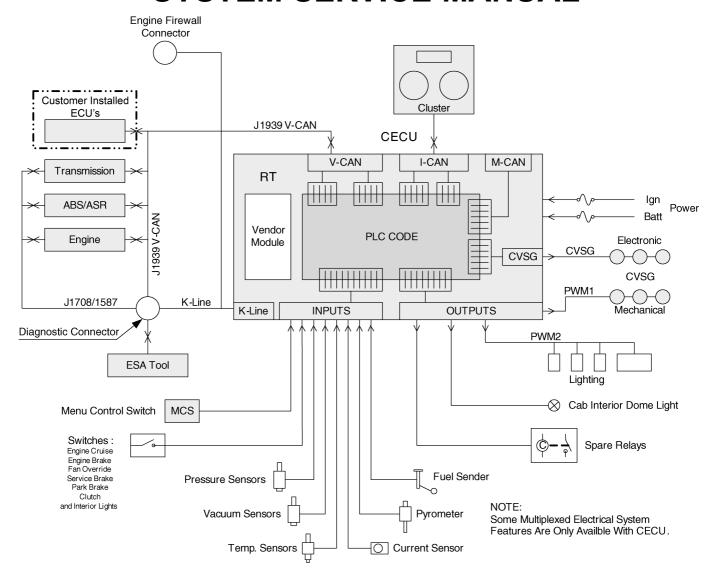


Section	Electrical System Service Manual
Number	PM819010/KM815054
Date	04/01/2010

2005 - 2010 MULTIPLEXED ELECTRICAL SYSTEM SERVICE MANUAL



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Table of Contents

Safety	•		•			•			1
Applies To									2
Exploded View	•								3
What's New .	•								4
General Informa	ati	on							5
Special Tools.						-			6
Specifications									7
How It Works.	•								8
Maintenance.						-			9
Disassembly / A	\s	se	ml	bly	/	-		-	
Inspection	-					-		-	
Troubleshooting	g								12
Glossary	•		•			•			13
Index	•								14



Safety

Important Notes. 1 - 2

Important Notes

The simulate function within ESA is a good diagnosis tool. Safety is always the primary 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.



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 the following software versions: ICU (P30-1003), CECU/CECU2 (P30-1002), and CECU3 (P30-1008.) For vehicles equipped with software version CECU3 with Chassis Node (P30-1009), refer to a separate publication.

Applies To

Electronic Service Analyst (ESA)	•		2 - 2
What Control Unit Do I Have			2 - 3
Models-Build Dates			2 - 4
Control Unit Identification			2 - 5
Control Unit Comparison Chart			2 - 7

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.

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.



What Control Unit Do I Have

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.

ICU or CECU?

Early multiplexing was for the instrumentation system only. The module was known as the Instrumentation Control Unit (ICU).

Now, as multiplexing from this control unit is being used for systems other than just the instrumentation, the module has been renamed the Cab Electronic Control Unit (CECU).

The CECU is an updated ICU. but now includes a few more circuits to incorporate the new features. ESA is the tool for both.

CECU's are available in a few variants according to the vehicle model and the engine emissions standard. ESA automatically identifies what version of CECU is connected and only permits software downloads that are applicable for that control unit.

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

Models-Build Dates

Models-Build Dates Chart

Control Unit	Hardware Part Number	Software Version	Models	Engine Emissions Level	Production Built 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 /	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		

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

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)
- Dome light function
- Menu Control Switch (MCS), only available with highline display

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

Types of Control Unit Identification

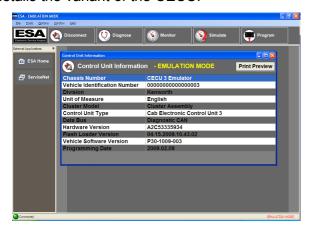
Electronic Catalog (ECAT) Identification

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

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 ICU/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.

Dome Light Identification

The CECU system has an updated feature that delays turning the dome light off when you close the door. The previous ICU system did not have this function so the light turns off as soon as the door is shut. Therefore, if the dome light does not turn off immediately after all doors are shut, then the vehicle has a CECU system. If the dome light

does turn off immediately, then the vehicle may be ICU OR CECU with this function disabled. In these cases, you will need to refer to ECAT for verification.

MCS Identification

For vehicles equipped with the highline 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

Control Unit Comparison Chart

The following charts show the differences between the ICU and CECU.

The first chart provides an alphabetical listing of the features available for either an ICU or CECU. Since the CECU is an updated ICU, almost all of the features of an ICU are found in a CECU.

The similarity of the modules is easily seen in the second chart as well. This chart is an abbreviated connector pinout of each module. Since the same wiring connections are used for both modules, its easy to see that the CECU has more circuits to handle the increase in multiplexed features. There are also a few features for the CECU that are only present on vehicles outfitted to meet the 2010 emissions standards.

Comparison Charts

Comparison Chart - (Supported Features)

Supported Features	ICU	CECU
Air filter restriction	Х	Х
Air pressure transducer	Х	Х
Ammeter	Х	Х
Axle temperature, center/steer	Х	Х
Axle temperature, front	Х	Х
Axle temperature, rear	Х	Х
Backlighting - auxiliary	X	Х
Brake switch (hyd)		Х
Brakesaver oil temperature	Х	Х
Cab dome lamp		Х
Check engine telltale	Х	Х
Clutch switch	7	X
Courtesy lights - left door	Х	X
Courtesy lights - right door		X
Cruise control		X
CVSG data/power	Х	X
Dash buzzer	X	X
Dash/panel illumination	X	X
Dimmer input	X	X
'	^	X
Dome lamp Editable telltale 1		
Editable telltale 2	X	X
	1	
Editable telltale 3	X	X
Editable telltale 4	X	X
Editable telltale 5	1	
Editable telltale 5	X	V
Editable telltale 6	X	X
Editable telltale 7	X	· ·
Editable telltale 8	X	X
Editable telltale 9	X	X
Engine fan override		X
Fifth wheel lock telltale	X	X
Fuel filter restriction	X	X
Fuel level sensor 1	X	X
Fuel level sensor 2	X	X
General oil temperature	X	X
Hazard	X	X
Headlamps active		X
High beam active	X	X
I-CAN high	X	X
I-CAN low	X	Х
Inhibit regen		X
Idle timer relay		X
Interaxle lock telltale	X	X
K-line	X	Х
Left turn	X	X
LVD input		X
Message display		Х
Outside air temperature	X	Х
Park brake active	X	Х
Park lamp/Headlamp active	X	Х
Power - accessory	X	X

Supported Features	ICU	CECU
Power - battery	Х	Х
Power - ignition	Х	Х
Power supply +5V sensors	Х	X
PTO		Х
Regeneration switch enable		Х
Retarder select		X
Right turn	Х	Х
Seat belt telltale		Х
Spare analog input		Х
Spare digital input		Х
Spare relay output	Х	Х
Stop engine telltale	Х	Χ
Tractor ABS telltale	Х	Х
Trailer ABS telltale	Х	Х
Transfer case oil temp	Х	Х
Transmission oil temp - aux	Х	Х
Transmission oil temp - main	Х	Х
V-CAN high	X	Х
V-CAN low	Х	Х

Comparison Chart - (Pinout)

Conn	Pin Number	Circuit Function	ICU	CECU
Α	1	CVSG power	Χ	Х
	2	Power - battery	Χ	X
	3	Cab dome lamp		X
	4	Menu control switch power		X
	5	Ground	Χ	X
	6	Menu control switch ground		X
	7	Dash/panel illumination	Χ	X
	8	Auxiliary backlighting	Χ	X
	9	Power - battery		Х



B 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 Brake Switch (Hydraulic) 5 Brake Switch (Hydraulic) 4 Seat belt telltale 5 X Seat belt telltale 6 X Seat belt telltale 7 X Seat belt telltale 8 Cruise set 9 Cruise resume 9 Cruise resume 10 Spare digital input 1L 11 Retarder select 1 X Seat Select 1 X Seat Select 1 X Seat Select 1 X Seat Select 1 X Select
3 Menu control switch enter 4 Courtesy lights - right door jamb switch 5 Brake Switch (Hydraulic) 6 Dome lamp input 7 Seat belt telltale 8 Cruise set 9 Cruise resume 10 Spare digital input 1L 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 Spare digital input 21 Spare digital input 22 LVD input 23 Spare digital input 24 Spare digital input 24 Spare digital input 25 XX
4 Courtesy lights - right door jamb switch 5 Brake Switch (Hydraulic) X 6 Dome lamp input X 7 Seat belt telltale X 8 Cruise set X 9 Cruise resume X 10 Spare digital input 1L X 11 Retarder select 1 X 12 Retarder select 2 X 13 Clutch switch X 14 Headlamps active X 15 PTO set X 16 PTO resume X 17 Engine fan override X 18 Regen enable X 19 Inhibit regen X 20 Spare digital input X 21 Spare digital input X 22 LVD input X 23 Spare digital input X 24 Spare digital input X
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5 Brake Switch (Hydraulic) X 6 Dome lamp input X 7 Seat belt telltale X 8 Cruise set X 9 Cruise resume X 10 Spare digital input 1L X 11 Retarder select 1 X 12 Retarder select 2 X 13 Clutch switch X 14 Headlamps active X 15 PTO set X 16 PTO resume X 17 Engine fan override X 18 Regen enable X 19 Inhibit regen X 20 Spare digital input X 21 Spare digital input X 22 LVD input X 23 Spare digital input X 24 Spare digital input X
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23 Spare digital input X 24 Spare digital input X
24 Spare digital input X
Total supply for contacts X X
2 Analog return X X
3 PTO oil temp X
3 Analog return X
4 K-line X X
5 Dimmer input X X
6 Air pressure transducer - X X
primary 7 Air pressure transducer - X X
secondary
8 Air pressure transducer - X X
application
9 Ammeter X X
10 Air filter restriction X X
11 Fuel filter restriction X X
12 Fuel level sensor 1 X X
13 Fuel level sensor 2 X X
14 CVSG data X X
15 CVSG return X X
16 Outside air temperature X X
17 Front axle temperature X X
18 Rear axle temperature X X
19 Center/steer axle temperature X X
20 General oil temperature X X
21 Transmission oil temperature X X
- main
22 Transmission oil temperature - X X auxiliary
23 Pyrometer X X
24 Brakesaver oil temperature X X

Conn	Pin Number	Circuit Function	ICU	CECU
	25	Analog return	Χ	Х
	26	Transfer case oil temperature	Χ	Х
	27	Remote throttle signal		Х
	28 thru 52	Spare		Х
D	1	Power - ignition	Χ	Х
	2	Courtesy lights - left door jamb	Χ	Х
		switch		
	3	Power - accessory	Χ	Х
	4	Hazard	Χ	Х
	5	Park lamp/Headlamp active	Χ	Х
	6	High beam active	Χ	Х
	7	Park brake active	Χ	Х
	8	Left turn	Χ	Х
	9	Right turn	Χ	Χ
	10	Cruise on/off		Х
	11	Interaxle lock telltale	X	X
	12	Fifth wheel lock telltale	X	X
	13	Tractor ABS telltale	X	X
	14	Trailer ABS telltale	X	X
	15	Check engine telltale	X	X
	16	Stop engine telltale	X	X
	17	Spare	X	X
	18	Spare	X	X
	19	Editable telltale 1	Х	Х
		See editable telltale table		
	20	Editable telltale 2	Х	Х
		See editable telltale table		
	21	Editable telltale 3	Χ	Х
		See editable telltale table		
	22	Editable telltale 4	Χ	Х
		See editable telltale table		
	23	Editable telltale 5	Χ	
		See editable telltale table		
	23	Spare digital input		Х
	24	Editable telltale 6	Χ	Х
		See editable telltale table		
	25	Editable telltale 7	Χ	Х
		See editable telltale table		
	26	Editable telltale 8	Х	Х
	20		_ ^	^
	27	See editable telltale table Editable telltale 9	Х	Х
	21		^	^
		See editable telltale table	.,	
	28	Dash buzzer 1A	X	X
	29	Dash buzzer 1B	X	X
	30	Dash buzzer 1C	X	X
	31	Dash buzzer 2	Х	X
	32	Not used		X
	33 34	Not used I-CAN high	Х	X
	35	I-CAN light	X	X
	36	I-CAN ground	X	X
	37	V-CAN high	X	X
	38	V-CAN low	X	X
	39	V-CAN ground	X	X
	38	V-Oran ground	^	٨

Conn	Pin Number	Circuit Function	ICU	CECU
	40	V-CAN low terminated	Χ	Х
Е	1	Idle timer relay		Х
	2	Spare relay output		Х
	3	Spare relay output		Х
	4	Spare relay output		Х
	5	Ground		Х
	6	Spare relay output		Х
	7	Spare relay output		Х
	8	Spare relay output		Х
	9	Spare relay output		Х

Editable Telltale Application

Editable Telltale Location	KW Cluster	KW DWIM	PB Cluster	PB DWIM
Editable Telltale 1	Position 4	Position 1	Position 2	Position 1
Editable Telltale 2	Position 7	Position 2	Position 3	Position 2
Editable Telltale 3	Position 8	Position 5	Position 4	Position 5
Editable Telltale 4	Position 9	n/a	Position 5	Position 8
Editable Telltale 5	Position 10	n/a	Position 7	Position 9
Editable Telltale 6	Position 12	n/a	Position 8	Position 10
Editable Telltale 7	Position 13	n/a	n/a	Position 11
Editable Telltale 8	Position 14	n/a	n/a	n/a
Editable Telltale 9	Position 16	n/a	n/a	n/a

See Editable Telltale Lights for illustration of possible telltale locations.

Exploded View

Control Unit Location 3 - 2

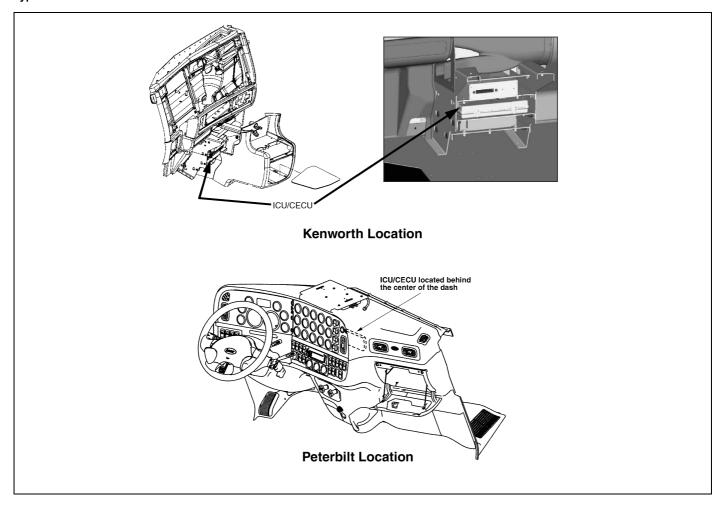
Control Unit Location

Instrumentation Control Unit/Cab Electronic Control Unit (ICU/CECU)

The heart of the multiplexed instrumentation system is the ICU/CECU. For the majority of

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

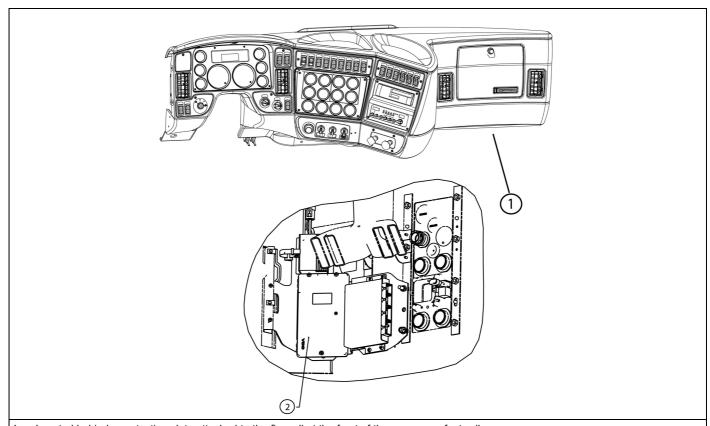
Typical ICU/CECU Locations



For Kenworth models T2000 and T700, the CECU is located at the front of the passenger footwell. It

is beneath the carpet, attached to the firewall and covered by a protective plate.

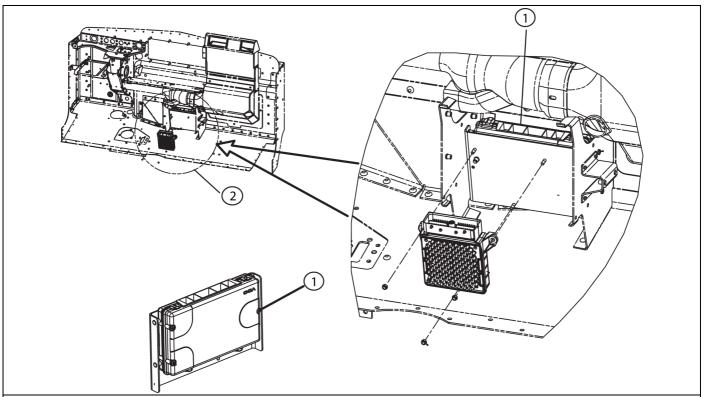
Kenworth T2000/T700 CECU Locations



- 1. Located behind a protective plate attached to the firewall at the front of the passenger footwell
- 2. Cab Electronic Control Unit (CECU)

For 2010 emissions compliant Kenworth medium duty models (T170, T270, T370), the CECU is located behind the lower center of the dash panel.

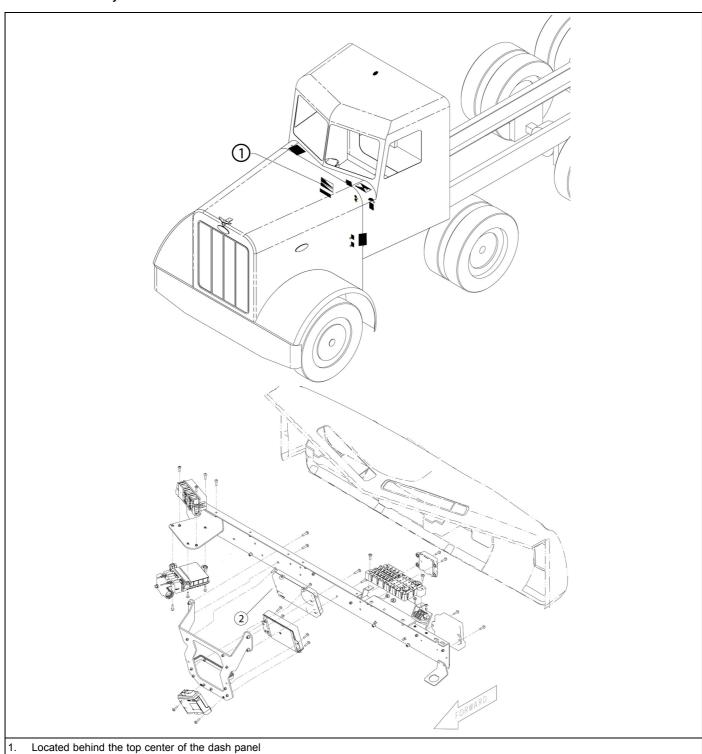
Kenworth Medium Duty CECU Locations



- 1. Cab Electronic Control Unit (CECU), located behind protective plate.
- 2. Behind lower center of dash, in back of the cupholder.

For 2010 emissions compliant Peterbilt medium duty models, the CECU is located behind the top center of the dash panel.

Peterbilt Medium Duty CECU Locations



- Cab Electronic Control Unit (CECU)

What's New

Electronic Service Analyst (ESA).	-	•	4 - 2
New Features of ESA 3			4 - 4

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.



There are many existing adapters that can continue to be used to support vehicles without 2010 emissions engines. 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?

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.

i

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. The Instrumentation Control Unit (ICU) does not possess all the capabilities of the newer CECU; however, ESA is the diagnostic tool for both control units.

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

New Features

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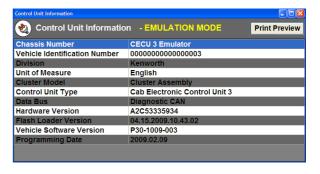
Connecting ESA

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



Navigating ESA

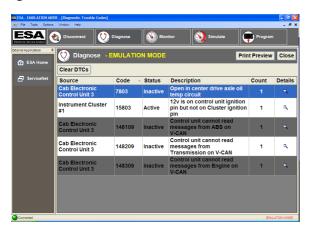
The navigation icons are located at the top of the ESA screen. Selecting an icon activates that portion of the program.



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 ICU/CECU.
- Simulate: limited activation of ICU/CECU outputs.
- Program: disable/enable components of the ICU/CECU.

Diagnose - New Features



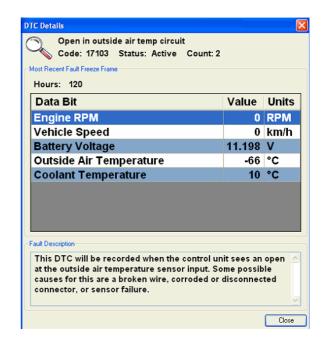
50 Stored Codes

The Diagnosis screen now has the ability to store and display up to 50 Diagnostic Trouble Codes (DTCs) for the CECU. The ICU is limited to 15.

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:



- 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.

ICU equipped vehicles still require the extra step of cycling the ignition key (from on to off and back on) in order to display active fault 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.



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

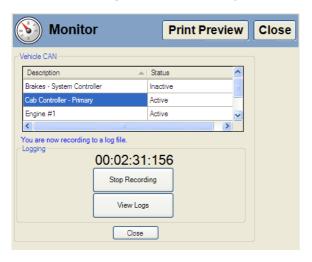
Monitoring shows a representation of what the control unit sees as input signals. Comparing what the unit sees to what the actual component (gauge, telltale, etc.) is doing helps determine if there is a problem.

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

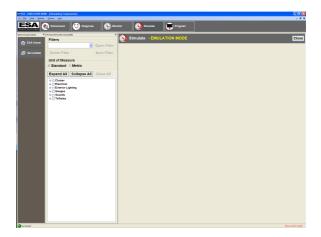
Monitoring Data Bus

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.



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.



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 always the primary 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.



Parameters

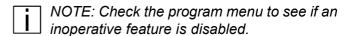
There were 14 parameters for the ICU. Parameters are like part numbers that tell the control unit what features are on the vehicle and hence what inputs/outputs need activated.

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.

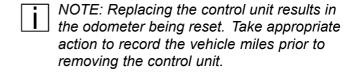
Now with the CECU, disabling really means disabled. A disabled gauge will not function. It is removed from all signal transmissions in order to allow the other features faster communication. This is very important when diagnosing a component that is inoperative. It may simply have been previously disabled.



Flash - New Features

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.





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.



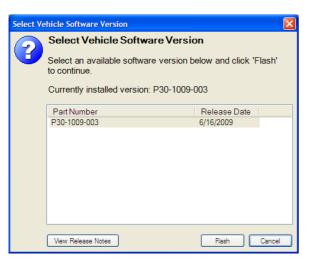
CAUTION: Interrupting the communication or power supply could result in hardware damage to the unit.

K-Line is 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 to vehicles containing "CECU3 with Chassis Node" software (P30-1009-XXX), the K-Line will be replaced with the D-CAN communication bus. However 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.



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.

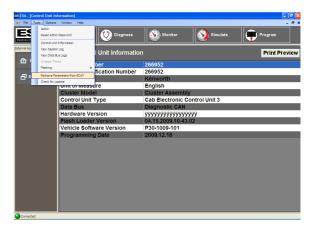
Backup Parameters

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.

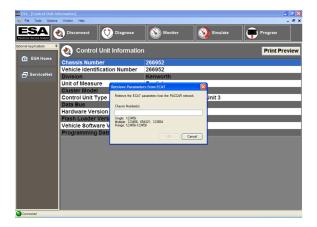
Retrieving Parameters

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.



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.



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.

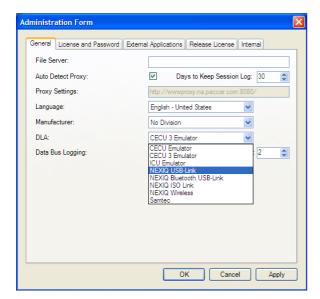
Administration - New Features



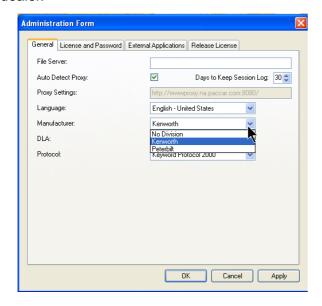
There are a few improvements made to the administration form that is found under the Tools pull down menu at the top of the ESA screen.

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.



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



	5	General	Inform	nation
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Service Resources											5 -	2
	_	-	-	-	-	-	-	-	-	-	_	_

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

For both the ICU and CECU, a disabled gauge cannot detect problems or trigger DTCs. But when it comes to the operation of the gauge, keep the following in mind:

- An ICU disabled gauge can still function.
- A CECU disabled gauge is removed from operation and does NOT function.

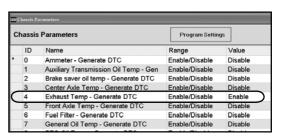
Control Unit	How the control unit handles disabled components
ICU	With the ICU, disabling a component turns off the
	components diagnostics but does not remove the
	component from operation. An ICU disabled gauge still
	functions, but is prevented from detecting problems and
	triggering DTCs.
CECU	With 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: 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 ICU/CECU to monitor it. Until the ICU/CECU is programmed, the link between the ICU/CECU and the gauge is termed "disabled" – that is, the ICU/CECU is prevented from detecting problems, and also from logging and displaying diagnostic trouble codes (DTCs).

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

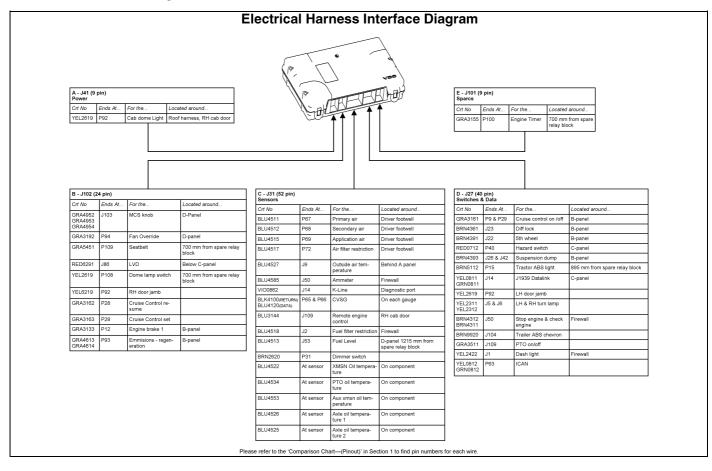


Once the ICU/CECU is programmed and the link to the gauge is "enabled", the ICU/CECU monitors it, diagnoses problems like "shorts" and "opens", logs DTCs for troubleshooting, and displays the DTCs on ESA's "Diagnose" screen.

Harness Interface Diagrams

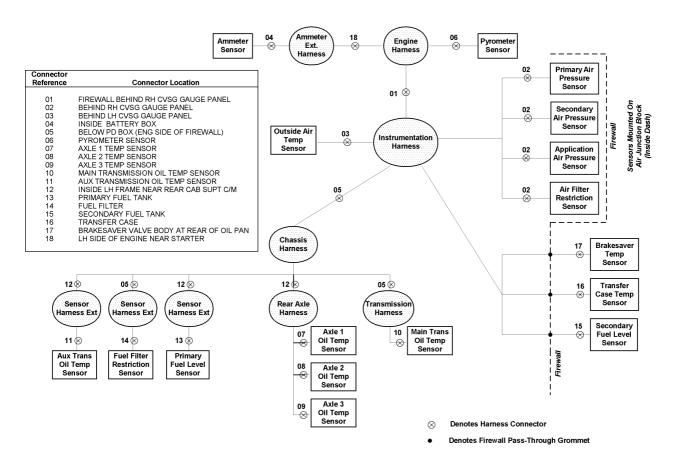
The following diagrams provide typical examples of harness inter-connects, or harness connections that provide the signals to the ICU/CECU. This type of reference is helpful when trying to locate harness inter-connection points. Sometimes these connections become loose, have bent or misaligned pins, and visually inspecting them may help identify why other electrical problems may be occurring.

Peterbilt Harness Interface Diagram



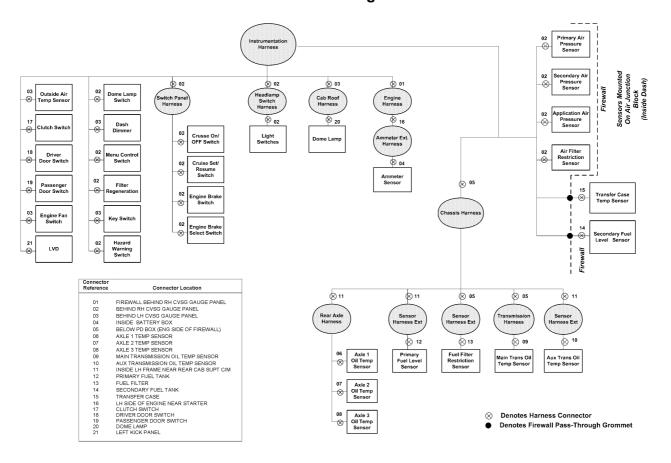
Kenworth ICU (P30-1003-XXX) Harness Interface Diagram

ICU Electrical Harness Interface Diagram



Kenworth CECU/CECU2 (P30-1002-XXX) and CECU3 (P30-1008-XXX) Harness Interface Diagram

CECU Electrical Harness Interface Diagram



ICU/CECU Details

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

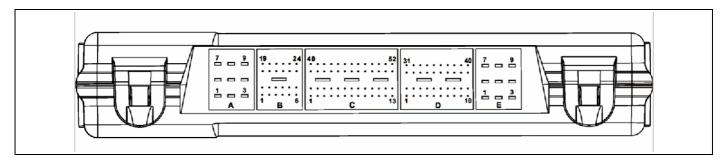
Connector Identification

There are 5 electrical connectors that plug into the ICU/CECU. The ICU uses only connectors A, C and D.

- 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 ICU/CECU showing where the harness connectors attach into the control unit, see ICU/CECU Figure. This figure identifies connector position on the control unit as well as individual connector pin locations.

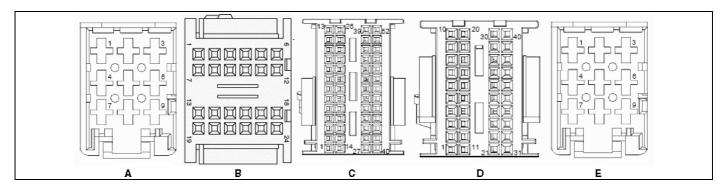
ICU/CECU



For connector face views at the harness connectors that plug into the ICU/CECU, see ICU/CECU Connector Face Views Figure. These

connectors all branch from the instrument panel harness that routes behind the dash.

