

# **SUZUKI ABS/AIRBAG 1.1 APPLICATION**

**Operator's Manual**

**tech 1<sup>®</sup>**

## 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 ABS/AIRBAG 1.1 APPLICATION DESCRIPTION

The Suzuki ABS/Airbag 1.1 Application is included in the Suzuki Mass Storage Cartridge and is used with the TECH 1 to diagnose and troubleshoot the Antilock Brake System (ABS) and Airbag system used on the following models.

### NORTH AMERICAN MARKET

YEAR	MODEL	SYSTEM	MFG.
95	SWIFT 1000/1300 (SW310/413)	ABS (ABS-VI) : 2WD. 4WSS AIRBAG (SDM-AI)	DELCO DELCO
96-98	SWIFT 1000/1300 (SW310/413)	ABS (ABS-VI) : 2WD. 4WSS AIRBAG (SDM-I)	DELCO DELCO
96-98	SIDEKICK/X90 (SE416/SZ416)	ABS (ABS-VI) : 2WD. 3WSS ABS (ABS-VI) : 4WD. 3WSS AIRBAG (SDM-I)	DELCO DELCO DELCO

### OTHER THAN NORTH AMERICAN MARKET

MODEL	SYSTEM	MANUFACTURER
SE416	ABS (ABS-VI) : 2WD . 3WSS ABS (ABS-VI) : 4WD . 3WSS	DELCO DELCO
SZ416	ABS (ABS-VI) : 2WD . 3WSS ABS (ABS-VI) : 4WD . 3WSS AIRBAG (SDM -I)	DELCO DELCO DELCO

The Suzuki ABS/Airbag 1.1 Application 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:

- Display diagnostic data parameters.
- Display and clear Diagnostic Trouble Codes (DTCs).
- 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.
- Display information about the state of the vehicle at the time the DTC occurred.
- Control various components (solenoids, relays, pump motors).
- Perform special diagnostic procedures on the ABS.
- Print data if the tester is connected to a serial printer.

This information can be analyzed and displayed to assist you in diagnosing ABS and Airbag problems.

## **HOW THE SUZUKI ABS/AIRBAG 1.1 APPLICATION WORKS WITH THE TECH 1**

The TECH 1 lets you monitor data and control Electronic Control Unit (ECU) operation by communicating with the ECU via the serial Data Link Connector (DLC) present in the vehicle. The TECH 1 consists of a microcomputer, which communicates with the ECU 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 ECU by applying an electrical signal to the serial DLC pin, then reads the ECU data signal from one of the DLC pins, and translates it into an intelligible data display. The SUZUKI ABS/AIRBAG 1.1 Application in the Suzuki Mass Storage Cartridge is the software program which performs all of the functions described in 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.
- 1 - 9** Designate trouble codes.
- F0 - F9** Select and control test mode.
- F8** Print Data List parameters.
- ENTER** Enter designated trouble code.

## 2.0 GETTING STARTED

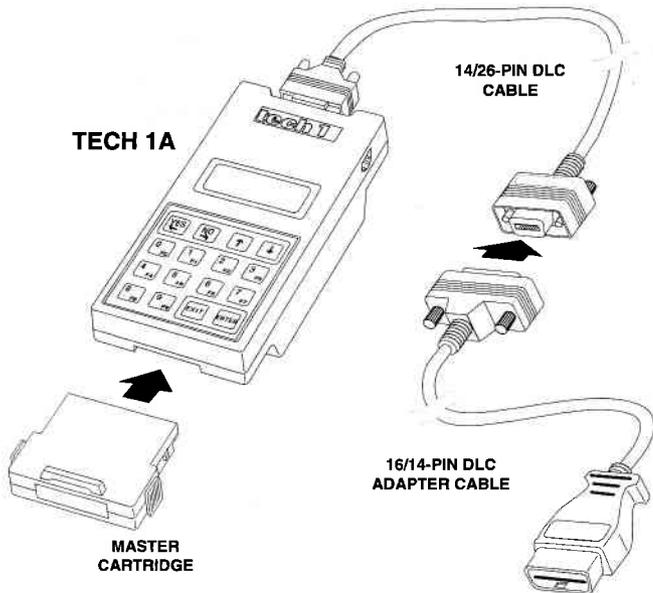
Before operating the Suzuki ABS/AIRBAG 1.1 Application with the TECH 1 the following steps must be performed:

1. Insert the Suzuki ABS/AIRBAG 1.1 Application cartridge into the bottom slot of the TECH 1. Verify that no other master cartridge (e.g. SUZUKI 1995 ECM Cartridge) is installed in the top slot.

2. Make sure the vehicle ignition is OFF.

### 3A. WHEN USING THE 16/14 PIN ADAPTER CABLE:

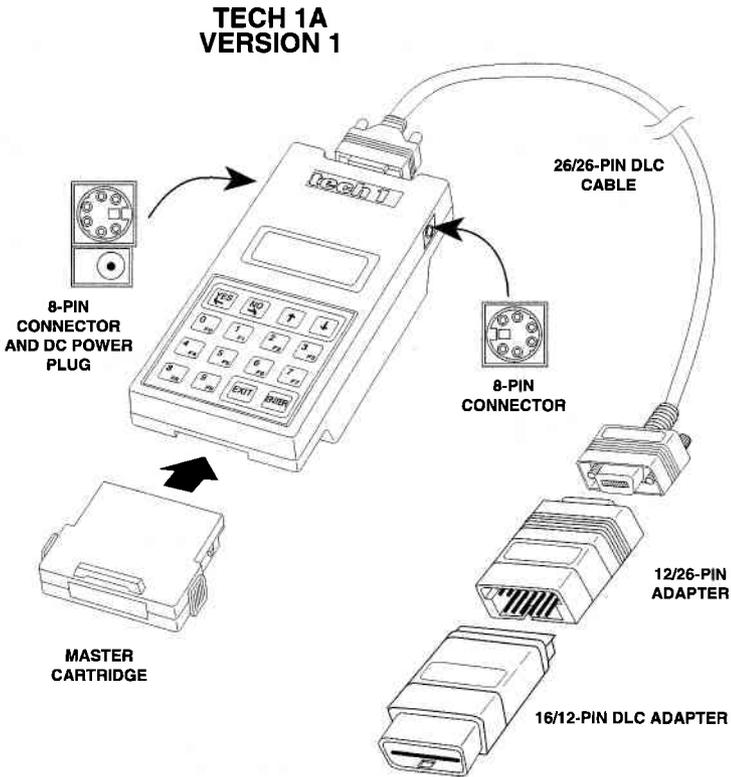
1. Connect the 14/26-pin Data Link Connector (DLC) cable to the tester and tighten the screws.
2. Connect the 16/14-pin adapter cable to the 14/26-pin DLC cable.



### 3B. WHEN USING THE 16/12 PIN ADAPTER:

#### WITH A TECH 1A VERSION 1:

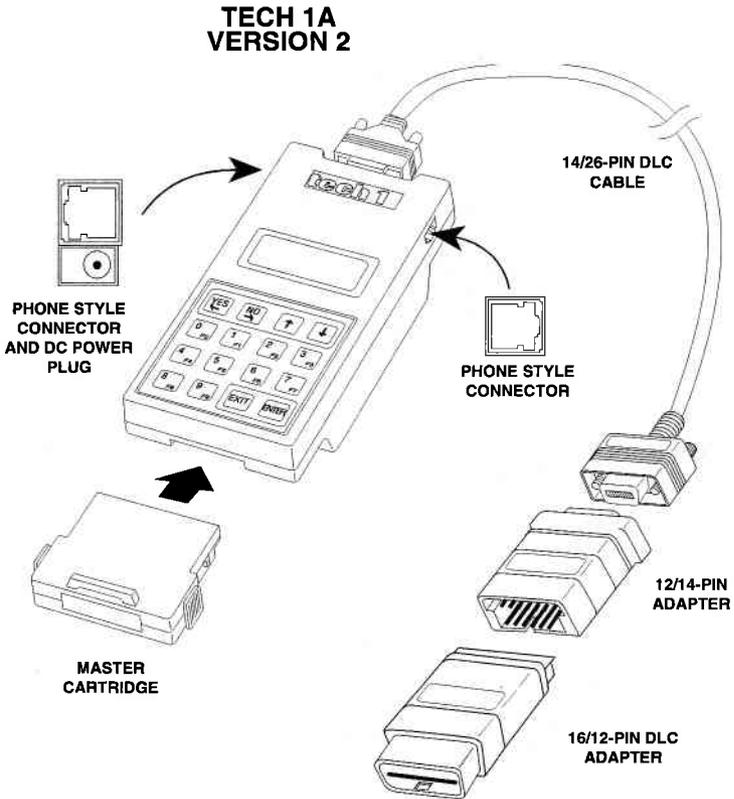
1. Connect the 26/26-pin DLC cable to the tester and tighten the screws.
2. Connect the 12/26-pin adapter to the 26/26-pin DLC cable and tighten the screws.
3. Connect the 16/12-pin DLC adapter to the 12/26-pin adapter.



### 3C. WHEN USING THE 16/12 PIN ADAPTER:

#### WITH A TECH 1A VERSION 2:

1. Connect the 14/26-pin DLC cable to the tester and tighten the screws.
2. Connect the 12/14-pin adapter to the 14/26-pin DLC cable and tighten the screws.
3. Connect the 16/12-pin DLC adapter to the 12/14-pin adapter.



4. 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.

Plug the TECH 1 Cable into the vehicle's DLC.

5. Turn the ignition switch on.

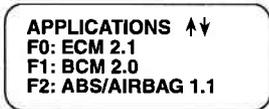
**NOTE:**

For vehicles equipped with an Immobilizer control system, power is supplied to the TECH 1 when the ignition switch is ON.

6. Verify that the tester displays the screen below.



7. Press **ENTER** to display the APPLICATIONS menu.



Press the key to the left of ABS/AIRBAG from the APPLICATIONS menu. If more than three applications are available, use **↑** or **↓** to scroll the display.

8. Verify that the tester displays the screen below, and then press **ENTER**.



If the TECH 1 display informs you that the companion application is missing, contact your TECH 1 distributor.

9. After **ENTER** is pressed, proceed to Section 4.0.

## **3.0 OPERATING PRECAUTIONS**

### **CONNECTING AND DISCONNECTING THE TECH 1 WHILE THE IGNITION KEY IS ON**

Due to the possibility of voltage spikes that could damage the ECU or TECH 1, you should not connect or disconnect the TECH 1 while the ignition key is ON or while the engine is running.

### **REMOVING THE CARTRIDGE WHILE POWER IS APPLIED**

You should not remove or install master or auxiliary cartridges while the ignition key is ON, or while the engine is running. If you wish to change or add a cartridge:

1. Turn the ignition off.
2. Disconnect the Data Link Connector (DLC) from the vehicle.
3. Install the cartridge in the bottom of the TECH 1.
4. Reconnect the DLC.
5. Turn the ignition ON.

If the TECH 1 does not appear to be functioning properly, perform the following steps to reset the TECH 1:

1. Turn the ignition off.
2. Disconnect the DLC from the vehicle.
3. Remove all cartridges from the TECH 1.
4. Connect the DLC to the vehicle.
5. When "MASTER CARTRIDGE IS MISSING OR MALFUNCTIONING" is displayed, disconnect the DLC from the vehicle.
6. Install the cartridge in the bottom of the TECH 1.
7. Reconnect the DLC to the vehicle.
8. Turn the ignition ON.

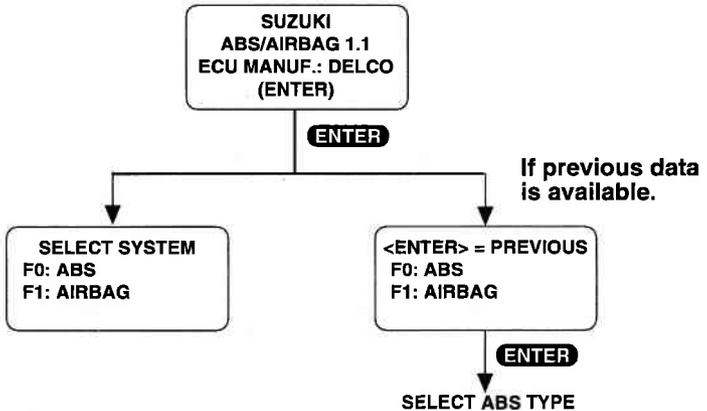
### **REMOVING OR CHANGING MASTER CARTRIDGES CONTAINING SNAPSHOT DATA**

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 SYSTEM

Press **ENTER** from the ABS/AIRBAG identification screen to continue to the Select System displays.

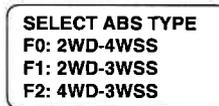
If stored data is available when the TECH 1 is powered up, **<ENTER> = PREVIOUS** is displayed at the top of the screen. Pressing **ENTER** automatically selects the last system that was selected. Since only the ABS system has Snapshot capabilities, only ABS data will be available for review.



Press **F0** to test the ABS, or press **F1** to test the Airbag system.

