INSTALLATION INSTRUCTIONS

Original Issue Date: **5/05**

Models: **Generator Set Controllers: Decision-Maker® 3+, 340, 550, 3000, and 6000**
ATS Controllers: M340/M340+ , MPAC® 1000, and MPAC® 1500
Power Monitor PM340
RSA 1000 (version 2.00 or higher), RSA II, and RSA III

Market: **Industrial and ATS**

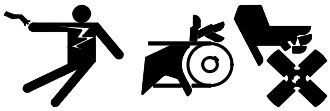
Subject: **Converters, Connections, and Controller Setup for Network Communication**

Contents

Safety Precautions

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

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

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.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Press the generator set off/reset button to shut down the generator set. (2) Disconnect the power to the battery charger, if equipped. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

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. Turn off 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.

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Only authorized personnel should open the 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.

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.

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.

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Introduction

This document contains diagrams and instructions for connection of the controllers and other devices listed below to a personal computer (PC) using Monitor III software or for other Modbus® applications. Single or multiple devices can be connected locally or remotely.

- Decision-Maker® 3+ Generator Set Controller
- Decision-Maker® 340 Generator Set Controller
- Decision-Maker® 550 Generator Set Controller
- Decision-Maker® 3000 Generator Set Controller
- Decision-Maker® 6000 Generator Set Controller
- M340/M340+ ATS Controller
- MPAC® 1000 ATS Controller
- MPAC® 1500 ATS Controller
- PM340 Power Monitor
- RSA 1000 (version 2.00 or higher)
- RSA II
- RSA III

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

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 10 controllers to an Ethernet network. Monitor III software can communicate with only one Modbus/Ethernet converter at a time.

- The Modbus/Ethernet converter can communicate with a maximum of 4 devices on the Ethernet side (e.g. a total of 4 computers and/or remote serial annunciators connected to the ethernet).

- The MPAC® 1500 ATS controller is equipped with RS-485 and Ethernet ports for communication. It uses Modbus® protocol and can use baud rates of 9600, 19200, and 57600. No Modbus® converters are required for the 1500 ATS Controller.

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 modem 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. Determine the length of cable required for the application and procure locally.

- Ethernet connections with the Modbus/Ethernet converter or the MPAC® 1500 ATS require 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) or built-in network interface 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. Contact your local network administrator for assistance in setting up your PC for network communication.

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

- Some computers are not equipped with serial ports. A serial port adapter may be required. The Quatech RS-232 1-port PCMCIA adapter and the Gigaware USB-A to serial cable are examples.

Modbus® Applications

The generator set controllers, ATS controllers, and power monitor covered in this document use Modbus® protocol to communicate with Monitor III software and the Remote Serial Annunciators.

For other Modbus applications, the Modbus master must be programmed to read the Modbus registers for the connected devices. The Modbus registers are published in TP-6113, Modbus Communications Protocol Operation Manual. A system designer trained in the application of Modbus® protocol must write and thoroughly test the program before implementation.

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 MPAC® 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
Decision-Maker 3+ Controller Operation Manual	TP-6161
Decision-Maker 340 Generator Set Controller Operation Manual	TP-5829
Decision-Maker 550 Controller Operation Manuals:	
version 2.10 and higher	TP-6200
versions prior to 2.10	TP-6083
Decision-Maker 3000 Controller Operation Manual	TP-6694
Decision-Maker 6000 Controller Operation Manual	TP-6750
M340 ATS Controller Operation Manual	TP-5569
M340+ ATS Controller Operation Manual	TP-5664
Modbus Protocol Operation Manual	TP-6113
Monitor III Software Operation Manual	TP-6347
MPAC 1000 ATS Controller Setup Program Manual	TP-6135
MPAC 1500 ATS Controller	TP-6714
Power Monitor Operation Manual	TP-5875
RSA 1000 Remote Serial Annunciator	TT-1377
RSA II Remote Serial Annunciator	TT-1485
RSA III Remote Serial Annunciator	TT-1625
SiteTech Software Operation Manual	TP-6701

Figure 2 Related Materials

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 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 15 to identify the hardware required for connection. Note which items are are included in the kits and which are customer-supplied; review the Additional Requirements section and the Parts Lists in Section 17. Obtain all cables, converter modules, and device modems required before beginning the installation and connection procedures.

   Note: Decision-Maker® 340 generator set controllers, M340/M340+ 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 for all devices except the MPAC® 1500 ATS controller.

At the power system controllers and devices:

3. Set up and install Modbus/KBUS converter modules in any Series 340 devices as instructed in Section 4.

   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 15.

4. Connect RS-232 or RS-485 cables to any other devices as instructed in Sections 5 through 12. Also see the connection diagrams in Section 15.

5. Connect the remaining hardware as shown in the connection diagrams in Section 15.

   Note: Circuit isolation is recommended for installations that may be exposed to electrical noise. See Section 16, Noise and Wiring Practices.

6. Configure the communication parameters on each device. Refer to Section 13, Device 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. All devices in the system must use the same baud rate for Modbus communication.

   Note: Choose 9600 for Series 340 devices using Modbus/KBUS converters. This is the baud rate setting for the KBUS side of the converter only and does not affect the baud rate used for Modbus communication with other devices. The baud rate for the Modbus side was set in step 3 using DIP switches on the converter and can be either 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 15.

   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 14.

   Note: MPAC® 1500 transfer switch controllers do not require the Modbus/Ethernet converter.

9. See the Monitor III Software Operation Manual for instructions to install and use Monitor III software. Set the baud rate to match the rate for the connected devices.

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, remote serial annunciator, 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 (all devices except MPAC® 1500 controllers).
- RS-232 connects up to 15.2 m (50 ft.) from PC's serial port.
- Some computers are not equipped with serial (RS-232) ports. A serial port adapter may be required. The Quatech RS-232 1-port PCMCIA adapter and the Gigaware USB-A to serial cable are examples.
- 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 Decision-Maker® 550 and 6000 controllers 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 Decision-Maker® 3+ Generator Set Controller and MPAC® 1000 ATS Controllers must use RS-485 connections for Monitor III communications.
- Refer to the connection diagrams in Section 15 of this document for connection details.

Local Connections

A PC can connect 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 15.

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 Decision-Maker® 3+ Generator Set Controller and MPAC® 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 Decision-Maker® 3+ generator set controller and MPAC® 1000 ATS controller.
- A local area network (LAN) with as many as 247 devices.

Use Belden #9841 or equivalent shielded twisted-pair cable for RS-485 connections.

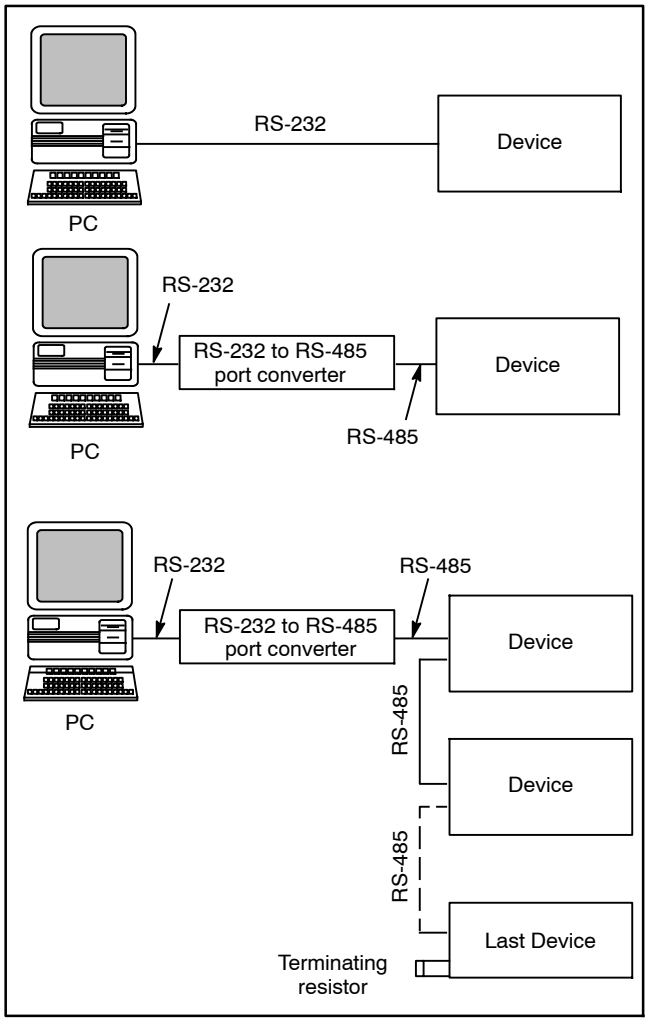


Figure 2-1 Local Connections

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 15.

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:

- Decision-Maker® 6000 Controller
- Decision-Maker® 550 Controller
- Decision-Maker® 340 Generator Set Controller
- M340/M340+ ATS Controller
- Power Monitor

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

- Decision-Maker® 3+ Generator Set Controller
- MPAC® 1000 and MPAC® 1500 ATS Controllers
- Up to 247 devices in an RS-485 local area network (LAN).

Note: The Decision-Maker® 550 and 6000 controllers 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.

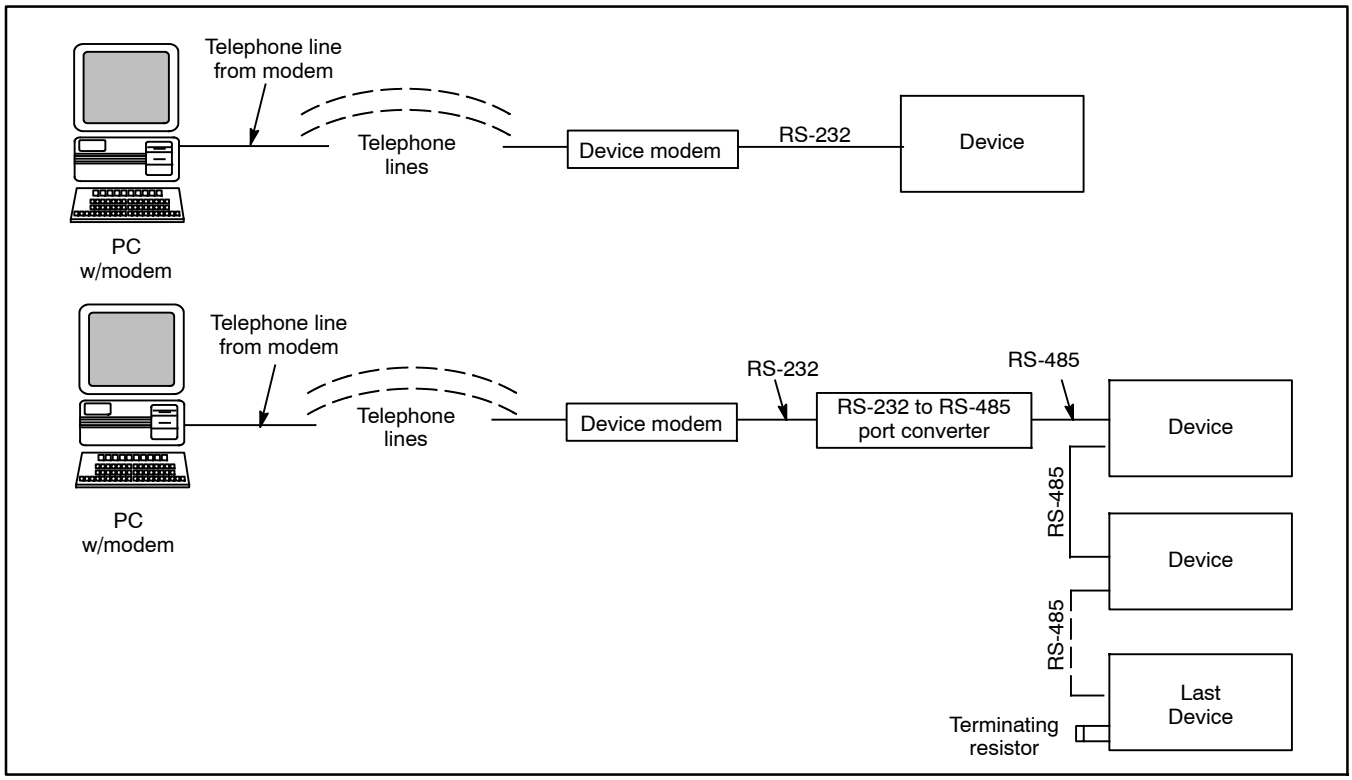


Figure 2-2 Remote Modem Connections

Remote Network (Ethernet) Connections

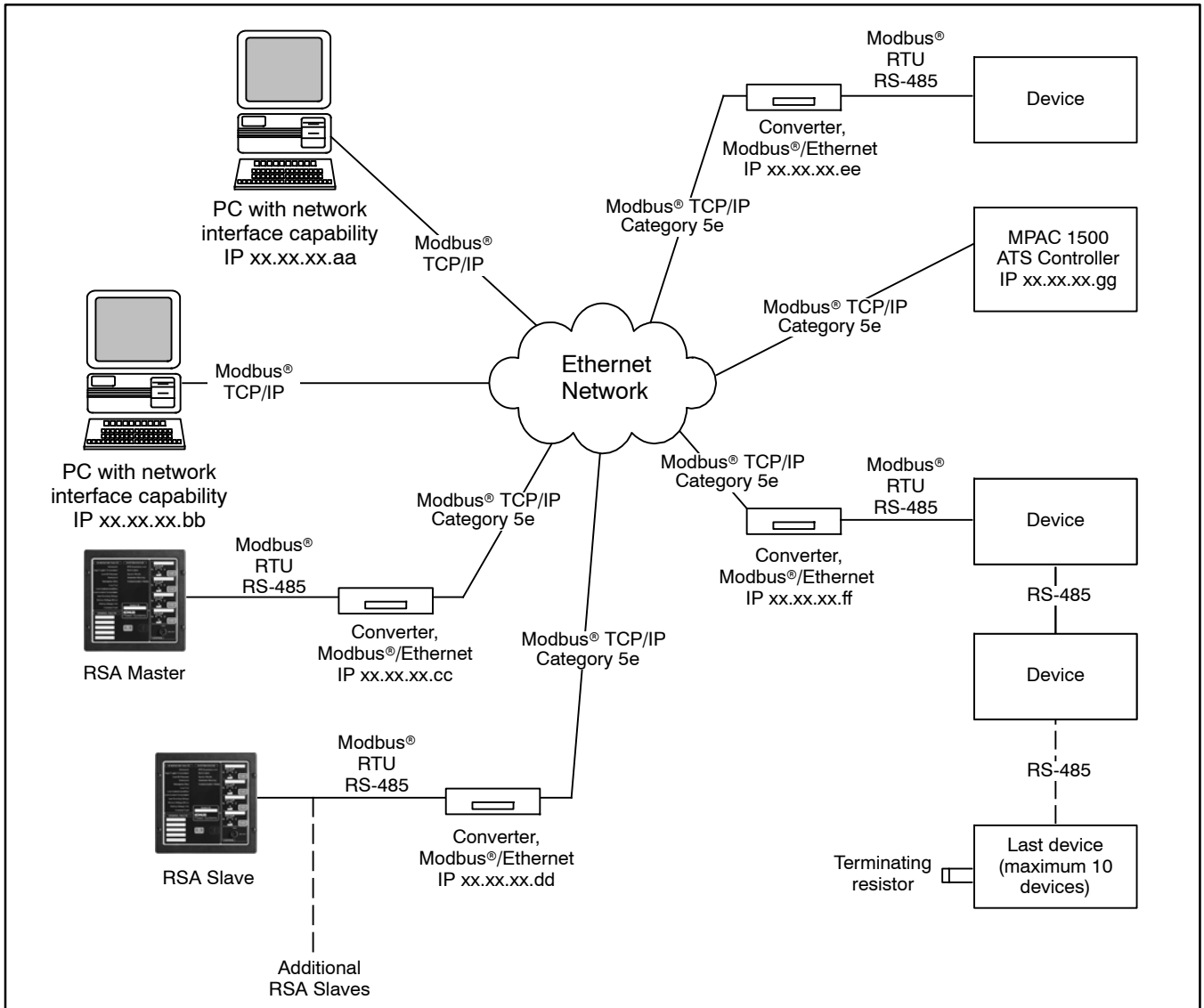
Many facilities use Ethernet networks to connect computers and equipment. The Modbus/Ethernet converter can be used to connect a single power system device or network of devices to an existing Ethernet network. Any remote PC connected to that Ethernet network and running Monitor III can then monitor 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 15. The converter is assigned a unique IP address to identify the connected device or network of devices. See Section 14 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 four 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.



Note: The RSA monitors only one Decision-Maker 3+, 550, or 6000 controller. That controller must have Modbus address=1.

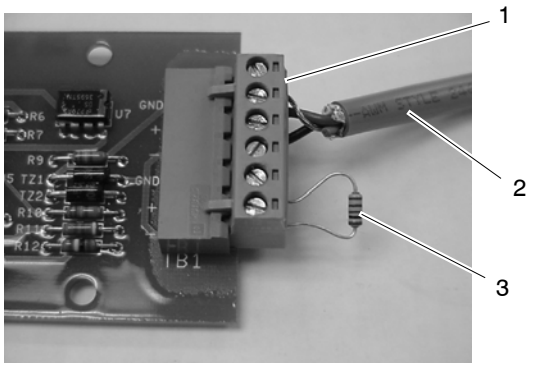
Note: The Modbus/Ethernet converter can connect to a maximum of 10 devices on the Modbus side, and can communicate with a maximum of 4 devices connected to the Ethernet.

Figure 2-3 Remote Network (Ethernet) Connection

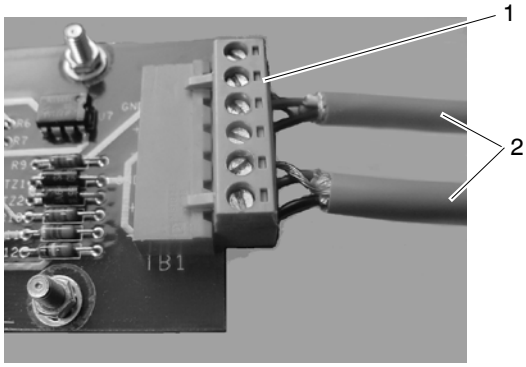
3 Connection Hardware

3.1 RS-485 Cables

All RS-485 cables are customer-supplied. Use Belden #9841 or equivalent shielded twisted-pair 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 3-1. Connect the 121-ohm termination resistor across the + and – terminals of the unused port on the last device for reliable communication in all installations.



One Cable



Two Cables

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1. RS-485 port connector
2. RS-485 cable, Belden #9841 or equivalent
3. Termination resistor, 121 ohm, 1% metal film, X-6058-27

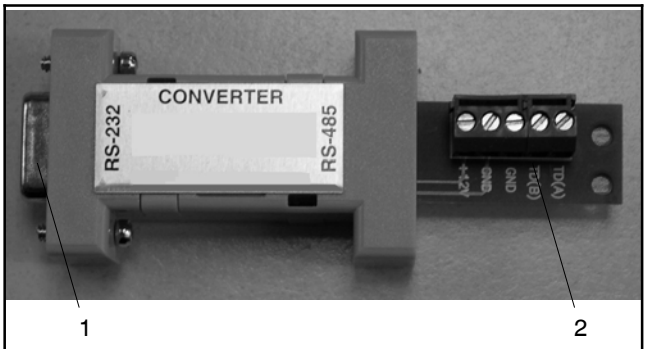
Figure 3-1 RS-485 Cable Connection Details

3.2 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 3-2. 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.



1. RS-232 connection
2. RS-485 connection. Do not connect to the +12V terminal on the converter. (The converter is powered through the PC's serial port.)

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Figure 3-2 RS-232 to RS-485 Port Converter

3.3 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 3-5 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 3-3. 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 3-4, 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 15.

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.

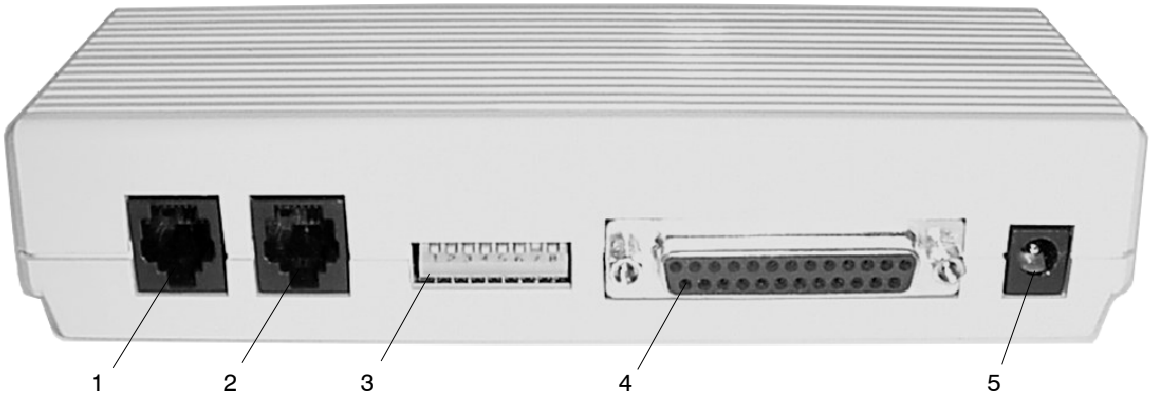
When all connections are made and power is available, place the power switch on front of the modem in the ON position. The modem's front panel LEDs should light as shown in Figure 3-4 when there is no communication activity. Adjust the volume control located on the side of the modem if desired.

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

Figure 3-3 Default Modem DIP Switch Settings

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

Figure 3-4 Idle LED Status



1. Telco jack, connects modem to telephone line
2. Telephone jack, optional telephone connection
3. DIP switches
4. RS-232 port
5. AC adapter jack

Figure 3-5 External Modem (typical), Rear View

4 Series 340 Device Connection

Series 340 devices include the following controllers:

- Decision-Maker® 340 generator set controller
- M340/M340+ transfer switch controller
- Power monitor (PM340)

4.1 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 4-1.

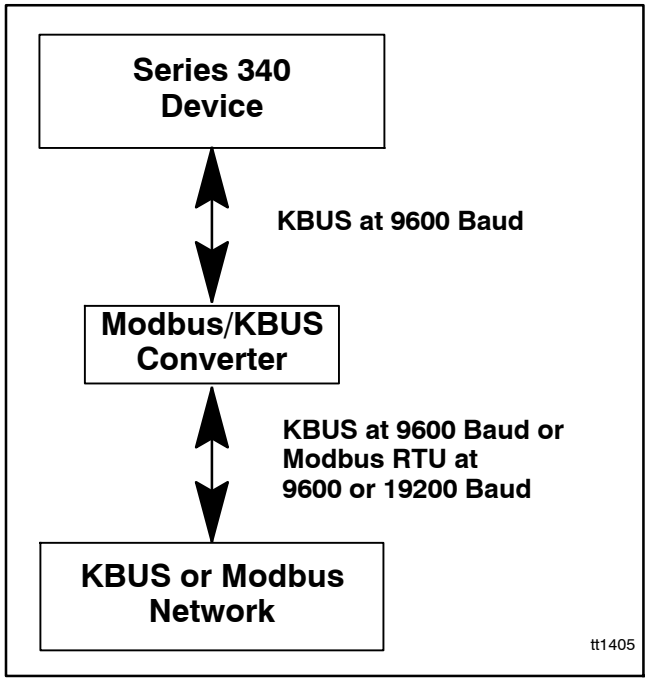


Figure 4-1 Modbus/KBUS Converter Function

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 4.2 to set the converter for KBUS or Modbus communication before installation.

4.2 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 4-2.

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.

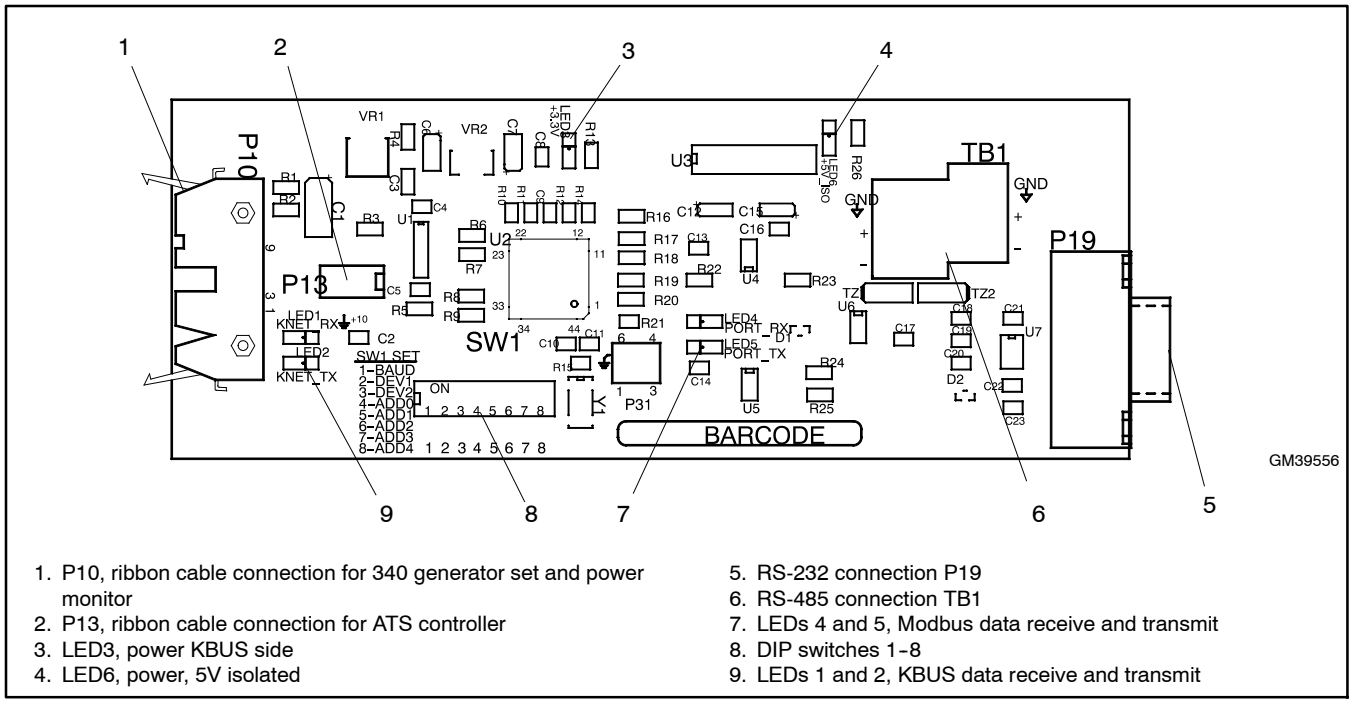
Modbus/KBUS Converter DIP Switch Settings

1. Set DIP switch 1 to select the Modbus baud rate. See Figure 4-3.

   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 4-4. 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 4-5. Each device in the system must have a unique network address.



