

**INSTALLATION INSTRUCTIONS**

Original Issue Date: 5/05

Model: 550, 340 , and 16-Light Generator Set Controllers, Series 1000 and 340/340+ ATS Controllers, Power Monitor, and RSA 1000

Market: Industrial and ATS

Subject: Converters, Connections, and Controller Setup for Network Communication

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**Introduction**

This document contains diagrams and instructions for connection of the following power system devices to a personal computer (PC) using Monitor III software or for other Modbus® applications:

- 550 Generator Set Controller
- 340/Digital Generator Set Controller
- 16-Light Generator Set Controller (requires red main logic board and communication module)
- Series 1000 Transfer Switch Controller
- M340/M340+ or MATS/MATS+ Microprocessor-Based Transfer Switch Controller
- Power Monitor
- RSA 1000 Remote Serial Annunciator version 2.00 or higher (for network communication).

**Note:** The version number is printed on the chip on the RSA 1000 circuit board. A service kit is available to upgrade earlier versions of the RSA 1000 for network communication. See TT-1377 for the RSA 1000.

Single or multiple devices can be connected locally or remotely. See Figure 1 for a list of kits covered by these instructions.

| Part Number   | Kit Description                           |
|---|---|
| GM41141-KP1/KP1S  | Monitor III software                      |
| GM41141-KP2/KP2S  | Monitor III software w/60 Hz device modem |
| GM41142-KP1   | Device modem, 220V/50Hz                   |
| GM41143-KP1   | Converter, RS-232/RS-485                  |
| GM41143-KP2   | Converter, Modbus®/Ethernet               |
| GM41143-KP3   | Converter, Modbus®/KBUS *                 |
| GM41144-KP1   | Cable, null modem, 3 m (10 ft.)           |
| * Required for 340 series microprocessor-based devices only |   |

**Figure 1** Connection Kits

Modbus® is a registered trademark of Schneider Electric.

## Notes on Kit Components and Applications:

- Monitor III software kits GM41141-KP1/KP1S include a 3 m (10 ft.) null modem cable for local connection of the PC to a device.
- Software kits GM41141-KP2/KP2S include a 120 V/60 Hz 19.2K device modem with cables and connectors for connection of the device or device network to telephone lines for remote communication.
- Install one Modbus®/KBUS converter module in each Series 340 device. The Modbus/KBUS converter module replaces older communication modules (for RS-232 or RS-485) and allows either KBUS or Modbus communication.
- Use one Modbus/Ethernet converter kit to connect up to 247 controllers to an Ethernet network. Monitor III software can communicate with only one Modbus/Ethernet converter at a time.

See the Additional Requirements section for hardware not included in the kits. Read the entire installation procedure and compare the kit parts with the parts list at the end of this publication before beginning installation. Perform the steps in the order shown.

## Additional Requirements

Check the connection types and connection diagrams for required hardware and cables before beginning the installation. In some cases, additional hardware or cables must be obtained locally. Follow Electronics Industry Association (EIA) recommendations for cables.

- For remote connections, the power system manufacturer offers device modems for the power system devices, but does not provide PC modems. Internal or external PC modems must be obtained by the user through a computer equipment supplier and set up according to the instructions provided with the modem.
- RS-485 connections require Belden #9841 or equivalent shielded twisted-pair cable, which is not provided in the kits. Procure the length of cable required for the application locally.

- The Modbus/Ethernet converter requires Category 5e network cable with an RJ45 connector. Check the type of cable and connectors used for the Ethernet connections at the site. Obtain the cable and connectors required for the application locally.
- Any PC used to monitor device(s) over the Ethernet must be equipped with a network interface card (NIC) and set up for Ethernet connection. Setting up the Ethernet network and connected computers is the responsibility of the user and is not covered in this documentation.

Check that the PC meets the minimum system requirements. See the Monitor III Operation Manual for a list of system requirements.

## List of Related Materials

This document explains converter module kit installation and hardware connections. For device setup instructions, refer to the Operation Manuals provided with the units. For the Series 1000 ATS Controller, refer to the Setup Program Operation Manual. For Monitor III software information, refer to the manual provided with the software kit or the Help function in the software.

Figure 2 lists the document part numbers for reference.

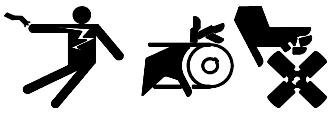
| Document Description   | Part Number                              |
|--|--|
| Monitor III Software Operation Manual                        | TP-6347/MP-6347                          |
| 550 Controller Operation Manuals:<br>version 2.10 and higher | TP-6200/MP-6200                          |
| versions prior to 2.10                                       | TP-6083/MP-6083                          |
| 16-Light Controller Operation Manual                         | TP-6161/MP-6161                          |
| Series 340 Generator Set Controller<br>Operation Manual      | TP-5829/MP-5829                          |
| Series 1000 ATS Controller Setup Program<br>Manual           | TP-6135/MP-6135                          |
| Series 340 ATS Controller Operation<br>Manual                | TP-5569/MP-5569<br>or<br>TP-5994/MP-5994 |
| Series 340+ ATS Controller Operation<br>Manual               | TP-5664/MP-5664                          |
| Power Monitor Operation Manual                               | TP-5875/MP-5875                          |
| Remote Serial Annunciator (RSA 1000)                         | TT-1377                                  |

**Figure 2** Related Materials

## Safety Precautions


Observe the following safety precautions while installing kits and connecting hardware.

---


|   |
|---|
| <b>⚠ WARNING</b>  |
|    |
| <b>Accidental starting. Can cause severe injury or death.</b>   |
| Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery. |

---

**Disabling the generator set. Accidental starting can cause severe injury or death.** Before working on the generator set or connected equipment, disable the generator set as follows: (1) Move the generator set master switch to the OFF position. (2) Disconnect the power to the battery charger. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent starting of the generator set by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer.

|   |
|---|
| <b>⚠ DANGER</b>   |
|  |
| <b>Hazardous voltage. Will cause severe injury or death.</b>                        |
| Disconnect all power sources before opening the enclosure.                          |

**Servicing the transfer switch. Hazardous voltage can cause severe injury or death.** Deenergize all power sources before servicing. Open the main circuit breakers of all transfer switch power sources and disable all generator sets as follows: (1) Move all generator set master controller switches to the OFF position. (2) Disconnect power to all battery chargers. (3) Disconnect all battery cables, negative (-) leads first. Reconnect negative (-) leads last when reconnecting the battery cables after servicing. Follow these precautions to prevent the starting of generator sets by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer. Before servicing any components inside the enclosure: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Test circuits with a voltmeter to verify that they are deenergized.

|   |
|---|
| <b>⚠ DANGER</b>   |
|  |
| <b>Hazardous voltage. Will cause severe injury or death.</b>                        |
| Only authorized personnel should open the enclosure.                                |

**Opening the power monitor enclosure. Hazardous voltage can cause severe injury or death.** Only trained and qualified personnel should open the power monitor enclosure.

**Opening the power monitor enclosure. Hazardous voltage can cause severe injury or death.** A transfer switch or generator set connected to the power monitor could automatically energize the power monitor or accessories. Disconnect all power sources before opening the enclosure. Move the generator set master switch on the controller to the OFF position and disconnect the battery negative (-) lead before proceeding.

**Current transformer voltage. Hazardous voltage can cause severe injury or death.** Disconnecting current transformer leads and reenergizing the power source could cause equipment damage and personal injury. If the situation requires reenergizing the power source, reconnect the current transformer leads or short the leads together first.

## Circuit Board Handling

Improper removal, installation, transportation, storage, or service can damage sensitive electronic components. Observe the following guidelines to prevent damage when working with circuit boards or electronic components.

### Circuit Board and Electronic Component Handling

- Keep circuit boards or electronic components inside the antistatic, cushioned factory packaging until installation.
- Store circuit boards or electronic components in a clean environment away from moisture, vibration, static electricity, corrosive chemicals, and solvents.
- Disconnect all power sources before removing or installing circuit boards or electronic components.
- Wear an approved, grounded, antistatic wrist strap when handling circuit boards or electronic components.
- Carefully hold the circuit board by its edges and not by any of its components or electrical contacts.
- Do not drop the circuit board or electronic components.
- Do not bend the circuit board, electronic components, or electronic component leads.
- Do not strike the circuit board or electronic components using or against a hard object.
- Clean dusty or dirty circuit boards with a vacuum cleaner or soft, dry brush.
- Never attempt circuit board repairs, adjustments, or modifications other than replacing plug-in service parts or performing manufacturer-approved installation or service procedures.

t:ta:001:001:a

## Notes on Network Addresses and Baud Rates

Note the following points when setting the device network addresses and baud rates.

### Network Addresses

- The network address for the 16-Light Controller is limited to odd numbers from 1–15.
- The network address for Series 340 devices is limited to numbers from 1 to 32 by the Modbus/KBUS converter.
- Network address 247 is reserved for RSA 1000 slave devices. Do not assign network address 247 to any other device.
- The Master/Slave DIP switch on the RSA 1000 sets the network address. Setting the DIP switch to the slave position for RSA 1000 slave devices sets the network address to 247.
- Use network address 1 for a controller that communicates with one or more RSA 1000 remote serial annunciators through an Ethernet network.

### Baud Rates

- All devices must use the same Modbus baud rate. For Series 340 controllers, the Modbus/KBUS converter's Modbus baud rate must match the baud rate of other devices in the system. The 340 controller's KBUS baud rate must be set at 9600 and may be different from the Modbus baud rate.
- The baud rate for the 16-Light Controller is fixed at 19200. Any site that includes a 16-Light Controller must use a baud rate of 19200 for all devices.
- The baud rate for the RSA 1000 is fixed at 19200. A Modbus/Ethernet converter connected to an RSA 1000 must be set for a baud rate of 19200.

# 1 Overview

The following procedure summarizes the steps required to connect and configure power system devices for Modbus communication and monitoring with Monitor III software. Read through this summary before starting in order to better understand the steps involved and identify the hardware required.

## Connection and Configuration Summary

1. Refer to the connection types in Section 2 to identify the type of connection to be used: local, remote/modem, or remote/Ethernet, to a single device or to multiple devices connected in an RS-485 network.
2. Refer to the connection diagrams in Section 3 to identify the hardware required for connection. Note which items are included in the kits and which are customer-supplied; review the Additional Requirements section and the Parts Lists in Section 13. Obtain all cables, converter modules, and device modems required before beginning the installation and connection procedures.

**Note:** Series 340 generator set controllers, transfer switch controllers, and power monitors require the installation of a Modbus/KBUS converter module.

**Note:** Ethernet connections require the use of a Modbus®/Ethernet converter module.

### At the site where the power system devices are located:

3. Set up and install Modbus/KBUS converter modules in any Series 340 devices as instructed in Section 5.
  - a. Set the baud rate DIP switch for 9600 or 19200. All devices in the system must use the same baud rate.
  - b. Set the device DIP switches to identify the type of controller or power monitor.
  - c. Use the ADDR DIP switches to assign a unique network address for each device in the system.
  - d. Connect RS-232 or RS-485 cables to the converter module as required for the connection as shown in the connection diagrams in Section 3.
4. Connect RS-232 or RS-485 cables to any other controllers as instructed in Sections 6 through 8. See the connection diagrams in Section 3.

5. Connect the remaining hardware as shown in the connection diagrams in Section 3.

**Note:** Circuit isolation is recommended for installations that may be exposed to electrical noise. See Section 12, Noise and Wiring Practices.

6. Configure the communication parameters on each device. Refer to Section 9, Controller Setup, and the device's Operation Manual.

- a. Configure each device for Modbus communications.
- b. Set the devices for local or remote communications as required for your application. Use a Local setting for Ethernet connections.
- c. Set the baud rate.

Choose 9600 for Series 340 devices using Modbus/KBUS converters. This is the baud rate setting for the KBUS side of the converter. The baud rate for the Modbus side was set in step 3 using DIP switches on the converter and must match the other devices in the system.

All other devices in the system must use the same baud rate, 9600 or 19200.

- d. Assign a unique network address to each device in the system.

**Note:** The network addresses for devices equipped with Modbus/KBUS converters were set in step 3 using DIP switches on the converter board.

### At the PC:

7. Connect the PC as shown in the connection diagrams in Section 3.

**Note:** Installation and connection of the PC modem or Ethernet connection will vary from one application to another and are the customer's responsibility. See your network administrator, if necessary.

8. For Ethernet networks, use the DeviceInstaller software to configure the Modbus/Ethernet converter as instructed in Section 11.
9. See the Monitor III Software Operation Manual for instructions to install and use Monitor III software.

## 2 Connection Types

A PC can communicate with generator set controllers, transfer switch controllers, and power monitors using local, remote (modem), or remote network (Ethernet) connections.

### Connection Notes:

- A device in the following diagrams is any generator set controller, transfer switch controller, or power monitor listed on page 1 of this document. All devices must be configured for Modbus communication.
- 340-series devices require Modbus/KBUS converters.
- Remote network (Ethernet) connections require a Modbus/Ethernet converter.
- RS-232 connects up to 15.2 m (50 ft.) from PC's serial port.
- RS-485 connects up to 247 devices with a maximum total cable length of 1220 m (4000 ft.). Obtain Belden #9841 or equivalent cable for RS-485 connections. Use a terminating resistor on the last device in the network. See the Electronics Industry Association (EIA) standards.
- The 550 controller can act as an RS-232 to RS-485 port converter when the controller is located within 15 m (50 ft.) of the PC.
- The 16-Light Generator Set Controller and Series 1000 ATS Controllers must use RS-485 connections for Monitor III communications.

### Local Connections

A PC connects directly to a device or network of devices with an RS-232 cable or an RS-232/RS-485 port converter and an RS-485 cable. See Figure 2-1 and the connection diagrams in Section 3.

For a single connection to a device within 15 m (50 ft.) of the PC, use an RS-232 cable to connect a PC to the RS-232 port on a device equipped with an RS-232 port. The 16-Light Generator Set Controller and Series 1000 ATS Controllers must use RS-485 connections for Monitor III communications.

Use an RS-232/RS-485 port converter and an RS-485 cable to connect the PC to:

- An RS-485 port on a device located up to 1220 m (4000 ft.) away from the converter.
- The 16-Light generator set controller and Series 1000 ATS controller.
- A local area network (LAN) with as many as 247 devices.

Obtain Belden #9841 or equivalent cable for RS-485 connections.

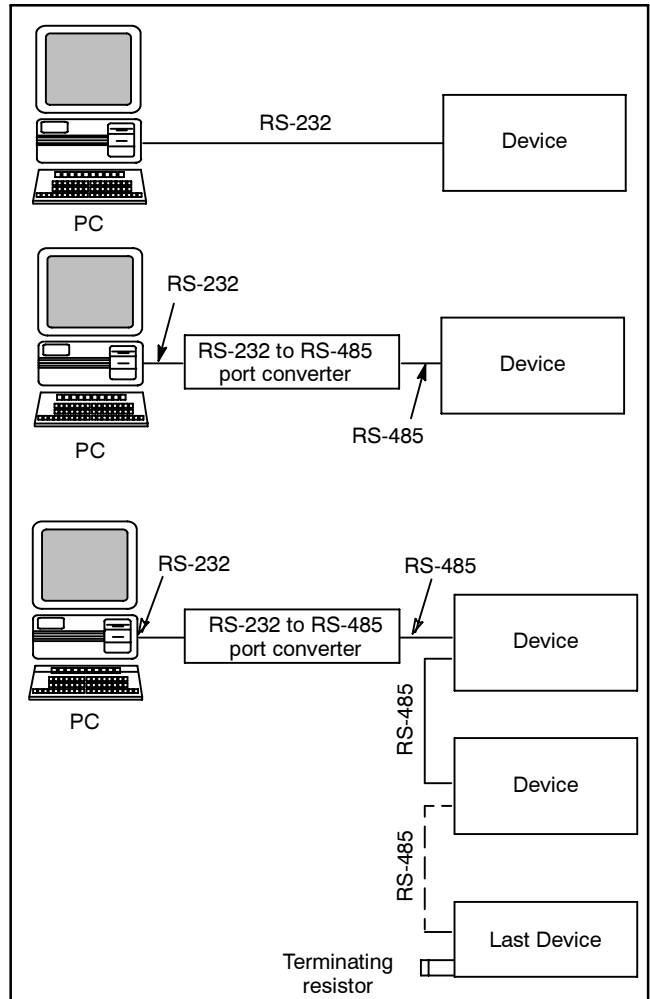


Figure 2-1 Local Connections

## Remote Modem Connections

The PC and device(s) are connected by modems. The PC communicates with the device or device network via a telephone network, and the PC can be located anywhere a telephone line can be accessed. See Figure 2-2 and the connection diagrams in Section 3.

For a single connection with up to 15 m (50 ft.) from the device to the device modem, use an RS-232 cable to connect the device modem to one of the following devices:

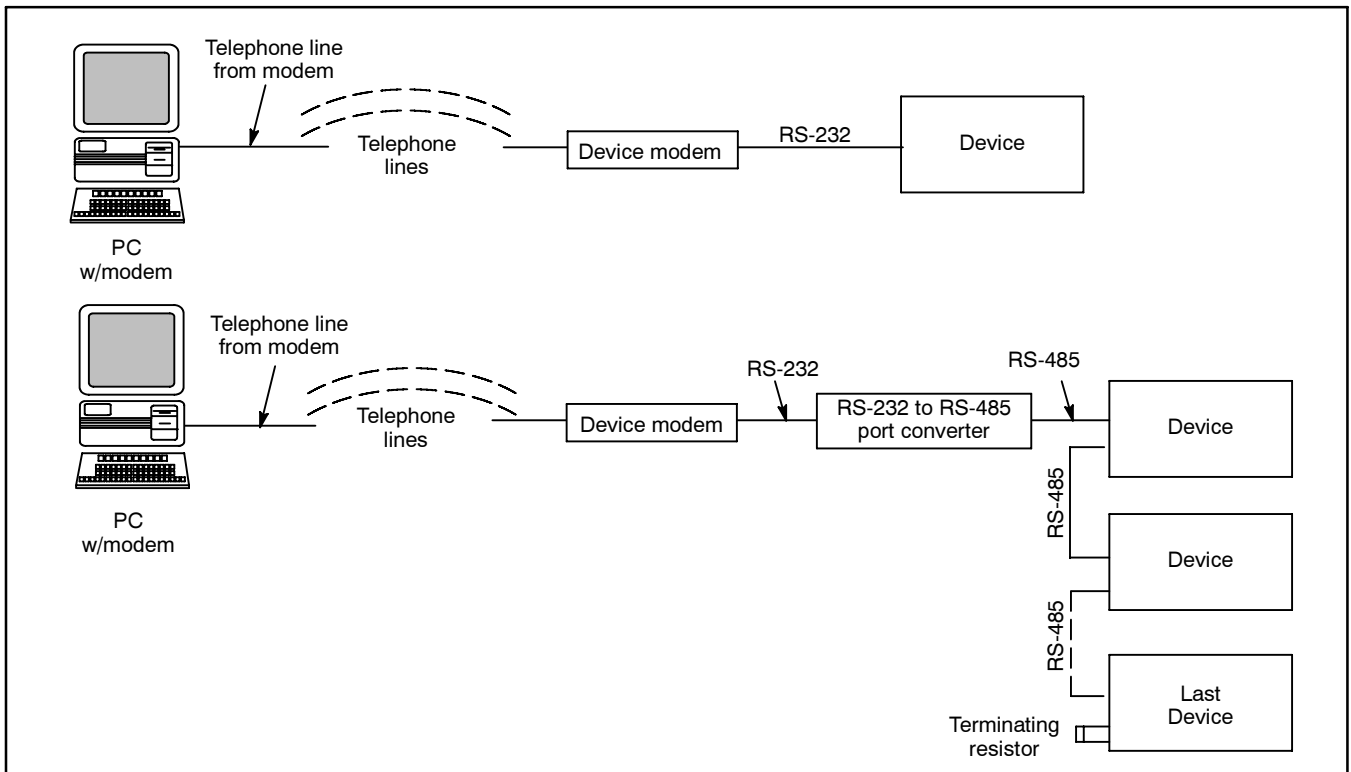
- 550 Controller
- 340 Generator Set Controller
- 340/340+ ATS Controller
- Power Monitor

Use a device modem, an RS-232/RS-485 port converter, and RS-485 cable to connect the following:

- 16-Light Generator Set Controller
- Series 1000 ATS Controllers
- Up to 247 devices in an RS-485 local area network (LAN).

