

CDS G3 and the PCM 09

Section 2A - Connecting and Operating the CDS G3 System

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CDS G3 Setup and Operation

Introduction

CDS (computer diagnostic system) G3 is a stand-alone program that provides diagnostic support for select engines and Mercury joystick piloting systems. All configuration functions necessary for preparing these systems for delivery are also supported. CDS G3 allows for CAN-based multiple-processor communication through a clean, easy-to-navigate interface.

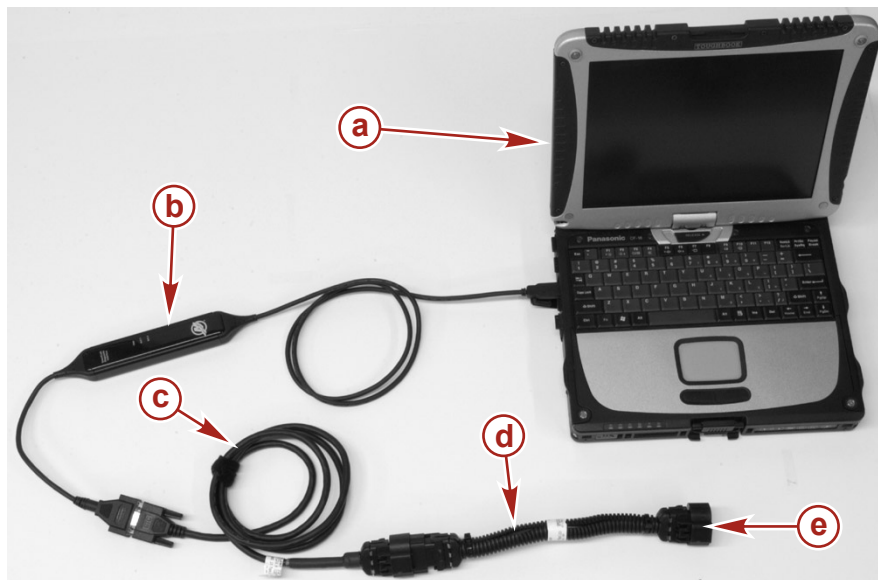
This manual assumes that you have successfully installed CDS G3 on your computer and have updated it to the most current version. For installation instructions, refer to the user manual loaded onto the computer diagnostic system laptop (in the Windows® **Start** menu > All Programs > Mercury Marine > User Manual) or on the CDS G3 software installation disc.

Connecting and Starting CDS G3

Connection to the Engine

1. Insert the CDS G3 SmartCraft diagnostic interface USB connector into a powered USB port.
2. Connect the SmartCraft diagnostic interface 9-pin connector to the CAN P/CAN H adapter harness 9-pin connector.
3. Connect the CAN P/CAN H adapter harness to the CDS G3 engine harness adapter.
4. Remove the CAN P termination resistor from the engine harness. Refer to the appropriate service manual for the location of the CAN P connector.
5. Connect the CDS G3 engine harness adapter to the CAN P engine harness connector.

IMPORTANT: The CDS G3 engine harness adapter (84-8M0046081) contains the correct termination resistor for the CDS G3 SmartCraft diagnostic interface to communicate on the CAN bus circuit.



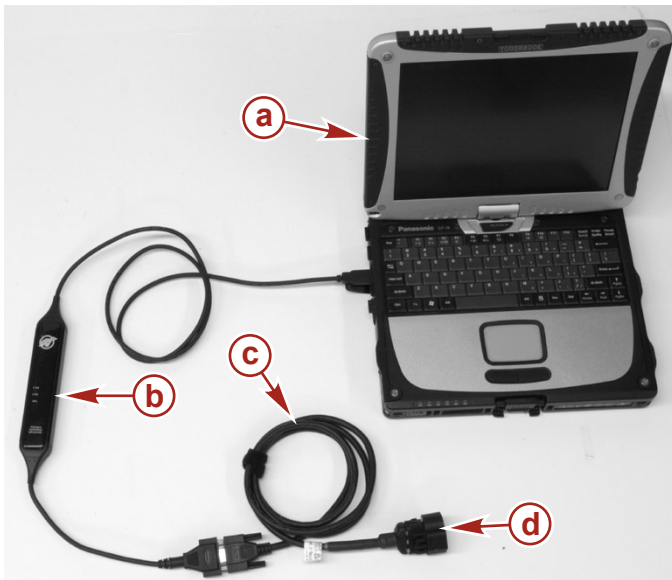
- a - Computer
- b - CDS G3 SmartCraft diagnostic interface
- c - CAN P/CAN H adapter harness
- d - CDS G3 engine harness adapter
- e - Connect to engine CAN P connector

