



Class 1

ISO 9001 CERTIFIED

607 NW 27th Ave
Ocala, FL 34475
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PRODUCT MANUAL

Vehicle Data Recorder (VDR) and Seat Belt Warning system



**P/N 118097
VDR module**




**P/N 118093
Seat Belt Warning Input module**



**P/N 118620
Seat Belt Warning display (small)**



**P/N 118551, P/N 119375
Seat Belt Warning display (large)**

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1. Revision Log

Rev	Date	Changes
1.10	2/17/2009	Added Seat Belt Warning input module configuration of "seat bounce" error validation timing (software version 1.2) Added Seat Belt Warning input module network tag alarms (software version 1.2) Added P/N 119375 large display with 6 seat positions. Added 119340 blanking labels.
1.00	1/27/2009	Initial requirements

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2. Overview

The Class 1 Vehicle Data Recorder (VDR) system is comprised of a Vehicle Data Recorder and a Seat Belt Warning system.

The Vehicle Data Recorder (p/n 118097) monitors and records engine RPM, throttle percentage, vehicle speed, ABS events, transmission range information, parking brake position, master warning position, and seatbelt status via J1939 CAN messages in accordance with NFPA 1901-2009 requirements.

The Seat Belt Warning system utilizes an input module (p/n 118093) and a display (small – p/n 118620, large – p/n 118551, or large – p/n 119375) to indicate the state of each seat.

2.1. Vehicle Data Recorder features

- Utilizes the SAE J1939 CAN standard to record NFPA required data
- 32 bit ARM processor.
- Retains the last 100 hours of stored data in memory (saved in one second intervals).
- Internal real-time clock with 10 year battery back-up.
- Two discrete inputs: Park Brake (ground polarity) and Master Warning (positive polarity).
- USB connector for data retrieval via VDR management software (p/n 119206).


2.2. Seat Belt Warning features

- Monitor up to 20 seats and 20 seat belts (ground polarity inputs) *.
- Each input is selectable for Normally Open (N.O.) or Normally Closed (N.C.) switch contacts (inputs are default set to N.O.).
- Validates seat/seatbelt sequencing.
- Enhanced “seat bounce” error validation.
- Small display fits into standard switch cutout (20 seats).
- Large display shows all seat states simultaneously (10 seats).

* Requires 2 Seat Belt Warning input modules. Each input module can monitor 10 seat and 10 seat belts.

The large display p/n 119375 is the same as the large display p/n 118551 except that the label only has 6 seat positions.



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3. Configuration

3.1. Vehicle Data Recorder (p/n 118097)

Configuration of the Vehicle Data Recorder module requires installation of the VDR Management Software (p/n 119206).

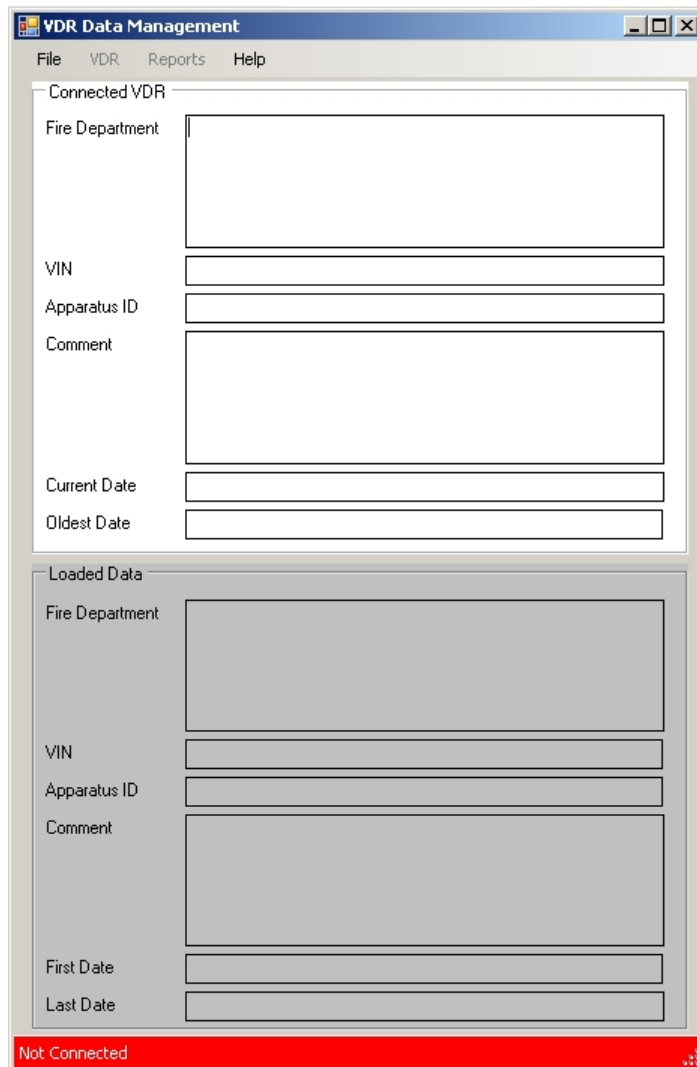
3.1.1. VDR Management Software installation

Load the VDR Management Software CD into the computer's CD slot and follow the on-screen directions. The VDR Management Software allows configuration and data retrieval from the VDR module.


3.1.2. Starting the VDR Management Software

From the computer's START bar, select "All Programs > VDR > VDR Data Management".

The VDR Management Software will open.



The screenshot shows the VDR Data Management software interface. The window title is "VDR Data Management" and it has a menu bar with "File", "VDR", "Reports", and "Help". The interface is divided into two main sections: "Connected VDR" and "Loaded Data". Each section contains input fields for "Fire Department", "VIN", "Apparatus ID", and "Comment", along with date fields. The "Connected VDR" section has "Current Date" and "Oldest Date" fields, while the "Loaded Data" section has "First Date" and "Last Date" fields. A red status bar at the bottom indicates "Not Connected".

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3.1.3. Connecting the VDR module to the computer

Power the VDR module (see section 8.4 for wiring requirements). Plug a male Type A to male Type B USB cable (no longer than 5 meters/16.4 feet) between the VDR module and the computer's USB port.

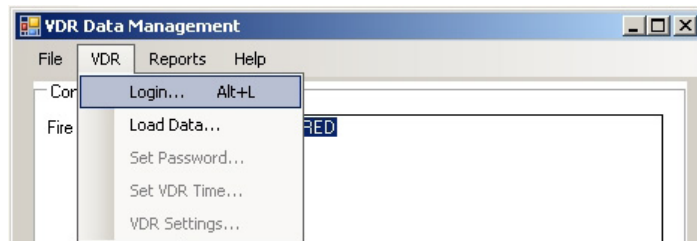
The VDR module to VDR Management Software USB connection is designed for Hi-Speed USB 2.0 connectivity. Computers with the older USB 1.1 port may still be used but data transfer times will slow.

The VDR Management Software will recognize that the VDR module has been connected by changing the bottom status bar color to yellow and showing "Connected – Not Logged In".



3.1.4. Log-in to the VDR through the VDR Management Software

Click on VDR > Login... (or use short cut keys ALT+L) to log in to the VDR module.



The VDR Management Software will open the VDR Login box. Enter the VDR module's password and click "OK". If this is the first time VDR module has been accessed the password will be the factory default (**12345678**).

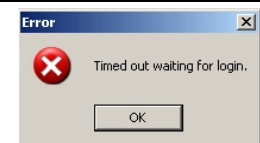



If the default password is used the VDR Management Software will issue a notice recommending the password be changed (see section 3.1.5 to change the VDR module's password).



The VDR Management Software will recognize that the VDR module has been logged in by changing the bottom status bar color to green and showing "Connected – Logged In".



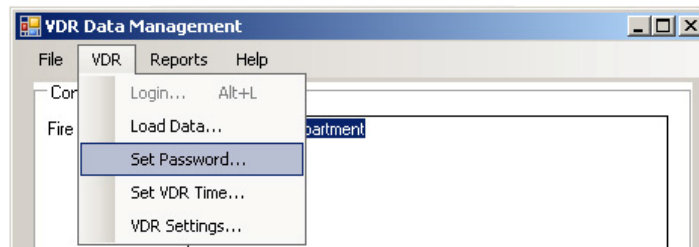
	<p><i>The VDR Management software may issue an "Error" window indicating "Timed out waiting for login" and the bottom status bar remains yellow.</i></p> <p><i>Please verify that the VDR Module's supply voltage is greater than 9 VDC.</i></p>
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3.1.5. Changing the VDR Module's password

The VDR module stores a unique password that allows the VDR Management Software access to the module's settings and saved data.

