

INSTRUMENTATION

Overview

The 2008 Blue Bird Vision instrument cluster is a single unit containing all electronic gauges manufactured by Stoneridge®. In addition to gauges, the instrument panel includes a centrally located LCD panel called the Driver Information Display (DID), an array of driver alert lights, and audible signals. The instrument cluster is not designed for disassembly. If faulty, it is replaced as a unit.

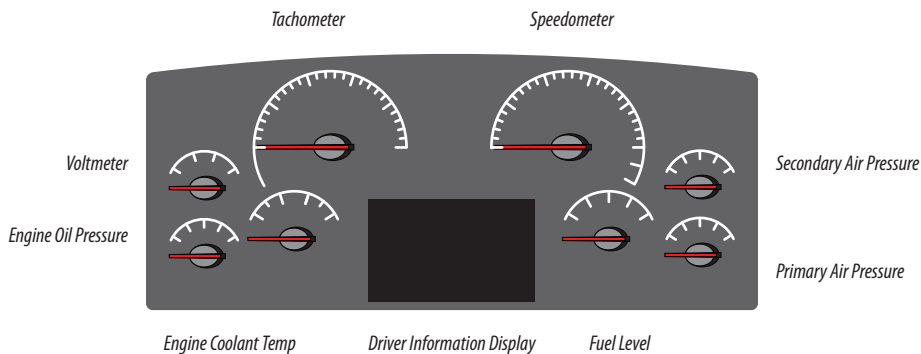
Because all of the gauges are electronic, there are no mechanically driven linkages such as speedometer or tachometer cables. The cluster receives both analog inputs from such components as the fuel tank sender and instrument panel dimmer switch; and digital inputs from components such as the engine and transmission control modules, via the J1939 databus and hard wire. Depending upon its current mode, the DID panel can display both driver-oriented information (such as fuel mileage statistics) or service-oriented information (such as engine, transmission, and ABS fault codes). The buttons on the right steering column stalk are used to cycle the DID through its various modes and menus.

Although the instrument cluster is electronic, it is not part of the Vision's Multiplex system. Instruments or warning lights in the cluster may receive signals which are output from the Multiplex system (such as those for turn signal indicators), but they are not part of the Multiplex system's programming logic.

On VISIONS equipped with hydraulic brakes, the instrument cluster contains 6 gauges. Buses equipped with air brakes have two additional gauges indicating primary (rear) and secondary (front) air pressure.



Gauge	Data Source
Speedometer	Engine ECU via J1939
Tachometer	Engine ECU via J1939
Engine Oil Pressure	Engine ECU via J1939
Engine Coolant Temperature	Engine ECU via J1939
Fuel Level	Analog Fuel Sender
Voltmeter	Analog input key on
Primary Air Pressure	Analog input
Secondary Air Pressure	Analog input



The instrument cluster is programmed at the factory according to certain features purchased with the specific bus. For example, the cluster on a bus equipped with air brakes is programmed to display applied brake pressure, whereas the cluster on a bus with hydraulic brakes is not. At the time of this writing, sixteen different configurations of the instrument cluster are installed on Blue Bird Visions. Each different configuration is assigned its own part number. When ordering a replacement instrument cluster, refer to the bus's Service Parts List (supplied with the bus) for the specific part number.

Stoneridge Instrument Clusters

- 0102937 Panel, Instrument, Air Brakes, English, Caterpillar
- 0102938 Panel, Instrument, Hydraulic Brakes, English, Caterpillar
- 0102939 Panel, Instrument, Air Brakes, Metric, Caterpillar
- 0102940 Panel, Instrument, Hydraulic Brakes, Metric, Caterpillar
- 0108672 Panel, Instrument, Air Brakes, English, Caterpillar, with Ammeter
- 0108673 Panel, Instrument, Air Brakes, English, Cummins
- 0108674 Panel, Instrument, Air Brakes, English, Cummins, with Ammeter
- 0108679 Panel, Instrument, Hydraulic Brakes, English, Caterpillar, with Ammeter
- 0108682 Panel, Instrument, Hydraulic Brakes, English, Cummins
- 0108683 Panel, Instrument, Hydraulic Brakes, English, Cummins, with Ammeter
- 0108684 Panel, Instrument, Air Brakes, Metric, Caterpillar, with Ammeter
- 0108685 Panel, Instrument, Air Brakes, Metric, Cummins
- 0108686 Panel, Instrument, Air Brakes, Metric, Cummins, Ammeter
- 0108687 Panel, Instrument, Hydraulic Brakes, Metric, Caterpillar, with Ammeter
- 0108688 Panel, Instrument, Hydraulic Brakes, Metric, Cummins
- 0108689 Panel, Instrument, Hydraulic Brakes, Metric, Cummins, with Ammeter

Appendixes In This Chapter

Appendix 1. Stoneridge Instrumentation Operators Guide. This document describes the operation of the DID panel using the buttons on the right steering column stalk, the menu tree of the DID panel, and how to store the vehicle's fuel capacity.

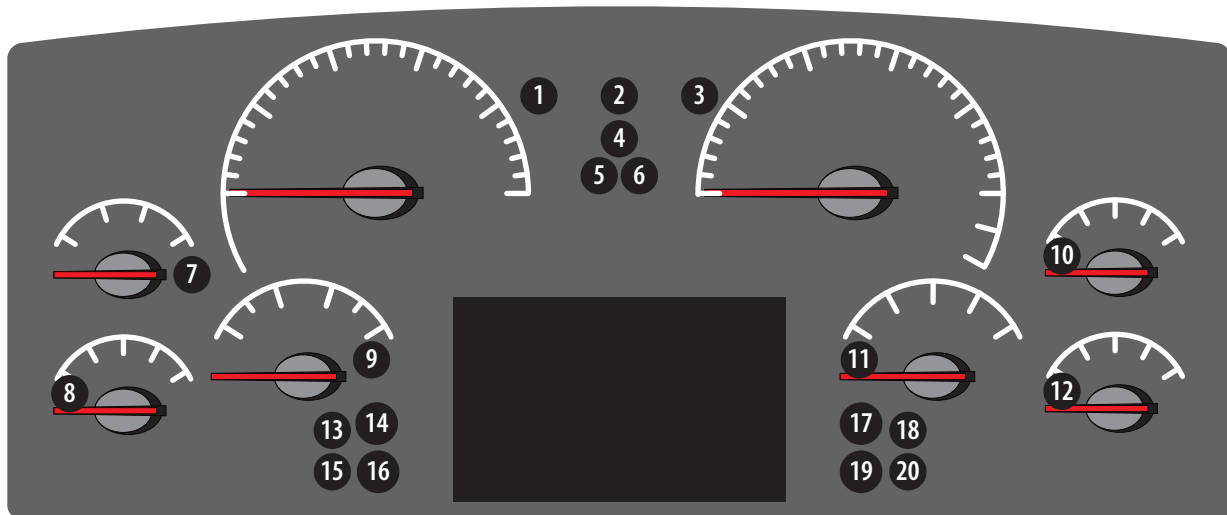
On The TechReference CD

Stoneridge Instrumentation Software Specification. This document describes in greater detail the programming of the DID panel, its audible alarms, parameters, etc.