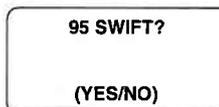
### SELECTING THE ABS TYPE

If you are testing the ABS system, the tester asks which type of ABS system is installed on the vehicle. Press the key to the left of the ABS type you are testing.



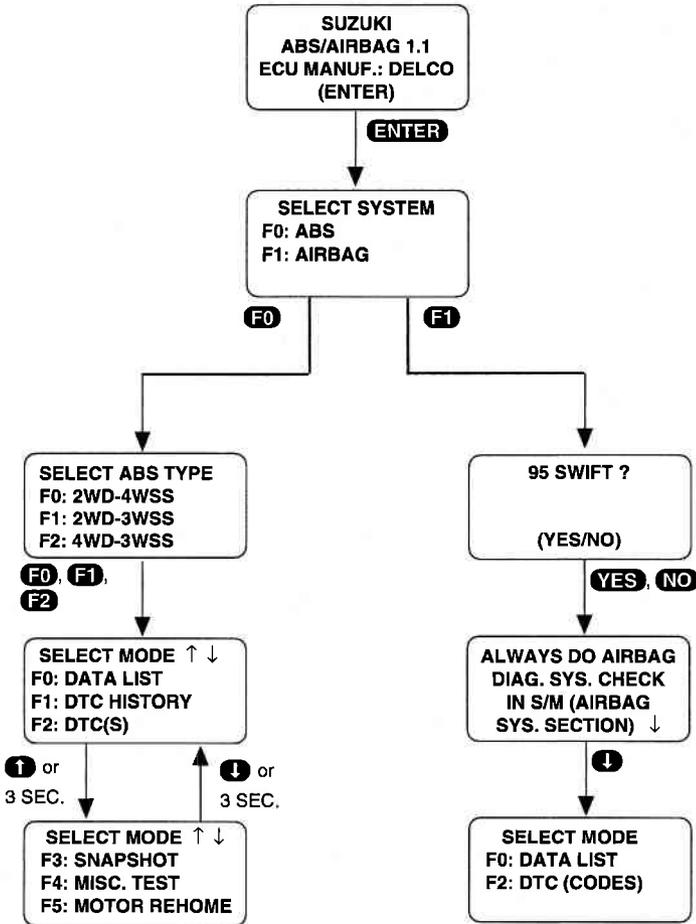
### SELECTING THE AIRBAG TYPE

If you are testing the AIRBAG system, the tester asks if the vehicle is a 95 SWIFT. Press **YES** if the vehicle you are testing is a 95 SWIFT, or press **NO** if the vehicle is not a 95 SWIFT.



## SELECT MODE MENU

Once a system is selected, the TECH 1 displays the Select Mode menu. Detailed instructions for selecting and operating the various test modes are provided in Section 5.0 of this manual.



### ACTIVE TECH 1 KEYS

- F0 - F1** Select System to Test.
- YES - NO** Select vehicle.
- EXIT** Return to previous step.

## 5.0 SELECTING AND OPERATING THE TEST MODES

### SELECTING THE TEST MODES

After selecting the system to test, the TECH 1 displays a Select Mode "menu."

Since all of the test modes cannot be displayed on the TECH 1 at the same time, the TECH 1 automatically sequences between all pages of the menu. To stop the automatic scrolling, press the **↑** or **↓** key. The menu may then be scrolled manually with the **↑** and **↓** keys.

To select a test mode, press the TECH 1 key listed to the left of the test mode on the menu. Regardless of which test modes are displayed, any test mode can be selected from the menu.

### TEST MODES AVAILABLE

Once a test mode is selected, operation begins. The following test modes are available for ABS and Airbag systems. Each test mode is described on the following pages.

ABS	AIRBAG
F0: DATA LIST F1: DTC HISTORY F2: DTC(s) F3: SNAPSHOT F4: MISC. TESTS F5: MOTOR REHOME	F0: DATA LIST F2: DTC (CODES)

### IMPORTANT NOTE

For SW series vehicles or SE and SZ series vehicles not equipped with an immobilizer system:

When F4: Misc. Tests is selected from the Select Mode menu, the following message is displayed and should be ignored, **FOR ALL ABS TESTS THE TECH 1 MUST BE POWERED DIRECTLY FROM THE BATTERY USING A BATTERY ADAPTER CABLE.** Power is provided to the tester through the DLC even when the ignition switch is off, therefore the battery adapter cable is not required.

## TEST MODES DESCRIPTIONS

- MODE F0:** DATA LIST - Displays diagnostic data parameters.
- MODE F1:** DTC HISTORY - Displays additional information about the state of the vehicle at the time of the occurrence of the trouble code(s).
- MODE F2:** DTC(s), DTC (CODES) - Displays Diagnostic Trouble Codes which have been stored. Trouble codes can also be cleared in Mode F2.
- MODE F3:** SNAPSHOT - Records data before and after the occurrence of an intermittent fault condition.
- MODE F4:** MISC. TESTS - The Miscellaneous Tests mode allows you to perform specialized tests on the ABS system.
- MODE F5:** MOTOR REHOME - Allows all three motors and pistons to be returned to the "home" position for brake system bleeding.

A list of the Miscellaneous Tests available is provided on the following page.

## MISCELLANEOUS TESTS AVAILABLE

### IMPORTANT NOTE

For SW series vehicles or SE and SZ series vehicles not equipped with an immobilizer system:

When F4: Misc. Tests is selected from the Select Mode menu, the following message is displayed and should be ignored, **FOR ALL ABS TESTS THE TECH 1 MUST BE POWERED DIRECTLY FROM THE BATTERY USING A BATTERY ADAPTER CABLE.** Power is provided to the tester through the DLC even when the ignition switch is off, therefore the battery adapter cable is not required.

The following Miscellaneous Test modes are available for testing the ABS. Press **F4** from the Select Mode menu to display the Misc. Tests menu.

F0: MANUAL CONTROL  
F2: HYDRAULIC CONTROL  
F4: MOTOR TEST  
F5: GEAR TENSION RELIEF  
F6: RELAY TEST  
F7: VOLTAGE LOAD  
F8: LAMP TEST  
F9: SYSTEM ID

**NOTE:** When **F4: MISC. TESTS** is selected for **SE** and **SZ** series vehicles with **4WD-3WSS**, the **TECH 1** displays the following menu.

SELECT SYSTEM  
F0: ABS  
F3: IDLE UP

Press **F0** to perform the Miscellaneous Tests listed above.

If **F3** is pressed, the **TECH 1** displays a menu with one option: "F0: MANUAL CNTRL." Press **F0** to perform the Manual Control Test on the Idle Up circuit.

Following is a description of each Miscellaneous Test.

## MISCELLANEOUS TESTS DESCRIPTIONS

- F0: MANUAL CONTROL** Allows you to manually control ABS actuators including the Solenoids and Motors.
- F2: HYDRAULIC CONTROL** Allows testing of the ABS brake hydraulic channels by automatically sequencing through RELEASE, HOLD, and APPLY functions on the channel you select.
- F4: MOTOR TEST** Once the motor pack has been separated from the ABS hydraulic modulator, the Motor test guides you through an automated ABS Motor Pack test.
- F5: GEAR TENSION RELIEF** Allows you to relieve tension from the motor gears in order to allow the motor pack to be separated from the modulator assembly.
- F6: RELAY TEST** Allows you to test the Enable Relay while displaying the ABS relay battery voltage. This allows verification of relay operation.
- F7: VOLTAGE LOAD TEST** Allows you to check the battery for adequate capacity for ABS operation. Appropriate messages are displayed that indicate any required area of service.
- F8: LAMP TEST** Allows manual control of ABS amber warning lamp circuit, red brake telltale circuit and light blue ABS active lamp if equipped.
- F9: SYSTEM ID** The System ID function displays data about the vehicle's ABS Controller.

## **IDLE UP CIRCUIT TEST (4WD-3WSS TYPE ONLY)**

### **F3: IDLE UP TEST**

Allows you to perform the Manual Control test on the Idle Up Circuit while displaying the circuit's feedback.

### **ACTIVE TECH 1 KEYS**



Stop the automatic scrolling, then manually scroll the menu up or down.



Select Test Mode or Miscellaneous Test.



Return to vehicle selection.

The purpose of the DATA LIST mode is to continuously monitor vehicle parameters. The TECH 1 allows you to display diagnostic parameters for the ABS and Airbag systems.

The TECH 1 displays data parameters in pairs. You can use preprogrammed pairs, or you can create your own pairs through the process explained on the following pages.

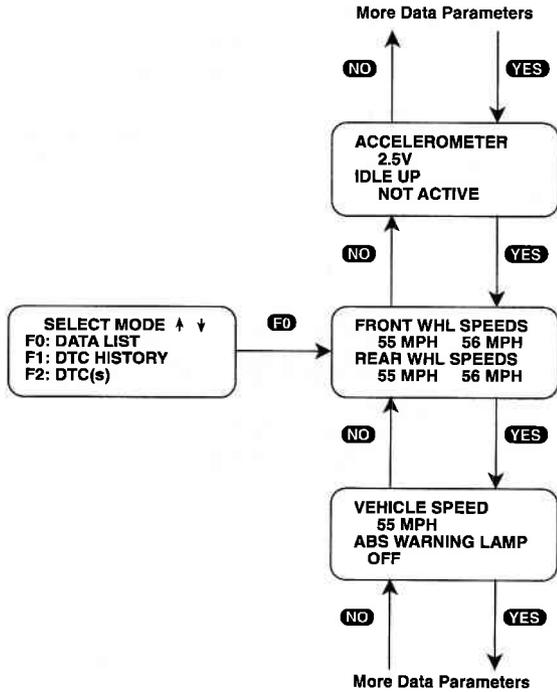
The TECH 1 display tells you which parameters are being monitored. The current value of the parameter is displayed with the parameter units. This means you don't have to hunt through manuals to determine what is being displayed.

#### **OPERATING PROCEDURE:**

1. Press **F0** to select DATA LIST from the Select Mode menu.
2. Select the data parameters to be displayed by scrolling through the parameters with the **YES** and **NO** keys. If you hold either key down, the TECH 1 sequences through all parameter pairs.
3. Pressing the **F8** key while in the Data List mode allows one sample of all data parameters to be printed, if the TECH 1 is connected to a serial printer.
4. If communication with the component being tested is lost, the TECH 1 will inform you. The TECH 1 will attempt to reestablish communications. If the attempt is successful the TECH 1 returns to the Data List display. If after five seconds there is still no communication, the TECH 1 displays messages indicating the cause of the fault.
5. Press **EXIT** to return to the Select Mode menu.

<b>DATA LIST</b>	<b>MODE F0</b>
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**EXAMPLE OF DATA LIST MODE OPERATION FOR ABS  
(FOR 4WD-3WSS TYPE)**



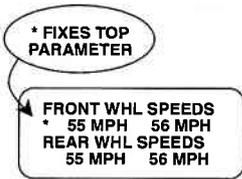
MODE F0	DATA LIST
---------	-----------

**CREATE YOUR OWN DATA PAIRS**

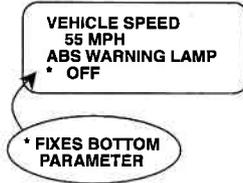
You can create data parameter pairs different from the preprogrammed pairs. Any two parameters can be made into a pair.

New data pairs are created by simply scrolling either the top or bottom display parameter, while the other display parameter is fixed. Pressing **F0** causes the top display parameter to be fixed, which is indicated with an "\*" in the left column of the second line of the display, as shown in Figure A. Pressing **F1** causes the bottom display parameter to be fixed, as shown in Figure B. To "unfix" the top parameter, press **F1**. Press **F0** to "unfix" the bottom parameter. The TECH 1 won't 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 FRONT WHEEL SPEED and VEHICLE SPEED. To do so, scroll through the preprogrammed pairs with the **YES** or **NO** key until you find a pair with FRONT WHEEL SPEED. Fix FRONT WHEEL SPEED by pressing **F0** since it is the top parameter. Then scroll the other half of the display with the **YES** or **NO** key until VEHICLE SPEED is displayed.



**FIGURE A**



**FIGURE B**

## DATA LIST PARAMETERS

Some Data List parameters are discrete parameters (they can only have two or three values), and their units are the descriptors for the states they can have. For example, the ABS RELAY CMD is either ON or OFF.

### ACTIVE TECH 1 KEYS

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

**F0** Mark the top display parameters as "fixed" or cancel the bottom display parameters as "fixed" for creating your own pairs.

**F1** Mark the bottom display parameter as "fixed" or cancel the top display parameters as "fixed" for creating your own pairs.

**F7** Toggle between English and Metric units (MPH vs km/h).

**F8** Output DATA LIST parameters to a printer.

**EXIT** Return to the Select Mode menu.

**MODE F1****DTC HISTORY**

The DTC History mode is only available when testing the ABS system.

DTC History is a feature that provides you with additional fault information for the purpose of increasing serviceability. This information, when used in conjunction with standard diagnostic procedures, can reduce the time you spend trying to locate the cause of intermittent faults, by identifying the degree of intermittence. Highly intermittent (rarely occurring) faults are difficult to recreate and therefore are usually diagnosed differently from frequent or current faults. DTC History identifies the following information:

Two “pages” of information are displayed for each of the first five failures and five pages of information are displayed for the last failure.