Click on VDR > Set Password...



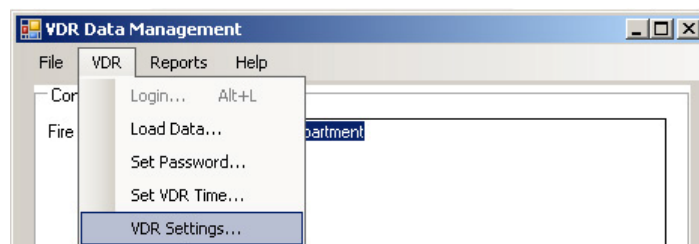
The VDR Management Software will open a "Set Password" box. Enter the desired new password (8 characters maximum) and click "OK".



3.1.6. Configuring the VDR Module's identification settings.

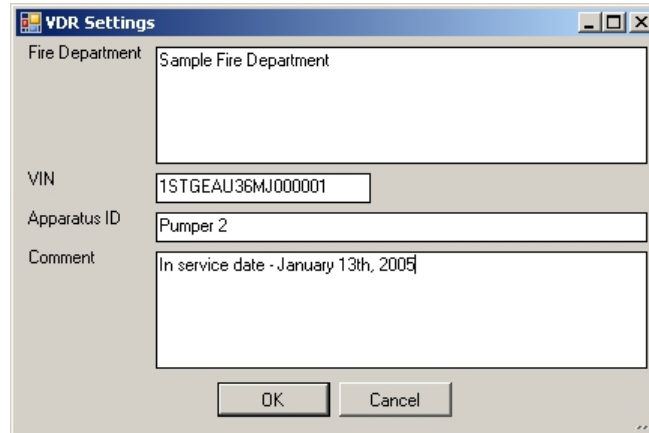
The VDR module stores the fire department's name, vehicle identification number (VIN), apparatus ID, and comments for data identification purposes.

To set these values click on VDR > VDR Settings...



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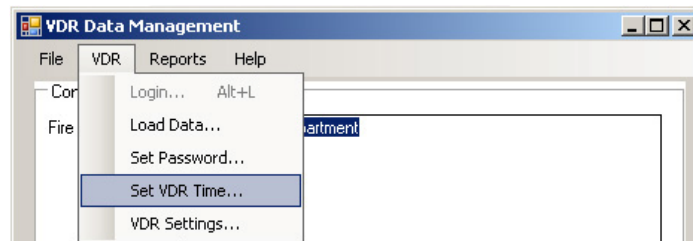
The VDR Management Software will open a “VDR Settings” box. Enter the desired fire department name, VIN, apparatus ID, and comments then click “OK” to save. This data is saved in the VDR Module’s memory and will not be lost when power is removed.



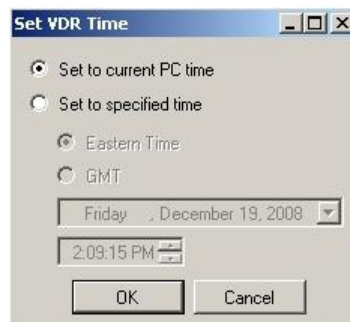
3.1.7. Configuring the VDR Module’s internal clock.

The VDR module has an internal real time clock that is preset from the factory for Greenwich Mean Time (GMT). The VDR module’s internal real time clock can be preset for local time if desired.

Click on VDR > Set VDR Time...



The VDR Management Software will open the “Set VDR Time” window. The computer’s current time or a user specified time may be used to set the VDR Module’s internal real time clock. Select the desired method and click “OK”. The VDR Module has an on-board clock battery and the time will not be lost when power is removed.

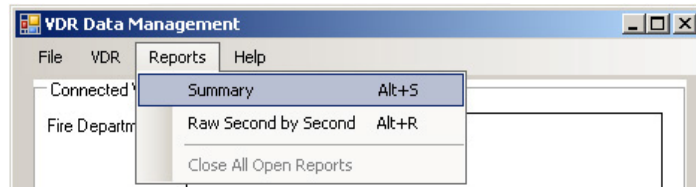


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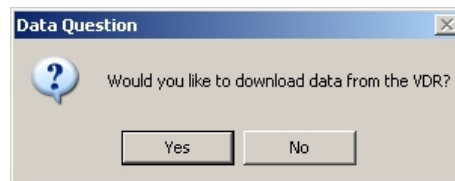
3.1.8. Retrieving the VDR Module's report data

The VDR module saves important vehicle status data in its memory. It is recommended that the VDR installer run the VDR system and then perform a VDR report retrieval to verify that all of the VDR data (see section 4.4) is able to be recorded by the VDR system.

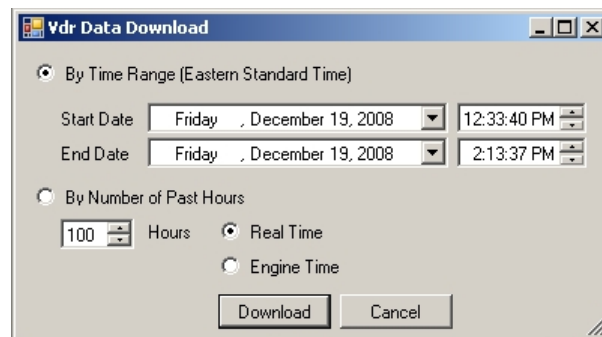
Click on Reports > Summary... (or use short cut keys ALT+S) to retrieve this data.




The VDR Management Software will open a "Data Question" box asking if you would like to download data from the VDR. Click "Yes".

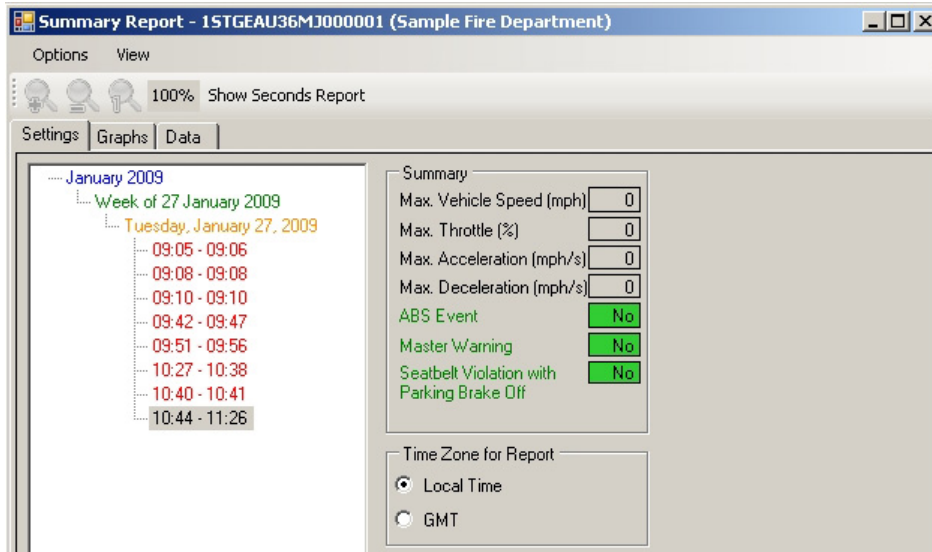



The VDR Management Software will open a "VDR Data Download" box to allow a specific time range or number of hours of data to be retrieved. Select the desired data range and click "Download".



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The VDR Management Software will open the "Summary Report" window which will allow viewing the data in specific formats and graphs.