**Note:** The 550 controller can act as an RS-232/RS-485 port converter when the controller is located within 15 m (50 ft.) of the device modem.

The power system manufacturer offers device modems for the power system devices, but does not provide PC modems. Internal or external PC modems must be obtained by the user.



**Figure 2-2** Remote Modem Connections

## Remote Network (Ethernet) Connections

Many facilities use Ethernet networks to connect computers and equipment. The Modbus/Ethernet converter can be used to connect a single power system device or network of devices to an existing Ethernet network. Any remote PC connected to that Ethernet network and running Monitor III can then monitor the device(s).

Use RS-485 cable to connect the devices together and to connect the device network to the Modbus/Ethernet converter. See Figure 2-2 and the connection diagrams in Section 3. The converter is assigned a unique IP address to identify the connected device or network of devices. See Section 11 for instructions. In the device

communication settings, select a Local connection. See Section 9 and the device Operation Manual.

Each Modbus/Ethernet converter can communicate with up to eight IP addresses at a time.

A PC is connected to the site's Ethernet network. The PC used to monitor the device(s) must be equipped with a network interface card (NIC) and set up for Ethernet connection. Obtain the Ethernet hardware for the PC from your computer equipment supplier.

Setting up the Ethernet network and connected computers is the responsibility of the user and is not covered in this documentation.

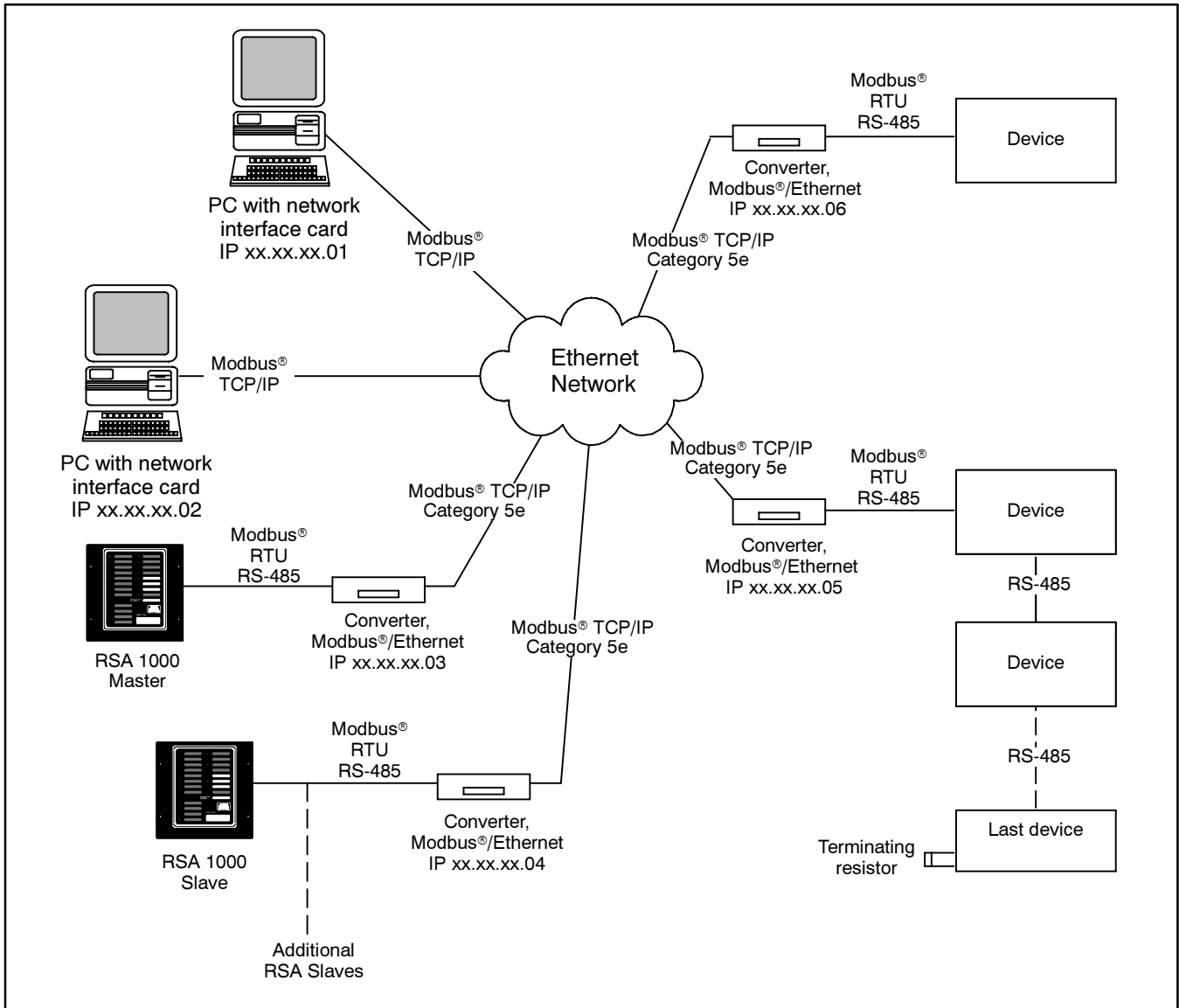
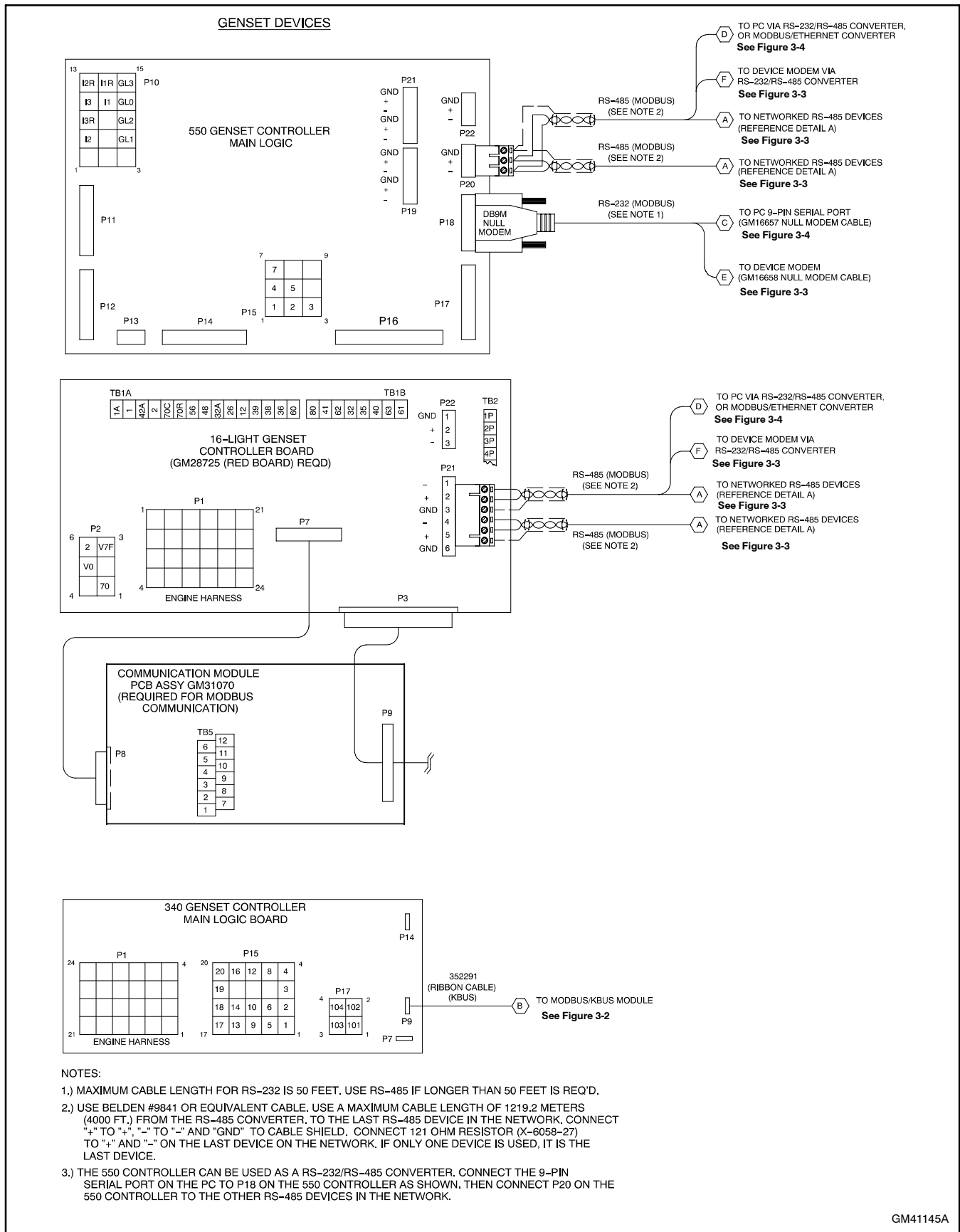


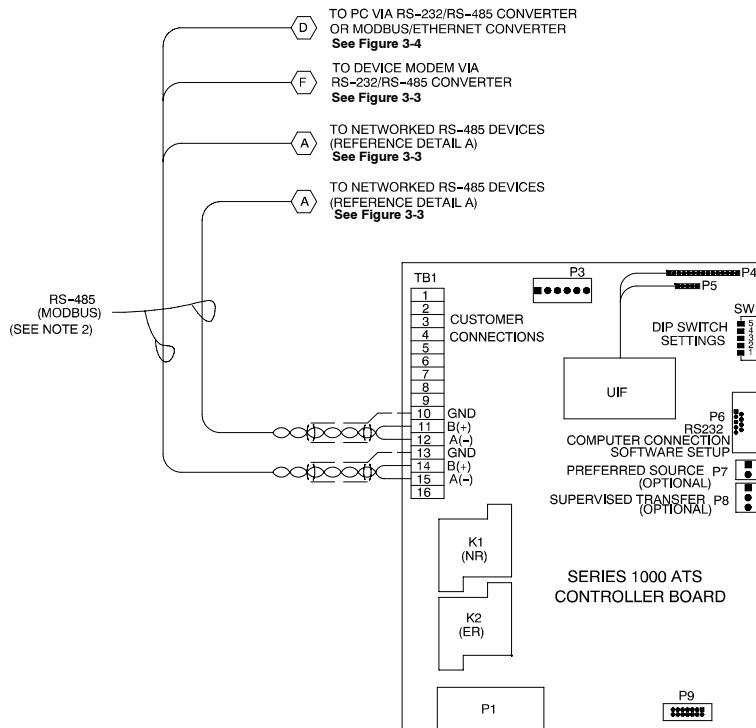
Figure 2-3 Remote Network (Ethernet) Connection

### 3 Connection Diagrams

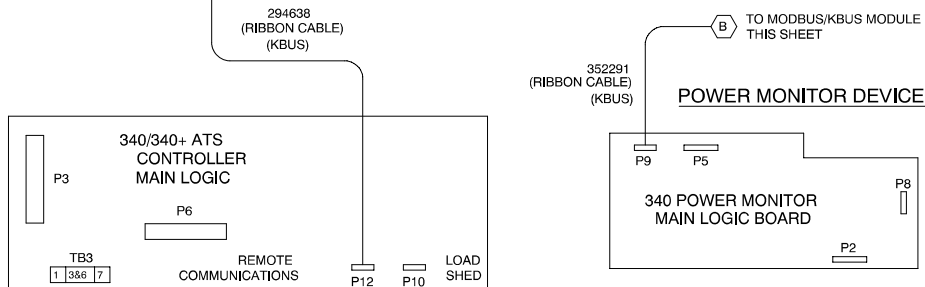
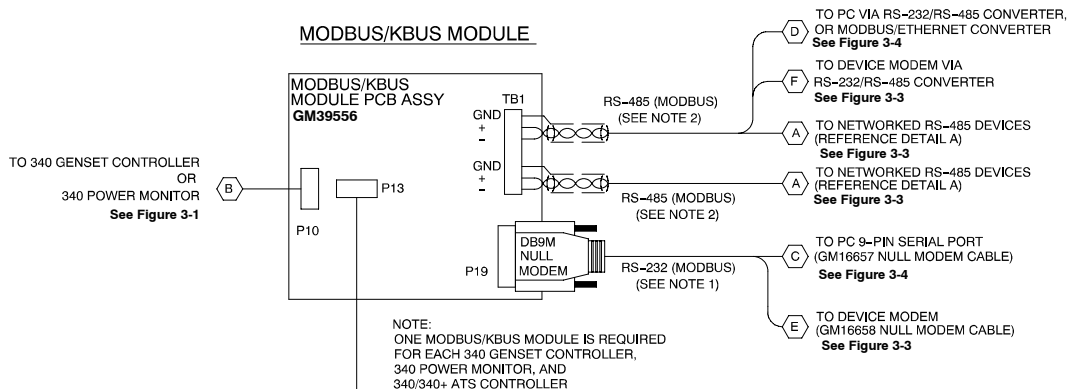


**Figure 3-1** Connection Diagram, Generator Set Controller Connections

**ATS DEVICES**



**MODBUS/KBUS MODULE**



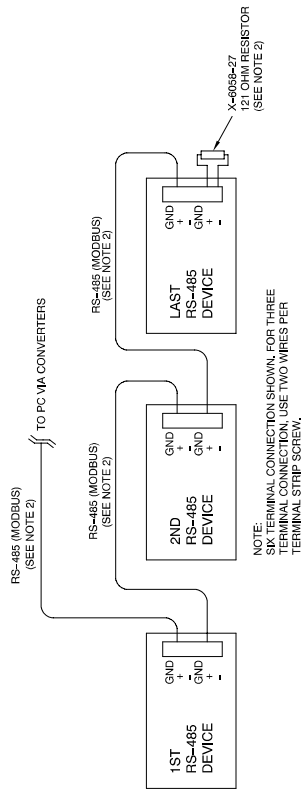
**NOTES:**

- 1.) MAXIMUM CABLE LENGTH FOR RS-232 IS 50 FEET. USE RS-485 IF LONGER THAN 50 FEET IS REQ'D.
- 2.) USE BELDEN #9841 OR EQUIVALENT CABLE. USE A MAXIMUM CABLE LENGTH OF 1219.2 METERS (4000 FT.) FROM THE RS-485 CONVERTER, TO THE LAST RS-485 DEVICE IN THE NETWORK. CONNECT "+" TO "+", "-" TO "-" AND "GND" TO CABLE SHIELD. CONNECT 121 OHM RESISTOR (X-6058-27) TO "+" AND "-" ON THE LAST DEVICE ON THE NETWORK. IF ONLY ONE DEVICE IS USED, IT IS THE LAST DEVICE.

GM41145A

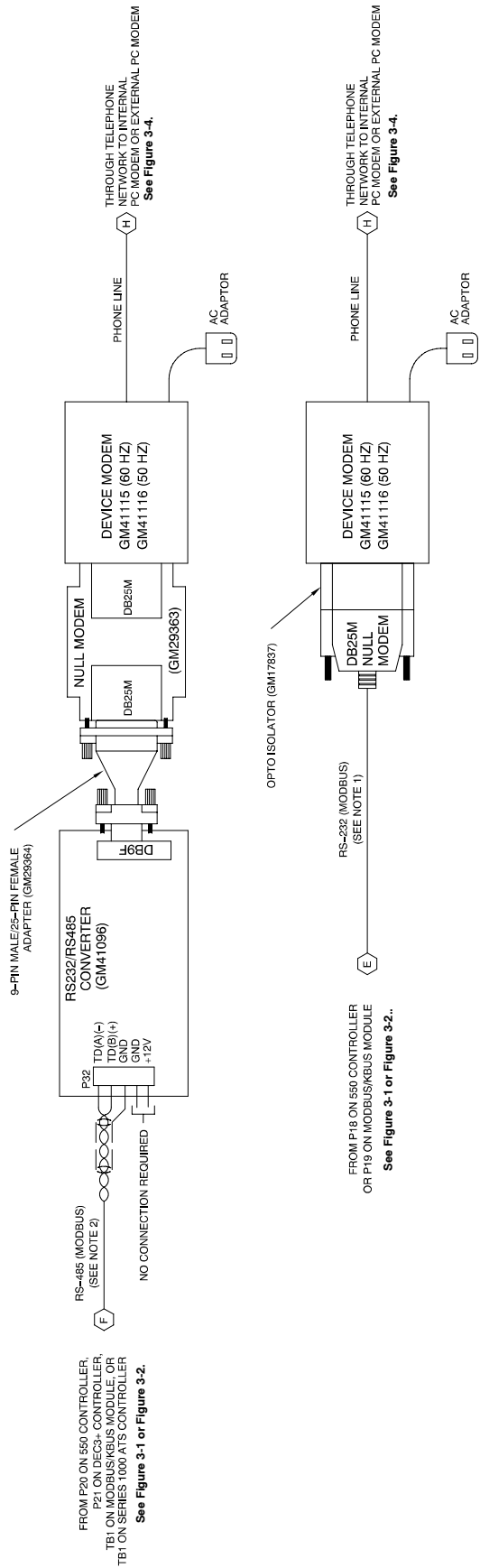
**Figure 3-2** Connection Diagram, ATS Controller, Power Monitor, and Modbus/KBUS Module Connections

**DETAIL A (EXAMPLE OF NETWORKED RS-485 DEVICES)**



**NOTES:**

- 1.) MAXIMUM CABLE LENGTH FOR RS-232 IS 50 FEET. USE RS-485 IF LONGER THAN 50 FEET IS REQD.
- 2.) USE BELDEN #9841 OR EQUIVALENT CABLE. USE A MAXIMUM CABLE LENGTH OF 1213.2 METERS (4000 FEET) PER THE RS-485 CONVERTER. THE LAST RS-485 DEVICE IN THE NETWORK SHOULD BE CONNECTED TO "1", "2", AND "GND" TO CABLE SHIELD. CONNECT 21 OHM RESISTOR (X-6058-27) TO "2", AND "-" ON THE LAST DEVICE ON THE NETWORK. IF ONLY ONE DEVICE IS USED, IT IS THE LAST DEVICE.
- 3.) THE 550 CONTROLLER CAN BE USED AS A RS-232/RS-485 CONVERTER. CONNECT THE 9-PIN SERIAL PORT ON THE PC TO P18 ON THE 550 CONTROLLER AS SHOWN. THEN CONNECT P20 ON THE 550 CONTROLLER TO THE OTHER RS-485 DEVICES IN THE NETWORK.



**Figure 3-3** Connection Diagram, RS-485 and Modem Connections



## 4 Connection Hardware

### 4.1 RS-485 Cables

All RS-485 cables are customer-supplied. Use Belden #9841 or equivalent cable for the RS-485 cables.

Connect one or two RS-485 cables to the detachable green RS-485 port connector as shown in Figure 4-1. Connect the 121-ohm termination resistor across the + and - terminals of the unused port on the last device for reliable communication in all installations.

