PACCAR Service Manual

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2010 Multiplexed Electrical System Service Manual — CECU3 with Chassis Node



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Important Notes

The simulate function within ESA is a good diagnosis tool. Safety is a concern, so many CECU outputs are not accessible for simulation such as: cruise control, engine oil pressure, park brake switch.

Simulation of gauges is also not permitted if the engine is running.

Replacing the control unit results in the odometer being reset. Take appropriate action to record the vehicle miles prior to removing the control unit.

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CAUTION

Interrupting the communication or power supply during a control unit reflash could result in hardware damage.

ESA recognizes when a software update is required on a connected vehicle. If for some reason the user chooses not to reflash the control unit, ESA triggers a warning display. The LCD backlighting of the speedometer and outside air temperature blink for 1 minute. The warning is triggered at every key-on of the vehicle until the required update is performed. This is to alert the operator or other technicians that a vehicle reflash is required.

ESA automatically identifies what version of control unit it is connected to, and only permits software downloads that are applicable for that control unit.

Check the program menu to see if an inoperative feature is disabled. This is very important when diagnosing an inoperative gauge on a CECU equipped vehicle. The gauge may simply have been previously disabled.

Instrumentation Service Information

describing how to remove, disassemble, and reinstall instrumentation components is located on ServiceNet. Before attempting any instrumentation repairs, the technician should have a complete understanding of the procedures described in ServiceNet.

This manual contains service manual information covering vehicles equipped with software version "CECU3 with Chassis Node" (P30-1009). For vehicles with prior CECU software versions (such as: ICU (P30-1003), CECU/CECU2 (P30-1002), and CECU3 (P30-1008)) refer to a separate publication (PM819010/KM815054).

When replacing a chassis node, disconnect the batteries and do not reconnect them until node installation and all wiring connections are complete. A new chassis node and the CECU need to be powered up simultaneously during the node's first power cycle; otherwise a fault on the Multi-Function Display (Kenworth) or Driver Information Display (Peterbilt) will indicate that the CECU is not recognizing the proper communication with the chassis node.

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Electronic Service Analyst (ESA)

ESA History

Multiplexed instrumentation was introduced in 2005. This method of communication, using a single wire to transmit multiple signals to many components, has dramatically reduced the size and complexity of the wiring bundle behind the dash panel.

While some traditional diagnostic and troubleshooting methods apply to multiplexed instruments, other methods do not. Professional service technicians needed a new diagnostic software program to make troubleshooting easier and more efficient. The program is called Electronic Service Analyst (ESA). It does not replace basic electrical system troubleshooting skills; it supplements them.

ESA is flexible and allows the technician to use his own experience and expertise to help find and fix the problem. The technician reviews fault codes stored in the components, verifies whether the instrumentation is working properly, and diagnoses the root cause of the problem using troubleshooting information found in ServiceNet.

Once the software is installed on a personal computer, it's easy to use. It's available in English, Spanish, and Canadian French. Much like existing PC-based service applications, this analytic program communicates over a wireless data link adapter (DLA) to the multiplexed components. A USB Link to data link adapter is used for easy ESA connection and communication.

ESA 3 is the latest revision/update to the troubleshooting software. As more features are added to take advantage of multiplexing, ESA needs to grow in order to continue to support the technician.

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NOTE

At the time of publication "ESA 3.1" was the latest released version of the Electronic Service Analyst. If there are subsequent releases of ESA (version 3.2, 3.3, 4.0, etc.), ESA will automatically update to the most recent version.

CECU3 Multiplexing Overview

This manual provides service information covering trucks equipped with the multiplexed instrumentation system. Before attempting to make service repairs, the technician should be knowledgeable about the system design, components, operation and troubleshooting procedures for diagnosing multiplexed instrumentation problems.

How communication works in a multiplex system: Each major subsystem in the truck's electrical system is operated by a control module that sends and receives data to and from a central hub computer. The subsystem control modules are referred to as nodes. The central hub computer is called the CECU (Cab Electronic Control Unit). Since we're into the third generation now, we sometimes call it CECU3.

The CECU receives data related to controlling the various devices of the electrical system. It then makes decisions based on that input and sends information to each of the subsystem system control modules (nodes) about what that node should do with the components it controls.

In this new generation, the CECU will, as before, control most of the instrumentation and interior lighting. Additionally it will now control exterior lighting, turn stalk, and wipers functions. The node that receives information from the CECU to control the exterior lighting, turn stalk, and wipers functions is called the chassis node.

Models–Build Dates

Identifying which control unit is in the vehicle helps determine what features are present and also aids in troubleshooting.

Control			Madala	Engine Emissions	Production Built
Unit	Hardware Part Number	Software version	Models	Level	Dates
ICU	Q21-1029-X-XXX	P30-1003-XXX	PB: 357, 378, 379, 385, 386	1998, 2004	2005 - present
			KW: C500, T600, T800, W900,		
			Off-Highway		
CECU / CECU2	Q21-1055-X-XXX /	P30-1002-XXX	PB: 365, 367, 384, 386, 388, 389	2007	2007 - present
	Q21-1075-X-XXX		KW: C500, T440/T470, T660,		
			T800, W900, Off-Highway		
			PB: 387		2008 - present
			KW : T2000		
			PB: 325, 330, 335, 340		2009 - present
CECU3	Q21-1076-X-XXX	P30-1008-XXX	PB: 325, 330, 337, 348, 387	2010	2010 - present
			KW: T170, T270, T370, T700		
CECU3 with	Q21-1076-X-XXX with	P30-1009-XXX	PB: 365, 367, 384, 386, 388, 389	2010	2010 - present
Chassis Node	Q21-1077-X-XXX		KW: C500, T440/T470, T660,		
			T800, W900, Off-Highway		

İ NOTE					
This manual contains service manual					
information covering vehicles equipped with					
software version "CECU3 with Chassis Node"					
(P30-1009). For vehicles with prior CECU					
software versions (such as: ICU (P30-1003),					
CECU/CECU2 (P30-1002), and CECU3					
(P30-1008)) refer to a separate publication					
(PM819010/KM815054).					

Control Unit Identification

Control unit identification can be made using a few methods:

- Searching using the Electronic Catalog (ECAT)
- Connecting using the Electronic Service Analyst (ESA)
- Menu Control Switch (MCS), only available with Multi-Function Display.

Using ECAT or ESA are the easiest and most exact ways of determining the type of control unit in the truck.

Electronic Catalog (ECAT) Identification

ECAT provides a parts list "as built" and Bill of Materials information for each specific truck. The catalog is searchable, and contains the part number and identification of the trucks instrument panel control unit.

- ICU Part Number Q21-1029-X-XXX
- CECU Part Number Q21-1055-X-XXX
- CECU2 Part Number Q21-1075-X-XXX
- CECU3 Part Number Q21-1076-X-XXX
- Chassis Node Part Number Q21-1077-X-XXX

The blank digits (denoted by "X") in the above part numbers represent:

- "-X" is the hardware revision.
- "-XXX" is the software boot loader version.

Electronic Service Analyst (ESA) Identification

Connecting using ESA brings up a control unit information window. In this window, the sixth line item is the Control Unit Type and identifies whether the truck has an ICU or CECU. It also details the variant of the CECU.



Line item ten of this Control Unit Information window displays the current Vehicle Software Version. This details the current CECU software and programming date that is presently installed on the vehicle.



Upon connection, ESA recognizes if a software update has been issued for the control unit within the connected vehicle. If an update is required, ESA prompts the technician to perform the update operation.

MCS Identification

For vehicles equipped with the Multi-Function Display, control unit identification is possible via the Menu Control Switch (MCS). Using the MCS knob, select the "Truck Information" menu. Use this menu to look up the "CECU SW Ver." Software version P30-1002-XXX can denote either a CECU or CECU2.

- ICU Software P30-1003-XXX
- CECU Software P30-1002-XXX
- CECU2 Software P30-1002-XXX
- CECU3 Software P30-1008-XXX
- CECU3 with Chassis Node Software P30-1009-XXX

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Exploded View

Control Unit Location 3 - 2

Control Unit Location

CECU Locations

The heart of the multiplexed instrumentation system is the CECU. For Peterbilt vehicles, the

Typical CECU Locations

CECU is located behind the center of the dash, near the radio. For Kenworth vehicles, the CECU is located behind the center console.



Chassis Node Locations

For Kenworth models with a daycab, the chassis node is located below the driver side door.

Kenworth Daycab Chassis Node Location



For Kenworth models with a aerocab, the chassis node is located under the rear sleeper sill.

Kenworth Aerocab Chassis Node Location



For Kenworth models with an aerocab with crossover exhaust, the chassis node is located on the underbell crossmember.

Kenworth Aerocab with Crossover Exhaust Chassis Node Location



For Peterbilt models, the chassis node is located behind the transmission and is mounted between the frame rails.

Peterbilt Chassis Node Location



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Electronic Service Analyst (ESA)

What is ESA?

Multiplexed instrumentation was introduced in 2005. This method of communication, using a single wire to transmit multiple signals to many components, has dramatically reduced the size and complexity of the wiring bundle behind the dash panel.

While some traditional diagnostic and troubleshooting methods apply to multiplexed instruments, other methods do not. Professional service technicians needed a new diagnostic software program to make troubleshooting easier and more efficient. The program is called Electronic Service Analyst (ESA). It does not replace basic electrical system troubleshooting skills; it supplements them.

ESA is flexible and allows the technician to use his own experience and expertise to help find and fix the problem. The technician reviews fault codes stored in the components, verifies whether the instrumentation is working properly, and diagnoses the root cause of the problem using troubleshooting information found in ServiceNet.

Once the software is installed on a personal computer, it's easy to use. It's available in English, Spanish, and Canadian French. Much like existing PC-based service applications, this analytic program communicates over a data link adapter (DLA) to the multiplexed components. A USB Link to data link adapter is used for ESA connection and communication and is compatible for use with all control units.



ESA is a must-have diagnostic tool for dealerships to troubleshoot the new instrumentation. ESA eliminates much of the time consuming guesswork in some hard to diagnose cases, and significantly reduces unnecessary gauge replacement.

Why ESA?

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ESA 3 is the latest revision/update to the troubleshooting software. As more features are added to take advantage of multiplexing, ESA needs to grow in order to continue to support the technician.

NOTE

At the time of publication "ESA 3.1" was the latest released version of the Electronic Service Analyst. If there are subsequent releases of ESA (version 3.2, 3.3, 4.0, etc.), ESA will automatically update to the most recent version.

As version 3 is simply an update to the ESA software, many of the functions, navigation and screen images look and feel just as before.

This ESA update includes diagnostic coverage of new features available with the Cab Electronic Control Unit (CECU), as well as several enhancements to the program itself.

Keep in mind; although the program and software contain many new improvements, the type of control unit that is in the truck determines some of the ESA features and procedures.

CECU and ESA 3 Highlights

- Manufacturer selection available
- Five Data Link Adapter (DLA) selections
- Storage and display of up to 50 Diagnostic Trouble Codes (DTCs)
- Components grouped by type to help find what you are looking for
- · Monitor capabilities expanded
- Selective simulation permitted while module software is active
- Many new features/parameters available in the program menu
- Available backup utility to save vehicle parameters
- · Out-of-date software warning
- Diagnostics, monitoring, and simulating of most exterior lighting
- Diagnostics, monitoring, and simulating of windshield wiper and washer Pump
- Addition of Nexiq USB Link to Data Link
 Adapter selections
- · Simplified flashing menu
- · Faster software flashing times
- Can choose between compatible software versions for a particular control unit
- As-Built control unit parameters can be retrieved from ECAT (ePortal access required)
- Print preview function allows printing from most screens
- Monitoring and logging of J1939 data bus

New Features of ESA 3

This section gives a brief overview of the many enhancements made to ESA.

New Features

Most of the important additions are highlighted here. Refer to ServiceNet for ESA information and resources.

Connecting ESA

Connecting with ESA has not changed, simply connect the vehicle using the DLA and the connectors included in the ESA kit and click on the connect icon.



Once the connection is established a revised Control Unit Information pop-up window automatically appears on screen. This is to greet the user with important criteria that will help in continuing to troubleshoot a vehicle. Information such as:

- Chassis number
- Vehicle Identification Number (VIN)
- Unit of measure of the cluster
- Type of control unit
- Data bus ESA is using to connect to the Control Unit
- When the module was last flashed
- What version of software is currently loaded onto the module

Control Unit Information		
Control Unit Informatio	n - EMULATION MODE	Print Preview
Chassis Number	CECU 3 Emulator	
Vehicle Identification Number	000000000000003	
Division	Kenworth	
Unit of Measure	English	
Cluster Model	Cluster Assembly	
Control Unit Type	Cab Electronic Control Unit 3	
Data Bus	Diagnostic CAN	
Hardware Version	A2C53335934	
Flash Loader Version	04.15.2009.10.43.02	
Vehicle Software Version	P30-1009-003	
Programming Date	2009.02.09	

Navigating ESA

The navigation icons are located at the top of the ESA screen. Selecting an icon activates that portion of the program.



The icons are:

- Connect/Disconnect: starts and stops communications with the truck via the DLA.
- Diagnose: read, review and monitor fault codes.
- Monitor: watch activity of inputs to the CECU.
- Simulate: limited activation of CECU outputs.
- Program: disable/enable components of the CECU.

Diagnose - New Features



50 Stored Codes

The Diagnosis screen now has the ability to store and display up to 50 Diagnostic Trouble Codes (DTCs) for the CECU.

Details

There is a Details columns for CECU diagnosis. Details are recorded at the first instance of the DTC. For example, if the DTC has been recorded twice, the count displays 2. The information in the details screen is also captured when that DTC was first recorded.

Selecting the magnifying glass in the details column for a DTC brings up a pop-up screen that provides the following freeze-frame information:

Most Recent Fault Freeze Frame Hours: 120		
Data Bit	Value	Units
Engine RPM	0	RPM
Vehicle Speed	0	km/h
Battery Voltage	11.198	V
Outside Air Temperature	-66	°C
Coolant Temperature	10	°C
Fault Description		
This DTC will be recorded when the control un at the outside air temperature sensor input. So causes for this are a broken wire, corroded or	nit sees an ome possib disconnec	open le ted

- Engine RPM
- Vehicle Speed
- Battery Voltage
- Outside Air Temp
- Coolant Temp

The same criteria are recorded for every DTC first occurrence. Some of the information may not relate to your specific DTC. As seen in the example there is a very abnormal reading for the outside air temperature, which is understandable since the DTC is dealing with a fault on that circuit.

The details screen also provides a brief description of the fault along with some possible cause suggestions.

Clearing DTCs

For CECU equipped vehicles, selecting "Clear DTCs" removes all non-active faults and instantly displays only active codes.

Service Manual Link

When ESA is updated, the service manual for the Multiplexed Electrical System is also downloaded to the computer that has ESA installed. The service manual is accessed through the Help menu link at the top of every screen.



If there are any service manual revisions available, they will automatically be updated in ESA when you are prompted to check for ESA updates (approximately every 45 days). The service manual is where to find a complete DTC list along with troubleshooting charts to help the technician diagnose problems.

Monitor - New Features

To allow more viewing area when monitoring multiple components, there are auto-hide pin icons for reducing some of the sub-windows on the monitor screen. When selected to auto-hide, the sub-window reduces to a tab on the left side of the monitor screen. Simply place the cursor over the tab to bring the sub-window back up for further selection.

EXA - EMULATION MODE - [Monitoring Components] Ele Tools Optons Window Help	_ 6 ×
ELESA 🔊 Disconnect	Monitor Simulate Program
Consideration Consi	Monitor EMUL Print Preview Close
Monitor Data View	

To make it easier to navigate to desired features, similar components have been grouped into a menu tree structure.

Monitoring shows a representation of what the control unit sees as input signals. Comparing what the unit sees to what the actual component (gauge, telltale, etc.) is doing helps determine if there is a problem.

The enhancements made to the CECU increased the amount of monitored components using ESA.

	ICU	CECU
Gauges	28	38
Telltales	26	58
Editable telltales	0	9
Switches	0	19
Alarm	0	7
LCD	0	4
Knob (driver information display)	0	1

Monitoring Data Bus

With ESA 3 the user is now able to monitor the vehicle data bus. Select the data bus group to be monitored. A table will open that shows all Control Units communicating on the bus. If a control unit stops communicating during the monitoring session, the status will change from Active to Inactive. If needed, the user also has the capability to record messages on the data bus to be sent to your service manager for further analysis.

	Monitor	Print Previe	w	Close		
Vehi	icle CAN					
D	escription 🔺	Status	^			
Bra	akes - System Controller	Inactive	E			
Ca	ab Controller - Primary	Active				
En	ngine #1	Active	~			
<	III III	>				
You	are now recording to a log file.					
CLOG	00:02:31	:156				
	View Logs					
	Close					

Simulate - New Features

As with the monitor screen, to allow more viewing area when simulating components, there are auto-hide pin icons for reducing some of the sub-windows. When selected to auto-hide, the sub-window reduces to a tab on the left side of the screen. Simply place the cursor over the tab to bring the sub-window back up for further selection.



To make it easier to navigate to desired features, similar components have been grouped into a menu tree structure.

💀 Ele Tools Options	<u>Window</u> Help
ESA Electronic Service Analyst	Disconnect 💟 Diagnose 🔊 Monitor 🥸 Si
External Applications 🕴 🖗	Monitor/Simulate Components P
🟠 ESA Home	Filters ▼ Open Filter
ServiceNet	Delete Filter Save Filter
	Onit of Measure ⊙ Standard O Metric
	Expand All Collapse All Close All
	Cluster Electrical Backup Alarm Windshield Washer Pump Windshield Wiper Exterior Lighting Driving Or Fog Lamps Left High Beam Headlamps Left Turn Rear/Stop Left Turn Side Marker Lamps Right Hub Beam Headlamp Right Trailer Turn Lamps Right Turn Rear/Stop Right Turn Front Right Turn Front Right Turn Rear/Stop Right Turn Side Secondary Fog Lamps # Gauges

Individual Output Simulation

Simulation performed with an ICU would basically shutdown the unit software so outputs could be simulated without being influenced by the other operations of the ICU. Now, with the CECU, individual outputs may be simulated while the control unit software is active. While this allows greater flexibility there is much that cannot and should not be simulated while a vehicle is operational. For instance, as a safety precaution, gauge simulation will not be permitted if there is engine rpm.

Safety Issues

While the simulate function is a good diagnosis tool, safety is a concern, so many CECU outputs are not accessible for simulation such as: cruise control, engine oil pressure, park brake switch.

Program - New Features

Similar components have been grouped into tabs to make finding your choice easier.

Chassis Number			
00002		Unlock Parameters	Program
Dash Lighting Display Drivetrain Lighting Optional Gauge Standard Gauge Telltale			
Description ^	Locked	Value	Group
ABS installed		Disabled	 Drivetrain
Aftertreatment Regeneration Function		Disabled	 Drivetrain
Aftertreatment Regeneration Switch		Disabled	 Drivetrain
Air Filter Restriction Gauge Installed		Disabled	 Optional Gauge
Alarm Clock Available		Disabled	≺ Display
Allison Transmission Temperature Gauge Installed		Disabled Enabled	Coptional Gauge

Parameters

There were 14 parameters for the ICU. Parameters are like part numbers that tell the control unit what features are on the vehicle and hence what inputs/outputs need activated.

With the CECU3, the available parameters have grown to around 130. Some parameters are restricted or locked to ensure proper activation.

Disable Components Now Means No Function

With the ICU, disabling a component would turn off the diagnostics but not remove the component from operation. An ICU disabled gauge still functions, but is prevented from detecting problems and triggering DTCs.

Now with the CECU, disabling really means disabled. A disabled gauge will not function. It is removed from all signal transmissions in order to allow the other features faster communication. This is very important when diagnosing a component that is inoperative. It may simply have been previously disabled.

NOTE

Check the program menu to see if an inoperative feature is disabled.

Flash - New Features

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It may be necessary to reflash a control unit for the following:

- Replacing a control unit.
- Updating the software of a control unit.
- Obtaining additional features when available.

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NOTE

Replacing the control unit results in the odometer being reset. Take appropriate action to record the vehicle miles prior to removing the control unit.

Reflashing takes approximately only 6 minutes over the K-line if using the USB Link adapter. The control unit must stay connected and power to the unit must be maintained throughout the flashing process.

\triangle	CAUTION
Interru	pting the communication or power supply
could r	esult in hardware damage to the unit.

K-Line was the communication bus used for diagnostics on vehicles with: ICU software (P30-1003-XXX), CECU/CECU2 software (P30-1002-XXX), or CECU3 Software (P30-1008-XXX). Moving forward, vehicles containing "CECU3 with Chassis Node" software (P30-1009-XXX), the K-Line has been replaced with the D-CAN communication bus. Basically the only difference the technician will notice is a faster reflash time.



Compatible Software

When initiating the flashing process, the technician is required to select the appropriate software version to program into the control unit. Only compatible software versions for the vehicle unit that is connected will present in the selection menu.

Select Ve	ehicle Software Version	2	K
	Select Vehicle Software Version		
	Select an available software version below and click 'Flash' to continue.		
	Currently installed version:	P30-1009-003	
	Part Number	Release Date	٦
	P30-1009-003	6/16/2009	
			1
	View Release Notes	Flash Cancel	

Details on the differences between available software versions are available through the View Release Notes button at the bottom of the Select Vehicle Software screen.

Backup Parameters

Flashing a control unit or replacing a control unit involves backing up the stored parameters of the unit. The backup saves an encrypted file onto the connected PC that is used to reload all the parameters of the control unit. These are the parameters that are enabled/disabled through the program menu. This ensures that your chassis number retains all the previously programmed functions.

Retrieving Parameters

ESA 3 has the capability to retrieve the parameter configuration from ECAT that was on the vehicle when issued from the factory. This may aid in restoring parameters in instances such as replacing a non responsive control unit. The technician must still verify the parameters are correct for any settings modified after the vehicle leaves the factory.

The as-built parameter sets can be retrieved from ECAT through the Tools drop down menu. It may also be presented as an option when flashing a blank unit or when parameters cannot be retrieved from a unit.



After selecting "Retrieve Parameters from ECAT", the user needs to enter the chassis number or numbers for the desired parameter sets to be downloaded.

🖬 ESA - [Control Unit Information]				
🤁 File Tools Options Window Help				. 8 ×
ESA 🔊 Disconnect	Diagnose	Monitor	Simulate	Program
Esa Hame	t Informatio	n		Print Preview
Chassis Number		266952		
Vehicle Identificat	ion Number	266952		
Division		Kenworth		
Unit of Measure	Rotriovo Paramot	ers from ECAT		
Cluster Model	Net fere Paramet	ers mon Loan		
Control Unit Type	Retaieve the ECAT	parameters from the PACCAR network	Jnit 3	
Data Bus	Chassis Number(s)			
Hardware Version				
Flash Loader Vers	Single: 123456 Multicle: 123456	74321 123654		
Vehicle Software	Range: 123456-123	458		
Programming Date	6			
Connected				

At this time, the user is required to log into ServiceNet with a valid ePortal account.



Once the login is verified, ESA will download the designated parameter sets and inform the user when the transfer is complete.



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The downloaded files are stored in a secure format that prohibits tampering. ESA also prevents any user from loading parameters sets designated for one chassis number into a control unit that is assigned to another chassis number.

To restore parameters from the downloaded parameter set, the user must Initiate a Flashing from the Tools drop down menu and select Restore Parameters.



Finally, the user needs to designate the source of the parameter set to be restored.



Out-of-Date Software Warning

Let's say an update has been issued for the CECU software and a truck is connected to ESA for some troubleshooting purpose. ESA recognizes that there is a software update required and prompts the technician to perform the operation. If for some reason the user chooses not to reflash the control unit, maybe there isn't sufficient time to perform an update or maybe the Data Link Adapter isn't immediately available, ESA triggers a warning display in the vehicle. This warning blinks the LCD backlighting of the speedometer and outside air temperature for 1 minute. The warning is triggered at every key-on of the vehicle until the required update is performed. This is to alert the operator or other technicians that a vehicle reflash is required.

Administration - New Features



There are a few improvements made to the administration form that is found under the Tools pull down menu at the top of the ESA screen.

First off, any changes now performed in the administration form automatically update as soon as the user selects Apply or OK on the administration window. It is no longer necessary to shut down and restart the program to initiate administration changes. A couple of highlight improvements involve selections under the Manufacturer and Data Link Adapter (DLA) options.

General	License and Password	External Applications Release License Internal
File Se	rver:	
Auto D	etect Proxy:	Days to Keep Session Log: 30
Proxy	Settings:	http://www.proxy.na.paccar.com:8080/
Langua	ige:	English - United States
Manufa	acturer:	No Division
DLA:		CECU 3 Emulator
Data B	us Logging:	CECU Emulator CECU 3 Emulator ICU Emulator
		NEXIQ USB-Link NEXIQ Bluetooth USB-Link NEXIQ ISO Link NEXIQ Wireless
		Samtec

The manufacturer selection allows ESA presentation as either a Kenworth or Peterbilt dealer.

Administration Form	×
General License and Password	External Applications Release License
File Server:	
Auto Detect Proxy:	✓ Days to Keep Session Log: 30 30
Proxy Settings:	http://www.proxy.na.paccar.com:8080/
Language:	English - United States 👻
Manufacturer:	Kenworth
DLA:	No Division Kenworth
Protocol:	Peterbilt Reyword Protocol 2000
	OK Cancel Apply

General Information

Service Resources

Service Manual Update

If there are any service manual revisions available, they will automatically be updated in ESA when you are prompted to check for ESA updates (approximately every 45 days). The service manual is accessed through the Help menu link at the top of every screen. The service manual is where to find a complete DTC list along with troubleshooting charts to help the technician diagnose problems.



Instrumentation Service Information

describing how to remove, disassemble, and reinstall instrumentation components is located on ServiceNet. Before attempting any instrumentation repairs, the technician should have a complete understanding of the procedures described in ServiceNet.

Disabled Gauges

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With the CECU, disabling a component turns the component off completely. The disabled component is removed from all signal transmissions in order to allow the other features on the vehicle faster communication. A disabled gauge will not function or communicate with the control unit.

NOTE	
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Check the program menu to see if an inoperative feature is disabled. This is very important when diagnosing an inoperative gauge on a CECU equipped vehicle. The gauge may simply have been previously disabled.

When a service technician installs an optional gauge in the multiplexed instrumentation system, the newly installed gauge will initially be disabled. Because the gauge is not factory-installed, the technician must program the CECU to monitor it. Until the CECU is programmed, the link between the CECU and the gauge is termed "disabled" – that is, the CECU is prevented from detecting problems, and also from logging and displaying diagnostic trouble codes (DTCs).

To program the CECU and enable gauges, select "Program". If the gauge value is "Disable", change it to "Enable".

10	III Chassis Parameters					
с	hassis	Parameters	Program Setting	ß		
	ID	Name	Range	Value		
۶.	0	Ammeter - Generate DTC	Enable/Disable	Disable		
	1	Auxiliary Transmission Oil Temp - Gen	Enable/Disable	Disable		
	2	Brake saver oil temp - Generate DTC	Enable/Disable	Disable		
	3	Center Axle Temp - Generate DTC	Enable/Disable	Disable		
C	4	Exhaust Temp - Generate DTC	Enable/Disable	Enable		
	5	Front Axle Temp - Generate DTC	Enable/Disable	Disable		
	6	Fuel Filter - Generate DTC	Enable/Disable	Disable		
	7	General Oil Temp - Generate DTC	Enable/Disable	Disable		
				and the second s		

Once the CECU is programmed and the link to the gauge is "enabled", the CECU monitors it, diagnoses problems like "shorts" and "opens", logs DTCs for troubleshooting, and displays the DTCs on ESA's "Diagnose" screen.

Communication Diagrams

The following diagram provides an example of the communication lines and signal paths of a typical multiplexed vehicle. Determining the correct communication lines that provide a signal to the

CECU and where these circuits interconnect, help pinpoint possible trouble areas. Sometimes these connections become loose, have bent or misaligned pins, and visually inspecting them may help identify why other electrical problems may be occurring.

Communication Interface Diagram



CECU Details

The heart of the multiplexed instrumentation system is the CECU. See Control Unit Locations for illustrations depicting the physical position of the control unit.

The CECU receives data related to controlling the various devices of the electrical system. It then makes decisions based on that input and sends information to subsystem system control modules (nodes) about what that node should do with the components it controls.

CECU Connector Identification

There are 5 electrical connectors that plug into the CECU.

- Connector A 9 pins
- Connector B 24 pins
- Connector C 52 pins
- Connector D 40 pins
- Connector E 9 pins

For an illustration of the side view of a CECU showing where the harness connectors attach into the control unit, see CECU Figure. This figure identifies connector position on the control unit as well as individual connector pin locations.

CECU



For connector face views at the harness connectors that plug into the CECU, see CECU Connector Face Views Figure. These connectors all branch from the instrument panel harness that routes behind the dash.

CECU Connector Face Views



CECU Comparison Chart - (Pinout)

Conn Pin Number		Circuit Function
А	1	CVSG power
	2	Power - battery
	3	Cab dome lamp
	4	Menu control switch power
	5	Ground
	6	Menu control switch ground
	7	Dash/panel illumination
	8	Auxiliary backlighting
	9	Power - battery
В	1	Menu control switch encode A
	2	Menu control switch encode B
	3	Menu control switch enter
	4	Courtesy lights - right door jamb switch
	5	Ignition input (Start)
	6	Dome lamp input
	7	Seat belt telltale
	8	Cruise set
	9	Cruise resume
	10	Back-up alarm mute
	11	Retarder select 1
	12	Retarder select 2
	13	Clutch switch
	14	Headlamps active
	15	PTO set
	16	PTO resume
	17	Engine fan override
	18	Regen enable
	19	Inhibit regen
	20	ABS off road
	21	Marker lamp (Tractor)
	22	LVD input
	23	Transfer Case Engaged
	24	Spare digital input

Conn	Pin Number	Circuit Function
С	1	Power supply +5V sensors
	2	Analog return
	3	PTO oil temp
	3	Spare analog input
	4	K-line
	5	Dimmer input
	6	Air pressure transducer - primary
	7	Air pressure transducer - secondary
	8	Air pressure transducer - application
	9	Spare analog input
	10	Air filter restriction
	11	Spare analog input
	12	Spare analog input
	13	Spare analog input
	14	CVSG data
	15	CVSG return
	16	Outside air temperature
	17	Spare analog input
	18	Spare analog input
	19	Spare analog input
	20	Spare analog input
	21	Transmission oil temperature - main
	22	Spare analog input
	23	Pyrometer
	24	Brakesaver oil temperature
	25	Analog return
	26	Spare analog input
	27	Remote throttle signal
	28	Spare analog input
	29	Spare analog input
	30	Spare analog input
	31	Wiper resistor ladder
	32	Turn signal resistor ladder
	33	LVD battery voltage
	34	Spare digital input
	35	C-CAN ground
	36	
	37	
	38	
	39	P OAN high
	40	
	41	D-CAN low
	42	D-CAN ground
	43	B-CAN high
	44	B-CAN dround
	40	B-CAN ground
	40	
	<u></u> <u>48</u>	
	40 40	Marker Jamp (Trailer)
	50	Fuel Level Sender Select
	51	Headlamp flash
	52	Headlamp high/low
	52	

Conn	Pin Number	Circuit Function
D	1	Power - ignition
	2	Courtesy lights - left door jamb switch
	3	Power - accessory
	4	Hazard
	5	Brake switch
	6	Spare digital input
	7	Park brake active
	8	Fog lamps
	9	HVAC On Switch
	10	Cruise on/off
	11	Interaxle lock telltale
	12	Fifth wheel lock telltale
	13	Tractor ABS telltale
	14	Trailer ABS telltale
	15	Check engine telltale
	16	Stop engine telltale
	17	Windshield wiper (fast)
	18	Secondary fog lamps
	19	Editable telltale 1
		See editable telltale table
	20	Editable telltale 2
		See editable telltale table
	21	Editable telltale 3
	21	
	22	
		See editable telltale table
	23	Spare relay chassis control
	24	Editable telltale 6
		See editable telltale table
	25	Editable telltale 7
		See editable telltale table
	26	Editable telltale 8
		See editable telltale table
	27	Editable telltale 9
	-	See editable telltale table
	20	
	20 20	Dash buzzer 18
	29 30	Dash buzzer 10
	30	Dash buzzer 2
	30	
	32	
	24	
	25	
	30	
	27	
	30 20	
	ა ბ აი	
	39	
	40	v-CAN IOW terminated

Conn	Pin Number	Circuit Function
Ш	1	Idle timer relay
	2	Windshield wiper relay
	3	Ignition relay (Start)
	4	Clearance lamp
	5	Ground
	6	LVD Bus 1
	7	LVD Bus 2
	8	Spare relay output
	9	Spare relay output

5

Editable Telltale Application

Editable Telltale Location	KW Cluster	PB Cluster
Editable Telltale 1	Position 4	Position 2
Editable Telltale 2	Position 7	Position 3
Editable Telltale 3	Position 8	Position 4
Editable Telltale 4	Position 9	Position 5
Editable Telltale 5	n/a	n/a
Editable Telltale 6	Position 12	Position 8
Editable Telltale 7	Position 13	n/a
Editable Telltale 8	Position 14	n/a
Editable Telltale 9	Position 16	n/a

See Cluster Components for illustration of possible telltale locations.

Chassis Node Details

The node that receives information from the CECU to control the exterior lighting and wipers functions is called the chassis node. The chassis node serves as a bidirectional conduit for both information and control.

Several sensors that in Multiplex Electrical version 1 and 2 were connected to the CECU (ICU for version 1) are now connected to the chassis node. These include:

- Ammeter
- Auxiliary Transmission Oil Temperature
- Axle Temperature, Rear
- Axle Temperature, Front
- Axle Temperature, Center / Steer
- Back Up Switch
- General Oil Temperature
- Fuel Filter Restriction
- PTO Oil Temperature
- Transfer Case Oil Temperature

The inputs, usually a variable voltage, from these sensors are fed into the chassis node where the information is them processed into data and sent to the CECU by way of the CAN (Controller Area Network) data bus. In addition to receiving and processing sensor data, the chassis node also controls the operation of relays that power several electrical subsystems. These include:

- Back Up Alarm
- Fog Lamps
- Stop Lights
- Trailer Turn Signals
- Turn Signals
- Windshield Washer

The information sent from the sensors attached to the chassis node is sent to the CECU, processed, and where appropriate returned to the chassis in the form of commands related to the outputs controlled by the chassis node.

The design and manufacture of the chassis node is such that it is delivered to the plant or dealership without configuration parameters loaded into it. Upon the first power cycle of the system the CECU downloads the appropriate configuration parameters so that the chassis node can setup its I/O correctly. Depending on the software configuration of the CECU, these parameters may be different than other trucks and unique to the specific requirements of the truck being assembled. Once the chassis node has received its configuration parameters, it stores them in flash memory permanently and does not require any additional downloads from the CECU. This is a one time event and once complete the chassis node can be removed and reinstalled without the need of a power cycle.

NOTE

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When replacing a chassis node, disconnect the batteries and do not reconnect them until the new node installation and all wiring connections are complete. A new chassis node and the CECU need to be powered up simultaneously during the node's first power cycle; otherwise a fault on the Multi-Function Display (Kenworth) or Driver Information Display (Peterbilt) will indicate that the CECU is not recognizing the proper communication with the chassis node.

The problem occurs when the CECU and chassis node are not powered up simultaneously during the first power cycle. This may happen for a variety of reasons which include; missing chassis node, missing fuses, harnessing not connected, etc. If the CECU recognizes that the chassis node is not communicating as expected, it will trigger a fault in the Multi-Function Display (Kenworth) or Driver Information Display (Peterbilt). Cycling the ignition will not correct this problem since the parameter file is only transmitted to the chassis node after a complete battery power cycle.

Perform a complete battery power cycle by cycling battery power directly at the batteries. Battery power should be removed from the system for at least 30 seconds during the power cycle so that all electrical devices completely discharge and are truly powered down.

Chassis Node Connector Identification

There are three 21-pin electrical connectors that plug into the Chassis Node.

- Connector A 21 pins
- Connector B 21 pins
- Connector C 21 pins

Chassis Node Figure

For an illustration of the side view of a Chassis Node showing where the harness connectors attach into the control unit, see Chassis Node Figure. This figure identifies connector position on the control unit as well as individual connector pin locations.



For connector face views at the harness connectors that plug into the Chassis Node, see Chassis Node Connector Face Views Figure.

Chassis Node Connector Face Views



Chassis Node Comparison Chart - (Pinout)

Conn	Pin Number	Circuit Function
А	1	Left headlamp low beam output (PWM)
	2	Power - ignition input
	3	Ground
	4	Battery power - 1
	5	Neutral switch input
	6	Fuel level 1 input
	7	Right headlamp high beam output
	8	Backup switch input
	9	Fuel level 2 input
	10	Marker lamp relay control output
	11	Spare digital input
	12	Spare analog input
	13	Left headlamp high beam output
	14	(reserved)
	15	Spare analog input
	16	Battery power - 2
	17	(reserved)
	18	F-CAN high
	19	Right headlamp low beam output (PWM)
	20	(reserved)
	21	F-CAN low
В	1	Battery power - 3
	2	Right turn/stop rear output (Tractor)
	3	Power supply +5V sensors
	4	Left turn front/side output
	5	Fuel filter restriction input
	6	Transmission oil temperature - auxiliary input
	7	Right turn front/side output
	8	Spare analog input
	9	General oil temperature input
	10	Battery power - 4
	11	Spare analog input
	12	Spare analog input
	13	Left turn/stop rear output
	14	Spare analog input
	15	Driving/fog lamps output
	16	Left turn trailer output
	17	Ammeter input
	18	Battery power - 7
	19	Battery power - 5
	20	Left turn front/DRL output
	21	Right turn front/DRL output

Conn	Pin Number	Circuit Function
С	1	Analog return
	2	Spare output
	3	Spare output
	4	Transfer case oil temperature input
	5	Spare output
	6	Spare output
	7	PTO oil temperature input
	8	Spare output
	9	Spare output
	10	Rear axle temperature input
	11	Spare output
	12	Spare output
	13	Front axle temperature input
	14	Spare output
	15	Battery power - 8
	16	Center/steer axle temperature input
	17	Windshield washer pump control output
	18	Secondary fog lamp relay control output
	19	Battery power - 8
	20	Right turn trailer output
	21	Back-up alarm control output
7 Specifications

Parameter Part Numbers. 7 - 2

Parameter Part Numbers

CECU Parameters

Parameters are used to identify to the CECU what features are present on a vehicle. The parameters can be altered by a dealer to enable, disable, or assign certain functionality to that feature. Parameter part numbers are searchable in ECAT and allow a dealer to determine what parameters were set at the factory. Also, if adding a new feature to a vehicle, the corresponding parameter needs to be programmed to the CECU and enabled.

CECU Parameter	Parameter	Min.	Max.	Evelopetion
Part Number	Description	Value	Value	Explanation
Q30-1015-000	ABS installed	0	1	Parameter controls DTC's related to ABS system.
				Value 0/Disabled means ABS is not installed and DTC's are disabled
				Value 1/Enabled means ABS is installed and DTC's are enabled.
Q30-1015-001	After Treatment	0	1	Parameter is used to allow information from the engine to turn on the
	Regeneration			telltales for the high exhaust temperature (emission system temperature)
	Function			and regeneration filter.
				Value 0/Disabled means not allow cluster to display DPF and HEST telltales
				on cluster.
				Value 1/Enabled means allow cluster to display DPF and HEST telltales on
				cluster.
Q30-1015-002	ATC installed	0	1	Currently has no effect on functionality. Parameter will be used to determine
				the presence of traction control.
				Value 0/Disabled means ATC is not installed.
				Value 1/Enabled means ATC is installed.
Q30-1015-003	Retarder Range Map	0	4	Parameter is used to define the engine brake levels.
				Value 1 means engine brake switches have two braking levels 0%, 100%.
				Value 2 means engine brake switches have three braking levels 0%, 50%,
				100%.
				Value 3 means engine brake switches have four braking levels 0%, 33%,
				66%, 100%.
				Value 4 means engine brake switches have three braking levels 0%, 33%,
				66%.
Q30-1015-004	Clutch Switch Present	1	1	Parameter is used to determine if the clutch switch is connected to the
				CECU.
				Value 0/Disabled means clutch switch is not installed (it has an automatic
				transmission or is hardwired to engine).
				Value 1/Enabled means clutch switch is installed (it has a manual
				transmission and is wired to the control unit).
Q30-1015-005	Cruise Control Set	0	1	Parameter is used to define the cruise control set/resume switch functionality.
	Switch Accel or Decel			Value 0/Disabled means set switch is used for accelerate, and resume
				switch is used for decelerate.
				Value 1/Enabled means set switch is used for decelerate, and resume
				switch is used for accelerate.
Q30-1015-006	Cruise Control	0	1	Parameter is used to determine if cruise control is installed and controls the
	Present			cruise control messages to the engine.
				Value 0/Disabled means cruise control switches are not installed.
				Value 1/Enabled means cruise control switches are installed.

CECU Parameter	Parameter	Min.	Max.	E-miles et an
Part Number	Description	Value	Value	Explanation
Q30-1015-007	Clock Alarm Available	0	1	Parameter is used to determine if the alarm clock will be displayed on the
				Multi-Function Display.
				Value 0/Disabled means Alarm Clock is not available in Multi-Function
				Display.
				Value 1/Enabled means Alarm Clock is available in Multi-Function Display
Q30-1015-008	Clock Available	0	1	Parameter is used to determine if the clock will be displayed on the
				Multi-Function Display.
				Value 0/Disabled means Clock is not available in Multi-Function Display.
				Value 1/Enabled means Clock available in Multi-Function Display
Q30-1015-009	Diagnostics Available	0	1	Parameter is used to determine if the diagnostics will be displayed on the
				Multi-Function Display.
				Value 0/Disabled means Diagnostic is not available in Multi-Function Display.
				Value 1/Enabled means Diagnostic is available in Multi-Function Display
Q30-1015-010	Ignition Timer	0	1	Parameter is used to determine if the ignition timer will be displayed on
	Available			the Multi-Function Display.
				Value 0/Disabled means Ignition Timer is not available in Multi-Function
				Display.
				Value 1/Enabled means Ignition Timer is available in Multi-Function Display
Q30-1015-011	Languages Available	0	1	Parameter is used to determine if other languages are available on the
				Multi-Function Display.
				Value 0/Disabled means Language selection is not available in
				Multi-Function Display.
				Value 1/Enabled means Language selection is available in Multi-Function
		-		Display
Q30-1015-012	RPM Detail Available	0	1	Parameter is used to determine if the RPM information will be displayed on
				the Multi-Function Display.
				Value 0/Disabled means RPM information is not available in Multi-Function
				Display.
				Value 1/Enabled means RPM information is available in Multi-Function
030 1015 013		0	1	Display
Q30-1013-013		0		displayed on the Multi-Function Display
				Value 0/Disabled means Trip Economy is not available in Multi Eurotion
				Display.
030-1015-014	Trip Information	0	1	Parameter is used to determine if the trip information will be displayed on
	Available	Ū	•	the Multi-Function Display
				Value 0/Disabled means Trin Information is not available in Multi-Function
				Disnlav
				Value 1/Enabled means Trin Information is available in Multi-Eurotion
				Disnlav
Q30-1015-015	Truck Information	0	1	Parameter is used to determine if the truck information will be displayed on
	Available			the Multi-Function Display.
				Value 0/Disabled means Truck Information is not available in Multi-Function
				Display.
				Value 1/Enabled means Truck Information is available in Multi-Function
				Display

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CECU Parameter	Parameter	Min.	Max.	F undamentary
Part Number	Description	Value	Value	Explanation
Q30-1015-016	Multi-Function	0	1	Parameter is used to control the scrolling in Multi-Function Display.
	Display Menus			Value 0/Disabled means that the menu will stop when it reaches the top or
	Wraparound			the bottom of the list when scrolling.
				Value 1/Enabled means that the menu will wrap around when it reaches the
				top or the bottom of the list when scrolling.
Q30-1015-017	Dome Lamp	0	1	Parameter is used to determine if the dome lamps are controlled by the
	Controlled By Door			(driver/passenger) door.
				Value 0/Disabled means the door does not control the dome lamps.
				Value 1/Enabled means the door does control the dome lamps.
Q30-1015-018	Dome Lamp Delay	0	1	Parameter is used to determine if the dome lamp delays turning off after
	Present			the door is closed.
				Value 0/Disabled means there is no delay before the dome lamp turns off.
				Value 1/Enabled means there is a delay before the dome lamp turns off.
Q30-1015-019	Dome Lamp Dimming	0	1	Parameter is used to determine if the dome lamp dims out slowly after the
	Present			door is closed.
				Value 0/Disabled means dome lamp turns off quickly after the door is closed
				and delay if enabled.
				Value 1/Enabled means dome lamp dims out slowly after the door is closed
000 4045 000	Air Eilten Destriction	0	4	and delay if enabled.
Q30-1015-020	Air Fliter Restriction	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of
	Gauge Installed			the air niter restriction gauge.
				Value U/Disabled means Air Flitter Restriction Gauge is not installed.
030 1015 021	Allicon Transmission	0	1	Value 1/Enabled means Air Filter Restriction Gauge is installed.
Q30-1013-021	Temperature Gauge	0	'	Allison transmission temperature gauge
	Installed			Value 0/Disabled means Allison Transmission Temperature Gauge is not
	inotalieu			installed
				Value 1/Enabled means Allison Transmission Temperature Gauge is
				installed
Q30-1015-022	Ammeter Gauge	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of
	Installed			the ammeter gauge.
				Value 0/Disabled means Ammeter Gauge is not installed.
				Value 1/Enabled means Ammeter Gauge is installed.
Q30-1015-023	Auxiliary	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
	Transmission			auxiliary transmission temperature gauge.
	Temperature Gauge			Value 0/Disabled means Auxiliary Transmission Temperature is not installed.
	Installed			Value 1/Enabled means Auxiliary Transmission Temperature is installed.
Q30-1015-024	Axle Temperature	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
	Front Gauge Installed			front axle temperature gauge if installed.
				Value 0/Disabled means Axle Temperature Front Gauge is not installed.
				Value 1/Enabled means Axle Temperature Front Gauge is installed.
Q30-1015-025	Axle Temperature	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
	Rear Gauge Installed			rear axle temperature gauge.
				Value 0/Disabled means Axle Temperature Rear Gauge is not installed.
				Value 1/Enabled means Axle Temperature Rear Gauge is installed.

