RDPMS
Predictive Maintenance



RDPMS for Railways

Product Range Overview

Product description, quick and easy selection of products.

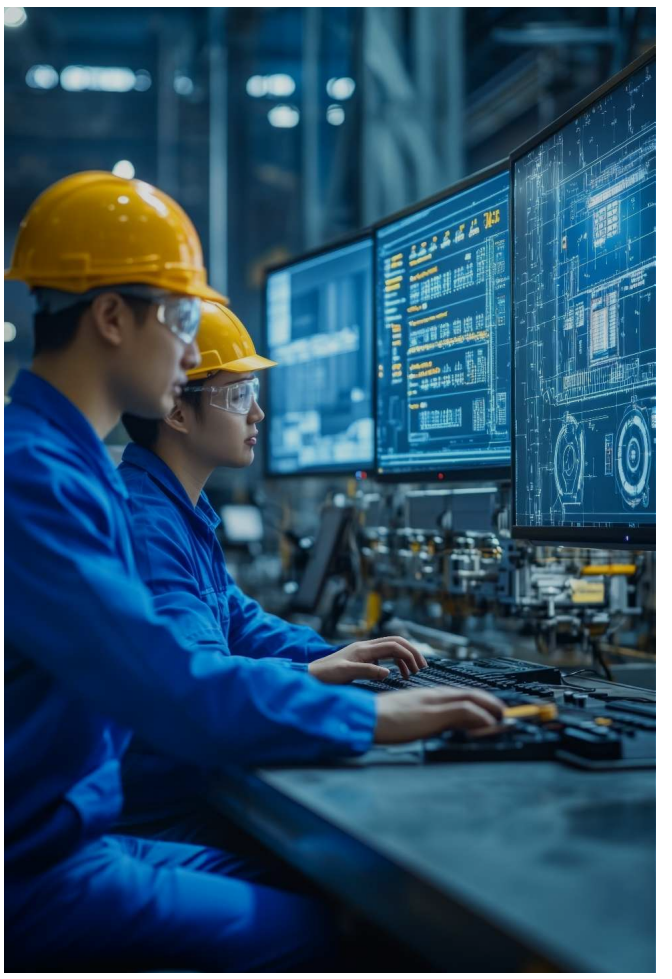
You may also visit Gadgeon website:

www.gadgeon.com

RDPMS
Predictive Maintenance

Connecting Railways to Smarter Solutions

Welcome to the '**Industry 4.0**' era in railway, where IoT is transforming the industry by enhancing safety, efficiency, and passenger experience. Through connected sensors, IoT allows real-time monitoring of railway assets, asset conditions, and asset operations, enabling proactive maintenance and minimizing disruptions.



Gadgeon's **RDPMS** (Remote Diagnostic and Predictive Maintenance System) leverages IoT and machine learning to detect potential issues early, reducing downtime and enhancing reliability. The cloud-based solution gives an easy-to-understand view of all assets, helping decision-makers get the information they need. Moreover, RDPMS supports automated alerts via SMS, Email, WhatsApp, Call, enabling quick responses to any issues that may arise. Our solution not only aligns with global standards **(EULYNX)** and promotes interoperability across systems.



RDPMS
Predictive Maintenance

Table Of Contents

1 Introduction 02

2 System Architecture 03

3 Sensorconnect Module 06

4 Field Transmission Unit (FTU) 08

5 RF Connect 10

6 IoT Gateway 12

7 RDPMS Application 14

Introduction

Gadgeon RDPMS is a cutting-edge solution that offers unparalleled capabilities in remote diagnostics and predictive maintenance, ensuring the safety, efficiency, and reliability of railway signaling assets. Gadgeon-RDPMS is an **RDSO** standard-compliant solution designed for remote monitoring, diagnostics, and predictive maintenance of railway signaling assets.

