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
- 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
- Process Industries
- Oil and Gas Exploration
- 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
- Temperature and Process Control
- Combustion Control
- Anti-Surge Control
- System Sequencing and Package Auxiliary 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
- Complex DLE fuel control algorithms
- Incipient Surge Detection
- Long-term naval programs

Description

The MicroNet Plus control is a VME-based, modular control system with redundant or simplex CPU and power supply options and a variety of I/O module choices. Additional chassis may be added to accommodate larger systems.

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 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
- 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 available in CAT-5 or fiber optic configurations
- Ethernet communications
- Simplex or dual power supplies
- Modular I/O
- Time stamping of events to 1 ms
- Hot replacement of modules for on-line repair

MicroNet Plus Control 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
The MicroNet Plus utilizes the robust and powerful 400 MHz Motorola* MPC5200 microprocessor. Extended temperature operation, suitability to real time operation, and long support life all combine to make the MPC5200 the right choice for the MicroNet Plus.

*—CPU is produced by Freescale, which separated from Motorola in July 2004.

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

- **CPU5200**
  - ✓ Supports up to 8 chassis for I/O intensive applications
  - ✓ Supports redundant Ethernet and CAN communication
  - ✓ Powerful processing for computation-intensive applications
- **CPU5200CS (Cyber Secure)**
  - ✓ Supports Cyber Secure communications
  - ✓ Same capabilities as module CPU5200
  - ✓ Achilles Level 1 Cyber Security Certification

MicroNet Plus CPU5200

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 communication links.

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 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 safety certified 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.

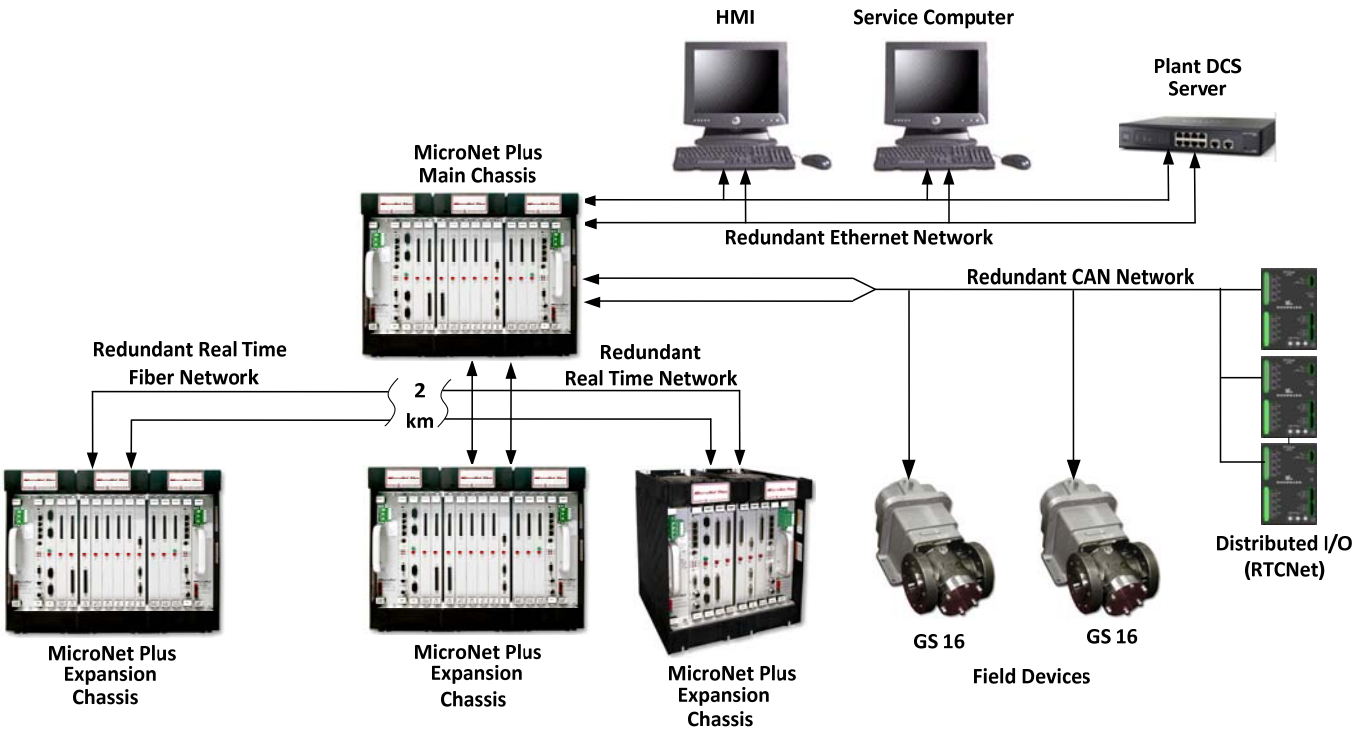
Woodward's powerful software service tools provide service personnel with extensive monitoring and troubleshooting for the MicroNet Plus. The service tools provide operational and analytical information such as graphical display of operating data , data logging (at rate group resolution), trending, event 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).

I/O Modules and Expandability

The MicroNet Plus control can accommodate any combination of Woodward 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 real-time control communications between the main and expansion chassis located up to 2 km apart.

Woodward's LINKnet™ 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:

UL:	UL Listed for Class I, Division 2, Groups A, B, C, & D, T3A (UL File E156028)

European Compliance for CE Marking:

EMC Directive:	89/336/EEC: EN61000-6-2, EN61000-6-4
Low Voltage Directive:	73/23/EEC: EN61010-1
ATEX Directive:	94/9/EC: EN60079-15 (Zone 2, Cat. 3, Group II G, Ex nA [nL] IIC T3 X)

Other European Compliance:

Machinery Directive:	98/37/EC (compliant as a component)

Marine Compliance

ABS:	ABS Rules 2006 4-9-7/Table 9
DNV:	Temp. Class A, Hum. Class B, Vib. Class B, and EMC Class A
LRS:	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.

WOODWARD

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