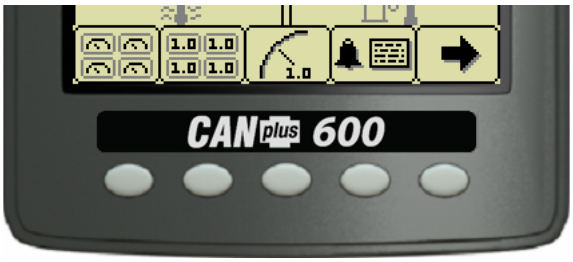
LOFA INDUSTRIES, INC.™
MANUFACTURER OF QUALITY ENGINE COMPONENTS

CANplus™ PC Simulator Brief Instructions

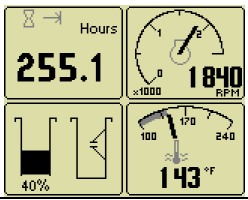
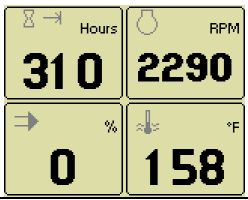
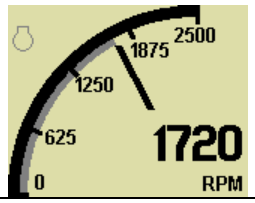
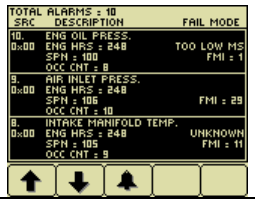
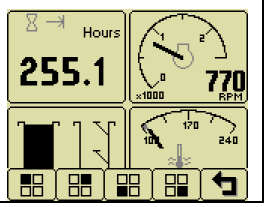
Introduction

The CANplus™ PC Simulator allows you to experience the CANplus display on your Windows® computer. The CANplus family is a platform to monitor and control diesel engines. The microprocessor-based, solid-state design uses high power semiconductors instead of outdated electromechanical relays to ensure reliable high current switching. Graphical gauge pages or a single large analog gauge are displayed on the 4.25" diagonal LCD. Virtually any SAE J1939 parameter reported by the ECU (Engine Control Unit) can be displayed including RPM, coolant temperature, oil pressure, engine hours, voltage and diagnostic codes. The trans-reflective, backlit display is clearly readable in both bright sunlight as well as total darkness and housed in a rugged IP67 rated housing.

Current alarm conditions are displayed in plain language on popup messages and can be viewed in the alarm list. Various diagnostic screens allow detailed investigation of the CANbus data stream. By accessing the *Configuration Menu*, users can customize displayed data to show metric or US units, display language and various other parameters such as the full-scale reading of gauges.



Five buttons access a context dependent ***button bar*** when any button from 1 to 4 is pressed. The graphical menu structure uses easily understood icons to indicate the button's current function. After 5 seconds of inactivity the button bar disappears.

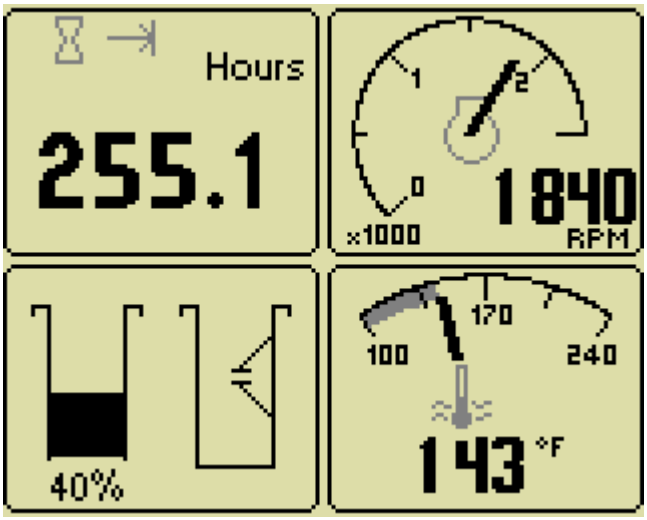
Button 1	Button 2	Button 3	Button 4	Button 5
Analog Gauge Pages	**Digital Gauge Pages**	**Single Analog Gauge**	**Active Alarm Page**	**Gauge Adjust**
Repeated presses cycle through four pages of analog gauges (16 total).	Repeated presses cycle through four pages of digital gauges (16 total).	Repeated presses cycle through various available analog gauges.	Displays active alarms including a plain language description.	Configures the parameters used by gauge pages.
				

