QUICKSILVER

Technician Reference Manual

Digital Diagnostic Terminal

Software Version 1.3

SmartCraft™ Systems

Printed in U.S.A. 90-881204003 1003

Note:

- To take full advantage of the tool, you should be knowledgeable and well trained in the OEM system described in this manual.

- This manual contains information that will allow you to use the tool to perform diagnostic tests and find possible locations of engine problems. It does **NOT** contain information on how to correct the problems. Once you have located a problem, consult the engine's service manual for repair instructions.

- All information, illustrations and specifications contained in this technical manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

SmartCraft Systems – Digital Diagnostic Terminal 90-881204003

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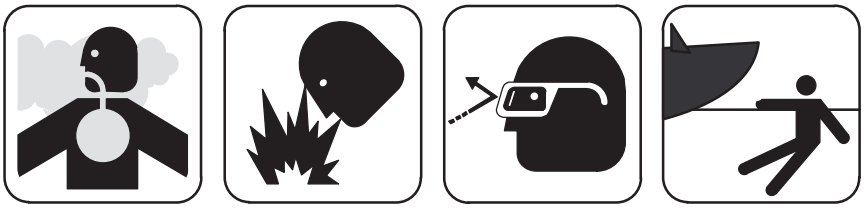
Preface

SAFETY PRECAUTIONS



⚠ WARNING

- **When an engine is operating, keep the service area WELL VENTILATED or attach a building exhaust removal system to the engine exhaust. Engines produce carbon monoxide, a poisonous gas which is odorless, causes slower reaction time, and can lead to serious injury or death.**
- **Fuel under pressure may escape and create a dangerous condition if you are working with fuel lines. Make sure there is adequate ventilation and there is no possibility of sparks present.**
- **Batteries contain sulfuric acid and produce explosive gases that can result in serious injury or death. To prevent ignition of gases, keep lighted cigarettes, sparks, flames, and other ignition sources away from the battery at all times. If you are using the battery as a power source, connect the RED (+) battery clip to the positive battery terminal and connect the BLACK (–) battery clip to a good ground away from the battery.**
- **Wear an ANSI approved eye shield when testing or repairing engines. Objects can be propelled by rotating engine components, and liquids escaping under pressure can cause serious injury.**
- **Do not operate the boat and operate the DDT at the same time. Any distractions may cause an accident. Have one person operate the DDT as another person operates the boat.**

ICONS

PRINT

Press F2, 1 This icon indicates that the Print function is available. Press F2 and then 1 to begin printing.

Line Lock

Available This icon indicates that Line Lock is available. The Line Lock feature allows display lines to be locked into position, rather than scrolled. An underline on the first column of a line indicates that it is locked.

Record

Available This icon indicates that RECORD is available. Press the RECORD key to record data being read from the Engine Control Module.

Press

To EXIT Press this key anytime when you wish to return to the previous menu or test mode.

Press this key for extra information. (May not be available on all ECMs)

Preface

WHAT'S NEW FOR CARTRIDGE VERSION 1.3 – SMARTCRAFT PCMs/ECMs

- Guardian Active Due To: – Fault Status 2004 MY and up
- Demand % – Data Monitor (DTS production models only)
- 'Master Print All' Function – History
- Set Maximum Trim Limit Position – Special Functions
- Set Maximum Trailer Limit Position – Special Functions
- Start/Stop Engine (DTS models only) – Output Load Test
- Shift Engine (DTS models only) – Output Load Test
- TDC Offset – Special Functions
- Glossary of terms updated
- FAQ updated
- Tach Link Config – Special Functions
- All prior PCM/ECM 555 models supported

1.0 Introduction

OVERVIEW

The Quicksilver Digital Diagnostic Terminal (DDT) has been developed specifically to help technicians diagnose and repair Mercury Marine two and four cycle engines.

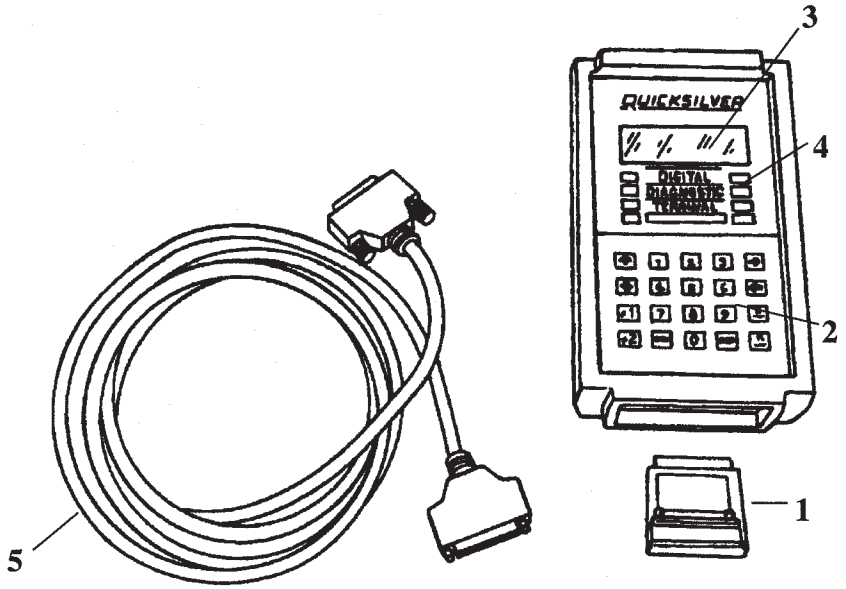
The SmartCraft Engine Diagnostics Cartridge contains a diagnostic program for the ECM that allows the technician access to all of the diagnostic capabilities available through the engine Electronic Control Module (ECM).

Simply hook the diagnostic cable to the ECM diagnostic connector and plug in the software cartridge. You will be able to monitor sensors and ECM data values including status switches.

The ECM program can help diagnose intermittent engine problems. It will record the state of the engine sensors and switches for a period of time, much like a tape recorder would, then you can play back and review the recorded information.

1.0 Introduction

DDT FEATURES



1 **SmartCraft Engine Diagnostic Cartridge –** contains the memory and the software to perform diagnostic tests and other functions.

2 **Key Pad –** allows you to enter data and reply to DDT messages.

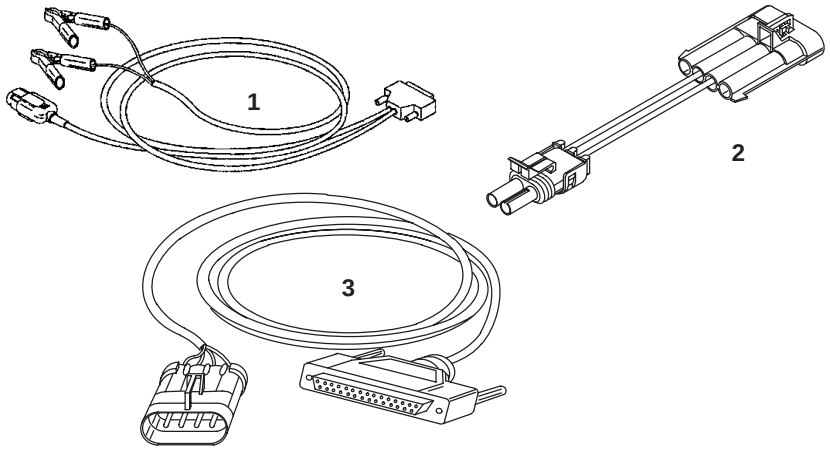
3 **Display Window –** displays data and messages to the user.

4 **LED Indicators –** indicate faults in certain areas.

5 **DDT Interface Cable –** connects the DDT to the Adapter Cable.

1.0 Introduction

DDT FEATURES



Engine Adaptor Cables

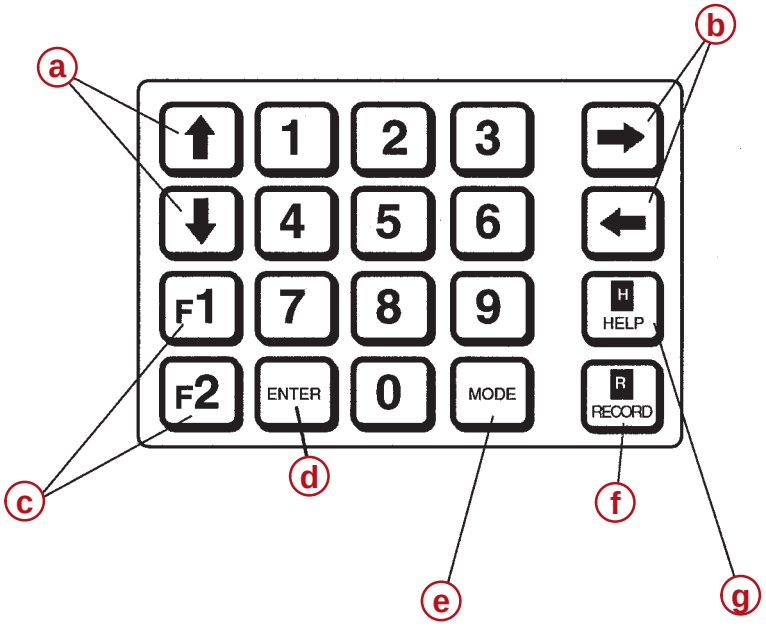
1 84-822560A 5
2001 and newer Outboard Opti/EFI/PCM or ECM 555 based SmartCraft Systems

2 84-822560A 12
Adaptor used with item 1 – for MerCruiser EFI/PCM or ECM 555 based SmartCraft Systems

3 84-822560A 13
MerCruiser EFI/PCM or ECM 555 based SmartCraft Systems

1.0 Introduction

DDT FEATURES



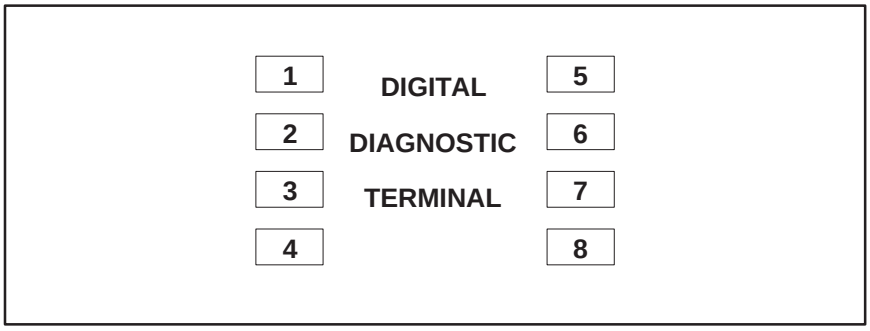
Keypad

- **a** - ↑ and ↓ Keys – Move through menus and move cursor up or down
- **b** - ← and → Keys – Move cursor left or right
- **c** - F1/F2 Keys – Allows the user to perform special functions
- **d** - ENTER Key – Enters your commands into the program
- **e** - MODE Key – Takes you back to the previous menu or test mode
- **f** - RECORD Key – Records data for review
- **g** - HELP Key – displays additional information (available on select ECM models only).

NOTE: *If a screen message contains the word "ENTER", you must press the ENTER key to accept the command you've keyed into the DDT.*

1.0 Introduction

DDT FEATURES



LED Indicators

NOTE: *The LED display consists of eight (8) LEDs arranged in two columns of four LEDs and located under the four line display. The LED display shows the numbers identified in this illustration; it does not show descriptions.*

1.0 Introduction

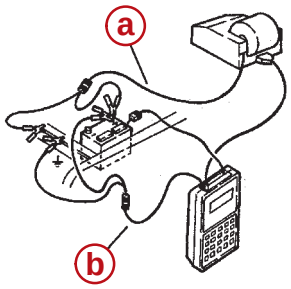
DDT FEATURES

F1 and F2 Keys

Extra functions are available using the Fl and F2 keys. All functions are NOT active during all tests.

F Key	Functions
Press	**Result**
F1 + F1	**F1 Menu** Press the F1 key twice to display the available F1 functions.
F1 + 1	**English / Metric** Toggles between English and Metric display.
F1 + 2	**Tone On / Off** “Tone On” will cause an audible beep each time a key is pressed. “Tone Off” turns the beep off. Toggles between On and Off each time the 2 key is pressed. Defaults to ON. Selection is saved in memory.
F2 + F2	**F2 Menu** Press the F2 key twice to display the available F2 functions.
F2 + 0	**Revision Level** Displays the revision level of the cartridge software.
F2 + 1	**Print** Prints the information you are viewing if a printer is attached.
F2 + 9	**File Manager** List, Playback, delete, rename or print files previously saved.

PRINTER SETUP



a - Printer Power Plug
b - DB-25 Printer Cable

NOTE: *The OTC serial printer (part number 3315, which has a 2400 baud rate) or OTC Hi Speed Serial printer (part number 3285, which has a 9600 baud rate) is recommended if a printer is desired.*

1 Connect power to the printer by using one of the following methods:

a. Insert the printer's power plug into the battery adapter cable and attach the battery adapter cable to the battery.

or

b. Insert the printer's power plug into a cigarette lighter receptacle.

2 Connect the DB-25 printer cable between the DDT's serial interface and the printer.

3 Turn the printer power switch On.

4 Set the DDT stop bit and baud rate as described in the section of this manual titled, Tool Setup.

5 The printer will be ready to print once you have completed and saved the setup. To begin printing, press F2, then 1 or press F2, then 9 to display the File Manager screen. While printing, the DDT ignores all commands (except the MODE key) and shows "PRINTING."

6 To stop a printout, press the MODE key. A few more lines may print while the printer memory is clearing.

You can print almost any time that data from the engine is being displayed. A screen that does not display data, such as the Injector Test, does not allow printing.

1.0 Introduction

USING OTHER SERIAL PRINTERS

Requirements for other printers

1 The printer must have a serial data protocol with x–on/x–off handshaking.

2 There is a tool-to-printer cable available. The cable must be configured as shown:

DB-25
2–TXD (Host out)
3–RCV (Host in)
7–Ground

3 The printer can have a baud rate of 300, 600, 1200, 2400, 4800, or 9600.

4 The printer must have one or two stop bit capability.
(The DDT defaults to 2400 baud rate and one stop bit.)

TOOL SETUP

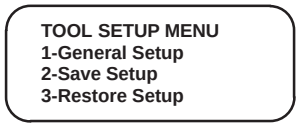
Overview

Use this function to select the DDT baud rate and the number of stop bits. You can also save the Tool Setup or restore the previously saved setup.

Make sure the SELECT FUNCTION Menu screen is displayed on the DDT.

Main Menu

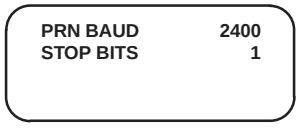
Press the 2 key. The TOOL SETUP MENU screen will appear.



General Setup

TO SET THE DDT:

From the TOOL SETUP MENU, press the 1 key. The GENERAL SETUP screen will appear.



Use the ↑ and ↓ keys to scroll the cursor. When the cursor is located on the line you wish to change, use the ← and → keys to change the options. Option choices are listed in the table below.

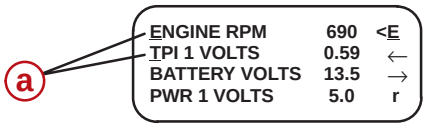
Parameter	Options	Defaults
Baud	300, 600, 1200, 2400, 4800, 9600	2400
Stop Bits	1 or 2	1

Once the selected choice is made, then press MODE to exit. From the TOOL SETUP MENU select 2 if you wish to save the setup. Follow the instructions on the screen. When the settings are saved press MODE to return to the SMARTCRAFT MONITOR screen.

1.0 Introduction

LINE LOCK

If you want a line of data to stay in place, press key 1, 2, 3 or 4 to hold data line 1, 2, 3, or 4 in place. Pressing the number again will unlock that line. As you scroll, the lines locked will stay in place and the next data items will appear in the unlocked lines.



a - Line Lock Example

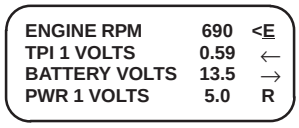
In the example screen shown above, lines 1 and 2 are locked (a locked line will underline the first character). New data lines will appear in lines 3 and 4.

RECORD/PLAYBACK

The Diagnostic Cartridge contains a Recording feature that allows you to capture information at certain times when data is displayed on the screen. Once data has been captured, you can play it back immediately or save it in a file for playback and printing.

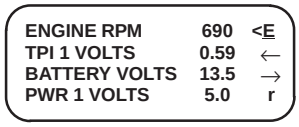
The data will be captured in “frames.” A “frame” of data is a snapshot of data read from the ECM.

Without operator action, the software continuously reads data from the ECM at the rate of one frame per second. The program saves each frame until 26 frames have been saved. The data is then continuously updated.



R = Indicates software continuously reading and updating data.

To record data, simply press the RECORD key on the DDT, but wait until you have about 26 frames of data (approximately 26 seconds) before you press the RECORD key. When the RECORD key is pressed, the 26 frames of data that occurred before the key was pressed will be captured, as well as the next 25 frames that occur after the key is pressed (the **R** displayed in lower right hand corner will change to a lower case **r**).

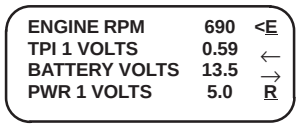


r = Recording in progress.

1.0 Introduction

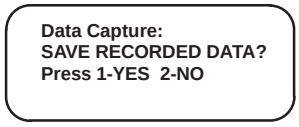
RECORD/PLAYBACK

When all 51 frames of data have been recorded, the **r** displayed in the lower right hand corner of the screen will change to an upper case **R** (underlined).

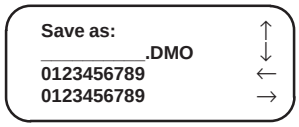


R = Recording complete.

To save the frames of data that have been captured, press the MODE key. This will automatically take you to the Data Capture Screen. When the Data Capture screen appears, press 1 – YES to save data.



Press the YES key if you want the data to be saved to a file. The following screen will appear.



You may enter any file name up to eight characters in length. To name the file, press a number key from 0 to 9 to select a number. Press the ↑ key and press a number from 0 to 9 to select the letters A to J.

Press the ↑ key to display the letters K to T and again to see the letters U to Z.

Press the ↓ key to display the previous set of letters.

When you have entered the file name, press the ENTER key.

RECORD/PLAYBACK

Save Error

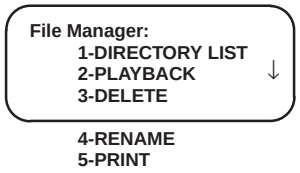
If Data Capture is unable to save a file, an error screen will be displayed. Errors usually occur because the number in the Needed Space field will be larger than the number in the Total Free field.

To free up enough space, first press the ENTER key to exit, then press F2 + 9 to enter the File Manager and select 3 – Delete. You will need to select a file that you no longer need and delete it. This will free up space in memory to store another file. (For further details, see the section on deleting files under File Manager.)

File Manager Menu

The File Manager Menu allows you to manage the limited space available for saving files. It also allows you to print and play back data that has been recorded and saved at an earlier date.

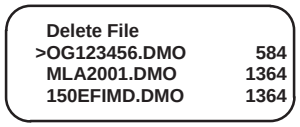
To reach the File Manager Menu, press the F2 key followed by the 9 key. The screen illustrated will appear.



Directory List

The Directory List option of the File Manager allows scrolling through the list of files in memory. The top line of the display always shows the amount of available space for new files.

From the File Manager Menu, press the 1 key and the screen illustrated will appear, provided files have been saved.



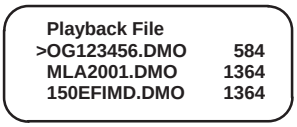
The ↑ and ↓ keys can be used to scroll through the list of files. Press the MODE key to exit back to the File Manager Menu.

1.0 Introduction

RECORD/PLAYBACK

Playback File

The Playback File option allows a file to be selected, then played back.



To access Playback File, press the 2 key from the File Manager Menu.

Use the ↑ and ↓ keys to scroll through the list of files. When the desired file is to the right of the > symbol on line 2, press the ENTER key to select the file.

The playback displays the data as it was recorded. (Use both the ↑ and ↓ keys and the ← and → keys to see information).

When you are finished playing back the data, press the MODE key to return to the File Manager Menu.

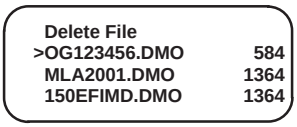
Delete

Delete files that are no longer needed. Otherwise, the area fills up and there will not be room for new data.

To delete a file from the File Manager Menu, press the 3 key and the Delete File menu will appear.

Use the ↑ and ↓ keys to scroll through the list of files. When the desired file is to the right of the > symbol on line 2, press the ENTER key to delete it.

The file will be deleted and the File Manager Menu will appear again.

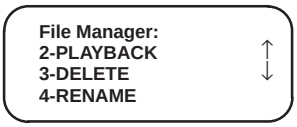


RECORD/PLAYBACK

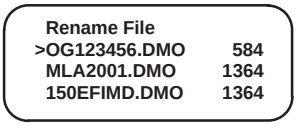
Rename

Files may be renamed from the File Manager Menu.

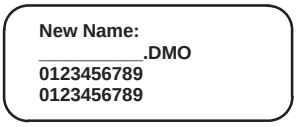
To rename a file from the File Manager Menu, press the 4 key. The Rename File menu will appear.



Use the ↑ and ↓ keys to scroll through the list of files. When the desired file is to the right of the > symbol on line 2, press the ENTER key to select it.



You may enter a new file name in the same way you did to originally save the file.



Press the ENTER key when the new name has been entered.

Live Data Printing

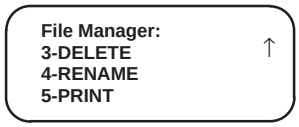
Live data printing can be activated either in the Data Monitor or Fault Status mode by pressing the F2 + 1 keys. Printing will continue indefinitely unless the MODE key is pressed. This will abort the printing process.

RECORD/PLAYBACK

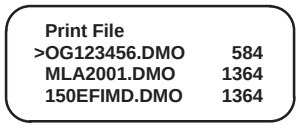
Print

Once data has been captured and saved to a file, the data may also be sent to the printer. Printing of files can be done without the DDT being connected to an ECM. This is done using a 12 volt power supply and printing through the File Manager function.

To print captured data from the File Manager Menu, select the PRINT option by pressing the 5 key. The Print File menu will appear.



Use the ↑ and ↓ keys to scroll through the list of files. When the desired file is to the right of the > symbol on line 2, press the ENTER key to select it.



The selected file will then be printed.

NOTE: *Files can also be transferred to a PC and printed from there. (See Personal Computer setup.)*

TRANSFERRING DATA TO A PC

It should be noted that the PRINT function can be used to transfer the formatted print data to a PC. The following example uses Windows 3™, but any DEC VT-100 terminal emulation program can be used.

NOTE: *You can use the existing serial printer cable, however, you may need to use a DB25 Null Modem adaptor plug and/or a DB25 to DB9 adaptor plug if required by your PC.*

1 Use OTC cable (p/n 212535) and connect between the DDT printer port and the PC's COM1 port (or an available serial port).

2 Set up the Windows terminal emulation program on the PC to capture the print data into a file as follows:

a. **Select the Accessories Icon.**

b. **Select the Terminal Icon.**

c. From the menu bar, **select Settings – Communications. Set the communications parameters** as follows:

Baud Rate:	9600
Data Bits:	8
Parity:	None
Stop Bits:	1
Flow control:	Xon/Xoff
Connector:	COM1

d. **Select OK.**

3 Make sure the DDT baud rate matches the terminal baud rate. This can be done from the Tool Setup Function. **Select 1 – General Setup** and **set the following**:

PRN BAUD to 9600 and
PRN STOP BITS to 1.

4 From the Windows terminal menu bar, **select Transfers – Receive text file.** You will then be asked to assign a filename. (File name you wish to upload from the cartridge. For example, OG123456.txt) *Important – the file must have a ".txt" extension.* **Select OK when entered.**

TRANSFERRING DATA TO A PC

5 To enter the DDT File Manager menu, **Press F2 and then 9 and select choice 5 – Print.** Use the ↑ and ↓ keys to scroll and select the file. **Press ENTER.** Data should now transfer to the PC screen.

NOTE: *If the data transfer to the PC screen does not look correct, this indicates that the baud rate is not correct. The cartridge default setting is 2400. Please make sure that the tool baud rate matches what you are setting up the PC software to do.*

6 Once all the data has been received, **select Transfers – Stop**, from the Windows terminal menu bar. The data will be saved to the hard drive as OG123456.txt.

7 **Clear the terminal screen for the next file. Select Edit – Clear Buffer.** Steps 4, 5, 6, and 7 can be repeated if you need to transfer more files.

8 Once the file has been saved on the PC, it can be manipulated in any desired manner. For example, you can;

- Print to the PC's printer.
- Edit the file.
- Include the file in a report. Most PC word processors and spread sheets can import a single text file into a document.

(Refer to your word processor manual for instructions on printing, editing and importing files.)

2.0 Marine Diagnostics

OVERVIEW

1-Mercury Marine

- **1-DATA MONITOR**
- **2-FAULT STATUS**
- **3-SYSTEM INFO**
- **4-HISTORY**
- **5-SPECIAL FUNCTIONS**

2.0 Marine Diagnostics

OVERVIEW

Testing with the DDT is easy. The software program presents a series of menus from which the technician selects tests or functions desired.

The software will communicate with the ECM and extract or monitor data stored or processed by the ECM. In general, the functions provided include; faults, events, data, data capture (recording) and file management.

You can perform many different functions, depending on the features that are available within the ECM.

a. Data Monitor – Display operating parameters that are being received from the ECM.

b. Fault Status – Display the current state of engine actuators or sensors.

c. System Info – Display the internal ID of an ECM.

d. History – Stored history within the ECM.

e. Special Functions – Allows user to perform special test functions as allowed by the ECM.

All of the menu functions available for the system selected will be displayed. If an up or down arrow is also displayed on the screen, press the ↑ or ↓ key to see the additional screens available.