ICU/CECU Connector Face Views



Comparison Chart - (Pinout)

1 2 3 4 5 6 7 8 9 10 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	CVSG power Power - battery Cab dome lamp Menu control switch power Ground Menu control switch ground Dash/panel illumination Auxiliary backlighting Power - battery Menu control switch encode A Menu control switch encode B Menu control switch enter Courtesy lights - right door jamb switch Brake Switch (Hydraulic) Dome lamp input Seat belt telltale Cruise set Cruise resume Spare digital input 1L	x x x x	X
3 4 5 6 7 8 9 1 2 3 4 5 6 7 8 9 1 1 2 3 4	Cab dome lamp Menu control switch power Ground Menu control switch ground Dash/panel illumination Auxiliary backlighting Power - battery Menu control switch encode A Menu control switch encode B Menu control switch enter Courtesy lights - right door jamb switch Brake Switch (Hydraulic) Dome lamp input Seat belt telltale Cruise set Cruise resume	X	X
4 5 6 7 8 9 1 2 3 4 5 6 7 8 9	Menu control switch power Ground Menu control switch ground Dash/panel illumination Auxiliary backlighting Power - battery Menu control switch encode A Menu control switch encode B Menu control switch enter Courtesy lights - right door jamb switch Brake Switch (Hydraulic) Dome lamp input Seat belt telltale Cruise set Cruise resume	Х	X
5 6 7 8 9 1 2 3 4 5 6 7 8 9	Ground Menu control switch ground Dash/panel illumination Auxiliary backlighting Power - battery Menu control switch encode A Menu control switch encode B Menu control switch enter Courtesy lights - right door jamb switch Brake Switch (Hydraulic) Dome lamp input Seat belt telltale Cruise set Cruise resume	Х	X
6 7 8 9 1 2 3 4 5 6 7 8 9	Menu control switch ground Dash/panel illumination Auxiliary backlighting Power - battery Menu control switch encode A Menu control switch enter Courtesy lights - right door jamb switch Brake Switch (Hydraulic) Dome lamp input Seat belt telltale Cruise set Cruise resume	Х	X
7 8 9 1 2 3 4 5 6 7 8 9	Dash/panel illumination Auxiliary backlighting Power - battery Menu control switch encode A Menu control switch encode B Menu control switch enter Courtesy lights - right door jamb switch Brake Switch (Hydraulic) Dome lamp input Seat belt telltale Cruise set Cruise resume		X
8 9 1 2 3 4 5 6 7 8 9	Auxiliary backlighting Power - battery Menu control switch encode A Menu control switch encode B Menu control switch enter Courtesy lights - right door jamb switch Brake Switch (Hydraulic) Dome lamp input Seat belt telltale Cruise set Cruise resume		X X X X X X X
9 1 2 3 4 5 6 7 8 9 10	Auxiliary backlighting Power - battery Menu control switch encode A Menu control switch encode B Menu control switch enter Courtesy lights - right door jamb switch Brake Switch (Hydraulic) Dome lamp input Seat belt telltale Cruise set Cruise resume	X	X X X X X X
1 2 3 4 5 6 7 8 9	Power - battery Menu control switch encode A Menu control switch encode B Menu control switch enter Courtesy lights - right door jamb switch Brake Switch (Hydraulic) Dome lamp input Seat belt telltale Cruise set Cruise resume		X X X X X X
2 3 4 5 6 7 8 9 10	Menu control switch encode A Menu control switch encode B Menu control switch enter Courtesy lights - right door jamb switch Brake Switch (Hydraulic) Dome lamp input Seat belt telltale Cruise set Cruise resume		X X X X X
2 3 4 5 6 7 8 9 10	Menu control switch encode B Menu control switch enter Courtesy lights - right door jamb switch Brake Switch (Hydraulic) Dome lamp input Seat belt telltale Cruise set Cruise resume		X X X X X
3 4 5 6 7 8 9 10	Menu control switch enter Courtesy lights - right door jamb switch Brake Switch (Hydraulic) Dome lamp input Seat belt telltale Cruise set Cruise resume		X X X X
5 6 7 8 9 10	Courtesy lights - right door jamb switch Brake Switch (Hydraulic) Dome lamp input Seat belt telltale Cruise set Cruise resume		X X X
5 6 7 8 9 10	jamb switch Brake Switch (Hydraulic) Dome lamp input Seat belt telltale Cruise set Cruise resume		X X X
6 7 8 9 10	Brake Switch (Hydraulic) Dome lamp input Seat belt telltale Cruise set Cruise resume		X
6 7 8 9 10	Dome lamp input Seat belt telltale Cruise set Cruise resume		X
7 8 9 10 11	Seat belt telltale Cruise set Cruise resume		Х
8 9 10 11	Cruise set Cruise resume		
9 10 11	Cruise resume		~
10 11			Х
11	Spare digital input 11		Х
	oparo aigitai iliput IL		Х
40	Retarder select 1		X
12	Retarder select 2		Χ
13	Clutch switch		Χ
14	Headlamps active		Χ
15	PTO set		Χ
16	PTO resume		Х
17	Engine fan override		Х
18			Χ
19			Х
	•		Х
			Х
			X
			X
			X
			X
			X
			_ ^
		Χ	
	<u> </u>		X
			X
			X
6	Air pressure transducer -	Х	Х
	primary		
7	Air pressure transducer -	Х	Х
	secondary		
8	Air pressure transducer -	Χ	Χ
	application		
9	Ammeter	Х	Х
			X
			X
			X
			X
			X
			X
	15 16 17 18 19 20 21 22 23 24 1 2 3 3 4 5 6	15 PTO set 16 PTO resume 17 Engine fan override 18 Regen enable 19 Inhibit regen 20 Spare digital input 21 Spare digital input 22 LVD input 23 Spare digital input 24 Spare digital input 1 Power supply +5V sensors 2 Analog return 3 PTO oil temp 3 Analog return 4 K-line 5 Dimmer input 6 Air pressure transducer - primary 7 Air pressure transducer - secondary 8 Air pressure transducer - application 9 Ammeter 10 Air filter restriction 11 Fuel filter restriction 12 Fuel level sensor 1 13 Fuel level sensor 2 14 CVSG data 15 CVSG return	15 PTO set 16 PTO resume 17 Engine fan override 18 Regen enable 19 Inhibit regen 20 Spare digital input 21 Spare digital input 22 LVD input 23 Spare digital input 24 Spare digital input 1 Power supply +5V sensors 2 Analog return 3 ApTO oil temp 3 Analog return 4 K-line 5 Dimmer input 6 Air pressure transducer - yeimary 7 Air pressure transducer - xecondary 8 Air pressure transducer - xecondary 8 </td

Conn	Pin Number	Circuit Function	ICU	CECU
	17	Front axle temperature	Χ	X
	18	Rear axle temperature	Χ	Х
	19	Center/steer axle temperature	Χ	Х
	20	General oil temperature	Χ	Х
	21	Transmission oil temperature	Х	Х
	22	- main Transmission oil temperature -	Х	Х
		auxiliary	,	
	23	Pyrometer	Χ	Х
	24	Brakesaver oil temperature	Χ	Х
	25	Analog return	Χ	Х
	26	Transfer case oil temperature	Χ	Х
	27	Remote throttle signal		Х
	28 thru 52	Spare		Х
D	1	Power - ignition	Χ	X
	2	Courtesy lights - left door jamb	Х	Х
		switch		
	3	Power - accessory	X	X
	4	Hazard	X	X
	5	Park lamp/Headlamp active	X	X
	6	High beam active	X	X
	7	Park brake active	X	X
	8	Left turn	X	X
	9	Right turn	Χ	
	10	Cruise on/off	V	X
	11 12	Interaxle lock telltale	X	X
	13	Fifth wheel lock telltale	X	X
	14	Tractor ABS telltale Trailer ABS telltale	X	X
	15	Check engine telltale	X	X
	16	Stop engine telltale	X	X
	17	Spare Spare	X	X
	18	Spare	X	X
	19	Editable telltale 1	X	X
		See editable telltale table		
	20	Editable telltale 2	Х	Х
		See editable telltale table		
	21	Editable telltale 3	Χ	Х
		See editable telltale table		
	22	Editable telltale 4	Х	Х
		See editable telltale table		
	23	Editable telltale 5	Х	
		See editable telltale table		
	23	Spare digital input		X
	24	Editable telltale 6	Х	Х
	25	See editable telltale table		
	25	Editable telltale 7	Х	X
	26	See editable telltale table Editable telltale 8	Х	Х
		See editable telltale table		
	27	Editable telltale 9	Х	Х
		See editable telltale table		
	28	Dash buzzer 1A	Χ	Х
	29	Dash buzzer 1B	Χ	Χ

Conn	Pin Number	Circuit Function	ICU	CECU
	30	Dash buzzer 1C	Х	Х
	31	Dash buzzer 2	Х	Х
	32	Not used		Х
	33	Not used		Х
	34	I-CAN high	Х	Х
	35	I-CAN low	Х	Х
	36	I-CAN ground	Х	Х
	37	V-CAN high	Х	Х
	38	V-CAN low	Х	Х
	39	V-CAN ground	Х	Х
	40	V-CAN low terminated	Х	Х

Conn	Pin Number	Circuit Function	ICU	CECU				
E	1	Idle timer relay		Х				
	2	Spare relay output		Х				
	3	Spare relay output						
	4	Spare relay output	Х					
	5	Ground		Х				
	6	Spare relay output		Х				
	7	Spare relay output		Х				
	8	Spare relay output		Х				
	9	Spare relay output		Χ				

Editable Telltale Application

Editable Telltale Location	KW Cluster	KW DWIM	PB Cluster	PB DWIM
Editable Telltale 1	Position 4	Position 1	Position 2	Position 1
Editable Telltale 2	Position 7	Position 2	Position 3	Position 2
Editable Telltale 3	Position 8	Position 5	Position 4	Position 5
Editable Telltale 4	Position 9	n/a	Position 5	Position 8
Editable Telltale 5	Position 10	n/a	Position 7	Position 9
Editable Telltale 6	Position 12	n/a	Position 8	Position 10
Editable Telltale 7	Position 13	n/a	n/a	Position 11
Editable Telltale 8	Position 14	n/a	n/a	n/a
Editable Telltale 9	Position 16	n/a	n/a	n/a

See Editable Telltale Lights for illustration of possible telltale locations.

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.	F. J. College
Part Number	Description	Value	Value	Explanation
Q30-1005-000*	ABS installed	0	1	Parameter controls DTC's related to ABS system.
Q30-1017-000**				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.
Q30-1005-001*	After Treatment	0	1	Parameter is used to allow information from the engine to turn on the
Q30-1017-001**	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.
Q30-1005-002*	ATC installed	0	1	Currently has no effect on functionality. Parameter will be used to determine
Q30-1017-002**				the presence of traction control.
				Value 0/Disabled means ATC is not installed.
				Value 1/Enabled means ATC is installed.
Q30-1005-003*	Retarder Range Map	0	4	Parameter is used to define the engine brake levels.
Q30-1017-003**				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%.
Q30-1005-004*	Clutch Switch Present	1	1	Parameter is used to determine if the clutch switch is connected to the
Q30-1017-004**				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).
Q30-1005-005*	Cruise Control Set	0	1	Parameter is used to define the cruise control set/resume switch functionality.
Q30-1017-005**	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.
Q30-1005-006*	Cruise Control	0	1	Parameter is used to determine if cruise control is installed and controls the
Q30-1017-006**	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.	Explanation
Part Number	Description	Value	Value	•
Q30-1005-007*	Clock Alarm Available	0	1	Parameter is used to determine if the alarm clock will be displayed on the
Q30-1017-007**				multifunction display.
				Value 0/Disabled means Alarm Clock is not available in Multifunction Display.
020 4005 000*	Clask Aveilable	0	1	Value 1/Enabled means Alarm Clock is available in Multifunction Display
Q30-1005-008*	Clock Available	0	ı	Parameter is used to determine if the clock will be displayed on the
Q30-1017-008**				multifunction display.
				Value 0/Disabled means Clock is not available in Multifunction Display.
020 4005 000*	Diagraphics Available	0	4	Value 1/Enabled means Clock available in Multifunction Display
Q30-1005-009*	Diagnostics Available	0	1	Parameter is used to determine if the diagnostics will be displayed on the
Q30-1017-009**				multifunction display.
				Value 0/Disabled means Diagnostic is not available in Multifunction Display.
200 400= 040*				Value 1/Enabled means Diagnostic is available in Multifunction Display
Q30-1005-010*	Ignition Timer	0	1	Parameter is used to determine if the ignition timer will be displayed on the
Q30-1017-010**	Available			multifunction display.
				Value 0/Disabled means Ignition Timer is not available in Multifunction
				Display.
		_		Value 1/Enabled means Ignition Timer is available in Multifunction Display
Q30-1005-011*	Languages Available	0	1	Parameter is used to determine if other languages are available on the
Q30-1017-011**				multifunction display.
				Value 0/Disabled means Language selection is not available in Multifunction
				Display.
				Value 1/Enabled means Language selection is available in Multifunction
				Display
Q30-1005-012*	RPM Detail Available	0	1	Parameter is used to determine if the RPM information will be displayed
Q30-1017-012**				on the multifunction display.
				Value 0/Disabled means RPM information is not available in Multifunction
				Display.
				Value 1/Enabled means RPM information is available in Multifunction Display
Q30-1005-013*	Trip Economy	0	1	Parameter is used to determine if the trip economy information will be
Q30-1017-013**	Available			displayed on the multifunction display.
				Value 0/Disabled means Trip Economy is not available in Multifunction
				Display.
				Value 1/Enabled means Trip Economy is available in Multifunction Display
Q30-1005-014*	Trip Information	0	1	Parameter is used to determine if the trip information will be displayed on
Q30-1017-014**	Available			the multifunction display.
				Value 0/Disabled means Trip Information is not available in Multifunction
				Display.
				Value 1/Enabled means Trip Information is available in Multifunction Display
Q30-1005-015*	Truck Information	0	1	Parameter is used to determine if the truck information will be displayed
Q30-1017-015**	Available			on the multifunction display.
				Value 0/Disabled means Truck Information is not available in Multifunction
				Display.
				Value 1/Enabled means Truck Information is available in Multifunction
				Display
Q30-1005-016*	Multifunction Display	0	1	Parameter is used to control the scrolling in multifunction display.
Q30-1017-016**	Menus Wraparound			Value 0/Disabled means that the menu will stop when it reaches the top or
				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.

CECU Parameter	Parameter	Min.	Max.	
Part Number	Description	Value	Value	Explanation
Q30-1005-017*	Dome Lamp	0	1	Parameter is used to determine if the dome lamps are controlled by the
Q30-1017-017**	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.
Q30-1005-018*	Dome Lamp Delay	0	1	Parameter is used to determine if the dome lamp delays turning off after
Q30-1017-018**	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.
Q30-1005-019*	Dome Lamp Dimming	0	1	Parameter is used to determine if the dome lamp dims out slowly after the
Q30-1017-019**	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
				and delay if enabled.
Q30-1005-020*	Air Filter Restriction	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of
Q30-1017-020**	Gauge Installed			the air filter restriction gauge.
				Value 0/Disabled means Air Filter Restriction Gauge is not installed.
				Value 1/Enabled means Air Filter Restriction Gauge is installed.
Q30-1005-021*	Allison Transmission	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
Q30-1017-021**	Temperature Gauge			Allison transmission temperature gauge.
	Installed			Value 0/Disabled means Allison Transmission Temperature Gauge is not
				installed.
				Value 1/Enabled means Allison Transmission Temperature Gauge is
				installed.
Q30-1005-022*	Ammeter Gauge	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of
Q30-1017-022**	Installed			the ammeter gauge.
				Value 0/Disabled means Ammeter Gauge is not installed.
				Value 1/Enabled means Ammeter Gauge is installed.
Q30-1005-023*	Auxiliary	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
Q30-1017-023**	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.
Q30-1005-024*	Axle Temperature	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
Q30-1017-024**	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.
Q30-1005-025*	Axle Temperature	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
Q30-1017-025**	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.
Q30-1005-026*	Axle Temperature	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of
Q30-1017-026**	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.
Q30-1005-027*	Brake Applied	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
Q30-1017-027**	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.

CECU Parameter	Parameter	Min.	Max.	Explanation
Part Number	Description	Value	Value	
Q30-1005-028*	Brakesaver Oil	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
Q30-1017-028**	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.
Q30-1005-029*	Engine Coolant	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
Q30-1017-029**	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.
Q30-1005-030*	Engine Manifold	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of
Q30-1017-030**	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.
Q30-1005-031*	Engine Oil Pressure	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
Q30-1017-031**	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.
Q30-1005-032*	Engine Oil	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of
Q30-1017-032**	Temperature Gauge			the engine oil temperature gauge.
Q00 1011 002	Installed			Value 0/Disabled means Engine Oil Temperature Gauge is not installed.
	otaou			, ,
Q30-1005-033*	Exhaust Temperature	0	1	Value 1/Enabled means Engine Oil Temperature Gauge is installed. Parameter controls the functionality (output on CVSG bus and DTC's) of the
	Gauge (Pyrometer)	0	'	exhaust temperature gauge.
Q30-1017-033**	Installed			
	Ilistalleu			Valve 0/Disabled means Exhaust Temperature Gauge is not installed.
020 1005 024*	Fuel Delivery	0	1	Valve 1/Enable means Exhaust Temperature Gauge is installed.
Q30-1005-034*	Fuel Delivery	U	1	Valve 0/Disabled means Fuel Delivery Pressure Gauge is not installed.
Q30-1017-034**	Pressure Gauge			Valve 1/Enable means Fuel Delivery Pressure Gauge is installed.
Q30-1005-035*	Installed Fuel Filter Restriction	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
	Gauge Installed	U	'	fuel restriction gauge.
Q30-1017-035**	Gauge Installed			
				Value 0/Disabled means Fuel Filter Restriction Gauge is not installed.
020 4005 020*	Cararal Oil	0	4	Value 1/Enabled means Fuel Filter Restriction Gauge is installed.
Q30-1005-036*	General Oil	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of
Q30-1017-036**	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.
Q30-1005-037*	Primary Air Pressure	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
Q30-1017-037**	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.
Q30-1005-038*	Primary Fuel Level	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of
Q30-1017-038**	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.
Q30-1005-039*	PTO Oil Temperature	0	1	Valve 0/Disabled means gauge is not installed.
Q30-1017-039**	Gauge Installed			Valve 1/Enable means gauge is installed.
Q30-1005-040*	Secondary Air	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of
Q30-1017-040**	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.

CECU Parameter	Parameter	Min.	Max.	Explanation
Part Number	Description	Value	Value	·
Q30-1005-041*	Secondary Fuel Level	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
Q30-1017-041**	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.
Q30-1005-042*	Transfer Case Oil	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of the
Q30-1017-042**	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.
Q30-1005-043*	Transmission	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of
Q30-1017-043**	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.
Q30-1005-044*	Voltmeter Gauge	0	1	Parameter controls the functionality (output on CVSG bus and DTC's) of
Q30-1017-044**	Installed			the voltmeter gauge.
				Value 0/Disabled means Voltmeter Gauge is not installed.
				Value 1/Enabled means Voltmeter Gauge is installed.
Q30-1005-045*	Engine Retarder	0	1	Parameter is used to determine if the engine brake switch is installed.
Q30-1017-045**	Present			Value 0/Disabled means engine brake switches are not installed.
				Value 1/Enabled means engine brake switches are installed.
Q30-1005-046*	Engine Make	0	2	Parameter is used to determine what type of engine is installed.
Q30-1017-046**				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.
Q30-1005-047*	Engine Fan Override	0	1	Parameter is used to determine if the fan override switch is installed.
Q30-1017-047**	Present			Value 0/Disabled means engine fan override switch is not installed.
				Value 1/Enabled means engine fan override switch is installed.
Q30-1005-048*	Gear Display Present	0	1	Parameter is used to determine the presence of gear display on the
Q30-1017-048**				multifunction display.
				Value 0/Disabled means Gear Display functionality is not available in
				Multifunction Display.
				Value 1/Enabled means Gear Display functionality is available in
				Multifunction Display.
Q30-1005-050*	Headlamp Warning	0	1	Parameter controls "headlamp-left-on"-warning.
Q30-1017-050**	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.
Q30-1005-051*	Change Distance	0	1	Parameter controls whether or not the operator can change the units in
Q30-1017-051**	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.
Q30-1005-052*	Cluster Backlight Day	0	255	Parameter is used to set the intensity of the backlighting for the cluster
Q30-1017-052**	Value			when the lights are not on.
				Value 0 means minimum illumination.
				Value 255 means maximum illumination.

CECU Parameter	Parameter	Min.	Max.	
Part Number	Description	Value	Value	Explanation
Q30-1005-053*	CVSG Backlight Day	0	127	Parameter is used to set the intensity of the backlighting for the gauges
Q30-1017-053**	Value			when the lights are not on.
				Value 0 means minimum illumination.
				Value 127 means maximum illumination.
Q30-1005-054*	Dash Backlight Day	0	255	Parameter is used to set the intensity of the backlighting for the entire dash
Q30-1017-054**	Value			when the lights are not on.
				Value 0 means minimum illumination.
				Value 255 means maximum illumination.
Q30-1005-055*	Dash Dim With Dome	0	1	Parameter is used to determine if the dash backlighting should dim if the
Q30-1017-055**	Light			dome light is on.
				Value 0/Disabled means the functionality is disabled.
				Value 1/Enabled means the functionality is enabled.
Q30-1005-056*	Dot-Matrix Backlight	0	255	Parameter is used to set the intensity of the backlighting for the multifunction
Q30-1017-056**	Day Value			display when the lights are not on.
				Value 0 means minimum illumination.
				Value 255 means maximum illumination.
Q30-1005-057*	Cluster LCD Backlight	0	255	Parameter is used to set the intensity of the backlighting for the Liquid Crystal
Q30-1017-057**	Day Value			Display in the Tachometer and Speedometer when the lights are not on.
				Value 0 means minimum illumination.
				Value 255 means maximum illumination.
Q30-1005-058*	Transfer Case	0	1	Parameter is used to determine which type of transfer case temperature
Q30-1017-058**	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
000 4005 050#	D D O I I	-		Continental).
Q30-1005-059*	Park Brake Symbol In	0	1	Parameter is used to determine if the park brake symbol is available on the
Q30-1017-059**	Indication Bar			indicator bar located on the RH side of the multifunction display.
				Value 0/Disabled means park brake symbol will not be displayed.
Q30-1005-060*	PTO Control Present	0	1	Value 1/Enabled means park brake symbol will be displayed.
	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).
Q30-1017-060**				
				Value 0/Disabled means PTO Control functionality is disabled.
Q30-1005-061*	Cruise Control Set	0	1	Value 1/Enabled means PTO Control functionality is enabled. Parameter is used to display cruise control set speed on MFD.
Q30-1003-001	Speed Displayed	O	'	Value 0/Disabled means cruise control set speed will not be displayed.
	Opeca Displayed			' ' '
Q30-1005-062*	After Treatment	0	1	Value 1/Enabled means cruise control set speed will be displayed. Parameter is used to determine if the Diesel Particulate Filter (DPF)
Q30-1003-002 Q30-1017-062**	Regeneration Switch	O	'	aftertreatment regeneration force or inhibit switches are installed.
Q30-1017-002	regeneration owner			Value 0/Disabled means After Treatment Regeneration Switch is not
				installed.
				Value 1/Enabled means After Treatment Regeneration Switch is installed.
Q30-1005-063*	Remote PTO Present	0	1	Parameter is used to determine if the remote PTO switches are installed
Q30-1017-063**	The state of the s			(PACCAR engines only).
250 1017 000				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.
Q30-1005-064*	RPM Sweet Spot High	0	3000	Parameter is used to set the high limit for RPM sweet spot bargraph
Q30-1017-064**	Limit	-		displayed on the multifunction display.
QUU-1017-00 1				and the second contraction of the second con



CECU Parameter	Parameter	Min.	Max.	
Part Number	Description	Value	Value	Explanation
Q30-1005-065*	RPM Sweet Spot Low	0	3000	Parameter is used to set the low limit for RPM sweet spot bargraph
Q30-1017-065**	Limit			displayed on the multifunction display.
Q30-1005-066*	Transmission Make	0	4	Parameter is used to determine the type/make of transmission.
Q30-1017-066**				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.
Q30-1005-067*	Brake Applied	0	1	Parameter is used to determine if the brake application pressure sensor is
Q30-1017-067**	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.
Q30-1005-068*	Dome Light	0	1	Parameter is used to determine if the dome lamps are controlled by the LVD.
Q30-1017-068**	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.
Q30-1005-070*	Alarm Bell Symbol	0	2	Parameter is used to determine the status of the alarm bell symbol in the
Q30-1017-070**				multifunction 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.
Q30-1005-071*	Ignition Timer	5	90	Parameter is used to determine the maximum time the idle timer can be set
Q30-1017-071**	Maximum Time			to. The value can be set in one minute increments.
				Value 5 means five minutes.
				Value 90 means ninety minutes.
Q30-1005-072*	Voltage Trim Multiplier	0	999999	Parameter is used to trim or calibrate the voltmeter. This value is the
Q30-1017-072**				"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
000 1005 070*	V. H. T. Off 1	•	40000	correct value.
Q30-1005-073*	Voltage Trim Offset	0	10000	Parameter is used to trim or calibrate the voltmeter. This value is the "offset"
Q30-1017-073**				portion of the trim and has a range between 0 and 10000. See "Voltmeter
Q30-1005-074*	Low Voltage	0	1	Trim Procedure" following this chart, for steps to determine the correct value. Parameter is used to determine if a low voltage disconnect system is
	Disconnect Installed	O	'	installed. Value 0/Disabled means a LVD system is not installed. Value
Q30-1017-074**	Disconnect mistalled			1/Enabled means a LVD system is installed.
Q30-1005-075*	Engine Fan With Park	0	1	Parameter is used to determine if the engine fan will turn on whenever the
Q30-1017-075**	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.
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CECU Parameter	Parameter	Min.	Max.	Evale
Part Number	Description	Value	Value	Explanation
Q30-1005-076*	Primary Air Pressure	0	1	Parameter is used to determine if the primary air pressure is broadcast on
Q30-1017-076**	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.
Q30-1005-077*	Secondary Air	0	1	Parameter is used to determine if the secondary air pressure is broadcast
Q30-1017-077**	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
000 4005 070*	\/-\/\/\/\/\/\/\/\/\/	0	4	V-CAN.
Q30-1005-078*	Voltage on V-CAN	0	1	Parameter is used to determine if voltage is broadcast on the V-CAN.
Q30-1017-078**				Value 0/Disabled means voltage is not broadcast on the V-CAN.
O20 4005 070*	Driman, Fuel Level en	0	4	Value 1/Enable means voltage is broadcast on the V-CAN.
Q30-1005-079* Q30-1017-079**	Primary Fuel Level on V-CAN	U	1	Parameter is used to determine if the primary fuel level is broadcast on the V-CAN.
Q30-1017-079***	V-CAIN			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.
Q30-1005-082*	Smart Wheel Installed	0	1	Parameter is used to determine if a smart wheel is installed. This parameter
Q30-1017-082**				enables the cluster retarder lamp. This lamp is only enabled when the truck
000 1011 002				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.
Q30-1005-083*	Governed Speed	0	1	Parameter controls if the Governed speed limit transmitted by the Engine on
Q30-1017-083**	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.
Q30-1005-084*	Remote Accelerator	0	1	Parameter controls fault logging for Remote Accelerator input (C27 of
Q30-1017-084**	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
Q30-1005-085*	Axle Temperature	0	1	with valid data (or "Error" if a fault is occurring on the input). Parameter controls fault logging of analog input and gauge outputs to
	Steer Gauge Installed	U	'	CVSG. (For Peterbilt Only)
Q30-1017-085**	Sicci Gauge maialleu			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.

CECU Parameter	Parameter	Min.	Max.	
Part Number	Description	Value	Value	Explanation
Q30-1005-086*	Fleet ID Available	0	1	Parameter controls whether the Fleet ID is visible in the Truck Information
Q30-1017-086**				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
				it will not be visible.
Q30-1005-087*	Brake Type	0	1	Parameter controls the input used for brake signal within the CECU3, and
Q30-1017-088**				the polarity of the ABS telltale,
400 .0 000				Value 0/Air means that the Air Brake Application analog input is used and
				the ABS telltale is "lit with 12V".
				Value 1/Enable means that the Hydraulic Brake digital input is used and the
				ABS telltale is "lit with 0V".
Q30-1005-088*	Brake Vendor	0	1	Parameter controls the input used for brake signal within the CECU3, and
Q30-1017-089**	Drane venue.			the polarity of the ABS telltale.
Q00-1017-003				Value 0/Bendix means that the Air Brake Application analog input is used
				and the ABS telltale is "lit with 12V".
				Value 1/WABCO means that the Hydraulic Brake digital input is used and
				the ABS telltale is "lit with 0V".
Q30-1005-089*	OAT Source	0	1	Parameter controls the signal used to populate the LCD in the Tachometer,
	OAT COURCE			as well as all other CECU features that use temperature as part of the
Q30-1017-087**				algorithm.
				Value 0/CECU means that the analog input of the CECU is used (non-OBD
				lengines).
				Value 1/Engine means that the J1939 V-CAN input from the Engine will
				be used.
				CAUTION: Modifying the sensor or its location can impact
				vehicle performance, emissions, and/or reliability.
Q30-1005-090*	Diesel Emissions	0	1	Parameter controls fault logging and gauge needle if the DEF gauge is
Q30-1017-090**	Fluid Gauge Installed			installed.
Q00 1017 000				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.
Q30-1008-501	Editable Telltale 1			Used by ESA to select the Icon displayed in monitor and simulate modes.
400 .000 00 .	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.
	Icon ID			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.
	Icon ID			Does not effect any vehicle functions. Refer to Q30-1008 drawing.
Q30-1008-519	Editable Telltale 4			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.
Q30-1008-520	Editable Telltale 5			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.
Q30-1008-522	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.

CECU Parameter	Parameter	Min.	Max.	F. Janeton
Part Number	Description	Value	Value	Explanation
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.
Q30-1017-061**	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 highline while the Cruise Control is engaged.
Q30-1017-091**	Starter RPM	0	1	Parameter is used to control whether the Starter will be disabled when the
	Protection Enable			engine is 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
				starter to engage.
Q30-1017-092**	Starter Overcrank	0	1	Parameter is used to control whether the starter will be disabled due to
	Protection Enable			overuse.
				Value 0/Disabled means the starter will not be disabled due to overuse.
				Value 1/Enabled means the starter will be disabled if the starter is overused
				(cranking for 90s without sufficient cooldown).
Q30-1017-093**	Advanced ABS	0	1	Parameter is used to control whether Adaptive Cruise and Braking is
	Installed			supported.
				Value 0/Not Installed means Adaptive Cruise and Braking is not supported.
				Value 1/Installed means the Adaptive Cruise and Braking is supported.
Q30-1017-094**	Water In Fuel Warning	0	1	Parameter is used to control whether operator warnings for Water in Fuel
	Enabled			are enabled.
				Value 0/Disabled means the warning is disabled.
				Value 1/Enabled means the vehicle supports detection of water in fuel and
				the warning is enabled.

