

POWerview SUITE - POWerview EVENT RECORDER

Progress Rail
A Caterpillar Company



Locomotive Digital Video Recorder (LDVR) Locomotive Voice & Video Recorder (LVVR)

The Progress Rail PowerView Locomotive Event Recorder is built on our legacy of railroad event recorders and innovative data acquisition products and solutions.

PowerView is a combined Locomotive Event Recorder (LDARS) and Audio and Video Recorder (LDVR). All data sets are synchronously stored on the recorder and analyzed via the PowerView Connect.

Data is stored on both an internal Crash Hardened Memory (CHM) module and an optional removable Solid State Drive (SSD). The CHM offers FRA-compliant Crash Protection and the SSD provides large storage capacities up to 4TBs.

When configured with the optional 128GB CHM, PowerView can store a minimum of 48 hours of Audio/Video data in Crash-Hardened memory, thus meeting upcoming Transport Canada

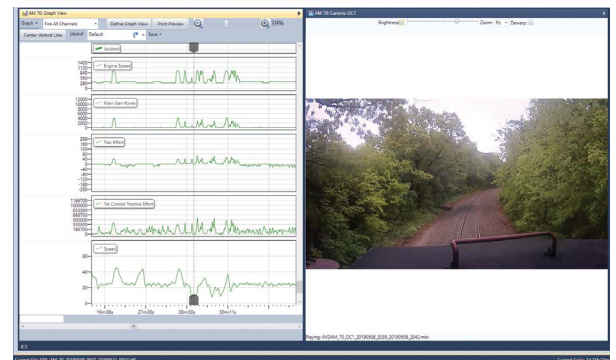
and possible FRA Transit Event Recorder requirements.

All data is synchronized via a master clock of choice (depending on availability) such as GPS, PTC & NTP.

All PowerView Event Recorder data can be downloaded via multiple paths. Local connectivity options include USB thumb drive, Ethernet, and removal of the SSD drive to mount to a PC using a USB 3.0 cable.

Remote downloads are processed via the PowerView Playback software, PowerView Connect, or other 3rd-party options. Various comm & network devices can be supported.

Multiple network camera types are supported, including Forward-facing cameras, interior dome and fish-eye



cameras. Resolution, frame rate and other camera settings can be statically configured or dynamically managed by the PowerView recorder based on locomotive operating conditions.

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POWerview SUITE - POWerview EVENT RECORDER

Features

Ethernet

4x 10/100 Fast Ethernet ports,
M12 connectors, A-coded 8-pin
1x GbE Ethernet port, M12 connector, X-coded 8-pin

Serial

2x RS-422/485 Full / Half Duplex
Synchronous (up to 19200 baud)/
Asynchronous (up to 57600 baud)

Digital Inputs

4x 30-80 VDC Optically Isolated
States: ON, OFF, Toggle (user
defined)

Audio

Dual Balanced-line audio input Supports
up to two (2) dedicated micro-
phones. Multiple camera microphones

USB

USB download port with cover

Clock

Internal real-time clock w/battery
back-up

GPS

GPS receiver with RP-TNC antenna
connector

User Interface

Compatible with web browsers such as
Chrome, Edge, and Firefox

Diagnostic and Health

Status Indicator LEDs on front panel
Detailed diagnostics via Web GUI

Progress Rail Event Playback Software

System Requirements

Windows 10 32/64 bit
Windows 7 32/64 bit Intel Core i3,
4 GB Ram or higher



Data Storage

Internal Crash Hardened Memory Module

Meets 49 CFR Part 229
Multiple capacities available (128GB meets
Transport Canada requirements)

SATA Drive Bay (SSD optional)

Accepts industry-standard 2.5 inch Solid
State Drive (SSD)
Monitored Key Lock
Hot-swappable
Up to 4TB capacities

Options

- LDVR Capability
- IP Network Camera(s)
- Multiple Quantity and types
 - Bullet cameras
 - 180-degree Fish-eye cameras

Multiple Frame Rates (dynamically
up to 60fps)
Multiple Resolutions up to 4K Supports
multi-streaming
Wide-Dynamic Range
Built-in 940mm IR LEDs for cab interior
illumination
Built-in microphones

Compression Codecs

Supports H265, H264, MJPEG, AAC and
other industry codecs

Dimensions

LSI 5 MCU Rack Mount
Width: 6.19 inches
Length: 11.5 inches
Height: 9.25 inches
Weight: 24 lbs