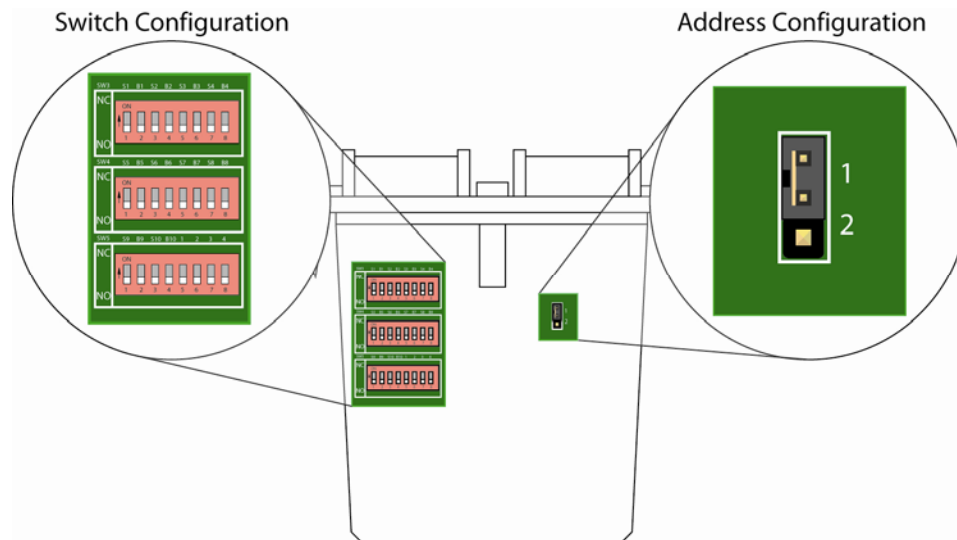


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3.2. Seat Belt Warning Input module (p/n 118093)

The Seat Belt Warning input module (p/n 118093) must be configured for the seat and seatbelt switch operation (either Normally Open or Normally Closed), “seat bounce” error validation timing (2, 3, 4, or 5 seconds), and the module address (either address 1 or address 2).

Open the Seat Belt Warning input module to gain access to the switch configuration switches and the address configuration jumper.



3.2.1. Input type configuration

The inputs for the seats and the seatbelts are designed for ground polarity. The configuration switches set the input type: NC = Normally Closed, NO = Normally Open (default). The “seat” configuration switches are labeled with an “S” and the seat position number, and the “seatbelt” configuration switches are labeled with a “B” and the seat position number. For example, the seat and seatbelt switches for seat position 2 are labeled “S2” and “B2”.

- The Normally Closed (NC) configuration is for inputs that are *open* when the seat (or belt) switch is activated.
- The Normally Open (NO) configuration is for inputs that are *closed* when the seat (or belt) switch is activated.


3.2.2. “Seat bounce” error validation timing

The default time for the “seat bounce” error validation (see section 4.1.2) is two seconds. This time can be increased to three, four, or five seconds by placing switch configuration switches 1, 2, or 3 into the ON position. If all three switches are in the OFF position then no time is added to the default timing of two seconds. Each switch turned to the ON position adds one second to the default timing. For example, if switches 1 and 2 are set to the ON position then the “seat bounce” error validation timing is set to four seconds (two default seconds plus two added seconds).

3.2.3. Address configuration

The Seat Belt Warning input module can be set to address 1 (default) or address 2. This allows two Seat Belt Warning input modules to be used in applications where up to 20 seat/belt positions are required. Place the address configuration jumper into the desired position (1 or 2).

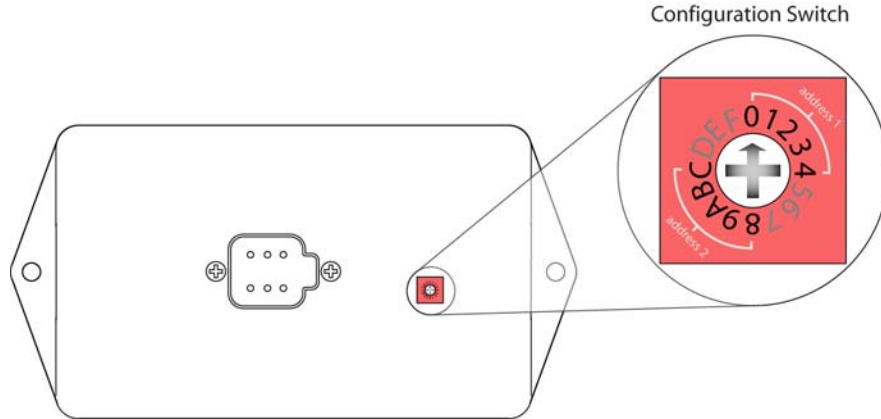
- The Seat Belt Warning display (small – p/n 118620) can display the seat status from two Seat Belt Warning input modules (up to twenty seats).
- Two Seat Belt Warning displays (large – p/n 118551) must be used to display the seat status from two Seat Belt Warning input modules (up to twenty seats).

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3.3. Seat Belt Warning display (large – p/n 118551, p/n 119375)

The Seat Belt Warning display (p/n 118551, p/n 119375) may be configured for a desired layout of the physical seat locations on the display (five different layouts) and the display's address (address 1 or address 2) by selecting a position on the configuration switch.

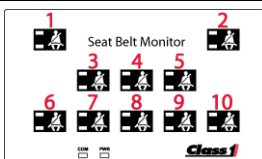
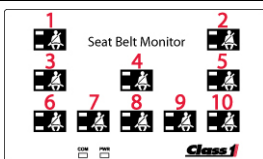
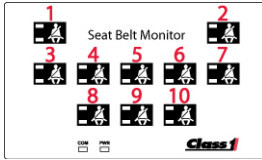
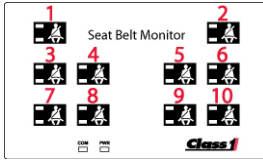
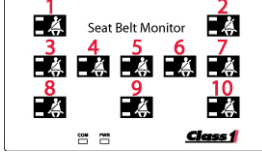
Remove the rubber plug from the rear of the Seat Belt Warning display to gain access to the configuration switch (replace the rubber plug after setting the position of the switch).



3.3.1. Seat belt display indicator position and address configuration

Configuration Switch positions 0, 1, 2, 3, and 4 set the Seat Belt Warning display to address 1 (which receives seat belt data from a Seat Belt Warning input module set to address 1) and sets the seat belt display indicator positions to one of the five (5) available.


Configuration Switch positions 8, 9, A, B, and C set the Seat Belt Warning display to address 2 (which receives seat belt data from a Seat Belt Warning input module set to address 2) and sets the seat belt display indicator positions to one of the five (5) available.

Configuration Switch position	Seat Belt Display indicator positions	Configuration Switch position	Seat Belt Display indicator positions
0 = address 1 or 8 = address 2		3 = address 1 or B = address 2	
1 = address 1 or 9 = address 2		4 = address 1 or C = address 2	
2 = address 1 or A = address 2			

The Seat Belt Display indicator positions directly correlate to the physical inputs of the address associated Seat Belt Warning input module.

3.3.2. Blanking labels

A set of blanking labels (p/n 119340) are included with the large display (p/n 118551 and p/n 119375) so that unused seating positions may be covered if desired.

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4. Operation

4.1. Seat and Seat Belt detection overview

The Seat Belt Warning system is designed to detect when a seat is occupied and when its associated seat belt is buckled correctly. The Seat Belt Warning system recognizes five (5) distinct seat/seat belt conditions: not occupied, occupied and buckled, seat belt violation, buckled and not occupied, and sequence violation.

The chart below describes the conditions with the associated alarm and indications (RED = negative indication, GRN = affirmative indication).

TYPE	CONDITION	DESCRIPTION	VDR	INDICATION	
			ALARM	RED	GRN
Valid	Not occupied	Seat is NOT occupied and associated seat belt is NOT buckled.			
Valid	Occupied and buckled	Seat is occupied and THEN the associated seat belt is buckled.			●
Error	Seat belt violation	Seat is occupied BUT the associated seat belt is NOT buckled.	●	●	
Error	Buckled and not occupied	Seat belt is buckled BUT the associated seat is not occupied.		●	
Error	Sequence violation	Seat belt is buckled and THEN the associated seat is occupied.	●	●	

Note: The VDR alarm will only sound when the park brake input is not active (see section 4.4.1.A).



The Seat Belt Warning system is designed to detect safe and unsafe conditions for seated occupants, but the system cannot defend against tampering with the seat or seat belt switches, system modules, or intentional manipulation of the seat and seat belt activations to circumvent safe operation. Class 1 cannot be held responsible in these circumstances.

4.1.1. Sequence violation during power on cycle

The Seat Belt Warning input module (p/n 118093) will indicate a *sequence violation* for a seat position if the seat is occupied and buckled before the input module power on cycle. This is due to the fact that the Seat Belt Warning input module cannot determine the order of seat/seat belt activation and therefore assumes the worst case scenario (seat belt was pre-buckled and occupant sits on top of seat belt).