**FIRST FIVE (OR FEWER) FAILURES**

The first five faults are displayed in the order in which they occurred. This information can be used to identify situations where an initial fault that was detected no longer remains, but the fault conditions explain the occurrence of a later fault.

The first page of information displays how often each of the first five faults have occurred. The second page informs you how many drive cycles have occurred since the code was last set.

This information identifies intermittent fault conditions and the degree of intermittence. If a fault occurred 1 out of 35 drive cycles, an unusual condition may have occurred, such as a severe pot hole, that caused the fault. In any case, a fault this intermittent is going to be difficult to locate. Up front, you know special diagnosis techniques are needed to identify the cause. If the fault occurred 10 out of 15 drive cycles, your chances of identifying the fault are much greater and recreation is probably much easier. Again, you know this before an attempt is made to identify the cause. If the fault occurs every drive cycle, the fault is easy to duplicate and diagnosis should be easier.

**LAST FAILURE**

The last failure that occurred is identified specifically. This fault is what brought the customer in for repair. Additionally, the following information identifies what was happening when the last fault occurred:

1. The first page of information about the last failure indicates the speed the ABS controller believes the vehicle was going at the time the fault occurred. An unreasonable number here may lead you to suspect wheel speed sensor problems.

The status of the brake switch at the time of the fault (Off or On). This tells you if there was any brake application when the fault occurred. Only the state of the brake switch is known, the brake pedal may have simply been depressed or shorted without any vehicle deceleration.

2. The second, third and fourth pages of information about the last failure display the status of the brake telltale at the time of the fault (ON or OFF), and whether or not the brake had been depressed during this ignition cycle. If the brake switch circuit was OPEN, no brake input is seen. Also, many drivers do not depress the brake when starting the car but do prior to putting the car in gear. If no brake input was seen prior to the fault and the brake switch circuit is OK, this information tells you the fault was probably detected shortly after the ignition switch was turned on.

Also on the second, third and fourth pages is whether or not the vehicle has been driven at a speed greater than 25 MPH during this ignition cycle and whether or not an ABS stop was in progress when the fault occurred. This may point to a fault caused by additional stresses or vibration the vehicle encountered when in an ABS stop.

3. The fourth and fifth pages of information about the last failure display the code set and how many drive cycles since this code set.

### **DRIVE CYCLES**

A drive cycle occurs when the ignition is turned "ON" and the vehicle is driven faster than 10 MPH. However, if a current code is set, a drive cycle occurs (counter increment) for that code even if 10 MPH is not reached prior to turning off the ignition.

***If no ABS faults have occurred for 100 drive cycles, the ABS controller will clear itself of all fault information.***

**OPERATING PROCEDURE**

1. Press **F1** to select DTC History from the Select Mode menu.
2. The TECH 1 displays two "pages" of information about the first failure which occurred. The first page indicates how many times the failure has occurred over how many drive cycles. The second page tells how many drive cycles have occurred since the code was last set.

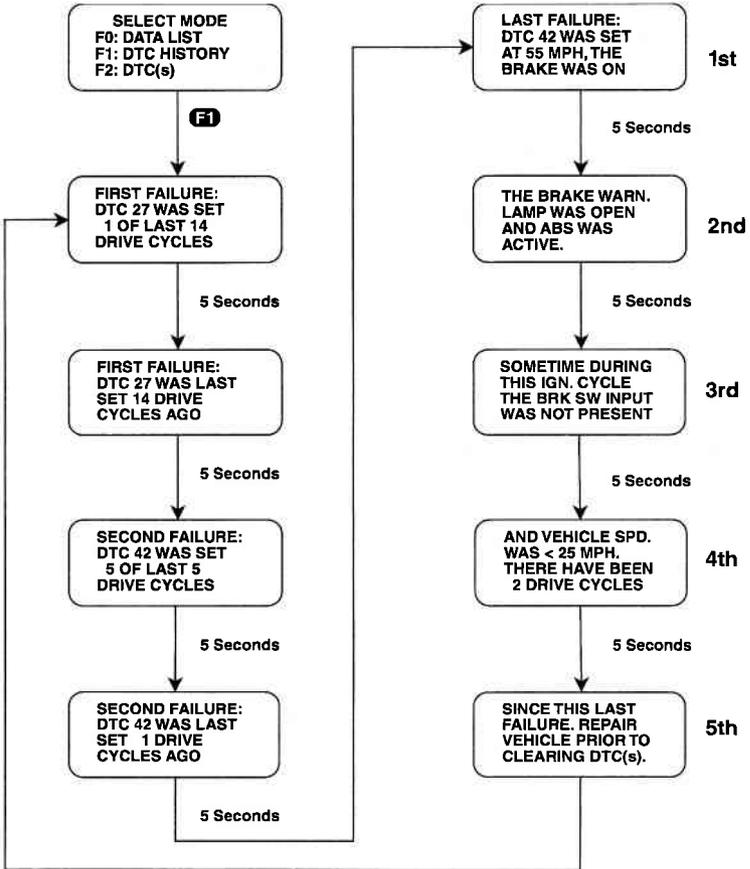
The pages automatically sequence at 5-second intervals. Press **↑** to manually sequence through the pages or **↓** to stop the sequencing.

3. Step 2 is repeated to display information from the first five failures. If fewer failures have occurred, only information from failures that have occurred is displayed.
4. After the first five (or fewer) trouble codes have been viewed, the TECH 1 displays additional information from the most recent failure. Five "pages" are needed to display all of the information about the last failure as shown in the flow chart on the following page. These pages automatically sequence at 5-second intervals, or you can press **↑** to manually sequence through them, or **↓** to freeze the display.

In the sample flow chart on the following page, the first failure (code 27) demonstrates an intermittent fault that was the first code set, but it hasn't occurred for the past 13 drive cycles. The second failure of the flow chart demonstrates an intermittent fault that was the second code set, but it hasn't occurred in the present drive cycle. In the example, the last failure is the same as the second failure, since only two failures had occurred. It is also possible for the last failure to be the same as the first because the first is an intermittent problem and could possibly cause another trouble code to be set after the second failure has been set.

5. Press **EXIT** to return to the Select Mode menu.

<b>DTC HISTORY</b>	<b>MODE F1</b>
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<b>ACTIVE TECH 1 KEYS</b>	
<b>F1</b>	Select DTC History from the Select Mode menu.
<b>F7</b>	Toggle between MPH and km/h display.
<b>↑</b>	Manually scroll the display.
<b>↓</b>	Stop the display from sequencing.
<b>EXIT</b>	Return to the Select Mode menu.

<b>MODE F2</b>	<b>DTC(s)</b>
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The DTC(s) or DTC (CODES) mode displays Diagnostic Trouble Codes which have been set by the vehicle. You can also use the DTC mode to clear the codes after the codes have been displayed.

DTC(s) or DTC (CODES) are set when an abnormal condition is detected. They are a key to diagnosing many of the problems which can occur in the vehicle. Therefore, you should look to see if any trouble codes are set at the beginning of every diagnostic session.

### OPERATING PROCEDURES:

1. Verify that the ignition is in the "ON" position.
2. Press **F2** to select the DTC(s) (For ABS) or DTC (CODES) (For AIRBAG) mode from the Select Mode menu.
3. If the ABS or AIRBAG is being tested and the vehicle's ABS or AIRBAG fails to respond to the TECH 1 within 6 seconds, the TECH 1 will display:

NO COMMUNICATION  
WITH VEHICLE.  
CHECK DLC.

(ABS)

NO DATA RECEIVED  
FROM SIR

(AIRBAG)

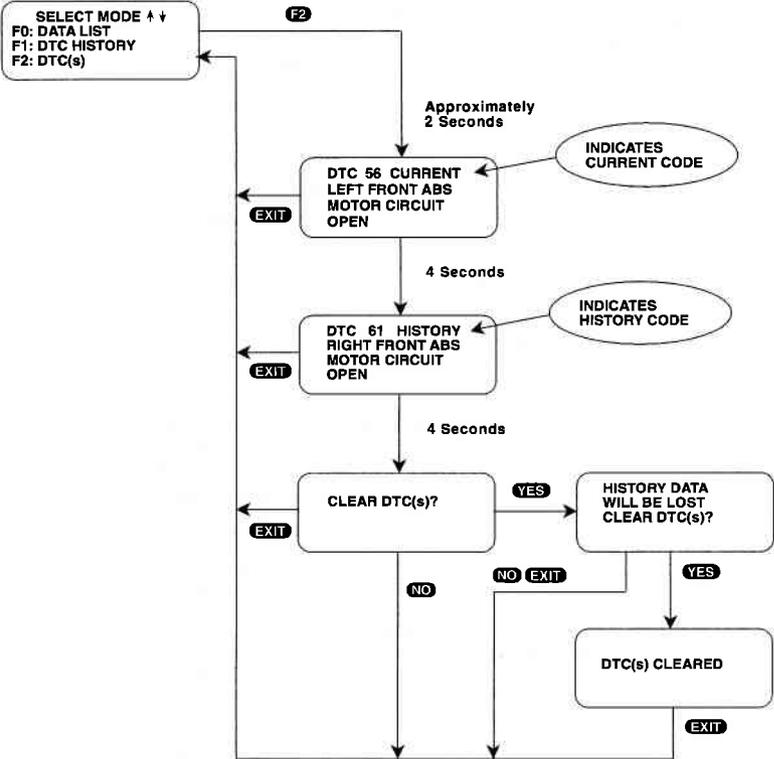
Under these conditions you should:

- Cycle power on the TECH 1.
- Cycle the vehicle's ignition and leave it in the ON position.
- Verify that the vehicle contains an ABS or AIRBAG system.
- Check the connection to the DLC.

If this message persists, you should check for a shorted serial data link or a faulty ABS or AIRBAG controller. This can happen if power or ground is not available to the ABS or AIRBAG controller. Refer to the ABS Diagnostic Circuit Check or AIRBAG Diagnostic System Check in the service manual.

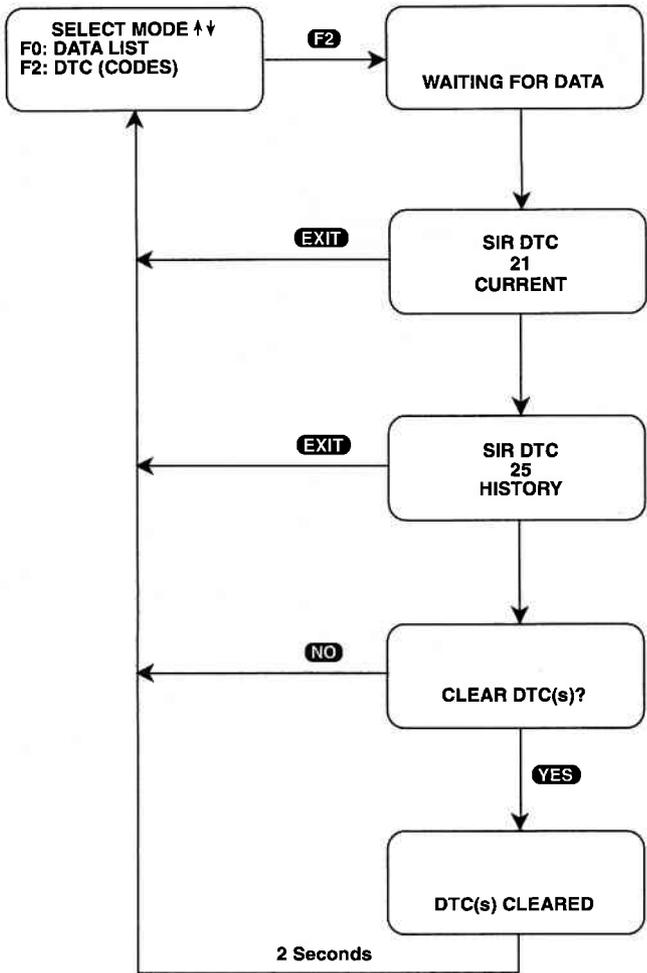
<b>DTC(s)</b>	<b>MODE F2</b>
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**EXAMPLE OF MODE F2: DTC DISPLAY & CLEARING FOR ABS**



<b>MODE F2</b>	<b>DTC(s)</b>
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**EXAMPLE OF MODE F2: DTC DISPLAY & CLEARING FOR AIRBAG**



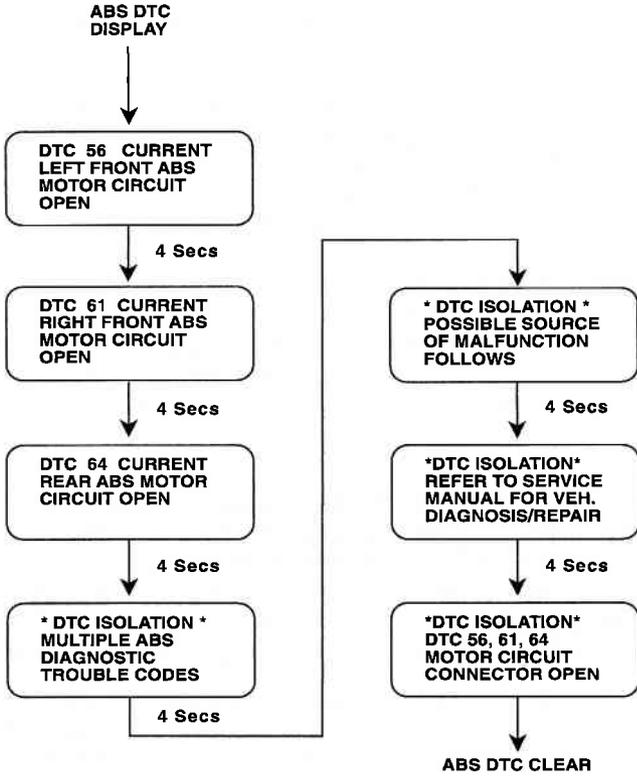
4. Once data has been received, the TECH 1 displays each code for 4 seconds. You can freeze the display by pressing the **⏏** key. Pressing **⏏** causes the TECH 1 to sequence to the next code. Refer to the Service Manual for a description of the trouble codes.
5. The DTCs are identified as either current or history codes. A current code is a fault which is currently present in the vehicle during this ignition cycle while a history code refers to a fault which occurred during a previous cycle. The TECH 1 distinguishes between current and history codes by displaying "CURRENT" for Current codes, and "HISTORY" for History codes.
6. For the ABS system, the TECH 1 performs analysis on the codes which are present and displays information on the most likely cause of the codes. This information is displayed immediately after the ABS DTC display has been completed. An example of ABS Fault Isolation is illustrated on the following page.