Core Components



Sensor Packaging



IO Modules



RF Communication Modules



Gateway



Dashboard



Cloud Platform



Alerting System



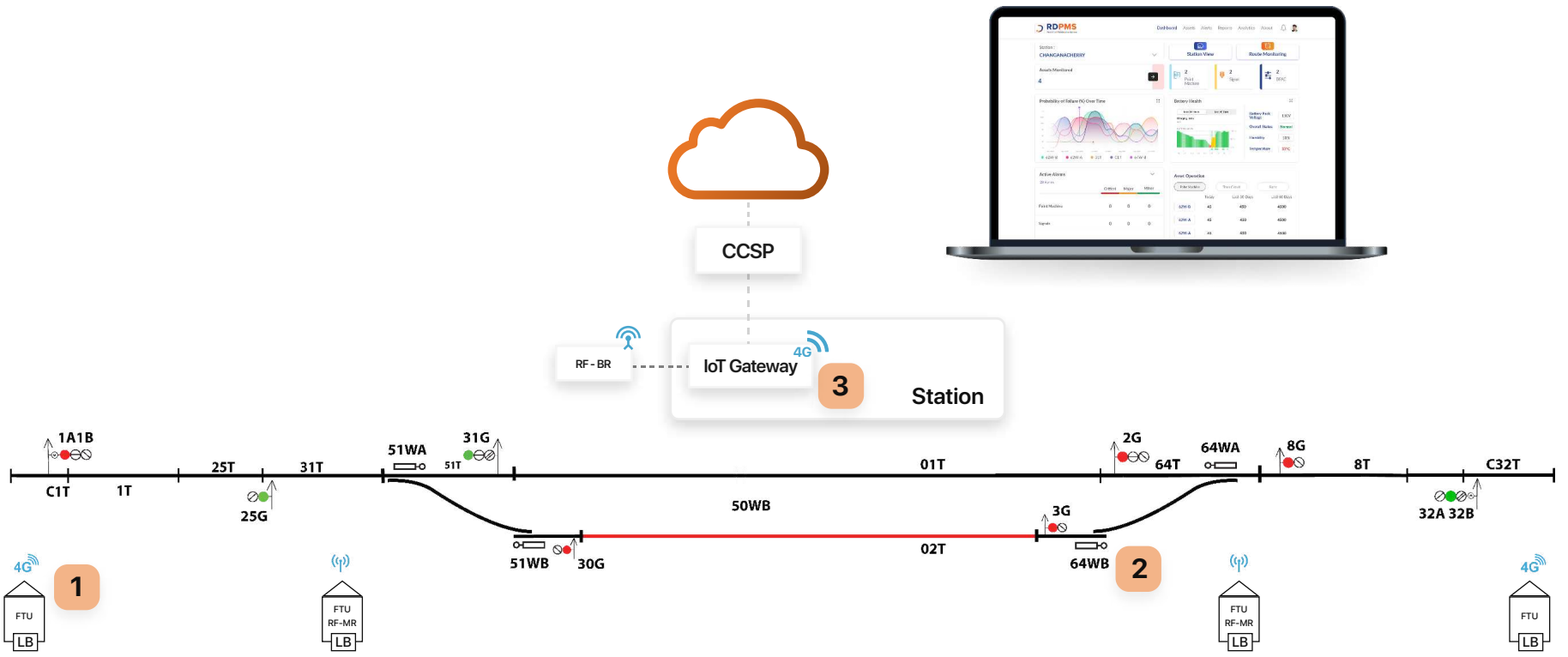
Prediction Engine

RDPMS Solution Features

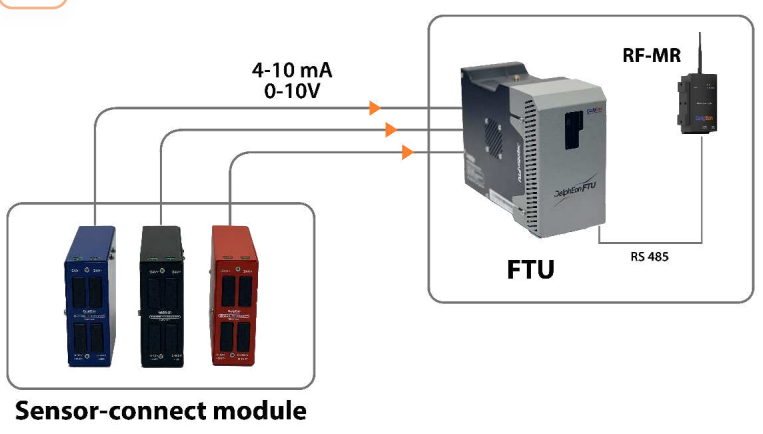
1. **Remote monitoring:** Real-time monitoring with instant fault detection and data-driven insights.
2. **User Management and Alerts :** Role-based user access management and Multi-channel alerts (SMS, Email, WhatsApp, Call).
3. **Hierarchical Station and Asset view :** Organized station hierarchy and detailed asset view per station.
4. **Historical Data Access :** Detailed historical records for improved traceability and analysis.
5. **Predictive Maintenance Alerts :** Advanced analytics to predict failures and optimize maintenance for cost savings.

Gadgeon Smart Systems' RDPMS is a specialized IoT solution for remote diagnostics and predictive maintenance. Gadgeon is an end-to-end Product engineering and Technology company, that specializes in crafting custom sensors and hardware for data collection especially from Railway signaling assets. By leveraging our expertise in Product engineering, IoT engineering, Embedded systems - Hardware and Firmware, Full stack development, Cloud application development, Advanced Data Analytics using Machine-Learning and AI; customers can gain on high-impact business transformation initiatives.

System Architecture

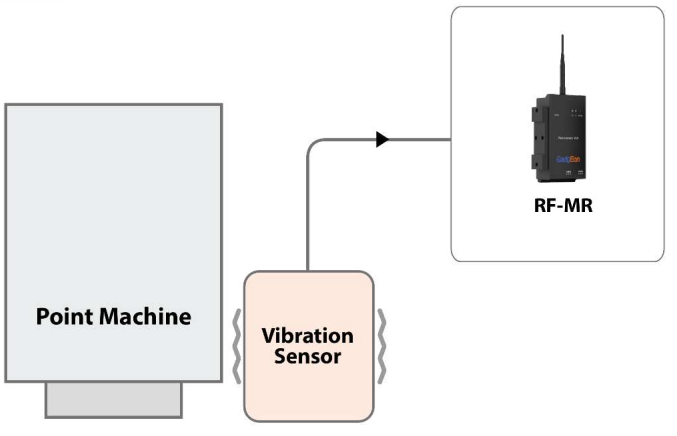


1



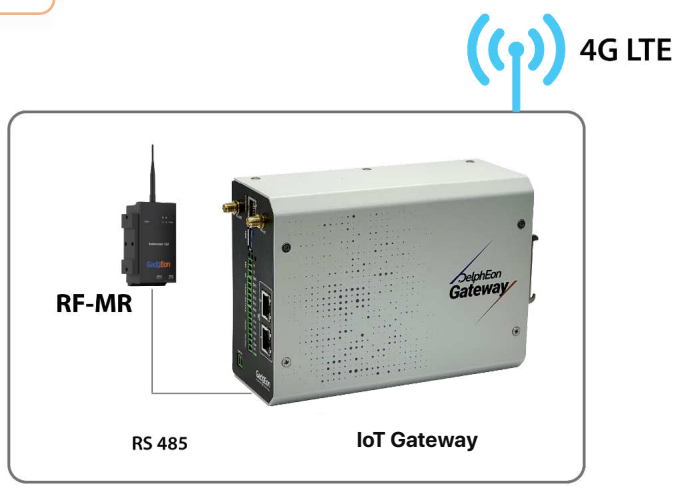
Field sensors connected to FTU capture real-time data such as Current, Voltage. The FTU processes this data locally, performing tasks like filtering and aggregation, before forwarding it to IoT Gateway via RF Routers.