Installation

Download the installer from the LOFA website at http://www.lofa.net/canplus. Run the installer to create the directories and shortcuts to run the program. Both the CANplus 600 simulator and the CANplus 750 simulator can be installed on the same computer.

Operation

Load the simulator using the shortcut created in Start | CANplus. The simulator displays a start-up screen and then displays simulated data on its virtual gauges. Initially the analog gauges are displayed but the display uses the screen last displayed on subsequent startups.



CANplus Display

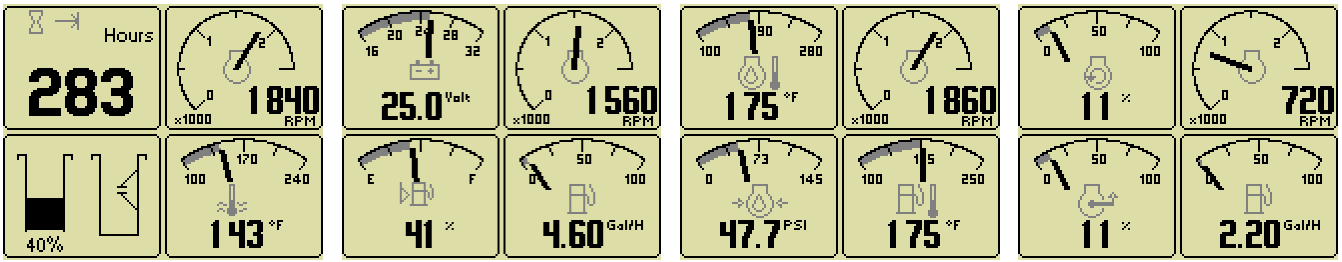
Soft buttons simplify the operator interface by displaying a *button bar* above the buttons when any of the first 4 buttons (buttons 1 to 4, starting from the left) are pressed. Icons on the button bar representing the current function of each button. The button bar disappears after 5 seconds if no further buttons are pressed.

Note

Clicking the mouse on one of the buttons simulates a button press.
Clicking on the button bar is ignored.

Analog Gauge Pages

Analog Gauge Pages provide four independent pages of analog gauges. To enable Analog Gauge Pages, press any of the first 4 buttons to show the top level button bar and then press button 1  . Alternate pages are selected by repeated pressing of button 1. The four standard gauge pages are shown below.

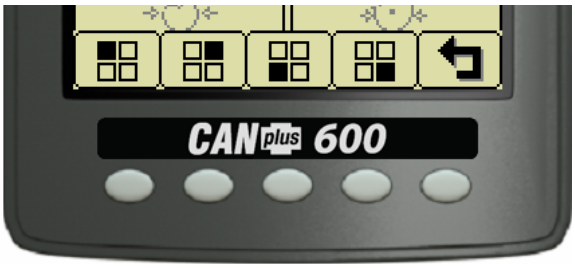


Note

Engine Hours are displayed as a digital value even on Analog Gauge Pages.

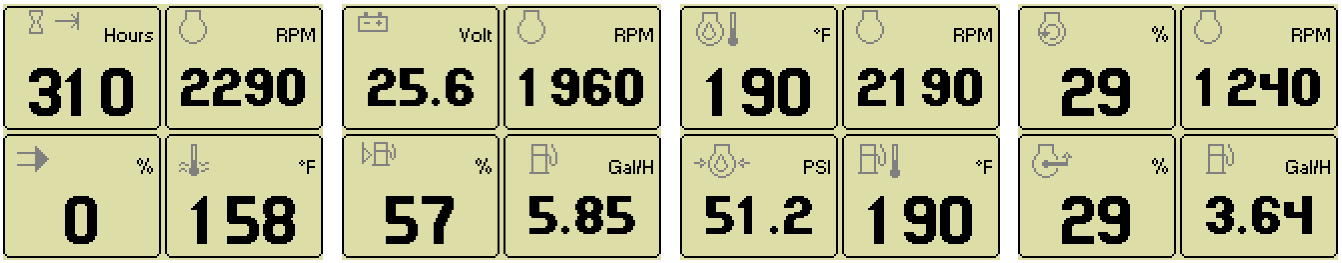
All 16 gauges may be configured by the user to create an application-specific view of CANbus data. Gauges are changed via *Adjust Mode,* accessed by pressing button 5  when the button bar is visible.

