

Released



Product Change Notification 06960 (Revision C, July 2024)

MicroNet™ CPU 5200 Module Status

Product Information

The MicroNet CPU5200 was introduced in 2005 for the MicroNet Plus and in 2009 for the TMR. This CPU has had only minimal hardware changes; however, there have been several upgrades to FPGA code and firmware causing the top-level part numbers to change due to coder compatibility. These upgrades are necessary to add features, to update the RTOS, and to create new functionality.

Active CPU5200 Modules

Part Number	Usage	Coder	RTN	Current Status	Non-Preferred	Inactive
5466-1035	Plus	4.06 to 5.04	5466-1036	Non-Preferred	2015	2028
5466-1045	Plus Cyber	5.03-0 to 5.04-0, 6.00+	5466-1046	Inactive	2015	2021
5466-1047	TMR & 5009	5.04-5.08	5466-1036	Non-Preferred	2020	2028
5466-1145	Plus Cyber	6.00-4+, MicroNet 1.0x+	5466-1146	Non-Preferred	2021	2027
5466-1245	Plus	6.00-4+, Micronet 1.0x+	5466-1246	Non-Preferred	2021	2027
5466-1247	TMR	TMR 1.00+	5466-1246	Preferred	2028	2032
5466-1347	TMR & 5009	TMR 1.01+	5466-1246	Preferred	2032	2037

Note 1: Non-preferred means not intended for new system installations. Unit remains fully supported for spare units and repairs.

Note 2: Inactive means that the module can no longer be produced. Typically, this is because of component obsolescence. Repairs and exchange units are supported if feasible (typically 5+ years after inactivation).

Note 3: 5466-1045 was inactivated early due to VxWorks cybersecurity issue "Urgent 11." Customers with -1045 CPUs may upgrade their CPU to 5466-1145 or 5466-1245 without charge.

Note 4: CPU5200s manufactured after 2011 can be updated by Woodward to the current revision. Contact Woodward for more information. You will be asked to provide the CPU serial numbers.

Note 5: The future dates shown above are approximate based on Woodward's current information on component obsolescence and planned component usage rates. The dates cannot be guaranteed due to the potential for unexpected obsolescence issues to occur.

Note 6: MicroNet Security manual 26479 provides information for applying MicroNet systems in cybersecurity-critical environments.

Released

Product Change Notification 06960

p.2

MicroNet Family Statement

With thousands of installed units, Woodward's premier turbine control product for triple redundant, redundant, and simplex applications is extremely important to us.

Woodward continues to invest heavily in the product line to ensure its market success and longevity. Woodward plans to extend the production life of the current platform and introduce paths to upgrade installations to new technologies lasting beyond the timelines of specific modules.

Customer Action

Use only **preferred** versions for new installations. **Non-Preferred** versions remain active to support spare parts production for customers with existing systems. The current preferred options are 5466-1511 and -1521 for MicroNet Plus, and 5466-1247 and -1347 for MicroNet TMR.

For additional information and support:

1. Contact your local Woodward representative and/or turbine OEM.
2. Woodward contact and business partner information can be obtained at www.woodward.com.
3. Technical assistance can be obtained by:
 - a. Searching for a local contact at www.woodward.com/directory
 - b. Call or email the Woodward Turbine Help Desk:
1-970-498-3095
TurbineHelpDesk@woodward.com

Copyright © Woodward, Inc. 2024
All Rights Reserved



PO Box 1519, Fort Collins CO 80522-1519, USA
1041 Woodward Way, Fort Collins CO 80524, USA
Phone +1 (970) 482-5811

Email and Website—www.woodward.com

Woodward has company-owned plants, subsidiaries, and branches, as well as authorized distributors and other authorized service and sales facilities throughout the world.

Complete address / phone / fax / email information for all locations is available on our website.

Released**Manual 26166V1****MicroNet Simplex & MicroNet Plus**

Chapter 1. General Information

1.1. Introduction

The MicroNet Plus and MicroNet Simplex controls are 32-bit microprocessor-based digital controllers that are programmable for many types of applications in the control of:

- Gas and Steam Turbines
- Gas and Diesel Engines
- Hydro Turbines

The MicroNet Controls family provide a flexible system to control any prime mover and its associated processes such as high speed control functions, system sequencing, auxiliary system control, surge control, monitoring and alarming, and station control. The MicroNet platform is available in simplex, redundant, and Triple Modular Redundant (TMR) configurations. This manual covers only simplex and redundant based control configurations. Please refer to manual 26167 for TMR-based control configurations.

