MARINE POWER DISPLAY

Operator's Guide

CATERPILLAR®

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INTRODUCTION

The Marine Power Display is a monitoring system for all electronically controlled Caterpillar® marine engines. The Marine Power Display provides current engine and transmission operating data. The screens can be customized to display different engine parameters using different sizes and types of gauges. One Marine Power Display is required for each engine up to a maximum of eight.

Hardware Features
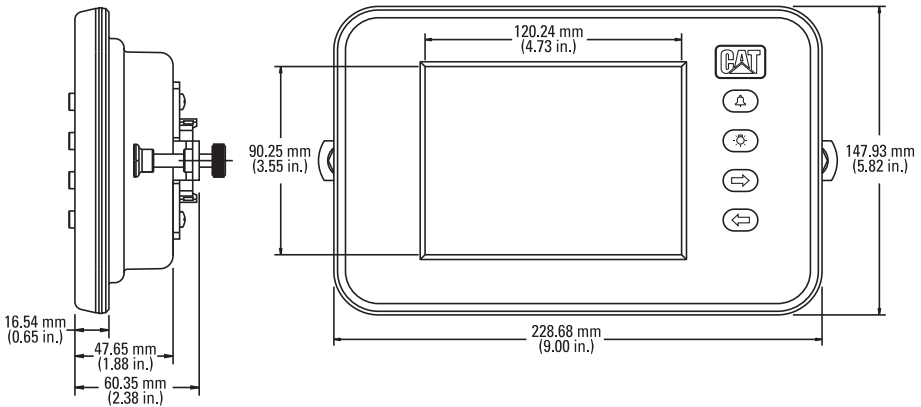
Dimensions:
- 147.93 mm high x 228.68 mm wide x 47.65 mm deep (5.82 in. high x 9.00 in. wide x 1.88 in. deep)

Screen:
- Positive image LCD, fully graphic, monochrome transflective, 320 by 240 pixels
- Double edgelit, red LED backlighting

Illumination:
- Stable over voltage range
- Adjustable by user, including off

Buttons:
- Marked with SAE Standard ICONS
- Red LED back lighting

Data Link:
- SAE J1939 CAN (Full Support)
- SAE J1708 Data Link (limited parameters)

Operating Range:
- Input system voltage of 12 or 24 VDC
- Full functionality from -20°C to +70°C (-4°F to 158°F)
- Sealed to 34.48 kPa (5 psi)
- Maximum viewing angle ± 35 degrees vertical, ± 50 degrees horizontal

Alarm:
- Piezo alarm is sealed in the interior of case
- External output for Relay Driver (100mA) – *applicable to MPD hardware part# 212-6187 and up*

Mounting System:
- Panel mounting system for display module with side mounted brackets and mounting screws
- Refer to the Marine Engine Electronic Displays Installation Guide SENR5002-03 or higher revision level
- When used with Multi-Station Control System refer to MSCS Installation Guide LEGM2735-00 or higher revision level
- Optional above dash mounting bracket

Application Code:
- Flash programmable

Service Tool Compatibility:
- Caterpillar ET field programming (3.1 or higher) with J1939 Data Link connection and Communications Adapter II

Software Features (J1939 Data Link)

Engine parameter data can be displayed in analog, bar graph or digital gauges in English or metric units:

Engine Speed, Percent Load, Boost Pressure, Coolant Temperature, Oil Pressure, Oil Temperature*, Fuel Rate, Fuel Pressure, Fuel Temperature, Inlet Manifold Temperature*, Transmission Temperature, Transmission Pressure, Engine Hours, Battery Voltage, Vessel Speed, Latitude, Longitude, Heading, Engine Trip Totals, Current Engine Totals

(* when applicable)

Software Features (J1708 Data Link)

Engine parameters can be displayed in analog, bar graph or digital gauges in English or metric units. These engine parameters can be displayed for 3408C and 3412C engines:

Engine Speed, Percent Load, Fuel Rate, Boost Pressure, Coolant Temperature, Oil Pressure, Engine Location, Fuel Pressure

These engine parameters can be displayed for 3176B engines:

Engine Speed, Percent Load, Fuel Rate, Boost Pressure, Coolant Temperature, Oil Pressure, Inlet Air Temperature

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MARINE POWER DISPLAY CONFIGURATION AND OPERATION

The Marine Power Display can accommodate up to three users with five screens for each. Three users can set up the Power Display screens to their preferences.