In the adjust mode a new button bar is displayed identifying the new button functions. Button 1 corresponds to the upper left gauge, button 2 to the upper right gauge, button 3 to the bottom left gauge and button 4 to the bottom right gauge. Successive presses of any of the buttons selects a different parameter to display for the corresponding gauge. Adjust Mode is exited by pressing button 5 and configuration is stored even when power is removed.



Digital Gauge Pages

Digital Gauge Pages display the same data as the Analog Gauge Pages but in digital format. To enable Digital Gauge Pages, press any of the first 4 buttons to show the top level button bar and then press button 2. Alternate pages are selected by repeated pressing of button 2. The four standard gauge pages are shown below.

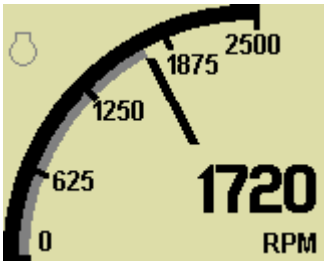


Note

The 16 gauges are the same for Analog and Digital Gauge Pages. Adjustments in either Analog Gauge Pages or Digital Gauge Pages affect the same gauge in the other mode.

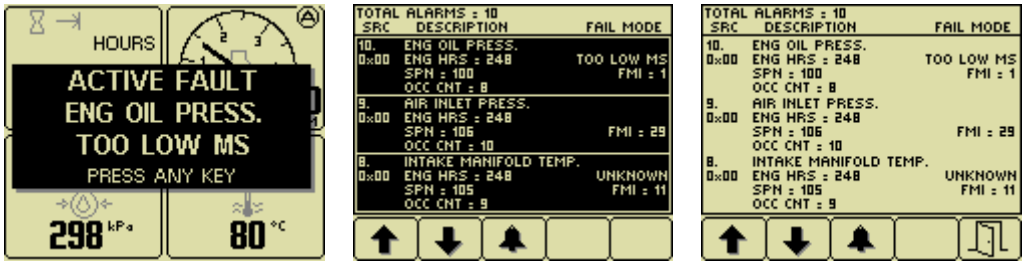
Single Analog Gauge

Single Analog Gauge uses the entire display for a single large analog gauge. This mode is enabled by pressing any of the first 4 buttons to show the top level button bar and then press button 3. The gauge displayed is selectable by repeatedly pressing button 3 while in the Single Analog Gauge mode while the menu bar is visible.



Active Alarms

A flashing popup window is overlaid on the current screen when an active alarm is received. The popup includes a plain language description in addition to the standard SPN-FMI pair defined by the SAE J1939 standard. Additionally the beeper sounds as an audible cue.



Example alarm message, plus alarm list screens showing unacknowledged conditions and acknowledged alarms. After acknowledgement, the exit button becomes active.

Note

Standard J1939 abbreviations are used for alarms.
MS = Most Severe, *MOD*= Moderately Severe, *LS* = Least Severe.

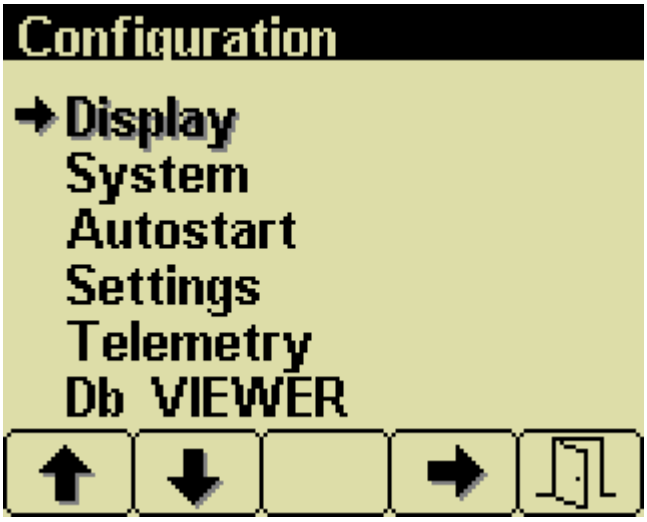
Alarm List

The Alarm List is accessed by pressing any button while an alarm popup is displayed or by pressing any of the first 4 buttons to show the button bar and then button 4. Alarms not yet acknowledged are shown in grey on black while acknowledged alarms are shown in black on grey. The list also indicates when the alarm occurred if engine hours are available. The most recent alarm is displayed at the top of the list. The list can be scrolled using buttons 1 and 2 and alarms acknowledged by pressing button 3. The Alarm List can be closed by pressing Button 5 once the alarms are acknowledged.