The Mainhead, Subhead, and/or Sub-subhead on the top of each page describes the steps needed to follow on the menu structure to arrive at the place on the DDT that is being described on that page. Select a choice by pressing the corresponding number key.

Main Menu

2.0 Marine Diagnostics

1-Mercury Marine

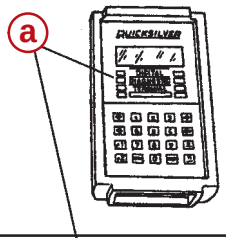
LED OVERVIEW

The SmartCraft systems diagnostic cartridge contains a diagnostic program for the ECM that allows the technician access to all of the diagnostic capabilities available through the engine Electronic Control Module (ECM).

Simply hook the diagnostic cable to the ECM diagnostic connector and plug in the software cartridge. You will be able to see the current state of the engine, status of sensors and switches, run time history and stored faults.

The ECM program can help diagnose intermittent engine problems. It will record the state of the engine sensors and switches for a period of time, much like a tape recorder would. Then you can playback and review the recorded information.

The DDT also has LED failure indicators below the display. These indicators illuminate when a fault exists in the following areas:



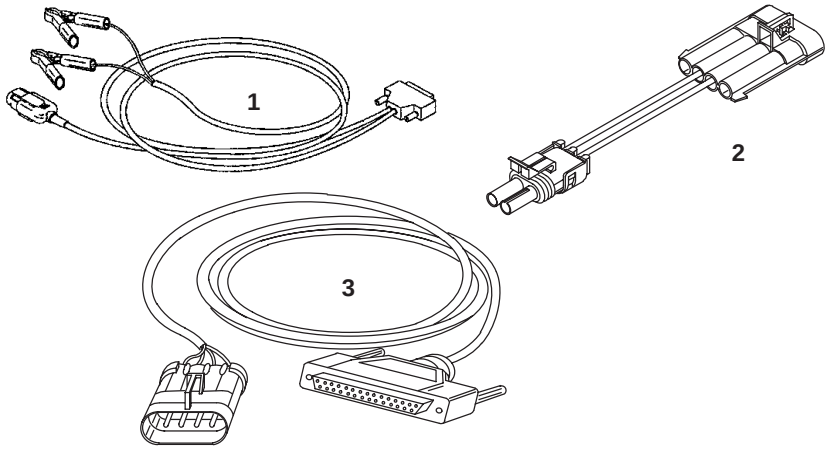
Ignition	**1**	**DIGITAL DIAGNOSTIC TERMINAL**	**5**	**Switches**
Injector	**2**		**6**	**Miscellaneous**
Pump	**3**		**7**	**Limiter**
Sensors	**4**		**8**	**Break In**

a - LED Indicators

2.0 Marine Diagnostics

1-Mercury Marine

ADAPTOR CABLES



1 84-822560A 5
2001 and newer Outboard Opti/EFI/PCM or ECM 555 based SmartCraft Systems

2 84-822560A 12
Adaptor used with item 1 – for MerCruiser EFI/PCM or ECM 555 based SmartCraft Systems

3 84-822560A 13
MerCruiser EFI/PCM or ECM 555 based SmartCraft Systems

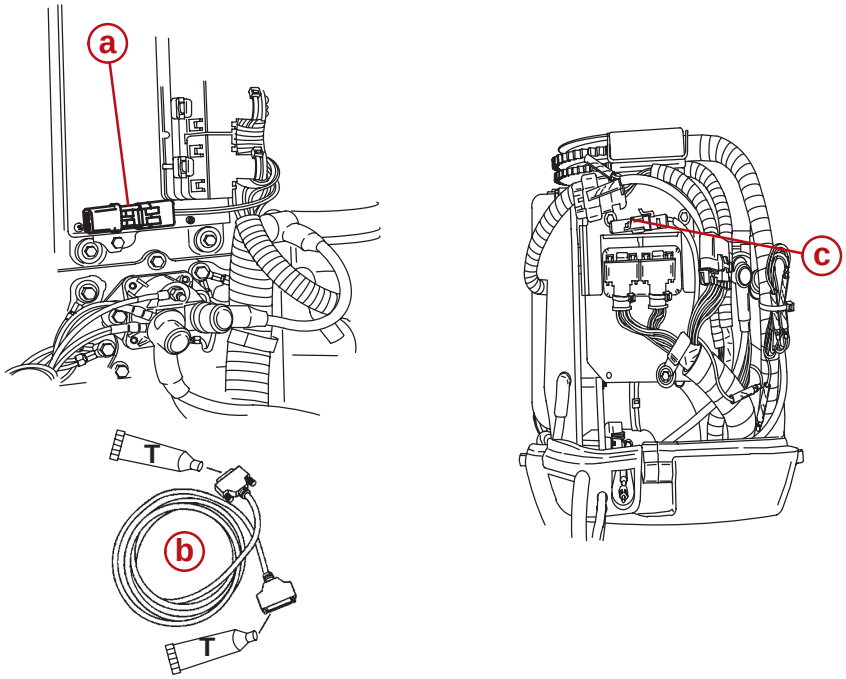
1-Mercury Marine

DIAGNOSTIC PORT LOCATIONS - OUTBOARD

IMPORTANT: Engine must be OFF before connecting the DDT adaptor cable to the ECM.

1 Connect the DDT adaptor cable to the ECM diagnostic port as shown. Attach the battery clips to a 12v battery.

2 Connect the DDT Interface Cable between the DDT and the DDT adaptor cable, if required.



a - Diagnostic Port Location 2.5L and 3.0L OptiMax
b - DDT Interface Cable
c - Diagnostic Port Location 30-60 HP 4 Stroke Outboard

T Dielectric Grease (92-823506--1)

NOTE: *Apply a small amount of dielectric grease to the 25 pin ends of the interface cables. This will minimize corrosion in the saltwater environment.*

2.0 Marine Diagnostics

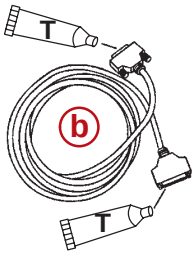
1-Mercury Marine

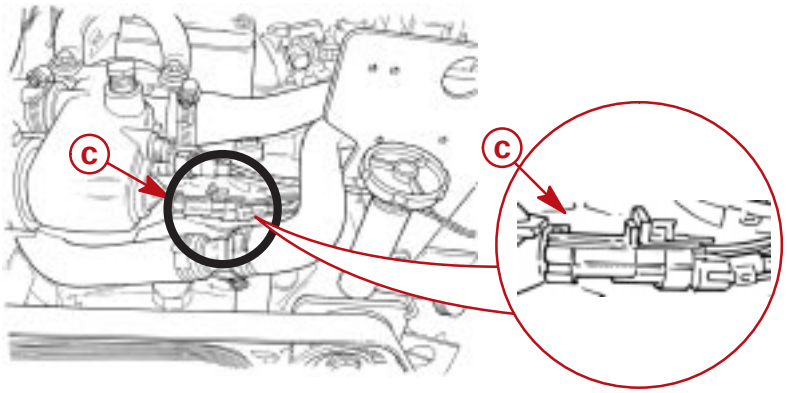
DIAGNOSTIC PORT LOCATIONS - MERCRUISER

IMPORTANT: Engine must be OFF before connecting the DDT adaptor cable to the ECM.

1 Connect the DDT adaptor cable to the ECM diagnostic port as shown. Attach the battery clips to a 12v battery.

2 Connect the DDT Interface Cable between the DDT and the DDT adaptor cable, if required.





a - Diagnostic Port Location 8.1L MerCruiser
b - DDT Interface Cable
c - Diagnostic Port Location 4.3-5.7-6.2L MerCruiser

T Dielectric Grease (92-823506--1)

NOTE: *Apply a small amount of dielectric grease to the 25 pin ends of the interface cables. This will minimize corrosion in the saltwater environment.*

2.0 Marine Diagnostics

1-Mercury Marine

POWER UP

NOTE: *If the display is blank:*
– engine switch is off
– the interface and/or adaptor cables are not properly connected

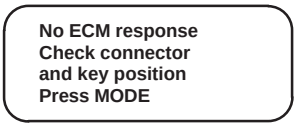
1 Insert the software cartridge into the DDT, making sure the label is facing up. You should feel it click into place if done correctly.

2 Set the engine key to RUN or ON position.

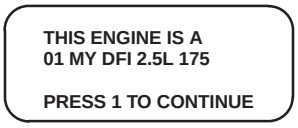
3 A power-up screen will be displayed while the DDT performs a self test.

After the copyright screen appears, the SmartCraft monitor screen will appear. Select 1 - Mercury Marine.

4 The DDT will attempt to communicate with the ECM. If it cannot, a NO RESPONSE screen will be displayed.



If the DDT can communicate with the ECM, the next screen displayed will indicate the model year, displacement and horsepower.

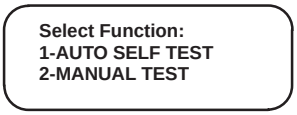


2.0 Marine Diagnostics

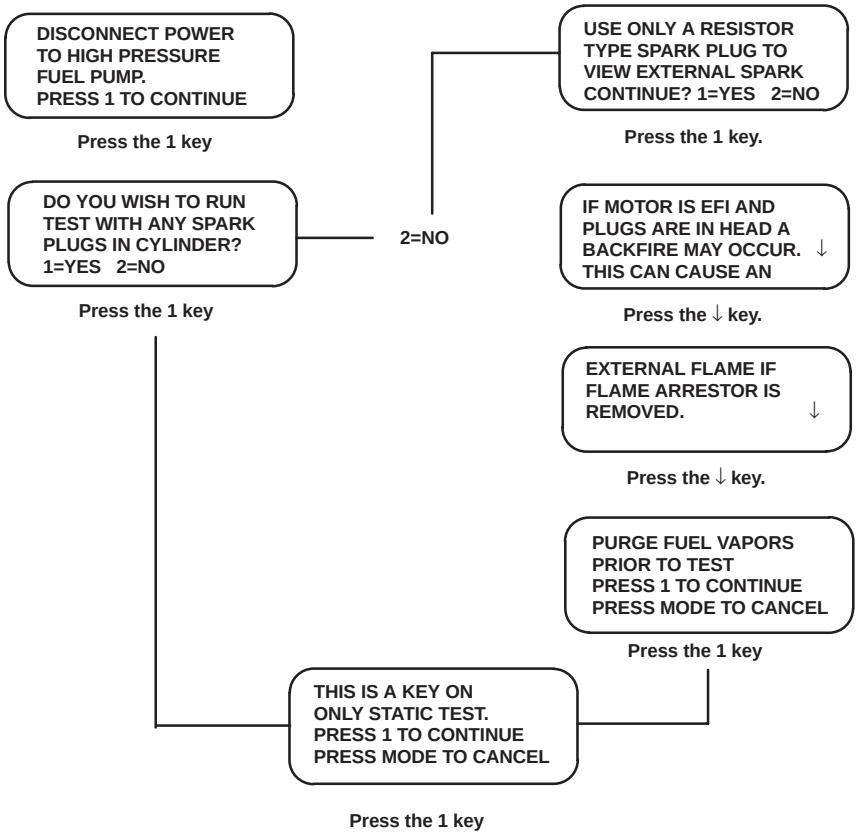
1-Mercury Marine

SELF TEST

The ECM diagnostic software has been enhanced to allow the user to make use of new DDT and ECM features.



The Auto Self Test will activate all system actuators and scan all sensors to determine if they are within the expected range. **It is advisable to disable the electric fuel pump(s) during the test.** To disable the electric fuel pump remove the fuse or unplug the connector(s) to the pump(s). Make sure the Select Function menu screen is displayed. Press the 1 key.



2.0 Marine Diagnostics

1-Mercury Marine

2 STROKE EXAMPLES

STATIC TEST IN
PROGRESS TESTING
DIRECT INJECTORS /
PRESS MODE TO CANCEL

STATIC TEST IN
PROGRESS TESTING
IGNITION –
PRESS MODE TO CANCEL

STATIC TEST IN
PROGRESS TESTING
FUEL INJECTORS \
PRESS MODE TO CANCEL

STATIC TEST IN
PROGRESS TESTING
HORN /
PRESS MODE TO CANCEL

STATIC TEST IN
PROGRESS TESTING
OIL PUMP \
PRESS MODE TO CANCEL

STATIC TEST IN
PROGRESS TESTING
SENSORS –
PRESS MODE TO CANCEL

TEST COMPLETED.
PRESS 1 TO VIEW
RESULTS OR PRESS
MODE TO EXIT

Press the 1 key to review results

4 STROKE EXAMPLES

STATIC TEST IN
PROGRESS TESTING
IGNITION –
PRESS MODE TO CANCEL

STATIC TEST IN
PROGRESS TESTING
FUEL INJECTORS \
PRESS MODE TO CANCEL

STATIC TEST IN
PROGRESS TESTING
IAC VALVE /
PRESS MODE TO CANCEL

STATIC TEST IN
PROGRESS TESTING
SENSORS –
PRESS MODE TO CANCEL

TEST COMPLETED.
PRESS 1 TO VIEW
RESULTS OR PRESS
MODE TO EXIT

Press the 1 key to review results

NOTE: *The type of tests performed will depend on the engine type and the system components supported by the ECM resulting in different screen displays.*

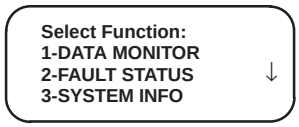
2.0 Marine Diagnostics

1-Mercury Marine

1-DATA MONITOR

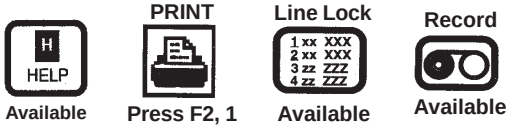
NOTE: *When starting the engine, the DDT may "lock up" due to low battery voltage. If this happens, remove the cartridge and reinsert it. This will reset the DDT and it will power up again.*

You can use the Data Monitor function to display engine operating parameters available from the ECM. The screen will display "live" data such as engine speed, throttle position, battery volts, air temperature, map psi, coolant temperature, TPI % and more. You can also record and/or print the data for detailed examination or for your records.



The Data Monitor display items may vary depending on the specific engine type being serviced. Many sensors or parameters may be common between two stroke or four stroke engines. The first section of the Data Monitor screens will be examples of a two stroke DFI engine. The next section will be examples of a four stroke EFI engine.

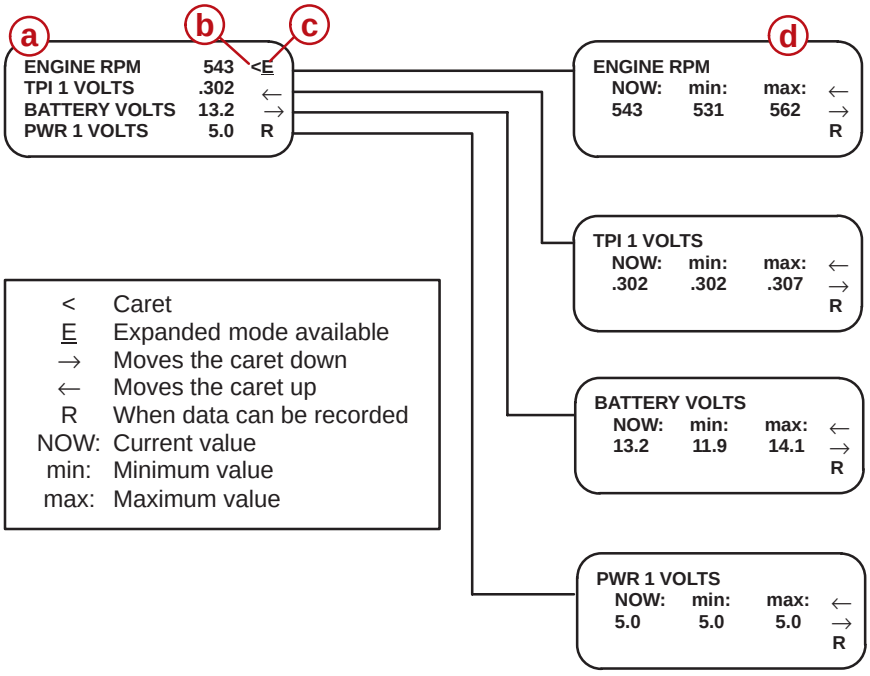
Press the 1 key. Start the engine. The DATA MONITOR screen will appear.



1-Mercury Marine

1-DATA MONITOR
(TWO STROKE EXAMPLE SCREENS)

Use the ← or → keys to move the caret to each parameter. Then press the ENTER key to display the expanded data for the parameter at the caret. To exit the expanded data screens, press the MODE key to return to the Data Monitor.



a - Screen 1
b - Caret
c - Indicates expanded mode available
d - Expanded mode

NOTE: *For all data items, the minimum value is the smallest value that has occurred since this test session. The maximum value is the largest value that has occurred since this test session.*

HELP	PRINT	Line Lock	Record
Available	Press F2, 1	Available	Available

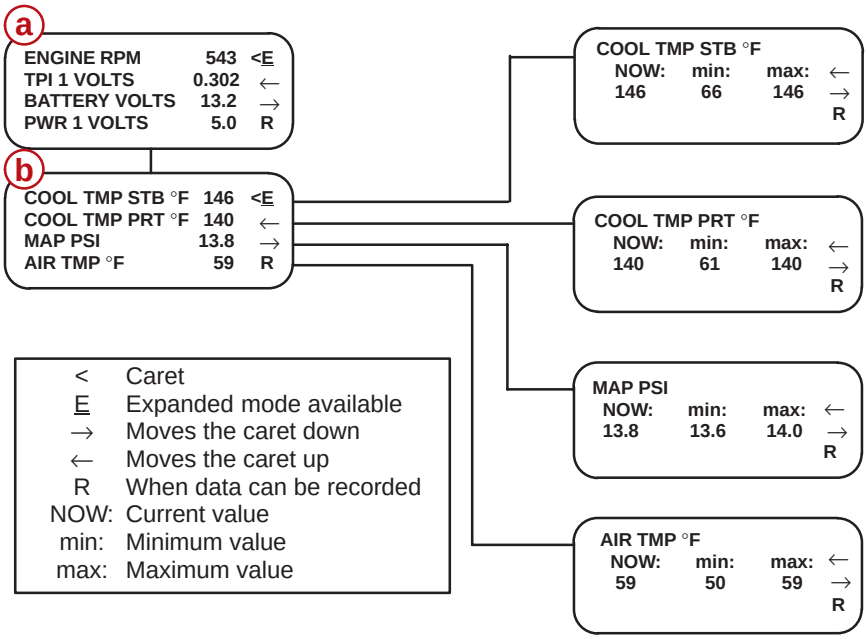
2.0 Marine Diagnostics

1-Mercury Marine

1-DATA MONITOR
(TWO STROKE EXAMPLE SCREENS)

NOTE: *Pressing 0 clears the minimum/maximum values.*

To view sensors on screen number 2, press the ↑ or ↓ key until the sensors for screen 2 are displayed. Press ENTER to view the expanded screen for the sensor positioned opposite of the < caret.



a - Screen 1
b - Screen 2

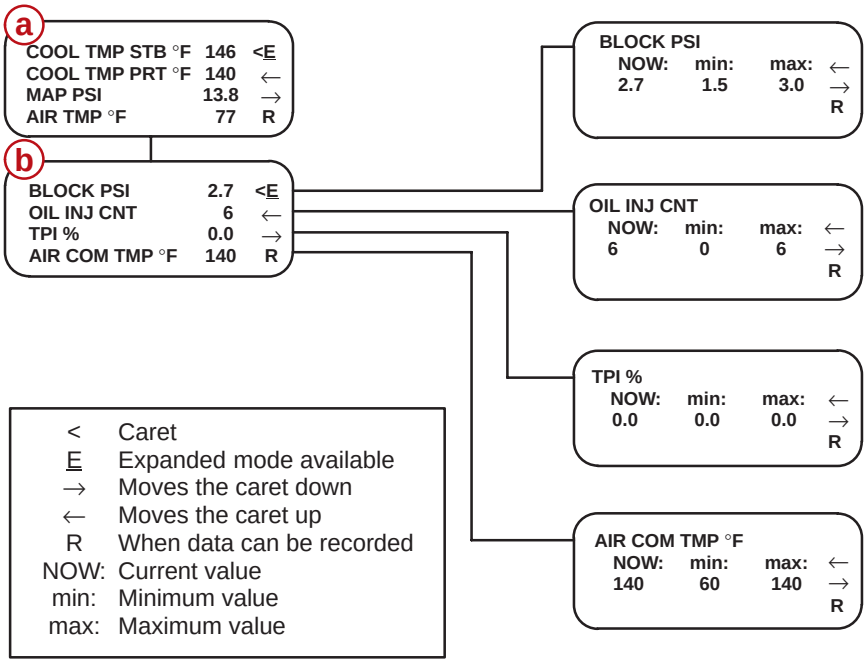
When the Data Monitor is reading data, you can press the RECORD key at any time to record four parameters currently displayed. The record function will also save the status of the LED indicators. See the **Record/Playback** section of this manual.

PRINT	Line Lock	Record	
Press F2, 1	Available	Available	Available

1-Mercury Marine

1-DATA MONITOR
(TWO STROKE EXAMPLE SCREENS)

To view sensors on screen number 3, press the ↑ or ↓ key until the sensors for screen 3 are displayed. Press ENTER to view the expanded screen for the sensor positioned opposite of the < caret.



a - Screen 2
b - Screen 3

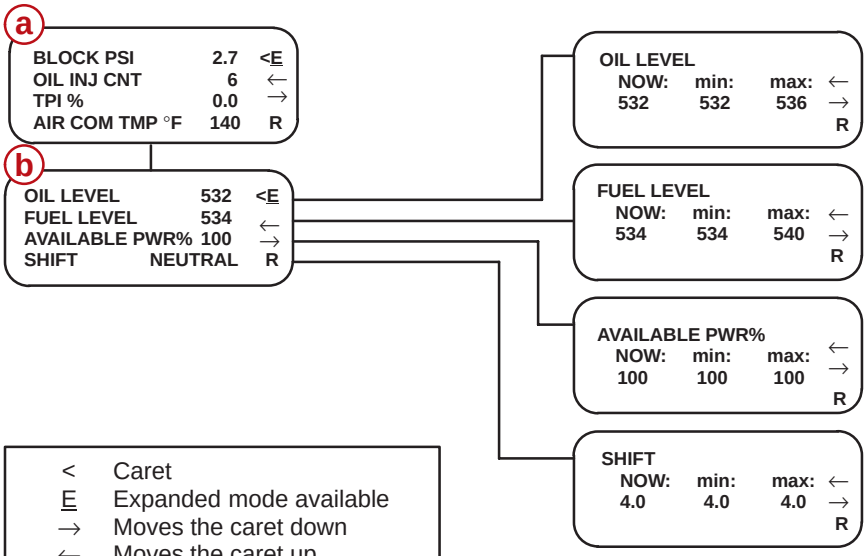
PRINT	Line Lock	Record	
Press F2, 1	Available	Available	Available

2.0 Marine Diagnostics

1-Mercury Marine

1-DATA MONITOR
(TWO STROKE EXAMPLE SCREENS)

To view sensors on screen number 4, press the ↑ or ↓ key until the sensors for screen 4 are displayed. Press ENTER to view the expanded screen for the sensor positioned opposite of the < caret.



<	Caret
E	Expanded mode available
→	Moves the caret down
←	Moves the caret up
R	When data can be recorded
NOW:	Current value
min:	Minimum value
max:	Maximum value

a - Screen 3
b - Screen 4

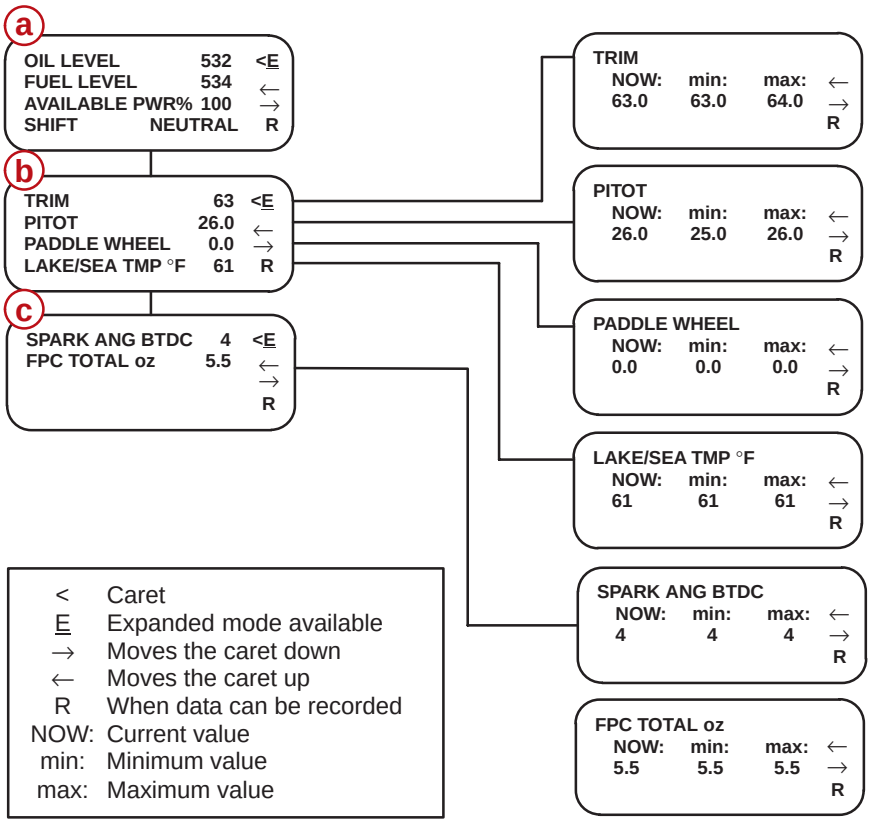
NOTE: *SHIFT NEUTRAL = 4.0*
SHIFT IN GEAR = 5.0

PRINT	Line Lock	Record		Press
Press F2, 1	Available	Available	Available	To EXIT

1-Mercury Marine

1-DATA MONITOR
(TWO STROKE EXAMPLE SCREENS)

To view sensors on screen number 4, press the ↑ or ↓ key until the sensors for screen 4 are displayed. Press ENTER to view the expanded screen for the sensor positioned opposite of the < caret.