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Connection to the Junction Box

1. Insert the CDS G3 SmartCraft diagnostic interface USB connector into a powered USB port.
2. Connect the SmartCraft diagnostic interface 9-pin connector to the CAN P/CAN H adapter harness 9-pin connector.
3. Connect the CAN P/CAN H adapter harness to the junction box.

IMPORTANT: Ensure that the correct termination resistor is installed on the CAN P bus. The CAN P bus must be properly terminated for the tool to communicate. Improper termination will result in communication errors or complete loss of communication.



- a - Computer
- b - CDS G3 SmartCraft diagnostic interface
- c - CAN P/CAN H adapter harness
- d - Connect to junction box

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Starting CDS G3

With the CDS G3 computer correctly connected to the PCM 09 engine, and the CDS G3 program running, turn the key to the on position. The CAN P indicator should turn green, indicating that CAN traffic exists between the PCM and the computer. Refer to **Controller Area Network (CAN)** for an explanation of CAN lines.



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CAN traffic indicators

The CAN indicators will let you know the communication status on CAN P and CAN H.

Green—The computer is communicating on the CAN bus.

Yellow—The computer is communicating with the cable but no data is being received on the CAN bus.

Red—The computer is not connected to the SmartCraft diagnostic interface cable.

NOTE: CAN H will only turn green in models using CAN H, such as those using Axius.

If CDS G3 Does Not Communicate with the Engine

Is CDS G3 CAN P traffic indicator icon red or yellow? If it is red, the SmartCraft diagnostic interface is not connected, not recognized by Windows®, or not configured correctly in the CDS G3 options menu. This is not a CAN issue, but rather a computer issue.

If it is yellow, the SmartCraft diagnostic interface is connected and communicating with the CDS G3 program through the USB port, but it is not communicating with the CAN bus configured in the port mapping menu in the CDS G3 options menu. Ensure that the key switch is in the on position and that the proper termination resistance is being used.

NOTE: Each SmartCraft diagnostic interface is identified by its serial number in software. If multiple cables are used on the same laptop, the port mapping may be incorrect for the serial number cable you currently have connected. If the indicator is green, the cable is communicating properly with the CDS G3 program and the CAN bus it is mapped to.

Is the SmartCraft diagnostic interface's PWR LED illuminated continuously? This indicates the cable is recognized by the computer and is communicating with the computer.

With the key switch in the on position, is the BUS 1 LED illuminated on the SmartCraft diagnostic interface? If it is off, the cable is not communicating on the CAN P bus. Verify proper CAN P bus termination and operation.

If CDS G3 does not communicate with the engine:

1. Ensure that the key is in the **on** position, and that the boat's gauges light up. If there is no gauge activity, no warning horn self test, or no other indication that the boat is powering up, troubleshoot accordingly.
2. Ensure that the SmartCraft diagnostic interface is properly connected. Check the
 - USB 2.0 port on the computer
 - 10-pin CAN connector at engine or helm
 - Terminator adapter cable used when needed to provide proper CAN P and H termination
3. Unplug the diagnostic interface at both ends, wait a few minutes, and plug it in again.
4. Try rebooting your computer after all the connections have been made, and especially if any updates occurred after the program was started.
5. If this does not resolve the issue, contact Mercury Product Support.

NOTE: *The BUS 2 LED is only used on DTS systems that use CAN H. Do not concern yourself with the BUS 2 LED status unless you are working on a Zeus or Axius system.*

Controller Area Network (CAN)

CAN lines are wire networks that are used to transmit digital signals. Different forms of digital communication fall under various communication protocols. Protocols are the rules about how the digital network is constructed and how it behaves. Terms such as CAN, J1850, J1939 all represent different types of communication protocols.

