ECM Cartridge and the **TECH 1** team up to become a diagnostic tool which is both powerful and easy to use. With the **TECH 1**, you can select test modes which let you:

- read engine data parameters
- read diagnostic trouble codes
- clear diagnostic trouble codes on certain models
- diagnose intermittent problems by capturing and storing multiple samples of system data BEFORE AND AFTER THE PROBLEM OCCURS, then examining the data to determine the problem. This data is saved in the **TECH 1** memory for at least one-half hour even if the power is removed from the **TECH 1**!
- control engine idle speed and EGR
- fix spark advance
- read ECM configuration information
- print data and vehicle informaion

This information can be analyzed and displayed to assist service technicians in diagnosing engine and driveability problems.

The SUZUKI 1995 ECM Cartridge is a **TECH 1** "Master" cartridge. When used with the **TECH 1** it is capable of monitoring and diagnosing the Suzuki Engine Control Module on all models equipped as follows:

YEAR	MODEL	ENGINE SIZE	FUEL SYSTEM	ECM NO.	MFG.
1995	VITARA/ESCUDO	2.0L	SFI	1	Hitachi

IMPORTANT NOTE:

THE 1995 CARTRIDGE DOES NOT SUPPORT VEHICLES FROM PREVIOUS YEARS.

The Suzuki 1995 ECM Cartridge is for use only with the above model and engine size. For diagnosing SE416, SF Series, SH410, SY413/416, refer to the Suzuki 91-94 ECM Cartridge Operator's Manual and use the Suzuki 91-94 ECM Cartridge.

HOW THE SUZUKI 1995 ECM CARTRIDGE WORKS WITH THE TECH 1

The **TECH 1** lets you monitor data and control ECM operation by communicating with the ECM via the serial data link connector (DLC) present in the vehicle. The **TECH 1** consists of a microcomputer, which communicates with the ECM and controls its operation, a keypad to receive directions from you, and a display to provide the data you need to diagnose vehicle electronic problems. The **TECH 1** communicates with the ECM by applying an electrical signal to the serial data link connector Diagnostic Enable pin, then reads the ECM data signal from one of the serial data link connector pins, and translates it into an intelligible data display. The SUZUKI 1995 ECM Cartridge contains the microcomputer program which performs all of the functions described in this manual.

HOW YOU USE THE SUZUKI 1995 ECM CARTRIDGE WITH THE TECH 1

The **TECH 1** and this cartridge are designed to be extremely easy to use. However, it is recommended that you read through the manual to get a feel for the operation of the **TECH 1**. The general steps to follow when diagnosing vehicle electronic problems with the **TECH 1** are:

1 -Connect the **TECH 1** to the vehicle
2 -Select the language, verify the ECM manufacturer (Hitachi), then select the vehicle engine type, and the test mode to be run.
3 -The **TECH 1** runs the test mode and you study the displayed data.

The **TECH 1** guides you through the ECM type selection by displaying a question which you answer by pressing the **YES** or **NO** keys. Test modes are selected by pressing the appropriate key displayed on the test mode selection "menu". You then select the data parameters you wish to monitor with the **YES** and **NO** keys. It doesn't take long to learn and there isn't a lot to remember, however, DETAILED OPERATING INSTRUCTIONS ARE GIVEN IN THE FOLLOWING SECTIONS OF THIS MANUAL.

GENERAL TECH 1 KEY FUNCTIONS

YES & NO	Answer questions asked on **TECH 1** display and select data parameters to monitor.
EXIT	Return to previous step.
↑ & ↓	Scroll through test mode selection menus and control display of captured data.
F0 - F1	Select ECM Engine displacement (either 2.0L or 1.8L).
F0 - F9	Select and control test mode.
F8	Print Data List parameters.
ENTER	Enter designated trouble code.

2.0 GETTING STARTED

Before operating the SUZUKI 1995 ECM Cartridge with the **TECH 1**, the following steps must be performed:

1. The SUZUKI 1995 ECM Cartridge is a master program cartridge sc insert it into the bottom slot of the **TECH 1**. Verify that no other master cartridge (e.g. SUZUKI 91-94 Cartridge) is installed in the top slot.

   If you are using a **TECH 1** tester and intend to connect it to a peripheral device such as a printer or terminal, install the RS232C Cartridge in the top cartridge slot. The RS232C Cartridge is not required if you are using a **TECH 1** Series A tester.

2. Make sure the vehicle ignition is OFF.

3. Locate the vehicle's serial data link connector (DLC). It is usually under the dash on the driver's side. Refer to the vehicle service manual if you are in doubt.

4. Plug the **TECH 1** cable into the vehicle serial data link connector.

5. Verify that the **TECH 1** displays the screen below:

LANGUAGE SELECTION MENU

6. If the display is correct, press the function key to the left of the language you wish to select.

   After the language is selected, turn the key to the RUN position. The **TECH 1** displays the screen below.

7. If the display is not correct, refer to Appendix B

3.0 OPERATING PRECAUTIONS

REMOVING THE CARTRIDGE WHILE POWER IS APPLIED

You should not remove or install master or auxiliary cartridges while power is applied. If you wish to change or add a cartridge, or if the **TECH 1** does not appear to be functioning properly, reset the **TECH 1** by disconnecting the power plug, install the cartridge, then reconnect the power plug.

REMOVING OR CHANGING MASTER CARTRIDGES CONTAINING SNAPSHOT DATA

SNAPSHOT data that has been captured by a master cartridge can be printed on a **TECH 1** (or compatible) printer, transferred to a computer for further analysis, or displayed on a terminal. The SNAPSHOT data will be retained within the **TECH 1** memory for at least one-half hour, even if the **TECH 1** is disconnected from the vehicle. However, IF YOU POWER UP THE **TECH 1** WITHOUT A MASTER CARTRIDGE OR WITH A DIFFERENT MASTER CARTRIDGE, THE SNAPSHOT DATA WILL BE LOST.

4.0 SELECTING THE VEHICLE

Once you've connected the **TECH 1** to the vehicle and selected a language, turn the key to the RUN position. The next step is to identify the vehicle you are testing. This section tells you how to do that.

CONFIRMING ECM MANUFACTURER

The **TECH 1** will ask you to confirm that the 1995 Suzuki ECM is manufacturered by Hitachi. Press **YES** to continue. If you press **NO** the TECH 1 will return you to the startup screen.

SELECTING THE ECM

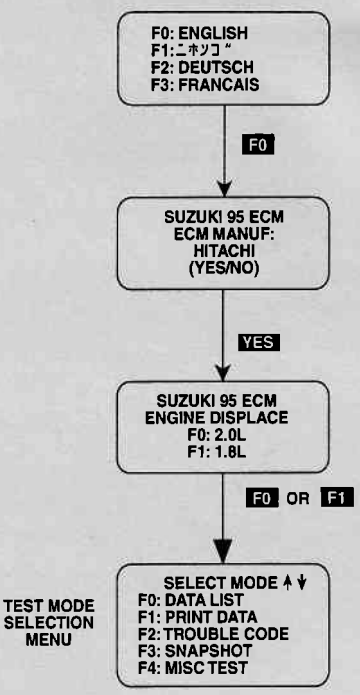
The **TECH 1** will ask you to select the ECM with engine displacement of either 2.0L or 1.8L. Press **F0** for a 2.0L engine or **F1** for a 1.8L engine.

SELECTING THE TEST MODES

After selecting the type of engine in the vehicle you are testing, the **TECH 1** displays the Select Mode sceen.

Press the function key to the left of the test you wish to perform and the **TECH 1** will display test modes for the vehicle you have selected. Detailed operating instructions for the various test modes are given in Section 5.0 of this manual.

ACTIVE TECH 1 KEYS	
F0 - F3	Select language.
F0 - F1	Select Engine Displacement.
YES & NO	Confirm ECM Manufacturer.



SELECTING A 1995 VEHICLE

5.0 SELECTING AND OPERATING THE TEST MODES

The following section contains a brief description of each test mode in the SUZUKI 1995 ECM Cartridge. A more detailed description of each test mode is given in the section discussing each test mode.

MODE F0: DATA LIST
Monitor data parameters from the engine computer.

MODE F1: PRINT DATA
Send one data stream of information to a serial printer, terminal or smart device.

MODE F2: TROUBLE CODES
Display stored trouble codes on all models and clear stored trouble codes on certain models.

MODE F3: SNAPSHOT
Capture and store ECM data parameters. Data is captured before and after a "trigger" point. Triggers can be on any trouble code, a particular trouble code, or manual **TECH 1** key press. Captured data can then be displayed as well as trouble codes.

MODE F4: MISCELLANEOUS TESTS
Displays sub-modes to operate single tests.

ECM NO.	YEAR	MODEL	RPM CONTROL	FIXED SPARK	IAC CAL. MODE	EGR CONTR	STEP EGR CONTR
1	1995	VITARA/ESCUDO	•	•	•		•

While the* TECH 1 *is connected to the serial data link connector and conversing with the ECM, the ECM ignores input signals from the TEST switch and the DIAG switch in the vehicle service connector.

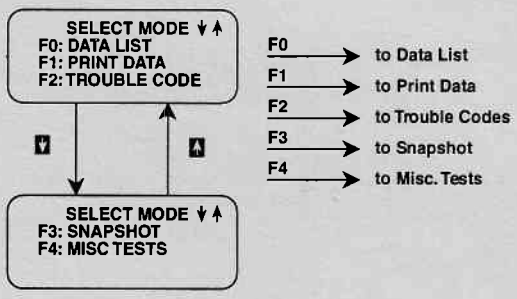
SELECTING TEST MODES

The **TECH 1** makes selecting the test mode easy by displaying a list of tests (a test mode "menu"). The menu also displays which key is used to select each test mode. An example test mode menu is shown below.

To select a test mode, simply press the **TECH 1** key listed to the left of the test mode on the menu. Since there are five test modes, the keys **F0** - **F4** are used.

