MURPHY
by ENOVATION CONTROLS

PowerView® Display
Model PV485

Murphy Standard Operations Manual

00-02-1207
2021-~~03~~06-~~25~~07
Section 78

Warranty - A limited warranty on materials and workmanship is given with this Murphy product.
A copy of the warranty may be viewed or printed by going to www.enovationcontrols.com/warranty

Please read the following information before installing.

BEFORE BEGINNING INSTALLATION OF THIS MURPHY PRODUCT:

- Read and follow all installation instructions.
- Please contact Enovation Controls immediately if you have any questions.

Revision Date	Details
2021-03-25	New Document
2021-06-07	Pre-production revision

Table of Contents

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Introduction

The PV485 is a rugged CAN-based controller. This manual explains the functions and display screens of the unit, ~~describes the display screens~~ and gives details about the PV485 Murphy Standard Configuration.

Engine Parameters

The following are some of the 62~~109~~ possible engine parameters that can be displayed in standard or metric units as well as in *English, French, German, Spanish, Italian, Japanese, Chinese, Portuguese, Russian and Czech languages.*

• Coolant Level • Fuel Level • Alternator Voltage • Oil Level • System Voltage	• DEF Level • Oil Pressure • Coolant Temperature • Battery Voltage • Oil Temperature •

Glossary of Terms and Acronyms

~~CAN – Controller Area Network~~
~~DM1 – Diagnostic Message 1, Active Diagnostic Trouble Codes~~
~~DM2 – Diagnostic Message 2, Previously Active Diagnostic Trouble Codes~~
~~DM4 – Freeze Frame Parameters~~
~~DPF – Diesel Particulate Filter~~
~~DTC – Diagnostic Trouble Code~~
~~ECU – Engine Control Unit~~
~~FMI – Failure Mode Identifier~~
~~PGN – Parameter Group Number~~
~~SPN – Suspect Parameter Number~~

Acronym/Term	Description
CAN	Controller Area Network
DM1	Diagnostic Message 1, Active Diagnostic Trouble Codes
DM2	Diagnostic Message 2, Previously Active Diagnostic Trouble Codes
DM4	Freeze Frame Parameters
DPF	Diesel Particulate Filter
DTC	Diagnostic Trouble Code
ECU	Engine Control Unit
FMI	Failure Mode Identifier
PGN	Parameter Group Number
SPN	Suspect Parameter Number

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Button Assignments

Review the icon on the screen directly above each button to determine that button's function. These functions change according to the screen that is displayed. In the above screen, Button 1 will provide the Password screen to enter the Main Menu. In other screens, Button 1 will serve a different function.

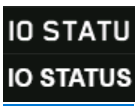
Home Screen

When first turning on the controller, you will see the Murphy logo display before the Home screen.

The Home screen displays Engine Hours, Time, RPM/Speed and up to 12 gauges, chosen from 62 available parameters.

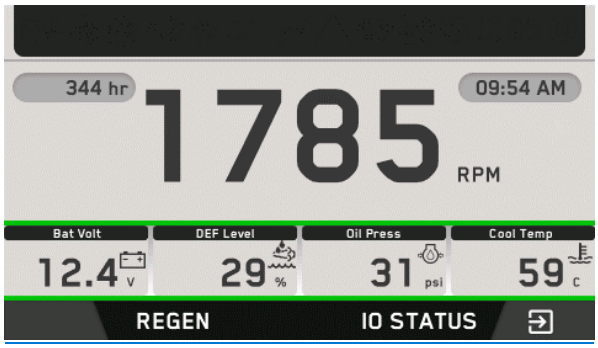
Button Functions

The table below explains the button functions when they appear on the screen.

Button Icon	Description
	Go to menu password screen.
	Throttle or digital gauge value decrease
	Throttle or digital gauge value increase
	Start engine
	Stop engine
	Next / Enter
	Go to fault screen
	Go to preset screen
	Go to I/O status screen
	Go to regeneration screen
	Back
	Select previous
	Select next

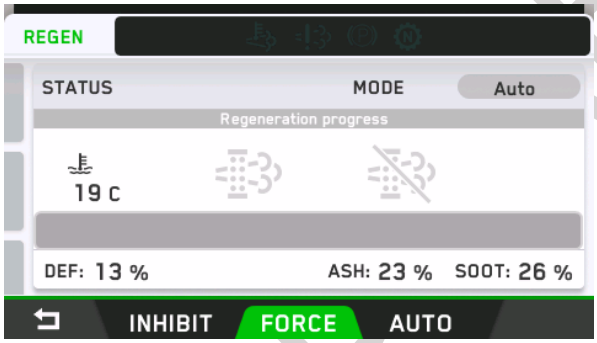
Scrolling 12 Gauges

Pressing the button 5 (or Press and hold for 3 seconds if there are active DM1 faults) on the main screen (, to reveal the next button  hiden button will show up as shown example in the image screen below) repeatedly will , press button 5 again will to cycle through all 12 chosen digital gauges.



Regen Screen

Pressing button 2 while Regen (as shown in the image above) is displayed will open the Regen page, shown below. This provides the user control of engine regeneration and current DPF status.



This same Regeneration page will automatically popup when regeneration is required. A User can press Button 3 (FORCE) to request regeneration or Button 2 (INHIBIT) to prevent/stop regeneration. Press Button 4 (AUTO) to exit Inhibit mode.
To carry out a force regeneration, each engine's specific regen requirements must be met.

To carry out a force regeneration, each engine's specific regen requirements must be met.

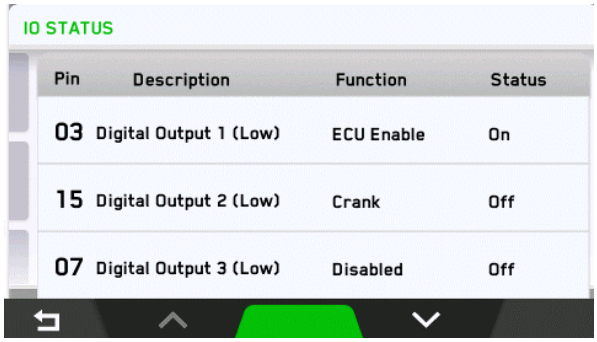
Commented [TM1]: Would it be better to state it as "In order to force a regeneration, each engine's specific regen requirements must be met."

Commented [2R1]: @Trina Moore yes, that's much better.

I/O Status Screen

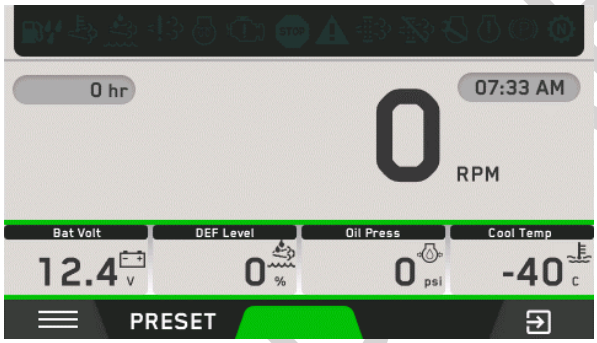
Pressing button 4 when IO Status is displayed will open the I/O status page as shown below. Display connector pins with their corresponding functions and current status will be shown. Use button 2 and 4 to scroll through multiple pages of the IO Status. Once you have navigated to the last available

page, the down arrow will turn gray indicating there are no more pages available.

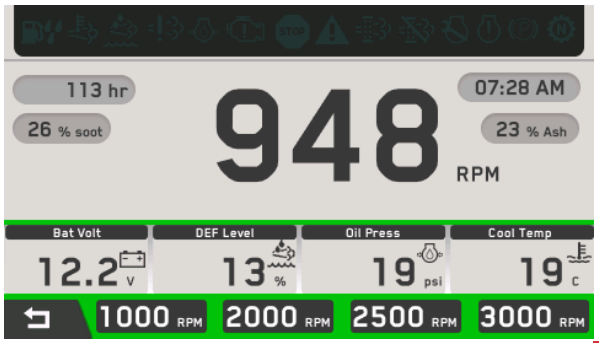


Preset Screen

If Throttle Type is set in the Throttle menu to Preset, the context of main screen button #2 will change to “PRESET” as shown in the next image.