^{*} Valid for CECU Software Version P30-1002-XXX

^{**} Valid for CECU Software Version P30-1008-XXX

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.
- 2. 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.
- 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.
- 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

Procedure	Value	Worksheet Entry
STEP 3: Measured BATT Voltage Engine		Α
Off		
STEP 6: Measured BATT Voltage Engine		В
Running		
STEP 4: Displayed BATT Voltage Engine		С
Off		
STEP 7: Displayed BATT Voltage Engine		D
Running		

En	try		Entry			Res	sult
В		-		Α	=		Е
D		-		С	=		F
Е		+		F	=		G
С		х		G	=		Н
Α		-		Н	=		ı
ı		х	1,0	000	=		J
J		+	5,0	5,000			K
G		х	100,000		=		L
K		=	Voltmeter Trim Offset		fset Valu	е	
L		=	Vo	Itmeter 1	Γrim Mult	iplier Val	ue

8 How It Works

Functional Description		. 8 - 2
CU/CECU Architecture		. 8 - 3
Cluster Components		. 8 - 4
Commercial Vehicle Smart Gauges (CVSG)	•	8 - 10
nstruments and Controls Operation		8 - 13
nstrumentation Troubleshooting Procedures	•	8 - 15
Highline Diagnostic Codes		8 - 16

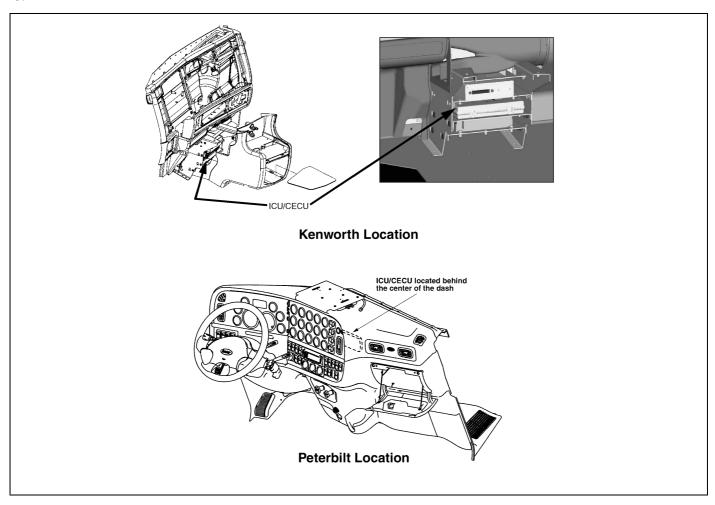
Functional Description

Instrumentation Control Unit/Cab Electronic Control Unit (ICU/CECU)

The heart of the multiplexed instrumentation system is the ICU/CECU. For the majority of

Typical ICU/CECU Locations

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



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



CAUTION: Don't cut or tap into green/yellow twisted pairs. Doing so will change the resistance in the J1939 circuit causing disruption of component communication on the databus. Only

use approved J1939 components with validated software.

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

ICU/CECU Architecture

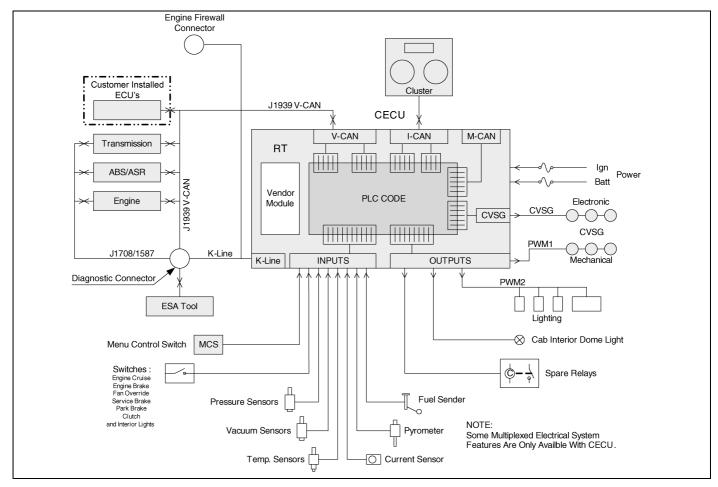
The software programming of the control unit can be grouped into three main types:

- 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.

CECU/CECU2 (P30-1002-XXX) and CECU3 (P30-1008-XXX) Block Diagram



NOTE: It is possible for the CECU to receive signals via the J1939 communications line from optional customer installed ECUs.

Refer to the appropriate reference literature for any customer installed ECU.



Cluster Components

The heart of the multiplexed instrumentation system is the ICU/CECU. For the majority of Peterbilt vehicles, the ICU/CECU is located behind the center of the dash, near the radio. For the majority of Kenworth vehicles, the ICU/CECU is located behind the center console. See Control Unit Locations for illustrations depicting the physical positioning 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-funtion Highline Display/Driver Information Display (if equipped), 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 ICU/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.

In models with separate parts, the power to the Speedometer and Tachometer is provided by the DWIM (Driver Warning and Information Module). Thus, if the connector behind the DWIM is removed, the power to these components will be removed also.

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 ICU/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 Multifunction Highline Display, the display will show the last screen that was displayed before the ignition was turned off.

NOTE: Before replacing the ICU/CECU or any gauges, check the wiring and fuses,
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.

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 ICU/CECU. Indirect telltales are turned ON and OFF during the Power On Self-Test at ignition. For these telltales, the ICU/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/DWIM is broken and the cluster/DWIM needs replaced because the individual LEDs are not serviceable.

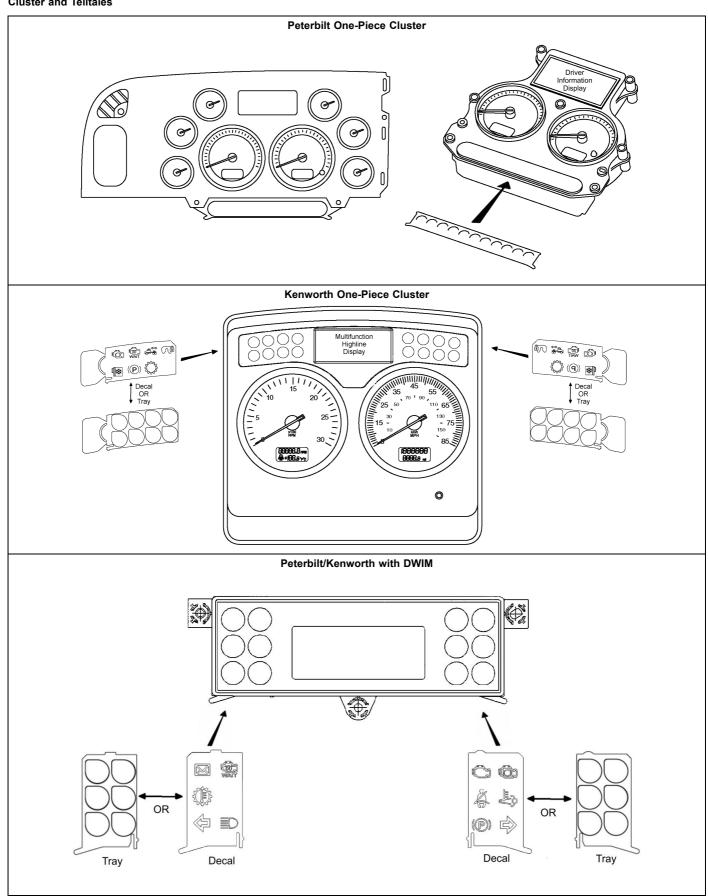
In some Peterbilt models equipped with a one-piece cluster, the Icon Tray slides into the bottom of the cluster. In other models equipped with separate parts, there are two icon trays that slide into the two sides of the Driver Warning Indicator Module (DWIM). In certain Peterbilt models, some telltales 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 other models equipped with separate parts, there are two icon trays that slide into the two sides of the Driver Warning Indicator Module (DWIM). In Kenworth models, there may be up to four telltales included in the Speedometer and Tachometer.

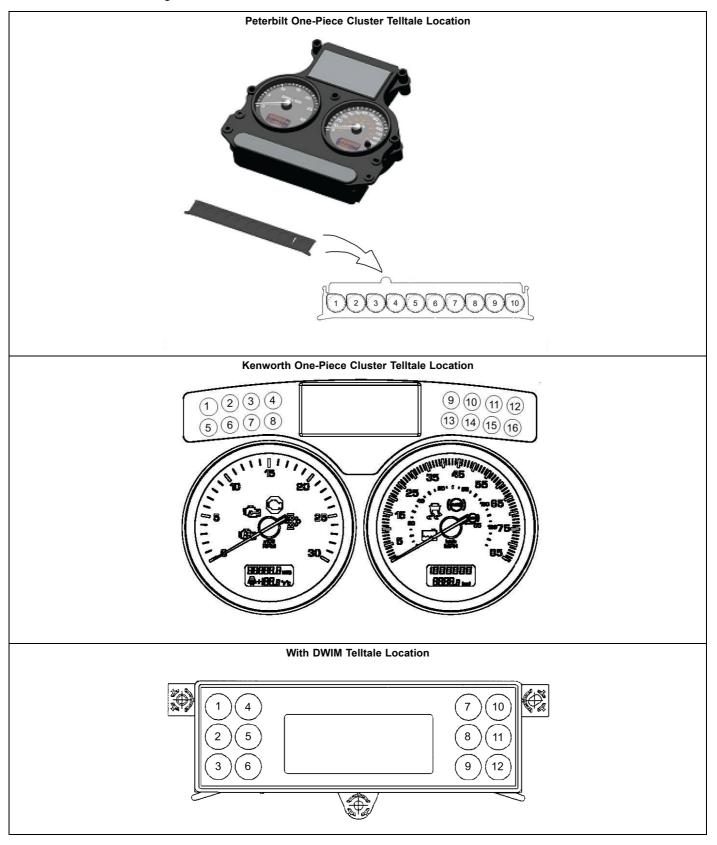
Incorporating the telltale icons onto removable pieces adds flexibility. This permits customizing the telltales according to the features on each chassis. In Kenworth trucks, the cluster and DWIM are shipped with a set of decals that meet 95% of the requirements for all chassis shipped. For the remaining 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



Location of Editable Telltale Lights



Editable Telltale Application

Editable Telltale Number	ICU Pin	CECU Pin	KW Cluster	KW DWIM	PB Cluster	PB DWIM
1	19	19	Position 4	Position 1	Position 2	Position 1
2	20	20	Position 7	Position 2	Position 3	Position 2
3	21	21	Position 8	Position 5	Position 4	Position 5
4	22	22	Position 9	n/a	Position 5	Position 8
5	23	n/a	Position 10	n/a	Position 7	Position 9
6	24	24	Position 12	n/a	Position 8	Position 10
7	25	25	Position 13	n/a	n/a	Position 11
8	26	26	Position 14	n/a	n/a	n/a
9	27	27	Position 16	n/a	n/a	n/a

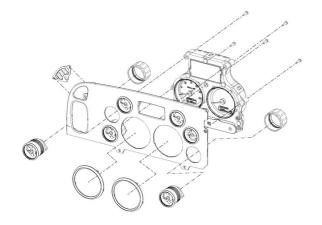
Commercial Vehicle Smart Gauges (CVSG)

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 ICU/CECU. CVSG's are electronic and mechanical. The electronic CVSG's receive digital data from the ICU/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 ICU/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.
- 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 ICU/CECU. Backlighting for the 2-inch electronic gauges is sent from the ICU/CECU to the gauges via the data link (Blue wire). The data link (blue wire) is also used to deliver information between the ICU/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 ICU/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 ICU/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 ICU/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.

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 and DWIM. 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 or DWIM 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

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
				DWIM connector (Telltale 7)
				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.			DWIM connector (Telltale 4)
				Pin 8 = 12V
				Pin 10 = GND
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	ITRIS lane	Refer to lane departure manual.	Pin 2 = 12V
	wire telltale gauge	departure 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.			5
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	
0.1.01.1	l/ " " " " "		Supplement.	D: 0 40/
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		

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 (H_2O). A clean filter should register 7 in. H_2O (may vary with system design) and a filter whose life is over registers approximately 25 in. H_2O .

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.

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	Type * Active
Air Starter Pressure	Mechanical	Active
Ammeter	Sensor	Active
Auxiliary Transmission Oil Temperature	Sensor	Passive
Brake Application Pressure	Sensor	Active
Brake Saver Application Air Pressure	Mechanical	Passive
Brake Saver Oil Temperature (Not		
available with EPA 2007 emission or	Sensor	
newer engines)		
Drive Axle Oil Temperature	Sensor	Passive
B: 151 (51:1	V-CAN	
Diesel Exhaust Fluid	(J1939)	
- · · · · · · ·	V-CAN	
Engine Coolant Temperature	(J1939)	Passive
Franks Oil Bassaus	V-CAN	
Engine Oil Pressure	(J1939)	
Francis and Transport	V-CAN	
Engine Oil Temperature	(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	Passive
Ivialiiola i ressure (Boost)	(J1939)	1 033146
Primary & Secondary Air Pressure	Sensor	
Pusher Axle Air Pressure	Mechanical	Active
Pyrometer (Exhaust Temperature) (Not		
available with EPA 2007 emission or	Sensor	
newer engines)		

In the second se		
Standard / Optional Input Source	Input Source	Sensor
Standard / Optional Input Source	input Source	Type *
Speedometer	V-CAN	Passive
Speedometer	(J1939)	rassive
Suspension Load Air Pressure	Mechanical	
	V-CAN	
Tachometer	(J1939)	
Tag Axle Air Pressure	Mechanical	
Trailer Brake Application Air Pressure	Mechanical	
Trailer Reservoir Air Pressure	Mechanical	
Transfer Case Oil Temperature	Mechanical	
Voltmeter	Internal Input	
volunetei	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).

Highline Diagnostic Codes

This section describes the Highline 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.

Highline 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
Rated Engine Power	Engine	166xx
Alternator Potential	Engine	167xx
Battery	Engine	168xx

Highline Text	Source	DTC
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
Injector Spill Valve 1	Engine	651xx
Injector Spill Valve 2	Engine	652xx
Injector Spill Valve 3	Engine	653xx

Highline Text	Source	DTC
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		
PTO Enable Switch	Engine Engine	979xx 980xx
Remote PTO Resume Switch		982xx
Remote PTO Set Switch	Engine	1
	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
Foot Brake Switch	Engine	1121xx
Post Intercooler Temp	Engine	1131xx
ECU Temp	Engine	1136xx
Turbo Inlet Temperature	Engine	1172xx
Turbo Wastegate Actuator	Engine	1188xx

Highline Text	Source	DTC
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	1715xx
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
Turbo 1	Engine	2629xx
Auxiliary Output 4	Engine	2646xx
Auxiliary Output 5	Engine	2647xx
EGR Mass Flow	Engine	2659xx
Turbo 1 Inlet	Engine	2789xx
Turbo 1 Output	Engine	2790xx
EGR	Engine	2791xx
VGT Position	Engine	2795xx
Engine Injector Calibration	Engine	2797xx
Air Shutdown Actuator	Engine	2813xx
Trans Crank Enable	Engine	2900xx
Intake Valve Oil Pressure	Engine	2948xx
Intake Valve Oil Pressure	Engine	2949xx
Intake Valve Oil Flessure	Engine	2950xx
Intake Valve Actuator 1	Engine	2951xx
Intake Valve Actuator 3	Engine	2952xx
Intake Valve Actuator 4	Engine	2953xx
Intake Valve Actuator 5	Engine	2954xx
Intake Valve Actuator 6	Engine	2955xx
Intake valve Actuator 0	LIIGIIIC	290000



Highline Text	Source	DTC
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	3484xx
DPF Purge Air Pressure	Engine	3486xx
DPF Air Pressure Control	Engine	3487xx
DPF Purge Air Actuator	Engine	3490xx
DPF Fuel Pressure	Engine	3494xx
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
ECU 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	3662xx
Engine Injector 5 Actuator 2	Engine	3663xx
Engine Injector 6 Actuator 2	Engine	3664xx
Particulate Trap Regen Inhibit Switch	Engine	3695xx
Particulate Trap Regen Force Switch	Engine	3696xx
Active Regen Switched Off	Engine	3703xx
Particulate Trap Regen Inhibited	Engine	3711xx
Particulate Trap Soot Load Percent	Engine	3719xx
Part Trap 1 Regen Not Available	Engine	3750xx
DPF Secondary Air Diff Pressure	Engine	3830xx
DPF Secondary Air Mass Flow	Engine	3832xx
NOx Limit Exceed Due to Quality	Engine	4094xx
NOx Limit Exceed Due to Quantity	Engine	4096xx
DPF Fuel Drain Voltage	Engine	4097xx

Highling Toyt	Source	DTC
Highline Text Aftertreatment DEF Tank Low Level	Source	5245xx
	Engine	5245XX
Indicator	Facility	50.40
Aftertreatment SCR Operator	Engine	5246xx
Inducement Severity		
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 DPF 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
OOL Ab but - D		
CGI Absolute Pressure	Engine	520197xx
CGI Absolute Pressure Connect Service Tool	Engine Engine	Any Other
	_	
Connect Service Tool	Engine	Any Other
Connect Service Tool Connect Service Tool	Engine Transmission	Any Other Any Other
Connect Service Tool Connect Service Tool Diff Lock Solenoid	Engine Transmission ABS	Any Other Any Other 564xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch	Engine Transmission ABS ABS	Any Other Any Other 564xx 576xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4	Engine Transmission ABS ABS ABS	Any Other Any Other 564xx 576xx 614xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4 System Voltage	Engine Transmission ABS ABS ABS ABS ABS	Any Other Any Other 564xx 576xx 614xx 627xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4 System Voltage ECU Fault	Engine Transmission ABS ABS ABS ABS ABS ABS	Any Other Any Other 564xx 576xx 614xx 627xx 629xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4 System Voltage ECU Fault ECU Fault	Engine Transmission ABS ABS ABS ABS ABS ABS ABS ABS	Any Other Any Other 564xx 576xx 614xx 627xx 629xx 630xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4 System Voltage ECU Fault ECU Fault J1939	Engine Transmission ABS	Any Other Any Other 564xx 576xx 614xx 627xx 629xx 630xx 639xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4 System Voltage ECU Fault ECU Fault J1939 SA LEFT Wheel Speed Sensor	Engine Transmission ABS	Any Other Any Other 564xx 576xx 614xx 627xx 629xx 630xx 639xx 789xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4 System Voltage ECU Fault ECU Fault J1939 SA LEFT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor	Engine Transmission ABS	Any Other Any Other 564xx 576xx 614xx 627xx 629xx 630xx 639xx 789xx 790xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4 System Voltage ECU Fault ECU Fault J1939 SA LEFT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor	Engine Transmission ABS	Any Other Any Other 564xx 576xx 614xx 627xx 629xx 630xx 639xx 789xx 790xx 791xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4 System Voltage ECU Fault ECU Fault J1939 SA LEFT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor DA LIEFT Wheel Speed Sensor	Engine Transmission ABS	Any Other Any Other 564xx 576xx 614xx 627xx 629xx 639xx 789xx 790xx 791xx 792xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4 System Voltage ECU Fault ECU Fault J1939 SA LEFT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor DA LEFT Wheel Speed Sensor DA RIGHT Wheel Speed Sensor	Engine Transmission ABS	Any Other Any Other 564xx 576xx 614xx 627xx 629xx 630xx 639xx 789xx 790xx 791xx 792xx 793xx 794xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4 System Voltage ECU Fault ECU Fault J1939 SA LEFT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor DA LEFT Wheel Speed Sensor DA RIGHT Wheel Speed Sensor AA LEFT Wheel Speed Sensor	Engine Transmission ABS	Any Other Any Other 564xx 576xx 614xx 627xx 629xx 639xx 789xx 790xx 791xx 792xx 793xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4 System Voltage ECU Fault ECU Fault J1939 SA LEFT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor DA LEFT Wheel Speed Sensor DA RIGHT Wheel Speed Sensor AA LEFT Wheel Speed Sensor AA LEFT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor AA LEFT Wheel Speed Sensor SA LEFT Wheel Speed Sensor SA LEFT Wheel Speed Sensor	Engine Transmission ABS	Any Other Any Other 564xx 576xx 614xx 627xx 629xx 630xx 639xx 789xx 790xx 791xx 792xx 793xx 794xx 795xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4 System Voltage ECU Fault ECU Fault J1939 SA LEFT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor DA LEFT Wheel Speed Sensor DA RIGHT Wheel Speed Sensor AA LEFT Wheel Speed Sensor AA LEFT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor SA RIGHT PMV	Engine Transmission ABS	Any Other Any Other 564xx 576xx 614xx 627xx 629xx 630xx 639xx 789xx 790xx 791xx 792xx 793xx 794xx 795xx 796xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4 System Voltage ECU Fault ECU Fault J1939 SA LEFT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor DA LEFT Wheel Speed Sensor DA RIGHT Wheel Speed Sensor AA LEFT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor SA LEFT PMV SA RIGHT PMV DA LEFT PMV	Engine Transmission ABS	Any Other Any Other 564xx 576xx 614xx 627xx 629xx 639xx 789xx 790xx 791xx 792xx 793xx 794xx 795xx 796xx 797xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4 System Voltage ECU Fault ECU Fault J1939 SA LEFT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor DA LEFT Wheel Speed Sensor DA RIGHT Wheel Speed Sensor AA LEFT Wheel Speed Sensor AA LEFT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor SA LEFT PMV DA LEFT PMV	Engine Transmission ABS	Any Other Any Other 564xx 576xx 614xx 627xx 629xx 639xx 789xx 790xx 791xx 792xx 793xx 794xx 795xx 796xx 797xx 798xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4 System Voltage ECU Fault ECU Fault J1939 SA LEFT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor DA LEFT Wheel Speed Sensor DA RIGHT Wheel Speed Sensor AA LEFT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor SA LEFT PMV SA RIGHT PMV DA LEFT PMV DA RIGHT PMV AA LEFT PMV	Engine Transmission ABS	Any Other Any Other 564xx 576xx 614xx 627xx 629xx 630xx 789xx 790xx 791xx 792xx 792xx 795xx 795xx 796xx 796xx 798xx 799xx 800xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4 System Voltage ECU Fault ECU Fault J1939 SA LEFT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor DA LEFT Wheel Speed Sensor DA RIGHT Wheel Speed Sensor AA LEFT Wheel Speed Sensor AA LEFT Wheel Speed Sensor AS RIGHT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor SA LEFT PMV SA RIGHT PMV DA LEFT PMV DA RIGHT PMV AA LEFT PMV Retarder Relay	Engine Transmission ABS	Any Other Any Other 564xx 576xx 614xx 627xx 629xx 630xx 639xx 789xx 790xx 791xx 792xx 794xx 795xx 796xx 797xx 798xx 799xx 799xx 800xx 801xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4 System Voltage ECU Fault ECU Fault J1939 SA LEFT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor DA LEFT Wheel Speed Sensor DA RIGHT Wheel Speed Sensor AA LEFT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor SA LEFT PMV SA RIGHT PMV DA LEFT PMV DA LEFT PMV AA LEFT PMV AA RIGHT PMV Retarder Relay Relay Diagonal 1	Engine Transmission ABS	Any Other Any Other 564xx 576xx 614xx 627xx 629xx 630xx 789xx 790xx 791xx 792xx 794xx 795xx 796xx 797xx 798xx 799xx 799xx 800xx 801xx 802xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4 System Voltage ECU Fault ECU Fault J1939 SA LEFT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor DA LEFT Wheel Speed Sensor DA RIGHT Wheel Speed Sensor AA LEFT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor AA RIGHT PMV DA RIGHT PMV DA RIGHT PMV AA RIGHT PMV Retarder Relay Relay Diagonal 1 TCV DA Solenoid	Engine Transmission ABS	Any Other Any Other 564xx 576xx 614xx 627xx 629xx 630xx 789xx 790xx 791xx 792xx 794xx 795xx 796xx 797xx 798xx 799xx 800xx 801xx 802xx 806xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4 System Voltage ECU Fault ECU Fault J1939 SA LEFT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor DA LEFT Wheel Speed Sensor DA RIGHT Wheel Speed Sensor AA LEFT Wheel Speed Sensor AA LEFT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor SA LEFT PMV SA RIGHT PMV DA LEFT PMV DA RIGHT PMV AA LEFT PMV ARIGHT PMV Retarder Relay Relay Diagonal 1 TCV DA Solenoid TCV SA Solenoid	Engine Transmission ABS	Any Other Any Other 564xx 576xx 614xx 627xx 629xx 630xx 789xx 790xx 791xx 792xx 794xx 795xx 796xx 797xx 798xx 799xx 800xx 801xx 802xx 806xx 807xx
Connect Service Tool Connect Service Tool Diff Lock Solenoid ASR Offroad Switch System Diagnostic Code 4 System Voltage ECU Fault ECU Fault J1939 SA LEFT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor DA LEFT Wheel Speed Sensor DA RIGHT Wheel Speed Sensor AA LEFT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor SA RIGHT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor AA RIGHT Wheel Speed Sensor AA RIGHT PMV DA RIGHT PMV DA RIGHT PMV AA RIGHT PMV Retarder Relay Relay Diagonal 1 TCV DA Solenoid	Engine Transmission ABS	Any Other Any Other 564xx 576xx 614xx 627xx 629xx 630xx 789xx 790xx 791xx 792xx 794xx 795xx 796xx 797xx 798xx 799xx 800xx 801xx 802xx 806xx

Stop Lamp Switch ABS 1045xx Trailer PMV ABS 1056xx SUSP Pressure Sensor ABS 1056xx Pressure Sensor ABS 1067xx Pressure Sensor Secondary Circuit ABS 1068xx Tires Size Out Of Range ABS 1069xx SAS Signal ABS 1808xx LAS Sensor ABS 1808xx LAS Sensor ABS 1809xx Connect Service Tool ABS Any Other Fuel Filter Restriction CECU 16xx Vehicle Speed Message Missing CECU 16xx Accel Pedal Message Missing CECU 11603 App. Air Pressure Sensor Open CECU 11603 App. Air Pressure Sensor Short CECU 11604 General Brake Fault CECU 11603 Pri. Air Pressure Sensor Open CECU 11704 Sec. Air Pressure Sensor Short CECU 11704 Sec. Air Pressure Sensor Short CECU 11803 Sec. Air Pressure Sensor Short CE	Highline Text	Source	DTC
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Highling Toyt	Source	DTC
Highline Text		
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

12 Troubleshooting

DIAGNOSTIC TROUBLE CODES	12 - 3
TROUBLESHOOTING PROCEDURES	12 - 14
Databus Gauge(s) Inoperative	12 - 15
Primary Air Pressure Gauge Inoperative	12 - 18
Secondary Air Pressure Gauge Inoperative	12 - 22
Application Air Pressure Gauge Inoperative	12 - 26
Air Filter Restriction Pressure Gauge Inoperative	12 - 30
Fuel Filter Restriction Pressure Gauge Inoperative	12 - 34
Ammeter Gauge Inoperative	12 - 38
Pyrometer Gauge Inoperative	12 - 42
Front Drive Axle Oil Temperature Gauge	12 - 47
Rear Drive Axle Oil Temperature Gauge Inoperative	9 12 - 52
Center Drive Axle Oil Temperature Gauge Inoperative	12 - 57
Transmission Oil Temperature Gauge Inoperative	12 - 62

Auxiliary Transmission Oil Temperature Gauge Inoperative.	e 12 - 6	67
Transfer Case Oil Temperature Gauge Inoperative	12 - 7	'2
Brake Saver Oil Temperature Gauge Inoperative	12 - 7	7
General Oil Temperature Gauge Inoperative	12 - 8	31
Primary Fuel Gauge Inoperative	12 - 8	86
Secondary Fuel Gauge Inoperative .	12 - 9	0
Engine Related DTCs	12 - 9	4
Outside Air Temperature Display Inoperative	12 - 9)6
CVSG Supply Open or Shorted	12 - 10	0
Dash Dimmer Input Open or Shorted, Dash Dimmer Output Shorted	12 - 10	2
Lite Diagnostic Procedure	12 - 10)4
Lite Terminating Resistor Test Procedure	12 - 10)5
Lite Short Circuit Test Procedure	12 - 10)6
Lite Short to Chassis Ground Test Procedure	12 - 10	7
Lite Open Circuit Test Procedure	12 - 10	8
Lite Diagnostic Procedures Conclusion	12 - 10	9

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 ICU/CECU.

ESA will:

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

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

DTC	ICU/CECU	Item / System	Description	Detailed Description
1603	ICU/CECU	Fuel Filter Restriction	Open in fuel filter restriction	This DTC will be recorded when the control unit sees
			circuit	an 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
				control unit located behind the cup holder through the
				IP harness, chassis harness and sender extension
				harness to the sensor on the fuel filter.
1604	ICU/CECU	Fuel Filter Restriction	Short in fuel filter restriction	This DTC will be recorded when the control unit sees
			circuit	a 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 control unit located behind the cup
				holder through the IP harness, chassis harness and
				sender extension harness to the sensor on the fuel filter.
7703	ICU/CECU	Rear Drive Oil Temp	Open in rear drive axle oil	This DTC will be recorded when the control unit sees
			temp circuit	an 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 control unit
				located behind the cup holder through the IP harness,
				chassis harness and rear axle harness to the sensor on
				the rear drive axle.
7704	ICU/CECU	Rear Drive Oil Temp	Short in rear drive axle oil	This DTC will be recorded when the control unit sees
			temp circuit	a 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 control unit
				located behind the cup holder through the IP harness,
				chassis harness and rear axle harness to the sensor on
				the rear drive axle.
7803	ICU/CECU	Center Drive axle Oil	Open in center drive axle oil	This DTC will be recorded when the control unit sees
		Temp	temp circuit	an 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 control unit
				located behind the cup holder through the IP harness,
				chassis harness and rear axle harness to the sensor on
				the center drive axle.

DTC	ICU/CECU	Item / System	Description	Detailed Description
7804	ICU/CECU	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 control unit
				located behind the cup holder through the IP harness,
				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	ICU/CECU	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	ICU/CECU	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
0.100	05011		A 1 (B 11B ;;;	in a connector, or sensor failure.
9109	CECU	Accelerator Pedal	Accelerator Pedal Position	This DTC will be recorded when the control unit does
		Position Message	Message missing	not see the Accelerator Pedal Position Speed message
				from 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
10702	ICHICECH	Air Filter Destriction	Onen in air filter restriction	holder through the IP harness to the engine harness.
10703	ICU/CECU	Air Filter Restriction	Open in air filter restriction	This DTC will be recorded when the control unit sees
			circuit	an 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
10704	ICU/CECU	Air Filter Restriction	Short in air filter restriction	the air junction block. This DTC will be recorded when the control unit sees
10704	ICO/CECO	WILL INCOLL CONTROLL	circuit	a short to +5V at the air filter restriction sensor input.
			Circuit	Some possible causes for this are a pinched wire, water
				1 ' '
				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.