The buttons have multiple functions dependent on which screen is displayed.

The button primary functions for the gauge screens are:

(🔔) • Alarm acknowledgment for all displays on that specific Data Link, silences audible alarm, and recalls active diagnostics

(☀) • Screen display
Normal (black letters with white background) Day Mode (bold) or Reverse (white letters with black background) Night Mode

(⇨) • Next screen

(⇦) • Previous screen

System Information

On initial power up, scroll through the screens to the "System Information" screen. This screen allows the following parameters to be configured: User Name, Unit Location, Display Units, and Vessel Speed Units. A menu box is located in the upper right corner of the screen. Press (🔔) to display the functions of the buttons

In the configuration mode the buttons have the following functions:

(🔔) • Scroll through parameter choices

(☀) • Exit

(⇨) • Move cursor up

(⇦) • Move cursor down

Use (⇨) or (⇦) to move the cursor up or down to select the parameter. The parameter name will appear in the box in the upper right corner of the screen.

Press (🔔) *to scroll through the choices:*

• User Name
USER000001, USER000002, USER000003

• Unit Location
BRIDGE, PORT WING STATION, STBD WING STATION, TOWER, ENGINE ROOM, AFT STATION, FLYBRIDGE, BOW STATION

• Display Units
ENGLISH, METRIC

• Vessel Speed Units
KNOTS, MPH, KPH

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The parameter choices will be highlighted on the screen with a black background and white letters.

When all the correct parameters have been chosen, press ⊙ to exit the configuration mode and then press ⇐ or ⇒ to return to the gauge screens.

Gauge Screens

The gauge screens can be configured with three different sizes of three types of gauges. Analog, bar graph, and digital gauges can be arranged to each user's requirements for the available engine parameters. Refer to Marine Power Display Screen Builder Software for gauge screen design options.

NOTE: If the engine software does not provide output for certain parameters, that particular gauge will disappear from the display screen. The gauge will reappear if the software is upgraded to support that parameter's output, or if the display is used with a different engine.

Current Engine Totals Screen

Engine hours, fuel used, average load factor, and average fuel consumption for a trip are available on the Current Engine Totals screen for engines with ADEM™ II ECUs and appropriate engine software. To clear the trip information and reset the trip parameters a toggle switch must be installed. See engine installation guide.

In addition to these parameters, engines with ADEM A3 ECUs also display the following parameters: trip values for idle hours and idle fuel; lifetime values for engine hours, idle hours, fuel, idle fuel, average load factor, and average fuel consumption. To clear the trip information and reset the trip parameters press ⇒ and ⇐ simultaneously. When the Clear Trip? window appears press and release ⇒ to confirm clearing the trip information. Press and release ⇐ to return without clearing the information.

Diagnostics

All diagnostic messages from the engine's ECU are supported by both a visual indicator and an audible alarm. With no active diagnostic codes, no DIAGNOSTIC indicator will be shown on the gauge screens. When an active fault is detected, the DIAGNOSTIC indicator will appear in the upper left corner of the screen, a diagnostic code description window will appear in the center of the screen, and the audible alarm will sound. Press the alarm acknowledgment button ⏰ to silence the alarm. Press the alarm acknowledgment button ⏰ again to scroll through or remove the diagnostic code description window. The DIAGNOSTIC code indicator will remain on the screen until the fault is corrected.

Display Modes

- Day Mode - The normal display is a white background with black letters and gauges. To increase or decrease the contrast, press and hold ⌖ to display the contrast slide bar. Use the arrow keys to adjust the contrast.