Once you press the PRESET button, the preset speed options will appear as shown in the following image. The preset speed allows the user to quickly control engine speed to a pre-configured target speed. The type of the target speed illustrated below will depend on the Target RPM Type setting in the menu. Available options are RPM or Percentage.



or

Press the corresponding speed button to request the indicated speed, and the back button to leave the page.

Alert Icons

The Alert Icons at the top of the main page will light up when communicating to the operator. Pay close attention to any Status Icon and its color that may appear.

Status Icon	Description
	Water in Fuel
	Engine Exhaust High Temperature Lamp
	Diesel Exhaust Fluid (DEF) Level
	Emission failure
	Engine Oil Pressure
	Preheat – Wait to Start
	Check Engine / malfunction
	Warning
	Diesel Particulate Filter Lamp

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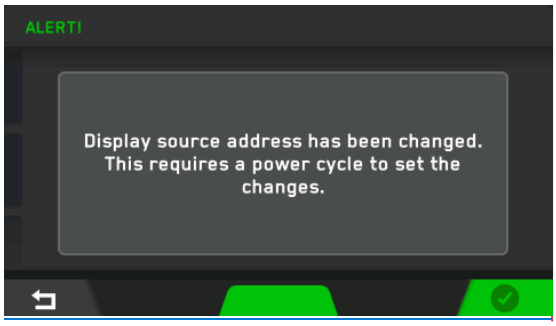
Status Icon	Description
	DPF Regeneration set to Inhibit – Displays when the machine or the operator has inhibited regeneration
	Maintenance / Service Required
	Check Engine / Protect
	Parking Brake Engaged
	Transmission Neutral
	Stop engine.
	Air filter
	Fuel filter
	Coolant level
	Coolant temperature
	Inducement warning (FPT only)

Popup Message Screen

When ~~the~~ a popup message is shown~~s screen shows~~, the user must acknowledge it by press~~ing~~ ~~the~~ button 1 to cancel or button 5 to accept, then the popup message ~~screen~~ will clear. Please pay attention to the indicated messages.



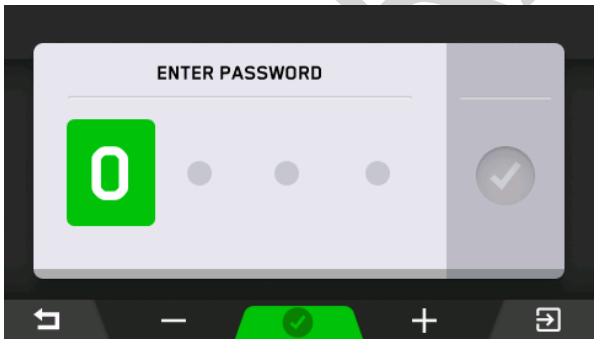
Main Menu

Press  (Button 1) then enter the appropriate password to gain access to the Main Menu.

There are three levels of security for the PV485:

- Low (factory password of 1111)
- Median (factory password of 5311)
- OEM (factory password of 3482)

These password selections may be changed within the menu.

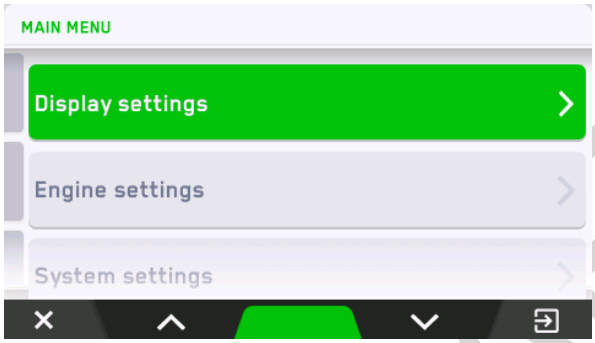


Enter Password

Step	Action
1	Adjust the highlighted number with the – (Button 2) and + (Button 4).

2	Press Button 5 to move to the next number.
3	Repeat steps 1 and 2 to assign all four numbers of the password, then press Button 3 to confirm.
4	Exit the Menu by pressing Button 1.

When the password has been accepted, the Main Menu screen will appear:



~~Using~~ Pressing buttons 2 and 4 will scroll through these Main menu items, which will be described in the following sections:

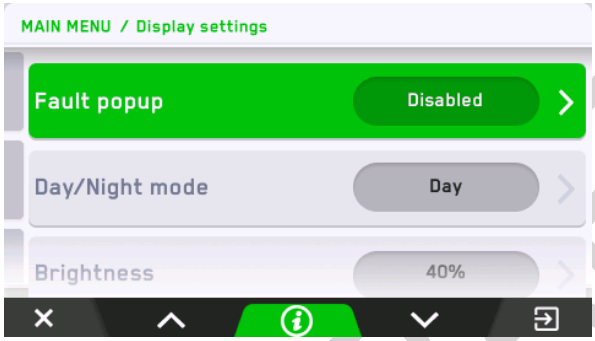
- Display Settings
- Engine Settings
- System Settings
- Advanced Settings
- I/O Settings
- Throttle Settings
- Communication Setup
- Diagnostics
- Customize Display Interface
- Main Screen Gauge Setup
- Engine special functions (only available to specific engines)

Pressing Button 5 will enter the selected menu area.

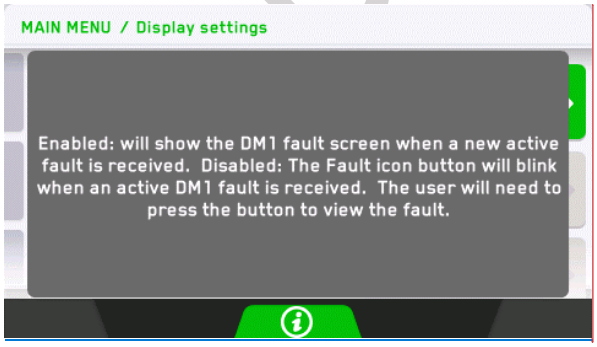
Display Settings

The Display Settings menu houses the controls for the appearance of the display:

- Fault Popup
- Day/Night Mode
- Brightness
- Language
- Units
- Clock
- View Service Reminder



Note that each menu item's current setting is indicated to the right of the corresponding item. If a Screen Tip is available for the selected menu item, the information symbol will be available on the navigation bar. Pressing Button 3 to view the available Screen Tip for the highlighted Fault popup above will appear as shown below:



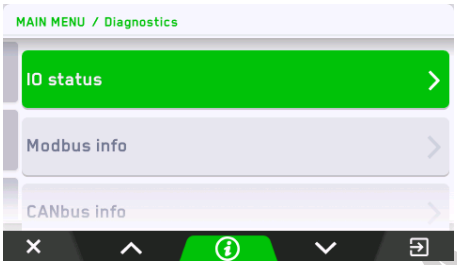
Pressing button 3 again will clear the Tip screen.

Fault Popup

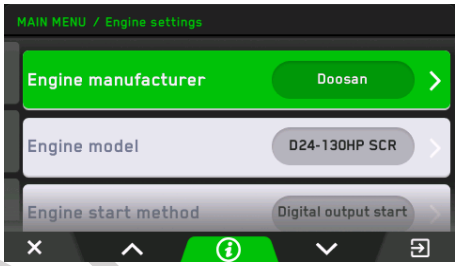
This selection allows the enabling or disabling of displaying the faults screen pop up. If disabled, a warning icon will appear on the navigation bar above button 1 or 5 when an active fault is received. The user must press the corresponding button to view the fault.

Day / Night Mode

To optimize visibility in Day/Night conditions, the display theme colors will change based on the selected option mode.



Day Mode



Night Mode

Brightness

This selection controls how dim or bright the screen appears. ~~The changes effect to selected Day / Night Mode setting~~.

Language

This selection ~~controls which language appears throughout the display~~theselects the displayed language. Available languages includinge English, French, German Spanish, Italian, Japanese, Chinese, Portuguese, Russian or Czech

Units

This selection controls how measurements are displayed.

