

The Fifth Generation Cascadia

Enhanced Backbone of the Cascadia

Improving the Backbone of the Fifth Generation Cascadia



Introduction of ACE – Electrical Architecture

- Enables the CTP3 and additional Safety ECUs

Intelligent Air System

- Eliminates airlines behind the dash and unlocks the introduction of the ePark Brake with Rollaway Mitigation

Intelligent Braking Control System

- Provides a smoother braking experience and increased brake life with Endurant Braking and Comfort Braking

"ACE" Electrical Architecture

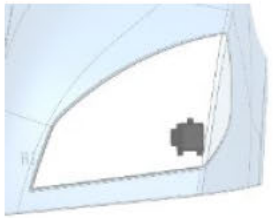
CEEAce + CTP3

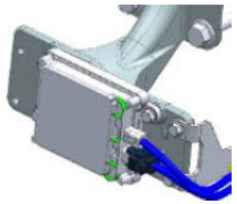
- 3x faster connection with CTP and safety ECUs
- Automotive Ethernet
- 32GBs of flash memory + storage expansion via USB connection is possible
- Updated version of backbone controllers
- Updated cybersecurity against potential attacks

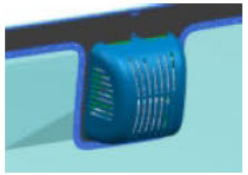


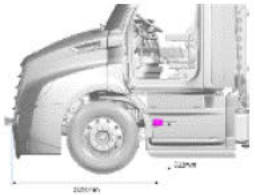
New Safety Enhancements

- New safety ECU
- 4 new short-range radars; new long-range radar
- New forward-facing camera for radar/camera fusion
- Updated DA housing









Enables Intelligent Braking Control System

- Better braking performance overall
- Introduction of Endurance Braking, Comfort Braking, and Brake Temperature Monitoring System
- Enablement of Rollaway Mitigation



“ACE” Communication Enhancements

An enhanced electrical architecture that allows us to continue to offer our customers a better product

Go Better: Allows for continued enhancements of powertrain and other controllers

Stop Smarter: Enables the new Intelligent Air Treatment and Intelligent Brake Control Systems

Drive Safer: Better communication across key safety systems allow us to offer ABA6

Be Better Informed: Paired with the CTP3, we now offer more data that our customer care about along with improved remote capabilities



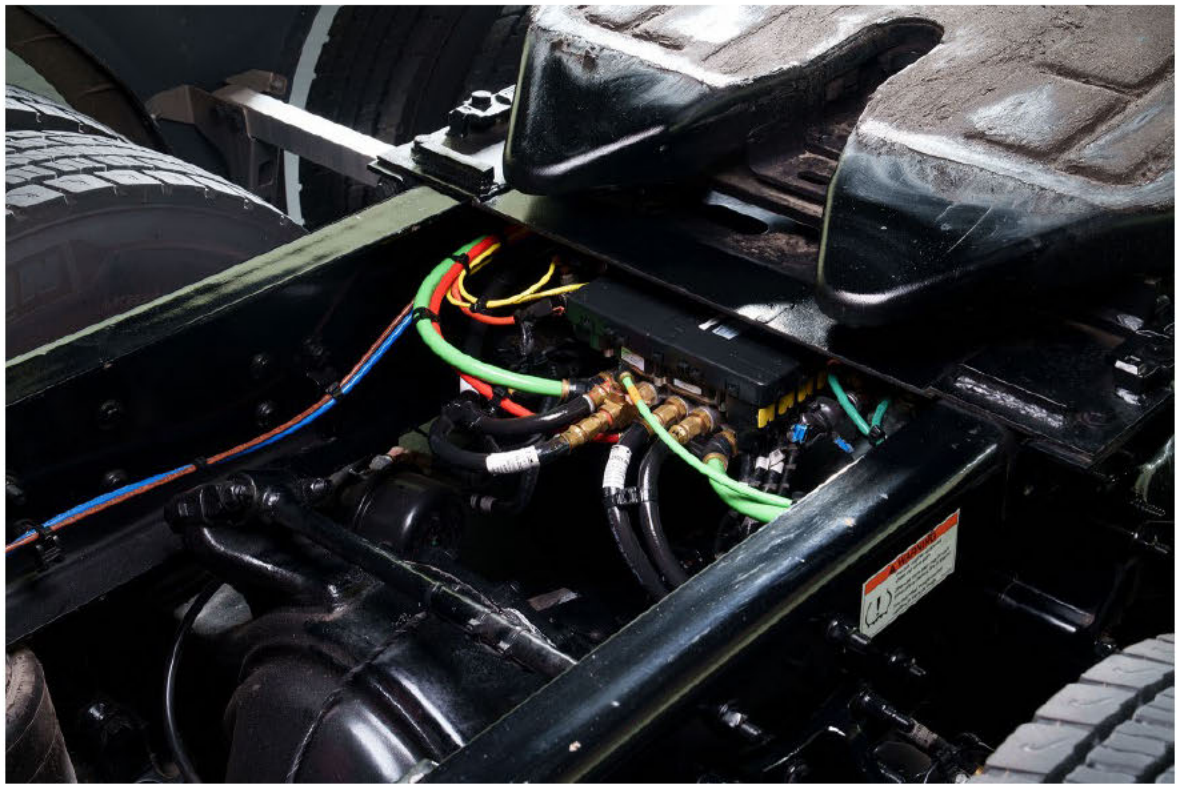
Fourth Gen Cascadia

- 4 low-volume networks (LIN)
- 11 standard networks (CAN)

Fifth Gen Cascadia

- 5 low-volume networks (LIN)
- 13 standard networks (CAN)
- 8 high speed networks (CANFD)
- 6 highest speed connections (ETH)

Intelligent Air System

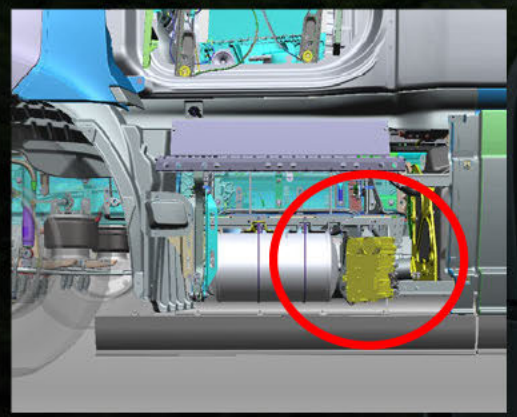


Key Features:

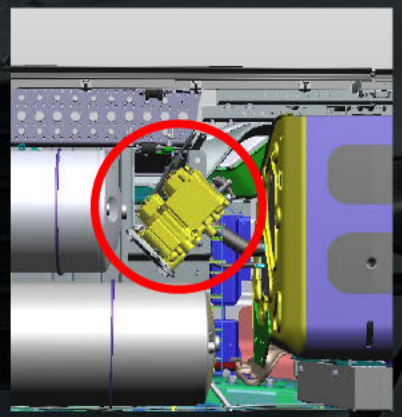
- Elimination of air lines behind the dash improving noise in the cab for driver comfort and easier diagnostics for increased uptime
- Upgraded O-ring fittings hold air for up to 72 hours, reducing the requirement of idling to build up the system pressure, saving both time and fuel
- The air tanks are automatically purged, which also saves time and eliminates the need for drivers to pull air cords or manually drain air tanks during a pre-trip inspection
- The intelligent air system unlocks the Intelligent Braking Control System introducing the ePark Brake and Rollaway Mitigation