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1604 ICU/CECU Application Air Pressure Short in application air pressure circuit The Writing of the Control unit located behind the cup holder through the IP harmess to the sensor on the air junction block.					air pressure sensor input. Some possible causes for this
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11704 ICU/CECU Application Air Pressure pressure or croult sensor in put. 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 harmess to the sensor on the air junction block. 11703 ICU/CECU Primary Air Pressure Circuit Short in primary air pressure in put. Some possible causes for this are a process or short to ground at the primary air pressure sensor input. Some possible causes for this are a process or short to ground at the primary air pressure sensor input. Some possible causes for this are a process or short to ground at the primary air pressure sensor input. Some possible causes for this are a process or short to ground at the primary air pressure circuit Short in primary air pressure a short to +5V at the primary air pressure sensor input. The primary air pressure sensor input. Some possible causes for this are a prinched wire, we in a connector, or sensor failure. The wiring for this sensor runs from the control unit located behind the cup holder through the lipharess to the sensor on the air junction block. 11803 ICU/CECU Secondary Air Pressure Pressure Circuit Pressure Circuit Pressure Circuit Pressure Pressure Circuit Pressure Pressure Circuit Pressure Pressure Circuit Pressure Circuit Pressure Pres					the control unit located behind the cup holder through
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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 harnes the sensor on the air junction block. 11703 ICU/CECU Primary Air Pressure circuit 11704 ICU/CECU Primary Air Pressure 11704 ICU/CECU Primary Air Pressure 11705 Short in primary air pressure circuit 11706 Short in primary air pressure circuit 11706 Short in primary air pressure circuit 11707 Short in primary air pressure circuit 11708 Short in primary air pressure circuit 11709 Short in primary air pressure circuit 11800 ICU/CECU Secondary Air Pressure 11800 ICU/CECU Secondary Air Pressure 11800 Short in primary air pressure circuit 11800 Short in primary air pr				pressure circuit	short to +5V at the tractor brake application air pressure
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International Content Inte					pinched wire, water in a connector, or sensor failure.
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11703 ICU/CECU Primary Air Pressure circuit Sean open or short to ground at the primary air pressure an 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, on sensor failure. The wiring for this sensor until sea a propen or short to ground at the primary air pressure sensor input. Some possible causes for this are a prinched wire, corroded or disconnected connector, or sensor failure. The wiring for this sensor until sea a short to 45V at the primary air pressure sensor in the air junction block. 11803 ICU/CECU Secondary Air Pressure Open in secondary air pressure sensor or the air junction block. 11804 ICU/CECU Secondary Air Pressure Open in secondary air pressure open or short to ground at the secondary air pressure of this are a broken wire, corroded or disconnected connector, or sensor failure. The wiring for this sensor input. Some possible causes for this are a broken wire, corroded or disconnected connector, or sensor failure. The wiring for this sensor input. Some possible causes for this are a broken wire, corroded or disconnected connector, or sensor failure. The wiring for this sensor input. Some possible causes for this are a broken wire, corroded or disconnected connector, or sensor failure. The wiring for this sensor input. Some possible causes for this are a broken wire corrod when the control unit sees short to +5V at the secondary air pressure sensor in some possible causes for this are a prinched wire, wire a connector, or sensor failure. The wiring for this sensor uns from the control unit located behind the indicer through the IP harness to the sensor on the air junction block. 11802 CECU Ignition Power Ignition Power is in an indeterminate state 11803 ICU/CECU Ignition Power Ignition Power is in an indeterminate state 11804 ICU/CECU Ignition Power Ignition Power Ignition sense wire comes from the control unit see between 33% and 66% of battery voltage on the ignit pin. A possible cause fo					located behind the cup holder through the IP harness to
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	em load,
supplied for the power distribution box near the	wer is
left foot through the IP harness to the control u	unit behind
the cup holder.	
17102 ICU/CECU Outside Air Temp Outside air temp message This DTC will be recorded when the CAN sign	
from engine error outside air temperature sensor from the engin	
invalid range. Some possible causes for this a	are broken
wire or sensor failure.	
CAUTION: Modifying the sensor of	or ite
location can impact vehicle perform	
emissions, and/or reliability.	mance,
17103 ICU/CECU Outside Air Temp Open in outside air temp This DTC will be recorded when the control un	nit sees an
circuit open at the outside air temperature sensor in	
possible causes for this are a broken wire, co	•
disconnected connector, or sensor failure. The	
for this sensor runs from the control unit locat	•
the cup holder through the IP harness and le	
mirror harness to the sensor on the mirror.	
17104 ICU/CECU Outside Air Temp Short in outside air temp This DTC will be recorded when the control u	unit sees
circuit a short to ground at the outside air temperatu	ure sensor
input. Some possible causes for this are a pin	
water in a connector, or sensor failure. The w	
this sensor runs from the control unit located	_
cup holder through the IP harness and left ha	
harness to the sensor on the mirror.	and mirror

DTC	ICU/CECU	Item / System	Description	Detailed Description
17131	ICU/CECU	Outside Air Temp	Outside air temp message	This DTC will be recorded when the control unit does
			from engine missing	not 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.
				location can impact vehicle performance,
17303	ICU	Exhaust Temp	Open in exhaust temp circuit	emissions, and/or reliability. This DTC will be recorded when the control unit sees
17000	100	Exhaust remp	Open in exhaust temp on our	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	ICU	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	ICU/CECU	Transmission Oil Temp	Open in transmission oil temp	This DTC will be recorded when the control unit sees
			circuit	an 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
47704	1011/05011	T : 0"T	01 1: 1 : 11	harness to the sensor on transmission.
17704	ICU/CECU	Transmission Oil Temp	Short in transmission oil temp	This DTC will be recorded when the control unit sees
			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 Economy	This DTC will be recorded when the control unit does
.5.55	0200	Economy message	message missing	not see the Instantaneous Fuel Economy 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.
		<u> </u>		the engine namess.

DTC	ICU/CECU	Item / System	Description	Detailed Description
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	ICU/CECU	Engine VIN	MX Engine and CECU3 VIN	This DTC will be recorded when the VIN of the MX
		Valid for 2010 emissions	mismatch	Engine does not match the VIN of the CECU3. This
		compliant engines		could be caused by swapping Engine controllers or
		CECU3		CECU3's without correctly reprogramming them.
24510	ICU/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
		Operation	Operation message	not 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	ICU/CECU	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 control unit located behind
				the cup holder through the IP harness 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	ICU/CECU	Item / System	Description	Detailed Description
44104	ICU/CECU	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 control unit located behind the cup
				holder through the IP harness 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	ICU/CECU	Aux Transmission Temp	Open in aux transmission	This DTC will be recorded when the control unit sees
			temp circuit	an 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	ICU/CECU	Aux Transmission Temp	Short in aux transmission	This DTC will be recorded when the control unit sees
			temp circuit	a 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 control unit located behind the cup holder through
				the IP harness, chassis harness and sensor extension
				harness to the sensor on auxiliary transmission.
57803	ICU/CECU	Forward Drive Oil Temp	Open in forward drive axle oil	This DTC will be recorded when the control unit sees an
			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 control unit
				located behind the cup holder through the IP harness,
				chassis harness and rear axle harness to the sensor
				on the forward drive axle.
57804	ICU/CECU	Forward Drive Oil Temp	Short in forward drive axle oil	This DTC will be recorded when the control unit sees a
			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 control unit
				located behind the cup holder through the IP harness,
				chassis harness and rear axle 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
			Load	an 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	ICU/CECU	Item / System	Description	Detailed Description
67806	ICU/CECU	CVSG / MCS Supply	CVSG / MCS supply Shorted	This DTC will be recorded when the sees a short to
			to ground	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	ICU	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	ICU/CECU	Primary Fuel	Open in primary fuel level	This DTC will be recorded when the control unit sees
		,	circuit	an 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 control unit located behind the
				cup holder through the IP harness, chassis harness and
				sender extension harness to the sensor on fuel tank.
82904	ICU/CECU	Primary Fuel	Short in primary fuel level	This DTC will be recorded when the control unit sees
			circuit	a 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 control unit located behind the cup
				holder through the IP harness, chassis harness and
				sender extension harness to the sensor on fuel tank.
83003	ICU/CECU	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 control unit located behind the
				cup holder through the IP harness, firewall jumper and
				sender extension harness to the sensor on fuel tank.
83004	ICU/CECU	Secondary Fuel	Short in secondary fuel level	This DTC will be recorded when the control unit sees
00001	100,0200	Cocondary 1 doi	circuit	a short to ground at the secondary fuel level sensor
			ondat	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
				sender 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
	5_55	Distance Message	Distance message missing	not see the High Resolution Vehicle Distance message
		5.555656496		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
			1	the engine harness.

DTC	ICU/CECU	Item / System	Description	Detailed Description
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	ICU/CECU	I-CAN	Control Unit cannot read	This DTC will be recorded when the control unit cannot
			messages from Cluster on	read messages from the cluster. Some possible causes
			I-CAN	for this 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	ICU	Brake Saver Oil Temp	Open in brake saver oil temp	This DTC will be recorded when the control unit sees
			circuit	an 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	ICU	Brake Saver Oil Temp	Short in brake saver oil temp	This DTC will be recorded when the control unit sees
			circuit	a 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	ICU/CECU	Transfer Case Oil Temp	Open in transfer case oil	This DTC will be recorded when the control unit sees
			temp circuit	an 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 control unit
				located behind the cup holder through the IP harness,
				firewall jumper and sensor extension harness to the
				sensor on transfer case.
138804	ICU/CECU	Transfer Case Oil Temp	Short in transfer case oil	This DTC will be recorded when the control unit sees
			temp circuit	a short to ground at the transfer case oil temperature
				sensor input. Some possible causes for this are a
1				pinched wire, water in a connector, or sensor failure.
				The wiring for this sensor runs from the control unit
				The wiring for this sensor runs from the control unit located behind the cup holder through the IP harness,
				_

DTC	ICU/CECU	Item / System	Description	Detailed Description
148109	ICU/CECU	V-CAN	Control unit cannot read	This DTC will be recorded when the control unit
			messages from ABS on	cannot read messages from the ABS system. Some
			V-CAN	possible causes for this are a broken wire, corroded or
				disconnected connector, no terminating resistors, no
				power to the ABS system or ABS ECU failure.
148209	ICU/CECU	V-CAN	Control Unit cannot read	This DTC will be recorded when the control unit cannot
			messages from Transmission	read messages from the transmission ECU. Some
			on V-CAN	possible causes for this are a broken wire, corroded or
				disconnected connector, no terminating resistors, no
				power to the Transmission or Transmission ECU failure.
148309	ICU/CECU	V-CAN	Control Unit cannot read	This DTC will be recorded when the control unit
			messages from Engine on	cannot read messages from the engine ECU. Some
			V-CAN	possible causes for this are a broken wire, corroded or
				disconnected connector, no terminating resistors, no
				power to the engine or engine ECU failure.
148703	ICU/CECU	Dash Light Dimmer	Open in dash dimmer input	This DTC will be recorded when the control unit sees
			circuit	an 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	ICU/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	ICU/CECU	Dash Light Dimmer	Short in dash dimmer output	This DTC will be recorded when the sees a short
			#1 circuit	to ground 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	ICU/CECU	Dash Light Dimmer	Short in dash dimmer output	This DTC will be recorded when the sees a short
			#2 circuit	to ground 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.
176102	CECU	Diesel Exhaust Fluid	Diesel Exhaust Fluid Level	This DTC will be recorded when the control unit
			Message Error	receives an invalid range on the diesel exhaust fluid
				level message from the engine ECU or does not receive
				the message in a timely manner.

DTC	ICU/CECU	Item / System	Description	Detailed Description
257903	ICU/CECU	Battery Current	Open in ammeter sensor	This DTC will be recorded when the control unit
			circuit	sees an 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 jumper from main cab breaker to the batteries.
257904	ICU/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 jumper from main cab breaker
				to the batteries.
524502	CECU	Diesel Exhaust Fluid	Diesel Exhaust Fluid Telltale	This DTC will be recorded when the control unit receives
			Message Error	an 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
				Inducement Severity.

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.

Databus Gauge(s) Inoperative

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

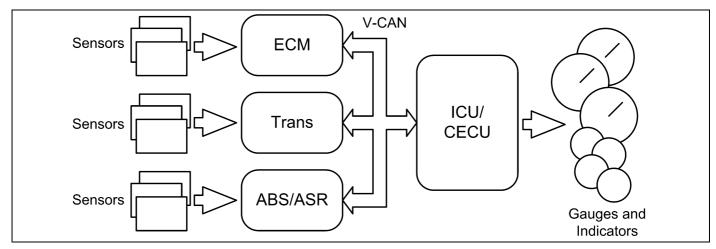
Symptom: One or more of the following gauges inoperative. All other non-V-CAN gauges are operational.

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

- Tachometer
- 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.

NOTE: 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.	NOTE: For vohicles with a CECUL use the "Brogger" feeture in ESA to
	until the pointers on	Vehicle gauge reading(s) are in	NOTE: For vehicles with a CECU, use the "Program" feature in ESA to
	the gauge images	the same range as the ESA gauge	make sure that the parameter for the inoperative gauge is enabled.
	are approximately	image(s). Go to Step 3-7.	An inoperative gauge may simply have its CECU parameter set to disabled.
	mid-scale. Observe		
	vehicle gauge		Check CVSG data link wiring: Observe Gauge position in the wiring
	movement.		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 ICU/CECU connector C.
			3. Check continuity between Pin 3 on gauge harness connector and Pin 15
			of the 52 Pin ICU/CECU 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 Test
			ICU/CECU and perform "Simulate" test again.
			If gauge functions properly test is complete. Install new
			ICU/CECU 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 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 -	Indicates the problem could be an open or short in the wiring from the
	view "Active" diagnostic	ICU/CECU cannot read messages	ICU/CECU to the Engine ECU. In addition, J1939 components such as
	trouble codes.	from Engine on V-CAN.	Terminating 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 -	Indicates the problem could be an open or short in the wiring from the
		ICU/CECU cannot read messages	ICU/CECU to the ABS ECU. In addition, J1939 components such as
		from ABS on V-CAN.	Terminating Resistors 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 -	Indicates the problem could be an open or short in the wiring from the
		ICU/CECU cannot read messages	ICU/CECU to the Transmission ECU. In addition, J1939 components such
		from Transmission on V-CAN.	as Terminating 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 J1939 Diagnostics
			section and return to Step 2 above.
		"Inactive" DTCs or No DTCs	Indicates two possible sets of causes for fault.
		displayed.	Indicates the problem could be caused by faulty data from Engine ECU.
			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 wiring on chassis or engine
			harness
			(2) Missing signal from Engine ECU.
			(a) Faulty Engine ECU hardware
			(b) Faulty Engine ECU software
			ii. If data from the Engine ECU is displayed on the OE Diagnostic
			Tool: Check to insure Engine data has been transmitted over
			J1939 circuits as opposed to J1587 circuits. Go to J1939
			Diagnostics. Correct faults found in J1939 Diagnostics section
			and return to Step 2 OR
			Connect test Engine ECU to determine if original ECU has
			failed. Go to Step 2 .
			Indicates the problem could be intermittent in nature. Proceed with
			diagnosis of inactive codes while looking for loose connectors, terminals
			or bare wiring that might make occasional contact with metal parts or
			other wires. Technicians may need to manipulate connectors to find
			intermittent connections. Go to J1939 Diagnostics. Correct faults found
L		<u> </u>	in J1939 Diagnostics section and return to Step 2 above.

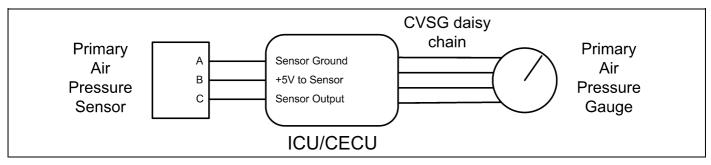
Primary Air Pressure Gauge Inoperative

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.



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 5
	pointer on the gauge		NOTE: For vehicles with a CECU, use the "Program" feature in ESA to
	image is approximately		make sure that the parameter for the inoperative gauge is enabled.
	mid-scale. Observe		An inoperative gauge may simply have its CECU parameter set to
	vehicle gauge	Valeinia anno ann adirentia in the	disabled.
	movement.	Vehicle gauge reading is in the	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.
			 Check continuity between Pin 1 on gauge harness connector and Pin 14 of the 52 Pin ICU/CECU connector C.
			 Check continuity between Pin 3 on gauge harness connector and Pin 15 of the 52 Pin ICU/CECU connector C.
			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.

good gauge and perform "Simulate" test again. i. If gauge functions properly test is complete. Install new gau permanently. Re-test and return truck to service. ii. If gauge does not function during "Simulate" test, install new (CU/CECU and perform "Simulate" test, install new (CU/CECU and perform "Simulate" test gain. (1) if gauge functions properly test is complete. Install new (CU/CECU permanently. Re-test and return truck to service. 2) If gauge does not function during "Simulate" test gain. (1) if gauge functions properly test is complete. Install new (CU/CECU permanently. Re-test and return truck to service. 3) Verify gauge functionsility. 4 Select "Diagnose" to view "Active" primary air pressure gauge diagnostic trouble codes. 4 Select "Diagnose" to view "Active" primary air pressure gauge diagnostic trouble codes. 5 Using a digital codes. 5 Using a digital codes. 5 Using a digital codes. 6 Concector. 6 Pin A – Ground Pin B – Input Voltage and Perform "Simulate" test quain. 7 In 1704 displayed — Short in primary air pressure circuit. 5 Using a digital content of the primary air pressure circuit. 5 Using a digital content of the primary air pressure circuit. 6 Sensor Ground! - There should multimeter, check the control with teses and permanent connector primal primary air pressure circuit. 5 Using a digital content of the primary air pressure sensor input. The fault is recorded when the control unit sees an open or short to ground at the primary air pressure sensor input. The fault is recorded when the voltage a tempor or possible sensor locations. 5 Using a digital connector. 6 Pin A – Ground Pin B – Input Voltage) - Input voltage a tempor or possible sensor locations. 7 See Harness Interface to the primary air pressure sensor input. The fault is recorded when the control unit sees a short to +6V at the primary air pressure sensor input. The fault is recorded when the control unit sees a short to +6V at the primary air pressure sensor input. The fault is recorded when the control uni	Step	Check	Result	Next Step
permanently. Re-test and return truck to service. ii. If gauge does not function during "Simulate" test, install Test ICUCECU and perform "Simulate" test again. (1) If gauge functions properly test is complete. Install new ICUCECU permanently. Re-test and return truck to service. (2) If gauge functionality. b. Return truck to service. 7. Is this a recheck after \$\$ bp, \$\$ top \$\$ or \$\$ top \$7\$ e. Wern Year truck to service. 8. No, "Gauge and CVSG data link wiring is not the problem. Go to \$\$ top \$7\$ e. Wes. Return truck to service. 9. No, "Gauge and CVSG data link wiring is not the problem. Go to \$\$ top \$7\$ e. Wes. Return truck to service. 1. Is this a recheck after \$\$ bp, \$\$ top \$\$ or \$\$ top \$7\$ e. Wes. Return truck to service. 1. Is this a recheck after \$\$ bp, \$\$ top \$\$ or \$\$ top \$7\$ e. Wes. Return truck to service. 2. Is this a recheck after \$\$ bp, \$\$ top \$\$ or \$\$ top \$7\$ e. Wes. Return truck to service. 3. Verify gauge functionality. 4. Select "Diagnose" to we've "Active" primary air pressure gauge des not function properly during "Simulate" test and return truck to service. 7. Is this a recheck after \$\$ bp, \$\$ top \$\$ or \$\$ top \$7\$ e. Wes. Return truck to service. 8. No, Gauge and CVSG data link wiring is not the problem. Go to \$\$ top \$4\$ or \$\$ top \$7\$ e. Wes. Return truck to service. 9. No "Active" DTCs displayed. —Open in primary air pressure sensor. Go to \$\$ top \$2\$ or \$\$ top \$7\$ e. Wes. Return truck to service. 1. In Indicates the problem could be a defective sensor, poor ground or no input output voides at the entry in the control unit sees an open or short to ground at the primary air pressure sensor input. The fault is recorded when the control unit sees as short to +5V at the primary air pressure sensor input. The fault is recorded when the voitage at the input is above 4.9 voits. 5. Using a digital multimeter, check the ground terminal. See MultiMeter Graphic below. See Connector. Pin C — Output Voitage on Sees and selective sensor connector Pin A and the ground terminal. See to th				
ICLUCECU and perform "Simulate" test again. (1) If gauge functions properly test is complete. Install new ICLUCECU peramently. Re-test and return truck to service. Comercial against truck is properly test in complete. Install new ICLUCECU and perform "Simulate" test replace gauge.				
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. 4 Select "Diagnose" to view "Active" DTCs displayed. DTC 11703 displayed — Open in primary air pressure gauge diagnostic trouble codes. DTC 11704 displayed — Short in primary air pressure serve incruit. DTC 11704 displayed — Short in primary air pressure sensor input. The fault is recorded when the voltage at the input is below. 1 volts. DTC 11704 displayed — Short in primary air pressure sensor input. The fault is recorded when the voltage at the input is below. 1 volts. DTC 11704 displayed — Short in primary air pressure sensor input. The fault is recorded when the voltage at the input is below. 1 volts. DTC 11704 displayed — Short in primary air pressure sensor input. The fault is recorded when the voltage at the input is below. 1 volts. See Connector. Pin A — Ground Pin B — Input Voltage Pin C — Output Voltage See Harness Interface Diagrams for possible sensor locations. See Connector Identification of the electrical connectors of IcU/CECU bisensor output voltage at sensor connector Pin B should be the electrical connectors of IcU/CECU placut for terminal details of the IcU/CECU leictrica connectors of IcU/CECU leictrica connectors of IcU/CECU leictrica connectors of the Icu/CECU leictrica connectors seal back to expose terminal ends.				ICU/CECU and perform "Simulate" test again. (1) If gauge functions properly test is complete. Install new ICU/CECU permanently. Re-test and return truck to service. (2) If gauge does not function properly during "Simulate" test, replace gauge.
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. No "Active" primary air pressure gauge diagnostic trouble codes. DTC 11703 displayed – Open in primary air pressure gauge diagnostic trouble codes. DTC 11704 displayed – Short in primary air pressure sensor input. The fault is recorded when the control unit sees an open or short to ground at the primary air pressure sensor input. The fault is recorded when the control unit sees a short to +5V at the primary air pressure sensor input. The fault is recorded when the control unit sees a short to +5V at the primary air pressure sensor input. The fault is recorded when the control unit sees a short to +5V at the primary air pressure sensor input. The fault is recorded when the control unit sees a short to +5V at the primary air pressure sensor input. The fault is recorded when the control unit sees a short to +5V at the primary air pressure sensor input. The fault is recorded when the control unit sees a short to +5V at the primary air pressure sensor input. The fault is recorded when the control unit sees an open or short to ground at the primary air pressure sensor input. The fault is recorded when the control unit sees an open or short to ground at the primary air pressure sensor input. The fault is recorded when the control unit sees an open or short to ground at the primary air pressure sensor input. The fault is recorded when the control unit sees an open or short to ground at the primary air pressure sensor input. The fault is recorded when the control unit sees an open or short to ground at the primary air pressure sensor input. The fault is recorded when the control unit sees an open or short to ground at the primary air pressure sensor input. The fault is recorded when the control unit sees an open or short to primary air pressure sensor input. The fault is recorded when the control unit sees an open or short to grou				
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. 1 Select "Diagnose" to view "Active" primary air pressure gauge diagnostic trouble codes. 1 DTC 11703 displayed — Open in primary air pressure circuit. 1 DTC 11704 displayed — Short in primary air pressure circuit. 1 DTC 11704 displayed — Short in primary air pressure circuit. 2 Using a digital multimeter, check the ground, input and output voltage at the input is below. 1 volts. 3 Using a digital multimeter, check the ground, input and output voltage becomes onnector. 5 Using a digital multimeter, check the ground, input and output voltage becomes onnector. Pin A and ground terminal. See Connector. 1 Pin A — Ground Pin B – Input Voltage Pin C — Output Voltage. See Harness Interface Diagrams for possible sensor locations. 2 See Connector (Pin B) should be +5 volts. See MultiMeter Graphic below. 3 See Connector (Pin B) should be +5 volts. See MultiMeter Graphic below. 4 Select "Diagnose" to view even the sensor connector round (Pin A) and a cab ground terminal. See humber of ground (Pin A) and a cab ground terminal. See humber of ground (Pin A) and a cab ground terminal. See humber of ground (Pin B) should be +5 volts. See MultiMeter Graphic below. 5 See Connector (Pin B) should be +5 volts. See MultiMeter Graphic below. 6 See Connector (Pin B) should be +5 volts. See MultiMeter Graphic below. 6 See Connector (Pin C) will vary depending on air pressure, but should be more than 1 volts and less than 4.9 volts. 9 See MultiMeter Graphic and Table below. 1 Volts and less than 4.9 volts. 1 Worte: Do not unplug san secessary. Go to Step 2. 2 Check input voltage at Pin B, check for voltage on Pin 1 of the 5 Pin ICU/CECU connector C. 3 If there is no voltage at Pin B, check for voltage on Pin 1 of the 5 Pin ICU/CECU and Pin B at sensor connector. Repair wiring as necessary. Go to Step 2. 3 If there is no voltage on Pin 1 at ICU/CECU, replace				
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diagnostic trouble codes. DTC 11704 displayed – Short in primary air pressure circuit.		view "Active" primary		·
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DTC 11704 displayed – Short in primary air pressure circuit. This DTC will be recorded when the control unit sees a short to +5V at the primary air pressure sensor input. The fault is recorded when the voltage a the input is above 4.9 volts. Sensor Ground) - There should be continuity between the sensor connector. Pin A – Ground Pin B – Input Voltage Pin C – Output Voltage See Harness Interface Diagrams for possible sensor locations. See Connector Identification of the electrical connectors of ICU/CECU. See ICU/CECU. See ICU/CECU Picottical connectors of the ICU/CECU electrical connectors. DTC 11704 displayed – Short in primary air pressure sensor input. The fault is recorded when the voltage at the input is above 4.9 volts. Check for continuity between sensor connector Pin A and ground terminal. It there is no continuity between Pin A and the ground terminal: i. Check for continuity between Pin A and the ground terminal: i. Check for continuity between Pin A and the ground terminal: i. Check for continuity between Pin A and the ground terminal: i. Check for continuity between Pin A and the ground terminal: i. Check for continuity between Pin A and the ground terminal: i. Check for continuity between Pin 5 of the 9 Pin ICU/CECU connector C. iii. Check for continuity between Pin 5 of the 9 Pin ICU/CECU connector A and a cab ground terminal. iii. Repair wiring as necessary. Go to Step 2. Check input voltage at Pin B, Go to Step 5-3. b. If there is voltage at Pin B, check for voltage on Pin 1 of the 5 Pin ICU/CECU and Pin B at sensor connector. Repair wiring as necessary. Go to Step 2. ii. If there is no voltage at Pin 1 at ICU/CECU, replace ICU/CEC Go to Step 2. iii. If there is no voltage at Pin Cu/CECU, replace ICU/CEC Go to Step 2. iii. If there is no voltage at Pin Cu/CECU and Pin B at sensor connector Pin C. a. If there is no voltage at Pin Cu/CECU and Pin B at sensor connector Pin C. a. If there is no voltage at Pin Cu/CECU and Pin B at sensor connector Pin C. a. If there is no volt		-	primary air pressure circuit.	
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multimeter, check the ground, input and output voltages at the sensor connector. Pin A – Ground Pin B – Input Voltage Pin C – Output Voltage See Harness Interface Diagrams for possible sensor locations. See Connector Identification for position and identification of the electrical connectors of ICU/CECU. See ICU/CECU Pinout for terminal details of the ICU/CECU electrical connections. MultiMeter Graphic below. (Sensor Input Voltage) - Input voltage prin C – Output Voltage) - Signal output voltage at sensor connector (Pin B) should be +5 volts. See MultiMeter Graphic below. (Sensor Output Voltage) - Signal output voltage at sensor connector (Pin C) will vary depending on air pressure, but should be more than electrical connectors of ICU/CECU Pinout for terminal details of the ICU/CECU Pinout for terminal details of the ICU/CECU electrical connectors seal back to expose terminal ends. be continuity between Pin A and the ground terminal. a. If there is continuity between Pin A and the ground terminal: i. Check for continuity between Pin 5 of the 9 Pin ICU/CECU connector C. iii. Check for continuity between Pin 5 of the 9 Pin ICU/CECU connector Pin B. a. If there is no continuity between Pin A and the ground terminal: i. Check for continuity between Pin 5 of the 9 Pin ICU/CECU connector C. iii. Repair wiring as necessary. Go to Step 2. Check input voltage at Pin B, check for voltage on Pin 1 of the 5 Pin ICU/CECU and Pin B at sensor connector. Repair wiring as necessary. Go to Step 2. ii. If there is no voltage on Pin 1, check continuity between Pin A and the ground terminal: ii. Check for continuity between Pin A and P 2 of the 52 Pin ICU/CECU connector C. iii. Repair wiring as necessary. Go to Step 2. Check input voltage at Pin B, check for voltage on Pin 1 of the 5 Pin ICU/CECU and Pin B at sensor connector. Repair wiring as necessary. Go to Step 2. ii. If there is no voltage on Pin 1 at ICU/CECU, replace ICU/CECU Go to Step 2.				the input is above 4.9 volts.
ground, input and output voltages at the sensor connector. Pin A – Ground Pin B – Input Voltage Pin C – Output Voltage See Harness Interface Diagrams for possible sensor locations. See Connector Identification of the electrical connectors of ICU/CECU See ICU/CECU Pinout for terminal details of the ICU/CECU Pinout for terminal details of the ICU/CECU electrical connections. See ICU/CECU electrical connectors of the ICU/CECU electrical connections. See Connector See ICU/CECU electrical connectors of the ICU/CECU electrical connectors each back to expose terminal ends. See North (Pin A) and a cab ground terminal. See MultiMeter Graphic below. (Sensor Input Voltage) - Input voltage in ICU/CECU to sensor connector (Pin B) should be +5 volts. See MultiMeter Graphic below. (Sensor Output Voltage) - Signal output voltage at sensor connector (Pin C) will vary depending on air pressure, but should be more than all volts and less than 4.9 volts. See MultiMeter Graphic and Table below. See ICU/CECU Pinout for terminal details of the ICU/CECU electrical connectors of the ICU/CECU electrical connectors of the ICU/CECU electrical connector seal back to expose terminal ends. A. If there is continuity between Pin A and the ground terminal, test complete. Go to Step 5-2. b. If there is no continuity between Pin A and the ground terminal in Check for continuity between Pin A and P 2 of the 52 Pin ICU/CECU connector C. ii. Check for continuity between Pin A and P 2 of the 52 Pin ICU/CECU connector Pin B 2. Check input voltage at sensor connector Pin B. If there is no voltage at Pin B, Go to Step 2. ii. If there is no voltage on Pin 1 of the 5 Pin ICU/CECU and Pin B at sensor connector. Repair wiring as necessary. Go to Step 2. iii. If there is no voltage on Pin 1 at ICU/CECU, replace ICU/CEC Go to Step 2. iii. If there is no voltage on Pin 1 at ICU/CECU, replace ICU/CEC Go to Step 2.	5			,
expose terminal ends. a. If there is no voltage at Pin C, replace sensor. Go to Step 2.		ground, input and output voltages at the sensor connector. Pin A – Ground Pin B – Input Voltage Pin C – Output Voltage See Harness Interface Diagrams for possible sensor locations. See Connector Identification for position and identification of the electrical connectors of ICU/CECU. See ICU/CECU Pinout for terminal details of the ICU/CECU electrical	connector ground (Pin A) and a cab ground terminal. See MultiMeter Graphic below. (Sensor Input Voltage) - Input voltage from ICU/CECU to sensor connector (Pin B) should be +5 volts. See MultiMeter Graphic below. (Sensor Output Voltage) - Signal output voltage at sensor connector (Pin C) will vary depending on air pressure, but should be more than .1 volts and less than 4.9 volts. See MultiMeter Graphic and Table below. I NOTE: Do not unplug sensor connector to perform sensor output voltage check. Slide	 a. If there is continuity between Pin A and the ground terminal, test is complete. Go to Step 5-2. b. If there is no continuity between Pin A and the ground terminal: i. Check for continuity between sensor connector Pin A and Pin 2 of the 52 Pin ICU/CECU connector C. ii. Check for continuity between Pin 5 of the 9 Pin ICU/CECU connector A and a cab ground terminal. iii. Repair wiring as necessary. Go to Step 2. 2. Check input voltage at sensor connector Pin B. a. If there is voltage at Pin B, Go to Step 5-3. b. If there is no voltage at Pin B, check for voltage on Pin 1 of the 52 Pin ICU/CECU connector C. i. If there is voltage on Pin 1, check continuity between Pin 1 at ICU/CECU and Pin B at sensor connector. Repair wiring as necessary. Go to Step 2. ii. If there is no voltage on Pin 1 at ICU/CECU, replace ICU/CECU. Go to Step 2.
Use test leads with U. If there is voltage at Pill C, Go to step 6.			Use test leads with	b. If there is voltage at Pin C, Go to Step 6 .



