



R2M System

REAL-TIME REMOTE DIAGNOSTIC MONITORING



Using a combination of shore-based software and on-train hardware **Trimble R2M** processes diagnostic data from rail vehicles in real time. It provides a comprehensive view of overall fleet status including specific vehicle faults and identifies potential faults that may arise.

It analyses and detects anomalies in on-vehicle component behavior to identify the status of component health and the possible impact this behavior may have on the vehicle and to the overall fleet. Also it can replay the events and behaviors that led to faults or incidents.

Benefits

- ▶ Increases mean time between faults reducing maintenance and running costs
- ▶ Immediately identifies faults and prevents potential faults improving fleet safety
- ▶ Pinpoints areas of difficulty for the vehicle operator (WSP, sanding, and overhead line voltage) enhancing infrastructure management
- ▶ Refines maintenance diagnosis and reduces "no fault found" outcomes lowering maintenance costs
- ▶ Lowers time between failures and decreases time taken to address faults optimizing maintenance programs
- ▶ Improves fleet reliability and availability

MOBILE APPS

- ▶ Trimble E2M Workshop app puts E2M functionality in the hands of your depot workforce wherever they need to be
- ▶ Trimble E2M Defect Reporting app means your staff can send reports direct to the Trimble E2M system from their phone or tablet

Features

- ▶ Works with existing on-board event recorders and train management systems
- ▶ For older fleets additional sensors can be added as part of routine maintenance and included in the system automatically
- ▶ Facilitates interactive and predictive fault detection
- ▶ Rules engine functionality automates data processing by defining data values required to cause an alert to be fired triggering action
- ▶ New rules and alerts can be defined and added to the system without affecting vehicles in service
- ▶ Real-time cross fleet performance monitoring identifies trends as they occur within a fleet
- ▶ Displays real-time schematic view of key subsystems as trains are in service
- ▶ Tracks vehicle and fleet location through mapping software
- ▶ View cab equipment in real time from the control room to understand the driver's experience
- ▶ Replay fault events to accurately diagnose root cause and repair actions during maintenance
- ▶ Recommends maintenance repair actions to the fleet maintainer based on the data received from on board systems

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R2M: Customer Experience

“Using R2M we are now able to bring real-time fault information into the control room and provide an intelligent decision and planning support.”

Steve Mitchell
Head of Fleet Engineering
Abellio Greater Anglia



Areas Addressed	Benefit
Miles per casualty	Improved by 60%
Delay minutes	Reduced by 40%
Maintenance investigation time	Reduced by 65%
Return on investment	< 9 months

The **Trimble NCU control unit** is a rail industry approved on-board condition monitoring device that can connect to a large number of on-board train signals and systems. Extremely configurable and designed specifically to work with the Trimble R2M remote diagnostic system the control unit complies with the railway standard EN50155 for electronic equipment on rolling stock.

EXAMPLE SIGNALS AND SUBSYSTEMS

- ▶ IntegrDigital/Analog I/O Modules
- ▶ GPS
- ▶ 10/100 Base-T Ethernet (via M12 connector)
- ▶ Modbus TCP/IP
- ▶ RS232/RS485
- ▶ Isolated RS485
- ▶ 3G modem for data communications
- ▶ 802.11 b/g Wi-Fi

OPTIONAL MODULAR EXPANSION

- ▶ Profinet
- ▶ CANopen
- ▶ MVB (Type EMD)
- ▶ LONWorks
- ▶ 5 port Ethernet switch (M12 connector)

FEATURES

The Trimble NCU control unit provides:

- ▶ A modular and expandable design, with a configurable number of digital and analog input signal modules
- ▶ Support for an on-train system architecture with multiple Trimble NCUs, connected through Ethernet or Wi-Fi, with data communications through a master Trimble NCU control unit
- ▶ Timestamp and GPS position stamping of all monitored data
- ▶ On-train data buffering when communications link is not available
- ▶ Remote monitoring and management of software and system configuration
- ▶ Seamless integration with the shore-based telemetry service
- ▶ Handles the transmission of large volumes of data
- ▶ Support for user requested downloads from TCMS, OTMR, and component controllers



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