Indicator Lights and Audible Alarm

An arrangement of LED-illuminated warning lights provide feedback to the Driver about various systems. These are located at the individual gauges, in a small cluster between the speedometer and tachometer, and across the bottom of the panel, as indicated below.

- | | |
|--------------------------------------|-----------------------------------|
| 1: Left Turn Signal | 13: Service Brake Applied |
| 2: High Beam | 14: Wait To Start |
| 3: Right Turn Signal | 15: Transmission Range Inhibit |
| 4: High Hydraulic Fluid Temperature | 16: Check Transmission |
| 5: Hydraulic Brake Failure | 17: ABS Fault |
| 6: Stop—Abnormal Condition | 18: Service Engine |
| 7: Low or High Voltage | 19: Park Brake Applied |
| 8: Low Engine Oil Pressure | 20: High Transmission Temperature |
| 9: High Engine Coolant Temperature | |
| 10: Low Secondary Brake Air Pressure | |
| 11: Low Fuel | |
| 12: Low Primary Brake Air Pressure | |



Diagnostics Password

When the instrument cluster is in its non-driving mode, service technicians may access a set of instrument cluster configuration settings, and engine, transmission and ABS codes by entering a password. The password is the number 2290. See Appendix 1 for information about navigating the DID panel.

Instrument Panel Removal

The instrument cluster is surrounded by a snap-in bezel and is attached to the dash housing with four screws on the inside surfaces of the recess. To remove the instrument assembly:

1. Turn the ignition switch to the "OFF" position and remove the key. Lower the steering wheel to the bottom of its travel.
2. Remove four screws around the inside surface of the instrument panel recess.
3. Carefully pull the instrument assembly out from the dash housing, and tilt it face-downward.
4. Disconnect the three harness connectors from the back of the instrument cluster.



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3.4. System states

The following state chart presents software operation modes and how the transition between them occurs.

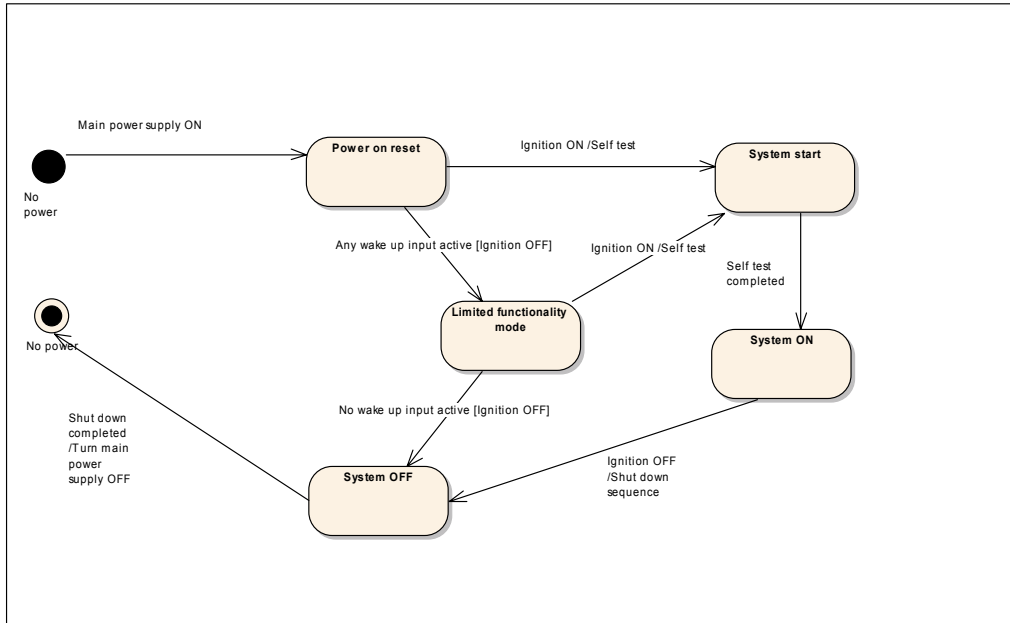


Figure 2: System States

3.4.1. System Start

3.4.1.1. Gauges

At key on a gauge sweep from zero position to max position and back to min position will be executed.

3.4.1.2. Bulb Test

At key on all warning lights will turn on for EE configurable number of seconds (EE_TIME_OUT_BULB) and then turn off. This function is called "Bulb_Test". If the EE parameter is set to 0 it is equivalent to set it to 1. To disable the bulb test it is necessary to disable the start up self test that includes pointer sweep, speaker and bulb test. Startup self test is enabled or disabled using the EE parameter EE_SELFTEST.

Active warning lights will turn on after the Bulb_Test is completed.

3.4.1.3. Speaker Test

Two different tones will be generated for one second each.

3.4.2. System ON

With ignition ON, the cluster is fully operative: gauges, telltales and DID respond, as described in this document, to events and information generated in the vehicle.

Once startup is completed the display will show the default screen (see Figure 6: Default Driving Mode). For a complete description of the available options refer to the Driver Information Display (DID) section.



3.4.3. System Off

When the ignition line goes low the micro shall zero ($-90^\circ \pm 3^\circ$) all gauges, except the fuel gauge, and store the current odometer value in EEPROM before power off the main processor.

3.4.3.1. Sleep Mode

This is not an operation mode for the main processor; it applies just to the slave processor. When the system is in Sleep Mode the main power supply and the main cluster processor are OFF while the slave processor monitors the wakeup inputs.

Wake up inputs
Hazard (Left & Right turn signals at the same time)
Backlight signal (pwm duty cycle $\geq 10\%$)
Select key
Ignition ON

Table 3: Wakeup Inputs

The system exits the Sleep mode when one of the wakeup inputs becomes active and the slave processor turns ON the main power supply which in turn activates the main processor.

3.4.4. Limited functionality Mode

When the cluster is waken up it can either enter "System start" mode, if ignition is ON, or "Limited functionality" mode if ignition is OFF. (Refer to Table 3 for inputs that can wake up the unit while in sleep mode) In "Limited functionality" mode available functions of the cluster are restricted to:

- Hazard lights activation (right and left turn signals)
- Backlighting
- Odometer Reading

If unit enters Limited functionality Mode, the unit will return to the Sleep Mode after 30 seconds of no_activity in the wake-up inputs described in Table 3.

