infinitive group

ramus

Remote Terminal

Introduction

Ramus Remote Terminal Unit (RTU) is a comprehensive data management device which collects and consolidates raw vehicle data to enable sophisticated and smart diagnostic analytics.

The RTU is specifically designed and engineered for the most demanding of rail applications and incorporates a wide variety of interconnects and protocols to monitor multiple data feeds from virtually any subsystem on the vehicle or wayside. The wide range of analogue, digital, CAN Bus, ModBus and serial interfaces optimises the harvesting of data from a wide array of systems into one device.

The RTU supports multiple modes of operation including: Firstly network communication to the Train Control Management Systems (TCMS) or to the Infinitive Ramus Edge Computing platform, the latter or which allows rolling stock owners and operators to analyse data in real-time; leveraging powerful on-train processing capabilities, Secondly stand-alone mobile communications though either 4G LTE/ 5G or WiFi (sold separately) utilised to offload data for customer analysis, and Thirdly if no communications are required, the RTU contains internal memory which allows the data to be stored and then manually collected when required. To maximise situational awareness, the RTU continuously monitors and records temperature, humidity, and vibration/acceleration forces providing additional insight into the local environment.

Improved operational efficiencies, customer service, and reduced costs can be realised by the data collation and transformation into rich information which allows for actionable insights and informed process change. In addition, integrated intelligent security monitors and detects data corruption and malicious attacks in real time ensuring the safety and security of customers, staff, and assets. Unequalled system availability is guaranteed through the implementation of a continuous self-diagnostic testing regime.

Features and benefits

Ramus Remote Terminal Unit (RTU) delivers:

- **Intelligence at the Edge** – Unrivalled levels of data granularity and integrity enables actionable change from condition based monitoring to risk based analysis.
- **Innovation at reduced cost** – The RTU has been specifically designed by industry professionals to confirm to very long industry lifecycles. Infinitive Group does not have a built in obsolescence policy and to this extent, functionality and new sensor modules can be added as required allowing customers to cater for size and long term growth.
- **Freedom to innovate** - Technology lifecycles and OEM entrapment are no longer restrictions to digital transformation projects. The RTU provides a migration path for customers to connect and manage their data.
- **Enterprise security you can rely on** – RTU uses advanced digital watermarking to detect corrupt data or malicious intrusions in real tiem enabling digital transformation through innovation and insight without comprising security.

T: +44 (0) 1908 018 900 E: info@infinitivegroup.co.uk W: infinitivegroup.co.uk

Ethernet Interface

10/100BaseT(X) Ports	1 x M12 D Coded Interface - IP67 Compliant
Speed/Duplex	Auto Negotiation
Magnetic Isolation Protection	1.5 kV (built-in)
Power	IEEE 802.3bt (backwards compatible with 802.3at & 802.3af)

Ethernet Software Features

Configuration Options	Web Console (HTTPS), REST API (HTTPS), Out of Band Recovery through Layer 2 on the Ethernet Interface
Management	DHCP Client, IPv4, NTP, SNMPv1, DNS, HTTPS, ARP, BOOTP, UDP, TCP/IP, ICMP, Securely Remotely Upgradable Firmware

Serial Interface

Connector	Harting Push Pull V14 Signal Connector 10 Pole Plastic 9-13 mm
No. of Ports	6 Ports - Each connector has 2 ports (software configurable)
Serial Standards	RS-232, RS-422, RS-485
Baud Rate	RS-232: 110 bps to 230.4 kbps RS-484/422: 50 bps to 10MBps (Upper limit data rates are subject to cable lengths and EMC Interference)
Data Bits	7, 8, 9
Stop Bits	1 or 2
Parity	None, Even, Odd
Flow Control	RTS/CTS (RS-232 only), DTR/DSR (RS-232 only), XON/XOFF
Serial Interface integrated hardware firewall preventing unwanted transmission to client devices	