~~For **Pressure**, select between Kpa, Bar or Psi.~~
~~For **Temperature**, select between F or C.~~
~~For **Speed**, select between Mph, Kph or m/s.~~
~~For **Distance**, select between Feet, Meters, mi or Km.~~

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Measurement	Available Selections
Pressure	Kpa, Bar or PSI
Temperature	°F° or °C°
Speed	MPH, KPH or M/S
Distance	Feet, Meters, Mi or Km
Flow	L/s, L/min, gal/min (US) or gal/min (UK)
Volume	L, gal (US) or gal (UK)

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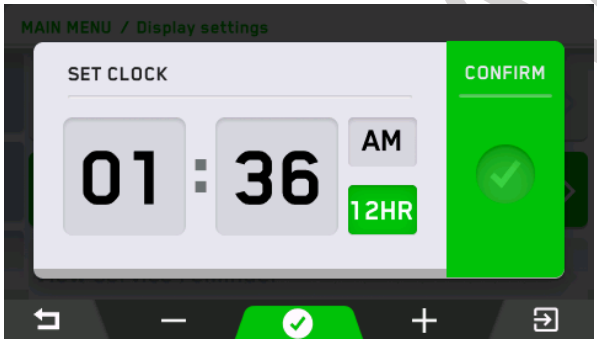
Clock

This selection ~~exists~~ allows a user to set the clock and choose a 12- or 24-hour display. ~~Display~~ Once the clock is set,~~must c~~ cycle power ~~power~~ on the display to update the clock.



Step	Action
1	Select Display Settings, then Clock from the Main Menu.
2	The next screen highlights the hour. Adjust this using Buttons 2 and/or 4.
3	To move to the next field, press Button 5.
4	Adjust the minutes. Press Button 5.
5	Select between AM or PM. Press Button 5.
6	(Optional Step) Change between 12HR and 24HR using Buttons 2 or 4.
7	Pressing Button 3 will display popup messages ~~will show ask~~ to confirm or cancel the new clock settings. ~~set the time and clock settings.~~
8	Exit the Menu by pressing Button 1.

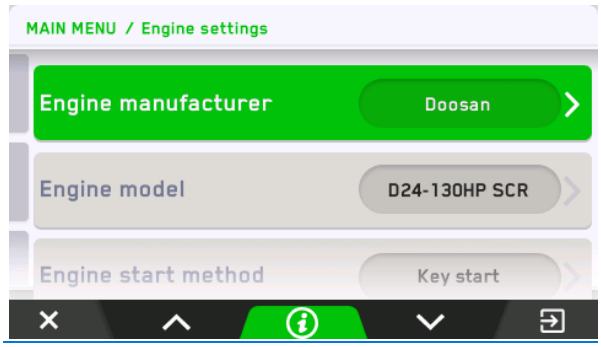
View Service Reminder

This selection ~~exists to shows~~displays the remaining hours left until service is needed for the Air filter, Battery life, Belt life, Fuel filter, Oil filter, Oil life and Overhaul. ~~To c~~Change or reset the service hours via the S~~s~~ystem S~~s~~ettings menu.

Engine Settings

The Engine Settings menu houses the settings for the Engine:

- Engine Manufacturer
- Engine Model (optional depends on Engine Manufacture)
- Engine Start Method
- Show Ash Gauge
- Show Soot Gauge
- Show Regen Progress
- Emission Settings



Engine Manufacturer

This selection allows the operator to select the engine manufacturer of the engine which currently includes: Caterpillar, Cummins, Deutz, JCB", Volvo, Perkins, HATZ, Yanmar, Kubota, Doosan, Kohler, John Deere, FPT, Isuzu, PSI, Ford, GM and Scania. By default, the engine manufacturer is set to Other. When an engine manufacturer is selected the display software will automatically adjust the required settings to ensure the engine is controlled per the manufacturer's requirements.

Engine Model

This optional selection allows the user to select the model of the engine. As with engine manufacturer, unique settings are applied once a different engine model is selected to ensure control settings meet the manufacturer's requirements.

Engine Start Method

This selection allows the operator to select the method that will start the engine:

Engine Start Method	Description
CAN Start	If selected, the engine can be started using a CAN message. The specific CAN messages need to be programmed.
Digital Output Start	This method uses digital output to control an external relay for crank.
~~Key Start~~Disabled	Crank is controlled by an external device such as a key.

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Show Ash Gauge

This selection determines whether the Optional Ash Gauge will be shown or hidden on the home screen.

Show Soot Gauge

This selection determines whether the Optional Soot Gauge will be shown or hidden on the home screen.

Show Regen Progress

This selection determines whether the progress during a Regeneration will be shown or hidden on the Regen screen.

Emission Settings

The following items are available under the Emission Settings menu:

Menu Item	Description
Emission Tier	(Stage V, Tier 4, Other)
Ash Load Warning	**Auto:** Warning will be controlled by the engine ECU. For example, DM1
	Set by Display: User can set the warning trigger level.
Soot Load Warning	**Auto:** Warning will be controlled by the engine ECU. For example, DM1.
	Set by Display: User can set the warning trigger level.
Display TX park (SPN70)	**Disabled:** Parking brake (spn 70) CAN message will not transmitted by the display.
	Enabled: Parking brake (spn 70) CAN message will transmitted by the display.
Display TX neutral (SPN604)	**Disabled:** Neutral switch (spn 604) CAN message will not transmitted by the display.
	Enabled: Neutral switch (spn 604) CAN message will transmitted by the display.

~~**Emission Tier** (Stage V, Other)~~
~~**Ash Load Warning:**~~

~~**Auto:** Warning will be controlled by the engine ECU. For example, DM1.~~

~~**Set by Display:** User can set the warning trigger level.~~
~~**Soot Load Warning:**~~

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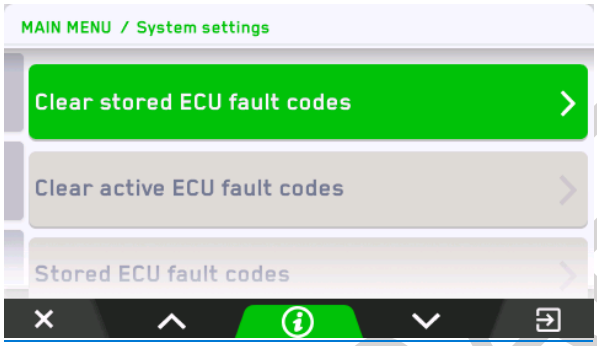
System Settings

The System Settings menu houses the settings for the System:

- Clear Stored ECU Fault Codes
- Clear Active ECU Fault Codes
-
- System Information
- Set Service Reminder
- Export Settings



Clear Stored ECU Fault Codes

This selection allows the operator to clear stored faults from the engine ECU. This

Clear Active ECU Fault Codes

This selection allows the operator to clear all active faults from the engine ECU. This setting should only be used by a qualified engine technician. All engine manufacturers and models may not support this feature.

Restore Factory Defaults

This selection allows the display parameters to be reset back to the Factory settings.

System Information

This selection displays the Engine Manufacturer, Software, Bootloader, Configuration, Unique ID, Part and Serial numbers.

Set Service Reminder

This selection provides the ability to set and reset service reminders for the Air Filter, Battery Life, Belt Life, Fuel Filter, Oil Filter, Oil Life and Overhaul.
Set the service hours to 0 if you do not wish to use the selected service reminder.

Export Settings

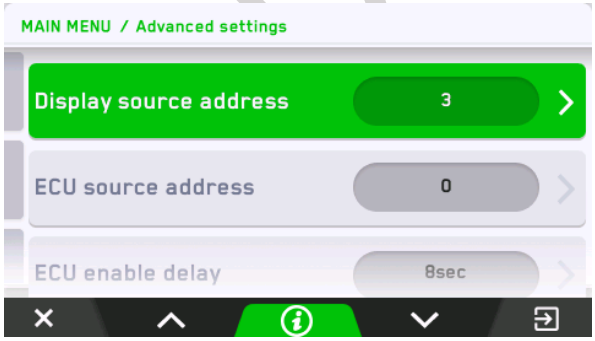
This selection allows exporting of established settings from the menu within the display. This feature is useful when the saved settings will be used on multiple displays. First ensure all settings are set then export to a USB using the programming kit (78700590), the programming harness (78090077) or your own harness. The exported file can then be imported to another display.