2



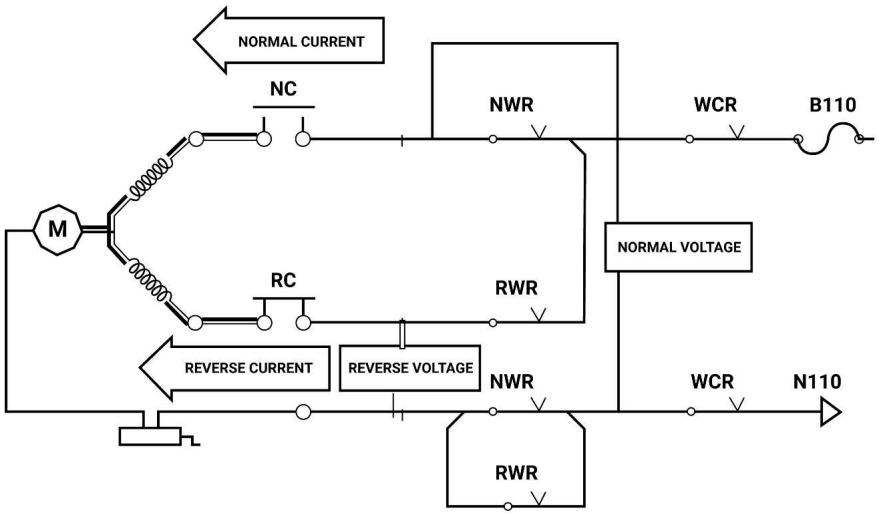
Vibration sensor placed near the point machine captures precise data on its operational health. This data is sent to the FTU, which forwards it to the RF Mesh Router for wireless transmission to RF Border Router.

3

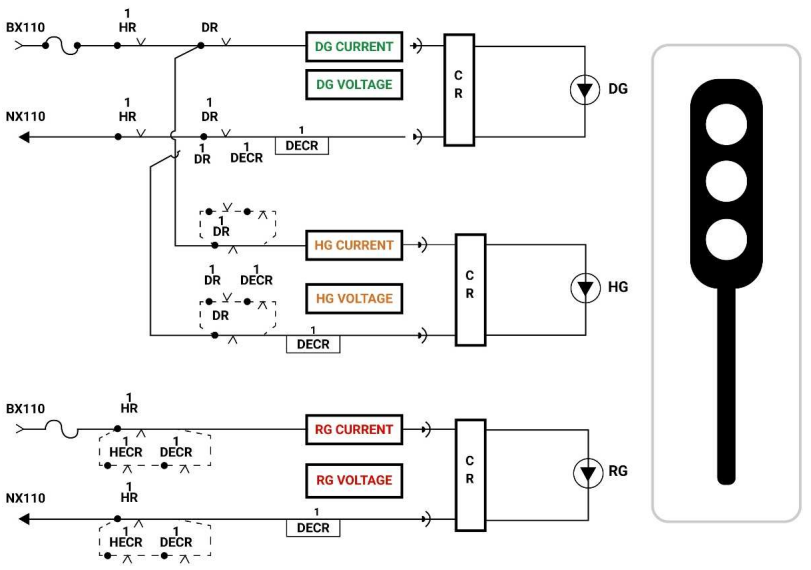


RF Border Router bridges the data to the IoT Gateway, which converts the data for integration with higher-level systems.

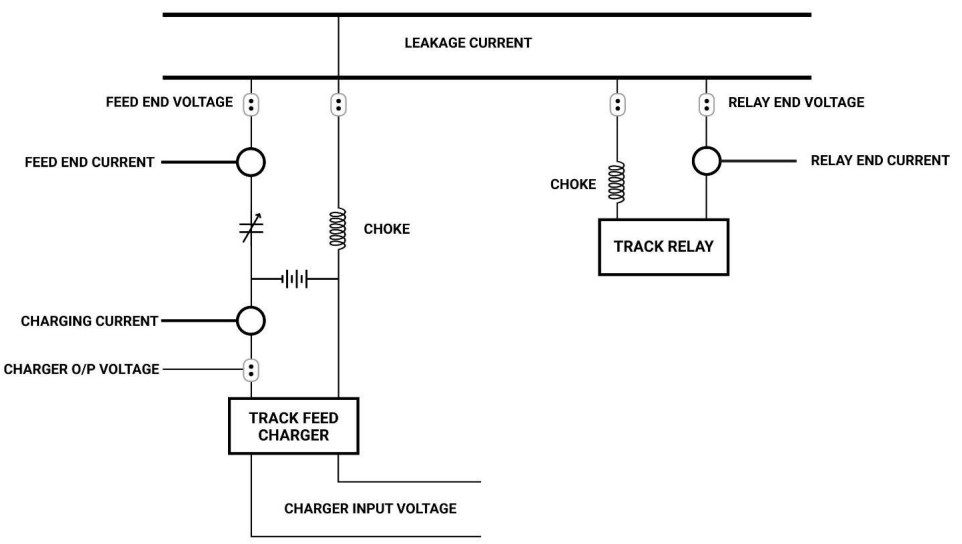
Point Machine : Monitor key parameters of the point machine, such as normal and reverse current / voltage, with a 20-millisecond sampling frequency, ensuring optimal performance and reliability.



Signals : Monitor essential current and voltage readings through all signal indicators. Measurements are taken every 1 second, with a heart- beat of 10 minutes.