Step	Check	Result	Next Step
		needle point tips to probe	3 1
		Connector terminals. Air Pressure (PSI) (VDC) 150 4.75	0.0 voc
		75 2.50 60 2.05 30 1.15 0 0.25 NOTE: Make sure that the system you are testing has some pressure to measure.	1. Connector Seal
			2. Pin A
			3. Pin B4. Place MultiMeter Probe On Pin C
6	Select "Diagnose"	DTC 11703 – Open in primary air	Check resistance between Pin C and ground terminal.
	to view primary air	pressure circuit is displayed as	a. If there is less than 5K ohms between Pin C and the ground terminal,
	pressure gauge DTCs.	"Active."	Check wiring for short from sensor to ICU/CECU. If short found,
	Next, unplug the primary		repair and go to Step 2.
	air pressure sensor		ii. Remove the 52 Pin ICU/CECU connector C and measure
	connector at sensor.		resistance between Pin 6 of the 52 Pin ICU/CECU connector C
	See Harness Interface		and ground terminal. If less than 5K ohms replace ICU/CECU
	Diagrams for possible		and go to Step 2 .
	sensor locations.		b. If there is more than 20K ohms between Pin C and ground terminal,
	See Connector		i. Check wiring for open from sensor to ICU/CECU. If open found,
	Identification for position		repair and go to Step 2 .
	and identification of the		ii. Remove the "C" connector from the ICU/CECU and measure
	electrical connectors of		resistance between Pin 6 of the 52 Pin ICU/CECU connector
	ICU/CECU.		C and ground terminal. If more than 20K ohms, replace
	See ICU/CECU Pinout for terminal details of		ICU/CECU and go to Step 2.
	the ICU/CECU electrical		
	connections.		
7	Select "Diagnose"	DTC 11704 - Short in primary air	If the fault is still "Active" after unplugging the sensor connector, you
	to view primary air	pressure circuit is displayed as	have confirmed there is a short. This sensor wire starts at pin 6 of the 52
	pressure gauge DTCs.	"Active".	Pin ICU/CECU connector C and ends at pin C on the sensor connector.
	Next, unplug the primary		There is a short between the sensor wire and a power source wire. Some
	air pressure 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 Harness Interface		Description ICU/CECU Pin
	Diagrams for possible		Power Supply Sensor +5V Connector C, Pin 1 Dash Illumination 1 Connector A, Pin 7
	sensor locations.		CVSG Power Connector A, Pin 1
	See Connector		Each power supply ends at the following connectors:
	Identification for position		Description Pin
	and identification of the		CVSG gauge power 4
	electrical connectors of		CVSG lighting 2
	ICU/CECU.		Primary air pressure transducer B

Step	Check	Result	Next	Step
	See ICU/CECU Pinout		Secondary air pressure	В
	for terminal details of		Application air pressure transducer	В
	the ICU/CECU electrical		Air filter restriction	С
			For future expansion	А
	connections.		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.	
		DTC 11704 - Short in primary air	If DTC 11704 changes to "Inactive" afte	r unplugging the sensor connector, you
		pressure circuit is now displayed	have confirmed the problem is a short to	+5V in the sensor itself, not the wiring.
		as "Inactive."	Replace sensor. Go to Step 2.	

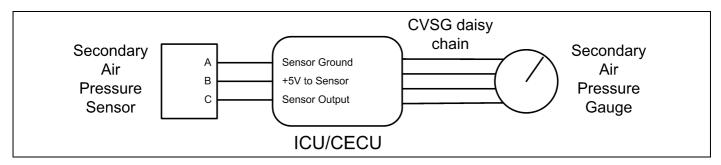
Secondary Air Pressure Gauge Inoperative

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.



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.	
	pointer on the gauge		NOTE: For vehicles with a CECU, use the "Program" feature in ESA to
	image is approximately		make sure that the parameter for the inoperative gauge is enabled.
	mid-scale. Observe		An inoperative gauge may simply have its CECU parameter set to
	vehicle gauge	Valeiala autora na adiran ia ia tha	disabled.
	movement.	Vehicle gauge reading is in the same range as the ESA gauge	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 .
			 b. If gauge is last gauge in daisy chain or followed by other non-functional gauges, go to Step 3-2.
			Check continuity between Pin 1 on gauge harness connector and Pin 14 of the 52 Pin ICU/CECU connector C.
			Check continuity between Pin 3 on gauge harness connector and Pin 15 of the 52 Pin ICU/CECU connector C.
			Repair daisy chain jumper harness as necessary.
			5. Once continuity on both wires exists, perform "Simulate" test again.

Step	Check	Result	Next Step
			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 ICU/CECU and perform "Simulate" test again. (1) If gauge functions properly test is complete. Install new ICU/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.
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		output voltage at sensor. Go to Step 5.
	air pressure gauge	DTC 11803 displayed – Open in	This DTC will be recorded when the control unit sees an open or short to
	diagnostic trouble	secondary air pressure circuit.	ground at the secondary air pressure sensor input. The fault is recorded when the voltage at the input is below .1 volts.
	codes.	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 multimeter, check the	(Sensor Ground) - There should be continuity between the sensor	Check for continuity between sensor connector Pin A and ground terminal.
	, i	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
	Pin B – Input Voltage	voltage from ICU/CECU to sensor	2 of the 52 Pin ICU/CECU connector C.
	Pin C – Output Voltage	connector (Pin B) should be +5	ii. Check for continuity between Pin 5 of the 9 Pin ICU/CECU
	See Harness Interface	volts. See MultiMeter Graphic	connector A and a cab ground terminal.
	Diagrams for possible	below. (Sensor Output Voltage) - Signal	iii. Repair wiring as necessary. Go to Step 2 .
	sensor locations.	output voltage at sensor connector	
	See Connector	(Pin C) will vary depending on air	a. If there is voltage at Pin B, Go to Step 5-3 .
	Identification for position and identification of the	pressure, but should be more than	b. If there is no voltage at Pin B, check for voltage on Pin 1 of the 52
	electrical connectors of	.1 volts and less than 4.9 volts.	Pin ICU/CECU connector C.
	ICU/CECU.	See MultiMeter Graphic and Table	i. If there is voltage on Pin 1, check continuity between Pin 1
	See ICU/CECU Pinout	below.	at ICU/CECU and Pin B at sensor connector. Repair wiring
	for terminal details of	NOTE: Do not unplug sensor connector to	as necessary. Go to Step 2.
	the ICU/CECU electrical	perform sensor output	ii. If there is no voltage on Pin 1 at ICU/CECU, replace ICU/CECU.
	connections.	voltage check. Slide	Go to Step 2.
		connector seal back to	Check signal output voltage at sensor connector Pin C.
		connector seal back to	Check signal output voltage at sensor connector Pin C.

Step	Check	Result	Next Step
		expose terminal ends.	a. If there is no voltage at Pin C, replace sensor. Go to Step 2 .
		Use test leads with	b. If there is voltage at Pin C, Go to Step 6 .
		needle point tips to probe	3 1
		connector terminals.	
		Air Pressure Output Voltage	0.0 vpc
		(PSI) (VDC)	V
		150 4.75	
		75 2.50	
		60 2.05	
		30 1.15	
		0 0.25	
		NOTE: Make sure that the	
		system you are testing	
		has some pressure to	
		measure.	₩
			1. Connector Seal
			2. Pin A
			3. Pin B
6	Select "Diagnose" to	DTC 11803 – Open in secondary	Place MultiMeter Probe On Pin C Check resistance between Pin C and ground terminal.
	view secondary air	air pressure circuit is displayed as	
	pressure gauge DTCs.	"Active."	d. It allows to the state of th
	Next, unplug the	, touve.	i. Check wiring for short from sensor to ICU/CECU. If short found,
	secondary air pressure		repair and go to Step 2.
	sensor connector at		ii. Remove the 52 Pin ICU/CECU connector C and measure
	sensor.		resistance between Pin 7 of the 52 Pin ICU/CECU connector C
	See Harness Interface		and ground terminal. If less than 5K ohms replace ICU/CECU
	Diagrams for possible		and go to Step 2 .
	sensor locations.		b. If there is more than 20K ohms between Pin C and ground terminal,
	See Connector		i. Check wiring for open from sensor to ICU/CECU. If open found,
	Identification for position		repair and go to Step 2 .
	and identification of the		ii. Remove the "C" connector from the ICU/CECU and measure
	electrical connectors of		resistance between Pin 7 of the 52 Pin ICU/CECU connector
	ICU/CECU.		C and ground terminal. If more than 20K ohms, replace
	See ICU/CECU Pinout		ICU/CECU and go to Step 2.
	for terminal details of		
	the ICU/CECU electrical		
	connections.		
7	Select "Diagnose" to	DTC 11804 - Short in secondary	If the fault is still "Active" after unplugging the sensor connector, you
	view secondary air	air pressure circuit is displayed as	have confirmed there is a short. This sensor wire starts at pin 7 of the 52
	pressure gauge DTCs.	"Active".	Pin ICU/CECU connector C and ends at pin C on the sensor connector.
	Next, unplug the		There is a short between the sensor wire and a power source wire. Some
	secondary air pressure		typical power wires to inspect are listed below (you may need to verify
	sensor connector at		any power source in the main cab harness):
	sensor.		Description ICU/CECU Pin
	See Harness Interface		Power Supply Sensor +5V Connector C, Pin 1
	Diagrams for possible		Dash Illumination 1 Connector A, Pin 7 CVSG Power Connector A, Pin 1
	sensor locations.		Each power supply ends at the following connectors:
	See Connector		Description Pin
1		ı	

Step	Check	Result	Next	Step
	Identification for position		CVSG gauge power	4
	and identification of the		CVSG lighting	2
	electrical connectors of		Primary air pressure transducer	В
	ICU/CECU.		Secondary air pressure	В
	See ICU/CECU Pinout		Application air pressure transducer	В
	for terminal details of		Air filter restriction	С
			For future expansion	Α
	the ICU/CECU electrical connections.		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.	
		DTC 11804 - Short in secondary air	If DTC 11804 changes to "Inactive" afte	r unplugging the sensor connector, you
		pressure 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.	

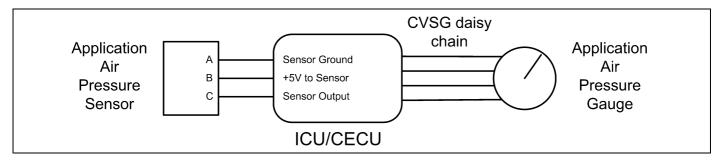
Application Air Pressure Gauge Inoperative

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.



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.	NOTE: For vehicles with a CECU, use the "Program" feature in ESA to
	pointer on the gauge		make sure that the parameter for the inoperative gauge is enabled.
	image is approximately		An inoperative gauge may simply have its CECU parameter set to
	mid-scale. Observe		disabled.
	vehicle gauge movement.	Vehicle gauge reading is in the	Check CVSG data link wiring: Observe Gauge position in the wiring
	movement.	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 .
			Check continuity between Pin 1 on gauge harness connector and Pin 14
			of the 52 Pin ICU/CECU connector C.
			Check continuity between Pin 3 on gauge harness connector and Pin 15
			of the 52 Pin ICU/CECU 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
			permanently. Re-test and return truck to service.
			ii. If gauge does not function during "Simulate" test, install Test
			ICU/CECU and perform "Simulate" test again.
			(1) If gauge functions properly test is complete. Install new
			ICU/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" Application			output voltage at sensor. Go to Step 5 .
	air pressure gauge	DTC 11603 displayed – Open i		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 44004 displayed . Obsert		the voltage at the input is below .1 volts.
		DTC 11604 displayed – Short i		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.
				the input is above 4.9 voits.
5	Using a digital	(Sensor Ground) - There shoul	t	Check for continuity between sensor connector Pin A and ground
	multimeter, check the	be continuity between the sens	or	terminal.
	ground, input and output	connector ground (Pin A) and		a. If there is continuity between Pin A and the ground terminal, test is
	<u>-</u>	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
	Pin B – Input Voltage	voltage from ICU/CECU to sen		2 of the 52 Pin ICU/CECU connector C.
	Pin C – Output Voltage	connector (Pin B) should be +5		ii. Check for continuity between Pin 5 of the 9 Pin ICU/CECU
	See Harness Interface	volts. See MultiMeter Graphic		connector A and a cab ground terminal.
	Diagrams for possible	below. (Sensor Output Voltage) - Sign	.	iii. Repair wiring as necessary. Go to Step 2 .
	sensor locations.	output voltage at sensor connec		
	See Connector	(Pin C) will vary depending on	ioi	
	Identification for position	air pressure, but should be mo	e	a. If there is voltage at Pin B, Go to Step 5-3 .
	and identification of the	than 0 volts and less than 5 vol		b. If there is no voltage at Pin B, check for voltage on Pin 1 of the 52
	electrical connectors of	See MultiMeter Graphic and Ta		Pin ICU/CECU connector C.
	ICU/CECU.	below.		i. If there is voltage on Pin 1, check continuity between Pin 1
	See ICU/CECU Pinout	NOTE: Do not unplug		at ICU/CECU and Pin B at sensor connector. Repair wiring
	for terminal details of	sensor connector to		as necessary. Go to Step 2.
	the ICU/CECU electrical	perform sensor output		ii. If there is no voltage on Pin 1 at ICU/CECU, replace ICU/CECU.
	connections.	voltage check. Slide		Go to Step 2.
		connector seal back to		Check signal output voltage at sensor connector Pin C.
		expose terminal ends.		a. If there is no voltage at Pin C, replace sensor. Go to Step 2 .
		Use test leads with		b. If there is voltage at Pin C, Go to Step 6 .
		needle point tips to pro	oe	3 1
		connector terminals. Air Pressure Output Voltace	_	0.0 vpc
		Air Pressure Output Voltag (PSI) (VDC)	.	V:)
		150 4.75		V=
		75 2.50		
		60 2.05		
		30 1.15		
		0 0.25 NOTE: Make sure that	-	2 4
		system you are testing	.,5	
		has some pressure to		
		measure.		Ţ
				Connector Seal
				2. Pin A
				3. Pin B
				4. Place MultiMeter Probe On Pin C

Step	Check	Result	Next S	Step
6	Select "Diagnose" to	DTC 11603 – Open in application	1. Check resistance between Pin C at	nd ground terminal.
	view application air	air pressure circuit is displayed as	a. If there is less than 5K ohms b	etween Pin C and the ground terminal,
	pressure gauge DTCs.	"Active."	i. Check wiring for short fro	m sensor to ICU/CECU. If short found,
	Next, unplug the		repair and go to Step 2 .	
	application air pressure			or from the ICU/CECU and measure
	sensor connector at			of the 52 Pin ICU/CECU connector C
	sensor.			ess than 5K ohms replace ICU/CECU
	See Harness Interface		and go to Step 2 .	soo than ore shing replace 100/0200
	Diagrams for possible		• •	s between Pin C and ground terminal,
	sensor locations.			_
	See Connector			m sensor to ICU/CECU. If open found
	Identification for position		repair and go to Step 2 .	
	and identification of the			or from the ICU/CECU and measure
	electrical connectors of			3 of the 52 Pin ICU/CECU connector
	ICU/CECU.		•	If more than 20K ohms, replace
	See ICU/CECU Pinout		ICU/CECU and go to Ste	ep 2.
	for terminal details of			
	the ICU/CECU electrical			
	connections.			
7	Select "Diagnose" to	DTC 11604 - Short in application	1. If the fault is still "Active" after unpl	ugging the sensor connector, you
	view application air	air pressure circuit is displayed as	have confirmed there is a short. Th	is sensor wire starts at pin 8 of the 52
	pressure gauge DTCs.	"Active".	Pin ICU/CECU connector C and en	nds at pin C on the sensor connector.
	Next, unplug the		There is a short between the senso	r wire and a power source wire. Some
	application air pressure		typical power wires to inspect are li	isted below (you may need to verify
	sensor connector at		any power source in the main cab	harness):
	sensor.		Description	ICU/CECU Pin
	See Harness Interface		Power Supply Sensor +5V	Connector C, Pin 1
	Diagrams for possible		Dash Illumination 1	Connector A, Pin 7
	sensor locations.		CVSG Power	Connector A, Pin 1
	See Connector		Each power supply ends at the following Description	g connectors: Pin
	Identification for position		CVSG gauge power	4
	and identification of the		CVSG lighting	2
	electrical connectors of		Primary air pressure transducer	В
	ICU/CECU.		Secondary air pressure	В
	See ICU/CECU Pinout		Application air pressure transducer	В
	for terminal details of		Air filter restriction	С
	the ICU/CECU electrical		For future expansion	A
	connections.		Through the Engine Harness	28
			Connector	Α.
			For the Ammeter sensor Check for pinched or chaffed sensor and	A nower wiring Renair or replace
			wiring as necessary. Go to Step 2 .	a power wiring. Repail of replace
		DTC 11604 - Short in application	If DTC 11604 changes to "Inactive" after	unplugging the sensor connector, you
		air pressure circuit is now	have confirmed the problem is a short to	, ,
		displayed as "Inactive."	•	
	<u> </u>	alopiayou as illactive.	1. Replace sensor. Go to Step 2 .	



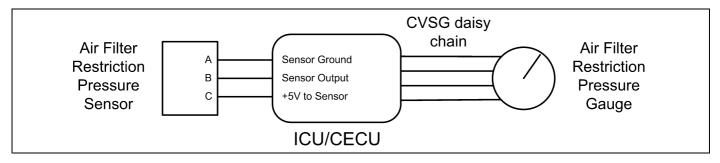
Air Filter Restriction Pressure Gauge Inoperative

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	Perform the following checks:
	the "Value" bar until the	to Step 3-1.	NOTE: For vehicles with a CECU, use the "Program" feature in ESA to
	pointer on the gauge image is approximately		make sure that the parameter for the inoperative gauge is enabled.
	mid-scale. Observe		An inoperative gauge may simply have its CECU parameter set to
	vehicle gauge		disabled.
	movement.	Vehicle gauge reading is in the	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 ICU/CECU connector C.
			3. Check continuity between Pin 3 on gauge harness connector and Pin 15
			of the 52 Pin ICU/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
			ICU/CECU and perform "Simulate" test again.
			(1) If gauge functions properly test is complete. Install new
			ICU/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	Using a digital	(Sensor Ground) - There should	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 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 ICU/CECU to sensor	r
	Pin B – Output Voltage	connector (Pin C) should be +5	Check for continuity between sensor connector Pin A and Pin
	Pin C – Input Voltage	volts. See Table below.	2 of the 52 Pin ICU/CECU connector C.
	See Harness Interface	(Sensor Output Voltage) - Signal	ii. Check for continuity between Pin 5 of the 9 Pin ICU/CECU
	Diagrams for possible	output voltage at sensor connecto	connector A and a cab ground terminal.
	sensor locations.	(Pin B) will vary depending on	iii. Repair wiring as necessary. Go to Step 2 .
	See Connector	strength of vacuum, but should be	2. Check input voltage at sensor connector Pin C.
	Identification for position	more than .1 volts and less than	a. If there is voltage at Pin C, Go to Step 5-3 .
	and identification of the	4.9 volts. See Table below.	b. If there is no voltage at Pin C, check for voltage on Pin 1 of the 52
	electrical connectors of	NOTE: Do not unplug	Pin ICU/CECU connector C.
	ICU/CECU.	sensor connector to	i. If there is voltage on Pin 1, check continuity between Pin 1
		perform sensor output	at ICU/CECU and Pin C at sensor connector. Repair wiring
	See ICU/CECU Pinout for terminal details of	voltage check. Slide	as necessary. Go to Step 2.
	the ICU/CECU electrical	connector seal back to	·
		expose terminal ends.	ii. If there is no voltage on Pin 1 at ICU/CECU, replace ICU/CECU.
	connections.	Use test leads with	Go to Step 2.
		needle point tips to probe	Check signal output voltage at sensor connector Pin B.
		connector terminals.	a. If there is no voltage at Pin B, replace sensor. Go to Step 2 .
		Pressure Output Voltage	b. If there is voltage at Pin B, Go to Step 6 .
		(PSI) (VDC)	1
		0 0.5	/ 0.0 vpc
		-1.5 4.5	
		NOTE: Make sure that the	
		system you are testing	
		has some pressure to	
		measure.	
			3 2
			∐
			1. Pin A
			2. Place MultiMeter Probe On Pin B
		L	3. Pin C

Step	Check	Result	Next Step
6	Select "Diagnose" to	DTC 10703 - Open in air filter	Check resistance between Pin B and ground terminal.
	view air filter restriction	restriction circuit is displayed as	a. If there is less than 5K ohms between Pin B and the ground terminal,
	gauge DTCs.	"Active."	 Check wiring for short from sensor to ICU/CECU. If short found,
	Next, unplug the air		repair and go to Step 2 .
	filter restriction sensor		ii. Remove the "C" connector from the ICU/CECU and measure
	connector at sensor.		resistance between Pin 10 of the 52 Pin ICU/CECU connector
	See Harness Interface		C and ground terminal. If less than 5K ohms replace ICU/CECU
	Diagrams for possible		and go to Step 2 .
	sensor locations.		
	See Connector		b. If there is more than 20K ohms between Pin B and ground terminal,
	Identification for position		 Check wiring for open from sensor to ICU/CECU. If open found,
	and identification of the		repair and go to Step 2.
	electrical connectors of		ii. Remove the "C" connector from the ICU/CECU and measure
	ICU/CECU.		resistance between Pin 10 of the 52 Pin ICU/CECU connector
	See ICU/CECU Pinout		C and ground terminal. If more than 20K ohms, replace
	for terminal details of		ICU/CECU and go to Step 2 .
	the ICU/CECU electrical		
	connections.		
7	Select "Diagnose" to	DTC 10704 - Short in air filter	1. If the fault is still "Active" after unplugging the sensor connector, you have
	view air filter restriction	restriction circuit is displayed as	confirmed there is a short. This sensor wire starts at pin 10 of the 52
	gauge DTCs.	"Active."	Pin ICU/CECU connector C and ends at pin B on the sensor connector.
	Next, unplug the air		There is a short between the sensor 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 Harness Interface		Description ICU/CECU Pin
	Diagrams for possible		Power Supply Sensor +5V Connector C, Pin 1
	sensor locations.		Dash Illumination 1 Connector A, Pin 7
	See Connector		CVSG Power Connector A, Pin 1
	Identification for position		Each power supply ends at the following connectors: Description Pin
	and identification of the		CVSG gauge power 4
	electrical connectors of		CVSG lighting 2
	ICU/CECU.		Primary air pressure transducer B
	See ICU/CECU Pinout		Secondary air pressure B
	for terminal details of		Application air pressure transducer B
	the ICU/CECU electrical		Air filter restriction C
	connections.		For future expansion A
			Through the Engine Harness 28
			Connector For the Ammeter sensor A
			Check for pinched or chaffed sensor and power wiring. Repair or replace
			wiring as necessary. Go to Step 2 .
		DTC 10704 - Short in air filter	If DTC 11704 changes to "Inactive" after 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."	Replace sensor. Go to Step 2 .
<u> </u>	l		1. Treplace sellsul. Gu tu step 2.



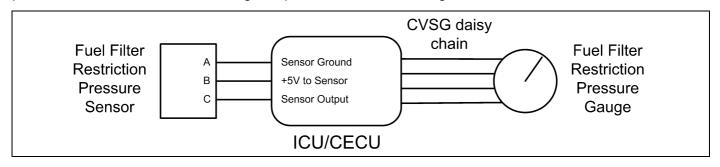
Fuel Filter Restriction Pressure Gauge Inoperative

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.



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		
3	"Open." Select "Simulate". Drag	Vehicle gauge does not move. Go	Perform the following checks:
	the "Value" bar until the	to Step 3-1.	Total and tollowing discord.
	pointer on the gauge	to etop o 1.	NOTE: For vehicles with a CECU, use the "Program" feature in ESA to
	image is approximately		make sure that the parameter for the inoperative gauge is enabled.
	mid-scale. Observe		An inoperative gauge may simply have its CECU parameter set to
	vehicle gauge		disabled.
	movement.	Vehicle gauge reading is in the	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 ICU/CECU connector C.
			3. Check continuity between Pin 3 on gauge harness connector and Pin 15
			of the 52 Pin ICU/CECU 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 permanently. Re-test and return truck to service.
			ii. If gauge does not function during "Simulate" test, install Test
			ICU/CECU and perform "Simulate" test again.
			(1) If gauge functions properly test is complete. Install new
			ICU/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"	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.	DTC 1601 displayed Chart 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.	secondary air pressure sensor input. The fault is recorded when the voltage at the input is above 4.9 volts.	
			the input is above 4.9 voits.	
5	Using a digital	(Sensor Ground) - There should	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 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 ICU/CECU to sensor	i. Check for continuity between sensor connector Pin A and Pin	
	Pin B – Input Voltage	connector (Pin B) should be +5	2 of the 52 Pin ICU/CECU connector C.	
	Pin C – Output Voltage	volts. See Table below.	ii. Check for continuity between Pin 5 of the 9 Pin ICU/CECU	
	See Harness Interface	(Sensor Output Voltage) - Signal	connector A and a cab ground terminal.	
	Diagrams for possible	output voltage at sensor connector	iii. Repair wiring as necessary. Go to Step 2.	
	sensor locations.	(Pin C) will vary depending on strength of vacuum, but should be	Check input voltage at sensor connector Pin B.	
	See Connector	more than .1 volts and less than	a. If there is voltage at Pin B, Go to Step 5-3 .	
	Identification for position	4.9 volts. See Table below.	b. If there is no voltage at Pin B, check for voltage on Pin 1 of the 52	
	and identification of the	4.0 Volto. Gee Table Below.	Pin ICU/CECU connector C.	
	electrical connectors of ICU/CECU.	NOTE: Do not unplug		
		sensor connector to	i. If there is voltage on Pin 1, check continuity between Pin 1 at ICU/CECU and Pin B at sensor connector. Repair wiring	
	See ICU/CECU Pinout for terminal details of	perform sensor output	as necessary. Go to Step 2 .	
	the ICU/CECU electrical	voltage check. Slide	ii. If there is no voltage on Pin 1 at ICU/CECU, replace ICU/CECU.	
	connections.	connector seal back to	Go to Step 2 .	
	comiconone.	expose terminal ends.		
		Use test leads with	Check signal output voltage at sensor connector Pin C.	
		needle point tips to probe	a. If there is no voltage at Pin C, replace sensor. Go to Step 2 .	
		connector terminals.	b. If there is voltage at Pin C, Go to Step 6 .	
		Pressure Output Voltage	3 1	
		(PSI) (VDC) 0 0.5	0.0 vpc	
			V=	
		-1.5 4.5 NOTE: Make sure that the		
		system you are testing		
		has some pressure to		
		measure.		
			į.	
			Connector Seal	
			2. Pin A	
			3. Pin B	
		L	4. Place MultiMeter Probe On Pin C	

Step	Check	Result	Next	Step		
6	Select "Diagnose" to	DTC 1603 – Open in fuel filter	1. Check resistance between Pin C a	and ground terminal.		
	view fuel filter restriction	restriction circuit is displayed as	a. If there is less than 5K ohms l	between Pin C and the ground terminal,		
	gauge DTCs.	"Active."		om sensor to ICU/CECU. If short found,		
	Next, unplug the fuel		repair and go to Step 2 .			
	filter restriction sensor			tor from the ICU/CECU and measure		
	connector at sensor.			11 of the 52 Pin ICU/CECU connector		
	See Harness Interface					
	Diagrams for possible		C and ground terminal. If less than 5K ohms replace ICU and go to Step 2 .			
	sensor locations.			ns between Pin C and ground terminal,		
	See Connector			•		
	Identification for position			om sensor to ICU/CECU. If open found,		
	and identification of the		repair and go to Step 2 .			
	electrical connectors of			tor from the ICU/CECU and measure		
	ICU/CECU.			11 of the 52 Pin ICU/CECU connector		
	See ICU/CECU Pinout		<u> </u>	If more than 20K ohms, replace		
	for terminal details of		ICU/CECU and go to St	tep 2.		
	the ICU/CECU electrical					
	connections.					
7	Select "Diagnose" to	DTC 1604 - Short in fuel filter	1. If the fault is still "Active" after unplugging the sensor connec			
		restriction circuit is displayed as	confirmed there is a short. This sensor wire starts at pin 11 of the 52 Pin			
	gauge DTCs.	"Active."		s through pin D3 (Chassis Harness		
	Next, unplug the fuel		· ·	C on the sensor connector. There is a		
	filter restriction sensor			d a power source wire. Some typical		
	connector at sensor.			elow (you may need to verify any power		
	See Harness Interface		source in the main cab harness):	IOLUGEOU P:		
	Diagrams for possible		Description Power Supply Sensor +5V	ICU/CECU Pin Connector C, Pin 1		
	sensor locations.		Dash Illumination 1	Connector A, Pin 7		
	See Connector		CVSG Power	Connector A, Pin 1		
	Identification for position		Each power supply ends at the followin	g connectors:		
	and identification of the		Description	Pin		
	electrical connectors of		CVSG gauge power	4		
	ICU/CECU.		CVSG lighting	2		
	See ICU/CECU Pinout		Primary air pressure transducer	В		
	for terminal details of		Secondary air pressure Application air pressure transducer	В В		
	the ICU/CECU electrical		Air filter restriction	С		
	connections.		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.			
		DTC 1604 - Short in fuel filter	If DTC 1604 changes to "Inactive" after			
		restriction circuit is now displayed	have confirmed the problem is a short in	n the sensor itself, not the wiring.		
		as "Inactive."	1. Replace sensor. Go to Step 2.			



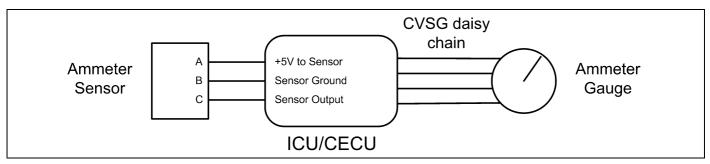
Ammeter Gauge Inoperative

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.



