

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



RRD23FR011

LOCOMOTIVE EVENT RECORDER

Specialist's Factual Report

November 6, 2023

TABLE OF CONTENTS

A. ACCIDENT.....	3
B. LOCOMOTIVE EVENT RECORDER SPECIALIST.....	3
C. DETAILS OF THE INVESTIGATION	3
1.1 Recording Description	3
1.2 Parameters.....	3
1.2.1 Distance Traveled.....	3
1.2.2 Speed.....	3
1.2.3 EIE (Tenth Sec), Horn (Tenth Sec), and PCS (Tenth Sec).....	4
1.3 Recorded Timing	4
D. FIGURES AND TABULAR DATA.....	4
APPENDIX A. VERIFIED AND PROVIDED PARAMETERS	8

A. ACCIDENT

Location: New Castle, Pennsylvania
Date: May 10, 2023
Time: 10:57 p.m. eastern daylight time (EDT)
Locomotive: Norfolk Southern 4342

B. LOCOMOTIVE EVENT RECORDER SPECIALIST

Specialist Cassandra Johnson
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 an event recorder file from the lead locomotive 4342.¹

1.1 Recording Description

The locomotive event recorder data were extracted using the Central Railway Data Playback 2020 (referred to as CDP 2020). The data file included the wheel size of 41.61 inches for NS 4342. The software outputted the locomotive event recorder parameters including distance and speed. The exported data have a sampling rate of one hertz (one data sample per second); therefore, the data have a precision of 1 second. Only data relevant to this event are provided in this report.

1.2 Parameters

Table 1 lists the parameters verified and provided in this report for NS 4342. Additionally, table 2 contains the unit and discrete state abbreviations for the parameters.

1.2.1 Distance Traveled

The output for the distance traveled is the distance decreasing in time.

1.2.2 Speed

The resolution of speed is 1 mile per hour (mph). Thus, any movement less than 1 mph will not be shown.

¹ In this report, Norfolk Southern lead locomotive 4342 is referenced as NS 4342.

1.2.3 EIE (Tenth Sec), Horn (Tenth Sec), and PCS (Tenth Sec)

As stated in section 1.1, the event recorder data were exported with a sampling rate of one sample per second. However, the engineer initiated emergency tenth second (EIE (Tenth Sec)), horn tenth second (Horn (Tenth Sec)) and pneumatic control switch tenth second (PCS (Tenth Sec)) parameters were exported in text to indicate tenths of a second by using a combination of dashes and ones. For example, the data -1--1111-- indicates the parameter was active in the following tenths of a second: 0.1, 0.4, 0.5, 0.6, and 0.7. Additionally, data recorded as 1111111111 indicates the parameter is active for the entire second.

1.3 Recorded Timing

The data was recorded in coordinated universal time (UTC). Within the CDP 2020 program, the timing was adjusted to local time, EDT, by subtracting 4 hours. Therefore, the times used in this report are expressed as EDT.

D. FIGURES AND TABULAR DATA

Figure 1 and 2 contain locomotive event recorder data from NS 4342 recorded during the event on May 10, 2023. All the parameters listed in table 1 are plotted except feet traveled, EIE (Tenth Sec), Horn (Tenth Sec), and PCS (Tenth Sec). Figure 1 covers data from 21:50:00 EDT to 23:15:00 EDT and figure 2 covers data from 22:48:00 EDT to 23:00:00 EDT.

The event recorder data from NS 4342 indicated at 22:57:39.0 EDT, the PCS (Tenth Sec) transitioned from ----- (not active) to 1111111111 (active). At 22:57:39 EDT, the speed was 28 mph, the throttle position was Notch 6, the trainline emergency (Trainline Emerg) changed from off to emergency (Emrgy), the brake pipe pressure (Brake Pipe PR) decreased from 89 pounds per square inch (psi) to 52 psi, and the positive train control lead milepost (PTC Lead MP) with its designated letters (PTC Lead MP Letter) was YG 73.0145.

At 22:57:40 EDT, the brake pipe pressure decreased to 4 psi, the throttle position changed to idle, and the speed remained 28 mph. At this time, the PTC Lead MP and its associated letters was YG 73.0064, and based on the feet traveled, NS 4342 moved 41 feet (ft).

At 22:58:01 EDT, the throttle position changed to dynamic brake (DB) and the speed reduced to 15 mph. At this time, the PTC Lead MP and its associated letters was YG 72.8851 and NS 4342 moved 711 ft.

At 22:58:16, NS 4342 came to a complete stop and had moved 151 ft. At this time, the PTC Lead MP and its associated letters was YG 72.8635.

The corresponding tabular data used to create figure 1 and 2, including feet traveled, EIE (Tenth Sec), Horn (Tenth Sec), and PCS (Tenth Sec), are provided in electronic comma-separated value (CSV) format as attachment 1 to this report.