CECU Parameter	Parameter	Min.	Max.	E-miles et an
Part Number	Description	Value	Value	Explanation
Q30-1015-026	Axle Temperature	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of
	Center/Steer Gauge			the center axle temperature gauge.
	Installed			Value 0/Disabled means Axle Temperature Center/Steer Gauge is not
				installed.
				Value 1/Enabled means Axle Temperature Center/Steer Gauge is installed.
Q30-1015-027	Brake Applied	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
	Pressure Gauge			brake application pressure gauge.
	Installed			Value 0/Disabled means Brake Applied Pressure Gauge is not installed.
				Value 1/Enabled means Brake Applied Pressure Gauge is installed.
Q30-1015-028	Brakesaver Oil	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
	Temperature Gauge			brakesaver oil temperature gauge.
	Installed			Valve 0/Disabled means Brakesaver Oil Temperature Gauge is not installed.
				Valve 1/Enable means Brakesaver Oil Temperature Gauge is installed.
Q30-1015-029	Engine Coolant	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
	Temperature Gauge			engine coolant temperature gauge.
	Installed			Value 0/Disabled means Engine Coolant Temperature Gauge is not installed.
				Value 1/Enabled means Engine Coolant Temperature Gauge is installed.
Q30-1015-030	Engine Manifold	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of
	Pressure (Turbo			the manifold pressure gauge.
	Boost) Gauge			Value 0/Disabled means Manifold Pressure Gauge is not installed.
	Installed			Value 1/Enabled means Manifold Pressure Gauge is installed.
Q30-1015-031	Engine Oil Pressure	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
	Gauge Installed			engine oil pressure gauge.
				Value 0/Disabled means Engine Oil Pressure Gauge is not installed.
				Value 1/Enabled means Engine Oil Pressure Gauge is installed.
Q30-1015-032	Engine Oil	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of
	Temperature Gauge			the engine oil temperature gauge.
	Installed			Value 0/Disabled means Engine Oil Temperature Gauge is not installed.
				Value 1/Enabled means Engine Oil Temperature Gauge is installed.
Q30-1015-033	Exhaust Temperature	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
	Gauge (Pyrometer)			exhaust temperature gauge.
	Installed			Valve 0/Disabled means Exhaust Temperature Gauge is not installed.
				Valve 1/Enable means Exhaust Temperature Gauge is installed.
Q30-1015-034	Fuel Delivery	0	1	Valve 0/Disabled means Fuel Delivery Pressure Gauge is not installed.
	Pressure Gauge			Valve 1/Enable means Fuel Delivery Pressure Gauge is installed.
	Installed			
Q30-1015-035	Fuel Filter Restriction	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
	Gauge Installed			fuel restriction gauge.
				Value 0/Disabled means Fuel Filter Restriction Gauge is not installed.
				Value 1/Enabled means Fuel Filter Restriction Gauge is installed.
Q30-1015-036	General Oil	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of
	Temperature Gauge			the general oil temperature gauge.
	Installed			Value 0/Disabled means General Oil Temperature Gauge is not installed.
				Value 1/Enabled means General Oil Temperature Gauge is installed.
Q30-1015-037	Primary Air Pressure	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
	Gauge Installed			primary air pressure gauge.
				Value 0/Disabled means Primary Air Pressure Gauge is not installed.
				Value 1/Enabled means Primary Air Pressure Gauge is installed.

CECU Parameter	Parameter	Min.	Max.	Evaluation
Part Number	Description	Value	Value	Explanation
Q30-1015-038	Primary Fuel Level	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of
	Gauge Installed			the primary fuel level gauge.
				Value 0/Disabled means Primary Fuel Level Gauge is not installed.
				Value 1/Enabled means Primary Fuel Level Gauge is installed.
Q30-1015-039	PTO Oil Temperature	0	1	Valve 0/Disabled means gauge is not installed.
	Gauge Installed			Valve 1/Enable means gauge is installed.
Q30-1015-040	Secondary Air	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of
	Pressure Gauge			the secondary air pressure gauge.
	Installed			Value 0/Disabled means Secondary Air Pressure Gauge is not installed.
				Value 1/Enabled means Secondary Air Pressure Gauge is installed.
Q30-1015-041	Secondary Fuel Level	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
	Gauge Installed			secondary fuel level gauge.
				Value 0/Disabled means Secondary Fuel Level Gauge is not installed.
				Value 1/Enabled means Secondary Fuel Level Gauge is installed.
Q30-1015-042	Transfer Case Oil	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
	Temperature Gauge			transfer case oil temperature gauge.
	Installed			Value 0/Disabled means Transfer Case Oil Temperature Gauge is not
				installed.
				Value 1/Enabled means Transfer Case Oil Temperature Gauge is installed.
Q30-1015-043	Transmission	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of
	Temperature Gauge			the transmission temperature gauge.
	Installed			Value 0/Disabled means Transmission Temperature Gauge is not installed.
				Value 1/Enabled means Transmission Temperature Gauge is installed.
Q30-1015-044	Voltmeter Gauge	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of
	Installed			the voltmeter gauge.
				Value 0/Disabled means Voltmeter Gauge is not installed.
				Value 1/Enabled means Voltmeter Gauge is installed.
Q30-1015-045	Engine Retarder	0	1	Parameter is used to determine if the engine brake switch is installed.
	Present			Value 0/Disabled means engine brake switches are not installed.
				Value 1/Enabled means engine brake switches are installed.
Q30-1015-046	Engine Make	0	2	Parameter is used to determine what type of engine is installed.
				Value 0 means the truck is equipped with CAT engine.
				Value 1 means the truck is equipped with CUMMINS engine.
				Value 2 means the truck is equipped with PACCAR engine.
Q30-1015-047	Engine Fan Override	0	1	Parameter is used to determine if the fan override switch is installed.
	Present			Value 0/Disabled means engine fan override switch is not installed.
				Value 1/Enabled means engine fan override switch is installed.
Q30-1015-048	Gear Display Present	0	1	Parameter is used to determine the presence of gear display on the
				Multi-Function Display.
				Value 0/Disabled means Gear Display functionality is not available in
				Multi-Function Display.
				Value 1/Enabled means Gear Display functionality is available in
				Multi-Function Display.
Q30-1015-050	Headlamp Warning	0	1	Parameter controls "headlamp-left-on"-warning.
	Present			Value 0/Disabled means an alarm will not sound when the lights are on, the
				key is off and the driver door is open.
				Value 1/Enabled means an alarm will sound when the lights are on, key is
				off and the driver door is open.

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CECU Parameter	Parameter	Min.	Max.	
Part Number	Description	Value	Value	Explanation
Q30-1015-051	Change Distance	0	1	Parameter controls whether or not the operator can change the units in
	Units			the cluster.
				Value 0/Disabled means the operator cannot change the units in the cluster.
				Value 1/Enabled means the operator can change the units in the cluster.
Q30-1015-052	Cluster Backlight Day	0	255	Parameter is used to set the intensity of the backlighting for the cluster when
	Value			the lights are not on.
				Value 0 means minimum illumination.
				Value 255 means maximum illumination.
Q30-1015-053	CVSG Backlight Day	0	127	Parameter is used to set the intensity of the backlighting for the gauges
	Value			when the lights are not on.
				Value 0 means minimum illumination.
				Value 127 means maximum illumination.
Q30-1015-054	Dash Backlight Day	0	255	Parameter is used to set the intensity of the backlighting for the entire dash
	Value			when the lights are not on.
				Value 0 means minimum illumination.
				Value 255 means maximum illumination.
Q30-1015-055	Dash Dim With Dome	0	1	Parameter is used to determine if the dash backlighting should dim if the
	Light			dome light is on.
				Value 0/Disabled means the functionality is disabled.
				Value 1/Enabled means the functionality is enabled.
Q30-1015-056	Dot-Matrix Backlight	0	255	Parameter is used to set the intensity of the backlighting for the
	Day Value			Multi-Function Display when the lights are not on.
				Value 0 means minimum illumination.
				Value 255 means maximum illumination.
Q30-1015-057	Cluster LCD Backlight	0	255	Parameter is used to set the intensity of the backlighting for the Liquid Crystal
	Day Value			Display in the Tachometer and Speedometer when the lights are not on.
				Value 0 means minimum illumination.
				Value 255 means maximum illumination.
Q30-1015-058	Transfer Case	0	1	Parameter is used to determine which type of transfer case temperature
	Temperature Sensor			sensor is installed for the transfer case temperature gauge. This determines
	Туре			the input range.
				Value 0 means Transfer Case Temperature Sensor Type = Delphi.
				Value 1 means Transfer Case Temperature Sensor Type = Siemens (or
				Continental).
Q30-1015-059	Park Brake Symbol In	0	1	Parameter is used to determine if the park brake symbol is available on the
	Indication Bar			indicator bar located on the RH side of the Multi-Function Display.
				Value 0/Disabled means park brake symbol will not be displayed.
				Value 1/Enabled means park brake symbol will be displayed.
Q30-1015-060	PTO Control Present	0	1	Parameter is used to determine the presence of PTO controls. (For
				CUMMINS engine, default value is 1 - Cruise Control PTO idle bump).
				Value 0/Disabled means PTO Control functionality is disabled.
				Value 1/Enabled means PTO Control functionality is enabled.

CECU Parameter	Parameter	Min.	Max.	F undamentary
Part Number	Description	Value	Value	Explanation
Q30-1015-061	Cruise Control Set	0	2	Parameter is used to control how the Cruise Control Set Speed is displayed
	Speed Display			to the operator.
				Value 0/Disabled means the Cruise Control Set Speed is not shown to the
				displayed.
				Value 1/Main Highline means the Cruise Control Set Speed is displayed in
				the Main Highline for 3 seconds after release of the set or resume switch.
				Value 2/Highline Side Bar means the Cruise Control Set Speed is displayed
				in the right side bar of the Multi-Function Display while the Cruise Control
				is engaged.
Q30-1015-062	After Treatment	0	1	Parameter is used to determine if the Diesel Particulate Filter (DPF)
	Regeneration Switch			aftertreatment regeneration force or inhibit switches are installed.
				Value 0/Disabled means After Treatment Regeneration Switch is not
				installed.
				Value 1/Enabled means After Treatment Regeneration Switch is installed.
Q30-1015-063	Remote PTO Present	0	1	Parameter is used to determine if the remote PTO switches are installed
				(PACCAR engines only).
				Value 0/Disabled means Remote PTO switches are not installed.
				Value 1/Enabled means Remote PTO switches are wired to CECU and
				functionality is enabled.
Q30-1015-064	RPM Sweet Spot	0	3000	Parameter is used to set the high limit for RPM sweet spot bargraph
	High Limit			displayed on the Multi-Function Display.
Q30-1015-065	RPM Sweet Spot Low	0	3000	Parameter is used to set the low limit for RPM sweet spot bargraph displayed
	Limit			on the Multi-Function Display.
Q30-1015-066	Transmission Make	0	4	Parameter is used to determine the type/make of transmission.
				Value 0 means the truck is equipped with Manual transmission.
				Value 1 means the truck is equipped with Autoshift transmission.
				Value 2 means the truck is equipped with Ultrashift transmission.
				Value 3 means the truck is equipped with Freedomline transmission.
				Value 4 means the truck is equipped with Allison transmission.
Q30-1015-067	Brake Applied	0	1	Parameter is used to determine if the brake application pressure sensor is
	Pressure Sensor			installed. This parameter will effect the functionality of the brake applied
	Installed			gauge and cruise control.
				Value 0/Disabled means brake application pressure sensor is not installed.
				Brake applied gauge will not function and CECU will not send brake info
				on databus.
				Value 1/Enabled means brake application pressure sensor is installed. Brake
				applied gauge will be enabled (If "Brake Applied Pressure Gauge Installed"
				parameter is also enabled) and CECU will send brake info on databus.
Q30-1015-068	Dome Light	0	1	Parameter is used to determine if the dome lamps are controlled by the LVD.
	Controlled By Low			Value 0/Disabled means the dome lamps are not controlled by the LVD.
	Voltage Disconnect			Value 1/Enabled means the dome lamps are controlled by the LVD.
Q30-1015-070	Alarm Bell Symbol	0	2	Parameter is used to determine the status of the alarm bell symbol in the
				Multi-Function Display.
				Value 0 means the alarm bell symbol is off.
				Value 1 means the alarm bell symbol is on solid.
				Value 2 means the alarm bell symbol is animated.

CECU Parameter	Parameter	Min.	Max.	
Part Number	Description	Value	Value	Explanation
Q30-1015-071	Ignition Timer	5	90	Parameter is used to determine the maximum time the idle timer can be set
	Maximum Time			to. The value can be set in one minute increments.
				Value 5 means five minutes.
				Value 90 means ninety minutes.
Q30-1015-072	Voltage Trim Multiplier	0	999999	Parameter is used to trim or calibrate the voltmeter. This value is the
				"multiplier" portion of the trim and has a range between 0 and 999999. See
				"Voltmeter Trim Procedure" following this chart, for steps to determine the
				correct value.
Q30-1015-073	Voltage Trim Offset	0	10000	Parameter is used to trim or calibrate the voltmeter. This value is the "offset"
				portion of the trim and has a range between 0 and 10000. See "Voltmeter
				Trim Procedure" following this chart, for steps to determine the correct value.
Q30-1015-074	Low Voltage	0	1	Parameter is used to determine if a low voltage disconnect system is
	Disconnect Installed			installed. Value 0/Disabled means a LVD system is not installed. Value
				1/Enabled means a LVD system is installed.
Q30-1015-075	Engine Fan With Park	0	1	Parameter is used to determine if the engine fan will turn on whenever the
	Brake Installed			park brakes are turned on.
				Value 0/Disabled means the engine fan will not come on when the park brakes are on.
				Value 1/Enabled means the engine fan will come on when the park brakes
				are on.
Q30-1015-076	Primary Air Pressure	0	1	Parameter is used to determine if the primary air pressure is broadcast on
	on V-CAN			the V-CAN.
				Value 0/Disabled means the primary air pressure is not broadcast on the
				V-CAN.
				Value 1/Enabled means the primary air pressure is broadcast on the V-CAN.
Q30-1015-077	Secondary Air	0	1	Parameter is used to determine if the secondary air pressure is broadcast
	Pressure on V-CAN			on the V-CAN.
				Value 0/Disabled means the secondary air pressure is not broadcast on
				the V-CAN.
				Value 1/Enabled means the secondary air pressure is broadcast on the
				V-CAN.
Q30-1015-078	Voltage on V-CAN	0	1	Parameter is used to determine if voltage is broadcast on the V-CAN.
				Value 0/Disabled means voltage is not broadcast on the V-CAN.
				Value 1/Enable means voltage is broadcast on the V-CAN.
Q30-1015-079	Primary Fuel Level on	0	1	Parameter is used to determine if the primary fuel level is broadcast on
	V-CAN			the V-CAN.
				Value 0/Disabled means the primary fuel level is not broadcast on the
				V-CAN.
				Value 1/Enable means the primary fuel level is broadcast on the V-CAN.
Q30-1015-082	Smart Wheel Installed	0	1	Parameter is used to determine if a smart wheel is installed. This parameter
				enables the cluster retarder lamp. This lamp is only enabled when the truck
				is equipped with a multiplex steering wheel.
				Value 0/Disabled means a smart wheel is not installed.
				Value 1/Enable means a smart wheel is installed.
Q30-1015-083	Governed Speed	0	1	Parameter controls if the Governed speed limit transmitted by the Engine on
	Limit Available			V-CAN is displayed on the "Engine Info" MFD screen.
				Value 0/Disabled means the Governed Speed Limit is not Displayed
				Value 1/Enable means the Governed Speed Limit is displayed, if the Engine
				is transmitting it.

PACCAR

CECU Parameter	Parameter	Min.	Max.	E-miles atten
Part Number	Description	Value	Value	Explanation
Q30-1015-084	Remote Accelerator	0	1	Parameter controls fault logging for Remote Accelerator input (C27 of
	Sensor Installed			CECU). Also controls transmission of Remote Accelerator information on
				V-CAN.
				Value 0/Disabled means that no DTCs will be logged if that input is in a
				failure state (open, short) and "Not Available" is transmitted on V-CAN
				Value 1/Enable means that DTCs will be logged if that input is in a failure
				state (open, short). The remote accelerator values on V-CAN are populated
020 1015 095	Avia Tomporatura	0	1	with valid data (or "Error" if a fault is occurring on the input).
Q30-1015-065	Axie Temperature	U	1	
	Steel Gauge Installed			Value 0/Disabled means that no DTCs will be logged if that input is in a
				failure state (open, short) and the gauge needle will not move if connected
				to the CVSG bus.
				Value 1/Enable means that DTCs will be logged if that input is in failure
				state (open, short) and the gauge needle will move when connected to the
				CVSG bus.
Q30-1015-086	Fleet ID Available	0	1	Parameter controls whether the Fleet ID is visible in the Truck Information
				screen in the MFD.
				Value 0/Disabled means the Fleet ID is not visible in the Truck Information
				screen.
				Value 1/Enable means the Fleet ID is enabled in the Truck Information
				screen. This requires the Fleet ID to be programmed by ESA, otherwise
000 4045 007				it will not be visible.
Q30-1015-087	Starter Stuck	0	1	Parameter controls whether the CECU will detect if the starter solehold
	Detection Enabled			IS SLUCK.
				value or Disable means the operator will not be warned when the starter
				Value 1/Enabled means the operator will be warned when the key is not in
				START but the starter is still engaged
Q30-1015-088	Diesel Emissions	0	1	Parameter controls fault logging and gauge needle if the DEF gauge is
	Fluid Gauge Installed			installed.
	-			Value 0/Disabled means that no faults will be logged and the gauge needle
				will not move if the gauge is installed.
				Value 1/Enable means that DTCs will be logged if the DEF information from
				the aftertreatment system is not available and the gauge needle will respond
				to DEF level changes.
Q30-1015-089	DRL Enabled	0	1	Parameter controls the DRL functionality of the exterior lighting.
				Value 0/Disable means the headlamp switch and high beam switch control
				the headlamps. When they are turned off, the headlamps will turn off.
				Value 1/Enabled means the low beams (at 50% power) or integrated turn
020 1015 000	DDL Inhibit Switch	0	2	signal will be on at all times when the headlamp or highbeam switch is not on.
Q30-1015-090		U	2	Value 0/Nene means that the DRL Inhibit Input is not shear of by the CECI.
	Type			Value 0/None means that the DRL million input is not observed by the CECO.
				active
				Value 2=Canadian (10 sec max) means that the DDL will be disabled when
				the switch is active for a maximum of 10 seconds. After 10 seconds the
				DRI will turn back on and a DTC will be active as long as the DRI switch
				is still active.



CECU Parameter	Parameter	Min.	Max.	Euclas attac
Part Number	Description	Value	Value	Explanation
Q30-1015-091	Brightness Sensor	0	1	Parameter controls whether faults are logged on the Brightness Sensor
	Installed			Analog input. It controls whether the dash dims.
				Value 0/Disabled means no DTCs are logged and the dash dimming will
				not automatically vary.
				Value 1/Enabled means DTCs will be logged if the analog input is in a fault
				condition (open, short) and the dash dimming will automatically vary.
Q30-1015-092	Fog Lamps Installed	0	1	Parameter controls the fog lamp outputs of the Chassis Node.
				Value 0/Disabled means the fog lamp output is not driven. If fog lamps are
				installed, they will never be lit.
				Value 1/Enabled means the fog lamp output will output faults (open, short).
Q30-1015-093	Lights With Wipers	0	1	Parameter controls whether the menu item is available for Lights with
	Enable			Wipers. When enabled by the operator through the MFD, the low beam
				headlamps will turn on whenever the wipers are active (INI, LOW, or HI).
				Value 0/Disabled means the headlamps will not turn on when the wipers
				are active.
				Value 1/Enabled means the headlamps will turn on when the wipers are
020 1015 004		0	40	active.
Q30-1015-094	пеац Lamp туре	0	40	
				Value 1/Dual means Dual Sealed Beam
				Value 2-9/reserved means reserved
				Value 10/PB means Replaceable Bulb
				Value 11-19/reserved means reserved
				Value 20/Integral means Integral Beam Pod
				Value 21-39/reserved means reserved
				Value 40/Integral means Integral Beam Pod HID
Q30-1015-095	Starter RPM	0	1	Parameter controls whether the Starter will be disabled when the engine is
	Protection Enable			running.
				Value 0/Disabled means the engine RPM will be ignored when allowing
				the starter to engage.
				Value 1/Enabled means the engine RPM must be below 500 rpm for the
020 1015 006	Startar In Coar	0	1	starter to engage.
Q30-1013-090	Protection Enable	0	1	transmission state
				Value 0/Disabled means the starter will be enabled regardless of the
				transmission state
				Value 1/Enabled means the starter will be disabled if the transmission is not
				in neutral (optional for manual transmissions)
030-1015-097	Starter Overcrank	0	1	Parameter controls whether the starter will be disabled due to overvee
Q00-1010-08/		0		Value 0/Disabled means the starter will not be disabled due to overluse.
				Value 1/Epobled moone the starter will he disabled if the starter is successed
				(cranking for 90s without sufficient cooldown)

CECU Parameter	Parameter	Min.	Max.	Euclose Alan
Part Number	Description	Value	Value	Explanation
Q30-1015-099	PACCAR Lighting	0	5	Parameter controls the Lighting Model
	Model			Value 0 = No Exterior Lighting
				Value 1 = KW BCAB
				Value 2 = PB BCAB
				Value 3 = KW NGP
				Value 4 = PB
				Value 5 = KW ECE Russian Homologation
Q30-1015-100	Fog Lamps	0	1	Parameter controls the secondary fog lamp outputs of the Chassis Node.
	Secondary Installed			Value 0/Disabled means the fog lamp output is not driven. If fog lamps are
				installed, they will never be lit.
				Value 1/Enabled means the fog lamp output will detect output faults (open,
				short).
Q30-1015-101	Trailer Detect Enable	0	1	Parameter controls the Trailer Detect functionality.
				Value 0/Disabled means there is no addition diagnostics of the trailer
				connection.
				value 1/Enabled means there is additional diagnostics of the trailer. The
				intermittently disconnecting while in motion
Q30-1015-102	Turn Lamps Front	0	1	Parameter controls the outputs for the front side turn lamps.
	Side Installed			Value 0/Disabled means with the hardware installed, the lamps will work.
				but the diagnostics will not (except short circuits)
				Value 1/Enabled means the outputs and diagnostics are enabled (mostly for
				the fender lamps for T660s). If it is enabled with no hardware installed, you
				will get constant open circuit errors.
Q30-1015-103	Turn Lamps Trailer	0	1	Parameter controls the outputs for the trailer outputs
	Installed			0/Disabled means with the hardware installed, the lamps will work, but the
				diagnostics will not (except short circuits)
				Value 1/Enabled means outputs and diagnostics are enabled. If it is enabled
000 4045 404				with no hardware installed, you will get constant open circuit errors.
Q30-1015-104	OAT Source	0	1	Parameter controls the signal used to populate the LCD in the Tachometer,
				as well as all other CECO realures that use temperature as part of the
				algorithm.
				Value 1/Engine means that the 11030 V/CAN input from the Engine will
				be used
				CAUTION
				Modifying the sensor or its location can impact vehicle
				performance, emissions, and/or reliability.
Q30-1015-104	DRL Enabled	0	1	Parameter controls the DRL functionality of the exterior lighting.
				Value 0/Disable means the headlamp switch and high beam switch control
				the headlamps. When they are turned off, the headlamps will turn off.
				Value 1/Enabled means the low beams (at 50% power) or integrated turn
				signal will be on at all times when the headlamp or highbeam switch is not on.

CECU Parameter	Parameter	Min.	Max.	
Part Number	Description	Value	Value	Explanation
Q30-1015-105	Backup Alarm Mute	0	1	Parameter controls the backup alarm mute functionality.
	Enabled			Value 0/Disabled means the backup alarm will never be muted.
				Value 1/Enabled means the external backup alarm speaker will be muted
				when the dash switch is activated by the operator.
Q30-1015-106	Pre Trip Lighting Test	0	1	Parameter controls the availability of the Pre Trip Lighting Test.
	Enabled			Value 0/Disabled means the menu item in the settings menu is not available
				and the Pre Trip sequence will never be executed.
				Value 1/Enabled means the menu item is available in the settings menu.
				When the operator enables it, the pre trip lighting sequence will be initiated.
Q30-1015-107	Pre Trip Test	10s	30s	Parameter controls the interval of the pre trip lighting test. This is how long it
	Sequence Interval			stays in any one mode before transition to the next test mode.
Q30-1015-108	Enable Gateway	0	1	Parameter controls the gateway functionality. This must be enabled for the
				following Gateway parameters to take effect.
				Value 0/Disabled means no Gateway of messages will occur.
				Value 1/Enabled means the settings of the following gateway parameters
				will be observed.
Q30-1015-109	Enable Router	0	1	Parameter controls the router functionality. This must be enabled for the
				following Router parameters to take effect.
				Value 0/Disabled means no Routing of messages will occur.
				Value 1/Enabled means the settings of the following router parameters will
				be observed.
Q30-1015-110	Gateway Engine	0	64	Parameter controls the settings for this individual message. Add the
	CCVS message			numbers together for multiple destinations.
				Value 0/OFF means this PGN will not be transmitted on any destination
				channels
				Value 1/BCAN means this PGN will be transmitted on BCAN
				Value 2/CCAN means this PGN will be transmitted on CCAN
				Value 4/DCAN means this PGN will be transmitted on DCAN
				Value 8/FCAN means this PGN will be transmitted on FCAN
				Value 16/ICAN means this PGN will be transmitted on ICAN
				Value 32/VCAN means this PGN will be transmitted on VCAN
Q30-1015-111	Gateway Engine DM1	0	64	Parameter controls the settings for this individual message. Add the
	message			numbers together for multiple destinations.
	meeeage			Value 0/OFF means this PGN will not be transmitted on any destination
				channels
				Value 1/BCAN means this PGN will be transmitted on BCAN
				Value 2/CCAN means this PCN will be transmitted on CCAN
				Value 2/CCAN means this PGN will be transmitted on CCAN
				Value 4/DCAN means this PGN will be transmitted on DCAN
				Value 16/ICAN means this PGN will be transmitted on ICAN
				Value 32/VCAN means this PGN will be transmitted on VCAN

CECU Parameter	Parameter	Min.	Max.		
Part Number	Description	Value	Value	Explanation	
Q30-1015-112	Gateway Engine	0	64	Parameter controls the settings for this individual message. Add the	
	EEC1 message			numbers together for multiple destinations.	
				Value 0/OFF means this PGN will not be transmitted on any destination	
				channels	
				Value 1/BCAN means this PGN will be transmitted on BCAN	
				Value 2/CCAN means this PGN will be transmitted on CCAN	
				Value 4/DCAN means this PGN will be transmitted on DCAN	
				Value 8/FCAN means this PGN will be transmitted on FCAN	
				Value 16/ICAN means this PGN will be transmitted on ICAN	
				Value 32/VCAN means this PGN will be transmitted on VCAN	
Q30-1015-113	Gateway Engine	0	64	Parameter controls the settings for this individual message. Add the	
	EEC2 message			numbers together for multiple destinations.	
				Value 0/OFF means this PGN will not be transmitted on any destination	
				channels	
				Value 1/BCAN means this PGN will be transmitted on BCAN	
				Value 2/CCAN means this PGN will be transmitted on CCAN	
				Value 4/DCAN means this PGN will be transmitted on DCAN	
				Value 8/FCAN means this PGN will be transmitted on FCAN	
				Value 16/ICAN means this PGN will be transmitted on ICAN	
				Value 32/VCAN means this PGN will be transmitted on VCAN	
Q30-1015-114	Gateway Engine ET1	0	64	Parameter controls the settings for this individual message. Add the	
	message			numbers together for multiple destinations.	
				Value 0/OFF means this PGN will not be transmitted on any destination	
				channels	
				Value 1/BCAN means this PGN will be transmitted on BCAN	
				Value 2/CCAN means this PGN will be transmitted on CCAN	
				Value 4/DCAN means this PGN will be transmitted on DCAN	
				Value 8/FCAN means this PGN will be transmitted on FCAN	
				Value 16/ICAN means this PGN will be transmitted on ICAN	
				Value 32/VCAN means this PGN will be transmitted on VCAN	
Q30-1015-115	Gateway Engine IC1	0	64	Parameter controls the settings for this individual message. Add the	
	message			numbers together for multiple destinations.	
				Value 0/OFF means this PGN will not be transmitted on any destination	
				channels	
				Value 1/BCAN means this PGN will be transmitted on BCAN	
				Value 2/CCAN means this PGN will be transmitted on CCAN	
				Value 4/DCAN means this PGN will be transmitted on DCAN	
				Value 8/FCAN means this PGN will be transmitted on FCAN	
				Value 16/ICAN means this PGN will be transmitted on ICAN	
				Value 32/VCAN means this PGN will be transmitted on VCAN	

CECU Parameter	Parameter	Min.	Max.	
Part Number	Description	Value	Value	Explanation
Q30-1015-116	Gateway Engine LFE	0	64	Parameter controls the settings for this individual message. Add the
	message			numbers together for multiple destinations.
				Value 0/OFF means this PGN will not be transmitted on any destination
				channels
				Value 1/BCAN means this PGN will be transmitted on BCAN
				Value 2/CCAN means this PGN will be transmitted on CCAN
				Value 4/DCAN means this PGN will be transmitted on DCAN
				Value 8/FCAN means this PGN will be transmitted on FCAN
				Value 16/ICAN means this PGN will be transmitted on ICAN
				Value 32/VCAN means this PGN will be transmitted on VCAN
Q30-1015-117	Gateway	0	64	Parameter controls the settings for this individual message. Add the
	Transmission DM1			numbers together for multiple destinations.
	message			Value 0/OFF means this PGN will not be transmitted on any destination
				channels
				Value 1/BCAN means this PGN will be transmitted on BCAN
				Value 2/CCAN means this PGN will be transmitted on CCAN
				Value 4/DCAN means this PGN will be transmitted on DCAN
				Value 8/FCAN means this PGN will be transmitted on FCAN
				Value 16/ICAN means this PGN will be transmitted on ICAN
				Value 32/VCAN means this PGN will be transmitted on VCAN
Q30-1015-118	Gateway	0	64	Parameter controls the settings for this individual message. Add the
	Transmission ETC1			numbers together for multiple destinations.
	message			Value 0/OFF means this PGN will not be transmitted on any destination
				channels
				Value 1/BCAN means this PGN will be transmitted on BCAN
				Value 2/CCAN means this PGN will be transmitted on CCAN
				Value 4/DCAN means this PGN will be transmitted on DCAN
				Value 8/FCAN means this PGN will be transmitted on FCAN
				Value 16/ICAN means this PGN will be transmitted on ICAN
				Value 32/VCAN means this PGN will be transmitted on VCAN
Q30-1015-119	Gateway	0	64	Parameter controls the settings for this individual message. Add the
	Transmission ETC2			numbers together for multiple destinations.
	message			Value 0/OFF means this PGN will not be transmitted on any destination
				channels
				Value 1/BCAN means this PGN will be transmitted on BCAN
				Value 2/CCAN means this PGN will be transmitted on CCAN
				Value 4/DCAN means this PGN will be transmitted on DCAN
				Value 8/FCAN means this PGN will be transmitted on FCAN
				Value 16/ICAN means this PGN will be transmitted on ICAN
				Value 32/VCAN means this PGN will be transmitted on VCAN

CECU Parameter	Parameter	Min.	Max.	F uclear that	
Part Number	Description	Value	Value	Explanation	
Q30-1015-120	Route Engine AMB	0	64	Parameter controls the settings for this individual message. Add the	
	message			numbers together for multiple destinations.	
				Value 0/OFF means this PGN will not be transmitted on any destination	
				channels	
				Value 1/BCAN means this PGN will be transmitted on BCAN	
				Value 2/CCAN means this PGN will be transmitted on CCAN	
				Value 4/DCAN means this PGN will be transmitted on DCAN	
				Value 8/FCAN means this PGN will be transmitted on FCAN	
				Value 16/ICAN means this PGN will be transmitted on ICAN	
				Value 32/VCAN means this PGN will be transmitted on VCAN	
Q30-1015-121	Route Engine EFLP1	0	64	Parameter controls the settings for this individual message. Add the	
	message			numbers together for multiple destinations.	
				Value 0/OFF means this PGN will not be transmitted on any destination	
				channels	
				Value 1/BCAN means this PGN will be transmitted on BCAN	
				Value 2/CCAN means this PGN will be transmitted on CCAN	
				Value 4/DCAN means this PGN will be transmitted on DCAN	
				Value 8/FCAN means this PGN will be transmitted on FCAN	
				Value 16/ICAN means this PGN will be transmitted on ICAN	
				Value 32/VCAN means this PGN will be transmitted on VCAN	
Q30-1015-122	Route Engine FD	0	64	Parameter controls the settings for this individual message. Add the	
	message			numbers together for multiple destinations.	
				Value 0/OFF means this PGN will not be transmitted on any destination	
				channels	
				Value 1/BCAN means this PGN will be transmitted on BCAN	
				Value 2/CCAN means this PGN will be transmitted on CCAN	
				Value 4/DCAN means this PGN will be transmitted on DCAN	
				Value 8/FCAN means this PGN will be transmitted on FCAN	
				Value 16/ICAN means this PGN will be transmitted on ICAN	
				Value 32/VCAN means this PGN will be transmitted on VCAN	
Q30-1015-123	Route Engine	0	64	Parameter controls the settings for this individual message. Add the	
	HOURS message			numbers together for multiple destinations.	
				Value 0/OFF means this PGN will not be transmitted on any destination	
				channels	
				Value 1/BCAN means this PGN will be transmitted on BCAN	
				Value 2/CCAN means this PGN will be transmitted on CCAN	
				Value 4/DCAN means this PGN will be transmitted on DCAN	
				Value 8/FCAN means this PGN will be transmitted on FCAN	
				Value 16/ICAN means this PGN will be transmitted on ICAN	
				Value 32/VCAN means this PGN will be transmitted on VCAN	

CECU Parameter	Parameter	Min.	Max.	-	
Part Number	Description	Value	Value	Explanation	
Q30-1015-124	Route Engine LFC	0	64	Parameter controls the settings for this individual message. Add the	
	message			numbers together for multiple destinations.	
				Value 0/OFF means this PGN will not be transmitted on any destination	
				channels	
				Value 1/BCAN means this PGN will be transmitted on BCAN	
				Value 2/CCAN means this PGN will be transmitted on CCAN	
				Value 4/DCAN means this PGN will be transmitted on DCAN	
				Value 8/FCAN means this PGN will be transmitted on FCAN	
				Value 16/ICAN means this PGN will be transmitted on ICAN	
				Value 32/VCAN means this PGN will be transmitted on VCAN	
Q30-1015-125	Route Engine VD	0	64	Parameter controls the settings for this individual message. Add the	
	message			numbers together for multiple destinations.	
				Value 0/OFF means this PGN will not be transmitted on any destination	
				channels	
				Value 1/BCAN means this PGN will be transmitted on BCAN	
				Value 2/CCAN means this PGN will be transmitted on CCAN	
				Value 4/DCAN means this PGN will be transmitted on DCAN	
				Value 8/FCAN means this PGN will be transmitted on FCAN	
				Value 16/ICAN means this PGN will be transmitted on ICAN	
				Value 32/VCAN means this PGN will be transmitted on VCAN	
Q30-1015-126	Route Transmission	0	64	Parameter controls the settings for this individual message. Add the	
	TRF1 message			numbers together for multiple destinations.	
				Value 0/OFF means this PGN will not be transmitted on any destination	
				channels	
				Value 1/BCAN means this PGN will be transmitted on BCAN	
				Value 2/CCAN means this PGN will be transmitted on CCAN	
				Value 4/DCAN means this PGN will be transmitted on DCAN	
				Value 8/FCAN means this PGN will be transmitted on FCAN	
				Value 16/ICAN means this PGN will be transmitted on ICAN	
				Value 32/VCAN means this PGN will be transmitted on VCAN	
Q30-1015-127	Transmit CECU LC	0	64	Parameter controls the settings for this individual message. Add the	
	message			numbers together for multiple destinations.	
				Value 0/OFF means this PGN will not be transmitted on any destination	
				channels	
				Value 1/BCAN means this PGN will be transmitted on BCAN	
				Value 2/CCAN means this PGN will be transmitted on CCAN	
				Value 4/DCAN means this PGN will be transmitted on DCAN	
				Value 8/FCAN means this PGN will be transmitted on FCAN	
				Value 16/ICAN means this PGN will be transmitted on ICAN	
				Value 32/VCAN means this PGN will be transmitted on VCAN	
Q30-1015-128	Enable LED Front	0	1	Parameter controls the ability of the diagnostics to detect faults on this	
	Side Turn			circuit. These lamps are the rear fender lamps or other supplemental lamps.	
				Value 0/Disabled means the LEDs will be incorrectly diagnosed as open	
				circuits due to their electrical characteristics.	
	1			Value 1/Enabled means the open circuit detection is disabled.	

CECU Parameter	Parameter	Min.	Max.	Fundamention	
Part Number	Description	Value	Value	Explanation	
Q30-1015-129	Enable LED Front	0	1	Parameter controls the ability of the diagnostics to detect faults on this circuit.	
	Turn DRL			These lamps are the Integral Beam turn/DRL lamp or fender turn lamps.	
				Value 0/Disabled means the LEDs will be incorrectly diagnosed as open	
				circuits due to their electrical characteristics.	
				Value 1/Enabled means the open circuit detection is disabled.	
Q30-1015-130	Enable LED Rear	0	1	Parameter controls the ability of the diagnostics to detect faults on this	
	Stop Turn			circuit. These lamps are the tractor brake/tail lamps.	
				Value 0/Disabled means the LEDs will be incorrectly diagnosed as open	
				circuits due to their electrical characteristics.	
				Value 1/Enabled means the open circuit detection is disabled.	
Q30-1015-131	Multiplex ABS Off	0	1	Parameter is used to determine if the ABS Off Road Switch is connected	
	Road Switch			to the CECU.	
				Value 0/Disabled means ABS Offroad Switch is not installed.	
				Value 1/Enabled means ABS Offroad Switch is installed.	
				This parameter is required for the ABS Off Road switch to communicate	
				with the ABS ECU via J1939 V-CAN.	
Q30-1015-132	Engine Fan on with	0	1	Parameter is used to determine if the engine fan will turn on whenever the	
	AC and Park Brake			park brakes and the air conditioning are on.	
				Value 0/Disabled means the engine fan will not come on when the park	
				brakes and air conditioning are on.	
				Value 1/Enabled means the engine fan will come on when the park brakes	
				and air conditioning are on.	
Q30-1015-133	Brake Lamps on with	0	1	Parameter is used to determine if the tractor and trailer brake lamps will turn	
	Engine Retarder			on when the engine retarder is engaged.	
				Value 0/Disabled means the tractor and trailer brake lamps will not turn on	
				when the engine retarder is engaged.	
				Value 1/Enabled means the tractor and trailer brake lamps will turn on when	
				the engine retarder is engaged.	
Q30-1015-134	CECU LVD Enable	0	1	Parameter is used to determine if the CECU is controlling the Low Voltage	
				Disconnect (LVD).	
				Value 0/Disabled means the CECU is not controlling LVD functionality.	
				Value 1/Enabled means the CECU is controlling LVD Functionality.	
Q30-1015-135	Operator Control of	0	1	Parameter is used to determine if the operator can control the Low Voltage	
	LVD Voltage Level			Disconnect (LVD) shutoff voltage.	
				Value 0/Disabled means the operator is not controlling the LVD shutoff	
				voltage.	
				Value 1/Enabled means the operator is controlling the LVD shutoff voltage.	
Q30-1015-136	Enable Snow Plow	0	1	Parameter is used to determine if the Chassis Node Primary Fog Lamp	
	Lamps			output is being used for Snow Plow Lamps.	
				Value 0/Disabled means the Primary Fog Lamp output on the Chassis Node	
				is not being used for Snow Plow Lamps (and will turn off when the high	
				beams are turned on).	
				Value 1/Enabled means the Primary Fog Lamp output on the Chassis Node	
				is being used for Snow Plow Lamps (and will not turn off when the high	
				beams are turned on).	

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CECU Parameter	Parameter	Min.	Max.		
Part Number	Description	Value	Value	Explanation	
Q30-1015-137	Advanced ABS	0	1	Parameter is used to determine if Advanced ABS is installed.	
	Installed			Value 0/Disabled means Advanced ABS is disabled.	
				Value 1/Enabled means Advanced ABS is enabled.	
				This parameter is required for trucks with Bendix Advanced Cruise with	
				Braking (ACB)	
Q30-1015-138	Water In Fuel Warning	0	1	Parameter is used to determine if the Water In Fuel warning pop-up	
	Enabled			message is enabled.	
				Value 0/Disabled means the Water In Fuel Pop-up warning message will not	
				display when the appropriate condition exists.	
				Value 1/Enabled means the Water In Fuel Pop-up warning message will	
				display when the appropriate condition exists.	
Q30-1015-139	Variable Speed Fan	5	50	Parameter is used to set the vehicle speed cut off for the Variable Speed Fan.	
	Cutoff Vehicle Speed			Value 5 means below 5 MPH the CECU sends the value of Variable Fan	
				Low Speed Value (Q30-1015-140) for the Engine Fan and above 5 MPH the	
				CECU sends the value of 100% for the Engine Fan when the appropriate	
				conditions exist.	
				Value 50 means below 50 MPH the CECU sends the value of Variable Fan	
				Low Speed Value (Q30-1015-140) for the Engine Fan and above 50 MPH	
				the CECU sends the value of 100% for the Engine Fan when the appropriate	
				conditions exist.	
Q30-1015-140	Variable Speed Fan	0	100	Parameter is used to set the Variable Speed Fan speed for the Engine Fan.	
	Low Value			Value 0 means 0% Engine Fan.	
				Value 100 means 100% Engine Fan.	
Q30-1015-141	Variable Speed Fan	0	1	Parameter is used to determine if the Variable Speed Fan is installed.	
	Enable			Value 0/Disabled means Variable Speed Fan is not installed.	
				Value 1/Enabled means the Variable Speed Fan is installed.	
				This parameter is required for the Borg Warner Cool Logic Fans.	
Q30-1008-501	Editable Telltale 1			Used by ESA to select the Icon displayed in monitor and simulate modes.	
	Icon ID			Does not effect any vehicle functions. Refer to Q30-1008 drawing.	
Q30-1008-517	Editable Telltale 3			Used by ESA to select the Icon displayed in monitor and simulate modes.	
000 4000 540				Does not effect any vehicle functions. Refer to Q30-1008 drawing.	
Q30-1008-518	Editable Telltale 2			Used by ESA to select the Icon displayed in monitor and simulate modes.	
020 1009 510	Icon ID Editable Telltale 4			Does not effect any vehicle functions. Refer to Q30-1008 drawing.	
Q30-1006-519				Deep pet effect on violate functions. Refer to Q20 1008 drawing	
030-1008-520	Editable Telltale 5			Used by ESA to select the Icon displayed in monitor and simulate modes	
				Does not effect any vehicle functions. Refer to Q30-1008 drawing	
Q30-1008-522	Editable Telltale 6			Used by ESA to select the Icon displayed in monitor and simulate modes.	
	Icon ID			Does not effect any vehicle functions. Refer to Q30-1008 drawing.	
Q30-1008-524	Editable Telltale 8			Used by ESA to select the Icon displayed in monitor and simulate modes.	
	Icon ID			Does not effect any vehicle functions. Refer to Q30-1008 drawing.	
Q30-1008-526	Editable Telltale 9			Used by ESA to select the Icon displayed in monitor and simulate modes.	
	Icon ID			Does not effect any vehicle functions. Refer to Q30-1008 drawing.	

Voltmeter Trim Offset Value

Voltmeter Trim Multiplier Value

Voltmeter Trim Procedure

Use the following steps when determining the appropriate parameter values for the Voltage Trim Multiplier and Voltage Trim Offset.

- 1. Turn ignition key to the ON position.
- Make sure the Voltmeter Trim Offset and Voltmeter Trim Multiplier parameters are set to the default values. Using ESA, select 'Parameters' from the main menu screen, then select 'Standard Gauges', then scroll down to view the Voltmeter Trim Offset and Voltmeter Trim Multiplier. If the values for these parameters are not set at the default values, use ESA to reset the values as follows:
 - a. Default Voltmeter Trim Offset = 5,000
 - b. Default Voltmeter Trim Multiplier = 100,000

NOTE

To correctly calibrate the voltmeter, both the Voltmeter Trim Offset and Voltmeter Trim Multiplier parameters must be reset to their default values before performing this procedure.

- 3. Measure the voltage at the batteries. Record the value on the worksheet as "Measured Battery Voltage Engine Off".
- 4. Note the displayed voltage using ESA or with the Voltmeter CVSG. Record the value on the worksheet as "Displayed Battery Voltage Engine Off".
- 5. Start the Engine.

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- 6. Measure the voltage at the batteries (same place as in step 3). Record the value on the worksheet as "Measured Battery Voltage Engine Running".
- 7. Note the displayed voltage using ESA or with the Voltmeter CVSG. Record the value on the worksheet as "Displayed Battery Voltage Engine Running".
- 8. Perform the calculations on the worksheet to determine the appropriate values for the Voltage Trim Multiplier and Voltage Trim Offset.
- 9. Use ESA to set the parameter values to the calculated values.

Voltmeter Trim Values Worksheet

Vehicle Voltage

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	Value	Work	sheet				
	Value	Entry					
	Magain	I		^			
SIEP 3	: weasu	ed BAT I	voltage	Engine			A
			-) / - 14	F actoria			
SIEP 6	: Measur	ed BALI	voitage	Engine			В
Running	9						
STEP 4	· Display	ed BATT	Voltage	Engine			С
Off	Diopidy	00 0/ 11	vonago	Engino			0
STEP 7	· Display	ed BATT	Voltage	Engine		D	
Running	. Diopiay т		voltage	Engine			D
En	Entry Entry					Res	sult
В		-		А	=		Е
D		-		С	=		F
Е		+		F	=		G
С		х		G	=		Н
Α		-		Н	=		
I		х	1,0	000	=		J
J		+	5,0	000	=		K
G		х	100	.000	=		L

How It Works

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Functional Description

Cab Electronic Control Unit (CECU)

The heart of the multiplexed instrumentation system is the CECU. For Peterbilt vehicles, the

Typical CECU Locations

CECU is located behind the center of the dash, near the radio. For Kenworth vehicles, the CECU is located behind the center console. See Control Unit Locations for illustrations depicting the physical position of the control unit.



Vehicle component inputs are sent to the CECU through the J1939 data bus or conventional wiring. The CECU interprets the various inputs and monitors/controls the functions for each input through the CECU software. Output signals from the CECU provide data for the gauges, warning lamps, audible alarms, and displays inside the cluster.

The CECU receives data related to controlling the various devices of the electrical system. It then makes decisions based on that input and sends information to subsystem system control modules (nodes) about what that node should do with the components it controls.

The node that receives information from the CECU to control the exterior lighting and wipers functions is called the chassis node. Sensor signals are processed into data and sent by the chassis node to the CECU by way of the CAN (Controller Area Network) data bus. The chassis node serves as a bidirectional conduit for both information and control. In addition to receiving and processing sensor data, the chassis node also controls the operation of relays that power several electrical subsystems.

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WARNING

Do not cut, tap or disconnect green/yellow twisted pair wires. Cutting, tapping or disconnecting these wires may cause disruption of component communication on the databus, resulting in the delay and/or miscommunication of warnings to the operator increasing the risk of an accident involving death, personal injury and/or property damage.