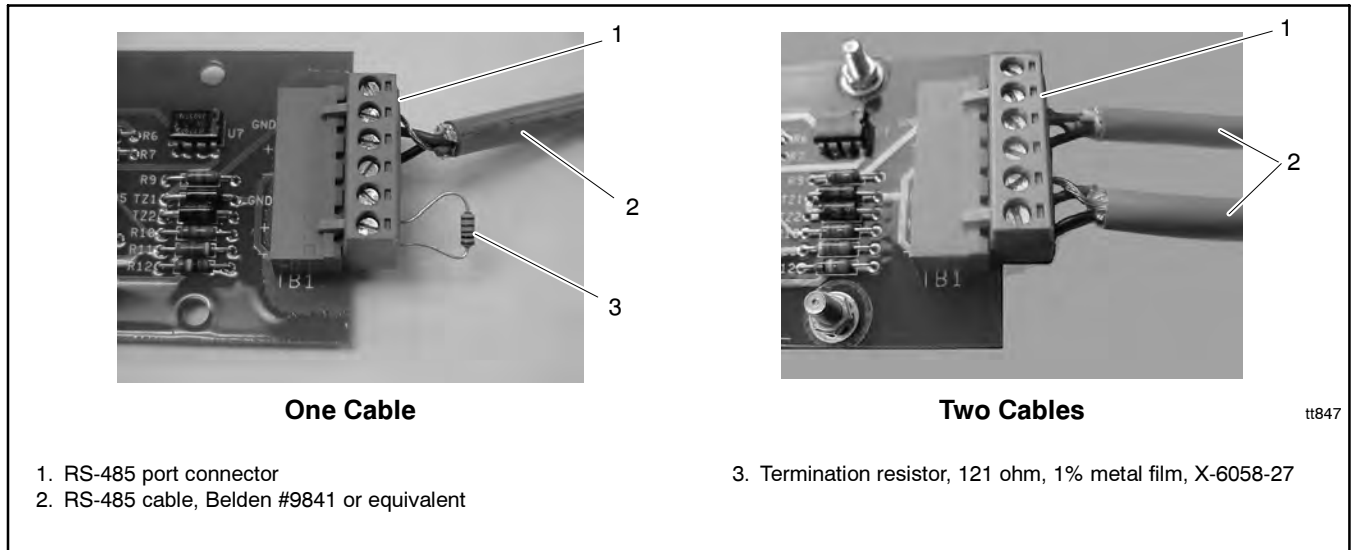


Figure 4-1 RS-485 Cable Connection Details

### 4.2 RS-232 to RS-485 Port Converters

RS-232 to RS-485 port converter GM41096 converts communication signals between the devices or PCs using different electrical standards.

Locate the external RS-232 to RS-485 converter module in an interior area in the building or with equivalent protection from environmental conditions.

Connect the RS-485 cable to the positive (+), negative (-), and ground (GND) terminals as shown in Figure 4-2. Do not connect to the +12V terminal on the converter. (The converter is powered through the PC's serial port.) Do not use a terminating resistor.

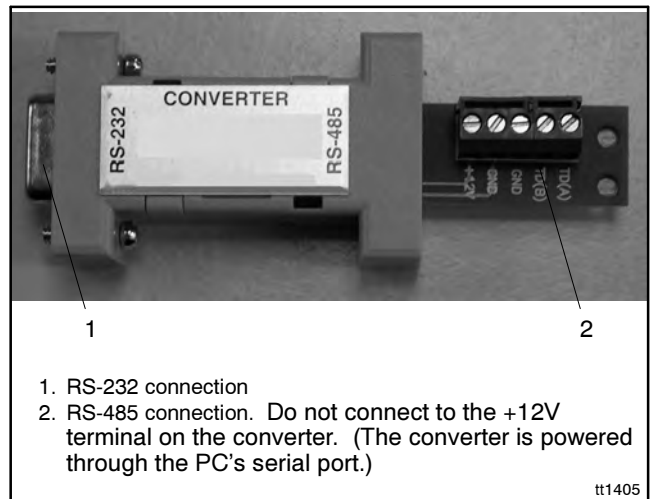


Figure 4-2 RS-232 to RS-485 Port Converter

### 4.3 Device Modems

Device modem GM41115 or GM41116 connects an RS-232 line from a power system controller or power monitor to a telephone line. Figure 4-5 shows the connectors and DIP switches on a typical device modem.

The power system manufacturer configures and programs the device modems. The baud rate is factory set at 19.2K. Further adjustment or programming should not be necessary.

Device modems are set up to automatically answer calls. In the case of operation problems, check the DIP switch settings in Figure 4-3. Adjust the DIP switch settings if needed, disconnect the RS-232 line and telephone lines, and turn the power off and then on again. If the LED indicators do not match the LED status shown in Figure 4-4, replace the modem.

Locate device modems in an interior area in the building or with equivalent protection from environmental conditions. If a standard wall outlet is provided inside an ATS or power monitor, the modem can be placed inside the enclosure.

Connect the device modem as shown in the connection diagrams in Section 3.

**Note:** The software kits with modems include the hardware required to connect any device listed in these instructions to the modem. Refer to the connection diagram for your device and select the cables and connectors required. You will not need to use all the parts in the kit.

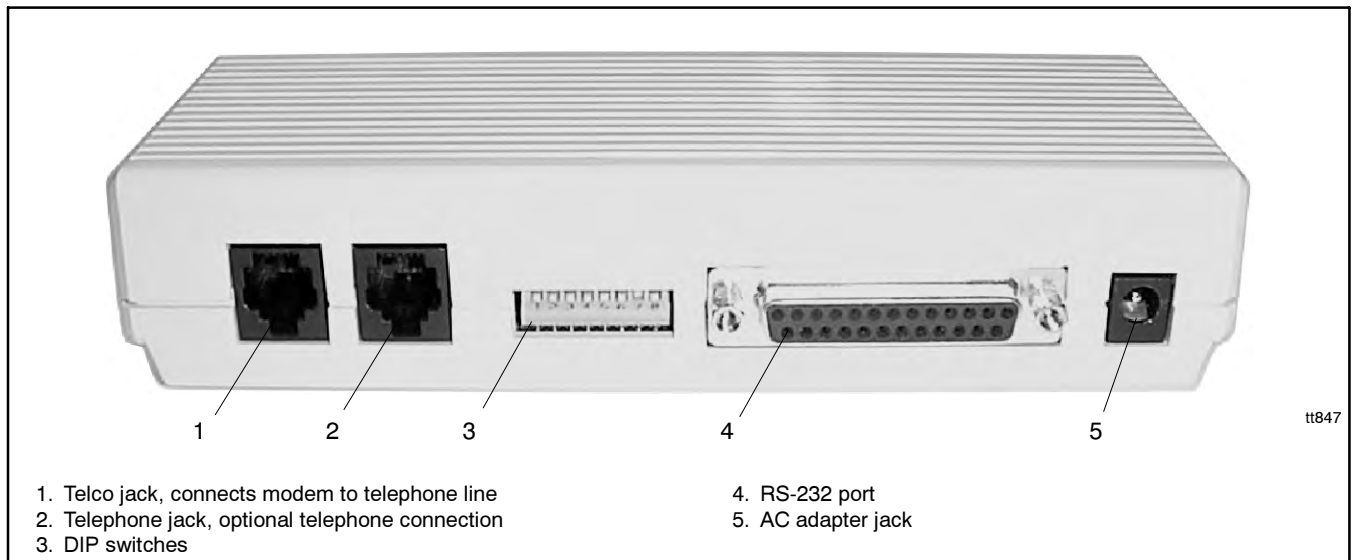
When all connections are made and power is available, place the power switch on front of the modem in the ON position. The modem's front panel LEDs should light as shown in Figure 4-4 when there is no communication activity. Adjust the volume control located on the side of the modem if desired.

| Switch | Device Modem    |                 |
|--------|-----------------|-----------------|
|        | GM41115 (60 Hz) | GM41116 (50 Hz) |
| 1      | Down            | Down            |
| 2      | Down            | Down            |
| 3      | Down            | Down            |
| 4      | Down            | Down            |
| 5      | Down            | Up              |
| 6      | Down            | Down            |
| 7      | Up              | Up              |
| 8      | Down            | Down            |
| 9      | —               | Down            |
| 10     | —               | Up              |

**Figure 4-3** Default Modem DIP Switch Settings

| Modem              | Front Panel LED |    |     |     |    |    | ARQ/FAX |
|--------------------|-----------------|----|-----|-----|----|----|---------|
|                    | AA              | CD | RD  | SD  | TR | CS |         |
| GM41115 or GM41116 | On              | On | Off | Off | On | On | Off     |

**Figure 4-4** Idle LED Status



**Figure 4-5** External Modem (typical), Rear View

## 5 Series 340 Device Connection

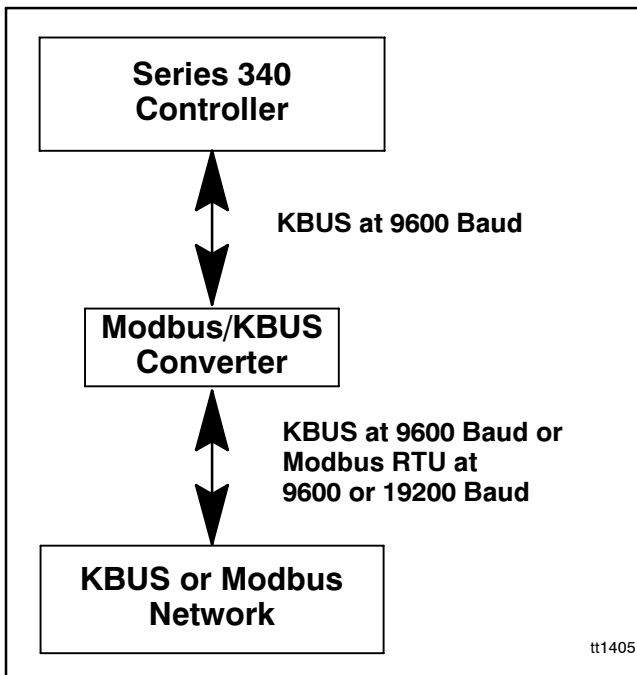
Series 340 devices include the following controllers:

- 340/Digital generator set controller
- 340/340+ or MATS/MATS+ microprocessor-based transfer switch controller
- Power monitor

### 5.1 Modbus/KBUS Converter Kits

Monitor III power system monitoring software uses Modbus® protocol to communicate with connected generator set controllers, transfer switch controllers, and power monitors. All Series 340 devices require the installation of Modbus/KBUS converter kits to enable Modbus communication.

The Modbus/KBUS converter replaces RS-232 and RS-485 communication modules for the controllers listed above. The Modbus/KBUS converter can be configured for either Modbus or KBUS communication. See Figure 5-1.



**Figure 5-1** Modbus/KBUS Converter Function

Modbus® is a registered trademark of Schneider Electric.

The Modbus/KBUS converter replaces the RS-232 and RS-485 communication modules formerly used for KBUS communication in series 340 devices. If your device is equipped with one of the older communication modules, remove the old communication module and ribbon cable before installing the new Modbus/KBUS converter and ribbon cable.

Follow the instructions in Section 5.2 to set the converter for KBUS or Modbus communication before installation.

### 5.2 Modbus/KBUS Converter Setup

Before installing the converter module inside the device enclosure, set the DIP switches on printed circuit board GM39556 as described here. See Figure 5-2.

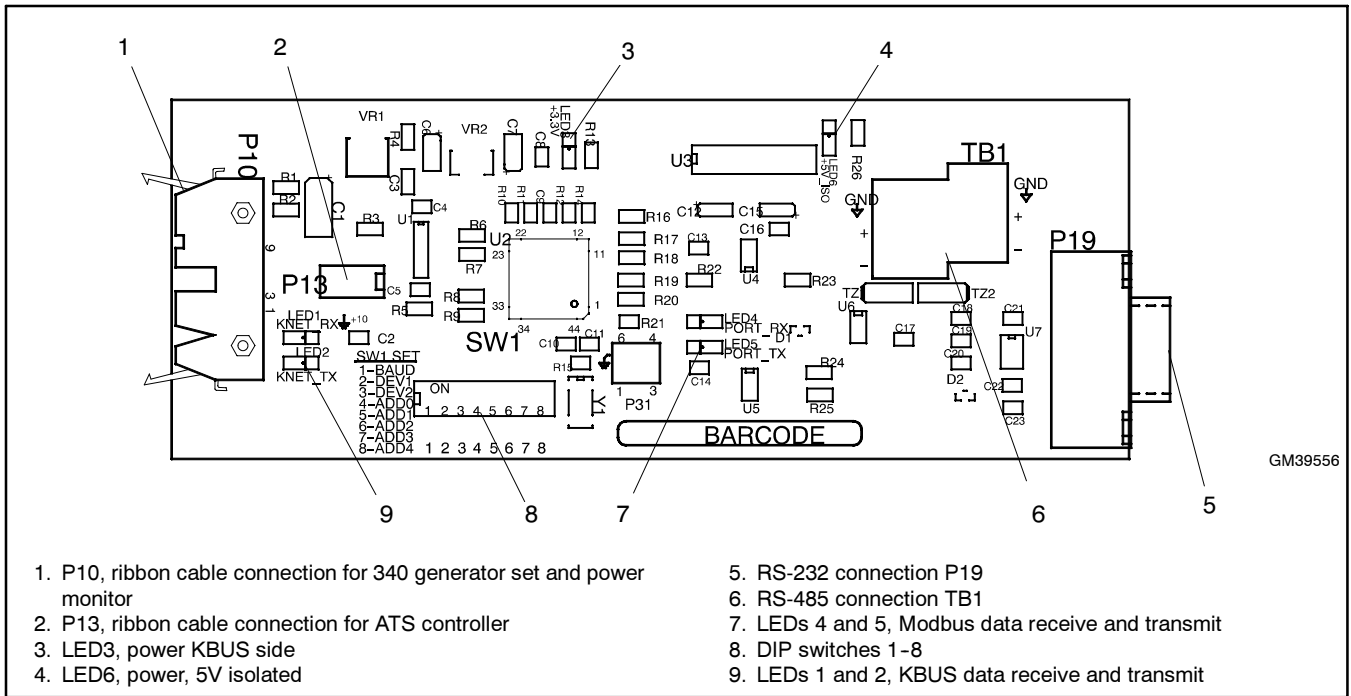
If the DIP switch settings need to be changed after converter module installation, first disconnect power to the converter module, change the DIP switch settings, and then reconnect power to reset the converter module.

#### Modbus/KBUS Converter DIP Switch Settings

1. Set DIP switch 1 to select the Modbus baud rate. See Figure 5-3.

**Note:** DIP switch 1 sets the Modbus baud rate, which must match the baud rates of other devices in the system. The KBUS baud rate is set at 9600 through the device communications settings and can be different from the Modbus baud rate. See Section 9.

2. Set DIP switches 2 and 3 to identify the type of device. See Figure 5-4. Use the settings for a simple KBUS converter for communication with the old Monitor II software or other KBUS applications.
3. Set the ADDR DIP switches 4-8 to assign the network address. See Figure 5-5. Each device in the system must have a unique network address.



**Figure 5-2** Modbus/KBUS Converter Board

| DIP Switch | Function         | Setting            |
|------------|------------------|--------------------|
| 1          | Modbus baud rate | OFF=19200, ON=9600 |
| 2, 3       | Device type      | See Figure 5-4.    |
| 4-8        | Network address  | See Figure 5-5.    |

**Figure 5-3** DIP Switch Functions

| Device                         | Output Protocol | Switch Settings |          |
|--------------------------------|-----------------|-----------------|----------|
|                                |                 | 2 (DEV1)        | 3 (DEV2) |
| Simple KBUS converter *        | KBUS            | ON              | ON       |
| 340 Generator Set Controller † | Modbus          | OFF             | ON       |
| 340 ATS Controller †           | Modbus          | ON              | OFF      |
| Power Monitor †                | Modbus          | OFF             | OFF      |

\* For Monitor II or other KBUS applications for all 340 devices  
 † For Monitor III or other Modbus applications

**Figure 5-4** Device DIP Switch Settings

| Network Address | Port Data<br>(for reference only) | DIP 4 | DIP 5 | DIP 6 | DIP 7 | DIP 8 |
|-----------------|-----------------------------------|-------|-------|-------|-------|-------|
|                 |                                   | ADDR0 | ADDR1 | ADDR2 | ADDR3 | ADDR4 |
| 1               | 00000                             | on    | on    | on    | on    | on    |
| 2               | 00001                             | OFF   | on    | on    | on    | on    |
| 3               | 00010                             | on    | OFF   | on    | on    | on    |
| 4               | 00011                             | OFF   | OFF   | on    | on    | on    |
| 5               | 00100                             | on    | on    | OFF   | on    | on    |
| 6               | 00101                             | OFF   | on    | OFF   | on    | on    |
| 7               | 00110                             | on    | OFF   | OFF   | on    | on    |
| 8               | 00111                             | OFF   | OFF   | OFF   | on    | on    |
| 9               | 01000                             | on    | on    | on    | OFF   | on    |
| 10              | 01001                             | OFF   | on    | on    | OFF   | on    |
| 11              | 01010                             | on    | OFF   | on    | OFF   | on    |
| 12              | 01011                             | OFF   | OFF   | on    | OFF   | on    |
| 13              | 01100                             | on    | on    | OFF   | OFF   | on    |
| 14              | 01101                             | OFF   | on    | OFF   | OFF   | on    |
| 15              | 01110                             | on    | OFF   | OFF   | OFF   | on    |
| 16              | 01111                             | OFF   | OFF   | OFF   | OFF   | on    |
| 17              | 10000                             | on    | on    | on    | on    | OFF   |
| 18              | 10001                             | OFF   | on    | on    | on    | OFF   |
| 19              | 10010                             | on    | OFF   | on    | on    | OFF   |
| 20              | 10011                             | OFF   | OFF   | on    | on    | OFF   |
| 21              | 10100                             | on    | on    | OFF   | on    | OFF   |
| 22              | 10101                             | OFF   | on    | OFF   | on    | OFF   |
| 23              | 10110                             | on    | OFF   | OFF   | on    | OFF   |
| 24              | 10111                             | OFF   | OFF   | OFF   | on    | OFF   |
| 25              | 11000                             | on    | on    | on    | OFF   | OFF   |
| 26              | 11001                             | OFF   | on    | on    | OFF   | OFF   |
| 27              | 11010                             | on    | OFF   | on    | OFF   | OFF   |
| 28              | 11011                             | OFF   | OFF   | on    | OFF   | OFF   |
| 29              | 11100                             | on    | on    | OFF   | OFF   | OFF   |
| 30              | 11101                             | OFF   | on    | OFF   | OFF   | OFF   |
| 31              | 11110                             | on    | OFF   | OFF   | OFF   | OFF   |
| 32              | 11111                             | OFF   | OFF   | OFF   | OFF   | OFF   |

**Figure 5-5** Network Address DIP Switch Settings (DIP switches 4-8)

### Diagnostic LEDs

Six LEDs on the circuit board indicate power and communication as shown in Figure 5-6.

| LED | Color | Description               |
|-----|-------|---------------------------|
| 1   | Amber | KBUS (KNET) data receive  |
| 2   | Amber | KBUS (KNET) data transmit |
| 3   | Red   | Power, 3.3V KNET side     |
| 4   | Amber | Modbus data receive       |
| 5   | Amber | Modbus data transmit      |
| 6   | Red   | Power, 5V isolated        |

**Figure 5-6** Diagnostic LEDs

## 5.3 Modbus/KBUS Converter Installation and Connection Procedure

Set up the converter module using the instructions in Section 5.2 before installing the converter.

Figure 5-8 through Figure 5-16 illustrate converter installation for the different devices. Refer to the illustrations for your device during installation.

1. Disable generator sets and disconnect all power sources.
  - a. Place all generator set master switches in the OFF position.
  - b. Disconnect the power to all battery chargers, if equipped.
  - c. Disconnect all generator set engine starting battery(ies), negative (-) leads first.
  - d. Disconnect all power sources to transfer switches or power monitors.
  - e. Turn off and disconnect the power to all devices in the system.
2. Locate ports and prepare to install converter modules in each device.
  - a. Open the device enclosure and find the port location or module installation location for each device.