Electronic Air Processing Unit (EAPU)

Driver Side View

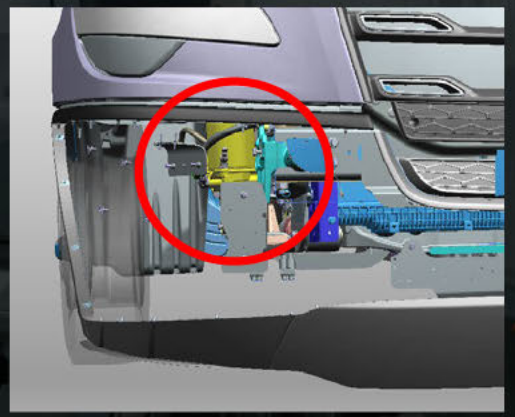


Bottom View

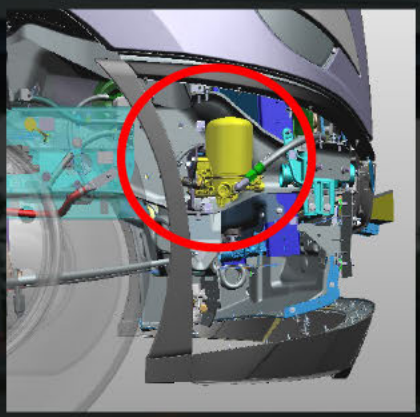


Air Dryer

Front View



Passenger Side View





Updated Hardware Locations

A Deeper Look..
ACE Architecture.



Terminology

DAIMLER

LEG M.43

Legend

Data BUS technology & speed	
RS 232	
D8	
K-Line	
Marquart-BUS	
SAE J1587	
LIN 19,2 kBit/s	
CAN 125 kBit/s	
CAN 250 kBit/s	
CAN 500 kBit/s	
CAN 500 kBit/s, ? Bit identifier	
CAN 667 kBit/s	
CAN FD	
USB	
Ethernet Base-T1	
Ethernet Base-Tx	
LVDS with direction	
HDBase-T	

Wiring types	
Single Wire	S
Twisted Pair	TP
Twisted Quad	TQ
Shielded Twisted Pair	STP
Double Twisted Pair	DTP
Twisted Quad Supplied (with Power supply)	TQS
Coaxial (LVDS)	CX
Analog Video (PAL, NTSC)	AV
Measurement CAN	M

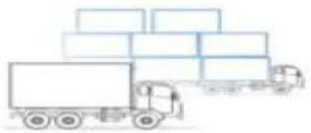
Terminations and Star Points
60 Ω - Termination / Star Point
120 Ω - Termination / Star Point
No Termination / Star Point

External Data Interfaces
Global Navigation Satellite System (GNSS)
Global System for Mobile Communications (GSM)
Wireless Local Area Network (WLAN)
Bluetooth (BT)
Near Field Communication (NFC)
Universal Serial Bus (USB)
Funk 433 MHz
Funk 5.8 GHz
Connector



CAN FD/Flex CAN

Why CAN FD over CAN Classic?



#1 Increased length
CAN FD supports up to 64 data bytes per data frame vs. 8 data bytes for Classical CAN. This reduces the protocol overhead and leads to an improved protocol efficiency.



#2 Increased speed
CAN FD supports dual bit rates: The nominal (arbitration) bit-rate limited to 1 Mbit/s as in Classical CAN - and the data bit-rate, which depends on the network topology/transceivers. In practice, data bit-rates up to 5 Mbit/s are achievable.



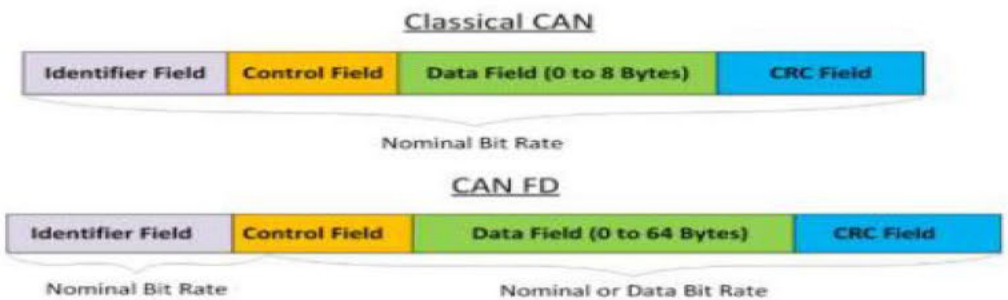
#3 Better reliability
CAN FD uses an improved cyclic redundancy check (CRC) and the "protected stuff-bit counter", which lower the risk of undetected errors. This is e.g. vital in safety-critical applications like vehicles and industrial automation.



#4 Smooth transition
CAN FD and Classical CAN only ECUs can be mixed under certain conditions. This allows for a gradual introduction of CAN FD nodes, greatly reducing costs and complexity for OEMs.

The CAN FD networks introduced with CEEAce are:

1. Backbone Interior CAN FD (500/5000kb)
2. Backbone Exterior CAN FD (500/5000kb)
3. Connectivity CAN FD (500/5000kb)
4. Sub-networks of VRDU3





Ethernet

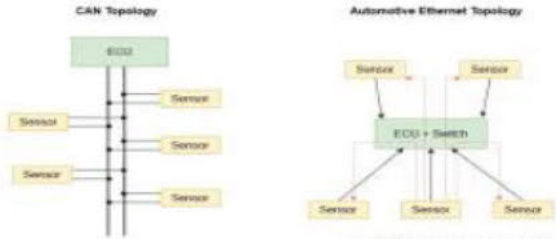
Automotive Ethernet

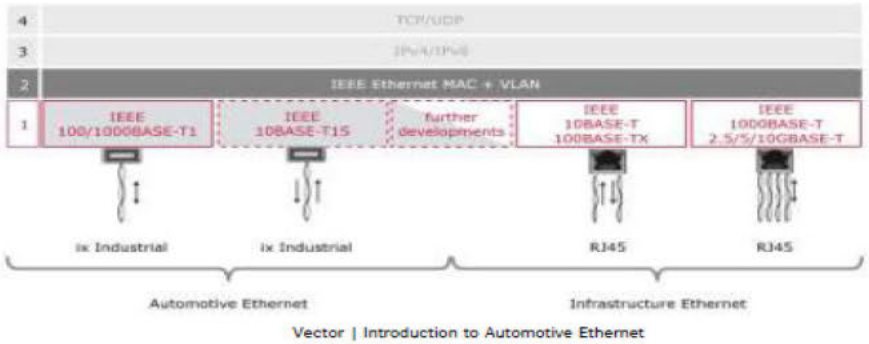
Motivation

To meet with the high data rate requirement for multimedia, infotainment, ADAS functions, diagnostics, flashing and so on.
Bandwidth of a 1000BaseT1 network is 1000 Megabit per second compared to a max. of 1 Mbps of CAN

