

MicroNet™ Plus

Control System, Redundant or Simplex

Applications

The MicroNet™ Plus control system is a flexible, state-of-the-art digital control system designed specifically for prime mover control applications such as:

- Gas Turbine Control
- Steam Turbine Control
- Compressor Control
- Hydro Turbine Control
- Diesel and Gas Engine Control

MicroNet Plus™ features, including redundant or simplex CPUs, modular I/O, flexible software environment, and highly accurate time synchronization make it ideal for its target markets:

- Power Generation
- Oil and Gas Exploration
- Process Industries
- Marine Transportation

MicroNet Plus™ control system flexibility and modularity adapt from simple applications with limited I/O to the most complex applications and processes with extensive I/O. I/O modules and application software provide the control engineer with the flexibility to control or monitor every parameter and process of typical applications, including:

- Speed and Load Control
- Anti-Surge Control
- Temperature and Process Control
- System Sequencing and Package Auxiliary Control
- Combustion Control
- Alarm + Shutdown annunciation

MicroNet Plus™ features and performance are specifically designed for the rigorous requirements of prime mover control. CPU capability, application software recursion rates and determinism, software algorithms, I/O signal conditioning and filtering, and numerous other features combine with long-term support and Woodward service to ensure a smooth start-up and long support life. These features create the ideal product when performance matters:

- Rigorous load rejection performance
- Incipient Surge Detection
- Complex DLE fuel control algorithms
- Long-term naval programs

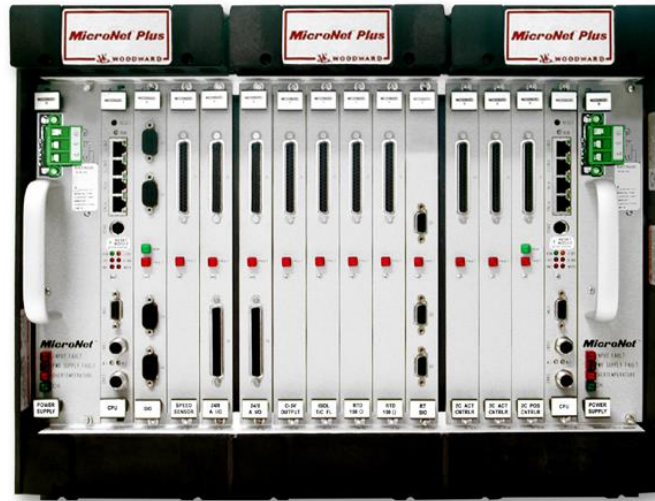
Description

The MicroNet Plus™ control is a VME-based, modular expandable control system with redundant or simplex CPU and power supply options and a variety of I/O module choices.

CPUs may be simplex or redundant, depending on customer requirements. A simplex CPU system can be upgraded to redundant CPUs by simply adding a second CPU and making a minor application software change.

I/O Module selection is customized to match customer requirements. I/O can be configured in any combination of simplex, duplex, or triplex and in any combination of analog, discrete, and specialty modules. I/O modules allow for hot replacement without removing control power.

The MicroNet Plus™ control utilizes Woodward's proven graphical application programmer (GAP) software. This function block format programming language provides an efficient means to program prime mover control logic. A Ladder Logic programming environment is also available for those users familiar with this programming structure.



- IEC61508 SIL-3 Certified (requires MSM Module)
- Simplex or redundant CPU configurations
- Real-time multi-tasking VxWorks® operating system
- Deterministic update rates as fast as 5 ms
- Improved control system availability and reliability
- SNTP compliant for time synchronization
- Expandable with redundant real-time network
- Ethernet communications
- Simplex or dual power supplies
- Modular I/O
- Time stamping of events to 1 ms
- On-Line program changes
- Hot replacement of modules for on-line repair

MicroNet Plus™ Chassis

The MicroNet Plus™ control is available in two chassis sizes to accommodate different space requirements. Both chassis reserve four slots for redundant power supplies, with the remaining slots available for VME modules (CPUs and I/O modules). CPUs occupy either one (simplex) or two (redundant) slots.

- Full-size Chassis 14 VME
- Narrow Chassis 8 VME



**MicroNet Plus™ Control Chassis
(14 VME slot option)**



**MicroNet Plus™ Control Chassis
(8 VME slot option)**

Power supplies may be simplex or redundant in any combination of input voltages.