6. SOUNDS

6.1. Audible Alarm

The audible alarm is used in the following conditions:

Function	Priority	Sound playback	Sound number
High Hydraulic Oil Temperature	1	Continuous	1
Stop engine	1	Continuous	1
Very low coolant level	1	Continuous	1
Low Oil Pressure	1	Continuous	1
High Coolant Temperature	1	Continuous	1
High Transmission Temp	1	Continuous	1
Check Transmission	1	Continuous	1
Low/High chassis voltage	2	Continuous	1
ABS	3	Continuous	1
Front low air pressure	4	Continuous	1
Rear low air pressure	4	Continuous	1
Wait to start	2	Continuous	2
Range inhibit	5	Continuous	2
Service engine soon	5	Continuous	2
Low Fuel Level	6	Single	2
Park brake reminder	3	Continuous	3
Turn signal	4	Single	4
Headlamps On reminder	3	Continuous	3

Blue Bird Addendum

Function	Priority	Sound Playback
Diesel Particle Filter (On fast blink)	2	Continuous 1
High Exhaust Temp Filter (On fast blink)	2	Continuous 1
Diesel Particle Filter (On solid)	4	Beep 1
High Exhaust Temp Filter (On solid)	4	Beep 1



7. DRIVER INFORMATION DISPLAY (DID)

The DID is intended to provide information to the driver in a graphical way. The DID is capable of displaying gauges, telltales and messages. The DID has several modes that depend on the current status of the vehicle (i.e. driving or not driving). While in driving mode, the DID should always show gauge information if there is no user interaction. Three different modes have been defined in order to simplify the understanding of the possible states that the DID supports. Such modes are:

- **Default Driving Mode (DDM):** This is the default view of the display, regardless of the state of the vehicle (i.e. moving or not moving). The cluster will always return to this view after a period of no activity, in the Stalk user interface. The allowed time without activity will depend on whether the bus is moving (speed > 1 MPH) or not (speed < 1 MPH) when a Stalk switch was pressed, while in the interactive driving mode. In the first case the timeout will be 7 seconds in the second case the timeout will be 15 seconds. Table 5 describes this conditioning in detail. Timeout values are handled through EEPROM parameters: EE_DRIVING_M_TIMEOUT, EE_NON_DRIVING_M_TIMEOUT.
- **Interactive Driving Mode (IDM):** This mode is accessed when the user presses the select key, while in the default view (DDM). Additional information can be accessed during this mode.
- **Non Driving Mode (NDM):** Accessed when a rollover of the menu is performed and the vehicle is not moving. Access to diagnostics and data log can be accessed in this mode.

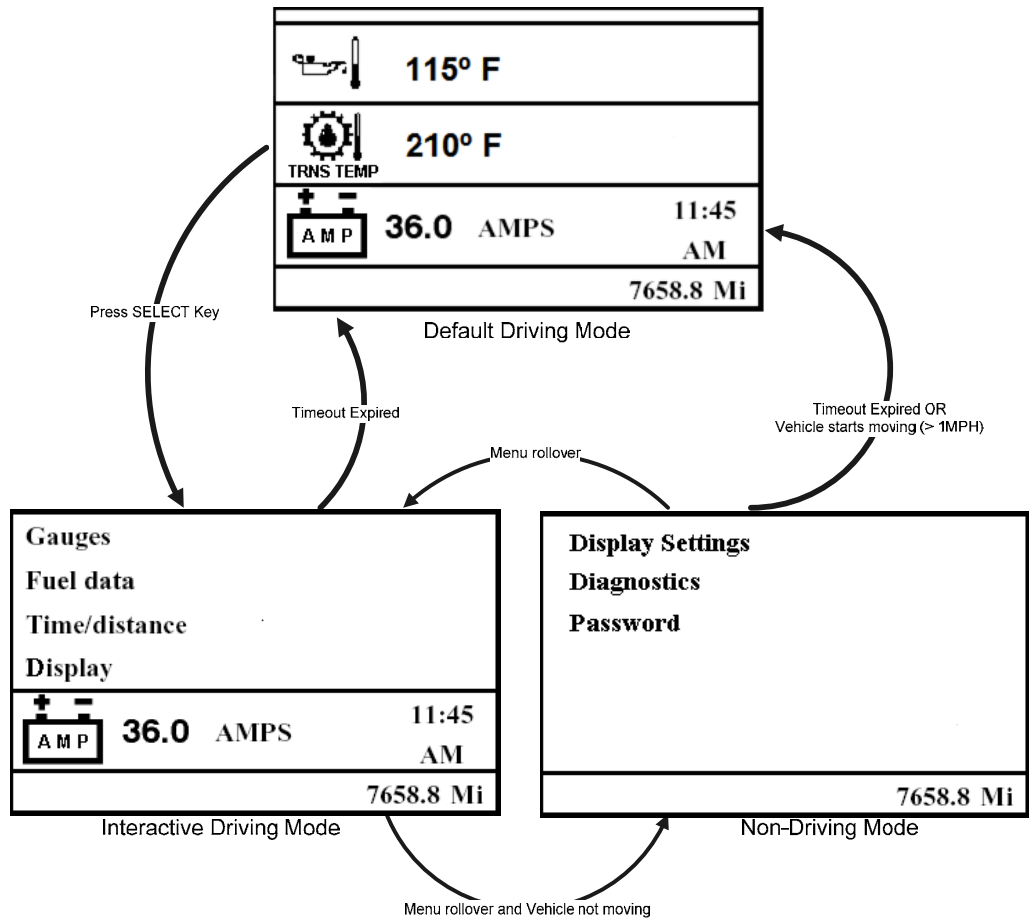


Figure 3: Display Menu logic

Stalk	Vehicle Speed	Timeout
No activity	> 1 MPH	7 sec.
	<= 1 MPH	15 sec

Table 5: Stalk inactivity timeout

Allowed inactivity period is determined every time the stalk switches are operated and is not changed when the bus speed changes. For example if vehicle was stopped, and the select button is pressed the timeout is started (15 seconds) then the vehicle starts moving (speed > 1MPH) the timeout value will remain as 15 seconds.

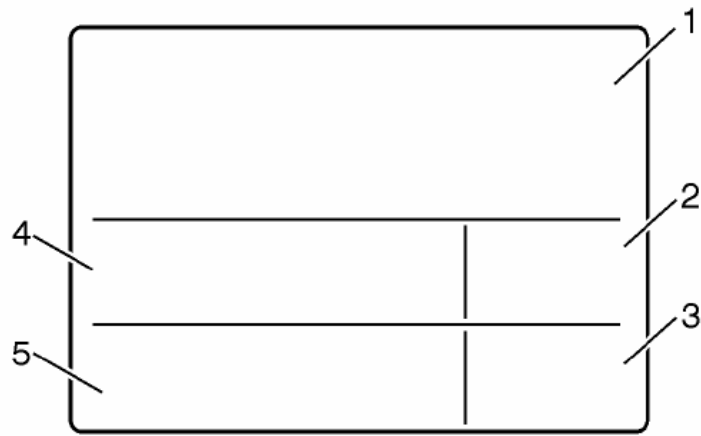
Using the password option it is possible to disable the timeout that returns from any screen to the Default Driving Mode (DDM) after the interval of inactivity has expired. This action allows the user to work with the unit in a debug mode, where the timeout is not returning to the default driving menu after 15 seconds of inactivity. Details about password protected functionality are provided in following sections.



7.1. Display Areas.

Figure 1 show the areas included in the display screen.