<	Caret
E	Expanded mode available
→	Moves the caret down
←	Moves the caret up
R	When data can be recorded
NOW:	Current value
min:	Minimum value
max:	Maximum value

a - Screen 4
b - Screen 5
c - Screen 6

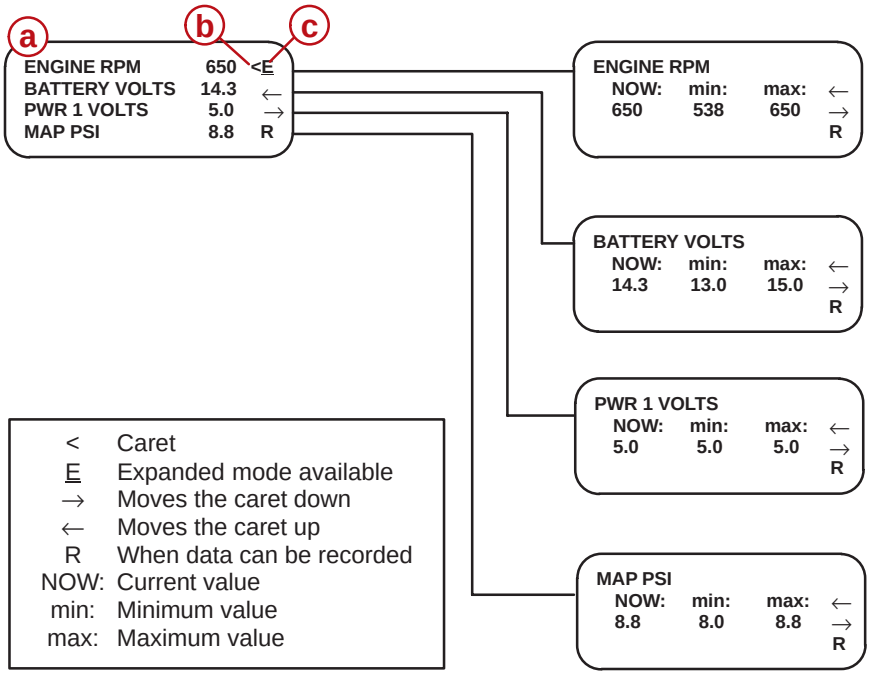
PRINT	Line Lock	Record		Press
Press F2, 1	Available	Available	Available	To EXIT

2.0 Marine Diagnostics

1-Mercury Marine

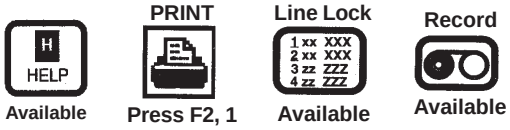
1-DATA MONITOR
(FOUR STROKE EXAMPLE SCREENS)

Use the ← or → keys to move the caret to each parameter. Then press the ENTER key to display the expanded data for the parameter at the caret. To exit the expanded data screens, press the MODE key to return to the Data Monitor.



a - Screen 1
b - Caret
c - Indicates expanded mode available

NOTE: *For all data items, the minimum value is the smallest value that has occurred since this test session. The maximum value is the largest value that has occurred since this test session.*

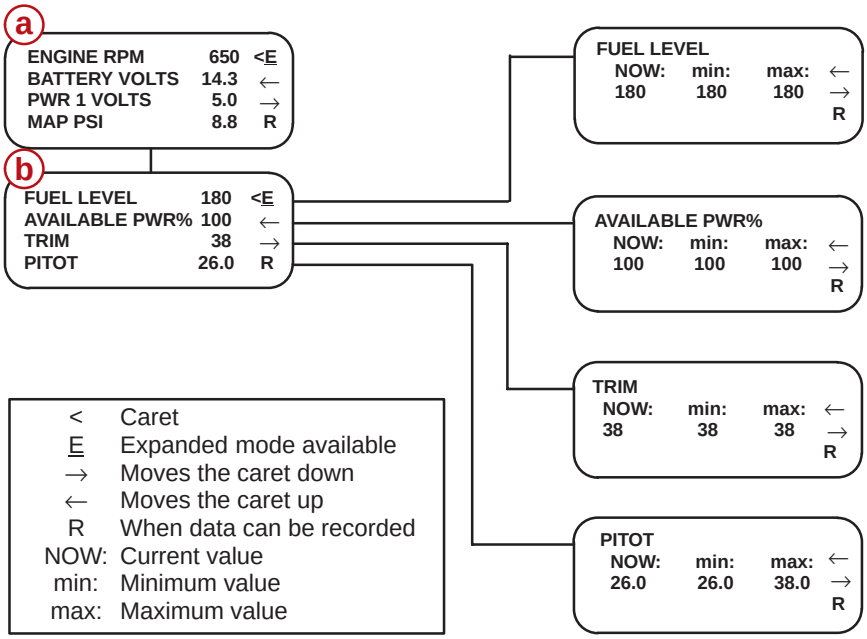


1-Mercury Marine

1-DATA MONITOR
(FOUR STROKE EXAMPLE SCREENS)

NOTE: *Pressing 0 clears the minimum/maximum values.*

To view sensors on screen number 2, press the ↑ or ↓ key until the sensors for screen 2 are displayed. Press ENTER to view the expanded screen for the sensor positioned opposite of the < caret.



a - Screen 1
b - Screen 2

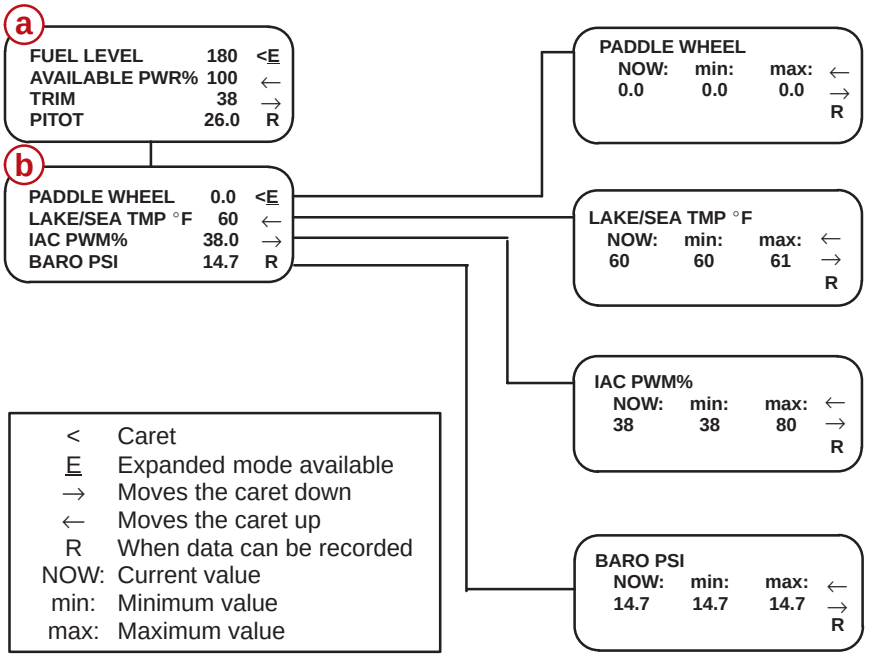
When the Data Monitor is reading data, you can press the RECORD key at any time to record four parameters currently displayed. The record function will also save the status of the LED indicators. See the **Record/Playback** section of this manual.

2.0 Marine Diagnostics

1-Mercury Marine

1-DATA MONITOR
(FOUR STROKE EXAMPLE SCREENS)

To view sensors on screen number 3, press the ↑ or ↓ key until the sensors for screen 3 are displayed. Press ENTER to view the expanded screen for the sensor positioned opposite of the < caret.



a - Screen 2
b - Screen 3

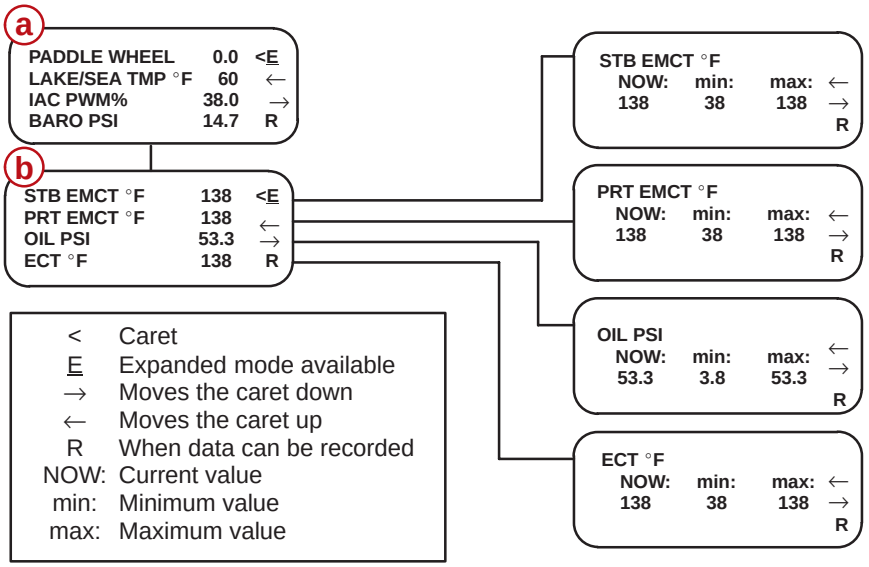
PRINT	Line Lock	Record	
Press F2, 1	Available	Available	Available

2.0 Marine Diagnostics

1-Mercury Marine

1-DATA MONITOR
(FOUR STROKE EXAMPLE SCREENS)

To view sensors on screen number 4, press the ↑ or ↓ key until the sensors for screen 4 are displayed. Press ENTER to view the expanded screen for the sensor positioned opposite of the < caret.



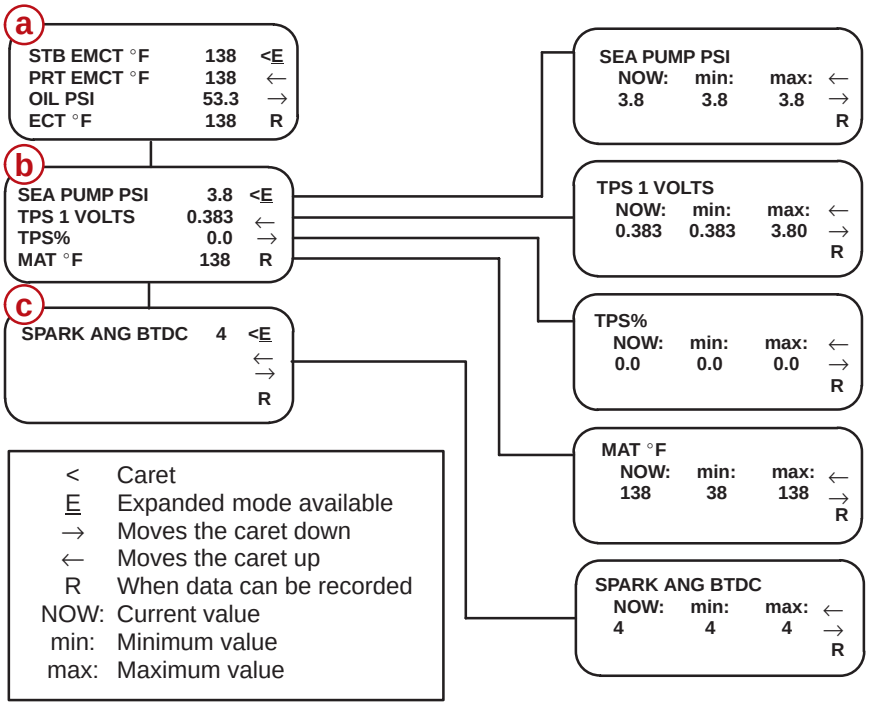
a - Screen 3
b - Screen 4

2.0 Marine Diagnostics

1-Mercury Marine

1-DATA MONITOR
(FOUR STROKE EXAMPLE SCREENS)

To view sensors on screen number 4, press the ↑ or ↓ key until the sensors for screen 4 are displayed. Press ENTER to view the expanded screen for the sensor positioned opposite of the < caret.



a - Screen 4
b - Screen 5
c - Screen 6

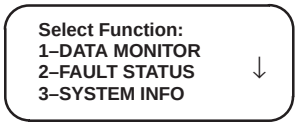
2.0 Marine Diagnostics

1-Mercury Marine

2-FAULT STATUS

You can use the Fault Status function to display the active or history status of ignition, injectors, pumps, sensors, switches, miscellaneous items, limit modes or break-in status.

Make sure that the SELECT FUNCTION menu screen is displayed on the DDT.



FAULT STATUS has been organized in a way by which all faults can be viewed from a single display area. For example: if a sensor fault occurs while connected to the ECM, LED 4 will light.

Press the 2 key

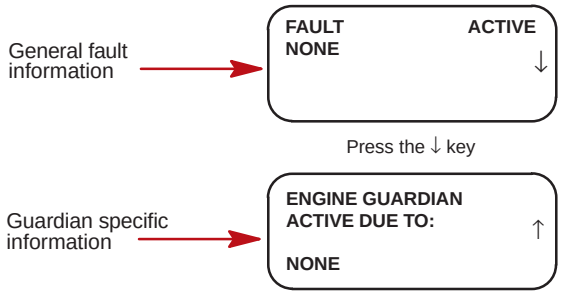
All LED (1-8) supported faults will be displayed in the FAULT STATUS display area. When a fault is currently active the YES message will appear. If the fault corrects itself while the user is still connected to the ECM, the message will change to NO. The message No would indicate that a past history event occurred with that specific device. NO is usually an indication of an intermittent connection problem. Faults are also stored in the Freeze Frame buffers. See the section on Freeze Frame for more details. If there are no faults active, the message NONE will be displayed in the FAULT STATUS screen.

2.0 Marine Diagnostics

1-Mercury Marine

2-FAULT STATUS

Starting with model year 2004 PCMs and ECMs can display to the DDT the exact reason that engine guardian is active. Here are a few examples of how engine guardian can reduce engine power: coolant temperature high, block pressure low, critical sensor faults or battery voltage just to name a few. If there are no problems requiring action by guardian then 'none' is displayed on the 'engine guardian active due to' screen. The screen has been added to the end of the existing fault active screen list.



PRINT
Press F2, 1

Press
MODE
To EXIT

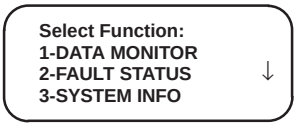
1-Mercury Marine

3-SYSTEM INFO

NOTE: *SYSTEM INFO includes typical ranges for sensors and output devices for the specific ECM.*

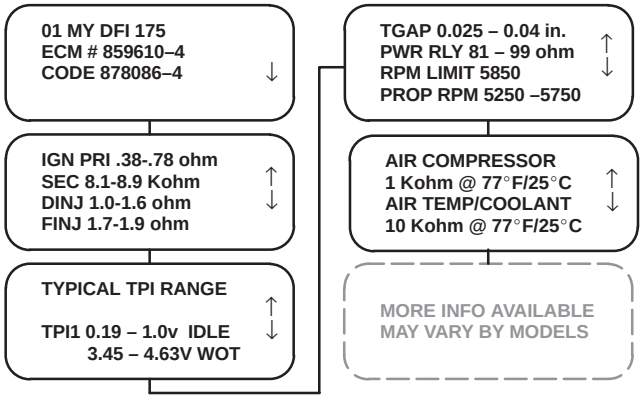
Using the SYSTEM INFO function, you can display the ID of the engine, ECM, Calibration, Engine version as well as component specs which are stored in the ECM.

Make sure that the SELECT FUNCTION menu screen is displayed on the DDT.



Press the 3 key. The SYSTEM INFO screen will appear.

Press the MODE key to return to the SELECT FUNCTION menu. The screens below are an example of how screens will appear.



PRINT
Press F2, 1

HELP
Available

Press MODE
To EXIT

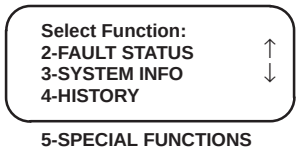
2.0 Marine Diagnostics

1-Mercury Marine

4-HISTORY

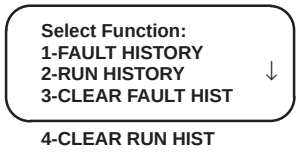
Using the HISTORY function, you can display the history stored in the ECM.

Make sure that the SELECT FUNCTION menu screen is displayed on the DDT. Use the ↓ key to display the additional screens.



The HISTORY group is split into 2 categories, FAULT and RUN HISTORY. Fault history contains Freeze Frame and Fault Seconds information. Run history contains a history count of actual run times for the entire RPM range, as well as important fault information.

Press the 4 key. The Select Function History screen will appear.



1-Mercury Marine

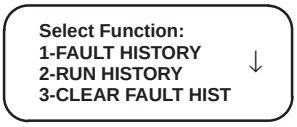
4-HISTORY

FREEZE FRAME

Fault History has been divided into two categories, Freeze Frame and Fault Seconds. Fault Seconds will record, in seconds, the length of time an engine critical system fault occurred. All other faults will be stored in a 10 buffer Freeze Frame. Freeze Frame allows the technician to actually view what operating conditions the engine was under at the time the fault occured.

The freeze frame auto capture software within the ECM, will store an instantaneous snapshot of engine critical data that will give the service technician more detailed information as to what the engine operating conditions were like at the time a fault was logged. There are a total of 10 storage buffers to retain fault information. The buffers are labeled 0 - 9 (10 buffer total). Each buffer will store a single fault. If frequent faults occur with the same component, rather than storing the same information in a new buffer, a frequency counter will be incremented by one count and all the remaining data items will be updated at the time the fault reoccurred. If there are no faults stored in freeze frame, the DDT will display the following message: NO STORED FAULTS. As the freeze frame buffers are filled, then the DDT menu choice will be updated accordingly. Example: if there are 3 buffers filled containing data, the DDT will display choices 0 - 2 in the menu list.

Make sure the SELECT FUNCTION menu screen is displayed on the DDT.



Press the 1 key. the Select Fault History screen will appear.

Press the 1 key to view Freeze Frame data history stored in the ECM.

2.0 Marine Diagnostics

1-Mercury Marine

4-HISTORY

```
PLEASE WAIT
READING ECM
DATA.....
```

If there is data stored in the Freeze Frame buffer, a menu list is displayed which actually identifies the fault that triggered the freeze frame event.

Make sure the FREEZE FRAME menu screen is displayed on the DDT.

```
FREEZE FRAME BUFFERS
0-BREAK-IN
1-DINJ6 OPEN
2-PORT OVERHEAT
```

or

```
FREEZE FRAME BUFFERS
NO STORED FAULTS

PRESS MODE TO EXIT
```

Press the 1 key. Direct Injector 6 or its connection triggered this event. You will now be able to view engine system data at the exact time the fault was recorded.

```
DINJ 6 OPEN
BARO PSI          14.1
BATT VOLTS        14.6
BLOCK PSI          5.3
```

← The barometric pressure when the fault occurred.
← The battery voltage when the fault occurred.
← The engine block pressure when the fault occurred.

```
BOAT SPEED        0.0
AIR TMP °F       78.8
COOL TMP °F       127
DEMAND %          0.0
```

← Boat speed when the fault occurred. 0 - 100%
← The engine temperature when the fault occurred.
← The primary (CTS) coolant temperature when the fault occurred.
← The Demand % (TPI%) when the fault occurred.
Demand % applies to DTS models.

```
ENGINE RPM          0
ENGINE STATE    STALL
FPC TOTAL        12.7
FREQ COUNTER        0
```

← The engine RPM when the fault occurred.
← The engine state when the fault occurred.
← The calibrated fueling level when the fault occurred.
← The number of times the fault occurred. 0=1 occurrence, 1=2 occurrence

NOTE: *Not all parameters are available on all engine models. See glossary for further descriptions of data labels.*

PRINT

Press F2, 1

Press

To EXIT

2.0 Marine Diagnostics

1-Mercury Marine

4-HISTORY

FUEL LEVEL %	38.0	↑
SHIFT	IN GEAR	
LAKE/SEA TMP °F	57	↓
LOAD %	0.0	

← The main fuel tank level % when the fault occurred.
← The engine was in gear (or neutral) when the fault occurred.
← The temperature of the lake/sea water when the fault occurred.
← The engine load % when the fault occurred.

MPRLY	0	↑
MAP PSI	14.1	
OIL LEVEL%	38.0	↓
PORT TAB POS	0.0	

← A value of zero indicates there was no request made to activate the main power relay. A value greater than zero indicates that the main power relay was active.
← The MAP pressure when the fault occurred.
← The main oil tank level % when the fault occurred.
← The position of the port trim tab when the fault occurred.

AVAILABLE PWR%	10.0	↑
RUN TIME	38.0	
STAR TAB POS	0.0	↓
TPI%	0.0	

← Available Engine Power % when the fault occurred.
← The time at which the fault occurred.(ECM run time of 38 hr.s)
← The position of the starboard trim tab when the fault occurred.
← The TPI% when the fault occurred.

TRIM POSITION	38.0	↑
COOL TMP STB °F	140	
COOL TMP PRT °F	138	

← The trim position when the fault occurred.
← The starboard coolant temp when the fault occurred.
← The port coolant temp when the fault occurred.

NOTE: *Not all parameters are available on all engine models. See glossary for further descriptions of data labels.*

PRINT

Press F2, 1

Press

To EXIT

2.0 Marine Diagnostics

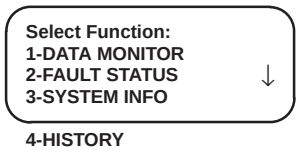
1-Mercury Marine

4-HISTORY

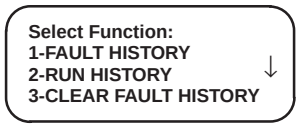
FAULT SECONDS

Using the Fault Seconds function you can display the total amount of time that an engine critical fault has occurred. Fault Seconds should be cleared once the problem has been corrected. Additional fault problems will also be stored in the Freeze Frame buffers for further evaluation if required.

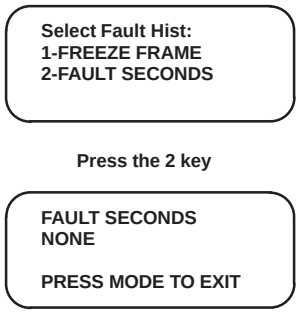
Make sure the Select Function menu screen is displayed. Press the 4 key.



The history menus will appear. Press the 1 key to view Fault History.



The select Fault history screen will appear.



If no faults are stored in the ECM a message indicating NONE will be displayed. If data is stored in the ECM then a fault time list will appear. Only engine critical data is recorded by the ECM. All other fault information will be stored in the Freeze Frame buffers.

1-Mercury Marine

4-HISTORY

FAULT SECONDS			or	FAULT SECONDS	
BATT VOLT HIGH	0			BATT VOLT HIGH	0
BATT VOLT LOW	0	↓		BATT VOLT LOW	0 ↓
BLOCK PRESS LOW	0			BLOCK PSI LOW	0
COMP OVERHEAT	0	↑		COMP OVERHEAT	0 ↑
ETC MOTOR OPEN	0			ETC MOTOR OPEN	0
ETC MOTOR SHORT	0	↓		ETC MOTOR SHRT	0 ↓
FUEL P INPUT HI	0			FUEL PSI IN HI	0
FUEL P INPUT LO	0	↑		FUEL PSI IN LO	0 ↑
GUARDIAN	38			GUARDIAN	38
KNOCK SENS1	0	↓		KNOCK SENS1	0 ↓
KNOCK SENS2	0			KNOCK SENS2	0
OIL PSI STR	0	↑		OIL PSI STR	0 ↑
OIL REMOTE STR	0			OIL REMOTE STR	0
OIL RESERVE STR	38	↓		OIL RESERV STR	38 ↓
MAP INPUT HI	0			MAP INPUT HI	0
MAP INPUT LO	0	↑		MAP INPUT LO	0 ↑
MAP IDLE CHECK	0			MAP IDLE CHECK	0
OIL PUMP	0	↓		OIL PUMP	0 ↓
OVERSPEED	38			OVERSPEED	38
PORT OVERHEAT	0	↑		PORT OVERHEAT	0 ↑
STAR OVERHEAT	0			STAR OVERHEAT	0
WARNING HORN	0			WARNING HORN	0
H2O IN FUEL	0			H2O IN FUEL	0

NOTE: *Not all parameters are available on all engine models. See glossary for further descriptions of data labels.*

PRINT

Press F2, 1

Press

To EXIT

2.0 Marine Diagnostics

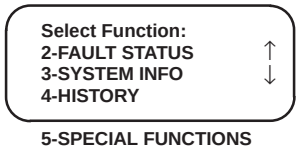
1-Mercury Marine

4-HISTORY

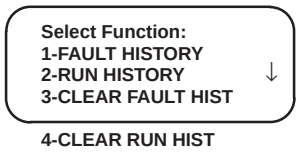
RUN HISTORY

NOTE: *Run Time is displayed in hours unless otherwise specified. The sum of the individual times may not always add up to the total ECM run time if the history was previously cleared. Time spent at each point must be at least 1 minute to be logged in history after which the time is updated every 6 (0.1 hour) minutes to the screen.*

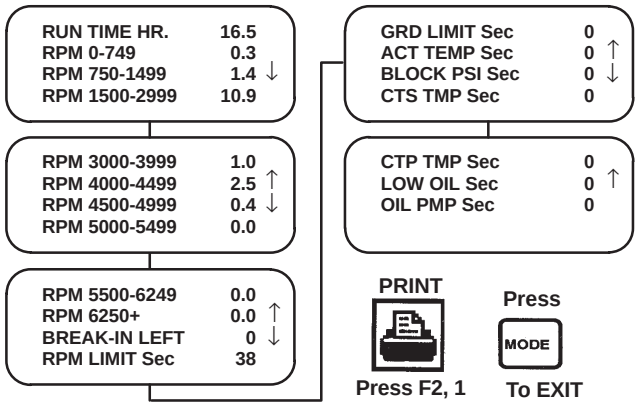
Press the MODE key to return to the SELECT FUNCTION menu. Make sure that the SELECT FUNCTION menu screen is displayed on the DDT. Use the ↓ key to display the additional screens.