- Night Mode - Press and release ⌖ to change the display to the night mode of a black background with white letters and gauges. To increase or decrease the brightness, press and hold ⌖ to display the brightness slide bar. Use the arrow keys to adjust the brightness. To increase or decrease the contrast with the back light on, press and release ⌖ again to display the contrast slide bar. Use the arrow keys to adjust the contrast. Press and release ⌖ to exit the contrast bar. Press and release ⌖ to return to Day Mode.

Signal Loss to Display

The loss of a signal to the display will result in a DIAGNOSTIC with the description of "NO DATA LINK SIGNAL."

Marine Power Display Screen Builder Software

- Allows the Marine Power Display screens to be customized to the requirements of the vessel operator or operators.

- Three sets of five screens can be downloaded and saved to the Marine Power Display.

- Compatible with Windows 95/98/NT 4.0/2000/ME/XP

- User defined display screens

  Parameters to display

  Format to display parameters (gauge, digital, or bar graph)

  Sizes limited to two or three for each type (gauge, digital, or bar graph)

  Location on screen for parameter display

  Addition/Deletion of screens (max 15 screens)

  Multiple user configurations (max 3 different users)

  User configuration file can be flashed

Marine Power Display Parameters

Engine operating and vessel control parameters available for display on MPD vary by control system version (ADEM II, ADEM A3, etc.) and by engine model. Available parameters will also differ between the primary ECU and backup ECU on engines with two ECUs. The charts on pages 9 and 10 list engine operating and vessel control parameters available for display by engine model.

Parameter	3126B	3176C 3196 3406E	C9 C7	C12 C18	3412E C30 C32
Engine Speed	X	X	X	X	X
Battery Voltage	X	X	X	X	X
Coolant Temperature	X	X	X	X	X
Oil Pressure	X	X	X	X	X
Fuel Rate	X	X	X	X	X
Engine Load	X	X	X	X	X
Boost Pressure	X	X	X	X	X
Fuel Pressure	X[1]	X	X	X	X
Fuel Temperature	X[1]	X	X	X	X
Transmission Pressure	X	X	X	X	X
Transmission Temperature	X	X	X	X	X
Inlet Manifold Temperature	X	X	X	X	
Oil Temperature	X[2]		X		X
Engine Hours	X	X	X	X	X
Vessel Speed	X	X	X	X	X
Latitude	X		X	X	X
Longitude	X		X	X	X
Heading	X		X	X	X
Coolant Level	X		X	X	
Total Engine Hours (Lifetime)	X		X	X	X
Total Fuel Used (Lifetime)	X		X	X	X
Total Idle Fuel (Lifetime)	X		X	X	X
Total Idle Hours (Lifetime)	X		X	X	X
Average Load Factor (Lifetime)	X		X	X	X
Average Fuel Consumption (Lifetime)	X		X	X	X
Trip Engine Hours	X	X	X	X	X
Trip Idle Hours	X		X	X	X
Trip Fuel	X	X	X	X	X
Trip Idle Fuel	X		X	X	X
Trip Average Load Factor	X		X	X	X
Trip Average Fuel Consumption	X	X	X	X	X
Gear Position	X	X	X	X	X
Troll Mode	X	X	X	X	X
Slow Vessel Mode Status	X	X	X	X	X
Sync Master Status	X	X	X	X	X
Sync Cruise Status	X	X	X	X	X
Shaft Speed	X	X	X	X	X
Active Control Station	X	X	X	X	X
Control Station Button/Lamp Status	X	X	X	X	X