When used in conjunction with the Electronic Service Analyst (ESA) diagnostic software tool, the technician can review fault codes stored in the CECU, verify whether the instrumentation is working properly and diagnose the root cause of the problem more easily.

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Chassis Node

The node that receives information from the CECU to control the exterior lighting and wipers functions is called the chassis node. The chassis node serves as a bidirectional conduit for both information and control.

Several sensors that in Multiplex Electrical version 1 and 2 were connected to the CECU (ICU for version 1) are now connected to the chassis node. These include:

- Ammeter
- Auxiliary Transmission Oil Temperature
- Axle Temperature, Rear
- Axle Temperature, Front
- Axle Temperature, Center / Steer
- Back Up Switch
- General Oil Temperature
- Fuel Filter Restriction
- PTO Oil Temperature
- Transfer Case Oil Temperature

The inputs, usually a variable voltage, from these sensors are fed into the chassis node where the information is them processed into data and sent to the CECU by way of the CAN (Controller Area Network) data bus. In addition to receiving and processing sensor data, the chassis node also controls the operation of relays that power several electrical subsystems. These include:

- Back Up Alarm
- Fog Lamps
- Stop Lights
- Trailer Turn Signals
- Turn Signals
- Windshield Washer

The information sent from the sensors attached to the chassis node is sent to the CECU, processed, and where appropriate returned to the chassis in the form of commands related to the outputs controlled by the chassis node.

The design and manufacture of the chassis node is such that it is delivered to the plant or dealership without configuration parameters loaded into it. Upon the first power cycle of the system the CECU downloads the appropriate configuration parameters so that the chassis node can setup its I/O correctly. Depending on the software configuration of the CECU, these parameters may be different than other trucks and unique to the specific requirements of the truck being assembled. Once the chassis node has received its configuration parameters, it stores them in flash memory permanently and does not require any additional downloads from the CECU. This is a one time event and once complete the chassis node can be removed and reinstalled without the need of a power cycle.

NOTE

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When replacing a chassis node, disconnect the batteries and do not reconnect them until the new node installation and all wiring connections are complete. A new chassis node and the CECU need to be powered up simultaneously during the node's first power cycle; otherwise a fault on the Multi-Function Display (Kenworth) or Driver Information Display (Peterbilt) will indicate that the CECU is not recognizing the proper communication with the chassis node.

The problem occurs when the CECU and chassis node are not powered up simultaneously during the first power cycle. This may happen for a variety of reasons which include; missing chassis node, missing fuses, harnessing not connected, etc. If the CECU recognizes that the chassis node is not communicating as expected, it will trigger a fault in the Multi-Function Display (Kenworth) or Driver Information Display (Peterbilt). Cycling the ignition will not correct this problem since the parameter file is only transmitted to the chassis node after a complete battery power cycle.

Perform a complete battery power cycle by cycling battery power directly at the batteries. Battery power should be removed from the system for at least 30 seconds during the power cycle so that all electrical devices completely discharge and are truly powered down.

CECU Architecture

The software programming of the control unit can be grouped into three main types:

- Run Time (RT) which acts as the operating system where all communication takes place.
- Programmable Logic Controller (PLC) Code manufacturer specific programmed code and software that is developed, accessible and editable.
- Vendor Module blocks of code that are developed for specific manufacturers to allow other features to be implemented more efficiently.

To better understand how Electronic Service Analyst (ESA) functions and why there are current limitations on some of the multiplexed features, by explaining what ESA can see. Currently ESA can look at all information that is communicated between the RT and PLC Code portions of the programming. Any signals, be they inputs, outputs, or dataline signals, sent between the RT and PLC Code are visible to ESA. These are the signals that may be monitored and simulated using ESA.

Limitations with the ESA program are found in the communications that go to the pre-developed Vendor Modules. Currently this information is not available for ESA to look at. That is why some features that have Vendor Module programming, such as the odometer and the message display, are not available to monitor and/or simulate through ESA.



CECU3 (P30-1009-XXX) Communication Diagram

i	NOTE
It is possible for via the J1939 optional custome appropriate refer installed ECU.	the CECU to receive signals communications line from er installed ECUs. Refer to the ence literature for any customer

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Cluster Components

The heart of the multiplexed instrumentation system is the CECU. For Peterbilt vehicles, the CECU is located behind the center of the dash, near the radio. For Kenworth vehicles, the CECU is located behind the center console. See Control Unit Locations for illustrations depicting the physical position of the control unit.

Central Instrument Cluster

The central instrument cluster is the instrumentation in the dash panel that is located directly in front of the driver. The instrumentation parts in this area include:

- Speedometer (including odometer and trip meter)
- Tachometer (including engine hour meter and outside temperature display)
- Kenworth multi-function display (if equipped)
- Peterbilt driver information display (if equipped)
- Pre-installed warning lights (telltale symbols)

Some models have a one-piece integrated cluster while the instrument cluster on other models consists of separate parts.

The Multi-Function Display (Kenworth) or Driver Information Display (Peterbilt), if equipped, is located at the top of the instrument cluster, displays vehicle information and warnings through a constant monitoring of the vehicle systems. The various functions may be accessed by navigating through menu screens using the menu control switch (rotational knob).

The central instrument cluster receives input data from the CECU via the I-CAN data bus. When the ignition key is first turned ON, the cluster performs a calibration power on self-test that can be used to troubleshoot the main instrumentation parts.

Power On Self-Test for Central Instrument Cluster

When the ignition key is first turned, the following calibration tests will be performed in the central instrument cluster parts.

- The speedometer and tachometer gauge pointers move from pointing at zero, counter-clockwise to their mechanical limit (approximately -8°), remain there for 1 second and return to pointing at zero.
- At the same time, all non-direct telltales (which are controlled by the CECU) are switched on together, and then switched off together.
- A warning sound sequence is also activated five times without a break.
- In Peterbilt models, the Driver Information Display will sequentially display warning icons. Then the display will show the last screen that was displayed before the ignition was turned off.
- In Kenworth models equipped with Multi-Function Display, the display will show the last screen that was displayed before the ignition was turned off.

NOTE

Before replacing the CECU or any gauges, check the wiring and fuses, and perform the diagnostic tests (Diagnostic Trouble Codes) using ESA to verify that you are not replacing a good component.

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Editable Telltale Lights

The central instrument cluster includes pre-installed warning light symbols (telltales). There are two types of telltales, direct and indirect.

Direct telltales are totally controlled by the device that is issuing the warning. See Direct Wire Telltales for more information.

Indirect telltales are controlled by the CECU. Indirect telltales are turned ON and OFF during the Power On Self-Test at ignition. For these telltales, the CECU receives inputs directly from the source wiring or from the J1939 bus. If any of the indirect telltales do not turn on during the Power On Self-Test, it means that the LED in the cluster is broken and the cluster needs replaced because the individual LEDs are not serviceable.

In some Peterbilt models equipped with a one-piece cluster, the Icon Tray slides into the bottom of the cluster. In certain Peterbilt models, some telltales may be incorporated in the Driver Information Display. These telltales will be sequenced through during the Power On Self-Test.

In Kenworth models equipped with a one piece central cluster, there are two telltale decals/trays that plug into the sides of the cluster. In Kenworth models, there may be up to four telltales included in the Speedometer and Tachometer. Incorporating the telltale icons onto removable pieces adds flexibility. This permits customizing the telltales according to the features on each chassis. In Kenworth trucks, the cluster is shipped with a set of decals that meet 95% of the requirements for all chassis shipped. For the remaining 5%, the decals are replaced with a set of custom build trays. It is possible to remove the decals and replace them with a set of trays that can be purchased from Paccar Parts. This information is currently provided in the Body Builder Manual.

The icon content of the decal has been changing with the progressive EPA and FMVSS requirements. Thus, depending on the engine year and some other factors, decals from similar vehicles may contain different telltales.

Cluster and Telltales



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Location of Editable Telltale Lights



Editable Telltale Application

Telltale Number	CECU Pin	KW Cluster	PB Cluster
1	19	Position 4	Position 2
2	20	Position 7	Position 3
3	21	Position 8	Position 4
4	22	Position 9	Position 5
5	n/a	Position 10	Position 7
6	24	Position 12	Position 8
7	25	Position 13	n/a
8	26	Position 14	n/a
9	27	Position 16	n/a

Commercial Vehicle Smart Gauges (CVSG)

The right and left instrument panel gauges used with the multiplexed instrumentation are commonly referred to as Commercial Vehicle Smart Gauges (CVSG). Like the central instrument cluster, the 2-inch gauges also receive input data directly from the CECU. CVSG's are electronic and mechanical. The electronic CVSG's receive digital data from the CECU via the CVSG data bus. The mechanical gauges (i.e. suspension air pressure, etc.) are driven directly by air pressure. Both types of gauges receive input signals from the CECU via a 4-wire "daisy chained" jumper harness that links one gauge to another.

Kenworth CVSG



Peterbilt CVSG



Power On Self-Test

When the ignition key is first turned ON, all the electronic 2-inch gauges will perform a calibration "power on self-test."

• Ignition key turned ON.

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- The gauge pointers move from pointing at zero, counterclockwise to their mechanical limit (approx. -5°), remain there for 1 second and return to pointing at zero.
- At the same time, all LED indicators are switched on together, and then switched off together.

NOTE

The mechanical CVSG do not perform a power on self-test

CVSG Gauge Information

The 2-inch electronic gauges receive their power from the CECU. Backlighting for the 2-inch electronic gauges is sent from the CECU to the gauges via the data link (Blue wire). The data link (blue wire) is also used to deliver information between the CECU and the 2-inch gauges. The 2-inch gauges are "series" (daisy-chained) connected using 4-way jumper harnesses linking the gauges together.

- Yellow = Power wire (9-16 volts)
- Green = Ground wire (Return)
- Blue = Data link
- Brown = Backlighting (used for mechanical gauges only)

Service Information and CVSG characteristics that service technicians should be aware of:

- There are two generations of CVSGs. The first is the white CVSG where the plastic housing and nut are made with white plastic. The second is the black CVSG where the plastic housing and nut are black. Use a white nut on a white CVSG and a black nut on a black CVSG. Otherwise, both generations work exactly the same and can be intermixed on the truck.
- Specialty CVSG gauges (such as the clock, PTO hour meter, and transmission display) are stand-alone gauges and are independent of the CECU.
- Optional mechanical gauge (such as air suspension) needles are driven mechanically by air pressure. There is no red warning lamp and the backlighting is through the brown wire from the CECU (a PWM input). The 4-way jumper harness is still used to pass all 4 circuits through the gauge to the next gauge in the chain.
- If the headlamps are on and the dimmer is turned to bright, you can scan the panel and tell which electronic gauges are wired and functioning correctly.
- If part of the panel has gauges backlit while some of the 2-inch gauges are not backlit, the jumper harness wire between the gauges is probably not connected properly.

- If the red indicator lamp is on but the gauge is operational, it indicates the value is out of normal range.
- If a 2-inch electronic gauge has a short or open in the sensor wiring, the gauge needle moves 5° below the first tick mark (approximately one needle thickness).
- The Diesel Exhaust Fluid (DEF) CVSG is unique in that the telltale will flash for extreme low fluid level.
- If a 2-inch electronic gauge has power (yellow wire) and ground (green wire) but is not receiving data (blue wire), after 30 seconds of waiting for data, the red indicator lamp at the 6 o'clock position of the gauge will begin to blink. This indicates there is an open or short in the blue wire between the gauge and the CECU. Since the 2-inch gauges are "series" (daisy-chain) connected, any other gauges downstream from the gauge that has lost connection will also begin to blink their warning lights.

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Direct Wire Telltales

Direct Wire Telltales are warning lights that are not controlled by the software in the CECU (not part of Multiplex system). The type of warning light (direct wire, vs multiplexed) is determined by either regulations, or space available in the Cluster. Currently, the direct wire warning lights are made with LEDs plus some protective circuitry. All direct telltales require 12V at their positive terminal and Ground at their negative terminal to light.

The operation of the MIL and Wait to Start can be observed at ignition during the bulb check function

(engine turns them on and off at ignition). If they are not working then, unplug the Cluster and apply 12V to their connectors per the following table.

For the Direct Wire Telltale in the gauge modules listed in the following table, the telltale function can be tested by unplugging the gauge from the harness and applying voltage to the connector pairs that belong to that warning light. If the LED lights up after applying voltage to them, the problem is either the wiring (in the rest of the system), or the controlling device.

Direct Telltale	Location	Related to	Functionality	Troubleshooting
MIL (2010)	Kenworth and Peterbilt	2010 Engines	Directly controlled by engine bulb	Cluster connector (Telltale 11)
	clusters after 2010, T7.		check at ignition.	Pin 13 = 12V
				Pin 14 = GND
Wait-To-Start	Kenworth and Peterbilt	2010 Engines	Directly controlled by engine bulb	Cluster connector (Telltale 2)
(2010)	clusters after 2010, T7.		check at ignition.	Pin 8 = 12V
	This lamp was driven by			Pin 10 = GND
	the CECU before 2010.			
Refrigerator	Kenworth cluster.	New interior	Light should be ON when the	Cluster connector
		refrigerator	refrigerator is turned ON (switch	Pin 1 = 12V
			located in the sleeper).	Pin 2 = GND
Lane Departure	Kenworth Direct	Lane departure	Refer to lane departure manual.	Pin 2 = 12V
	wire telltale gauge	system		Pin 6 = GND
	Q43-1128-001.			
Service	Kenworth Direct	Allison 1000/2000	Refer to transmission manual.	Pin 2 = 12V
Transmission	wire telltale gauge			Pin 6 = GND
	Q43-1127-001.			
Range Inhibit	Kenworth Direct	Allison 1000/2000	Refer to transmission manual.	Pin 4 = 12V
	wire telltale gauge			Pin 8 = GND
	Q43-1127-001.			
Overspeed	Kenworth Direct	Cummins engine	ON when the shutdown valve	Pin 1 = 12V
Shutdown	wire telltale gauge	overspeed	is closed and with some test	Pin 5 = GND
	Q43-1127-001.	shutdown	conditions. Refer to EAOS	
			Supplement.	
Cab Status	Kenworth Direct	Cab power status	Always ON when power applied	Pin 3 = 12V
	wire telltale gauge	indicator in firetrucks	to the cab.	Pin 7 = GND
	Q43-1127-001.	with cab power		
		shutdown switch		

Direct Telltale

Instruments and Controls Operation

Before attempting to repair any instrumentation problems, the technician should have a complete understanding of how the instruments and controls operate.

Air Filter Restriction Pressure - The Air Filter Restriction Pressure gauge indicates the condition of the engine air cleaner and is measured by inches of water (H₂O). A clean filter should register 7 in. H₂O (may vary with system design) and a filter whose life is over registers approximately 25 in. H₂O.

Air Starter Pressure - The Air Starter Pressure Gauge indicates the amount of air pressure in the air start reservoir.

Ammeter - The Ammeter monitors the vehicle's electrical system and makes sure the system is in balance and operating normally. If not, it may be drawing power from the alternator (positive reading) or from the batteries (negative reading). Under normal conditions the ammeter will read nearly "zero."

Axle, Drive Oil Temperature - The Drive Axle Oil Temperature gauges (front, rear, and center) indicate the temperature of the lubricant in the vehicle's axles.

Axle, Pusher Air Pressure, #1, #2, #3 - The Pusher Axle Air Pressure gauges indicate the air pressure in each of the pusher axles suspension air bags.

Axle, Tag Air Pressure - The Tag Axle Air Pressure gauge indicates the amount of air pressure in the tag axle suspension air bags.

Brake, Application Air Pressure - The Brake Application Air Pressure gauge indicates how much air pressure is being applied from the foot brake valve or trailer brake hand valve to the air brakes.

BrakeSaver Application Air Pressure (Export vehicles only) - The BrakeSaver Application Air Pressure gauge indicates the amount of air pressure applied to the BrakeSaver hand control valve.

BrakeSaver Oil Temperature (Export vehicles only) - The BrakeSaver Oil Temperature gauge

indicates the temperature in the BrakeSaver. If the oil temperature exceeds the maximum limits, a red warning lamp in the gauge turns on.

Engine Coolant Temperature - The Engine Coolant Temperature gauge indicates the temperature of the engine coolant. If the coolant temperature exceeds the maximum limits, a red warning lamp in the gauge illuminates and an audible warning sounds. If the coolant temperature continues to rise, the Check Engine and/or Stop Engine lights illuminate. Under normal operating conditions the water temperature gauge should register between 165 and 205°F (74 and 90°C). Under certain conditions, somewhat higher temperatures may be acceptable. The maximum allowable temperature is 220°F (104°C) with the cooling system pressurized, except for certain engines.

Engine, Oil Pressure - If the oil pressure drops below the minimum pressure a red warning light in the gauge illuminates, the Stop Engine light illuminates and an audible alarm tone sounds.

Engine Oil Temperature - The Engine Oil Temperature gauge indicates the engine oil temperature. If the oil temperature exceeds the maximum limits, a red warning light in the gauge illuminates.

Engine Pyrometer (Export vehicles only) -

The Engine Pyrometer gauge indicates engine exhaust gas temperature. Since it responds almost immediately to changes in exhaust gas temperature, the pyrometer is an excellent indicator of engine output. Monitor it in conjunction with the tachometer and manifold pressure gauge.

Fuel Filter Restriction Pressure - This gauge tells you the condition of the fuel filter by indicating the restriction from the fuel filter to the fuel pump. The restriction is measured by inches of mercury (in-Hg).

Fuel Level, Primary/Secondary (if equipped) - The Primary Fuel gauge and Secondary Fuel gauge (if equipped) indicate the approximate amount of fuel in each fuel tank. In addition to indicating empty and full, the gauge(s) also indicate the fuel level in graduated increments. When the fuel level for each tank is below 1/4 full, a red warning light in the gauge illuminates. **General Air Pressure #1, #2** - The General Air Pressure gauge(s) are used for customer installed component applications.

General Oil Temperature - The General Oil Temperature gauge(s) are used for customer installed component applications.

Manifold Pressure (Boost) - The Manifold Pressure (Boost) gauge indicates the power the engine is putting out by showing the amount of turbo boost. If the pressure indicated by the manifold pressure gauge goes down, there may be something wrong with the engine.

Primary and Secondary Air Pressure Gauge

- The Primary Air Pressure gauge indicates pressure in the rear braking system. The Secondary gauge indicates pressure in the front braking system. Each gauge indicates the amount of air pressure in each system in pounds per square inch (psi). On vehicles equipped with metric air pressure gauges, the gauge faceplate includes a kPa (major) scale and psi (minor) scale. If the pressure in either or both circuits falls below 65 psi, a red warning light in the gauge illuminates and an audible alarm tone sounds when the engine is running.

Speedometer - The Speedometer indicates the vehicle speed in miles per hour (mph) and in kilometers per hour (km/h). For KW vehicles, the speedometer also includes several warning and indicator lamps.

Suspension Load Air Pressure, #1, #2 - The Suspension Load Air Pressure gauge indicates the amount of air pressure in the air suspension air bags. When the vehicle is equipped with a second Suspension Load Air pressure gauge, the #1 gauge indicates the air pressure in the driver's side air bags. The #2 gauge indicates the air pressure in the passenger's side air bags.

Tachometer - The Tachometer measures the engine speed in revolutions per minute (rpm). For KW vehicles, the speedometer also includes several warning and indicator lamps.

Tractor Brake Application Air Pressure - The Tractor Brake Application Air Pressure gauge indicates the amount of air pressure applied to the tractor brakes.

Trailer Brake Application Air Pressure - The Trailer Brake Application Air Pressure gauge indicates the amount of air pressure applied to the trailer brakes during brake foot valve and/or hand brake control valve applications.

Trailer Reservoir Air Pressure - The Trailer Reservoir Air Pressure gauge indicates the amount of air pressure in the trailer brake reservoir.

Transfer Case Oil Temperature - The Transfer Case Oil Temperature gauge indicates the temperature of the oil in the transfer case. If the oil temperature exceeds maximum limits, a red warning light in the gauge illuminates.

Transmission Oil Temperature, Auxiliary - The Auxiliary Transmission Oil Temperature gauge indicates the temperature of the oil in the auxiliary transmission.

Transmission Oil Temperature, Main - The Main Transmission Oil Temperature Gauge indicates the temperature of the oil in the transmission.

Transmission Retarder Oil Temperature -

The Transmission Retarder Oil Temperature gauge indicates the temperature of the oil in the transmission retarder.

Voltmeter - The Voltmeter displays the battery voltage. Normally, it shows 12 to 14V (volts). A red warning light in the gauge illuminates when an out of range condition exists.
Instrumentation Troubleshooting Procedures

The troubleshooting procedures in this manual have been designed to assist the technician in diagnosing multiplexed instrumentation problems using the Electronic Service Analyst (ESA) hardware/software diagnostic service tool. While ESA can help the technician diagnose an instrumentation problem quickly and easily, it is not intended to substitute a technician's knowledge and experience for applying basic electrical troubleshooting skills (i.e., performing voltage, open circuit, resistance checks, etc.) when required. The troubleshooting procedures in this manual incorporate the use of the ESA diagnostic service tool and certain electrical checks the technician must be able to perform in order to correctly diagnose the problem.

Gauge Input Sources

Standard / Optional Input Source	Input Source	Sensor*
Air Filter Restriction Pressure	Sensor	Active
Air Starter Pressure	Mechanical	
Ammeter	Sensor	Active
Auxiliary Transmission Oil	0	Dession
Temperature	Sensor	Passive
Brake Application Pressure	Sensor	Active
Brake Saver Application Air Pressure	Mechanical	Passive
Drive Axle Oil Temperature	Sensor	Passive
Diesel Exhaust Fluid	V-CAN (J1939)	
Engine Coolant Temperature	V-CAN (J1939)	Passive
Engine Oil Pressure	V-CAN (J1939)	
Engine Oil Temperature	V-CAN (J1939)	
Fuel Filter Restriction Pressure	Sensor	
Fuel Level	Sensor	Active
General Air Pressure	Mechanical	Passive
General Oil Temperature	Sensor	
Main Transmission Oil Temperature	Sensor	Passive
Manifold Pressure (Boost)	V-CAN (J1939)	Passive
Primary & Secondary Air Pressure	Sensor	
Pusher Axle Air Pressure	Mechanical	Active
Speedometer	V-CAN (J1939)	Passive
Suspension Load Air Pressure	Mechanical	
Tachometer	V-CAN (J1939)	
Tag Axle Air Pressure	Mechanical	
Trailer Brake Application Air Pressure	Mechanical	
Trailer Reservoir Air Pressure	Mechanical	
Transfer Case Oil Temperature	Mechanical	
Voltmeter	Internal Voltage	

* Sensor Types:

- Active Sensor Has 3 wires and requires an electrical power source to operate. Output is a linear voltage.
- Passive Sensor- Has 2 wires and does not require an electrical power source to operate. Generate their output via the energy being sensed (for example: temperature).

Display Diagnostic Codes

This section describes the Multi-Function Display (Kenworth) or Driver Information Display (Peterbilt) text in the Diagnostic Screen and the DTC that triggered it. In the following table, the "xx" represents any two digit Failure Mode Indicator (FMI).

The Source column identifies the system/controller that the DTC relates to. Only CECU related codes have troubleshooting procedures in this publication. Refer to the following for all non-CECU related codes.

- Engine see engine service tool and engine service manual.
- Transmission see transmission service tool and transmission service manual.
- ABS see ABS service tool and ABS service manual.
- DPF see engine service tool and engine service manual.

Display Text	Source	DTC
EGR Valve Leakage	Engine	27xx
Secondary Fuel Level	Engine	38xx
Intercooler Coolant Temperature	Engine	52xx
Two Speed Axle Switch	Engine	69xx
Park Brake Switch	Engine	70xx
Max Vehicle Speed Limit	Engine	74xx
Exhaust Trap Inlet Pressure	Engine	81xx
Vehicle Speed Sensor	Engine	84xx
Throttle Position	Engine	91xx
AUX Torque Switch	Engine	93xx
Fuel Delivery Pressure	Engine	94xx
Fuel Filter Restriction	Engine	95xx
Fuel Tank Level	Engine	96xx
Water In Fuel	Engine	97xx
Engine Oil Level	Engine	98xx
Engine Oil Filter	Engine	99xx
Engine Oil Pressure	Engine	100xx
Crankcase Pressure	Engine	101xx
Boost Pressure	Engine	102xx
Turbo Speed	Engine	103xx
Intake Manifold Air Temp	Engine	105xx
Intake Manifold Pressure	Engine	106xx
Barometric Pressure	Engine	108xx
Engine Coolant Temperature	Engine	110xx
Low Coolant Level	Engine	111xx
Water Pump	Engine	112xx
Engine Droop	Engine	113xx
Inlet Air Mass Flow Rate	Engine	132xx
Fuel Rail Pressure	Engine	157xx
Switched Power	Engine	158xx

Display Text	Source	DTC
Rated Engine Power	Engine	166xx
Alternator Potential	Engine	167xx
Battery	Engine	168xx
Ambient Air Temperature	Engine	171xx
Air Inlet Temperature	Engine	172xx
Exhaust Gas Temperature	Engine	173xx
Fuel Temp	Engine	174xx
Engine Oil Temperature	Engine	175xx
Engine Fuel Rate	Engine	183xx
Engine Speed	Engine	190xx
Trans Output Speed	Engine	191xx
Trip Fuel	Engine	231xx
Total Distance Traveled	Engine	245xx
Clock Real Time	Engine	251xx
EGR Delta Pressure	Engine	411xx
EGR Temp	Engine	412xx
OEM AUX Temperature	Engine	441xx
Engine Percent Torque	Engine	513xx
Retarder Torque	Engine	520xx
Gear Out of Range	Engine	524xx
Reference Retarder	Engine	556xx
Throttle Switch	Engine	558xx
Torque Converter Lockup	Engine	573xx
Engine Idle Timer Override	Engine	592xx
Idle Shutdown Occurrence	Engine	593xx
Engine Idle Shutdown Alert	Engine	594xx
Cruise Enable Switch	Engine	596xx
Brake Switch	Engine	597xx
Clutch Switch	Engine	598xx
Cruise Set Switch	Engine	599xx
Cruise Decel Switch	Engine	600xx
Cruise Resume Switch	Engine	601xx
Cruise Accel Switch	Engine	602xx
Brake Pedal Switch 2	Engine	603xx
J1708 Data Link Error	Engine	608xx
System Diagnostic Code 1	Engine	611xx
System Diagnostic Code 2	Engine	612xx
System Diagnostic Code 3	Engine	615xx
5V Supply 1	Engine	620xx
Red Stop Lamp Status	Engine	623xx
Amber Stop Lamp Status	Engine	624xx
Intake Air Heater	Engine	626xx
ECU Power Loss	Engine	627xx
ECU Warning	Engine	629xx
Engine Software Error	Engine	630xx
Engine Software Error	Engine	631xx
Fuel Shutoff Valve	Engine	632xx
Fuel Control Valve	Engine	633xx
Timing Actuator	Engine	635xx
Engine Speed Signal	Engine	637xx
J1939 Datatlink	Engine	639xx
AUX Dual Output Shutdown	Engine	640xx
Turbo Actuator	Engine	641xx
Engine External Speed Command	Engine	644xx
Fan Clutch Driver	Engine	647xx
BPV Diag SLMP Data	Engine	649xx



Display Text	Source	DTC
Injector Spill Valve 1	Engine	651xx
Injector Spill Valve 2	Engine	652xx
Injector Spill Valve 3	Engine	653xx
Injector Spill Valve 4	Engine	654xx
Injector Spill Valve 5	Engine	655xx
Injector Spill Valve 6	Engine	656xx
Injector Spill Valve 7	Engine	657xx
Injector Spill Valve 8	Engine	658xx
Injector Spill Valve 9	Engine	659xx
Injector Spill Valve 10	Engine	660xx
Injector Spill Valve 11	Engine	661xx
Injector Spill Valve 12	Engine	662xx
Starter Solenoid	Engine	677xx
8V Supply	Engine	678xx
AUX PWM Driver	Engine	697xx
AUX I/O Circuit 1	Engine	701xx
AUX I/O Circuit 2	Engine	702xx
AUX I/O Circuit 3	Engine	703xx
AUX I/O Circuit 4	Engine	704xx
AUX I/O Circuit 5	Engine	705xx
AUX I/O Circuit 6	Engine	706xx
AUX I/O Circuit 7	Engine	707xx
Speed Sensor 2	Engine	723xx
Inlet Air Heater	Engine	729xx
A/C Comp Clutch Switch	Engine	876xx
Front Axle Speed	Engine	904xx
PWM Output	Engine	923xx
Auxiliary Output 2	Engine	925xx
Auxiliary Output 3	Engine	926xx
Fuel Pump Actuator	Engine	931xx
Engine Retarder	Engine	973xx
Remote Accel	Engine	974xx
Fan Control Output	Engine	977xx
PTO Set Speed Switch	Engine	979xx
PTO Enable Switch	Engine	980xx
Remote PTO Resume Switch	Engine	982xx
Remote PTO Set Switch	Engine	984xx
A/C Pressure Switch	Engine	985xx
Fan Request Speed	Engine	986xx
Sensor Supply Voltage	Engine	1043xx
Fan Driver	Engine	1071xx
Engine Brake (Jake)	Engine	1072xx
Engine Brake (Jake)	Engine	1073xx
Exhaust Brake Actuator	Engine	1074xx
Fuel Lift Pump	Engine	1075xx
Fuel Injection Pump Calibration	Engine	1076xx
Fuel Injection Pump Control	Engine	1077xx
5V Supply 1	Engine	1079xx
5V Supply 2	Engine	1080xx
Engine Retarder Torque	Engine	1085xx
Air Supply Pressure Input	Engine	1087xx
Engine Warning State	Engine	1107xx
Engine Near Shutdown	Engine	1109xx
Engine Brake Output	Engine	1112xx
	Engine	1121XX
Post Intercooler Temp	Engine	1131xx

Display Text	Source	DTC
ECU Temp	Engine	1136xx
Turbo Inlet Temperature	Engine	1172xx
Turbo Wastegate Actuator	Engine	1188xx
Anti-Theft	Engine	1195xx
Anti-Theft	Engine	1196xx
Exhaust Gas Pressure	Engine	1209xx
Water Pump Temp	Engine	1212xx
Fault CAN Bus 2	Engine	1231xx
Engine Shutdown Switch	Engine	1237xx
High Fuel Leakage	Engine	1239xx
Fuel Control Valve	Engine	1244xx
Timing Actuator	Engine	1245xx
Oil Burn Valve	Engine	1265xx
Idle Shutdown	Engine	1267xx
Starter Solenoid	Engine	1321xx
Fuel Rail 1	Engine	1347xx
Fuel Rail 2	Engine	1348xx
Injector Rail	Engine	1349xx
Change Engine Oil	Engine	1378xx
Engine Oil Level	Engine	1380xx
Fuel Filter	Engine	1382xx
AUX Temp 1	Engine	1385xx
AUX Pressure	Engine	1388xx
Pressure Relief Valve	Engine	1442xx
ECU Power Relay	Engine	1485xx
Injector Boost Voltage	Engine	1542xx
Engine Derated	Engine	1569xx
Cruise Speed Out of Range	Engine	1588xx
Cruise Speed Out of Range	Engine	1590xx
Cruise Pause Switch	Engine	1633xx
Intake Air Temperature	Engine	1636xx
Fan Speed	Engine	1639xx
Auto Start Failed	Engine	1664xx
Demand Retarder	Engine	1/15xx
Retarder Selection	Engine	1716XX
Catalyst Tank Level	Engine	1761xx
Maximum Retarder Speed	Engine	1780xx
YC Engine Control	Engine	1817XX
YC Brake Control	Engine	1819XX
Accel Pedal Position	Engine	2623XX
	Engine	2629XX
Auxiliary Output 4	Engine	2040XX
	Engine	2047XX
EGR Mass Flow	Engine	2039XX
Turbo 1 Output	Engine	2709XX
	Engine	2790XX
	Engine	279122
Engine Injector Calibration	Engine	279322
	Engine	28131
Trans Crank Enable	Engine	201322
Intake Valve Oil Pressure	Fngine	294822
Intake Valve Oil Pressure	Engine	204022
Intake Valve Actuator 1	Fngine	295022
Intake Valve Actuator 2	Fngine	295122
Intake Valve Actuator 3	Engine	205177
Intake valve ACLUAIOI 3	⊏ngine	ZYJZXX

Display Text	Source	DTC
Intake Valve Actuator 4	Engine	2953xx
Intake Valve Actuator 5	Engine	2954xx
Intake Valve Actuator 6	Engine	2955xx
Coolant Driver	Engine	2988xx
Catalyst Missing	Engine	3050xx
EGR Plugged	Engine	3058xx
J1939 DPF Monitor	Engine	3064xx
Exhaust Gas Temp 1	Engine	3241xx
Particulate Trap Inlet Temp 1	Engine	3242xx
Exhaust Gas Temp 3	Engine	3245xx
Particulate Trap Outlet Temp	Engine	3246xx
Exhaust Gas Temp 2	Engine	3249xx
Particulate Trap 1 Pressure	Engine	3251xx
Particulate Trap 2 Temp	Engine	3258xx
Particulate Trap 2 Inlet Temp	Engine	3276xx
Particulate Trap 2 Outlet Temp	Engine	3280xx
Particulate Trap 2 Pressure	Engine	3285xx
Catalyst Dosing Unit	Engine	3361xx
DPF Fuel Pressure Actuator 1	Engine	3471xx
DPF Air Pressure Actuator 1	Engine	3472xx
DPF Ignition Failure	Engine	3473xx
DPF Ignition Loss	Engine	3474xx
DPF Fuel Pressure Control	Engine	3479xx
DPF Fuel Pressure Voltage	Engine	3480xx
Regen Fuel Rate	Engine	3481xx
DPF Fuel Enable Actuator	Engine	3482xx
DPF Ignition Current	Engine	3484yy
	Engine	3486yy
DPF Air Pressure Control	Engine	348777
	Engine	3/10/1 XX
	Engine	3490
Sensor Supply Voltage 1	Engine	3509xx
Sensor Supply Voltage 2	Engine	3510xx
Sensor Supply Voltage 3	Engine	3511xx
Sensor Supply Voltage 4	Engine	3512xx
Sensor Supply Voltage 5	Engine	3513xx
Regen Manually Disabled	Engine	3530xx
Ambient Air Density	Engine	3555xx
DPF Fuel Injector 1 No Response	Engine	3556xx
ECH Power Output	Engine	3598xx
Engine Injector 1 Actuator 2	Engine	3659xx
Engine Injector 2 Actuator 2	Engine	3660xx
Engine Injector 3 Actuator 2	Engine	3661xx
Engine Injector 4 Actuator 2	Engine	3662vv
Engine Injector 5 Actuator 2	Engine	366377
Engine Injector 6 Actuator 2	Engine	3664vv
Particulate Tran Regen Inhibit Switch	Engine	369577
Particulate Tran Regen Force Switch	Engine	360622
Active Regen Switched Off	Engine	3703vv
Particulate Tran Regen Inhibited	Engine	3711vv
Particulate Trap Soot Load Porcont	Engine	3710vv
Part Tran 1 Pegen Not Available	Engino	3750vv
DPE Secondary Air Diff Processo	Engine	3830
DE Soondary Air Mass Flow	Engine	2020/XX
NOV Limit Excood Dup to Quality	Engine	2032XX
NOX Limit Exceed Due to Quality	Engine	403433
		403033

Display Text	Source	DTC
NOx Limit Exceed Due to Quality	Engine	4094xx
NOx Limit Exceed Due to Quantity	Engine	4096xx
DPF Fuel Drain Voltage	Engine	4097xx
Aftertreatment DEF Tank Low Level	Engine	5245xx
Indicator	0	
Aftertreatment SCR Operator	Engine	5246xx
Inducement Severity	go	0_10/01
Electronic Trans Control 1	Engine	61442xx
Electronic Trans Control 2	Engine	61445xx
SWD Derate Lamp Data	Engine	65519xx
EXT PWM PCAC	Engine	65520xx
J1939CM DPF State	Engine	65521xx
J1939CM DPF Shutdown	Engine	65522xx
EXT PWM Back Pressure	Engine	65523xx
J1939CM DPE Post Filter	Engine	65524xx
J1939CM DPF Fail WO Engine	Engine	65525xx
J1939CM DPF Fail And Engine	Engine	65526xx
J1939CM DPF Lamp Data	Engine	65527xx
Fuel Injector 246 HI	Engine	65528xx
Fuel Injector 135 HI	Engine	65529xx
Fuel Injector 4 Lamp Data	Engine	65530xx
Fuel Injector 2 Lamp Data	Engine	65531xx
Fuel Injector 6 Lamp Data	Engine	65532xx
Fuel Injector 3 Lamp Data	Engine	65533xx
Fuel Injector 5 Lamp Data	Engine	65534xx
Fuel Injector 1 Lamp Data	Engine	65535xx
CGI Mass Flow Rate	Engine	520192xx
CGI Gas Temp	Engine	520193xx
CGI Actuator Shaft Position	Engine	520194xx
CGI Diff Pressure	Engine	520196xx
CGI Absolute Pressure	Engine	520197xx
Connect Service Tool	Engine	Any Other
Connect Service Tool	Transmission	Any Other
Diff Lock Solenoid	ABS	564xx
ASR Offroad Switch	ABS	576xx
System Diagnostic Code 4	ABS	614xx
System Voltage	ABS	627xx
FCU Fault	ABS	629xx
ECU Fault	ABS	630xx
.11939	ABS	639xx
SA FFT Wheel Speed Sensor	ABS	789xx
SA RIGHT Wheel Speed Sensor	ABS	790xx
DA LEET Wheel Speed Sensor	ABS	791xx
DA RIGHT Wheel Speed Sensor	ABS	792xx
AA LEFT Wheel Speed Sensor	ABS	793xx
AA RIGHT Wheel Speed Sensor	ABS	794xx
SA LEFT PMV	ABS	795xx
SA RIGHT PMV	ABS	796xx
DA LEFT PMV	ARS	797xx
	ARS	798xx
AA I FET PMV	ABS	799xx
AA RIGHT PMV	ABS	800xx
Retarder Relay	ARS	801xx
Relay Diagonal 1	ABS	802xx
TCV DA Solenoid	ABS	806xx
		00077



Display Text	Source	DTC
TCV SA Solenoid	ABS	807xx
Wheel Speed Sensor Reversed	ABS	810xx
ABS Lamp Fault	ABS	811xx
Stop Lamp Switch	ABS	1045xx
Trailer PMV	ABS	1056xx
SUSP Pressure Sensor	ABS	1059xx
Pressure Sensor	ABS	1067xx
Pressure Sensor Secondary Circuit	ABS	1068xx
Tires Size Out Of Range	ABS	1069xx
SAS Signal	ABS	1807xx
YRS Sensor	ABS	1808xx
LAS Sensor	ABS	1809xx
Connect Service Tool	ABS	Any Other
Fuel Filter Restriction	CECU	16xx
Wait Starter Cooldown Enforced	CECU	1675xx
High Beam Lamp(s) Fault	CECU	2348xx
Low Beam Lamp(s) Fault	CECU	2350xx
Left Front Lamp(s) Fault	CECU	2368xx
Right Front Lamp(s) Fault	CECU	2370xx
Left Rear Lamp(s) Fault	CECU	2372xx
Right Rear Lamp(s) Fault	CECU	2374xx
Marker Lamp(s) Fault	CECU	2378xx
Clearance Lamp(s) Fault	CECU	2382xx
Primary Fog Lamps Fault	CECU	2388xx
Secondary Fog Lamps Fault	CECU	2390xx
Left Trailer Lamp(s) Fault	CECU	2396xx
Right Trailer Lamp(s) Fault	CECU	2398xx
Current Sensor Fault	CECU	2579xx
Main Light Switch Fault	CECU	2872xx
Sec. Light Switch Fault	CECU	2873xx
High Beam Switch Fault	CECU	2874xx
Hazard Switch Fault	CECU	2875xx
Turn Lamp Switch Fault	CECU	2876xx
Vehicle Speed Message Missing	CECU	8409
Accel Pedal Message Missing	CECU	9109
App. Air Pressure Sensor Open	CECU	11603
App. Air Pressure Sensor Short	CECU	11604
Pri. Air Pressure Sensor Open	CECU	11703
Pri. Air Pressure Sensor Short	CECU	11704
Sec. Air Pressure Sensor Open	CECU	11803
Sec. Air Pressure Sensor Short	CECU	11804
Ignition Power Circuit Fault	CECU	15802
Ignition Power Circuit Fault	CECU	15803
Ignition Power Circuit Fault	CECU	15804
Control Unit Over Voltage	CECU	16800
Control Unit Under Voltage	CECU	16801
Outside Temp Sensor Open	CECU	17103
Outside Temp Sensor Short	CECU	17104
Instant Economy Message Missing	CECU	18409
Engine Speed Message Missing	CECU	19009
Odometer Offset Recalculated	CECU	24510
Engine Hours Message Missing	CECU	24709
Total PTO Hours Message Missing	CECU	24809
Gauge Bus Power Open Circuit	CECU	67805
Gauge Bus Power Short Circuit	CECU	67806
Pri. Fuel Level Sensor Open	CECU	82903

Display Text	Source	DTC
Pri. Fuel Level Sensor Short	CECU	82904
Vehicle Distance Message Missing	CECU	91709
Total PTO Fuel Message Missing	CECU	102809
Instrument Bus Comm Failure	CECU	123109
ABS J1939 Failure	CECU	148109
Trans. J1939 Failure	CECU	148209
Engine J1939 Failure	CECU	148309
Dash Dimmer Switch Open	CECU	149106
Dash Dimmer Switch Short	CECU	149206
Connect Service Tool	CECU	Any Other
Exhaust Trap Inlet Pressure	DPF	81xx
Vehicle Speed Sensor	DPF	84xx
Fuel Delivery Pressure	DPF	94xx
Boost Pressure	DPF	102xx
Barometric Pressure	DPF	108xx
Switched Power	DPF	158xx
Engine Fuel Rate	DPF	183xx
Engine Speed	DPF	190xx
Total Distance Traveled	DPF	245xx
Engine Percent Torque	DPF	513xx
J1939 Datalink	DPF	639xx
AUX I/O Circuit 1	DPF	701xx
AUX I/O Circuit 2	DPF	702xx
AUX I/O Circuit 3	DPF	703xx
AUX I/O Circuit 4	DPF	704xx
AUX I/O Circuit 5	DPF	705xx
AUX I/O Circuit 6	DPF	706xx
AUX I/O Circuit 7	DPF	707xx
Air Supply Pressure Input	DPF	1087xx
Exhaust Gas Temp 1	DPF	3241xx
Exhaust Gas Temp 3	DPF	3245xx
Exhaust Gas Temp 2	DPF	3249xx
Particulate Trap 1 Pressure	DPF	3251xx
Catalyst Dosing Unit	DPF	3361xx
DPF Fuel Pressure Actuator 1	DPF	3471xx
DPF Air Pressure Actuator 1	DPF	3472xx
DPF Purge Air Pressure	DPF	3486xx
Part Trap 1 Regen Not Available	DPF	3750xx
Connect Service Tool	DPF	Any Other

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12 Troubleshooting

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DIAGNOSTIC TROUBLE CODES

Introduction

ESA is a PC-based diagnostic tool that detects fault codes and helps troubleshoot the new multiplexed electrical system. ESA communicates over a data-link adapter (DLA) to the vehicle CECU.

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- Verify instrumentation functionality
- Read fault codes from components
- Diagnose the problem using information on ServiceNet

The following chart provides a listing of possible CECU diagnostic trouble codes (DTCs) and links to their corresponding troubleshooting procedures.

DTC	CECU3/Chassis	Item / System	Description	Detailed Description
	Node			
1603	Chassis Node	Fuel Filter Restriction	Open in fuel filter restriction	This DTC will be recorded when the control unit sees an
			circuit	open or short to ground at the fuel filter restriction sensor
				input. Some possible causes for this are a broken wire,
				corroded or disconnected connector, or sensor failure. The
				wiring for this sensor runs from the chassis node through
				the chassis harness and sender extension harness to the
				sensor on the fuel filter.
1604	Chassis Node	Fuel Filter Restriction	Short in fuel filter restriction	This DTC will be recorded when the control unit sees a
			circuit	short to +5V at the fuel filter restriction sensor input. Some
				possible causes for this are a pinched wire, water in a
				connector, or sensor failure. The wiring for this sensor runs
				from the chassis node through the chassis harness and
				sender extension harness to the sensor on the fuel filter.
7703	Chassis Node	Rear Drive Oil Temp	Open in rear drive axle oil	This DTC will be recorded when the control unit sees an
			temp circuit	open at the rear drive axle oil temperature sensor input.
				Some possible causes for this are a broken wire, corroded
				or disconnected connector, or sensor failure. The wiring for
				this sensor runs from the chassis node through the chassis
				harness and rear axle harness to the sensor on the rear
				drive axle.
7704	Chassis Node	Rear Drive Oil Temp	Short in rear drive axle oil	This DTC will be recorded when the control unit sees a
			temp circuit	short to ground at the rear drive axle oil temperature sensor
				input. Some possible causes for this are a pinched wire,
				water in a connector, or sensor failure. The wiring for this
				sensor runs from the chassis node through the chassis
				harness and rear axle harness to the sensor on the rear
				drive axle.
7803	Chassis Node	Center/Steer axle Oil	Open in Center/Steer axle	This DTC will be recorded when the control unit sees an
		Temp	oil temp circuit	open at the center drive axle oil temperature sensor input.
				Some possible causes for this are a broken wire, corroded
				or disconnected connector, or sensor failure. The wiring for
				this sensor runs from the chassis node through the chassis
				harness and rear axle harness to the sensor on the center
				drive axle.

