RTCnet™

Real-time distributed input-output (I/O) devices for turbomachinery controls

Applications

RTCnet™ is a rugged distributed I/O solution for use with Woodward turbine controls. It is the first distributed I/O that not only supports Woodward's deterministic "rate-group", real-time operation, but that is also fully synchronized with the main control processor. RTCnet offers Woodward customers all the benefits of MicroNet™ real-time performance in a distributed, compact solution.

RTCnet features redundant CAN communication ports for high availability in demanding turbomachinery applications. It can be used for high performance control loops where general purpose, asynchronous distributed I/O cannot.

RTCnet has an ultra-rugged, all metallic DIN-rail mount packaging suitable for skid mount and turbine enclosure installations. The lightweight packaging can sustain high vibration, 40 G shock, and a wide (–40 °C to +100 °C) temperature range. It is marine compliant (e.g., rated for high-humidity areas). It also has 500 V (ac) isolation to protect against damage due to wiring errors and to ensure reliable operation in the harshest EMC environments.

Description

RTCnet works in conjunction with the Woodward MicroNet control platform to create reliable, distributed I/O solutions that enable reductions in signal wiring between the control room and the controlled equipment. Distributing the I/O as close as possible to the device eliminates long wiring runs. It also enables significant cost savings and simplified (easier, faster, and less expensive to install and maintain) solutions. Distributing RTCnet nodes enables factory pre-wiring of the control instrumentation, which allows for quick, error-free field installation with faster commissioning and start-up times.

RTCnet I/O features redundant CAN ports, which enable high-availability operation when combined with MicroNet Plus redundant CPUs. The nodes communicate continuously during a CPU failover event.

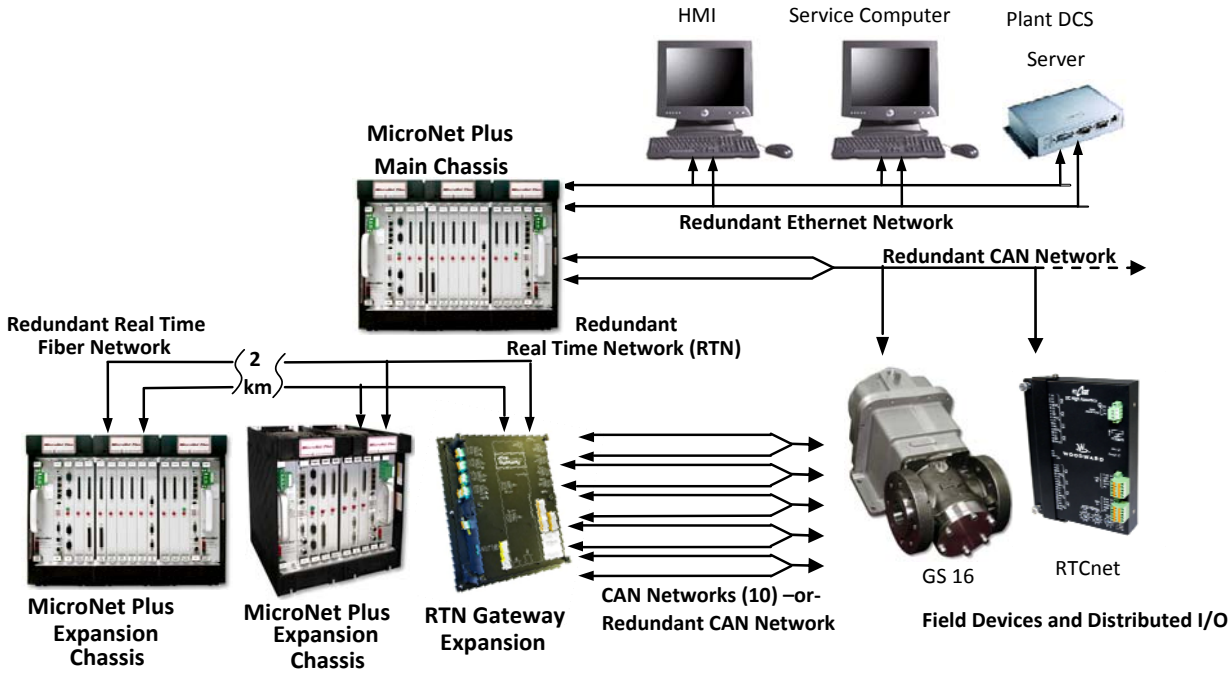
RTCnet is configured with Woodward's proven Graphical Application Programmer (GAP™) software. This function-block programming language provides an efficient means to program turbomachinery and engine controls. Complete configuration, diagnostics, and fault status monitoring are performed in the GAP environment.

