MULTINET
Serial to Ethernet Converter

Instruction Manual

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FEATURES

- Converts Modbus® RTU over RS485 into Modbus® TCP/IP over Ethernet.
- Supports both 10BaseT Ethernet and 10BaseF fiber connections.
- Connect up to 32 RS485 serial devices to an Ethernet network.
- Modbus® TCP/IP allows multiple SCADA masters to simultaneously connect and communicate to the same IED.
- Industrially hardened product for utility and industrial applications.
- Simple "plug and play" device setup with enerVista software.

DESCRIPTION

The MultiNet Serial-to-Ethernet converter is a communications module that provides GE Multilin serial Modbus IEDs with Modbus TCP/IP communications over Ethernet. MultiNet has the capability to connect up to 32 serial Modbus devices, eliminating complex wiring and additional communications converters, as well as providing a streamlined and economical Ethernet hub. Unlike most communications converters designed for commercial use, MultiNet is environmentally hardened to withstand severe utility and industrial conditions.

MultiNet can be used to connect an existing Modbus RTU network over RS485 onto a LAN in order to support multiple SCADA masters or advanced HMI systems. Additionally, the use of MultiNet greatly facilitates the setup and wiring of any serial device to a communications center since it avoids costly RS485 cable runs. Finally, large RS485 networks are slow and have a typical limit of 32 devices. MultiNet allows customers to expand that limit as well as improving network performance by separating large RS485 networks into smaller groups.
RS485 data transmission and reception is accomplished over a single twisted pair with transmit and receive data alternating over the same two wires. Using this port, continuous monitoring and control to a PLC, protection relay or any serial Modbus IED is possible.

Connect the “+”, “–” and common terminal of MultiNet to the “+”, “–” and common terminals of all the IEDs. Correct polarity must also be observed. For instance, the IEDs must be connected with all RS485 “+” terminals connected together, and all RS485 “–” terminals connected together.

To minimize errors from noise, the use of shielded twisted pair wire is recommended. The COM terminal should be connected to the common wire inside the shield, when provided. To avoid loop currents, the shield should be grounded at one point only. Each relay should also be daisy-chained to the next relay in the link. A maximum of 32 relays can be connected in this manner without exceeding driver capability.

Lightning strikes and ground surge currents can cause large momentary voltage differences between remote ends of the communication link. For this reason, surge protection devices are internally provided at the communication port. An isolated power supply with an opto-coupled data interface also acts to reduce noise coupling. To ensure maximum reliability, all equipment should have similar transient protection devices installed.

Both ends of the RS485 circuit can be terminated with impedance as shown in Figure 2: Typical Configuration. Termination networks should only be applied if long cable runs are used between RS485 connections. A typical load value for a terminating network is a 120-ohm resistor in series with a 100-pF capacitor.

http://www.GEindustrial.com/multilin
10BASE-F FIBER OPTIC PORT

The fiber optic communications port allows for fast and efficient communications with Modbus TCP/IP at 10 Mbps. Fiber optic transmissions provide an ideal solution for areas where RS485 communications or Ethernet via a twisted pair have traditionally caused problems. Fiber is immune to electrical interference and provides complete isolation.

Optical fibers may be connected to the MultiNet supporting a wavelength of 820 nm in multimode. Optical fiber is only available with the MultiNet-FE option (see the Order Code for details). The MultiNet-FE has a 10BaseF transmitter/receiver for optical fiber communications and supports optical fiber sizes of 50/125 µm, 62.5/125 µm, and 100/140 µm. The fiber optic port is designed such that the response times will not vary for any core 100 µm or less in diameter. For optical power budgeting, splices are required every 1 km for the transmitter/receiver pair (the ST type connector contributes for a connector loss of 0.2 dB). When splicing optical fibers, the diameter and numerical aperture of each fiber must be the same. Only a quarter turn of the coupling is required to engage or disengage the ST type connector.

The 10BaseT Ethernet port and the 10BaseF Fiber port are internally linked and should not be used together.

Ensure the dust covers are installed when the fiber is not in use. Dirty or scratched connectors can lead to high losses on a fiber link.

Observing any fiber transmitter output may cause injury to the eye!

INPUT POWER TERMINALS

The input power terminals are located on the left side of the green terminal block. MultiNet may be connected to either 90 to 265 V AC at 50/60 Hz or 90 to 300 V DC supply power. The terminals are labeled “+” and “−” for DC positive and negative input power and “L” and “N” are for AC line and neutral input power. The GND terminal must be connected to ground to ensure adequate protection against transients.

Control power supplied to the MultiNet must be connected to the matching power supply range. If the voltage is applied to the wrong terminals, damage may occur!

