

PRO-LINK 9000

ELECTRONIC SERVICE TOOL OPERATION

Section 5.2
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DESCRIPTION

Fault codes can be detected and stored in three components. The IDM (Injector Driver Module), the ECM (Electronic Control Module), and the VPM (Vehicle Personality Module).

The EST (Electronic Service Tool) (Figure 5.2-1.) is used to access stored fault codes by plugging it into the American Trucking Association (ATA) data link connector located in the cab of the vehicle. This allows the tool to communicate with the VPM and gather faults from the ECM and IDM through the VPM.

DIAGNOSTIC CODE RETRIEVAL

Turn all accessories and the ignition off. Connect the EST tool to the (ATA) diagnostic connector located on the lower left kick panel inside the cab. The screen of the reader should light up as soon as the tool is plugged in.

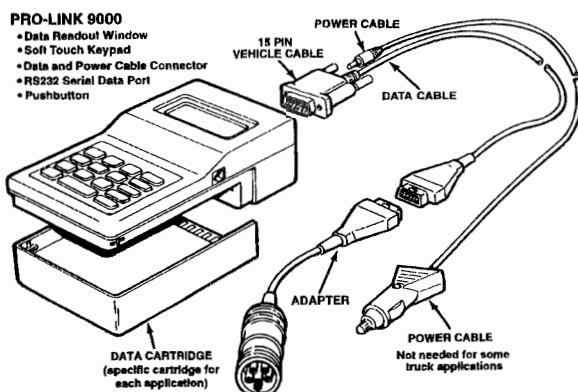
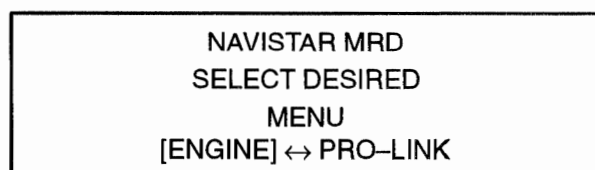


Figure 5.2-1. – Electronic Service Tool
Pro-Link 9000

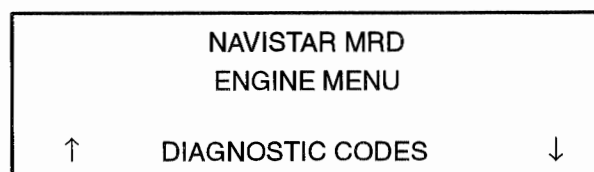
Turn the ignition key to the "ON" position but **do not start the engine**. This will allow the EST to receive data from the electronic control components on the truck. If no data is received press "ENTER" to retry. The information received will be data as to the current status of the engine.

To access the fault codes press the "FUNC" key to switch to the main menu.



From the main menu select "ENGINE" by pressing the "←" key. This will cause the brackets to be placed around the "ENGINE" selection. Then press "ENTER".

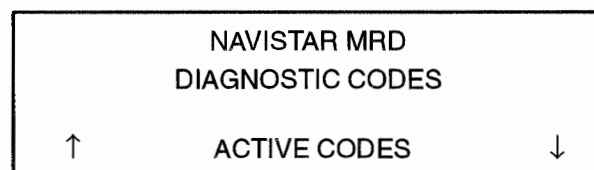
From the next menu, select "DIAGNOSTIC CODES". The selection will have the "↑↓" symbol on the screen, which means there are other selections available. By pressing the "↓" key the other selections will display on the screen. The first screen that will appear will be "DIAGNOSTIC CODES". If another option was selected press "↓" key until "DIAGNOSTIC CODES" appears on the screen. Next press "ENTER". At this point diagnostic codes can be accessed.



ACTIVE CODES

The first option that will appear is "ACTIVE CODES". By selecting this option, the fault codes that are currently occurring or that have occurred during the last key on cycle will be displayed. Press "ENTER". If there are any "Active Codes" the first one will appear on the screen along with a description of the code. If there are any additional codes "Active" the "↑↓" symbol will appear on the screen.

Press "↓" key to access additional codes. If there are not any codes "Active", "NO ACTIVE CODES" will appear on the screen.