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.
	"Ammeter," then select	display reasonable reading.	
3	"Open." Select "Simulate". Drag	Vehicle gauge does not move. Go	Perform the following checks:
3	the "Value" bar until the	to Step 3-1.	renorm the following checks.
	pointer on the gauge	10 0100 0 1.	NOTE: For vehicles with a CECU, use the "Program" feature in ESA to
	image is approximately		make sure that the parameter for the inoperative gauge is enabled.
	mid-scale. Observe		An inoperative gauge may simply have its CECU parameter set to
	vehicle gauge		disabled.
	movement.	Vehicle gauge reading is in the	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.
			Check continuity between Pin 1 on gauge harness connector and Pin 14
			of the 52 Pin ICU/CECU connector C.
			3. Check continuity between Pin 3 on gauge harness connector and Pin 15
			of the 52 Pin ICU/CECU 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
			permanently. Re-test and return truck to service.
			ii. If gauge does not function during "Simulate" test, install Test
			ICU/CECU and perform "Simulate" test again.
			(1) If gauge functions properly test is complete. Install new
			ICU/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	Res	sult	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" ammeter	_		output voltage at sensor. Go to Step 5.	
	diagnostic trouble	DTC 257903 disp	olayed - Open in	This DTC will be recorded when the control unit sees an open or short to	
	codes.	ammeter sensor	circuit.	ground at the secondary air pressure sensor input. The fault is recorded when	
				the voltage at the input is below .1 volts.	
		DTC 257904 disp	•	This DTC will be recorded when the control unit sees a short to +5V at the	
		ammeter sensor	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	Check for continuity between sensor connector Pin B and ground	
	multimeter, check the	be continuity bety	ween the sensor	terminal.	
	ground, input and output	connector ground	(Pin B) and the	a. If there is continuity between Pin B and the ground terminal, test is	
	voltages at the sensor	firewall ground st		complete. Go to Step 5-2.	
	connector.	(Sensor Input Vo	• , .	b. If there is no continuity between Pin B and the ground terminal	
	Pin A – Input Voltage	voltage from ICU		i. Check for continuity between terminal B and Pin 9 of the 52	
	Pin B – Ground	connector (Pin A) should be +5	Pin ICU/CECU connector C.	
	Pin C – Output Voltage	volts.		ii. Check for continuity between Pin 5 of the 9 Pin ICU/CECU	
	See Harness Interface	(Sensor Output V	0 , 0	connector A and a cab ground terminal	
	Diagrams for possible	output voltage at		III Danada dalam an anno 20 to 20 to 5.4	
	sensor locations.	(Pin C) will vary o			
	See Connector	amperage, but sh		2. Check input voltage at sensor connector Pin A.	
	Identification for position	than 0 volts and I		a. If there is voltage at Pin A, Go to Step 5-3 .	
	and identification of the	See Table below.	o not unplug	b. If there is no voltage at Pin A, check for voltage on Pin 1 of the 52	
	electrical connectors of		onnector to	Pin ICU/CECU connector C.	
	ICU/CECU.		sensor output	i. If there is voltage on Pin 1, check continuity between Pin 1	
	See ICU/CECU Pinout	·	heck. Slide	at ICU/CECU and Pin A at sensor connector. Repair wiring	
	for terminal details of	connecto	r seal back to	as necessary. Go to Step 5-2.	
	the ICU/CECU electrical	expose te	erminal ends.	ii. If there is no voltage on Pin 1 at ICU/CECU, replace ICU/CECU.	
	connections.	Use test	leads with	Go to Step 2.	
		needle po	oint tips to probe	3. Check signal output voltage at sensor connector Pin C.	
		connecto	r terminals.	a. If there is no voltage at Pin C, replace sensor. Go to Step 2 .	
		Average	Output Voltage	b. If there is voltage at Pin C, check for voltage on Pin 9 of the 52 Pin	
		Range	(VDC)	ICU/CECU connector C.	
		120	4.5	i. If voltage is present on Pin 9 at ICU/CECU connector, replace	
		60	3.5	ICU/CECU. Go to Step 2.	
		0	2.5	ii. If there is no voltage on Pin 9 at ICU/CECU connector, Go to	
		-60	1.5	Step 6.	
		-120	0.5	1	
				/ 0.0 vpc	
				V=	
				11	
				3 2	
				Î.	
				Place MultiMeter Probe On Pin C	
				2. Pin B	
				19 <u>Dia</u> A	
¹ 12 - 4	. 0	ļ		PM819010/KM815054 (04/01/2010)	

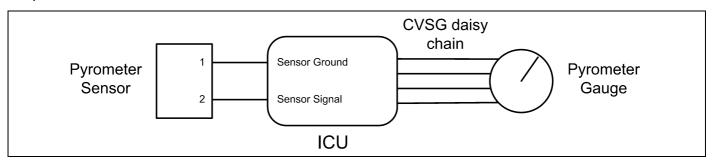
Step	Check	Result	Next Step
6	Select "Diagnose" to	DTC 257903 – Open in ammeter	Using a jumper wire, jump across sensor harness connector Pins B
	view ammeter gauge	sensor circuit is displayed as	and C.
	DTCs.	"Active."	2
	Next, unplug the		
	ammeter connector		
	at sensor.		
	See Harness Interface		
	Diagrams for possible		
	sensor locations.		
	See Connector		1
	Identification for position		
	and identification of the		1. Pin B
	electrical connectors of		2. Pin C
	ICU/CECU.		
	See ICU/CECU Pinout		a. If an "Active" DTC 257904 - Short in ammeter sensor circuit is
	for terminal details of		now displayed, you have confirmed there is not an open in the
	the ICU/CECU electrical		sensor output voltage wire to the ICU/CECU. The original fault (DTC
	connections.		257903) was logged because there is an open in the ammeter
			sensor itself, not the wiring. Replace sensor. Go to Step 2 .
			b. If DTC 257904 is not displayed, there is an open circuit in the wire
			between sensor connector Pin C and Pin 9 of the 52 Pin ICU/CECU
			connector C. Repair wiring as necessary. Go to Step 2 .
			Alternate test method: Check for continuity between sensor connector Pin C
			(sensor output voltage) and Pin 9 of the 52 Pin ICU/CECU connector C.
			 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 ICU/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 ICU/CECU connector C
	Next, unplug the		Check for a pinched or chaffed wire between Pin C (sensor output)
	ammeter connector		voltage) and Pin 9 of the 52 Pin ICU/CECU connector C. Repair wiring as
	at sensor.		necessary. Go to Step 2 .
	See Harness Interface	DTC 257904 - Short in ammeter	If DTC 257904 changes to "Inactive" after unplugging the sensor connector,
	Diagrams for possible	sensor circuit is now displayed as	you have confirmed the problem is a short in the sensor itself, not the wiring.
	sensor locations.	"Inactive."	1. Replace sensor. Go to Step 2 .
	See Connector		·
	Identification for position		
	and identification of the		
	electrical connectors of		
	ICU/CECU.		
	See ICU/CECU Pinout		
	for terminal details of		
	the ICU/CECU electrical		
	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.



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.	Co to Stan 4
	window, select "Exhaust Temperature," then	Gauge graphic on screen does not display reasonable reading.	GO to Step 4.
	select "Open."	display reasonable reading.	
3	Select "Simulate". Drag	Vehicle gauge does not move. Go	Perform the following checks:
	the "Value" bar until the	to Step 3-1.	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	If gauge is mounted between two other functioning gauges CVSG data
	mid-scale. Observe	image. Go to Step 3-7 .	link wiring is OK. go to Step 3-5 .
	vehicle gauge movement.		a. If gauge is last gauge in daisy chain or followed by other
	movement.		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.
			3. Check continuity between Pin 3 on gauge harness connector and Pin
			15 of the 52 Pin ICU 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 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.
			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.
4	Select "Diagnose" to	DTC 17303 displayed – Open in	Indicates the problem could be an open in the wiring from the ICU to the
	view "Active" ammeter	exhaust temp circuit.	pyrometer sensor or a defective sensor. Go to Step 5 , and if necessary,
	diagnostic trouble	DTC 17204 displayed Chartin	Step 6.
	codes.	DTC 17304 displayed - Short in	Indicates the problem could be a short to ground in the wiring from the ICU to
		exhaust temp circuit.	the pyrometer sensor or a defective sensor. Go to Step 5 , and if necessary,
			Step 7.

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	nuity between Pin 1 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 co	ntinuity between Pin 1 and	d 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
	sensor connector.	Pin 23 of the 52 Pin ICU connector		52 Pin ICU connecto	or C.	
	Pin 1 – Ground	C.		a. If there is contir	nuity between Pin 2 and Pi	n 23, test is complete.
	Pin 2 - Signal			Go to Step 6.	•	,
	See Harness Interface				ntinuity between Pin 2 and	d Pin 23 at ICU, repair
	Diagrams for possible				sary. Go to Step 5-2.	
	sensor locations.		Alte	ernate test method: F	Resistance in the pyromete	er sensor (thermocouple)
	See Connector				haust temperature increas	` ,
	Identification for position		1.	-	rometer sensor harness c	
	and identification of the electrical connectors of				x (i.e.Ametek PST2000 Te	-
	ICU/CECU.				d 2, you can simulate the	, ., .
	See ICU/CECU Pinout			known resistance.		
	for terminal details of		2.	Observe vehicle gau	ge reading on dash.	
	the ICU/CECU electrical		3.	If gauge needle move	es to approximately the sa	me temperature as in the
	connections.				olem is a defective pyrome	*
				below.		
				Tei		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
				250	482	384.6
				300	572	419.7
				350	662	454.2
				400	752	488.1
				450	842	521.4
				500	932	554.1
				600	1112	617.8
				700	1292	679.2
				800	1472	738.2
				900	1652	794.9
				1000	1832	849.2

Step	Check	Result	Next Step
6	Select "Diagnose"	DTC 17303 - Open in exhaust	Using a jumper wire, jump across sensor harness connector Pins 1 and 2.
	to view exhaust	temp circuit is displayed as	1.
	temperature gauge	"Active."	The state of the s
	DTCs.		
	Unplug pyrometer		
	harness connector		
	at sensor.		
	See Harness Interface		
	Diagrams for possible		\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
	sensor locations.		
	See Connector		
	Identification for position		
	and identification of the		
	electrical connectors of		1. Pin 1
	ICU/CECU.		
	See ICU/CECU Pinout		2. Pin 2
	for terminal details of		
	the ICU/CECU electrical		a. If an "Active" DTC 17304 - Short in exhaust temp circuit is now
	connections.		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"	DTC 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."	of the 52 Pin ICU connector C.
	DTCs.		1. Check for a pinched or chaffed wire between Pin 2 (sensor signal) and
	Next, unplug the		Pin 23 of the 52 Pin ICU connector C. Repair wiring as necessary. Go to
	pyrometer harness		Step 2.
	connector at sensor.	DTC 17304 - Short in exhaust	If DTC 17304 changes to "Inactive" after unplugging the sensor connector, you
	See Harness Interface	temp circuit is now displayed as	have confirmed the problem is a short in the sensor itself, not the wiring.
	Diagrams for possible	"Inactive."	1. Replace sensor. Go to Step 2.
	sensor locations.		
	See Connector		
	Identification for position		
	and identification of the		
	electrical connectors of		
	ICU/CECU.		
	See ICU/CECU Pinout		
	for terminal details of		

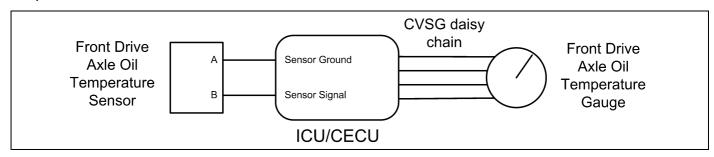
Step	Check	Result	Next Step
	the ICU/CECU electrical		
	connections.		

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			
3	select "Open." Select "Simulate". Drag	Vehicle gauge does not move. Go	Porform the following checks:	
3	_	to Step 3-1.	renorm the following checks.	
	pointer on the gauge	Vehicle gauge reading is in the	NOTE: For vehicles with a CECU, use the "Program" feature in ESA to	
	image is approximately	same range as the ESA gauge	make sure that the parameter for the inoperative gauge is enabled.	
	mid-scale. Observe	image. Go to Step 3-7 .	An inoperative gauge may simply have its CECU parameter set to	
	vehicle gauge	image. Go to Gtep 5-7.	disabled.	
	movement.		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 .	
			Check continuity between Pin 1 on gauge harness connector and Pin 14 of the 52 Pin ICU/CECU connector C.	
			 Check continuity between Pin 3 on gauge harness connector and Pin 15 of the 52 Pin ICU/CECU connector C. 	
			Repair daisy chain jumper harness as necessary.	
			5. Once continuity on both wires exists, perform "Simulate" test again.	
			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 ICU/CECU and perform "Simulate" test again.	
			(1) If gauge functions properly test is complete. Install new	
			ICU/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 57803 displayed - Open in	Indicates the problem could be an open in the wiring	from the ICU/CECU to
	view front drive axle	axle 1 oil temp circuit.	the pyrometer sensor or a defective sensor. Go to ${f S}$	tep 5, and if necessary,
	temperature gauge		Step 6.	
	diagnostic trouble	DTC 57804 displayed - Short in	Indicates the problem could be a short to ground in	
	codes.	axle 1 oil temp circuit.	ICU/CECU to the sensor or a defective sensor. Go to	Step 5, and if necessary,
5	Unplug oil temperature	(Sensor Ground) - There should	Step 7. 1. Check for continuity between sensor connector	Din Δ and firewall ground
5	harness connector at	be continuity between the sensor	stud.	Fill A and illewall ground
	sensor.	connector ground wire (Pin A) and		around terminal test is
	Using a digital	a cab ground terminal.	 a. If there is continuity between Pin A and the complete. Go to Step 5-2. 	e ground terminal, test is
	multimeter, check	(Signal) - There should be	·	I the ground terminal
	continuity on ground	continuity between the sensor	 b. If there is no continuity between Pin A and repair wiring as necessary. Go to Step 5- 	•
	and signal wire at	connector signal wire (Pin B) and		
	sensor connector.	Pin 17 of the 52 Pin ICU/CECU	Check for continuity between sensor connector 52 Pin ICU/CECU connector C.	Pin B and Pin 17 of the
	Pin A – Ground	connector C.		n 47 taat is samulate
	Pin B - Signal		 a. If there is continuity between Pin B and Pi Go to Step 6. 	n 17, test is complete.
	See Harness Interface		•	I Dia 47 at IOU/OFOU
	Diagrams for possible		b. If there is no continuity between Pin B and	
	sensor locations.		repair wiring as necessary. Go to Step 5-2	
	See Connector		Alternate test method: Resistance in the oil temper	, ,
	Identification for position		signal wire changes as oil temperature increases/de	
	and identification of the		By unplugging the oil temperature sensor harm	
	electrical connectors of		connecting a resistor decade box (i.e., Ametek appropriate resistor to Pins A and B, you can s	,
	ICU/CECU.		dialing in a known resistance.	initiate the sensor by
	See ICU/CECU Pinout		Observe vehicle gauge reading on dash.	
	for terminal details of			ma tamparatura aa in
	the ICU/CECU electrical		If gauge needle moves to approximately the sa the table below, the problem is a defective oil to	
	connections.		table below.	imperature serisor. See
			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
	İ	İ	<u> </u>	100.01
			248	100.91
			248 266	77.54

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" to	DTC 57803 - Open in axle 1	1. Using a jumper wire, jump across sensor harnes	ss connector Pins A and B.
	view front drive axle temperature gauge DTCs. Unplug oil temperature harness connector at sensor. See Harness Interface Diagrams for possible sensor locations. See Connector Identification for position and identification of the electrical connectors of ICU/CECU. See ICU/CECU Pinout for terminal details of the ICU/CECU electrical connections.	oil temp circuit is displayed as "Active."	1. Pin B 2. Pin A a. If an "Active" DTC 57804 - Short in axle 1 displayed, you have confirmed there is no signal wire to the ICU/CECU. The original 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	t an open in the sensor fault (DTC 57803) was temperature sensor itself, pp 2. open circuit in the signal
			wire between sensor connector Pin B and ICU/CECU connector C. Repair wiring as	necessary. Go to Step 2.
			Alternate test method: Check for continuity between (sensor signal) and Pin 17 of the 52 Pin ICU/CECU	
			If there is no continuity, repair wiring as necess 57803 should now be displayed as "Inactive."	eary. After repairs, DTC
			If there is continuity between sensor connector 52 Pin ICU/CECU connector C, the open circui not in the wiring. Replace sensor.	
7	Select "Diagnose" to view front drive axle temperature gauge	DTC 57804 - Short in axle 1 oil temp circuit is displayed as "Active."	If the fault is still "Active" after unplugging the sensor confirmed there is a short to ground between Pin B (of the 52 Pin ICU/CECU connector C.	
	DTCs. Next, unplug the oil temperature harness		 Check for a pinched or chaffed wire between P Pin 17 of the 52 Pin ICU/CECU connector C. R Go to Step 2. 	
	connector at sensor. See Harness Interface Diagrams for possible	DTC 57804 - Short in axle 1 temp circuit is now displayed as "Inactive."	If DTC 57804 changes to "Inactive" after unplugging have confirmed the problem is a short in the sensor 1. Replace sensor. Go to Step 2 .	•
	sensor locations. See Connector Identification for position and identification of the			

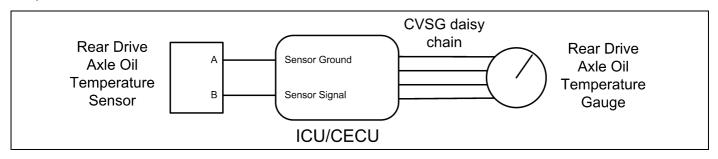
Step	Check	Result	Next Step
	electrical connectors of		
	ICU/CECU.		
	See ICU/CECU Pinout		
	for terminal details of		
	the ICU/CECU electrical		
	connections.		

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."	Vehicle severe done not seve Co	Desferms the fellowing sheets.
3	Select "Simulate". Drag	Vehicle gauge does not move. Go	Perform the following checks:
	the "Value" bar until the	to Step 3-1 .	NOTE: For vehicles with a CECU, use the "Program" feature in ESA to
	pointer on the gauge image is approximately	Vehicle gauge reading is in the	make sure that the parameter for the inoperative gauge is enabled.
	mid-scale. Observe	same range as the ESA gauge	An inoperative gauge may simply have its CECU parameter set to
	vehicle gauge	image. Go to Step 3-7 .	disabled.
	movement.		Check CVSG data link wiring: Observe Gauge position in the wiring
	movement.		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 .
			 Check continuity between Pin 1 on gauge harness connector and Pin 14
			of the 52 Pin ICU/CECU connector C.
			Check continuity between Pin 3 on gauge harness connector and Pin 15
			of the 52 Pin ICU/CECU connector C.
			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.
			 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 TestICU/CECU and perform "Simulate" test again.
			(1) If gauge functions properly test is complete. Install new
			ICU/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
<u> </u>	<u> </u>		Step 4.

Step	Check	Result	L	Next Step		
4	Select "Diagnose" to	DTC 7703 displayed - Open in	Indi	Indicates the problem could be an open in the wiring from the ICU/CECU to		
	view rear drive axle	axle 2 oil temp circuit.	the	sens	sor or a defective sensor. Go to Step 5, and	if necessary, Step 6.
	temperature gauge	DTC 7704 displayed - Short in	Indi	cate	s the problem could be a short to ground in	the wiring from the
	diagnostic trouble	axle 2 oil temp circuit.	ICL	J/CE	CU to the sensor or a defective sensor. Go to	Step 5, and if necessary,
	codes.			p 7.		
5	Unplug oil temperature	(Sensor Ground) - There should	1.		eck for continuity between sensor connector	Pin A and firewall ground
	harness connector at	be continuity between the sensor		stu	d.	
	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	d the ground terminal,
	continuity on ground	continuity between the sensor			repair wiring as necessary. Go to Step 5-	1.
	and signal wire at sensor connector.	connector signal wire (Pin B) and Pin 18 of the 52 Pin ICU/CECU	2.	Ch	eck for continuity between sensor connector	Pin B and Pin 18 of the
		connector C.		52	Pin ICU/CECU connector C.	
	Pin A – Ground	Connector C.		a.	If there is continuity between Pin B and Pi	in 18, test is complete.
	Pin B - Signal				Go to Step 6.	
	See Harness Interface			b.	If there is no continuity between Pin B and	d Pin 18 at ICU/CECU,
	Diagrams for possible sensor locations.				repair wiring as necessary. Go to Step 5-2	2.
	See Connector		Alte	erna	te test method: Resistance in the oil tempe	rature sensor (thermistor)
	Identification for position		sigr	nal w	rire changes as oil temperature increases/de	creases.
	and identification of the		1.	Ву	unplugging the oil temperature sensor harn	ess connector and
	electrical connectors of			cor	nnecting a resistor decade box (i.e., Ametek	PST2000 Tester), or an
	ICU/CECU.			app	propriate resistor to Pins A and B, you can s	imulate the sensor by
	See ICU/CECU Pinout			dia	ling in a known resistance.	
	for terminal details of		2.	Ob	serve vehicle gauge reading on dash.	
	the ICU/CECU electrical		3.	If g	auge needle moves to approximately the sa	me temperature as in
	connections.			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
I	I	I	l			I

Step	Check	Result	Next Step	
			320	37.75
			338	30.32
			356	24.58
			374	20.11
			392	16.58
6	Select "Diagnose" to view rear drive axle temperature gauge DTCs. Unplug oil temperature harness connector at sensor. See Harness Interface Diagrams for possible sensor locations. See Connector Identification for position and identification of the electrical connectors of ICU/CECU. See ICU/CECU Pinout for terminal details of the ICU/CECU electrical connections.	DTC 7703 - Open in axle 2 oil temp circuit is displayed as "Active."		temp circuit is now t an open in the sensor fault (DTC 7703) was temperature sensor itself, p 2. open circuit in the signal Pin 18 of the 52 Pin necessary. Go to Step 2. en sensor connector Pin B connector C. ary. After repairs, DTC Pin B and Pin 18 of the
7	Select "Diagnose" to view rear drive axle temperature gauge DTCs. Next, unplug the oil temperature harness connector at sensor. See Harness Interface Diagrams for possible sensor locations. See Connector Identification for position and identification of the	DTC 7704 - Short in axle 2 oil temp circuit is displayed as "Active." DTC 7704 - Short in axle 2 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 (of the 52 Pin ICU/CECU connector C. 1. Check for a pinched or chaffed wire between Pin 18 of the 52 Pin ICU/CECU connector C. Rigo to Step 2. If DTC 7704 changes to "Inactive" after unplugging thave confirmed the problem is a short in the sensor in Replace sensor. Go to Step 2.	sensor signal) and Pin 18 in B (sensor signal) and epair wiring as necessary. he sensor connector, you

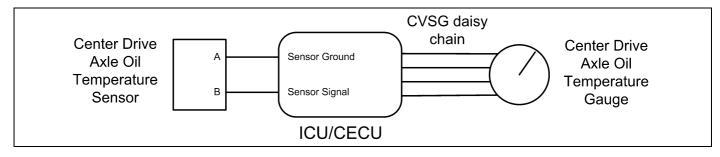
Step	Check	Result	Next Step
	electrical connectors of		
	ICU/CECU.		
	See ICU/CECU Pinout		
	for terminal details of		
	the ICU/CECU electrical		
	connections.		

Center Drive Axle Oil Temperature Gauge Inoperative

DTC7803 and DTC7804

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

The Center 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.
	"Center Drive Axle	display reasonable reading.	
	Oil Temperature," then		
	select "Open."	Valida manna da a a a tamana O	Defend the fellowing shorter
3	Select "Simulate". Drag	Vehicle gauge does not move. Go	Perform the following checks:
		to Step 3-1.	NOTE: For vehicles with a CECU, use the "Program" feature in ESA to
	pointer on the gauge	Vehicle gauge reading is in the	make sure that the parameter for the inoperative gauge is enabled.
	image is approximately mid-scale. Observe	same range as the ESA gauge	An inoperative gauge may simply have its CECU parameter set to
	vehicle gauge	image. Go to Step 3-7 .	disabled.
	movement.		Check CVSG data link wiring: Observe Gauge position in the wiring
	movement.		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 .
			Check continuity between Pin 1 on gauge harness connector and Pin 14
			of the 52 Pin ICU/CECU connector C.
			3. Check continuity between Pin 3 on gauge harness connector and Pin 15
			of the 52 Pin ICU/CECU connector C.
			Repair daisy chain jumper harness as necessary.
			5. Once continuity on both wires exists, perform "Simulate" test again.
			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 ICU/CECU and perform "Simulate" test again.
			(1) If gauge functions properly test is complete. Install new
			ICU/CECU permanently. Re-test and return truck to service.
			(2) 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.

Step	Check	Result	Next Step		
4	Select "Diagnose" to	DTC 7803 displayed - Open in	Indicates the problem could be an open in the wiring from the ICU/CEC	U to	
	view center drive axle	axle 3 oil temp circuit.	the sensor or a defective sensor. Go to Step 5, and if necessary, Step 6	S .	
	temperature gauge	DTC 7804 displayed - Short in	Indicates the problem could be a short to ground in the wiring from the		
	diagnostic trouble	axle 3 oil temp circuit.	ICU/CECU to the sensor or a defective sensor. Go to Step 5 , and if necessity	essary,	
	codes.		Step 7.		
5	Unplug oil temperature	(Sensor Ground) - There should	Check for continuity between sensor connector Pin A and firewall of the continuity between sensor connector Pin A and firewall of the continuity between sensor connector Pin A and firewall of the continuity between sensor connector Pin A and firewall of the continuity between sensor connector Pin A and firewall of the continuity between sensor connector Pin A and firewall of the continuity between sensor connector Pin A and firewall of the continuity between sensor connector Pin A and firewall of the continuity between sensor connector Pin A and firewall of the continuity between sensor connector Pin A and firewall of the continuity between sensor connector Pin A and firewall of the continuity between sensor connector Pin A and firewall of the continuity between sensor connector Pin A and firewall of the continuity between sensor connector Pin A and the continuity between sensor connector Pin A and the continuity between sensor connector Pin A and the continuity between sensor connector Pin A and the continuity between sensor continuity	round	
	harness connector at	be continuity between the sensor	stud.		
	sensor.	connector ground wire (Pin A) and		est 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 termin	al,	
	continuity on ground	continuity between the sensor	repair wiring as necessary. Go to Step 5-1.		
	and signal wire at sensor connector.	connector signal wire (Pin B) and Pin 19 of the 52 Pin ICU/CECU	2. Check for continuity between sensor connector Pin B and Pin 19 c	f the	
	Pin A – Ground	connector C.	52 Pin ICU/CECU connector C.		
		Connector C.	a. If there is continuity between Pin B and Pin 19, test is comple	ete.	
	Pin B - Signal		Go to Step 6.		
	See Harness Interface		b. If there is no continuity between Pin B and Pin 19 at ICU/CE	CU,	
	Diagrams for possible sensor locations.		repair wiring as necessary. Go to Step 5-2.		
	See Connector		Alternate test method: Resistance in the oil temperature sensor (therr	nistor)	
	Identification for position		signal wire changes as oil temperature increases/decreases.		
	and identification of the		1. By unplugging the oil temperature sensor harness connector and		
	electrical connectors of		connecting a resistor decade box (i.e., Ametek PST2000 Tester), of	r an	
	ICU/CECU.		appropriate resistor to Pins A and B, you can simulate the sensor	by	
	See ICU/CECU Pinout		dialing in a known resistance.		
	for terminal details of		2. Observe vehicle gauge reading on dash.		
	the ICU/CECU electrical		3. If gauge needle moves to approximately the same temperature as	in	
	connections.		the table below, the problem is a defective oil temperature sensor.	See	
			table below.		
			Temp °F Resistance Oh	ms	
			-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		
			284 302	60.32 47.46	

320 338 356 374 392 6 Select "Diagnose" to view center drive axle temperature gauge DTCs. DTC 7803 - Open in axle 3 oil temp 1. Using a jumper wire, jump across sensor harne	37.75 30.32 24.58 20.11 16.58 ess connector Pins A and B.
6 Select "Diagnose" to view center drive axle temperature gauge 356 374 392 1. Using a jumper wire, jump across sensor harner to circuit is displayed as "Active."	24.58 20.11 16.58
6 Select "Diagnose" to view center drive axle temperature gauge 374 392 1. Using a jumper wire, jump across sensor harne to circuit is displayed as "Active."	20.11 16.58
6 Select "Diagnose" to view center drive axle temperature gauge Select "Diagnose" to view center drive axle temperature gauge 392 1. Using a jumper wire, jump across sensor harne 1	16.58
6 Select "Diagnose" to view center drive axle temperature gauge DTC 7803 - Open in axle 3 oil temp 1. Using a jumper wire, jump across sensor harner 1	· ·
view center drive axle temperature gauge circuit is displayed as "Active."	ess connector Pins A and B.
temperature gauge	
Unplug oil temperature harness connector at sensor. See Harness Interface Diagrams for possible sensor locations. See Connector Identification for position and identification of the electrical connectors of ICU/CECU. See ICU/CECU Pinout for terminal details of the ICU/CECU electrical connections. 1. Pin B 2. Pin A a. If an "Active" DTC 7804 - Short in axle 3 displayed, you have confirmed there is not signal wire to the ICU/CECU. The original logged because there is an open in the oil not the wiring. Replace sensor. Go to Steep S	ot an open in the sensor al fault (DTC 7803) was ill temperature sensor itself, ep 2. open circuit in the signal d Pin 19 of the 52 Pin recessary. Go to Step 2.
(sensor signal) and Pin 19 of the 52 Pin ICU/CECU 1. If there is no continuity, repair wiring as necess	
7803 should now be displayed as "Inactive." 2. If there is continuity between sensor connector 52 Pin ICU/CECU connector C, the open circunot in the wiring. Replace sensor.	
7 Select "Diagnose" to view center drive axle temperature gauge DTC 7804 - Short in axle 3 oil temp of the fault is still "Active" after unplugging the sense confirmed there is a short to ground between Pin B of the 52 Pin ICU/CECU connector C.	-
DTCs. 1. Check for a pinched or chaffed wire between F	Pin B (sensor signal) and
Next, unplug the oil Pin 19 of the 52 Pin ICU/CECU connector C. F	Repair wiring as necessary.
temperature harness Go to Step 2.	
connector at sensor. DTC 7804 - Short in axle 3 oil If DTC 77804 changes to "Inactive" after unplugging	•
See Harness Interface temp circuit is now displayed as have confirmed the problem is a short in the sensor	itself, not the wiring.
Diagrams for possible "Inactive." 1. Replace sensor. Go to Step 2.	
sensor locations.	
See Connector	
Identification for position	
and identification of the	

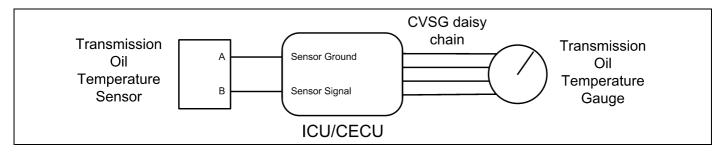
Step	Check	Result	Next Step
	electrical connectors of		
	ICU/CECU.		
	See ICU/CECU Pinout		
	for terminal details of		
	the ICU/CECU electrical		
	connections.		