Differences with traditional in-vehicle network Technologies

Automotive Ethernet is not a shared medium communication system but a switched network*





Vector | Introduction to Automotive Ethernet

The Ethernet networks introduced with CEEAce are:

1. Driver Assistance ETH (100Base-T1)
2. Connectivity ETH (100Base-T1)
3. HMI and Connectivity ETH (1000Base-T1)
4. HMI ETH (100Base-Tx)
5. Diagnostic ETH (100Base-Tx)

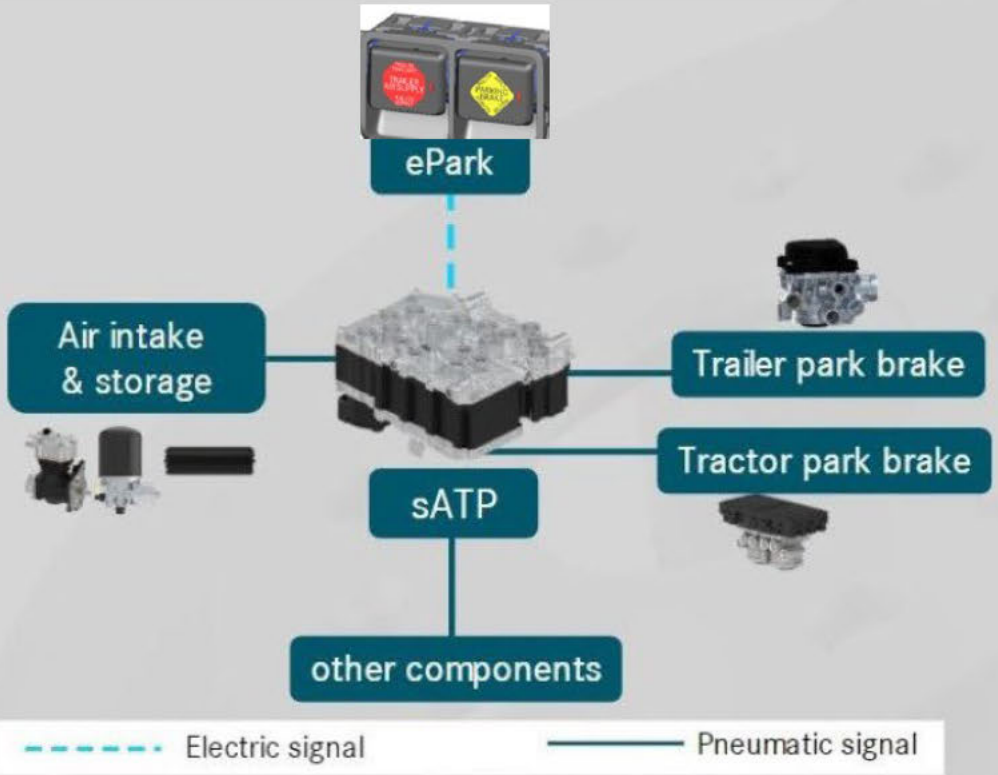
A Deeper Look..
sATP





sATP

Intelligent Air System - **sATP** (Scalable Air Treatment Platform)



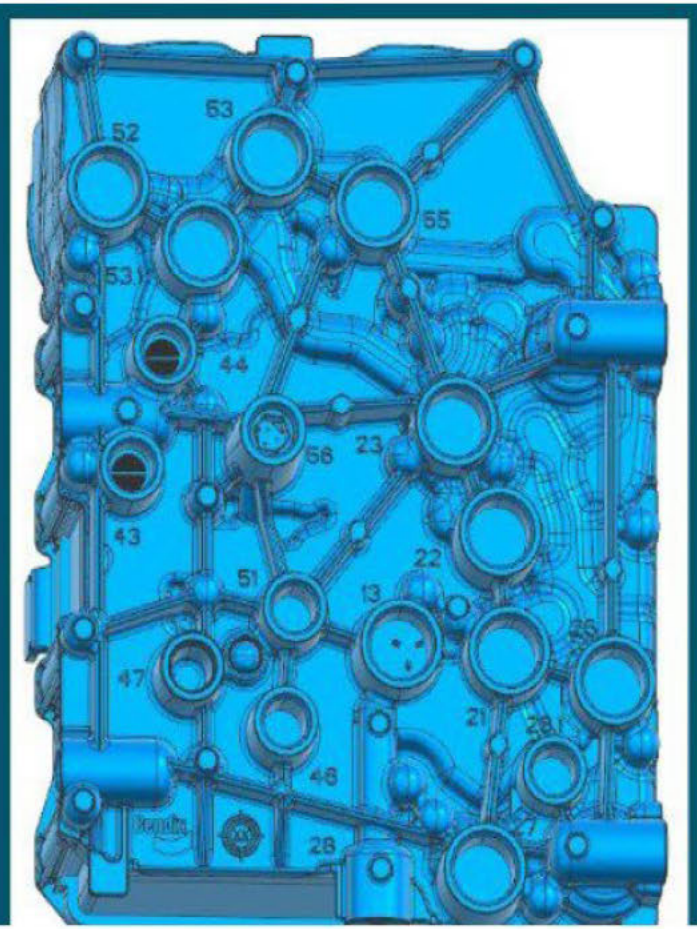
Operation: The scalable air treatment platform is an electronic controller that combines the functionality of an electronic air-processing unit (EAPU) and an electronic parking brake control module (ePBC).

It primarily controls the compressed air distribution to the braking system components and a few other vehicle systems, such as seats, cab suspension, primary air suspensions, and a few engine auxiliary components.

It acts as an interface between the park brake push buttons/switches/hand control valve and respective modulator valves. It also monitors pressure limits for air tanks, air compressors, and air dryer to initiate loading and unloading cycles.



sATP Port Detail Information



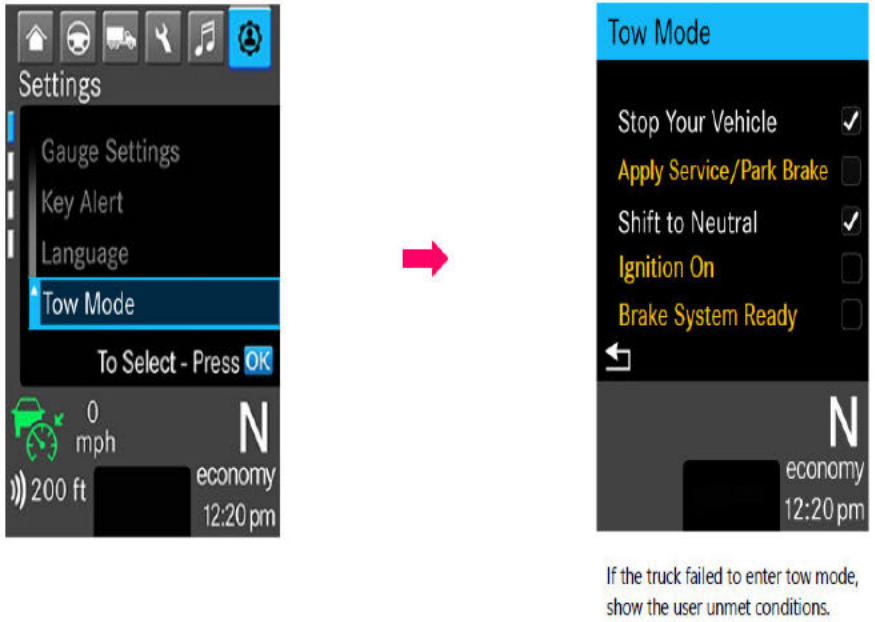
PORT	DESCRIPTION	PORT	DESCRIPTION
13	INLET –FROM SUPPLY TANK	44	EXTERNAL RELEASE EPB –TRAILER
21	C1 –PRIMARYCIRCUIT	46	UNLOADER CONTROL –DRYER 1
22	C2 –SECONDARY CIRCUIT	47	UNLOADER CONTROL –DRYER2
23	AUXILIARY CIRCUIT	51	COMPRESSOR CONTROL
26	AUXILLARYCIRCUIT	52	TRACTOR PARK BRAKE 1
26.1	AUXILIARY CIRCUIT	53	TRACTORPARK BRAKE 2
27	SUSPENSIONCIRCUIT	53.1	TRACTORPARK BRAKE 3
28	INLET –EXTERNAL FILL	55	TRAILER SUPPLY
43	EXTERNALRELEASE EPB –TRACTOR	56	DRYER PURGE SUPPLY



