

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



RRD23FR002

LOCOMOTIVE EVENT RECORDER

Specialist's Factual Report

May 18, 2023

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A. ACCIDENT

Location: Beaumont, Texas
Date: October 28, 2022
Time: 12:15 a.m. central daylight time (CDT)
Locomotive: CBFX 3832

B. LOCOMOTIVE EVENT RECORDER SPECIALIST

Specialist Cassandra
Mechanical Engineer
National Transportation Safety Board (NTSB)

C. DETAILS OF THE INVESTIGATION

A locomotive event recorder group was not convened. The NTSB Vehicle Recorder Division received event recorder files from CBFX 3832.

1.0 Recording Description

Using the wheel size of 37.00 inches as provided by investigators, CBFX 3832's event recorder data from each file were extracted using the Wabtec Railways Electronics QUADS software program (referred to as QUADS). The software outputted the locomotive event recorder parameters including distance and speed. The exported data recorded in tenths of a second and only recorded when one of the parameter's values changed. Only data relevant to this event are provided in this report.

1.1 Parameters

Table 2 lists the locomotive parameters verified and provided in this report for CBFX 3832. Additionally, table 3 contains the unit abbreviations for the parameters.

1.1.1 Distance

The QUADS program exported speed and distance by using the number of wheel rotations saved in the recorder file and the wheel size entered in the program.

An apparent discontinuity appeared in the data at 00:00:29.0 CDT. The speed and distance data were reviewed and at 00:00:27.3 CDT, the distance was 17,191.1 feet (ft) and the speed was 5.0 miles per hour (mph). At 00:00:29.0 CDT, the distance was 17,283.4 ft while the speed remained at 5.0 mph (see figure 1). Using the distance at these two times, the speed was calculated to be 37.1 mph; thus, the distance data at 00:00:29.0 CDT is invalid. Therefore, the exported distance will not

be used in this report, and instead, a new distance parameter (derived distance) was derived by using the speed data and its recorded times. For convenience, the derived distance was zeroed when the locomotive came to a complete stop at 00:03:07.0 CDT.

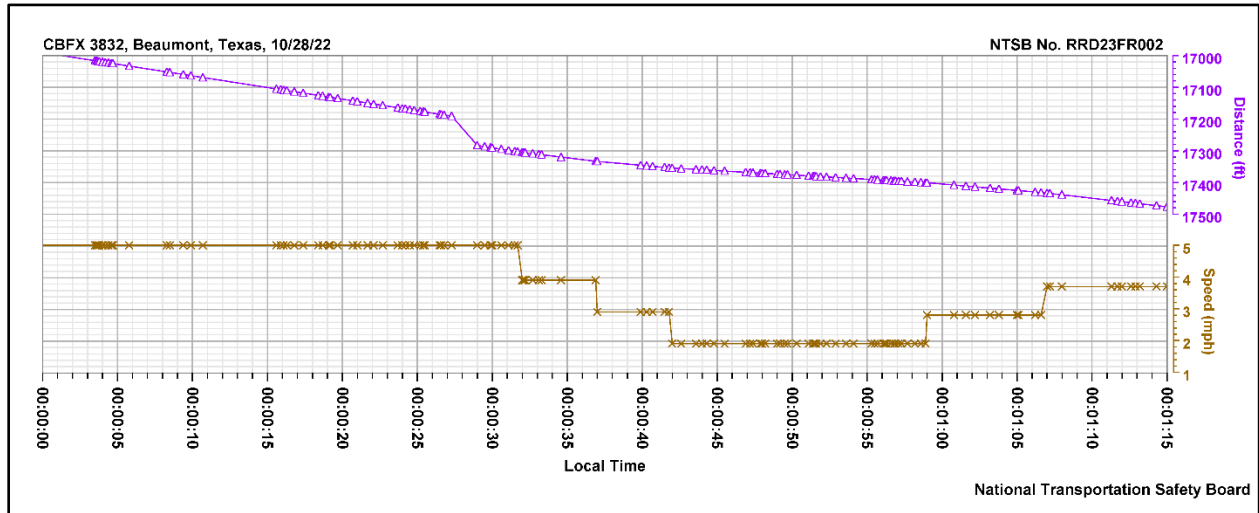


Figure 1. QUAD's exported distance and speed data from 00:00:00 CDT (midnight) to 00:01:15 CDT.