X[1] Commercial Ratings Only   X[2] Optional

Marine Power Display Parameters

| Parameter	3500B Primary ECU	3500B Backup ECU	3500B Series II Primary ECU	3500B Series II Backup ECU	3412C 3408C	3176B
Engine Speed	X	X	X	X	X	X
Battery Voltage	X	X	X	X		
Coolant Temperature	X		X		X	X
Oil Pressure	X		X		X	X
Fuel Rate	X		X		X	X
Engine Load	X		X		X	X
Boost Pressure	X		X		X	X
Fuel Pressure	X		X			
Transmission Pressure	X		X			
Transmission Temperature	X		X			
Inlet Manifold Temperature	X					
Engine Hours	X		X			
Vessel Speed	X		X			
Latitude			X			
Longitude			X			
Heading			X			
Air Inlet Temperature	X					
Exhaust Temperature Right	X		X			
Exhaust Temperature Left	X		X			
Oil Filter Pressure	X		X			
Fuel Filter Pressure	X		X			
Coolant Level			X			
75% Overspeed Verify			X	X		
Total Engine Hours (Lifetime)			X			
Total Fuel Used (Lifetime)			X			
Total Idle Fuel (Lifetime)			X			
Total Idle Hours (Lifetime)			X			
Average Load Factor (Lifetime)			X			
Average Fuel Consumption (Lifetime)			X			
Trip Engine Hours			X			
Trip Idle Hours			X			
Trip Fuel			X			
Trip Idle Fuel			X			
Trip Average Load Factor			X			
Trip Average Fuel Consumption			X			
Gear Position			X			
Troll Mode			X			
Slow Vessel Mode Status			X			
Sync Master Status			X			
Sync Cruise Status			X			
Shaft Speed			X			
Active Control Station			X			
Control Station Button/Lamp Status			X			

MARINE POWER DISPLAY SCREEN BUILDER SOFTWARE

Installation

Please refer to the MPD Builder (LERM0436-02), version 1.2 of the Marine Power Display screen builder software. It is available through the Caterpillar Media Logistics ordering system.

Screen Design

MPD Builder provides a layout grid to arrange the gauges and a gauge menu. The left side of the screen has a miniature image of each of the five screens.
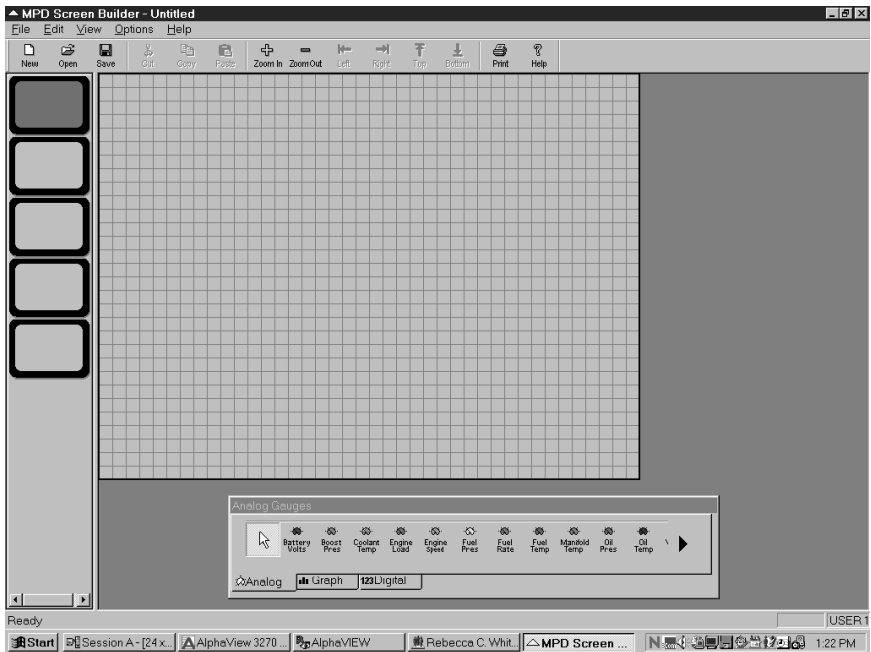
Tool Bar

The tool bar at the top of the MPD Builder screen has the following functions:

- New – opens a new file with five screens
- Open – opens a previously saved file
- Save – saves the current open file
- Cut – removes a highlighted gauge or gauges
- Copy – copies the highlighted gauge or gauges

- Paste – pastes the highlighted gauge or gauges to the same screen or to another screen
- Zoom In – enlarges the layout grid
- Zoom Out – reduces the layout grid to the default size
- Print – prints the current open file
- Help – displays a window with the software version

Screen Selection

Each file contains five screens. When a new file is opened the layout grid for screen one is displayed. To select another screen, click the left mouse button on one of the miniature screens on the left side of the Builder screen.

