Digital Gauge Not Reading Correctly

Symptom: Digital Gauge Not Reading Correctly

General Information
Most CCFT fuel system installations will incorporate a standalone digital gauge in the dash. The gauge has three different screens that can be accessed by pushing either the left or right button. The parameters the gauge displays are Fuel Pressure, Miles to Empty, and Fuel Level. This gauge reads information from the J1939 databus from two possible sources, the fuel delivery system (FDS) ecu and the vehicle controller in some instances. The digital gauge always reads the fuel pressure and distance to empty from the FDS ecu, and in some installations the fuel level if the OEM is not broadcasting the fuel level. In some installations the OEM broadcasts the fuel level, and in these cases, the FDS ecu does not broadcast the fuel level.

Depending on what is being displayed incorrectly on the gauge can lead to the root cause of the issue. The gauge can either be showing an incorrect value, or all dashes (----) on the different screens. It is important to note what all three screens are displaying as all three screens together lead to the correct diagnosis.

If the digital gauge is displaying an incorrect value, this means that the digital gauge is communicating with the ecu that broadcasts the parameter, but the ecu is not getting a correct signal from the pressure/temperature transducer, the engine ecu, or the fuel level interface module (FLIM) is not creating the correct effective resistance. In the case of Miles to Empty being incorrect, the capacity of the fuel system may be programmed incorrectly in the FDS ecu. If the digital gauge is broadcasting all dashes (----) on a screen, that means the gauge is not seeing the correct parameter being broadcast on the data bus.

The signals and parameters that the FDS ecu reads for the fuel pressure, miles to empty, and fuel level are below:

Fuel Pressure: FDS ecu reads a voltage signal from the pressure/temperature sensor.
Fuel Temperature: FDS ecu reads a voltage signal from the pressure/temperature sensor.
Average Fuel Economy: FDS ecu reads the parameter from the engine ECM and uses this parameter to calculate miles to empty.
Fuel System Capacity: Parameter that is programmed in the FDS ECU
Fuel Level FDS ECU Calculation: FDS calculates fuel level based on the pressure and temperature of the CNG fuel in the FDS. 0% fuel level is at 250 psi regardless of fuel temperature. 100% fuel level is correlated to 3600 psi at 70^{o}F.
Fuel Level Curve: Paccar, Freightliner, and Volvo/Mack Conventional have unique fuel curves that are programmed in the FDS ECU.
Fuel Level Interface Module: Creates a PWM signal to create a simulated resistor to the OEM module to read the fuel level on Paccar, Freightliner, and Volvo/Mack Conventional.
Fuel Level OEM broadcast: The OEM broadcast the fuel level based on the simulated resistance it sees from the FLIM.

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Symptoms: Digital Gauge Shows All Dashes on All Screens (---)

Condition

- Key ON
- Vehicle will not crank.
- Vehicle will not run.

General Information

If the digital gauge is displaying all dashes on all screens, or all dashes on pressure and miles to empty, and either 0% or 100% for fuel level on Paccar, Freightliner, or Volvo/Mack Conventional, and the vehicle will not crank or run, the most likely cause is the FDS ECU is not powered up and need to check for power and ground to the ECU.

Action

- Check for power and ground to the FDS ECU while key is in the Run position. The ECU requires power on two pins, so verify power and ground.
- If no power at FDS ECU, check and verify getting power and ground from the OEM connections.

Specification

- 12-volt power to FDS ECU while key is in the on position and while in the Run position

Symptoms – Digital gauge shows all dashes (----) on all screens

Condition

- Key on
- Engine Cranks
- Engine Runs
- Possible other engine, abs, or vehicle J1939 fault codes

General Information

If the digital gauge is displaying all dashes but the engine will crank and run, then the most likely causes are that the digital gauge is programmed to the incorrect baud rate, the FDS ECU is programmed to the incorrect baud rate, or FDS ECU or digital gauge has a bad connection to the J1939 data bus.

Action

- Gauge is programmed to the incorrect baud rate for the truck.
- The J1939 wires to the gauge are not connected properly.
- The gauge is connected to the incorrect J1939 network.
- ECU programmed to incorrect baud rate for the chassis.
- ECU not connected to the correct J1939 data bus on the truck.
- J1939 connectors in the CCFT System Harness not connected.
- J1939 wires for CCFT ECU not wired correctly.

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Digital Gauge Not Reading Correctly

Specification

- Check for baud rate on digital gauge.
  - Pus the center button and hold until contrast screen comes up.
  - Push center button again until ??? screen comes up.
  - Push center button again until the SW and Config screen comes up.
    - If config starts with a 3, the gauge is 250kb.
    - If config starts with a 5, the gauge is 500kb.
- See table below for baud rate for various chassis.