CAN communication is extremely fast, and CAN networks are able to self-diagnose to a certain extent. When messages are sent from module to module, a response is also sent back. The purpose of the response is to tell the module sending the message (sender) that its message has been received and understood by the receiving module (recipient). For example, if the tachometer has failed and is no longer able to communicate on the network, other modules may send a message saying they cannot see the tachometer. The other modules are programmed to report a code if they are not receiving responses to their messages.

CAN P, previously known as CAN 1 carries SmartCraft data. In the world of CAN lines, CAN P carries low and medium speed data. It's a pretty busy communication line as there are a lot of messages being sent back and forth in the SmartCraft system. CAN P is also the backup line for CAN X in the event of a CAN X line failure. Should CAN X fail, throttle, shift, steering and trim commands will be sent on CAN P.

CAN X, previously known as CAN 2, is responsible for transmitting throttle, shift, steering and trim commands. CAN X is a high-speed line and is very busy with all of the messages being sent back and forth. There is one CAN X line per engine. If it is determined that CAN X communication has failed, throttle, shift, steering and trim commands are then sent over CAN P.

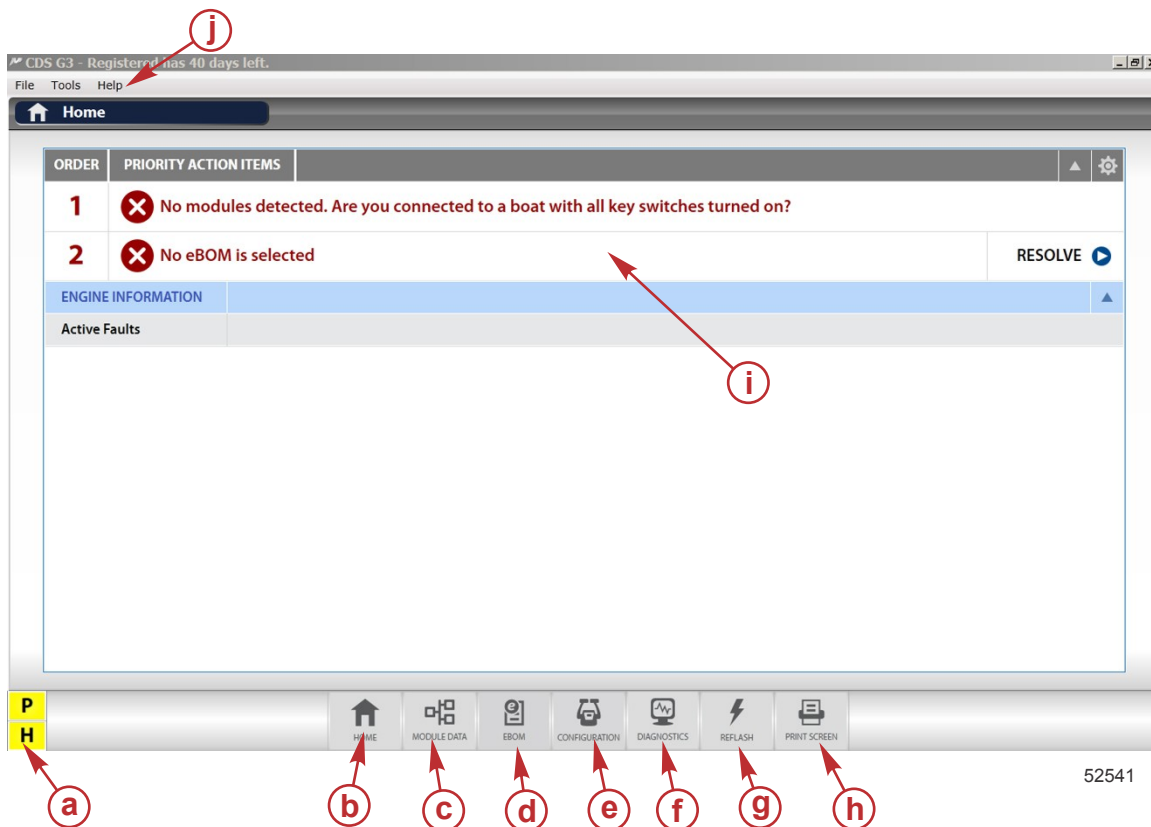
CAN H is a bridge between multiple CAN X lines. CAN H keeps the engines in sync and ensures that both know what is happening on the other. This is essential to accurately control the vessel and is also what makes the extreme maneuverability of Axius vessels possible. CAN H also carries the data for the autopilot module (APM), global positioning system (GPS), inertial measurement unit (IMU), and the helm trackpad (not the remote trackpad—throttle and shift levers).

