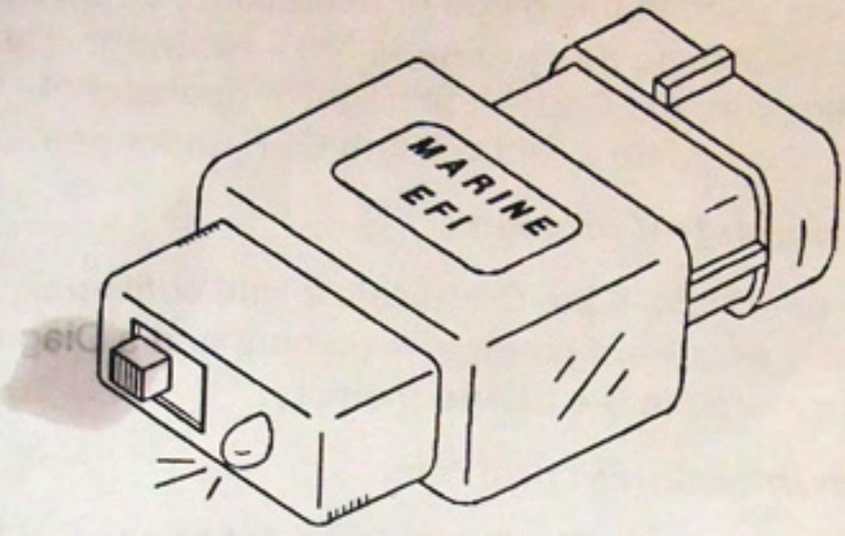
CodeMate Tester

Marine ECM diagnostics



The marine Engine Control Module (ECM) continually checks the integrity of its sensors and controls. When a problem is detected, a Diagnostic Trouble Code (DTC) is set and retained in the ECM's computer memory. These stored trouble codes are intended to assist a service technician in diagnosing engine and control system problems.

Rinda Technologies' CodeMate diagnostic tool provides the marine service technician with 3 separate diagnostic functions. It can be used as a system Malfunction Indicator Lamp (MIL), a trouble code display & erase tool, and a base spark timing tool.

CONNECTING CODEMATE

1) Turn the engine's ignition switch to the OFF position. (engine not running)
2) Locate the engine's Data Link Connector (DLC)
3) Place CodeMate's test switch in the OFF position and plug the CodeMate unit into the Data Link Connector. Be sure to slide the CodeMate tool completely into the data connector so that the connector's locking tab clicks into place. With this accomplished, the CodeMate unit is now properly connected.

MALFUNCTION INDICATOR LAMP

With the CodeMate unit plugged into the Data Link Connector and its test switch set to the OFF position, CodeMate will function as a Malfunction Indicator Lamp. During engine operation, this function informs the service technician or boat owner that a problem has occurred and that the boat should be brought in for service as soon as possible.

When CodeMate is used in this mode of operation, its light will turn ON when the **ignition key is ON** and the **engine is NOT running.** This functions as a "bulb test" to make sure the CodeMate's light is operational. When the engine is started, CodeMate's light will turn OFF under normal conditions.

Indication of a persistent problem:

During engine operation, if the CodeMate's light continually remains ON, it indicates that a *persistent* problem is present and a Diagnostic Trouble Code has been stored in the ECM's memory.

Indication of an intermittent problem:

If, during engine operation, the CodeMate's light turns ON for a brief period of time (10 seconds or more) and then turns OFF, it indicates that an *intermittent* problem has occurred and that a Diagnostic Trouble Code has been stored in the ECM's memory.

READING TROUBLE CODES

CodeMate is capable of reading trouble codes that are stored in the ECM's computer memory. As described in the preceding section, trouble codes are stored when the ECM detects an intermittent or persistent problem related to the EFI system. Trouble code read-out should be performed with the ignition **Key ON** and the **Engine OFF**. Use the following steps to read trouble codes.

