APACS+ M-BUS/M-NET Interface Installation for Windows® 2000 and NT® Personal Computers
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### Significant Change for Revision 2

Addition of the PCI-Type MBI card.
1 Introduction

This document provides information on installing and servicing one or more MODULBUS (M-BUS) or MODULNET (M-NET) network interfaces in a Windows® 2000 or NT® personal computer. In an APACS+™ or QUADLOG® control system, such interfaces:

- Directly connect computers to the system’s M-BUS or M-NET network(s).
- Make data exchange possible between PC-based software applications and system control resources.

All variations of APACS+ and QUADLOG system architectures include at least one computer directly tied to M-BUS or M-NET.

A PC’s M-BUS or M-NET interface is comprised of two components:

- An ISA or PCI-Type circuit card installed within the computer.
- Driver software that controls card operation.

The interface card features cable connectors for establishing a redundant M-BUS or M-NET link between the computer and system control resources. Driver software governs the card’s data exchange activities and ensures card compatibility with the computer’s operating system.

**NOTE**

The M-BUS/M-NET driver described in this manual is the 4.50 version released with APACS+ R4 Service Pack B or later. It is valid only for M-BUS or M-NET interfaces in Windows 2000 and NT personal computers.

The interface cards this document discusses are identified below:

- Part # 16249-51 ISA-Type M-BUS Interface (MBI) Card
- Part # 16267-1 ISA-Type M-NET Interface (MNI) Card
- Part # 16413-51 PCI-Type M-BUS Interface (MBI-PCI) Card
- Part # 16413-15 PCI-Type M-BUS/M-NET Interface (MBI/MNI) Card

The MBI and MNI cards are both ISA-Type boards that plug into personal computer ISA busses. The MBI and MBI/MNI cards are both PCI-Type boards and require PCI bus installation. The MBI/MNI card offers dual purpose MBI and MNI functionality.
1.1 Document Organization

This document is organized into the seven sections described below:

- **Section 1, Introduction** – Provides product description, product support, and related literature information. Procedures for installing ISA-Type MBI, MNI or PCI-Type MBI and MBI/MNI cards in Windows 2000 and NT computers are summarized.

- **Section 2, Card Installation, Handling, and Maintenance Considerations** – Discusses issues concerning interface card preparation, installation, maintenance, delivery, and handling.

- **Section 3, M-BUS and M-NET Interface Installation** – Provides detailed procedures for installing an M-BUS or M-NET Interface in a Windows 2000 and NT PC. The procedures cover both ISA and PCI interface card types.

- **Section 4, Installing Interface Cards** – Describes the physical installation of ISA-Type MBI, MNI and PCI-Type MBI and MBI/MNI cards in a personal computer. Section 3 refers readers to this section.

- **Section 5, Making PC-to-M-BUS/M-NET Network Connections** – Describes the connections that link a PC to either an M-BUS or M-NET network. Section 3 refers readers to this section.

- **Section 6, Upgrading to MBI-PCI or MBI/MNI Card** – Provides procedures for replacing a computer’s ISA-Type MBI or MNI card with a PCI-Type MBI or MBI/MNI card.

- **Section 7, Spare Parts and Accessories** – Describes each card’s spare parts and accessories.

- **Section 8, Specifications** – Describes each card’s specifications.

1.2 Product Description

Detailed interface card descriptions, as well as a description of the driver software that controls card operation are provided in the sections that follow.

1.2.1 Interface Cards

In an APACS+/QUADLOG system, M-BUS and M-NET interface cards enable personal computers to connect to the M-BUS or M-NET network(s) upon which the system is structured. This connection:

- Makes computer-to-control resource communications possible.

- Is essential to configuration, diagnostic, and operator interface program operation.

- Is redundant and accommodates an M-BUS or M-NET network’s A and B sides.
MBI and MNI cards install into the 16-bit, ISA expansion slots of personal computers. The MBI card provides a direct M-BUS connection, while the MNI card connects to a plant-wide, carrier band, M-NET network.

MBI and MNI card functionality is combined together in the PCI-type MBI/MNI card. A single MBI/MNI card plugs into any of the 33 MHz, 32-bit, PCI slots in a computer. It can be linked to either M-BUS or M-NET, but not both simultaneously. If multiple M-BUS and M-NET interfaces are desired in a single PC, more than one MBI/MNI card can be installed in the computer. One computer can support up to three MBI/MNI cards.

The MBI-PCI card is an M-BUS only version of the MBI/MNI card.

1.2.2 ISA-Type MBI, MNI & PCI-Type MBI, MBI/MNI Driver Software V 4.50

M-BUS/M-NET driver software governs ISA-Type MBI, MNI and PCI-Type MBI and MBI/MNI card operation. Version 4.50:

- is provided on the APACS+ R4 Service Pack B installation disc.
- operates exclusively on Windows 2000 and NT system nodes running APACS+ R4 software components only.
- is compatible with dual processor, server-class platforms.
- requires 32K of RAM memory to properly function in a PC.

**NOTE**

Complete operating system and hardware requirements for APACS+/QUADLOG computers are documented in the *ProcessSuite™ Version 3.01 Installation Guide*.

In working with interface cards to process data exchanged over M-BUS or M-NET, the driver software’s responsibilities include:

- arbitrating interface card resources among multiple HMI-related programs.
- generating detailed fault and error detection reports.
- posting start-up diagnostic and error messages to the NT Event Log and/or APACS+ Diagnostic Logger Utility.
1.2.3 Installation Considerations

Be advised of the following incompatibilities that may prevent M-BUS or M-NET interface installation on PCs.

1.2.3.1 EISA Bus Incompatibility

M-BUS/M-NET driver software does not support ISA-Type MBI or MNI cards plugged into EISA PC busses. In Windows NT computers, driver installation fails if an EISA bus is detected.

1.2.3.2 Incompatibility with Pre-R4 APACS+ Software

M-BUS/M-NET driver version 4.50 is not backwards compatible with APACS+ software preceding R4. As such, avoid inadvertently using pre-R4 installation CDs to re-load programs on nodes already running R4 software components. Failure to do this can create problems for the version 4.50 driver, since:

- DLL files critical to driver operation, such as MBUS32.DLL and ELOGGR32.DLL, can be potentially overwritten with older versions.

- An old M-BUS/M-NET driver can be activated in Windows NT computers and cause conflicts with the new one.

1.3 M-BUS/M-NET Interface Upgrades

Users with computers requiring M-BUS/M-NET interface enhancement or repair are encouraged to substitute ISA-Type MBI and MNI cards with PCI-Type. Such substitutions are, of course, only possible in computers with PCI busses. PCI cards are preferred replacements since they:

- simplify workstation and server upgrades to newer technology platforms that no longer support the ISA bus.

- are simpler to install than ISA-Type interface cards, since they require no on-board jumper settings, or card-specific I/O and memory address configurations.

Detailed card upgrade procedures are provided in Section 6, Upgrading to MBI or MBI/MNI Card.
1.4 Procedural Summaries

The steps to follow for setting up a PC’s M-BUS or M-NET interface are determined by:

• the PC’s operating system – Windows 2000 or NT.

• whether you are installing an ISA or PCI-Type interface card.

Installation procedures covering all operating system and card types are summarized below.

NOTE

A PC must already be running Windows 2000 or NT before installing its M-BUS or M-NET interface. Operating system software should always be loaded first. Hardware and software that turns a PC into an APACS+ or QUADLOG system node should be installed afterwards.

1.4.1 Windows 2000 Procedures

The following summarizes M-BUS and M-NET interface installation in a Windows 2000 computer.

1.4.1.1 ISA-Type MBI or MNI Card Installation

In a Windows 2000 PC, an ISA-Type MBI or MNI card should be installed using this sequence of steps:

1. Take the card and arrange its W1 and W3 jumpers to desired hardware I/O address and IRQ line number settings. Assign Node, Rack, and Slot numbers to the card.

   NOTE

   Node, Rack, and Slot numbers make up the card’s M-BUS/M-NET address. Addresses of this type always identify devices directly tied to an M-BUS or M-NET network, regardless of whether they are physically installed in controller rack slots.

2. Record (write down) the card’s W1 and W3 jumper settings and Node, Rack, and Slot numbers. After verifying that the card’s W2 jumper is in its default position, place the card aside.

NOTE

A license file floppy disk and parallel port hardkey determine the selection of ProcessSuite and APACS+ software components that load onto a computer. Of all the programs supplied on Siemens software installation CDs, only those authorized by the computer’s license file and hardkey will install.

4. Load the computer’s APACS+ software components using the R4 APACS+ Control CD. After these components are installed, a prompt to load M-BUS/M-NET driver software displays. Answer No to cancel driver installation from the Control CD and finish the Control CD’s run. Driver software will be installed from the Service Pack B disc in the next step.

5. Install service pack software from the APACS+ Service Pack B disc. M-BUS/M-NET driver version 4.50 will be written to the PC hard drive automatically.

6. Power down the computer, disassemble its case, and install the MBI or MNI card in one of its ISA bus slots. Only one MBI or MNI card per PC is permitted. After reassembling the PC’s case, use the card’s connectors and appropriate cables to connect the computer to your system’s redundant M-BUS or M-NET network (if available).

7. Power on the computer and, as it boots up, access its BIOS setup program. Verify that PC BIOS settings are compatible with interface card operation. Exit the BIOS program and let the computer finish booting up.

8. Run the Windows Add/Remove Hardware Wizard to complete the card’s configuration and load its driver software. When prompted, enter the hardware I/O address, IRQ number setting, and Node, Rack, and Slot numbers recorded in step 2.

9. Verify card operation by accessing the M-BUS/M-NET window of the APACS+ Control Panel Applet.

1.4.1.2 PCI-Type MBI and MBI/MNI Card Installation

The following sequence of steps summarizes the Windows 2000 installation of one or more PCI-Type MBI and MBI/MNI cards.

1. Assign Node, Rack, and Slot numbers to the MBI-PCI or MBI/MNI card(s) to be installed. Record (write down) the numbers for later reference and place the card(s) aside.

NOTE

Node, Rack, and Slot numbers make up a card’s M-BUS/M-NET address. Addresses of this type always identify devices directly tied to an M-BUS or M-NET network, regardless of whether they are physically installed in controller rack slots. If more than one MBI-PCI or MBI/MNI card is to be installed, unique Node, Rack, and Slot numbers must be assigned each card.

**NOTE**

A license file floppy disk and parallel port hardkey determine the selection of ProcessSuite and APACS+ software components that load onto the computer. Of all the programs supplied on Siemens software installation CDs, only those authorized by the computer’s license file and hardkey will install.

3. Load the computer’s APACS+ software components using the R4 APACS+ Control CD. After these components are installed, a prompt to install M-BUS/M-NET driver software displays. Answer **No to cancel driver installation from the Control CD and finish the Control CD’s run.** Driver software will be installed from the Service Pack B disc in the next step.

4. Install service pack software from the APACS+ Service Pack B disc. M-BUS/M-NET driver version 4.50 will be written to the PC hard drive automatically.