New modes…

Maintenance mode is for when a service member is working on the truck and requires park brake not to be set while outside of the vehicle. (say they need to rock the vehicle back and forth or let a tire rotate). Anti roll away is turned off during maintenance mode. This can be activated via pressing and holding the park brake switch and turning the key to off position, as well as Diagnostic Link.

Tow mode is the method of putting the braking and pneumatic electronics in a safe state while towing the vehicle. All other towing steps should be taken like todays vehicle. The battery cut off switch CLDS will also put the electronics in a safe state as to not inadvertently activate while being towed



If the truck failed to enter tow mode, show the user unmet conditions.



sBSP

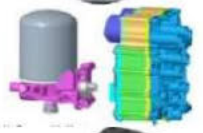
Cascadia Fifth Gen

1. Air out of the dash with electric park brake & trailer hand control, digital/electronic gauges, and electric switches with ECP. The frontwall pass through reduces down to seat and horn.
2. The electric brake pedal allows for electronic braking (EBS) primary with pneumatic backup (ABS). The pedal has a new feel both in the stroke and braking because instead of providing a proportional amount of pressure, the system provides a proportional amount of deceleration.
3. The steer axle brakes have two versions, Standard and Advanced, where Standard is similar to current mBSP ABS (pneumatic primary with electric override) and Advanced is EBS (electric primary with pneumatic backup). Advanced also has integrated pressure sensors for closed loop control.
4. sATP provides a variety of benefits with electronic governor and air dryer control as well as providing the controls for electronic park brake.
5. CMAx is the new integrated brake ECU and drive axle valve with integrated pressure sensing.
6. The new Trailer Control Module replaces the tractor protection valve assembly with integrated modulators, quick release, and pressure sensors. Autonomous will require an advanced version. All valves act as relays, especially with the TP, improvements in brake timing are expected.
7. aWSS, Active Wheel Speed Sensors with new AK protocol for higher resolution including low speed accuracy.