This potential scenario can be eliminated by keeping the Seat Belt Warning input module powered continuously (see section 9.1 for current draw).

4.1.2. “Seat bounce” error validation

The seat inputs of the Seat Belt Warning input module (p/n 118093) have a special two to five second bounce timer which is designed to prevent the system from reporting a *buckled and not occupied* error when a buckled occupant removes pressure from the seat’s occupant detection switch which could easily happen if an occupant adjusts their body or the vehicle encounters a bump during operation.

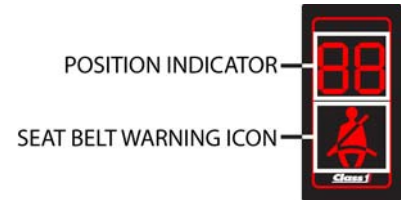
The system will report a *buckled and not occupied* error if a buckled occupant removes pressure from the seat’s occupant detection switch for longer than the configured “seat bounce” error validation time (see section 3.2.2).

The system will again report *occupied and buckled* when the occupant sits correctly in the seat by putting pressure on the seat’s occupant detection switch.

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4.2. Seat Belt Warning display (small – p/n 118620)

The Seat Belt Warning display (p/n 118620) is capable of showing the seat status of up to 20 seats with its position indicator and seat belt warning icon.



4.2.1. Display initialization

The Seat Belt Warning display performs a visual initialization cycle during the first three (3) seconds after a new power cycle. This initialization should be used to verify that the display's warning indicators are functioning properly.



The display shows "88" and the seat belt warning icon is red during the first second after a power cycle.



The display shows "88" and the seat belt warning icon is green during the next (2nd) second after a power cycle.



The display shows a normal operating indication after the last (3rd) second after a power cycle.

4.2.2. Operating indications

The Seat Belt Warning display indicates the status of the seat and seat belt inputs based on communication messages from the Seat Belt Warning input module (p/n 118093).




The Seat Belt Warning display position indicator and seat belt warning icon will remain dark when no seats are occupied and no seat belts are buckled.



The Seat Belt Warning display will light the seat belt warning icon green when all occupied seats are buckled properly.



The Seat Belt Warning display will indicate a position number and light the seat belt warning icon red when an occupied seat has a seat belt violation or seat belt sequence error. When more than one seat has a seat belt violation or seat belt sequence error the position indicator will cycle through the seat positions in violation/error.

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4.2.3. Communication error indication

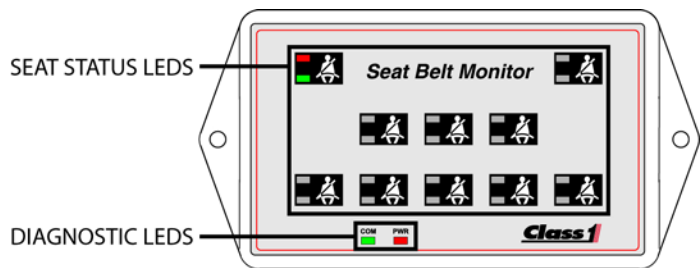


The Seat Belt Warning display position indicator shows dashes and the seat belt warning icon flashes red when communication messages are not received from the Seat Belt Warning input module (see section 6 for troubleshooting).

4.3. Seat Belt Warning display (large – p/n 118551, p/n 119375)

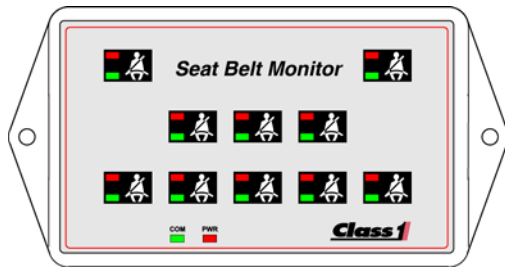
The Seat Belt Warning display (p/n 118551) is capable of showing the seat status of up to 10 seats with individual (red and green) seat status LEDs.

The Seat Belt Warning display (p/n 119375) is capable of showing the seat status of up to 6 seats with individual (red and green) seat status LEDs.

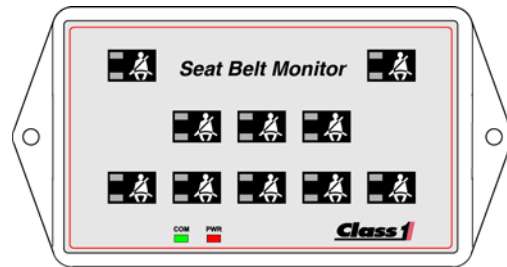


4.3.1. Display initialization

The Seat Belt Warning display performs a visual initialization cycle during the first three (3) seconds after a new power cycle. This initialization should be used to verify that the display's LEDs are functioning properly.



The display activates all seat status LEDs during the first 3 seconds after a power cycle.



The display then shows a normal operating indication.

4.3.2. Operating indications

The Seat Belt Warning display indicates the status of the seat and seat belt inputs based on communication messages from the Seat Belt Warning input module (p/n 118093).




The seat status LEDs will remain dark when a seat is not occupied and the associated seat belt is not buckled.



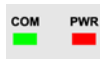
The green seat status LED will light when a seat is occupied and its associated seat belt is buckled properly.



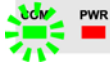
The red seat status LED will light when a seat is occupied and has a seat belt violation or has a seat belt sequence error.

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4.3.3. Diagnostic indications

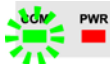


The green COM diagnostic LED will be lit when communication messages are properly received from the Seat Belt Warning input module.



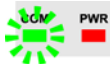
The green COM diagnostic LED will flash slowly (once per second) when communication messages are not received from the Seat Belt Warning input module.

Verify matching addresses of the Seat Belt Warning display (section 3.3.1) and the Seat Belt Warning input module (section 3.2.3). Verify that the Seat Belt Warning input module is properly connected to the CAN bus.



The green COM diagnostic LED will flash quickly (five times per second) when there is a passive communication error.

Verify that terminating resistor(s) are installed, verify the connection to the CAN bus is properly connected, etc.




The green COM diagnostic LED will double flash (every two seconds) when there is an active communication error.

Verify that CAN H and CAN L are not shorted together or to ground or power, etc.



The green COM diagnostic LED and the red PWR diagnostic LED will be OFF if there is a problem with the main display power.

Verify that power is connected properly to the display (pin 1 – power, pin 2 – ground).

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4.4. Vehicle Data Recorder (p/n 118097)

The Vehicle Data Recorder saves a continuous loop of 100 engine hours of second-by-second time and date stamped data as directed by NFPA.

- Vehicle speed (SAE CAN message)
- Engine RPM (SAE CAN message)
- Throttle position (SAE CAN message)
- Vehicle acceleration (derived from vehicle speed)
- Vehicle deceleration (derived from vehicle speed)
- ABS events (SAE CAN message)
- Master warning input (physical input – pin 8)
- Park brake input (physical input – pin 5)
- Seat and seat belt status (Seat belt warning CAN message)

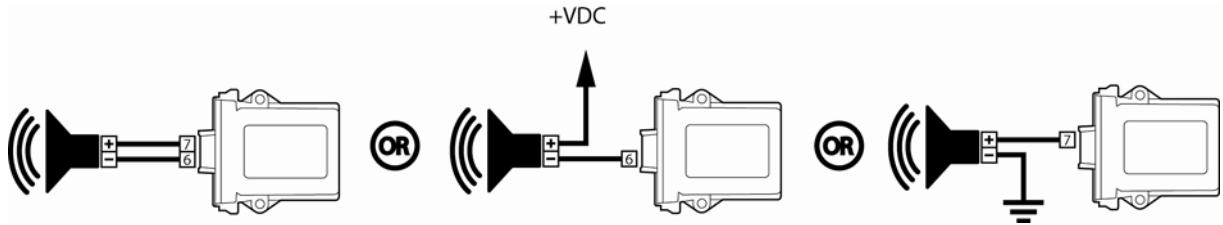


The recorded data can be retrieved by using the VDR Management Software (see section 3.1.2).

4.4.1. Alarm operation

An external alarm connected to the Vehicle Data Recorder is used to alert the vehicle operator to seat belt violations and Vehicle Data Recorder error conditions.