Use Figure 5-8 through Figure 5-16, shown immediately after this Installation Procedure, to determine where to install converter modules and/or connect cables.

- b. Remove protective covers to access the port or module mounting location, if required.

**Note:** The device may have a communication module installed at the converter location. Remove the communication module and ribbon cable. The new converter replaces the old communication module.

3. Connect the ribbon cable included in the kit to the converter module.

**ATS controller only:** Connect ribbon cable 294638 to P13 on the converter module. See Figure 3-2.

**340 generator set controller and power monitor only:** Connect ribbon cable 352291 to P10 on the converter module. See Figure 3-2.

4. Install the converter module.
  - a. Install the spacers included with the kit on the mounting studs on the device or cover. Use Figure 5-7 to identify the correct spacer length for your device.

| Device                   | Spacer                   |             |
|--------------------------|--------------------------|-------------|
|                          | Description              | Part number |
| Generator Set Controller | Spacer, .25 OD, .937 in. | X-712-14    |
| Power Monitor            | Spacer, .25 OD, .375 in. | X-712-13    |
| ATS Controller           | Spacer, .25 OD, .625 in. | X-712-8     |

**Figure 5-7** Spacers

- b. Carefully place converter circuit board GM39556 onto the mounting studs through the holes provided in the module. Refer to the corresponding figures shown immediately following this procedure for the circuit board orientation.
- c. Install a lock washer X-22-7 and a nut X-72-4 on each stud and carefully tighten the nut. Overtightening the nuts can damage the module.
- d. **Power monitor only:** Place cover 294719 from the kit over the module so that the two longer studs pass through the holes provided. Place a lock washer and a nut on each of the studs and tighten the nuts to hold the cover on. Overtightening the nuts can damage the cover and/or the module.
5. Carefully connect the loose end of the ribbon cable included in the kit to the device circuit board as shown in the corresponding figure.

**ATS controller only:** Connect the loose end of ribbon cable 294638 to P12 on the controller's main logic board. See Figure 3-2.

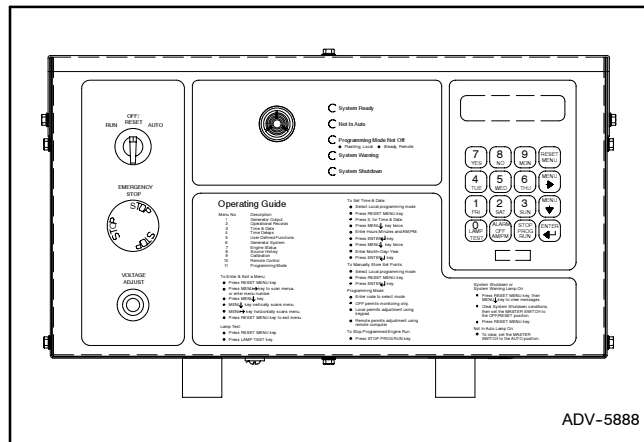
**340 generator set controller and power monitor:** Connect the loose end of ribbon cable 352291 to P9 on the device's main logic board. See Figure 3-2.

6. Connect the RS-232 or RS-485 cable to each device. See the connection diagrams in Section 3.

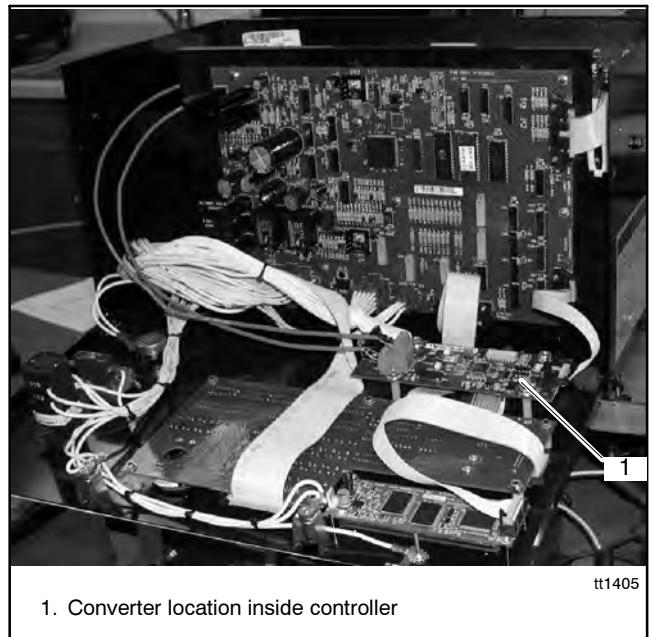
**Note:** Monitor III software kits include one RS-232 cable: GM16657 for connection to the PC or GM16658 for connection to the device modem. Shielded RS-485 cable is customer-supplied.

7. Replace the covers.
  - a. Replace the protective covers removed in step 2 and tighten the cover screws.
  - b. Close and lock the enclosure doors on all system devices.
8. Make final connections to the PC. See the connection diagrams in Section 3.
9. Enable generator sets and restore power.
  - a. Check that the generator set master switches are in the OFF position.
  - b. Reconnect power to the battery charger(s), if equipped.
  - c. Reconnect the generator set engine starting batteries, negative (-) leads last.
10. Proceed to Section 9 to configure the controller's communication parameters.

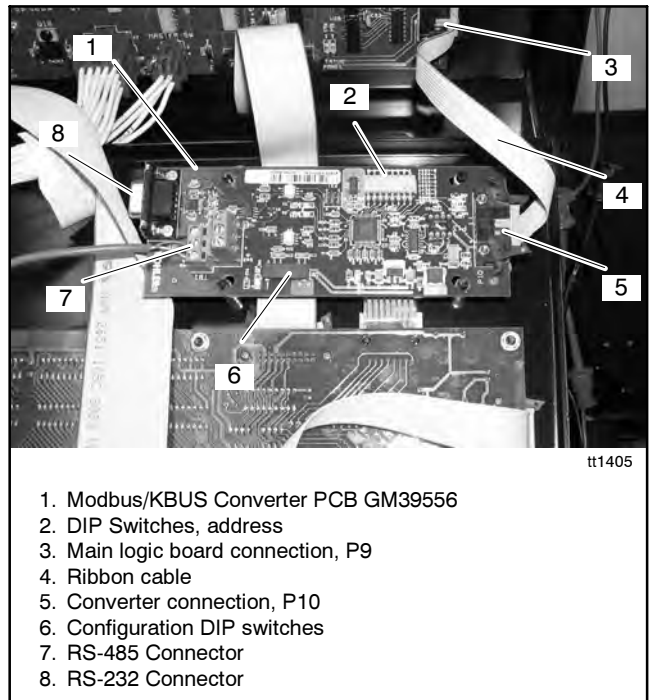
### 340 Generator Set Controller Modbus/KBUS Converter Kit Installation



**Figure 5-8** 340 Generator Set Controller



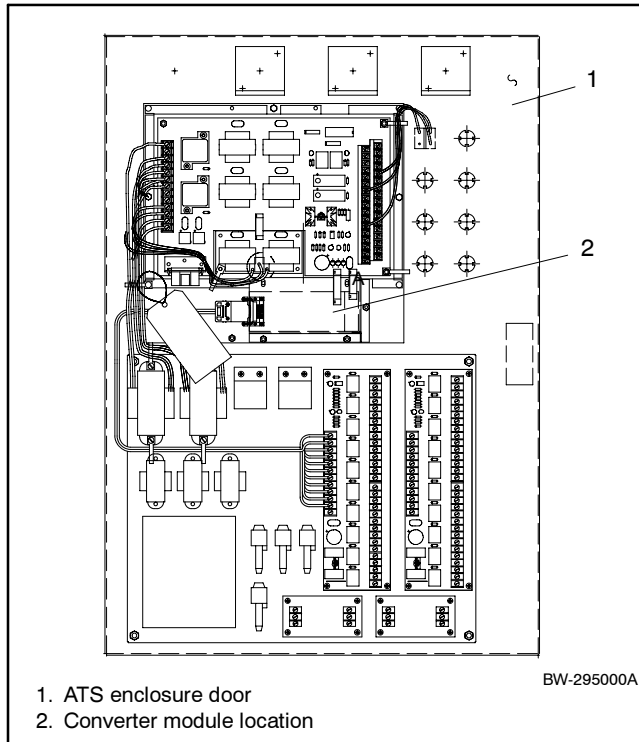
**Figure 5-9** Modbus/KBUS Converter Installation for the 340 Generator Set Controller



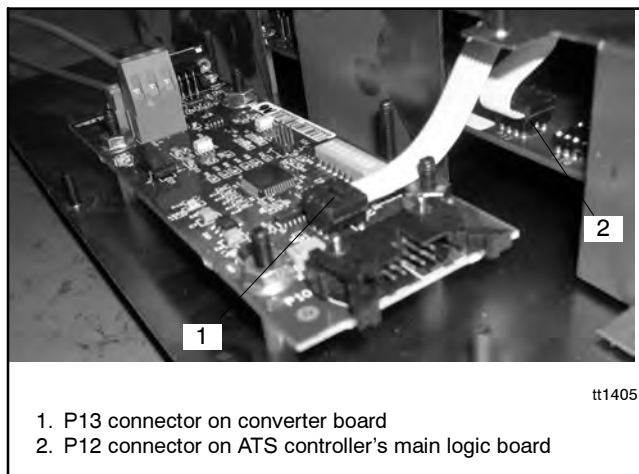
**Figure 5-10** Converter Connections and DIP Switches

### 340/340+ Microprocessor-Based ATS Controller Modbus/KBUS Converter Module Installation

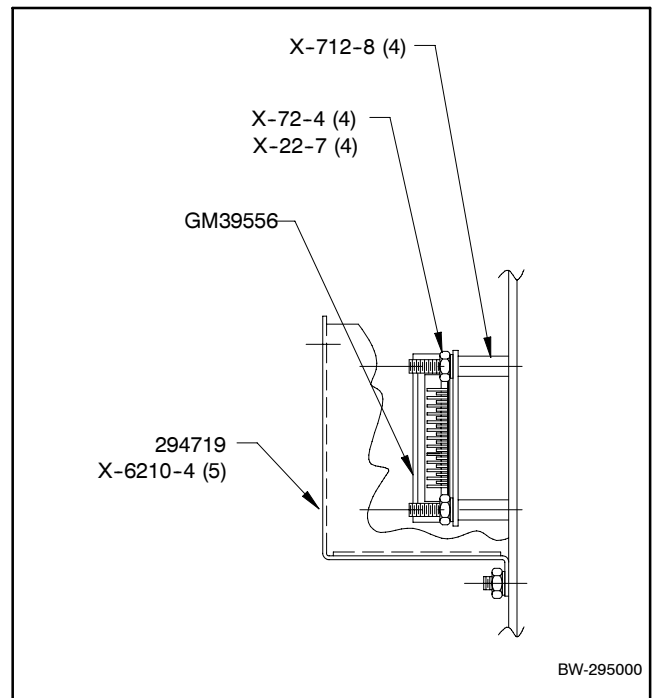
Mount Modbus/KBUS converter module GM39556 on mounting studs located below the main controller housing. If the ATS is equipped with a load shed accessory KD-35N or DD-35N, mount the converter module over it as shown in Figure 5-14. Install cover 294719 over the assembly as shown in Figure 5-13 or Figure 5-14.



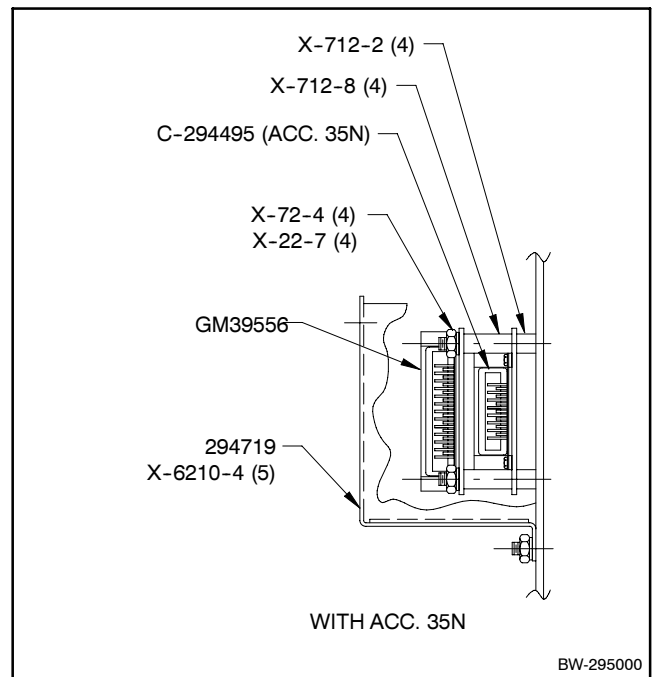
**Figure 5-11** Converter Module Location for Series 340 Microprocessor-Based ATS Controllers



**Figure 5-12** Ribbon Cable Connection

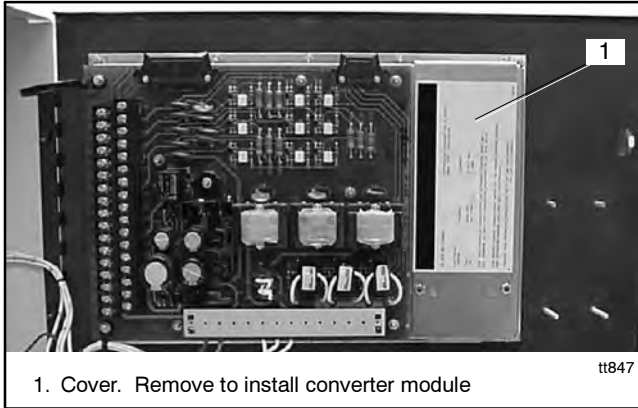


**Figure 5-13** Converter Module Installation Details for ATS Controllers Without Load Shed Accessory 35N

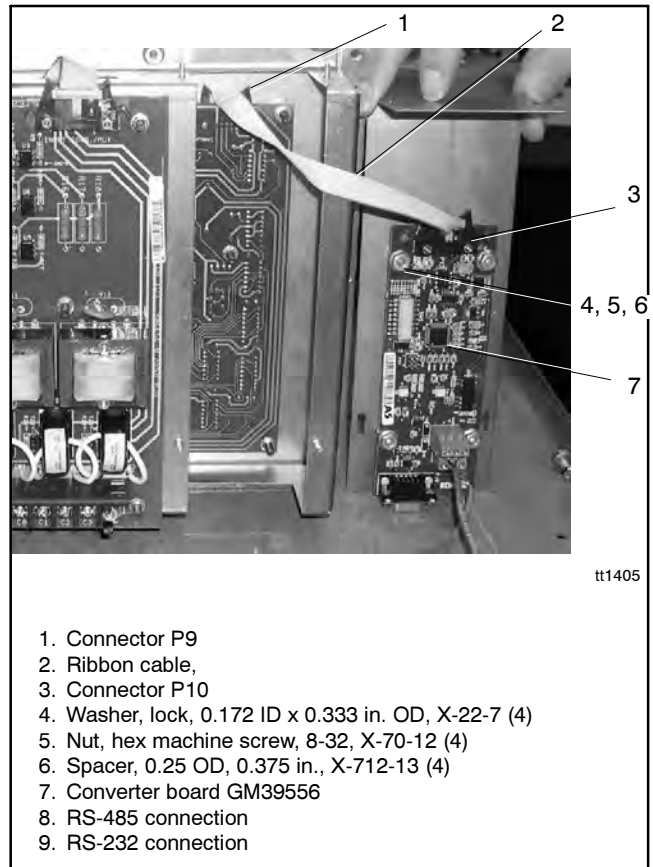


**Figure 5-14** Converter Module Installation Details for ATS Controllers With Load Shed Accessory 35N

## Power Monitor Modbus/KBUS Converter Kit Installation



**Figure 5-15** Converter Module Location and Connection for the Power Monitor



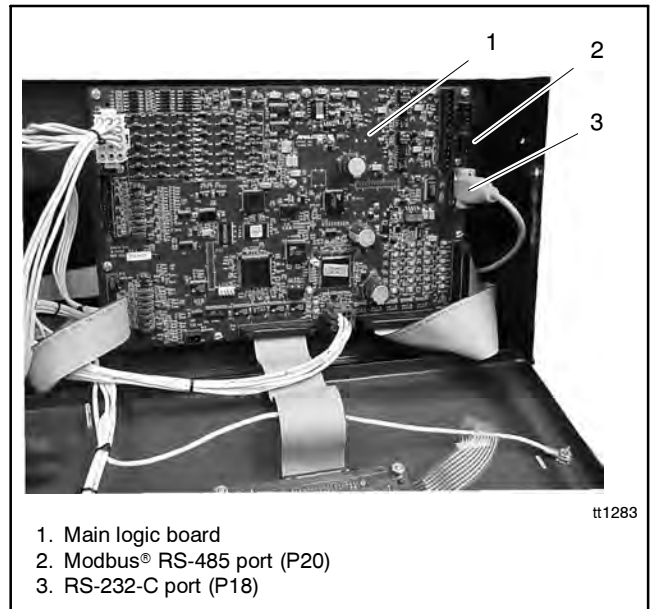
**Figure 5-16** Converter Module Installation Details for the Power Monitor

## 6 550 Generator Set Controller Connection

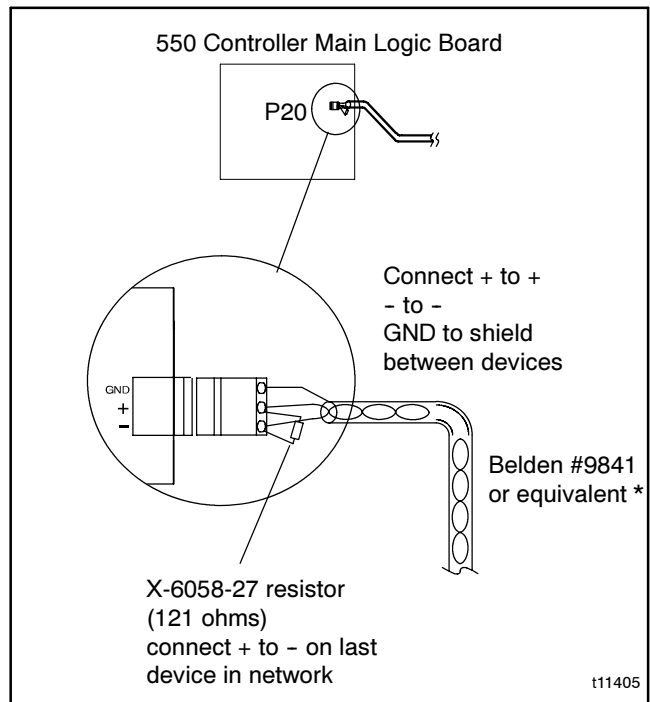
Use the following procedure to connect the hardware. Observe the safety precautions.

### 550 Controller Connection Procedure

1. Place the generator set master switch in the OFF position.
  2. Disconnect the power to the battery charger, if equipped.
  3. Disconnect the generator set engine starting battery(ies), negative (-) lead first.
  4. Turn off and disconnect the power to all devices in the system.
  5. Open the enclosure and locate the connection ports as shown in Figure 6-1 and Figure 6-3.
  6. Make connections to the desired controller port(s). For RS-232 connections, use connector P18. For RS-485 connections, use the Modbus® RS-485 connector, P20.
- Note:** Connectors P19 and P21 are used for other applications.
7. Close the controller enclosure.
  8. Check that the generator set master switch is in the OFF position.
  9. Reconnect the generator set engine starting battery, negative (-) lead last.
  10. Reconnect power to the battery charger, if equipped.
  11. Proceed to Section 9 to configure the controller's communication parameters.



