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VMIPMC-6101
PMC-Based Copper Gigabit Ethernet Adapter

Installation Guide

12090 South Memorial Parkway
Huntsville, Alabama 35803-3308, USA
(256) 880-0444 ◆ (800) 322-3616 ◆ Fax: (256) 882-0859

522-756101-000 Rev. B

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Overview

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Introduction

The VMIPMC-6101 is a PMC-based Gigabit Ethernet Adapter with a copper interface. The Gigabit Ethernet Adapter is ideally suited for applications requiring 1000BaseT Ethernet.

The VMIPMC-6101 uses the Intel® 82543GC Gigabit Ethernet Media Access Controller (MAC). The Gigabit Ethernet MAC provides a 32-/64-bit, 33/66 MHz interface compliant with PCI Specification Rev 2.2. It also has a 64 Kbyte packet buffer to maintain high performance. A copper 1000BaseT interface is provided using a front panel mounted RJ-45 connector. Drivers, available for download at **www.vmic.com,** make the VMIPMC-6101 easy to integrate with Single Board Computer (SBC) products such as VMIC's VMEbus and CompactPCI offerings.

The VMIPMC-6101 PMC-Based Gigabit Ethernet Adapter has several useful features:

- PCI mezzanine card (PMC) form factor
- 1000T copper interface using the front panel RJ-45 type connector with twisted-pair cabling (Category 5 for 1000BaseT)
- Can operate at 10, 100 or 1000 Megabit/second rates
- 64-bit/66 MHz interface
- 64 Kbyte packet buffer
- PCI revision 2.2 compliant
- IEEE 802.1Q/802.1p/802.3ad/802.3ab/802.3z/802.3x compliant
- Universal PMC signaling operation

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Functional Description

The Gigabit Ethernet MAC is a highly integrated, high-performance, second-generation Ethernet LAN controller for 1000 Mbps data rate. This device is targeted for Network Interface Card (NIC) designs, as well as for embedded applications that use Peripheral Component Interconnect (PCI) bus backplanes.

The Gigabit Ethernet MAC provides an interface to the host processor by using on-chip command and status registers, and a shared host memory area set up mainly during initialization. The Gigabit Ethernet MAC is a highly optimized architecture that delivers high performance and PCI bus efficiency. The Gigabit Ethernet MAC also minimizes I/O accesses and interrupts required to manage the device, and provides an easily configurable design.

To enhance PCI bandwidth usage, the Gigabit Ethernet MAC caches up to 64 packet descriptors in a single burst. In addition, the large 64 Kbyte packet buffer maintains high performance as available PCI bandwidth descriptors change.

PCI Core Interface

The PCI core provides a complete glueless interface to a 33/66 MHz, 32/64-bit PCI bus. The Gigabit Ethernet MAC provides 32 or 64 bits of address/data, as well as the complete control interface to operate on a 32- or 64-bit PCI bus. In systems with dedicated I/O bus per connector, this provides sufficient bandwidth to support sustained 1000 Mbps full duplex transfer rates. Systems with a shared bus or 32-bit wide interface might not be able to maintain 1000 Mbps, but can sustain multiple hundreds of Mbits. Figure 1 is a block diagram of the Gigabit Ethernet MAC.

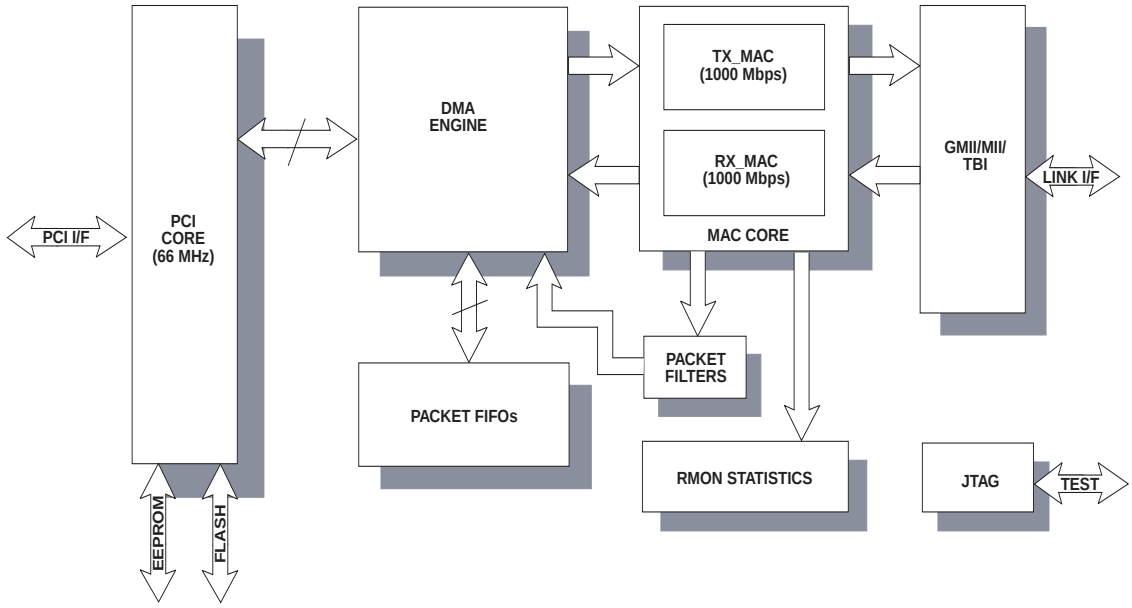


Figure 1 The Gigabit Ethernet MAC Functional Block Diagram

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When the VMIPMC-6101 serves as a PCI target, the VMIPMC-6101 follows the PCI configuration specification, and allows all accesses to the Gigabit Ethernet MAC to be automatically mapped into free memory and I/O space upon initialization of the PCI system.

When processing transmit and receive frames, the VMIPMC-6101 operates as master on the PCI bus.

As a master, transaction burst length on the PCI bus is determined by several factors, including:

- PCI latency timer expiration
- Type of bus transfer being made
- Size of the data transfer
- Whether the data is initiated by receive or transmit logic

Hardware Installation

The VMIPMC-6101 can be plugged into any PMC site that supports bus mastering. The board will operate properly in either 32- or 64-bit sites. If the PMC site supports triggering for the interrupts, use level triggering for the VMIPMC-6101 board. The drivers available on the VMIC website allow for self-configuring of the board when properly installed.

Media Connection

The VMIPMC-6101 is available with a copper interface using an RJ-45 front panel connector. The copper interface connection is made using a Category 5 twisted-pair cable for 1000BaseT or 100BaseTX. For 10BaseT, use Category 3, 4 or 5 twisted-pair cables.

NOTE: If you want to use this adapter in a residential environment, you must use a Category 5 twisted-pair cable.

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Reference Material List

Refer to PCI Local Bus Specification for a detailed explanation of the PCI Local bus. The *PCI Local bus Rev. 2.2 Specification* is available from the following source:

PCI Special Interest Group
P.O. Box 14070
Portland, OR 97214
U.S.: (800) 433-5177
International: (503) 797-4207
FAX: (503) 234-6762

For a detailed explanation of the Common Mezzanine Card Family and its characteristics, refer to the *CMC Specification, P1386/Draft 2.0* from:

IEEE Standards Department
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445 Hoes Lanes, P.O. Box 1331
Piscataway, NJ 08855-1331, USA

For a detailed explanation of the Physical and Environmental Layers for PCI Mezzanine Cards, refer to the *PMC Specification, P1386.1/Draft 2.0* from:

IEEE Standards Department
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445 Hoes Lanes, P.O. Box 1331
Piscataway, NJ 08855-1331, USA

Physical Description and Specifications

Refer to Product Specification 800-756101-000 available from:

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Safety Summary

The following general safety precautions must be observed during all phases of the operation, service and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture and intended use of this product.

VMIC assumes no liability for the customer's failure to comply with these requirements.

Ground the System

To minimize shock hazard, the chassis and system cabinet must be connected to an electrical ground. A three-conductor AC power cable should be used. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet.

Do Not Operate in an Explosive Atmosphere

Do not operate the system in the presence of flammable gases or fumes. Operation of any electrical system in such an environment constitutes a definite safety hazard.

Keep Away from Live Circuits

Operating personnel must not remove product covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

Do Not Service or Adjust Alone

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

Do Not Substitute Parts or Modify System

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to VMIC for service and repair to ensure that safety features are maintained.

Dangerous Procedure Warnings

Warnings, such as the example below, precede only potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

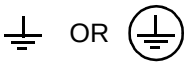
STOP: Dangerous voltages, capable of causing death, are present in this system. Use extreme caution when handling, testing and adjusting.

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Safety Symbols Used in This Manual



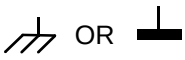
Indicates dangerous voltage (terminals fed from the interior by voltage exceeding 1000 V are so marked).



Protective conductor terminal. For protection against electrical shock in case of a fault. Used with field wiring terminals to indicate the terminal which must be connected to ground before operating equipment.



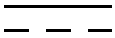
Low-noise or noiseless, clean ground (earth) terminal. Used for a signal common, as well as providing protection against electrical shock in case of a fault. Before operating the equipment, terminal marked with this symbol must be connected to ground in the manner described in the installation (operation) manual.



Frame or chassis terminal. A connection to the frame (chassis) of the equipment which normally includes all exposed metal structures.



Alternating current (power line).



Direct current (power line).



Alternating or direct current (power line).

STOP: This symbol informs the operator that a practice or procedure should not be performed. Actions could result in injury or death to personnel, or could result in damage to or destruction of part or all of the system.

WARNING: This sign denotes a hazard. It calls attention to a procedure, a practice or a condition, which, if not correctly performed or adhered to, could result in injury or death to personnel.

CAUTION: This sign denotes a hazard. It calls attention to an operating procedure, a practice or a condition, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the system.

NOTE: Calls attention to a procedure, a practice, a condition or the like, which is essential to highlight.

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CHAPTER 1

Configuration and Installation

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Introduction

This chapter describes the installation and configuration of the board. Cable configuration and board layout are illustrated in this chapter.

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Unpacking Procedures

CAUTION: Some of the components assembled on VMIC's products may be sensitive to electrostatic discharge and damage may occur on boards that are subjected to a high-energy electrostatic field. When the board is placed on a bench for configuring, etc., it is suggested that conductive material should be inserted under the board to provide a conductive shunt. Unused boards should be stored in the same protective boxes in which they were shipped.

Upon receipt, any precautions found in the shipping container should be observed. All items should be carefully unpacked and thoroughly inspected for damage that might have occurred during shipment. The board(s) should be checked for broken components, damaged printed circuit board(s), heat damage, and other visible contamination. All claims arising from shipping damage should be filed with the carrier and a complete report sent to VMIC together with a request for advice concerning the disposition of the damaged item(s).

System Requirements

Before installing the VMIPMC-6101 PMC-Based Ethernet Adapter, check your system for the following required or minimum configuration requirements:

- One open 32- or 64-bit bus master PMC site
- 64 Mbyte of system memory
- The latest system BIOS for your computer
- Operating system; if using Microsoft Windows NT 4.0, service pack 5
- Copper interface using Category 5, twisted-pair cabling for 100/1000 Mbps
- An IEEE 802.3z or 802.3ab compliant gigabit switch or a buffered repeater

Software Drivers

Software drivers for the VMIPMC-6101 are available through the VMIC website (see web address below). After downloading the driver of choice, go to the readme.txt file for instructions to load the driver, or for Windows drivers, run the executable and follow the on-screen instructions.

NOTE: The drivers must be installed before the VMIPMC-6101 can be used.

VMIC website: www.vmic.com

For drivers that are not available on the website, contact VMIC Customer Service.

VMIC Customer Service is available at: 1-800-240-7782.
Or E-mail us at **software.cs@vmic.com**

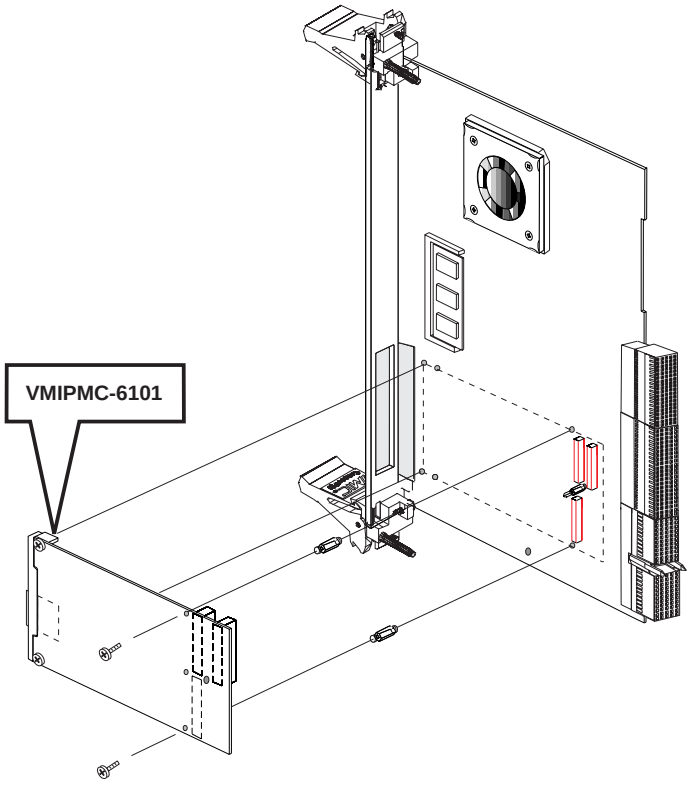
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Physical Installation

CAUTION: Do not install or remove the board while power is applied.

Host systems containing PMC card sites vary widely in appearance and board installation procedures. VMIC recommends examining the host system installation procedures prior to installing this board.

1. Remove the PMC slot cover bracket where the board is to be installed per the host unit hardware documentation.
2. Insert this board firmly onto the PMC connectors (see Figure 1-1 for installation of the VMIPMC-6101.)
3. Secure the VMIPMC-6101 board to the PMC connectors using the four screws provided. See Figure 1-2 on page 20.

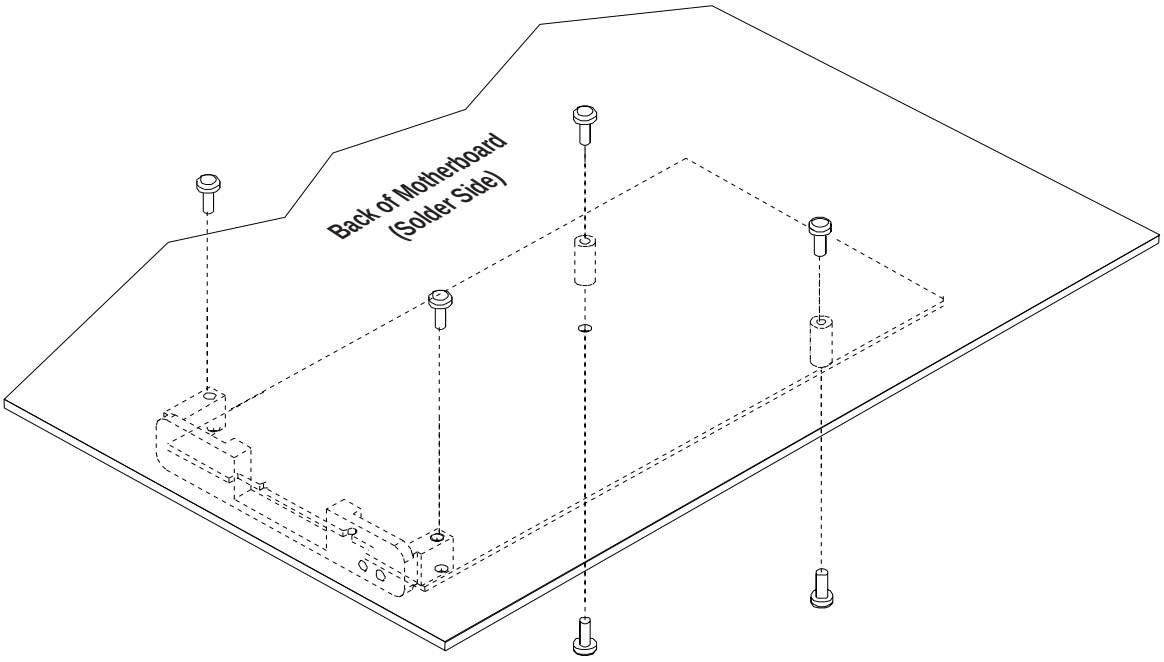


NOTE: The VMIPMC-6101 is designed to interface with any suitable PMC compliant baseboard using a direct PCI bus interface compliant with v2.2 of the PCI signalling specification as defined by IEEE P1386.1 Draft 2.0.

Figure 1-1 Installing the VMIPMC-6101

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4. Slide the SBC into the chassis, firmly seating the board onto the backplane connectors. Secure the SBC to the chassis using the screws in the front panel.
5. Turn the power on. The computer's PCI BIOS automatically assigns resources to the adapter. If you get a PCI configuration error, see *PCI Configuration Troubleshooting* on page 26.



NOTE: All mounting screws are supplied by VMIC.

Figure 1-2 Location of Mounting Screws (Motherboard Solder Side)

Driver Installation

When you install the VMIPMC-6101 Gigabit Ethernet Adapter Windows NT drivers, an advanced configuration utility called PROSet is also installed. Users running Windows NT 4.0 can easily test hardware, set advanced adapter features and set standard features with PROSet.

To start PROSet, click the Adapter Properties button in the Network Control Panel. When the PROSet window appears, click Select Network Adapter. Then, choose the Intel PRO / 1000 Gigabit Server Adapter. For additional information, refer to the PROSet online help topics by clicking the Help button.

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Cable Type and Installation

The VMIPMC-6101 is available with a copper interface utilizing an RJ-45 front panel connector. The front panel connector uses Category 5, twisted-pair cables as shown in Figure 1-3. Figure 1-4 on page 22 illustrates the installation of the Category 5, twisted-pair cable.

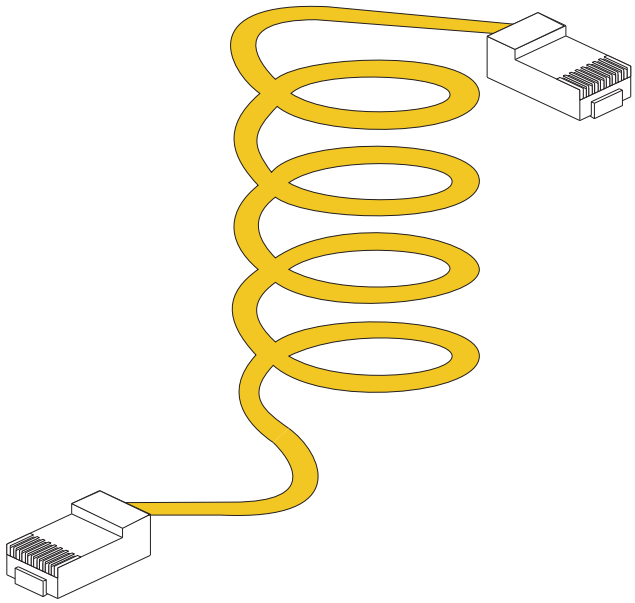


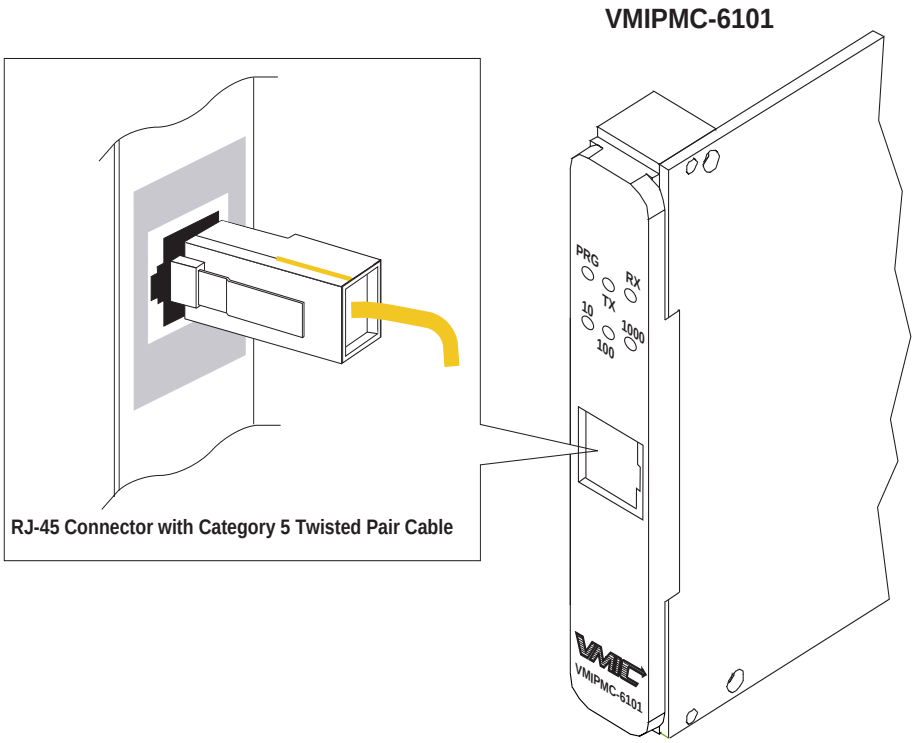
Figure 1-3 Category 5, Twisted-Pair Cable

Attach the Network Cable

Insert the Category 5, twisted-pair network cable into the adapter's RJ-45 front panel connector as shown in Figure 1-4 on page 22. For 1000BaseT, your network cable must be Category 5, twisted-pair cable.

NOTE: If you plan to run the adapter at 1000 Mbps, it must be connected to a compatible 1000 Mbps switch. For 10BaseT, use Category 3, 4 or 5 twisted-pair wiring. If you want to use this adapter in a residential environment, you **MUST** use a Category 5 twisted-pair cable.

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Category 5 TPE Cable with RJ-45 Connector

Figure 1-4 VMIPMC-6101 Cable Connections

NOTE: Most compatible switches do not support all three speeds on a single port. Check your switch documentation for details.

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Front Panel Status LEDs

The VMIPMC-6101 has six status LEDs located on the front panel. The status LEDs are used to give a visual status of the VMIPMC-6101 during normal operations (see Figure 1-5 below for an illustration of the front panel).

Table 1-1 Front Panel Status LEDs

LED	Description	Color
PRG	Programmable LED. May be used to identify the adapter by blinking.	Green
TX	When lit, indicates the adapter is sending data.	Green
RX	When lit, indicates the adapter is receiving data.	Green
10 Mbps	When lit, indicates the adapter is connected to a valid link partner and is receiving and transmitting link pulses at a 10 Mbps rate.	Green
100 Mbps	When lit, indicates the adapter is connected to a valid link partner and is receiving and transmitting link pulses at a 100 Mbps rate.	Green
1000 Mbps	When lit, indicates the adapter is connected to a valid link partner and is receiving and transmitting link pulses at a 1000 Mbps rate.	Green

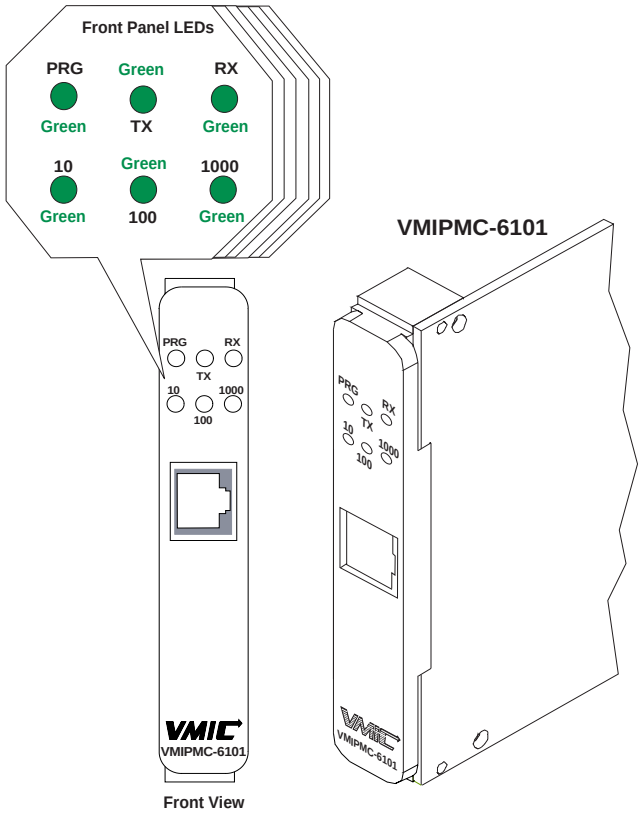


Figure 1-5 Location of Status LEDs and Definitions

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Additional Setup and Configuration

The VMIPMC-6101 adapter supports a wide range of advanced networking features.

Adapter Teaming: Maximize throughput and fault tolerance in your servers with:

- Adapter Fault Tolerance (AFT) - Provides automatic redundancy for your adapter. If the primary adapter fails, the secondary takes over. Adapter Fault Tolerance supports two to eight adapters per team, at any combination of speeds.
- Adaptive Load Balancing (ALB) - Allows balancing of the transmission data flow among two to eight adapters. Also includes the AFT option. Works with any gigabit switch. All adapters must run at the same speed.
- Cisco Gigabit EtherChannel (GEC) - Creates a team of two to eight adapters to increase transmission and reception throughput. Also includes AFT option. Requires a switch with Cisco GEC capability.

Virtual LAN (VLAN): Improves network security and efficiency by creating VLANs for your workgroups.

Intel PROSet: Use this Windows based utility to easily set up teams or run diagnostics. Installs automatically in Windows NT 4.0. For Windows 2000, install with the Intel setup program.

Speed and Duplex: Adapter default is set to Auto Negotiation Enabled. This mode automatically sets the best speed and duplex combination for most switches that also support Auto Negotiation.

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Troubleshooting

If you cannot link to your switch, try the following:

1. **Check the LEDs on the adapter** (see Table 1-1 on page 23 for LED definitions).

If the 10, 100 or 1000 Mbps LED is not on, check all connections at the link partner. Make sure the link partner is set to match the adapter (preferably set to Auto Negotiation Enabled) and the driver is loaded.

2. **Make sure the cable is installed properly.**

The network cable must be securely attached at all connections. If the cable is attached but the problem persists, try a different cable.

3. **Test the adapter.**

Run the adapter and network tests described in Test the Adapter (for Windows operating systems only).

4. **Check "Common Problems", Table 1-2 on page 27 and try the recommended solutions.**

If you still have problems, contact VMIC Customer Service.

VMIC Customer Service is available at: 1-800-240-7782.
Or E-mail us at customer.service@vmic.com

Test the Adapter

Diagnostic software is available with the Windows NT driver that allows you to test the adapter to see if there are any problems with the adapter hardware, the cabling, or the network connection. It is a good idea to run diagnostic tests every time you install an adapter. You can also use diagnostics to isolate problems during troubleshooting.

NOTE: The diagnostic software can only be used with Windows operating systems.

Windows NT Procedure

1. Double-click the Network icon in the Control Panel. Then go to the Adapter tab and click Properties to start the diagnostic utility.
2. In PROSet, click on PRO/1000 Gigabit Ethernet Adapter to select it (this is used with VMIC's VMIPMC-6101 Ethernet Adapter).
3. Click the Diagnostics tab. A list of available tests will be displayed.
4. Click Run Tests. You can also select/deselect individual tests with the check boxes. If an error is detected, information about the error will be displayed.
5. Repeat steps 2 - 4 for each VMIPMC-6101 Gigabit Ethernet Adapter installed in the computer.

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PCI Configuration Troubleshooting

Some PCI bus computers require additional steps to configure a PCI bus-compliant adapter. Try the following if you are having problems configuring the adapter:

- Disable PnP in the BIOS. In some computers, you may need to use the PCI BIOS Setup program to disable PnP if resources are not properly assigned to adapters and other add-in cards.
- Enable the PMC site. In some PCI computers, you may need to use the PCI BIOS Setup program to enable the PMC site. This is especially common in PCI computers with PhoenixBIOS.
- Enable the PMC site for bus master. Some PCI BIOS Setup programs require you to enable the slot for bus master / master. Check your PCI BIOS Setup program and the computer's documentation to make sure the slot is set for bus master / master.
- Configure the PMC site for level-triggered interrupts. The PMC site the adapter is using must be configured for level-triggered interrupts, not edge-triggered interrupts. Check your PCI BIOS Setup program to make sure triggering is set up.
- Reserve interrupts and / or memory addresses for ISA adapters. This prevents PCI bus compliant adapters from trying to use the same settings as ISA cards. Check your PCI BIOS Setup program; there may be IRQ options such as Enable for ISA or Disable for PCI.

Here are some examples of PCI BIOS Setup program parameters:

PMC Site#:	Site where the adapter is installed.
Master:	ENABLED
Slave:	ENABLED
Latency timer:	40 - 80
Interrupt:	Choose any one of several that the BIOS Setup provides.
Edge-level	Level

The exact wording of the parameters varies with different computers.

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Common Problems and Solutions

Table 1-2 Common Problems and Solutions

Problem	Solution
Your computer can't find the adapter	• Make sure the adapter is seated firmly on the connectors. • Try a different PMC site bus master site (if available). See your hardware documentation to identify bus master site. • Try a different VMIPMC-6101 PMC Gigabit Ethernet Adapter.
Diagnostics pass but the connection fails	• Make sure the network cable is securely attached.
An adapter stopped working after you installed the VMIPMC-6101	• Make sure the cable is connected to the VMIPMC-6101 adapter and not to another adapter. • Check for a resource conflict. See PCI Configuration Troubleshooting. • Make sure both adapters are seated firmly in the slot. • Check all cables.
The adapter stopped working without apparent cause	• Try reseating the adapter. • The network driver files may be damaged or deleted. Reinstall the drivers. • Try a different VMIPMC-6101 (if available).
The 10, 100 or 1000 Mbps LEDs do not light	• Make sure you have loaded the adapter driver. • Check all connections at the adapter and the buffered repeater or switch. • Try another port on the buffered repeater or switch. Check that the port is configured for 1000 Mbps and full duplex.
RX or TX LED does not light	• Make sure you have loaded the network drivers. • Network may be idle; try logging in from a workstation. • The adapter is not transmitting or receiving data; try another adapter (if available).

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Maintenance

Maintenance

This section provides information relative to the care and maintenance of VMIC's products. If the product malfunctions, verify the following:

- Software
- System configuration
- Electrical connections
- Jumper or configuration options
- Boards are fully inserted into their proper connector location
- Connector pins are clean and free from contamination
- No components of adjacent boards are disturbed when inserting or removing the board from the chassis
- Quality of cables and I/O connections

If the product must be returned, contact VMIC for a Return Material Authorization (RMA) Number. **This RMA Number must be obtained prior to any return**.

Contact VMIC customer Service at 1-800-240-7782, or
E-mail: customer.service@vmic.com .

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Maintenance Prints

User level repairs are not recommended. The drawings and tables in this manual are for reference purposes only.

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