At power up, the

Advanced Settings

The Advanced Settings menu houses additional settings for the System:

- Display Source Address
- ECU Source Address
- ECU Enable Delay
- TSC1 Setup
- Shutdown and Warning
- Median Menu Access Control
- Low Menu Access Control
- Change Passwords (OEM, Median and Low)



Display Source Address

Allows the operator to set the address claim of the display when used on the CANbus. This address is relative to the address from which the ECU requires the TSC1 to be broadcast. Consult your engine manufacturer or dealer to obtain the correct source address the display should utilize to communicate correctly with the engine ECU. Factory set to 3 and changed per Engine Manufacturer setting.

ECU Source Address

Allows the operator to set the source address to which the ECU will be connected. Normally set to 0, 1 or 2 per SAE J1939 specifications. Factory set to 0.

ECU Enable Delay

Allows the operator to set a delay time (in seconds) before the ECU enable is active. To use this feature the ECU enable power must be controlled by the display output with an external relay. Applying a delay to the ECU enable power allows the operator the ability to adjust the time required for the ECU to establish communication with the display/controller after power up.

TSC1 Setup

This selection will allow the operator to configure the following settings for Torque Speed Control (TSC) 1:

Menu Item	Choices/Description
TSC1 Enable	**Enabled:** display will transmit TSC1 messages.
	Disabled: display will not transmit TSC1 messages.
TSC1 Independence	**Enabled:** allows the user to set a separate source address for TSC1 throttling from the display's claim address. This should only be done if the service technician knows this to be true.
	Disabled: TSC1 throttling from the display's claim address.
TSC1 Source Address	(**numeric value**)

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	allows setting TSC1 throttle to be sent from a source address separate than the display claim address. (Only appears when TSC1 Independence is set to Enabled)
Calculate TSC1 Checksum	**Enabled:** The display will add the checksum to the transmitted TSC1 message. This requirement is common with Stage V engines.
	Disabled: The display will not calculate checksum and the value will be 0xF.

~~Continued~~

Calculate TSC1 Count~~Menu Item~~ **~~Calculate TSC1 Count~~**	**Enabled:** The display will add the Count calculation to the transmitted TSC1 message. This requirement is common with Stage V engines.~~**Choices/Description**~~
	Disabled: The display will not calculate Count and the value will be 0xF. ~~**Enabled:** The display will add the Count calculation to the transmitted TSC1 message. This requirement is common with Stage V engines.~~
SPN 3349 Transmission Rate	(10, 20, 50, 100, 250, 500, 750, 1000 ms) This parameter indicates the transmission rate at which the display will transmit the TSC1 message. ~~**Disabled:** The display will not calculate Count and the value will be 0xF.~~
SPN 3350 Control Purpose~~SPN 3349 Transmission Rate~~	(Acc Pedal Op, Cruise Control, PTO Governor, Road Speed Gov, Engine Protection, Temp Power Control) This parameter indicates which control mode the sending device is using to generate the TSC1 command. ~~(10, 20, 50, 100, 250, 500, 750, 1000 ms)~~ ~~This parameter indicates the transmission rate at which the display will transmit the TSC1 message.~~
SPN 518 Requested Torque~~SPN 3350 Control Purpose~~	(numeric value) This parameter provides control/limit of the output torque. ~~(Acc Pedal Op, Cruise Control, PTO Governor, Road Speed Gov, Engine Protection, Temp Power Control)~~ ~~This parameter indicates which control mode the sending device is using to generate the TSC1 command.~~

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SPN 695 Override Mode~~SPN 518 Requested Torque~~	(Override Disabled, Speed Control, Torque Control, Speed/Torque Limit Control) The override control mode defines which sort of command is used.: ~~(numeric value)~~ ~~This parameter provides control/limit of the output torque.~~
SPN 696 Control Conditions~~SPN 695 Override Mode~~	(Transient, Stability, Vehicle Driveline, PTO Driveline) This parameter provides the governor characteristics that are desired during speed control. ~~(Override Disabled, Speed Control, Torque Control, Speed/Torque Limit Control)~~ ~~The override control mode defines which sort of command is used.:~~
SPN 897 Control Priority~~SPN 696 Control Conditions~~	(Highest, High, Medium, Low) This field is used as an input to the engine or retarder to determine the priority of the Override Control Mode received in the Torque/Speed Control message. ~~(Transient, Stability, Vehicle Driveline, PTO Driveline)~~ ~~This parameter provides the governor characteristics that are desired during speed control.~~
~~**SPN 897 Control Priority**~~	~~(Highest, High, Medium, Low)~~ ~~This field is used as an input to the engine or retarder to determine the priority of the Override Control Mode received in the Torque/Speed Control message.~~

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Shutdown and Warning

This selection will establish the following settings for Analog Inputs 1-4:

Menu Item	Choices/Description
Warnings	Setpoint (numeric value), Rule (Greater than Setpoint, Less than Setpoint), Action Delay (numeric value in mS). Note: Warning is disabled when the warning Setpoint =0. When the defined Rule condition is true, and Action Delay time outs, a popup message will show.
Shutdowns	Setpoint (numeric value), Rule (Greater than Setpoint, Less than Setpoint), Action Delay (numeric value in mS) Note: Shutdown is disabled when the warning Setpoint =0. When the defined Rule condition is true, and Action Delay time outs, the display will disable the ECU enabled output.

Alt excite fail warning

This selection provides the charging fail warning if enabled. There are two different charging fail triggering conditions:

- If a digital output function is set to ~~-~~"Alt excite~~r~~" ~~function is used in digital out~~, the output will try to excite the alternator, and a charg~~ing~~e fail warning will be triggered if voltage does not increase after 5 attempts.
- If Alternator Potential (SPN 167) or Electrical Potential (SPN 168) CAN messages are ~~available~~present, a charg~~ing~~ fail warning will be triggered after 1 minute if voltage does not increase.

~~This selection will establish the following settings for Analog Inputs 1-4:~~

- ~~Warnings: Setpoint (numeric value), Rule (Greater than Setpoint, Less than Setpoint), Action Delay (numeric value in mS), and~~
  - ~~Warning is disabled when the warning Setpoint =0. When the defined Rule condition is true, and Action Delay time outst, a popup message will show.~~

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Commented [NY5]: @Osayamen Imade the alt excite warning has been moved into the warning and shutdown and listed after the analogues warning. Please review this and the analog warning above, so they are looks in the same sub group.

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Medium/Low Menu Access Control

By default all menu items are available to all password access levels (OEM, Medium and Low). An OEM password is required to edit access to the following menu items for Medium and Low password users:

- Display Settings
- Engine Settings
- System Settings
- Advanced Settings
- IO Settings
- Throttle Settings
- Communication Setup
- Diagnostics
- Customize Display Interface
- Main Screen Gauge Setup
- Engine Special Functions

Change Passwords (OEM, Medium and Low)

This selection will allow you to select your own password in place of the factory-set password for the OEM, Medium and Low menu access levels of security.

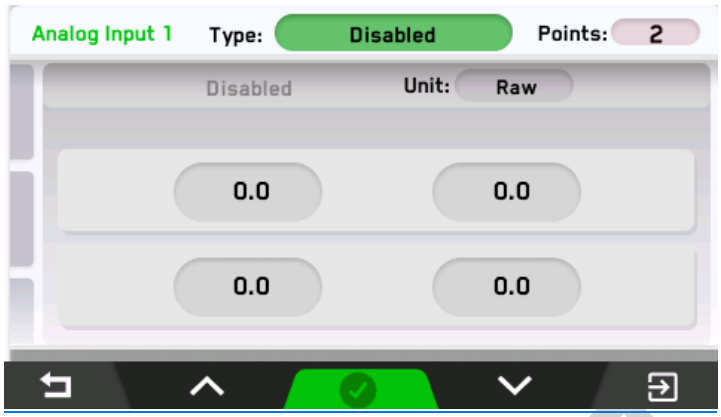
IO Settings

This menu item controls the parameters for the:

- Analog Inputs
- Digital Inputs
- Analog Outputs
- Digital Outputs
- Frequency Input Pulse.