Track Circuit : Monitor vital feed end current / voltage, relay end current / voltage, charger output current / voltage, and charger input voltage. Measurements are taken every 1 second, with a heart-beat of 10 minutes.



Axle Counter : Measure voltage from eight critical parameters, providing comprehensive monitoring to enhance system reliability and performance.

Battery Pack : Track vital battery parameters such as individual cell voltage, string current & temperature. Accurately estimate the remaining charge of each cell, helps to maintain optimal battery performance.

RDPMS
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Product Details

Sensorconnect Module



SensorConnect provides accurate measurements of **current** (Non-intrusive) and **voltage** (Optically isolated) in various industrial environments. With its modular design and advanced isolation technology, SensorConnect ensures reliable performance while minimizing space and installation efforts. Whether it's for railway systems, oil and gas operations, or intelligent buildings, SensorConnect delivers **precision**, **safety**, and **efficiency** in a single compact module.

Advantages

Precision & Safety

Compact & Easy Installation

Rugged & Reliable Performance

Technical data

Sensor Connect - Vibration

Category	Specification
Power Supply	5V DC
Communication Interface	RS485
Baud Rate	Adjustable (default at 9600 bps)
Operating Temperature	-40°C to +85°C
Attitude Angle Range	0-360°
Resolution	Gyroscope: 0.01°/s Accelerometer: 0.0001g Magnetometer: 0.1μT

Sensorconnect - Current

	SC-DC10A	SC-DC1A	SC-AC1A
Type	DC	DC	AC
Measuring type	Contact less current measurement	Contact less current measurement	Contact less current measurement
Max current	10A DC	1A DC	1A AC
Power supply	12-40V DC	12-40V DC	12-40V DC
Output	0-10V	0-10V	0-10V
Operating temperature	-35 ºC to 70 ºC	-35 ºC to 70 ºC	-35 ºC to 70 ºC
Mounting	Din Rail mountable	Din Rail mountable	Din Rail mountable

Sensorconnect - Voltage

	SC-DC110V	SC-DC10V	SC-AC110V
Type	DC	DC	AC TRMS
Max input voltage	160V DC	10V DC	150V AC (50 or 60 Hz)
Power supply	24V to 60V DC/AC	24V to 60V DC/AC	24V to 60V DC/AC
Accuracy class (Acc to IEC 60688)	0.2	0.2	0.2
Isolation	Input to output : 3.2kv Power supply to input/output : 5.2kv	Input to output : 3.2kv Power supply to input/output : 5.2kv	Input to output : 3.7kv Power supply to input/output : 3.7kv
Output	0-10V or 4-20mA	0-10V or 4-20mA	0-10V or 4-20mA
Operating temperature	-35 ºC to 70 ºC	-35 ºC to 70 ºC	-35 ºC to 70 ºC
Mounting	Din Rail mountable	Din Rail mountable	Din Rail mountable

Transform Your Operations with SensorConnect

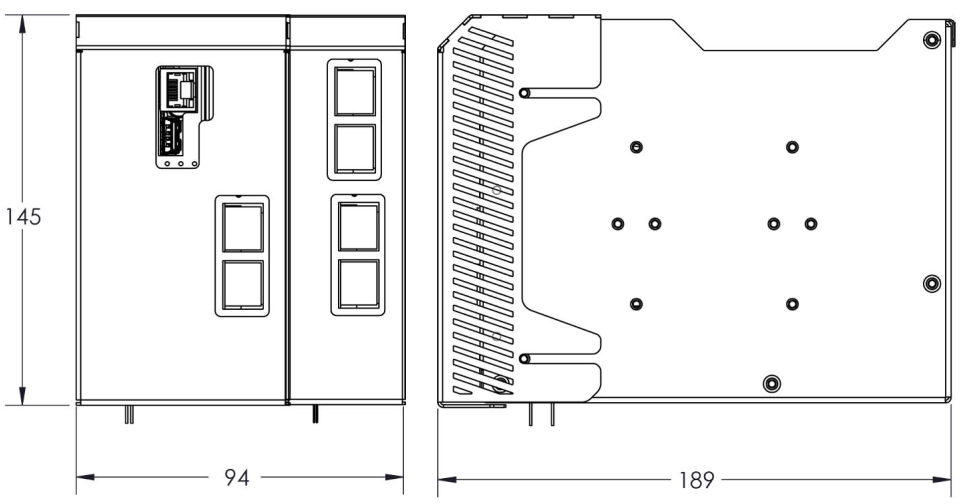
SensorConnect is engineered for industries that require reliable and scalable solutions. With its robust design and user-friendly installation, you can effortlessly integrate it into your Industrial IoT systems.

Field Transmission Unit (FTU)



Field Transmission Unit (FTU) provides powerful **telemetry capabilities**, allowing remote monitoring and management of assets. With its advanced and modular IO capabilities and various communication options, the FTU ensures reliable data logging, edge processing and data transmission (to central systems) enabling monitoring and analysis, even in the most challenging environments.Additionally, the FTU includes a user-friendly web interface for seamless configuration.

All dimensions in **mm**



- **Modular & Adaptable**
  The flexible backplane architecture enables easy customization, allowing the FTU to adapt to various applications. You can expand the number of analog and digital inputs by integrating additional I/O daughter cards.

- **Flexible Analog Input Options**
  Easily switch between 4-20 mA and 0-10 V analog input modes, providing versatility and adaptability to meet various application requirements.

Features

- **High-Performance Processing**
  Driven by the ARM Cortex A53, the FTU handles complex data processing swiftly, ensuring you have access to actionable insights in real time.

- **Industry-Standard Connectivity**
  Easily integrate the FTU into your existing systems with Modbus TCP communication, providing a seamless flow of data between remote assets and central control systems.