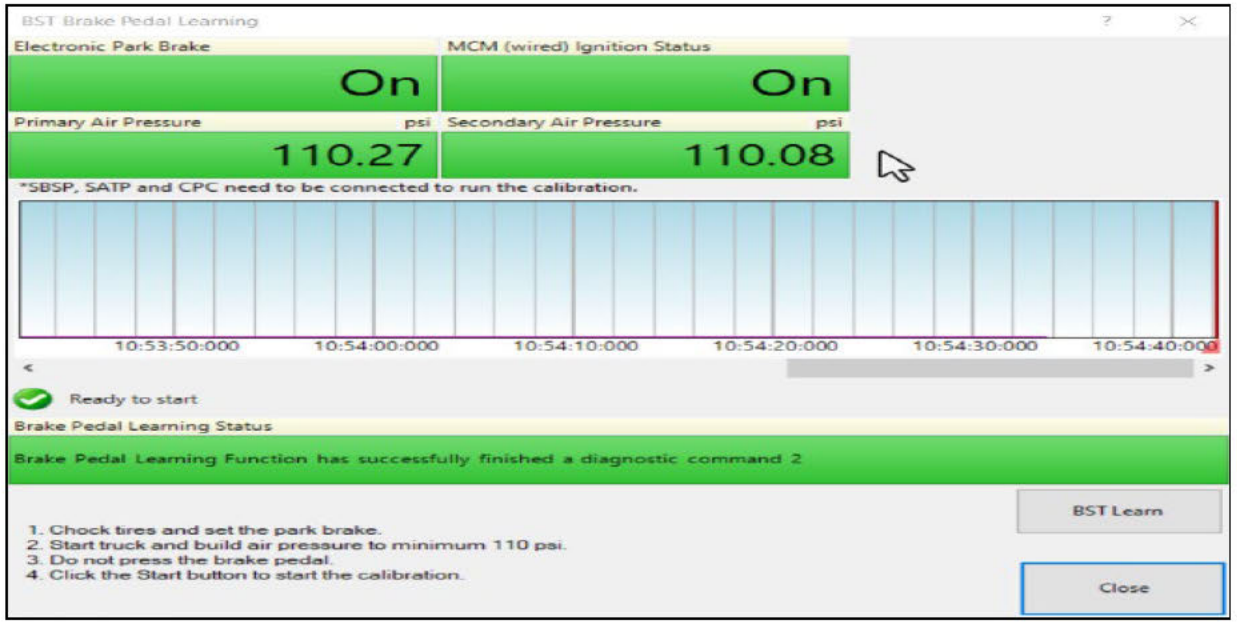






BST Brake Pedal Learn

BST Brake Pedal Learning

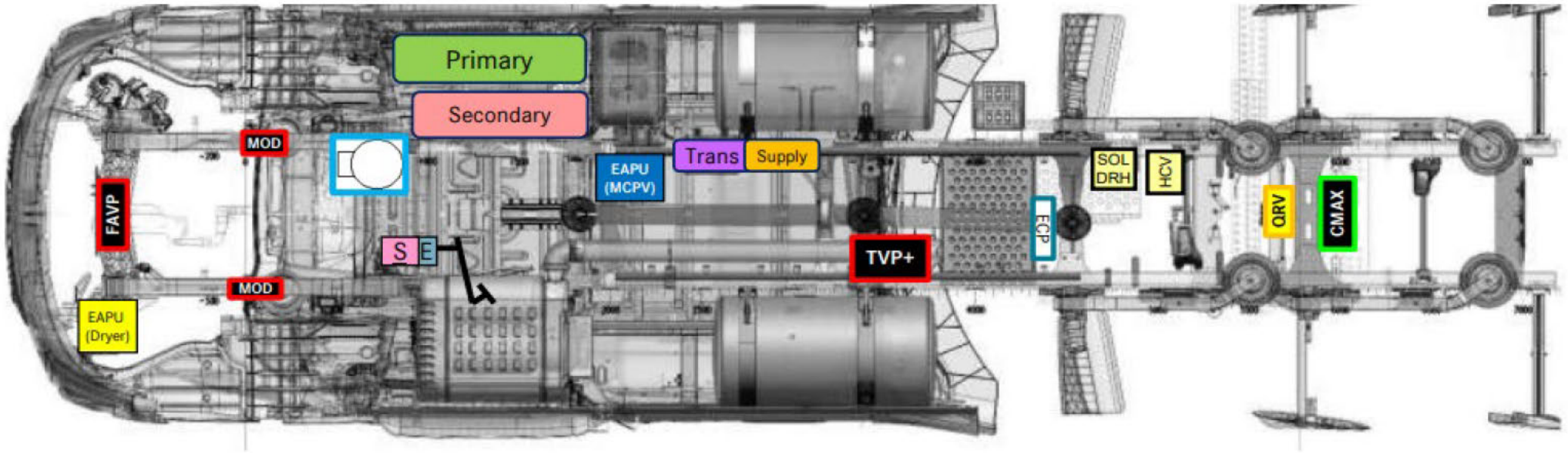


It is necessary to perform the BST Brake Pedal Learning after a new brake pedal has been installed. There is no fault code or HMI indication associated with this calibration.

Once the panel has opened, the technician must chock tires, set park brake, and start the engine to allow the vehicle to build primary and secondary air pressure. The technician will then be instructed to slowly press the brake pedal until the learning is complete.

1. Connect the vehicle to DiagnosticLink® using the diagnostic connector.
2. Turn the vehicle ignition ON and crank the engine to running. Allow the vehicle to pressurize the primary and secondary air systems to at least 110 psi.
3. To start the learning, the SBSP, SATP, and CPC ECUs must be connected in DiagnosticLink.

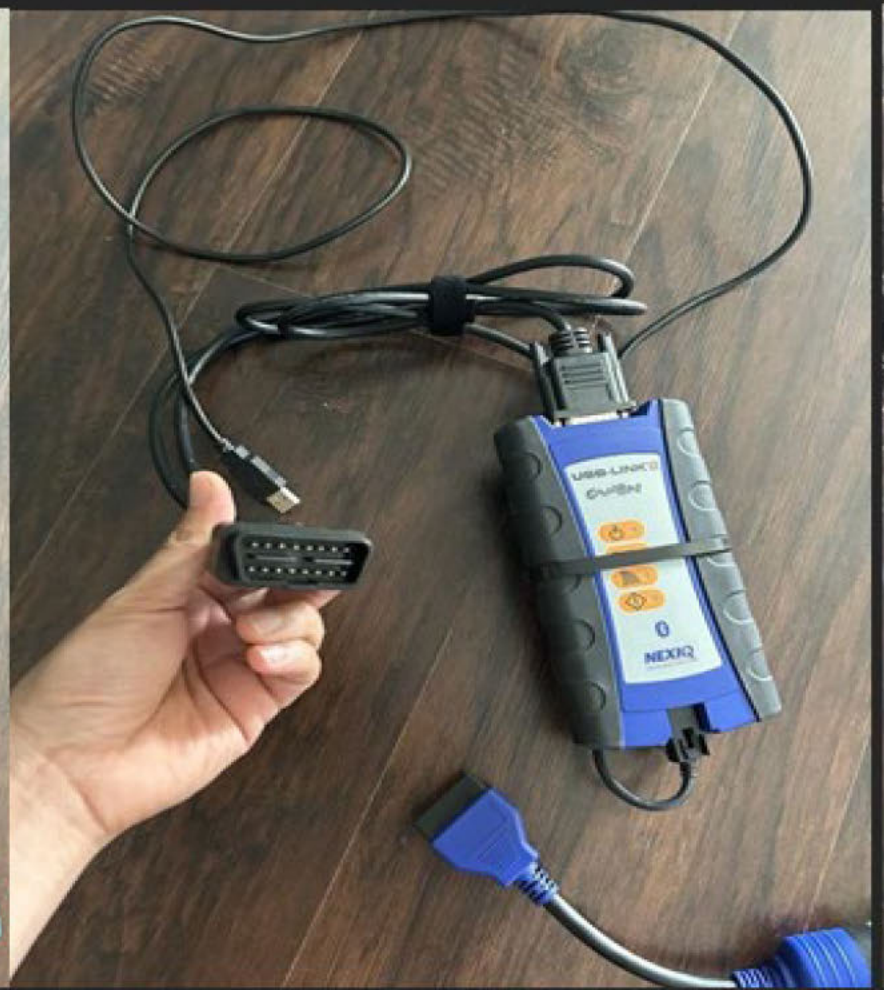
sBSP


Primary
Secondary
MOD
FAVP
MOD
EAPU
(Dryer)
S
E
EAPU
(MCPV)
Trans
Supply
TVP+
ECP
SOL
DRH
HCV
QRV
CMAX