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DIAGNOSTIC CODE RETRIEVAL – Continued

REFRESH CODES

If the fault that caused the "Active Code" is no longer malfunctioning, it will still be displayed as an "ACTIVE CODE", until the key is cycled off. To update the active codes in the EST, without turning the key off, press the "**FUNC**" key to return to the "**DIAGNOSTIC CODES**" MENU".

Press the "↓" key repeatedly until the "**REFRESH CODES**" selection appears on the screen. Press "**ENTER**" and the codes will update in the EST.

NAVISTAR MRD DIAGNOSTIC CODES		
↑	REFRESH CODES	↓

INACTIVE CODES

To access "Inactive Codes" press the "**FUNC**" key. This will access the last prior selection. Then press the "↓" key to select "**INACTIVE CODES**". Press the "**ENTER**" key.

Inactive codes are faults that have occurred in the past, and are now stored in memory. An "Active Code" will become an "Inactive" code if the key is shut off or the malfunction no longer exists (such as an intermittent problem).

NAVISTAR MRD DIAGNOSTIC CODES		
↑	INACTIVE CODES	↓

CLEAR CODES

To remove the codes from the memory, the EST is equipped with a "**CLEAR CODES**" option. To access this option, press the "**FUNC**" key, this will revert back to the "**DIAGNOSTIC CODES**" menu. Press the "↓" key until "**CLEAR CODES**" appears on the screen. Press the "**ENTER**" key and the screen will ask "**ARE YOU SURE?**" Press the "←" key to select "**YES**". Press "**ENTER**" and the codes will be deleted.

CLEAR CODES		
ARE YOU SURE?		
[YES]	← →	[NO]

DIAGNOSTIC TESTS

Diagnostic tests are "Self Tests" performed by the electronic components upon demand by the operator. The "Self Tests" check various output circuits to determine if they are functioning properly.

There are two types of self tests.

1. "ENGINE OFF"
2. "ENGINE RUNNING"

"ENGINE OFF" self tests check output circuits electrically for open or short circuits with the **engine not running**.

The "ENGINE RUNNING" test, checks the outputs of engine electronic controls with the **engine running**. The effect on engine operation is measured and compared to an expected level. If the level of operation is not within specification, a fault is recorded.

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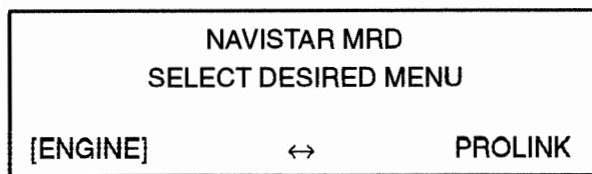
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DIAGNOSTIC TESTS – Continued

ENGINE OFF TEST

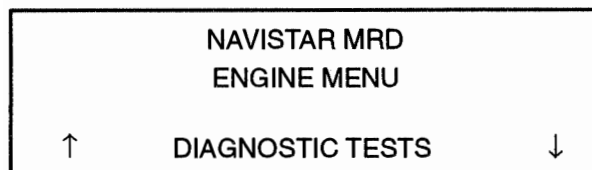
To perform "Engine Off" self tests, turn off all accessories and ignition off. Connect the EST to the ATA connector on the vehicle. Access the "ENGINE OFF TESTS" in the "DIAGNOSTIC TESTS" section of the EST.

To access this test, press the "FUNC" key. This will allow access to the last prior selection. Or press the "FUNC" key repeated until the main menu appears on the screen.

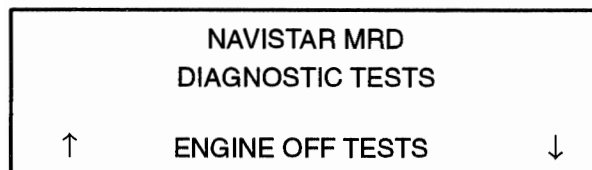


Move the brackets to engine selection by pressing the "←" key. Then press "ENTER".

Next select the "DIAGNOSTIC TESTS" menu by pressing the "↓" key, until "DIAGNOSTIC TESTS" is shown on the screen. Press enter to make this selection.



Press the "↓" key until the "ENGINE OFF TESTS" is shown on the screen. At this point, press "ENTER".



After the "ENTER" key is pressed, the EST will cause the ECM to perform a self test.