- **Robust I/O Capabilities**
  Featuring 20 analog and 4 digital inputs/ outputs, the FTU is equipped to handle a broad range of sensors and inputs, providing comprehensive monitoring.

- **Secure, Remote Access**
  With built-in VPN support, you can securely access and manage the FTU from anywhere in the world.

- **Communication options**
  It supports Modbus TCP, Modbus RTU, Wi-Fi and 4G LTE communication options.

Device Configuration And Functionality

Field Transmission Unit (FTU)

Interface configuration	LAN, 4G/LTE
IO configuration	Card specific Channel configuration
Device Control	Soft Reboot
Security	User authentication(Json Web Token), Reset password
Diagnostic	Downloadable application logs with log rotate support

System Specification

CPU	Arm Cortex-A53 64-bit 2-CORE at 1.0 GHz
OS	QorIQ SDK (FSL Linux Distro) 3.1.10 (dunfell)
Storage	8GB eMMC5.1 NAND FLASH
RAM	DDR4 2GB
Programming	Linux CPP , Shell Scripting, C
Serial Port	Isolated RS485- 1X3POS 3.5mm Terminal Block - 1
PCIe Slots	PCIe 2.0; 2 Mini PCIe Slots (Half Size &Full size) for Wi-Fi and 4G/LTE
Power Input	24 ~ 36 VDC
Ethernet Port	RJ-45 10/100/1000 Mbps
Power options	24V@ 500mA (typical) and @ 850mA (maximum)
Storage Temperature	0°C to 85°C
Working Temperature	0°C to 70°C

Boundless Applications

FTU Module is used to instrument legacy equipment on a factory floor for remote monitoring. It is equipped with analog inputs, digital I/O, and relay outputs which can be connected to sensors and actuators. It acts as a Modbus TCP or RTU slave, that can be controlled from IoT Gateways or any Modbus master controller for remote monitoring.

Multiple industries can leverage FTU for implementing solutions like Building Management Systems, Process Monitoring, Home Automation, and Remote asset Monitoring.

RF Connect



RF Connect enables reliable, long-range wireless data transmission from remote locations to a central gateway. Utilizing the **license-free RF band in India**, RF Connect eliminates the need for complex wiring infrastructures, making it an ideal solution for environments with connectivity challenges. Available in two configurations— **Mesh Router (MR)** and **Border Router (BR)**—RF Connect ensures robust data collection and transmission in even the most difficult terrains.

Why Choose RF Connect?

1. **Long-Range, Reliable Communication**: With a range of several kilo meters in Line of Sight (LOS), RF Connect provides uninterrupted data transmission across vast distances.
2. **Self-Healing Mesh Network**: The multi-hop mesh technology ensures seamless data transfer, even in areas with potential signal interference or obstructions.
3. **Cost-Effective & Easy Installation**: The compact design and elimination of field wiring reduce installation costs, making it ideal for deployment in remote or hard-to-reach locations.
4. **Connectivity with devices**: Industry-standard downstream connectivity allows seamless integration with a wide range of field devices, such as PLCs, meters, and I/O modules.

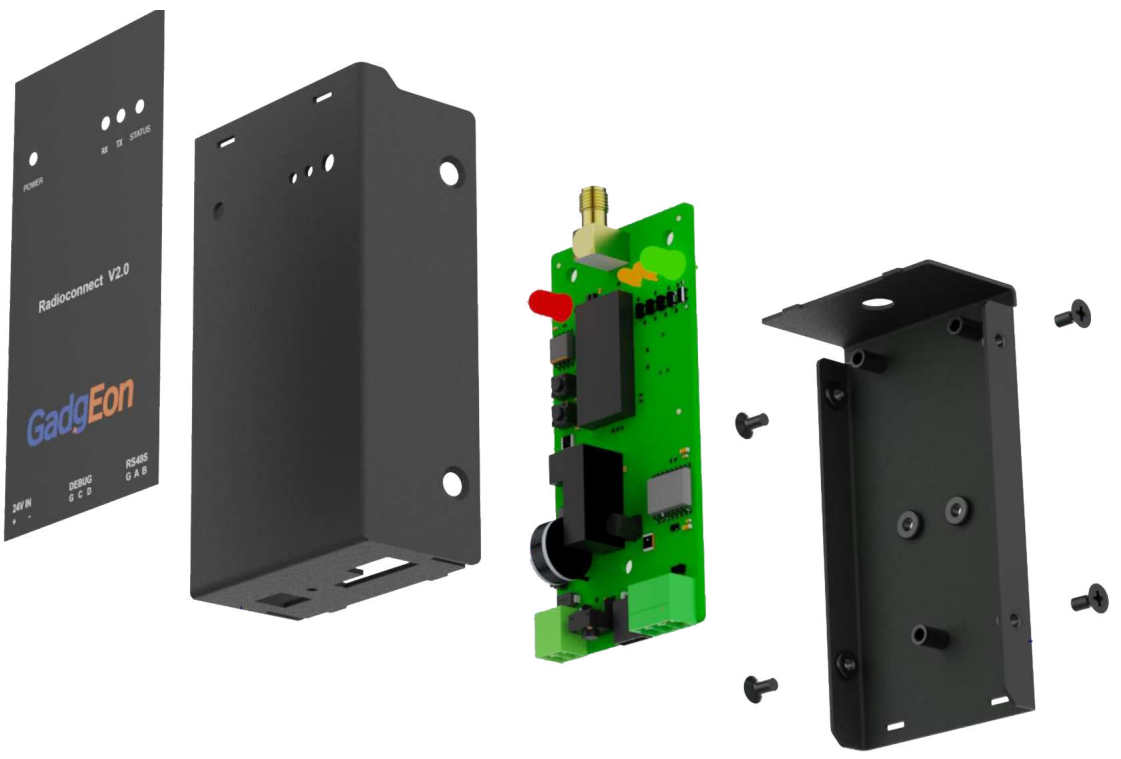
Key Features

- Operates On License-Free RF Band
- Mesh And Border Router Configurations
- Time Sync
- TSCH (6Tisch) Technology
- OTA Firmware Updates
- MODBUS RTU Protocol