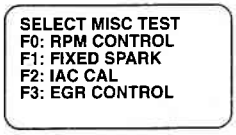
The first three test modes are shown as soon as the ECM is selected. The other test modes will automatically scroll onto the display after three seconds. The display will automatically scroll between the two screens. To stop the automatic scrolling, press either the ↑ or ↓ key. The menu may then be manually changed by pressing either the ↑ or ↓ key. All multiple menus of more than three items scroll in this way.

REGARDLESS OF WHICH TEST MODES ARE DISPLAYED, ANY TEST MODE CAN BE SELECTED AT ANY TIME FROM THE MENU.



Select Mode Menu

The Miscellaneous Test mode is used to select a submenu of tests. Pressing **F4** displays the miscellaneous tests available. To return to the Select Mode menu just press **EXIT**.



1.8L ENGINE

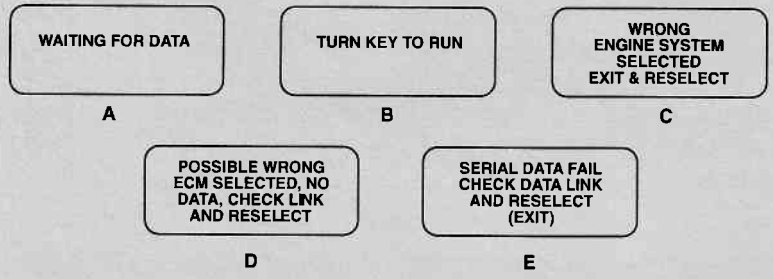
2.0L ENGINE

Once you have selected the test mode, operation begins. Detailed operating instructions for each test mode are given in this section.

ACTIVE TECH 1 KEYS	
F0 - **F4**	Select Test mode or Miscellaneous Test mode.
↑ & ↓	Stop automatic menu scrolling, then used to manually control the menu display.
EXIT	Return to Vehicle Select step or return to Select Mode menu from Miscellaneous Tests menu.

TECH 1-ECM COMMUNICATIONS STATUS DISPLAYS

Most **TECH 1** test modes display data. Therefore, these test modes require the ECM to send data to the **TECH 1**. When you select a test mode, you may see one or more of the following **TECH 1**-ECM communications status displays.



DISPLAY A:
This means that the **TECH 1** cannot yet display data as it has not yet received a complete data message from the ECM. This display is sometimes seen right after selecting a test mode.

DISPLAY B:
This is a reminder that the ignition key needs to be in the RUN position for the **TECH 1** to communicate with the vehicle.

DISPLAY C:
This occurs when the **TECH 1** determines that the data stream it receives from the ECM does not match the vehicle that you have selected. If this happens, return to the vehicle select step by pressing **EXIT**. Double check your selection.

DISPLAY D:
This occurs when the **TECH 1** has not received any data from the ECM. In this case, you should verify that the ignition is ON and check the serial data link connections. **An incorrect engine type selection may also cause this condition.**

Display E:
This occurs when communication with a vehicle has failed after communication has already been established.

ACTIVE TECH 1 KEYS FOR DATA LIST	
EXIT	Return to vehicle select mode.

MODE F0 | DATA LIST

The purpose of the DATA LIST mode is to passively monitor data which is being transmitted from the ECM during normal operation of the vehicle. This mode does not affect vehicle operation and you can use it to read data to see if it is correct, or at least reasonable. The current value of the parameter is displayed with the parameter units. This means you don't have to hunt through manuals to find out what is being displayed.

The data parameters are displayed in pre-programmed pairs. You can also create your own pairs through the process explained on the following pages.

OPERATING PROCEDURE:

1. Press **F0** to select the DATA LIST mode from the Select Mode menu.

2. Select the data parameters to be displayed by scrolling through the parameters with the **YES** and **NO** keys.

3. You may return to the Select Mode menu at any time by pressing **EXIT**.

Operation of the DATA LIST mode is summarized in the flow diagram on the following page.

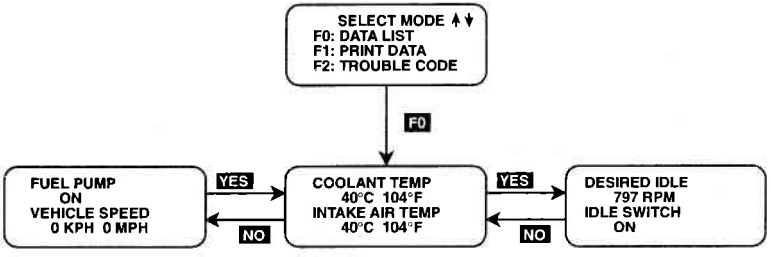
ACTIVE TECH 1 KEYS FOR DATA LIST	
YES & **NO**	Scroll through displayed data parameters.
F0	Mark top displayed parameter as "fixed" for creating your own data pairs.
F1	Mark bottom displayed parameter as "fixed" for creating your own data pairs.
EXIT	Return to select mode menu.

VIEWING ECM DATA PARAMETERS

In order to maximize the information that can be seen at one time, the **TECH 1** displays data parameters in pre-assigned pairs. The first data pair displayed after you press **F0** is shown in the figure below. Also shown is how to scroll through the Data List with the **YES** and **NO** keys and how to create your own data pairs with the **F0** and **F1** keys.

To see other pre-assigned pairs, press either the **YES** or **NO** key. The **YES** key will cause the **TECH 1** to scroll forward through the list of pre-assigned pairs, while the **NO** key will cause scrolling backwards.

Section 8.0 contains descriptions of all engine data parameters.



MODE F0	DATA LIST

CREATE YOUR OWN DATA PAIRS

You can create data parameter pairs which are different from the preassigned pairs. Any two parameters can be displayed as a pair by simply scrolling either the bottom or top display parameter, while the other display parameter is fixed. To "fix" the top parameter press **F0**, an asterisk will appear by the fixed parameter. Press **F1** to "fix" the lower parameter. The **TECH 1** will not allow both the top and bottom parameters to be fixed at the same time.

As an example, let's say you wish to create a pair with ENGINE SPEED and SPARK ADVANCE. To do so, scroll through the pre-assigned pairs with the **YES** and **NO** key until you find a pair with ENGINE SPEED. Fix the ENGINE SPEED by pressing the **F0** key if ENGINE SPEED is the top parameter, or the **F1** key if it is the bottom. Then scroll the other half of the display with either the **YES** or **NO** key until SPARK ADVANCE is displayed.

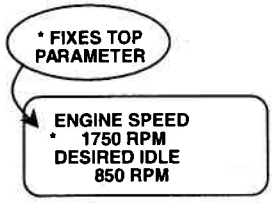


FIGURE A

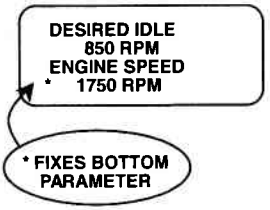


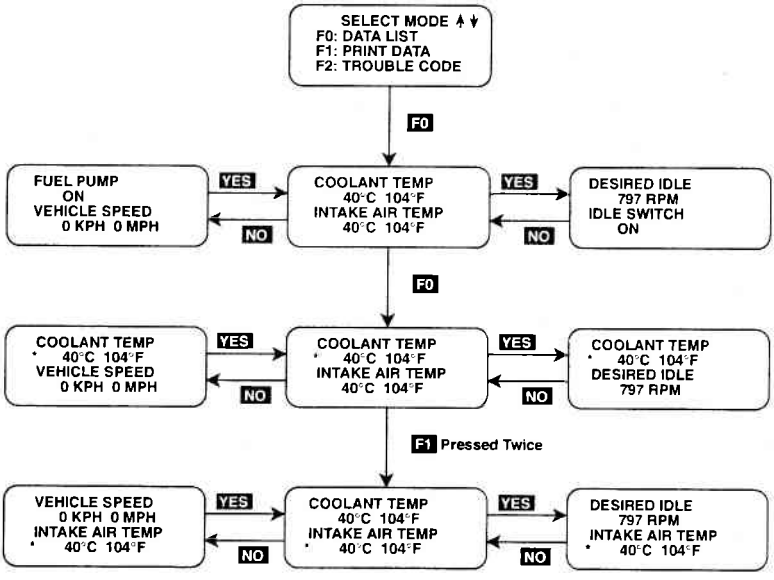
FIGURE B

PRINTING DATA

The currently displayed sample may be printed if the **TECH 1** is equipped with an RS232C I/F Cartridge (P/N TK05030A) connected to a compatible printer. To print the data, press **F8**. The **TECH 1** keyboard is disabled while data is being sent to the printer.

NOTE:
The RS232C I/F Cartridge is not required if you are using a **TECH 1** Series A tester.

DATA LIST	MODE F0



ACTIVE TECH 1 KEYS FOR CREATING DATA PAIRS

YES, **NO** Scroll through displayed data parameters.

EXIT Return to the Select Mode menu.

F0 & **F1** "FIX" the upper or lower parameter.

MODE F1	PRINT DATA

PRINT DATA

When the RS232C I/F Cartridge is installed in the **TECH 1**, or if you are using a **TECH 1** Series A tester, the Print Data mode allows you to print the VIN, engine type and Data List to a serial printer or terminal. This is the data list sent by the engine computer to the **TECH 1**. The data list parameters can be printed without printing the VIN or engine type by pressing the **F8** key in the Data List or Snapshot Replay mode.

OPERATING PROCEDURE:

1. Press **F1** to select the Print Data mode from the Select Mode menu. The VIN entry screen is the first screen displayed in this mode. Only the last 6 digits of the VIN are entered on this screen. This information is then printed out as part of the header information that accompanies each data list print out. The VIN is entered via the numeric portion of the key pad and the **ENTER** key is pressed to move to the next section of the print function.

2. The next screen requires the **ENTER** key to be pressed to start printing the data. This screen allows the cable to be connected between the RS232C Cartridge and the receiving device.