**Figure 6-1** Communication Port Locations for the 550 Generator Set Controller



**Figure 6-2** RS-485 Connector Details

MAIN LOGIC BOARD

P18 RS232 CONNECTIONS

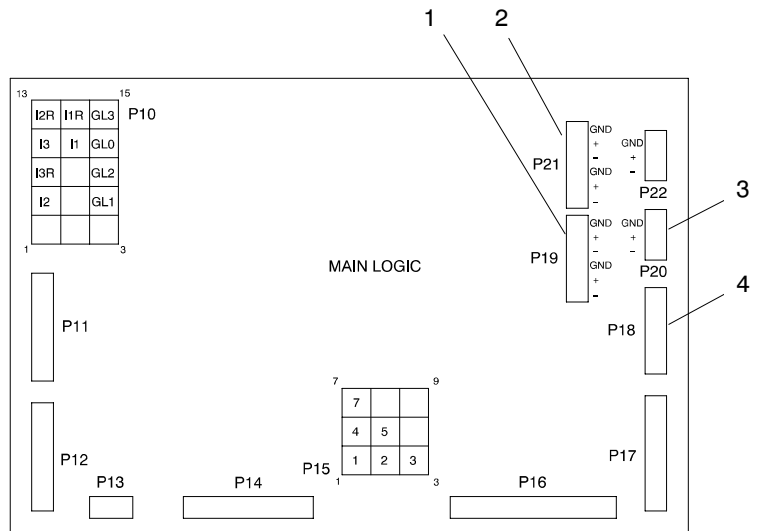
- P18-1 CD
- P18-2 RX
- P18-3 TX
- P18-4 DTR
- P18-5 GROUND
- P18-6 DSR
- P18-7 RTS
- P18-8 CTS
- P18-9 RI

P20 RS485 NON-ISOLATED CONNECTIONS

- P20-1 GND
- P20-2 +
- P20-3 -

P21 RS485A ISOLATED CONNECTIONS

- P21-1 GND
- P21-2 +
- P21-3 -
- P21-4 GND
- P21-5 +
- P21-6 -





ADV-6602B-

1. P19 spare connector for factory use
2. P21 RS-485 KBUS isolated connections
3. P20 RS-485 Modbus® non-isolated connections
4. P18 RS-232 non-isolated connections

**Figure 6-3** 550 Controller Communication Connections Pin Identification

## 7 Series 1000 ATS Controller Connection

|   |
|---|
|  <b>DANGER</b>   |
|    |
| <p><b>Hazardous voltage.</b><br/> <b>Will cause severe injury or death.</b></p> <p>Disconnect all power sources before opening the enclosure.</p> |

**Short circuits. Hazardous voltage/current can cause severe injury or death.** Short circuits can cause bodily injury and/or equipment damage. Do not contact electrical connections with tools or jewelry while making adjustments or repairs. Remove all jewelry before servicing the equipment.

Series 1000 programmable transfer switch controllers can be connected directly to a personal computer through an RS-485 connection or connected from a remote site using modems and RS-485 connections. An RS-232 to RS-485 converter is required to connect the controller's RS-485 connection to the PC serial port or to connect the transfer switch controller to the device modem. See Section 3 for connection diagrams.

**Note:** Version 1.21 or higher of the ATS controller's application software is required for the Monitor III program to communicate successfully with the transfer switch. Check the software version number in the System Information data window. See the Monitor III software Operation Manual for instructions.

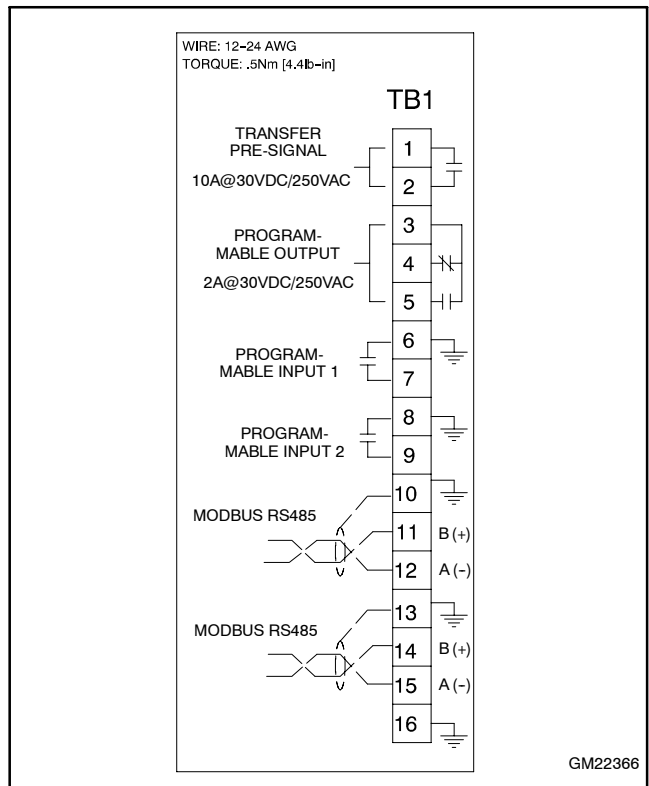
Use the following procedure to connect up to 247 transfer switches in an RS-485 network.

### Transfer Switch Network Connection Procedure

1. Locate terminal strip TB1 on the controller's main logic board. See Figure 7-1.
2. Connect the incoming RS-485 cable to terminals TB1-11 and TB1-12. Connect the cable shield to the ground terminal, TB1-10. See Figure 7-2.
3. If there is more than one transfer switch in the network, connect the outgoing RS-485 cable to terminals TB1-14 and TB1-15. Connect A (-) to A (-) and B (+) to B (+). Connect the cable shield to the ground terminal, TB1-13.
4. Tighten the connections to 0.5 Nm (4.4 in. lb.).
5. Proceed to Section 9 to configure the controller's communication parameters.



**Figure 7-1** 1000 ATS Controller (cover removed)



**Figure 7-2** Terminal Strip TB1 Connections

## 8 16-Light Generator Set Controller Connection

This section describes how to connect the controller to other devices in a Modbus® network and set the controller's network address.

### 8.1 Communications Board

The communications board is required for Modbus® communication with this controller. The communications board is available either factory-installed or as a field-installed kit. A ribbon cable connects the communications board to the controller's main logic board. Follow the instructions provided with the kit to install and connect the board, if necessary.

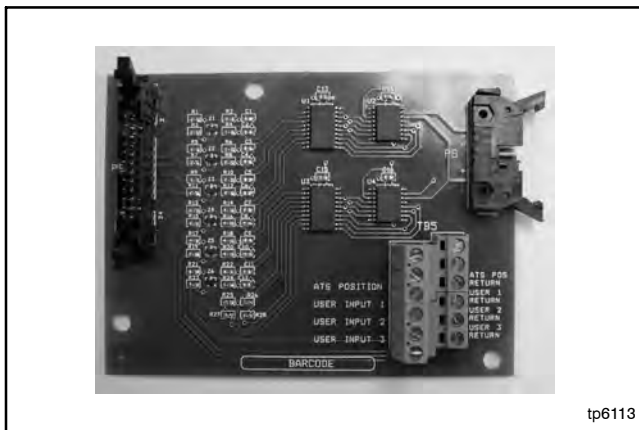
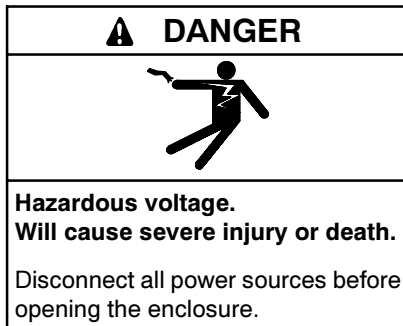


Figure 8-1 Communications Board



#### NOTICE

**Electrostatic discharge damage.** Electrostatic discharge (ESD) damages electronic circuit boards. Prevent electrostatic discharge damage by wearing an approved grounding wrist strap when handling electronic circuit boards or integrated circuits. An approved grounding wrist strap provides a high resistance (about 1 megohm), *not a direct short*, to ground.

Connect to the TB5 connector on the controller board. See Figure 8-2. Use Belden #9841 or equivalent cable to connect devices in a network. Attach to the RS-485 connector as shown in Figure 6-2. Use a termination resistor on the last device in the network.

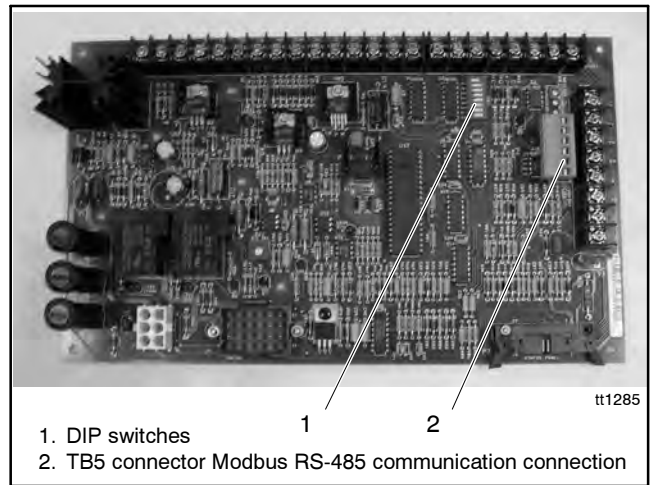


Figure 8-2 16-Light Controller Circuit Board

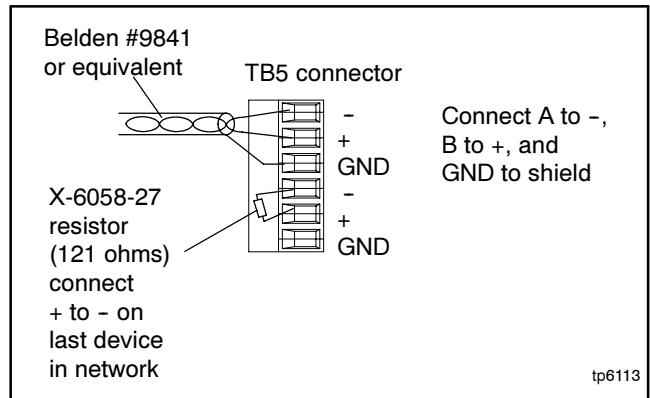


Figure 8-3 RS-485 Connection Details

## 8.2 Network Address

Each Modbus® device in the network requires a unique address. The 16-Light Controller circuit board contains eight DIP switches. See Figure 8-2 for the DIP switch location on the controller circuit board.

Use DIP switches 6, 7, and 8 to set the controller's network address as described below. Figure 8-4 shows the DIP switch positions for each address number.

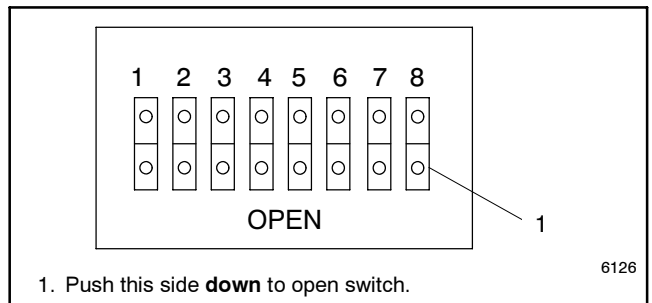
**Note:** The network address for the 16-Light Controller is limited to odd numbers between 1 and 15.

Push down the end of the DIP switch near the OPEN label to open the switch, or push down the other end to close it. See Figure 8-5.

**Note:** After changing the DIP switch settings, be sure to power down and then power up the controller (disconnect and then reconnect the battery or use the prime power switch, if equipped). The controller recognizes DIP switch changes only at powerup.

| Modbus®<br>Address | DIP Switches |           |           |
|--------------------|--------------|-----------|-----------|
|                    | 6            | 7         | 8         |
|                    | Value = 2    | Value = 4 | Value = 8 |
| 1                  | Open         | Open      | Open      |
| 3                  | Closed       | Open      | Open      |
| 5                  | Open         | Closed    | Open      |
| 7                  | Closed       | Closed    | Open      |
| 9                  | Open         | Open      | Closed    |
| 11                 | Closed       | Open      | Closed    |
| 13                 | Open         | Closed    | Closed    |
| 15                 | Closed       | Closed    | Closed    |

**Figure 8-4** 16-Light Controller Network Address DIP Switches



**Figure 8-5** DIP Switch Open Position

## 9 Remote Serial Annunciator (RSA 1000) Connection

These instructions explain connection of an RSA 1000 through an Ethernet network. For all other RSA 1000 connections and additional instructions, refer to the instruction sheet provided with the RSA 1000, TT-1377.

RSA 1000 version 2.00 or higher is required for network communication. Check the decal on the circuit board for the version number. The Modbus/Ethernet converter must have firmware version 2.0 or higher. See the Device Details screen in the DeviceInstaller software, Section 11.2.

Set RSA DIP switch 5 to the ON position for Ethernet network communication with the Modbus/Ethernet converter. Set DIP switch 4 for master or slave as needed.

A system can have one RSA master and up to three RSA slaves. The converter can have a maximum of 8 connections. Refer to Section 11 for instructions to set the Modbus/Ethernet converter for an RSA master or an RSA slave.

Each Modbus/Ethernet converter in the system must have a different IP address. Obtain IP addresses from your system administrator. See Section 11 .

| Modbus/Ethernet Converter Power Supply               | RSA 1000 Isolation Jumper T3    |
|--|---------------------------------|
| DC adapter provided with converter kit (isolated)    | Connect T3 to T2 (non-isolated) |
| Engine starting battery or other non-isolated supply | Connect T3 to T1 (isolated)     |

Figure 9-1 RSA 1000 T3 Isolation Jumper

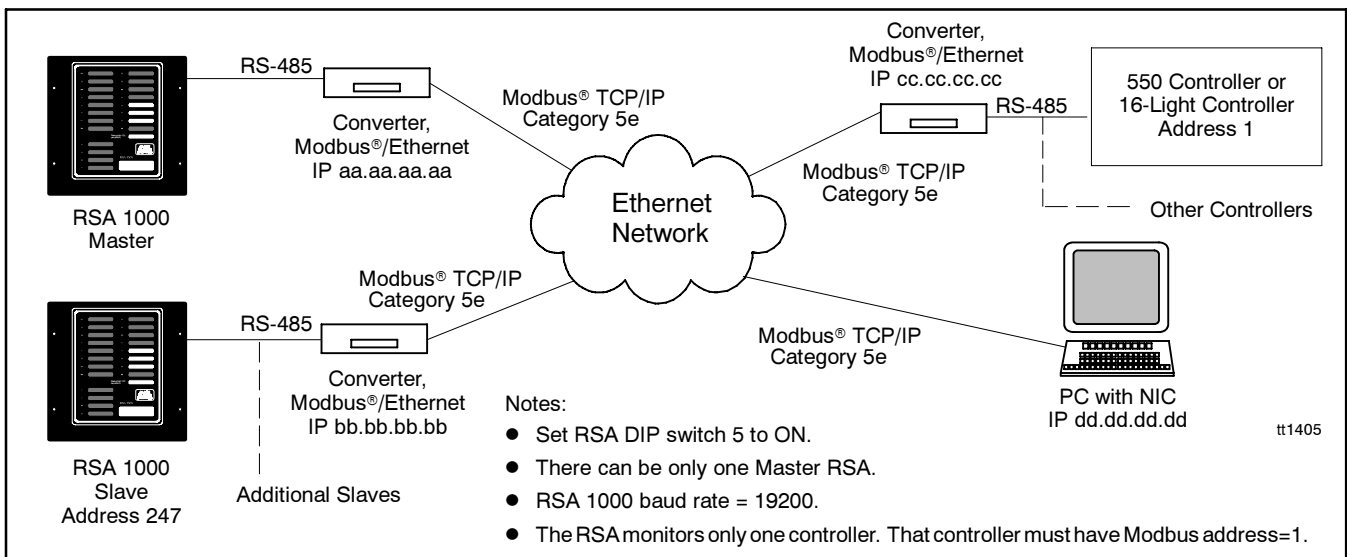


Figure 9-2 RSA 1000 Ethernet Network Connections

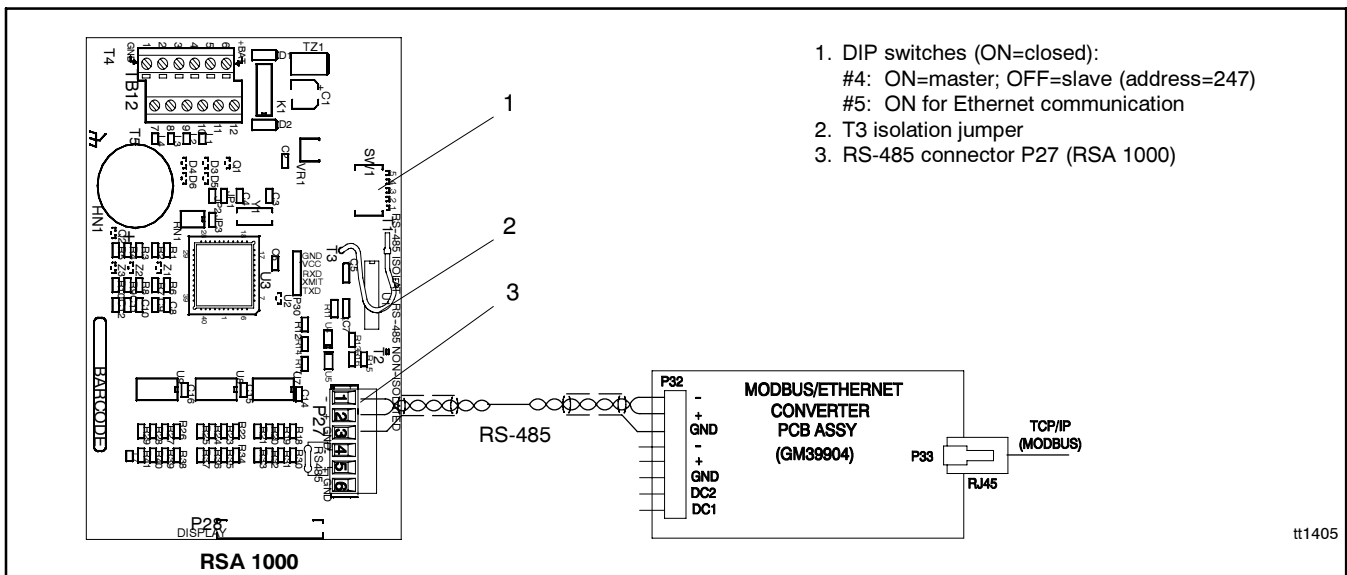


Figure 9-3 Connection Details

# 10 Device Setup

Refer to the device Operation Manual for instructions.  
See List of Related Materials.