***The Antilock Brake System features a sophisticated on-board diagnostic system that, under most fault conditions, will specifically identify the cause of the fault detected. Because of this "pinpointing" ability, there are some conditions where more than one trouble code will be stored when certain faults occur.***

***The "ABS FAULT ISOLATION" feature identifies multiple trouble codes that can be caused by common area faults, and will display the probable source of the fault. Consult the service manual to verify the isolation has not been caused by a catastrophic failure or a series of faults that occurred over a period of time. Under these conditions, the "FAULT ISOLATION" information may not identify the actual source of the fault.***

<b>MODE F2</b>	<b>DTC(s)</b>
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**EXAMPLE OF ABS FAULT ISOLATION**



**CODE CLEARING:**

7. a) ABS: After all DTCs and ABS fault isolation messages have been displayed, the TECH 1 prompts you to "CLEAR DTC(s)". If you press **NO**, you leave the TROUBLE CODE mode without clearing the codes.
- b) AIRBAG: To clear all stored DTCs on the vehicle, press **EXIT** to go to the Clear DTC(s) Phase. When "CLEAR DTC(s)?" is displayed, press **YES** to clear the DTCs, or press **NO** for not clearing them.
8. a) ABS: If you press **YES**, the following message is displayed on the TECH 1:

HISTORY DATA  
WILL BE LOST.  
CLEAR DTC(s)?

If you are testing the ABS, this gives you the opportunity to examine more information which the ABS controller has saved about the ABS trouble codes. Press **NO** if you do not want to clear the codes. Pressing **YES** will cause ABS codes to be cleared. Press **EXIT** to return to the Select Mode menu.

- b) AIRBAG: When the **YES** key is pressed, the TECH 1 will display either "DTC(s) CLEARED" or a "DTC(s) NOT CLEARED." After a few seconds the TECH 1 will automatically display the Select Mode menu. When the **NO** key is pressed, the DTCs are retained in the AIRBAG controller and the **TECH 1** will display the Select Mode menu.
9. If the "CODE CLEAR FAIL" message is displayed, reenter the DTC mode and try to clear codes again. If it fails again, then you probably have an intermittent connection to the DLC. It is also possible that the controller is malfunctioning.

**ACTIVE TECH 1 KEYS****YES** & **NO**

Used to determine whether DTCs should be cleared or not.

↓

Freeze the display of the latest DTC.

↑

Display the next DTC.

**EXIT**Terminate DTC display.  
Display "CLEAR DTC(s)?" (AIRBAG only).

The SNAPSHOT mode is only available when ABS is selected from the System Select menu.

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

SNAPSHOT mode is a very powerful tool for quickly and easily diagnosing otherwise time consuming intermittent problems. And it isn't nearly as complicated or difficult to master as it first appears. A few minutes of experimenting with the TECH 1 in the SNAPSHOT mode will quickly familiarize you with its practical versatility and extraordinary diagnostic capabilities.

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. When the memory is full, the oldest (earliest) data collected is erased to make room for new information.

A "TRIGGER" tells the TECH 1 the start, center and end points of data collection. You can specify a "TRIGGER CONDITION" so the TECH 1 collects data that will be most useful in diagnosing the current problem. You can also select the location of the "TRIGGER POINT."

### **TRIGGER POINT**

If F9: TRIG. POINT is selected from the SNAPSHOT OPTIONS menu, a trigger point selection menu is displayed. The Trigger Point menu allows you to specify which data to capture — data that occurs before, after, or both before and after the point at which the trigger occurs. If no trigger point is selected, the center trigger point will be used and a similar number of data samples before and after the trigger will be saved. Trigger point is fully explained in Step 4 of the Operating Procedure.

## TRIGGER CONDITION

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

- 1) **MANUAL TRIGGER (F1)**: While operating the SNAPSHOT mode, you can always cause the trigger to occur by pressing the **F9**, **ENTER** or **EXIT** keys.
- 2) **AUTOMATIC TRIGGER (F2)**: The TECH 1 examines the ABS data and triggers the SNAPSHOT if an abnormal condition occurs. The ABS automatic trigger feature is intended to identify deviations in data or input signals that may not set an ABS trouble code. If an automatic trigger condition is encountered, it may provide information to support customer complaints of irregular ABS performance or intermittent ABS warning lights. The automatic trigger will occur if one of the following conditions exists:
  - A sudden change in speed of one wheel. Be sure you are driving at a constant speed on a clean, dry, smooth surface when a trigger occurs. Spinning the tires, locking the wheels while braking, driving through pot holes, or performing ABS stops will cause a trigger that is NOT identifying a system problem.
  - Very short loss of brake switch input, that may not set a code, but will cause a momentary loss of ABS.
  - A very short loss of brake switch circuit input that may not set a code, but will cause a momentary loss of ABS.
  - If the red brake telltale turns on.
  - If the battery voltage falls below 11.0 volts or goes above 16 volts.
  - Loss of data.

The intent of the ABS automatic trigger feature is to identify short duration intermittent problems. For this reason, the data is taken at a high rate of speed: approximately every 1/20th of a second.

**MODE F3****ABS SNAPSHOT**

- 3) ANY CODE **F3**: Any trouble code detected will cause the trigger.
- 4) SINGLE CODE **F4**: 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.

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

**VIEWING CAPTURED DATA**

You have the option of bypassing the Data Capture phase and displaying previously captured data by selecting F0: REPLAY DATA from the SNAPSHOT menu. 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 unplugged from the DLC for at least one-half hour.

If no data has been captured, or if data stored in the TECH 1 memory is not data from the vehicle currently being tested (i.e. it's from a previously tested vehicle), the TECH 1 will display the following message for 4 seconds (or until the **1** or **EXIT** key is pressed):

CAPTURED DATA  
NOT FROM  
SELECTED  
VEHICLE

CAPTURED DATA  
NOT FROM  
SELECTED  
SYSTEM

**PRINTING CAPTURED DATA**

In addition, the cartridge has the capability to print the captured data, providing a hard copy of any selected data sample. The TECH 1 printer is required to support this print function. See Step 14 of the Operating Procedure.

**OPERATING PROCEDURE:**

The operation of SNAPSHOT mode is divided into three phases: Set-Up (Steps 1-4), Data Capture (Steps 5-8), and Data Display (Steps 9-15).

**SETUP PHASE**

1. Press **F3** to select SNAPSHOT mode from the Select Mode menu.
2. The trigger condition and review data options are displayed in a self-scrolling SNAPSHOT MODE 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 **F0**.
3. You can choose a specific ABS trouble code for the trigger condition by pressing **F4**. How to enter the code number is explained below.

When the TECH 1 screen displays "ENTER DTC XXX," 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 **F9**, **ENTER** or **EXIT** key. If the code you enter does not exist for the vehicle being tested, an "INVALID DTC" message will be displayed and the code will have to be reentered.

4. In addition to offering a trigger condition selection, this cartridge offers the option of selecting a trigger point. If you select **F9: TRIG. POINT** from the SNAPSHOT OPTION menu, the following options are displayed: **F0: BEGINNING**, **F1: CENTER**, and **F2: END OF DATA**. How Trigger Point works is explained on the following page.

**MODE F3****ABS SNAPSHOT****F0: BEGINNING**

The trigger will be at the beginning of the captured data. After the trigger occurs, the TECH 1 will continue to capture data until the memory is full, then the data will be displayed. If not enough data samples have been collected to fill the TECH 1 memory (because the **EXIT** key was pressed before the TECH 1 memory was full), fewer than the maximum number of samples will be saved.

**F1: CENTER**

A similar number of data samples that occurred before and after the trigger point are captured. However, if the trigger occurs at or near the start of the Data Capture phase, there will be fewer samples before the trigger point available for display. Also, if the **EXIT** key is pressed after the trigger occurs, but before the TECH 1 memory is full, fewer data samples captured after the trigger point will be available for display.

**F2: END OF DATA**

Data that occurred before the trigger is captured.

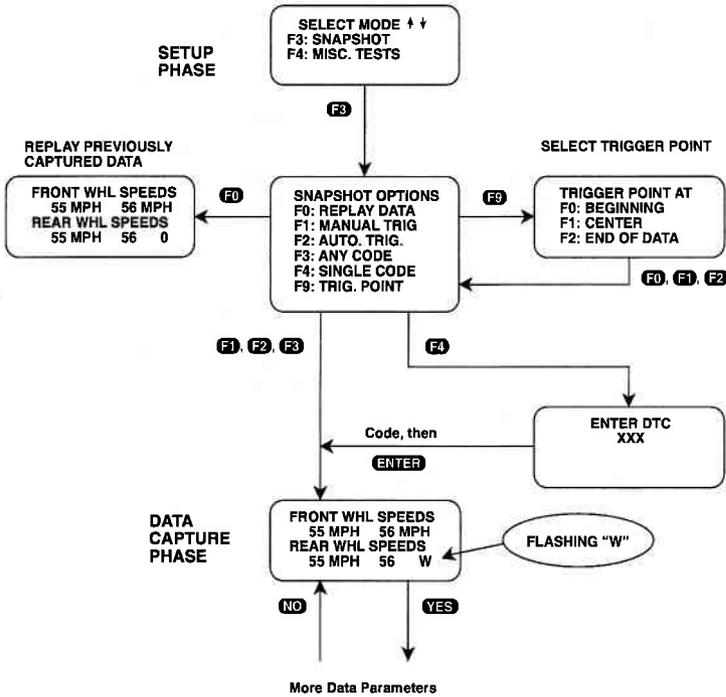
**ACTIVE TECH 1 KEYS IN THE SETUP PHASE**

<b>F0</b>	Replay previously captured data.
<b>F1</b>	Select the manual trigger mode.
<b>F2</b>	Select the automatic trigger mode.
<b>F3</b>	Select the trigger on any code mode.
<b>F4</b>	Select the trigger on specified code .
<b>F9</b>	Select Trigger Point.
<b>0 - 9</b>	Select specific trouble code.
<b>ENTER</b>	Enter selected trouble code.
<b>EXIT</b>	Terminate the SNAPSHOT mode and return to the Select Mode menu.

## SNAPSHOT SETUP PHASE

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 F0: REPLAY DATA.

## SNAPSHOT SETUP PHASE



**DATA CAPTURE PHASE**

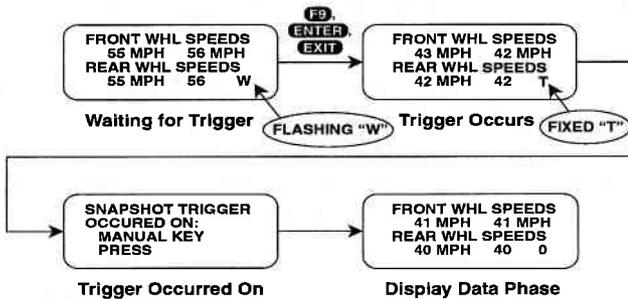
5. Once the trigger condition is specified, the TECH 1 begins storing data parameters and trouble codes while displaying the Data List parameters. Trouble codes for some systems are also stored and can be displayed in the Data Display phase.
6. The data is organized as a number of data "samples." The value or state of each parameter as well as all trouble codes are saved for each sample. The data display indicates 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 **F9**, **EXIT** or **ENTER** keys can always be used to force a trigger.