DTC	CECU3/Chassis	Item / System	Description	Detailed Description
	Node			
7804	Chassis Node	Center Drive axle Oil	Short in center drive axle oil	This DTC will be recorded when the control unit sees a
		Temp	temp circuit	short to ground at the center drive axle oil temperature
				sensor input. Some possible causes for this are a pinched
				wire, water in a connector, or sensor failure. The wiring for
				this sensor runs from the chassis node through the chassis
				harness and rear axle harness to the sensor on the center
				drive axle.
8409	CECU	Wheel-Based Vehicle	Wheel Based Vehicle Speed	This DTC will be recorded when the control unit does
		Speed Message	Message missing	not see the Wheel Based Vehicle Speed message from
				the engine, or when the message has timed out. Some
				possible causes for this include faulty wiring to the engine
				controller, incorrect engine programming or a faulty engine
				controller. The data bus wiring runs from the control unit
				located behind the cup holder through the IP harness to the
				engine harness.
9003	Chassis Node	PTO Oil Temp	Open in PTO oil temp circuit	This DTC will be recorded when the control unit sees an
				open at the PTO oil temperature sensor input. Some
				possible causes for this are a broken wire, corroded or
				disconnected connector, or sensor failure.
9004	Chassis Node	PTO Oil Temp	Short in PTO oil temp circuit	This DTC will be recorded when the control unit sees a
				short to ground at the PTO oil temperature sensor input.
				Some possible causes for this are a pinched wire, water in
				a connector, or sensor failure.
9109	CECU	Accelerator Pedal	Accelerator Pedal Position	This DTC will be recorded when the control unit does not
		Position Message	Message missing	see the Accelerator Pedal Position Speed message from
		Ū	0 0	the engine, or when the message has timed out. Some
				possible causes for this include faulty data link wiring to
				the engine controller incorrect engine programming or a
				faulty engine controller. The data bus wiring runs from the
				control unit located behind the cup holder through the IP
				harness to the engine harness
10703	CECU	Air Filter Restriction	Open in air filter restriction	This DTC will be recorded when the control unit sees an
			circuit	open at the air filter restriction sensor input. Some possible
				causes for this are a broken wire, corroded or disconnected
				connector or sensor failure. The wiring for this sensor runs
				from the control unit located behind the cup holder through
				the IP harness to the sensor on the air junction block
10704	CECU	Air Filter Restriction	Short in air filter restriction	This DTC will be recorded when the control unit sees a
	0200		circuit	short to +5V at the air filter restriction sensor input. Some
				possible causes for this are a pinched wire water in a
				connector or sensor failure. The wiring for this sensor runs
				from the control unit located behind the cup holder through
				the IP harness to the senser on the air junction block
11603	CECU	Application Air Pressure	Open in application air	This DTC will be recorded when the control unit sees an
11000	OLOU			open or short to ground at the tractor brake application
				air pressure sensor input. Some possible causes for this
				an pressure sensor input. Some possible causes for this
				are a broken wire, confided of disconnected connector,
				or sensor ranure. The winning for this sensor runs from the
				control unit located benind the cup holder through the IP
1	1	1	1	inarness to the sensor on the air junction block

DTC	CECU3/Chassis	Item / System	Description	Detailed Description
	Node			
11604	CECU	Application Air Pressure	Short in application air	This DTC will be recorded when the control unit sees a
			pressure circuit	short to +5V at the tractor brake application air pressure
				sensor input. Some possible causes for this are a pinched
				wire, water in a connector, or sensor failure. The wiring
				for this sensor runs from the control unit located behind
				the cup holder through the IP harness to the sensor on
				the air junction block.
11703	CECU	Primary Air Pressure	Open in primary air pressure	This DTC will be recorded when the control unit sees an
			circuit	open or short to ground at the primary air pressure sensor
				input. Some possible causes for this are a broken wire,
				corroded or disconnected connector, or sensor failure. The
				wiring for this sensor runs from the control unit located
				behind the cup holder through the IP harness to the sensor
				on the air junction block.
11704	CECU	Primary Air Pressure	Short in primary air pressure	This DTC will be recorded when the control unit sees a
			circuit	short to +5V at the primary air pressure sensor input. Some
				possible causes for this are a pinched wire, water in a
				connector, or sensor failure. The wiring for this sensor runs
				from the control unit located behind the cup holder through
				the IP harness to the sensor on the air junction block.
11803	CECU	Secondary Air Pressure	Open in secondary air	This DTC will be recorded when the control unit sees an
			pressure circuit	open or short to ground at the secondary air pressure
				sensor input. Some possible causes for this are a broken
				wire, corroded or disconnected connector, or sensor failure.
				The wiring for this sensor runs from the control unit located
				behind the cup holder through the IP harness to the sensor
				on the air junction block.
11804	CECU	Secondary Air Pressure	Short in secondary air	This DTC will be recorded when the control unit sees a
			pressure circuit	short to +5V at the secondary air pressure sensor input.
				Some possible causes for this are a pinched wire, water in
				a connector, or sensor failure. The wiring for this sensor
				runs from the control unit located behind the cup holder
				through the IP harness to the sensor on the air junction
				block.
15802	CECU	Ignition Power	Ignition Power is in an	This DTC will be recorded when the control unit sees
			indeterminate state	between 33% and 66% of battery voltage on the ignition
				pin. A possible cause for this is faulty ignition sense wiring.
				The ignition sense wire comes from the power distribution
				box to the control unit behind the cup holder. This sense
				wire is also used for other control units such as the door
				modules and cluster. The wiring to those control units may
				be the issue.
15803	CECU	Ignition Power	12V is on control unit ignition	This DTC will be recorded when the control unit sees 12V
			pin but not on cluster ignition	on control unit ignition pin but not on cluster ignition pin.
			pin	Some possible causes for this are a broken wire, corroded
				or disconnected connector. Ignition power is supplied to
				the cluster from the power distribution box near the drivers
				left foot through the IP harness to the cluster

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DTC	CECU3/Chassis	Item / System	Description	Detailed Description
	Node			
15804	CECU	Ignition Power	12V is on cluster ignition	This DTC will be recorded when the control unit sees 12V
			pin but not on control unit	on cluster ignition pin but not on control unit ignition pin.
			ignition pin	Some possible causes for this are a broken wire, corroded
				or disconnected connector. Ignition power is supplied to
				the control unit from the power distribution box near the
				drivers left foot through the IP harness to the control unit
				behind the cup holder.
16800	CECU	Control Unit Battery	Over voltage	The control unit continually monitors the voltage it is
		Voltage		supplied. If the voltage is above 15 volts the system will
				record this fault. Some possible causes for this fault are
				faulty alternator, or jump starting with to high of voltage.
				Power is supplied from the power distribution box near the
				drivers left foot through the IP harness to the control unit
				behind the cup holder.
16801	CECU	Control Unit Battery	Under voltage for more than	The control unit continually monitors the voltage it is
		Voltage	10 minutes	supplied. If the voltage is below 10 volts for 10 minutes
				the system will record this fault. Some possible causes for
				this fault are low batteries, too much system load, faulty
				alternator, or corroded connectors. Power is supplied for
				the power distribution box near the drivers left foot through
				the IP harness to the control unit behind the cup holder.
17102	CECU	Outside Air Temp	Outside air temp message	This DTC will be recorded when the CAN signal for the
			from engine error	outside air temperature sensor from the engine is in the
				invalid range. Some possible causes for this are broken
				wire or sensor failure.
				CAUTION
				Modifying the sensor or its location can
				impact vehicle performance, emissions,
				and/or reliability.
17103	CECU	Outside Air Temp	Open in outside air temp	This DTC will be recorded when the control unit sees an
			circuit	open at the outside air temperature sensor input. Some
				possible causes for this are a broken wire, corroded or
				disconnected connector, or sensor failure. The wiring for
				this sensor runs from the control unit located behind the
				cup holder through the IP harness and left hand mirror
				harness to the sensor on the mirror.
17104	CECU	Outside Air Temp	Short in outside air temp	This DTC will be recorded when the control unit sees a
			circuit	short to ground at the outside air temperature sensor input.
				Some possible causes for this are a pinched wire, water in
				a connector, or sensor failure. The wiring for this sensor
				runs from the control unit located behind the cup holder
				through the IP harness and left hand mirror harness to the
				sensor on the mirror.

DTC	CECU3/Chassis	Item / System	Description	Detailed Description
	Node			
17131	CECU	Outside Air Temp	Outside air temp message	This DTC will be recorded when the control unit does not
			from engine missing	receive an ambient air condition message from the engine.
				Some possible causes for this are a broken wire, corroded
				or disconnected connector, no terminating resistors, no
				power to the Engine system or Engine ECU failure.
				Modifying the sensor or its location can
				impact venicle performance, emissions,
				and/or reliability.
17303	CECU	Exhaust Temp	Open in exhaust temp circuit	This DTC will be recorded when the control unit sees an
				open at the exhaust temp sensor input. Some possible
				causes for this are a broken wire, corroded or disconnected
				connector, or sensor failure. The wiring for this sensor
				runs from the control unit located behind the cup holder
				through the IP harness and engine harness to the sensor
				on exhaust pipe just behind turbo.
17304	CECU	Exhaust Temp	Short in exhaust temp circuit	This DTC will be recorded when the control unit sees a
				short to ground at the exhaust temp sensor input. Some
				possible causes for this are a pinched wire, water in a
				connector, or sensor failure. The wiring for this sensor
				runs from the control unit located behind the cup holder
				through the IP harness and engine harness to the sensor
				on exhaust pipe just behind turbo.
17703	CECU	Transmission Oil Temp	Open in transmission oil	This DTC will be recorded when the control unit sees an
			temp circuit	open at the transmission oil temperature sensor input.
				Some possible causes for this are a broken wire, corroded
				or disconnected connector, or sensor failure. The wiring
				for this sensor runs from the control unit located behind
				the cup holder through the IP harness, engine harness.
				chassis harness and transmission harness to the sensor
				on transmission
17704	CECU	Transmission Oil Temp	Short in transmission oil	This DTC will be recorded when the control unit sees
			temp circuit	a short to ground at the transmission oil temperature
				sensor input. Some possible causes for this are a pinched
				wire water in a connector or sensor failure. The wiring
				for this sensor runs from the control unit located behind
				the cup holder through the IP harness, engine harness
				chassis harness and transmission harness to the sensor
				on transmission
18409	CECU	Instantaneous Fuel	Instantaneous Fuel	This DTC will be recorded when the control unit does
10100	0200		Economy message missing	not see the Instantaneous Fuel Economy message from
		Economy message	Leonomy message missing	the engine or when the message has timed out. Some
				no engine, or when the message has timed out. Some
				possible causes for this include faulty withing to the engine
				deta hug wiring nung from the control with located to him different
				uata bus willing runs from the control unit located bening the
1	1	1	1	rcup holder through the IP harness to the engine harness.

DTC	CECU3/Chassis	Item / System	Description	Detailed Description
	Node			
19009	CECU	Engine Speed Message	Engine Speed message	This DTC will be recorded when the control unit does
			missing	not see the Engine Speed message from the engine, or
				when the message has timed out. Some possible causes
				for this include faulty wiring to the engine controller or a
				faulty/misconfigured engine controller. The data bus wiring
				runs from the control unit located behind the cup holder
				through the IP harness to the engine harness.
23731	CECU	Engine VIN	MX Engine and CECU3 VIN	This DTC will be recorded when the VIN of the MX Engine
		Valid for 2010 emissions	mismatch	does not match the VIN of the CECU3. This could be
		compliant engines		caused by swapping Engine controllers or CECU3's without
		CECU3		correctly reprogramming them.
24510	CECU	Offset of Odometer	Odometer offset has been	The instrumentation system continually calculates the
			recalculated	odometer reading using information from the engine
				ECU. It stores the offset between the engine ECU and
				instrumentation system. This offset is recalculated if the
				engine ECU or the control unit are replaced. This DTC will
				appear when the offset is recalculated.
24709	CECU	Engine Total Hours of	Engine Total Hours of	This DTC will be recorded when the control unit does not
		Operation	Operation message	see the Engine Total Hours of Operation message from
				the engine, or when the message has timed out. Some
				possible causes for this include faulty data bus wiring to
				the engine controller or a faulty/misconfigured engine
				controller. The data bus wiring runs from the control unit
				located behind the cup holder through the IP harness to the
				engine harness.
24809	CECU	Total Power Takeoff	Total Power Takeoff Hours	This DTC will be recorded when the control unit does
		Hours	message	not see the Total Power Takeoff Hours message from
				the engine, or when the message has timed out. Some
				possible causes for this include faulty data bus wiring to
				the engine controller or a faulty/misconfigured engine
				controller. The data bus wiring runs from the control unit
				located behind the cup holder through the IP harness to the
				engine harness.
44103	Chassis Node	General Temp	Open in general oil temp	This DTC will be recorded when the control unit sees an
			circuit	open at the general oil temperature sensor input. Some
				possible causes for this are a broken wire, corroded or
				disconnected connector, or sensor failure. The wiring
				for this sensor runs from the chassis node through the
				chassis and IP harnesses to a connector behind the right
				hand gauge panel. The sensor can be used to monitor
				many different components, follow extension harnesses to
				determine sensor location.

DTC	CECU3/Chassis	Item / System	Description	Detailed Description
	Node			
44104	Chassis Node	General Temp	Short in general oil temp	This DTC will be recorded when the control unit sees a
			circuit	short to ground at the general temperature sensor input.
				Some possible causes for this are a pinched wire, water in
				a connector, or sensor failure. The wiring for this sensor
				runs from the chassis node through the chassis and IP
				harnesses to a connector behind the right hand gauge
				panel. The sensor can be used to monitor many different
				components, follow extension harnesses to determine
				sensor location.
44203	Chassis Node	Aux Transmission Temp	Open in aux transmission	This DTC will be recorded when the control unit sees an
			temp circuit	open at the auxiliary transmission oil temperature sensor
				input. Some possible causes for this are a broken wire,
				corroded or disconnected connector, or sensor failure. The
				wiring for this sensor runs from the control unit located
				behind the cup holder through the IP harness, chassis
				harness and sensor extension harness to the sensor on
				auxiliary transmission.
44204	Chassis Node	Aux Transmission Temp	Short in aux transmission	This DTC will be recorded when the control unit sees a
			temp circuit	short to ground at the auxiliary transmission oil temperature
				sensor input. Some possible causes for this are a pinched
				wire, water in a connector, or sensor failure. The wiring for
				this sensor runs from the chassis node through the chassis
				harness and sensor extension harness to the sensor on
				auxiliary transmission.
57803	Chassis Node	Forward Drive Oil Temp	Open in forward drive axle	This DTC will be recorded when the control unit sees an
			oil temp circuit	open at the forward drive axle oil temperature sensor input.
				Some possible causes for this are a broken wire, corroded
				or disconnected connector, or sensor failure. The wiring for
				this sensor runs from the chassis node through the chassis
				harness and sensor extension harness to the sensor on
				the forward drive axle.
57804	Chassis Node	Forward Drive Oil Temp	Short in forward drive axle	This DTC will be recorded when the control unit sees a
			oil temp circuit	short to ground at the forward drive axle oil temperature
				sensor input. Some possible causes for this are a pinched
				wire, water in a connector, or sensor failure. The wiring for
				this sensor runs from the chassis node through the chassis
				harness and sensor extension harness to the sensor on
				the forward drive axle.
67805	CECU	CVSG / MCS Supply	CVSG / MCS supply Open	This DTC will be recorded when the control unit sees an
			Load	open load on the power supply to the CVSG bus and the
				Menu Control Switch. A possible cause of this failure is a
				broken wire leading to the 2" gauges. A common symptom
				of this fault is that none of the 2" gauges are working.

DTC	CECU3/Chassis	Item / System	Description	Detailed Description
	Node			
67806	CECU	CVSG / MCS Supply	CVSG / MCS supply Shorted	This DTC will be recorded when the sees a short to ground
			to ground	on the CVSG supply. Some possible causes for this are a
				pinched wire, water in a connector, bent pins on a CVSG
				or a failed CVSG. The wiring for CVSG runs from the
				control unit located behind the cup holder through the IP
				harness to two connectors on each side of the cluster.
				CVSG jumpers are used to link the remaining gauges. A
				common symptom of this fault is that none of the 2" gauges
				are working.
80404	CECU	ABS Mode	"Tractor ABS Not Installed"	This DTC will be recorded when the control unit "ABS
			Input is shorted and ABS	Installed" parameter is disabled and it is receiving
			system is present.	messages from an ABS system on V-CAN. If the vehicle
				is to be equipped with ABS enable the "ABS Installed"
				parameter. If the vehicle is not to be equipped with ABS
				remove the ABS control unit.
82903	Chassis Node	Primary Fuel	Open in primary fuel level	This DTC will be recorded when the control unit sees an
			circuit	open at the primary fuel level sensor input. Some possible
				causes for this are a broken wire, corroded or disconnected
				connector, or sensor failure. The wiring for this sensor runs
				from the chassis node through the chassis harness and
				sensor extension harness to the sensor on fuel tank.
82904	Chassis Node	Primary Fuel	Short in primary fuel level	This DTC will be recorded when the control unit sees a
			circuit	short to ground at the primary fuel level sensor input.
				Some possible causes for this are a pinched wire, water in
				a connector, or sensor failure. The wiring for this sensor
				runs from the chassis node through the chassis harness
				and sensor extension harness to the sensor on fuel tank.
83003	Chassis Node	Secondary Fuel	Open in secondary fuel level	This DTC will be recorded when the control unit sees
			circuit	an open at the secondary fuel level sensor input. Some
				possible causes for this are a broken wire, corroded or
				disconnected connector, or sensor failure. The wiring for
				this sensor runs from the chassis node through the chassis
				harness and sensor extension harness to the sensor on
				fuel tank.
83004	Chassis Node	Secondary Fuel	Short in secondary fuel level	This DTC will be recorded when the control unit sees a
			circuit	short to ground at the secondary fuel level sensor input.
				Some possible causes for this are a pinched wire, water in
				a connector, or sensor failure. The wiring for this sensor
				runs from the chassis node through the chassis harness
				and sensor extension harness to the sensor on fuel tank.
91709	CECU	High Resolution Vehicle	High Resolution Vehicle	This DTC will be recorded when the control unit does not
		Distance Message	Distance message missing	see the High Resolution Vehicle Distance message from
				the engine, or when the message has timed out. Some
				possible causes for this include faulty data bus wiring to
				the engine controller or a faulty engine controller. The data
				bus wiring runs from the control unit located behind the cup
				holder through the IP harness to the engine harness

DTC	CECU3/Chassis	Item / System	Description	Detailed Description
	Node			
102809	CECU	Total Engine PTO Fuel	Total Engine PTO Fuel Used	This DTC will be recorded when the control unit does
		Used Message	Message missing	not see the Total Engine PTO Fuel Used message from
				the engine, or when the message has timed out. Some
				possible causes for this include faulty data bus wiring to
				the engine controller or a faulty/misconfigured engine
				controller. The data bus wiring runs from the control unit
				located behind the cup holder through the IP harness to the
				engine harness.
123109	CECU	I-CAN	Control Unit cannot read	This DTC will be recorded when the control unit cannot read
			messages from Cluster on	messages from the cluster. Some possible causes for this
			I-CAN	are a broken wire, corroded or disconnected connector, no
				power to the cluster or cluster failure. The wiring for I-CAN
				is a twisted pair that runs from the control unit located
				behind the cup holder through the IP harness to the cluster.
138703	CECU	Brake Saver Oil Temp	Open in brake saver oil temp	This DTC will be recorded when the control unit sees an
			circuit	open at the brake saver oil temperature sensor input.
				Some possible causes for this are a broken wire, corroded
				or disconnected connector, or sensor failure. The wiring
				for this sensor runs from the control unit located behind
				the cup holder through the IP harness, firewall jumper and
				sensor extension harness to the sensor on brake saver.
138704	CECU	Brake Saver Oil Temp	Short in brake saver oil temp	This DTC will be recorded when the control unit sees a
			circuit	short to ground at the brake saver oil temperature sensor
				input. Some possible causes for this are a pinched wire,
				water in a connector, or sensor failure. The wiring for this
				sensor runs from the control unit located behind the cup
				holder through the IP harness, firewall jumper and sensor
				extension harness to the sensor on brake saver.
138803	Chassis Node	Transfer Case Oil Temp	Open in transfer case oil	This DTC will be recorded when the control unit sees an
			temp circuit	open at the transfer case oil temperature sensor input.
				Some possible causes for this are a broken wire, corroded
				or disconnected connector, or sensor failure. The wiring for
				this sensor runs from the chassis node through the chassis
				harness and sensor extension harness to the sensor on
				transfer case.
138804	Chassis Node	Transfer Case Oil Temp	Short in transfer case oil	This DTC will be recorded when the control unit sees a
			temp circuit	short to ground at the transfer case oil temperature sensor
				input. Some possible causes for this are a pinched wire,
				water in a connector, or sensor failure. The wiring for this
				sensor runs from the chassis node through the chassis
				harness and sensor extension harness to the sensor on
				transfer case.
148109	CECU	V-CAN	Control unit cannot read	This DTC will be recorded when the control unit cannot
			messages from ABS on	read messages from the ABS system. Some possible
			V-CAN	causes for this are a broken wire, corroded or disconnected
				connector, no terminating resistors, no power to the ABS
				system or ABS ECU failure.

DTC	CECU3/Chassis	Item / System	Description	Detailed Description
	Node			
148209	CECU	V-CAN	Control Unit cannot	This DTC will be recorded when the control unit cannot
			read messages from	read messages from the transmission ECU. Some possible
			Transmission on V-CAN	causes for this are a broken wire, corroded or disconnected
				connector, no terminating resistors, no power to the
				Transmission or Transmission ECU failure.
148309	CECU	V-CAN	Control Unit cannot read	This DTC will be recorded when the control unit cannot
			messages from Engine on	read messages from the engine ECU. Some possible
			V-CAN	causes for this are a broken wire, corroded or disconnected
				connector, no terminating resistors, no power to the engine
				or engine ECU failure.
148703	CECU	Dash Light Dimmer	Open in dash dimmer input	This DTC will be recorded when the control unit sees an
			circuit	open at the dash light dimmer control input. Some possible
				causes for this are a broken wire, corroded or disconnected
				connector, or dimmer control failure. The wiring for this
				control runs from the control unit located behind the cup
				holder through the IP harness to the control on the dash.
148704	CECU	Dash Light Dimmer	Short in dash dimmer input	This DTC will be recorded when the control unit sees a
			circuit	short to ground at the dash light dimmer control input.
				Some possible causes for this are a pinched wire, water in
				a connector, or dimmer control failure. The wiring for this
				control runs from the control unit located behind the cup
				holder through the IP harness to the control on the dash.
149106	CECU	Dash Light Dimmer	Short in dash dimmer output	This DTC will be recorded when the sees a short to ground
			#1 circuit	on the #1 dimmer output. Some possible causes for this
				are a pinched wire, water in a connector, or dimmed
				component failure. This output controls dimming to the left
				and right spare backlighting.
149206	CECU	Dash Light Dimmer	Short in dash dimmer output	This DTC will be recorded when the sees a short to ground
			#2 circuit	on the #2 dimmer output. Some possible causes for this
				are a pinched wire, water in a connector, or dimmed
				component failure. This output controls dimming to much
				of the instrument illumination and backlighting.
167502	CECU	Starter Motor Cooldown	Diesel Exhaust Fluid Level	This DTC will be recorded when the allowed cranking time
		Enforce	Message Error	has been reached and the starter is disabled. This DTC will
				go away and the starter will be re-enabled after 15 minutes.
176102	CECU	Diesel Exhaust Fluid	Diesel Exhaust Fluid Level	This DTC will be recorded when the control unit receives
			Message Error	an invalid range on the diesel exhaust fluid level message
				from the engine ECU or does not receive the message in
				a timely manner.
2348xx	Chassis Node	Exterior Lighting - High	High Beam Output Fault	This set of DTCs (xx = anything) will be recorded when
		Beam		there is a problem with one of the High Beam circuits. This
				could be caused by failed bulbs, wiring harness issues, or
				corroded connectors.
				Left high beam output from Pin 13 of the Chassis Node
				connector A.
				Right high heam output from Pin 7 of the Chassis Node
				connector Δ

DTC	CECU3/Chassis	Item / System	Description	Detailed Description
	Node			
2350xx	Chassis Node	Exterior Lighting - Low	Low Beam Output Fault	This set of DTCs (xx = anything) will be recorded when
		Beam		there is a problem with one of the Low Beam circuits. This
				could be caused by failed bulbs, wiring harness issues, or
				corroded connectors.
				Left low beam output from Pin 1 of the Chassis Node
				connector A.
				Right low beam output from Pin 19 of the Chassis Node
				connector A.
2368xx	Chassis Node	Exterior Lighting - Left	Left Front Turn Fault	This set of DTCs (xx = anything) will be recorded when
		Front Turn		there is a problem with one of the Left Front Turn circuit.
				This could be caused by failed bulbs, wiring harness
				issues, or corroded connectors.
				Left front turn output from Pin 4 of the Chassis Node
				connector B.
2370xx	Chassis Node	Exterior Lighting - Right	Right Front Turn Fault	This set of DTCs (xx = anything) will be recorded when
		Front Turn		there is a problem with one of the Right Front Turn circuit.
				This could be caused by failed bulbs, wiring harness
				issues, or corroded connectors.
				Right front turn output from Pin 7 of the Chassis Node
				connector B.
2372xx	Chassis Node	Exterior Lighting -	Tractor/Truck Left Rear	This set of DTCs (xx = anything) will be recorded when
		Tractor/Truck Left Rear	Turn/Stop Fault	there is a problem with one of the Left Rear Turn/Stop
		Turn/Stop		circuit. This could be caused by failed bulbs, wiring harness
				issues, or corroded connectors.
				Tractor/Truck left rear turn/stop output from Pin 13 of the
				Chassis Node connector B.
2374xx	Chassis Node	Exterior Lighting -	Tractor/Truck Right Rear	This set of DTCs (xx = anything) will be recorded when
		Tractor/Truck Right	Turn/Stop Fault	there is a problem with one of the Right Rear Turn/Stop
		Rear Turn/Stop		circuit. This could be caused by failed bulbs, wiring harness
				issues, or corroded connectors.
				Tractor/Truck right rear turn/stop output from Pin 2 of the
				Chassis Node connector B.
2378xx	Chassis Node	Exterior Lighting -	Marker Lamp Fault	This set of DTCs (xx = anything) will be recorded when
		Marker Lamp		there is a problem with one of the Marker Lamp circuit. This
				could be caused by failed bulbs, wiring harness issues, or
				corroded connectors.
				Marker lamp relay control output from Pin 10 of the Chassis
				Node connector A.
2382xx	CECU	Exterior Lighting -	Clearance Lamp Fault	This set of DTCs (xx = anything) will be recorded when
		Clearance Lamp		there is a problem with one of the Clearance Lamp circuit.
				This could be caused by failed bulbs, wiring harness
				issues, or corroded connectors.
2388xx	Chassis Node	Exterior Lighting - Fog	Fog Lamp Fault	This set of DTCs (xx = anything) will be recorded when
		Lamp		there is a problem with one of the Fog Lamp circuit. This
				could be caused by failed bulbs, wiring harness issues, or
				corroded connectors.
				Fog lamps output from Pin 15 of the Chassis Node
				connector B

DTC	CECU3/Chassis	Item / System	Description	Detailed Description
	Node			
2390xx	Chassis Node	Exterior Lighting -	Secondary Fog Lamp Fault	This set of DTCs (xx = anything) will be recorded when
		Secondary Fog Lamp		there is a problem with one of the Secondary Fog Lamp
				circuit. This could be caused by failed bulbs, wiring harness
				issues, or corroded connectors.
				Secondary fog lamp relay control output from Pin 18 of the
				Chassis Node connector C.
2396xx	Chassis Node	Exterior Lighting - Left	Left Turn Trailer Lamp Fault	This set of DTCs (xx = anything) will be recorded when
		Turn Trailer Lamp		there is a problem with one of the Left Turn Trailer Lamp
				circuit. This could be caused by failed bulbs, wiring harness
				issues, or corroded connectors.
				Left turn trailer output from Pin 16 of the Chassis Node
				connector B.
2398xx	Chassis Node	Exterior Lighting - Right	Right Turn Trailer Lamp	This set of DTCs (xx = anything) will be recorded when
		Turn Trailer Lamp	Fault	there is a problem with one of the Right Turn Trailer Lamp
				circuit. This could be caused by failed bulbs, wiring harness
				issues, or corroded connectors.
				Right turn trailer output from Pin 20 of the Chassis Node
				connector C.
257903	CECU	Battery Current	Open in ammeter sensor	This DTC will be recorded when the control unit sees an
			circuit	open at the ammeter sensor input. Some possible causes
				for this are a broken wire, corroded or disconnected
				connector, or sensor failure. The wiring for this sensor runs
				from the control unit located behind the cup holder through
				the IP harness, engine harness and ammeter extension
				harness to the sensor on the jumper from main cab breaker
				to the batteries.
257904	CECU	Battery Current	Short in ammeter sensor	This DTC will be recorded when the control unit sees
			circuit	a short at the ammeter sensor input. Some possible
				causes for this are pinched wire, water in a connector, or
				sensor failure. The wiring for this sensor runs from the
				control unit located behind the cup holder through the IP
				harness, engine harness and ammeter extension harness
				to the sensor on the jumper from main cab breaker to the
				batteries.
286307	CECU	Wiper Switch	Wiper Switch Out of Range	This DTC will be recorded when the wiper switch is not
				providing a valid value (outside the ranges defined). This
				could be caused by a fault in the turn stalk or a wiring
				harness issue.
				For trucks equipped with a Turn Stalk Module (TSM),
				refer to the Turn Signal Stalk/Turn Stalk Module Electrical
				Service Manual (KM815060) for TSM description and
				troubleshooting of any suspect TSM related issues.
286612	CECU	Washer Switch	Washer Active for over 15s	This DTC will be recorded when the washer request has
				been active for over 15s.
				For trucks equipped with a Turn Stalk Module (TSM).
				refer to the Turn Signal Stalk/Turn Stalk Module Electrical
				Service Manual (KM815060) for TSM description and
				troubleshooting of any suspect TSM related issues

DTC	CECU3/Chassis	Item / System	Description	Detailed Description
	Node			
287204	CECU	Flash to Pass Switch	Short in Flash to Pass Switch	This DTC will be recorded when the control unit sees the
				flash to pass switch TRUE for over 10 seconds.
				For trucks equipped with a Turn Stalk Module (TSM),
				refer to the Turn Signal Stalk/Turn Stalk Module Electrical
				Service Manual (KM815060) for TSM description and
				troubleshooting of any suspect TSM related issues.
287304	CECU	Marker Lamp Flash	Short in Marker Lamp Flash	This DTC will be recorded when the control unit sees the
		Switch	Switch	marker lamp flash switch TRUE for over 10 seconds.
				For trucks equipped with a Turn Stalk Module (TSM),
				refer to the Turn Signal Stalk/Turn Stalk Module Electrical
				Service Manual (KM815060) for TSM description and
				troubleshooting of any suspect TSM related issues.
287404	CECU	High Beam Toggle	Short in High Beam Toggle	This DTC will be recorded when the control unit sees the
		Switch	Switch	high beam toggle switch TRUE for over 10 seconds.
				For trucks equipped with a Turn Stalk Module (TSM),
				refer to the Turn Signal Stalk/Turn Stalk Module Electrical
				Service Manual (KM815060) for TSM description and
				troubleshooting of any suspect TSM related issues.
287604	CECU	Turn Signal Switch	Short in Turn Signal Switch	This DTC will be recorded when the control unit sees the
				turn stalk input of a short circuit value (< 253Ω).
				For trucks equipped with a Turn Stalk Module (TSM),
				refer to the Turn Signal Stalk/Turn Stalk Module Electrical
				Service Manual (KM815060) for TSM description and
				troubleshooting of any suspect TSM related issues.
287607	CECU	Turn Signal Switch	Out of Range - Turn Signal	This DTC will be recorded when the control unit sees the
			Switch	turn stalk input in an invalid range (253 Ω < Input < 270 Ω
				OR 580Ω < Input < 685Ω).
				For trucks equipped with a Turn Stalk Module (TSM),
				refer to the Turn Signal Stalk/Turn Stalk Module Electrical
				Service Manual (KM815060) for TSM description and
				troubleshooting of any suspect TSM related issues.
524502	CECU	Diesel Exhaust Fluid	Diesel Exhaust Fluid Telltale	This DTC will be recorded when the control unit receives an
			Message Error	invalid range on the diesel exhaust fluid telltale message
				from the engine ECU or does not receive the message in
				a timely manner.
524602	CECU	Diesel Exhaust Fluid	Diesel Exhaust Fluid	This DTC will be recorded when the control unit sees
			Inducement Severity Error	a invalid value from the J1939 network for Operator
			1	Inducement Severity.

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TROUBLESHOOTING PROCEDURES

Introduction

This section provides troubleshooting procedures for Diagnostic Trouble Codes (DTCs) and symptoms that result when faults occur in the multiplexed electrical system.

The following procedures have been developed to assist the technician in diagnosing multiplexed problems using the Electronic Service Analyst (ESA) hardware/software diagnostic tool. It is assumed the service technician performing instrumentation repairs is knowledgeable about how to use ESA.

DTC148109, DTC148209, DTC148309 and DTC176102 V-CAN (J1939)

Symptom: One or more of the following gauges inoperative. All other non-V-CAN gauges are operational.

- Engine Oil Pressure Gauge
- Engine Oil Temperature Gauge
- Engine Coolant Temperature Gauge

Tachometer

li

- Speedometer
- Diesel Exhaust Fluid Gauge

V-CAN Databus gauges receive their data from the J1939 data link via the engine ECU, which receives its data from various sensors on the engine and transmission.

NOT	E

In case of a PX-6 engine, the calculated value (instead of measured value) is broadcast by the engine



Step	Check	Result	Next Step	
1	Turn ignition key ON.		Go to Step 2.	
	Start ESA, then select			
	"Connect" to establish			
	communication to the			
	vehicle.			
2	Select "Monitor". From	Gauge graphic(s) on screen	Go to Step 3.	
	the "Components"	display reasonable readings		
	window, select all of	Gauge graphic(s) on screen do not	Go to Step 4.	
	the failed functions then	display reasonable readings		
	select "Open".			
3	Select "Simulate".	Vehicle gauge(s) do not move. Go	Perform the following checks:	
	Drag the "Value" bar	to Step 3-1.		
	until the pointers on	Vehicle gauge reading(s) are in		
	the gauge images	the same range as the ESA gauge	Use the "Program" feature in ESA to make sure that	
	are approximately	image(s). Go to Step 3-7.	the parameter for the inoperative gauge is enabled.	
	mid-scale. Observe		An inoperative gauge may simply have its CECU	
	vehicle gauge		parameter set to disabled.	
	movement.		1. Check CVSG data link wiring: Observe Gauge position in the wiring	
			daisy chain.	
			a If gauge is mounted between two other functioning gauges CVSG	
			data link wiring is OK. Go to Sten 3-5	
			b. If gauge is last gauge is deiny shein or followed by other	
			non-functional gauges, go to Step 3-2.	
			2. Check continuity between Pin 1 on gauge harness connector and Pin 14	
			of the 52 Pin CECU connector C.	
			 Check continuity between Pin 3 on gauge harness connector and Pin 15 of the 52 Pin CECU connector C. 	
			4 Repair daisy chain jumper harness as necessary	
			 Once continuity on both wires exists, perform "Simulate" test again. 	
			a If gauge functions properly during "Simulate" test repair is complete	
			Return truck to service	
			h If gourge doop not function during "Simulate" toot install Toot CECU	
			and perform "Simulate" test again.	
			i. If gauge functions properly test is complete. Install new CECU	
			permanently. Re-test and return truck to service.	
			ii If gauge does not function properly during "Simulate" test	
			replace gauge.	
			6. Once gauge is replaced	
			a. Verify gauge functionality.	
			b. Return truck to service.	
			7. Is this a recheck after Step 4?	
			a. Yes. Return truck to service	
			b. No, Gauge and CVSG data link wiring is not the problem. Go to	
			Step 4.	

Step	Check	Result	Next Step	
4	Select "Diagnose" to	DTC 148309 displayed – CECU	Indicates the problem could be an open or short in the wiring from the CECU	
	view "Active" diagnostic	cannot read messages from	to the Engine ECU. In addition, J1939 components such as Terminating	
	trouble codes.	Engine on V-CAN.	Resistors may be missing or damaged. Data from the Engine ECU may be	
			missing or corrupting the J1939 data stream. Go to J1939 Lite Diagnostic	
			Procedure. Correct faults found in J1939 Diagnostics section and return to	
			Step 2 above.	
		DTC 148109 displayed – CECU	Indicates the problem could be an open or short in the wiring from the CECU to	
		cannot read messages from ABS	the ABS ECU. In addition, J1939 components such as Terminating Resistors	
		on V-CAN.	may be missing or damaged. Data from the ABS ECU may be missing or	
			corrupting the J1939 data stream. Go to J1939 Lite Diagnostic Procedure.	
			Correct faults found in J1939 Diagnostics section and return to Step 2 above.	
		DTC 148209 displayed – CECU	Indicates the problem could be an open or short in the wiring from the CECU	
		cannot read messages from	to the Transmission ECU. In addition, J1939 components such as Terminating	
		Transmission on V-CAN.	Resistors may be missing or damaged. Data from the Transmission ECU may	
			be missing or corrupting the J1939 data stream. Go to J1939 Lite Diagnostic	
			Procedure. Correct faults found in J 1939 Diagnostics section and return to	
		"Inactive" DTCs or No DTCs	Step 2 above.	
		displayed	Indicates the problem could be caused by foulty data from Engine ECU	
			1. Indicates the problem could be caused by faulty data from Engine ECO.	
			a. Connect Engine OE Diagnostic Tool to determine if engine is	
			transmitting engine data when the engine is running.	
			i. If data from the Engine ECU is not displayed in the OE	
			Diagnostic Tool check for:	
			(1) Missing signal from engine mounted sensor or Vehicle	
			Speed sensor.	
			(a) Faulty sensor	
			(b) Faulty engine sensor wiring supplied by Engine OE	
			(c) Faulty vehicle speed sensor wining on chassis of engine	
			(2) Missing signal from Engine ECU	
			(2) Missing signal from Engine ECU.	
			(a) Faulty Engine ECU software	
			(b) i auty Engine ECO software	
			II. If data from the Engine ECU is displayed on the OE Diagnostic	
			1001: Check to insure Engine data has been transmitted over	
			Diagnostical Correct found in 14020 Diagnostics costion	
			and rature to Stop 2 OP	
			Connect test Engine ECLI to determine if original ECLI has	
			failed Go to Stop 2	
			2 Indicates the problem sould be intermittent in patient. Dressed with	
			 Indicates the problem could be intermittent in nature. Proceed with diagnosis of inactive codes while leaking for loose connectors, terminale 	
			or bare wiring that might make accessional contact with motel parts or	
			or bare writing that might make occasional contact with metal parts or other wires. Technicians may need to manipulate connectors to find	
			intermittent connections. Co to 11030 Diagnostics. Correct faulte found	
			in J1939 Diagnostics section and return to Step 2 above.	

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Primary Air Pressure Gauge Inoperative

DTC11703 and DTC11704

Symptom: Primary air pressure gauge inoperative. All other gauges are operational.

The Primary Air Pressure Gauge uses an electronic transducer (sensor) which monitors system air pressure and converts it into a voltage

output that is sent to the instrumentation system. The output voltage of the sensor is proportional to the pressure it is sensing.

The following procedures have been developed to assist the technician in diagnosing multiplexed instrumentation problems using the Electronic Service Analyst (ESA) hardware/software diagnostic tool. It is assumed the service technician performing instrumentation repairs is knowledgeable about how to use ESA.



Step	Check	Result	Next Step	
1	Turn ignition key ON.		Go to Step 2.	
	Start ESA, then select			
	"Connect" to establish			
	communication to the			
	vehicle.			
2	Select "Monitor". From	Gauge graphic on screen displays	Go to Step 3.	
	the "Components"	reasonable reading.		
	window, select "Primary	Gauge graphic on screen does not	Go to Step 4.	
	Air Pressure", then	display reasonable reading.		
	select "Open."			
3	Select "Simulate". Drag	Vehicle gauge does not move. Go	Perform the following checks:	
	the "Value" bar until the	to Step 3-1.	NOTE	
	pointer on the gauge			$ \rightarrow $
	image is approximately		Use the "Program" feature in ESA to make sure that	t
	mid-scale. Observe		the parameter for the inoperative gauge is enabled.	•
	vehicle gauge		An inoperative gauge may simply have its CECU	וו
	movement.		parameter set to disabled.	
		Vehicle gauge reading is in the	1. Check CVSG data link wiring: Observe Gauge position in the wiring	
		same range as the ESA gauge	daisy chain.	
		image. Go to Step 3-7.	a. If gauge is mounted between two other functioning gauges CVSC	Э
			data link wiring is OK. Go to Step 3-5	
			b. If gauge is last gauge in daisy chain or followed by other	
			non-functional gauges, go to Step 3-2.	
			2 Check continuity between Din 1 on gauge harness connector and Din :	14
			of the 52 Pin CECU connector C.	14
			3. Check continuity between Pin 3 on gauge harness connector and Pin	15
			of the 52 Pin CECU connector C.	
			4. Repair daisy chain jumper harness as necessary.	
			5. Once continuity on both wires exists, perform "Simulate" test again.	
			 a. If gauge functions properly during "Simulate" test, repair is comple Return truck to service. 	ete.
			b If gauge does not function during "Simulate" test install a known	
			good gauge and perform "Simulate" test again.	
			 If gauge functions properly test is complete. Install new gauge permanently. Re-test and return truck to service. 	ge
			ii. If gauge does not function during "Simulate" test, install Test	t
			CECU and perform "Simulate" test again.	
			(1) If gauge functions properly test is complete. Install new	
			CECU permanently. Re-test and return truck to service.	
			(2) If gauge does not function properly during "Simulate" tes	st.
			replace gauge.	,
			6. Once gauge is replaced	
			a Verify gauge functionality	
			 vering gauge rundering. Betwee truck to complete 	
			7. Is this a recheck after Step 5, Step 6 or Step 7?	
			a. Yes. Return truck to service.	
			b. No, Gauge and CVSG data link wiring is not the problem. Go to	
			Step 4.	

Step	Check	Result	Next Step	
4	Select "Diagnose" to	No "Active" DTCs displayed.	Indicates the problem could be a defective sensor, poor ground or no input or	
	view "Active" primary		output voltage at sensor. Go to Step 5.	
	air pressure gauge	DTC 11703 displayed – Open in	This DTC will be recorded when the control unit sees an open or short to	
	diagnostic trouble	primary air pressure circuit.	ground at the primary air pressure sensor input. The fault is recorded when	
	codes.		the voltage at the input is below .1 volts.	
		DTC 11704 displayed – Short in	This DTC will be recorded when the control unit sees a short to +5V at the	
		primary air pressure circuit.	primary air pressure sensor input. The fault is recorded when the voltage at	
			the input is above 4.9 volts.	
5	Using a digital	(Sensor Ground) - There should	1. Check for continuity between sensor connector Pin A and ground	
	multimeter, check the	be continuity between the sensor	terminal.	
	ground, input and output	connector ground (Pin A) and	a. If there is continuity between Pin A and the ground terminal, test is	
	voltages at the sensor	a cab ground terminal. See	complete. Go to Step 5-2.	
	connector.	MultiMeter Graphic below.	b If there is no continuity between Pin A and the ground terminal:	
	Pin A – Ground	(Sensor Input Voltage) - Input	i. Check for continuity between concert connector Din A and Din 2	
	Pin B – Input Voltage	voltage from CECU to sensor	I. Check for continuity between sensor connector PITA and PIT2	
	Pin C – Output Voltage	connector (Pin B) should be +5		
	See CECU Pinout	volts. See MultiMeter Graphic	II. Check for continuity between Pin 5 of the 9 Pin CECU	
	for terminal details of	below.	connector A and a cab ground terminal.	
	the CECU electrical	(Sensor Output Voltage) - Signal	iii. Repair wiring as necessary. Go to Step 2.	
	connections.	output voltage at sensor connector	2. Check input voltage at sensor connector Pin B.	
		(Pin C) will vary depending on air	a. If there is voltage at Pin B, Go to Step 5-3 .	
		pressure, but should be more than	b. If there is no voltage at Pin B, check for voltage on Pin 1 of the 52	
		.1 volts and less than 4.9 volts.	Pin CECU connector C.	
		See Multimeter Graphic and Table	i. If there is voltage on Pin 1, check continuity between Pin 1	
			at CECU and Pin B at sensor connector. Repair wiring as	
			necessary. Go to Step 2 .	
		Do not unplug sensor	ii. If there is no voltage on Pin 1 at CECU, replace CECU. Go	
		connector or penetrate	to Step 2.	
		the wire insulation	3. Check signal output voltage at sensor connector Pin C.	
		to perform a sensor	a. If there is no voltage at Pin C, replace sensor. Go to Step 2.	
		Slide connector seal	b. If there is voltage at Pin C, Go to Step 6 .	
		back to expose	3 1	
		terminal ends		
		test leads with needle		
		point tips to probe	V	
		connector terminals.		
		(PSI) (VDC)		
		150 4 75		
		75 2.50		
		60 2.05		
		30 1 15		
		0 0.25	V ¥	

Step	Check	Result	Next	Step
		i NOTE Make sure that the system you are testing has some pressure to measure.	 Connector Seal Pin A Pin B Place MultiMeter Probe On Pin C 	
6	Select "Diagnose" to view primary air pressure gauge DTCs. Next, unplug the primary air pressure sensor connector at sensor. See CECU Pinout for terminal details of the CECU electrical connections.	DTC 11703 – Open in primary air pressure circuit is displayed as "Active."	 Check resistance between Pin C a If there is less than 5K ohms b Check wiring for short free repair and go to Step 2. Remove the 52 Pin CECL between Pin 6 of the 52 terminal. If less than 5K b. If there is more than 20K ohm Check wiring for open free repair and go to Step 2. Remove the "C" connect resistance between Pin 6 Remove the "C" connect resistance between Pin 6 If resistance between Pin 6 If and go to Step 2. 	nd ground terminal. retween Pin C and the ground terminal, com sensor to CECU. If short found, U connector C and measure resistance Pin CECU connector C and ground ohms replace CECU and go to Step 2 . Is between Pin C and ground terminal, com sensor to CECU. If open found, tor from the CECU and measure 6 of the 52 Pin CECU connector C more than 20K ohms, replace CECU
7	Select "Diagnose" to view primary air pressure gauge DTCs. Next, unplug the primary air pressure sensor connector at sensor. See CECU Pinout for terminal details of the CECU electrical connections.	DTC 11704 - Short in primary air pressure circuit is displayed as "Active".	1. If the fault is still "Active" after unpl have confirmed there is a short. There is a short between the sense typical power wires to inspect are I any power source in the main cab Description Power Supply Sensor +5V Dash Illumination 1 CVSG Power Each power supply ends at the following Description CVSG gauge power CVSG lighting Primary air pressure transducer Secondary air pressure transducer Application air pressure transducer Air filter restriction For future expansion Through the Engine Harness Connector For the Ammeter sensor Check for pinched or chaffed sensor an wiring as necessary.Go to Step 2.	lugging the sensor connector, you his sensor wire starts at pin 6 of the is at pin C on the sensor connector. or wire and a power source wire. Some isted below (you may need to verify harness): CECU Pin Connector C, Pin 1 Connector A, Pin 7 Connector A, Pin 7 Connector A, Pin 1 g connectors: Pin 4 2 B B B B C C A 28 A d power wiring. Repair or replace
		DTC 11704 - Short in primary air pressure circuit is now displayed as "Inactive."	If DTC 11704 changes to "Inactive" after have confirmed the problem is a short to 1. Replace sensor. Go to Step 2 .	unplugging the sensor connector, you +5V in the sensor itself, not the wiring.

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Secondary Air Pressure Gauge Inoperative

DTC11803 and DTC11804

Symptom: Secondary air pressure gauge inoperative. All other gauges are operational.