The VDR has two outputs for external alarm use and both are switched. Pin 7 is switched positive vehicle voltage and pin 6 is switched ground. The two outputs are activated simultaneously so any of the three alarm connection methods below may be used.



A. SEAT BELT VIOLATION ALARM

The Vehicle Data Recorder will beep the alarm at one second intervals when it receives a seat belt violation or sequence violation (see section 4.1) while the park brake input (pin 5) is turned OFF.

B. VDR ERROR CONDITION ALARM

The Vehicle Data Recorder will beep the alarm ten (10) times very quickly during a new power cycle to indicate that an internal error has been detected. The VDR will then pulse the alarm once, twice, or three times to indicate the specific error condition.

ALARM PULSES	ERROR	DESCRIPTION
1	Not receiving CAN messages.	The Seat Belt Warning CAN bus (pins 2, 11) or the Engine/Transmission CAN bus (pins 4, 9) may have a wiring problem. Use the VDR’s diagnostic LEDs to determine which bus is causing the error condition (see section 4.4.2).
2	Internal memory read/write error.	The VDR is having difficulty reading or writing from memory and may not be able to record the required NFPA data.
3	Internal clock error.	The internal real time clock is not advancing and will cause time stamped data to be inaccurate.

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4.4.2. Diagnostic LEDs

The Vehicle Data Recorder has 5 LEDs which are intended for quick diagnostic evaluation and are viewable through the amber enclosure.

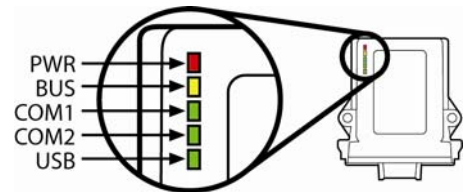
PWR – red LED is ON when the VDR module has proper voltage after the internal fuse.

BUS – yellow LED is on when the VDR module has proper voltage at the connector (pins 1, and 12 – see section 8.4).

COM1 – green LED is ON solid when CAN communication is good with the Seat Belt Warning system.

COM2 – green LED is ON solid when CAN communication is good with the engine/transmission system.

USB – green LED is ON solid when the VDR module has made a valid connection to the host computer running the VDR Management software.



The CAN communication LEDs (COM1, COM2) will flash to indicate an error.

- Slow flash (once per second) indicates that the CAN bus is good but the VDR is not receiving messages from the Seat Belt Warning system.
- Fast flash (five times per second) indicates that there is an issue with the CAN bus. Verify that terminating resistor(s) are installed, verify the connection to the CAN bus is properly connected, verify that CAN H and CAN L are not shorted together or to ground or power, etc.

4.4.3. OEM responsibility

The Vehicle Data Recorder must be properly powered and connected to the associated CAN buses to record NFPA data correctly. It is the OEM's responsibility to ensure that the VDR is connected properly and the potential for tampering is minimized.

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4.5. Seat Belt Warning input module (p/n 118093)

The Seat Belt Warning input module (p/n 118093) monitors the status of 10 seats and 10 seat belts for use in determining seat and seat belt status and transmitting the results to the Seat Belt Warning display and Vehicle Data Recorder.

The Seat Belt Warning input module transmits four ES-Key network tags based on seat and seat belt combinations that may be used within an ES-Key network database for alarm purposes.



4.5.1. Network alarm tags

The Seat Belt Warning input module is recognized as an *input module* within the ES-Key network database. The address is determined by the Seat Belt Warning input module's address jumper position (see section 3.2.3). The address is 14 when the jumper is in position 1, and 15 when the jumper is in position 2.

INPUT SPACE	CONDITION	DESCRIPTION
24	Buckled but occupant is leaning	This input is ACTIVE when a seat position was occupied and buckled correctly, but currently the seat switch is not activated.
25	Seat belt violation	This input is ACTIVE when a seat is occupied BUT the associated seat belt is NOT buckled.
26	Buckled and not occupied	This input is ACTIVE when a seat belt is buckled BUT the associated seat is not occupied.
27	Sequence violation	This input is ACTIVE when a seat belt is buckled and THEN the associated seat is occupied.

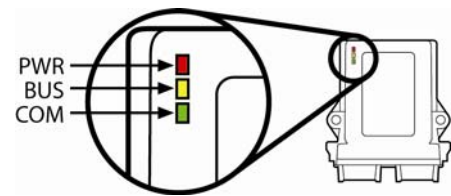
4.5.2. Diagnostic LEDs

The Seat Belt Warning input module has 3 LEDs which are intended for quick diagnostic evaluation and are viewable through the amber enclosure.

PWR – red LED is ON when the VDR module has proper voltage after the internal fuse.

BUS – yellow LED is on when the VDR module has proper voltage at the gray connector (power stud, and pin 12 – see section 8.1).

COM – green LED is ON solid when CAN communication is good with a Seat Belt Warning display.



The CAN communication LED (COM) will flash to indicate an error.

- Slow flash (once per second) indicates that the CAN bus is good but the Seat Belt Warning input module is not receiving messages from the Seat Belt Warning display.
- Fast flash (five times per second) indicates that there is a passive CAN bus communication error. Verify that terminating resistor(s) are installed, verify the connection to the CAN bus is properly connected, etc.
- Double flash (every two seconds) indicates that there is an active CAN bus communication error. Verify that CAN H and CAN L are not shorted together or to ground or power, etc.

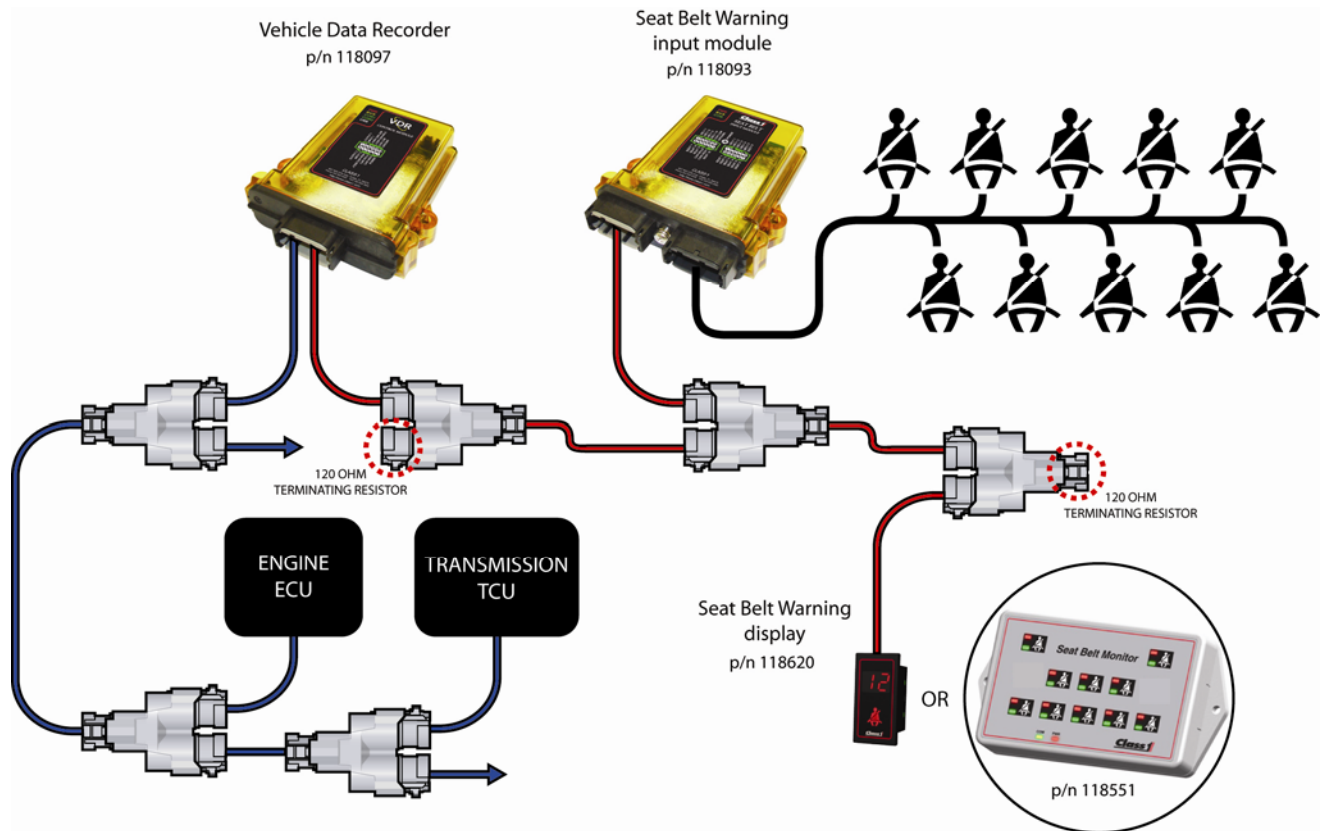
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5. Application

5.1. Typical VDR system

The illustration below shows a typical VDR system utilizing the Vehicle Data Recorder and Seat Belt Warning modules.