3. When the **ENTER** key is pressed the "WAITING TO PRINT DATA" screen is displayed until printing begins. If this screen is displayed for more than a few seconds, something is wrong with the set up. Check that all connections are secure, and that any receiving device is turned on and in the proper receive mode.

4. As printing begins, the **TECH 1** displays the % COMPLETE of the print procedure. After the printing is 100% complete, the VIN screen is immediately displayed with the previously selected VIN. Pressing the **ENTER** key twice from this screen will cause another data stream to be buffered for printing as soon as the current data stream is output from the **TECH 1**.

5. Pressing the **EXIT** key at any point will cause the select mode menu to be displayed. If the **EXIT** key is pressed before printing is completed, only the data that has already been sent to the RS232C Cartridge will be printed. SOME DATA WILL BE LOST.

PRINT DATA | MODE F1

PRINT DATA VIN ENTRY SCREEN

SET UP RS232C CARTRIDGE

RS232C INTERFACE CARTRIDGE NOT CONNECTED

PRINT INITIALIZATION

PRINT IN PROGRESS SCREEN

ACTIVE TECH 1 KEYS TO PRINT DATA

ENTER	Move to the next section of the Print Data function.
0 - 9	VIN entry keys.
EXIT	Terminate the Print Data mode and return to the Select Mode menu.

PRINT SAMPLE

1995 SUZUKI
ENGINE TYPE: 2.0 L SFI
VIN: 123456
TECH 1 DATA LIST

NO.	DESCRIPTION	VALUE
1.	COOLANT TEMP	-16°C 3°F
2.	INTAKE AIR TEMP	-16°C 3°F
3.	DESIRED IDLE	266 RPM
4.	IDLE SWITCH	ON
5.	IAC DUTY	34%

MODE F2 | TROUBLE CODES

TROUBLE CODES DESCRIPTION

Trouble codes or diagnostic codes are set by the ECM when an abnormal condition is detected. They are a key to diagnosing many of the problems which can occur in the vehicle. The TROUBLE CODE mode allows you quick access to trouble codes for initial vehicle checks and to check that a repair procedure has been successful. **TECH 1** displays for the TROUBLE CODES mode are shown on the following page.

The **TECH 1** can clear all stored trouble codes on 1995 Suzuki vehicles.

OPERATING PROCEDURE:

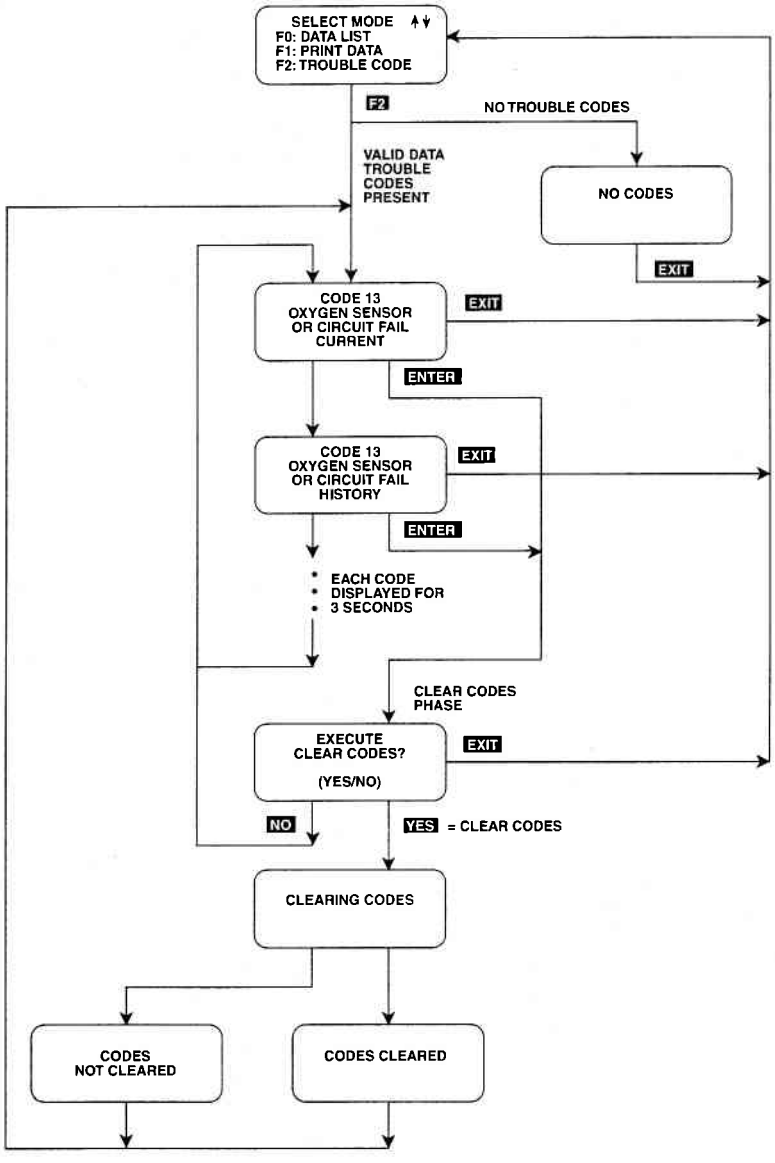
1. Press **F2** to select the TROUBLE CODE mode from the Select Mode menu. The test title will be displayed for three seconds (see figure on following page).

   If no trouble codes are present, the **TECH 1** will display a message to that effect.

2. If trouble codes are present, the **TECH 1** will automatically display each trouble code for three seconds.

3. The trouble codes will be continuously displayed, wrapping around to the first code automatically after the last trouble code has been displayed. First a listing of all Current trouble codes is displayed, followed by History trouble codes with a Current vs. History indication.

TROUBLE CODES | MODE F2



CLEAR CODES PHASE

4. To clear all stored trouble codes on the vehicles listed above, press the **ENTER** key to go to Clear Codes Phase. As the **TECH 1** will display "EXECUTE CLEAR CODES?", select either the **YES** key for clearing codes or the **NO** key for not clearing them.

   When the **YES** key is pressed, **TECH 1** will display a "CLEARING CODES" message, followed by either a "CODES CLEARED" or a "CODES NOT CLEARED" message. After a few seconds the **TECH 1** will automatically start displaying trouble codes again. If no trouble codes are present at this time the "NO CODES" screen is displayed. When the **NO** key is pressed, the trouble codes are retained in the ECM and the **TECH 1** will start displaying trouble codes again.

5. Pressing **EXIT** will terminate the trouble codes mode returning you to the select mode menu.

NOTE

Trouble codes can also be displayed in SNAPSHOT mode.

TROUBLE CODES can also be printed in a tabular format using the Screen Print feature if the RS232C I/F Cartridge is installed or if you are using a **TECH 1** Series A tester. Screen Print is enabled by pressing **F6** until an "RS232 SET-UP" menu is displayed. Press **F1** to enable the Screen Print function. Refer to the RS232C I/F or **TECH 1** Series A Operators Manual for more detail.

ACTIVE TECH 1 KEYS FOR TROUBLE CODES	
ENTER	Clear all stored ECM trouble codes.
YES	Clear all stored ECM trouble codes.
NO	Return to display trouble codes. Codes are not cleared.
F6 (Hold)	Select "RS232C SET-UP" menu.
EXIT	Terminate the trouble code display and return to the select mode menu.

MODE F3 | SNAPSHOT

The purpose of the SNAPSHOT test mode is to help you isolate an intermittent or transient problem by STORING ENGINE DATA PARAMETERS BEFORE AND/OR AFTER THE PROBLEM OCCURS.

When the **TECH 1** is operating in SNAPSHOT mode, it is constantly storing information about data parameters and trouble codes. A time and position index for the stored information is also saved.

The **TECH 1** stores all of the Data List parameters and trouble codes for the vehicle selected. When the memory is full, the oldest (earliest) data collected is erased to make room for new information.

A "TRIGGER" tells the **TECH 1** when to stop collecting data. You can specify a "TRIGGER CONDITION" so the **TECH 1** collects data that will be most useful in diagnosing the current problem.

TRIGGER CONDITION

The trigger condition defines the specific circumstances under which you want the trigger to be set. The possible trigger conditions are:

1) ANY CODE: If any trouble code is detected by the **TECH 1**, it will cause the trigger to be set.

2) SINGLE CODE: You can select a specific trouble code that must be detected before the trigger will be set. Step 3 in the Operating Procedure tells you how to enter the code.

3) MANUAL TRIGGER: While operating the SNAPSHOT mode, you can always cause the trigger to be set by pressing the **ENTER** key.

Once the trigger occurs, the **TECH 1** will retain data according to which trigger point you have selected.

VIEWING CAPTURED DATA

By selecting F3: REPLAY DATA from the SNAPSHOT menu you have the option of bypassing the Data Capture phase and displaying previously captured data. All data captured during SNAPSHOT will be retained in the **TECH 1** until it is overwritten by a new SNAPSHOT, or if the **TECH 1** is disconnected from the serial data link connector or the cigarette lighter for at least one-half hour.

PRINTING CAPTURED DATA

In addition, you can print the captured data, providing a hard copy of any selected data sample. A **TECH 1** printer is required to support this print function. See Step 11.

MODE F3 | SNAPSHOT

OPERATING PROCEDURE:

The operation of SNAPSHOT mode is divided into three phases: Set-Up (Steps 1-3), Data Capture (Steps 4-7), and Data Display (Steps 8-12).

SET-UP PHASE

1. Press **F3** to select the SNAPSHOT mode from the Select Mode menu.

2. The trigger condition and review data options are displayed next in a self-scrolling Snapshot Options menu.

   To select a trigger option, just press the Function Key displayed to the left of the desired trigger condition. To replay previously captured data, press **F3**.