OEM	Model	Date	Baud Rate
All	All	Prior to January 2018	250kb
Peterbilt	All	Prior to October 2018	250kb
Peterbilt	567/579	After October 2018	500kb
Peterbilt	520	After July 2021	500kb
Peterbilt	337/338/348	All	250kb
Peterbilt	536/537/538/548	All	500kb
Kenworth	All	Prior to October 2018	250kb
Kenworth	T (Old Medium Duty)	All	250kb
Kenworth	T660/T880	After October 2018	500kb
Kenworth	T (New Medium Duty)	All	500kb
Autocar	After January 2018	All	500kb
Crane Carrier			250kb
Crane Carrier			500kb
Battle Motors	All	All	500kb
Mack Cab Overs	All	All	250kb
Mack Conventional	All	All	250kb
Volvo	All	All	250kb
Dennis Eagle	All	All	250kb
Freightliner	All		250kb
Freightliner	Cascadia		500kb
Freightliner	SD		500kb

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Linked Solutions

- Digital Fuel Gauge (042-033)
- Electronic Control Unit (ECU) (042-029)

Repair

- Replace or repair components that were found to be out of specification.

Validation

- Key ON check digital fuel gauge.

Symptom: Digital gauge shows (----) for Pressure and Miles to Empty, but Fuel Level is correct

General Information:

This condition will only be chassis where the OEM broadcasts the fuel on the J1939 data bus, Paccar, Freightliner, Volvo, and Mack Conventional. This condition is most likely a J1939 connection/wiring issue between the FDS ECU and the vehicle J1939 data bus, or the FDS ECU is programmed to the incorrect baud rate. Since fuel level is reading correctly, this means the FDS ECU is sending the correct signal to the FLIM, the FLIM is creating the correct effective resistance to the chassis, and the gauge is the correct baud rate for the OEM.

Condition

- Key on
- Engine Cranks
- Engine Runs
- Possible other engine, abs, or vehicle J1939 fault codes

Action

- FDS ECU not connected to CCFT chassis interface harness.
- The J1939 wires to the FDS ECU are not connected properly.
- FDS ECU programmed to incorrect baud rate.
- ECU programmed to incorrect baud rate for the chassis.
- J1939 connectors in the CCFT System Harness not connected.
- J1939 wires for CCFT ECU not wired correctly.

Repair

- Replace or repair components that were found to be out of specification.

Validation

- Key ON check digital fuel gauge.

Digital Gauge Not Reading Correctly

Symptom: Digital Gauge Pressure correct, Fuel Level correct, Miles to Empty 0

General Information

Miles to Empty requires the FDS ECU to read the Average Fuel Economy parameter from the engine. The FDS ECU will read the signals for pressure and temperature from the FDS pressure/temperature transducer and calculate the fuel level. From the fuel level and the system capacity programmed in the FDS ECU, the FDS ECU will calculate the miles to empty by multiplying the useable fuel and the average miles per gallon. If the Miles to Empty is showing 0, the most likely causes are the FDS ECU is not communicating with the engine ECM to read the Average Fuel Economy, or the FDS ECU is seeing an out-of-range value from either pressure or temperature reading on the FDS Pressure/Temperature transducer. The engine has two data buses but may not broadcast the Average Fuel Economy on both data buses.

Condition

- Key on
- Engine Cranks
- Engine Runs

Action

- CCFT chassis interface harness not connected to the engine data bus.
- The J1939 wires to the engine ECM are not wired correctly.
- The J1939 connection on the FDS chassis interface harness connected to the incorrect engine data bus.

Repair

- Replace or repair components that were found to be out of specification.

Validation

- Key ON check digital fuel gauge.

Symptom: Digital Gauge Pressure and Miles to Empty correct, Fuel Level between 1-99%, but not the correct value

General Information:

This condition will only be chassis where the OEM broadcasts the fuel on the J1939 data bus, Paccar, Freightliner, Volvo, and Mack Conventional. The most likely cause of this condition is the FDS ECU is programmed for the incorrect fuel curve. These chassis require the FLIM to create a simulated resistance to drive the correct value for the OEM to broadcast. Every OEM, and for some OEM's it even varies by model, require a different simulated resistance to drive the correct value.

Action

- FDS ECU programmed to the incorrect OEM Make/Model

Repair

Digital Gauge Not Reading Correctly

- Reprogram or Replace FDS ECU found to be out of specification.

Validation

- Key ON check digital fuel gauge.

Symptom: Digital Gauge Pressure and Miles to Empty 0 when there is pressure to it, Fuel Level near 100%, but not the correct value

General Information:

This condition will only be chassis where the OEM broadcasts the fuel on the J1939 data bus, Paccar, Freightliner, Volvo, and Mack Conventional. The most likely cause of this condition is the FDS ECU is reading pressure signal or temperature signal from the FDS Pressure/Temperature transducer that is out of range. If the gauge is showing any number and not all dashes(----) then the gauge is communicating with the FDS ECU, but the default value is 0 if the pressure or temperature reading is out of range, and fuel level to 100%. The most like causes of this failure is a bad sensor, wiring terminals not seated fully in the connectors, or bad wire.

Action

- Check the FDS Pressure/Temperature sensor connector for any terminals pushed back or corrosion.
- Check the FDS Pressure/Temperature sensor for any signs of damage, such as cracked electrical housing.
- Back probe the sensor to measure the outlet voltage for both the pressure and temperature referencing the sensor ground to the sensor.

Repair

- Repair or replace the appropriate component.

Validation

- Key ON check digital fuel gauge.