MOUNTING

MultiNet is DIN rail mountable and ships with two DIN rail clips attached on the rear of the unit. The DIN rail clips can attach the unit onto a standard 35 mm DIN rail. Place the top hooks of the clip against the DIN rail and apply a downward force until an audible click is heard. In order to remove the unit, place a standard slotted screwdriver between the unit and the DIN rail and apply an upward force.

Each clip is held onto the unit using a standard 4-40 Phillips head screw. If the DIN rail option is not used, remove the DIN rail clips by unscrewing the six screws. Once the clips have been removed re-screw the six screws back into their original positions. Do not substitute screws, since the wrong length of screw may damage the internals of the product and void the warranty.
Figure 2: Typical Configurations
GETTING STARTED WITH ENERVISTA TO SETUP MULTINET

The MultiNet setup software is provided to edit settings and configure the unit. The setup software connects to the unit through either the 10BaseT (RJ45) port or the 10BaseF (fiber) port.

The following requirements must be met to ensure correct operation of the MultiNet setup software:

- Pentium class or higher processor (Pentium II 300 MHz or higher recommended)
- Windows 95, 98, 98SE, ME, NT 4.0 (Service Pack 4 or higher), 2000, XP
- 64 MB of RAM (256 MB recommended)
- 40 MB of available hard drive space (100 MB recommended)
- Video capable of displaying 800 × 600 or higher in High Color mode (16-bit color)
- An Ethernet communications port.

To download MultiNet directly, go to [http://www.geindustrial.com/multilin/software/multilin.htm](http://www.geindustrial.com/multilin/software/multilin.htm)

To download MultiNet through enerVista (suggested), follow the procedure outlined below.

1. **Download enerVista**
   a) **From the Web:**
      i) Direct your web browser to the enerVista website at [http://www.enerVista.com](http://www.enerVista.com). Click on the “Download Now” button.
      ii) Run the enerVista installation program and follow the on-screen instructions.
   b) **From the enerVista CD:**
      i) Insert the enerVista CD into your computer’s CD drive and it will automatically open the welcome page. Click on the “Install Now” button.
      ii) Run the enerVista installation program and follow the on-screen instructions.
2. Setup the MultiNet Software:
   i) On the main enerVista page, select “IED SetUp” from the LaunchPad window.
   ii) Click on the “Install Software” button at the top of the screen.
   iii) Select MultiNet from the product list. Indicate whether you are installing the software from CD or the Web, then click “Check Now”.
   iv) Check off the MultiNet Setup program from the Downloads screen and click “Download Now”.
   v) Once the download is complete, the MultiNet installation file will be shown on screen. Double-click this file to run the installation program.
   vi) Run the installation program and follow the on-screen instructions.
   x) Once the installation is complete, click on ”IED Setup” on the left panel of the screen. You will see a Multinet icon on the IED screen. Double click on it to launch the MultiNet setup application.

![enerVista LaunchPad](http://www.GEindustrial.com/multilin)
CONFIGURATION

Before starting, verify that the Ethernet network cable is properly connected to the Ethernet port on MultiNet. To connect MultiNet directly to the Ethernet port of a PC or laptop, use a crossover cable; to connect MultiNet directly to an Ethernet network, use a regular pass-through RJ-45 cable.

To setup MultiNet for Ethernet communications use the following procedure:

1. Install and start the latest version of the MultiNet setup software (available from the GE Multilin Products CD or online from http://www.GEindustrial.com/multilin; see the previous section: Getting Started with MultiNet Software).

![MultiNet Setup Software Main Screen](image)

Figure 3: MultiNet Setup Software Main Screen

1. Select the **Communications > Device Setup** menu item to open the Device Setup window.
2. The left pane shows the currently configured MultiNet Devices. Click the **Add Device** button to add a new MultiNet device to the device list.
3. Enter the desired name in the **Device Name** field and a description (optional) of the device.
4. The MAC address is used to identify and configure the unit. Fill in the MAC address field with the address found on the back of MultiNet (for example, 00-20-4A-62-AE-66).

![Device Setup Screen]

*Figure 4: Device Setup Screen*

5. Under network settings, enter the IP address, Subnet and Gateway of the MultiNet network interface. If these values are not known, consult your network administrator.

6. Under port settings, enter the Baud Rate and Parity bit for the MultiNet serial interface.

7. Once the serial and network settings have been entered, click [SAVE] to save the changes. The message "success saving settings to MultiNet device" will appear in the status window when complete. Additional devices may be added to the list by following the same procedure.