Relative Humidity

0% to 95% non-condensing

Operating Temperature -40° C to +70° C

Storage Temperature

-50° C to +85° C

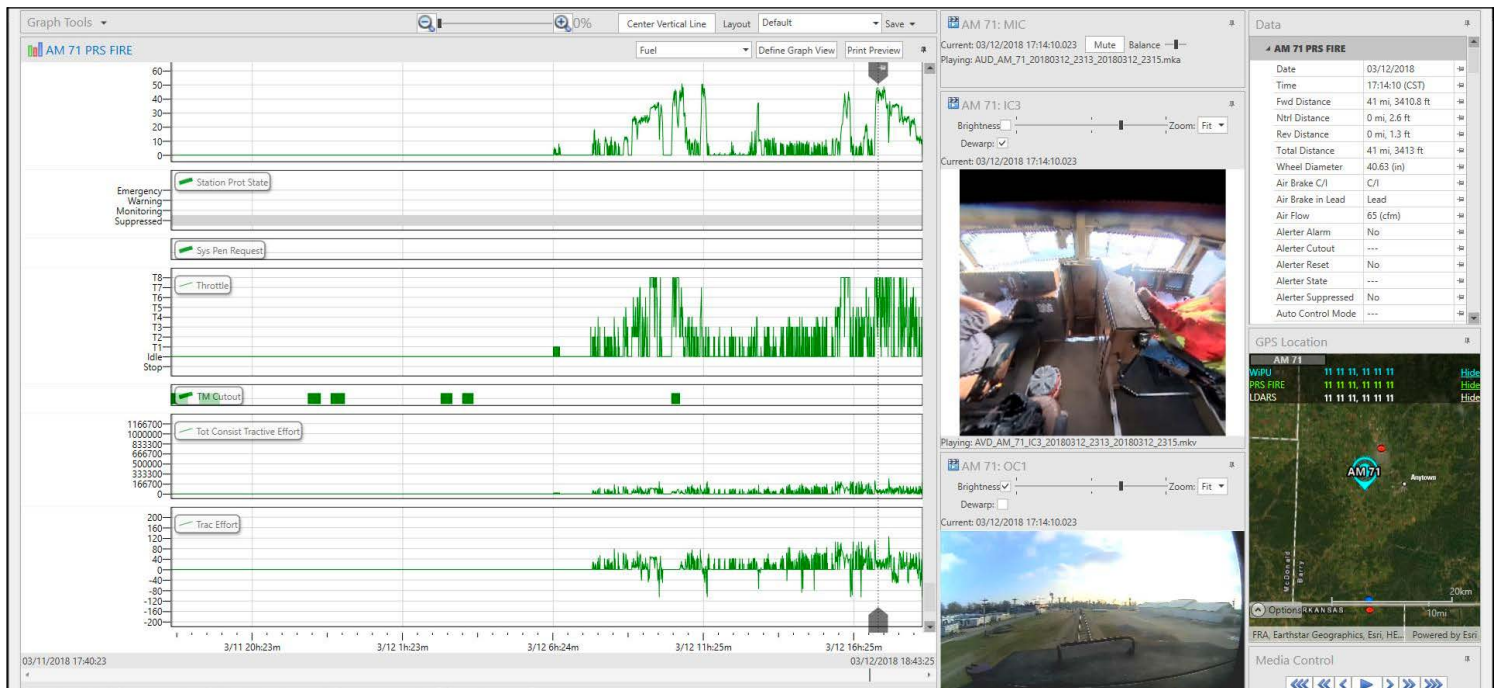
Power

Operating Voltage 40-90 VDC Voltage Range
20-135 VDC Current Draw 15 Watts Max
Reverse polarity protection
Overvoltage protection

Meets the following specifications:

FRA 49 CFR Part 229
AAR S-9101B
AAR S-9401 (5702)
IEEE 1482.1 compliant
IP 67

POWerview SUITE - POWerview EVENT PLAYBACK



The Progress Rail PowerView Event Playback software is the next iteration of PRS railroad event recorders and innovative data acquisition products and software.

PowerView Event Playback software is a multi-featured data video playback and data analysis tool that is compatible with several Locomotive Event Recorder file formats, including the new PRS PowerView Event Recorder.