Analog Inputs

Analog Inputs 1 through 4 will display the following screen when selected:



Step	Action
1	Select IO Settings, then Analog Inputs from the Main Menu. Press Button 5 to select and enter.
2	Choose the Analog Input to edit and press Button 5 to enter.
3	On the above-displayed screen, press Button 2 or 4 to scroll through these choices: Disabled, Resistive Digital, 0_5V Digital, Resistive, 4_20mA, 0_5V. Press Button 5 to move to the next field.
4	Repeat Step 3 with the Points, Unit and numerical values fields until your changes are complete.
5	Press button 3 to confirm the changes, or button 1 to exit and discard changes~~When your changes are complete, pPress Button 3 to confirm the changes.~~
~~6~~	~~Press Button 1 to exit this level of the menu, any changes will be discard.~~

Renaming Analog Inputs

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Commented [TM6]: Hi guys..if i press button 3 to confirm in step 5, then am i going backwards in step 6? think step 5 should read "press button 3 to confirm the changes, or button 1 to exit and discard changes" and then delete step 6...?

Commented [TM7]: I demoted the level of this because I felt it should be a sub of Analog Inputs, please correct me if I am wrong. That being said, I've read it and am confused on where I would find the Rename option, think a screenshot of that is needed.

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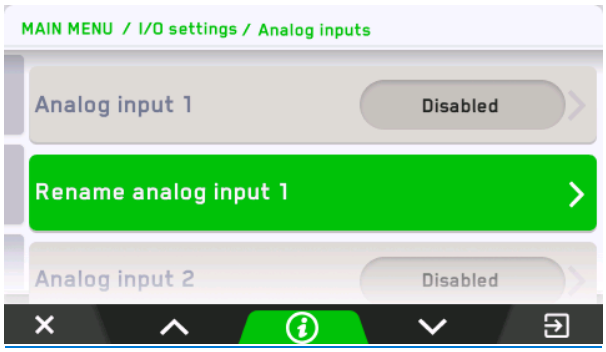

For each Analog Input, the option exists to Rename that input. Select Rename Analog Input (#) and the following screen will appear to create a different name.

Use the buttons below the arrow keys to move the cursor along the keyboard. Select a letter and then press Button 3 to enter it. When complete, highlight Done and press Button 3 to confirm.

Digital Inputs

There are three Digital Inputs, and for each one there will be a function and an active state. Digital input 1 and 2 are normally closed (NC) (i.e., the state is high when nothing is connected). Digital input 3 is normally open (NO) (i.e., the state is low when nothing is connected).

Digital Input Options	Description
Functions	Disabled
	Strat/Stop

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	Throttle Decrease This function will be set automatically if the Throttle Type is set to Switch and the switch throttle decrease input is set to any of the digital inputs.
	Throttle Increase This function will be set automatically if the Throttle Type is set to Switch and the switch throttle increase input is set to any of the digital inputs.
	Stop Engine
	Regen Request
	Neutral Switch
	Park Brake
	Park & Neutral
	Engine Idle
	Preset Speeds 1, 2, 3 or 4
	Crank Abort
Active State	**Active High**
	Active Low

~~Functions:~~

- **~~Disabled~~**
- **~~Strat/Stop~~**
- **~~Throttle Decrease~~** ~~This function will be set automatically used if the Throttle Type is set to Switch and the switch throttle decrease input matchedis set to any of the digital inputs.~~
- **~~Throttle Increase~~** ~~This function will be set automatically if the Throttle Type is set to Switch and the switch throttle increase input is set to any of the digital inputs. This function will be automatically used if the Throttle Type is Switch and switch throttle increase input matched.~~
- **~~Stop Engine~~**
- **~~Regen Request~~**
- **~~Neutral Switch~~**
- **~~Park Brake~~**
- **~~Park & Neutral~~**
- **~~Engine Idle~~**
- **~~Preset Speeds 1, 2, 3 or 4~~**
- **~~Crank Abort.~~**

~~Active:~~

- **~~High~~**
- **~~Low~~**

~~Step~~	~~Action~~

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~~1~~	~~Select IO Settings, then Digital Inputs from the Main Menu. Press Button 5 to select and enter.~~
~~2~~	~~Select Digital Input 1, 2, 3 or 4 Function (NC) and press Button 5 to enter. Use Button 2 or 4 to scroll through the choices of Disabled, Strat/Stop, Throttle Decrease, Throttle Increase, Stop Engine, Regen Request, Neutral Switch, Park Brake, Park & Neutral, Engine Idle, Preset Speeds 1, 2, 3 or 4, or Crank Abort. Press Button 3 to place a checkmark beside the desired option. Press Button 1 to exit this level of the menu.~~
~~3~~	~~Select Digital Input 1, 2, 3 or 4 Action and press Button 5 to enter.~~
~~4~~	~~Use Button 2 or 4 to select either Low or High. Press Button 3 to confirm the choice.~~
~~5~~	~~Press Button 1 to exit this level of the menu.~~

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Analog Outputs

This menu option will set the Analog Outputs to either Disabled or Buzzer.

~~Step~~	~~Action~~
~~1~~	~~Select IO Settings, then Analog Outputs from the Main Menu. Press Button 5 to select and enter.~~
~~2~~	~~Use Button 2 or 4 to scroll through the choices of Disabled or Buzzer. Press Button 3 to place a checkmark beside the desired option. Press Button 1 to exit this level of the menu.~~

Digital Outputs

This menu option will set the parameters for Digital Outputs 1 through 4.

Functions	Description
Disabled	
PreStart Delay	The delay time can be set when this function is selected. External relay required

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Crank	The crank cut time can be set when this function is selected. External relay required
ECU Enable	The enable delay time is controlled by ECU Enable Delay in the Advanced Settings. External relay required
Regen Lamp	Lamp can set blink timer
Shutdown Lamp	Lamp can set blink timer
Common Alarm	Lamp can set blink timer
Not In Auto	Lamp can set blink timer
Engine Running	Lamp can set blink timer
Alt Excitor	External relay required, while engine is running the excitor will try every 10 seconds to excite alternator. After 5 attempts, if the voltage remains below the Alt Excitor Setpoint, charge fail warning will be set.

Functions:

Disabled

PreStart Delay (The delay time can be set when this function is selected. External relay required)

Crank (The crank cut time can be set when this function is selected. External relay required)

ECU Enable (The enable delay time is controlled by ECU Enable Delay in the Advanced Settings. External relay required)

Regen Lamp (Lamp can set blink timer)

Shutdown Lamp (Lamp can set blink timer)

Common Alarm (Lamp can set blink timer)

Not In Auto (Lamp can set blink timer)

Engine Running (Lamp can set blink timer)

Alt Excitor (External relay required, while engine is running the excitor will try every 10 seconds to excite alternator. After tried 5 attempts, times if the voltage stillremains below the Alt Excitor Setpoint, charge fail warning will be set.)

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Step	Action
1	Select IO Settings, then Digital Outputs from the Main Menu. Press Button 5 to select and enter.
2	Use Button 2 or 4 to scroll to each Digital Output, then press Button 5 to enter. Press Button 5 once more for Output Function, and press Button 3 to select one of the following choices: Disabled, PreStart Delay, Crank, ECU Enable, Regen

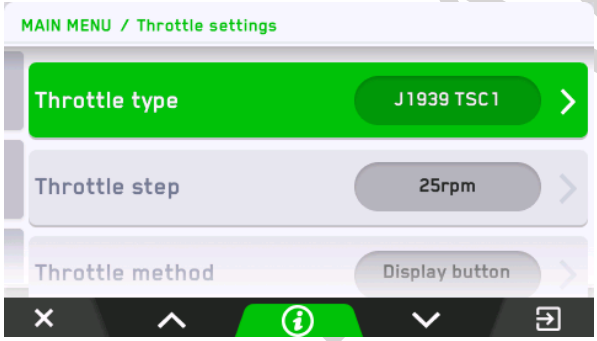
Frequency Input Pulse

This option allows the setting of the Frequency Input Pulse.