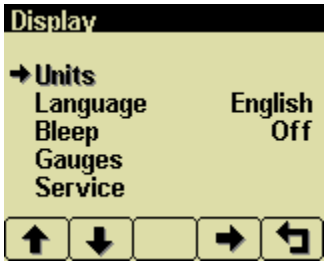
An alarm indicator is displayed near the upper right corner of the display as long as alarms are active. The indicator and alarm messages in the list are automatically removed when the alarm is no longer received for a few seconds.

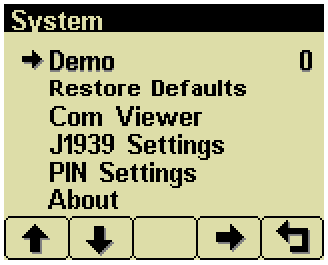
Configuration Menu

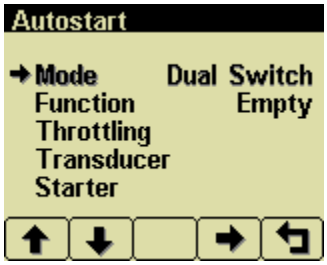
This *Configuration Menu* allows the user to set various operating parameters such as US or metric units, scale limits for tachometer and service timers. The configuration menu is entered by pressing and holding button 5 (the right hand button) in any mode for at least 3 seconds. If PIN entry is enabled the correct PIN must be entered to access the configuration menu. The top level configuration menu is displayed as shown. Buttons 1 ⬆ and 2 ⬇ allow you to choose from *Display*, *System*, *Autostart, Settings, Telemetry* or *Db Viewer*. Pressing button 4 ➡ selects the chosen menu item indicated in bold and the arrow ➡. Each item is described in detail on the following pages. Settings are automatically stored when exiting the current menu even when power is removed.

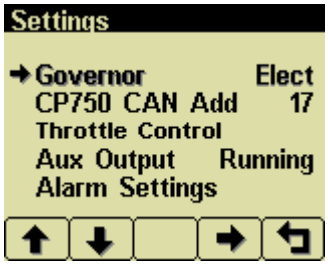


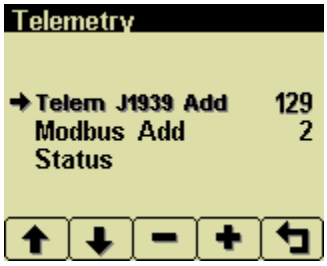
The Configuration menu and its choices.
Pressing Button 4 ➡ selects the highlighted menu item.
Button 5 exits the configuration mode.

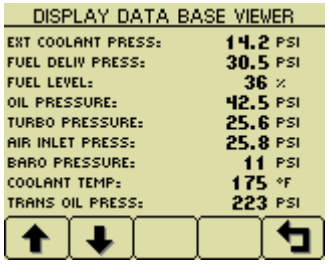












Note

The menus shown are those for the CANplus 750.
Not all menus are available in the CANplus 600 simulator.

Demo Modes

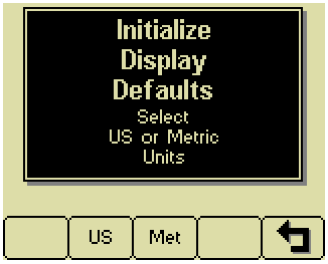
The simulator supports several demo modes to provide gauge data. Mode 1 simulates speed data and engine parameters. Mode 2 only simulates engine parameters. Mode 3 simulates speed data, engine parameters and alarms. Mode 0 disables Demo Mode.

Note

The simulator automatically starts in Demo Mode 1.
Select Demo Mode 3 to simulate alarms.
Select Demo Mode 0 will simulate the loss of data.

Restore Defaults

This allows resetting all configuration information to default US [US] or Metric [Met] units. Additionally the display is reset to the initial configuration.