The MicroNet Operating System, together with Woodward's Graphical Application Program (GAP), produces a powerful control environment. Woodward's unique rate group structure ensures that control functions will execute deterministically at rate groups defined by the application engineer. Critical control loops can be processed within five milliseconds. Less critical code is typically assigned to slower rate groups. The rate group structure prevents the possibility of changing system dynamics by adding additional code. Control is always deterministic and predictable.

Dedicated inputs and outputs (I/O) are available onboard for key control signals while distributed I/O can be used for other less critical parameters.

Communications with the MicroNet platform are available to program and service the control as well as to interface with other systems (Plant DCS, HMI, etc.). Application code is generated by use of Woodward's GAP program or Woodward's Ladder Logic programming environment. A service interface allows the user to view and tune system variables. Several tools are available to provide this interface (see Engineering and Service Access). Communication protocols such as TCP/IP, OPC, Modbus, and other current designs are included so that the user can correctly interface the control to existing or new plant level systems.

The MicroNet platform is expandable into multiple chassis as required by the system size and will support any mix of I/O, including networked and distributed I/O. The MicroNet control is available in chassis sizes with 6, 8, 12, or 14 VME slots. Each has dedicated power supply and control sections located in a single chassis. The power supply architecture supports simplex or redundant power supplies.

1.2. Specifications and Compatibility

For environmental specifications and MicroNet compatibility information, please refer to the appropriate appendix in Volume 2 of this manual.

1.3. Non-Preferred and Obsolete Modules

For information on all non-preferred or obsolete modules see Volume 3 of this manual.

Details on all Active Preferred modules are contained in Volumes 1 and 2 of this manual.

Released

Manual 26166V1

MicroNet Simplex & MicroNet Plus

MicroNet Plus

- MicroNet 14 or 8 VME Slot Chassis
- Dual CPU's for redundant operation
- Single CPU for simplex operation
- CPU5200/ CPU5200L and CPU P1020
- Simplex or Redundant I/O modules
- Simplex or Redundant Power
- Redundant smart fans



MicroNet Plus Redundant System (Single, Dual, or Triple rack system)

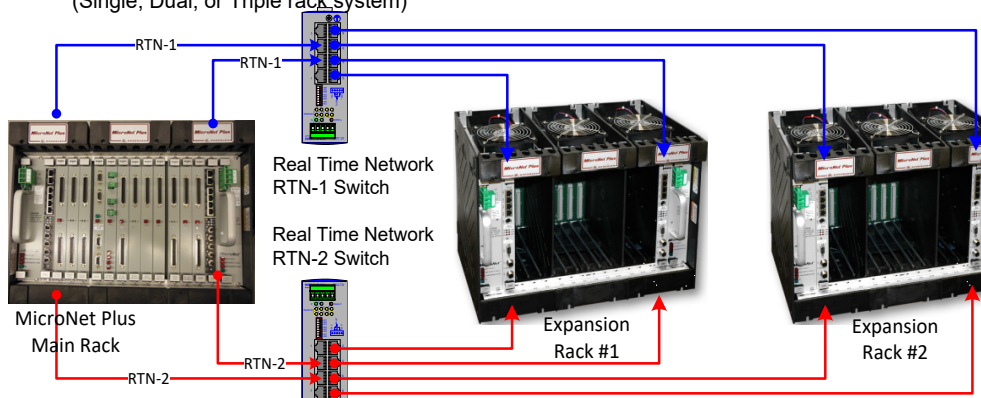


Figure 2-1. MicroNet Plus Redundant System

2.1.2. Redundant CPU Theory

The MicroNet Plus control system uses redundant CPU5200/CPU5200L modules that must be located in the first and last VME slots (A1 and A8 / A14). The chassis has a single motherboard and houses 2 power-supplies, 2 CPUs, and 12 I/O slots. The CPUs share a single data path to the VME modules and each other.