System Specifications

RF Connect

General Specification	Power Input	24 VDC
	Radio Standard	IEEE 802.15.4 g/e
	Operating Temp	-30°C to +85°C
	Storage Temp	-40°C to +150°C
	Dimensions	93 x 51 x 28 mm
	Weight	175 g
Wireless Specifications	Wireless Band	865.125 MHz - 866.725 MHz
	Max Output Power	27 dBm
	Network Architecture	TSCH (6TiSCH) (IPv6 + Time Slotted Channel Hopping)
Serial Communication	Data Collection Protocol	MODBUS RTU
	Port	Isolated RS485
	Baud Rate	115200 bps



> Empowering seamless connectivity and control, RF Connect bridges the gap between data and action, driving smarter, more resilient operations.

IoT Gateway

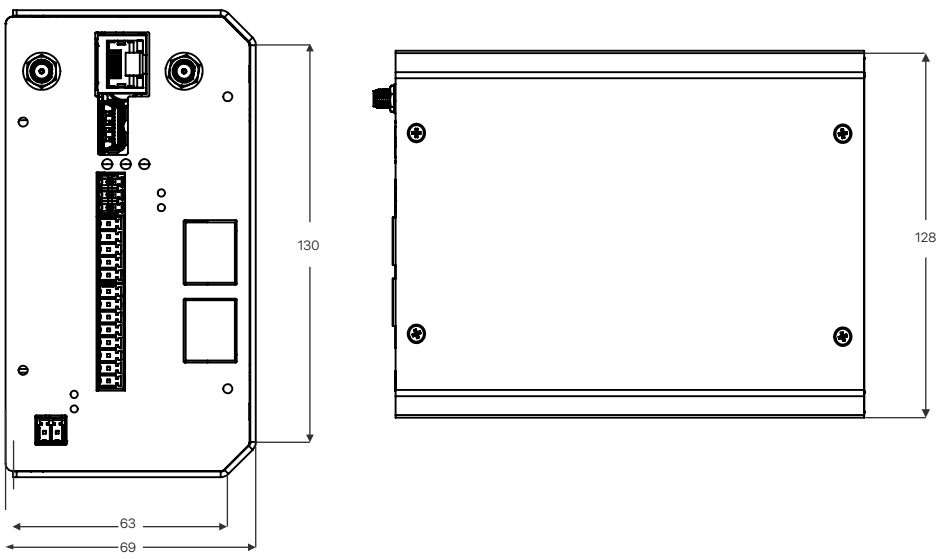


IoT Gateway is a robust, industrial-grade edge device that serves as the central hub for **communication**, **data collection**, and management in IoT ecosystems. It seamlessly connects to a wide range of devices and sensors, supporting protocols like Modbus and OPC UA, enabling efficient remote monitoring, advanced analytics, and **predictive maintenance.**

Secure Connectivity

- Secure connectivity – user authentication (JSON Web token) and reset password
- Multiple connectivity options – Ethernet with 10/100/1000Mbps and PCIe x1 interfaces
- Downloadable application logs with log rotate
- Physical Isolation between OT-IT

All dimensions in **mm**



Features

- **Robust Data Handling**
  Equipped with a high-performance ARM Cortex A53 CPU, the IoT Gateway ensures swift and efficient data processing for industrial operations.
- **Universal Connectivity**
  Supports a wide range of downstream connectivity protocols, including Modbus TCP/RTU, OPC UA, and BACnet, along with upstream protocols such as MQTT, Kafka, MS SQL, and PostgreSQL—ensuring seamless communication across all devices and systems.
- **Resilient in Rugged Environments**
  With its lightweight, compact design and durable build, it performs in the most demanding industrial settings.
- **Flexible Configuration Options**
  Users can configure devices easily through the web interface or by uploading a custom Excel sheet. Backup and restore configurations to simplify operations across multiple sites.
- **Edge Capability**
  Equipped with Timer, Trigger, Delta, Event, and Threshold-based reading capabilities along with optional write functionality for added flexibility.

Use Cases

1 Remote Monitoring
Gateways are deployed in remote monitoring systems to measure operational and process parameters such as temperature, humidity, pressure, current, voltage, vibration etc in industrial facilities, laboratories, and outdoor environments.

2 Energy Management Systems
Gateways control and monitor energy consumption in buildings, factories, and renewable energy installations.

3 Building Management
The IoT Gateway facilitates real-time monitoring of HVAC, lighting, energy meters, and flow meters; optimizing energy efficiency and managing building operations.