Gauges Selection Menu

- On the gauge menu, click on the tabs for Analog, Bar Graph, and Digital to display the available gauges for each type. These gauges are available in the three types:
  Battery Volts, Boost Pressure, Coolant Temperature, Engine Load, Engine Speed, Fuel Pressure, Fuel Rate, Fuel Temperature, Manifold Temperature, Oil Pressure, Oil Temperature, Vessel Speed, Transmission Pressure, Transmission Temperature.
- The digital gauge menu also includes:
  Engine Hours, Heading, Latitude, Longitude.
- Use the black arrow on the far right side of the gauge menu to scroll through the remainder of the gauge selections.

Gauge Application

- To add a gauge to the screen, click the left mouse button and drag the gauge to the layout grid, or click the left mouse button on the gauge and click again on the layout grid. Click the white arrow on the left side of the gauge menu to deselect the gauge.
- Once a gauge is on the layout grid it can be highlighted. A single gauge on the layout grid can be highlighted by clicking the left mouse button. Multiple gauges can be highlighted by holding the shift key and clicking on each gauge.
- The gauge must be highlighted to perform the available functions. With the gauge highlighted it can be moved to any part of the layout grid by clicking the left mouse button and dragging. When the gauge is highlighted, click the right mouse button to display a menu with Cut, Copy, Paste, Type, Size, Scaling, and Align. These menu selections perform the following functions on the highlighted gauge or gauges:

Cut – removes the gauge from the layout grid of the screen.

Copy – copies the gauge.

Paste – pastes the gauge to a different part of the same layout grid or to another grid.

Type – changes the gauge to analog, graph, or digital.

Size – changes the gauge size to medium or large (the default size is small).

Scaling – changes the scale on the Engine Speed, Fuel Rate, and Vessel Speed analog and digital gauges. Engine Speed scale can be changed from the default of 0-3000 to 0-3600 or 0-4000. Fuel Rate scale can be changed from the default of 0-50 to 0-80. Vessel Speed can be changed from the default of 0-30 to 0-50 or 0-80.

Align – aligns the highlighted gauges by the left, right, top, or bottom edges.
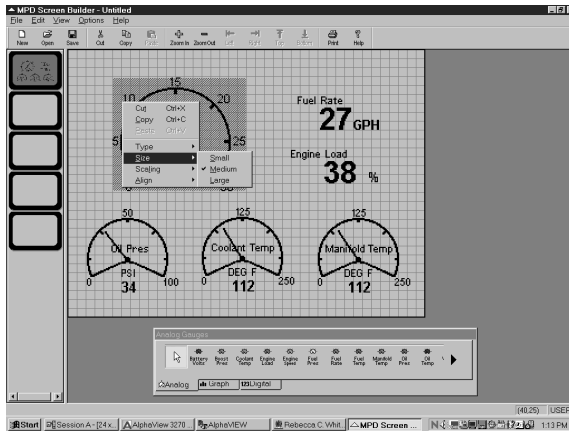
Flash Download of Customized Files

After the set of five screens has been constructed, select the intended user for these screens. Select Options, User Bank, then select the number of the appropriate user. Then save the file.

When the gauge screens for each user have been saved, the files can be transferred to the Marine Power Display using the Caterpillar Electronic Technician (ET) service tool, version 3.1 or higher, and Communication Adapter II 1.1 software. Customer version of ET 2001B or higher will allow the customer to program builder tool files to the Marine Power Display.