1.1.2 Interpolated Derived Distance

As stated earlier, the data recorded in tenths of a second but would only record when one of the parameter's values changed; thus, there are large gaps in derived parameters such as Distance. To provide the derived distance at a constant sampling rate of 10 hertz, the derived distance was interpolated using the cubic spline algorithm. The parameter's name is "derived distance interp."

1.1.3 Throttle

The throttle data has numerical values of 0, 1, 2, 3, and 4. Throttle 0 indicates Idle and throttles 1 to 4 indicate notches 1 to 4, respectively.

1.2 Recorded Timing

The recorded time from CBFX 3832's locomotive event recorder data file is independently time stamped and, consequently, the recorded times may not reflect the actual time of the day. During the initial download, an offset of 5 minutes and 19 seconds was manually entered to correlate to local time and this offset was embedded in the data files. Therefore, the times in this report and attachment are referenced as CDT.

D. FIGURES AND TABULAR DATA

Figures 2 to 4 contain locomotive event recorder data from CBFX 3832 recorded during the event on October 28, 2022. All the parameters listed in table 2 are plotted. Figure 2 covers data from 23:59:00 CDT (October 27, 2022) to 00:04:00 CDT (October 28, 2022), figure 3 covers data on October 28, 2022, from 00:02:15 CDT to 00:03:15 CDT, and lastly, figure 4 covers data on October 28, 2022, from 00:02:50 CDT to 00:03:08 CDT.

Table 1 lists select event recorder data from CBFX 3832 on October 28, 2022.

Table 1. Select event recorder data from CBFX 3832.

Local Time	Speed (mph)	Brake Pipe Pressure (psi)	Throttle Position	Derived Distance (ft)	Engine Initiated Emergency (EIE)	Pneumatic Control Switch (PCS)
00:02:58.9	3.6	87	Notch 2	35.6	Off	Off
00:02:59.6	3.6	87	Idle	31.9	Off	Off
00:03:00.0	3.6	87	Idle	29.8	Off	Off
00:03:00.3	3.6	79	Idle	28.3	Off	Off
00:03:00.4	3.6	53	Idle	27.7	Off	Off
00:03:00.5	3.6	38	Idle	27.2	Off	Off
00:03:00.6	3.6	28	Idle	26.7	Off	Off
00:03:00.7	3.6	21	Idle	26.1	Off	Off
00:03:00.8	3.6	16	Idle	25.6	Off	Off
00:03:00.9	3.6	13	Idle	25.1	On	Off
00:03:01.4	3.6	1	Idle	22.4	On	On
00:03:07.0	0	0	Idle	0	On	On

The corresponding tabular data used to create figures 2 to 4 are provided in electronic comma-separated value (CSV) format as attachment 1 to this report.

Submitted by:

Cassandra Johnson
Sr. Mechanical Engineer

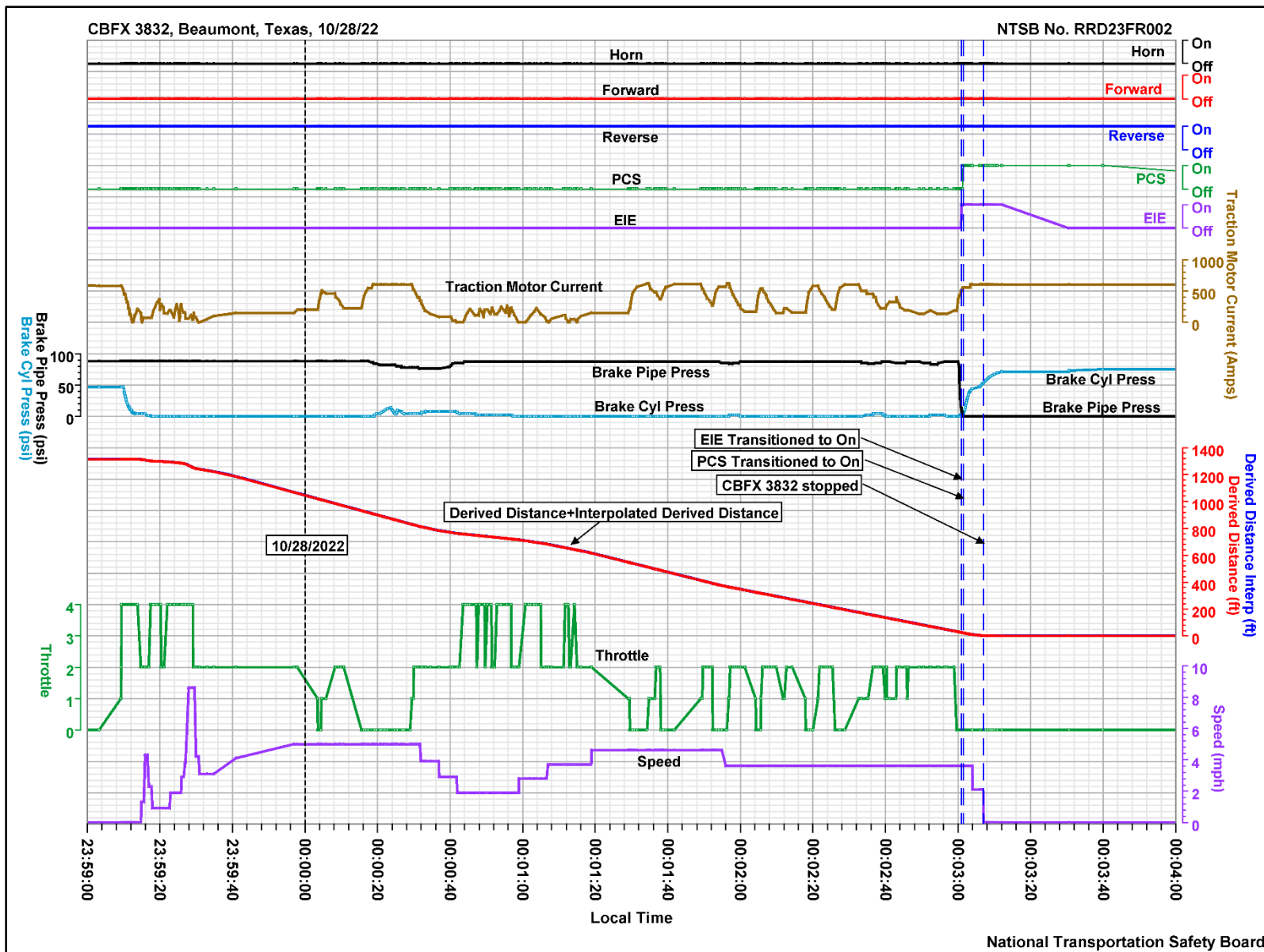


Figure 2. Event recorder parameters from 23:59:00 CDT (October 27, 2022) to 00:04:00 CDT (October 28, 2022).