The Secondary Air Pressure Gauge uses an electronic transducer (sensor) which monitors system air pressure and converts it into a voltage

output that is sent to the instrumentation system. The output voltage of the sensor is proportional to the pressure it is sensing.

The following procedures have been developed to assist the technician in diagnosing multiplexed instrumentation problems using the Electronic Service Analyst (ESA) hardware/software diagnostic tool. It is assumed the service technician performing instrumentation repairs is knowledgeable about how to use ESA.



Step	Check	Result	Next Step
1	Turn ignition key ON.		Go to Step 2.
	Start ESA, then select		
	"Connect" to establish		
	communication to the		
	vehicle.		
2	Select "Monitor." From	Gauge graphic on screen displays	Go to Step 3.
	the "Components"	reasonable reading.	
	window, select	Gauge graphic on screen does not	Go to Step 4.
	"Secondary Air	display reasonable reading.	
	Pressure," then select		
	"Open."		
3	Select "Simulate". Drag	Vehicle gauge does not move. Go	Perform the following checks:
	the "Value" bar until the	to Step 3-1.	NOTE
	pointer on the gauge		
	image is approximately		Use the "Program" feature in ESA to make sure that
	mid-scale. Observe		the parameter for the inoperative gauge is enabled.
	vehicle gauge		An inoperative gauge may simply have its CECU
	movement.		parameter set to disabled.
		Vehicle gauge reading is in the	1. Check CVSG data link wiring: Observe Gauge position in the wiring
		same range as the ESA gauge	daisy chain.
		image. Go to Step 3-7.	a. If gauge is mounted between two other functioning gauges CVSG
			data link wiring is OK. Go to Step 3-5.
			b. If gauge is last gauge in daisy chain or followed by other
			non-functional gauges, go to Step 3-2.
			2. Check continuity between Pin 1 on gauge harness connector and Pin 14
			of the 52 Pin CECU connector C.
			3. Check continuity between Pin 3 on gauge harness connector and Pin 15 of the 52 Pin CECL connector C
			 Repair daisy chain jumper harness as necessary.
			5. Once continuity on both wires exists, perform "Simulate" test again.
			a. If gauge functions properly during "Simulate" test, repair is complete.
			Return truck to service.
			 b. If gauge does not function during "Simulate" test, install a known good gauge and perform "Simulate" test again.
			i. If gauge functions properly test is complete. Install new gauge
			ii If gauge does not function during "Simulate" test install Test
			CECU and perform "Simulate" test again.
			CECU permanently. Re-test and return truck to service.
			(2) If gauge does not function properly during "Simulate" test, replace gauge.
			6. Once gauge is replaced
			a. Verify gauge functionality.
			b. Return truck to service.
			7. Is this a recheck after Step 5, Step 6 or Step 7?
			a Yes Return truck to service

Step	Check	Result	Next Step	
			 No, Gauge and CVSG data link wiring is not the problem. Go to Step 4. 	
4	Select "Diagnose" to	No "Active" DTCs displayed.	Indicates the problem could be a defective sensor, poor ground or no input or	
	view Active Secondary	DTC 11803 displayed – Open in	This DTC will be recorded when the control unit sees an open or short to	
	diagnostia traubla	secondary air pressure circuit	ground at the secondary air pressure sensor input. The fault is recorded who	
			the voltage at the input is below .1 volts.	
		DTC 11804 displayed – Short in	This DTC will be recorded when the control unit sees a short to +5V at the	
		secondary air pressure circuit.	secondary air pressure sensor input. The fault is recorded when the voltage at	
			the input is above 4.9 volts.	
5	Using a digital	(Sensor Ground) - There should	1. Check for continuity between sensor connector Pin A and ground	
	multimeter, check the	be continuity between the sensor	terminal.	
	ground, input and output	connector ground (Pin A) and	a. If there is continuity between Pin A and the ground terminal, test is	
	voltages at the sensor	a cab ground terminal. See	complete. Go to Step 5-2.	
	connector.	MultiMeter Graphic below.	b. If there is no continuity between Pin A and the ground terminal:	
	Pin A – Ground	(Sensor Input Voltage) - Input	i. Check for continuity between sensor connector Pin A and Pin 2	
	Pin B – Input Voltage	connector (Pin B) should be +5	of the 52 Pin CECU connector C.	
	Pin C – Output Voltage	volts See MultiMeter Graphic	ii. Check for continuity between Pin 5 of the 9 Pin CECU	
	See CECU Pinout	below.	connector A and a cab ground terminal.	
		(Sensor Output Voltage) - Signal	iii. Repair wiring as necessary. Go to Step 2.	
		output voltage at sensor connector	2. Check input voltage at sensor connector Pin B.	
		(Pin C) will vary depending on air	a. If there is voltage at Pin B. Go to Step 5-3 .	
		pressure, but should be more than	b. If there is no voltage at Pin B, check for voltage on Pin 1 of the 52	
		.1 volts and less than 4.9 volts.	Pin CECU connector C.	
		See MultiMeter Graphic and Table	i. If there is voltage on Pin 1, check continuity between Pin 1	
		below.	at CECU and Pin B at sensor connector. Repair wiring as	
			necessary. Go to Step 2.	
		Do not unplug sensor	ii. If there is no voltage on Pin 1 at CECU, replace CECU. Go	
		connector or penetrate	to Step 2.	
		the wire insulation	3. Check signal output voltage at sensor connector Pin C.	
		to perform a sensor	a. If there is no voltage at Pin C, replace sensor. Go to Step 2.	
		Slide connector seal	b. If there is voltage at Pin C, Go to Step 6 .	
		back to expose	3 1	
		terminal ends. Use		
		test leads with needle		
		point tips to probe	V	
		connector terminals.		
		Air Pressure Output Voltage		
		(PSI) (VDC)		
		150 4.75		
		75 2.50		
		60 2.05		
		30 1.15		
		0 0.25	Ļ	

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Step	Check	Result	t Next Step	
		i NOTE Make sure that the	 Connector Seal Pin A Dia B 	
		system you are testing has some pressure to measure.	 PIN B Place MultiMeter Probe On Pin C 	
6	Select "Diagnose" to view secondary air pressure gauge DTCs. Next, unplug the secondary air pressure sensor connector at sensor. See CECU Pinout for terminal details of the CECU electrical connections.	DTC 11803 – Open in secondary air pressure circuit is displayed as "Active."	 Check resistance between Pin C a If there is less than 5K ohms b Check wiring for short fr repair and go to Step 2. Remove the 52 Pin CEC between Pin 7 of the 52 terminal. If less than 5K If there is more than 20K ohm Check wiring for open fr repair and go to Step 2. Remove the "C" connec resistance between Pin and ground terminal. If resistance If resistance 	Ind ground terminal. Detween Pin C and the ground terminal, om sensor to CECU. If short found, U connector C and measure resistance Pin CECU connector C and ground ohms replace CECU and go to Step 2 . Its between Pin C and ground terminal, om sensor to CECU. If open found, tor from the CECU and measure 7 of the 52 Pin CECU connector C more than 20K ohms, replace CECU
7	Select "Diagnose" to view secondary air pressure gauge DTCs. Next, unplug the secondary air pressure sensor connector at sensor. See CECU Pinout for terminal details of the CECU electrical connections.	DTC 11804 - Short in secondary air pressure circuit is displayed as "Active".	and go to Step 2 . 1. If the fault is still "Active" after unp have confirmed there is a short. There is a short between the sense typical power wires to inspect are any power source in the main cab Description Power Supply Sensor +5V Dash Illumination 1 CVSG Power Each power supply ends at the following Description CVSG gauge power CVSG lighting Primary air pressure transducer Secondary air pressure transducer Air filter restriction For future expansion Through the Engine Harness Connector For the Ammeter sensor Check for pinched or chaffed sensor any wiring as necessary Go to Step 2	lugging the sensor connector, you his sensor wire starts at pin 7 of the ds at pin C on the sensor connector. or wire and a power source wire. Some listed below (you may need to verify harness): <u>CECU Pin</u> <u>Connector C, Pin 1</u> <u>Connector A, Pin 7</u> <u>Connector A, Pin 1</u> g connectors: <u>Pin</u> <u>4</u> <u>2</u> <u>B</u> <u>B</u> <u>B</u> <u>C</u> <u>A</u> <u>2</u> <u>A</u> <u>A</u> d power wiring. Repair or replace
		DTC 11804 - Short in secondary air pressure circuit is now displayed as "Inactive."	If DTC 11804 changes to "Inactive" after have confirmed the problem is a short to 1. Replace sensor. Go to Step 2 .	r unplugging the sensor connector, you +5V in the sensor itself, not the wiring.

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Application Air Pressure Gauge Inoperative

DTC11603 and DTC11604

Symptom: Application air pressure gauge inoperative. All other gauges are operational.

The Application Air Pressure Gauge uses an electronic transducer (sensor) which monitors system air pressure and converts it into a voltage

output that is sent to the instrumentation system. The output voltage of the sensor is proportional to the pressure it is sensing.

The following procedures have been developed to assist the technician in diagnosing multiplexed instrumentation problems using the Electronic Service Analyst (ESA) hardware/software diagnostic tool. It is assumed the service technician performing instrumentation repairs is knowledgeable about how to use ESA.



Step	Check	Result	Next Step
1	Turn ignition key ON.		Go to Step 2.
	Start ESA, then select		
	"Connect" to establish		
	communication to the		
	vehicle.		
2	Select "Monitor." From	Gauge graphic on screen displays	Go to Step 3.
	the "Components"	reasonable reading.	
	window, select	Gauge graphic on screen does not	Go to Step 4.
	"Application Air	display reasonable reading.	
	Pressure", then select		
	"Open."		
3	Select "Simulate". Drag	Vehicle gauge does not move. Go	Perform the following checks:
	the "Value" bar until the	to Step 3-1.	
	pointer on the gauge		
	image is approximately		Use the "Program" feature in ESA to make sure that
	mid-scale. Observe		the parameter for the inoperative gauge is enabled.
	vehicle gauge		An inoperative gauge may simply have its CECU
	movement.		parameter set to disabled.
		Vehicle gauge reading is in the	1. Check CVSG data link wiring: Observe Gauge position in the wiring
		same range as the ESA gauge	daisy chain.
		image. Go to Step 3-7 .	a. If gauge is mounted between two other functioning gauges CVSG
			data link wiring is OK. Go to Step 3-5 .
			b. If gauge is last gauge in daisy chain or followed by other
			non-functional gauges, go to Step 3-2 .
			2. Check continuity between Pin 1 on gauge harness connector and Pin 14
			of the 52 Pin CECU connector C.
			3. Check continuity between Pin 3 on gauge harness connector and Pin 15
			of the 52 Pin CECU connector C.
			4. Repair daisy chain jumper harness as necessary.
			5. Once continuity on both wires exists, perform "Simulate" test again.
			 a. If gauge functions properly during "Simulate" test, repair is complete. Return truck to service.
			b. If gauge does not function during "Simulate" test, install a known
			good gauge and perform "Simulate" test again.
			i. If gauge functions properly test is complete. Install new gauge
			ii If gauge does not function during "Simulate" test install Test
			CECU and perform "Simulate" test again.
			CECU permanently. Re-test and return truck to service.
			(2) If gauge does not function properly during "Simulate" test, replace gauge.
			6. Once gauge is replaced
			a. Verify gauge functionality.
			b. Return truck to service.
			7. Is this a recheck after Step 5, Step 6 or Step 7?
			a. Yes. Return truck to service.
		1	1

Step	Check	Result	Next Step	
			 No, Gauge and CVSG data link wiring is not the problem. Go to Step 4. 	
4	Select "Diagnose" to view "Active" Application	No "Active" DTCs displayed.	Indicates the problem could be a defective sensor, poor ground or no input or output voltage at sensor. Go to Step 5 .	
	air pressure gauge	DTC 11603 displayed – Open in	This DTC will be recorded when the control unit sees an open or short to	
	diagnostic trouble	application air pressure circuit.	ground at the secondary air pressure sensor input. The fault is recorded wh	
	codes.		the voltage at the input is below .1 volts.	
		DTC 11604 displayed – Short in	This DTC will be recorded when the control unit sees a short to +5V at the	
		application air pressure circuit.	secondary air pressure sensor input. The fault is recorded when the voltage at	
			the input is above 4.9 volts.	
5	Using a digital	(Sensor Ground) - There should	1. Check for continuity between sensor connector Pin A and ground	
	multimeter, check the	be continuity between the sensor	terminal.	
	ground, input and output	connector ground (Pin A) and	a If there is continuity between $Pin A$ and the around terminal test is	
	voltages at the sensor	a cab ground terminal. See	complete Go to Step 5-2	
	connector.	MultiMeter Graphic below.	b If there is no continuity between Din A and the ground terminal:	
	Pin A – Ground	(Sensor Input Voltage) - Input	b. In there is no continuity between Fin A and the ground terminal.	
	Pin B – Input Voltage	voltage from CECU to sensor	 Check for continuity between sensor connector Pin A and Pin 2 of the 52 Pin CECU connector C 	
	Pin C – Output Voltage	connector (Pin B) should be +5	ii Chack for continuity between Din 5 of the 0 Din CECU	
	See CECU Pinout	volts. See MultiMeter Graphic	II. Check for continuity between Pin 5 of the 9 Pin CECO	
	for terminal details of	below.		
	the CECU electrical	(Sensor Output Voltage) - Signal	III. Repair wiring as necessary. Go to Step 2.	
	connections.	Output voltage at sensor connector	2. Check input voltage at sensor connector Pin B.	
		air pressure, but should be more	a. If there is voltage at Pin B, Go to Step 5-3 .	
		than 0 volts and less than 5 volts	b. If there is no voltage at Pin B, check for voltage on Pin 1 of the 52	
		See MultiMeter Graphic and Table	Pin CECU connector C.	
		below	i. If there is voltage on Pin 1, check continuity between Pin 1	
			at CECU and Pin B at sensor connector. Repair wiring as	
			necessary. Go to Step 2.	
		Do not unplug sensor	ii. If there is no voltage on Pin 1 at CECU, replace CECU. Go	
		connector or penetrate	to Step 2.	
		to porform a consor	3. Check signal output voltage at sensor connector Pin C.	
		output voltage check	a. If there is no voltage at Pin C, replace sensor. Go to Step 2.	
		Slide connector seal	b. If there is voltage at Pin C, Go to Step 6.	
		back to expose	3 1	
		terminal ends. Use		
		test leads with needle		
		point tips to probe		
		connector terminals.		
		Air Pressure Output Voltage		
		(PSI) (VDC)		
		150 4.75		
		75 2.50		
		60 2.05		
		30 1.15		
		0 0.25	Ļ	

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Step	Check	Result	Next	Step
		i NOT Make sure that the system you are testing has some pressure to measure.	 Connector Seal Pin A Pin B Place MultiMeter Probe On Pin C 	
6	Select "Diagnose" to view application air pressure gauge DTCs. Next, unplug the application air pressure sensor connector at sensor. See CECU Pinout for terminal details of the CECU electrical connections.	DTC 11603 – Open in application air pressure circuit is displayed as "Active."	 Check resistance between Pin C a If there is less than 5K ohms b Check wiring for short fr repair and go to Step 2. Remove the "C" connec resistance between Pin and ground terminal. If I go to Step 2. If there is more than 20K ohm Check wiring for open fr repair and go to Step 2. Remove the "C" connec resistance between Pin and ground terminal. If I go to Step 2. 	Ind ground terminal. Detween Pin C and the ground terminal, om sensor to CECU. If short found, tor from the CECU and measure 8 of the 52 Pin CECU connector C less than 5K ohms replace CECU and Its between Pin C and ground terminal, om sensor to CECU. If open found, tor from the CECU and measure 8 of the 52 Pin CECU connector C more than 20K ohms, replace CECU
7	Select "Diagnose" to view application air pressure gauge DTCs. Next, unplug the application air pressure sensor connector at sensor. See CECU Pinout for terminal details of the CECU electrical connections.	DTC 11604 - Short in application air pressure circuit is displayed as "Active".	 If the fault is still "Active" after unp have confirmed there is a short. T 52 Pin CECU connector C and end There is a short between the sense typical power wires to inspect are any power source in the main cab Description Power Supply Sensor +5V Dash Illumination 1 CVSG Power Each power supply ends at the followin Description CVSG gauge power CVSG lighting Primary air pressure transducer Secondary air pressure transducer Application air pressure transducer Application air pressure transducer For future expansion Through the Engine Harness Connector For the Ammeter sensor Check for pinched or chaffed sensor ar 	lugging the sensor connector, you his sensor wire starts at pin 8 of the ds at pin C on the sensor connector. or wire and a power source wire. Some listed below (you may need to verify harness): <u>CECU Pin</u> <u>Connector C, Pin 1</u> <u>Connector A, Pin 7</u> <u>Connector A, Pin 1</u> <u>g connectors:</u> <u>Pin</u> <u>4</u> <u>2</u> <u>B</u> <u>B</u> <u>B</u> <u>B</u> <u>C</u> <u>A</u> <u>28</u> <u>A</u> d power wiring. Repair or replace
		DTC 11604 - Short in application air pressure circuit is now displayed as "Inactive."	If DTC 11604 changes to "Inactive" after have confirmed the problem is a short to 1. Replace sensor. Go to Step 2 .	r unplugging the sensor connector, you +5V in the sensor itself, not the wiring.

Air Filter Restriction Pressure Gauge Inoperative

DTC10703 and DTC10704

Symptom: Air filter restriction gauge inoperative. All other gauges are operational.

The Air Filter Restriction Gauge uses an electronic transducer (sensor) to monitor vacuum pressure and converts it into a voltage output that is sent to

the instrumentation system. The output voltage of the sensor is proportional to the vacuum it is sensing.



Step	Check	Result		Next Step
1	Turn ignition key ON.		Go	to Step 2.
	Start ESA, then select			
	"Connect" to establish			
	communication to the			
	vehicle.			
2	Select "Monitor." From	Gauge graphic on screen displays	Go	to Step 3.
	the "Components"	reasonable reading.		
	window, select "Air Filter	Gauge graphic on screen does not	Go	to Step 4.
	RestrictionPressure."	display reasonable reading.		
	then select "Open."			
3	Select "Simulate". Drag	Vehicle gauge does not move. Go	Per	form the following checks:
	the "Value" bar until the	to Step 3-1.		
	pointer on the gauge			NOTE
	image is approximately		U	se the "Program" feature in ESA to make sure that
	mid-scale. Observe		th	e parameter for the inoperative gauge is enabled.
	vehicle gauge		A	n inoperative gauge may simply have its CECU
	movement.		pa	arameter set to disabled.
		Vehicle gauge reading is in the	1.	Check CVSG data link wiring: Observe Gauge position in the wiring
		same range as the ESA gauge		daisv chain.
		image. Go to Step 3-7.		a If gauge is mounted between two other functioning gauges CVSC
				data link wiring is OK. Go to Sten 3-5
				b If some is lost some in deiny shein on fellowed by other
				b. If gauge is last gauge in daisy chain or followed by other
				non-runctional gauges, go to Step 3-2.
			2.	Check continuity between Pin 1 on gauge harness connector and Pin 14 of the 52 Pin CECU connector C.
			3.	Check continuity between Pin 3 on gauge harness connector and Pin 15
				of the 52 Pin CECU connector C.
			4.	Repair daisy chain jumper harness as necessary.
			5.	Once continuity on both wires exists, perform "Simulate" test again.
				a. If gauge functions properly during "Simulate" test, repair is complete.
				Return truck to service.
				b. If gauge does not function during "Simulate" test, install a known good gauge and perform "Simulate" test again.
				permanently. Re-test and return truck to service.
				ii. If gauge does not function during "Simulate" test, install Test
				CECU and perform "Simulate" test again.
				(1) If gauge functions properly test is complete. Install new
				CECU permanently. Re-test and return truck to service.
				(2) If gauge does not function properly during "Simulate" test,
				replace gauge.
			6.	Once gauge is replaced
				a. Verify gauge functionality.
				b. Return truck to service.
			7.	Is this a recheck after Step 5, Step 6 or Step 7?
				a. Yes. Return truck to service.
				b. No, Gauge and CVSG data link wiring is not the problem. Go to
				Step 4.

Step	Check	Result	Next Step
4	Select "Diagnose" to	No "Active" DTCs displayed.	Indicates the problem could be a defective sensor, poor ground or no input or
	view "Active" air filter		output voltage at sensor. Go to Step 5.
	restriction gauge	DTC 10703 displayed – Open in	This DTC will be recorded when the control unit sees an open or short to
	diagnostic trouble	air filter restriction circuit.	ground at the secondary air pressure sensor input. The fault is recorded when
	codes.		the voltage at the input is below .1 volts.
		DTC 10704 displayed – Short in	This DTC will be recorded when the control unit sees a short to +5V at the
		air filter restriction circuit.	secondary air pressure sensor input. The fault is recorded when the voltage at
			the input is above 4.9 volts.
5	Llsing a digital	(Sensor Ground) - There should	1 Check for continuity between sensor connector Pin A and ground
5	multimeter check the	be continuity between the sensor	terminal
	around input and output	connector ground (Pin A) and the	
		firewall ground stud	a. If there is continuity between Pin A and the ground terminal, test is
			complete. Go to Step 5-2.
	connector.	(Sensor Input Voltage) - Input	b. If there is no continuity between Pin A and the ground terminal:
	Pin A – Ground	voltage from CECU to sensor	i. Check for continuity between sensor connector Pin A and Pin 2
	Pin B – Output Voltage	connector (Pin C) should be +5	of the 52 Pin CECU connector C.
	Pin C – Input Voltage	volts. See Table below.	ii. Check for continuity between Pin 5 of the 9 Pin CECU
	See CECU Pinout	(Sensor Output Voltage) - Signal	connector A and a cab ground terminal.
	for terminal details of	output voltage at sensor connector	iii Bonair wiring as necessary. Go to Ston 2
	the CECU electrical	(Pin B) will vary depending on	in. Repair winnig as necessary. Go to Step 2.
	connections.	strength of vacuum, but should be	2. Check input voltage at sensor connector Pin C.
		more than .1 volts and less than	a. If there is voltage at Pin C, Go to Step 5-3 .
		4.9 volts. See Table below.	b. If there is no voltage at Pin C, check for voltage on Pin 1 of the 52
		I NOTE	Pin CECU connector C.
			i. If there is voltage on Pin 1, check continuity between Pin 1
		connector or penetrate	at CECU and Pin C at sensor connector. Repair wiring as
		the wire insulation	necessary. Go to Step 2.
		to porform a sonsor	ii If there is no voltage on Pin 1 at CECU replace CECU Go
		output voltage shock	to Step 2
		Slide connector cool	2. Charle simple stant stant at some som som stan Die D
		Silde connector sear	5. Check signal output voltage at sensor connector Fill B.
		terminal onde	a. If there is no voltage at Pin B, replace sensor. Go to Step 2.
		terrinial ends. Use	b. If there is voltage at Pin B, Go to Step 6 .
		noint ting to probe	1
		connector terminals	
		connector terminals.	
		Pressure Output Voltage	
		(PSI) (VDC)	
		0 0.5	
		-1.5 4.5	
		I NOTE	
		Maka avea that the	
		system you are testing	
		has some pressure to	- 1 Ρίο Δ
		measure.	
			2. Place MultiMeter Probe On Pln B
1		1	13 Pin C

Step	Check	Result	Next	Step
6	Select "Diagnose" to	DTC 10703 – Open in air filter	1. Check resistance between Pin B a	ind ground terminal.
	view air filter restriction	restriction circuit is displayed as	a. If there is less than 5K ohms b	petween Pin B and the ground terminal,
	gauge DTCs.	"Active."	i. Check wiring for short fr	om sensor to CECU. If short found,
	Next, unplug the air		repair and go to Step 2.	
	filter restriction sensor		ii Remove the "C" connec	tor from the CECU and measure
	connector at sensor.		resistance between Pin	10 of the 52 Pin CECU connector C
	See CECU Pinout		and ground terminal. If I	ess than 5K ohms replace CECU and
	for terminal details of		and ground terminal. In	
	the CECU electrical		go to otop 2.	a between Dir D and mound to mind.
	connections.		b. If there is more than 20K onm	is between Pin B and ground terminal,
			i. Check wiring for open fr	om sensor to CECU. If open found,
			repair and go to Step 2.	
			ii. Remove the "C" connec	tor from the CECU and measure
			resistance between Pin	10 of the 52 Pin CECU connector C
			and ground terminal. If	more than 20K ohms, replace CECU
			and go to Step 2.	
7	Select "Diagnose" to	DTC 10704 - Short in air filter	1. If the fault is still "Active" after unp	lugging the sensor connector, you
	view air filter restriction	restriction circuit is displayed as	have confirmed there is a short. T	his sensor wire starts at pin 10 of the
	gauge DTCs.	"Active."	52 Pin CECU connector C and en	ds at pin B on the sensor connector.
	Next, unplug the air		There is a short between the sense	or wire and a power source wire. Some
	filter restriction sensor		typical power wires to inspect are	listed below (you may need to verify
	connector at sensor.		any power source in the main cab	harness):
	See CECU Pinout		Description	CECU Pin
	for terminal details of		Power Supply Sensor +5V	Connector C, Pin 1
	the CECU electrical		Dash Illumination 1	Connector A, Pin 7
	connections.		CVSG Power	
			Each power supply ends at the followin	g connectors.
			CVSG gauge power	4
			CVSG lighting	2
			Primary air pressure transducer	B
			Secondary air pressure	В
			Application air pressure transducer	В
			Air filter restriction	С
			For future expansion	A
			Through the Engine Harness	28
			Connector	
			For the Ammeter sensor	Α
			Check for pinched or chaffed sensor ar	nd power wiring. Repair or replace
			wiring as necessary.Go to Step 2.	
		DIC 10/04 - Short in air filter	ו טוע 11/04 changes to "Inactive" afte	r unplugging the sensor connector, you
		restriction circuit is now displayed	have confirmed the problem is a short to	+5V in the sensor itself, not the wiring.
		as "Inactive."	1. Replace sensor. Go to Step 2.	

Fuel Filter Restriction Pressure Gauge Inoperative

DTC1603 and DTC1604

Symptom: Fuel filter restriction gauge inoperative. All other gauges are operational.

The Fuel Filter Restriction Gauge uses an electronic transducer (sensor) to monitor vacuum pressure and converts it into a voltage output that

is sent to the instrumentation system. The output voltage of the sensor is proportional to the vacuum it is sensing.

The following procedures have been developed to assist the technician in diagnosing multiplexed instrumentation problems using the Electronic Service Analyst (ESA) hardware/software diagnostic tool. It is assumed the service technician performing instrumentation repairs is knowledgeable about how to use ESA.



Step	Check	Result	Next Step
1	Turn ignition key ON.		Go to Step 2.
	Start ESA, then select		
	"Connect" to establish		
	communication to the		
	vehicle.		
2	Select "Monitor." From	Gauge graphic on screen displays	Go to Step 3.
	the "Components"	reasonable reading.	
	window, select "Fuel	Gauge graphic on screen does not	Go to Step 4.
	Filter Restriction	display reasonable reading.	
	Pressure," then select		
	"Open."		
3	Select "Simulate". Drag	Vehicle gauge does not move. Go	Perform the following checks:
	the "Value" bar until the	to Step 3-1.	
	pointer on the gauge		
	image is approximately		Use the "Program" feature in ESA to make sure that
	mid-scale. Observe		the parameter for the inoperative gauge is enabled.
	vehicle gauge		An inoperative gauge may simply have its CECU
	movement.		parameter set to disabled.
		Vehicle gauge reading is in the	1. Check CVSG data link wiring: Observe Gauge position in the wiring
		same range as the ESA gauge	daisy chain.
		image. Go to Step 3-7.	a. If gauge is mounted between two other functioning gauges CVSG
			data link wiring is OK. Go to Step 3-5.
			b. If gauge is last gauge in daisy chain or followed by other
			non-functional gauges, go to Step 3-2.
			2 Check continuity between Pin 1 on gauge harness connector and Pin 14
			of the 52 Pin CECU connector C.
			3. Check continuity between Pin 3 on gauge harness connector and Pin 15 of the 52 Pin CECL connector C
			 Repair daisy chain jumper harness as necessary.
			5 Once continuity on both wires exists perform "Simulate" test again
			a. If gauge functions properly during "Simulate" test, repair is complete.
			Return truck to service.
			b. If gauge does not function during "Simulate" test, install a known
			good gauge and perform "Simulate" test again.
			permanently. Re-test and return truck to service.
			 If gauge does not function during "Simulate" test, install Test CECU and perform "Simulate" test again.
			(1) If gauge functions properly test is complete. Install new
			CECU permanently. Re-test and return truck to service.
			(2) If gauge does not function properly during "Simulate" test,
			replace gauge.
			6. Once gauge is replaced
			a. Verify gauge functionality.
			b. Return truck to service.
			7. Is this a recheck after Step 5, Step 6 or Step 7?
			a. Yes. Return truck to service.

Step	Check	Result	Next Step
			b. No, Gauge and CVSG data link wiring is not the problem. Go to
			Step 4.
4	Select "Diagnose"	No "Active" DTCs displayed.	Indicates the problem could be a defective sensor, poor ground or no input or
	to view "Active" fuel		output voltage at sensor. Go to Step 5.
	filter restriction gauge	DTC 1603 displayed – Open in	This DTC will be recorded when the control unit sees an open or short to
	diagnostic trouble	application air pressure circuit.	ground at the secondary air pressure sensor input. The fault is recorded when
	codes.	DTO 4004 disclosus du Obart in	the voltage at the input is below .1 volts.
		DTC 1604 displayed – Short In	This DTC will be recorded when the control unit sees a short to +5V at the
		application air pressure circuit.	the input is above 4.0 volte
Э	multimeter, check the	be continuity between the sensor	terminal.
	ground, input and output	connector ground (Pin A) and the	a If there is continuity between Pin A and the ground terminal test is
	voltages at the sensor	firewall ground stud.	complete. Go to Step 5-2.
	connector.	(Sensor Input Voltage) - Input	b If there is no continuity between Pin A and the ground terminal:
	Pin A – Ground	voltage from Chassis Node to	i Check for continuity between sensor connector Din A and Din 1
	Pin B – Input Voltage	sensor connector (Pin B) should	of the Chassis Node connector C
	Pin C – Output Voltage	be +5 volts. See Table below.	ii Check for continuity between Pin 3 of the Chassis Node
	See Chassis Node	(Sensor Output Voltage) - Signal	connector A and a cab ground terminal.
	Pinout for terminal	output voltage at sensor connector	iii Renair wiring as necessary. Go to Sten 2
	details of the Chassis	(Pin C) will vary depending on	2 Check input voltage at sonser connector Pin P
	Node electrical	strength of vacuum, but should be	2. Check input voltage at sensor connector Fin B.
	connections.	more than .1 volts and less than	a. If there is voltage at Pin B, Go to Step 5-3 .
		4.9 VOILS. See Table below.	b. If there is no voltage at PIN B, check for voltage on PIN 3 of the Chassis Node connector P.
			i litthere is unlight on Dir 2, shask continuity between Dir 2 of
			 If there is voltage on Pin 3, check continuity between Pin 3 of the Chassis Node connector R and Rin R at concert connector.
		Do not unplug sensor	Renair wiring as necessary. Go to Sten 2
		the wire insulation	ii If there is no voltage on Din 3 of the Chaseis Node connector
		to perform a sensor	B replace Chassis Node Go to Step 2
		output voltage check	3 Check signal output voltage at sensor connector Pin C
		Slide connector seal	a. If there is no voltage at Din C replace sensor. Go to Stan 2
		back to expose	a. If there is voltage at Pin C. Co to Step C.
		terminal ends. Use	
		test leads with needle	
		point tips to probe	0.0 vdc
		connector terminals.	
		Pressure Output Voltage	
		(PSI) (VDC)	
		0 0.5	
		-1.5 4.5	
		I NOTE	
		Make sure that the	
		system you are testing	
		has some pressure to	↓
		measure.	1 Connector Seal
			2 Pin Δ
			2. Din P
			4 - Diago MultiMotor Drobo On Din C
12 - 3	8	P	PM819003/KM815056 (09/16/2011)

Step	Check	Result	Next Step
6	Select "Diagnose" to	DTC 1603 – Open in fuel filter	1. Check resistance between Pin C and ground terminal.
	view fuel filter restriction	restriction circuit is displayed as	a. If there is less than 5K ohms between Pin C and the ground termina
	gauge DTCs.	"Active."	i. Check wiring for short from sensor to Chassis Node. If short
	Next, unplug the fuel		found, repair and go to Step 2 .
	filter restriction sensor		ii Remove the "B" connector from the Chassis Node and measur
	connector at sensor.		resistance between Pin 5 of the Chassis Node connector B
	See Chassis Node		and ground terminal. If less than 5K ohms replace Chassis
	Pinout for terminal		Node and go to Step 2
	details of the Chassis		he letters is more than 20K alma between Din C and ground termine
	Node electrical		b. In there is more than 20K onlins between Pin C and ground termina
	connections.		i. Check wiring for open from sensor to Chassis Node. If open
			found, repair and go to Step 2 .
			ii. Remove the "B" connector from the Chassis Node and measure
			resistance between Pin 5 of the Chassis Node connector B
			and ground terminal. If more than 20K ohms, replace Chassis
			Node and go to Step 2 .
7	Select "Diagnose" to	DTC 1604 - Short in fuel filter	1. If the fault is still "Active" after unplugging the sensor connector, you
	view fuel filter restriction	restriction circuit is displayed as	have confirmed there is a short. This sensor wire starts at Pin 5 of the
	gauge DTCs.	"Active."	Chassis Node connector B and ends at pin C on the sensor connector.
	Next, unplug the fuel		There is a short between the sensor wire and a power source wire. Som
	filter restriction sensor		typical power wires to inspect are listed below (you may need to verify
	connector at sensor.		any power source in the main cab harness):
	See Chassis Node		Description CECU Pin
	Pinout for terminal		Power Supply Sensor +5V Connector C, Pin 1
	details of the Chassis		CVSC Dewor
	Node electrical		Each power supply ends at the following connectors:
	connections.		Description Pin
	See CECU Pinout		CVSG gauge power 4
	for terminal details of		CVSG lighting 2
	the CECU electrical		Primary air pressure transducer B
	connections.		Secondary air pressure B
			Application air pressure transducer B
			Air filter restriction C
			For future expansion A
			Through the Engine Harness 28
			Connector
			For the Ammeter sensor A
			Check for pinched or chaπed sensor and power wiring. Repair or replace
		DTC 1604 Short in fuel filter	WIRING as necessary. Go to Step 2.
		restriction circuit is now displayed	In Dire root changes to mactive aner unplugging the sensor connector, you
		restriction circuit is now displayed	have confirmed the problem is a short in the sensor itself, not the wiring.
		as mactive.	1. Replace sensor. Go to Step 2.

Ammeter Gauge Inoperative

DTC257903 and DTC257904

Symptom: Ammeter gauge inoperative. All other gauges are operational.

The Ammeter Gauge uses a contactless sensor using Hall Effect. The sensor is positioned on the

cab feed wire inside the battery box, or for firewall mounted circuit breakers, near the firewall.



Check

Turn ignition key ON.

vehicle.

"Open."

Start ESA, then select "Connect" to establish communication to the

Select "Monitor." From

Select "Simulate". Drag the "Value" bar until the

pointer on the gauge image is approximately

mid-scale. Observe

vehicle gauge

movement.

the "Components"

window, select "Ammeter," then select

Step

1

2

3

e Manual		12				
Result	1	Next Step				
	Go t	o Step 2.				
Gauge graphic on screen displays reasonable reading.	Go t	o Step 3.				
Gauge graphic on screen does not display reasonable reading.	Joes not Go to Step 4 . g.					
Vehicle gauge does not move. Go	Perfo	Perform the following checks:				
to Step 3-1.	i	I NOTE				
	Us the An pa	e the "Program" feature in ESA to make sure that e parameter for the inoperative gauge is enabled. inoperative gauge may simply have its CECU rameter set to disabled.				
Vehicle gauge reading is in the same range as the ESA gauge	1.	Check CVSG data link wiring: Observe Gauge position in the wiring daisy chain.				
image. Go to Step 3-7.		a. If gauge is mounted between two other functioning gauges CVSG data link wiring is OK. Go to Step 3-5 .				
		If gauge is last gauge in daisy chain or followed by other non-functional gauges, go to Step 3-2.				
	2.	Check continuity between Pin 1 on gauge harness connector and Pin 14 of the 52 Pin CECU connector C.				
	3.	Check continuity between Pin 3 on gauge harness connector and Pin 15 of the 52 Pin CECU connector C.				
	4.	Repair daisy chain jumper harness as necessary.				
	5.	Once continuity on both wires exists, perform "Simulate" test again.				
		 a. If gauge functions properly during "Simulate" test, repair is complete Return truck to service. 				
		 If gauge does not function during "Simulate" test, install a known good gauge and perform "Simulate" test again. 				

	4.	Rep	air daisy chain jumper harness as necessary.
	5.	Onc	e continuity on both wires exists, perform "Simulate" test again.
		a.	If gauge functions properly during "Simulate" test, repair is complete
			Return truck to service.
		b.	If gauge does not function during "Simulate" test, install a known good gauge and perform "Simulate" test again.
			i. If gauge functions properly test is complete. Install new gauge permanently. Re-test and return truck to service.
			ii. If gauge does not function during "Simulate" test, install Test CECU and perform "Simulate" test again.
			(1) If gauge functions properly test is complete. Install new
			CECU permanently. Re-test and return truck to service.
			replace gauge.
	6.	Onc	e gauge is replaced
		a.	Verify gauge functionality.
		b.	Return truck to service.
	7.	Is th	is a recheck after Step 5, Step 6 or Step 7?
		a.	Yes. Return truck to service.
		b.	No, Gauge and CVSG data link wiring is not the problem. Go to Step 4 .

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PACCAR

Step	Check	Result			Next Step
4	Select "Diagnose" to	No "Active" DTCs disp	olayed.	Indica	cates the problem could be a defective sensor, poor ground or no input of
	view "Active" ammeter			outpu	put voltage at sensor. Go to Step 5.
	diagnostic trouble	DTC 257903 displaye	d - Open in	This [s DTC will be recorded when the control unit sees an open or short to
	codes.	ammeter sensor circu	it.	groun	und at the secondary air pressure sensor input. The fault is recorded who
				the vo	voltage at the input is below .1 volts.
		DTC 257904 displaye	d - Short in	This [s DTC will be recorded when the control unit sees a short to +5V at the
		ammeter sensor circu	it.	secor	ondary air pressure sensor input. The fault is recorded when the voltage
				the in	input is above 4.9 volts.
5	Using a digital	(Sensor Ground) - Th	ere should	1. (Check for continuity between sensor connector Pin B and ground
	multimeter, check the	be continuity between	the sensor	t	terminal.
	ground, input and output	connector ground (Pir	n B) and the	á	a. If there is continuity between Pin B and the ground terminal, test i
	voltages at the sensor	firewall ground stud.			complete. Go to Step 5-2.
	connector.	(Sensor Input Voltage	e) - Input	ł	b. If there is no continuity between Pin B and the ground terminal
	Pin A – Input Voltage	voltage from CECU to	o sensor		i. Check for continuity between terminal B and Pin 9 of the 52
	Pin B – Ground	connector (Pin A) sho	ould be +5		Pin CECU connector C.
	Pin C – Output Voltage	volts.			ii Check for continuity between Pin 5 of the 9 Pin CECU
	See CECU Pinout	(Sensor Output Voltag	ge) - Signal		connector A and a cab ground terminal
	for terminal details of	output voltage at sens	or connector		iii Pongir wiring as necessary. Go to Ston 5 1
	the CECU electrical	(Pin C) will vary deper	nding on the		Check insult veltage at eargest connector Din A
	connections.	amperage, but should	be more	2. (Check input voltage at sensor connector Pin A.
		than U voits and less t	inan 5 voits.	á	a. If there is voltage at Pin A, Go to Step 5-3 .
				ł	b. If there is no voltage at Pin A, check for voltage on Pin 1 of the 52
			NOTE		Pin CECU connector C.
		Do not unplug	sensor		i. If there is voltage on Pin 1, check continuity between Pin 1
		connector or pe	enetrate		at CECU and Pin A at sensor connector. Repair wiring as
		the wire ins	sulation		necessary. Go to Step 5-2.
		to perform a	sensor		ii. If there is no voltage on Pin 1 at CECU, replace CECU. Go
		output voltage	check.		to Step 2.
		Slide connecto	or seal	3. (Check signal output voltage at sensor connector Pin C.
		DACK to	expose	á	a. If there is no voltage at Pin C, replace sensor. Go to Step 2.
		terminal ends.	Use	ł	b. If there is voltage at Pin C, check for voltage on Pin 9 of the 52 Pi
		noint tine to	neeule		CECU connector C.
		connector term	inals		i. If voltage is present on Pin 9 at CECU connector, replace
			111015.		CECU. Go to Step 2.
		Average Out	tput Voltage		ii. If there is no voltage on Pin 9 at CECU connector, Go to Step
		Range	(VDC)		1
		120	4.5		
		60	3.5		
		0	2.5		
		-60	1.5		
		-120	0.5	1	
				/	
				/	
				3	
					₩ ₩
				1. I	Place MultiMeter Probe On Pin C
				2. I	Pin B
				3. 1	Pin A
40		I			
12 - 4	12		- F	7AC	CCAR PM819003/KM815056 (09/16/201

Step	Check	Result	Next Step
6	Select "Diagnose" to	DTC 257903 – Open in ammeter	1. Using a jumper wire, jump across sensor harness connector Pins B
	view ammeter gauge	sensor circuit is displayed as	and C.
	DTCs.	"Active."	2
	Next, unplug the		
	ammeter connector		
	at sensor.		
	See CECU Pinout		
	for terminal details of		
	the CECU electrical		
	connections.		
			1. Pin B
			2. Pin C
			a If an "Active" DTC 257904 - Short in ammeter sensor circuit is now
			displayed you have confirmed there is not an open in the sensor
			output voltage wire to the CECIL The original fault (DTC 257903)
			was logged because there is an open in the ammeter sensor itself
			not the wiring Replace sensor. Go to Stan 2
			her the wing. Replace school: Go to Gtop 1 .
			b. If DTC 25/904 is not displayed, there is an open circuit in the wire between senser connector Pin C and Pin 0 of the 52 Pin CECU
			permeeter C. Beneir wiring as personally Co to Stan 2
			Alternate test with de Oberla for earlierite between earlierite betwee
			(sensor output voltage) and Pin 9 of the 52 Pin CECU connector C.
			1. If there is no continuity, repair wiring as necessary. After repairs, DTC
			257903 should now be displayed as "Inactive."
			2. If there is continuity between sensor connector Pin C and Pin 9 of the 52
			Pin CECU connector C, the open circuit is in the sensor itself, not in
			the wiring. Replace sensor.
7	Select "Diagnose" to	DTC 257904 - Short in ammeter	If the fault is still "Active" after unplugging the sensor connector, you have
	view ammeter gauge	sensor circuit is displayed as	confirmed there is a short to ground between Pin C (sensor output voltage)
	DTCs.	"Active."	and Pin 9 of the 52 Pin CECU connector C
	Next, unplug the		1. Check for a pinched or chaffed wire between Pin C (sensor output
	ammeter connector		voltage) and Pin 9 of the 52 Pin CECU connector C. Repair wiring as
	at sensor.		necessary. Go to Step 2.
	See CECU Pinout	DTC 257904 - Short in ammeter	If DTC 257904 changes to "Inactive" after unplugging the sensor connector,
	for terminal details of	sensor circuit is now displayed as	you have confirmed the problem is a short in the sensor itself, not the wiring.
	the CECU electrical	"Inactive."	1. Replace sensor. Go to Step 2.
	connections.		

Pyrometer Gauge Inoperative

DTC17303 and DTC17304

Symptom: Pyrometer gauge inoperative. All other gauges are operational.

The Pyrometer Gauge uses a thermocouple sensor to measure engine exhaust gas temperature after it leaves the turbo.



Result

Check

Step

1

2

3

4

Start ESA, then select "Connect" to establish communication to the		Go to Step 2.
 Select "Monitor." From the "Components"	Gauge graphic on screen displays reasonable reading	Go to Step 3.
window, select "Exhaust Temperature," then select "Open."	Gauge graphic on screen does not display reasonable reading.	Go to Step 4 .
the "Value" bar until the pointer on the gauge image is approximately mid-scale. Observe vehicle gauge movement.	to Step 3-1 . Vehicle gauge reading is in the same range as the ESA gauge image. Go to Step 3-7 .	 Check CVSG data link wiring: Observe Gauge position in the wiring daisy chain. If gauge is mounted between two other functioning gauges CVSG data link wiring is OK. go to Step 3-5. a. If gauge is last gauge in daisy chain or followed by other non-functional gauges, go to Step 3-2. b. Check continuity between Pin 1 on gauge harness connector and Pin 14 of the 52 Pin ICU connector C. Check continuity between Pin 3 on gauge harness connector and Pin 15 of the 52 Pin ICU connector C. Check continuity on both wires exists, perform "Simulate" test again. a. If gauge functions properly during "Simulate" test, install Test ICU and perform "Simulate" test again. i. If gauge functions properly test is complete. Install new ICU permanently. Re-test and return truck to service. ii. If gauge does not function properly during "Simulate" test, replace gauge. Once gauge is replaced. a. Verify gauge functionality.
		 b. Return truck to service. 7. Is this a recheck after Step 5, Step 6 or Step 7? a. Yes. Return truck to service.
		 b. No, Gauge and CVSG data link wiring is not the problem. Go to Step 4.
Select "Diagnose" to view "Active" ammeter diagnostic trouble	DTC 17303 displayed – Open in exhaust temp circuit.	Indicates the problem could be an open in the wiring from the ICU to the pyrometer sensor or a defective sensor. Go to Step 5 , and if necessary, Step 6 .
codes.	DTC 17304 displayed - Short in exhaust temp circuit.	Indicates the problem could be a short to ground in the wiring from the ICU to the pyrometer sensor or a defective sensor. Go to Step 5 , and if necessary, Step 7 .