Press the 4 key. The SELECT FUNCTION screen will appear.



Press the 2 key. The HISTORY screen will appear. Use the ↓ key to display the additional screens and the ↑ to return to the previous screen.



Press the MODE key to return to the Select Fault History menu.

1-Mercury Marine

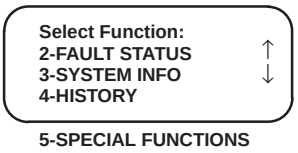
4-HISTORY

CLEAR FAULT HISTORY

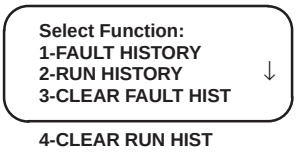
NOTE: *The Clear Fault function will only work with 'key-on', engine not running.*

The CLEAR FAULT HISTORY function will reset **all** fault counters to zero. After a component is replaced the user may wish to clear the history fault counters.

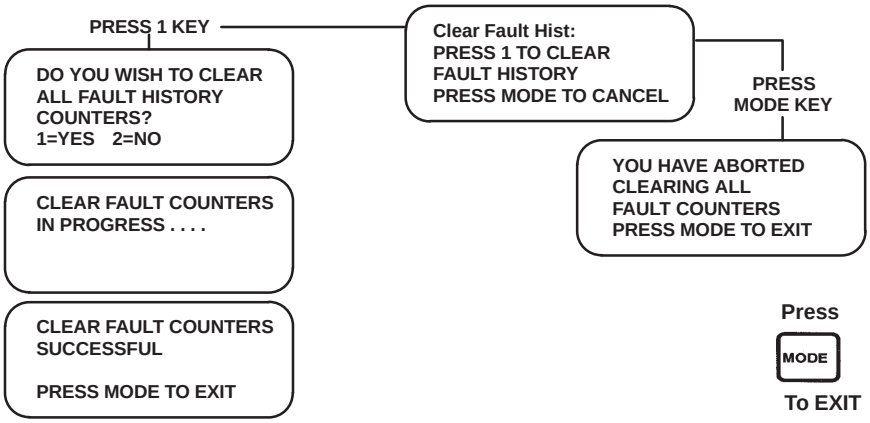
Press the MODE key to return to the SELECT FUNCTION menu. Make sure that the SELECT FUNCTION menu screen is displayed on the DDT. Use the ↓ key to display the additional screens.



Press the 4 key. The SELECT FUNCTION screen will appear.



Press the 3 key. The CLEAR FAULT HIST screen will appear. Use the ↓ key to display the additional screens and the ↑ to return to the previous screen.



2.0 Marine Diagnostics

1-Mercury Marine

4-HISTORY

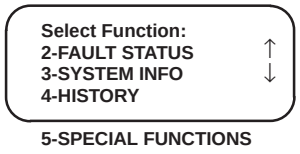
CLEAR RUN HISTORY

NOTE: *The Clear Fault function will only work with 'key-on', engine not running.*

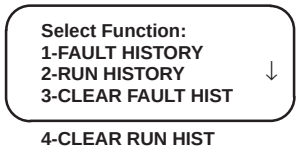
NOTE: *The Run Time Hour and break-in left cannot be erased during a run history clear.*

The CLEAR RUN HISTORY function will reset **all** run counters to zero. After engine maintenance is performed the user may wish to clear the history run counters.

Press the MODE key to return to the SELECT FUNCTION menu. Make sure that the SELECT FUNCTION menu screen is displayed on the DDT. Use the ↓ key to display the additional screens.



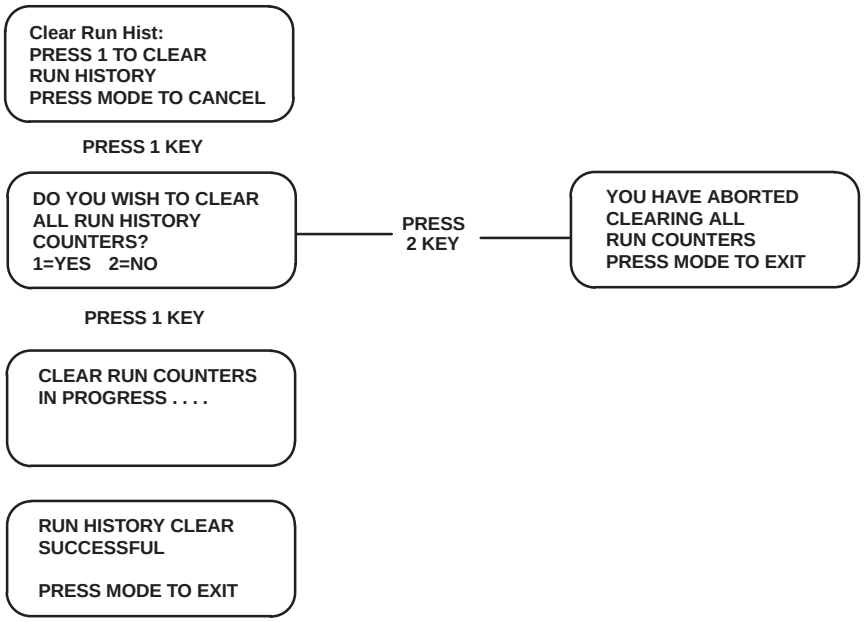
Press the 4 key. The SELECT FUNCTION screen will appear.



1-Mercury Marine

4-HISTORY

Press the 4 key. The CLEAR RUN HIST screen will appear. Use the ↓ key to display the additional screens and the ↑ to return to the previous screen.



Press

MODE

To EXIT

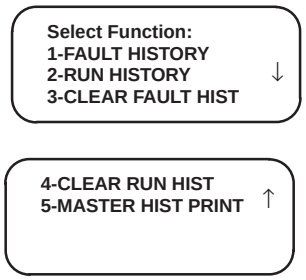
2.0 Marine Diagnostics

1-Mercury Marine

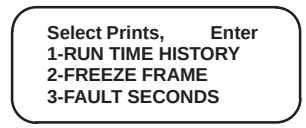
4-HISTORY

The MASTER HISTORY PRINT function will allow the user to print all history files stored in the ECM by accessing one convenient menu.

Make sure the SELECT FUNCTION menu is displayed on the DDT. Press the 5 key.



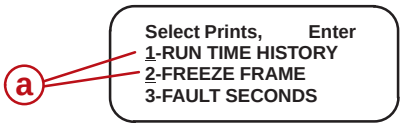
The SELECT PRINTS screen will appear.



1-Mercury Marine

4-HISTORY

To print all 3 choices requires the user to press the 1 key, followed by the 2 key and then the 3 key. The selected choices will be indicated by the number underline feature used in the linelock function. To deselect your choice, simply press the number of the selection you wish to not print. Once you have selected your choice(s) then press the ENTER key to print the file(s) you have selected.



a - Linelock

NOTE: *The time required to print all files will depend on the number of files stored in the ECM history.*

Press
MODE
To EXIT

Line Lock
1 xx XXX
2 xx XXX
3 zz ZZZ
4 zz ZZZ
Available

2.0 Marine Diagnostics

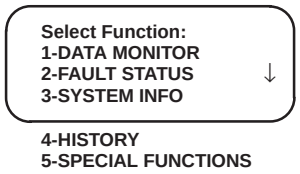
1-Mercury Marine

5-SPECIAL FUNCTIONS

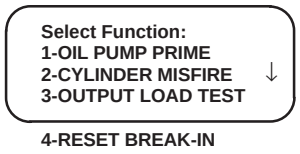
OIL PUMP PRIME

NOTE: *Priming of Oil Pump should only be needed on pre-delivery, (new engine installation) if the block has been rebuilt, essentially any time maintenance to the oiling system is required.*

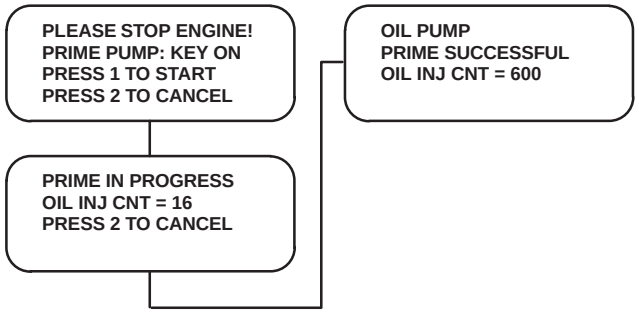
Press the MODE key to return to the SELECT FUNCTION menu. Make sure that the SELECT FUNCTION menu screen is displayed on the DDT. Use the ↓ key to display the additional screens.



Press the 5 key. The SPECIAL FUNCTIONS screen will appear.



Press the 1 key and follow the instructions on the screen to prime the electronic oil pump.



Press the MODE key to return to the SELECT FUNCTION menu.

Press

To EXIT

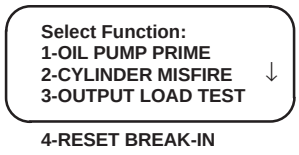
1-Mercury Marine

5-SPECIAL FUNCTIONS

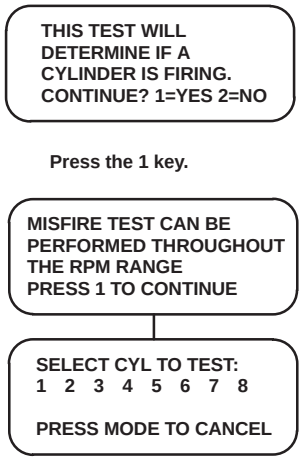
CYLINDER MISFIRE

NOTE: *This test will run automatically once the user has entered a cylinder number to test.*

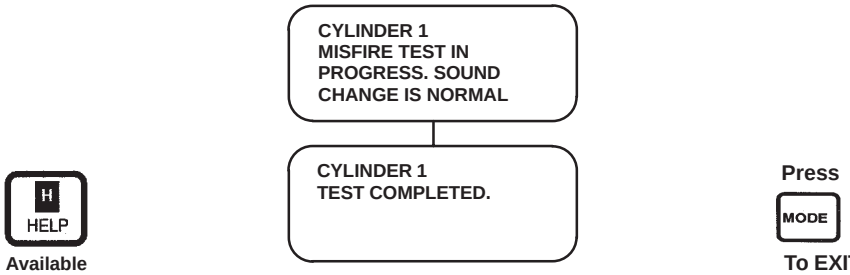
The CYLINDER MISFIRE test helps the technician isolate a problem cylinder. Press the 2 key.



The CYLINDER MISFIRE screen will appear.



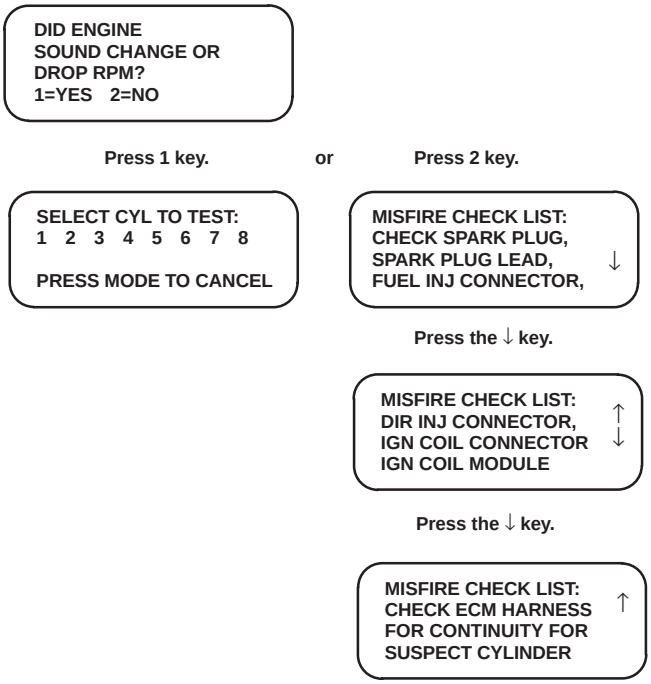
Press the 1 key to select Cylinder 1



2.0 Marine Diagnostics

1-Mercury Marine

5-SPECIAL FUNCTIONS



NOTE: *On four stroke large horsepower engines it may be difficult to detect any noticeable RPM or sound change when the misfire test is done at idle. If no obvious change is noticed try the test again at another throttle position greater than zero percent.*

Available

Press

To EXIT

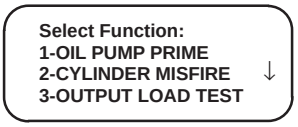
1-Mercury Marine

5-SPECIAL FUNCTIONS

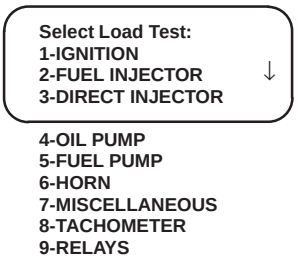
IGNITION LOAD TEST

Using the OUTPUT LOAD TEST function, you can exercise the ECM and various output loads (ignition coils, injectors, pumps, horn, etc.) controlled by the ECM.

Make sure that the SELECT FUNCTION menu screen is displayed on the DDT. Press the 3 key.



The SELECT LOAD TEST screen will appear.



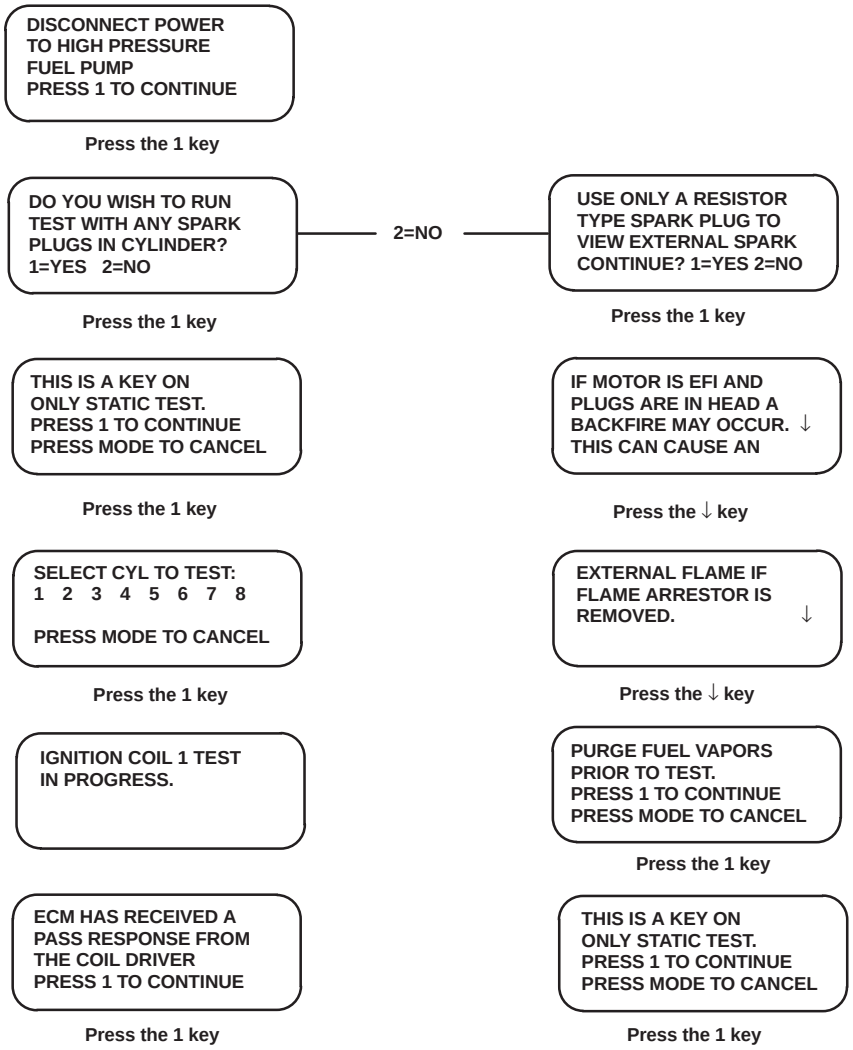
WARNING: When ignition load (spark) testing is required on any conventional EFI engine (non direct fuel injection), make sure to follow the safety precautions listed in the Preface Section of this reference manual. If there are fuel vapors present in the engine, the ignition load (spark) test could ignite the fuel vapors and cause the engine to backfire. An engine backfire condition may result in internal engine damage. Purge fuel vapors from the system if required. Do not remove flame arrestor if the engine is equipped with one, otherwise a flame from a engine backfire may ignite fuel vapors and cause a fire or bodily harm.

2.0 Marine Diagnostics

1-Mercury Marine

5-SPECIAL FUNCTIONS

This test is run with key switch in run position only (engine off). To test the ignition coil output press the 1 key.



NOTE: *A maximum of eight cylinders can be displayed on the test menu screen.*

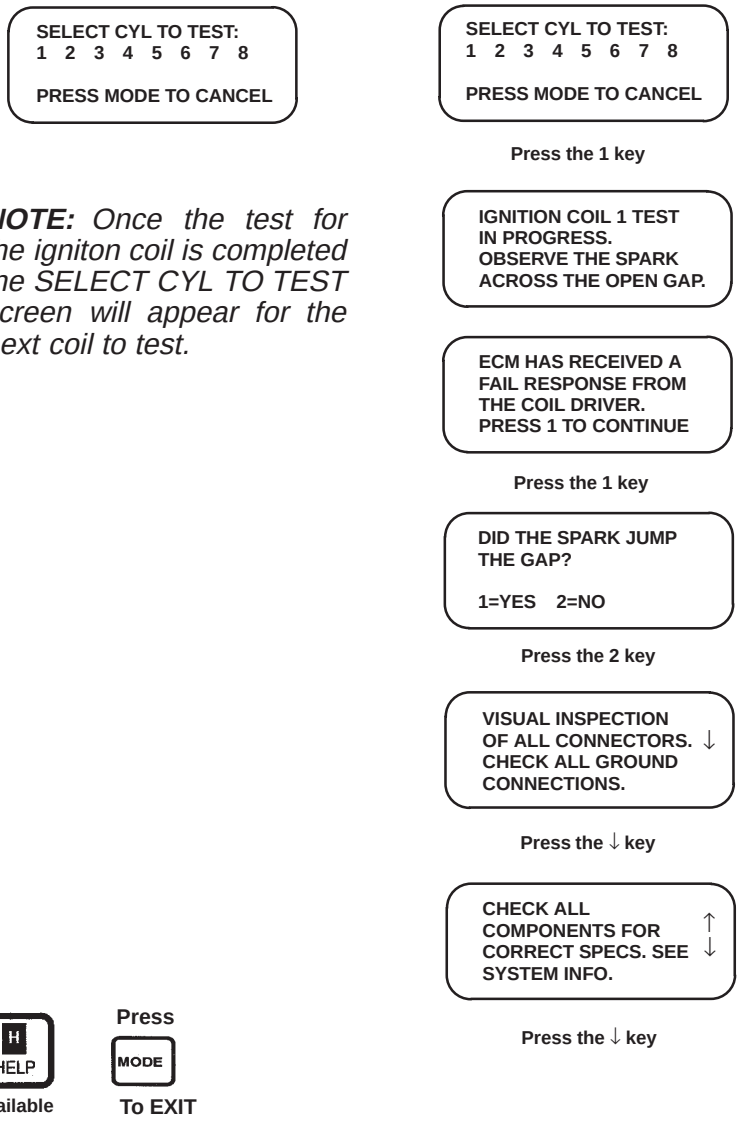
1-Mercury Marine

5-SPECIAL FUNCTIONS

SELECT CYL TO TEST:
1 2 3 4 5 6 7 8

PRESS MODE TO CANCEL

NOTE: *Once the test for the igniton coil is completed the SELECT CYL TO TEST screen will appear for the next coil to test.*

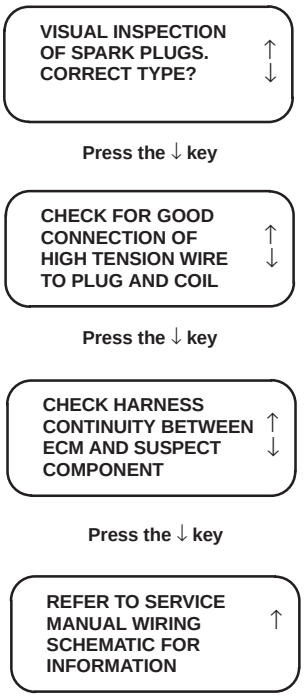


NOTE: *This test will run automatically once the user has entered a cylinder number to test.*

2.0 Marine Diagnostics

1-Mercury Marine

5-SPECIAL FUNCTIONS



HELP Available

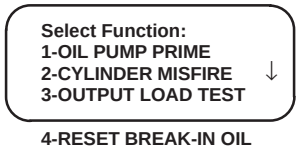
Press MODE To EXIT

1-Mercury Marine

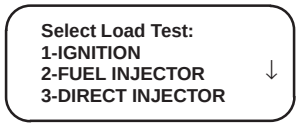
5-SPECIAL FUNCTIONS

FUEL INJECTOR LOAD TEST

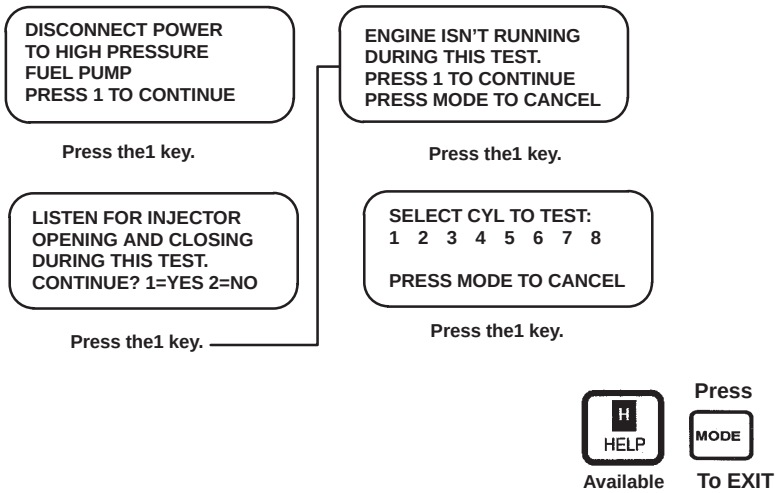
Using the OUTPUT LOAD TEST function, you can exercise the ECM and various output loads (ignition coils, injectors, pumps, horn, etc.) controlled by the ECM. Make sure that the SELECT FUNCTION menu screen is displayed on the DDT. Press the 3 key.



The SELECT LOAD TEST screen will appear.



This test is run with key switch in run position only (engine off). To test the fuel injector for mechanical activity press the 2 key.

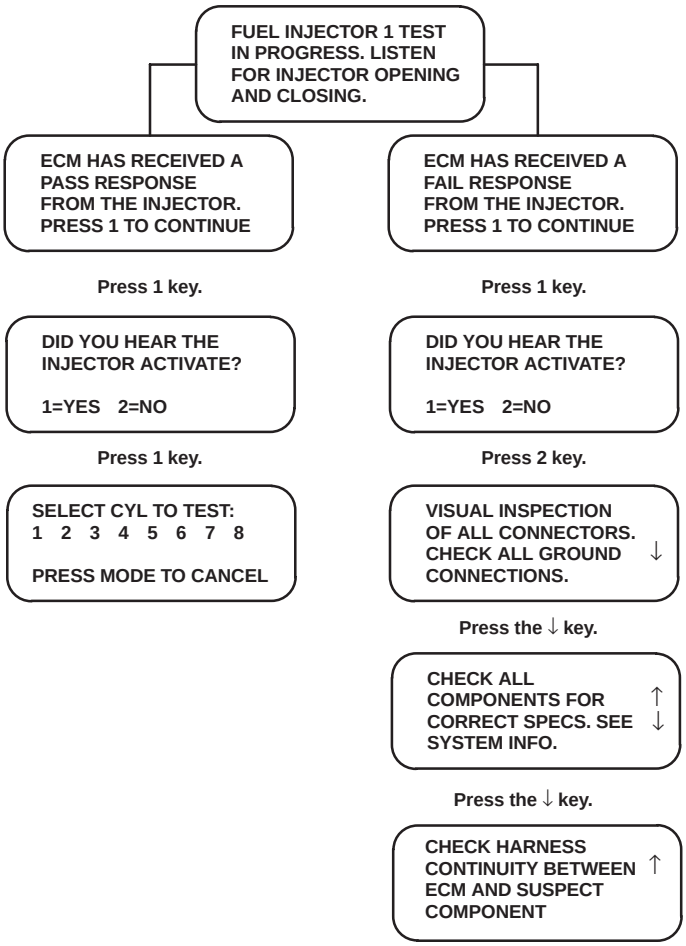


NOTE: *This test will run automatically once the user has entered a cylinder number to test. Disable fuel pump by removing fuse or unplugging fuel pump connector if so equipped.*

2.0 Marine Diagnostics

1-Mercury Marine

5-SPECIAL FUNCTIONS



H HELP Available

Press MODE To EXIT

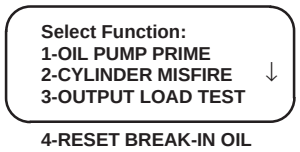
1-Mercury Marine

5-SPECIAL FUNCTIONS

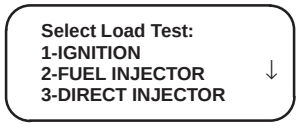
DIRECT INJECTOR LOAD TEST

Using the OUTPUT LOAD TEST function, you can exercise the ECM and various output loads (ignition coils, injectors, pumps, horn, etc.) controlled by the ECM.