In a redundant system, there are two CPU modules, running the same application program, receiving power from the same pins on the VME backplane, and with access to the I/O modules over the same VME bus. The CPU modules communicate their health to each other over the VME bus, and arbitrate for control of the bus. The CPU which is in slot 1 and in good "health" first, gains control of the I/O modules, and is called the System Controller or SYSCON. The other CPU is then the backup or STANDBY CPU. The SYSCON sends all necessary state information to the backup CPU, allowing it to take control of the I/O modules if the SYSCON fails.

The following conditions will cause a failover from the SYSCON CPU to the backup STANDBY CPU:

- Failure of the on board CPU module power supplies
- Failure of the processor core, including the processor, RAM, flash, oscillator, and supporting internal circuitry.
- A reset of the SYSCON CPU, caused by the front panel or remote Resets
- An application requested failover
- An application stop

Released

Manual 26166V1

MicroNet Simplex & MicroNet Plus

The value of redundancy is dependent on the ability of the application to detect the failure. For analog and actuator outputs, current and/or voltage read back is provided. For discrete outputs, fault detection requires sensing the relay contact state.

2.4. MicroNet Plus Simplex Operation

To use the MicroNet Plus for simplex operation, the CPU must be in the first user slot (slot A1).

- In the GAP application, select the MICRONET14 or MICRONET8 chassis and use a CPU module in slot A1.
- The CPU can only be the CPU5200/CPU5200L or CPU P1020.
- Assign communication and I/O modules according to your application needs.
- Compile and code your application using the Woodward GAP/Coder tools.
- Use the AppManager Service Tool to load and start the application over Ethernet.
- After starting the application, the CPU will initialize the I/O and run the real-time application.
- System initialization is complete when all the I/O module fault LED's are cleared.

Expansion Chassis Notes

The GAP application may also define expansion chassis by using the Remote Real Time Network (Remote RTN) module in slot A1 of each expansion chassis.

Note: MicroNet Plus based systems require that the expansion chassis use the Remote RTN module in slot A1. The CPU in the main chassis controls the expansion chassis through its redundant RTN port connections to the Remote RTN module.

2.5. Module Replacement

Chapter 15 contains Installation and Replacement procedures for VME Modules, power supplies, relay boxes, and other devices. Individual CPU and I/O module sections in Chapters 6 through 9 are an additional reference for installation and replacement information.

Sections 5.2 and 5.4 contain additional details for power supply installation and replacement. Note that power must be removed from the power supply input before a module is removed or inserted.

NOTICE



**RESET
MODULE
BEFORE REMOVAL**

Live insertion and removal of the CPU5200, CPU P1020, and Remote RTN modules is allowed in a MicroNet Plus chassis. These modules should be reset immediately before removing them from the chassis. This notifies the module that it will be removed and provides a graceful failover to another healthy CPU or Remote RTN module if available.

2.6. Latent Fault Detection

Because a redundant system can tolerate some single faults, it is possible for a fault to go undetected. Undetected faults are termed latent faults. If another fault occurs when a latent fault exists, the second fault could cause a shutdown. It is important to detect a latent fault in a redundant system so that it may be repaired before another fault occurs. Without a fully triplicated system it is not possible to detect all latent faults, however most faults can be detected. For single or redundant I/O points, fault detection is dependent on the application software to detect its I/O faults.

Released

Manual 26166V1

MicroNet Simplex & MicroNet Plus

Table 5-4. CPU Fault LED Flash Codes

Source Code	Fault Code	Fault Message
2	1	WGInitRAMDrives Error
2	4	WGInitFlashDrives Error
2	7	CPU in WRONG Slot!!
2	9	Chassis Switch set to #, must be set to 0 to run
2	10	Error Initializing User Accounts
3	5	Chassis Switch not Valid! Main must be set to zero!
4	7	Wrong CPU type
4	9	Footprint out of date
1	1	RAM error
1	2	Data bus error
1	3	Address bus error
1	4	Memory Cell test error
1	5	Bootloader error

5.3. PowerPC CPU5200 Module (Motorola)

5.3.1. Module Description

The MicroNet PowerPC CPU Module contains a Motorola MPC5200 processor, 128 MB DDR RAM, 64 MB of flash memory, a Real Time clock, and various communication peripherals. These peripherals include (2) general use Ethernet ports, (2) Real Time Network ports, (1) serial port, (1) one service port, and (2) CAN ports. This module includes an FPGA to provide VMEbus master/slave capability as well as other functions necessary for redundant systems.