- Top Level** Menu field
- Middle Level** Favorite Display
- Bottom Level** Status Bar and Odometer



W3005515

- 1 Driving Mode window
- 2 Clock window
- 3 Odometer window
- 4 Favorite Display window
- 5 Status window

Figure 4: Display Windows

Menu navigation and option selection is done by pressing the Esc, Select, Up and Down buttons located in the stalk switch control lever. See Figure 5

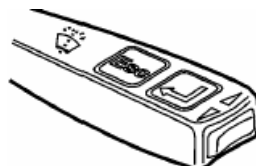


Figure 5: Stalk switch control lever

- Esc (escape) is used to return to the previous menu and cancel a setting operation
- <J Select is used to activate the highlighted option in the menu. Also it is used as the “enter” key.
- Up arrow moves the cursor up, also increments a numeric value during setting operations.
- Down arrow moves the cursor down, also decrements a numeric value during setting operations.

7.1.1. Driving Mode window

This area is always present regardless of vehicle speed.

7.1.2. Clock window

This area displays current time information in the format selected via “Display settings” menu.

7.1.3. Odometer window

The odometer displays 0.0 to 9,999,999.9 km or miles that correspond to total vehicle distance value. The resolution is 0.1 miles or 0.1 km depending on the current unit selection. If the maximum value that can be displayed is exceeded the cluster will continue accumulating distance but the most significant digit will be invisible to the driver.

Odometer value is calculated using vehicle speed received via J1939 **Cruise Control/Vehicle Speed** message from the ECM PGN 65265 (0xFE1), SPN Wheel-based Vehicle Speed.

Calculated value will be stored in the non-volatile memory every half a mile (0.5 mile) and when ignition OFF is detected.

It can be displayed in miles or kilometers as selected via “Display settings” menu.

The odometer information must be transferable to a new gauge package in situations when a gauge package fails. The parameter to use is EE_COV. The EE_COV value is a 32 bit unsigned value with resolution 0.01 miles/bit added to the odometer value. EE_COV value can be updated using Volvo Workshop tool.

It is recommended to reset the trip odometer after EE_COV parameter is updated since the trip odometer value may result in an inaccurate value.

The odometer shall be readable with the ignition off when the vehicle back lighting (headlight switch in park light position) is activated.

The cluster should be able to accurately save/retrieve the odometer value for a minimum of 1,000,000 miles.

7.1.4. Favorite Display window

This window will display the first gauge of the “Default Driving Mode” screen. For the 8 gauges version this window will always display the reading corresponding to air application. For the 6 gauges version it might contain any of the gauges available in the display: air suspension, transmission temperature or ammeter. In the Interactive driving mode (IDM) the same gauge information is displayed. In the non-driving mode (NDM) this window becomes part of menu window.



7.1.5. Status window

This window will show information equivalent to a telltale using an icon.



Condition	Displayed information
Cruise Control Set input active	CC
Alternator digital input active	ALT
Electronic Traction Control	ETC
Regenerate	
Exhaust high temperature	

Table 6: Telltales using icons

7.1.5.1. Cruise Control

Source: Cruise Control States in J1939 message CCVS (PGN 65265)

Activation: CC state <> off and <> not available

Deactivation: When CC state = Off or service brake digital input becomes active

7.1.5.2. Alternator

Source: Digital input – Alternator (located at C2)

Activation: When digital input is active (active low)

Deactivation: When digital input is inactive.

7.1.5.3. Electronic Traction Control

Source: Digital input – ETC (located at C17)

Activation: When digital input is active (active low)

Deactivation: When digital input is inactive.

7.1.5.4. Regenerate

Source: Particulate Trap Lamp Command in J1939 (PGN 64982)

Activation: Icon will be displayed when Particulate Trap Lamp Command = 001

Icon will flash when Particulate Trap Lamp Command = 100

Deactivation: Particulate Trap Lamp Command <> 001 and <> 100

7.1.5.5. Exhaust high temperature

Source: Exhaust high temperature in J1939 (PGN 64982)

Activation: Icon will be displayed when Exhaust high temperature = 001

Deactivation: Exhaust high temperature <> 001

7.1.5.6. Water in fuel (WIF)

Source: Digital input

Activation: When the digital input goes active

Deactivation: When the digital input goes inactive

EE parameter: N/A

7.1.6. Information, warning and alarm indicators

DID will display 3 types of indicators: information, warnings and alarms. When specific conditions are detected a window displaying an icon that represents the condition will popup.

Information, warning and alarm indicators can be acknowledged by pressing the ESC button. Once an information or warning message is acknowledged it will not be displayed again until the associated condition becomes inactive and then active again. Alarm indicators will popup cyclically (every 10 seconds) since they can not be inhibited. Alarms are associated to high-risk conditions, and hence they will keep alerting the user, as the condition exists.

The info/warning/alarm works slightly different depending on current operation mode, these differences are described below.

More than one indicator can be active at the same time. A displayed message can be replaced by a new message provided the new message has a higher priority. The displayed message is the highest priority; in the same category the more recent message.

7.1.6.1. Popup message in driving mode

- Info - will popup and overwrite the information present in the driving mode window
- Warning - will popup and overwrite the information present in the driving mode window
- Alarm - will popup over the driving mode, clock and favorite display windows.

7.1.6.2. Popup message in non driving mode

- Info - will not be shown until Driving mode is entered.
- Warning - will not be shown until Driving mode is entered.
- Alarm - will popup and overwrite the information present in the driving mode, clock window and favorite windows.

7.1.6.3. Information, warning and alarm conditions

Detected condition	EEPROM parameter *	Default type
Battery voltage error	EE_BATTERY_ERROR_WARNING_TYPE	Alarm
Low Air pressure	EE_INT_FAULT_BRAKE_PRESSURE	Alarm
Engine Maintenance	EE_ENG_MAINTENANCE_WARNING_TYPE	Warning
J1939 comm. Failure	EE_J1939_BUS_FAILURE_WARNING_TYPE	Warning
Vehicle speed error	EE_SPEED_ERROR_WARNING_TYPE	Warning
Service engine soon	EE_SERVICE_ENG_WARNING_TYPE	Info
Turn signal ON	EE_TURNED_LIGHT_WARNING_TYPE	Info

Table 7: Indicator Types

* EEPROM parameter configures the indicator type

7.1.6.3.1. Engine maintenance

Source: Amber warning lamp status in J1939 DM1 from the ECM.
 Activation: display indicator when amber lamp status = 01b
 Deactivation: remove indicator when amber lamp status <> 01b

7.1.6.3.2. J1939 comm. failure

Activation: When J1939 ETC1 (SA = 3) or EEC1 (SA=0) or both messages are not received for 5 consecutive seconds
 Deactivation: message reception reestablished.



7.1.6.3.3. Service engine soon

Source: Service distance and service delay in J1939 SERV message (PGN65216).

Activation: indicator will be displayed when service distance > 16126 km or when Service delay > 4000 h

Deactivation: When Service distance <= 16126 km or when Service delay <= 4000 h

7.1.6.3.4. Battery voltage error

See [Low/high chassis voltage](#) alarm section.