1. P10, ribbon cable connection for 340 generator set and power monitor
2. P13, ribbon cable connection for ATS controller
3. LED3, power KBUS side
4. LED6, power, 5V isolated
5. RS-232 connection P19
6. RS-485 connection TB1
7. LEDs 4 and 5, Modbus data receive and transmit
8. DIP switches 1–8
9. LEDs 1 and 2, KBUS data receive and transmit

Figure 4-2 Modbus/KBUS Converter Board

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

Figure 4-3 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
M340/M340+ 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 4-4 Device DIP Switch Settings

Network Address	Port Data (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 4-5 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 4-6.

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 4-6 Diagnostic LEDs

4.3 Modbus/KBUS Converter Installation and Connection Procedure

Set up the converter module using the instructions in Section 4.2 before installing the converter.

Figure 4-8 through Figure 4-16 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 4-8 through Figure 4-16, 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 the connection diagrams in Section 15.

   340 generator set controller and power monitor only: Connect ribbon cable 352291 to P10 on the converter module. See the connection diagrams in Section 15.

4. Install the converter module.

   a. Install the spacers included with the kit on the mounting studs on the device or cover. Use Figure 4-7 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 4-7 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 the connection diagrams in Section 15.

   Decision-Maker® 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 the connection diagrams in Section 15.

6. Connect the RS-232 or RS-485 cable to each device. See the connection diagrams in Section 15.

   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 15.

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.

Decision-Maker® 340 Generator Set Controller Modbus/KBUS Converter Kit Installation

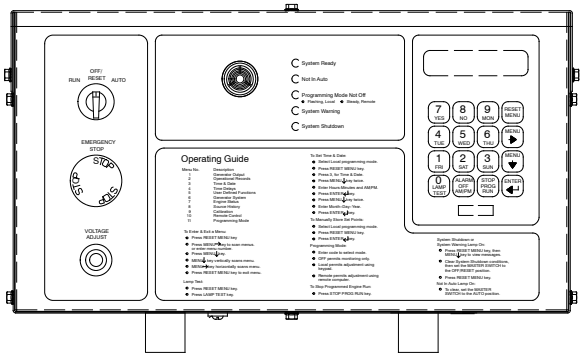
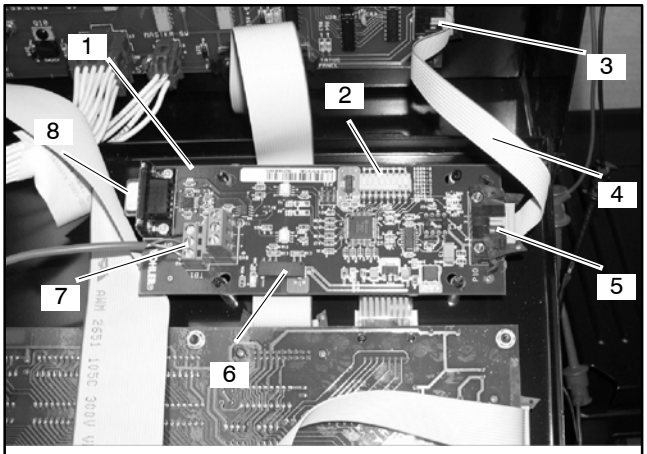


Figure 4-8 Decision-Maker® 340 Generator Set Controller

1. Converter location inside controller

Figure 4-9 Modbus/KBUS Converter Installation for the 340 Generator Set Controller

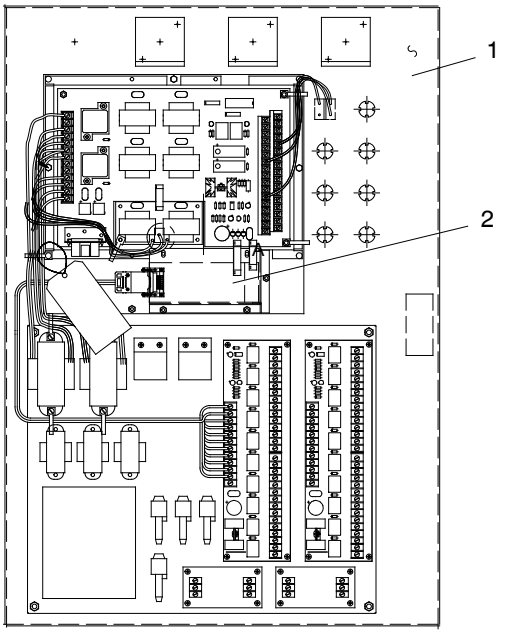


1. Modbus/KBUS Converter PCB GM39556
2. DIP Switches, address
3. Main logic board connection, P9
4. Ribbon cable
5. Converter connection, P10
6. Configuration DIP switches
7. RS-485 Connector
8. RS-232 Connector

Figure 4-10 Converter Connections and DIP Switches

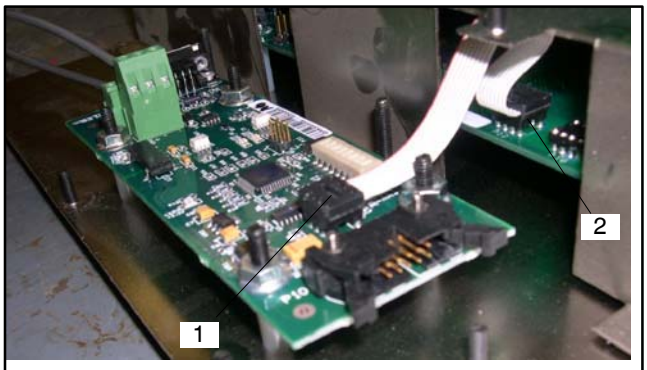
M340/M340+ ATS Controller Modbus/KBUS Converter Module Installation

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 4-14. Install cover 294719 over the assembly as shown in Figure 4-13 or Figure 4-14.



1. ATS enclosure door
2. Converter module location

Figure 4-11 Converter Module Location for M340/M340+ ATS Controllers



1. P13 connector on converter board
2. P12 connector on ATS controller's main logic board

Figure 4-12 Ribbon Cable Connection

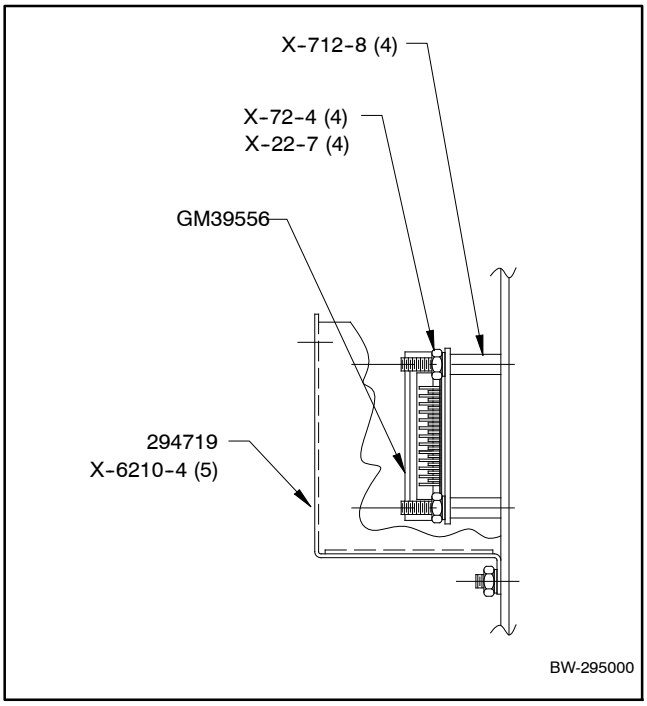


Figure 4-13 Converter Module Installation Details for ATS Controllers Without Load Shed Accessory 35N

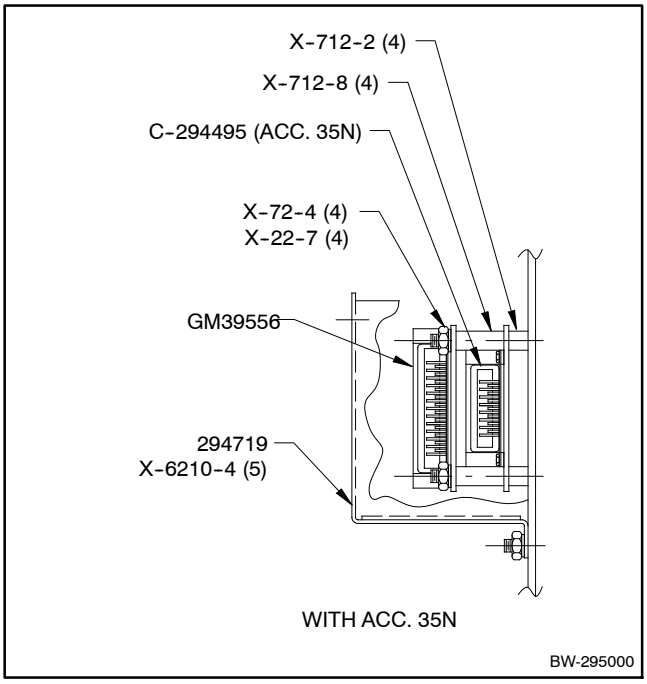
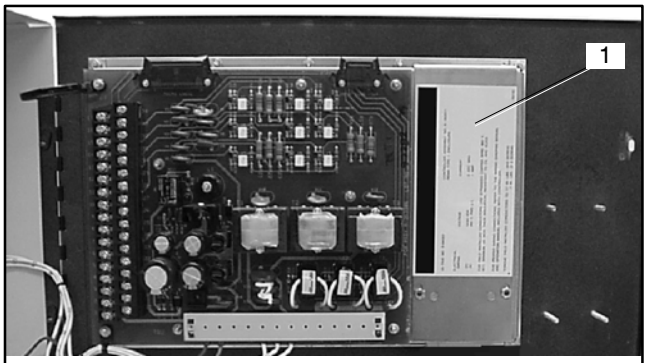


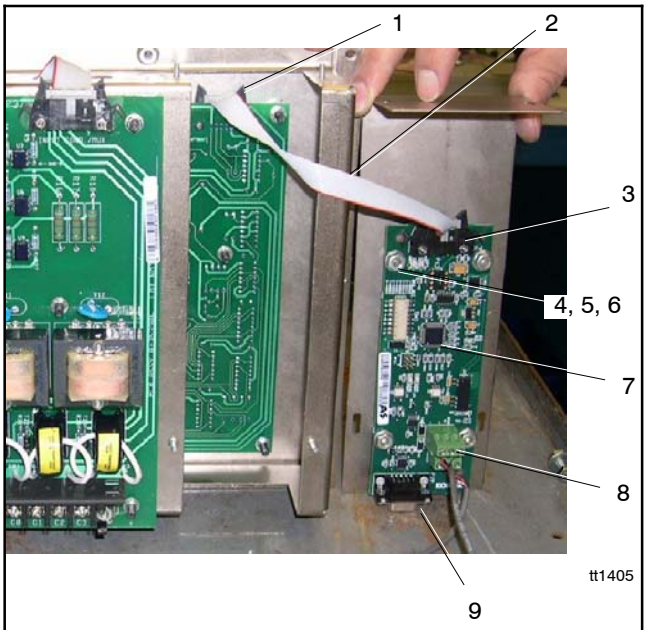
Figure 4-14 Converter Module Installation Details for ATS Controllers With Load Shed Accessory 35N

Power Monitor Modbus/KBUS Converter Kit Installation



1. Cover. Remove to install converter module

Figure 4-15 Converter Module Location and Connection for the Power Monitor



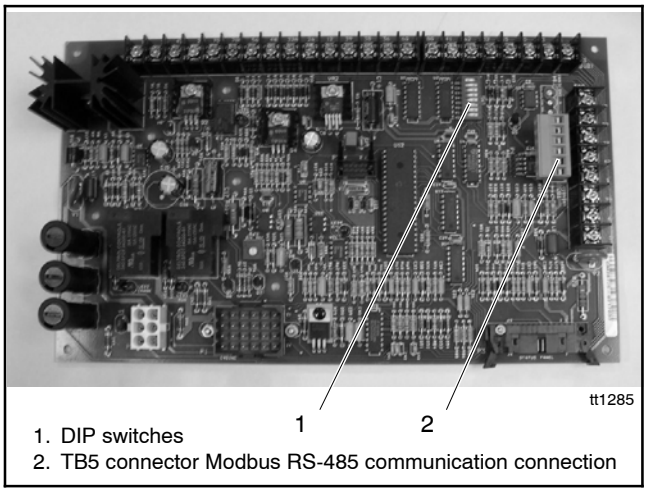
1. Connector P9
2. Ribbon cable,
3. Connector P10
4. Washer, lock, 0.172 ID x 0.333 in. OD, X-22-7 (4)
5. Nut, hex machine screw, 8-32, X-70-12 (4)
6. Spacer, 0.25 OD, 0.375 in., X-712-13 (4)
7. Converter board GM39556
8. RS-485 connection
9. RS-232 connection

Figure 4-16 Converter Module Installation Details for the Power Monitor

5 Decision-Maker 3+ 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.

A red circuit board GM28725 or a blue circuit board GM64497 is required for Modbus communication with this controller. See Figure 5-1.



1. DIP switches
2. TB5 connector Modbus RS-485 communication connection

Figure 5-1 Decision-Maker 3+ Controller Circuit Board GM28725 (red board)

5.1 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.

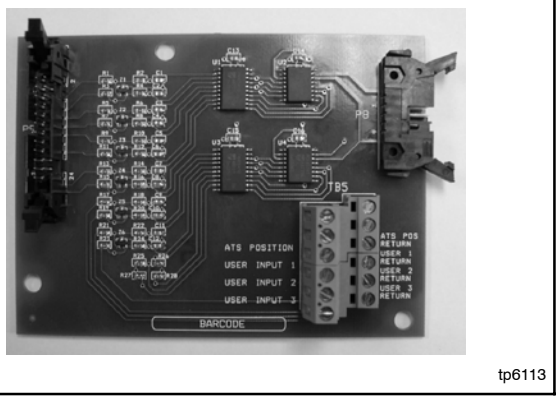


Figure 5-2 Communications Board

5.2 Network Connection

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

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.

Use Belden #9841 or equivalent cable to connect devices in a network. Connect to the TB5 connector on the controller board. See Figure 5-1. Attach to the RS-485 connector as shown in Figure 5-3. Use a termination resistor on the last device in the network.

Also see the network connection diagrams in Section 15.

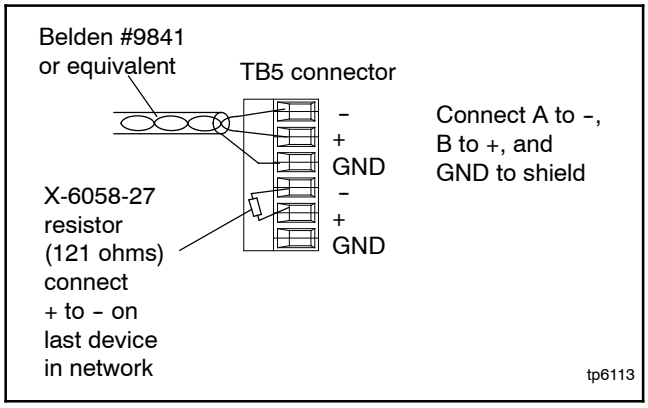


Figure 5-3 RS-485 Connection Details

5.3 Network Address

Each Modbus® device in the network requires a unique address. The Decision-Maker 3+ Controller circuit board contains eight DIP switches. See Figure 5-1 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 5-4 shows the DIP switch positions for each address number.

Note: The network address for the Decision-Maker 3+ 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 5-5.

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® 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 5-4 Decision-Maker 3+ Controller Network Address DIP Switches

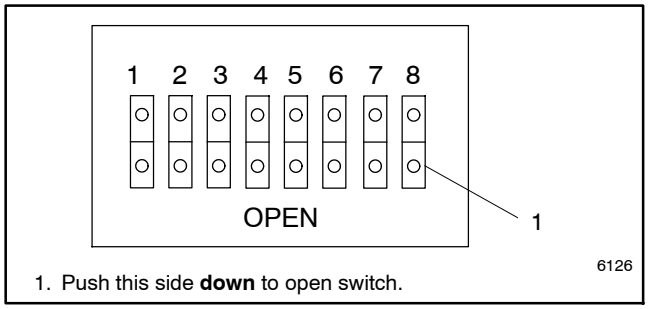


Figure 5-5 DIP Switch Open Position

6 Decision-Maker 550 Controller Connection

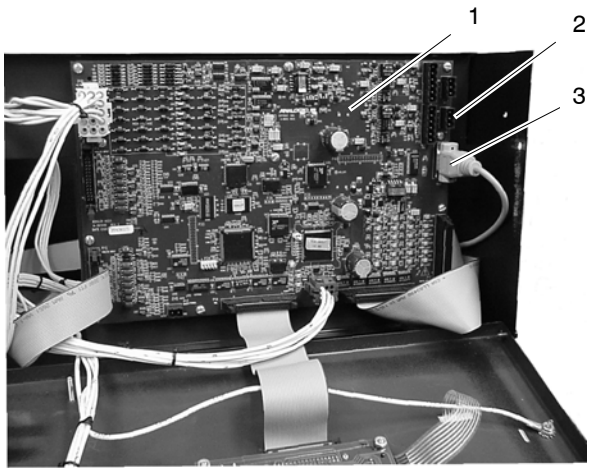
Use the following procedure to connect the hardware. Observe the safety precautions. Also see the network connection diagrams in Section 15.

Ethernet connections require the use of a Modbus/Ethernet converter module. See Figure 2-3 and Section 14, Converter, Modbus/Ethernet.

Decision-Maker 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 13 to configure the controller's communication parameters.



1. Main logic board
2. Modbus® RS-485 port (P20)
3. RS-232-C port (P18)

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

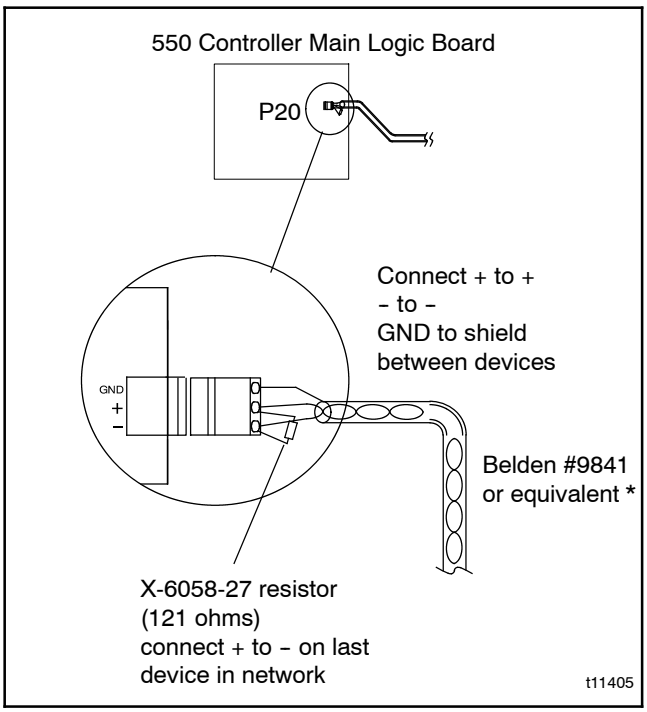


Figure 6-2 RS-485 Connector Details

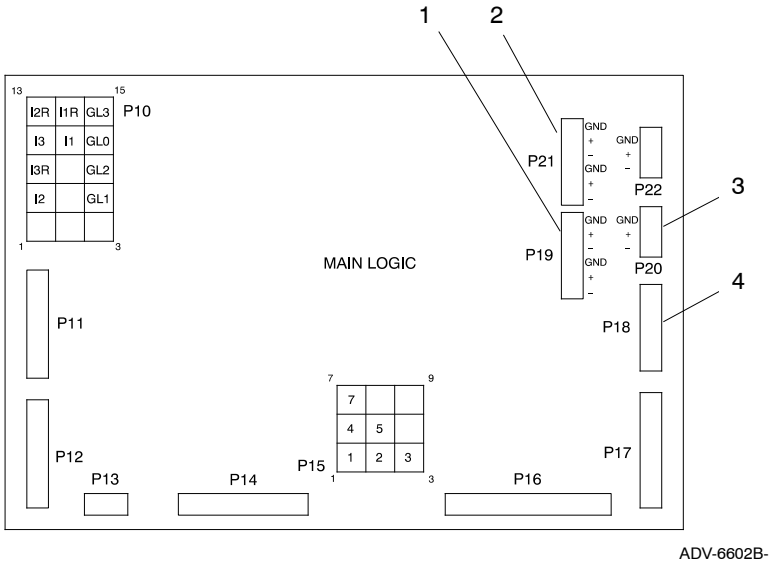
Modbus® is a registered trademark of Schneider Electric.

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 –



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 Decision-Maker 550 Controller Communication Connections Pin Identification

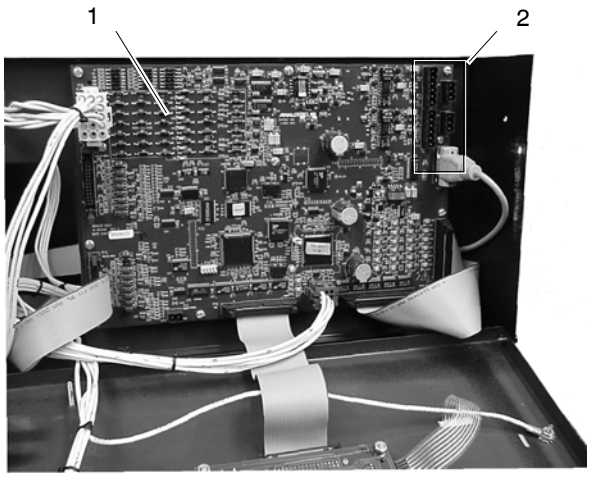
7 Decision-Maker 6000 Controller Connection

Use the following procedure to connect the hardware. Observe the safety precautions. Also see the network connection diagrams in Section 15.

Ethernet connections require the use of a Modbus/Ethernet converter module. See Figure 2-3 and Section 14, Converter, Modbus/Ethernet.

Decision-Maker 6000 Controller Connection Procedure

1. Press the OFF button on the controller.
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 7-1 and Figure 7-3.
6. Make connections to the desired controller port(s). For RS-232 connections, use connector P18. For RS-485 connections, use Modbus® RS-485 connector P19 or P20. See Figure 7-2 and Figure 7-3.
7. Close the controller enclosure.
8. Verify that the controller is OFF.
9. Reconnect the generator set engine starting battery, negative (–) lead last.
10. Reconnect power to the battery charger, if equipped.
11. Proceed to Section 13 to configure the controller's communication parameters.



1. Main logic board
2. Communication ports

Figure 7-1 Communication Port Locations for the 550 Generator Set Controller

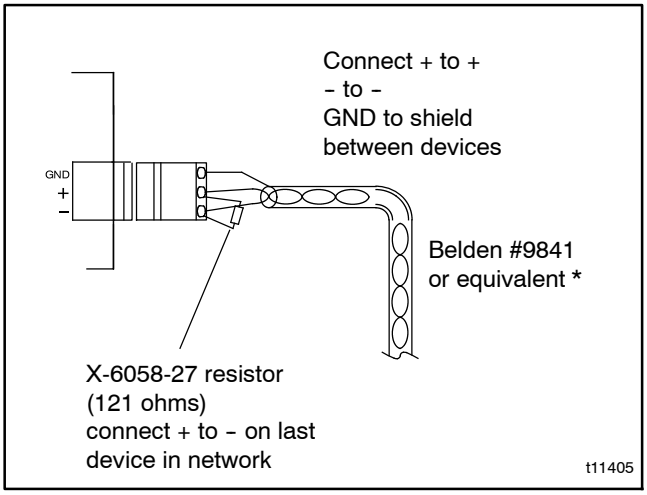
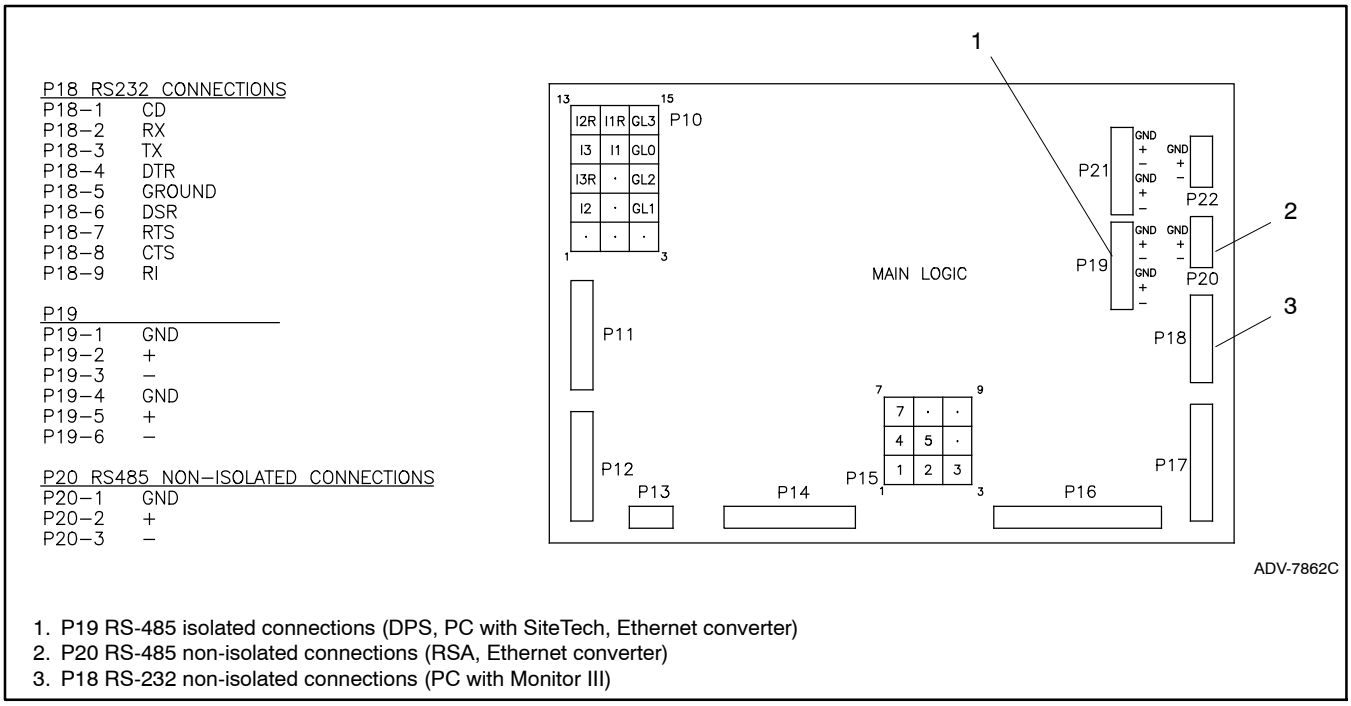


Figure 7-2 RS-485 Connector Details

Modbus® is a registered trademark of Schneider Electric.