The number of samples saved by the TECH 1 is a function of the system being tested. Normally, the trigger point occurs in the center of the data and half of the samples are before the trigger and half are after. If you selected a different trigger point during setup (using the **F9** function) the trigger point (sample 0) will be near the beginning or end of the samples.

7. Once the trigger occurs, the TECH 1 continues 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 fixed "T." As soon as the memory is full, the data capture terminates automatically.

After the data capture terminates, the TECH 1 briefly displays the cause of the trigger. This display can also be seen by pressing **F3** in the Data Display Phase (Step 12).

8. Pressing **EXIT** after the trigger has occurred terminates the Data Capture phase early, and the SNAPSHOT mode will move to the Data Display phase.

**ABS SNAPSHOT****MODE F3****ACTIVE TECH 1 KEYS IN THE DATA CAPTURE PHASE**

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

**F0** Mark the top displayed parameter as "fixed" or cancel the bottom displayed parameter as "fixed" for creating your own data pairs.

**F1** Mark the bottom displayed parameter as "fixed" or cancel the top displayed parameter as "fixed" for creating your own data pairs.

**F7** Toggle between MPH and km/h display.

**F9** Manual trigger.

**ENTER** Manual trigger.

**EXIT** Manual trigger, or  
Display captured data if trigger has already occurred.

**DATA DISPLAY PHASE**

9. The Data Display phase is indicated with a number (initially 0) in the lower right-hand corner of the display. Select the data to be displayed by using the **YES** and **NO** keys).
10. The “current” DTCs present during each sample can be displayed by pressing **F2**. The DTCs automatically scroll once, then the display returns to the Data Display list. “CURRENT” displayed at the end of line two in the DTC display indicates the code is a current code. History codes are not read during SNAPSHOT mode.

The DTC display can be “frozen” by pressing the **↓** key, then “unfrozen” by pressing the **↑** key.

11. 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

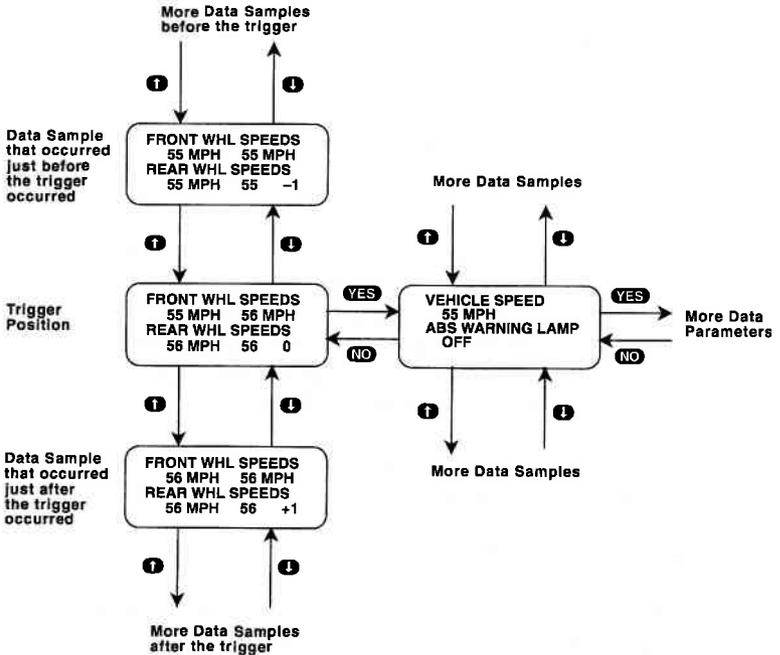
12. Pressing **F3** allows you to determine what caused the SNAPSHOT trigger to occur. For example, if you selected the Automatic Trigger option, pressing **F3** might result in the following display:

SNAPSHOT TRIGGER  
OCCURED ON:  
INTERMITTENT  
WHEEL SPEED

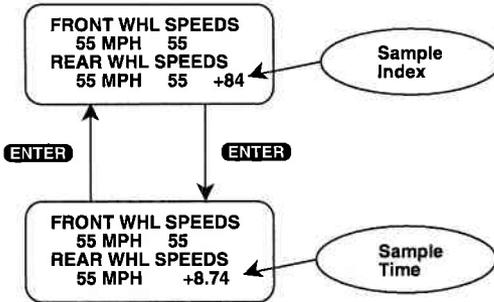
# ABS SNAPSHOT

# MODE F3

## DATA DISPLAY PHASE



13. While in the data display phase, pressing **ENTER** causes 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 +8.74 means the sample was received 8.74 seconds after the trigger sample. A sample time of -2.71 seconds means the sample was received 2.71 seconds before the trigger.

14. The currently displayed sample may be printed if the tester is connected to a compatible printer. To print the data, press **F8**. While the tester is sending data to the printer, the keyboard is disabled.

SNAPSHOT data can also be printed in a tabular format using the SCREEN PRINT feature. Refer to the TECH 1 Series A or RS232C I/F Cartridge Operator's Manual for more detail.

15. When you are finished viewing the sampled data, press **EXIT** to return to the Snapshot Option menu. If you are finished with the SNAPSHOT mode, press **EXIT** again to return to the Select Mode menu.

**ACTIVE TECH 1 KEYS IN THE 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.
- F3** Display cause of SNAPSHOT trigger.
- F4** Advance to first (earliest) sample.
- F5** Advance to trigger sample (sample 0).
- F6** Advance to last (most recent) sample.
- F7** Toggle between MPH and km/h display.
- F8** Print current data sample.
- ENTER** Toggle between sample index and sample time display.
- EXIT** Return to Snapshot Option menu.

<b>MODE F4</b>	<b>MISC. TESTS</b>
<b>F0: MANUAL CONTROL</b>	

The Manual Control functions allow you to manually control each motor and solenoid for component diagnosis. You can turn the solenoids on and off, turn the ABS motors on and off and control their direction (apply or release). Opens, shorts to ground, and shorts to battery can be confirmed by comparing what is commanded by the TECH 1, what the ABS controller sees as a response (motor feedbacks), and what the actual output is at the actuator. When the motor is moving, the feedback current will be less than the command current. When the piston is at the top or bottom of the bore or stuck, the feedback current will equal the command current. The solenoids will automatically be turned off if left on for more than 30 seconds and must be allowed to cool before being turned back on. An "INHIBITED" message is displayed on line 1 if additional cooling time is required.

#### **OPERATING PROCEDURE:**

1. Press **F4** to select Misc. Tests from the Select Mode menu. Refer to the "IMPORTANT NOTE" on Page 5-1.
2. For 4WD-3WSS type, press **F0** to select ABS from the Select System menu.
3. Press **F0** to select the Manual Control Test.
4. A display confirming that you have entered the Manual Control test is displayed for four seconds, or until the **↑** key is pressed.
5. A screen explaining which TECH 1 keys are used to control the various functions is displayed until you press the **YES** key.
6. The function selection menu displays all of the functions which you can control in this test along with the function key to press to select a function.

<b>MISC. TESTS</b>	<b>MODE F4</b>
<b>F0: MANUAL CONTROL</b>	

Note that the top row of function keys (**F0** - **F2**) control tests for the Left Front wheel functions. The next row of function keys (**F4** - **F6**) control the same functions for the Right Front wheel. Rear wheel components are controlled by function keys on the bottom row (**F8** and **F9**). Also, the selection is arranged so the first key in a row controls motor apply, the second key controls motor release, and the third key controls solenoids.

	<b>MOTOR APPLY</b>	<b>MOTOR RELEASE</b>	<b>SOLENOID</b>
<b>LF</b>	F0 LF APPLY	F1 LF RELEASE	F2 LF SOLENOID
<b>RF</b>	F4 RF APPLY	F5 RF RELEASE	F6 RF SOLENOID
<b>REAR</b>	F8 REAR APPLY	F9 REAR RELEASE	

Once you have selected a function to test, use the key to turn the function ON and the key to turn the function OFF.

During a motor apply or a motor release, the command and feedback currents for that motor are sampled. Those samples can be replayed immediately after the motor is turned off.

During solenoid, pressing the **↑** key turns ON the COMMAND and pressing the **↓** key turns it OFF. If "INHIBITED" appears on the display when trying to turn ON the COMMAND from OFF, wait until it disappears.

To select a different function to test, you can either press **EXIT** to return to the function selection menu to choose a different test, or just press the function key for the test you want to perform.

<b>MODE F4</b>	<b>MISC. TESTS</b>
<b>F0: MANUAL CONTROL</b>	

7. Press **EXIT** to return to the Manual Control Test menu. Press **EXIT** again to display the Select Test menu.

*When you exit from the Manual Control test, the TECH 1 will rehome the motors and display a message informing you that the motors have been rehomed.*

### ACTIVE TECH 1 KEYS

<b>F0</b>	Select Manual Control test.
<b>F0</b> - <b>F2</b> , <b>F4</b> - <b>F6</b> , <b>F8</b> - <b>F9</b>	Select function to control.
<b>F4</b> , <b>F5</b>	Advance to first (earliest) sample.
<b>F6</b>	Advance to last (most recent) sample.
<b>↑</b>	Turn function ON, scroll through selected samples.
<b>↓</b>	Turn function OFF, scroll through selected samples.
<b>YES</b>	Continue Manual Control test.
<b>EXIT</b>	Return to the Select Test menu.



<b>MODE F4</b>	<b>MISC. TESTS</b>
<b>F2: HYDRAULIC CONTROL</b>	

**CAUTION**

**To perform the following test, both vehicle drive wheels must be securely raised or there will be unintended vehicle movement that could injure someone.**

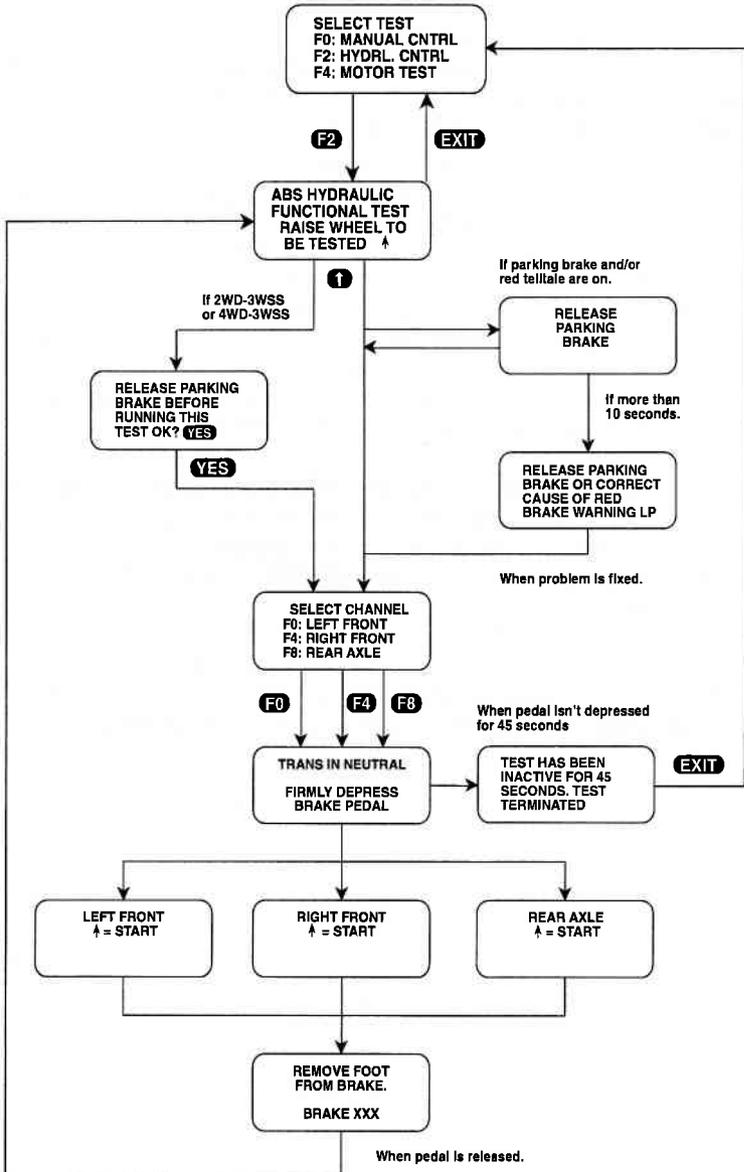
This test allows you to manually perform the APPLY, HOLD, and RELEASE ABS functions for brake system diagnosis.

**OPERATING PROCEDURE:**

1. Press **F4** to select Misc. Tests from the Select Mode menu. Refer to the "IMPORTANT NOTE" on Page 5-1.
2. For 4WD-3WSS type, press **F0** to select ABS from the Select System menu.
3. Press **F2** to select the Hydraulic Control Test.
4. The TECH 1 display confirms that you are in the ABS Hydraulic Functional Test and instructs you to raise the wheel to be tested. When the wheel has been raised, press the **1** key.
5. If the parking brake is on, the TECH 1 will tell you to release it. If the parking brake is released within 10 seconds the TECH 1 automatically continues to the Select Channel menu.