The CPU5200 Module can operate in both simplex and redundant modes. Every MicroNet Plus simplex control contains one CPU module located in the first I/O slot of the MicroNet chassis. A redundant configuration will also have a CPU located in the CPU2 location (slot 8 or slot 14 depending on which chassis is used).

This module was designed and rated for –40 to +85 °C operation in the industrial marketplace.

For CPU module installation and replacement instructions, see the instructions for installing and replacing the VME module in Chapter 15, Installation and Service, and Section 9.4.3—Installation.

NOTICE


**RESET
MODULE
BEFORE REMOVAL**

Live insertion and removal of this module is allowed in a MicroNet Plus chassis. This module should be reset immediately before removing it from the chassis. This notifies the module that it will be removed and provides a graceful failover to another healthy CPU module if available.

The CPU module runs the GAP application program. Figure 5-2 is a block diagram of a CPU module. When the power is applied, the CPU module will perform diagnostic tests, before running the application program.

The CPU module contains a battery to power the real time clock when power to the control is off. This battery is not user-replaceable. The resolution of the real time clock is 10 milliseconds.

Released

Manual 26166V1

MicroNet Simplex & MicroNet Plus

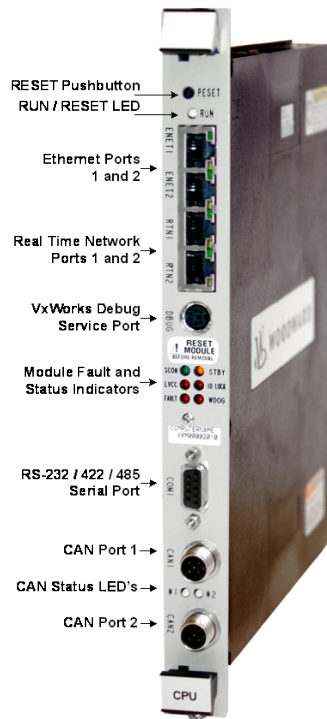


Figure 5-11. PowerPC CPU5200 Module (Motorola)

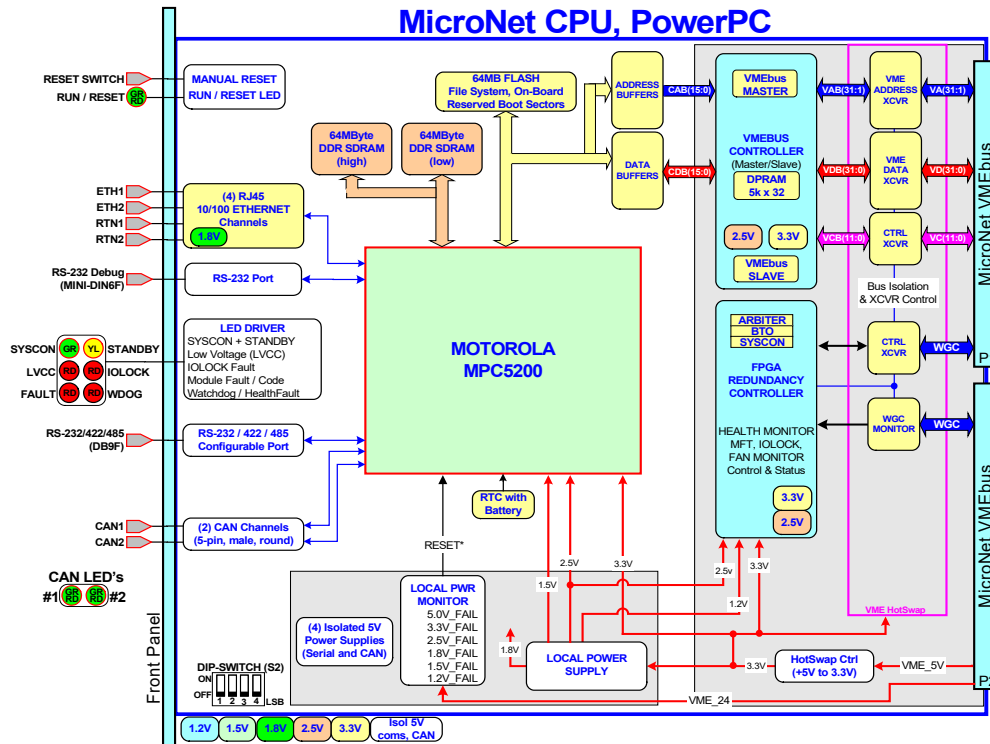


Figure 5-12. CPU Module Block Diagram

Released

Manual 26166V1

MicroNet Simplex & MicroNet Plus

5.3.2. Module Configuration

Hardware Configuration

The Module Configuration Switch (S2) must be configured properly for CPU mode (main rack, address 0x000) operation. This module will be factory configured appropriately.