The playback software can play back synchronized locomotive data and LDVR data, in addition to synchronized data from other sources. All data is combined in a modern, easy-to-use client application. All data sources are combined and displayed to the user in a synchronized format, including video, data, GPS mapping, etc.

A full graphical interface enables enhanced visualization of events. Detailed data analysis can be performed by utilizing a sophisticated Filter Editor to create and store data queries.

It offers industry leading Chain of Custody (CoC) features by utilizing specific proprietary file formats as well as AES encryption.

The Event Playback software also focuses on ease of use. All window panes can float, dock, or be hidden, and moved and displayed on various monitors. Cross-tab navigation is supported, as is multiple file export features.

The Progress Rail PowerView Event Playback is compatible with Windows 7, 8.1, and Windows 10.

POWERVIEW SUITE - POWERVIEW EVENT PLAYBACK

Features

Ethernet

1x 10/100 Fast Ethernet ports, M12 connectors, A-coded 8-pin TCP/IP
AAR Class C/D output messages

Serial

1x RS-485 Half Duplex
Asynchronous Isolated
External Sensors via Modbus
1x RS-232 Full Duplex (EOT Systems, Diagnostics)
Asynchronous Isolated

Digital Inputs

33 x 30-80 VDC General Purpose (Speed, Train Line Signals, Aux)
1 30-80 VDC Generator Field input
10 x 12-32V Cab Signal Inputs (ATP, Radio Signals)

Analog Inputs

7 x 0-80V .1V resolution (Battery Level, Dynamic Brake Control)
1 x 0-16V .1V Resolution (Aux sensors)
6 x 0 to +- 10V .1V Resolution (Aux sensors)

Tachometer Input

Configurable pulses per revolution, Pulse or sine wave input

Pressure Inputs

- 8 x analog or digital
- 4 x 0-160 psi
- 1 x 0-250 psi
- 1 x 25 psi switch
- 2 x 15 psi switch
Configurable (at ordering).

4-20 ma Inputs

7 x Connect to remote sensors
Traction motor currents
Main Generator Voltage
A combination of external sensors can be applied for various purposes:

- Single current sensor to monitor traction motor current
- Multiple current sensors with a Voltage sensor to monitor traction motor current, horsepower, tractive effort, etc.

Configuration

Configurable inputs by file upload
Input Scaling, Debounce,
Report Frequency, IP Address
Generates programmable AAR Class C
Format Tag Data

Options

Progress Rail PowerView System

Event Recorder

Crash Hardened Memory (CHM)
IP Cameras, Microphones

Alerter/Vigilance Module

Mag Valve Output
Audio Warning
Display Module - LED Warning

SPECIFICATIONS

Dimensions

Width: 12.98 inches
Length: 15.52 inches
Height: 6.29 inches
Weight: 10 lbs.
Relative Humidity
0% to 95% non-condensing

Operating Temperature

-40° C to +70° C

Storage Temperature

-50° C to +85° C

Power

Operating Voltage 40-90 VDC

Voltage Range 20-135 VDC

Reverse polarity protection

Overvoltage protection

Isolation

Inputs isolated in banks

80 V Digital/Analog

32 V Digital

16 V Analog

+10 V Analog

Tachometer

Pressure

4-20 ma

Meets the following specifications:

AAR S-9401 (5702)

POWerview SUITE - POWerview CONNECT

Locomotive Operational Status

MOVING Online

Brake Cylinder Pressure: 0.0 PSI NetworkStatus: Online PowerVoltage: 73.4 V
Speed: 4.54 MPH Throttle Position: NOTCH1

Latest values as of: 11/11/21 16:13 CST

Live Data

Latest values as of: 11/11/21 16:13 CST

- Alerter Acknowledge: FALSE
- Alerter Alarm: FALSE
- Alerter Cutoff: INVALID
- Alerter Penalty: FALSE
- Brake Air Flow: 0.0 CFM
- Brake Ball: FALSE
- Brake Cylinder Pressure: 0.0 PSI
- Brake Emergency: FALSE
- Brake Emergency Conductor: FALSE
- Brake Emergency Engineer: SUPPRESSION
- Brake Handle Position: FALSE
- Brake Penalty: FALSE
- Brake Penalty Type: NONE
- Brake Pipe Pressure: 69.33 PSI