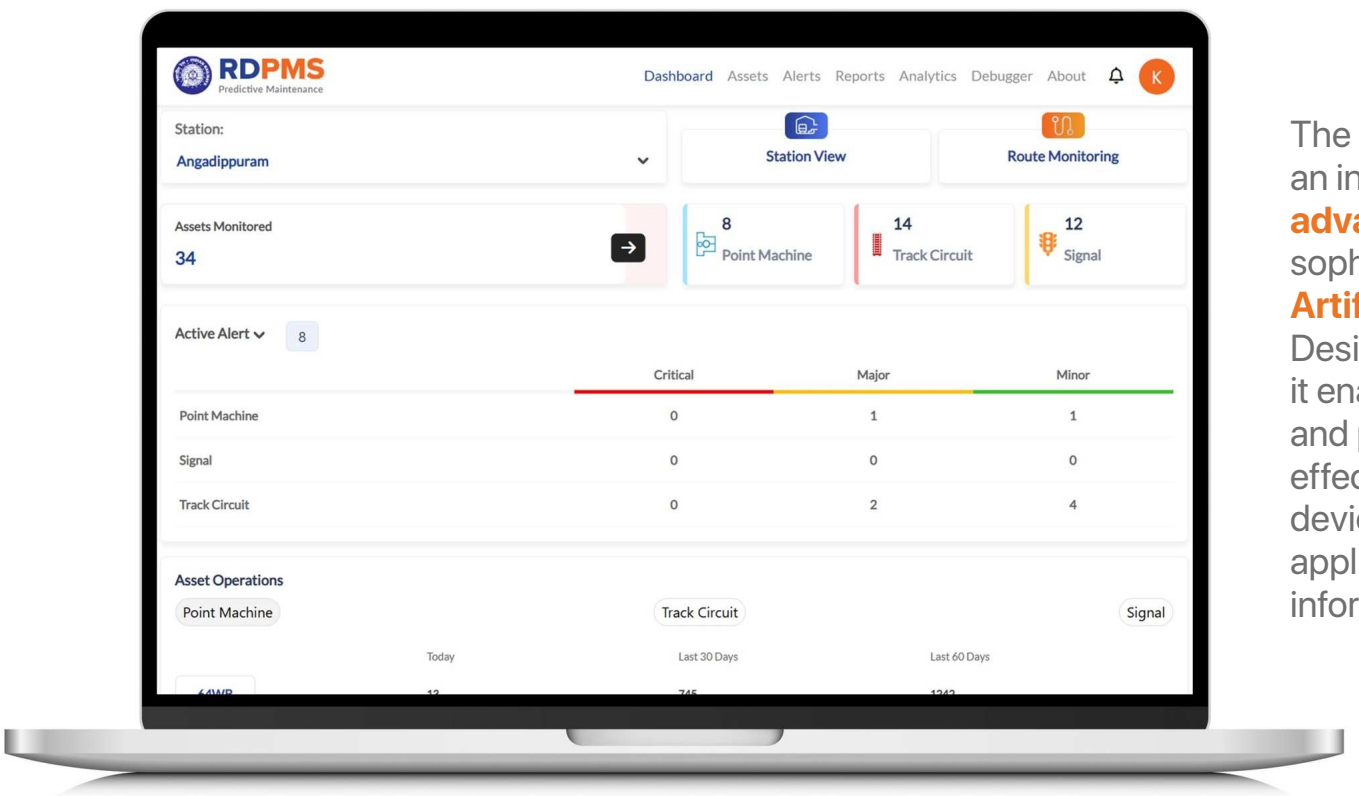
4 Industry 4.0
Gateways collect data from sensors, machines, industrial systems such as PLCs, controllers, and other devices to analyze conditions, and automate industrial functions for optimal yield and resource efficiency

Technical data

IoT Gateway

CPU	Arm Cortex-A53 64-bit 2-CORE at 1.0 GHz
OS	QorIQ SDK (FSL Linux Distro) 3.1.10 (dunfell)
Storage	8GB eMMC5.1 NAND FLASH
RAM	DDR4 2GB
Programming	Linux CPP , Shell Scripting, C
Serial Port	Isolated RS485- 1X3POS 3.5mm Terminal Block - 1
PCIe Slots	PCIe 2.0; 2 Mini PCIe Slots (Half Size &Full size) for Wi-Fi and 4G/LTE
Power Input	24 ~ 36 VDC
Ethernet Port	RJ-45 10/100/1000 Mbps x3
Power options	24V@ 500mA (typical) and @ 850mA (maximum)
Storage Temperature	0°C to 85°C
Working Temperature	0°C to 70°C

RDPMS Application



The RDPMS Application Software is an intuitive platform that leverages **advanced** computational logic and sophisticated Machine Learning and **Artificial Intelligence** models. Designed to provide real-time insights, it enables users to monitor the health and performance of signaling assets effectively. Accessible on both mobile devices and desktop computers, this application ensures that critical asset information is always within reach.

Key Features

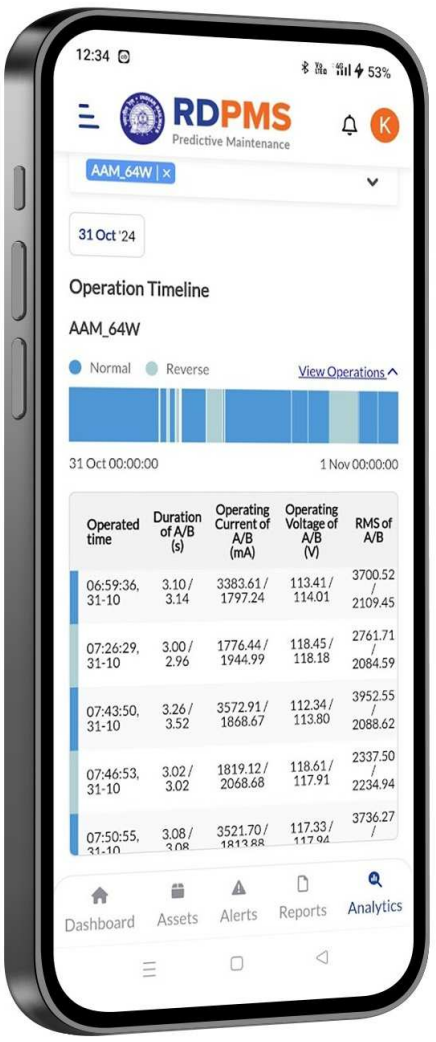
Real-Time Remote Monitoring : Enables users to monitor asset performance in real-time from any location, providing continuous oversight of configured routes and operational sequences. This minimizes the need for on-site inspections and supports faster response to potential issues.