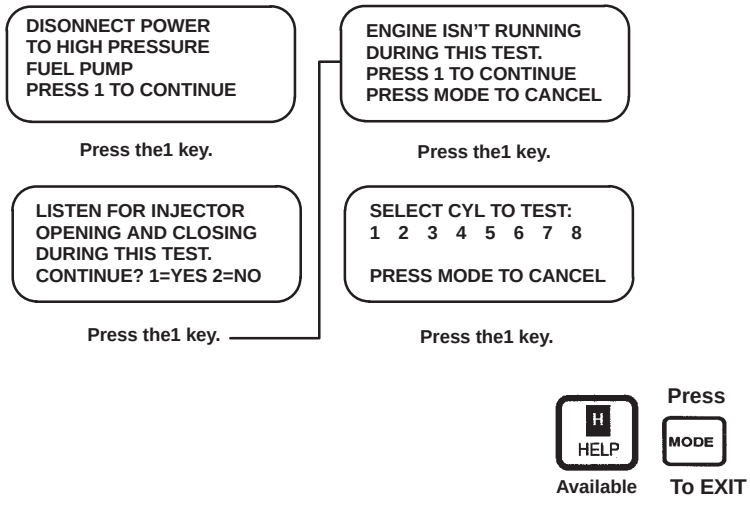
Make sure that the SELECT FUNCTION menu screen is displayed on the DDT. Press the 3 key.



The SELECT LOAD TEST screen will appear.



This test is run with key switch in run position only (engine off). To test the direct injector for mechanical activity press the 3 key.

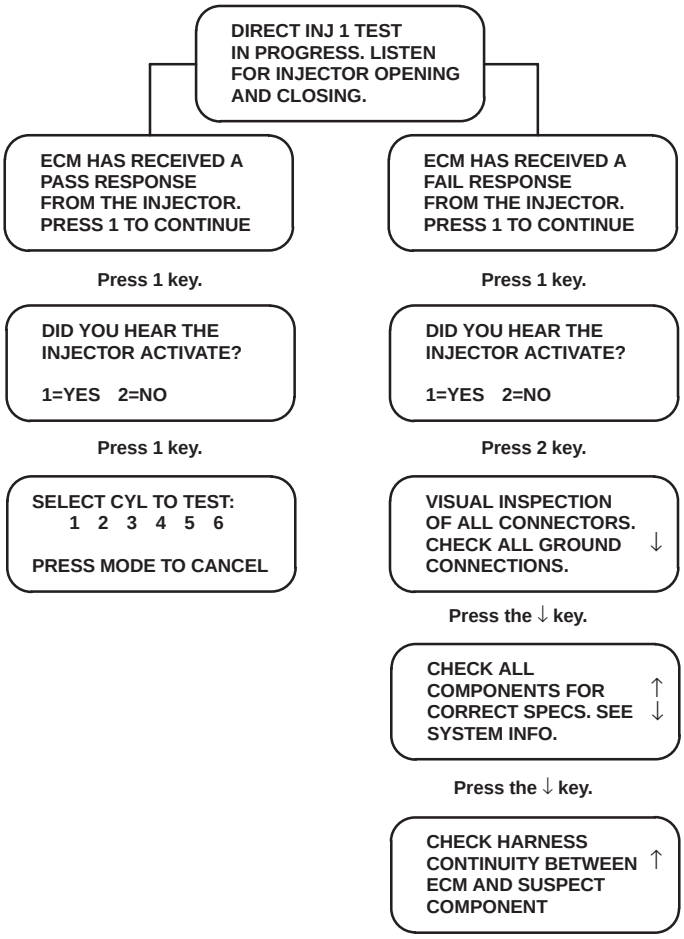


NOTE: *This test will run automatically once the user has entered a cylinder number to test.*

2.0 Marine Diagnostics

1-Mercury Marine

5-SPECIAL FUNCTIONS



HELP Available

Press MODE To EXIT

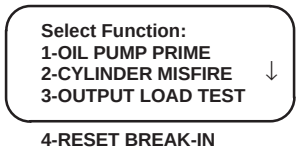
1-Mercury Marine

5-SPECIAL FUNCTIONS

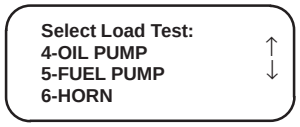
OIL PUMP LOAD TEST

Using the OUTPUT LOAD TEST function, you can exercise the ECM and various output loads (ignition coils, injectors, pumps, horn, etc.) controlled by the ECM.

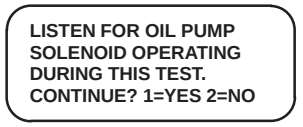
Make sure that the SELECT FUNCTION menu screen is displayed on the DDT. Press the 3 key.



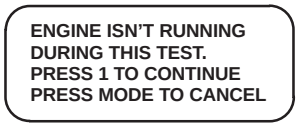
The SELECT LOAD TEST screen will appear. Use the ↓ key to display the additional screens and the ↑ to return to the previous screen.



This test is run with key switch in run position only (engine off). To test the oil pump for mechanical activity press the 4 key.



Press the1 key.



Press the1 key.

Available

Press

To EXIT

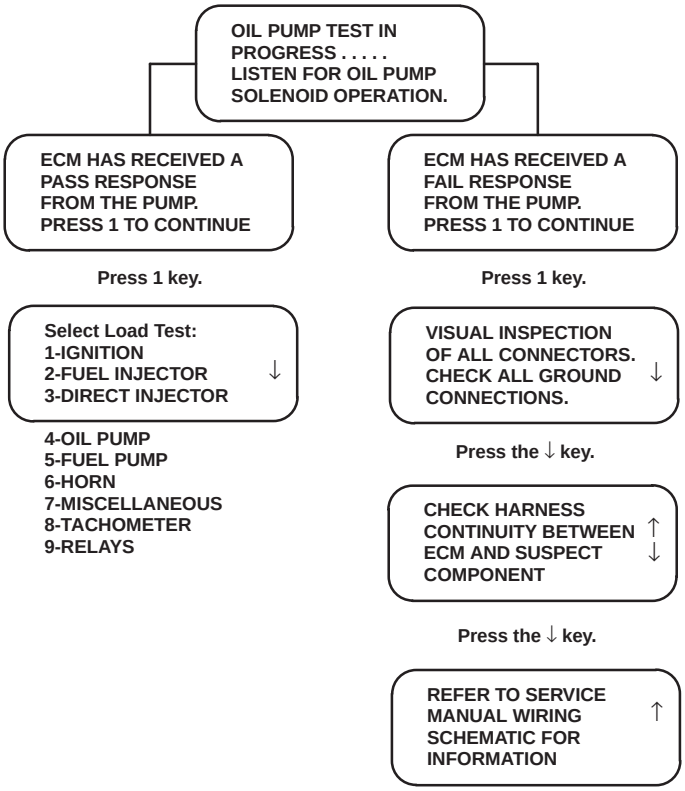
NOTE: *This test will run automatically once the user has entered oil pump test.*

NOTE: *It is **normal** for fuel pump to run during the test since the main power relay controls the pump.*

2.0 Marine Diagnostics

1-Mercury Marine

5-SPECIAL FUNCTIONS



HELP Available

Press MODE To EXIT

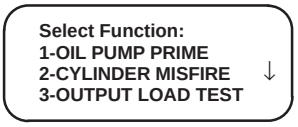
1-Mercury Marine

5-SPECIAL FUNCTIONS

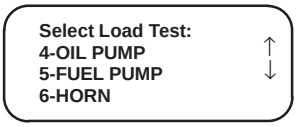
FUEL PUMP LOAD TEST

Using the OUTPUT LOAD TEST function, you can exercise the ECM and various output loads (ignition coils, injectors, pumps, horn, etc.) controlled by the ECM.

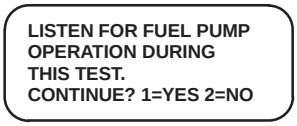
Make sure that the SELECT FUNCTION menu screen is displayed on the DDT. Press the 3 key.



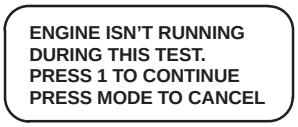
The SELECT LOAD TEST screen will appear. Use the ↓ key to display the additional screens and the ↑ to return to the previous screen.



This test is run with key switch in run position only (engine off). To test the fuel pump for mechanical activity press the 5 key.



Press the1 key.



Press the1 key.

NOTE: *This test will run automatically once the user has entered fuel pump test.*

Available

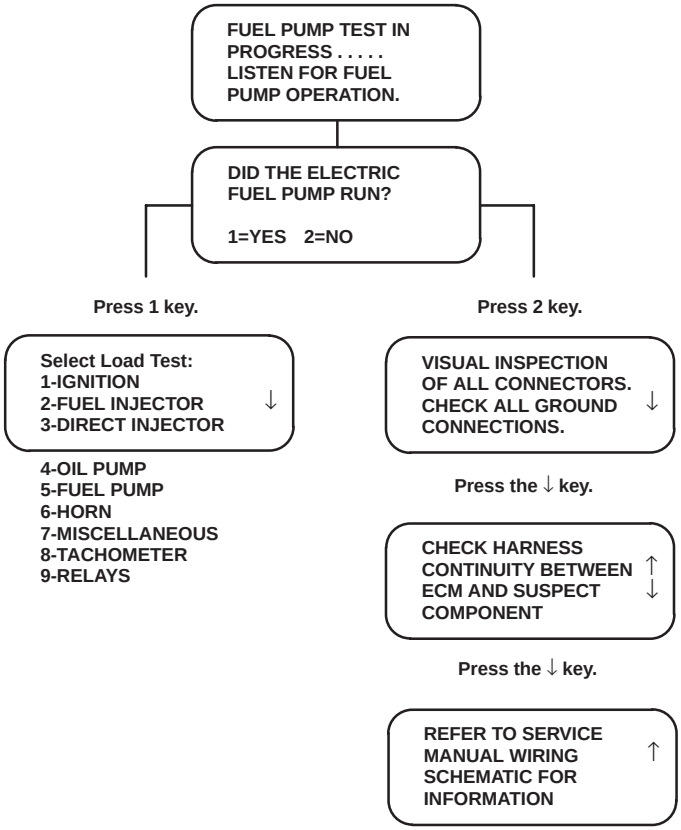
Press

To EXIT

2.0 Marine Diagnostics

1-Mercury Marine

5-SPECIAL FUNCTIONS



H HELP Available

Press MODE To EXIT

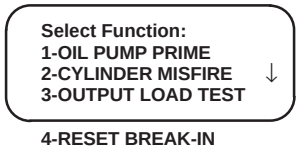
1-Mercury Marine

5-SPECIAL FUNCTIONS

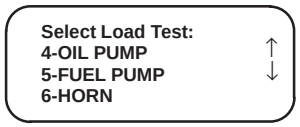
HORN LOAD TEST

Using the OUTPUT LOAD TEST function, you can exercise the ECM and various output loads (ignition coils, injectors, pumps, horn, etc.) controlled by the ECM.

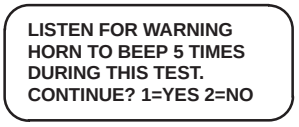
Make sure that the SELECT FUNCTION menu screen is displayed on the DDT. Press the 3 key.



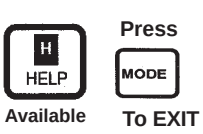
The SELECT LOAD TEST screen will appear. Use the ↓ key to display the additional screens and the ↑ to return to the previous screen.

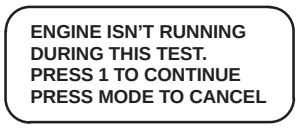


This test is run with key switch in run position only (engine off). To test the horn for an audible response press the 6 key.



Press the1 key.





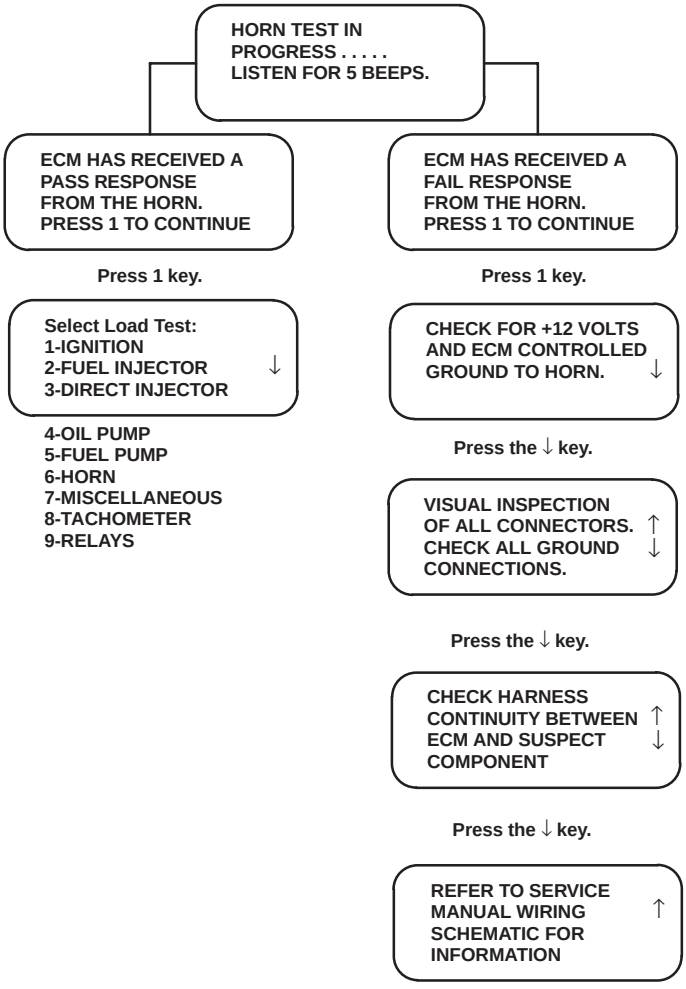
Press the1 key.

NOTE: *This test will run automatically once the user has entered horn test. It is* ***normal*** *for fuel pump to run during the test since the main power relay controls the pump.*

2.0 Marine Diagnostics

1-Mercury Marine

5-SPECIAL FUNCTIONS



HELP Available

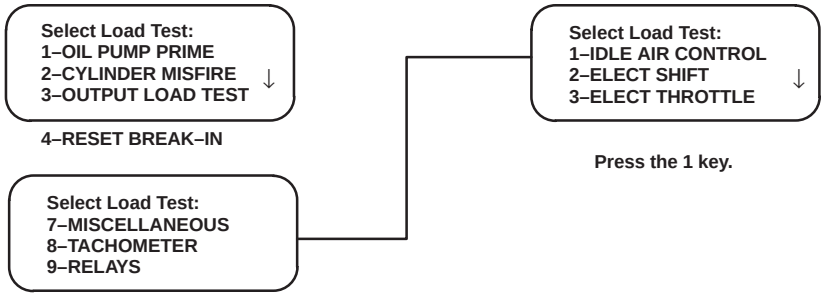
Press MODE To EXIT

1-Mercury Marine

5-SPECIAL FUNCTIONS

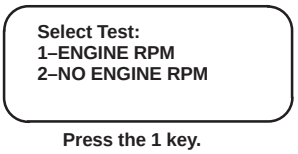
MISCELLANEOUS – IDLE AIR CONTROL

Using the OUTPUT LOAD TEST function, you can exercise the ECM and various output loads (ignition coils, injectors, pumps, horn etc) controlled by the ECM. Make sure the SELECT FUNCTION menu screen is displayed on the DDT. Press the 3 key.



The purpose of this test is to check the functionality of the Idle Air Control valve. The behavior of the test on a running engine will depend on the engine coolant temperature and the idle control calibration in the ECM. Once the engine has reached it's normal operating temperature the running test will allow you to apply a positive or a negative offset to the base IAC setpoint. As you decrease the offset with a negative value the engine RPM should decrease. The engine idle control strategy may prevent you from exceeding the allowable setpoints. For example a value of +60% may exhibit the same behavior as a value of +100% (no noticeable change in RPM).

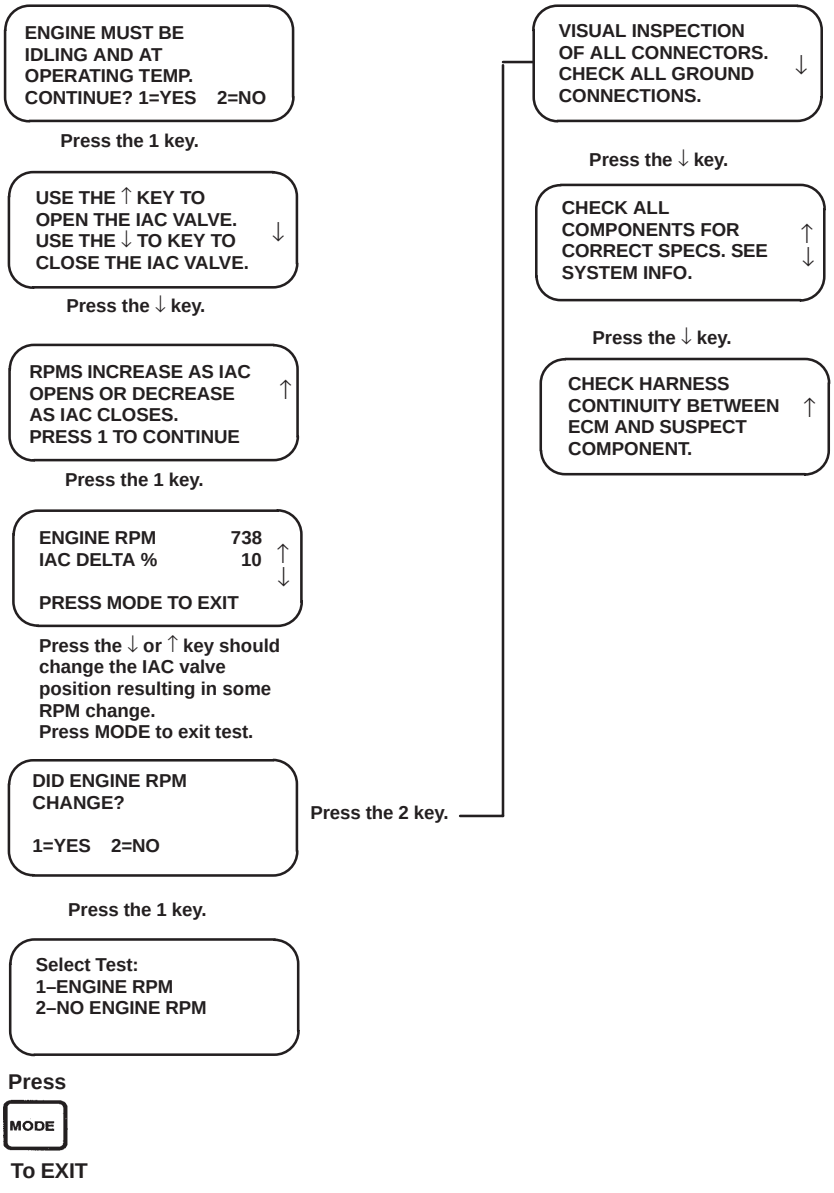
IAC TEST WITH ENGINE RPM



1-Mercury Marine

5-SPECIAL FUNCTIONS

IAC TEST WITH ENGINE RPM – continued



1-Mercury Marine

5-SPECIAL FUNCTIONS

IAC TEST WITH NO ENGINE RPM

Select Test:
1–ENGINE RPM
2–NO ENGINE RPM

Press the 2 key.

Select Step Size:
1– 5 Percent
2– 10 Percent
3– 15 Percent
4– 20 Percent

Press the 1,2,3, or 4 key for the desired step.

ENGINE ISN'T RUNNING
DURING THIS TEST
PRESS 1 TO CONTINUE
PRESS MODE TO CANCEL

Press the 1 key.

USE THE ↑ KEY TO
OPEN THE IAC VALVE.
USE THE ↓ TO KEY TO
CLOSE THE IAC VALVE.

Press the ↓ key.

THE IAC VALVE WILL
MOVE IN THE STEPS
YOU HAVE SELECTED
PRESS 1 TO CONTINUE

Press the 1 key.

1-Mercury Marine

5-SPECIAL FUNCTIONS

IAC TEST WITH NO ENGINE RPM – continued

THE IAC VALVE WILL
MOVE IN THE STEPS
YOU HAVE SELECTED
PRESS 1 TO CONTINUE

Press the 1 key.

ENGINE RPM 0
IAC DELTA % 10 ↑ ↓

PRESS MODE TO EXIT

or

ENGINE ISN'T RUNNING
DURING THIS TEST
PRESS 1 TO CONTINUE
PRESS MODE TO CANCEL

Press the 1 key.

VISUAL INSPECTION
OF ALL CONNECTORS.
CHECK ALL GROUND ↓
CONNECTIONS.

Press the ↓ key.

CHECK ALL
COMPONENTS FOR
CORRECT SPECS. SEE ↑ ↓
SYSTEM INFO.

Press the ↓ key.

CHECK HARNESS
CONTINUITY BETWEEN ↑
ECM AND SUSPECT
COMPONENT.

Press the ↑ key. As you step in a positive direction you should hear a buzzing sound as the IAC valve opens. **This sound may be difficult to hear unless the IAC is removed from the engine for testing purposes only.** Entering a negative step (a value less than zero) may have no affect on the valve since it's already closed. Example: a DELTA % of -20 will cause no change since the valve is closed.

Press

MODE

To EXIT

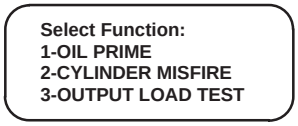
1-Mercury Marine

5-SPECIAL FUNCTIONS

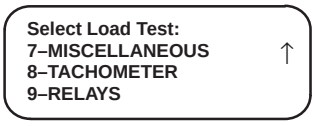
ELECTRONIC SHIFT CONTROL – ESC

Using the OUTPUT LOAD TEST function, you can exercise the ECM and various output loads (ignition coils, injectors, pumps, horn etc.) controlled by the ECM.

Make sure the SELECT FUNCTION menu screen is displayed on the DDT. Press the 3 key.



The SELECT LOAD TEST screen will appear. Use the ↓ key to display the additional screens and the ↑ to return to the previous screen.



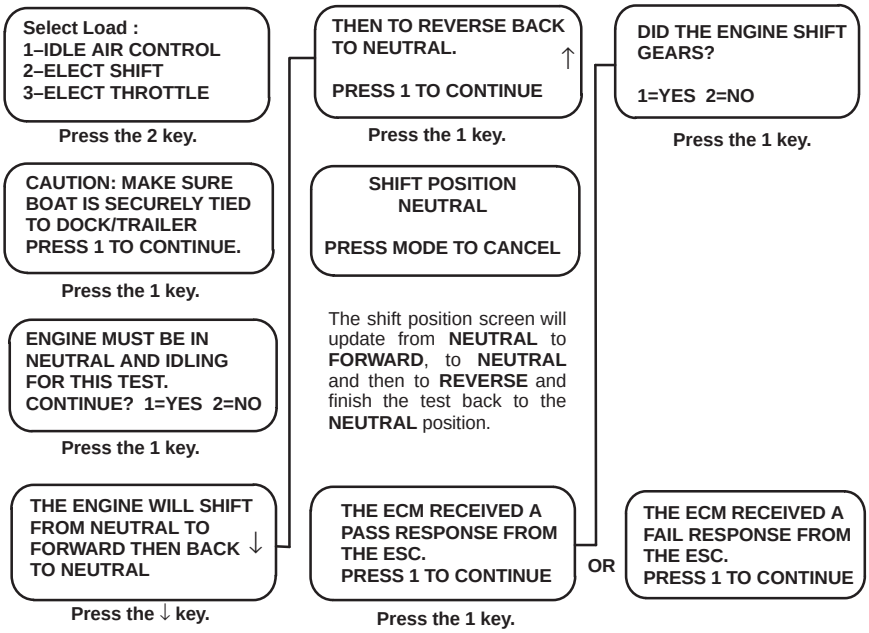
Press the 7 key.

2.0 Marine Diagnostics

1-Mercury Marine

5-SPECIAL FUNCTIONS

ELECTRONIC SHIFT CONTROL – ESC – continued



NOTE: *This test will only function with the engine running in neutral. If the ESC (electronic shift control) on the engine **does** respond to this test, then diagnose the wiring between the CHI and the ERC. Refer to the electrical wiring diagram in the service manual if needed.*

Press

MODE

To EXIT

1-Mercury Marine

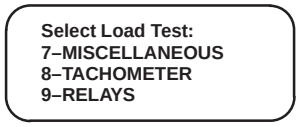
5-SPECIAL FUNCTIONS

ELECTRONIC THROTTLE CONTROL – ETC

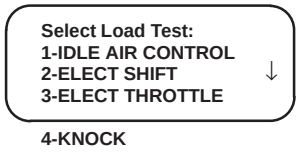
Using the OUTPUT LOAD TEST function, you can exercise the ECM and various output loads (ignition coils, injectors, pumps, horn etc.) controlled by the ECM.

Make sure the SELECT FUNCTION menu screen is displayed on the DDT. Press the 3 key.

The SELECT LOAD TEST screen will appear. Use the ↓ key to display the additional screens and the ↑ to return to the previous screen. Press the 7 key.



The miscellaneous load test menu may consist of the Idle Air Control (IAC), the Electronic Shift Control (ESC), Electronic Throttle Control (ETC) or Knock if the engine is so equipped. To test the ETC press the 3 key.

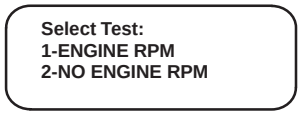


1-Mercury Marine

5-SPECIAL FUNCTIONS

ELECTRONIC THROTTLE CONTROL – ETC – continued

The Select Test screen is displayed on the DDT. The ETC test can be performed with the engine running or not. This test allows the technician to instruct the ECM to open or close the throttle valve (blade). If no engine rpm is selected the DDT is allowed to move the throttle valve (blade) from closed to a full open postion. Testing with engine rpm the valve (blade) will not move the full range.