Communication Interface

NEXIQ3 Does not Require Additional Cable





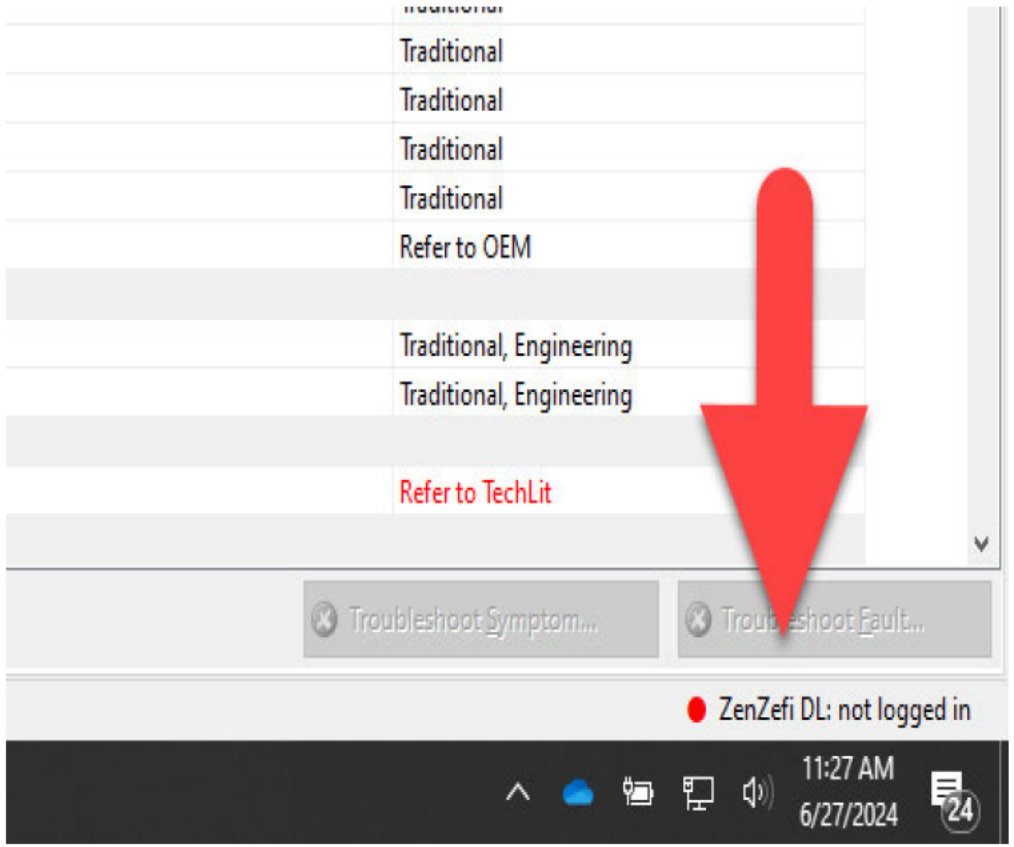


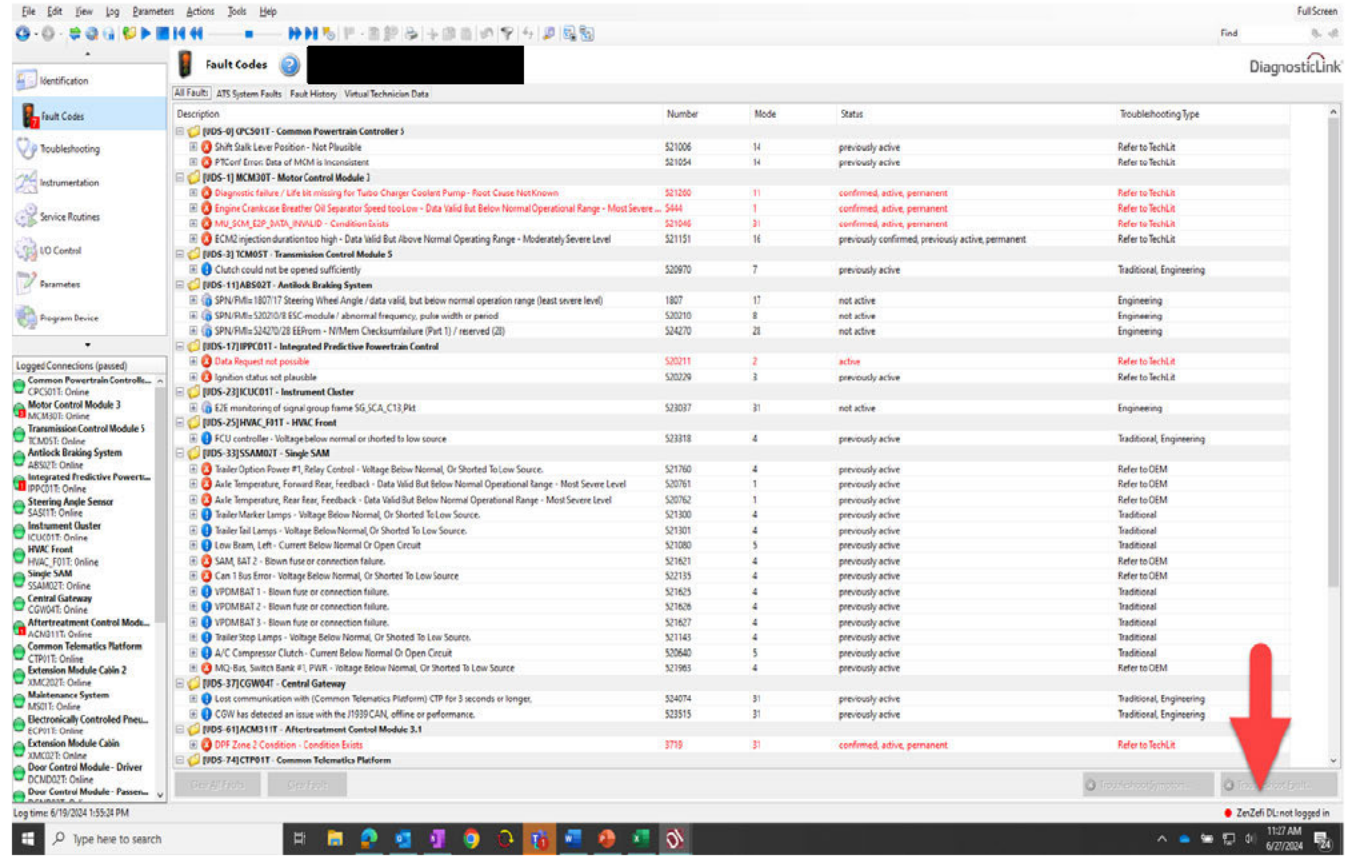


ZenZefi/Diagnostic Link

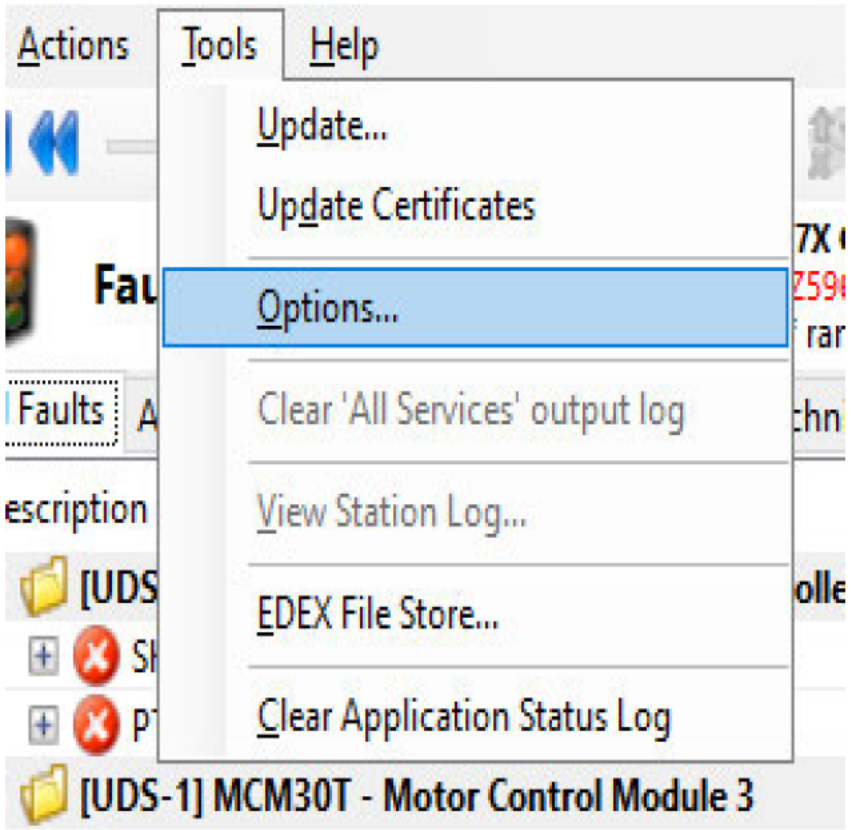
- ZenZefi security certificates are needed starting with the Cascadia Fifth Gen platform that should launch in the first quarter of 2025.
- ZenZefi certificates are not needed for Daimler products model year 2024 and older. The users can just ignore the indicator.