Configure the device(s) for communication. Set the communications parameters as shown in Figure 10-1.

| Device                                  | Menu or Index  | Parameter   | Setting  |
|---|--|---|--|
| 550 Generator Set Controller            | Menu 13, Communications                                | Modbus On Line  | YES  |
|   |  | Connection Type   | Single or Converter‡, as appropriate for your connection type.   |
|   |  | Primary port  | Choose the port connected to the Modbus master. RS-232 is chosen automatically if Converter‡ is selected for the connection type.  |
|   |  | Address   | Use a unique network address for each unit. Use numbers between 1 and 247. Use 1 for a single connection or for a controller communicating with an RSA 1000 through the Ethernet. Do not use 0 (zero). |
|   |  | Baud rate   | 9600 or 19200. Must match the PC and all devices in the system.  |
| 16-Light Generator Set Controller       | DIP Switches   | Address   | Set to an odd number from 1 to 15 (maximum of 8 addresses). Use 1 for a controller communicating with an RSA 1000 through the Ethernet. See Section 8.2.   |
|   | N/A  | Baud rate   | 19200 (not adjustable). Must match the PC and all devices in the system.   |
| 340/Digital generator set controller    | Menu 10, Remote Control                                | Remote Control: Online?                                     | YES  |
|   |  | Remote Control: Local, LAN, Remote, or Remote Area Network? | Select the appropriate setting for your connection type. Use Local for Ethernet connections. See Section 2.  |
|   |  | Address   | Any *  |
|   |  | Baud rate   | 9600 †   |
| Series 1000 ATS Controller              | Setup Program (see the Setup Program Operation Manual) | Address   | Use a unique network address for each unit. Use numbers between 1 and 247. Use 1 for a single connection. Do not use 0 (zero).   |
|   |  | Baud rate   | 9600 or 19200. Must match the PC and all devices in the system.  |
| M340/M340+ or MATS/MATS+ ATS Controller | Index 13, Remote Control and Monitoring Settings       | Remote Control, On-Line?                                    | YES  |
|   |  | Local, LAN, Remote, or Remote Area Network                  | Select the appropriate setting for your connection type. Use Local for Ethernet connections. See Section 2.  |
|   |  | Address   | Any *  |
|   |  | Baud rate   | 9600 †   |
| Power monitor                           | Menu 8, Remote Control                                 | On Line   | YES  |
|   |  | Local, LAN, Remote, or Remote Area Network                  | Select the appropriate setting for your connection type. Use Local for Ethernet connections. See Section 2.  |
|   |  | Address   | Any *  |
|   |  | Baud rate   | 9600 †   |
| RSA 1000                                | DIP Switch 4   | Master/Slave  | ON for master<br>OFF for slave   |
|   | DIP Switch 5   | Connection  | ON for Ethernet connection.  |
|   | N/A  | Baud rate   | 19200 (not adjustable). Must match the Modbus/Ethernet converter baud rate.  |

\* The network address for Series 340 devices is set using DIP switches on the converter module and will override the network address on the controller.  
† This baud rate must be set at 9600 to match the KBUS side of the Modbus/KBUS converter. It may be different from the Modbus baud rates of other devices in the system.  
‡ The Converter selection on the 550 controller sets the controller to act as an RS-232 to RS-485 converter. Do not select the Converter setting on the 550 if the Modbus/Ethernet converter is used.

**Figure 10-1** Device Communication Settings

## 11 Converter, Modbus/Ethernet

The Modbus®/Ethernet converter allows the connection of a device or a network of devices to an Ethernet network. The connected controller(s) can then be monitored using Monitor III software installed on a personal computer connected to the same Ethernet network.

The setup and maintenance of the Ethernet network is the user's responsibility. Contact the network administrator for assistance and information needed for the converter module setup in Section 11.2.

Write down the MAC address printed on the converter label. It consists of 6 pairs of alphanumeric characters (for example, 00-20-4A-84-08-B8). See Figure 11-1.

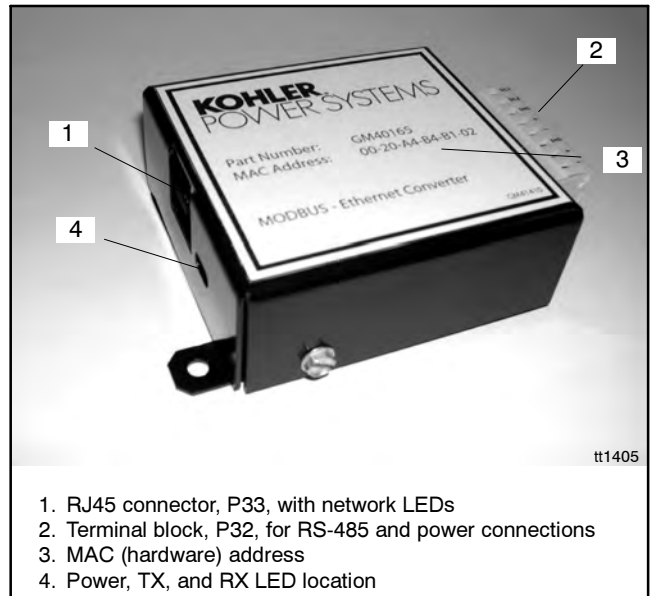
**Note:** You will need the MAC address later for the converter setup procedure.

### 11.1 Connections

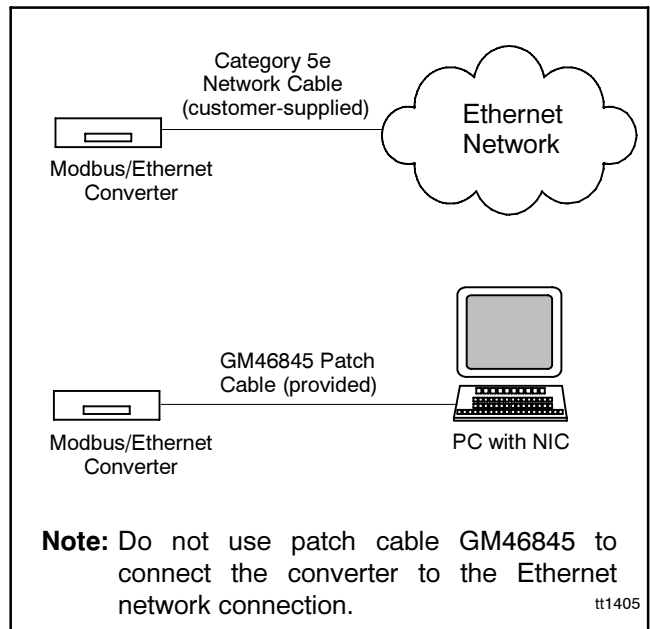
Check the type of cable and connectors required to connect the converter to the Ethernet network at the site. The converter uses an RJ45 connector for Ethernet connection. Use customer-supplied category 5e cable to connect to the Ethernet network. See Figure 11-1. Connect the device or device network to the converter using RS-485 cable as shown in Figure 3-4.

Converter kits shipped after 9/26/05 include a 0.9-m (3-ft.) patch cable, GM46845, for direct connection to the PC's network interface card for converter module setup or local monitoring.

**Note:** Do not use patch cable GM46845 to connect the converter to the Ethernet network connection. See Figure 11-2.



**Figure 11-1** Modbus®/Ethernet Converter



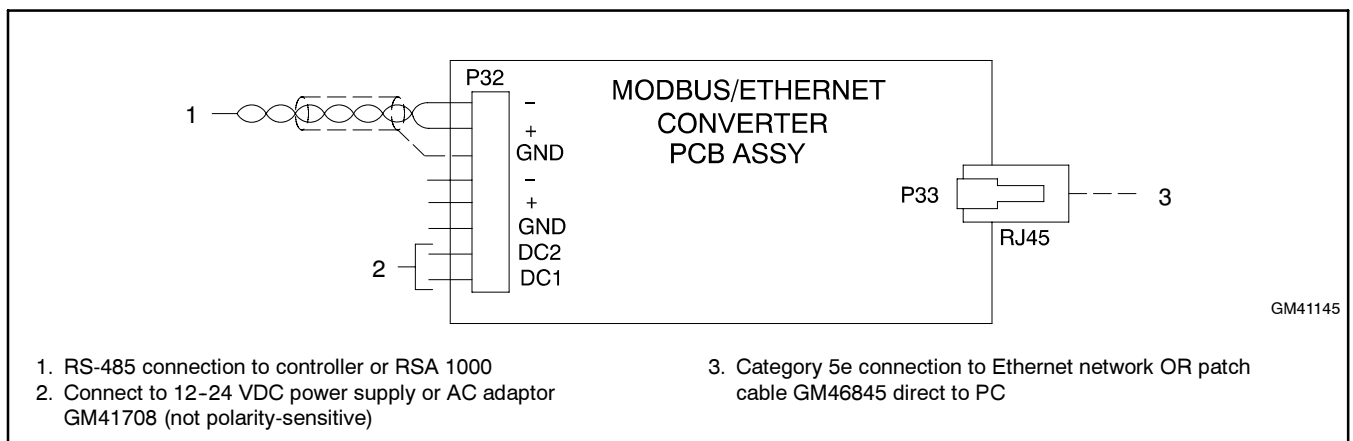
**Figure 11-2** Converter Connection Cables

The converter module requires a power supply of 120 VAC or 12–24 VDC. Connect the DC1 and DC2 terminals on the converter module to the generator set's engine starting battery or to the AC power adaptor included with the converter kit. See Figure 11-4 for the power connection terminals.

For AC power, a power adapter and four plugs are included with the converter kit. See Figure 11-3. The plugs are labeled for US, UK, EURO, and AUS. Select the appropriate plug for your area. Slide it over the two metal prongs on the power adapter and then push it down until it snaps firmly into place. To remove the plug, press the plastic button on the power adapter and slide the plug up and off.



**Figure 11-3** Power Adapter with Plugs



**Figure 11-4** Converter Connections

### 11.1.1 Converter Diagnostics and Troubleshooting

LEDs indicate converter operation as shown in Figure 11-5. See Figure 11-1 for the LED locations. Network LEDs on the RJ45 connector indicate communication on the Ethernet network side. TX and RX LEDs indicate communication on the Modbus side. If neither the TX nor the RX LEDs flashes, check the converter power, connections and settings. If only one of the TX or RX LEDs flashes, check the connected devices on the RS-485 side.

| LED  | Indication  |
|------|---|
| PWR  | Lights to indicate power to the converter.  |
| TX   | Flashes to indicate Modbus data is being transmitted.                                   |
| RX   | Flashes to indicate Modbus data is being received.                                      |
| RJ45 | LEDs on the RJ45 connector light to indicate network communication on the Ethernet side |

**Figure 11-5** Converter LEDs

## 11.2 Converter Module Setup

### 11.2.1 Install DeviceInstaller Software

DeviceInstaller software is included with the Modbus®/Ethernet converter module. Install the software on a PC that is connected to the same subnet as the converter module. See Section 11.2.2, Subnets.

In order to install the DeviceInstaller software, the installation program requires the .NET Framework version 1.1.4322 or later. It can be downloaded free from Microsoft®. If version 1.1.4322 is not already installed, the installation program will ask if you wish to install it. The computer must be on an Internet-enabled network to download the file.

**Note:** The appearance of some screens may be different in different versions of the DeviceInstaller software.

### 11.2.2 Subnets

For converter setup using the DeviceInstaller software, the PC must be connected to the same subnet as the Modbus/Ethernet converter. Subnets divide a network into groups differentiated by different IP address groups. No routers or gateways can exist between the PC and the converter.

If the DeviceInstaller program reports a subnet issue with the PC, *write down* the IP address for the PC and then change it to a temporary static IP address on the same subnet as the converter.

**Note:** Be sure to write down the PC's IP address before changing it. You may need to change it back after you have finished setting up the converter.

Microsoft® is a registered trademark of Microsoft Corporation.

Consult the Windows Help files on your PC or your network administrator for instructions to change the IP address on the PC.

Click the Help button in the DeviceInstaller program or the button labeled TCP/IP Tutorial on the DeviceInstaller Assign IP Wizard windows to display additional information on IP addresses and subnets.

### 11.2.3 Assign IP Address and Set the Baud Rate

Use DeviceInstallerSoftware to assign an IP address to the Modbus/Ethernet converter and set the converter's baud rate.

The Modbus/Ethernet converter and all connected devices must use the same baud rate.

The converter may have a default IP address assigned at the factory for test purposes. **Change the IP address to an address owned by the user.** Use the following procedure to change the IP address to an address provided by the local network administrator.

#### Procedure to Set the IP Address

1. Launch DeviceInstaller from the Windows Start button→Programs→DeviceInstaller→DeviceInstaller.
2. In the DeviceInstaller menu on the top of the opening screen, click *View* → *Details*. If the devices are already displayed in detail format, nothing will change.
3. Click the button labeled *Search* on the left side of the DeviceInstaller toolbar. It has a picture of a magnifying glass. See Figure 11-6.

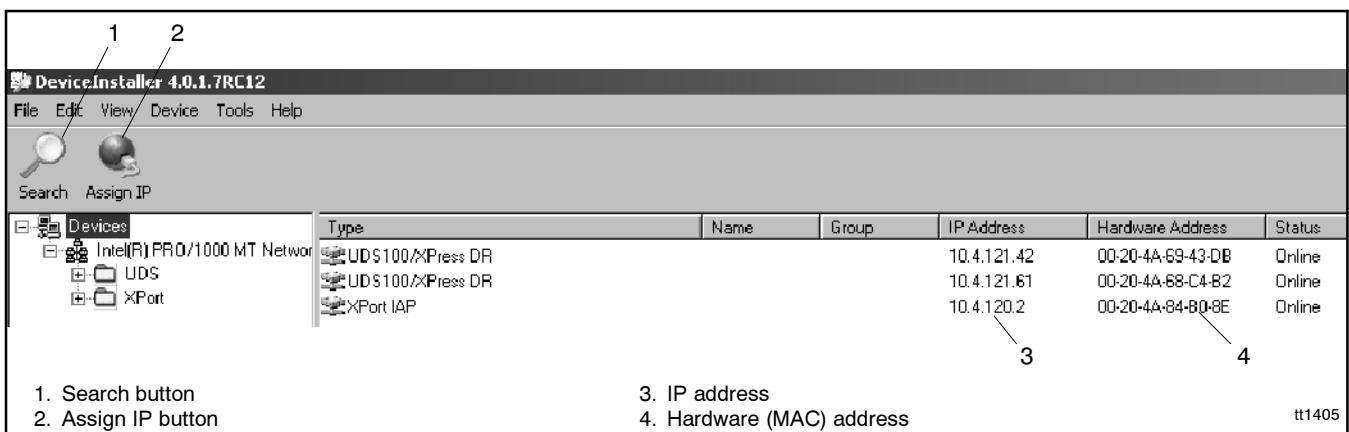
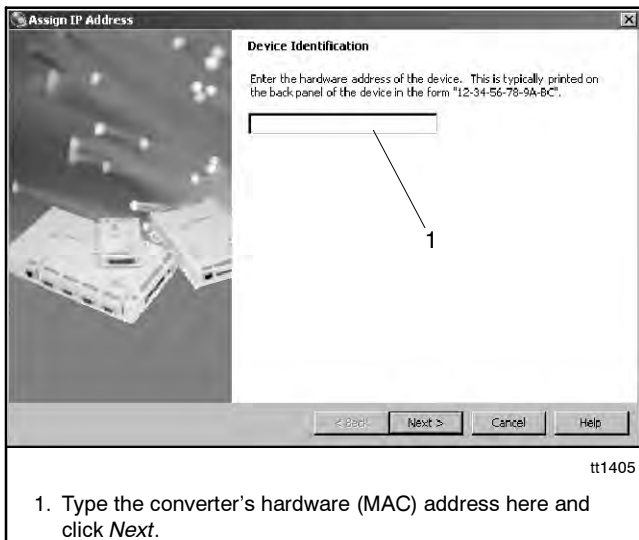


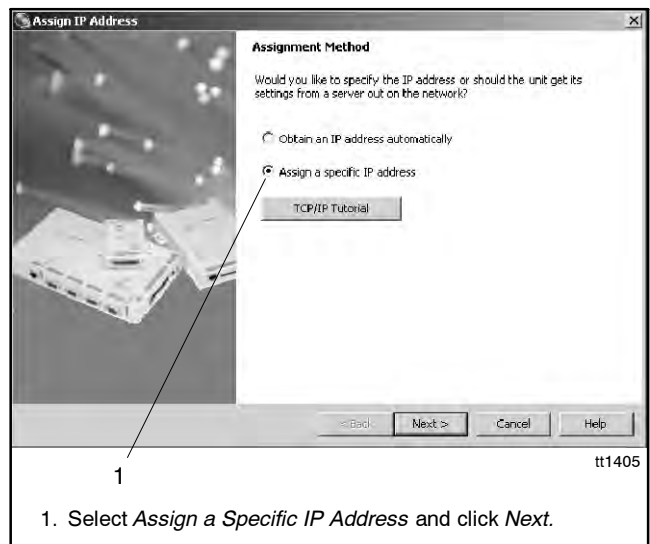
Figure 11-6 DeviceInstaller Opening Screen

4. In the list of displayed devices, find the device with the hardware address that matches the MAC address printed on the external label of the Modbus®/Ethernet converter. It will consist of 6 pairs of alphanumeric characters separated with dashes and is displayed in the column labeled *Hardware Address*. The Type column will show XPort or XPortIAP.
5. Check the IP address column for the converter. If the device **does not** have an IP address already assigned, proceed to step 6. If the device **does** have an IP address assigned, proceed to step 7.
6. If the device **does not** have an IP address already assigned:
  - a. Make sure NONE of the devices listed are highlighted by clicking in the white area below the list of devices.
  - b. Click the button labeled *Assign IP* in the DeviceInstaller toolbar. It has a picture of a globe with a plug in it. See Figure 11-6.
  - c. Enter the converter's hardware address (MAC address) in the first *Assign IP Address* window. See Figure 11-7. The MAC address is printed on the converter's label. It is OK to enter dashes between each pair of characters and the letters are not case-sensitive.
  - d. Click *Next* and go to Step 8.



**Figure 11-7** Enter Hardware (MAC) Address (step 6)

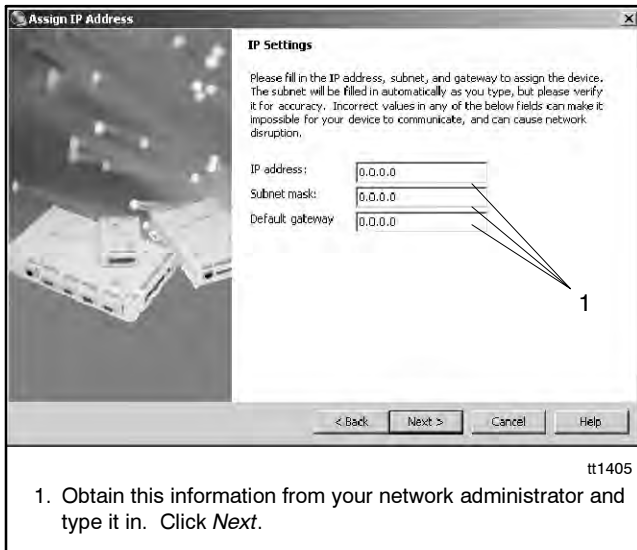
7. If the device **does** have an IP address assigned, follow these steps to change it to an address owned by the customer:
  - a. Click once on the line of the device to be changed. It should become highlighted. See Figure 11-6. If you accidentally double-click a dialog box will appear. Click the *Cancel* button to close it.
  - b. Click the button labeled *Assign IP* in the DeviceInstaller toolbar. It has a picture of a globe with a plug in it. See Figure 11-6.
  - c. Goto Step 8.
8. Select *Assign a Specific IP Address* in the Assignment Method window, and click *Next*. See Figure 11-8.



**Figure 11-8** Assignment Method

9. See Figure 11-9. Type in your IP address, subnet mask, and default gateway in dotted decimal notation. Check with your network administrator for this information. The Subnet mask will fill in automatically, but it should be verified. You may be able to use the recommended mask and leave the gateway blank. Click Next.

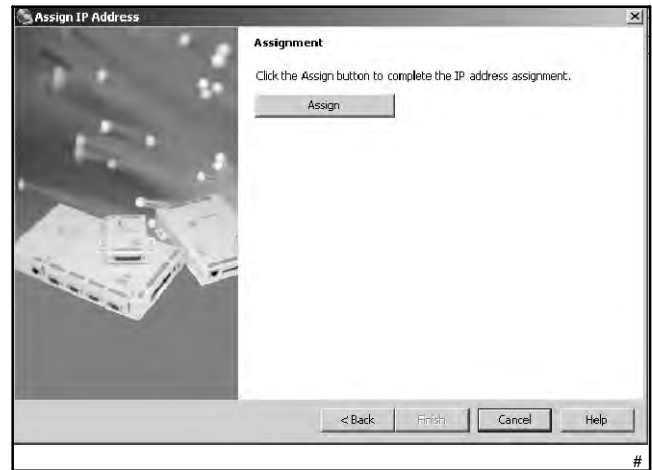
**Note:** Write down the IP address. You will need to enter it into the Monitor III software later.



**Figure 11-9** IP Settings (step 9)

**Note:** Anytime before you click the *Assign* button in the next step, you can click *Cancel* to discard the settings and close the wizard.