Refer to manual 26640 for more details (available to download at www.woodward.com/publications).

- Plug-and-play configuration for Woodward controls using GAP™ software
- Real-time, deterministic performance
- Wide temperature range (–40 °C to +100 °C)
- High shock (40 G) and vibration
- Compact aluminum alloy DIN-rail mount package
- Fully synchronized with main control processor
- Greater mean time between failures (MTBF)
- Distributed, compact solution
- Redundant CAN communications
- High reliability*
- Skid mount capable

*Reliability data available upon request.

Specifications



Environmental Specifications

Operating Temperature	–40 °C to +100 °C
Storage Temperature	–40 °C to +105 °C
Vibration	8.2 Grms, industrial skid mount, per Woodward RV1
Shock	40 G, 3x each axis, per Woodward MS1
Humidity	5 % to 95 %, non-condensing
Ingress Rating/Installation	IP20, Pollution Degree 2, Overvoltage Category 3
EMC Emissions	EN 61000-6-4 (Heavy Industrial) IACS UR E10 (Commercial Marine)
EMC Immunity	EN 61000-6-2 (Heavy Industrial) IACS UR E10 (Commercial Marine)

Communications

- Deterministic, GAP selectable communication rates of 10 ms, 20 ms, 40 ms, 80 ms, or 160 ms
- Synchronous communications with MicroNet Real-time Control Execution (rate groups)
- Strict input gather (read) and output scatter (write) rules enforced by firmware

Network Connections	2 Redundant CAN 2.0B ports, separate connectors
Network Isolation	500 V (ac) to chassis, input power, I/O channels, between CAN ports

Network Speed/Length (baud rate configuration rotary switch):

1 Mbit @ 30 m
500 Kbit @ 100 m
250 Kbit @ 250 m (thick cable only, otherwise limited to 100 m)
125 Kbit @ 500 m (thick cable only, otherwise limited to 100 m)

- Node Address set with 2 rotary switches to configure the node address (range of 1–99)

Status and Fault Indication

CPU Status LED	Green
FAULT LED	Red with diagnostic fault codes

- Multiple status and fault outputs in GAP software block

Reliability

- Designed for high availability (HA) on critical applications
- Woodward “Designed for Six Sigma” (DFSS) engineering processes fully utilized

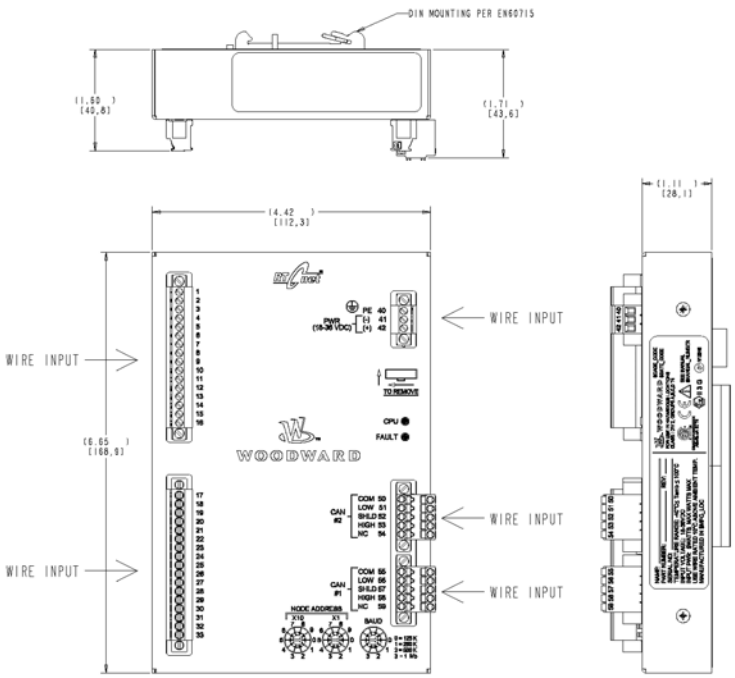
Robust Isolation (500 V ac)

- Input power isolated from chassis, inputs, outputs, and CAN communications ports
- CAN communications individually isolated from each other, chassis, input power, inputs, and outputs
- Input circuits isolated from chassis, input power, CAN communications
- Output circuits isolated from chassis, input power, CAN communications

Physical Dimensions (measured from top of DIN rail, without connectors)