5. Power down the computer, disassemble its case, and install the MBI/MNI card(s) in the computer’s PCI bus. Up to three MBI-PCI or MBI/MNI cards per PC are permitted.

6. Power on the computer. Windows 2000 should auto-detect the MBI-PCI or MBI/MNI card(s) you have just installed. Follow displayed prompts to load driver software and enter the Node, Rack, and Slot numbers recorded in step 1.

7. Verify card operation by accessing the M-BUS/M-NET window of the **APACS+ Control Panel Applet.** If necessary, use the **Control Panel Applet** to edit Node, Rack, and Slot numbers.

8. Use MBI-PCI or MBI/MNI card connectors and appropriate cables to link the computer to your system’s redundant M-BUS or M-NET network(s) (if available).

9. Use the **Control Panel Applet** to verify M-BUS/M-NET communications. Verify MBI-PCI or MBI/MNI card status by observing the behavior of its status LED.

### 1.4.2 Windows NT Procedures

The following steps summarize M-BUS and M-NET interface installation in a Windows NT computer.

#### 1.4.2.1 ISA-Type MBI or MNI Card Installation

In a Windows NT PC, an ISA-Type MBI or MNI card should be installed using this sequence of steps:

1. Take the card and arrange its W1 and W3 jumpers to desired hardware I/O address and IRQ line number settings. Assign Node, Rack, and Slot numbers to the card.
NOTE

Node, Rack, and Slot numbers make up the card’s M-BUS/M-NET address. Such addresses always identify devices directly tied to an M-BUS or M-NET network, regardless of whether they are physically installed in controller rack slots.

2. Record (write down) the card’s W1 and W3 jumper settings and Node, Rack, and Slot numbers. After verifying that the card’s W2 jumper is in its default position, place the card aside.

3. Make sure that the Windows NT computer is powered down. Disassemble its case, and install the MBI or MNI card in one of its ISA bus slots. Only one MBI or MNI card per PC is permitted. Reassemble the case after the card is installed.

4. Power on the computer and, as it boots up, access its BIOS setup program. Verify that PC BIOS settings are compatible with interface card operation. Exit the BIOS program and let the computer finish booting up.

5. Use ProcessSuite 3.01 installation CDs to install the PC’s ProcessSuite components.

NOTE

A license file floppy disk and parallel port hardkey determine the selection of ProcessSuite and APACS+ software components that load onto a computer. Of all the programs supplied on Siemens software installation CDs, only those authorized by the computer’s license file and hardkey will install.

6. Load the computer’s APACS+ software components using the R4 APACS+ Control CD. After these components are installed, a prompt to load M-BUS/M-NET driver software displays. Answer No to cancel driver installation from the Control CD and finish the Control CD’s run. Driver software will be installed from the Service Pack B disc in the next step.

7. Install service pack software from the APACS+ Service Pack B disc. When prompted, answer Yes to write M-BUS/M-NET driver version 4.50 to the PC’s hard drive.

8. After driver software is written to the hard drive, the M-BUS/M-NET Wizard automatically launches to load the driver. When prompted, enter the hardware I/O address, IRQ number setting, and Node, Rack, and Slot numbers recorded in step 2.

9. Use the card’s connectors and appropriate cables to connect the computer to your system’s redundant M-BUS or M-NET network (if available). Verify card operation by accessing the M-BUS/M-NET window of the APACS+ Control Panel Applet.
1.4.2.2 PCI-Type MBI or MBI/MNI Card Installation

The following sequence of steps summarizes the Windows NT installation of one or more PCI-Type MBI or MBI/MNI cards.

1. Assign Node, Rack, and Slot numbers to the MBI-PCI or MBI/MNI card(s) to be installed. Record (write down) the numbers for later reference and place the card(s) aside.

   **NOTE**

   Node, Rack, and Slot numbers make up a card’s M-BUS/M-NET address. Addresses of this type always identify devices directly tied to an M-BUS or M-NET network, regardless of whether they are physically installed in controller rack slots. If more than one MBI-PCI or MBI/MNI card is to be installed, unique Node, Rack, and Slot numbers must be assigned each card.

2. Make sure the Windows NT computer is powered down. Disassemble its case, and install the MBI/MNI card(s) in the computer’s PCI bus. Up to three MBI-PCI or MBI/MNI cards per PC are permitted. Reassemble the PC’s case after completing card installation.


   **NOTE**

   A license file floppy disk and parallel port hardkey determine the selection of ProcessSuite and APACS+ software components that load onto the computer. Of all the programs supplied on Siemens software installation CDs, only those authorized by the computer’s license file and hardkey will install.

4. Load the computer’s APACS+ software components using the R4 APACS+ Control CD. After these components are installed, a prompt to install M-BUS/M-NET driver software displays. Answer **No** to cancel driver installation from the Control CD and finish the Control CD’s run. Driver software will be installed from the Service Pack B disc in the next step.

5. Install service pack software from the APACS+ Service Pack B disc. When prompted, answer **Yes** to write M-BUS/M-NET driver version 4.50 to the PC’s hard drive.

6. After driver software written to the hard drive, an **M-BUS/M-NET Wizard** automatically launches to load the driver. When prompted, enter Node, Rack, and Slot numbers recorded in step 1 for each of the cards installed in step 2.

7. Verify card operation by accessing the M-BUS/M-NET window of the **APACS+ Control Panel Applet**. If necessary, use the **Control Panel Applet** to edit Node, Rack, and Slot numbers.
8. Use MBI-PCI or MBI/MNI card connectors and appropriate cables to link the computer to your system’s redundant M-BUS or M-NET network(s) (if available).

9. Use the Control Panel Applet to verify M-BUS/M-NET communications. Verify MBI-PCI or MBI/MNI card status by observing the behavior of its status LED.

1.5 Product Support

Product support can be obtained from a Technical Support Center (TSC). Each regional TSC is a customer service center that provides direct telephone support on technical issues related to the functionality, application, and integration of all products supplied by Siemens. Regional TIC contact information is provided in Table 1–1. Your regional TSC is the first place you should call when seeking product support information. When calling, it is helpful to have the following information ready:

- Caller name and company name
- Product part number or model number and version
- If there is a problem with product operation:
  - Whether the problem is intermittent
  - The steps performed before the problem occurred
  - Any error messages or LED indications displayed
  - Installation environment

Product documentation is now located in the Library forum of the Process Automation User Connection at: [http://sitescape.sea.siemens.com/](http://sitescape.sea.siemens.com/). The Process Automation User Connection is a secure site. Registration is open to all verified users of Siemens process automation systems. If you are not already, and would like to become a member, please visit our Process Automation User Connection web page at: [http://www.sea.siemens.com/process/support/papauc.html](http://www.sea.siemens.com/process/support/papauc.html)

Contained within the Process Automation User Connection is the APACS+/QUADLOG Secure Site at: [http://sitescape.sea.siemens.com/forum/aca-1/dispatch.cgi/?apacsquadlo](http://sitescape.sea.siemens.com/forum/aca-1/dispatch.cgi/?apacsquadlo) forum. This site is only open to customers with an active service agreement. It contains all service manuals, service memos, service notes, configuration manuals, etc. for the APACS+ and QUADLOG family of products. If you are experiencing technical difficulties with the site, please contact SiteScape technical support at: toll free 1-877-234-1122 (US) or 1-513-336-1474.
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<th>TIC NORTH AMERICA</th>
<th>Tel: +1 215 646 7400, extension 4842</th>
</tr>
</thead>
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<td>Fax: +1 215 283 6343</td>
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</tr>
<tr>
<td>Hours of Operation: 8 a.m. to 5 p.m. eastern time Monday – Friday (except holidays)</td>
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<tr>
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<tr>
<td>Hours of Operation: 8:30 a.m. to 4:30 p.m. GMT/BST Monday – Friday (except holidays)</td>
<td>Secure Web Site: <a href="http://www.siemens.com">www.siemens.com</a></td>
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1.6 International Standards Organization (ISO) Symbols

Refer to Table 1–2 for an explanation of ISO (International Standards Organization) and IEC (International Electrotechnical Commission) symbols that, when appropriate, are prominently displayed on the surfaces of hardware. The symbols are also used in instructions to denote CAUTION and WARNING notes.

Table 1–2 ISO/IEC Symbols

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PUBLICATION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>
| ![Symbol](image) | ISO 3864, No. B.3.6 | WARNING: Risk of Electric Shock. The symbol is prominently displayed on the surfaces of hardware. When used in an instruction, text accompanies the symbol that identifies something that can be dangerous and possibly life threatening to personnel. For example:  

**WARNING**
Risk of electric shock. Remove power from all involved wires before making connections to the Marshalled Termination Assembly. |
| ![Symbol](image) | ISO 3864, No. B.3.1 | CAUTION: Refer to accompanying Installation and Service Instruction. The symbol is prominently displayed on the surfaces of hardware. When used in an instruction, text accompanies the symbol that identifies something that can damage equipment or cause a control problem with a process. For example:  

**CAUTION**
The safety system should not be operated with forced I/O. |
| ![Symbol](image) | IEC 417, No. 5019 | PROTECTIVE CONDUCTOR TERMINAL  
Symbol is prominently displayed on the surfaces of hardware. |
1.7 Related Literature

The following literature should be available when performing M-BUS or M-NET interface installation:

- *APACS+ Control Panel Applet Version 4.41 or Higher* (Document # SG39-15)

- *MODULNET Carrier Band Network Installation and Service Instruction*  
  (Document # SD39MODULNET-1)

- *MODULBUS Expander Module (MBX) Installation and Service Instruction*  
  (Document # SD39MBX-1)

- Installation literature supplied by the manufacturer of your Windows 2000 or NT computer.
2 Card Installation, Handling, and Maintenance Considerations

Before setting up a PC’s M-BUS or M-NET interface, be advised of the following considerations regarding card installation, handling and maintenance.

2.1 Tool Requirements

Hand tools typically used to install or service electronic equipment are the only tool requirements for installing and maintaining ISA-Type MBI, MNI and PCI-Type MBI and MBI/MNI cards.

2.2 NEC Conformance

Card installation should conform to the National Electrical Code (NEC) and all local electrical and construction codes that apply to your site.

2.3 EMC Directive Requirements

The ISA-Type MBI, MNI and PCI-Type MBI and MBI/MNI cards meet EMC emission and immunity standards as certified by a “Declaration of Conformity” statement provided at the back of this manual. This statement also identifies the Technical Construction File certificate number assigned the cards.

For a complete APACS+ or QUADLOG system to be EMC directive compliant, equipment enclosures must:

- Provide sufficient RF attenuation.
- House only equipment whose AC power input conductors and M-BUS/M-NET cables are filtered.
- Be grounded and tied to the shields of all shielded cables entering or exiting them.

Consult Siemens for additional information concerning EMC Directive compliance and the availability of enclosures and other required hardware.

2.4 CSA Certification

CSA (Canadian Standards Association) certification requires that the following conditions be met:

- A PC must power an ISA-Type MBI, MNI or PCI-Type MBI or MBI/MNI card with a Safety Extra Low Voltage (SELV) source, as defined in Annex H of CSA Standard C22.2 No. 1010.1, IEC 1010-1, and EN 61010-1.
- A document certifying the interface card’s safe operation in the PC selected by the user must be obtained.
2.5 Environmental Considerations

Industrial environments may subject equipment to severe operating conditions. Conditions at interface card locations must be within the specifications described in Section 8.

CAUTION

Exceeding interface card temperature specifications may adversely affect card performance and cause damage. Periodically check PC air temperature to ensure that it is within an acceptable range.

2.5.1 Avoiding Electromagnetic Interference

To ensure reliable data communications, locate PCs with ISA-Type MBI, MNI or PCI-Type MBI or MBI/MNI cards as far as possible from sources of electromagnetic and switching transient interference. Interferences sources include high current electrical equipment. PCs should have good grounding at their power outlets. The use of three-conductor power cords is required.

2.5.2 Reducing The Effect of Industrial Contaminants

Industrial environments often contain particulate, liquid, and gaseous contaminants. Particulate matter, usually dust and dirt, is abrasive and can cause intermittent contact in connectors associated with circuit assemblies. A layer of dust on circuit boards will interfere with semiconductor heat dissipation. Liquid and gaseous contaminants can corrode metal, rubber, plastic and circuit board components. Prolonged exposure to contaminants may result in equipment malfunction.

To protect against contaminant-related equipment malfunctions, carry out the following:

- Identify contaminants and implement methods to reduce their presence.

- Vacuum away or apply a dampened rag or mop to all dust and dirt when cleaning equipment and the surrounding area, especially the floor.

- Clean or replace all air conditioning filters, room air filters, and equipment filters regularly. Inform personnel with access to APACS+/QUADLOG hardware of the importance of area cleanliness.
2.6  Equipment Delivery and Handling

Interface card shipping, receiving, and warehouse storage considerations are described below.

2.6.1  Pre-Delivery Test

Interface cards are factory tested and inspected to ensure proper operation. If a card is ordered factory-installed in a PC that is part of a factory-assembled APACS+/QUADLOG system, card operation is validated during overall system testing and inspection.

2.6.2  Factory Shipment

ISA-Type MBI, MNI and PCI-Type MBI and MBI/MNI cards are placed in a static shielding bag and packaged for shipment. Card accessories are packaged separately.

2.6.3  Receipt of Shipment

All cartons should be inspected at the time of their delivery for possible external damage. Any visible damage should be immediately recorded on the carrier’s copy of the delivery slip.

Each carton should be carefully unpacked and its contents checked against the enclosed packing list. At the same time, each item should be inspected for hidden damage that may or may not have been accompanied by exterior carton damage. If it is found that some items have been damaged or are missing, notify Siemens immediately and provide full details. In addition, damages must be reported to the carrier with a request for an on-site inspection of the damaged item and its shipping carton.

2.6.4  Return of Shipment within North America

To return equipment, call the Siemens Repair Order Group at (215) 646-7400, Ext. 4RMA (4762) weekdays between 8:00 AM and 4:45 PM Eastern Time to obtain a Return Material Authorization (RMA) number. Mark the RMA number prominently on the outside of the return shipment.

When calling for an RMA number, provide the reason for the return. If returning equipment for repair, failure information, such as error codes, failure symptoms, and installation environment description, will be requested. Supply a purchase order number for repairs.

A Material Safety Data Sheet (MSDS) must be included with each item being returned that was stored or used anywhere hazardous materials were present.

Package items in original shipping materials or for safe shipment if original shipping materials are not available. Contact the Repair Order Group for shipping recommendations. An interface card must be placed in a static shielding bag to protect it from electrostatic discharge.
2.6.5  Return of Shipment outside of North America

Contact the appropriate Siemens subsidiary listed in Section 1.5 of this manual. Provide the reason for the return. For repairs, supply a purchase order number. Request equipment packaging and shipping instructions if necessary.

2.6.6  Equipment Handling

Use electrostatic discharge (ESD) protection techniques to handle MBI, MNI, and MBI/MNI cards removed from static shielding bags. Card edge connector pins should not be touched. Hold cards carefully by their edges and do not subject them to excessive shock or vibration.

![CAUTION]

Use a grounded wrist strap to provide ESD protection whenever the MBI, MNI, or MBI/MNI card is removed from its protective bag.

2.6.7  Equipment Storage

Consult Section 8 of this manual for interface card storage temperature and humidity specifications.

2.7  Maintenance

The MBI, MNI, and MBI/MNI cards require minimal maintenance. Some routine maintenance is recommended in the form of periodic visual inspection and cleaning when necessary.

2.7.1  Visual Inspection

Interface cards should be subjected to periodic visual inspections. The frequency of such inspections depends on the severity of the operating environment. The purpose of the inspection is to reveal any excessive accumulation of dust, dirt, or other foreign material on the surface of the card that will prevent efficient heat dissipation and possibly cause failure.
2.7.2 Cleaning

Cleaning MBI, MNI, or MBI/MNI cards involves careful brushing and vacuuming to remove accumulated dust and dirt harboring chemical particulate that may accelerate terminal, switch, or connector contact corrosion. Cleaning restores cooling efficiency.

2.7.3 Spare and Replacement Parts

One spare MBI, MNI, or MBI/MNI card should be stocked for every one to ten in service. Spare and replacement cards and cables can be ordered from the factory or through a local Siemens representative. Refer to Section 7 for the part numbers of optional and accessory items. Assembly part numbers are printed on most hardware components. Interface cards contain no user-serviceable parts.
3  M-BUS and M-NET Interface Installation

M-BUS and M-NET interface installation procedures for Windows 2000 and NT PCs and ISA and PC interface card types are provided in the sections that follow.

NOTE

A PC must already be running Windows 2000 or NT before beginning M-BUS or M-NET interface installation.

3.1  Windows 2000 Procedures

Procedures for installing an M-BUS and M-NET interface on a Windows 2000 computer are provided in the sections that follow.

3.1.1  ISA-Type MBI or MNI Card Installation

In a Windows 2000 PC, an M-BUS or M-NET interface based on an ISA-Type MBI or MNI card should be installed per the sections below.

3.1.1.1  Preparing the ISA-Type Interface Card

Figure 3–1 and Figure 3–2 depict the ISA-Type MBI and MNI cards, respectively.

Figure 3–1  Part # 16249-51 MBI Card
Observe the locations of your card’s W1, W2, and W3 jumpers. The jumpers on W1 and W3 must be configured to desired settings, while those at W2 should be checked to ensure that they are in their default arrangement. Node, Rack, and Slot numbers should be assigned the card. Refer to the procedure below:

1. Arrange the W1 jumpers to a desired hardware I/O address per Table 3-1 below. Select an address that does not conflict with any other ISA-Type cards already installed in the computer. Record (write down) the hardware I/O address you configure.

CAUTION

Interface cards are susceptible to electrostatic discharge (ESD) damage. Handle the cards wearing a grounded wrist strap and on a static dissipative workbench or mat.
### Table 3-1 W1 Hardware I/O Address Jumper Settings

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<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>3E0*</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>3F0*</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>

2. Position the W3 jumper to a desired interrupt request (IRQ) setting. W3 is labeled with IRQ settings of 5, 9, 10, 11, and 12, with 10 being the default. Record (write down) the IRQ setting you configure.

3. Using Figure 3–1 and Figure 3–2 as references, make sure that W2 jumpers on your ISA-Type interface card are arranged in the default 32K position.

4. Assign Node, Rack, and Slot numbers to your ISA-Type interface card. Since the card will not be installed in a physical rack slot, select a Slot number between 11 and 16. Record (write down) the Node, Rack, and Slot numbers you choose.
3.1.1.2 Installing ProcessSuite 3.01 Software

Power the computer on and install its license file floppy and parallel port hardkey. Use ProcessSuite 3.01 installation CDs to install the PC’s ProcessSuite components. Consult the ProcessSuite 3.01 Installation Guide for installation procedures.

3.1.1.3 Installing APACS+ Control CD Software

After ProcessSuite applications are installed, use the R4 APACS+ Control CD to load APACS+ software components. Once Control CD components are installed, a prompt to load M-BUS/M-NET driver software displays as depicted in Figure 3–3.

Click No to cancel driver installation at this time and finish the Control CD’s run. Driver software will be installed from the Service Pack B disc as described in the next section.

3.1.1.4 Installing Service Pack B Software

Install service pack software from the APACS+ Service Pack B disc. The disc will automatically write M-BUS/MNET driver version 4.50 to the computer’s hard drive.

3.1.1.5 Installing the Interface Card in the Computer

Once all software has been installed, power down the computer. Refer to Section 4 and carry out its procedures for installing your MBI card or MNI card in one of the computer’s ISA bus slots.

3.1.1.6 Connecting the PC to M-BUS/M-NET

Once your computer is equipped with either an MBI card or MNI card, it can be connected to an M-BUS or M-NET network, if one is available. Refer to Section 5 and carry out its procedures for establishing a PC-to-M-BUS/M-NET connection.
3.1.1.7 Verifying PC BIOS Settings

Power on the PC and access its BIOS settings as it boots up. If necessary, refer to PC manufacturer instructions for accessing the BIOS setup program. Verify the following in the BIOS setup program:

- The BIOS is set to a “Plug and Play” operating system.
- The IRQ number you selected in Section 3.1.1 is NOT reserved for an ISA card.
- The memory address range 000D8000 to 000DFFFF is NOT reserved for an ISA card.

Close the BIOS setup program after the above items have been verified and allow the computer to finish booting up.

3.1.1.8 Running the Add/Remove Hardware Wizard

To complete ISA-Type interface card configuration, run the Windows 2000 Add/Remove Hardware Wizard as described below:

1. Click Start > Settings > Control Panel

   *The Control Panel window displays.*

2. In the Control Panel, double-click the Add/Remove Hardware icon.

   *The Add/Remove Hardware Wizard launches.*

3. Click Next >.

   *The Add/Remove Hardware Wizard prompts you to choose a hardware task.*

4. Select Add/Troubleshoot a device and click Next >.

   *Windows searches for plug and play hardware to install and displays a prompt to choose a hardware device.*

5. From the displayed list, select Add a new device and click Next >.

   *The wizard asks if you want Windows to search for new hardware.*

6. Select No, I want to select the hardware from a list and click Next >.

   *A hardware type list displays.*
7. Scroll down the list and select **Network adapters**. Click **Next >**.

*The prompt of Figure 3–4 displays where a manufacturer’s network adapter must be selected.*

![Figure 3–4 Prompt to Select a Manufacturer’s Network Adapter](image)

8. From the prompt’s **Manufacturers** list, select **Siemens Energy & Automation**. From its **Network Adapter** list, select **M-BUS or M-NET ISA Adapter**. Click **Next >**.

*The warning depicted in Figure 3-5 displays, indicating that ISA Adapter hardware settings cannot be automatically found.*

![Figure 3–5 Warning Indicating Failure to Automatically Find ISA Card Hardware Settings](image)

9. Click **OK**.

*The Resources window of Figure 3–6 displays.*
Figure 3–6   Add New Hardware Wizard’s Resources Window

10. In the Resources window, select Input/Output Range and click Change Setting….

The Edit Input/Output Range dialog box of Figure 3–7 displays.

Figure 3–7   Edit Input/Output Range Dialog Box
11. In the **Value** field of **Edit Input/Output Range** dialog box, enter **0390-039F**. Click **OK**.

   The Resources window of Figure 3–6 displays.

12. In the **Resources** window, select **Interrupt Request** and click **Change Setting**.

   The **Edit Interrupt Request** dialog box of Figure 3–8 displays.

![Figure 3–8 Edit Interrupt Request Dialog Box](image)

13. In the **Value** field of the **Edit Interrupt Request** dialog box, enter the IRQ number you assigned the ISA-Type interface card in Section 3.1.1.1. The default value is **10**. Click **OK**.

   The Resources window of Figure 3–6 displays.

14. In the **Resources** window, select **Memory Range** and click **Change Setting**.

   The **Edit Memory Range** dialog box of Figure 3–9 displays.
15. In the Value field of Edit Memory Range dialog box, enter 000D8000-000DFFFF. Click OK.

The Resources window of Figure 3–6 displays.

16. Click OK to close the Resources window.

The Digital Signature Not Found window of Figure 3–10 displays.
17. Click **Yes** to continue the installation.  

*Driver software loads and the Configure window of Figure 3–11 displays.*

![Figure 3–11 Window for Configuring Node, Rack, and Slot Numbers](image)

18. In the *Configure* window, enter the Node, Rack, and Slot numbers assigned your ISA-Type interface card in Section 3.1.1. Check the box to the left of **Use these N/R/S values for INI and all adapters**. Make sure that the field at the bottom of the *Configure* window reads **Operational mode only**. Click **OK**.

*The Configure window closes. The Add/Remove Hardware Wizard completes its run and indicates that an M-BUS or M-NET Adapter has been installed.*

19. Click **Finish**.

*A prompt to restart the computer displays. Click OK to restart the computer and complete M-BUS/M-NET interface installation.*

### 3.1.1.9 Verifying Card Operation

Proceed with the following steps to verify interface card operation.

1. In the Windows **Control Panel**, double-click the **APACS+** icon.

   *The APACS+ Control Panel Applet launches.*

2. In the **Control Panel Applet**, click the **M-BUS/M-NET** tab.
3. In the Item field of the M-BUS/M-NET tab, use the [ ] to select your M-BUS/M-NET ISA Adapter.

4. Click Status….

   *A Status window for the card specified in step 3 displays.*

5. In the Status window, verify that the Driver State’s value is Operational Mode. The M-BUS/M-NET driver will be operational only if its interface card is functioning properly. Once Operational Mode is verified, click Close to display the Control Panel Applet window again.

6. If your computer is linked to an M-BUS or M-NET network, click Modules….

   *The M-BUS/M-NET Modules and Clients window displays.*

7. In the window, click the + sign next to SYSTEM and expand the module tree. If M-BUS/M-NET communications are good, all installed APACS+/QUADLOG system control resources will be identified in the module tree by Node, Rack, and Slot number.

8. Click Close to close the M-BUS/M-NET Modules and Clients window.

9. Click OK to close the Control Panel Applet and return to Windows.

3.1.2 PCI-Type MBI or MBI/MNI Card Installation

The sections that follow provide Windows 2000 installation procedures for one or more PCI-Type MBI or MBI/MNI cards. The MBI/MNI card is depicted in Figure 3–12 below. The same procedure is used for MBI-PCI as for MBI/MNI.

---

![Figure 3–12 Part # 161413-15 MBI/MNI Card](image)
3.1.2.1 Assigning Node, Rack, and Slot Numbers

Assign Node, Rack, and Slot numbers to the MBI/MNI card(s) to be installed. Since the card(s) will not be installed in a physical rack slot, select a Slot number between 11 and 16. If installing multiple cards, each card should have its own unique Node, Rack, and Slot address. Record (write down) these numbers for later reference and place the card(s) aside.

3.1.2.2 Installing ProcessSuite and APACS+ Software

Carry out the procedures for installing ProcessSuite and APACS+ software provided in Sections 3.1.1.2 through 3.1.1.4.

3.1.2.3 Installing the Interface Card(s) in the Computer

Once all software has been installed, power down the Windows 2000 computer. Refer to Section 4 and carry out its procedures for installing your MBI/MNI card(s) in the computer’s PCI bus.

3.1.2.4 Performing MBI/MNI Card Configuration

Power on the Windows 2000 computer. After the computer boots up, the MBI/MNI card(s) will be auto-detected. Follow the steps below to configure the detected card(s).

1. Windows 2000 will indicate that it has found new hardware and identify an MBI/MNI card as a “PCI Bridge.” Click OK to load driver software for the detected MBI/MNI card. The Digital Signature Not Found window of Figure 3–10 displays.

2. Click Yes to continue the installation. Driver software loads and the Configure window of Figure 3–11 displays.

3. In the Configure window, enter Node, Rack, and Slot numbers recorded in Section 3.1.2.1. Note the following:

   - If configuring a single PCI interface card:
     - The Node, Rack, and Slot Numbers you enter apply to that card only.
     - Check the box to the left of Use these N/R/S values for INI and all adapters.
     - Make sure that the field at the bottom of the Configure window indicates Operational mode only.
• If configuring multiple PCI interface cards:
  
  o Enter one of the Node, Rack, and Slot addresses arrived at in Section 3.1.2.1. This address will be randomly assigned to one of the PCI cards installed in the computer.
  
  o Check the box to the left of **Use these N/R/S values for INI and all adapters**.

  **NOTE**

  The steps for entering a PCI card’s Node, Rack, and Slot numbers will repeat for each PCI card that Windows 2000 detects. For each repeat display of **Figure 3–11’s Configuration window**, a different Node, Rack, and Slot address from the procedure of Section 3.1.2.1 should be entered. Each Node, Rack, and Slot address entered will be randomly assigned to one of the computer’s PCI cards.

  Once the computer’s PCI cards are operational, the APACS+ Control Panel Applet can be used to reconfigure their Node, Rack, and Slot numbers to desired values.

  The checkbox to the left of **Use these N/R/S values for INI and all adapters** should be checked when entering your first Node, Rack, and Slot address. Leave it unchecked when subsequent Node, Rack, and Slot numbers are entered.

  o Make sure that the field at the bottom of the **Configure** window indicates **Operational mode only**.

  4. Click **OK**.

  The **Configuration window closes. If only a single MBI/MNI card is installed in the computer, you will be returned to Windows and card configuration will be complete. If multiple MBI/MNI cards are installed, Windows will detect another card and steps 1 through 5 will be repeated until all cards have been configured with Node, Rack, and Slot numbers.**

**3.1.2.5 Verifying Card Operation**

Proceed with the following steps to verify interface card operation.

1. In the Windows **Control Panel**, double-click the **APACS+** icon.

  The **APACS+ Control Panel Applet launches**

2. In the **Control Panel Applet**, click the **M-BUS/M-NET tab**.
3. In the Item field of the M-BUS/M-NET tab, use the ▼ to select an M-BUS/M-NET PCI adapter. The ▼ will reveal a list of cards if multiple interface cards have been installed.

4. Click Status….

   A Status window for the card selected in step 3 displays.

5. In the Status window, verify that the Driver State’s value is Operational Mode. The M-BUS/M-NET driver will be operational only if its corresponding interface card is functioning properly.

6. If multiple PCI-type interface cards have been installed, repeat steps 3 through 5 for each card.

7. Click Close to display the Control Panel Applet window again.

3.1.2.6 Changing Node, Rack, and Slot Numbers

If necessary, use the Control Panel Applet to change the Node, Rack, and Slot Numbers configured in Section 3.1.2.4.

1. In the Control Panel Applet, click the M-BUS/M-NET tab.

2. In the Item field of the M-BUS/M-NET tab, use the ▼ to select an M-BUS/M-NET PCI adapter. The ▼ will reveal a list of cards if multiple interface cards have been installed.

3. Click Configure….

   The Configure window of Figure 3–11 displays.

4. Enter new Node, Rack, and Slot numbers and click OK.

5. If multiple PCI-type interface cards have been installed, repeat steps 1 through 4 for each card.

6. Click OK to close the Control Panel Applet.

3.1.2.7 Connecting the PC to M-BUS/M-NET

Use MBI/MNI card connectors and appropriate cables to connect the Windows 2000 computer to your system’s M-BUS or M-NET network(s) (if available). Refer to Section 5 and carry out its procedures for establishing PC-to-M-BUS/M-NET connections.
3.1.2.8 Verifying M-BUS/M-NET Communications

If the Windows 2000 computer was connected to one or more M-BUS or M-NET networks in Section 3.1.2.7, perform the following steps to verify M-BUS/M-NET communications.

1. In the Windows Control Panel, double-click the APACS+ icon.

   *The APACS+ Control Panel Applet launches.*

2. In the Control Panel Applet, click the M-BUS/M-NET tab.

3. In the Item field of the M-BUS/M-NET tab, use the to select an M-BUS/M-NET PCI adapter. The will reveal a list of cards if the computer contains multiple interface cards.

4. Click Modules…

   *The M-BUS/M-NET Modules and Clients window displays.*

5. In the window, click the + sign next to SYSTEM and expand the module tree. If M-BUS/M-NET communications are good, all installed APACS+/QUADLOG system control resources will be identified in the module tree by Node, Rack, and Slot number.

6. Click Close to close the M-BUS/M-NET Modules and Clients window.

7. If multiple PCI-type interface cards are installed and connected to an M-BUS or M-NET network, repeat steps 3 through 6 for each card.

8. Click OK to close the Control Panel Applet and return to Windows.

3.1.2.9 Viewing the MBI/MNI Card’s LED Status Indicator

The MBI/MNI card is equipped with an LED to indicate its status as defined by Table 3-2.

<table>
<thead>
<tr>
<th>LED BEHAVIOR</th>
<th>MBI/MNI Card Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Red</td>
<td>M-BUS/M-NET Driver has never been loaded.</td>
</tr>
<tr>
<td>Solid Green</td>
<td>Driver loaded and working, both network sides good.</td>
</tr>
<tr>
<td>Momentary or solid Black</td>
<td>Driver disabled, not working, or not loaded.</td>
</tr>
<tr>
<td>Alternate flashing Red/Green</td>
<td>Driver working, one network side bad.</td>
</tr>
<tr>
<td>Alternate flashing Red/Black</td>
<td>Driver working, both network sides bad.</td>
</tr>
<tr>
<td>Mostly Red with one second flashes of Green every five seconds</td>
<td>Driver is in Analyze Mode.</td>
</tr>
</tbody>
</table>
3.2 Windows NT Procedures

Procedures for installing an M-BUS and M-NET interface on a Windows NT computer are provided in the sections that follow.

3.2.1 ISA-Type MBI or MNI Card Installation

In a Windows NT PC, an M-BUS or M-NET interface based on an ISA-Type MBI or MNI card should be installed per the sections below.

3.2.1.1 Preparing the ISA-Type Interface Card

Refer to Section 3.1.1.1 procedures for:

• Configuring and recording the ISA-Type interface card’s hardware I/O address and IRQ number assignments.

• Assigning and recording the card’s Node, Rack, and Slot numbers.

3.2.1.2 Installing the Interface Card in the computer

Make sure the Windows NT computer is powered down. Refer to Section 4 and carry out its procedures for installing your MBI card or MNI card in one of the computer’s ISA bus slots.

3.2.1.3 Verifying PC BIOS Settings

Power on the Windows NT computer and access its BIOS settings as it boots up. If necessary, refer to PC manufacturer instructions for accessing the BIOS setup program. In the BIOS setup program, verify that the following is reserved for an ISA card:

• The IRQ number you assigned the card in Section 3.2.1.1

• Memory address range 000D8000 to 000DFFFF

Close the BIOS setup program after the above items have been verified and allow the computer to finish booting up.

3.2.1.4 Installing ProcessSuite and APACS+ Software

Carry out the procedures for installing ProcessSuite and APACS+ software provided in Sections 3.1.1.2 through 3.1.1.4.
3.2.1.5 Running the M-BUS/M-NET Wizard

The procedures of the last section end with the installation of the M-BUS/M-NET driver. Once the driver is installed, the **M-BUS/M-NET Wizard** automatically launches to facilitate ISA-Type interface card configuration. To use the wizard, follow the steps below:

1. **When** the **M-BUS/M-NET Wizard** launches, it displays the *Introduction* window depicted in [Figure 3–13](#).

![Figure 3–13 M-BUS/M-NET Wizard’s Introduction Window](image)

2. Select **Install M-BUS/M-NET** software and click **Next>**.

   *The wizard’s Installation window displays as depicted in [Figure 3–14](#)*.
3. Select **ISA M-BUS adapter driver** or **ISA M-NET adapter driver**. Click **Install**.

The wizard checks for an ISA-Type interface card’s presence, loads its driver software, and displays the Configure window depicted in Figure 3–15.

![Figure 3–14 M-BUS/M-NET Wizard’s Installation Window](image)

![Figure 3–15 M-BUS/M-NET Wizard’s Configure Window for ISA-Type Interface Cards](image)
4. In the Configure window, enter the hardware I/O address, IRQ number, and Node, Rack, and Slot numbers recorded in Section 3.2.1.1. Check the box to the left of **Use these N/R/S values for INI and all adapters**. Make sure that the field at the bottom of the Configure window indicates **Operational mode only**. Click OK.

The Configure window closes and ISA card configuration completes. The wizard’s Installation window displays again and lists an ISA adapter in the field labeled **Currently installed M-BUS/M-NET software**.

5. Click **Finish** to close the M-BUS/M-NET Wizard and return to Windows.

3.2.1.6 Connecting the PC to M-BUS/M-NET

Once your computer is equipped with either an MBI card or MNI card, it can be linked to an M-BUS or M-NET network, if one is available. Refer to Section 5 and carry out its procedures for establishing a PC-to-M-BUS/M-NET connection.

3.2.1.7 Verifying Card Operation

Carry out the procedure for verifying card operation provided in Section 3.1.1.9.

3.2.2 PCI-Type MBI or MBI/MNI Card Installation

The sections that follow provide Windows NT installation procedures for one or more PCI-Type MBI or MBI/MNI cards. The same procedure is used for MBI-PCI as for MBI/MNI.

3.2.2.1 Assigning Node, Rack, and Slot Numbers

Assign Node, Rack, and Slot numbers to the MBI/MNI card(s) to be installed. Since the card(s) will not be installed in a physical rack slot, select a Slot number between 11 and 16. If installing multiple cards, each card should have its own unique Node, Rack, and Slot address. Record (write down) these numbers for later reference and place the card(s) aside.

3.2.2.2 Installing the Interface Card(s) in the Computer

Make sure the Windows NT computer is powered down. Refer to Section 4 and carry out its procedures for installing your MBI/MNI card(s) in the computer’s PCI bus.

3.2.2.3 Installing ProcessSuite and APACS+ Software

Carry out the procedures for installing ProcessSuite and APACS+ software provided in Sections 3.1.1.2 through 3.1.1.4.
3.2.2.4 Running the M-BUS/M-NET Wizard

The procedures of the last section end with the installation of the M-BUS/M-NET driver. Once the driver is installed, the M-BUS/M-NET Wizard automatically launches to facilitate PCI-Type interface card configuration(s). To use the wizard, follow the steps below.

1. When the M-BUS/M-NET Wizard launches, it displays the Introduction window depicted in Figure 3–13.

2. Select Install M-BUS/M-NET software and click Next>.

   The wizard’s Installation window displays as depicted in Figure 3–14.

3. In the wizard’s Installation window, select PCI M-BUS/M-NET adapter driver and click Install.

   The wizard checks for a PCI interface card’s presence, loads driver software, and displays the Configure Window depicted in Figure 3–16.

![Figure 3–16](image-url) M-BUS/M-NET Wizard’s Configure Window for PCI-Type Interface Cards
4. In the Configure window, enter Node, Rack, and Slot numbers recorded in Section 3.2.2.1. Note the following:

- If configuring a single PCI interface card:
  
  o The Node, Rack, and Slot Numbers you enter apply to that card only.
  
  o Check the box to the left of **Use these N/R/S values for INI and all adapters**.
  
  o Make sure that the field at the bottom of the Configure window indicates **Operational mode only**.

- If configuring multiple PCI interface cards:
  
  o Enter one of the Node, Rack, and Slot addresses arrived at in Section 3.2.2.1. This address will be randomly assigned to one of the PCI cards installed in the computer.
  
  o Check the box to the left of **Use these N/R/S values for INI and all adapters**.

  **NOTE**

  The steps for entering a PCI card’s Node, Rack, and Slot numbers must be repeated for each PCI card the computer contains. For each repeat display of Figure 3-16’s Configuration window, a different Node, Rack, and Slot address from the procedure of Section 3.2.2.1 should be entered. Each Node, Rack, and Slot address entered will be randomly assigned to one of the PCI cards.

  Once the computer’s PCI cards are operational, the APACS+ Control Panel Applet can be used to reconfigure their Node, Rack, and Slot numbers to desired values.

  The checkbox to the left of **Use these N/R/S values for INI and all adapters** should be checked when running the wizard for the first time. Leave it unchecked during repeat configuration process runs.

  o Make sure that the field at the bottom of the Configure window indicates **Operational mode only**.

5. Click **OK**.

   The Configure window closes and PCI card configuration completes. The wizard’s Installation window displays again. The PCI adapter configured in step 4 is listed in the field labeled **Currently installed M-BUS/M-NET software**.
6. If installing multiple PCI-type interface cards, repeat steps 3 and 4 for each card within the computer.

7. Click **Finish** to close the **M-BUS/M-NET Wizard** and return to Windows.

### 3.2.2.5 Verifying Card Operation

Proceed with the following steps to verify interface card operation.

1. In the Windows **Control Panel**, double-click the **APACS+** icon.

   *The APACS+ Control Panel Applet launches*

2. In the **Control Panel Applet**, click the **M-BUS/M-NET** tab.

3. In the **Item** field of the **M-BUS/M-NET** tab, use the to select an M-BUS/M-NET PCI adapter. The will reveal a list of cards if multiple interface cards have been installed.

4. Click **Status**....

   *A Status window for the card specified in step 3 displays.*

5. In the **Status** window, verify that the **Driver State**’s value is **Operational Mode**. The M-BUS/M-NET driver will be operational only if its corresponding interface card is functioning properly.

6. If multiple PCI-type interface cards have been installed, repeat steps 3 through 5 for each card.

7. Click **Close** to display the **Control Panel Applet** window again.

### 3.2.2.6 Changing Node, Rack, and Slot Numbers

If necessary, use the **Control Panel Applet** to change the Node, Rack, and Slot Numbers configured in Section [3.2.2.4](#).

1. In the **Control Panel Applet**, click the **M-BUS/M-NET** tab.

2. In the **Item** field of the **M-BUS/M-NET** tab, use the to select an M-BUS/M-NET PCI adapter. The will reveal a list of cards if multiple interface cards have been installed.

3. Click **Configure**....

   *The Configure window of Figure 3–16 displays.*
4. Enter new Node, Rack, and Slot numbers and click OK.

5. If multiple PCI-type interface cards have been installed, repeat steps 1 through 4 for each card.

6. Click OK to close the Control Panel Applet.

3.2.2.7 Connecting the PC to M-BUS/M-NET

Use MBI/MNI card connectors and appropriate cables to connect the Windows NT computer to your system’s M-BUS or M-NET network(s) (if available). Refer to Section 5 and carry out its procedures for establishing PC-to-M-BUS/M-NET connections.

3.2.2.8 Verifying M-BUS/M-NET Communications

If the Windows NT computer was connected to one or more M-BUS or M-NET networks in Section [3.2.2.7], perform the following steps to verify M-BUS/M-NET communications.

1. In the Windows Control Panel, double-click the APACS+ icon.

   The APACS+ Control Panel Applet launches.

2. In the Control Panel Applet, click the M-BUS/M-NET tab.

3. In the Item field of the M-BUS/M-NET tab, use the ▼ to select an M-BUS/M-NET PCI adapter. The ▼ will reveal a list of cards if the computer contains multiple interface cards.

4. Click Modules….

   The M-BUS/M-NET Modules and Clients window displays.

5. In the window, click the + sign next to SYSTEM and expand the module tree. If M-BUS/M-NET communications are good, all installed APACS+/QUADLOG system control resources will be identified in the module tree by Node, Rack, and Slot number.

6. Click Close to close the M-BUS/M-NET Modules and Clients window.

7. If multiple PCI-type interface cards are installed and connected to an M-BUS or M-NET network, repeat steps 3 through 6 for each card.

8. Click OK to close the Control Panel Applet and return to Windows.

3.2.2.9 Viewing the MBI/MNI Card’s LED Status Indicator

The MBI/MNI card is equipped with an LED to indicate status. See Table 3–2, which describes how to interpret LED colors and signal patterns.
4 Installing Interface Cards

Procedures for physically installing ISA-Type MBI, MNI and PCI-Type MBI and MBI/MNI cards in personal computers are provided in the sections that follow.

**CAUTION**

The MBI, MNI, and MBI/MNI cards as well as personal computer circuit boards are susceptible to electrostatic discharge (ESD) damage. Perform interface card installation procedures wearing a grounded wrist strap and on a static dissipative workbench or mat.

4.1 Installing ISA-Type MBI or MNI Cards

The procedure below describes how to install an ISA-Type MBI or MNI card in a PC. Only one MBI or MNI card per PC is permitted.

1. Remove an MBI or MNI card from its static shielding bag and place it on a static dissipative work surface.

2. Follow the procedures of Section 3.1.1.1 to configure the MBI or MNI card’s W1 and W3 jumpers.

3. Power down the PC in which the MBI or MNI card will be installed. Disconnect the computer’s AC power cord and disassemble its case. Refer to PC manufacturer instructions for installing ISA expansion boards.

4. Plug the MBI or MNI card into one of the PC’s ISA slots. Reassemble the PC’s case and reconnect its AC power cord.

4.2 Installing PCI-Type MBI or MBI/MNI Cards

Use the following procedure to install one or more PCI-Type MBI or MBI/MNI Cards in a PC. Up to three MBI - MBI/MNI cards per PC are permitted.

1. Power down the PC in which the MBI-PCI or MBI/MNI card(s) will be installed. Disconnect the computer’s AC power cord and disassemble its case. Refer to PC manufacturer instructions for installing PCI boards.

2. Remove an MBI-PCI or MBI/MNI card from its static shielding bag and plug it into one of the computer’s PCI slots. Tighten the card’s bracket screw to ensure that the card is properly seated in its slot. Refer to Figure 4–1.
3. Repeat step 2 for each of the MBI-PCI or MBI/MNI cards you intend to install in the computer.

4. If an MBI/MNI card will be used to link a PC to M-NET, install a Part # 16413-105 Clamping Plate over the card’s MNI connectors. The Clamping Plate’s “A” and “B” letters should be oriented as shown in Figure 4–1. To secure the Clamping Plate, use hex nuts tightened to no more than 30 in-lb torque.
5 Making PC-to-M-BUS/M-NET Network Connections

Use this section’s procedures to connect a computer to an M-BUS or M-NET network.

5.1 MBI Card Connections To M-BUS

PCs equipped with MBI cards can be connected to an M-BUS network using the information presented below.

5.1.1 M-BUS Basics

MODULBUS (M-BUS) is a redundant, token-passing, 5 Mbps, communications bus that interconnects up to four APACS+/QUADLOG racks. The racks, which may be either ten-slot MODULRACs or six-slot SIXRACs, contain the control and I/O modules of system controllers. Up to four PCs with MBI cards can be connected to M-BUS through wires called MBI cables. ProcessSuite, APACS+, and QUADLOG software running on the PCs enable plant personnel to configure controllers and perform process control and monitoring tasks.

IMPORTANT

M-BUS refers to rack interconnections only. PCs are arranged in a separate “MBI network”, built on MBI cards and cables, that connects to M-BUS.

Racks interconnected via M-BUS and computers linked to M-BUS through MBI cables, together form an APACS+ or QUADLOG Local Area System. Three Local Area Systems containing controllers built from MODULRACs are depicted in Figure 5–1.

As Figure 5–1 illustrates, M-BUS’s primary and backup sides are labeled A and B, respectively. Standard MBI Cables in lengths of 4 and 15 meters can be used to form a network of daisy-chained PCs that directly connects to M-BUS’s A and B sides. See Figure 5–2.

NOTE

M-BUS’s A and B sides are distinguished by graphic symbols marking all cables and connectors.

For distances greater than 15 meters, Standard MBI Cables can be attached to MBI Extension Cables to increase MBI connection lengths by 50 or 150 meters. Refer to Figure 5–3. Within M-BUS itself, controller racks are linked together by M-BUS Interconnect Cables in lengths of between 2.5 and 15 meters. Part numbers for all cables are provided in Section 7, Spare Parts and Accessories.
Figure 5–1  Three Local Area Systems Demonstrating M-BUS and MBI Connections
SD39MBIMNI-3  
Making PC-to-M-BUS/M-NET Network Connections

Figure 5–2  Standard MBI Cables for M-BUS A and B Sides

Figure 5–3  MBI Extension Cables for M-BUS A and B Sides
5.1.2 Building a Local Area System

Note the following with regard to a Local Area System’s construction:

- The maximum combined length of all Standard MBI and MBI Extension Cables cannot exceed 168 meters.
- Any PC network topology is permitted, so long as the limits of four computers and 168 meters of MBI cable connections are not surpassed.
- M-BUS only supports no more than four controller racks.
- M-BUS Interconnect Cables used between racks cannot exceed a maximum combined length of 18.3 meters.
- The controller rack or PCs at the extreme ends of the Local Area System’s interconnections must have terminators plugs installed at their M-BUS A and B connectors. See Figure 5-4.

![Figure 5-4 M-BUS A and B Terminators](image)

5.1.3 Routing MBI Extension Cable Through Conduit

If MBI Extension Cables are to be installed in conduit, their non-isolated connectors can be cut-off to accommodate conduit insertion and routing. Restore non-isolated connectors using appropriate quantities of the Part # 16137-142 MBI Extension Cable Non-Isolated Connector Replacement Kit. One kit can be used to replace the non-isolated connector of a 50 or 150 m, MBI Extension Cable. Connectors for both M-BUS A and B sides are provided.
5.1.4 Installing MBI Cable Connections

Perform the following procedure to install MBI Cable Connections that link PCs to M-BUS.

1. Note the following from APACS+/QUADLOG system installation drawings provided by plant personnel or a system integrator:
   - The locations of all controller racks and PCs that form a Local Area System.
   - The number of Standard MBI and MBI Extension Cables required and their lengths.
   - The number of Part # 16137-142 Connector Kits required if MBI Extension Cables are to be cut for conduit routing.

2. Per system installation drawings, route Standard MBI Cables and, if applicable, MBI Extension Cables:
   - Between the appropriate controller rack(s) and the PC(s) to be directly connected to M-BUS.
   - Among all PCs to be interconnected in the Local Area System’s MBI network(s).

3. If MBI Extension Cable is to be routed through conduit too small to accommodate its connectors, perform the following:
   - Using Figure 5–3, identify the non-isolated connector ends of the A and B side MBI Extension Cables routed through conduit.
   - Cut off each cable’s non-isolated connector at the cable entrance into the connector. Discard the connector. **DO NOT** cut the isolated connectors at each cable’s opposite end.
   - Route the cut end of the cables through the conduit to their connection points. The maximum allowable cable pulling force is 67 lbs.
   - At the cut end of each cable, re-attach connectors supplied with the Part # 16137-142 connector replacement kit.

4. Connect A and B side Standard MBI or MBI Extension Cables to the M-BUS A and B connectors of the controller rack identified in step 2.
IMPORTANT

It may be necessary to first remove terminator plugs installed in the rack’s M-BUS A and B connectors. Do not remove the terminators from both A and B sides if the controller contained in the rack is on-line. One side must remain terminated during cable installation.

5. Connect the terminated ends of A and B side Standard MBI Cables to their corresponding M-BUS A and B connectors on each computer’s MBI card. The terminated ends of Standard MBI Cables are identified in Figure 5–2.

6. If applicable, connect all A and B side MBI Extension Cables within the MBI network containing the PCs. Per Figure 5–3, each MBI Extension Cable should have its:
   • Isolated connector engaged with the terminated end of a Standard MBI Cable.
   • Non-isolated connector engaged with a Standard MBI Cable’s unterminated end.

7. Per Figure 5–1, install M-BUS A and B terminators at the M-BUS A and B connectors of the devices at the extreme ends of the Local Area System’s interconnections.

8. Proceed with MBI card configuration procedures of Section 3.1.1.

5.2 MNI Card Connections to M-NET

PCs equipped with MNI cards can be connected to an M-NET network using the information presented below.

5.2.1 M-NET Basics

MODULNET (M-NET) is an extension of M-BUS that may be used when distance requirements exceed M-BUS distance limits. Designed according to IEEE 802.4 specifications, M-NET is a redundant, token-passing, carrier band network that provides communications at a 5 Mbps transmission rate.

For any given installation, M-NET length and the number of drops that can be connected to it are calculated by formula or extracted from graphs provided in Document # SD39MODULNET-1, MODULNET Carrier Band Network Installation and Service Instruction. Each M-NET drop can link to an entire Local Area System as depicted in Figure 5–1, or a computer equipped with an MNI card.

A Local Area System connects to M-NET through a controller-resident communications module called an M-BUS Expander (MBX). M-NET connections to both a controller and PC are illustrated in Figure 5–5.
As Figure 5-5 illustrates, M-NET’s primary and backup sides are labeled A and B, respectively. While drops from M-NET trunk cable are shown as originating from 2-port taps, 4-port and 8-port taps can also be used.

Drop connections to the M-NET A and B connectors of MBX modules and MNI cards are implemented using RG-6 cable. Note that PCs with MNI cards cannot be connected in daisy-chain fashion to M-NET. An MNI card can only be connected via RG-6 cable to tap drop ports.

RG-6 cable is available from Siemens in spools of user-specified lengths or in pre-fabricated standard lengths of 1 meter (3.3 feet) and 6 meters (19.7 feet). Pre-fabricated cables include factory installed RG-6 F-connectors for making M-NET drop port-to-device connections. RG-6 Drop Cable that must be cut to size will require F-connectors that are manually attached on-site. Part numbers for RG-6 cable, F-connectors, and the implements required for manually attaching F-connectors are listed in Section 7, "Spare Parts and Accessories. For more information on constructing an M-NET network, consult Document # SD39MODULNET-1.
5.2.2 Installing M-NET Drop Cable Connections to PCs

Perform the following procedure to connect PCs equipped with MNI cards to their assigned tap drop ports on M-NET A and B:

1. Note the following from APACS+/QUADLOG system installation drawings provided by plant personnel or a system integrator:
   - The locations of all PCs and their respective M-NET A and B taps.
   - The number of M-NET A and B RG-6 drop cables and their lengths.
   - The number of F-connectors that must be manually attached to drop cables cut to size.

2. Route drop cable between a PC and its corresponding M-NET A and B taps. If applicable, allow extra cable for F-connector installation.

   **IMPORTANT**
   
   RG-6 cable should be pulled with no more than 45 lbs. of force. The cable also has a minimum bend radius of 8 cm (3 inches) and should not be bent around sharp corners.

3. If applicable, attach F-connectors to both ends of each cut drop cable as shown in Figure 5-6. Be sure to use the crimping tools called for by Figure 5–6's procedures.

4. Tag each drop cable connector with the following information:
   - **Cable’s Tap End:** Tap ID, drop port number, and M-NET A or B identification.
   - **Cable’s MNI Card End:** Tap ID, MNI card’s Node, Rack, and Slot numbers, and M-NET A or B identification.

5. Connect the drop cables to the taps as follows:
   - At the M-NET A tap, thread the cable connector with the **white** sealing boot onto the drop port and tighten it moderately.
   - At the M-NET B tap, thread the cable connector with the **black** sealing boot onto the drop port and tighten it moderately.
   - Stress-relieve the cables at the drop ports. Firmly tighten their connectors with a ½” open-end wrench using no more than 20 to 25 in-lbs. torque.
1. For M-NET A drop cable, slip a Part # M00184 white heat shrinkable sealing boot over a cut cable end. For M-NET B cable, use a Part # M00185 black sealing boot.

2. Remove 3/16” (4.8 mm) of cable jacket. Do not cut the braid. Fold the exposed braid over the jacket.

3. Remove the outer foil and expose the inner braid.

4. Fold the outer braid back over the inner braid and flair both braids slightly.

5. Trim the braids to approximately 1/16” (1.6 mm). Remove 1/16” (1.6 mm) of the inner foil and dielectric. Be careful not to score the center conductor.

6. Push the F-connector pin over the cable’s center conductor. Crimp it into place using a 0.054” (1.4 mm) hexagon crimp tool.

7. Guide the pin into the F-connector insulator. Push the F-connector onto the cable until a reasonable stop is felt.

8. Crimp the connector with a 0.324” (8.2 mm) hexagon crimp tool.

9. Do not apply heat to the sealing boot at this time. This will be performed after M-NET operation has been validated.

10. When drop cable is disconnected from service, thread a dropsaver into the disconnected F-connector by hand until it is tight. This will protect the connector’s threads and center conductor.

Figure 5–6  M-NET Drop Cable End Preparation
IMPORTANT

Drop cables are color coded according to the black or white color of their sealing boots and connected to the appropriate M-NET A or B taps. Do not inadvertently mismatch the taps and cables.

If an MNI card is not yet installed in the PC and the M-NET is running, install Part # 14753-2 F-Type, 75 Ω Precision Terminators to unconnected drop cable ends. Terminators should remain on unused drop cables at all times. Should a cable be disconnected from an MNI card, attach a Terminator to its unconnected end.

6. Connect the drop cables to a PC’s MNI card as follows:

- Thread the cable connector with the white sealing boot onto the card’s M-NET A connector and tighten it moderately.
- Thread the cable connector with the black sealing boot onto the card’s M-NET B connector and tighten it moderately.
- Stress-relieve both cables at the card. Firmly tighten the connectors with a ½” open-end wrench using no more than 20 to 25 in-lbs. torque.

IMPORTANT

Drop cables are color coded according to the black or white color of their sealing boots and connected to the appropriate M-NET A or B card connectors. Do not inadvertently mismatch the card connectors and cables.

7. Repeat steps 2 through 6 for every PC to be connected to an M-NET A and B tap.

8. Proceed with MNI card configuration procedures of Section 3.1.1.

5.3 MBI-PCI or MBI/MNI Card Connections to M-BUS or M-NET

The MBI/MNI card combines MBI and MNI card functionality on a single board. As such, the procedures for making MBI/MNI card connections to M-BUS are virtually the same as those provided in Section 5.1 for MBI cards. Section 5.2’s procedures for connecting MNI cards to M-NET also apply MBI/MNI cards.

Be advised, however, of the following difference with regard to connecting an MBI-PCI or MBI/MNI card to M-BUS. These PCI-Type cards feature a single DB15 female M-BUS connector. To connect the card to M-BUS’s A and B sides, its DB15 M-BUS connector must be fitted with a Part # 16137-215 Conversion Cable. The Conversion Cable is shown in Figure 5–7. M-BUS’s A and B sides can be reached through its branches, which engage Standard MBI Cables.
Note that one MBI/MNI card can interface to either M-BUS or M-NET, but not both simultaneously. If connections to multiple M-BUS or M-NET networks are desired, up to three MBI/MNI cards can be installed in a single PC.

Connecting the Part # 16137-215 Conversion Cable to the MBI/MNI card’s M-BUS connector automatically disables its M-NET connectors. Re-enabling the M-NET connectors is simply a matter of removing the Conversion Cable.

Once M-BUS or M-NET connections are made to a PC’s MBI-PCI or MBI/MNI card, proceed with verifying card operation per the instructions of Sections 3.1.2 or 3.2.2.
6 Upgrading to MBI-PCI or MBI/MNI Card

The following procedures describe replacing a personal computer’s MBI or MNI card with an MBI-PCI or MBI/MNI card.

6.1 Windows 2000 Procedure

To replace a Windows 2000 PC’s MBI or MNI card with an MBI-PCI or MBI/MNI card, perform the procedure below.

1. With the Windows 2000 PC powered on, access the Control Panel and double-click the APACS+ icon.

   The APACS+ Control Panel Applet launches.

2. In the Control Panel Applet, click the M-BUS/M-NET tab.

3. In the Item field, use the ▼ to select the MBI or MNI ISA Adapter to be replaced.

4. Click Configure….

   The MBI or MNI card’s Configure window displays.

5. Write down the card’s Node, Rack, and Slot numbers and close the Configure window.

6. Click OK to close the Control Panel Applet and return to Windows.

7. In the Windows Control Panel, double-click the Add/Remove Hardware icon.

   The Add/Remove Hardware Wizard launches.

8. Click Next> and select Uninstall/Unplug a device.

9. Click Next> and select Uninstall a device.

   A list of devices installed in your computer is displayed.

10. From the list of devices, select M-BUS/M-NET ISA Adapter. Click Next>.

    Windows disables the MBI or MNI card and its driver software.

11. Power down the Windows 2000 PC. Disconnect the MBI or MNI card’s M-BUS/M-NET cables. Disassemble the computer’s case and remove the MBI or MNI card from its ISA bus slot.

12. Install a new PCI-Type MBI or MBI/MNI card per the procedures of Section 3.1.2. When prompted, enter the Node, Rack, and Slot numbers recorded in step 5.
6.2 Windows NT Procedure

To replace a Windows NT computer’s MBI or MNI card with an MBI-PCI or MBI/MNI card, perform the procedure below.

1. With the Windows NT computer powered on, access the Control Panel and double-click the APACS+ icon.

   *The APACS+ Control Panel Applet launches.*

2. In the Control Panel Applet, click the M-BUS/M-NET tab.

3. In the Item field, use the to select the MBI or MNI ISA Adapter to be replaced.

4. Click Configure….

   *The MBI or MNI card’s Configure window displays.*

5. Write down the card’s Node, Rack, and Slot numbers and close the Configure window.

6. Click OK to close the Control Panel Applet and return to Windows.

7. Click Start > Programs > ProcessSuite > APACS+ > M-BUS M-NET Driver.

   *The M-BUS/M-NET Wizard launches.*

8. Select Uninstall M-BUS/M-NET Software. Click Next>.

9. Select the M-BUS or M-NET ISA Adapter you wish to uninstall from the displayed list. Click Uninstall.

   *Windows disables the MBI or MNI card and its driver software.*

10. Power down the Windows NT computer. Disconnect the MBI or MNI card’s M-BUS/M-NET cables. Disassemble the computer’s case and remove the MBI or MNI card from its ISA bus slot.

11. Install a new PCI-Type MBI or MBI/MNI card per the procedures of Section 3.2.2. When prompted, enter the Node, Rack, and Slot numbers recorded in step 5.
7  Spare Parts and Accessories

The following tables list replacement and accessory part numbers that are applicable to the installation and service of M-BUS/M-NET interfaces in Windows 2000 and NT computers.

Table 7–1 Replacement Interface Cards

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>16249-51</td>
<td>ISA-Type M-BUS Interface (MBI) Card</td>
</tr>
<tr>
<td>16267-1</td>
<td>ISA-Type M-NET Interface (MNI) Card</td>
</tr>
<tr>
<td>16413-15</td>
<td>PCI-Type M-BUS/M-NET Interface (MBI/MNI) Card</td>
</tr>
<tr>
<td>16413-51</td>
<td>PCI-Type M-BUS Interface (MBI) Card</td>
</tr>
</tbody>
</table>

Table 7–2 Standard MBI Cable Kits

<table>
<thead>
<tr>
<th>M-BUS SIDE</th>
<th>KIT PART #</th>
<th>CABLE PART #</th>
<th>TERMINATOR PART #</th>
<th>CABLE LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>16137-172</td>
<td>16137-174</td>
<td>16137-173</td>
<td>4 meters (13.1 feet)</td>
</tr>
<tr>
<td>B</td>
<td>16137-175</td>
<td>16137-177</td>
<td>16137-176</td>
<td>4 meters (13.1 feet)</td>
</tr>
<tr>
<td>A</td>
<td>16137-178</td>
<td>16137-179</td>
<td>16137-173</td>
<td>15 meters (49.2 feet)</td>
</tr>
<tr>
<td>B</td>
<td>16137-180</td>
<td>16137-181</td>
<td>16137-176</td>
<td>15 meters (49.2 feet)</td>
</tr>
</tbody>
</table>

Each kit includes the indicated cable length and terminator.

Table 7–3 MBI Extension Cables

<table>
<thead>
<tr>
<th>A SIDE CABLE PART #</th>
<th>B SIDE CABLE PART #</th>
<th>CABLE LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>16137-95</td>
<td>16137-97</td>
<td>50 meters (164 feet)</td>
</tr>
<tr>
<td>16137-96</td>
<td>16137-98</td>
<td>150 meters (482 feet)</td>
</tr>
</tbody>
</table>

Table 7–4 MBI/MNI Card Accessories

<table>
<thead>
<tr>
<th>CABLE PART #</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>16137-215</td>
<td>M-BUS Conversion Cable for PCI-Type MBI and MBI/MNI Card</td>
</tr>
</tbody>
</table>
### Table 7–5  M-NET Installation Materials

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>W2077</td>
<td>RG-6 Drop Cable (Specify length when ordering)</td>
</tr>
<tr>
<td>16137-68</td>
<td>M-NET A Drop Cable with Dropsaver, 6 meters (19.7 feet)</td>
</tr>
<tr>
<td>16137-69</td>
<td>M-NET B Drop Cable with Dropsaver, 6 meters (19.7 feet)</td>
</tr>
<tr>
<td>16137-78</td>
<td>M-NET A Drop Cable with Dropsaver, 1 meter (3.3 feet)</td>
</tr>
<tr>
<td>16137-79</td>
<td>M-NET B Drop Cable with Dropsaver, 1 meter (3.3 feet)</td>
</tr>
</tbody>
</table>
| 16056-438   | RG-6 Drop Cable Kit containing:  
• Connector sealing boots  
• Dropsavers  
• 50 meters (163 feet) RG-6 cable  
• Instructions |
| 14784-500   | F-Type Connector, RG-6 (single piece) |
| 16056-661   | Right-angle F-connector adapter (Use to route RG-6 cable around bend radii smaller than 3 inches. Includes gold contacts and a contact lubricant to prevent corrosion). |
| 16056-411   | Dropsaver F-Connector Protector (single piece) |
| 14753-2     | F-Type Precision Terminator, 75 ohms (single piece) |
| 16056-378   | Cable Preparation Tool Kit containing:  
• RG-6 and RG-11 crimping tools  
• Instructions |
| 16056-626   | Cable Preparation Tool Kit containing:  
• RG-11 Armored Cable preparation tool  
• Instructions |
### 8 Specifications

This section provides the specifications for the ISA-Type MBI, MNI and PCI-Type MBI, MBI/MNI cards.

#### Table 8–1 M-BUS/M-NET Interface Specifications

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>SPECIFICATION</th>
<th>ISA MBI CARD</th>
<th>ISA MNI CARD</th>
<th>PCI MBI/MNI CARD</th>
<th>PCI MBI CARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Requirement From PC</td>
<td>Operating Voltage</td>
<td>5 VDC +/- 10%</td>
<td>5 VDC +/- 10%</td>
<td>5 VDC +/- 5%</td>
<td>5 VDC +/- 5%</td>
</tr>
<tr>
<td></td>
<td>Operating Current</td>
<td>0.75 A</td>
<td>0.75 A</td>
<td>0.75 A</td>
<td>0.75 A</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Height</td>
<td>4.2 inches (107 mm)</td>
<td>4.2 inches (107 mm)</td>
<td>4.2 inches (107 mm)</td>
<td>4.2 inches (107 mm)</td>
</tr>
<tr>
<td></td>
<td>Length</td>
<td>7.65 inches (194 mm)</td>
<td>7.65 inches (194 mm)</td>
<td>6.9 inches (175 mm)</td>
<td>6.9 inches (175 mm)</td>
</tr>
<tr>
<td>Network Interface Communications</td>
<td>Network Type</td>
<td>Redundant A and B side MODULBUS (M-BUS)</td>
<td>Redundant A and B side MODULNET (M-NET)</td>
<td>Redundant A and B side MODULBUS or M-NET</td>
<td>Redundant A and B side MODULBUS (M-BUS)</td>
</tr>
<tr>
<td></td>
<td>IEEE Specification</td>
<td>Unmodulated IEEE 802.4</td>
<td>Carrier Band IEEE 802.4</td>
<td>Same as for MBI Card and MNI Card.</td>
<td>Unmodulated IEEE 802.4</td>
</tr>
<tr>
<td></td>
<td>Signal</td>
<td>-</td>
<td>Direct Encoded Data</td>
<td>Same as for MBI Card and MNI Card.</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Signal Modulation</td>
<td>-</td>
<td>Phase Coherent FSK</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Media Access/Protocol</td>
<td>Deterministic Token Passing</td>
<td>Deterministic Token Passing</td>
<td>-</td>
<td>Deterministic Token Passing</td>
</tr>
<tr>
<td></td>
<td>Data Transmission Rate</td>
<td>5 Mbps</td>
<td>5 Mbps</td>
<td>-</td>
<td>5 Mbps</td>
</tr>
<tr>
<td></td>
<td>Interface Connectors</td>
<td>Side A: DB9 Male</td>
<td>Side A: F-Type Female</td>
<td>M-BUS connection is single DB15 that must be fitted with Part # 16137-215 Conversion Cable. M-NET connection same as MNI Card’s.</td>
<td>Side B: DB9 Female</td>
</tr>
<tr>
<td>MODULBUS Network</td>
<td>Maximum Length of PC MBI Network</td>
<td>168 meters (550 feet)</td>
<td>-</td>
<td>168 meters (550 feet)</td>
<td>168 meters (550 feet)</td>
</tr>
<tr>
<td></td>
<td>Maximum M-BUS Length Across Four Controller Racks</td>
<td>18.3 meters (60 feet)</td>
<td>-</td>
<td>18.3 meters (60 feet)</td>
<td>18.3 meters (60 feet)</td>
</tr>
<tr>
<td></td>
<td>Total MODULBUS Length</td>
<td>168 meters (550 feet) + 18.3 meters (60 feet)</td>
<td>-</td>
<td>168 meters (550 feet) + 18.3 meters (60 feet)</td>
<td>168 meters (550 feet) + 18.3 meters (60 feet)</td>
</tr>
<tr>
<td></td>
<td>Maximum Number of Racks</td>
<td>4</td>
<td>-</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Maximum Number of PCs</td>
<td>4</td>
<td>-</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>
### TABLE 8-1  M-BUS/M-NET Interface Specifications (Continued)

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>SPECIFICATION</th>
<th>ISA MBI CARD</th>
<th>ISA MNI CARD</th>
<th>PCI MBI/MNI CARD</th>
<th>PCI MBI CARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODULNET Network</td>
<td>Maximum Length of Trunk Cable</td>
<td>-</td>
<td>915 meters (3000 feet) with four 2-port taps and 20-ft drop cables or four 4-port taps and 3-ft drop cables</td>
<td>915 meters (3000 feet) with four 2-port taps and 20-ft drop cables or four 4-port taps and 3-ft drop cables</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Maximum Drop Cable Length</td>
<td>-</td>
<td>48.8 meters (160 feet)</td>
<td>48.8 meters (160 feet)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Available MODULNET Taps</td>
<td>-</td>
<td>2, 4, and 8-port taps</td>
<td>2, 4, and 8-port taps</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Maximum Number of MODULNET Drops</td>
<td>-</td>
<td>64</td>
<td>64</td>
<td>-</td>
</tr>
<tr>
<td>Operating</td>
<td>Temperature</td>
<td>0 to 60 °C (32 to 140°F)</td>
<td>0 to 55 °C (32 to 131°F)</td>
<td>0 to 60 °C (32 to 140°F)</td>
<td>0 to 60 °C (32 to 140°F)</td>
</tr>
<tr>
<td>Environment</td>
<td>Relative Humidity</td>
<td>5 to 95% non-condensing</td>
<td>10 to 90% non-condensing</td>
<td>5 to 95% non-condensing</td>
<td>5 to 95% non-condensing</td>
</tr>
<tr>
<td></td>
<td>Maximum Moisture Limits</td>
<td>0.028 lbs water/lbs air</td>
<td>0.028 lbs water/lbs air</td>
<td>0.028 lbs water/lbs air</td>
<td>0.028 lbs water/lbs air</td>
</tr>
<tr>
<td></td>
<td>Installation Category</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td></td>
<td>Pollution Degree</td>
<td>2</td>
<td>2</td>
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<tr>
<td>Storage</td>
<td>Temperature</td>
<td>0 to 70 °C (32 to 158 °F)</td>
<td>-20 to 70 °C (-4 to 158 °F)</td>
<td>0 to 85 °C (32 to 185 °F)</td>
<td>0 to 85 °C (32 to 185 °F)</td>
</tr>
<tr>
<td>Environment</td>
<td>Relative Humidity</td>
<td>5 to 95% non-condensing</td>
<td>5 to 95% non-condensing</td>
<td>5 to 95% non-condensing</td>
<td>5 to 95% non-condensing</td>
</tr>
</tbody>
</table>
WARRANTY

The Company warrants all equipment manufactured by it and bearing its nameplate, and all repairs made by it, to be free from defects in material and workmanship under normal use and service. If any part of the equipment herein described, and sold by the Company, proves to be defective in material or workmanship and if such part is within twelve months from date of shipment from the Company’s factory, returned to such factory, transportation charges prepaid, and if the same is found by the Company to be defective in material or workmanship, it will be replaced or repaired, free of charge, f.o.b. Company’s factory. The Company assumes no liability for the consequence of its use or misuse by Purchaser, his employees or others. A defect in the meaning of this warranty in any part of said equipment shall not, when such part is capable of being renewed, repaired or replaced, operate to condemn such equipment. This warranty is expressly in lieu of all other warranties, guaranties, obligations, or liabilities, expressed or implied by the Company or its representatives. All statutory or implied warranties other than title are hereby expressly negated and excluded.

Warranty repair or replacement requires the equipment to be returned to one of the following addresses:

<table>
<thead>
<tr>
<th>Siemens Energy &amp; Automation, Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1201 Sumneytown Pike</td>
</tr>
<tr>
<td>Spring House, PA 19477 U.S.A.</td>
</tr>
<tr>
<td>Tel: +1 215 646 7400</td>
</tr>
<tr>
<td>Fax: +1 215 283 6340</td>
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</table>

<table>
<thead>
<tr>
<th>Siemens Moore Process Automation (Canada) Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.O. Box 370</td>
</tr>
<tr>
<td>2719 Highway 7 West</td>
</tr>
<tr>
<td>Brampton</td>
</tr>
<tr>
<td>Ontario L6V 2L3</td>
</tr>
<tr>
<td>Canada</td>
</tr>
<tr>
<td>Tel. (905) 457 9638</td>
</tr>
<tr>
<td>Fax (905) 457-4182</td>
</tr>
<tr>
<td>Fax (905) 457-6499</td>
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<table>
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<tr>
<th>Siemens Moore Process Automation</th>
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</thead>
<tbody>
<tr>
<td>Copse Road</td>
</tr>
<tr>
<td>Lufton</td>
</tr>
<tr>
<td>Yeovil, Somerset BA22 8RN</td>
</tr>
<tr>
<td>England, UK</td>
</tr>
<tr>
<td>Tel. (44 1935) 706262</td>
</tr>
<tr>
<td>Fax (44 1935) 706969</td>
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</table>

<table>
<thead>
<tr>
<th>Moore Process Automation Solutions (Italia)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.r.l.Via S. Aleramo 2</td>
</tr>
<tr>
<td>20063 Cernusco sul Naviglio</td>
</tr>
<tr>
<td>Milano, Italy</td>
</tr>
<tr>
<td>Tel. (39) 02 9290541</td>
</tr>
<tr>
<td>Fax (39) 02 92905454</td>
</tr>
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<table>
<thead>
<tr>
<th>SIEMENS Nederland NV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prinses Beatrixlaan 26</td>
</tr>
<tr>
<td>NL-2595 AL Den Haag</td>
</tr>
<tr>
<td>P.O. Box 16068</td>
</tr>
<tr>
<td>NL-2500 BB Den Haag</td>
</tr>
<tr>
<td>Tel. +31 (0)70 333 1201</td>
</tr>
<tr>
<td>Fax +31 (0)70 333 3885</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Siemens Advanced Engineering Pte Ltd</th>
</tr>
</thead>
<tbody>
<tr>
<td>A &amp; D AS PAS CoC/A&amp;D PI1/PI5 CoC</td>
</tr>
<tr>
<td>2 Kallang Sector 5th Floor</td>
</tr>
<tr>
<td>Singapore 349277</td>
</tr>
<tr>
<td>Tel. +65 740 7700</td>
</tr>
<tr>
<td>Fax +65 740 7817</td>
</tr>
<tr>
<td>TIC Singapore Tel: (65) 7407842</td>
</tr>
</tbody>
</table>

The warranty will be null and void if repair is attempted without authorization by a member of the Siemens Energy & Automation, Inc., Service Department.
EC Declaration of Conformity

Manufacturer: Siemens Energy & Automation, Inc.
Address: 1201 Sumneytown Pike, Spring House, PA 19477
Product: MBI PCI I/O Bus Interface

The product described above, when marked with the CE mark, is in conformity with the provisions of the following European Directives:


Spring House, 17 November 2003

[Signature]
John J. Sweeney, Approvals Coordinator

[Signature]
Peter F. Schiano, Manager, PAS R & D, Spring House, PA

Annex A is part of this declaration
Annex A to the EC Declaration of Conformity

Conformance to the directives indicated on page 1 is assured through the application of the following standards, certifications and assessments.

**Directive 89/336/EC  Electromagnetic Compatibility**

Conformance to directive 89/336/EC is based on conformance with the following standards:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Date</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>EN 50081-2</td>
<td>1993</td>
<td>Electromagnetic compatibility - Generic emission standard – Part 2: Industrial environment</td>
</tr>
<tr>
<td>EN 61000-6-2</td>
<td>2001</td>
<td>Electromagnetic compatibility (EMC) – Part 6-2: Generic standards - Immunity for industrial environments</td>
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</table>