1. P19 RS-485 isolated connections (DPS, PC with SiteTech, Ethernet converter)
2. P20 RS-485 non-isolated connections (RSA, Ethernet converter)
3. P18 RS-232 non-isolated connections (PC with Monitor III)

Figure 7-3 Decision-Maker 6000 Controller Modbus Communication Ports

8 Decision-Maker 3000 Controller Connection

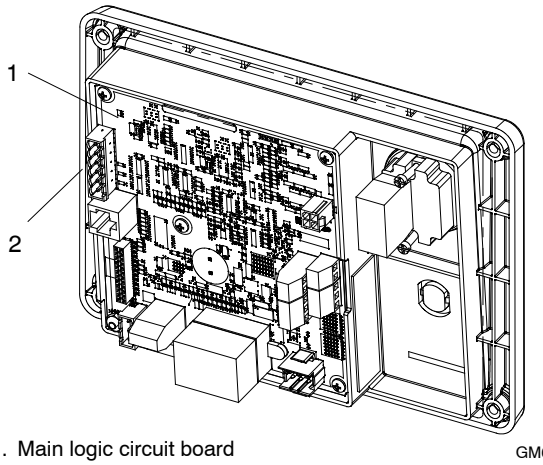
Controller firmware version 2.08 or higher is required for Modbus communication with this controller. The firmware (software) version number is shown in the controller's overview menu. See the controller Operation Manual for instructions to check the firmware version number. Use Kohler® SiteTech™ software and a personal computer connected to the controller's USB port to update the controller firmware, if necessary. See TP-6701, SiteTech Software Operation manual, for instructions.

Use the following procedure to connect the hardware. Observe the safety precautions. Also see the network connection diagrams in Section 15.

Ethernet connections require the use of a Modbus/Ethernet converter module. See Figure 2-3 and Section 14, Converter, Modbus/Ethernet.

Decision-Maker 3000 Connection Procedure

1. Press the OFF button on the controller.
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. Connect to communication port P21 as shown in Figure 8-1.
6. Verify that the controller is OFF.
7. Reconnect the generator set engine starting battery, negative (-) lead last.
8. Reconnect power to the battery charger, if equipped.
9. Proceed to Section 13. Use Kohler® SiteTech™ software and a personal computer connected to the controller's USB port to configure the controller's communication parameters. See TP-6701, SiteTech Software Operation Manual, for instructions.



1. Main logic circuit board
2. P21 for RS-485 communication connection

GM65741-

Figure 8-1 Communication Port P21

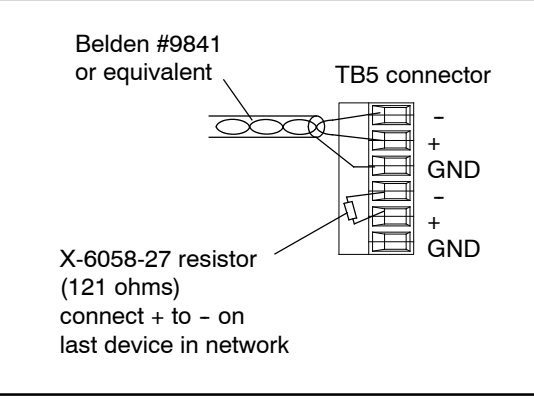


Figure 8-2 Connection Details

9 RSA 1000 Remote Serial Annunciator Connection

These instructions explain connection of an RSA 1000 to communicate with a Decision-Maker 550 or Decision-Maker 3+ generator set controller 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. The version number is printed on the processor on the circuit board. See Figure 9-2. A service kit is available to upgrade earlier versions of the RSA 1000 for network communication.

The Modbus/Ethernet converter must have firmware version 2.0 or higher. See the Device Details screen in the DeviceInstaller software, Section 14.4.

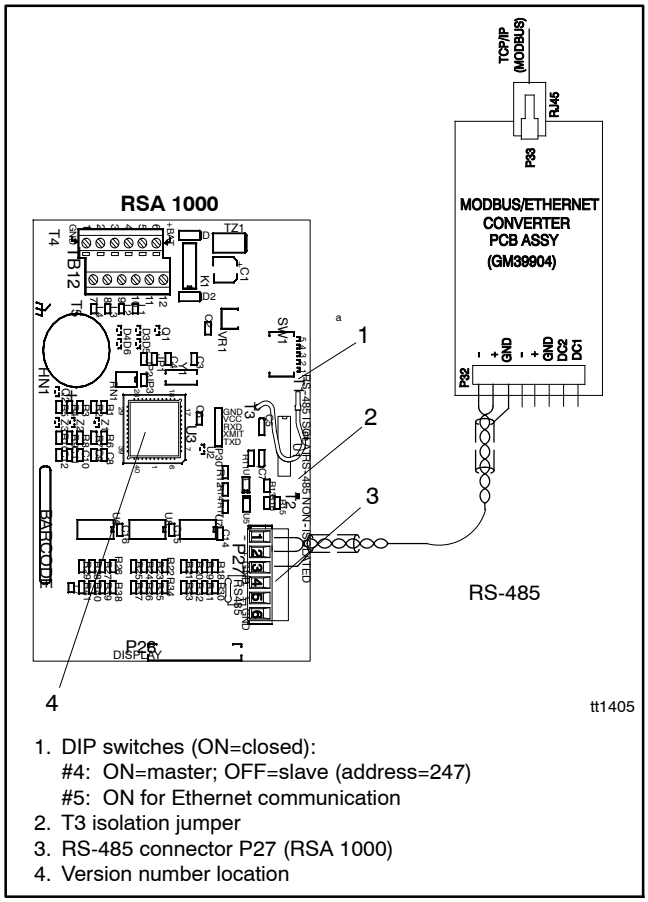
Set RSA DIP switch 5 to the ON position for Ethernet network communication with the Modbus/Ethernet converter. Set DIP switch 4 for master or slave as needed.

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 14 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 14.

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



1. DIP switches (ON=closed):
   #4: ON=master; OFF=slave (address=247)
   #5: ON for Ethernet communication
2. T3 isolation jumper
3. RS-485 connector P27 (RSA 1000)
4. Version number location

Figure 9-2 Connection Details

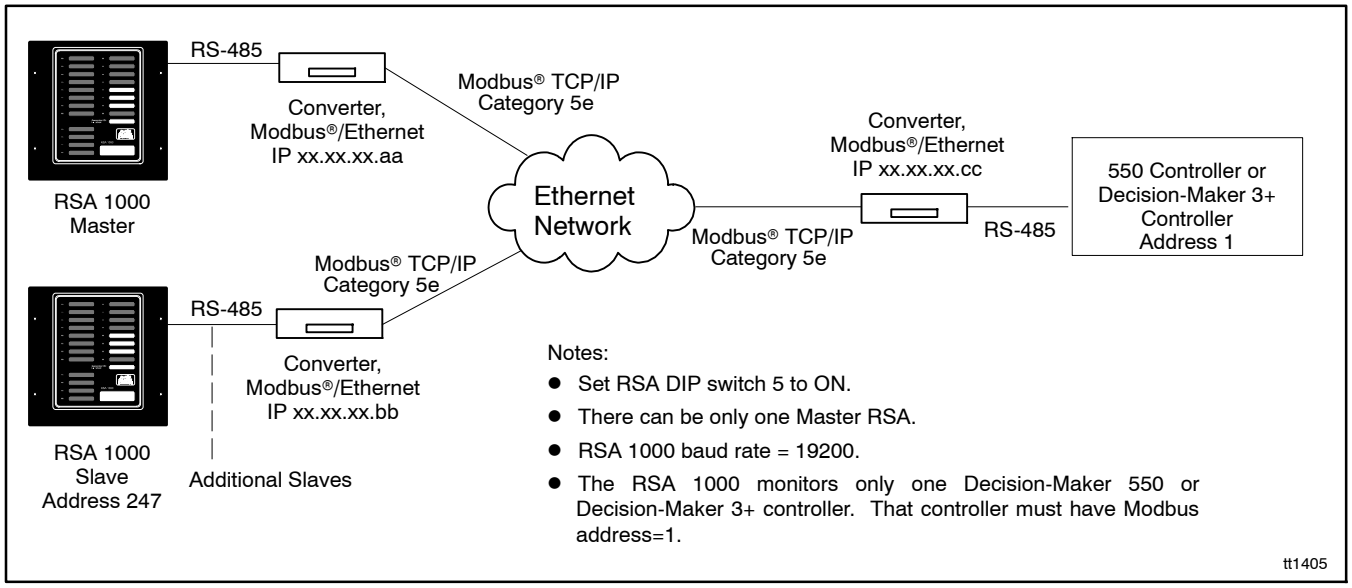


Figure 9-3 RSA 1000 Ethernet Network Connections

10 RSA II and RSA III Connection

See Figure 10-1 for connection of an RSA II to a Modbus/Ethernet converter. Notice the master and slave designations. See Figure 10-2 for RSA III connections to the Modbus/Ethernet converter.

See Figure 10-3 for RSA II or RSA III Ethernet network connections.

Use Kohler® SiteTech™ software to set the Modbus settings on the RSA II or RSA III. See Section 13, Device Setup.

If the RSA demonstrates communication problems or the master RSA does not see a slave, disconnect power and then reconnect power to the master RSA.

For all other RSA II connections and additional instructions, refer to the instruction sheet provided with the RSA II, TT-1485.

See TT-1625, provided with the RSA III, for complete RSA III installation, connection, and setup instructions.

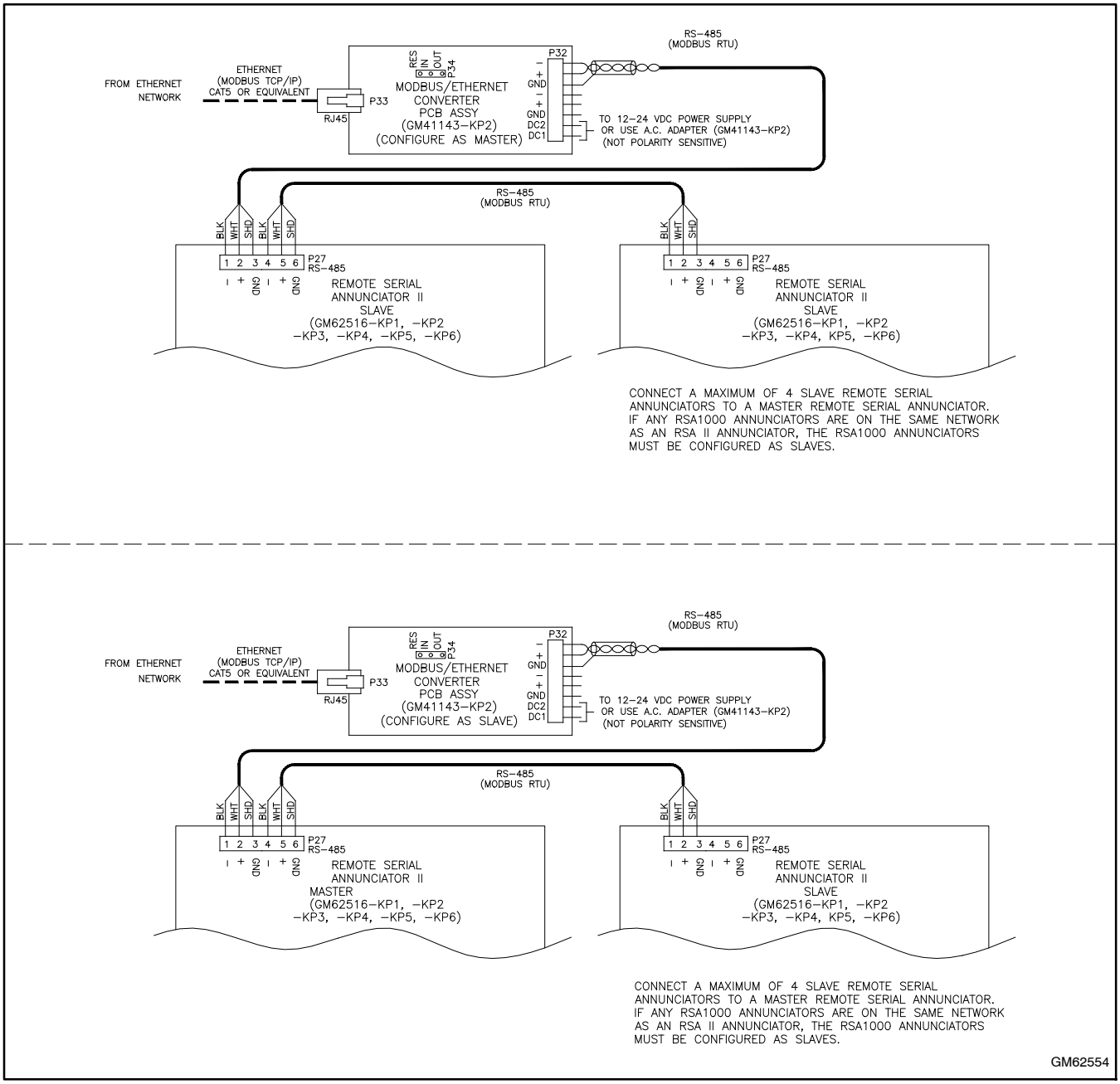


Figure 10-1 RSA II to Modbus/Ethernet Converter Connection Details

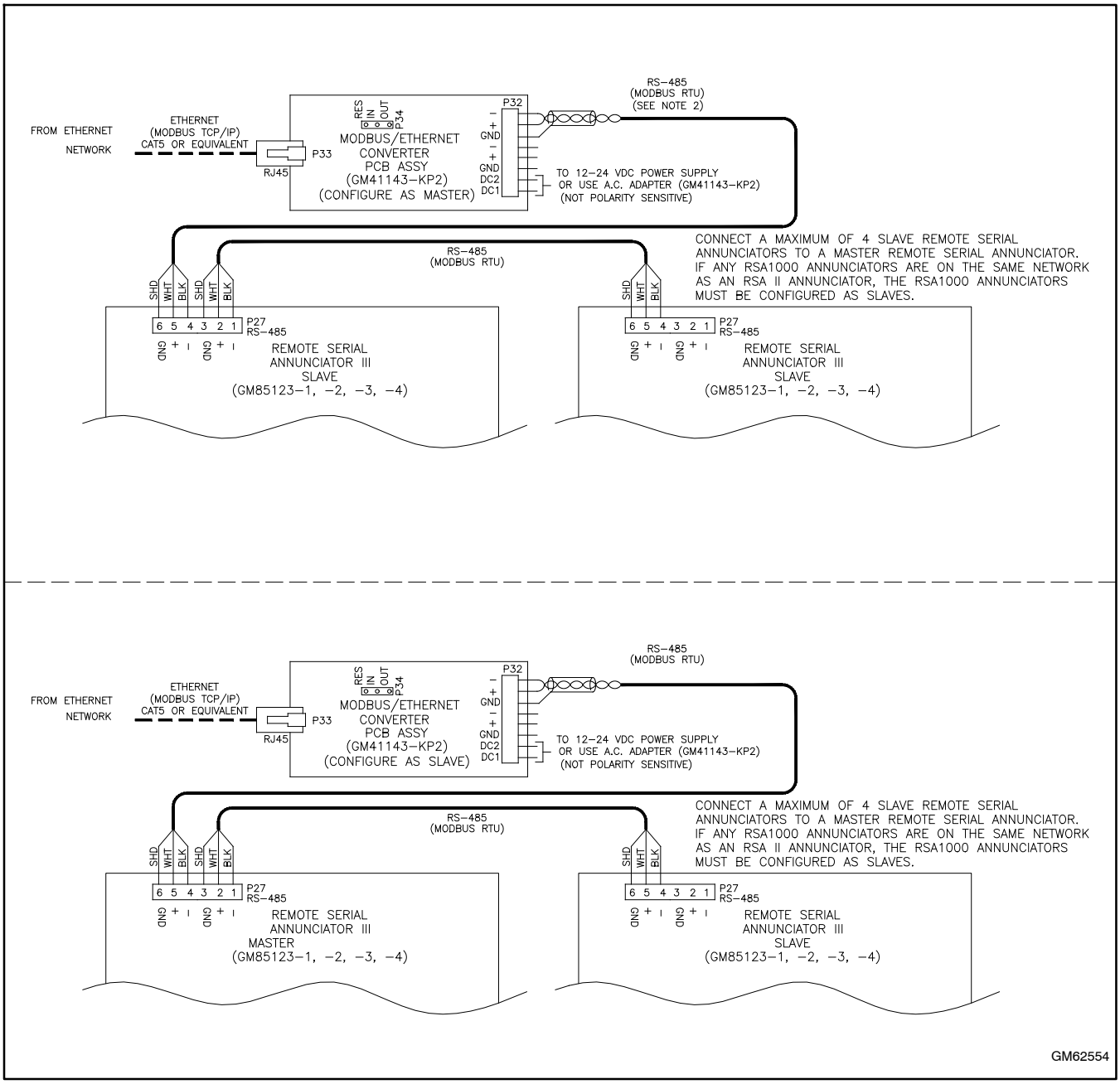


Figure 10-2 RSA III to Modbus/Ethernet Converter Connections (Note master and slave designations)

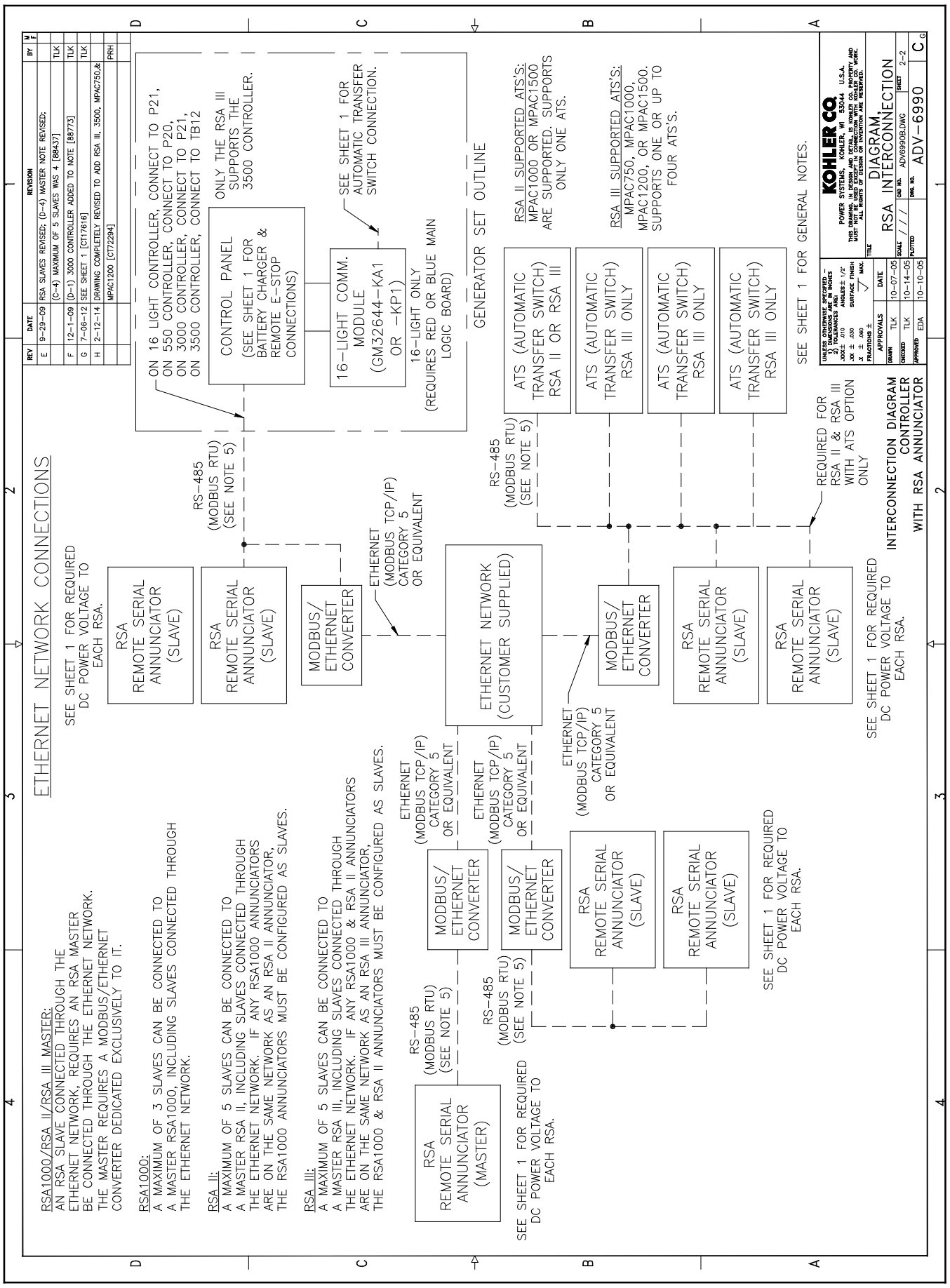


Figure 10-3 RSA Interconnection Diagram, ADV-6990, Sheet 2

11 MPAC 1000 ATS Controller Connection

⚠ DANGER

Hazardous voltage.
Will cause severe injury or death.

Disconnect all power sources before opening the enclosure.

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.

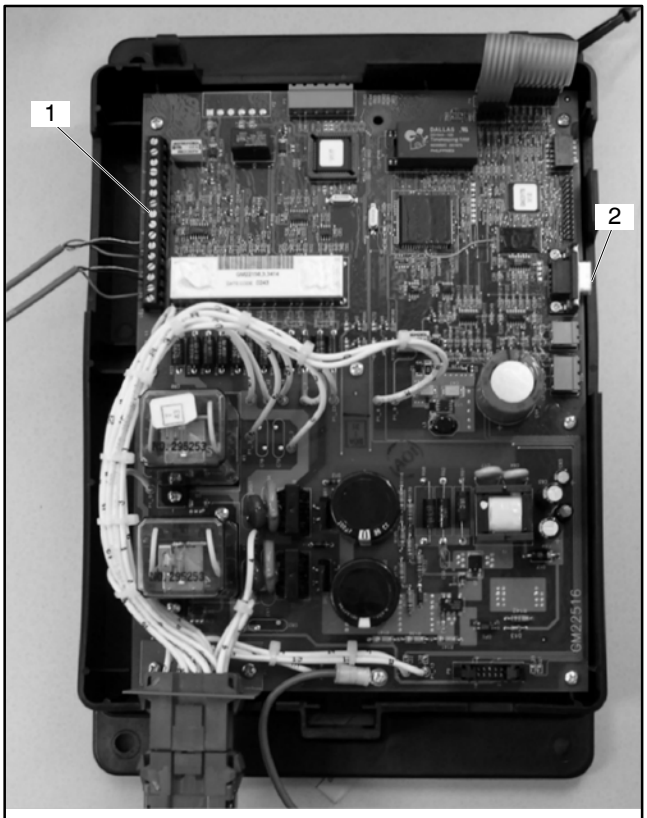
MPAC® 1000 programmable transfer switch controllers can be connected directly to a personal computer through an RS-485 connection or connected from a remote site using modems and RS-485 connections. An RS-232 to RS-485 converter is required to connect the controller's RS-485 connection to the PC serial port or to connect the transfer switch controller to the device modem. See Section 15 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 11-1.
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 11-2.
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 13 to configure the controller's communication parameters.



1. Terminal strip TB1 with RS-485 connections
2. Serial port (connection for Setup Program only; do not use for Monitor III Program)

Figure 11-1 MPAC® 1000 ATS Controller (cover removed)

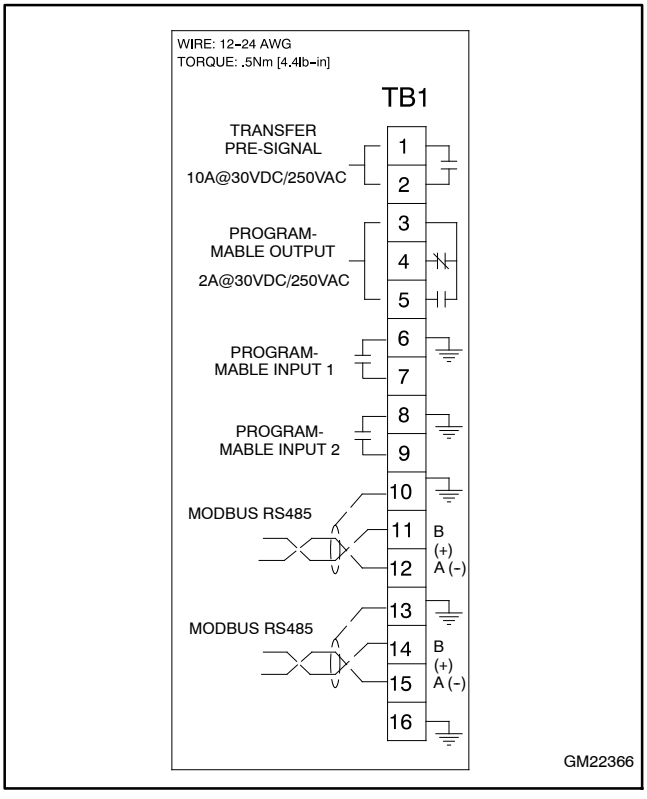


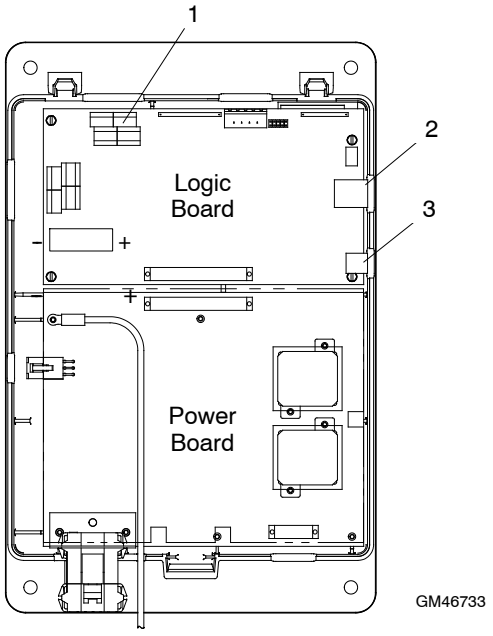
Figure 11-2 Terminal Strip TB1 Connections

12 MPAC 1500 ATS Connection

Note: For communication connection information for Decision-Maker® MPAC 750, 1200, and 1500 controllers that were introduced in March, 2014, refer to the Operation Manual provided with the transfer switch. Also see the network connection diagrams in Section 15.