CAN H is unique to Axius-equipped boats and vessels without Axius systems will show CAN H as yellow in CDS G3 because CAN H is not present.

CAN V works with VesselView to carry the information related to the house generator and the heating, ventilation, and air conditioning (HVAC) systems.

CDS G3 Operation

Priority Action Items



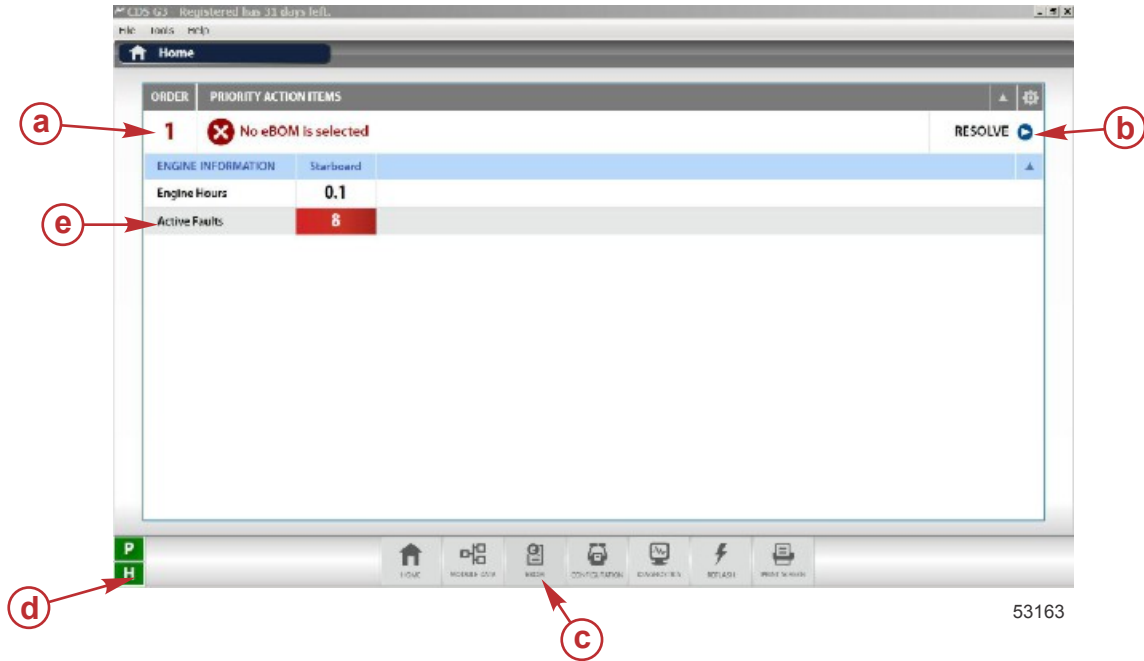
Home page

- a**- CAN traffic indicators
- b**- **Home** page button
- c**- **Module Data** button
- d**- **EBOM** button
- e**- **Configuration** button
- f**- **Diagnostics** button
- g**- **Reflash** button
- h**- **Print Screen** button
- i**- Priority action items—issues that need to be resolved
- j**- Tool bar, including **File**, **Tools** (options, updates, registration), and **Help**

Once CDS G3 is connected to the PCM 09, and the program is started, the **Home** screen will appear and list any priority action items that need to be resolved before proceeding. In the preceding image, CDS G3 is indicating a CAN communication error (both indicators are yellow and no modules are detected) and the need to select an EBOM.