Not all modules are required to comprise a system. The Vehicle Data Recorder module may be omitted if only the Seat Belt Warning system is desired and vice-versa.



Note: Proper CAN bus termination is required. The seat belt warning CAN bus should have a 120 Ohm terminating resistor located at its ends (2 resistors per bus).

5.1.1. Number of seats permitted

The Seat Belt Warning Input module (p/n 118093) can support up to 10 seats. If more seats (up to 20) are required then a second Seat Belt Warning Input module must be installed and addressed correctly (see section 3.2.3).


The Seat Belt Warning display (p/n 118551) can support up to 10 seats (p/n 119375 can support up to 6 seats). If more seats (up to 20) are required then a second Seat Belt Warning display must be installed and addressed correctly (see section 3.2.3).

A single Seat Belt Warning display (p/n 118620) can support up to 20 seats.

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6. Troubleshooting

PROBLEM	LIKELY CAUSES	WHAT TO DO
Seat Belt Warning display shows warning even when associated seat isn't occupied and associated seat belt isn't buckled.	Associated seat input is active OR Associated seat belt input is active OR Associated seat input configuration switch is set incorrectly OR Associated seat belt input configuration switch is set incorrectly.	Verify seat and seat belt input configuration switch settings in the Seat Belt Warning input module (see section 3.2.1). Verify seat and seat belt input pins on Seat Belt Warning input module (p/n 118093) for proper polarity and continuity (see section 8.1). Verify proper operation of OEM seat and seat belt switches.
Seat Belt Warning display shows warning when occupant is properly seated and buckled.	Associated seat input is not active OR Associated seat belt input is not active OR Associated seat input configuration switch is set incorrectly OR Associated seat belt input configuration switch is set incorrectly OR Occupant was seated and buckled prior to power activation of the Seat Belt Warning input module (p/n 118093).	Verify seat and seat belt input configuration switch settings in the Seat Belt Warning input module (see section 3.2.1). Verify seat and seat belt input pins on Seat Belt Warning input module (p/n 118093) for proper polarity and continuity (see section 8.1). Verify proper operation of OEM seat and seat belt switches. Make certain that power is applied to the Seat Belt Warning input module (p/n 118093) prior to occupant seating.
Seat Belt Warning display does not show warning when occupant is seated while not buckled.	Associated seat input is not active OR Associated seat input configuration switch is set incorrectly.	Verify seat input configuration switch settings in the Seat Belt Warning input module (see section 3.2.1). Verify seat input pins on Seat Belt Warning input module (p/n 118093) for proper polarity and continuity (see section 8.1). Verify proper operation of OEM seat and seat belt switches.
Small Seat Belt Warning display (p/n 118620) shows incorrect seat warning.	Seat Belt Warning input module (p/n 118093) may be addressed incorrectly. When the address is incorrectly selected the displayed seat error will be either 10 +/- the actual seat. For example, if the warning should be seat 2 but seat 12 is displayed then the Seat Belt Warning input module's address is set to "2" when it should be set to "1" OR The seat input or seat belt input is connected to the wrong pin of the Seat Belt Warning input module. For example, if the warning should be seat 2 but seat 6 is displayed.	Verify the address setting in the Seat Belt Warning input module (see section 3.2.3). Verify that the correct seat/seat belt input is being used in the connector of the Seat Belt Warning input module (see section 8.1).
Small Seat Belt Warning display (p/n 118620) shows dashes and the warning icon is flashing red.	The Seat Belt Warning display is not properly connected to the CAN bus OR The Seat Belt Warning input module is not properly connected to the CAN bus or is not powered.	Verify the display's CAN connection to the CAN bus (see section 8.2). Verify that the Seat Belt Warning input module is powered and properly connected to the CAN bus (see section 8.1).

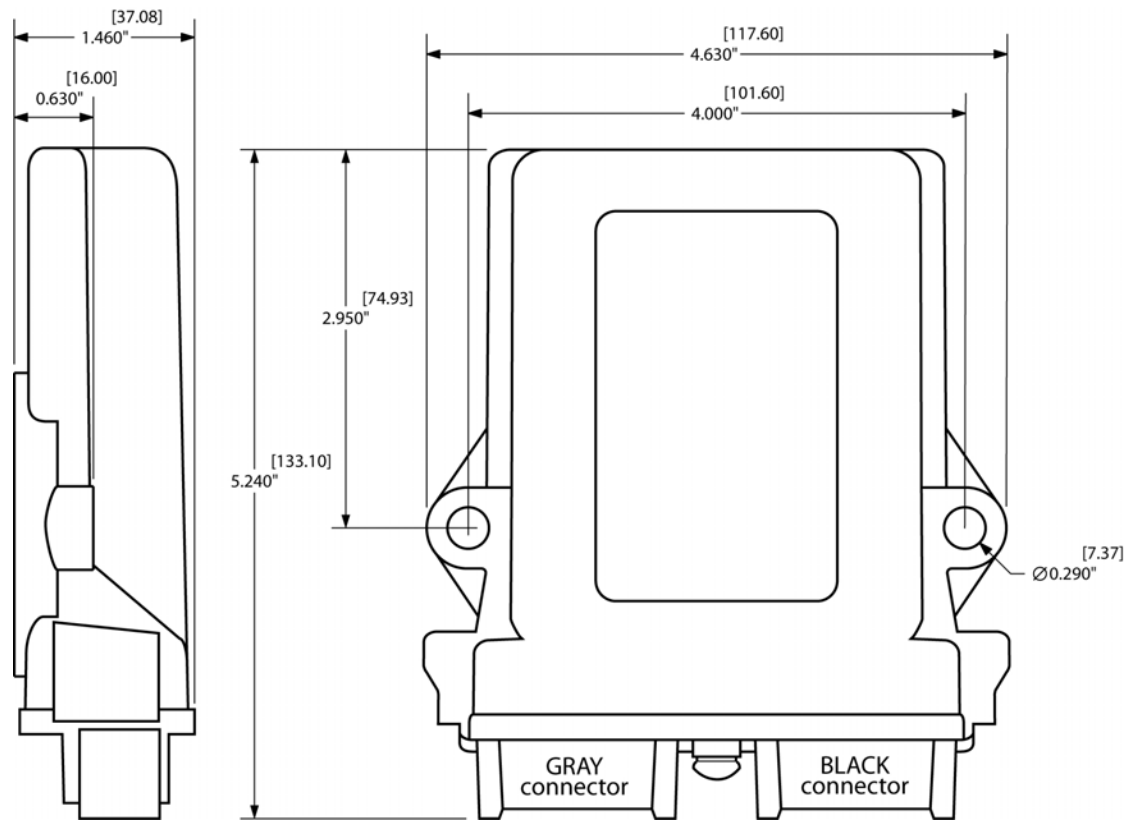
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PROBLEM	LIKELY CAUSES	WHAT TO DO
Large Seat Belt Warning display (p/n 118551, p/n 119375) does not show warnings and the green COM LED flashes.	Seat Belt Warning display is addressed incorrectly. The display's address should match that of the Seat Belt Warning input module OR The Seat Belt Warning display is not properly connected to the CAN bus OR The Seat Belt Warning input module is not properly connected to the CAN bus or is not powered.	Verify the address setting in the Seat Belt Warning display (see section 3.3.1). Verify the type of COM LED flash (see section 4.3.3) and verify the probable CAN bus error. Verify that the Seat Belt Warning input module is powered and properly connected to the CAN bus (see section 8.1).
The audible warning alarm sounds for active violations when the parking brake is applied.	The park brake input to the Vehicle Data Recorder's pin 5 is not active OR The park brake input to the Vehicle Data Recorder's pin 5 is the wrong polarity OR The OEM parking brake switch is not functioning.	Verify the continuity from the park brake switch to pin 5 of the VDR module. Verify that the input from the park brake is a ground polarity signal. Verify operation of the OEM park brake switch.
The audible warning alarm never sounds even when the Seat Belt Warning display shows active violations.	The park brake input to the Vehicle Data Recorder's pin 5 is always active. The Vehicle Data Recorder is not powered.	Verify the input to pin 5 of the VDR module is not shorted to ground. Verify operation of the OEM park brake switch. Verify that the Vehicle Data Recorder is powered. Use on board diagnostic LEDs (see section 4.4.2).
Master warning switch activations never recognized (per VDR Management software report).	The master warning input to the Vehicle Data Recorder's pin 8 is not active OR The master warning input to the Vehicle Data Recorder's pin 8 is the wrong polarity OR The OEM master warning switch is not functioning.	Verify the continuity from the master warning switch to pin 8 of the VDR module. Verify that the input from the master warning switch is a positive polarity signal of at least 70% of system voltage. For example, if the system voltage is 13.8V then the voltage to the input should be 9.6V or greater. Verify operation of the OEM master warning switch.
Master warning switch is always active (per VDR Management software report).	The master warning input to the Vehicle Data Recorder's pin 8 is always active.	Verify the input to pin 8 of the VDR module is not shorted to positive voltage. Verify operation of the OEM master warning switch.