If the parking brake is not released within 10 seconds, or if the red telltale light remains on even when the parking brake is released, the TECH 1 instructs you to release the parking brake or correct the cause of the red telltale staying on. When the problem is resolved, the TECH 1 displays the Select Channel menu.

6. Choose the wheel you wish to test from the Select Channel menu.
7. When a wheel has been selected, the TECH 1 instructs you to place the transmission in neutral, then firmly depress the brake pedal. Do not release the pedal until the TECH 1 instructs you to do so.

**MISC. TESTS****MODE F4****F2: HYDRAULIC CONTROL****HYDRAULIC CONTROL TEST**

8. Have an assistant try to spin the wheel selected. It should not spin. This is to verify base brake apply.
9. Press the **↑** key to start the test. The TECH 1 will display "RELEASE" on the screen and your assistant should be able to spin the wheel selected. This verifies ABS brake pressure release. The TECH 1 will then display "HOLD" on the screen and a countdown timer. During this portion of the test, the brake pressure previously released is being held and your assistant should be able to spin the selected wheel. This verifies that the ABS unit can "HOLD" the released pressure and checks for internal leaks. The TECH 1 then commands the ABS modulator to "APPLY" (APPLY is displayed on the screen). Your assistant should not be able to spin the wheel selected at this point. This test verifies that the ABS modulator can reapply brake pressure to the selected channel. Refer to the vehicle's Service Manual for component servicing if a problem is found during this test.
10. At the conclusion of the test, the TECH 1 instructs you to take your foot off the brake pedal. When the pedal is released, the TECH 1 returns to the beginning of the Hydraulic test. Run the test on another wheel, or press **EXIT** to return to the Select Test menu.

***When you exit from the Hydraulic Control test, the TECH 1 will rehome the motors and display a message informing you that the motors have been rehomed.***

**MISC. TESTS**

**MODE F4**

**F2: HYDRAULIC CONTROL**

**ACTIVE TECH 1 KEYS**

**F2**

Select Hydraulic Control test.

**↑**

Confirm that all wheels are off the ground.

**YES** & **NO**

Respond to TECH 1 questions.

**EXIT**

Return to the Select Test menu.

<b>MODE F4</b>	<b>ABS TESTS</b>
<b>F3: IDLE UP TEST</b>	

The Idle Up test controls the idle up circuit and displays the Idle Up status on 4WD-3WSS equipped vehicles.

### OPERATING PROCEDURE

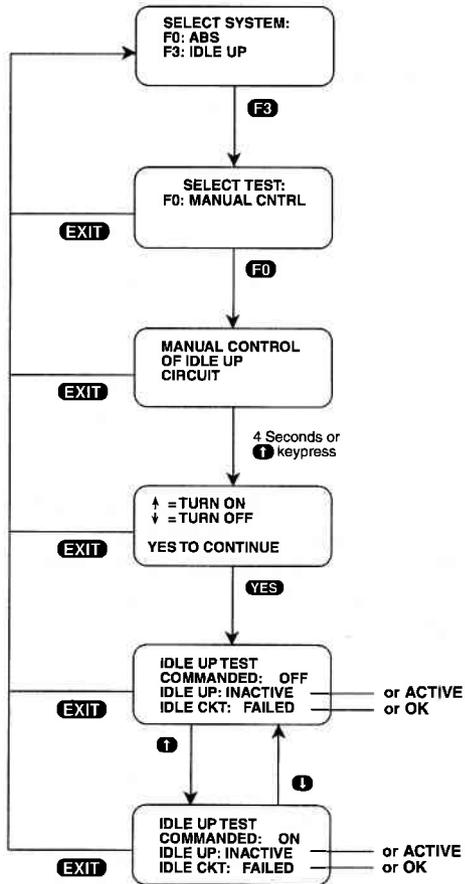
1. Press **F4** to select Misc. Tests from the Select Mode menu.
2. Press **F3** to select Idle Up from the Select ABS Test menu.
3. Press **F0** to select Manual Control from the Select Test menu.
4. The TECH 1 display confirms that you have manual control of the idle up circuit, then advances to a display of instructions for controlling the idle up circuit.
5. The instruction display shows that the **↑** key is used to turn the idle up circuit ON and the **↓** key is used to turn the idle up circuit OFF. Press **YES** to continue to the next display.
6. The TECH 1 displays the state to which you have commanded the idle up circuit (ON or OFF), the circuit's status (ACTIVE or INACTIVE), and the circuit's condition (OK or FAILED). When you press the **↑** or **↓** key, the TECH 1 will command the idle up circuit to the state you select.
7. Press **EXIT** to return to the Select Test menu. Press **EXIT** again to display the Select System menu.

### ACTIVE TECH 1 KEYS

<b>F0</b>	Select Manual Control test.
<b>F3</b>	Select Idle Up system.
<b>↑</b>	Turns idle up circuit ON.
<b>↓</b>	Turns idle up circuit OFF.
<b>EXIT</b>	Return to Select Tests menu.

<b>ABS TESTS</b>	<b>MODE F4</b>
<b>F3: IDLE UP TEST</b>	

### IDLE UP TEST



<b>MODE F4</b>	<b>MISC. TESTS</b>
<b>F4: MOTOR TEST</b>	

Once the motor pack has been separated from the ABS hydraulic modulator, the Motor Pack Test will functionally test the motor pack for proper operation. If the motor pack is still attached to the modulator, the TECH 1 will perform the gear tension relief sequence to allow you to remove it. A flow chart of the Motor Pack Test is provided on the following pages.



### CAUTION

**Prior to removing the motor pack from the ABS hydraulic modulator, prevailing motor torque or gear tension must be removed from the gear train to ease the motor pack separation process and prevent personal injury.**

### IMPORTANT NOTE

**For SE and SZ series vehicles equipped with an immobilizer system, a battery adapter cable (Suzuki P/N 09932-56020) is necessary, because power is not provided to the tester through the DLC when the ignition switch is off.**

**When testing, be sure to disconnect the connector from the immobilizer controller and supply power to the TECH 1 by using a battery adapter cable.**

### OPERATING PROCEDURE:

1. Press **F4** to select Misc. Tests from the Select Mode menu. Refer to the "IMPORTANT NOTE" above.
2. For 4WD-3WSS type, press **F0** to select ABS from the Select System menu.
3. Press **F4** to select the MOTOR Test.
4. The TECH 1 display confirms that you are in the Automated ABS Motor Pack Diagnosis test. The display automatically scrolls after four seconds, or after pressing the **↑** key.

5. The TECH 1 asks if the motor pack has been separated from the modulator. Answer by pressing the **YES** or **NO** key.

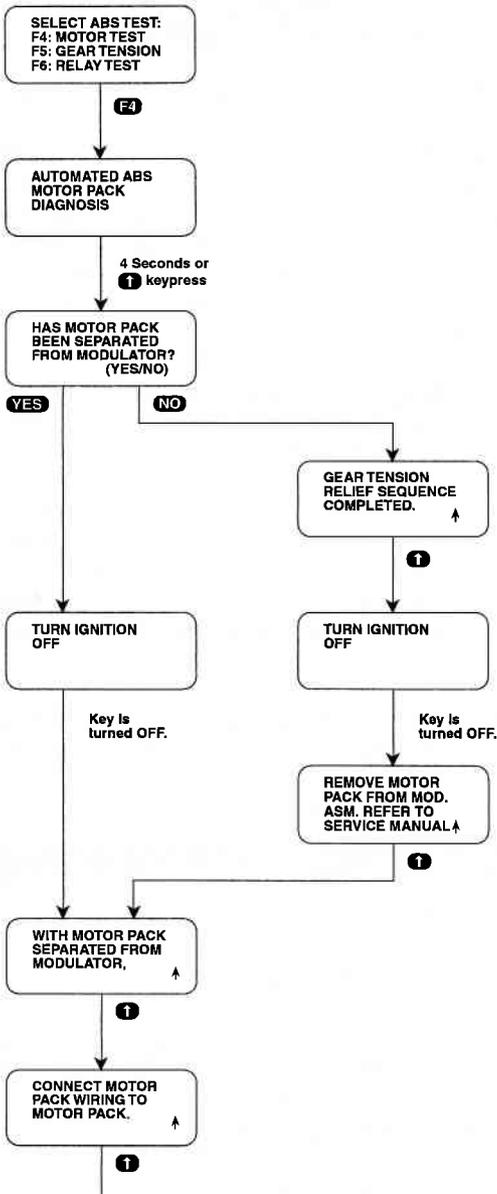
If the answer is YES, the TECH 1 instructs you to turn the ignition OFF.

If the answer is NO, the TECH 1 performs a gear tension relief sequence and then informs you that the sequence has been completed. Press the **↑** key to scroll to the next screen, which instructs you to turn the ignition OFF. After the ignition key is turned OFF, the TECH 1 instructs you to remove the motor pack from the hydraulic modulator assembly. Refer to the service manual for the proper procedure.

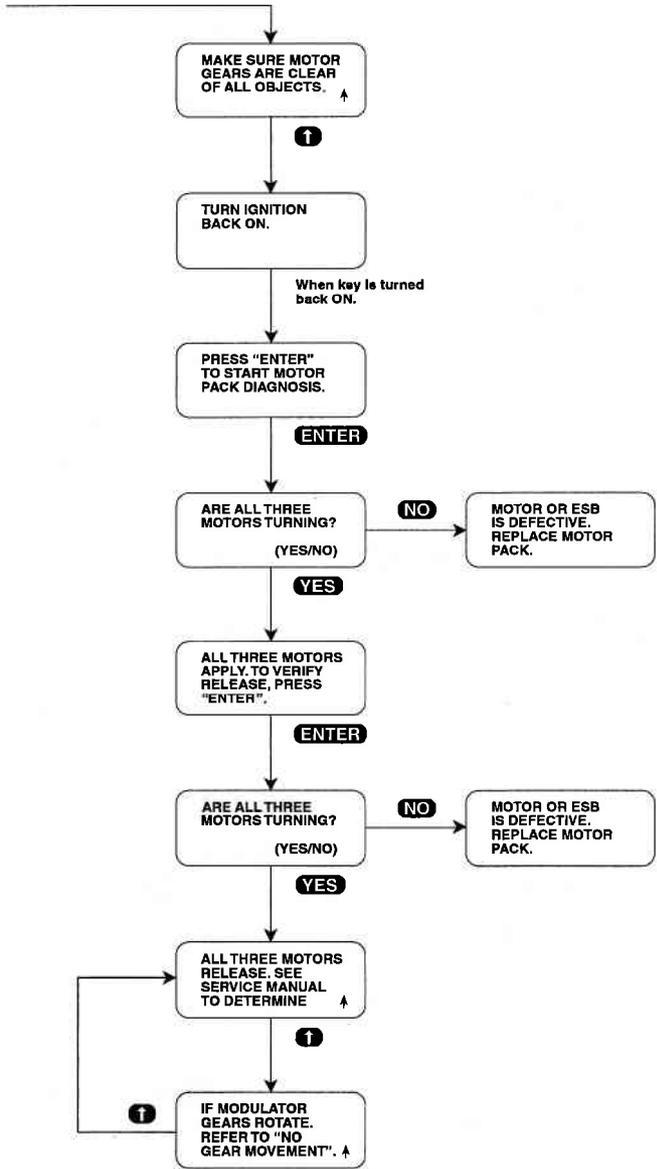
6. The TECH 1 instructs you to connect the motor pack wiring to the motor pack, position the motor pack so that the gears are clear of all objects, and then turn the ignition back ON.
7. The TECH 1 will guide you through a series of actions to perform and questions to answer. If an "↑" is displayed in the lower right corner of the display, press the **↑** key after the action is completed to continue to the next page of instructions. If the TECH 1 asks a question, answer by pressing the **YES**, **NO** or **ENTER** key.
8. After all tests have been performed the TECH 1 displays the test results. If the test failed, rerun the Motor Test to verify the results.
9. Press **EXIT** to return to the Select Test menu.

#### ACTIVE TECH 1 KEYS

<b>F4</b>	Select Motor Pack test.
<b>↑</b>	Advance screen after performing requested action.
<b>YES</b> & <b>NO</b>	Answer questions on the TECH 1 display.
<b>ENTER</b>	Start motor pack diagnosis.
<b>EXIT</b>	Return to the Select Test menu.

**MODE F4****MISC. TESTS****F4: MOTOR TEST**

<b>MISC. TESTS</b>	<b>MODE F4</b>
<b>F4: MOTOR TEST</b>	



**MODE F4**

**MISC. TESTS**

**F5: GEAR TENSION RELIEF TEST**

The Gear Tension Relief test relieves tension from the motor gears so the motor pack can be removed for off-vehicle service.