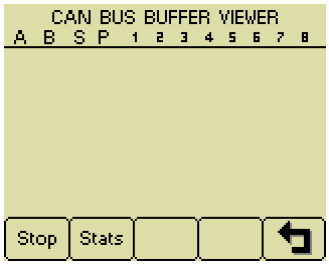


The default settings are:

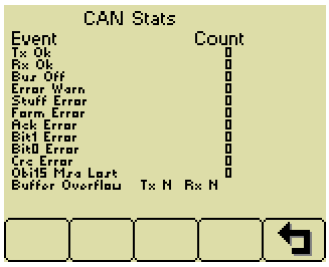
Setting	US	Metric
Language	English	
Button Beep	On	
Service Timers	Off	
Display Mode	Analog Gauges	
Gauge Pages	Defaults	
Quad Adjust	On	
Demo Mode	0 (Off)	
Source Address	0	
Display CAN Address	40	
Alarm Filter	Glb	
SPN Version	1	
Speed Source	Auto	
PIN Entry	Off	
PIN	1111	
Max Gauge RPM	2500	
Max Gauge Speed	40 MPH	60 KmH
Speed Units	MPH	KmH
Distance Units	Miles	Km
Pressure Units	PSI	kPa
Volume Units	Gal	L
Temperature Units	°F	°C

J1939 Viewer

This screen provides a hexadecimal dump of the last messages received on the CANbus. This viewer displays the raw data. To see the decoded data use the *Db Viewer*.

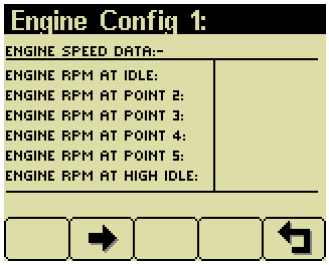


Button 1 [Stop] freezes the display while button 2 [Stats] shows CANbus data statistics screen.



Engine Config

This screen displays the engine configuration information received from the ECU.



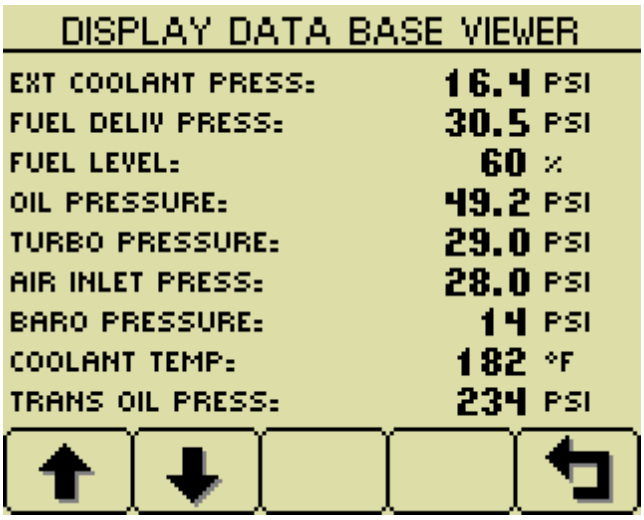
Button 2 [→] selects the next page of engine configuration while button 1 [←] selects the previous page.

Note

The simulator does not supply data for the J1939 Viewer or the Engine Configuration.

Db Viewer

The Database Viewer displays and decodes all data monitored by the display. This diagnostic tool allows viewing data not normally displayed.



The list can be scrolled using buttons 1 ⬆ and 2 ⬇ and closed by pressing Button 5 ↩.

Note

The Database Viewer is always in English regardless of language selected.

Preferred Screen Store

The display automatically stores the current screen as the preferred page after a delay of approximately 15 seconds. The display will use the last stored screen on the next power-up.

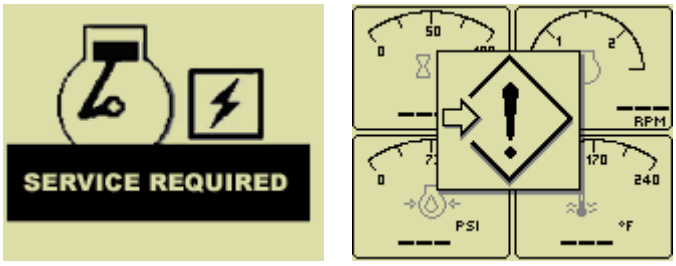
Note

Selecting *Restore Defaults* restores the Analog Gauge Pages and default gauges.