12

Next Step

1	2

Step	Check	Result			Next Step	
5	Unplug pyrometer	(Sensor Ground) - There should	1.	Check for continuity	between sensor connector	Pin 1 and a cab ground
	harness connector	be continuity between the sensor		terminal.		
	at sensor.	connector ground wire (Pin 1) and		a. If there is contin	uity between Pin 1 and the	e ground terminal, test is
	Using a digital	a cab ground terminal.		complete. Go to	o Step 5-2.	
	multimeter, check	(Signal) - There should be		b. If there is no co	ntinuity between Pin 1 and	the ground terminal,
	continuity on ground	continuity between the sensor		repair wiring as	necessary. Go to Step 5-	1.
	and signal wire at	connector signal wire (Pin 2) and	2.	Check for continuity	between sensor connector	Pin 2 and Pin 23 of the
	Bin 1 Cround	Pin 23 of the 52 Pin ICO connector		52 Pin ICU connecto	r C.	
	Pin 1 – Glound	0.		a. If there is contin	nuity between Pin 2 and Pi	n 23, test is complete.
				Go to Step 6.		
	for terminal details of			b. If there is no co	ntinuity between Pin 2 and	l Pin 23 at ICU, repair
	the CECU electrical			wiring as neces	sary. Go to Step 5-2.	
	connections.		Alte	ernate test method: F	Resistance in the pyromete	r sensor (thermocouple)
			sigr	nal wire changes as ex	haust temperature increas	es/decreases.
			1.	By unplugging the py	rometer sensor harness c	onnector and connecting
				a resistor decade bo	x (i.e.Ametek PST2000 Te	ster), or an appropriate
				resistor to Pins 1 and	d 2, you can simulate the s	sensor by dialing in a
			_	known resistance.		
			2.	Observe vehicle gau	ge reading on dash.	
			3.	If gauge needle move	es to approximately the sa	me temperature as in the
				table below, the prob	em is a defective pyrome	ter sensor. See Table
				Ter	mp	Resistance
				°C	°F	Ohms
				-40	-40	169.7
				-20	-4	185.1
				0	32	200.5
				25	77	219.6
				50	122	238.5
				100	212	275.9
				150	302	312.7
				200	392	349.0
I				250	482	384.6
				300	572	419.7
				350	662	454.2
				400	752	488.1
I				450	842	521.4
I				500	932	554.1
I				600	1112	617.8
I				700	1292	679.2
I				800	1472	738.2
I				900	1652	794.9
	1		1	1000	1832	849.2

Step	Check	Result	Next Step
6	Select "Diagnose"	DTC 17303 - Open in exhaust	1. Using a jumper wire, jump across sensor harness connector Pins 1 and 2.
	to view exhaust	temp circuit is displayed as	
	temperature gauge	"Active."	
	DTCs.		
	Unplug pyrometer		
	harness connector		
	at sensor.		
	See CECU Pinout		
	for terminal details of		
	the CECU electrical		
	connections.		
			1. Pin 1
			2. Pin 2
			a If an "Active" DTC 17304 - Short in exhaust temp circuit is now
			displayed you have confirmed there is not an open in the sensor
			signal wire to the ICU. The original fault (DTC 17303) was logged
			because there is an open in the pyrometer sensor itself, not the
			wiring. Replace sensor.
			b If DTC 17304 is not displayed, there is an open circuit in the signal
			wire between sensor connector Pin 2 and Pin 23 of the 52 Pin ICU
			connector C. Repair wiring as necessary.
			Alternate test method: Check for continuity between sensor connector Pin 2
			(sensor signal) and Pin 23 of the 52 Pin ICU connector C.
			1. If there is no continuity, repair wiring as necessary. After repairs, DTC
			17303 should now be displayed as "Inactive."
			2. If there is continuity between sensor connector Pin 2 and Pin 23 of the
			52 Pin ICU connector C, the open circuit is in the sensor itself, not in
			the wiring. Replace sensor.
7	Select "Diagnose"	DIC 17304 - Short in exhaust	If the fault is still "Active" after unplugging the sensor connector, you have
	to view exhaust	temp circuit is displayed as	confirmed there is a short to ground between Pin 2 (sensor signal) and Pin 23
	temperature gauge	Active.	or the 52 Pin ICU connector C.
	Novt upplus the		1. Check for a pinched or chatted wire between Pin 2 (sensor signal) and
	nvext, unplug the		Pin 23 of the 52 Pin ICU connector C. Repair wiring as necessary. Go to
	connector at sensor	DTC 17304 - Short in exhaust	Step 2.
	See CECIL Pinout	temp circuit is now displayed as	have confirmed the problem is a short in the sensor itself, not the wiring
	for terminal details of	"Inactive."	1 Replace sensor Go to Step 2
	the CECU electrical		1. Replace serior. Or to otep 2.
	connections.		



Front Drive Axle Oil Temperature Gauge

DTC57803 and DTC57804

Symptom: Front drive axle oil temperature gauge inoperative. All other gauges are operational.

The Front Drive Axle Oil Temperature Gauge uses a thermistor sensor to measure axle oil temperature.



Step	Check	Result	Next Step
1	Turn ignition key ON.		Go to Step 2.
	Start ESA, then select		
	"Connect" to establish		
	communication to the		
	vehicle.		
2	Select "Monitor." From	Gauge graphic on screen displays	Go to Step 3.
	the "Components"	reasonable reading.	
	window, select	Gauge graphic on screen does not	Go to Step 4.
	"Front Drive Axle Oil	display reasonable reading.	
	Temperature," then		
	select "Open."		
3	Select "Simulate". Drag	Vehicle gauge does not move. Go	Perform the following checks:
	the "Value" bar until the	to Step 3-1.	
	pointer on the gauge	Vehicle gauge reading is in the	<u>I</u> NOTE
	image is approximately	same range as the ESA gauge	Use the "Program" feature in ESA to make sure that
	mid-scale. Observe	image. Go to Step 3-7.	the parameter for the inoperative gauge is enabled.
	vehicle gauge		An inoperative gauge may simply have its CECU
	movement.		parameter set to disabled.
			1 Check CVSC data link wiring: Observe Cauge position in the wiring
			 Check CVSG data link winnig. Observe Gauge position in the winnig data chain.
			a. If gauge is mounted between two other functioning gauges CVSG
			data link wiring is OK. Go to Step 3-5.
			b. If gauge is last gauge in daisy chain or followed by other
			non-functional gauges, go to Step 3-2 .
			2. Check continuity between Pin 1 on gauge harness connector and Pin 14
			of the 52 Pin CECU connector C.
			3. Check continuity between Pin 3 on gauge harness connector and Pin 15
			of the 52 Pin CECU connector C.
			4. Repair daisy chain jumper harness as necessary.
			5. Once continuity on both wires exists, perform "Simulate" test again.
			a If gauge functions properly during "Simulate" test repair is complete
			Return truck to service.
			b. If aguad doos not function during "Simulate" tost install a known
			good gauge and perform "Simulate" test again.
			 If gauge functions properly test is complete. Install new gauge permanently. Re-test and return truck to service.
			ii. If gauge does not function during "Simulate" test, install Test
			CECU and perform "Simulate" test again.
			(1) If gauge functions properly test is complete. Install new
			CECU permanently. Re-test and return truck to service.
			(2) If gauge does not function properly during "Simulate" test,
			replace gauge.
			6. Once gauge is replaced.
			a. Verify gauge functionality.
			h Return truck to service
			7 Is this a reshock offer Step 5 Step 5 or Step 70
			7. IS unis a recrieck arter step 5, step 6 or step 7?
			a. Yes. Return truck to service.

Step	Check	Result	Next Step	
			 b. No, Gauge and CVSG data link wiring is r Step 4. 	not the problem. Go to
4	Select "Diagnose" to view front drive axle temperature gauge	DTC 57803 displayed - Open in axle 1 oil temp circuit.	Indicates the problem could be an open in the wiring the pyrometer sensor or a defective sensor. Go to S Step 6 .	from the Chassis Node to tep 5 , and if necessary,
	diagnostic trouble	DTC 57804 displayed - Short in	Indicates the problem could be a short to ground in the	ne wiring from the Chassis
	codes.	axle 1 oil temp circuit.	Node to the sensor or a defective sensor. Go to Ste	p 5 , and if necessary,
			Step 7.	
5	Unplug oil temperature	(Sensor Ground) - There should	1. Check for continuity between sensor connector	Pin A and firewall ground
	harness connector at	be continuity between the sensor	stud.	
	sensor.	connector ground wire (Pin A) and	a. If there is continuity between Pin A and the	e ground terminal, test is
	Using a digital	a cab ground terminal.	complete. Go to Step 5-2.	
	multimeter, check	(Signal) - There should be	b. If there is no continuity between Pin A and	the ground terminal,
	continuity on ground	continuity between the sensor	repair wiring as necessary. Go to Step 5-	1.
	and signal wire at	connector signal wire (Pin B)	2. Check for continuity between sensor connector	Pin B and Pin 13 of the
	sensor connector.	and Pin 13 of the Chassis Node	Chassis Node connector C.	
	Pin A – Ground	connector C.	a. If there is continuity between Pin B and Pi	n 13, test is complete.
	Pin B - Signal		Go to Step 6	
	See Chassis Node		b. If there is no continuity between Pin B and	Pin 13 at Chassis Node,
	Pinout for terminal details of the Chassis		repair wiring as necessary. Go to Step 5-2	2.
	Node electrical		Alternate test method: Resistance in the oil temper	rature sensor (thermistor)
	connections.		signal wire changes as oil temperature increases/de	creases.
			1. By unplugging the oil temperature sensor harn	ess connector and
			connecting a resistor decade box (i.e., Ametek	PST2000 Tester), or an
			appropriate resistor to Pins A and B, you can s	imulate the sensor by
			dialing in a known resistance.	
			2. Observe vehicle gauge reading on dash.	
			3. If gauge needle moves to approximately the sa	me temperature as in
			the table below, the problem is a defective oil te	emperature sensor. See
			table below.	Decistance Ohme
			-40	100 856
			-22	52 594
			-4	28.582
			14	16 120
			32	9 399
			50	5,658
			68	3,000
			86	2 240
			104	1 465
			122	080 3
			140	670.0
			140	460 7
			138	400.7
			1/6	333.8
			194	241.8
			212	178.03
			230	133.08
			248	100.91

Step	Check	Result	Next Step	
			266	77.54
			284	60.32
			302	47.46
			320	37.75
			338	30.32
			356	24.58
			374	20.11
			392	16.58
6	Select "Diagnose" to view front drive axle temperature gauge DTCs. Unplug oil temperature harness connector at sensor. See Chassis Node Pinout for terminal details of the Chassis Node electrical connections.	DTC 57803 - Open in axle 1 oil temp circuit is displayed as "Active."	 Using a jumper wire, jump across sensor harnes Using a jumper wire, jump across sensor harnes Using a jumper wire, jump across sensor harnes Pin B Pin B Pin A a. If an "Active" DTC 57804 - Short in axle 1 displayed, you have confirmed there is no signal wire to the Chassis Node. The origin logged because there is an open in the oil not the wiring. Replace sensor. Go to Ste b. If DTC 57804 is not displayed, there is an wire between sensor connector Pin B and Node connector C. Repair wiring as necess Alternate test method: Check for continuity betweet (sensor signal) and Pin 13 of the Chassis Node conre If there is no continuity, repair wiring as necess 57803 should now be displayed as "Inactive." 	temp circuit is now t an open in the sensor hal fault (DTC 57803) was temperature sensor itself, p 2 . open circuit in the signal Pin 13 of the Chassis issary. Go to Step 2 . en sensor connector Pin B hector C. ary. After repairs, DTC
			 If there is continuity between sensor connector Chassis Node connector C the open circuit is in the wiring. Replace sensor. 	Pin B and Pin 13 of the the sensor itself, not in

0.1	Observit	De sult	No. 4 Of an
Step	Check	Result	Next Step
7	Select "Diagnose" to	DTC 57804 - Short in axle 1	If the fault is still "Active" after unplugging the sensor connector, you have
	view front drive axle	oil temp circuit is displayed as	confirmed there is a short to ground between Pin B (sensor signal) and Pin
	temperature gauge	"Active."	13 of the Chassis Node connector C.
	DTCs.		1. Check for a pinched or chaffed wire between Pin B (sensor signal) and
	Next, unplug the oil		Pin 13 of the Chassis Node connector C. Repair wiring as necessary.
	temperature harness		Go to Step 2.
	connector at sensor.	DTC 57804 - Short in axle 1	If DTC 57804 changes to "Inactive" after unplugging the sensor connector, you
	See Chassis Node	temp circuit is now displayed as	have confirmed the problem is a short in the sensor itself, not the wiring.
	Pinout for terminal	"Inactive."	1. Replace sensor. Go to Step 2.
	details of the Chassis		
	Node electrical		
	connections.		

Rear Drive Axle Oil Temperature Gauge Inoperative

DTC7703 and DTC7704

Symptom: Rear drive axle oil temperature gauge inoperative. All other gauges are operational.

The Rear Drive Axle Oil Temperature Gauge uses a thermistor sensor to measure axle oil temperature.



Step	Check	Result	Next Step
1	Turn ignition key ON.		Go to Step 2.
	Start ESA, then select		
	"Connect" to establish		
	communication to the		
	vehicle.		
2	Select "Monitor." From	Gauge graphic on screen displays	Go to Step 3.
	the "Components"	reasonable reading.	
	window, select	Gauge graphic on screen does not	Go to Step 4.
	"Rear Drive Axle Oil	display reasonable reading.	
	Temperature," then		
	select "Open."		
3	Select "Simulate". Drag	Vehicle gauge does not move. Go	Perform the following checks:
	the "Value" bar until the	to Step 3-1.	
	pointer on the gauge	Vehicle gauge reading is in the	NOIE NOIE
	image is approximately	same range as the ESA gauge	Use the "Program" feature in ESA to make sure that
	mid-scale. Observe	image. Go to Step 3-7 .	the parameter for the inoperative gauge is enabled.
	vehicle gauge		An inoperative gauge may simply have its CECU
	movement.		parameter set to disabled.
			4 Charle OV/CC date link without Observe Course position in the within
			1. Check CVSG data link winng. Observe Gauge position in the winng
			a. If gauge is mounted between two other functioning gauges CVSG
			data link wiring is OK. Go to Step 3-5 .
			b. If gauge is last gauge in daisy chain or followed by other
			non-functional gauges, go to Step 3-2.
			2. Check continuity between Pin 1 on gauge harness connector and Pin 14
			of the 52 Pin CECU connector C.
			3. Check continuity between Pin 3 on gauge harness connector and Pin 15
			of the 52 Pin CECU connector C.
			4. Repair daisy chain jumper harness as necessary.
			5. Once continuity on both wires exists, perform "Simulate" test again.
			a If gauge functions properly during "Simulate" test repair is complete
			Return truck to service.
			b If gauge does not function during "Simulate" test install a known
			good gauge and perform "Simulate" test again.
			i If gauge functions properly test is complete. Install new gauge
			permanently. Re-test and return truck to service.
			ii. If gauge does not function during "Simulate" test, install Test
			CECU and perform "Simulate" test again.
			(1) If gauge functions properly test is complete. Install new
			CECU permanently. Re-test and return truck to service.
			(2) If gauge does not function properly during "Simulate" test,
			replace gauge.
			6. Once gauge is replaced.
			a. Verify gauge functionality.
			b. Return truck to service.
			7 Is this a recheck after Step 5 Step 6 or Step 7?
			2. Vos Boturn truck to convice
			a. 165. Return truck to service.

Image: Sec: Difference of the sensor of a defective sensor. Co to Step 5, and Theorems, Step 7. 5 Unspite of the chassis Node decircles the problem could be an open in the wiring from the Chassis Node to the sensor or a defective sensor. Co to Step 5, and Theorems, Step 7. 5 Unspite of theorem could be an open in the wiring from the Chassis Node to the sensor or a defective sensor. Co to Step 5, and Theorem 2. 5 Unspite of theorem could be an open in the wiring from the Chassis Node to the sensor or a defective sensor. Co to Step 5, and Theorem 2. 5 Unspite of theorem could be an open in the wiring from the Chassis Node to the sensor or a defective sensor. Co to Step 5, and Theorem 2. 5 Unspite of theorem could be an open in the wiring from the Chassis Node theorem 2. 6 Unspite of theorem could be an open open in the wiring from the Chassis Node identity on ground attentional. 9 Unspite of the Chassis Node identity on ground terminal, test complete. Go to Step 5.2. 9 If there is continuity between Pin A and the ground terminal, test complete. Go to Step 5.4. 9 If there is continuity between Pin B and Pin 10, test is complete. Go to Step 5.4. 9 If there is continuity between Pin B and Pin 10, test is complete. Go to Step 5.4. 9 If there is continuity between Pin B and Pin 10, test is complete. Go to Step 5.4. 9 If there is continuity between Pin B a	Step	Check	Result	Next Step	
Step 4. Step 4. 4 Select "Diagnose" to view rear drive add temperature gauge diagnosite toroble doces. DTC 7703 displayed - Open in gal 2 of temp creat. Indicates the problem could be an open in the wing from the Chassie Node the perature gauge diagnosite toroble sensor. 5 Unplug oil temperature sensor. (Sensor Ground) - There should be continuity between the sensor connector ground wine (Pin A) and ground wine (Pin A) and pin 10 of the Chassis Node Pin A - Ground Pin B - Signal 1. Check for continuity between Pin A and the ground terminal, complete. Co is Step 5 -1. 8 Check for continuity between the sensor connector ground wine (Pin A) and Pin 10 of the Chassis Node enclored signal wire (Pin B) and Pin 10 of the Chassis Node econector C. 1. Check for continuity between Pin A and the ground terminal, complete. Co is Step 5 -1. 8 Check for continuity between Pin A and the ground terminal, connector Signal wire (Pin B) and Pin 10 of the Chassis Node econector C. 1. The check for continuity between Pin B and Pin 10, repair wiring a necessary. Go to Step 5 -2. 9 Finder Chassis Node electrical connections. 1. Step C - Annet K PST2000 Tester), or a appropriate resistor to Pins A and B, you can simulate the sensor by dialing in a known resistance. 2. Observe whole gauge reading on dash. 1. Finder Ground Pin A - Ground Pin A - Ground Connections. 1. The gauge needide moves to approximatety the same temperature asi				b. No, Gauge and CVSG data link wiring is r	ot the problem. Go to
4 Select "Dagnos" to wew rear drive axie temperature gage diagnostic trouble codes. DIC 7704 displayed - Open in axie 2 of temp circuit. Indicates the problem could be an open in the wring from the Chassis Node DIC 7704 displayed - Short in axie 2 of temp circuit. 5 Mineckes the problem could be an open in the wring from the Chassis Node sensor. Sensor Cround) - There should be connector ground write (Pin A) and a cab ground terminal. Indicates the problem could be an open in the wring from the Chassis Node to the sensor or a defective sensor. Go to Step 5.4. 6 Mineckes the problem could be connector ground write (Pin A) and a cab ground terminal. I. Check for continuity between Pin A and the ground terminal, repair wring as necessary. Go to Step 5.1. 6 Mineckes the problem could be connector C. If there is no continuity between Pin B and Pin 10, test is complete. Go to Step 5.2. 9 Pin B - Signal See Chassis Node Pin D - Signal connector sal If there is no continuity between Pin B and Pin 10, repair wring a necessary. Co to Step 5.2. 10 Check ther continuity between Pin B and Pin 10, repair wring a necessary. Co to Step 5.2. If there is no continuity between Pin B and Pin 10, repair wring a necessary. Co to Step 5.2. 10 If the chassis Node Pinot for terminal details of the Chassis Node electrical connection a If gauge needle moves to approximately the same temperature as in the table below. If degrade of the problem is a defective oil temprerature as in the table below.				Step 4.	
were rear drive axie temperature gauge diagnostic trouble codes. axie 2 of temp circuit. the sensor or a defective sensor. Go to Step 5, and if necessary. Step 5. 5 Unplug of temperature hamess connector at sensor. (Sensor Ground). There should be continuity between the sensor connector ground wire (Pin A) and a cab ground wire (Pin B) and Pin 10 of the Chassis Note connector signal wire at sensor connector. (Signal). There should be connective provid wire (Pin B) and Pin 10 of the Chassis Note connector signal wire (Pin B) and Pin 10 of the Chassis Note connections. If there is continuity between Pin A and the ground terminal, test. 8 Check for continuity between the sensor connector signal wire (Pin B) and Pin 10 of the Chassis Note Pin A - Ground Pin B - Signal If there is continuity between Pin B and Pin 10, test is complete. Co to Step 5. 9 Hore terminal. If there is continuity between Pin B and Pin 10, test is complete. Co to Step 5. 9 Hore terminal. If there is continuity between Pin B and Pin 10, test is complete. Co to Step 5. 9 Hore terminal. If there is a continuity between Pin B and Pin 10, test is complete. Co to Step 5. 10 Hore terminal. If there is a continuity between Pin B and Pin 10, test is complete. Co to Step 5. 11 Hore terminal. If there is a continuity between Pin B and Pin 10, repair wiring a mecessary. Go to Step 5.2. 11 Hore terminal. If there ter	4	Select "Diagnose" to	DTC 7703 displayed - Open in	Indicates the problem could be an open in the wiring	from the Chassis Node to
Imperature gauge disgnostic trouble codes DTC 7704 displayed - Short in axte 2 of lemp circuit. Indicates the problem could be a short by ground in the wiring from the Chas- sensor or a defective sensor. Go to Step 5, and if necessary. Step 7. 5 Unplug oil temperature sensor. Sensor Ground) - There should be connector ground wire (Pin A) and a cab ground terminal, a cab ground terminal, econnector signal wire (Pin B) and Pin 10 of the Chassis Node Pin A - Ground Pin B - Signal See Chassis Node Pinout for terminal details of the Chassis Node electrical connections. 1. Check for continuity between Pin A and the ground terminal, econnector C. 8 If there is continuity between Pin A and the ground terminal, end pin 10 of the Chassis Node electrical connections. 1. Check for continuity between Pin A and the ground terminal, end pin 10 of the Chassis Node electrical connections. 2. Check for continuity between Pin B and Pin 10, test is complete. Go to Step 6. 1. By unplugging the oil temperature sensor (thermist signal wire changes as oil temperature sensor thermist signal wire changes as oil temperature sensor thermist signal wire changes as oil temperature sensor the Pirator Pin B and Pin 10, repair wiring a necessary. Go to Step 5.2. 8 If there is continuity between Pin B and Pin 10, repair wiring a necessary. Go to Step 5.2. 8 If there is continuity between Pin B and Pin 10, repair wiring a necessary. Go to Step 5.2. 8 If there is continuity between Pin B and Pin 10, repair wiring a necessary. Go to Step 5.2. 9 If there is continuity between Pin B and Pin 10, repair wiring a necessary. Go to Step 5.2. 1		view rear drive axle	axle 2 oil temp circuit.	the sensor or a defective sensor. Go to Step 5, and	if necessary, Step 6.
diagnostic trouble codes axite 2 of lemp circuit. Node to the sensor or a defective sensor. Go to Step 5, and if necessary. Sensor. 5 Unplug oil temperature sensor. (Sensor Ground) - There should be confinuity between the sensor connector ground wire (Pin A) and a cib ground terminal. 1. Check for continuity between Pin A and the ground terminal, commetor ground wire (Pin A) and signal wire at sensor connector signal wire (Pin B) sensor connector signal wire (Pin B) sensor connector C. a. If there is no continuity between Pin A and the ground terminal, repair wiring as necessary. Go to Step 5-2. 2. Check for continuity between Pin B and Pin 10 of th Chassis Node center C C. b. If there is no continuity between Pin B and Pin 10, test is complete. Go to Step 6. 3. If there is no continuity between Pin B and Pin 10, repair wiring a necessary. Go to Step 5-2. Atternate test method: Resistance in the oil temperature sensor thermist signal wire change as oil temperature sensor than connections. 4. If there is no continuity between Pin B and Pin 10, repair wiring a necessary. Go to Step 5-2. 4. If there is no continuity between Pin B and Pin 10, repair wiring a necessary. Go to Step 5-2. 4. If there is no continuity between Pin B and Pin 10, repair wiring a necessary. Go to Step 5-2. 4. If there is no continuity between Pin B and Pin 10, repair wiring a necessary. Go to Step 5-2. 4. If group needin moves to approximately the same temperature sensor. The table below. the problem is a defective oil temperature sensor. The table below. the route of the ta		temperature gauge	DTC 7704 displayed - Short in	Indicates the problem could be a short to ground in the	ne wiring from the Chassis
codes. Step 7. 5 Unplug of imperature hamess connector at sensor. Sensor Ground) - There should be continuity between the sensor connector ground wire (Pin A) and and signal wire at sensor connector ing wire (Pin B) sensor connector signal See Chassis Node Pin B - Signal See Chassis Node electrical connections. Check for continuity between Pin B and Pin 10, test is complete. Go to Step 6. 6 If there is no continuity between Pin B and Pin 10, repair wiring a necessary. Go to Step 5.2. 7 If there is no continuity between Pin B and Pin 10, test is complete. Go to Step 6. 8 If there is no continuity between Pin B and Pin 10, repair wiring a necessary. Go to Step 5.2. 8 If there is no continuity between Pin B and Pin 10, repair wiring a necessary. Go to Step 5.2. 8 If there is no continuity between Pin B and Pin 10, repair wiring a necessary. Go to Step 5.2. 8 If there is no continuity between Pin B and Pin 10, repair wiring a necessary. Go to Step 5.2. 9 If any prepretim easistance in the oil temperature sensor tharmes		diagnostic trouble	axle 2 oil temp circuit.	Node to the sensor or a defective sensor. Go to Ste	p 5 , and if necessary,
 Jonplug oil temperature (Sensor Ground) - There should names connector a to continuity between the sensor connector ground wire (Pin A) and a signal wire at a cab ground terminal. In Check for continuity between Pin A and the ground terminal. test complete. Check (Signal) - There should be continuity between the sensor connector signal wire (Pin B) sensor connector signal wire (Pin B) as sensor connector C. If there is continuity between Pin A and the ground terminal. Check for continuity between Pin A and the ground terminal. Connector signal wire (Pin B) as sensor connector C. If there is no continuity between Pin B and Pin 10 of the Chassis Node electrical connectors. If there is no continuity between Pin B and Pin 10, test is complete. Go to Step 6.2. Alternato test method: Resistance in the oil temperature sensor thermises connector and connecting a resistor decade box (i.e., Ametek PS1200) Tester), or a appropriate resistor. By unplugging in a known resistance. Observe while gauge reading on dash. If gauge needle moves to approximately the same temperature as in the table below. Tegistan E and Pin 10, 483 (Signal P and P A A A A B, you can simulate the sensor by dialing in a known resistance. Observe while gauge reading on dash. If gauge needle moves to approximately the same temperature as in the table below. Tegistan A A B, Signal A B B A		codes.		Step 7.	
harness connector a connector ground wire (Pin A) and a cab ground terminal. a. If there is continuity between Pin A and the ground terminal, test complete. Co to Step 5-2. multimeter, check (Signal) - There should be continuity between Pin A and the ground terminal, repair wiring as necessary. Go to Step 5-1. and Pin 10 of the Chassis Node pin A - Ground Pin B - Signal connector C. See Chassis Node pinot 10 of the Chassis Node Pinou for terminal continuity between Pin B and Pin 10, test is complete. Co to Step 6. Node electrical connector C. onnector source Continuity between Pin B and Pin 10, test is complete. Co to Step 6. b. If there is no continuity between Pin B and Pin 10, test is complete. Co to Step 6. b. If there is no continuity between Pin B and Pin 10, test is complete. Co to Step 6. connections. If there is no continuity between Pin B and Pin 10, test is complete. Co to Step 6. b. If there is no continuity between Pin B and Pin 10, test is complete. Co to Step 6. If there is no continuity between Pin B and Pin 10, test is complete. Co to Step 6. connection subtriation the oil temperature sensor thermist isgnal wire changes as oil temperature sensor thermist isgnal wire changes as oil temperature sensor thermist isgnal wire changes as oil temperature sensor temperature as in the table below. connecting relatis defective oil temperature sensor filter sensor condetor oil tem	5	Unplug oil temperature	(Sensor Ground) - There should	1. Check for continuity between sensor connector	Pin A and firewall ground
 sensor. connector ground wire (Pin A) and and signal wire at and signal wire at and signal wire (at sensor connector. Pin A - Ground Pin A - Ground details of the Chassis Node electrical connectorions. connector C. and Pin 10 of the Chassis Node prinout for terminal details of the Chassis Node electrical connector and signal wire (at be chassis Node connector C. and Pin 10 of the Chassis Node electrical connector and connector and details of the Chassis Node electrical connector A. details of the Chassis Node electrical connector of the Chassis Node electrical connector of the Chassis Node electrical connections. details of the Chassis Node electrical connections at the print encomplete. details of the Chassis Node electrical connections. details of the Chassis Node electrical connections. details of the Chassis Node electrical connections. details of the Chassis Node electrical connections at the table below, the problem is a defective oil temperature as in the table below, the problem is a defective oil temperature sensor. Se table below. details of the Chassis Node electrical connections at the table below, the problem is a defective oil temperature sensor to prove the problem is a defective oil temperature sensor to prove the problem is a defective oil temperature sensor to protent the problem is a defective oil temper		harness connector at	be continuity between the sensor	stud.	
Using a digital a cab ground terminal. complete. Go to Stop 5-2. and signal wire at signal wire at sensor connector signal wire (Pi IP) and Pin 10 of the Chassis Node connector C. If there is no continuity between Pin B and Pin 10, test is complete. Go to Stop 5-1. Pin A - Ground connector C. If there is continuity between Pin B and Pin 10, test is complete. Go to Stop 5-2. Pin B - Signal connector C. If there is continuity between Pin B and Pin 10, test is complete. Go to Stop 5-2. Node electrical connections. connector C. If there is no continuity between Pin B and Pin 10, test is complete. Go to Stop 5-2. Alternate test method: Reasistance in the oil temperature sensor (thermist signal wire changes as oil temperature sensor theresson (thermist signal wire changes as oil temperature sensor thaness connector and connecting a resistor to Pins A and B, you can simulate the sensor by dialing in a known resistance. If days are defined to the problem is a defective oil temperature sensor. Se table below. If days are defined to the chass as 0. If days are defined to the chassis Node electrical connecting a resistor to Pins A and B, you can simulate the sensor by dialing in a known resistance. If days are defined to the problem is a defective oil temperature sensor. Se table below. If days are defined to the problem is a defective oil temperature sensor. Se table below. If days are defined to the chass as 0. If days are defined to the days are defined to the days are days are defined to the days as 0.		sensor.	connector ground wire (Pin A) and	a. If there is continuity between Pin A and the	e ground terminal, test is
Initimeter, check (Signal) - There should be continuity between the sensor connector signal wire (Pin B) and Pin 10 of the Chassis Node Pin A - Ground b. If there is no continuity between sensor connector Pin B and Pin 10 of the Chassis Node Pin B - Signal See Chassis Node Pin B - Signal connector C. a. If there is no continuity between Pin B and Pin 10, test is complete. Go to Step 5. Node electrical connections. connector Pin B and Pin 10, test is complete. Go to Step 5.2 Alternate test method: Resistance in the oil temperature sensor (thermist signal wire changes as oil temperature increases/decreases. 1. By unplugging the oil temperature sensor tharmess connector and connections. connection are sistor decade box (i.e., Ametek PST2000 Tester), or a appropriate resistor of Pin S A and B, you can simulate the sensor by dialing in a known resistance. 2. Observe vehicle gauge reading on dash. 3. 3. If gauge needle moves to approximately the same temperature as in the table below. Here YF Resistance Ohmes 4-0 4.11 100,856 -22 52,594 4.14 16,120 3.2 9,399 4.3 248,682 4.4 28,682 4.4 28,682 4.14 16,120 3.2 9,399 5.5 5,658 6.8 3,511		Using a digital	a cab ground terminal.	complete. Go to Step 5-2.	
continuity on ground and signal wire at sensor connector. connector signal wire (Pin B) and Pin 10 of the Chassis Node connector C. Check for continuity between sor connector Pin B and Pin 10 of th Chassis Node connector C. Pin A – Ground Pin B - Signal See Chassis Node connector C. If there is continuity between Pin B and Pin 10, test is complete. Go to Step 5. See Chassis Node connections. If there is no continuity between Pin B and Pin 10, test is complete. Go to Step 5. Node electrical connections. If there is no continuity between Pin B and Pin 10, repair wiring a necessary. Go to Step 5.2. Alternate test method: Resistance in the oil temperature sensor (thermist signal wire changes as oil temperature increases/dccreases. I By unplugging the oil temperature sensor harness connector and connecting a resistor to Pins A and B, you can simulate the sensor by dialing in a known resistance. I Desrve vehicle gauge reading on dash. I If gauge needle moves to approximately the same temperature as in the table below. The problem is a defective oil temperature sensor. Se table below. 40 100.856 22 52.504 43 14 16.120 33.6 35.11 440 100.856 68 2.240 14 16.120 158 486.7 164 1		multimeter, check	(Signal) - There should be	b. If there is no continuity between Pin A and	the ground terminal,
 and signal wire at sensor connector signal wire (Pin B) and Pin 10 of the Chassis Node connector C. Check for continuity between Pin B and Pin 10, test is complete. Connector C. If there is continuity between Pin B and Pin 10, test is complete. Go to Step 6 If there is no continuity between Pin B and Pin 10, test is complete. Signal wire changes as of the performance of the chassis Node connector S. If there is no continuity between Pin B and Pin 10, test is complete. Signal wire changes as of the performance of the chassis Node electrical connections. If there is no continuity between Pin B and Pin 10, test is complete. Signal wire changes as of the performance sensor thermess connector and connecting a resistor decade box (i.e., Ametek PST2000 Tester), or an appropriate resistor to Pins A and B, you can simulate the sensor by dialing in a known resistance. Observe vehicle gauge reading on dash. If gauge needle moves to approximately the same temperature as in the table below. Temp *F Resistance Other 40 100,856 -22 0,5254 -4 4 28,582 -14 100,856 -22 0,5254 -4 4 28,582 -14 100,856 -22 0,5254 -4 4 28,582 -14 100,856 -22 0,5254 -4 4 28,582 -14 100,856 -22 0,5254 -4 4 28,582 -14 100,856 -22 0,5658 -68 3,511 -68 2,240 -14 1,61,20 -22 0,939 -50 5,558 -68 68 3,511 -68 2,240 -14 1,61,20 -22 0,939 -50 5,558 -68 68 3,511 -68 2,240 -14 1,465 -122 0,903 -15,558 -68 3,511 -68 -2,240 -14 -14 -14,65 -122 0,903 -15,558 -68 -15,558 -168 -158 -168 -122 -168 -178 -176 -1333.8 -194 -124 -18,18 -124 -124 -134 -124 -124 -134 -124 -124 -134 -124 -124 -134 -124 -134 -124 -124 -134 -124 -124 -134 -124 -124 -134 -124 -124 -134 -124 -124 -134 -124 -134 -134 -134 -134 -134 -134 -134 -13		continuity on ground	continuity between the sensor	repair wiring as necessary. Go to Step 5-	1.
sensor connector. and Pin 10 of the Chassis Node connector C. Chassis Node connector C. Pin B - Signal See Chassis Node See Chassis Node If there is continuity between Pin B and Pin 10, test is complete. Go to Step 6. Indext for terminal details of the Chassis Node electrical connections. If there is no continuity between Pin B and Pin 10, repair wiring a necessary. Go to Step 5-2. Alternate test method: Resistance in the oil temperature sensor (thermist signal wire changes as oil temperature sensor thaness connector and connecting a resistor decade box (e., Ametek PST2000 Tester), or a appropriate resistor to Pins A and B, you can simulate the sensor by dialing in a known resistance. 2. Observe vehicle gauge reading on dash. 3. If gauge needle moves to approximately the same temperature as in the table below, the problem is a defective oil temperature as nor. Se table below. Very *F Resistance Ohmes 440 100,856 -22 22 52,594 -4 28,582 14 16,120 32 9,399 50 6,688 68 3,511 86 2,240 104 1,465 122 960.3 140 670.9 158 486.7 164 248.		and signal wire at	connector signal wire (Pin B)	2. Check for continuity between sensor connector	Pin B and Pin 10 of the
Pin A – Ground connector C. Pin B - Signal a. If there is continuity between Pin B and Pin 10, test is complete. Go to Step 5. See Chassis Node electrical connections. b. If there is no continuity between Pin B and Pin 10, repair wiring a mecessary. Go to Step 5-2. Alternate test method: Resistance in the oil temperature sensor (thermist signal wire changes as oil temperature sensor harness connector and connecting a resistor decade box (i.e., Ameter NST2000 Tester), or a appropriate resistor to Pins A and B, you can simulate the sensor by dialing in a known resistance. 2. Observe vehicle gauge readie moves to approximately the same temperature sensor. Set table below. ************************************		sensor connector.	and Pin 10 of the Chassis Node	Chassis Node connector C.	
Pin B - Signal Go to Step 6. See Chassis Node		Pin A – Ground	connector C.	a. If there is continuity between Pin B and Pi	in 10, test is complete.
See Chassis Node Pinout for terminal details of the Chassis Node electrical connections. Alternate test method: Resistance in the oil temperature sensor (thermist signal wire changes as oil temperature sensor charness connector and connecting a resistor decade box (i.e., Ametek PST2000 Tester), or al appropriate resistor to Pins A and B, you can simulate the sensor by dialing in a known resistance. 2. Observe vehicle gauge reading on dash. 3. If gauge needle moves to approximately the same temperature as in the table below, the problem is a defective oil temperature sensor. Se table below. 40 100,856 -22 52,594 44 28,582 14 16,120 32 9,399 50 5,658 68 3,511 86 2,240 104 1,465 122 980,3 140 104 141 6,120 32 9,399 50 5,658 68 3,511 86 2,240 104 1,465 122 980,3 140 176 158 468,7 176 333,8		Pin B - Signal		Go to Step 6.	
Proout for terminal details of the Chassis Node electrical connections. Alternate test method: Resistance in the oil temperature sensor (thermist signal wire changes as oil temperature sensor harness connector and connecting are seistor decade box (i.e., Ametek PST2000 Tester), or a appropriate resistor to Pins A and B, you can simulate the sensor by dialing in a known resistance. 2. Observe vehicle gauge reading on dash. 3. If gauge needle moves to approximately the same temperature as in the table below, the problem is a defective oil temperature sensor. Se table below. 40 100,856 -22 52,594 -4 28,582 14 16,120 32 9,399 50 6,658 68 3,3511 86 2,240 104 1,465 122 990,3 140 6,70,9 158 448,7 176 333,8 194 241,8 212 178,03 230 133,08 194 241,8 213 248 100,91 248 100,91 248 100,91 248 100,91		See Chassis Node		b. If there is no continuity between Pin B and	l Pin 10. repair wiring as
details of the Chassis Atternate test method: Resistance in the oil temperature sensor (thermist signal wire changes as oil temperature increases/decreases. 1. By unplugging the oil temperature sensor harness connector and connecting a resistor decade box (i.e., Ametek PST2000 Tester), or a appropriate resistor to Pins A and B, you can simulate the sensor by dialing in a known resistance. 2. Observe vehicle gauge reading on dash. 3. If gauge needle movers to approximately the same temperature as in the table below. Yerng °F Resistance Ohms 40 100,856 -22 52,594 -40 100,856 -22 52,594 -40 100,856 -22 52,594 -44 28,592 14 16,120 32 9,399 50 5,658 68 3,511 68 2,240 104 1,465 122 980,3 14 16,120 158 468,71 168 2,240 104 1,465 122 980,3 140 16,86,71 158 468,71		Pinout for terminal		necessary. Go to Step 5-2.	, 1
Node electrical connections. International control control control control control control signal wire charges as oil temperature increases/decreases. 1. By unplugging the oil temperature sensor harness connector and connecting a resistor decade box (i.e., Ametek PST2000 Tester), or a appropriate resistor to Pins A and B, you can simulate the sensor by dialing in a known resistance. 2. Observe vehicle gauge reading on dash. 3. If gauge needle moves to approximately the same temperature as in the table below, the problem is a defective oil temperature sensor. Se table below. 40 100,856 -22 52,594 -4 28,582 14 16,120 32 9,399 50 5,658 68 3,511 86 2,240 104 14,65 122 980,3 130 140 670,9 140 104 670,9 141 1,465 122 143 1,465 144 144 1,465 122 158 468,7 176 158 468,7 176 158 468,7 133,08 159 133,08 133,08 <		details of the Chassis		Alternate test method: Resistance in the oil temper	rature sensor (thermistor)
connections. Image: Connections of the outside conduction. 1. By unplugging the oil temperature sensor harness connector and connecting a resistor decade box (i.e., Ametek PST2000 Tester), or a appropriate resistor to Pins A and B, you can simulate the sensor by dialing in a known resistance. 2. Observe vehicle gauge reading on dash. 3. If gauge needle moves to approximately the same temperature sensor. Se table below. 40 100,856 -22 52,594 -4 28,682 14 16,120 32 9,399 50 5,658 68 3,511 86 2,240 104 1,465 122 980,3 140 104,455 122 980,3 141 1,465 122 980,3 134 144 140 1465 122 980,3 140 1465 122 980,3 140 1465 122 980,3 140 670,9 158 468,7 168 32,82		Node electrical		signal wire changes as oil temperature increases/de	creases
 I. by unpudging the emission matrices contraction and connecting a resistor decade box (i.e., Ametek PST2000 Tester), or a appropriate resistor to Pins A and B, you can simulate the sensor by dialing in a known resistance. I. Doserve vehicle gauge reading on dash. If gauge needle moves to approximately the same temperature as in the table below, the problem is a defective oil temperature sensor. Se table below. Temp °F Resistance Ohms 40 100,856 -22 52,594 -44 28,582 14 16,120 32 9,399 50 5,658 68 3,511 86 2,240 104 14,665 122 980,3 140 670,9 158 468,7 176 333.8 194 241.8 194 241.8 194 241.8 194 241.8 194 241.8 100,91 266 77,54 		connections.		1 By upplugging the oil temporature sensor harn	oss connector and
Image: Control of the second state				connecting a resistor decade box (i.e. Ametek	PST2000 Tester) or an
Image: Second				appropriate resistor to Pins A and B, you can s	imulate the sensor by
Temp % Resistance Ohms 2. Observe vehicle gauge reading on dash. 3. If gauge needle moves to approximately the same temperature as in the table below, the problem is a defective oil temperature sensor. See table below. 40 100.856 -22 52.594 -4 28.582 14 16,120 32 9.399 50 5.658 68 3.511 86 2.240 104 1,465 122 980.3 140 670.9 158 468.7 176 333.8 194 241.8 212 178.03 230 133.08 248 100.91				dialing in a known resistance	
Image: Construct and the state of the state is a second				2 Observe vehicle gauge reading on dash	
Image is a serie index of approximately the same temperature as in the table below, the problem is a defective oil temperature sensor. Se table below. Temp °F Resistance Ohms -40 100,856 -22 52,594 -4 28,582 14 16,120 32 9,399 50 5,658 68 3,511 86 2,240 104 1,465 105 5,658 114 16,120 32 9,399 50 5,658 122 980,3 104 1,465 122 980,3 140 670,9 158 468,7 176 333.8 194 241.8 212 178,03 230 133.08 248 100.91 266 77.54				2. Observe venice gauge reading on dash.	
Temp °F Resistance Ohms -40 100,856 -22 52,594 -4 28,582 14 16,120 32 9,399 50 5,658 68 3,511 86 2,240 104 1,465 102 980,3 104 1,465 114 16,120 105 104 104 1,465 104 1,465 104 1,465 104 1,465 104 1,465 104 1,465 104 1,465 104 1,465 104 1,465 105 468,7 104 1,465 105 468,7 104 241,8 104 241,8 104 241,8 104 241,8 104 241,8 104 2448				 If gauge needle moves to approximately the satisfies a defective oil to 	me temperature as in
Temp °F Resistance Ohms -40 100,856 -22 52,594 -4 28,582 14 16,120 32 9,399 50 5,658 68 3,511 86 2,240 104 1,465 122 980.3 140 670.9 158 468.7 176 333.8 194 241.8 212 178.03 230 133.08 248 100.91				table below.	imperature sensor. See
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$				Temp °F	Resistance Ohms
-22 52,594 -4 28,582 14 16,120 32 9,399 50 5,658 68 3,511 86 2,240 104 1,465 122 980.3 122 980.3 140 670.9 158 468.7 176 333.8 194 241.8 194 241.8 194 241.8 194 241.8 194 241.8 194 244.8 100.91 13.08 248 100.91				-40	100,856
-4 28,582 14 16,120 32 9,399 50 5,658 68 3,511 86 2,240 104 1,465 122 980.3 140 670.9 158 468.7 176 333.8 194 241.8 212 178.03 230 133.08 248 100.91 266 77.54				-22	52,594
14 16,120 32 9,399 50 5,658 68 3,511 86 2,240 104 1,465 122 980.3 140 670.9 158 468.7 176 333.8 194 241.8 212 178.03 230 133.08 248 100.91 266 77.54				-4	28,582
32 9,399 50 5,658 68 3,511 86 2,240 104 1,465 122 980.3 140 670.9 158 468.7 176 333.8 194 241.8 212 178.03 230 133.08 248 100.91 266 77.54				14	16,120
1 1				32	9 399
68 3,511 68 2,240 104 1,465 122 980.3 140 670.9 158 468.7 176 333.8 194 241.8 212 178.03 230 133.08 248 100.91 266 77.54				50	5 658
86 2,240 104 1,465 122 980.3 140 670.9 158 468.7 176 333.8 194 241.8 212 178.03 230 133.08 248 100.91 266 77.54				68	3 511
104 1,465 122 980.3 140 670.9 158 468.7 176 333.8 194 241.8 212 178.03 230 133.08 248 100.91 266 77.54				86	2 240
104 1,465 122 980.3 140 670.9 158 468.7 176 333.8 194 241.8 212 178.03 230 133.08 248 100.91 266 77.54				104	1 /65
122 980.3 140 670.9 158 468.7 176 333.8 194 241.8 212 178.03 230 133.08 248 100.91 266 77.54				104	1,405
140 670.9 158 468.7 176 333.8 194 241.8 212 178.03 230 133.08 248 100.91 266 77.54				122	980.3
158 468.7 176 333.8 194 241.8 212 178.03 230 133.08 248 100.91 266 77.54				140	670.9
176 333.8 194 241.8 212 178.03 230 133.08 248 100.91 266 77.54				158	468.7
194 241.8 212 178.03 230 133.08 248 100.91 266 77.54				176	333.8
212 178.03 230 133.08 248 100.91 266 77.54				194	241.8
230 133.08 248 100.91 266 77.54				212	178.03
248 100.91 266 77.54				230	133.08
266 77.54				248	100.91
				266	77.54

Step	Check	Result	Next Step	
			284	60.32
			302	47.46
			320	37.75
			338	30.32
			356	24.58
			274	24.56
			374	20.11
6	Select "Diagnose" to	DTC 7703 - Open in axle 2 oil temp	392 1 Using a jumper wire, jump across sensor harnes	10.58 s connector Pins A and B
Ū	view rear drive axle	circuit is displayed as "Active "		
	temperature gauge			
	DTCs.			
	Unplug oil temperature			
	harness connector at			
	sensor.			
	See Chassis Node			
	Pinout for terminal			
	details of the Chassis		2	
	Node electrical			
	connections.		1. Pin B	
			2. Pin A	
			a. If an "Active" DTC 7704 - Short in axle 2	temp circuit is now
			displayed, you have confirmed there is no	t an open in the sensor
			signal wire to the Chassis Node. The origi	nal fault (DTC 7703) was
			logged because there is an open in the oil	temperature sensor itself,
			not the wiring. Replace sensor. Go to Ste	p 2.
			b. If DTC 7704 is not displayed, there is an o	open circuit in the signal
			wire between sensor connector Pin B and	Pin 10 of the Chassis
			Node connector C. Repair wiring as neces	sary. Go to Step 2.
			Alternate test method: Check for continuity betwee	en sensor connector Pin B
			(sensor signal) and Pin 10 of the Chassis Node con	nector C.
			1. If there is no continuity, repair wiring as necess	ary. After repairs, DTC
			7703 should now be displayed as "Inactive."	
			2. If there is continuity between sensor connector	Pin B and Pin 10 of the
			Chassis Node connector C, the open circuit is i	n the sensor itself, not in
			the wiring. Replace sensor.	· · · · · ·
7	Select "Diagnose" to	DIC //04 - Short in axle 2 oil temp	IT the fault is still "Active" after unplugging the senso	r connector, you have
		circuit is displayed as "Active."	10 of the Chassis Node connector C	sensor signar) and Pin
			1. Chock for a pipehod or shoffed with between P	in P (concercional) and
	Next unnlug the oil		Pin 10 of the Chassis Node connector C. Dans	in b (sensor signal) and
	temperature harness		Go to Step 2	in winning as necessary.
	connector at sensor	DTC 7704 - Short in axle 2 oil	If DTC 7704 changes to "Inactive" after unplugging t	he sensor connector vou
	See Chassis Node	temp circuit is now displayed as	have confirmed the problem is a short in the sensor	itself, not the wiring.
	Pinout for terminal	"Inactive."	1. Replace sensor. Go to Step 2	
	details of the Chassis			
	Node electrical			
	connections.			