Method 1

This procedure applies to engines with the following serial number and below:

|						
3412E	s/n	9KS00800 and lower		3500B	s/n	All
3412E	s/n	9PW00355 and lower		3412C	s/n	All
3406E	s/n	9WR01560 and lower		3408C	s/n	All
3196	s/n	2XR03370 and lower		3176B	s/n	All
3176C	s/n	6BW00493 and lower				

A service tool field harness must be fabricated to connect the service tool to the data link for transferring the screen files. This harness must also be connected to the engine service tool connector.

Harness Fabrication

Parts required for the harness are:

Qty	Part Number	Description
1	165-0200	Cable Assembly
1	8T8735	Connector
1	8T8736	Connector
*	143-5018	Data Cable (twisted pair, 2 conductors)
*		16 AWG wire

(* fabricate to length)
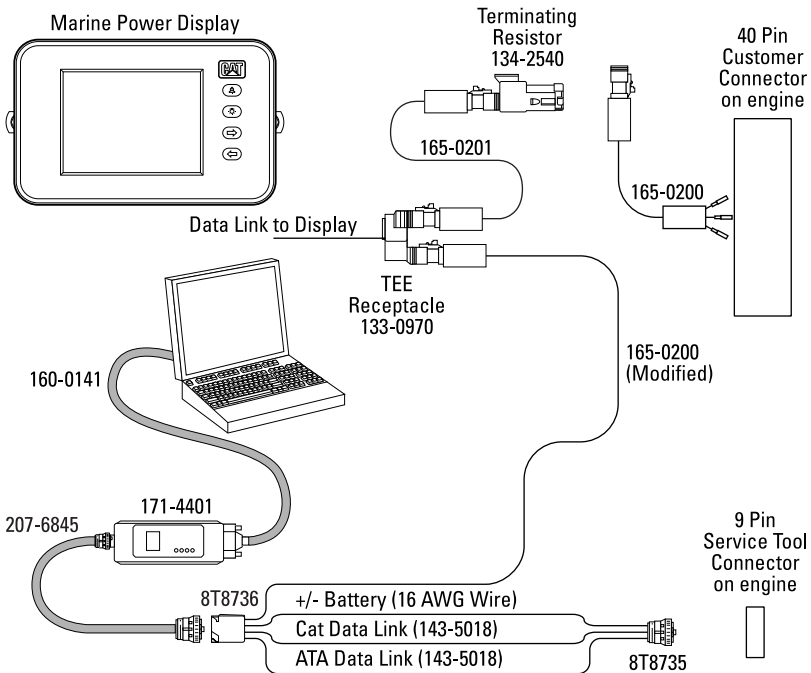
The connector pin outs for the 8T8736 and the 8T8735 connectors are:

F   CAN Negative

G   CAN Positive

C   CAN Shield

A + Battery (11-45 VDC)

B - Battery (ground)

D   Cat Data Link Positive

E   Cat Data Link Negative

J   ATA Data Link Positive

H   ATA Data Link Negative

1. Remove the 133-0969 Sockets from the 165-0200 Cable As. and replace the sockets with 8T8729 Pins. This becomes the 165-0200 (modified) cable.

2. Connect the wires as shown in the diagram and the pin out chart.

3. Use 143-5018 Data Cable for the Cat Data Link and the ATA Data Link connections between the 8T8736 and the 8T8735 Connectors.

4. Use 16 AWG wire for the + Battery and - Battery connections between the 8T8736 and the 8T8735 Connectors.

File Download

1. Disconnect the vessel data link wiring from the 165-0200 Data Cable that is connected to the 40 pin customer connector.

2. Connect the service tool field harness (8T8735 Connector) to the engine service tool connector.

3. Connect the modified 165-0200 Cable As. of the service tool field harness to the 133-0970 TEE Receptacle of the data link for the Power Display.

4. Connect the laptop to the Communication Adapter II with the 160-0141 Adapter Cable and the Communication Adapter II to the 8T8736 Connector of the service tool field harness with the 207-6845 Adapter Cable.