When the test is complete, the screen will display the number of new faults found in the self test. If there are any additional faults found, press "ENTER" and the faults will be displayed. If there is more than one fault found during the test, the "↑↓" symbol will be shown on the screen. Press the "↓" key to access any additional faults.

After the "ENGINE OFF TEST" has been performed several other tests are available.

At the completion of the "ENGINE OFF TEST" press the "FUNC" key to access the "ENGINE OFF TEST MENU".

The first option will be "ACTIVE CODES". By selecting this option, any active codes will be displayed.

STANDARD TEST (ENGINE OFF)

Press the "↓" key to display other options. The next option will be "STANDARD TEST". By selecting this option, the "ENGINE OFF TEST" will be repeated.

INJECTOR TEST (ENGINE OFF)

Press the "FUNC" key to continue. The next option is "INJECTOR TEST". By selecting this test the ECM will exercise (Buzz) the electronic injectors. During this test it will measure the circuits as well activate the injectors. This will allow the technician to listen to the operation of the injector without the engine running. At the completion of the test, if the electronic components detect any faults they will be recorded and displayed. Also by monitoring the noise made by the injector the technician can determine if an injector does not fire electronically.

Note: This test can only be done after the Engine Off test has been completed.

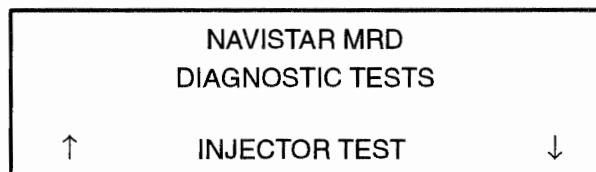
Select the "INJECTOR TEST" then press the "ENTER" key.

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ELECTRONIC SERVICE TOOL OPERATION

DIAGNOSTIC TESTS – Continued

INJECTOR TEST (ENGINE OFF) – Continued



Depressing the **"ENTER"** key will start the test.

At first all the injectors are energized, a loud buzzing noise can be heard.

Next, each injector will be energized individually. This will proceed in sequence starting at number 1 cylinder and proceeding through number 8 cylinder. All eight injectors should be heard as the injectors fire.

After the injectors are fired individually the complete sequence will repeat several times.

At the end of the test, the screen will indicate if any faults were found. If faults are indicated, press the **"ENTER"** key. This will display any faults that were recorded. If there are multiple faults the "↑↓" symbol will appear on the screen. Press the "↓" key to display the other faults.

OUTPUT STATE TEST

The next test available is the **"OUTPUT STATE TEST"**. This will signal the ECM to energize the output circuits for testing.

There are two modes of operation during this test. The first is **"OUTPUT ARE LOW"** and the other is **"OUTPUTS ARE HIGH"**.

When in the **"OUTPUTS ARE LOW"** mode the ECM will pull down the output voltage to ground. This will actuate the output components that are controlled by the ECM grounding the circuits. During this test **"OUTPUTS ARE LOW"** will be displayed on the screen.

When in the **"OUTPUTS ARE HIGH"** mode the ECM will pull up the output voltage to 12 volts. This will actuate the output components that are controlled by the ECM energizing the control circuits with 12 volts. During this test, **"OUTPUTS ARE HIGH"** will be displayed on the screen.

During this test, the following components will be exercised, IDM Enable relay, EPR (Exhaust Back Pressure Regulator), IPR (Injection Pressure Regulator), ECI (Engine Crank Inhibit Relay), EDL (Engine Data Link Relay), OWL (Oil/Water Light & Alarm), VRE (Vehicle Retarder enable) relay and WARN engine light.

To access this test press the "↓" key until **"OUTPUT STATE TEST"** appears on the screen. Press **"ENTER"** to start the test.

Press the **"ENTER"** key to switch from **"OUTPUTS ARE LOW"** to **"OUTPUTS ARE HIGH"**. The mode will change each time the **"ENTER"** key is pressed.

To end the test press the **"FUNC"** key.

While the test is being performed the technician can measure output circuits to be certain the ECM outputs are functioning properly.

VSS TEST

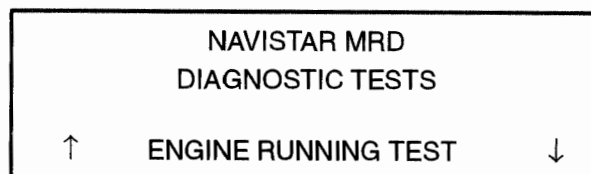
Not available at present.