Throttle Settings

This menu item controls the parameters for the Throttle:

- Throttle Type
- Throttle Step
-
- Idle RPM
- Target RPM Type
- Throttle Method
- Preset Speed (if Throttle Type is Preset Speed)
- Switch throttle decrease input (if Throttle Type is Switch)
- Switch throttle increase input (if Throttle Type is Switch)
- Knob throttle input (if Throttle Type is Knob)



Throttle Type

This option allows the setting of the Throttle designation.

Menu Item	Description
J1939 TSC1	Operator can use this setting to throttle engine manually with display's push buttons.
Preset speed	Operator can select preconfigured speed with displays' push button or inputs as trigger.

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Switch	Switch inputs are required, and functions are used as digital when selected
Knob	Analog input is used as resistive when selected

Step	Action
1	Select Throttle Settings, then Throttle Type from the Main Menu. Press Button 5 to select and enter.
2	Use Button 2 or 4 to scroll to select between J1939 TSC1 or Preset Speed.
3	Press Button 3 to confirm and Button 1 to exit the Menu.

- **J1939 TSC1** (operator can use this setting to throttle engine manually with display's push buttons.)
- **Preset speed** (operator can select preconfigured speed with displays' push button or inputs as trigger.)
- **Switch** (switch inputs are required, and functions are used as digital when selected)
- **Knob** (analog input is used as resistive when selected)

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Throttle Step

This option controls the throttle increase/decrease step size between requested ~~when request a new t~~target engine speed. ~~allows the setting of the difference between one throttle setting to another.~~

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.Step	Action
1	Select Throttle Settings, then Throttle Step from the Main Menu. Press Button 5 to select and enter.
2	Use Button 2 or 4 to adjust in increments of 5 the numeric value shown. With a Throttle Step of 50, each press of the Throttle up button would increase the RPM by 50 (i.e., 300 to 350). Each press of the Throttle down button would decrease the RPM by 50 (300 to 250).
3	Press Button 3 to confirm and Button 1 to exit the Menu.

Commented [OI8]: @Nan Yan Can you clarify what you mean by how fast the engine speed rolling up/down towards the target speed? I assume we can only change step size.

Commented [NY9R8]: Please check if it make sense now.

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Throttle Method

This setting determines how the increase or decrease of RPMs will be accomplished.

Step	Action

~~1~~	~~Select Throttle Settings, then Throttle Method from the Main Menu. Press Button 5 to select and enter.~~
~~2~~	~~Use Button 2 or 4 to highlight either Display button or Digital Input.~~
~~3~~	~~Press Button 3 to confirm and Button 1 to exit the Menu.~~

Max and Idle RPM

~~These options allow~~This allows the operator to set ~~you to set a limit on the~~the limit for max and idle ~~RPMs needed for idling and maximum power~~speedengine speed.

~~Step~~	~~Action~~
~~1~~	~~Select Throttle Settings, then Max RPM or Idle RPM from the Main Menu. Press Button 5 to select and enter.~~
~~2~~	~~Use Button 2 or 4 to adjust the RPM number.~~
~~3~~	~~Press Button 3 to confirm and Button 1 to exit the Menu.~~

Target RPM Type

This option allows the operator ~~you t~~to select how your RPMs will be displayed as RPM or Percentage. if percentage is selected the display will calculate the target RPM between the idle and maximum speed based on 0 to 100%. ~~.~~

Throttle Method

This setting determines how the increase or decrease of RPMs will be accomplished.

Switch throttle decrease/increase input

Operator can select which input for switch throttle input. The selected input will be used as digital input. When the input is active engine will continue step towards to the Max/Idle RPM.

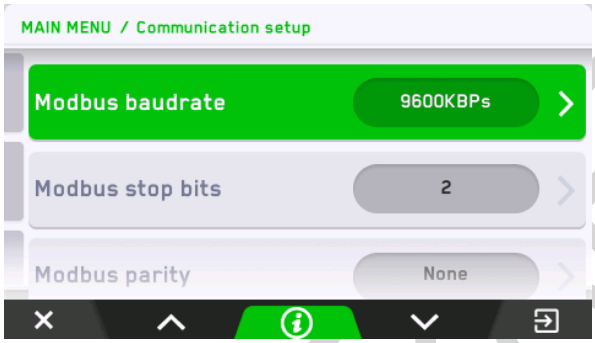
Knob throttle input

Operator can select which input for Knob throttle input. The selected input will be used as resistive input. The default resistance range is set to 0 to 1000ohm, the range can be modified in the I/O settings. When engine started if the knob position not at home (minimum) position, a popup up messages will show to asked operator to return the knob to home position.

Communication Setup

This menu sets the Modbus and CAN communication.

- Modbus baud rate
- Modbus stop bits
- Modbus parity
- Modbus slave address (display is used as slave)
- CAN baud rate
- CAN termination resistor



Modbus Baud Rate

This menu item allows the operator to set the baud rate for Modbus communication.
Default set to 38400 Kbps

- 2400 Kbps
- 4800 Kbps
- 9600 Kbps
- 19200 Kbps
- 38400 Kbps
- 57600 Kbps
- 115200 Kbps

Modbus Stop Bits

This menu item allows the operator to set the Stop Bits for Modbus communication.
Default set to 1.

- 1
- 2

Modbus Parity

This menu item allows the operator to set the Parity for the Modbus communication.
Default to None

- None
- Odd
- Even

Modbus Slave Address

This menu item allows the operator to set the Slave Address for Modbus communication. Default to 1.

CAN Baud Rate

This menu item allows the operator to set the Baud Rate for CAN communication.
Default to 250Kbps

- 10 Kbps
- 20 Kbps
- 50 Kbps
- 100 Kbps
- 125 Kbps
- 250 Kbps
- 500 Kbps
- 800 Kbps
- 1 Mbps

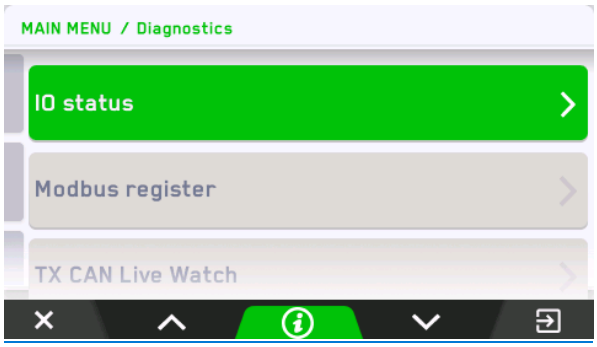
CAN Termination Resistor

Allows the operator to enable or disable the display's internal 120 ohm terminating resistor. This should be enabled if the display is located at the end of the CANbus and there is no end-terminating resistor on the harness. Factory set to Enable.

Diagnostics

This menu section provides the operator diagnostics tools to aid in troubleshooting.

- IO status
- Modbus Register
- TX CAN Live Watch
- RX CAN Recorder
- DM1 Logger
- Stored ECU Fault Codes



IO Status

Please refer to I/O Status Screen (page 10).

Modbus Register

This menu item allows you to review all mapped Modbus registers, descriptions and live status.

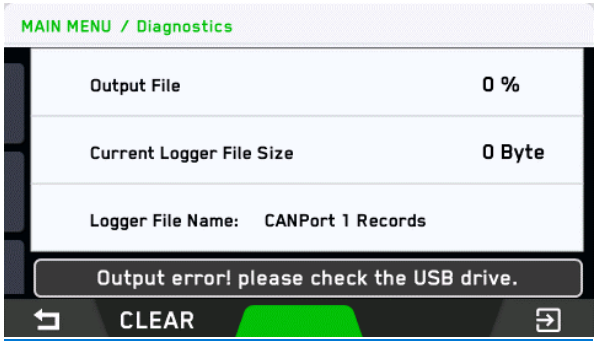
TX CAN Live Watch

This menu item allows you to view the live status of all transmitted CAN messages .

RX CAN Recorder

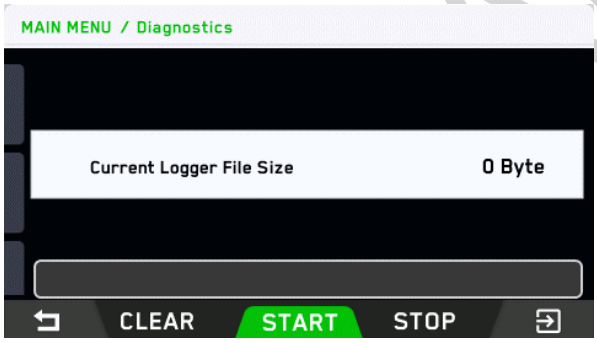
This menu item allows the operator to create a received CAN traffic recording file and export it to a USB drive, which can later be used for analysis. The recorder will automatically record CAN traffic for 10 seconds then export the file to a USB drive.