Source: Ignition analog input

Activation:

- When voltage is below EE_INT_FAULT_VOLT_LOW – EE_INT_FAULT_VOLT_HYST for EE_INT_FAULT_VOLT_TIME and EE_INT_FAULT_VOLT_LOW_OUTPUT is set to activate.
- When voltage is above EE_INT_FAULT_VOLT_HIGH + EE_INT_FAULT_VOLT_HYST for EE_INT_FAULT_VOLT_TIME and EE_INT_FAULT_VOLT_HIGH_OUTPUT is set to activate.

Deactivation:

- When voltage is above EE_INT_FAULT_VOLT_LOW + EE_INT_FAULT_VOLT_HYST
- When voltage is below EE_INT_FAULT_VOLT_HIGH – EE_INT_FAULT_VOLT_HYST

7.1.6.3.5. Vehicle speed error

Source: J1939 Wheel-based Vehicle Speed in PGN65265 (0xFEf1).

Activation: speed value = data not available (0xFExx) or sensor error (0xFFxx)

Deactivation: valid speed valid is received

7.1.6.3.6. Turn signal ON

Activation: When left or right turn signal has been on for more than 1 mile

Deactivation: One second after the flasher has been deactivated.

7.2. Driving Mode

During this mode, the DID will show the display-gauges using the areas 1 and 4 from Figure 4. A representation of such mode is depicted in Figure 6.

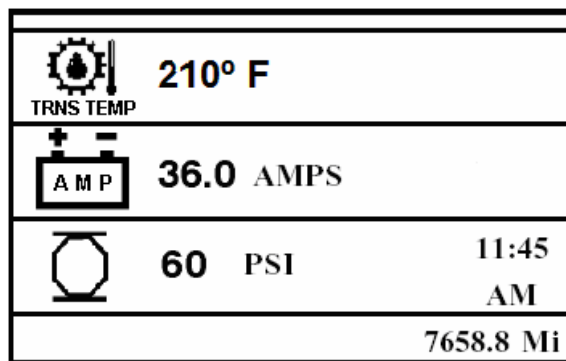


Figure 6: Default Driving Mode

If the select button from the Stalk is pressed, then the display will enter the Interactive Driving Mode. Options displayed in such mode are depicted in Figure 7. Under this interactive mode, the user can navigate thru several menus. After a period of inactivity in the Stalk interface (already described), the driving menu will timeout and return to its default (DDM) view shown in Figure 6.

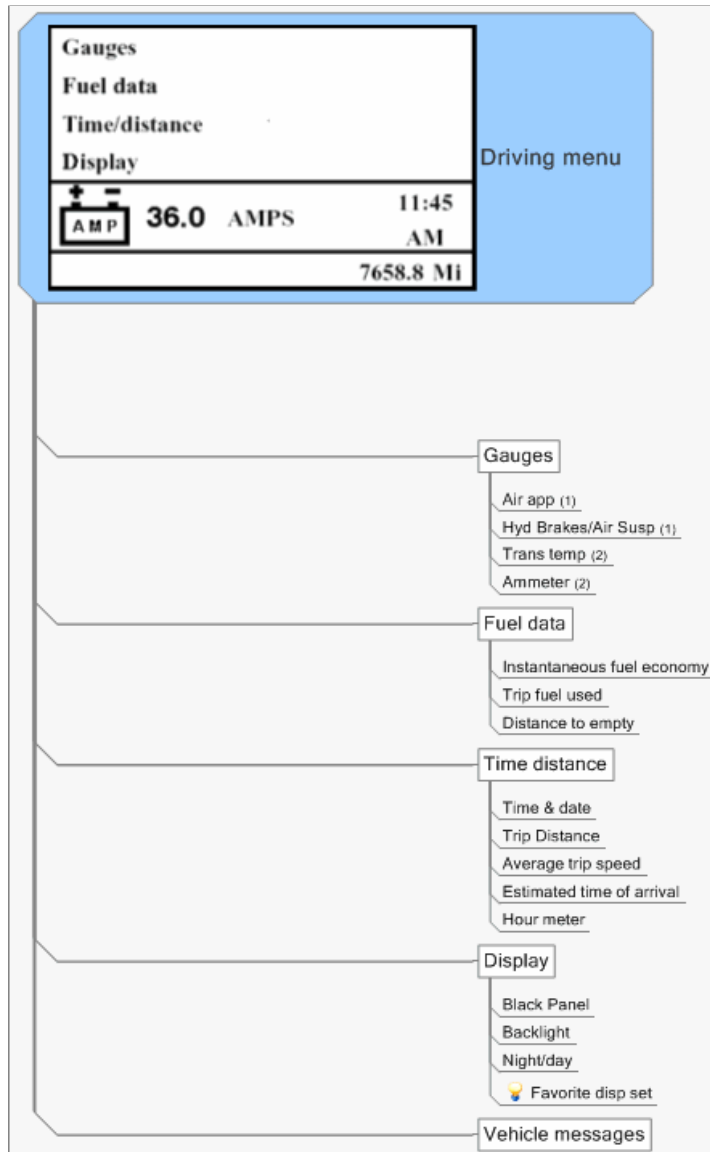


Figure 7: Interactive Driving Mode

- (1) availability depends on cluster type (6/8 gauges)
- (2) availability depends on configuration (option can be enabled or disabled)



7.2.1. Gauges

Based on the cluster type the available gauges in this option will vary. In both versions it is possible to have all the available gauges displayed in the Default Driving Mode screen.

For air brake systems (8 gauges) available options are:

- Air application pressure (Air app)
- Transmission temperature (Trans temp)
- Ammeter (Ammeter)

For hydraulic systems (6 gauges) available options are:

- Transmission temperature (Trans temp)
- Air suspension (Hyd Brakes/Air Susp)
- Ammeter (Ammeter)

Configuration also determines available gauges. Ammeter and air suspension gauges can be disabled via the configuration menu and in consequence will not be included in the gauge menu.

7.2.1.1. Trans temp

The transmission temperature gauge option displays transmission oil temperature. The transmission temperature data source will be J1939 Transmission Oil Temperature in PGN65272 (0xFE8).

7.2.1.2. Ammeter

The ammeter gauge option will show current value from the power regulator in the bus. Displayed value is associated to an analog input. The presence of this gauge depends on the EEPROM parameter EE_AMMETER_ENABLE. Such parameter is configurable via the Configuration Menu.

7.2.1.3. Hydraulic air pressure (Hyd Brakes/Air Susp)

The hydraulic air pressure gauge option only exists in buses with hydraulic brake system. It displays air pressure value retrieved from an analog input. This gauge will be displayed based on the configuration of the EEPROM parameter EE_AIR_SUSP_GAUGE_ENABLE. Such parameter is configurable via the Configuration Menu.

This gauge will use the same analog input used for Front Air Application Gauge. There is no valid configuration for the cluster where both, Hydraulic and Air are supported simultaneously.

7.2.1.4. Front/Rear Air Application Pressure

The front and rear air application pressure gauge option only exists in buses with air brake system. It displays front and rear air application pressure readings from the analog inputs front and rear air application. This display-gauge can be seen by selecting the appropriate option in the interactive mode of the driving menu. This option will be displayed based on the EEPROM parameter EE_CLUSTER_TYPE.