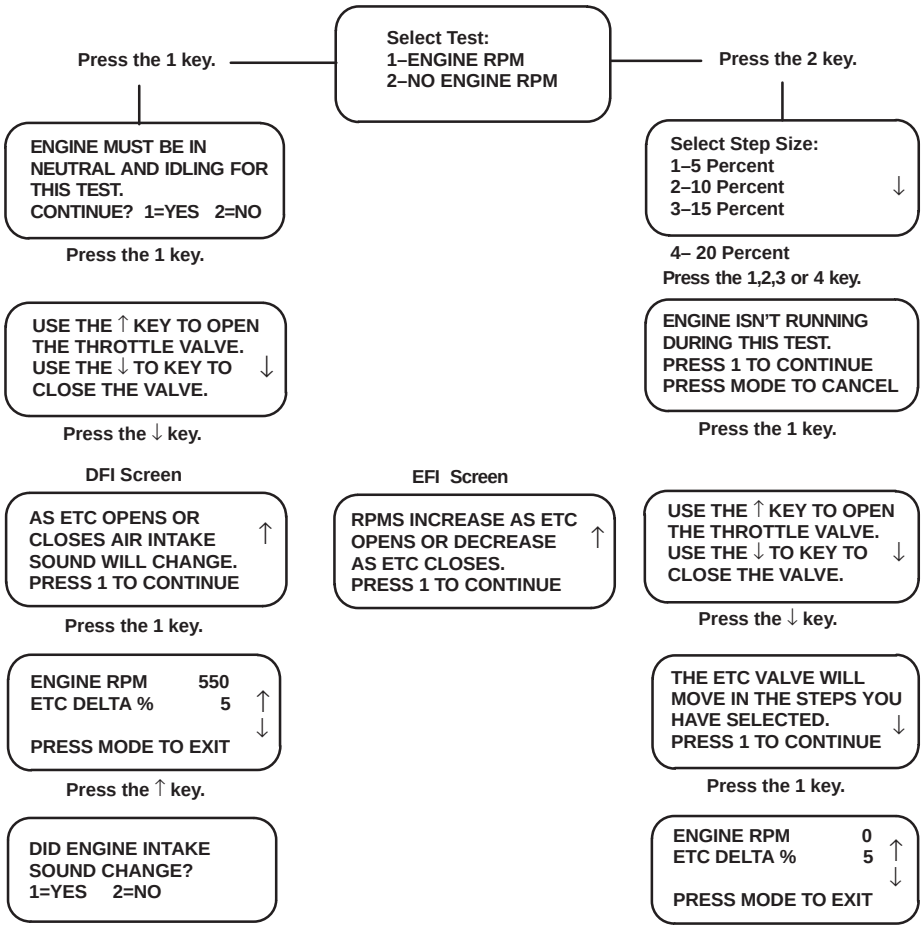
NOTE: *If the electronic throttle control on the engine* ***does*** *respond to this test, then diagnose the wiring or sensors between the ECM or the throttle control box at the helm. Refer to the electrical wiring diagram in the service manual if needed.*

Press

To EXIT

1-Mercury Marine

5-SPECIAL FUNCTIONS



NOTE: *Depending on the percent incremental steps chosen, there may not be any apparent valve movement for the first few arrow key movements. Basically the ETC can be compared to an electronic throttle cam. If the initial cam profile is flat for a specific engine application, there will be no valve position change for a given arrow key selection.*

Press

To EXIT

2.0 Marine Diagnostics

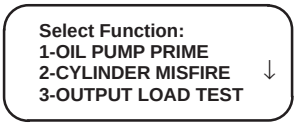
1-Mercury Marine

5-SPECIAL FUNCTIONS

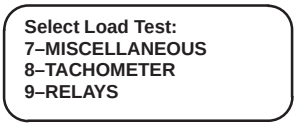
KNOCK OUTPUT LOAD TEST

Using the OUTPUT LOAD TEST function, you can exercise the ECM and various output loads (ignition coils, injectors, pumps, horn, etc.) controlled by the ECM.

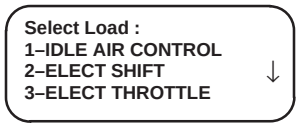
Make sure that the SELECT FUNCTION menu screen is displayed on the DDT. Press the 3 key.



The SELECT LOAD TEST screen will appear. Use the ↓ key to display the additional screens and the ↑ to return to the previous screen.

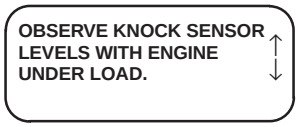


Press the 7 key.



Press the 4 key.

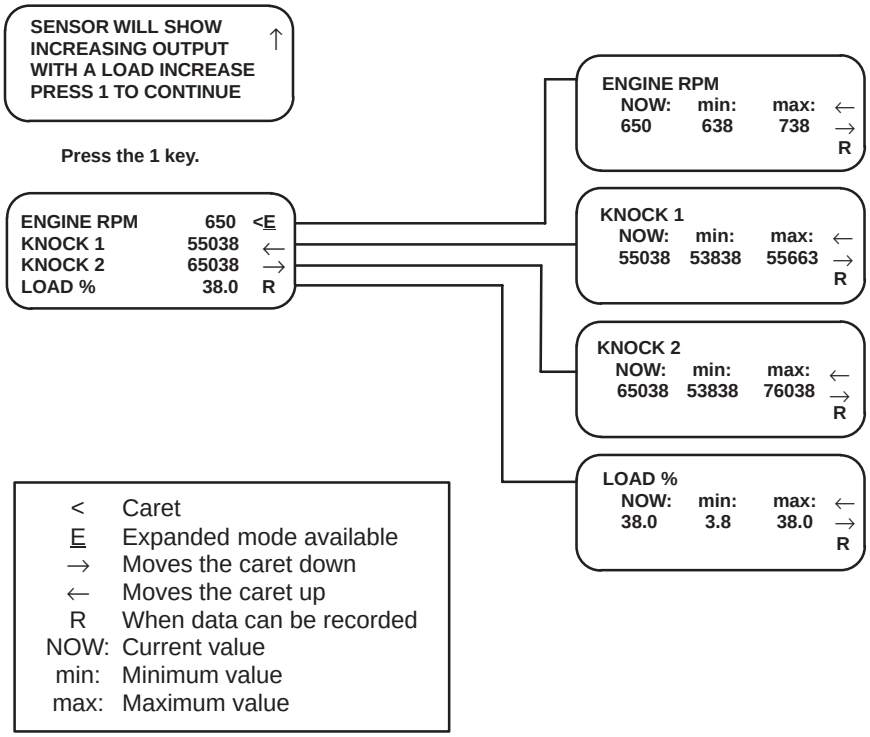
Press the ↓ key.



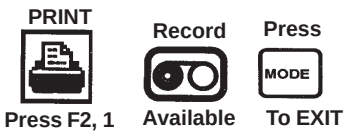
Press the ↓ key.

1-Mercury Marine

5-SPECIAL FUNCTIONS



NOTE: *The knock sensor output levels will vary with normal cylinder combustion. The purpose of this test is to verify that the output levels of the sensors change with the engine load across the RPM range.*



2.0 Marine Diagnostics

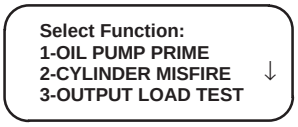
1-Mercury Marine

5-SPECIAL FUNCTIONS

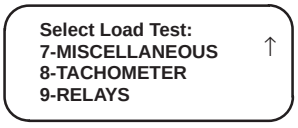
BOOST VALVE LOAD TEST

Using the OUTPUT LOAD TEST function, you can exercise the ECM and various output loads (ignition coils, injectors, pumps, etc.) controlled by the ECM. The boost valve load test will allow the user to operate the valve at zero engine speed. This test will allow the user to determine if the valve is operating smoothly throughout the range of its travel.

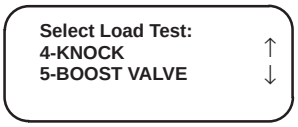
Make sure the SELECT FUNCTION menu is displayed on the DDT. Press the 3 key.



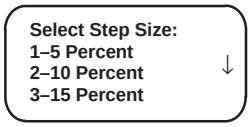
Press the 3 key.



Press the 7 key.

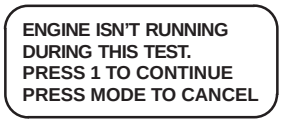


Press the 5 key.



4– 20 Percent

Press the 1,2,3 or 4 key for the desired step.



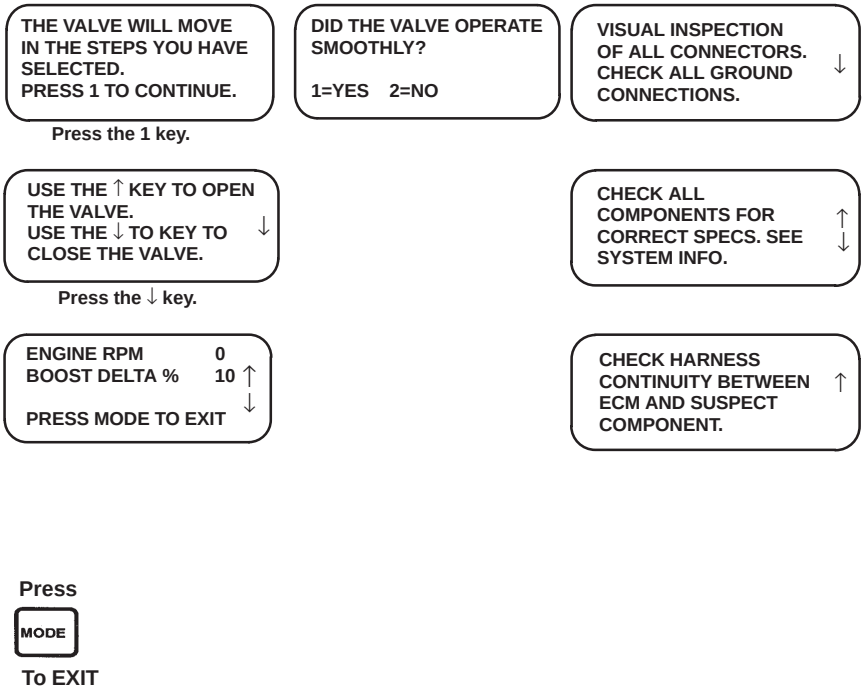
Press the 1 key.

1-Mercury Marine

5-SPECIAL FUNCTIONS

BOOST VALVE LOAD TEST

– continued



Press

MODE

To EXIT

NOTE: *It will be necessary to remove the hose coupling to the boost valve so that you can visually see the valve operate during this test.*

2.0 Marine Diagnostics

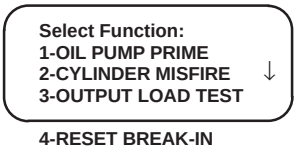
1-Mercury Marine

5-SPECIAL FUNCTIONS

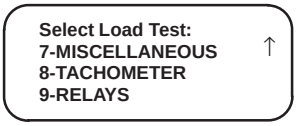
TACHOMETER LOAD TEST

Using the OUTPUT LOAD TEST function, you can exercise the ECM and various output loads (ignition coils, injectors, pumps, horn, etc.) controlled by the ECM.

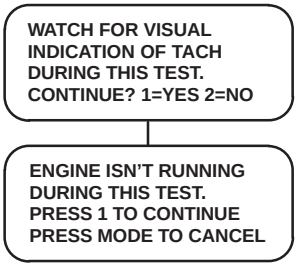
Make sure that the SELECT FUNCTION menu screen is displayed on the DDT. Press the 3 key.



The SELECT LOAD TEST screen will appear. Use the ↓ key to display the additional screens and the ↑ to return to the previous screen.



This test is run with key switch in run position only (engine off). To test the tachometer press the 8 key.



NOTE: *This test will run automatically once the user has entered tach test. It is* ***normal*** *for fuel pump to run during the test since the main power relay controls the pump.* ***This test will only work with an analog tach.***

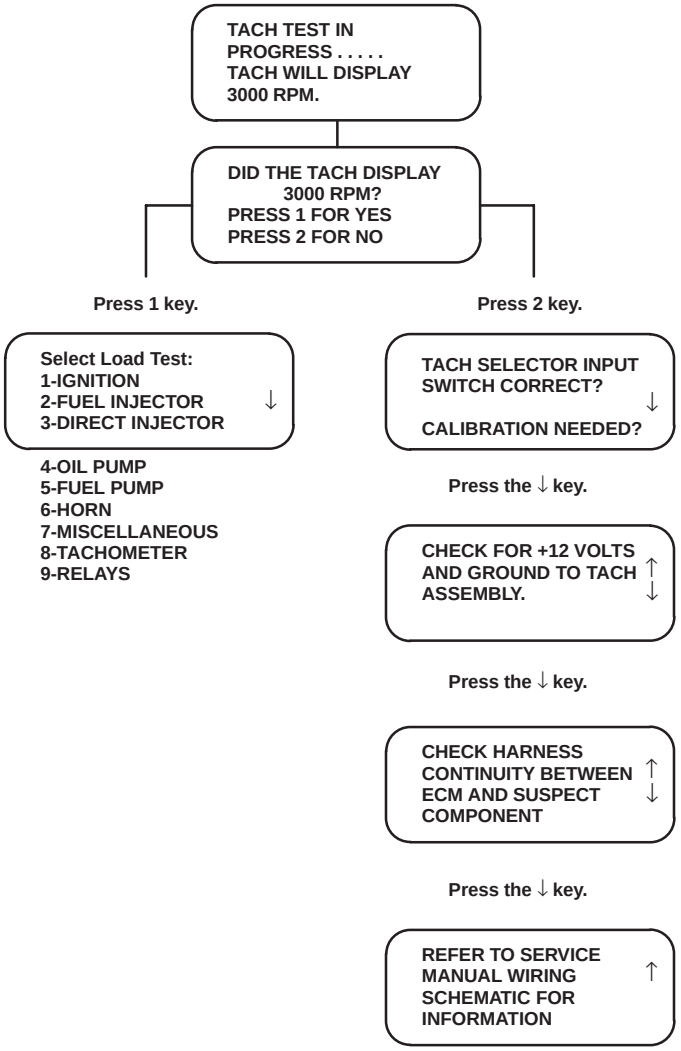
Available

Press

To EXIT

1-Mercury Marine

5-SPECIAL FUNCTIONS



Available

Press

To EXIT

2.0 Marine Diagnostics

1-Mercury Marine

5-SPECIAL FUNCTIONS

RELAY LOAD TEST

Using the OUTPUT LOAD TEST function, you can exercise the ECM and various output loads (ignition coils, injectors, pumps, horn, etc.) controlled by the ECM. Make sure that the SELECT FUNCTION menu screen is displayed on the DDT. Press the 3 key.

```
Select Function:
1-OIL PUMP PRIME
2-CYLINDER MISFIRE
3-OUTPUT LOAD TEST
```

The SELECT LOAD TEST screen will appear. Use the ↓ key to display the additional screens and the ↑ to return to the previous screen.

```
Select Load Test:
7-MISCELLANEOUS
8-TACHOMETER
9-RELAYS
```

Press the 9 key.

```
Select Relay Test:
1–MAIN POWER RELAY
2–FUEL PUMP RELAY
3–STB TAB RELAYS
                    ↓
```

```
4–PRT TAB RELAYS
5–TRIM RELAYS
6–START RELAY
```

The following tests are done with key switch in run position only (engine off): main power and fuel pump relays. To test the **main power or fuel pump relay** press 1 or 2 key.

```
LISTEN FOR RELAY
ACTIVATION DURING
THIS TEST.
CONTINUE? 1=YES 2=NO
```

Press the 1 key.

```
ENGINE ISN'T RUNNING
DURING THIS TEST.
PRESS 1 TO CONTINUE
PRESS MODE TO CANCEL
```

Press the 1 key.

NOTE: *This test will run automatically once the user has entered the relay test. Outboards typically use the main power to relay control the fuel pump. MerCruiser uses a dedicated fuel pump relay. Refer to the appropriate service manual if required.*

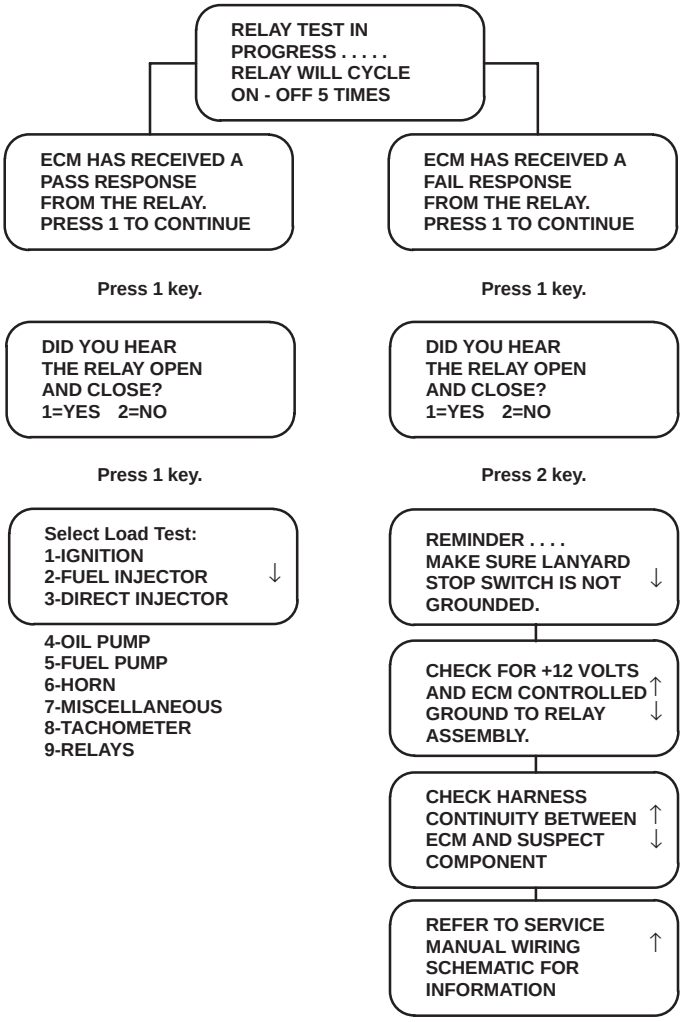
Available

Press

To EXIT

1-Mercury Marine

5-SPECIAL FUNCTIONS



NOTE: *This test will run automatically once the user has entered relay test.*

Available

Press

To EXIT

2.0 Marine Diagnostics

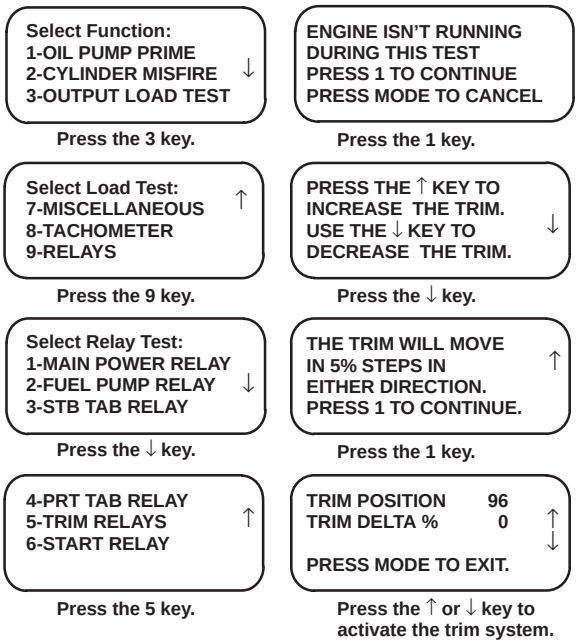
1-Mercury Marine

5-SPECIAL FUNCTIONS

TRIM RELAY LOAD TEST – Note: Digital Throttle And Shift Models Only

Using the OUTPUT LOAD TEST function, you can exercise the ECM and various output loads (ignition coils, injectors, pumps, etc.) controlled by the ECM. The trim relay load test will allow the user to trim the engine or drive without using the ERC trim button. This test will allow the user to determine if a 'no trim' problem is the fault of the ERC trim button or its associated wiring.

Make sure the SELECT FUNCTION menu is displayed on the DDT. Press the 3 key.



NOTE: *If the engine/drive trims properly when using the DDT test function then it can be assumed that there is a problem at the helm with the wiring or trim switch at the ERC. See the wiring diagram in the service manual for further information if required.*

Press

To EXIT

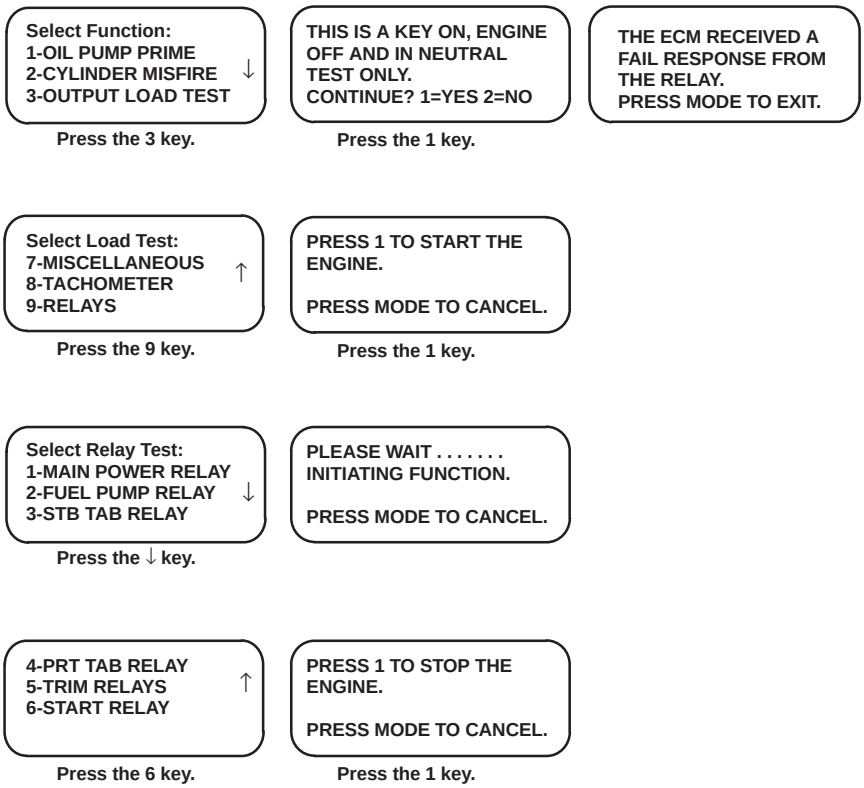
1-Mercury Marine

5-SPECIAL FUNCTIONS

START RELAY LOAD TEST – Note: Digital Throttle And Shift Models Only

Using the OUTPUT LOAD TEST function, you can exercise the ECM and various output loads (ignition coils, injectors, pumps, etc.) controlled by the ECM. The start relay load test will allow the user to start the engine without using the CHI start button. This test will allow the user to determine if a no start (crank) problem is the fault of CHI and its wiring, or a wiring / component problem located at the engine.

Make sure the SELECT FUNCTION menu is displayed on the DDT. Press the 3 key.



2.0 Marine Diagnostics

1-Mercury Marine

5-SPECIAL FUNCTIONS

START RELAY LOAD TEST

– continued

NOTE: *If the ECM fails to see engine RPM during the start relay test, it is then assumed that there is a problem with the start (relay) solenoid(s) circuit(s). First verify all battery connections and proper charge state of the battery. Check continuity between the ECM harness and the corresponding solenoids (relays). Check the relay coil for proper resistance values across the coil. If the engine cranks properly when using the DDT test function then it can be assumed that there is a problem at the helm with the wiring between CHI and the start switch. See the wiring diagram in the service manual for further information if required.*

Press

To EXIT

1-Mercury Marine

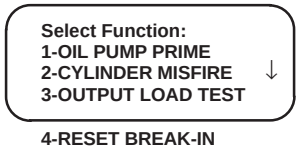
5-SPECIAL FUNCTIONS

RESET BREAK-IN

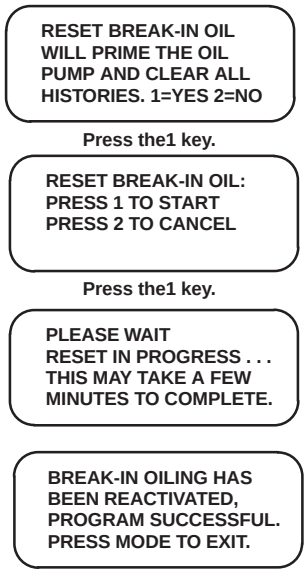
Using the RESET BREAK-IN function, you can reprogram the ECMs factory break-in oil mode.

IMPORTANT: In the event that a new powerhead is installed you must reset the oiling routine.

Make sure that the SELECT FUNCTION menu screen is displayed on the DDT. Press the 4 key.



The RESET BREAK-IN OIL screen will appear. Press 1 key.



NOTE: *The reset mode will clear all fault and run history counters, followed by a complete oil pump prime cycle.*

2.0 Marine Diagnostics

1-Mercury Marine

5-SPECIAL FUNCTIONS

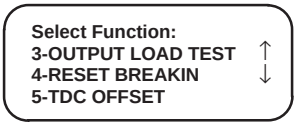
TDC OFFSET

The TDC Offset function will allow the user to program the correct TDC offset required by the engine as it was configured at the factory if there is a need to replace the original ECM.

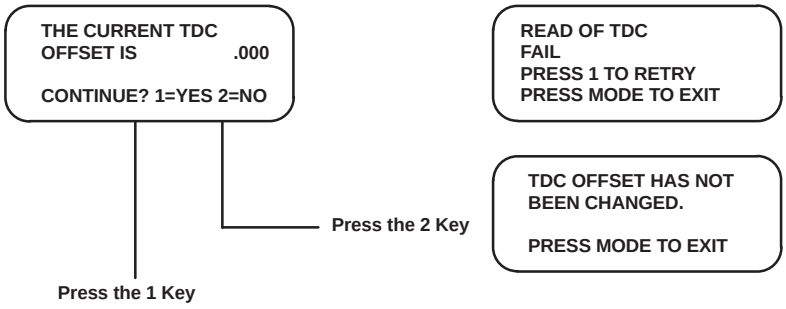
CAUTION: Incorrect TDC offset can cause problems with engine running quality if adjusted outside of acceptable limits.