Camera Snapshots

Video Snapshots/Timeline

Available: 13, Displayed Count: 13

OC1 11/11/21 6:57 CST OC1 11/11/21 7:42 CST OC1 11/11/21 8:37 CST OC1 11/11/21 9:32 CST

Locomotive Details

AM 72

Category	Customer	Active
Vehicle	Arkansas & Missouri Railroad	TRUE
Industry	Identification	
Rail	AM_72	

CHM Part Number: 12868 USB3
CHM Part Revision: TEST2
CHM Part Serial Number: CHM TEST2
Cab Signal Aspects: No data
Locomotive Number: 72.0
Part Number: 251467-000A
Part Revision: ADO-Q

Events & Diagnostics

Diagnosics Recorder Data

Latest values as of: 11/11/21 16:13 CST

- CHMPartNum: 12868 USB3
- CHMPartRev: TEST2
- CHMSerialNum: CHM TEST2
- CHMSize: 128.0 GB
- CHMSizeStatus: OK
- CHMStatus: OK
- FIRECommStatus: TRUE
- FIREGPSLat: 36.91991 DEG
- FIREGPSLon: -93.92086 DEG
- FIREGPSSpeed: 4.54 MPH
- GPSLat: 36.9198883 DEG
- GPSLon: -93.9208167 DEG

Alarms

Name	Event Time	Data
EOT Locomotive Alert	11/11/21 14:40 CST	No data.
EOT Locomotive Alert	11/11/21 9:49 CST	No data.
EOT Locomotive Alert	11/11/21 6:53 CST	No data.
Emergency Locomotive	11/11/21 4:05	No

PowerView Connect - Advanced Remote Monitoring with next-generation solutions

The Progress Rail PowerView Connect Office System is built on our legacy of event recorders and innovative data acquisition and asset protection products and solutions.

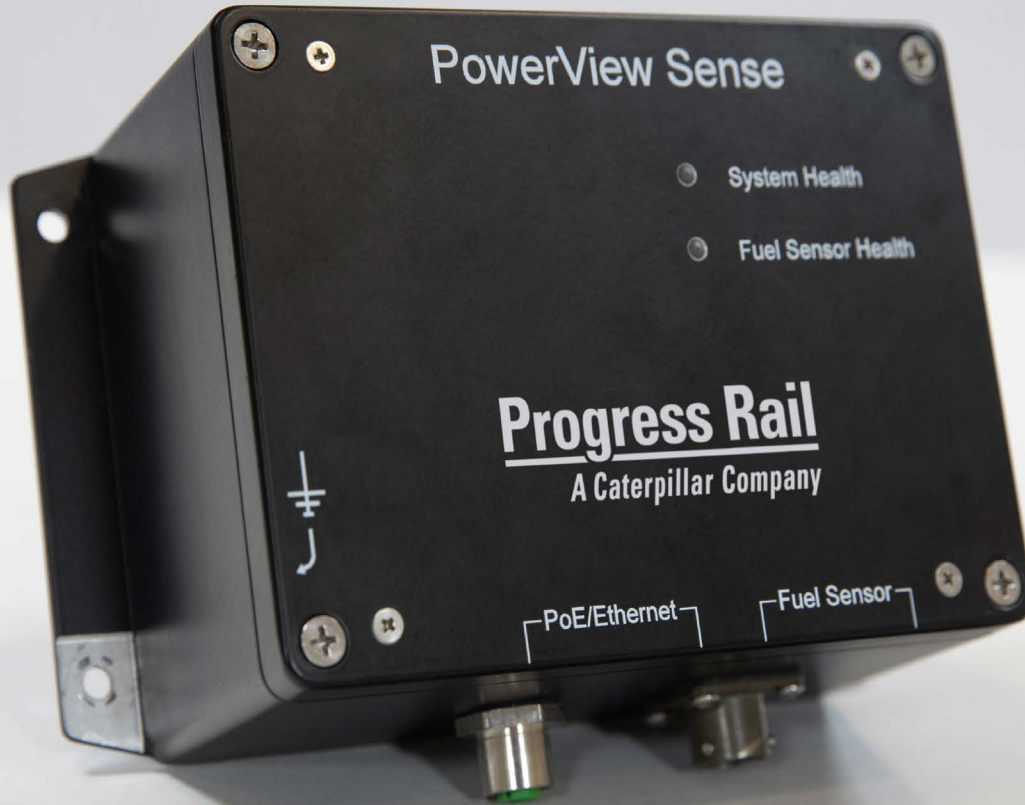
PowerView is both an **On-Premise** and **Cloud hosted** back office solution that uses data from the PowerView product line to provide near realtime locomotive operational status and conditions as well as wayside asset protection information. The On-Premise solution enable users to host on their secure network infrastructure.