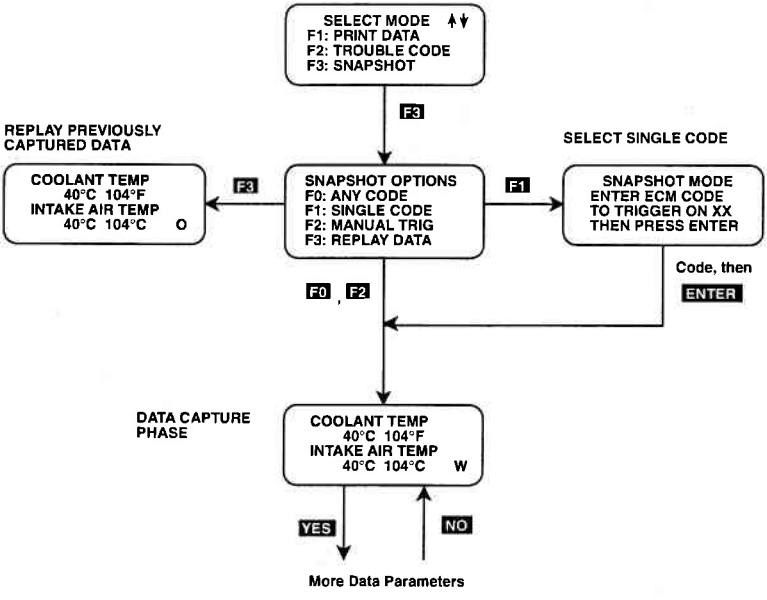
3. To choose a specific ECM trouble code, press **F1** in the Snapshot Options menu.

   When the **TECH 1** screen displays "SNAPSHOT MODE, ENTER ECM CODE TO TRIGGER ON xx", use numeric keys **0** - **9** to enter the two digit trouble code number that you have selected, then press the **ENTER** key. The **TECH 1** will continue to store data until the specified trouble code is detected, or until you press the **EXIT** key. If the code you enter does not exist for the engine type being tested, an "INVALID CODE" message will be displayed and the code will have to be reentered.

ACTIVE TECH 1 KEYS IN SNAPSHOT SET-UP PHASE	
EXIT	Return to Snapshot Options menu.
F0 - **F2**	Select trigger condition.
F3	Select Replay Data.
0 - **9**	Select specific trouble code.
ENTER	Enter selected trouble code.

SNAPSHOT SET-UP PHASE (Select Trigger Condition or Display Previously Captured Data).

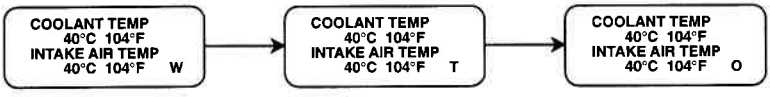
To select a trigger condition, press the function key to the left of the desired trigger condition. To bypass the Data Capture phase and review previously captured data, press **F3**.



DATA CAPTURE PHASE

4. Once the trigger condition is specified, the **TECH 1** begins storing engine data parameters and trouble codes while displaying the Data List parameters.

5. The data is organized as a number of data 'samples'. The value or state of each parameter as well as all trouble codes are saved for each sample. The data display will indicate the 'waiting for trigger' condition with a flashing 'W' in the lower right-hand corner of the display. While waiting for the selected trigger, the **ENTER** key can always be used to force a trigger.



Waiting for Trigger | Trigger Occurs | Data Display Phase

6. Once the trigger occurs, the **TECH 1** will continue to save data samples until its memory is full. The data display indicates that the trigger has occurred by replacing the flashing 'W' with a flashing 'T'. As soon as the memory is full, the data capture terminates automatically and the **TECH 1** goes to the Data Display phase.

7. Pressing **EXIT** will terminate the Data Capture phase. If the trigger has already occurred, the Snapshot mode will move to the Data Display Phase.

ACTIVE TECH 1 KEYS IN SNAPSHOT DATA CAPTURE PHASE

YES & NO	Scroll through displayed data parameters.
F0	Mark top displayed parameter as "fixed" for creating your own data pairs.
F1	Mark bottom displayed parameter as "fixed" for creating your own data pairs.
ENTER	Manual trigger.
EXIT	Display captured data if trigger has already occurred.

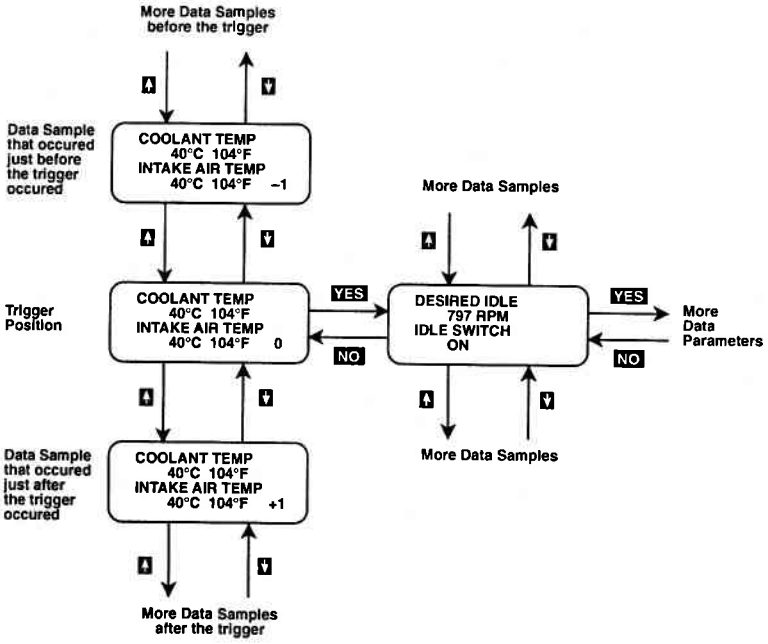
MODE F3 | SNAPSHOT

DATA DISPLAY PHASE

8. The Data Display phase is indicated with a number (initially zero) in the lower right-hand corner of the display. Select the data to be displayed by using the **YES** and **NO** keys.

NOTE

During the Data Display phase, the trouble codes present during each sample can be displayed by pressing **F2**.

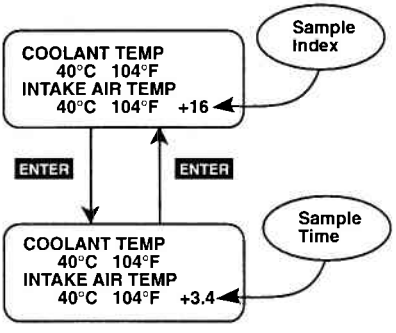


9. Use the ↑ and ↓ keys to select the desired sample. An index is displayed in the lower right-hand corner of the **TECH 1** display. Sample "0" corresponds to the trigger sample; sample "–1" is the sample immediately preceding the trigger; sample "+1" is immediately after the trigger, and so on. The index range may be less than the maximum number of samples if not enough time was allowed for data capture before or after the trigger.

   You can advance directly to the first, last, or trigger sample with the press of a button.

   F4: Display first (earliest) sample
   F5: Display trigger sample (0)
   F6: Display last (most recent) sample

10. While in the data display phase, pressing **ENTER** will cause the **TECH 1** to toggle between the sample index and sample time.



The sample time display gives the time in seconds (relative to the trigger sample) at which the **TECH 1** received the currently displayed sample. For example, a sample time of +3.4 means the sample was received 3.4 seconds after the trigger sample. A sample time of –2.6 seconds means the sample was received 2.6 seconds before the trigger.

11. The currently displayed sample may be printed if the tester is connected to a compatible printer. To print the data, press F8. The **TECH 1** keyboard will be disabled while data is being sent to the printer.

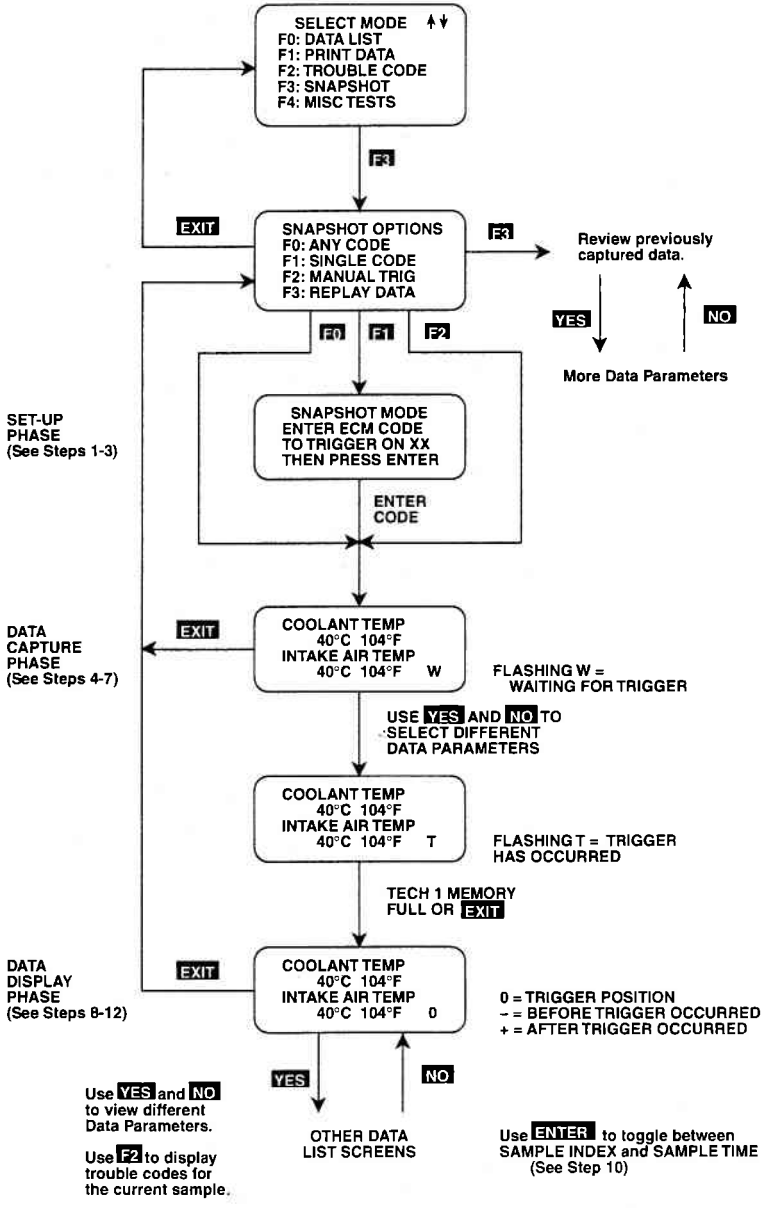
    SNAPSHOT data can also be printed in a tabular format using the Screen Print feature if the RS232C I/F Cartridge is installed or if you are using a **TECH 1** Series A tester. Screen Print is enabled by pressing F6 until an "RS232 SET-UP" menu is displayed. Press F1 to enable the Screen Print function. Refer to the RS232C I/F or **TECH 1** Series A Operator's Manual for more detail.