Service replacement ECMs are programmed with a nominal TDC offset.

Make sure the SELECT FUNCTION menu is displayed on the DDT. Press the 5 key.



The READING TDC OFFSET screen will appear if supported by the ECM.



1-Mercury Marine

5-SPECIAL FUNCTIONS

TDC OFFSET

– continued

```
TDC OFFSET        .000
NEW OFFSET        .125   ↑
SAVE OFFSET?             ↓
1=YES  2=NO
```

Press the 1 Key

```
THE NEW TDC OFFSET
HAS BEEN STORED IN
THE ECM.
PRESS MODE TO EXIT
```

Using the ↑ or ↓ keys to increment or decrement the value in the new offset field. Incremental steps of .0625 degrees are available. Pressing the ↑ key twice will display 0.125. Any negative value will display the minus symbol, otherwise assume a positive number.

NOTE: *Before replacing the original ECM, use the DDT to read the factory TDC offset and write it down. Use this* ***original*** *value when configuring the replacement ECM with the original offset value.*

Press

MODE

To EXIT

2.0 Marine Diagnostics

1-Mercury Marine

5-SPECIAL FUNCTIONS

ENGINE LOCATION

Engine location will allow the user to configure multi engine installations within the SmartCraft network. All engines shipped from the factory are ECM configured as a starboard outside engine. For example, if a dual installation is desired, then the appropriate engine ECM needs to be reprogrammed to an outside port engine. Doing this will make sure the correct ECM data is transmitted to the correct set of SmartCraft gauges.

There are 4 location configurations available:

1-Starboard	STB (factory default)
2-Port	PRT
3-Starboard inside	STB2
4-Port inside	PRT2

Fig. 1 below shows a dual engine installation.

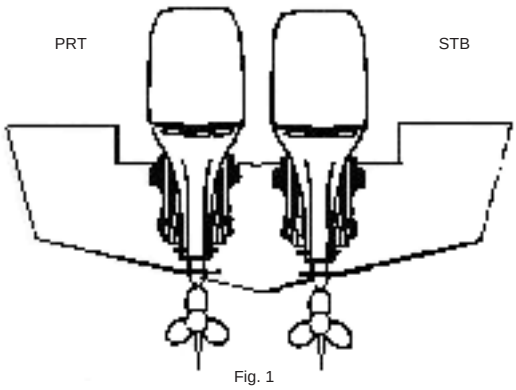


Fig. 1

To change the engine location use the Special Functions menu, select choice 6-ENGINE LOCATION.

Select Function: ↑
4-RESET BREAK-IN
5-TDC OFFSET
6-ENGINE LOCATION

1-Mercury Marine

5-SPECIAL FUNCTIONS

ENGINE LOCATION
– continued

The screen will appear asking you to select the number of engines installed on the boat. Press the 2 key for a twin installation.

```
PLEASE SELECT THE
NUMBER OF ENGINES
INSTALLED ON THE BOAT
  1     2     3     4
```

```
THIS IS CURRENTLY A
STARBOARD OUTSIDE
ENGINE
PRESS 1 TO CONTINUE
```

Press the 1 key.

```
DUAL ENGINE
>PRT              STB
SELECT NEW LOCATION
AND PRESS ENTER
```

Use the ← or → key to move the cursor to the location you wish to configure. Then press the ENTER key.

```
YOU HAVE SELECTED A
PORT OUTSIDE
ENGINE
1=YES             2=NO
```

The screen message will then ask you to confirm your selection. Press the 1 key to confirm your choice.

```
THIS LOCATION IS NOW
A PORT OUTSIDE
ENGINE                    ↓
```

```
TURN KEY OFF THEN
BACK TO RUN FOR ECM       ↑
TO ACCEPT LOCATION
PRESS MODE TO EXIT
```

Turning the key to off, then back to run, will force the ECM to update the current engine location.

NOTE: *See the appendix for additional installation examples.*

Available

Press

To EXIT

2.0 Marine Diagnostics

1-Mercury Marine

5-SPECIAL FUNCTIONS

TRIM LIMIT – Note: Digital Throttle and Shift models only.

The trim limit function will allow the user to configure the ECM to control the maximum up trim limit function. This trim limit function is only supported if the ECM has input from the 3 wire trim sensor.

Make sure the SELECT FUNCTION menu is displayed on the DDT. Press the 7 key.

```
Select Function:
5–TDC OFFSET
6–ENGINE LOCATION
7–TRIM LIMIT
```

The TRIM LIMIT screen will appear.

```
DO YOU WISH TO
SET THE MAXIMUM
UP TRIM LIMIT?
1 = YES   2 = NO
```

Press the 1 key.

Activate the trim up switch using the ERC trim up button to the desired maximum trim position.

```
TRIM ENGINE TO
MAXIMUM DESIRED
POSITION.
CONTINUE?  1=YES  2=NO
```

Press the 2 key

```
LIMIT NOT STORED
OPERATION CANCELED
BY USER.
PRESS MODE TO EXIT
```

Press the 1 key

```
MAXIMUM TRIM LIMIT
SETPOINT WILL NOW
BE STORED IN THE ECM.
CONTINUE?  1=YES  2=NO
```

Press the 2 key

```
LIMIT NOT STORED
OPERATION CANCELED
BY USER.
PRESS MODE TO EXIT
```

Press the 1 key

```
TURN KEY OFF THEN
BACK TO RUN FOR ECM
TO ACCEPT NEW LIMIT.
PRESS MODE TO EXIT
```

```
TRIM LIMIT
UPDATE FAIL
PRESS 1 TO RETRY.
PRESS MODE TO EXIT
```

Press

MODE

To EXIT

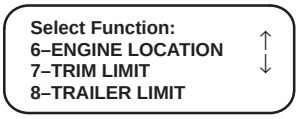
1-Mercury Marine

5-SPECIAL FUNCTIONS

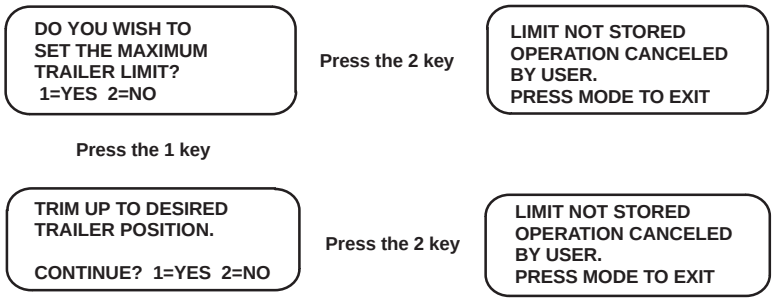
TRAILER LIMIT – Note: Digital Throttle and Shift models only.

Using the OUTPUT LOAD TEST function, you can exercise the ECM and various output loads (ignition coils, injectors, pumps, etc) controlled by the ECM. The trailer limit function will allow the user to configure the maximum limit that a MerCruiser sterndrive model can be trimmed to prevent damage to swim platforms, etc. For outboard models this function can be used to prevent cowl damage when the engine is trimmed up and the cowl is in close proximity to the engine well at the transom.

Make sure the SELECT FUNCTION menu is displayed on the DDT. Press the 8 key.



The TRAILER LIMIT screen will appear.



2.0 Marine Diagnostics

1-Mercury Marine

5-SPECIAL FUNCTIONS

TRAILER LIMIT

– continued

Activate the trim up switch to move the drive / engine to the desired maximum trailer position.

Press 1 to continue.

```
MAX. TRAILER LIMIT
SETPOINT WILL NOW
BE STORED IN THE ECM.
CONTINUE?  1=YES  2=NO
```

```
TRAILER LIMIT
UPDATE FAIL
PRESS 1 TO RETRY
PRESS MODE TO EXIT
```

Press 1 to continue.

```
TURN KEY OFF THEN
BACK TO RUN FOR ECM
TO ACCEPT NEW LIMIT.
PRESS MODE TO EXIT
```

Press

To EXIT

1-Mercury Marine

5-SPECIAL FUNCTIONS

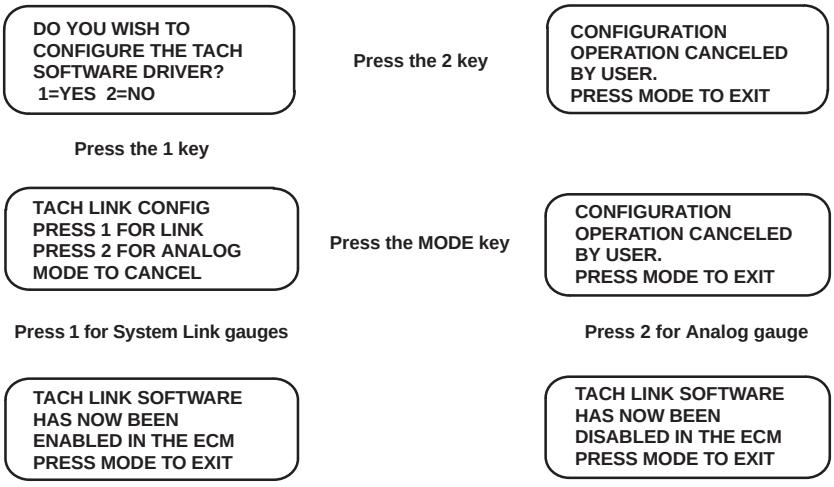
TACH LINK CONFIG

Future ECU software enhancements will allow the TACH LINK CONFIGURATION function to modify the behavior of the tachometer signal. The ECU tach circuit normally drives a conventional analog tach. TACH LINK CONFIG gives the technician the ability to instruct the ECU to send analog or digital information through the gray tach wire. If the ECU supports this function, the SmartCraft System Link gauges can be used when they are connected to the standard tach wire after the TACH LINK has been configured to send digital information.

Make sure the SELECT FUNCTION menu is displayed on the DDT. Press the 9 key.

```
Select Function:
7–TRIM LIMIT
8–TRAILER LIMIT
9–TACH LINK CONFIG
```

The TACH LINK CONFIG screen will appear.



1-Mercury Marine

5-SPECIAL FUNCTIONS

TACH LINK CONFIG
– continued

NOTE: *Pressing 1 sends a command to the ECM to enable the Tach Link software feature. This will disable the conventional analog tach signal. Pressing 2 will disable the software if the boat owner decides to revert back to a conventional analog tachometer. The Tach Link is typically not enabled at the factory.*

Press

To EXIT

2.0 Marine Diagnostics

1-Mercury Marine

SAMPLE PRINTOUTS – LIVE OR RECORDED

NOTE: *Not all printout samples are shown. Press mode to stop printing. Output may continue until printer buffer is cleared out.*

Press F2 and then 1 from either the Data Monitor, Fault Status, System Info or History screens for data printout. To print recorded data see section under RECORD/PLAYBACK methods.

```
          MERCURY MARINE
            SMARTCRAFT

01MY DFI 2.5L 175
ECM#  859610–4
CODE  878086–4

  BREAKIN
BARO PSI              =  14.2
BATT VOLTS            =  12.4
BLOCK  PSI            =   3.8
BOAT SPEED            =   0.0
AIR TMP  deg  F       =  59.0
COOL TMP deg F        =  78.8
DEMAND %              =   2.0
ENGINE RPM            =  1579
ENGINE STATE             RUN
FPC TOTAL             =   2.0
FREQ COUNTER          =     0
FUEL LEVEL %          =  11.9
SHIFT                 IN GEAR
LAKE/SEA TMP  deg F   =    61
LOAD %                =   3.8
MPRLY REQ             =    20
MAP PSI               =  14.2
OIL LEVEL %           =  12.4
PORT TAB POS          =   0.0
AVAILABLE PWR %       =   100
RUN TIME              =   1.8
STAR TAB POS          =   0.0
TPI %                 =   2.0
TRIM POSITION         =  64.7
COOL TMP STB  deg F   =  76.2
COOL TMP PRT  deg F   =  78.8
```

```
          MERCURY MARINE
            SMARTCRAFT

01MY DFI 2.5L 175
ECM#  859610–4
CODE  878086–4

        RUNTIME HISTORY PRINTOUT


TOTAL RUN TIME HR.    = 3.8
  0– 749              = 1.0
 750–1499             =  0.1
1500–2999             = 0.0
3000–3999             = 2.0
4000–4499             = 0.5
4500–4999             = 0.2
5000–5499             = 0.0
5500–6249             = 0.0
6250+                 = 0.0
BREAK–IN LEFT         =  38
RPM LIMIT SEC         =    0
GRD LIMIT SEC         =    0
ACT TEMP SEC          =    0
BLOCK PSI SEC         =    0
CTS TMP SEC           =    0
CTP TMP SEC           =    0
LOW OIL  SEC          =    0
OIL PMP SEC           =    0
```

2.0 Marine Diagnostics

1-Mercury Marine

```
MERCURY MARINE
SYSTEM INFORMATION PRINTOUT


01MY DFI  2.5L 175
ECM# 859610–4
CODE 878086–4
0310_175_002
IGN PRI .38–.78 ohm
SEC 8.1–8.9 Kohm
DINJ 1.0–1.6 ohm
FINJ 1.7–1.9 ohm
TYPICAL TPI RANGE

TPI1 0.19–1.0v IDLE
    3.45–4.63v WOT
TGAP 0.025–0.04in
PWR RLY 81–99 ohm
RPM LIMIT 5850
PROP RPM 5250–5750
AIR COMPRESSOR
1 Kohm @ 77F/25C
AIR TEMP/COOLANT
10 Kohm @ 77F/25C
BATV 12.6–15.0
MAP   7–15 psi
FUEL = AIR + 10psi
AIR  78–82 psi

OIL PUMP COIL
1.8–2.0 ohms

1 FUSE–INJ/OIL PUMP
2 FUSE–FUEL PUMP
3 FUSE–ACCESSORY
4 FUSE–IGNITION
OVERTEMP/BLOCK
PRESSURE LIMITS ARE
CONTROLLED BY
ENGINE GUARDIAN
SEE SERVICE MANUAL
FOR GUARDIAN INFO
```

3.0 Glossary of Terms

SMARTCRAFT SYSTEMS

5 VDC PWR LO	5 Volt ECM Internal Power Supply Low
5 VDC PWR 2 LO	5 Volt ECM Power Supply Low to SmartCraft Sensors (Not Available on All Models)
ACT	**A**ir **C**ompressor **T**emperature (F or C) Sensor
ACT INPUT HI	**A**ir **C**ompressor **T**emperature Sensor Input is High
ACT INPUT LO	**A**ir **C**ompressor **T**emperature Sensor Input is Low
ACT TMP Sec	Time Spent in Air Compressor Overheat
ACTIVE	Active Fault State of Sensors, Switches, Injectors, etc ...
AT	Intake Manifold **A**ir **T**emperature (F or C) Sensor
AT INPUT HI	Air Temperature (engine) Sensor Input is High
AT INPUT LO	Air Temperature (engine) Sensor Input is Low
AIR COM TMP	Air Compressor Temperature Sensor (F or C)
AIRFLOW HI	Incoming Airflow to Engine is Higher Than Expected
AIR TEMP CKT HI	Air Temperature (engine) Sensor Circuit is High
AIR TEMP CKT LO	Air Temperature (engine) Sensor Circuit is Low
AIR TMP	Intake Manifold Air Temperature (F or C) Sensor
AVAILABLE PWR %	A Normally Functioning System Will Allow Engine to Make 100% Power.
BARO PSI	Barometric Pressure (PSI or kPa)
BATT VOLTS	Main Engine Battery Volts
BATTERY VOLTS	Main Engine Battery Volts
BATT VOLT HIGH	Battery Voltage is Above the Allowable Limit
BATT VOLT LOW	Battery Voltage is Below the Allowable Limit
BLK PSI MIN	Block Pressure Minimum Specification
BLOCK PRESS LOW	Engine Block Pressure Below Acceptable Limit
BLOCK PSI	Inlet Water Pressure (PSI or kPa)
BLOCK PSI Sec	Time Spent with Low Water Pressure to Block
BLOK PSI	Inlet Water Pressure (PSI or kPa)
BLOCK OVERHEAT	Engine Block is Overheating
BLOCK TMP	Block Temperature (F or C)

3.0 Glossary of Terms

BLK TEMP CKT HI	Engine Block Temperature Sensor Circuit is High
BLK TEMP CKT LO	Engine Block Temperature Sensor Circuit is Low
BOOST BY CKT HI	Boost Bypass Circuit is High
BOOST BY CKT LO	Boost Bypass Circuit is Low
BOOST VALVE ERR	Boost Valve Diagnostic Error; Test Valve
BPSI INPUT HI	Block Pressure Sensor Input is High
BPSI INPUT LO	Block Pressure Sensor Input is Low
BREAK-IN	Engine Break-In Routine
BREAKIN ACTIVE	Engine Break-In Routine is Active
BREAK-IN LEFT	Time Remaining in Engine Break-In Routine
BREAKIN STR	BreakIn Strategy
BUFFER	An Area Used to Temporarily Store Data
BUS +12	CAN Bus 12 Volt Supply for SmartCraft
CALIB ID	Calibration ID of ECM
CAN	Controller Area Network
CAN ERR1	CAN Wiring Problem. Check ALL Pins & Terminators
CAN ERR2	CAN Wiring Problem. Check ALL Pins & Terminators
CAN ERR3	CAN Wiring Problem. Check ALL Pins & Terminators
CAN ERR4	CAN Wiring Problem. Check ALL Pins & Terminators
CAN ERR5	CAN Wiring Problem. Check ALL Pins & Terminators
CAN ERR6	CAN Wiring Problem. Check ALL Pins & Terminators
CAN ERR7	CAN Wiring Problem. Check ALL Pins & Terminators
CAN ERR8	CAN Wiring Problem. Check ALL Pins & Terminators
CAN ERR9	CAN Wiring Problem. Check ALL Pins & Terminators
CAN ERR10	CAN Wiring Problem. Check ALL Pins & Terminators
CHI	Customer Helm Interface (SC5000)

3.0 Glossary of Terms

CODE	Calibration ID of ECM
COOL TMP PRT	**C**oolant **T**emp **P**ort (F or C) Sensor
COOL TMP STB	**C**oolant **T**emp **S**tarboard (F or C) Sensor
COMP	**A**ir **C**ompressor **T**emperature Sensor
COMP OVERHEAT	**A**ir **C**ompressor **T**emperature is Above the Allowable Limit
COMP TEMP CKT HI	**A**ir **C**ompressor **T**emperature Sensor Circuit is High
COMP TEMP CKT LO	**A**ir **C**ompressor **T**emperature Sensor Circuit is Low
COMP TMP	**A**ir **C**ompressor **T**emperature (F or C)
COMPRESS OVRHT	**A**ir **C**ompressor **T**emperature is Above the Allowable Limit
CTP INPUT HI	Coolant Temperature Port Sensor Input is High
CTP INPUT LO	Coolant Temperature Port Sensor Input is Low
CTP TMP Sec	Time Spent in Overheat on the Port Bank
CTS INPUT HI	Coolant Temperature Starboard Sensor Input is High
CTS INPUT LO	Coolant Temperature Starboard Sensor Input is Low
CTS TMP Sec	Time Spent in Overheat on the Starboard Bank
DDT	Digital Diagnostic Terminal
DEMAND %	TPI% / TPS%; On DTS Models this is ERC Demand %
DEMAND DIFF	Faulty Potentiometers in ERC
DINJ1 – DINJ6 OPEN	Direct Injector 1-6 is Open Circuit
DINJ1 – DINJ6 SHORT	Direct Injector 1-6 is Short Circuit
DRIVE LUBE LO	Low Drive Lube Reservoir
DRIVER POWER LO	Insufficient Battery Voltage or Wiring Problem
DTS	Digital Throttle and Shift
DUAL CAN ERR	Wiring Problem Between CAN1 & CAN2
ECM 555	Electronic Control Module with a Power PC 555 microcomputer
ECM MEMORY ERR	ECM Memory Has Been Corrupted
ECM ID	ECM Hardware Revision Level
ECM_TRIG1-8 OPEN	ECM Spark Trigger Signal Circuit 1-8 is Open
ECM_TRIG1-8 SHORT	ECM Spark Trigger Signal Circuit 1-8 is Short

3.0 Glossary of Terms

ECT	**E**ngine **C**oolant **T**emperature (F or C) Sensor
ENGINE ID	Engine Identification
ENGINE RPM	Revolutions Per Minute of Engine
ERC	**E**lectronic **R**emote **C**ontrol Handle at the Helm
ESC	**E**lectronic **S**hift **C**ontrol (Actuator)
ESC CONTROL LOST	ESC Cannot Maintain In-Gear Position
ESC - NS POS DIFF	ESC Determination of its Position and Neutral Switch Position Don't Agree
ESC - ERC POS DIFF	ESC (actuator's determination of its) Position and Commanded Position Do Not Agree
ESC TIMEOUT	ESC Actuator Has Not Physically Moved With Respect to the ERC Lever (demand) Position
EST 1-8	**E**lectronic **S**park **T**rigger Signal to the Ignition Coil Driver Circuit
EST 1-8 OPEN	**E**lectronic **S**park **T**rigger Signal Circuit 1-8 is Open
EST 1-8 SHORT	**E**lectronic **S**park **T**rigger Signal Circuit 1-8 is Short
ETC CONTROL	Loss of **E**lectronic **T**hrottle **C**ontrol Circuit
ETC STICKING	Electronic Throttle Control Sticking or Binding
ETC IDLE RANGE	ETC is Outside of its Expected Idle Range
ETC MOTOR OPEN	Electronic Throttle Control Motor is Open (Not Available on All Models)
ETC MOTOR SHORT	Electronic Throttle Control Motor is Shorted (Not Available on All Models)
FINJ 1 – FINJ 8 OPEN	Fuel Injector Circuit 1-8 is Open
FINJ 1 – FINJ 8 SHORT	Fuel Injector Circuit 1-8 is Shorted
FPC TOTAL	**F**uel **P**er **C**ycle Per Cylinder. Total Fuel Amount Currently Being Used By Engine.
FREEZE FRAME	A Snapshot of Captured Engine Data Stored in ECM History
FUEL LEVEL	Boat Tank Fuel Sender Data
FUEL LVL CKT HI	Fuel Level Sensor Circuit High (same as Fuel Lvl Input Hi)
FUEL LVL CKT LO	Fuel Level Sensor Circuit Low (same as Fuel Lvl Input Lo)
FUEL LVL CKT2 HI	Fuel Level Sensor Circuit #2 High (same as Fuel Lvl Input Hi)
FUEL LVL CKT2 LO	Fuel Level Sensor Circuit #2 Low (same as Fuel Lvl Input Lo)

3.0 Glossary of Terms

FUEL LVL IN HI	Fuel Level Sensor Input is High
FUEL LVL IN LO	Fuel Level Sensor Input is Low
FUEL PRES CKT LO	Fuel Pressure Sensor Circuit is Low (Not Available On All Models)
FUEL PRES CKT HI	Fuel Pressure Sensor Circuit is High (Not Available On All Models)
FUEL PSI CKT HI	Fuel Pressure Sensor Circuit High (same as Fuel Pres Input Hi)
FUEL PSI CKT LO	Fuel Pressure Sensor Circuit Low (same as Fuel Pres Input Lo)
FUEL PUMP CKT	Fuel Pump Circuit or Relay Fault
FUEL PUMP RLY	Fuel Pump Relay
GEAR POS DIFF	ESC Position Sensor Doesn't Agree With the Shift Switch
GUARDIAN	Engine Guardian Strategy is Active
GRD LIMIT Sec	Time Spent in Engine Guardian
H_20 IN FUEL	Water in Fuel Filter
H_20 PRES CKT HI	Engine Water Pressure Sensor Crcuit is High
H_20 PRES CKT LO	Engine Water Pressure Sensor Crcuit is Low
HALL SENSOR	Hall Effect (Encoder/Crank Position) Sensor
HALL SNSR STR	Hall Effect (Encoder/Crank Position) Sensor Strategy is Active
HEAD OVRHT	Cylinder Head is Overheating
HEAD TMP	Cylinder Head Temperature (F or C)
HEAD TEMP CKT HI	Cylinder Head Temperature Sensor Circuit is High
HEAD TEMP CKT LO	Cylinder Head Temperature Sensor Circuit is Low
HELM ADC CHECK	Command Module Reliability Check or CAN Bus Problem
HORN	Horn Driver (internal to ECM for non DTS models)
HORN OUTPUT	Warning Horn System Not Functional (same as Warning Horn)
IAC OUTPUT	**I**dle **A**ir **C**ontrol Valve or Circuit Fault
IAC PWM%	**I**dle **A**ir **C**ontrol Valve Duty Cycle Percent
IDLE	Idle TPI=0%
IDLE MAP STR	Idle RPM MAP Strategy (same as MAP Idle Check)

3.0 Glossary of Terms

IGN 1 – IGN 8	Ignition Coil for Cylinders One thru Eight
IGN PRI	Ignition Coil Primary
KNOCK SENSOR1	Knock Sensor #1 (not available on all models) or KNK SNSR1
KNOCK SENSOR2	Knock Sensor #2 (not available on all models) or KNK SNSR2
LAKE/SEA	Lake or Sea Water Temp (F or C)
LED	**L**ight **E**mitting **D**iode (Typically Red in Color)
LIFT PUMP OUT	Check Fuel Supply Module Lift Pump
LIFT PUMP SW HI	Lift pump switch is high - fuel supply module overflow
LIFT PUMP TIMER	Fuel Supply Module is not filling
LOW DRIVE LUBE	Low Drive Lube Reservoir
LOW OIL SEC	Time Spent on Low Oil Reserve
MAP	**M**anifold **A**bsolute **P**ressure Sensor (PSI or kPa)
MAP CKT HI	**M**anifold **A**bsolute **P**ressure Sensor Circuit High (same as Map Input Hi)
MAP CKT LO	**M**anifold **A**bsolute **P**ressure Sensor Circuit Low (same as Map Input Lo)
MAP DIFF ERR	Both TPIs Are Functioning But MAP Sensor Calculations Don't Agree. Therefore the MAP Sensor is Suspected as Faulty.
MAP INPUT HI	MAP Sensor Input is High
MAP INPUT LO	MAP Sensor Input is Low
MAP IDLE CHECK	MAP Sensor Rationality/Loss of Vacuum Check (Not Available On All Models)
MAT	**M**anifold **A**ir **T**emperature (F or C) (same as AT)
MAT CKT HI	**M**anifold **A**ir **T**emperature Circuit High (same as AT Input Hi)
MAT CKT LO	**M**anifold **A**ir **T**emperature Circuit Low (same as AT Input Lo)
MPRLY	Main Power Relay
MPRLY BACKFEED	An External Power Source Has Bypassed The Main Power Relay
MPRLY OUTPUT	Main Power Relay Output Circuit Has a Fault
NA	Not Available
NEUTRAL OVERSPD	Neutral Gear Overspeed