8. Click [OK] to close the device setup screen.

**EXAMPLE: Connecting MultiNet to a PQM**

The following steps detail how to use MultiNet in order to connect a PQM to an Ethernet network.

1. Wire COM1 on the back of the PQM to the RS485 terminals on MultiNet. The wiring is detailed in *Figure 2: Typical Configuration*. Since for this example short cable runs are used, terminators are not necessary.

2. Check the settings within the PQM, noting the Baud rate, Parity Bit and Slave Address. For the sake of this example the values of **19200**, **none** (or N), and **254** will be used for the baud rate, parity bit, and slave address respectively.
3. Note the MAC address of the MultiNet unit. For this example, a MAC address of **00-20-4A-62-AE-00** will be used. The MAC address is located on the rear of the unit.

4. Connect MultiNet to the network LAN. Consult your IT administrator to determine a suitable IP address, subnet, and gateway setting for the unit. For this example we will use **192.168.1.2** as the IP address, **255.255.255.0** as the Subnet and **192.168.1.1** as the Gateway.

5. Open the MultiNet setup software. Use the procedure detailed in the *Configuration* section to configure the unit. For this example the following settings will be used:

   **Device Name:** MultiNet 1  
   **IP Address:** 192.168.1.2  
   **Subnet:** 255.255.255.0  
   **Gateway:** 192.168.1.1  
   **Baud Rate:** 19200  
   **Parity Bit:** None

   *NOTE* The baud rate and parity bit are identical to those set within the PQM. Additionally, the MAC address from step 3 is needed to configure the Network settings.

6. Close the MultiNet setup software and open enerVista Viewpoint.

7. From the main screen of enerVista Viewpoint, click **Device Setup** to open the Device Setup window.

   ![Device Setup Screen within Viewpoint](image)

   *Figure 5: Device Setup Screen within Viewpoint*

8. On the left is the device list showing the “Quick Connect” default site. Click on the plus sign next to the “Quick Connect” site to reveal the “Quick Connect” default device. Selecting this device allows parameters to be entered in the right pane.
9. For this example, we are going to configure the “Quick Connect” device as our PQM. Select Ethernet as the interface and fill in the IP address and slave address of the PQM.

10. Click **Read Order Code**. Viewpoint will locate the PQM device and connect to it. Once this order code has been read, click **OK** to save the configuration.

11. Select the **Plug & Play > Create Schema** menu item to open the Plug and Play Device dialog box. Ensure that “PQM” is selected within the drop down selection. Click **Create** to automatically create plug and play screens for the PQM.

   ![Figure 6: Dialog Box for Creating “plug and play” Screens](image)

12. When finished, the plug and play menu will appear, showing our PQM labeled as **Quick Connect**. Click the **Dashboard** button below the PQM icon to view the device information. We have now successfully accessed our PQM through MultiNet.

   ![Figure 7: Plug and Play Menu Showing Attached PQM.](image)
EXAMPLE: Configuring a Laptop to communicate to MultiNet over crossover cable.

This procedure details how to configure MultiNet for use with a crossover cable. Using a crossover cable allows for a direct local connection to a MultiNet device, bypassing the network. The following procedure is based upon the Windows 2000 operating system; variations of this procedure will work other windows operating systems, as they are all fairly similar.

This example uses sample values for IP address, subnet and gateway. Please substitute these values with your own.

1. Connect a CAT5 crossover Ethernet cable between the laptop running the MultiNet setup software and the MultiNet unit. Since the 10BaseT connection is being used, the 10BaseF connection must be disconnected.

2. Right click on My Network Places and select properties from the pop down menu.

3. Click on the Local Area Connection icon and select properties.

4. Select Internet Protocol (TCP/IP) and click Properties.

5. Record the current settings of the Internet Protocol (TCP/IP) properties window.

6. Select the Use the following IP address button. The laptop must be configured with the same settings as the MultiNet. For example, if an IP address of 192.168.1.2 has been assigned to the MultiNet, use that address as the gateway for the laptop. Similarly, set the IP address of the laptop to the gateway IP of the MultiNet. For example, set the laptop IP address to “192.168.1.1” if the gateway IP of the MultiNet is “192.168.1.1”. The subnet mask is to remain the same. Fill in the corresponding fields:

   IP address: 192.168.1.1
   Subnet: 255.255.255.0
   Gateway address: 192.168.1.2

   The laptop has been configured as the gateway for MultiNet – do not connect the laptop back to the network without first restoring the settings for the IP address. Again, the IP address, Subnet and gateway supplied here are for this example only. Please change these values so that they correspond to the values assigned in your network.