Connecting and Operating the CDS G3 System

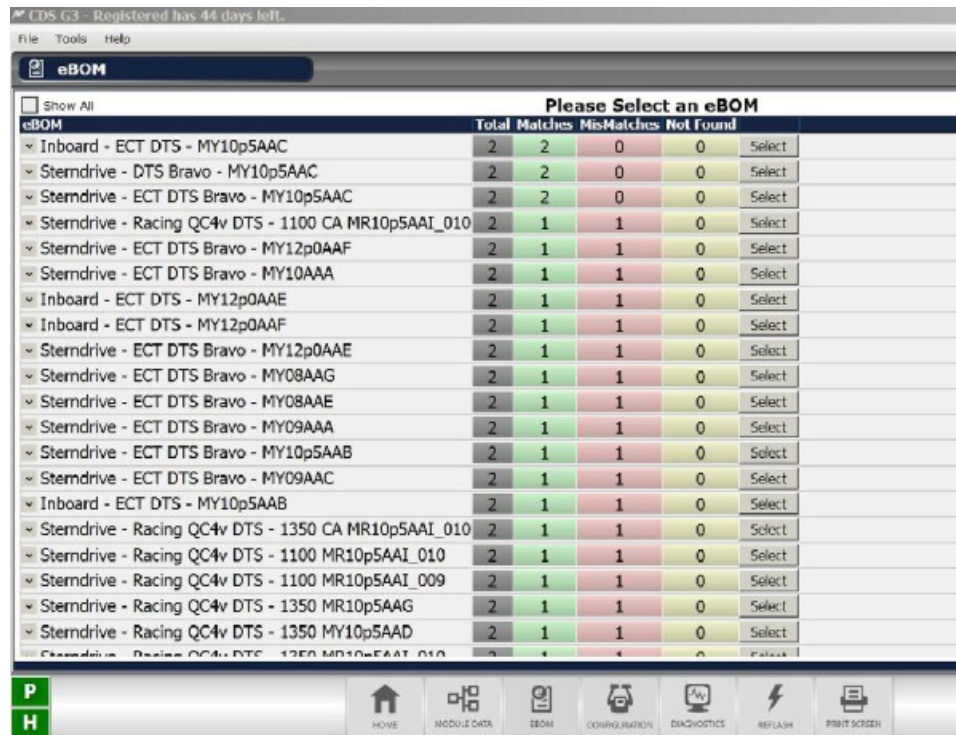
In the following image, CDS G3 is indicating communication on both CAN P and CAN H. It also shows that an EBOM has yet to be selected and that there are eight active faults. To resolve the faults, the correct EBOM must first be selected.



- a** - Priority action item
- b** - **Resolve** button
- c** - **EBOM** button
- d** - CAN traffic indicators
- e** - Active faults found

Selecting an EBOM

Typically, as in the preceding image, selecting an electronic bill of materials (EBOM) is the first issue that needs to be addressed before the active faults or live data can be examined. Select the EBOM icon from the bottom of the screen to call up the EBOM menu.



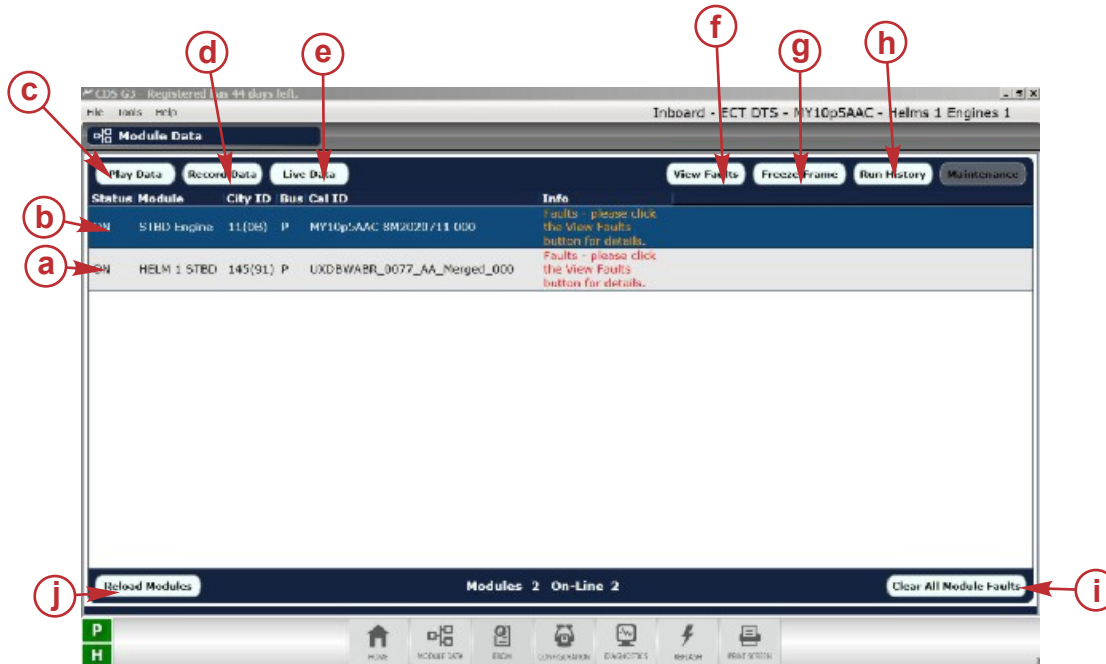
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EBOM screen