Submitted by:

Cassandra Johnson
Sr. Mechanical Engineer

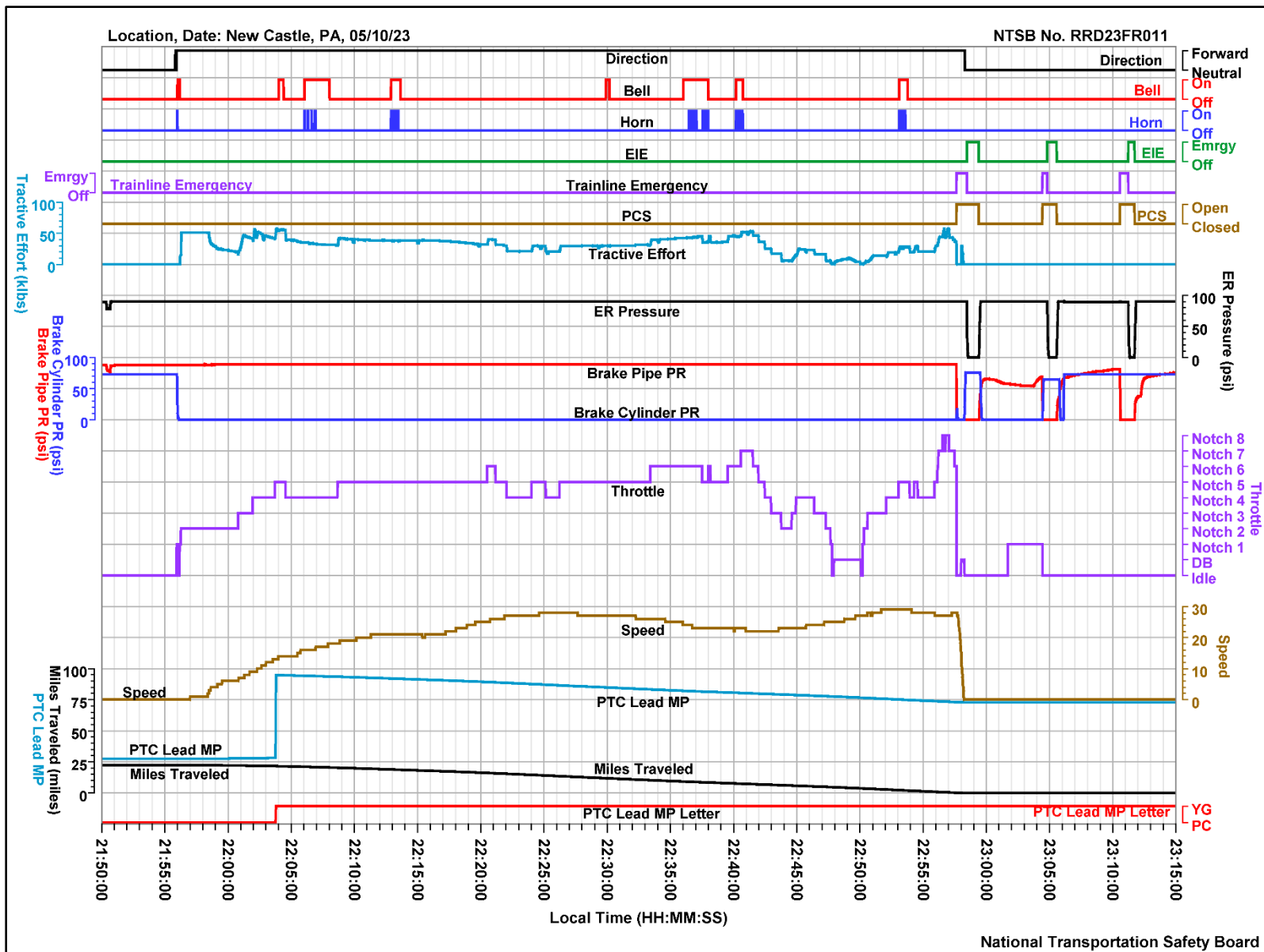


Figure 1. NS 4342's locomotive event recorder parameters (21:50:00 EDT to 23:15:00 EDT).