ENGINE RUNNING TEST

The **"ENGINE RUNNING TEST"** will test engine outputs and performance with the engine running. This will allow the technician to determine if the outputs are within proper operating specifications.

Engine running tests can only be performed with the engine above 160° F (71° C) and no vehicle speed.

To access the **"ENGINE RUNNING TEST"**, from the **"DIAGNOSTIC TESTS"** menu, press the "↓" key until **"ENGINE RUNNING TEST"** is displayed on the screen. Press the **"ENTER"** key to start the test.



Pressing the **"ENTER"** key will begin the test. The ECM will raise the engine low idle and command full ICP (Injection Control Pressure). The ECM will then measure what the actual pressure is and compare it to the commanded value.

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DIAGNOSTIC TESTS – Continued

ENGINE RUNNING TEST – Continued

After testing Injection Control Pressure, the ECM will activate the EBP (Exhaust Back Pressure) step test. It will then command a specific back pressure and measure the EBP signal. The ECM will then compare the expected value against the commanded value to determine if the exhaust back pressure device is functioning correctly.

At the completion of the test the engine will return to normal low idle and the screen will display the number of faults found.

If there are any faults found, press the **"ENTER"** key to display the faults. If the **"↑↓"** symbol is shown, more faults are accessible. Press the **"↓"** key to display additional faults.

After the **"ENGINE RUNNING TEST"** has been completed the injector test is accessible.

INJECTOR TEST

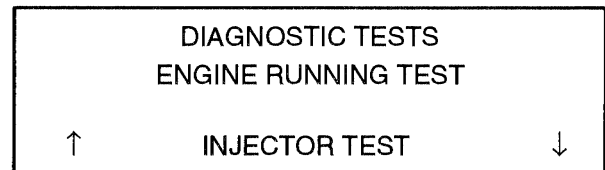
The injector test will test each cylinder's contribution. This will measure how much work is being done by each cylinder as compared to the other cylinders.

The ECM will measure this by increasing the amount of fuel delivery to the injector being tested and monitoring the reduction in the other cylinders to maintain engine speed. If there is no reduction in fuel delivery to the other cylinders, the ECM will set a fault code.

To access the **"INJECTOR TEST"** from the Diagnostic Tests menu press the **"↓"** key until the **"INJECTOR TEST"** is shown on the screen under the **"ENGINE RUNNING TESTS"** menu. Then press the **"ENTER"** key.

Note 1: **"ENGINE RUNNING TEST"** must be performed first to access this test.

Note 2: While performing this test the engine will run rough!



When the test is complete, the number of faults found will be displayed. If there are any faults found press the **"ENTER"** key to display the faults. If there is more than one fault, the **"↑↓"** symbol will be displayed. Press the **"↓"** key to display other faults.

TACH BUFFER TEST

The Tach Buffer Test checks the circuit between the ECM and VPM along with the internal buffer circuit in the VPM.

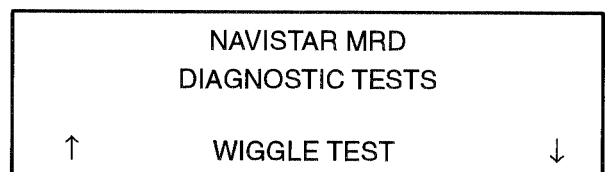
To perform this test select the **"TACH BUFFER TEST"** from the **"ENGINE RUNNING TEST"** menu.

The test must be performed with the engine speed above 1250 RPM.

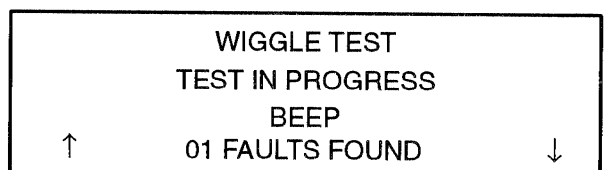
WIGGLE TEST

"WIGGLE TEST" is available under the Diagnostic Test Menu. The wiggle test is to assist the technician in finding an intermittent condition. The wiggle test will monitor both signal outputs and inputs on a continuous basis. Any interruption in the circuit will cause a fault.