NOTE: It is required to have a USB drive plugged into the USB port prior to use of this function. If there is an output error message, retry with a different USB drive then press button 5 to export.



DM1 Recording

This menu item allows the operator to make a DM1 recording file and export it to a USB drive, which can later be used for analysis.
Press the start button to begin logging
the DM1 messages. To export, first press the STOP button (4) and then press button (5) to save the file to the USB drive.



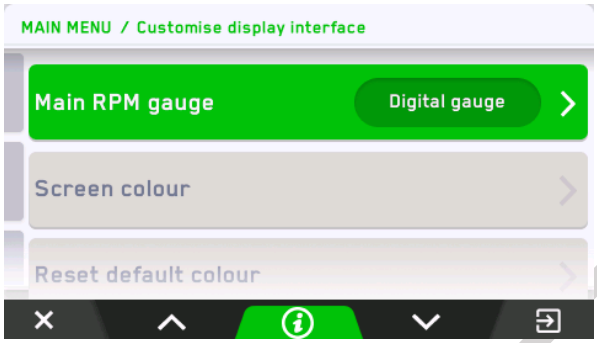
Stored ECU Fault Codes

This selection allows the operator to query the Engine ECU for a review of its stored fault codes. Some engine manufacturers and models may not support this feature.

Customize Display Interface

This menu item allows the operator to change how the display presents engine information.

- Main RPM gauge
- Screen color
- Reset default color
- Upload splash image

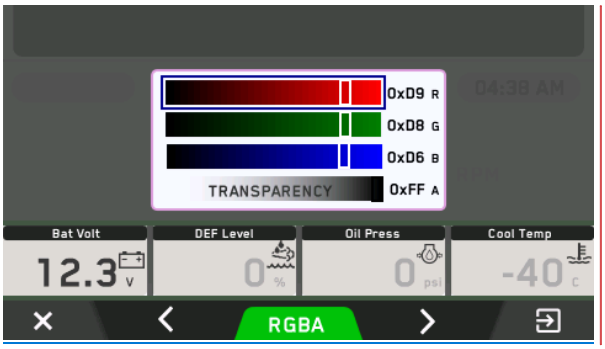


Main RPM Gauge

This option allows the operator to set the style of the Main RPM Gauge as a Digital Gauge or a Rotary Gauge.

Screen Color

This page allows the operator to change the color of various screen elements to align the theme to the intended application's design language.
Color settings of the display are tied to Day/Night mode. If the display is currently in Day mode,
Color settings of the display are tied to Day/Night mode.
If the display is currently in Day mode, the chosen colors will be associated with the Day selection. Likewise, if the display is in Night mode, the chosen colors will be associated with the Night mode selection. Use Button 5 to select displayed cells on the screen and save the chosen color.
The screen below shows the main page editor.



Press Button 3 (RGBA) to move the highlight to change Red, Green, Blue, or Transparency (Alpha) of the selected object.

Reset Default Color

To return the display to its factory default color(s).

Upload Splash Image

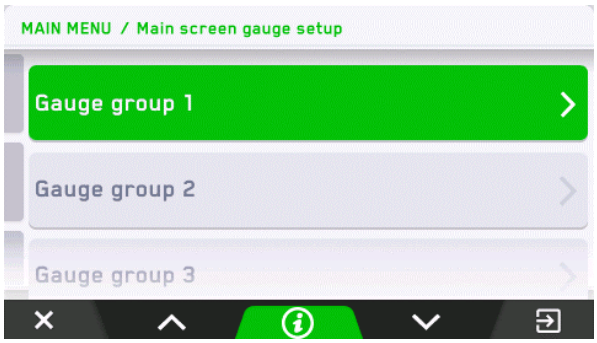
To upload a logo that will appear on the display as it boots up, follow these steps:

NOTE: To be compatible with the PV485 display, the uploaded image must be 480 x 272 pixels.

Step	Action
1	Select Customize Display Interface, then Upload Splash Image from the Main Menu. Press Button 5 to select and enter.
2	The display will look for a USB memory device with images on it. Insert a USB with the logo file. Refresh the screen if necessary.
3	Files on the USB that are .png, .jpg, .bmp or .gif will appear in a list. Press Button 2 or 4 to highlight the appropriate file. Press Button 3 to confirm.
4	Press Button 1 to exit the menu. Power off/on to see the new splash screen.

Main Screen Gauge Setup

This menu option allows the ~~establishment~~ operator to set the parameter to be monitored by each of the gauges on the main page~~of the gauges being monitored by the display.~~



Gauge Groups 1 through 3

Each Gauge group will contain 4 gauges that will each be chosen from 62 parameters.

- Accel Ped1 (SPN 91)
- Load@RPM (SPN 92)
- Actual Engine Torque (SPN 513)
- Engine RPM (SPN 190)
- Oil Level (SPN 98)
- Coolant Level (SPN 111)
- Alternator Voltage (SPN 167)
- System Voltage (SPN 168)
- Battery Voltage
- Output Shaft Speed (SPN 191)
- In Shaft Speed (SPN 161)
- Throttle Position (SPN 51)
- Fuel Level (SPN 96)
- DEF Level (SPN 1761)
- % Soot (3719)
- % Ash (SPN 3720)
- Urea Level (PGN FF87)
- Oil Temp (SPN 175)
- Intercooler Temp (SPN 52)
- Coolant Temp (SPN 110)
- Air Inlet Temp (SPN 172)
- Intake Temp (SPN 105)
- Exhaust Temp (SPN 173)
- Transmission oil Temp (SPN 177)
- Fuel Temp (SPN 174)
- Aux Temp (SPN 441)

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Hydraulic oil Temp (SPN 1638)
DPF Inlet Temp (SPN 3242)
DPF Outlet Temp (SPN 3246)
Trip Fuel (SPN 182)
Total Fuel Used (SPN 250)
Trip Distance (SPN 244)
Total vehicle Dist (SPN 245)
Oil Press (SPN 100)
Coolant Press (SPN 109)
Boost Press (SPN 102)
Air Differential Press (SPN 107)
Transmission oil Press (SPN 127)
Fuel Delivery Press (SPN 94)
Barometric Press (SPN 108)
Aux Press (SPN 1387)
Air Inlet Press (SPN 106)
Hydraulic oil Press (SPN 1762)
Fuel Rate (SPN 183)
Instant Fuel Economy (SPN 184)
Average fuel Economy (SPN 185)
Fan Speed (SPN 1639)
Vehicle Speed (SPN 84)
Current Gear (SPN 523)
Select Gear (SPN 524)
Torque Lock (SPN 573)
Aux IO 1 (SPN 701)
Pedal Switch (SPN 558)
Requested Gear (SPN 525)
Desired Engine Speed (SPN 515)
Engine Timing (SPN 1436)
Engine total Revolutions (SPN 249)
Hydrocarbon loading (SPN 7934)
Analog~~ue~~ Input 1
Analog~~ue~~ Input 2
Analog~~ue~~ Input 3
Analog~~ue~~ Input 4

~~Step~~	~~Action~~

~~1~~	~~Select Main Screen Gauge Setup, then Gauge Group 1 from the Main Menu. Press Button 5 to select and enter.~~
~~2~~	~~Select Gauge 1 and press Button 5 to enter.~~
~~3~~	~~Press Button 2 or 4 to scroll through the available 109 parameters, and press Button 3 when the appropriate one appears.~~
~~4~~	~~Repeat steps 2 and 3 for gauges 2-4.~~
~~5~~	~~Repeat steps 1 through 4 for the other Gauge Groups.~~
~~6~~	~~Press Button 1 to exit the menu.~~

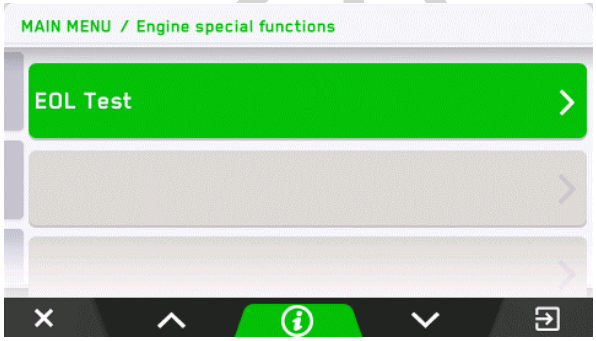
Engine Manufacturer Specific ~~Special~~ Functions

The availability of these functions is ~~is function is~~ based on the selected Engine Manufacturer. ~~Currently has the following function been created.~~

If the operator selects:

Deutz Engine:

EOL Test is available, this allows the operator to ~~C~~conduct ~~the~~ an end of line test/full regeneration. ~~Check functionality including stationary signal, operator release, and check for any errors. (Normal thermostat should be installed).~~



CAT or Perkins:

Maintenance Reset will reset the Service infomation (SPN916).