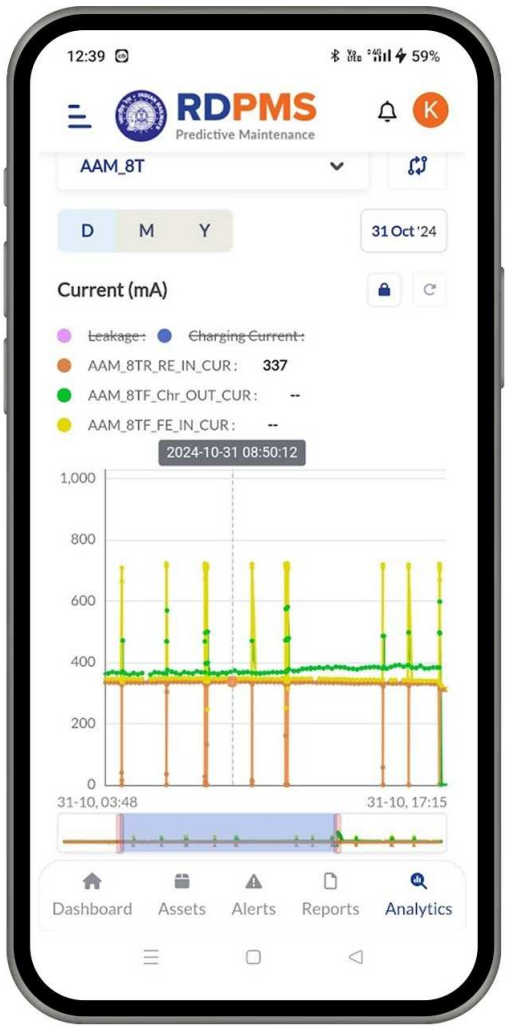
Asset Health and Status Tracking : Provides comprehensive tracking of asset conditions through dynamic dashboards that display performance metrics, such as RUL, MTTR, MTBF and operational cycles. This data supports informed maintenance planning and resource allocation.

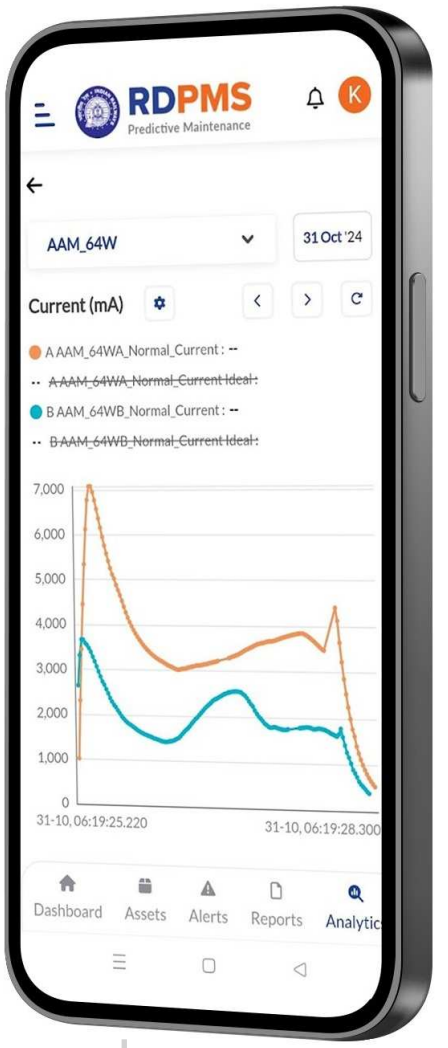
Automated Reporting and Data Analysis : Generates automated reports summarizing asset performance, maintenance history, and alert records. This feature aids in compliance reporting, trend analysis, and decision-making based on historical data insights.

Customizable Alerts and Notifications : Allows users to configure notifications for specific events, such as anomalies, performance thresholds, or upcoming maintenance. Real-time alerts help prioritize urgent tasks and keep teams informed of critical situations.

Comprehensive Asset Management : The RDPMS Application supports mapping of assets based on hierarchy, adjacency and routes. Users can monitor active alerts, operational timelines, and analyze each asset's health in comparison to its related assets.







Users can view detailed PM operation information in the operational table, which includes the start time, operation type, duration, operation current, operation voltage, and RMS value. Additionally, an operation profile is available that provides insights using raw field data for each PM operation.

Users can select a date from a date picker to view the corresponding graph for that specific time period. Additionally, users can choose to focus on individual parameters, such as current or voltage, by selecting from options located beside the Default View button. The visible area of the graph can be easily adjusted using a slider positioned below it, enhancing customization.

Users can select assets from a convenient dropdown menu. Users can also choose dates using a date picker located in the top right corner, with the option to select up to three days at a time.The graph can be interacted with by zooming in and out, and a reset button is available to restore the graph to its original state.

> With RDPMS, you'll experience a seamless blend of innovation and simplicity, transforming data into actionable insights that enhance predictive maintenance. Our user-focused approach ensures you can manage your railway assets with confidence.

Notes

Notes

RDPMS
Predictive Maintenance

Partner with the Experts

Partner with us to revolutionize your maintenance operations. Our RDPMS leverage advanced analytics to optimize maintenance schedules, minimize downtime, and reduce costs. Contact us today to unlock the power of predictive maintenance and achieve new levels of operational excellence.

Why Us?

- Ease of Installation
- Cost-Effective
- Low Maintenance
- Durable and Reliable
- Easy Calibration
- Proven Technology
- Highly Configurable
- OTA Updates
- Compliance to RDSO Spec

GadgEon
Engineering Smartness

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Milpitas, CA, USA

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Aartselaar, Belgium

Gadgeon Middle East
Dubai, UAE

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