7.2.2. Fuel Data

This option will provide information to the user related to fuel economy.

7.2.2.1. Instantaneous Fuel Economy



mpg

This option will present instantaneous and average fuel consumption received from the engine via J1939 PGN 65,266 (LFE).

7.2.2.2. Distance to Empty



mpg



This option will display the calculated distance that can still be traveled based on average fuel rate, fuel level and tank capacity.

7.2.3. Time Distance Data

7.2.3.1. Time and date



11:45 001013
AM

This option will display current time and date. The select button is used to enter new settings. Date will be formatted according to the selection done via Display Settings menu options.

7.2.3.2. Trip odometer

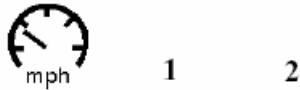


1 2

2 Trip odometers are handled. Values can be reset by pressing the select button. Value range is 0 to 99999 mi or km, no decimal places are displayed. When the maximum displayed value is reached the trip odometer is set to zero.



7.2.3.3. Average Trip Speed



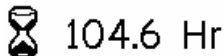
This option will display average speed. Values can be reset by pressing the select button.

7.2.3.4. Time of arrival



Time of arrival will be calculated using average speed and the distance to be traveled. Distance to be traveled can be entered by pressing the select button.

7.2.3.5. Hour meter



This option displays Total Engine Hours received from the engine via Hours message (PGN 65253). The cluster is periodically requesting this message (6 times/minute). Displayed resolution is tenths of an hour. In case the information is not received or it is not valid dashes will be shown.

7.2.4. Display

7.2.4.1. Set Blackpanel

This option will set the display backlight to a minimum value. It could be used as an option for nocturnal driving. To return to normal illumination the following sequence shall be executed: select "set blackpanel" option and press escape before the timeout to return to default driving mode expires

7.2.4.2. Backlight

This option will allow setting the backlight intensity.

7.2.4.3. Day/Night Mode

Each time the select button is pressed when this option is selected toggles between day and night display modes.

Day mode sets dark text over light background

Night mode sets light text over dark background.

7.2.4.4. Favorite Display set

This option shall be used to define the contents of Default Driving Mode screen.

There are 3 areas available to display a gauge. Available gauges depend on cluster type and selected configuration.

Once the "Favorite Display set" option is selected follow the steps below to customize the "Default Driving Mode" screen:

- Move to the desired display area using the up and down buttons, press select then use the up and down buttons to see available gauges, when the desired gauge is displayed press select.

The procedure is repeated for each of the available areas (3). The area at the bottom of the screen is always visible even when the Driving Mode menu is displayed (area 4 in figure 4).

7.3. Non-Driving Mode

While vehicle is not moving (speed <= 1 MPH) user can enter into the Non-driving mode (NDM) moving the arrow one more position while in the last or first menu item of the IDM. NDM is depicted in Figure 8. Configuration and diagnostics options are available in this mode. The non-driving mode consists of the driving mode window, the favorite window and the clock window shown in Figure 4.

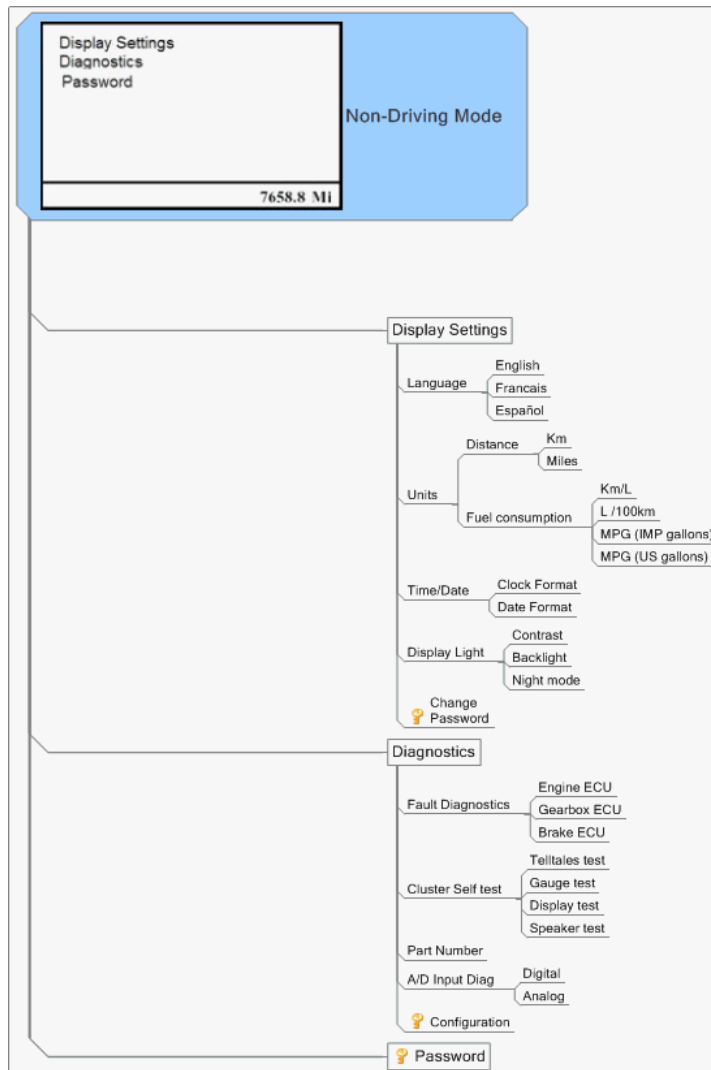


Figure 8: Non-driving Mode



7.3.1. Display Setting

7.3.1.1. Language

Select between English, Français and Español options. This setting is used to display the appropriate text in the menu options and warning messages.

7.3.1.2. Units

Measurement units selection for options associated to distance and fuel consumption functions.

7.3.1.3. Time/Date

Select between 24 and 12 hrs time format and between “yymmdd”, “ddmmyy”, “mmdyy” date formats.

7.3.1.4. Display Light

Set display viewing parameters: contrast, back illumination and night mode.

7.3.1.5. Change password

Password protected option to configure a new secret code that limits access to specific options. To access this option the user should know current password.

7.3.2. Diagnostics

The DID shall provide monitoring capabilities. They can be divided in two different needs:

- **Monitor all digital and analog inputs in real-time:** The intent is to provide a way to easily diagnose all digital and analog inputs connected to the cluster. This is done, providing a reading of the current state of all digital and analog inputs as is described in detail in A/D Input Diagnostics.
- **Fault Diagnostics:** The purpose of this feature is to provide a way to monitor data trouble codes (DTCs) generated by the ECUs in the vehicle: Engine, Automatic Transmission, Hydraulic ABS System and Air Brake System. Details of these functions are provided in the next paragraphs.

7.3.2.1. Fault Diagnostics

Vision Cluster is connected to J1939 and J1708 networks of the vehicle. Not all the ECUs will report their Data Trouble Codes (DTC) in both networks. Table 8 indicates the network used by each ECU to report its faults. Only active faults will be displayed.