Transmission Oil Temperature Gauge Inoperative

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		
2	select "Open."	Vehicle gauge does not move. Co.	Porform the following sheeks:
3	Select "Simulate". Drag the "Value" bar until the	Vehicle gauge does not move. Go	Perform the following checks:
	pointer on the gauge	to Step 3-1.	NOTE: For vehicles with a CECU, use the "Program" feature in ESA to
	image is approximately	Vehicle gauge reading is in the	make sure that the parameter for the inoperative gauge is enabled.
	mid-scale. Observe	same range as the ESA gauge image. Go to Step 3-7 .	An inoperative gauge may simply have its CECU parameter set to
	vehicle gauge	Image. Go to Step 3-7 .	disabled.
	movement.		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 .
			Check continuity between Pin 1 on gauge harness connector and Pin 14
			of the 52 Pin ICU/CECU connector C.
			3. Check continuity between Pin 3 on gauge harness connector and Pin 15
			of the 52 Pin ICU/CECU 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
			permanently. Re-test and return truck to service.
			ii. If gauge does not function during "Simulate" test, install Test ICU/CECU and perform "Simulate" test again.
			(1) If gauge functions properly test is complete. Install new
			ICU/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 17703 displayed – Open in	Indi	cates	the problem could be an open in the wiring	from the ICU/CECU to
	view main transmission	transmission oil temp circuit.	the	sens	or or a defective sensor. Go to Step 5, and	if necessary, Step 6.
	oil temperature gauge	DTC 17704 displayed – Short in	Indi	cates	the problem could be a short to ground in	the wiring from the
	diagnostic trouble	transmission oil temp circuit.	ICU	/CEC	CU to the sensor or a defective sensor. Go to	Step 5, and if necessary,
	codes.		Ste			
5	Unplug oil temperature	(Sensor Ground) - There should	1.	Che	eck for continuity between sensor connector	Pin A and firewall ground
	harness connector at	be continuity between the sensor		stud	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.	
	multimeter, check	(Signal) - There should be		b.	If there is no continuity between Pin A and	d 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) and	2.	Che	eck for continuity between sensor connector	Pin B and Pin 21 of the
	sensor connector.	Pin 21 of the 52 Pin ICU/CECU		52 I	Pin ICU/CECU connector C.	
	Pin A – Ground	connector C.		a.	If there is continuity between Pin B and Pi	in 21, test is complete.
	Pin B - Signal				Go to Step 6.	
	See Harness Interface			b.	If there is no continuity between Pin B and	d Pin 21 at ICU/CECU,
	Diagrams for possible				repair wiring as necessary. Go to Step 5-2	
	sensor locations.		Alte	rnat	e test method: Resistance in the oil tempe	rature sensor (thermistor)
	See Connector				re changes as oil temperature increases/de	, ,
	Identification for position		1.		unplugging the oil temperature sensor harn	
	and identification of the		' '	-	necting a resistor decade box (i.e., Ametek	
	electrical connectors of				ropriate resistor to Pins A and B, you can s	,
	ICU/CECU.				ing in a known resistance.	,
	See ICU/CECU Pinout		2.		serve vehicle gauge reading on dash.	
	for terminal details of		3.		auge needle moves to approximately the sa	mo tomporaturo as in
	the ICU/CECU electrical connections.		J.	-	table below, the problem is a defective oil to	·
	Connections.				e below.	Simperature defidor. dec
					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 17703 - Open in transmission	Using a jumper wire, jump across sensor harnes	
	view transmission	oil temp circuit is displayed as	1	
	temperature gauge	"Active."		
	DTCs.			
	Unplug oil temperature			
	harness connector at		<i> </i>	
	sensor.		// \	
	See Harness Interface		\	
	Diagrams for possible		\\ _	
	sensor locations.		2	
	See Connector			
	Identification for position		1. Pin B	
	and identification of the		2. Pin A	
	electrical connectors of			
	ICU/CECU.		a. If an "Active" DTC 17704 - Short in transm	ission temp circuit is now
	See ICU/CECU Pinout		displayed, you have confirmed there is no	t an open in the sensor
	for terminal details of		signal wire to the ICU/CECU. The original	fault (DTC 17703) was
	the ICU/CECU electrical		logged because there is an open in the oil	temperature sensor itself,
	connections.		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
			ICU/CECU connector C. Repair wiring as	necessary. Go to Step 2.
			Alternate test method: Check for continuity between	en sensor connector Pin B
			(sensor signal) and Pin 21 of the 52 Pin ICU/CECU	connector C.
			1. If there is no continuity, repair wiring as necess	ary. 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 ICU/CECU connector C, the open circui	t is in the sensor itself,
			not in the wiring. Replace sensor.	
7	Select "Diagnose" to	DTC 17704 - Short in transmission	If the fault is still "Active" after unplugging the senso	r connector, you have
	view transmission	oil temp circuit is displayed as	confirmed there is a short to ground between Pin B (sensor signal) and Pin 21
	temperature gauge	"Active."	of the 52 Pin ICU/CECU connector C.	
	DTCs.		Check for a pinched or chaffed wire between P	in B (sensor signal) and
	Next, unplug the oil		Pin 21 of the 52 Pin ICU/CECU connector C. R	epair wiring as necessary.
	temperature harness	DT0 47704 01 11 1	Go to Step 2.	
	connector at sensor.		If DTC 17704 changes to "Inactive" after unplugging	
	See Harness Interface	oil temp circuit is now displayed	have confirmed the problem is a short in the sensor	nsen, not the wiring.
	Diagrams for possible	as "Inactive."	1. Replace sensor. Go to Step 2 .	
	sensor locations.			
	See Connector			
	Identification for position			
	and identification of the			

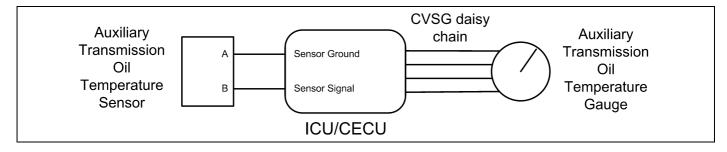
Step	Check	Result	Next Step
	electrical connectors of		
	ICU/CECU.		
	See ICU/CECU Pinout		
	for terminal details of		
	the ICU/CECU electrical		
	connections.		

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.



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.	Co to Ctory A
	window, select "Auxiliary	Gauge graphic on screen does not	G0 to Step 4.
	Transmission Oil	display reasonable reading.	
	Temperature," then		
3	select "Open." Select "Simulate". Drag	Vehicle gauge does not move. Go	Perform the following checks:
	_	to Step 3-1.	Toriorin the following checks.
	pointer on the gauge	Vehicle gauge reading is in the	NOTE: For vehicles with a CECU, use the "Program" feature in ESA to
	image is approximately	same range as the ESA gauge	make sure that the parameter for the inoperative gauge is enabled.
	mid-scale. Observe	image. Go to Step 3-7 .	An inoperative gauge may simply have its CECU parameter set to
	vehicle gauge		disabled.
	movement.		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 .
			Check continuity between Pin 1 on gauge harness connector and Pin 14
			of the 52 Pin ICU/CECU connector C.
			3. Check continuity between Pin 3 on gauge harness connector and Pin 15
			of the 52 Pin ICU/CECU connector C.
			Repair daisy chain jumper harness as necessary.
			5. Once continuity on both wires exists, perform "Simulate" test again.
			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
			ICU/CECU and perform "Simulate" test again.
			(1) If gauge functions properly test is complete. Install new
			ICU/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"	DTC 44203 displayed - Open in	Indicates the problem could be an open in the wiring	from the ICU/CECU 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
	temperature gauge	aux transmission temp circuit.	ICU/CECU to the sensor or a defective sensor. Go to	Step 5, and if necessary,
	diagnostic trouble		Step 7.	
	codes.			
5	Unplug oil temperature	(Sensor Ground) - There should	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	-
	continuity on ground and signal wire at	continuity between the sensor connector signal wire (Pin B) and	repair wiring as necessary. Go to Step 5-	1.
	sensor connector.	Pin 22 of the 52 Pin ICU/CECU	2. Check for continuity between sensor connector	Pin B and Pin 22 of the
	Pin A – Ground	connector C.	52 Pin ICU/CECU connector C.	
	Pin B - Signal		a. If there is continuity between Pin B and Pi	n 22, test is complete.
	See Harness Interface		Go to Step 6.	
	Diagrams for possible		b. If there is no continuity between Pin B and	d Pin 22 at ICU/CECU,
	sensor locations.		repair wiring as necessary. Go to Step 5-2	2.
	See Connector		Alternate test method: Resistance in the oil temper	rature sensor (thermistor)
	Identification for position		signal wire changes as oil temperature increases/de	creases.
	and identification of the		1. By unplugging the oil temperature sensor harn	ess connector and
	electrical connectors of		connecting a resistor decade box (i.e., Ametek	PST2000 Tester), or an
	ICU/CECU.		appropriate resistor to Pins A and B, you can s	imulate the sensor by
	See ICU/CECU Pinout		dialing in a known resistance.	
	for terminal details of		Observe vehicle gauge reading on dash.	
	the ICU/CECU electrical		3. If gauge needle moves to approximately the sa	me temperature as in
	connections.		the table below, the problem is a defective oil to	emperature 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
1	I	I	1	100.07

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
6	Select "Diagnose"	DTC 44203 - Open in aux	392 1. Using a jumper wire, jump across sensor harnes	16.58
	to view auxiliary	transmission temp circuit is	a soling a jumper wire, jump across sensor names	o connector i mo / tana b.
	transmission	displayed as "Active."		
	temperature gauge			
	DTCs.			
	Unplug oil temperature			
	harness connector at		// \	
	sensor.		\	
	See Harness Interface		\ \	
	Diagrams for possible		2	
	sensor locations.			
	See Connector		1. Pin B	
	Identification for position		2. Pin A	
	and identification of the			
	electrical connectors of		a. If an "Active" DTC 44204 - Short in transm	ission town sirguit is now
	ICU/CECU.		 a. If an "Active" DTC 44204 - Short in transm displayed, you have confirmed there is no 	•
	See ICU/CECU Pinout		signal wire to the ICU/CECU. The original	-
	for terminal details of		logged because there is an open in the oil	` ,
	the ICU/CECU electrical		not the wiring. Go to Step 2 .	tomporatare concernation,
	connections.		b. If DTC 44204 is not displayed, there is an	onen circuit in the signal
			wire between sensor connector Pin B and	,
			ICU/CECU connector C. Repair wiring as	
			Alternate test method: Check for continuity between	
			(sensor signal) and Pin 22 of the 52 Pin ICU/CECU	_
			If there is no continuity, repair wiring as necess	
			44203 should now be displayed as "Inactive."	a.,. / itto: ropairs, D10
			2. If there is continuity between sensor connector	Pin B and Pin 22 of the
			52 Pin ICU/CECU connector C, the open circui	t is in 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	•
	to view auxiliary	transmission temp circuit is	confirmed there is a short to ground between Pin B (sensor signal) and Pin 22
	transmission	displayed as "Active."	of the 52 Pin ICU/CECU connector C.	
	temperature gauge		Check for a pinched or chaffed wire between P	,
	DTCs.		Pin 22 of the 52 Pin ICU/CECU connector C. R	epair wiring as necessary.
	Next, unplug the oil	DTC 44204 Chart in a	Go to Step 2.	the concer connector with
	temperature harness	DTC 44204 - Short in aux	If DTC 44204 changes to "Inactive" after unplugging	-
	connector at sensor.	transmission temp circuit is now	have confirmed the problem is a short in the sensor	nsen, not the winng.
	See Harness Interface	displayed as "Inactive."	1. Replace sensor. Go to Step 2 .	
	Diagrams for possible			
	sensor locations.		I	

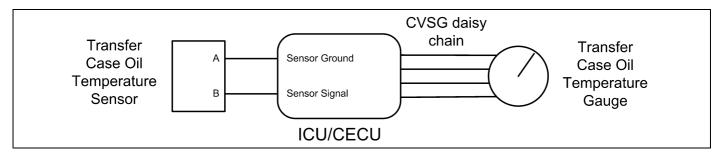
Step	Check	Result	Next Step
	See Connector		
	Identification for position		
	and identification of the		
	electrical connectors of		
	ICU/CECU.		
	See ICU/CECU Pinout		
	for terminal details of		
	the ICU/CECU electrical		
	connections.		

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.



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 the "Value" bar until the	Vehicle gauge does not move. Go	Perform the following checks:
	pointer on the gauge	to Step 3-1.	NOTE: For vehicles with a CECU, use the "Program" feature in ESA to
	image is approximately	Vehicle gauge reading is in the	make sure that the parameter for the inoperative gauge is enabled.
	mid-scale. Observe	same range as the ESA gauge image. Go to Step 3-7 .	An inoperative gauge may simply have its CECU parameter set to
	vehicle gauge		disabled.
	movement.		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 ICU/CECU connector C.
			3. Check continuity between Pin 3 on gauge harness connector and Pin 15
			of the 52 Pin ICU/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
			ICU/CECU and perform "Simulate" test again.
			(1) If gauge functions properly test is complete. Install new
			ICU/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	Indicat	es the problem could be an open in the wiring	from the ICU/CECU to
	view transfer case oil	transfer case oil temp circuit.	the ser	nsor or a defective sensor. Go to Step 5, and	if necessary, Step 6.
	temperature gauge	DTC 138804 displayed - Short in	Indicat	es the problem could be a short to ground in	the wiring from the
	diagnostic trouble	transfer case oil temp circuit.	ICU/CI	ECU to the sensor or a defective sensor. Go to	Step 5, and if necessary,
	codes.		Step 7		
5	Unplug oil temperature	(Sensor Ground) - There should		heck for continuity between sensor connector	Pin A and firewall ground
	harness connector at	be continuity between the sensor	st	tud.	
	sensor.	connector ground wire (Pin A) and	a.	,	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.	•	=
	continuity on ground and signal wire at	continuity between the sensor connector signal wire (Pin B) and		repair wiring as necessary. Go to Step 5-	1.
	sensor connector.	Pin 26 of the 52 Pin ICU/CECU	2. C	heck for continuity between sensor connector	Pin B and Pin 26 of the
	Pin A – Ground	connector C.	52	2 Pin ICU/CECU connector C.	
	Pin B - Signal		a.	If there is continuity between Pin B and Pi	n 26, test is complete .
	See Harness Interface			Go to Step 6.	
	Diagrams for possible		b.	If there is no continuity between Pin B and	d Pin 26 at ICU/CECU,
	sensor locations.			repair wiring as necessary. Go to Step 5-2	2.
	See Connector		Altern	ate test method: Resistance in the oil tempe	rature sensor (thermistor)
	Identification for position		signal	wire changes as oil temperature increases/de	creases.
	and identification of the		1. B	y unplugging the oil temperature sensor harn	ess connector and
	electrical connectors of		CC	onnecting a resistor decade box (i.e., Ametek	PST2000 Tester), or an
	ICU/CECU.			ppropriate resistor to Pins A and B, you can s	imulate the sensor by
	See ICU/CECU Pinout		di	aling in a known resistance.	
	for terminal details of		2. O	bserve vehicle gauge reading on dash.	
	the ICU/CECU electrical		3. If	gauge needle moves to approximately the sa	me temperature as in
	connections.			e table below, the problem is a defective oil to	emperature sensor. See
			ta	ble below.	
				Temp °F -40	Resistance Ohms
				-22	100,856 52,594
				-22 -4	28,582
					·
				14	16,120
				32	9,399
				50	5,658
				68 86	3,511
				86 104	2,240
					1,465
				122	980.3 670.9
				140 159	
				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	Using a jumper wire, jump across sensor harnes	
	view transfer case	case oil temp circuit is displayed	1	
	temperature gauge	as "Active."		
	DTCs.			
	Unplug oil temperature			
	harness connector at		// \	
	sensor.			
	See Harness Interface			
	Diagrams for possible			
	sensor locations.		2	
	See Connector			
	Identification for position		1. Pin B	
	and identification of the		2. Pin A	
	electrical connectors of			
	ICU/CECU.		a. If an "Active" DTC 138804 - Short in trans	fer case oil temp circuit
	See ICU/CECU Pinout		is now displayed, you have confirmed the	re is not an open in the
	for terminal details of		sensor signal wire to the ICU. The original	fault (DTC 138803) was
	the ICU/CECU electrical		logged because there is an open in the oil	temperature sensor itself,
	connections.		not the wiring. Go to Step 2.	
			b. If DTC 138804 is not displayed, there is a	n open circuit in the signal
			wire between sensor connector Pin B and	Pin 26 of the 52 Pin
			ICU/CECU connector C. Repair wiring as	necessary. Go to Step 2.
			Alternate test method: Check for continuity between	en sensor connector Pin B
			(sensor signal) and Pin 26 of the 52 Pin ICU/CECU	connector C.
			1. If there is no continuity, repair wiring as necess	ary. After repairs, DTC
			138803 should now be displayed as "Inactive."	
			2. If there is continuity between sensor connector	
			52 Pin ICU/CECU connector C, the open circui	t is in the sensor itself,
7	Select "Diagnose" to	DTC 120004 Chart in transfer	not in the wiring. Replace sensor.	ager connector you have
7		DTC 138804 - Short in transfer	A . If the fault is still "Active" after unplugging the ser	-
	view transfer case oil temperature gauge	case oil temp circuit is displayed as "Active."	confirmed there is a short to ground between Pin B (of the 52 Pin ICU/CECU connector C.	sensul signal) and Fill 20
	DTCs.	ao nouvo.		in R (concor cianal) and
	Next, unplug the oil		 Check for a pinched or chaffed wire between P Pin 26 of the 52 Pin ICU/CECU connector C. R 	, ,
	temperature harness		Go to Step 2 .	epair wiring as necessary.
	connector at sensor.	DTC 138804 - Short in transfer	If DTC 138804 changes to "Inactive" after unpluggin	g the sensor connector.
	See Harness Interface	case oil temp circuit is now	you have confirmed the problem is a short in the ser	-
	Diagrams for possible	displayed as "Inactive."	Replace sensor. Go to Step 2 .	Ŭ
	sensor locations.	-	, , , , , , , , , , , , , , , , , , ,	
	See Connector			
	Identification for position			
	and identification of the			
l	I	I	I	

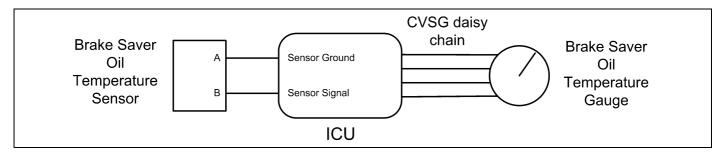
Step	Check	Result	Next Step
	electrical connectors of		
	ICU/CECU.		
	See ICU/CECU Pinout		
	for terminal details of		
	the ICU/CECU electrical		
	connections.		

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.



12 - 78

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 "Brake	Gauge graphic on screen does not	Go to Step 4.
	Saver 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.	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.	data link wiring is OK. Go to Step 3-5.
	vehicle gauge		b. If gauge is last gauge in daisy chain or followed by other
	movement.		non-functional gauges, go to Step 3-2.
			Check continuity between Pin 1 on gauge harness connector and Pin
			14 of the 52 Pin ICUconnector C.
			Check continuity between Pin 3 on gauge harness connector and Pin
			15 of the 52 Pin ICUconnector 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
			permanently. Re-test and return truck to service.
			ii. If gauge does not function during "Simulate" test, install Test
			ICU and perform "Simulate" test again.
			(1) If gauge functions properly test is complete. Install new ICU
			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
<u> </u>	0 1 4 "D"	DTO 400700 II	Step 4.
4	Select "Diagnose" to	DTC 138703 displayed - Open in	Indicates the problem could be an open in the wiring from the ICU/CECU to
	view brake saver oil	brake saver oil temp circuit.	the sensor or a defective sensor. Go to Step 5 , and if necessary, Step 6 .
	temperature gauge	DTC 138704 displayed - Short in	Indicates the problem could be a short to ground in the wiring from the
	diagnostic trouble	brake saver oil temp circuit.	ICU/CECU to the sensor or a defective sensor. Go to Step 5 , and if necessary,
<u> </u>	codes.		Step 7.

Step	Check	Result			Next Step	
5	Unplug oil temperature	(Sensor Ground) - There should	1.	Ch	eck for continuity between sensor connector	Pin A and firewall ground
	harness connector at	be continuity between the sensor		stu	d.	
	sensor.	connector ground wire (Pin A) and		a.	If there is continuity between Pin A and th	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 an	d the ground terminal,
	continuity on ground	continuity between the sensor			repair wiring as necessary. Go to Step 5-	=
	and signal wire at	connector signal wire (Pin B) and	2.	Ch	eck for continuity between sensor connector	r Pin B and Pin 24 of the
	sensor connector.	Pin 24 of the 52 Pin ICU/CECU			Pin ICU/CECU connector C.	
	Pin A – Ground	connector C.		a.	If there is continuity between Pin B and P	in 24, test is complete.
	Pin B - Signal				Go to Step 6 .	,
	See Harness Interface			b.	If there is no continuity between Pin B an	d Pin 24 at ICU/CECU
	Diagrams for possible			٥.	repair wiring as necessary. Go to Step 5 -	•
	sensor locations.		ΔIŧ	orna	te test method: Resistance in the oil tempe	
	See Connector				rire changes as oil temperature increases/de	` '
	Identification for position		1.		unplugging the oil temperature sensor harr	
	and identification of the		1.	•	nnecting a resistor decade box (i.e., Ametek	
	electrical connectors of				propriate resistor to Pins A and B, you can s	•
	ICU/CECU.				ling in a known resistance.	simulate the concer by
	See ICU/CECU Pinout		2.		serve vehicle gauge reading on dash.	
	for terminal details of					ama tamparatura aa in
	the ICU/CECU electrical		3.	_	auge needle moves to approximately the sate table below, the problem is a defective oil t	
	connections.				le below.	emperature sensor. See
				- 10.0	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
					320	37.75
					338	30.32
					356	24.58
					374	20.11
		l			392	16.58

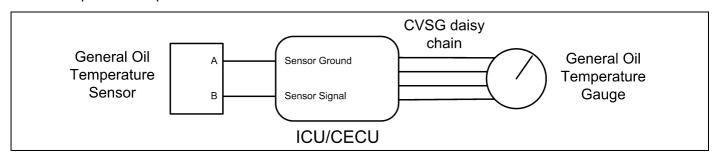
Step	Check	Result	Next Step
6	Select "Diagnose" to	DTC 138703 - Open in brake	1. Using a jumper wire, jump across sensor harness connector Pins A and B.
	view brake saver oil	saver oil temp circuit is displayed	1
	temperature gauge	as "Active."	
	DTCs.		
	Unplug oil temperature		
	harness connector at		
	sensor.		
	See Harness Interface		
	Diagrams for possible		\\ \ \\
	sensor locations.		2
	See Connector		
	Identification for position		1. Pin B
	and identification of the		2. Pin A
	electrical connectors of		2. 1117
	ICU/CECU.		
	See ICU/CECU Pinout		a. If an "Active" DTC 138704 - Short in brake saver oil temp circuit
	for terminal details of		is now displayed, you have confirmed there is not an open in the
	the ICU/CECU electrical		sensor signal wire to the ICU. The original fault (DTC 138703) was
	connections.		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 ICU/CECU connector C, the open circuit is in the sensor itself,
	0.1.4.1101		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
	temperature gauge	as "Active."	of the 52 Pin ICU connector C.
	DTCs.		1. Check for a pinched or chaffed wire between Pin B (sensor signal) and
	Next, unplug the oil		Pin 24 of the 52 Pin ICU connector C. Repair wiring as necessary. Go to
	temperature harness		Step 2.
	connector at sensor.		If DTC 138704 changes to "Inactive" after unplugging the sensor connector,
	See Harness Interface	oil temp circuit is now displayed	you have confirmed the problem is a short in the sensor itself, not the wiring.
	Diagrams for possible	as "Inactive."	1. Replace sensor. Go to Step 2 .
	sensor locations.		
	See Connector		
	Identification for position		
	and identification of the		
	electrical connectors of		
	ICU/CECU.		
	See ICU/CECU Pinout		
	for terminal details of		
	the ICU/CECU electrical		
	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.	
	,	Gauge graphic on screen does not	Go to Step 4.
		display reasonable reading.	
_	select "Open."		
	Select "Simulate". Drag	Vehicle gauge does not move. Go	Perform the following checks:
		to Step 3-1.	NOTE: For vehicles with a CECU, use the "Program" feature in ESA to
	pointer on the gauge	Vehicle gauge reading is in the	make sure that the parameter for the inoperative gauge is enabled.
		same range as the ESA gauge	An inoperative gauge may simply have its CECU parameter set to
	mid-scale. Observe	image. Go to Step 3-7 .	disabled.
	vehicle gauge		Check CVSG data link wiring: Observe Gauge position in the wiring
	movement.		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 ICU/CECU connector C.
			3. Check continuity between Pin 3 on gauge harness connector and Pin 15
			of the 52 Pin ICU/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
			ICU/CECU and perform "Simulate" test again.
			(1) If gauge functions properly test is complete. Install new
			ICU/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"	DTC 44103 displayed - Open in	Indicates the problem could be an open in the wiring from the ICU/CECU to
	to view general oil	general oil temp circuit.	the sensor or a defective sensor. Go to Step 5, and if necessary, Step 6.
	temperature gauge	DTC 44104 displayed - Short in	Indicates the problem could be a short to ground in the wiring from the
	diagnostic trouble	general oil temp circuit.	ICU/CECU to the sensor or a defective sensor. Go to Step 5 , and if necessar
	codes.		Step 7.
5	Unplug oil temperature	(Sensor Ground) - There should	Check for continuity between sensor connector Pin A and firewall groun
	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 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 sensor connector.	connector signal wire (Pin B) and Pin 20 of the 52 Pin ICU/CECU	2. Check for continuity between sensor connector Pin B and Pin 20 of the
		connector C.	52 Pin ICU/CECU connector C.
	Pin A – Ground Pin B - Signal	Connector C.	a. If there is continuity between Pin B and Pin 20, test is complete.
			Go to Step 6.
	See Harness Interface Diagrams for possible		b. If there is no continuity between Pin B and Pin 20 at ICU/CECU,
	sensor locations.		repair wiring as necessary. Go to Step 5-2.
	See Connector		Alternate test method: Resistance in the oil temperature sensor (thermistor
	Identification for position		signal wire changes as oil temperature increases/decreases.
	and identification of the		By unplugging the oil temperature sensor harness connector and
	electrical connectors of		connecting a resistor decade box (i.e., Ametek PST2000 Tester), or an
	ICU/CECU.		appropriate resistor to Pins A and B, you can simulate the sensor by
	See ICU/CECU Pinout		dialing in a known resistance.
	for terminal details of		2. Observe vehicle gauge reading on dash.
	the ICU/CECU electrical		3. If gauge needle moves to approximately the same temperature as in
	connections.		the table below, the problem is a defective oil 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
			266 77.54
			284 60.32

Step	Check	Result	Next Step	
			320	37.75
			338	30.32
			356	24.58
			374	20.11
			392	16.58
6	Select "Diagnose" to view general oil temperature gauge DTCs. Unplug oil temperature harness connector at sensor. See Harness Interface Diagrams for possible sensor locations. See Connector Identification for position and identification of the electrical connectors of ICU/CECU. See ICU/CECU Pinout for terminal details of the ICU/CECU electrical connections.	DTC 44103 - Open in general oil temp circuit is displayed as "Active."	1. Using a jumper wire, jump across sensor harnes 1. Pin B 2. Pin A 2. Pin A 2. Pin A 3. If an "Active" DTC 44104 - Short in general displayed, you have confirmed there is not signal wire to the ICU/CECU. The original logged because there is an open in the oil not the wiring. Go to Step 2. 3. If DTC 44104 is not displayed, there is an wire between sensor connector Pin B and ICU/CECU connector C. Repair wiring as ICU/CECU connector C. Repair wiring as Alternate test method: Check for continuity between (sensor signal) and Pin 20 of the 52 Pin ICU/CECU connector 1. If there is no continuity, repair wiring as necess 44103 should now be displayed as "Inactive." 2. If there is continuity between sensor connector	al oil temp circuit is now tan open in the sensor fault (DTC 44103) was temperature sensor itself, open circuit in the signal Pin 20 of the 52 Pin necessary. Go to Step 2. In sensor connector Pin B connector C. ary. After repairs, DTC
7	Soloet "Diagnoso"	DTC 44104 Short in general	52 Pin ICU/CECU connector C, the open circui not in the wiring. Replace sensor.	
,	Select "Diagnose" to view general oil temperature gauge	DTC 44104 - Short in general oil temp circuit is displayed as "Active."	If the fault is still "Active" after unplugging the senso confirmed there is a short to ground between Pin B (of the 52 Pin ICU/CECU connector C.	· ·
	DTCs. Next, unplug the oil temperature harness		 Check for a pinched or chaffed wire between P Pin 20 of the 52 Pin ICU/CECU connector C. Re Go to Step 2. 	, ,
	connector at sensor.	DTC 44104 - Short in general oil	If DTC 44104 changes to "Inactive" after unplugging	the sensor connector, you
	See Harness Interface	temp circuit is now displayed as	have confirmed the problem is a short in the sensor	tself, not the wiring.
	Diagrams for possible sensor locations.	"Inactive."	1. Replace sensor. Go to Step 2 .	
	See Connector Identification for position			
	and identification of the			

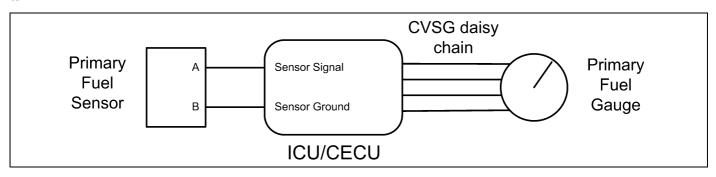
Step	Check	Result	Next Step
	electrical connectors of		
	ICU/CECU.		
	See ICU/CECU Pinout		
	for terminal details of		
	the ICU/CECU electrical		
	connections.		