   IMPORTANT: On some laptops running on battery power, the power saving features interfere with the WinFlash program. If you experience difficulties with the download, connect your laptop to AC power. When downloading to Marine Power Display, the ET window should be the only one open. All other windows should be closed for the downloading process.

5. Start the **WinFlash** program by clicking on **Start / Programs / Caterpillar ET / WinFlash**.

6. When the **ECU Selector** window comes up, select **Marine Power Display** and click on **OK**.
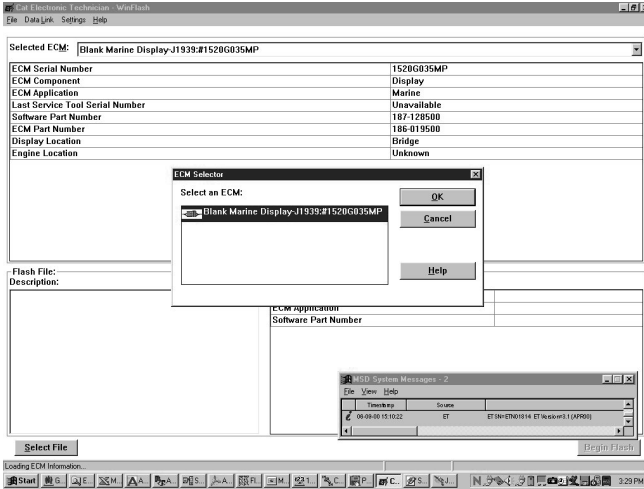
7. Information on the Marine Power Display unit will appear. Click on **Select File** to display the flash files. Be sure that the file type window has all files selected. The customized screen files have a .mpd extension. The Marine Power Display application files have a .fls extension.
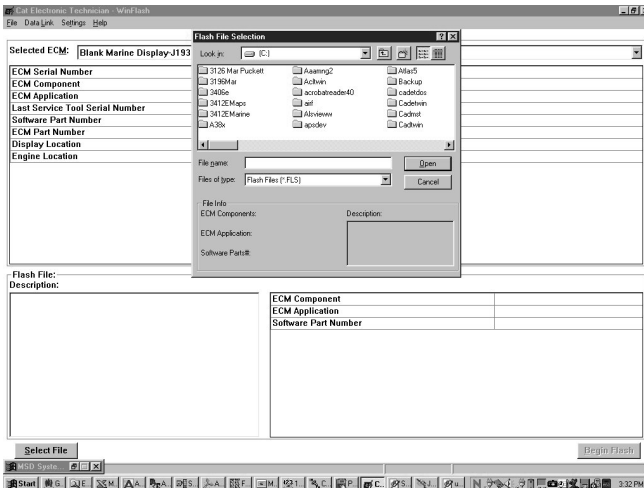
8. Select the customized screen file and click on **OK**.