ECU	Protocol
Engine	J1939 or J1587
Hydraulic ABS	J1587
Air Brake System	J1939 or J1587
Transmission	J1939

Table 8: Communication Protocol and DTCs

DTC information will be accessible through the Diagnostics option in the Non-Driving Menu.

7.3.2.2. Cluster Self test

This option is provided as a way to exercise the telltales, gauges, display and speaker. Selecting one of the available options in this menu starts the test, to stop it press the ESC button.

7.3.2.3. Part number

Cluster identification information is displayed when this option is selected.

7.3.2.4. A/D Input Diagnostics

The cluster should provide means for reading the current state of all digital and analog inputs at a given time. Outputs will not be monitored. The cluster will use the DID to provide such information to the user. The DID will reflect any change of the status of the input no later than 1 second after a state transition occurred.

Under this option it will be possible to select between digital or analog inputs. Once selected the type of inputs to monitor, a set of 5 inputs with their current status will be displayed. The name of the input that will be used is provided in Table 10 and Table 11 in the *Caption* column; input value will be displayed as described in the Readout column. As an example, the first screen of the digital inputs will display as depicted in Table 9.

R. Turn	OFF
Park Brk	OFF
Park Brk L.	ON
L. Turn	ON
High Beam	OFF

Table 9: First Screen of Digital Inputs

More than one screen will be needed to display all inputs available in the cluster. Navigation will be done using *UP/DOWN* buttons. Once the last screen is reached, pressing down button will result in displaying the first page again; similarly if up is pressed when the first screen is displayed the last page will be shown. None of the navigation keys is included in the digital inputs to be diagnosed.

A high level representation on how this should be implemented is presented in Figure 9.

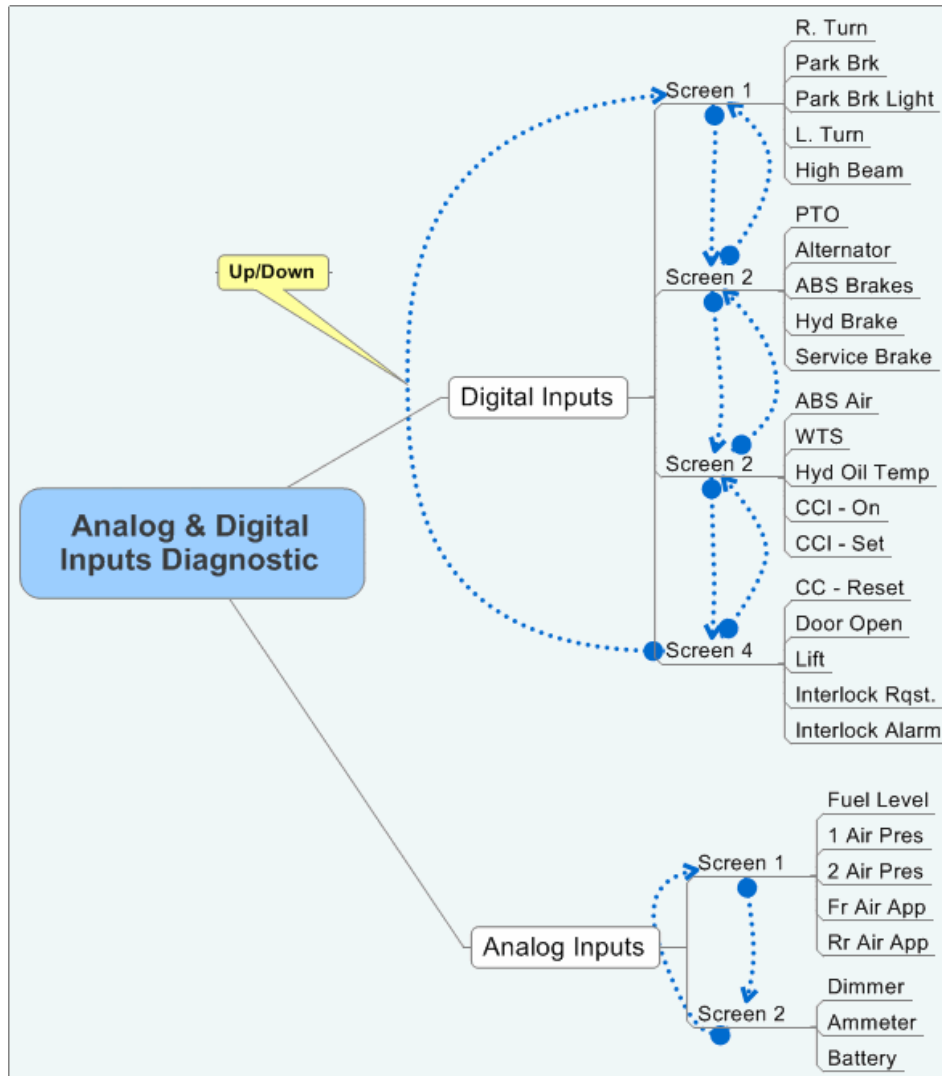


Figure 9: Input Diagnostic Screen Navigation

Inputs available in the diagnostic screens are listed in Table 10 and Table 11:

PIN	Digital Inputs	Caption	Readout	Resolution
A21	Right Turn Signal	R. Turn	ON / OFF	Binary
B23	Park Brake Set	Park Brk	ON / OFF	Binary
B24	Park Brake Light	Park Brk Light	ON / OFF	Binary
B25	Left Turn Signal	L. Turn	ON / OFF	Binary
B28	High Beam	High Beam	ON / OFF	Binary
C1	PTO/High Idle	PTO	ON / OFF	Binary
C2	Alternator	Alternator	ON / OFF	Binary
C3	ABS Hydraulic Brakes	ABS Brakes	ON / OFF	Binary
C5	Hydraulic Brake	Hyd. Brake	ON / OFF	Binary
C8	Service Brake	Service Brake	ON / OFF	Binary
C10	ABS Air	ABS Air	ON / OFF	Binary
C12	Wait To Start	WTS	ON / OFF	Binary
C16	High Hydraulic Oil Temp	Hyd Oil Temp.	ON / OFF	Binary
C24	Cruise Control - On	CC - ON	ON / OFF	Binary
C25	Cruise Control - Set	CC - Set	ON / OFF	Binary
C26	Cruise Control - Reset	CC - Reset	ON / OFF	Binary
C7	Door Open	Door Open	ON / OFF	Binary
C6	Lift Not Stowed	Lift	ON / OFF	Binary
C22	Brake Interlock Reqst.	Interlock Rqst.	ON / OFF	Binary
		Interlock		
C23	Brake Interlock Alarm	Alarm	ON / OFF	Binary

Table 10: Digital Inputs to be displayed

PIN	Analog Inputs	Caption	Range	Resolution
B3	Fuel Level	Fuel Level	0 – 100%	1%
C13	Primary Air Pressure (8 gauges only)	1 Air Pres. Hyd Brake /Air	0-180 PSI	1 PSI
C13	Hyd. Air Pres. (Air Suspension)	Susp	0-180 PSI	1 PSI
C14	Secondary Air Pressure	2 Air Pres.	0-180 PSI	1 PSI
B13	Front Air Application Pressure	Fr. Air App.	0-180 PSI	1 PSI
B14	Rear Air Application Pressure	Rr Air App.	0-180 PSI	1 PSI
B9	Dimmer	Dimmer Sw	0 – 100% -150 – 150	1%
B6	Ammeter	Ammeter	A	1 A
A3	Ignition Switch	Battery	0 – 14V	0.01 V

Table 11: Analog Inputs to be displayed

If the value present at the analog input is out of the operation range, the diagnostic screen will display “Out of Range” for that particular input.