10. Click the *Assign* button in the next window to assign the IP settings, or click *Cancel* to discard changes and close the wizard. See Figure 11-10.
11. After the IP address has been assigned, click the *Finish* button on the bottom of the Wizard window.



**Figure 11-10**  
Assignment

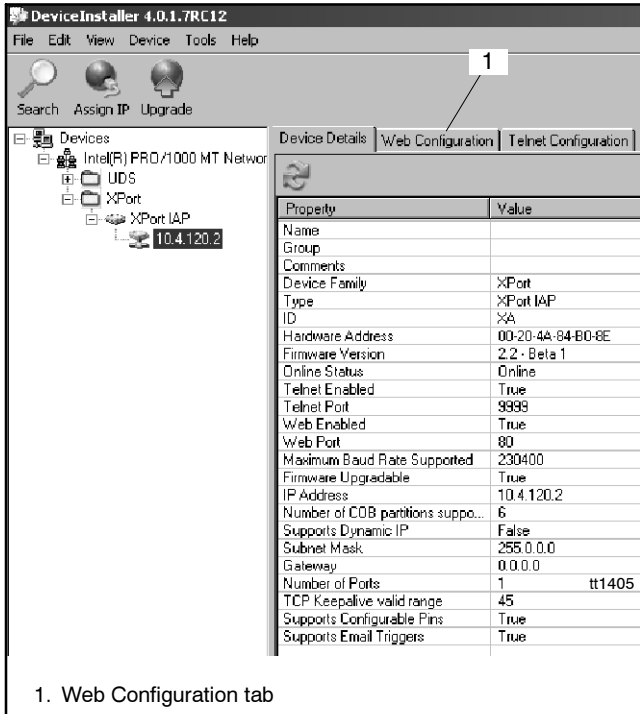
## Procedure to Set the Baud Rate

Use the DeviceInstaller program to check and change the baud rate if necessary using the following steps.

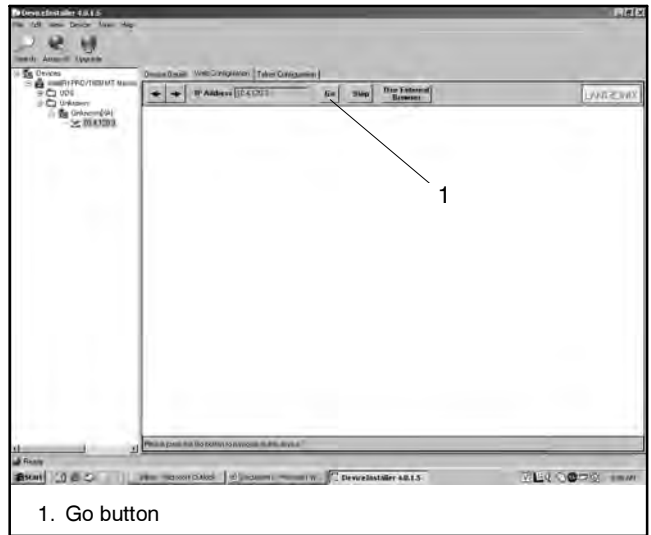
1. Highlight the converter on the list of devices found on the network. See Figure 11-6.
2. Double click on the device line to bring up the Device Details screen. See Figure 11-11.
3. Click on the Web Configuration tab to bring up the Baud Rate screen. See Figure 11-12.
4. Click on the Go button.
5. Use the drop-down arrow in the Baud box to select the baud rate. See Figure 11-13. Set the baud rate to match the Modbus® baud rates of the devices connected to the converter (generator set controllers, transfer switch controllers, and power monitors).
6. Click on the Submit Query button.

**Note:** The baud rate can also be set through the Telnet Configuration screen. See Section 11.3.

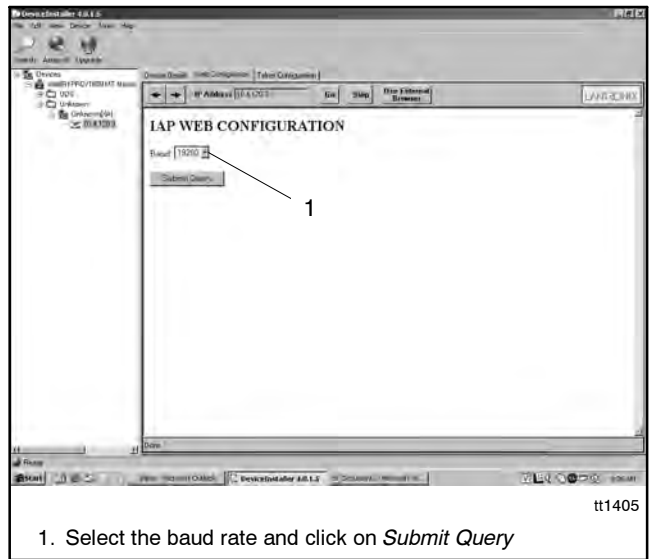
7. Select File→Exit to close the DeviceInstaller program.



**Figure 11-11**  
Device Details Screen



**Figure 11-12** Web Configuration



**Figure 11-13** Baud Rate

## 11.3 Advanced Setup: Serial Communication Settings

The Telnet Configuration screen in the DeviceInstaller program can be used to check the serial communication settings and change the settings, if necessary.

**Note:** Serial communication settings other than the baud rate are factory-set and should not require adjustment in most cases.

**Note:** Consult your network administrator for assistance with this procedure.

The settings for controllers are different from the settings for a Remote Serial Annunciator (RSA 1000). The Telnet configuration screens appear as shown in Figure 11-15 through Figure 11-17. Also refer to Figure 11-18 for the serial communication settings.

### 11.3.1 Using the Telnet Configuration Screens

1. Follow the instructions in Section 11.2.3, steps 1 through 4 to start the DeviceInstaller program and find the Modbus®/Ethernet converter. Double-click on the line for the Modbus/Ethernet converter to open the Device Details screen. See Figure 11-11.
2. Click on the Telnet Configuration tab to open the Telnet configuration screen. See Figure 11-14.
3. Click on the Connect button.
4. Press Enter to enter the setup mode.

**Note:** If Enter is not pressed within 5 seconds, the connection will time out and disconnect.

The Telnet configuration screens appear as shown in Figure 11-15 through Figure 11-17. In the Telnet configuration screen, the last line in the window is the command line, which tells you that the program is waiting for input. The possible responses are shown in parentheses. For example, the last two lines on the first screen read:

**D)efault settings, S)ave, Q)uit without save  
Select Command or parameter set (1...4) to change**

Notice that the parameter sets on the screen are numbered 1 through 4 (or 1 through 5). Type the number of the parameter set to be changed.

**Note:** The Network/IP settings were set using the Assign IP Address Wizard in previous steps and are different for each location. **Do not copy the Network/IP settings shown in Figure 11-15 through Figure 11-17.**

Press the Enter key after typing the parameter set number. For other items, just type the number without pressing the Enter key and watch the last line of the screen for the next command.

The program will prompt you to enter the setting for each parameter with a command line listing the parameter, the possible inputs, and the default setting in parentheses. Press Enter to accept the value shown in parentheses for each item if changes are not required.

Refer to Figure 11-18 when changing the serial communication settings.

For example:

#### **Attached Device (1=Slave, 2=Master) (1)**

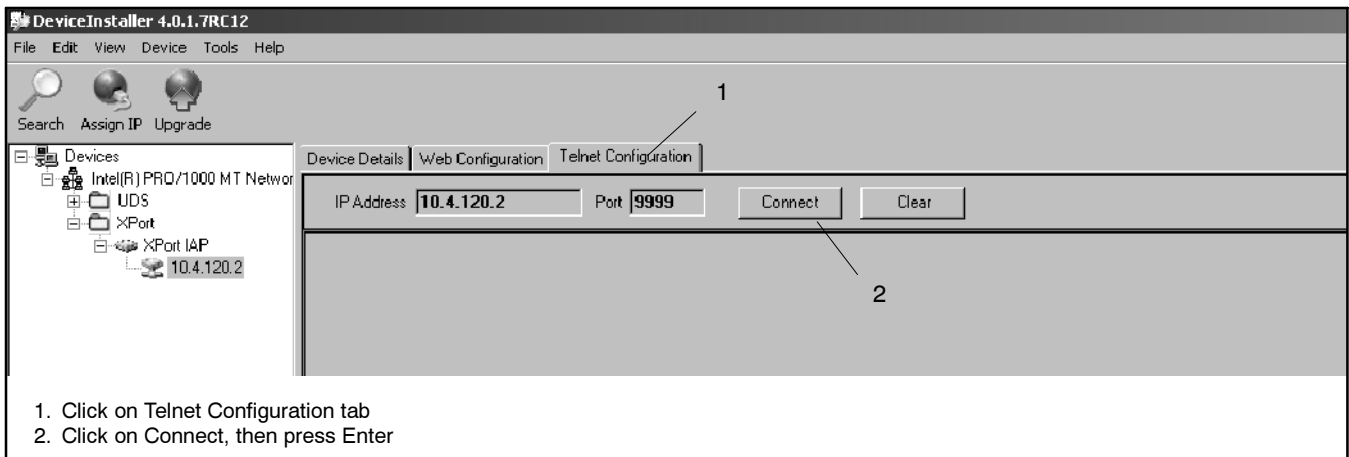
To select Slave, type 1 and Enter *or* press the Enter key to accept the default value in parentheses, which in this example is 1. To select Master, type 2 and Enter.

After the parameters in a set have been changed, the opening command line will reappear:

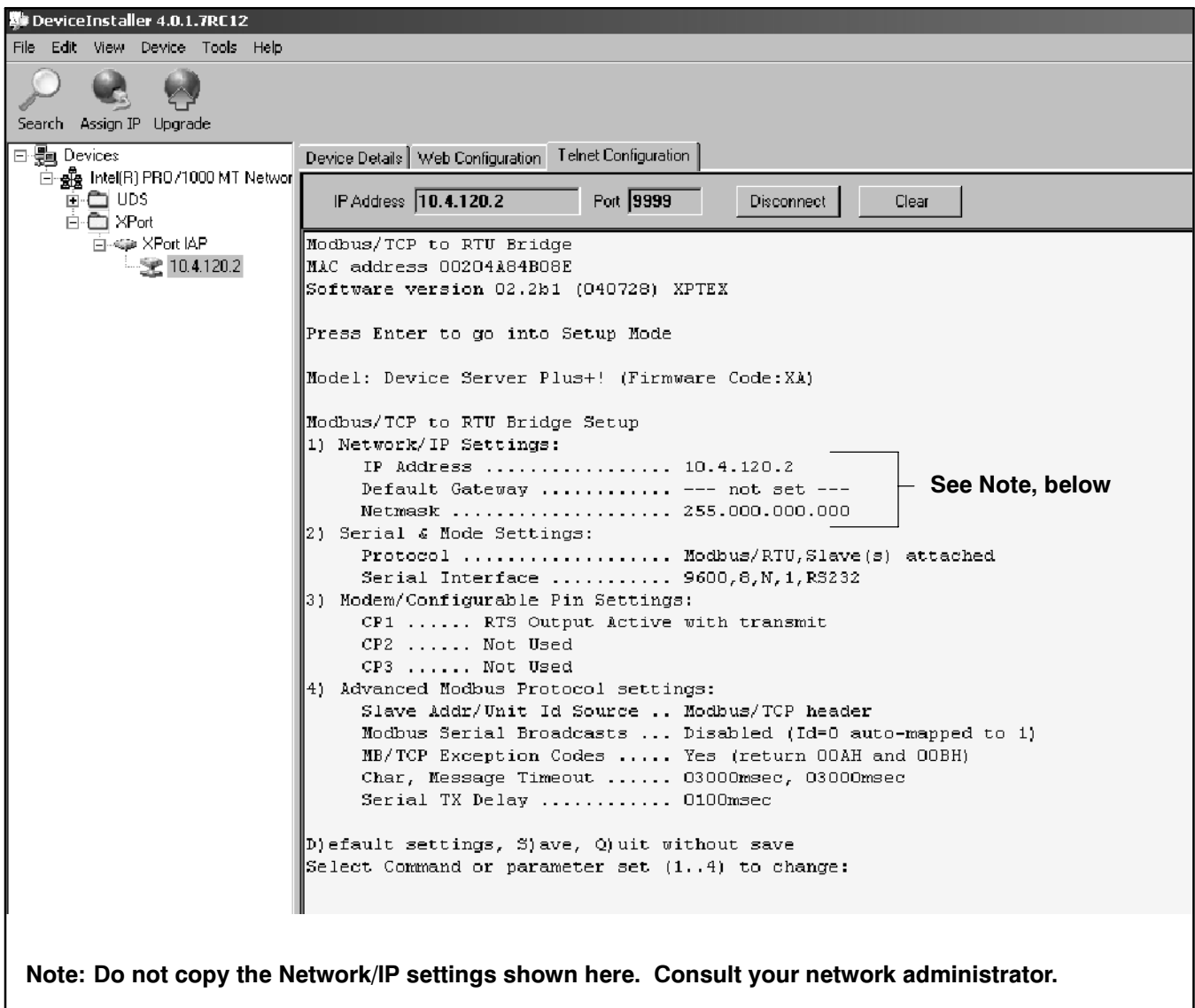
**D)efault settings, S)ave, Q)uit without save  
Select Command or parameter set (1...4) to change**

Type one of the following:

- A parameter set number from **1** to **4** to change additional settings
- **D** to return to the default settings for all parameters
- **S** to save the changes made to all settings
- **Q** to quit without saving your changes.