9. Click on **Begin Flash**. Observe the status bar until downloading is 100% complete.

   As the file is downloading, the Marine Power Display will have the message "Programming Receiving Data."
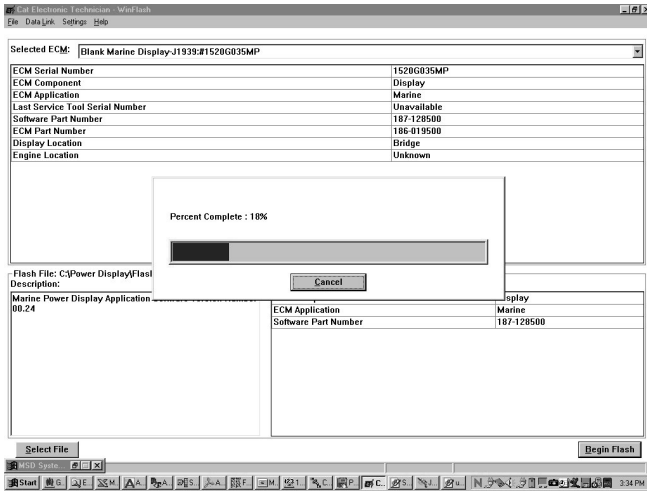
10. When downloading is complete, the **Cat® Electronic Technician** window will appear with the message "**Flash completed successfully.**" Select **Exit** to shut down **WinFlash**.
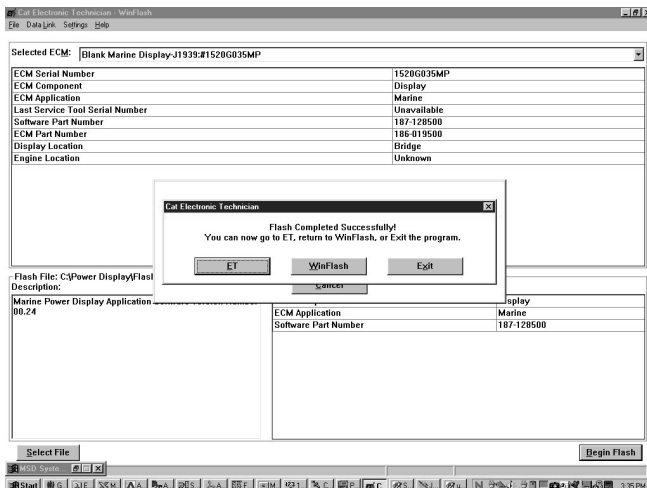
Method 2

The ET service tool can be directly connected to the engine's service tool connector on the following engines:

3412E	s/n	9KS00801 and up	C30	s/n	All
3412E	s/n	9PW00356 and up	C18	s/n	All
3406E	s/n	9WR01561 and up	C12	s/n	All
3196	s/n	2XR03371 and up	C9	s/n	All
3176C	s/n	6BW00494 and up	3126B	s/n	All
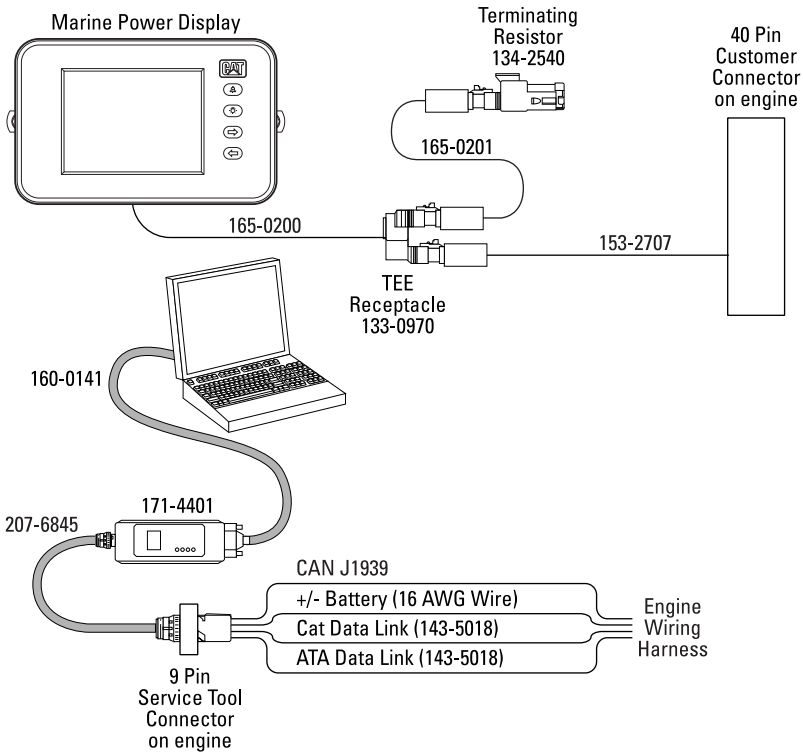
File Download

Follow steps 4 through 10 beginning on page 15.

NOTES

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