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 Step 3.
	the "Components"	reasonable reading.	
	window, select "Primary	Gauge graphic on screen does not	Go to Step 4.
		display reasonable reading.	
3	"Open." Select "Simulate". Drag	Vehicle gauge does not move. Go	Porform the following checke:
	=	to Step 3-1.	1 enorm the following checks.
	pointer on the gauge	Vehicle gauge reading is in the	NOTE: For vehicles with a CECU, use the "Program" feature in ESA to
	image is approximately	same range as the ESA gauge	make sure that the parameter for the inoperative gauge is enabled.
	mid-scale. Observe	image. Go to Step 3-7 .	An inoperative gauge may simply have its CECU parameter set to
	vehicle gauge		disabled.
	movement.		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 ICU/CECU connector C.
			3. Check continuity between Pin 3 on gauge harness connector and Pin 15
			of the 52 Pin ICU/CECU 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
			permanently. Re-test and return truck to service.
			ii. If gauge does not function during "Simulate" test, install Test ICU/CECU and perform "Simulate" test again.
			(1) If gauge functions properly test is complete. Install new
			ICU/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 82903 displayed - Open in	Indicates the problem could be an open in the wiring fr	om the ICU/CECU to
	view primary fuel	primary fuel level circuit.	the sensor or a defective sensor. Go to Step 5, and if r	necessary, Step 6.
	gauge diagnostic trouble	DTC 82904 displayed - Short in	Indicates the problem could be a short to ground in the	e wiring from the
	codes.	primary fuel level circuit.	ICU/CECU to the sensor or a defective sensor. Go to S	Step 5, and if necessary,
			Step 7.	
5	Unplug fuel gauge	(Sensor Ground) - There should	Check for continuity between sensor connector Pi	in 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 g	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 t	he 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) and	Check for continuity between sensor connector P	in A and Pin 12 of the
	sensor connector.	Pin 12 of the 52 Pin ICU/CECU	52 Pin ICU/CECU connector C.	
	Pin A – Signal	connector C.	a. If there is continuity between Pin A and Pin	12 tost is complete
	Pin B - Ground		Go to Step 6 .	12, test is complete.
	See Harness Interface		·	0:- 40 -+ IOLUOFOLI
	Diagrams for possible		b. If there is no continuity between Pin A and F	7in 12 at ICU/CECU,
	sensor locations.		repair wiring as necessary. Go to Step 5-2 .	
	See Connector		Alternate test method: Resistance in the fuel level se	ensor signal wire
	Identification for position		changes as the fuel level changes.	
	and identification of the		 By unplugging the fuel gauge sensor harness con 	nector and connecting
	electrical connectors of		a resistor decade box (i.e. Ametek PST2000 Test	ter), or an appropriate
	ICU/CECU.		resistor to Pins A and B, you can simulate the se	nsor by dialing in a
	See ICU/CECU Pinout		known resistance.	
	for terminal details of		2. Observe vehicle gauge reading on dash.	
	the ICU/CECU electrical		3. If gauge needle moves to approximately the same	e level as in the table
	connections.		below, the problem is a defective fuel level sensor	r. 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 82903 - Open in primary	Using a jumper wire, jump across sensor harness	
	view primary fuel gauge	fuel level circuit is displayed as		
	DTCs.	"Active."		
	Unplug fuel gauge			
	harness connector.		If an "Active" DTC 82904 - Short in primary fuel level ci	ircuit is now displayed
	See Harness Interface		you have confirmed there is not an open in the sensor	
	Diagrams for possible		ICU/CECU. The original fault (DTC 82903) was logged	=
	sensor locations.		open in the sensor itself, not the wiring. Go to Step 2 .	
	See Connector		If DTC 82904 is not displayed, there is an open circuit	in the signal wire
	Identification for position		between sensor connector Pin A and Pin 12 of the 52	=
	and identification of the		connector C. Repair wiring as necessary. Go to Step 2	
	electrical connectors of		Alternate test method: Check for continuity between	
	ICU/CECU.		(sensor signal) and Pin 12 of the 52 Pin ICU/CECU co	
	See ICU/CECU Pinout			
	for terminal details of		If there is no continuity, repair wiring as necessary	y. After repairs, DTC
	torrima dotano or		82903 should now be displayed as "Inactive."	

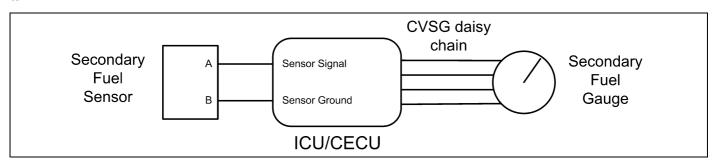
Step	Check	Result	Next Step
	the ICU/CECU electrical connections.		If there is continuity between sensor connector Pin A and Pin 12 of the 52 Pin ICU/CECU connector C, the open circuit is in the sensor itself, not in the wiring. Replace sensor.
7	Select "Diagnose" to view primary fuel level gauge DTCs. Next, unplug the fuel gauge harness connector at sensor. See Harness Interface Diagrams for possible sensor locations. See Connector Identification for position	DTC 82904 - Short in primary fuel level circuit is displayed as "Active." DTC 82904 - Short in primary fuel level circuit is now displayed as "Inactive."	not in the wiring. Replace sensor. If the fault is still "Active" after unplugging the sensor connector, you have confirmed there is a short to ground between Pin A (sensor signal) and Pin 12 of the 52 Pin ICU/CECU connector C. 1. Check for a pinched or chaffed wire between Pin A (sensor signal) and Pin 12 of the 52 Pin ICU/CECU connector C, Repair wiring as necessary. Go to Step 2. If DTC 82904 changes to "Inactive" after unplugging the sensor connector, you have confirmed the problem is a short in the sensor itself, not the wiring. 1. Replace sensor. Go to Step 2.
	and identification of the electrical connectors of ICU/CECU. See ICU/CECU Pinout for terminal details of the ICU/CECU 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		
2	vehicle. Select "Monitor." From	Gauge graphic on screen displays	Co to Stop 2
	the "Components"	reasonable reading.	Go to step 3.
	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.	NOTE: For vehicles with a CECU, use the "Program" feature in ESA to
	pointer on the gauge	Vehicle gauge reading is in the	make sure that the parameter for the inoperative gauge is enabled.
	image is approximately mid-scale. Observe	same range as the ESA gauge image. Go to Step 3-7 .	An inoperative gauge may simply have its CECU parameter set to
	vehicle gauge	image. Oo to Step 3-7.	disabled.
	movement.		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 .
			 Check continuity between Pin 1 on gauge harness connector and Pin 14 of the 52 Pin ICU/CECU connector C.
			3. Check continuity between Pin 3 on gauge harness connector and Pin 15
			of the 52 Pin ICU/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.
			 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
			and perform "Simulate" test again.
			(1) If gauge functions properly test is complete. Install new
			ICU/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 83003 displayed - Open in	Indicates the problem could be an open in the wiring from the ICU/CECU 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
	codes.	secondary fuel level circuit.	ICU/CECU to the sensor or a defective sensor. Go to $\textbf{Step 5},$ 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
	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) and	Check for continuity between sensor connector Pin A and Pin 13 of the
	sensor connector.	Pin 13 of the 52 Pin ICU/CECU	52 Pin ICU/CECU connector C.
	Pin A – Signal	connector C.	a. If there is continuity between Pin A and Pin 13, test is complete.
	Pin B - Ground		Go to Step 6 .
	See Harness Interface		
	Diagrams for possible		b. If there is no continuity between Pin A and Pin 13 at ICU/CECU,
	sensor locations.		repair wiring as necessary. Go to Step 5-2 .
	See Connector		Alternate test method: Resistance in the fuel level sensor signal wire
	Identification for position		changes as the fuel level changes.
	and identification of the		1. By unplugging the fuel gauge sensor harness connector and connecting
	electrical connectors of		a resistor decade box (i.e. Ametek PST2000 Tester), or an appropriate
	ICU/CECU.		resistor to Pins A and B, you can simulate the sensor by dialing in a
	See ICU/CECU Pinout		known resistance.
	for terminal details of		2. Observe vehicle gauge reading on dash.
	the ICU/CECU electrical		3. If gauge needle moves to approximately the same level as in the table
	connections.		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	Using a jumper wire, jump across sensor harness connector Pins A and B.
	view secondary fuel	fuel level circuit is displayed as	
	gauge DTCs.	"Active."	
	Unplug fuel gauge		
	harness connector.		If an "Active" DTC 83004 - Short in secondary fuel level circuit is now
	See Harness Interface		displayed, you have confirmed there is not an open in the sensor signal wire to
	Diagrams for possible		the ICU/CECU. The original fault (DTC 83003) was logged because there is
	sensor locations.		an open in the sensor itself, not the wiring. Go to Step 2 .
	See Connector		If DTC 83004 is not displayed, there is an open circuit in the signal wire
	Identification for position		between sensor connector Pin A and Pin 13 of the 52 Pin ICU/CECU
	and identification of the		connector C. Repair wiring as necessary. Go to Step 2 .
	electrical connectors of		Alternate test method: Check for continuity between sensor connector Pin A
	ICU/CECU.		,
	See ICU/CECU Pinout		(sensor signal) and Pin 13 of the 52 Pin ICU/CECU connector C.
	for terminal details of		1. If there is no continuity, repair wiring as necessary. After repairs, DTC
	nor terminar details of		83003 should now be displayed as "Inactive."

Step	Check	Result	Next Step
	the ICU/CECU electrical connections.		 If there is continuity between sensor connector Pin A and Pin 13 of the 52 Pin ICU/CECU connector C, the open circuit is in the sensor itself, not in the wiring. Replace sensor.
7	level gauge DTCs. Next, unplug the fuel gauge harness connector at sensor. See Harness Interface Diagrams for possible sensor locations. See Connector Identification for position and identification of the electrical connectors of ICU/CECU. See ICU/CECU Pinout	DTC 83004 - Short in secondary fuel level circuit is displayed as "Active." DTC 83004 - Short in secondary fuel level circuit is now displayed as "Inactive."	If the fault is still "Active" after unplugging the sensor connector, you have confirmed there is a short to ground between Pin A (sensor signal) and Pin 13 of the 52 Pin ICU/CECU connector C. 1. Check for a pinched or chaffed wire between Pin A (sensor signal) and Pin 13 of the 52 Pin ICU/CECU connector C. Repair wiring as necessary. If DTC 83004 changes to "Inactive" after unplugging the sensor connector, you have confirmed the problem is a short in the sensor itself, not the wiring. 1. Replace sensor. Go to Step 2.
	for terminal details of the ICU/CECU electrical connections.		

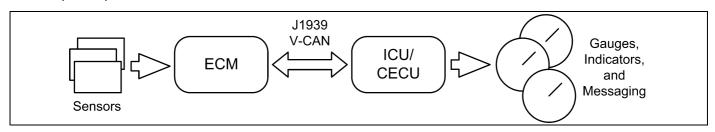
Engine Related DTCs

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

Symptom: numerous engine related components inoperative.

The ICU/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.



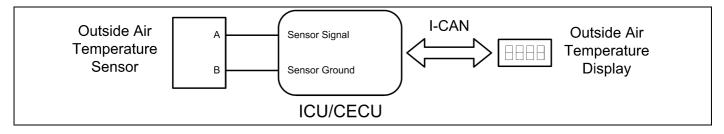
Step	Check	Result	Next Step
1	Turn ignition key ON.		Go to Step 2.
	Start ESA, then select		
	"Connect" to establish		
	communication to the		
	vehicle.		
2	Select "Diagnose" to	Numerous Engine Control Module	Most likely, there was or is some J1939 communication failure between the
	view any Engine Control	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.



Step	Check	Resu	lt		Next Step
1	Turn ignition key ON.	Noou	- -		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	ding. 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.				
	NOTE: Manitar				
	NOTE: Monitor				
	mode is only				
	available if				
	vehicle has a				
	CECU. For an ICU, go directly				
	to Step 3 .				
3	•	Outside air temperature does not fu	unction during C	luster test or	Replace Gauge Cluster.
		does not function properly.			.,
	"Components" window,	Outside air temperature display pro	ceeds through i	ts test pattern	For CECU: Verify gauge is still not working
	•	as described in the Cluster Test de	_		properly. If not, install a test CECU and test
	observe the outside air	control unit to Gauge Cluster comm	nunication is ope	erational.	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 open in the wiring from the			
	trouble codes.	ICU/CECU to the sensor or a defective sensor.			
		DTC 17104 displayed. Short in out	side air tempera	ture circuit.	Go to Step 7.
		Indicates the problem could be a sh	ort to ground in	the wiring from	
		the ICU/CECU to the sensor or a de			
5	Unplug outside air	(Sensor Resistance) – Determine to	•		Measure the sensor resistance
	temperature harness	resistance of the sensor should ma			a. If sensor resistance is correct. Go to
	connector at mirror	the best way to get the real tempera	ature is to put th	e 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	,		2. Check for continuity between sensor
	connector.	connector ground wire (Pin B) and t	_		connector Pin B and the ground terminal.
	Using a digital	(Signal) - There should be continu	,		a. If there is continuity between Pin
	multimeter, check the	connector signal wire (Pin A) and P	in 16 of the 52 F	Pin ICU/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 -00 F	-40	wiring as necessary. Go to Step 5-1
	Pin A – Signal	180,000	-28.5	-20	Check for continuity between sensor
	Pin B – Ground	91,000	-18	0	connector Pin A and Pin 16 of the 52 Pin
	See Harness Interface	47,000	-6.5	20	ICU/CECU connector C.
	Diagrams for possible	27,000	4	39	
	sensor locations.	15,000	16	61	a. If there is continuity between Pin A
	See Connector	10,000	25	77	and Pin 16 of the 52 Pin ICU/CECU
	Identification for position	9,100	27	81	connector C, test is complete. Go
	and identification of the	5,600	39	102	to Step 6.
l	ļ				I

Step	Check	Resu	lt		Next Step
	electrical connectors of	3,900	48	118	b. If there is no continuity between
	ICU/CECU.	2,400	61.5	142	Pin A and Pin 16, repair wiring as
	See ICU/CECU Pinout	1,800	69.5	157	necessary. Go to Step 5-2.
	for terminal details of	910	91.5	197	Alternate test method: Resistance in the
	the ICU/CECU electrical		00		outside temperature sensor (thermistor) signa
	connections.				wire changes as the outside air temperature
					increases/decreases.
					1. By unplugging the outside air temperatur harness connector at the mirror harness to instrument panel 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. a. While performing the test, observe the temperature display on the dasl b. If the display reads approximately the same temperature as in the table on the previous page, the problem.
					a defective sensor.
6	Select "Diagnose"	DTC 17103 – Open in outside air te	emperature circu	uit is displayed	Using a jumper wire, jump across senso
	to view outside air	as "Active".			harness connector Pin A and B.
	temperature DTCs.				a. If an "Active" DTC 17104 – Short
	Unplug outside air				in outside air temperature circuit is
	temperature harness				now displayed, you have confirmed
	connector at mirror				there is not an open in the sensor
	harness to instrument panel harness				signal wire to the ICU/CECU. The
	connector.				original fault (DTC 17103) was logged because there is an open
	See Harness Interface				in the sensor itself, not the wiring.
	Diagrams for possible				Replace the sensor. Go to Step 2 .
	sensor locations.				
	See Connector				b. If DTC 17104 is not displayed, ther is an open circuit in the signal wire
	Identification for position				between sensor connector Pin A
	and identification of the				and Pin 16 of the 52 Pin ICU/CECU
	electrical connectors of				connector C. Repair wiring as
	ICU/CECU.				necessary. Go to Step 2 .
	See ICU/CECU Pinout				
	for terminal details of				
	the ICU/CECU electrical				
	connections.				

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 the
	to view outside air	as "Active".	sensor connector, you have confirmed there
	temperature DTCs.		is a short to ground between Pin A (sensor
	Unplug outside air		signal) and Pin 16 of the 52 Pin ICU/CECU
	temperature harness		connector C.
	connector at mirror		Check for a pinched or chaffed wire
	harness to instrument		between Pin A (sensor signal) and Pin
	panel harness		16 of the 52 Pin ICU/CECU connector C.
	connector.		Repair wiring as necessary. Go to Step 2.
	See Harness Interface		
	Diagrams for possible		
	sensor locations.		
	See Connector		
	Identification for position		
	and identification of the	DT0 /T404 01 /1 / / / / / / / / / / / / / / / / /	15 1-10 1 1 1 1 1 1
	electrical connectors of	DTC 17104 – Short in outside air temperature circuit is now	If DTC 17104 changes to "Inactive" after
	ICU/CECU.	displayed as "Inactive".	unplugging the sensor connector, you have
	See ICU/CECU Pinout		confirmed the problem is a short in the sensor
	for terminal details of		itself, not the wiring. Replace the sensor. Go
	the ICU/CECU electrical		to Step 2.
	connections.		

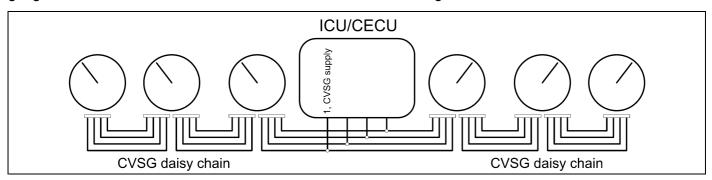
CVSG Supply Open or Shorted

DTC67805 and DTC67806

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

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

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



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 – ICU/CECU	Go to Step 5.
		has 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	CECU connector A.	
	the 9 Pin ICU/CECU	Voltage at Pin 1 of the 9 Pin CECU	Go to Step 5.
	connector A.	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 1		inoperative, the First CVSG in the daisy chain is faulty. Replace as necessary.
	of the 9 Pin ICU/CECU		
	connector A and pin 4 of		
	the CVSG daisy chain		
	connector.		

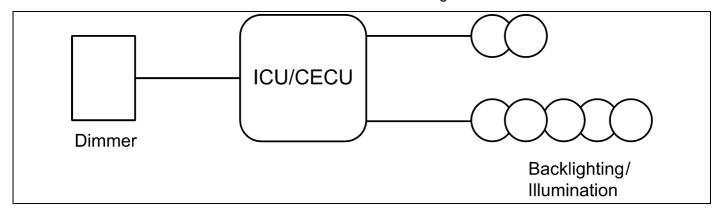
Dash Dimmer Input Open or Shorted, Dash Dimmer Output Shorted

DTC148703, DTC148704, DTC149106 and DTC149206

Symptom: dash dimmer inoperative.

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

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



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	
	0.1.4.50	input to the ICU/CECU is good.	
3	Select "Diagnose" to	DTC 148703 displayed – Open in	Indicates the problem could be an open in the wiring from the ICU/CECU to
	view dash dimmer	dash dimmer input circuit.	the 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
4	trouble codes.	dash dimmer input circuit.	ICU/CECU to the rheostat or a defective rheostat. Go to Step 6 .
4	Connect a jumper wire from Pin 5 of the 52 Pin	DTC 148703 is no longer active.	The open exists in the wiring from Pin 5 of the 52 Pin ICU/CECU connector C to Pin 3 of the dimmer control switch. You may confirm this by checking the
	ICU/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 ICU/CECU connector
	control switch.		
	CONTROL SWITCH.		C should vary between 390 ohms and 1390 ohms as the dimmer switch is operated.
			·
			Unplug of the 52 Pin ICU/CECU connector C from the control unit. Management to a point a provide the Section 1.0 Pin ICU/CECU approaches The Section 1.0 Pin ICU/CECU connector C from the control unit. The Section 1.0 Pin ICU/CECU connector C from the control unit.
			Measure the resistance from Pin 5 of the 52 Pin ICU/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 ICU/CECU checks out fine. Check for a loose or bent pin at Pin
			5 of the ICU/CECU connector.
			b. If resistance is missing or not within range at Pin 5 and circuit has
	0.1.101	DT0 440700 : 1711 17	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		The resistance varies between	The dimmer switch is operational. Check all electrical connections to make
			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	
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 ICU/CECU connector
	Pin 3 – Dimmer Signal		C to 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 ICU/CECU connector A feeds many
	view dash dimmer	dash dimmer output circuit 1.	instrumentation and component backlighting.
	output related diagnostic		Dimmer output 2 from Pin 8 of the 9 Pin ICU/CECU connector A routes to only
	trouble codes.	dash dimmer output circuit 2.	the left and right spare backlight connectors. Check wiring for possible short to
		F	ground conditions and repair as necessary.
			1/



Lite Diagnostic Procedure

J1939

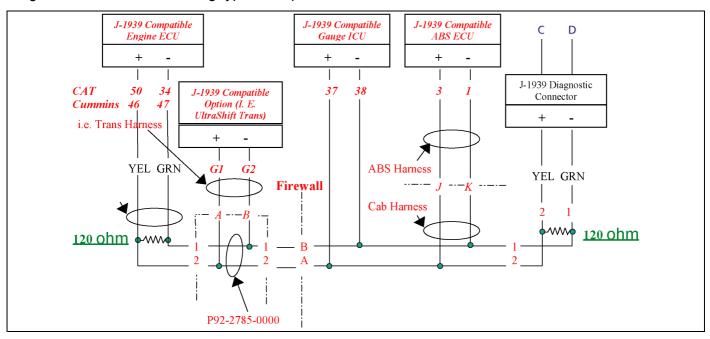
Symptom: Multiple V-CAN (J1939) Databus Gauge(s) Inoperative or Automated Transmission not shifting properly

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.

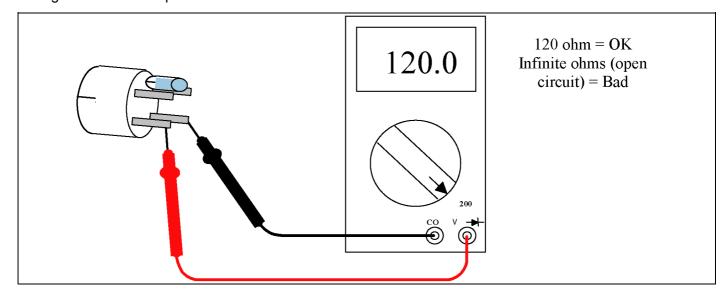
- The procedures will also determine whether the system terminating resistors meet required resistance specifications.
- Perform the tests in order and record the resistance readings for each test.
- Failure of any of the following procedures will render the J1939 data link inoperative.
- See the following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

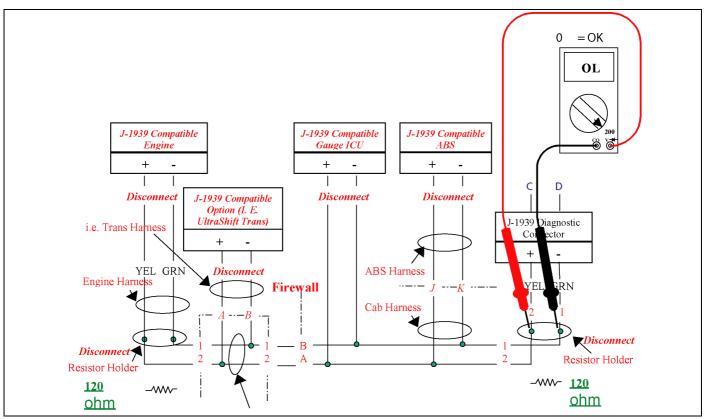


Lite Short Circuit Test Procedure

J1939

Disconnect all connectors labeled with *Red Bold* (*Italic*) 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 (light) text.
- Resistance reading should be zero or no reading indicating open circuit.
- Any resistance reading indicates an undesirable short circuit condition.

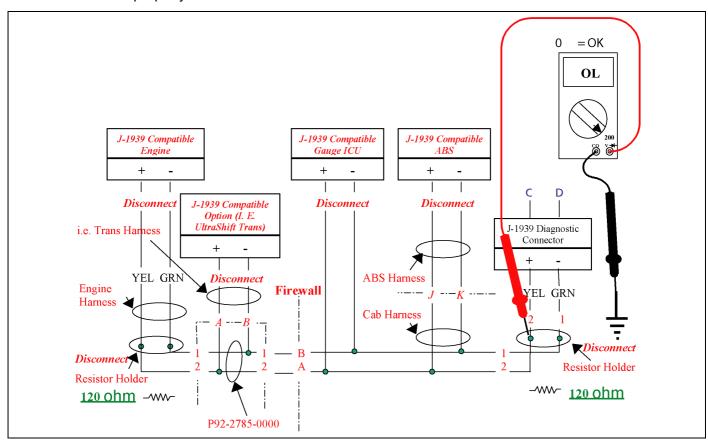


Lite Short to Chassis Ground Test Procedure

J1939

 Insure all connectors labeled with Red (Bold Italic) 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 (light) text with Chassis Ground.
- Move red lead and test circuit continuity at terminal 1 labeled in Red (light) text with Chassis Ground.
- Resistance reading should be zero or no reading indicating open circuit.
- Any resistance reading indicates an undesirable short circuit condition.

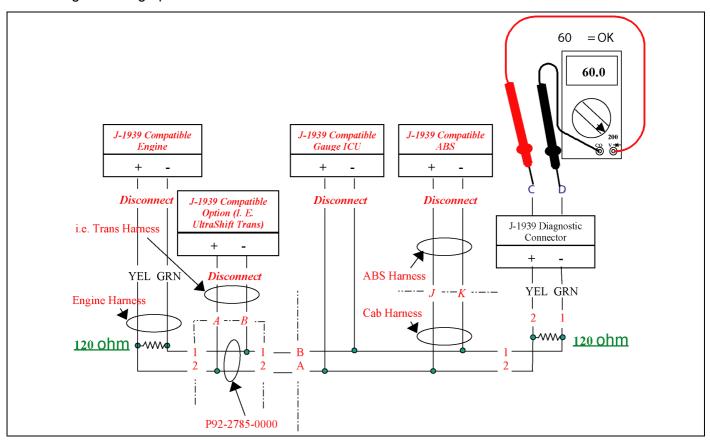


Lite Open Circuit Test Procedure

J1939

- Insure all connectors labeled with Red (Bold Italic) 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 labeled in Blue (Heavy block) text. Circuit resistance should be approximately 60 ohm.
- Re-test at each of the connectors labeled with Red (Italic) 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.

13 Glossary

Acronyms and Abbreviations 13 - 2

Acronyms and Abbreviations

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

Index

Α	D	DTC16800 12-6
Air filter restriction pressure	Dash dimmer input open or	DTC16801 12-6
gauge inoperative	shorted	DTC17102 12-6
DTC10703 12-30	DTC148703 12-102	DTC17103 12-6
DTC10704 12-30	DTC148704 12-102	DTC17104 12-6
Ammeter gauge	DTC149106 12-102	DTC17131 12-7
inoperative	DTC149206 12-102	DTC17303 12-7
DTC257903 12-38	Dash dimmer output	DTC17304 12-7
DTC257904 12-38	shorted	DTC176102 12-12
Application air pressure	DTC148703 12-102	DTC17703 12-7
gauge inoperative	DTC148704 12-102	DTC17704 12-7
DTC11603 12-26	DTC149106 12-102	DTC18409 12-7
DTC11604 12-26	DTC149206 12-102	DTC19009 12-8
Auxiliary transmission	Databus gauge(s)	DTC23731 12-8
oil temperature gauge	inoperative	DTC24510 12-8
inoperative	DTC148109 12-15	DTC24709 12-8
DTC44203 12-67	DTC148209 12-15	DTC24809 12-8
DTC44204 12-67	DTC148309 V-CAN	DTC257903 12-13
	(J1939) 12-15	DTC2579034 12-13
В	Diàgnostic trouble	DTC44103 12-8
В	codes 12-3	DTC44104 12-9
Brake saver oil temperature	DTC102809 12-11	DTC44203 12-9
gauge inoperative	DTC10703 12-4	DTC44204 12-9
DTC138703 12-77	DTC10704 12-4	DTC524502 12-13
DTC138704 12-77	DTC11603 12-5	DTC524602 12-13
	DTC11604 12-5	DTC57803 12-9
C	DTC116703 12-5	DTC57804 12-9
Center drive axle oil	DTC11704 12-5	DTC67805 12-9
temperature gauge	DTC11803 12-5	DTC67806 12-10
inoperative	DTC11804 12-5	DTC7703 12-3
DTC7803 12-57	DTC123109 12-11	DTC7704 12-3
DTC7804 12-57	DTC138703 12-11	DTC7803 12-3
Cluster Components 8-4	DTC138704 12-11	DTC7804 12-4
Commercial Vehicle Smart	DTC138803 12-11	DTC80404 12-10
Gauges (CVSG) 8-10	DTC138804 12-11	DTC82903 12-10
Control Unit	DTC148109 12-12	DTC82904 12-10
Build dates 2-4	DTC148209 12-12	DTC83003 12-10
Comparison chart 2-7	DTC148309 12-12	DTC83004 12-10
Functional	DTC148703 12-12	DTC8409 12-4
description 8-2	DTC148704 12-12	DTC9003 12-4
Identification 2-5	DTC149106 12-12	DTC9004 12-4
Location 3-2	DTC149206 12-12	DTC9109 12-4
CVSG supply open or	DTC15802 12-5	DTC91709 12-10
shorted	DTC15803 12-6	Direct Wire Telltales 8-12
DTC67805 12-100	DTC15804 12-6	Disabled gauges 5-2
DTC67806 12-100	DTC1603 12-3	
	DTC1604 12-3	

E	Н	Retrieving 4-9
Editable Telltale 8-6	Harness Interface	Power On Self-Test 8-5
Application 8-9	Diagrams 5-3	Primary air pressure gauge
Configuration 8-7	Harness interface	inoperative
Location 8-8	diagrams 5-3	DTC11703 12-18
Electronic Service Analyst	Highline Diagnostic	DTC11704 12-18
(ESA) 2-2	Codes 8-16	Primary fuel gauge
Administration 4-11		inoperative
Diagnose 4-5	I	DTC82903 12-86
Highlights 4-3		DTC82904 12-86
History 2-2	ICU/CECU	Pyrometer gauge
Monitor 4-6	Architecture 8-3	inoperative
Navigating 4-5	Block diagram 8-3	DTC17303 12-42
New features 4-4	Comparison chart 5-7	DTC17304 12-42
Program 4-8	Connector face views 5-6	
Simulate 4-7	Connector	R
What is ESA 4-2	identification 5-6	Rear drive axle oil
What's new 4-2	ICU/CECU details 5-6	temperature gauge
Why ESA 4-3	Side view 5-6	inoperative
Engine related DTCs	Important Notes 1-2	DTC7703 12-52
DTC102809 12-94	Instruments and	DTC7703 12-52 DTC7704 12-52
DTC18409 12-94	Controls 8-13	D1C1104 12-32
DTC19009 12-94		
DTC24709 12-94	L	S
DTC24809 12-94	Lite diagnostic procedure	Secondary air pressure
DTC8409 12-94	(J1939) 12-104	gauge inoperative
DTC9109 12-94	Lite diagnostic procedures	DTC11803 12-22
DTC91709 12-94	conclusion (J1939) 12-109	DTC11804 12-22
Exploded View 3-2	Lite open circuit test	Secondary fuel gauge
	procedure (J1939) 12-108	inoperative
F	Lite short circuit test	DTC83003 12-90
Front drive axle oil	procedure (J1939) 12-106	DTC83004 12-90
	Lite short to chassis	Service manual link 4-6
temperature gauge DTC57803 12-47	ground test procedure	Service Manual Update 5-2
DTC57803 12-47 DTC57804 12-47	(J1939) 12-107	Service Resources 5-2
Fuel filter restriction	Lite terminating resistor test	Disabled gauges 5-2
	procedure (J1939) 12-105	Harness interface
pressure gauge inoperative		diagram 5-3
DTC1603 12-34	0	ICU/CECU details 5-6
DTC1604 12-34	Out-of-Date software	Service manual
D101004 12-04		update 5-2
	warning 4-11 Outside air temperature	Voltmeter trim values
G	display inoperative	worksheet 7-12
General Information 5-2	DTC17103 12-96	Service resources
General oil temperature	DTC17103 12-90 DTC17104 12-96	Voltmeter trim
gauge inoperative	D1C17104 12-90	procedure 7-12
DTC44103 12-81	_	Specifications 7-2
DTC44104 12-81	P	
	Parameter	
	Backing up 4-9	
	Part numbers 7-2	

T

Transfer case oil temperature gauge inoperative DTC138803 12-72 DTC138804 12-72 Transmission oil temperature gauge inoperative DTC17703 12-62 DTC17704 12-62 Troubleshooting 12-3

V

Voltmeter Trim Values 7-12