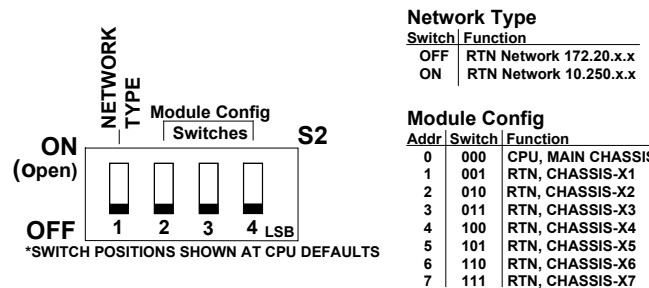


Figure 5-13. PowerPC CPU5200 Module Hardware Configuration

Note: If CAN for GS6 or RTCnet / LINKnet HT operation is required from an expansion rack, a CPU module must be used in place of the Remote RTN module and configured for an RTN using the Module Configuration Switch (S2) as shown above.

IMPORTANT

It is recommended to verify proper switch settings before installing the module in the system and when troubleshooting CPU-related issues.

IMPORTANT

If the CPU module is incorrectly configured for RTN mode, Ethernet ports #1 and #2 are NOT active and AppManager will not be available.

Network Type

The Network Type setting is factory set OFF to automatically configure the RTN communication port IP addresses to the 172.20.x.x series.

IMPORTANT

It is recommended to verify proper switch settings before installing the module in the system and when troubleshooting CPU or RTN related issues.

The Network Type setting on all CPU and Remote RTN modules in the system must match for proper system operation.

The customer network attached to Ethernet #1 or #2 may already use the RTN port addresses of 172.20.x.x. In this case, the Network Type switch should be configured ON to use the 10.250.x.x RTN port addresses.

Network Configuration

Ethernet ports (ENET1, ENET2) can be configured for the customer network as desired. The RTN ports (RTN1, RTN2) are reserved for communicating with Woodward Real Time Network devices such as expansion racks. See the on-site Network Administrator to define an appropriate I/P address configuration for ENET1 and ENET2.

Released

Manual 26166V1

MicroNet Simplex & MicroNet Plus

5.3.3. Front Panel Indicators (LEDs)

The MicroNet PowerPC CPU5200 module has the following front-panel LEDs.

Table 5-5. PowerPC CPU5200 Module Front Panel LEDs

LED	Name	Description
 RUN	RUN	<u>RUN / RESET (GREEN/RED)</u> —Active RED when the user pushes the reset switch. Active GREEN upon release and after the CPU Operating system is loaded and running.
 TX/RX ETH LINK	TX/RX	<u>TX/RX (GREEN)</u> —Active GREEN when data is transmitted or received.
	LINK	<u>LINK ACTIVE (YELLOW)</u> —A valid Ethernet connection to another device exists
 SYSCON  LVCC  FAULT	SYSCON	<u>System Controller (GREEN)</u> —Active when this CPU or Remote RTN module is the VMEbus System Controller.
	STANDBY	<u>Standby Ready (YELLOW)</u> —Active when the STANDBY mode of this CPU or Remote RTN module is ready to release or take over the System Controller functions in a failover event.
	LVCC	<u>Low VCC Power Fault (RED)</u> —A CPU or VME power supply high or low tolerance fault has been detected. - Local CPU power faults could be 1.2 V, 1.5 V, 1.8 V, 2.5 V, or 3.3 V. - VME power faults could be VME_5V, VME_5VPC, or VME_24V.
	IOLOCK	<u>IOLOCK (RED)</u> —This LED indicates that an I/O LOCK condition exists either locally on the CPU itself and/or on the VMEbus.
	FAULT	<u>CPU FAULT (RED)</u> —Actively flashes CPU fault codes as necessary.
	WATCHDOG	<u>CPU Watchdog / Health Faults (RED)</u> —The processor watchdog or Health monitor has tripped and the CPU or Remote RTN module is prevented from running. The CPU Watchdog includes a 1 ms failover event and an 18 ms timeout event. Health faults include GAP fault, Watchdog events, and local SYSCLK and MFT hardware faults.
 #1  #2	CAN #1, #2	<u>CAN #1, #2 (GREEN/RED)</u> —Active GREEN or RED when data is transmitted or received through CAN port #1 or #2.