1) Follow the steps described in "Connecting CodeMate" to install it onto the engine's Data Link Connector.
2) Turn the ignition key ON but DO NOT start the engine. (Key ON - Engine OFF)
3) Place CodeMate's test switch in the ON position. This action puts the EFI system into the *Service Mode.*
4) Observe the sequence of flashes on CodeMate's indicator light.
5) When complete, turn the ignition key OFF and disconnect the CodeMate unit.

Upon the initial activation of CodeMate's test switch, the indicator light should flash Code 12 three times consecutively. This Code 12 sequence

consists of a "Flash, pause, Flash-Flash, long pause" and is repeated two more times for a total of three readouts. Code 12 indicates that the ECM's diagnostic capabilities are working. Following the Code 12 sequence (Code 12 displayed 3 times), any stored trouble codes will be displayed in a similar manner. Each trouble code will be displayed 3 times before proceeding to the next code. Codes will be output in an ascending order, lowest to highest. If no codes are stored, the Code 12 sequence will simply repeat itself until CodeMate's test switch is placed in the OFF position.

MARINE EFI TROUBLE CODE LISTING

1993-1995 GM Marine EFI

Code	*Description*
14	Coolant Sensor
21	Throttle Position Sensor
23	Manifold Air Temp Sensor
33	Manifold Absolute Pressure Sensor
42	Electronic Spark Timing
43	Electronic Spark Control
51	ECM Calibration Checksum Error

1996 - Up GM Marine EFI

Code	*Description*
14	Coolant Sensor Voltage High (cold)
15	Coolant Sensor Voltage Low (hot)
21	Throttle Position Sensor Voltage High
22	Throttle Position Sensor Voltage Low
23	Manifold Air Temp Sensor High (cold)
24	Speed Sensor (if installed)
25	Manifold Air Temp Sensor Low (hot)
33	Manifold Absolute Pressure Sensor High
34	Manifold Absolute Pressure Sensor Low
41	Electronic Spark Timing Open Circuit
42	Electronic Spark Timing Grounded Circuit
43	Electronic Spark Control Detects Continuous Knock
44	Electronic Spark Control Cannot Detect Knock
51	ECM Calibration Checksum Error
52	ECM Hardware Failure

Note: Use '93-'95 trouble code listing for '96 MerCruiser EFI

CLEARING TROUBLE CODES

To clear stored trouble codes with CodeMate use the following procedure:

1) Follow the steps described in "Connecting CodeMate" to install it onto the engine's Data Link Connector.
2) Turn the ignition key ON but DO NOT start the engine. (Key ON - Engine OFF)
3) Place CodeMate's test switch in the ON position. This action puts the EFI system into the Service Mode.
4) Move the throttle, while in Neutral, from 0% to 100% then back to 0%.
5) Turn the ignition key OFF for 5 seconds.

6) Perform the "Reading Stored Trouble Codes" procedure to verify that the codes have been cleared.

7) When complete, turn the ignition key OFF and disconnect the CodeMate unit.

Note: *Always be sure that the engine's battery is fully charged before attempting the above procedure. A low battery may impair the ECM's ability to clear its stored trouble codes.*

Additional Service Mode Features

Placing CodeMate's test switch in the ON position causes the ECM to operate in its Service Mode. The Service Mode not only causes trouble codes to be displayed on CodeMate's indicator light as described above, it also commands the ECM to preform the following functions:

1) During Service Mode, the ECM will energize all of its relays and solenoids with the exception of the fuel pump relay. This allows the technician to troubleshoot circuits which may be difficult to activate without the engine operating under a variety of load conditions.

2) Service Mode also causes the Idle Air Control (IAC) motor to move to its fully extended position ('93-'95 GM EFI & '93-'96 MerCruiser only). This action reduces the amount of air entering the engine's intake and may cause the engine to idle abnormally low or stall.

3) Ignition Spark Advance is held to a fixed value during Service Mode. This facilitates the setting of Base Timing as described in the next section.

BASE SPARK TIMING FUNCTION

As a result of its ability to place the EFI system in its Service Mode, CodeMate provides the technician with a convenient method of setting the engine's Base Spark Timing. The procedure requires the use of an appropriate timing light as well as adherance to the manufacturer's recommended steps for this service. Please refer to the manufacturer's service manual for details on performing this procedure.

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