

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



RRD22MR010

ELECTRONIC CONTROL MODULE

Specialist's Factual Report

November 3, 2022

A. ACCIDENT SUMMARY

Location: Mendon, Missouri
Date: June 27, 2022
Vehicle 1: Amtrak train No. 4
Vehicle 2: 2007 Kenworth dump truck

B. ELECTRONIC CONTROL MODULE SPECIALIST

Specialist: W. Deven Chen
Electrical Engineer - Recorder Specialist
National Transportation Safety Board (NTSB)

C. DETAILS OF THE INVESTIGATION

A recorder group was not convened. The NTSB Vehicle Recorder Division received the following electronic control module (ECM) from the 2007 Kenworth dump truck:

Recorder Manufacturer/Model:	Caterpillar ECM
Part Number:	10R5649-07
Recorder Serial Number:	1108L187JX

1.0 Recorder Description

The Caterpillar ECMs monitor, measure, and communicate data on the engine and drive train of vehicles by processing the sensor information to make decisions about how to control actuators that effect engine fuel management, antilock brake system activation, cruise-control management, transmission shifting, climate-control management, etc. Although the ECMs are not equipped with Event Data Recorders (EDRs) as in passenger vehicles, they record diagnostic trouble code snapshots¹ whenever a sensor reports data outside the sensor's normal values. These snapshots, which are triggered by engine faults or operator input, record engine operation and parameters surrounding the event, such as vehicle speed.

1.1 Recorder Data Recovery

Upon arrival at the Vehicle Recorder Division, an exterior examination revealed the device had sustained impact damage, as shown in figure 1. The device was identified as a Caterpillar ECM based on the marked part number, as shown in figure

¹Snapshot -- a summary of data recorded in a very small window of time.

2. The device was opened and cleaned, and further visual examination did not find damage on its circuit boards.

The device was hand-carried to a Carter Machinery facility for data download, with the supervision of the recorder specialist and a highway accident investigator from the NTSB. The download was successful, and the data indicated that there were no snapshots associated with the accident (occurred on June 27, 2022) recorded on the ECM. Figure 3 shows a list of the snapshots recorded on the ECM. There were two snapshots triggered by events before the accident date; one was recorded on June 17, 2022, and the other one was on January 18, 2022. The two *Diagnostic* snapshots on the top of the list were triggered by the downloading process. The data also indicated that the ECM was installed in a vehicle with Caterpillar C15 engine, and that the internal clock of the ECM was about two hours ahead of the eastern daylight time (EDT) at the time of downloading, as shown in figure 4. All the available data recorded on the ECM was downloaded and provided as attachment 1 to this report.



Figure 1. Top view and side view of the Caterpillar ECM as Received.



Figure 2. Identification of the Caterpillar ECM as Received.

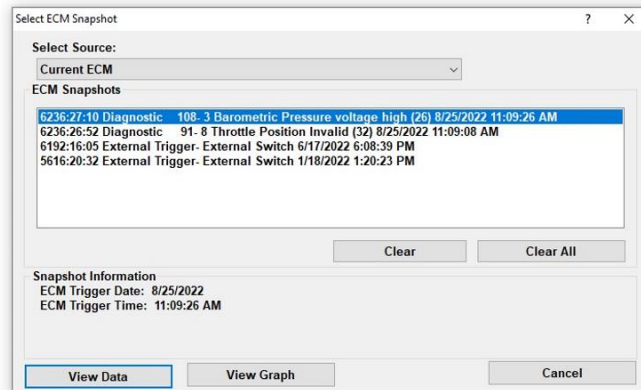


Figure 3. List of events recorded on the Caterpillar ECM.

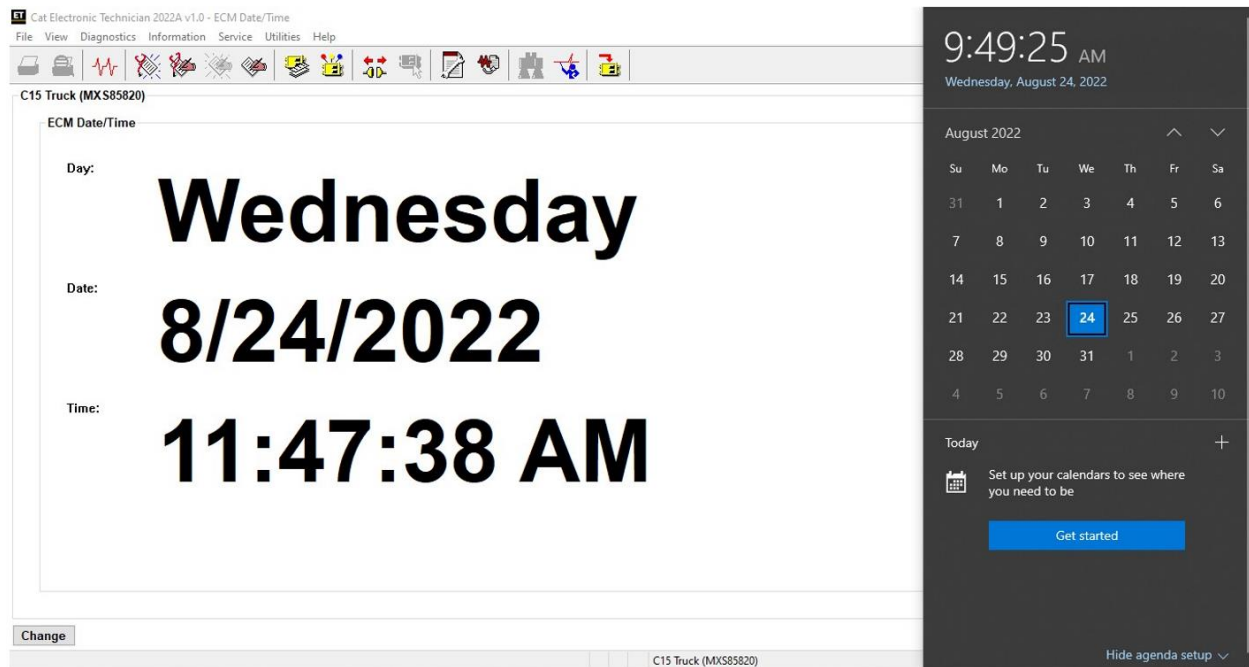


Figure 4. Internal clock of the Caterpillar ECM comparing to EDT at the time of downloading.

Submitted by:

W. Deven Chen
Electrical Engineer - Recorder Specialist