Popup Messages and Alerts

Service Required

Users can set up to sixteen service timers in hours in the Configuration menu. The SERVICE REQUIRED popup is displayed at power up when one or more service timers has expired. Pressing any button removes the popup. If no button is pressed the popup closes in approximately 5 seconds.

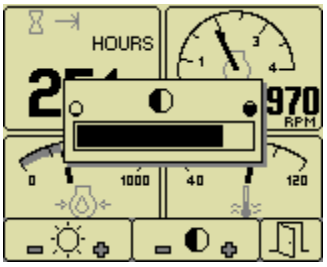


Pop-up warnings of service required and data communications failure.

Data Not Available

Gauges and the Db Viewer will display ---- if the desired data is not available. The display value returns to normal when parameter data is received.

Adjusting Lighting and Contrast



Pressing button 5 (the right-hand button) when there is no menu bar opens the lighting and contrast menu bar. The display has a number of back-lighting levels that allow the display to be read in the dark. The level is adjusted by pressing buttons 1 decrease or button 2 to increase illumination. Contrast is adjusted in the same manner using buttons 3 and 4 .

Note

The display adjusts the contrast with ambient temperature.
Manual contrast adjustments are only necessary with extreme climate change.

The menu is exited by pressing button 5 . The lighting and contrast settings are retained after the unit is switched off.

Note

If the contrast has been adjusted poorly, the factory setting is restored by pressing buttons 1 thru 4 simultaneously. This action does not change other user-configured settings.

Diagnostic Trouble Codes (DTC)

CANbus Diagnostic Trouble Codes are a pair of numbers; the Suspect Parameter Number (SPN) and Failure Mode Identifier (FMI). The SPN indicates the faulting subsystem and the FMI identifies the type of failure.

Typical SPNs

Standard SPN codes are defined by SAE J1939-71. Not all standard codes are provided by ECUs. Manufacturers may add additional SPN codes beyond the codes identified in J1939-71. Refer to ECU documentation for supported SPNs.

SPN	Description
51	Throttle Position
91	Accelerator Pedal Position
94	Fuel Delivery Pressure
98	Engine Oil Level
100	Engine Oil Pressure
110	Engine Coolant Temperature
111	Coolant Level

FMI

FMI codes are defined by SAE J1939-71. Refer to ECU documentation for correct interpretation of FMI codes for a specific SPN.

FMI	Description
0	Data valid but above normal operational range
1	Data valid but below normal operational range
2	Data erratic, intermittent or incorrect
3	Voltage above normal or shorted high
4	Voltage below normal or shorted low
5	Current below normal or open circuit
6	Current above normal or grounded circuit
7	Mechanical system not responding properly
8	Abnormal frequency, pulse width or period
9	Abnormal update rate
10	Abnormal rate of change
11	Failure mode not identifiable
12	Bad intelligent device or component
13	Out of calibration
14	Special instructions
15	Data valid but above normal operational range (least severe)
16	Data valid but above normal operational range (moderately severe)
17	Data valid but below normal operational range (least severe)
18	Data valid but below normal operational range (moderately severe)
19	Received network data in error
20 thru 30	Reserved for future assignment
31	Not available or condition exists

Data Parameters Monitored

This table lists the engine and transmission parameters that are monitored via the CANbus. The parameters can be displayed by the user-configurable gauge pages or the single analog gauge. DB is an abbreviation for the internal database which stores all data transmitted from the engine/transmission. The complete database can be accessed on the display via the Configuration menu.

Icon	Parameter	Gauge Pages	Single Analog	Database
	Electrical (Volts or Amps)			
	Electrical Potential	●	●	●
	Battery Potential Switched	●	●	●
	Net Battery Current	●	●	●
	Alternator Potential	●	●	●
	Alternator Current	●	●	●
	Fuel (L, Gal, IGal) or (L/h, Gal/h IGal/h) or (km/L, MPG or IMPG)			
	Fuel Remaining	●		●
	Fuel Rate	●	●	●
	Instantaneous Fuel Economy	●		●
	Trip Fuel Economy	●		●
	Trip Fuel	●		●
	Trip Fuel Rate	●		●
	Total Fuel Used	●	●	●
	Fuel Leakage 1			●
	Fuel Leakage 2			●
	Distance (km, Miles or Nmiles)			
	Distance Remaining	●		●
	Trip Distance	●		●
	Total Vehicle Distance	●		●
	Pressure (kPa, PSI or bar)			
	Fuel Delivery Pressure	●	●	●
	Barometer Pressure	●		●
AUX1	Auxiliary Pressure 1	●		●
	Boost Pressure	●	●	●
	Air Inlet Pressure	●		●
	Air Filter 1 Differential Pressure	●		●
	Injector Metering Rail 1 Pressure			●
	Injector Metering Rail 2 Pressure			●
	Coolant Pressure	●	●	●
	Engine Oil Pressure	●	●	●
	Transmission Oil Pressure	●	●	●
	Clutch Pressure			●
	Air Start Pressure			●
	Injection Control Pressure			●
	Temperature (°C or °F)			
	Engine Coolant Temperature	●	●	●
	Engine Intercooler Temperature	●		●
	Engine Oil Temperature 1	●	●	●
	Transmission Oil Temperature	●	●	●
	Turbo Oil Temperature	●		●
	Fuel Temperature	●	●	●