- 112 x 169 x 30 mm (4.4 x 6.7 x 1.2 inches)
- NOTE—High accuracy thermocouple input is slightly larger to accommodate special package: 127 x 175 x 34 mm (5.0 x 6.9 x 1.3 inches)

Outline Drawing



RTCnet™ HT Node Outline Drawing

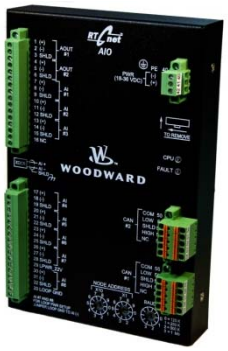
Examples

All have:

Power Input Voltage Range	18 V to 36 V (dc)
Over-voltage Protection	±60 V (dc) (power input)
Over-voltage Protection	±36 V (dc) (I/O circuits)

- Input power reverse polarity protection
- Miswire protection for short-circuits to earth or other channels
- Internal Temp Sensor (±1.0 °C typical) available to host over CAN communications

Analog Input/Output



Number of Input Channels	8 (4 mA to 20 mA)
Number of Output Channels	2 (4 mA to 20 mA)

- 22 V loop power available with short circuit and over-voltage protection

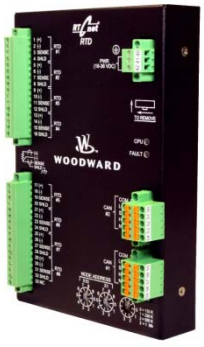
Hardware Filter	2 poles @ 10 ms (all channels except channel 6)
Fast Hardware Filter	2 poles @ 5 ms (channel 6) – meets gas turbine compressor discharge pressure (CDP) dynamic input requirements

- 14 bit input resolution / 12 bit output resolution

Input Accuracy	≤ 0.03 mA
Output Accuracy	≤ 0.05 mA
Max Output Load Impedance	400 Ω
Input Power	5.6 W max (no loop power)
Input Power	12.1 W max (with 250 mA of loop power)

- CAN communication provides engineering units to/from host in mA

RTD Input Node



Number of Channels	8
Input Range	0 to 600) Ω
Input RTD Type	100 Ω, 200 Ω (2 & 3 wire, European & American curves)
RTD Excitation Current	1 mA
Hardware Filter	2 poles @ ~10 ms
Accuracy	±1.1 °C with Automatic temperature compensation
Resolution	< 0.1 °C (~15 bits)
Input Power	5.0 W max

- CAN communication provides engineering units to host in °C, °F, or ohms (default = °C)

Thermocouple Input

Number of Channels	8
Cold Junction Sensors	2
Input T/C Sensor Types	K, J, T, B, E, N, R, S, and mV
Hardware Filter	2 poles @ ~10 ms

- Automatic cold junction and temperature compensation

Input Accuracy	±3.5 °C (total error including input and cold junction sensor error)
Resolution	< 0.1 °C (~15 bits)
Input Power	4.3 W max

- CAN communication provides engineering units to host in °C, °F, or ohms (default = °C)

High Accuracy Thermocouple

Number of Channels	8
Cold Junction Sensors	8 (one dedicated to each input)
Input T/C Sensor Types	K, J, T, B, E, N, R, S, and mV
Hardware Filter	2 poles @ ~10 ms
15 bit Resolution	< 0.1 °C

- Special package design enables high-sigma wiring interface at the terminal block where cold junction occurs
- Automatic cold junction and temperature compensation

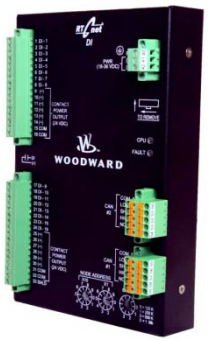
Input Accuracy	±1.5 °C (total error including input and cold junction sensor error)

- Designed to meet or exceed OEM requirements for exhaust-gas temperature (EGT) sensing on industrial gas turbines

Resolution	< 0.1 °C (~15 bits)
Input Power	4.3 W max

- CAN communication provides engineering units to host in °C, °F, or ohms (default = °C)

Discrete Input



Number of Channels	16
Input Range	18 V to 36 V (dc)
Contact Power Output	24 V, 0 mA to 200 mA, short circuit & diode protected
Hardware Filter	one pole @ 1 ms
Input Power	5.8 W max

- CAN communication provides configurable TRUE / FALSE status to host

Discrete Output

Number of Channels	16 low side driver outputs
Load Voltage	24 V (dc)
Load Current Range	250 mA per channel

- Readback fault detects failed output driver channel

Input Power	4.2 W max

- CAN communication provides configurable TRUE / FALSE command from host

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