Serial Signals

RS-232	RS-232 TxD, RxD, RTS, CTS, DTR, DSR, GND. Can operate as DCE or DTE (Cable Option)
RS-422	TX+, TX-, RX+, RX-, GND
RS-485	Data+, Data-, GND

CAN Bus

Connector	Harting Push Pull V14 Signal Connector 10 Pole Plastic 9-13 mm
Number of Channels	2
Max Speed	1MBps

Oscilloscope Inputs

Number of Channels	16
Input Loop Impedance	480K Ohm for 24V model 960K Ohm for 48 V model 2.25M Ohm for 110V model
Max Sampling Frequency Continuous	50 KHz per channel
Max Sampling Frequency Burst	180 KHz per channel
Burst Sampling Buffer	200K Samples per channel
Connector	Harting Push Pull V4 Plug Signal 10 Pole. Connector is shared with 4-20mA Analogue Inputs (4 x Oscilloscope and 1 x Current Loop per connector)
Input Voltage Range	-4V to +32V For 24V Model, -8V to +64V For 48V Model, -18V to +150V For 110V Model
Absolute Maximum Voltage Range ***(Data recording invalid)***	-10V to +60V For 24V Model, -20V to +120V For 48V Model, -47V to +180V For 110V Model
Configurable voltage thresholds for digital signal analysis (Including multiple thresholds) and for triggering Burst Samples. E.g. transition detection	
Fast Fourier Transform of input signals can be done in real time	

Analogue Inputs

Number of Channels	4
Input Current	4-20mA Current Loop (Includes No Connect Detection)
Connector	Harting Push Pull V4 Plug Signal 10 Pole. Connector is shared with 4-20mA Analogue Inputs (4 x Oscilloscope and 1 x Current Loop per connector)
Max Sampling Frequency	50 KHz per channel
Sampling Buffer	200K Samples per channel

Dry Contacts

Number of Outputs	4 sold state
Max continuous current	3A
Peak Current	10A
Max Voltage across Contacts	160 Vdc, 110 Vac
Min switch voltage	1V
Max switching frequency	5Hz
Isolation	1.5Kv
Current Monitoring functionality	
Thermal overload detection	

Internal Temperature Sensors

Number of Channels	3 (Board, Case, CPUs)
Measurement Range	-64 to 150 Degrees Centigrade
Accuracy	±1 Degree Centigrade (0-100 Degrees Centigrade)
Max Sampling Frequency	1Hz

Internal Accelerometer

Number of Channels	6 Axis (X, Y, Z, Pitch, Roll and Yaw)
Measurement Range	±16G
Max Sampling Frequency	8kHz

Power Parameters

Three different models based on input voltage. Unit can be powered by either Power over Ethernet or by Auxiliary Power Supply. Unit can be configured with redundant supplies for fault tolerance	
Device supports positive and negative earth	
Input Voltage	Three models available for different voltages: 24VDC, 48VDC and 110VDC
Input Current	800 mA @ 24 VDC, 400 mA @ 48 VDC,180mA @ 110VDC
No. of Power Inputs	1
Auxiliary Power Input Connector	4 Pin M12 S Coded

Specifications

Housing	Metal
Dimensions (without connectors)	220 x 150 x 60 mm
Weight	Approx 700 grams
Installation	Base plate mounted to appropriate surface

Environmental Limits

Operating Temperature	-40 to 70°C
Storage Temperature (package included)	-40 to 85°C
Ambient Relative Humidity	5 to 95% (non-condensing)
IP67 ingress compliant (When all connectors populated or correct blanking plugs fitted)	

Standards and Certifications

EN 50121	Railway applications – Electromagnetic compatibility. Part 1-3: General & Apparatus
EN 50155	Railway applications – Electronic equipment used on rolling stock
EN 61373	Railway applications – Rolling stock equipment – Shock and vibration tests
EN 45445	Railway applications – Fire protection on railway vehicles – Part 2: Requirements for fire behaviour of materials and components

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