5.3.4. Module Reset

Front Panel Reset Switch

The CPU module has a pushbutton reset switch on the front panel to reset the module. If a GAP application was successfully running at the time of reset, the same application will be auto-started and re-initialized.

Released

Manual 26479

Cyber Security Manual

Chapter 1. Purpose

This manual provides information on cybersecurity strategies for the Woodward MicroNet Plus and MicroNet TMR turbine control systems. Woodward offers CPUs that with a variety of cybersecurity capabilities including user account management with secure passwords, secure applications and encrypted communications. Some versions are Achilles certified.

The minimum CPUs that should be considered for use in security-critical applications are versions with user levels and secure passwords. The 5466-1035 and -1141 CPU on MicroNet Plus and the 5466-1047 and -1247 CPUs for MicroNet TMR do not meet these requirements. If your system has one of these CPUs (or an older Pentium/NT CPU with Ethernet) the system should be upgraded to one of the modern CPUs for security.

Table 1-1. CPU Information

MicroNet Plus							
CPU	Preferred	Min. Coder	Secure Passwords	Achilles Cert	SSH/Firewall	SecureApp	
5466-1035	No	4.06	No	No	No	No	
5466-1045	No	6.00-1	Yes	No	Yes	No	
5466-1141	No	6.00-4	No	No	No	Yes	
5466-1145	No	6.00-4	Yes	Yes	Yes	No	
5466-1245	No	6.00-4	Yes	No	No	No	
5466-1511	Yes	Plus 1.02	Yes	Yes	Yes	No	
5466-1521	Yes	Plus 1.02	Yes	Yes	Yes	Yes	
MicroNet TMR							
CPU	Preferred	Min. Coder	Secure Passwords	Achilles Cert	SSH/Firewall	SecureApp	
5466-1047	No	4.06	No	No	No	No	
5466-1247	No	6.00-1	Yes	No	Yes	No	
5466-1347	Yes	TMR 1.01	Yes	Yes	No	No	

Table 1-2. Reference Documents, Manuals, and Information

Security Device/Appliance	Artifact / Document
MicroNet Plus	Control Manual (#26166V1, 26166V2, 26166V3) VxWorks RTOS Software Manual (#26336) Achilles Certification report (see Appendix –Achilles Certification Excerpts)
MicroNet TMR	Control Manual (#26167V1, 26167V2, 26167V3) VxWorks RTOS Software Manual (26336) Achilles Certification report (see Appendix –Achilles Certification Excerpts)
SOS	Help file—select Help/Help from the SOS tool
GAP Program	Help file—select Help/Help from the GAP™ Editor tool
AppManager	Help file—select Help/Help from the AppManager tool
Typical System	See Figure 9-2 EACMS Architecture
Project Deliverable	Project specific Network Configuration Document(s)
Moxa EDR-810	Woodward Manual 35095 MOXA EDR-810 Service Manual
Tofino Xenon	Woodward Manual 35097 Belden Tofino Xenon Service Manual
Configuration Management Monitoring Appliance	

Additional supporting citations are listed in the References section.

Woodward

4



GLOBAL INDUSTRIAL AUTOMATION SOURCING

Ready to source this part?

Ask for availability, pricing and delivery options.

Request a fast quote

Include the product title and any required part number or quantity.

EMAIL

info@apterpower.com

PHONE

+86 18106909650

[CHAT ON WHATSAPP >](#)



[SCAN TO CHAT ON WHATSAPP](#)

PRODUCT: 5466-1035 / Woodward MicroNet Plus CPU5200 Module

The enclosed manufacturer pages are reproduced without alteration to technical content.

Apter Power is not an authorized distributor, reseller or representative of the products featured.

Product names, trademarks, brands and logos remain the property of their respective owners.