12.1 Introduction

The MPAC™ 1500 transfer switch controller has three types of communications connections: one or two RS-485 serial ports, an Ethernet port, and a USB port. See Figure 12-1. The Modbus/Ethernet converter is not required for this controller, except in applications that use Simple Network Management Protocol (SNMP).



1. RS-485 connection TB2 (one or two ports)
2. Ethernet connection RJ-45P13
3. USB connection P12 (for file transfer only)

Figure 12-1 Communication Connections (controller cover removed for illustration only)

Use Ethernet or serial connections to connect the transfer switch to a personal computer for system monitoring and control using Monitor III software or other Modbus applications. The controller uses Modbus® TCP/IP communication protocol over the Ethernet port, and Modbus® RTU communication protocol over the serial ports. The Modbus registers are available in the Modbus Protocol manual. See the List of Related Materials.

Note: Modbus® applications other than Monitor III software require a Modbus software driver written by a trained and qualified systems programmer.

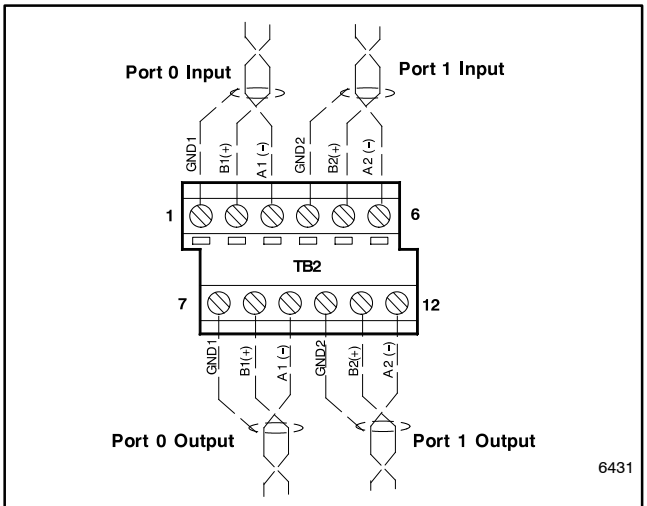
The USB port is used only for file transfer between the controller and a memory device. See the Transfer Switch Operation and Installation Manual for instructions to transfer files through the USB port.

12.2 MPAC 1500 Serial Connections

Use serial connections to TB2 on the controller's logic board to connect the transfer switch to a personal computer, the optional ATS remote annunciator, a Modbus network, or the Modbus/Ethernet converter (required only for SNMP). System monitoring and control using Monitor III software requires serial connection to a personal computer as described in this section. See Figure 12-1 for the location of TB2.

The serial ports are isolated RS-485 ports with connection speeds of 9.6, 19.2, and 57.6 kbps. Use shielded twisted-pair cable to connect to the RS-485 connectors on the main logic board terminal strip TB2 for serial connections. For connection to a PC, use RS-485 to RS-232 converter GM41096 and connect to the PC's serial port.

Connect the Modbus input and output to the terminals shown in Figure 12-2. Use #12-24 AWG twisted-pair wire. Belden cable #9841 or equivalent is recommended. Connect the shield to ground. Tighten the connections to 0.5 Nm (4.4 in. lb.).



Note: Controller may have one or two ports.

Figure 12-2 Main Logic Board Modbus RS-485 Connections to TB2

Modbus® is a registered trademark of Schneider Electric.

12.3 MPAC 1500 Ethernet Connections

The MPAC® 1500 transfer switch can be connected to a building's Ethernet network to communicate with personal computers connected to the same subnet. The MPAC® 1500 ATS controller does not require a Modbus/Ethernet converter for Ethernet connection.

Note: Contact your local network administrator for assistance with network connections and setup.

Ethernet Port. The Ethernet port is a standard RJ-45 female plug on the controller's main logic board. See Figure 12-1 for the location of the Ethernet port. Use Category 5e or better cable to connect the controller to the building's network. The Ethernet connection allows the controller to communicate with a personal computer on the network to run Monitor III Software or other Modbus applications.

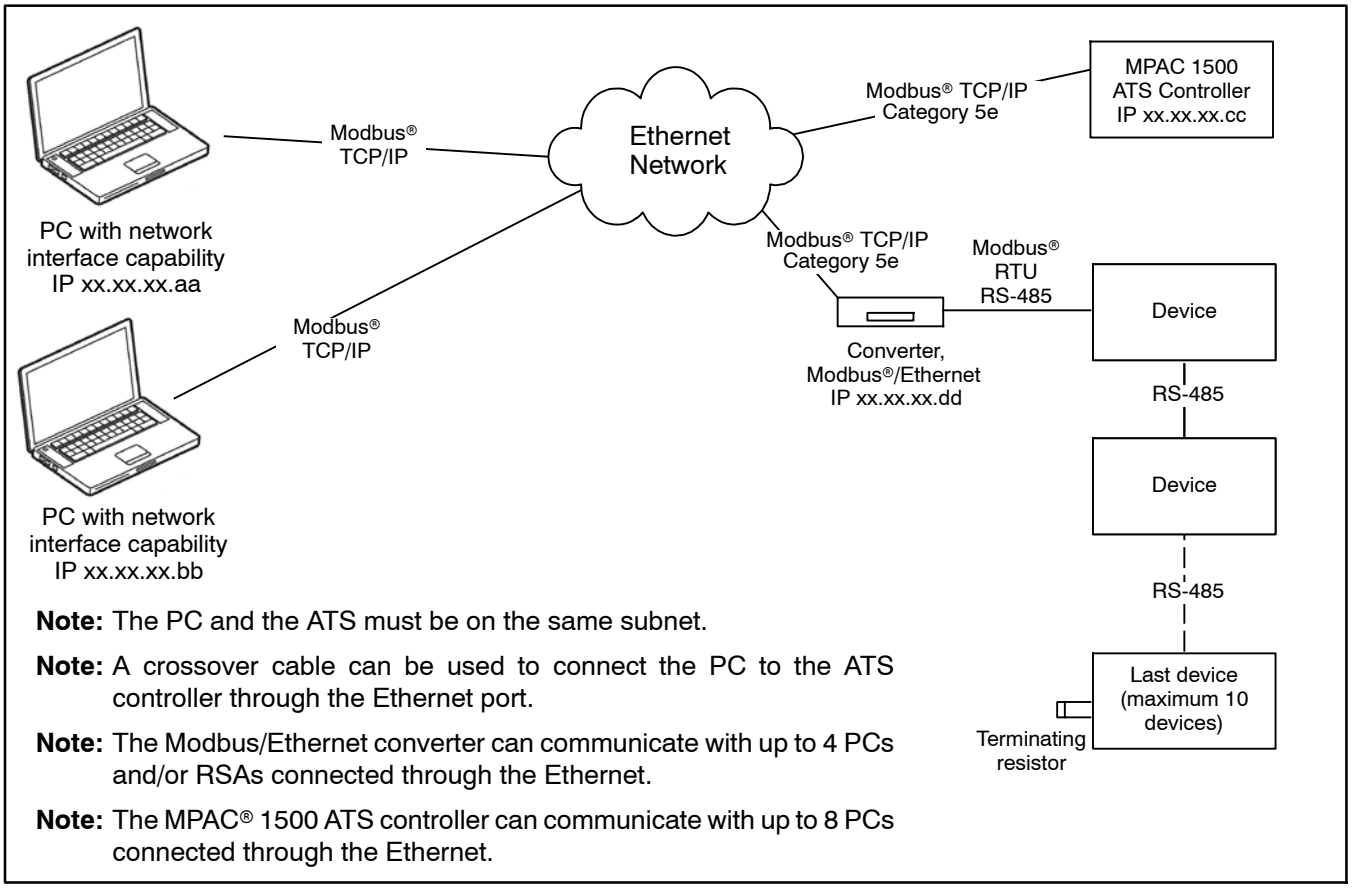
A crossover cable can be used to connect the ATS controller directly to a PC through the Ethernet port.

Note: For an Ethernet connection, obtain an IP address and subnet mask number from the local system administrator.

Use the Setup menus to assign a port number, IP address, and subnet mask number. The controller may have a default IP address assigned at the factory for test purposes. **Change the IP address to an address owned by the user.** See Section 12.4 for instructions to set the communication parameters.

The MPAC® 1500 controller does not operate as a Modbus-to-Ethernet converter for other devices in a network. For multiple device networks connected to the personal computer through the Ethernet, use a Modbus-to-Ethernet converter for the other devices in the network. See Figure 12-3.

The controller can communicate with up to eight (8) simultaneous TCP/IP (ethernet) connections. If anyone attempts to establish a ninth connection, the first connection that was established will be dropped. These eight connections do not include the two RS-485 serial ports. In the extreme case, eight users may be communicating with the controller via TCP/IP network connections and two may be communicating through serial ports 0 and 1, for a total of ten communication channels. As the controller is asked to communicate with more and more outside devices, its performance will slow down.



Note: The PC and the ATS must be on the same subnet.

Note: A crossover cable can be used to connect the PC to the ATS controller through the Ethernet port.

Note: The Modbus/Ethernet converter can communicate with up to 4 PCs and/or RSAs connected through the Ethernet.

Note: The MPAC® 1500 ATS controller can communicate with up to 8 PCs connected through the Ethernet.

Figure 12-3 Ethernet Connections to Multiple-Device Network

12.4 MPAC 1500 ATS Controller Communications Setup

Use the communications setup screen to set the communication parameters for serial or Ethernet connections. See Figure 12-4. The controller uses Modbus® communication protocol.

12.4.1 Serial Communication

Set the following communication parameters for serial communication. Also see Figure 12-5.

Baud Rate, Port 0 and 1. Required for serial connections. The baud rate must match the baud rate of the connected PC.

Modbus Server, Port 0 and 1. Enable one or both serial ports for Modbus communication.

Modbus Addr, Port 0 and 1. Assign a unique address between 001 and 247 to each serial port.

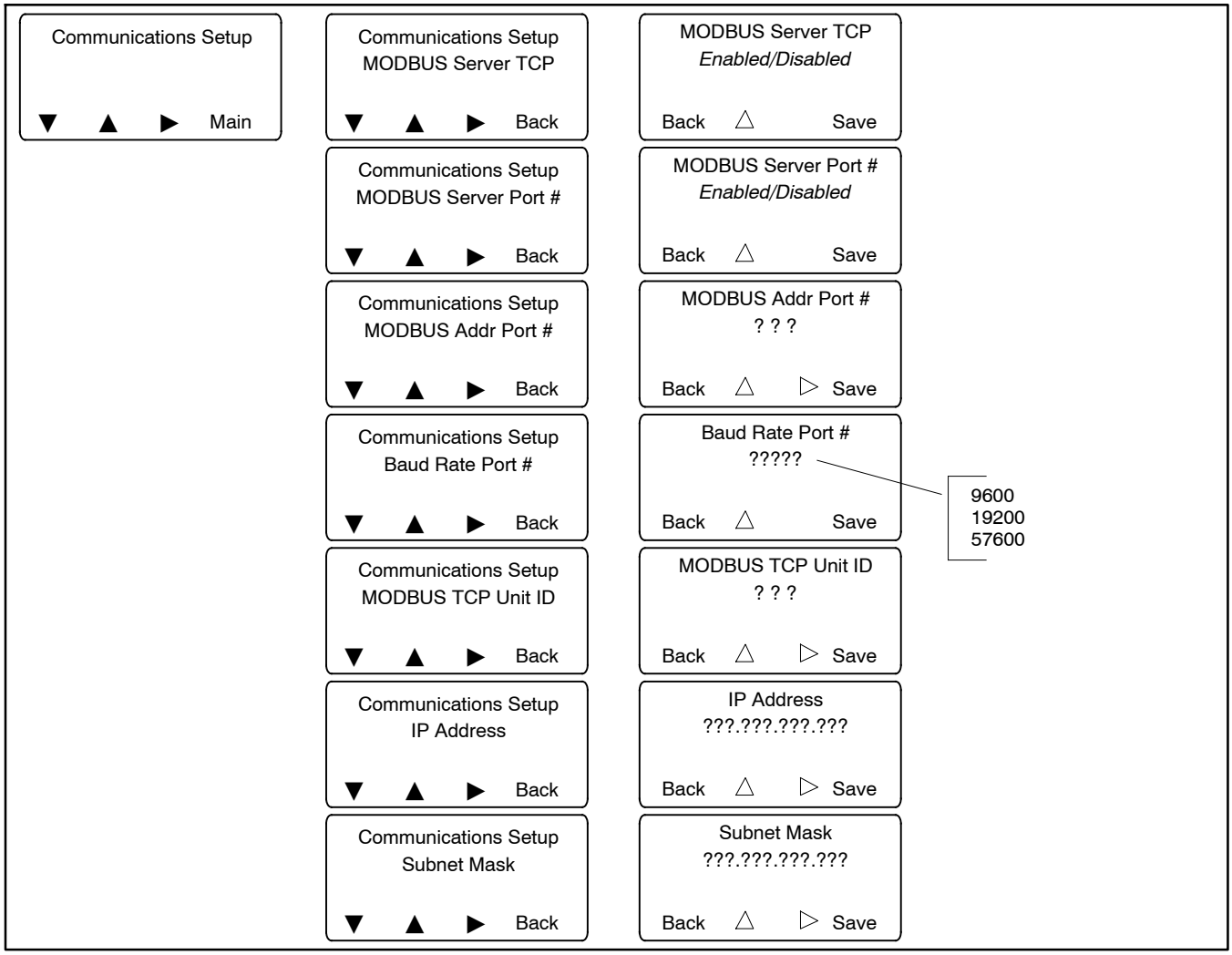


Figure 12-4 Communications Setup

Setting	Range	Needed for Connection Type:			Notes
		Serial	Remote Serial (modem)	Ethernet	
Modbus Server TCP	Enabled or Disabled			X	Enable for network communication through the Ethernet port.
Modbus Server Port 0	Enabled or Disabled	X	X		Enable for Modbus communication through serial port 0 on the main logic board.
Modbus Server Port 1	Enabled or Disabled	X	X		Enable for Modbus communication through serial port 1 on the main logic board.
Modbus Addr Port 0	001-247 default 1	X	X		Address for RS-485 serial port 0 (on the logic board). Each port must have a different address.
Modbus Addr Port 1	001-247 default 2	X	X		Address for RS-485 serial port 1 (on the logic board). Each port must have a different address.
Baud Rate Port 0	9600, 19200, 57600	X	X		Baud rate in bits per second for serial communication between the controller and a personal computer's COM port.
Baud Rate Port 1	9600, 19200, 57600	X	X		
Modbus TCP Unit ID	—			X	Factory-set to 3. A unit ID is required for Modbus over TCP communication. The unit ID for TCP communication is analogous to the Modbus address for serial communication through the RS-485 ports.
IP Address	—			X	Obtain from your local network administrator. Every device on the network must have a unique IP address.
Subnet Mask	—			X	Obtain from your local network administrator.
MAC Address	Factory-set			X	Hardware address, entered at the factory. Not adjustable. Appears only in the Communications View screen.

Figure 12-5 MPAC® 1500 ATS Controller Communication Parameters

12.4.2 Ethernet Communication

Work with your local network administrator to set the following communication parameters for Ethernet communication. Also see Figure 12-5.

Modbus Server TCP. Enable TCP if the transfer switch is connected to a network for TCP/IP communication (for example, Ethernet communication).

Modbus Address. Assign a unique Modbus address to each device on the network. Monitor III software requires a unique Modbus address to identify the controller. Record the address to enter into Monitor III software.

Modbus TCP Unit ID. A unit ID is required for Modbus over TCP communication. The unit ID for TCP communication is analogous to the Modbus address for serial communication through the RS-485 ports.

IP Address and Subnet Mask. The transfer switch may have a default IP address assigned at the factory. **Change the IP address to an address owned by the user.** Obtain an IP address and subnet mask information from the local network administrator.

MAC address. The MAC hardware address is factory-set. It can be seen in the View>Communications Setup screens but not viewed or changed in the setup menus.

13 Device Setup

To configure the devices for communication, set the communications parameters as shown in Figure 13-1. Refer to the device Operation Manual for instructions. See List of Related Materials.

To view and adjust settings on the Decision-Maker® 3000 controller, use Kohler SiteTech™ software and a personal computer connected to the controller through the USB port. See TP-6701, SiteTech Software Operation Manual, for instructions.

See Section 12.4 for MPAC® 1500 ATS controller communications settings.

Important Notes About Network Addresses and Baud Rates

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

Network Addresses

- The network address for the Decision-Maker® 3+ 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 connected devices must use the same Modbus baud rate.**
- For Monitor III software, the baud rate must be set at each device and also entered into the Monitor III program on the computer. All connected devices and the computer must use the same 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 Decision-Maker® 3+ Controller is fixed at 19200. Any site that includes a Decision-Maker 3+ 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.

13.1 Communication Settings

The following table summarizes the communication settings for various devices.

Device	Menu or Index	Parameter	Setting
DEC 6000 Generator Set Controller	Menu 13, Communications	Protocol	MODBUS 0 for ports P18 (RS-232) or P20 (RS-485)
			MODBUS 1 for port P19 (RS-485 ISO)
		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. P18 (RS-232) is chosen automatically if Converter‡ is selected for the connection type.
		Address	Use a unique network address between 1 and 247 for each unit. 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.
DEC 3000 Generator Set Controller	SiteTech Modbus Group	Address	Use a unique network address between 1 and 247 for each unit. Use 1 for a single connection. Do not use 0 (zero).
		Baud rate	9600, 19200, 38400, or 57600. Must match the PC and all devices in the system.
DEC 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 between 1 and 247 for each unit. 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.
DEC 3+ 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 5.3.
	N/A	Baud rate	19200 (not adjustable). Must match the PC and all devices in the system.
DEC 340 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 †

* 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. See Section 4.2.

† 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 Modbus baud rate is set using a DIP switch on the converter. See Section 4.2.)

‡ 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.

(Table continues on next page.)

Device	Menu or Index	Parameter	Setting
MPAC 1500 ATS Controller	Communications Setup screen	See Section 12.4.	See Section 12.4.
MPAC 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+ 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 (PM 340)	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, 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.
RSA II RSA III	Modbus group (use SiteTech™ software)	Modbus Baud Rate	9600, 19200, 38400, or 57600 bps. Must match the PC and all devices in the system.
		Is Modbus Master	Yes for master, No for slave
		Modbus Slave Address	Use a unique address between 1 and 247.
		Modbus Timeout Factor	Default = 5. Adjust from 1 (fast) to 10 (slow) if necessary.

* 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. See Section 4.2.

† 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 Modbus baud rate is set using a DIP switch on the converter. See Section 4.2.)

‡ 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 13-1 Device Communication Settings

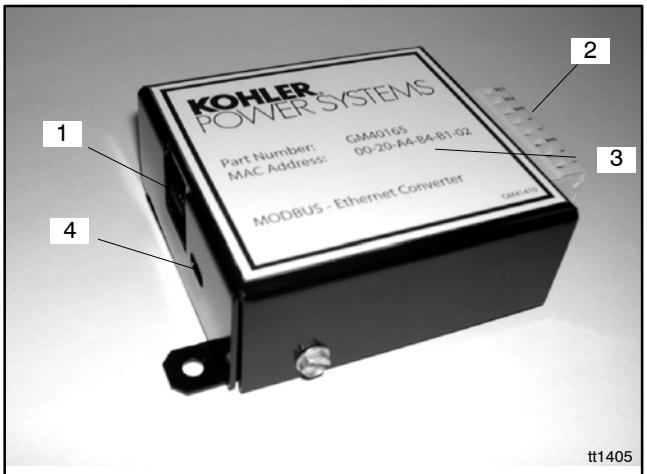
14 Converter, Modbus/Ethernet

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 14.4.

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 14-1.

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



1. RJ45 connector, P33, with network LEDs
2. Terminal block, P32, for RS-485 and power connections
3. MAC (hardware) address
4. Power, TX, and RX LED location

Figure 14-1 Modbus®/Ethernet Converter

14.1 Connections

Check the type of cable and connectors required to connect the converter to the Ethernet network at the site.

Converter to PC

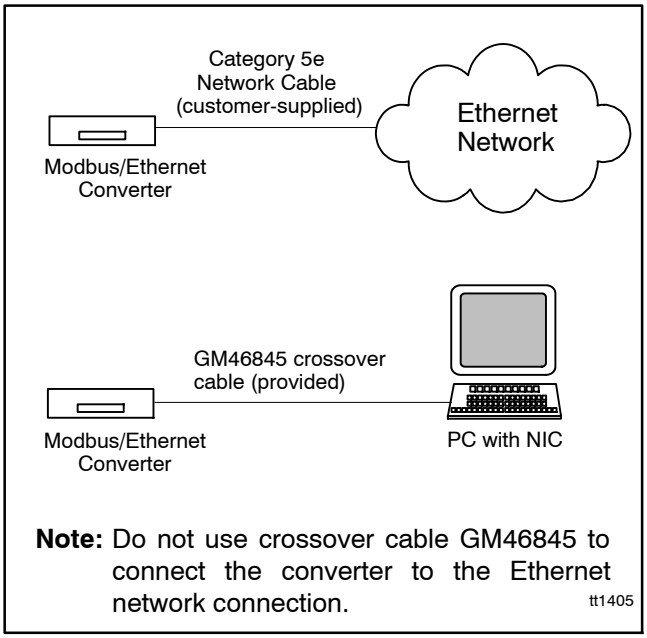
Connect the converter to a personal computer for converter module setup. Connect directly to the PC or over the Ethernet as described below. See Figure 14-2. The converter can be connected directly to the PC using a crossover cable for converter setup or local monitoring. Converter kits include a 0.9-m (3-ft.) crossover cable, GM46845, for direct connection to the PC's network interface card. Connect the crossover cable to the converter's RJ45 connector P33. See Figure 14-1.

The converter can also communicate with the PC over an ethernet connection. Use the converter's RJ45 connector P33 for Ethernet connection. See Figure 14-1. Use customer-supplied category 5e cable to connect to the Ethernet network. The PC must be connected to the same subnet as the Modbus/Ethernet converter. See Section 14.4.2, subnets.

Note: Do not use crossover cable GM46845 to connect the converter to the Ethernet network connection. See Figure 14-2.

Converter to Device

Refer to the connection diagrams in Section 15. Connect the device or device network to the converter using RS-485 cable. Belden #9841 shielded twisted-pair cable is recommended. Connect to terminal block P32 on the converter. See Figure 14-1.



Note: Do not use crossover cable GM46845 to connect the converter to the Ethernet network connection.

tt1405

Figure 14-2 Converter Connection to a Personal Computer

14.2 Converter Module Power Supply

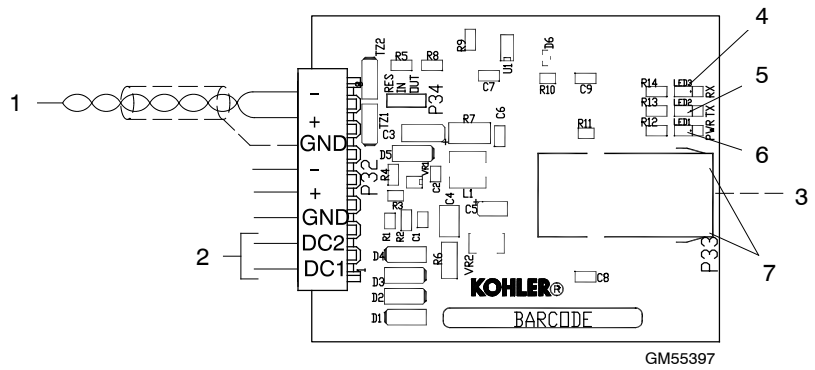
The converter module requires a power supply of 120 VAC or 12–24 VDC. Connect to the generator set engine starting battery or to 120VAC power as described below.

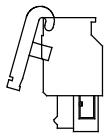
DC Power Connection

Connect the DC1 and DC2 terminals on the converter module to the generator set's engine starting battery See Figure 14-3 for the power connection terminals.

AC Power Connection

A power adapter is included with the converter kit. For AC power, connect the power adaptor to power connection terminals DC1 and DC2 on terminal block P32 as shown in Figure 14-3.





Use the plastic tool provided to facilitate wiring the RS-485 connections.

1. RS-485 connection to controller or RSA
2. Connect to 12–24 VDC power supply or AC adaptor GM41708 (not polarity-sensitive)
3. Category 5e connection to Ethernet network OR crossover cable GM46845 direct to PC
4. RX LED3, Yellow
5. TX LED2, Green
6. PWR LED1, Red
7. Communication LEDs on the RJ45 connector

Figure 14-3 Converter Connections

14.3 Converter Diagnostic LEDs and Troubleshooting

LEDs indicate converter operation as shown in Figure 14-4. See Figure 14-3 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	Color	Indication
PWR	Red	Lights to indicate power to the converter.
TX	Green	Flashes to indicate Modbus data is being transmitted.
RX	Yellow	Flashes to indicate Modbus data is being received.
RJ45	Amber or Green	LEDs on the RJ45 connector light to indicate network communication on the Ethernet side. Lights will flicker when communicating.

Figure 14-4 Converter LEDs

14.4 Converter Module Setup

Connect the converter module to a personal computer as described in Section 14.1. Contact the local network administrator for assistance with the following procedures.

14.4.1 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 14.4.2, 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 vary with different versions of the DeviceInstaller software.

14.4.2 Subnets

For converter setup, 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.

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.

Microsoft® is a registered trademark of Microsoft Corporation.

14.4.3 DHCP and IP Addresses

Converters with version 3.0 firmware support DHCP (dynamic host configuration protocol). DHCP is a protocol used by networked devices to obtain IP addresses and other parameters such as the default gateway and subnet mask.

When using the converters in DHCP mode, the network administrator must assign the converter's MAC address to a fixed IP address in the network to ensure that the IP address will not change. The assigned address will be used by other Kohler products (Monitor III, RSA 1000, other converters, etc.) to establish communication with the products on the converter.

To select DHCP, assign IP address 0.0.0.0 to the converter. To use the converter as fixed/assigned IP, simply enter an IP address other than 0.0.0.0. See Section 14.4.6 for instructions to assign an IP address to the converter.

Note: Obtain IP addresses from your local network administrator. Verify that the IP address is not used by another device on the network.