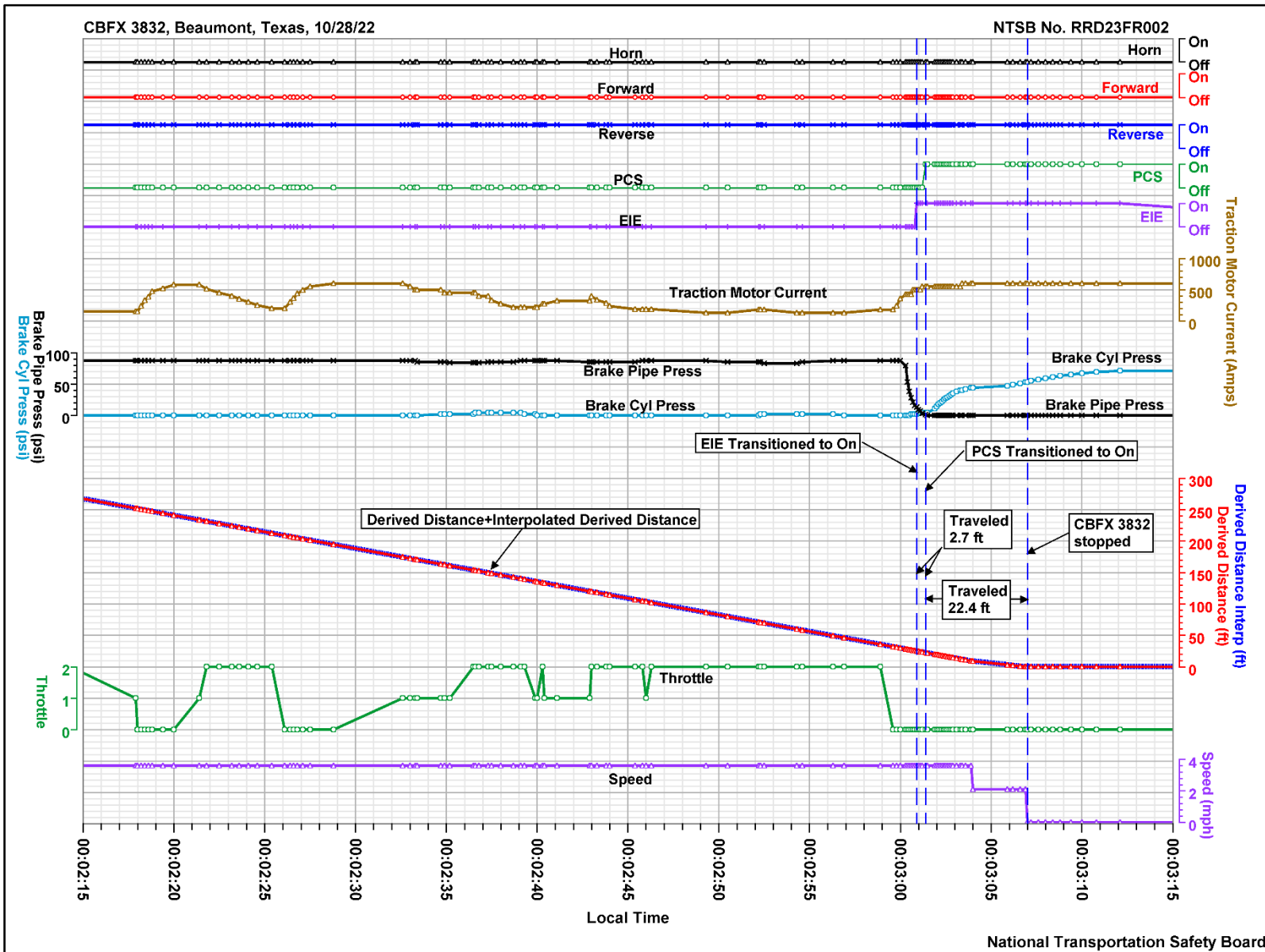


Figure 3. Event recorder parameters on October 28, 2022, from 00:02:15 CDT to 00:03:15 CDT.