3.0 Glossary of Terms

OIL INJ CNT	Number of Counts of Oil Pump Activation Cycles
OIL JET CKT HI	Oil Jet Pressure Circuit is High
OIL JET CKT LO	Oil Jet Pressure Circuit is Low
OIL JET PRES LO	Oil Jet Pressure is Low
OIL LEVEL	Main Oil Tank Sender Data
OIL LVL BOAT LO	Oil Level in Boat Tank is Low
OIL LVL ENG LO	Oil Reserve Active on Engine Tank (Low Oil Switch)
OIL LVL CKT HI	Oil Level Sensor Circuit is High
OIL LVL CKT LO	Oil Level Sensor Circuit is Low
OIL LVL IN HI	Oil Level Sensor Input is High
OIL LVL IN LO	Oil Level Sensor Input is Low
OIL PMP Sec	Time Spent with Oil Pump Fault
OIL PRES LO	Oil Pressure is Low
OIL PRES CKT HI	Oil Pressure Sensor Circuit High
OIL PRES CKT LO	Oil Pressure Sensor Circuit Low
OIL PSI	Engine Oil Pressure (PSI or kPa)
OIL PSI CKT HI	Oil Pressure Sensor Circuit High
OIL PSI CKT LO	Oil Pressure Sensor Circuit Low
OIL PSI STR	Oil Pressure Strategy (Not Available on All Models)
OIL PUMP	Oil Pump Electrical Fault or Wiring
OIL PUMP OUTPUT	Oil Pump Electrical Fault or Wiring
OIL QLTY CKT HI	Oil Quality Circuit High (Not Available on All Models)
OIL QLTY CKT LO	Oil Quality Circuit Low (Not Available on All Models)
OIL REMOTE STR	Remote Oil Tank Strategy (Not Available on All Models)
OIL RESERVE STR	Oil Reserve Strategy is Active (Low Oil Switch Has Been Activated)
OVERSPEED	Overspeed or RPM Limit
OIL SYSTEM	Oil System Fault
OIL TMP CKT HI	Oil Temperature Circuit High
OIL TMP CKT LO	Oil Temperature Circuit Low
OIL TMP OVRHT	Oil Temperature Overheat

3.0 Glossary of Terms

OVERSPEED	Engine has entered stage 0 of RPM limit (normal rev limit).
OVERSPEED 1	Engine has entered stage 1 of RPM limit (abnormal rev limit).
OVERSPEED 2	Engine has entered stage 2 of RPM limit (abnormal rev limit).
OVER TMP Sec	Time in Seconds Spent in Over Heat Condition
PADDLE WHEEL	Data Used to Calculate Boat Speed (Frequency in Hertz)
PADDLE WHEEL STR	Paddle Wheel Strategy
PCM 555	Propulsion Control Module with a Power PC555 microcomputer
PITOT	Pitot Pressure Sensor data for Boat Speed Calculations
PITOT CKT HI	Pitot Pressure Sensor Circuit High
PITOT CKT LO	Pitot Pressure Sensor Circuit Low
PORT EMCT CKT HI	Port Exhaust Manifold Coolant Sensor Circuit High
PORT EMCT CKT LO	Port Exhaust Manifold Coolant Sensor Circuit Low
PORT EMCT OVRHT	Port Exhaust Manifold Coolant Temperature Overheat
PRT EMCT	Port Exhaust Manifold Coolant Temp (F or C)
PRT EMCT CKT HI	Port Exhaust Manifold Coolant Sensor Circuit High
PRT EMCT CKT LO	Port Exhaust Manifold Coolant Sensor Circuit Low
PRT EMCT OVRHT	Port Exhaust Manifold Coolant Temperature Overheat
PITOT INPUT HI	Pitot Pressure Sensor Input is High
PITOT INPUT LO	Pitot Pressure Sensor Input is Low
PORT HEAD OVRHT	Overheat on the Port Bank
PORT OVERHEAT	Overheat on the Port Bank
PWR 1 VOLTS	Power Supply 1 Volts (internal to ECM) for Sensors
PWR RLY	Main Power Relay
PWR RELAY OUTPUT	Main Power Relay Output Circuit Has a Fault (see FAQ)

3.0 Glossary of Terms

PWR RELAY BACKFD	An External Power Source Has Bypassed The Main Power Relay
PWR1 LOW	+5v Sensor Power Supply is Low
REVERSE OVERSPD	Reverse Gear Overspeed
RPM LIMIT SEC	Time Spent in RPM Limit (seconds)
RUN TIME HR.	Total Run Time in Hours with this ECM
SC5000	SystemView 5000 Display (CHI)
SC DIAG CKT HI	Supercharger Diagnostic Circuit is High
SC OVERHEAT	Supercharger Overheat
SC TEMP CKT LO	Supercharger Temperature Circuit is Low
SC TEMP CKT HI	Supercharger Temperature Circuit is High
SUP CHG TMP	Supercharger Outlet Temperature (F or C)
SEA PUMP CKT HI	Sea Pump Pressure Sensor Circuit High
SEA PUMP CKT LO	Sea Pump Pressure Sensor Circuit Low
SEA PUMP PSI	Sea Pump Pressure (PSI or kPa)
SEA PUMP PSI LO	Sea Pump Pressure Low
SEA TMP CKT HI	Sea/Lake Temperature Circuit High (same as Sea Tmp Input Hi)
SEA TMP CKT LO	Sea/Lake Temperature Circuit Low (same as Sea Tmp Input Lo)
SEA TMP IN HI	Sea/Lake Temperature Sensor Input is High
SEA TMP IN LO	Sea/Lake Temperature Sensor Input is Low
SEC	Secondary of Ignition Coil
SEC FINJ1-6 OPEN	Secondary Fuel Injector Circuit 1-6 is Open
SEC FINJ1-6 SHORT	Secondary Fuel Injector Circuit 1-6 is Shorted
SHIFT	Neutral or In Gear Position
SHIFT DRV OVRHT	Internal ECM Driver for Shift Actuator is Overheating
SHIFT POS CKT HI	Shift Position Sensor Input Circuit is High
SHIFT POS CKT LO	Shift Position Sensor Input Circuit is Low
SHIFT ADAPT ERR	Check ESC components for binding. ESC Actuator Faulty?
SHIFT ANT SWITCH	Problem with Shift Anticipate Switch or Problem with Outdrive
SHIFT SWITCH	Faulty Neutral Switch or Wiring
SMARTSTART ERR	DTS Engine Failed to See Flywheel Rotation When Commanded to Start. No Engine RPM Detected. No Starter Engagement?

3.0 Glossary of Terms

STAR OVERHEAT	Overheat on the Starboard Bank
START SOLENOID	Open Circuit to Start Solenoid
STBD HEAD OVRHT	Overheat on the Starboard Bank
STBD TEMP CKT HI	Coolant Temperature Starboard Sensor Circuit is High
STBD TEMP CKT LO	Coolant Temperature Starboard Sensor Circuit is Low
STB EMCT	Starboard Exhaust Manifold Coolant Temp (F or C)
STB EMCT CKT HI	Starboard Exhaust Manifold Coolant Temperature Circuit High
STB EMCT CKT LO	Starboard Exhaust Manifold Coolant Temperature Circuit Low
STB EMCT OVRHT	Starboard Exhaust Manifold Coolant Temperature Overheat
STBD EMCT CKT HI	Starboard Exhaust Manifold Coolant Temperature Circuit High
STBD EMCT CKT LO	Starboard Exhaust Manifold Coolant Temperature Circuit Low
STBD EMCT OVRHT	Starboard Exhaust Manifold Coolant Temperature Overheat
STEER CKT HI	OutDrive Steering Position Sensor Circuit High
STEER CKT LO	OutDrive Steering Position Sensor Circuit Low
STEER INPUT HI	OutDrive Steering Position Sensor Input is High (Not Available on all Models)
STEER INPUT LO	OutDrive Steering Position Sensor Input is Low (Not Available on all Models)
STOP CKT ACTIVE	Emergency Stop Circuit is either in the closed position or shorted to ground.
TGAP	Crank Position Sensor (Trig) Air Gap
THERMOSTAT FAULT	Check Cooling System Components
TPI % or TPS %	Throttle Position Indicator (demand) Percent
TPI or TPS	Throttle Position Indicator or Throttle Position Sensor
TPI ALL ERR	None of the Two TPIs and MAP Agree. Faulty Wiring?
TPI1 DIFF ERR	MAP Sensor Range = TPI2 but TPI1 Doesn't Agree

3.0 Glossary of Terms

TPI1 CKT HI	TPI #1 Sensor Circuit is High
TPI1 CKT LO	TPI #1 Sensor Circuit is Low
TPI 1 INPUT HI	TPI #1 Sensor Input is High
TPI 1 INPUT LO	TPI #1 Sensor Input is Low
TPI 1 NO ADAPT	Throttle Position Indicator #1 has a Mechanical System, Linkage or Connection Fault. ECM Software will not Properly Adapt.
TPI1 ADAPT ERR	Same as Above
TPI 1 RANGE HI	TPI #1 is Above the Allowable High Range
TPI 1 RANGE LO	TPI #1 is Below the Allowable Low Range
TPI 1 VOLTS	Throttle Position Indicator #1 Volts
TPS1 CKT HI	Throttle Position Sensor #1 Circuit High (same as TPI 1 Input Hi)
TPS1 CKT LO	Throttle Position Sensor #1 Circuit Low (same as TPI 1 Input Lo)
TPS1 NO ADAPT	Throttle Position Sensor #1 has a Mechanical System, Linkage or Connection Fault. ECM Software will not Properly Adapt (same as TPI 1 No Adapt)
TPI2 DIFF ERR	MAP Sensor Range = TPI1 but TPI2 Doesn't Agree
TPI2 CKT HI	Throttle Position Indicator #2 Circuit High
TPI2 CKT LO	Throttle Position Indicator #2 Circuit Low
TPI2 NO ADAPT	Throttle Position Indicator #2 has a Mechanical System, Linkage or Connection Fault. ECM Software will not Properly Adapt
TPI2 RANGE HI	Throttle Position Indicator #2 Range High
TPI2 RANGE LO	Throttle Position Indicator #2 Range Low
TPI2 VOLTS	Throttle Position Indicator #2 Volts
TRANS OVERHEAT	Transmission Overheat
TRIM	Trim Sender Data
TRIM CKT HI	Trim Sensor Circuit High (same as Trim Input Hi)
TRIM CKT LO	Trim Sensor Circuit Low (same as Trim Input Lo)
TRIM INPUT HI	Trim Sensor Input is High
TRIM INPUT LO	Trim Sensor Input is Low
VENT SWITCH HI	Vent Switch is high due to fuel in vent canister

3.0 Glossary of Terms

VR SENSOR	Variable Reluctance (Encoder/Crank Position) Sensor
VR SNSR STR	Variable Reluctance (Encoder/Crank Position) Sensor Strategy
WARNING HORN	Warning Horn system not functional (Horn Output)
WATER IN FUEL	Water in Fuel Filter
WATER PRES LO	Water Pressure to Engine is Low
WOT	Wide Open Throttle TPI=100%
XCHK DEMAND DIFF	SC5000 or Command Module Not Equal to PCM Cross Check of Demand Value (Incorrect positions used when configuring levers at CHI, faulty CHI or ECM)
XCHK SHIFT DIFF	SC5000 or Command Module Not Equal to PCM Cross Check of Shift Position

Frequently Asked Questions:

1. What is a circuit (CKT) high or low fault?

- A circuit fault can be due to an open or short condition, which may include a damaged sensor, a connector or wiring harness problem. The ECM has detected that its sensor input has either gone to a high or low input condition. Depending on the sensor type used a low may not necessarily indicate a short circuit or a high may not necessarily indicate an open circuit condition. In either case there is a problem detected by the ECM.

2. What is a STR (Strategy)?

- A strategy is a method of control that involves ECM reaction to various engine conditions normally based on inputs from various sensors or switches. Example: If a critical engine sensor, like the engine coolant sensor or oil pressure sensor is disconnected, the ECM control strategy may only allow the engine to operate at some reduced level of engine power in an attempt to protect the engine from damage.

3. What is a TPI/TPS High or Low Range fault?

- The TPI/TPS sensor diagnostic fault calibration within the ECM, can alert the technician of a fault condition where the sensor is above or below the normal operating range. This fault is not the same as an open or short circuit fault. Possible causes may be loose or misadjusted throttle linkage and excessive wear on components connected to the TPI/TPS.

4. What is a (MPR) Main Power Relay Output Fault?

- If the battery voltage available at the engine is less than 7.5 volts, **for example** during cranking, the MPR may not close or even remain closed during cranking, resulting in no spark, no injector activity or no voltage to the electric fuel pump(s). The ECM decides the MPR output circuit is at fault and sets a fault code, which is stored in the Freeze Frame buffer. A MPR output fault can either be one of two types: the voltage being transferred across its relay contacts is below allowable limits, the relay coil itself is faulty, its connection to the relay coil socket or the associated harness wire is open circuit.

Other typical problems that may cause MPR Output faults:

- Incorrect battery type and capacity
- Use of a deep cycle battery as the primary cranking battery ☹
- Loose or corroded battery cables (at the battery or the engine)
- Discharged battery (shorted or dead cells)
- Faulty battery switch contacts or loose connections
- Short extension wires from battery switches that have excessive amounts of shrink sleeve partially covering the ring terminals
- Incorrectly sized battery cables if longer battery cables are required
- 12 volt power buss-bar connection problem

5. What's wrong when I see a PWR1 or 5VDC Power Low fault?

- The ECM is complaining about the health of its internal 5 volt power supply. Usually this results from a short circuit between the +5vdc wiring to ground. Any external engine sensors or accessory SmartCraft sensors, if improperly connected, can result in overloading the 5 volt supply.

NOTE: *If the 5vdc supply is low enough the engine may be impossible to even start.*

Typical problems include:

- SmartCraft accessory harness missing the protective waterproof cap and pins are corroding
- Damaged paddlewheel sensor has allowed the sensor wiring to be exposed to water.

Service Hint: While monitoring the +5 volt supply reading with the DDT, disconnect the main SmartCraft accessory harness to see if the voltage problem is corrected. If not, continue disconnecting engine sensors one at a time until problem is corrected. Repair or replace the faulty components.

NOTE: *After repairs are completed make sure to clear Fault History in order to clear any faults created during the testing process.*

6. Why doesn't an EST or ECM Trigger Open register as a fault when the engine is running?

- The ECM signal that triggers the ignition coil driver can only be detected as an open circuit when there is no engine speed. Likewise, a short circuit can only be detected with engine speed.

7. What are MAP Diff or TPI Diff errors?

- ECM system strategies allow the MAP pressure readings to be correlated to typical TPI readings for any given RPM and boat load. The ECM calculates the differences between nominal MAP readings and the current TPI readings. If there are any differences outside the typical operating range, then MAP differences or TPI difference errors are stored in the ECM Freeze Frame history buffers. Either the MAP sensor or TPI may be unplugged, intermittent or having a harness connection problem resulting in these errors.

8. What is a MAP Idle Check or MAP Idle Err?

- The engine is expected to pull a little vacuum on the inlet at idle. If there is no pressure difference between the ambient barometer at key-up to the pressure (MAP) in the intake, the throttle bore must be missing, a very large air leak, a possible fault in the wiring harness or the sensor has failed.

9. Why do I see strange characters (#&ςΨπδ?) displayed in fault status or freeze frame?

- The DDT software version that you are using is not up to date with the ECU software version. You need to upgrade to the most recent version of the DDT cartridge.

10. What can I do when the DDT fails to operate (locks up) during engine cranking?

- In most situations the battery voltage is low during cranking. Make sure the battery is fully charged. If the DDT power clips are attached at the powerhead, try connecting them directly to the battery instead. This will minimize the voltage drop and improve the chances that you'll have adequate power to the DDT while cranking.

3.0 Glossary of Terms

11. Overspeed Fault & Engine Guardian Fault – what does this indicate?

- On an EFI engine, overspeed is used as a method of controlling engine power much like the way engine guardian protects an OptiMax engine. For example: if the engine block temperature is running too warm, but not at a critical level, the PCM/ECM analyzes all sensor inputs and engine load. Once the calculations are made, then the engine guardian strategy determines what appropriate engine RPM can be achieved under those given operating conditions and reduces RPM based on the sensor inputs and the current engine load. If the engine temperature reaches a critical condition, then the only remaining option is to sound the overheat alarm and reduce power to a minimum level. Overheat seconds are only logged when the critical overheat temperature is reached and the alarm is sounded.

12. What is a MPRLY REQ (Main Power Relay Request) in the Freeze Frame buffer?

- The PCM/ECM can request the main power relay be turned on for various reasons. For example: When the keyswitch is turned to the 'on' position, the PCM/ECM requests the fuel pump to be also turned on. During the time the relay is active, a number code is displayed in the Freeze Frame buffer, which represents that the relay was on for various reasons. Depending on the requirements at the time a fault was recorded, seeing a number for MPRLY REQ only indicates the relay was on and nothing more. If the number displayed is equal to zero this means the relay was off at the time the fault was recorded. ***Do not interpret this number as an indication to the number of times the relay was faulty. If the number is greater than zero then the relay was turned on.***

13. Why is my engine slowing down and how do I know if Engine Guardian is active?

- View the parameter called AVAILABLE PWR% on the Data Monitor Screen. If everything is normal, 100% will be displayed. If 100% is displayed then Engine Guardian is not responsible for the reduction in RPM. Anything less than 100% indicates a problem and Guardian is or soon will be active. For example, look at the various engine temperature sensors to see if anything seems warmer than normal.

NOTE: *As a general rule consider the "normal" operating temperature to be the same as the operating specification of the thermostats installed on the engine.*

14. LED 4 is active and I see the following faults: oil lvl in (ckt) hi, fuel lvl in (ckt) hi or sea temp in (ckt) hi. Is there a problem and how can I eliminate these faults?

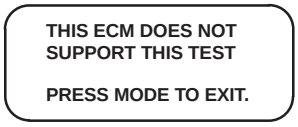
- If there is no paddlewheel (contains the lake/sea temp sensor), SmartCraft fuel or oil level sensors installed, by default the ECM will record and store these fault codes. For the most part these faults can be ignored provided that the sensors are not installed. If the engine is equipped with any of these sensors, this fault indicates that a sensor is faulty or the wiring connected to the sensor has a connection problem.

15. What is a good tool to use to diagnose boat-wiring problems?

- A keyswitch test harness with horn is one of the best tools to carry in your toolbox. This will quickly help you isolate a problem, is it the boat wiring or is it on the engine? Use Mercury Marine p/n 15000A 7 for most outboard applications.

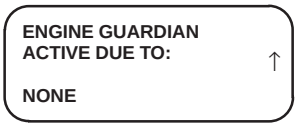
3.0 Glossary of Terms

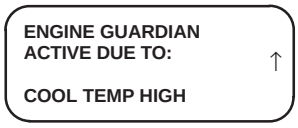
16. The screen below appears when I wish to enter a test mode. What does this mean?



- The test function you have selected is not supported by the ECM because the component you wish to test is not physically on the engine (i.e. an EFI engine doesn't have direct injectors) or the software test function in the ECM is not able to test the component at this time.

17. What does the screen below tell me? Why don't I see this on all ECMs?





- Starting with model year 2004 ECM software and cartridge version 1.3 you will see an extra screen displayed at the very end of the Fault Status list. Older ECMs will not support this feature and the screen is not displayed. This screen will try to indicate the reason that Engine Guardian is active. If all engine functions are normal then NONE will be displayed. If Guardian is trying to protect the engine for lack of cooling water, then COOL TEMP HIGH is displayed. If you observe the engine operating temperatures you should see that the engine might be running hotter than normal and eventually Guardian will take control in an effort to protect the engine. Critical oil level, battery voltage, coolant temp high, oil pressure or forced idle, just to name a few, will be displayed on this screen when appropriate. Forced idle usually indicates a serious condition that requires immediate attention. Multiple messages are not available at the same time on this screen. In the event that multiple 'Guardian Active Due To' faults exist, the next one will be displayed as soon as the first displayed fault has been corrected.

18. What's wrong when LED #6 is turned on?

- LED #6 indicates a fault is active in the miscellaneous group. This group currently consists of:

Horn	Horn for non - DTS engines
IAC	Idle Air Control
ETC	Electronic Throttle Control
ESC	Electronic Shift Control
CAN Error	Communications Fault
MPRLY	Main Power Relay Output
System Volts	System Voltage Fault
PWR1 or 2	+5v Power Supply internal to ECM
Start Relay	Smart Start Relay for DTS engine

NOTE: *The list of the above faults will depend on the model year of the ECU / engine under test. If the fault is currently active, you can monitor the condition by viewing selection 2 – Fault Status.*

19. What is Tach Link Config?

- The ECU tach circuit normally drives a conventional analog tach. TACH LINK CONFIG gives the technician the ability to instruct the ECU to send analog or digital information through the gray tach wire. If the ECU supports this function, the SmartCraft System Link gauges can be used when they are connected to the standard tach wire after the TACH LINK has been configured to send digital information.

20. What is a Thermostat Fault?

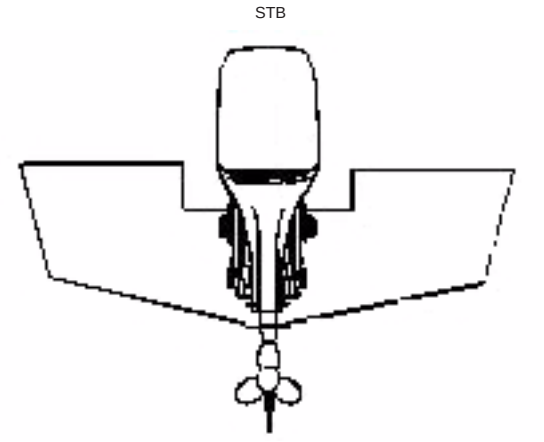
- New ECU software has the ability to determine if the thermostat might be stuck in the open position. Based on a predetermined period of engine running time versus the expected change in cylinder head temperature the ECU expects to see a reasonable temperature change. If the expected rise in temperature doesn't meet the calibrated temperature and time period it's assumed that the thermostat is stuck in the open position. This software feature may not apply to all engine models.

3.0 Glossary of Terms

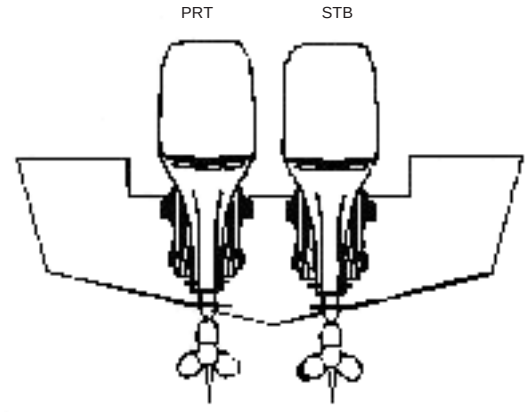
NOTES

4.0 Appendix

ENGINE LOCATION



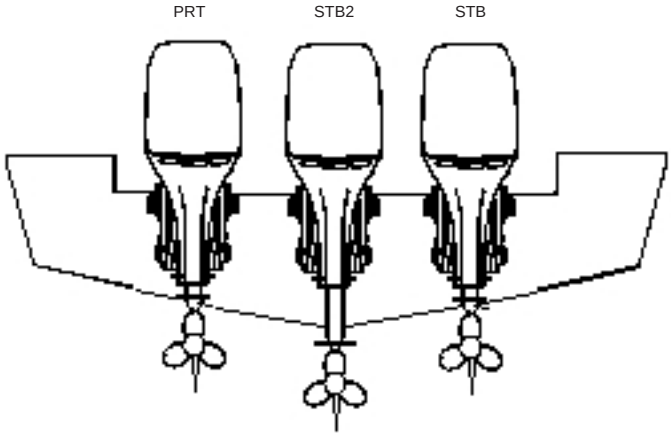
Single engine installation



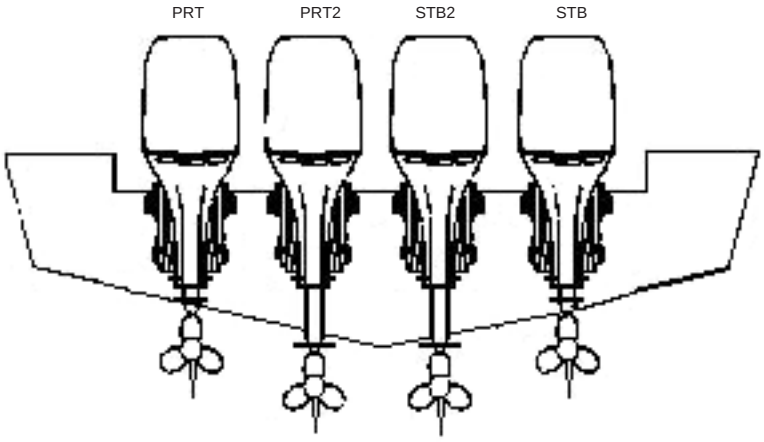
Dual engine installation

4.0 Appendix

ENGINE LOCATION



Triple engine installation



Quad engine installation