Icon	Parameter	Gauge Pages	Single Analog	Database
	Intake Manifold 1 Temperature	●	●	●
	Air Inlet Temperature	●		●
	Exhaust Gas Temperature	●	●	●
	Auxiliary Temperature 1	●		●
	Engine ECU Temperature			●
	Exhaust Gas Port 1 Temperature			●
	Exhaust Gas Port 2 Temperature			●
	Turbo 1 Compressor Inlet Temperature			●
Percentage (%)				
	Fuel Level	●		●
	Acceleration Position	●	●	●
	Throttle Position			●
	Engine Oil Level	●		●
	Coolant Level	●		●
	Estimated Percent Fan Speed	●		●
	Drivers Demand Percent Torque	●		●
	Actual Engine Percent Torque	●	●	●
	Torque Use at RPM	●	●	●
Speed (RPM, km/h, MPH or KTS)				
	Input Shaft Speed			●
	Output Shaft Speed			●
	Engine Speed	●	●	●
	Turbo 1 Speed			●
	Engine Desired Operating Speed			●
	Navigation Wheel Based Vehicle Speed	●		●
Time (h)				
	Total Engine Hours	●		●
	Trip Engine Hours	●		●
	Service Hours			●
Miscellaneous				
	Torque Converter Lock-Up Engaged			●
	Current Gear	●		●
	Selected Gear	●		●
	CANTX Disable			●

Abbreviations

The units *MPG* and *Gal* denote US gallons. For non-US US gallons (UK, Canada, etc) the units are denoted as *IMPG* or *IGal*. *N* denotes nautical miles. *KTS* denotes knots.

Note

If a parameter is not available it will not be possible to select it.
If a parameter becomes unavailable while in view `---` is displayed.

Glossary

CAN	Controller Area Network (also referred to as CANbus); serial communications protocol for electronic engines use
DTC	Diagnostic Trouble Code; the combination of SPN and FMI that identifies a specific error
ECU	Engine Control Unit; electronic device responsible for controlling and monitoring engine operation
FMI	Failure Mode Identifier; defines the type of failure detected in the subsystem identified by the SPN
GPS	Global Positioning System; a system of satellites and receiving devices used to compute positions on the earth, used in navigation
ISO	International Standard Organization; an international organization working with the United Nations that maintains technology standards for global industry
J1939	SAE engine data protocol using CAN 2.0B
LCD	Liquid Crystal Display; a display technology that uses electric current to align crystals in a special liquid. When current is applied the crystals change their orientation creating a darker area.
NMEA	National Marine Electronics Association, serial communications protocol for marine use
RS-232	Standard electrical interface for serial communications
RS-485	Standard differential electrical interface for serial communications
SAE	Society of Automotive Engineers; professional association of transportation industry engineers that sets most auto-industry standards for the testing, measuring, and designing of automobiles and their components
Soft buttons	Push buttons whose function changes according to use
SPN	Suspect Parameter Number; a number used to identify a particular element, component or parameter associated with an ECU

Note

The messages, icons and error codes displayed conform to J1939 standards wherever possible.

A copy of the relevant standards documents may be accessed and purchased at:
http://www.sae.org/standardsdev/groundvehicle/j1939a.htm

Software Revision History

0.2 Initial release, 27-Aug-2007. Based on display version 1.35.

Document Revision Information

Initial: 7-Sep-2007.

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463-3000-09 Initial - 7-Sep-2007