12. When you are finished viewing the sampled data, press EXIT to return to the Snapshot Options menu. If you are finished with the SNAPSHOT mode, press EXIT again to return to the select mode menu.

ACTIVE TECH 1 KEYS IN SNAPSHOT DATA DISPLAY PHASE

YES & NO	Scroll through displayed data parameters.
↑ & ↓	Scroll through selected samples.
F0 & F1	Fix top or bottom display parameter respectively.
F2	Display trouble codes for current sample.
F4	Advance to first (earliest) sample.
F5	Advance to trigger sample (sample 0).
F6	Advance to last (most recent) sample.
F6 (Hold)	Select "RS232C SET-UP" menu.
F8	Print current data sample (if equipped with RS232C I/F Cartridge or **TECH 1** Series A and printer).
ENTER	Toggle between sample index and sample time display.
EXIT	Return to Snapshot Options menu.

SNAPSHOT MODE FLOW CHART



MODE F4	MISC. TESTS
SUBMODE F0	RPM CONTROL

RPM Control is not an engine test, but it allows you to control the RPM. If an elevated RPM, minimum air adjustment or diagnosis of the IAC valve is required for any reason, this mode allows quick and easy control of the RPM from any area of the car.

NOTICE:

THIS TEST SHOULD ONLY BE RUN WITH THE PARKING BRAKE ON AND THE WHEELS ADEQUATELY SECURED. ANY OTHER MODE OF OPERATION IS NOT RECOMMENDED AND IS UNSAFE.

OPERATING PROCEDURES

1. Press **F0** to select the RPM Control mode from the Miscellaneous Test menu. The RPM CONTROL instruction screen is displayed, followed by the BLOCK WHEELS screen.

2. Block the wheels, set the parking brake, put the transmission in Park or Neutral, then start the engine. Warm the engine to operating temperature (at least 70°C).

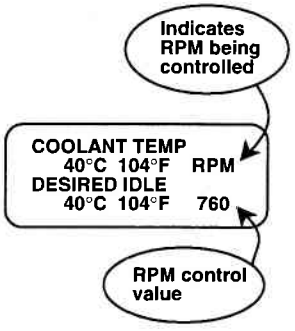
3. Press **ENTER** to begin the test.

4. The **TECH 1** first automatically controls the engine speed to the current desired idle. When the RPM Control Testing Screen is displayed, you can increase the engine RPM by pressing the ↑ key. To decrease the RPM, press the ↓ key. Holding down either key will cause the RPM to change in the appropriate direction.

   If the **TECH 1** detects any of the following conditions, the RPM Control mode will be terminated:
   - Engine speed less than 500 RPM or greater than 2000 RPM.
   - Coolant temperature is below 70°C.
   - Idle switch is "OFF".

MISC. TESTS	MODE F4
RPM CONTROL	SUBMODE F0

5. While in the RPM CONTROL mode, parameters can be displayed as in the DATA LIST mode. RPM appears at the end of line two of the display, and the currently commanded value of RPM is displayed at the end of line four. Data parameters can be scrolled and fixed as in the DATA LIST mode.



RPM CONTROL TESTING SCREEN

6. To return to the initial desired idle control RPM, press the **ENTER** key.

7. Press the **EXIT** key to return control of the IAC valve to the ECM and to return to the Miscellaneous Tests menu.

ACTIVE TECH 1 KEYS FOR RPM CONTROL	
↑	Increase engine speed.
↓	Decrease engine speed.
YES & NO	Scroll through displayed data parameters.
F0 & F1	Mark top or bottom displayed parameter as fixed for creating your own data pairs.
ENTER	Return to initial desired idle RPM control.
EXIT	Terminate the RPM CONTROL mode and return to the Miscellaneous Test menu.

MODE F4	MISC. TESTS
SUBMODE F1	FIXED SPARK MODE

The purpose of the Fixed Spark mode is to continuously monitor engine data parameters while commanding ECM operation in the fixed spark mode. The Fixed Spark mode allows you to set the engine timing.

The **TECH 1** Fixed Spark mode allows monitoring of engine data parameters in a manner identical to that of the Data List mode. Fixed spark operation is indicated by the letters "FXS" in the lower right corner of the **TECH 1** display as shown on the following page.

OPERATING PROCEDURE:

1. Press **F1** to select the Fixed Spark mode from the Miscellaneous Test menu.

2. Set the parking brake, block the wheels, then start the engine. Warm the engine to operating temperature (at least 70°C).

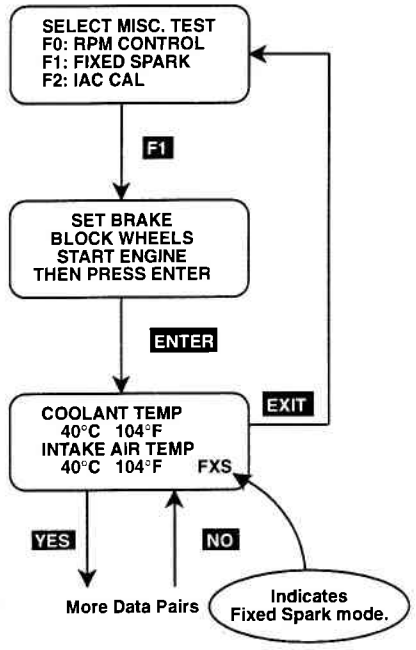
3. Press **ENTER** to begin the test.

4. Select the data parameters to be displayed by scrolling through the parameters with the **YES** and **NO** keys. If the **TECH 1** detects vehicle speed, the Fixed Spark mode will be terminated.

5. Press **EXIT** to terminate the Fixed Spark mode and return to the Miscellaneous Tests menu.

Operation of the Fixed Spark mode is summarized in the following flow diagram.

MISC. TESTS	MODE F4
FIXED SPARK MODE	SUBMODE F1



FIXED SPARK MODE

ACTIVE TECH 1 KEYS FOR FIXED SPARK MODE

YES & NO	Scroll through displayed parameters.
F0	Mark top displayed parameter as "fixed" for creating your own data pairs.
F1	Mark bottom displayed parameter as "fixed" for creating your own data pairs.
EXIT	Return to Miscellaneous Test menu.

MODE F4	MISC. TESTS
SUBMODE F2	IAC CAL

The purpose of the IAC CAL mode is to set the duty of the IAC valve to a certain value at idle speed. This is done by adjusting the Idle adjustment screw in the throttle body. The IAC CAL mode allows monitoring of engine data parameters in a manner identical to that in the DATA LIST mode.

OPERATING PROCEDURE:

1. Press **F2** to select the IAC CAL from the Miscellaneous Test menu.

2. Block the wheels, shift to Park and set the parking brake.

3. Make sure the vehicle is in Park with the parking brake engaged, start the engine unless it is already running. Warm the engine to operating temperature (at least 70°C).

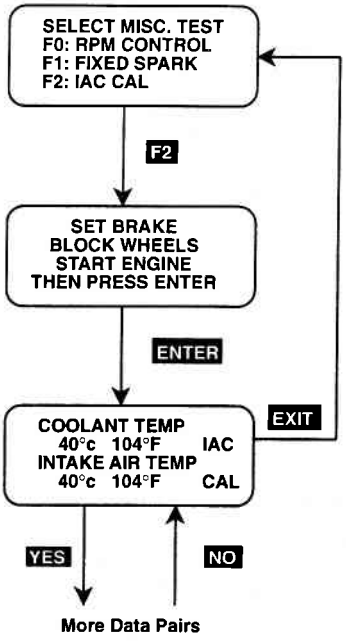
4. Press **ENTER** to begin the test.

5. Select the data parameters to be displayed by scrolling through the parameters with the **YES** and **NO** keys. The letters "IAC" appearing at the end of line two of the display indicate that the IAC valve is being controlled. At the end of line four of the display, "CAL" (Calibrated Air) will be displayed.

6. Press **EXIT** to return to the Miscellaneous Tests menu and return control of the IAC system to the ECM.

Operation of the IAC CAL function is summarized in the following flow diagram.

MISC. TESTS	MODE F4
IAC CAL	SUBMODE F2



IDLE AIR CONTROL CALIBRATION (IAC CAL)

ACTIVE TECH 1 KEYS FOR IAC CAL	
YES & NO	Scroll through displayed data parameters.
F0	Mark top displayed parameter as "fixed".
F1	Mark bottom displayed parameter as "fixed".
ENTER	Advance to IAC Control, provided vehicle is in Park or Neutral.
EXIT	Return to Miscellaneous Test menu.

MODE F4	MISC. TESTS
SUBMODE F3	EGR CONTROL

The EGR Control is for models with a 1.8L engine only.

The EGR Control mode allows you to continuously monitor Data List parameters while commanding the EGR control ON. When EGR control is ON, exhaust gas is introduced into the intake manifold. The engine should be warmed to control operating temperature before performing the EGR Control mode test.

OPERATING PROCEDURE:

1. Press **F3** to select the EGR Control mode from the Miscellaneous Test menu.

2. Set the parking brake, block the wheels, then start the engine. Warm the engine to operating temperature (at least 70°C).