To access **"WIGGLE TEST"** from the Diagnostic Test Menu, press the **"↓"** key until **"WIGGLE TEST"** is displayed on the screen. Press the **"ENTER"** key, to start the test.



At any time during the Wiggle Test if an open or short is detected, the EST will beep and the word **"BEEP"** will display on the screen.



PRO-LINK 9000 ELECTRONIC SERVICE TOOL OPERATION

DIAGNOSTIC TESTS – Continued

WIGGLE TEST – Continued

While in the Wiggle mode, the technician can move and wiggle the wiring harness and connectors to locate the problem.

To end the test press the "FUNC" key. The message will ask "STOP THIS TEST" press the "←" key to select yes. This will end the test.

WIGGLE TEST		
TEST IN PROGRESS		
STOP THIS TEST		
[YES]	↔	[NO]

If any faults were detected, press the "ENTER" key to display the fault.

SERVICE TOOL FUNCTIONS

PRO-LINK FUNCTIONS

Several options are available in the Pro-Link tool menu. To access these functions press the "→" key to select the "PRO-LINK" options. This will cause brackets [] to be placed around "PRO-LINK". Press the "ENTER" key to make this selection.

NAVISTAR MRD		
SELECT DESIRED		
MENU		
ENGINE	↔	PRO-LINK

From the tool menu press the "↓" key to display the tool functions.

CONTRAST ADJUST

From the "CONTRAST ADJUST" display press the "ENTER" key to select this option.

Use the "↑↓" keys on the Pro-Link keypad to adjust the contrast of the characters on the Pro-Link display.

ENGLISH/METRIC

The Pro-Link displays in either English or Metric units. To select the feature, press the "← →" keys to select either English or Metric. Press the "ENTER" key to enter the selection.

CUSTOM DATA LIST

This selection enables the technician to design a custom data list, placing data items in the list in the order that the technician chooses to view them. When the Custom Data List is selected from the Function Menu, the following screen is displayed.

SELECT CUSTOM		
DATA LIST OPTION		
↑	DISPLAY STANDARD	↓

Display Standard

The Pro-Link stores in memory both the Standard Data List and one Custom Data List created by the technician. Selecting Display Standard selects the default list configuration for viewing and printing data lists. Pressing the "ENTER" key presents Diagnostic Data on the display in the Standard format for viewing.

Display Custom

Selecting Display Custom, selects the list configuration created with the Edit Custom menu selection. The Pro-Link displays Diagnostic data on the Pro-Link screen in the chosen custom format. If no custom list exists, the Standard List is displayed.

Edit Custom

Selecting Edit Custom enables the technician to configure how he wants to view Diagnostic Data on the Pro-Link screen and/or from a printer. The editing screen is shown below.

SELECT PARAMETER ↑↓		
PRESS ENTER		
CURRENT LINE ← 1 →		
ACTIVE CODES		[NO]

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SERVICE TOOL FUNCTIONS – Continued

CUSTOM DATA LIST – Continued

The table below shows the keys used for creating the Custom Data List and the result of the key.

FUNC Exits Edit Custom Mode

- Scrolls up Current Line number and Parameter
- ← Scrolls down Current Line
- ↑ Scrolls up the Parameter only, Current Line Number unchanged
- ↓ Scrolls down the Parameter only, Current line number unchanged

ENTER Accepts the Current Line number and Parameter combination

To create a custom Data List:

- Select the desired data line as the Current Line number.
- Select the desired parameter to be displayed on the line.
- Press the **ENTER** key. No change to the data list occurs unless **ENTER** is pressed.
- Repeat for each Data Line.

Reset Custom

This selection resets the Custom Data list back to the Standard List form. When selected, the following screen is displayed.

RESET CUSTOM LIST BACK TO STANDARD ARE YOU SURE? ← →		
YES		[NO]

No is the default action. Reset the Custom Data List to the Standard List by pressing the ← key to Select **YES**, then press the **"ENTER"** key.

NOTE: If the Custom Data List is reset to the Standard List form, the Custom List is lost and must be recreated.

RESTART

Restart resets the Pro-Link to the beginning of the program. The contrast adjustment is not affected by Restart.