MicroNet Plus™ CPU, Operating System, and Software

MicroNet Plus provides two CPU options depending on the application. Either CPU option may be used in simplex or redundant mode:

- **CPU5200 (Base CPU)**
 - ✓ Supports up to 8 chassis for I/O intensive applications
 - ✓ Supports redundant Ethernet and CAN communication
 - ✓ Optional Cybersecure and Secure Application versions available
- **CPUP1020 (High Performance CPU)**
 - ✓ Dual Core SOC CPU for processing and communications intensive systems.
 - ✓ Standard Cybersecurity
 - ✓ Expanded communications with 6 Ethernet ports (2 @ 1 GB, 2 @ 100MB)
 - ✓ CANOpen / RTC ports for direct control of RTCnet/LinkNet HT distributed I/O and CANOpen controlled valves
 - ✓ Optional Secure Application version available



**MicroNet Plus™ CPU
P1020**

The MicroNet Plus™ control system incorporates an SNTP version 4 compliant timeserver that enables the control to be synchronized to less than 1 millisecond of any other external time source. Time stamping of sequence of events can be accomplished to 1 ms resolution on Discrete I/O and to 5 ms resolution on Analog I/O and software process variables.

MicroNet Plus™ Redundant Operation

The MicroNet Plus system is capable of running in a redundant master / standby configuration to provide higher availability. Synchronized memory assures that both CPUs use the same operating information in every rate group. If the master CPU becomes inoperable, full system control, including control of the I/O, is transferred to the standby CPU in less than 1 ms without affecting prime mover operation. After correcting the master CPU fault, the system can continue running on the standby CPU, or control of the system can be transferred back to the original master CPU. Annunciation of any control transfer is given through

MicroNet Plus™ applications are created with Woodward's Graphical Application Programmer (GAP™) tool. GAP™ is a high-level functional programming tool providing Function Block Diagrams, Sequential Functional Charts, Ladder Logic, and lower level programming support. GAP's powerful features ensure that control engineers can concentrate on control logic rather than programming details. A third-party Human Machine Interface (HMI) is often provided for operator interface. See product specification 03216 for additional details about GAP™.

GAP™ application programs may be tested in Woodward's NetSim™ simulation environment against a process model to ensure proper field operation. This powerful simulation tool reduces system-commissioning time and enables convenient field upgrades in the future.

For IEC61508 SIL-3 based applications, a MicroNet Safety Module (MSM) is required as part of the MicroNet system. The MSM functions as the system's SIL-3 logic solver, and its fast (12 millisecond) response time and integrated overspeed and acceleration detection/protection functionality make it ideal for applications on critical high-speed rotating motors, compressor, turbines, or engines. For more information on the MicroNet Safety Module, refer to Woodward product spec 03375.

The MicroNet Plus™ control systems supports many of the communication protocols used in modern prime mover and plant automation controllers. Protocols supported:

- Ethernet TCP/IP
- Ethernet UDP/IP
- OPC DA 3.0 and AE 1.0
- Ethernet Global Data (EGD)
- Modbus®* (RTU and ASCII) over Ethernet
- Modbus (RTU and ASCII) over serial
- CANopen
- Custom Proprietary Drivers for communicating to specific devices

*—Modbus is a trademark of Schneider Automation Inc.

Woodward's powerful software service tools provide service personnel with extensive monitoring and troubleshooting for the MicroNet Plus™. The service tools provide operational and analytical information such as graphical display of operating data, data logging (at rate group resolution), trending, event logging, X-Y plotting, and other features. For additional information on Woodward software service tools, see product specifications 03201 (Control Assistant) and 03306 (Monitor GAP).

On-Line Changes

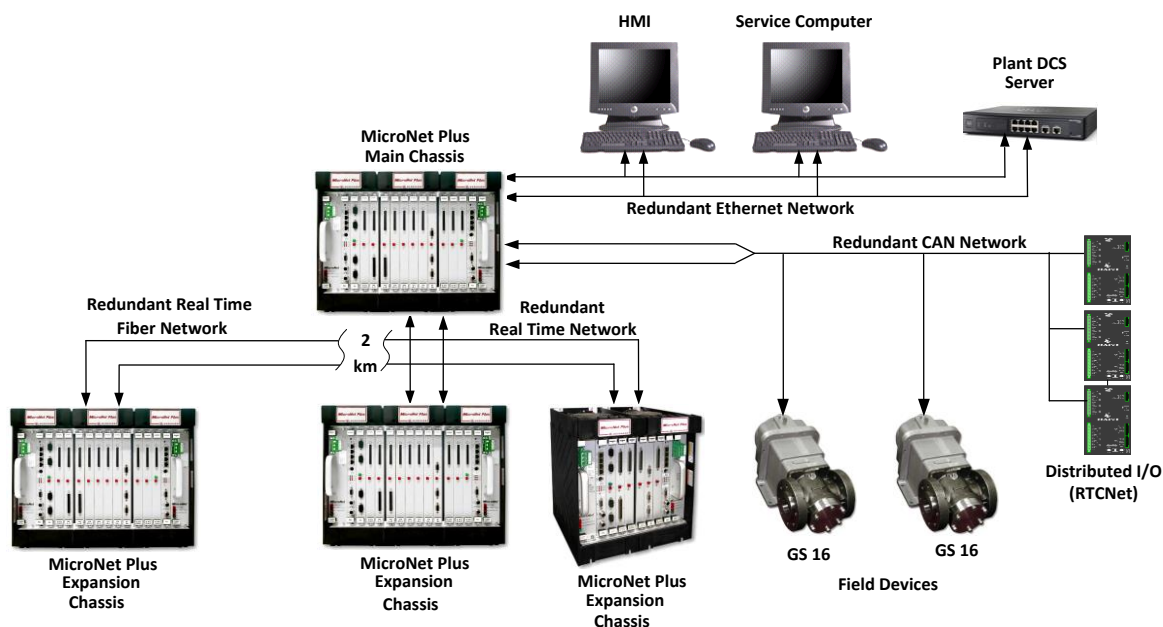
When used with GAP 4.0 and redundant CPUs, MicroNet Plus™ allows on-line changes including adding, removing, or changing program logic, adding or removing I/O and modifying communications. GAP 4.0's OLC protection mode helps guide the programmer through the changes and allows pre-testing of the change on the Backup CPU prior to switching over turbine control to the updated program.