14.4.4 Converter Setup

The converter can be connected to the PC through the network or through a crossover cable. See Section 14.1. The converter can be set up using the DeviceInstaller software provided with the converter module kit, or by using the Telnet command at the command prompt.

Option 1: Connect to a network that supports DHCP. See Section 14.4.5.

Option 2: Connect directly to a PC using the crossover cable. See Section 14.4.7.

14.4.5 Network Connection

To establish the initial connection with the converter when it is **connected to a network** that supports DHCP:

1. Use a CAT-5 ethernet cable to connect the converter to the network.

2. Using DeviceInstaller software (provided with the converter kit), search the network for the converter's MAC address. See Figure 14-6. Once the converter has been found, use the telnet feature in Device Installer to setup the converter. Proceed to Section 14.4.6 for instructions.

14.4.6 Setting the IP Address and Baud Rate Using Device Installer

Use DeviceInstaller Software 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.

Use DeviceInstaller to Connect to the Converter

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 14-6.

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.

Procedure to Set the IP Address

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.

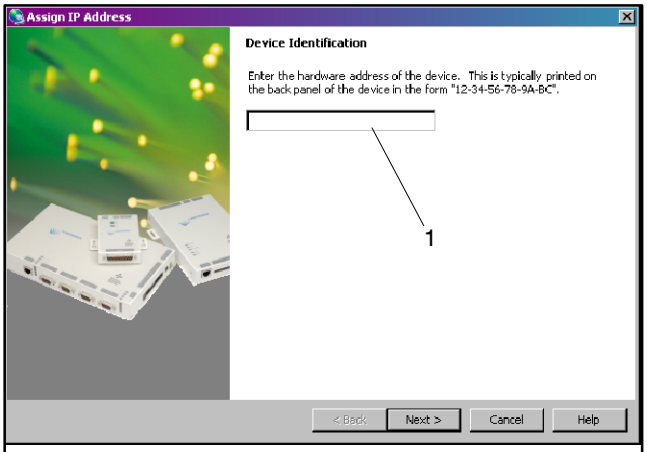
6. If the device **does not** have an IP address already assigned:

   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 14-6.

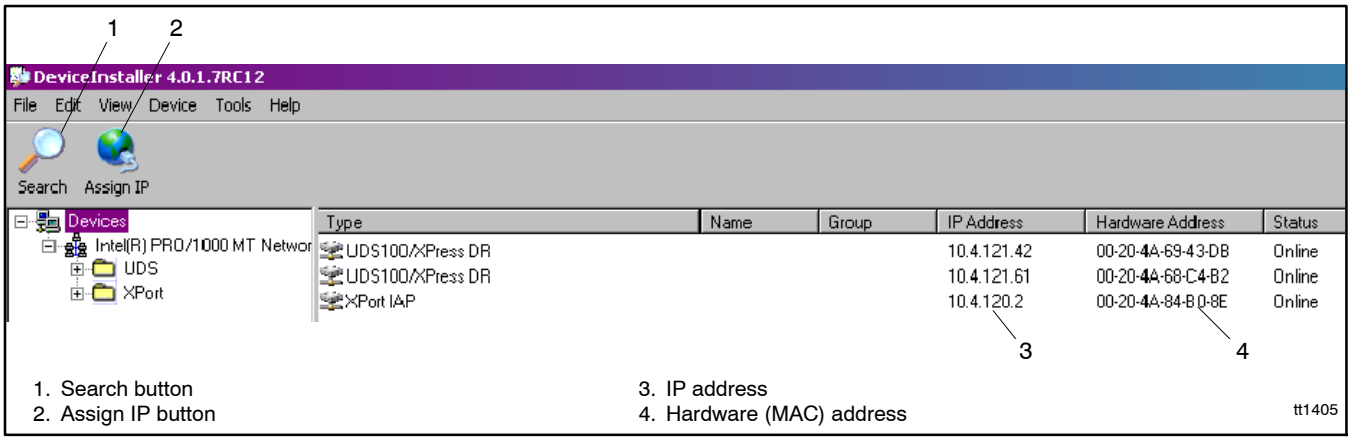
   c. Enter the converter's hardware address (MAC address) in the first *Assign IP Address* window. See Figure 14-5. The MAC address is printed on the converter's label. It is OK to enter dashes between each pair of characters and the letters are not case-sensitive.

   d. Click *Next* and go to Step 8.



1. Type the converter's hardware (MAC) address here and click *Next*.

Figure 14-5 Enter Hardware (MAC) Address



1. Search button
2. Assign IP button
3. IP address
4. Hardware (MAC) address

Figure 14-6 DeviceInstaller Opening Screen

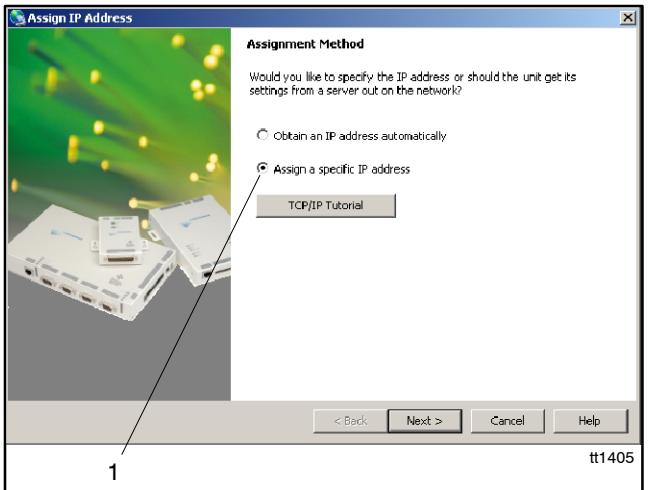
7. If the device **does** have an IP address assigned, follow these steps to change it to an address owned by the customer:

   a. Click once on the line of the device to be changed. It should become highlighted. See Figure 14-6. 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 14-6.

   c. Go to Step 8.

8. Select *Assign a Specific IP Address* in the Assignment Method window, and click *Next*. See Figure 14-7.

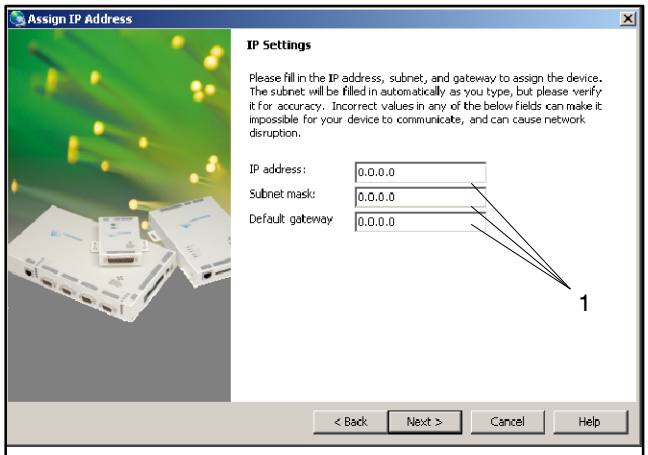


1. Select *Assign a Specific IP Address* and click *Next.*

Figure 14-7 Assignment Method

9. See Figure 14-8. 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 program later.



1. Obtain this information from your network administrator and type it in. Click *Next*.

Figure 14-8 IP Settings

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 14-9.

11. After the IP address has been assigned, click the *Finish* button on the bottom of the Wizard window.

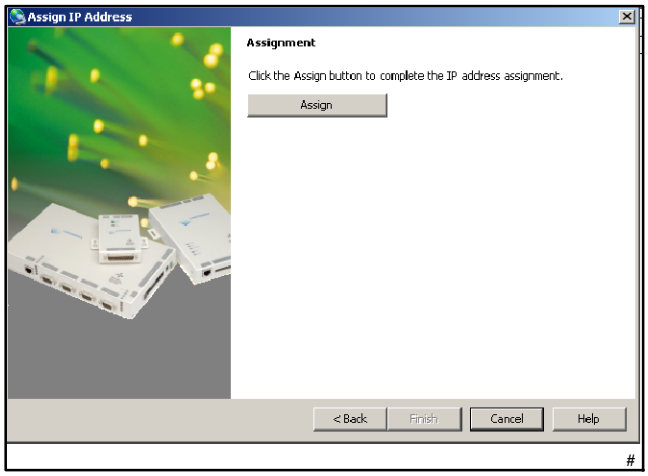


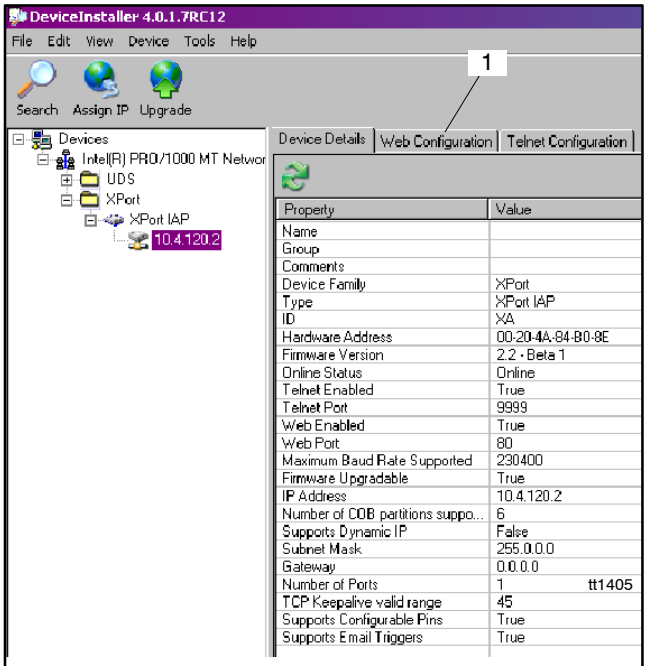
Figure 14-9 Assignment

Procedure to Set the Baud Rate

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

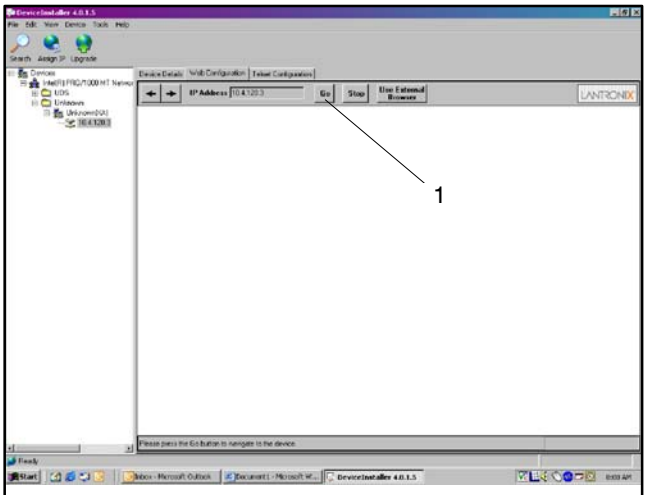
1. Highlight the converter on the list of devices found on the network. See Figure 14-6.
2. Double click on the device line to bring up the Device Details screen. See Figure 14-10.
3. Click on the Web Configuration tab to bring up the Baud Rate screen. See Figure 14-11.
4. Click on the Go button.
5. Use the drop-down arrow in the Baud box to select the baud rate See Figure 14-12. 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 14.4.8.
7. Select File→Exit to close the DeviceInstaller program.



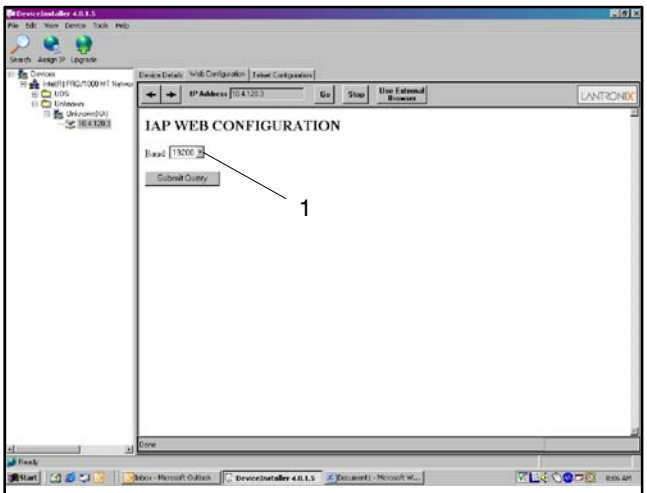
1. Web Configuration tab

Figure 14-10 Device Details Screen



1. Go button

Figure 14-11 Web Configuration



1. Select the baud rate and click on *Submit Query*

Figure 14-12 Baud Rate

14.4.7 Direct Connection

To establish the initial connection with the converter when it is **directly connected to a PC using the crossover cable**:

1. Verify that the PC has a fixed IP address and write down the IP address.

2. Assign a temporary IP address to the converter using the command “arp”. The temporary IP address must be different than the PC but have the same subnet. For example, if the IP Address of the PC is 172.20.28.1, then the temporary IP Address of the converter must be 172.20.28.x (where x can be any number except 0 and the number used for the PC).

   Note: Obtain IP addresses from your local network administrator. Verify that the IP address is not used by another device on the network.

   To set the temporary IP address of the converter, open a command prompt window and enter the following:

   C:\> arp –s *Converters_Temporary_IP_ Address Converters_MAC_Address*

   Example: See Figure 14-13. To assign temporary IP Address 172.20.28.19 to converter MAC Address 00204a992f50:

   C:\> arp –s 172.20.28.19 00-20-4a-99-2f-50

   Note: The arp command will respond only if there was an error.

3. Using the command prompt window: Try to telnet to the converter by using the temporary IP Address of the converter with a port number of 1.

   Continuing from the previous example:

   c:\> telnet 172.20.28.19 1

   Note: This step is not optional. Telnet will respond with an error, which is needed for the next step.

4. After step 3 is completed, the controller is ready to communicate using telnet. Telnet to the converter by using the temporary IP Address of the converter with a port number of 9999. Continuing the example:

   c:\> telnet 172.20.28.19 9999

5. As soon as telnet shows the version number of the converter, press the Enter key.

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

6. You are now ready to set up the converter. Proceed to Section 14.4.8 for instructions to set up the converter using telnet.

Figure 14-13 Direct Connection Example Using arp and telnet Commands

14.4.8 Telnet Configuration

The Telnet Configuration screen in the DeviceInstaller program can be used to check the serial communication settings and change the settings, if necessary. The telnet screens can also be accessed as described in Section 14.4.4.

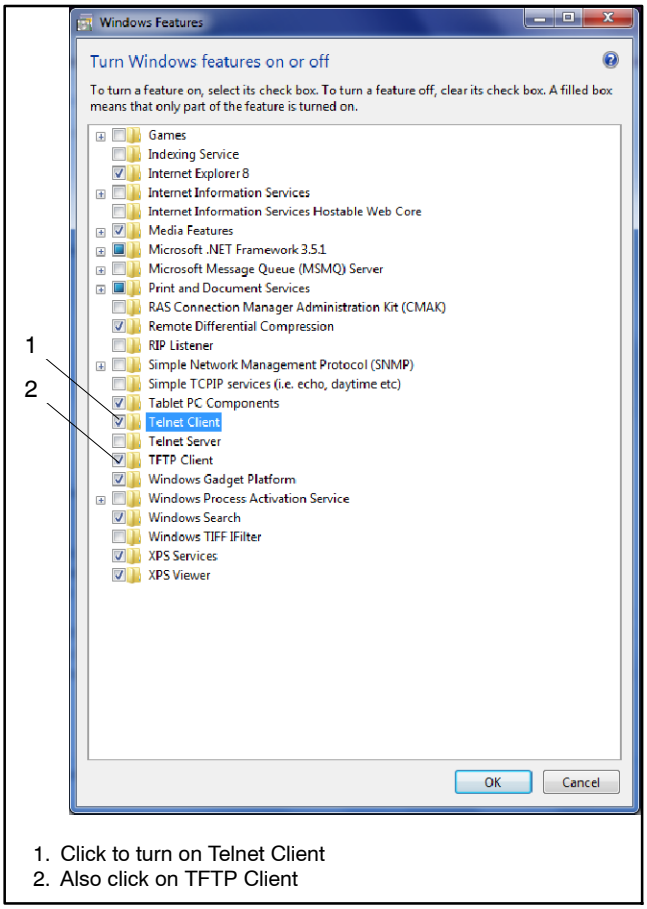
Note: Serial communication settings other than the baud rate are factory-set and should not require adjustment in most cases.

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

The Telnet configuration screens appear as shown in Figure 14-16 through Figure 14-20. The converter settings for controllers, RSA 1000, RSA II, and RSA III are shown in the tables in Section 14.4.10.

Telnet with Windows® 7

Telnet is not activated by default on the Microsoft® Windows® 7 operating system. To activate Telnet on the PC, open the Control Panel, select Programs, and then select Programs and Features. Select Turn Windows Features On or Off. Find the Telnet Client and click on the box so that the box is checked. See Figure 14-14. While you are in this screen, also activate the TFTP client, which will be needed to update the firmware on the Modbus/Ethernet converter. (See Section 14.5.8 for firmware upgrade instructions.) Click OK and wait while Windows makes the adjustments.



1. Click to turn on Telnet Client
2. Also click on TFTP Client

Figure 14-14 Telnet Activation, Microsoft Windows 7

Using Telnet

The setup can be performed over an ethernet connection using Device Installer as described below, or with the converter connected directly to the PC using the crossover cable GM46845 supplied with the converter kit.

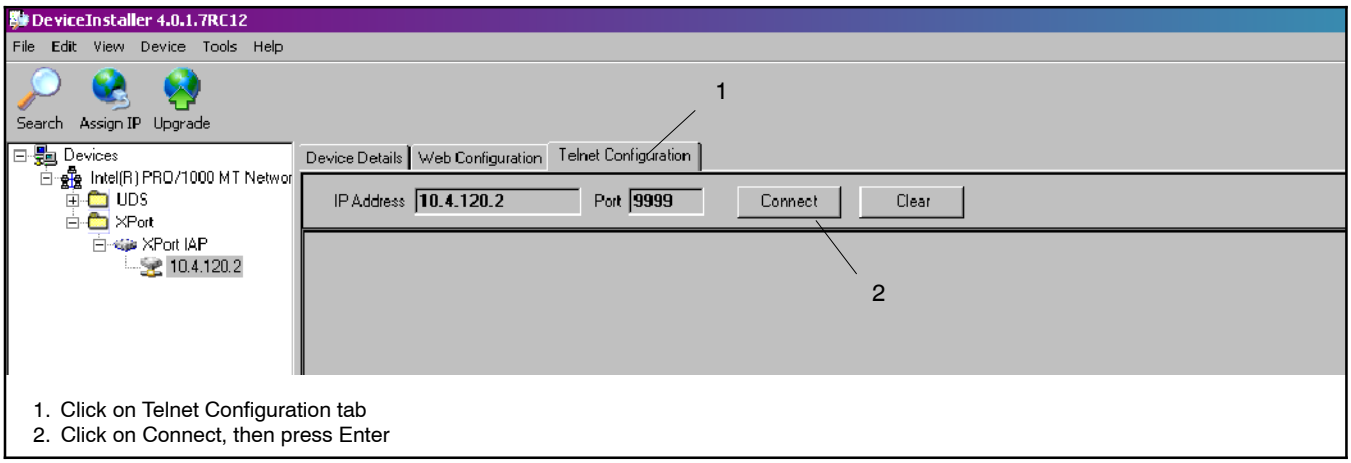
Telnet Using DeviceInstaller over an Ethernet Connection

1. Follow the instructions in Section 14.4.6, 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 14-10.
2. Click on the Telnet Configuration tab to open the Telnet configuration screen. See Figure 14-15.
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.

Telnet Using a Crossover Cable to Connect Directly to the PC

See Section 14.4.4 for instructions to connect using the telnet command at the command prompt.



1. Click on Telnet Configuration tab
2. Click on Connect, then press Enter

Figure 14-15 DeviceInstaller Telnet Configuration Opening Screen

14.4.9 Telnet Configuration Screens

The Telnet configuration screens appear as shown in Figure 14-16 through Figure 14-20. The Telnet screens are the same whether connected through DeviceInstaller or connected directly to the PC.

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...5) to change

Notice that the parameter sets on the screen are numbered 1 – 5 and 7. 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 the figures in this section.**

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. Type the new value or press Enter to accept the value shown in parentheses if changes are not required.

Refer to the tables in Section 14.4.10 when changing the serial communication settings.

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...5) to change

Type one of the following:

- A parameter set number from **1** to **7** 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.

Notes

Parameter Set 1

SNMP devices have some additional parameters in set 1. See Figure 14-20. Set up the device that should receive the SNMP data by going into option 1 using Telnet:

- Provide an SNMP community name when prompted. The default community name is “public.”
- Provide the IP address of the device receiving the traps.

See Section 14.5 for more information about SNMP.

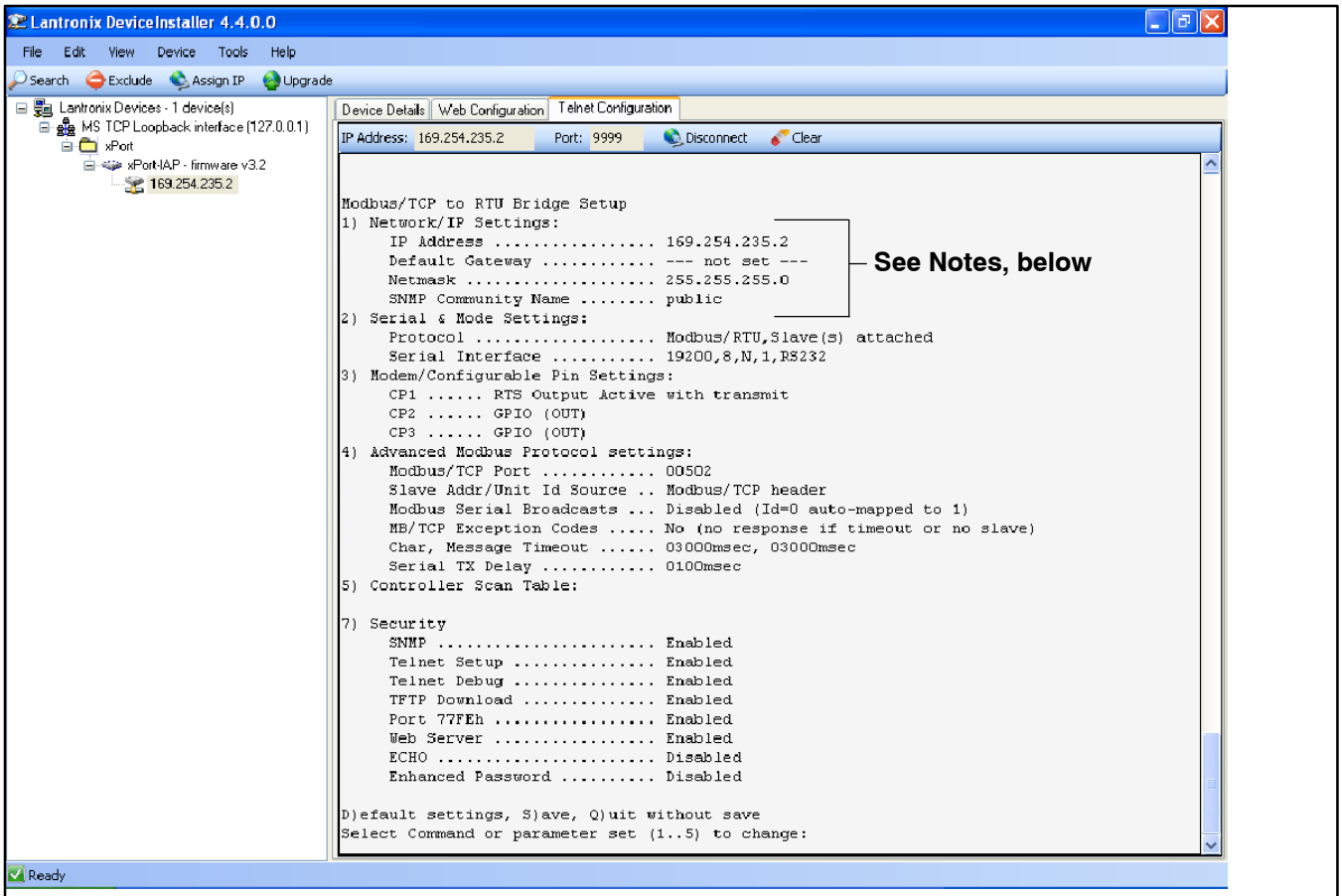
Parameter Set 5

Parameter set 5 appears for some applications:

- For an RSA master device, parameter set 5 is for mapping the IP address table. See Section 14.4.11.
- For SNMP applications, (requires converters with version 3.0.0.0 or higher firmware), parameter set 5 is for the controller scan table. See Section 14.5.

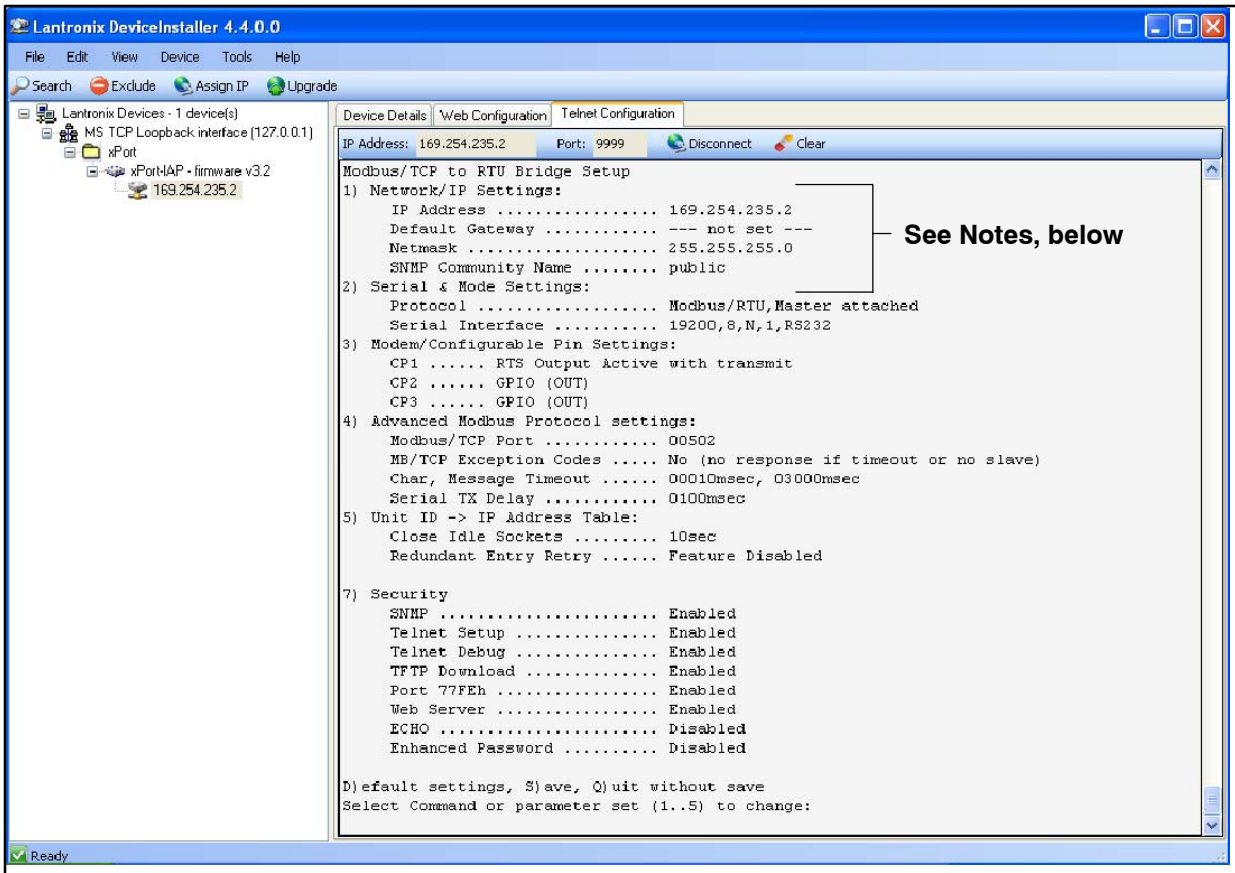
Parameter Set 7

Use the default settings for parameter set 7, Security.