3. Control the engine speed to 1500-4000 RPM, then press **ENTER**.

4. Select the data parameters to be displayed by scrolling through the parameters with the **YES** and **NO** keys. "EGR" is displayed at the end of line 2 and "ON" is displayed at the end of line 4 indicating that the EGR system is being controlled.

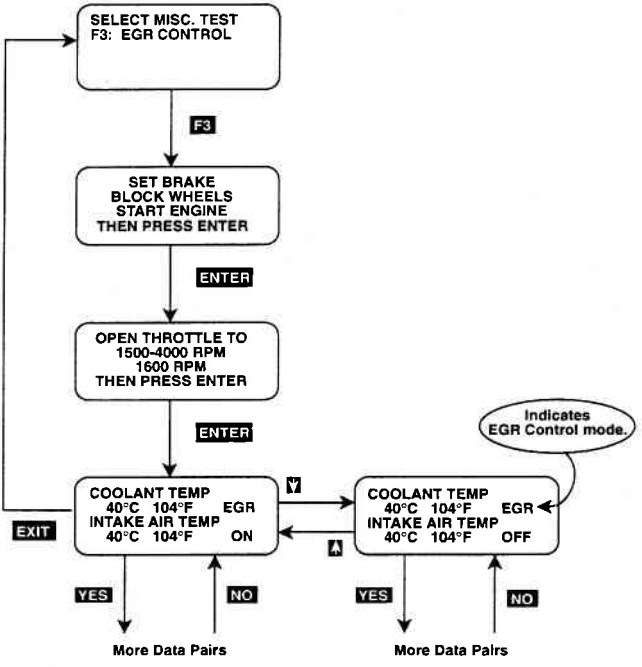
   If the **TECH 1** detects any of the following conditions, EGR Control will be terminated.
   - Engine speed less than 1500 RPM or greater than 4000 RPM.
   - Coolant temperature is below 70°C.
   - Idle switch is "ON".

5. The test begins with the EGR on. To control the EGR off, press the ↓ key. To control EGR on again press the ↑ key. The Data List display for monitoring the engine's response is available while the EGR is being controlled.

6. Press **EXIT** to return to the Miscellaneous Test menu and return EGR Control to the ECM.

Operation of the EGR Control mode is summarized in the following flow diagram.

MISC. TESTS	MODE F4
EGR CONTROL	SUBMODE F3



ACTIVE TECH 1 KEYS FOR EGR CONTROL MODE

YES & NO	Scroll through displayed data parameters.
F0	Mark top displayed parameter as "fixed".
F1	Mark bottom displayed parameter as "fixed".
ENTER	Advance to EGR Control, provided vehicle is in Park or Neutral.
↑	Switch EGR control on while viewing parameters.
↓	Switch EGR control off while viewing parameters.
EXIT	Return to Miscellaneous Test menu.

MODE F4	MISC. TESTS
SUBMODE F4	STEPPING EGR CONTROL

The Stepping EGR Control mode is for models with a 2.0L engine only.

The Stepping EGR Control mode allows you to regulate the Stepping EGR opening in increments from 0 to 100, and displays the stepping EGR monitor value as a percentage. The **TECH 1** initializes the Stepping EGR opening to the current value (=0%).

OPERATING PROCEDURE:

1. Press **F4** to select the STEPPING EGR Control mode from the Miscellaneous Test menu.

2. Set the parking brake, block the wheels, put the transmission in Park or Neutral, then start the engine. Warm the engine to operating temperature (at least 70°C).

3. Press **ENTER** to begin the test.

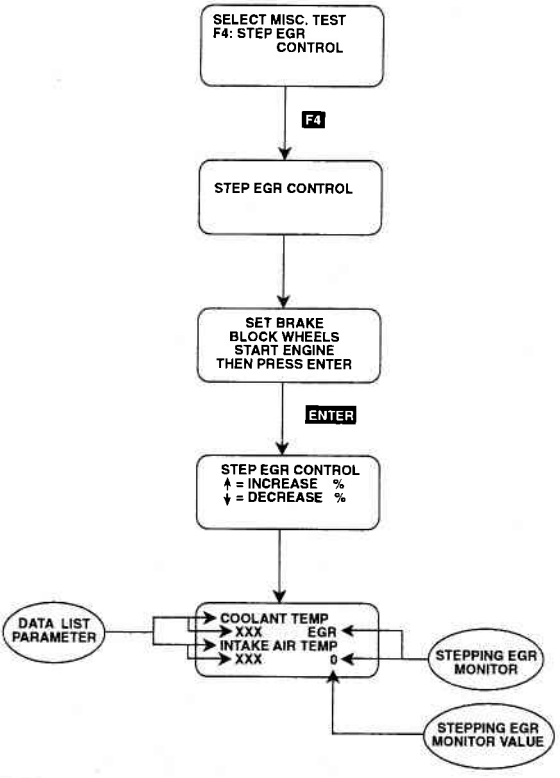
4. If the **TECH 1** detects any of the following conditions, Stepping EGR Control will be terminated and the cause will be displayed.
   - Engine speed falls below 200 RPM.
   - Idle Switch is "OFF".
   - Coolant temperature falls below 70°C.

5. The test begins with the STEPPING EGR at 0%. "EGR" is displayed at the end of line 2 and the Stepping EGR value is displayed at the end of line 4. To increase the Stepping EGR value, press the ↑ key. To decrease the Stepping EGR value, press the ↓ key. The STEPPING EGR value is displayed as a percentage (%).

6. Press **EXIT** to return to the Miscellaneous Test menu.

Operation of the STEPPING EGR Control mode is summarized in the following flow diagram.

MISC. TESTS	MODE F4
STEPPING EGR CONTROL	SUBMODE F4



ACTIVE TECH 1 KEYS FOR STEPPING EGR CONTROL MODE

YES & NO	Scroll through displayed data parameters.
ENTER	Advance to STEPPING EGR Control provided vehicle is in Park or Neutral.
↑	Increase STEPPING EGR control value while viewing parameters.
↓	Decrease STEPPING EGR control value while viewing parameters.
EXIT	Return to Miscellaneous Test menu.

6.0 FINISHING UP

After using the SUZUKI 1995 ECM Cartridge, a few simple steps will insure that you get the most life out of your diagnostic tool.

First, remove power to the **TECH 1** by disconnecting the serial data link cable from the serial data link connector. You may want to inspect the cable and connector for any damage or corrosion.

Next, unplug the cartridge and store it and the cable in the travelling case.

If the **TECH 1** should become dirty you may wipe it off with a clean cloth and mild detergent or hand soap. Avoid using harsh solvents such as petroleum based cleaning agents, Benzene, Trichloroethylene, etc. Although the **TECH 1** is water resistant it is not waterproof so be sure to thoroughly dry off the **TECH 1** prior to storage.

7.0 TROUBLE CODES

Listed below is a brief description for all trouble codes that can be displayed with the SUZUKI 1995 ECM Cartridge.

ECM TROUBLE CODE	TECH 1 DISPLAY DESCRIPTOR	TROUBLE CODE DESCRIPTION
13	OXYGEN SENSOR OR CIRCUIT FAIL	Oxygen sensor or circuit malfunction. (1.8L ENGINE)
13	OXYGEN SENSOR B1 OR CIRCUIT FAIL	Bank 1 Oxygen sensor or circuit malfunction. (2.0L ENGINE)
14	ECT SENSOR OR CIRCUIT OPEN	Engine coolant temperature sensor or circuit open.
15	ECT SENSOR OR CIRCUIT SHORT	Engine coolant temperature sensor or circuit short.
21	TP SENSOR VOLTAGE HIGH	Throttle position sensor signal voltage too high. Throttle position sensor or circuit failure.
22	TP SENSOR VOLTAGE LOW	Throttle position sensor signal voltage too low. Throttle position sensor or circuit failure.
23	IAT SENSOR OR CIRCUIT OPEN	Intake air temperature too low. Intake air temperature sensor or circuit open.
24	VSS NO SIGNAL	Vehicle Speed Sensor signal not received by the ECM. Vehicle speed sensor circuit failure.
25	IAT SENSOR OR CIRCUIT SHORT	Intake air temperature too high. Intake air temperature sensor or circuit short.

ECM TROUBLE CODE	TECH 1 DISPLAY DESCRIPTOR	TROUBLE CODE DESCRIPTION
26	OXYGEN SENSOR B2 OR CIRCUIT FAIL	Bank 2 Oxygen sensor or circuit malfunction. (2.0L ENGINE only)
33	MAF SENSOR VOLTAGE HIGH	Mass Air Flow sensor sensor voltage too high. MAF sensor or circuit failure.
34	MAF SENSOR VOLTAGE LOW	Mass Air Flow sensor signal voltage too low. MAF sensor or circuit failure.
41	IGNITION SIGNAL FAIL	Ignition signal not received by the ECM. Ignition system problem.
42	CMP SENSOR NO SIGNAL	Camshaft Position sensor signal not received by the ECM. CMP sensor or circuit failure.
51	EGR VALVE CIRCUIT OPEN	EGR Valve circuit open. (2.0L ENGINE only)

8.0 DATA LIST PARAMETER DESCRIPTIONS

The **TECH 1** is capable of displaying a wide variety of ECM parameters in Data List, Snapshot, RPM Control and Output Test modes. The ECM sends the **TECH 1** information regarding the state of the engine as the ECM sees it. The **TECH 1** 'translates' and displays this information in the form of parameters selected by the service technician. This section describes those parameters.

There are two basic types of ECM parameters: discrete and analog. Discrete parameters are 'bits' of information and can be in only one of two distinct states (on/off, open/closed, etc.). Switches and solenoids are examples of discrete parameters. Analog parameters are used to represent quantities and are displayed as a value with appropriate units. Examples of analog parameters include Engine Speed, Coolant Temperature, Oxygen Sensor Voltage, etc.