I/O Modules and Expandability

The MicroNet Plus™ control can accommodate any combination of standard MicroNet I/O modules to provide maximum application flexibility. I/O modules are designed and tested for the specific needs of prime mover control and monitoring. Exceptional accuracy, fast-synchronized updates, high channel-to-channel isolation, and other features differentiate them from common industrial I/O modules. Hot-replacement allows most modules to be exchanged while power is applied. Many modules are "Smart Modules" with an on-board micro-controller to manage the module's internal operations and to provide continuous self-diagnostics. Smart modules are self-calibrating and provide periodic on-line calibration monitoring to ensure the integrity of I/O measurement and control.

For applications requiring a large amount of I/O, the CPUs in the main MicroNet Plus™ chassis can communicate with up to seven MicroNet Plus™ expansion chassis over a real-time network (see figure below). Fiber optic switches and cables may also be used for communications between the main and expansion chassis located up to 2 km apart.

Woodward's RTCnet™ and LINKnet HT™ Distributed I/O modules integrate seamlessly to the MicroNet Plus™ to provide a convenient and cost-effective solution for sequencing and monitoring functions (see product specification 85572). Other commercially-available Distributed I/O options may also be used with the available MicroNet Plus™ networks (such as CANopen, Ethernet, Serial).



Specifications

Operating Conditions

Temperature

0 to 55 °C (32 to 131 °F) ambient air temperature range

Shock

US MIL-STD-810C, method 516.2-1, procedure 1B (15 G, 11 ms half-sine pulse)

Vibration

Lloyd's ENV2 test #1

Regulatory Compliance

North American:

CSA: CSA Listed for Class I, Division 2, Groups A, B, C, & D, T3A
(CSA Certificate 2314167)

European Compliance for CE Marking:

EMC Directive: Declared to Directive 2014/30/EU

Low Voltage Directive: Directive 2014/35/EU

ATEX Directive: Directive 2014/34/EU (Zone 2, Cat. 3, Group II G, Ex nA [nL] IIC T3 X)

Other European Compliance:

EAC Customs Union: Certified for use in Ordinary Locations only to Technical Regulation CU 004/2011 on the Safety of Low Voltage Equipment and CU 020/2011 on the Electromagnetic Compatibility of Technical Equipment Declaration of Conformity Registration No: RU C-US.A132.B.02262.

Marine Compliance

ABS: ABS Rules for Condition of Classification of Classification, Part 1, 2015 Steel Vessel Rules
DNV-GL: Standard for Certification No. 2.4, 2006: Temp. Class A, Hum. Class B, Vib. Class B, and EMC Class A

LRS: Type Approval Test Specification No. 1, 2002, ENV1 and ENV2

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MicroNet Plus™ Chassis

All versions are bulkhead mounted or adaptable to 19" (483 mm) rack mount back panel. Designed for control room environment.

MicroNet Plus™ with power supply section and 8 I/O slots

Dimensions

12.6" wide x 14.3" high x 12.1" deep (320 mm wide x 363 mm high x 307 mm deep)

Approximate Weight

35 lb (16 kg)

MicroNet Plus™ with power supply section and 14 I/O slots

Dimensions

18.8" wide x 14.3" high x 12.1" deep (478 mm wide x 363 mm high x 307 mm deep)

Approximate Weight

53 lb (24 kg)

Power Supply Input Options

18–36 Vdc, 100–150 Vdc, 88–132 Vac (47–63 Hz), 180–264 Vac (47–63 Hz)

*Specifications apply to most components and modules. Some certifications may be pending. Contact Woodward for further information. Do not use the drawings in this specification for construction.



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