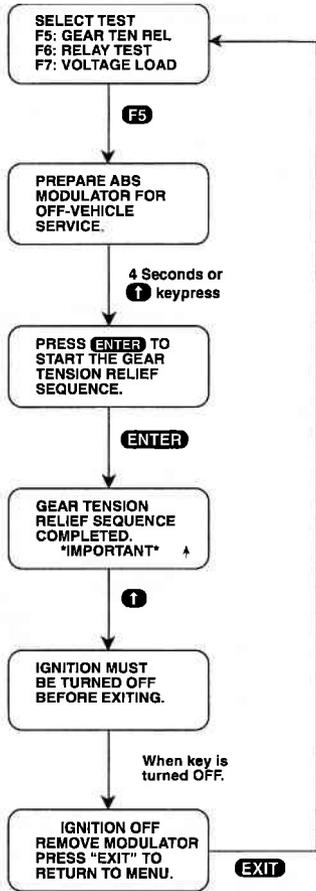
**CAUTION!**

Prior to removing the motor pack from the ABS hydraulic modulator, prevailing motor torque, or gear tension must be removed from the gear train to ease the motor pack separation process and prevent personal injury and/or gear train damage.

**OPERATING PROCEDURE:**

1. Press **F4** to select Misc. Tests from the Select Mode menu. Refer to the "IMPORTANT NOTE" on Page 5-1.
2. For 4WD-3WSS type, press **F0** to select ABS from the Select System menu.
3. Press **F5** to select the Gear Tension Relief Test.
4. The TECH 1 will confirm that you are in the Gear Tension Relief test. Consult the service manual for pretest preparations. The display will automatically scroll after 4 seconds, or after pressing the **↑** key.
5. The TECH 1 will ask you to press the **ENTER** key to start the Gear Tension Relief sequence. Press the **ENTER** key.
6. The TECH 1 will inform you when the Gear Tension Relief sequence has been completed. Press the **↑** key to scroll to the next page of instructions.
7. To finish the test, turn the ignition key OFF, then follow the instructions on the next screen. Press the **EXIT** key after the motor pack is separated from the hydraulic modulator. The TECH 1 will return to the Select Test menu.

<b>MISC. TESTS</b>	<b>MODE F4</b>
<b>F5: GEAR TENSION RELIEF TEST</b>	



<b>ACTIVE TECH 1 KEYS</b>	
<b>F5</b>	Select Gear Tension test.
<b>↑</b>	Scroll to the next page of instructions.
<b>ENTER</b>	Start the Gear Tension Relief sequence.
<b>EXIT</b>	Return to the Select Test menu.

**MODE F4****MISC. TESTS****F6: RELAY TEST**

The Relay test controls the enable relay while displaying the switched battery voltage into the ABS Controller. This tests allows verification of relay operation.

**OPERATING PROCEDURE:**

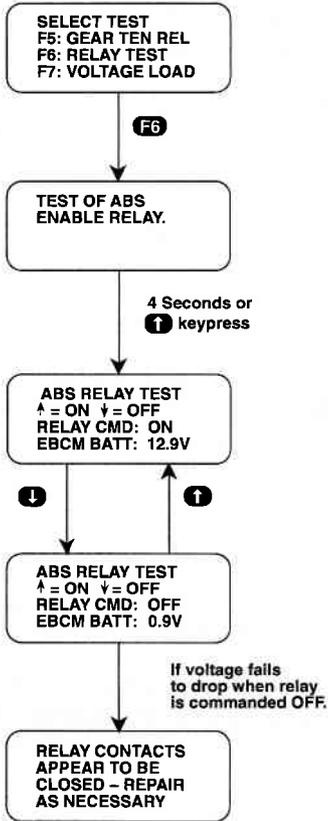
1. Press **F4** to select Misc. Tests from the Select Mode menu. Refer to the "IMPORTANT NOTE" on Page 5-1.
2. For 4WD-3WSS type, press **F0** to select ABS from the Select System menu.
3. Press **F6** to select the Relay Test.
4. The TECH 1 display will confirm that you are in the Relay test. The display will automatically scroll after 4 seconds, or after pressing the **↑** key.
5. The TECH 1 will display the keys used to control the relay, the status of the relay (whether it is commanded OFF or ON), and the current battery voltage as seen by the ABS controller.
6. Use the **↓** key to turn the relay OFF and the **↑** key to turn the relay back ON. If the relay is commanded OFF, the battery voltage should drop to below 5.0V within 2 seconds. If it fails to do this, the TECH 1 will inform you that the relay contacts appear to be closed. Consult the service manual to make the necessary repairs.
7. Press the **EXIT** key to return to the Select Test menu.

**ACTIVE TECH 1 KEYS**

<b>F6</b>	Select Relay test.
<b>↑</b>	Turns relay ON.
<b>↓</b>	Turns relay OFF.
<b>EXIT</b>	Return to the Select Test menu.

<b>MISC. TESTS</b>	<b>MODE F4</b>
<b>F6: RELAY TEST</b>	

**RELAY TEST**

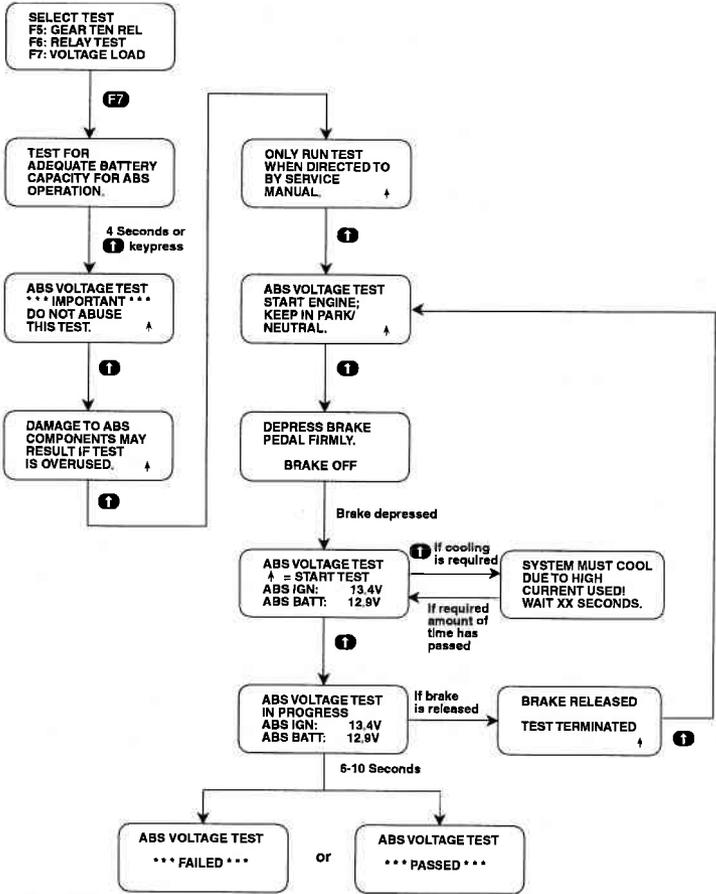


In the Voltage Load test you can energize many of the ABS components to create a significant current draw. Ignition voltage and ABS battery voltage are then monitored. If one or both voltages drop significantly, appropriate messages are displayed to direct you to the required area or service.

### OPERATING PROCEDURE:

1. Press **F4** to select Misc. Tests from the Select Mode menu. Refer to the "IMPORTANT NOTE" on Page 5-1.
  2. For 4WD-3WSS, press **F0** to select ABS from the Select System menu.
  3. Press **F7** to select the Voltage Load Test.
  4. The TECH 1 display will confirm that you are in the ABS Voltage Load test. The display will automatically scroll after 4 seconds, or after pressing the **↑** key.
  5. Press the **↑** key to sequence through the 3 message displays that caution you against abusing or overusing this test.
  6. When "ABS VOLTAGE TEST" is displayed on the TECH 1 screen, start the engine and leave the transmission in park/neutral. Press the **↑** key to continue the test.
  7. The TECH 1 will ask you to press on the brake pedal firmly. Do so and the TECH 1 display will inform you of the current ABS ignition voltage and the ABS battery voltage. Press the **↑** key to start the test.
- If the Voltage Load test has just been performed, you may have to wait up to 60 seconds for the components to cool before the test can be run again. If you attempt to run the Voltage Load test again too soon, the TECH 1 displays a warning and also displays a countdown timer of how long before the test can be run again.
8. The test will take 6 to 10 seconds to complete during which time you must keep the brake pedal depressed. The TECH 1 will inform you that the test is in progress. When the TECH 1 concludes the test, the results of the tests are displayed.
  9. Press the **EXIT** key to return to the Select Test menu.

<b>MISC. TESTS</b>	<b>MODE F4</b>
<b>F7: VOLTAGE LOAD TEST</b>	



<b>ACTIVE TECH 1 KEYS</b>	
<b>F7</b>	Select Voltage Load test.
<b>⬆</b>	Advance the TECH 1 display after performing a requested action.
<b>EXIT</b>	Return to the Select Test menu.

<b>MODE F4</b>	<b>MISC. TESTS</b>
<b>F8: LAMP TEST</b>	

The Lamp test allows you to manually control Lamps for diagnostic purposes. The TECH 1 displays the list of Lamps for the vehicle you are testing.

**OPERATING PROCEDURE:**

1. Press **F4** to select Misc. Tests from the Select Mode menu. Refer to the "IMPORTANT NOTE" on Page 5-1.
2. For 4WD-3WSS type, press **F0** to select ABS from the Select System menu.
3. Press **F8** to select the LAMP Test.
4. The TECH 1 display confirms that you are in the ABS Lamp test. The display will automatically scroll after 4 seconds, or when you press the **↑** key.
5. A Select Lamp menu is displayed. Press the key (**F0**, **F1**, **F2**) that corresponds to the Lamp you want to test. The example is for the Red Brake Lamp.

Use the **↑** and **↓** keys to turn the Lamp ON and OFF (or flash). The commanded state of the Lamp is displayed on line 3 and depending on the Lamp, the feedback state may be displayed on line 4.

6. Press **EXIT** to return to the Select Lamp menu, or press **EXIT** twice to return to the Select Test menu.

**ACTIVE TECH 1 KEYS**

- |                                      |  |
|--------------------------------------|--|
| <b>F0</b> , <b>F1</b> ,<br><b>F2</b> | Select the Lamp you want to test from the Select Lamp menu.                                |
| <b>↑</b>                             | Turn the selected Lamp ON.   |
| <b>↓</b>                             | Turn the selected Lamp OFF.  |
| <b>EXIT</b>                          | Return to the Select Lamp menu. Press <b>EXIT</b> twice to return to the Select Test menu. |

<b>MISC. TESTS</b>	<b>MODE F4</b>
<b>F8: LAMP TEST</b>	

**LAMP TEST**

SELECT TEST  
 F8: LAMP TEST  
 F9: SYSTEM ID

F8

MANUAL CONTROL  
 OF ABS LAMPS.

4 Seconds or  
 ↑ keypress

SELECT LAMP  
 F0: ABS WARN LP  
 F1: RED BRAKE LP  
 F2: ACTIVE LAMP

F1

RED BRAKE LIGHT  
 ↑ = ON ↓ = OFF  
 COMMAND: OFF  
 FEEDBACK: OFF

↑

↓

RED BRAKE LIGHT  
 ↑ = ON ↓ = OFF  
 COMMAND: ON  
 FEEDBACK: ON

<b>MODE F4</b>	<b>MISC. TESTS</b>
<b>F9: SYSTEM ID</b>	

This feature allows you to identify the ABS VI vehicle application, the ABS version, Electronic Brake Control Module (EBCM) manufacturing, and calibration information without having to access or remove the EBCM.

***The software ID is not related to a PROM version in the ABS controller. The ABS controller has NO SERVICE-ABLE OR REMOVABLE PROM. The ID and sequence number are for controller identification purposes only.***

#### **OPERATING PROCEDURE:**

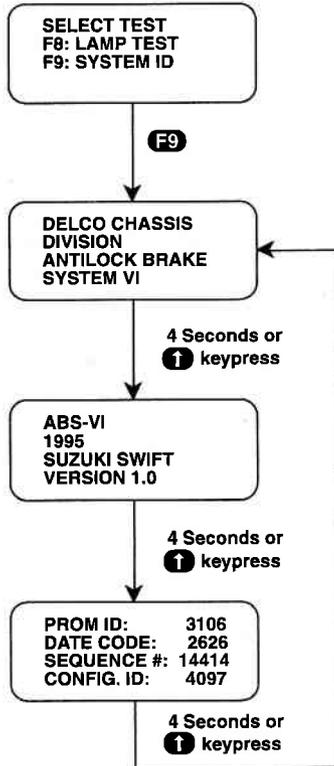
1. Press **F4** to select Misc. Tests from the Select mode menu. Refer to the "IMPORTANT NOTE" on Page 5-1.
2. For 4WD-3WSS type, press **F0** to select ABS from the Select System menu.
3. Press **F9** to select the SYSTEM ID.
4. The TECH 1 will display information about the Delco Chassis Division ABS controller on 3 TECH 1 screens.
  - a. System identification screen
  - b. Model year, platform and ABS version number screen
  - c. Software identification screen

This information may be referenced by service manuals or service bulletins. It can be used to determine that the correct ABS controller is installed in the vehicle. It may also be used for warranty purposes.

5. The TECH 1 will continuously scroll through the 3 screens at 4-second intervals. The display can be frozen by pressing the **↓** key and unfrozen by pressing the **↑** key.
6. Press the **EXIT** key to return to the Select Test menu.