Center/Steer Axle Oil Temperature Gauge Inoperative

DTC7803 and DTC7804

Symptom: Center/Steer axle oil temperature gauge inoperative. All other gauges are operational.

The Center/Steer Axle Oil Temperature Gauge uses a thermistor sensor to measure axle oil temperature.



Step	Check	Result	Next Step
1	Turn ignition key ON.		Go to Step 2.
	Start ESA, then select		
	"Connect" to establish		
	communication to the		
	vehicle.		
2	Select "Monitor." From	Gauge graphic on screen displays	Go to Step 3.
	the "Components"	reasonable reading.	
	window, select	Gauge graphic on screen does not	Go to Step 4.
	"Center/Steer Axle	display reasonable reading.	
	Oil Temperature," then		
	select "Open."		
3	Select "Simulate". Drag	Vehicle gauge does not move. Go	Perform the following checks:
	the "Value" bar until the	to Step 3-1.	
	pointer on the gauge	Vehicle gauge reading is in the	L NOTE
	image is approximately	same range as the ESA gauge	Use the "Program" feature in ESA to make sure that
	mid-scale. Observe	image. Go to Step 3-7.	the parameter for the inoperative gauge is enabled.
	vehicle gauge		An inoperative gauge may simply have its CECU
	movement.		parameter set to disabled.
			1. Check CVSG data link wiring: Observe Gauge position in the wiring
			daisy chain.
			a. If gauge is mounted between two other functioning gauges CVSG
			data link wiring is OK. Go to Step 3-5 .
			b. If gauge is last gauge in daisy chain or followed by other
			non-functional gauges, go to Step 3-2.
			2. Check continuity between Pin 1 on gauge harness connector and Pin 14
			of the 52 Pin CECU connector C.
			3. Check continuity between Pin 3 on gauge harness connector and Pin 15
			of the 52 Pin CECU connector C.
			4. Repair daisy chain jumper harness as necessary.
			5. Once continuity on both wires exists, perform "Simulate" test again.
			a. If gauge functions properly during "Simulate" test, repair is complete.
			Return truck to service.
			b. If gauge does not function during "Simulate" test, install a known
			good gauge and perform "Simulate" test again.
			i. If gauge functions properly test is complete. Install new gauge
			II. If gauge does not function during "Simulate" test, install lest
			CECU and perform "Simulate" test again.
			(1) If gauge functions properly test is complete. Install new
			CECU permanentily. Re-test and return truck to service.
			(2) It gauge does not function property during "Simulate" test,
			replace gauge.
			6. Once gauge is replaced.
			a. Verify gauge functionality.
			b. Return truck to service.
			7. Is this a recheck after Step 5, Step 6 or Step 7?
			a. Yes. Return truck to service.

4 Select "Diagnose" to view center/steer axle temperature gauge diagnostic trouble codes. DTC 7803 displayed - Open in axle 3 oil temp circuit. Indicates the problem could be an open in the wiring from the Chassis Node the sensor or a defective sensor. Go to Step 5, and if necessary, Step 6. 5 Unplug oil temperature displayed (Sensor Ground) - There should be continuity between the sensor 1. Check for continuity between sensor connector Pin A and firewall groun stud	Step	Check	Result	Next Step	
Step 4. 4 Select "Diagnose" to view center/steer axle temperature gauge diagnostic trouble codes. DTC 7803 displayed - Open in axle 3 oil temp circuit. Indicates the problem could be an open in the wiring from the Chassis Node the sensor or a defective sensor. Go to Step 5, and if necessary, Step 6. 5 Unplug oil temperature barness connector at (Sensor Ground) - There should be continuity between the sensor 1. Check for continuity between sensor connector Pin A and firewall groun stud				b. No, Gauge and CVSG data link wiring is r	not the problem. Go to
4 Select "Diagnose" to view center/steer axle temperature gauge diagnostic trouble codes. DTC 7803 displayed - Open in axle 3 oil temp circuit. Indicates the problem could be an open in the wiring from the Chassis Node the sensor or a defective sensor. Go to Step 5, and if necessary, Step 6. 5 Unplug oil temperature barness connector at (Sensor Ground) - There should be continuity between the sensor 1. Check for continuity between sensor connector Pin A and firewall groun stud				Step 4.	
view center/steer axle axle 3 oil temp circuit. the sensor or a defective sensor. Go to Step 5, and if necessary, Step 6. temperature gauge DTC 7804 displayed - Short in Indicates the problem could be a short to ground in the wiring from the Chas diagnostic trouble axle 3 oil temp circuit. Node to the sensor or a defective sensor. Go to Step 5, and if necessary, Step 6. codes. DTC 7804 displayed - Short in Indicates the problem could be a short to ground in the wiring from the Chas Step 7. Step 7. 5 Unplug oil temperature (Sensor Ground) - There should 1. barness connector at be continuity between the sensor stud	4	Select "Diagnose" to	DTC 7803 displayed - Open in	Indicates the problem could be an open in the wiring	from the Chassis Node to
temperature gauge diagnostic trouble codes. DTC 7804 displayed - Short in axle 3 oil temp circuit. Indicates the problem could be a short to ground in the wiring from the Chas Node to the sensor or a defective sensor. Go to Step 5, and if necessary, Step 7. 5 Unplug oil temperature barness connector at (Sensor Ground) - There should be continuity between the sensor 1. Check for continuity between sensor connector Pin A and firewall groun stud		view center/steer axle	axle 3 oil temp circuit.	the sensor or a defective sensor. Go to Step 5, and	if necessary, Step 6.
diagnostic trouble codes. axle 3 oil temp circuit. Node to the sensor or a defective sensor. Go to Step 5, and if necessary, Step 7. 5 Unplug oil temperature barness connector at (Sensor Ground) - There should be continuity between the sensor 1. Check for continuity between sensor connector Pin A and firewall groun stud		temperature gauge	DTC 7804 displayed - Short in	Indicates the problem could be a short to ground in the	he wiring from the Chassis
codes. Step 7. 5 Unplug oil temperature (Sensor Ground) - There should barness connector Pin A and firewall groun barness connector at be continuity between the sensor stude 1.		diagnostic trouble	axle 3 oil temp circuit.	Node to the sensor or a defective sensor. Go to Ste	p 5 , and if necessary,
5 Unplug oil temperature (Sensor Ground) - There should 1. Check for continuity between sensor connector Pin A and firewall grou-	<u> </u>	codes.		Step 7.	
L Inamess connector at the continuity between the sensor the stud	5	Unplug oil temperature	(Sensor Ground) - There should	1. Check for continuity between sensor connector	Pin A and firewall ground
		harness connector at	be continuity between the sensor	stud.	
sensor. Connector ground wire (Pin A) and a. If there is continuity between Pin A and the ground terminal, test i		sensor.	connector ground wire (Pin A) and	a. If there is continuity between Pin A and the	e ground terminal, test is
Using a digital a cab ground terminal. complete. Go to Step 5-2.		Using a digital	a cab ground terminal.	complete. Go to Step 5-2.	
b. If there is no continuity between Pin A and the ground terminal,		multimeter, check	(Signal) - There should be	b. If there is no continuity between Pin A and	d the ground terminal,
repair wiring as necessary. Go to Step 5-1.		and signal wire at	connector signal wire (Pin B)	repair wiring as necessary. Go to Step 5-	1.
2. Check for continuity between sensor connector Pin B and Pin 16 of the Chassis Node		sensor connector	and Pin 16 of the Chassis Node	2. Check for continuity between sensor connector	Pin B and Pin 16 of the
Pin A – Ground Connector C		Pin A – Ground	connector C	Chassis Node connector C.	
a. If there is continuity between Pin B and Pin 16, test is complete.		Pin B - Signal		a. If there is continuity between Pin B and Pi	in 16, test is complete.
Go to Step 6.		See Chassis Node		Go to Step 6.	
b. If there is no continuity between Pin B and Pin 16, repair wiring as		Pinout for terminal		b. If there is no continuity between Pin B and	Pin 16, repair wiring as
details of the Chassis		details of the Chassis		necessary. Go to Step 5-2.	
Alternate test method: Resistance in the oil temperature sensor (thermistor		Node electrical		Alternate test method: Resistance in the oil tempe	rature sensor (thermistor)
connections. signal wire changes as oil temperature increases/decreases.		connections.		signal wire changes as oil temperature increases/de	creases.
1. By unplugging the oil temperature sensor harness connector and				1. By unplugging the oil temperature sensor harn	ess connector and
connecting a resistor decade box (i.e., Ametek PST2000 Tester), or an				connecting a resistor decade box (i.e., Ametek	PST2000 Tester), or an
appropriate resistor to Pins A and B, you can simulate the sensor by				appropriate resistor to Pins A and B, you can s	imulate the sensor by
dialing in a known resistance.				dialing in a known resistance.	
2. Observe vehicle gauge reading on dash.				2. Observe vehicle gauge reading on dash.	
3. If gauge needle moves to approximately the same temperature as in				3. If gauge needle moves to approximately the sa	me temperature as in
the table below, the problem is a defective oil temperature sensor. See				the table below, the problem is a defective oil te	emperature sensor. See
table below.				table below.	
Temp °F Resistance Ohms				Temp °F	Resistance Ohms
-40 100,656				-40	100,656
-22 52,594				-22	52,594
				-4	28,582
14 16,120				14	16,120
32 9,399				32	9,399
50 5,658				50	5,658
68 3,511				68	3,511
86 2,240				86	2,240
104 1,465				104	1,465
122 980.3				122	980.3
140 670.9				140	670.9
158 468.7				158	468.7
176 333.8				176	333.8
194 241.8				194	241.8
212 178.03				212	178.03
230 133.08				230	133.08
248 100.91				248	100.91
266 77.54				266	77.54

Step	Check	Result	Next Step		
			284	60.32	
			302	47.46	
			320	37.75	
			338	30.32	
			356	24.58	
			374	20.11	
			302	16 58	
6	Select "Diagnose" to	DTC 7803 - Open in axle 3 oil temp	 Using a jumper wire, jump across sensor harnes 	ss connector Pins A and B.	
	view center/steer axle	circuit is displayed as "Active."			
	temperature gauge		1 - Ester		
	DTCs.				
	Unplug oil temperature				
	harness connector at				
	sensor.				
	See Chassis Node				
	Pinout for terminal				
	details of the Chassis		2		
	Node electrical				
	connections.		1. Pin B		
			2. Pin A		
			a. If an "Active" DTC 7804 - Short in axle 3	temp circuit is now	
			displayed, you have confirmed there is not an open in the sensor		
			signal wire to the Chassis Node. The original fault (DTC 7803) was		
			logged because there is an open in the oil temperature sensor itself,		
			not the wiring. Replace sensor. Go to Step 2.		
			b. If DTC 7804 is not displayed, there is an open circuit in the signal		
			wire between sensor connector Pin B and Pin 16 of the Chassis		
			Node connector C. Repair wiring as necessary. Go to Step 2 .		
			Alternate test method: Check for continuity between sensor connector Pin B		
			(sensor signal) and Pin 16 of the Chassis Node connector C.		
			1. If there is no continuity, repair wiring as necessary. After repairs, DTC		
			7803 should now be displayed as "Inactive."		
			2. If there is continuity between sensor connector Pin 16 of the Chassis		
			Node connector C, the open circuit is in the sen	sor itself, not in the wiring.	
7	Select "Diagnose" to	DTC 7804 - Short in axle 3 oil temp	Replace sensor.	r connector you have	
	view center/steer axle	circuit is displayed as "Active "	confirmed there is a short to around between Pin R	(sensor signal) and Pin	
	temperature gauge		16 of the Chassis Node connector C.		
	DTCs.		1. Check for a pinched or chaffed wire between P	in B (sensor signal) and	
	Next, unplug the oil		Pin 16 of the Chassis Node connector C. Repa	ir wiring as necessary.	
	temperature harness		Go to Step 2.	<u> </u>	
	connector at sensor.	DTC 7804 - Short in axle 3 oil	If DTC 77804 changes to "Inactive" after unplugging	the sensor connector, you	
	See Chassis Node	temp circuit is now displayed as	have confirmed the problem is a short in the sensor	itself, not the wiring.	
	Pinout for terminal	"Inactive."	1. Replace sensor. Go to Step 2.		
	details of the Chassis				
	Node electrical				
	connections.				

DTC17703 and DTC17704

Symptom: Transmission oil temperature gauge inoperative. All other gauges are operational.

The Transmission Oil Temperature Gauge uses a thermistor sensor to measure transmission oil temperature.



Step	Check	Result	Next Step
1	Turn ignition key ON.		Go to Step 2.
	Start ESA, then select		
	"Connect" to establish		
	communication to the		
	vehicle.		
2	Select "Monitor." From	Gauge graphic on screen displays	Go to Step 3.
	the "Components"	reasonable reading.	
	window, select	Gauge graphic on screen does not	Go to Step 4.
	"Transmission Oil	display reasonable reading.	
	Temperature," then		
	select "Open."		
3	Select "Simulate". Drag	Vehicle gauge does not move. Go	Perform the following checks:
	the "Value" bar until the	to Step 3-1.	
	pointer on the gauge	Vehicle gauge reading is in the	LI NOTE
	image is approximately	same range as the ESA gauge	Use the "Program" feature in ESA to make sure that
	mid-scale Observe	image Go to Step 3-7	the parameter for the inoperative gauge is enabled
	vehicle gauge		An inoperative gauge may simply have its CECU
	movement		parameter set to disabled
	movement.		
			1. Check CVSG data link wiring: Observe Gauge position in the wiring
			daisy chain.
			a. If gauge is mounted between two other functioning gauges CVSG
			data link wiring is OK. Go to Step 3-5 .
			b. If gauge is last gauge in daisy chain or followed by other
			non-functional gauges, go to Step 3-2.
			2 Check continuity between Pin 1 on gauge barness connector and Pin 14
			of the 52 Pin CECU connector C.
			3. Check continuity between Pin 3 on gauge harness connector and Pin 15
			of the 52 Pin CECU connector C.
			4. Repair daisy chain jumper harness as necessary.
			5. Once continuity on both wires exists, perform "Simulate" test again.
			a. If gauge functions properly during "Simulate" test, repair is complete.
			Return truck to service.
			b. If gauge does not function during "Simulate" test, install a known
			good gauge and perform "Simulate" test again.
			i If gauge functions properly test is complete. Install new gauge
			permanently. Re-test and return truck to service.
			ii. If gauge does not function during "Simulate" test, install Test
			CECU and perform "Simulate" test again.
			(1) If gauge functions properly test is complete. Install new
			CECU permanently. Re-test and return truck to service.
			(2) If gauge does not function properly during "Simulate" test.
			replace gauge.
			6. Once gauge is replaced.
			a Verify gauge functionality
			b Paturn truck to service
			7. IS THIS A RECHECK ATTER STEP 5, STEP 6 OF STEP 7?
			a. Yes. Return truck to service.

Step	Check	Result	Next Step	
			 b. No, Gauge and CVSG data link wiring is not the problem. Go to Step 4 	
4	Select "Diagnose" to	DTC 17703 displayed – Open in	Indicates the problem could be an open in the wiring	from the CECU to the
	view main transmission	transmission oil temp circuit.	sensor or a defective sensor. Go to Step 5, and if ne	ecessary, Step 6.
	oil temperature gauge	DTC 17704 displayed – Short in	Indicates the problem could be a short to ground in t	he wiring from the CECU
	diagnostic trouble	transmission oil temp circuit.	to the sensor or a defective sensor. Go to Step 5, ar	nd if necessary, Step 7.
	codes.			
5	Unplug oil temperature	(Sensor Ground) - There should	1. Check for continuity between sensor connector	Pin A and firewall ground
	harness connector at	be continuity between the sensor	stud.	
	sensor.	connector ground wire (Pin A) and	a. If there is continuity between Pin A and the	e ground terminal, test is
	Using a digital	a cab ground terminal.	complete. Go to Step 5-2.	0
	multimeter, check	(Signal) - There should be	b If there is no continuity between Pin A and	d the around terminal
	continuity on ground	continuity between the sensor	renair wiring as necessary. Go to Step 5-	1
	and signal wire at	connector signal wire (Pin B)	2 Check for continuity between concer connector	Din B and Din 21 of the
	sensor connector.	and Pin 21 of the 52 Pin CECU	52 Pin CECI I connector C	
	Pin A – Ground	connector C.		
	Pin B - Signal		a. If there is continuity between Pin B and Pi	n 21, test is complete.
	See CECU Pinout		Go to Step 6.	
	for terminal details of		b. If there is no continuity between Pin B and	I Pin 21 at CECU, repair
	the CECU electrical		wiring as necessary. Go to Step 5-2.	
	connections.		Alternate test method: Resistance in the oil temper	rature sensor (thermistor)
			signal wire changes as oil temperature increases/de	creases.
			1. By unplugging the oil temperature sensor harn	ess connector and
			connecting a resistor decade box (i.e., Ametek	PST2000 Tester), or an
			appropriate resistor to Pins A and B, you can s	imulate the sensor by
			dialing in a known resistance.	
			2. Observe vehicle gauge reading on dash.	
			3. If gauge needle moves to approximately the sa	ime temperature as in
			the table below, the problem is a defective oil te	emperature sensor. See
			table below.	1
			Temp °F	Resistance Ohms
			-40	100,856
			-22	52,594
			-4	28,582
			14	16,120
			32	9,399
			50	5,658
			68	3,511
			86	2,240
			104	1,465
			122	980.3
			140	670.9
			158	468.7
			176	333.8
			194	241.8
			212	178 03
			230	133.08
			248	100.91
			266	77 54
			200	11.04

Step	Check	Result	Next Step	
			284	60.32
			302	47.46
			320	37.75
			338	30.32
			356	24 58
			374	20.11
			392	16 58
6	Select "Diagnose" to	DTC 17703 - Open in transmission	1. Using a jumper wire, jump across sensor harnes	s connector Pins A and B.
-	view transmission	oil temp circuit is displayed as	1	
	temperature gauge	"Active."		
	DTCs.			
	Unplug oil temperature			
	harness connector at			
	sensor.			
	See CECU Pinout			
	for terminal details of			
	the CECU electrical		2	
	connections.			
			1. Pin B	
			2. Pin A	
			a. If an "Active" DTC 17704 - Short in transm	ission temp circuit is now
			displayed you have confirmed there is not an open in the sensor	
			signal wire to the CECU. The original fault (DTC 17703) was logged	
			because there is an open in the oil temperature sensor itself, not	
			the wiring. Go to Step 2 .	
			b. If DTC 17704 is not displayed, there is an open circuit in the signal	
			wire between sensor connector Pin B and Pin 21 of the 52 Pin	
			CECU connector C. Repair wiring as necessary. Go to Step 2.	
			Alternate test method: Check for continuity between sensor connector Pin B	
			(sensor signal) and Pin 21 of the 52 Pin CECU connector C.	
			1. If there is no continuity, repair wiring as necessary. After repairs. DTC	
			17703 should now be displayed as "Inactive."	
			2. If there is continuity between sensor connector	Pin B and Pin 21 of the
			52 Pin CECU connector C, the open circuit is ir	n the sensor itself, not in
	Soloot "Diagnoss" to	DTC 17704 Short in transmission	the wiring. Replace sensor.	r connector very have
'	view transmission	oil temp circuit is displayed as	confirmed there is a short to ground between Dia P	(sensor signal) and Din
	temperature gauge	"Active "	21 of the 52 Pin CECIJ connector C	oonsor signar and Fill
	DTCs		1 Check for a pipehod or shoffed wire between D	in D (concercional) and
	Next unplug the oil		Check for a pinched or chaffed wire between P	in b (sensor signal) and
	temperature harness		Go to Stop 2	winny as necessary.
	connector at sensor	DTC 17704 - Short in transmission	If DTC 17704 changes to "Inactive" after unplugging	the sensor connector you
	See CECU Pinout	oil temp circuit is now displayed	have confirmed the problem is a short in the sensor	itself, not the wirina.
	for terminal details of	as "Inactive."	1 Replace sensor Go to Step 2	, .
	the CECU electrical			
	connections.			
Auxiliary Transmission Oil Temperature Gauge Inoperative

DTC44203 and DTC44204

Symptom: Auxiliary transmission oil temperature gauge inoperative. All other gauges are operational.

The Auxiliary Transmission Oil Temperature Gauge uses a thermistor sensor to measure transmission oil temperature. The following procedures have been developed to assist the technician in diagnosing multiplexed instrumentation problems using the Electronic Service Analyst (ESA) hardware/software diagnostic tool. It is assumed the service technician performing instrumentation repairs is knowledgeable about how to use ESA.



Step	Check	Result	Next Step
1	Turn ignition key ON.		Go to Step 2.
	Start ESA, then select		
	"Connect" to establish		
	communication to the		
	vehicle.		
2	Select "Monitor." From	Gauge graphic on screen displays	Go to Step 3.
	the "Components"	reasonable reading.	
	window, select "Auxiliary	Gauge graphic on screen does not	Go to Step 4.
	Transmission Oil	display reasonable reading.	
	Temperature," then		
	select "Open."		
3	Select "Simulate". Drag	Vehicle gauge does not move. Go	Perform the following checks:
	the "Value" bar until the	to Step 3-1.	
	pointer on the gauge	Vehicle gauge reading is in the	<u>NOIE</u>
	image is approximately	same range as the ESA gauge	Use the "Program" feature in ESA to make sure that
	mid-scale. Observe	image. Go to Step 3-7.	the parameter for the inoperative gauge is enabled.
	vehicle gauge		An inoperative gauge may simply have its CECU
	movement.		parameter set to disabled.
			1 Check CVSC data link wiring: Observe Cauge position in the wiring
			daisy chain
			the second is recursted between two other functioning recurses (1/00)
			a. If gauge is mounted between two other functioning gauges CVSG
			b. If gauge is last gauge in daisy chain or followed by other
			non-functional gauges, go to Step 3-2.
			2. Check continuity between Pin 1 on gauge harness connector and Pin 14
			of the 52 Pin CECU connector C.
			3. Check continuity between Pin 3 on gauge harness connector and Pin 15
			of the 52 Pin CECU connector C.
			4. Repair daisy chain jumper harness as necessary.
			5. Once continuity on both wires exists, perform "Simulate" test again.
			a. If gauge functions properly during "Simulate" test, repair is complete.
			Return truck to service.
			b. If gauge does not function during "Simulate" test, install a known
			good gauge and perform "Simulate" test again.
			 If gauge functions properly test is complete. Install new gauge permanently. Re-test and return truck to service.
			ii. If gauge does not function during "Simulate" test, install Test
			(1) If gauge functions properly test is complete Install new
			CECU permanently. Re-test and return truck to service
			(2) If gauge does not function properly during "Simulate" test
			replace gauge
			6 Onco gaugo is roplaced
			U. Once yauge is replaced.
			a. verity gauge functionality.
			D. Return truck to service.
			7. Is this a recheck after Step 5, Step 6 or Step 7?
			a. Yes. Return truck to service.

Step	Check	Result	Next Step
			 No, Gauge and CVSG data link wiring is not the problem. Go to Step 4.
4	Select "Diagnose"	DTC 44203 displayed - Open in	Indicates the problem could be an open in the wiring from the Chassis Node to
	to view auxiliary	aux transmission temp circuit.	the sensor or a defective sensor. Go to Step 5, and if necessary, Step 6.
	transmission oil	DTC 44204 displayed - Short in	Indicates the problem could be a short to ground in the wiring from the Chassis
	temperature gauge	aux transmission temp circuit.	Node to the sensor or a defective sensor. Go to Step 5, and if necessary,
	diagnostic trouble		Step 7.
5	Unplug oil temperature	(Sensor Ground)	1. Check for continuity
	harness connector at	- There should	between sensor
	sensor.	be continuity	connector Pin A and
	Using a digital	between	firewall ground stud.
	multimeter, check	the sensor	a If there is
	continuity on ground	connector	continuity
	and signal wire at	ground wire (Pin	between Pin A
	sensor connector.	A) and a cab	and the ground
	Pin A – Ground	ground terminal.	terminal, test is
	Pin B - Signal	(Signal) -	complete. Go
	See Chassis Node	There should	to Step 5-2.
	Pinout for terminal	be continuity	b If there is
	details of the Chassis	between	no continuity
	Node electrical	the sensor	between Pin A
	connections.	connector signal	and the ground
		wire (Pin B) and	terminal, repair
		Pin 6 of the	wiring as
		Chassis Node	necessary. Go
		connector B.	to Step 5-1.
			2. Check for continuity
			between sensor
			connector Pin B and
			Pin 6 of the Chassis
			Node connector B.
			a. If there is
			continuity
			between Pin B
			and Pin 6, test
			is complete.
			Go to Step 6.
			b. If there is
			no continuity
			between Pin
			B and Pin 6,
			repair wiring as
			necessary. Go
			to Step 5-2.
			Alternate test method:
			Resistance in the
			oil temperature
			sensor (thermistor)
	I	I I	

Step	Check	Result	Next Step	
			signal wire changes	
			as oil temperature	
			increases/decreases.	
			1. By unplugging the	
			oil temperature	
			sensor harness	
			connector and	
			connecting a	
			resistor decade	
			box (i.e., Ametek	
			PST2000 Tester),	
			or an appropriate	
			resistor to Pins A	
			and B, you can	
			simulate the sensor	
			by dialing in a known	
			resistance.	
			2. Observe vehicle	
			gauge reading on	
			dash.	
			3. If gauge needle	
			moves to	
			approximately the	
			same temperature	
			as in the table	
			below, the problem	
			is a defective oil	
			temperature sensor.	
			See table below.	
				100.856
			-22	52 594
			1	28 582
			14	16 120
			20	0 200
			52	J,JJJ 5 650
			50	0,000
			00	0.040
			00	2,240
			104	1,400
			122	980.3
			140	670.9
			158	468.7
			176	333.8
			194	241.8
			212	178.03
			230	133.08
			248	100.91
			266	77.54
			284	60.32

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Step	Check	Result	Next Step	
			302	47.46
			320	37.75
			338	30.32
			356	24.58
			374	20 11
			392	16.58
6	Select "Diagnose"	DTC 44203 - Open in aux	 Using a jumper wire, jump across sensor harnes 	ss connector Pins A and B.
	to view auxiliary	transmission temp circuit is		
	transmission	displayed as "Active."	1 - Esta	
	temperature gauge			
	DTCs.			
	Unplug oil temperature			
	harness connector at			
	sensor.			
	See Chassis Node			
	Pinout for terminal		2	
	details of the Chassis			
	Node electrical		1. Pin B	
	connections.		2. Pin A	
			a. If an "Active" DTC 44204 - Short in transm	ission temp circuit is now
			displayed, you have confirmed there is no	t an open in the sensor
			signal wire to the Chassis Node. The orig	inal fault (DTC 44203)
			was logged because there is an open in the	ne oil temperature sensor
			itself, not the wiring. Go to Step 2.	
			b. If DTC 44204 is not displayed, there is an	open circuit in the signal
			wire between sensor connector Pin B and	Pin 6 of the Chassis Node
			connector B. Repair wiring as necessary.	Go to Step 2.
			Alternate test method: Check for continuity betwee	en sensor connector Pin B
			(sensor signal) and Pin 6 of the Chassis Node conne	ector B.
			 If there is no continuity, repair wiring as necess 44203 should now be displayed as "Inactive." 	ary. After repairs, DTC
			2 If there is continuity between sensor connector	Pin B and Pin 6 of the
			Chassis Node connector R the open circuit is in	n the sensor itself not in
			the wiring. Replace sensor	
7	Select "Diagnose"	DTC 44204 - Short in aux	If the fault is still "Active" after unplugging the senso	r connector, you have
	to view auxiliary	transmission temp circuit is	confirmed there is a short to ground between Pin B	(sensor signal) and Pin
	transmission	displayed as "Active."	6 of the Chassis Node connector B.	
	temperature gauge		1. Check for a pinched or chaffed wire between P	in B (sensor signal) and
	DTCs.		Pin 6 of the Chassis Node connector B. Repair	wiring as necessary. Go
	Next, unplug the oil		to Step 2.	
	temperature harness	DTC 44204 - Short in aux	If DTC 44204 changes to "Inactive" after unplugging	the sensor connector, you
	connector at sensor.	transmission temp circuit is now	have confirmed the problem is a short in the sensor	itself, not the wiring.
	See Chassis Node	displayed as "Inactive."	1. Replace sensor. Go to Step 2.	
	Pinout for terminal			
	details of the Chassis			
	Node electrical			
	connections.			

Transfer Case Oil Temperature Gauge Inoperative

DTC138803 and DTC138804

Symptom: Transfer case oil temperature gauge inoperative. All other gauges are operational.

The Transfer Case Oil Temperature Gauge uses a thermistor sensor to measure the oil temperature.

The following procedures have been developed to assist the technician in diagnosing multiplexed instrumentation problems using the Electronic Service Analyst (ESA) hardware/software diagnostic tool. It is assumed the service technician performing instrumentation repairs is knowledgeable about how to use ESA.



Step	Check	Result	Next Step
1	Turn ignition key ON.		Go to Step 2.
	Start ESA, then select		
	"Connect" to establish		
	communication to the		
	vehicle.		
2	Select "Monitor." From	Gauge graphic on screen displays	Go to Step 3.
	the "Components"	reasonable reading.	
	window, select "Transfer	Gauge graphic on screen does not	Go to Step 4.
	Case Oil Temperature,"	display reasonable reading.	
	then select "Open."		
3	Select "Simulate". Drag	Vehicle gauge does not move. Go	Perform the following checks:
	the "Value" bar until the	to Step 3-1.	
	pointer on the gauge	Vehicle gauge reading is in the	
	image is approximately	same range as the ESA gauge	Use the "Program" feature in ESA to make sure that
	mid-scale. Observe	image. Go to Step 3-7.	the parameter for the inoperative gauge is enabled.
	vehicle gauge		An inoperative gauge may simply have its CECU
	movement.		parameter set to disabled.
			1. Check CVSG data link wiring: Observe Gauge position in the wiring
			daisy chain.
			a If gauge is mounted between two other functioning gauges CVSG
			data link wiring is OK. Go to Step 3-5
			h. If gauge is last gauge in drive chain or followed by other
			b. In gauge is last gauge in taily chain or followed by other
			Check continuity between Dir 4 on source between connector and Dir 44
			2. Check continuity between Pin 1 on gauge namess connector and Pin 14
			3. Check continuity between Pin 3 on gauge namess connector and Pin 15
			Repair daisy chain jumper harness as necessary.
			5 Once continuity on both wires exists perform "Simulate" test again
			b. Choc containing on boar whee exists, perform "Cimulate" test again.
			Return truck to service.
			b. If gauge does not function during "Simulate" test, install a known
			good gauge and perform "Simulate" test again.
			i. If gauge functions properly test is complete. Install new gauge
			permanently. Re-test and return truck to service.
			ii. If gauge does not function during "Simulate" test, install Test
			CECU and perform "Simulate" test again.
			(1) If gauge functions properly test is complete. Install new
			CECU permanently. Re-test and return truck to service.
			(2) If gauge does not function properly during "Simulate" test,
			replace gauge.
			6. Once gauge is replaced.
			a. Verify gauge functionality.
			b. Return truck to service.
			7. Is this a recheck after Step 5, Step 6 or Step 7?
			a. Yes. Return truck to service.
			b. No, Gauge and CVSG data link wiring is not the problem. Go to
			Step 4.

Step	Check	Result			Next Step	
4	Select "Diagnose" to	DTC 138803 displayed - Open in	Ind	icate	s the problem could be an open in the wiring	from the Chassis Node to
	view transfer case oil	transfer case oil temp circuit.	the	sen	sor or a defective sensor. Go to Step 5, and	if necessary, Step 6.
	temperature gauge	DTC 138804 displayed - Short in	Ind	icate	is the problem could be a short to ground in the	he wiring from the Chassis
	diagnostic trouble	transfer case oil temp circuit.	No	de to	the sensor or a defective sensor. Go to Ste	p 5 , and if necessary,
	codes.		Ste	p 7.		
5	Unplug oil temperature	(Sensor Ground) - There should	1.	Ch	eck for continuity between sensor connector	Pin A and firewall ground
	namess connector at	connector ground wire (Pin A) and		SIL		
	Lising a digital	a cab ground terminal		а.	If there is continuity between Pin A and th	e ground terminal, test is
		(Signal) - There should be			complete. Go to Step 5-2.	
	continuity on around	continuity between the sensor		b.	If there is no continuity between Pin A and	d the ground terminal,
	and signal wire at	connector signal wire (Pin B)			repair wiring as necessary. Go to Step 5-	1.
	sensor connector.	and Pin 4 of the Chassis Node	2.	Ch	eck for continuity between sensor connector	^r Pin B and Pin 4 of the
	Pin A – Ground	connector C.		Ch	lassis Node connector C.	
	Pin B - Signal			а.	If there is continuity between Pin B and P	in 4, test is complete .
	See Chassis Node				Go to Step 6.	
	Pinout for terminal			b.	If there is no continuity between Pin B and	l Pin 4 at Chassis Node,
	details of the Chassis				repair wiring as necessary. Go to Step 5-	2.
	Node electrical		Alt	erna	te test method: Resistance in the oil tempe	rature sensor (thermistor)
	connections.		sigi	nal w	vire changes as oil temperature increases/de	creases.
			1.	By	unplugging the oil temperature sensor harn	ess connector and
				co	nnecting a resistor decade box (i.e., Ametek	PST2000 Tester), or an
				ap	propriate resistor to Pins A and B, you can s	simulate the sensor by
				uia Ol		
			2.	Oc.	serve venicle gauge reading on dash.	
			3.	lf g	gauge needle moves to approximately the sa	ame temperature as in
				tok	a table below, the problem is a defective oil to	emperature sensor. See
				tar	Temp °F	Resistance Ohms
					-40	100,856
					-22	52,594
					-4	28,582
					14	16,120
					32	9,399
					50	5,658
					68	3,511
					86	2,240
					104	1,465
					122	980.3
					140	670.9
					158	468.7
					176	333.8
					194	241.8
					212	178.03
					230	133.08
					248	100.91
					266	77.54
					284	60.32
					302	47.46

Step	Check	Result	Next Step	
			320	37.75
			338	30.32
			356	24.58
			374	20.11
			392	16.58
6	Select "Diagnose" to	DTC 138803 - Open in transfer	1. Using a jumper wire, jump across sensor harnes	ss connector Pins A and B.
	view transfer case	case oil temp circuit is displayed	1.	
	temperature gauge	as "Active."		
	DTCs.			
	Unplug oil temperature			
	harness connector at			
	sensor.			
	See Chassis Node			
	Pinout for terminal			
	Nede electrical		2	
	connections.			
			2. Pin A	
				e
			a. If an "Active" DTC 138804 - Short in trans	rer case oil temp circuit
			sensor signal wire to the Chassis Node	The original fault (DTC
			138803) was logged because there is an o	open in the oil temperature
			sensor itself not the wiring Go to Step 2	
			b If DTC 138804 is not displayed there is an	open circuit in the signal
			wire between sensor connector Pin B and	Pin 4 of the Chassis Node
			connector C. Repair wiring as necessary.	Go to Step 2.
			Alternate test method: Check for continuity betwee	en sensor connector Pin B
			(sensor signal) and Pin 4 of the Chassis Node conne	ector C.
			1. If there is no continuity, repair wiring as necess	ary. After repairs, DTC
			130003 Should now be displayed as "inactive."	Din D and Dir 4 - fith-
			Chassis Node connector C, the open circuit is if	
			the wiring. Replace sensor	
7	Select "Diagnose" to	DTC 138804 - Short in transfer	A . If the fault is still "Active" after unplugging the ser	nsor connector, you have
	view transfer case oil	case oil temp circuit is displayed	confirmed there is a short to ground between Pin B	(sensor signal) and Pin
	temperature gauge	as "Active."	4 of the Chassis Node connector C.	
	DTCs.		1. Check for a pinched or chaffed wire between P	in B (sensor signal) and
	Next, unplug the oil		Pin 4 of the Chassis Node connector C. Repair	wiring as necessary.
	temperature harness		Go to Step 2.	
	connector at sensor.	DTC 138804 - Short in transfer	If DTC 138804 changes to "Inactive" after unpluggin	g the sensor connector,
	See Chassis Node	case oil temp circuit is now	you have confirmed the problem is a short in the sen	sor itself, not the wiring.
	Pinout for terminal	displayed as "Inactive."	1. Replace sensor. Go to Step 2 .	
	details of the Chassis			
	Node electrical			
1	connections.	1		

PTO Oil Temperature Gauge Inoperative

DTC9003 and DTC9004

Symptom: PTO oil temperature gauge inoperative. All other gauges are operational.

The PTO Oil Temperature Gauge uses a thermistor sensor to measure the oil temperature.



Step	Check	Result	Next Step		
1	Turn ignition key ON.		Go to	Step 2.	
	Start ESA, then select				
	"Connect" to establish				
	communication to the				
	vehicle.				
2	Select "Monitor." From	Gauge graphic on screen displays	Go to	Step 3.	
	the "Components"	reasonable reading.			
	window, select "PTO	Gauge graphic on screen does not	Go to	Step 4.	
	Oil Temperature," then	display reasonable reading.			
	select "Open."				
3	Select "Simulate". Drag	Vehicle gauge does not move. Go	Perform	m the following checks:	
	the "Value" bar until the	to Step 3-1.		NOTE	
	pointer on the gauge	Vehicle gauge reading is in the		NOTE	
	image is approximately	same range as the ESA gauge	Use	e the "Program" feature in ESA to make sure that	
	mid-scale. Observe	image. Go to Step 3-7.	the	parameter for the inoperative gauge is enabled.	
	vehicle gauge		An	inoperative gauge may simply have its CECU	
	movement.		para	ameter set to disabled.	
			1 0	theck CVSG data link wiring: Observe Gauge position in the wiring	
			1. O	aisy chain	
			u.	If source is resurred between two other functioning source $O(20)$	
			a	data lielawiden is OK Os to Otan 2	
				data link wiring is OK. Go to Step 3-5.	
			b.	. If gauge is last gauge in daisy chain or followed by other	
				non-functional gauges, go to Step 3-2.	
			2. C	Check continuity between Pin 1 on gauge harness connector and Pin 14	
			o	f the 52 Pin CECU connector C.	
			3. C	Check continuity between Pin 3 on gauge harness connector and Pin 15	
			of	f the 52 Pin CECU connector C.	
			4. R	Repair daisy chain jumper harness as necessary.	
			5. O	Once continuity on both wires exists, perform "Simulate" test again.	
			a	If gauge functions properly during "Simulate" test, repair is complete.	
				Return truck to service.	
			b	. If gauge does not function during "Simulate" test, install a known	
				good gauge and perform "Simulate" test again.	
				i. If gauge functions properly test is complete. Install new gauge	
				permanently. Re-test and return truck to service.	
				ii If dauge does not function during "Simulate" test install Test	
				CECU and perform "Simulate" test again	
				(1) If gauge functions properly test is complete Install new	
				CECU permanently Re-test and return truck to service.	
				(2) If gauge does not function properly during "Simulate" test	
				replace gauge.	
			6 0	Dince dauge is replaced	
			- -	Verify gauge functionality	
			, a	Determ track to complete	
			D.	Return truck to service.	
			7. Is	s this a recheck after Step 5, Step 6 or Step 7?	
			a	. Yes. Return truck to service.	
			b	. No, Gauge and CVSG data link wiring is not the problem. Go to	
				Step 4.	

Step	Check	Result	Next Step	
4	Select "Diagnose"	DTC 9003 displayed - Open in	Indicates the problem could be an open in the wiring	from the Chassis Node to
	to view PTO oil	PTO oil temp circuit.	the sensor or a defective sensor. Go to Step 5, and	if necessary, Step 6.
	temperature gauge	DTC 9004 displayed - Short in	Indicates the problem could be a short to ground in the	ne wiring from the Chassis
	diagnostic trouble	PTO oil temp circuit.	Node to the sensor or a defective sensor. Go to Ste	p 5 , and if necessary,
	codes.		Step 7.	
5	Unplug oil temperature	(Sensor Ground) - There should	1. Check for continuity between sensor connector	Pin A and firewall ground
	harness connector at	be continuity between the sensor	stud.	
	sensor.	connector ground wire (Pin A) and	a. If there is continuity between Pin A and the	e ground terminal, test is
	Using a digital	a cab ground terminal.	complete. Go to Step 5-2.	
	continuity on ground	(Signal) - There should be	b. If there is no continuity between Pin A and	d the ground terminal,
	and signal wire at	connector signal wire (Pin B) and	repair wiring as necessary. Go to Step 5 -	1.
	sensor connector	Pin 7 of Chassis Node connector	2. Check for continuity between sensor connector	Pin B and Pin 7 of
	Pin A – Ground	C	Chassis Node connector C.	
	Pin B - Signal		a. If there is continuity between Pin B and P	in 7, test is complete .
	See Chassis Node		Go to Step 6.	
	Pinout for terminal		b. If there is no continuity between Pin B and	l Pin 7, repair wiring as
	details of the Chassis		necessary. Go to Step 5-2.	
	Node electrical		Alternate test method: Resistance in the oil tempe	rature sensor (thermistor)
	connections.		signal wire changes as oil temperature increases/de	creases.
			1. By unplugging the oil temperature sensor harn	ess connector and
			connecting a resistor decade box (i.e., Ametek	PST2000 Tester), or an
			appropriate resistor to Pins A and B, you can s	imulate the sensor by
			dialing in a known resistance.	
			2. Observe vehicle gauge reading on dash.	
			3. If gauge needle moves to approximately the sa	me temperature as in
			the table below, the problem is a defective oil te	emperature sensor. See
			table below.	
			Iemp °F	100.856
			-22	52 594
			-4	28 582
			14	16 120
			30	0,120
			50	5,555
			68	3,511
			86	2 240
			104	2,240
			109	020 2
			140	670.0
			140	160 7
			176	400.7
			104	000.0 0/1 Q
			134	241.0
			212	170.03
			230	133.08
			248	100.91
			266	(1.54
			284	60.32
			302	47.46

Step	Check	Result	Next Step	
			320	37.75
			338	30.32
			356	24.58
			374	20.11
			392	16.58
6	Select "Diagnose" to	DTC 9003 - Open in PTO oil temp	1. Using a jumper wire, jump across sensor harnes	s connector Pins A and B.
	view PTO temperature	circuit is displayed as "Active."	1	
	gauge DTCs.		The second secon	
	Unplug oil temperature			
	harness connector at			
	sensor.			
	See Chassis Node			
	Pinout for terminal			
	details of the Chassis			
			2	
	connections.		1 Pin B	
			2 Pin A	
			2. 1 11 7	
			a If an "Active" DTC 9004 - Short in PTO oi	l temp circuit is now
			displayed you have confirmed there is no	t an open in the sensor
			signal wire to the Chassis Node. The origi	nal fault (DTC 9003) was
			logged because there is an open in the oil	temperature sensor itself,
			not the wiring. Go to Step 2.	
			b. If DTC 9004 is not displayed, there is an o	open circuit in the signal
			wire between sensor connector Pin B and	Pin 7 of Chassis Node
			connector C. Repair wiring as necessary.	Go to Step 2.
			Alternate test method: Check for continuity betwee	en sensor connector Pin B
			(sensor signal) and Pin 7 of Chassis Node connecto	r C.
			1. If there is no continuity, repair wiring as necess	ary. After repairs, DTC
			9003 should now be displayed as "Inactive."	
			2. If there is continuity between sensor connector	Pin B and Pin 7 of
			the wiring Deplace connector C, the open circuit is i	n the sensor itself, not in
7	Select "Diagnose"	DTC 9004 - Short in PTO oil temp	A. If the fault is still "Active" after unplucating the ser	nsor connector, you have
	to view PTO oil	circuit is displayed as "Active."	confirmed there is a short to ground between Pin B ((sensor signal) and Pin 7
	temperature gauge		of Chassis Node connector C.	
	DTCs.		1. Check for a pinched or chaffed wire between P	in B (sensor signal) and
	Next, unplug the oil		Pin 7 of Chassis Node connector C. Repair wir	ing as necessary. Go to
	temperature harness		Step 2	-
	connector at sensor.	DTC 9004 - Short in PTO oil	If DTC 9004 changes to "Inactive" after unplugging t	he sensor connector, you
	See Chassis Node	temp circuit is now displayed as	have confirmed the problem is a short in the sensor	itself, not the wiring.
	Pinout for terminal	"Inactive."	1. Replace sensor. Go to Step 2.	
	details of the Chassis			
	Node electrical			
	connections.			

Brake Saver Oil Temperature Gauge Inoperative

DTC138703 and DTC138704

Symptom: Brake saver oil temperature gauge inoperative. All other gauges are operational.

The Brake Saver Oil Temperature Gauge uses a thermistor sensor to measure the engine retarder oil temperature.

The following procedures have been developed to assist the technician in diagnosing multiplexed instrumentation problems using the Electronic Service Analyst (ESA) hardware/software diagnostic tool. It is assumed the service technician performing instrumentation repairs is knowledgeable about how to use ESA.