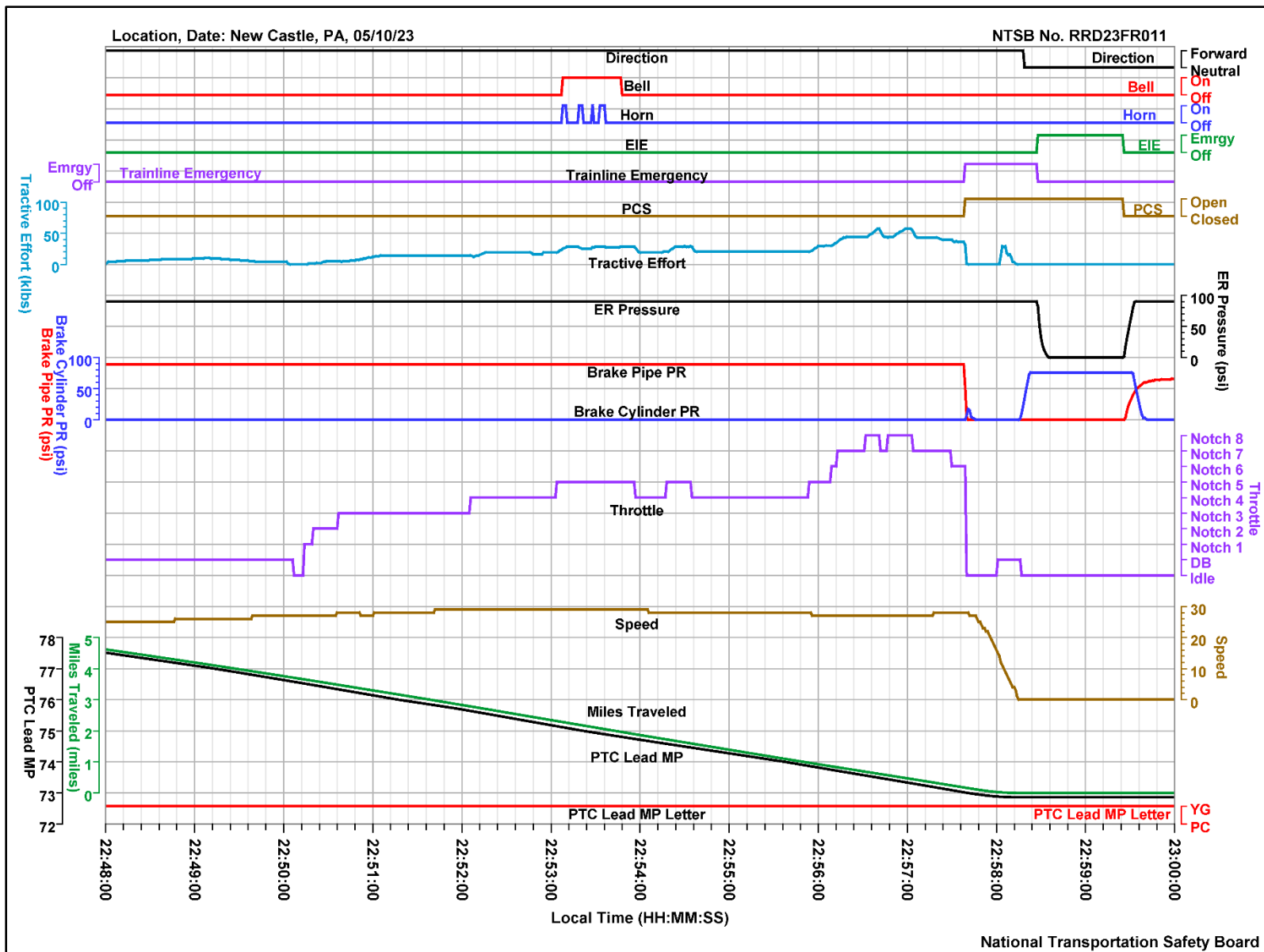


Figure 2. NS 4342's locomotive event recorder parameters (22:48:00 EDT to 23:00:00 EDT).

APPENDIX A. VERIFIED AND PROVIDED PARAMETERS

This appendix describes the locomotive event recorder parameters provided and verified in this report for NS 4342. Table 1 lists the parameters, parameter descriptions, and units. Table 2 contains the unit and discrete state abbreviations for the parameters.

Table 1. Verified and provided locomotive event recorder parameters for NS 4342.

Parameter	Parameter Description	Unit
Bell	Bell Activation	
Brake Cylinder PR	Brake Cylinder Pressure	psi
Brake Pipe PR	Brake Pipe Pressure	psi
Direction	Direction of Travel	
EIE	Engineer Initiated Emergency	
EIE (Tenth Sec)	Engineer Initiated Emergency (Tenth Second)	
ER Pressure	Equalizing Reservoir Pressure	psi
Feet Traveled	Feet Traveled	ft
Horn	Horn Activation	
Horn (Tenth Sec)	Horn (Tenth Second)	
Miles Traveled	Miles Traveled	miles
PCS	Pneumatic Control Switch	
PCS (Tenth Sec)	Pneumatic Control Switch (Tenth Second)	
PTC Lead MP	Positive Train Control Milepost from the Lead Locomotive	
PTC Lead MP Letter	Letter Designation associated with the Positive Train Control Milepost data	
Speed	Speed	mph
Throttle	Throttle Position	
Tractive Effort	Tractive Effort	klbs
Trainline Emergency	Trainline Emergency status	

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 2. Unit and discrete state abbreviations.

Unit and Discrete State Abbreviation	Description
DB	Dynamic Brake
Emrgy	Emergency
ft	feet
klbs	kilo pounds
mph	miles per hour
psi	pounds per square inch