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GROUP: 18 - Vehicle Performance

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SUBJECT:

P203E and P203F Additional Diagnostic Information

OVERVIEW:

This bulletin provides additional information regarding diagnosing Diesel Exhaust Fluid (DEF) issue in extreme cold weather. Diagnostic Trouble Codes (DTCs) P203E - Reductant Level Sensor 1 Circuit Intermittent and/or P203F - Reductant Level Too Low set.

MODELS:

2019 - 2021	(DJ)	RAM 2500 Pickup
2019 - 2021	(D2)	RAM 3500 Pickup
2019 - 2021	(DD)	RAM 3500 Cab Chassis
2019 - 2021	(DP)	RAM 4500/5500 Cab Chassis

NOTE: This bulletin applies to vehicles within the following markets/countries: North America, LATAM, EMEA and APAC.

NOTE: This bulletin applies to vehicles equipped with a 6.7L I6 Cummins Turbo Diesel Engine (Sales Code ETL or ETN) or 6.7L I6 Cummins HO Turbo Diesel Engine (Sales Code ETM).

DISCUSSION:

Several reports have been received of vehicles in the field setting DTCs P203E and/or P203F. Many of these vehicles were located in areas of extreme cold, or in areas where the temperatures can go from extreme cold to warm in short periods of time. An analysis of returned parts from several of these vehicles has shown a high rate of No Trouble Found (NTF). Further analysis of information returned from the field, has narrowed down the cause into 3 possible scenarios.

- Scenario #1 - DEF Tank Overfilled.
- Scenario #2 - Residual Ice in the DEF Tank or Covering the Level Sensor.
- Scenario #3 - DEF Crystallization Covering the Level Sensor.

NOTE: If you encounter a vehicle with the above condition, please review each scenario below, and repair accordingly prior to replacing any parts.

DEF Level Sensor Operation:

The DEF level sensor is new starting in the 2019 Model Year. The new design level sensor uses an Ultrasonic Frequency (UF) signal to detect the proper fluid level. Previous model years use a radio frequency type sensor which operates differently, and can be less accurate.

In order for the UF level sensor to operate properly, it is crucial that there is sufficient air space between the top level of the fluid, and the top of the DEF tank. DEF tanks are specially designed to have an air space above the fluid, which is crucial for the level sensor to function. Without that air space, the UF signal cannot be returned to the sensor properly leading to a "No Echo" condition.

Scenario #1: DEF Tank Overfill

One leading cause of P203E is due to the DEF tank being overfilled. If the DEF tank is overfilled, the fluid will take up the air space designed into the top of the tank, leading to the “no echo” condition with the sensor. This will cause P203E to set.

Scenario #1 Repair:

To correct the overfill condition, the DEF tank will need to be drained to the proper level. Once drained, verify the “DEF Level (Hardwired)” now reads a valid level (not 0%).

Does the DEF Level (Hardwired) reading now read a valid level?

- YES>>> Follow the **P203E Drive Cycle** below.
- NO>>> Refer to **Scenario #3**.

Scenario #2: Residual Ice

Another cause of P203E and P203F is residual ice in the DEF tank. Once ambient temperatures reach approximately 12°F (-11°C), the DEF fluid in the tank will freeze. The P203E diagnostic will not run if the DEF tank, and ambient temperatures stay below 39°F (4°C). However, as the ambient temperature warms up, and the tank begins to thaw, the DEF tank may not be completely thawed by the time the P203E DTC enabling criteria are met. If there is a residual layer of ice in the tank, the ice will cause the “no echo” condition setting P203E. Vehicles are especially susceptible to having residual ice in the tank, in areas where there is a large swing in temperatures (from extreme cold to warm), in a short period of time. Additionally, if ice is covering the sensor (Fig. 1) when the temperatures are too cold to run the P203E monitor, it could lead to P203F. Even if there is sufficient fluid level in the tank.

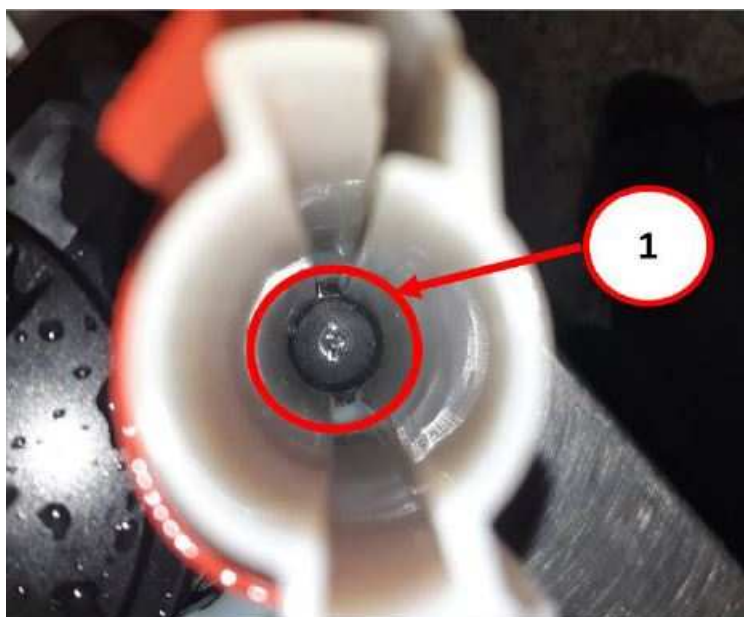


Fig. 1
DEF Pump Assembly

1 - Ice In Level Sensor Focus Tube.