The PowerView system is communications agnostic and can support multiple communications options such as cellular networks as well as leveraging existing network communications (such as PTC comms).

The system easily enables file downloads and live data streaming from the PowerView as well as live video streaming. PowerView Connect includes a Customizable Alarm Generator, where users can establish alarming criteria and logic and generate realtime alarms across an entire fleet or sub-fleet of locomotives.

When supported with additional sensors, the system also includes powerful Fuel Monitoring solutions. IoT edge device applications enable flexibility to monitor additional applications. PowerView Connect offers industry leading edge and cloud processing capability and secure, storage capacity, and leverages robust Caterpillar global infrastructure.

POWERSVIEW SUITE -



The Progress Rail PowerView Sense module is one of several optional upgrades that expands the monitoring capabilities of the PowerView Event Recorder system.

PowerView Sense (PV Sense) contains an accelerometer and gyro module that easily interfaces with the PowerView Event Recorder system via a simple to install, single-cable Ethernet connection.

The PV Sense module is designed with a small and rugged modular design for flexible and standardized mounting orientations across dissimilar locomotive fleets. For example, PV Sense can always be on the forward cab bulkhead of any locomotive type, ensuring similar sensor calibration across an entire fleet of various locomotive types.

The 3-axis accelerometers and gyroscope produce IMU information that reports X, Y and Z-axis acceleration data, as well as locomotive pitch and roll data.

PV Sense is IP 67 rated and contains both an Isolated 10/100 Base-T PoE Ethernet Port (802.3af/at), AAR standard M12-8 pin,

A coded female connector. The sensor also contains an isolated RS 485 Serial Port for use with an option Ultrasonic Fuel Tank sensor. PV Sense supplies power to the Ultrasonic sensor.

External LED indicators visually convey system health, as well as optional Fuel

Sensor health. The system also supports remote firmware updates via the locomotive Ethernet network and interfaces.

FEATURES

Connectors

RS 485 Serial Port (for Fuel Sensor)
MIL-DTL-26482 connector
M12 Female 8 Pin A-Code (POE)

LED Status

System and Fuel Sensor Health Indicators

Sensors

High Precision Accelerometer 2/4/8G, 14CLCC
Accelerometer, $\pm 200g$, 12bit, 16TFLGA
3-axis MEMS GYRO, SPI/I2C, $\pm 245dps$, 16LGA

Certification

AAR S-9401

SPECIFICATIONS

Dimensions (w x h x d)

7" x 4.25" x 3"
Wall-mountable

Relative Humidity

0% to 95% non-condensing

Operating Temperature

-40° C to +70° C

Storage Temperature

-50° C to +85° C

Power

15 watts Power-Over-Ethernet (PoE network switch with available power budget required)

POWerview SUITE - POWerview EXPANSION MODULE (IEM)



PowerView Input Expansion Module (IEM) - Advanced event recorder with advanced solutions

The Progress Rail PowerView Input Expansion Module (IEM) is a signal interface/collector which enables nonintegrated locomotives to send data to the Progress Rail PowerView product line as well as EMD and other systems.

The IEM module collects data from various analog, digital, and airbrake pressure signal sources on the locomotive and aggregates this data and sends via Ethernet to the Progress Rail PowerView system and other systems.

The IEM module has an expansive array of analog, digital, cab signal, airbrake, axle tachometer, and current monitoring inputs. It can optionally include a Sil-2 level Alerter module with crew display.

Data communications is via an M12 Ethernet port, and supports multiple industry protocols such as Class C/D messaging.

Additional Traction Motor Current and Generator Voltage modules are available. These modules enable monitoring of locomotive Traction Motor and Generator current and voltage in a module that can be positioned in a variety of locations. Connection to the IEM is via 4-20ma current loop.

When combined with the PowerView Event Recorder and Event Playback software, the Progress Rail PowerView system provides a complete next-generation Locomotive Event Recorder system for non-integrated locomotives.