•	2

Step	Check	Result			Next Step
1	Turn ignition key ON.		Go t	o Step	2.
	Start ESA, then select				
	"Connect" to establish				
	communication to the				
	vehicle.				
2	Select "Monitor." From	Gauge graphic on screen displays	Go t	o Step	3.
	the "Components"	reasonable reading.			
	window, select "Brake	Gauge graphic on screen does not	Go t	o Step	4.
	Saver Oil Temperature,"	display reasonable reading.			
	then select "Open."				
3	Select "Simulate". Drag	Vehicle gauge does not move. Go	Perf	orm the	e following checks:
	the "Value" bar until the	to Step 3-1.	1.	Check	CVSG data link wiring: Observe Gauge position in the wiring
	pointer on the gauge	Vehicle gauge reading is in the		daisy	chain.
	image is approximately	same range as the ESA gauge		a. If	gauge is mounted between two other functioning gauges CVSG
	mid-scale. Observe	image. Go to Step 3-7.		d	ata link wiring is OK. Go to Step 3-5 .
	venicie gauge			b. If	gauge is last gauge in daisy chain or followed by other
	movement.			n	on-functional gauges, go to Step 3-2.
			2.	Check	continuity between Pin 1 on gauge harness connector and Pin
				14 of t	he 52 Pin ICUconnector C.
			3.	Check	continuity between Pin 3 on gauge harness connector and Pin
				15 of t	he 52 Pin ICUconnector C.
			4.	Repair	daisy chain jumper harness as necessary.
			5.	Once	continuity on both wires exists, perform "Simulate" test again.
				a lf	aguae functions properly during "Simulate" test repair is complete
				R	Return truck to service.
				b lf	gauge does not function during "Simulate" test install a known
				g. I	ood gauge and perform "Simulate" test again.
				i.	If gauge functions properly test is complete. Install new gauge permanently. Re-test and return truck to service.
				ii	If gauge does not function during "Simulate" test, install Test
					(1) If gauge functions properly test is complete Install new ICLL
					nermanently. Re-test and return truck to service
					(2) If gauge does not function properly during "Simulate" test.
					replace gauge.
			6	Once	gauge is replaced
			0.	a \/	
				a. V	
			_	U. H	
			7.	is this	a recneck after Step 5, Step 6 or Step 7?
				a. Y	es. Return truck to service.
				b. N	lo, Gauge and CVSG data link wiring is not the problem. Go to
				S	tep 4.
4	Select "Diagnose" to	DTC 138703 displayed - Open in	Indic	cates th	e problem could be an open in the wiring from the CECU to the
	view brake saver oil	brake saver oil temp circuit.	sens	sor or a	detective sensor. Go to Step 5, and if necessary, Step 6.
	temperature gauge	broke sever eil temp sireuit		cates th	e problem could be a short to ground in the wiring from the CECU
	diagnostic trouble	Diake saver oli temp circuit.	เง เท	e sensi	or or a delective sensor. Go to Step 5, and it necessary, Step 7.
	codes.				

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Step	Check	Result	Next Step	
5	Unplug oil temperature	(Sensor Ground) - There should	1. Check for continuity between sensor connect	or Pin A and firewall ground
	harness connector at	be continuity between the sensor	stud.	
	sensor.	connector ground wire (Pin A) and	a. If there is continuity between Pin A and	he ground terminal, test is
	Using a digital	a cab ground terminal.	complete. Go to Step 5-2.	
	multimeter, check	(Signal) - There should be	b. If there is no continuity between Pin A a	nd the ground terminal,
	continuity on ground	continuity between the sensor	repair wiring as necessary. Go to Step	5-1.
	and signal wire at	and Pin 24 of the 52 Pin CECU	2. Check for continuity between sensor connect	or Pin B and Pin 24 of the
	Pin A = Ground	connector C	52 Pin CECU connector C.	
	Pin B - Signal		a. If there is continuity between Pin B and	Pin 24, test is complete.
	See CECU Pinout		Go to Step 6.	
	for terminal details of		b. If there is no continuity between Pin B a	nd Pin 24 at CECU, repair
	the CECU electrical		wiring as necessary. Go to Step 5-2.	
	connections.		Alternate test method: Resistance in the oil temp	erature sensor (thermistor)
			signal wire changes as oil temperature increases/	ecreases.
			 By unplugging the oil temperature sensor has a sensor has	ness connector and
			connecting a resistor decade box (i.e., Amete	simulate the sensor by
			dialing in a known resistance	Simulate the Sensor by
			2 Observe vehicle gauge reading on dash	
			3 If gauge needle moves to approximately the	same temperature as in
			the table below, the problem is a defective oi	temperature sensor. See
			table below.	
			Temp °F	Resistance Ohms
			-40	100,856
			-22	52,594
			-4	28,582
			14	16,120
			32	9,399
			50	5,658
			68	3,511
			86	2,240
			104	1,465
			122	980.3
			140	670.9
			158	468.7
			176	333.8
			194	241.8
			212	178.03
			230	133.08
			248	100.91
			200	(7.54
			284	00.32
			302	47.40
			320	30.22
			356	24.59
			374	24.00
			302	20.11
I	l	Ι	392	10.00

Step	Check	Result	Next Step
6	Select "Diagnose" to	DTC 138703 - Open in brake	1. Using a jumper wire, jump across sensor harness connector Pins A and B.
	view brake saver oil	saver oil temp circuit is displayed	1
	temperature gauge	as "Active."	1 - V
	DTCs.		
	Unplug oil temperature		
	harness connector at		
	sensor.		
	See CECU Pinout		
	for terminal details of		
	the CECU electrical		2
	connections.		
			1. Pin B
			2. Pin A
			a. If an "Active" DTC 138704 - Short in brake saver oil temp circuit
			is now displayed, you have confirmed there is not an open in the
			sensor signal wire to the ICU. The original fault (DTC 138703) was
			logged because there is an open in the oil temperature sensor itself,
			not the wiring. Go to Step 2 .
			b. If DTC 138704 is not displayed, there is an open circuit in the signal
			wire between sensor connector Pin B and Pin 24 of the 52 Pin ICU
			connector C. Repair wiring as necessary. Go to Step 2.
			Alternate test method: Check for continuity between sensor connector Pin B
			(sensor signal) and Pin 24 of the 52 Pin ICU connector C.
			1. If there is no continuity, repair wiring as necessary. After repairs, DTC
			138703 should now be displayed as "Inactive."
			2. If there is continuity between sensor connector Pin B and Pin 24 of the
			52 Pin CECU connector C, the open circuit is in the sensor itself, not in
_			the wiring. Replace sensor.
7	Select "Diagnose" to	DTC 138704 - Short in brake	If the fault is still "Active" after unplugging the sensor connector, you have
	view brake saver oil	saver oil temp circuit is displayed	confirmed there is a short to ground between Pin B (sensor signal) and Pin 24
		as Active.	or the 52 Pin ICU connector C.
	DICS.		1. Check for a pinched or chaffed wire between Pin B (sensor signal) and
	topporature borpoor		Pin 24 of the 52 Pin ICU connector C. Repair wiring as necessary. Go to
		DTC 138701 - Short in brake saver	Step 2.
		oil temp circuit is now displayed	you have confirmed the problem is a short in the sensor itself not the wiring
	for terminal details of	as "Inactive."	1 Donlace senser. Go to Stop 2
	the CECU electrical		1. Replace sensor. Ou to step 2.
	connections		

General Oil Temperature Gauge Inoperative

DTC44103 and DTC44104

Symptom: General oil temperature gauge inoperative. All other gauges are operational.

The General Oil Temperature Gauge uses a thermistor sensor to measure the oil temperature for some optional components.



Step	Check	Result		Next Step
1	Turn ignition key ON.		Go to	Step 2.
	Start ESA, then select			
	"Connect" to establish			
	communication to the			
	vehicle.			
2	Select "Monitor." From	Gauge graphic on screen displays	Go to	Step 3.
	the "Components"	reasonable reading.		
	window, select "General	Gauge graphic on screen does not	Go to	Step 4.
	Oil Temperature," then	display reasonable reading.		
	select "Open."			
3	Select "Simulate". Drag	Vehicle gauge does not move. Go	Perfor	rm the following checks:
	the "Value" bar until the	to Step 3-1.		
	pointer on the gauge	Vehicle gauge reading is in the		NOTE
	image is approximately	same range as the ESA gauge	Use	e the "Program" feature in ESA to make sure that
	mid-scale. Observe	image. Go to Step 3-7.	the	parameter for the inoperative gauge is enabled.
	vehicle gauge		An	inoperative gauge may simply have its CECU
	movement.		par	ameter set to disabled.
			1. C	Check CVSG data link wiring: Observe Gauge position in the wiring
			C	daisy chain.
			a	a. If gauge is mounted between two other functioning gauges CVSG
				data link wiring is OK. go to Step 3-5 .
			t	b. If gauge is last gauge in daisy chain or followed by other
				non-functional gauges, go to Step 3-2.
			2. (Check continuity between Pin 1 on gauge harness connector and Pin 14
			c	of the 52 Pin CECU connector C.
			3. (Check continuity between Pin 3 on gauge harness connector and Pin 15
			c	of the 52 Pin CECU connector C.
			4. F	Repair daisy chain jumper harness as necessary.
			5 (Once continuity on both wires exists, perform "Simulate" test again
			0.	If gauge functions properly during "Cimulate" test repeir is complete
			6	a. In gauge functions property during Simulate test, repair is complete.
			t	b. If gauge does not function during "Simulate" test, install a known
				good gauge and perform "Simulate" test again.
				i. If gauge functions properly test is complete. Install new gauge
				permanently. Re-test and return truck to service.
				ii. If gauge does not function during "Simulate" test, install Test
				CECU and perform "Simulate" test again.
				(1) If gauge functions properly test is complete. Install new
				CECU permanently. Re-test and return truck to service.
				(2) If gauge does not function properly during "Simulate" test,
				replace gauge.
			6. 0	Once gauge is replaced.
			a	a. Verify gauge functionality.
				Return truck to service
			, .	a this a rashaak after Sten 5. Oton 6 or Sten 70
			7. 1	IS THIS A FECHECK ATTER STEP 5, STEP 6 OF STEP 7?
			a	a. Yes. Return truck to service.
			t	b. No, Gauge and CVSG data link wiring is not the problem. Go to
				Step 4.

Step	Check	Result			Next Step	
4	Select "Diagnose"	DTC 44103 displayed - Open in	Ind	icate	s the problem could be an open in the wiring	from the Chassis Node to
	to view general oil	general oil temp circuit.	the	sens	sor or a defective sensor. Go to Step 5, and	if necessary, Step 6.
	temperature gauge	DTC 44104 displayed - Short in	Ind	icate	s the problem could be a short to ground in the	he wiring from the Chassis
	diagnostic trouble	general oil temp circuit.	No	de to	the sensor or a defective sensor. Go to Ste	p 5 , and if necessary,
	codes.		Ste	p 7.		
5	Unplug oil temperature	(Sensor Ground) - There should	1.	Ch	eck for continuity between sensor connector	Pin A and firewall ground
		connector ground wire (Pin A) and		siu	u.	
	Lising a digital	a cab ground terminal		a.	If there is continuity between Pin A and th	e ground terminal, test is
	multimeter check	(Signal) - There should be			complete. Go to Step 5-2.	
	continuity on around	continuity between the sensor		b.	If there is no continuity between Pin A and	d the ground terminal,
	and signal wire at	connector signal wire (Pin B)		~	repair wining as necessary. Go to Step 5-	
	sensor connector.	and Pin 9 of the Chassis Node	2.	Ch	eck for continuity between sensor connector	Pin B and Pin 9 of the
	Pin A – Ground	connector B.		Cn		
	Pin B - Signal			а.	If there is continuity between Pin B and Pi	n 9, test is complete. Go
	See Chassis Node					
	Pinout for terminal			D.	If there is no continuity between Pin B and	Pin 9 at Chassis Node,
	details of the Chassis				repair wining as necessary. Go to Step 5-	Z .
	Node electrical		Alt	erna	te test method: Resistance in the oil tempe	rature sensor (thermistor)
	connections.		sigi	nai w	ire changes as on temperature increases/de	creases.
			1.	Ву	unplugging the oil temperature sensor harn	ess connector and
				201	propriate resistor to Pins A and R, you can s	PST2000 Tester), or an
				dia	ling in a known resistance	simulate the sensor by
			2	Oh	serve vehicle gauge reading on dash	
			3	lfo	auge needle moves to approximately the sa	ame temperature as in
			J .	the	table below the problem is a defective oil to	emperature sensor. See
				tab	le below.	
					Temp °F	Resistance Ohms
					-40	100,856
					-22	52,594
					-4	28,582
					14	16,120
					32	9,399
					50	5,658
					68	3,511
					86	2,240
					104	1,465
					122	980.3
					140	670.9
					158	468.7
					176	333.8
					194	241.8
					212	178.03
					230	133.08
					248	100.91
					266	77.54
					284	60.32
					302	47.46

Step	Check	Result	Next Step	
			320	37.75
			338	30.32
			356	24.58
			374	20.11
			392	16.58
	to view general oil temperature gauge DTCs. Unplug oil temperature harness connector at sensor.	oil temp circuit is displayed as "Active."		
	See Chassis Node Pinout for terminal details of the Chassis Node electrical connections.		2 1. Pin B 2. Pin A	
			 a. If an "Active" DTC 44104 - Short in general displayed, you have confirmed there is no signal wire to the Chassis Node. The orig was logged because there is an open in the itself, not the wiring. Go to Step 2. b. If DTC 44104 is not displayed, there is an wire between sensor connector Pin B and connector B. Repair wiring as necessary. Alternate test method: Check for continuity betweet (sensor signal) and Pin 9 of the Chassis Node connector I. If there is no continuity, repair wiring as necessary 44103 should now be displayed as "Inactive." 2. If there is continuity between sensor connector B, the open circuit is in the wiring. Replace sensor. 	al oil temp circuit is now t an open in the sensor inal fault (DTC 44103) ne oil temperature sensor open circuit in the signal Pin 9 of the Chassis Node Go to Step 2 . en sensor connector Pin B sector B. ary. After repairs, DTC Pin B and Pin 9 of the n the sensor itself, not in
7	Select "Diagnose" to view general oil temperature gauge DTCs. Next, unplug the oil temperature harness connector at sensor. See Chassis Node Pinout for terminal details of the Chassis Node electrical connections	DTC 44104 - Short in general oil temp circuit is displayed as "Active." DTC 44104 - Short in general oil temp circuit is now displayed as "Inactive."	 If the fault is still "Active" after unplugging the senso confirmed there is a short to ground between Pin B 9 of the Chassis Node connector B. 1. Check for a pinched or chaffed wire between P Pin 9 of the Chassis Node connector B. Repair to Step 2. If DTC 44104 changes to "Inactive" after unplugging have confirmed the problem is a short in the sensor 1. Replace sensor. Go to Step 2. 	r connector, you have (sensor signal) and Pin in B (sensor signal) and wiring as necessary. Go the sensor connector, you itself, not the wiring.

Primary Fuel Gauge Inoperative

DTC82903 and DTC82904

Symptom: Primary fuel gauge inoperative. All other gauges are operational.

The Primary Fuel Level Gauge uses a variable resistor sensor to measure the fuel level in the tank.



Step	Check	Result		Next Step
1	Turn ignition key ON.		Go to	Step 2.
	Start ESA, then select			
	"Connect" to establish			
	communication to the			
	vehicle.			
2	Select "Monitor." From	Gauge graphic on screen displays	Go to	o Step 3.
	the "Components"	reasonable reading.	Cata	Stop 4
	window, select "Primary	display reasonable reading	G0 10	5 Step 4.
	Fuel Gauge," then select	display reasonable reading.		
3	Open. Select "Simulate" Drag	Vehicle dauge does not move. Go	Perfo	rm the following checke:
5	the "Value" bar until the	to Sten 3-1		
	pointer on the gauge	Vehicle gauge reading is in the	i	NOTE
	image is approximately	same range as the FSA gauge	Use	e the "Program" feature in ESA to make sure that
	mid-scale. Observe	image. Go to Step 3-7.	the	parameter for the inoperative gauge is enabled.
	vehicle gauge		An	inoperative gauge may simply have its CECU
	movement.		par	ameter set to disabled.
			1. (Check CVSG data link wiring: Observe Gauge position in the wiring
			(daisy chain.
			á	a. If gauge is mounted between two other functioning gauges CVSG
				data link wiring is OK. go to Step 3-5.
			ł	b. If gauge is last gauge in daisy chain or followed by other
				non-functional gauges, go to Step 3-2.
			2. (Check continuity between Pin 1 on gauge harness connector and Pin 14
			0	of the 52 Pin CECU connector C.
			3. (Check continuity between Pin 3 on gauge harness connector and Pin 15
			4	of the 52 Pin CECU connector C. Repair daisy chain jumper harness as necessary
			5 (Once continuity on both wires exists, perform "Simulate" test again
			5. 0	once continuity on both wires exists, perform Simulate itest again.
			ć	a. If gauge functions properly during "Simulate fest, repair is complete. Return truck to service.
			ł	b. If gauge does not function during "Simulate" test, install a known
				good gauge and perform "Simulate" test again.
				 If gauge functions properly test is complete. Install new gauge permanently. Re-test and return truck to service.
				ii. If gauge does not function during "Simulate" test install Test
				CECU and perform "Simulate" test again.
				(1) If gauge functions properly test is complete. Install new
				CECU permanently. Re-test and return truck to service.
				(2) If gauge does not function properly during "Simulate" test,
				replace gauge.
			6. (Once gauge is replaced.
			á	a. Verify gauge functionality.
			H	b. Return truck to service.
			7. 1	Is this a recheck after Step 5. Step 6 or Step 7?
				a Yes Return truck to service
				h No Gauge and CVSG data link wiring is not the problem. Go to
				Step 4.

Step	Check	Result		Next Step
4	Select "Diagnose" to	DTC 82903 displayed - Open in	Indi	icates the problem could be an open in the wiring from the Chassis Node to
	view primary fuel	primary fuel level circuit.	the	sensor or a defective sensor. Go to Step 5, and if necessary, Step 6.
	gauge diagnostic trouble	DTC 82904 displayed - Short in	Indi	icates the problem could be a short to ground in the wiring from the Chassis
	codes.	primary fuel level circuit.	Noc	de to the sensor or a defective sensor. Go to Step 5, and if necessary,
-			Ste	эр 7.
5	Unplug fuel gauge	(Sensor Ground) - There should	1.	Check for continuity between sensor connector Pin B and firewall ground
	harness connector at	be continuity between the sensor		stud.
	sensor.	connector ground wire (Pin B) and		a. If there is continuity between Pin B and the ground terminal, test is
	Using a digital	a cab ground terminal.		complete. Go to Step 5-2.
	multimeter, check	(Signal) - There should be		b. If there is no continuity between Pin B and the ground terminal,
	continuity on ground	continuity between the sensor		repair wiring as necessary. Go to Step 5-1.
	and signal wire at	connector signal wire (Pin A)	2.	Check for continuity between sensor connector Pin A and Pin 6 of the
		connector A		Chassis Node connector A.
				a. If there is continuity between Pin A and Pin 6, test is complete. Go
	Pin B - Ground			to Step 6.
	See Chassis Node			b. If there is no continuity between Pin A and Pin 6 at Chassis Node,
	details of the Chassis			repair wiring as necessary. Go to Step 5-2.
			Alte	ernate test method: Resistance in the fuel level sensor signal wire
	connections		cha	anges as the fuel level changes.
			1.	By unplugging the fuel gauge sensor harness connector and connecting
				a resistor decade box (i.e. Ametek PST2000 Tester), or an appropriate
				resistor to Pins A and B, you can simulate the sensor by dialing in a
				known resistance.
			2.	Observe vehicle gauge reading on dash.
			3.	If gauge needle moves to approximately the same level as in the table
				below, the problem is a defective fuel level sensor. See Table below.
				Fuel Level Resistance Ohms
				Empty 240
				1/4 Full 154
				1/2 Full 103
				3/4 Full 65
	0 + ("0' - ")			Full 33
6	Select "Diagnose" to	DIC 82903 - Open in primary	1.	Using a jumper wire, jump across sensor namess connector Pins A and B.
		"Active "		a. If an "Active" DTC 82904 - Short in primary fuel level circuit is now
	DICS.	Active.		displayed, you have confirmed there is not an open in the sensor
	barness connector			signal wire to the Chassis Node. The original fault (DTC 82903)
	See Chassis Node			was logged because there is an open in the sensor itself, not the wiring. Go to Step 2
	Pinout for terminal			winnig. Go to Glep 2 .
	details of the Chassis			u. II D I C δ2904 is not displayed, there is an open circuit in the signal
	Node electrical			connector A Repair wiring as pecessary. Go to Stop 2
	connections.			
			Δltz	ernate test method: Check for continuity between sensor connector Din A
			(sei	nsor signal) and Pin 6 of the Chassis Node connector A.
			1	If there is no continuity, repair wiring as necessary. After repairs DTC
				82903 should now be displayed as "Inactive."
			I	

Step	Check	Result	Next Step
			2. If there is continuity between sensor connector Pin A and Pin 6 of the
			Chassis Node connector A, the open circuit is in the sensor itself, not in
			the wiring. Replace sensor.
7	Select "Diagnose" to	DTC 82904 - Short in primary	If the fault is still "Active" after unplugging the sensor connector, you have
	view primary fuel level	fuel level circuit is displayed as	confirmed there is a short to ground between Pin A (sensor signal) and Pin
	gauge DTCs.	"Active."	6 of the Chassis Node connector A.
	Next, unplug the		1. Check for a pinched or chaffed wire between Pin A (sensor signal) and
	fuel gauge harness		Pin 6 of the Chassis Node connector A, Repair wiring as necessary. Go
	connector at sensor.		to Step 2.
	See Chassis Node	DTC 82904 - Short in primary fuel	If DTC 82904 changes to "Inactive" after unplugging the sensor connector, you
	Pinout for terminal	level circuit is now displayed as	have confirmed the problem is a short in the sensor itself, not the wiring.
	details of the Chassis	"Inactive."	1. Replace sensor. Go to Step 2.
	Node electrical		
	connections.		

Secondary Fuel Gauge Inoperative

DTC83003 and DTC83004

Symptom: Secondary fuel gauge inoperative. All other gauges are operational.

The Secondary Fuel Level Gauge uses a variable resistor sensor to measure the fuel level in the tank.



Step	Check	Result	Next Step
1	Turn ignition key ON.		Go to Step 2.
	Start ESA, then select		
	"Connect" to establish		
	communication to the		
	vehicle.		
2	Select "Monitor." From	Gauge graphic on screen displays	Go to Step 3.
	the "Components"	reasonable reading.	
	window, select	Gauge graphic on screen does not	Go to Step 4.
	"Secondary Fuel	display reasonable reading.	
	Gauge," then select		
	"Open."		
3	Select "Simulate". Drag	Vehicle gauge does not move. Go	Perform the following checks:
	the "Value" bar until the	to Step 3-1.	
	pointer on the gauge	Vehicle gauge reading is in the	<u>I</u> NOIE
	image is approximately	same range as the ESA gauge	Use the "Program" feature in ESA to make sure that
	mid-scale. Observe	image. Go to Step 3-7.	the parameter for the inoperative gauge is enabled.
	vehicle gauge		An inoperative gauge may simply have its CECU
	movement.		parameter set to disabled.
			1 Check CVSC data link wiring: Observe Cauge position in the wiring
			daisy chain
			a. If gauge is mounted between two other functioning gauges CVSG
			data link wiring is OK. go to Step 3-5.
			b. If gauge is last gauge in daisy chain or followed by other
			non-functional gauges, go to Step 3-2 .
			2. Check continuity between Pin 1 on gauge harness connector and Pin 14
			of the 52 Pin CECU connector C.
			3. Check continuity between Pin 3 on gauge harness connector and Pin 15
			of the 52 Pin CECU connector C.
			4. Repair daisy chain jumper harness as necessary.
			5. Once continuity on both wires exists, perform "Simulate" test again.
			a. If gauge functions properly during "Simulate" test, repair is complete.
			Return truck to service.
			b. If gauge does not function during "Simulate" test, install a known
			good gauge and perform "Simulate" test again.
			 If gauge functions properly test is complete. Install new gauge permanently. Re-test and return truck to service.
			ii If gauge does not function during "Simulate" test install Test
			and perform "Simulate" test again
			(1) If gauge functions properly test is complete. Install new
			CECI permanently. Re-test and return truck to service
			(2) If gauge does not function properly during "Simulate" test
			(2) in gauge does not rendered property during Simulate test,
			o. Once gauge is replaced.
			a. verify gauge functionality.
			b. Return truck to service.
			7. Is this a recheck after Step 5, Step 6 or Step 7?
			a. Yes. Return truck to service.

Step	Check	Result	Next Step
			b. No, Gauge and CVSG data link wiring is not the problem. Go to
			Step 4.
4	Select "Diagnose" to	DTC 83003 displayed - Open in	Indicates the problem could be an open in the wiring from the Chassis Node to
	view secondary fuel	secondary fuel level circuit.	the sensor or a defective sensor. Go to Step 5, and if necessary, Step 6.
	gauge diagnostic trouble	DTC 83004 displayed - Short in	Indicates the problem could be a short to ground in the wiring from the Chassis
	codes.	secondary fuel level circuit.	Node to the sensor or a defective sensor. Go to Step 5, and if necessary,
			Step 7.
5	Unplug fuel gauge	(Sensor Ground) - There should	1. Check for continuity between sensor connector Pin B and firewall ground
	namess connector at	be continuity between the sensor	stud.
	sensor.	connector ground wire (PIII B) and	a. If there is continuity between Pin B and the ground terminal, test is
	Using a digital		complete. Go to Step 5-2.
	multimeter, check	(Signal) - There should be	b. If there is no continuity between Pin B and the ground terminal,
	and signal wire at	connector signal wire (Pin A)	repair wiring as necessary. Go to Step 5-1 .
	sensor connector	and Pin 9 of the Chassis Node	2. Check for continuity between sensor connector Pin A and Pin 9 of the
		connector A	Chassis Node connector A.
			a. If there is continuity between Pin A and Pin 9, test is complete. Go
	Fill B - Glouilu		to Step 6.
	Disput for terminal		b. If there is no continuity between Pin A and Pin 9 at Chassis Node,
	details of the Chassis		repair wiring as necessary. Go to Step 5-2.
			Alternate test method: Resistance in the fuel level sensor signal wire
	connections		changes as the fuel level changes.
	connections.		1. By unplugging the fuel gauge sensor harness connector and connecting
			a resistor decade box (i.e. Ametek PST2000 Tester), or an appropriate
			resistor to Pins A and B, you can simulate the sensor by dialing in a
			known resistance.
			2. Observe vehicle gauge reading on dash.
			3. If gauge needle moves to approximately the same level as in the table
			below, the problem is a defective fuel level sensor. See Table below.
			Fuel Level Resistance Ohms
			Empty 240
			1/4 Full 154
			1/2 Full 103
			3/4 Full 65
			Full 33
6	Select "Diagnose" to	DTC 83003 - Open in secondary	1. Using a jumper wire, jump across sensor harness connector Pins A and B.
	view secondary fuel	fuel level circuit is displayed as	a. If an "Active" DTC 83004 - Short in secondary fuel level circuit is
	gauge DTCs.	"Active."	now displayed, you have confirmed there is not an open in the
	Unplug fuel gauge		sensor signal wire to the Chassis Node. The original fault (DTC
	harness connector.		83003) was logged because there is an open in the sensor itself, not
	See Chassis Node		the wiring. Go to Step 2.
	Pinout for terminal		b. If DTC 83004 is not displayed, there is an open circuit in the signal
	details of the Chassis		wire between sensor connector Pin A and Pin 9 of the Chassis Node
			connector A. Repair wiring as necessary. Go to Step 2 .
	connections.		
			Alternate test method: Check for continuity between sensor connector Pin A
			(sensor signal) and Pin 9 of the Chassis Node connector A.

Step	Check	Result	Next Step
			 If there is no continuity, repair wiring as necessary. After repairs, DTC 83003 should now be displayed as "Inactive." If there is continuity between sensor connector Pin A and Pin 9 of the Chassis Node connector A, the open circuit is in the sensor itself, not in
			the wiring. Replace sensor.
7	Select "Diagnose" to	DTC 83004 - Short in secondary	If the fault is still "Active" after unplugging the sensor connector, you have
	view secondary fuel	fuel level circuit is displayed as	confirmed there is a short to ground between Pin A (sensor signal) and Pin
	level gauge DTCs.	"Active."	9 of the Chassis Node connector A.
	Next, unplug the		1. Check for a pinched or chaffed wire between Pin A (sensor signal) and
	fuel gauge harness		Pin 9 of the Chassis Node connector A. Repair wiring as necessary.
	connector at sensor.	DTC 83004 - Short in secondary	If DTC 83004 changes to "Inactive" after unplugging the sensor connector, you
	See Chassis Node	fuel level circuit is now displayed	have confirmed the problem is a short in the sensor itself, not the wiring.
	Pinout for terminal	as "Inactive."	1. Replace sensor. Go to Step 2.
	details of the Chassis		
	Node electrical		
	connections.		

Engine Related DTCs

DTC8409, DTC9109, DTC17102, DTC17131, DTC18409, DTC19009, DTC24709, DTC24809, DTC91709, DTC102809, DTC524502 and DTC524602

Symptom: numerous engine related components inoperative.

The CECU obtains many of its inputs from V-CAN (J1939) datalink communications. The DTCs listed

above are all generated when an Engine Control Module databused message is not received.



Step	Check	Result	Next Step
1	Turn ignition key ON.		Go to Step 2.
	Start ESA, then select		
	"Connect" to establish		
	communication to the		
	vehicle.		
2	Select "Diagnose" to	Numerous Engine Control Module	Most likely, there was or is some J1939 communication failure between the
	view any Engine Control	message DTCs are present and	Engine Control Module and CECU. Go to J1939 Lite Diagnostic Procedure.
	Module diagnostic	occurred at the same time.	
	trouble codes.	Only a single or few Engine related	If there was J1939 communication loss, more codes would have been
		DTCs are present.	recorded. Most likely these codes concern individual sensor failures or sensor
			to ECM faults. Please reference your OEM engine service information for
			specific engine electrical concerns.

Outside Air Temperature Display Inoperative

DTC17103 and DTC17104

Symptom: Outside air temperature display inoperative or inaccurate.

The Outside Air Temperature display uses a thermistor sensor in the driver's side mirror to measure the outside air temperature.

The following procedures have been developed to assist the technician in diagnosing multiplexed instrumentation problems using the Electronic Service Analyst (ESA) hardware/software diagnostic tool. It is assumed the service technician performing instrumentation repairs is knowledgeable about how to use ESA.



Step	Check	Resu	lt		Next Step
1	Turn ignition key ON.				Go to Step 2.
	Start ESA, then select				
	"Connect" to establish				
	communication to the				
	vehicle.				
2	Select "Monitor". From	Gauge graphic on ESA screen disp	lays correct rea	iding. This	Go to Step 3.
	the cluster portion of the	means the sensor to control unit is	operational.		
	"Components" window,	Gauge graphic on ESA screen disp	lays an inaccura	ate reading.	Go to Step 4.
	select "Outside Air				
	Temperature.				
	[i]	NOTE			
	Monitor				
	mode is only				
	available if				
	vehicle has a				
	CECU For an				
	ICLL an directly				
	to Step 3				
3	Select "Simulate". From	Outside air temperature does not fu	Inction during C	Replace Gauge Cluster.	
	the cluster portion of the	does not function properly.	-		
	"Components" window,	Outside air temperature display pro	ceeds through i	For CECU: Verify gauge is still not working	
	select "Cluster Test" and	as described in the Cluster Test description. This means the			properly. If not, install a test CECU and test
	observe the outside air	control unit to Gauge Cluster communication is operational.			again.
	temperature display.				For ICU: Go to Step 4
4	Select "Diagnose"	No Diagnostic trouble codes			Go to Step 5.
	to view outside air	DTC 17103 displayed. Open in out	side air tempera	ature circuit.	Go to Step 6.
	temperature diagnostic	Indicates the problem could be an o	open in the wirir	ng from the	
	trouble codes.	CECU to the sensor or a defective	sensor.		
		DTC 17104 displayed. Short in out	side air tempera	Go to Step 7.	
		Indicates the problem could be a sh	ort to ground in	the wiring from	
		the CECU to the sensor or a defect	ive sensor.		
5	Unplug outside air	(Sensor Resistance) – Determine tl	ne real tempera	ture. The	1. Measure the sensor resistance
	temperature harness	resistance of the sensor should ma	tch the table be	Iow. NOTE:	a. If sensor resistance is correct. Go to
	connector at mirror	the best way to get the real tempera	ature is to put th	ie sensor in a	Steps 5-2 and 5-3.
	harness to instrument	cup of crushed ice and water.			b. If incorrect replace sensor.
	panel harness	(Sensor Ground) - There should be	continuity betwe	een the sensor	2. Check for continuity between sensor
	connector.	connector ground wire (Pin B) and t	he firewall grou	nd stud.	connector Pin B and the ground terminal.
	Using a digital	(Signal) – There should be continu	ity between the	sensor	a. If there is continuity between Pin
	multimeter, check the	connector signal wire (Pin A) and P	in 16 of the 52	Pin CECU	B and the ground terminal, test is
	resistance of the sensor,	connector C.	_	_	complete. Go to Step 7.
	the continuity on ground	Resistance	Temp	Temp	b If there is no continuity between Pin
	and signal wire at sensor	Ohms	°C	°F	B and the ground terminal repair
	connector.	390,000	-40	-40	wiring as necessary Go to Step 5-1
	Pin A – Signal	180,000	-28.5	-20	3 Check for continuity between sensor
	Pin B – Ground	91,000	-18	0	connector Pin A and Pin 16 of the 52 Pin
	See CECU Pinout	47,000	-6.5	20	CECII connector C
	for terminal details of	27,000	4	39	e If there is continuity between D'
	the CECU electrical	15,000	16	61	a. If there is continuity between Pin
	connections.	10,000	25	77	A and Pin 16 of the 52 Pin CECU

Step	Check	Result			Next Step
		9,100	27	81	connector C, test is complete. Go
		5,600	39	102	to Step 6.
		3,900	48	118	b. If there is no continuity between
		2,400	61.5	142	Pin A and Pin 16 , repair wiring as
		1,800	69.5	157	necessary. Go to Step 5-2.
		910	91.5	197	Alternate test method: Resistance in the
					outside temperature sensor (thermistor) signal
					wire changes as the outside air temperature
					increases/decreases.
					1. By unplugging the outside air temperature
					harness connector at the mirror harness
					to instrument panel harness connector
					(i.e. Amotok PST2000 Tector) or an
					appropriate resistor to Pins A and B you
					can simulate the sensor by dialing in a
					known resistance.
					a. While performing the test, observe
					the temperature display on the dash.
					b. If the display reads approximately
					the same temperature as in the table
					on the previous page, the problem is
					a defective sensor.
6	Select "Diagnose"	DTC 17103 – Open in outside air te	emperature circu	it is displayed	1. Using a jumper wire, jump across sensor
	to view outside air	as "Active".			harness connector Pin A and B.
	lemperature DTCs.				a. If an "Active" DTC 17104 – Short in
	temperature harness				displayed, you have confirmed there
	connector at mirror				is not an open in the sensor signal
	harness to instrument				wire to the CECU. The original fault
	panel harness				(DTC 17103) was logged because
	connector.				there is an open in the sensor itself,
	See CECU Pinout				not the wiring. Replace the sensor.
	for terminal details of				Go to Step 2 .
	the CECU electrical				b. If DTC 17104 is not displayed, there
	connections.				is an open circuit in the signal wire
					between sensor connector Pin A
					and Pin 16 of the 52 Pin CECU
					connector C. Repair wiring as
					and Pin 16 of the 52 Pin CECU connector C. Repair wiring as
Step	Check	Result	Next Step		
------	-------------------------	---	---		
7	Select "Diagnose"	DTC 17104 – Short in outside air temperature circuit is displayed	If the fault is still "Active" after unplugging		
	to view outside air	as "Active".	the sensor connector, you have confirmed		
	temperature DTCs.		there is a short to ground between Pin A		
	Unplug outside air		(sensor signal) and Pin 16 of the 52 Pin CECU		
	temperature harness		connector C.		
	connector at mirror		1. Check for a pinched or chaffed wire		
	harness to instrument		between Pin A (sensor signal) and Pin 16		
	panel harness		of the 52 Pin CECU connector C. Repair		
	connector.		wiring as necessary. Go to Step 2.		
	See CECU Pinout				
	for terminal details of				
	the CECU electrical				
	connections.				
		DTC 17104 – Short in outside air temperature circuit is now	If DTC 17104 changes to "Inactive" after		
		displayed as "Inactive".	unplugging the sensor connector, you have		
			confirmed the problem is a short in the sensor		
			itself, not the wiring. Replace the sensor. Go		
			to Step 2.		

CVSG Supply Open or Shorted

DTC67805 and DTC67806

Symptom: CVSG (2" Commercial Vehicle Smart Gauges) are inoperative.

The CVSG supply is daisy chained from one gauge to another. The CECU monitors the supply

to these gauges and will issue a trouble code if the supply is either open or shorted.

The following procedures have been developed to assist the technician in diagnosing multiplexed instrumentation problems using the Electronic Service Analyst (ESA) hardware/software diagnostic tool. It is assumed the service technician performing instrumentation repairs is knowledgeable about how to use ESA.



Step	Check	Result	Next Step
1	Turn ignition key ON.		Go to Step 2.
	Start ESA, then select		
	"Connect" to establish		
	communication to the		
	vehicle.		
2	Select "Monitor." From	Gauge graphic(s) on screen	The gauges do not have an active open or short in the CVSG supply.
	the "Components"	display reasonable readings.	Intermittent causes may include a pinched wire, loose connection, bent or
	window, select some of		corroded pins on the CVSG supply circuit.
	the suspect functions.	Gauge graphic(s) on screen do	Go to Step 3.
		not display readings.	
3	Select "Diagnose" to	DTC 67805 displayed –CECU	Go to Step 4.
	view "Active" diagnostic	sees an open load on the CVSG	
	trouble codes.	power supply circuit.	
		DTC 67806 displayed – CECU has	Go to Step 5.
		a short to ground on the CVSG	
		power supply circuit.	
4	Test for CVSG voltage	No voltage at Pin 1 of the 9 Pin	Replace CECU and retest.
	supply at Pin 1 of the 9	CECU connector A.	
	Pin CECU connector A.	Voltage at Pin 1 of the 9 Pin CECU	Go to Step 5.
		connector A.	
5	Disconnect the 4 Pin	No continuity.	Repair and replace circuits as necessary.
	CVSG daisy chain	Continuity exists.	Reconnect the CVSG daisy chain. Make sure the connection is properly
	connector. Check		seated and there are no bent or misaligned pins. If the gauges remain
	continuity between Pin		inoperative, the First CVSG in the daisy chain is faulty. Replace as necessary.
	1 of the 9 Pin CECU		
	connector A and pin 4 of		
	the CVSG daisy chain		
	connector.		

Dash Dimmer Input Open or Shorted, Dash Dimmer Output Shorted

DTC148703, DTC148704, DTC149106 and DTC149206

Symptom: dash dimmer inoperative.

The Dash Dimmer input signal comes from the driver controlled dimmer rheostat. The CECU

reads the resistance of the signal to determine the dimming request and varies the voltage output to control the illumination brightness.

The following procedures have been developed to assist the technician in diagnosing multiplexed instrumentation problems using the Electronic Service Analyst (ESA) hardware/software diagnostic tool. It is assumed the service technician performing instrumentation repairs is knowledgeable about how to use ESA.



Step	Check	Result	Next Step
1	Turn ignition key ON.		Go to Step 2.
	Start ESA, then select		
	"Connect" to establish		
	communication to the		
	vehicle.		
2	Select "Monitor". From	Graphic on screen does not	Go to Step 3.
	the switch portion of the	display reading.	
	"Components" window,	Graphic on screen displays	Go to Step 7.
	select "Dimmer"	reasonable reading as the Dimmer	
		rheostat is operated. Dimmer	
		input to the CECU is good.	
3	Select "Diagnose" to	DTC 148703 displayed – Open in	Indicates the problem could be an open in the wiring from the CECU to the
	view dash dimmer	dash dimmer input circuit.	rheostat or a defective rheostat. Go to Step 4.
	input related diagnostic	DTC 148704 displayed – Short in	Indicates the problem could be a short to ground in the wiring from the CECU
	trouble codes.	dash dimmer input circuit.	to the rheostat or a defective rheostat. Go to Step 6.
4	Connect a jumper wire	DTC 148703 is no longer active.	The open exists in the wiring from Pin 5 of the 52 Pin CECU connector C to
	from Pin 5 of the 52		Pin 3 of the dimmer control switch. You may confirm this by checking the
	Pin CECU connector C		continuity of this circuit. Replace wiring and retest.
	to Pin 3 of the dimmer		Alternate test method: Resistance at Pin 5 of the 52 Pin CECU connector
	control switch.		C should vary between 390 ohms and 1390 ohms as the dimmer switch
			is operated.
			1. Unplug of the 52 Pin CECU connector C from the control unit. Measure
			the resistance from Pin 5 of the 52 Pin CECU connector C to ground.
			a. If the resistance at Pin 5 varies between 390 ohms and 1390 ohms
			as the dimmer switch is operated, the dimmer switch and circuit to
			the CECU checks out fine. Check for a loose or bent pin at Pin 5
			of the CECU connector.
			b. If resistance is missing or not within range at Pin 5 and circuit has
			continuity. Dimmer switch may be faulty. Go to Step 5 .
	Select Clear DTCs.	DTC 148703 is still active.	Dimmer control switch may be faulty. Go to Step 5.
5	Measure the resistance	The resistance varies between	The dimmer switch is operational. Check all electrical connections to make
	between Pin 3 and Pin 9	390 ohms and 1390 ohms as the	sure that there are no bent pins, corroded terminals, or broken wires. Make
	of the Dimmer switch.	dimmer switch is operated.	sure that all electrical connections are firmly seated. Retest vehicle.
		Resistance reading is missing or	Dimmer switch is faulty, replace the switch and retest.
		not within range (390 ohms to	
		1390 ohms)	
6	Unplug the Dimmer	DTC 148704 is no longer active.	The short to ground is probably the result of a faulty connection at the dimmer
	connector at the rheostat		control switch or the switch itself. Repair as necessary.
	control switch.	DTC 148704 is still active.	Short to ground is in the circuit from Pin 5 of the 52 Pin CECU connector C to
	Pin 3 – Dimmer Signal		Pin 3 of the dimmer control switch. Repair and retest.
	to the control unit		
	Select clear DTCs.		
7	Select "Diagnose" to	DTC 149106 displayed – Short in	Dimmer output 1 from Pin 7 of the 9 Pin CECU connector A feeds many
	view dash dimmer	dash dimmer output circuit 1.	instrumentation and component backlighting.
	output related diagnostic	DTC 149206 displayed – Short in	Dimmer output 2 from Pin 8 of the 9 Pin CECU connector A routes to only the
	trouble codes.	dash dimmer output circuit 2.	left and right spare backlight connectors. Check wiring for possible short to
			ground conditions and repair as necessary.

Lite Diagnostic Procedure

J1939

Symptom: Multiple V-CAN (J1939) Databus Gauge(s) Inoperative or Automated Transmission not shifting properly

V-CAN Databus gauges receive their data from the J1939 data link via the engine ECU, which receives its data from various sensors on the engine and transmission.

The following procedures have been developed to assist the technician in diagnosing V-CAN Diagnostic Trouble Codes using typical shop diagnostic equipment. It is assumed the service technician performing instrumentation repairs is knowledgeable about how to use a Volt-Ohm Meter.

- The procedures will also determine whether the system terminating resistors meet required resistance specifications.
- Perform the tests in order and record the resistance readings for each test.
- Failure of any of the following procedures will render the J1939 data link inoperative.
- See the following illustration for the overall J1939 schematic.



Lite Terminating Resistor Test Procedure

J1939

Disconnect Resistors from blue resistor holders and test resistance (approximately 120 ohm) of each resistor across terminals as shown. If OK, then go to the next step.



Lite Short Circuit Test Procedure

J1939

Disconnect all connectors labeled with GREEN text at the component itself (i.e., engine and ABS ECU's). Leave Terminating Resistors disconnected. Insure all remaining connectors are properly latched.

- Test circuit continuity at terminals 1 and 2 labeled in RED text.
- Resistance reading should be zero or no reading indicating open circuit.
- Any resistance reading indicates an undesirable short circuit condition.



Lite Short to Chassis Ground Test Procedure

J1939

- Insure all connectors labeled with GREEN text (i.e., engine and ABS ECU's) remain disconnected. Leave Terminating Resistors disconnected. Insure all remaining connectors are properly latched.
- Test circuit continuity at terminal 2 labeled in RED text with Chassis Ground.
- Move red lead and test circuit continuity at terminal 1 labeled in RED text with Chassis Ground.
- Resistance reading should be zero or no reading indicating open circuit.
- Any resistance reading indicates an undesirable short circuit condition.



Lite Open Circuit Test Procedure

J1939

- Insure all connectors labeled with GREEN text (i.e., engine and ABS ECU's) remain disconnected.
- Reinstall the Terminating Resistors.
- Insure all remaining connectors are properly latched.
- Resistance reading should be zero or no reading indicating open circuit.

- Test circuit resistance at terminals C and D labeled in BLUE text. Circuit resistance should be approximately 60 ohm.
- Re-test at each of the disconnected connectors labeled with GREEN text (i.e., engine and ABS ECU's)
- Resistance reading of zero or no reading indicates open circuit, check for cut wires or loose connections.
- Resistance reading significantly higher than 60 ohm indicates possible corrosion at terminal connectors.



Lite Diagnostic Procedures Conclusion

J1939

- Once all of the preceding tests are completed and passed, reconnect the J1939 compatible components and test the system for functionality with appropriate ECU diagnostic tools.
 - Caterpillar has J1939 Communication test built into diagnostic screen
- If diagnostic tools will not communicate with ECU's, check for power and ground to diagnostic tool.
- Verify engine ECU parameters are programmed to communicate using J1939
- If ECU settings, vehicle J1939 wiring, and power and ground to diagnostic tool are OK and communication is still impossible, then the ECU is suspected to be malfunctioning. Either replace the ECU with a test unit or contact the ECU manufacturer for assistance.



Acronyms and Abbreviations 13 - 2

Acronyms and Abbreviations

13

ABS	Anti-lock Brakes System
ATC	Automatic Traction Control
CAN	Controller Area Network
CECU	Cab Electronic Control Unit
CVSG	Commercial Vehicle Smart Gauges
DEF	Diesel Emissions Fluid
DID	Driver Information Display
DLA	Data Link Adapter
DPF	Diesel Particulate Filter
DTC	Diagnostic Trouble Code
DWIM	Driver Warning and Information Module
ECAT	Electronic Catalog
ECM	Engine Control Module
ECU	Electronic Control Unit
EGR	Exhaust Gas Recirculation
ESA	Electronic Service Analyst
FMI	Failure Mode Indicator
HEST	High Exhaust System Temperature
ICU	Instrumentation Control Unit
IP	Instrument Panel
KW	Kenworth
LCD	Liquid Crystal Display
LVD	Low Voltage Disconnect
MCS	Menu Control Switch
MFD	Multi-Function Display
OBD	On Board Diagnostics
PB	Peterbilt
PD	Power Distribution
PLC	Programmable Logic Controller
PTO	Power Take Off
PWM	Pulse Width Modulation
RT	Run Time
USB	Universal Serial Bus
VIN	Vehicle Identiofication Number

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