Parameters are grouped by ECM function. The categories are:

1) General and Electrical

2) Fuel Delivery and Spark Control

3) Emissions & Driveability

4) Transmission

5) Miscellaneous

CATEGORY DESCRIPTIONS

1) General Parameters are those that affect or are effected by many different ECM systems. Included are: Engine Speed, Vehicle Speed, Engine Coolant Temperature and Charging Efficiency related parameters.

   Electrical Parameters can be used to help diagnose vehicle electrical problems and include Battery Voltage, Electric Load.

2) Fuel Delivery Parameters describe the ECM fuel control system in action. The ECM (after the engine has warmed up) controls the air/fuel mixture ratio based on the values of certain engine sensor inputs. Examples of such inputs include Intake Air Temperature and Mass Air Flow, and Oxygen Sensor Voltage. The output signals of the fuel control system depend on the fuel delivery system.

   Spark Control Parameters are associated with spark timing calculations. Engine sensor values are used by the ECM to increase or decrease (retard) spark advance.

3) Emissions & Driveability refer to all parameters that are related to improvements in performance or air pollution reduction.

   Systems included are:
   Idle Air Control
   Exhaust Gas Recirculation
   Evaporative Emission Control

4) Transmission Parameters represent signals from the transmission to the ECM. At this time the state of the D-Range shift light is the only transmission parameter.

5) The Miscellaneous Parameter for the SUZUKI 1995 ECM Cartridge is the state of the A/C switch.

DESCRIPTOR FORMAT

Following is a description of every parameter that can be displayed with the SUZUKI 1995 ECM Cartridge. Included is: 1) a listing of all the parameters available for each category; 2) a description, the units, and the range of the analog parameters. Following these descriptions is the ECM-Parameter Cross Reference which shows what parameters are available for each ECM. The parameters are listed in alphabetical order.

GENERAL AND ELECTRICAL PARAMETERS

GENERAL
Charging Efficiency
Engine Coolant Temperature
Engine Speed
Vehicle Speed

ELECTRICAL
Battery Positive Voltage
Electric Load

FUEL DELIVERY AND SPARK CONTROL PARAMETERS

FUEL DELIVERY
Fuel Pump
Injector Pulse Width
Intake Air Temperature
Mass AIR Flow
Mixture Control Dwell (Ave.)
Mixture Control Learn Value
Mixture Control Monitor
O2S Activation
Oxygen Sensor
Rich and Lean Monitor
Throttle Angle
Throttle Position Sensor

SPARK CONTROL
Spark Advance

EMISSIONS & DRIVEABILITY PARAMETERS

Desired Idle Speed
EGR
EVAP Canister Purge Solenoid
Idle Switch
IAC Duty
Power Steering Pressure (PSP) Switch

TRANSMISSION PARAMETERS

D-Range Shift

MISCELLANEOUS PARAMETERS

A/C Switch

PARAMETER INDEX

PARAMETER DEFINITIONS

GENERAL

CHARGING EFFICIENCY

UNITS	RANGE
%	0 - 100

Charging efficiency is calculated using data from the mass air flow and camshaft position sensors. A higher charging efficiency indicates a larger engine load.

ENGINE COOLANT TEMPERATURE

UNITS	RANGE
°C	–40 - 120
°F	–40 - 250

Engine Coolant Temperature is an analog input to the ECM. The Coolant Temperature sensor is a temperature variable resistor in series with a fixed resistor in the ECM and biased with a reference voltage. The ECM reads the voltage across the Coolant Temperature sensor and converts this voltage into temperature.

ENGINE SPEED

UNITS	RANGE
RPM	0 - 9999

Engine speed is an ECM internal parameter. It is computed by reference pulses from the Camshaft Position Sensor and is used by virtually all ECM systems.

VEHICLE SPEED

UNITS	RANGE
KPH	0 - 250
MPH	0 - 155

Vehicle speed is an ECM internal parameter. It is computed by timing pulses coming from the vehicle speed sensor. Vehicle speed is used for the IAC control in the ECM.

ELECTRICAL PARAMETERS

BATTERY POSITIVE VOLTAGE

UNITS	RANGE
VOLTS	0.0 - 20.0

Battery Positive Voltage is an analog input signal read by the ECM. This parameter is used for voltage correction of the fuel injection quantity.

ELECTRIC LOAD

STATES
OFF/ON

The electrical system load affects the engine load, which causes variations in engine speed. The Electric Load parameter will read ON or OFF depending on the state of certain electrical components (such as the radiator fan motor, head lights, parking lights, blower fan motor, rear defogger, brake lights, etc.) The ECM uses the ON or OFF signal to compensate for variations in engine load by controlling the IAC valve.

FUEL DELIVERY PARAMETERS

FUEL PUMP

STATES
OFF/ON

ON is displayed when the ECM activates the fuel pump via the fuel pump relay switch.

INJECTOR PULSE WIDTH

UNITS	RANGE
mSEC	0.00 - 99.99

The Base Width is the length of time (in milliseconds) the ECM is commanding the fuel injectors on. Injector 'on' time is how EFI systems control fuel mixture. A longer 'on' time yields a richer mixture.

INTAKE AIR TEMPERATURE

UNITS	RANGE
°C	–40 - 120
°F	–40 - 250

Intake Air Temperature is needed to determine the amount of air passing into the intake manifold as air density varies with temperature.

MASS AIR FLOW

UNITS	RANGE
g/sec.	0.0 - 450.0

Certain engines have a Mass Air Flow (MAF) sensor which measures air flow into the intake manifold. This data is used by the ECM in determining engine load.

MIXTURE CONTROL DWELL

	UNITS	RANGE
BANK 1 (LH BANK)	NONE	–1.00 - 1.00
BANK 2 (RH BANK)	NONE	–1.00 - 1.00

Mixture Control Dwell value represents short term corrections to the air/fuel mixture computation. A value of 0 indicates no correction, a value greater than 0 means an enrichment correction, and a value less than 0 implies an enleanment correction.

If "***" appears in the tester screen, it means that the vehicle you are testing is not equipped with this sensor.

FUEL DELIVERY PARAMETERS

MIXTURE CONTROL LEARN VALUE

	UNITS	RANGE
BANK 1 (LH BANK)	NONE	–1.00 - 1.00
BANK 2 (RH BANK)	NONE	–1.00 - 1.00

The Mixture Control Learn Value represents long term corrections to the air/fuel mixture computation. A value of 0 indicates no correction, a value greater than 0 means an enrichment correction, and a value less than 0 implies an enleanment correction.

If "✶✶✶" appears in the tester screen, it means that the vehicle you are testing is not equipped with this sensor.

MIXTURE CONTROL MONITOR

	UNITS	RANGE
BANK 1 (LH BANK)	NONE	–1.00 - 1.00
BANK 2 (RH BANK)	NONE	–1.00 - 1.00

The value of Mixture Control Monitor is obtained by putting values of the Mixture CONTROL DWELL and MIXTURE CONTROL LEARN VALUE together. This value indicates how much correction is necessary to keep the air/fuel mixture stoichiometrical. If it fluctuates within –0.25 (SFI) to 0.25 (SFI) range, it is normal. If this value remains at –0.25(SFI) while feedback control is properly carried out, it means that the base air/fuel mixture ratio before correction is overrich and maximum enleanment correction is being done, therefore it is abnormal. If it remains at 0.25(SFI), it also means abnormal for the reason opposite to the above.

If "✶✶✶" appears in the tester screen, it means that the vehicle you are testing is not equipped with this sensor.

O2S ACTIVATION

	STATES
1.8L & 2.0L BANK 1/2 (LH/RH BANK)	ACTIVATION/DEACTIVATION

ACTIVATION is displayed when the oxygen sensor is operating within the activation temperature range and producing the expected output over a certain period of time. The oxygen sensor is deactivated by the ECM and DEACTIVATION is displayed if it does not reach the activation temperature or if it does not produce an adequate reading over a certain period of time.

FUEL DELIVERY PARAMETERS

OXYGEN SENSOR

	UNITS	RANGE
1.8L	mV	0 - 1250
BANK 1/2 (LH/RH BANK) - 2.0L	mV	0 - 1280

The Oxygen Sensor, located in the exhaust stream, is the primary input to the fuel delivery system. A high voltage indicates a rich mixture while a low voltage indicates a lean mixture. After the ECM is in the closed loop mode of operation the fuel mixture is adjusted based upon the voltage of this sensor.

If "***" appears in the tester screen, it means that the vehicle you are testing is not equipped with this sensor.

NOTE: The oxygen sensor must be hot (>260 deg C, >500 deg F) before it will function properly.

Notice:

Do not attempt to measure the oxygen sensor voltage with a standard voltmeter! This may damage the sensor.

RICH AND LEAN MONITOR

	STATES
1.8L & 2.0L BANK 1/2 (LH/RH BANK)	1/2 RICH/LEAN

This parameter tells whether the oxygen sensor voltage is above or below a programmed threshold. The threshold is normally computed to be the oxygen sensor voltage corresponding to an intake air/fuel ratio of 14.7 or about 450 mV. An Oxygen sensor voltage reading above the threshold means the intake mixture is rich whereas an oxygen sensor voltage below the threshold corresponds to a lean mixture.

THROTTLE POSITION SENSOR

UNITS	RANGE
V	0.00 - 5.00

The Throttle Position Sensor reading provides throttle valve opening information in the form of voltage. This information is used for correction, such as enrichment correction during acceleration.

The voltage reading should increase as the throttle is opened. 0 V indicates a broken or shorted sensor.

FUEL DELIVERY PARAMETERS

THROTTLE ANGLE

UNITS	RANGE
°	0.00 - 90.0

The Throttle Angle parameter displays the throttle position related to the fully closed position. 0-0.5 refers to a fully closed throttle while about 80 is a wide open throttle.

SPARK CONTROL PARAMETERS

SPARK ADVANCE

UNITS	RANGE
°	–10 - 60 BTDC

Spark Advance refers to the total spark advance being commanded by the ECM. The actual ignition timing should be checked by using a timing light.