Alternative Low Idle can be used as a Lower Low Idle for prolonged i~~I~~dling period without Electrical Load or an elevated i~~I~~dle for fast warmup. When used as a Lower Low Idle, special attention is required ~~about the~~on the current ~~E~~electrical ~~L~~load to avoid discharging the ~~the Machine~~ machine battery ~~discharge~~.

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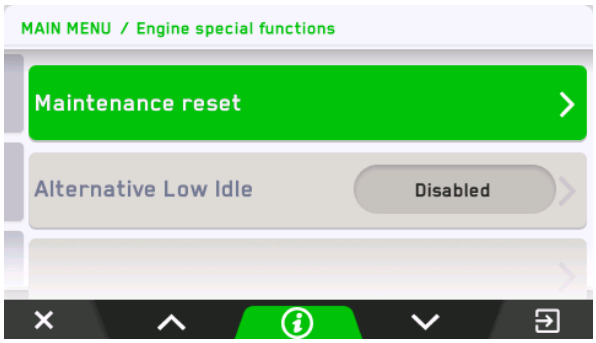
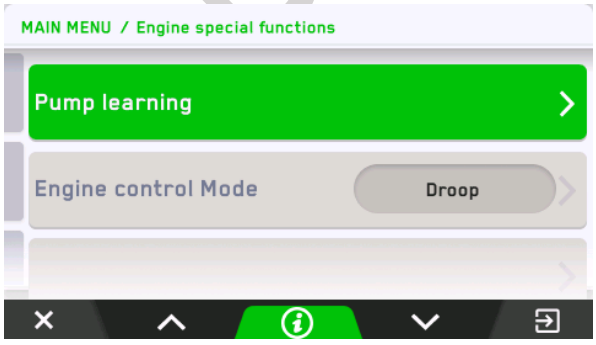

MAIN MENU / Engine special functions
Maintenance reset
Alternative Low Idle
Disabled

Kubota:

Pump Learning is available on engines equipped with the Denso ECU . The display will automaticaly send pump learning settings to the engine ECU.

Engine Control Mode	Description
Droop	Choosing Droop for Engine Control Mode is like a mechanical engine's governor. The engine speed follows “Accelerator Pedal Position [%] (0% - 100%)”. However, when the load is increased, the engine speed drops like a mechanical engine.
Isochronous	The engine speed follows “Target Engine Speed [rpm]”.Even if the load is increased, the engine speed is controlled to a constant speed. However, if the load demand is bigger than the maximum power curve, the engine cannot keep the engine speed ~~in a c~~constant ~~speed~~. The lowest engine speed and the highest engine speed are specified by each engine model.

~~Engine Control Mode, the **droop** control mode is like a mechanical engine's governor characteristics. The engine speed follows “Accelerator Pedal Position [%] (0% - 100%)”. However, when the load is increased, the engine speed drops like a mechanical engine. **Isochronous**: The engine speed follows “Target Engine Speed [rpm]”.Even if the load is increased, the engine speed is controlled to a constant speed. However, if the load demand is bigger than the maximum power curve, the engine cannot keep the engine speed in a constant speed. The lowest engine speed and the highest engine speed are specified by each engine model.~~



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FPT:

Menu Item	Description
High Idle Speed decrease	Useful in working conditions where the application cannot run at a natural engine high-idle speed. Here the operator can change the speed setpoint.
Low Idle Speed increase	Useful in working conditions where the application cannot run at a natural engine low-idle speed. Here the operator can change the speed setpoint.

~~High Idle Speed decrease function can be useful in those working conditions where the application cannot run at a natural engine high-idle speed. Here user the operator can change the speed setpoint~~

~~Low Idle Speed increase function can be useful in those working conditions where the application cannot run at a natural engine low-idle speed. Here user the operator can change the speed setpoint~~

Volvo:

Menu Item	Description
Governor mode select	• Engine speed mode request • Torque mode request
Idle speed select	• Normal running speed request • Idle speed request

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Frequency select	• Primary engine speed request (1500rpm) • Secondary engine speed request (1800rpm)
Idle calibration state	• Normal • Idle calibration in process
Preheat request	• Inactive • Active
Engine restored operation	• Inactive • Active
Disable fuel	• Inactive • Active

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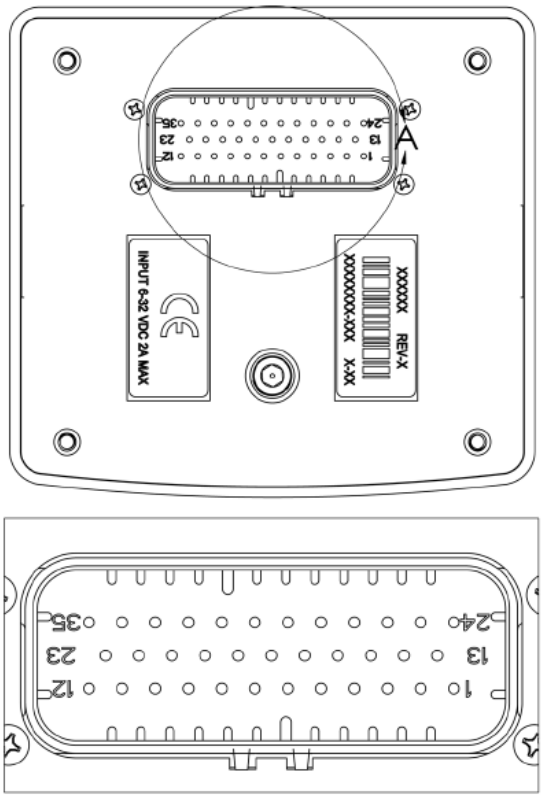
Wiring Instructions

PIN Specifications for AMPSEAL Style Connection



DETAIL A
SCALE 2 : 1

Pin #	Pin Assignments
1	USB D-
2	USB ID
3	Digital Output 1 (Low side, 500 mA)
4	Digital Output 3 (Low side, 500 mA)
5	Frequency Input (Alternator and Mag)
6	Digital Input 1
7	Digital Input 3
8	A/D Input 2 (0-5v, 4-20 mA, Resistive)
9	A/D Input 4 (0-5v, 4-20 mA, Resistive)
10	Analog Output (0-5 V)
11	N/C
12	N/C
13	USB Shield
14	CAN -
15	Digital Output 2 (Low side, 500 mA)
16	Digital Output 4 (Low side, 500 mA)
17	Freq Input Return
18	Digital Input 2
19	A/D Input 1 (0-5v, 4-20 mA, Resistive)
20	A/D Input 3 (0-5v, 4-20 mA, Resistive)
21	A/D Gnd
22	Analog Output Gnd
23	N/C
24	USB D+
25	USB Vbus
26	CAN +
27	Ignition
28	Batt+
29	Batt-
30	Batt2+
31	N/C
32	N/C
33	N/C
34	RS485 -
35	RS485 +

PIN SPECIFICATIONS FOR AMPSEAL STYLE CONNECTION

Accessories

P/N 78-00-0824 – Wiring Harness, Loose leads, 24 inches

P/N 78-09-0077 – Programming Harness

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