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7. Dimensions and Installation

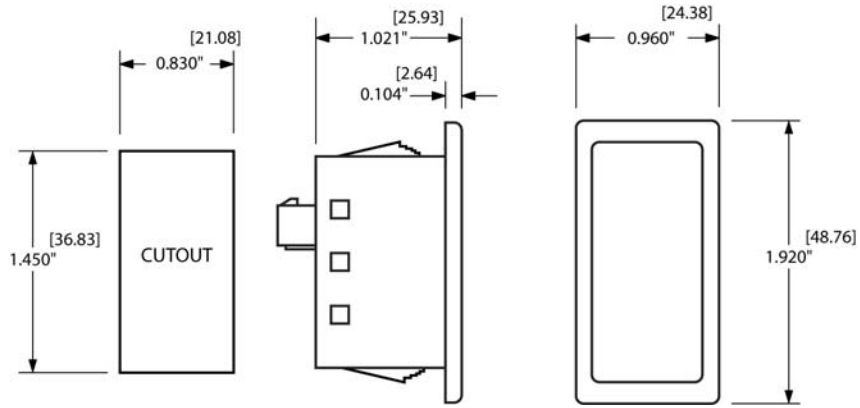
7.1. Seat Belt Warning Input Module (p/n 118093) dimensions



DIMENSIONS IN INCHES [MILLIMETERS]

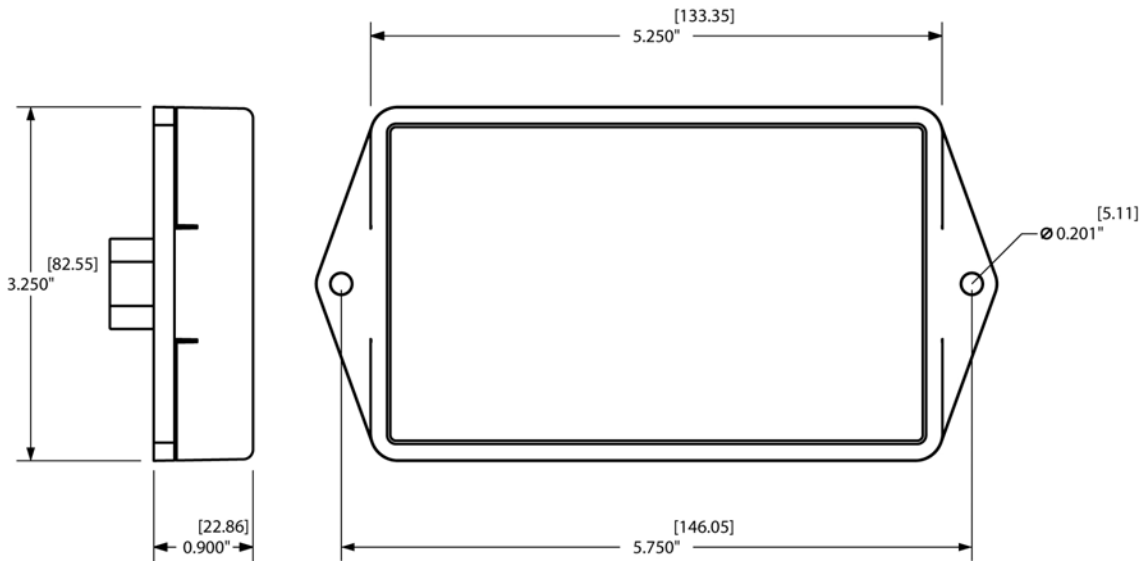
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7.2. Seat Belt Warning Display (small – p/n 118620) dimensions




DIMENSIONS IN INCHES [MILLIMETERS]

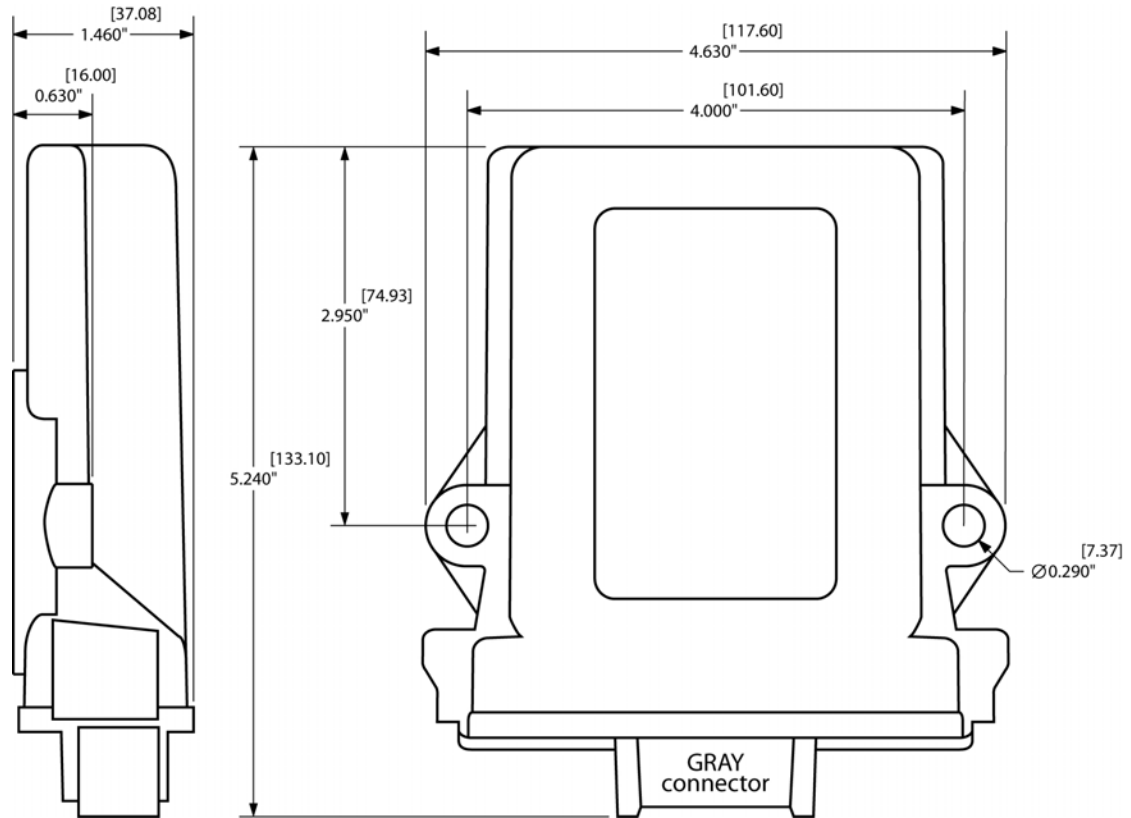
7.3. Seat Belt Warning Display (large – p/n 118551, p/n 119375) dimensions




DIMENSIONS IN INCHES [MILLIMETERS]