**Figure 11-14** Telnet Configuration Opening Screen



**Figure 11-15** Telnet Configuration Setup Mode Window for Controllers

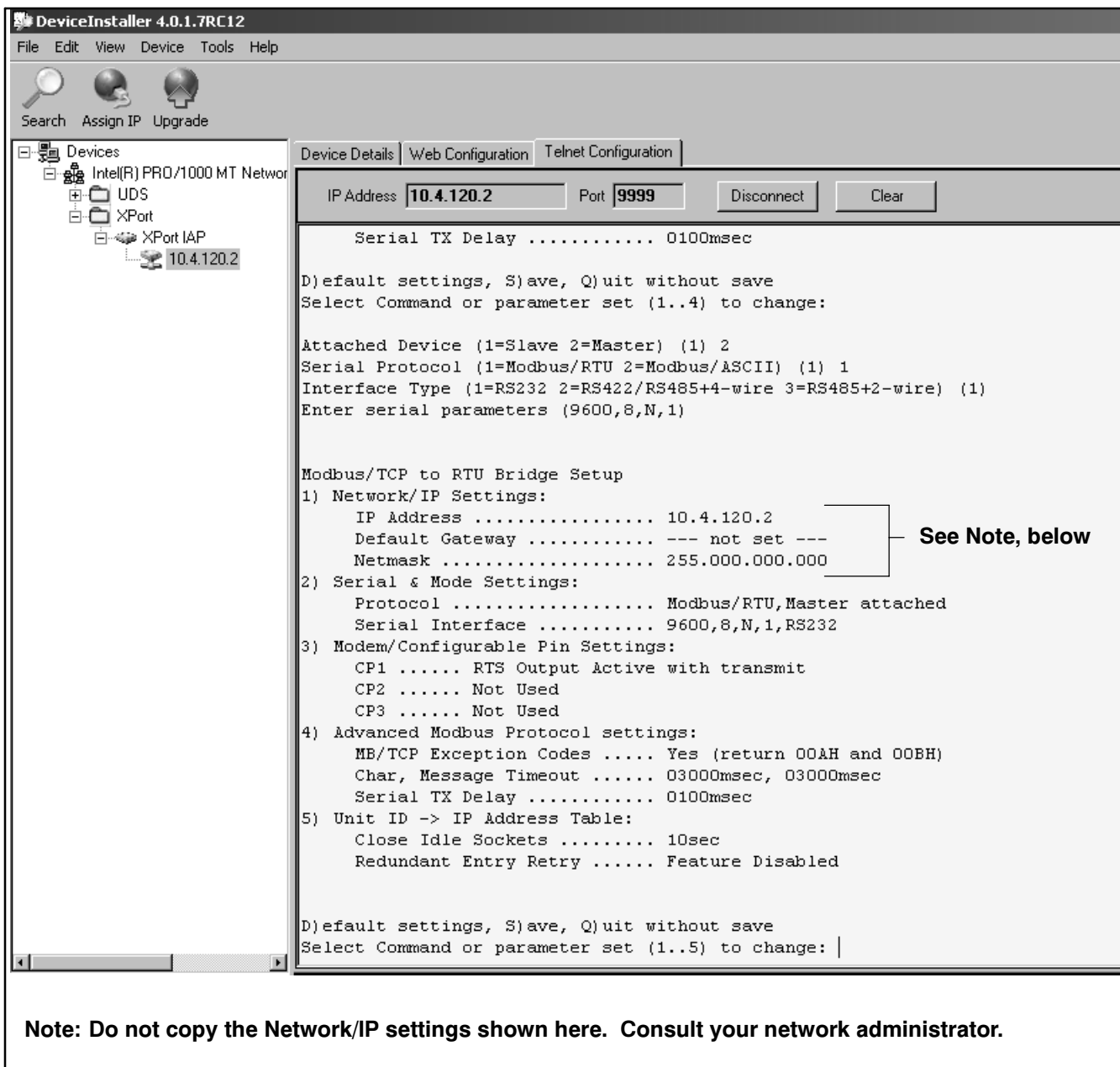


Figure 11-16 Telnet Configuration Setup Mode Window for an RSA Master

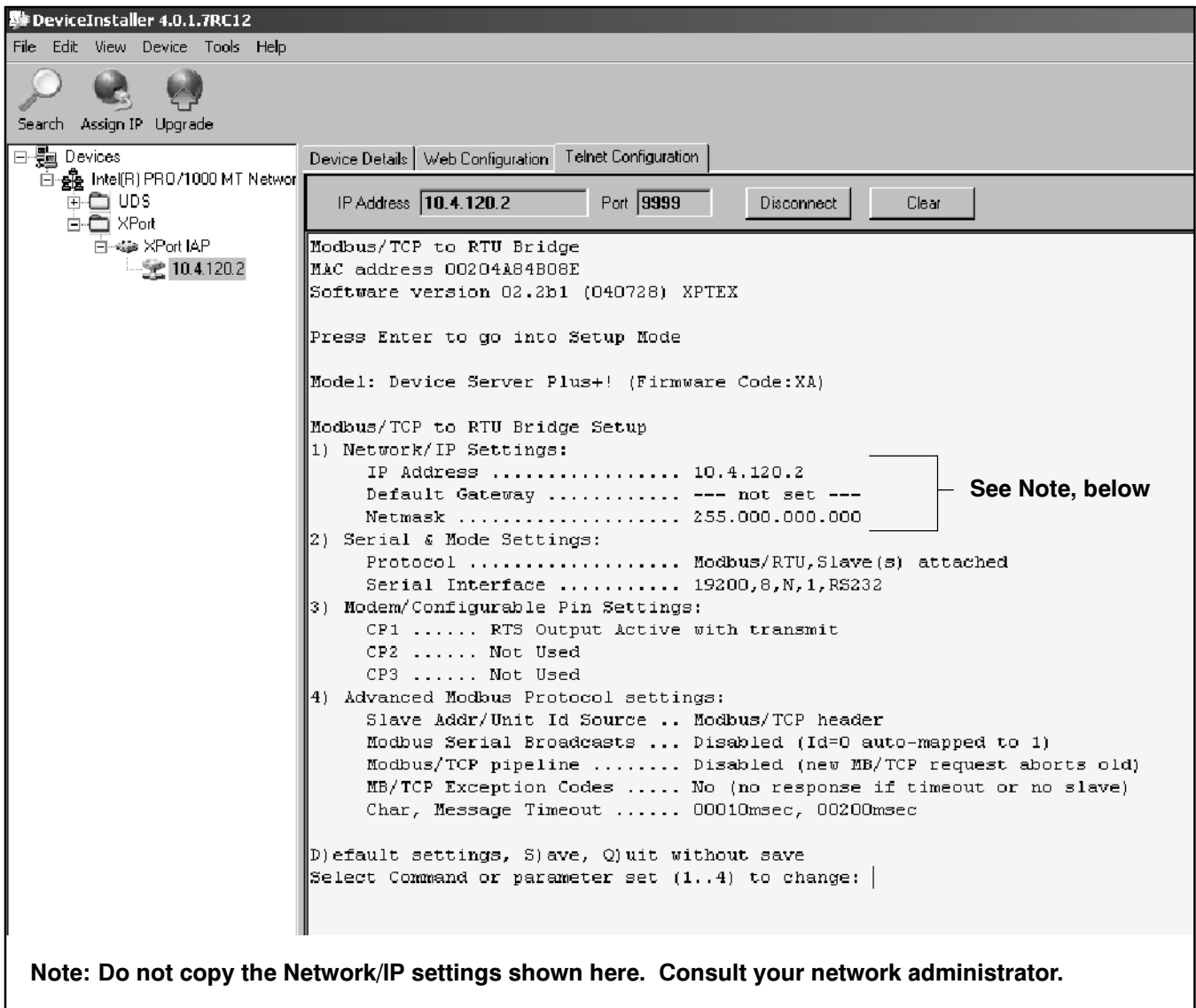


Figure 11-17 Telnet Configuration Setup Mode Window for an RSA Slave

| Parameter   | Settings  |                            |                                      |
|---|---|----------------------------|--------------------------------------|
|   | Controller  | RSA 1000 Master            | RSA 1000 Slave                       |
| 1) Network/IP Settings  |   |                            |                                      |
| IP Address  | Network-dependent. Contact the local network administrator. |                            |                                      |
| Default Gateway   |   |                            |                                      |
| Netmask   |   |                            |                                      |
| 2) Serial and Mode Settings   |   |                            |                                      |
| Protocol:   | Modbus/RTU, Slave   | Modbus/RTU, Master         | Modbus/RTU, Slave                    |
| Attached Device   | Slave   | Master                     | Slave                                |
| Serial Protocol   | Modbus/RTU  | Modbus/RTU                 | Modbus/RTU                           |
| Serial Interface:   |   |                            |                                      |
| Interface Type  | RS232   | RS232                      | RS232                                |
| Serial Parameters *   | 19200*,8,N,1  | 19200,8,N,1                | 19200,8,N,1                          |
| 3) Modem/Configurable Pin Settings  |   |                            |                                      |
| CP1:  |   |                            |                                      |
| CP1 Function  | RTS Output  | RTS Output                 | RTS Output                           |
| RTS Mode  | Active w/Transmit   | Active w/Transmit          | Active w/Transmit                    |
| Delay after Output RTS  | 0   | 0                          | 0                                    |
| Wait for CTS to go Active   | N   | N                          | N                                    |
| Delay dropping RTS after TX   | 0   | 0                          | 0                                    |
| CP2   | Not Used  | Not Used                   | Not Used                             |
| CP3   | Not Used  | Not Used                   | Not Used                             |
| 4) Advanced Modbus Protocol Settings  |   |                            |                                      |
| Slave Addr Source   | Modbus/TCP header<br>(choose 0=Auto)                        | N/A                        | Modbus/TCP header<br>(choose 0=Auto) |
| Modbus Serial Broadcasts  | Disabled  | N/A                        | Disabled                             |
| MB/TCP Exception Responses  | Yes   | Yes                        | No                                   |
| Modbus/TCP Pipeline   | Enabled<br>(choose 1 = No)                                  | Enabled<br>(choose 1 = No) | Disabled<br>(choose 2 = Yes)         |
| Char Timeout  | 3000  | 10                         | 10                                   |
| Message Timeout   | 3000  | 3000                       | 200                                  |
| Serial TX Delay   | 100   | 100                        | 0                                    |
| Swap 4x/OH to get 3x/1/x  | No  | No                         | No                                   |
| 5) Unit ID → IP Address Table (appears for master devices only)   |   |                            |                                      |
| Close Idle Sockets  | N/A   | 10 sec                     | N/A                                  |
| Redundant Entry Retries   | N/A   | Disabled                   | N/A                                  |
| Mapping:  |   |                            |                                      |
| Controller  | N/A   | 001-001: xx.xx.xx.xx       | N/A                                  |
| RSA slave (optional)  | N/A   | 247-247: xx.xx.xx.xx       | N/A                                  |
| * The first serial parameter is the baud rate and may be 9600 or 19200, as required to match connected devices. |   |                            |                                      |

**Figure 11-18** Serial Communication Settings Summary

### 11.3.2 Address Table (Mapping, Master Device Only)

After the attached device has been set to Master in parameter set 2, the serial communications setup for an RSA 1000 master shows a fifth set of parameters, **Unit ID → IP Address Table**. See Figure 11-16. These parameters map the Modbus addresses of devices communicating with the master device to their IP addresses. The master device will communicate only with the slave devices whose IP addresses are entered into the IP address table.

An RSA 1000 master can communicate with one 550 or 16-Light controller and multiple RSA 1000 slaves. See Figure 9-2. The 550 or 16-Light controller communicating with the RSA 1000 must have Modbus address 1. RSA slaves have Modbus address 247 (DIP switch 4 on the RSA is set to the slave position; see Figure 10-1).

Refer to Figure 11-19 during the following procedure. Your entries are shown in boxes in the figure.

#### Mapping Address Table Procedure

1. The following command line appears at the bottom of the Telnet Configuration screen:  
**Select Command or parameter set (1...5) to change**  
Type **5** to enter parameter set 5.
2. Type in the values shown in Figure 11-19 for the next two entries:  
**Close Idle TCP sockets**, type **10**  
**Redundant entry retries**, type **0**.
3. The following command line appears:  
**A)dd, D)delete, E) select function**  
Type **A** to add the Modbus address and IP address for the controller being monitored by the RSA 1000.
4. As shown in Figure 11-19, type **1** for the next two entries:  
**Modbus addr from**, type **1**  
**Modbus addr to**, type **1**.  
**Note:** Press the Enter key to accept the default value shown in parentheses, if appropriate.
5. At **Slave IP address**, enter the IP address for the controller's Modbus/Ethernet converter. See Figure 11-19.  
**Note: Your IP addresses will be different than those shown in Figure 11-19. Obtain IP addresses from your network administrator.**
6. If one or more RSA slaves are connected through another Modbus/Ethernet converter, return to step 3 to add the mapping for the slave(s). Use **247** for the two Modbus address entries and then enter the IP address for the slave's Modbus/Ethernet converter.
7. At the command line :  
**A)dd, D)delete, E) select function**  
Type **E** to exit parameter set 5
8. At the next prompt:  
**D)efault settings, S)ave, Q)uit without save**  
**Select Command or parameter set (1...5) to change**  
Type **S** to save the settings.

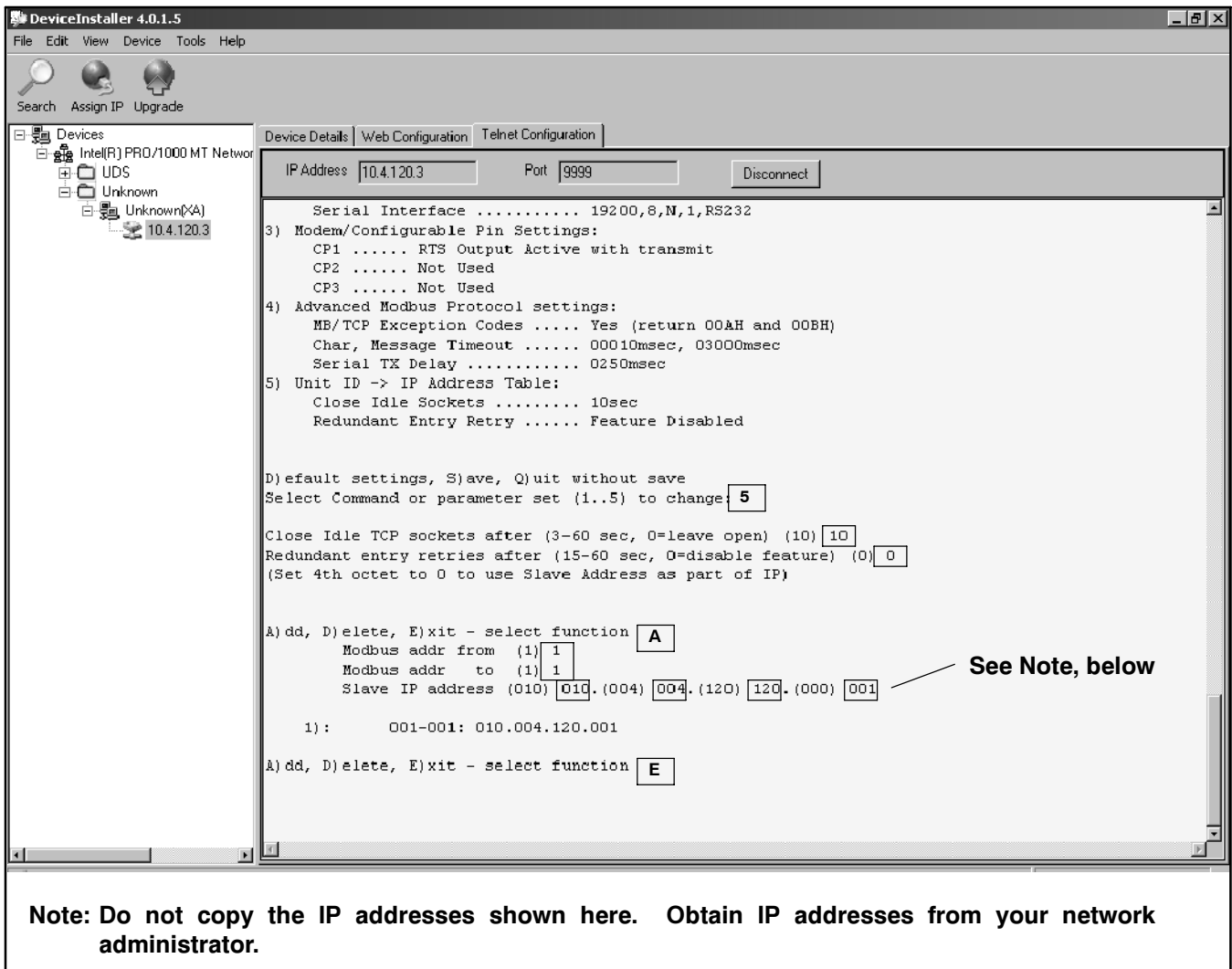


Figure 11-19 Mapping Modbus to IP addresses for the RSA 1000 Master (parameter set 5)

## 12 Noise and Wiring Practices

Electrical noise is an unwanted electrical signal that can cause errors in measurement, loss of control, malfunctions in microprocessor-based control systems, errors in data transfer between systems over communication links, or reductions in system performance.

Good system design and wiring practices can minimize noise levels and the effects of noise.

Noise, because of its random nature, is typically characterized by frequency distribution. Many noise sources are broad-spectrum, that is, they produce many frequencies distributed over a wide range. Broad-spectrum noise is particularly troublesome because it cannot be removed easily by filtering, and because it can affect a variety of systems in unpredictable ways. One common source of broad-spectrum noise is a switch, which can produce voltage and current changes when an electrical circuit is connected and disconnected.

Coupling is the transfer of signals between separate circuits. Signals from one circuit become noise in another. The amount of coupling is cumulative and is a function of the proximity of the circuits, their orientation, exposed area, and length of run. Minimize coupling by the following:

- Isolating circuits from each other by using separate raceways or conduit
- Separating circuits from each other by locating them as far apart as possible
- Enclosing circuits with a grounded metallic shield such as an enclosure, metallic conduit, or cable shield
- Running conductors perpendicular, rather than parallel, to each other
- Running wires loosely and randomly rather than bundling them tightly together
- Twisting a circuit's wires together in pairs

In an industrial environment, there are typically five types of circuits with different noise emission and rejection capabilities. The five types of circuits are as follows:

- **High-Power Distribution.** Circuits to high-power loads such as large electric motors and heaters can

emit transient high levels of broad-spectrum noise. Loads on high-power distribution circuits are nearly immune to noise.

- **General Purpose Power Distribution.** Circuits to medium-power loads such as lighting, offices, light-duty equipment, and small motors such as fans and pumps can emit transient, medium levels of broad-spectrum noise. Some electronic equipment, such as computers, emits constant levels of broad-spectrum noise in addition to transient broad-spectrum noise. Loads on general-purpose circuits, except for sensitive electronic equipment, are nearly immune to noise.
- **Control.** Control circuits include DC circuits and 120 VAC maximum AC circuits that operate at a low power level (less than 1 W). Typical circuits include circuits to switches, actuators, and dry-contact relays, including the generator engine-start circuit. Control circuits emit transient low levels of broad-spectrum noise and are fairly immune to noise.
- **Analog.** Analog circuits are low-voltage DC circuits that convey measurement information as relatively small changes in current or voltage. Typical circuits include those connected to the controller's analog inputs. Analog circuits create the lowest noise levels and are the most sensitive to noise.
- **Communication and Signaling.** Communication and signaling circuits are low-voltage circuits that convey information. Typical circuits include RS-232 and RS-485 serial communication lines, telephone lines, and computer network lines. These circuits create noise with frequencies related to the communication signaling rate. These circuits have some level of built-in noise immunity. Typical systems will detect or correct errors caused by noise below certain levels, but with a corresponding reduction in the data transfer rate.

When planning an installation, separate all of these types of circuits as much as possible to minimize the hazards of insulation failure, accidental miswiring, and noise coupling. For best results, install control circuits, analog circuits, and communication and signaling circuits separately. Combining circuit types is unavoidable in the controller's enclosure and some other areas.

**Note:** It is very important to isolate high- and medium-power circuits in raceways or conduit separate from the other types of circuits.

## 13 Parts Lists

### Software, Monitor III

| Kit: GM41141-KP1 |                                     |             |
|------------------|-------------------------------------|-------------|
| Qty.             | Description                         | Part Number |
| 1                | Cable, DB9M\DB9F, null modem        | GM16657     |
| 1                | USB Interface                       | GM29225     |
| 1                | Software, Windows Monitor III       | GM41097     |
| 1                | O/M Monitor III Software            | TP-6347     |
| 1                | Installation Instructions           | TT-1405     |
| 1                | Resistor, 121 Ohm, 1/4W, Ax. THT-MF | X-6058-27   |

### Software, Monitor III

| Kit: GM41141-KP1S |                                     |             |
|-------------------|-------------------------------------|-------------|
| Qty.              | Description                         | Part Number |
| 1                 | Cable, DB9M\DB9F, null modem        | GM16657     |
| 1                 | USB Interface                       | GM29225     |
| 1                 | Software, Windows Monitor III       | GM41098     |
| 1                 | O/M Monitor III Software            | MP-6347     |
| 1                 | Installation Instructions           | TT-1405     |
| 1                 | Resistor, 121 Ohm, 1/4W, Ax. THT-MF | X-6058-27   |

### Software, Monitor III w/ Modem

| Kit: GM41141-KP2 |                                     |             |
|------------------|-------------------------------------|-------------|
| Qty.             | Description                         | Part Number |
| 1                | Cable, DB9M\DB25M, AT Modem         | GM16658     |
| 1                | Isolator, Optical                   | GM17837     |
| 1                | USB Interface                       | GM29225     |
| 1                | Connector, null modem               | GM29363     |
| 1                | Connector                           | GM29364     |
| 1                | Converter, RS232/RS485              | GM41096     |
| 1                | Software, Windows Monitor III       | GM41097     |
| 1                | Modem, device                       | GM41115     |
| 1                | O/M Monitor III Software            | TP-6347     |
| 1                | Installation Instruction            | TT-1405     |
| 1                | Resistor, 121 Ohm, 1/4W, Ax. THT-MF | X-6058-27   |

### Software, Monitor III w/ Modem

| Kit: GM41141-KP2S |                                     |             |
|-------------------|-------------------------------------|-------------|
| Qty.              | Description                         | Part Number |
| 1                 | Cable, DB9M\DB25M, AT modem         | GM16658     |
| 1                 | Isolator, optical                   | GM17837     |
| 1                 | USB Interface                       | GM29225     |
| 1                 | Connector, null modem               | GM29363     |
| 1                 | Connector                           | GM29364     |
| 1                 | Converter, RS232/RS485              | GM41096     |
| 1                 | Software, Windows Monitor III       | GM41098     |
| 1                 | Modem, Device                       | GM41115     |
| 1                 | O/M Monitor III Software            | MP-6347     |
| 1                 | Installation Instructions           | TT-1405     |
| 1                 | Resistor, 121 Ohm, 1/4W, Ax. THT-MF | X-6058-27   |

### Converter, RS232/RS485

| Kit: GM41143-KP1 |                                     |             |
|------------------|-------------------------------------|-------------|
| Qty.             | Description                         | Part Number |
| 1                | Converter, RS232/RS485              | GM41096     |
| 1                | Resistor, 121 Ohm, 1/4W, Ax. THT-MF | X-6058-27   |
| 1                | Installation Instructions           | TT-1405     |

### Converter, Modbus/Ethernet

| Kit: GM41143-KP2 |                                 |             |
|------------------|---------------------------------|-------------|
| Qty.             | Description                     | Part Number |
| 1                | Plug, 8-Position, cage clamp    | GM40142     |
| 1                | Assy, Modbus/Ethernet converter | GM40165     |
| 1                | Software, Device Installer      | GM41146     |
| 1                | Adapter, 90-264 VAC to 12 VDC   | GM41708     |
| 1                | Adapter, universal AC plug      | GM41709     |
| 1                | Patch cable                     | GM46845     |
| 1                | Installation Instructions       | TT-1405     |

### Converter, Modbus/KBUS

| Kit: GM41143-KP3 |                                     |             |
|------------------|-------------------------------------|-------------|
| Qty.             | Description                         | Part Number |
| 1                | Multiconductor cable, ribbon        | 294638      |
| 1                | Box, cover                          | 294719      |
| 1                | Multiconductor cable, ribbon        | 352291      |
| 1                | PCB Assy, Modbus/KBUS Converter     | GM39556     |
| 1                | Installation Instructions           | TT-1405     |
| 4                | Washer,lock.172 ID x.333 in. OD     | X-22-7      |
| 1                | Resistor, 121 Ohm, 1/4W, Ax. THT-MF | X-6058-27   |
| 5                | Nut, flange whiz, 8-32              | X-6210-4    |
| 4                | Spacer, .25 OD, .375 in.            | X-712-13    |
| 4                | Spacer, .25 OD, .937 in.            | X-712-14    |
| 4                | Spacer, .25 OD, .625 in.            | X-712-8     |
| 4                | Nut, hex machine screw, 8-32        | X-72-4      |

### Modem, Device, 220V, 50Hz

| Kit: GM41142-KP1 |                                     |             |
|------------------|-------------------------------------|-------------|
| Qty.             | Description                         | Part Number |
| 1                | Cable, DB9M\DB25M, AT modem         | GM16658     |
| 1                | Isolator, optical                   | GM17837     |
| 1                | Connector, null modem               | GM29363     |
| 1                | Connector                           | GM29364     |
| 1                | Converter, RS232/RS485              | GM41096     |
| 1                | Modem, device                       | GM41116     |
| 1                | Installation Instructions           | TT-1405     |
| 1                | Resistor, 121 Ohm, 1/4W, Ax. THT-MF | X-6058-27   |

### Cable, PC Direct Connect

| Kit: GM41144-KP1 |                              |             |
|------------------|------------------------------|-------------|
| Qty.             | Description                  | Part Number |
| 1                | Cable, DB9M\DB9F, null modem | GM16657     |
| 1                | Installation Instructions    | TT-1405     |

# Notes