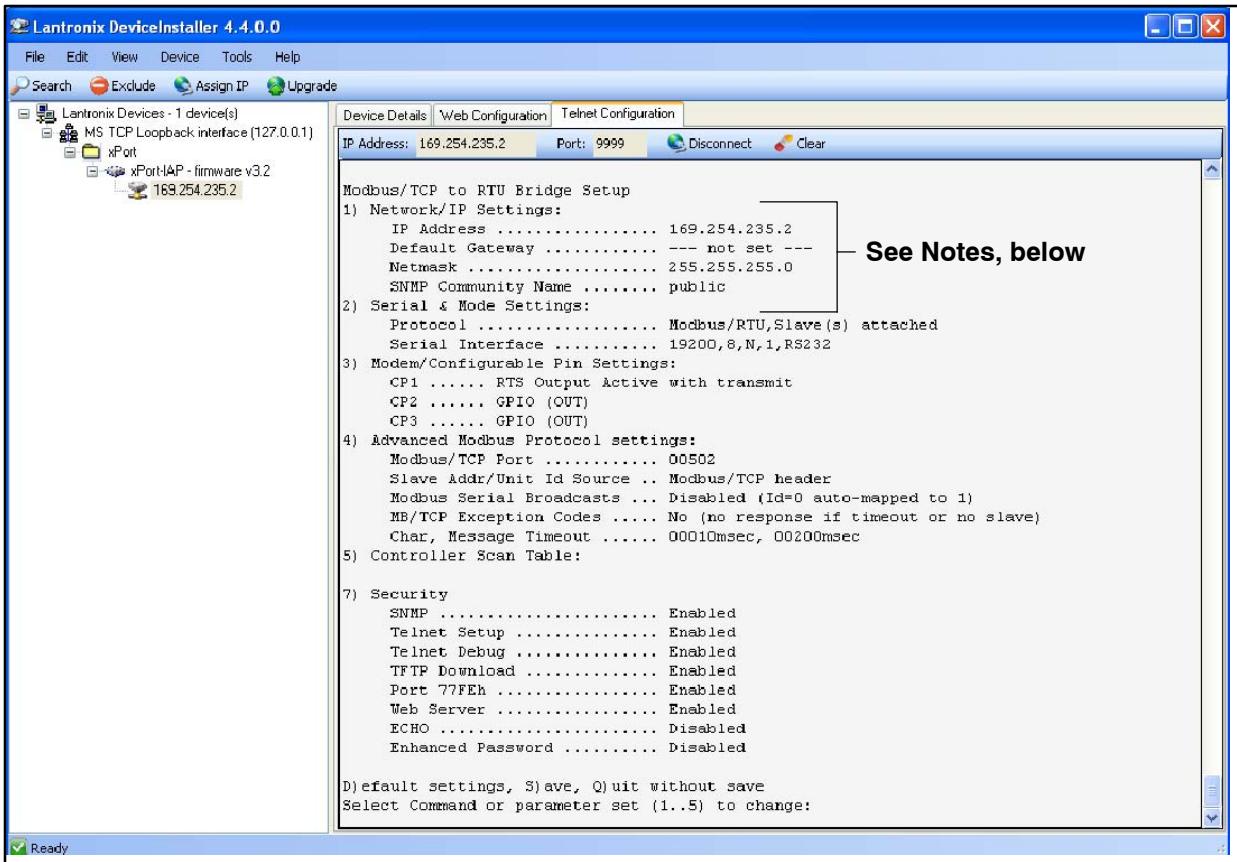
Note: Do not copy the Network/IP settings shown here. Consult your network administrator. IP address 0.0.0.0/DHCP/BOOTP/AUTOIP indicates a dynamic IP address. See Section 14.4.3. Do not copy the device settings shown here. Refer to the tables in Section 14.4.10 for specific device settings.

Figure 14-16 Telnet Configuration Setup Mode Window for Controllers



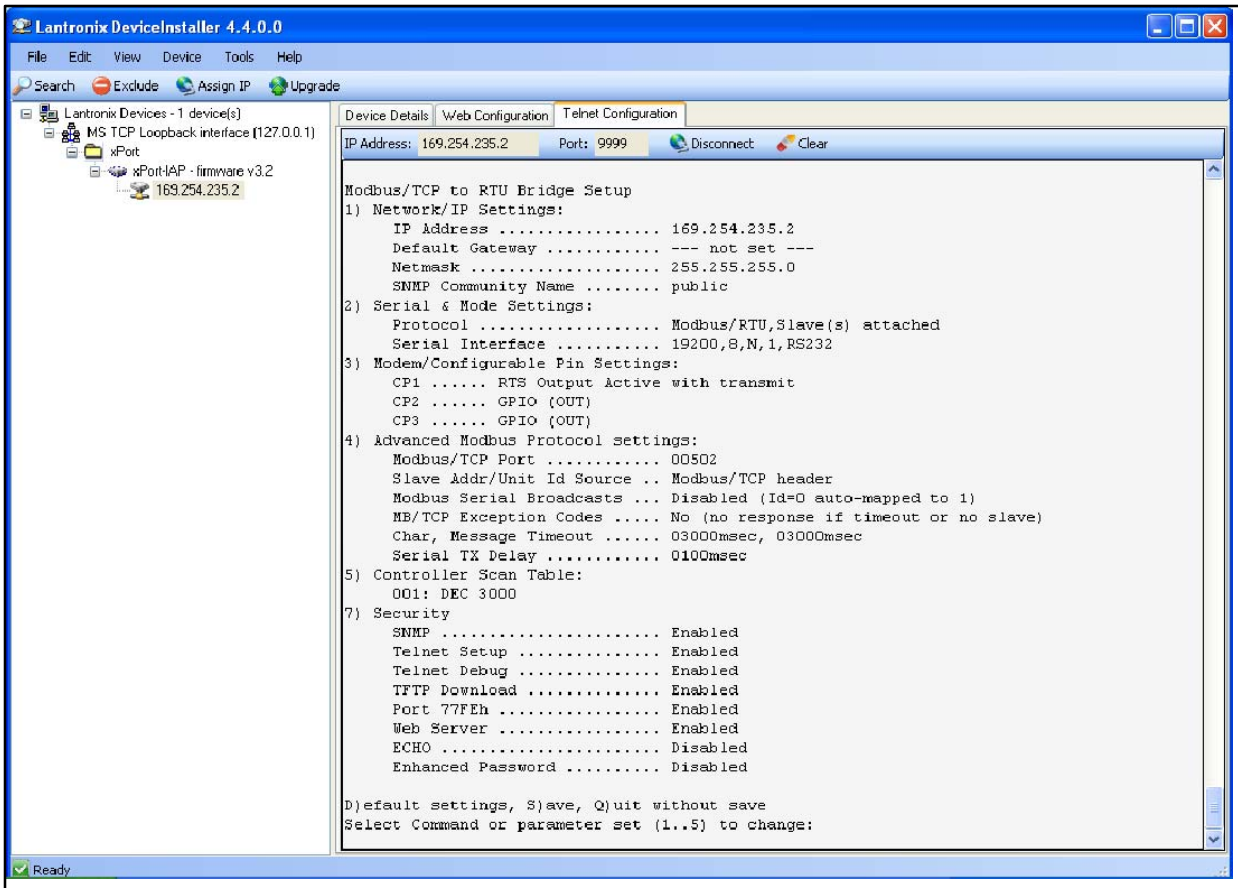
Note: Do not copy the Network/IP settings shown here. Consult your network administrator.
IP address 0.0.0.0/DHCP/BOOTP/AUTOIP indicates a dynamic IP address. See Section 14.4.3. Do not copy the device settings shown here. Refer to the tables in Section 14.4.10 for specific device settings.

Figure 14-17 Telnet Configuration Setup Mode Window for an RSA Master



Note: Do not copy the Network/IP settings shown here. Consult your network administrator.
IP address 0.0.0.0/DHCP/BOOTP/AUTOIP indicates a dynamic IP address. See Section 14.4.3. Do not copy the device settings shown here. Refer to the tables in Section 14.4.10 for specific device settings.

Figure 14-18 Telnet Configuration Setup Mode Window for an RSA Slave



Note: Do not copy the Network/IP settings shown here. Consult your network administrator. IP address 0.0.0.0/DHCP/BOOTP/AUTOIP indicates a dynamic IP address. See Section 14.4.3. Do not copy the device settings shown here. Refer to the tables in Section 14.4.10 for specific device settings.

Figure 14-19 Telnet Configuration Setup Mode Window for SNMP

```
D)efault settings, S)ave, Q)uit without save
Select Command or parameter set (1..5) to change:

IP Address (192) .(168) .(000) .(001)
Set Gateway IP Address (N) ? N

Set Netmask (N for default) (Y) ? N

Change Telnet/Web config password (N) ? N
SNMP Community Name (public)
IP address for SNMP traps (192) .(168) .(000) .(200)
```

Figure 14-20 Parameter Set 1 for SNMP

14.4.10 Modbus/Ethernet Converter Settings

Parameter	Settings		
	Controller	**RSA 1000 Master**	**RSA 1000 Slave**
1) Network/IP Settings			
IP Address	Network-dependent. Contact the local network administrator.		
Set Gateway IP Address			
Netmask			
SNMP Community Name	default is public	default is public	default is public
IP Address for SNMP Traps		N/A	N/A
2) Serial and Mode Settings			
Protocol:			
Attached Device	Slave	Master	Slave
Serial Protocol	Modbus/RTU	Modbus/RTU	Modbus/RTU
Serial Interface:			
Interface Type	RS232	RS232	RS232
Serial Parameters *	9600 or 19200,8,N,1	9600 or 19200,8,N,1	9600 or 19200,8,N,1
3) Modem/Configurable Pin Settings			
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	No	No	No
Delay dropping RTS after TX	0	0	0
CP2:			
Function	GPIO	GPIO	GPIO
RTS Mode	Output	Output	Output
Delay after Output RTS	—	—	—
Wait for CTS to go Active	—	—	—
Delay dropping RTS after TX	—	—	—
CP3:			
Function	GPIO	GPIO	GPIO
Invert GPIO (active high)	No	No	No
RTS Mode	Output	Output	Output
Delay after Output RTS	—	—	—
Wait for CTS to go Active	—	—	—
Delay dropping RTS after TX	—	—	—
4) Advanced Modbus Protocol Settings			
Slave Addr Source	502	N/A	502
Slave Addr	0 (Auto)	N/A	0 (Auto)
Modbus Serial Broadcasts	Disabled	N/A	Disabled
MB/TCP Exception Responses	No	No	No
Disable Modbus/TCP Pipeline	No (Enabled)	No (Enabled)	No (Enabled)
Char Timeout	3000	10	10
Message Timeout	3000	3000	200
Serial TX Delay	100	100	0
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

Parameter	Settings		
	Controller	**RSA 1000 Master**	**RSA 1000 Slave**
5) Controller Scan Table (for assigning trap and Modbus tables to slave units for SNMP control/functions)			
Modbus address	address of the controller	N/A	N/A
Controller Type	DEC 3+, 550, 3000, 3500, 6000 or MPAC (750, 1000, 1200, 1500)	N/A	N/A
7) Security	Use the default settings.	Use the default settings.	Use the default settings.
Disable SNMP	No	No	No
SNMP community name	default is public	default is public	default is public
Disable Telnet setup	No	No	No
Disable Telnet debug port	No	No	No
Disable DFTP firmware Update	No	No	No
Disable port 77FEh	No	No	No
Disable web server	No	No	No
Disable ECHO ports	Yes	Yes	Yes
Disable enhanced password	No	No	No
* The first serial parameter is the baud rate and may be 9600 or 19200, as required to match connected devices.			

Figure 14-21 Modbus/Ethernet Converter Settings for Controllers and RSA 1000

Parameter	Settings	
	RSA II Master	**RSA II Slave**
1) Network/IP Settings		
IP Address	Network-dependent. Contact the local network administrator.	
Set Gateway IP Address		
Netmask		
SNMP Community Name	default is public	default is public
IP Address for SNMP Traps	N/A	N/A
2) Serial and Mode Settings		
Protocol:	Modbus/RTU, Master	Modbus/RTU, Slave
Attached Device	Master	Slave
Serial Protocol	Modbus/RTU	Modbus/RTU
Serial Interface:		
Interface Type	RS232	RS232
Serial Parameters *	9600,8,N,1 or 19200,8,N,1	9600,8,N,1 or 19200,8,N,1
3) Modem/Configurable Pin Settings		
CP1:		
CP1 Function	RTS Output	RTS Output
RTS Mode	Active w/Transmit	Active w/Transmit
Delay after Output RTS	0	0
Wait for CTS to go Active	No	No
Delay dropping RTS after TX	0	0
CP2:		
Function	GPIO	GPIO
RTS Mode	Output	Output
Delay after Output RTS	—	—
Wait for CTS to go Active	—	—
Delay dropping RTS after TX	—	—
CP3:		
Function	GPIO	GPIO
RTS Mode	Output	Output
Invert GPIO (active high)	No	No
Delay after Output RTS	—	—
Wait for CTS to go Active	—	—
Delay dropping RTS after TX	—	—
4) Advanced Modbus Protocol Settings		
Slave Addr Source	N/A	502
Slave Addr Source	N/A	0 (Auto)
Modbus Serial Broadcasts	N/A	Disabled
MB/TCP Exception Responses	No	No
Disable Modbus/TCP Pipeline	No (Enabled)	No (Enabled)
Char Timeout	10	50
Message Timeout	3000	1000
Serial TX Delay	100	50
5) Unit ID → IP Address Table (appears for master devices only)		
Close Idle Sockets	10 sec	N/A
Redundant Entry Retries	Disabled	N/A
Mapping:		
Controller	001–001: xx.xx.xx.xx See Figure 14-24	N/A

Parameter	Settings	
	RSA II Master	**RSA II Slave**
RSA slave (optional)	111–111: xx.xx.xx.xx See Figure 14-24	N/A
5) Controller Scan Table (for assigning trap and Modbus tables to slave units for SNMP control/functions)		
Modbus address	N/A	N/A
Controller Type	N/A	N/A
7) Security	Use the default settings.	Use the default settings.
Disable SNMP	No	No
SNMP community name	default is public	default is public
Disable Telnet setup	No	No
Disable Telnet debug port	No	No
Disable DFTP firmware Update	No	No
Disable port 77FEh	No	No
Disable web server	No	No
Disable ECHO ports	Yes	Yes
Disable enhanced password	No	No
* The first serial parameter is the baud rate and may be 9600 or 19200, as required to match connected devices.		
Note: For the RSA II, the Modbus address can be any number from 001 to 247. See Figure 14-24.		

Figure 14-22 Modbus/Ethernet Converter Settings for RSA II

Parameter	Settings	
	RSA III Master	**RSA III Slave**
1) Network/IP Settings		
IP Address	Network-dependent. Contact the local network administrator.	
Set Gateway IP Address		
Netmask		
SNMP Community Name	default is public	default is public
IP Address for SNMP Traps	N/A	N/A
2) Serial and Mode Settings		
Protocol:	Modbus/RTU, Master	Modbus/RTU, Slave
Attached Device	Master	Slave
Serial Protocol	Modbus/RTU	Modbus/RTU
Serial Interface:		
Interface Type	RS232	RS232
Serial Parameters *	9600,8,N,1 or 19200,8,N,1	9600,8,N,1 or 19200,8,N,1
3) Modem/Configurable Pin Settings		
CP1:		
Function	RTS Output	RTS Output
RTS Mode	Active w/Transmit	Active w/Transmit
Delay after Output RTS	0	0
Wait for CTS to go Active	N	N
Delay dropping RTS after TX	0	0
CP2:		
Function	GPIO	GPIO
RTS Mode	Output	Output
Delay after Output RTS	—	—
Wait for CTS to go Active	—	—
Delay dropping RTS after TX	—	—
CP3:		
Function	GPIO	GPIO
RTS Mode	Output	Output
Invert GPIO (active high)	No	No
Delay after Output RTS	—	—
Wait for CTS to go Active	—	—
Delay dropping RTS after TX	—	—
4) Advanced Modbus Protocol Settings		
Slave Addr Source	N/A	502
Slave Addr	N/A	0 (Auto)
Modbus Serial Broadcasts	N/A	Disabled
MB/TCP Exception Responses	No	No
Disable Modbus/TCP Pipeline	No (Enabled)	No (Enabled)
Char Timeout	10	3000
Message Timeout	3000	3000
Serial TX Delay	25	25
5) Unit ID → IP Address Table (appears for master devices only)		
Close Idle Sockets	10 sec	N/A
Redundant Entry Retries	Disabled	N/A
Mapping:		
Controller	001–001: xx.xx.xx.xx; See Figure 14-24	N/A
RSA slave (optional)	247–247: xx.xx.xx.xx; See Figure 14-24	N/A

Parameter	Settings	
	RSA III Master	**RSA III Slave**
5) Controller Scan Table (for assigning trap and Modbus tables to slave units for SNMP control/functions)		
Modbus address	N/A	N/A
Controller Type	N/A	N/A
7) Security	Use the default settings.	Use the default settings.
Disable SNMP	No	No
SNMP community name	default is public	default is public
Disable Telnet setup	No	No
Disable Telnet debug port	No	No
Disable DFTP firmware Update	No	No
Disable port 77FEh	No	No
Disable web server	No	No
Disable ECHO ports	Yes	Yes
Disable enhanced password	No	No

* The first serial parameter is the baud rate and may be 9600 or 19200, as required to match connected devices.

Note: For the RSA III, the Modbus address can be any number from 001 to 247. See Figure 14-24.

Figure 14-23 Modbus/Ethernet Converter Settings for RSA III

14.4.11 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 master shows a fifth set of parameters, **Unit ID → IP Address Table**. See Figure 14-17. 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 generator set controller and multiple RSA 1000 slaves. See Figure 9-3. A controller communicating with the RSA 1000 must have Modbus address 1. RSA 1000 slaves have Modbus address 247 (DIP switch 4 on the RSA is set to the slave position; see Figure 13-1).

A controller communicating with the RSA II or RSA III can have any Modbus address between 1 and 247. An RSA II or RSA III slave can also have any Modbus address between 1 and 247. See Figure 14-24.

Refer to Figure 14-25 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 14-25 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)elete, E) select function
   Type **A** to add the Modbus address and IP address for the controller being monitored by the RSA 1000.

4. Type in the Modbus address for the controller. See Figure 14-25.

   Note: Press the Enter key to accept the default value shown in parentheses, if appropriate.

   a. Controller with RSA 1000: Type **1** for the next two entries:
      Modbus addr from, type **1**
      Modbus addr to, type **1**.

   b. Controller with RSA II or RSA III: Type the controller Modbus address for the next two entries. For example, the controller's Modbus address may be 17:
      Modbus addr from, type **17**
      Modbus addr to, type **17**.

5. At **Slave IP address**, enter the IP address for the controller's Modbus/Ethernet converter. See Figure 14-25.

   Note: Your IP addresses will be different than those shown in Figure 14-25. 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).

   RSA 1000: Type in **247** for the two Modbus address entries and then enter the IP address for the slave's Modbus/Ethernet converter.

   RSA II or RSA III: Type in the slave RSA's Modbus address 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)elete, 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.

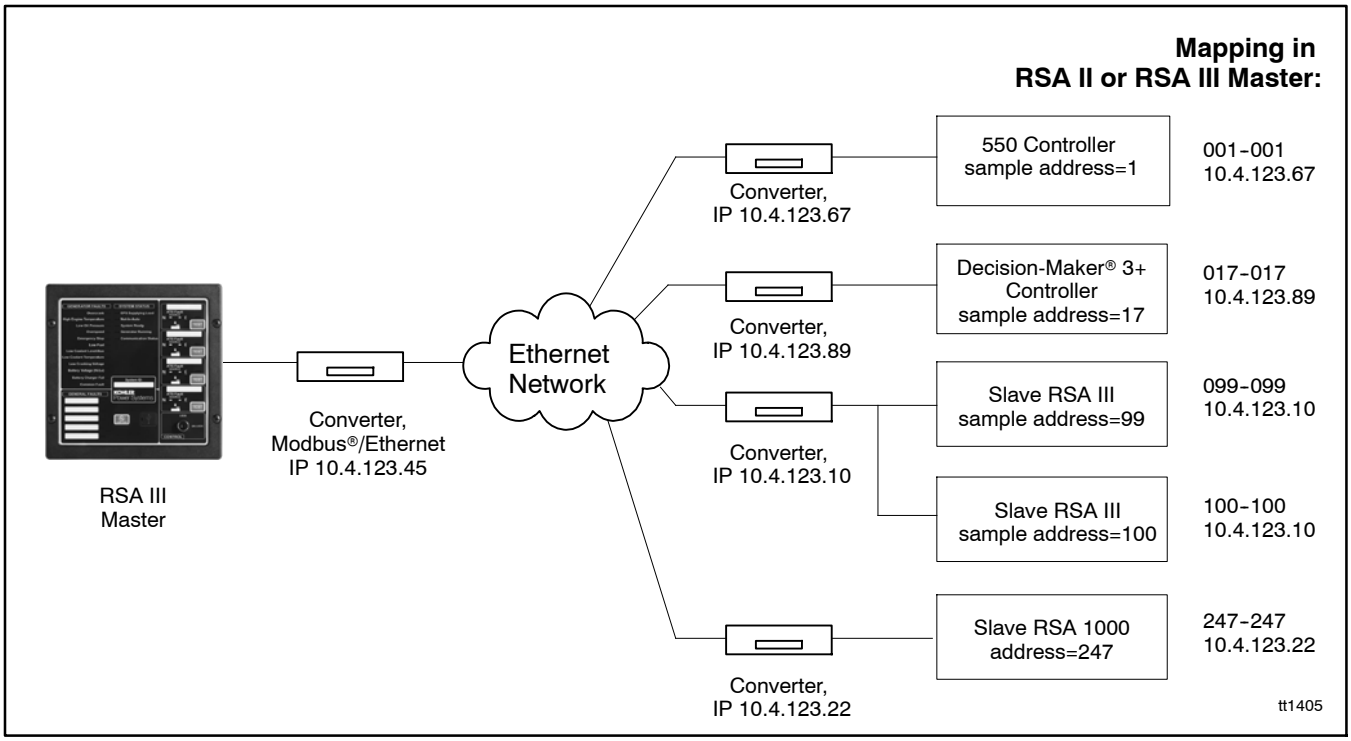
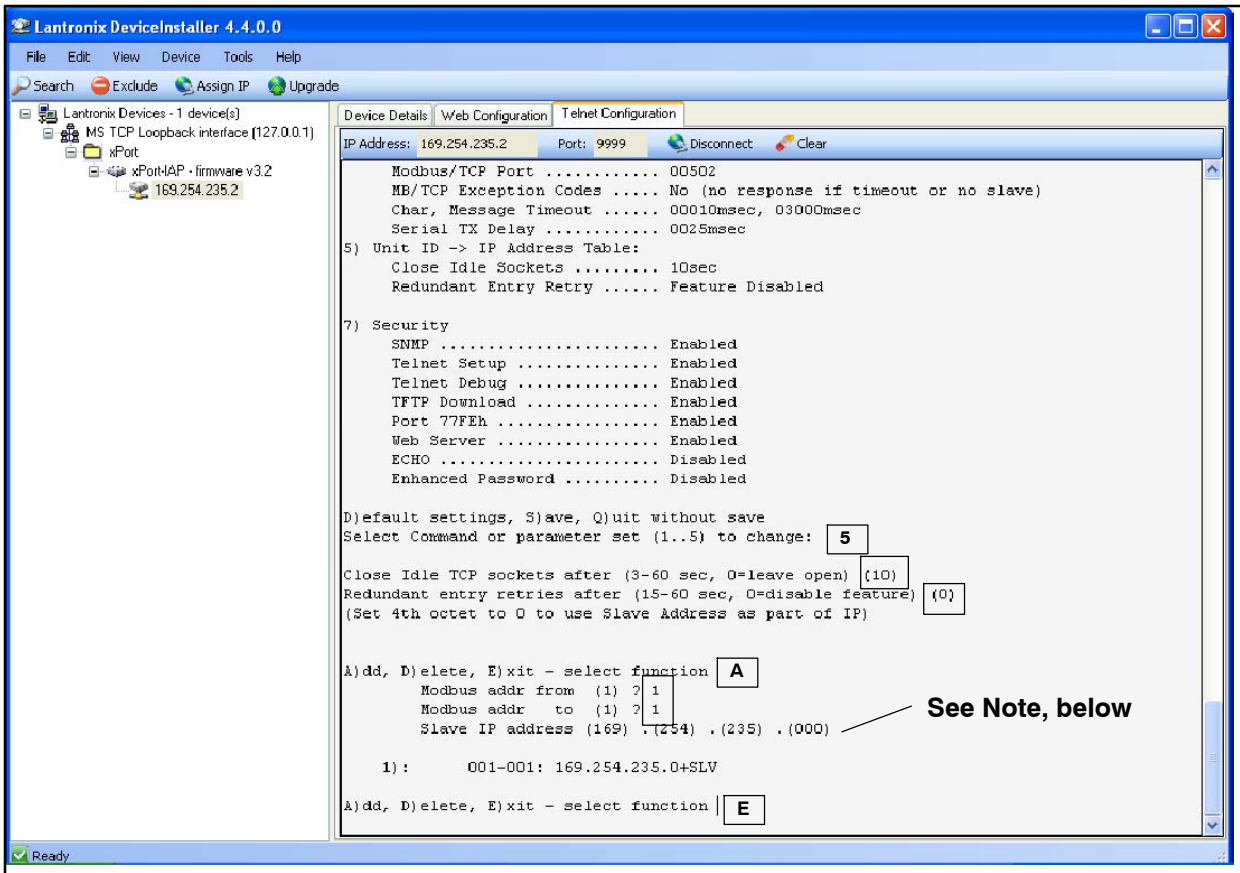


Figure 14-24 RSA II or RSA III Connections with Sample Addresses and Mapping



Note: Do not copy the Network/IP settings shown here. Consult your network administrator.
IP address 0.0.0.0/DHCP/BOOTP/AUTOIP indicates a dynamic IP address. See Section 14.4.3.
Do not copy the device settings shown here. Refer to the tables in Section 14.4.10 for specific device settings.