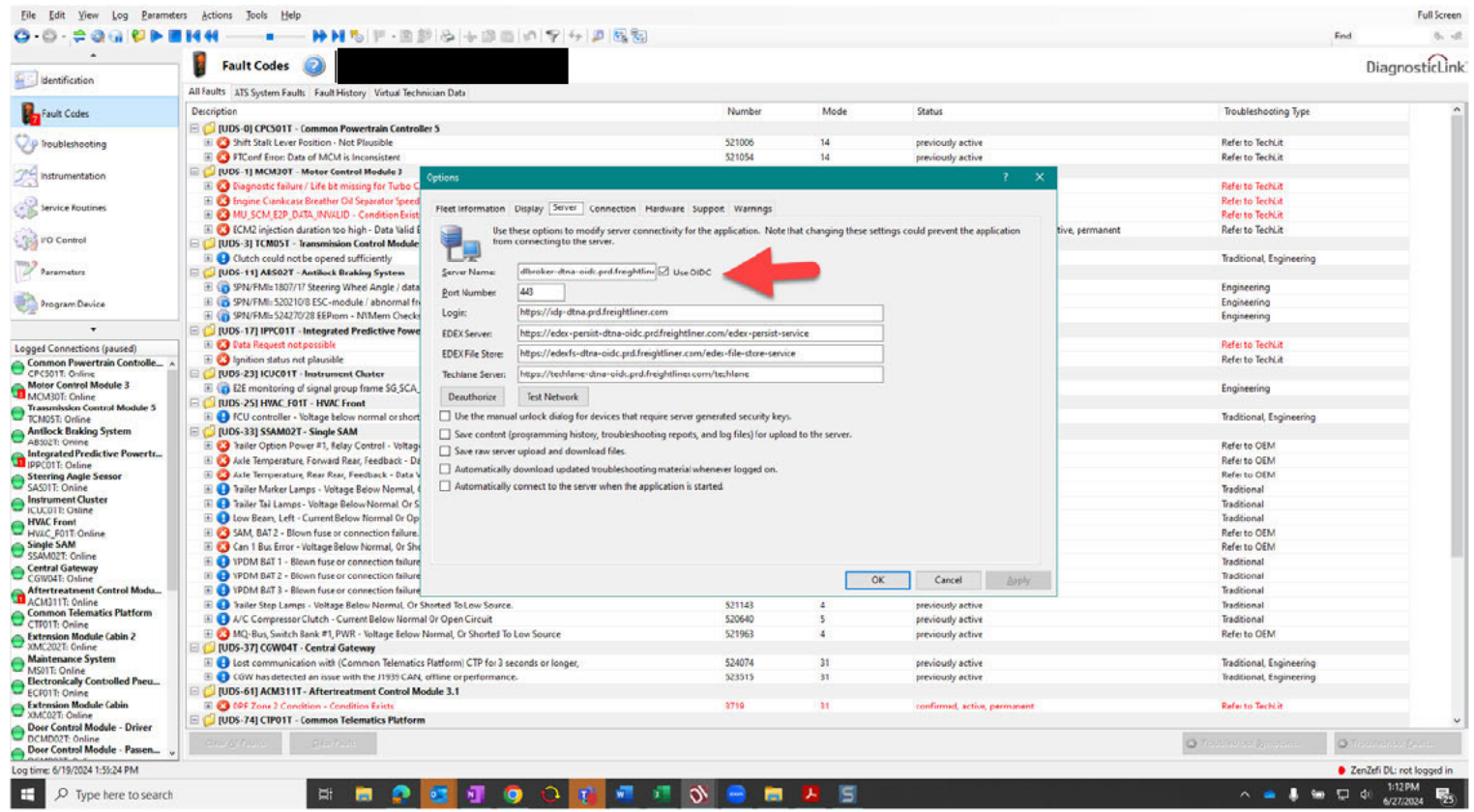
ZenZefi:DL not logged in indicator is in the lower right-hand corner of DiagnosticLink 8.20 or newer.