RS-232 SERIAL PORT

This selection allows the technician to configure the Pro-Link RS-232 serial port for either printer or terminal (personal computer) output. The screen below appears when this item is selected.

RS-232 SERIAL PORT FUNCTION MENU		
↑	PRINTER OUTPUT	↓

This selection is used to print out diagnostic information.

The Pro-Link is set up to print to the Pro-Link Printer and no Port Setup is necessary for that printer. In order to print to a different printer, follow the instructions under Port Setup, in the Electronic Service Tool manual.

The following screen will be displayed if the **"PRINTER OUTPUT"** function is selected.

SELECT DATA TO PRINT		
↑	DATA LIST	↓

There are five types of data which can be printed out:

DATA LIST
DIAGNOSTIC CODES
CALIBRATION DATA
SNAPSHOT DATA
REPROG PARMS

Press the "↓" key to select other options. Press **"ENTER"** and the selection will be printed.

PRO-LINK 9000 ELECTRONIC SERVICE TOOL OPERATION

SERVICE TOOL FUNCTIONS – Continued

Snapshot

Selecting the Snapshot option will display the following screen.

```
DO YOU WISH TO PRINT
THE COMPLETE LIST
OR A CUSTOM LIST?
[COMPLETE]  ← →  CUSTOM
```

Complete

Choosing "**COMPLETE**" produces a screen as shown below.

```
SNAPSHOT PRINTOUT
SELECT FRAMES
TRIG = ###          FRAMES = ###
START = ###
```

TRIG = Frame number that contains the trigger.

FRAME = Total number of frames in Snapshot memory (a frame is one complete Data List)

START = The first frame desired to print

Selecting "**COMPLETE**" will print all lines of the data list. Enter the first frame desired to print at "**START**" and press "**ENTER**". Now line four will display END = # # #. Enter the last frame desired to print and press "**ENTER**". The tool will now print the complete data list for each of the frames that are selected.

Custom

Selecting Custom produces the following screen.

```
SELECT UP TO 6 DATA
PARAMETERS TO PRINT
USE FUNC TO QUIT
ENTER TO CONTINUE
```

Press the "**ENTER**" key and the following screen appears.

```
SELECT DATA TO PRINT
PRESS ENTER
COLUMN # = 1
ACTIVE CODES
```

Use the "↑↓" keys to scroll the list on line four. Choose the item desired for column 1 of the custom list, press the "**ENTER**" key. Line three, "**COLUMN #**", advances to 2. Repeat this procedure for all six columns of data to be printed. Press the "**FUNC**" key when finished. The Select Frames screen appears. Select the desired frames to print and the Custom printout will begin.

SNAPSHOT

Snapshot allows the technician to record data from the Data List, for review. This can be helpful for collecting data while driving the truck or for searching for an intermittent problem.

The following functions are available for Snapshot:

- Quick Trigger
- Trigger Setup
- Data Update Rate
- Review Snapshot

Quick Trigger

The Quick Trigger function enables the technician to take a second Snapshot quickly, using the previous setting established during Trigger Setup for the first Snapshot. It is not necessary to reset the setup values for each Snapshot. Press the "**ENTER**" key and the data is displayed on the Pro-Link screen.

The Quick Trigger default trigger is Any Numeric Key. Press any numeric key on the Pro-Link keypad to start recording data. Press any numeric key again to stop recording data.

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SERVICE TOOL FUNCTIONS – Continued

Trigger Setup

Trigger Setup allows the technician to configure how and when Snapshot triggers. Selecting this option displays the screen shown below.

SELECT SNAPSHOT TRIGGER SOURCE		
↑	ANY NUMERIC KEY	↓

Four choices are available for Snapshot triggering.

- Any Numeric Key
- Any Code
- Specific PID
- Specific SID

Any Numeric Key

Choosing this option requires the technician to press any numeric key on the Pro-Link keypad to activate the trigger.

Specific Code, PID and SID

When selecting a Specific Code, PID or SID a screen is displayed which enables the technician to choose the Code, PID or SID to trigger on from a list of those choices.

Setting Memory Trigger Point

Selecting any of the Trigger Setup options presents the display below.

DO YOU WISH TO ADJUST THE MEMORY TRIGGER POINT		
YES	← →	[NO]

NO is the default. To adjust the trigger point, use the "←" key to select **YES**, then press **"ENTER"**. Selecting YES present the following screen.