Figure 14-25 Mapping Modbus to IP addresses for the RSA Master (parameter set 5)

14.5 SNMP

Modbus/Ethernet converters with firmware version numbers shown in Figure 14-26 have Simple Network Management Protocol (SNMP) capability. Converter firmware can be updated using the procedure outlined in Section 14.5.8. The latest versions of converter firmware files are available for download through TechTools.

Controller Model	Converter Firmware Version #
Decision-Maker® 3+ and 550 MPAC® 1000	3.0.0.0 or higher
Decision-Maker® 3000 and 6000 MPAC® 1500	3.1.0.0 or higher

Figure 14-26 Converter Firmware Version Numbers for SNMP Capability

14.5.1 SNMP Overview

Simple Network Management Protocol (SNMP) is a protocol for accessing data from a network device. Transport of SNMP data is done using User Datagram Protocol (UDP). The location and format of the data is defined in a Management Information Base (MIB). An MIB is a type of database for accessing information. A custom MIB describes the specific data coming from Kohler's controllers. Operation Center/Management software accesses the information contained in the MIB and provides the human interface. See Section 14.5.5, MIB File.

The Modbus/Ethernet converter will actively poll the RS-485 bus. The data obtained will then be made available over TCP/IP via the Simple Network Management Protocol (SNMP). The converter will support SNMP with the Kohler Decision-Maker® 550, Decision-Maker® 3+ and MPAC® 1000 controllers.

14.5.2 SNMP Setup

Use the Telnet Configuration screen to set up SNMP on the Modbus/Ethernet converter. See Section 14.4.8, Telnet Configuration, and Figure 14-19.

The default SNMP community name is "public." The community name can be changed using the Telnet Configuration screen.

Use the Telnet configuration screen to set up the SNMP parameters. See Section 14.4.7 for instructions to access the Telnet screen.

- In parameter set 1, provide an SNMP community name. The default community name is *public.*
- Also in parameter set 1, provide the IP address of the device receiving the traps.
- In parameter set 2, choose Modbus/RTU, Slave(s) Attached.
- In parameter set 5, set up the controller scan table by entering the Modbus address and controller type for each connected controller. See the following procedure.

Setting Up the Controller Scan Table

See Figure 14-19. Select the controller's Modbus address and then the controller type as described below. You can select up to 10 devices.

1. Go into option 5 by typing the number 5 at the prompt.
2. Type in the Modbus address (1–247) of the controller to monitor.
3. Select what type of controller is being monitored. Note: Use the space bar to scroll through the selections. See Figure 14-27.
4. Repeat steps 2 and 3 until all the desired controllers are selected.
5. Exit option 5 by typing the letter E at the prompt.
6. Save the settings by typing the letter S at the prompt.

Controller Type	Abbreviation
Decision-Maker® 3+	DEC 3+
Decision-Maker® 550	DEC 550
Decision-Maker® 3000	DEC 3000
Decision-Maker® 6000	DEC 6000
MPAC®1000 ATS	MPAC 1000
MPAC®1500 ATS	MPAC 1500

Figure 14-27 Controller Type Selections for Controller Scan Table

14.5.3 Scanning

The Modbus/Ethernet converter scans the controllers connected to the Modbus/RTU RS485 bus. Additional configuration options will be added to the Modbus Setup menu to configure a list of controllers to be scanned by the converter. The list contains the controller address (1–247) and type (550, 3+, MPAC). A maximum of 10 controllers can be configured. If necessary, additional controllers can be supported by installing additional converters on the network. Other types of Modbus slaves can be connected to the RS485 bus and will be accessible using Modbus/TCP.

The scanning of the controllers may have to share the RS485 bus with Modbus/TCP requests coming from Monitor III or other Modbus/TCP clients. Access to the bus will be split between the scanning task and the Modbus/TCP connections.

On startup the converter validates the configuration settings by polling the Device ID register on the controllers once a minute until a valid response is received. See Figure 14-28. The data from the controllers are scanned up to once a second in a round-robin fashion. The scan rate is dependent on the number of controllers on the bus and the number of Modbus/TCP requests. Controllers or other Modbus slaves that are not communicating will significantly affect the performance of the scan loop. Controllers that fail to respond will be taken offline after 3 attempts. Offline controllers will only be polled once a minute to determine if they are back online.

The Kohler data is defined as a private enterprise MIB. The MIB basically consists of two tables, a controller data/status table and an alarm table. The address of each generator controller is unique and is used as the index or key field for the controller table. This field can be used to cross-reference a generator controller with its alarms in the alarm table. The combination of the controller address and the alarm index fields is unique and is used as the indexes for the alarm table. All fields are read-only except for the Remote Command field in the Controller Table.

Controller	Device ID	Register
Decision-Maker® 3+	18	49999
MPAC® 1000	19	49999
Decision-Maker® 550	20	49999
MPAC® 1500	23	49999
Decision-Maker® 3000	37	1001
Decision-Maker® 6000	41	49999

Figure 14-28 DeviceID Numbers

14.5.4 Remote Command (Start/Stop)

The Remote Command field can be used to send a one-time Remote Start or Stop command to Decision-Maker 550 and 3+ generator set controllers and MPAC 1000 transfer switch controllers. This field will be set back to None (0) following the Modbus write.

14.5.5 MIB File

The Management Information Base (MIB) file is included on the Device Installer CD-ROM and also available to download through the Kohlernet website Tech Tools page. Figure 14-29 shows the basic layout of the MIB.

Provide the MIB file to your network adminstrator.

Controller Table[10] {1}

Controller Entry {1}

Controller Type (550, 3+, MPAC 1000, MPAC 1500, 3000, 6000) {1.1–10} [RO]

Controller Address (1–247) {2.1–10, Index} [RO]

Controller Status (Unknown, Good, Bad) {3.1–10} [RO]

Controller Remote Command (None, Start, Stop) {4.1–10} [R/W]

Controller Alarm Table[16*10] {2}

Alarm Entry {1}

Controller Address (1–247) {1.1–160, Index} [RO]

Alarm Index (1–16) {2.1–160, Index} [RO]

Alarm Code (0–255) {3.1–160} [RO]

Alarm Severity (NFPA shutdown, NFPA warning, …) {4.1–160} [RO]

Alarm Description (32 chars of text) {5.1–160} [RO]

where: [RO] = Read Only and [R/W] = Read/Write

Figure 14-29 MIB Basic Layout

14.5.6 Alarm Reporting

The converter can report up to 16 alarms on SNMP from each controller. The alarms are prioritized and the 16 highest priority alarms are reported. There are currently six priority levels, shown in Figure 14-30.

Description	Priority Level
NFPA Shutdown	1
NFPA Warning	2
NFPA Alarm/status	3
Non-NFPA Shutdown	4
Non-NFPA Warning	5
Non-NFPA Alarm/status	6

Figure 14-30 Alarm Priority Levels

Each alarm is reported with the Message Code (0–XXX), severity level (1–6) and text description. The text description for MDEC Red and Yellow alarms will contain an additional MDEC code on the Decision-Maker® 550 and 3+ controllers. The message codes and text descriptions are listed in Section 14.5.7.

The converter alerts the Operation Center/Management system to alarm changes by issuing an SNMP trap. A trap is issued to report alarm occurrence and removal. The trap contains the controller's device ID, alarm Message Code, severity level and text description. An additional configuration parameter will be needed for the IP address of the Operation Center/Management system to which the converter will direct trap messages.

The SNMP manager (PC/server) receives notifications (traps) on port 162. To use SNMP traps to automate alarm actions:

- If the managing device is a router, set the device to redirect traps sent on port 162 to the PC/server acting as the final managing device.
- Set the final managing device (PC/server) to receive traps on port 162.

Contact your network administrator for assistance, if necessary.

Network Usage	Port Number	Port Protocol
Modbus/TCP	502	TCP
SNMP	161	UDP
SNMP traps	162	UDP
Web page	80	TCP
Telnet configuration	9999	TCP

Figure 14-31 Port Numbers and Protocol

14.5.7 SNMP Message (Alarm) Codes

The following tables list the SNMP message (alarm) codes and descriptions for different controllers.

Decision-Maker® 3+ Controller	
Code	**Message**
1	Master switch not in auto
2	Master switch error
3	Overcrank
4	Locked Rotor
5	Overspeed
6	Low oil pressure
7	Low oil pressure
8	High coolant temperature
9	High coolant temperature
10	Low coolant temperature
11	Aux. delay
12	Aux. immediate
13	MDEC yellow alarm
14	MDEC red alarm
15	Loss of ECM comms
80	No AC voltage
81	MDEC yellow alarm
82	Speed sensor fault
83	Intermittent speed sensor
84	Master switch not in auto
85	MDEC charge air temperature
86	MDEC low fuel pressure
87	MDEC high oil temperature
88	Low oil pressure
89	High coolant temperature
90	Low coolant temperature

Figure 14-32 SNMP Message Codes, Decision-Maker™ 3+ Controller

Decision-Maker® 550 and 6000 Controllers	
Code	**Message**
0	Emergency stop
1	Overspeed
2	Overcrank
3	High Coolant Temp Shutdown
4	Low Oil Pressure Shutdown
5	Low Coolant Temp
6	Low Fuel warning
7	High Coolant Temp warning
8	Low Oil Pressure warning
9	Master Not In Auto
11	Low Battery Voltage
12	High Battery Voltage
15	Loss of ECM comms
16	No Oil Pressure Signal
17	High Oil Temp Shutdown
18	No Coolant Temp Signal
19	Low Coolant Level
20	Speed sensor fault
21	Locked Rotor
22	Master switch error
23	Master switch open
24	Master switch off
25	No AC voltage
26	Over Voltage
27	Under Voltage
28	Weak Battery
29	Over Frequency
30	Under Frequency
31	Load Shed kW Overload
32	Load Shed kW Under Frequency
33	Over Current
35	Internal Fault
43	Critical Overvoltage
44	Alternator Protect Shutdown
45	Air Damper Indicator
46	Digital Input 01
47	Digital Input 02
48	Digital Input 03
49	Digital Input 04
50	Digital Input 05
51	Digital Input 06
52	Digital Input 07
53	Digital Input 08
54	Digital Input 09
55	Digital Input 10

Decision-Maker® 550 and 6000 , cont'd	
Code	**Message**
56	Digital Input 11
57	Digital Input 12
58	Digital Input 13
59	Digital Input 14
60	Digital Input 15
61	Digital Input 16
62	Digital Input 17
63	Digital Input 18
64	Digital Input 19
65	Digital Input 20
66	Digital Input 21
67	Analog Input 01
68	Analog Input 02
69	Analog Input 03
70	Analog Input 04
71	Analog Input 05
72	Analog Input 06
73	Analog Input 07
99	Genset Parameter Warning
100	Genset S/N Mismatch Warning
101	Genset S/N Mismatch Shutdown
103	Protective Relay Overvoltage
104	Protective Relay Under Voltage
105	Protective Relay Overfrequency
106	Protective Relay Underfrequency
107	Protective Relay Reverse Power
108	Protective Relay Over Power
109	Protective Relay Loss of Field
110	Protective Relay Overcurrent Vr
111	Reverse Power Shutdown
112	Over Power Shutdown
113	Loss of Field Shutdown
114	Over Current Shutdown
116	In Sync
121	Oil Temp Loss of Signal
122	High Oil Temp
123	Intake Air Temp Loss of Signal
124	High Intake Air Temp
125	High Intake Air Temp
126	MDEC/ADEC Yellow Alarm
127	MDEC/ADEC Red Alarm
129	Low Coolant Temp
130	MDEC/ADEC Load Shed Over Temp

Figure 14-33 SNMP Message Codes, Decision-Maker® 550 Controller

Decision-Maker® 3000 Controller				
EventID	**Level**	**FMI**	**ParamID**	**Text to display**
1	4	16	1100	Overspeed
1	4	18	1100	Underspeed
1	2	18	1102	Low Oil Pressure Warning
1	4	18	1102	Low Oil Pressure Shutdown
1	2	18	1103	Low Coolant Temperature
1	2	16	1103	High Coolant Temp Warning
1	4	16	1103	High Coolant Temp Shutdown
1	4	5	1103	No Coolant Temp Signal
1	4	18	1105	Low Coolant Level Shutdown
1	2	18	1106	Low Fuel Warning
1	4	18	1106	Low Fuel Shutdown
1	2	16	1106	High Fuel Warning
1	2	0	1106	Critically High Fuel Warning
1	2	18	1110	Low Fuel Pressure Warning
1	2	18	1107	Low Battery Voltage
1	2	16	1107	High Battery Voltage
1	2	18	1104	Low Oil Level Warning
1	4	18	1104	Low Oil Level Shutdown
1	4	18	1334	Under Voltage
1	4	16	1334	Over Voltage
1	4	18	1336	Under Voltage
1	4	16	1336	Over Voltage
1	4	18	1338	Under Voltage
1	4	16	1338	Over Voltage
1	4	18	1358	Under Frequency
1	4	16	1358	Over Frequency
1	4	16	1331	Over Power Shutdown
1	4	16	1601	Low Maximum Alternator Current

Figure 14-34 Event ID 1, Parameter Value Abnormal, Decision-Maker 3000 Controller (see Figure 14-35 for additional SNMP codes)

Decision-Maker® 3000 Controller	
EventID	**Fault Condition**
1	Parameter Value Abnormal
2	BlockHeaterControl
3	NotInAuto
4	OverCrank
5	BatteryChargerFault
6	LowCrankingVoltage
7	AirDamper
8	EpsSupplyingLoad
9	GeneratorRunning
10	NFPA110AlarmActive
12	EngineCoolDownActive
13	EngineStartDelayActive
14	EngineStartAidActive
15	SystemReady
16	RemoteStart
17	PublicCanStart
18	ModbusStart
19	EmergencyStop
20	AlternatorProtection
21	GroundFaultInput
22	ChicagoCodeActive
23	AuxiliaryInput
24	CommonWarning
25	CommonFault
26	RunRelayCoilOverload
27	StarterRelayCoilOverload
28	LockedRotor
29	SpeedSensorFault
30	ACSensingLost
32	EngineDerateActive
33	InjectorWiringFault
34	WaterInFuel
35	FuelTankLeak
36	LossOfFuel
37	ElectricalMeteringCommunicationLoss
38	VoltageRegulatorCommunicationLoss
39	Tps1HigherThanTps2
40	Tps1LowerThanTps2
41	Tps1HighVoltage
42	Tps1LowVoltage
43	CannotReachHiLoTps
44	Tps1Tps2SimulVoltageOutOfRange
45	OilPressureHigh
46	OilPressureLow
47	OpsVoltageHigh
48	OpsVoltageLow
49	TipActive
50	TipHighVoltage
51	TipLowVoltage

Decision-Maker® 3000 Controller	
EventID	**Fault Condition**
52	IatHigherThanExpected2
53	IatHighVoltage
54	IatLowVoltage
55	IatHigherThanExpected1
56	MapLowVoltage
57	MapHighPressure
58	BpHighPressure
59	BpLowPressure
60	EctHigherThanExpected2
61	EctChtHighVoltage
62	EctChtLowVoltage
63	EctHigherThanExpected1
64	ECMBatteryVoltageHigh
65	ECMBatteryVoltageLow
66	SparkRevLimitExceeded
67	MaxGovernSpeedOverride
68	FuelRevLimitExceeded
69	FlashCsumInvalid
70	InternalEcuFailure
71	RamFailure
72	CrankSyncNoise
73	CrankSignalLost
74	NoCrankSyncAtStart
75	ECMCommunicationLoss
76	ECMAddressConflict
77	CamSyncNoise
78	CamSignalLost
79	Knock1ExcessiveSignal
80	Knock1SensorOpen
81	External5V1High
82	External5V1Low
83	External5V2High
84	External5V2Low
85	MilRelayCoilShortToPower
86	MilRelayGroundShort
87	MilRelayCoilOpen
88	FuelRunOutLongerThanExpected
89	PrimaryLoopOpen
90	PrimaryLoopShorted
91	StartRelayCoilShortToPower
92	StartRelayGroundShort
93	PowerRelayCoilShortToPower
94	PowerRelayGroundShort
95	PowerRelayCoilOpen
96	Ego1Open
97	Tps2HighVoltage
98	Tps2LowVoltage
99	ClosedLoopHighNg
100	ClosedLoopLowNg

Decision-Maker® 3000 Controller	
EventID	**Fault Condition**
101	AdaptiveLearnHighLpgNG
102	AdaptiveLearnLowLpgNG
103	ClosedLoopHighLpg
104	ClosedLoopLowLpg
105	Ego2Open
106	Knock2ExcessiveSignal
107	Knock2SensorOpen
108	MjDeliveryPressureHigh
109	MjDeliveryPressureLow
110	MjVoltageSupplyHigh
111	MjVoltageSupplyLow
112	MjInternalFault
113	MjCommLost
125	EngineStarted
126	EngineStopped
127	FuelPrimingStarted
128	FuelPrimingStopped
129	USBDeviceConnected
130	USBDeviceDisconnected
133	DefaultParametersLoaded
135	MaintenanceRequired
139	FirmwareUpgradeFault
140	FirmwareUpgradeIntegrityTestFailed
141	FirmwareStartupIntegrityTestFailed
142	SystemTimerFailed
143	WatchdogTimerExpired
144	InternalFailure
145	FileSystemError
146	USBError
147	PublicCanCommunicationLoss
148	GeneratorCommunicationLoss
156	OptionBoard1CommunicationLoss
157	OptionBoard2CommunicationLoss
158	OptionBoard3CommunicationLoss
159	OptionBoard4CommunicationLoss
163	TestEvent
176	ECMModelMismatch
177	BackupParametersLoaded
178	AutoRecovery
179	RemoteReset
181	ECMUnknownFault
222	LowFuel
223	FuelSpill
224	MinorFault
225	J1939CANShutdown

Figure 14-35 SNMP Message Codes, Decision-Maker® 3000 Controller

MPAC® 1000 Transfer Switch Controller	
Code	**Message**
1	End Time Delay Button
2	Test Button
3	Exercise Button
4	Lamp Test Button
5	Service Required Reset
6	Exerciser Set
7	Maintenance DIP Switch
8	Exerciser Loaded DIP Switch
9	Test Loaded DIP Switch
10	One/Two Week DIP Switch
11	Disable Exercise DIP Switch
12	Supervised Switch in Manual
13	Supervised Immediate Transfer
14	Supervised Switch in Auto
15	Source N Preferred
16	Source E Preferred
17	I/O Module Timeout
18	I/O Module Bus Error
26	No Function Defined
27	Preferred Source Available
28	Standby Source Available
29	Contactor in Preferred Position
30	Contactor in Standby Position
31	Contactor in Off Position
32	Contactor in Source N Position
33	Contactor in Source E Position
34	Not in Auto
35	Load Control Active
36	Low Battery on Standby Source
37	Exerciser Started
38	Test Mode Active
39	Peak Shave Active
40	Non–Emergency Transfer
41	Load Bank Activate
42	Start Source N Generator
43	Start Source E Generator
44	In Phase Monitor Wait for Synch
45	Common Alarm
46	Source N Under Voltage
47	Source N Over Voltage
48	Source N Loss of Phase
49	Source N Phase Rotation Error
50	Source N Over Frequency
51	Source N Under Frequency
52	Source E Under Voltage
53	Source E Over Voltage
54	Source E Loss of Phase
55	Source E Phase Rotation Error

MPAC® 1000 Transfer Switch Controller, cont'd	
Code	**Message**
56	Source E Over Frequency
57	Source E Under Frequency
58	Failure to Acquire Standby
59	Failure to Transfer
60	I/O Module Comms Lost
61	I/O Module Not Found
62	I/O Module Not Installed
63	Aux. Switch Fault
64	Aux. Switch Open
65	Load Control Output #0
66	Load Control Output #1
67	Load Control Output #2
68	Load Control Output #3
69	Load Control Output #4
70	Load Control Output #5
71	Load Control Output #7
72	Load Control Output #7
73	Load Control Output #8
74	Software Controlled RDO#1
75	Software Controlled RDO#2
76	Software Controlled RDO#3
77	Software Controlled RDO#4
78	3 Source System Disable
86	No Function Defined
87	Forced Transfer to Off
88	Peak Shave Mode
89	Inhibit Transfer
90	Remote End Time Delay
91	Remote Test
92	Low Battery Voltage
93	Remote Common Alarm
94	Bypass Contactor Disable
95	3 Source System Disable
103	Contactor Moved
104	EEPROM Access Warning
105	Internal Fault
106	System Ready
107	Critical Service Required
108	Non-Critical Service Required
109	System Parameter Changed
110	Source N Available
111	Source E Available
112	Source E Over Frequency
113	Source E Under Frequency
114	Source E Loss of Phase
115	Source E Phase Rotation Error

MPAC® 1000 Transfer Switch Controller, cont'd	
Code	**Message**
116	Over Voltage L1-L2 Source E
117	Over Voltage L2-L3 Source E
118	Over Voltage L3-L1 Source E
119	Under Voltage L1-L2 Source E
120	Under Voltage L2-L3 Source E
121	Under Voltage L3-L1 Source E
122	Partial Meter Read
130	History Read from EEPROM
131	DCA Read from EEPROM
132	Exercise Time Updated
133	Network Settings Updated
134	Settings Read from EEPROM
135	Transfer Mode Changed
136	Default History Loaded
137	Default Settings Loaded
138	Default Common Alarms Loaded
143	Modbus Force Transfer to Off
144	Modbus Peak Shave
145	Modbus System Test

Figure 14-36 SNMP Message Codes, MPAC® 1000 Transfer Switch Controller

MPAC® 1500 ATS Controller	
Code	**Description**
6	Maintenance DIP Switch Changed State
27	New I/O Module Detected
69	Failure to Acquire Standby
70	Failure to Acquire Preferred
71	Failure to Transfer
72	I/O Module Comms Lost
74	Aux. Switch Fault
75	Aux. Switch Open
102	Inhibit Transfer
106	Remote Common Alarm
129	Phase Rotation Error

Figure 14-37 SNMP Message Codes, MPAC® 1500 Transfer Switch Controller

14.5.8 Converter Firmware Upgrade Procedure

Use the following procedure to update the converter's firmware to version 3.0.0.0 or later for Simple Network Management Protocol (SNMP) capability.

The TFTP client (used in the following procedure) is not activated by default on PCs with the Microsoft® Windows® 7 operating system. See Section 14.4.8 for instructions to activate the TFTP client.

Note: Converters with Xport firmware V2.0 or later can be upgraded using this procedure. The firmware version number is shown in the device details screen and on the Telnet Configuration screen. See Figure 14-10 or Figure 14-16.

1. Copy the .rom files to the hard C-drive on your PC (C:\):

   - xpiapupg.rom is needed for converters with firmware versions older than 3.0.0.0.
   - amxp_kohler_3000RC2.rom is needed for all converters.

   Note: The upgrade files and firmware files must be located on the C:\ drive of your PC.

2. Connect the converter to the PC as described in Section 14.1.

3. The PC and Converter must be connected to the same subnet, similar to requirements for converter setup with DeviceInstaller Software (V4.1.0.3 or later). Refer to Section 14.4.2.

4. On the PC, go to Start>Programs>Accessories> Command Prompt. Change to a C:\ directory.

5. Enter the follow commands in the DOS screen to load the new files onto the converter:

   a. For converters with firmware versions older than 3.0.0.0:
   C:\tftp –i <*IP address x.x.x.x*> put xpiapupg.rom XA

   Note: Use upper case XA as shown.

   b. **Wait** 20 seconds

   c. For all converters:
   C:\tftp –i <*IP address x.x.x.x*> put amxp_kohler_3000RC2.rom xA

   Note: The difference in case for the destination file name is important. Use lower case x and upper case A as shown: xA.

   d. **Wait** 45 seconds.

   Note: Interruption of the download may require restarting the process from step 5a.

   e. Start the Device Installer Software on the PC. See Section 14.4.

   f. Enter Telnet Setup and input a 'D' for Default Settings.

   g. Enter a '5' and configure the attached generator controllers (Modbus address and type).

   h. This step is only necessary if using SNMP: Enter a '1' and set the network parameters, SNMP community and IP address for traps.

   i. Enter an 'S' to save the configuration.

6. File download should be complete and ready to test with a network management software that uses SNMP to find controller faults/event (traps) in the converter.

Note: The MIB file is required to make use of the SNMP interface. The MIB file is included on the Device Installer CD-ROM and on Tech Tools. An overview of the file is shown in Section 14.5.5 for reference.

14.5.9 Converter Firmware Downgrade

If it is necessary to downgrade the converter firmware to a pre-SNMP version, use the Advanced Recovery feature of Device Installer, version 4.0.0.x and later. Advanced Recovery may not work correctly on older versions of Device Installer.

In Device Installer, select Tools/Advanced/Recover Firmware from the pull-down menu. Set the device model to XPort-03.

15 Connection Diagrams

System connection diagrams GM62554 sheets 1 through 7 are shown on the following pages.