Scenario #2 Repair:

To correct this scenario, the DEF tank must be fully thawed out. Allow the vehicle to sit in a heated shop or garage overnight to thaw. If necessary, remove the DEF pump to drain the fluid, and remove all residual ice. Take care when removing the DEF pump to avoid damage to the pump, and heater mat. Once all the ice has been removed or thawed, follow the **P203E Drive Cycle** below.

Scenario #3: DEF Crystallization Covering the Level Sensor

Another cause of P203E and P203F is the DEF level sensor being covered in a layer or DEF crystals, or ice (Fig. 2) . Vehicles that are in extreme cold for long periods of time can start to have a buildup of DEF crystals on the bottom of the tank. When DEF tanks are completely frozen for long periods of time, evaporation will start to occur. This evaporation of the ice will leave DEF crystallization.

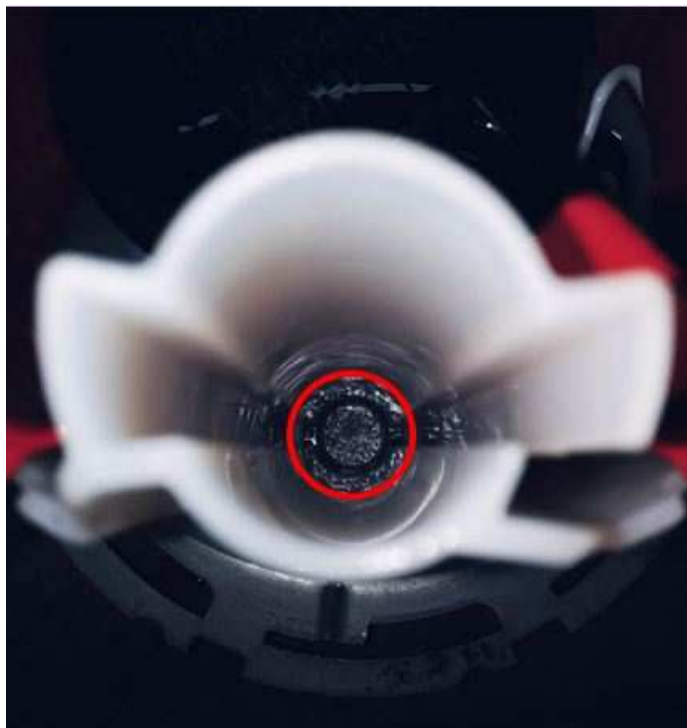


Fig. 2

DEF Crystallization Buildup In Level Sensor Focus Tube

NOTE: Do NOT clean DEF system components using regular tap water. The mineral content in tap water can cause issues with the system. Only use fresh DEF fluid, or warm, distilled water to clean crystallization from the DEF components.

CAUTION! Take care not to allow DEF fluid to come in contact with any electrical connections or wiring. This will cause rapid corrosion to form.

Scenario #3 Repair:

Unless the DEF fluid shows signs of contamination, crystallization that has formed in the tank, and on the pump components can be cleaned without having to replace any parts. Flush the tank, and clean the pump components using fresh DEF, or warm distilled water. In some instances, it may be necessary to remove the DEF tank, and agitate the fluid by shaking the tank. Thoroughly drain the DEF or distilled water used to clean the crystallization, and add fresh DEF. If P203E was set, follow the **P203E Drive Cycle** below.

P203E Drive Cycle:

NOTE: When performing the drive cycle to clear the message, please drive as steadily as possible at highway speeds. Avoid excessive stop and go, large bumps, or excessive curves in the road to keep fluid slosh in the DEF tank at a minimum. Excessive fluid slosh in the tank will delay the monitor from passing leading to inability to clear the message.

CAUTION! If the vehicle is in a derated power state, safely drive the vehicle at the derated speeds for a minimum of 15 minutes as steadily as possible to avoid tank slosh

To clear the “Service DEF” message set by P203E, and ensure the vehicle is repaired, please drive the vehicle under the following operating conditions.

- Steady state driving at highway speeds for a minimum of 15 minutes with minimal stopping and starting to reduce DEF Tank sloshing.
- Ambient Temperature Greater Than 4°C (39°F).
- DEF Tank Temperature (as reported by the temperature sensor) Greater Than 4°C (39°F).
- DEF Tank Temperature (as reported by the Urea Quality Sensor) 4°C (39°F).

If the DTC goes stored, and the “Service DEF” message on the EVIC no longer appears, top off the DEF tank to the proper level, and release it back to the customer. DO NOT replace the DEF pump unit if this DTC was caused by overfilling of the tank or crystalline buildup on the sensor.

POLICY:

Information Only