EMISSIONS & DRIVEABILITY PARAMETERS

DESIRED IDLE SPEED

UNITS	RANGE
RPM	0 - 2000

The Desired Idle Speed is an ECM internal parameter which indicates the ECM requested idle. If the engine is not running, this number is not valid.

EGR

STATES
ON/OFF

1.8L — ON is displayed when the EGR SV valve turns on (when EGR gas flows into the intake manifold), and OFF is displayed when the EGR SV valve turns off (when EGR gas does not flow into the intake manifold). The EGR gas flow is regulated according to driving conditions by the EGR modulator and the solenoid vacuum valve, which switches the vacuum passage to the diaphragm of the EGR valve.

2.0L — ON is displayed when the EGR valve is not fully closed (when EGR gas flows into the intake manifold), and OFF is displayed when the EGR valve is fully closed (when EGR gas does not flow into the intake manifold). The EGR gas flow is regulated according to driving conditions by the stepper motor, which is operated by the signals from ECM.

EMISSIONS & DRIVEABILITY PARAMETERS (cont.)

EVAP CANISTER PURGE SOLENOID

UNITS	RANGE
%	0 - 100

The EVAP Canister Purge Solenoid parameter displays the degree to which the purge valve is either open or closed. 0% means that the purge valve is completely closed while 100% is a fully open valve.

IDLE SWITCH

STATES
ON/OFF

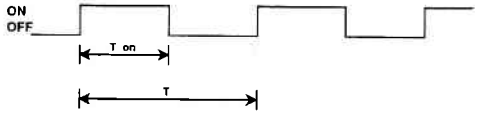
The Idle Switch parameter will read ON when the throttle valve is fully closed, or OFF when the throttle is not fully closed.

IAC DUTY

UNITS	RANGE
%	0 - 100

The IAC Valve uses a duty solenoid valve. It controls the engine idle speed by varying the valve open time within a certain set cycle and thus controls the amount of by-pass air.

Idle Air Control Duty is obtained by using T on ÷ T x 100 (%)



POWER STEERING PRESSURE (PSP) SWITCH

STATES
ON/OFF

The Power Steering Pressure Switch parameter displays ON when the steering wheel is cranked all the way to the right or left.

TRANSMISSION PARAMETERS

D-RANGE SHIFT
(A/T only)

STATES
D RANGE/P-N RANGE

The D-range shift parameter reads D-RANGE when the transmission is shifted to any drive range (Drive, 1st, 2nd or Reverse). This signal informs the ECM that a load has been applied to the engine so the ECM can adjust fuel compensation and IAC accordingly.

The D-range shift signal is also indicated for manual transmissions but should be ignored.

MISCELLANEOUS PARAMETERS

A/C SWITCH

STATES
OFF/ON

This Parameter represents the current state of the A/C Switch (compressor). This signal is fed back to the ECM to let the ECM know the current state of the A/C, ON or OFF.

APPENDICES

A. UNDERSTANDING SUZUKI ECMs

B. IF YOU'RE HAVING A PROBLEM

C. GLOSSARY OF TERMS

A. UNDERSTANDING SUZUKI ECMs

The serial data link uses message-oriented transmissions with a UART type data format. The communication is via a single-wire half-duplex bus using a master/slave protocol. The serial data link can be used for communications during normal operation or as an interface to a test device for diagnostic operations. If there is no requirement for data sharing between the vehicle's components during normal operation, the link can be implemented as a diagnostics only link. Numerous diagnostic modes provide a maximum of system flexibility.

Interface to the serial data link can be implemented using standard UART type devices communicating at a 7812.5 baud rate. The interface devices required for this phase are available as stand-alone devices or integrated with CPU's (or MPU's) in a large number of micro-controllers.

Network access is via a master/slave protocol. The serial data link can have at most one device functioning as the master at any point in time. The **TECH 1** controls all communications on the serial data link. A slave device (ECM) can transmit data only after it has been interrogated by the master device. A typical operating scenario is for the master device to periodically send a polling message to one or more of the slave devices. The slaves can then send a response message (containing, for example, the states of the slave's inputs or internal parameters) back to the master.

Once the **TECH 1** has gotten control of the serial data link, it can perform diagnostics on any of the devices connected to serial data link which support serial data diagnostics. It is important to note that the tester can only perform diagnostics which were provided for in the design of the various components. "Hooks" in the software of the on-board components must be provided in order to allow diagnostics to be performed. The more "hooks" that are provided, the more sophisticated the diagnostics which can be performed. Some components might implement minimum diagnostics such as trouble code and diagnostic parameter readout. Other components might implement high-end diagnostics including provision for extensive control over the operation of the component and override of internal parameters. This can be used to exercise specific circuits in order to assist in the isolation of faults.

B. IF YOU'RE HAVING A PROBLEM

Although the **TECH 1** was designed to give you years of trouble-free service, occasional problems may occur that require special attention. Some of these problems may be corrected with a few simple steps. Examples of most of the displays which you might see under abnormal conditions are shown. In addition, the most likely cause for the condition is given as well as other possible causes and recommendations on how to isolate or eliminate the problem. If the problem appears to be in the **TECH 1**, perform the Self-test (described in the **TECH 1** Operators Manual.)

1.

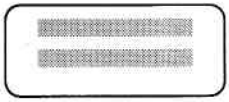
Blank Screen

MOST LIKELY CAUSE:
- **TECH 1** power supply is malfunctioning.

OTHER POSSIBLE CAUSES:
- Faulty cable.
- No power is applied to the **TECH 1**.

RECOMMENDATIONS:
- Plug the **TECH 1** into another vehicle to verify proper operation.

2.



MOST LIKELY CAUSE:
- Two master cartridges are installed.

OTHER POSSIBLE CAUSES:
- Master cartridge is malfunctioning.
- **TECH 1** is malfunctioning.

RECOMMENDATIONS:
- Make sure that only one master cartridge is installed in the **TECH 1**.
- Remove all cartridges and see if "MASTER CARTRIDGE MISSING OR MALFUNCTIONING" message is displayed. If it is, try installing another master cartridge.

3.

MOST LIKELY CAUSE:
- Master cartridge is not installed.

OTHER POSSIBLE CAUSES:
- Dirty contacts on the master cartridge connector.
- Two master cartridges installed.

RECOMMENDATIONS:
- Verify that a master cartridge is installed.
- Clean contacts on master cartridge connector with alcohol.
- Try a different master cartridge.

4.

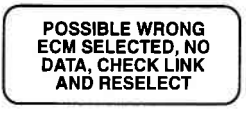
Keyboard or display locked up or program sporadically returns to first page

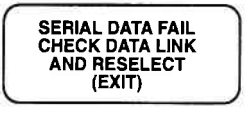
MOST LIKELY CAUSE:
- Serial data link cable loose or bad.

OTHER POSSIBLE CAUSES:
- Master Cartridge loose or dirty contacts.
- **TECH 1** malfunction.

RECOMMENDATIONS:
- Cycle power to the **TECH 1** (unplug & replug the serial data link connector).
- Check **TECH 1** cartridge socket and cartridge edge connector.
- Check serial data link cable & connector for wear for or corrosion.

5.





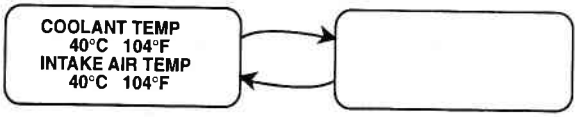
TECH 1 is not receiving data

MOST LIKELY CAUSE:
- ECM-serial data link connector cable problems.

OTHER POSSIBLE CAUSES:
- Serial data link cable loose or bad or connector pins loose or corroded.
- Bad ECM.

RECOMMENDATIONS:
- Verify a good serial data link cable connection.
- Cycle power to the **TECH 1**.
- Run the **TECH 1** Self-test.

6.



Data List parameters flash on and off.

MOST LIKELY CAUSE:

- Serial data link cable loose or bad.

OTHER POSSIBLE CAUSES:

- Serial data link cable connector pins loose or corroded.
- ECM-serial data link connector cable problems.
- Intermittent ECM problem.

RECOMMENDATIONS:

- Verify a good serial data link cable connection.
- Cycle power to the **TECH 1**.

C. GLOSSARY OF TERMS

ABS	Absolute
A/C	Air Conditioning
A/T	Automatic Transmission
B1	Bank 1 (LH Bank)
B2	Bank 2 (RH Bank)
BTDC	Before Top Dead Center
CAL	Calibration
CMP	Camshaft Position
CONTR	Control
DLC	Data Link Connector (SDL connector)
ECM	Engine Control Module
ECT	Engine Coolant Temperature
EFFI	Efficiency
EGR	Exhaust Gas Recirculation
EGRT	Exhaust Gas Recirculation Temperature
EVAP	Evaporative Emission
FCC	Federal Communications Commission
FXS	Fixed Spark Mode
IAC	Idle Air Control
IAT	Intake Air Temperature
INJ	Injector
ISC	Idle Speed Control
mmHg	millimeters of Mercury
MAF	Mass Air Flow
MANI	Manifold
MAP	Manifold Absolute Pressure
MFI	Multiport Fuel Injection (Multi Port Fuel Injection, MPI)
MONIT	Monitor
MPU	Micro Processing Unit
mV	Millivolt
O2S	Oxygen Sensor
POS	Position

PRESS	Pressure
PSP	Power Steering Pressure
PS SV Valve	Power Steering Solenoid Vacuum Valve (Power Steering Vacuum Switching Valve, PS VSV)
RS232C	Standard Serial Communication interface
SDL	Serial Data Link
SENS	Sensor
SOL	Solenoid
SP valve	Solenoid Purge Valve
SPD	Speed
TBI	Throttle Body Fuel Injection (Single Port Fuel Injection, SPI)
THROT	Throttle
TP	Throttle Position
UART	Universal Asynchronous Receiver Transmitter
VAF	Volume Air Flow
VIN	Vehicle Identification Number
VSS	Vehicle Speed Sensor