The EBOM screen will present a selection of choices that match what CDS G3 sees on the CAN line. More than one possible match may be displayed. Select the correct one for your application. Once the EBOM is selected, make sure that it is running the most recent calibration. Refer to **Reflash Screen** for information on finding the most recent calibration.

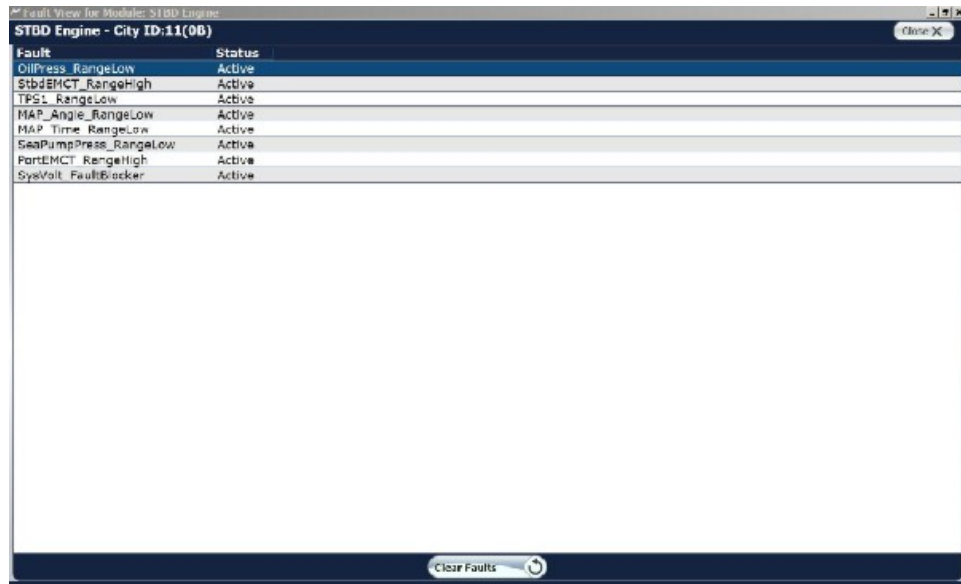
Module Data

Once the EBOM is selected, selecting the **Module Data** screen will bring up a selection of modules connected to the boat. This includes the PCM 09 and any other modules, such as the command control module (CCM). Once the engine PCM is selected, other screens can be accessed as shown in the following image.