7. Click OK to save the changes. Depending on your operating system, you may wish to restart your PC.
8. Open the MultiNet setup program and follow the procedure detailed within the **CONFIGURATION** section. For this example use the IP address of 192.168.1.2, subnet of 255.255.255.0 and a gateway of 192.168.1.1.

9. Once the configuration of the MultiNet device is complete, return the laptop to its previous settings using the recorded values from step 5. If the MultiNet device was configured properly, communications may be tested on the connected network using enerVista, as shown in the first example.
ORDER CODE

There are two order codes for the GE Multilin MultiNet converter: MULTINET-E and MULTINET-FE.

<table>
<thead>
<tr>
<th>MULTINET</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>10BaseT Ethernet Port</td>
</tr>
<tr>
<td>FE</td>
<td>10BaseT Ethernet Port, and 10BaseF fiber optic port.</td>
</tr>
</tbody>
</table>
**ETHERNET:**
Version 2.0/IEEE 802.3
10BaseT: RJ45 connection
10BaseF: 820 nm, multi-mode, fiber optic with ST connector
Modbus® TCP/IP

**SPECIFICATIONS**

**ETHERNET:**
Version 2.0/IEEE 802.3
10BaseT: RJ45 connection
10BaseF: 820 nm, multi-mode, fiber optic with ST connector
Modbus® TCP/IP

**RS485 PORT:**
RS485 2-wire, half duplex, isolated
Baud Rate: 300 bps to 115.2 Kbps
Protocol: Modbus® RTU

**INSTALLATION:**
Configuration through enerVista setup software

**ENVIRONMENTAL:**
Humidity: 95% non-condensing
Operating Temperature: –20°C to 70°C
Storage Temperature: –40 to 85°C (–40 to 185°F)
IP rating: IP 40

**POWER INPUT:**
DC power: 90 to 300 V DC
AC power: 90 to 264 V AC at 50/60 Hz

**APPROVALS:**
ISO: Manufactured to an ISO9001 registered program
UL: Listed for US and Canada under E83849 - Vol. 1 Sec.10.
FCC: PART 15

**MECHANICAL SPECIFICATIONS:**
Material: Metal enclosure
Dimensions: 6.6” × 3.98” × 1.46”
Shipping box: 12.9” × 9” × 3.25”
Ship weight: 2 lbs.

**TYPE TESTS:**
EMC Test Levels: EN 50263
Test Conditions: IEC60255-6
ESD: IEC60255-22-2
(IEC 61000-4-2)
IEEE/ANSI C37.90.3
Surge Immunity: *IEC 60255-22-5
(Fast Transient: IEC 60255-22-4
(IEC 61000-4-4)
IEEE/ANSI C37.90.1
Oscillatory: IEEE/ANSI C37.90.1
*IEC 60255-22-1
Dielectric Strength: IEC 60255-5
Insulation Resistance: IEC 60255-5
Impulse Voltage: IEC 60255-5
Power Fr. Magnetic Field: IEC 61000-4-8
Pulse Magnetic Field: IEC 61000-4-9
Voltage Dip/ Interruption: IEC 61000-4-11
RF cond. & radiated emission: IEC 60255-25
RF Conducted Immunity: IEC 60255-22-6
(IEC 61000-4-6)
RF Radiated Immunity: *IEC 60255-22-3
(IEC 61000-4-3)
IEEE/ANSI C37.90.2
Digital Port. Tel. Immunity: IEC 50204
Temperature: (Cold) IEC 60068-2-1,
(Hot) IEC 60068-2-2
Relative humidity: IEC 60068-2-30
Ingress Protection: IEC 60529
Mechanical Stress: 2 G
* RJ-45 not supported for marked tests

http://www.GEindustrial.com/multilin
WARRANTY

GE Multilin Product Warranty

General Electric Multilin Inc. (GE Multilin) warrants each product it manufactures to be free from defects in material and workmanship under normal use and service for a period of 24 months from date of shipment from factory.

In the event of a failure covered by warranty, GE Multilin will undertake to repair or replace the product providing the warrantor determined that it is defective and it is returned with all transportation charges prepaid to an authorized service center or the factory. Repairs or replacement under warranty will be made without charge.

Warranty shall not apply to any product that has been subject to misuse, negligence, accident, incorrect installation or use, not in accordance with instructions nor any unit that has been altered outside a GE Multilin authorized factory outlet.

GE Multilin is not liable for special, indirect or consequential damages or for loss of profit or for expenses sustained as a result of a product malfunction, incorrect application or adjustment.

For complete text of Warranty (including limitations and disclaimers) refer to GE Multilin Standard Conditions of Sale.