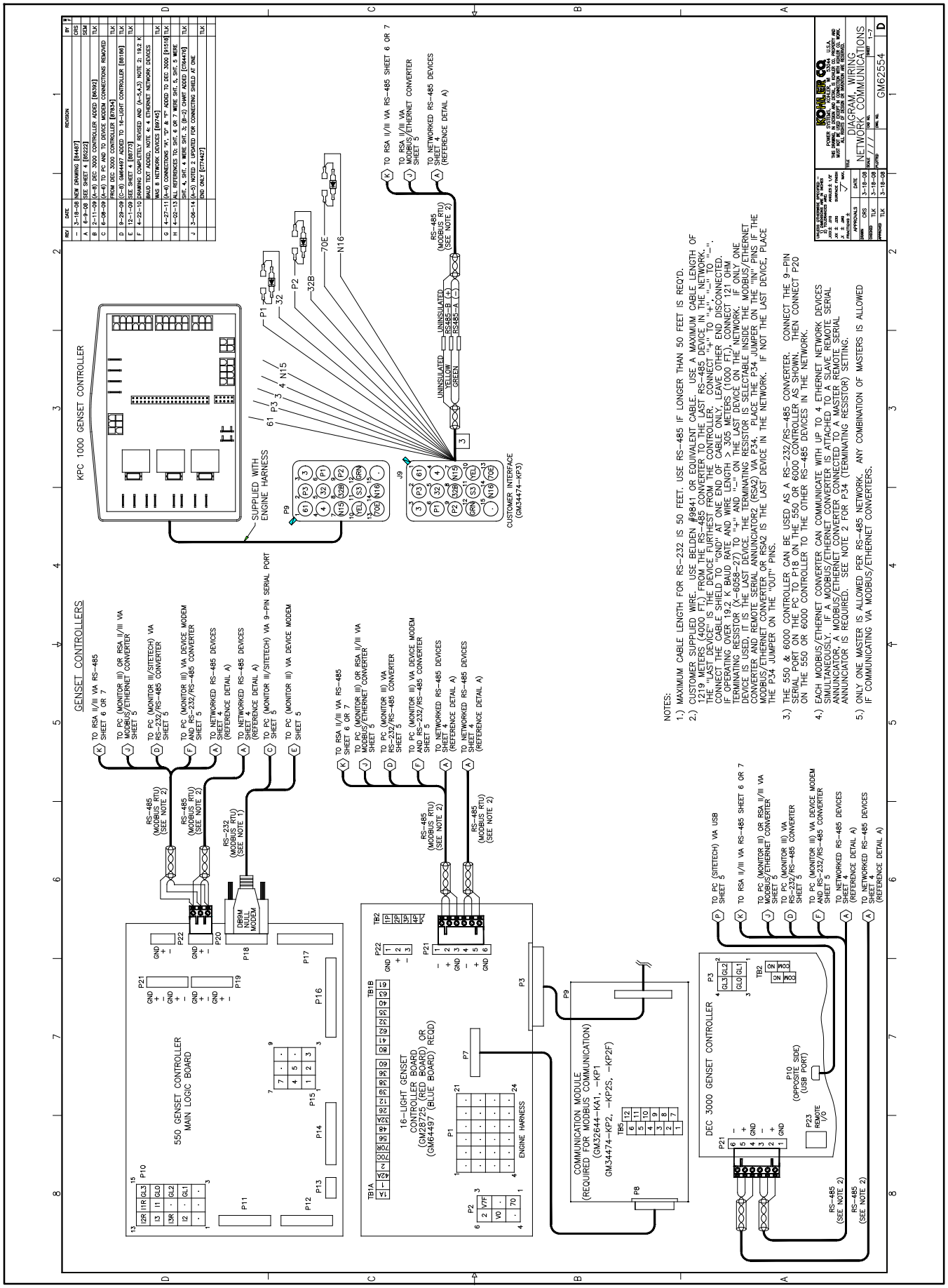


Figure 15-1 Wiring Diagram, Network Communications, GM62554, Sheet 1

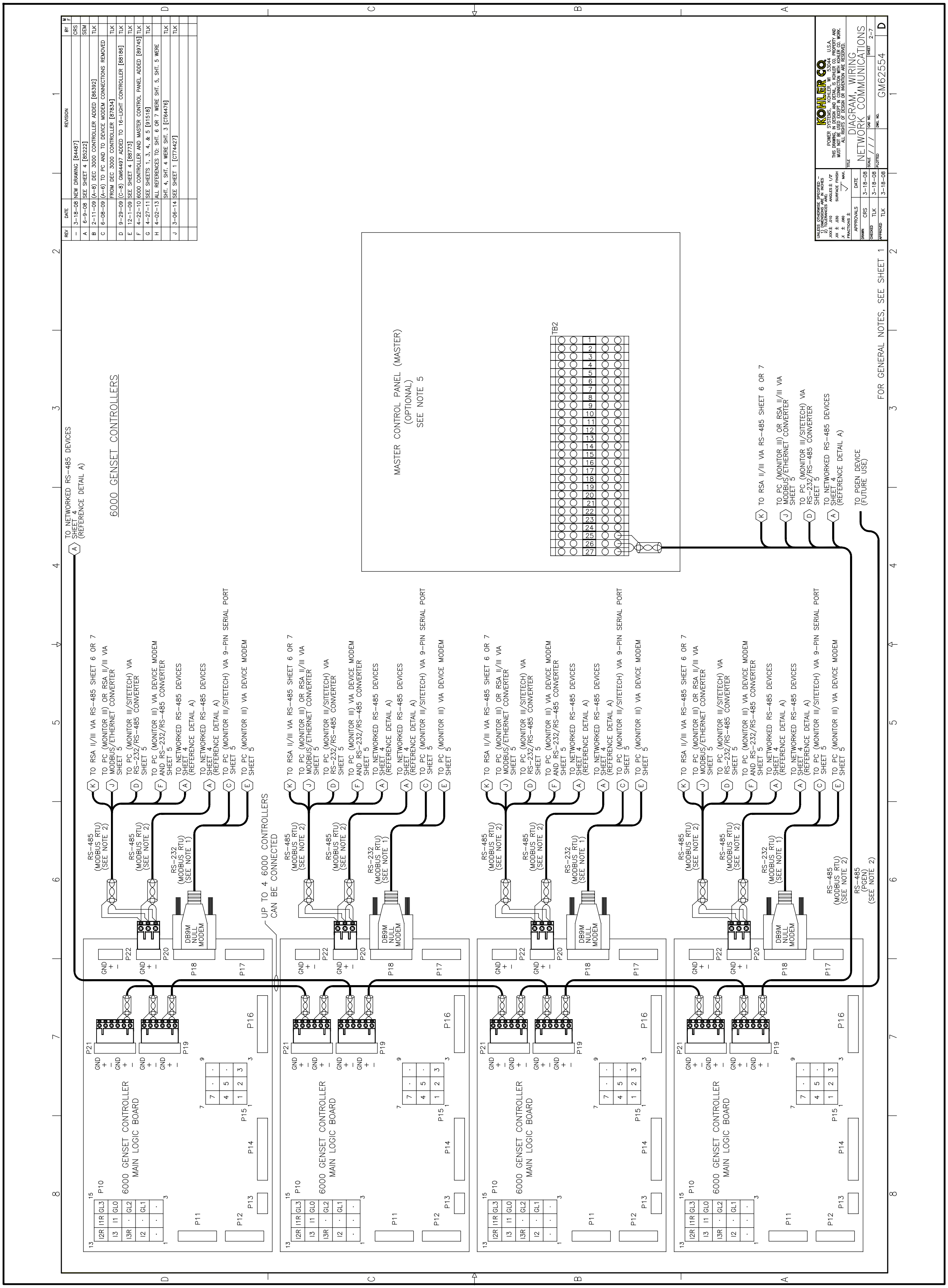


Figure 15-2 Wiring Diagram, Network Communications, GM62554, Sheet 2

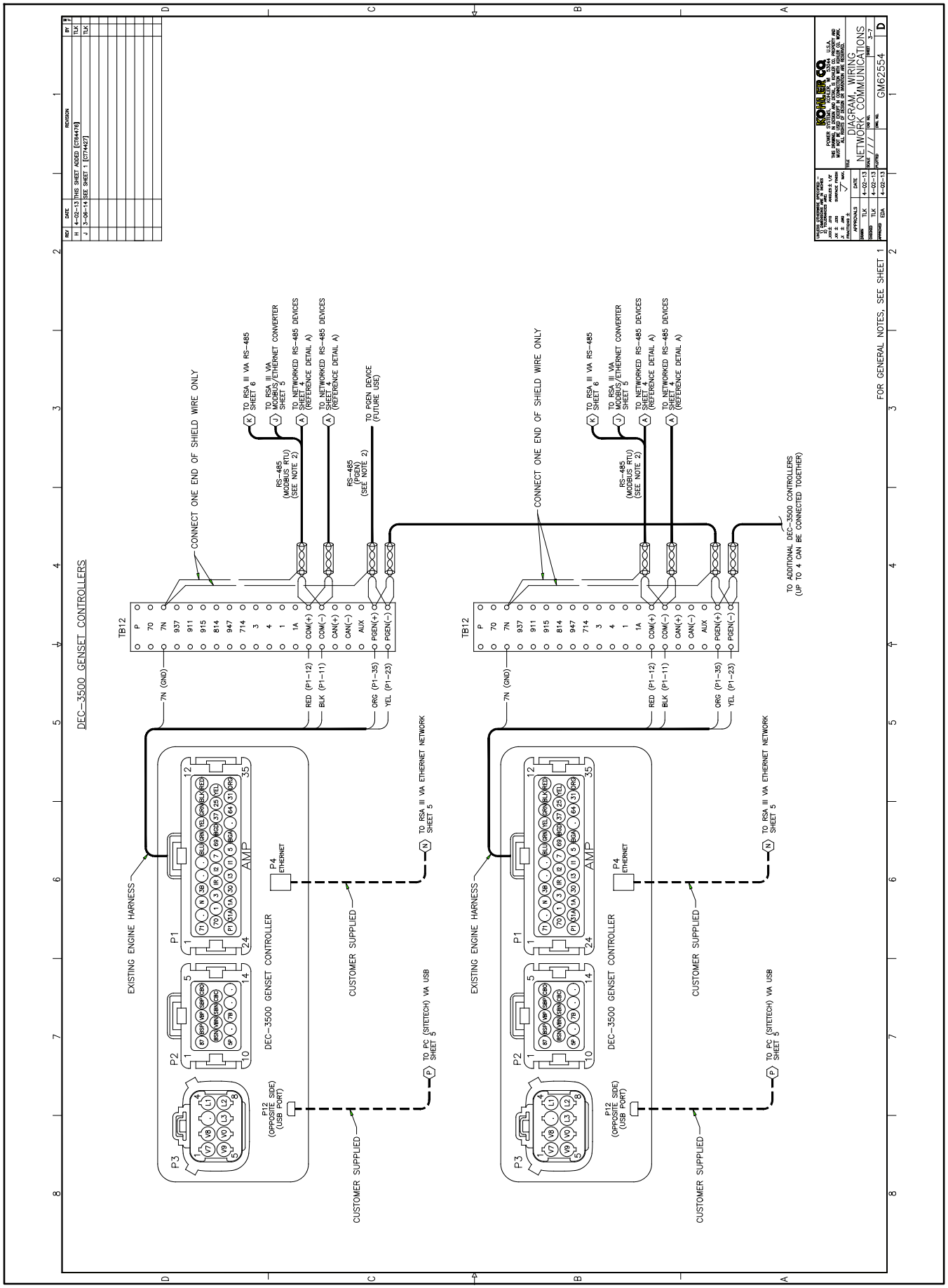


Figure 15-3 Wiring Diagram, Network Communications, GM62554, Sheet 3

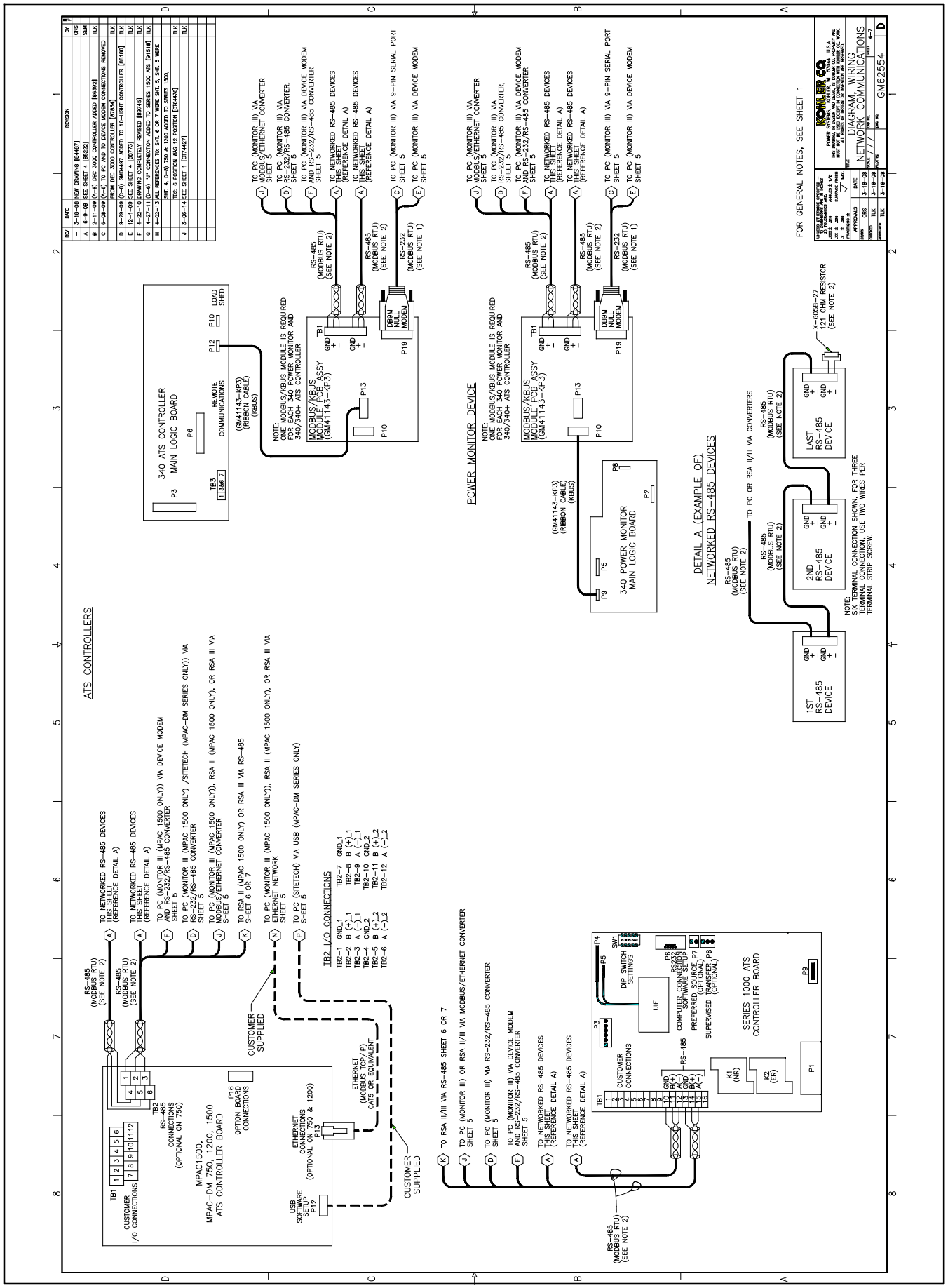


Figure 15-4 Wiring Diagram, Network Communications, GM62554, Sheet 4

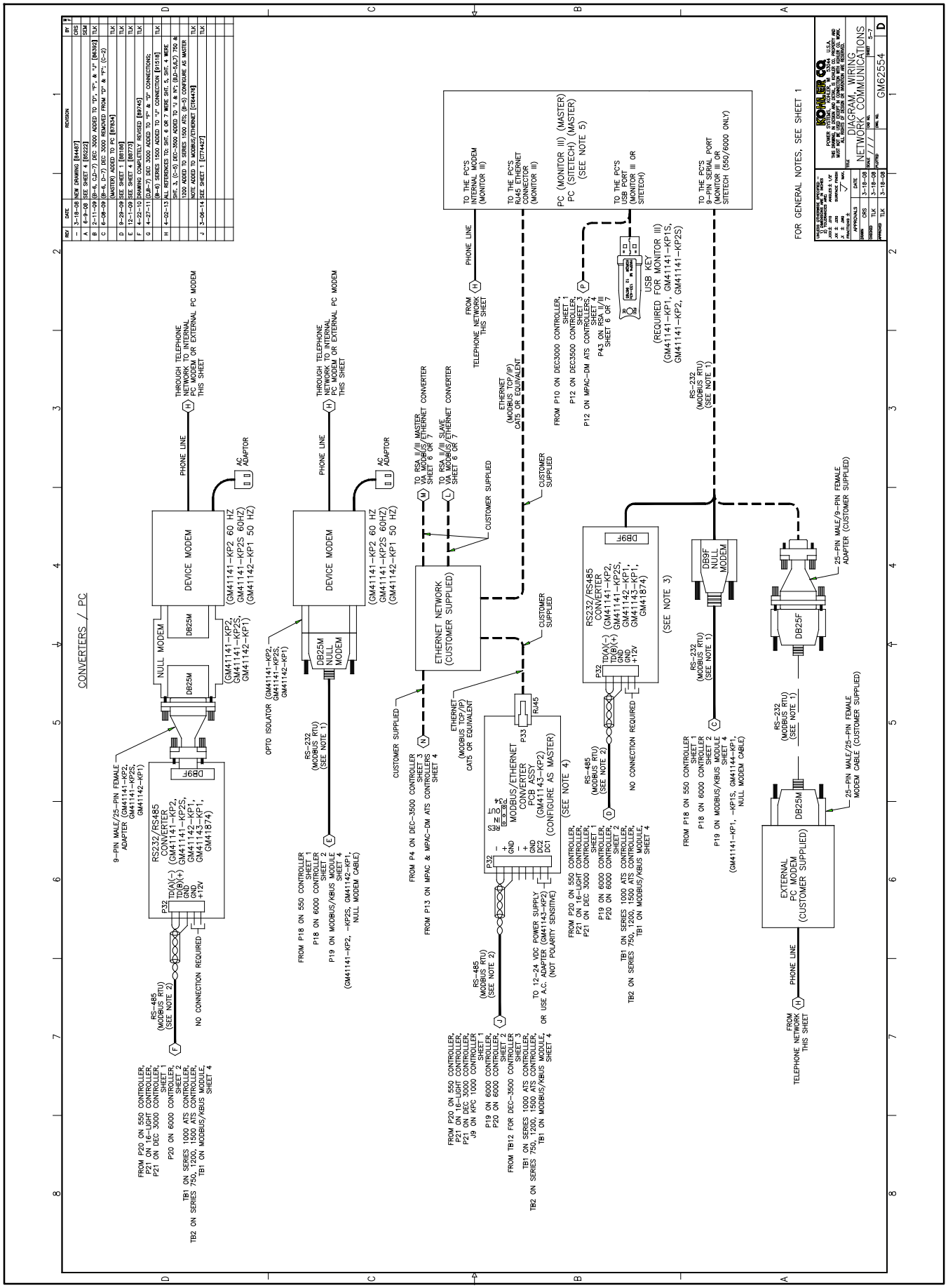


Figure 15-5 Wiring Diagram, Network Communications, GM62554, Sheet 5

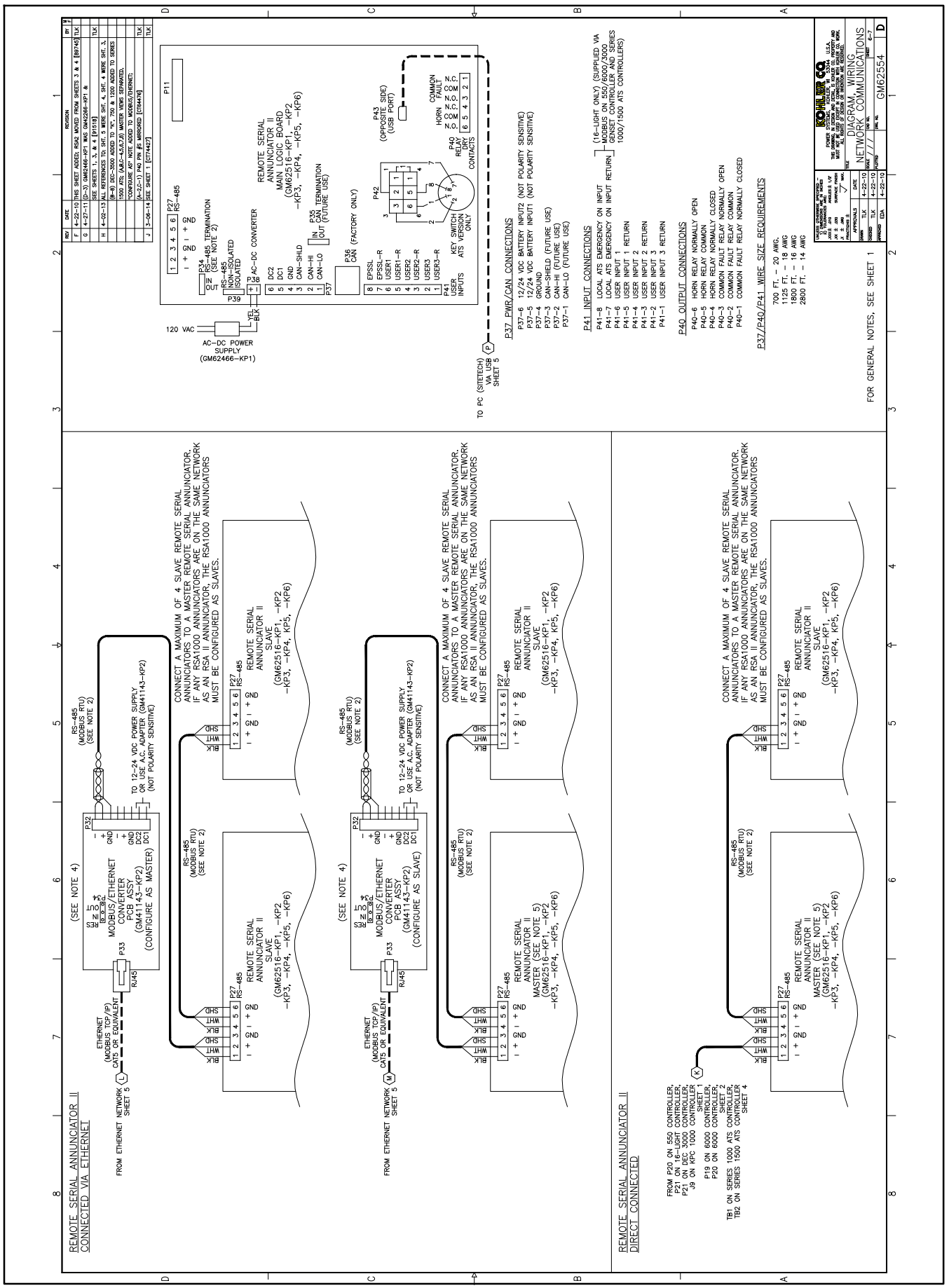


Figure 15-6 Wiring Diagram, Network Communications, GM62554, Sheet 6

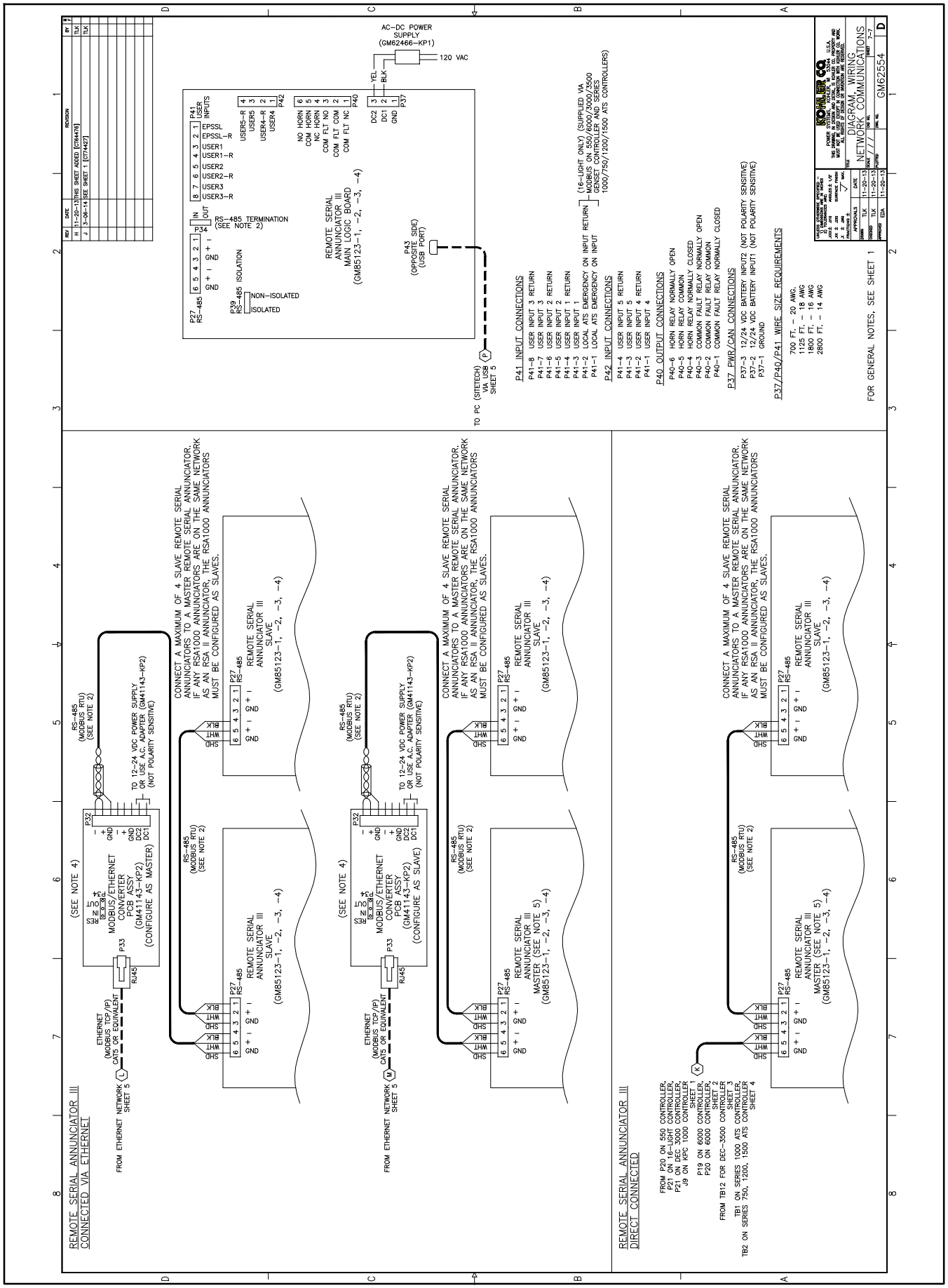


Figure 15-7 Wiring Diagram, Network Communications, GM62554, Sheet 7

16 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.

17 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	crossover 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

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