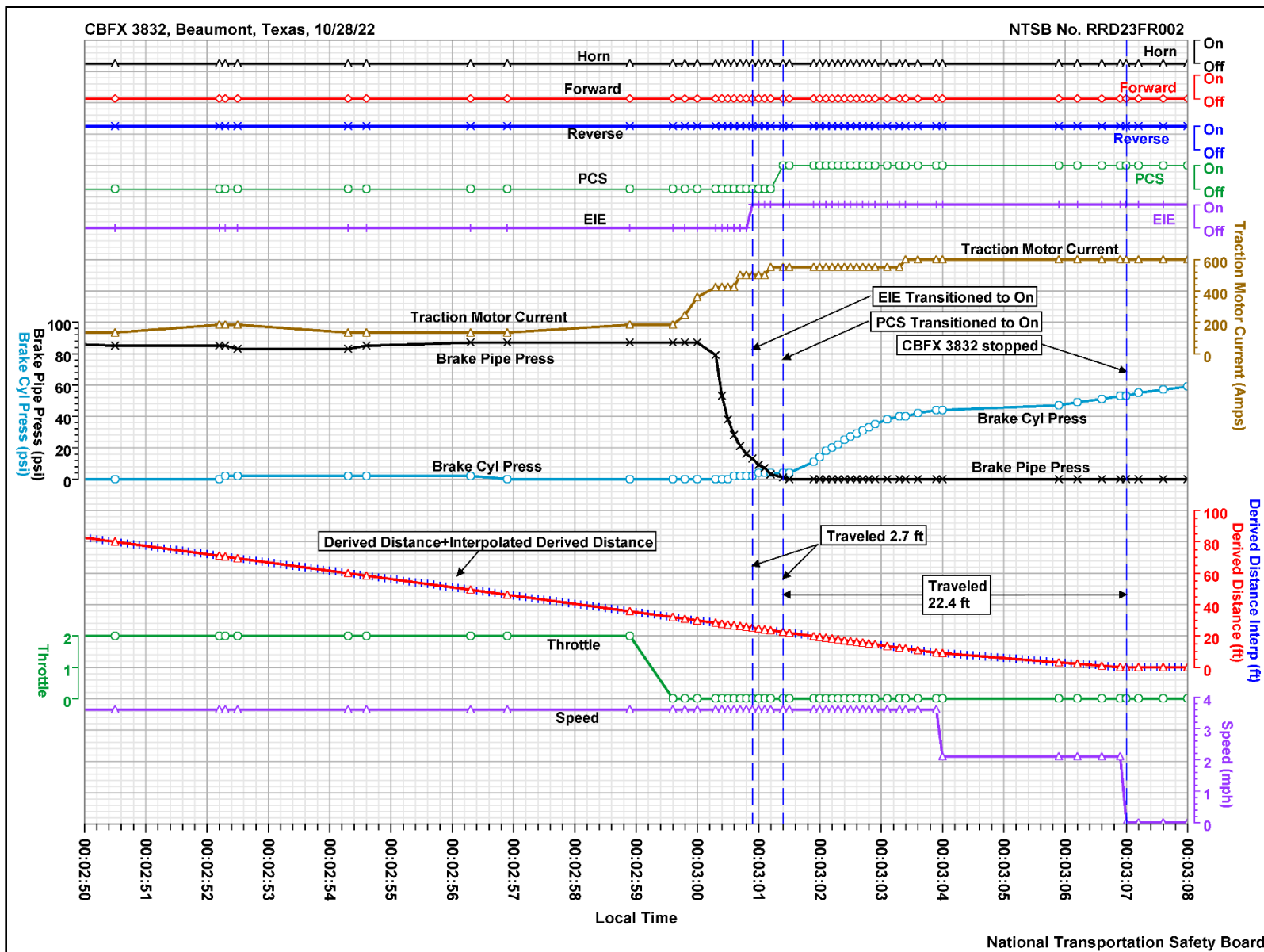


Figure 4. Event recorder parameters on October 28, 2022, from 00:02:50 CDT to 00:03:08 CDT.

APPENDIX A. VERIFIED AND PROVIDED PARAMETERS

This appendix describes the locomotive event recorder parameters provided and verified in this report for CBFX 3832. Table 2 lists the parameters, parameter descriptions, and units. Table 3 contains the unit abbreviations for the parameters.

Table 2. Verified and provided locomotive event recorder parameters for CBFX 3832.

Parameter	Parameter Description	Unit
Brake Cyl Press	Brake Cylinder Pressure	psi
Brake Pipe Press	Brake Pipe Pressure	psi
EIE	Engineer Initiated Emergency	
Derived Distance	Derived Distance Traveled	ft
Derived Distance Interp	Interpolated Derived Distance Traveled	ft
Forward	Forward Direction of Travel	
Horn	Horn	
PCS	Pneumatic Control Switch	
Reverse	Reverse Direction of Travel	
Speed	Speed	mph
Throttle	Throttle Position	
Traction Motor Current	Traction Motor Current	Amps

Note: Parameters with a blank unit description in table 1 are discrettes. A discrete is typically a 1-bit parameter that is either a 0 state or a 1 state where each state is uniquely defined for each parameter.

Table 3. Unit abbreviations.

Unit Abbreviation	Description
Amps	Amperes
ft	feet
mph	miles per hour
psi	pounds per square inch