When one of these inputs is not available based on the cluster type the information provided by the diagnostic screen will be N/A.

C13 displayed caption will change based on the parameter EE_CLUSTER_TYPE: “1 Air Pres” for 8 gauges version and “Air Susp.” for 6 gauges.



7.3.2.5. Configuration

The Vision cluster should provide a way to configure a specific set of parameters during the manufacturing process at Bluebird facility.

The configuration of the cluster will be accomplished using the cluster user interface (i.e. stalk switches and DID). Access to the Configuration option is protected and requires the user to provide the access code via the "Password" option to enable it.

The configuration items that will be displayed in the configuration menu are described in Table 12.

It is necessary to execute an ignition cycle (OFF/ON), after revising desired parameters, for EE parameter changes to take effect.











Parameter	Description	Caption	Configuration	Default Value
Trip (EE_TRIP_ODO)	whether or not a trip odometer is present	Trip Odometer	ON/OFF	ON
Default Parameters (EE_INFORMATION_LINE)	Activates/Deactivates windows 3 and 5 (Odometer and Status Window) in the DID	Default Parameters	ON/OFF	ON
Self Test (EE_SELFTEST)	Turns the self test function at start-up on and off. This will enable/disable: <ul style="list-style-type: none"> • Gauge Sweep • Bulb Test • Speaker Test As described in Section 3.4.1	Self Test	ON/OFF	ON
Transmission Diagnostics (EE_TRANS_DIAG)	When turned on, shows active SPN and FMI transmission faults. This feature will enable the associated diagnostic screen for SPNs and FMIs.	Trans. Diagnostics	ON/OFF	ON
Test Panel Enabled (EE_TEST_PANEL)	This parameter renders inoperative the configured cluster type, when selected value is 6 or 8. Under this condition the cluster can be used as a production chassis test fixture, whose type is given by EE_TEST_PANEL parameter value.	Test Panel	OFF/6/8	OFF
Turn Signal Click (EE_TURN_SIGNAL_CLICK)	when turned on, the turn signal click is active and when turned off, there is no turn signal click	Turn Signal Click	ON/OFF	ON
Stop Light Inhibit (EE_STOP_LIGHT_INHIBIT)	Parameter used to evaluate the conditions that control service brake telltale. See section 5.16	Stop Light Inhibit	ON/OFF	OFF
Engine Type (EE_ENGINE_TYPE)	Selection between possible engines. Note: Cummins and Cat will be the two engines available for MY 2006. MY 2007 will require supporting additionally J. Deere or GM engines, which will be added into the possible configuration list.	Engine Type	CMS / CAT	CAT
Brake Interlock (EE_BRAKE_INTERLOCK_SYSTEM)	Indicates if the brake system includes brake interlock. Parameter used to evaluate the conditions that control service brake telltale. See section 5.16	Brake Interlock	ON/OFF	OFF
Lift Authorization (EE_LIFT_AUTHORIZATION)	when turned on, software is enabled for the lift authorization function	Lift Authorization	ON/OFF	OFF
Ammeter Enable (EE_AMMETER_ENABLE)	When set, the Ammeter DID-gauge will be present. Otherwise it will be disabled.	Ammeter	ON/OFF	ON
Air Suspension Enable (EE_AIR_SUSP_GAUGE_ENABLE)	When set, the Air suspension DID gauge will be present; otherwise it will be disabled and not shown.	Air Suspension	ON/OFF	ON



ABS active state (EE_ABS_INPUT_HIGH_OR_LOW)	This option configures the active state of the ABS input	ABS Input	LOW/HIGH	HIGH
Tank Fuel Capacity (EE_FUEL_100_US_GALLONS)	It selects between 60 or 100 gallons fuel tank capacity	Fuel Tank	60/100	60




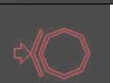







Table 12: Configuration Items

III. DID ICONS DESCRIPTION

 TRNS TEMP	Transmission Temperature. When transmission Temperature Exceeds set point Warning is enabled.
 APP AIR	Ammeter. Only on models programmed at assembly. Reads system Electrical current value It shows AIR APPLICATION Pressure
	Air Suspension Indicates Pressure on Hydraulic brake models only. Not available on Air brake models. Suspension air on these models is read from Analogue sensor Transducer: Front.
	Miles per gallon. This option will present instantaneous and average fuel consumption received from the engine Alternate display of fuel consumption (MPK liters/100km, Km/L) can be changed in non driving mode
	Distance to empty. This option will display the calculated distance that can still be traveled based on average fuel rate, fuel level and tank capacity. Tank capacity is programmed at assembly.
 11:45 AM 001013	Time and Date. This option will display current time and date. The select button is used to enter new settings. When a number is highlighted it can be decremented by the up down keys. The select key will advance selection to next subsequent section. Time & Date will be formatted according to the selection done via Display Settings menu options in non driving mode.
 1 2	Trip Odometers. This display may be deactivated at time of assembly configuration. If present values can be reset by pressing the select button when this item in the time distance menu is selected. Value range is 0 to 99999 mi or km, no decimal places are displayed. When the maximum displayed value is reached the trip odometer is set to zero.
 1 2	Average Speed. This option will display average speed when this item in the time distance menu is selected. Toggle stalk switch to average speed. Both Values must be reset by pressing the select button
	Time of Arrival. When this item in the time distance menu is selected time of arrival will be calculated using average speed and the distance to be traveled. Distance to be traveled can be entered by pressing the select button And then decrement the stalk up down keys to the desired distance
 104.6 Hr	Engine Hours. When this option is selected in the time distance menu the cluster requests Hours message from the Engine Once the information is received it is displayed. With a resolution of tenths of an hour. In case the information is not received or it is not valid dashes will be shown.



IV. Telltale Icons & Description

Icon	Description
	Right Directional light Click may be disabled
	Left Directional Light Click may be disabled
	Active when hydraulic oil temperature is above set Point
	Active on Hydraulic brake units when a condition in system is out of range
	Active when brakes are applied. This
	Shift inhibit Indicator activated by transmission(the gear box)
	Indicator associated to the "amber light" status set by the gear box
	Active when engine is not ready to be started
	Active when fault exist in either Air or Hydraulic brake system
	Active when Park brake is set
	Active when transmission oil temperature set point is exceeded. Temperature value is shown in the DID
	Multiple events activate this telltale: <ol style="list-style-type: none"> 1) Time or distance for maintenance service is exceeded. 2) Engine detects abnormal conditions as: low coolant level, high coolant temperature, low oil pressure and reports them via "amber lamp status" in the active diagnostic