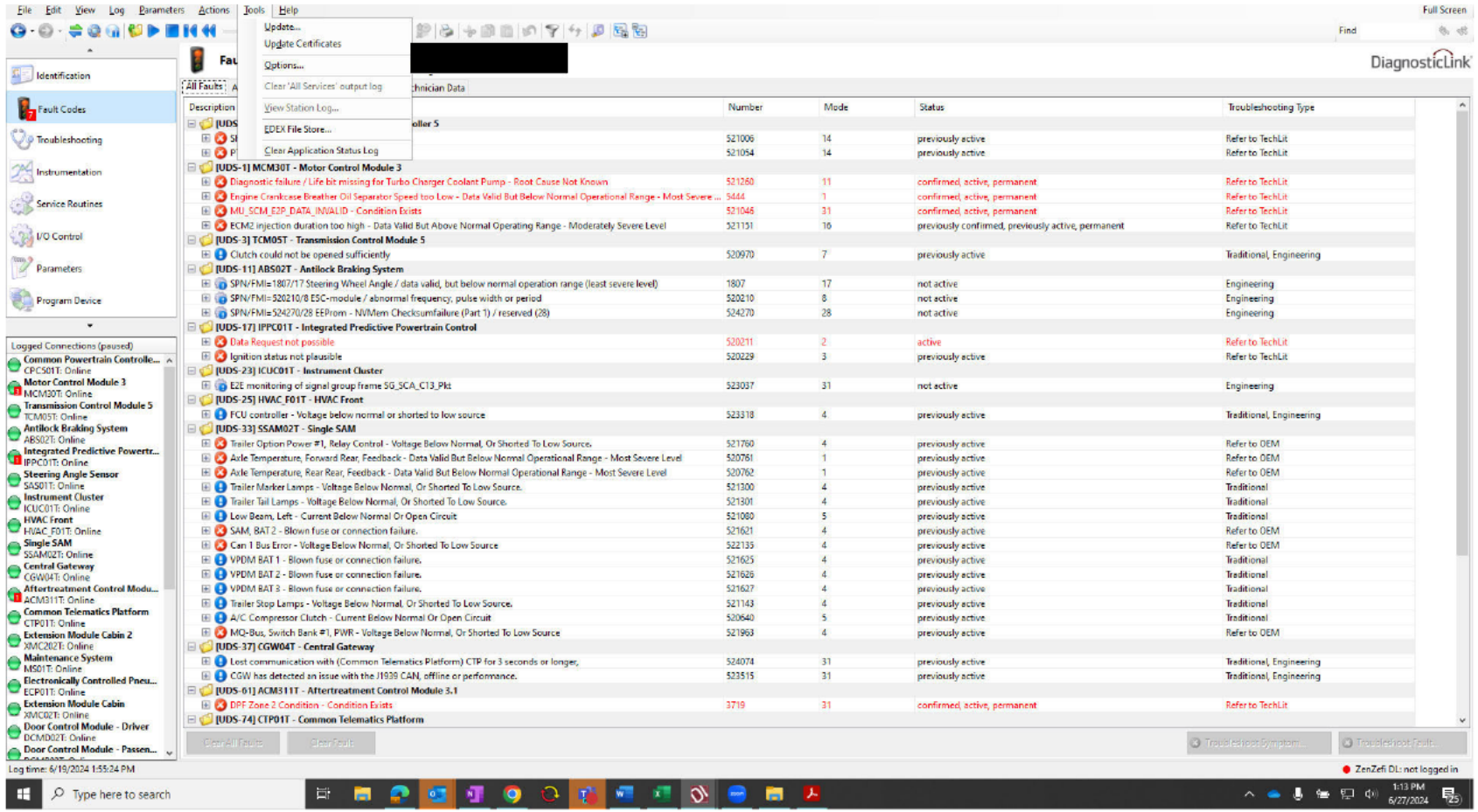


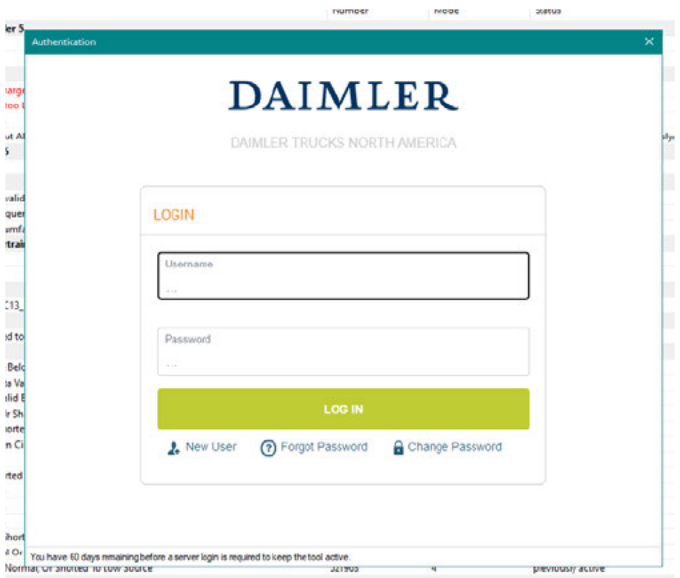
A couple of steps are needed to obtain the ZenZefi certificates.
The user will need to enable OIDC in DiagnosticLink and then download the ZenZefi certificates.
To enable OIDC navigate to the top control bar in DiagnosticLink to Tools > Options > Server Name.
Click the box “Use OIDC” then click apply.



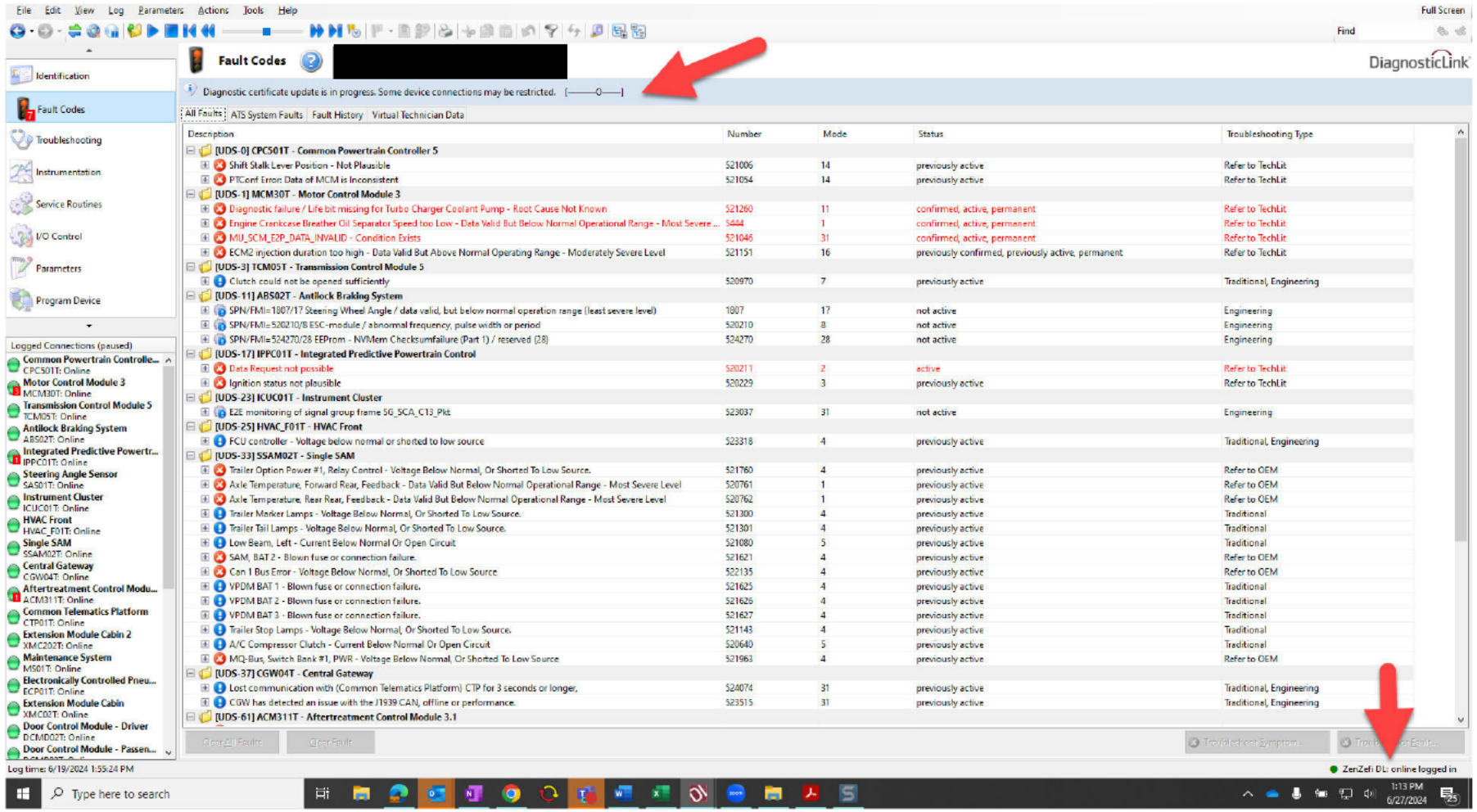


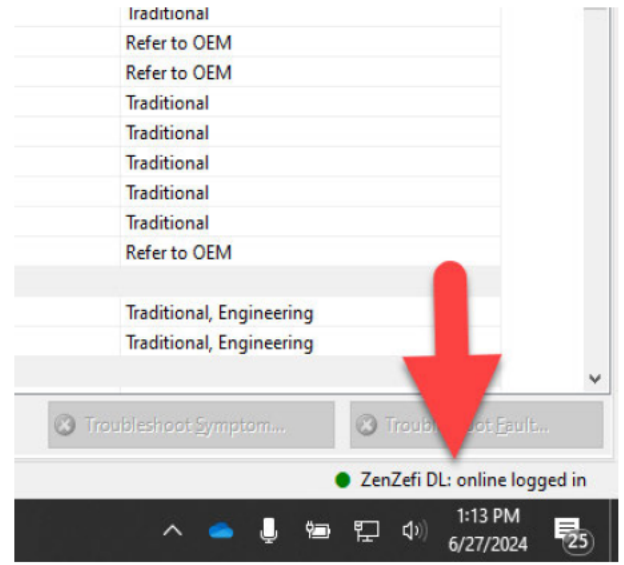
Ensure that there is an internet connection available for the server connection.
Navigate to the top control bar in DiagnosticLink to Tools > Update Certificates.
A pop-up window will appear for the user to log in.





After the user logs in a banner will pop up for a short time at the top of the screen.
If the log in is successful, the indicator in the lower right-hand corner of the screen will turn green and display ZenZefi DL: online logged in.
Once logged in the tech does not need a continuous internet connection.





Fifth Generation Updates
ABS Wiring