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7.4. Vehicle Data Recorder (p/n 118097) dimensions



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					BY	AMS

8. Connector Description

8.1. Seat Belt Warning Input module (p/n 118093)

Mating connector: Deutsch DTM06-12SA GRAY
Mating sockets: 0462-201-20141 (nickel)
 0462-201-2031 (gold) recommended for CAN
Wedge lock: W12S Recommended wire gage: 20-24 AWG

PIN	CIRCUIT	DESCRIPTION
1	SEAT 10	(INPUT) – Seat input (ground polarity)
2	CAN HIGH	(DATA) – Seatbelt CAN data, 250Kbits/s
3	CAN SHIELD	(DATA) – Seatbelt CAN data, 250Kbits /s
4	SEAT 9	(INPUT) – Seat input (ground polarity)
5	SEAT 8	(INPUT) – Seat input (ground polarity)
6	SEAT 7	(INPUT) – Seat input (ground polarity)
7	BELT 7	(INPUT) – Belt input (ground polarity)
8	BELT 8	(INPUT) – Belt input (ground polarity)
9	BELT 9	(INPUT) – Belt input (ground polarity)
10	BELT 10	(INPUT) – Belt input (ground polarity)
11	CAN LOW	(DATA) – Seatbelt CAN data, 250Kbits /s
12	SUPPLY (-)	(INPUT) – Battery ground

Recommended ring terminal: #10
Recommended wire gage: 12-18 AWG

PIN	CIRCUIT	DESCRIPTION
STUD	SUPPLY (+)	(INPUT) – Battery voltage (+9VDC...+32VDC)

Mating connector: Deutsch DTM06-12SB BLACK
Mating sockets: 0462-201-20141
Wedge lock: W12S Recommended wire gage: 20-24 AWG

PIN	CIRCUIT	DESCRIPTION
1	BELT 1	(INPUT) – Belt input (ground polarity)
2	BELT 2	(INPUT) – Belt input (ground polarity)
3	BELT 3	(INPUT) – Belt input (ground polarity)
4	BELT 4	(INPUT) – Belt input (ground polarity)
5	BELT 5	(INPUT) – Belt input (ground polarity)
6	BELT 6	(INPUT) – Belt input (ground polarity)
7	SEAT 6	(INPUT) – Seat input (ground polarity)
8	SEAT 5	(INPUT) – Seat input (ground polarity)
9	SEAT 4	(INPUT) – Seat input (ground polarity)
10	SEAT 3	(INPUT) – Seat input (ground polarity)
11	SEAT 2	(INPUT) – Seat input (ground polarity)
12	SEAT 1	(INPUT) – Seat input (ground polarity)




8.2. Seat Belt Warning display (small – p/n 118620)

Mating connector: AMP 794617-6
Mating sockets: AMP 794610-3
Recommended wire gage: 20-24 AWG

PIN	CIRCUIT	DESCRIPTION
1	SUPPLY (+)	(INPUT) – Battery voltage (+9VDC...+16VDC)
2	SUPPLY (-)	(INPUT) – Battery ground
3	----	Not used
4	CAN HIGH	(DATA) – Seatbelt CAN data, 250Kbits/s
5	CAN LOW	(DATA) – Seatbelt CAN data, 250Kbits /s
6	CAN SHIELD	(DATA) – Seatbelt CAN data, 250Kbits /s



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	PRODUCT	Vehicle Data Recorder and Seat Belt Warning system			REV	1.10
					BY	AMS

8.3. Seat Belt Warning display (large – p/n 118551, p/n 119375)

Mating connector: Deutsch DT06-6S GRAY
Mating sockets: 0462-201-16141 (nickel)
 0462-201-1631 (gold) recommended for CAN
Wedge lock: W6S Recommended wire gage: 16-20 AWG

PIN	CIRCUIT	DESCRIPTION
1	SUPPLY (+)	(INPUT) – Battery voltage (+9VDC...+32VDC)
2	SUPPLY (-)	(INPUT) – Battery ground
3	----	Not used
4	CAN HIGH	(DATA) – Seatbelt CAN data, 250Kbits/s
5	CAN LOW	(DATA) – Seatbelt CAN data, 250Kbits /s
6	CAN SHIELD	(DATA) – Seatbelt CAN data, 250Kbits /s




8.4. Vehicle Data Recorder (p/n 118097)

Mating connector: Deutsch DTM06-12SA GRAY
Mating sockets: 0462-201-20141 (nickel)
 0462-201-2031 (gold) recommended for CAN
Wedge lock: W12S Recommended wire gage: 20-24 AWG

PIN	CIRCUIT	DESCRIPTION
1	SUPPLY (+)	(INPUT) – Battery voltage (+9VDC...+32VDC)
2	CAN HIGH	(DATA) – Seatbelt CAN data, 250Kbits/s
3	CAN SHIELD	(DATA) – Seatbelt CAN data, 250Kbits /s
4	CAN HIGH	(DATA) – VDR SAE J1939 CAN, 250Kbits/s
5	INPUT 1	(INPUT) – Park Brake, ground polarity
6	OUTPUT 2	(OUTPUT) – Alarm, ground polarity (switched, 0.25A)
7	OUTPUT 1	(OUTPUT) – Alarm, positive polarity (switched, 0.25A)
8	INPUT 2	(INPUT) – Master Warn, positive polarity
9	CAN LOW	(DATA) – VDR SAE J1939 CAN, 250Kbits /s
10	CAN SHIELD	(DATA) – VDR SAE J1939 CAN, 250Kbits /s
11	CAN LOW	(DATA) – Seatbelt CAN data, 250Kbits /s
12	SUPPLY (-)	(INPUT) – Battery ground



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9. Operating Parameters

9.1. Seat Belt Warning input module (p/n 118093)


Product category	SAE J1939 CAN
Voltage range	+9VDC...+32VDC
Current draw (@ 13.8VDC)	32mA (no inputs active)
	34mA (2 inputs active)
	37mA (4 inputs active)
	40mA (6 inputs active)
	42mA (8 inputs active)
	44mA (10 inputs active)
	47mA (12 inputs active)
	50mA (14 inputs active)
	53mA (16 inputs active)
55mA (18 inputs active)	
57mA (all inputs active)	
Temperature range	-40°C...+85°C
Environmental range	IP 67
CAN specification	SAE J1939, 250 Kbits/second
Protection	Internal thermal fuse
	Reverse voltage protection (pins 1 and 12 of gray connector)
	CAN buses protected to 24V
	ESD voltage protected to SAE J1113 specification for heavy duty trucks
	Transient voltage protected to SAE J1113 specification for heavy duty trucks

9.2. Seat Belt Warning display (small – p/n 118620)

Product category	SAE J1939 CAN
Voltage range	+9VDC...+16VDC
Current draw (@ 13.8VDC)	57mA
Temperature range	-40°C...+85°C
Environmental range	IP 10
CAN specification	SAE J1939, 250 Kbits/second
Protection	Internal thermal fuse
	Reverse voltage protection (pins 1 and 2 of connector)
	CAN buses protected to 24V
	ESD voltage protected to SAE J1113 specification for heavy duty trucks

9.3. Seat Belt Warning display (large – p/n 118551, p/n 119375)

Product category	SAE J1939 CAN
Voltage range	+9VDC...+32VDC
Current draw (@ 13.8VDC)	25mA (no seat LEDs active)
	75mA (all green seat LEDs active)
Temperature range	-40°C...+85°C
Environmental range	IP 42
CAN specification	SAE J1939, 250 Kbits/second
Protection	Internal thermal fuse
	Reverse voltage protection (pins 1 and 2 of connector)
	CAN buses protected to 24V
	ESD voltage protected to SAE J1113 specification for heavy duty trucks
	Transient voltage protected to SAE J1113 specification for heavy duty trucks

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9.4. Vehicle Data Recorder (p/n 118097)

Product category	SAE J1939 CAN
Voltage range	+9VDC...+32VDC
Current draw (@ 13.8VDC)	78mA
Temperature range	-40°C...+85°C
Environmental range	IP 42
CAN specification	SAE J1939, 250 Kbits/second
Protection	Internal thermal fuse Reverse voltage protection (pins 1 and 12 of connector) CAN buses protected to 24V ESD voltage protected to SAE J1113 specification for heavy duty trucks Transient voltage protected to SAE J1113 specification for heavy duty trucks


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