MISC. TESTS	MODE F4
F9: SYSTEM ID	

### EXAMPLES OF SYSTEM ID DISPLAYS



ACTIVE TECH 1 KEYS	
<b>F9</b>	Select System ID from the Select Test menu.
<b>↑</b>	Manually scroll the display screen.
<b>↓</b>	Freeze the display screen.
<b>EXIT</b>	Return to the Select Test menu.

**MODE F5****MOTOR REHOME**

This feature allows you to command the ABS motors to drive the pistons to the home position at the top of each bore.

**OPERATING PROCEDURE:**

1. Press **F5** to select Motor Rehome from the Select Mode menu.

The TECH 1 will not perform a motor rehome if the vehicle is moving, if certain codes are set, or if the brakes are applied.

2. The TECH 1 informs you that the motors are being rehomed.

3. "MOTOR REHOME COMPLETE" is displayed when the motors are rehomed, then the TECH 1 returns to the Select Mode menu.

**ACTIVE TECH 1 KEYS****F5**

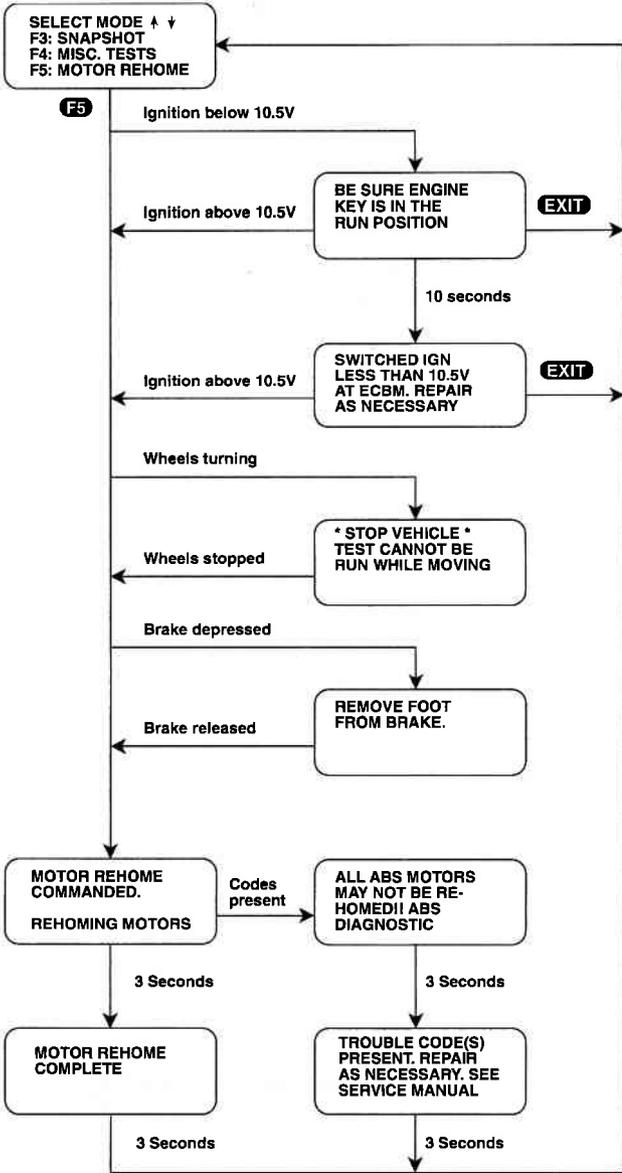
Select Motor Rehome from the Select Mode menu.

**EXIT**

Return to the Select Mode menu.

<b>MOTOR REHOME</b>	<b>MODE F5</b>
---------------------	----------------

**MOTOR REHOME**



## **6.0 FINISHING UP**

When you've finished testing, the following procedure should be followed:

1. Check to see if any Trouble Codes are still set. If you've already cleared codes for a component, but the codes are still set, then the conditions which caused the codes to be set are probably still present. Do not clear codes prior to diagnosing or repairing the ABS system if a fault is present. Valuable Code History information that would help isolate the problem will be lost. You should refer to the Suzuki Service Manual to isolate the problem.
2. Disconnect the TECH 1 from the vehicle's DLC.

### **NOTE:**

If the TECH 1 should become dirty, you may clean it with a 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 your TECH 1 prior to storage.

# **APPENDICES**

- A. IF YOU'RE HAVING A PROBLEM**
- B. GLOSSARY OF TERMS**

## A. IF YOU'RE HAVING A PROBLEM

This section is intended to help you get back on track if the TECH 1 appears to be operating abnormally. 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.

1.



**Blank screen.**

### **MOST LIKELY CAUSE:**

- No power is applied to the TECH 1.

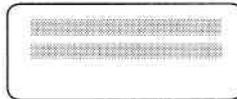
### **OTHER POSSIBLE CAUSES:**

- TECH 1 power supply is malfunctioning.

### **RECOMMENDATIONS:**

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

2.



### **MOST LIKELY CAUSE:**

- Cartridge was inserted while power was applied to TECH 1.

### **OTHER POSSIBLE CAUSES:**

- Two master cartridges are installed.
- 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.

**MASTER CARTRIDGE  
IS MISSING OR  
MALFUNCTIONING**

**MOST LIKELY CAUSE:**

- Master cartridge is not installed.

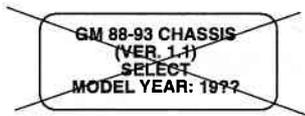
**OTHER POSSIBLE CAUSES:**

- Dirty contacts on the master cartridge connector.
- Master cartridge is malfunctioning.

**RECOMMENDATIONS:**

- Verify that a master cartridge is installed.
- Clean contacts on master cartridge connector with methyl (wood) alcohol.
- Try a different master cartridge.

4.



**Wrong display after power is applied.**

**MOST LIKELY CAUSE:**

- Wrong master cartridge is installed.

**OTHER POSSIBLE CAUSES:**

- Master cartridge is malfunctioning.
- TECH 1 is malfunctioning.

**RECOMMENDATIONS:**

- Verify that the correct cartridge is installed in the bottom slot of the TECH 1 and that there isn't a master cartridge in the top slot.
- Try another cartridge.
- Remove the master cartridge and perform the TECH 1 Self-test (refer to the TECH 1 Operator's Manual).

5.

NO DATA RECEIVED  
FROM SIR

NO DATA  
RECEIVED FROM  
EBCM

COMMUNICATION  
WITH EBCM  
FAILED

**MOST LIKELY CAUSE:**

- TECH 1 cable is not plugged securely into DLC.

**OTHER POSSIBLE CAUSES:**

- Ignition switch is not in "ON" position.
- Serial data link is shorted or open-circuited.
- ABS or AIRBAG is malfunctioning.
- TECH 1 is malfunctioning.

**RECOMMENDATIONS:**

- Verify that TECH 1 is plugged securely into DLC.
- Cycle power on the TECH 1 and then cycle the ignition.
- Verify that ignition is in "ON" position.
- Check for serial data link shorted or open.
- Remove the cartridge and perform the TECH 1 Self-test (refer to the TECH 1 Operator's Manual).

6.

NO COMMUNICATION  
WITH VEHICLE.  
CHECK DLC.

**MOST LIKELY CAUSE:**

- TECH 1 cable has come loose from DLC.

**OTHER POSSIBLE CAUSES:**

- Ignition switch has been turned "OFF."
- Cable is not plugged securely into TECH 1.
- Serial data link is shorted or open-circuited.
- ABS controller is malfunctioning.

**RECOMMENDATIONS:**

- Verify that ignition is in "ON" position.
- Verify that TECH 1 is plugged securely into DLC.
- Check for serial data link shorted or open.

7.

SUZUKI  
MASS STORAGE  
CARTRIDGE - VX.X  
<ENTER>

or

SUZUKI  
ABS/AIRBAG 1.1  
ECU MANUF.: DELCO  
(ENTER)

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

**MOST LIKELY CAUSE:**

- DLC cable loose.

**OTHER POSSIBLE CAUSES:**

- Master cartridge has loose or dirty contacts.
- TECH 1 is malfunctioning.

**RECOMMENDATIONS:**

- Cycle power to the TECH 1 (unplug and replug the DLC).
- Check TECH 1 cartridge socket and cartridge edge connector.
- Check DLC cable and connector for wear and corrosion.

8.

COMPANION  
APPLICATION  
MISSING

**MOST LIKELY CAUSE:**

- ABS/AIRBAG Application not installed in the Mass Storage Cartridge.

**OTHER POSSIBLE CAUSES:**

- Mass Storage Cartridge is not installed correctly.
- Wrong cartridge is installed in the tester.

**RECOMMENDATIONS:**

- Confirm that the Suzuki Mass Storage Cartridge is correctly installed in the bottom cartridge slot of the tester.
- Confirm that no other Master or Mass Storage Cartridge is installed in the top cartridge slot.
- Contact your TECH 1 distributor to have the application installed in the Mass Storage Cartridge.

## **B. GLOSSARY OF TERMS**

This section describes the abbreviations and terminology which are used in this manual and in the TECH 1 displays.

<b>36 VEN</b>	The Status of the 36 Volts Enable
<b>ABS</b>	Antilock Brake System
<b>ADS</b>	The Status of the Auxiliary Discriminating Sensor
<b>ADSMISS</b>	The Status of the Auxiliary Discriminating Sensor (ADS Missing)
<b>B+</b>	Battery voltage.
<b>BATT or BAT</b>	Battery
<b>BCM</b>	Body Computer Module
<b>BRK</b>	Brake
<b>CAL</b>	Calibration
<b>CMD</b>	Command
<b>CNTRL</b>	Control
<b>CNTRLR</b>	Controller
<b>CNTS or CNTCS</b>	Contacts
<b>Control Test</b>	A test where the TECH 1 controls some of the vehicle's functions.
<b>CTL or CNTL</b>	Control
<b>DCD ABS VI</b>	Delco Chassis Division's ABS VI system
<b>DATA LIST</b>	TECH 1 operating mode where DLC diagnostic information is displayed.
<b>Data Parameter</b>	A parameter which represents a quantity and is displayed as a value with appropriate units (volts, C, %...).
<b>DCD</b>	Delco Chassis Division

<b>Diagnostic Codes</b>	Trouble codes. Set by the ABS or SIR to indicate the occurrence of abnormal conditions.
<b>Discrete Parameter</b>	A parameter which can be in one of only two possible states (HIGH/LOW, ON/OFF,...).
<b>DLC</b>	Data Link Connector
<b>DRIVER 36 VLR</b>	Driver Side 36 Volt Loop Resistance
<b>EBCM</b>	Electronic Brake Control Module (ABS controller)
<b>ECM</b>	Engine Control Module
<b>ECU</b>	Electronic Control Unit
<b>ESB</b>	Expansion Spring Brake
<b>FDBK or FB or FBK</b>	Feedback
<b>FREQ</b>	Frequency
<b>FRT</b>	Front
<b>Function Keys</b>	Keys on the TECH 1 which can be used to select a particular function: F0, F1...F9. These keys double as numeric keys: 0...9.
<b>GND</b>	Ground potential (low side of battery)
<b>HYDRL</b>	Hydraulic
<b>ID</b>	Identification
<b>IGN</b>	Ignition
<b>km/h</b>	Kilometers per hour
<b>LF</b>	Left Front
<b>LR</b>	Left Rear
<b>LT or LITE</b>	Light
<b>MPH</b>	Miles per hour

<b>MS</b>	Milliseconds (1000ths of a second)
<b>MTR</b>	Motor
<b>MV</b>	Millivolts (1000ths of a volt)
<b>Numeric Keys</b>	Keys (0,1...9) which are used to enter numeric values such as trouble codes. These keys double as function keys: F0...F9.
<b>P/N</b>	Park/Neutral Switch
<b>Parameter</b>	A piece of information which is displayed by the TECH 1.
<b>PASS.</b>	Passenger
<b>PRESS</b>	Pressure
<b>PRNDL</b>	Transmission shifter indicator (Park, Reverse, Neutral, Drive and Low)
<b>PROM</b>	Programmable Read Only Memory
<b>PSI</b>	Pounds per square inch
<b>RA</b>	Rear Axle
<b>REL</b>	Relay
<b>REL</b>	Release (when used with "solenoid")
<b>RF</b>	Right Front
<b>RLY</b>	Relay
<b>RR</b>	Right Rear
<b>SDL</b>	Serial Data Link
<b>SHRT</b>	Short
<b>Snapshot Test</b>	TECH 1 operating mode which is used to isolate intermittent problems.
<b>SOL</b>	Solenoid

<b>SW</b>	Switch
<b>TCS</b>	Traction Control System
<b>Trouble Codes</b>	Same as Diagnostic Trouble Codes. Set by the ABS or SIR to indicate the occurrence of abnormal conditions.
<b>TST</b>	Test
<b>TT</b>	Telltales: Indicator lights
<b>V</b>	Volts
<b>VDIF</b>	Voltage Difference
<b>VSS</b>	Vehicle Speed Sensor
<b>WHL</b>	Wheel
<b>WSS</b>	Wheel Speed Sensor