T INDICATES LOCATION OR TRIGGER IN MEMORY		
BEG	MID	END
[.....T.....]		

Use the ← → keys on the Pro-Link keypad to adjust the location of "T" along the line, then press **"ENTER"** to accept this position. When the trigger occurs, all data to the right of "T" was received after the trigger occurred or towards the end of the Snapshot, Data to the left of "T" was received before the trigger occurred or towards the beginning of the Snapshot.

Processing the Trigger

After defining all the setup functions, pressing the **"ENTER"** key presents the prompt on the screen, **"WAITING FOR TRIGGER"**.

The Pro-Link is now storing data from the ECM and waiting for the trigger condition to occur. When the trigger occurs, the prompt is displayed **"PROCESSING TRIGGER"**. The Pro-Link will record data in its memory buffer until full. When complete refer to **"Review Snapshot"**.

Review Snapshot

This function will only be displayed when there is Snapshot data in memory to view. The Snapshot should have been triggered previously and the data stored in memory. The following screen is displayed.

DATA
DATA
DATA
T = ### C = ### GOTO _ _ _

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ELECTRONIC SERVICE TOOL OPERATION

SERVICE TOOL FUNCTIONS – Continued

Review Snapshot – Continued

The "↑↓" keys are active and scroll the data up and down. The "←→" keys scroll the current frame number (C). Pressing any numeric key followed by pressing the "ENTER" key reverts to that frame number. Entering a GOTO_ _ _ frame number greater than the number of frames in memory, reverts to the highest frame in memory. Pressing the "ENTER" key without having pressed any other key presents the codes for that frame. Arrows appear on line four if there is more than one code. Pressing "ENTER" again reverts back to the Review Snapshot Data List mode. Data Update Rate

This selection gives the technician the ability to determine how often Snapshot data is updated in

memory. As the time is increased, the delay between sampling frames is increased. The following screen is displayed when this option is selected.

DATA UPDATE RATE SELECT DELAY THEN PRESS ENTER CURRENT = 0.1 NEW = 0.1
--

On the numeric keypad of the Pro-link, type in the desired delay time from within the range of 0.1 to 9.9 seconds, then press "ENTER". The screen automatically returns to the Snapshot Function Menu screen.

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**ELECTRONIC SERVICE TOOL
MPSI PRO-LINK MAP
WITH 1678129C3 VPM**

MAINTENANCE DATA
↓
PROM
↓
PRO-Link

ENGINE

DIAGNOSTIC CODES

ACTIVE CODES
INACTIVE CODES
REFRESH CODES
CLEAR CODES
DESCRIPTION OPTION

DIAGNOSTIC TESTS

ENGINE OFF TEST
ENGINE RUNNING TEST
SHAKE WARNING TEST
MODULE TEST

ACTIVE CODES
STANDARD TEST
SELECTOR TEST
TACH RAPID TEST
VEH TEST

OUTPUTS ARE LOW
OUTPUTS ARE HIGH

CALIBRATION DATA

SERVICE PROGRAMMING
GET PAINS FROM ENG
SEND PAINS TO SYS
GET PAINS FROM SYS
PROGRAM ENG PAINS

RE-SET

PRINTER OUTPUT
TERMINAL OUTPUT
PORT SETUP

CUSTOM DATA LIST

DISPLAY STANDARD
DISPLAY CUSTOM
TEXT CUSTOM
RESET CUSTOM

BRIGHTNESS ADJUST

SNAPSHOT

CHUCK TYPING
THUNDER
THUNDER SETUP
UPGRADE BATS
REVIEW
SNAPSHOT

COMMUNICATIONS TRANSLATOR

RESTART

OVERVIEW PROTECTION

overmode mode
high torque
modifying seats
diesel factor %

IDLE SHUTDOWN

idle shut mode
idle shut time
WOT idle hours
idle timeout

FUEL HOURS/MILES

fuel fuel mode
WOT fuel hours
idle timeout

EVENT ENGINE HOURS

event engine hours
low oil per test 1
low oil per test 2
low oil per test 3
low oil per test 4
low oil per test 5
low oil per test 6
low oil per test 7
low oil per test 8
low oil per test 9
low oil per test 10
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