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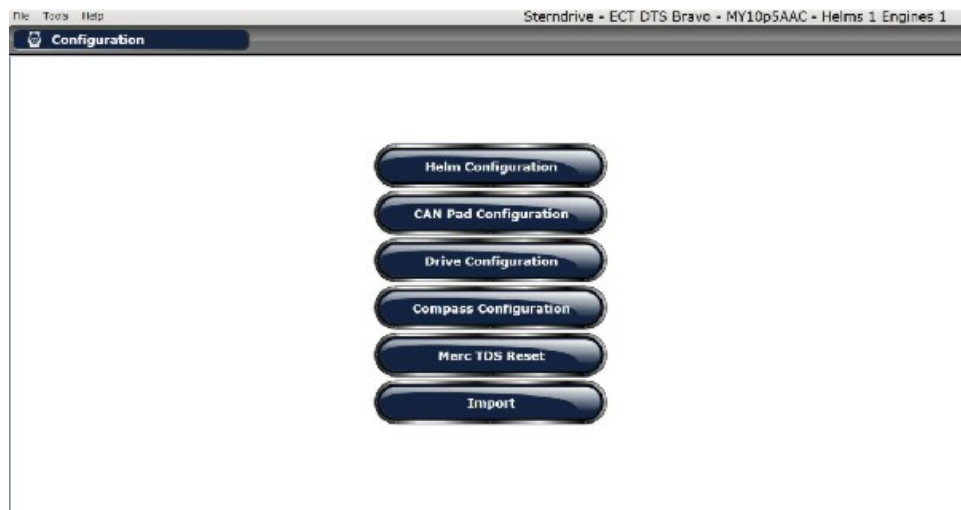
- a - Helm module (CCM) found
- b - Engine module (PCM 09) found
- c - **Play Data** button—Plays back recorded data
- d - **Record Data** button—Records data for playback
- e - **Live Data** button—Displays data as it is being received. Refer to **Section 2E - CDS G3 Live Data Screen** for details.
- f - **View Faults** button—Lists the active faults. Refer to **Section 2G - CDS G3 Fault List (Alphabetical Order)**.
- g - **Freeze Frame** button—Displays a snapshot of engine data at the moment of the last time each fault occurred. Refer to **Section 2F - Freeze Frame Data**.
- h - **Run History** button—Displays total engine hours, as well as the amount of time spent in various RPM ranges
- i - **Clear All Module Faults** button—Clears existing faults. Used to clear the buffer. Faults that are still active will reappear after a few moments.
- j - **Reload Modules** button—Refreshes the list of modules found



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Active faults screen

Configuration Screen



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Configuration screen

The configuration button brings up options for configuring the helm, CAN pads, drives, and electronic compass, as well as resetting the theft deterrent system (TDS), or importing a vessel personality. Each option walks the operator through the necessary procedures, and will not be covered in this manual.

Diagnostics Screen



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Diagnostics screen

The diagnostics screen provides a variety of set-up screens and diagnostic tests. Depending on your application, not all of the tests may be available. These tests and set-up screens offer interactive instructions, and will not be covered in this manual.

Reflash Screen



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Reflash screen

The reflash screen allows you to update your PCM 09 to the latest calibration. The CDS G3 help system has a chart listing all of the current PCM ECT calibrations. Refer to the chart and check if an updated calibration is available for the engine you are working on. If so, the CDS G3 tool can reflash the PCM with the new calibration. A portion of the CDS G3 help system's chart is shown as an example in the following screen capture.

Model Description	Current CALIBRATION IN PCM	Is this calibration the latest available	Select Update G3 Reflash Calibration Package Listed Below	Part Number to Order Replacement PCM	REFLASH PACKAGE INFORMATION
MCM 3.0L ECT FWC	8M2005277	NO	Cal is latest	8M0049841	
MCM 3.0L ECT FWC	8M2014915	NO	Reflash	8M0049841	
MCM 3.0L ECT FWC	8M2017075	NO	Replace PCM	8M0049841	
MCM 3.0L ECT FWC	8M2018036	NO	Calibration for Service Reflash Only	8M0049841	
MCM 3.0L ECT FWC	8M2019101	NO		8M0049841	
MCM 3.0L ECT FWC	8M2020283	NO		8M0049841	
MCM 3.0L ECT FWC	8M2020693	YES		8M0049841	MCM 30 A EC FWC 8M2020693 1.0
MCM 3.0L ECT RWC	8M2005276	NO		8M0049840	
MCM 3.0L ECT RWC	8M2014914	NO		8M0049840	

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MerCruiser reflash reference screen

Once the **Reflash** button is selected, the CDS G3 system will determine if your system has the necessary prerequisites for reflashing the module and will walk you through the procedure for updating the calibrations. Refer to CDS G3's help file, located under the **Help** icon at the top of the screen, for more information.

Print Screen

Selecting the **Print Screen** option will take a screen capture of whatever is being displayed at the time and save it in an Adobe® pdf file in the location specified under the **Options** tab. This option is expected to be updated in future versions. Refer to the **CDS G3 User Manual**, which was installed on the computer along with the program.

Notes: