

# Installation and Operation Manual

## PENTAGRAM horNET Giga PCI (P6111-1)



*The latest versions of manual, drivers and applications are available on  
[www.pentagram.eu](http://www.pentagram.eu)*

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## ***Introduction***

Thank you for purchasing a PENTAGRAM network interface card! We are convinced that it will meet your expectations and will provide a reliable experience.

The purpose of this manual is to explain the installation and operation of the card, and to provide useful information on certain aspects of computer networks.

A glossary is provided at the end of this manual to clarify any unfamiliar terms which you may encounter while reading this document.

A network interface card (or NIC) is a device which allows your computer to connect to a network. It supports fast data interchange with other users, and the network connection will enable you to work more productively and to play the latest multiplayer games with your friends.

The PENTAGRAM horNET Giga PCI (P6111-1) network interface card is based on the state-of-the-art Realtek RTL8169SC chip, which is a Fast Ethernet controller contained in a single highly integrated circuit. The chip supports the ACPI (Advanced Configuration Power Interface) functionality for PCI cards to ensure efficient power management under operating systems which feature the OSPM (Operating System Power Management) technology.

## ***Package content***

- PENTAGRAM horNET Giga PCI (P6111-1) network interface card
- CD with drivers for most operating systems
- Operating manual

## ***System requirements***

- PC with a Pentium 200 MHz or equivalent CPU (or faster)
- Available PCI slot
- At least 32 MB RAM
- 30 MB free hard disk space
- CD drive
- Operating system: Microsoft Windows NT 4.0, Windows 98/98SE, Windows Me, Windows 2000, Windows XP/XP 64-bit or Linux.

## Features

- One port with automatic MDI/MDI-X switching, enabling the card to be connected quickly to a switch or another computer.
- Jumbo Frames support to ensure high performance in new applications which require large frame transfers (graphics and video editing applications).
- Auto-negotiation: speed (1000/100/10 Mbps) and full duplex/half duplex.
- Support for back-pressure (half-duplex) and IEEE802.3x (duplex) flow control to prevent errors when transmitting and receiving data at different speeds.
- Status LEDs for quick network operation diagnostics.
- Full duplex support to double the effective network bandwidth.
- Wake-on-LAN (for PCI 2.2).
- 32-bit PCI Bus Master support for high performance at low CPU load.
- PCI 2.1 and PCI 2.2 compliance.
- Automatic IRQ (interrupt request) and I/O (input/output) address configuration.

## Technical specifications

Data rate	10 Mbps, 100 Mbps, 1000 Mbps (autonegotiation)
Transfer mode	10/100 Mbps half-duplex, full duplex (autonegotiation) 1000 Mbps duplex
Standards supported	<ul style="list-style-type: none"> <li>• IEEE 802.3: 10Base-T</li> <li>• IEEE 802.3u: 100Base-TX</li> <li>• IEEE 802.3ab: 1000Base-T</li> <li>• IEEE 802.3x: flow control support with full duplex</li> <li>• IEEE 802.1p: Layer 2 QoS</li> <li>• IEEE 802.1q: Virtual LAN (VLAN) Tag and Jumbo Frame support</li> </ul>
Interface	One shielded RJ-45 connector with automatic crossover sensing (Auto MDIX)
System bus	PCI version 2.2
Cabling and connectors	RJ-45 (10Base-T): UTP Cat. 3, 4 or 5 RJ-45 (100Base-TX): UTP Cat. 5 RJ-45 (1000Base-T): UTP Cat. 5
Status LEDs	Two connection activity LEDs: 1000 Mbps and 10/100 Mbps
Operating temperature	0 to 45°C (32 to 113°F)
Humidity	5-95% (non-condensing)

## Installation

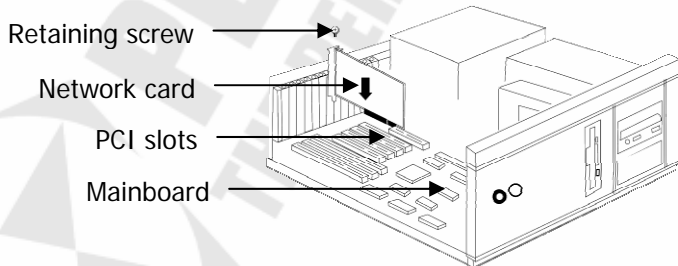
### Installing the card in your computer

Ensure that you have sufficient workspace on your desk to perform the installation, and then proceed as follows:

1. **Turn off your computer** (it is recommended to switch off the power supply or disconnect the power cord from the computer).
2. Open the computer's case.
3. Select a vacant **PCI** slot.

Port appearance	Port name
	PCI-Express x16
	AGP
	AGP Pro
	PCI

4. Insert the card gently into the selected PCI slot, and then attach it to the chassis using a screw.



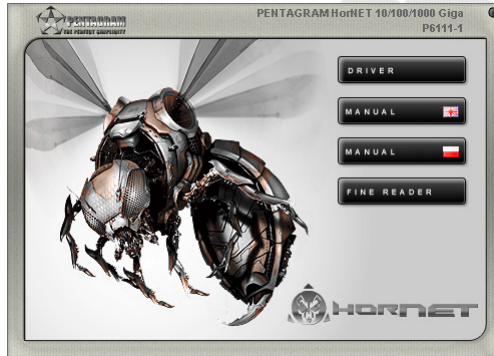
5. Attach the appropriate network cable to the connector on the network interface card.
6. Close the case, connect the power cord and start the computer.

## Driver installation

The CD supplied with the card contains drivers for popular operating systems, i.e. for the Windows family of systems and for Linux-based systems (all stable 2.4.x and 2.6.x kernels). Driver installation under Windows is explained below.

When the system is launched for the first time after installing the card, a message will display that a new "Ethernet Controller" device has been detected. Close the dialog box and perform the following steps to install the driver:

1. Insert the driver CD into the CD-ROM drive.
2. The setup wizard will be launched automatically. If the CD-ROM Autorun feature is disabled, run **Setup.exe** in the CD's root directory.



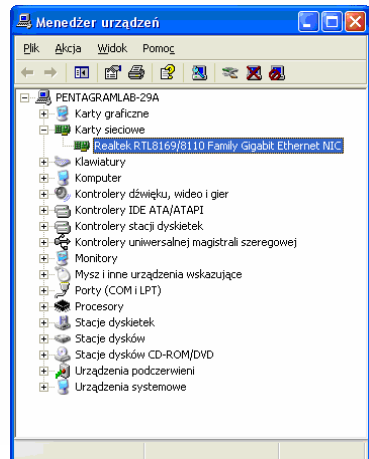
3. Click **Driver**.
4. The driver will be installed and the "Driver Install Completed" message will be displayed.

## Validating the installation

In order to validate the device installation, click on the **Start** menu and select (**Settings >**) **Control Panel**. In the Control Panel, select **System** and then:

- under Windows XP/XP 64-bit, 2000 or Me, select **Hardware** and click **Device Manager**;
- under Windows 98/98SE, select **Device Manager**.

A new device should appear under the **Network Adapters** node:  
Realtek RTL8169/8110 Family Gigabit Ethernet NIC.



## Cabling

To ensure that the device can transfer data at the desired speeds, networking cables must meet appropriate standards.

**1000 Mbps:** Data transfer at 1000 Mbps requires Cat. 5 cables (Cat. 5e recommended) with all four wire pairs terminated in an RJ-45 connector. For a straight-through cable, both connectors must be terminated according to the EIA/TIA 568B wiring standard. For a crossover cable, one connector must follow EIA/TIA 568A and the other must follow EIA/TIA 568B.

**100 Mbps:** Data transfer at 100 Mbps requires a Cat. 5 cable with correctly terminated connectors (see 1000 Mbps); this standard only uses two wire pairs.

**10 Mbps:** Data transfer at 10 Mbps requires Cat. 3, 4 or 5 cables with correctly terminated connectors (see 1000 Mbps). This standard also only uses two wire pairs.

## Status LEDs

Two LEDs are located on the card's bracket (the metal part visible on the outside of the computer), which indicate the card's connection speed and port activity.

Designation	Color	Function
1000 ACT	Green	On: 1000 Mbps connection Flashing: Data transfer
10/100 ACT	Orange	On: 100 Mbps connection Flashing: Data transfer

## PING

A method commonly used to verify correct network operation is to use the PING command, which can be run from the command line interface. In order to open the command line dialog under Windows 95, 98 or Me, open the **Start** menu, select **Run** and then type `COMMMAND.COM` and click **OK**. Under Windows 2000 and XP, use the same procedure to launch the command line interface, replacing `COMMMAND.COM` with `CMD.EXE`. PING syntax is explained below.

```
PING [options] target_name
```

The following options are available:

- t Ping the specified host until stopped.
- a To see statistics and continue - type Control-Break; To stop - type Control-C.
- r Resolve addresses to hostnames.
- n count Number of echo requests to send.
- l size Send buffer size.
- f Set Don't Fragment flag in packet.
- i TTL Time To Live.
- v TOS Type Of Service.
- r count Record route for count hops.
- s count Timestamp for count hops.
- j host-list Loose source route along host-list.
- k host-list Strict source route along host-list.
- w timeout Timeout in milliseconds to wait for each reply.

An example of the simplest usage for the command is as follows:

```
ping computer2
```

where `computer2` is the name of the computer with which you want to check connectivity.

If everything works correctly, the system should respond with a message similar to the one below.

```
Pinging komputer2 [192.168.2.2] with 32 bytes of data:
```

```
Reply from 192.168.2.2: bytes=32 time<1 ms TTL=128
Reply from 192.168.2.2: bytes=32 time<1 ms TTL=128
Reply from 192.168.2.2: bytes=32 time<1 ms TTL=128
Reply from 192.168.2.2: bytes=32 time<1 ms TTL=128
```

```
Ping statistics for 192.168.2.2:
```

```
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milliseconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

The above messages show examples of results obtained by running PING. Your results may vary, although the differences should not be significant. Packet round trips should be as short as possible, however if the cable between computers is very long or of low quality, they may be higher than in the example above.

Extended response times or lost packets may result from a number of reasons, including:

- network congestion
- large network (multiple interconnected subnets)
- poor quality of the connection cable
- connection at 10 Mbps.

## ***Glossary of key terms***

The purpose of this section is to explain some of the most important concepts related to computer networks.

### **Ethernet**

Ethernet is a highly popular networking system developed by Xerox. Depending on version, it supports data transfers at 10 Mbps, 100 Mbps or 1000 Mbps. Ethernet uses CSMA/CD (Carrier Sense Multiple Access/Collision Detection) technology for network access, making it possible for workstations to share a single cable (although only one workstation can use the cable at any given time). A short description of various Ethernet standards is provided below, including information on cable types and maximum segment lengths.

### **Ethernet standards**

- **10Base-2**  
Also known as 'thin' Ethernet (Thinnet); data rate: 10 Mbps; coaxial cable; maximum segment length: 185 m (607 ft).
- **10Base-5**  
Also known as 'thick' Ethernet (Thicknet); data rate: 10 Mbps; coaxial cable; maximum segment length: 500 m (1,640 ft).
- **10Base-T**  
Data rate: 10 Mbps; twisted pair cable; maximum segment length: 100 m (328 ft).
- **10Broad-36**  
Data rate: 10 Mbps; coaxial cable; maximum segment length: 3,600 m (11,800 ft).
- **10Base-F**  
Data rate: 10 Mbps; fiber optic cable; maximum segment length: 4 km (2,5 mi).
- **100BaseTX**  
Data rate: 100 Mbps; maximum segment length: 100 m (328 ft).
- **100Base-T**  
Data rate: 100 Mbps; maximum segment length: 100 m (328 ft).
- **100VG-AnyLAN**  
Data rate: 100 Mbps, demand priority access; maximum segment length: 150 m (492 ft).

### **Topologies**

- **Bus**  
With the bus topology, all workstations are connected to a single cable (trunk). The information transferred reaches all workstations, but is only picked up by the one to which it has been transmitted.
- **Star**  
With the star topology, workstations are connected to hubs. Depending on the hub used, the information transferred reaches all workstations or is transmitted between individual workstations.
- **Star-Configured Ring**  
With this topology, workstations are configured physically as a star, however signals are transmitted from station to station as in a ring configuration. A typical example of this type of network is Token Ring.

- **Star/Bus Configuration**

This standard combines two topologies, where groups of workstations connected into stars are linked in the same manner as individual workstations on a bus.

## Protocols

- **TCP/IP**

TCP/IP (Transmission Control Protocol/Internet Protocol) combines two protocols, i.e. TCP (Transmission Control Protocol) and IP (Internet Protocol). TCP is responsible for the connection to the terminal system, supporting flow control, packet receipt acknowledgement, packet sequencing, checksum validation and resending. IP defines packet format and addressing. The address space and IP address format depend on IP version:

IP version	Address space	Sample IP address
IPv4	32-bit	192.168.2.2
IPv6	128-bit	FEDC:BA98:7654:3210:FEDC:BA98:7654:3210

- **NetBEUI**

NetBEUI is supported by the Microsoft Windows family of systems (from Windows for Workgroups onwards), and is closely related to NetBIOS, providing transport services as requested by NetBIOS.

- **NetBIOS**

NetBIOS is an interface designed for programmers who develop IBM LAN Server, Microsoft LAN Manager and OS/2 local area networking software.

It establishes communications sessions between computers and manages the connections.

- **IPX**

IPX is a peer-to-peer networking protocol built into Novell NetWare.

## Organizational units

- **Workgroups**

Workgroups provide a simple method for organizing computers and users on a local area network into logical groupings. They support the definition of various privileges for individual groups, and make it easier to manage the network.

- **Domains**

Like workgroups, domains are designed to facilitate network management. The hierarchy of domains is similar to that of a nation, with the country (main domain), states (subdomains of the main domain), counties (subdomains of subdomains), and so on. Depending on its place in the hierarchy, each domain can have different privileges, which helps enforce network security.

## Other

- **DHCP**

DHCP (Dynamic Host Configuration Protocol) supports automatic TCP/IP configuration (IP address assignment, DNS configuration, default gateway configuration, etc.). A DHCP server assigns arbitrary IP addresses to computers using a specific pool, or specific settings, depending on configuration.

- **DNS (Domain Name Service)**

DNS is a service available on TCP/IP-based networks which assigns easy-to-remember names (e.g. computer.domain.com) to numeric addresses (e.g. 198.168.148.144). Programs such as Telnet, SMTP or FTP use DNS to locate an IP address on the basis of the name provided.

- **Gateway**

A gateway is used to connect networks while providing protocol, data structure format, language and/or architecture translation.

- **Router**

A router connects local area networks or wide area networks, and controls the flow of packets between these networks. If more than one possible connection exists between two networks, the router will select the most efficient or cost-effective route.

- **Segment**

In an Ethernet environment, a segment means a section of a cable which serves as a bus. Signals broadcast within a segment reach every workstation connected to that segment.

- **Host**

A host is a device (e.g. a computer or a printer) to which a network address is assigned.

- **WINS**

WINS (Windows Internet Name Service) supports distinguishing between computer names by translating them to assigned IP addresses, and performs a reverse process, i.e. resolves IP addresses to Windows names.

- **Hub**

A hub is a device used to transmit signals or data from one computer to all other computers connected to that hub.

- **Switching Hub**

A switching hub differs from a standard hub with increased performance and the ability to offload the network. Higher performance and reduced network load are achieved by using the port switching functionality, and specifically by transmitting data only to the target computers (a standard hub transmits data to all computers, thus significantly congesting the network).



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